Low Current Preamplifier with Output Limiting

GK504 - DATA SHEET

FEATURES

- **designed to drive Class D integrated receivers**
- **adjustable peak clipper**
- **low current drain**
- **low noise and distortion**
- **low external parts count**
- **two low noise preamplifiers**
- **transconductance output stage**
- **mid supply referenced output**
- **preamp A for Gain Trim or Telecoil**

STANDARD PACKAGING

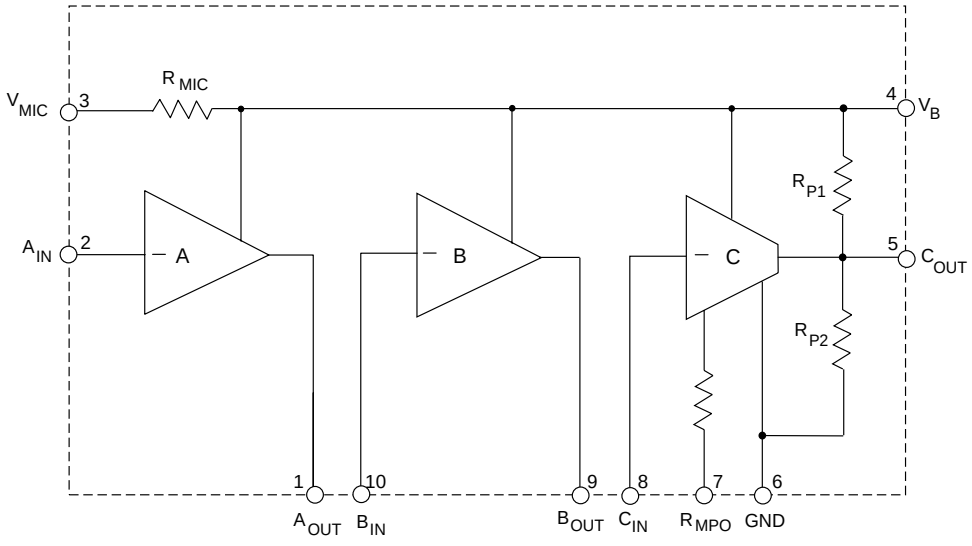
- 10 pin MICROpac
- 10 pin PLID®
- 10 pin SLT
- Chip (56 x 84 mils)
  Au Bump

DESCRIPTION

The GK504 is Gennum's proprietary low current preamplifier designed to drive the Class D series receivers. It consists of two independent single-ended, low noise inverting amplifiers, a symmetrical peak clipping, mid-supply referenced, transconductance output stage, and an on-chip microphone decoupling resistor.

Blocks A and B typically have an open loop voltage gain of 53 dB, with the closed loop gain set by the ratio of the feedback resistor to 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. It is acceptable to DC-couple blocks A and B of the device, however the third stage must be AC coupled in order to maintain DC bias requirements.

The major advantage of the GK504 over other preamplifiers is the electronic MPO adjustment. Since conventional MPO is not possible in the class D receivers, it is provided electronically. The maximum output swing is easily set using an R_{MPO} resistor. The receiver output level is thus limited, preventing it from exceeding the discomfort level.



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BLOCK DIAGRAM

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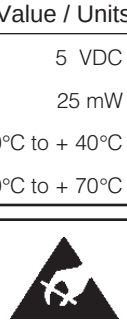
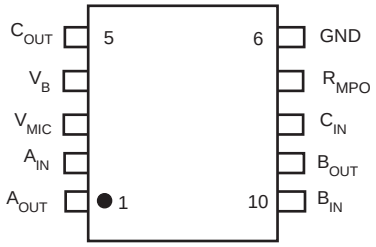
ABSOLUTE MAXIMUM RATINGS

Parameter	Value / Units
Supply Voltage	5 VDC
Power Dissipation	25 mW
Operating Temperature	-10°C to + 40°C
Storage Temperature	-20°C to + 70°C

CAUTION
CLASS 1 ESD SENSITIVITY



PIN CONNECTIONS



ELECTRICAL CHARACTERISTICS

Positive Current corresponds to current INTO the pin, Negative Current corresponds to current OUT of the pin, Conditions: Frequency = 1 kHz, Temperature 25°C. V_P - Pin voltage measured with conditions as shown in Test Circuit.

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	I_{AMP}		165	240	315	µA
Input Referred Noise	IRN	NFB 0.2 – 10 kHz at 12 dB/oct	-	2	-	µVRMS
Distortion	THD		-	<1.0	-	%
On-Chip Microphone Resistance	R_{MIC}		3	4	5	kΩ
STAGES A and B						
Input Bias Current	I_{BIAS}	R_F=1M (Note 1)	-25	0	25	nA
Input Bias Voltage	V_{BIAS}		500	590	650	mV
Output Swing Lo	V_{OL}	R_F=1M (Note 2)	200	280	590	mV
Max Output Current Capability	I_{MAX}		-15	-30	-45	µA
Open Loop Voltage Gain	A_{VOL}		46	53	-	dB
OUTPUT STAGE						
Voltage Gain (Pin 8 to Pin 5)	A_V	V_{IN}AC = -52 dBV, R_{MPO}= 0Ω	14	16	18	dB
Gain Loss (Pin 8 to Pin 5)	ΔGAIN	V_{IN} = -62 dBV, R_{MPO}= 50k,Note 3	-	0	2.5	dB
Maximum Output Level	MPO	V_{IN}AC = -22 dBV, R_{MPO} = 0Ω	-14.5	-12.5	-10.5	dBV
MPO Range	ΔMPO	V_{IN}AC = -22 dBV,R_{MPO} = (0 to 10k)	12	14	16	dB
Output Impedance	Z_{OUT}		19	24	29	KΩ

All parameters and conditions remain as shown in Test Circuit unless otherwise specified in Conditions column.

NOTES: 1. $I_{BIAS} = (Vp(1,9) - Vp(1,9)_{[RF=1M]})/1M$

2. $V_{OL} = V_{BIAS} - Vp(1,9)_{[VIN\ DC=+1\mu A,RF=1M,IL=+15\mu A]}$

3. $\Delta GAIN = (V_{OUT} / V_{IN\ [VIN=-62dBV,\ RMPO=0]}) - (V_{OUT} / V_{IN\ [VIN=-62dBV,\ RMPO=50k]})$

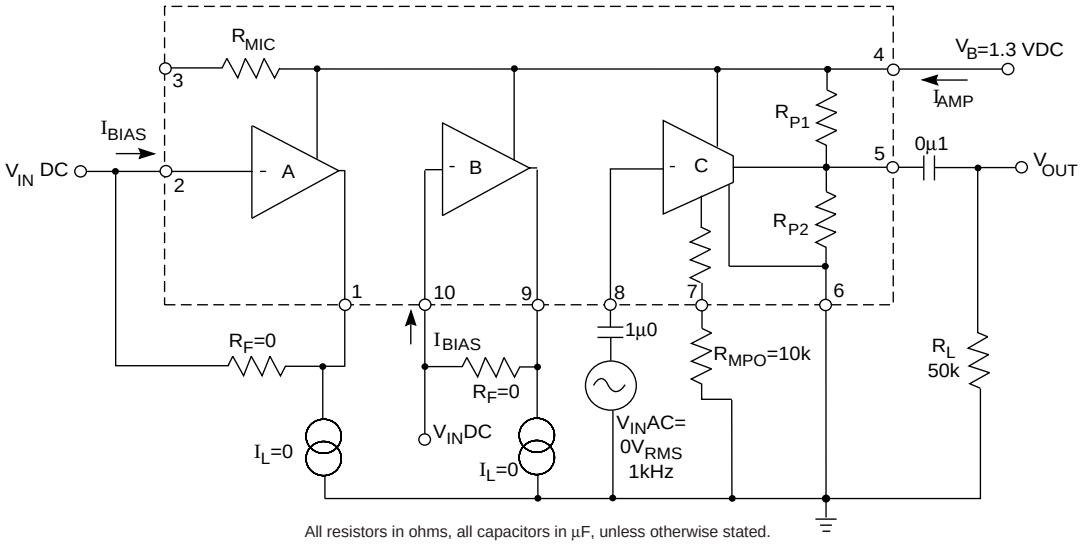


Fig. 1 Test Circuit

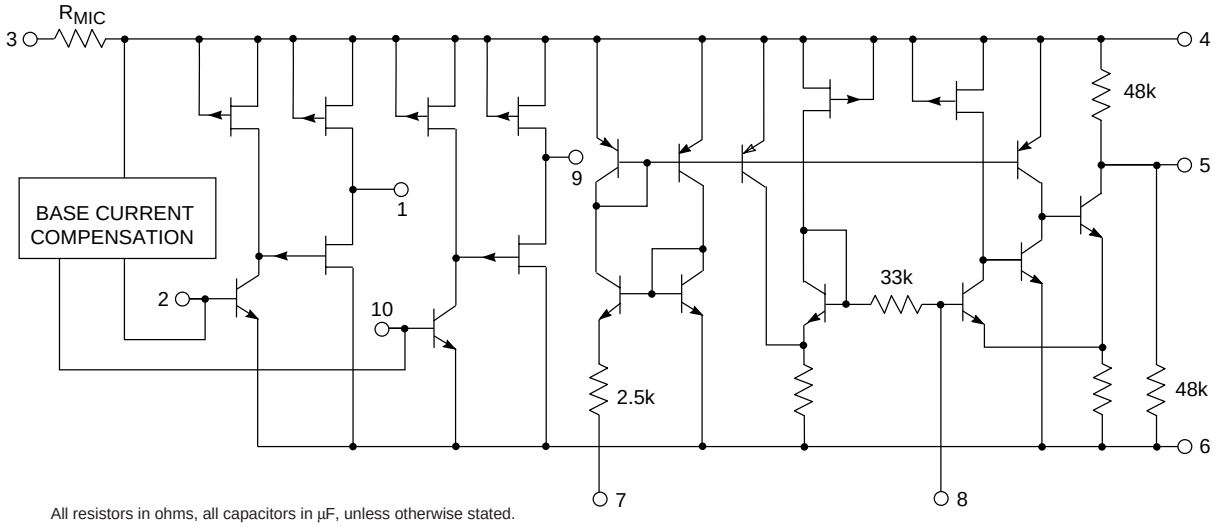
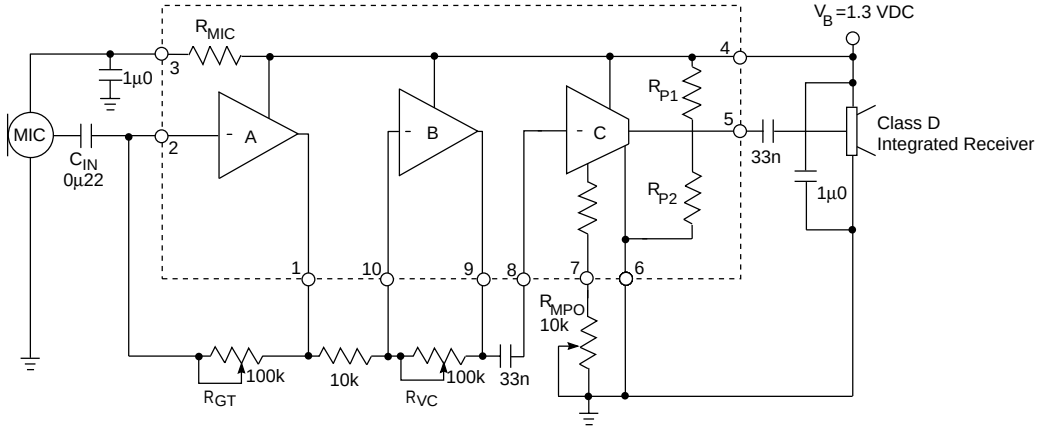
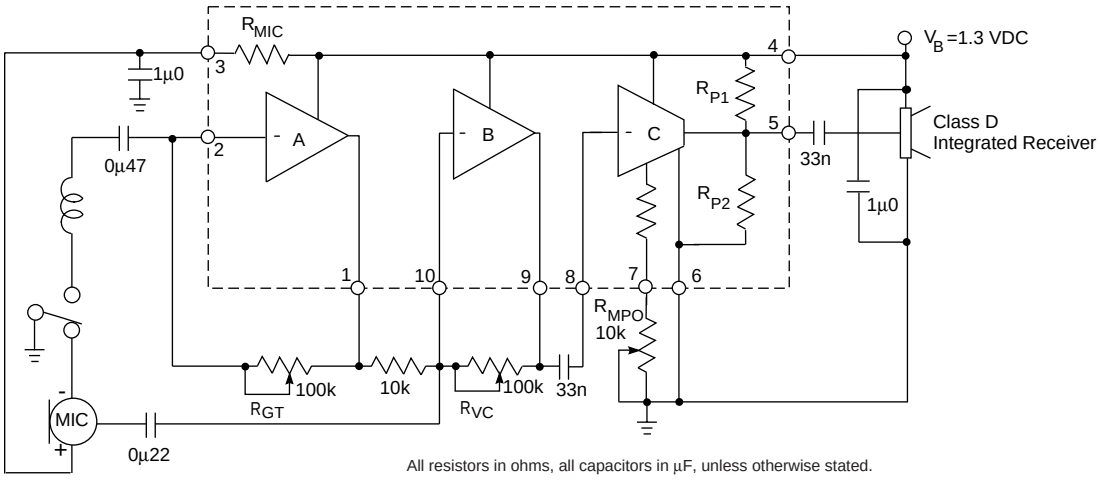


Fig. 2 Functional Schematic



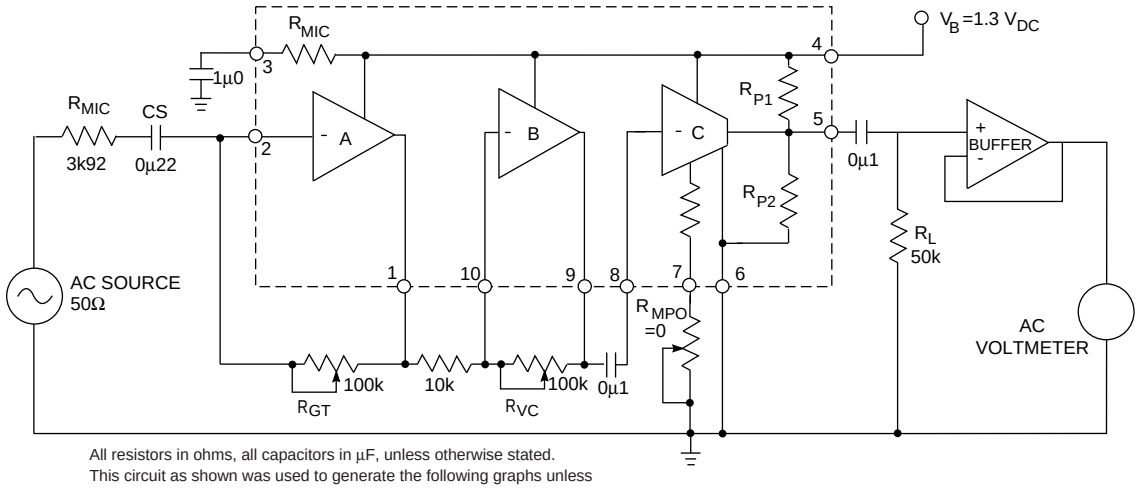
All resistors in ohms, all capacitors in µF, unless otherwise stated.

Fig. 3 Typical Hearing Instrument Application



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

Fig. 4 Typical Hearing Instrument Application



All resistors in ohms, all capacitors in µF, unless otherwise stated.
This circuit as shown was used to generate the following graphs unless otherwise stated.

Fig. 5 Characterization Circuit

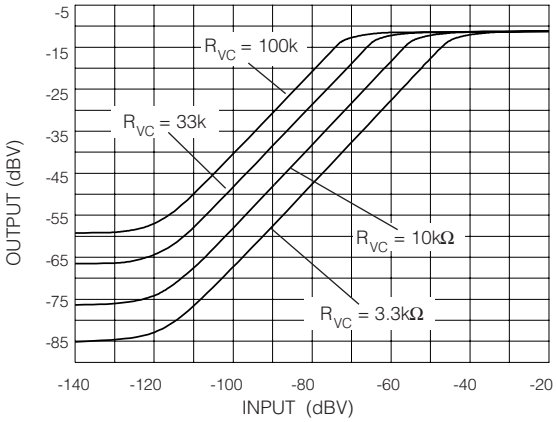


Fig. 6 I/O for Various R_{VC} Values

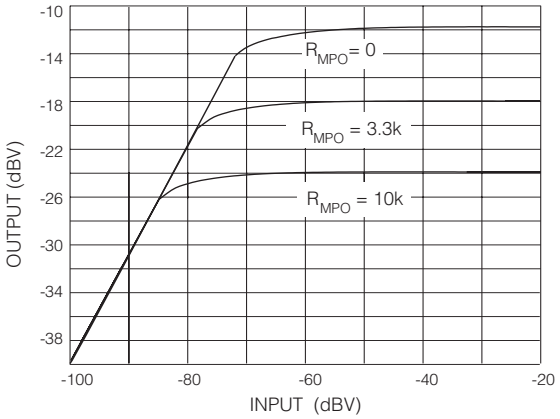


Fig. 7 MPO for Various R_{MPO} Values

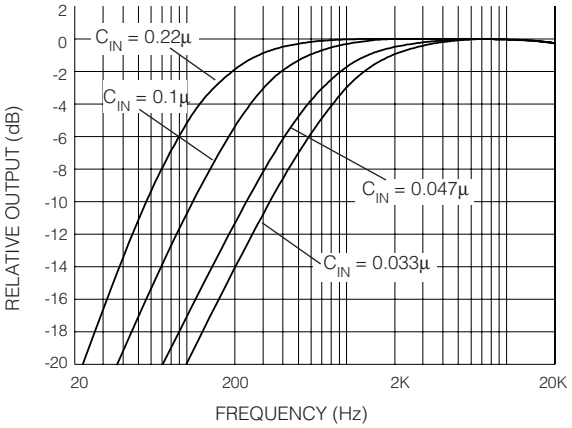


Fig. 8 Frequency Response for Various C_{IN} Values

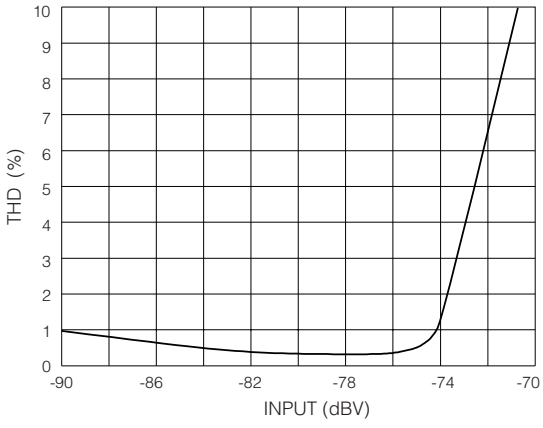


Fig. 9 Distortion vs Input Level (R_{GT} = R_{VC} = 100k)

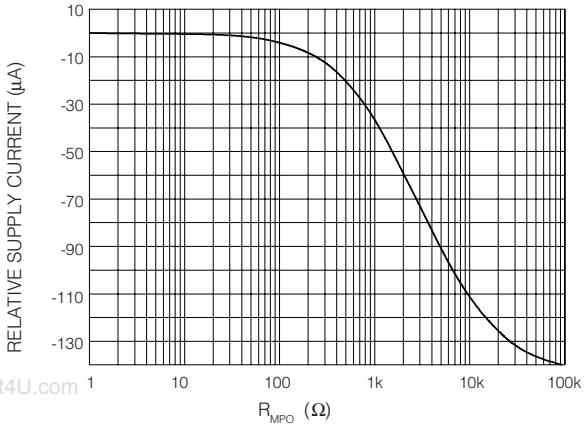


Fig. 10 Change in Supply Current vs R_{MPO}

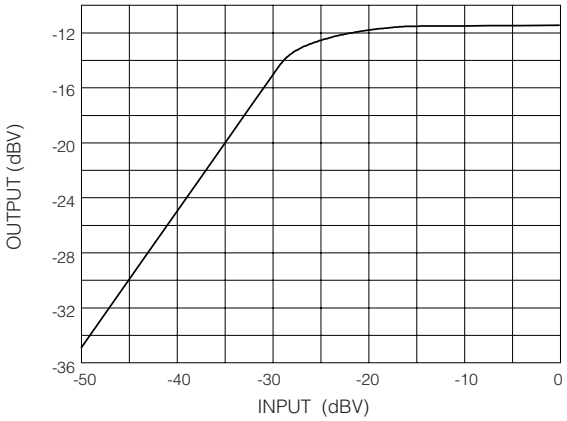


Fig. 11 I/O for Amplifier C
(as in Fig. 1)

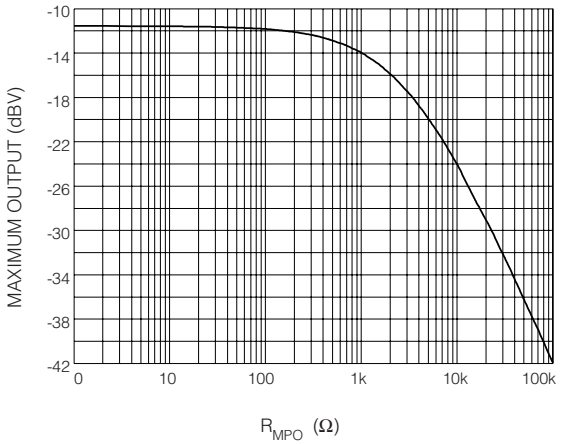


Fig. 12 Maximum Output vs R_{MPO}
(as in Fig. 1, V_{IN}AC= -15dBV)

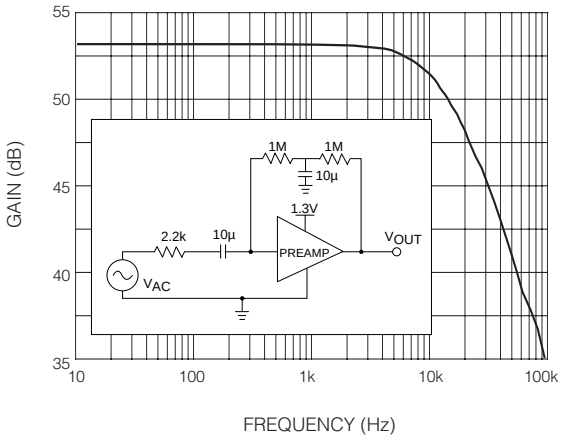


Fig. 13 Preamplifiers A and B
Open Loop Voltage Gain

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:

Updated to Data sheet