M5228P/FP

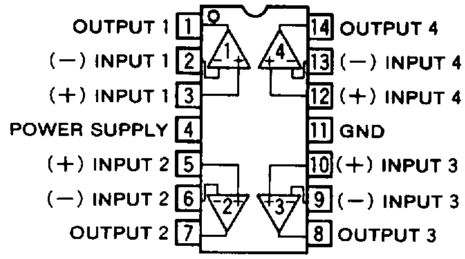
QUAD LOW-NOISE OPERATIONAL AMPLIFIERS (DUAL POWER SUPPLY TYPE)

DESCRIPTION

The M5228 is a semiconductor integrated circuit designed for a low-noise preamplifier in audio equipment and a general-purpose operational amplifier in other electronic equipment. Four low-noise operational amplifier circuits displaying internal phase-compensated high gain and low distortion are contained in a 14-pin standard DIP and 14-pin mini flat (FP) package for application overt a side range as a general-purpose dual amplifier in general electronic equipment.

The device has virtually the same characteristics as the 4557, 4558, 4559 and 741 operational amplifiers. The unit can also be used as a single power supply type and amplifier in portable equipment. It is also suitable as a headphone amplifier because of its high load current.

PIN CONFIGURATION (TOP VIEW)



Outline 14P4 (P)
14P2S-A (FP)

FEATURES

- High gain, low distortion
  ············ G_{VO}=110dB, THD=0.0015%(typ.)
- High slew rate, high f_T ······ SR=2.2V/μs, f_T=7MHz(typ.)
- Low noise(R_g=1kΩ)FLAT ············ V_{NI}=2μVrms(typ.)
  RIAA ············ V_{NI}=1μVrms(typ.)
- Operation with low supply voltage ········· $V_{CC}\geqq$4V(±2V)
- High load current, high power dissipation
  ············ I_{LP}=±50mA, P_d=700mW(M5228P)
  P_d=550mW(M5228FP)

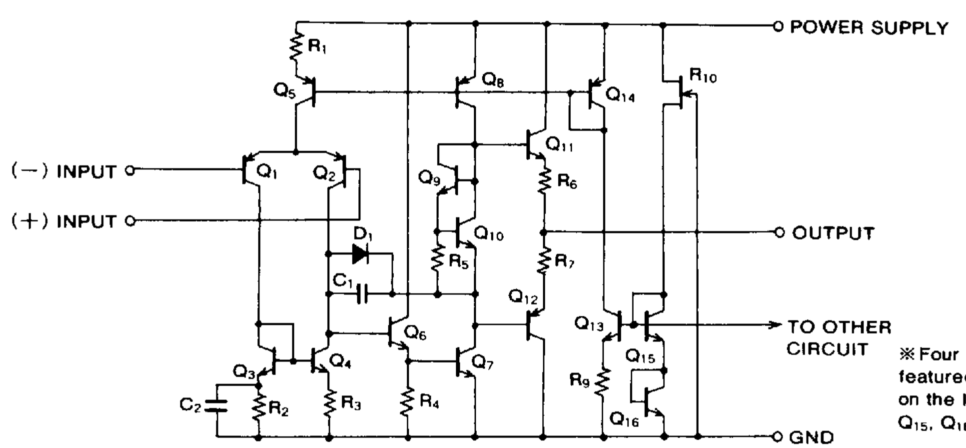
APPLICATION

General-purpose amplifier in stereo equipment, tape decks and radio stereo cassette recorders; active filters, servo amplifiers, operational circuits in other general electronic equipment.

RECOMMENDED OPERATING CONDITION

Supply voltage range ································ ±2∼±16V
Rated supply voltage ································ ±15V

BLOCK DIAGRAM



※Four circuits are featured in the circuit on the left. (except Q_{15}, Q_{16}, R_{10})

MITSUBISHI ELECTRIC

QUAD LOW-NOISE OPERATIONAL AMPLIFIERS (DUAL POWER SUPPLY TYPE)

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

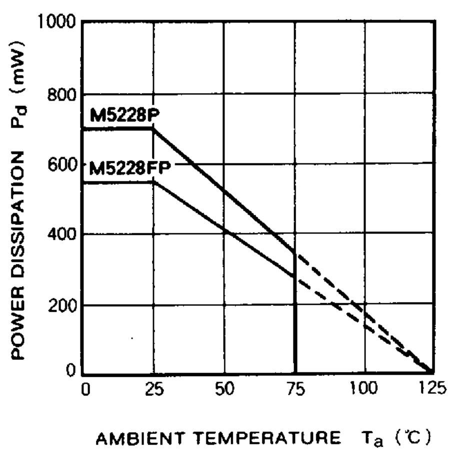
Symbol	Parameter	Conditions	Ratings	Unit
V_{CC}	Supply voltage		±18	V
I_{LP}	Load current		±50	mA
V_{id}	Differential input voltage		±30	V
V_{IC}	Common input voltage		±15	V
P_d	Power dissipation		700(DIP)/550(FP)	mW
K_θ	Thermal derating	T_a≧25℃	7(DIP)/5.5(FP)	mW/℃
T_{opr}	Ambient temperature		−20～+75	℃
T_{stg}	Storage temperature		−55～+125	℃

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

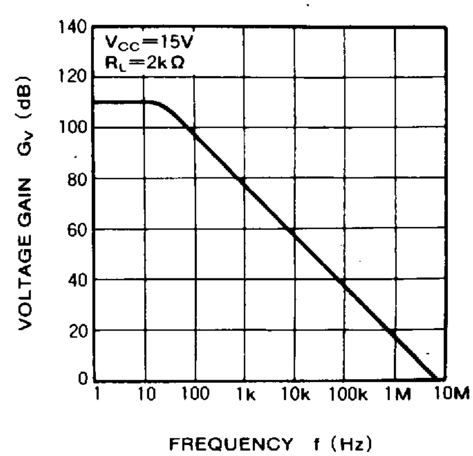
Symbol	Parameter	Test conditions	Limits Min.	Limits Typ.	Limits Max.	Unit
I_{CC}	Circuit current	V_{in}=0		6.0	12.0	mA
V_{IO}	Input offset voltage	R_S≦10kΩ		0.5	6.0	mV
I_{IO}	Input offset current			5	200	nA
I_{IB}	Input bias current				500	nA
R_{in}	Input resistance		0.3	5		MΩ
G_{VO}	Open loop voltage gain	R_L≧2kΩ, V_O=±10V	86	110		dB
V_{OM}	Maximum output voltage	R_L≧10kΩ	±12	±14		V
		R_L≧2kΩ	±10	±13		
V_{CM}	Common input voltage range		±12	±14		V
CMRR	Common mode rejection ratio	R_S≦10kΩ	70	90		dB
SVRR	Supply voltage rejection ratio	R_S≦10kΩ		30	150	μV/V
P_d	Power dissipation			180	360	mW
SR	Slew rate	G_V=0dB, R_L=2kΩ		2.2		V/μs
f_T	Gain bandwidth product			7		MHz
V_{NI}	Input referred noise voltage	R_S=1kΩ, BW:10Hz～30kHz		2.0		μVrms

TYPICAL CHARACTERISTICS

THERMAL DERATING (MAXIMUM RATING)

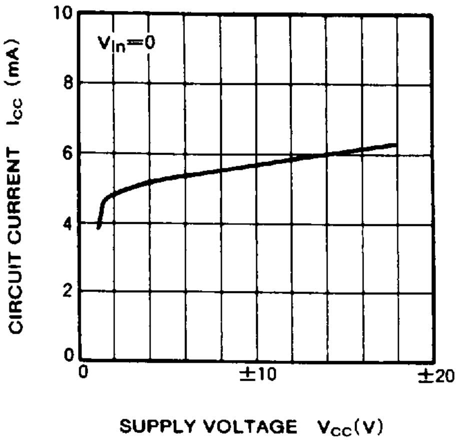


VOLTAGE GAIN VS. FREQUENCY RESPONSE

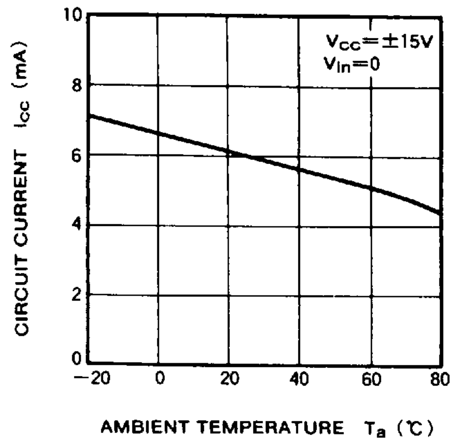


QUAD LOW-NOISE OPERATIONAL AMPLIFIERS (DUAL POWER SUPPLY TYPE)

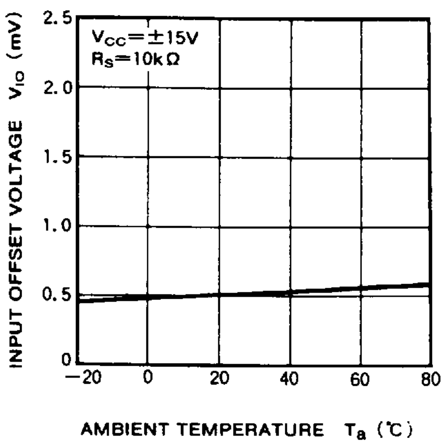
CIRCUIT CURRENT VS. SUPPLY VOLTAGE



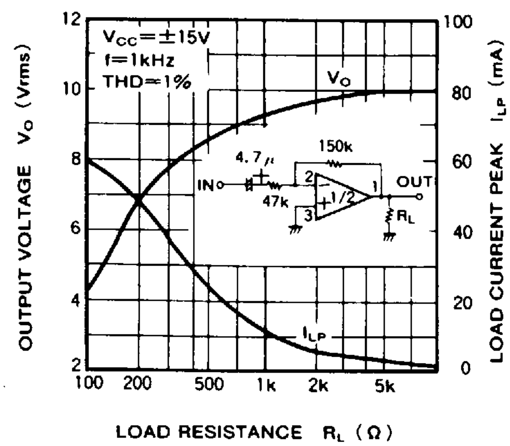
CIRCUIT CURRENT VS. AMBIENT TEMPERATURE



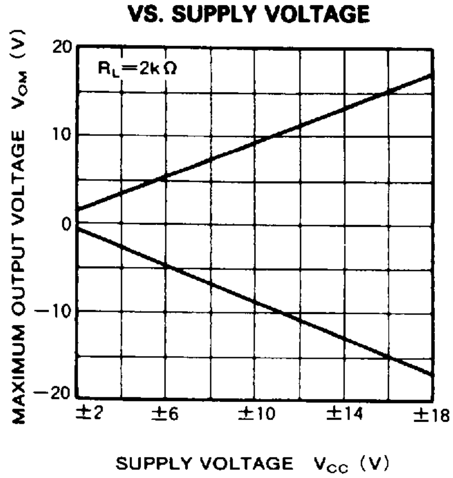
INPUT OFFSET VOLTAGE VS. AMBIENT TEMPERATURE



OUTPUT VOLTAGE / LOAD CURRENT PEAK VS. LOAD RESISTANCE



MAXIMUM OUTPUT VOLTAGE VS. SUPPLY VOLTAGE



MAXIMUM OUTPUT VOLTAGE VS. FREQUENCY RESPONSE