GENNUM CORPORATION

Adaptive Highpass Filter with Independent Gain Block

GR581 DATA SHEET

FEATURES

- **unity gain 12 dB/oct. highpass Butterworth filter**
- **adaptive frequency range from 200 Hz to 2 kHz**
- **rectifier threshold set to 82 dBSPL (adjustable)**
- **low noise, typically 2.6 μV**
- **300 μA typical current drain**
- **operates from 1.1 to 3 VDC**
- **preamplifier with 56 dB open loop gain**

PACKAGING

- 10 pin MICROpac
- 10 pin PLID®
- Chip (73 x 59 mils)

DESCRIPTION

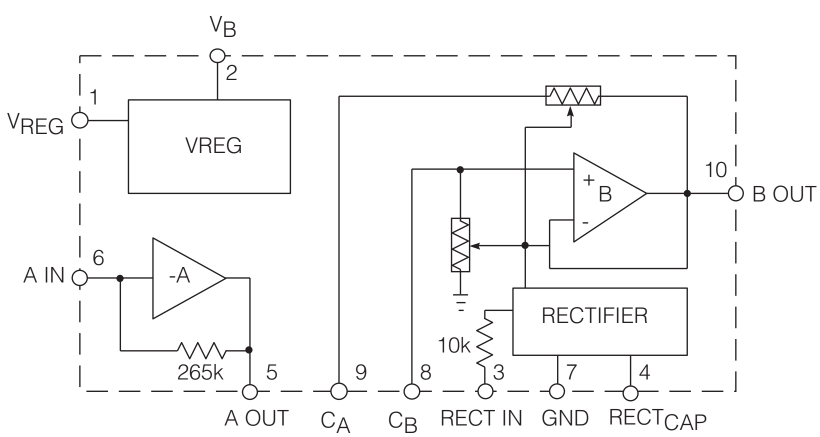
The GR581 is a level-sensitive, adaptive highpass filter comprised of a current controlled highpass filter, a half- wave rectifier, a voltage regulator for microphone bias and a separate preamplifier.

The internal rectifier senses the long term average signal level and controls the filter response by setting the control current of the filter. The rectifier sensitivity, with respect to the input signal, can be increased by placing the internal preamplifier (A) before the filter section of the GR581. The preamplifier has an internal 265 kΩ feedback resistor from its input to output, to facilitate in setting the gain.

An increase of 20 dB above the rectifier threshold will automatically increase the corner frequency one decade above the initial corner frequency. The filter will only allow an increase in corner frequency of one decade, regardless of further increases in the input signal level.

It is recommended that the attack and release times be set to 30 ms and 90 ms respectively. The average time period of a speech frame is about 15 ms which is not long enough to activate the filter, however long term average noise, which can have time periods greater than 30 ms, will activate the filter (providing that the amplitude is above the rectifier threshold).

The GR581 is an improved version of the LS581adaptive high pass filter and has an identical pinout.



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

FUNCTIONAL BLOCK DIAGRAM

Revision Date: January 2001

Document No. 520 - 60 - 05

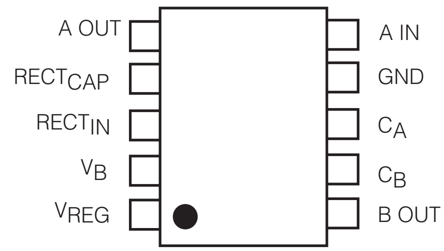
GENNUM CORPORATION P.O. Box 489, Stn A, Burlington, Ontario, Canada L7R 3Y3 tel. (905) 632-2996 fax: (905) 632-2814
Gennum Japan Corporation: C-101, Miyamae Village, 2-10-42 Miyamae, Suginami-ku, Tokyo 168-0081, Japan tel. (03) 3334-7700 fax:(03) 3247-8839

ABSOLUTE MAXIMUM RATINGS

PARAMETER	VALUE
Supply Voltage	3 VDC
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 CONNECTIONS



ELECTRICAL CHARACTERISTICS

Conditions: Supply Voltage V_{CC} = 1.3 V, Temperature 25°C

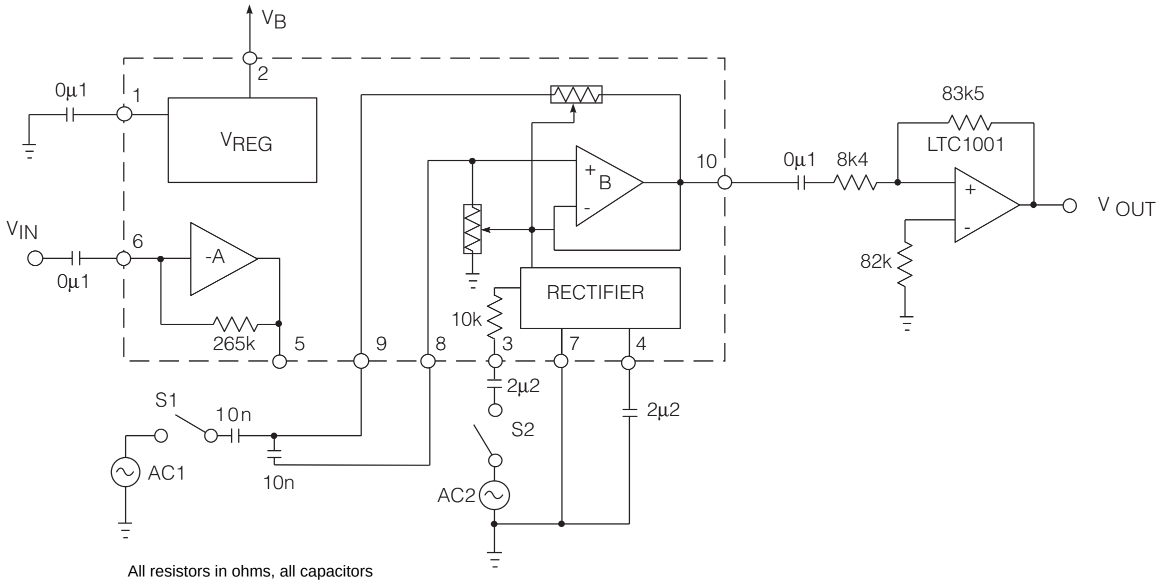
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Total Current	I_T			165	300	450	µA
Voltage Regulator (Pin 1)	V_{REG}			0.87	0.93	0.99	V_{DC}
Input Referred Noise	IRN	NFB 0.2 - 10kHz at 12dB/oct	Filter f_c set to 0.2kHz	-	2.6	-	µVRMS
			Filter f_c set to 2kHz	-	5.6	-	
Attack Time	t_{ATT}			-	30	-	ms
Release Time	t_{REL}			-	90	-	ms
STAGE A							
Quiescent Voltage on pin 5	V_{Q5}			0.49	-	0.67	V_{DC}
Open Loop Gain	A_{OL}			45	56	-	dB
Feedback Resistor	R_F			175	265	355	kΩ
Current Sourcing Capacity	I_{SOURCE}			15	30	-	µA
Current Sinking Capacity	I_{SINK}			15	30	-	µA
FILTER SECTION							
Quiescent Voltage on pin 3	V_{Q3}			0.49	0.58	0.67	V_{DC}
Quiescent Voltage on pin 4	V_{Q4}			0.49	0.58	0.67	V_{DC}
Quiescent Voltage on pin 8	V_{Q8}			0.55	-	0.78	V_{DC}
Quiescent Voltage on pin 9	V_{Q9}			0.55	-	0.78	V_{DC}
Filter Insertion Loss	FIL	V_{OUT} = 850mVRMS f=2kHz (S1 closed)		-0.5	0.1	1.3	dB
Distortion	THD	V_{OUT} = 850mVRMS f=1kHz (S1 closed)		-	2	3	%
Rectifier Gain	A_{REC}	$V_{AC\,2}$ = 2.5mVRMS (S2 closed) f = 100Hz (Note 1)		5	7	9	
Rectifier Bandwidth	B_R	V_{AC2} = 20mVRMS (S2 closed)		-	4	-	kHz
Pin 9 Nominal Current	I_{P9}	VP9 = 0V		0.70	1.00	1.30	µA
Current Range	I_{RANGE}	(Note 2, 3)		8	10	12	
Slope		(Note 2, 4)		0.75	1	1.25	
Rectifier Threshold	V_{TH}	f = 100Hz (Note 2, 5)		1.7	2.5	2.8	mV_{DC}
Corner Frequency	f_c	(Note 2, 6)		140	200	260	Hz

All Conditions and Parameters remain as show in Test Circuit unless otherwise specified in CONDITIONS Column.

V_{QX} - quiescent (unbias) voltage measured on the pin, (nothing connected to the pin). V_{PX} - actual voltage measured on the pin at given condition (X is pin number).

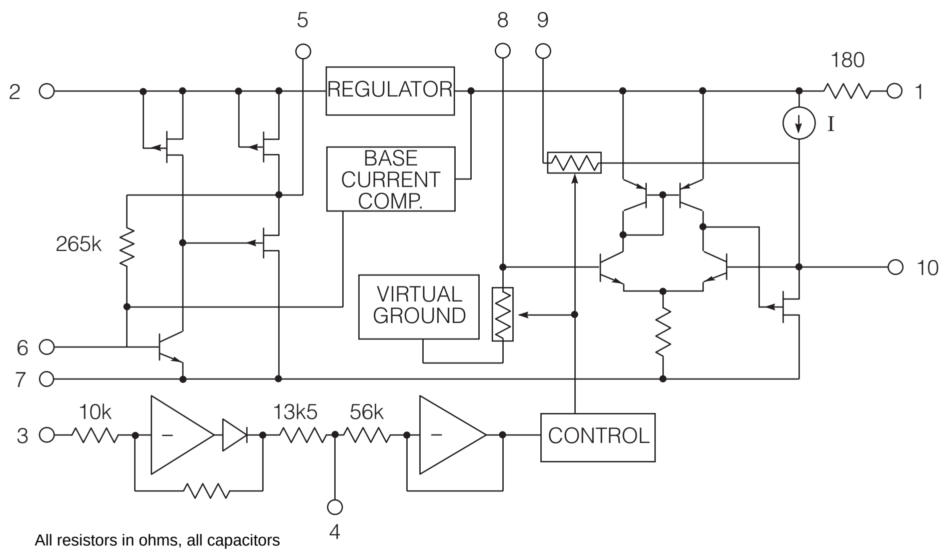
NOTES:

1. A_{REC} = 1.9375 x (V_{P4} / V_{P3}) [V_{IN} = 10mV_{RMS}] - 0.9375 x (V_{P4} / V_{P3}) [V_{IN} = 18mV_{RMS}]
2. I_{D0} = I_{P9} [V_{P9} = 0] ; I_{D1} = I_{P9} [V_{P4} = V_{Q4} + 35mV ; V_{P9} = 0]
   I_{D2} = I_{P9} [V_{P4} = V_{Q4} + 85mV ; V_{P9} = 0]; I_{D3} = I_{P9} [V_{P4} = V_{Q4} + 180mV ; V_{P9} = 0]
3. I_{RANGE} = I_{D3} / I_{D0}
4. SLOPE = ((I_{D2} - I_{D1}) / 50mV) x 14kΩ
5. V_{AL} = 85mV - ((I_{D2} - I_{D0}) / SLOPE) x 14kΩ: V_{AH} = 85mV + (50mV x (I_{D3} - I_{D2}) / (I_{D2} - I_{D1}));
   $V_{P4} \le V_{AL}$ [V_{IN} = 1.7mV_{RMS}] and $V_{P4} \ge V_{AL}$ [V_{IN} = 2.8mV_{RMS}]
6. f_c = 1 / (2 x π x 1.41 x 10nF x R); R = 26mV x ((1 / I_{D0}) + (1 / (I2 - I_{D0})))
   I2 = ((3 x (I_{D0} + I_{P9}[V_{P9} = V_{Q9} + 18mV])) / (4 - ((I_{D0} + I_{P9} [V_{P9} = V_{Q9} + 18mV]) / (I_{D0} + I_{P9}[V_{P9} = V_{Q9} - 18mV])))



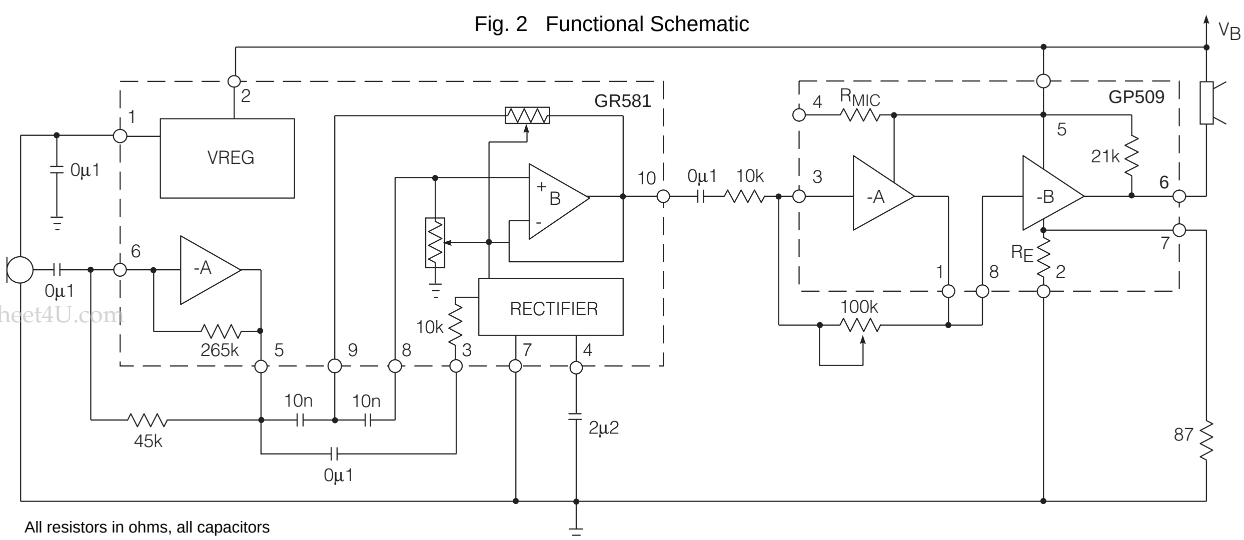
All resistors in ohms, all capacitors
in farads unless otherwise stated.

Fig. 1 Test Circuit



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

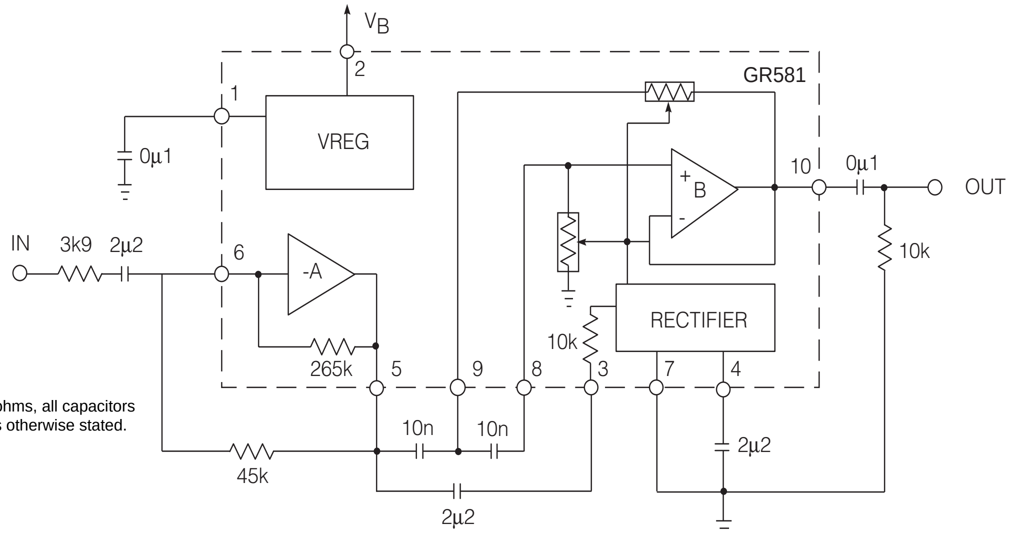
Fig. 2 Functional Schematic



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

Fig. 3 Typical Hearing Instrument Application

320 - 00 - 03



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

Fig. 4 Characterisation Circuit (used to generate typical curves)

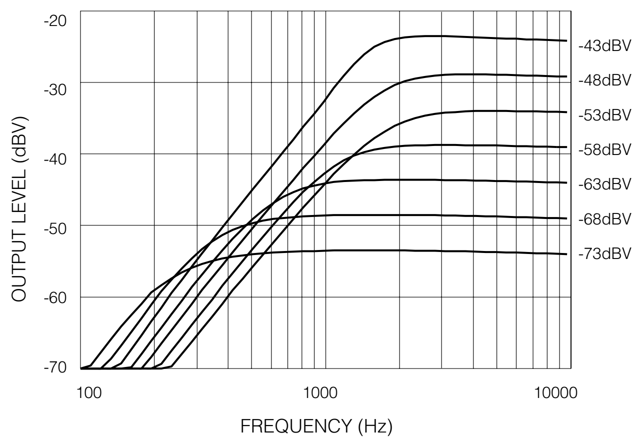


Fig. 5 Frequency Response

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
This product is in a development phase and specifications are subject to change without notice. Gennum reserves the right to remove the product at any time. Listing the product does not constitute an offer for sale.

PRELIMINARY DATA SHEET
The product is in a preproduction phase and specifications are subject to change without notice.

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.