

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 $V_{NI}=1.9\mu\text{Vrms}(\text{typ.})$
 $(R_S=100\text{k}\Omega \text{ BW}10\text{Hz}\sim 30\text{kHz FLAT})$
 $S/N=73\text{dB}(\text{typ.})$
 (Shorted input, RIAA, IHF-A network, PHONO 2.5mVrms)
- High input impedance due to J-FET input
 $R_i=1000\text{M}\Omega(\text{typ.})$
- High slew rate $S_R=20\text{V}/\mu\text{s}(\text{typ.})$
- High gain, low distortion
 $G_{VO}=100\text{dB}(\text{typ.})$, $\text{THD}=0.002\%$
 $(G_V=35.6\text{dB, RIAA, }V_O=5\text{Vrms})$
- Large load current and allowable current
 $I_{LP}=\pm 50\text{mA}$, $P_d=800\text{mW}(\text{SIP})$
 $P_d=625\text{mW}(\text{DIP})$, $P_d=440\text{mW}(\text{FP})$

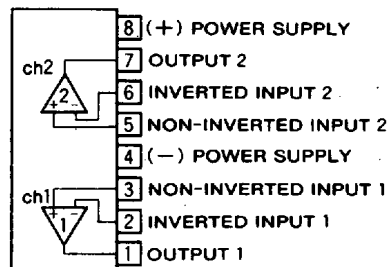
APPLICATION

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

RECOMMENDED OPERATING CONDITION

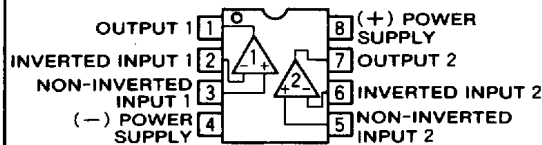
- Supply voltage range $\pm 5\sim\pm 15\text{V}$
- Rated supply voltage $\pm 15\text{V}$

PIN CONFIGURATION (TOP VIEW)



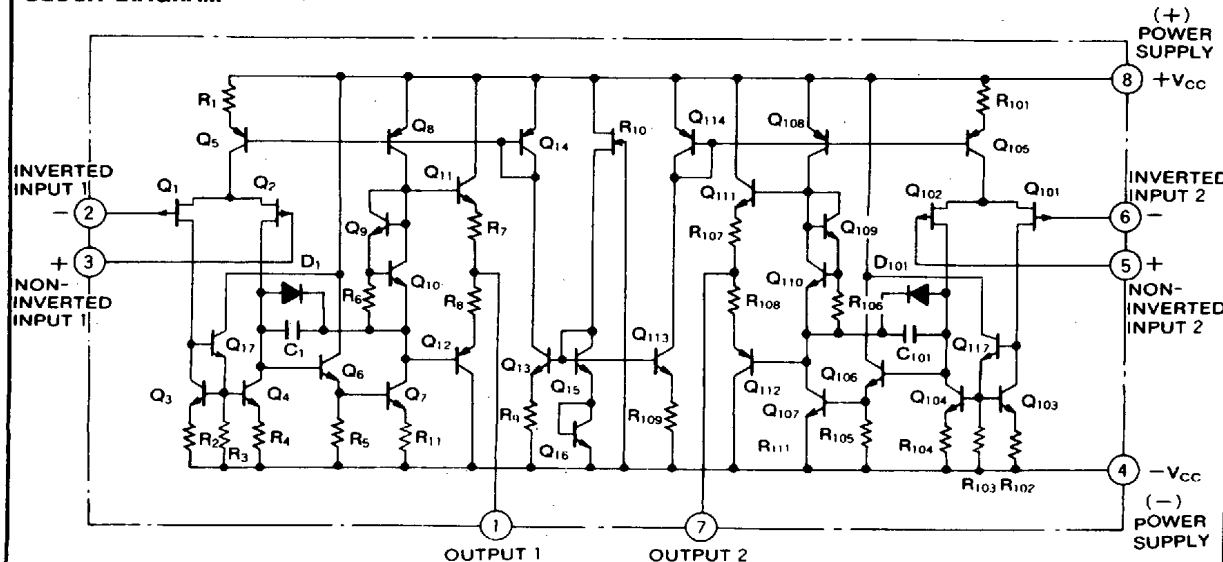
Outline 8P5 (AL)

DIP, MINI FLAT



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

BLOCK DIAGRAM



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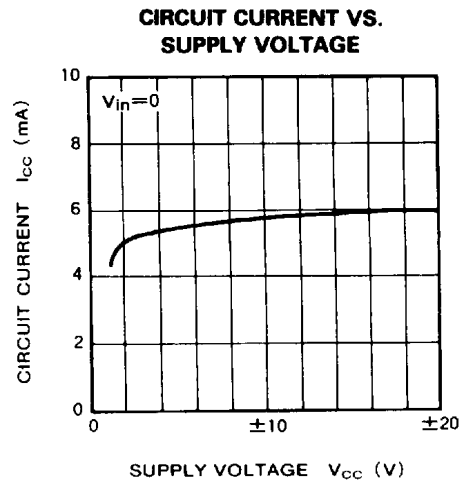
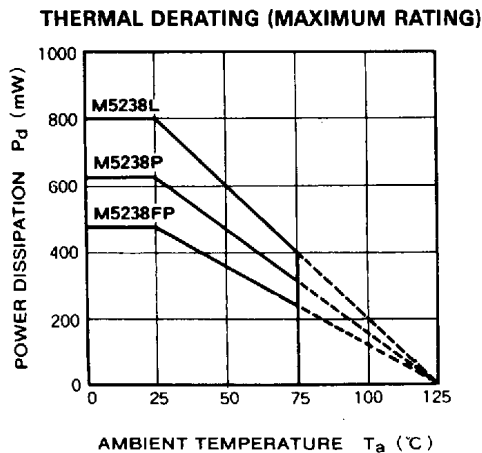
ABSOLUTE MAXIMUM RATINGS ($T_a=25^\circ\text{C}$, unless otherwise noted)

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	$T_a \geq 25^\circ\text{C}$	8(SIP)/6.25(DIP)/4.4(FP)	mW/°C
T_{opr}	Ambient temperature		$-20 \sim +75$	°C
T_{stg}	Storage temperature		$-55 \sim +125$	°C

ELECTRICAL CHARACTERISTICS ($T_a=25^\circ\text{C}$, $V_{CC}=\pm 15\text{V}$)

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	$R_s \leq 10\text{k}\Omega$		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		M Ω
G_{VO}	Open loop voltage gain	$R_L \geq 2\text{k}\Omega$, $V_o = \pm 10\text{V}$	86	106		dB
V_{OM}	Maximum output voltage	$R_L \geq 10\text{k}\Omega$	± 12	± 14		V
		$R_L \geq 2\text{k}\Omega$	± 10	± 13		V
V_{CM}	Common input voltage width		± 10	± 12		V
CMRR	Common mode rejection ratio	$R_s \leq 10\text{k}\Omega$	70	76		dB
SVRR	Supply voltage rejection ratio	$R_s \leq 10\text{k}\Omega$		30	150	$\mu\text{V/V}$
P_d	Power dissipation			174	270	mW
SR	Slew rate	$G_v=0\text{dB}$, $R_L=2\text{k}\Omega$		20		V/ μs
f_T	Gain bandwidth product			6		MHz
V_{NI}	Input referred noise voltage	$R_s=100\Omega$, BW=10Hz~30kHz		1.9		μVrms

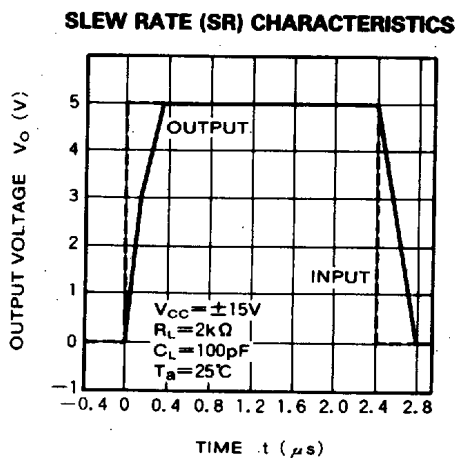
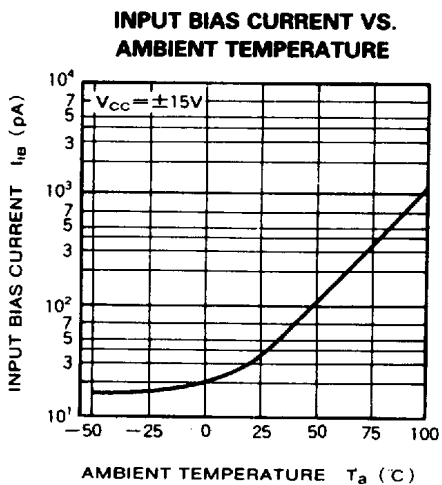
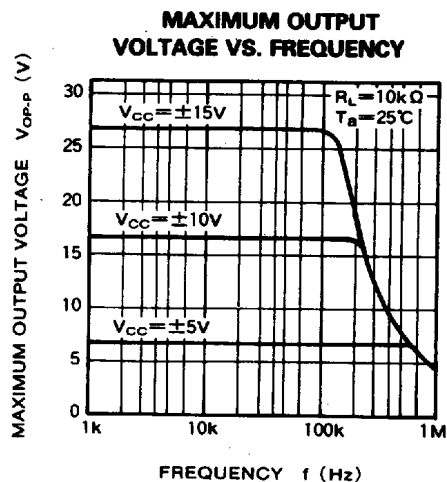
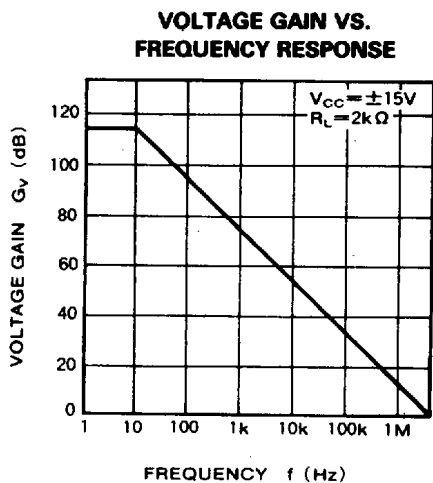
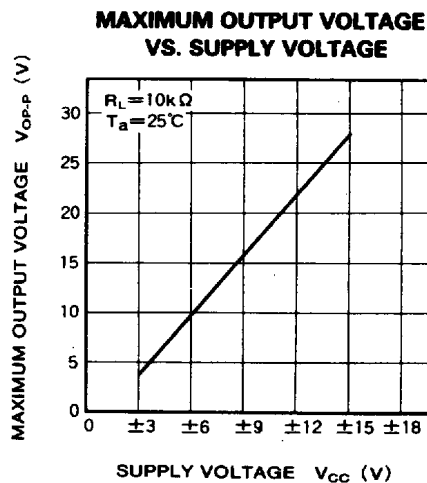
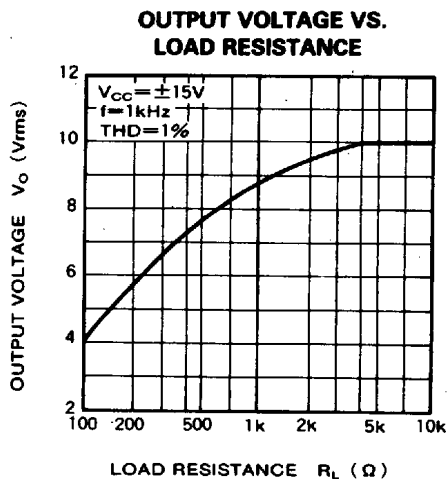
TYPICAL CHARACTERISTICS



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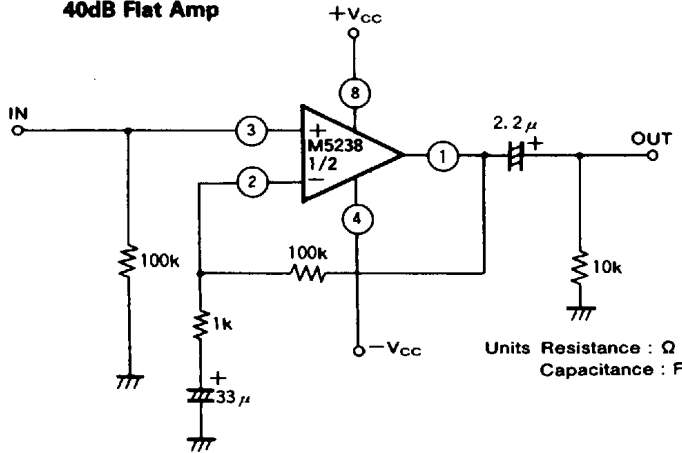


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DUAL LOW-NOISE J-FET INPUT OPERATIONAL AMPLIFIERS

APPLICATION CIRCUIT 1

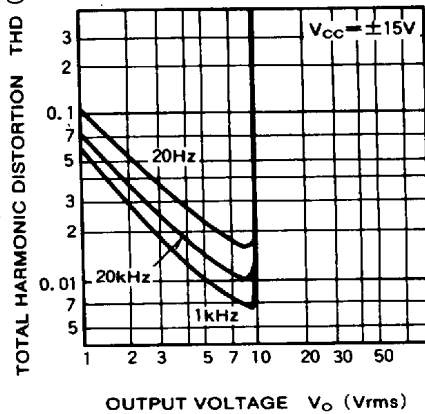
40dB Flat Amp



TYPICAL CHARACTERISTICS

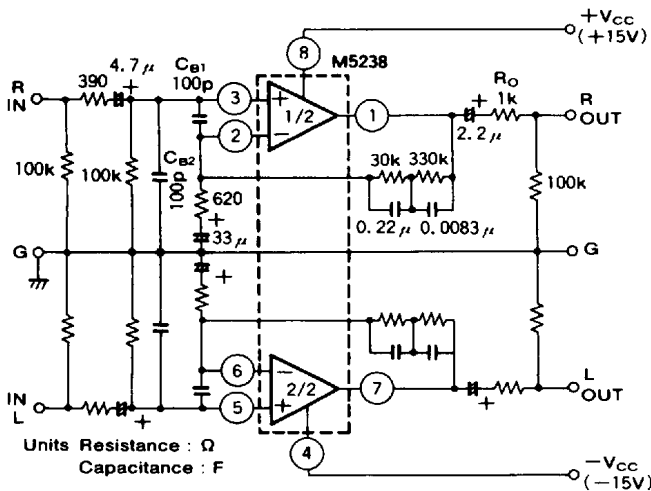
- $V_{CC} = \pm 15V$
- $G_V = 40dB (f = 1kHz)$
- $V_O = 9.5V_{rms} (f = 1kHz, THD = 0.1\%)$
- $THD = 0.007\% (f = 1kHz, V_O = 7V_{rms})$

TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE



APPLICATION CIRCUIT 2

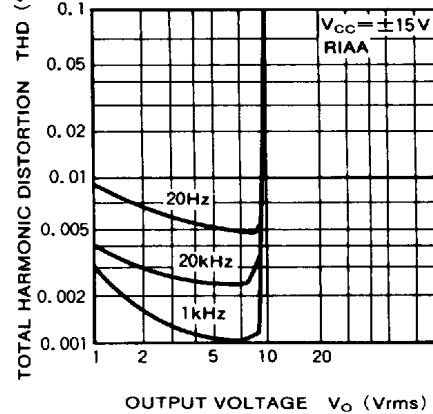
Stereo equalizer amplifier circuit



TYPICAL CHARACTERISTICS ($V_{CC} = \pm 15V, RIAA$)

- $G_V = 35.6dB (f = 1kHz)$
- $V_{NI} = 1.9\mu V_{rms} (R_S = 100\Omega, BW = 20Hz \sim 30kHz)$
- $S/N = 73dB$ (IHF-A network, shorted input, 2.5mVrms input sensitivity)
- $THD = 0.001\% (f = 1kHz, V_O = 7V_{rms})$

TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE



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.

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