

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

**DESCRIPTION**

The M5218 are semiconductor integrated circuits designed for a low noise preamplifier in audio equipment and a general-purpose operational amplifier in other electronic equipment. Two low noise operational amplifier circuits displaying internal phase-compensated high gain and low distortion are contained in an 8-pin SIP, DIP or FP for application over a wide range as a general-purpose dual amplifier in general electronic equipment.

The devices have virtually the same characteristics as the 4557, 4558, 4559 and 741 operational amplifiers.

The units 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.

**FEATURES**

- High gain, low distortion  
.....  $G_{VO}=110\text{dB}$ ,  $\text{THE}=0.0015\%$ (typ.)
- High slew rate, high  $f_T$   
.....  $\text{SR}=3.0\text{V}/\mu\text{s}$ ,  $f_T=7\text{MHz}$ (typ.)
- Low noise ( $R_S=1\text{k}\Omega$ ) FLAT .....  $V_{NI}=2\mu\text{Vrms}$ (typ.)  
RIAA .....  $V_{NI}=1\mu\text{Vrms}$ (typ.)
- Operation with low supply voltage  
.....  $V_{CC}\geq 4\text{V}(\pm 2\text{V})$
- High load current, high power dissipation  
.....  $I_{LP}=\pm 50\text{mA}$ ,  $P_d=800\text{mW}$ (SIP)  
 $P_d=625\text{mW}$ (DIP),  $P_d=440\text{mW}$ (FP)

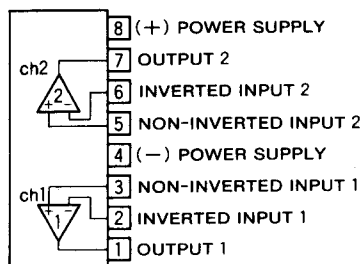
**APPLICATION**

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

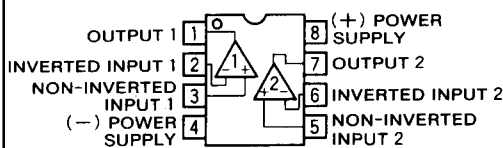
**RECOMMENDED OPERATING CONDITIONS**

Supply voltage range .....  $\pm 2 \sim \pm 16\text{V}$   
Rated supply voltage .....  $\pm 15\text{V}$

**PIN CONFIGURATION (TOP VIEW)**

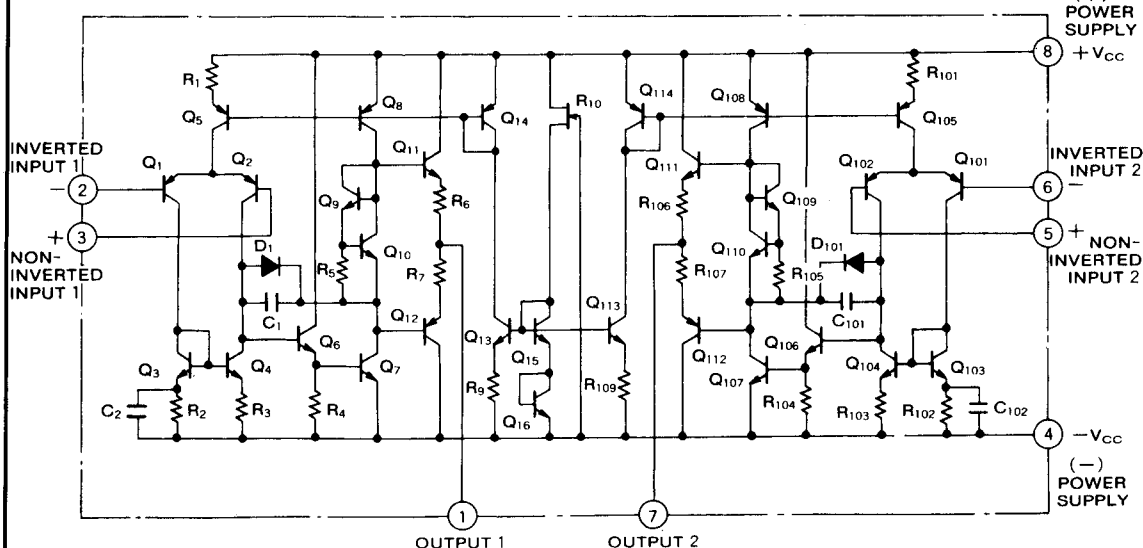


Outline 8P5 (AL)



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

**BLOCK DIAGRAM**



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## ABSOLUTE MAXIMUM RATINGS (T<sub>a</sub>=25°C, unless otherwise noted)

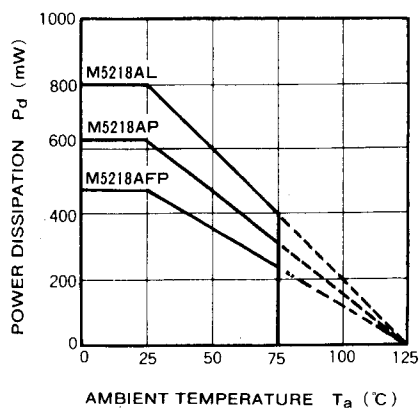
| Symbol           | Parameter                  | Conditions           | Ratings                   | Unit  |
|------------------|----------------------------|----------------------|---------------------------|-------|
| V <sub>CC</sub>  | Supply voltage             |                      | ±18                       | V     |
| I <sub>LP</sub>  | Load current               |                      | ±50                       | mA    |
| V <sub>Id</sub>  | Differential input voltage |                      | ±30                       | V     |
| V <sub>IC</sub>  | Common input voltage       |                      | ±15                       | V     |
| P <sub>d</sub>   | Power dissipation          |                      | 800(SIP)/625(DIP)/440(FP) | mW    |
| K <sub>θ</sub>   | Thermal derating           | T <sub>a</sub> ≥25°C | 8(SIP)/6.25(DIP)/4.4(FP)  | mW/°C |
| T <sub>opr</sub> | Ambient temperature        |                      | −20~+75                   | °C    |
| T <sub>stg</sub> | Storage temperature        |                      | −55~+125                  | °C    |

## ELECTRICAL CHARACTERISTICS (T<sub>a</sub>=25°C, V<sub>CC</sub>=±15V)

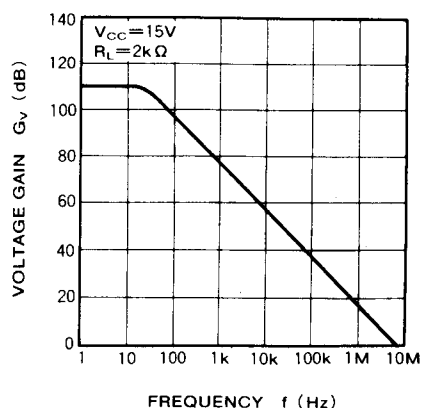
| Symbol          | Parameter                    | Test conditions                           | Limits |      |      | Unit  |
|-----------------|------------------------------|-------------------------------------------|--------|------|------|-------|
|                 |                              |                                           | Min.   | Typ. | Max. |       |
| I <sub>CC</sub> | Circuit current              | V <sub>in</sub> =0                        |        | 3.0  | 6.0  | mA    |
| V <sub>IO</sub> | Input offset voltage         | R <sub>S</sub> ≤10kΩ                      |        | 0.5  | 6.0  | mV    |
| I <sub>IO</sub> | Input offset current         |                                           |        | 5    | 200  | nA    |
| I <sub>IB</sub> | Input bias current           |                                           |        |      | 500  | nA    |
| R <sub>in</sub> | Input resistance             |                                           | 0.3    | 5    |      | MΩ    |
| G <sub>VO</sub> | Open loop voltage gain       | R <sub>L</sub> ≥2kΩ, V <sub>O</sub> =±10V | 86     | 110  |      | dB    |
| V <sub>OM</sub> | Maximum output voltage       | R <sub>L</sub> ≥10kΩ                      | ±12    | ±14  |      | V     |
|                 |                              | R <sub>L</sub> ≥2kΩ                       | ±10    | ±13  |      |       |
| V <sub>CM</sub> | Common input voltage range   |                                           | ±12    | ±14  |      | V     |
| CMRR            | Common mode rejection ratio  | R <sub>S</sub> ≤10kΩ                      | 70     | 90   |      | dB    |
| SVRR            | Supply voltage               | R <sub>S</sub> ≤10kΩ                      |        | 30   | 150  | μV/V  |
| P <sub>d</sub>  | Power dissipation            |                                           |        | 90   | 180  | mW    |
| SR              | Slew rate                    | G <sub>v</sub> =0dB, R <sub>L</sub> =2kΩ  |        | 3.0  |      | V/μs  |
| f <sub>T</sub>  | Gain bandwidth product       |                                           |        | 7    |      | MHz   |
| V <sub>NI</sub> | Input referred noise voltage | R <sub>S</sub> =1kΩ, BW:10Hz~30kHz        |        | 2.0  |      | μVrms |

## TYPICAL CHARACTERISTICS

THERMAL DERATING (MAXIMUM RATING)

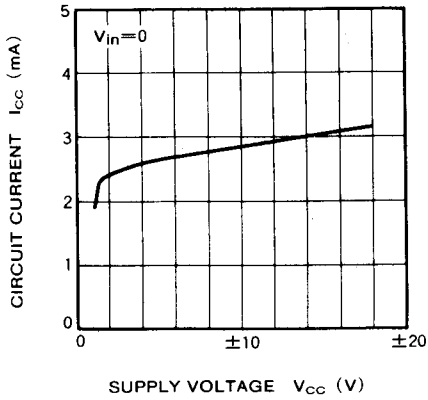


VOLTAGE GAIN VS. FREQUENCY RESPONSE

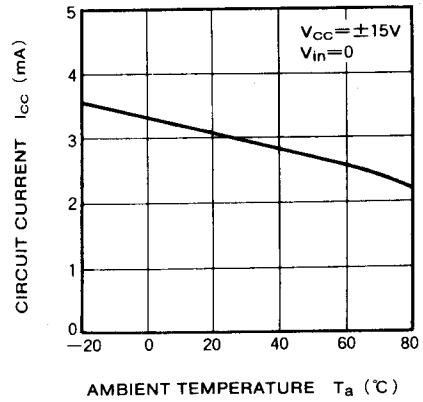


**DUAL LOW-NOISE OPERATIONAL AMPLIFIERS (DUAL POWER SUPPLY TYPE)**

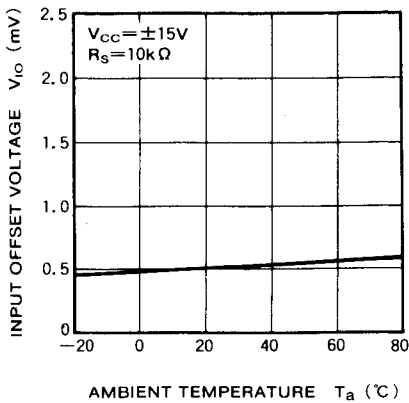
**CIRCUIT CURRENT VS.  
SUPPLY VOLTAGE**



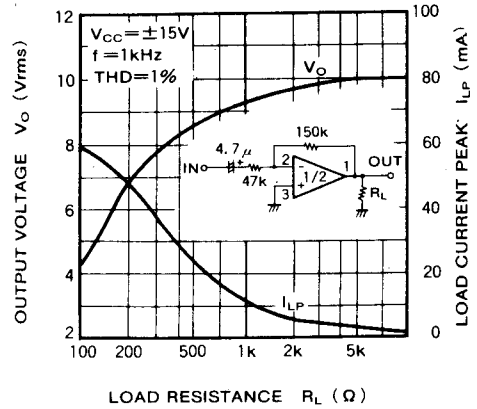
**CIRCUIT CURRENT VS.  
AMBIENT TEMPERATURE**



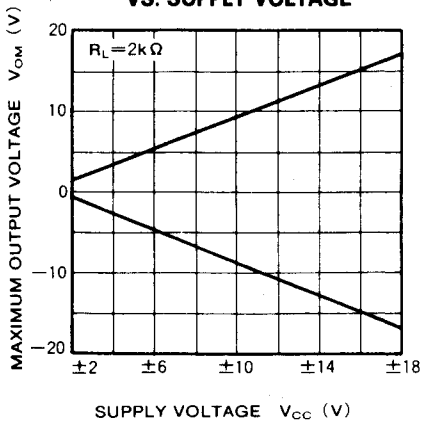
**INPUT OFFSET VOLTAGE VS.  
AMBIENT TEMPERATURE**



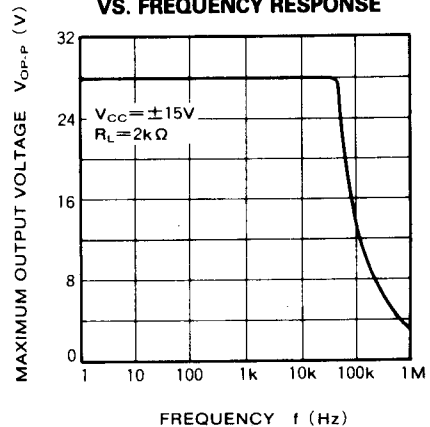
**OUTPUT VOLTAGE / LOAD CURRENT  
PEAK VS. LOAD RESISTANCE**



**MAXIMUM OUTPUT VOLTAGE  
VS. SUPPLY VOLTAGE**



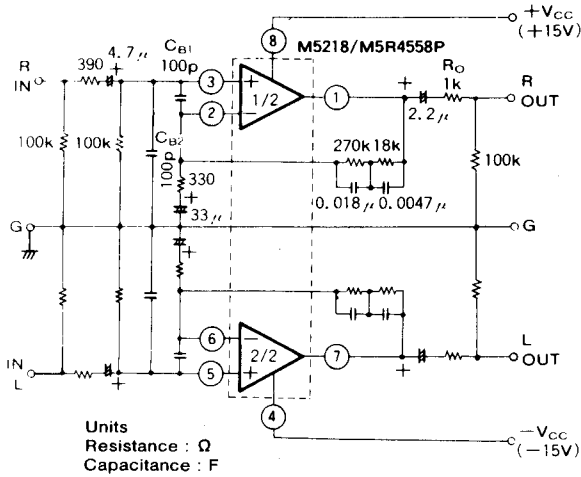
**MAXIMUM OUTPUT VOLTAGE  
VS. FREQUENCY RESPONSE**



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

**APPLICATION EXAMPLES**

**(1) Stereo Equalizer amplifier circuit**

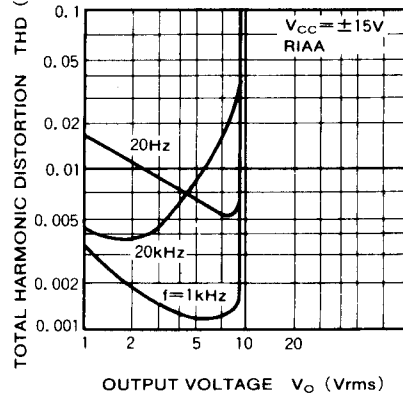


Left channel circuit constants are identical to those of right channel.  
 $C_{B1}$ ,  $C_{B2}$  : Capacitors for buzz prevention, use if required.  
 $R_O$  : Resistor used to prevent parasitic oscillation for capacitive loads and current limiting with shorted and other abnormal load conditions.

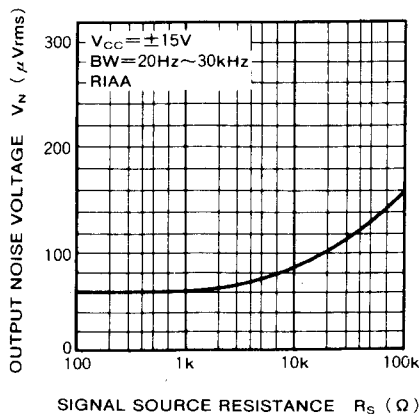
**TYPICAL CHARACTERISTICS ( $V_{CC} = \pm 15V$ , RIAA)**

- $G_v = 35.6 \text{ dB}$  ( $f = 1 \text{ kHz}$ )
- $V_{NI} = 1 \mu\text{Vrms}$  ( $R_S = 1 \text{ k}\Omega$ ,  $BW = 20 \text{ Hz} \sim 30 \text{ kHz}$ )
- Signal-to-noise = 72.5 dB (IHF-A network, shorted input, 2.5mVrms input sensitivity)
- THD = 0.0015% ( $f = 1 \text{ kHz}$ ,  $V_O = 3 \text{ Vrms}$ )

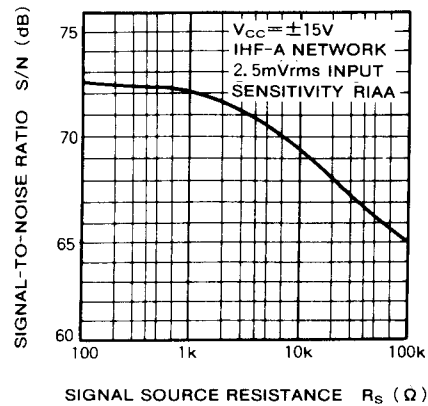
**TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE**



**OUTPUT NOISE VOLTAGE VS. SIGNAL SOURCE RESISTANCE**

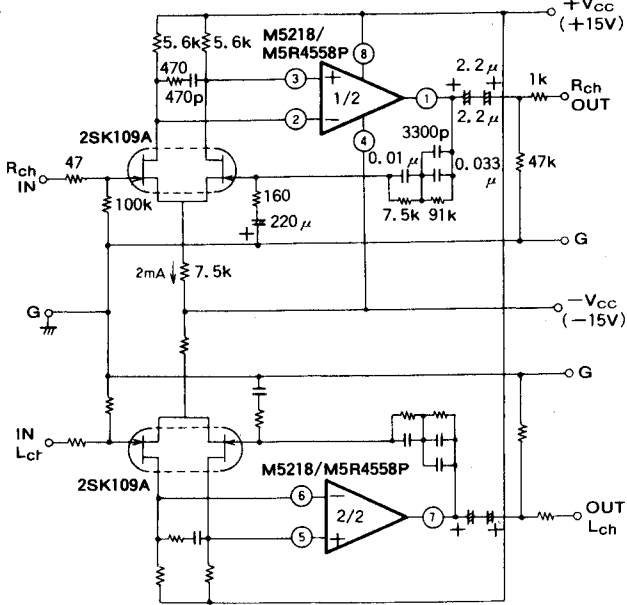


**SIGNAL-TO-NOISE RATIO VS. SIGNAL SOURCE RESISTANCE**



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(2) High S / N stereo DC ICL equalizer

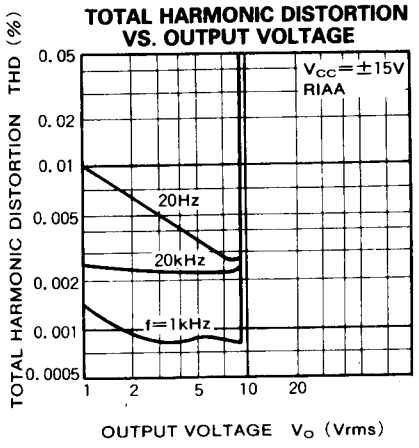


Left channel circuit constants are identical to those of right channel.

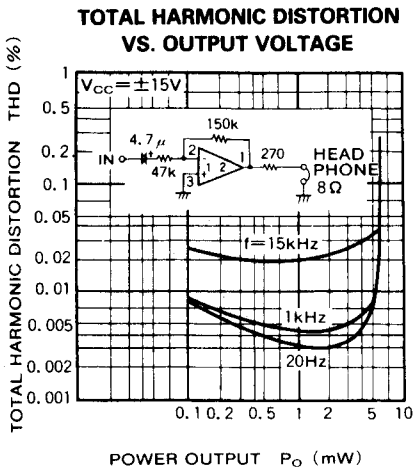
Units Resistance :  $\Omega$   
Capacitance : F

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

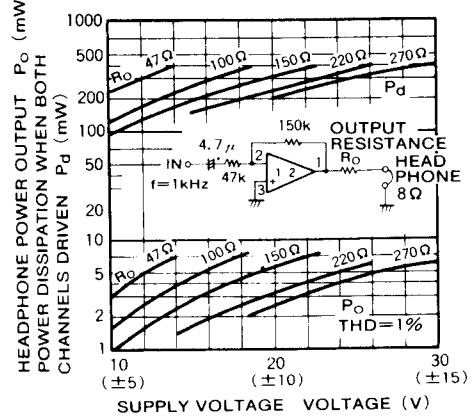
- Signal-to-noise = 72.5dB (IHF-A network, shorted input, 2.5mVrms input sensitivity)
- $V_{NI} = 0.77 \mu Vrms$  ( $R_S = 5.1k\Omega$ , BW = 5Hz ~ 100kHz)
- $G_V = 35.6dB$  ( $f = 1kHz$ )



(3) Headphone amplifier



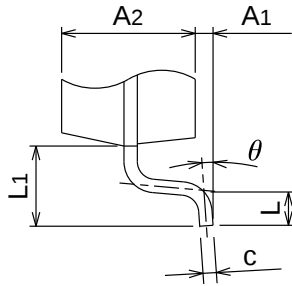
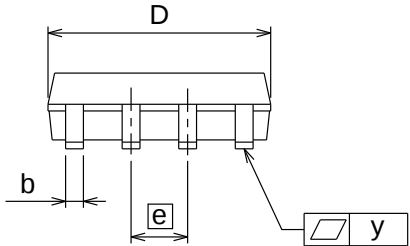
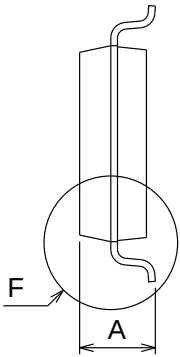
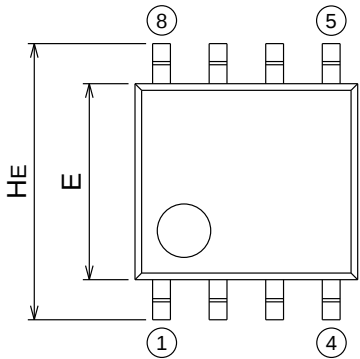
(Output resistance  $R_O$  is made the parameter)  
POWER OUTPUT / POWER DISSIPATION VS. SUPPLY VOLTAGE



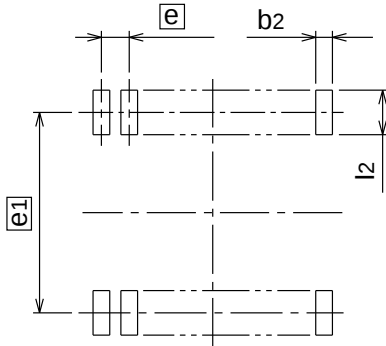
# 8P2S-A

## Plastic 8pin 225mil SOP

| EIAJ Package Code | JEDEC Code | Weight(g) | Lead Material |
|-------------------|------------|-----------|---------------|
| SOP8-P-225-1.27   | —          | 0.07      | Cu Alloy      |



Detail F



Recommended Mount Pad

| Symbol | Dimension in Millimeters |      |     |
|--------|--------------------------|------|-----|
|        | Min                      | Nom  | Max |
| A      | —                        | —    | 1.9 |
| A1     | 0.05                     | —    | —   |
| A2     | —                        | 1.5  | —   |
| b      | 0.35                     | 0.4  | 0.5 |
| c      | 0.13                     | 0.15 | 0.2 |
| D      | 4.8                      | 5.0  | 5.2 |
| E      | 4.2                      | 4.4  | 4.6 |
| e      | —                        | 1.27 | —   |
| HE     | 5.9                      | 6.2  | 6.5 |
| L      | 0.2                      | 0.4  | 0.6 |
| L1     | —                        | 0.9  | —   |
| y      | —                        | —    | 0.1 |
| θ      | 0°                       | —    | 10° |
| b2     | —                        | 0.76 | —   |
| e1     | —                        | 5.72 | —   |
| l2     | 1.27                     | —    | —   |