**FEATURES**

- 210  $\mu\text{A}$  typical current drain
- 4 inverting opamps; B with 6 dB greater drive current
- minimum 46 dB open loop gain
- ideal for - active filtering
  - dual channel hearing aids
  - mixers
  - microphone / telecoil preamps

**STANDARD PACKAGING**

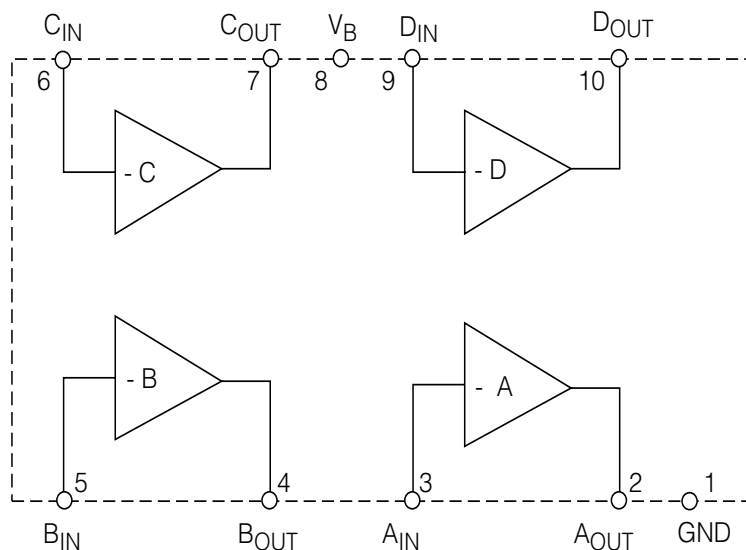
- 10 pin PLID®
- 10 pin SLT
- Chip (61 x 55 mils)

Au Bump

**DESCRIPTION**

The LX509 consists of 4 independent low noise, low current inverting operational amplifiers utilizing Gennum's low voltage bipolar JFET technology. Each amplifier has a minimum open loop gain of 46 dB with the closed loop gain set by the ratio of a feedback ( $R_f$ ) resistor to the source impedance ( $R_s$ ). For a well controlled gain tolerance from amplifier to amplifier, it is recommended that the closed loop gain is at least 20 dB below the open loop gain.

Three of the preamplifiers, A, C and D are capable of delivering typically 30  $\mu\text{A}$  of peak current drive while the fourth pre-amplifier B has 6 dB more current drive capability, allowing a 6 dB greater output into the same load impedance, or the same output level into one half the load impedance.

**BLOCK DIAGRAM**

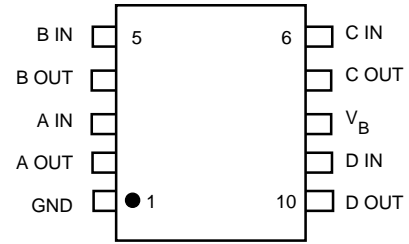
## ABSOLUTE MAXIMUM RATINGS

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

**CAUTION**  
CLASS 1 ESD SENSITIVITY



## PIN CONNECTION



## ELECTRICAL CHARACTERISTICS

$V_{OUT}$  Pin voltage measured with conditions as shown in Test Circuit

Positive Current corresponds to current INTO the pin

Negative Current corresponds to current OUT of the pin

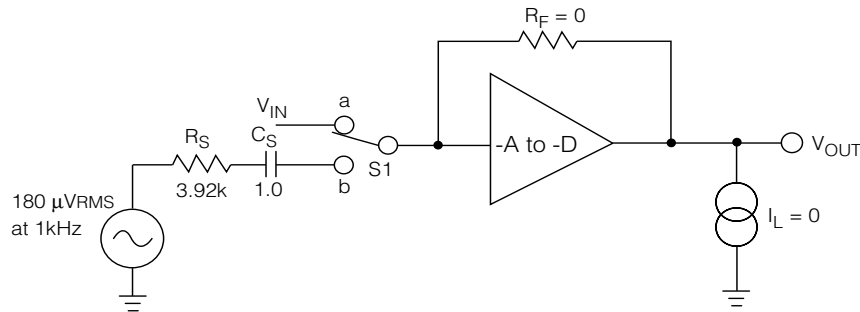
Conditions: Frequency = 1 kHz, Temperature = 25°C, Supply Voltage  $V_B = 1.3$  VDC

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Total Current	$I_{TOT}$		115	210	305	$\mu A$
Input Bias Voltage	$V_{BIAS}$		500	570	620	mVDC
Input Bias Current	$I_{BIAS}$	$R_F = 1\text{ M}\Omega$	-50	0	50	nA
Output Voltage Swing - Hi	$V_{OH}$	$V_{IN} = 0.4\text{ VDC}$ , $R_F = \infty$ $I_L = -10\text{ }\mu A$ , (Note 1)	200	580	-	mVDC
Output Voltage Swing - Lo	$V_{OL}$	$I_{IN} = +1\text{ }\mu A$ , $R_F = \infty$ $I_L = +10\text{ }\mu A$ , (Note 2)	200	280	-	mVDC
Open Loop Voltage Gain	$A_{VOL}$		46	56	-	dB
Input Referred Noise	IRN	NFB 0.2 to 10kHz at 12dB/Oct	-	1	-	$\mu V_{RMS}$
Harmonic Distortion	THD		-	1	-	%
Current Drive		A, C, D,	-	30	-	$\mu A$
Capability		B	-	60	-	$\mu A$

All Parameters and Switches remain as shown in Test Circuit unless otherwise stated in "Conditions" Column

**Notes:** 1  $V_{OH} = V_{OUT} - V_{OUT}$  ( $I_L = -10\text{ }\mu A$  for Blocks A, C, D,  $I_L = -20\text{ }\mu A$  for Block B)

2  $V_{OL} = V_{OUT} - V_{OUT}$  ( $I_L = +10\text{ }\mu A$  for Blocks A, C, D,  $I_L = +20\text{ }\mu A$  for Block B)



All resistors in ohms, all capacitors in  $\mu F$  unless otherwise stated

Fig. 1 LX509 Test Circuit

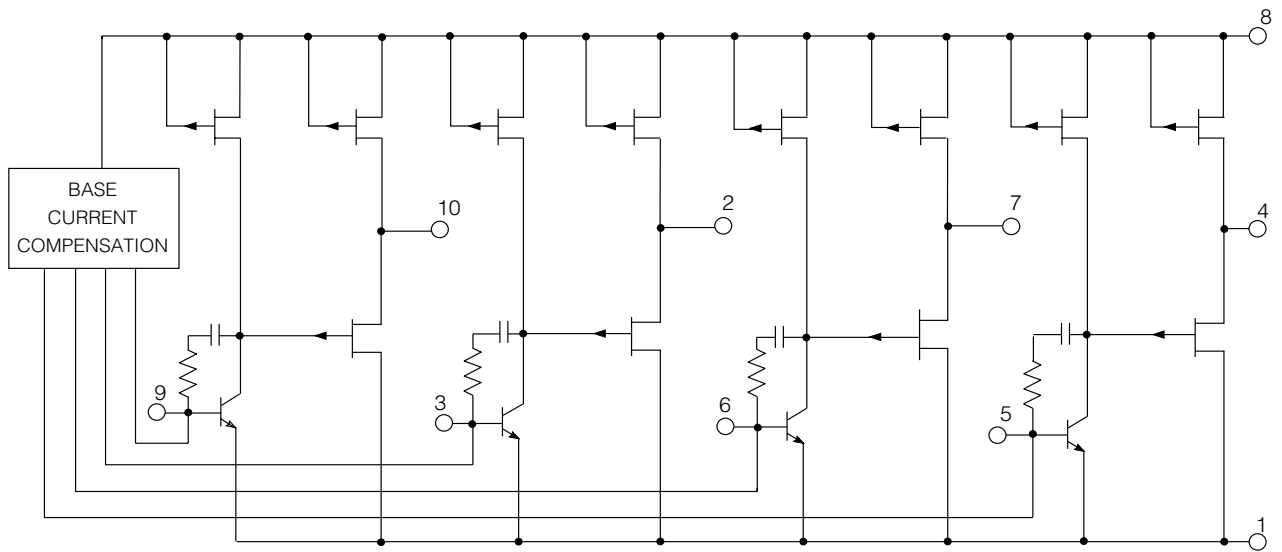


Fig. 2 Functional Schematic

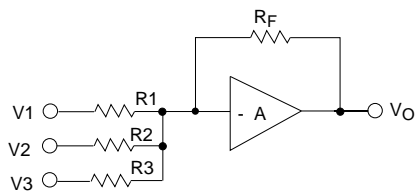


Fig. 3a Summing Amplifier

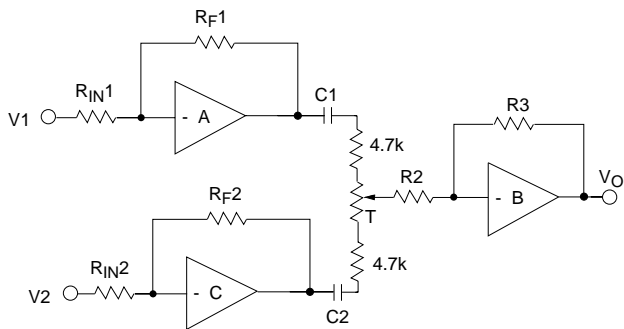


Fig. 3b Mixing Circuit

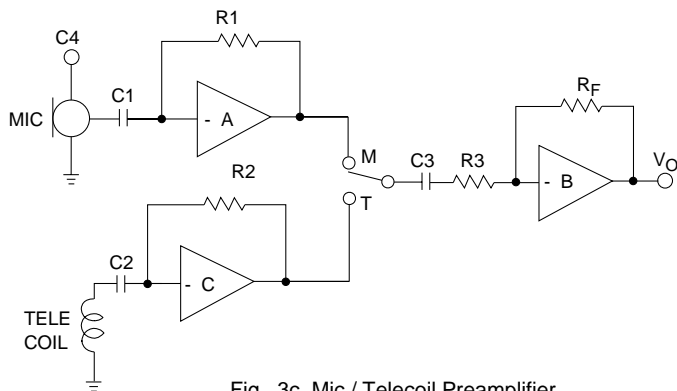


Fig. 3c Mic / Telecoil Preamplifier

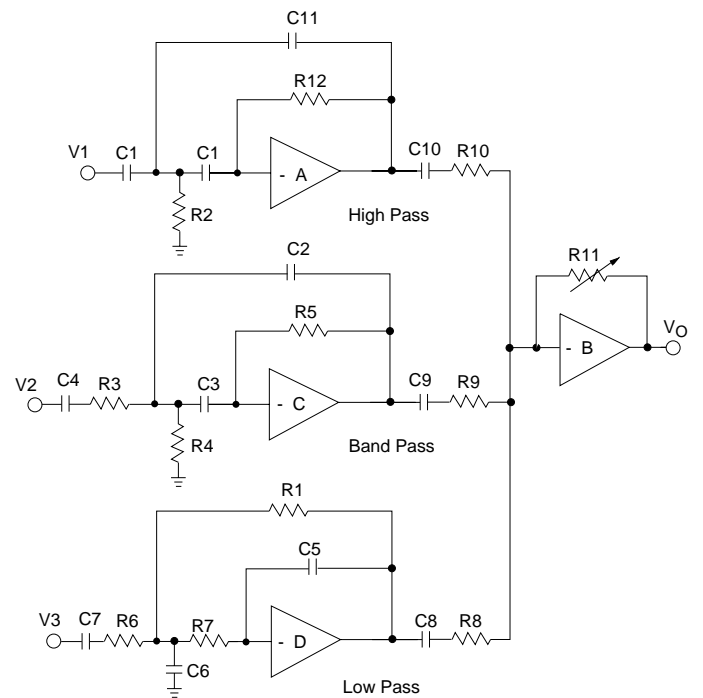


Fig. 3d Multi-Band Filtering

(for Filter Design refer to Note 600-9, Active Filtering for Hearing Aids)  
All resistors in ohms, all capacitors in  $\mu\text{F}$  unless otherwise stated

Fig. 3 LX509 Application Circuits

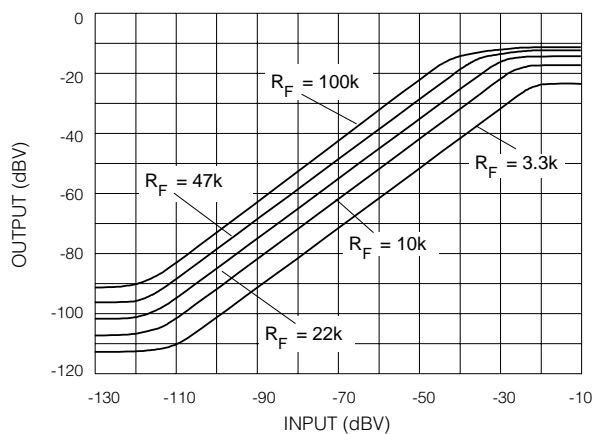


Fig. 4 I/O Characteristics for Various  $R_F$  Values

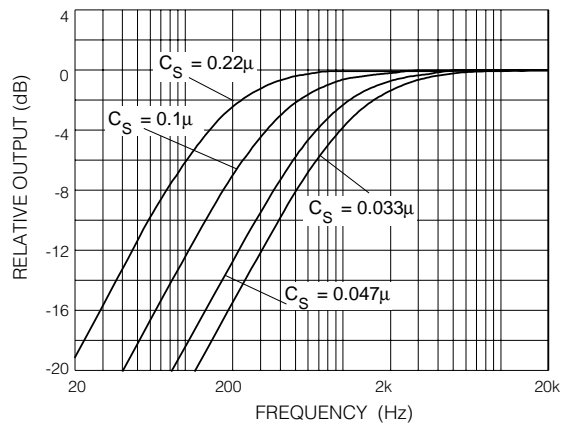


Fig. 5 Closed Loop Frequency Response for Various  $C_S$  Values

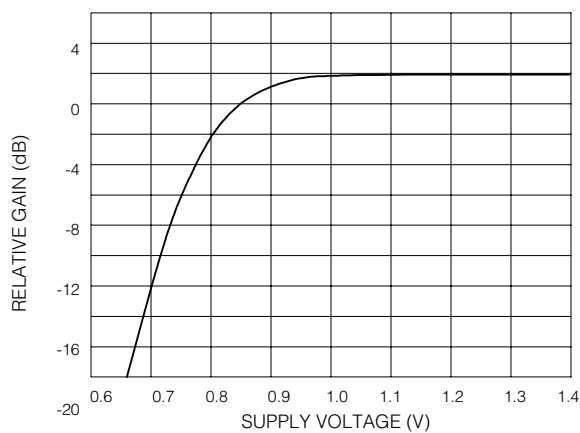


Fig. 6 Gain vs Supply Voltage

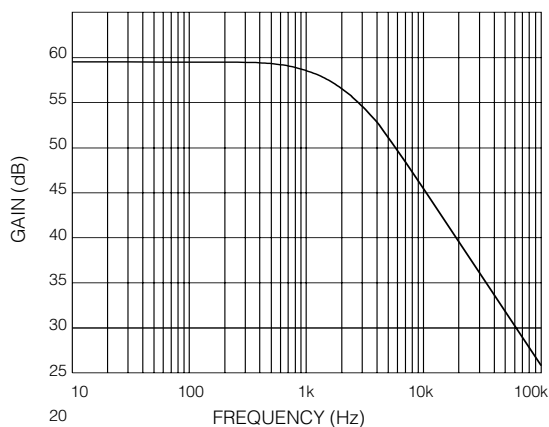


Fig. 7 Preamplifier Open Loop Frequency Response

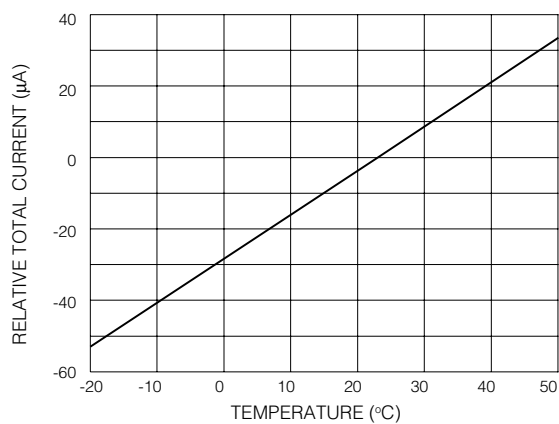


Fig. 8 Total Current vs Temperature

#### GENNUM CORPORATION

##### MAILING ADDRESS:

P.O. Box 489, Stn. A, Burlington, Ontario, Canada L7R 3Y3  
Tel. +1 (905) 632-2996 Fax +1 (905) 632-2814

##### SHIPPING ADDRESS:

970 Fraser Drive, Burlington, Ontario, Canada L7L 5P5

#### GENNUM JAPAN CORPORATION

C-101, Miyamae Village, 2-10-42 Miyamae, Suginami-ku, Tokyo 168-0081, Japan  
Tel. +81 (3) 3334-7700 Fax: +81 (3) 3247-8839

#### DOCUMENT IDENTIFICATION: DATA SHEET

The product is in production. Gennum reserves the right to make changes at any time to improve reliability, function or design, in order to provide the best product possible.

#### REVISION NOTES:

Changes to standard packaging information.

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