M5238AL/P/FP

DUAL LOW-NOISE J-FET INPUT OPERATIONAL AMPLIFIERS

DESCRIPTION

The M5238 is a semiconductor integrated circuit designed as a low-noise Bi-FET operational amplifier which adopts J-FETs in the input stage. Noise reduction characteristic in the input stage has been improved by 3 - 4dB, when compared with the M5221 general-purpose Bi-FET operational amplifier, and two circuits for yielding a high input impedance, high slew rate and low bias current and other excellent characteristics, are housed in an 8-pin SIP, DIP or FP.

It can be widely used as a general-purpose operational amplifier in stereo equipment, tape decks, digital audio disc players and other similar products as well as in VCRs, video disc players and video related players.

FEATURES

- Low noise, input-referred noise ····· V_{NI}=1.9μVrms(typ.)
  (R_S=100kΩ BW10Hz~30kHz FLAT)
  S/N=73dB(typ.)
  (Shorted input, RIAA, IHF-A network, PHONO 2.5mVrms)
- High input impedance due to J-FET input
  ····· R_i=1000MΩ(typ.)
- High slew rate ····· S_R=20V/μs(typ.)
- High gain, low distortion
  ····· G_{VO}=100dB(typ.), THD=0.002%
  (G_V=35.6dB, RIAA, V_O=5Vrms)
- Large load current and allowable current
  ····· I_{LP}=±50mA, P_d=800mW(SIP)
  P_d=625mW(DIP), P_d=440mW(FP)

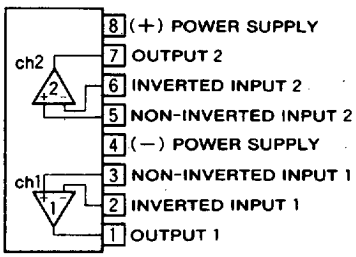
APPLICATION

General purpose preamplifier in stereo equipment, tape decks and digital audio disc players, VCRs and video disc players.

RECOMMENDED OPERATING CONDITION

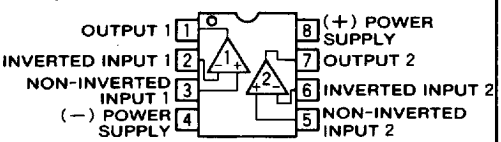
Supply voltage range ····· ±5~±15V
Rated supply voltage ····· ±15V

PIN CONFIGURATION (TOP VIEW)



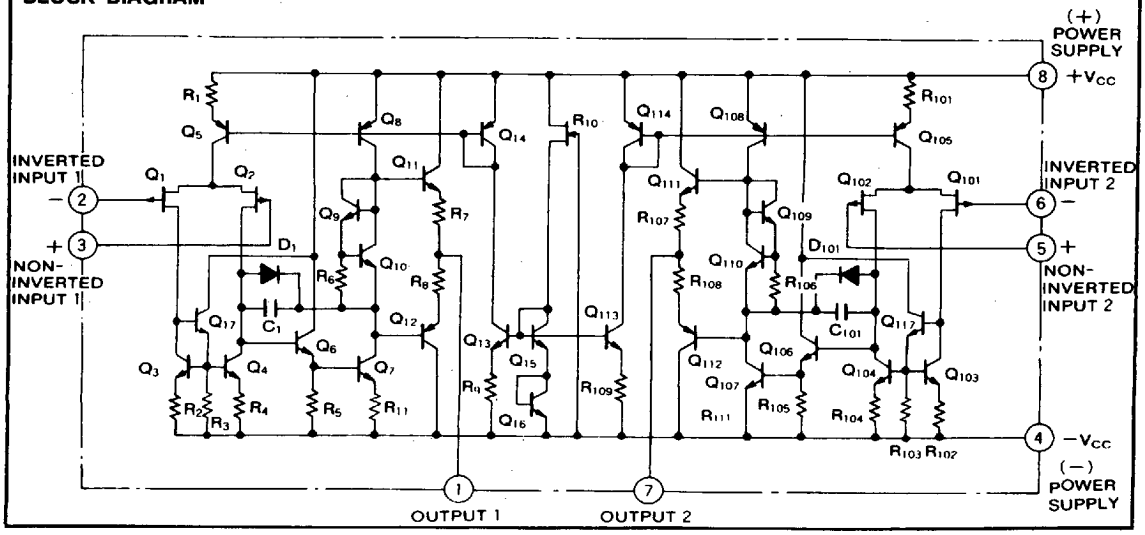
Outline 8P5 (AL)

DIP, MINI FLAT



Outline 8P4 (AP)
8P2S-A (AFP)

BLOCK DIAGRAM



MITSUBISHI ELECTRIC

DUAL LOW-NOISE J-FET INPUT OPERATIONAL AMPLIFIERS

ABSOLUTE MAXIMUM RATINGS (T_a=25℃, unless otherwise noted)

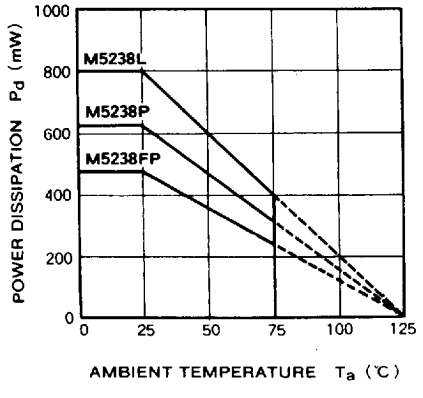
Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		±18	V
I_{LP}	Load current		±50	mA
V_{Id}	Differential input voltage		±30	V
V_{ic}	Common input voltage		±15	V
P_d	Power dissipation		800(SIP)/625(DIP)/440(FP)	mW
K_θ	Thermal derating	$T_a \geqq 25$℃	8(SIP)/6.25(DIP)/4.4(FP)	mW/℃
T_{opr}	Ambient temperature		−20～+75	℃
T_{stg}	Storage temperature		−55～+125	℃

ELECTRICAL CHARACTERISTICS (T_a=25℃, V_{CC}=±15V)

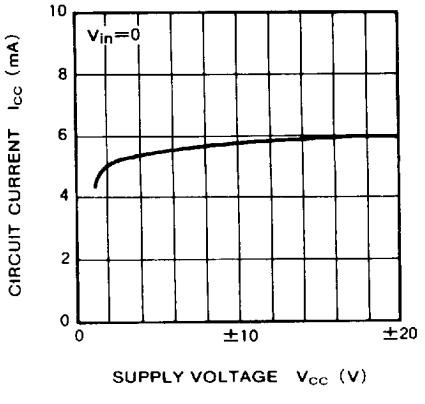
Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
I_{CC}	Circuit current	V_{in}=0		5.8	9.0	mA
V_{IO}	Input offset voltage	$R_S \leqq 10k\Omega$		2.0	10.0	mV
I_{IO}	Input offset current			5	200	pA
I_{IB}	Input bias current			30	400	pA
R_{in}	Input resistance			10^3		MΩ
G_{VO}	Open loop voltage gain	$R_L \geqq 2k\Omega$, V_O=±10V	86	106		dB
V_{OM}	Maximum output voltage	$R_L \geqq 10k\Omega$	±12	±14		V
		$R_L \geqq 2k\Omega$	±10	±13		
V_{CM}	Common input voltage width		±10	±12		V
CMRR	Common mode rejection ratio	$R_S \leqq 10k\Omega$	70	76		dB
SVRR	Supply voltage rejection ratio	$R_S \leqq 10k\Omega$		30	150	μV/V
P_d	Power dissipation			174	270	mW
SR	Slew rate	G_V=0dB, R_L=2kΩ		20		V/μs
f_T	Gain bandwidth product			6		MHz
V_{NI}	Input referred noise voltage	R_S=100Ω, BW=10Hz～30kHz		1.9		μVrms

TYPICAL CHARACTERISTICS

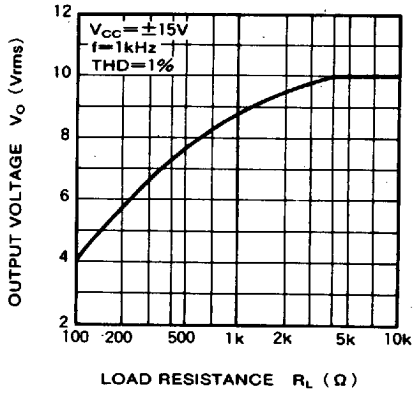
THERMAL DERATING (MAXIMUM RATING)



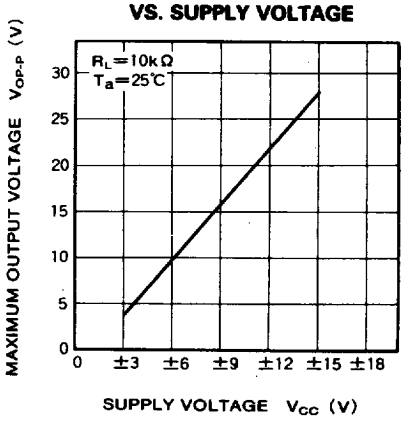
CIRCUIT CURRENT VS. SUPPLY VOLTAGE



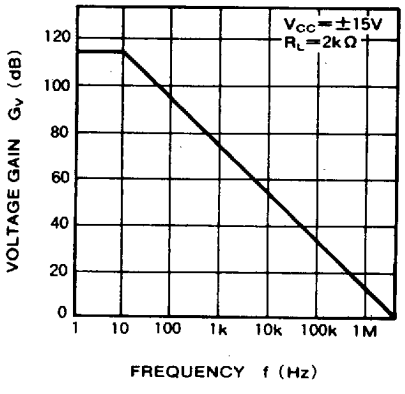
OUTPUT VOLTAGE VS. LOAD RESISTANCE



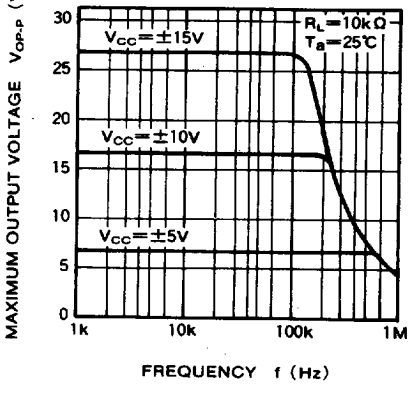
MAXIMUM OUTPUT VOLTAGE VS. SUPPLY VOLTAGE



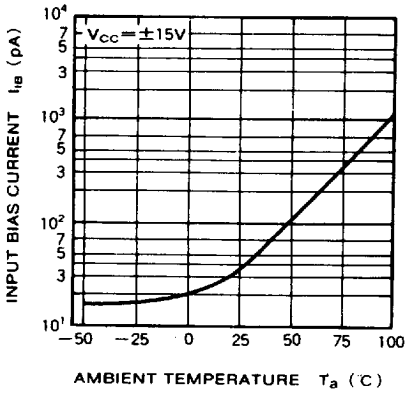
VOLTAGE GAIN VS. FREQUENCY RESPONSE



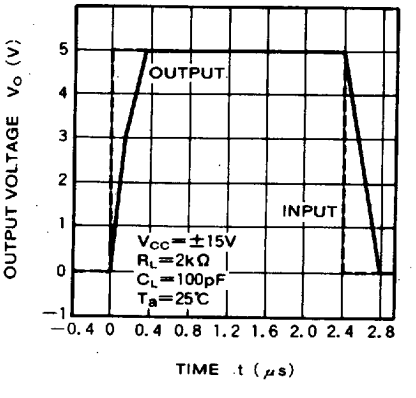
MAXIMUM OUTPUT VOLTAGE VS. FREQUENCY



INPUT BIAS CURRENT VS. AMBIENT TEMPERATURE



SLEW RATE (SR) CHARACTERISTICS



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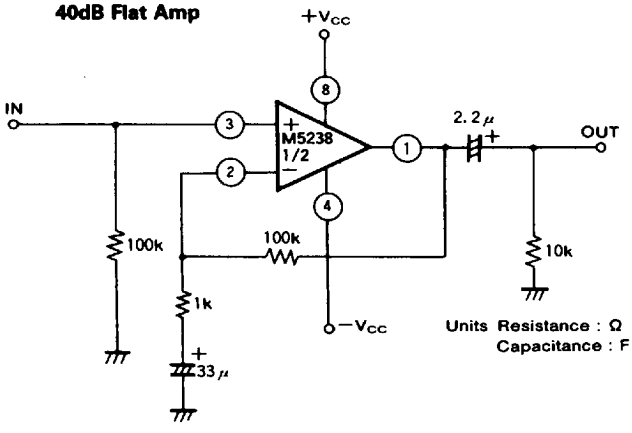
APPLICATION CIRCUIT 1

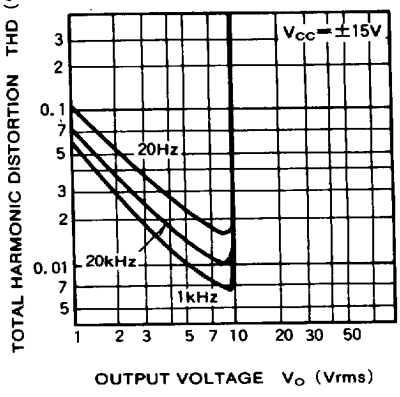
40dB Flat Amp



TYPICAL CHARACTERISTICS

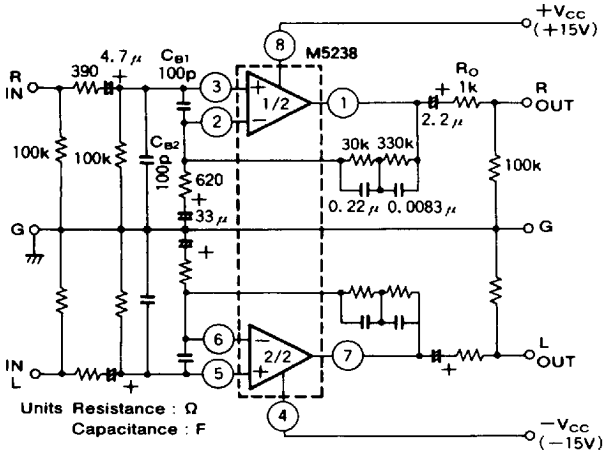
- V_{CC}=±15V
- G_V=40dB(f=1kHz)
- V_O=9.5Vrms(f=1kHz, THD=0.1%)
- THD=0.007%(f=1kHz, V_O=7Vrms)

TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE



APPLICATION CIRCUIT 2

Stereo equalizer amplifier circuit



L_{ch} circuit constants are identical to those of R_{ch}.

C_{B1}, C_{B2} : Capacitors for buzz prevention, use if required.

R_O : Resistor used to prevent parasitic oscillation for capacitive loads and current limiting with shorted and other abnormal load conditions.

TYPICAL CHARACTERISTICS (V_{CC}=±15V, RIAA)

- G_V=35.6dB(f=1kHz)
- V_{NI}=1.9μVrms(R_S=100Ω, BW=20Hz~30kHz)
- S/N=73dB (IHF-A network, shorted input, 2.5mVrms input sensitivity)
- THD=0.001%(f=1kHz, V_O=7Vrms)

TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE