# Class A Amplifier with 2 Independent Gain Blocks

LP508 DATA SHEET

## FEATURES

- **1 μV input referred noise**
- **1.0 to 5 VDC operating range**
- **61 dB typical gain (adjustable)**
- **0.28 to 2.0 mA range of transducer current**
- **1 % electrical distortion**
- **the first and second blocks can be DC coupled**
- **4.0 kΩ microphone decoupling resistor, on-chip**
- **100 Hz to 50 kHz frequency response**
- **volume control range >40 dB**

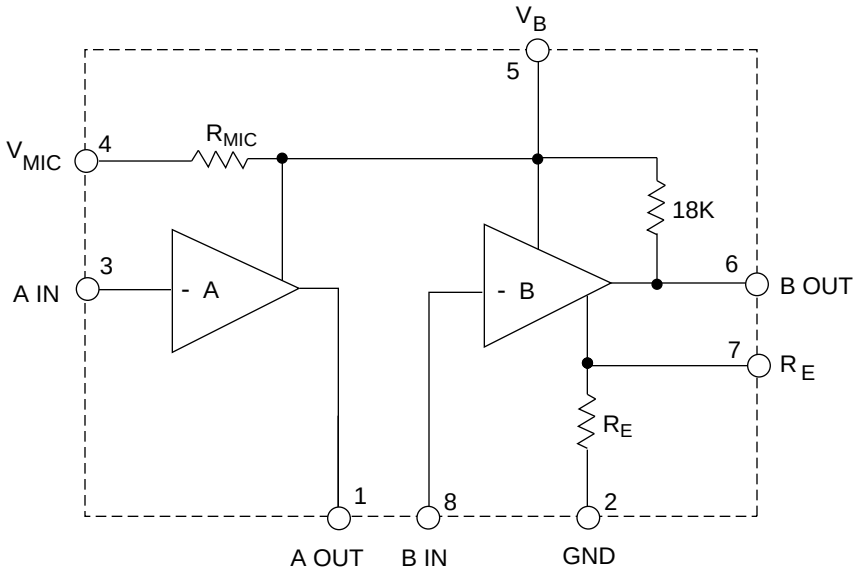
## STANDARD PACKAGING

- 8 pin MICROpac
- 8 pin MINIpac
- 8 pin PLID ®
- 8 pin SLT
- Chip (59 x 53 mils)
  Au Bump

## DESCRIPTION

The LP508 is an 8 pin Class A amplifier utilizing Gennum's proprietary low voltage bipolar JFET technology. It consists of 2 single ended, low noise inverting gain blocks. The first block has a typical open loop gain of 50 dB, with the closed loop gain set by the ratio of the feedback resistor to the the source impedance. The second block has the output transistor bias set by $R_E$ and $V_{RE}$ at pin 7 which is 27 mV.

Typically, the gain of the first block is set to 29 dB, with the second block at 32 dB, giving a total gain of 61 dB.




**BLOCK DIAGRAM**

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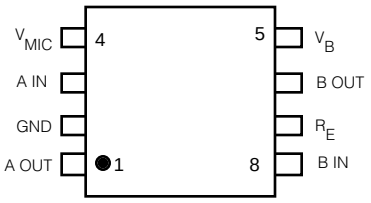
## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | VALUE/UNITS |
|---|---|
| Supply Voltage | 5 V DC |
| Power Dissipation | 25 mW |
| Operating Temperature Range | -10°C to 40° C |
| Storage Temperature Range | -20°C to 70° C |

**CAUTION**
CLASS 1 ESD SENSITIVITY

## PIN CONNECTION

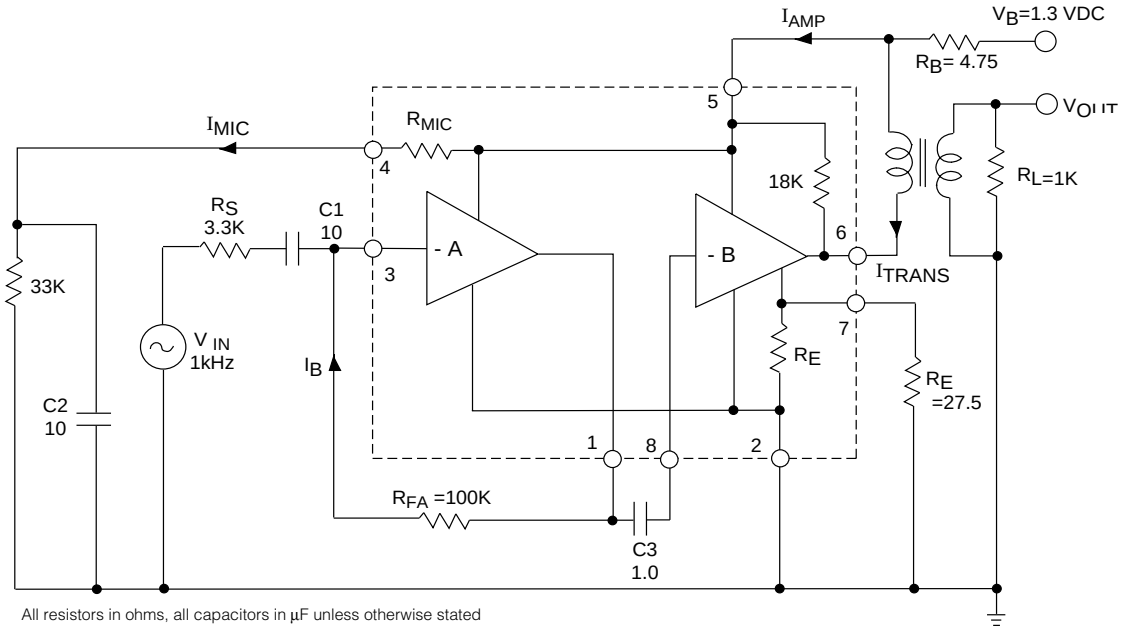



## ELECTRICAL CHARACTERISTICS

Conditions: Frequency = 1 kHz, Temperature = 25°C, Supply Voltage $V_B$ = 1.3 VDC

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Gain (Closed Loop) | $A_{CL}$ | $V_{OUT}$=500mVRMS | 57 | 61 | 65 | dB |
| Distortion | THD | $V_{OUT}$=500mVRMS | - | 1 | 4 | % |
| Amplifier Current | $I_{AMP}$ | $I_{AMP}= I_A + I_{MIC}$ | 125 | 195 | 255 | µA |
| Transducer Current | $I_{TRANS\ H}$ | $R_E$ = 27.5 | 1.1 | 1.3 | 1.7 | mA |
| Transducer Current | $I_{TRANS\ L}$ | $R_E$ = ∞ | 200 | 275 | 350 | µA |
| Input Referred Noise | IRN | NFB 0.2 to 10 kHz at 12 dB/oct. | - | 1 | 2 | µV |
| Stable with Battery Resistance to | | | - | - | 22 | Ω |
| Input Bias Current (pin 3) | $I_B$ | | -50 | 0 | 50 | nA |
| On Chip Emitter Resistor | $R_E$ | | - | 100 | - | Ω |
| Emitter Bias Voltage (Pin 7) | $V_{RE}$ | | - | 27 | - | mV |
| Microphone Decoupling Resistor | $R_{MIC}$ | | - | 4 | - | kΩ |

All parameters and switches remain as shown in Test Circuit unless otherwise stated in "Conditions" column




All resistors in ohms, all capacitors in µF unless otherwise stated

Fig. 1 Test Circuit

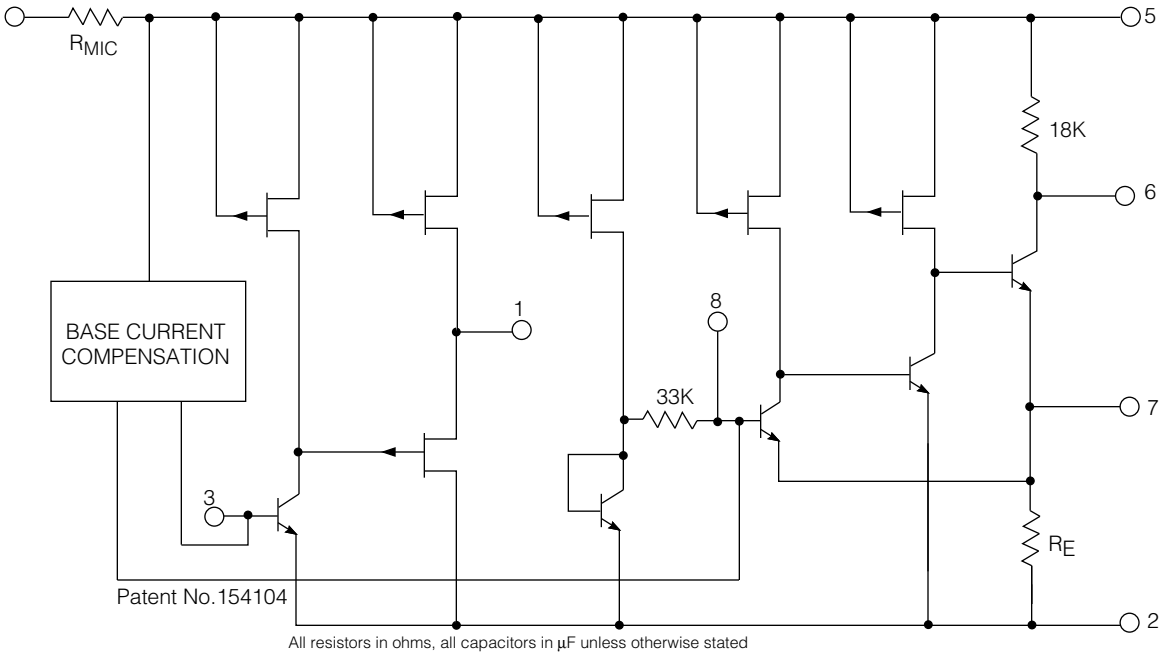
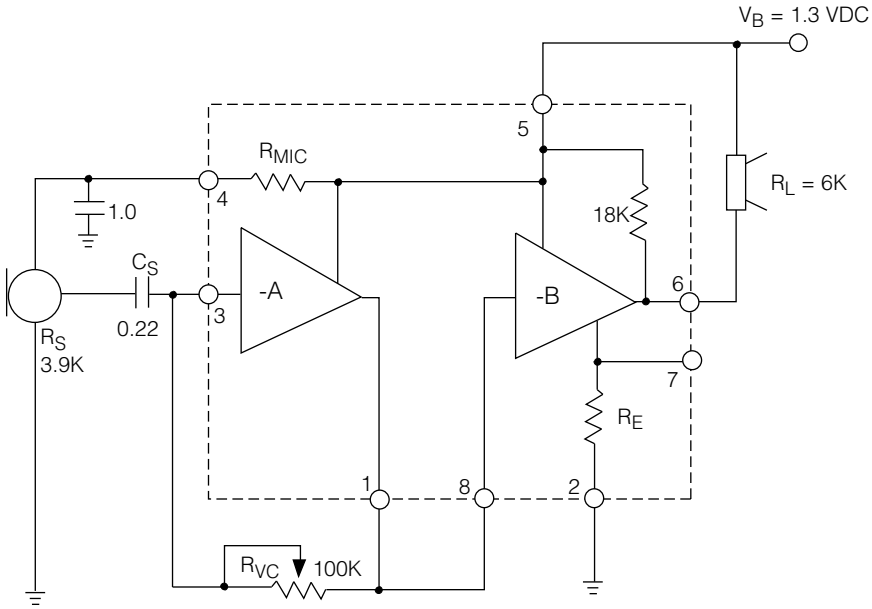



Fig. 2 Functional Schematic




Gain of stage $A = 20\text{Log}_{10}\left(\frac{R_{VC}}{R_S}\right)$ Gain of stage $B = 20\text{Log}_{10}\left(\frac{R_L \;//\; 18K}{R_E}\right)$

For low impedance receivers, a capacitor from pin 6 to pin 2 may be required for stability.

All resistors in ohms, all capacitors in µF unless otherwise stated

Fig. 3 Typical Hearing Aid Circuit

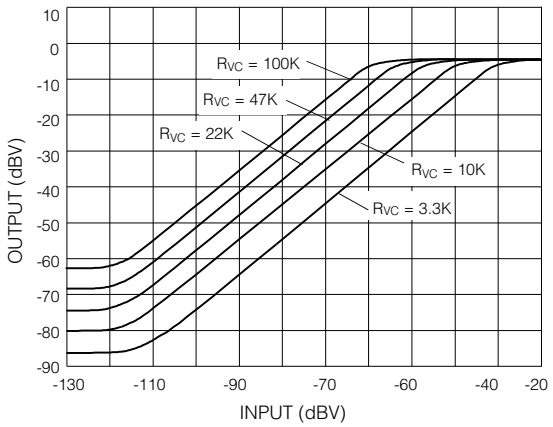



Fig. 4 I/O Characteristics at Various $R_{VC}$ Values

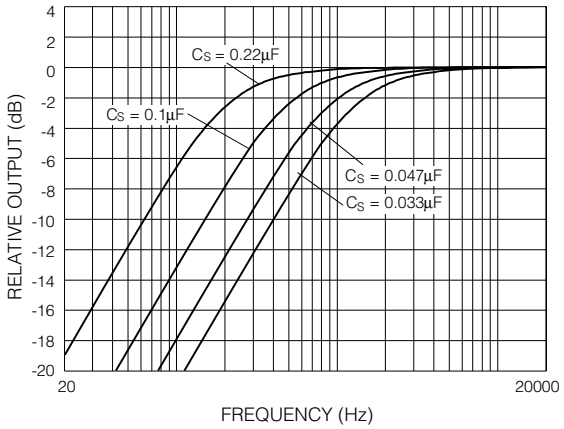



Fig. 5 Frequency Response at Various $C_S$ Values

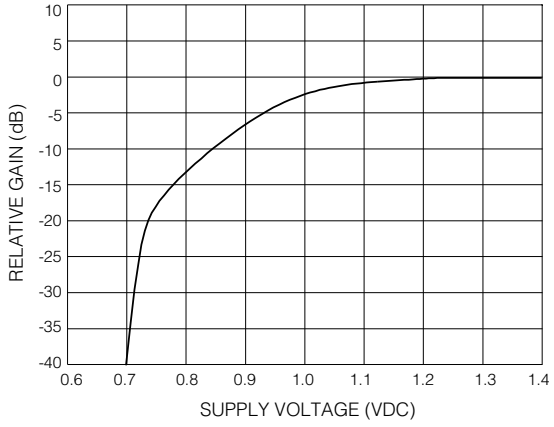



Fig. 6 Gain vs Supply Voltage

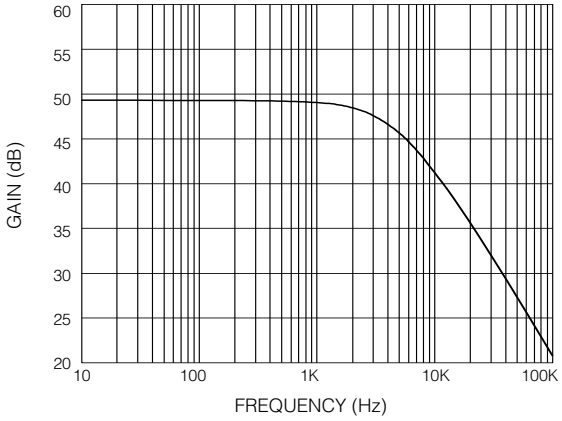



Fig. 7 Preamplifier A Open Loop Frequency Response

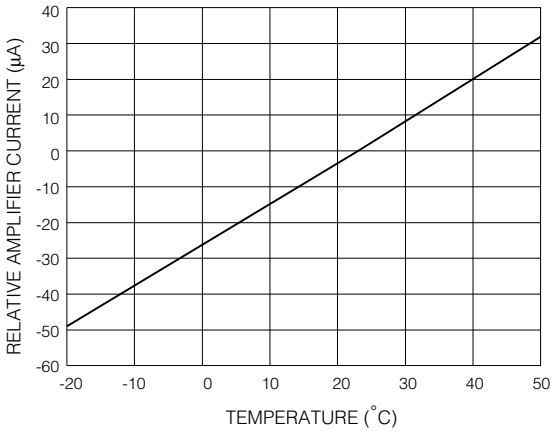



Fig. 8 Amplifier Current vs Temperature

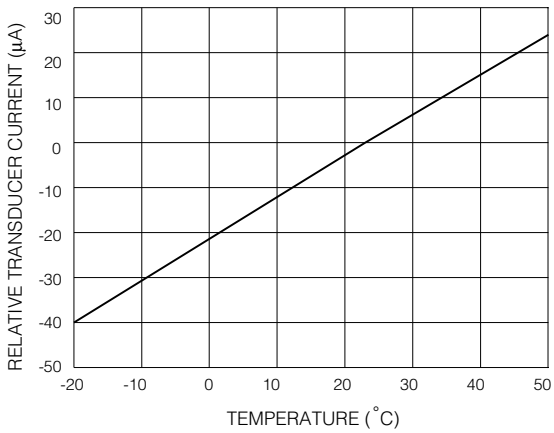



Fig. 9 Transducer Current vs Temperature

DOCUMENT IDENTIFICATION
PRODUCT PROPOSAL

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DATA SHEET
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REVISION NOTES
Pb/Sn bump removed, corrections to Figure 1.