Class A Amplifier with 2 Independent Gain Blocks

GP509 DATA SHEET

FEATURES

- **low amplifier current (typical 105 μA)**
- **low noise and distortion**
- **1.0 to 5 VDC operating range**
- **independent preamplifier**
- **Class A output stage**
- **variable transducer current**
- **4.0 kΩ microphone decoupling resistor, on-chip**

STANDARD PACKAGING

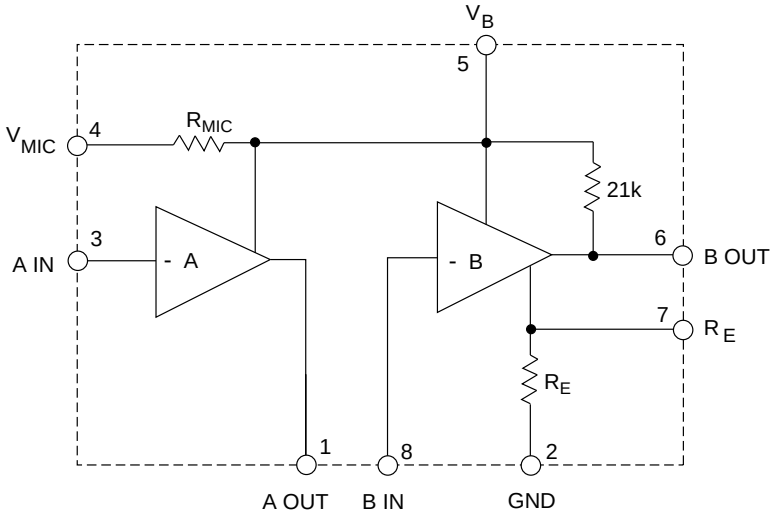
- 8 pin MICROpac
- 8 pin PLID ®
- 8 pin SLT
- Chip (61 x 55 mils)

DESCRIPTION

The GP509 is a Class A amplifier utilizing Gennum's proprietary low voltage JFET technology. It consists of a single-ended, low noise inverting gain block, a Class A output stage, and an on-chip microphone decoupling resistor.

Block A typically has an open loop voltage gain of 56 dB, with the closed loop gain set by the ratio of the feedback resistor to the source impedance. It is recommended that the maximum closed loop gain be 20 dB lower than the open loop gain. All blocks of the device are internally bias compensated, preventing any DC current flow via external feedback resistors. Without this compensation, audible scratchiness would be present during changes in volume control settings.

The output stage of the GP509 is a Class A current drive. It has a fixed reference voltage of typically 30 mV at pin 7 of the device. The current that flows in the transducer is the ratio of the 30 mV reference voltage and the on-chip emitter resistor (R_E). To increase the bias current in the transducer, simply place an external R_E resistor from pin 7 to ground, thereby decreasing the equivalent emitter resistance and increasing the current.



BLOCK DIAGRAM

Revision Date: January 1996

Document No. 510 - 71 - 04

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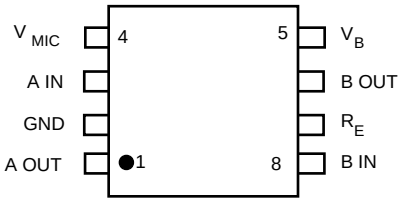
ABSOLUTE MAXIMUM RATINGS

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

CAUTION
CLASS 1 ESD SENSITIVITY

PIN CONNECTION

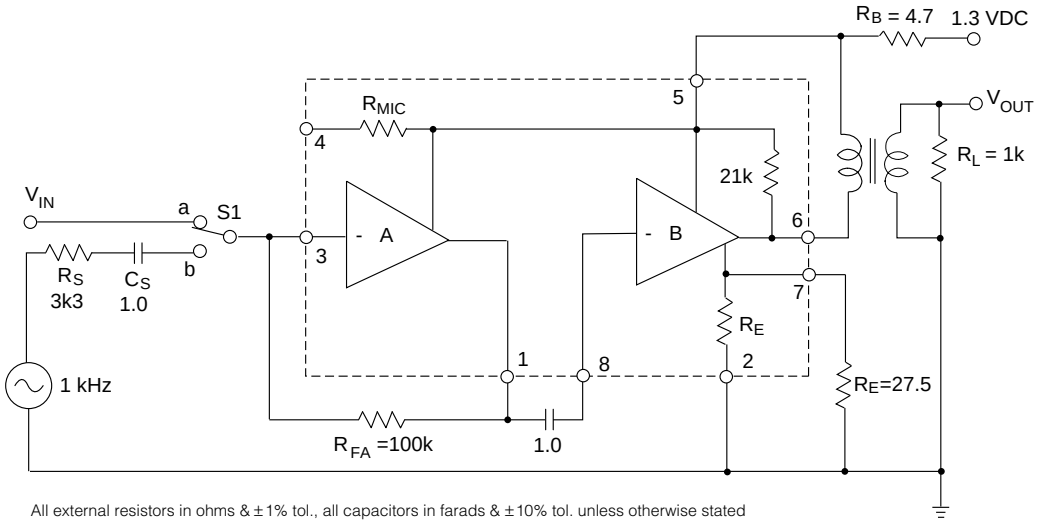


ELECTRICAL CHARACTERISTICS

Supply Voltage = +1.3 VDC, Frequency = 1 kHz, Temperature = 25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Amplifier Current	I_{AMP}		55	105	150	µA
Transducer Current	I_{TRANS}	$R_E = \infty$	225	300	375	µA
Maximum Transducer Current	$I_{TRANS(MAX)}$	$R_E = 0\ \Omega$	2	-	-	mA
Voltage Gain	A_V	S1 = b V_{OUT}= 500 mVRMS	58	61	64	dB
Harmonic Distortion	THD	S1 = b V_{OUT} = 500 mVRMS	-	1	4	%
Input Referred Noise	IRN	NFB 0.2 to 10 kHz at 12dB/Oct	-	1	2	µV RMS
Stable with Battery Resistance Resistance (R_B) to:	Stability	$R_B = 22\ \Omega$	-	-	22	Ω
Input Bias Current	I_{BIAS}	R_{FA} = 1M	-50	0	50	nA
Microphone Resistance	R_{MIC}		3	4	5	kΩ
Emitter Bias Voltage (Pin 7)	V_{RE}		-	30	-	mV
On Chip Emitter Resistor	R_E		-	100	-	Ω
A Output Current Capability (Pin 1)	I_{OUT}		-	30	-	µA

Note: All parameters and switches as shown in Test Circuit unless otherwise stated in CONDITIONS column



All external resistors in ohms & ±1% tol., all capacitors in farads & ±10% tol. unless otherwise stated

Fig. 1 Test Circuit

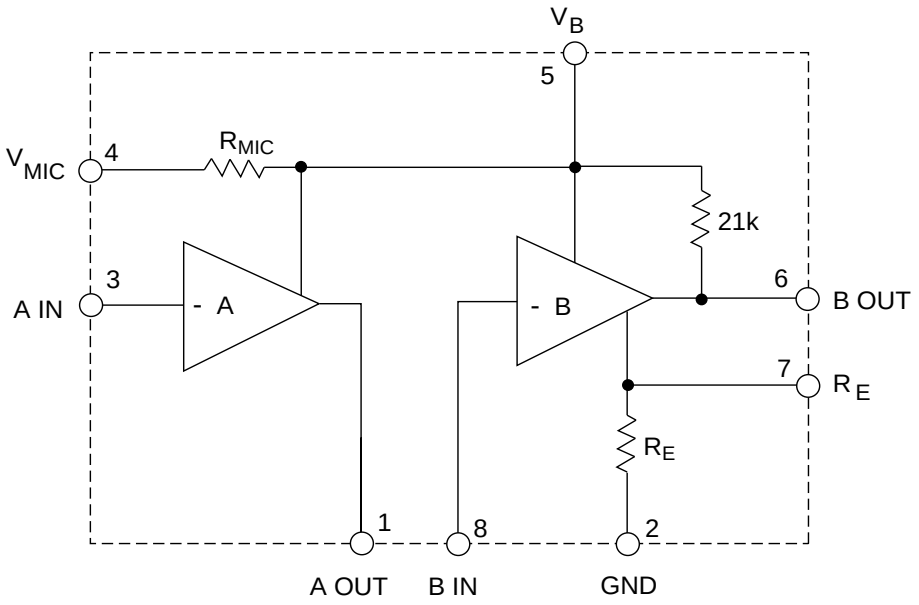
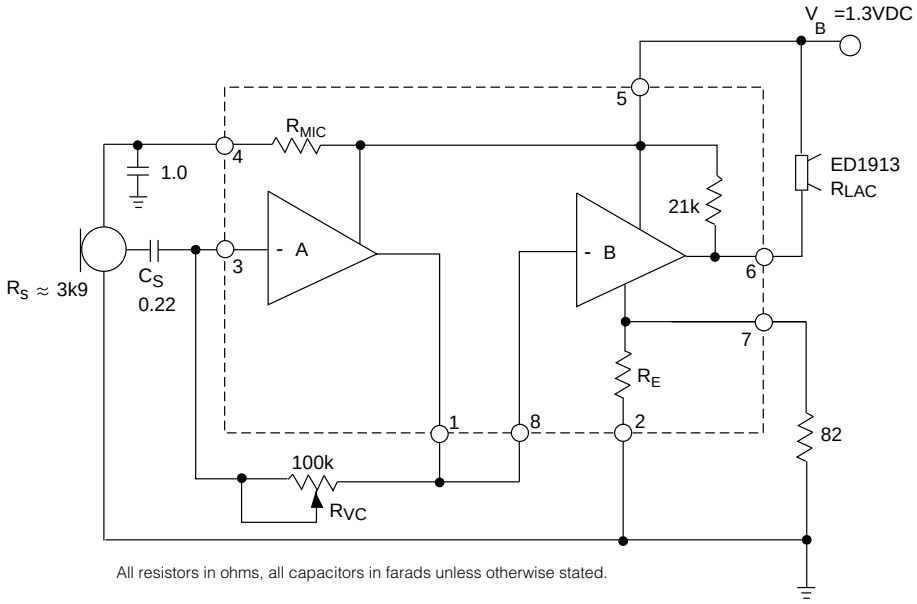


Fig. 2 Functional Schematic



Gain of Stage $A = 20 \text{ Log}_{10} \frac{R_{VC}}{R_S}$

Gain of Stage $B = 20 \text{ Log}_{10} \frac{R_{LAC} \text{ // } 21K}{R_E \text{ // } 82}$

Fig. 3 Typical Hearing Aid Circuit

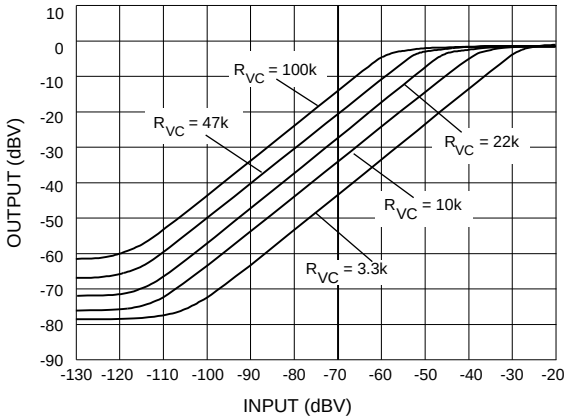


Fig.4 I/O Characteristics for Various Gain Settings

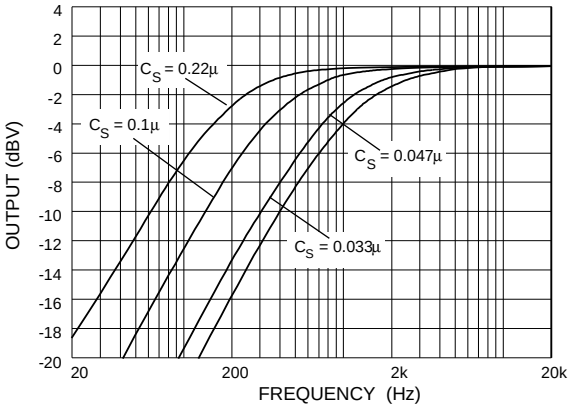


Fig. 5 Closed Loop Frequency Response for Various C_S Values

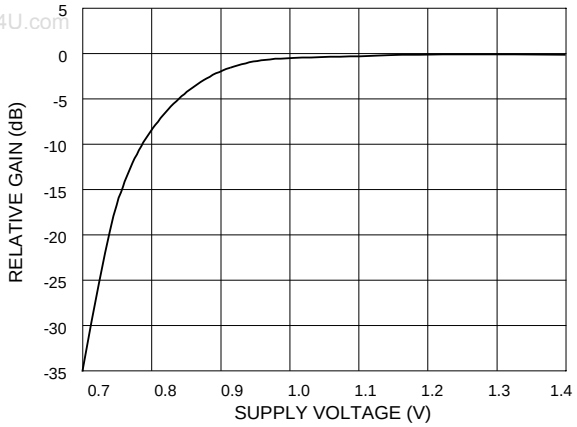


Fig.6 Gain vs Supply Voltage

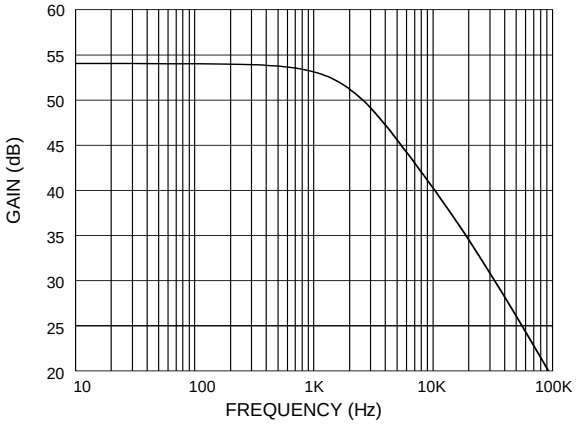


Fig.7 Preamplifier Open Loop Frequency Response

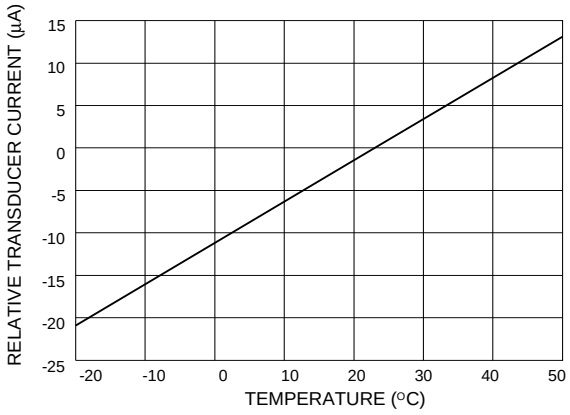


Fig. 8 Transducer Current vs Temperature

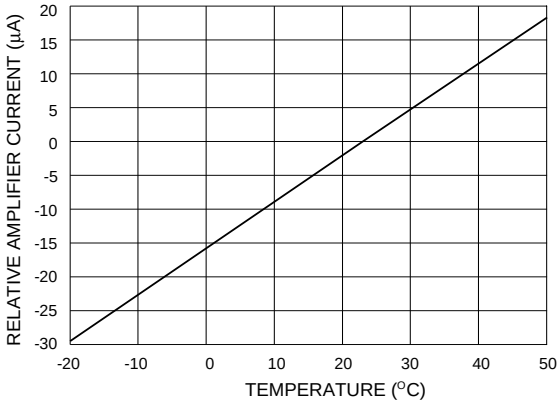


Fig. 9 Amplifier Current vs Temperature

REVISION NOTES

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DOCUMENT IDENTIFICATION

PRODUCT PROPOSAL
This data has been compiled for market investigation purposes only, and does not constitute an offer for sale.

ADVANCE INFORMATION NOTE
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DATA SHEET
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