



## Low Distortion AGC Compression Amplifier

LP502 CUSTOM DATA SHEET

### FEATURES

- adjustable gain from 0 to 60 dB
- 0.94 V DC voltage regulator on-chip
- attack time fixed at less than 1 ms
- release time adjustable from 40 to 500 ms
- low input referred noise 1.2  $\mu$ V
- <1 % distortion at 10 mVRMS output
- operates from 1.05 to 3 VDC

### STANDARD PACKAGING

- 8 pin MICROpac
- 8 pin PLID<sup>®</sup>
- Chip (64 x 62 mils)

Au Bump

### DESCRIPTION

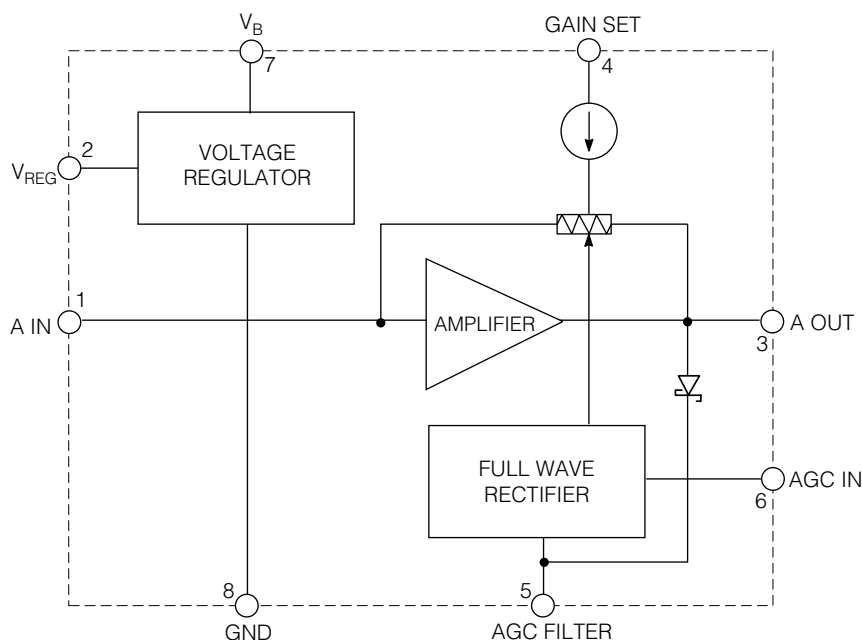
The LP502 is a compression (AGC) preamplifier that consists of a single-ended input inverting amplifier, with an internal current controlled resistance connected between input and output.

By using  $R_{GT}$  (see test circuit) to vary the value of this current controlled resistance, the amplifier gain and compression threshold can be controlled over a range of 60 dB.

The AGC current is derived from a full wave rectifier driven by a differential amplifier. The attack time of the AGC circuit is fixed at less than 1 ms. The release time is adjustable from 40 to 500 ms by selecting the value of an external capacitor (C3).

Internally, a series shunt voltage regulator produces a 0.94 V DC regulated output voltage. This provides a bias for electret microphones and permits circuit operations over a wide range of supply voltages, 1.05 to 3 VDC for LP502 without any degradation of electrical performances.

As compared to the LD502, the LP502 incorporates an additional diode between the amplifier output and the AGC filter point. This "attack diode" is responsible for precharging the AGC filter point, which enables quicker attack time and helps to reduce the gain overshoot (during transients) that is observed in the LD502 with certain combinations of AGC input coupling and filter capacitors. However, with this diode connected, some level of AGC is always present with higher output levels even when the AGC input is disconnected. Therefore the LP502 cannot be used as a "pure" linear amplifier.



### BLOCK DIAGRAM

Patented 1985  
Canada 1183580

Patent Pending Europe 83.300836.0  
USA 4506169 Japan 58-06886

Document No. HP2802-1

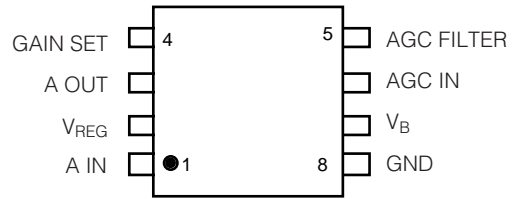
## ABSOLUTE MAXIMUM RATINGS

PARAMETER	VALUE/UNITS
Supply Voltage	3 V DC
Power Dissipation	25 mW
Operating Temperature Range	-10°C to 50° 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	$A_V$	$V_{OUT} = 11.0$ mV, $20 \text{ Log} \left( \frac{V_{OUT}}{V_{IN}} \right)$	38	41	46	dB
Output Level	$V_{OHIGH}$	$V_{IN} = 6.32$ mV, S1 closed	7.5	12	15.5	mV
Distortion -Linear - AGC	THD	$V_{OUT} = 11.0$ mV	-	1	2.9	%
		$V_{IN} = 6.32$ mV, S1 closed	-	1	2.2	%
Input Referred Noise	IRN	S2 closed, NFB 0.2 to 10 kHz at 12 dB/Oct	-	1.2	2.2	$\mu$ V
Compression Function Ratio		$V_{IN} = 0.1$ to 6.32 mV, S1 closed	2	5	8	dB
Total Amplifier Current	$I_{AMP}$		160	310	380	$\mu$ A
Regulated Voltage	$V_{REG}$		0.890	0.940	0.990	VDC
Supply Rejection	PSRR		51	60	-	dB

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

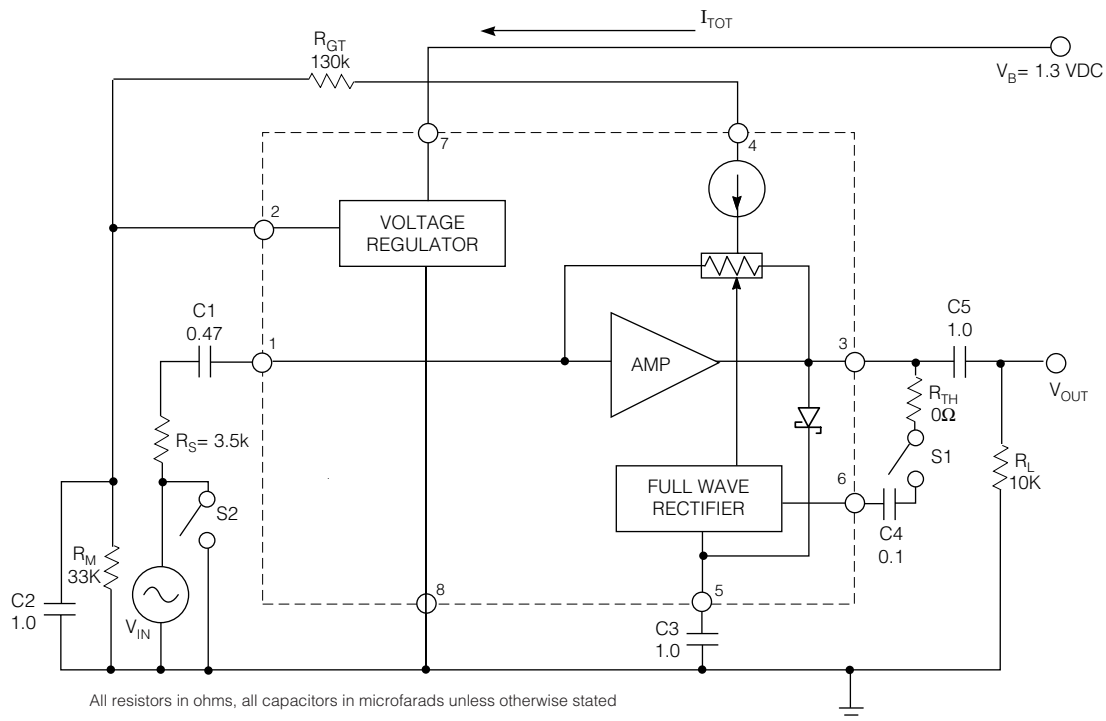


Fig. 1 Test Circuit

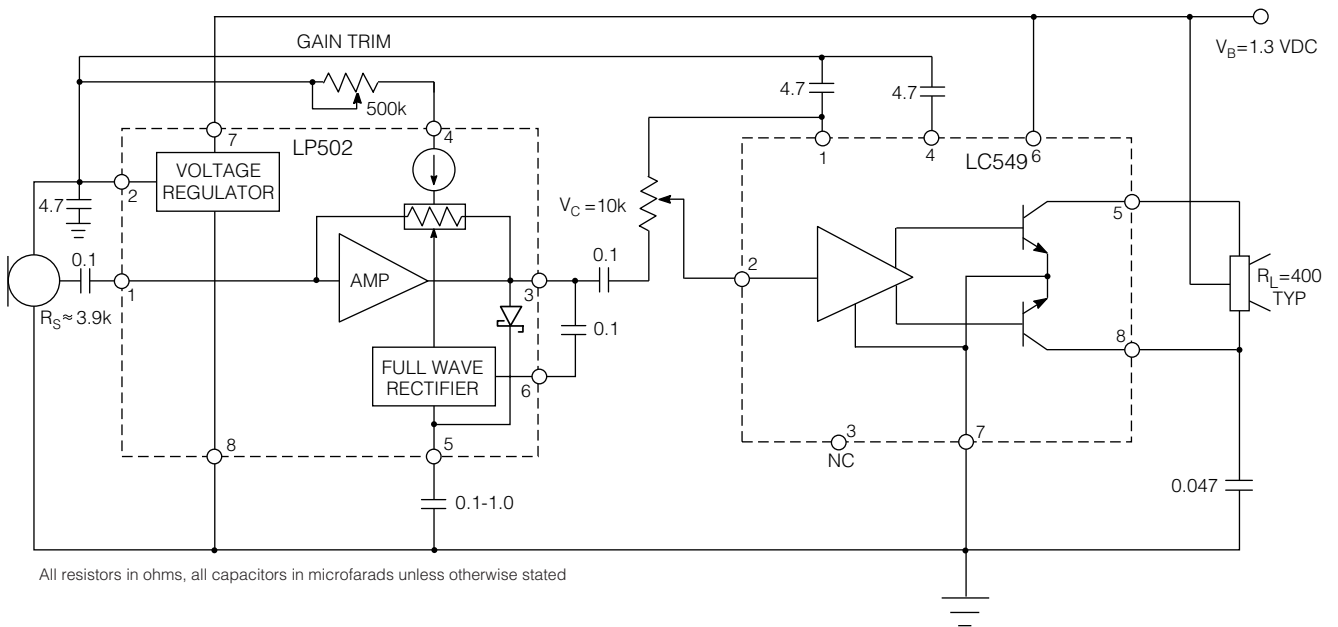


Fig. 2 LP502/LC549 Hearing Instrument Application

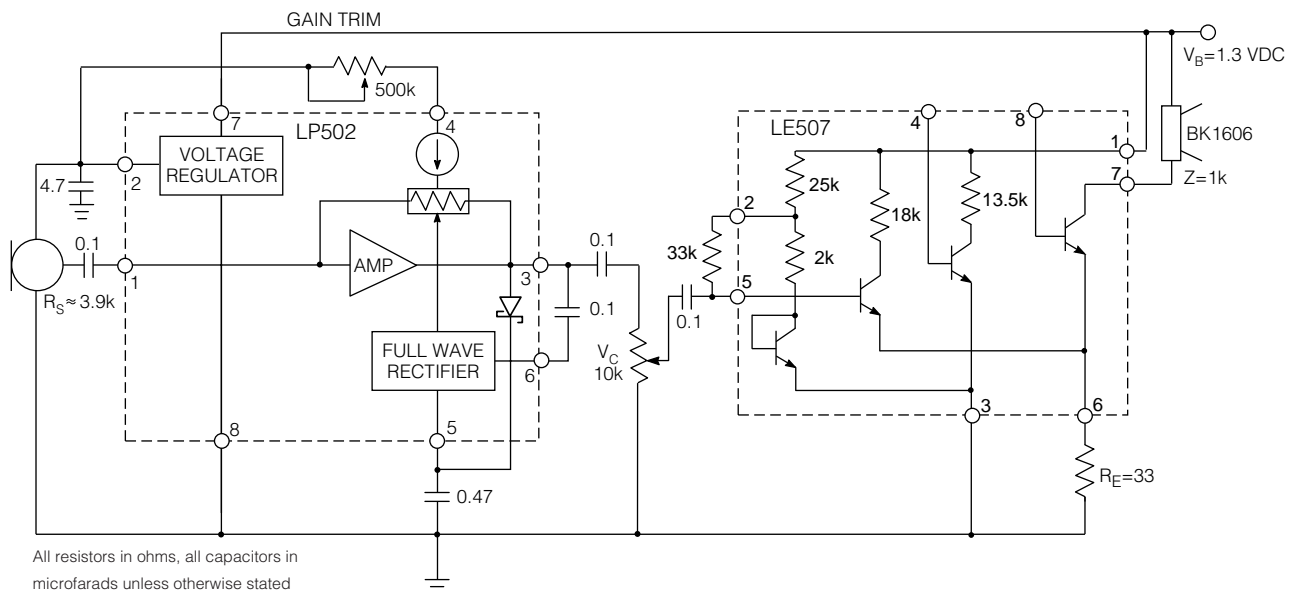


Fig. 3 LP502/LE507 Hearing Instrument Application

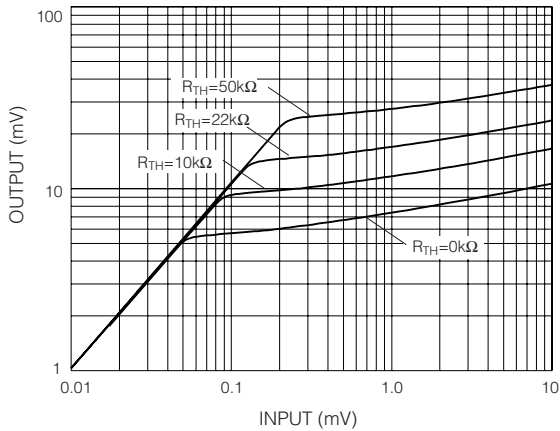


Fig. 4 I/O Characteristics at Various  $R_{TH}$  Values

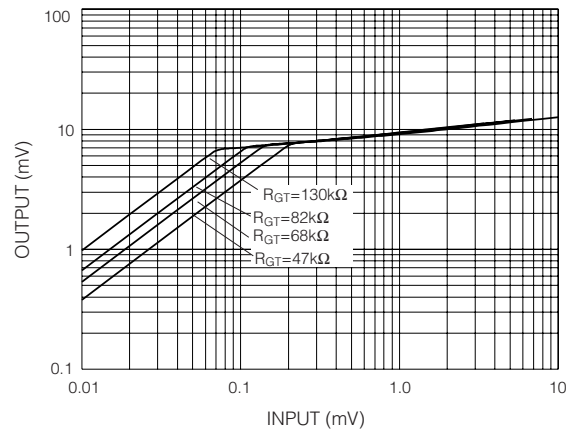


Fig. 5 I/O Characteristics at Various  $R_{GT}$  Values

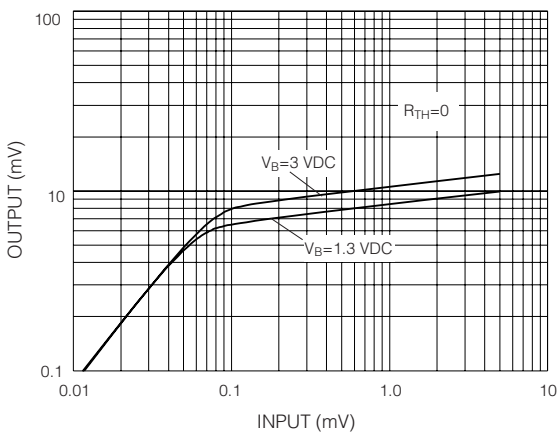


Fig. 6 Effects of Supply Voltage Variation

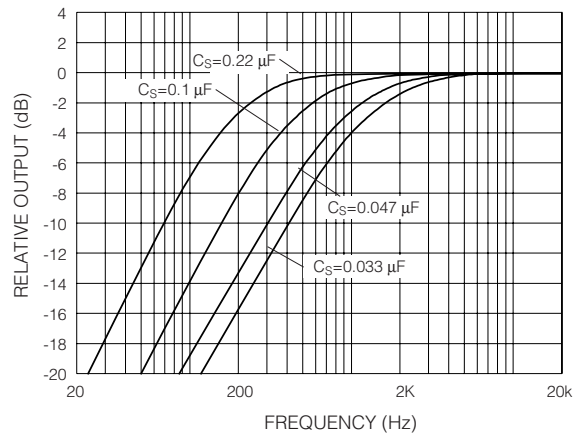


Fig. 7 Frequency Response at Various  $C_S$  Values

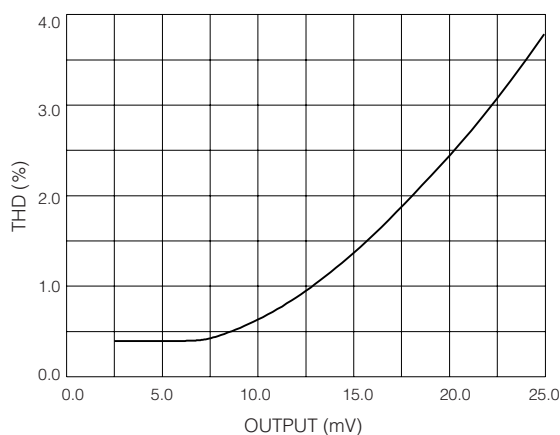


Fig. 8 Total Harmonic Distortion vs Output Level

**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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