



# SANKEN POWER TRANSISTORS

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# Contents

# SANKEN POWER TRANSISTORS

Transistor Selection Guide ..2	B1420.....45	C4073 .....87	C5130 .....129
Reliability.....6	B1559.....46	C4130 .....88	C5239 .....130
Temperature Derating in	B1560.....47	C4131 .....89	C5249 .....131
Safe Operating Area.....9	B1570.....48	C4138 .....90	C5271 .....132
Accessories.....9	B1587.....49	C4139 .....91	C5287 .....133
Switching Characteristics	B1588.....50	C4140 .....92	C5333 .....134
Test Circuit.....10	B1624.....51	C4153 .....93	C5370 .....135
Symbols and Term.....10	B1625.....52	C4296 .....94	D1769 .....136
A1186.....11	B1626.....53	C4297 .....95	D1785 .....137
A1215.....12	B1647.....54	C4298 .....96	D1796 .....138
A1216.....13	B1648.....55	C4299 .....97	D2014 .....139
A1262.....14	B1649.....56	C4300 .....98	D2015 .....140
A1294.....15	B1659.....57	C4301 .....99	D2016 .....141
A1295.....16	C2023 .....58	C4304 .....100	D2017 .....142
A1303.....17	C2837 .....59	C4381/2 .....101	D2045 .....143
A1386/A.....18	C2921 .....60	C4388 .....102	D2081 .....144
A1488/A.....19	C2922 .....61	C4418 .....103	D2082 .....145
A1492.....20	C3179 .....62	C4434 .....104	D2083 .....146
A1493.....21	C3263 .....63	C4445 .....105	D2141 .....147
A1494.....22	C3264 .....64	C4466 .....106	D2389 .....148
A1567.....23	C3284 .....65	C4467 .....107	D2390 .....149
A1568.....24	C3519/A.....66	C4468 .....108	D2401 .....150
A1667/8.....25	C3678 .....67	C4495 .....109	D2438 .....151
A1673.....26	C3679 .....68	C4511 .....110	D2439 .....152
A1693.....27	C3680 .....69	C4512 .....111	D2493 .....153
A1694.....28	C3830 .....70	C4517/A.....112	D2494 .....154
A1695.....29	C3831 .....71	C4518/A.....113	D2495 .....155
A1725.....30	C3832 .....72	C4546 .....114	D2557 .....156
A1726.....31	C3833 .....73	C4557 .....115	D2558 .....157
A1746.....32	C3834 .....74	C4662 .....116	D2560 .....158
A1859/A.....33	C3835 .....75	C4706 .....117	D2561 .....159
A1860.....34	C3851/A.....76	C4883/A.....118	D2562 .....160
A1907.....35	C3852/A.....77	C4886 .....119	D2589 .....161
A1908.....36	C3856 .....78	C4907 .....120	SAH02 .....162
A1909.....37	C3857 .....79	C4908 .....121	SAH03 .....163
B1257.....38	C3858 .....80	C5002 .....122	Discontinued Parts
B1258.....39	C3890 .....81	C5003 .....123	Guide .....164
B1259.....40	C3927 .....82	C5071 .....124	
B1351.....41	C4020 .....83	C5099 .....125	
B1352.....42	C4024 .....84	C5100 .....126	
B1382.....43	C4064 .....85	C5101 .....127	
B1383.....44	C4065 .....86	C5124 .....128	

# Transistor Selection Guide

## V<sub>CEO</sub>-I<sub>C</sub>

Collector-Emmitter Voltage V <sub>CEO</sub> (V)	800		C3678 C4020 C4299 C4304 C4445 C4908		C3679 C4300		C3680 C4301 C5002 C5003		C5124							
	600		C5249								C4706					
	550		C4517 C4517A C5239		C4518 C4518A C5287				C3927 C4557							
	500					C3830 C4907			C3831							
	400				C4073 C4418 C4662 C5130		C3832 C3890 C4130 C4546		C4138 C4296	C3833 C4297 C5071	C4139 C4298 C4434			C4140		
	380					D2141										
	300	C2023 C5333														
	250					D2017										
	230											A1294 C3263		A1295 C3264		
	200	A1668 C4382	D2016		C5271 D2557 D2558							A1493 C3857		A1494 C3858		
	180	A1859A C4883A										A1386A A1492 A1673 C3519A C3856 C4388		A1216 C2922		
	160											A1215 A1386 C2921 C3519				
	150	A1667 A1859 C4381 C4883						B1559 B1587 D2389 D2438	A1186 B1560 B1588 C2837 D2390 D2439	B1570 D2401	A1303 A1860 C3284 C4886	B1647 B1649 D2560 D2562		B1648 D2561		
	140								A1695 A1909 C4468 C5101							
	120			D2015		D1769 D1785 D2045	C3834 C3835 C4153	A1694 A1908 C4467 C5100	B1259 D2081				B1382 B1420 D2082			B1383 D2083
	110					B1624 B1625 B1626 B1659 D2493 D2494 D2495 D2589										
	100					B1258										
80		C3852A	A1488A C3851A D2014		A1693 A1725 A1726 A1907 C4466 C4511 C4512 C5099											
60		C3852	A1262 A1488 B1257 C3179 C3851 D1796							A1568 B1351 B1352 C4065						
50		C4495							C4024	A1567 A1746 C4064 C5370	C4131					
40																
		2	3	4	5	6	7	8	10	12	14	15	16	17	18	25
		Collector Current I <sub>C</sub> (A)														

# Transistor Selection Guide

## ■ Transistors for Switch Mode Power Supplies (for AC80–130V input)

V <sub>CB0</sub> (V)	V <sub>CE0</sub> (V)	I <sub>c</sub> (A)	MT-25 (TO220)	FM20 (TO220F)	MT-100 (TO3P)	FM100 (TO3PF)	
250	200	5		C5271			
500	400	5		C4073			
				C4418			
				C4662			
		7	C3832	C3890			
				C4130			
		10			C4138	C4296	
		12				C3833	C4297
						C5071	
		15				C4139	C4298
				C4434			
18				C4140			
600	400	5		C5130			
		7		C4546			
	500	6	C3830	C4907			
		10			C3831		
	600	3		C5249			

## ■ Transistors for Switch Mode Power Supplies (for AC180–280V input)

V <sub>CB0</sub> (V)	V <sub>CE0</sub> (V)	I <sub>c</sub> (A)	MT-25 (TO220)	FM20 (TO220F)	MT-100 (TO3P)	FM100 (TO3PF)
900 (1000)	550	3	C5239	C4517(A)		
		5		C4518(A)	C5287	
		10			C3927	C4557
	600	14			C4706	
900	800	3	C4020	C4908		
					C3678	C4299
				C4304		C4445
		5			C3679	C4300
		7			C3680	C4301

# Transistor Selection Guide

## Transistors for Audio Amplifiers

### ■ Single Transistors

#### ● Single Emitter

Type No.	Pc(W)	VCE0(V)	Ic(A)	hFE(min)	f <sub>T</sub> (MHz)	Package
2SA1725/2SC4511	30	80	6	50	20	FM20 (TO220F)
2SA1726/2SC4512	50					MT-25 (TO220)
2SA1693/2SC4466	60					MT-100 (TO3P)
2SA1907/2SC5099	60					FM100 (TO3PF)
2SA1908/2SC5100	75	120	8			MT-100 (TO3P)
2SA1694/2SC4467	80					MT-100 (TO3P)
2SA1909/2SC5101	80	140	10			FM100 (TO3PF)
2SA1673/2SC4388	85	180	15			MT-100 (TO3P)
2SA1695/2SC4468	100	140	10			
2SA1492/2SC3856	130	180	15			
2SA1493/2SC3857	150	200	15			
2SA1494/2SC3858	200		17			MT-200 (2-screw mount)

#### ● LAPT (Multi emitter for High Frequency)

Type No.	Pc(W)	VCE0(V)	Ic(A)	hFE(min)	f <sub>T</sub> (MHz)	Package
2SA1860/2SC4886	80	150	14	50	50	FM100 (TO3PF)
2SA1186/2SC2837	100		10		60	MT-100 (TO3P)
2SA1303/2SC3284	125		14		50	
2SA1386/2SC3519	130	160	15		40	
2SA1386A/2SC3519A	130	180			35	
2SA1294/2SC3263	130	230			50	
2SA1215/2SC2921	150	160	17		40	MT-200 (2-screw mount)
2SA1216/2SC2922	200	180			35	
2SA1295/2SC3264	200	230				



# Transistor Selection Guide

## Darlington Transistors

Type No.	Pc(W)	VCE0(V)	Ic(A)	hFE(min)	f <sub>T</sub> (MHz)	Package		
2SB1626	30	110	6	5000	100	FM20 (TO220F)		
2SD2495					60			
2SB1659	50				100	MT-25 (TO220)		
2SD2589					60			
2SB1624	60				100	MT-100 (TO3P)		
2SD2493					60			
2SB1625	60				100	FM100 (TO3PF)		
2SD2494					60			
2SB1587	75				150		8	65
2SD2438								80
2SB1559	80	10	65	MT-100 (TO3P)				
2SD2389			80					
2SB1588	80	15	50	FM100 (TO3PF)				
2SD2439			55					
2SB1649	85		200			45		
2SD2562						70		
2SB1560	100	150	10	50		MT-100 (TO3P)		
2SD2390				55				
2SB1647	130		15	45				
2SD2560				70				
2SB1570	150		12	50	MT-200 (2-screw mount)			
2SD2401				55				
2SB1648	200		17	45				
2SD2561				70				

## Temperature compensation Transistors and Driver Transistors

Type No.	Pc(W)	VCE0(V)	Ic(A)	hFE(min)	f <sub>T</sub> (MHz)	Package	Remarks
2SC4495	25	50	3	500	40	FM20 (TO220F)	Temperature compensation
2SC4883	20	150	2	60	120		Driver, Complement 2SA1859
2SC4883A		180					Driver, Complement 2SA1859A
2SA1859	20	-150	-2	60	60		Driver, Complement 2SC4883
2SA1859A		-180					Driver, Complement 2SC4883A

# Reliability

## 1. Definition of Reliability

The word reliability is an abstract term which refers to the degree to which equipment or components, such as semiconductor devices, are resistant to failure. Reliability can be and is often measured quantitatively. Reliability is defined as "whether equipment or components (such as a semiconductor device) under given conditions perform the same at the end of a given period as at the beginning."

## 2. Reliability Function

In general, there are three types of failure modes in electronic components:

1. Infant failure
2. Random failure
3. Wear-out failure

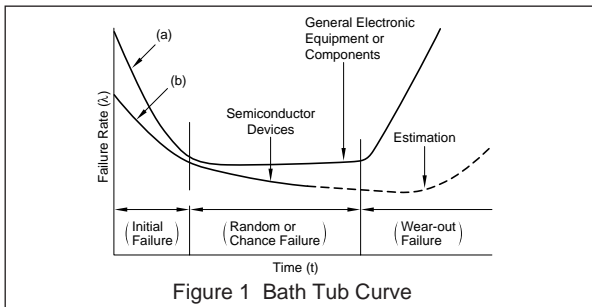


Figure 1 Bath Tub Curve

These three types of failure describe "bathtub curve" shown in Figure 1. Infant failures can be attributed to trouble in the production process and can be eliminated by aging before shipment to customers, stricter control of the production process and quality control measures. Semiconductor devices such as transistors, unlike electronic equipment, take a considerable amount of time to reach the stage where wear-out failure begins to occur. And, as shown in Figure 1 (b), they also last much longer than electronic equipment. This shows that the longer they are used the more stable they actually become.

The reduction that occurs in random failures can be approximated by Weibull distribution, logarithmic normal distribution, or gamma distribution, but Weibull distribution best expresses the phenomenon that occurs with transistors.

## 3. Quantitative Expression of Reliability

While there are many ways to quantitatively express reliability, two criteria, failure rate and life span, are generally used to define the reliability of semiconductors such as transistors.

### a) Failure Rate (FR)

Failure rate often refers to instantaneous failures or  $\lambda(t)$ . In general of reliability theory, however, the cumulative failure rate, or Reliability Index, is

$$F \cdot R = \frac{r(t)}{N \cdot t} \dots \dots \dots (1)$$

Where N = Net quantity used, and  
r(t) = Net quantity failed after t hours

If we assign t the arbitrary

$$F \cdot R = \frac{r}{N} \times 100 (\%/1,000 \text{ hours}) \dots \dots \dots (2)$$

In situations where the cumulative failure rate is small, failure is expressed in units of one Fit,  $10^{-9}$  (failures/hours).

### b) Life Span(L)

Life Span can be expressed in terms of average lifespan or as Mean Time Between Failure (MTBF), but assuming that random failure is shown by the Index Distribution [ $\lambda(t) = \text{constant}$ ], then Life Span or L can be shown by the equation

$$L = \frac{1}{F \cdot R} (\text{hours}) \dots \dots \dots (3)$$

## 4. Applications Considered on Reliability

- a) The type and specifications of our transistors and semiconductor devices vary depending on the application that will be required by their intended use. Customer should, therefore, determine which type will best suit their purposes.
- b) Note that high temperatures or long soldering periods must be avoided during soldering, as heat can be transmitted through external leads into the interior. This may cause deterioration if the maximum allowable temperature is exceeded.
- c) When using the transistor under pulse operation or inductive load, the Safe Operating Area (SOA) for the current and voltage must not be exceeded (Figure 2).

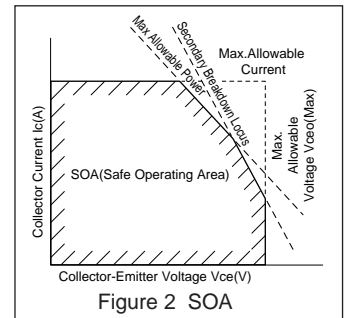


Figure 2 SOA

- d) The reliability of transistors and semiconductor devices is greatly affected by the stress of junction temperature. If we accept in general proceed in the form of Arrhenius equation, the relationship between the junction temperature  $T_j$  and lifespan L can be expressed with the following empirical formula

$$\ln L = A + \frac{B}{T_j} \dots \dots \dots (4)$$

It is, hence, very important to derate the junction temperature to assure a high reliability rate.

## 5. Reliability Test

Sanken bases its test methods and conditions on the following standards. Tests are conducted under these or stricter conditions. The details of these are shown in Table 1.

- MIL-STD-202F (Test method for electrical and electronic components)
- MIL-STD-750C (Test method for semiconductor equipment)
- JIS C 7021 (Endurance test and environmental test method for individual semiconductor devices)
- JIS C 7022 (Endurance test and environmental test method for integrated circuits of semiconductors)

## 6. Quality Assurance

To ensure high quality and high reliability, quality control and production process control procedures are executed from the receipt of parts through the entire production process. Our quality assurance system is shown in Figure 3.



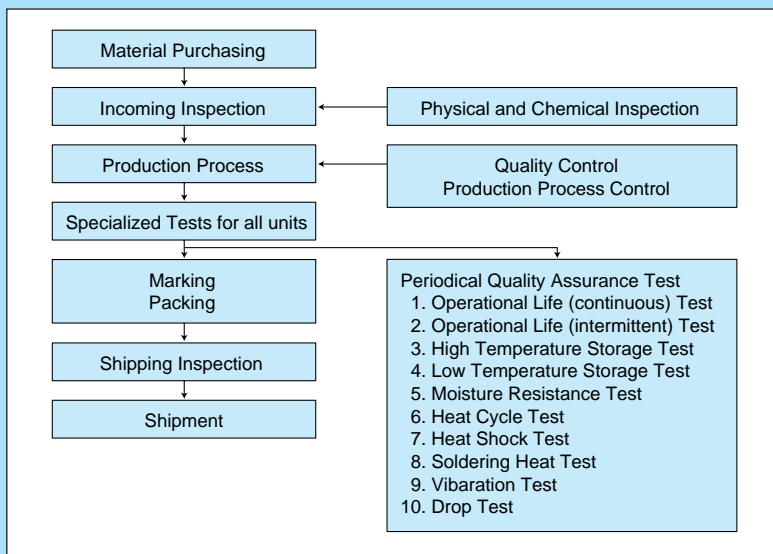
# Reliability

Table 1: Test Methods and Conditions

Test	Details of the Testing Method	LTPD(%)
Continuous Operations Test	Collector dissipation with maximum junction temperature is applied continuously at room temperature to judge lifespan and reliability under transistor operating conditions.	*5/1000hrs
Intermittent Operation Test	Power equal to that used in the Continuous Operations Test is applied intermittently to test the transistor's lifespan and reliability under on and off conditions.	5/1000hrs
High Temperature Storage Test	Confirms the highest storage temperature and operating temperature of transistors.	5/1000hrs
Low Temperature Storage Test	Confirms the lowest storage temperature of transistors.	5/1000hrs
Moisture Resistance Test	Tested at RH=85% and TA=85°C for the effects of the interaction between temperature and humidity, and the effects of surface insulation between electrodes and high temperature/high humidity.	5/1000hrs
Heat Cycle Test	Tested at Tstg min – Room temp. – Tstg max – Room temp. for 10 cycles (one cycle 30 min. –5 min. –30 min. –5 min.) to detect mechanical faults and characteristic changes caused by thermal expansion and shrinkage of the transistor.	5
Heat Shock Test	Tested at 100°C (5 min.), 25°C (within 3 sec.), 0°C (5 min.) for 10 cycles to check for mechanical faults and characteristic changes caused by thermal expansion and shrinkage of transistor.	5
Soldering Heat Test	Tested at 260 ± 5°C, 10 ± 1 sec, by dipping lead wire to 1.5mm from the seating plane in solder bath to check for characteristic changes caused by drastic temperature rises of exterior lead wire.	5
Vibrations Test	Tested at amplitude 1.52mm, vibration frequency 10-55 Hz in directions of X, Y, Z, for 2 hours each (total 6 hours) to check for characteristic changes caused by vibration during operation and transportation.	5
Drop Test	Tested by dropping 10 times from 75 cm height to check for mechanical endurance and characteristic changes caused by shock during handling.	5

\* Reliability Standard : 60%

Figure 3 Quality Assurance System



# Reliability

## 7. Notes Regarding Storage, Characteristic Tests, and Handling

Since reliability can be affected adversely by improper storage environment and handling methods during Characteristic tests, please observe the following cautions.

### a) Cautions for Storage

1. Ensure that storage conditions comply with the standard temperature (5 to 35°C) and the standard relative humidity (around 40 to 75%) and avoid storage locations that experience extreme changes in temperature or humidity.
2. Avoid locations where dust or harmful gases are present, and avoid direct sunlight.
3. Reinspect for rust in leads and solderability that have been stored for a long time.

### b) Cautions for Characteristic Tests and Handling

1. When characteristic tests are carried out during inspection testing and other standard test periods, protect the transistor from surges of power from the testing device, shorts between the transistor and the heatsink

### c) Silicone Grease

When using a heatsink, please coat the back surface of the transistor and both surfaces of the insulating plate with a thin layer of silicone grease to improve heat transfer between the transistor and the heatsink.

Recommended Silicone Grease

- G-746 (Shin-Etsu Chemical)
- YG6260 (Toshiba Silicone)
- SC102 (Dow Corning Toray Silicone)

### d) Torque when Tightening Screws

Thermal resistance increases when tightening torque is small, and radiation effects are decreased. When the torque is too high, the screw can cut, the heatsink can be deformed, and/or distortion can arise in the product's frame. To avoid these problems, Table 2 shows the recommended tightening torques for each product type.

Table 2. Screw Tightening Torques

Package	Screw Tightening Torque
MT25 (TO-220)	0.490 to 0.686 N · m (5 to 7kgf · cm)
FM20 (TO-220 Full Mold)	0.490 to 0.686 N · m (5 to 7kgf · cm)
MT100 (TO-3P)	0.686 to 0.822 N · m (7 to 9kgf · cm)
FM100 (TO-3P Full Mold)	0.686 to 0.822 N · m (7 to 9kgf · cm)
MT200 (TO-3P two-point mount)	0.686 to 0.822 N · m (7 to 9kgf · cm)

### e) Soldering Temperature

In general, the transistor is subjected to high temperatures when it is mounted on the printed circuit board, whether from flow solder from a solderbath, or, in hand operations from a soldering iron. The testing method and test conditions (JIS-C-7021 standards) for a transistor's heat resistance during soldering are:

At a distance of 1.5mm from the transistor's main body, apply 260°C for 10 seconds, and 350°C for 3 seconds.

However, please stay well within these limits and for as short a time as possible during actual soldering.

# Reliability

## Temperature Derating in Safe Operating Area

Flange (case) temperature is typically described as 25°C, but it must be derated subject to the operating temperature.

This derating curve is determined by manufacturing conditions of devices, materials used etc. and in case of a silicon transistor, breakdown voltage and DC Current Gain are significantly deteriorated in the temperature range of 260°C to 360°C.

Hence, the collector current must be derated by using the derating curve in Fig.2 where the breakdown point is set at 260°C.

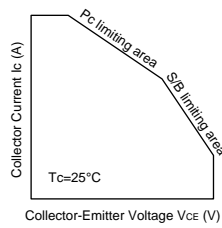


Fig.1 Safe Operating Area

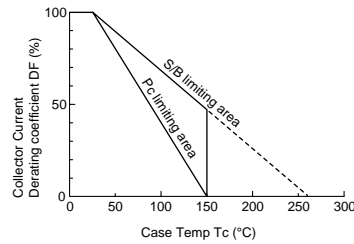


Fig.2 Derating Curve of Safe Operating Area

Derating coefficient is obtained from temperature in Fig.2 and it must be applied to the current value of the safe operating area in order to obtain the derated current.

## Accessories

- ☆ Sanken Transistors do not include accessories. Accessories may be attached at a cost if requested.
- ☆ Sanken transistor case is a standard size, and can be used with any generally sold accessories.

- Insulator: Mica, with a thickness of 0.06mm, +0.045 –0.005 allowance
- Insulation Bush for MT-25 (TO220)

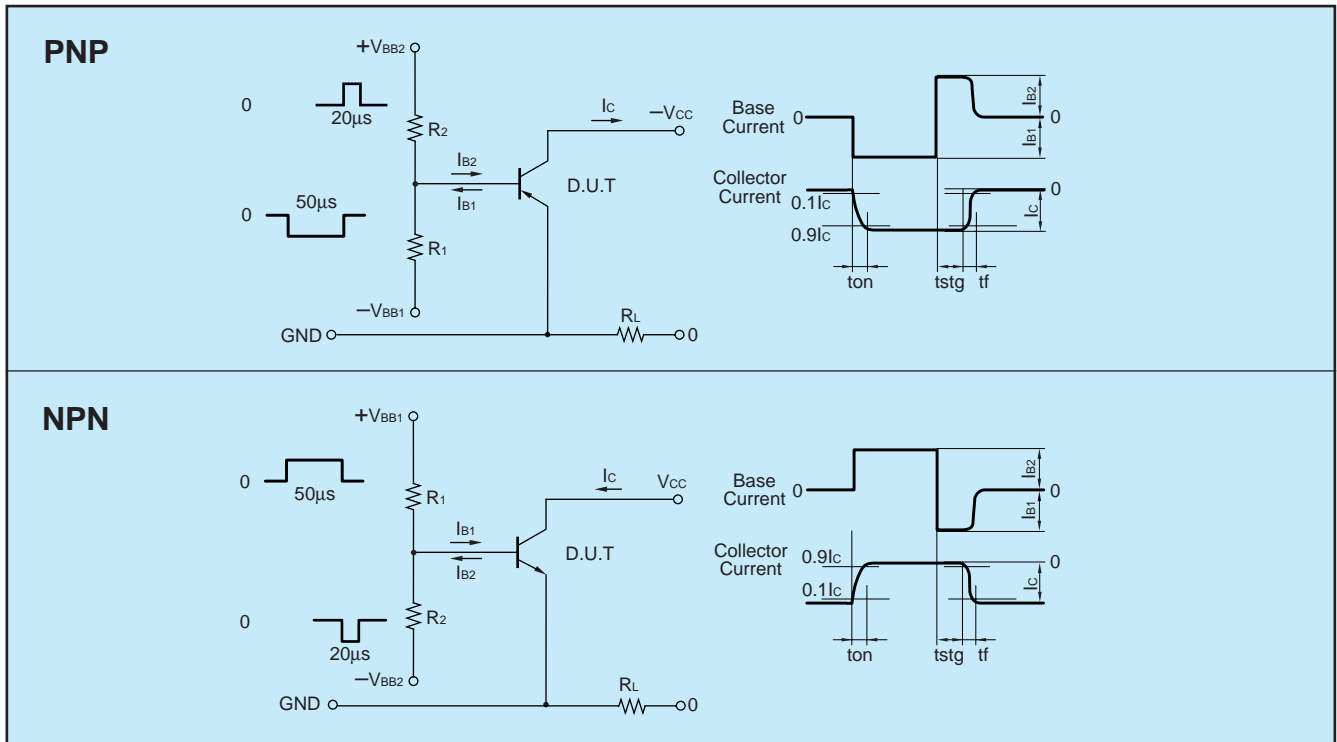
Type Name: Mold(10)Mica	Type Name: Mold(14)Mica	Type Name: Mold(9)Mica	

# Switching Characteristics

## Typical Switching Characteristics (Common Emitter)

$V_{CC}$ (V)	$R_L$ ( )	$I_C$ (A)	$V_{B2}$ (V)	$V_{BB1}$ (V)	$V_{BB2}$ (V)	$I_{B1}$ (A)	$I_{B2}$ (A)	$t_r$ ( $\mu s$ )	$t_{stg}$ ( $\mu s$ )	$t_f$ ( $\mu s$ )
-----------------	--------------	--------------	-----------------	------------------	------------------	-----------------	-----------------	----------------------	--------------------------	----------------------

## Switching Characteristics Test Circuit/Measurement Wave Forms



# Symbols

Symbol	Item	Definition
$V_{CBO}$	Collector-Base Voltage	DC Voltage between Collector and Base when Emitter is open
$V_{CEO}$	Collector-Emitter Voltage	Voltage between Collector and Emitter when Base is open and voltage is reversely applied to Collector junction
$V_{EBO}$	Emitter-Base Voltage	DC voltage between Emitter and Base when Collector is open
$I_C$	Collector Current	DC current passing through Collector electrode
$I_B$	Base Current	DC current passing through Base electrode
$P_C$	Collector Power Dissipation	Power consumed at Collector junction
$T_j$	Operating Junction Temperature	Maximum allowable temperature value at absolute maximum ratings
$T_{stg}$	Storage Temperature	Maximum allowable range of ambient temperature at non-operation
$I_{CBO}$	Collector Cutoff Current	Collector current when Emitter is open and a specified reverse voltage is applied between Collector and Base
$I_{EBO}$	Emitter Cutoff Current	Emitter current when Collector is open and a specified reverse voltage is applied between Emitter and Base
$V_{(BR)CEO}$	Collector-Emitter Saturation Voltage	Breakdown voltage between Collector and Emitter when Base is open
$h_{FE}$	DC Current Gain	Ratio of DC output current and DC input current at a specified voltage and current (Emitter common)
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	DC voltage between Collector and Emitter under specified saturation conditions
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	DC voltage between Base and Emitter under specified saturation conditions
$V_{FEC}$	Emitter-Collector Diode Forward Voltage	Diode forward voltage between Emitter and Collector when Base is open
$f_t$	Cut-off Frequency	Frequency at the specified voltage and current where $h_{FE}$ is 1 (0dB)
$C_{ob}$	Collector Junction capacitance	Junction capacitance between collector and Base at a specified voltage and frequency

•  $T_a=25^\circ C$  unless otherwise specified.

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC2837)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1186	Unit
V <sub>CB0</sub>	-150	V
V <sub>CE0</sub>	-150	V
V <sub>EBO</sub>	-5	V
I <sub>C</sub>	-10	A
I <sub>B</sub>	-2	A
P <sub>C</sub>	100(Ta=25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

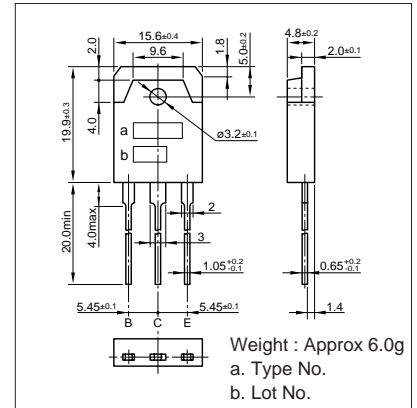
Symbol	Conditions	2SA1186	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-150V	-100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-5V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-25mA	-150min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-3A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-0.5A	-2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =1A	60typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-80V, f=1MHz	110typ	pF

\*h<sub>FE</sub> Rank: O(50to100), P(70to140), Y(90to180)

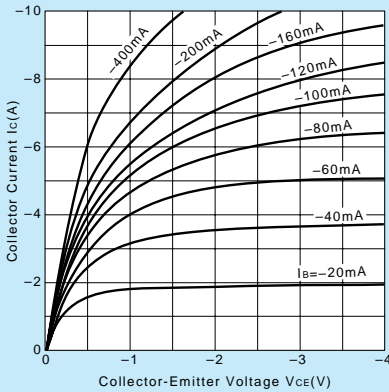
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>B2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-60	12	-5	5	-500	500	0.25typ	0.8typ	0.2typ

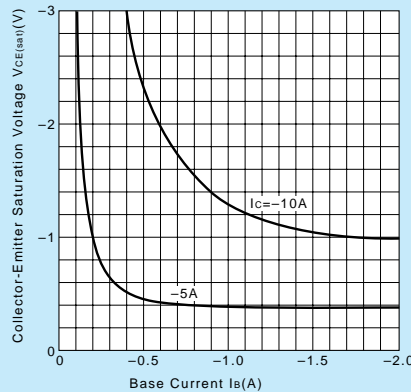
**External Dimensions MT-100(TO3P)**



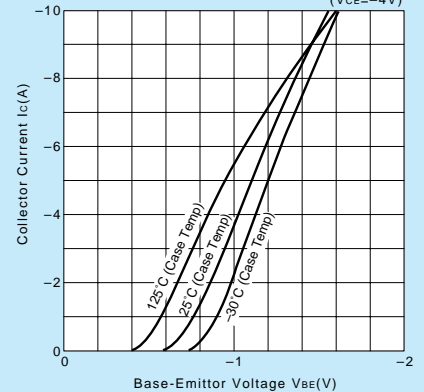
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



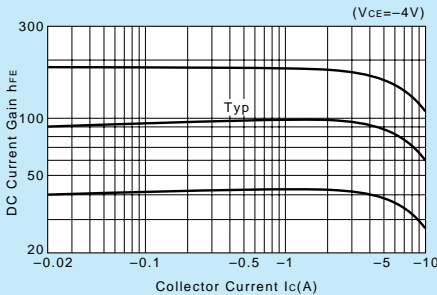
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



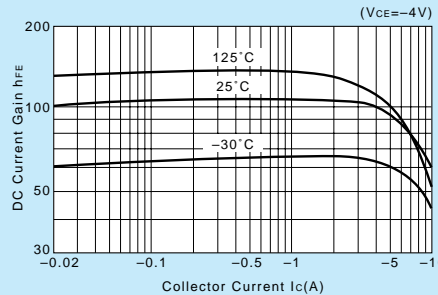
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



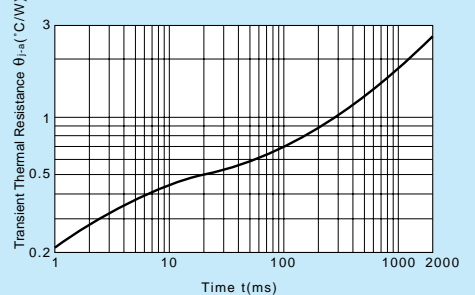
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



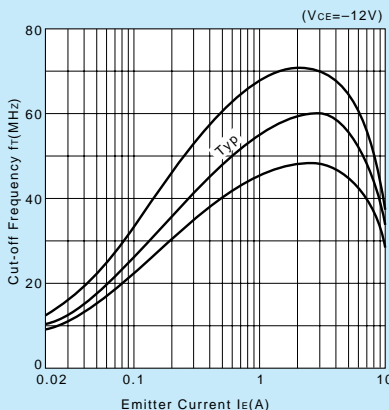
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



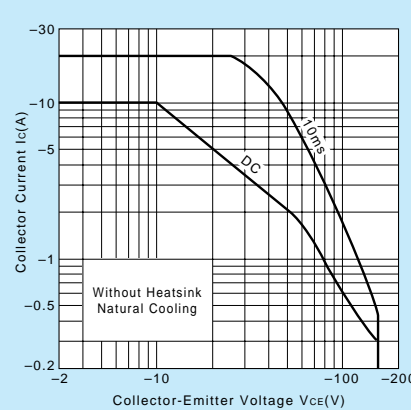
θ<sub>j-a</sub>-t Characteristics



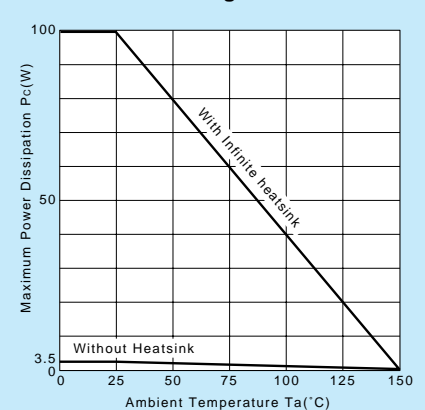
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)



P<sub>C</sub>-T<sub>a</sub> Derating



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC2921)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1215	Unit
V <sub>CB0</sub>	-160	V
V <sub>CEO</sub>	-160	V
V <sub>EB0</sub>	-5	V
I <sub>C</sub>	-15	A
I <sub>B</sub>	-4	A
P <sub>C</sub>	150(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

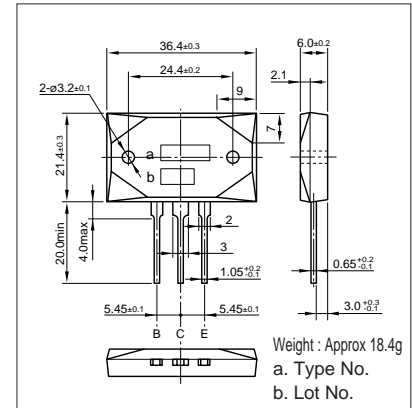
Symbol	Conditions	2SA1215	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-160V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V(BR)CEO	I <sub>C</sub> =-25mA	-160min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-5A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-0.5A	-2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	50typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	400typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

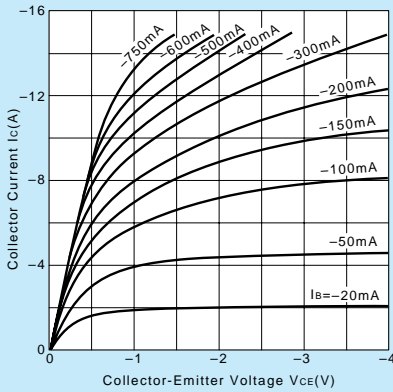
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>B2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>sig</sub> (μs)	t <sub>f</sub> (μs)
-60	12	-5	5	-500	500	0.25typ	0.85typ	0.2typ

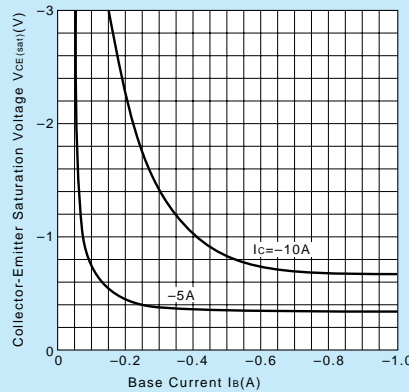
**External Dimensions MT-200**



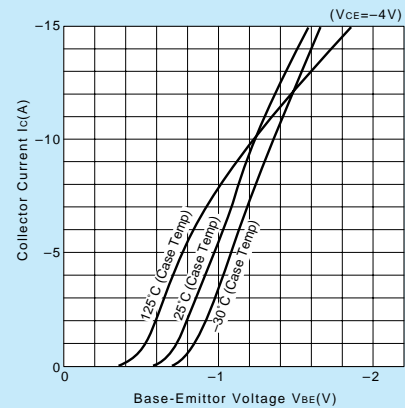
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



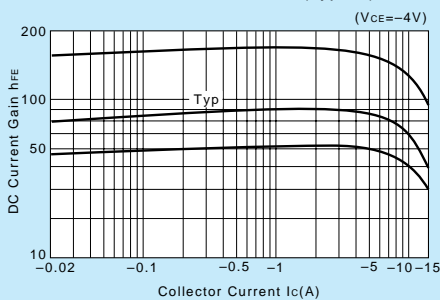
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



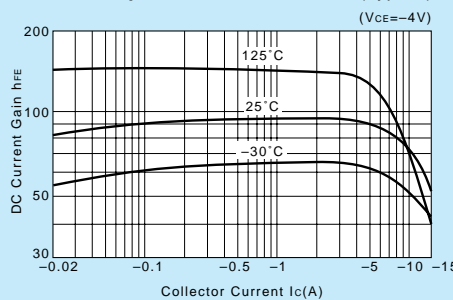
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



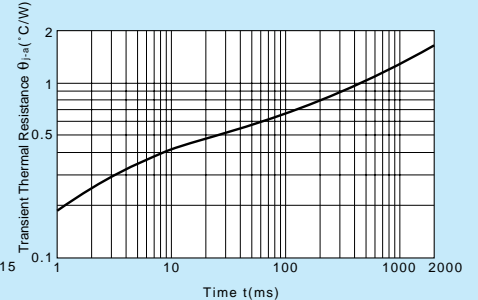
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



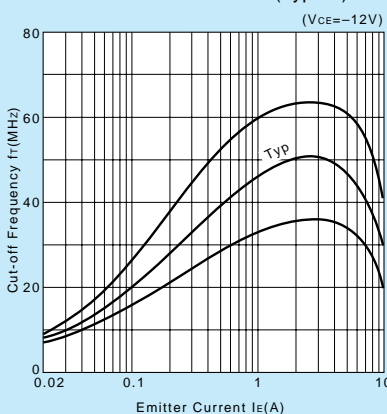
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



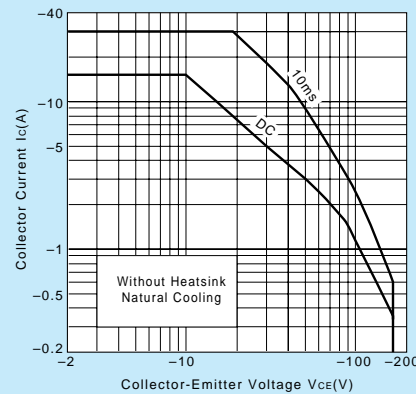
**θ<sub>J-a</sub>-t Characteristics**



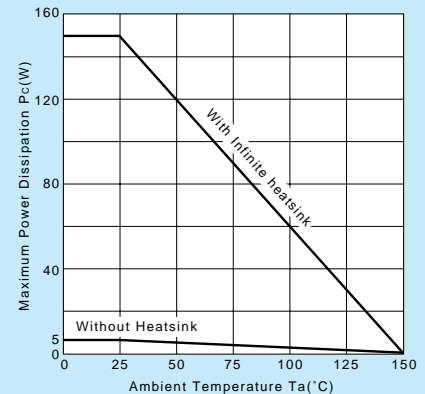
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**





Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC2922)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

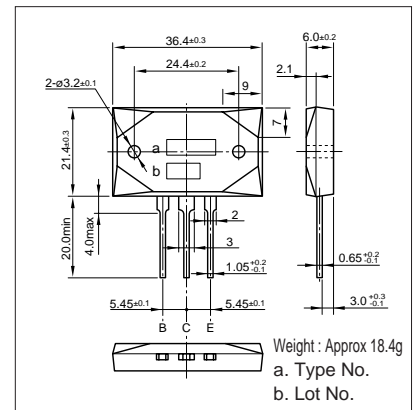
Symbol	2SA1216	Unit
V <sub>CB0</sub>	-180	V
V <sub>CE0</sub>	-180	V
V <sub>EBO</sub>	-5	V
I <sub>C</sub>	-17	A
I <sub>B</sub>	-5	A
P <sub>C</sub>	200(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1216	Unit
V <sub>CB0</sub>	V <sub>CB</sub> =-180V	-100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-5V	-100max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =-25mA	-180min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-8A	30min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-8A, I <sub>B</sub> =-0.8A	-2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	40typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	500typ	pF

\*h<sub>FE</sub> Rank O(30to60), Y(50to100), P(70to140), G(90to180)

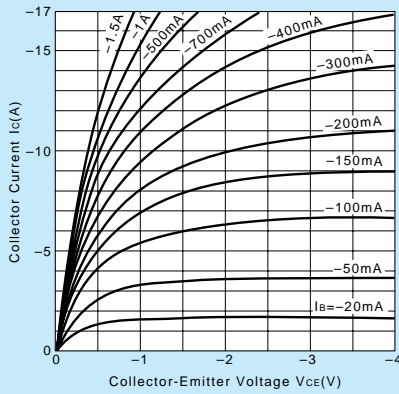
**External Dimensions MT-200**



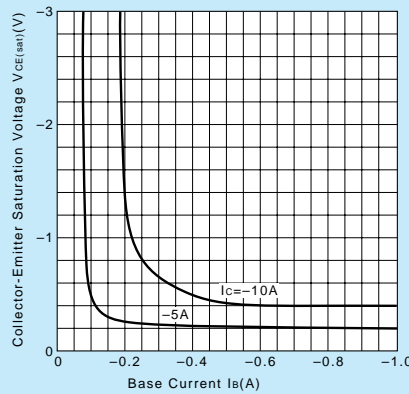
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>B2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-40	4	-10	5	-1	1	0.3typ	0.7typ	0.2typ

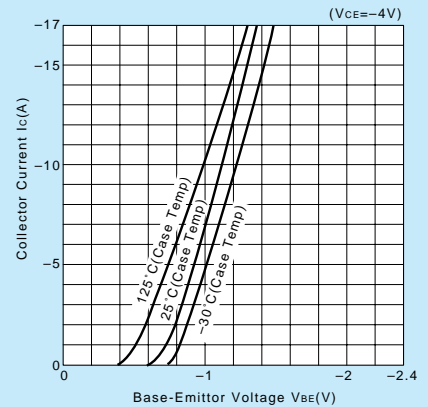
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



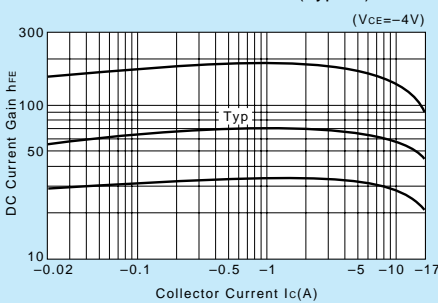
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



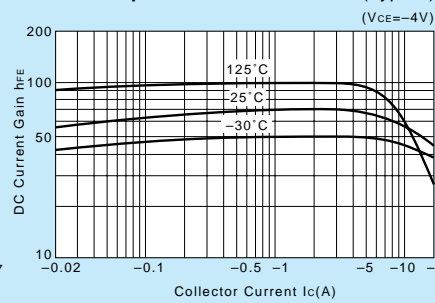
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



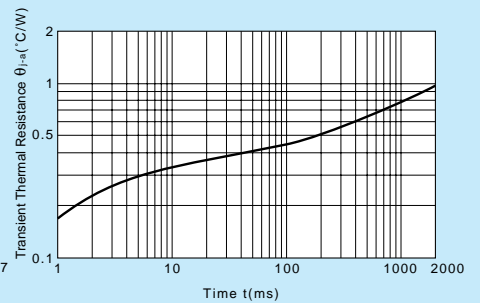
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



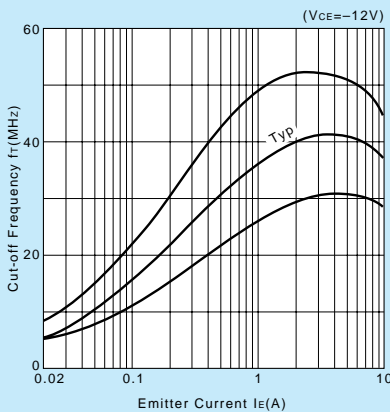
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



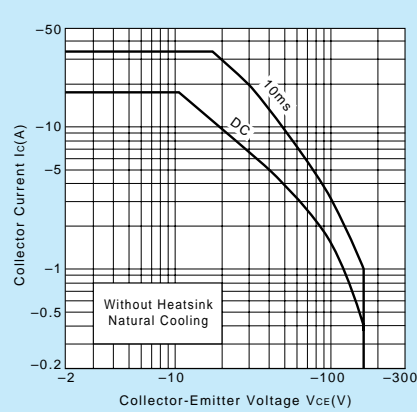
**θ<sub>j-a</sub>-t Characteristics**



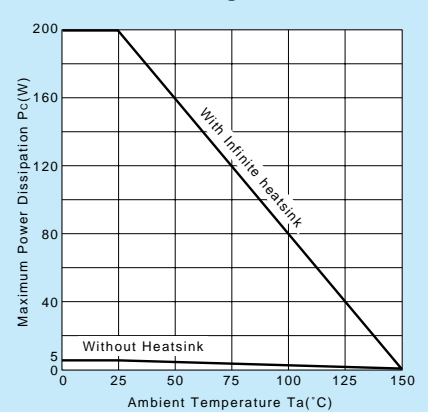
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SA1262

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3179)

Application : Audio and General Purpose

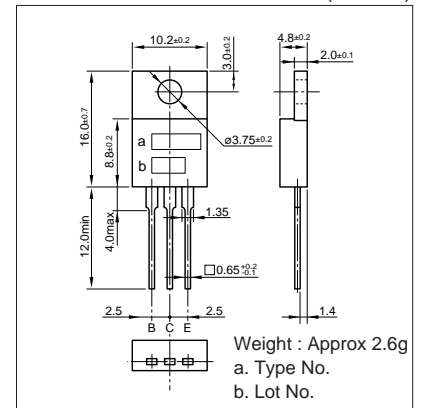
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1262	Unit
V <sub>CB0</sub>	-60	V
V <sub>CE0</sub>	-60	V
V <sub>EB0</sub>	-6	V
I <sub>c</sub>	-4	A
I <sub>B</sub>	-1	A
P <sub>c</sub>	30(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1262	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-60V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =-25mA	-60min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-1A	40min	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-2A, I <sub>B</sub> =-0.2A	-0.6max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.2A	15typ	MHZ
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHZ	90typ	pF

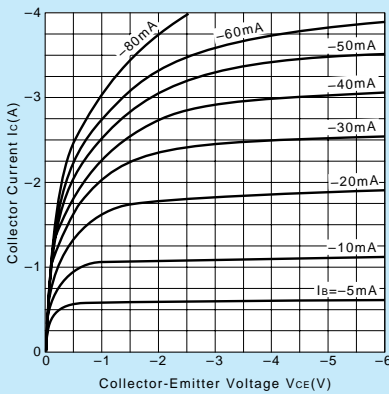
**External Dimensions MT-25(TO220)**



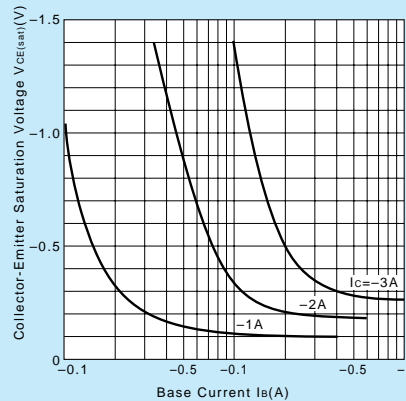
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-20	10	-2	-10	5	-200	200	0.25typ	0.75typ	0.25typ

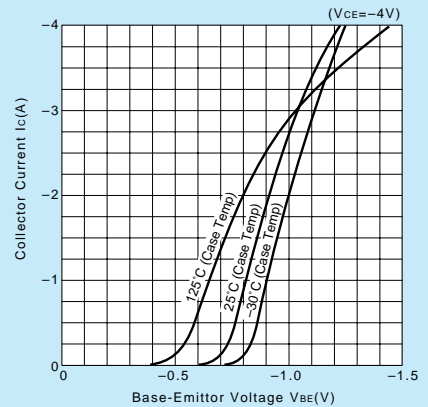
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



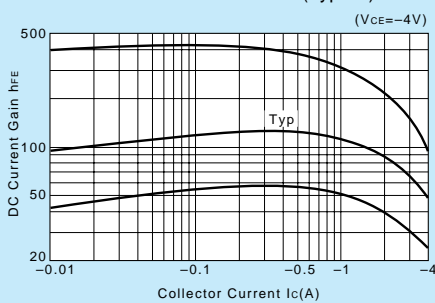
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



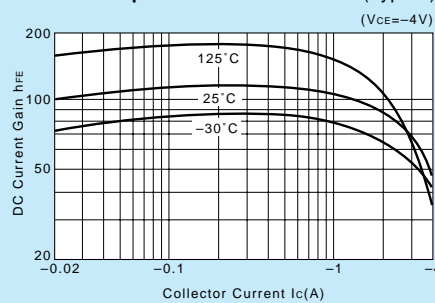
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



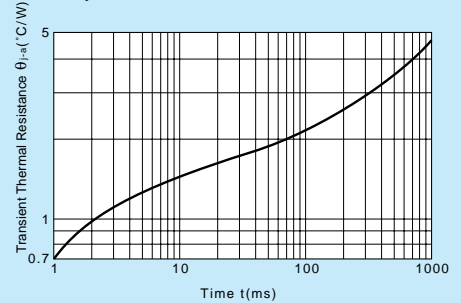
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



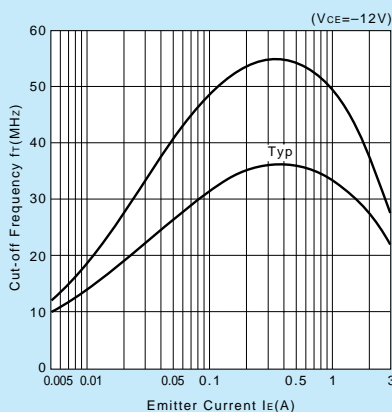
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



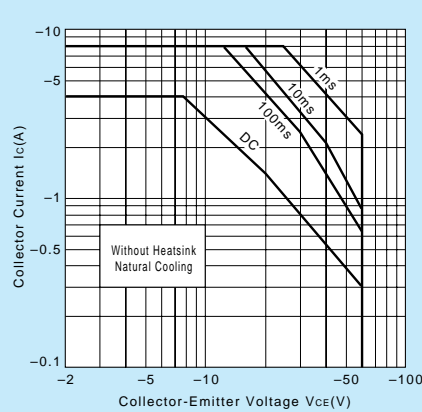
**θ<sub>j-a</sub>-t Characteristics**



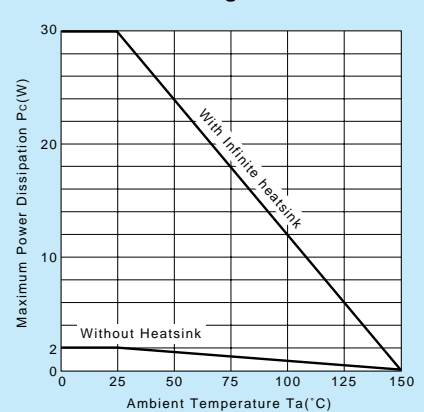
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3263)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1294	Unit
V <sub>CB0</sub>	-230	V
V <sub>CE0</sub>	-230	V
V <sub>EBO</sub>	-5	V
I <sub>C</sub>	-15	A
I <sub>B</sub>	-4	A
P <sub>C</sub>	130(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

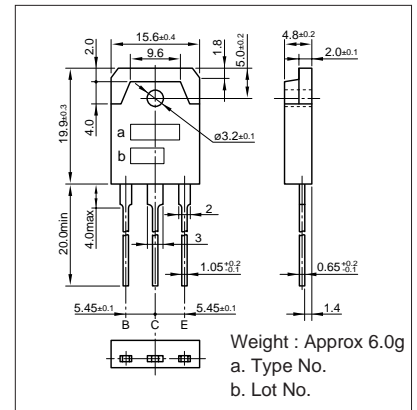
Symbol	Conditions	2SA1294	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-230V	-100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-5V	-100max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =-25mA	-230min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-5A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-0.5A	-2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	35typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	500typ	pF

\*h<sub>FE</sub> Rank O(50to100), Y(70to140)

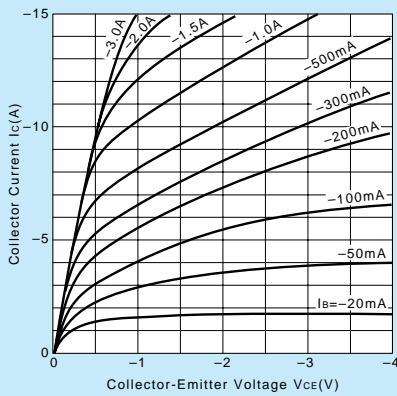
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-60	12	-5	-10	5	-500	500	0.35typ	1.50typ	0.30typ

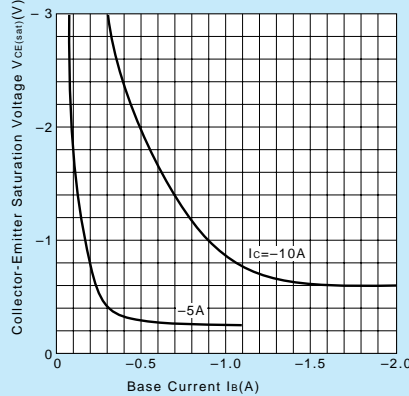
**External Dimensions MT-100(TO3P)**



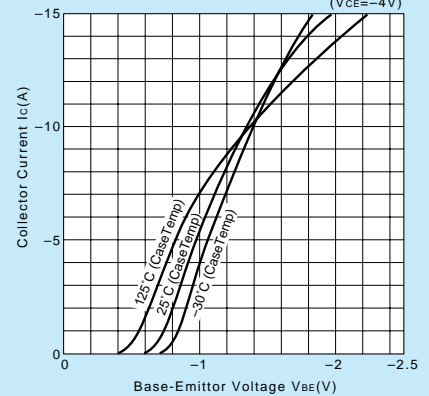
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



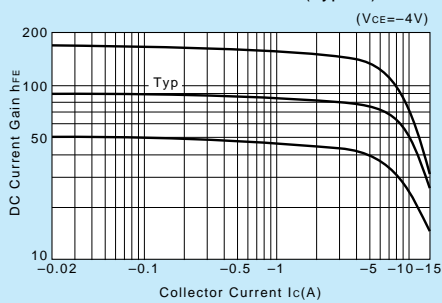
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



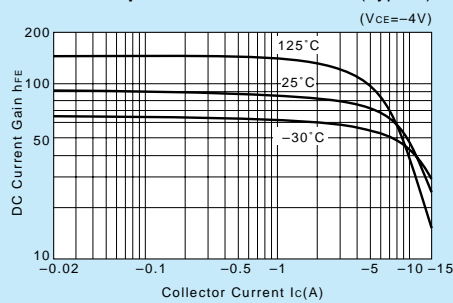
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



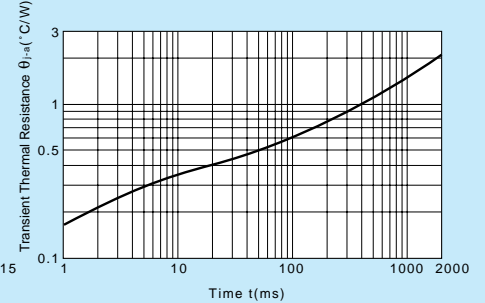
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



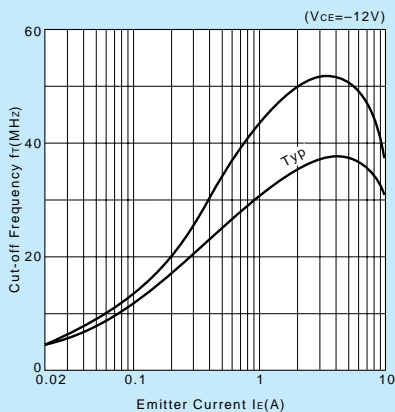
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



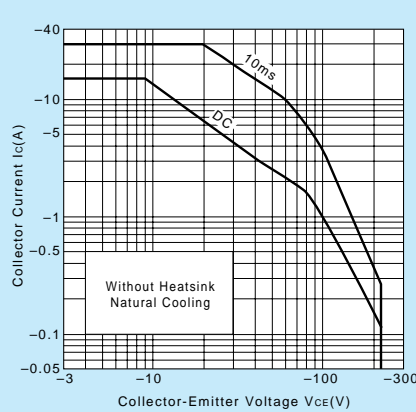
**θ<sub>j-a</sub>-t Characteristics**



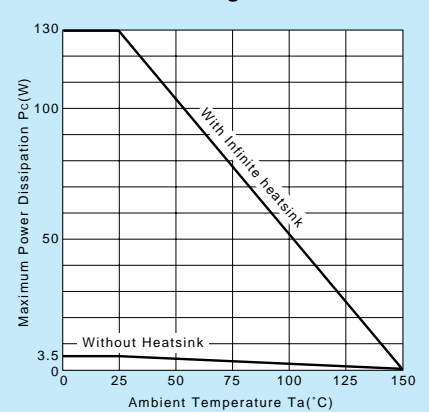
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3264)

Application : Audio and General

**Absolute maximum ratings** (Ta=25°C)

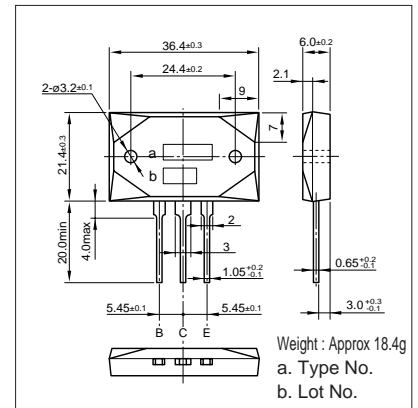
Symbol	2SA1295	Unit
V <sub>CB0</sub>	-230	V
V <sub>CE0</sub>	-230	V
V <sub>EB0</sub>	-5	V
I <sub>C</sub>	-17	A
I <sub>B</sub>	-5	A
P <sub>C</sub>	200(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1295	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-230V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V(BR)CEO	I <sub>C</sub> =-25mA	-230min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-5A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-0.5A	-2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	35typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	500typ	pF

\*h<sub>FE</sub> Rank O(50to100), Y(70to140)

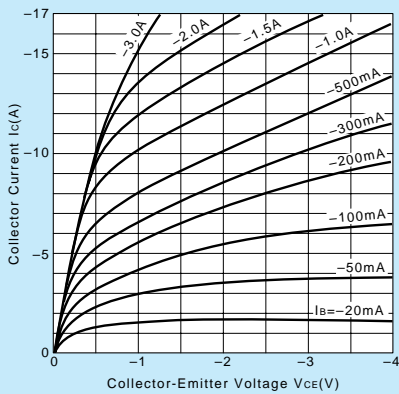
**External Dimensions MT-200**



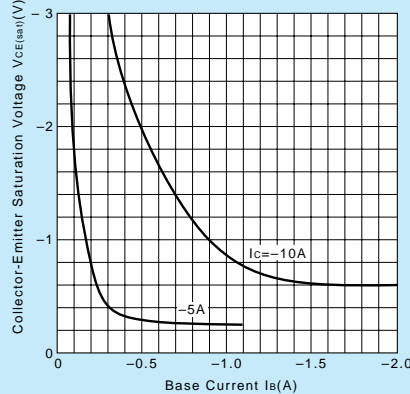
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-60	12	-5	-10	5	-500	500	0.35typ	1.50typ	0.30typ

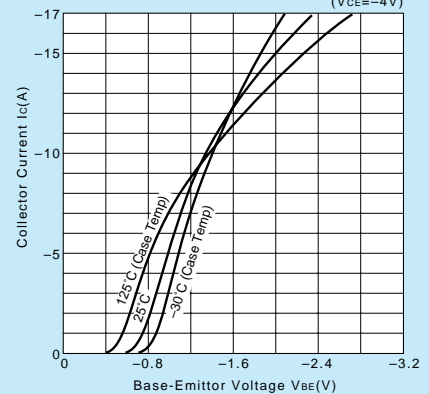
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



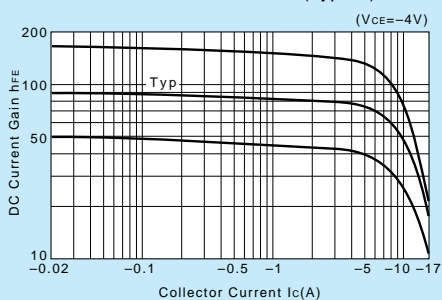
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



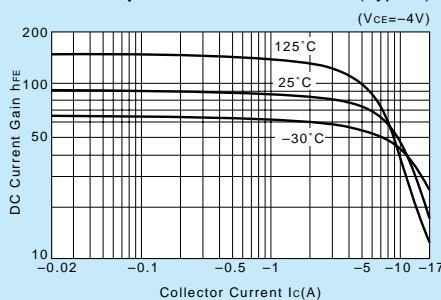
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



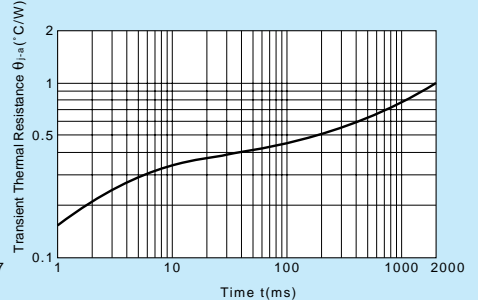
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



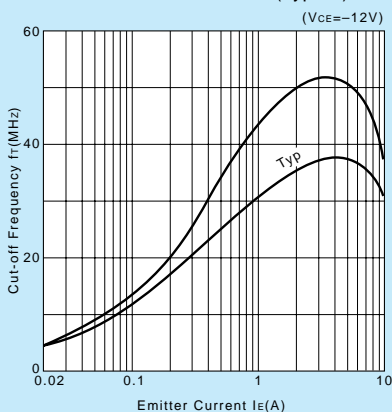
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



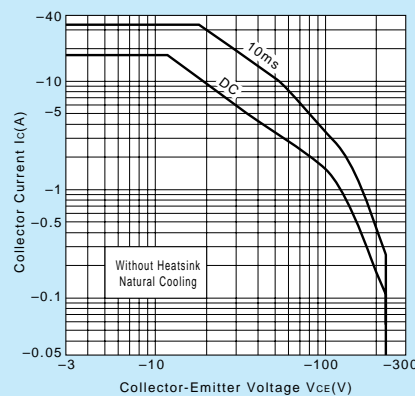
**θ<sub>JA</sub>-t Characteristics**



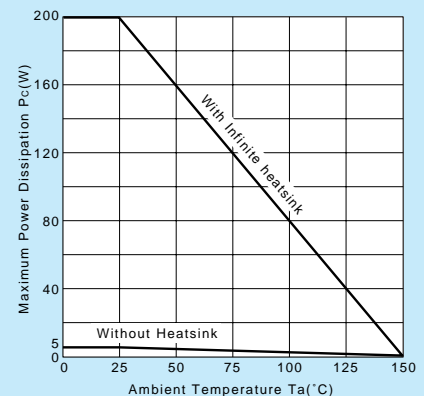
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3284)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

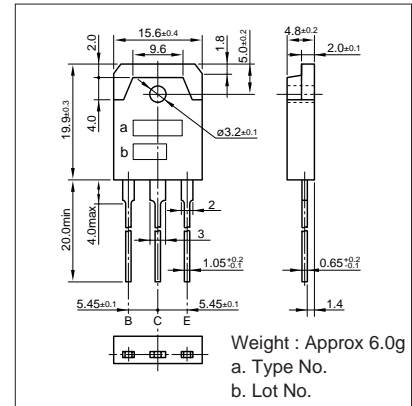
Symbol	2SA1303	Unit
V <sub>CB0</sub>	-150	V
V <sub>CE0</sub>	-150	V
V <sub>EB0</sub>	-5	V
I <sub>C</sub>	-14	A
I <sub>B</sub>	-3	A
P <sub>C</sub>	125(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1303	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-150V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-25mA	-150min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-5A	50min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-0.5A	-2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	50typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	400typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

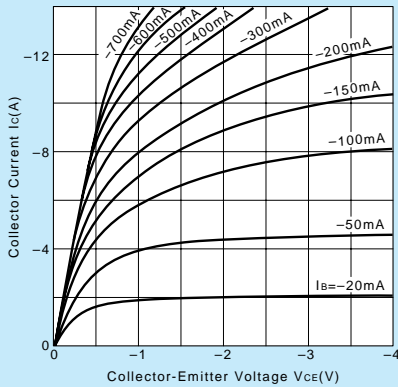
**External Dimensions MT-100(TO3P)**



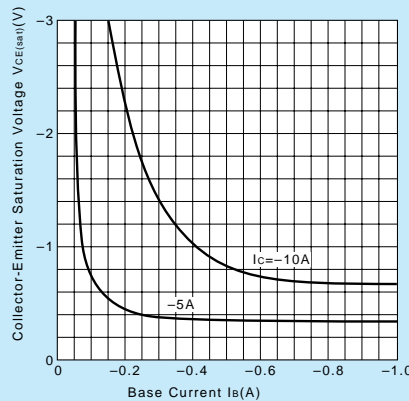
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-60	12	-5	-10	5	-500	500	0.25typ	0.85typ	0.2typ

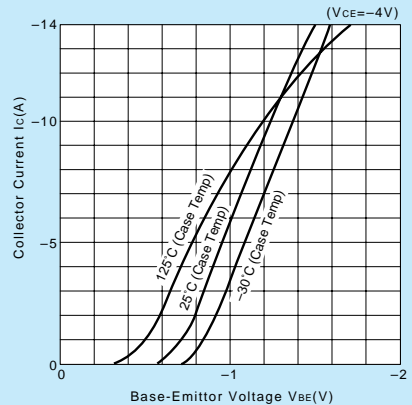
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



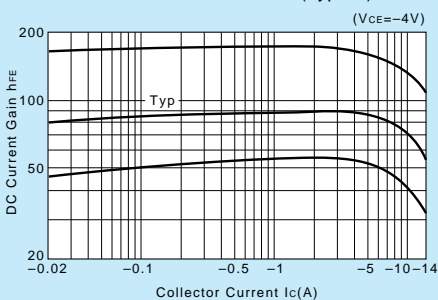
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



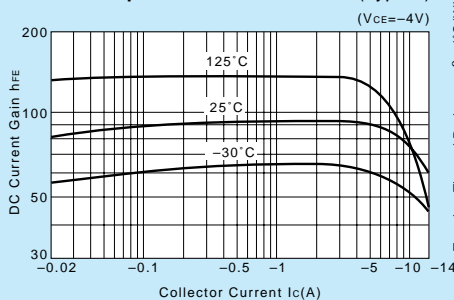
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



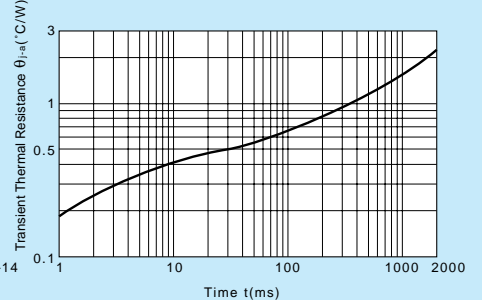
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



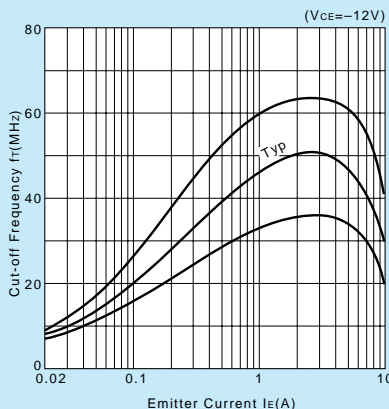
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



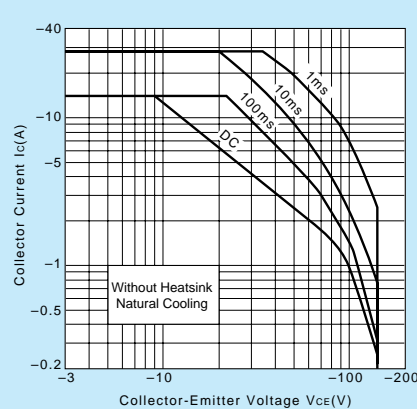
**θ<sub>j-a</sub>-t Characteristics**



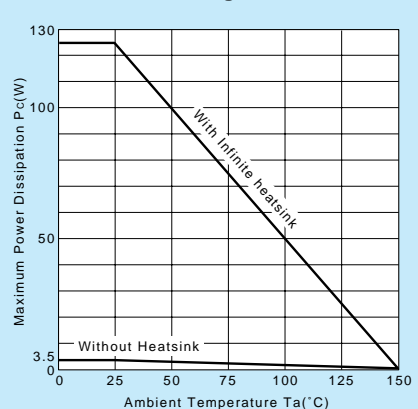
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# LAPT 2SA1386/1386A

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3519/A)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

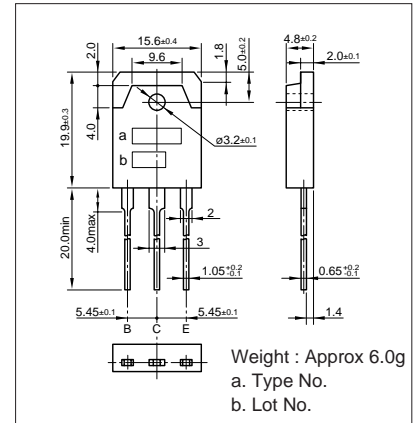
Symbol	2SA1386	2SA1386A	Unit
VcBo	-160	-180	V
VcEO	-160	-180	V
VEBO	-5		V
Ic	-15		A
Ib	-4		A
Pc	130(Tc=25°C)		W
Tj	150		°C
Tstg	-55 to +150		°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1386	2SA1386A	Unit
IcBo	VcB=	-100max	-100max	μA
VEBO	VEB=-5V	-100max		μA
V(BR)CEO	Ic=-25mA	-160min	-180min	V
hFE	VCE=-4V, Ic=-5A	50min*		
VCE(sat)	Ic = -5A, IB=-0.5A	-2.0max		V
fr	VCE=-12V, IE=2A	40typ		MHz
COB	VcB=-10V, f=1MHz	500typ		pF

\*hFE Rank O(50 to 100), P(70 to 140), Y(90 to 180)

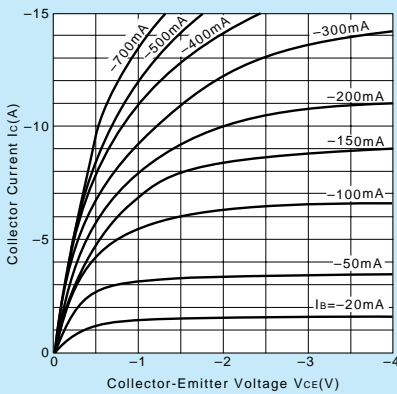
**External Dimensions MT-100(TO3P)**



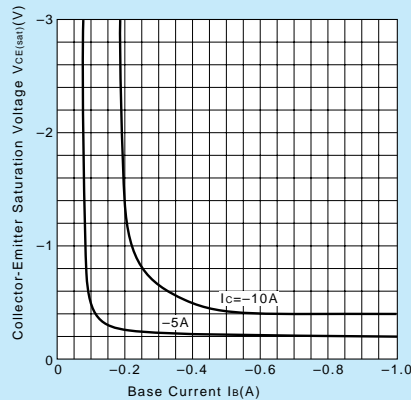
**Typical Switching Characteristics (Common Emitter)**

VCC (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	IB1 (A)	IB2 (A)	ton (μs)	tstg (μs)	tf (μs)
-40	4	-10	-10	5	-1	1	0.3typ	0.7typ	0.2typ

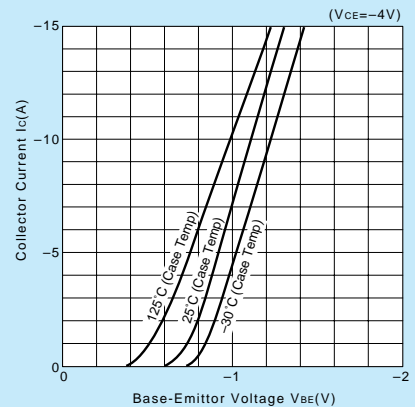
**Ic-VCE Characteristics (Typical)**



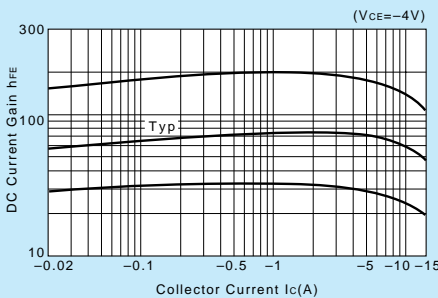
**VCE(sat)-IB Characteristics (Typical)**



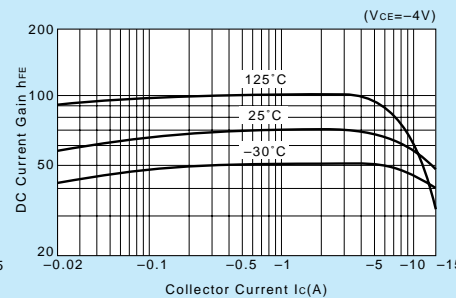
**Ic-VBE Temperature Characteristics (Typical)**



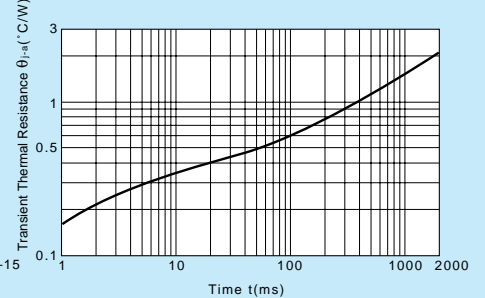
**hFE-Ic Characteristics (Typical)**



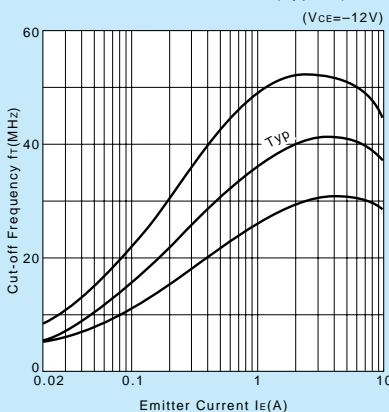
**hFE-Ic Temperature Characteristics (Typical)**



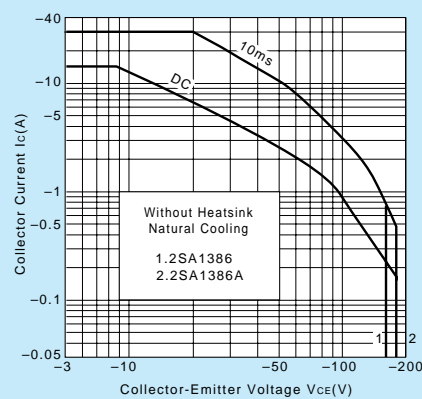
**θj-a-t Characteristics**



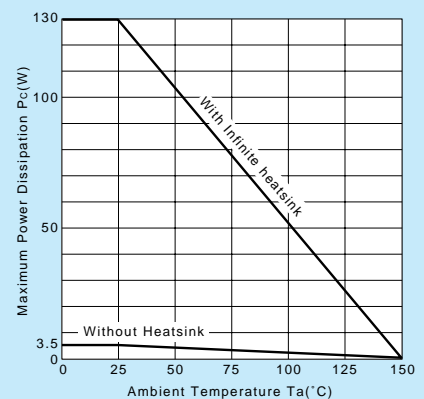
**fT-IE Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**Pc-Ta Derating**





# 2SA1488/1488A

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3851/A)

Application : Audio and General Purpose

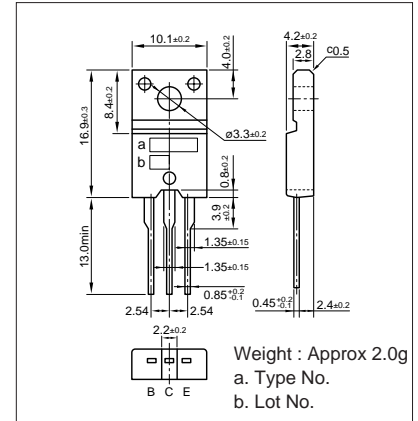
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1488	2SA1488A	Unit
VcBo	-60	-80	V
VcEO	-60	-80	V
VEBO	-6		V
Ic	-4		A
Ib	-1		A
Pc	25(Tc=25°C)		W
Tj	150		°C
Tstg	-55 to +150		°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1488	2SA1488A	Unit
IcBo	VcB=	-100max	-100max	μA
VcEO	VcB=	-60	-80	V
IEBO	VEB=-6V		-100max	μA
V(BR)C EO	Ic=-25mA	-60min	-80min	V
hFE	VCE=-4V, Ic=-1A		40min	
VCE(sat)	Ic=-2A, Ib=-0.2A		-0.5max	V
fT	VCE=-12V, IE=0.2A		15typ	MHZ
COB	VcB=-10V, f=1MHZ		90typ	pF

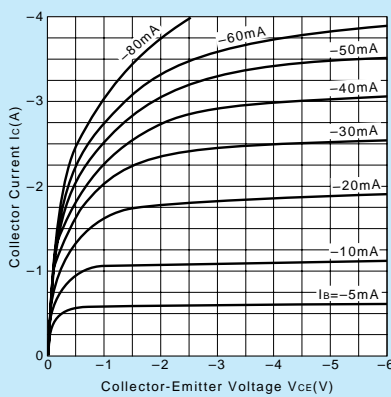
**External Dimensions FM20 (TO220F)**



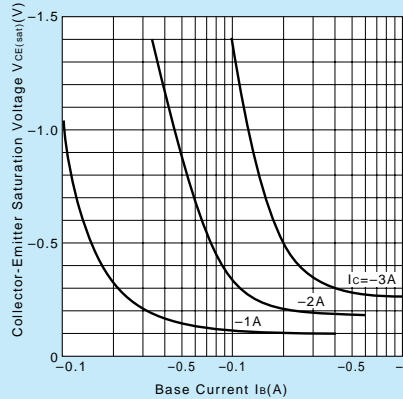
**Typical Switching Characteristics (Common Emitter)**

Vcc (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	Ib1 (mA)	Ib2 (mA)	ton (μs)	tstg (μs)	tf (μs)
-12	6	-2	-10	5	-200	200	0.25typ	0.75typ	0.25typ

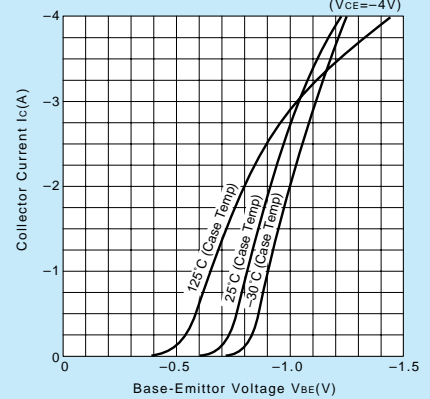
**Ic-VCE Characteristics (Typical)**



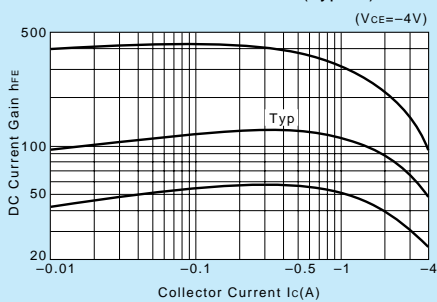
**VCE(sat)-Ib Characteristics (Typical)**



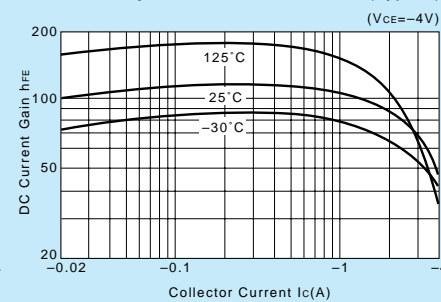
**Ic-VBE Temperature Characteristics (Typical)**



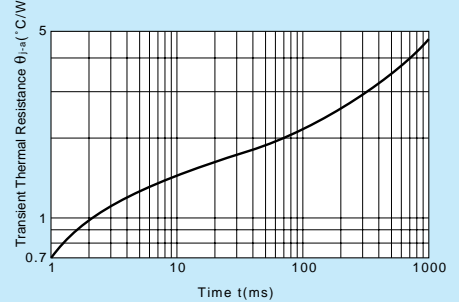
**hFE-Ic Characteristics (Typical)**



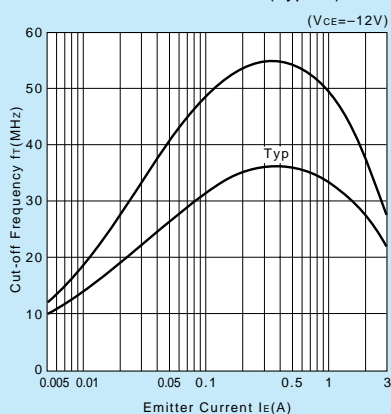
**hFE-Ic Temperature Characteristics (Typical)**



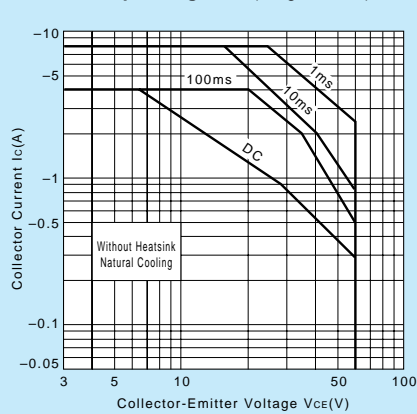
**θj-a-t Characteristics**



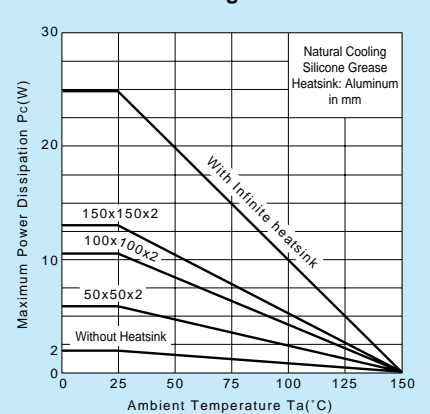
**fT-IE Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**Pc-Ta Derating**



# 2SA1492

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3856)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

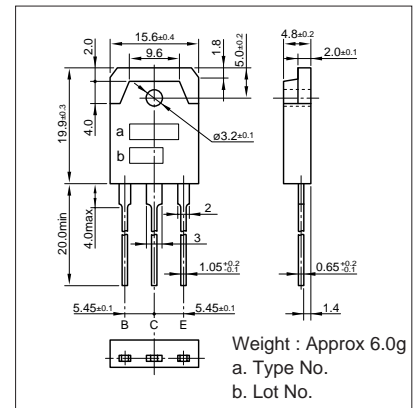
Symbol	2SA1492	Unit
V <sub>CB0</sub>	-180	V
V <sub>CE0</sub>	-180	V
V <sub>EBO</sub>	-6	V
I <sub>C</sub>	-15	A
I <sub>B</sub>	-4	A
P <sub>C</sub>	130(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1492	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-180V	-100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-6V	-100max	μA
V(BR)CEO	I <sub>C</sub> =-50mA	-180min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-3A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-0.5A	-2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	20typ	MHZ
COB	V <sub>CB</sub> =-10V, f=1MHZ	500typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

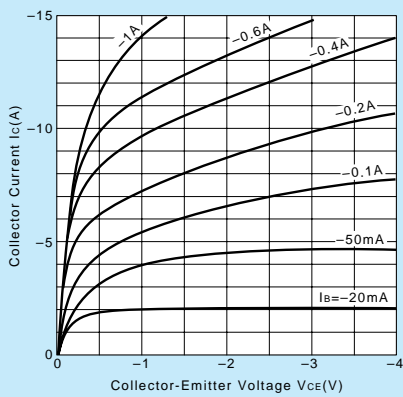
**External Dimensions MT-100(TO3P)**



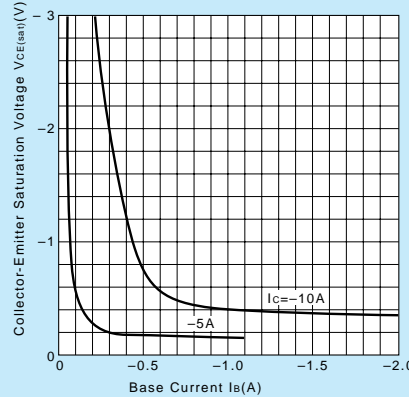
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-40	4	-10	-10	5	-1	1	0.6typ	0.9typ	0.2typ

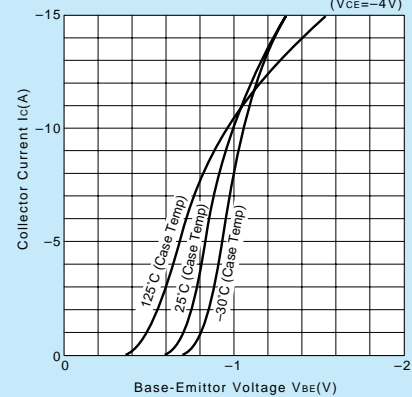
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



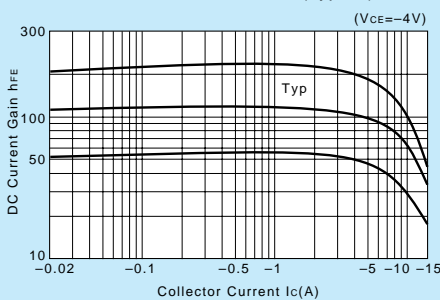
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



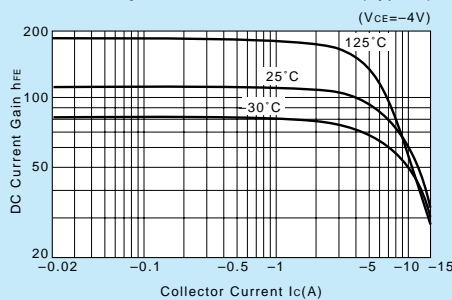
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



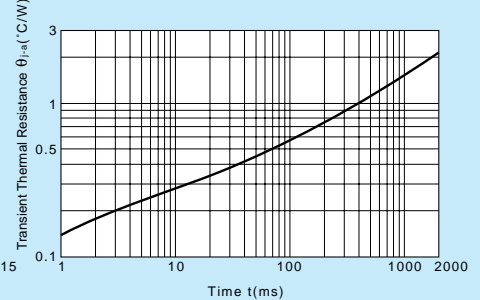
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



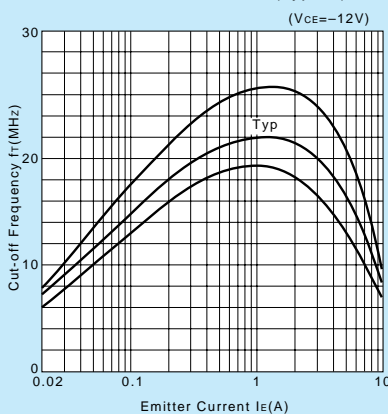
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



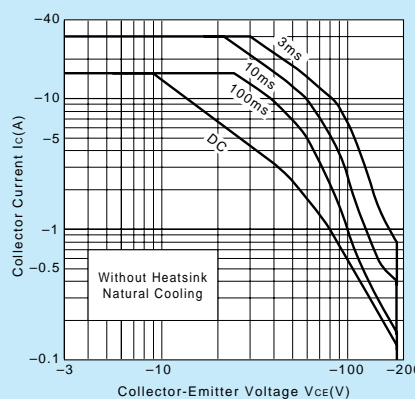
**θ<sub>J-a</sub>-t Characteristics**



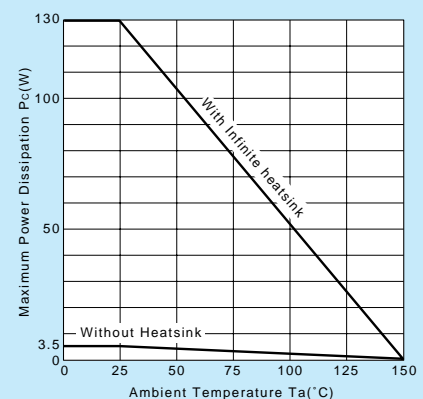
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SA1493

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3857)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

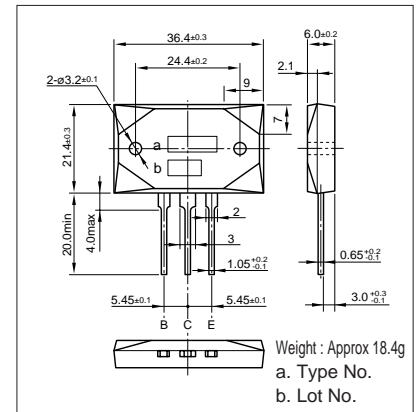
Symbol	2SA1493	Unit
V <sub>CB0</sub>	-200	V
V <sub>CE0</sub>	-200	V
V <sub>EB0</sub>	-6	V
I <sub>c</sub>	-15	A
I <sub>B</sub>	-5	A
P <sub>c</sub>	150(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1493	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-200V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =-50mA	-200min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-5A	50min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-10A, I <sub>B</sub> =-1A	-3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	20typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	400typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

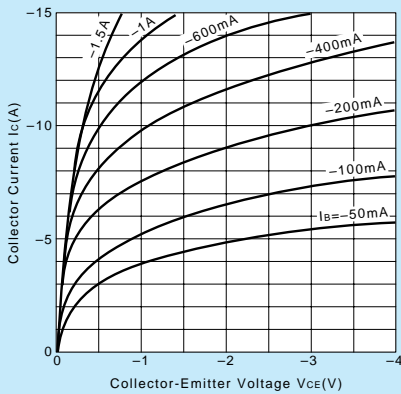
**External Dimensions MT-200**



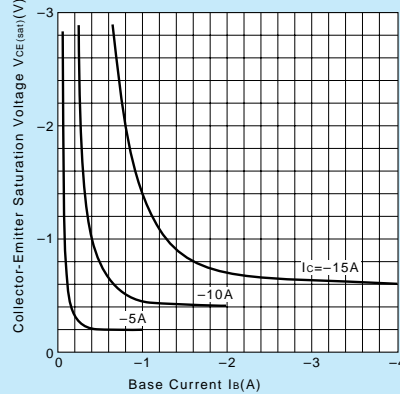
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-60	12	-5	-10	5	-500	500	0.3typ	0.9typ	0.2typ

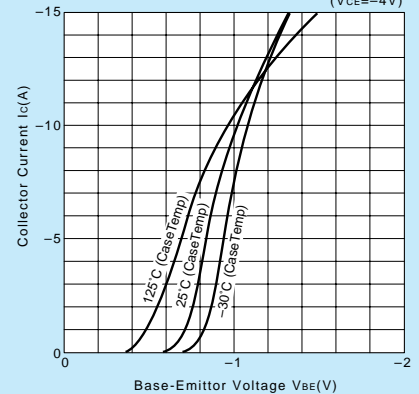
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



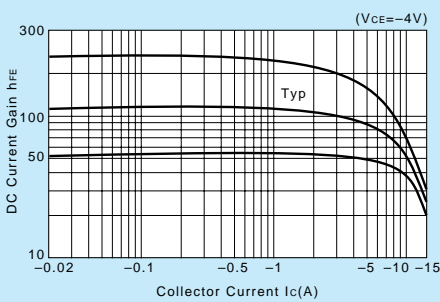
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



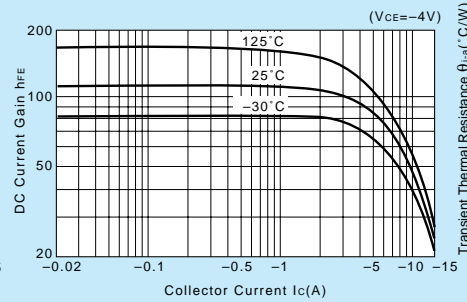
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



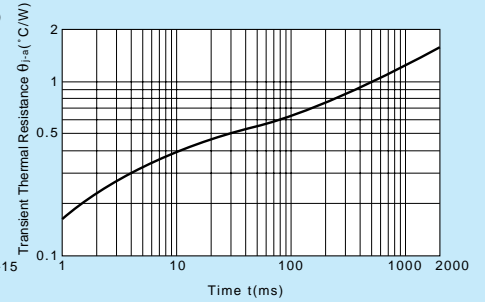
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



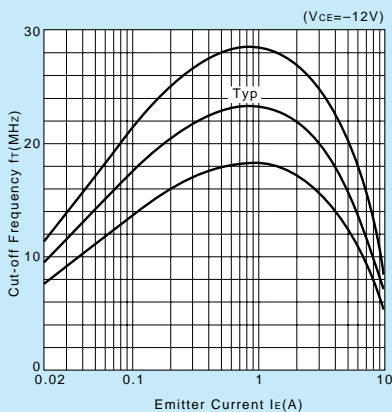
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



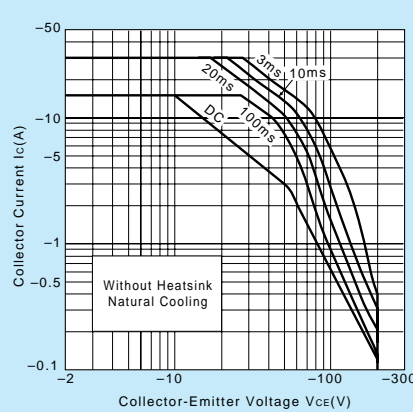
**θ<sub>j-a</sub>-t Characteristics**



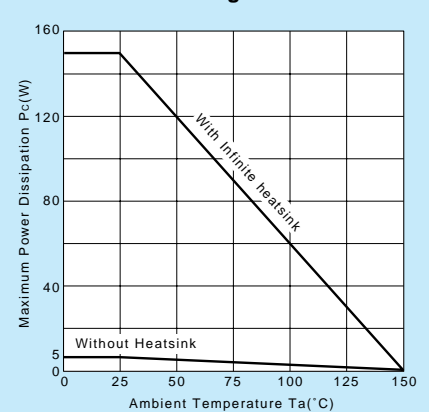
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SA1494

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3858)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

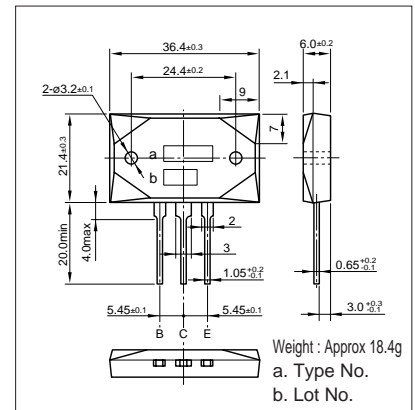
Symbol	2SA1494	Unit
V <sub>CB0</sub>	-200	V
V <sub>CEO</sub>	-200	V
V <sub>EB0</sub>	-6	V
I <sub>C</sub>	-17	A
I <sub>B</sub>	-5	A
P <sub>C</sub>	200(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1494	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-200V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-50mA	-200min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-8A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-10A, I <sub>B</sub> =-1A	-2.5max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =1A	20typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	500typ	pF

\*h<sub>FE</sub> Rank Y(50to100), P(70to140), G(90to180)

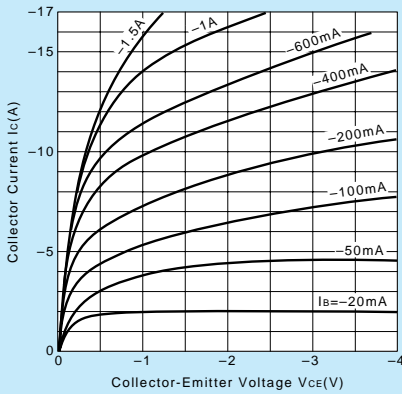
**External Dimensions MT-200**



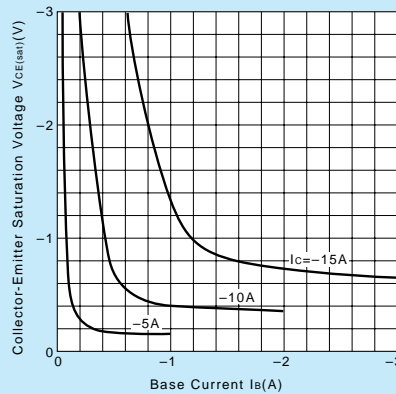
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-40	4	-10	-10	5	-1	1	0.6typ	0.9typ	0.2typ

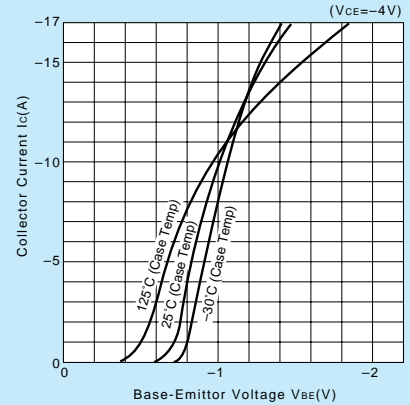
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



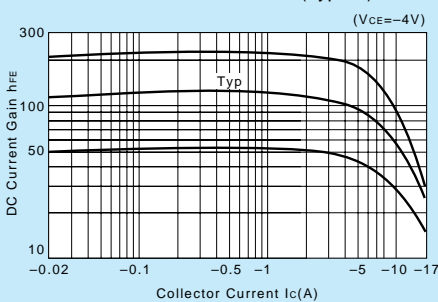
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



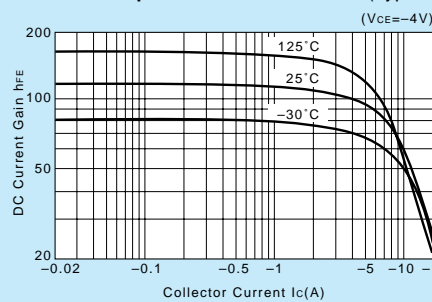
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



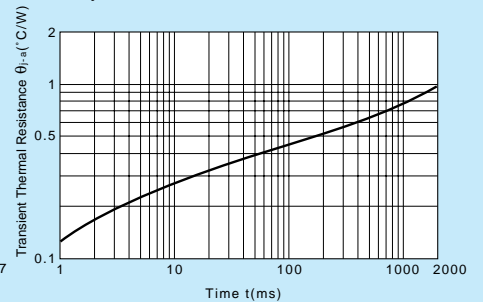
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



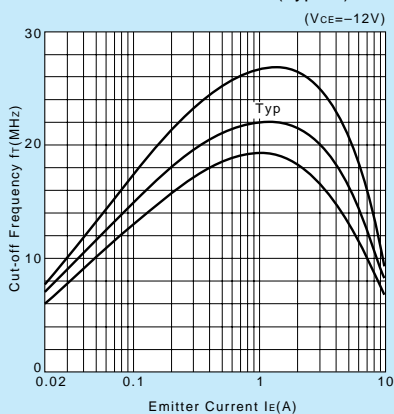
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



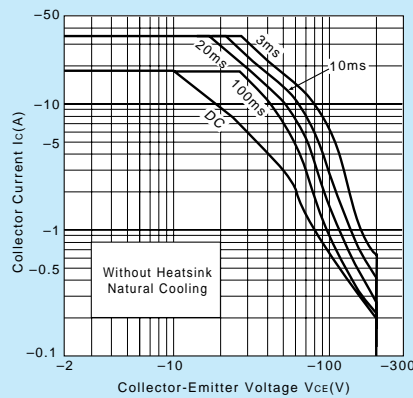
**θ<sub>j-a</sub>-t Characteristics**



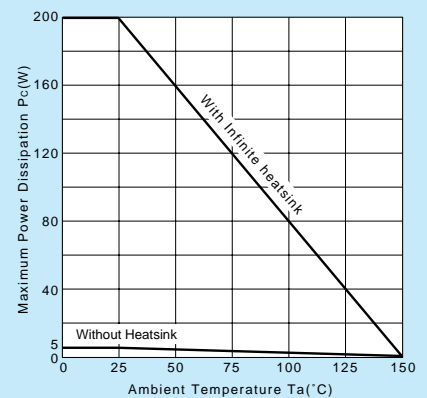
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



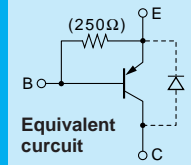
**P<sub>C</sub>-T<sub>a</sub> Derating**





Built-in Diode at C-E  
Low  $V_{CE}(\text{sat})$

# 2SA1568



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4065)

Application : DC Motor Driver, Chopper Regulator and General Purpose

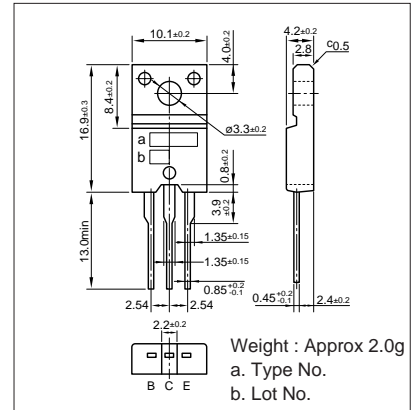
**Absolute maximum ratings** ( $T_a=25^\circ\text{C}$ )

Symbol	2SA1568	Unit
$V_{CB0}$	-60	V
$V_{CE0}$	-60	V
$V_{EBO}$	-6	V
$I_C$	$\pm 12$	A
$I_B$	-3	A
$P_C$	35( $T_C=25^\circ\text{C}$ )	W
$T_{jg}$	150	$^\circ\text{C}$
$T_{stg}$	-55 to +150	$^\circ\text{C}$

**Electrical Characteristics** ( $T_a=25^\circ\text{C}$ )

Symbol	Conditions	2SA1568	Unit
$I_{CBO}$	$V_{CB}=-60\text{V}$	-100max	$\mu\text{A}$
$I_{EBO}$	$V_{EB}=-6\text{V}$	-60max	mA
$V_{(BR)CEO}$	$I_C=-25\text{mA}$	-60min	V
$h_{FE}$	$V_{CE}=-1\text{V}, I_C=-6\text{A}$	50min	
$V_{CE}(\text{sat})$	$I_C=-6\text{A}, I_B=-0.3\text{A}$	-0.35max	V
$V_{FEC}$	$I_{EO}=-10\text{A}$	-2.5max	V
$f_r$	$V_{CE}=-12\text{V}, I_E=0.5\text{A}$	40typ	MHz
COB	$V_{CB}=-10\text{V}, f=1\text{MHz}$	330typ	pF

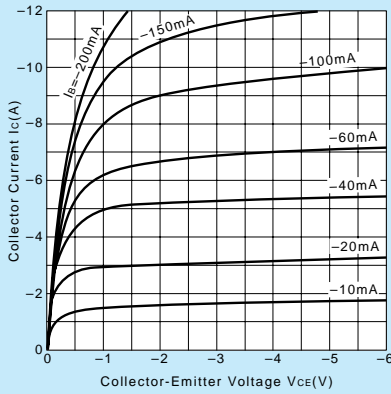
**External Dimensions FM20 (TO220F)**



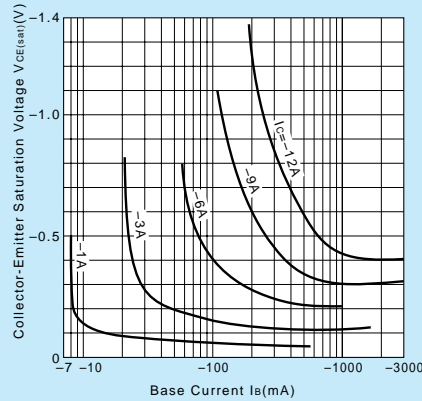
**Typical Switching Characteristics (Common Emitter)**

$V_{CC}$ (V)	$R_L$ ( $\Omega$ )	$I_C$ (A)	$V_{BB1}$ (V)	$V_{BB2}$ (V)	$I_{B1}$ (mA)	$I_{B2}$ (mA)	$t_{on}$ ( $\mu\text{s}$ )	$t_{stg}$ ( $\mu\text{s}$ )	$t_f$ ( $\mu\text{s}$ )
-24	4	-6	-10	5	-120	120	0.4typ	0.4typ	0.2typ

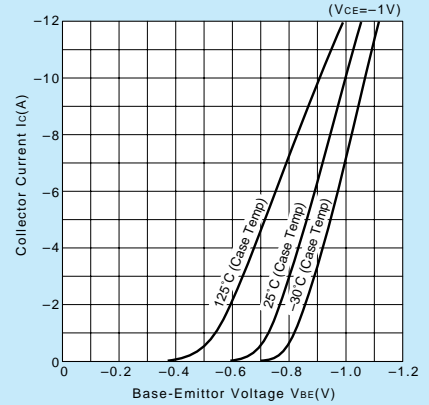
**$I_C-V_{CE}$  Characteristics (Typical)**



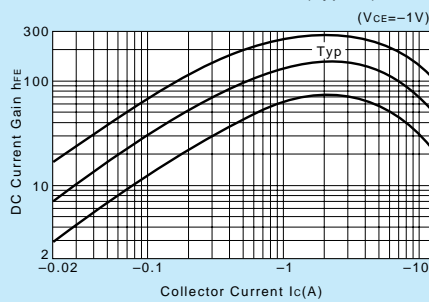
**$V_{CE}(\text{sat})-I_B$  Characteristics (Typical)**



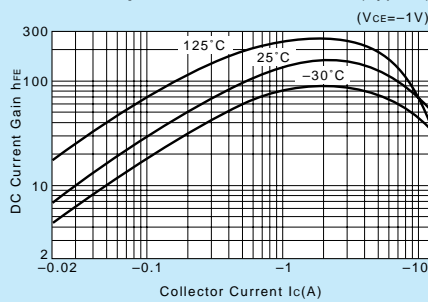
**$I_C-V_{BE}$  Temperature Characteristics (Typical)**



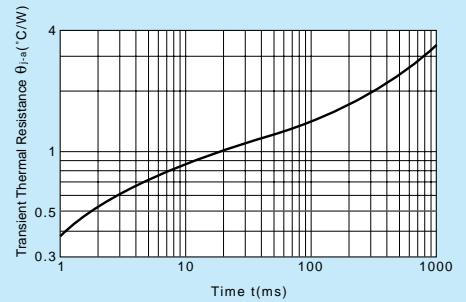
**$h_{FE}-I_C$  Characteristics (Typical)**



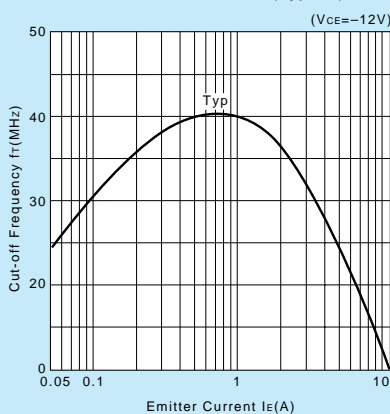
**$h_{FE}-I_C$  Temperature Characteristics (Typical)**



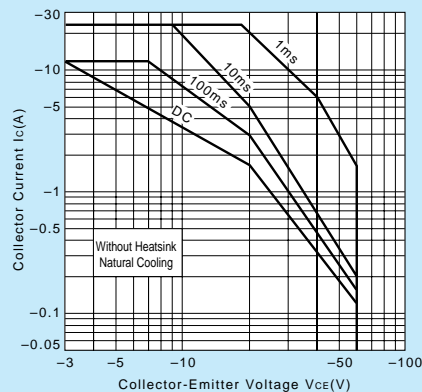
**$\theta_{j-a}-t$  Characteristics**



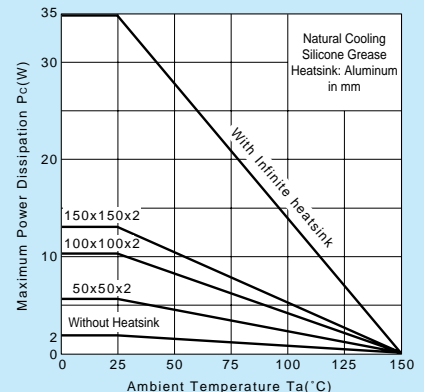
**$f_T-I_E$  Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**$P_C-T_a$  Derating**





# 2SA1667/1668

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4381/4382)

Application : TV Vertical Output, Audio Output Driver and General Purpose

## Absolute maximum ratings (Ta=25°C)

Symbol	2SA1667	2SA1668	Unit
VcBo	-150	-200	V
VcEO	-150	-200	V
VEBO	-6		V
Ic	-2		A
Ib	-1		A
Pc	25(Tc=25°C)		W
Tj	150		°C
Tstg	-55 to +150		°C

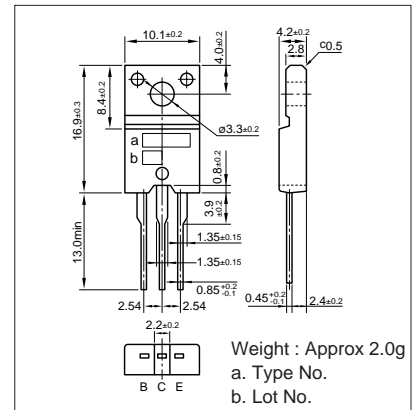
## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SA1667	2SA1668	Unit
IcBo	VcB=	-10max	-10max	μA
IEBO	VEB=-6V	-10max		μA
V(BR)CEO	Ic=-25mA	-150min	-200min	V
hFE	VCE=-10V, Ic=-0.7A	60min		
VCE(sat)	Ic=-0.7A, Ib=-0.07A	-1.0max		V
fr	VCE=-12V, IE=0.2A	20typ		MHz
COB	VcB=-10V, f=1MHz	60typ		pF

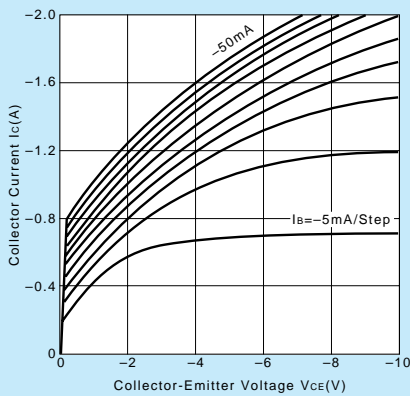
## Typical Switching Characteristics (Common Emitter)

VCC (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	Ib1 (mA)	Ib2 (mA)	ton (μs)	tstg (μs)	tf (μs)
-20	20	-1	-10	5	-100	100	0.4typ	1.5typ	0.5typ

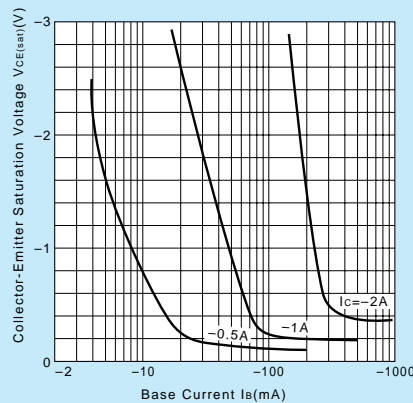
## External Dimensions FM20 (TO220F)



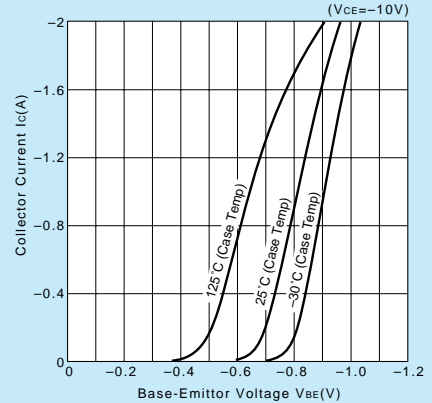
Ic-VCE Characteristics (Typical)



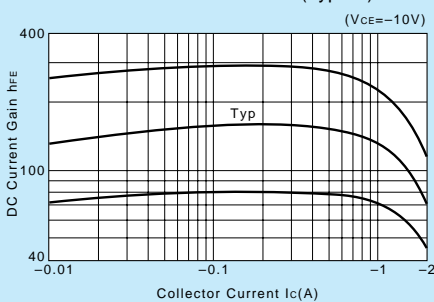
VCE(sat)-Ib Characteristics (Typical)



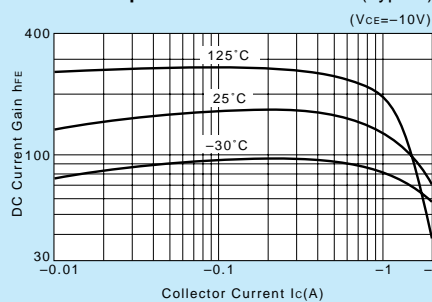
Ic-VBE Temperature Characteristics (Typical)



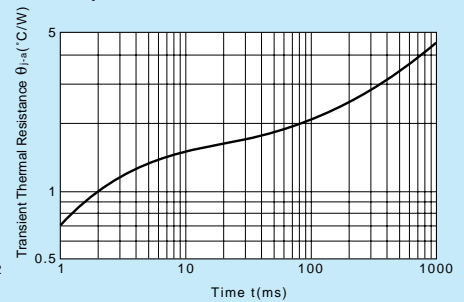
hFE-Ic Characteristics (Typical)



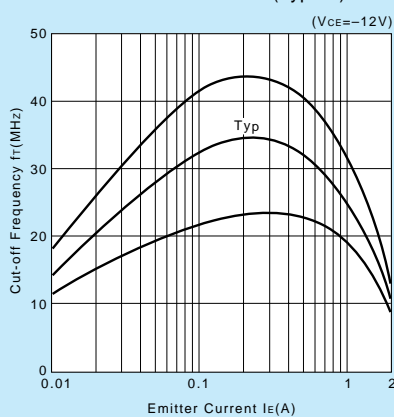
hFE-Ic Temperature Characteristics (Typical)



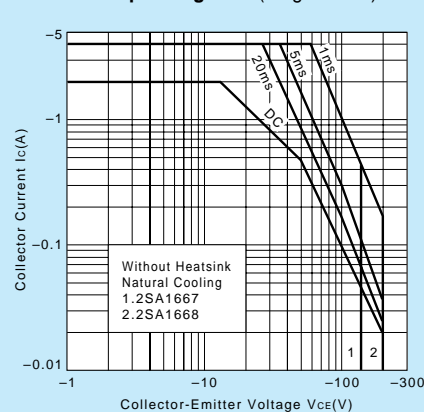
θja-t Characteristics



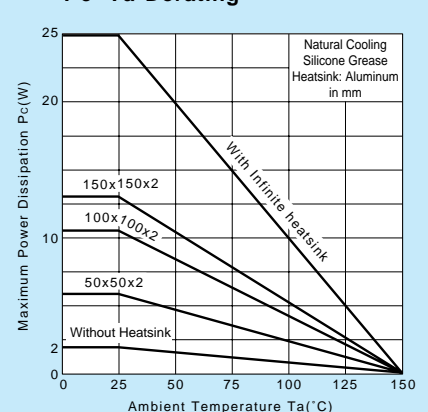
fT-IE Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc-Ta Derating



# 2SA1673

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4388)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

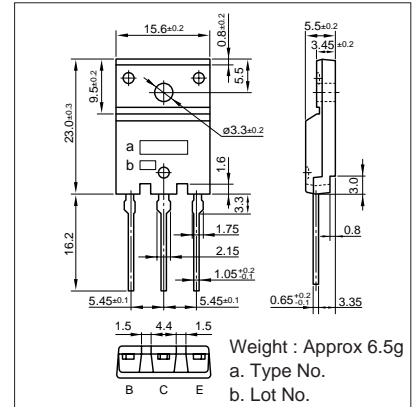
Symbol	2SA1673	Unit
VcBO	-180	V
VCEO	-180	V
VEBO	-6	V
Ic	-15	A
IB	-4	A
Pc	85(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1673	Unit
ICBO	VcB=-180V	-10max	μA
IEBO	VEB=-6V	-10max	μA
V(BR)CEO	Ic=-50mA	-180min	V
hFE	VCE=-4V, Ic=-3A	50min*	
VCE(sat)	Ic=-5A, IB=-0.5A	-2.0max	V
fr	VCE=-12V, IE=0.5A	20typ	MHz
COB	VcB=-10V, f=1MHz	500typ	pF

\*hFE Rank O(50to100), P(70to140), Y(90to180)

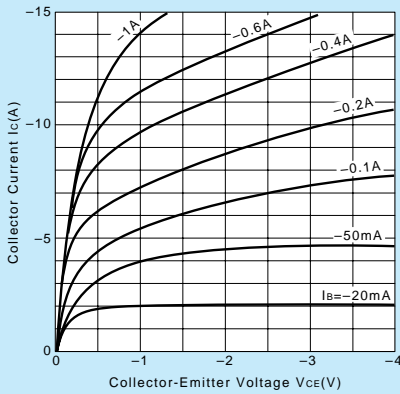
**External Dimensions FM100(TO3PF)**



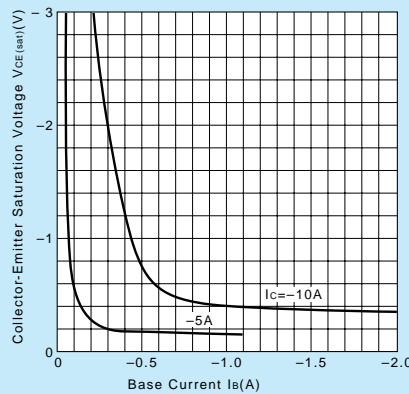
**Typical Switching Characteristics (Common Emitter)**

Vcc (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	IB1 (A)	IB2 (A)	ton (μs)	tstg (μs)	tf (μs)
-40	4	-10	-10	5	-1	1	0.6typ	0.9typ	0.2typ

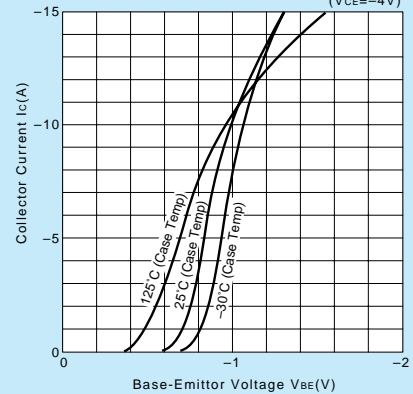
**Ic-VCE Characteristics (Typical)**



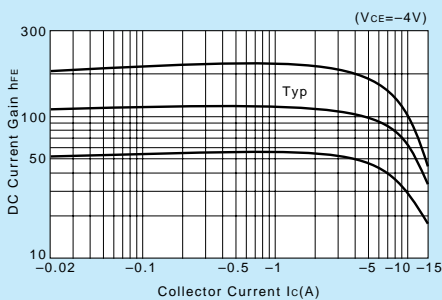
**VCE(sat)-IB Characteristics (Typical)**



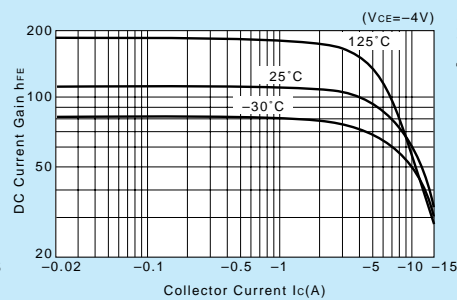
**Ic-VBE Temperature Characteristics (Typical)**



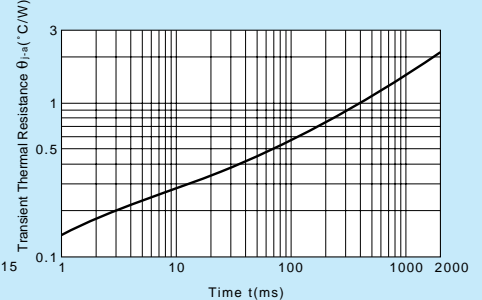
**hFE-Ic Characteristics (Typical)**



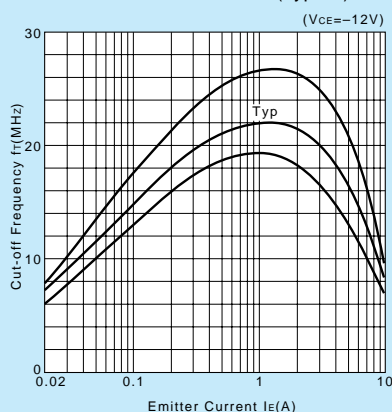
**hFE-Ic Temperature Characteristics (Typical)**



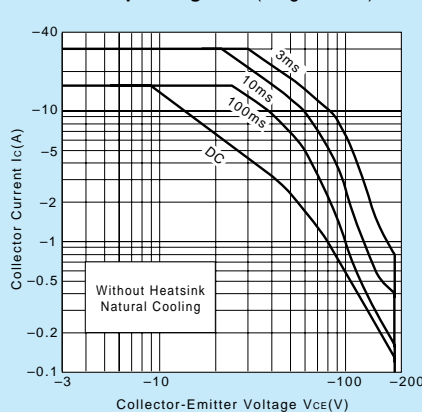
**θj-a-t Characteristics**



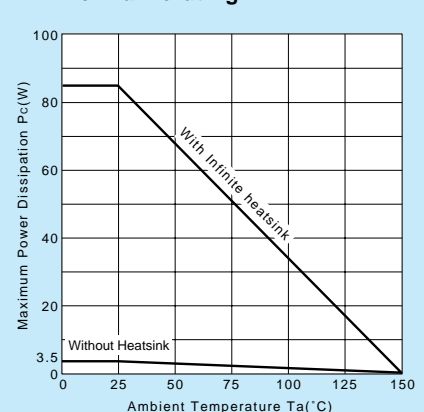
**fr-IE Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**Pc-Ta Derating**



# 2SA1693

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4466)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1693	Unit
V <sub>CB0</sub>	-80	V
V <sub>CEO</sub>	-80	V
V <sub>EBO</sub>	-6	V
I <sub>c</sub>	-6	A
I <sub>B</sub>	-3	A
P <sub>c</sub>	60(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

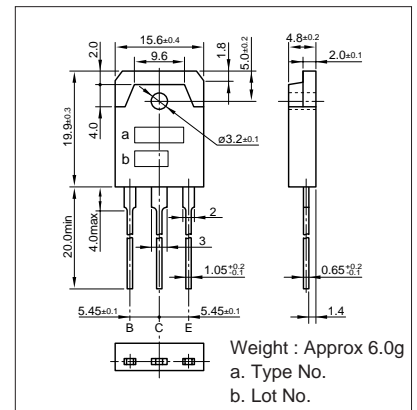
Symbol	Conditions	2SA1693	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-80V	-10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-6V	-10max	μA
V(BR)CEO	I <sub>c</sub> =-50mA	-80min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-2A	50min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-2A, I <sub>B</sub> =-0.2A	-1.5max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	20typ	MHZ
COB	V <sub>CB</sub> =-10V, f=1MHZ	150typ	pF

\*h<sub>FE</sub> Rank O(50to100), P(70to140), Y(90to180)

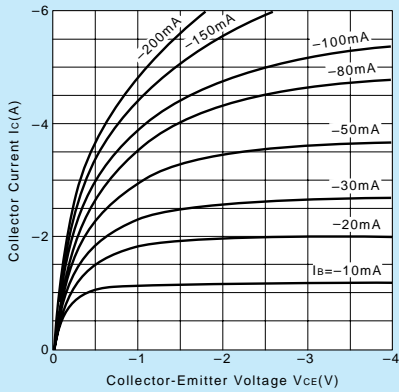
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-30	10	-3	-10	5	-0.3	0.3	0.18typ	1.10typ	0.21typ

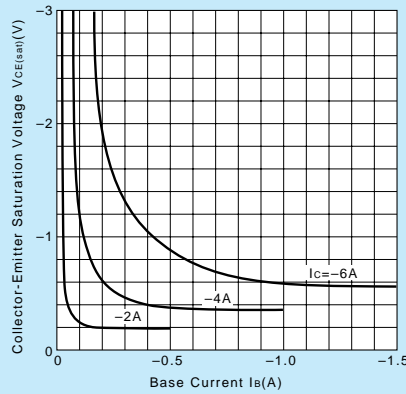
**External Dimensions MT-100(TO3P)**



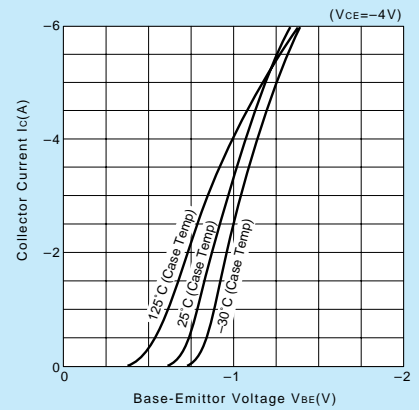
I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)



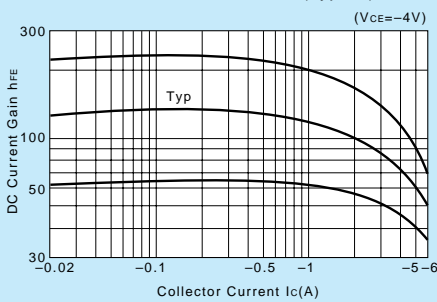
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



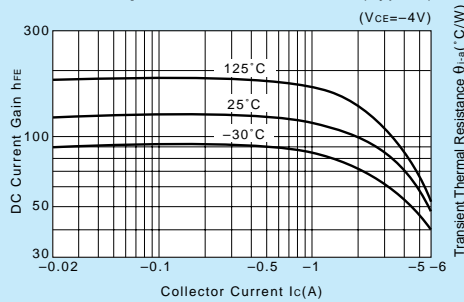
I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



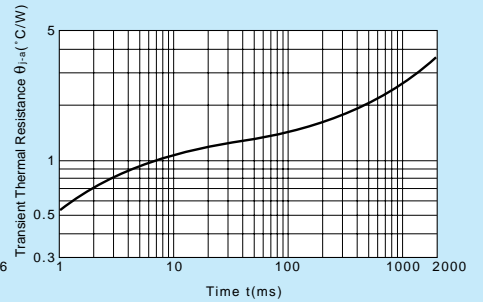
h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)



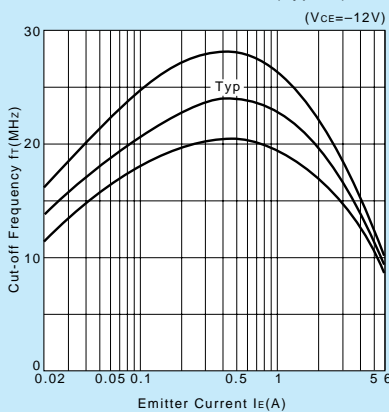
h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)



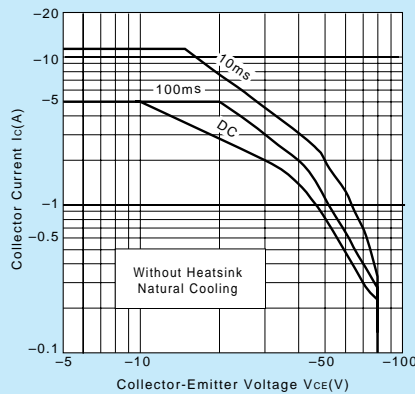
θ<sub>j-a</sub>-t Characteristics



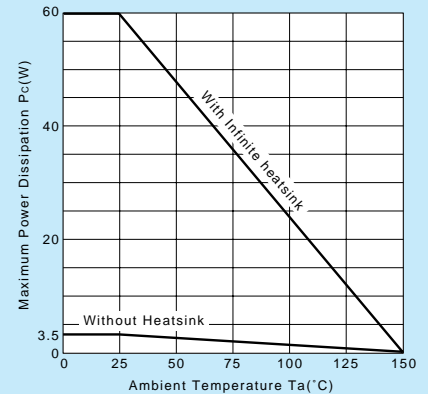
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)



P<sub>c</sub>-T<sub>a</sub> Derating



# 2SA1694

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4467)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1694	Unit
V <sub>CB0</sub>	-120	V
V <sub>CE0</sub>	-120	V
V <sub>EB0</sub>	-6	V
I <sub>c</sub>	-8	A
I <sub>B</sub>	-3	A
P <sub>c</sub>	80(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

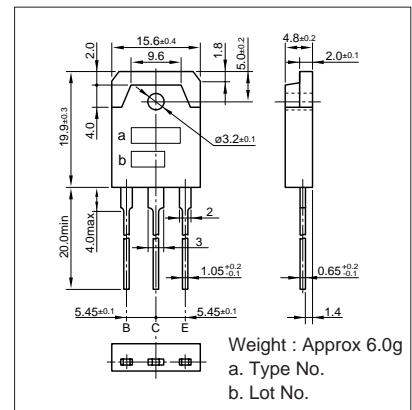
Symbol	Conditions	2SA1694	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-120V	-10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-10max	μA
V(BR) <sub>CEO</sub>	I <sub>c</sub> =-50mA	-120min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-3A	50min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-3A, I <sub>B</sub> =-0.3A	-1.5max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	20typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	300typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

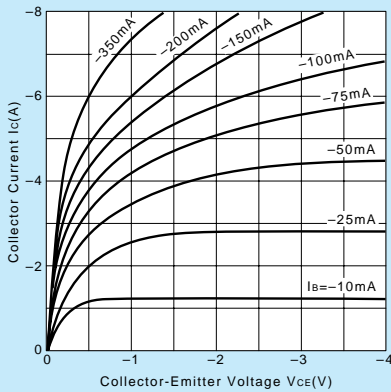
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-40	10	-4	-10	5	-0.4	0.4	0.14typ	1.40typ	0.21typ

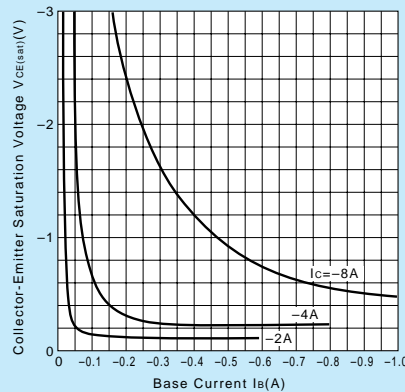
**External Dimensions MT-100(TO3P)**



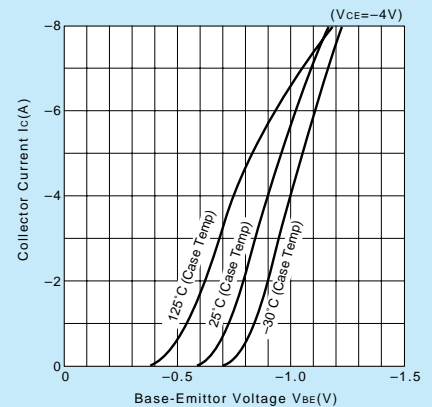
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



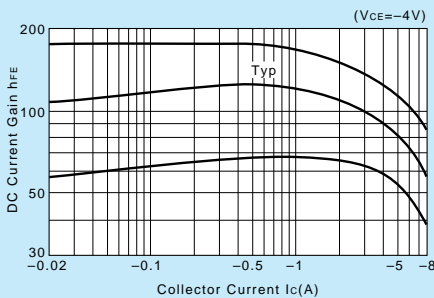
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



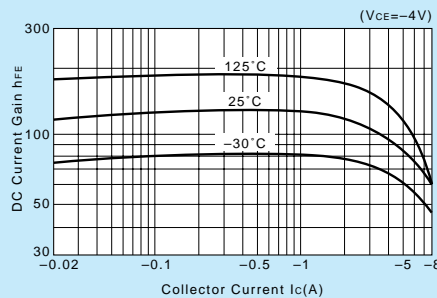
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



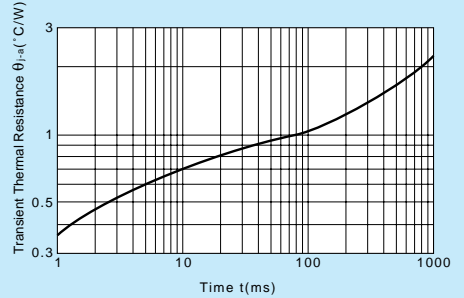
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



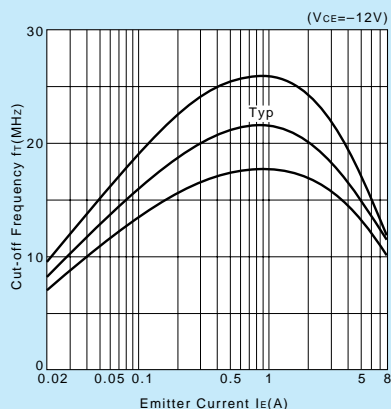
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



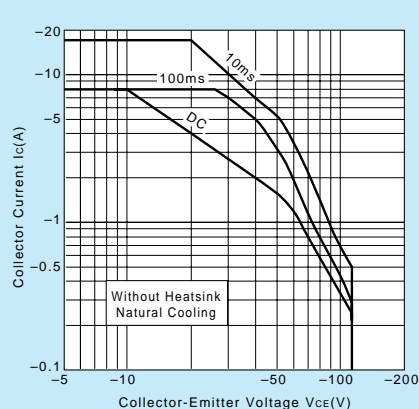
**θ<sub>j-a</sub>-t Characteristics**



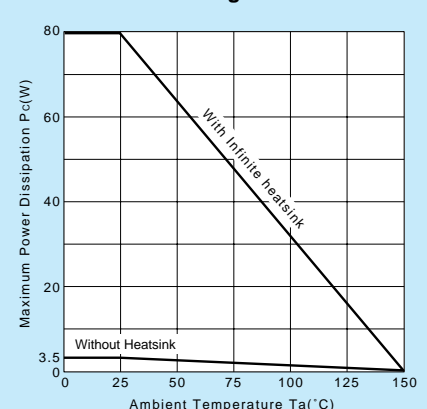
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SA1695

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4468)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1695	Unit
V <sub>CB0</sub>	-140	V
V <sub>CE0</sub>	-140	V
V <sub>EB0</sub>	-6	V
I <sub>C</sub>	-10	A
I <sub>B</sub>	-4	A
P <sub>C</sub>	100(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

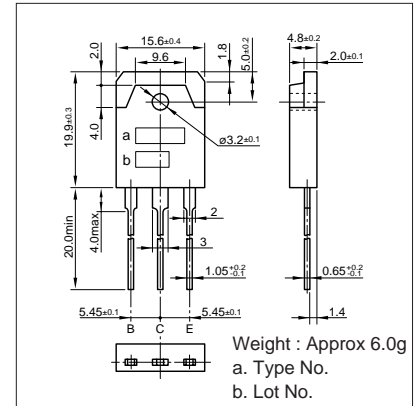
Symbol	Conditions	2SA1695	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-140V	-10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-10max	μA
V(BR)CEO	I <sub>C</sub> =-50mA	-140min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-3A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-0.5A	-0.5max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	20typ	MHZ
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHZ	400typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

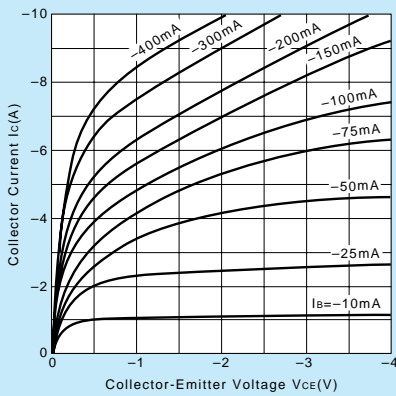
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-60	12	-5	-10	5	-0.5	0.5	0.17typ	1.86typ	0.27typ

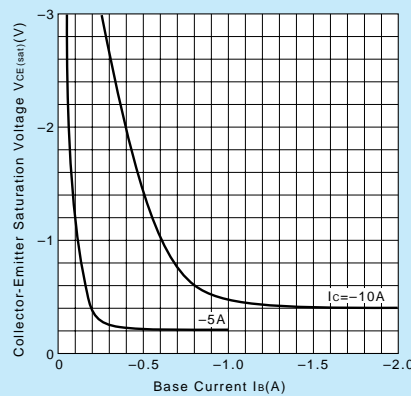
**External Dimensions MT-100(TO3P)**



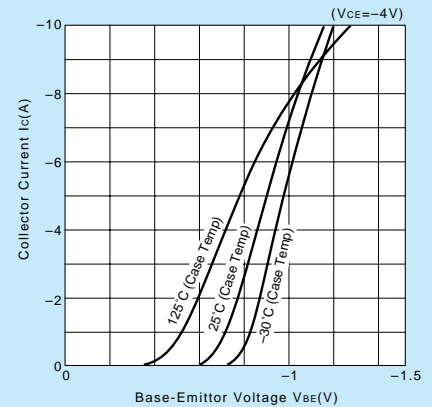
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



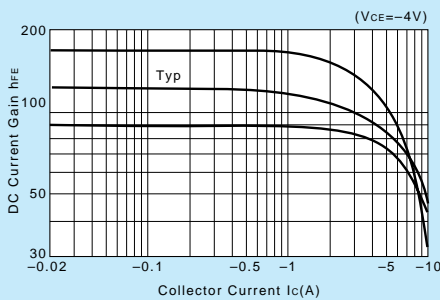
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



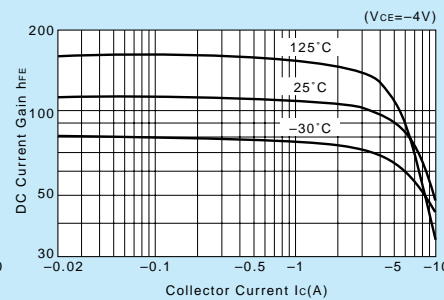
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



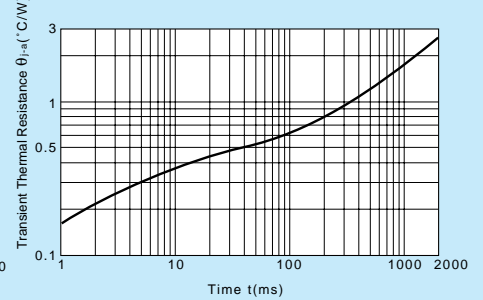
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



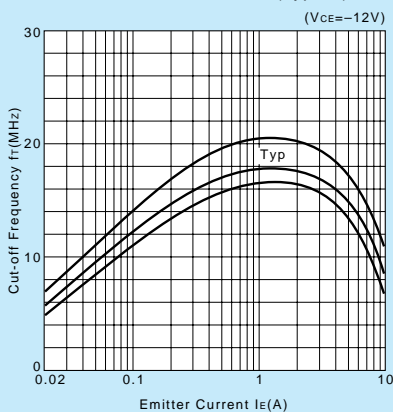
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



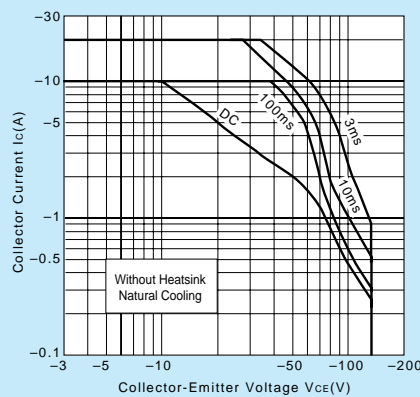
**θ<sub>j-a</sub>-t Characteristics**



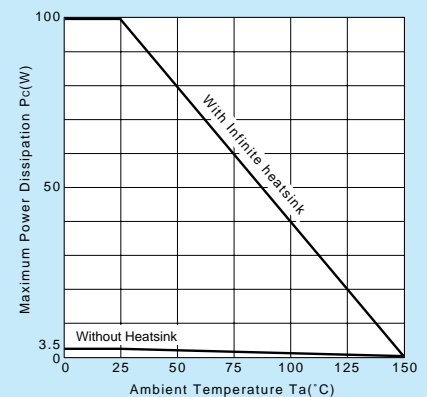
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SA1725

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4511)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1725	Unit
V <sub>CB0</sub>	-80	V
V <sub>CEO</sub>	-80	V
V <sub>EBO</sub>	-6	V
I <sub>C</sub>	-6	A
I <sub>B</sub>	-3	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

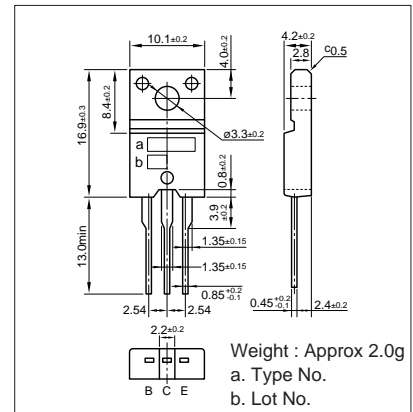
Symbol	Conditions	2SA1725	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-80V	-10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-6V	-10max	μA
V(BR)CEO	I <sub>C</sub> =-25mA	-80min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-2A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-2A, I <sub>B</sub> =-0.2A	-0.5max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	20typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	150typ	pF

\*h<sub>FE</sub> Rank O(50to100), P(70to140), Y(90to180)

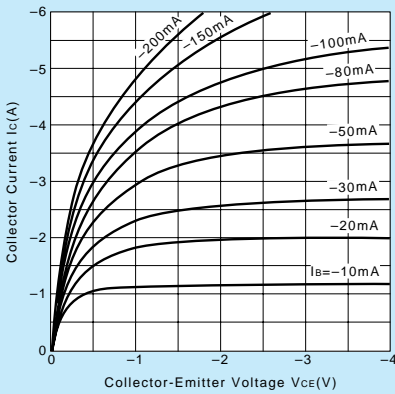
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-30	10	-3	-10	5	-0.3	0.3	0.18typ	1.10typ	0.21typ

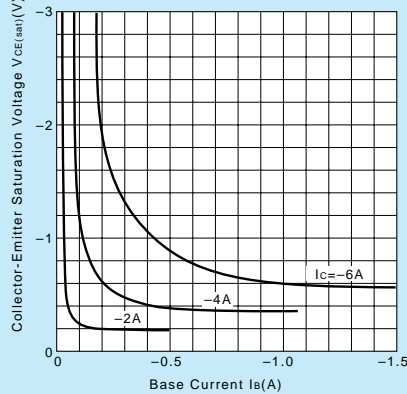
**External Dimensions FM20(TO220F)**



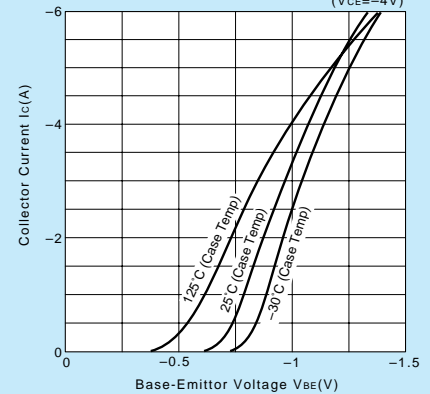
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



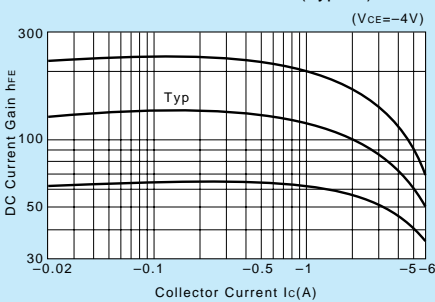
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



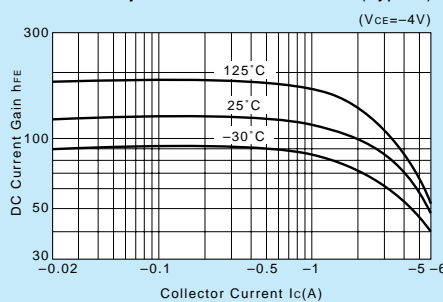
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



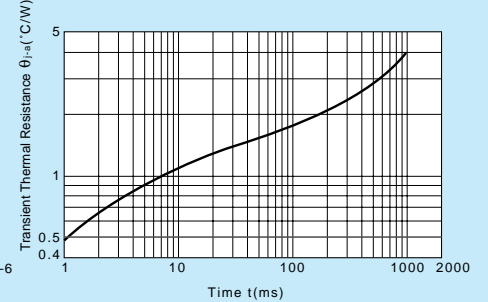
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



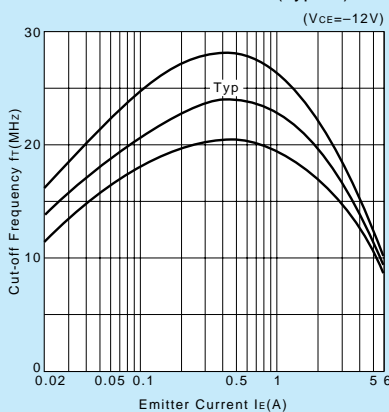
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



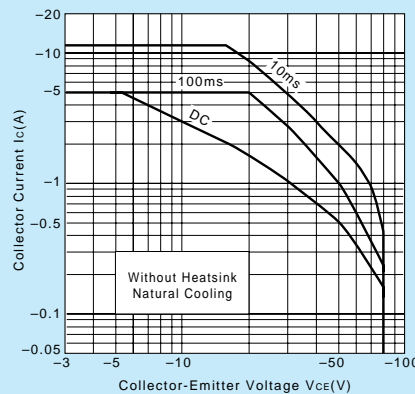
**θ<sub>j-a</sub>-t Characteristics**



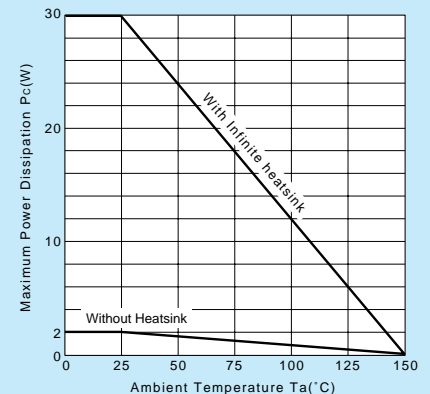
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SA1726

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4512)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1726	Unit
V <sub>CB0</sub>	-80	V
V <sub>CE0</sub>	-80	V
V <sub>EBO</sub>	-6	V
I <sub>c</sub>	-6	A
I <sub>B</sub>	-3	A
P <sub>c</sub>	50(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

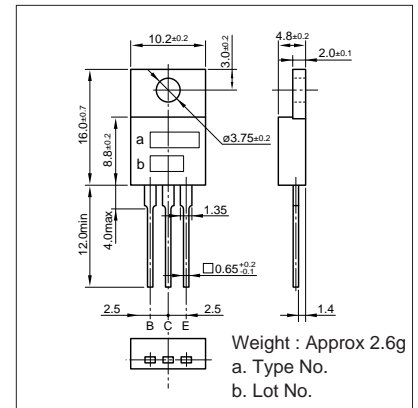
Symbol	Conditions	2SA1726	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-80V	-10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-6V	-10max	μA
V(BR)CEO	I <sub>c</sub> =-25mA	-80min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-2A	50min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-2A, I <sub>B</sub> =-0.2A	-0.5max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	20typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	150typ	pF

\*h<sub>FE</sub> Rank O(50to100), P(70to140), Y(90to180)

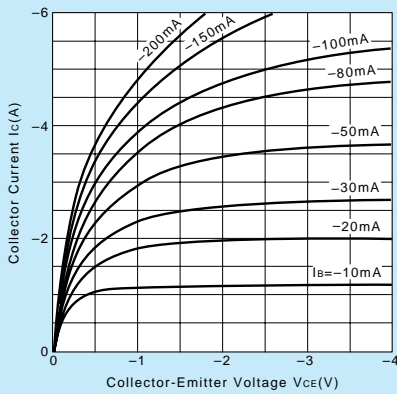
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-30	10	-3	-10	5	-0.3	0.3	0.18typ	1.10typ	0.21typ

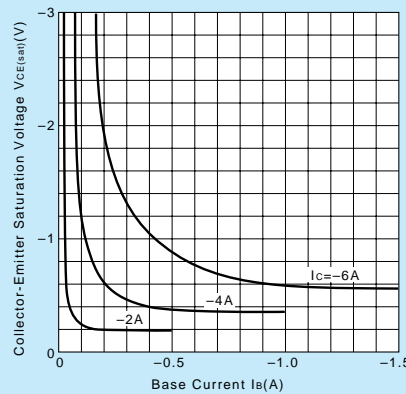
**External Dimensions MT-25(TO220)**



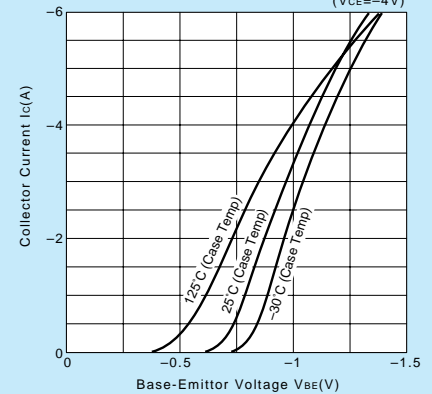
I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)



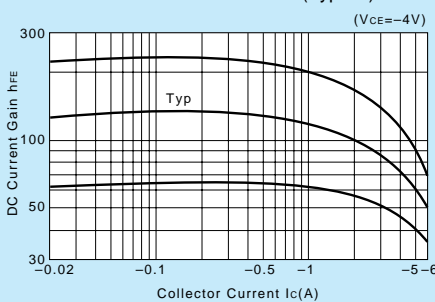
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



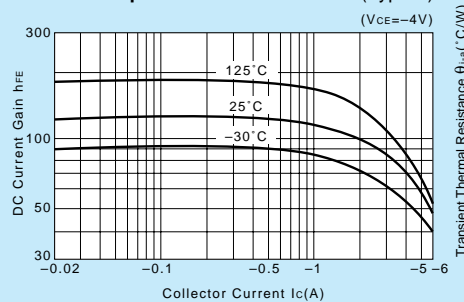
I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



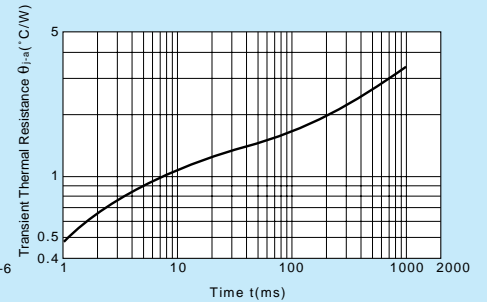
h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)



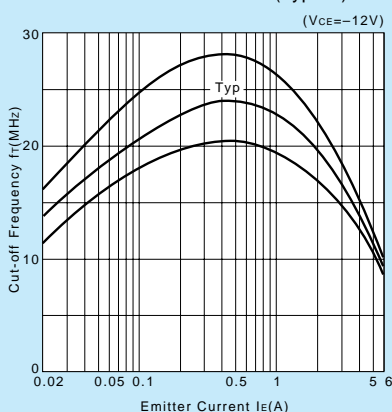
h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)



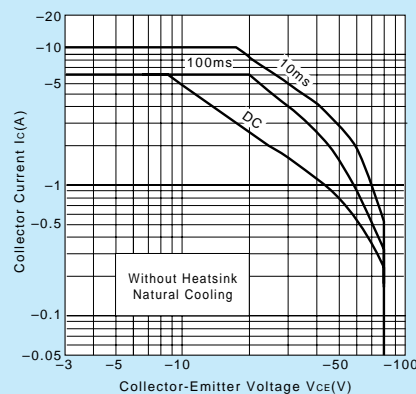
θ<sub>j-a</sub>-t Characteristics



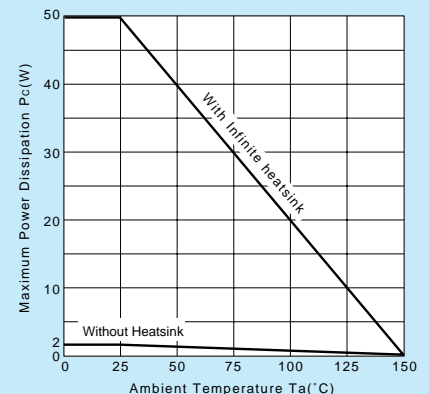
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)



P<sub>c</sub>-T<sub>a</sub> Derating





Low  $V_{CE(sat)}$

# 2SA1746

Silicon PNP Epitaxial Planar Transistor

Application : Chopper Regulator, Switch and General Purpose

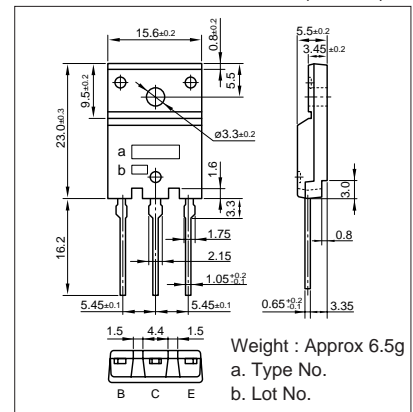
**Absolute maximum ratings** ( $T_a=25^\circ\text{C}$ )

Symbol	2SA1746	Unit
$V_{CB0}$	-70	V
$V_{CE0}$	-50	V
$V_{EB0}$	-6	V
$I_C$	-12(Pulse-20)	A
$I_B$	-4	A
$P_C$	60( $T_C=25^\circ\text{C}$ )	W
$T_{jg}$	150	$^\circ\text{C}$
$T_{stg}$	-55 to +150	$^\circ\text{C}$

**Electrical Characteristics** ( $T_a=25^\circ\text{C}$ )

Symbol	Conditions	2SA1746	Unit
$I_{CB0}$	$V_{CB}=-70\text{V}$	-10max	$\mu\text{A}$
$I_{EB0}$	$V_{EB}=-6\text{V}$	-10max	$\mu\text{A}$
$V_{(BR)CEO}$	$I_C=-25\text{mA}$	-50min	V
$h_{FE}$	$V_{CE}=-1\text{V}, I_C=-5\text{A}$	50min	
$V_{CE(sat)}$	$I_C=-5\text{A}, I_B=-80\text{mA}$	-0.5max	V
$V_{BE(sat)}$	$I_C=-5\text{A}, I_B=-80\text{mA}$	-1.2max	V
$f_r$	$V_{CE}=-12\text{V}, I_E=1\text{A}$	25typ	MHz
$C_{OB}$	$V_{CB}=-10\text{V}, f=1\text{MHz}$	400typ	pF

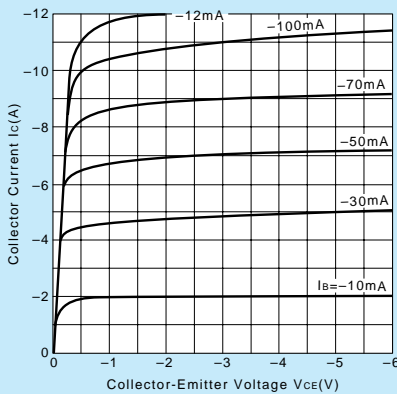
**External Dimensions FM100(TO3PF)**



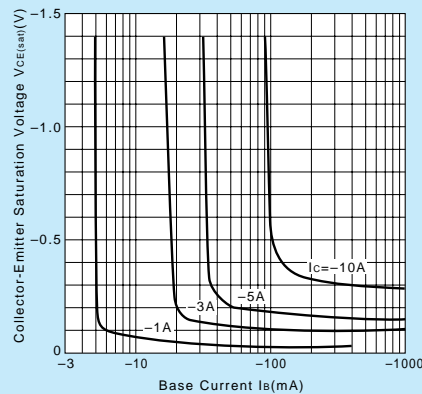
**Typical Switching Characteristics (Common Emitter)**

$V_{CC}$ (V)	$R_L$ ( $\Omega$ )	$I_C$ (A)	$V_{BB1}$ (V)	$V_{BB2}$ (V)	$I_{B1}$ (mA)	$I_{B2}$ (mA)	$t_{on}$ ( $\mu\text{s}$ )	$t_{stg}$ ( $\mu\text{s}$ )	$t_f$ ( $\mu\text{s}$ )
-20	4	-5	-10	5	-80	80	0.5typ	0.6typ	0.3typ

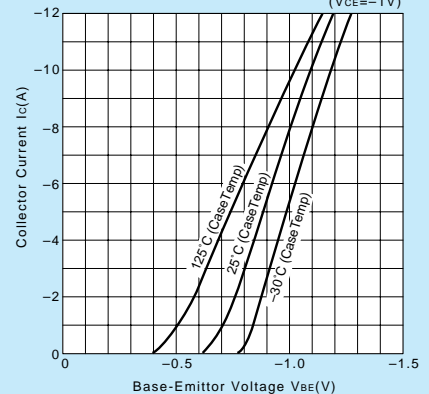
**$I_C-V_{CE}$  Characteristics (Typical)**



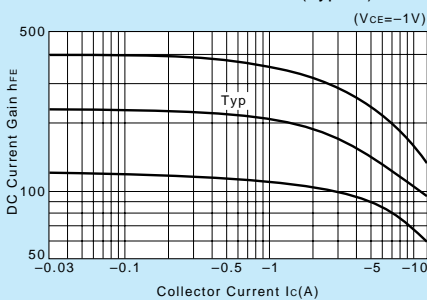
**$V_{CE(sat)}-I_B$  Characteristics (Typical)**



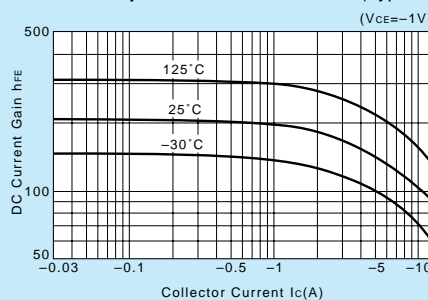
**$I_C-V_{BE}$  Temperature Characteristics (Typical)**



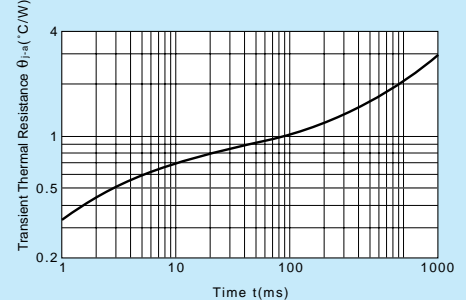
**$h_{FE}-I_C$  Characteristics (Typical)**



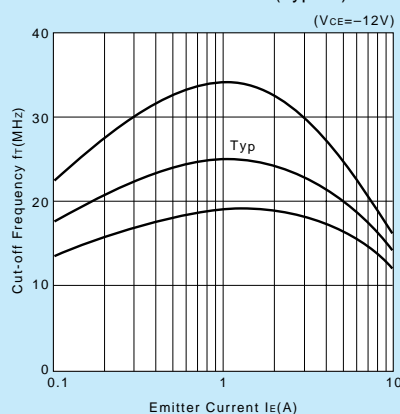
**$h_{FE}-I_C$  Temperature Characteristics (Typical)**



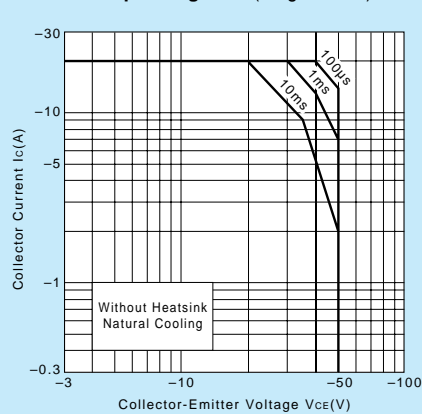
**$\theta_{j-a}-t$  Characteristics**



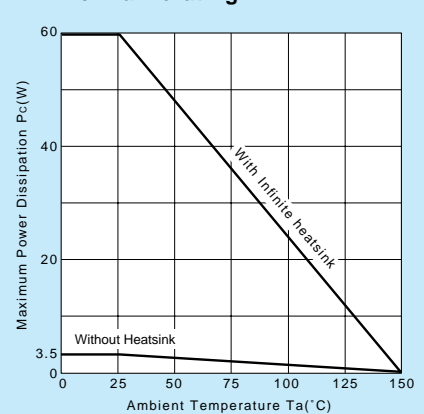
**$f_r-I_E$  Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**$P_C-T_a$  Derating**



# 2SA1859/1859A

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4883/A)

Application : Audio Output Driver and TV Velocity-modulation

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1859	2SA1859A	Unit
V <sub>CBO</sub>	-150	-180	V
V <sub>CEO</sub>	-150	-180	V
V <sub>EBO</sub>	-6		V
I <sub>C</sub>	-2		A
I <sub>B</sub>	-1		A
P <sub>C</sub>	20(T <sub>C</sub> =25°C)		W
T <sub>J</sub>	150		°C
T <sub>stg</sub>	-55 to +150		°C

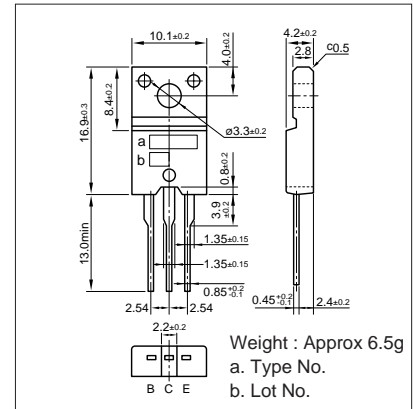
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1859	2SA1859A	Unit
I <sub>CBO</sub>	V <sub>CB</sub> =	-10max		μA
V <sub>CEO</sub>	V <sub>CB</sub> =	-150	-180	V
I <sub>EBO</sub>	V <sub>EB</sub> =-6V	-10max		μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-10mA	-150min	-180min	V
h <sub>FE</sub>	V <sub>CE</sub> =-10V, I <sub>C</sub> =-0.7A	60 to 240		
V <sub>CE(sat)</sub>	I <sub>C</sub> =-0.7A, I <sub>B</sub> =-70mA	-1.0max		V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.7A	60typ		MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	30typ		pF

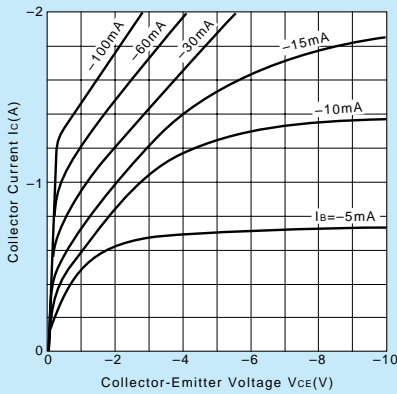
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-20	20	-1	-10	5	-100	100	0.5typ	1.0typ	0.5typ

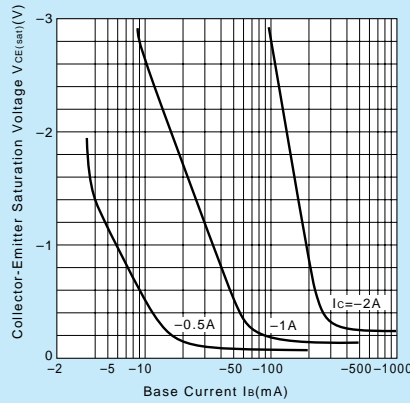
**External Dimensions FM20(TO220F)**



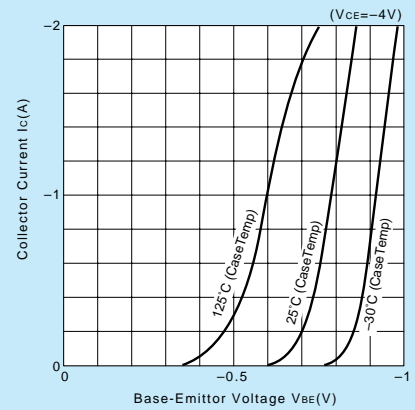
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



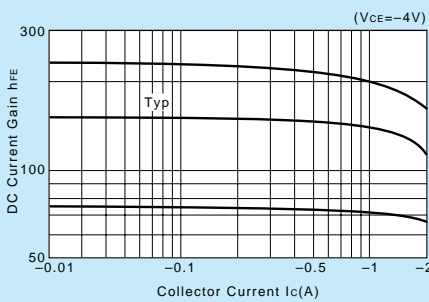
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



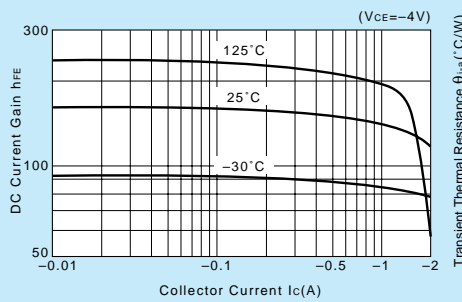
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



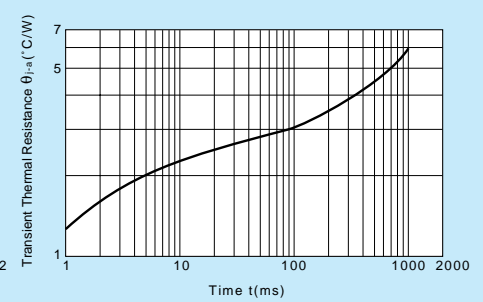
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



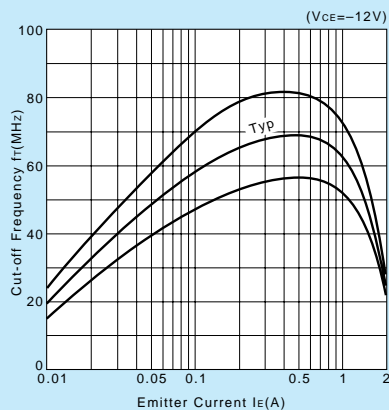
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



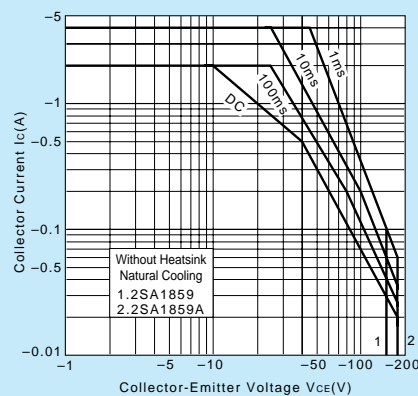
**θ<sub>j-a</sub>-t Characteristics**



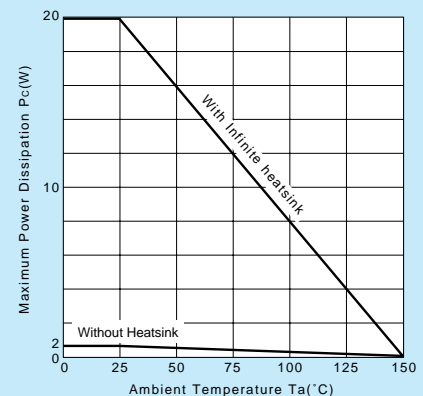
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4886)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1860	Unit
V <sub>CB0</sub>	-150	V
V <sub>CE0</sub>	-150	V
V <sub>EB0</sub>	-5	V
I <sub>c</sub>	-14	A
I <sub>B</sub>	-3	A
P <sub>c</sub>	80(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

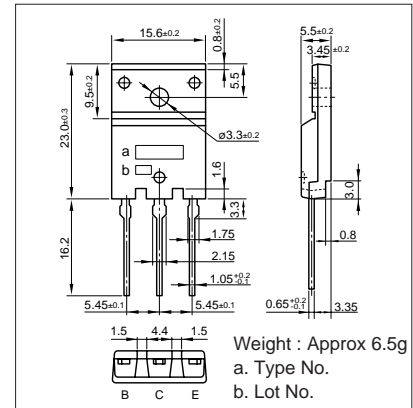
Symbol	Conditions	2SA1860	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-150V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V(BR) <sub>CEO</sub>	I <sub>c</sub> =-25mA	-150min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-5A	50min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-5A, I <sub>B</sub> =-500mA	-2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	50typ	MHZ
CoB	V <sub>CB</sub> =-10V, f=1MHz	400typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50to100), P(70to140), Y(90to180)

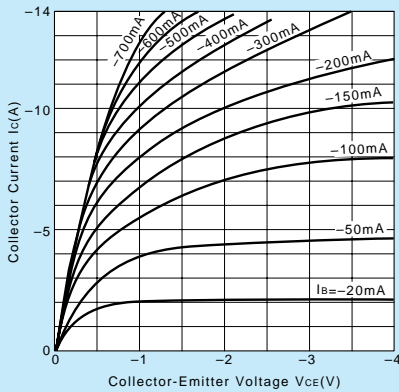
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-60	12	-5	-10	5	-500	500	0.25typ	0.85typ	0.2typ

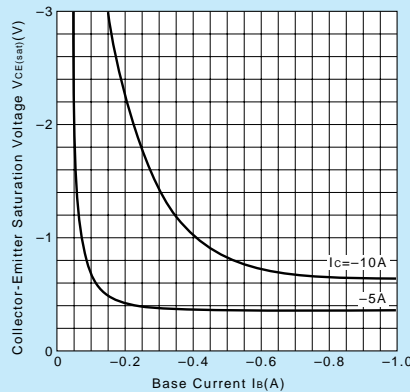
**External Dimensions FM100(TO3PF)**



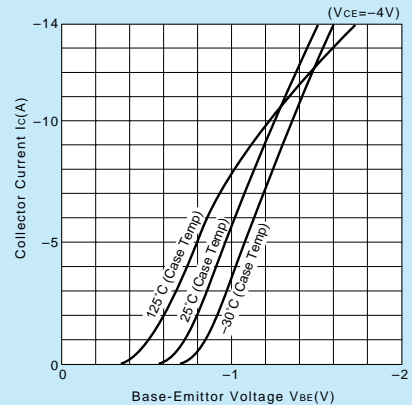
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



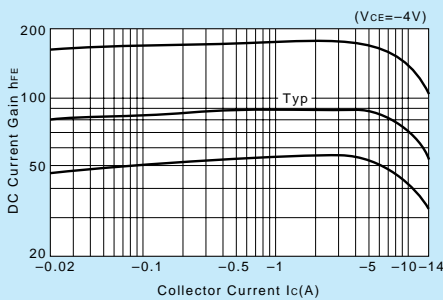
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



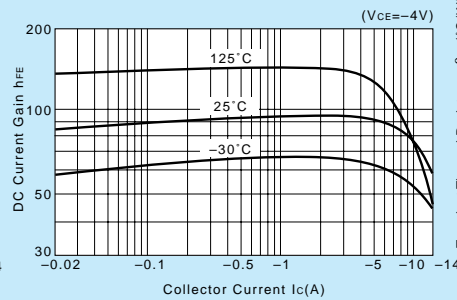
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



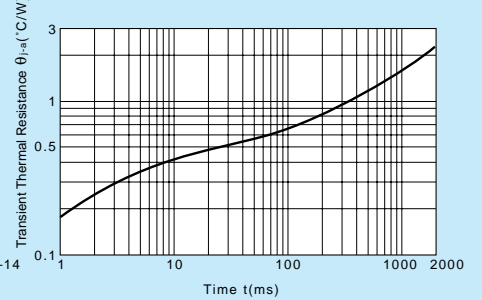
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



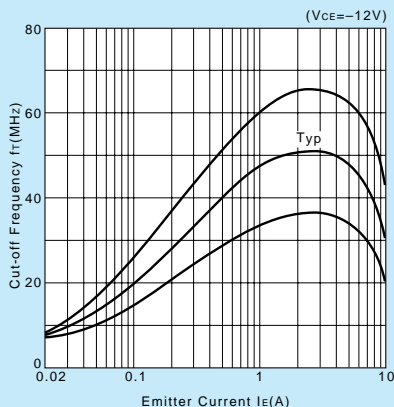
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



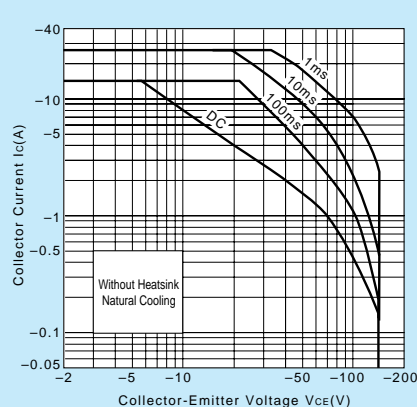
**θ<sub>j-a</sub>-t Characteristics**



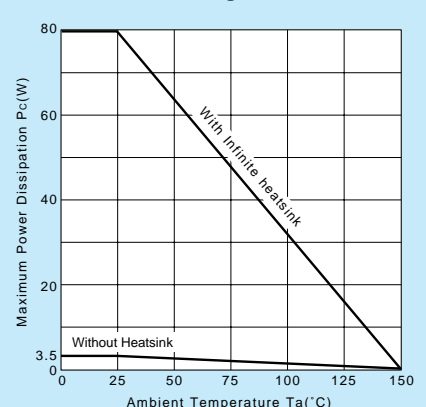
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SA1907

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC5099)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

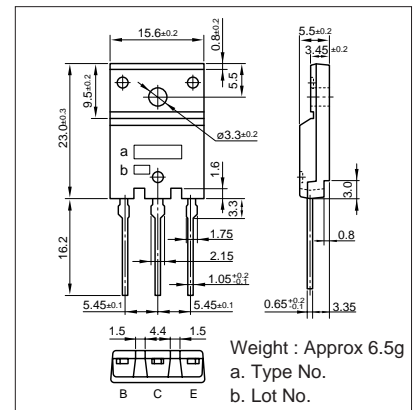
Symbol	2SA1907	Unit
V <sub>CB0</sub>	-80	V
V <sub>CE0</sub>	-80	V
V <sub>EB0</sub>	-6	V
I <sub>c</sub>	-6	A
I <sub>B</sub>	-3	A
P <sub>c</sub>	60(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SA1907	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-80V	-10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-10max	μA
V(BR) <sub>CEO</sub>	I <sub>c</sub> =-50mA	-80min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-2A	50min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-12A, I <sub>B</sub> =-0.2A	-0.5max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	20typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	150typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

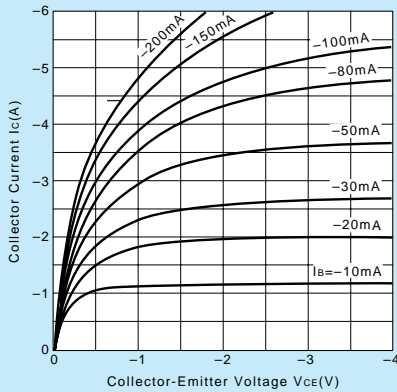
**External Dimensions FM100(TO3PF)**



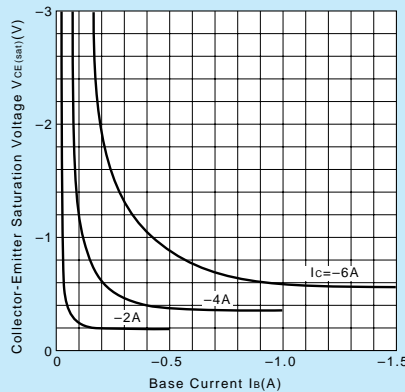
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-30	10	-3	-10	5	-0.3	0.3	0.18typ	1.10typ	0.21typ

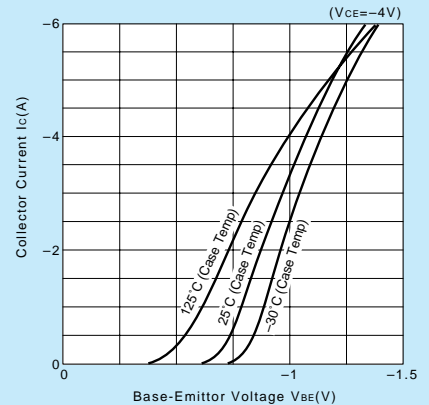
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



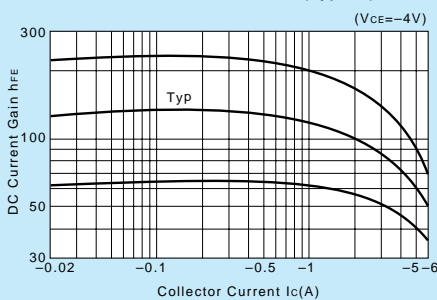
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



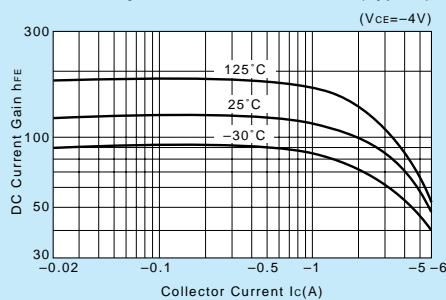
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



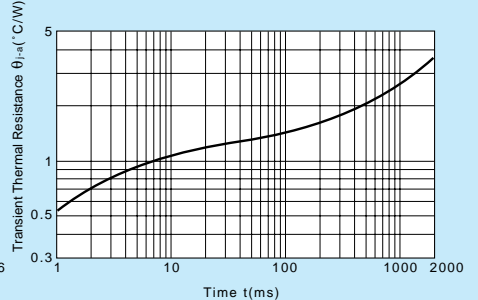
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



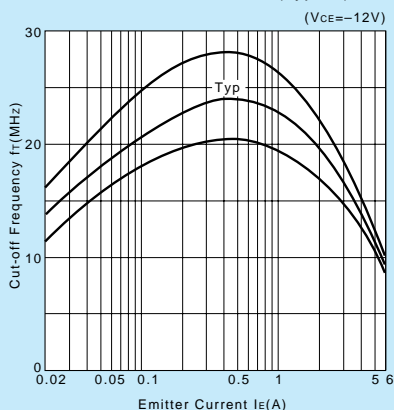
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



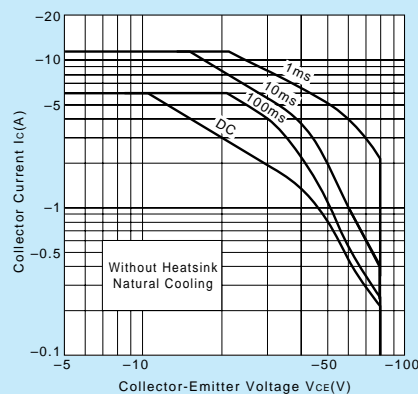
**θ<sub>j-a</sub>-t Characteristics**



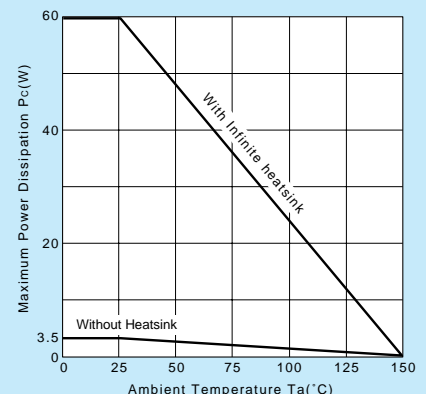
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SA1908

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC5100)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1908	Unit
V <sub>CB0</sub>	-120	V
V <sub>CEO</sub>	-120	V
V <sub>EBO</sub>	-6	V
I <sub>C</sub>	-8	A
I <sub>B</sub>	-3	A
P <sub>C</sub>	75(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

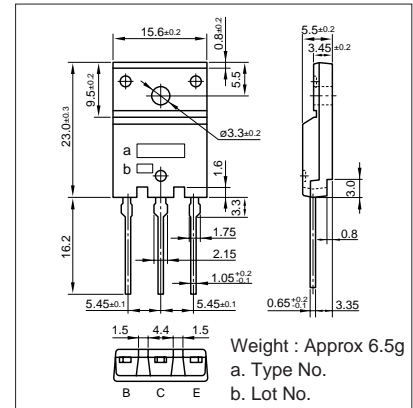
Symbol	Conditions	2SA1908	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-120V	-10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-6V	-10max	μA
V(BR)CEO	I <sub>C</sub> =-50mA	-120min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-3A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-3A, I <sub>B</sub> =-0.3A	-0.5max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	20typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	300typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

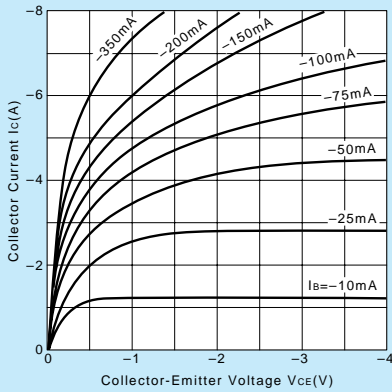
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-40	10	-4	-10	5	-0.4	0.4	0.14typ	1.40typ	0.21typ

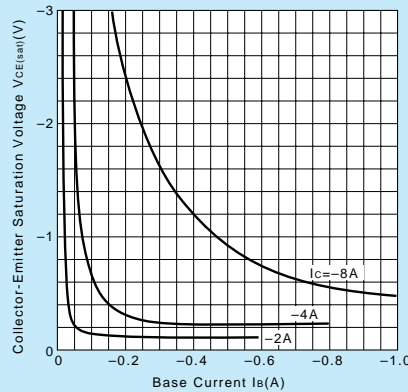
**External Dimensions FM100(TO3PF)**



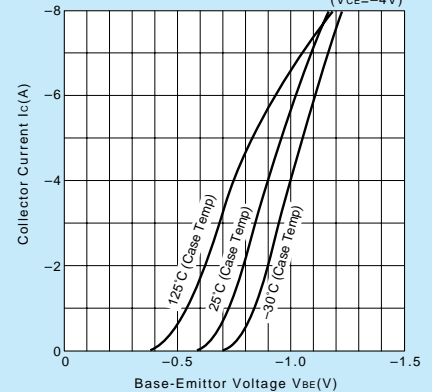
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



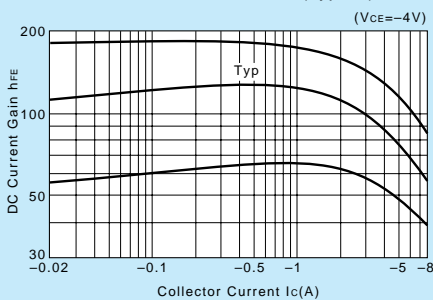
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



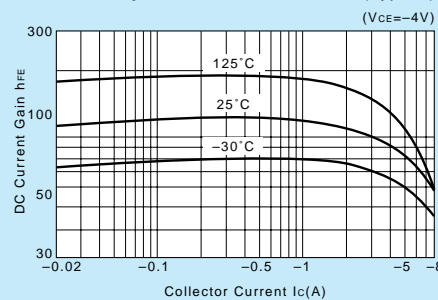
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



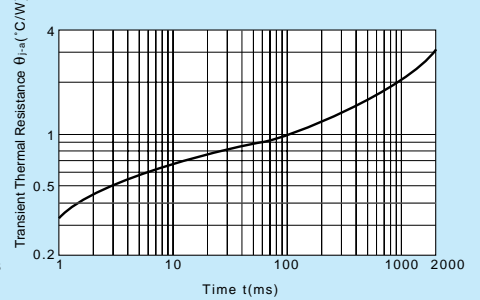
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



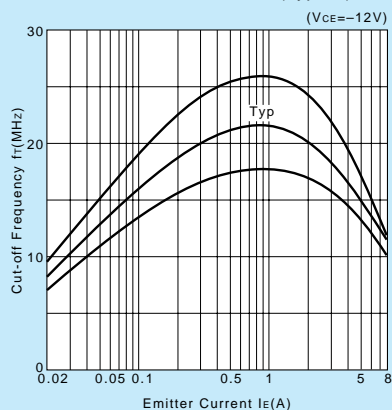
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



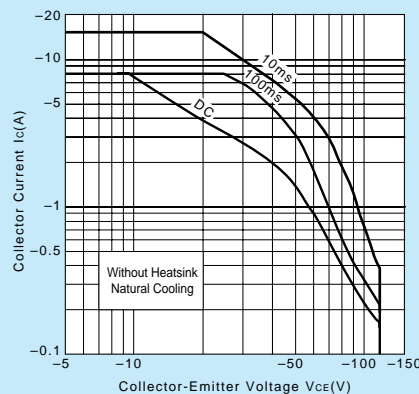
**θ<sub>j-a</sub>-t Characteristics**



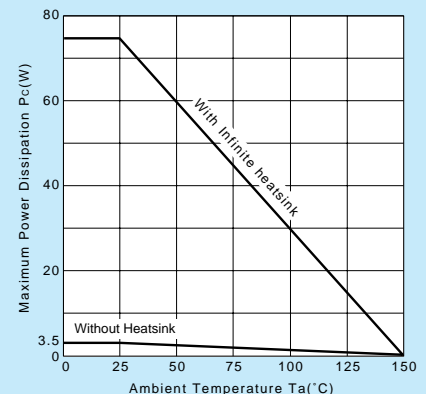
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SA1909

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC5101)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SA1909	Unit
VcBo	-140	V
VcEO	-140	V
VEBO	-6	V
Ic	-10	A
IB	-4	A
Pc	80(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

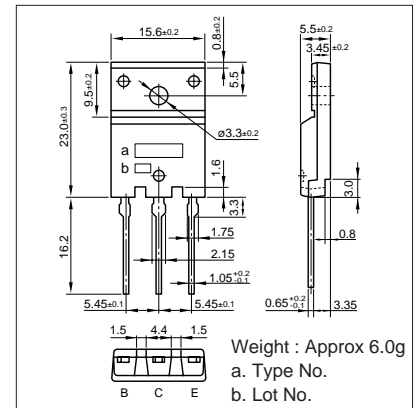
Symbol	Conditions	2SA1909	Unit
ICBO	VcB=-140V	-10max	μA
IEBO	VEB=-6V	-10max	μA
V(BR)CEO	Ic=-50mA	-140min	V
hFE	VcE=-4V, Ic=-3A	50min*	
VcE(sat)	Ic=-5A, IB=-0.5A	-0.5max	V
fr	VcE=-12V, IE=0.5A	20typ	MHz
COB	VcB=-10V, f=1MHz	400typ	pF

\*hFE Rank O(50to100), P(70to140), Y(90to180)

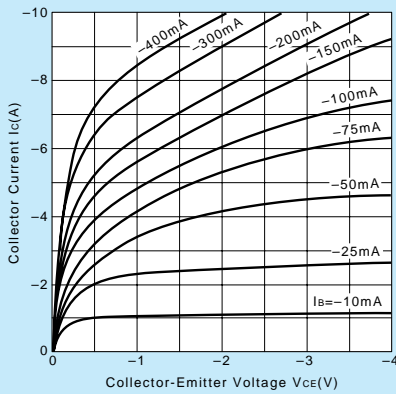
**Typical Switching Characteristics (Common Emitter)**

Vcc (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	IB1 (A)	IB2 (A)	ton (μs)	tstg (μs)	tf (μs)
-60	12	-5	-10	5	-0.5	0.5	0.17typ	1.86typ	0.27typ

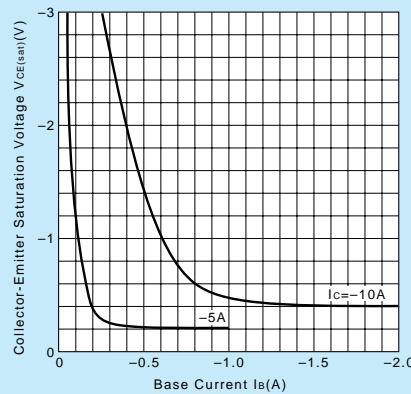
**External Dimensions FM100(TO3PF)**



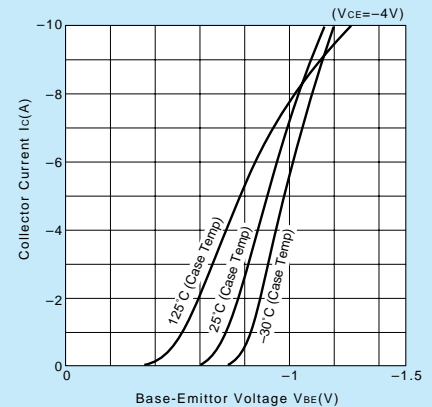
**Ic-VcE Characteristics (Typical)**



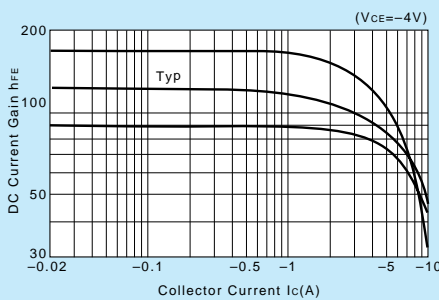
**VcE(sat)-IB Characteristics (Typical)**



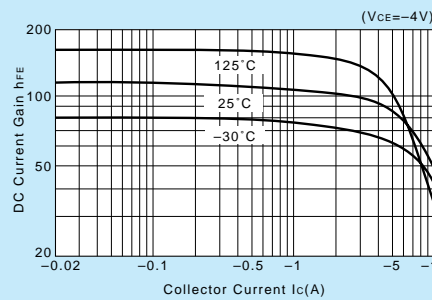
**Ic-VBE Temperature Characteristics (Typical)**



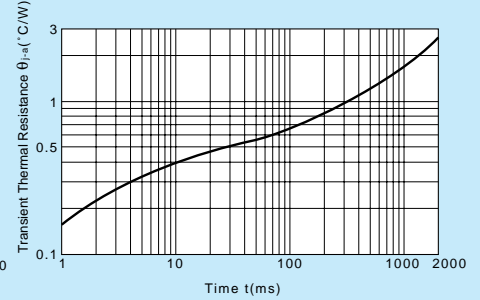
**hFE-Ic Characteristics (Typical)**



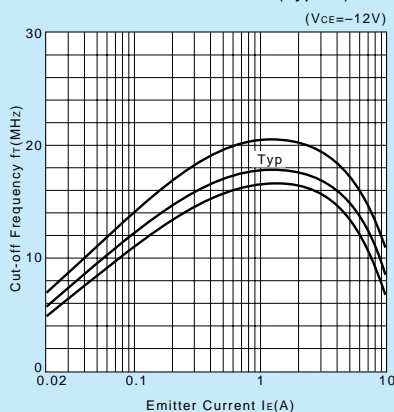
**hFE-Ic Temperature Characteristics (Typical)**



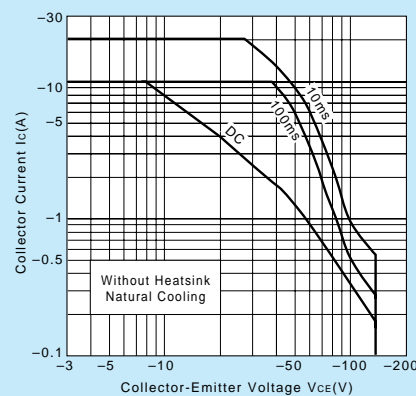
**θj-a-t Characteristics**



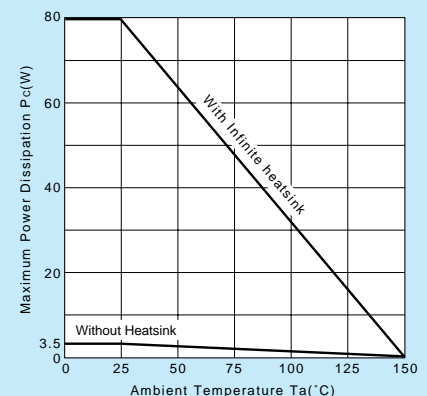
**fr-IE Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

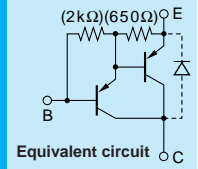


**Pc-Ta Derating**



# Darlington

# 2SB1257



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2014)

Application : Driver for Solenoid, Relay and Motor and General Purpose

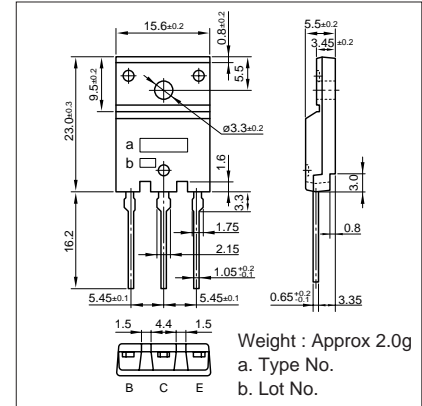
### Absolute maximum ratings (Ta=25°C)

Symbol	2SB1257	Unit
V <sub>CB0</sub>	-60	V
V <sub>CEO</sub>	-60	V
V <sub>EB0</sub>	-6	V
I <sub>C</sub>	-4(Pulse-6)	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	25(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SB1257	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-60V	-10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-10max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-10mA	-60min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-3A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-3A, I <sub>B</sub> =-6mA	-1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-3A, I <sub>B</sub> =-6mA	-2max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.2A	150typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	75typ	pF

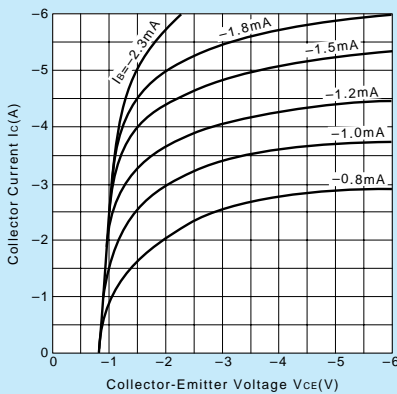
### External Dimensions FM20(TO220F)



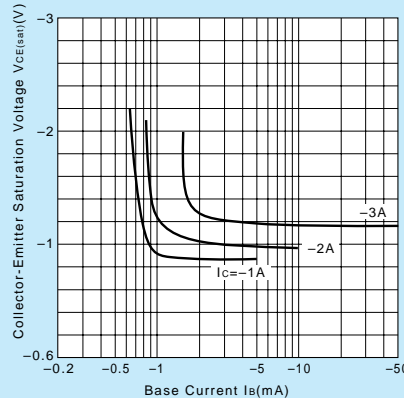
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-30	10	-3	-10	5	-10	10	0.4typ	0.8typ	0.6typ

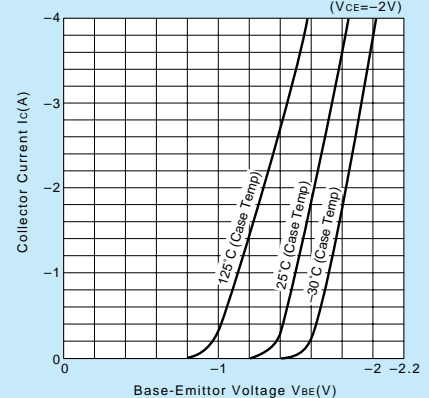
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



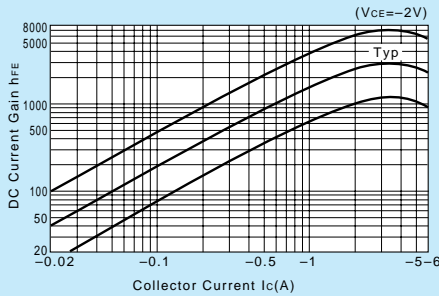
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



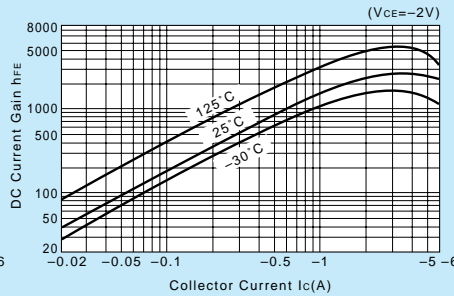
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



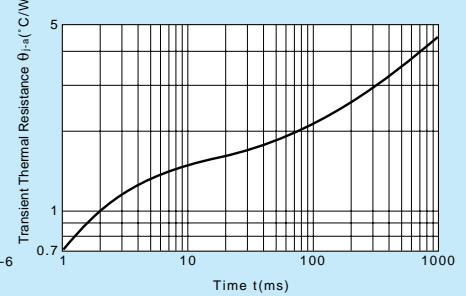
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



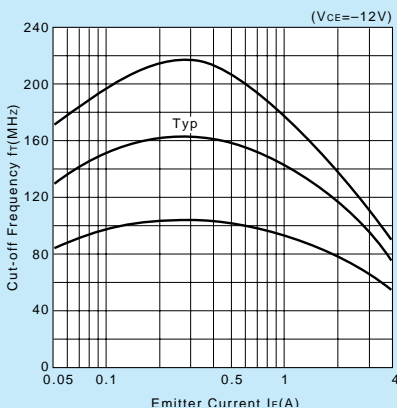
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



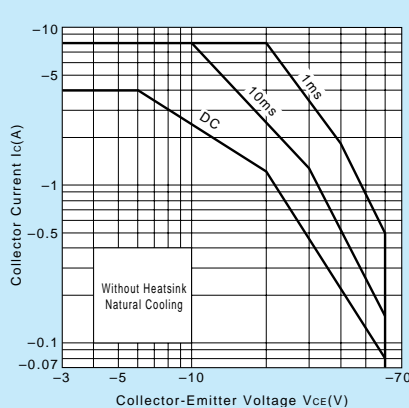
θ<sub>j-a</sub>-t Characteristics



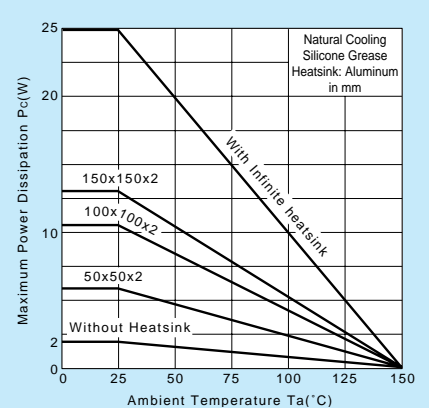
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)



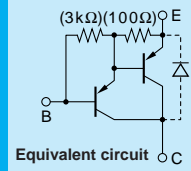
P<sub>C</sub>-T<sub>a</sub> Derating





# Darlington

# 2SB1258



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD1785)

Application : Driver for Solenoid, Relay and Motor and General Purpose

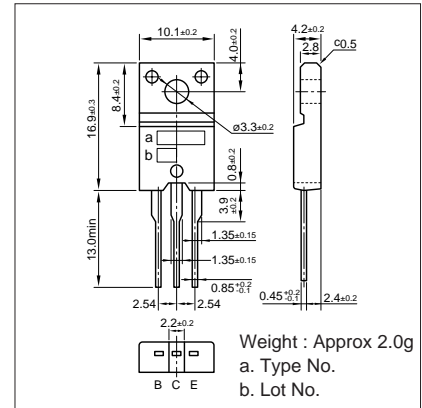
### Absolute maximum ratings (Ta=25°C)

Symbol	2SB1258	Unit
V <sub>CB0</sub>	-100	V
V <sub>CEO</sub>	-100	V
V <sub>EB0</sub>	-6	V
I <sub>C</sub>	-6(Pulse-10)	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SB1258	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-100V	-10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-10max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-10mA	-100min	V
h <sub>FE</sub>	V <sub>CE</sub> =-2V, I <sub>C</sub> =-3A	1000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-3A, I <sub>B</sub> =-6mA	-1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-3A, I <sub>B</sub> =-6mA	-2max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.2A	100typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	100typ	pF

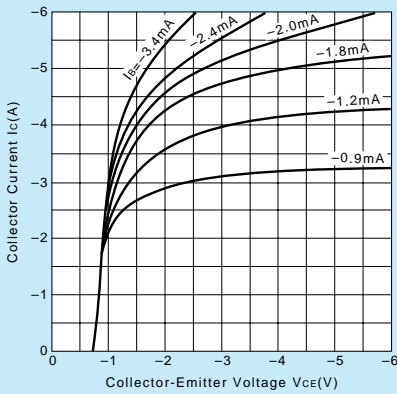
### External Dimensions FM20(TO220F)



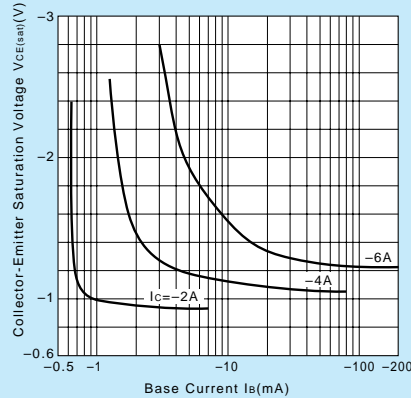
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-30	10	-3	-10	5	-6	6	0.6typ	1.6typ	0.5typ

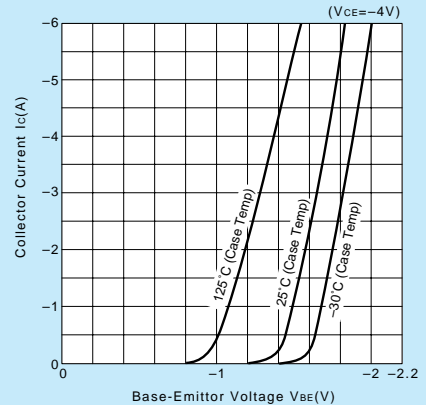
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



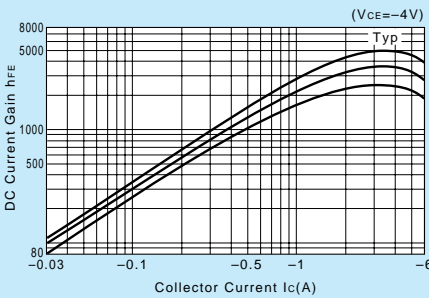
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



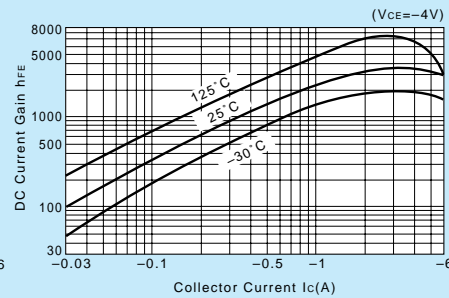
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



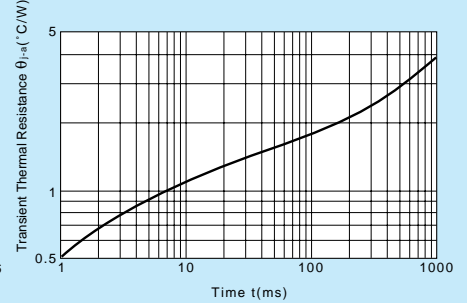
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



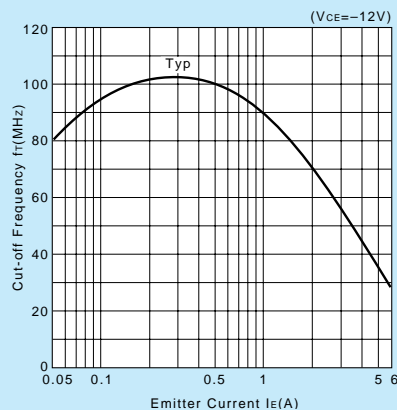
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



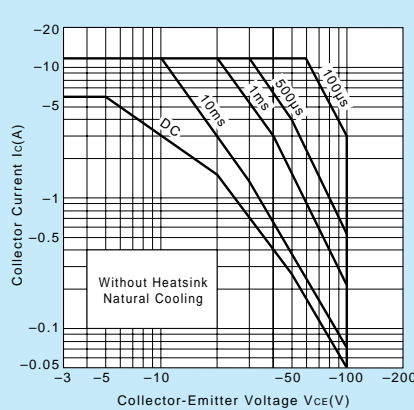
θ<sub>J-a</sub>-t Characteristics



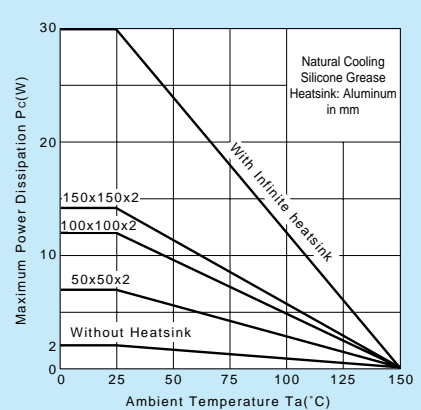
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)

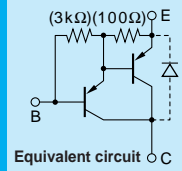


P<sub>C</sub>-T<sub>a</sub> Derating



Darlington

# 2SB1259



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2081)

Application : Driver for Solenoid, Relay and Motor and General Purpose

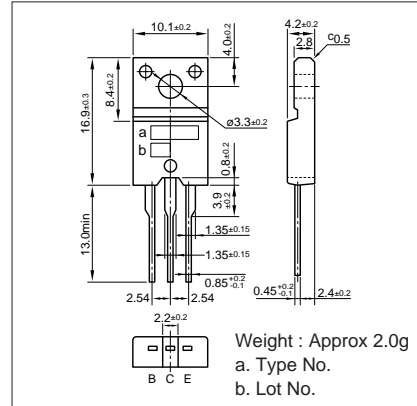
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SB1259	Unit
V <sub>CB0</sub>	-120	V
V <sub>CE0</sub>	-120	V
V <sub>EB0</sub>	-6	V
I <sub>C</sub>	-10(Pulse-15)	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SB1259	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-120V	-10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-10max	mA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =-10mA	-120min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-5A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-10mA	-1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-10mA	-2.0max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.2A	100typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	145typ	pF

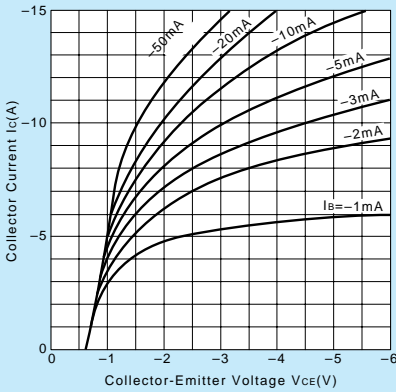
**External Dimensions FM20(TO220F)**



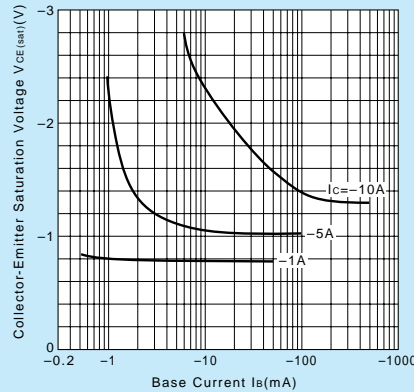
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-30	10	-3	-10	5	-6	6	0.6typ	1.6typ	0.5typ

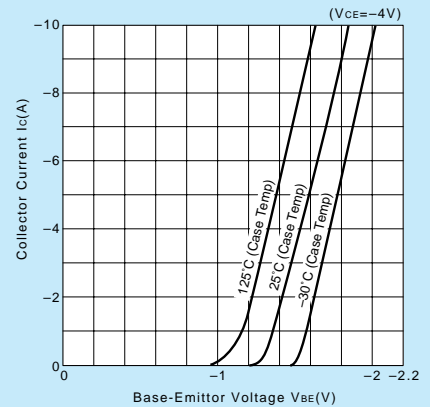
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



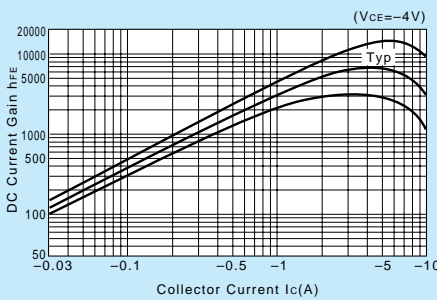
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



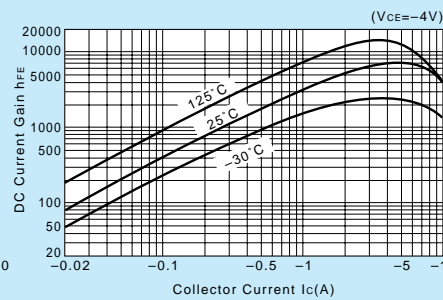
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



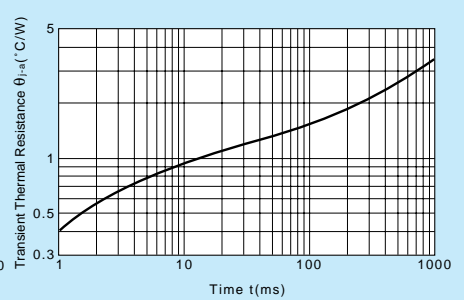
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



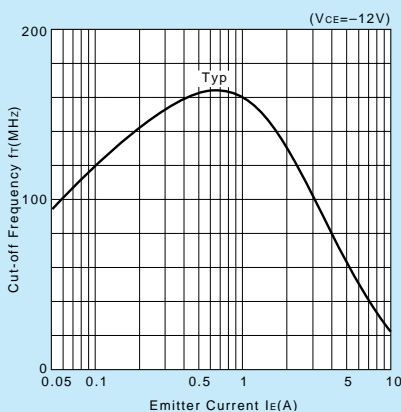
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



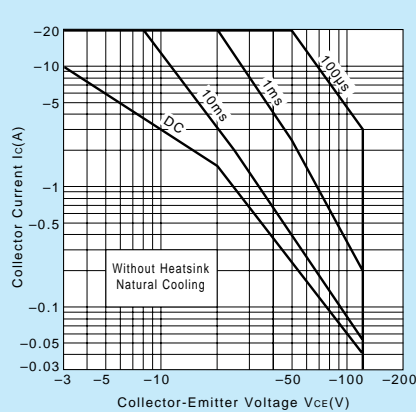
**θ<sub>j-a</sub>-t Characteristics**



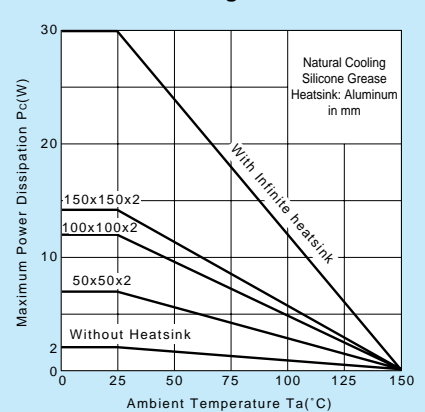
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

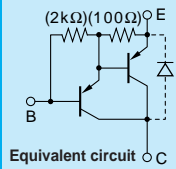


**P<sub>C</sub>-T<sub>a</sub> Derating**



# Darlington

# 2SB1351



Silicon PNP Epitaxial Planar Transistor

Application : Driver for Printer Head, Solenoid, Relay, Motor and General Purpose

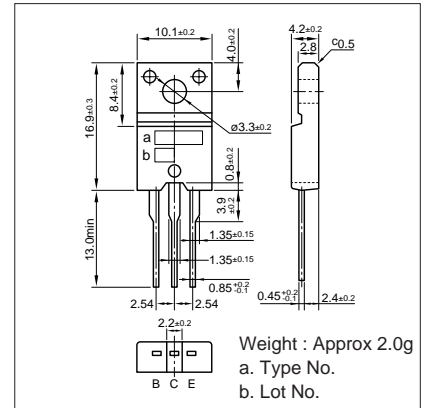
### Absolute maximum ratings (Ta=25°C)

Symbol	2SB1351	Unit
V <sub>CB0</sub>	-60	V
V <sub>CEO</sub>	-60	V
V <sub>EBO</sub>	-6	V
I <sub>C</sub>	-12(Pulse-20)	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Condition	2SB1351	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-60V	-10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-6V	-10max	mA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =-10mA	-60min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-10A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-10A, I <sub>B</sub> =-20mA	-1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-10A, I <sub>B</sub> =-20mA	-2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =1A	130typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	170typ	pF

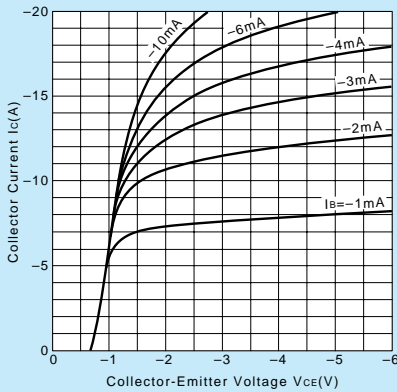
### External Dimensions FM20(TO220F)



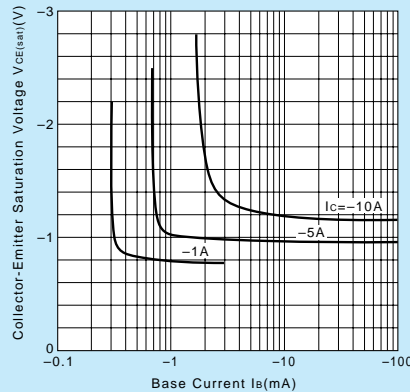
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-40	4	-10	-10	5	-20	20	0.7typ	1.5typ	0.6typ

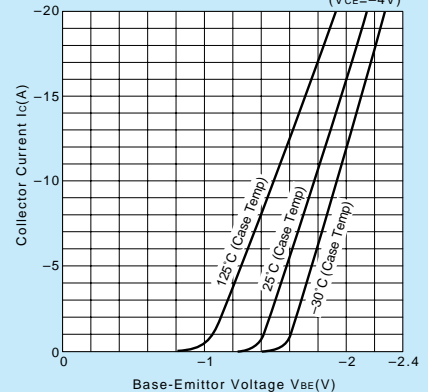
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



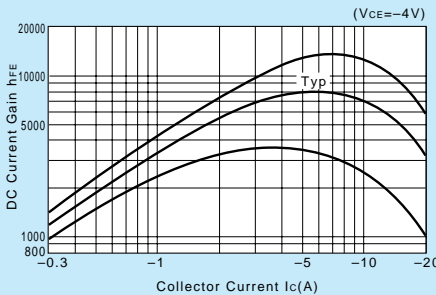
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



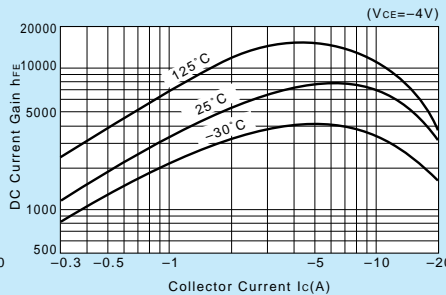
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



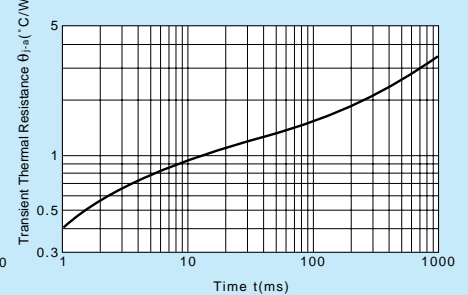
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



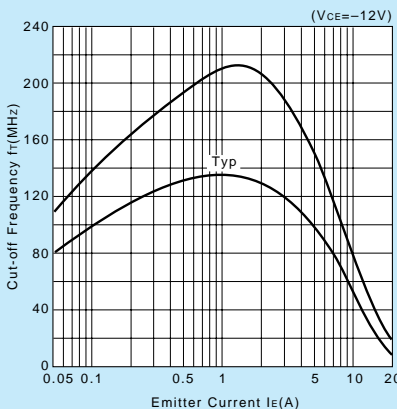
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



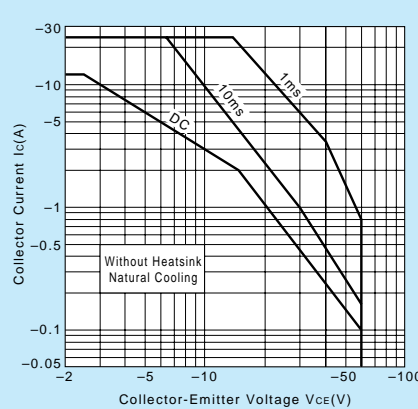
θ<sub>j-a</sub>-t Characteristics



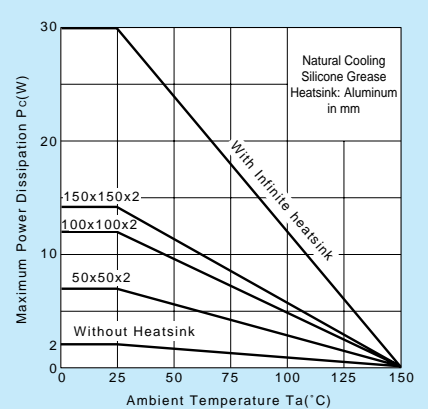
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)

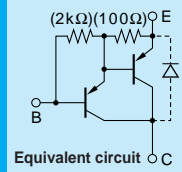


P<sub>C</sub>-T<sub>a</sub> Derating



# Darlington

# 2SB1352



Silicon PNP Epitaxial Planar Transistor

Application : Driver for Printer Head, Solenoid, Relay, Motor and General Purpose

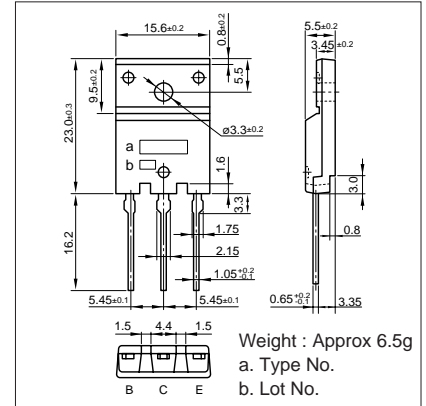
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SB1352	Unit
V <sub>CB0</sub>	-60	V
V <sub>CE0</sub>	-60	V
V <sub>EB0</sub>	-6	V
I <sub>C</sub>	-12(Pulse-20)	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	60(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SB1352	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-60V	-10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-10max	mA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =-10mA	-60min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-10A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-10A, I <sub>B</sub> =-20mA	-1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-10A, I <sub>B</sub> =-20mA	-2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =1A	130typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	170typ	pF

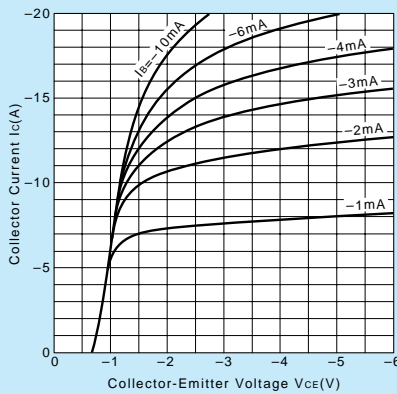
**External Dimensions FM100(TO3PF)**



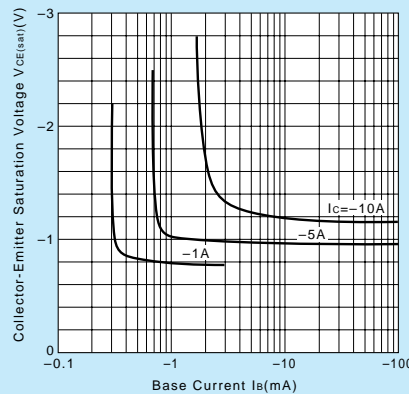
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-40	4	-10	-10	5	-20	20	0.7typ	1.5typ	0.6typ

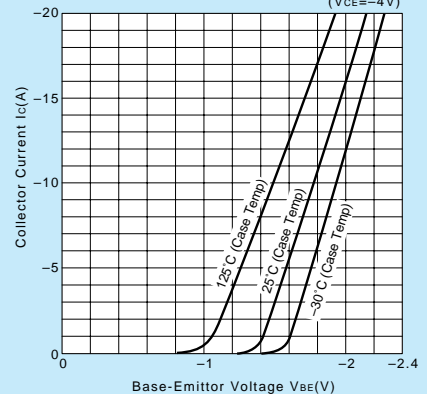
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



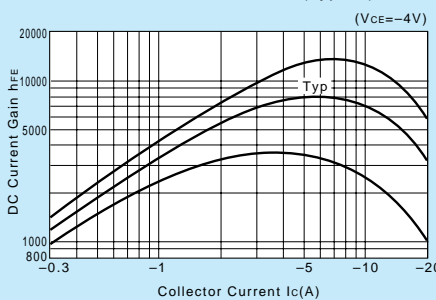
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



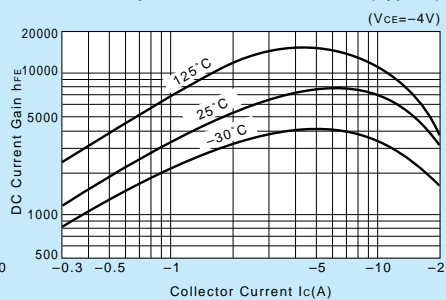
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



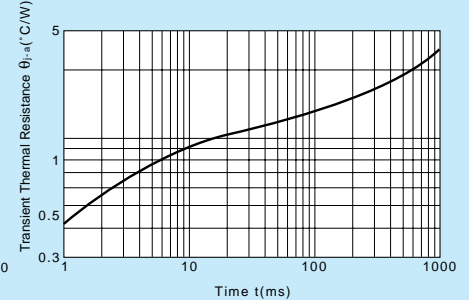
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



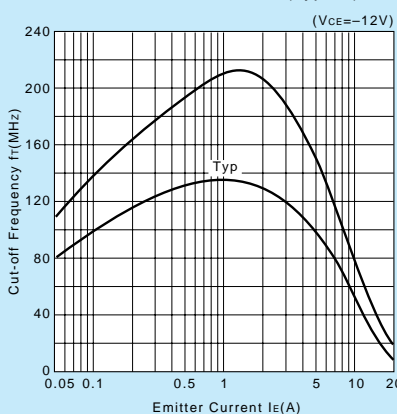
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



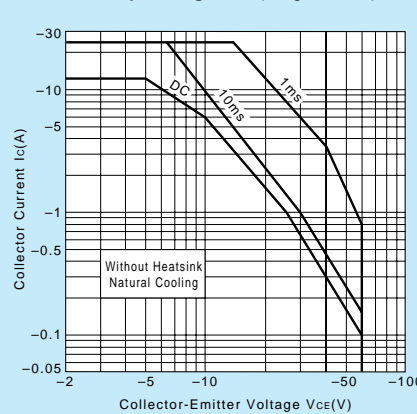
**θ<sub>j-a</sub>-t Characteristics**



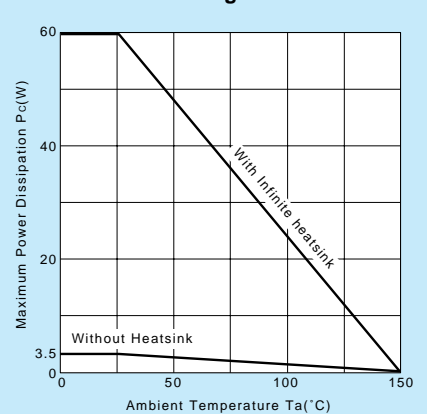
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

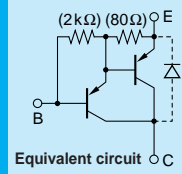


**P<sub>C</sub>-T<sub>a</sub> Derating**



# Darlington

# 2SB1382



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2082)

Application : Chopper Regulator, DC Motor Driver and General Purpose

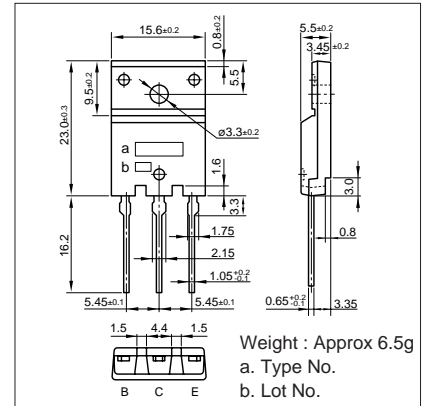
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SB1382	Unit
V <sub>CB0</sub>	-120	V
V <sub>CEO</sub>	-120	V
V <sub>EB0</sub>	-6	V
I <sub>C</sub>	-16(Pulse-26)	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	75(Tc=25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SB1382	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-120V	-10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-6V	-10max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-10mA	-120min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-8A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-8A, I <sub>B</sub> =-16mA	-1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-8A, I <sub>B</sub> =-16mA	-2.5max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =1A	50typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	350typ	pF

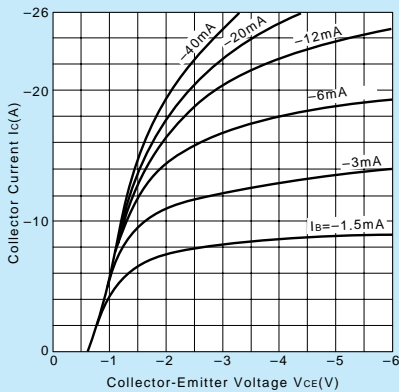
**External Dimensions FM100(TO3PF)**



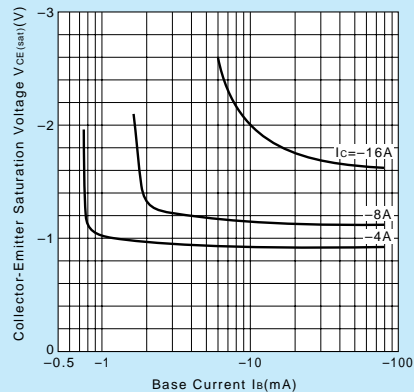
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-40	5	-8	-10	5	-16	16	0.8typ	1.8typ	1.0typ

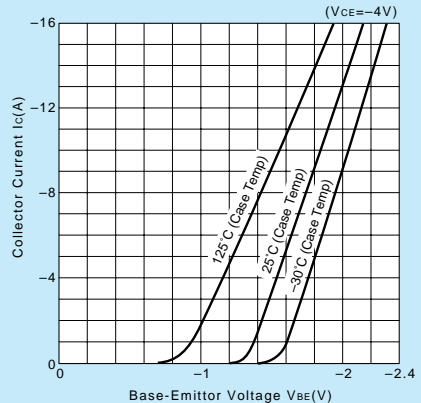
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



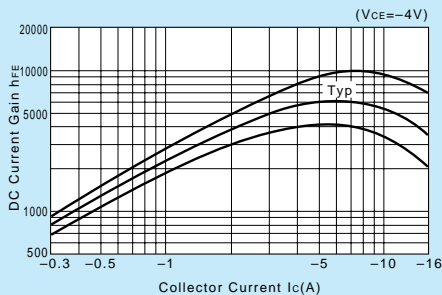
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



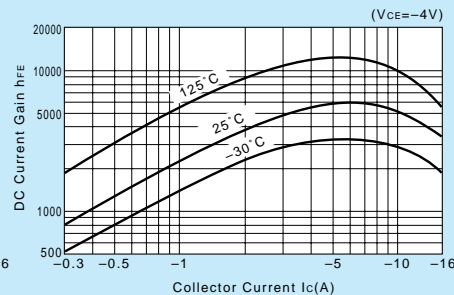
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



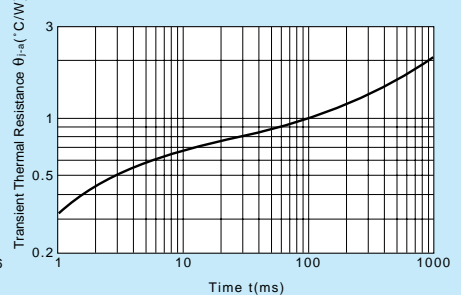
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



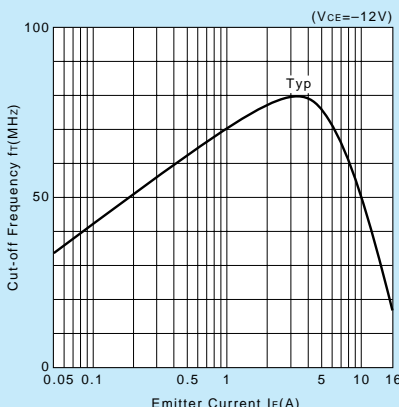
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



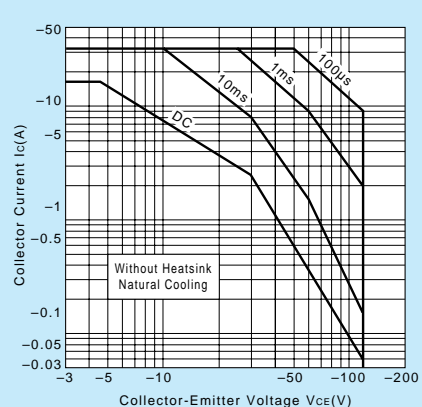
**θ<sub>J-a</sub>-t Characteristics**



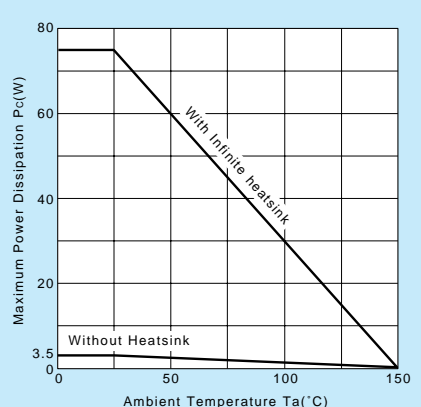
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

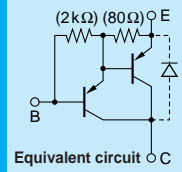


**P<sub>C</sub>-T<sub>a</sub> Derating**



# Darlington

# 2SB1383



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2083)

Application : Chopper Regulator, DC Motor Driver and General Purpose

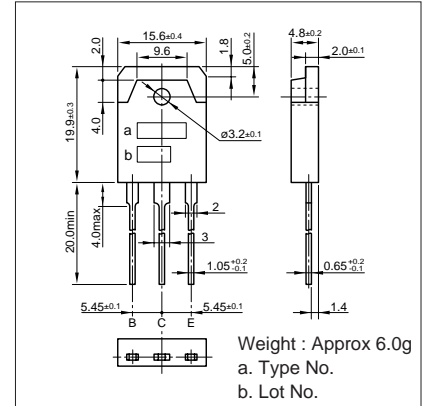
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SB1383	Unit
V <sub>CB0</sub>	-120	V
V <sub>CEO</sub>	-120	V
V <sub>EBO</sub>	-6	V
I <sub>C</sub>	-25(Pulse-40)	A
I <sub>B</sub>	-2	A
P <sub>C</sub>	120(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SB1383	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-120V	-10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-6V	-10max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-25mA	-120min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-12A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-12A, I <sub>B</sub> =-24mA	-1.8max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-12A, I <sub>B</sub> =-24mA	-2.5max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =1A	50typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	230typ	pF

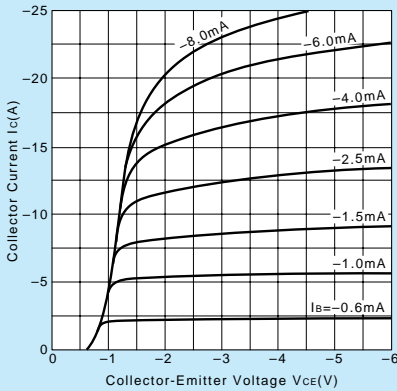
**External Dimensions MT-100(TO3P)**



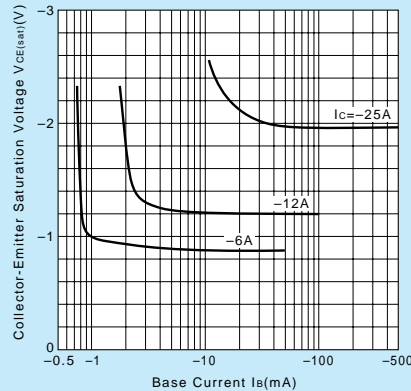
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-24	2	-12	-10	5	-24	24	1.0typ	3.0typ	1.0typ

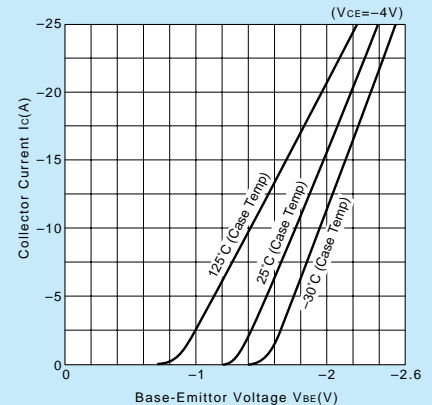
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



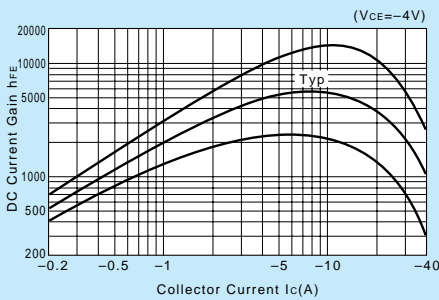
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



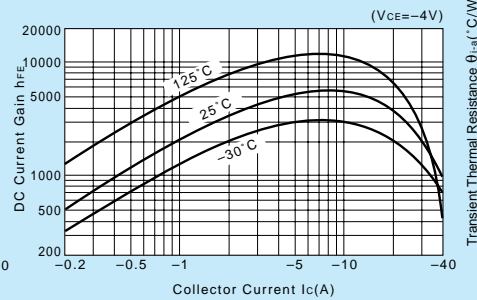
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



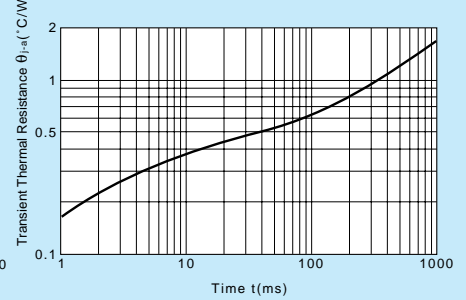
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



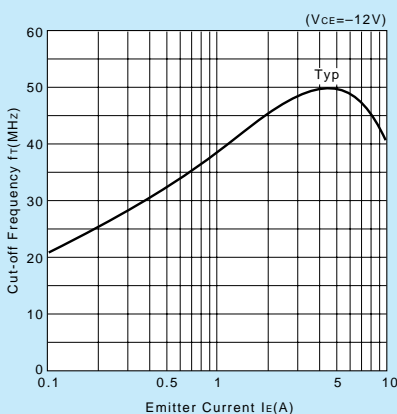
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



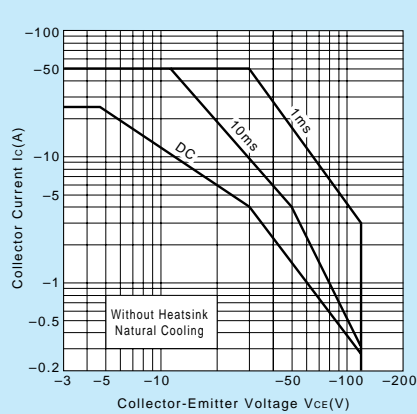
**θ<sub>J-a</sub>-t Characteristics**



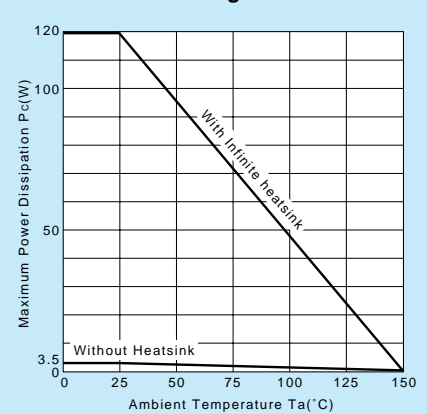
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

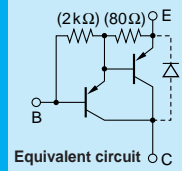


**P<sub>C</sub>-T<sub>a</sub> Derating**



# Darlington

# 2SB1420



Silicon PNP Epitaxial Planar Transistor

Application : Chopper Regulator, DC Motor Driver and General Purpose

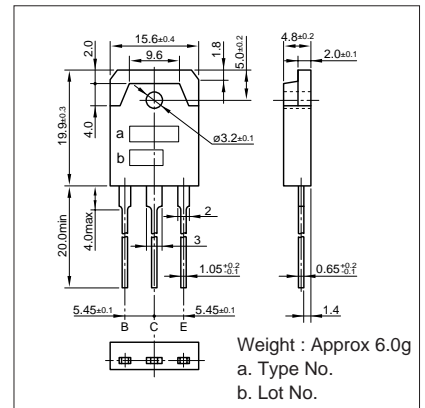
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SB1420	Unit
V <sub>CB0</sub>	-120	V
V <sub>CEO</sub>	-120	V
V <sub>EBO</sub>	-6	V
I <sub>C</sub>	-16(Pulse-26)	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	80(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SB1420	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-120V	-10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-6V	-10max	mA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =-10mA	-120min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-8A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-8A, I <sub>B</sub> =-16mA	-1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-8A, I <sub>B</sub> =-16mA	-2.5max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =1A	50typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	350typ	pF

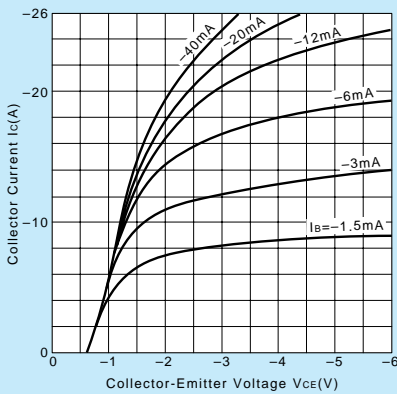
**External Dimensions MT-100(TO3P)**



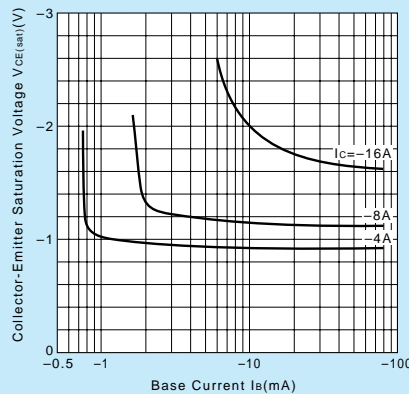
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-24	2	-12	-10	5	-24	24	1.0typ	3.0typ	1.0typ

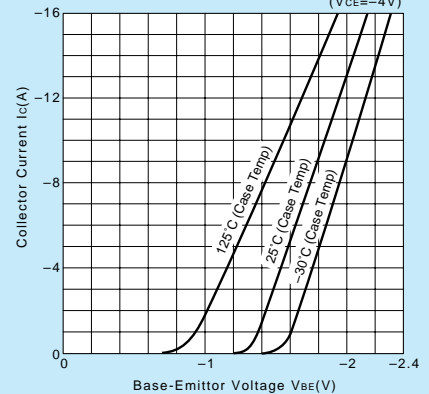
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



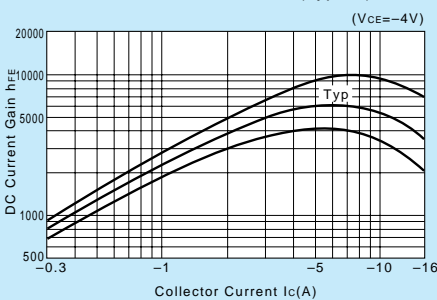
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



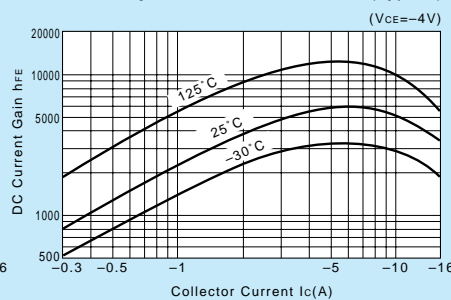
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



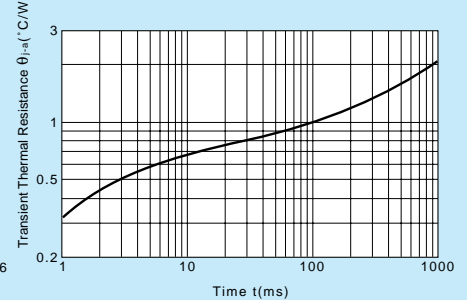
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



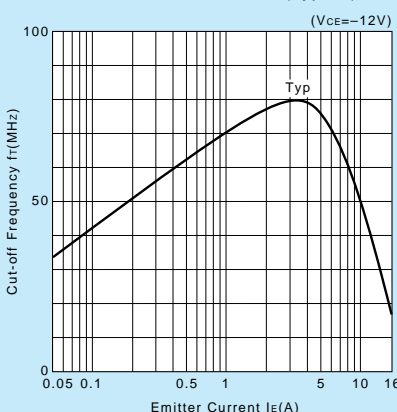
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



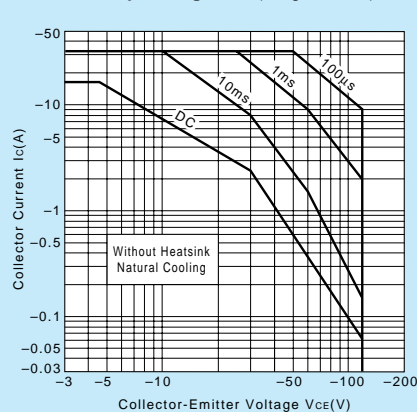
**θ<sub>j-a</sub>-t Characteristics**



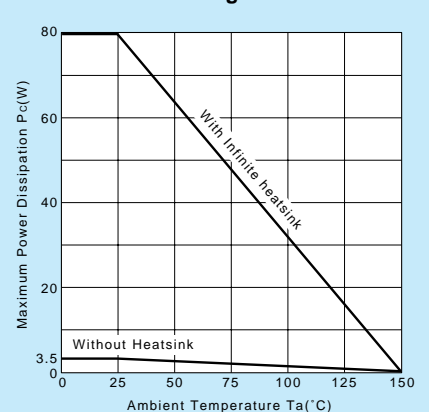
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



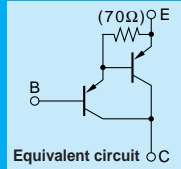
**P<sub>C</sub>-T<sub>a</sub> Derating**





# Darlington

# 2SB1559



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2389)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SB1559	Unit
V <sub>CB0</sub>	-160	V
V <sub>CE0</sub>	-150	V
V <sub>EB0</sub>	-5	V
I <sub>C</sub>	-8	A
I <sub>B</sub>	-1	A
P <sub>c</sub>	80(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

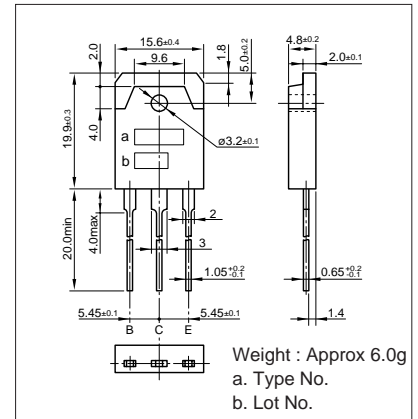
Symbol	Conditions	2SB1559	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-160V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-30mA	-150min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-6A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-6A, I <sub>B</sub> =-6mA	-2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-6A, I <sub>B</sub> =-6mA	-3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =1A	65typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	160typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

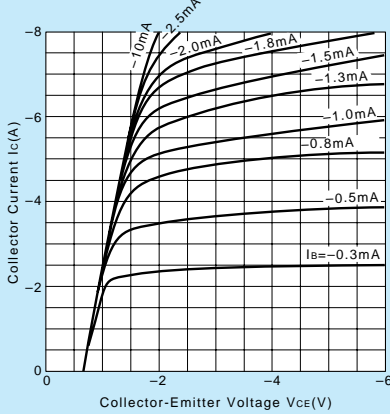
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-60	10	-6	-10	5	-6	6	0.7typ	3.6typ	0.9typ

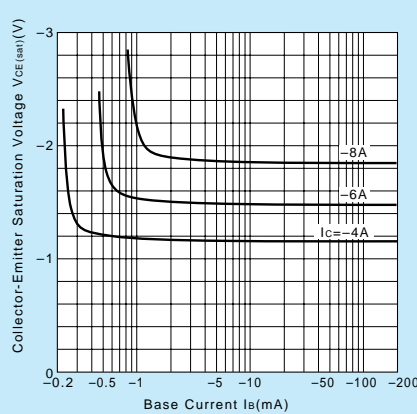
**External Dimensions MT-100(TO3P)**



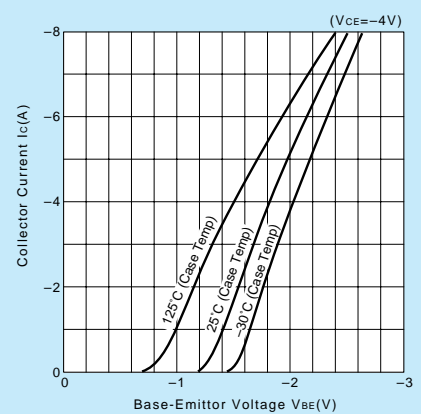
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



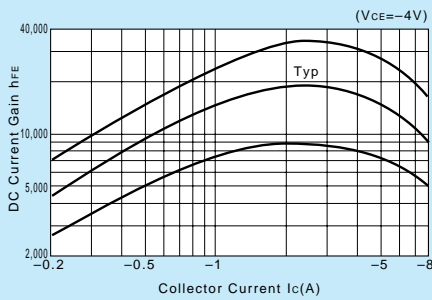
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



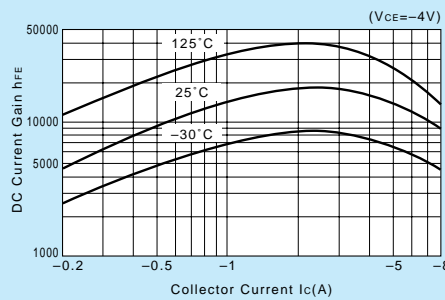
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



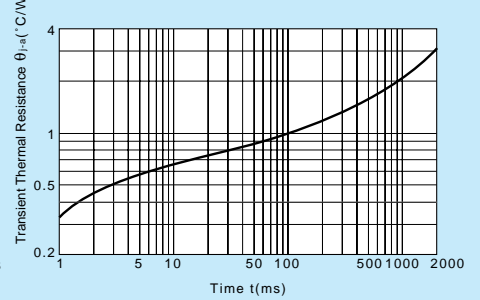
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



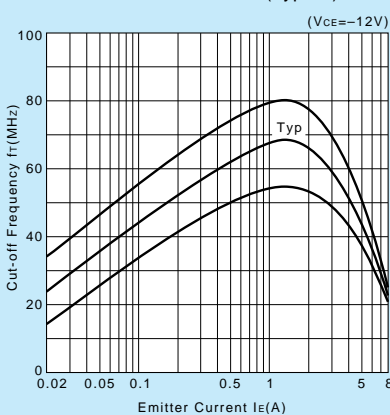
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



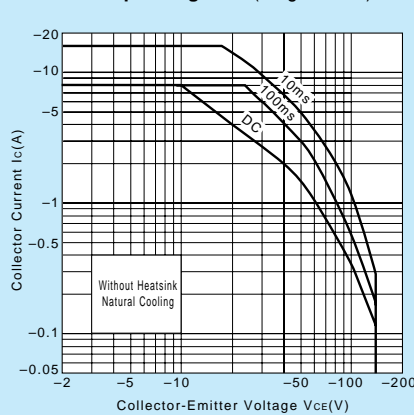
**θ<sub>j-a</sub>-t Characteristics**



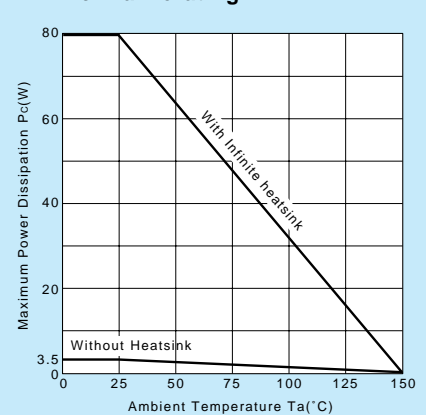
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

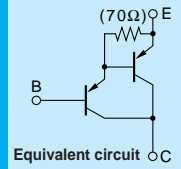


**P<sub>c</sub>-T<sub>a</sub> Derating**



# Darlington

# 2SB1560



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2390)

Application : Audio, Series Regulator and General Purpose

### Absolute maximum ratings (Ta=25°C)

Symbol	2SB1560	Unit
V <sub>CB0</sub>	-160	V
V <sub>CEO</sub>	-150	V
V <sub>EB0</sub>	-5	V
I <sub>C</sub>	-10	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	100(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

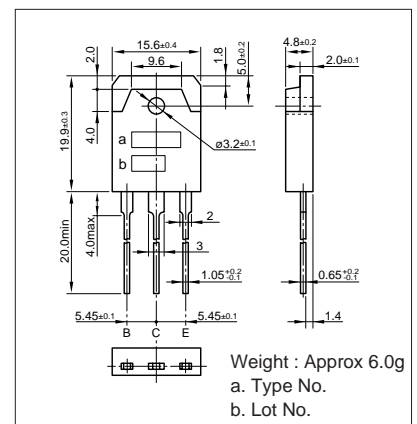
Symbol	Conditions	2SB1560	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-160V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-30mA	-150min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-7A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-7A, I <sub>B</sub> =-7mA	-2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-7A, I <sub>B</sub> =-7mA	-3.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	50typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	230typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000to12000), P(6500to20000), Y(15000to30000)

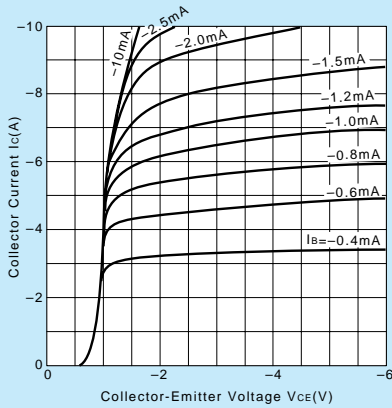
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-70	10	-7	-10	5	-7	7	0.8typ	3.0typ	1.2typ

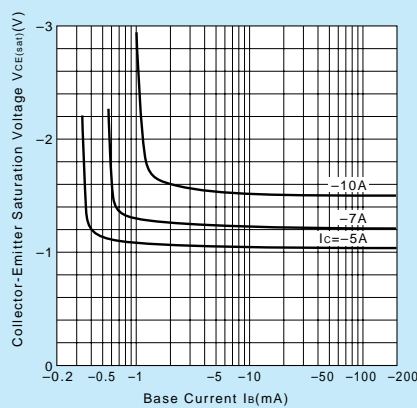
### External Dimensions MT-100(TO3P)



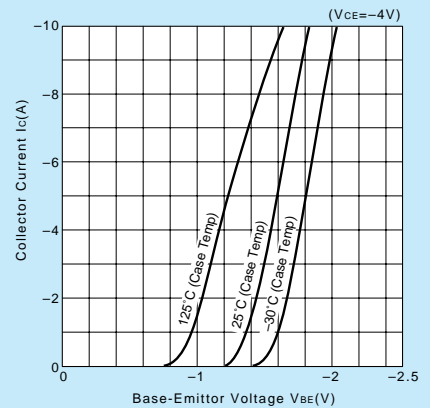
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



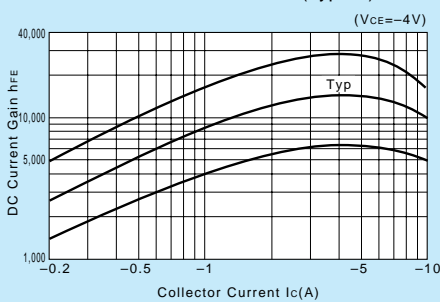
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



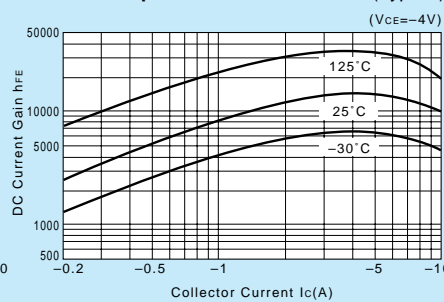
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



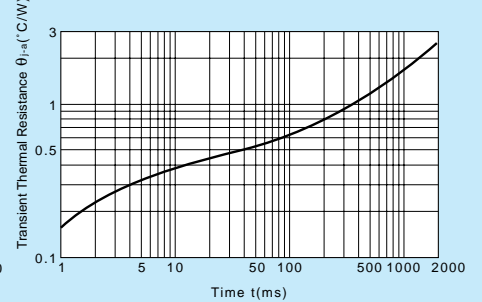
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



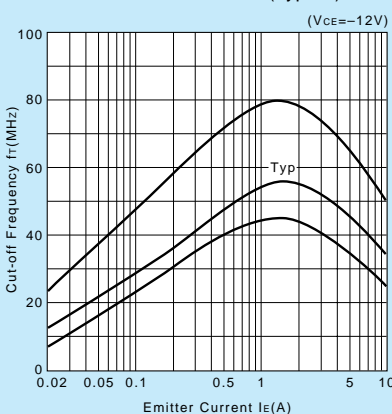
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



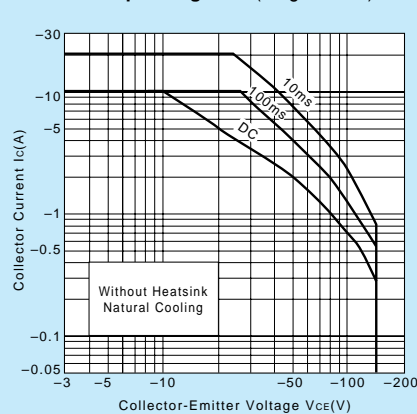
θ<sub>j-a</sub>-t Characteristics



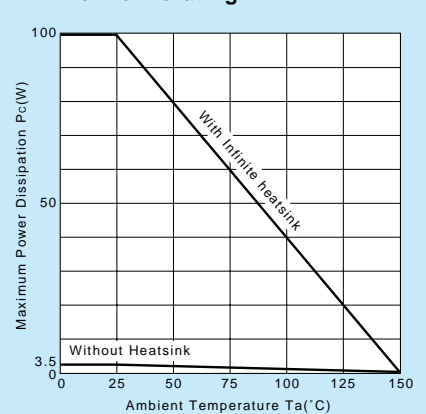
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)

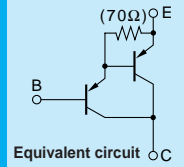


P<sub>C</sub>-T<sub>a</sub> Derating



# Darlington

# 2SB1570



**Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2401)**

**Application :** Audio, Series Regulator and General Purpose

**Absolute maximum ratings (Ta=25°C)**

Symbol	2SB1570	Unit
V <sub>CB0</sub>	-160	V
V <sub>CEO</sub>	-150	V
V <sub>EBO</sub>	-5	V
I <sub>C</sub>	-12	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	150(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics (Ta=25°C)**

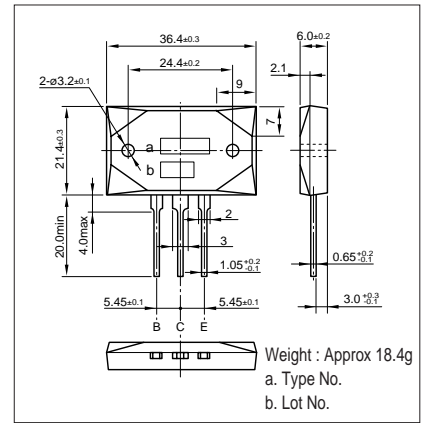
Symbol	Conditions	2SB1570	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-160V	-100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-5V	-100max	μA
V(BR)CEO	I <sub>C</sub> =-30mA	-150min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-7A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-7A, I <sub>B</sub> =-7mA	-2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-7A, I <sub>E</sub> =2A	-3.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	50typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	230typ	pF

\*h<sub>FE</sub> Rank ○(5000to12000), P(6500to20000), Y(15000to30000)

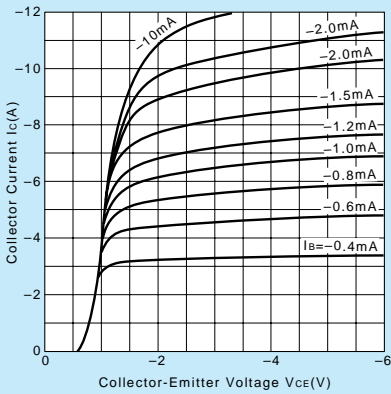
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-70	10	-7	-10	5	-7	7	0.8typ	3.0typ	1.2typ

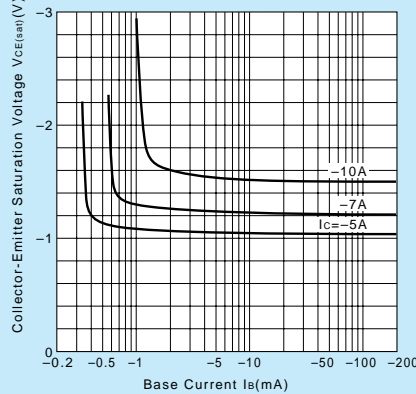
**External Dimensions MT-200**



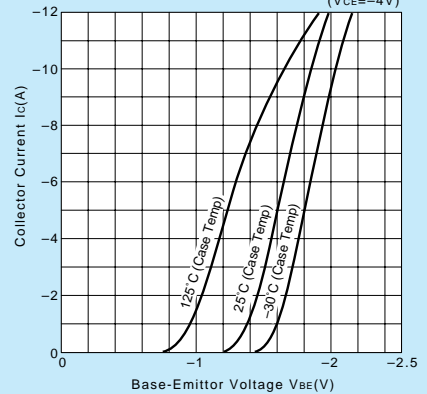
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



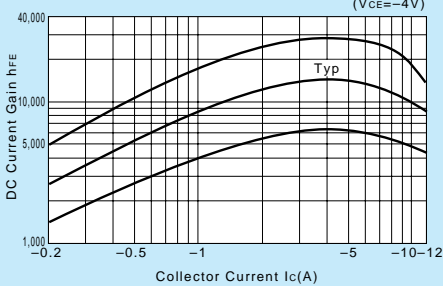
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



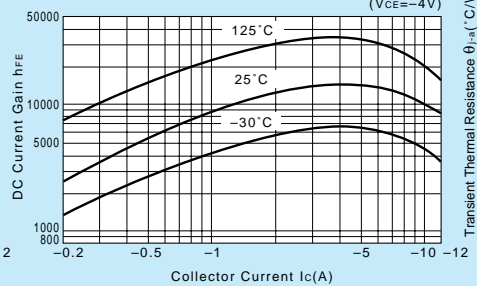
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



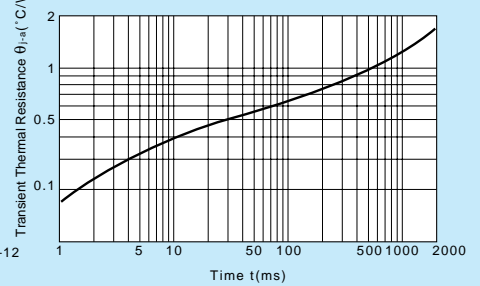
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



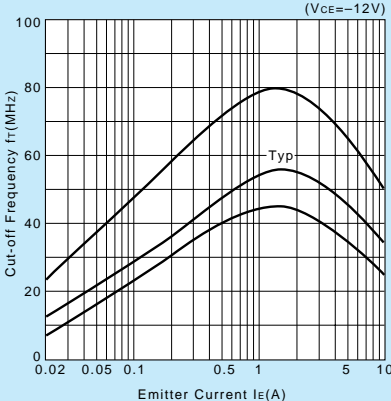
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



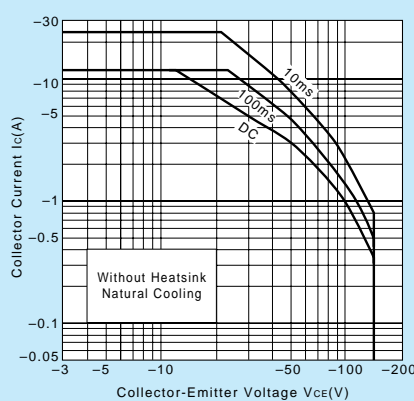
**θ<sub>j-a</sub>-t Characteristics**



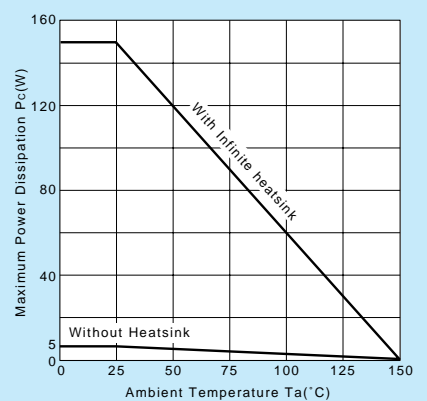
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

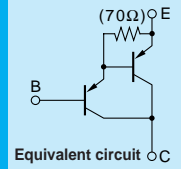


**P<sub>C</sub>-T<sub>a</sub> Derating**



Darlington

# 2SB1587



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2438)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SB1587	Unit
V <sub>CB0</sub>	-160	V
V <sub>CEO</sub>	-150	V
V <sub>EB0</sub>	-5	V
I <sub>c</sub>	-8	A
I <sub>B</sub>	-1	A
P <sub>c</sub>	75(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

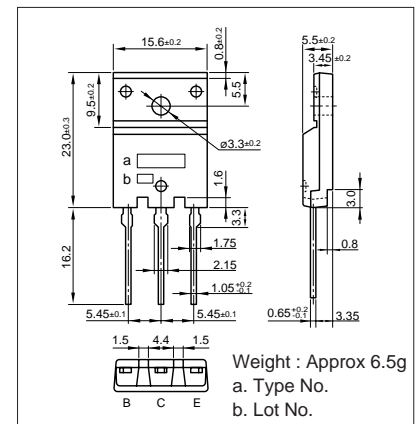
Symbol	Conditions	2SB1587	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-160V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =-30mA	-150min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-6A	5000min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-6A, I <sub>B</sub> =-6mA	-2.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =-6A, I <sub>B</sub> =-6mA	-3.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =1A	65typ	MHZ
COB	V <sub>CB</sub> =-10V, f=1MHZ	160typ	pF

\*h<sub>FE</sub> Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

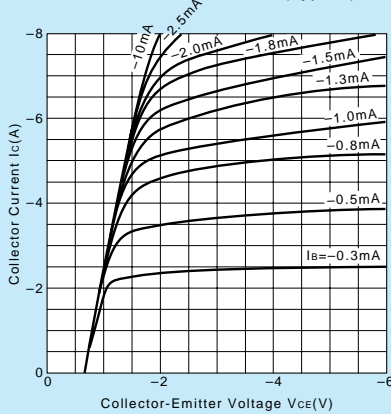
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-60	10	-6	-10	5	-6	6	0.7typ	3.6typ	0.9typ

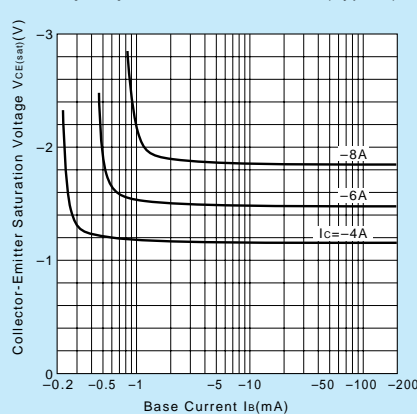
**External Dimensions FM100(TO3PF)**



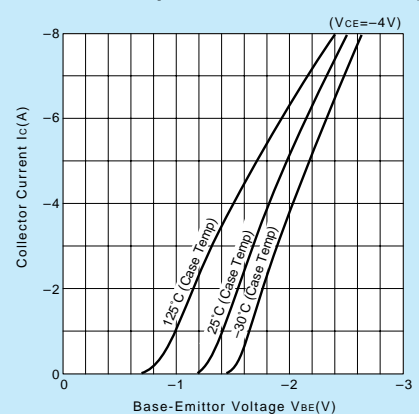
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



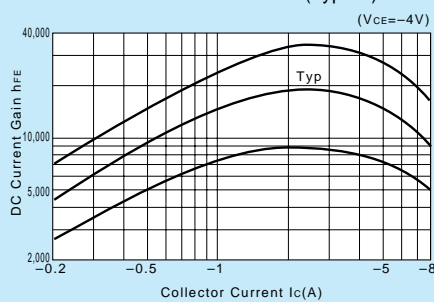
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



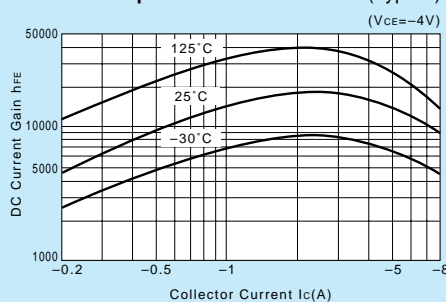
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



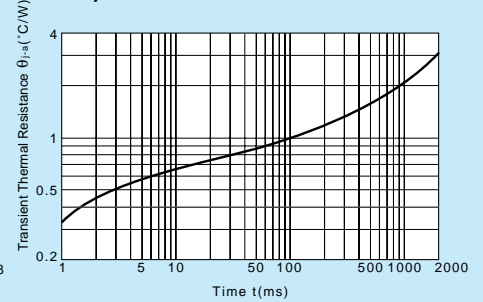
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



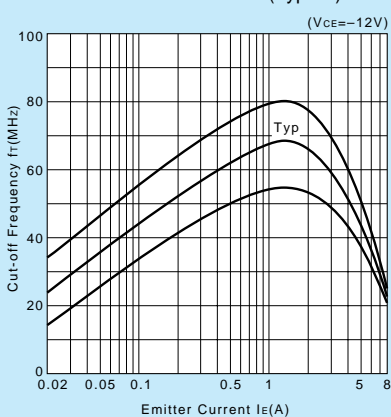
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



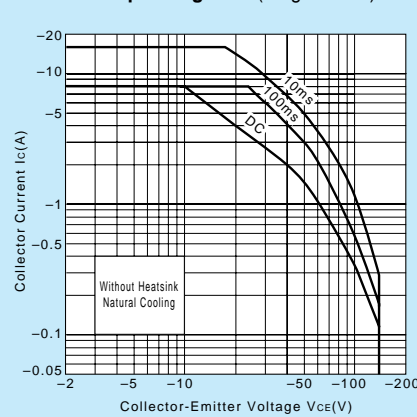
**θ<sub>j-a</sub>-t Characteristics**



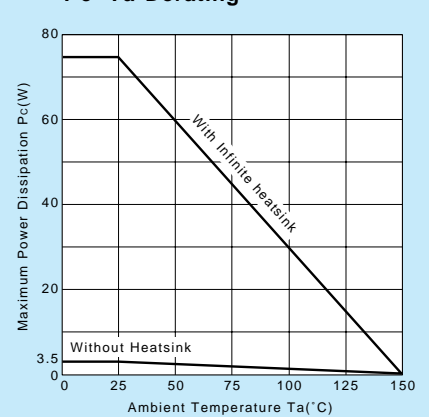
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

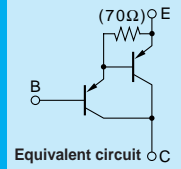


**P<sub>c</sub>-T<sub>a</sub> Derating**



Darlington

# 2SB1588



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2439)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

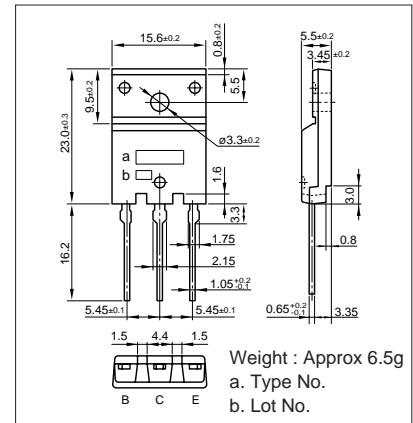
Symbol	2SB1588	Unit
V <sub>CB0</sub>	-160	V
V <sub>CEO</sub>	-150	V
V <sub>EB0</sub>	-5	V
I <sub>c</sub>	-10	A
I <sub>B</sub>	-1	A
P <sub>c</sub>	80(T <sub>c</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SB1588	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-160V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V(BR)CEO	I <sub>c</sub> =-30mA	-150min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-7A	5000min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-7A, I <sub>B</sub> =-7mA	-2.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =-7A, I <sub>B</sub> =-7mA	-3.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	50typ	MHZ
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHZ	230typ	pF

\*h<sub>FE</sub> Rank ○(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

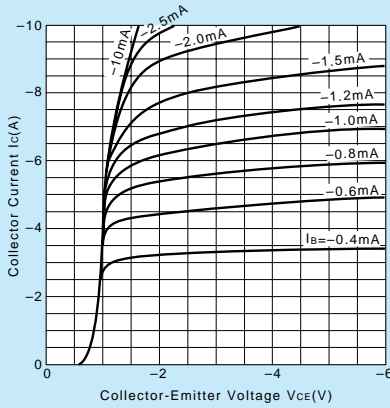
**External Dimensions FM100(TO3PF)**



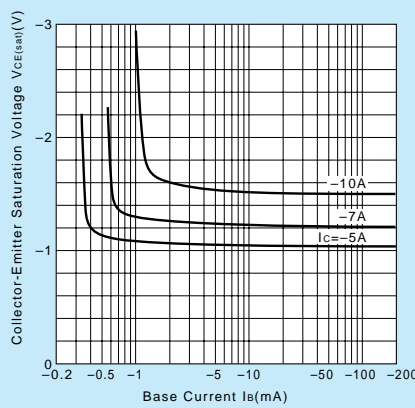
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-70	10	-7	-10	5	-7	7	0.8typ	3.0typ	1.2typ

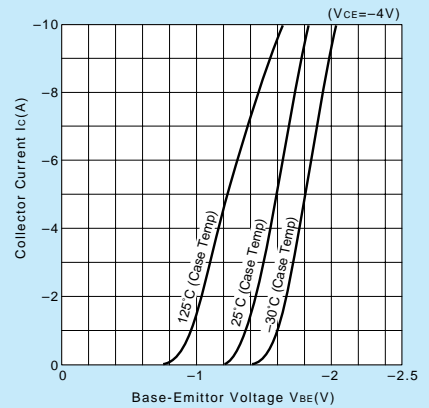
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



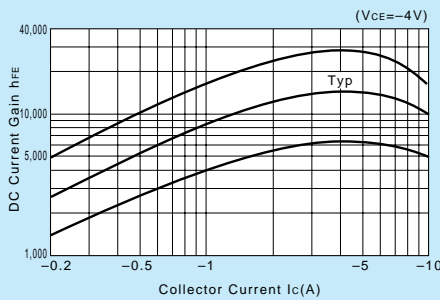
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



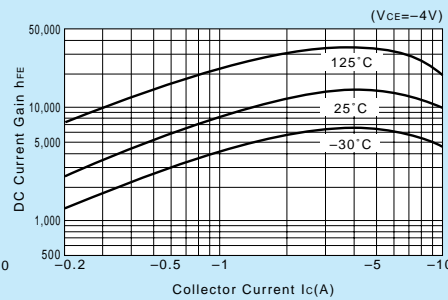
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



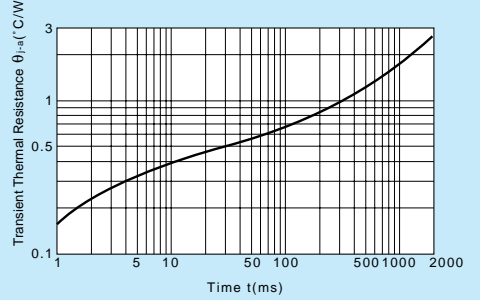
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



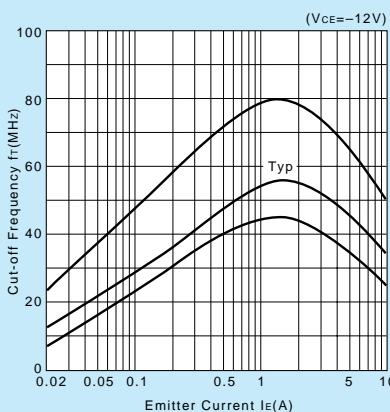
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



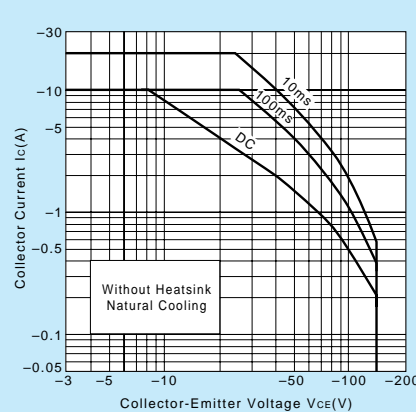
**θ<sub>j-a</sub>-t Characteristics**



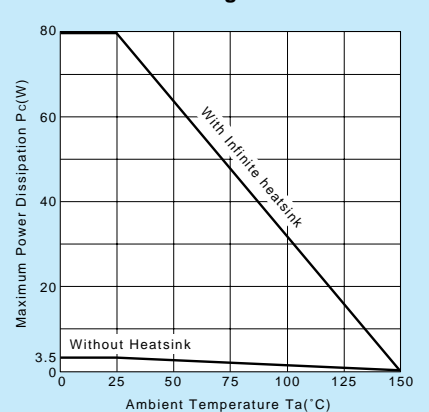
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

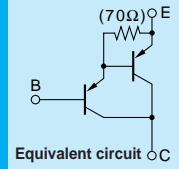


**P<sub>c</sub>-T<sub>a</sub> Derating**



# Darlington

# 2SB1624



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2493)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SB1624	Unit
V <sub>CB0</sub>	-110	V
V <sub>CEO</sub>	-110	V
V <sub>EBO</sub>	-5	V
I <sub>C</sub>	-6	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	60(Tc=25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

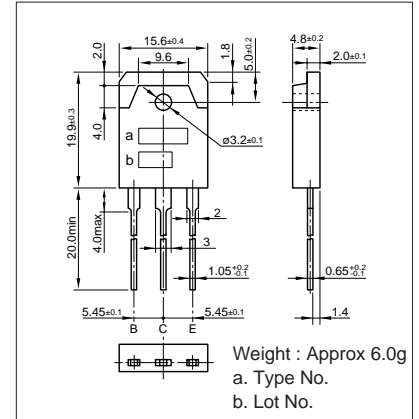
Symbol	Conditions	2SB1624	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-110V	-100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-5V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-30mA	-110min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-5A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-5mA	-2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-5mA	-3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	100typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	110typ	pF

\*h<sub>FE</sub> Rank ○(5000to12000), P(6500to20000), Y(15000to30000)

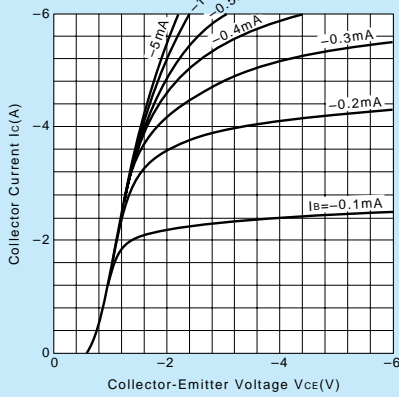
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-30	6	-5	-10	5	-5	5	1.1typ	3.2typ	1.1typ

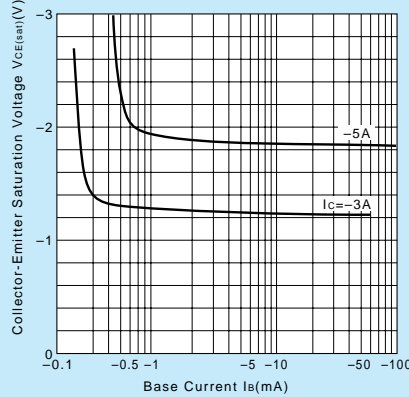
**External Dimensions MT-100(TO3P)**



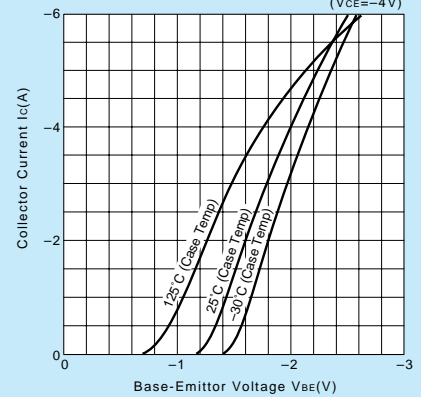
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



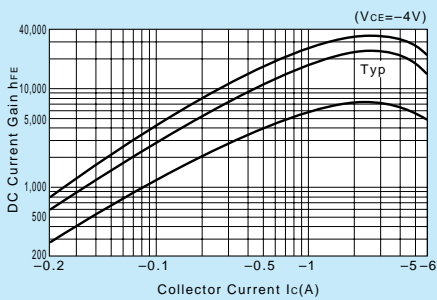
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



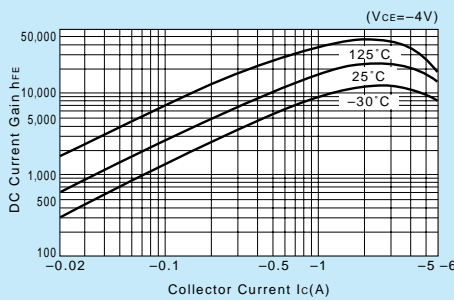
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



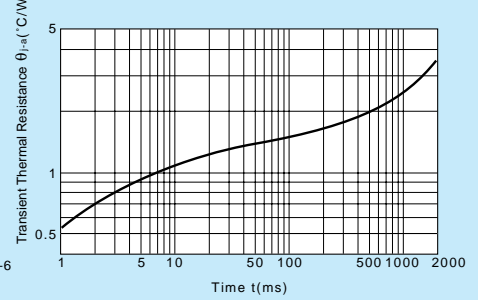
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



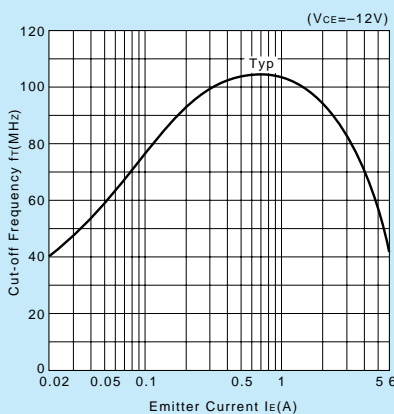
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



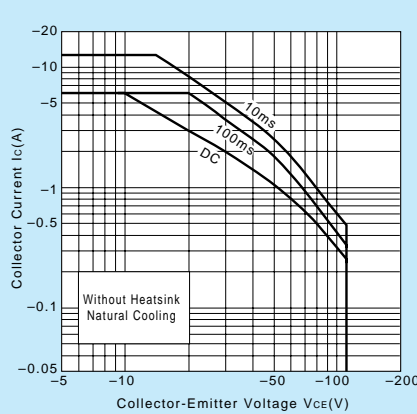
**θ<sub>j-a</sub>-t Characteristics**



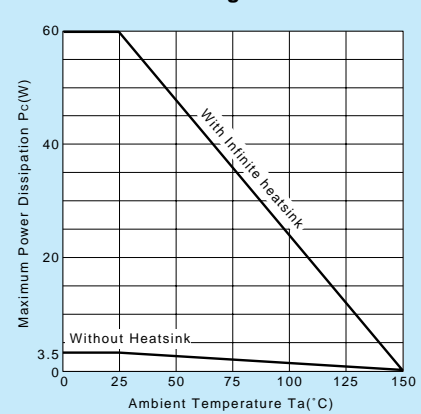
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**

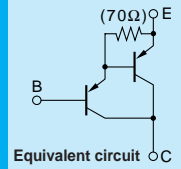






Darlington

# 2SB1626



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2495)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SB1626	Unit
V <sub>CB0</sub>	-110	V
V <sub>CEO</sub>	-110	V
V <sub>EB0</sub>	-5	V
I <sub>c</sub>	-6	A
I <sub>B</sub>	-1	A
P <sub>c</sub>	30(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

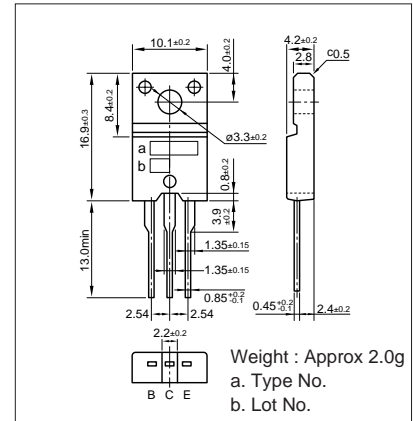
Symbol	Conditions	2SB1626	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-110V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =-30mA	-110min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-5A	5000min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-5A, I <sub>B</sub> =-5mA	-2.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =-5A, I <sub>B</sub> =-5mA	-3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	100typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	110typ	pF

\*h<sub>FE</sub> Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

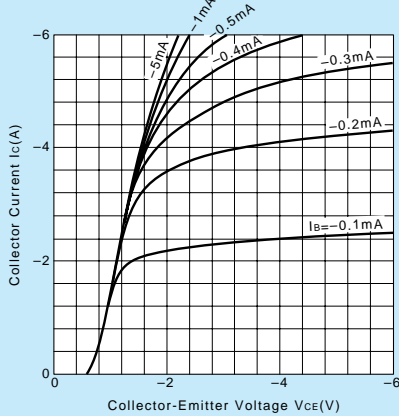
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-30	6	-5	-10	5	-5	5	1.1typ	3.2typ	1.1typ

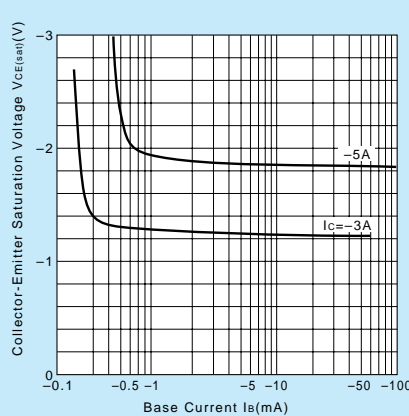
**External Dimensions FM20(TO220F)**



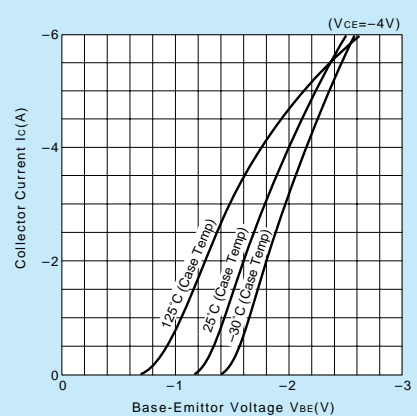
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



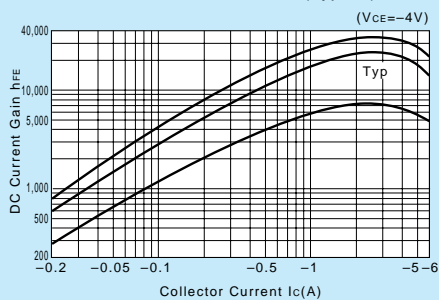
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



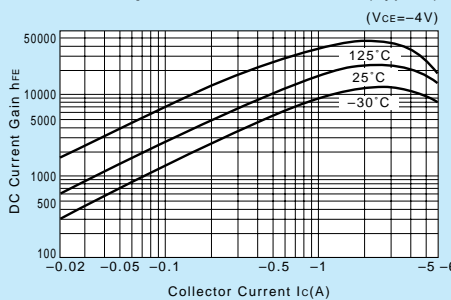
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



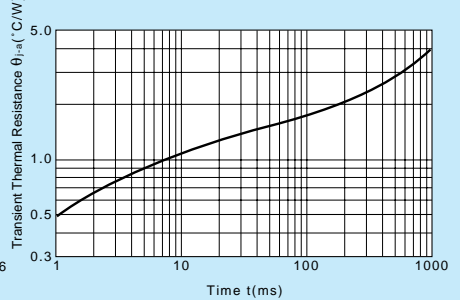
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



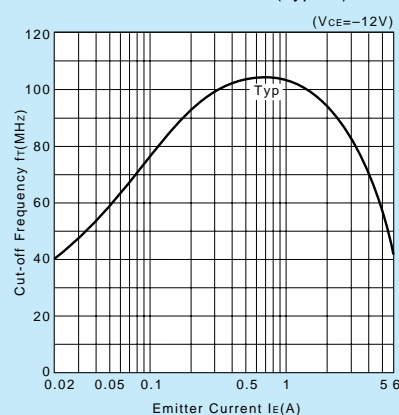
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



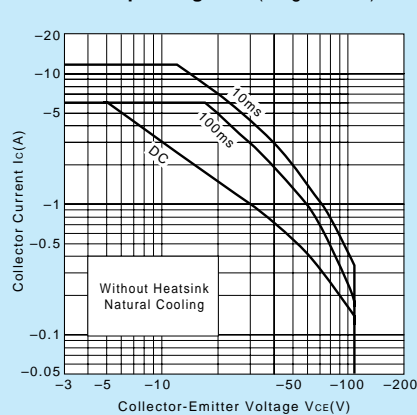
**θ<sub>j-a</sub>-t Characteristics**



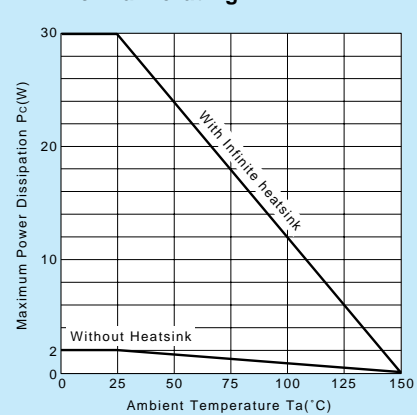
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



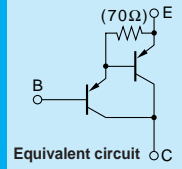
**P<sub>c</sub>-T<sub>a</sub> Derating**





# Darlington

# 2SB1648



**Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2561)**

**Application :** Audio, Series Regulator and General Purpose

**Absolute maximum ratings (Ta=25°C)**

Symbol	2SB1648	Unit
V <sub>CB0</sub>	-150	V
V <sub>CEO</sub>	-150	V
V <sub>EB0</sub>	-5	V
I <sub>c</sub>	-17	A
I <sub>B</sub>	-1	A
P <sub>c</sub>	200(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics (Ta=25°C)**

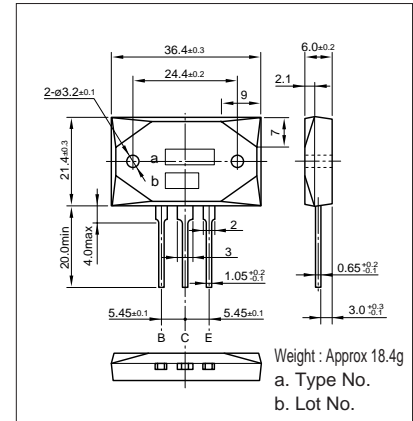
Symbol	Conditions	2SB1648	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-150V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =-30mA	-150min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>c</sub> =-10A	5000min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =-10A, I <sub>B</sub> =-10mA	-2.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =-10A, I <sub>B</sub> =-10mA	-3.0max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	45typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	320typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000to12000), P(6500to20000), Y(15000to30000)

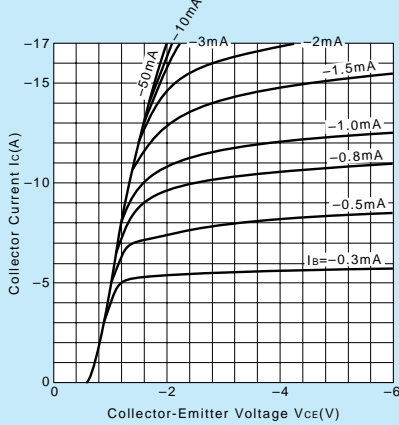
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-40	4	-10	-10	5	-10	10	0.7typ	1.6typ	1.1typ

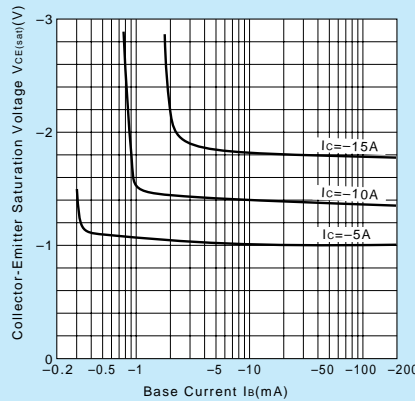
**External Dimensions MT-200**



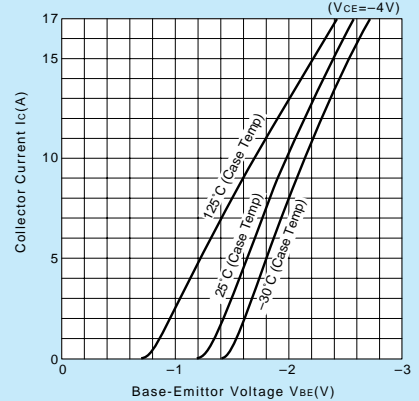
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



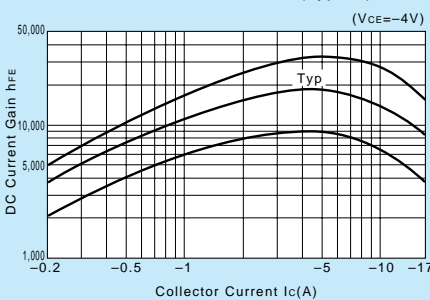
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



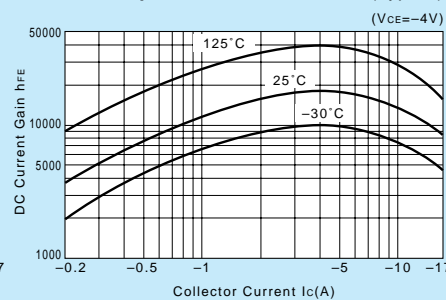
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



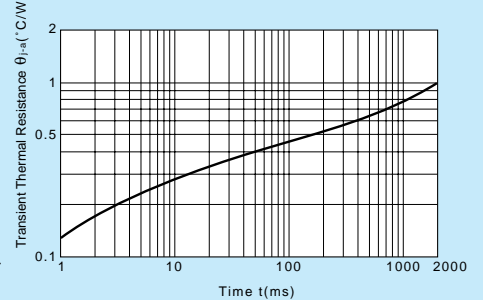
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



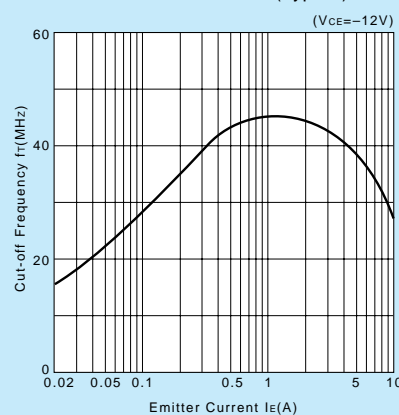
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



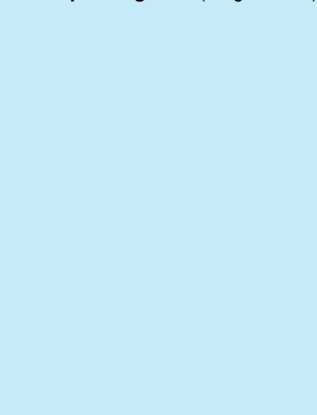
**θ<sub>j-a</sub>-t Characteristics**



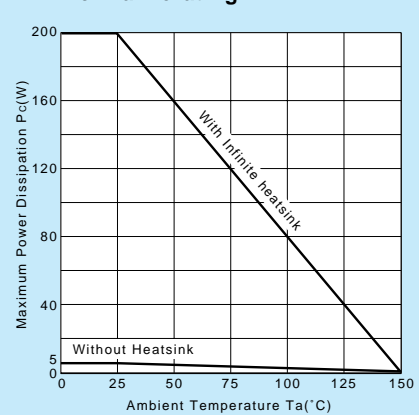
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

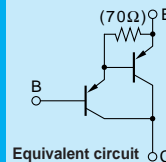


**P<sub>c</sub>-T<sub>a</sub> Derating**



# Darlington

# 2SB1649



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2561)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

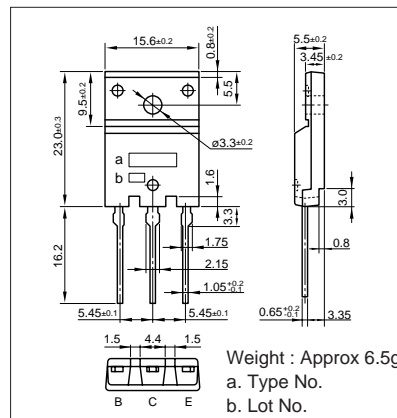
Symbol	2SB1649	Unit
V <sub>CB0</sub>	-150	V
V <sub>CE0</sub>	-150	V
V <sub>EB0</sub>	-5	V
I <sub>C</sub>	-15	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	85(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SB1649	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-150V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-30mA	-150min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-10A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-10A, I <sub>B</sub> =-10mA	-2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-10A, I <sub>B</sub> =-10mA	-3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =2A	45typ	MHz
COB	V <sub>CB</sub> =-10V, f=1MHz	320typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000to12000), P(6500to20000), Y(15000to30000)

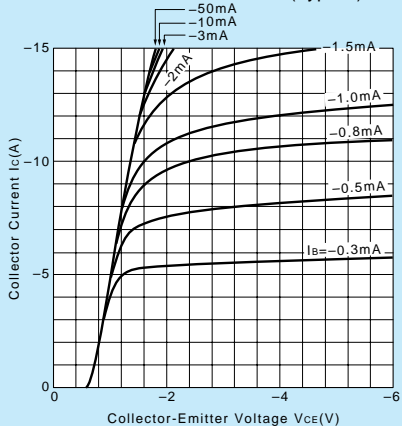
**External Dimensions FM100(TO3PF)**



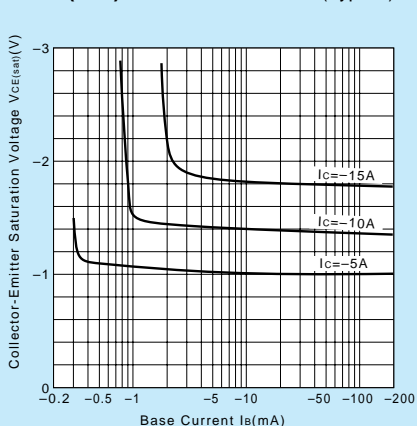
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-40	4	-10	-10	5	-10	10	0.7typ	1.6typ	1.1typ

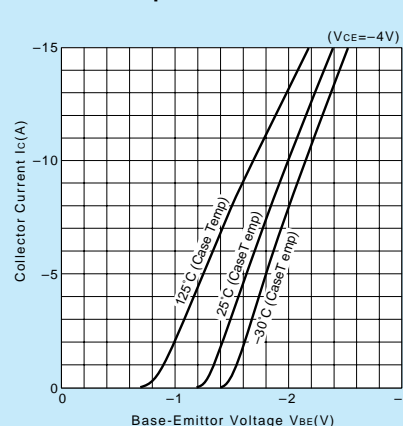
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



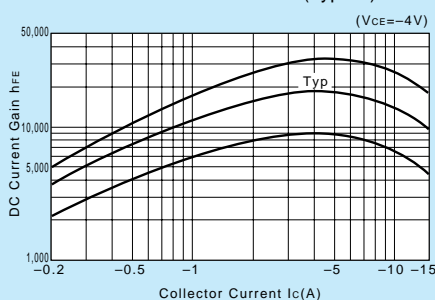
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



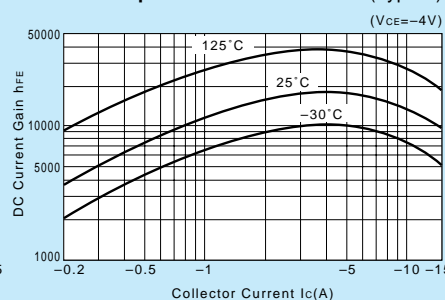
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



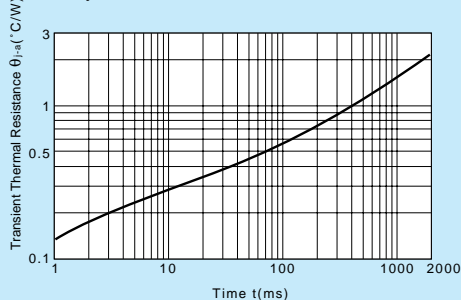
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



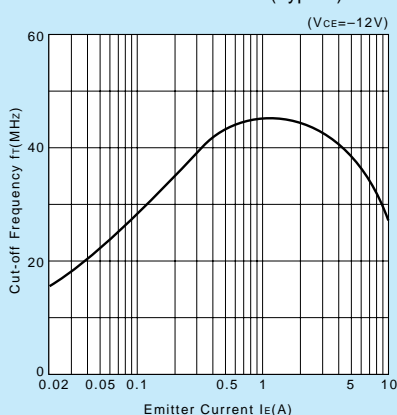
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



**θ<sub>j-a</sub>-t Characteristics**

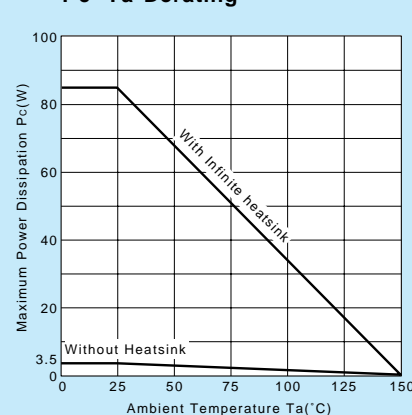


**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



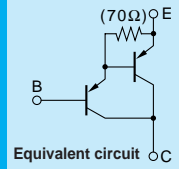
**Safe Operating Area (Single Pulse)**

**P<sub>C</sub>-T<sub>a</sub> Derating**



# Darlington

# 2SB1659



**Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2589)**

**Application : Audio, Series Regulator and General Purpose**

**Absolute maximum ratings (Ta=25°C)**

Symbol	2SB1659	Unit
V <sub>CB0</sub>	-110	V
V <sub>CE0</sub>	-110	V
V <sub>EB0</sub>	-5	V
I <sub>C</sub>	-6	A
I <sub>B</sub>	-1	A
P <sub>C</sub>	50(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics (Ta=25°C)**

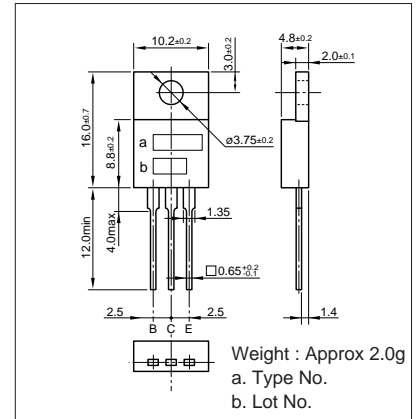
Symbol	Conditions	2SB1659	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-110V	-100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-5V	-100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =-30mA	-110min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-5A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-5mA	-2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =-5A, I <sub>B</sub> =-5mA	-3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.5A	100typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =-10V, f=1MHz	110typ	pF

\*h<sub>FE</sub> Rank:  $\bar{O}$ (5000to12000), P(6500to20000), Y(15000to30000)

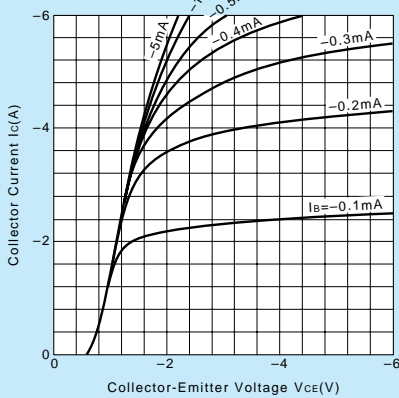
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
-30	6	-5	-10	5	-5	5	1.1typ	3.2typ	1.1typ

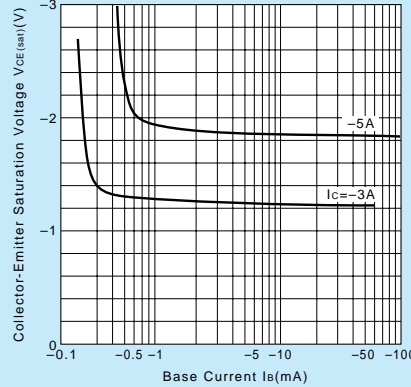
**External Dimensions MT-25(TO220)**



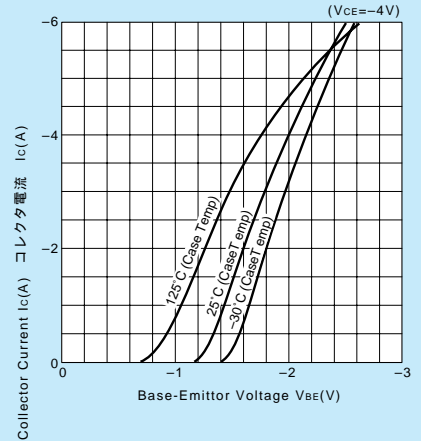
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



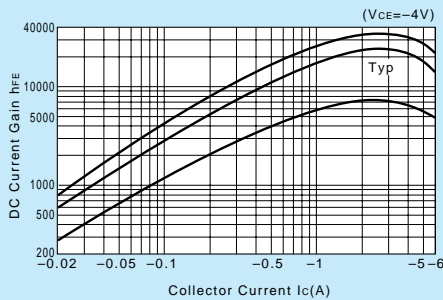
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



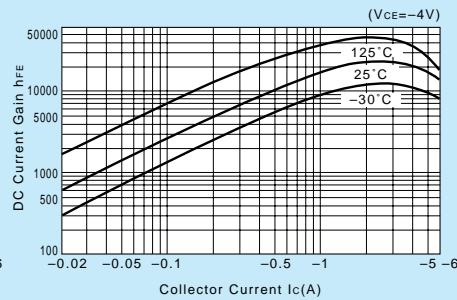
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



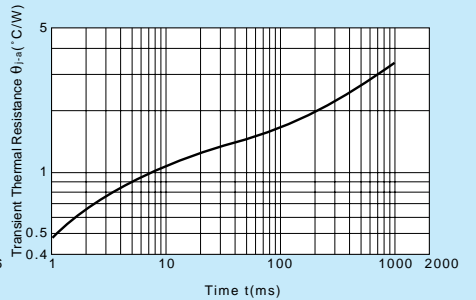
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



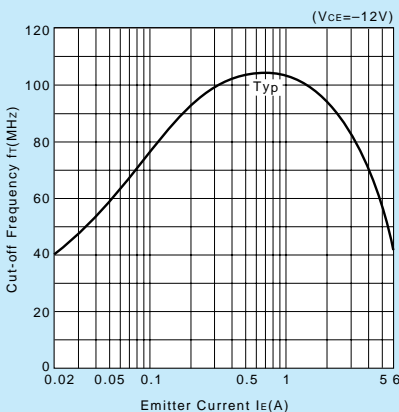
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



**θ<sub>j-a</sub>-t Characteristics**

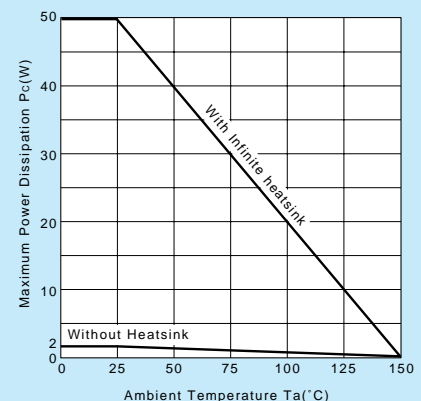


**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC2023

Silicon NPN Triple Diffused Planar Transistor

Application : Series Regulator, Switch, and General Purpose

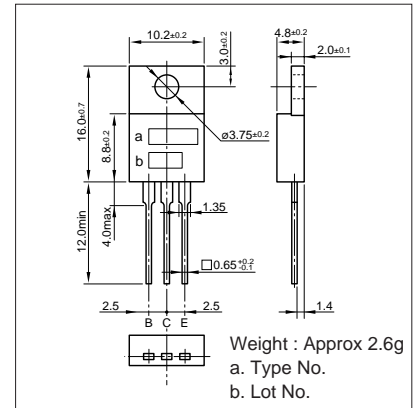
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC2023	Unit
V <sub>CB0</sub>	300	V
V <sub>CEO</sub>	300	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	2	A
I <sub>B</sub>	0.2	A
P <sub>C</sub>	40(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC2023	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =300V	1.0max	mA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	1.0max	mA
V(BR)CEO	I <sub>C</sub> =25mA	300min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =0.5A	30min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =1.0A, I <sub>B</sub> =0.2A	1.0max	V
f <sub>r</sub>	V <sub>CE</sub> =12A, I <sub>E</sub> =-0.2A	10typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	75typ	pF

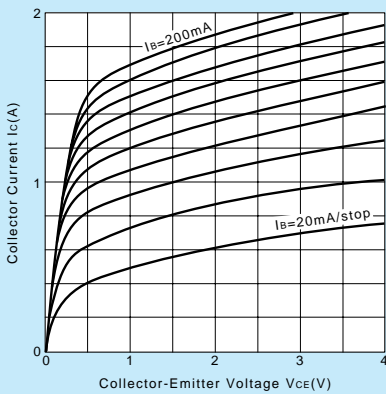
**External Dimensions MT-25(TO220)**



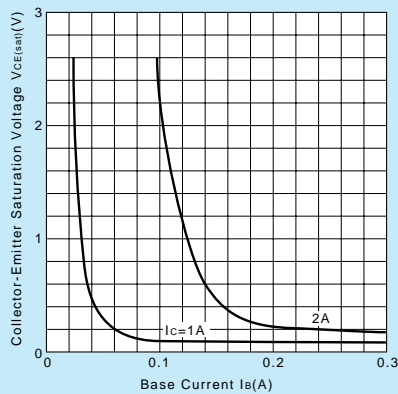
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>B2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
100	100	1.0	-5	100	-200	0.3typ	4.0typ	1.0typ

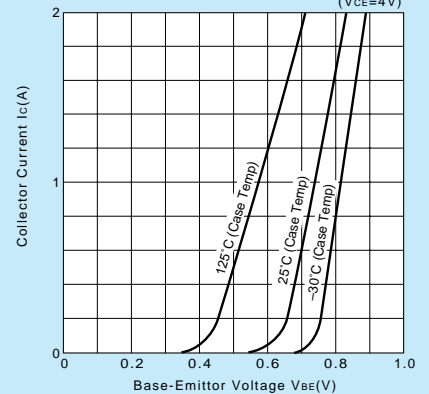
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



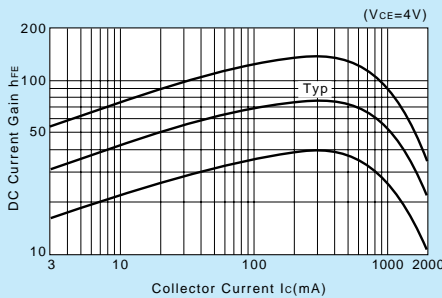
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



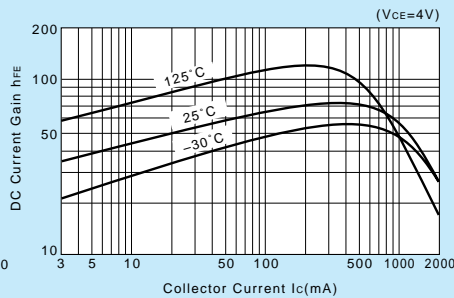
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



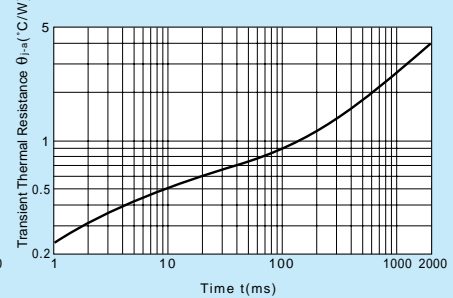
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



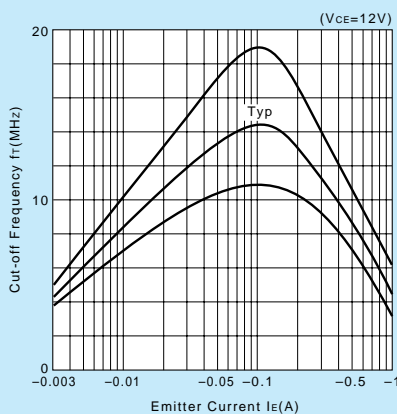
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



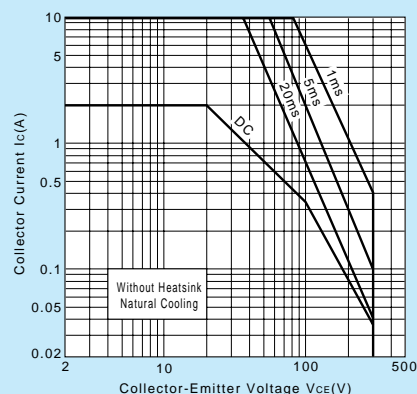
**θ<sub>j-a</sub>-t Characteristics**



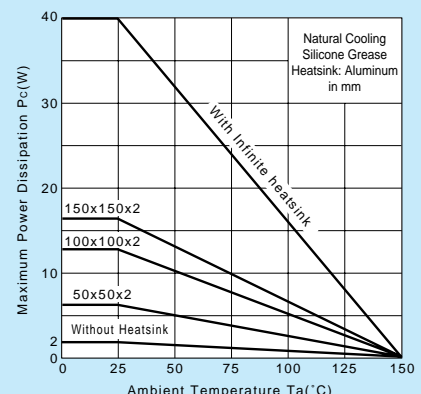
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1186)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC2837	Unit
V <sub>CB0</sub>	150	V
V <sub>CEO</sub>	150	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	10	A
I <sub>B</sub>	2	A
P <sub>C</sub>	100(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

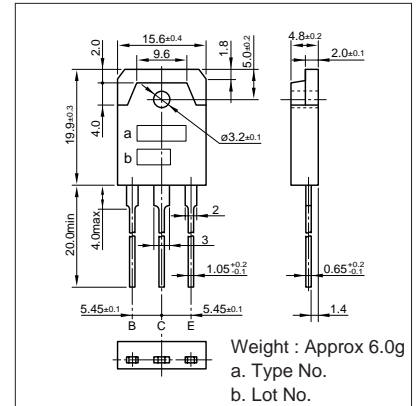
Symbol	Conditions	2SC2837	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =150V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =25mA	150min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3V	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =0.5A	2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	70typ	MHz
COB	V <sub>CB</sub> =80V, f=1MHz	60typ	pF

\*h<sub>FE</sub> Rank O(50 to 100), P(70 to 140), Y(90 to 180)

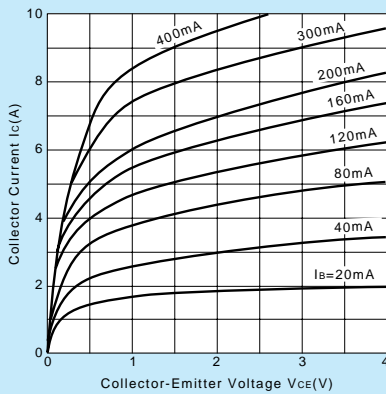
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>B2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
60	12	5	-5	500	-500	0.2typ	1.4typ	0.35typ

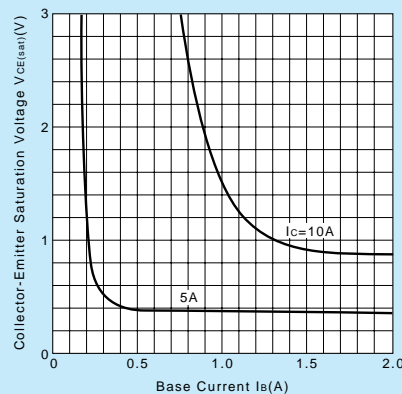
**External Dimensions MT-100(TO3P)**



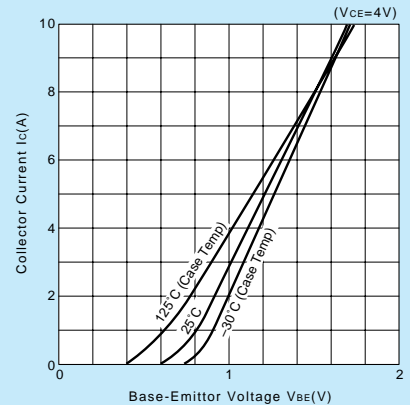
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



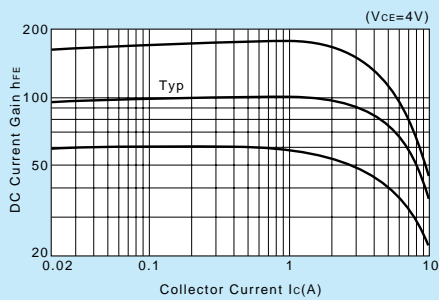
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



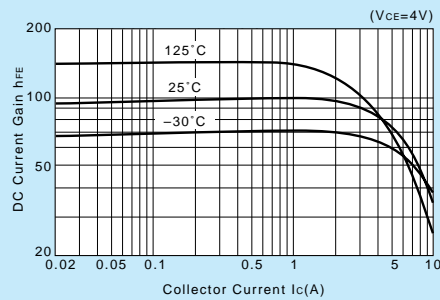
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



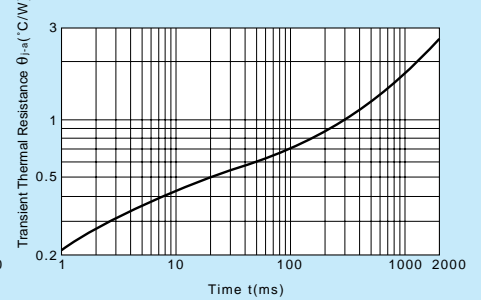
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



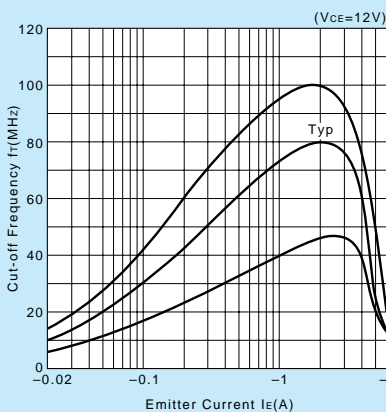
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



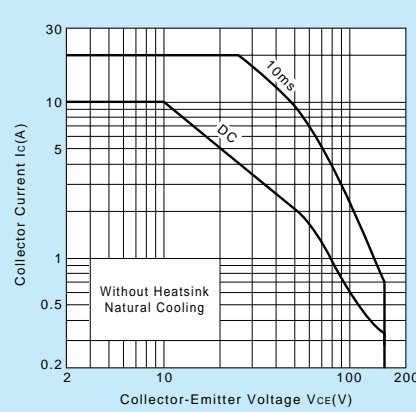
**θ<sub>j-a</sub>-t Characteristics**



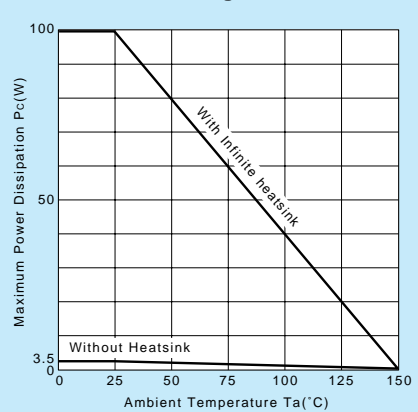
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**





Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1215)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

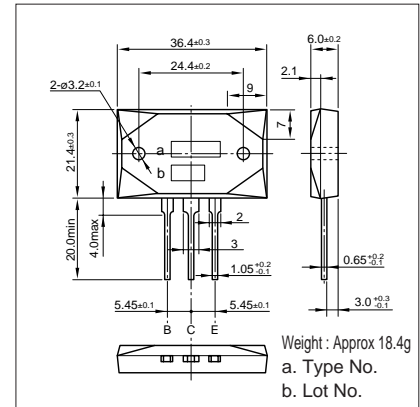
Symbol	2SC2921	Unit
VCBO	160	V
VCEO	160	V
VEBO	5	V
Ic	15	A
IB	4	A
Pc	150(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC2921	Unit
ICBO	V <sub>CB</sub> =160V	100max	μA
IEBO	V <sub>EB</sub> =5V	100max	μA
V(BR)CEO	I <sub>C</sub> =25mA	160min	V
hFE	V <sub>CE</sub> =4V, I <sub>C</sub> =5A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =0.5A	2.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	60typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	200typ	pF

\*hFE Rank O(50 to 100), P(70 to 140), Y(90 to 180)

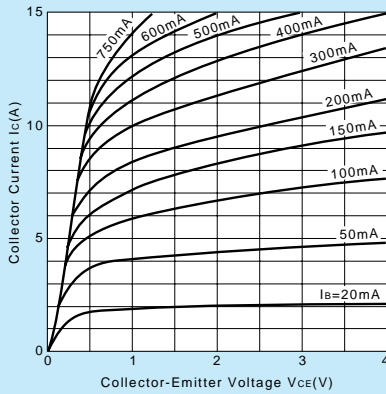
**External Dimensions MT-200**



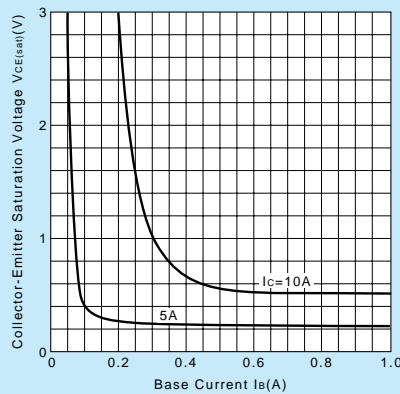
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>B2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
60	12	5	-5	500	-500	0.2typ	1.5typ	0.35typ

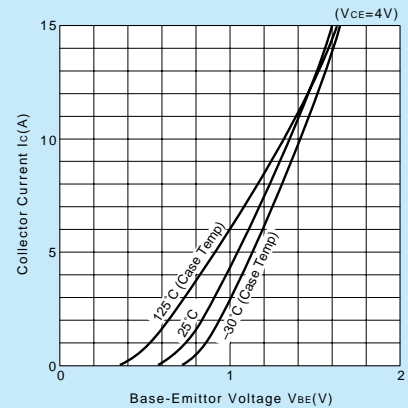
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



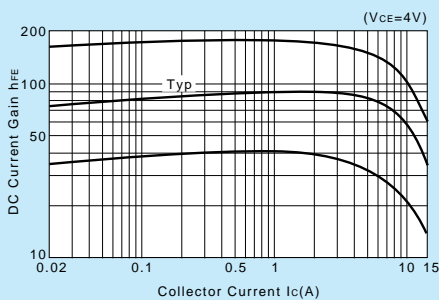
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



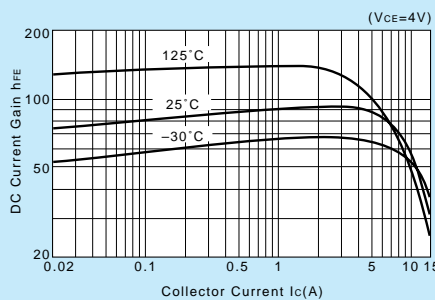
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



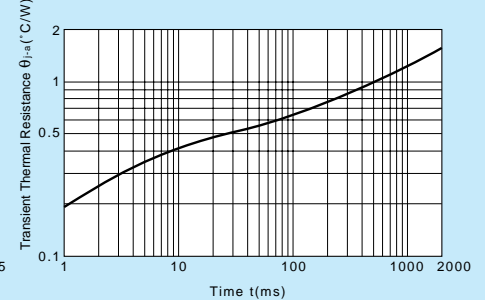
**hFE-I<sub>C</sub> Characteristics (Typical)**



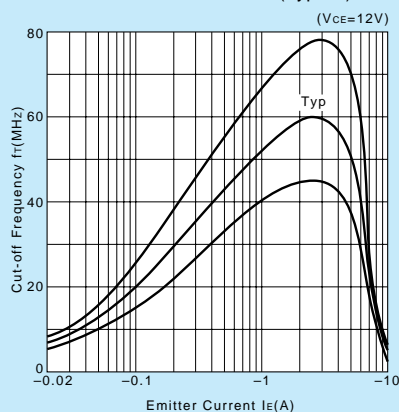
**hFE-I<sub>C</sub> Temperature Characteristics (Typical)**



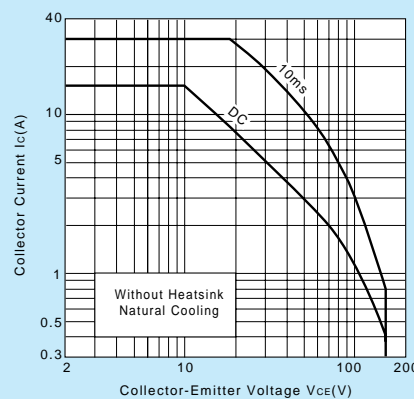
**θ<sub>j-a-t</sub> Characteristics**



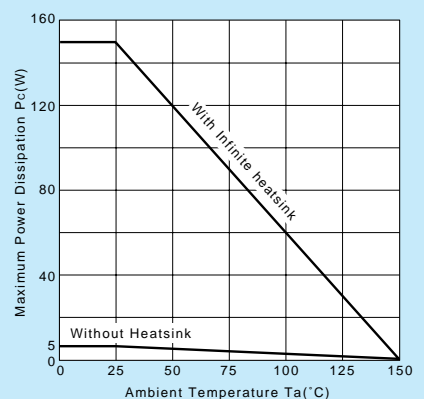
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1216)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

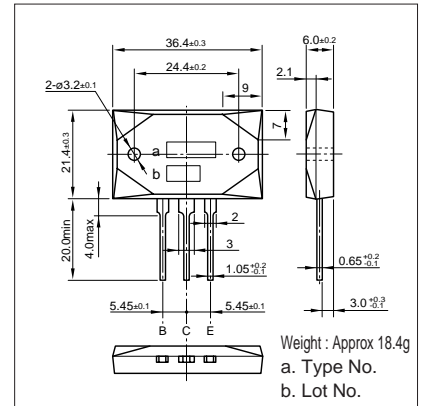
Symbol	2SC2922	Unit
V <sub>CB0</sub>	180	V
V <sub>CEO</sub>	180	V
V <sub>EBO</sub>	5	V
I <sub>C</sub>	17	A
I <sub>B</sub>	5	A
P <sub>C</sub>	200(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC2922	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =180V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =5V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =25mA	180min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =8V	30min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =0.8A	2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	50typ	MHz
CoB	V <sub>CB</sub> =10V, f=1MHz	250typ	pF

\*h<sub>FE</sub> Rank ○(30 to 60), Y(50 to 100), P(70 to 140), G(90 to 180)

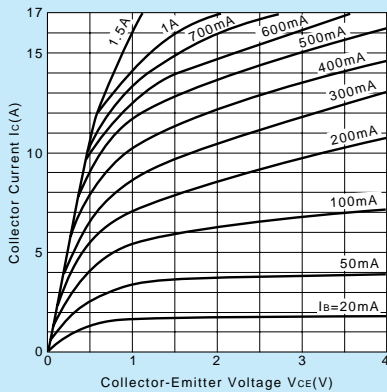
**External Dimensions MT-200**



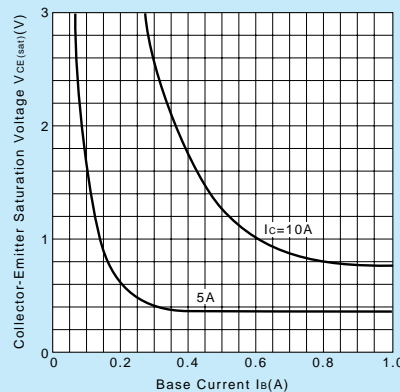
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>B2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	4	10	-5	1	-1	0.2typ	1.3typ	0.45typ

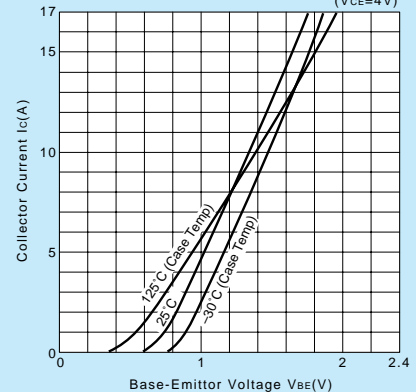
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



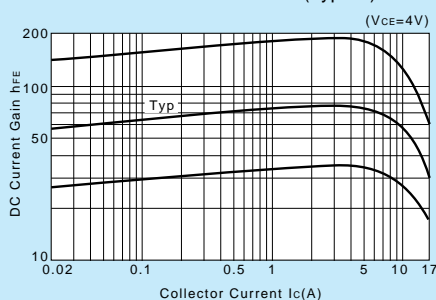
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



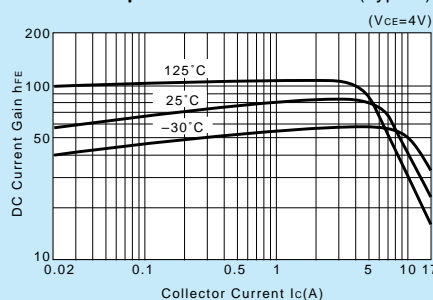
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



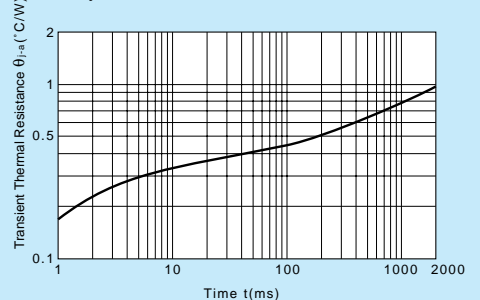
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



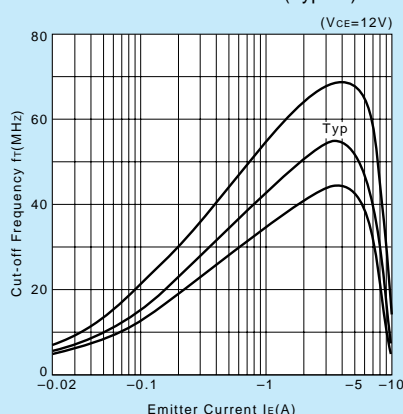
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



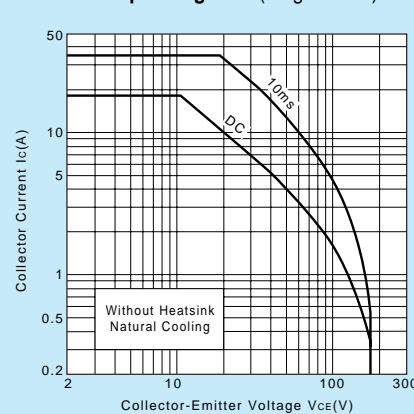
**θ<sub>j-a</sub>-t Characteristics**



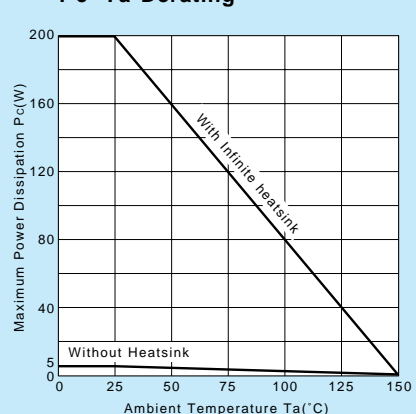
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC3179

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1262)

Application : Audio and General Purpose

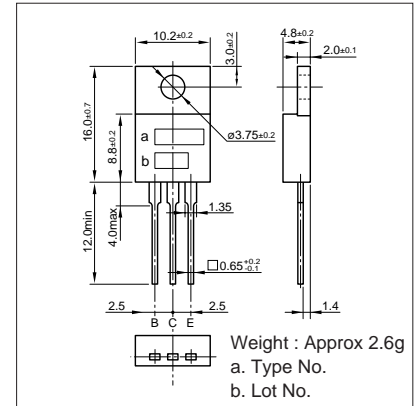
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3179	Unit
V <sub>CB0</sub>	80	V
V <sub>CEO</sub>	60	V
V <sub>EBO</sub>	6	V
I <sub>C</sub>	4	A
I <sub>B</sub>	1	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3179	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =80V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =6V	100max	μA
V(BR)CEO	I <sub>C</sub> =25mA	60min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =1V	40min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.2A	0.6max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.2A	15typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	60typ	pF

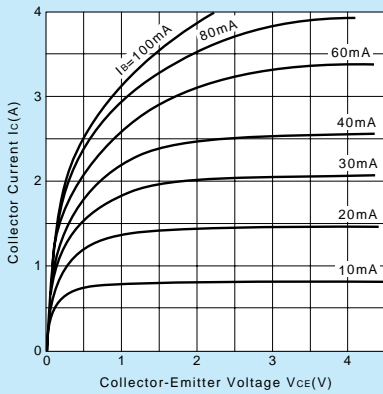
**External Dimensions MT-25(TO220)**



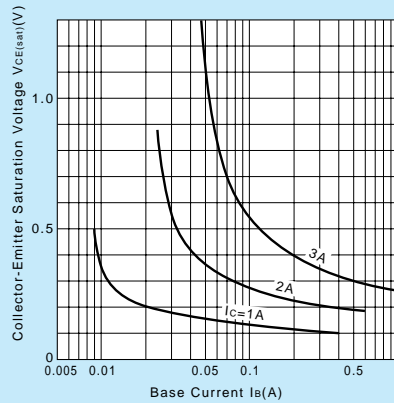
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
20	10	2	10	-5	200	-200	0.2typ	1.9typ	0.29typ

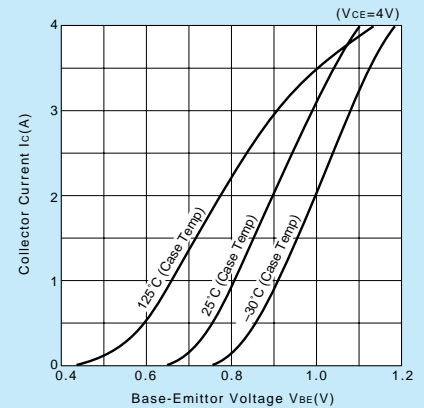
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



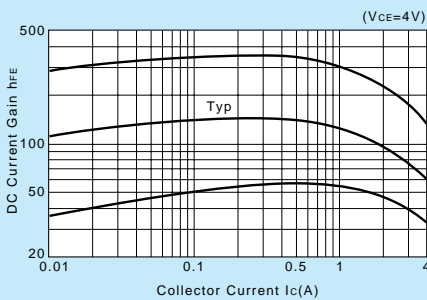
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



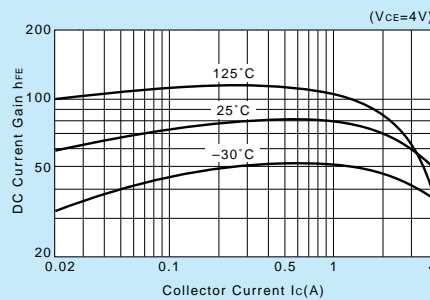
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



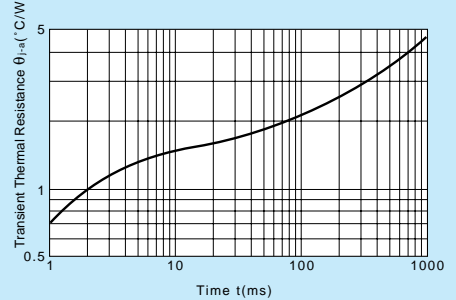
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



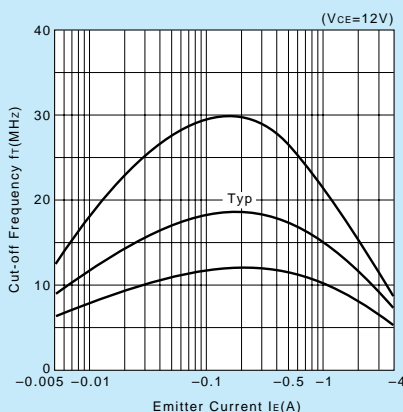
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



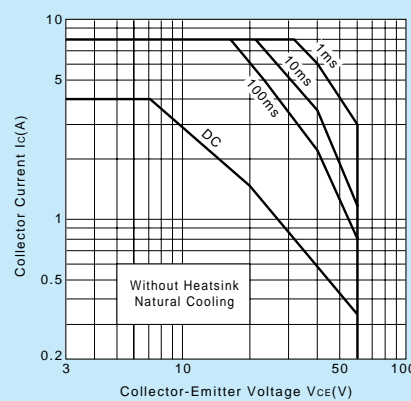
**θ<sub>j-a</sub>-t Characteristics**



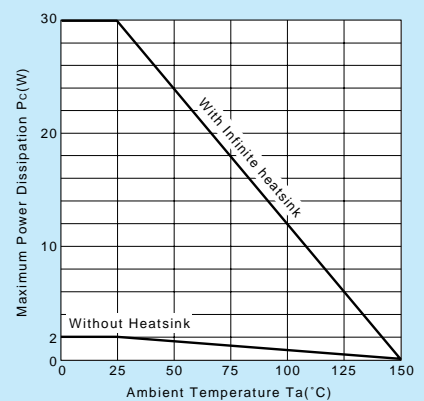
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1294)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3263	Unit
VcBO	230	V
VCEO	230	V
VEBO	5	V
Ic	15	A
IB	4	A
Pc	130(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

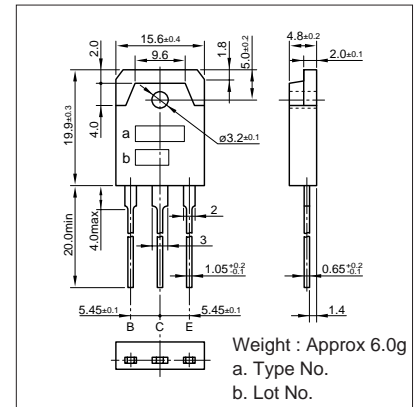
Symbol	Conditions	2SC3263	Unit
IcBO	VcB=230V	100max	μA
IEBO	VEB=5V	100max	μA
V(BR)CEO	Ic=25mA	230min	V
hFE	VCE=4V, Ic=5A	50min*	
VCE(sat)	Ic=5A, IB=0.5A	2.0max	V
fr	VCE=12V, IE=-2A	60typ	MHz
COB	VcB=10V, f=1MHz	250typ	pF

\*hFE Rank  $\bar{O}$ (50 to 100), Y(70 to 140)

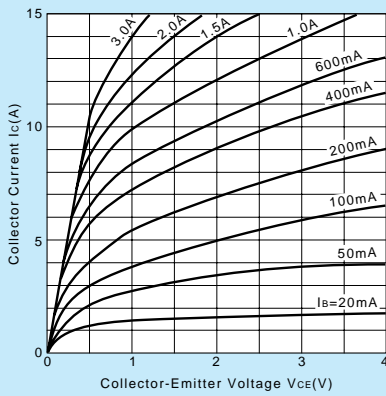
**Typical Switching Characteristics (Common Emitter)**

Vcc (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	IB1 (mA)	IB2 (mA)	ton (μs)	tstg (μs)	tf (μs)
60	12	5	10	-5	500	-500	0.30typ	2.40typ	0.50typ

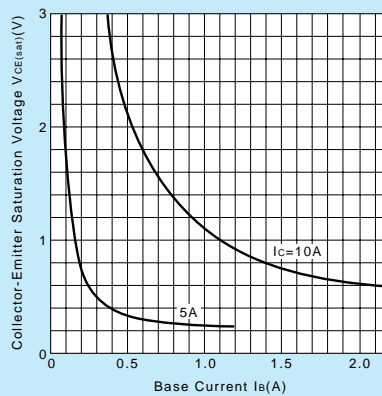
**External Dimensions MT-100(TO3P)**



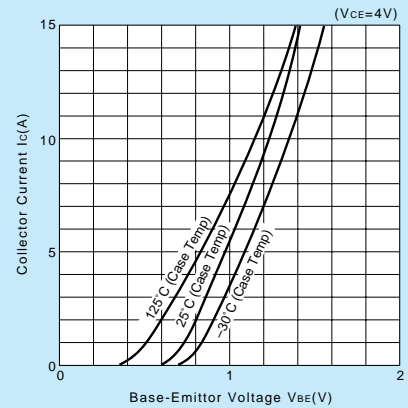
**Ic-VCE Characteristics (Typical)**



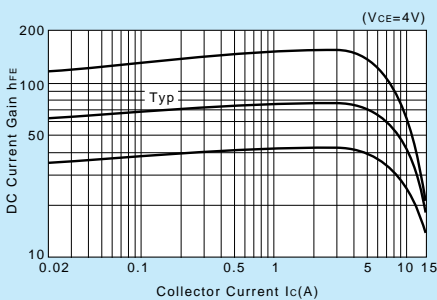
**VCE(sat)-IB Characteristics (Typical)**



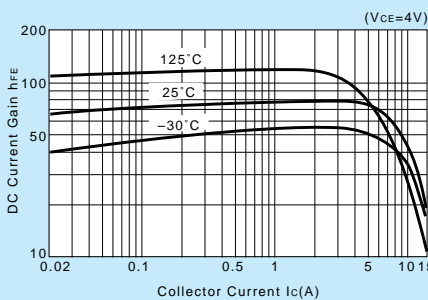
**Ic-VBE Temperature Characteristics (Typical)**



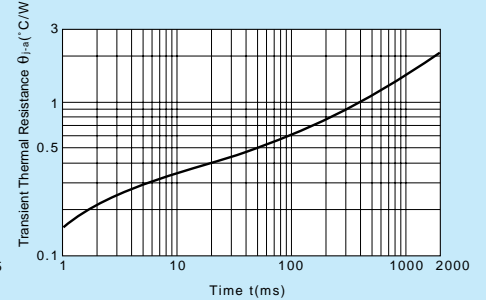
**hFE-Ic Characteristics (Typical)**



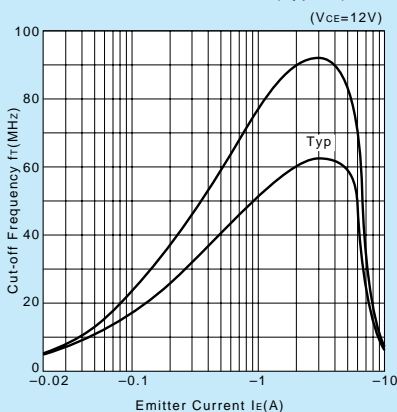
**hFE-Ic Temperature Characteristics (Typical)**



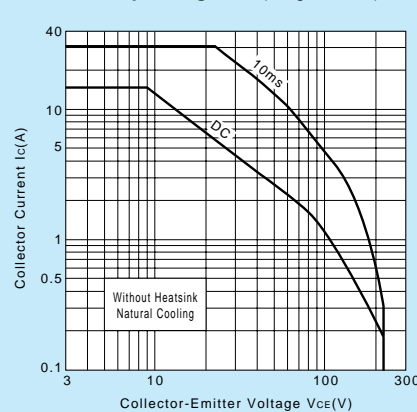
**θj-a-t Characteristics**



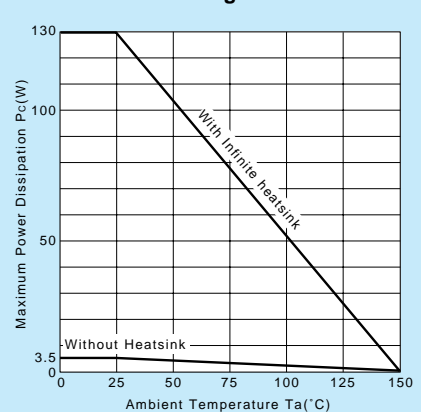
**fT-IE Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**Pc-Ta Derating**



Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1295)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

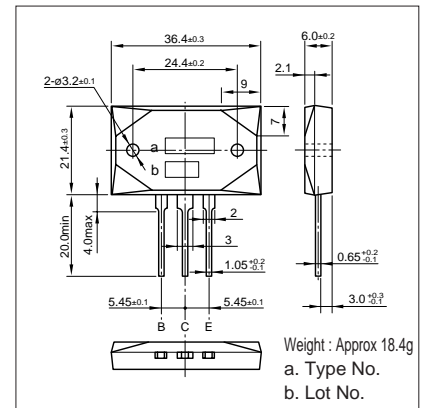
Symbol	2SC3264	Unit
V <sub>CB0</sub>	230	V
V <sub>CEO</sub>	230	V
V <sub>EBO</sub>	5	V
I <sub>c</sub>	17	A
I <sub>B</sub>	5	A
P <sub>c</sub>	200(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3264	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =230V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =5V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>c</sub> =25mA	230min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =5A	50min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =5A, I <sub>B</sub> =0.5A	2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	60typ	MHz
CoB	V <sub>CB</sub> =10V, f=1MHz	250typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), Y(70 to 140)

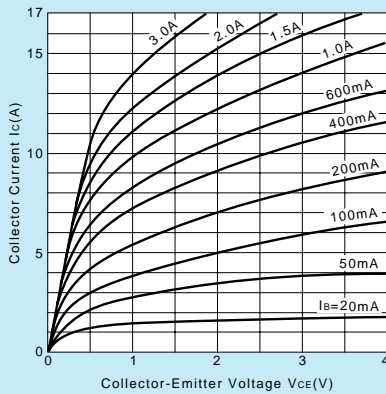
**External Dimensions MT-200**



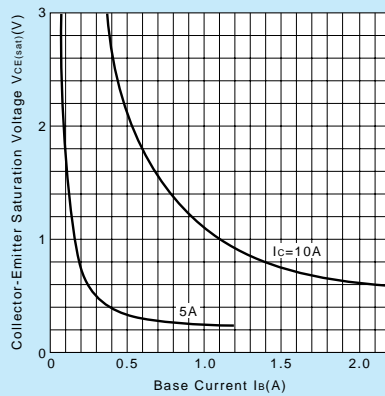
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
60	12	5	10	-5	0.5	-0.5	0.30typ	2.40typ	0.50typ

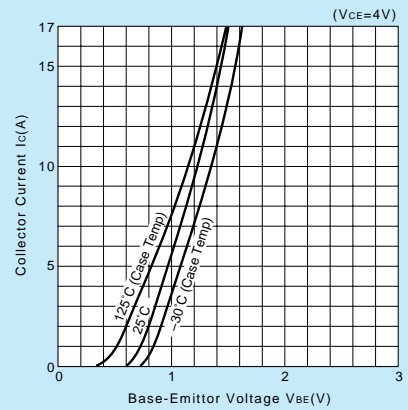
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



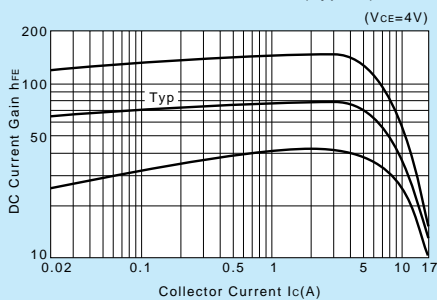
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



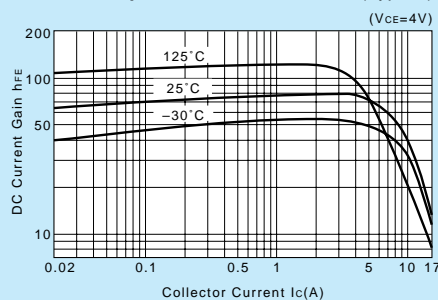
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



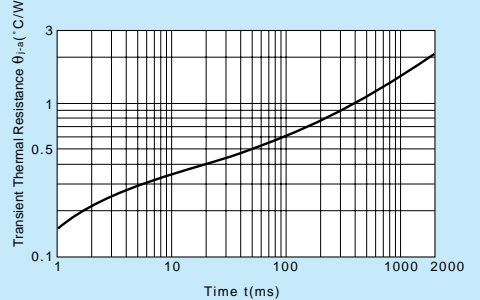
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



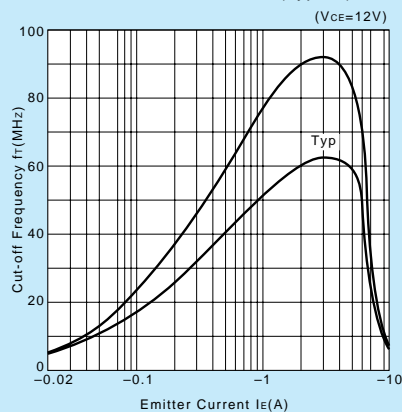
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



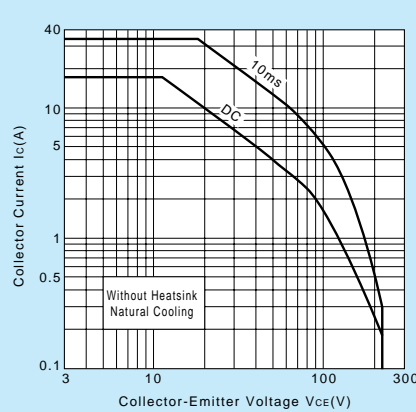
**θ<sub>j-a</sub>-t Characteristics**



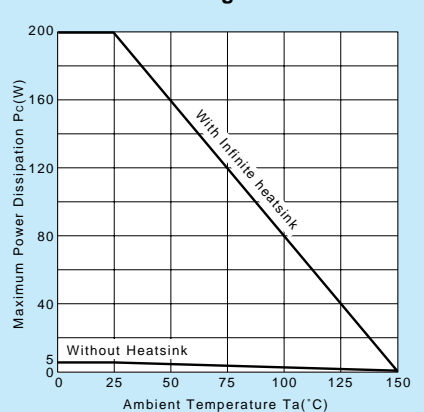
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1303)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

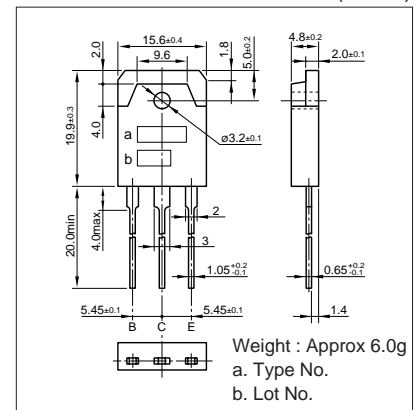
Symbol	2SC3284	Unit
V <sub>CB0</sub>	150	V
V <sub>CE0</sub>	150	V
V <sub>EB0</sub>	5	V
I <sub>c</sub>	14	A
I <sub>B</sub>	3	A
P <sub>c</sub>	125(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3284	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =150V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =25mA	150min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =5A	50min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =5A, I <sub>B</sub> =0.5A	2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	60typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	200typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

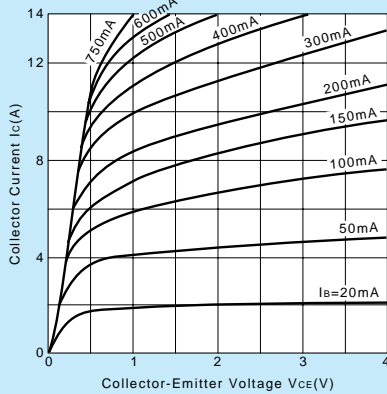
**External Dimensions MT-100(TO3P)**



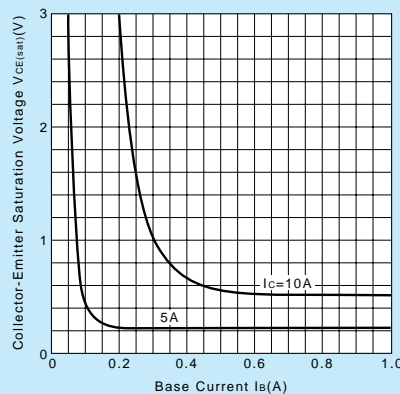
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
60	12	5	10	-5	0.5	-0.5	0.2typ	1.5typ	0.35typ

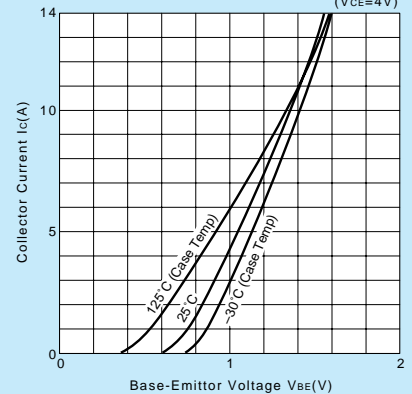
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



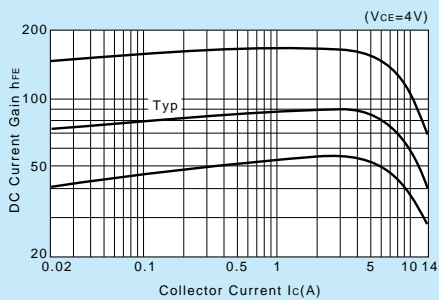
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



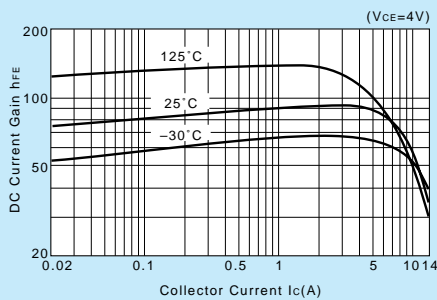
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



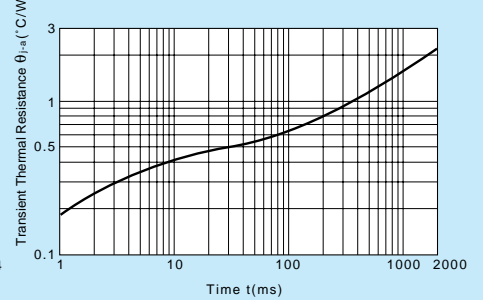
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



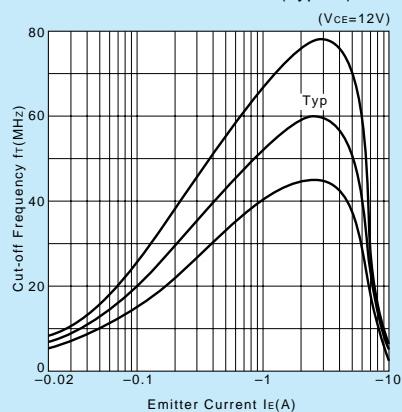
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



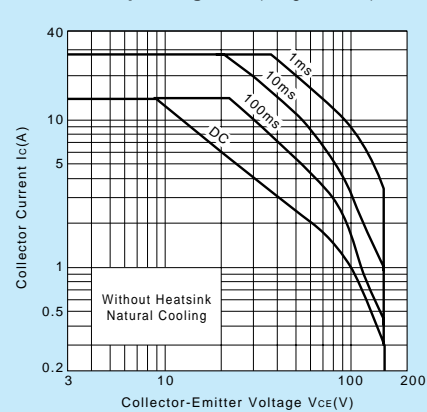
**θ<sub>j-a</sub>-t Characteristics**



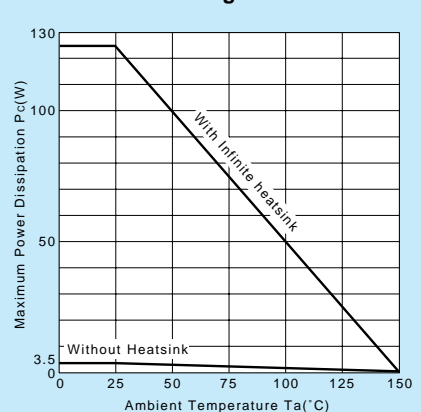
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# LAPT 2SC3519/3519A

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1386/A)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3519	2SC3519A	Unit
V <sub>CB0</sub>	160	180	V
V <sub>CE0</sub>	160	180	V
V <sub>EB0</sub>	5		V
I <sub>C</sub>	15		A
I <sub>B</sub>	4		A
P <sub>C</sub>	130(Tc=25°C)		W
T <sub>j</sub>	150		°C
T <sub>stg</sub>	-55 to +150		°C

**Electrical Characteristics** (Ta=25°C)

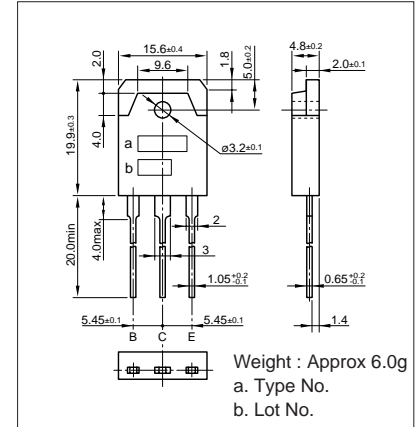
Symbol	Conditions	2SC3519	2SC3519A	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =	160	180	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max		μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	160min	180min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =5A	50min*		
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =0.5A	2.0max		V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	50typ		MHz
COB	V <sub>CB</sub> =10V, f=1MHz	250typ		pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

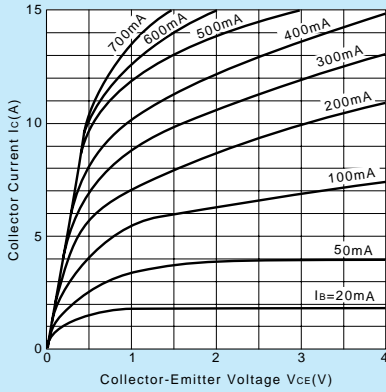
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	4	10	10	-5	1	-1	0.2typ	1.3typ	0.45typ

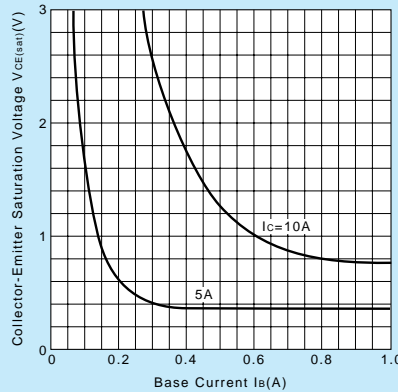
**External Dimensions MT-100(TO3P)**



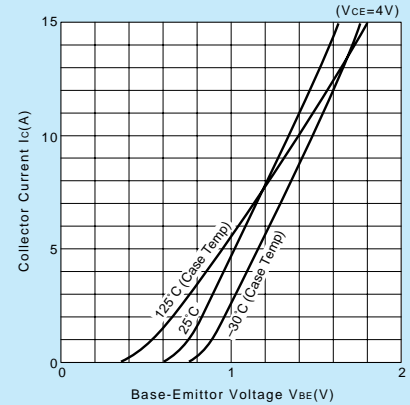
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



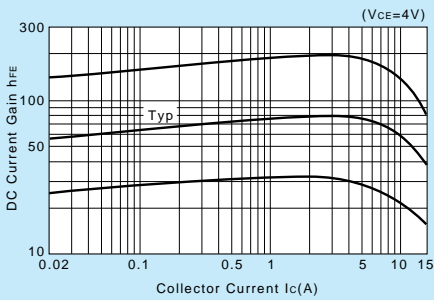
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



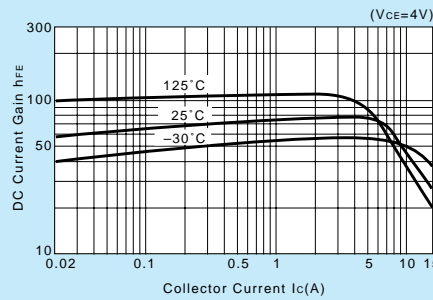
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



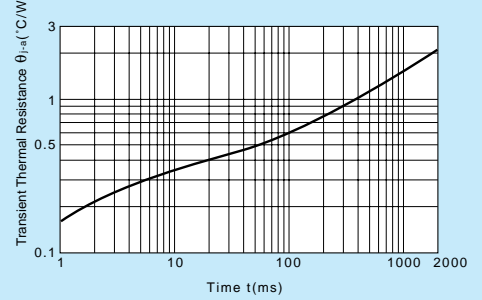
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



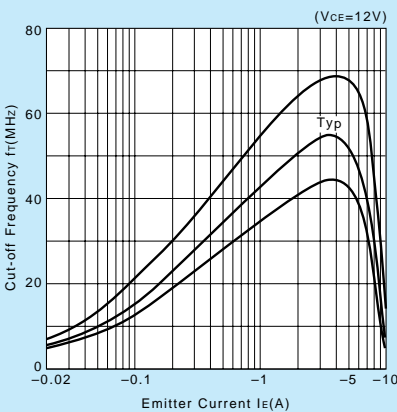
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



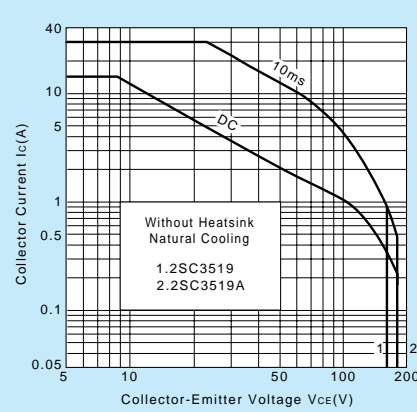
**θ<sub>j-a</sub>-t Characteristics**



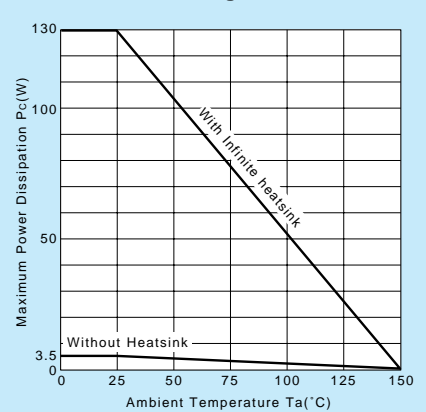
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**





# 2SC3678

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

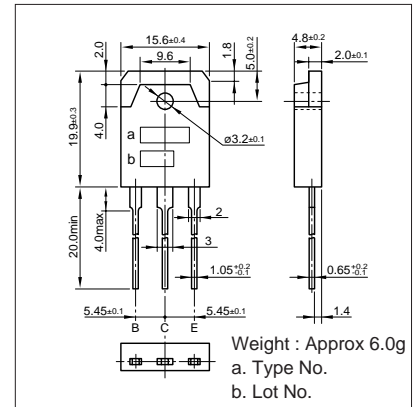
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3678	Unit
V <sub>CB0</sub>	900	V
V <sub>CEO</sub>	800	V
V <sub>EBO</sub>	7	V
I <sub>C</sub>	3(Pulse6)	A
I <sub>B</sub>	1.5	A
P <sub>C</sub>	80(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3678	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =7V	100max	μA
V(BR)CEO	I <sub>C</sub> =10mA	800min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =1A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =1A, I <sub>B</sub> =0.2A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =1A, I <sub>B</sub> =0.2A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	6typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	50typ	pF

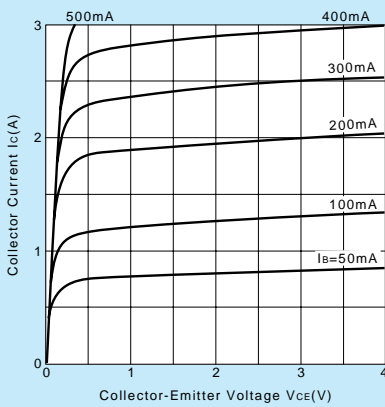
**External Dimensions MT-100(TO3P)**



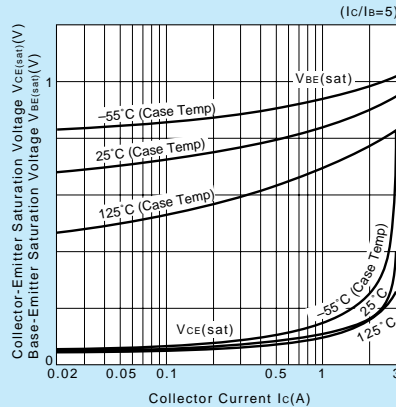
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	250	1	10	-5	0.15	-0.5	1max	5max	1max

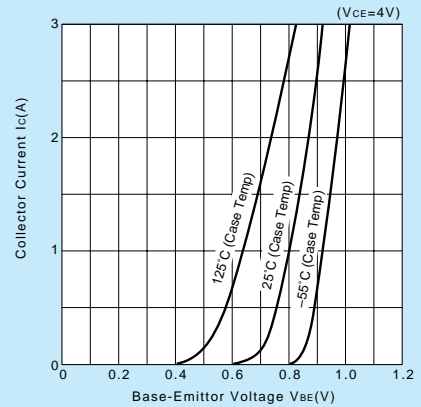
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



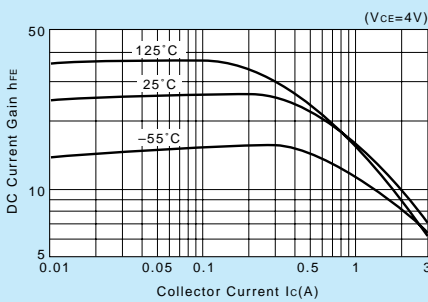
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



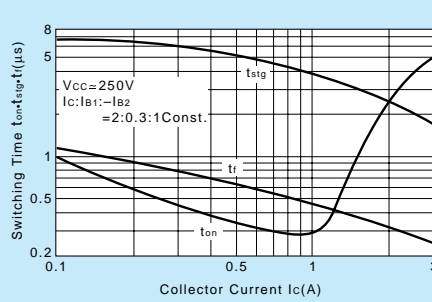
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



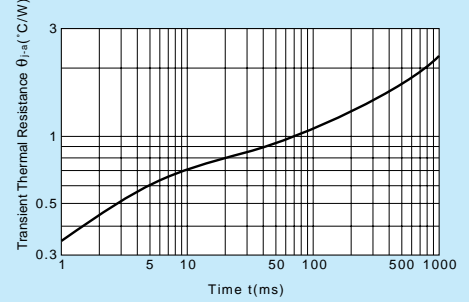
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



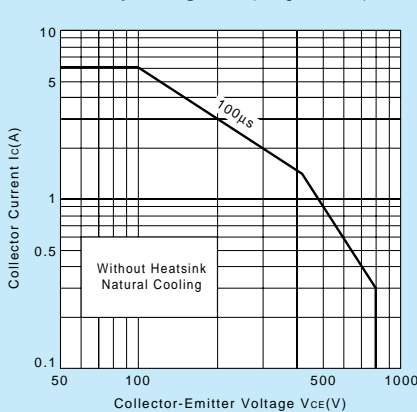
**t<sub>on</sub>, t<sub>stg</sub>, t<sub>r</sub>-I<sub>C</sub> Characteristics (Typical)**



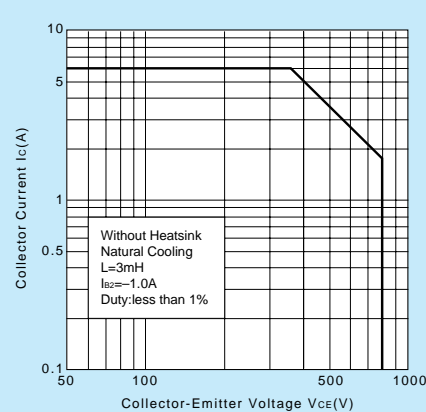
**θ<sub>j-a</sub>-t Characteristics**



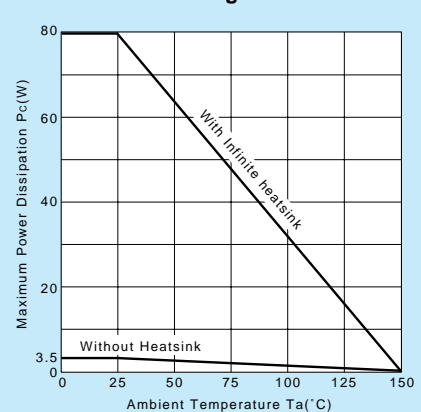
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC3679

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

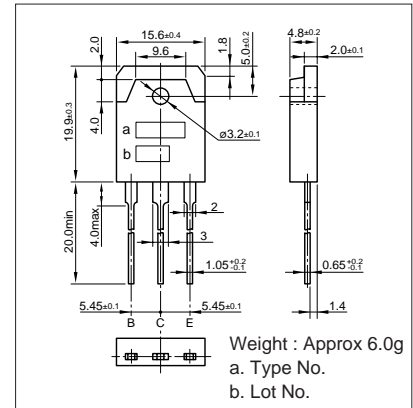
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3679	Unit
V <sub>CB0</sub>	900	V
V <sub>CEO</sub>	800	V
V <sub>EB0</sub>	7	V
I <sub>C</sub>	5(Pulse10)	A
I <sub>B</sub>	2.5	A
P <sub>C</sub>	100(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3679	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	800min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =2A	10to30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.4A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.4A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	6typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	75typ	pF

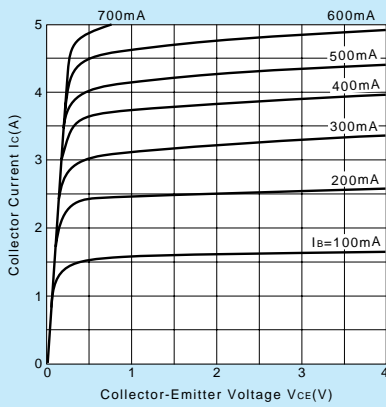
**External Dimensions MT-100(TO3P)**



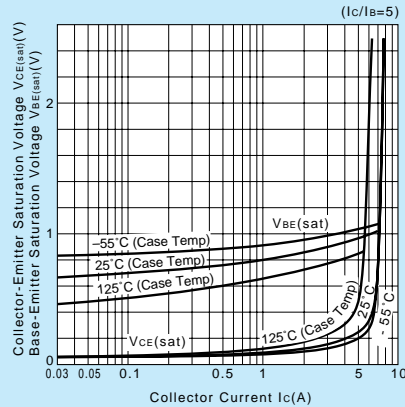
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	125	2	10	-5	0.3	-1	1max	5max	1max

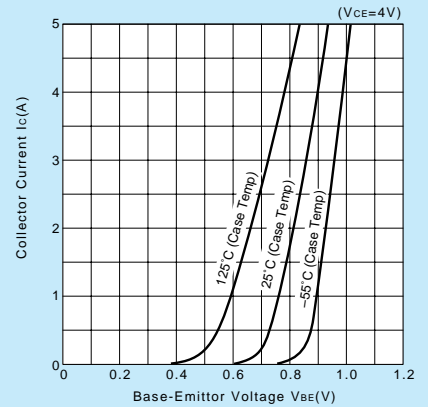
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



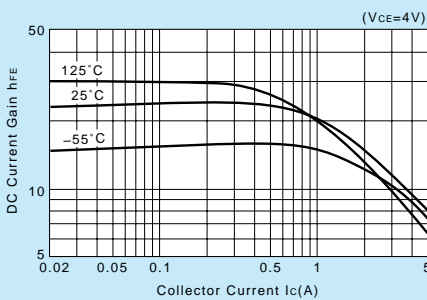
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



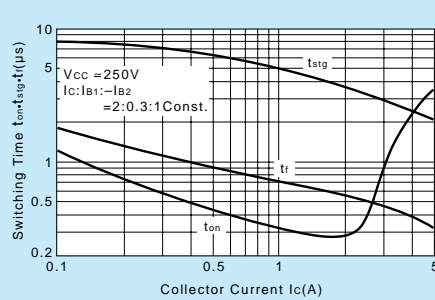
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



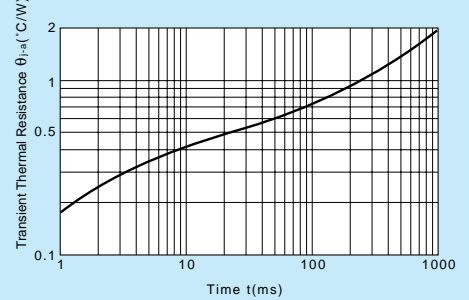
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



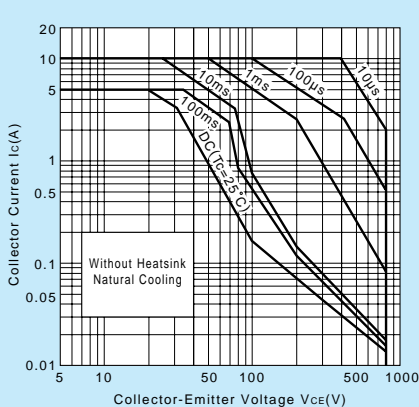
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



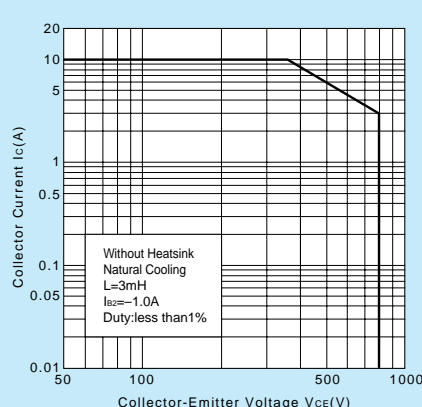
**θ<sub>j-a</sub>-t Characteristics**



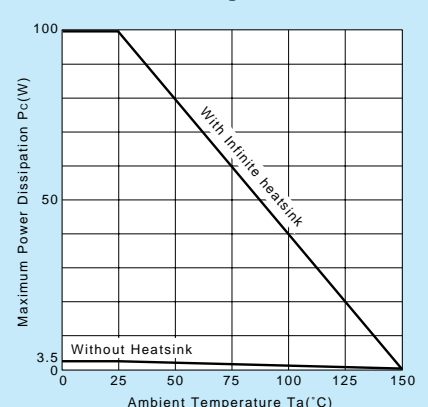
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC3680

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

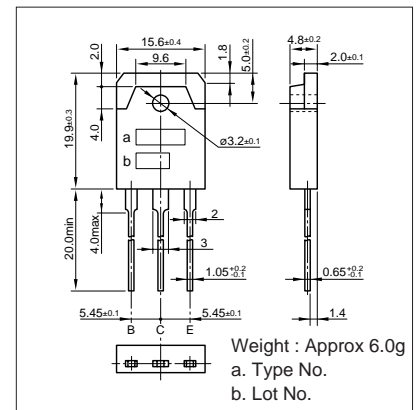
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3680	Unit
V <sub>CB0</sub>	900	V
V <sub>CE0</sub>	800	V
V <sub>EB0</sub>	7	V
I <sub>C</sub>	7(Pulse14)	A
I <sub>B</sub>	3.5	A
P <sub>C</sub>	120(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3680	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	800min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	10to30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	6typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	105typ	pF

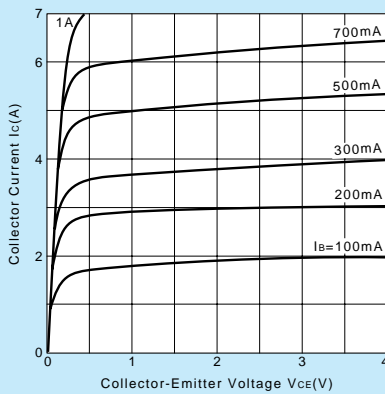
**External Dimensions MT-100(TO3P)**



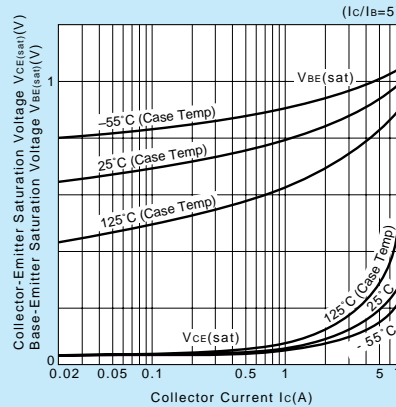
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	83	3	10	-5	0.45	-1.5	1max	5max	1max

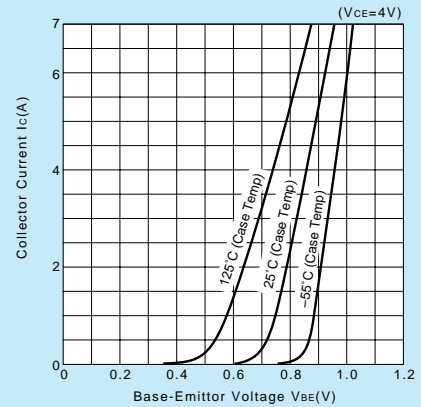
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



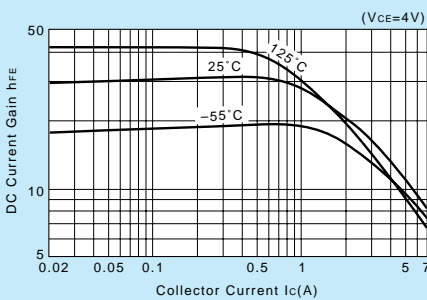
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



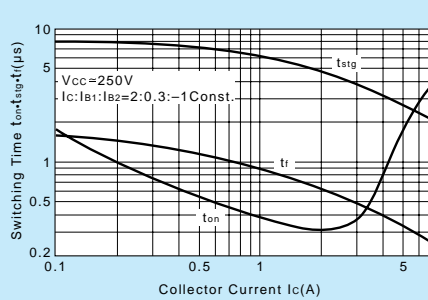
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



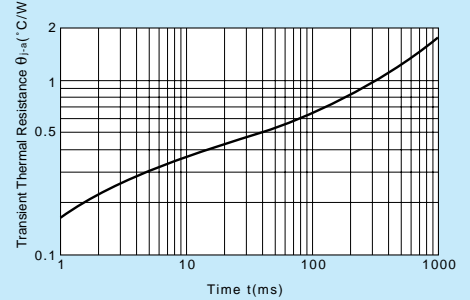
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



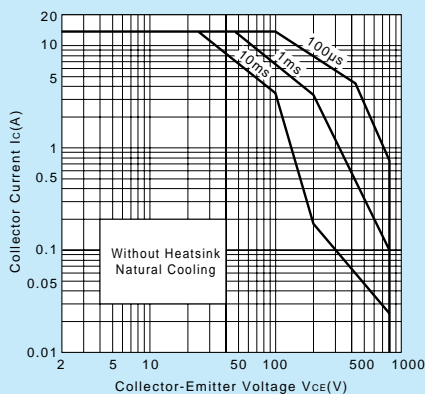
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



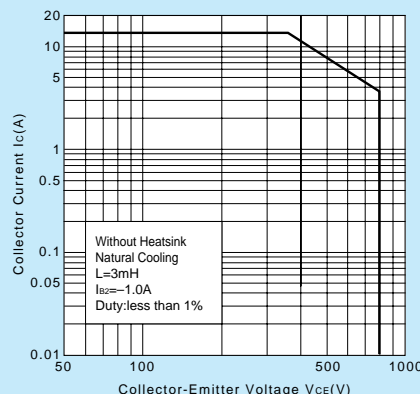
**θ<sub>j-a</sub>-t Characteristics**



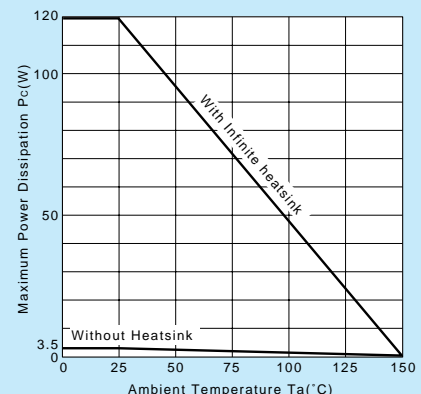
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC3830

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

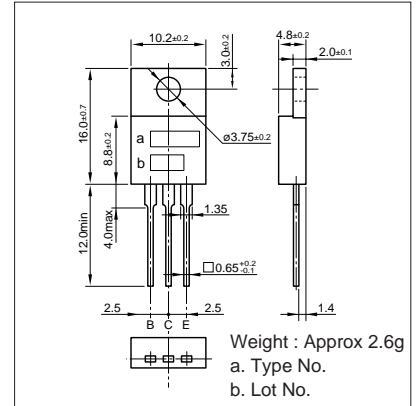
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3830	Unit
V <sub>CB0</sub>	600	V
V <sub>CEO</sub>	500	V
V <sub>EB0</sub>	10	V
I <sub>C</sub>	6(Pulse12)	A
I <sub>B</sub>	2	A
P <sub>C</sub>	50(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3830	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =600V	1max	mA
I <sub>EB0</sub>	V <sub>EB</sub> =10V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	500min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =2A	10to30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.4A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.4A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	8typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	45typ	pF

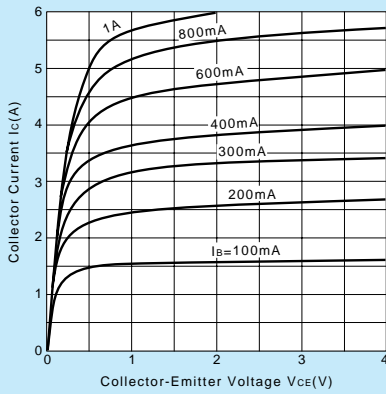
**External Dimensions MT-25(TO220)**



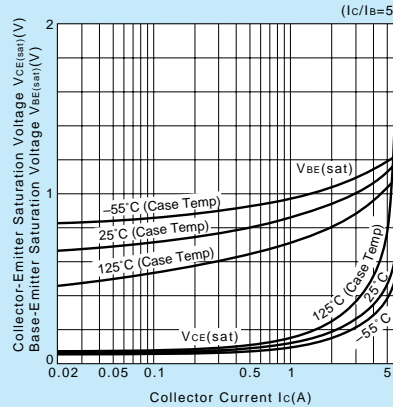
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>r</sub> (μs)
200	100	2	10	-5	0.2	-0.4	1max	4.5max	0.5max

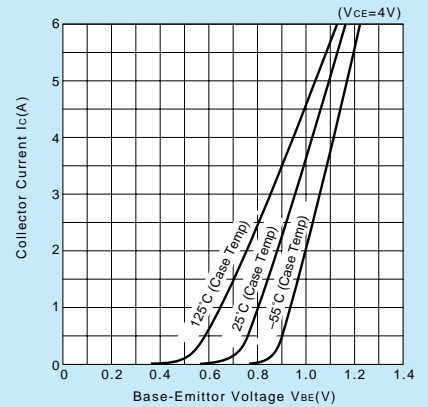
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



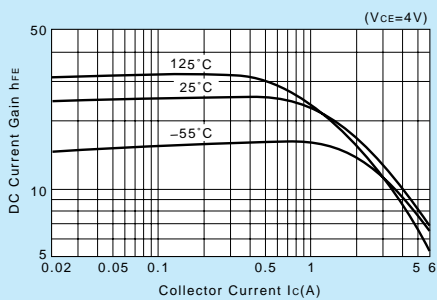
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



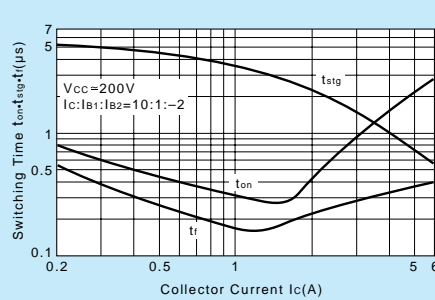
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



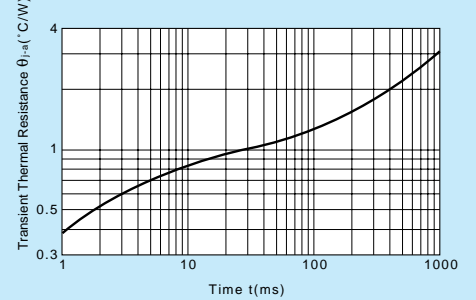
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



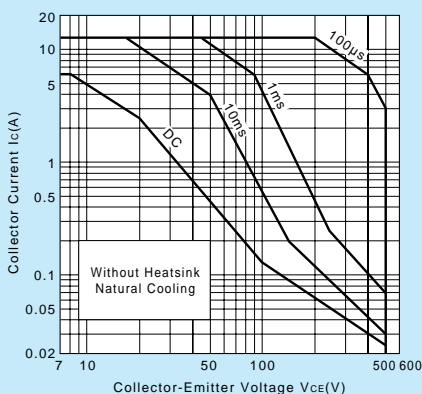
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>r</sub>-I<sub>C</sub> Characteristics (Typical)**



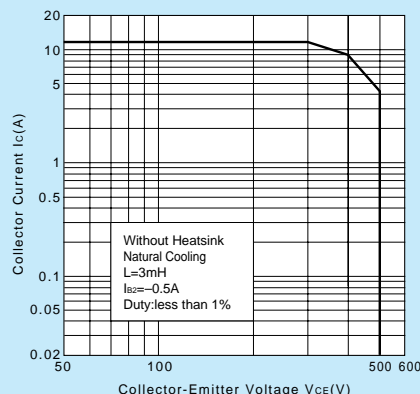
**θ<sub>j-a</sub>-t Characteristics**



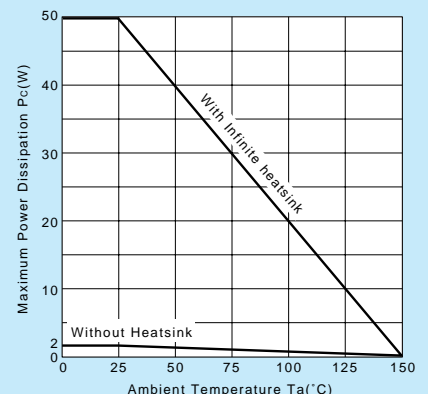
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC3831

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3831	Unit
Vcbo	600	V
Vceo	500	V
Vebo	10	V
Ic	10(Pulse20)	A
Ib	4	A
Pc	100(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

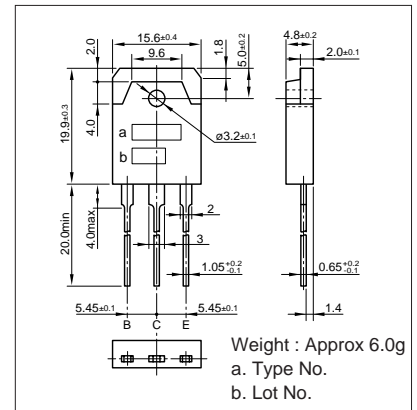
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3831	Unit
Icbo	Vcb=600V	1max	mA
Iebo	VEB=10V	100max	μA
V(BR)CEO	Ic=25mA	500min	V
hFE	VCE=4V, Ic=5A	10to30	
VCE(sat)	Ic=5A, Ib=1A	0.5max	V
VBE(sat)	Ic=5A, Ib=1A	1.3 max	V
fr	VCE=12V, IE=-1A	8typ	MHZ
COB	Vcb=10V, f=1MHZ	105typ	pF

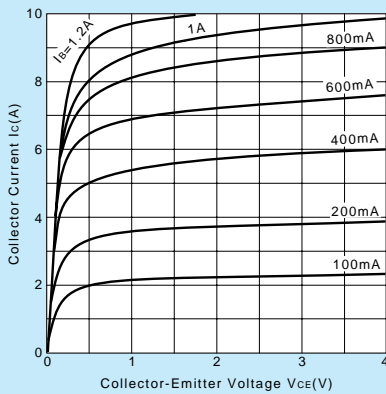
**Typical Switching Characteristics (Common Emitter)**

Vcc (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	IB1 (A)	IB2 (A)	ton (μs)	tstg (μs)	tf (μs)
200	40	5	10	-5	0.5	-1.0	1max	4.5max	0.5max

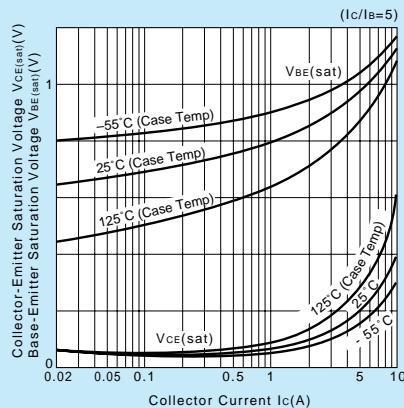
**External Dimensions MT-100(TO3P)**



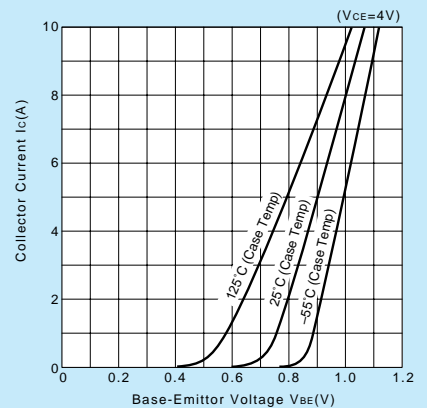
**Ic-VCE Characteristics (Typical)**



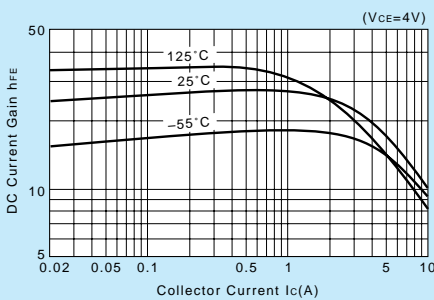
**VCE(sat), VBE(sat)-Ic Temperature Characteristics (Typical)**



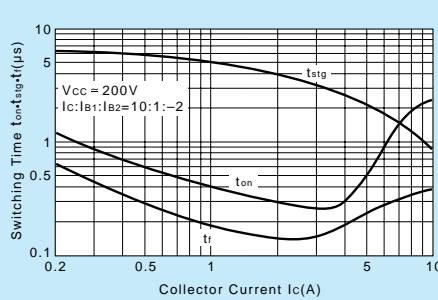
**Ic-VBE Temperature Characteristics (Typical)**



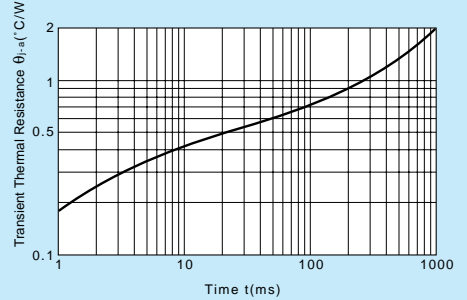
**hFE-Ic Characteristics (Typical)**



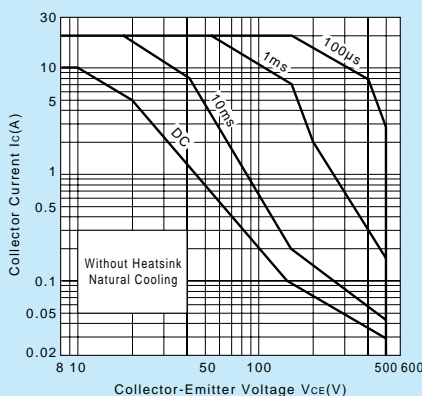
**ton, tstg, tr-Ic Characteristics (Typical)**



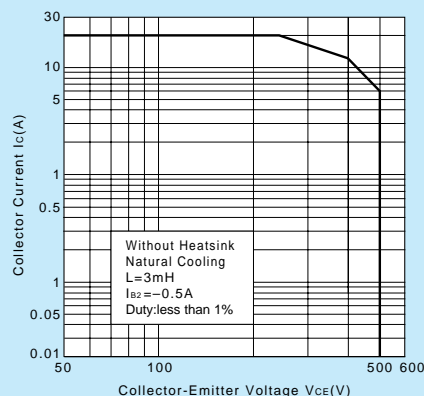
**θj-a-t Characteristics**



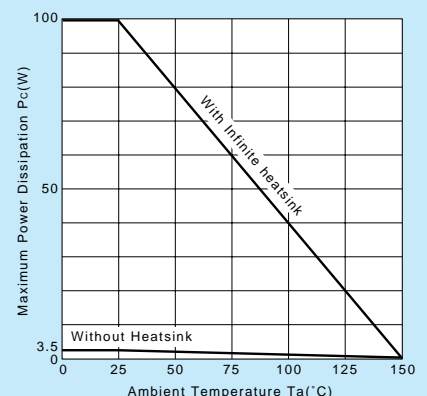
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**Pc-Ta Derating**



# 2SC3832

**Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)**

**Application :** Switching Regulator and General Purpose

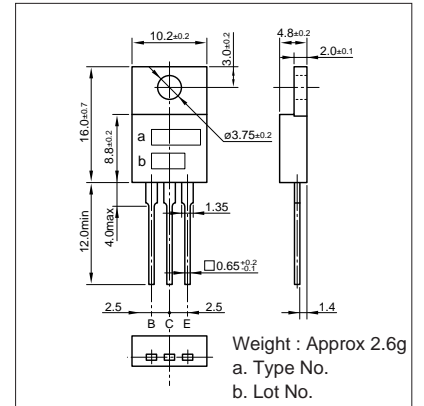
**Absolute maximum ratings (Ta=25°C)**

Symbol	2SC3832	Unit
V <sub>CB0</sub>	500	V
V <sub>CEO</sub>	400	V
V <sub>EB0</sub>	10	V
I <sub>C</sub>	7(Pulse14)	A
I <sub>B</sub>	2	A
P <sub>C</sub>	50(T <sub>C</sub> =25 )	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics (Ta=25°C)**

Symbol	Conditions	2SC3832	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =10V	100max	μA
V(BR)CEO	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	10to30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	10typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	50typ	pF

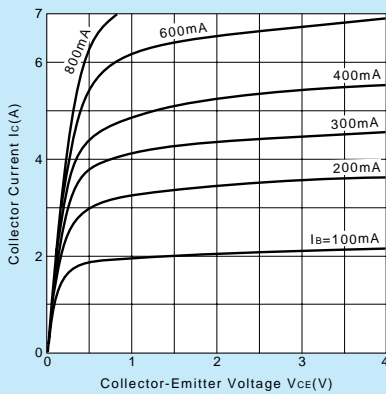
**External Dimensions MT-25(TO220)**



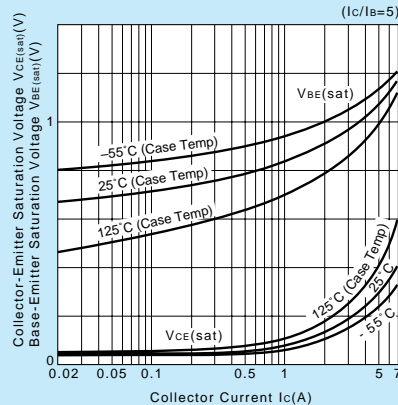
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	66.7	3	10	-5	0.3	-0.6	1max	3max	0.5max

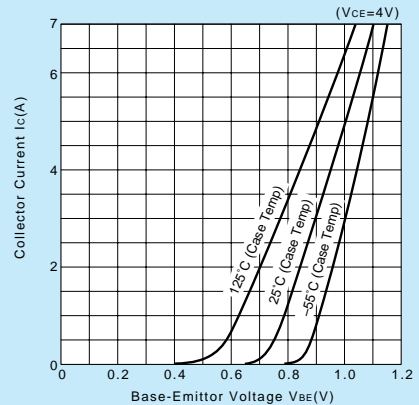
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



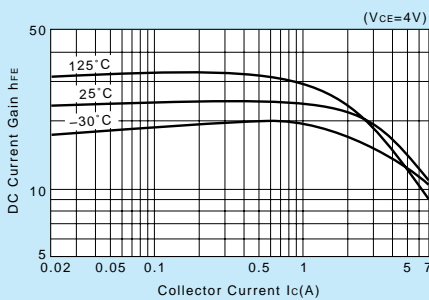
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



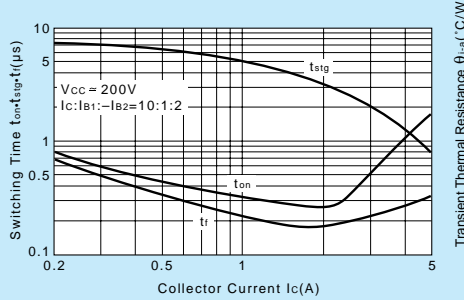
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



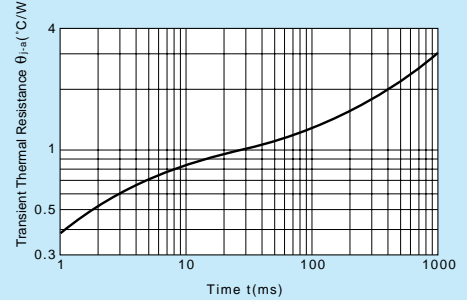
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



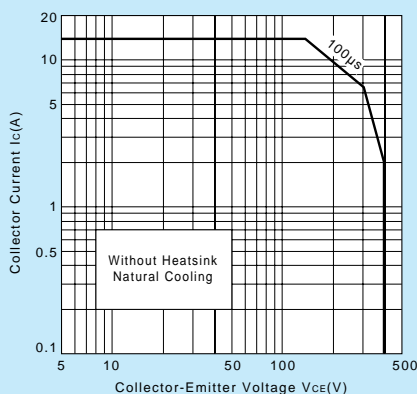
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



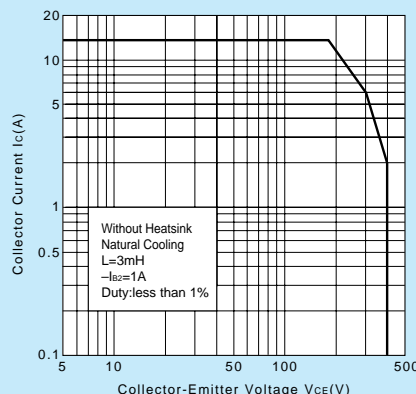
**θ<sub>j-a</sub>-t Characteristics**



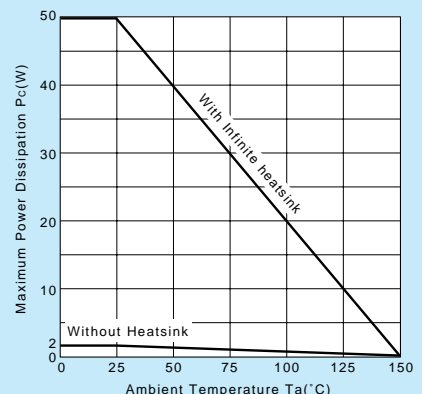
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC3833

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3833	Unit
V <sub>CB0</sub>	500	V
V <sub>CEO</sub>	400	V
V <sub>EBO</sub>	10	V
I <sub>C</sub>	12(Pulse24)	A
I <sub>B</sub>	4	A
P <sub>C</sub>	100(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

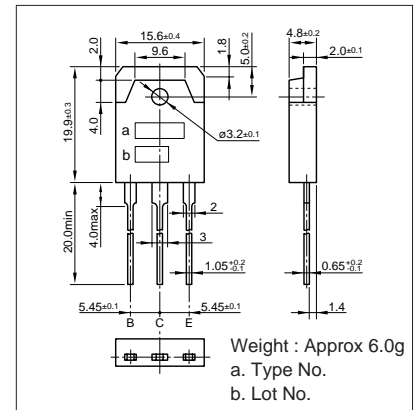
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3833	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =10V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =7A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =1.4A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =1.4A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	10typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	105typ	pF

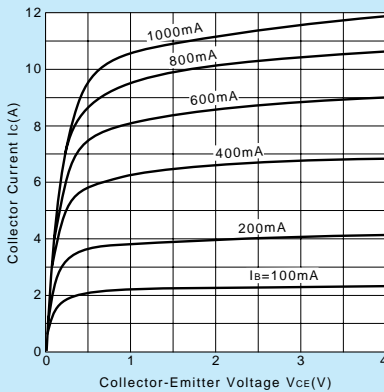
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	28.5	7	10	-5	0.7	-1.4	1.0max	3.0max	0.5max

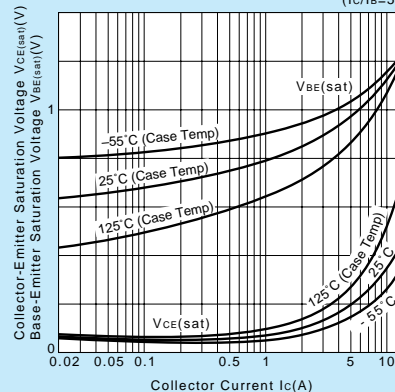
**External Dimensions MT-100(TO3P)**



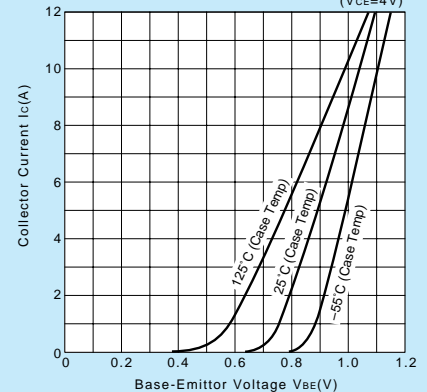
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



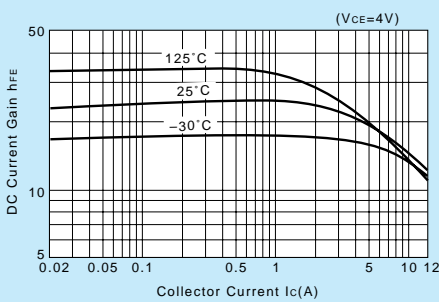
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



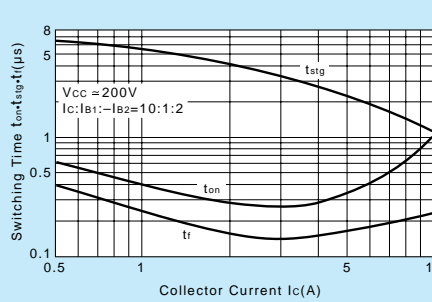
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



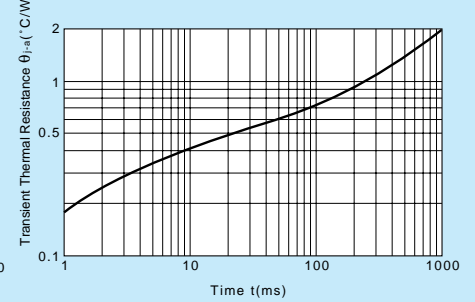
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



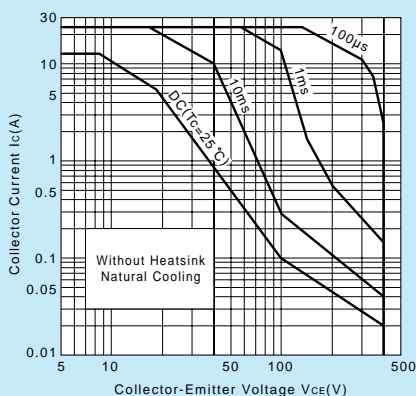
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



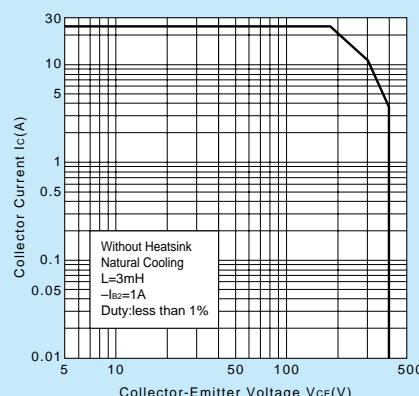
**θ<sub>j-a</sub>-t Characteristics**



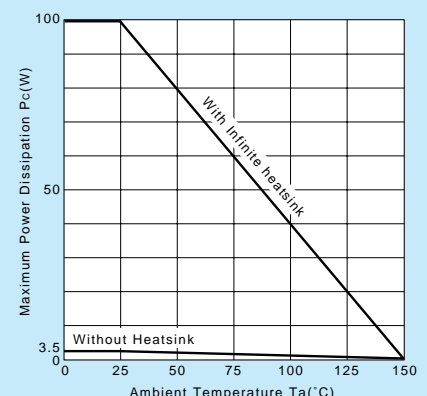
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**





# 2SC3834

Silicon NPN Triple Diffused Planar Transistor (Switching Transistor)

Application : Humidifier, DC-DC Converter, and General Purpose

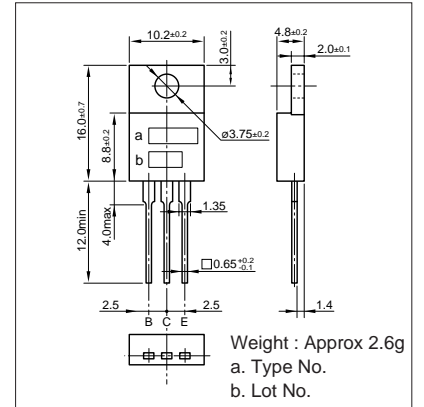
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3834	Unit
VcBO	200	V
VCEO	120	V
VEBO	8	V
Ic	7(Pulse14)	A
IB	3	A
Pc	50(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3834	Unit
ICBO	V <sub>CB</sub> =200V	100max	μA
IEBO	V <sub>EB</sub> =8V	100max	μA
V(BR)CEO	I <sub>C</sub> =50mA	120min	V
hFE	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	70to220	
VCE(sat)	I <sub>C</sub> =3A, I <sub>B</sub> =0.3A	0.5max	V
VBE(sat)	I <sub>C</sub> =3A, I <sub>B</sub> =0.3A	1.2max	V
fr	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	30typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	110typ	pF

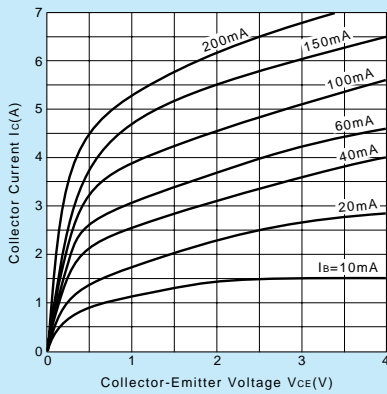
**External Dimensions MT-25(TO220)**



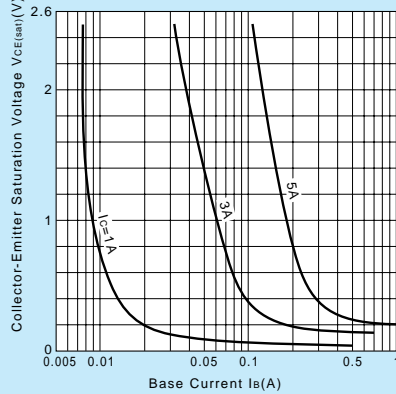
**Typical Switching Characteristics (Common Emitter)**

VCC (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	IB1 (A)	IB2 (A)	ton (μs)	tstg (μs)	tf (μs)
50	16.7	3	10	-5	0.3	-0.6	0.5max	3.0max	0.5max

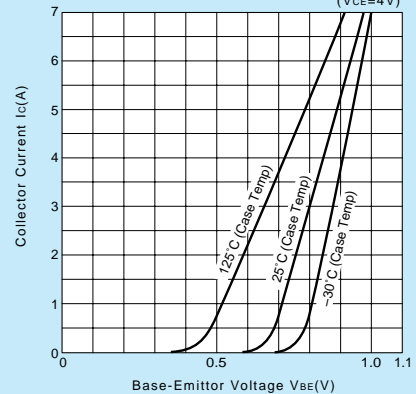
**Ic-VCE Characteristics (Typical)**



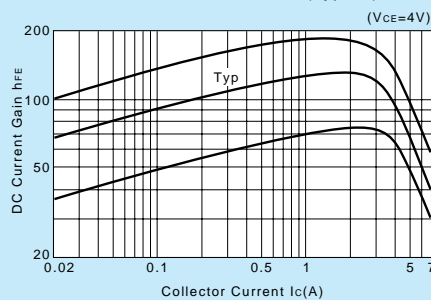
**VCE(sat)-IB Characteristics (Typical)**



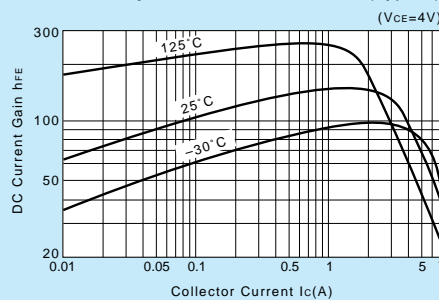
**Ic-VBE Temperature Characteristics (Typical)**



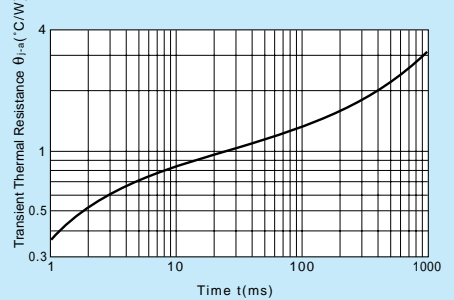
**hFE-Ic Characteristics (Typical)**



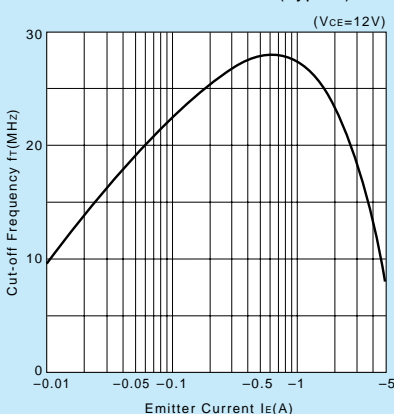
**hFE-Ic Temperature Characteristics (Typical)**



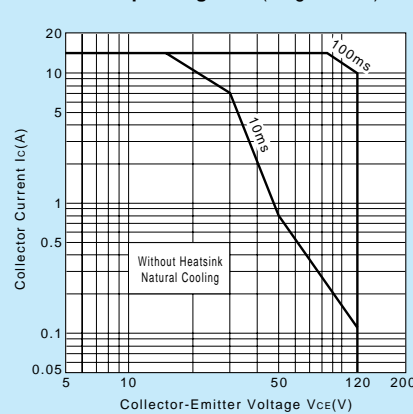
**θj-a-t Characteristics**



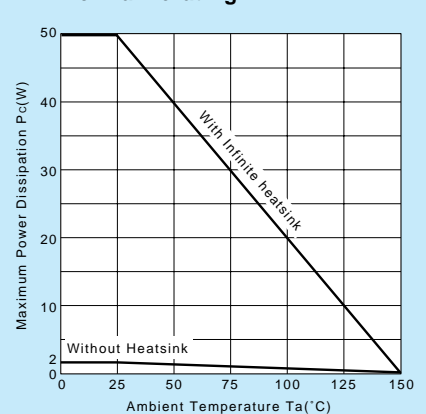
**fr-Ie Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**Pc-Ta Derating**



# 2SC3835

Silicon NPN Triple Diffused Planar Transistor (Switching Transistor)

Application : Humidifier, DC-DC Converter, and General Purpose

## Absolute maximum ratings (Ta=25°C)

Symbol	2SC3835	Unit
V <sub>CB0</sub>	200	V
V <sub>CEO</sub>	120	V
V <sub>EB0</sub>	8	V
I <sub>c</sub>	7(Pulse14)	A
I <sub>B</sub>	3	A
P <sub>c</sub>	70(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

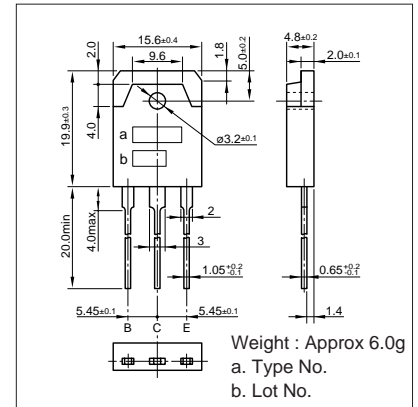
## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC3835	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =8V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =50mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =3A	70 to 220	
V <sub>CE(sat)</sub>	I <sub>c</sub> =3A, I <sub>B</sub> =0.3A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =3A, I <sub>B</sub> =0.3A	1.2max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	30typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	110typ	pF

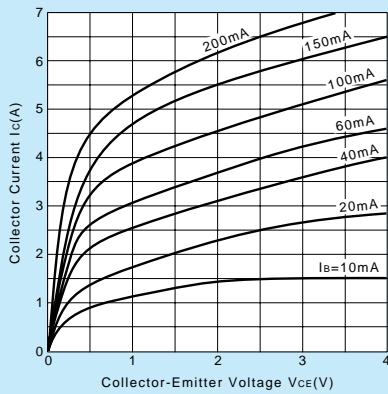
## Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
50	16.7	3	10	-5	0.3	-0.6	0.5max	3.0max	0.5max

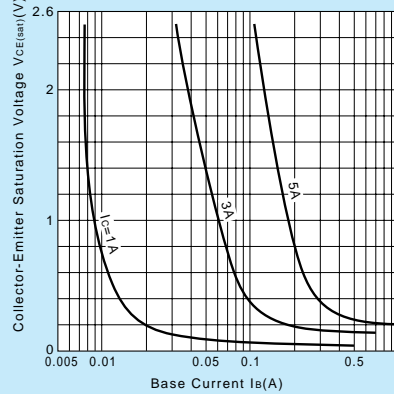
## External Dimensions MT-100(TO3P)



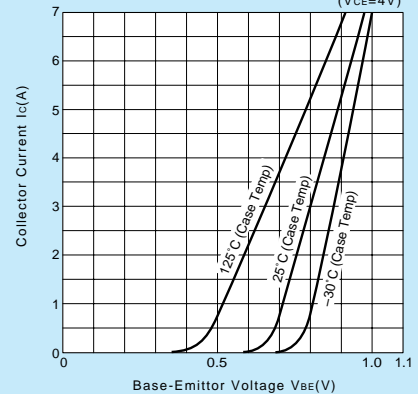
I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)



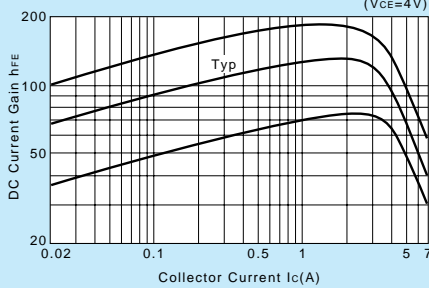
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



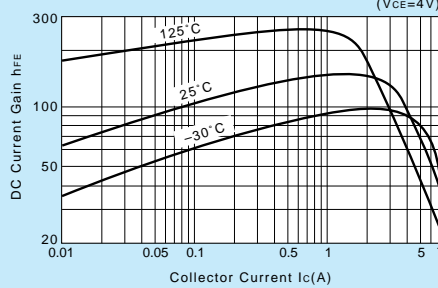
I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



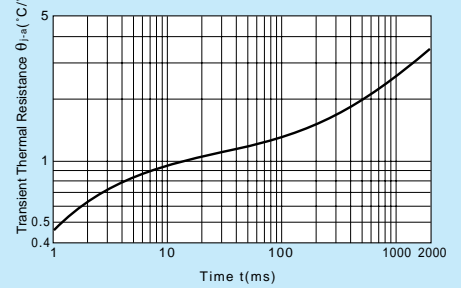
h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)



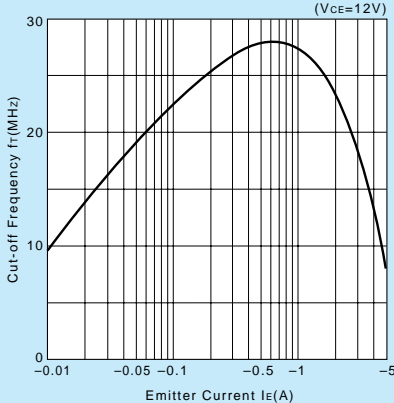
h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)



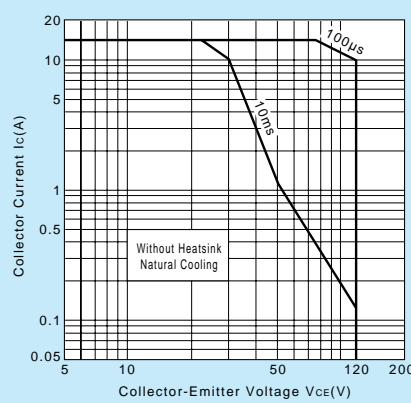
θ<sub>j-a</sub>-t Characteristics



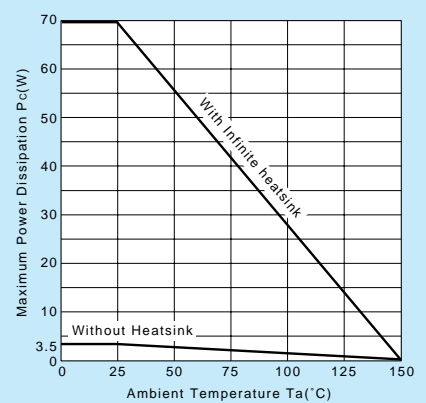
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)



P<sub>c</sub>-T<sub>a</sub> Derating





High  $h_{FE}$   
Low  $V_{CE(sat)}$

# 2SC3852/3852A

Silicon NPN Epitaxial Planar Transistor

Application : Driver for Solenoid and Motor, Series Regulator and General Purpose

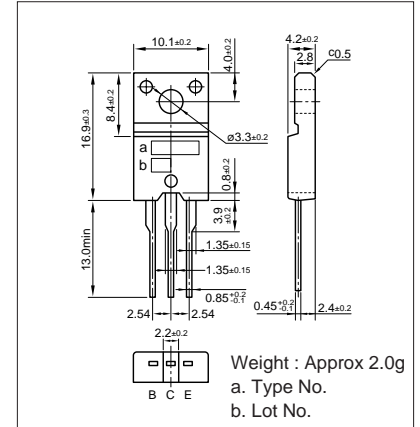
**Absolute maximum ratings** ( $T_a=25^\circ\text{C}$ )

Symbol	2SC3852	2SC3852A	Unit
$V_{CBO}$	80	100	V
$V_{CEO}$	60	80	V
$V_{EBO}$	6		V
$I_C$	3		A
$I_B$	1		A
$P_C$	25 ( $T_C=25^\circ\text{C}$ )		W
$T_j$	150		$^\circ\text{C}$
$T_{stg}$	-55 to +150		$^\circ\text{C}$

**Electrical Characteristics** ( $T_a=25^\circ\text{C}$ )

Symbol	Conditions	2SC3852	2SC3852A	Unit
$I_{CBO}$	$V_{CB} =$	10max		$\mu\text{A}$
$V_{CEO}$	$I_C = 2\text{mA}$	60min	80min	V
$I_{EBO}$	$V_{EB} = 6\text{V}$	100max		$\mu\text{A}$
$V_{(BR)CEO}$	$I_C = 25\text{mA}$	60min	80min	V
$h_{FE}$	$V_{CE} = 4\text{V}, I_C = 0.5\text{A}$	500min		
$V_{CE(sat)}$	$I_C = 2\text{A}, I_B = 50\text{mA}$	0.5max		V
$f_T$	$V_{CE} = 12\text{V}, I_E = -0.2\text{A}$	15typ		MHz
$COB$	$V_{CB} = 10\text{V}, f = 1\text{MHz}$	50typ		pF

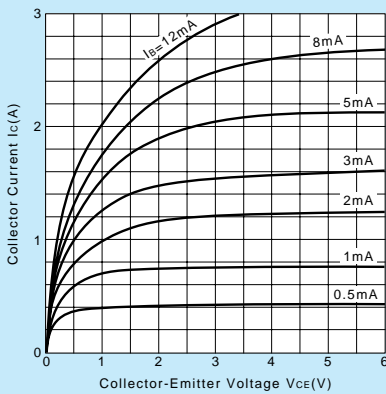
**External Dimensions FM20(TO220F)**



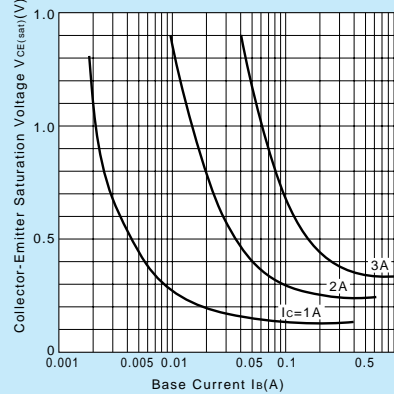
**Typical Switching Characteristics (Common Emitter)**

$V_{CC}$ (V)	$R_L$ ( $\Omega$ )	$I_C$ (A)	$V_{BB1}$ (V)	$V_{BB2}$ (V)	$I_{B1}$ (mA)	$I_{B2}$ (mA)	$t_{on}$ ( $\mu\text{s}$ )	$t_{sig}$ ( $\mu\text{s}$ )	$t_f$ ( $\mu\text{s}$ )
20	20	1.0	10	-5	15	-30	0.8typ	3.0typ	1.2typ

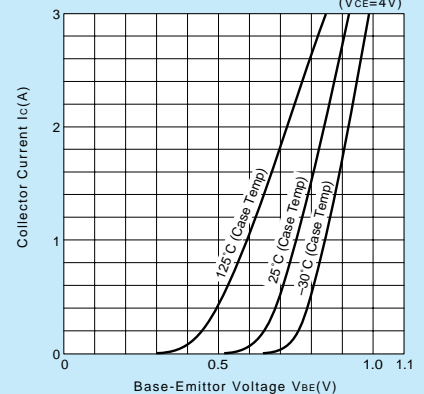
**$I_C - V_{CE}$  Characteristics (Typical)**



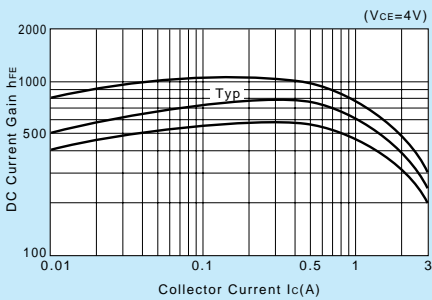
**$V_{CE(sat)} - I_B$  Characteristics (Typical)**



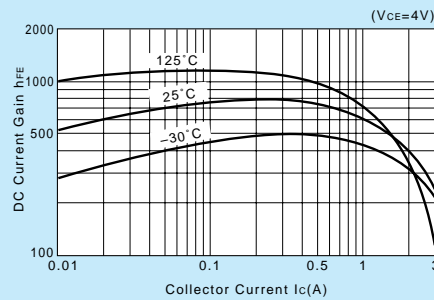
**$I_C - V_{BE}$  Temperature Characteristics (Typical)**



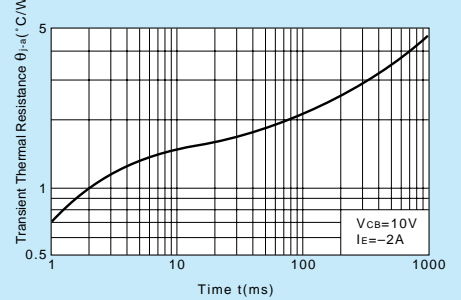
**$h_{FE} - I_C$  Characteristics (Typical)**



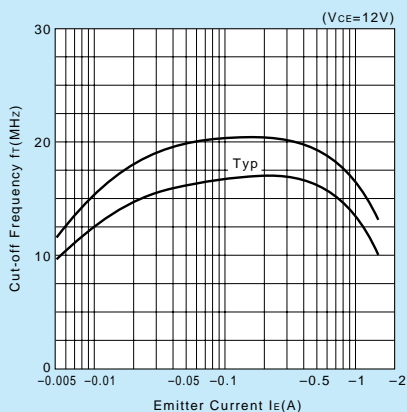
**$h_{FE} - I_C$  Temperature Characteristics (Typical)**



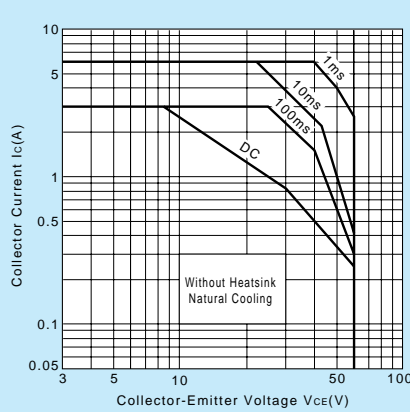
**$\theta_{j-a} - t$  Characteristics**



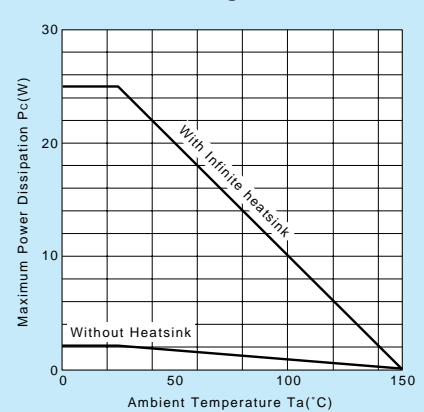
**$f_T - I_E$  Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**$P_C - T_a$  Derating**



# 2SC3856

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1492)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3856	Unit
V <sub>CB0</sub>	200	V
V <sub>CEO</sub>	180	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	15	A
I <sub>B</sub>	4	A
P <sub>C</sub>	130(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

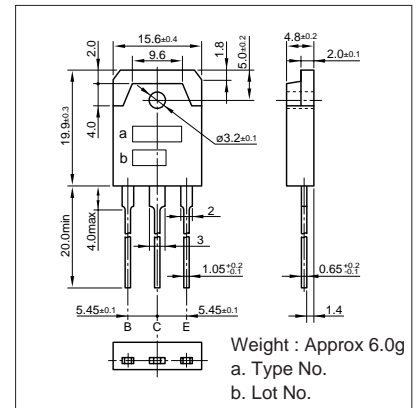
Symbol	Conditions	2SC3856	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	100max	μA
V(BR)CEO	I <sub>C</sub> =50mA	180min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =0.5A	2.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	300typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

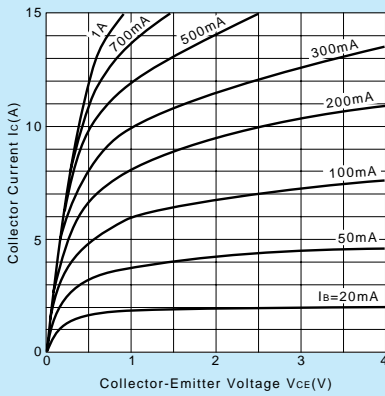
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	4	10	10	-5	1	-1	0.5typ	1.8typ	0.6typ

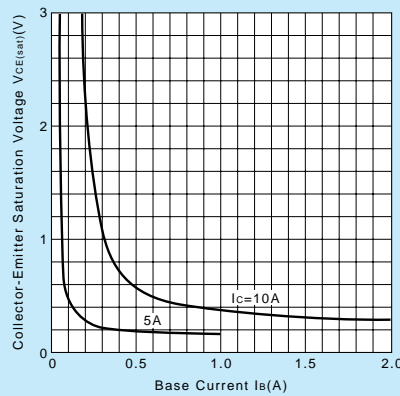
**External Dimensions MT-100(TO3P)**



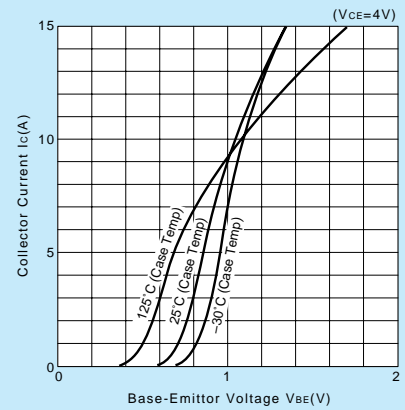
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



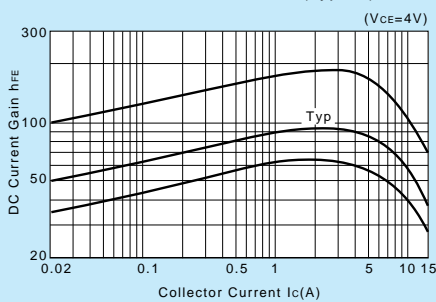
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



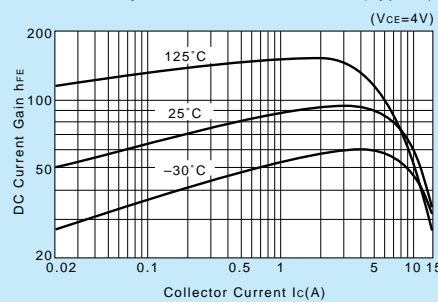
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



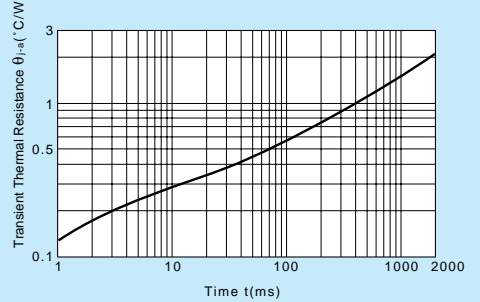
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



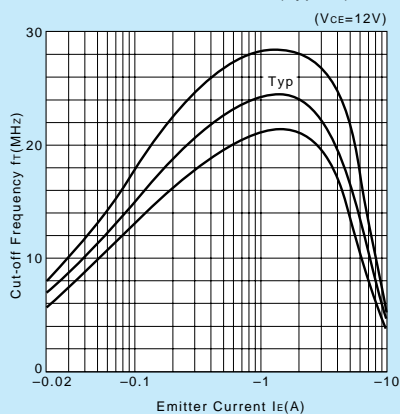
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



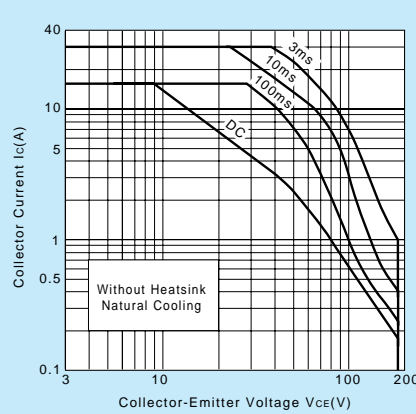
**θ<sub>j-a</sub>-t Characteristics**



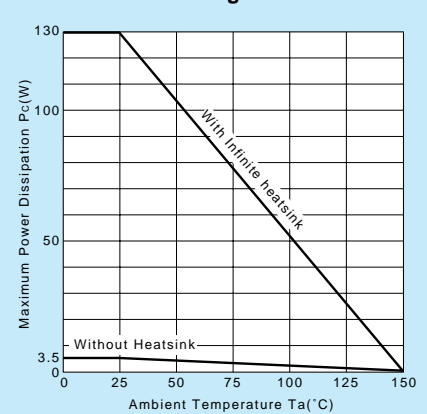
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC3857

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1493)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3857	Unit
V <sub>CB0</sub>	200	V
V <sub>CEO</sub>	200	V
V <sub>EB0</sub>	6	V
I <sub>c</sub>	15	A
I <sub>B</sub>	5	A
P <sub>c</sub>	150(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

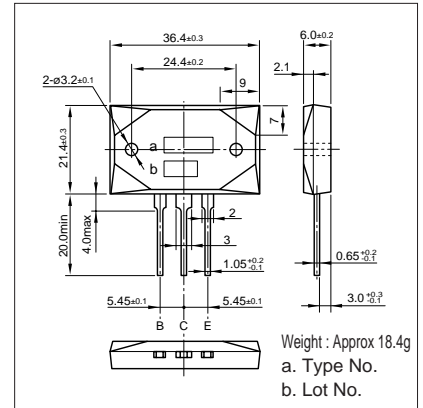
Symbol	Conditions	2SC3857	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>c</sub> =50mA	200min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =5A	50min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =10A, I <sub>B</sub> =1A	3.0max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	250typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

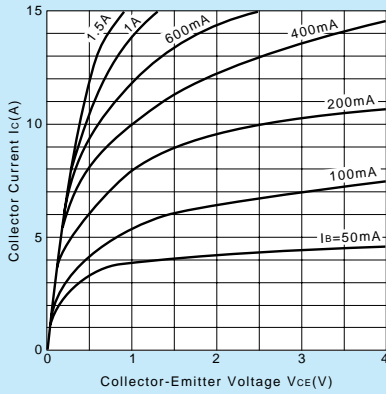
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
60	12	5	10	-5	0.5	-0.5	0.3typ	2.4typ	0.4typ

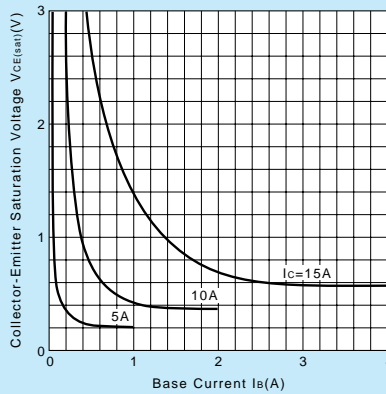
**External Dimensions MT-200**



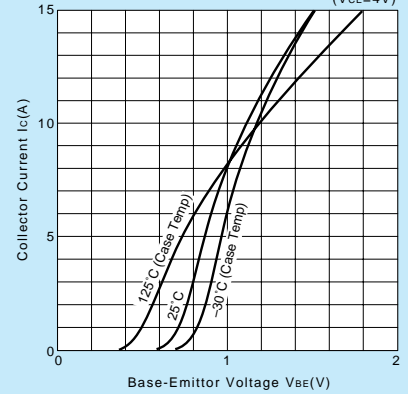
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



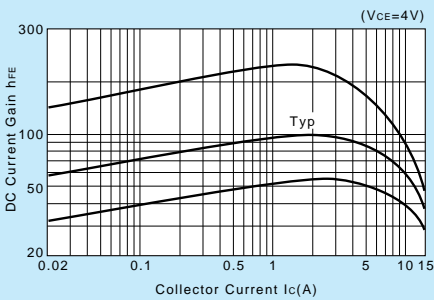
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



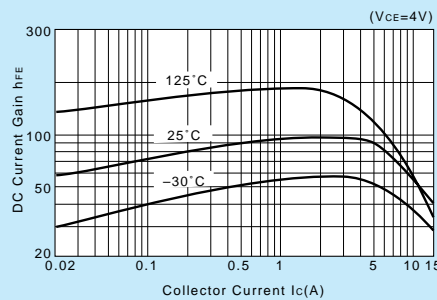
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



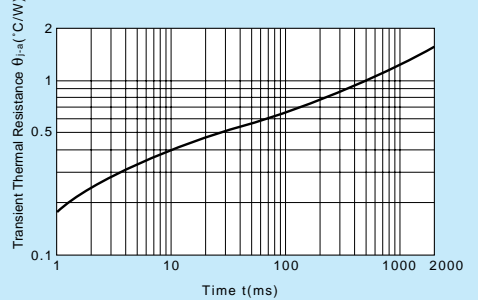
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



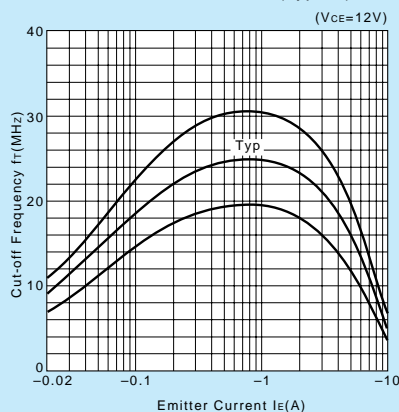
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



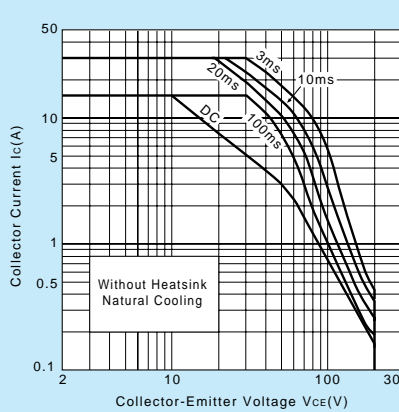
**θ<sub>j-a</sub>-t Characteristics**



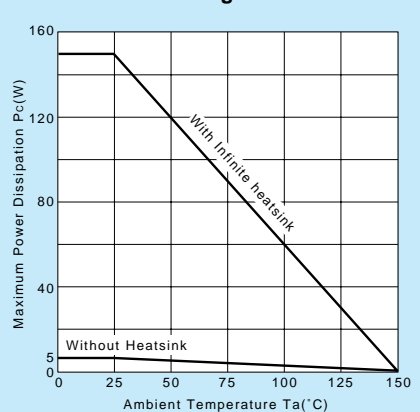
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SC3858

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1494)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

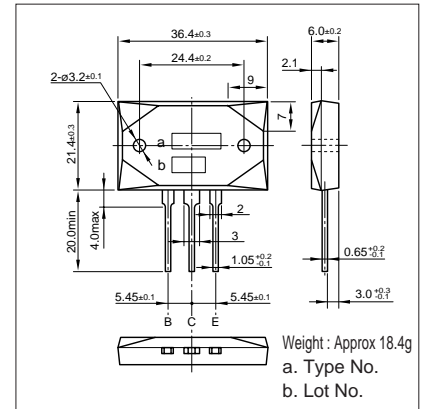
Symbol	2SC3858	Unit
V <sub>CB0</sub>	200	V
V <sub>CEO</sub>	200	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	17	A
I <sub>B</sub>	5	A
P <sub>C</sub>	200(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3858	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =50mA	200min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =8A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =10A, I <sub>B</sub> =1A	2.5max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	300typ	pF

\*h<sub>FE</sub> Rank Y(50 to 100), P(70 to 140), G(90 to 180)

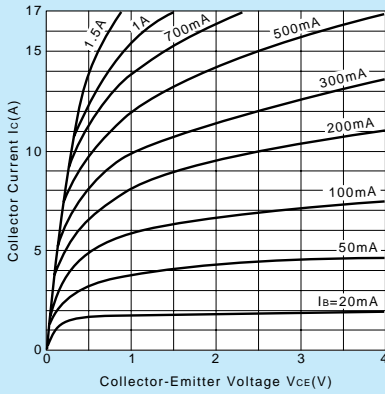
**External Dimensions MT-200**



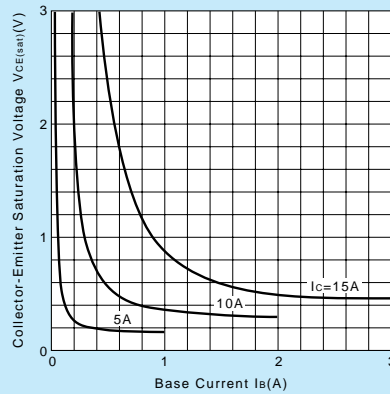
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	4	10	10	-5	1	-1	0.5typ	1.8typ	0.6typ

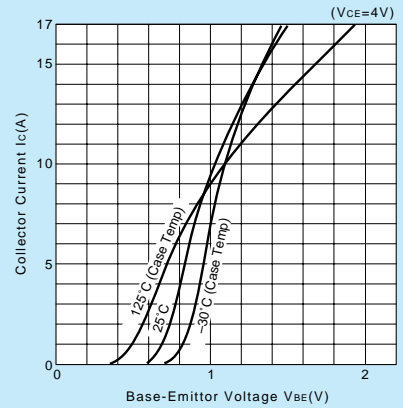
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



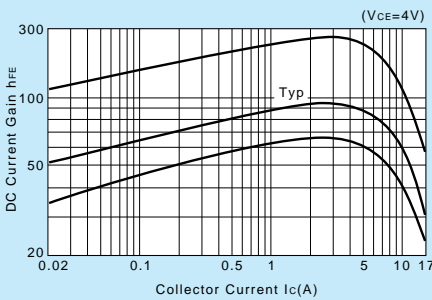
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



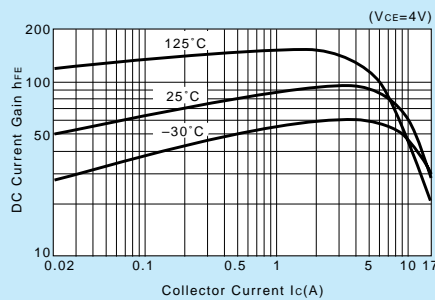
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



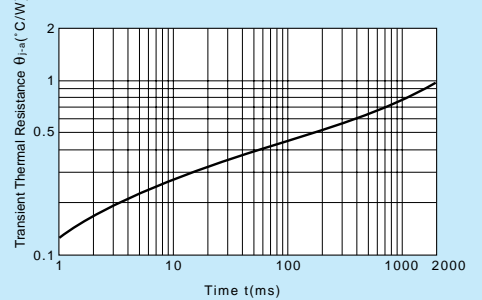
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



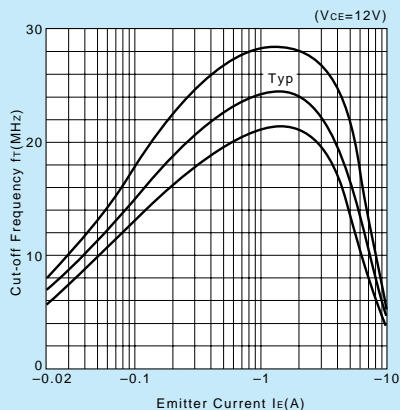
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



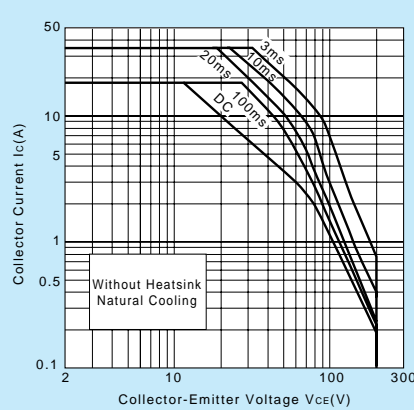
**θ<sub>j-a</sub>-t Characteristics**



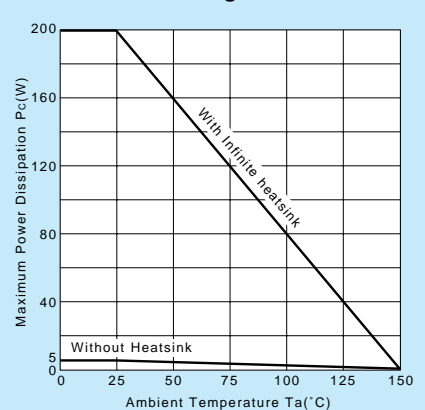
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**





# 2SC3890

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor) Application : Switching Regulator and General Purpose

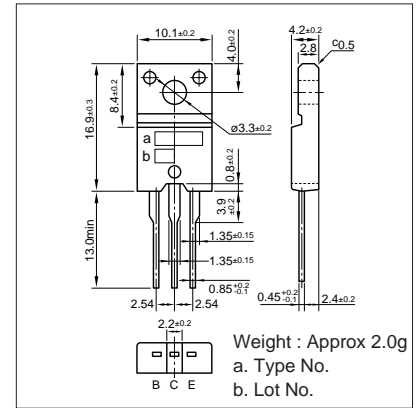
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC3890	Unit
V <sub>CB0</sub>	500	V
V <sub>CEO</sub>	400	V
V <sub>EBO</sub>	10	V
I <sub>C</sub>	7(Pulse14)	A
I <sub>B</sub>	2	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC3890	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =10V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	10typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	50typ	pF

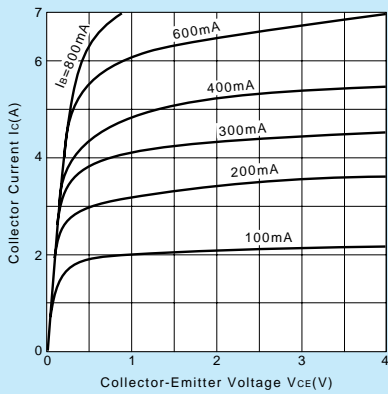
### External Dimensions FM20(TO220F)



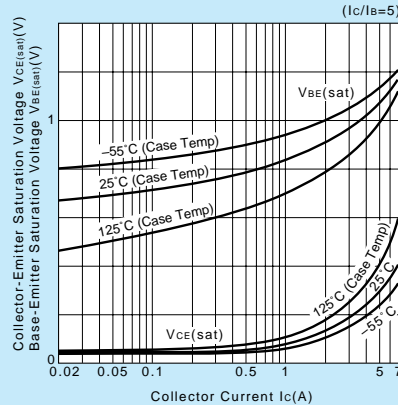
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	66	3	10	-5	0.3	-0.6	1max	3max	0.5max

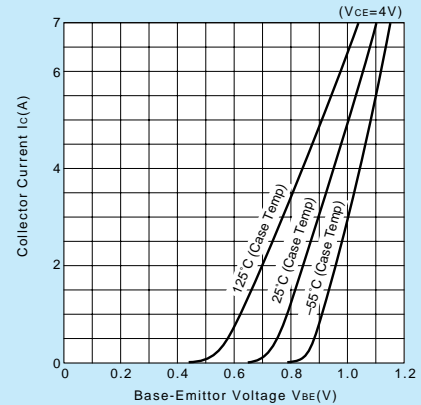
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



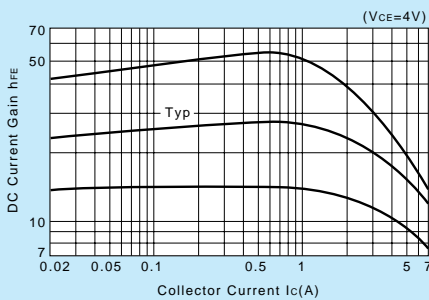
V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



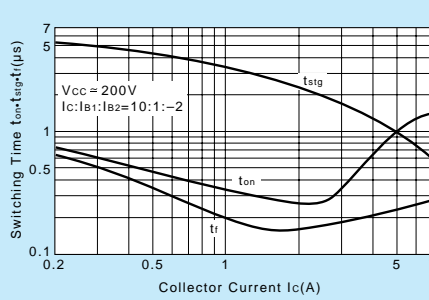
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



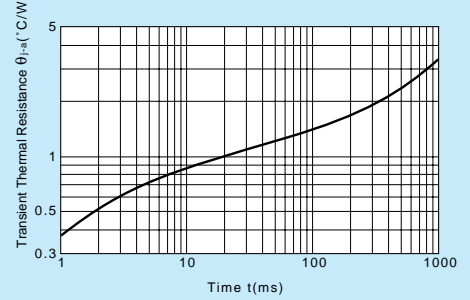
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



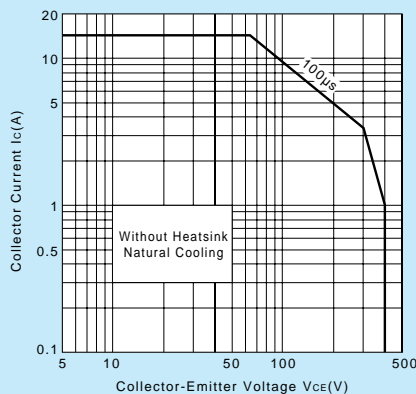
t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)



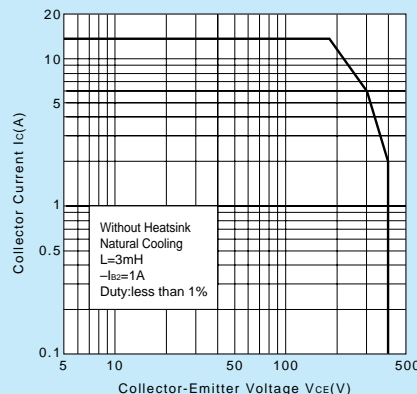
θ<sub>J-a</sub>-t Characteristics



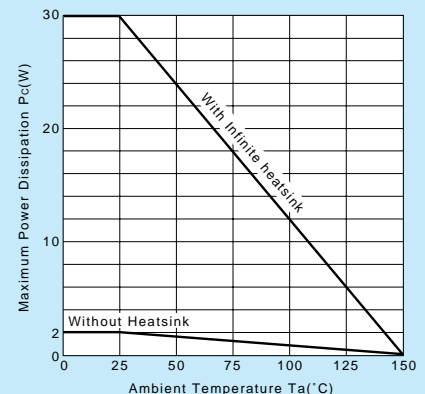
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>C</sub>-T<sub>a</sub> Derating



# 2SC3927

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

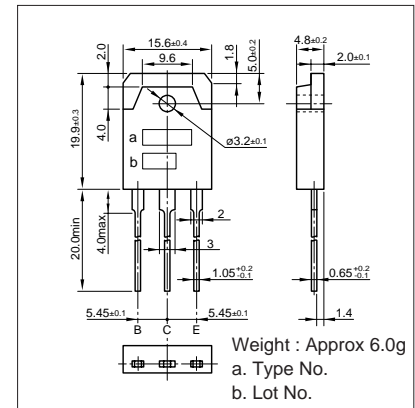
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC3927	Unit
V <sub>CB0</sub>	900	V
V <sub>CEO</sub>	550	V
V <sub>EBO</sub>	7	V
I <sub>C</sub>	10(Pulse15)	A
I <sub>B</sub>	5	A
P <sub>C</sub>	120(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC3927	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =7V	100max	μA
V(BR)CEO	I <sub>C</sub> =10mA	550min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =5A	10 to 28	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =1A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =1A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	6typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	105typ	pF

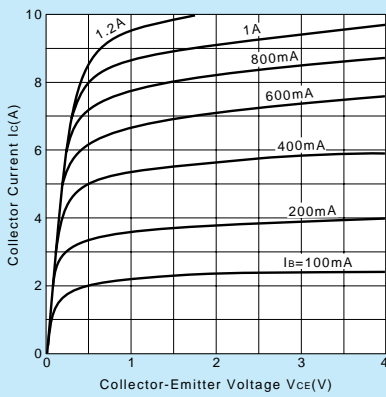
**External Dimensions MT-100(TO3P)**



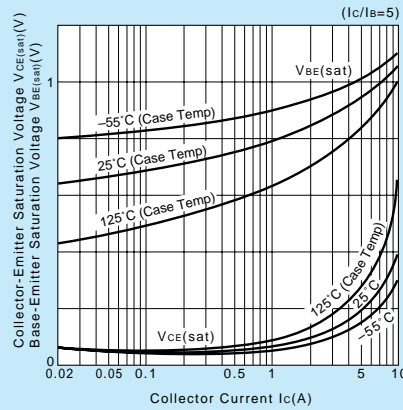
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	50	5	10	-5	0.75	-1.5	1max	5max	0.5max

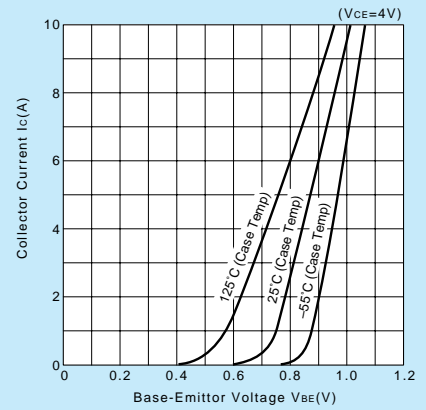
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



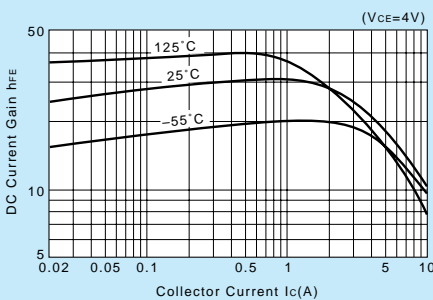
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



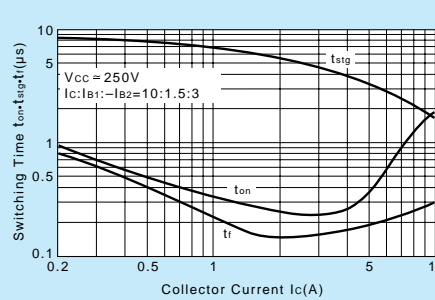
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



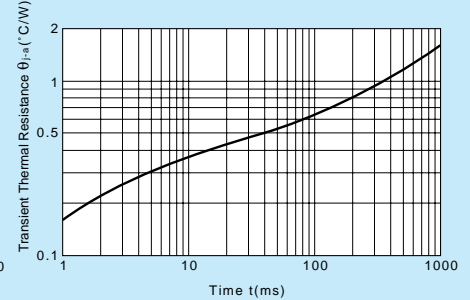
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



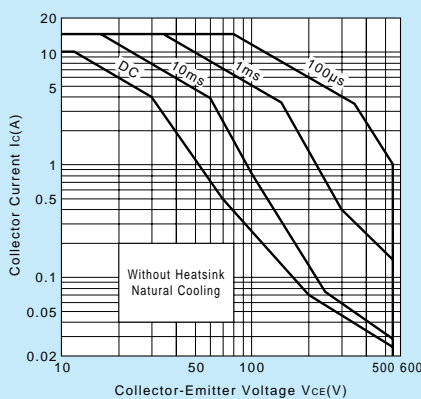
**t<sub>on</sub>\*t<sub>stg</sub>\*t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



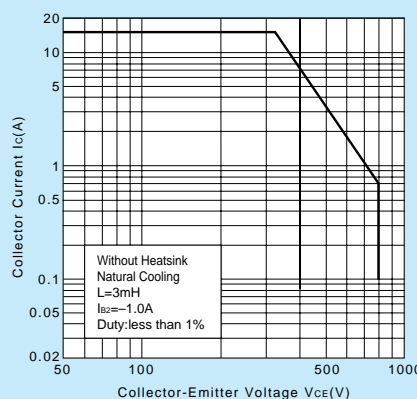
**θ<sub>j-a</sub>-t Characteristics**



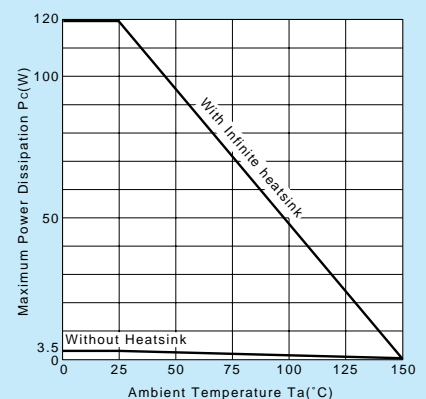
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC4020

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

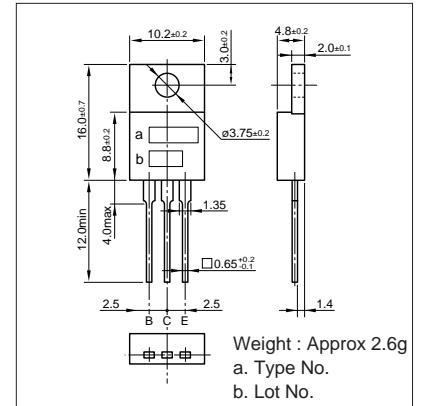
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4020	Unit
V <sub>CB0</sub>	900	V
V <sub>CEO</sub>	800	V
V <sub>EB0</sub>	7	V
I <sub>c</sub>	3(Pulseδ)	A
I <sub>B</sub>	1.5	A
P <sub>c</sub>	50(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4020	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V(BR)CEO	I <sub>c</sub> =10mA	800min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =0.7A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>c</sub> =0.7A, I <sub>B</sub> =0.14A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =0.7A, I <sub>B</sub> =0.14A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	6typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	40typ	pF

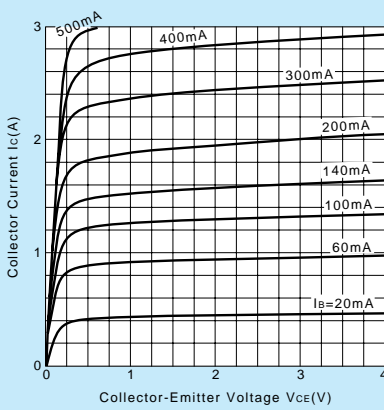
**External Dimensions MT-25(TO220)**



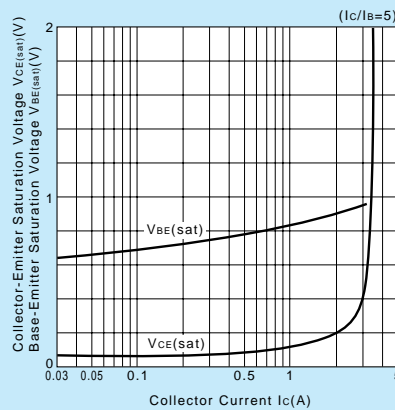
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	357	0.7	10	-5	0.1	-0.35	1max	5max	1max

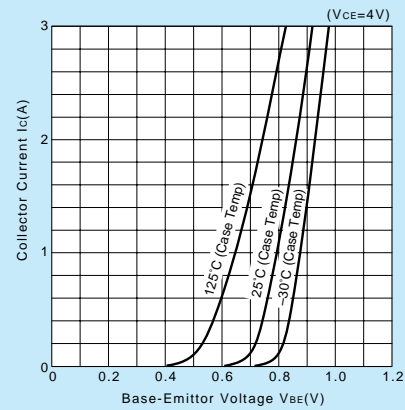
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



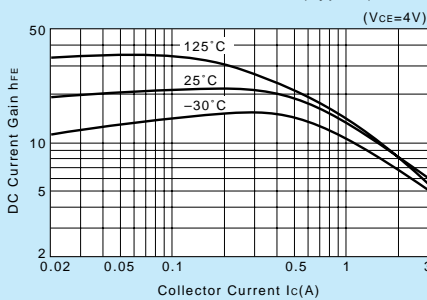
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



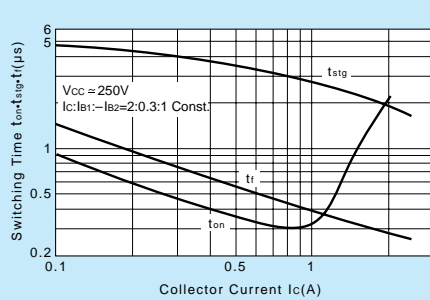
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



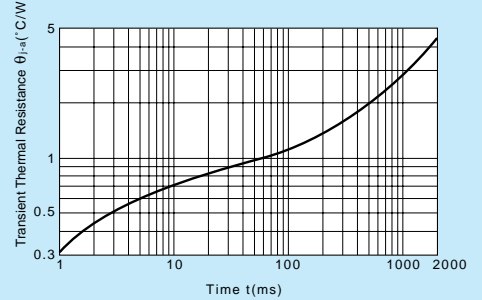
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



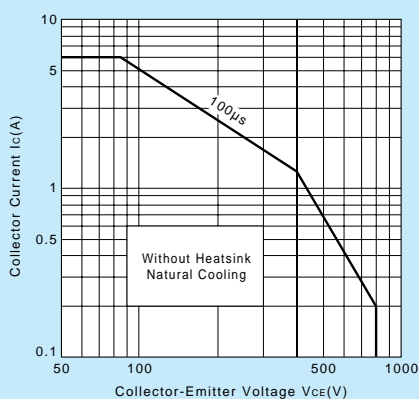
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)**



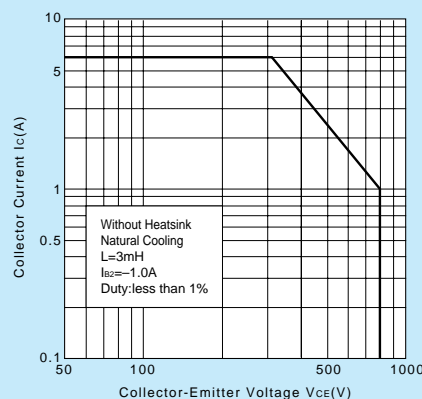
**θ<sub>j-a</sub>-t Characteristics**



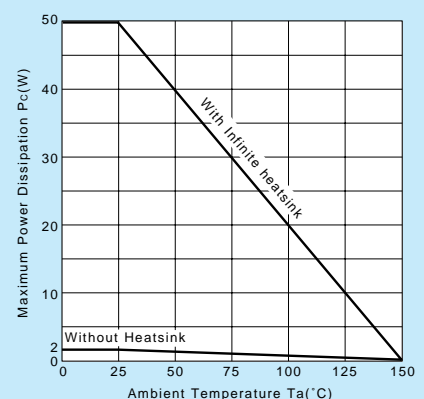
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>c</sub>-T<sub>a</sub> Derating**



High  $h_{FE}$   
Low  $V_{CE(sat)}$

# 2SC4024

Silicon NPN Epitaxial Planar Transistor

Application : DC-DC Converter, Emergency Lighting Inverter and General Purpose

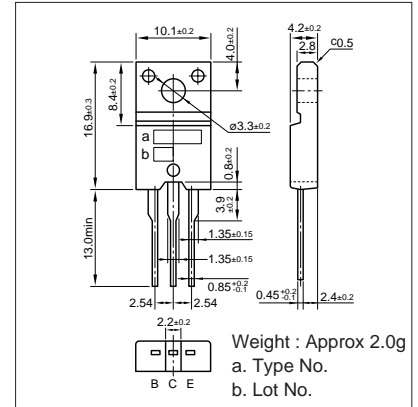
**Absolute maximum ratings** ( $T_a=25^\circ\text{C}$ )

Symbol	2SC4024	Unit
$V_{CB0}$	100	V
$V_{CE0}$	50	V
$V_{EB0}$	15	V
$I_c$	10	A
$I_B$	3	A
$P_c$	35( $T_c=25^\circ\text{C}$ )	W
$T_j$	150	$^\circ\text{C}$
$T_{stg}$	-55 to +150	$^\circ\text{C}$

**Electrical Characteristics** ( $T_a=25^\circ\text{C}$ )

Symbol	Conditions	2SC4024	Unit
$I_{CB0}$	$V_{CB}=100\text{V}$	10max	$\mu\text{A}$
$I_{EB0}$	$V_{EB}=15\text{V}$	10max	$\mu\text{A}$
$V_{(BR)CEO}$	$I_c=25\text{mA}$	50min	V
$h_{FE}$	$V_{CE}=4\text{V}, I_c=1\text{A}$	300 to 1600	
$V_{CE(sat)}$	$I_c=5\text{A}, I_B=0.1\text{A}$	0.5max	V
$f_T$	$V_{CE}=12\text{V}, I_E=-0.5\text{A}$	24typ	MHz
COB	$V_{CB}=10\text{V}, f=1\text{MHz}$	150typ	pF

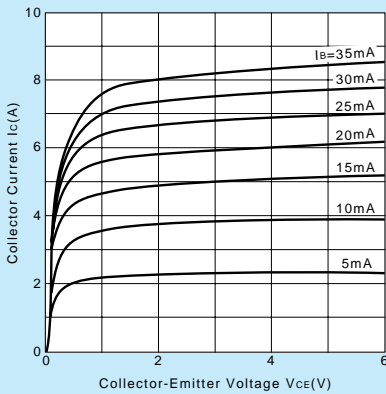
**External Dimensions FM20(TO220F)**



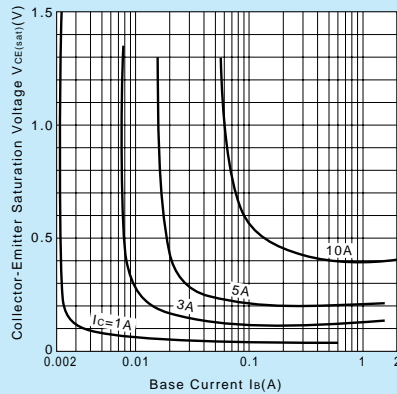
**Typical Switching Characteristics (Common Emitter)**

$V_{CC}$ (V)	$R_L$ ( $\Omega$ )	$I_c$ (A)	$I_{B1}$ (A)	$I_{B2}$ (A)	$t_{on}$ ( $\mu\text{s}$ )	$t_{stg}$ ( $\mu\text{s}$ )	$t_f$ ( $\mu\text{s}$ )
20	4	5	0.1	-0.1	0.5typ	2.0typ	0.5typ

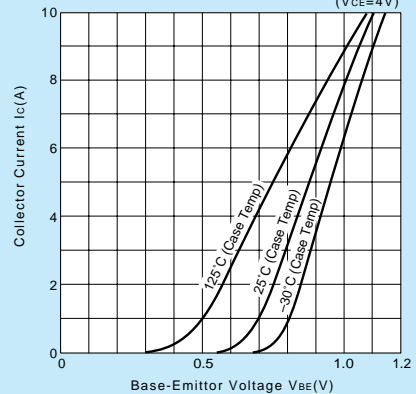
**$I_c-V_{CE}$  Characteristics (Typical)**



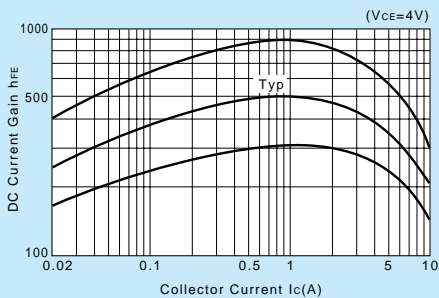
**$V_{CE(sat)}-I_B$  Characteristics (Typical)**



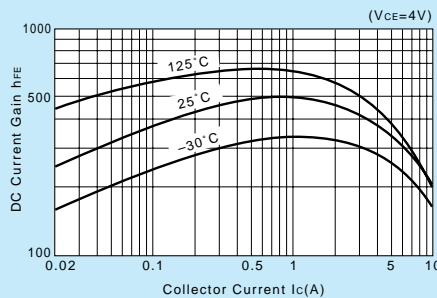
**$I_c-V_{BE}$  Temperature Characteristics (Typical)**



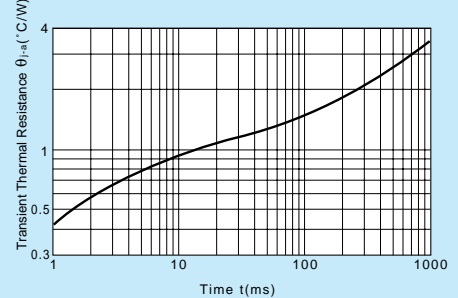
**$h_{FE}-I_c$  Characteristics (Typical)**



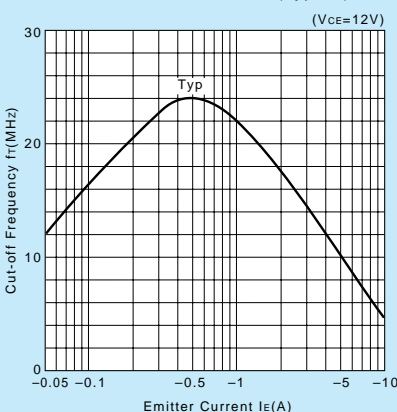
**$h_{FE}-I_c$  Temperature Characteristics (Typical)**



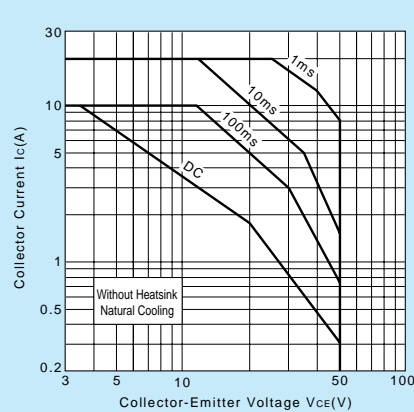
**$\theta_{j-a}-t$  Characteristics**



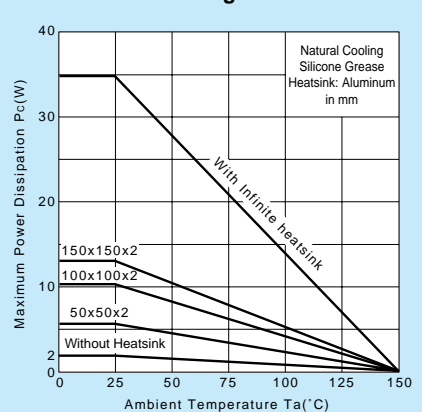
**$f_T-I_E$  Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**$P_c-T_a$  Derating**



# LOW $V_{CE(sat)}$ 2SC4064

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1567)

Application : DC Motor Driver and General Purpose

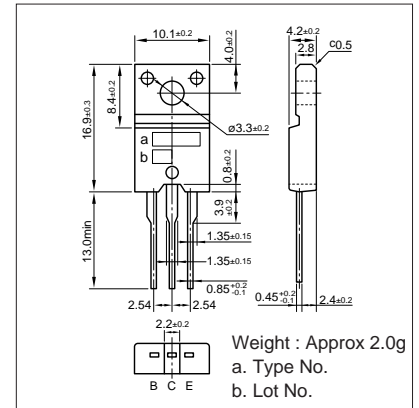
**Absolute maximum ratings** ( $T_a=25^\circ\text{C}$ )

Symbol	2SC4064	Unit
$V_{CBO}$	50	V
$V_{CEO}$	50	V
$V_{EBO}$	6	V
$I_C$	12	A
$I_B$	3	A
$P_C$	35( $T_C=25^\circ\text{C}$ )	W
$T_j$	150	$^\circ\text{C}$
$T_{stg}$	-55 to +150	$^\circ\text{C}$

**Electrical Characteristics** ( $T_a=25^\circ\text{C}$ )

Symbol	Conditions	2SC4064	Unit
$I_{CBO}$	$V_{CB}=50\text{V}$	100max	$\mu\text{A}$
$I_{EBO}$	$V_{EB}=6\text{V}$	10max	$\mu\text{A}$
$V_{(BR)CEO}$	$I_C=25\text{mA}$	50min	V
$h_{FE}$	$V_{CE}=1\text{V}, I_C=6\text{A}$	50min	
$V_{CE(sat)}$	$I_C=6\text{A}, I_B=0.3\text{A}$	0.35max	V
$f_T$	$V_{CE}=12\text{V}, I_E=-0.5\text{A}$	40typ	MHz
$C_{OB}$	$V_{CB}=12\text{V}, f=1\text{MHz}$	180typ	pF

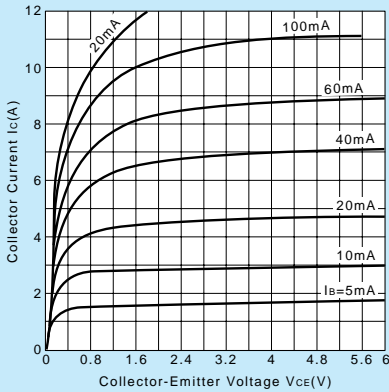
**External Dimensions FM20(TO220F)**



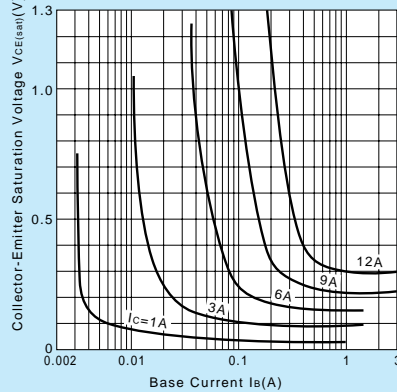
**Typical Switching Characteristics (Common Emitter)**

$V_{CC}$ (V)	$R_L$ ( $\Omega$ )	$I_C$ (A)	$V_{BB1}$ (V)	$V_{BB2}$ (V)	$I_{B1}$ (A)	$I_{B2}$ (A)	$t_{on}$ ( $\mu\text{s}$ )	$t_{stg}$ ( $\mu\text{s}$ )	$t_f$ ( $\mu\text{s}$ )
24	4	6	10	-5	0.12	-0.12	0.6typ	1.4typ	0.4typ

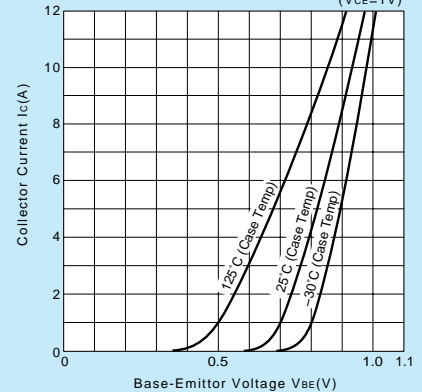
**$I_C-V_{CE}$  Characteristics (Typical)**



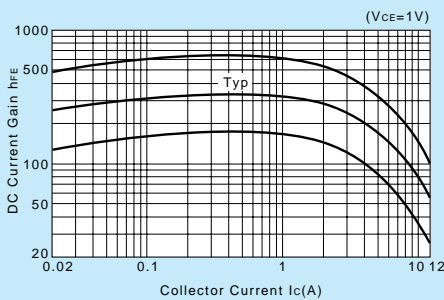
**$V_{CE(sat)}-I_B$  Characteristics (Typical)**



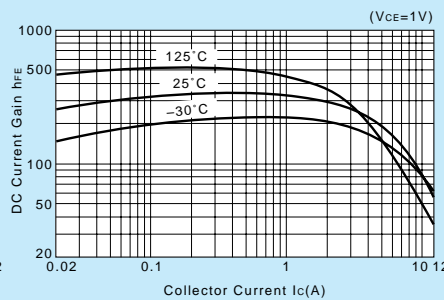
**$I_C-V_{BE}$  Temperature Characteristics (Typical)**



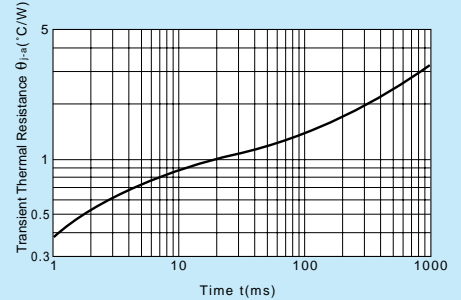
**$h_{FE}-I_C$  Characteristics (Typical)**



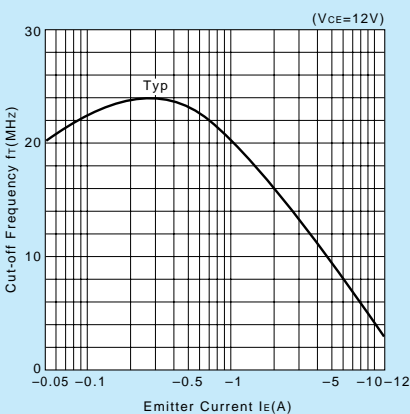
**$h_{FE}-I_C$  Temperature Characteristics (Typical)**



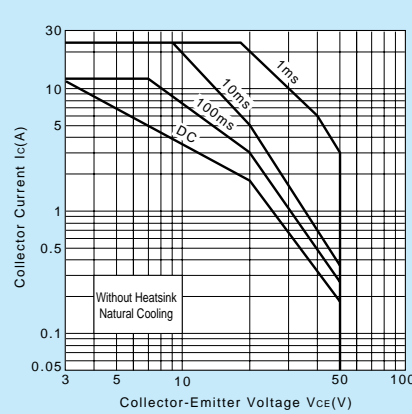
**$\theta_{j-a}-t$  Characteristics**



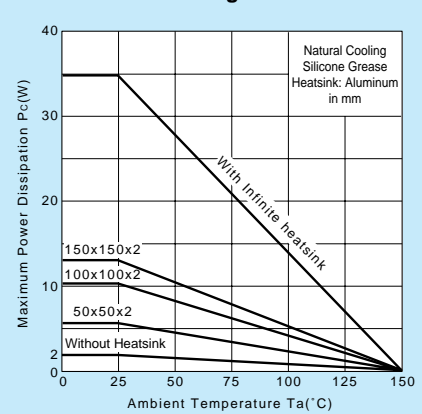
**$f_T-I_E$  Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

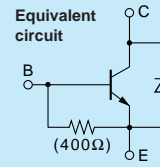


**$P_C-T_a$  Derating**



Built-in Diode at C-E  
Low  $V_{CE(sat)}$

# 2SC4065



Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1568)

Application : DC Motor Driver and General Purpose

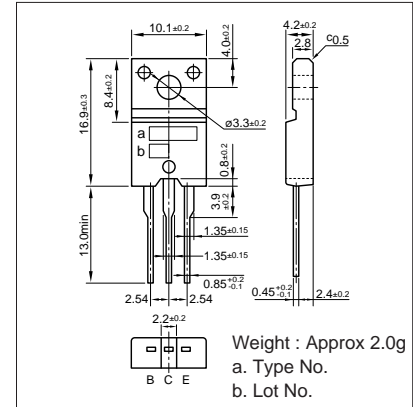
**Absolute maximum ratings** ( $T_a=25^\circ\text{C}$ )

Symbol	2SC4065	Unit
$V_{CBO}$	60	V
$V_{CEO}$	60	V
$V_{EBO}$	6	V
$I_C$	$\pm 12$	A
$I_B$	3	A
$P_C$	35( $T_c=25^\circ\text{C}$ )	W
$T_j$	150	$^\circ\text{C}$
$T_{stg}$	-55 to +150	$^\circ\text{C}$

**Electrical Characteristics** ( $T_a=25^\circ\text{C}$ )

Symbol	Conditions	2SC4065	Unit
$I_{CBO}$	$V_{CB}=60\text{V}$	100max	$\mu\text{A}$
$I_{EBO}$	$V_{EB}=6\text{V}$	60max	mA
$V_{(BR)CEO}$	$I_C=25\text{mA}$	60min	V
$h_{FE}$	$V_{CE}=1\text{V}, I_C=6\text{A}$	50min	
$V_{CE(sat)}$	$I_C=6\text{A}, I_B=1.3\text{A}$	0.35max	V
$V_{FEC}$	$V_{ECO}=10\text{A}$	2.5max	V
$f_T$	$V_{CE}=12\text{V}, I_E=-0.5\text{A}$	24typ	MHz
$COB$	$V_{CB}=10\text{V}, f=1\text{MHz}$	180typ	PF

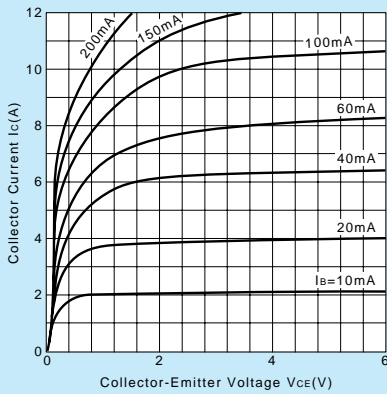
**External Dimensions FM20(TO220F)**



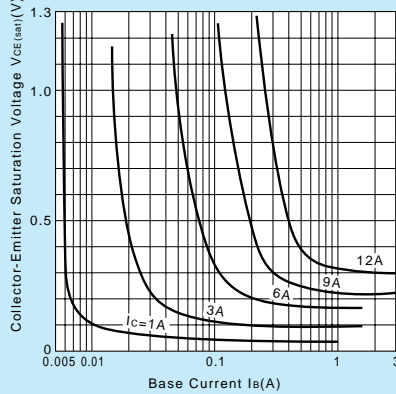
**Typical Switching Characteristics (Common Emitter)**

$V_{CC}$ (V)	$R_L$ ( $\Omega$ )	$I_C$ (A)	$V_{BB1}$ (V)	$V_{BB2}$ (V)	$I_{B1}$ (A)	$I_{B2}$ (A)	$t_{on}$ ( $\mu\text{s}$ )	$t_{stg}$ ( $\mu\text{s}$ )	$t_f$ ( $\mu\text{s}$ )
24	4	6	10	-5	0.12	-0.12	0.6typ	1.4typ	0.4typ

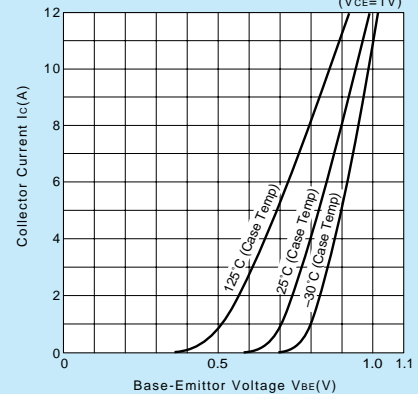
**$I_C-V_{CE}$  Characteristics (Typical)**



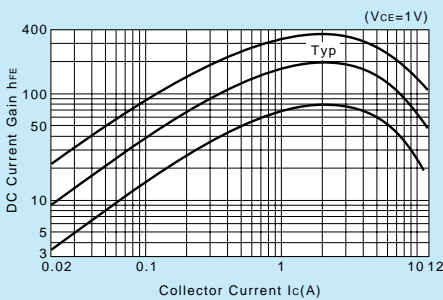
**$V_{CE(sat)}-I_B$  Characteristics (Typical)**



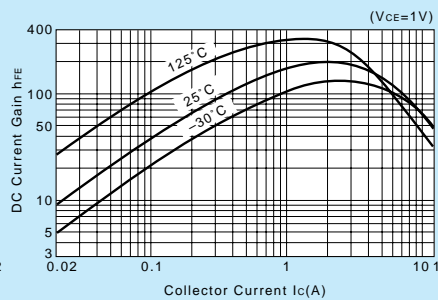
**$I_C-V_{BE}$  Temperature Characteristics (Typical)**



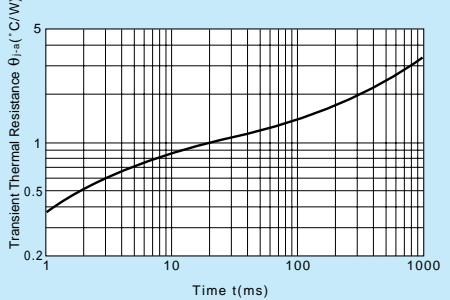
**$h_{FE}-I_C$  Characteristics (Typical)**



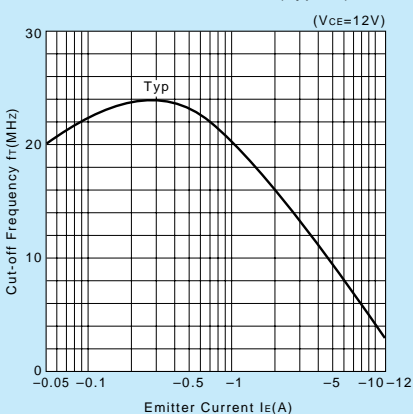
**$h_{FE}-I_C$  Temperature Characteristics (Typical)**



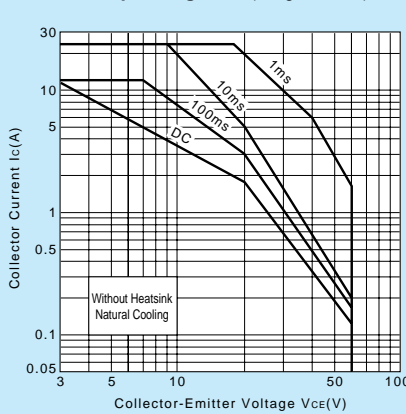
**$\theta_{j-a}-t$  Characteristics**



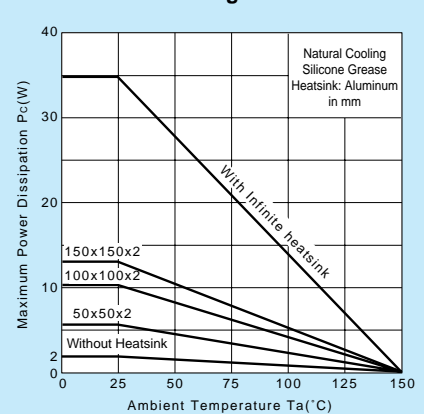
**$f_T-I_E$  Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**$P_C-T_a$  Derating**



# 2SC4073

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor) Application : Switching Regulator and General Purpose

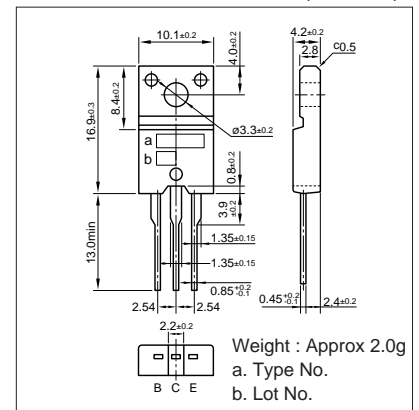
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC4073	Unit
V <sub>CB0</sub>	500	V
V <sub>CE0</sub>	400	V
V <sub>EB0</sub>	10	V
I <sub>c</sub>	5(Pulse10)	A
I <sub>B</sub>	2	A
P <sub>c</sub>	30(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4073	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =10V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =2A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>c</sub> =2A, I <sub>B</sub> =0.4A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =2A, I <sub>B</sub> =0.4A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	10typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	30typ	pF

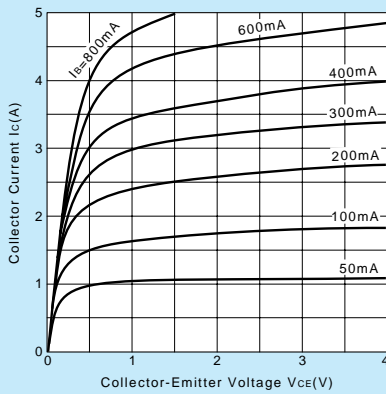
### External Dimensions FM20(TO220F)



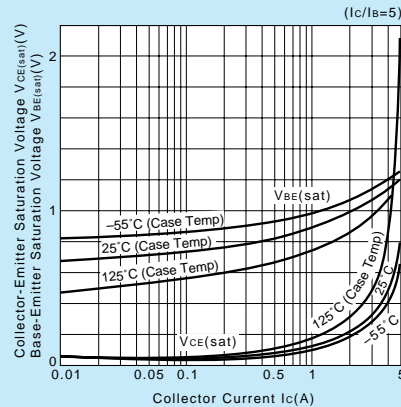
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	100	2	10	-5	0.2	-0.4	1max	3max	0.5max

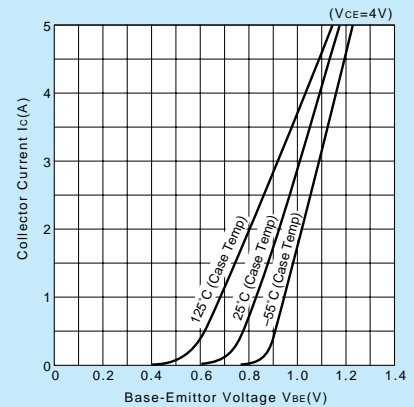
I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)



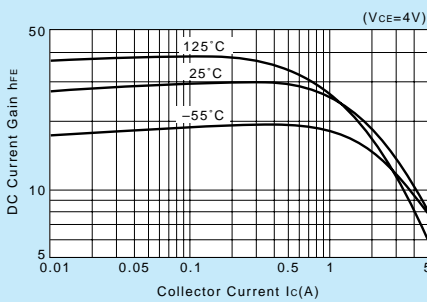
V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>c</sub> Temperature Characteristics (Typical)



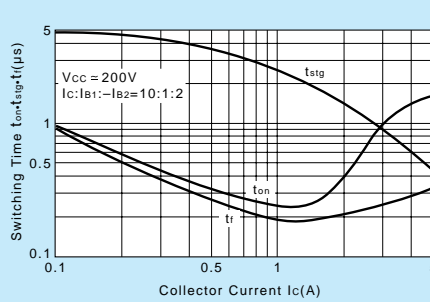
I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



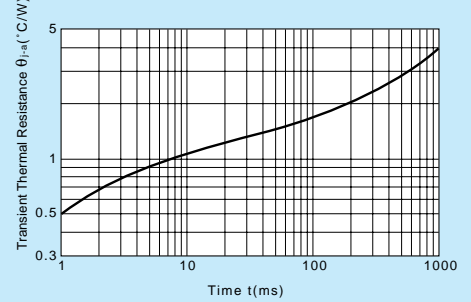
h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)



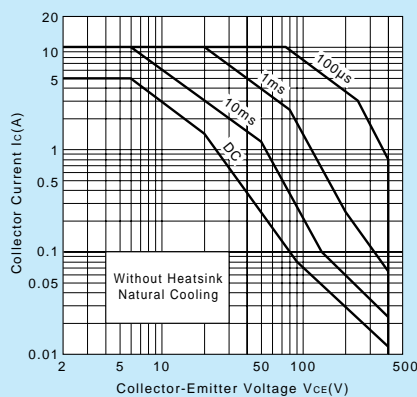
t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)



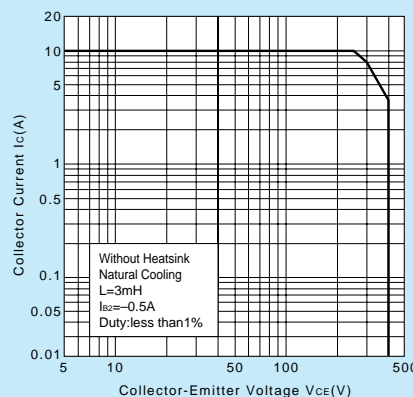
θ<sub>j-a</sub>-t Characteristics



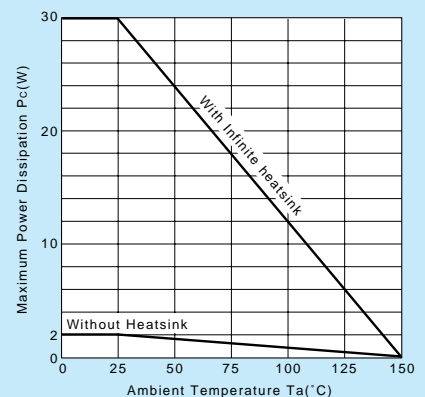
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>c</sub>-T<sub>a</sub> Derating





# 2SC4130

Silicon NPN Epitaxial Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

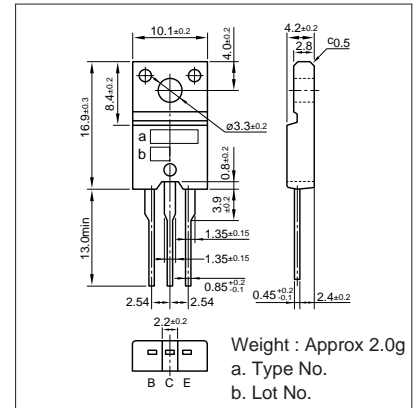
## Absolute maximum ratings (Ta=25°C)

Symbol	2SC4130	Unit
V <sub>CB0</sub>	500	V
V <sub>CEO</sub>	400	V
V <sub>EBO</sub>	10	V
I <sub>C</sub>	7(Pulse 14)	A
I <sub>B</sub>	2	A
P <sub>C</sub>	30(Tc=25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4130	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =10V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	15typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	50typ	pF

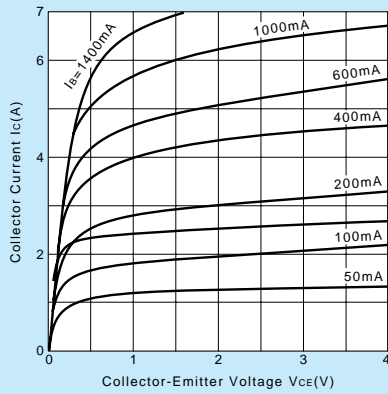
## External Dimensions FM20(TO220F)



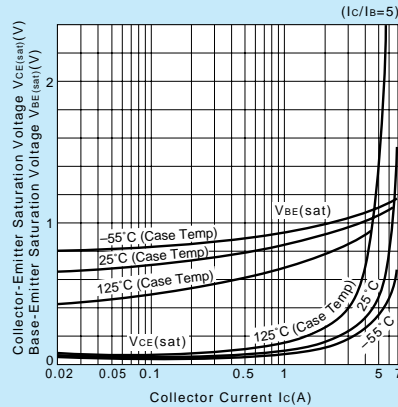
## Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>r</sub> (μs)
200	67	3	10	-5	0.3	-0.6	1max	2.2max	0.5max

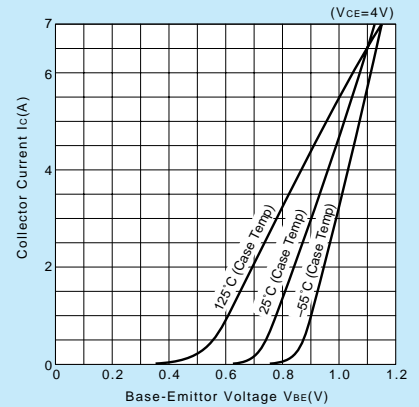
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



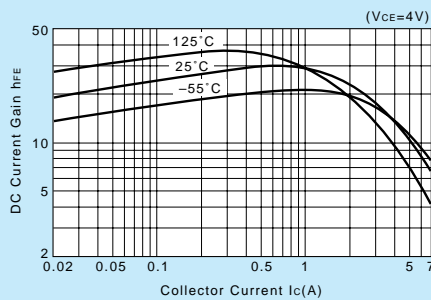
V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



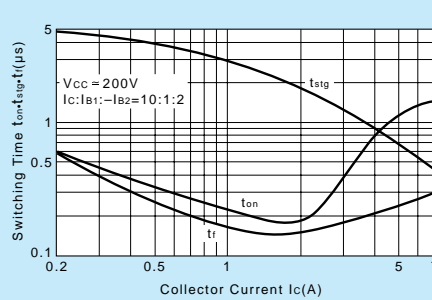
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



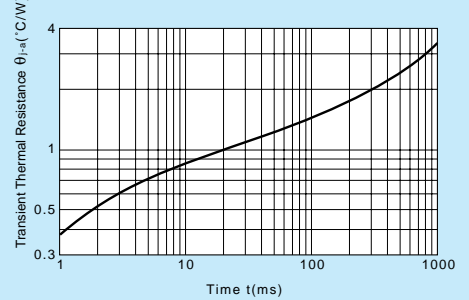
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



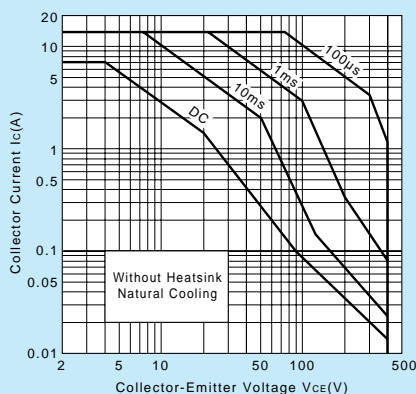
t<sub>on</sub>•t<sub>stg</sub>•t<sub>r</sub>-I<sub>C</sub> Characteristics (Typical)



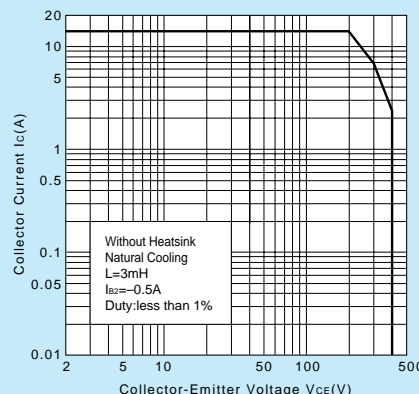
θ<sub>j-a</sub>-t Characteristics



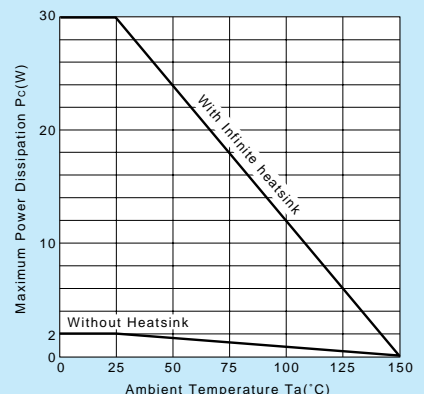
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>C</sub>-T<sub>a</sub> Derating



# LOW V<sub>CE</sub> (sat) 2SC4131

Silicon NPN Epitaxial Planar Transistor

Application : DC-DC Converter, Emergency Lighting Inverter and General Purpose

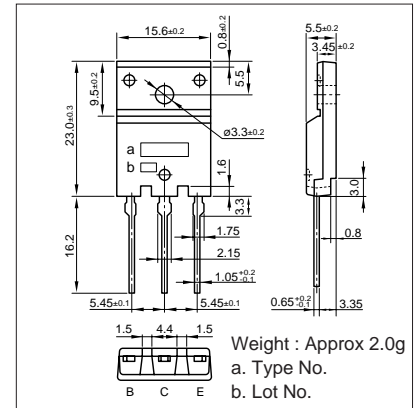
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4131	Unit
V <sub>CB0</sub>	100	V
V <sub>CEO</sub>	50	V
V <sub>EBO</sub>	15	V
I <sub>C</sub>	15(Pulse25)	A
I <sub>B</sub>	4	A
P <sub>C</sub>	60(Tc=25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4131	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =100V	10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =15V	10max	μA
V(BR)CEO	I <sub>C</sub> =25mA	50min	V
h <sub>FE</sub>	V <sub>CE</sub> =1V, I <sub>C</sub> =5A	60 to 360	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =80mA	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =80mA	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	18typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	210typ	pF

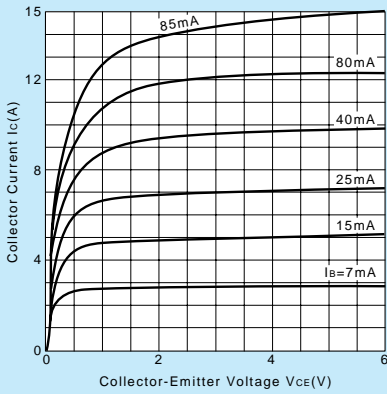
**External Dimensions FM100(TO3PF)**



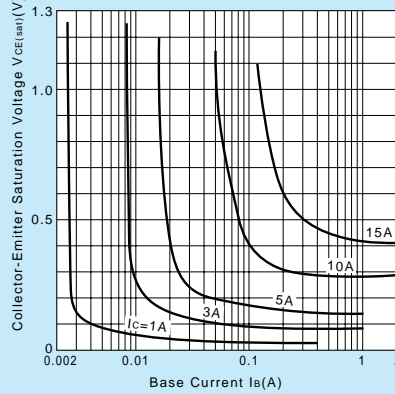
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
20	4	5	10	-5	0.08	-0.08	0.5typ	2.0typ	0.4typ

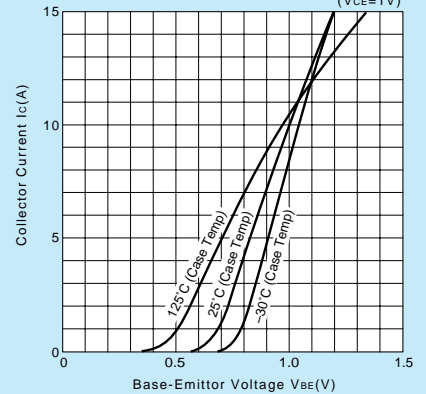
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



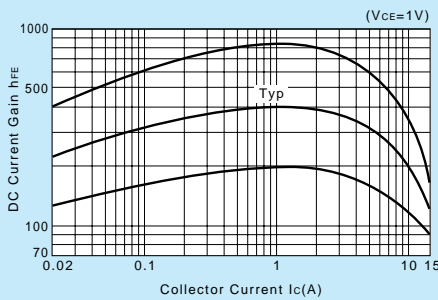
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



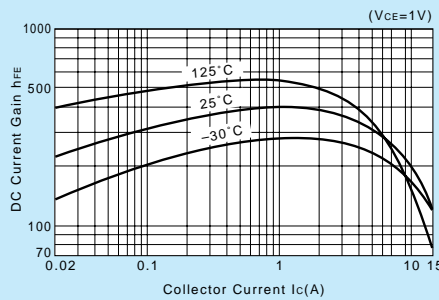
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



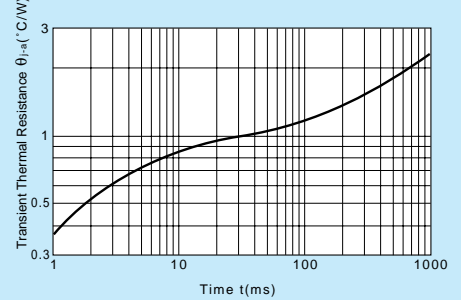
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



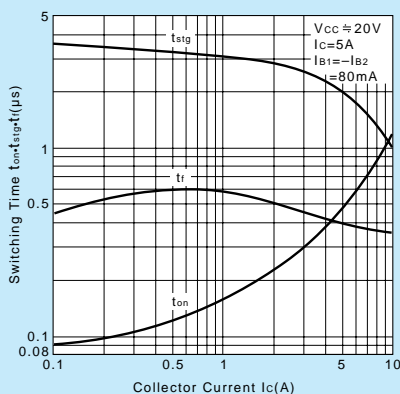
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



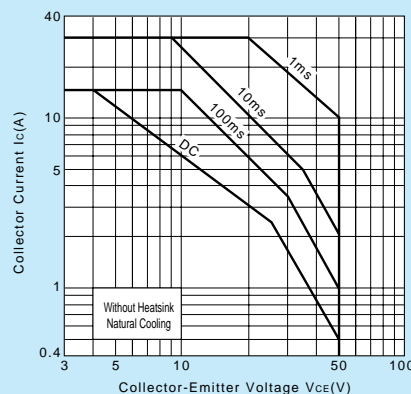
**θ<sub>ja</sub>-t Characteristics**



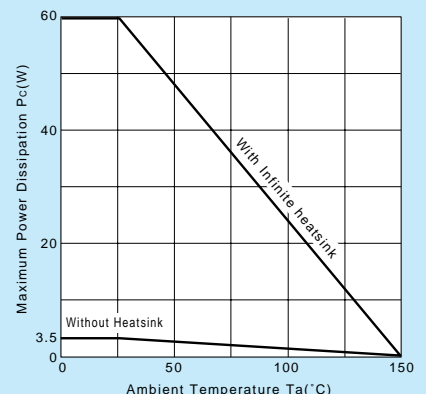
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>r</sub>-I<sub>C</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC4138

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4138	Unit
V <sub>CB0</sub>	500	V
V <sub>CEO</sub>	400	V
V <sub>EB0</sub>	10	V
I <sub>C</sub>	10(Pulse20)	A
I <sub>B</sub>	4	A
P <sub>C</sub>	80(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

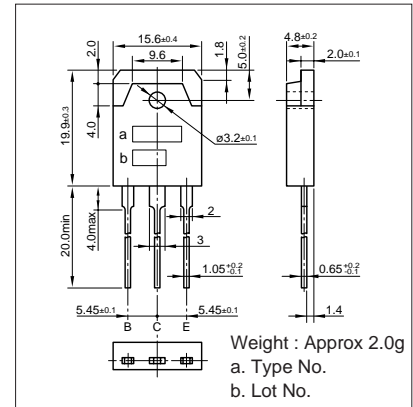
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4138	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =10V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =6A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =6A, I <sub>B</sub> =1.2A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =6A, I <sub>B</sub> =1.2A	1.3max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.7A	10typ	MHZ
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHZ	85typ	pF

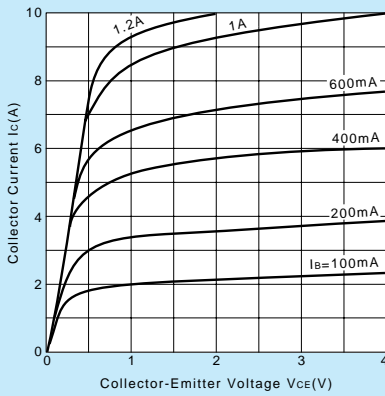
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	33.3	6	10	-5	0.6	-1.2	1max	3max	0.5max

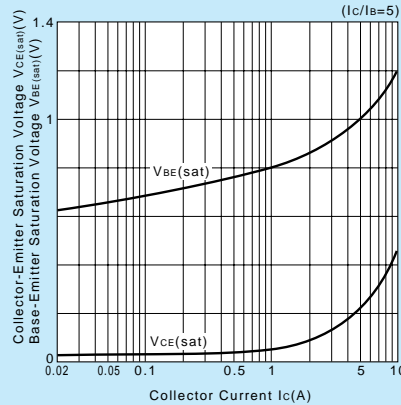
**External Dimensions MT-100(TO3P)**



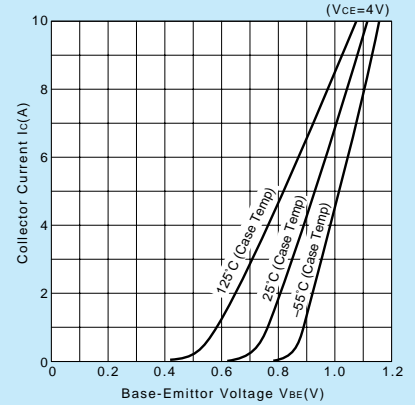
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



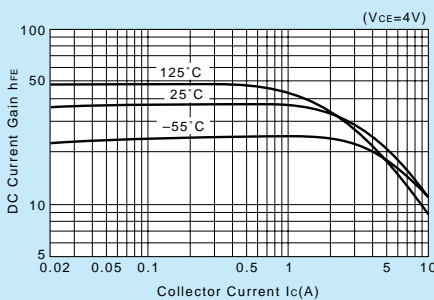
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



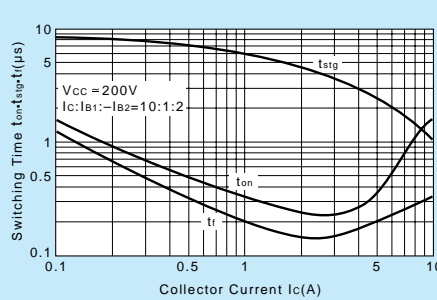
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



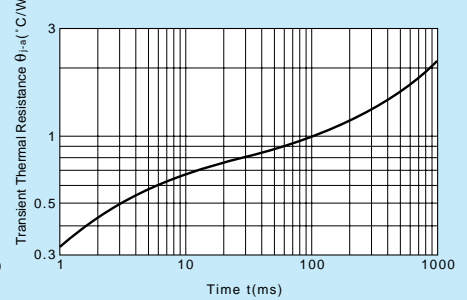
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



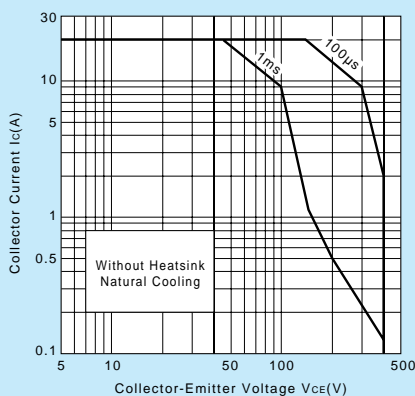
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



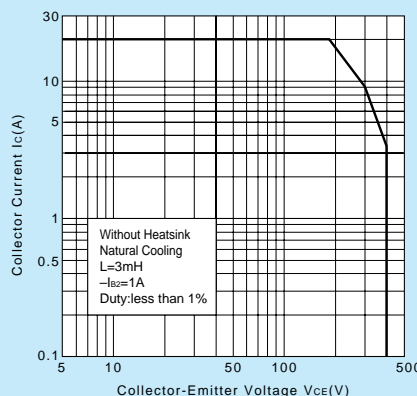
**θ<sub>j-a</sub>-t Characteristics**



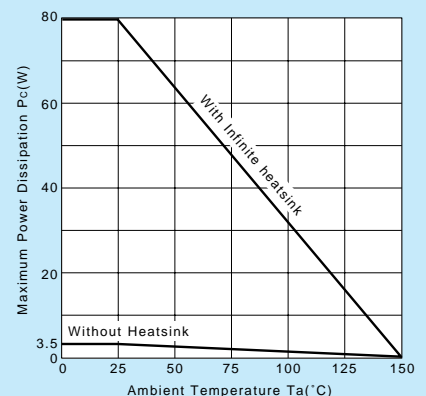
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC4139

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor) Application : Switching Regulator and General Purpose

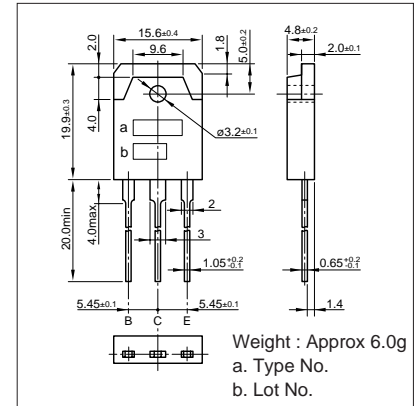
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC4139	Unit
V <sub>CB0</sub>	500	V
V <sub>CEO</sub>	400	V
V <sub>EBO</sub>	10	V
I <sub>C</sub>	15(Pulse30)	A
I <sub>B</sub>	5	A
P <sub>C</sub>	120(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4139	Unit
I <sub>CBO</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =10V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =8A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =1.6A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =1.6A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1.5A	10typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	85typ	pF

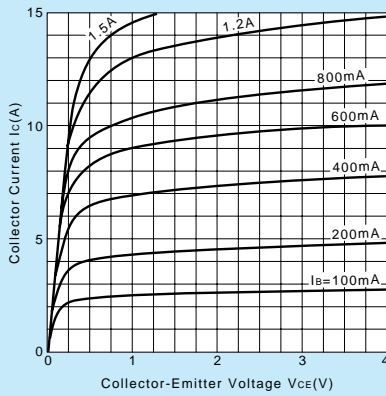
### External Dimensions MT-100(TO3P)



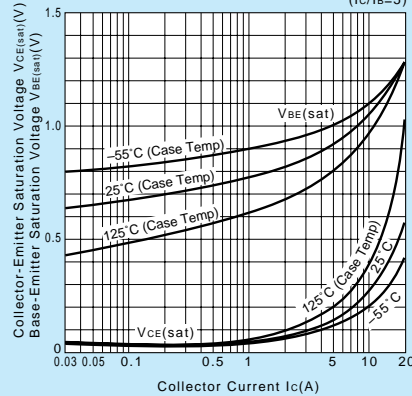
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	25	8	10	-5	0.8	-1.6	1max	3max	0.5max

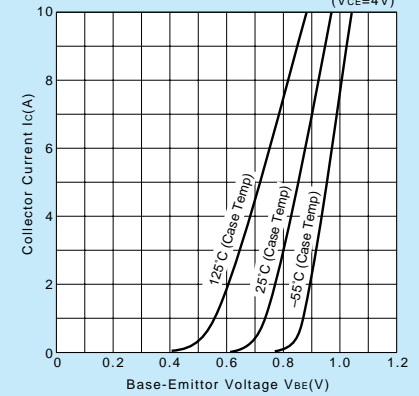
### I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



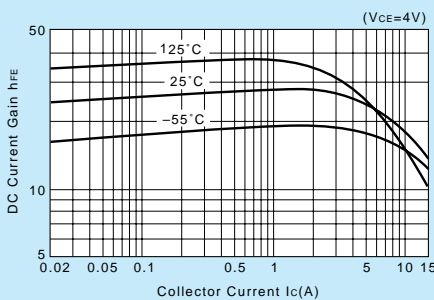
### V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



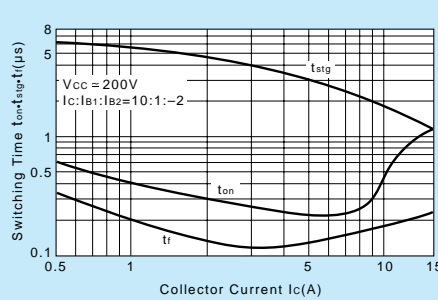
### I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



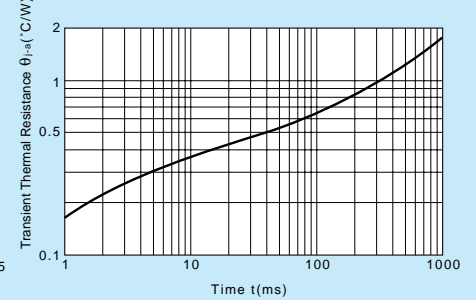
### h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



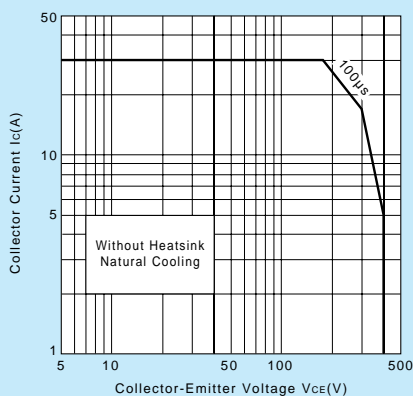
### t<sub>on</sub>\*t<sub>stg</sub>\*t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)



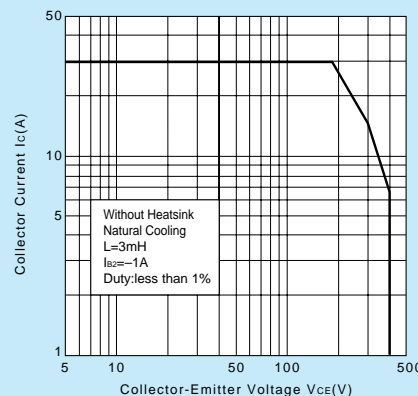
### θ<sub>j-a</sub>-t Characteristics



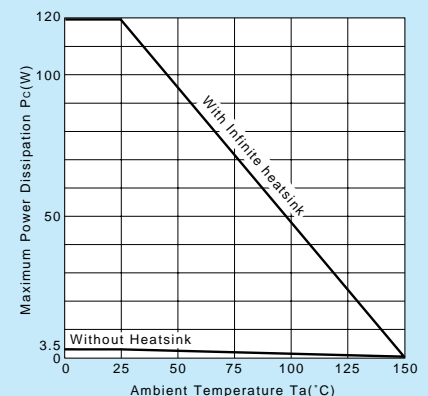
### Safe Operating Area (Single Pulse)



### Reverse Bias Safe Operating Area



### P<sub>C</sub>-T<sub>a</sub> Derating



# 2SC4140

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

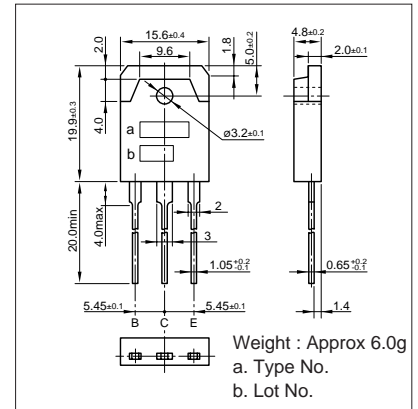
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4140	Unit
Vcbo	500	V
Vceo	400	V
Vebo	10	V
Ic	18(Pulse36)	A
Ib	6	A
Pc	130(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4140	Unit
Icbo	Vcb=500V	100max	μA
IEBO	VEB=10V	100max	μA
V(BR)CEO	Ic=25mA	400min	V
hFE	VCE=4V, Ic=10A	10 to 30	
VCE(sat)	Ic=10A, IB=2A	0.5max	V
VBE(sat)	Ic=10A, IB=2A	1.3max	V
fr	VCE=12V, IE=-2.0A	10typ	MHZ
COB	Vcb=10V, f=1MHZ	165typ	pF

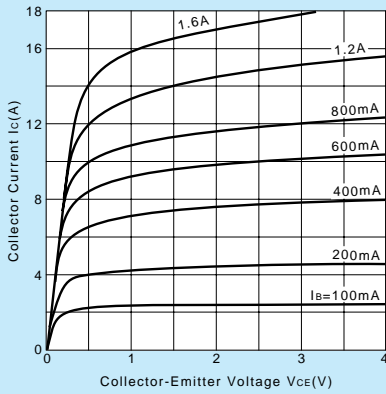
**External Dimensions MT-100(TO3P)**



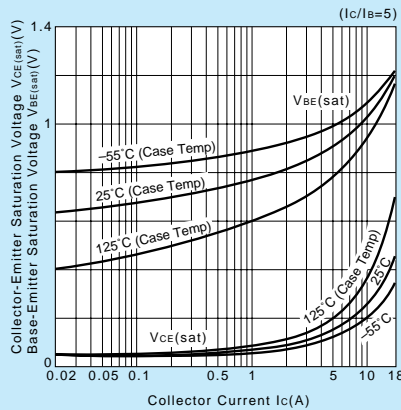
**Typical Switching Characteristics (Common Emitter)**

VCC (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	IB1 (A)	IB2 (A)	ton (μs)	tstg (μs)	tf (μs)
200	20	10	10	-5	1	-2	1max	3max	0.5max

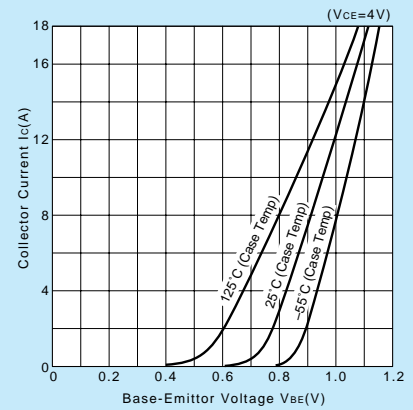
**Ic-VCE Characteristics (Typical)**



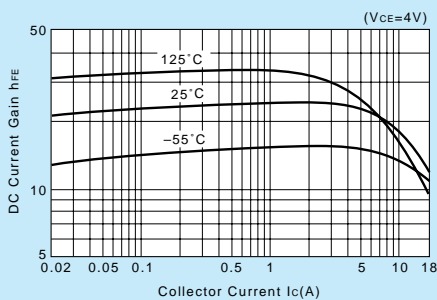
**VCE(sat), VBE(sat)-Ic Temperature Characteristics (Typical)**



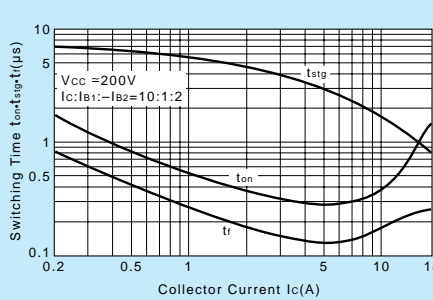
**Ic-VBE Temperature Characteristics (Typical)**



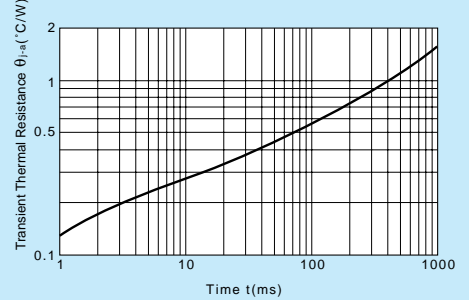
**hFE-Ic Characteristics (Typical)**



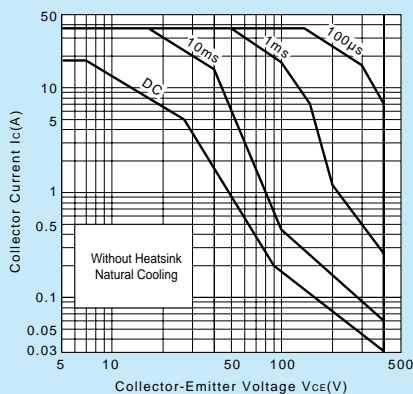
**ton•tstg•tr-Ic Characteristics (Typical)**



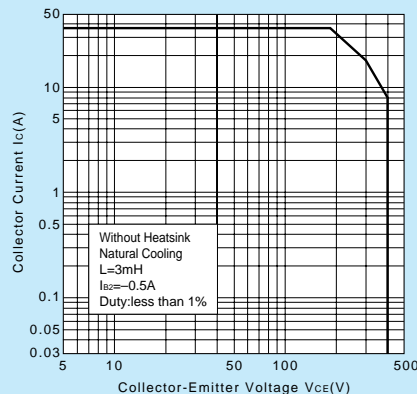
**θj-a-t Characteristics**



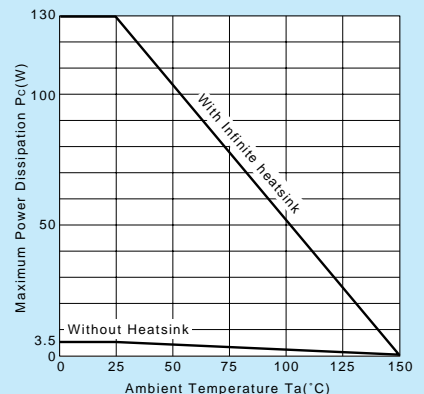
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**Pc-Ta Derating**



# 2SC4153

Silicon NPN Triple Diffused Planar Transistor (Switching Transistor)

Application : Humidifier, DC-DC Converter, and General Purpose

## Absolute maximum ratings (Ta=25°C)

Symbol	2SC4153	Unit
V <sub>CB0</sub>	200	V
V <sub>CEO</sub>	120	V
V <sub>EB0</sub>	8	V
I <sub>C</sub>	7(Pulse14)	A
I <sub>B</sub>	3	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

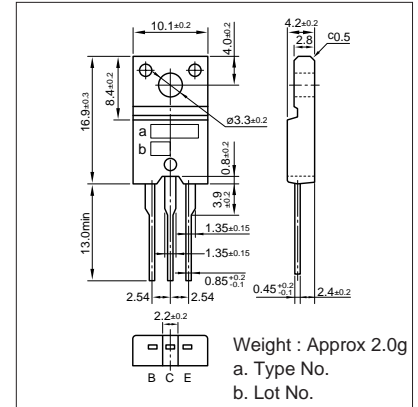
## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4153	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =8V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =50mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	70 to 220	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.3A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.3A	1.2max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	30typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	110typ	pF

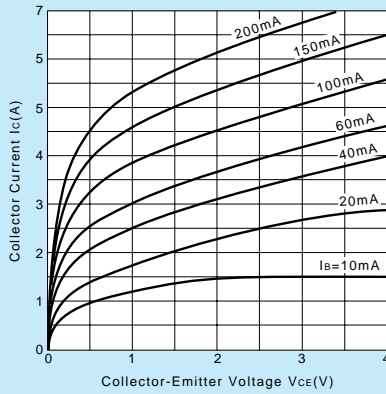
## Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
50	16.7	3	10	-5	0.3	-0.6	0.5max	3max	0.5max

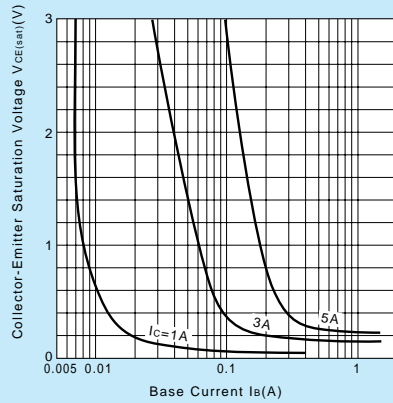
## External Dimensions FM20(TO220F)



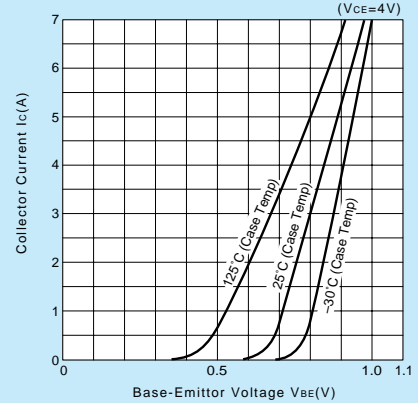
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



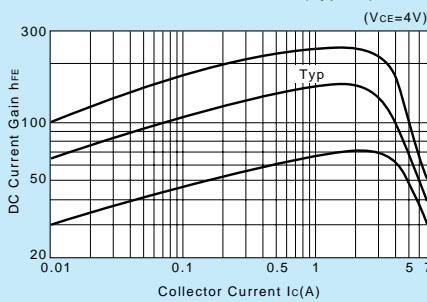
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



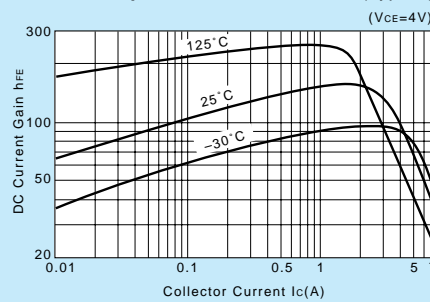
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



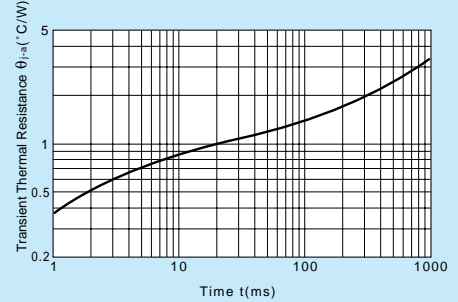
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



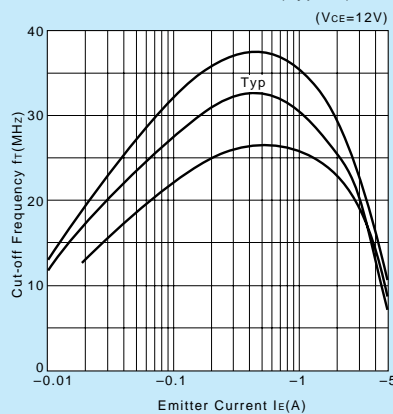
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



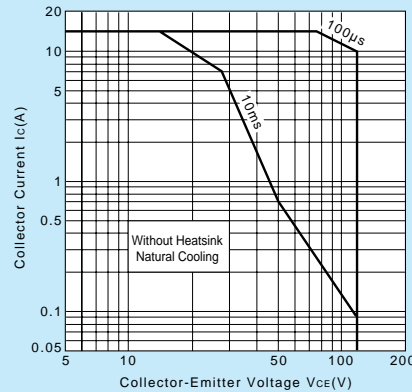
θ<sub>j-a</sub>-t Characteristics



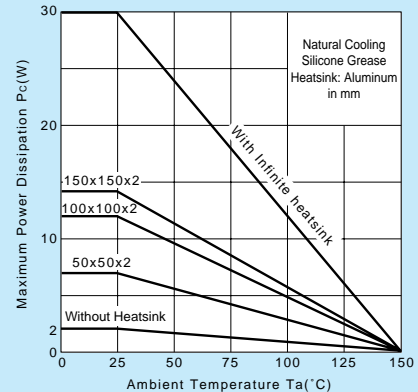
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)



P<sub>C</sub>-T<sub>a</sub> Derating



# 2SC4296

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor) Application : Switching Regulator and General Purpose

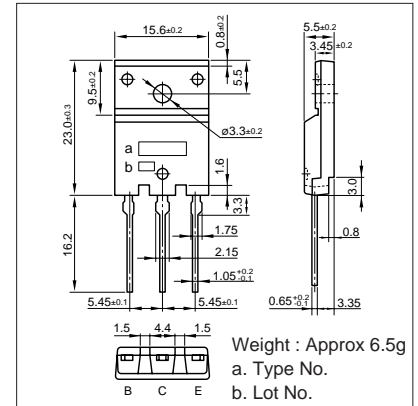
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC4296	Unit
V <sub>CB0</sub>	500	V
V <sub>CEO</sub>	400	V
V <sub>EBO</sub>	10	V
I <sub>c</sub>	10(Pulse20)	A
I <sub>B</sub>	4	A
P <sub>c</sub>	75(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4296	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =10V	100max	μA
V(BR)CEO	I <sub>c</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =6A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>c</sub> =6A, I <sub>B</sub> =1.2A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =6A, I <sub>B</sub> =1.2A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.7A	10typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	85typ	pF

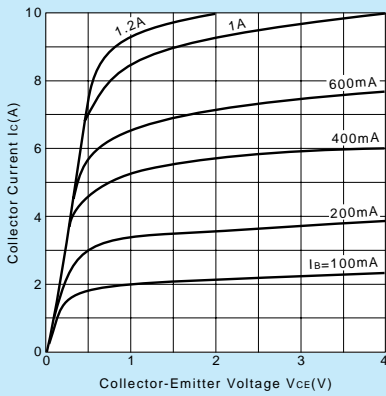
### External Dimensions FM100(TO3PF)



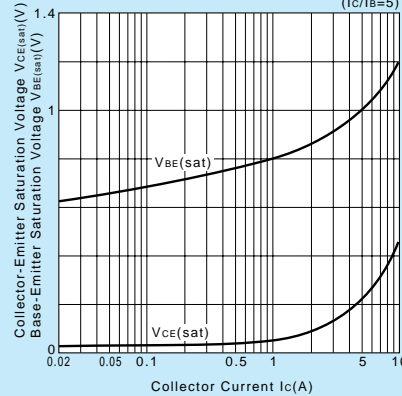
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	33	6	10	-5	0.6	-1.2	1max	3max	0.5max

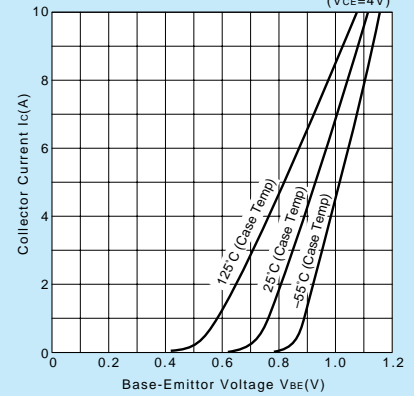
I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)



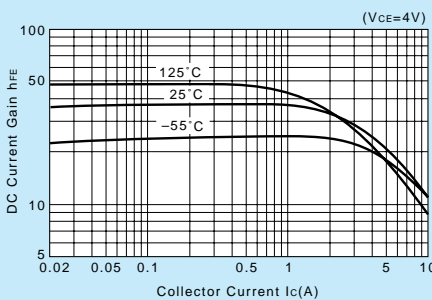
V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>c</sub> Temperature Characteristics (Typical)



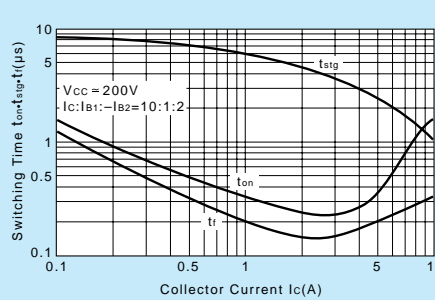
I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



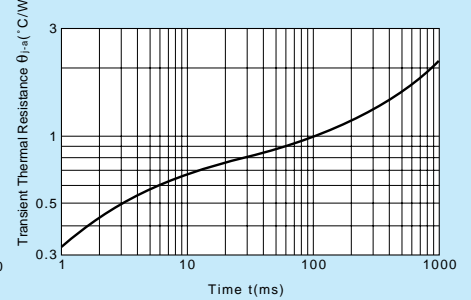
h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)



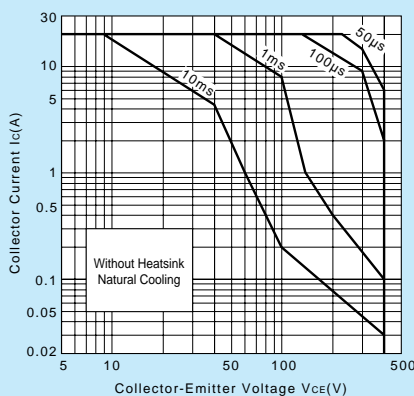
t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)



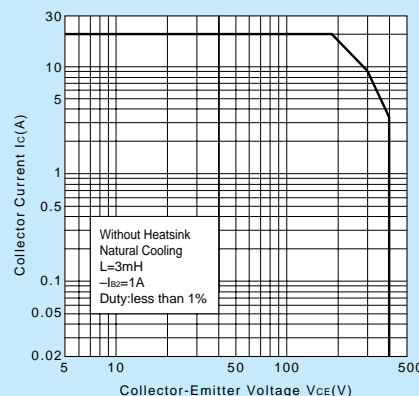
θ<sub>j-a</sub>-t Characteristics



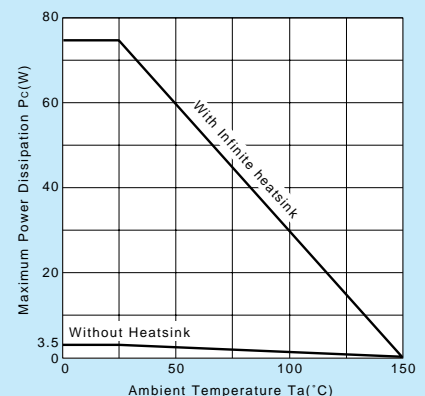
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>c</sub>-T<sub>a</sub> Derating





# 2SC4297

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor) Application : Switching Regulator and General Purpose

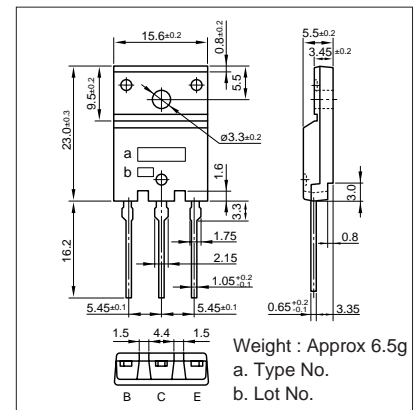
## Absolute maximum ratings (Ta=25°C)

Symbol	2SC4297	Unit
V <sub>CB0</sub>	500	V
V <sub>CE0</sub>	400	V
V <sub>EB0</sub>	10	V
I <sub>c</sub>	12(Pulse24)	A
I <sub>B</sub>	4	A
P <sub>c</sub>	75(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4297	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =10V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =7A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>c</sub> =7A, I <sub>B</sub> =1.4A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =7A, I <sub>B</sub> =1.4A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	10typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	105typ	pF

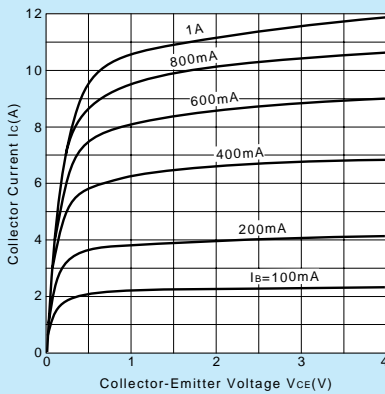
## External Dimensions FM100(TO3PF)



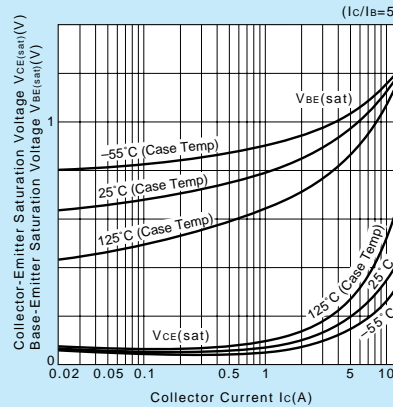
## Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	28.5	7	10	-5	0.7	-1.4	1max	3max	0.5max

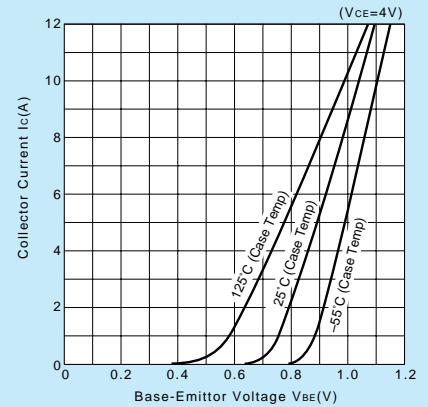
### I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)



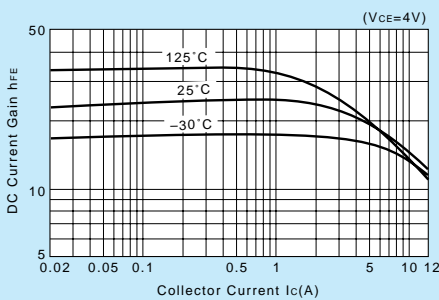
### V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>c</sub> Temperature Characteristics (Typical)



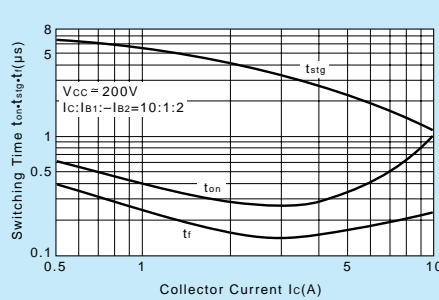
### I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



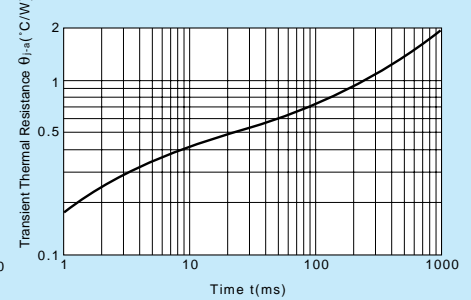
### h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)



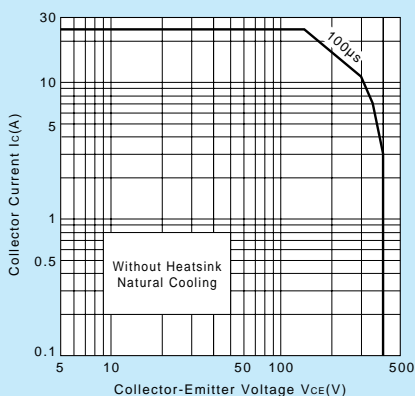
### t<sub>on</sub>, t<sub>stg</sub>, t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)



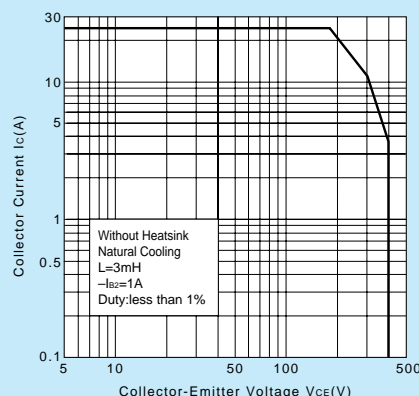
### θ<sub>j-a</sub>-t Characteristics



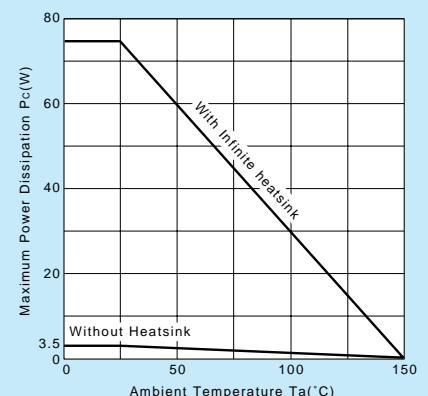
### Safe Operating Area (Single Pulse)



### Reverse Bias Safe Operating Area



### P<sub>c</sub>-T<sub>a</sub> Derating



# 2SC4298

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor) Application : Switching Regulator and General Purpose

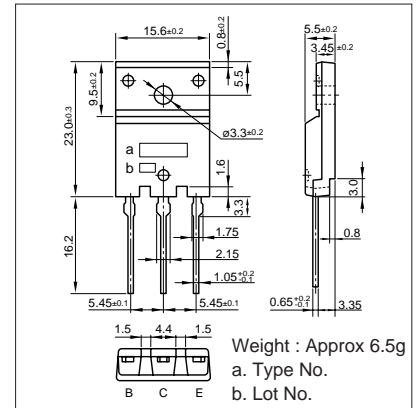
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC4298	Unit
V <sub>CB0</sub>	500	V
V <sub>CEO</sub>	400	V
V <sub>EBO</sub>	10	V
I <sub>C</sub>	15(Pulse30)	A
I <sub>B</sub>	5	A
P <sub>C</sub>	80(Tc=25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4298	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =10V	100max	μA
V(BR)CEO	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =8A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =1.6A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =1.6A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1.5A	10typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	85typ	pF

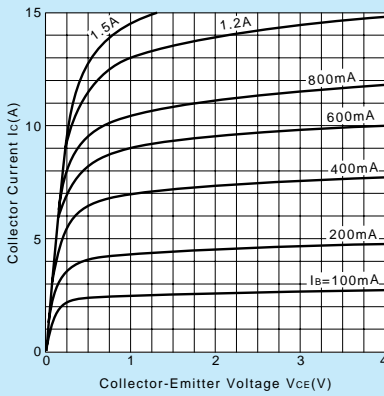
### External Dimensions FM100(TO3PF)



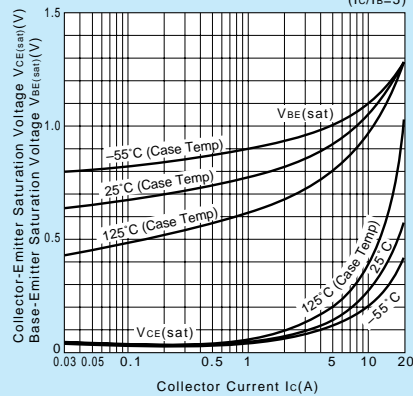
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	25	8	10	-5	0.8	-1.6	1max	3max	0.5max

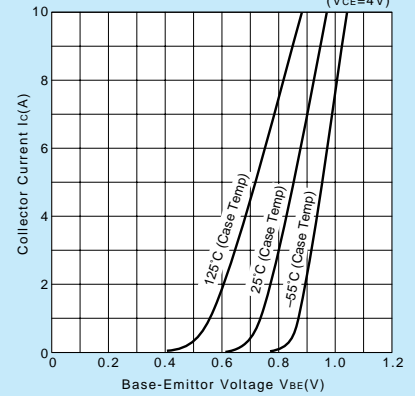
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



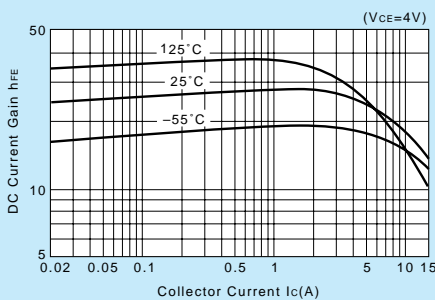
V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



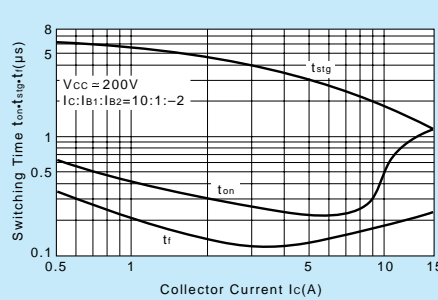
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



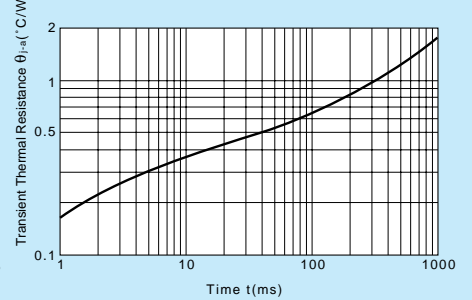
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



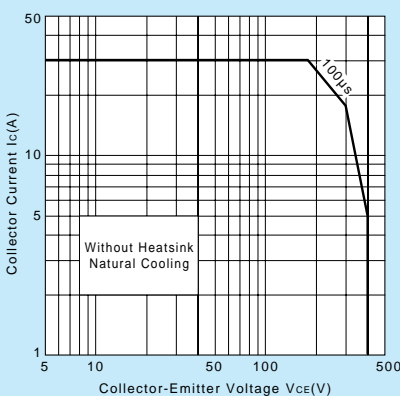
t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)



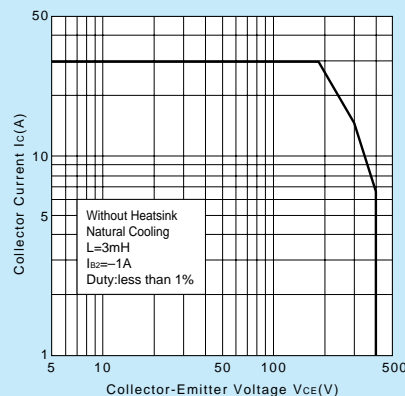
θ<sub>j-a</sub>-t Characteristics



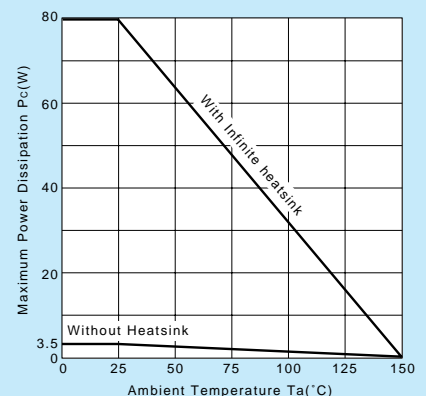
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>C</sub>-T<sub>a</sub> Derating



# 2SC4299

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

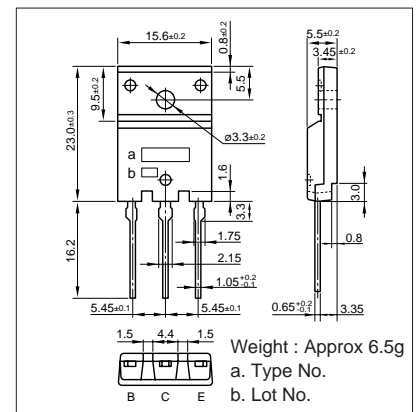
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4299	Unit
V <sub>CB0</sub>	900	V
V <sub>CE0</sub>	800	V
V <sub>EB0</sub>	7	V
I <sub>c</sub>	3(Pulse6)	A
I <sub>B</sub>	1.5	A
P <sub>c</sub>	70(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4299	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>c</sub> =10mA	800min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =1A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>c</sub> =1A, I <sub>B</sub> =0.2A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =1A, I <sub>B</sub> =0.2A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	6typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	50typ	pF

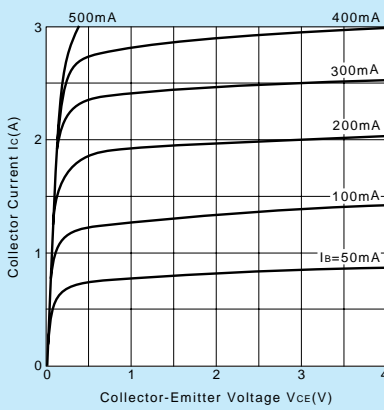
**External Dimensions FM100(TO3PF)**



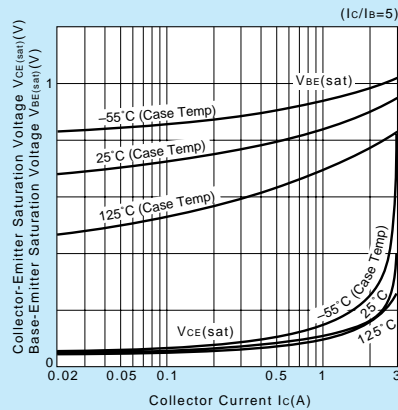
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	250	1	10	-5	0.15	-0.5	1max	5max	1max

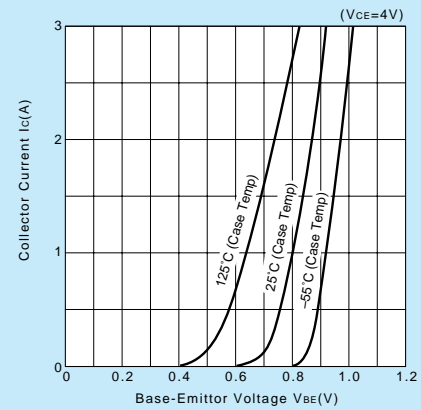
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



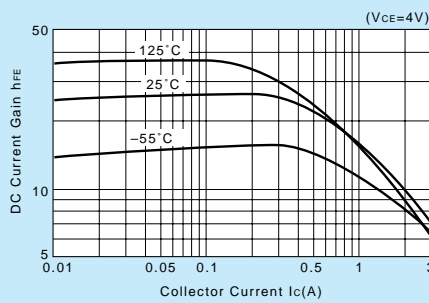
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



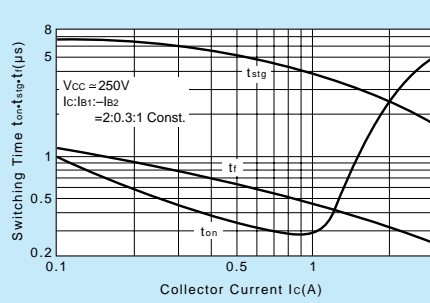
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



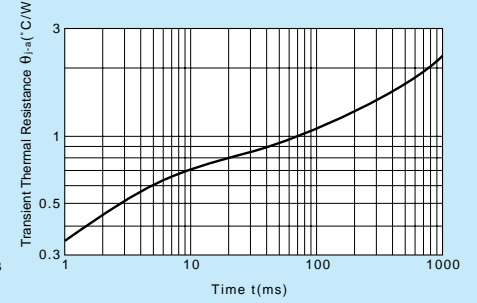
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



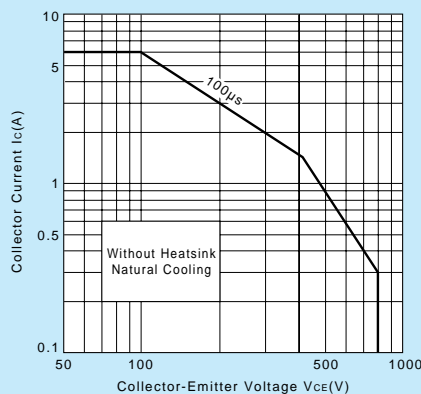
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)**



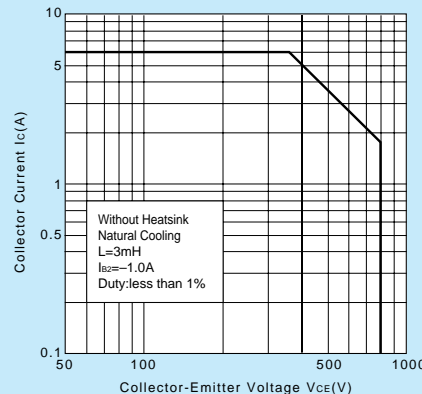
**θ<sub>j-a</sub>-t Characteristics**



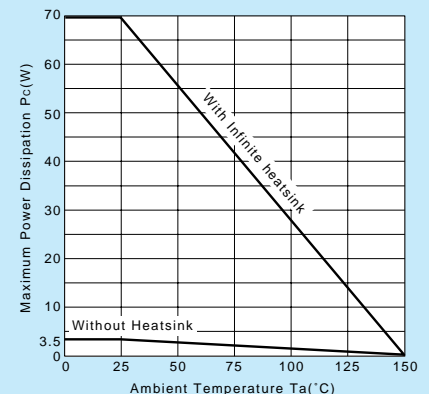
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SC4300

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

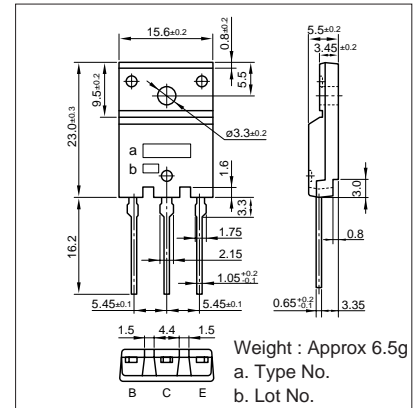
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4300	Unit
V <sub>CB0</sub>	900	V
V <sub>CEO</sub>	800	V
V <sub>EBO</sub>	7	V
I <sub>C</sub>	5(Pulse10)	A
I <sub>B</sub>	2.5	A
P <sub>C</sub>	75(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4300	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =7V	100max	μA
V(BR)CEO	I <sub>C</sub> =10mA	800min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =2A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.4A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.4A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	6typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	75typ	pF

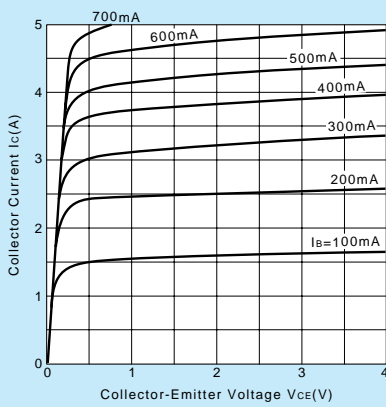
**External Dimensions FM100(TO3PF)**



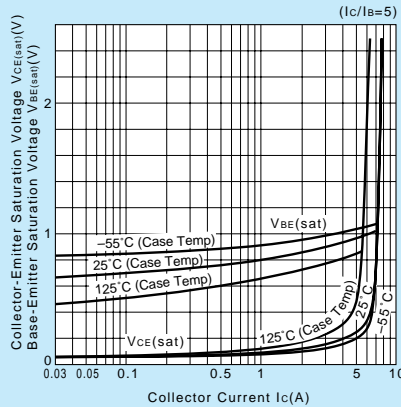
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>r</sub> (μs)
250	125	2	10	-5	0.3	-1	1max	5max	1max

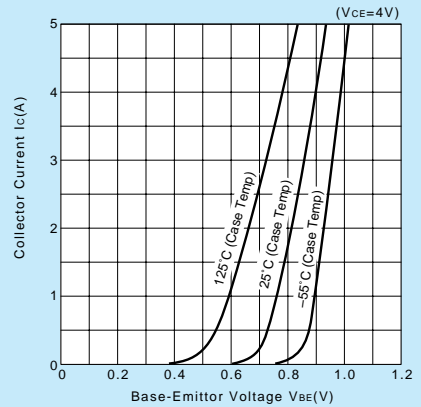
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



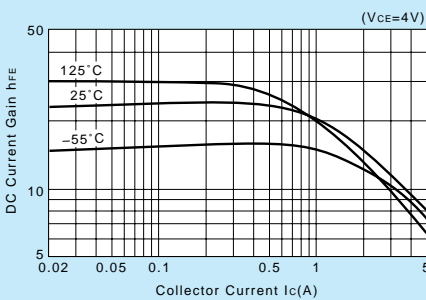
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



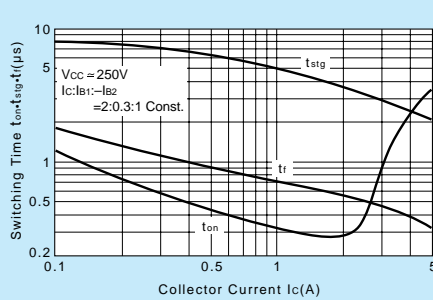
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



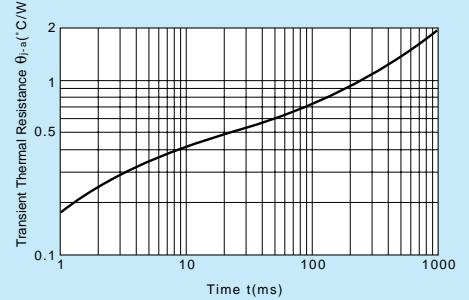
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



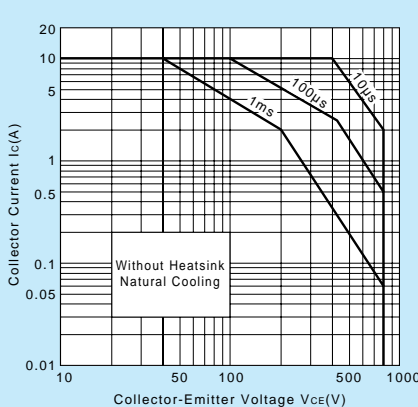
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>r</sub>-I<sub>C</sub> Characteristics (Typical)**



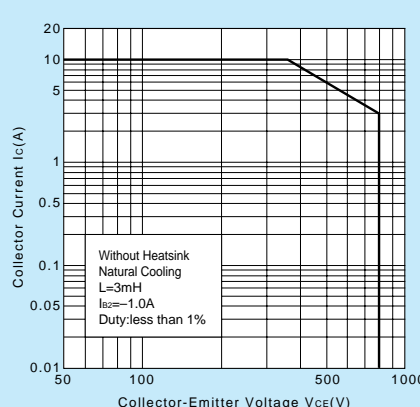
**θ<sub>j-a</sub>-t Characteristics**



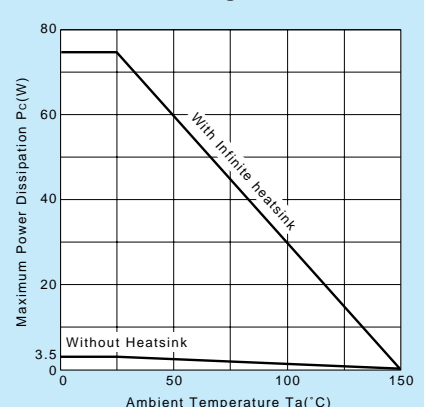
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC4301

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor) Application : Switching Regulator, Lighting Inverter and General Purpose

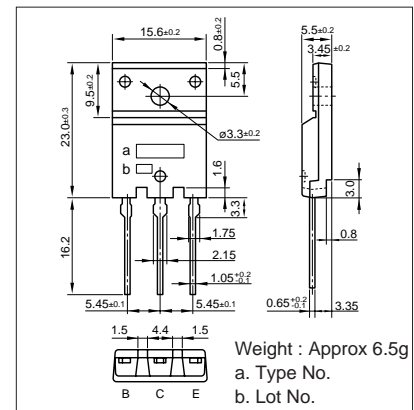
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC4301	Unit
V <sub>CB0</sub>	900	V
V <sub>CE0</sub>	800	V
V <sub>EBO</sub>	7	V
I <sub>C</sub>	7(Pulse14)	A
I <sub>B</sub>	3.5	A
P <sub>c</sub>	80(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4301	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =7V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	800min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	6typ	MHZ
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHZ	105typ	pF

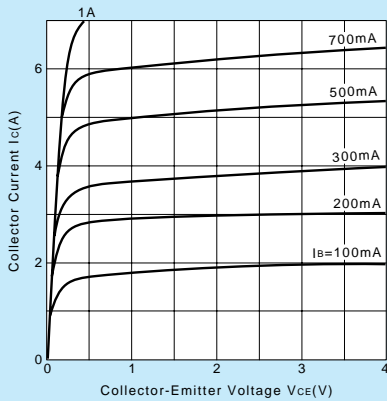
### External Dimensions FM100(TO3PF)



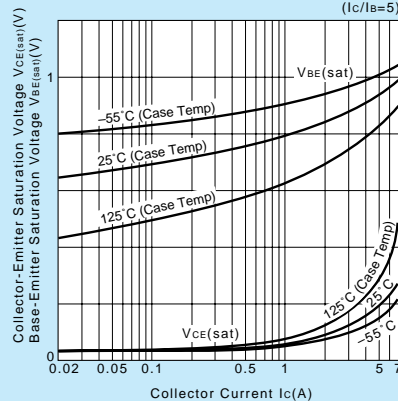
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	83	3	10	-5	0.45	-1.5	1max	5max	1max

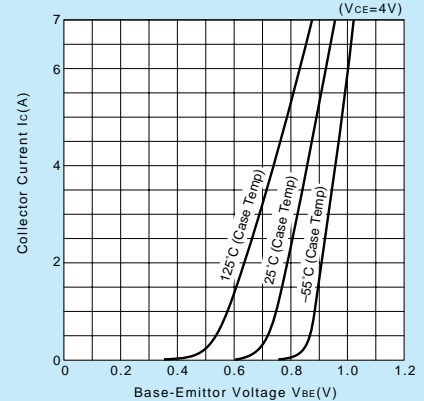
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



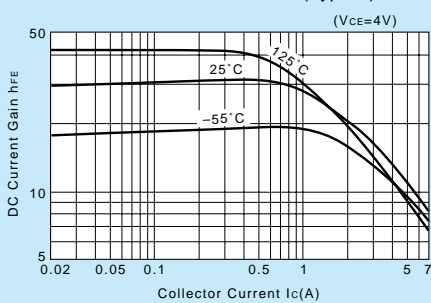
V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



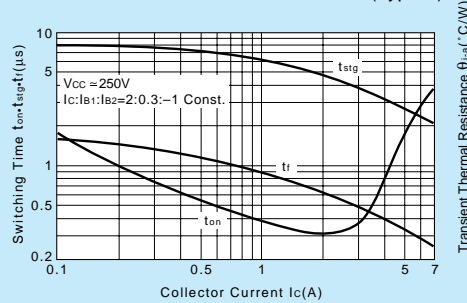
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



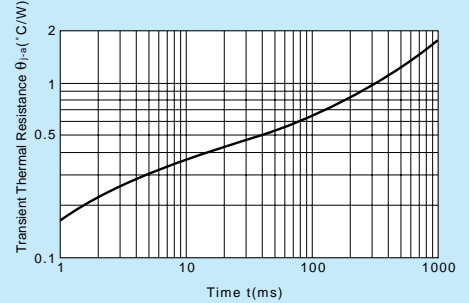
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



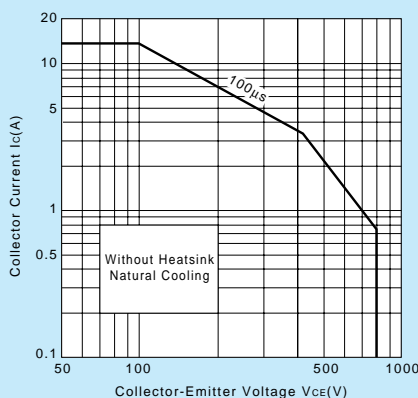
t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)



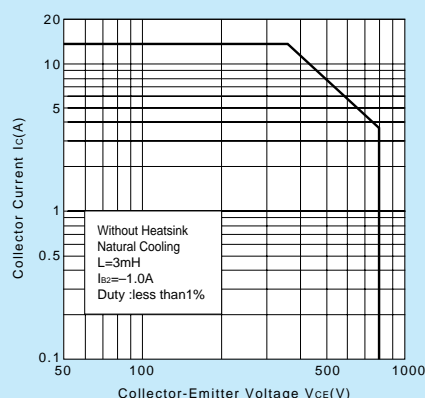
θ<sub>j-a</sub>-t Characteristics



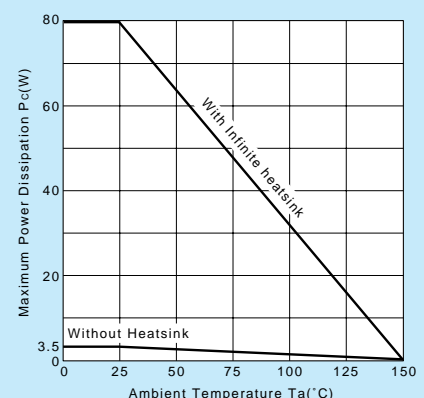
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>c</sub>-T<sub>a</sub> Derating



# 2SC4304

Silicon NPN Triple Diffused Planar Transistor (High Voltage High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

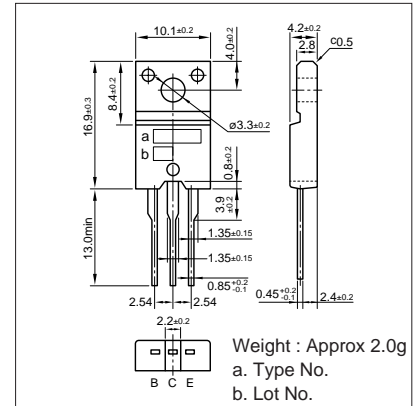
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC4304	Unit
V <sub>CB0</sub>	900	V
V <sub>CEO</sub>	800	V
V <sub>EB0</sub>	7	V
I <sub>C</sub>	3(Pulse6)	A
I <sub>B</sub>	1.5	A
P <sub>C</sub>	35(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4304	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	800min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =0.7A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =0.7A, I <sub>B</sub> =0.14A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =0.7A, I <sub>B</sub> =0.14A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	15typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	50typ	pF

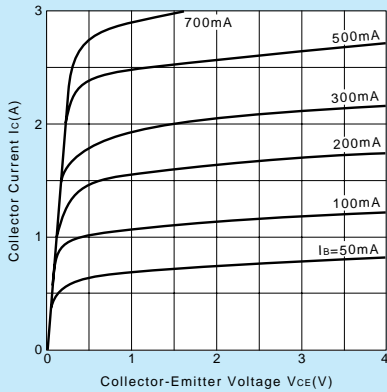
### External Dimensions FM20(TO220F)



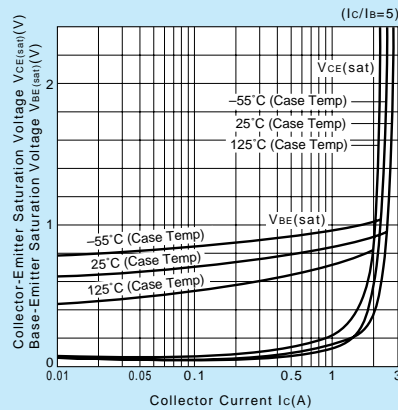
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	357	0.7	10	-5	0.1	-0.35	0.7max	4.0max	0.7max

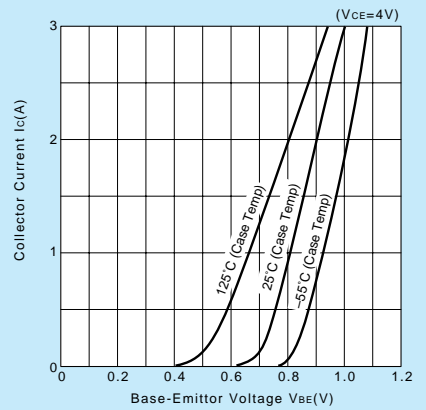
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



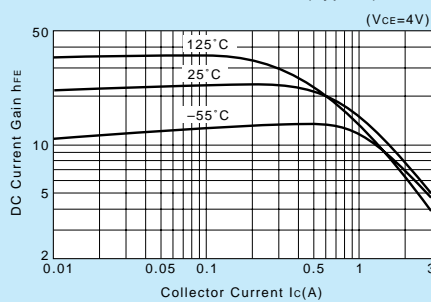
V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



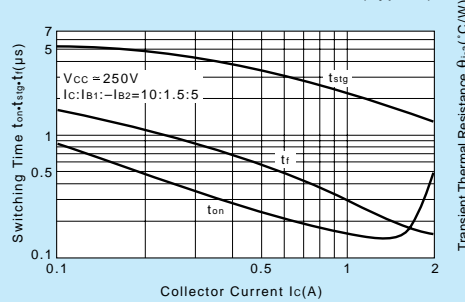
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



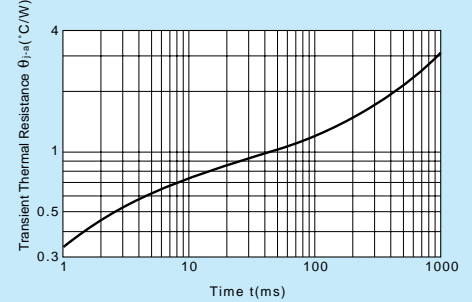
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



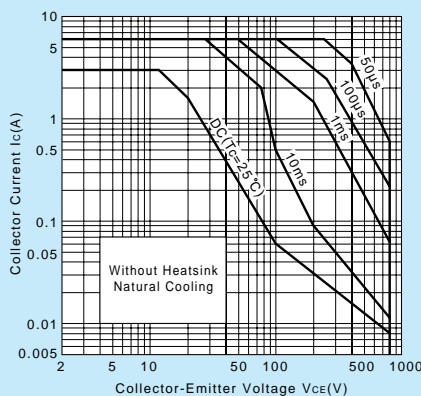
t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)



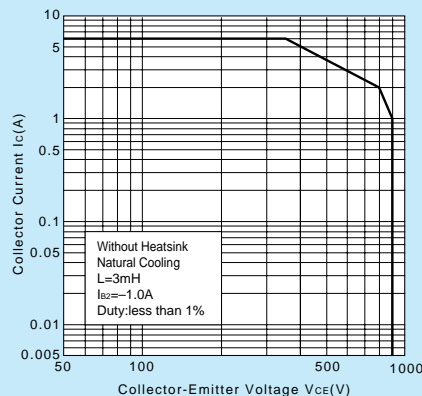
θ<sub>j-a</sub>-t Characteristics



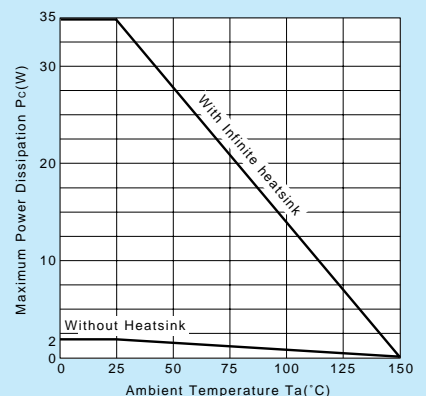
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>C</sub>-T<sub>a</sub> Derating



# 2SC4381/4382

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1667/1668) Application : TV Vertical Output, Audio Output Driver and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4381	2SC4382	Unit
V <sub>CB0</sub>	150	200	V
V <sub>CE0</sub>	150	200	V
V <sub>EB0</sub>	6		V
I <sub>C</sub>	2		A
I <sub>B</sub>	1		A
P <sub>C</sub>	25(T <sub>C</sub> =25°C)		W
T <sub>J</sub>	150		°C
T <sub>stg</sub>	-55 to +150		°C

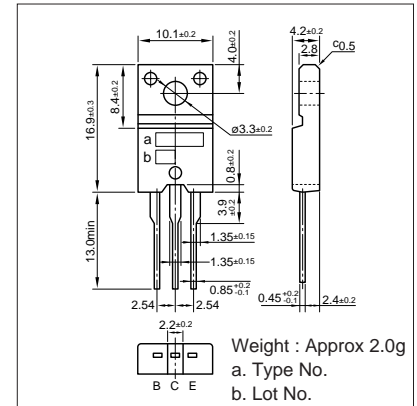
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4381		2SC4382		Unit
		150	200	150	200	
I <sub>CB0</sub>	V <sub>CB</sub> =	10max				μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max				μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	150min		200min		V
h <sub>FE</sub>	V <sub>CE</sub> =10V, I <sub>C</sub> =0.7A	60min				
V <sub>CE(sat)</sub>	I <sub>C</sub> =0.7A, I <sub>B</sub> =0.07A	1.0max				V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.2A	15typ				MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	35typ				pF

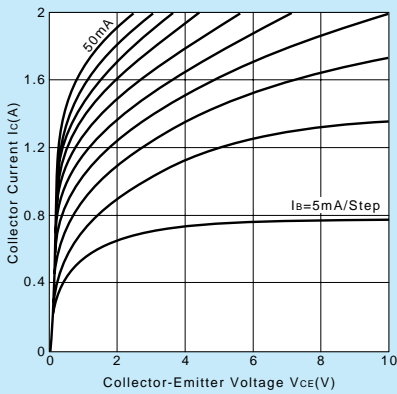
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
20	20	1	10	-5	100	-100	1.0typ	3.0typ	1.5typ

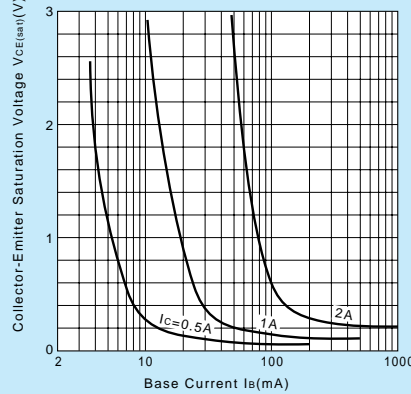
**External Dimensions FM20(TO220F)**



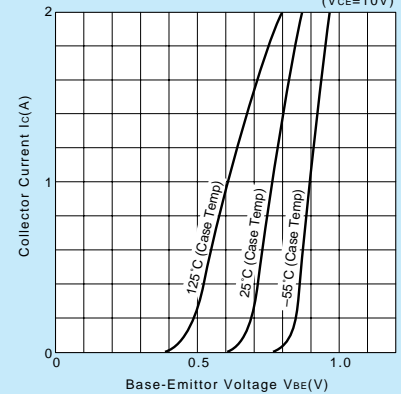
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



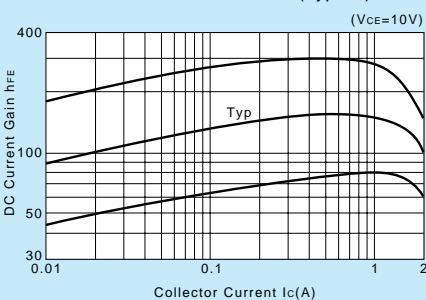
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



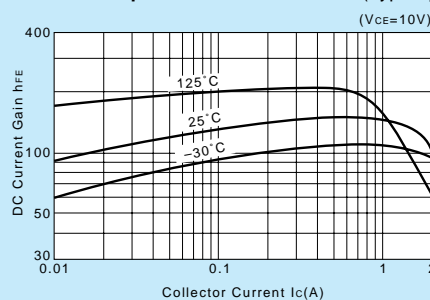
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



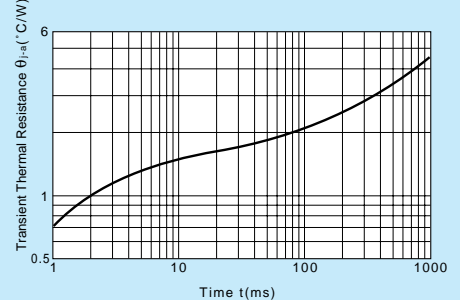
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



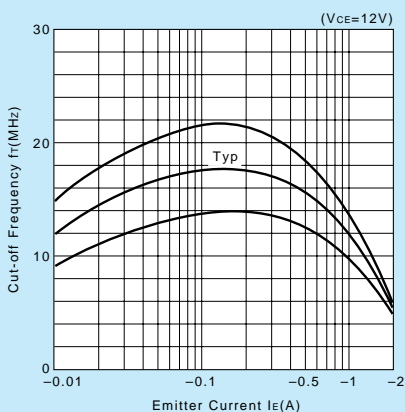
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



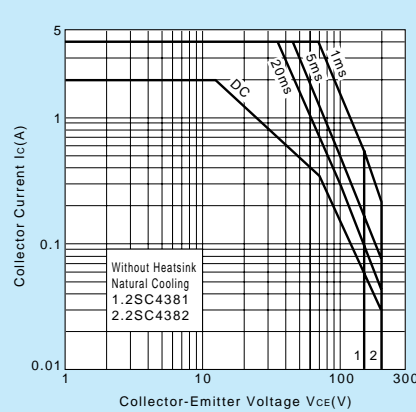
**θ<sub>j-a</sub>-t Characteristics**



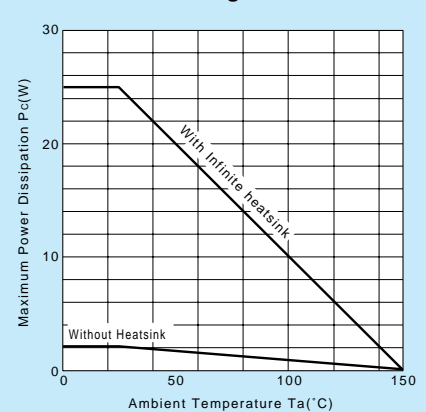
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**





# 2SC4388

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1673)

Application : Audio and General Purpose

## Absolute maximum ratings (Ta=25°C)

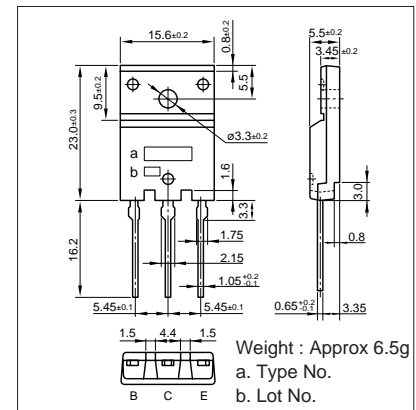
Symbol	2SC4388	Unit
V <sub>CB0</sub>	200	V
V <sub>CEO</sub>	180	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	15	A
I <sub>B</sub>	4	A
P <sub>C</sub>	85(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4388	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =50mA	180min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =0.5A	2.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	300typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

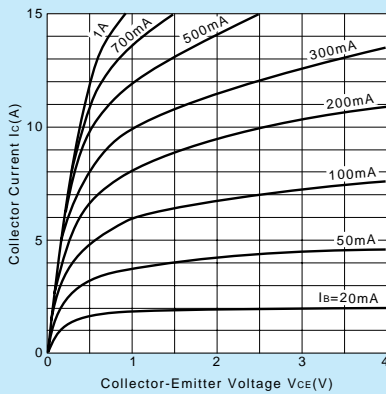
## External Dimensions FM100(TO3PF)



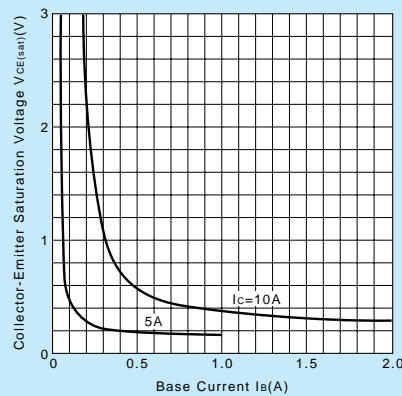
## Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	4	10	10	-5	1	-1	0.5max	1.8max	0.6max

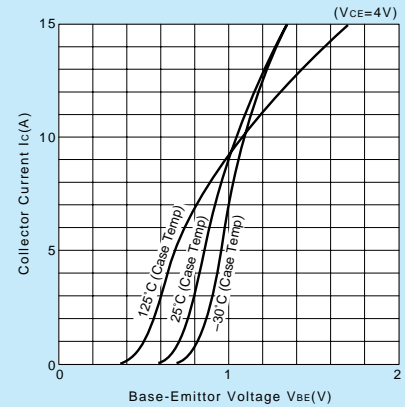
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



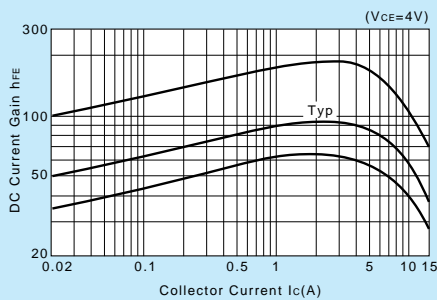
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



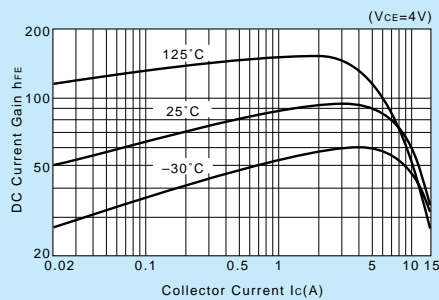
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



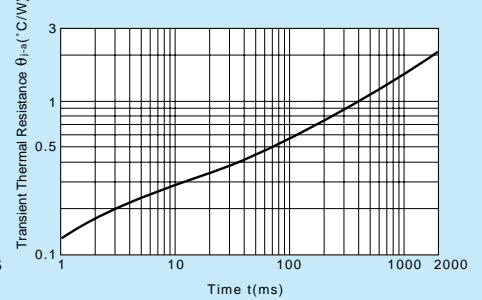
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



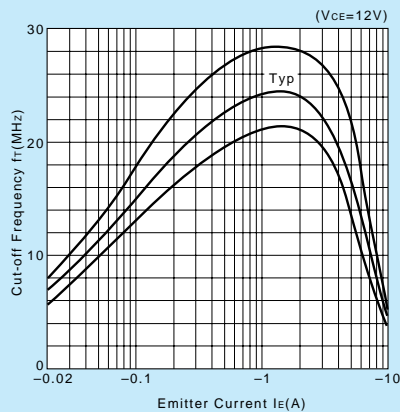
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



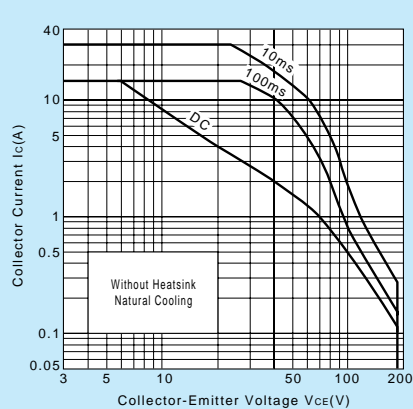
θ<sub>j-a</sub>-t Characteristics



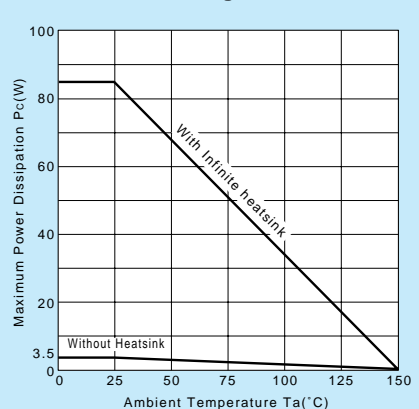
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)



P<sub>C</sub>-T<sub>a</sub> Derating



# 2SC4418

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor) Application : Switching Regulator and General Purpose

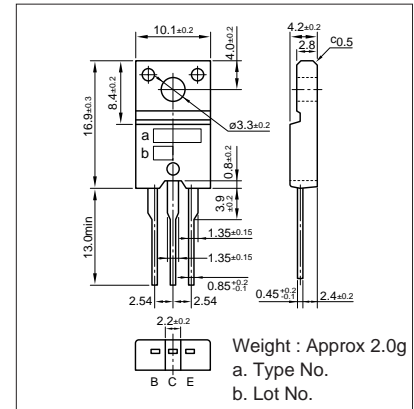
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC4418	Unit
V <sub>CB0</sub>	500	V
V <sub>CE0</sub>	400	V
V <sub>EB0</sub>	10	V
I <sub>c</sub>	5(Pulse10)	A
I <sub>B</sub>	2	A
P <sub>c</sub>	30(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4418	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =10V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>c</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =1.5A	10to30	
V <sub>CE(sat)</sub>	I <sub>c</sub> =1.5A, I <sub>B</sub> =0.3A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =1.5A, I <sub>B</sub> =0.3A	1.3max	V
f <sub>t</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	20typ	MHZ
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHZ	30typ	pF

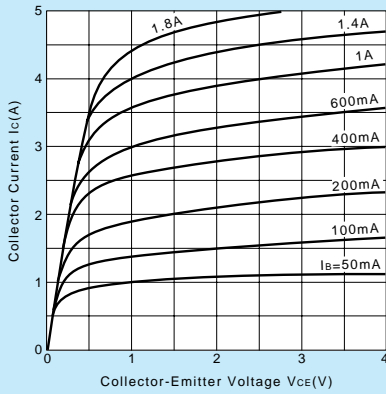
### External Dimensions FM20(TO220F)



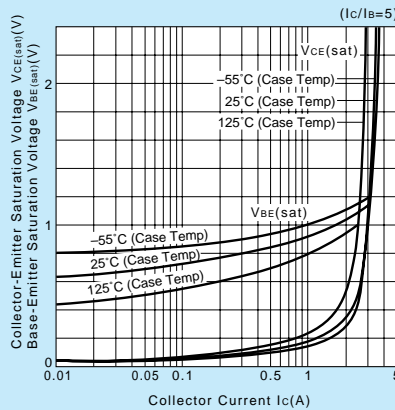
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	133	1.5	10	-5	0.15	-0.3	1max	2.5max	0.5max

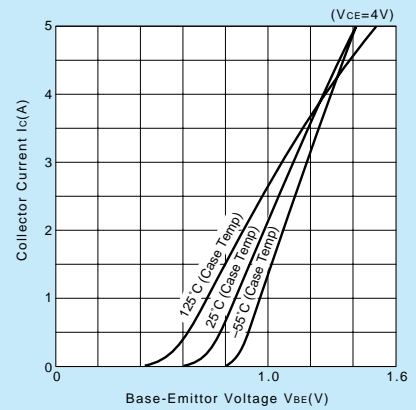
I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)



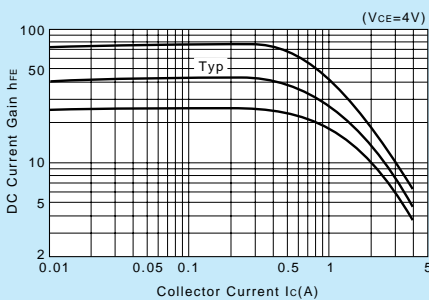
V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>c</sub> Temperature Characteristics (Typical)



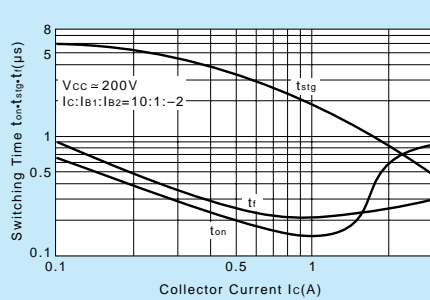
I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



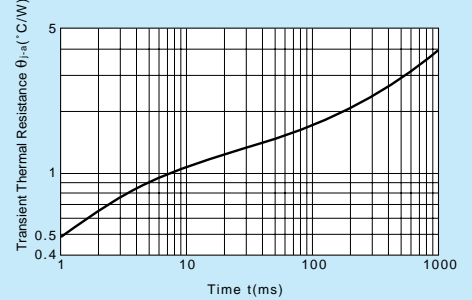
h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)



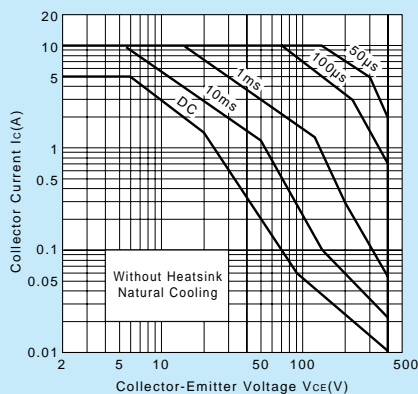
t<sub>on</sub>\*t<sub>stg</sub>\*t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)



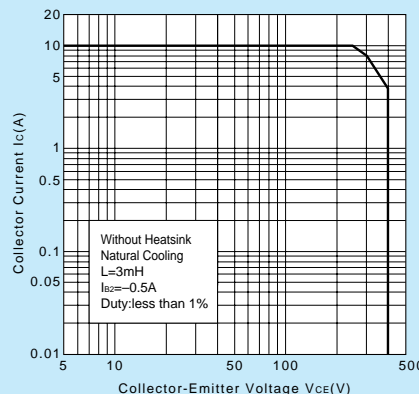
θ<sub>j-a</sub>-t Characteristics



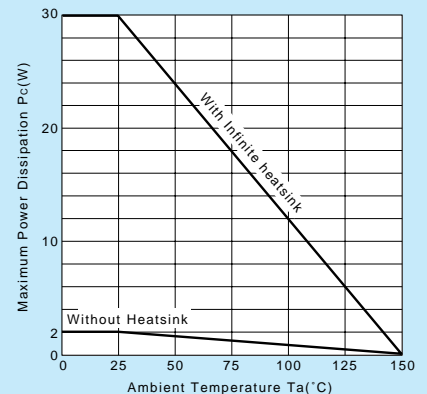
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>c</sub>-T<sub>a</sub> Derating



# 2SC4434

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator, Lighting Inverter, and General Purpose

## Absolute maximum ratings (Ta=25°C)

Symbol	2SC4434	Unit
V <sub>CB0</sub>	500	V
V <sub>CE0</sub>	400	V
V <sub>EB0</sub>	10	V
I <sub>C</sub>	15(Pulse30)	A
I <sub>B</sub>	5	A
P <sub>C</sub>	120(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

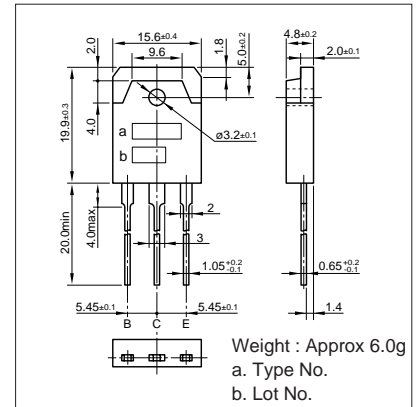
## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4434	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =10V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =8A	10to25	
V <sub>CE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =1.6A	0.7max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =1.6A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1.5A	10typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	135typ	pF

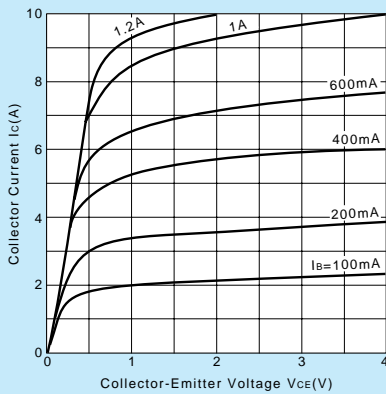
## Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>r</sub> (μs)
200	25	8	10	-5	1.6	-3.2	0.5max	2.0max	0.15max

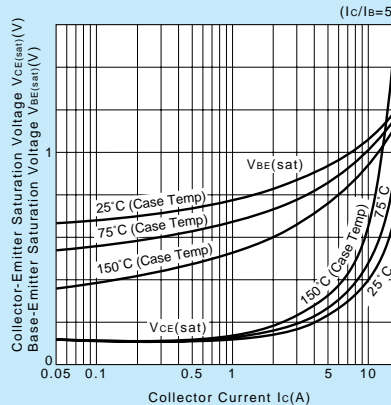
## External Dimensions MT-100(TO3P)



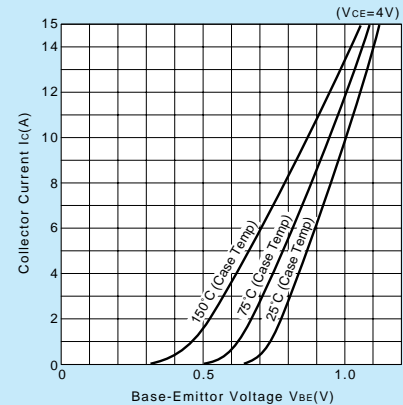
### I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



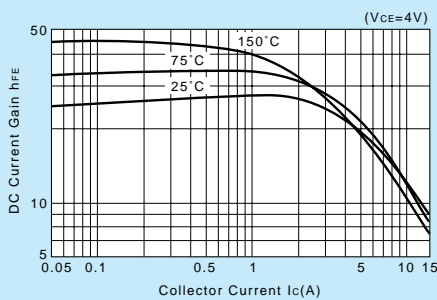
### V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



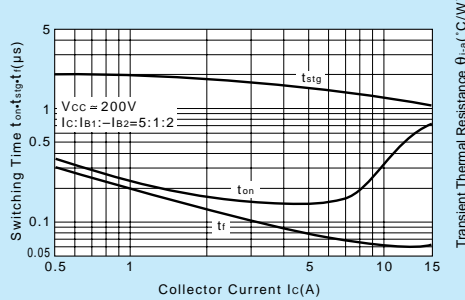
### I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



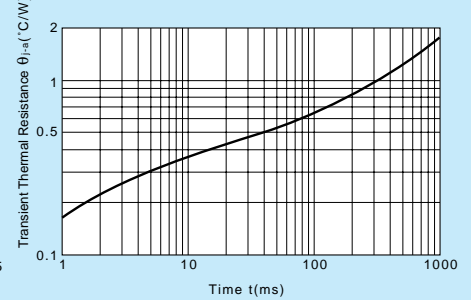
### h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



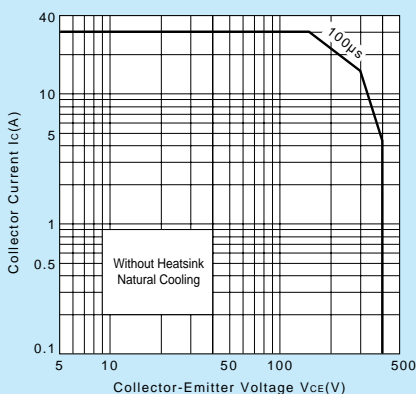
### t<sub>on</sub>•t<sub>stg</sub>•t<sub>r</sub>-I<sub>C</sub> Characteristics (Typical)



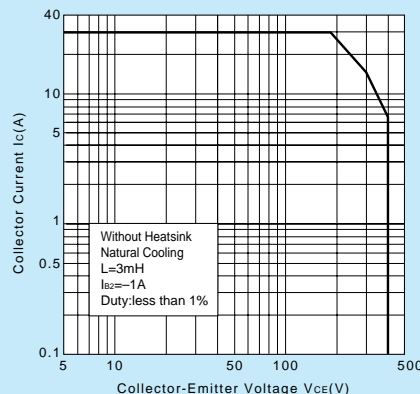
### θ<sub>j-a</sub>-t Characteristics



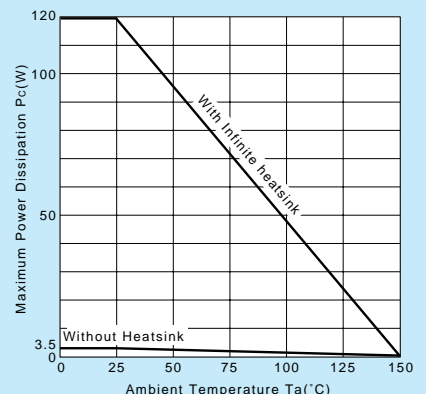
### Safe Operating Area (Single Pulse)



### Reverse Bias Safe Operating Area



### P<sub>C</sub>-T<sub>a</sub> Derating



# 2SC4445

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor) Application : Switching Regulator and General Purpose

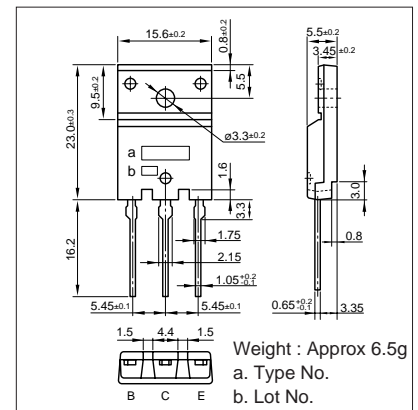
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC4445	Unit
V <sub>CB0</sub>	900	V
V <sub>CE0</sub>	800	V
V <sub>EB0</sub>	7	V
I <sub>c</sub>	3(Pulse6)	A
I <sub>B</sub>	1.5	A
P <sub>c</sub>	60(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4445	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V(BR)CEO	I <sub>c</sub> =10mA	800min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =0.7A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>c</sub> =0.7A, I <sub>B</sub> =0.14A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =0.7A, I <sub>B</sub> =0.14A	1.2max	V
f <sub>t</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	15typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	50typ	pF

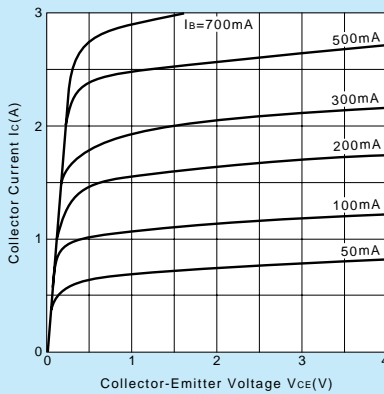
### External Dimensions FM100(TO3PF)



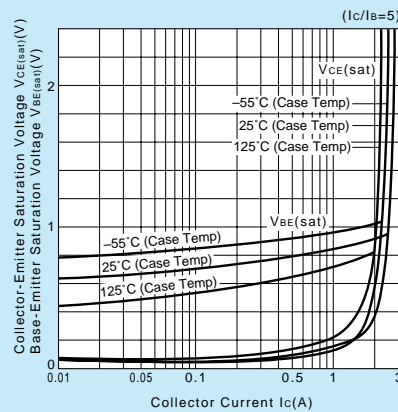
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	357	0.7	10	-5	0.1	-0.35	0.7max	4max	0.7max

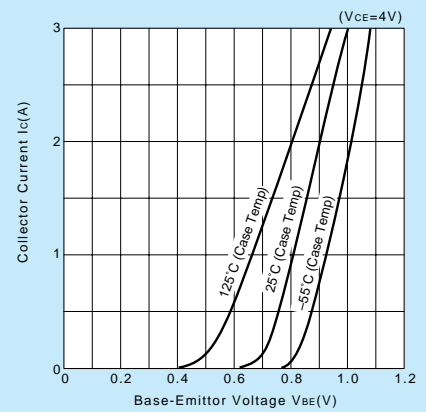
### I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)



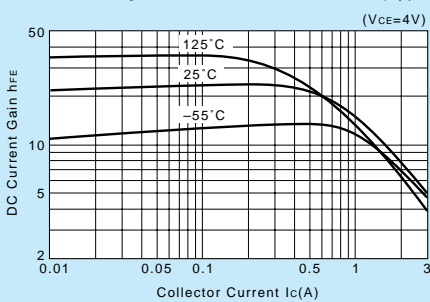
### V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>c</sub> Temperature Characteristics (Typical)



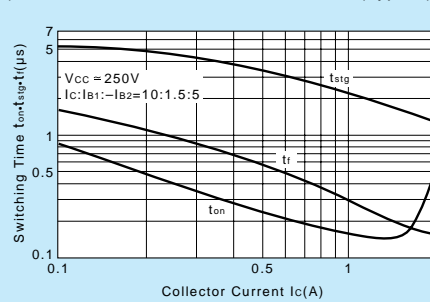
### I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



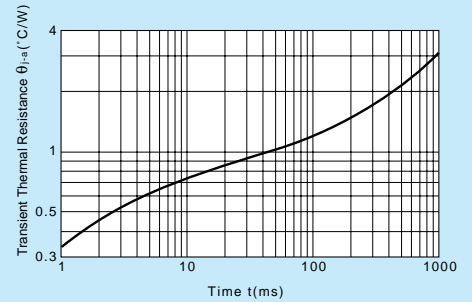
### h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)



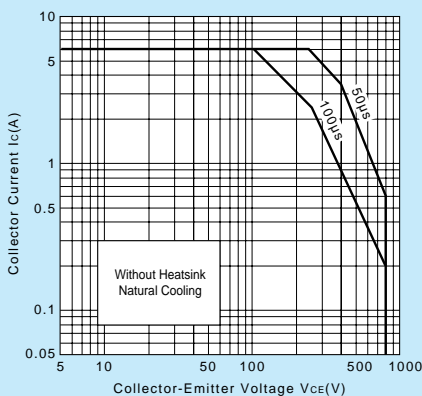
### t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)



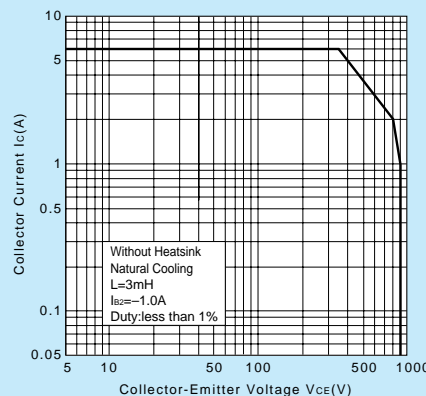
### θ<sub>j-a</sub>-t Characteristics



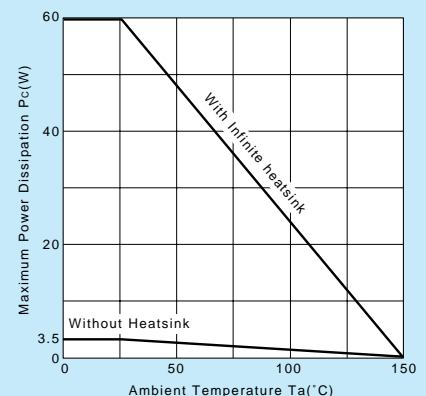
### Safe Operating Area (Single Pulse)



### Reverse Bias Safe Operating Area



### P<sub>c</sub>-T<sub>a</sub> Derating



# 2SC4466

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1693)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

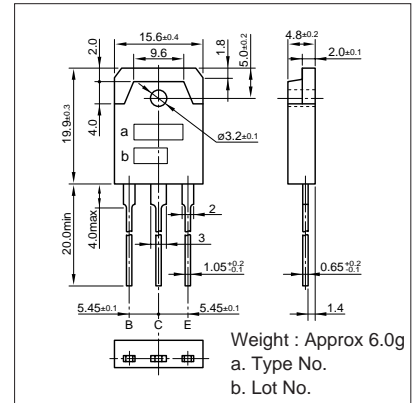
Symbol	2SC4466	Unit
V <sub>CB0</sub>	120	V
V <sub>CEO</sub>	80	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	6	A
I <sub>B</sub>	3	A
P <sub>C</sub>	60(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4466	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =120V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =50mA	80min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =2A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.2A	1.5max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	110typ	pF

\*h<sub>FE</sub> Rank O(50to100), P(70to140), Y(90to180)

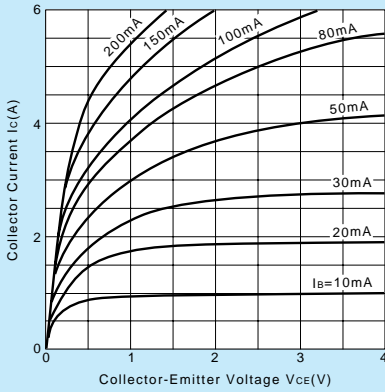
**External Dimensions MT-100(TO3P)**



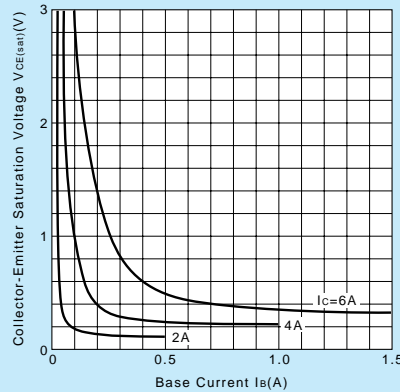
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	10	3	10	-5	0.3	-0.3	0.16typ	2.60typ	0.34typ

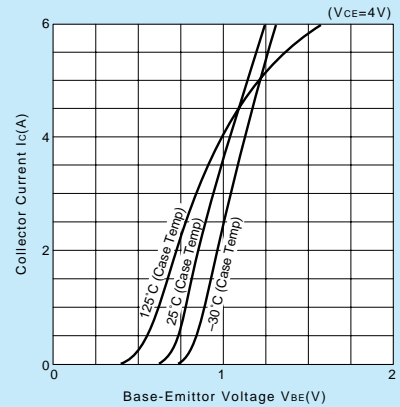
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



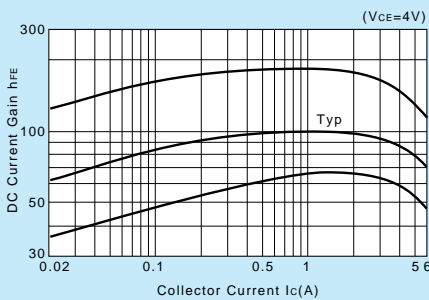
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



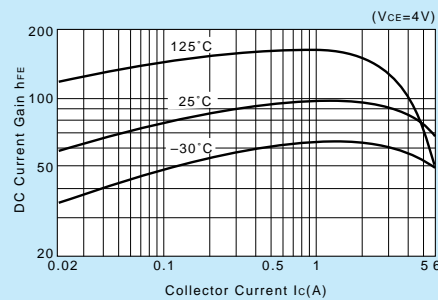
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



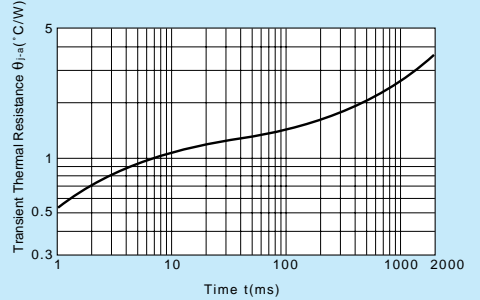
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



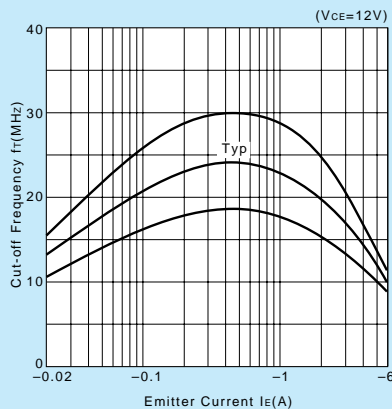
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



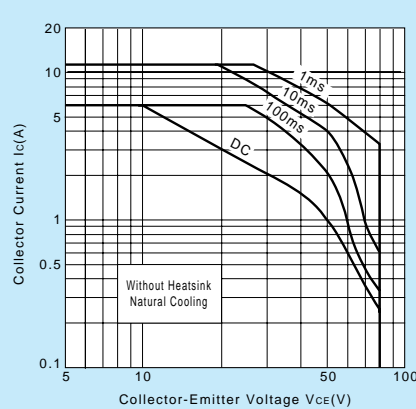
**θ<sub>j-a</sub>-t Characteristics**



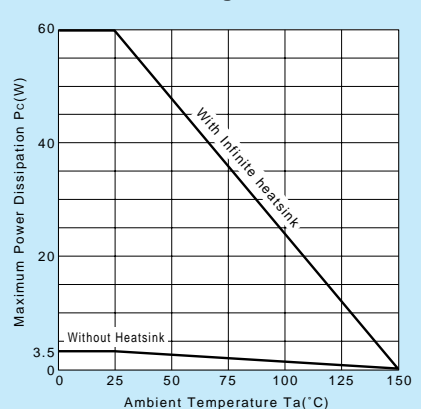
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC4467

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1694)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4467	Unit
V <sub>CB0</sub>	160	V
V <sub>CE0</sub>	120	V
V <sub>EBO</sub>	6	V
I <sub>C</sub>	8	A
I <sub>B</sub>	3	A
P <sub>c</sub>	80(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

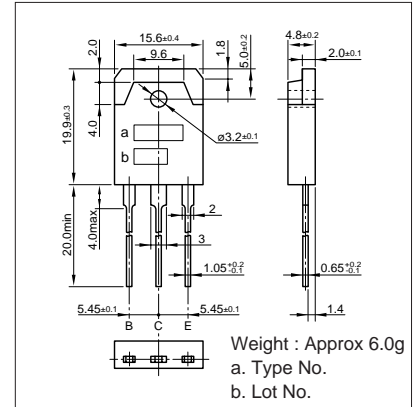
Symbol	Conditions	2SC4467	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =160V	10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =6V	10max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =50mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.3A	1.5max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	200typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50to100), P(70to140), Y(90to180)

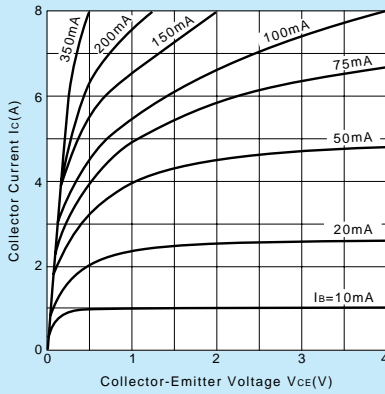
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	10	4	10	-5	0.4	-0.4	0.13typ	3.50typ	0.32typ

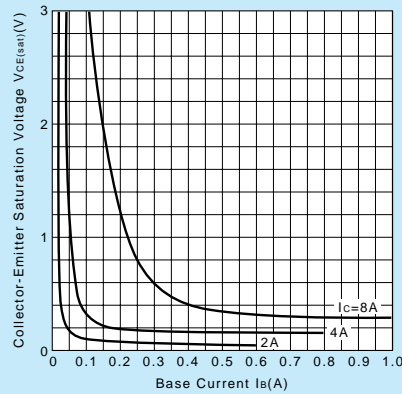
**External Dimensions MT-100(TO3P)**



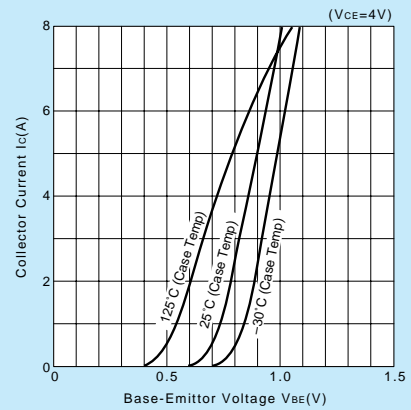
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



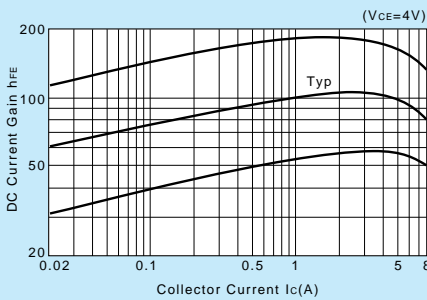
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



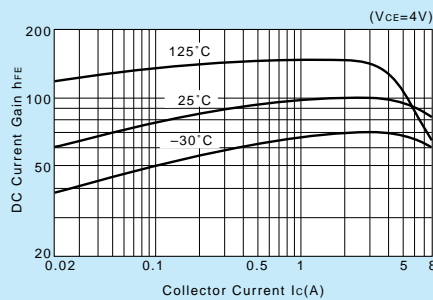
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



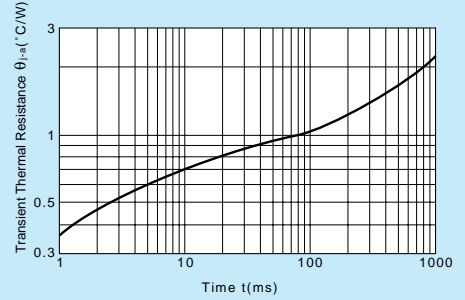
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



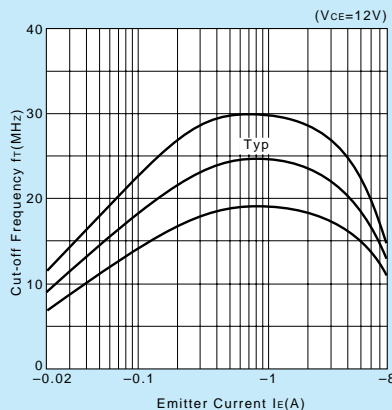
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



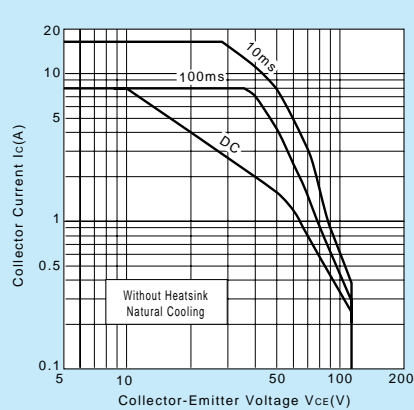
**θ<sub>J-a</sub>-t Characteristics**



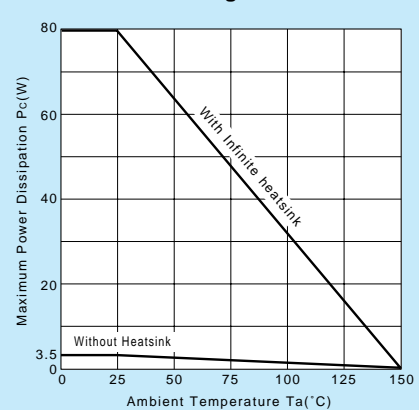
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SC4468

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1695)

Application : Audio and General Purpose

### Absolute maximum ratings (Ta=25°C)

Symbol	2SC4468	Unit
V <sub>CB0</sub>	200	V
V <sub>CEO</sub>	140	V
V <sub>EBO</sub>	6	V
I <sub>C</sub>	10	A
I <sub>B</sub>	4	A
P <sub>C</sub>	100(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

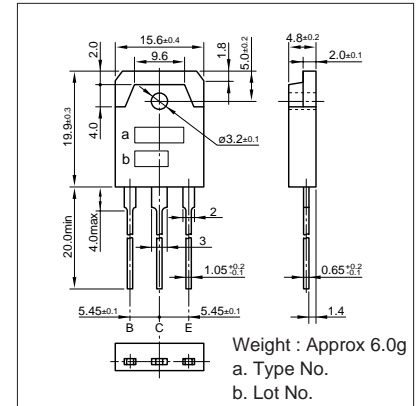
Symbol	Conditions	2SC4468	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =6V	10max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =50mA	140min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =0.5A	0.5max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	250typ	pF

\*h<sub>FE</sub> Rank O(50to100), P(70to140), Y(90to180)

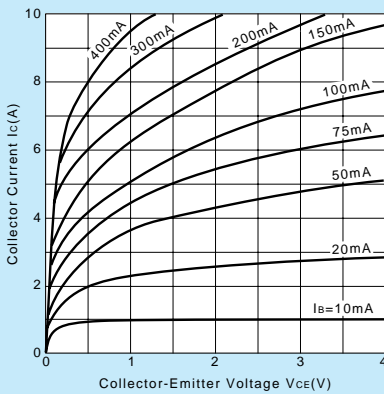
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
60	12	5	10	-5	0.5	-0.5	0.24typ	4.32typ	0.40typ

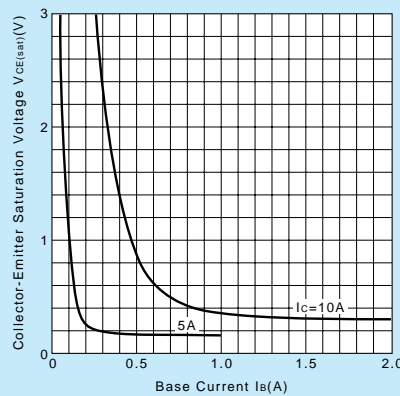
### External Dimensions MT-100(TO3P)



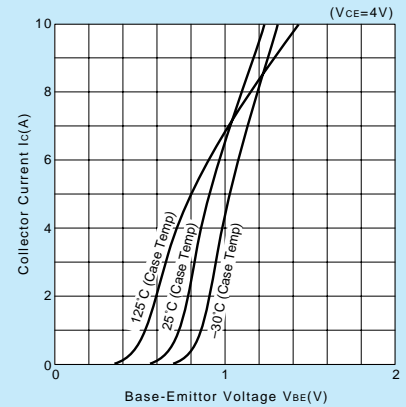
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



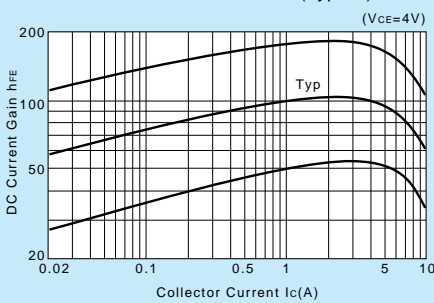
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



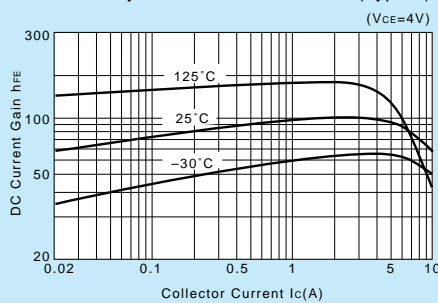
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



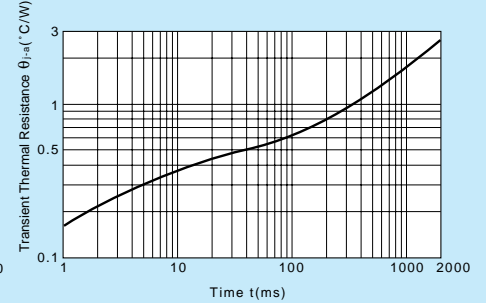
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



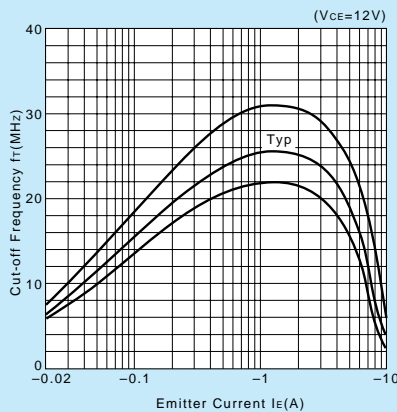
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



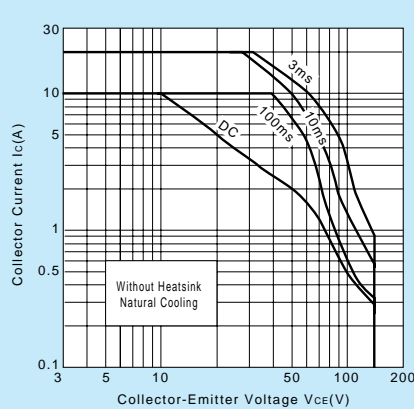
θ<sub>j-a</sub>-t Characteristics



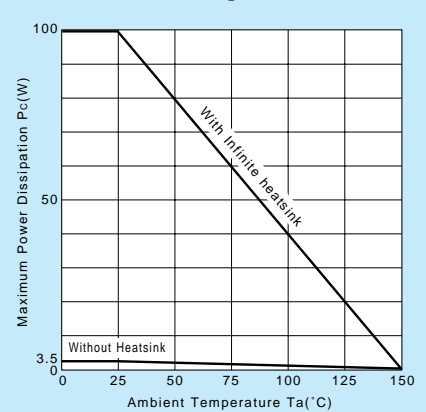
f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)



P<sub>C</sub>-T<sub>a</sub> Derating





High  $h_{FE}$   
Low  $V_{CE(sat)}$

# 2SC4495

Silicon NPN Triple Diffused Planar Transistor

Application : Audio Temperature Compensation and General Purpose

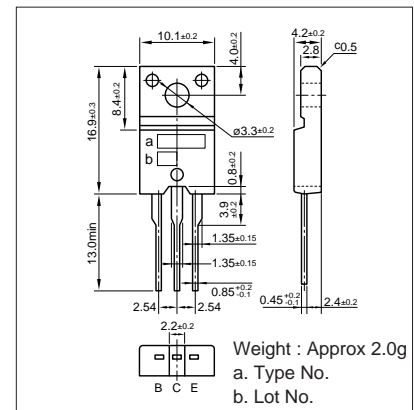
**Absolute maximum ratings** ( $T_a=25^\circ\text{C}$ )

Symbol	2SC4495	Unit
$V_{CBO}$	80	V
$V_{CEO}$	50	V
$V_{EBO}$	6	V
$I_C$	3	A
$I_B$	1	A
$P_c$	25( $T_c=25^\circ\text{C}$ )	W
$T_j$	150	$^\circ\text{C}$
$T_{stg}$	-55 to +150	$^\circ\text{C}$

**Electrical Characteristics** ( $T_a=25^\circ\text{C}$ )

Symbol	Conditions	2SC4495	Unit
$I_{CBO}$	$V_{CB}=80\text{V}$	10max	$\mu\text{A}$
$I_{EBO}$	$V_{EB}=6\text{V}$	10max	$\mu\text{A}$
$V_{(BR)CEO}$	$I_C=25\text{mA}$	50min	V
$h_{FE}$	$V_{CE}=4\text{V}, I_C=0.5\text{A}$	500min	
$V_{CE(sat)}$	$I_C=1\text{A}, I_B=20\text{mA}$	0.5max	V
$f_r$	$V_{CE}=12\text{V}, I_E=-0.1\text{A}$	40typ	MHz
COB	$V_{CB}=10\text{V}, f=1\text{MHz}$	30typ	pF

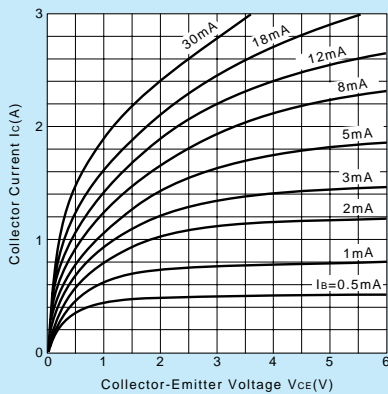
**External Dimensions FM20(TO220F)**



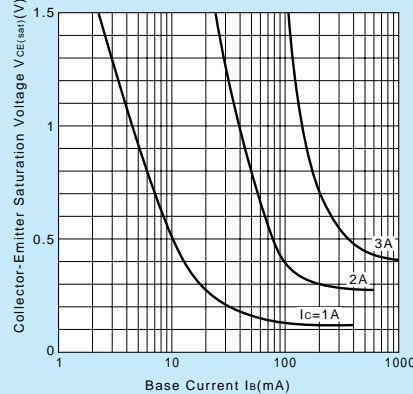
**Typical Switching Characteristics (Common Emitter)**

$V_{CC}$ (V)	$R_L$ ( $\Omega$ )	$I_C$ (A)	$V_{BB1}$ (V)	$V_{BB2}$ (V)	$I_{B1}$ (mA)	$I_{B2}$ (mA)	$t_{on}$ ( $\mu\text{s}$ )	$t_{stg}$ ( $\mu\text{s}$ )	$t_f$ ( $\mu\text{s}$ )
20	20	1	10	-5	15	-30	0.45typ	1.60typ	0.85typ

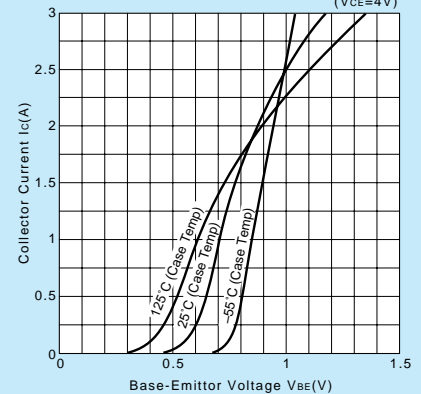
$I_C-V_{CE}$  Characteristics (Typical)



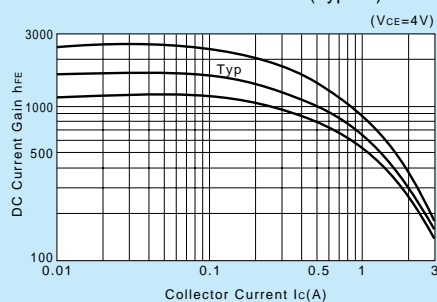
$V_{CE(sat)}-I_B$  Characteristics (Typical)



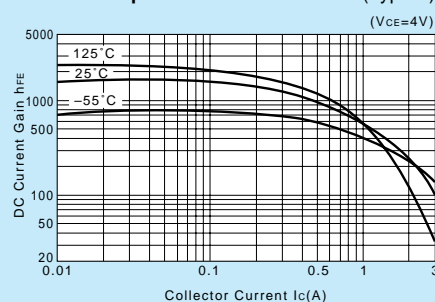
$I_C-V_{BE}$  Temperature Characteristics (Typical)



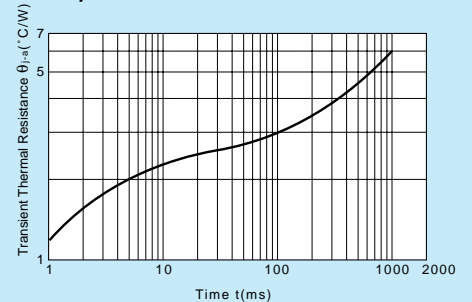
$h_{FE}-I_C$  Characteristics (Typical)



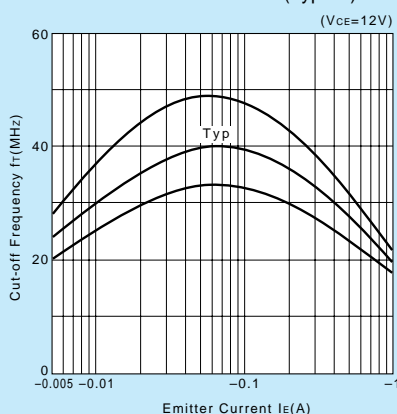
$h_{FE}-I_C$  Temperature Characteristics (Typical)



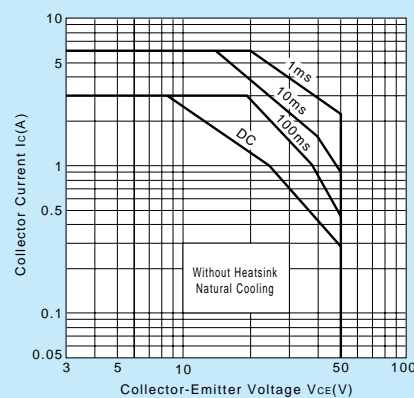
$\theta_{j-a}-t$  Characteristics



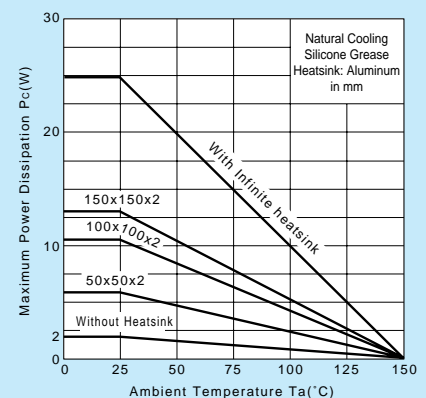
$f_T-I_E$  Characteristics (Typical)



Safe Operating Area (Single Pulse)



$P_c-T_a$  Derating



# 2SC4511

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1725)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

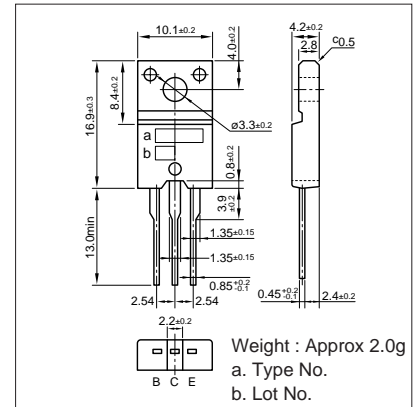
Symbol	2SC4511	Unit
V <sub>CB0</sub>	120	V
V <sub>CEO</sub>	80	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	6	A
I <sub>B</sub>	3	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4511	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =120V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	μA
V(BR)CEO	I <sub>C</sub> =25mA	80min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =2A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.2A	0.5max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	110typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50to100), P(70to140), Y(90to180)

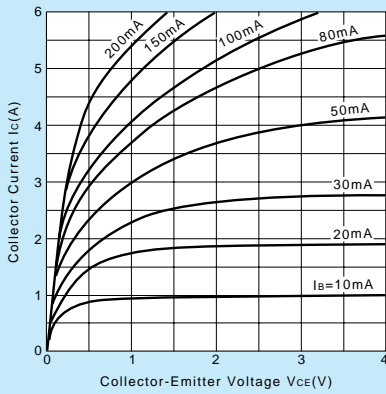
**External Dimensions FM20(TO220F)**



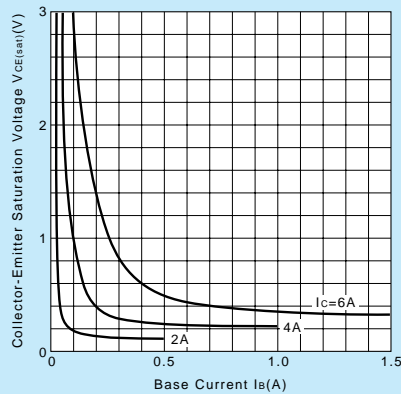
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	10	3	10	-5	0.3	-0.3	0.16typ	2.60typ	0.34typ

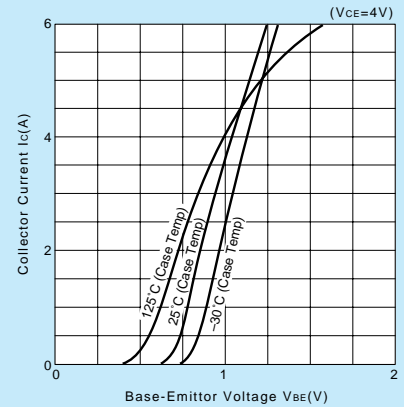
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



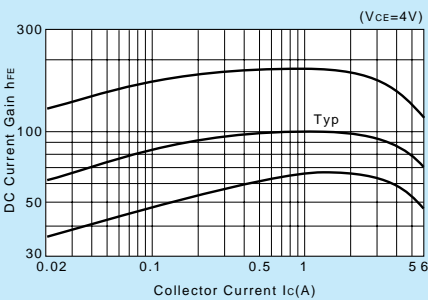
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



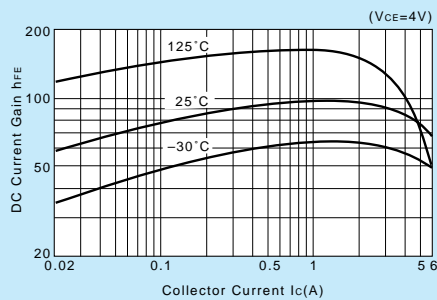
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



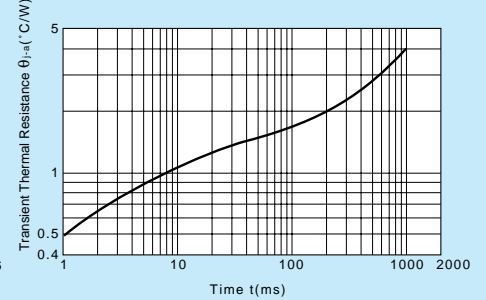
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



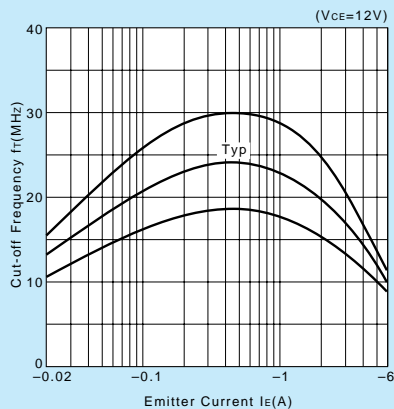
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



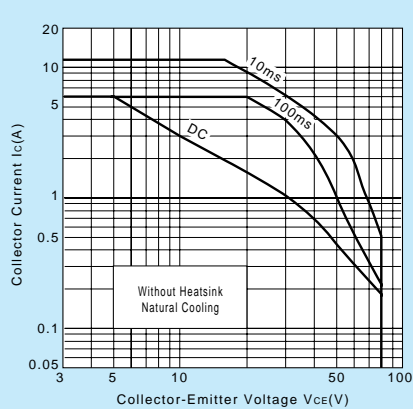
**θ<sub>j-a</sub>-t Characteristics**



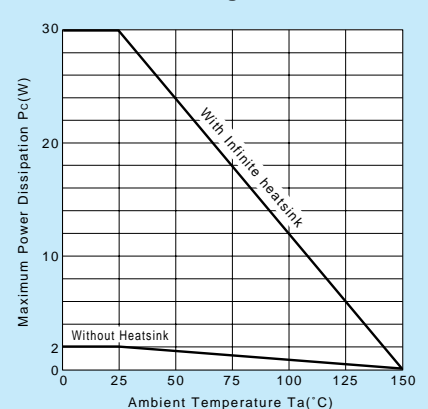
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC4512

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1726)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

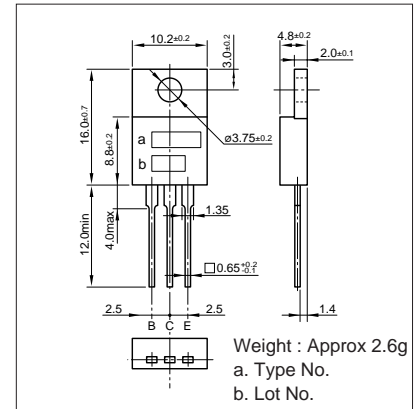
Symbol	2SC4512	Unit
VcBO	120	V
VCEO	80	V
VEBO	6	V
Ic	6	A
IB	3	A
Pc	50(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4512	Unit
ICBO	V <sub>CB</sub> =120V	10max	μA
IEBO	V <sub>EB</sub> =6V	10max	μA
V(BR)CEO	I <sub>C</sub> =25mA	80min	V
hFE	V <sub>CE</sub> =4V, I <sub>C</sub> =2A	50min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =0.2A	0.5max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	110typ	pF

\*hFE Rank  $\bar{O}$ (50to100), P(70to140), Y(90to180)

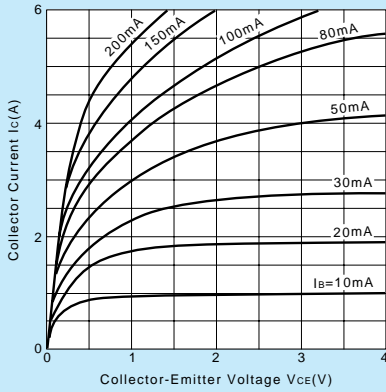
**External Dimensions MT-25(TO220)**



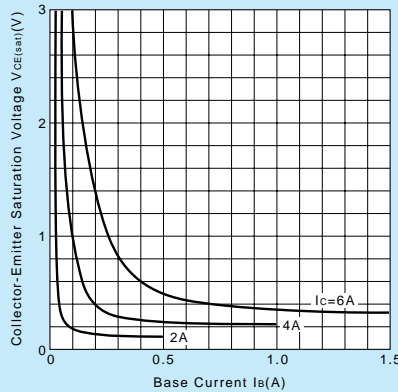
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	10	3	10	-5	0.3	-0.3	0.16typ	2.60typ	0.34typ

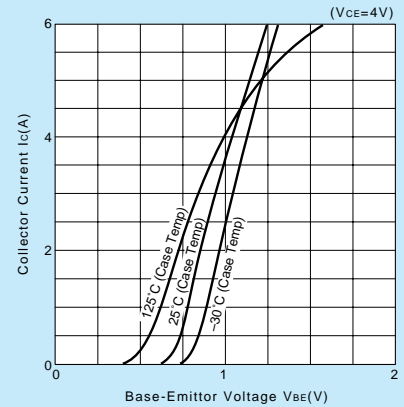
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



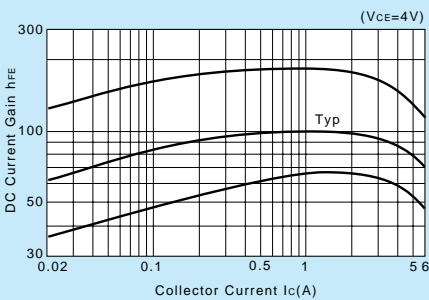
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



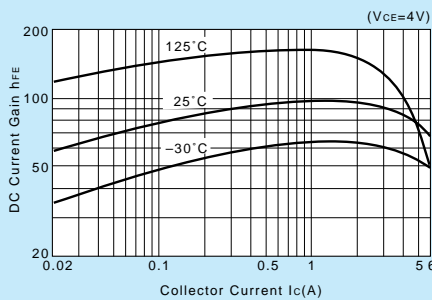
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



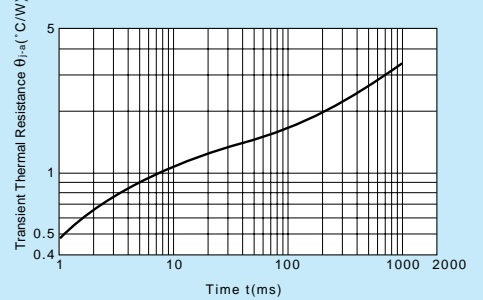
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



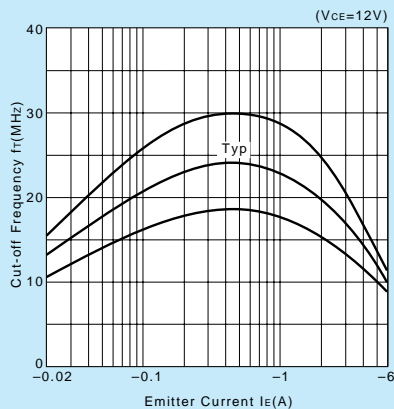
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



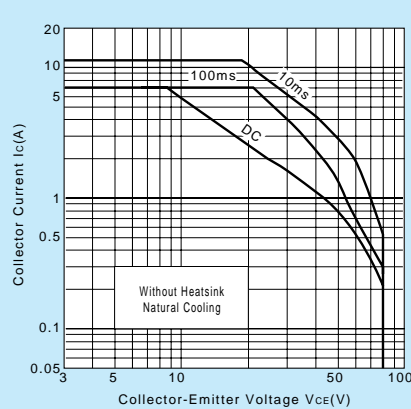
**θ<sub>j-a</sub>-t Characteristics**



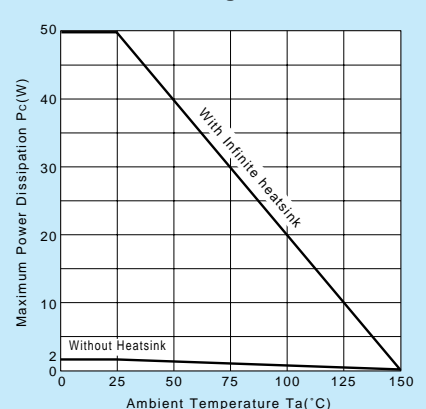
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SC4517/4517A

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4517	2SC4517A	Unit
V <sub>CB0</sub>	900	1000	V
V <sub>CE0</sub>	550		V
V <sub>E0</sub>	7		V
I <sub>c</sub>	3(Pulse6)		A
I <sub>B</sub>	1.5		A
P <sub>c</sub>	30(T <sub>c</sub> = 25°C)		W
T <sub>j</sub>	150		°C
T <sub>stg</sub>	-55 to +150		°C

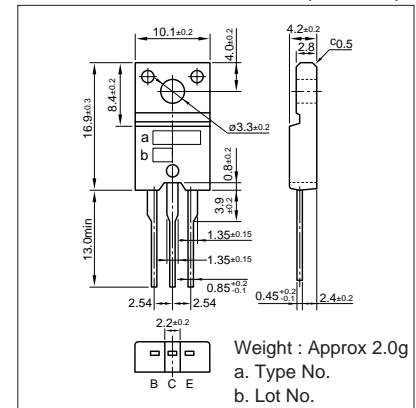
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4517	2SC4517A	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max		μA
I <sub>E0</sub>	V <sub>EB</sub> =7V	100max		μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =10mA	550min		V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =1A	10 to 30		
V <sub>CE(sat)</sub>	I <sub>c</sub> =1A, I <sub>B</sub> =0.2A	0.5max		V
V <sub>BE(sat)</sub>	I <sub>c</sub> =1A, I <sub>B</sub> =0.2A	1.2max		V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.25A	6typ		MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	35typ		pF

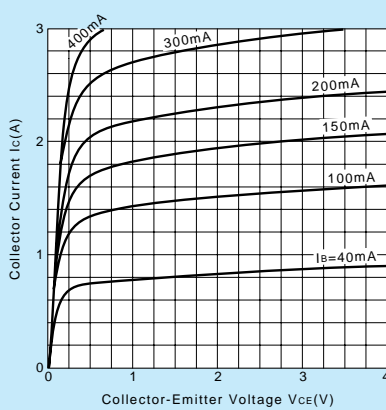
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	250	1	10	-5	0.15	-0.45	0.7max	4max	0.5max

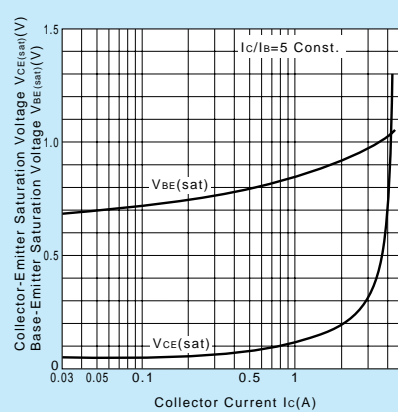
**External Dimensions FM20(TO220F)**



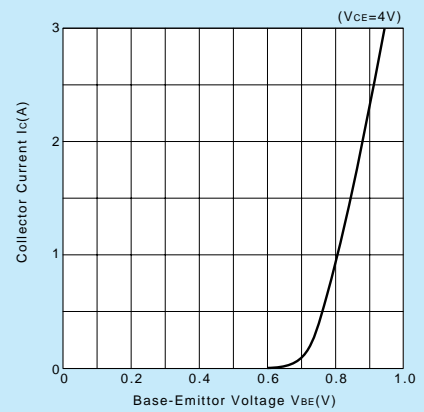
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



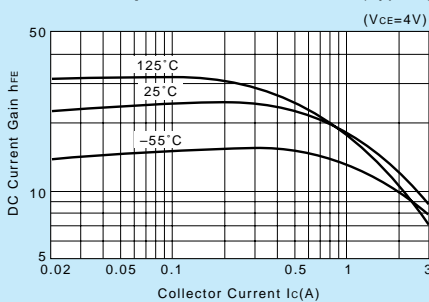
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



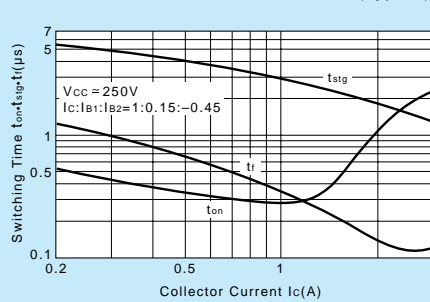
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



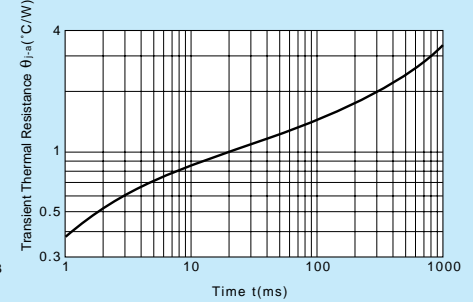
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



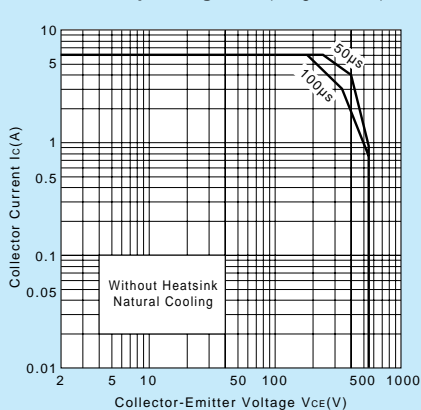
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)**



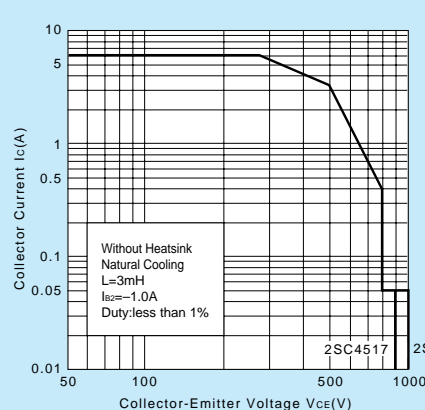
**θ<sub>j-a</sub>-t Characteristics**



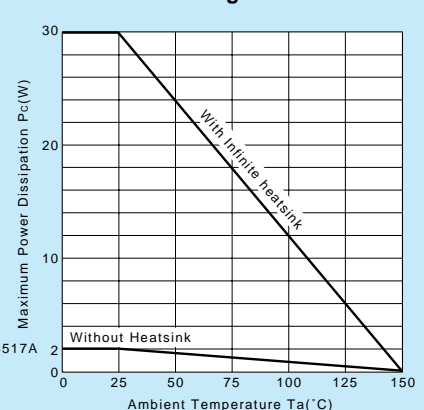
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SC4518/4518A

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor) Application : Switching Regulator, Lighting Inverter and General Purpose

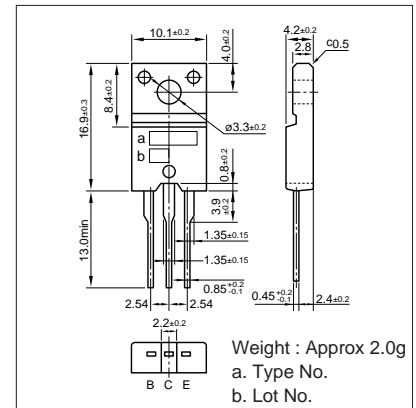
## Absolute maximum ratings (Ta=25°C)

Symbol	2SC4518	2SC4518A	Unit
VCBO	900	1000	V
VCEO	550		V
VEBO	7		V
Ic	5(Pulse10)		A
Ib	2.5		A
Pc	35(Tc=25°C)		W
Tj	150		°C
Tstg	-55 to +150		°C

## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4518	2SC4518A	Unit
ICBO	V <sub>CB</sub> =800V	100max		μA
IEBO	V <sub>EB</sub> =7V	100max		μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =10mA	550min		V
hFE	V <sub>CE</sub> =4V, I <sub>c</sub> =1.8A	10 to 25		
V <sub>CE(sat)</sub>	I <sub>c</sub> =1.8A, I <sub>B</sub> =0.36A	0.5max		V
V <sub>BE(sat)</sub>	I <sub>c</sub> =1.8A, I <sub>B</sub> =0.36A	1.2max		V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.35A	6typ		MHz
COB	V <sub>CB</sub> =10V, f=1MHz	50typ		pF

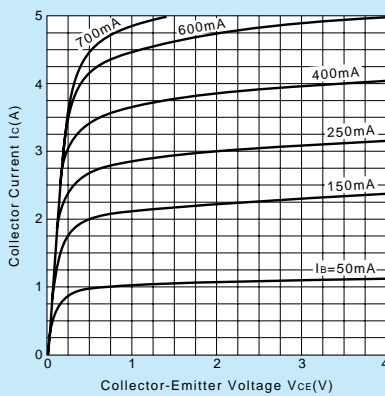
## External Dimensions FM20(TO220F)



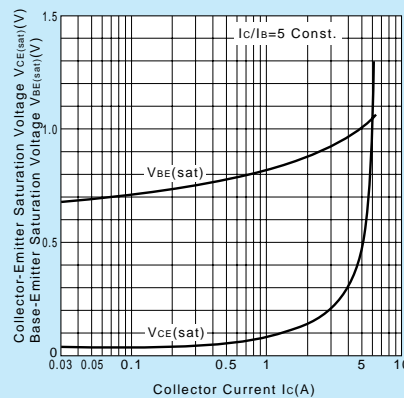
## Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	139	1.8	10	-5	0.27	-0.9	0.7max	4max	0.5max

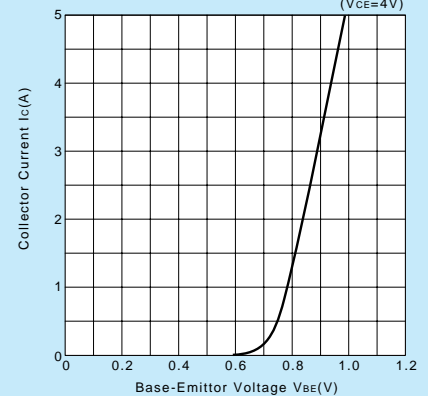
## I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)



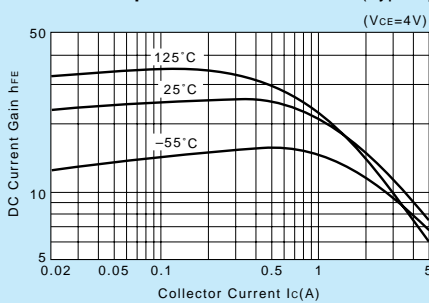
## V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>c</sub> Temperature Characteristics (Typical)



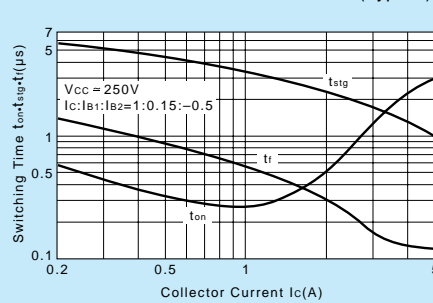
## I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



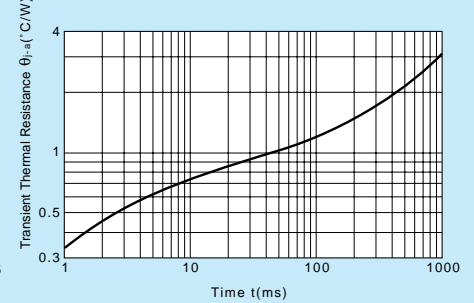
## hFE-I<sub>c</sub> Temperature Characteristics (Typical)



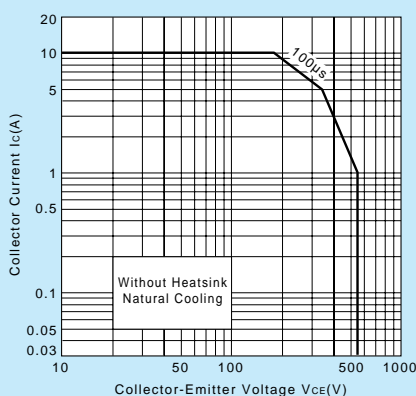
## t<sub>on</sub>•t<sub>stg</sub>•t<sub>r</sub>-I<sub>c</sub> Characteristics (Typical)



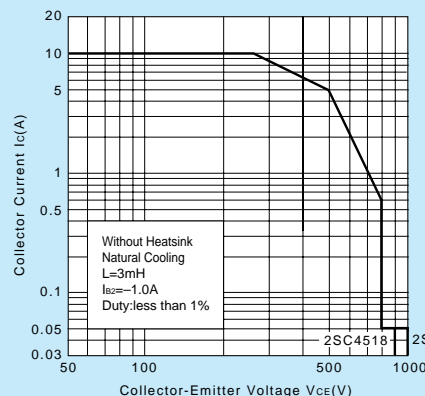
## θ<sub>j-a</sub>-t Characteristics



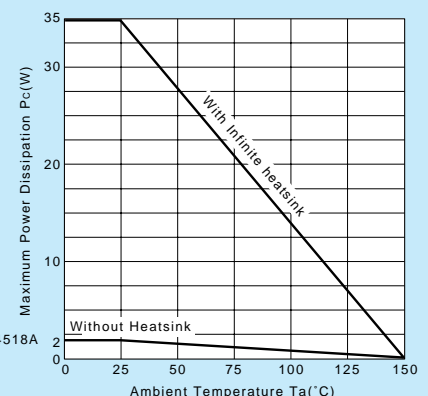
## Safe Operating Area (Single Pulse)



## Reverse Bias Safe Operating Area



## P<sub>c</sub>-T<sub>a</sub> Derating



# 2SC4546

Silicon NPN Triple Diffused Planar Transistor (High Voltage and Ultra-high Speed Switching Transistor) Application : Switching Regulator, Lighting Inverter and General Purpose

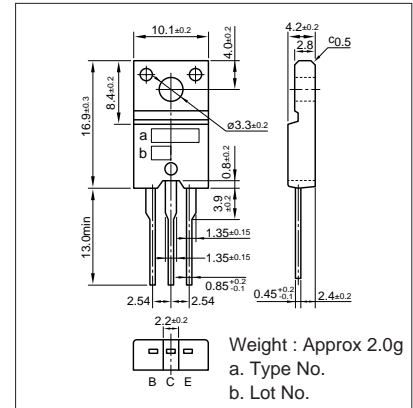
## Absolute maximum ratings (Ta=25°C)

Symbol	2SC4546	Unit
V <sub>CB0</sub>	600	V
V <sub>CEO</sub>	400	V
V <sub>EB0</sub>	7	V
I <sub>C</sub>	7(Pulse14)	A
I <sub>B</sub>	2	A
P <sub>C</sub>	30(Tc=25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4546	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =600V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	10to25	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	0.7max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.6A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	10typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	55typ	pF

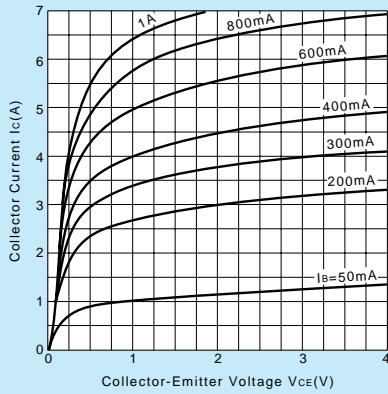
## External Dimensions FM20(TO220F)



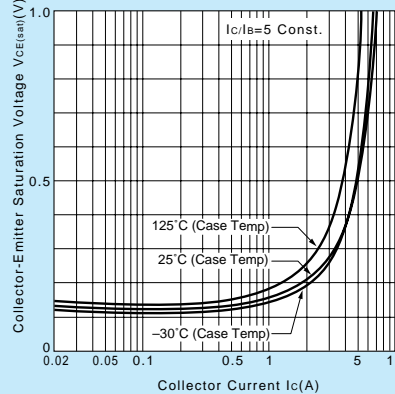
## Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	67	3	10	-5	0.6	-1.2	0.5max	2max	0.15max

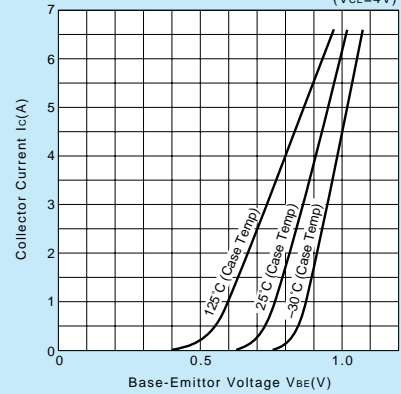
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



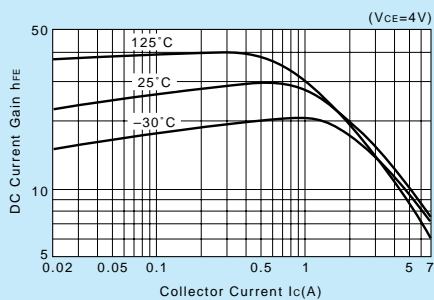
V<sub>CE(sat)</sub>-I<sub>C</sub> Characteristics (Typical)



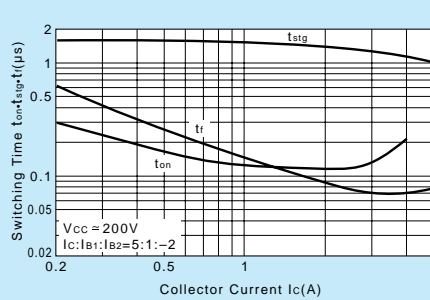
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



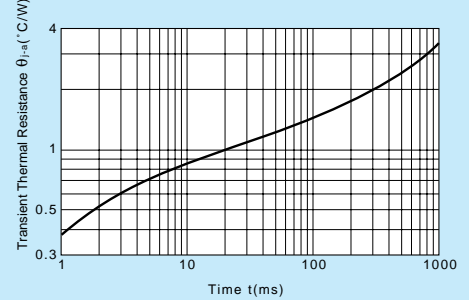
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



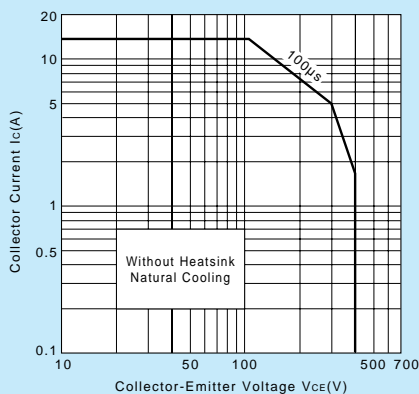
t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)



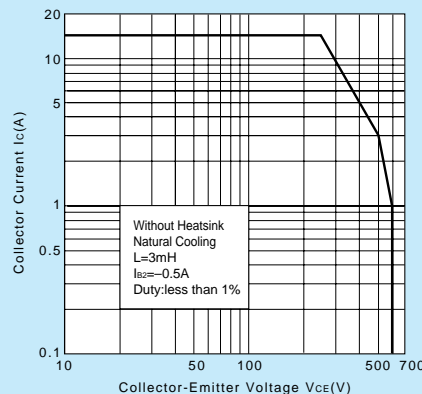
θ<sub>j-a</sub>-t Characteristics



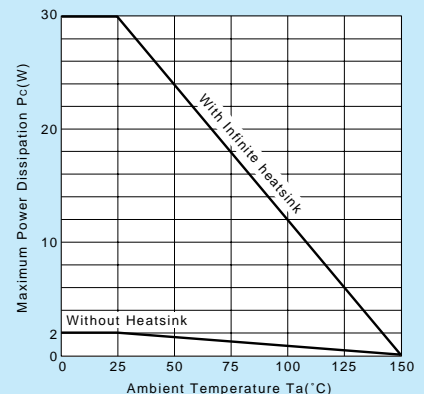
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>C</sub>-T<sub>a</sub> Derating



# 2SC4557

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4557	Unit
Vcbo	900	V
Vceo	550	V
Vebo	7	V
Ic	10(Pulse20)	A
Ib	5	A
Pc	80(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

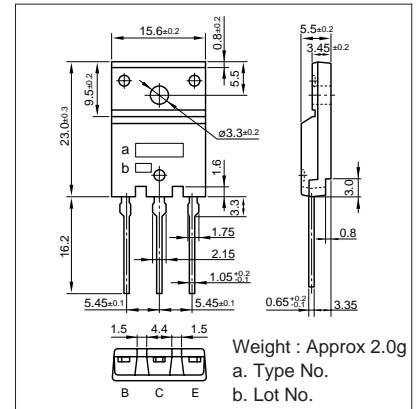
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4557	Unit
Icbo	Vcb=800V	100max	μA
Iebo	VEB=7V	100max	μA
V(BR)CEO	Ic=10mA	550min	V
hFE	VCE=4V, Ic=5A	10 to 28	
VCE(sat)	Ic=5A, Ib=1A	0.5max	V
VBE(sat)	Ic=5A, Ib=1A	1.2max	V
fr	VCE=12V, IE=-1A	6typ	MHz
COB	Vcb=10V, f=1MHz	105typ	pF

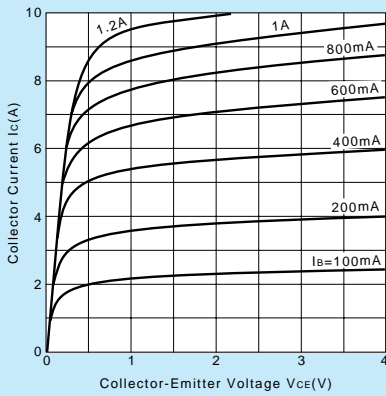
**Typical Switching Characteristics (Common Emitter)**

Vcc (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	Ib1 (A)	Ib2 (A)	ton (μs)	tstg (μs)	tr (μs)
250	50	5	10	-5	0.75	-1.5	1max	5max	0.5max

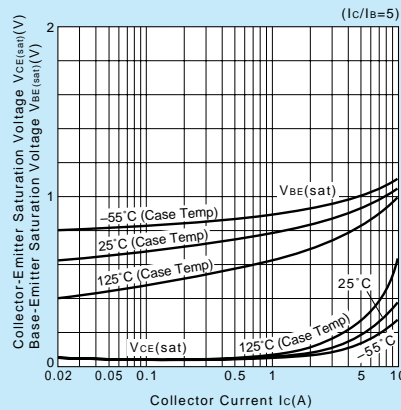
**External Dimensions FM100(TO3PF)**



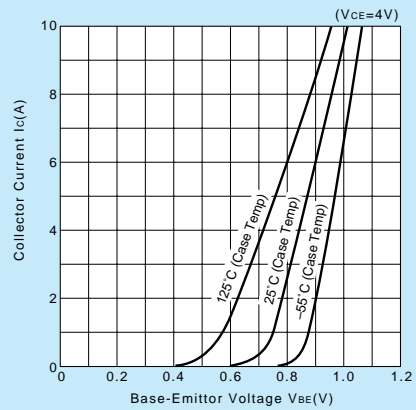
**Ic-Vce Characteristics (Typical)**



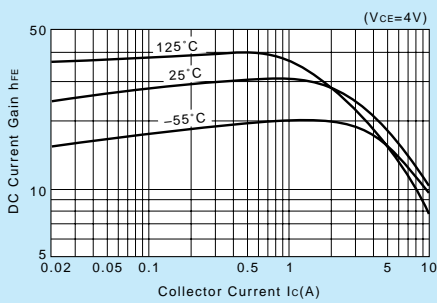
**Vce(sat), Vbe(sat)-Ic Temperature Characteristics (Typical)**



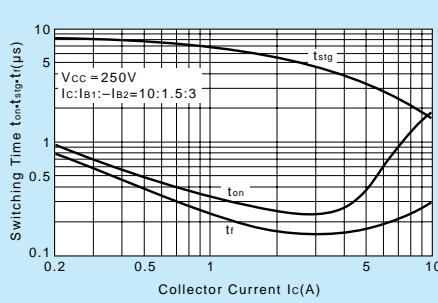
**Ic-Vbe Temperature Characteristics (Typical)**



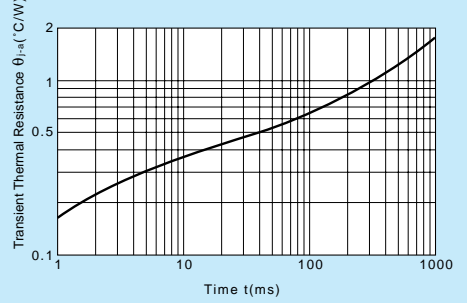
**hFE-Ic Temperature Characteristics (Typical)**



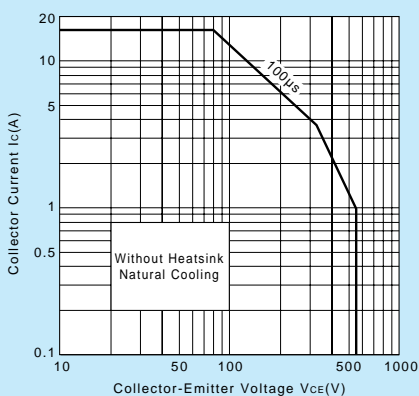
**ton•tstg•tr-Ic Characteristics (Typical)**



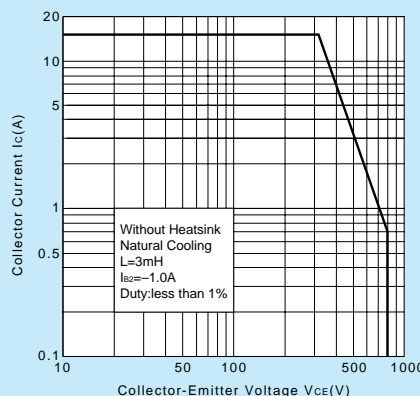
**θj-a-t Characteristics**



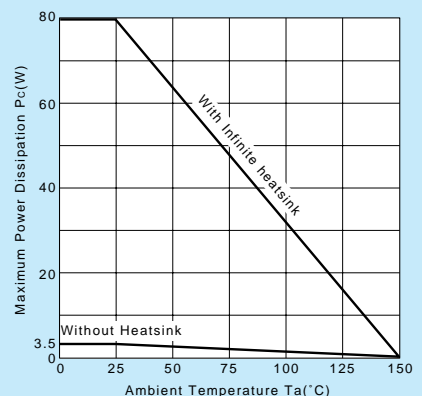
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**Pc-Ta Derating**





# 2SC4662

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

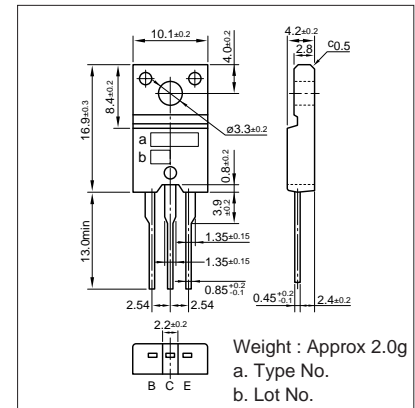
## Absolute maximum ratings (Ta=25°C)

Symbol	2SC4662	Unit
V <sub>CB0</sub>	500	V
V <sub>CEO</sub>	400	V
V <sub>EBO</sub>	10	V
I <sub>C</sub>	5(Pulse10)	A
I <sub>B</sub>	2	A
P <sub>C</sub>	30(Tc=25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC4662	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =10V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =1.5A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =1.5A, I <sub>B</sub> =0.3A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =1.5A, I <sub>B</sub> =0.3A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	20typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	30typ	pF

## External Dimensions FM20(TO220F)



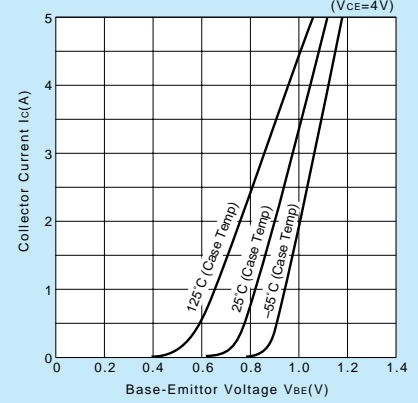
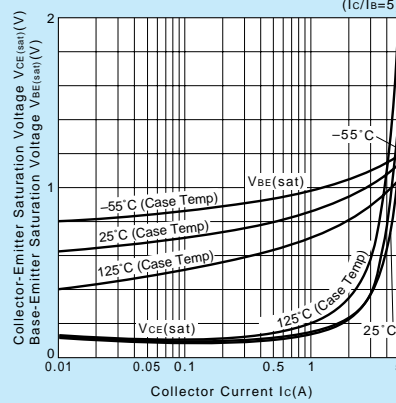
## Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>r</sub> (μs)
200	133	1.5	10	-5	0.15	-0.3	1max	2.5max	0.5max

## I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)

## V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)

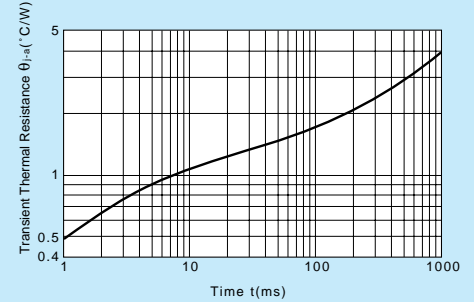
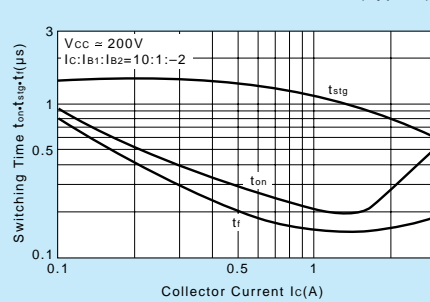
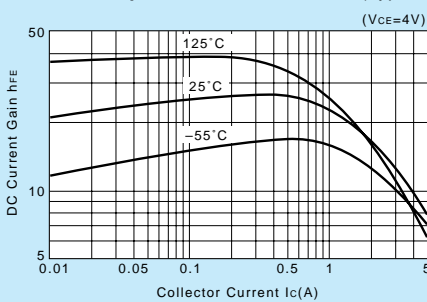
## I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



## h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)

## t<sub>on</sub>•t<sub>stg</sub>•t<sub>r</sub>-I<sub>C</sub> Characteristics (Typical)

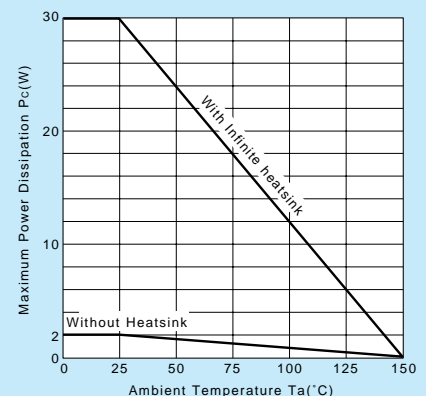
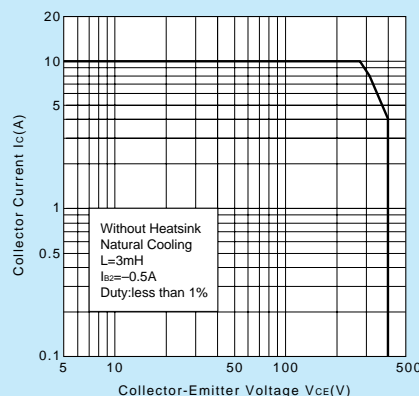
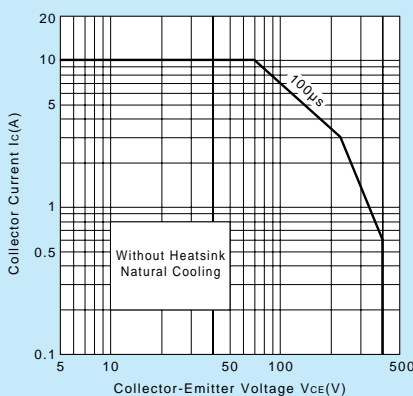
## θ<sub>j-a</sub>-t Characteristics



## Safe Operating Area (Single Pulse)

## Reverse Bias Safe Operating Area

## P<sub>C</sub>-T<sub>a</sub> Derating



# 2SC4706

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4706	Unit
V <sub>CB0</sub>	900	V
V <sub>CE0</sub>	600	V
V <sub>EB0</sub>	7	V
I <sub>C</sub>	14(Pulse28)	A
I <sub>B</sub>	7	A
P <sub>C</sub>	130(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55to+150	°C

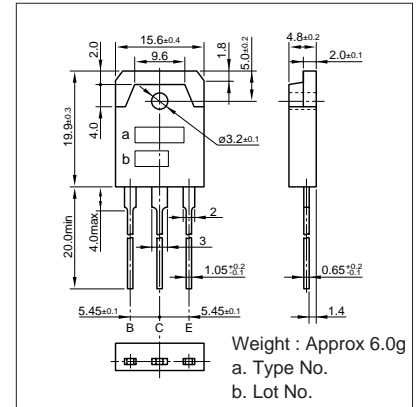
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4706	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =10mA	600min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =7A	10to25	
V <sub>CE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =1.4A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =1.4A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1.5A	6typ	MHZ
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHZ	160typ	pF

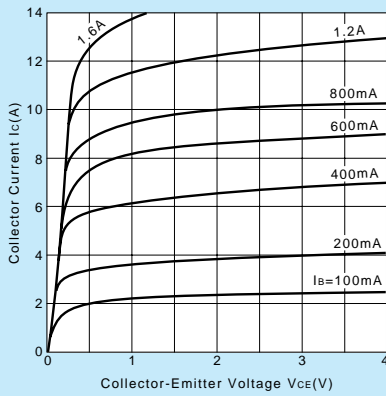
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	35.7	7	10	-5	1.05	-3.5	1max	5max	0.7max

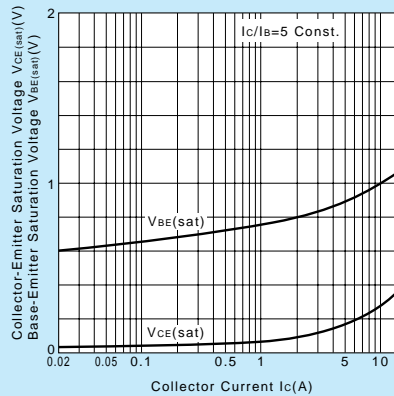
**External Dimensions MT-100(TO3P)**



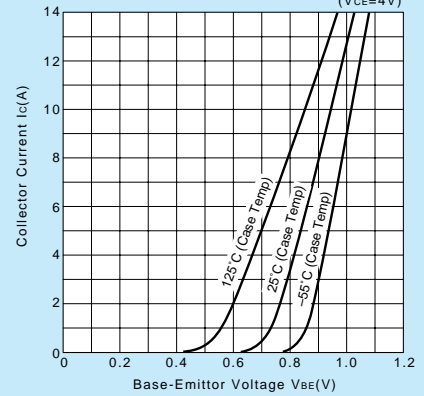
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



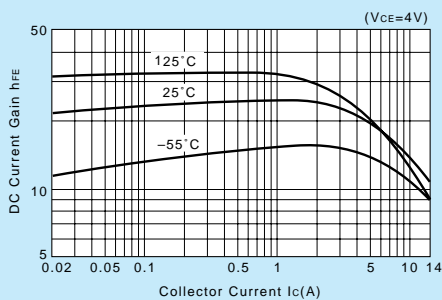
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



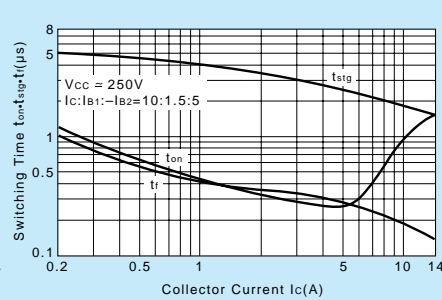
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**

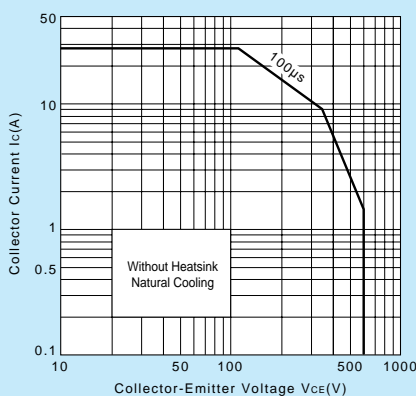


**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**

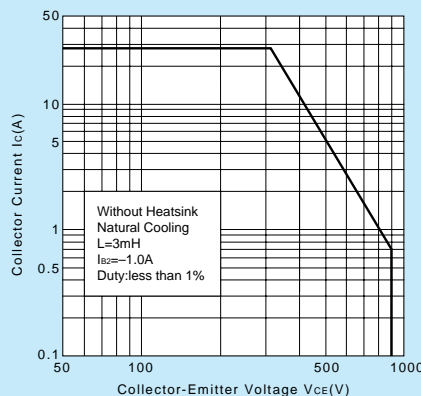


**θ<sub>j-a</sub>-t Characteristics**

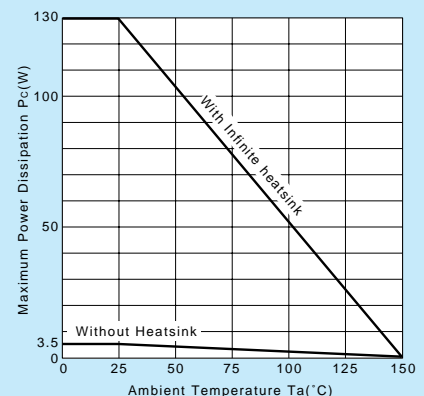
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC4883/4883A

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1859/A)

Application : Audio Output Driver and TV Velocity-modulation

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4883	2SC4883A	Unit
V <sub>CB0</sub>	150	180	V
V <sub>CEO</sub>	150	180	V
V <sub>EBO</sub>	6		V
I <sub>C</sub>	2		A
I <sub>B</sub>	1		A
P <sub>C</sub>	20(Tc=25°C)		W
T <sub>j</sub>	150		°C
T <sub>stg</sub>	-55 to +150		°C

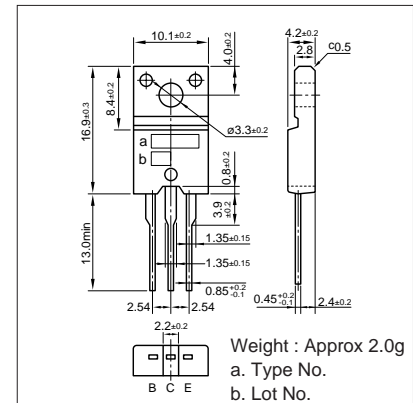
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4883	2SC4883A	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =	150	180	μA
I <sub>EBO</sub>	V <sub>EB</sub> =6V	10max		μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	150min	180min	V
h <sub>FE</sub>	V <sub>CE</sub> =10V, I <sub>C</sub> =0.7A	60to240		
V <sub>CE(sat)</sub>	I <sub>C</sub> =0.7A, I <sub>B</sub> =70mA	1.0max		V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.7A	120typ		MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	30typ		pF

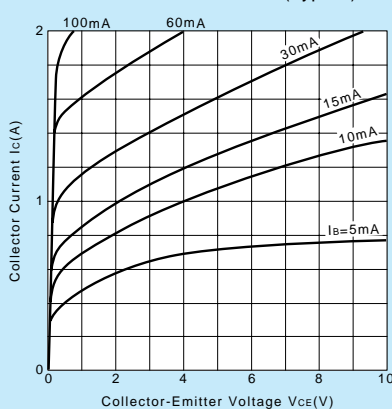
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
20	20	1	10	-5	100	-100	0.5typ	1.5typ	0.5typ

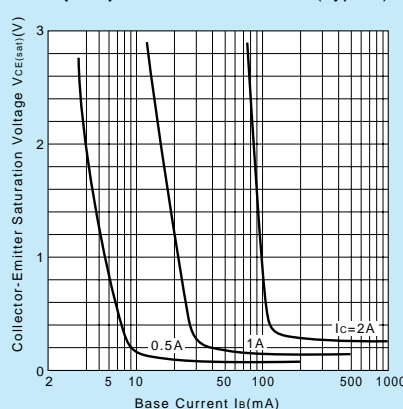
**External Dimensions FM20(TO220F)**



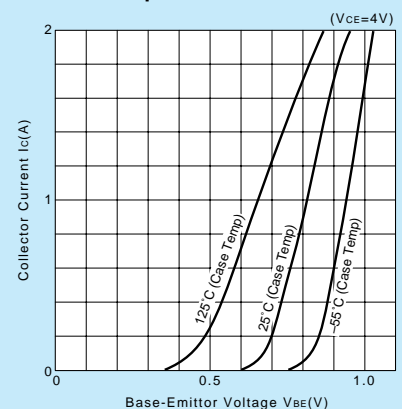
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



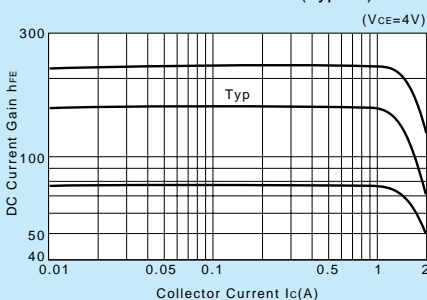
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



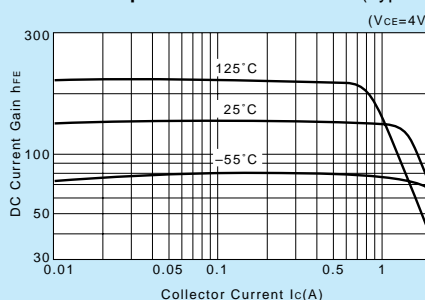
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



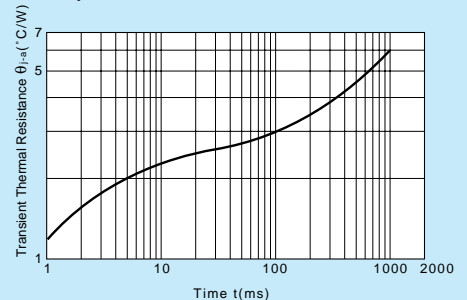
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



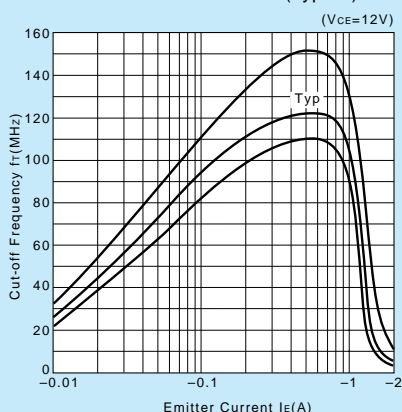
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



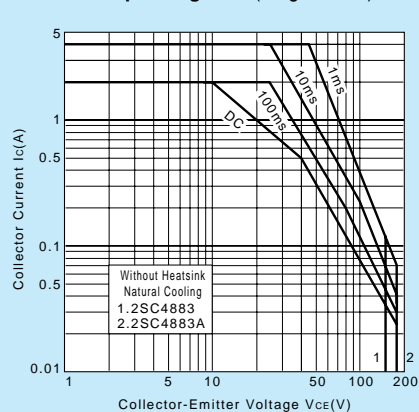
**θ<sub>j-a</sub>-t Characteristics**



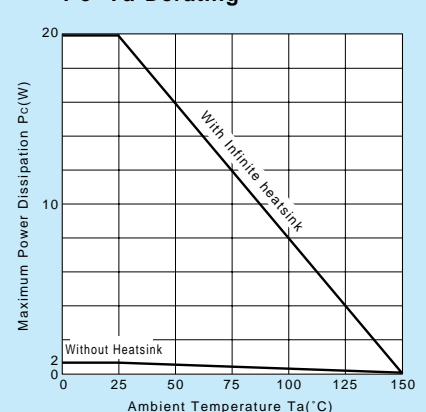
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1860)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4886	Unit
Vcbo	150	V
Vceo	150	V
Vebo	5	V
Ic	14	A
Ib	3	A
Pc	80(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

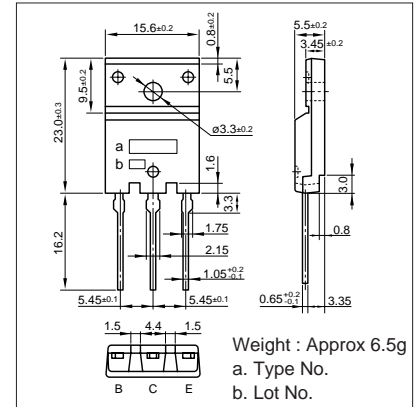
Symbol	Conditions	2SC4886	Unit
Icbo	Vcb=150V	100max	μA
Iebo	VEB=5V	100max	μA
V(BR)CEO	Ic=25mA	150min	V
hFE	VCE=4V, Ic=5A	50min*	
VCE(sat)	Ic=5A, Ib=500mA	2.0max	V
fr	VCE=12V, IE=-2A	60typ	MHz
COB	Vcb=10V, f=1MHz	200typ	pF

\*hFE Rank O(50 to 100), P(70 to 140), Y(90 to 180)

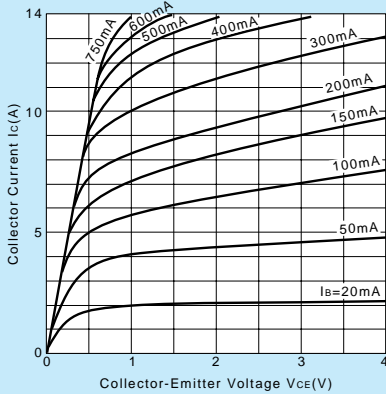
**Typical Switching Characteristics (Common Emitter)**

VCC (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	Ib1 (A)	Ib2 (A)	ton (μs)	tstg (μs)	tf (μs)
60	12	5	10	-5	0.5	-0.5	0.26typ	1.5typ	0.35typ

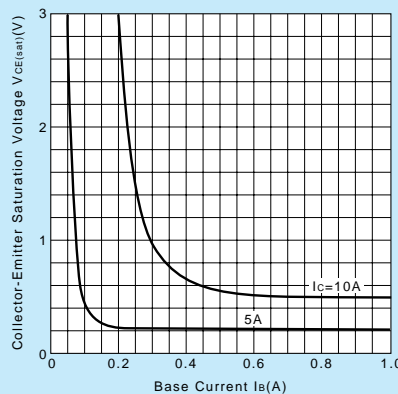
**External Dimensions FM100(TO3PF)**



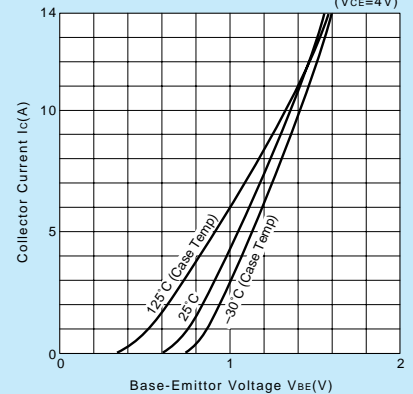
**Ic-VCE Characteristics (Typical)**



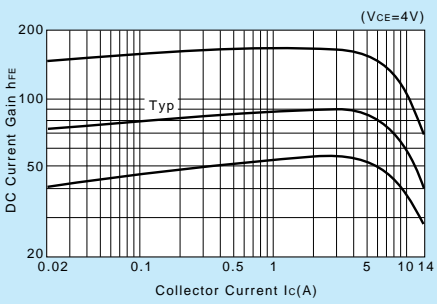
**VCE(sat)-Ib Characteristics (Typical)**



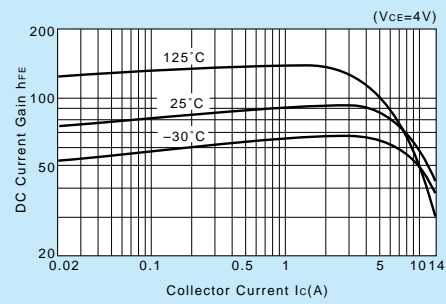
**Ic-VBE Temperature Characteristics (Typical)**



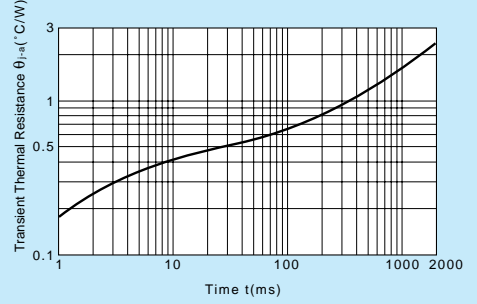
**hFE-Ic Characteristics (Typical)**



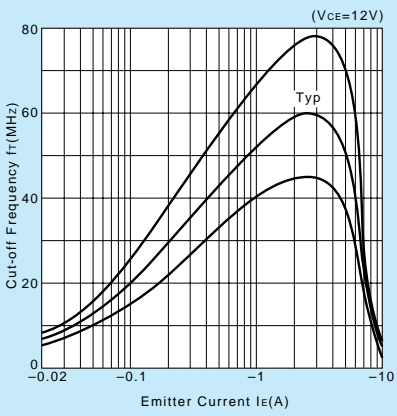
**hFE-Ic Temperature Characteristics (Typical)**



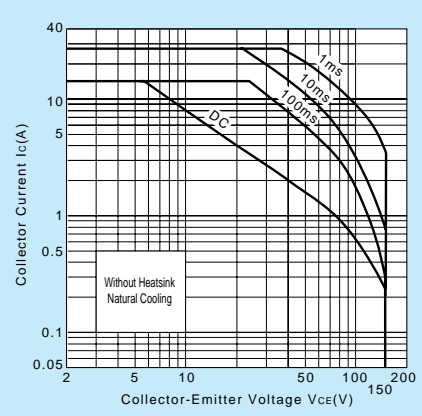
**θj-a-t Characteristics**



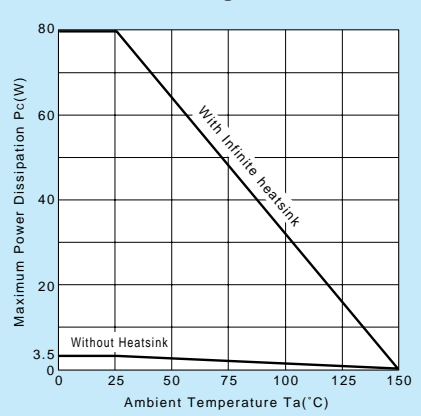
**fr-IE Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**Pc-Ta Derating**



# 2SC4907

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

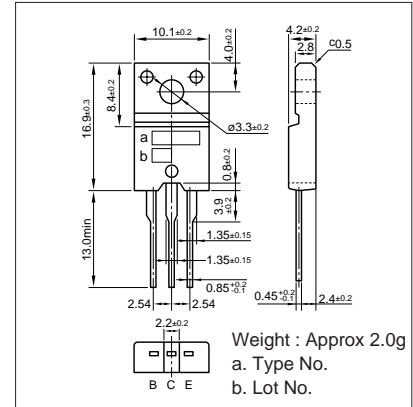
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4907	Unit
V <sub>CB0</sub>	600	V
V <sub>CEO</sub>	500	V
V <sub>EB0</sub>	10	V
I <sub>C</sub>	6(Pulse12)	A
I <sub>B</sub>	2	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4907	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =600V	1max	mA
I <sub>EB0</sub>	V <sub>EB</sub> =10V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	500min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =2A	10to30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.4A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =0.4A	1.3max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	8typ	MHZ
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHZ	45typ	pF

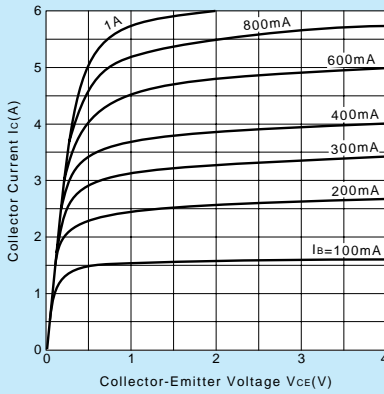
**External Dimensions FM20(TO220F)**



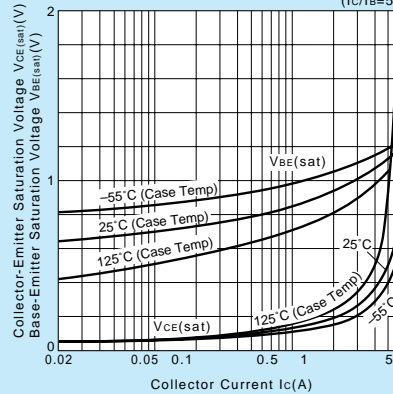
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	100	2	10	-5	0.2	-0.4	1max	4.5max	0.5max

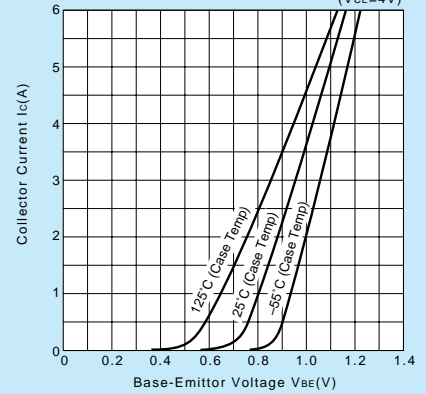
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



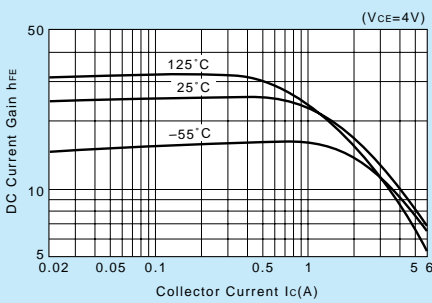
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



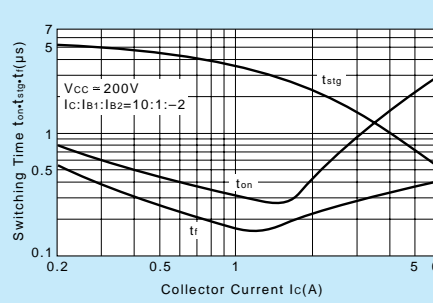
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



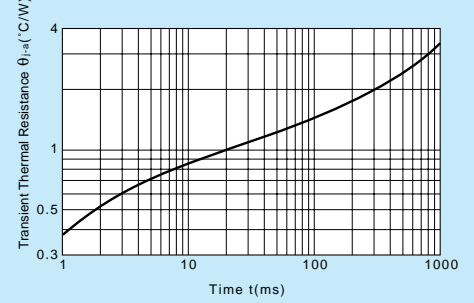
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



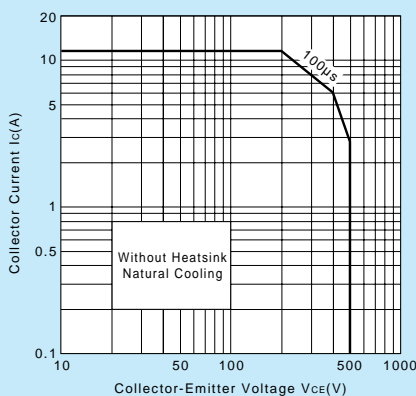
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



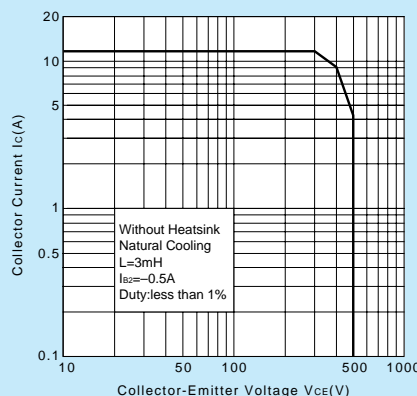
**θ<sub>j-a</sub>-t Characteristics**



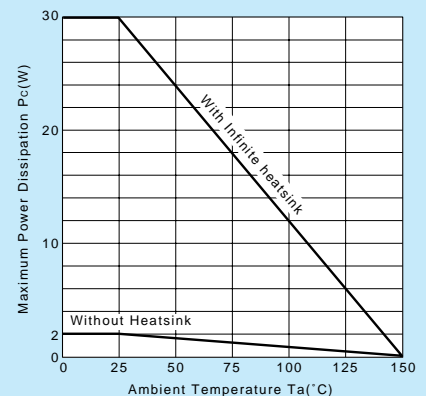
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC4908

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

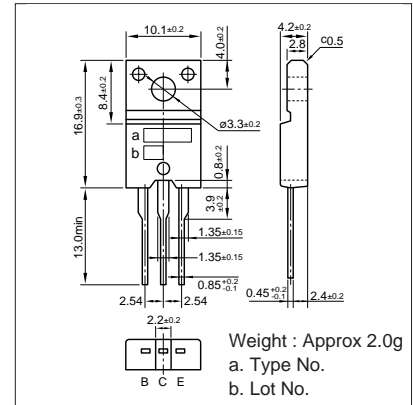
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC4908	Unit
V <sub>CB0</sub>	900	V
V <sub>CE0</sub>	800	V
V <sub>EB0</sub>	7	V
I <sub>C</sub>	3(Pulse6)	A
I <sub>B</sub>	1.5	A
P <sub>C</sub>	35(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC4908	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	800min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =0.7A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =0.7A, I <sub>B</sub> =0.14A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =0.7A, I <sub>B</sub> =0.14A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	6typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	40typ	pF

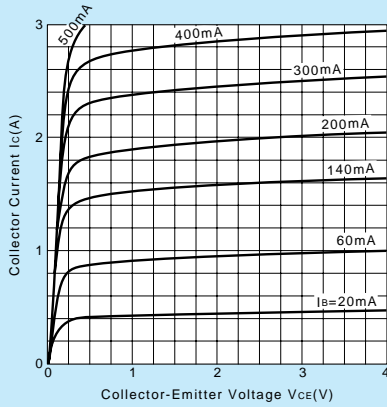
**External Dimensions FM20(TO220F)**



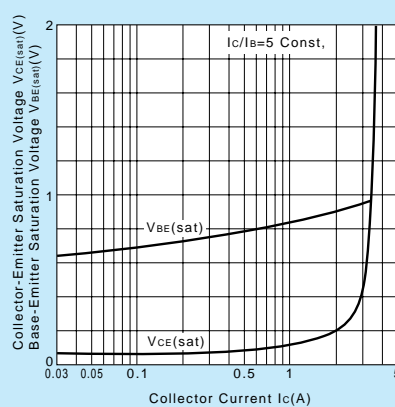
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	357	0.7	10	-5	0.1	-0.35	1max	5max	1max

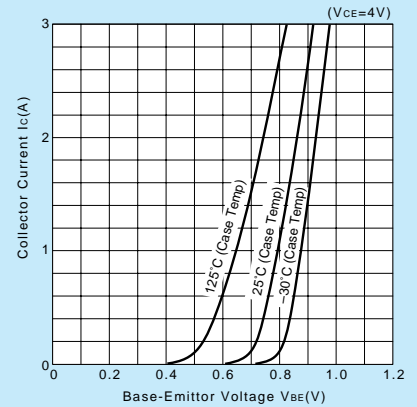
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



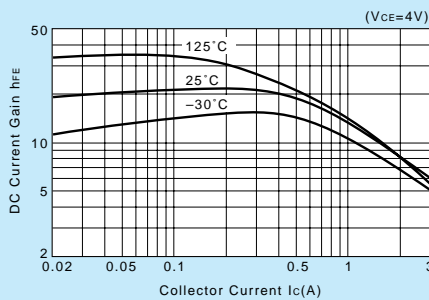
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



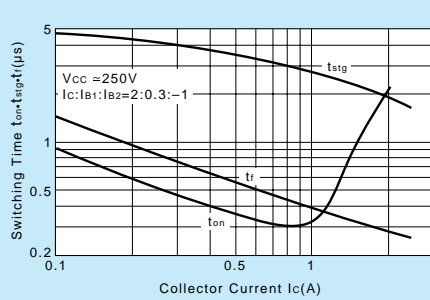
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



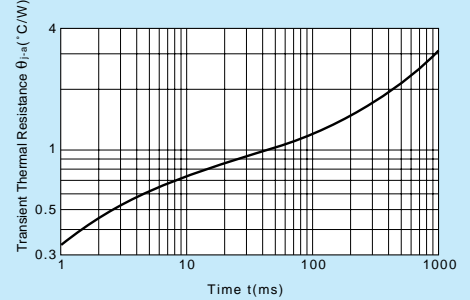
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



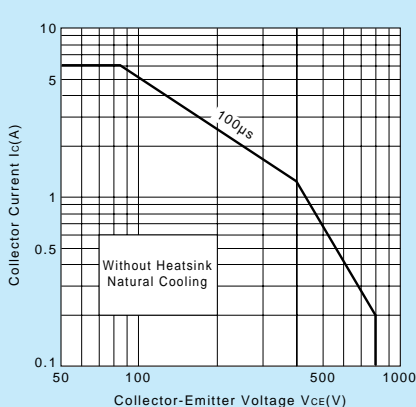
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



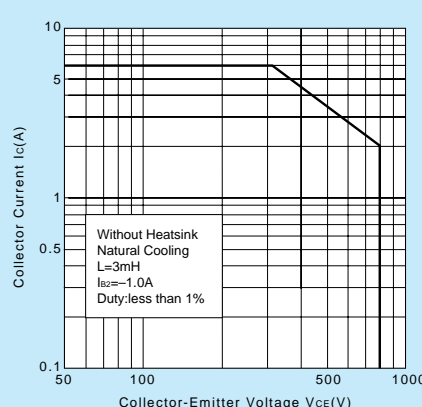
**θ<sub>j-a</sub>-t Characteristics**



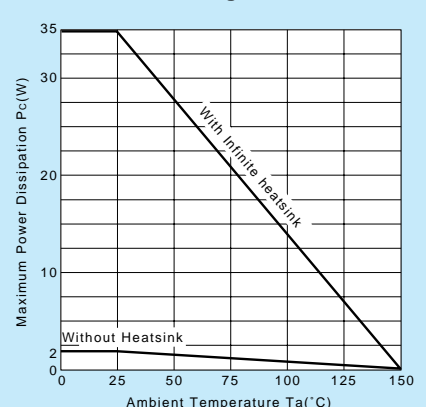
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC5002

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Display Horizontal Deflection Output, Switching Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC5002	Unit
V <sub>CB0</sub>	1500	V
V <sub>CEO</sub>	800	V
V <sub>EB0</sub>	6	V
I <sub>c</sub>	7(Pulse14)	A
I <sub>B</sub>	3.5	A
P <sub>c</sub>	80(Tc=25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

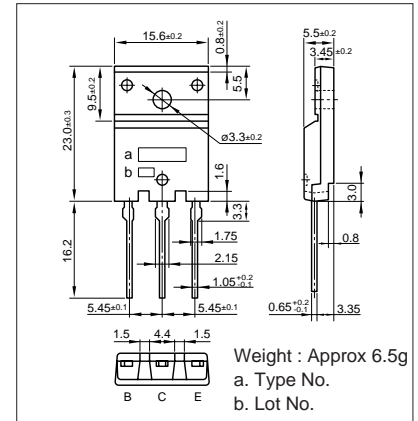
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC5002	Unit
I <sub>CB01</sub>	V <sub>CB</sub> =1200V	100max	μA
I <sub>CB02</sub>	V <sub>CB</sub> =1500V	1max	mA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>c</sub> =10mA	800min	V
h <sub>FE1</sub>	V <sub>CE</sub> =5V, I <sub>c</sub> =1A	8min	
h <sub>FE2</sub>	V <sub>CE</sub> =5V, I <sub>c</sub> =5A	4 to 9	
V <sub>CE(sat)</sub>	I <sub>c</sub> =5A, I <sub>B</sub> =1.2A	5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =5A, I <sub>B</sub> =1.2A	1.5max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	4typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	100typ	pF

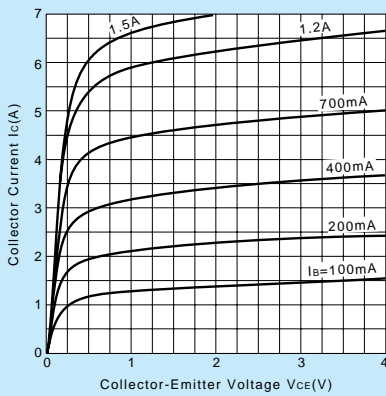
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	50	4	10	-5	0.8	-1.6	4.0max	0.2max

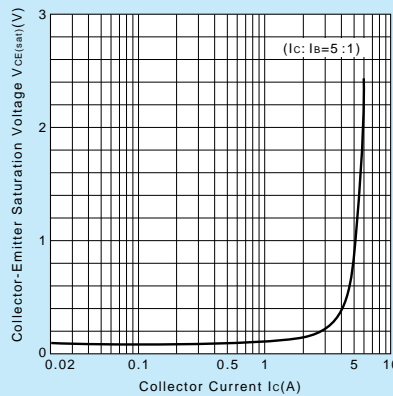
**External Dimensions FM100(TO3PF)**



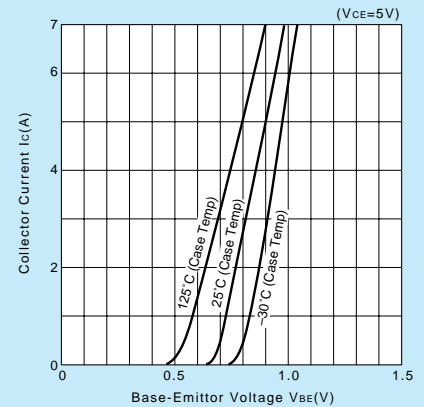
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



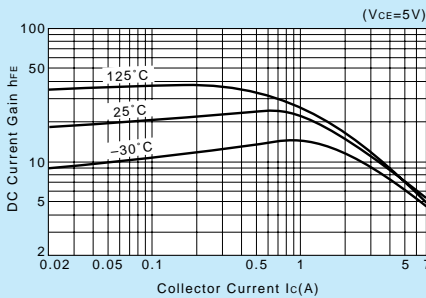
**V<sub>CE(sat)</sub>-I<sub>c</sub> Characteristics (Typical)**



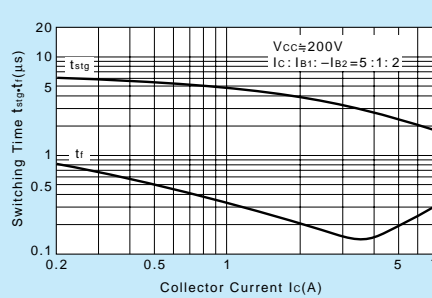
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



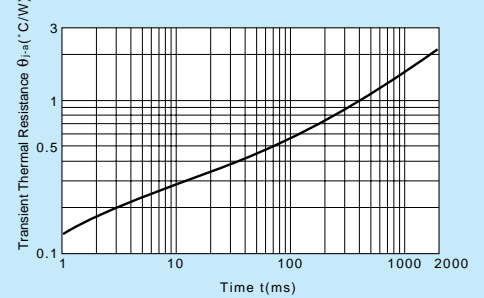
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



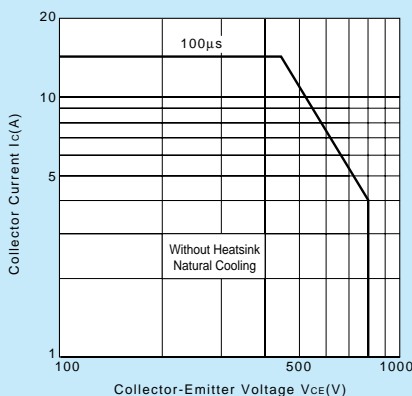
**t<sub>stg</sub>\*t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)**



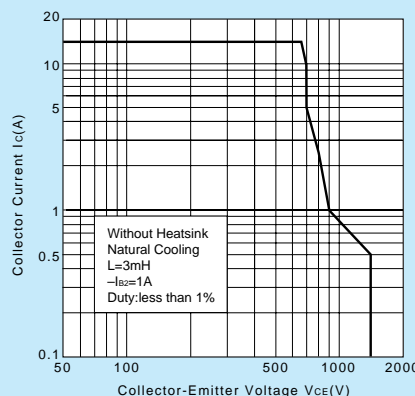
**θ<sub>j-a</sub>-t Characteristics**



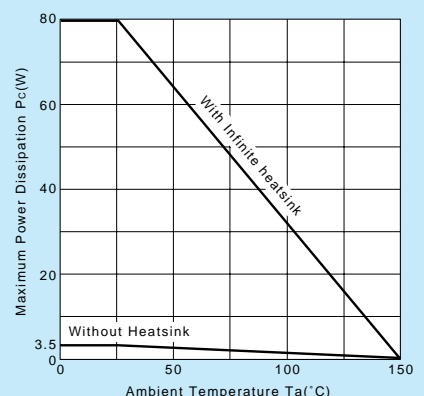
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>c</sub>-T<sub>a</sub> Derating**

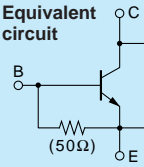




# Built-in Damper Diode

# 2SC5003

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Display Horizontal Deflection Output, Switching Regulator and General Purpose

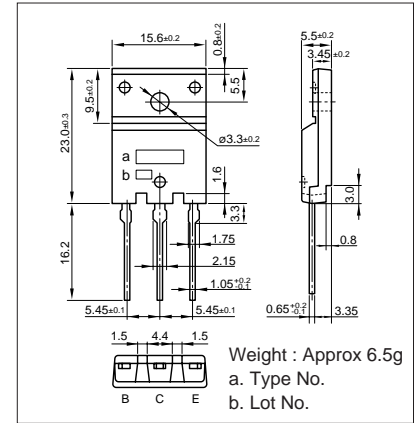
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC5003	Unit
V <sub>CB0</sub>	1500	V
V <sub>CEO</sub>	800	V
V <sub>EBO</sub>	6	V
I <sub>c</sub>	7(Pulse14)	A
I <sub>B</sub>	3.5	A
P <sub>c</sub>	80(T <sub>c</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC5003	Unit
I <sub>CB01</sub>	V <sub>CB</sub> =1200V	100max	μA
I <sub>CB02</sub>	V <sub>CB</sub> =1500V	1max	mA
I <sub>CEO</sub>	V <sub>CE</sub> =800V	1max	mA
V <sub>EBO</sub>	I <sub>E</sub> =300mA	6min	V
h <sub>FE1</sub>	V <sub>CE</sub> =5V, I <sub>c</sub> =1A	8min	
h <sub>FE2</sub>	V <sub>CE</sub> =5V, I <sub>c</sub> =5A	4 to 9	
V <sub>CE(sat)</sub>	I <sub>c</sub> =5A, I <sub>B</sub> =1.2A	5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =5A, I <sub>B</sub> =1.2A	1.5max	V
V <sub>FEC</sub>	I <sub>E</sub> =7A	2.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	4typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	100typ	pF

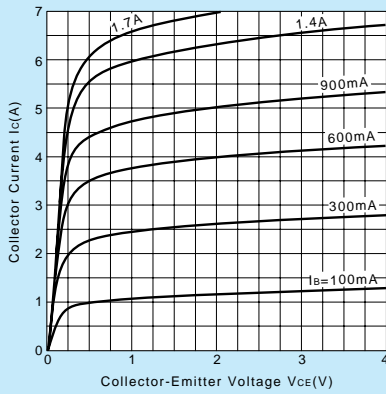
### External Dimensions FM100(TO3PF)



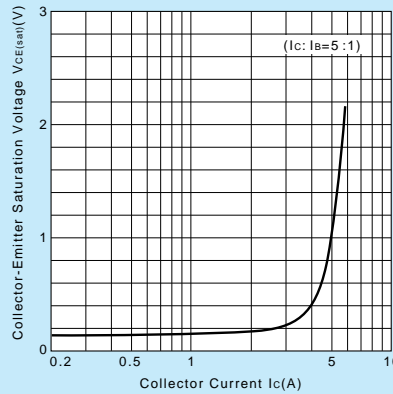
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	50	4	10	-5	0.8	-1.6	4.0max	0.2max

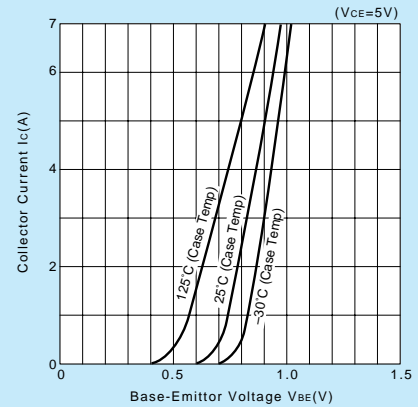
I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)



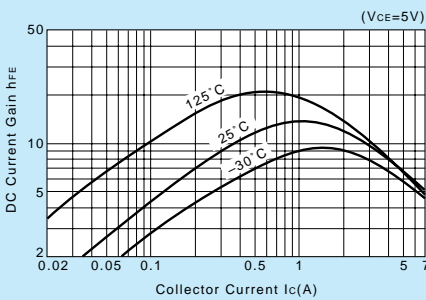
V<sub>CE(sat)</sub>-I<sub>c</sub> Characteristics (Typical)



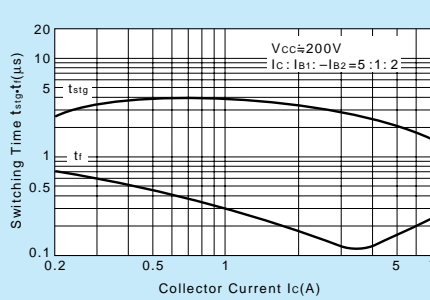
I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



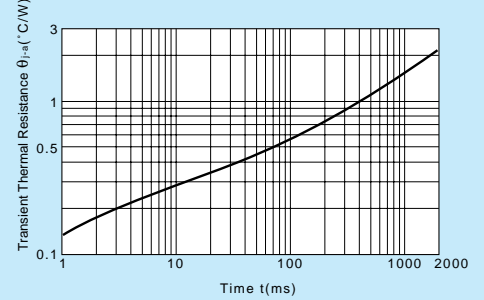
h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)



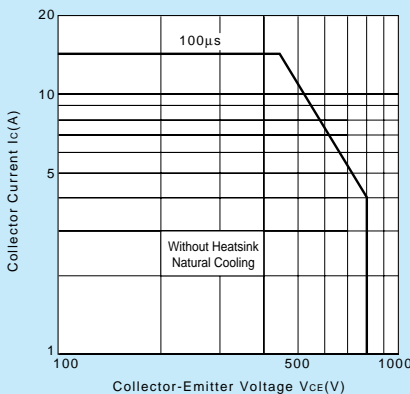
t<sub>stg</sub>•t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)



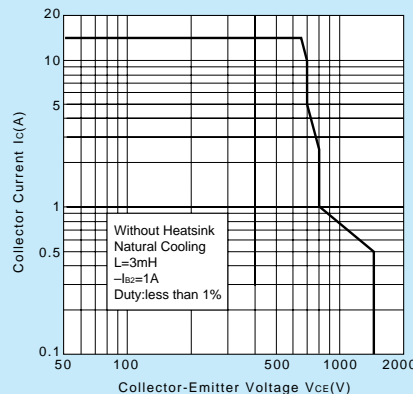
θ<sub>j-a</sub>-t Characteristics



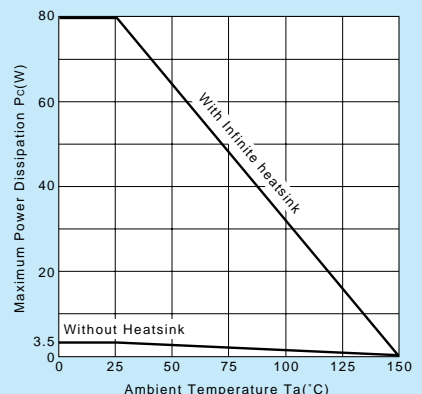
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>c</sub>-T<sub>a</sub> Derating



# 2SC5071

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor) Application : Switching Regulator and General Purpose

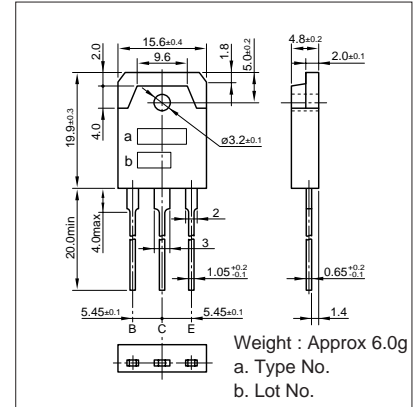
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC5071	Unit
V <sub>CB0</sub>	500	V
V <sub>CEO</sub>	400	V
V <sub>EBO</sub>	10	V
I <sub>C</sub>	12(Pulse24)	A
I <sub>B</sub>	4	A
P <sub>C</sub>	100(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC5071	Unit
I <sub>CBO</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =10V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =7A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =1.4A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =1.4A	1.3max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	10typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	105typ	pF

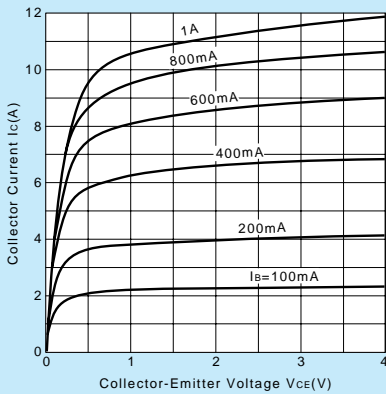
**External Dimensions MT-100(TO3P)**



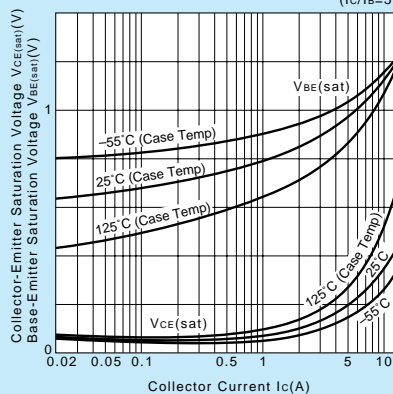
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	28.5	7	10	-5	0.7	-1.4	1.0max	3.0max	0.5max

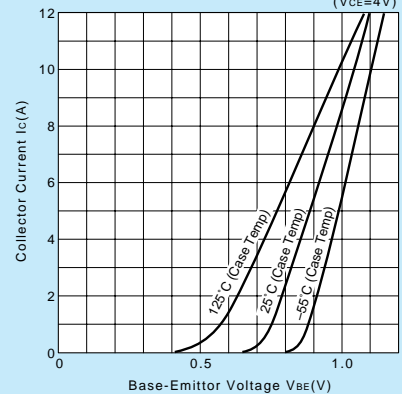
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



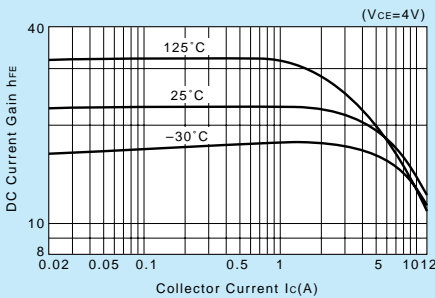
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



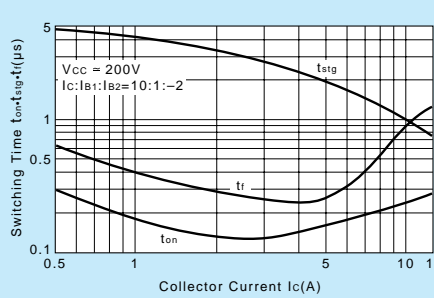
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



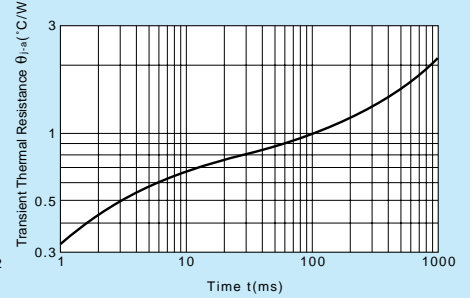
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



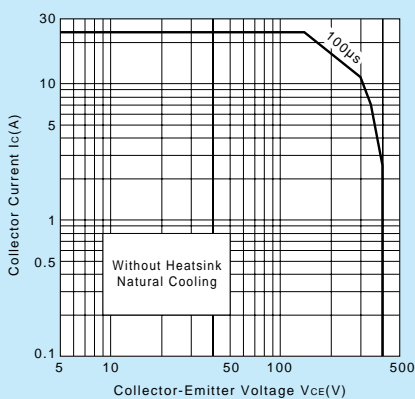
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



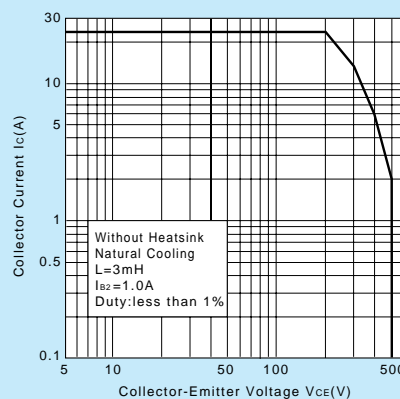
**θ<sub>j-a</sub>-t Characteristics**



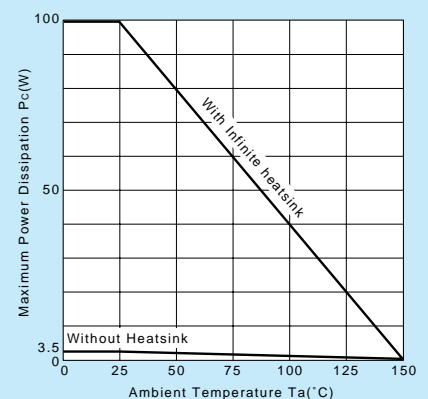
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC5099

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1907)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

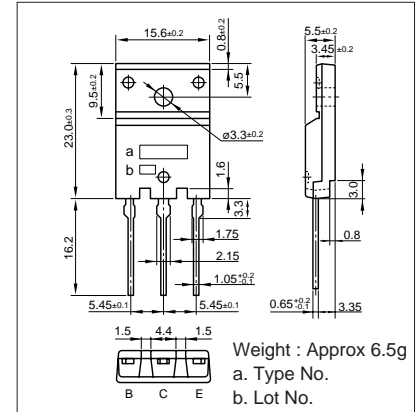
Symbol	2SC5099	Unit
V <sub>CB0</sub>	120	V
V <sub>CEO</sub>	80	V
V <sub>EBO</sub>	6	V
I <sub>c</sub>	6	A
I <sub>B</sub>	3	A
P <sub>c</sub>	60(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC5099	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =120V	10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =6V	10max	μA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =50mA	80min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =2A	50min*	
V <sub>CE(sat)</sub>	I <sub>c</sub> =2A, I <sub>B</sub> =0.2A	0.5max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	110typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

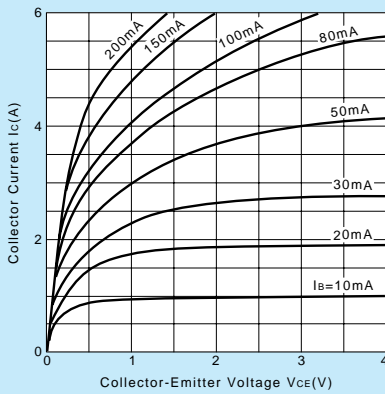
**External Dimensions FM100(TO3PF)**



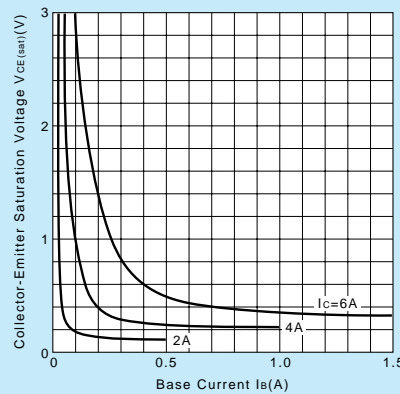
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	10	3	10	-5	0.3	-0.3	0.16typ	2.60typ	0.34typ

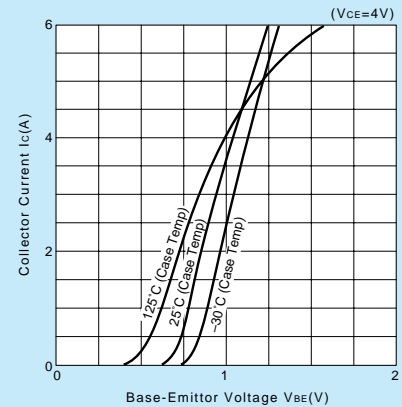
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



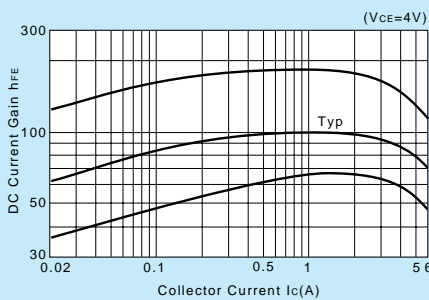
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



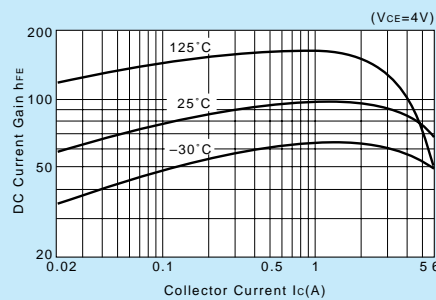
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



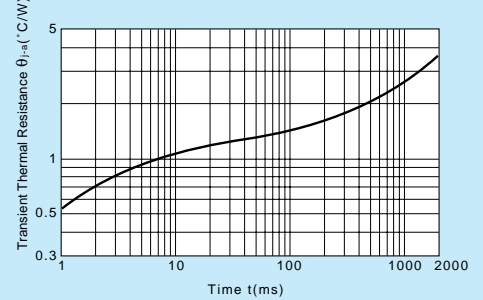
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



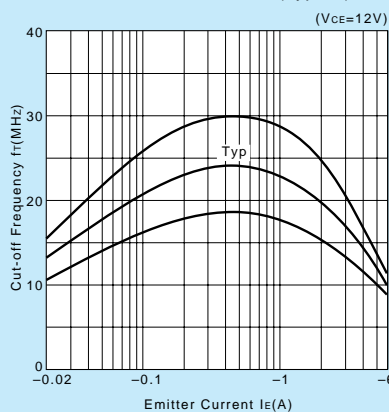
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



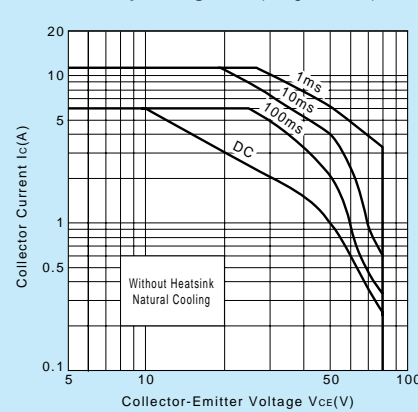
**θ<sub>j-a</sub>-t Characteristics**



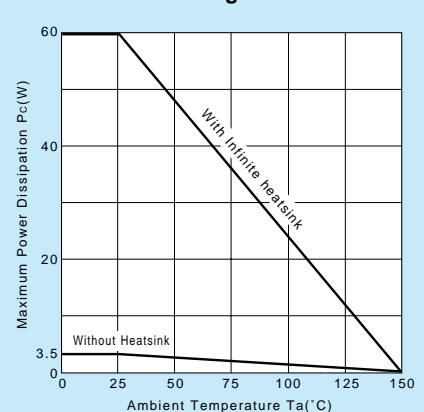
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SC5100

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1908)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC5100	Unit
V <sub>CB0</sub>	160	V
V <sub>CEO</sub>	120	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	8	A
I <sub>B</sub>	3	A
P <sub>C</sub>	75(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

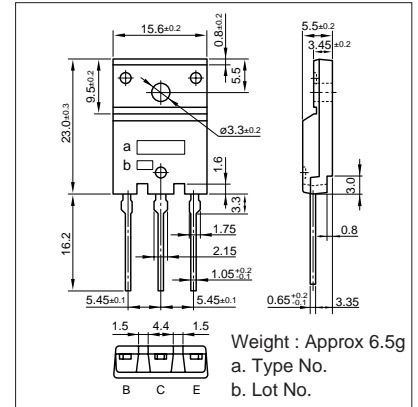
Symbol	Conditions	2SC5100	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =160V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =50mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =0.3A	0.5max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	200typ	pF

\*h<sub>FE</sub> Rank O(50 to 100), P(70 to 140), Y(90 to 180)

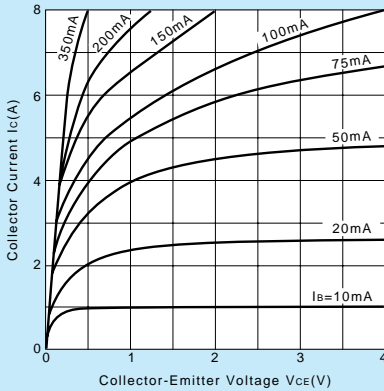
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	10	4	10	-5	0.4	-0.4	0.13typ	3.50typ	0.32typ

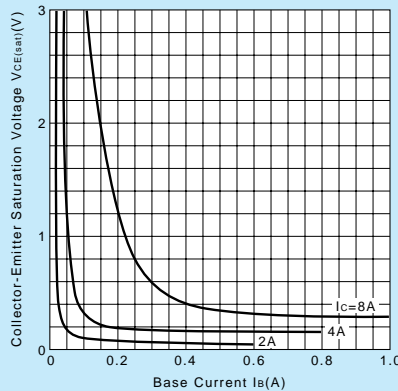
**External Dimensions FM100(TO3PF)**



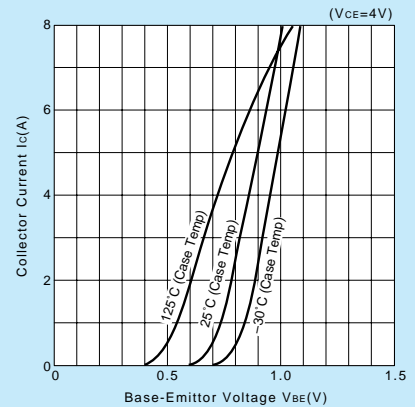
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



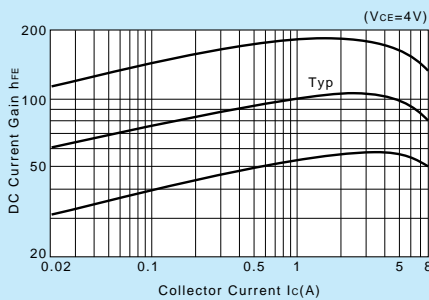
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



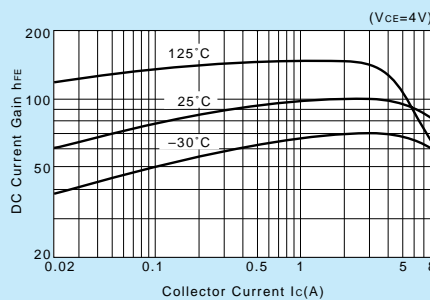
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



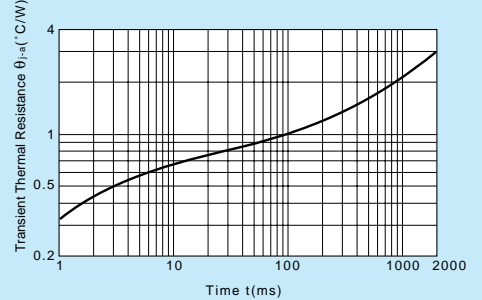
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



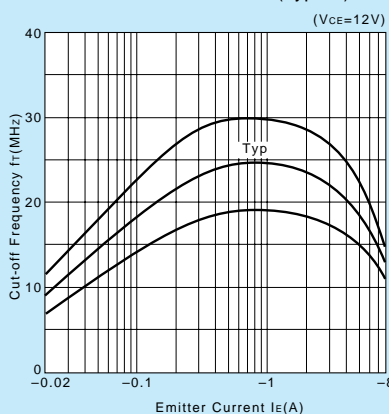
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



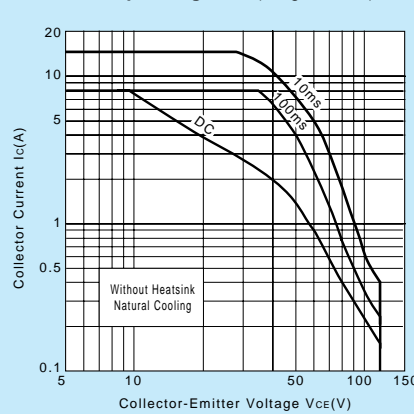
**θ<sub>j-a</sub>-t Characteristics**



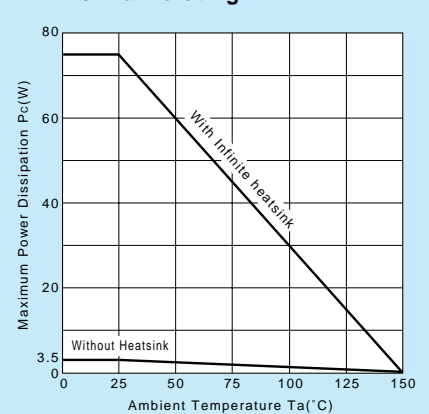
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC5101

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1909)

Application : Audio and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC5101	Unit
V <sub>CB0</sub>	200	V
V <sub>CEO</sub>	140	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	10	A
I <sub>B</sub>	4	A
P <sub>C</sub>	80(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

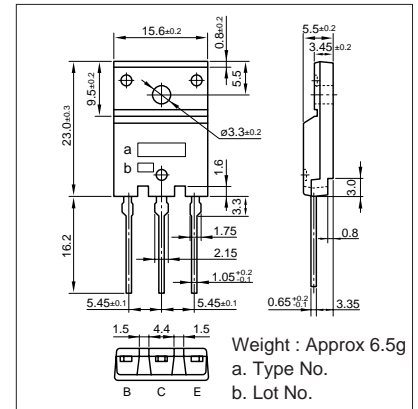
Symbol	Conditions	2SC5101	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =50mA	140min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	50min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =0.5A	0.5max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	250typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (50 to 100), P(70 to 140), Y(90 to 180)

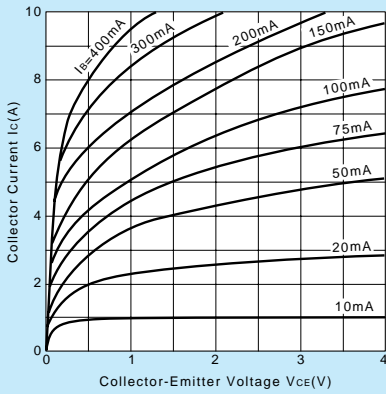
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
60	12	5	10	-5	0.5	-0.5	0.24typ	4.32typ	0.40typ

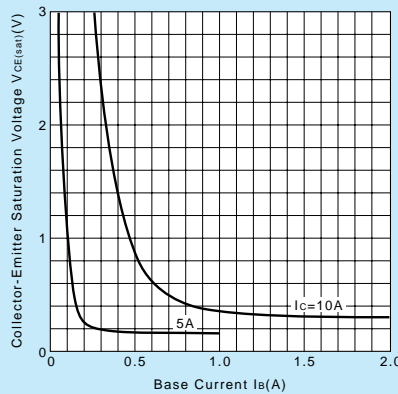
**External Dimensions FM100(TO3PF)**



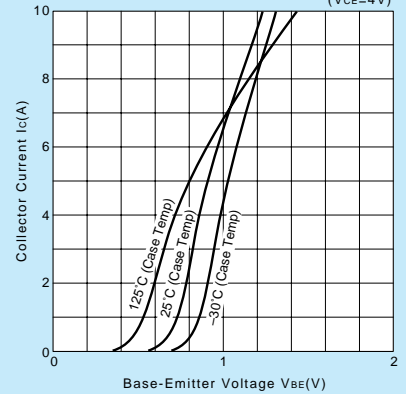
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



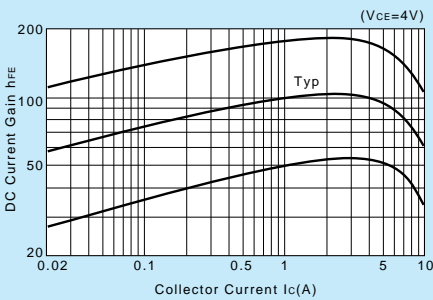
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



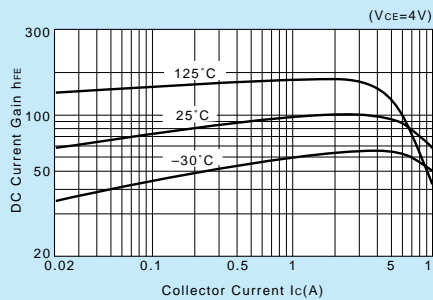
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



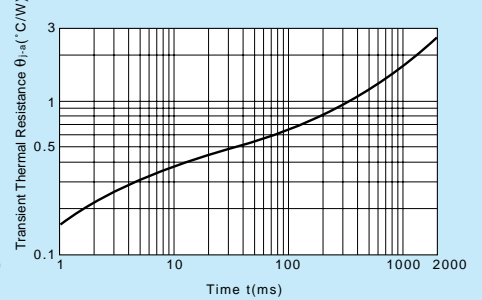
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



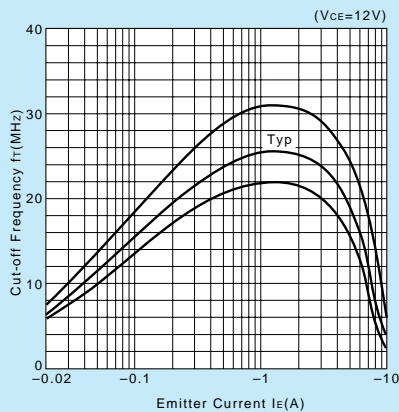
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



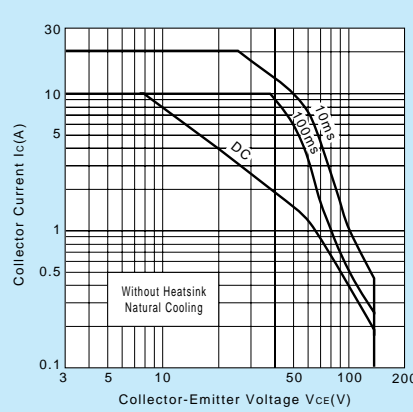
**θ<sub>j-a</sub>-t Characteristics**



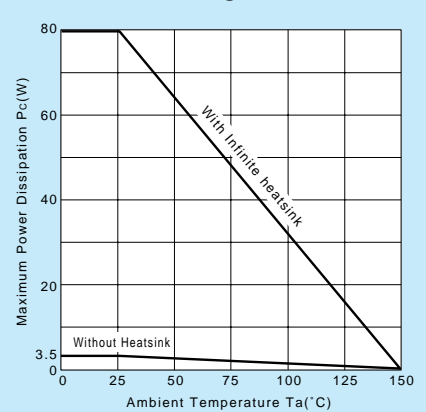
**f<sub>r</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC5124

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Display Horizontal Deflection Output, Switching Regulator and General Purpose

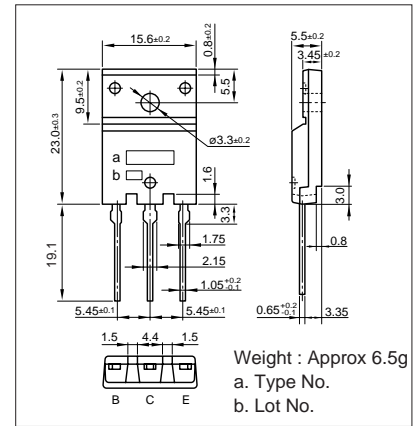
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC5124	Unit
V <sub>CB0</sub>	1500	V
V <sub>CEO</sub>	800	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	10(Pulse20)	A
I <sub>B</sub>	5	A
P <sub>C</sub>	100(Tc=25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC5124	Unit
I <sub>CB01</sub>	V <sub>CB</sub> =1200V	100max	μA
I <sub>CB02</sub>	V <sub>CB</sub> =1500V	1max	mA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	800min	V
h <sub>FE1</sub>	V <sub>CE</sub> =5V, I <sub>C</sub> =1A	8min	
h <sub>FE2</sub>	V <sub>CE</sub> =5V, I <sub>C</sub> =8A	4 to 9	
V <sub>CE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =2A	5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =2A	1.5max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	3typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	130typ	pF

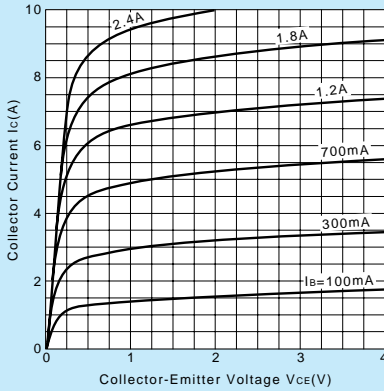
**External Dimensions FM100(TO3PF)**



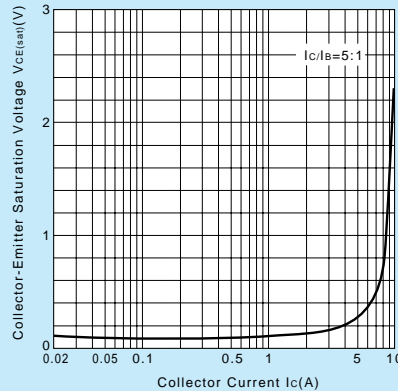
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	33.3	6	10	-5	1.2	-2.4	0.1typ	4.0typ	0.2typ

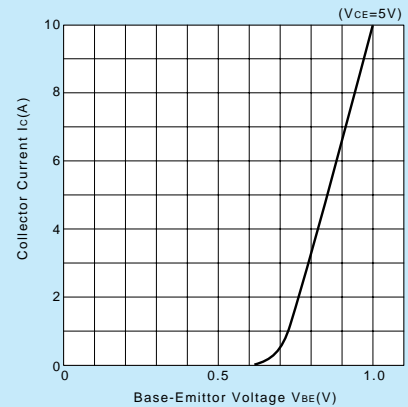
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



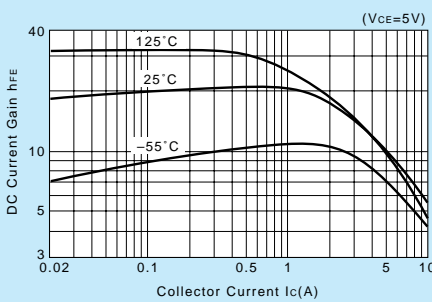
**V<sub>CE(sat)</sub>-I<sub>C</sub> Characteristics (Typical)**



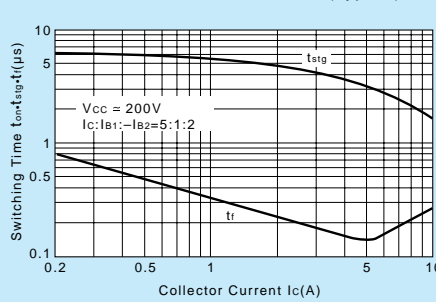
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**

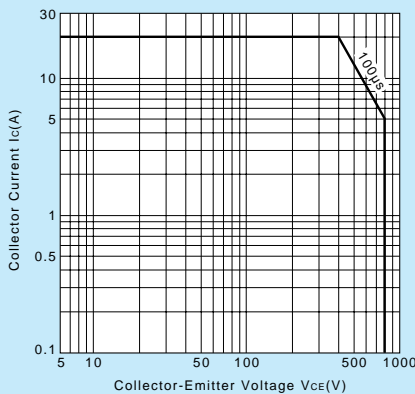


**t<sub>stg</sub>•t<sub>r</sub>-I<sub>C</sub> Characteristics (Typical)**

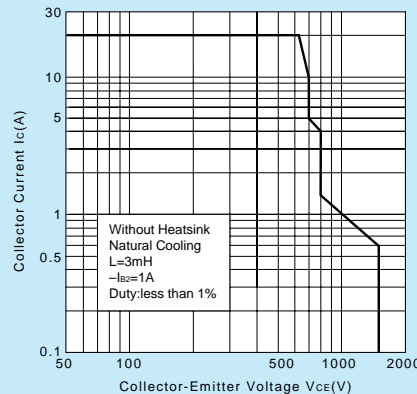


**θ<sub>j-a</sub>-t Characteristics**

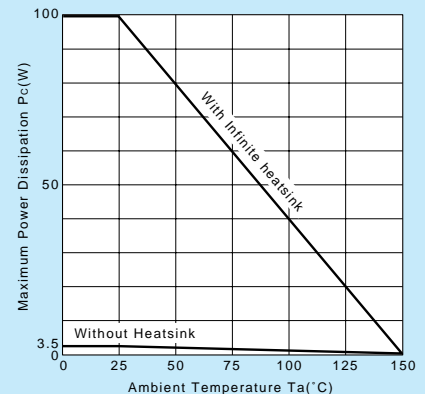
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC5130

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor) Application : Switching Regulator and General Purpose

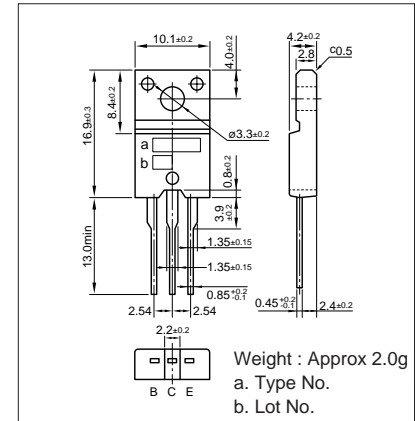
### Absolute maximum ratings (Ta=25°C)

Symbol	2SC5130	Unit
V <sub>CB0</sub>	600	V
V <sub>CEO</sub>	400	V
V <sub>EB0</sub>	10	V
I <sub>C</sub>	5(Pulse10)	A
I <sub>B</sub>	2	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC5130	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =500V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =10V	10max	μA
V(BR)CEO	I <sub>C</sub> =25mA	400min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =1.5A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =1.5A, I <sub>B</sub> =0.3A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =1.5A, I <sub>B</sub> =0.3A	1.3max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	30typ	pF

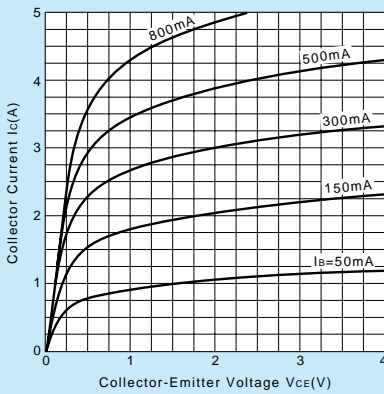
### External Dimensions FM20(TO220F)



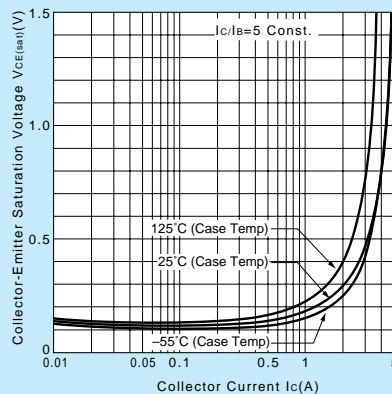
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	133	1.5	10	-5	0.15	-0.3	1max	2max	0.3max

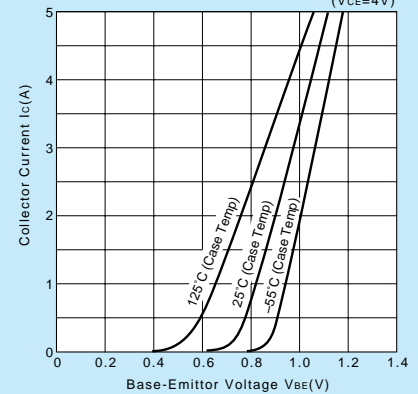
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



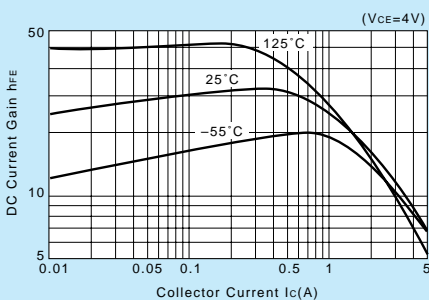
V<sub>CE(sat)</sub>-I<sub>C</sub> Characteristics (Typical)



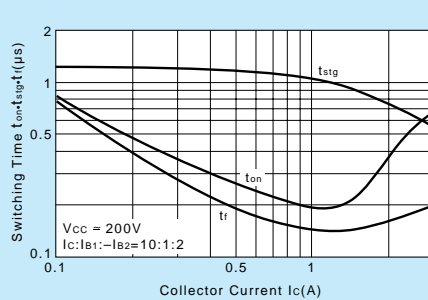
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



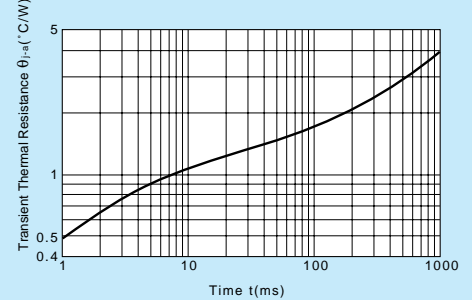
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



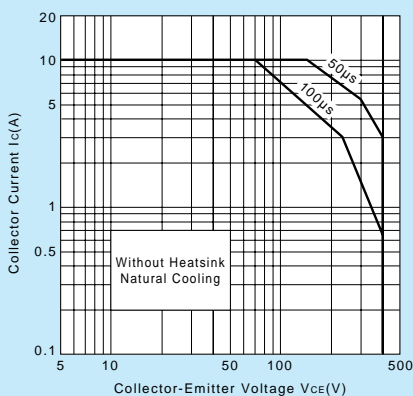
t<sub>on</sub>\*t<sub>stg</sub>\*t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)



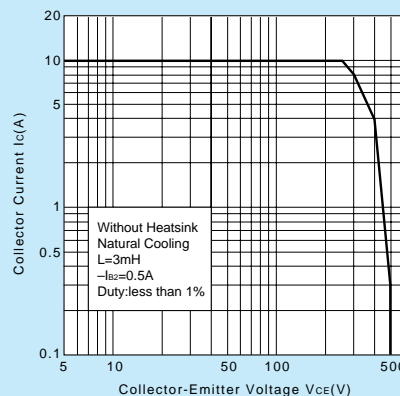
θ<sub>j-a</sub>-t Characteristics



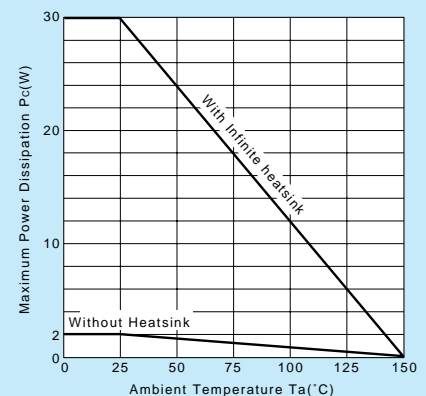
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P<sub>C</sub>-T<sub>a</sub> Derating





# 2SC5239

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

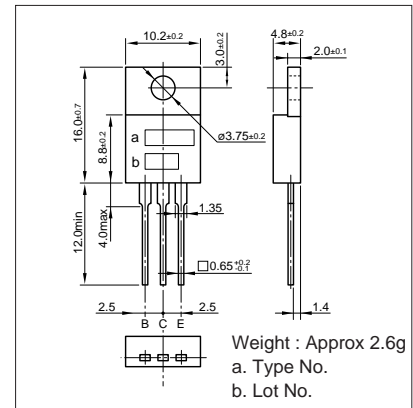
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC5239	Unit
V <sub>CB0</sub>	900	V
V <sub>CEO</sub>	550	V
V <sub>EBO</sub>	7	V
I <sub>C</sub>	3(Pulse6)	A
I <sub>B</sub>	1.5	A
P <sub>C</sub>	50(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC5239	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =7V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	550min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =1A	10 to 30	
V <sub>CE(sat)</sub>	I <sub>C</sub> =1A, I <sub>B</sub> =0.2A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =1A, I <sub>B</sub> =0.2A	1.2max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.25A	6typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	35typ	pF

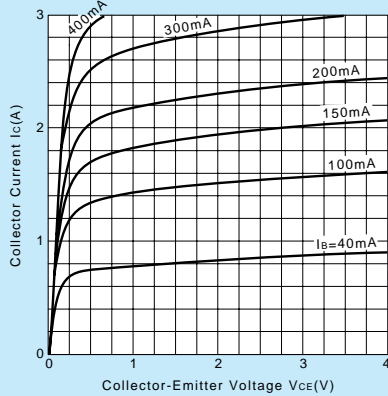
**External Dimensions MT-25(TO220)**



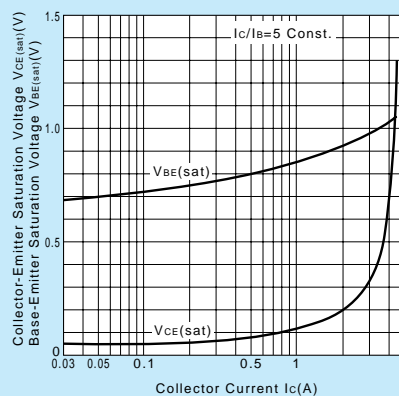
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	250	1	10	-5	0.15	-0.45	0.7max	4.0max	0.5max

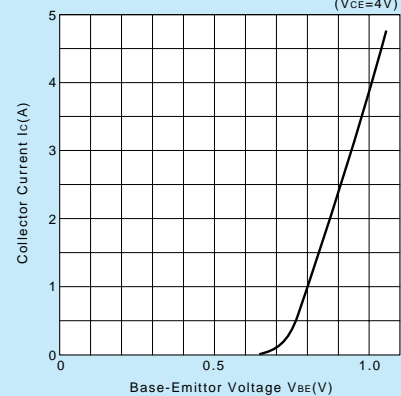
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



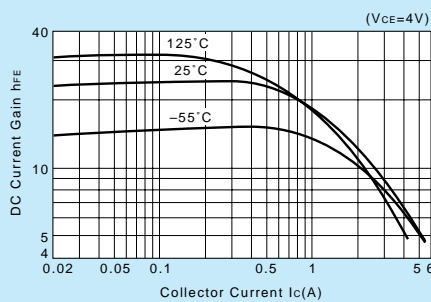
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



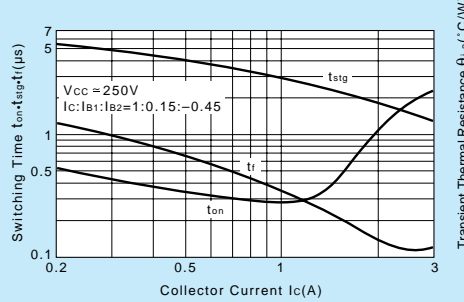
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



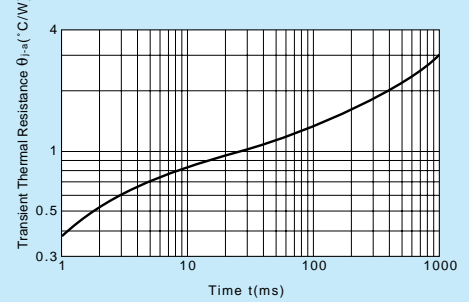
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



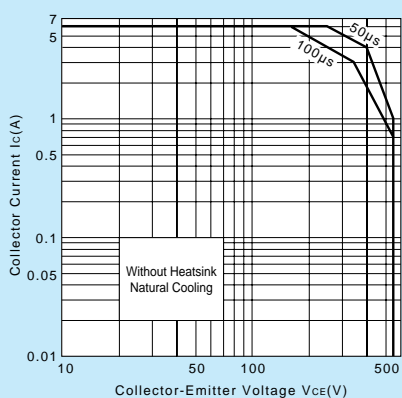
**t<sub>on</sub>, t<sub>stg</sub>, t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



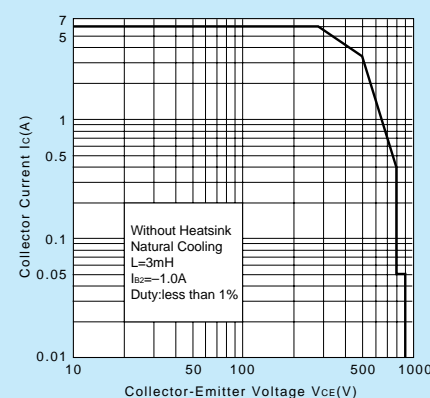
**θ<sub>j-a</sub>-t Characteristics**



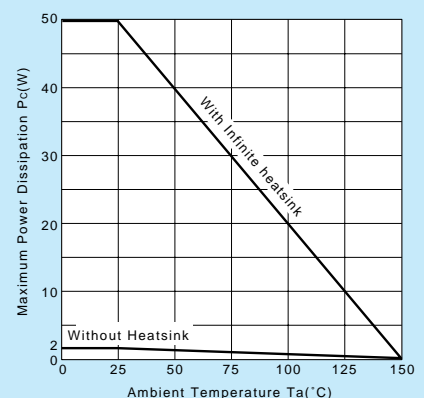
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC5249

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

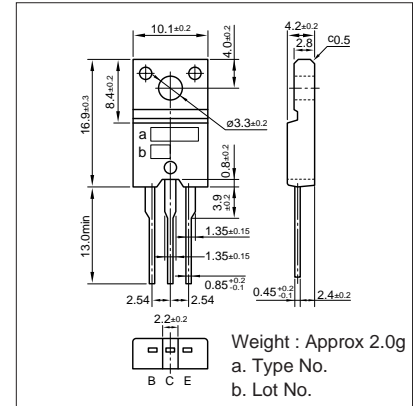
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC5249	Unit
V <sub>CB0</sub>	600	V
V <sub>CEO</sub>	600	V
V <sub>EBO</sub>	7	V
I <sub>c</sub>	3(Pulse)	A
I <sub>B</sub>	1.5	A
P <sub>c</sub>	35(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC5249	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =600V	100max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =7V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>c</sub> =10mA	600min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =1A	20 to 40	
V <sub>CE(sat)</sub>	I <sub>c</sub> =1A, I <sub>B</sub> =0.2A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =1A, I <sub>B</sub> =0.2A	1.2max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.3A	6typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	50typ	pF

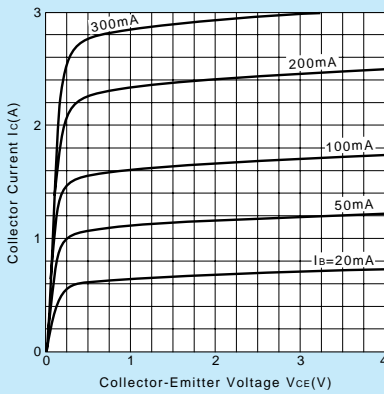
**External Dimensions FM20(TO220F)**



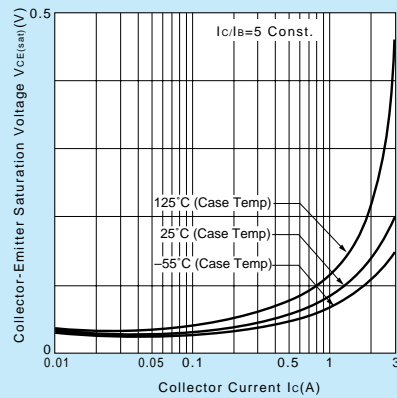
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>c</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
200	200	1	10	-5	0.1	-0.1	1.0max	19max	1.0max

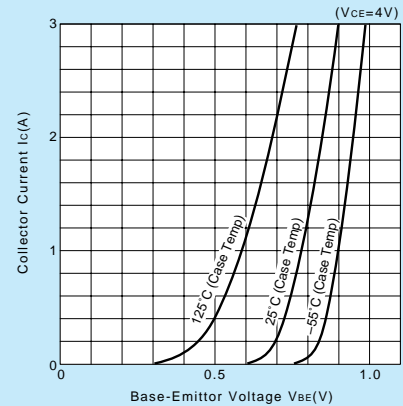
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



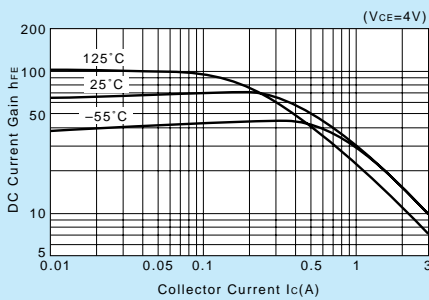
**V<sub>CE(sat)</sub>-I<sub>c</sub> Characteristics (Typical)**



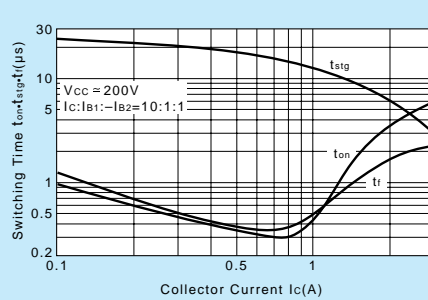
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



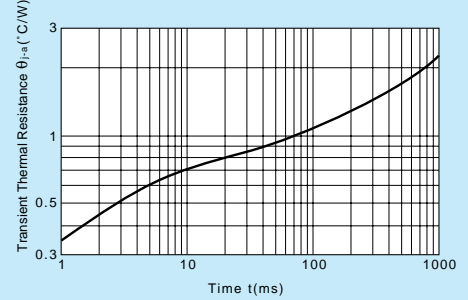
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



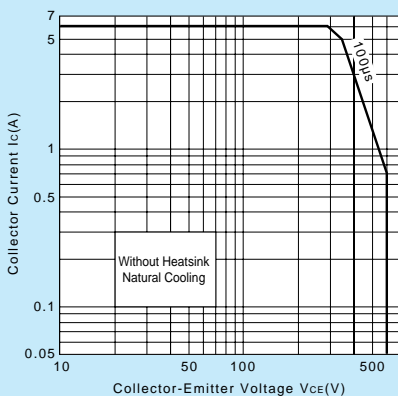
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>c</sub> Characteristics (Typical)**



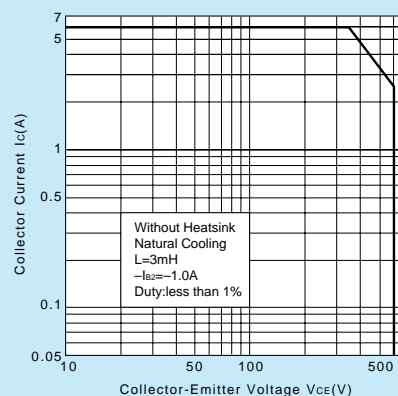
**θ<sub>j-a</sub>-t Characteristics**



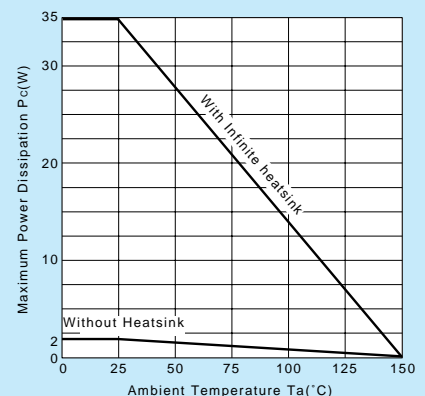
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# 2SC5271

## Silicon NPN Triple Diffused Planar Transistor

Application : Resonant Switching Regulator and General Purpose

### Absolute maximum ratings (Ta=25°C)

Symbol	2SC5271	Unit
V <sub>CB0</sub>	300	V
V <sub>CE0</sub>	200	V
V <sub>EB0</sub>	7	V
I <sub>C</sub>	5(Pulse10)	A
I <sub>B</sub>	2	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

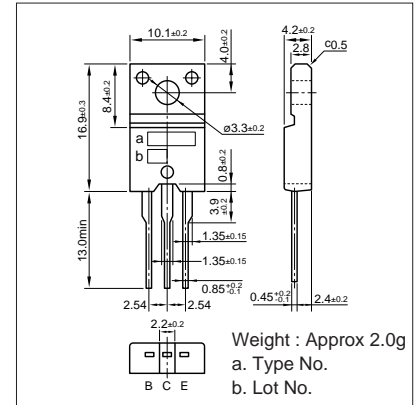
### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SC5271	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =300V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	200min	V
h <sub>FE1</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =2.5A	10 to 30	
h <sub>FE2</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =1mA	15min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2.5A, I <sub>B</sub> =0.5A	1.0max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =2.5A, I <sub>B</sub> =0.5A	1.5max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	10typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	45typ	pF

### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
150	60	2.5	10	-5	0.5	-1.0	0.3max	1.0max	0.1max

### External Dimensions FM20(TO220F)



# 2SC5287

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

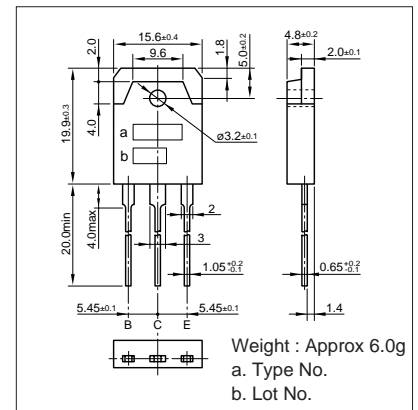
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC5287	Unit
V <sub>CB0</sub>	900	V
V <sub>CE0</sub>	550	V
V <sub>EB0</sub>	7	V
I <sub>C</sub>	5(Pulse10)	A
I <sub>B</sub>	2.5	A
P <sub>C</sub>	80(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC5287	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =800V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =7V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	550min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =1.8A	10 to 25	
V <sub>CE(sat)</sub>	I <sub>C</sub> =1.8A, I <sub>B</sub> =0.36A	0.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =1.8A, I <sub>B</sub> =0.36A	1.2max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.35A	6typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	50typ	pF

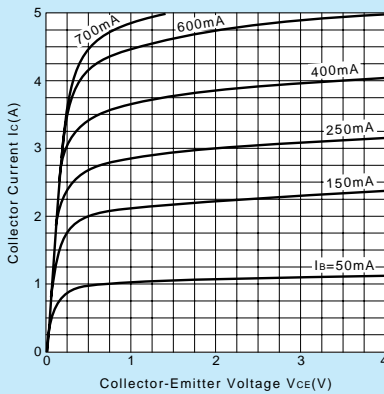
**External Dimensions MT-100(TO3P)**



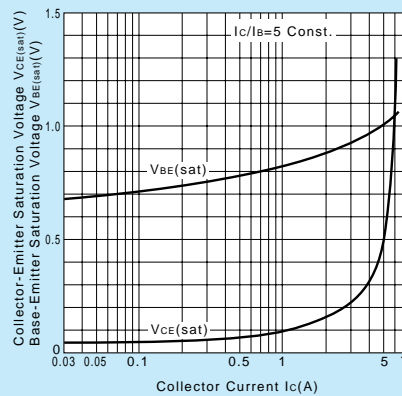
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
250	139	1.8	10	-5	0.27	-0.9	0.7max	4.0max	0.5max

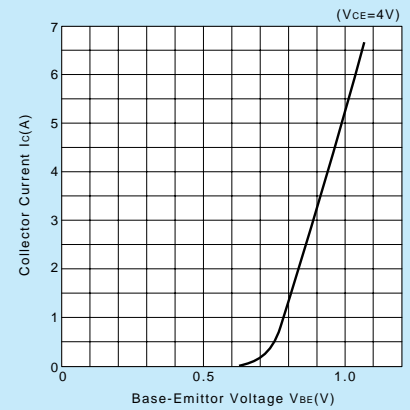
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



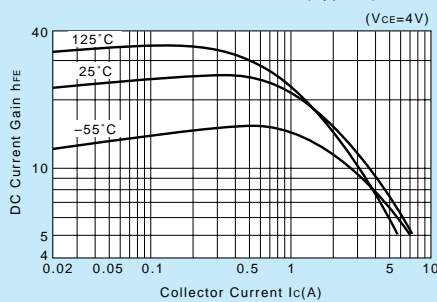
**V<sub>CE(sat)</sub>, V<sub>BE(sat)</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



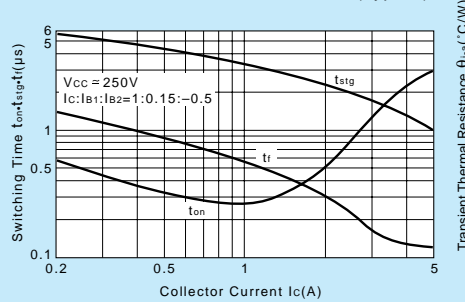
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



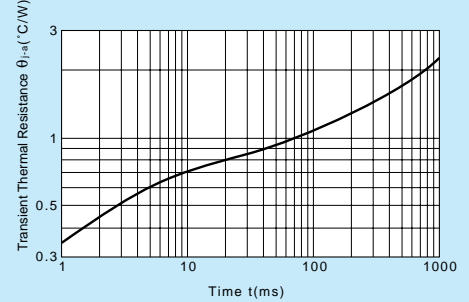
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



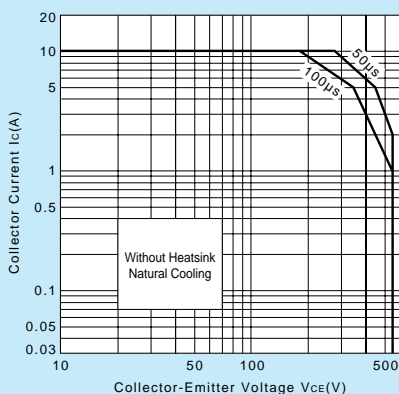
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>f</sub>-I<sub>C</sub> Characteristics (Typical)**



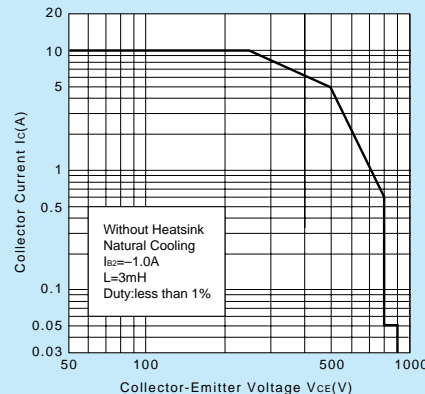
**θ<sub>j-a</sub>-t Characteristics**



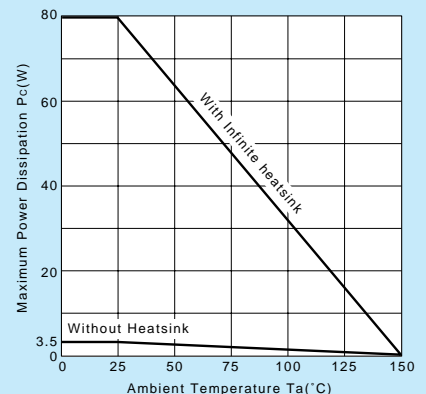
**Safe Operating Area (Single Pulse)**



**Reverse Bias Safe Operating Area**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC5333

Silicon NPN Triple Diffused Planar Transistor

Application : Series Regulator, Switch, and General Purpose

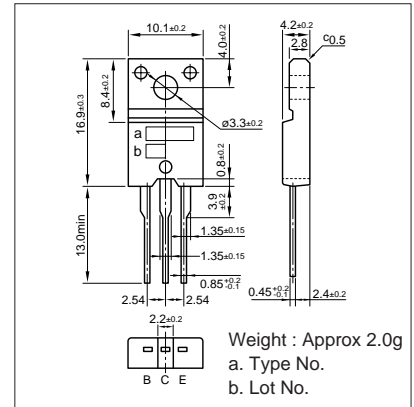
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC5333	Unit
V <sub>CB0</sub>	300	V
V <sub>CE0</sub>	300	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	2	A
I <sub>B</sub>	0.2	A
P <sub>C</sub>	35(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55to+150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SC5333	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =300V	1.0max	mA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	1.0max	mA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =25mA	300min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =0.5A	30min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =1.0A, I <sub>B</sub> =0.2A	1.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.2A	10typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	75typ	pF

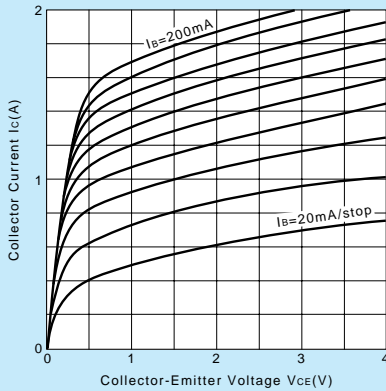
**External Dimensions FM20(TO220F)**



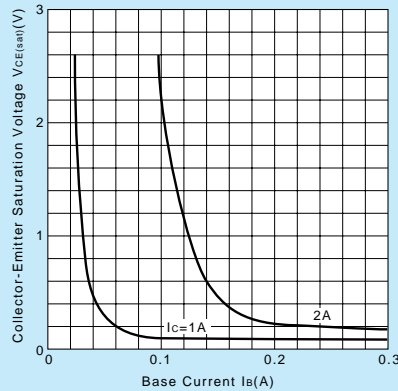
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>B2</sub> (V)	I <sub>B1</sub> (A)	I <sub>B2</sub> (A)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
100	100	1.0	-5	0.1	-0.2	0.3typ	4.0typ	1.0typ

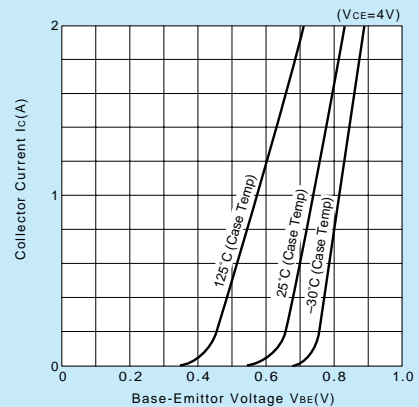
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



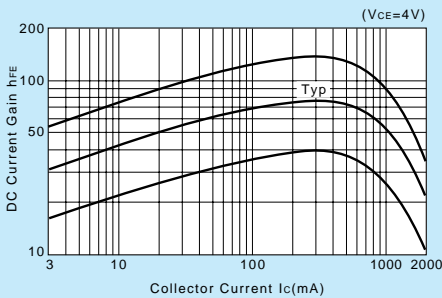
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



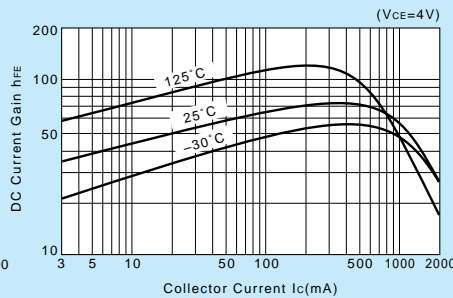
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



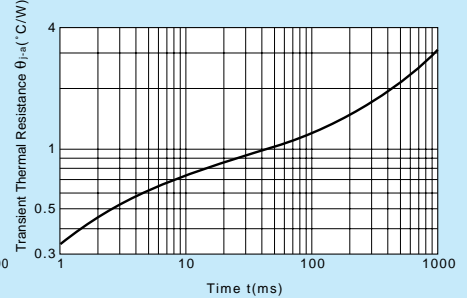
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



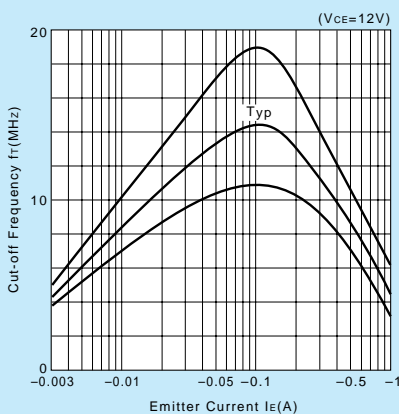
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



**θ<sub>J-a</sub>-t Characteristics**

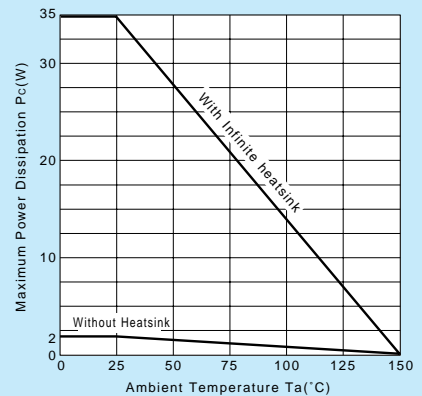


**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

**P<sub>C</sub>-T<sub>a</sub> Derating**



# 2SC5370

Silicon NPN Epitaxial Planar Transistor

Application : Emergency Lighting Inverter and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SC5370	Unit
V <sub>CB0</sub>	60	V
V <sub>CEO</sub>	40	V
V <sub>EBO</sub>	7	V
I <sub>C</sub>	12	A
I <sub>B</sub>	3	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55to+150	°C

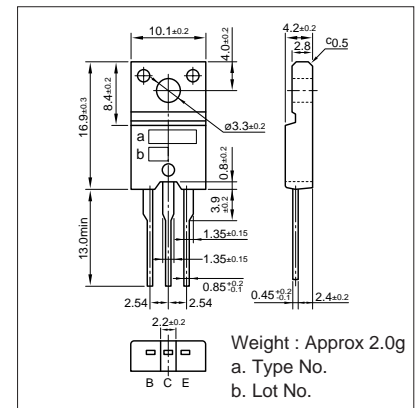
**Electrical Characteristics**

(Ta=25°C)

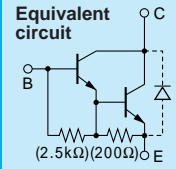
Symbol	Conditions	2SC5370	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =60V	10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =7V	10max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	40min	V
h <sub>FE</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =6A	70min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =6A, I <sub>B</sub> =0.3A	0.3max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =6A, I <sub>B</sub> =0.3A	1.2max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-3A	90typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	120typ	pF

\*h<sub>FE</sub> Rank  $\bar{0}$ (70to 140), Y(120to 240), G(200 to 400)

**External Dimensions FM20(TO220F)**



# Darlington 2SD1769



Silicon NPN Triple Diffused Planar Transistor

Application : Driver for Solenoid, Relay and Motor, Series Regulator, and General Purpose

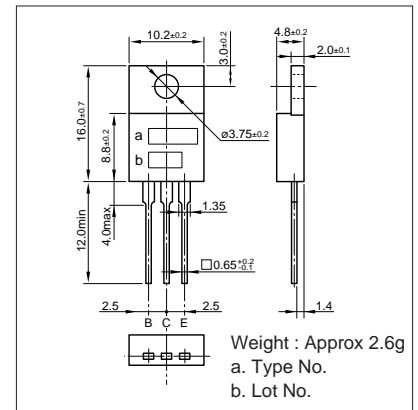
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD1769	Unit
V <sub>CB0</sub>	120	V
V <sub>CEO</sub>	120	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	6(Pulse10)	A
I <sub>B</sub>	1	A
P <sub>c</sub>	50(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SD1769	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =120V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	20max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =3A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =3mA	1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =3mA	2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.2A	100typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	typ	pF

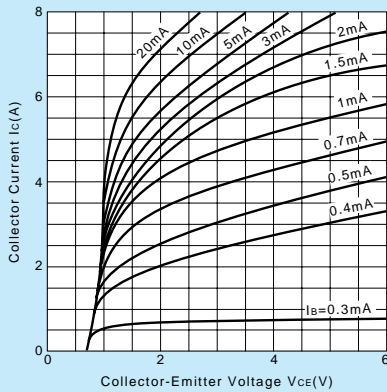
**External Dimensions MT-25(TO220)**



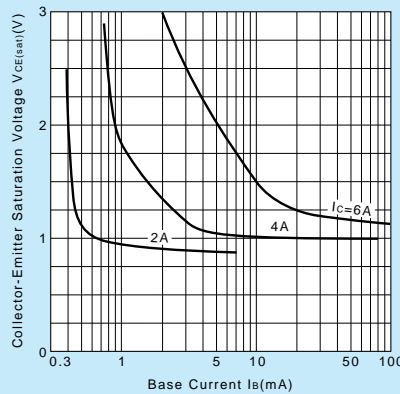
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	10	3	10	-1.5	3	-3	0.5typ	5.5typ	1.5typ

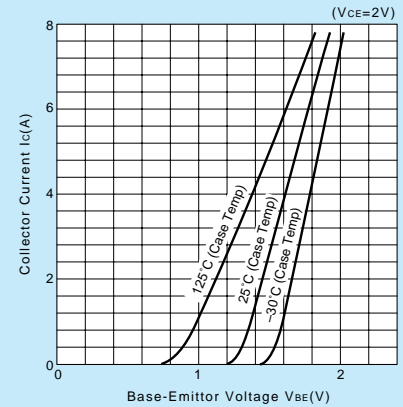
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



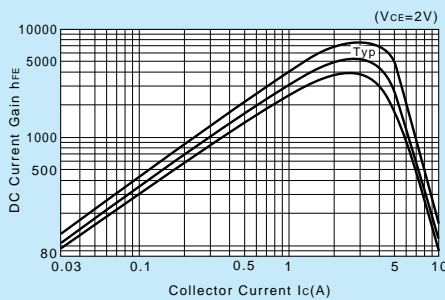
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



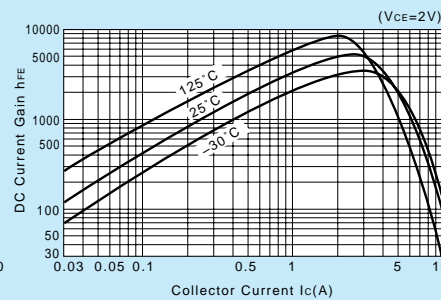
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



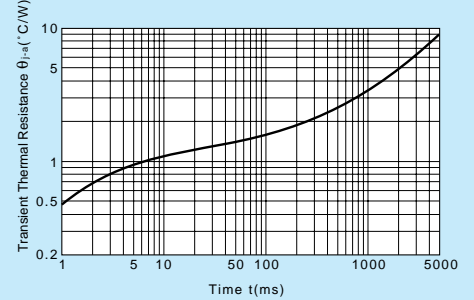
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



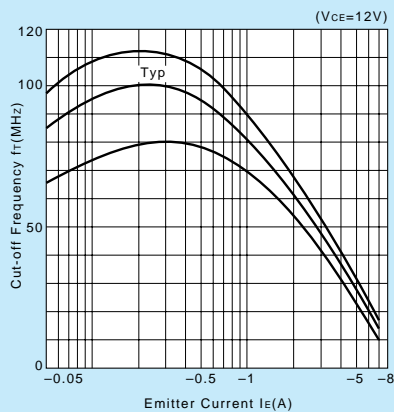
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



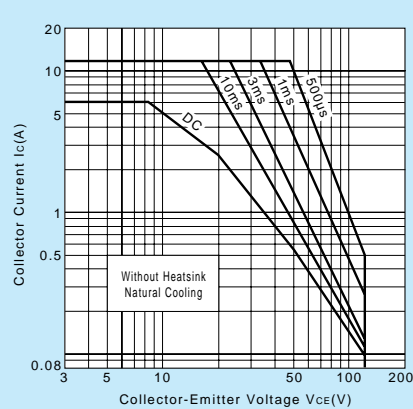
**θ<sub>JA</sub>-t Characteristics**



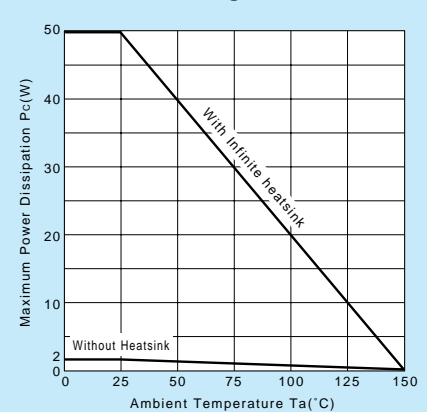
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

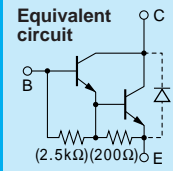


**P<sub>c</sub>-T<sub>a</sub> Derating**





# Darlington 2SD1785



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1258) Application : Driver for Solenoid, Relay and Motor, Series Regulator, and General Purpose

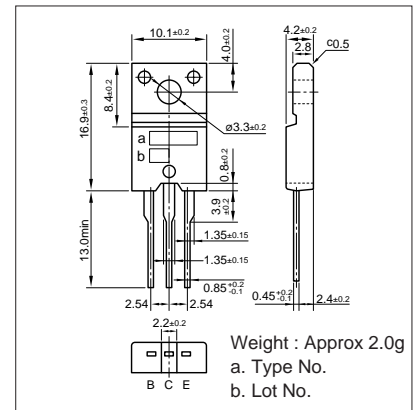
**Absolute maximum ratings (Ta=25°C)**

Symbol	2SD1785	Unit
V <sub>CB0</sub>	120	V
V <sub>CEO</sub>	120	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	6(Pulse10)	A
I <sub>B</sub>	1	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics (Ta=25°C)**

Symbol	Conditions	2SD1785	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =120V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	mA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =10mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =3A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =3mA	1.5max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.1A	100typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	70typ	pF

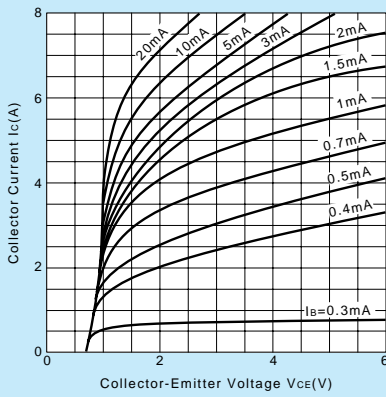
**External Dimensions FM20(TO220F)**



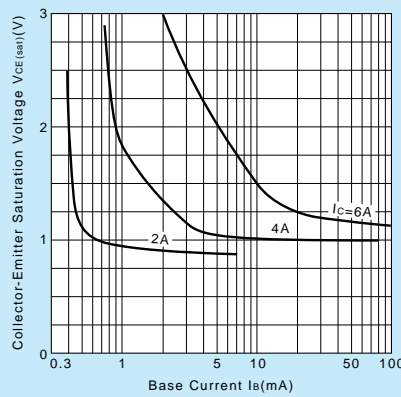
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	10	3	10	-1.5	3	-3	0.5typ	5.5typ	1.5typ

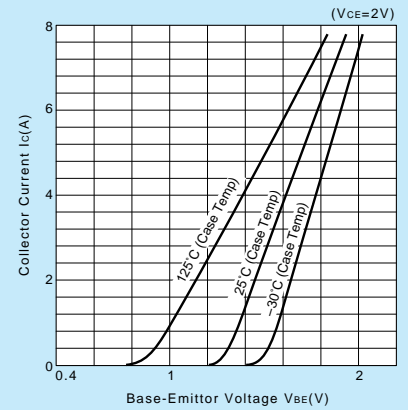
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



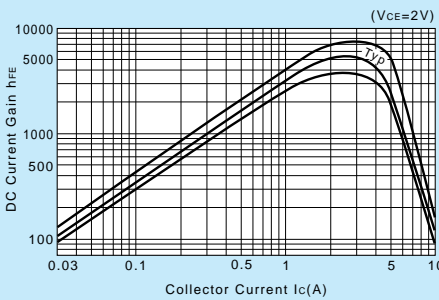
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



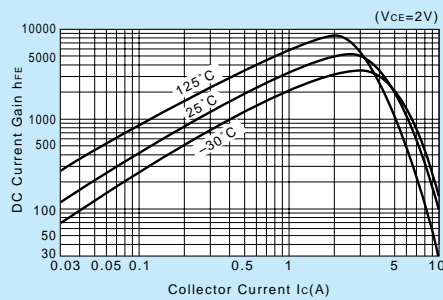
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



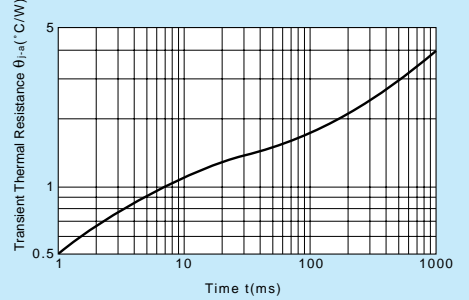
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



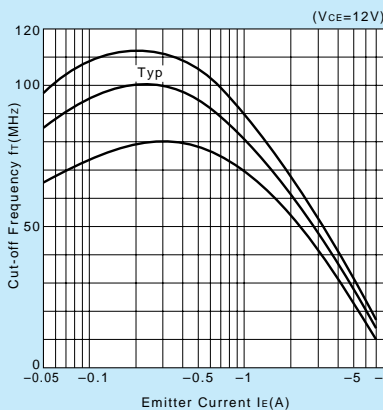
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



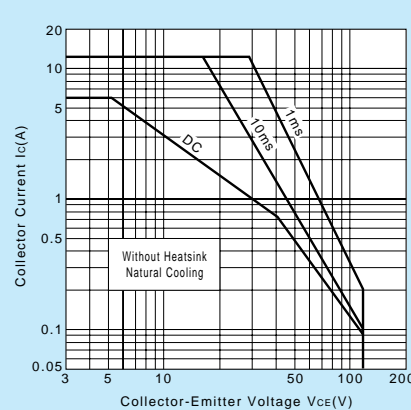
**θ<sub>J-a</sub>-t Characteristics**



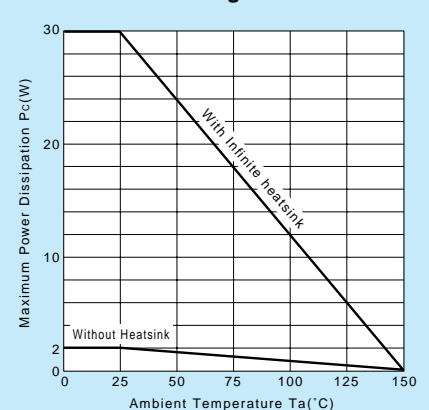
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

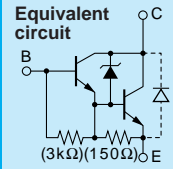


**P<sub>C</sub>-T<sub>a</sub> Derating**



# Built-in Avalanche Diode for Surge Absorbing Darlington

# 2SD1796



Silicon NPN Triple Diffused Planar Transistor

Application : Driver for Solenoid, Relay and Motor and General Purpose

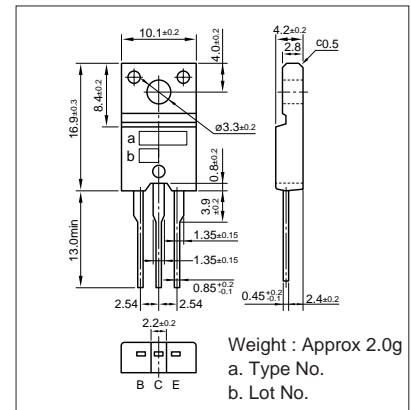
### Absolute maximum ratings (Ta=25°C)

Symbol	2SD1796	Unit
V <sub>CB0</sub>	60±10	V
V <sub>CEO</sub>	60±10	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	4	A
I <sub>B</sub>	0.5	A
P <sub>C</sub>	25(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SD1796	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =50V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	60±10	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =3A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =10mA	1.5max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.2A	60typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	45 typ	pF

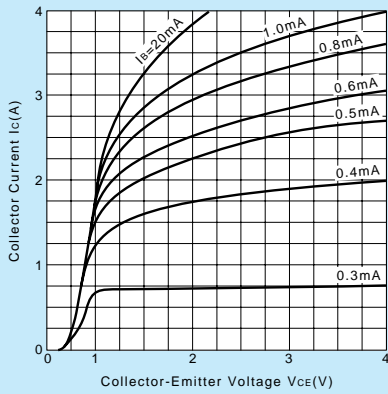
### External Dimensions FM20(TO220F)



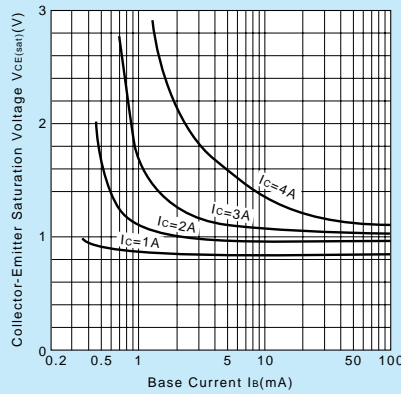
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	10	3	10	-5	10	-10	1.0typ	4.0typ	1.5typ

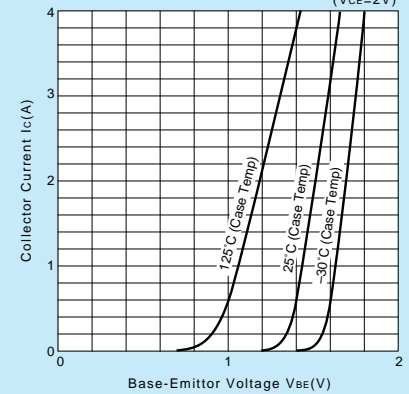
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



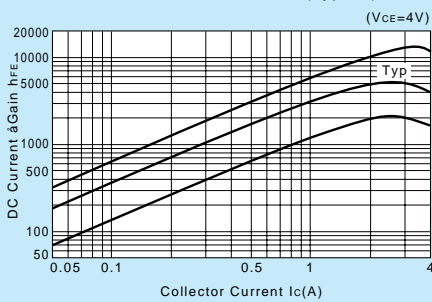
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



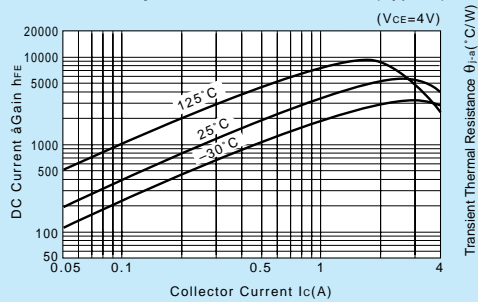
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



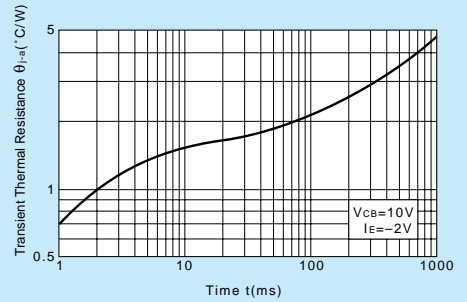
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



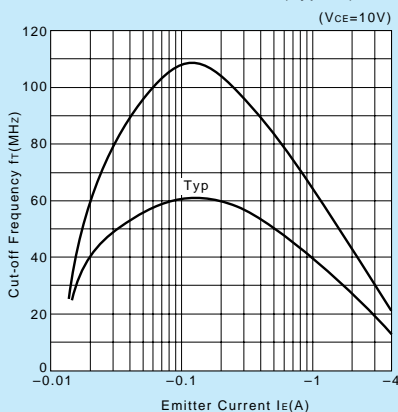
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



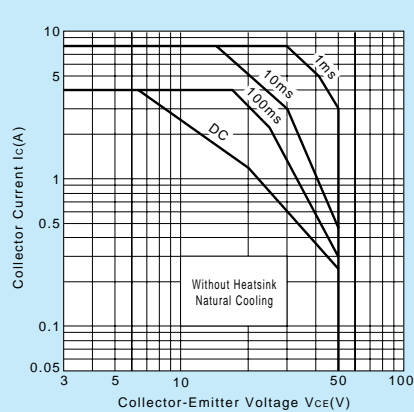
θ<sub>j-a</sub>-t Characteristics



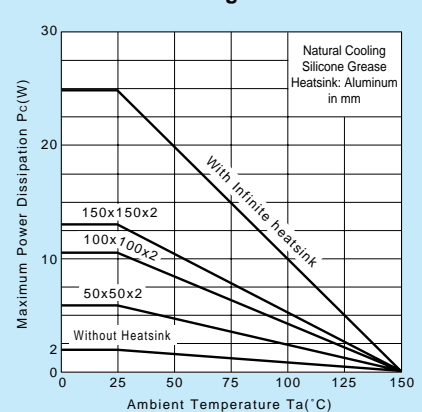
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



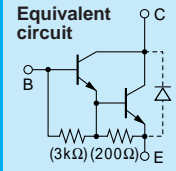
Safe Operating Area (Single Pulse)



P<sub>C</sub>-T<sub>a</sub> Derating



# Darlington 2SD2014



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1257)

Application : Driver for Solenoid, Relay and Motor, Series Regulator, and General Purpose

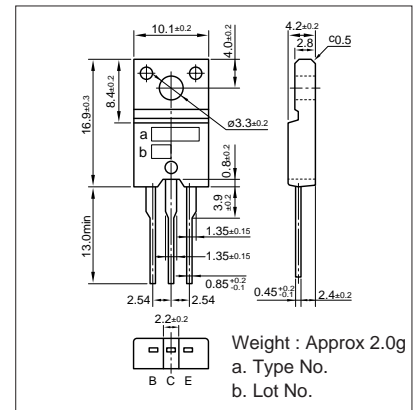
### Absolute maximum ratings (Ta=25°C)

Symbol	2SD2014	Unit
V <sub>CB0</sub>	120	V
V <sub>CEO</sub>	80	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	4	A
I <sub>B</sub>	0.5	A
P <sub>C</sub>	25(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SD2014	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =120V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	mA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =10mA	80min	V
h <sub>FE</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =3A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =3mA	1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =3mA	2.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.1A	75typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	45typ	pF

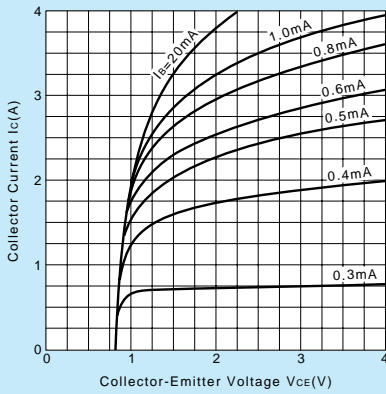
### External Dimensions FM20(TO220F)



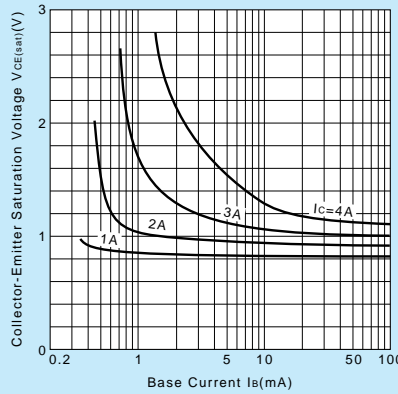
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	10	3	10	-5	10	-10	1.0typ	4.0typ	1.5typ

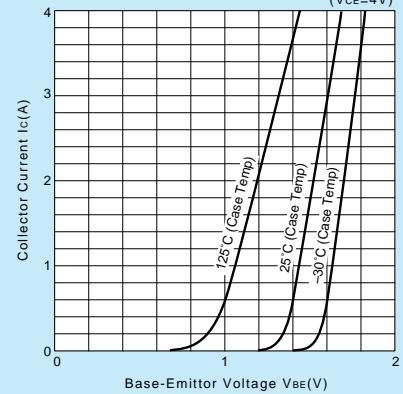
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



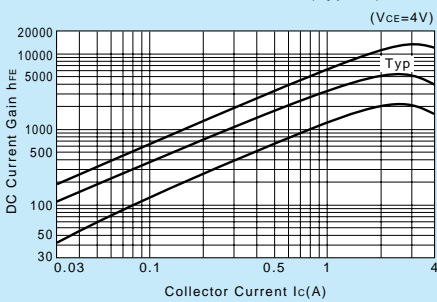
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



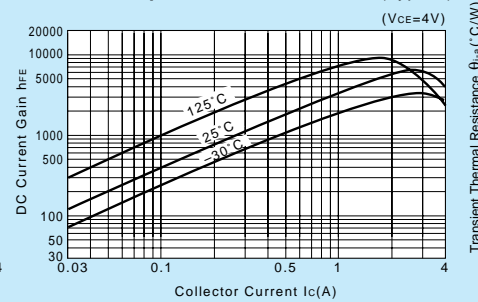
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



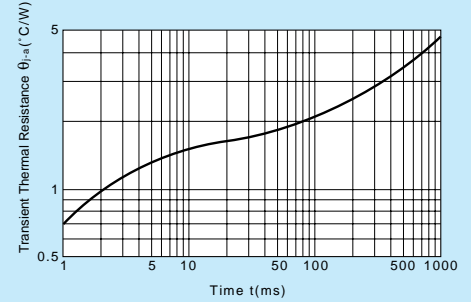
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



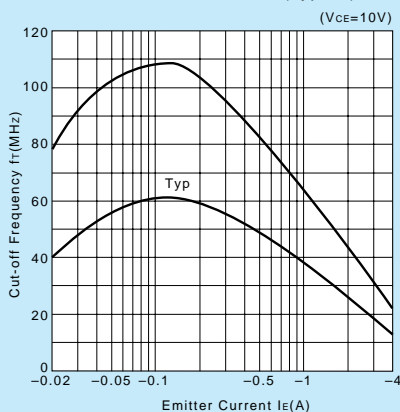
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



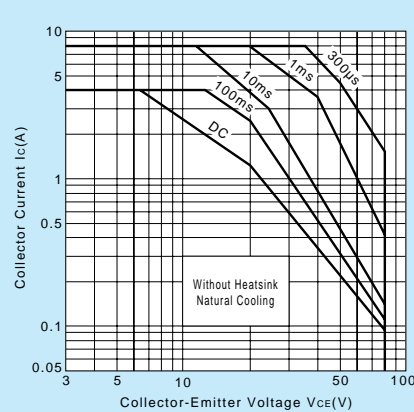
θ<sub>j-a</sub>-t Characteristics



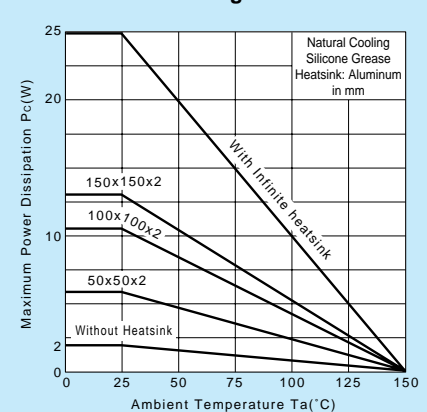
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)

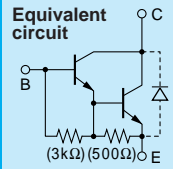


P<sub>C</sub>-T<sub>a</sub> Derating



Darlington

# 2SD2015



Silicon NPN Triple Diffused Planar Transistor

Application : Driver for Solenoid, Relay and Motor and General Purpose

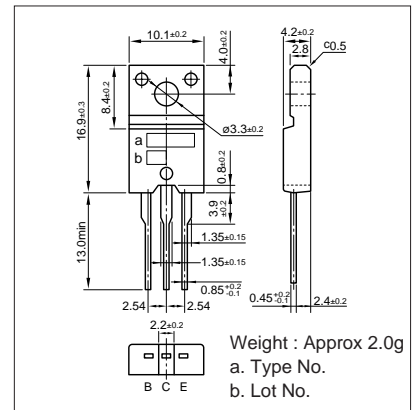
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2015	Unit
V <sub>CB0</sub>	150	V
V <sub>CEO</sub>	120	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	4	A
I <sub>B</sub>	0.5	A
P <sub>C</sub>	25(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SD2015	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =150V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =2A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =2mA	1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =2mA	2.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.1A	40typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	40typ	pF

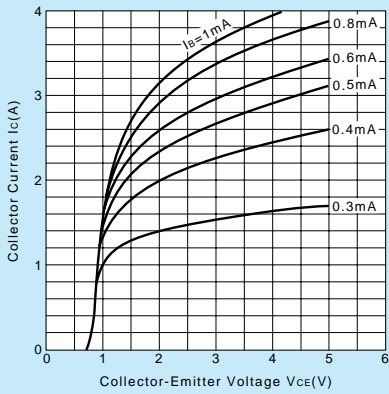
**External Dimensions FM20(TO220F)**



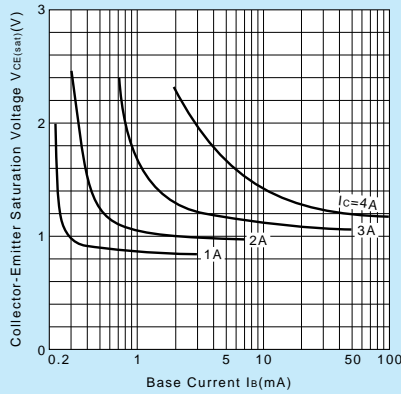
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	20	2	10	-5	10	-10	0.6typ	5.0typ	2.0typ

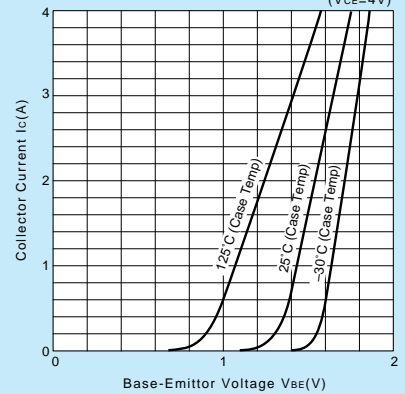
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



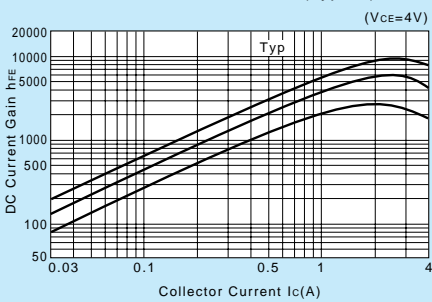
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



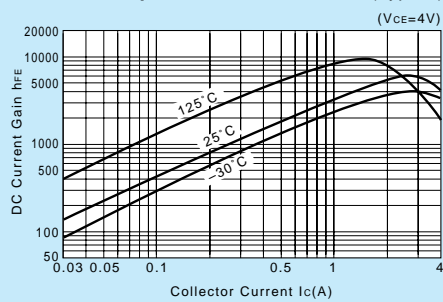
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



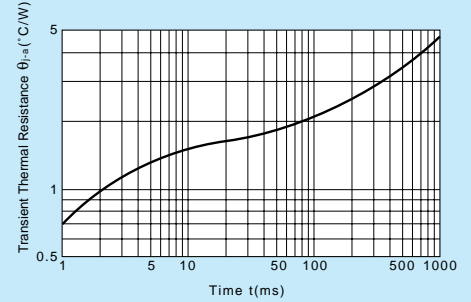
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



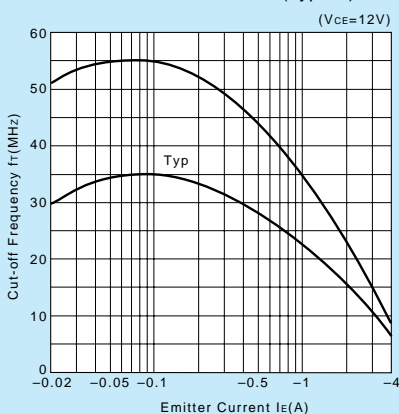
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



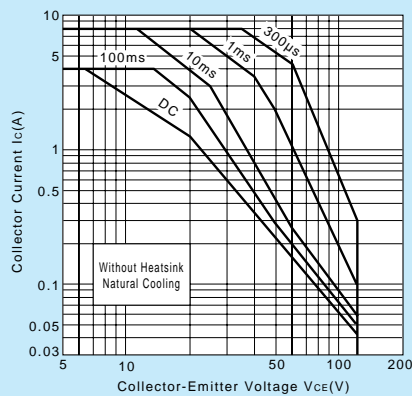
θ<sub>j-a</sub>-t Characteristics



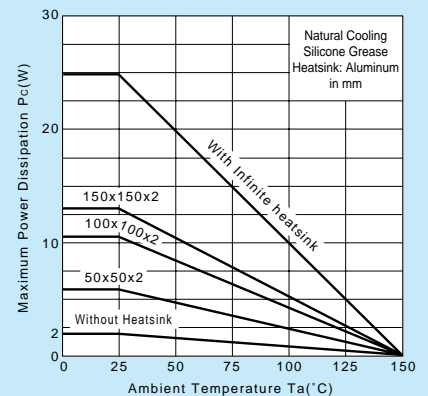
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



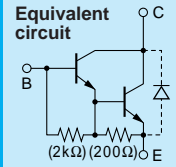
Safe Operating Area (Single Pulse)



P<sub>C</sub>-T<sub>a</sub> Derating



# Darlington 2SD2016



Silicon NPN Triple Diffused Planar Transistor

Application : Igniter, Relay and General Purpose

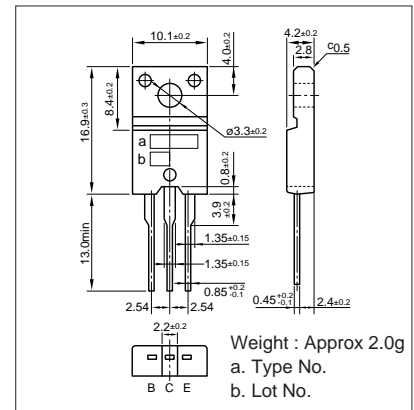
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2016	Unit
V <sub>CB0</sub>	200	V
V <sub>CEO</sub>	200	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	3	A
I <sub>B</sub>	0.5	A
P <sub>C</sub>	25(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

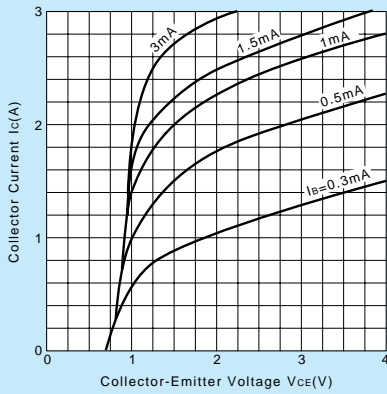
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SD2016	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	mA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =10mA	200min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =1A	1000 to 15000	
V <sub>CE(sat)</sub>	I <sub>C</sub> =1A, I <sub>B</sub> =1.5mA	1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =1A, I <sub>B</sub> =1.5mA	2.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.1A	90typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	40typ	pF

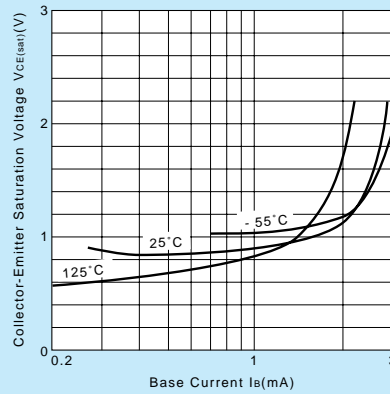
**External Dimensions FM20(TO220F)**



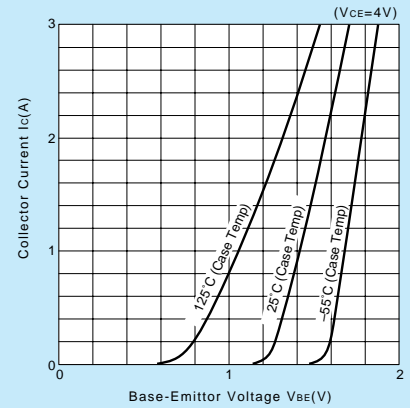
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



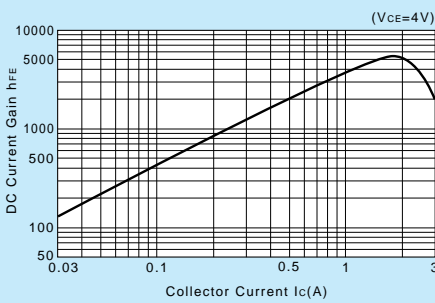
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



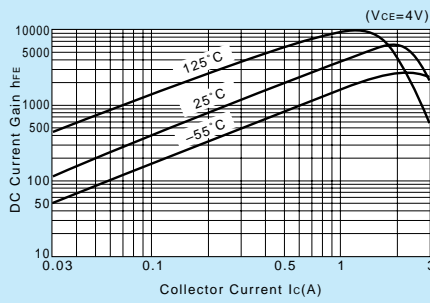
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



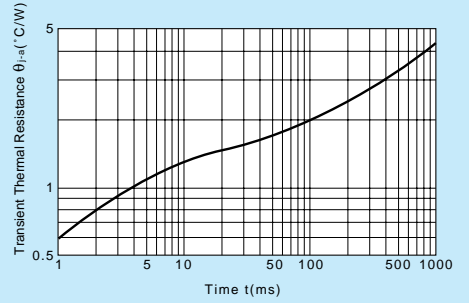
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



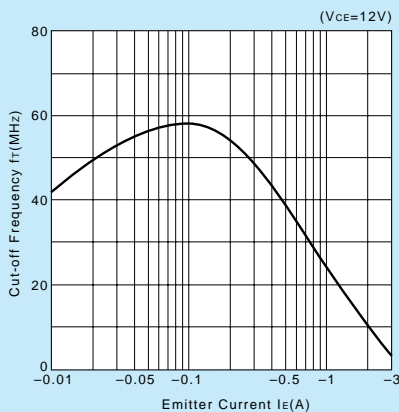
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



θ<sub>J-a</sub>-t Characteristics

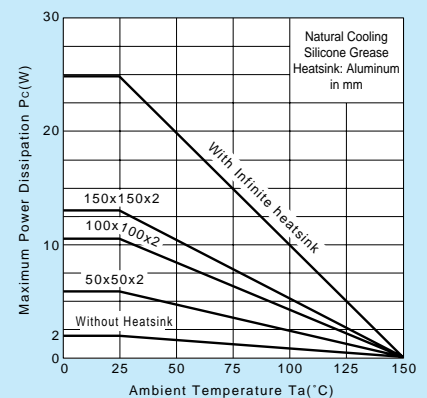


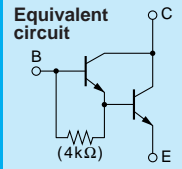
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)

P<sub>C</sub>-T<sub>a</sub> Derating





## Silicon NPN Triple Diffused Planar Transistor

Application : Driver for Solenoid, Relay and Motor and General Purpose

### Absolute maximum ratings (Ta=25°C)

Symbol	2SD2017	Unit
V <sub>CB0</sub>	300	V
V <sub>CE0</sub>	250	V
V <sub>EB0</sub>	20	V
I <sub>C</sub>	6	A
I <sub>B</sub>	1	A
P <sub>C</sub>	35(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

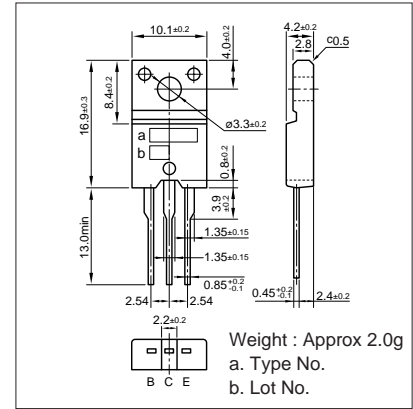
### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SD2017	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =300V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =20V	10max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	250min	V
h <sub>FE</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =2A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =2mA	1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =2A, I <sub>B</sub> =2mA	2.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	65typ	pF

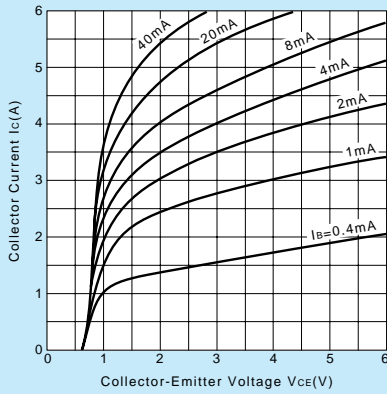
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
100	50	2	10	-5	5	-10	0.6typ	16.0typ	3.0typ

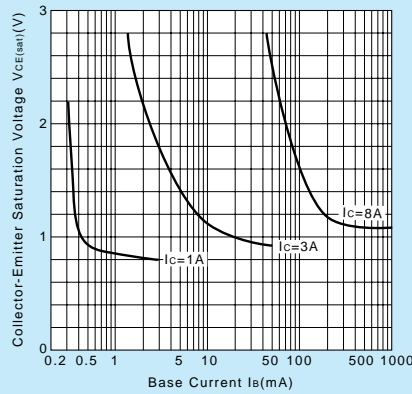
### External Dimensions FM20(TO220F)



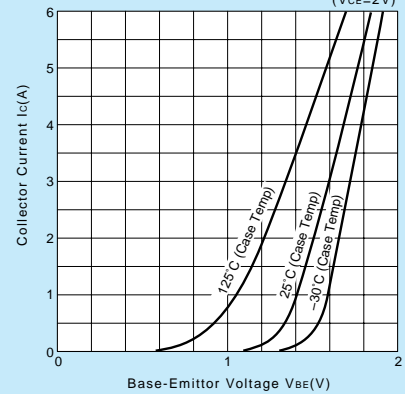
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



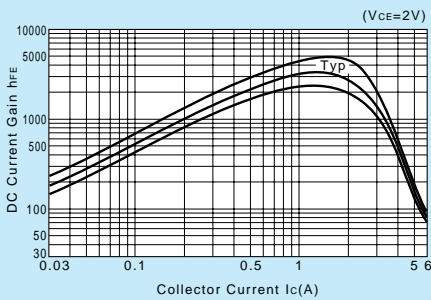
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



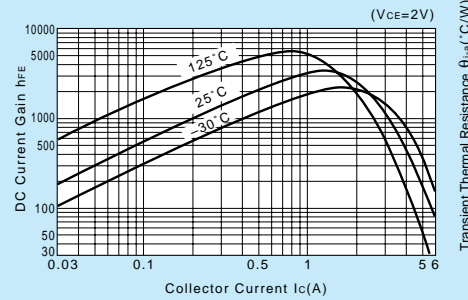
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



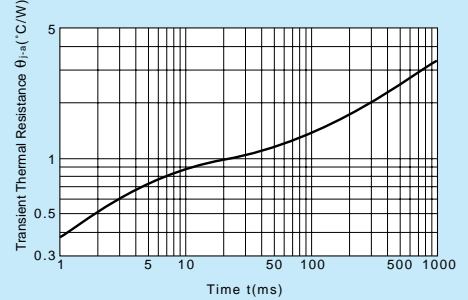
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



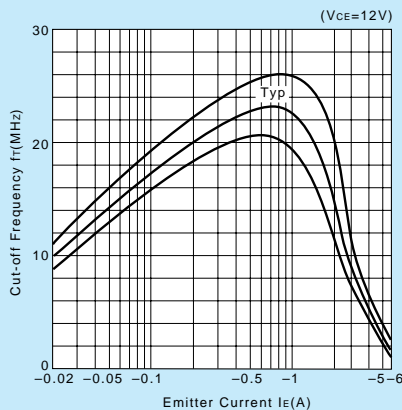
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



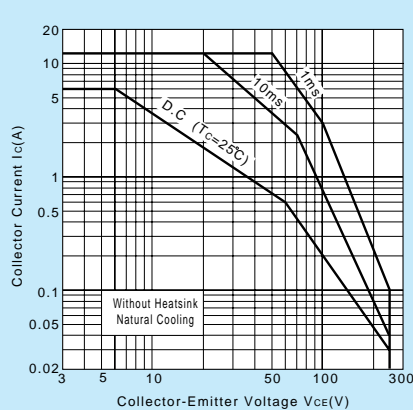
θ<sub>j-a</sub>-t Characteristics



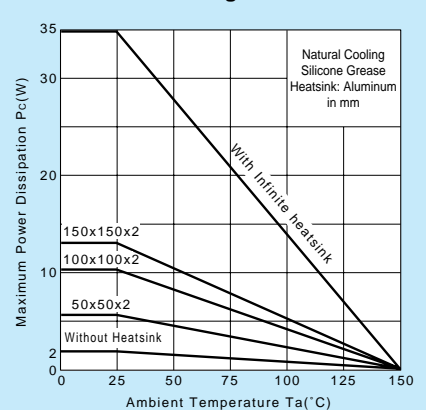
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)

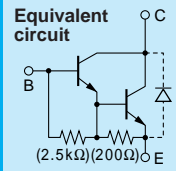


P<sub>C</sub>-T<sub>a</sub> Derating





# Darlington 2SD2045



Silicon NPN Triple Diffused Planar Transistor

Application : Driver for Solenoid, Motor and General Purpose

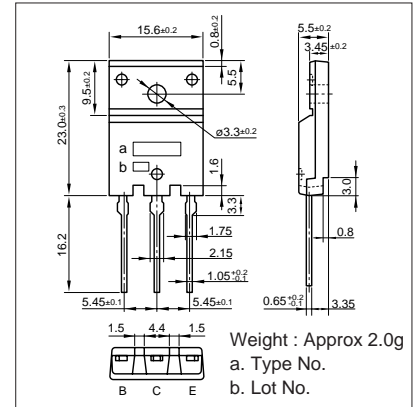
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2045	Unit
V <sub>CB0</sub>	120	V
V <sub>CEO</sub>	120	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	6(Pulse10)	A
I <sub>B</sub>	1	A
P <sub>c</sub>	50(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SD2045	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =120V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =3A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =3mA	1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =3A, I <sub>B</sub> =3mA	2.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	50typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	70typ	pF

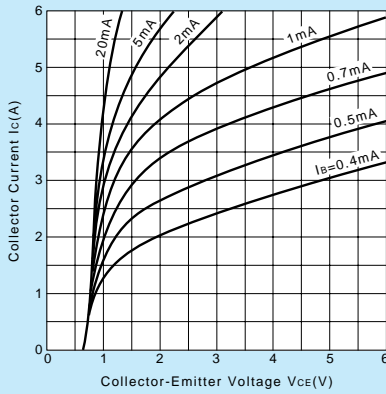
**External Dimensions FM100(TO3PF)**



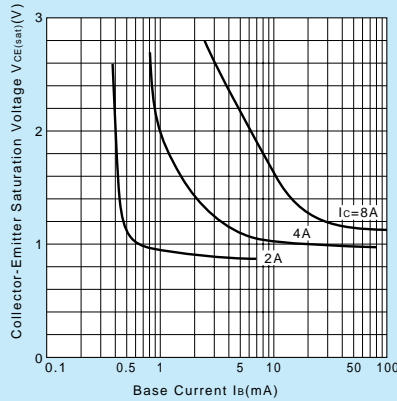
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	10	3	10	-5	3	-3	0.5typ	5.5typ	1.5typ

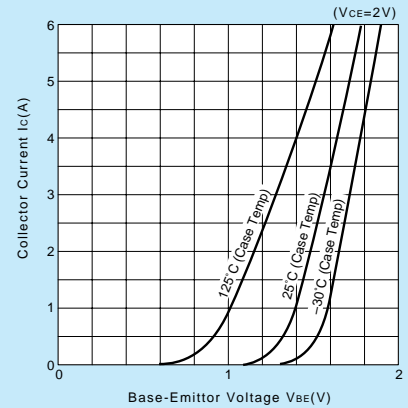
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



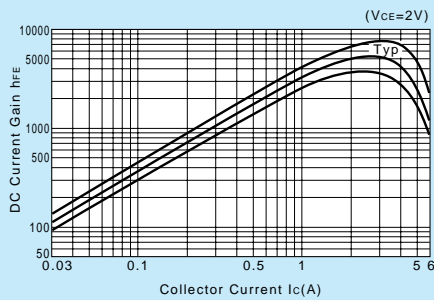
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



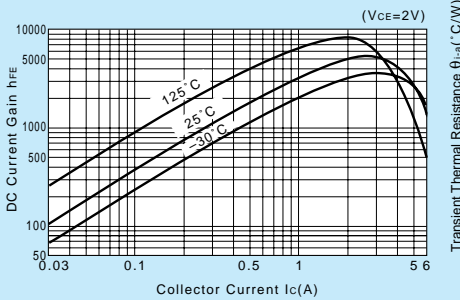
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



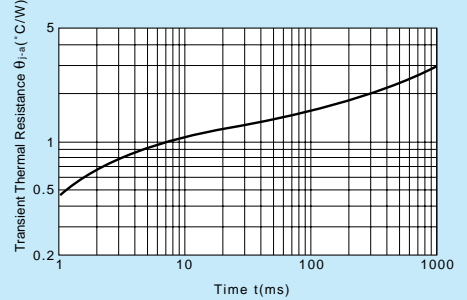
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



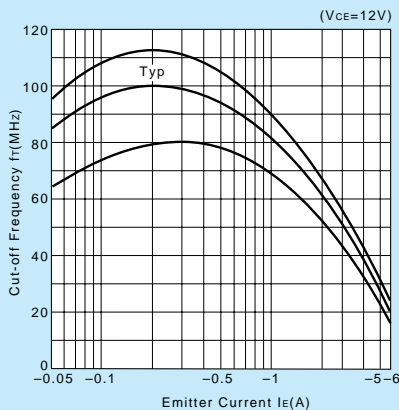
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



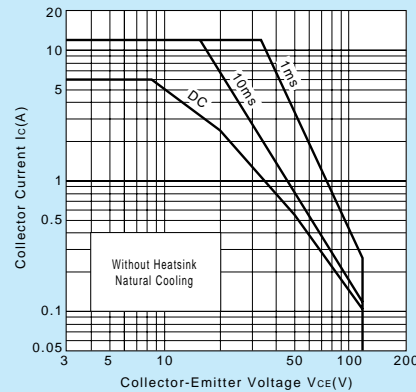
**θ<sub>j-a</sub>-t Characteristics**



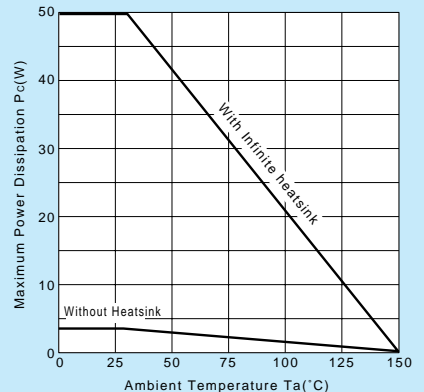
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**



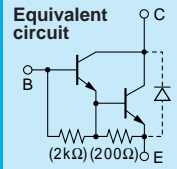
**P<sub>c</sub>-T<sub>a</sub> Derating**





Darlington

# 2SD2081



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1259)

Application : Driver for Solenoid, Motor and General Purpose

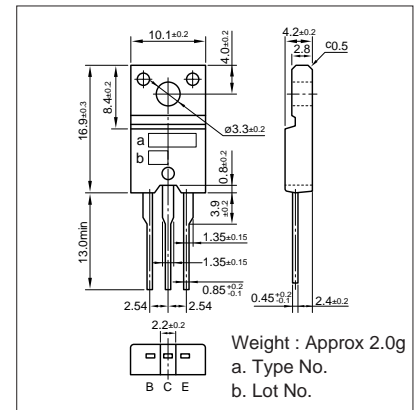
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2081	Unit
V <sub>CB0</sub>	120	V
V <sub>CEO</sub>	120	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	10(Pulse15)	A
I <sub>B</sub>	1	A
P <sub>c</sub>	30(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

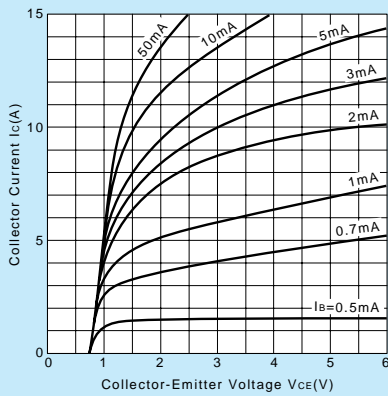
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SD2081	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =120V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	mA
V <sub>(BR)CEO</sub>	I <sub>c</sub> =10mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>c</sub> =5A	2000min	
V <sub>CE(sat)</sub>	I <sub>c</sub> =5A, I <sub>B</sub> =5mA	1.5max	V
V <sub>BE(sat)</sub>	I <sub>c</sub> =5A, I <sub>B</sub> =5mA	2.0max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	60typ	MHZ
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHZ	95typ	pF

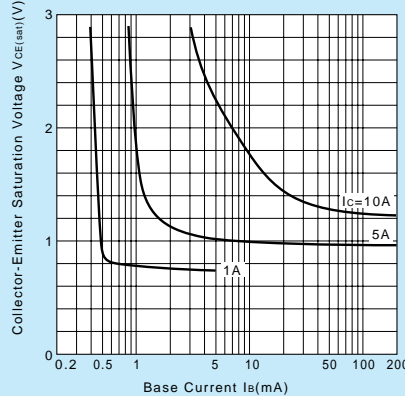
**External Dimensions FM20(TO220F)**



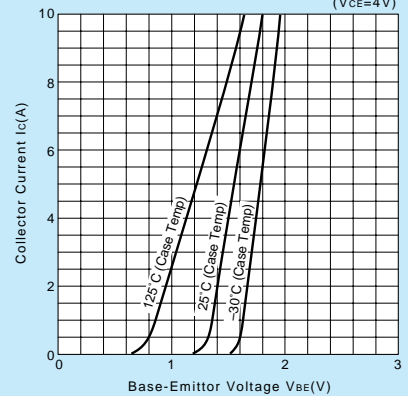
**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



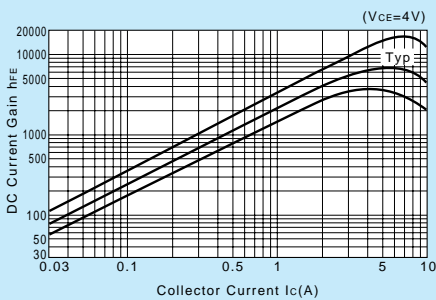
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



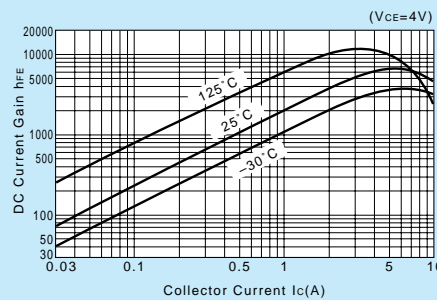
**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



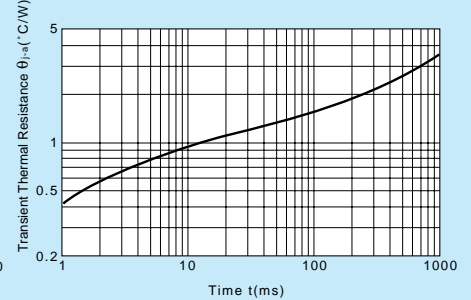
**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**



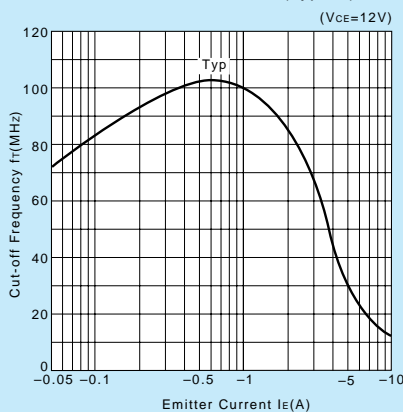
**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**



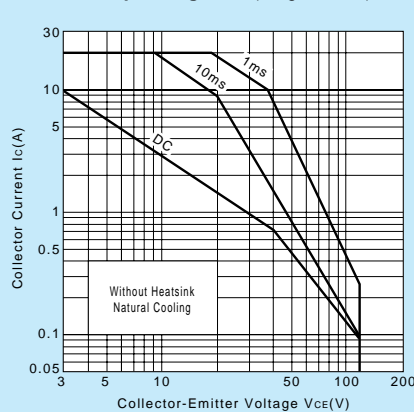
**θ<sub>j-a</sub>-t Characteristics**



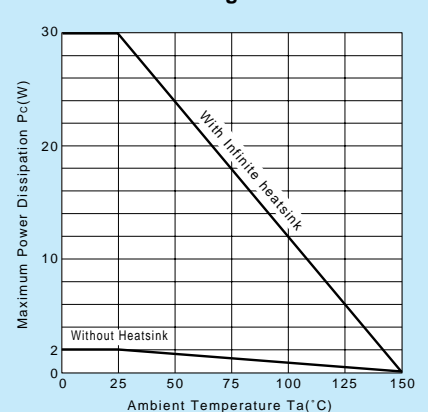
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



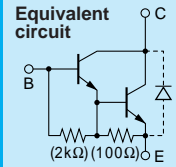
**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# Darlington 2SD2082



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1382)

Application : Driver for Solenoid, Motor and General Purpose

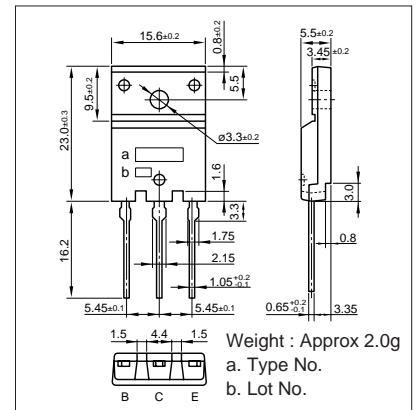
### Absolute maximum ratings (Ta=25°C)

Symbol	2SD2082	Unit
V <sub>CB0</sub>	120	V
V <sub>CE0</sub>	120	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	16(Pulse26)	A
I <sub>B</sub>	1	A
P <sub>c</sub>	75(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SD2082	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =120V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =8A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =16mA	1.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =8A, I <sub>B</sub> =16mA	2.5max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	20typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHz	210typ	pF

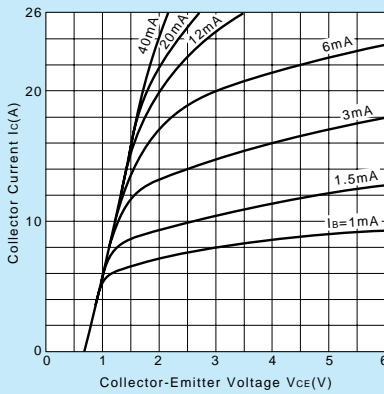
### External Dimensions FM100(TO3PF)



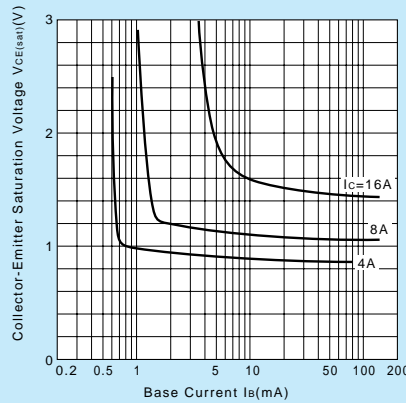
### Typical Switching Characteristics (Common Emitter)

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	5	8	10	-5	16	-16	0.6typ	7.0typ	1.5typ

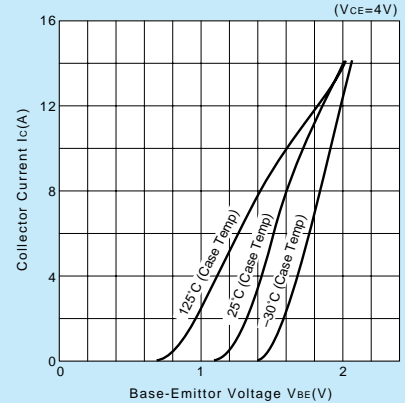
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



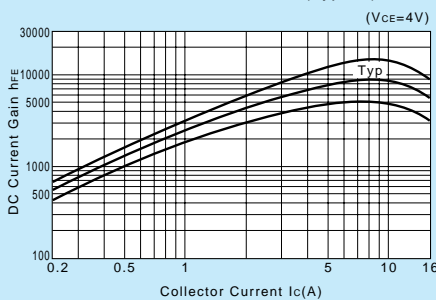
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



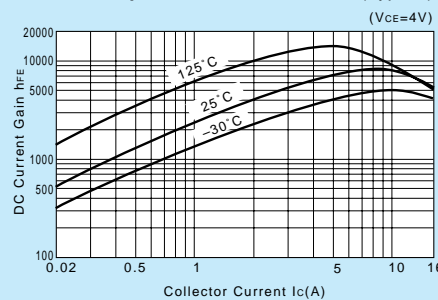
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



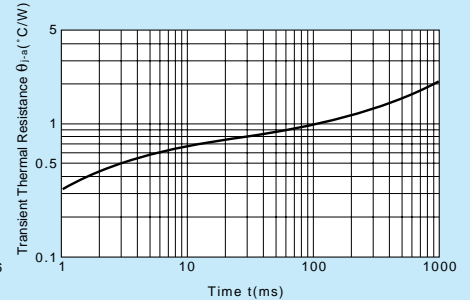
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



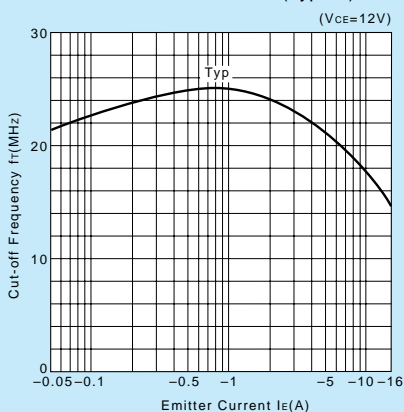
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



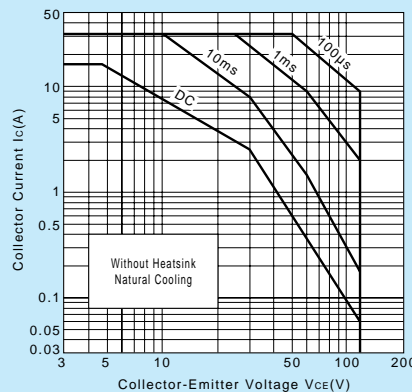
θ<sub>j-a-t</sub> Characteristics



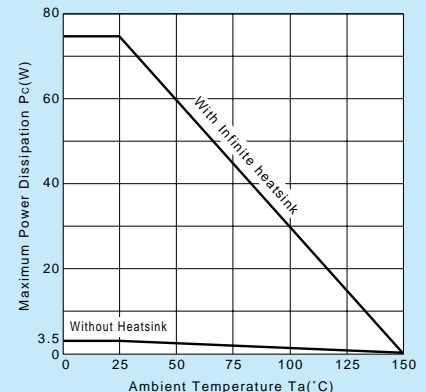
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)

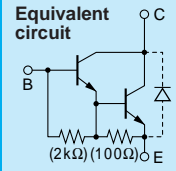


P<sub>c</sub>-T<sub>a</sub> Derating



Darlington

# 2SD2083



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1383)

Application : Driver for Solenoid, Motor and General Purpose

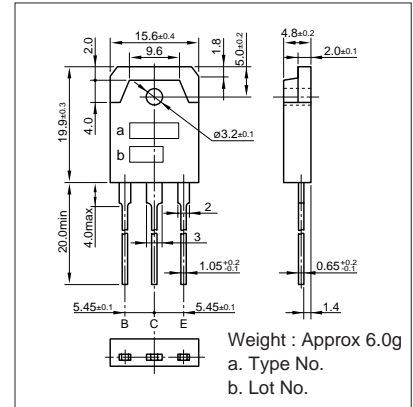
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2083	Unit
V <sub>CB0</sub>	120	V
V <sub>CEO</sub>	120	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	25(Pulse40)	A
I <sub>B</sub>	2	A
P <sub>C</sub>	120(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SD2083	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =120V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	10max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	120min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =12A	2000min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =12A, I <sub>B</sub> =24mA	1.8max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =12A, I <sub>B</sub> =24mA	2.5max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	20typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	340typ	pF

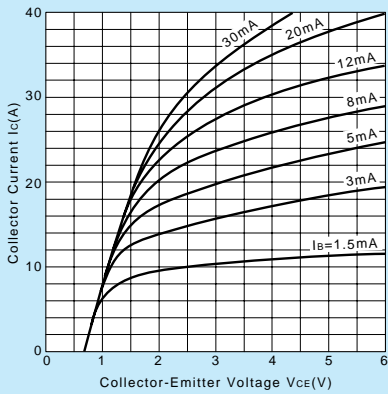
**External Dimensions MT-100(TO3P)**



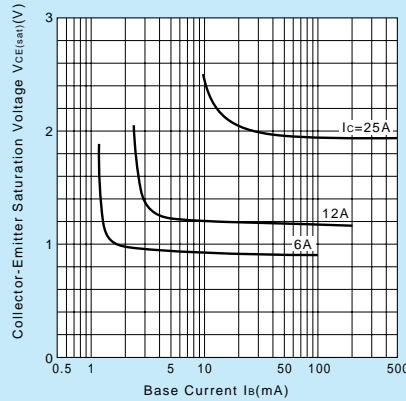
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
24	2	12	10	-5	24	-24	1.0typ	6.0typ	1.0typ

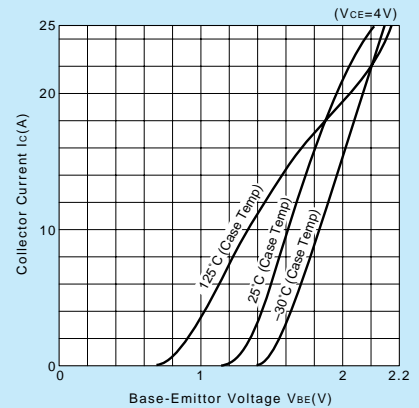
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



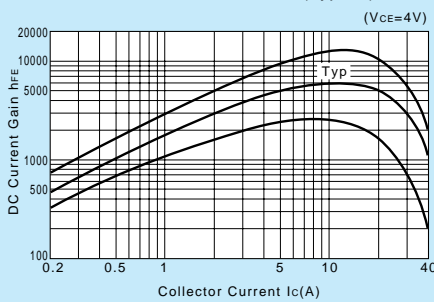
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



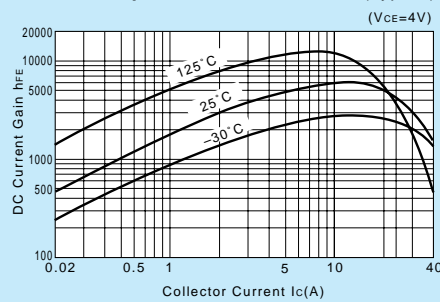
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



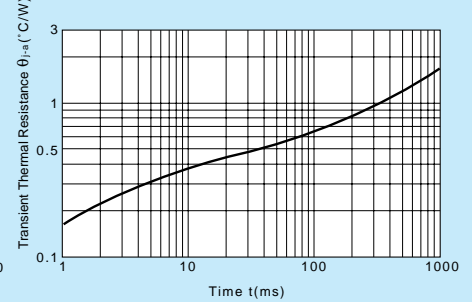
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



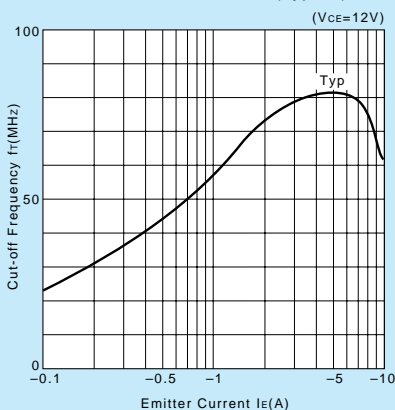
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



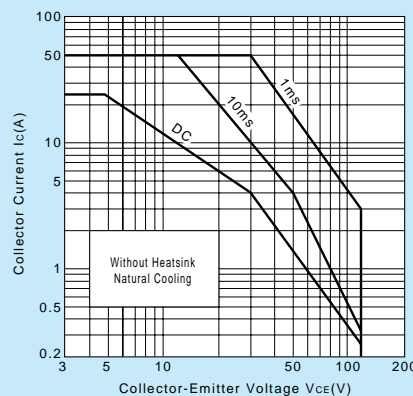
**θ<sub>j-a</sub>-t Characteristics**



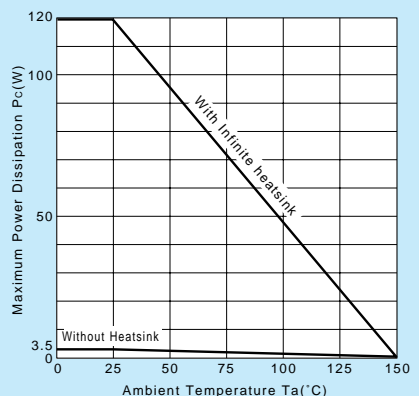
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

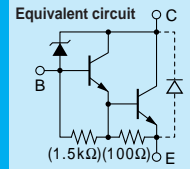


**P<sub>C</sub>-T<sub>a</sub> Derating**



# Built-in Avalanche Diode for Surge Absorbing Darlington

# 2SD2141



Silicon NPN Triple Diffused Planar Transistor

Application : Ignitor, Driver for Solenoid and Motor, and General Purpose

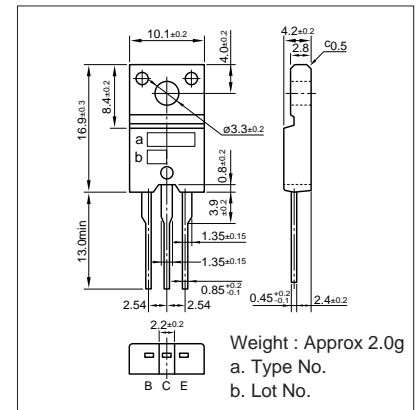
### Absolute maximum ratings (Ta=25°C)

Symbol	2SD2141	Unit
V <sub>CB0</sub>	380±50	V
V <sub>CE0</sub>	380±50	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	6(Pulse10)	A
I <sub>B</sub>	1	A
P <sub>C</sub>	35(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

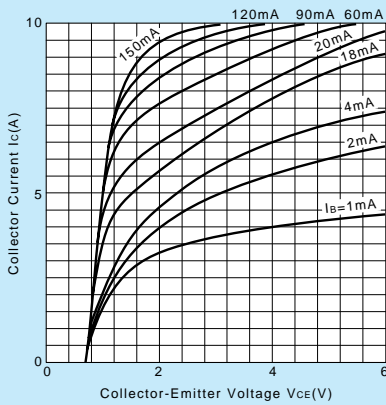
### Electrical Characteristics (Ta=25°C)

Symbol	Conditions	2SD2141	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =330V	10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	20max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =25mA	330 to 430	V
h <sub>FE</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =3A	1500min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =4A, I <sub>B</sub> =20mA	1.5max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	20typ	MHZ
COB	V <sub>CB</sub> =10V, f=1MHZ	95typ	pF

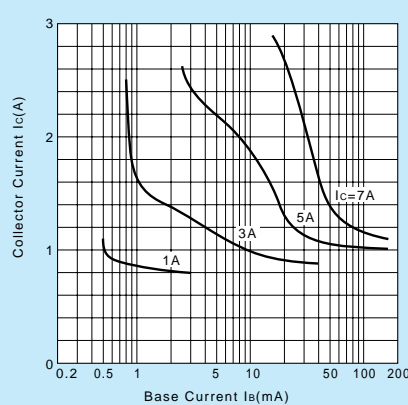
### External Dimensions FM20(TO220F)



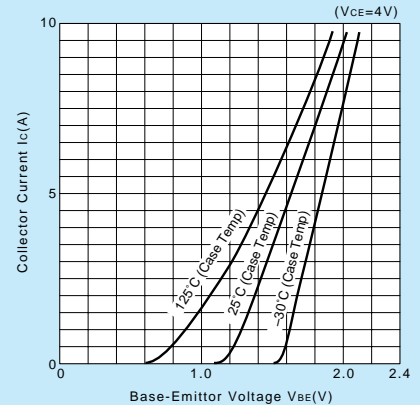
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



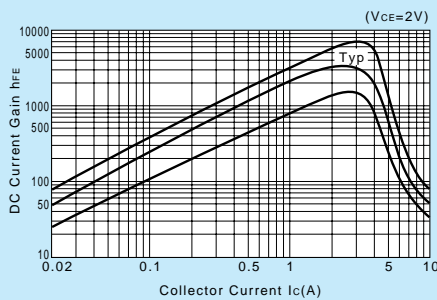
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



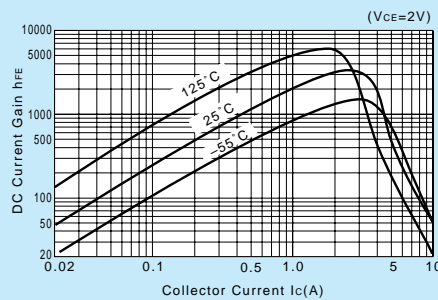
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



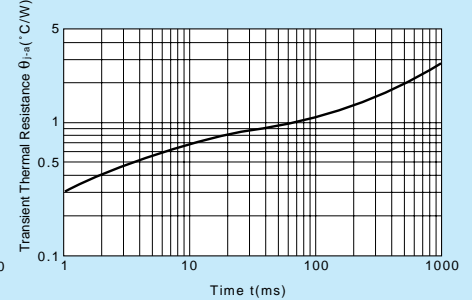
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



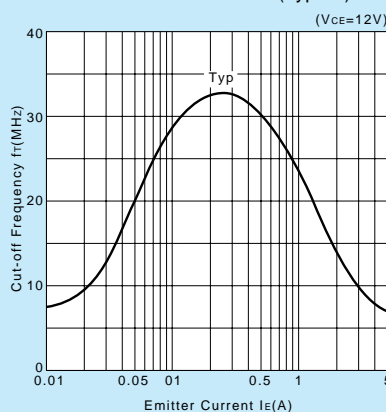
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



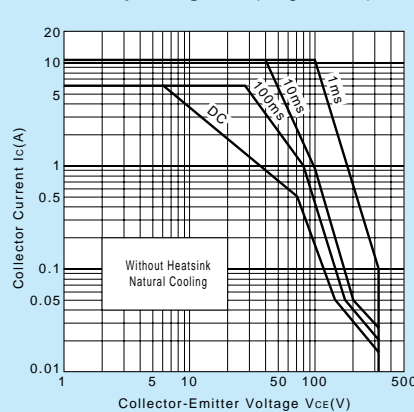
θ<sub>j-a-t</sub> Characteristics



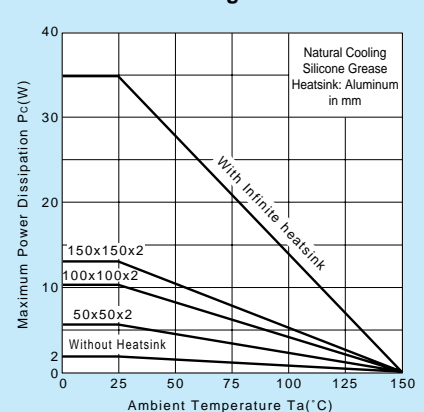
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



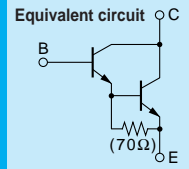
Safe Operating Area (Single Pulse)



P<sub>C</sub>-T<sub>a</sub> Derating



# Darlington 2SD2389



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1559)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2389	Unit
V <sub>CB0</sub>	160	V
V <sub>CE0</sub>	150	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	8	A
I <sub>B</sub>	1	A
P <sub>C</sub>	80(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

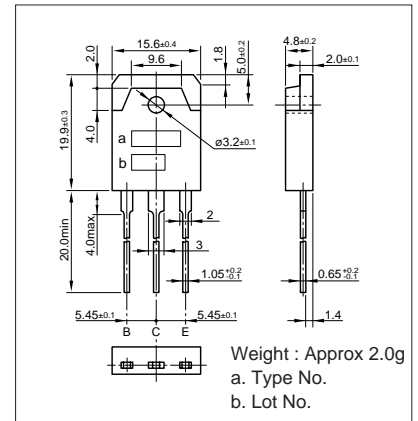
Symbol	Conditions	2SD2389	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =160V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =30mA	150min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =6A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =6A, I <sub>B</sub> =6mA	2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =6A, I <sub>B</sub> =6mA	3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-1A	80typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	85typ	pF

\*h<sub>FE</sub> Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

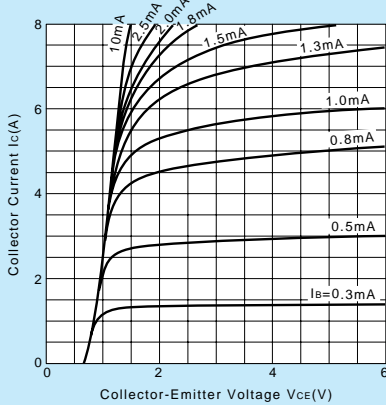
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
60	10	6	10	-5	6	-6	0.6typ	10.0typ	0.9typ

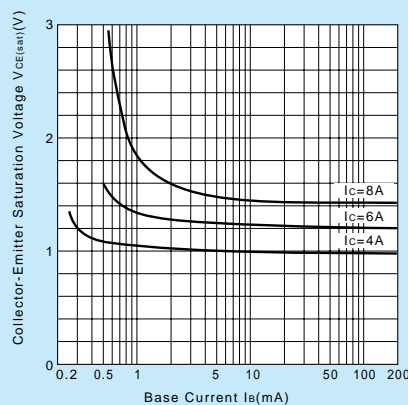
**External Dimensions MT-100(TO3P)**



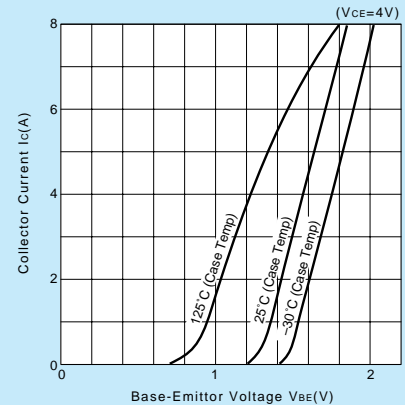
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



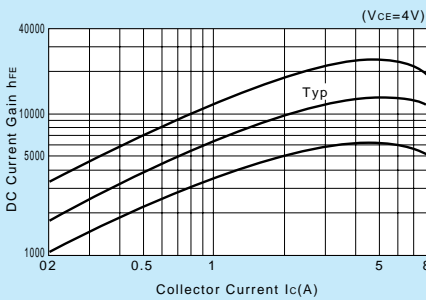
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



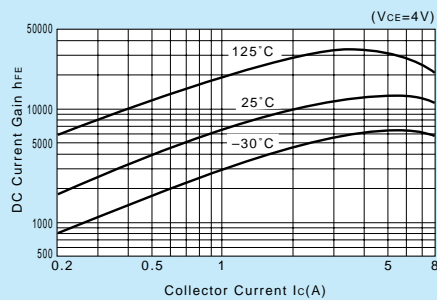
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



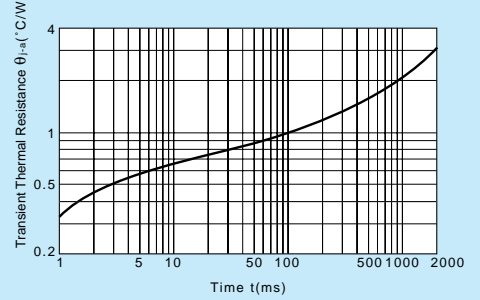
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



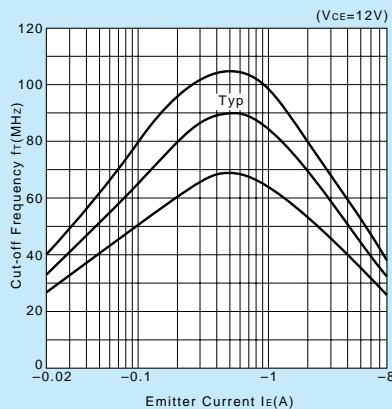
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



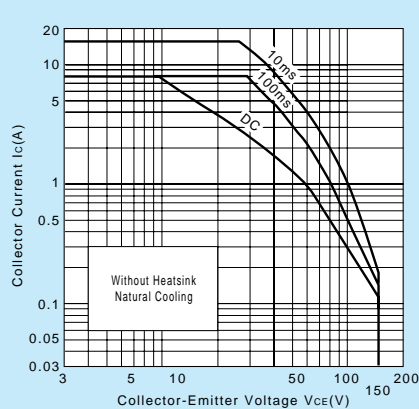
**θ<sub>j-a</sub>-t Characteristics**



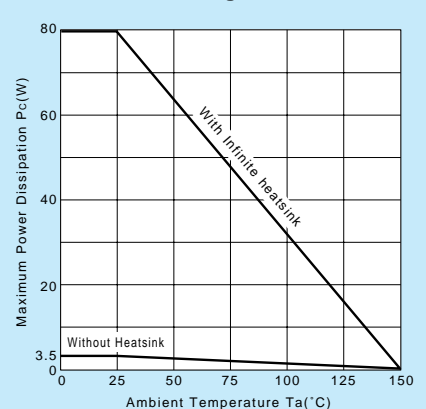
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



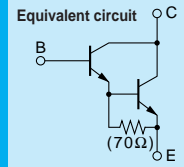
**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# Darlington 2SD2390



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1560)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2390	Unit
V <sub>CB0</sub>	160	V
V <sub>CE0</sub>	150	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	10	A
I <sub>B</sub>	1	A
P <sub>C</sub>	100(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

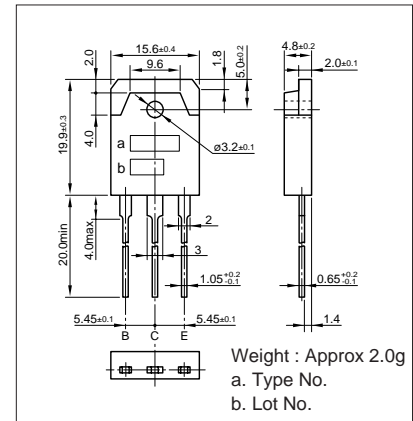
Symbol	Conditions	2SD2390	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =160V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =30mA	150min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =7A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =7mA	2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =7mA	3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	55typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	95typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

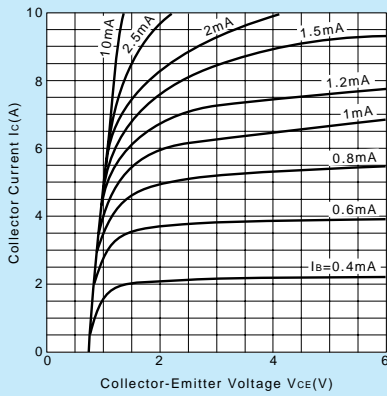
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
70	10	7	10	-5	7	-7	0.5typ	10.0typ	1.1typ

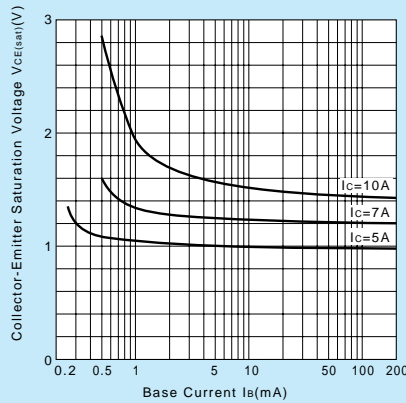
**External Dimensions MT-100(TO3P)**



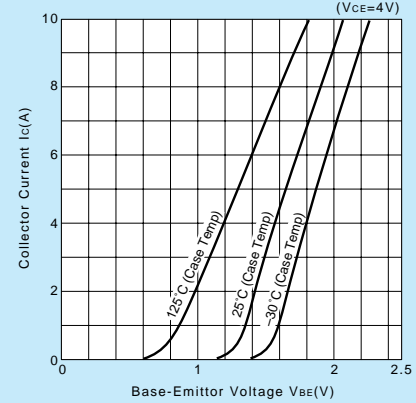
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



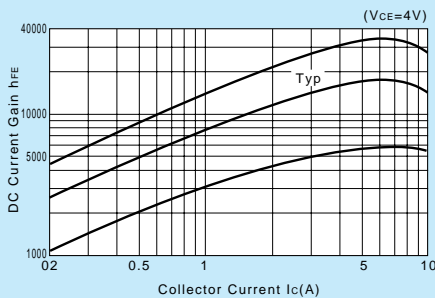
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



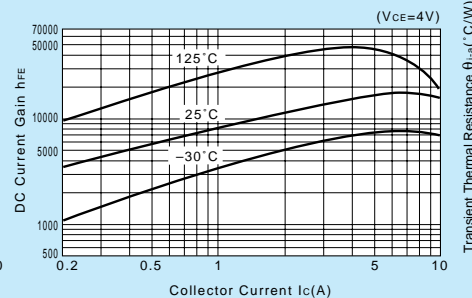
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



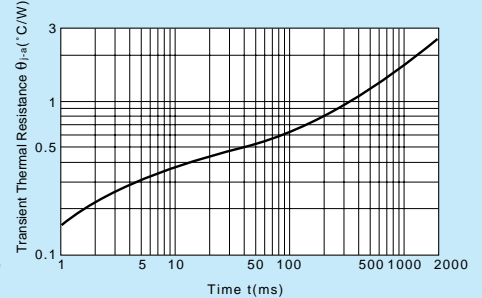
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



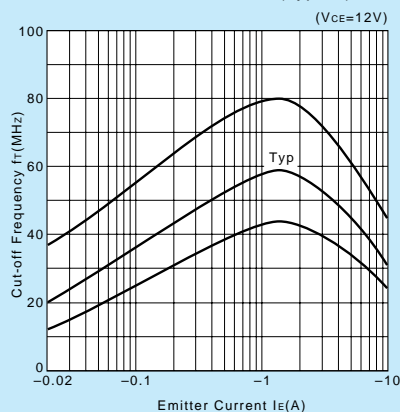
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



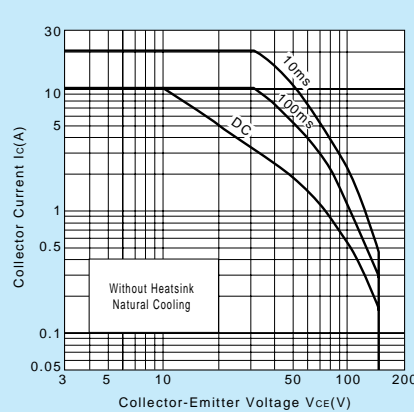
**θ<sub>j-a</sub>-t Characteristics**



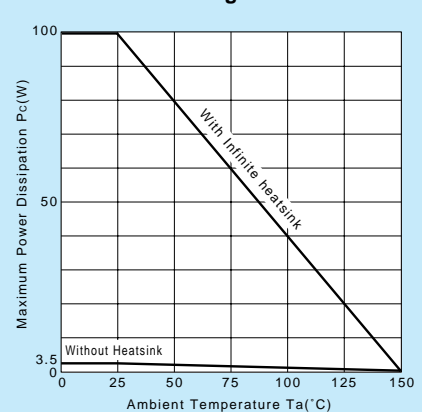
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

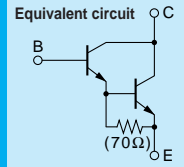


**P<sub>C</sub>-T<sub>a</sub> Derating**



Darlington

# 2SD2401



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1570)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2401	Unit
V <sub>CB0</sub>	160	V
V <sub>CE0</sub>	150	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	12	A
I <sub>B</sub>	1	A
P <sub>C</sub>	150(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

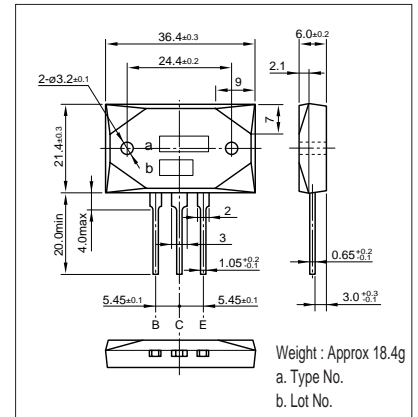
Symbol	Conditions	2SD2401	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =160V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =30mA	150min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =7A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =7mA	2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =7mA	3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	55typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	95typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000to12000), P(6500to20000), Y(15000to30000)

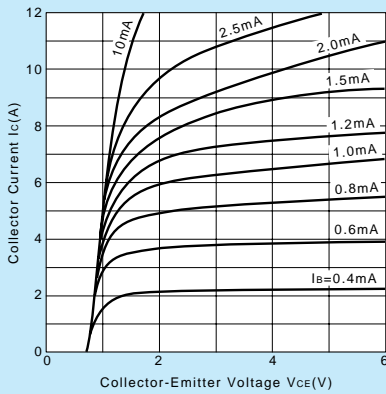
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
70	10	7	10	-5	7	-7	0.5typ	10.0typ	1.1typ

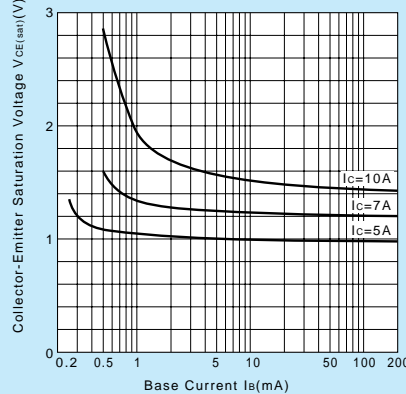
**External Dimensions MT-200**



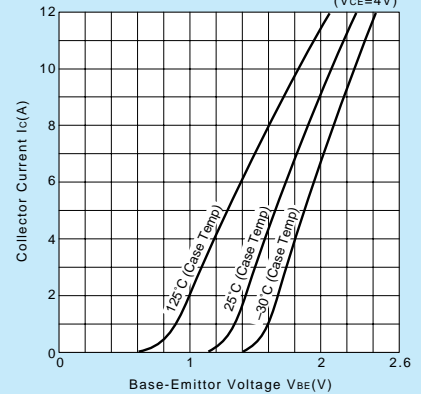
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



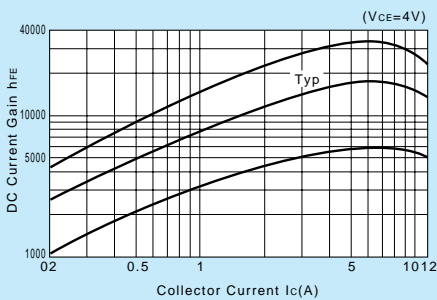
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



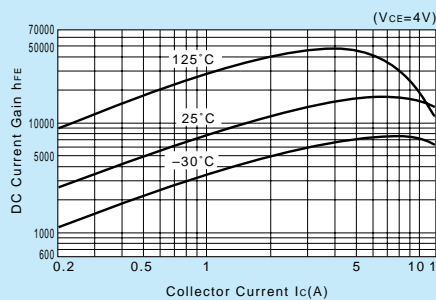
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



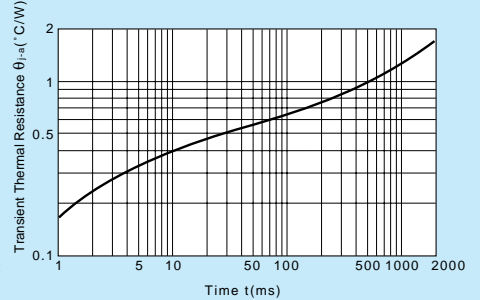
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



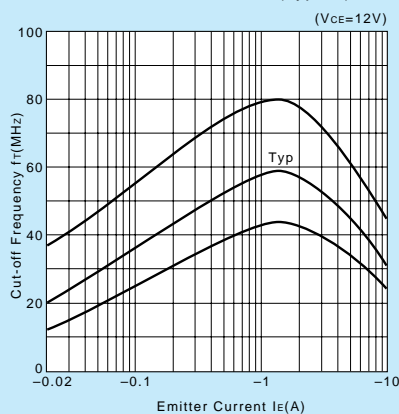
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



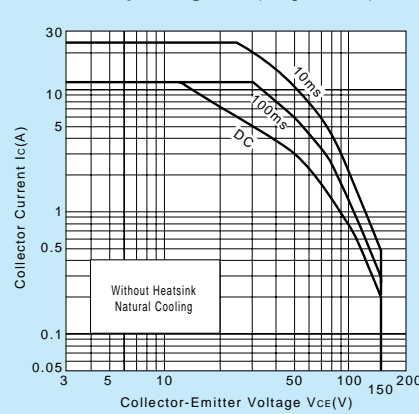
**θ<sub>j-a</sub>-t Characteristics**



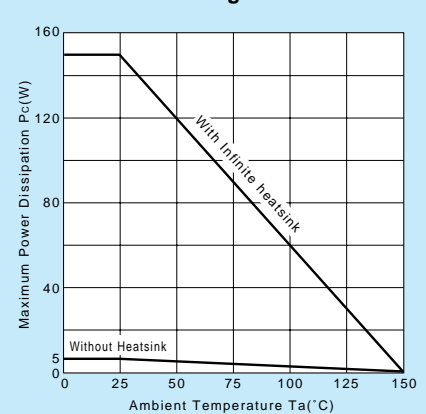
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

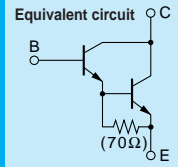


**P<sub>C</sub>-T<sub>a</sub> Derating**





# Darlington 2SD2438



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1587)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2438	Unit
VcBO	160	V
VcEO	150	V
VEBO	5	V
Ic	8	A
IB	1	A
Pc	75(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

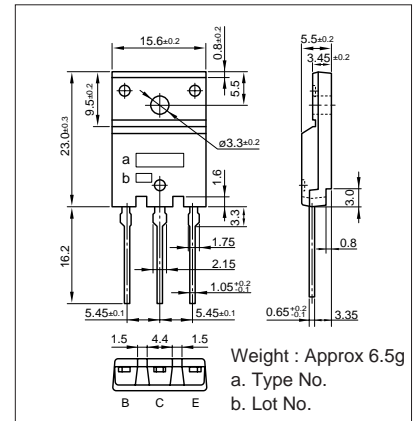
Symbol	Conditions	2SD2438	Unit
ICBO	VcB=160V	100max	μA
IEBO	VEB=5V	100max	μA
V(BR)CEO	Ic=30mA	150min	V
hFE	VcE=4V, Ic=6A	5000min*	
VcE(sat)	Ic=6A, IB=6mA	2.5max	V
VBE(sat)	Ic=6A, IB=6mA	3.0max	V
fT	VcE=12V, IE=-1A	80typ	MHz
COB	VcB=10V, f=1MHz	85typ	pF

\*hFE Rank  $\bar{O}$ (5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

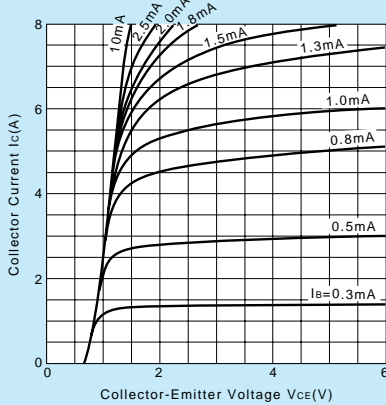
**Typical Switching Characteristics (Common Emitter)**

Vcc (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	IB1 (mA)	IB2 (mA)	ton (μs)	tstg (μs)	tf (μs)
60	10	6	10	-2	6	-6	0.6typ	10.0typ	0.9typ

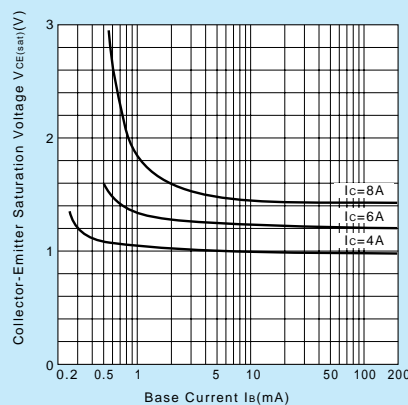
**External Dimensions FM100(TO3PF)**



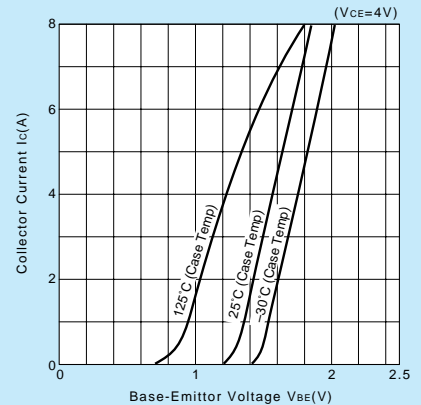
Ic-VcE Characteristics (Typical)



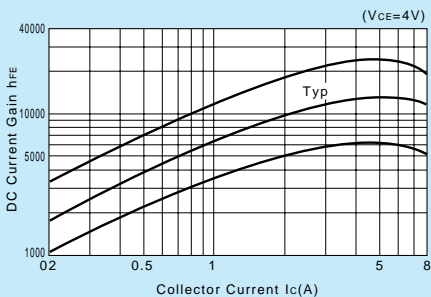
VcE(sat)-IB Characteristics (Typical)



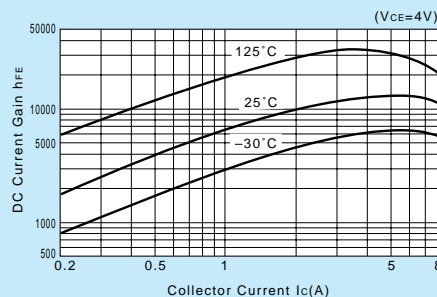
Ic-VBE Temperature Characteristics (Typical)



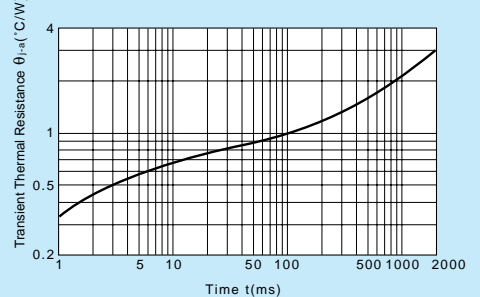
hFE-Ic Characteristics (Typical)



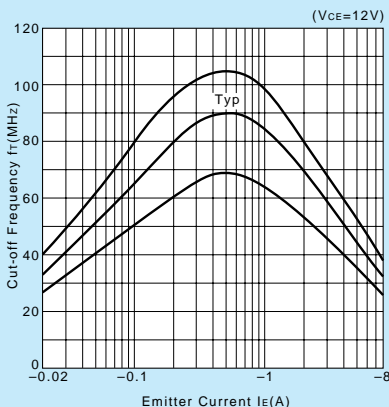
hFE-Ic Temperature Characteristics (Typical)



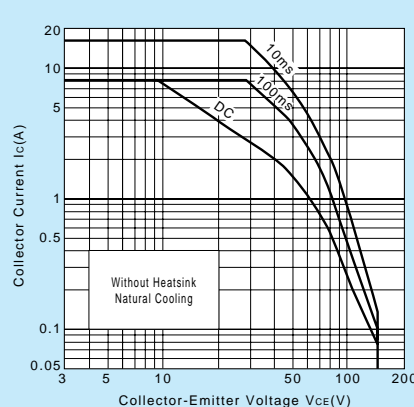
θj-a-t Characteristics



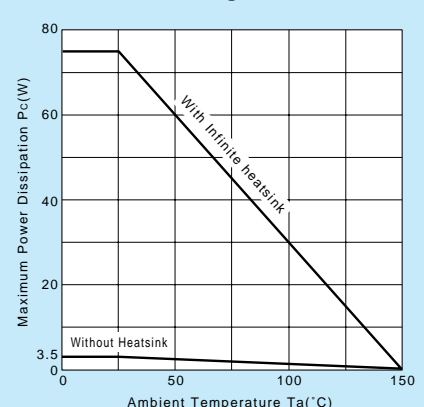
fT-IE Characteristics (Typical)



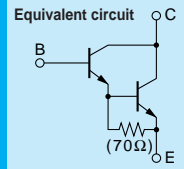
Safe Operating Area (Single Pulse)



Pc-Ta Derating



# Darlington 2SD2439



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1588)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2439	Unit
V <sub>CB0</sub>	160	V
V <sub>CE0</sub>	150	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	10	A
I <sub>B</sub>	1	A
P <sub>C</sub>	80(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

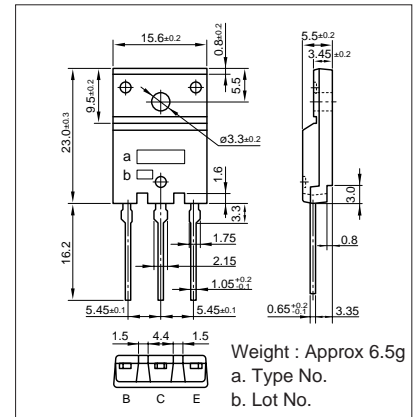
Symbol	Conditions	2SD2439	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =160V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =30mA	150min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =7A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =7mA	2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =7A, I <sub>B</sub> =7mA	3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	55typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	95typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

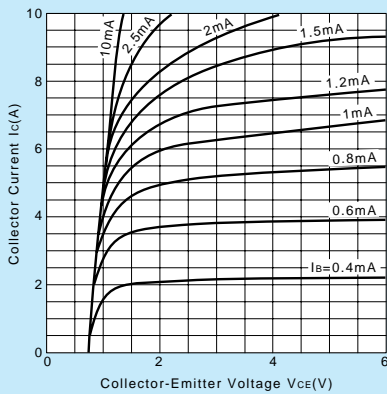
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
70	10	7	10	-5	7	-7	0.5typ	10.0typ	1.1typ

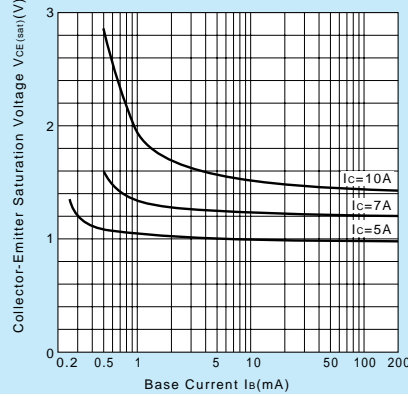
**External Dimensions FM100(TO3PF)**



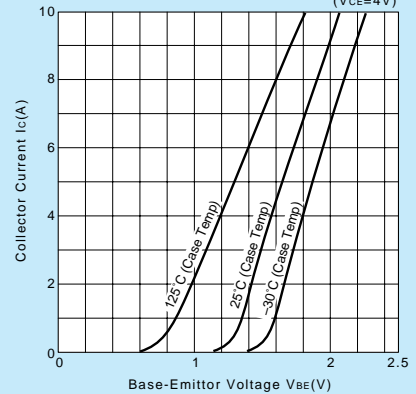
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



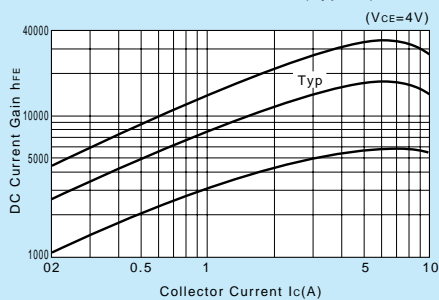
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



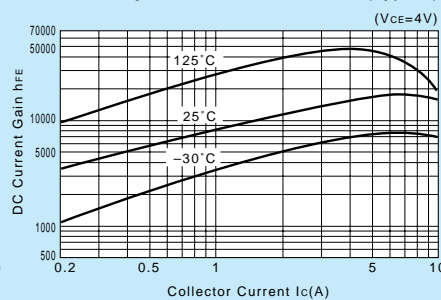
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



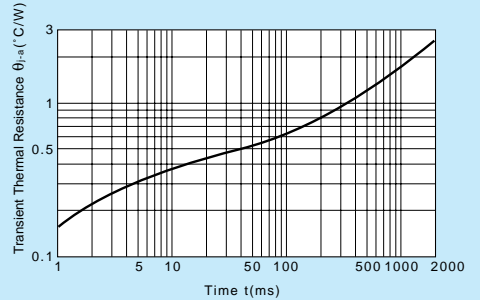
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



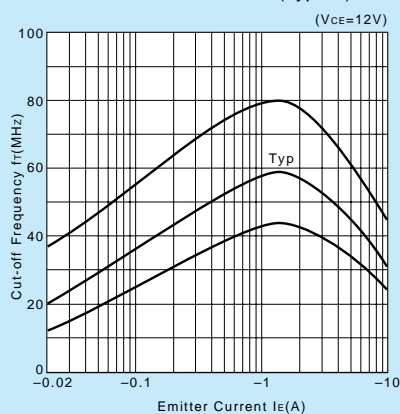
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



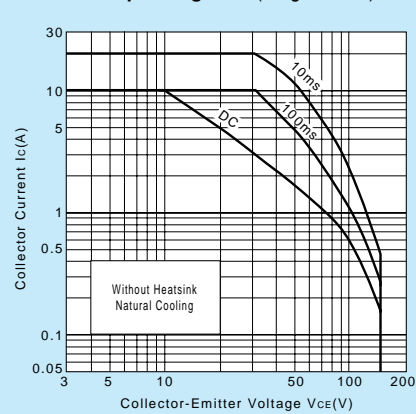
**θ<sub>j-a</sub>-t Characteristics**



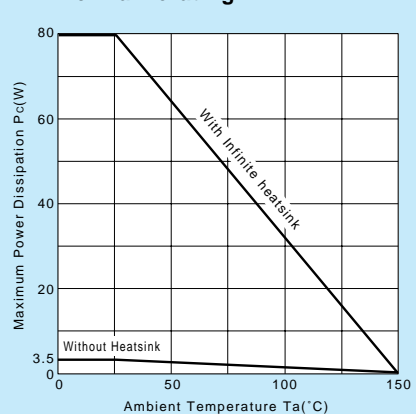
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



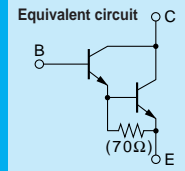
**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# Darlington 2SD2493



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1624)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2493	Unit
V <sub>CB0</sub>	110	V
V <sub>CEO</sub>	110	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	6	A
I <sub>B</sub>	1	A
P <sub>C</sub>	60(Tc=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

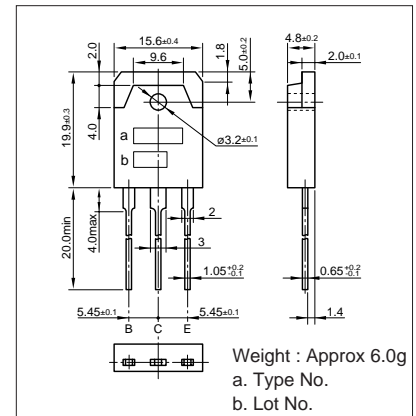
Symbol	Conditions	2SD2493	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =110V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =30mA	110min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =5A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =5mA	2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =5mA	3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	60typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	55typ	pF

\*h<sub>FE</sub> Rank: O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

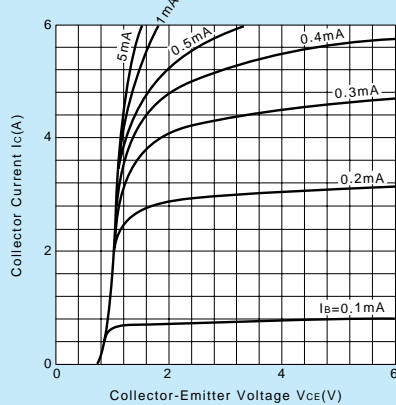
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	6	5	10	-5	5	-5	0.8typ	6.2typ	1.1typ

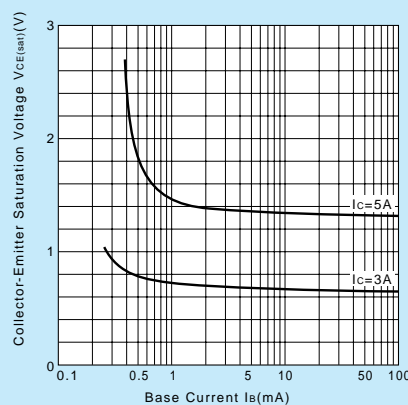
**External Dimensions MT-100(TO3P)**



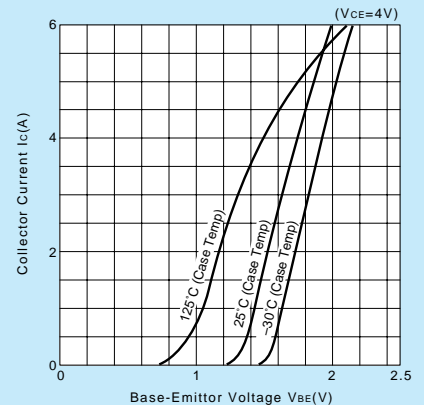
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



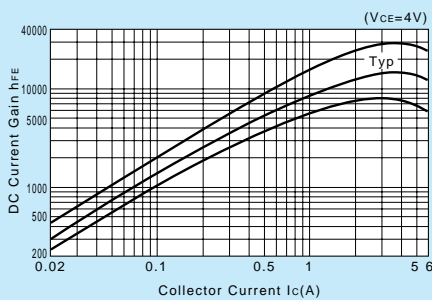
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



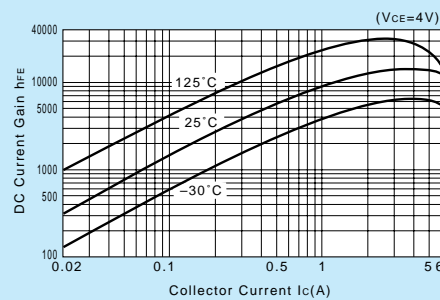
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



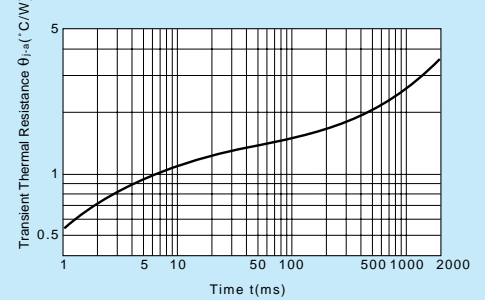
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



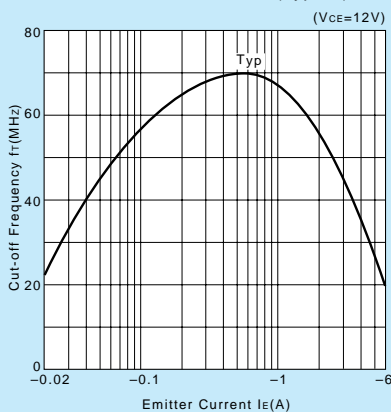
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



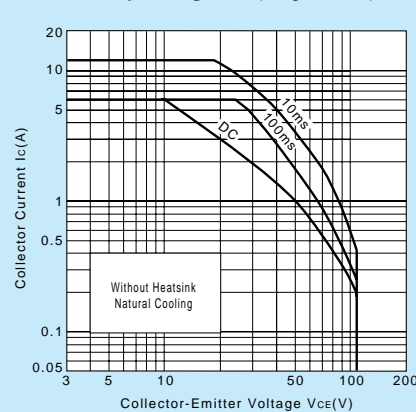
**θ<sub>j-a</sub>-t Characteristics**



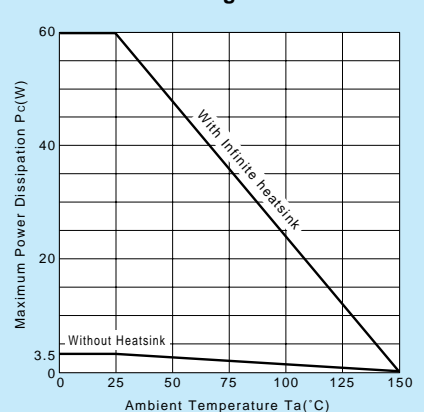
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



**Safe Operating Area (Single Pulse)**

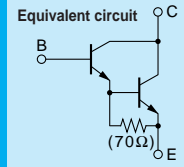


**P<sub>C</sub>-T<sub>a</sub> Derating**



Darlington

# 2SD2494



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1625)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2494	Unit
V <sub>CB0</sub>	110	V
V <sub>CE0</sub>	110	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	6	A
I <sub>B</sub>	1	A
P <sub>C</sub>	60(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

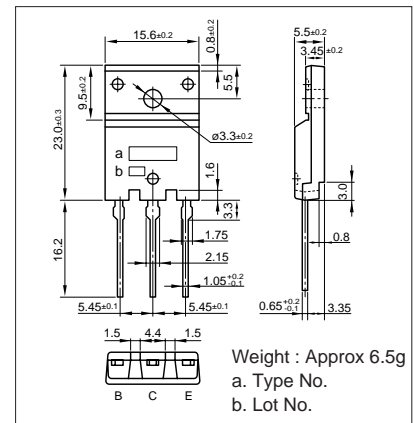
Symbol	Conditions	2SD2494	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =110V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =30mA	110min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =5A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =5mA	2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =5mA	3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	60typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	55typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

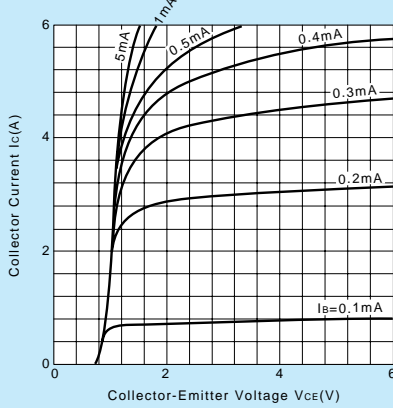
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	6	5	10	-5	5	-5	0.8typ	6.2typ	1.1typ

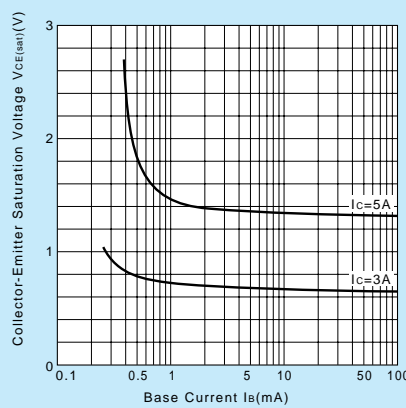
**External Dimensions FM100(TO3PF)**



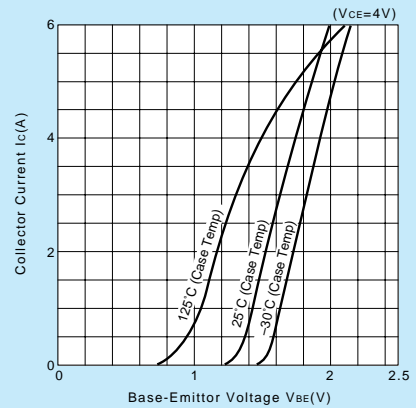
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



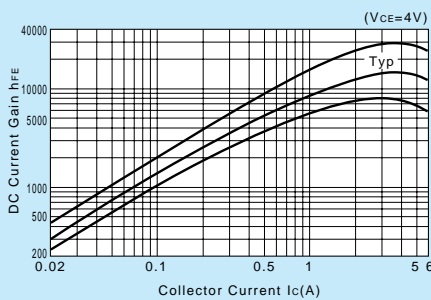
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



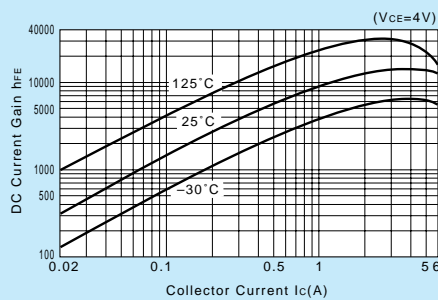
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



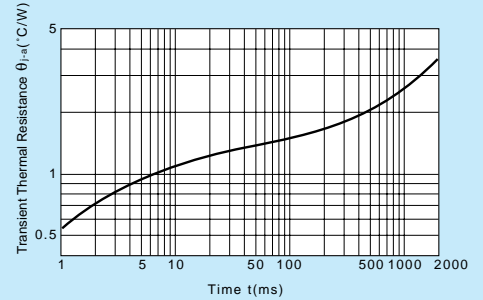
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



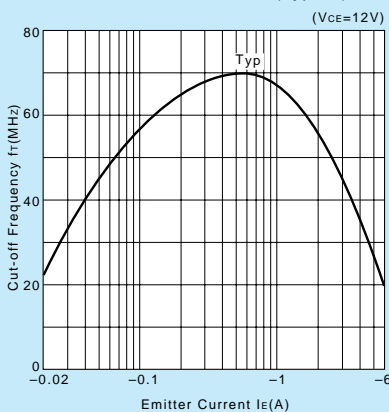
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



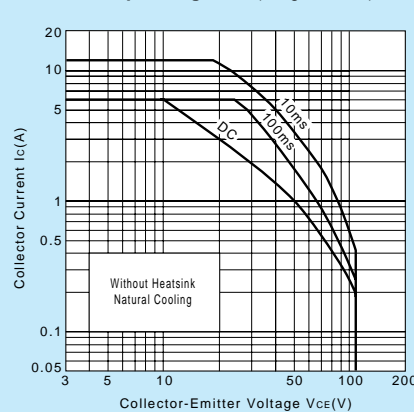
**θ<sub>J-a</sub>-t Characteristics**



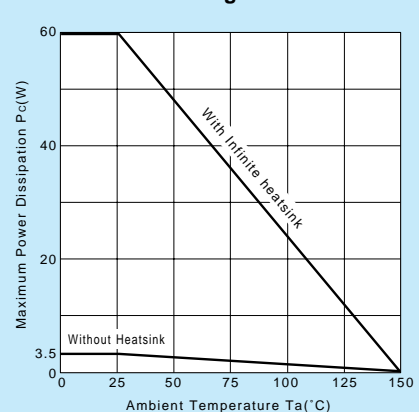
**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



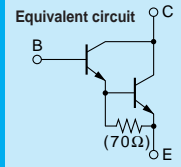
**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# Darlington 2SD2495



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1626)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2495	Unit
V <sub>CB0</sub>	110	V
V <sub>CE0</sub>	110	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	6	A
I <sub>B</sub>	1	A
P <sub>C</sub>	30(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

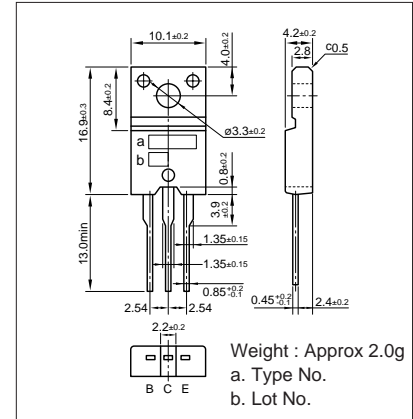
Symbol	Conditions	2SD2495	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =110V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V(BR)CE0	I <sub>C</sub> =30mA	110min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =5A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =5mA	2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =5mA	3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	60typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	55typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

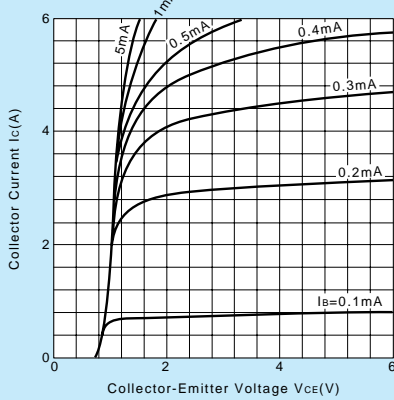
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	6	5	10	-5	5	-5	0.8typ	6.2typ	1.1typ

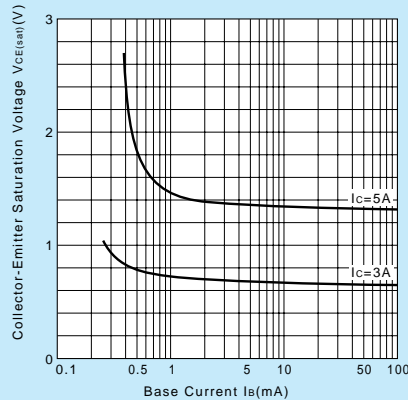
**External Dimensions FM20(TO220F)**



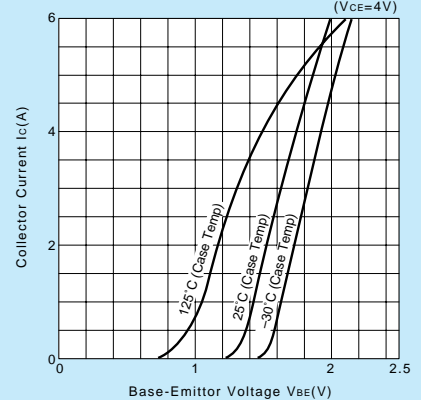
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



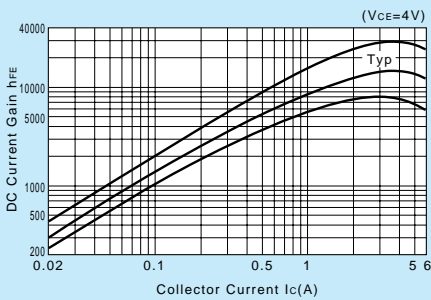
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



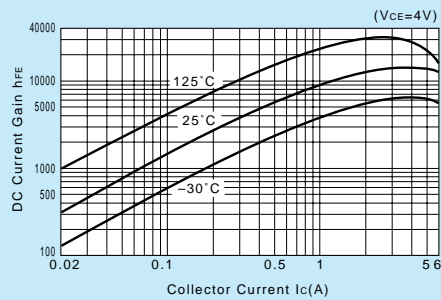
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



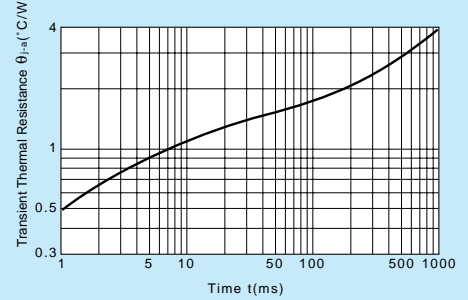
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



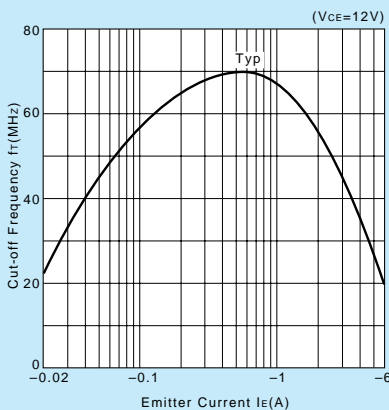
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



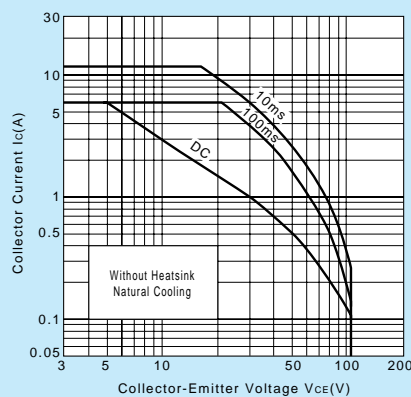
θ<sub>j-a-t</sub> Characteristics



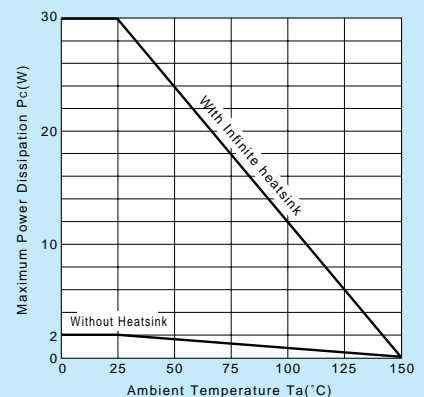
f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



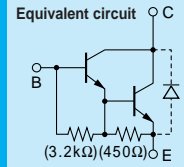
Safe Operating Area (Single Pulse)



P<sub>C</sub>-T<sub>a</sub> Derating



# Darlington 2SD2557



Silicon NPN Triple Diffused Planar Transistor

Application : Series Regulator and General Purpose

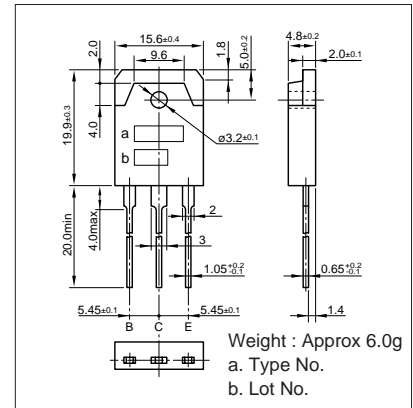
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2557	Unit
V <sub>CB0</sub>	200	V
V <sub>CEO</sub>	200	V
V <sub>EB0</sub>	6	V
I <sub>C</sub>	5	A
I <sub>B</sub>	2	A
P <sub>C</sub>	70(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

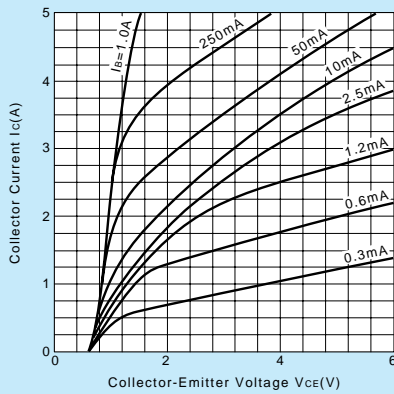
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SD2557	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	5max	mA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =10mA	200min	V
h <sub>FE</sub>	V <sub>CE</sub> =5V, I <sub>C</sub> =1A	1500 to 6500	
V <sub>CE(sat)</sub>	I <sub>C</sub> =1A, I <sub>B</sub> =5mA	1.5max	V
f <sub>T</sub>	V <sub>CE</sub> =10V, I <sub>E</sub> =-0.5A	15typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	110typ	pF

**External Dimensions MT-100(TO3P)**

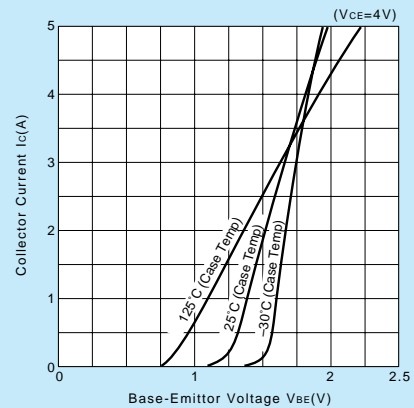


**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



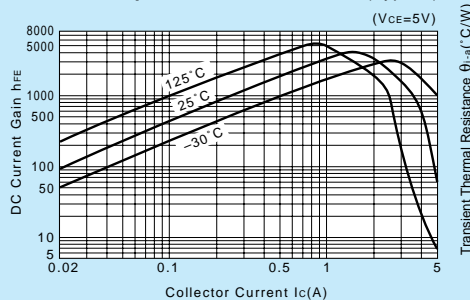
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**

**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**

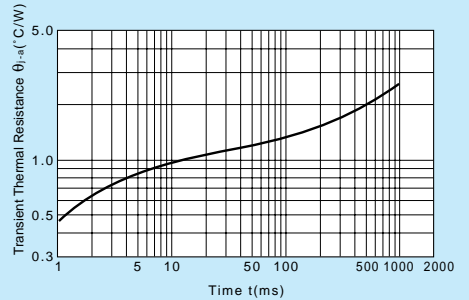


**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**

**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**

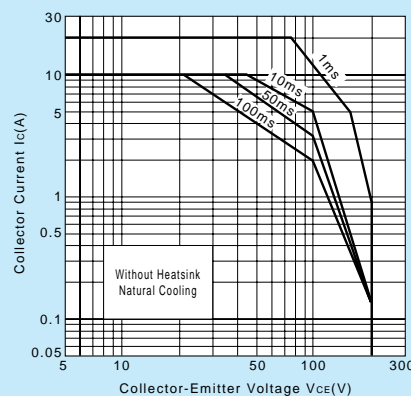


**θ<sub>j-a</sub>-t Characteristics**

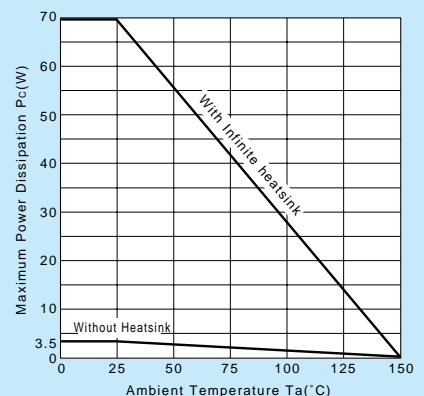


**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**

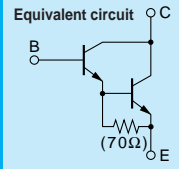
**Safe Operating Area (Single Pulse)**



**P<sub>C</sub>-T<sub>a</sub> Derating**



# Darlington 2SD2558



Silicon NPN Triple Diffused Planar Transistor

Application : Series Regulator and General Purpose

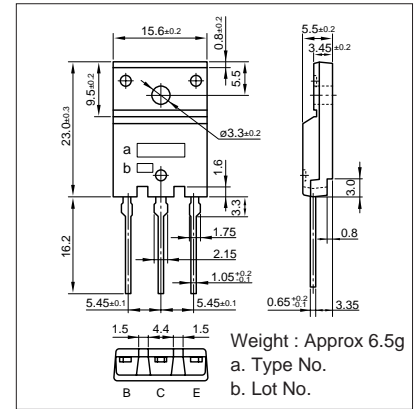
**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2558	Unit
V <sub>CB0</sub>	200	V
V <sub>CE0</sub>	200	V
V <sub>EB0</sub>	6	V
I <sub>c</sub>	5	A
I <sub>B</sub>	2	A
P <sub>c</sub>	60(T <sub>c</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

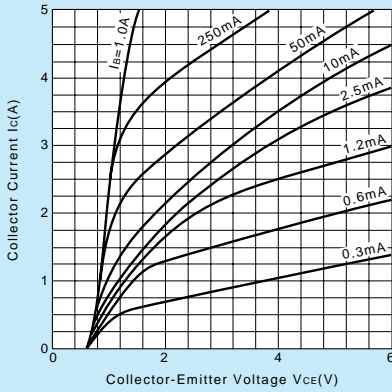
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	2SD2558	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =200V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =6V	5max	mA
V(BR) <sub>CEO</sub>	I <sub>c</sub> =10mA	200min	V
h <sub>FE</sub>	V <sub>CE</sub> =5V, I <sub>c</sub> =1A	1500 to 6500	
V <sub>CE(sat)</sub>	I <sub>c</sub> =1A, I <sub>B</sub> =5mA	1.5max	V
f <sub>r</sub>	V <sub>CE</sub> =10V, I <sub>E</sub> =-0.5A	15typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	110typ	pF

**External Dimensions FM100(TO3PF)**

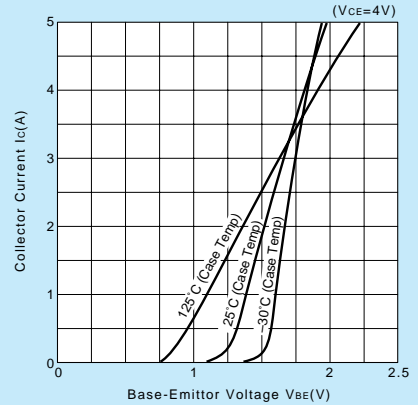


**I<sub>c</sub>-V<sub>CE</sub> Characteristics (Typical)**



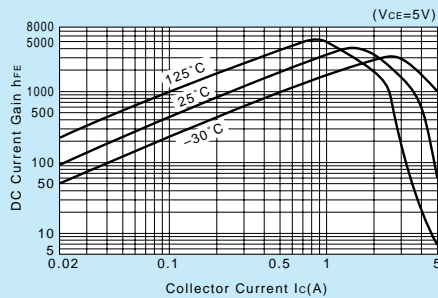
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**

**I<sub>c</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**

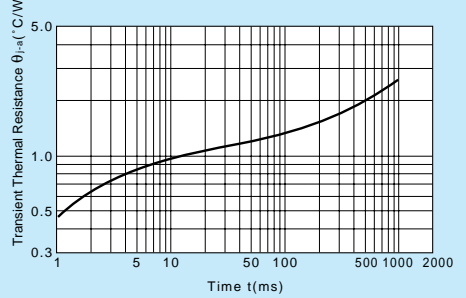


**h<sub>FE</sub>-I<sub>c</sub> Characteristics (Typical)**

**h<sub>FE</sub>-I<sub>c</sub> Temperature Characteristics (Typical)**

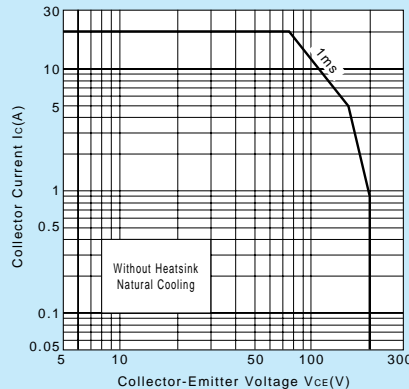


**θ<sub>j-a</sub>-t Characteristics**

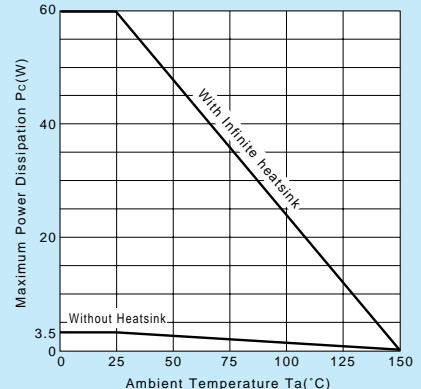


**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**

**Safe Operating Area (Single Pulse)**

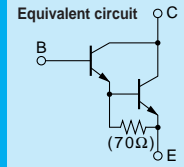


**P<sub>c</sub>-T<sub>a</sub> Derating**





# Darlington 2SD2560



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1647)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2560	Unit
V <sub>CB0</sub>	150	V
V <sub>CE0</sub>	150	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	15	A
I <sub>B</sub>	1	A
P <sub>C</sub>	130(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55to+150	°C

**Electrical Characteristics** (Ta=25°C)

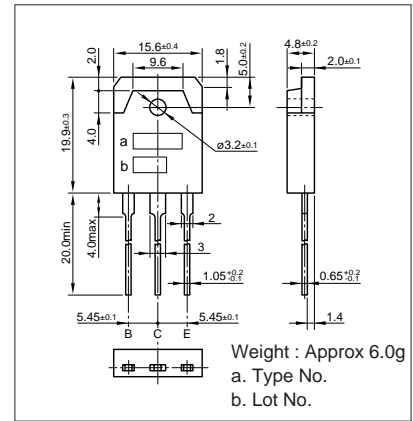
Symbol	Conditions	2SD2560	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =150V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =30mA	150min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =10A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =10A, I <sub>B</sub> =10mA	2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =10A, I <sub>B</sub> =10mA	3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	70typ	MHz
COB	V <sub>CB</sub> =10V, f=1MHz	120typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000to12000), P(6500to20000), Y(15000to30000)

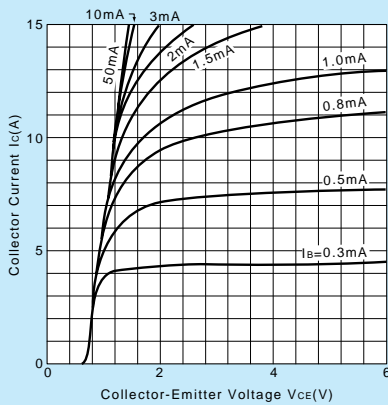
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	4	10	10	-5	10	-10	0.8typ	4.0typ	1.2typ

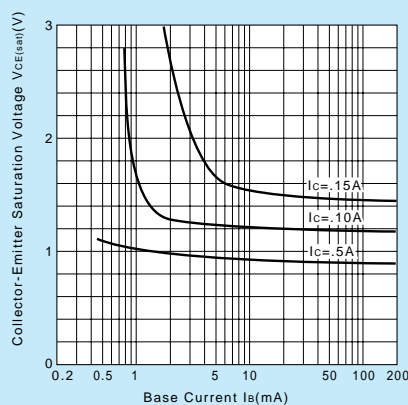
**External Dimensions MT-100(TO3P)**



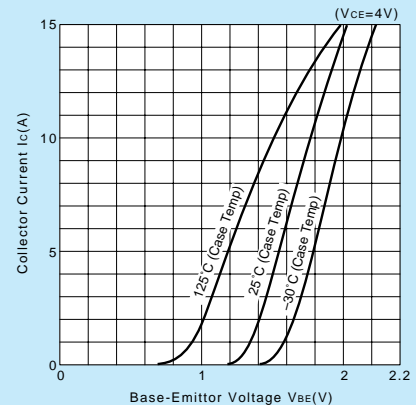
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



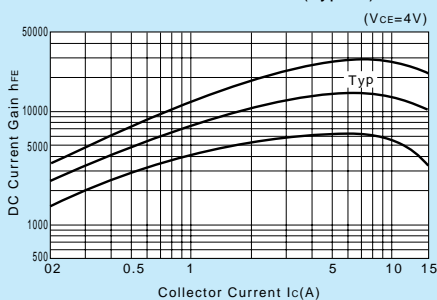
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



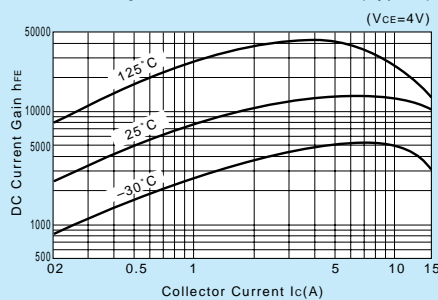
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



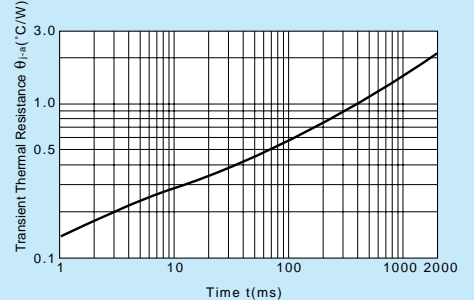
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



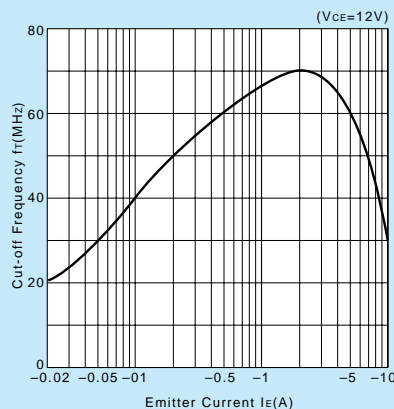
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



**θ<sub>j-a</sub>-t Characteristics**

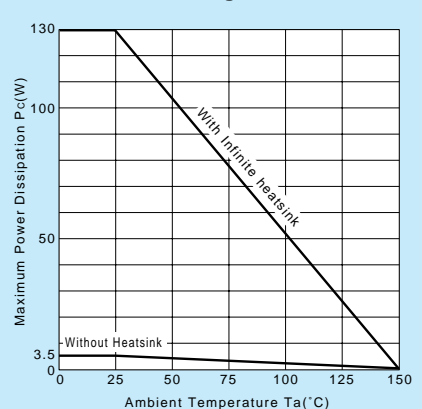


**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



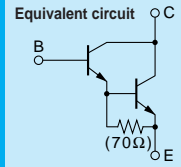
**Safe Operating Area (Single Pulse)**

**P<sub>C</sub>-T<sub>a</sub> Derating**



Darlington

# 2SD2561



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1648)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2561	Unit
VcBO	150	V
VcEO	150	V
VEBO	5	V
Ic	17	A
Ib	1	A
Pc	200(Tc=25°C)	W
Tj	150	°C
Tstg	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

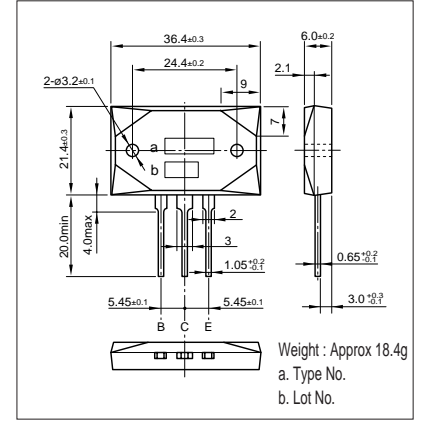
Symbol	Conditions	2SD2561	Unit
IcBO	VcB=150V	100max	μA
IeBO	VEB=5V	100max	μA
V(BR)CEO	Ic=30mA	150min	V
hFE	VCE=4V, Ic=10A	5000min*	
VCE(sat)	Ic=10A, Ib=10mA	2.5max	V
VBE(sat)	Ic=10A, Ib=10mA	3.0max	V
fr	VCE=12V, IE=-2A	70typ	MHz
COB	VcB=10V, f=1MHz	120typ	pF

\*hFE Rank: O(5000to12000), P(6500to20000), Y(15000to30000)

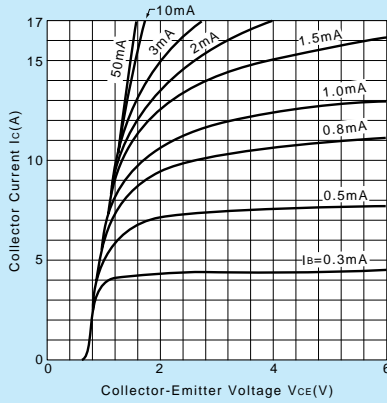
**Typical Switching Characteristics (Common Emitter)**

VCC (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	Ib1 (mA)	Ib2 (mA)	ton (μs)	tstg (μs)	tf (μs)
40	4	10	10	-5	10	-10	0.8typ	4.0typ	1.2typ

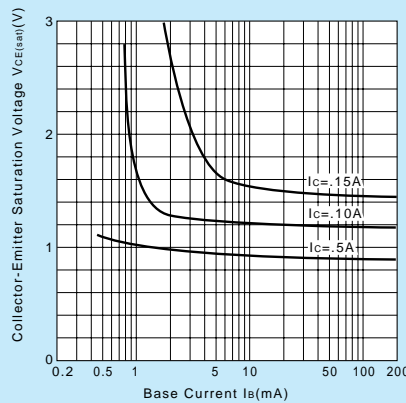
**External Dimensions MT-200**



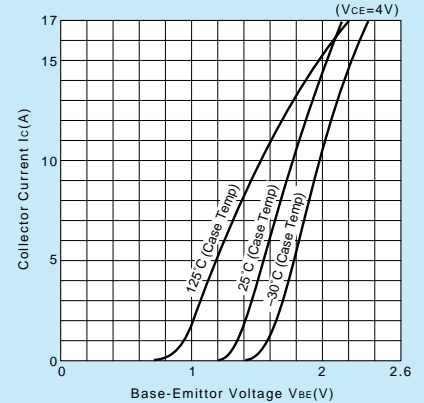
**Ic-VCE Characteristics (Typical)**



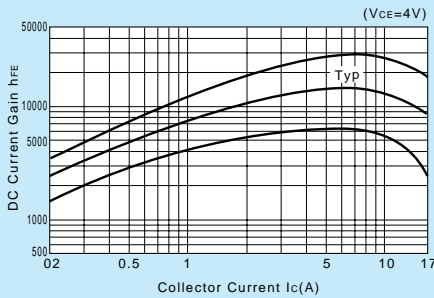
**VCE(sat)-Ib Characteristics (Typical)**



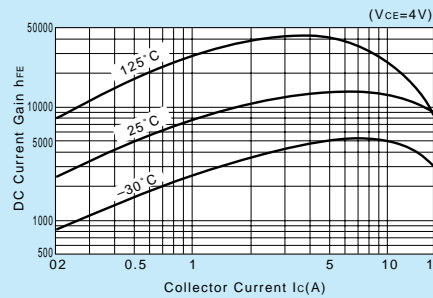
**Ic-VBE Temperature Characteristics (Typical)**



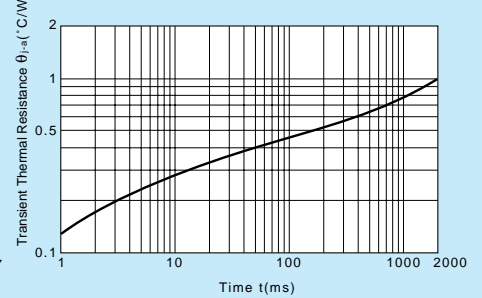
**hFE-Ic Characteristics (Typical)**



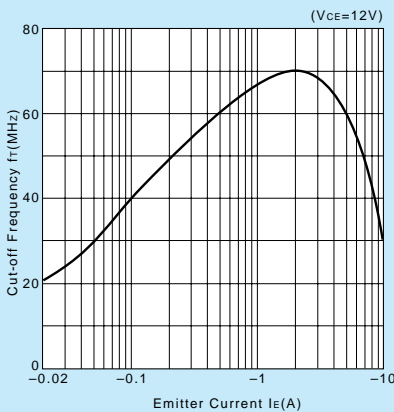
**hFE-Ic Temperature Characteristics (Typical)**



**θj-a-t Characteristics**

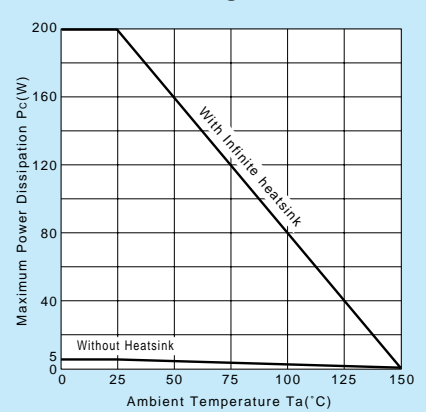


**fr-IE Characteristics (Typical)**

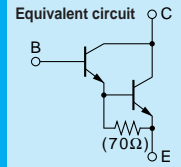


**Safe Operating Area (Single Pulse)**

**Pc-Ta Derating**



# Darlington 2SD2562



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1649)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2562	Unit
V <sub>CB0</sub>	150	V
V <sub>CE0</sub>	150	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	15	A
I <sub>B</sub>	1	A
P <sub>C</sub>	85(T <sub>C</sub> =25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

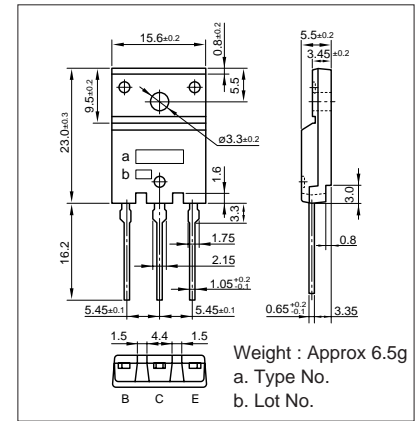
Symbol	Conditions	2SD2562	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =150V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =30mA	150min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =10A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =10A, I <sub>B</sub> =10mA	2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =10A, I <sub>B</sub> =10mA	3.0max	V
f <sub>T</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-2A	70typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	120typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000to12000), P(6500to20000), Y(15000to30000)

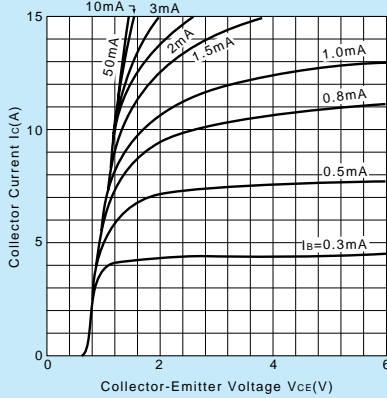
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
40	4	10	10	-5	10	-10	0.8typ	4.0typ	1.2typ

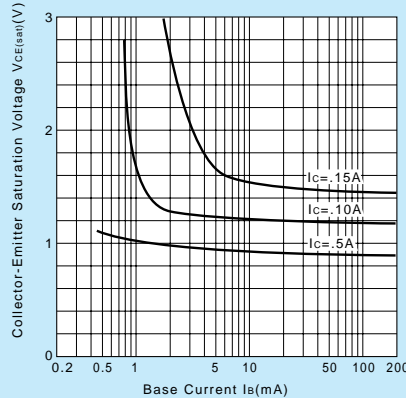
**External Dimensions FM100(TO3PF)**



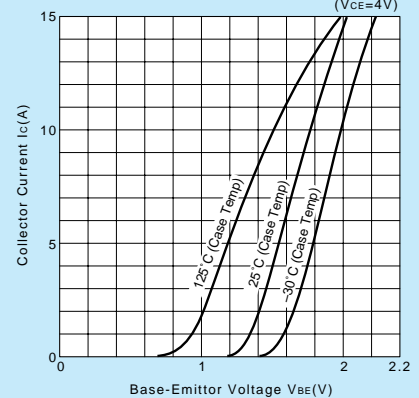
I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



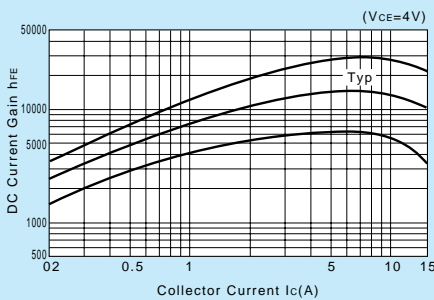
V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)



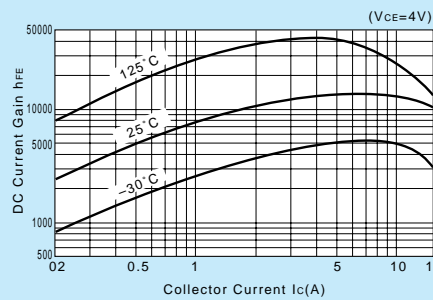
I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



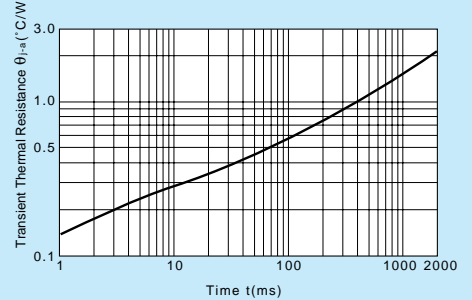
h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)



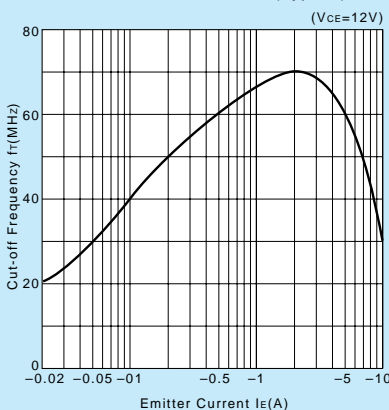
h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



θ<sub>j-a</sub>-t Characteristics

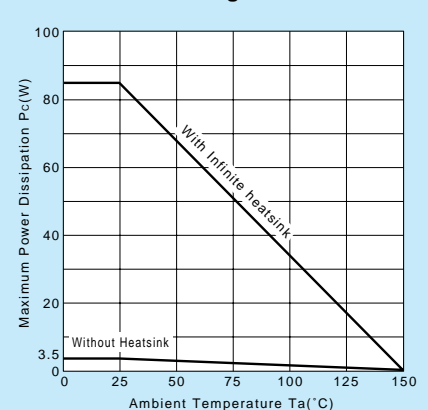


f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)



Safe Operating Area (Single Pulse)

P<sub>C</sub>-T<sub>a</sub> Derating



# Darlington 2SD2589

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1659)

Application : Audio, Series Regulator and General Purpose

**Absolute maximum ratings** (Ta=25°C)

Symbol	2SD2589	Unit
V <sub>CB0</sub>	110	V
V <sub>CE0</sub>	110	V
V <sub>EB0</sub>	5	V
I <sub>C</sub>	6	A
I <sub>B</sub>	1	A
P <sub>C</sub>	50(T <sub>C</sub> =25°C)	W
T <sub>J</sub>	150	°C
T <sub>stg</sub>	-55 to +150	°C

**Electrical Characteristics** (Ta=25°C)

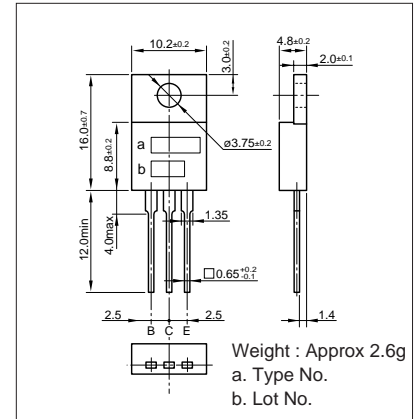
Symbol	Conditions	2SD2589	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =110V	100max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =5V	100max	μA
V <sub>(BR)CEO</sub>	I <sub>C</sub> =30mA	110min	V
h <sub>FE</sub>	V <sub>CE</sub> =4V, I <sub>C</sub> =5A	5000min*	
V <sub>CE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =5mA	2.5max	V
V <sub>BE(sat)</sub>	I <sub>C</sub> =5A, I <sub>B</sub> =5mA	3.0max	V
f <sub>r</sub>	V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A	60typ	MHz
C <sub>OB</sub>	V <sub>CB</sub> =10V, f=1MHz	55typ	pF

\*h<sub>FE</sub> Rank  $\bar{O}$ (5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

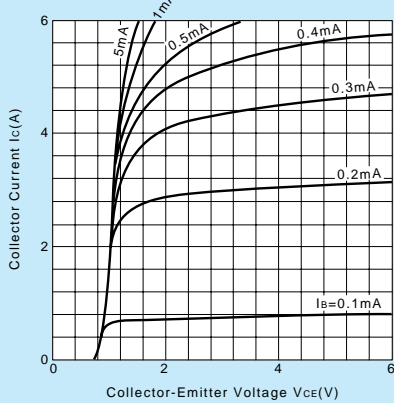
**Typical Switching Characteristics (Common Emitter)**

V <sub>CC</sub> (V)	R <sub>L</sub> (Ω)	I <sub>C</sub> (A)	V <sub>BB1</sub> (V)	V <sub>BB2</sub> (V)	I <sub>B1</sub> (mA)	I <sub>B2</sub> (mA)	t <sub>on</sub> (μs)	t <sub>stg</sub> (μs)	t <sub>f</sub> (μs)
30	6	5	10	-5	5	-5	0.8typ	6.2typ	1.1typ

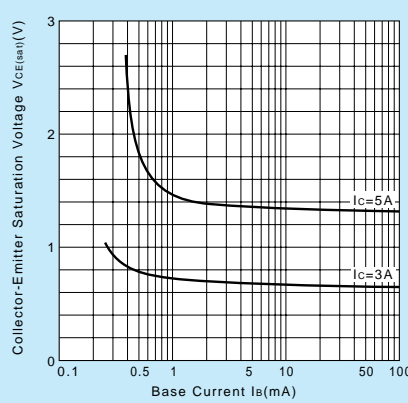
**External Dimensions FM-25(TO220)**



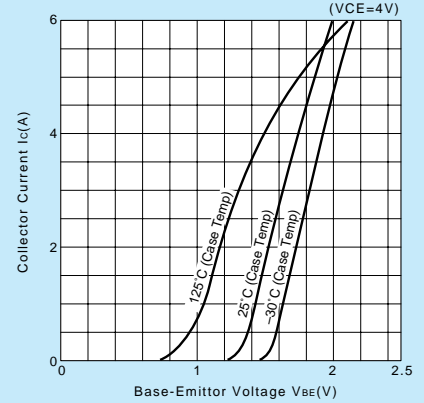
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



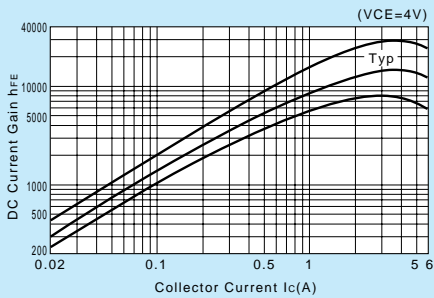
**V<sub>CE(sat)</sub>-I<sub>B</sub> Characteristics (Typical)**



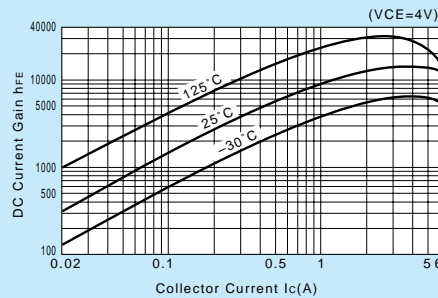
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



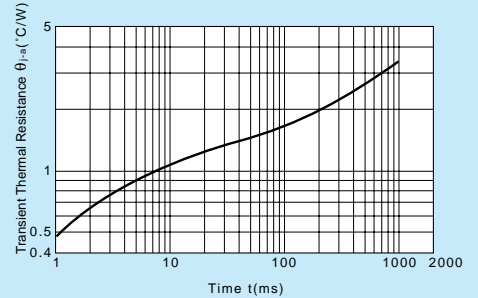
**h<sub>FE</sub>-I<sub>C</sub> Characteristics (Typical)**



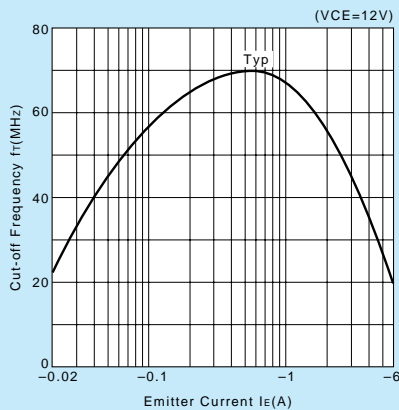
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



**θ<sub>J-a</sub>-t Characteristics**

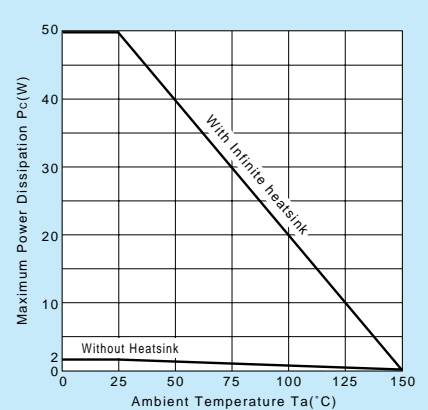


**f<sub>T</sub>-I<sub>E</sub> Characteristics (Typical)**



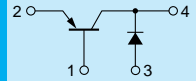
**Safe Operating Area (Single Pulse)**

**P<sub>C</sub>-T<sub>a</sub> Derating**



# SAH02

Equivalent circuit



Silicon PNP Epitaxial Planar Transistor with Shottky Barrier Diode

Application : Chopper Regulator

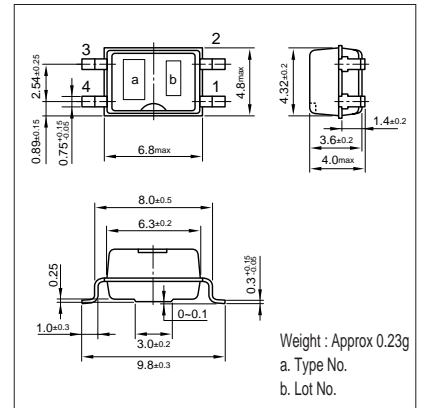
**Absolute maximum ratings** (Ta=25°C)

Symbol	SAH02	Unit
V <sub>CB0</sub>	-30	V
V <sub>CE0</sub>	-30	V
V <sub>EB0</sub>	-10	V
I <sub>C</sub>	-3	A
I <sub>B</sub>	-0.5	A
P <sub>c</sub>	800(Ta=25°C)	mW
T <sub>j</sub>	125	°C
T <sub>stg</sub>	-40 to +125	°C

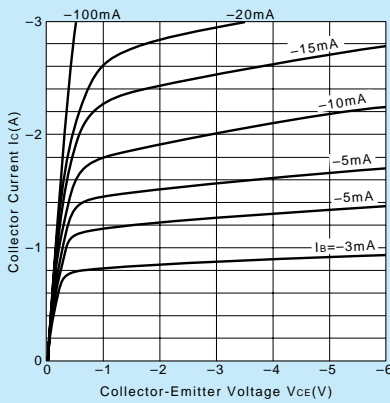
**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	SAH02	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-30V	-10max	μA
I <sub>EB0</sub>	V <sub>EB</sub> =-10V	-10max	μA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =-10mA	-30min	V
h <sub>FE1</sub>	V <sub>CE</sub> =-2V, I <sub>C</sub> =-1A	100min	
h <sub>FE2</sub>	V <sub>CE</sub> =-2V, I <sub>C</sub> =-0.5A	150min	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-0.5A, I <sub>B</sub> =-20mA	-0.3max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.3A	100typ	MHZ
COB	V <sub>CB</sub> =-10V, f=1MHZ	45typ	pF

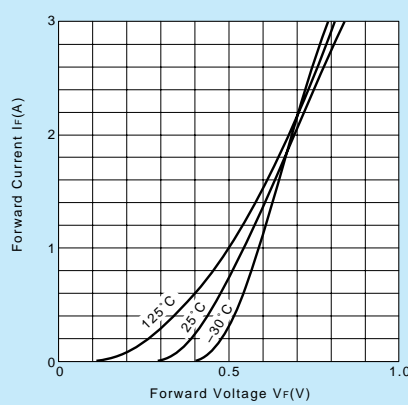
**External Dimensions PS Pack**



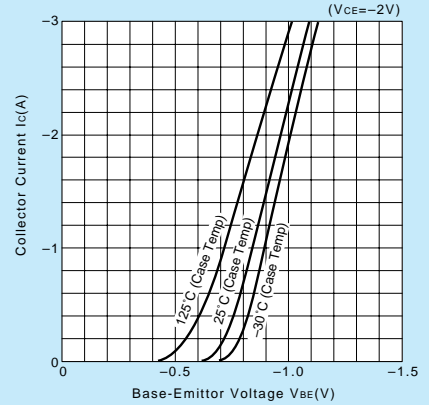
**I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)**



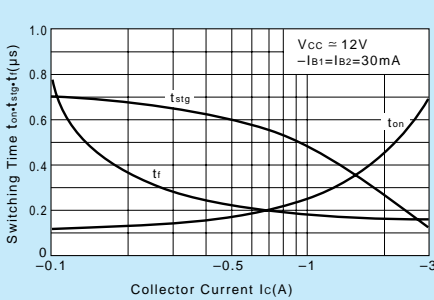
**Diode I<sub>F</sub>-V<sub>F</sub> Characteristics**



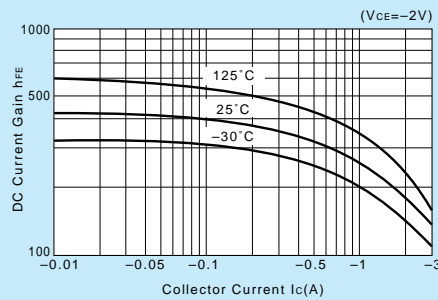
**I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)**



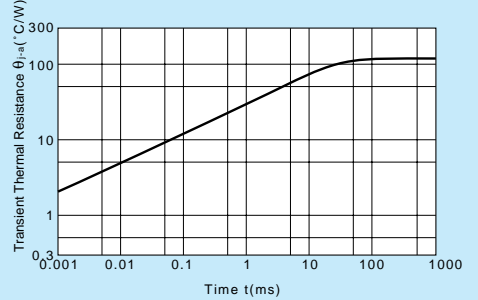
**t<sub>on</sub>•t<sub>stg</sub>•t<sub>r</sub>-I<sub>C</sub> Characteristics (Typical)**



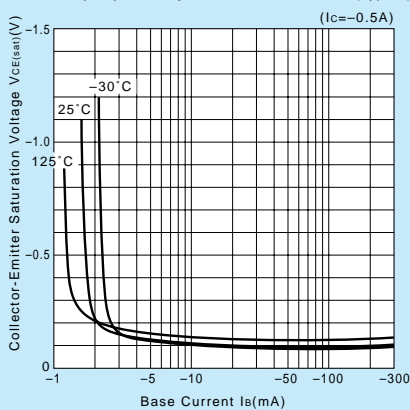
**h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)**



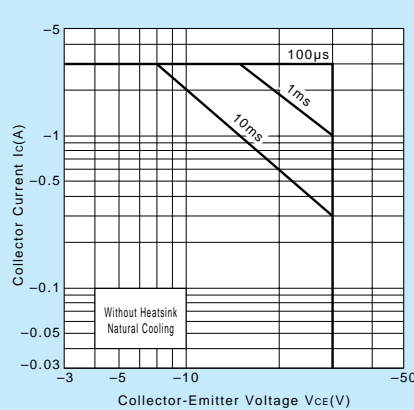
**θ<sub>j-a</sub>-t Characteristics**



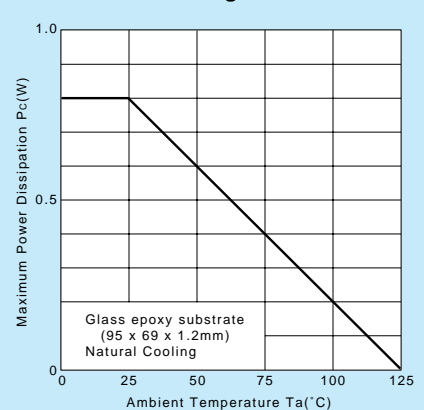
**V<sub>CE(sat)</sub>-I<sub>B</sub> Temperature Characteristics (Typical)**



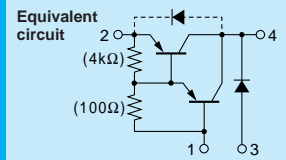
**Safe Operating Area (Single Pulse)**



**P<sub>c</sub>-T<sub>a</sub> Derating**



# SAH03



Silicon PNP Epitaxial Planar Transistor with Fast-Recovery Rectifier Diode

Application : Voltage change switch for motor

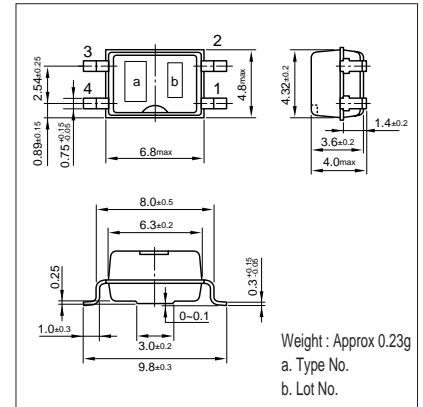
## Absolute maximum ratings (Ta=25°C)

Symbol	SAH03	Unit
V <sub>CB0</sub>	-60	V
V <sub>CEO</sub>	-60	V
V <sub>EBO</sub>	-6	V
I <sub>C</sub>	-1.2	A
I <sub>B</sub>	-0.1	A
P <sub>c</sub>	1.0(Ta=25°C)	W
T <sub>j</sub>	150	°C
T <sub>stg</sub>	-40to+150	°C

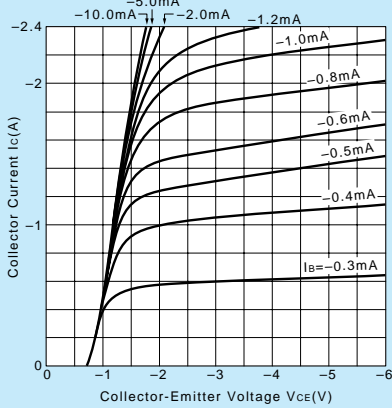
## Electrical Characteristics (Ta=25°C)

Symbol	Conditions	SAH03	Unit
I <sub>CB0</sub>	V <sub>CB</sub> =-60V	-10max	μA
I <sub>EBO</sub>	V <sub>EB</sub> =-6V	-3max	mA
V(BR) <sub>CEO</sub>	I <sub>C</sub> =-10mA	-60min	V
h <sub>FE</sub>	V <sub>CE</sub> =-4V, I <sub>C</sub> =-1A	2000to12000	
V <sub>CE(sat)</sub>	I <sub>C</sub> =-1A, I <sub>B</sub> =-2mA	-1.4max	V
f <sub>r</sub>	V <sub>CE</sub> =-12V, I <sub>E</sub> =0.1A	100typ	MHZ
COB	V <sub>CB</sub> =-10V, f=1MHZ	30typ	pF
V <sub>R</sub>	I <sub>R</sub> =100μA	100 min	V
V <sub>F</sub>	I <sub>F</sub> =0.5A	1.5 max	V
t <sub>rr</sub>	I <sub>F</sub> =±100mA	100 typ	ns

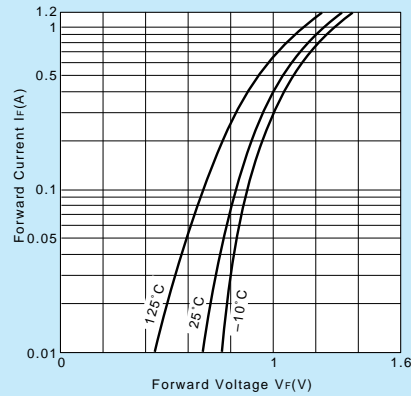
## External Dimensions PS Pack



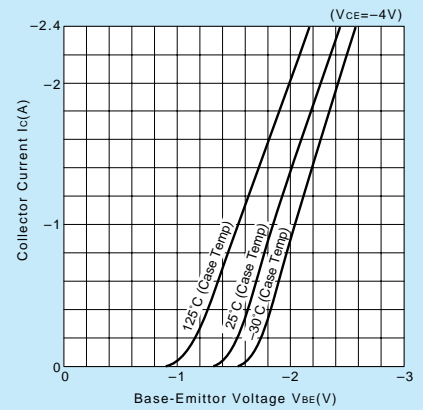
## I<sub>C</sub>-V<sub>CE</sub> Characteristics (Typical)



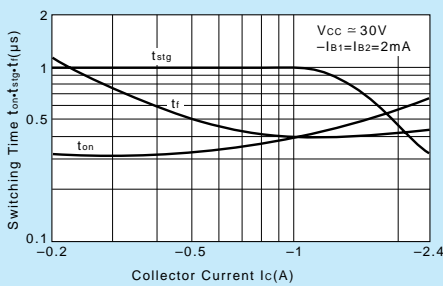
## Diode I<sub>F</sub>-V<sub>F</sub> Characteristics



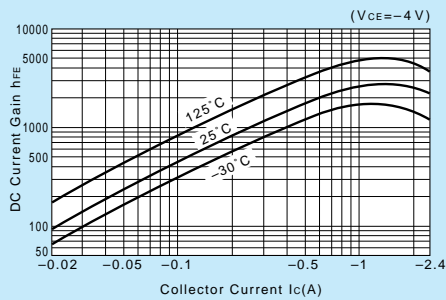
## I<sub>C</sub>-V<sub>BE</sub> Temperature Characteristics (Typical)



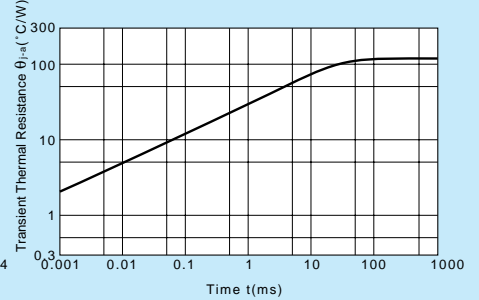
## t<sub>on</sub>•t<sub>stg</sub>•t<sub>r</sub>-I<sub>C</sub> Characteristics (Typical)



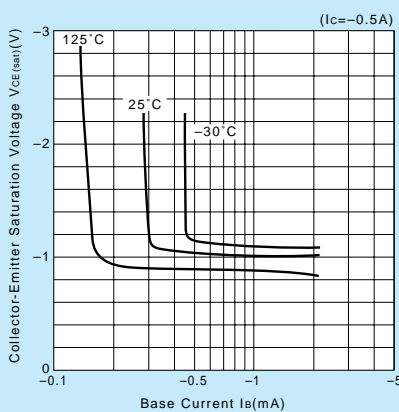
## h<sub>FE</sub>-I<sub>C</sub> Temperature Characteristics (Typical)



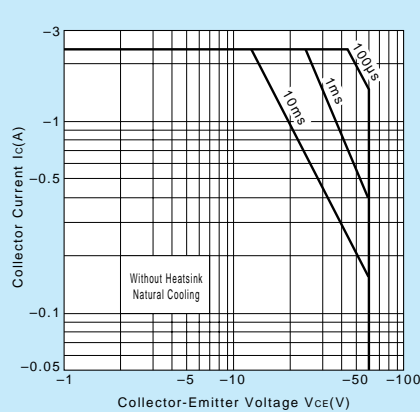
## θ<sub>j-a</sub>-t Characteristics



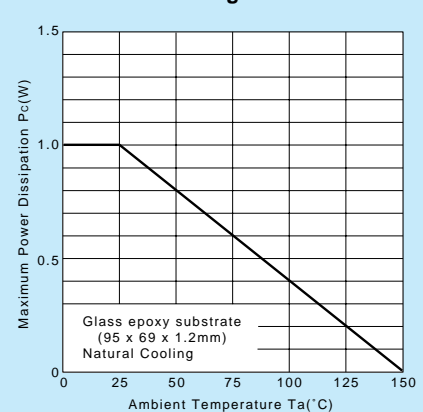
## V<sub>CE(sat)</sub>-I<sub>B</sub> Temperature Characteristics (Typical)



## Safe Operating Area (Single Pulse)



## P<sub>c</sub>-T<sub>a</sub> Derating



# Discontinued Parts Guide

Discontinued Parts	Replacement Parts
2SA744to745	2SA1694to1695
2SA746to747	2SA1695
2SA764to765	2SA1725to1726
2SA807to808	2SA1693to1694
2SA878	-
2SA892	2SB1351
2SA907to909	2SA1215to1216,1295
2SA971	-
2SA980to982	2SA1694
2SA1067	-
2SA1068	-
2SA1102	2SA1693
2SA1103	2SA1694
2SA1104	2SA1694
2SA1105	2SA1695
2SA1106	2SA1695
2SA1116	2SA1493
2SA1117	2SA1494
2SA1135	2SA1693
2SA1169	2SA1493
2SA1170	2SA1494
2SA1187	-
2SA1205	2SA1746
2SA1355	2SA1262,1488
2SB622	-
2SB711to712	2SB1259,1351
2SB1005	2SB1257
2SB1476	2SB1624
2SB1586	2SB1625
2SC1107	2SC3179,3851
2SC1108	2SC3851A
2SC1109	2SC3179,3851
2SC1110	2SC3851A
2SC1111to1112	2SC4467to4468
2SC1113	2SC4511to4512
2SC1114	-
2SC1115to1116	2SC4468
2SC1402to1403	2SC4467to4468
2SC1436	-
2SC1437	-
2SC1440to1441	-
2SC1442to1443	-
2SC1444to1445	2SC4511to4512
2SC1454	-
2SC1477	-
2SC1504	2SC2023
2SC1577to1578	2SC3833,3831
2SC1579to1580	2SC4706
2SC1584to1585	2SC2921-2922,3264
2SC1618to1619	2SC4466-4467
2SC1629	2SD2045
2SC1664	2SC4558
2SC1768	-
2SC1777	-
2SC1783	-
2SC1786	-
2SC1828	2SC3832,3830

Discontinued Parts	Replacement Parts
2SC1829	-
2SC1830	2SD2082,2083
2SC1831	-
2SC1832	-
2SC1888to1889	2SC3852,3852A
2SC2022	2SC2023
2SC2147	-
2SC2198	2SC4024
2SC2199	2SC4131
2SC2256	-
2SC2260to2262	2SC4467
2SC2302	2SC3832
2SC2303	2SC3833
2SC2304	2SC3833
2SC2305	-
2SC2306	2SC4140
2SC2307	2SC3833
2SC2317	2SD2016
2SC2354	2SC2023
2SC2364	-
2SC2365	2SC3831
2SC2491	2SC4024
2SC2492	-
2SC2493	-
2SC2577	2SC4466
2SC2578	2SC4467
2SC2579	2SC4467
2SC2580	2SC4468
2SC2581	2SC4468
2SC2607	2SC3857
2SC2608	2SC3858
2SC2665	2SC4466
2SC2723	2SC4140
2SC2761	-
2SC2773	2SC3857
2SC2774	2SC3858
2SC2809	-
2SC2810A	2SC4820
2SC2825	2SD2045
2SC2838	-
2SC2900	-
2SC3409	2SC3679
2SC3520	2SC4140
2SC3706	-
2SC3909	2SC3680
2SC4023	2SC5124
2SC4199,4199A	2SC5124
2SC4302	2SC4301
2SC4303,4303A	2SC5002
2SC4494	2SC4495
2SC4756	2SC5002
2SD15to18	2SC4468
2SD80to84	2SC4466,4467
2SD90to94	2SC3179,3851,3851A
2SD163to166	2SC4468
2SD201to203	2SC4466to4467
2SD211to214	2SC4468

Discontinued Parts	Replacement Parts
2SD219to221	2SC3179,3851,3851A
2SD219Flo221F	2SC3179,3851,3851A
2SD222to224	2SC3179,3851,3851A
2SD236to238	2SC3179,3851,3851A
2SD241to244	2SC3179,3851,3851A
2SD256to259	2SC3179,3851,3851A
2SD419to421	2SD1769,1785
2SD556to557	2SC4468
2SD593to594	2SC4020
2SD605	-
2SD606	-
2SD614to615	2SD1769,1785
2SD617	2SD2082
2SD721	2SD2081
2SD722	2SD2081
2SD807	2SC3679
2SD810	2SC4024
2SD971	-
2SD972	2SD1796
2SD1031	2SD1769,1785
2SD1170	2SD2045
2SD1532	2SD2015
2SD2231	2SD2493
2SD2437	2SD2494

Repair Parts	Replacement Parts
2SA768to769	2SA1262,1488,1488A
2SA770to771	2SA1725,1726
2SA957to958	2SA1667,1668
2SA1489	2SA1693
2SA1490	2SA1694
2SA1491	2SA1695
2SA1643	2SA1725
2SA1670	2SA1907
2SA1671	2SA1908
2SA1672	2SA1909
2SC1826to1827	2SC3179,3851,3851A
2SC1983to1984	2SC3852,3852A
2SC1985to1986	2SC4511,4512
2SC2167to2168	2SC4381,4382
2SC2315to2316	2SC4558
2SC2810	2SC3890
2SC3300	2SC4131
2SC3853	2SC4466
2SC3854	2SC4467
2SC3855	2SC4468
2SC4385	2SC5099
2SC4386	2SC5100
2SC4387	2SC5101
2SC4503	2SD2083
2SC4558	2SD2495
2SC4820	2SC4518





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