# GA3203 Programmable DynamEQ®III

PRELIMINARY DATA SHEET

GA3203

## FEATURES

- **low & high frequency gain adjustment**
- **adjustable high frequency compression ratio (1:1 to 4:1)**
- **fixed low frequency compression ratio (3:1)**
- **twin average detection™**
- **24dB/octave band split filter**
- **8:1 output compression limiting**
- **notch filter to minimize acoustic feedback**
- **pre & post emphasis circuitry**
- **low level squelch control (1:2 expansion)**
- **multi memory (4)**
- **8 programmable parameters**

## thinSTAX™ PACKAGING

Hybrid typical dimensions:
0.200 x 0.128 x 0.060in.
(5.08 x 3.25 x 1.52mm)

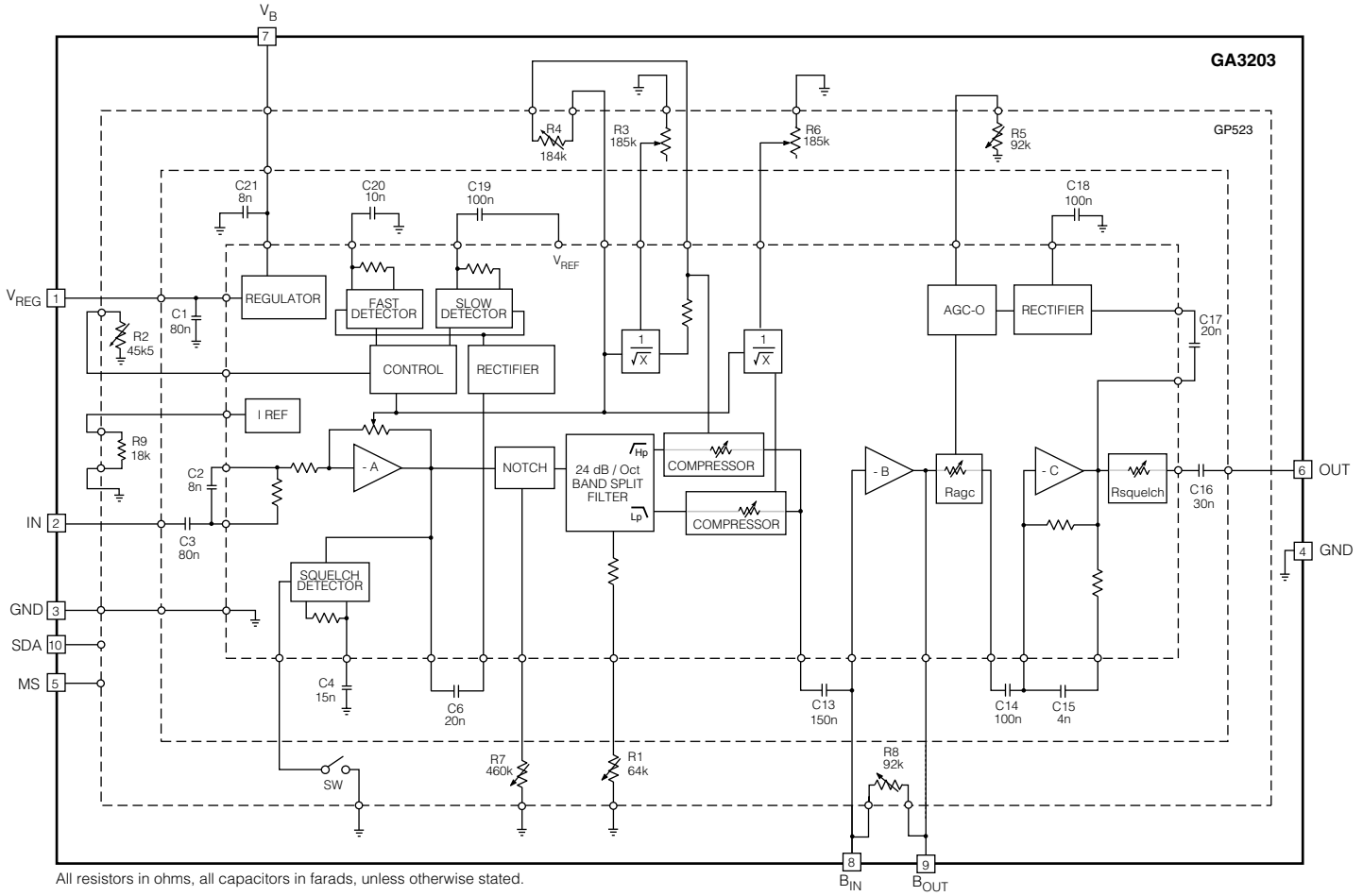
## DESCRIPTION

The GA3203 programmable hybrid is composed of a DynamEQ®III Wide Dynamic Range Compression signal processor and the GP523 controller memory chip.

The hybrid has 8 programmable parameters including Low Frequency Gain, High Frequency Gain, High Frequency Compression Ratio, Band Split Filter Crossover Frequency, AGC-I Threshold Kneepoint, AGC-O Threshold, Volume Control and Notch Feedback Control.

The DynamEQ®III includes a squelch circuit which attenuates microphone and circuit noise in quiet environments and high gain conditions. It also includes low distortion compression limiting AGC-O, pre and post emphasis circuitry, and an acoustic feedback notch filter.

The GA3203 hybrid code programmed into the GP523 is “4”.




**BLOCK DIAGRAM**

Revision Date: May 2001

Document No. 522 - 13 - 04

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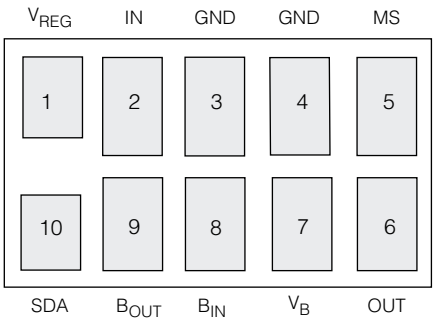
Web Site: www.gennum.com E-mail: hipinfo@gennum.com

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER | VALUE |
|---|---|
| Supply Voltage | 2VDC |
| Power Dissipation | 25mW |
| Operating Temperature Range | -10°C to 40°C |
| Storage Temperature Range | -20°C to 70°C |

**CAUTION**
ELECTROSTATIC
SENSITIVE DEVICES
DO NOT OPEN PACKAGES OR HANDLE
EXCEPT AT A STATIC FREE WORKSTATION

## PAD CONNECTION




## ELECTRICAL CHARACTERISTICS

Conditions: Supply Voltage $V_B$ = 1.3VDC, Frequency = 3kHz, Temperature = 25°C

The programmable parameters are adjusted to the following set values unless otherwise specified:

(FC) R1 - Tap 15; (TH) R2 - Tap 15; ($G_{HI}$) R3 - Tap 0; ($CR_{HI}$) R4 - Tap 15; (MPO) R5 - Tap 4; ($G_{LO}$) R6 - Tap 15;

(NOTCH) R7 - Tap 24; (VC) R8 - Tap 23; (Squelch) SW - CLOSED (0).

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| SYSTEM PERFORMANCE | | | | | | |
| Hybrid Amplifier Current | $I_{AMP}$ | $V_{IN}$ = 0V, R6 - Tap 0, SW - Open (Squelch Enabled) | 315 | 660 | 945 | µA |
| Minimum Voltage | Vb | | 1.1 | - | - | V |
| Regulator Voltage | $V_{REG}$ | $V_{IN}$ = 0V, R6 - Tap 0, $I_{REG}$ = 30µA | 860 | 910 | 960 | mV |
| Regulator Supply Rejection | PSRR | | - | 50 | - | ratio |
| System Gain High Frequency | $A_{VHIGH}$ | $V_{IN}$ = -95dBV | 48 | 51 | 54 | dB |
| System Gain Low Frequency | $A_{VLOW}$ | $V_{IN}$ = -95dBV @1kHz, R1 - Tap 0, R3 - Tap 15, R4 - Tap 0, R6 - Tap 0 | 43 | 46 | 49 | dB |
| Input Referred Noise | IRN | | - | 3.0 | - | µV |
| Total Harmonic Distortion | THD | $V_{IN}$ = -40dBV @ 1kHz, R1 - Tap 0, R6 - Tap 0 | - | 0.5 | 1 | % |
| THD with Maximum Allowable Input | $THD_{MAX}$ | $V_{IN}$ = -25dBV @ 1kHz, R1 - Tap 0, R6 - Tap 0 | - | 1 | 5 | % |
| AGC-I (Note 1) | | | | | | |
| Minimum Compression Knee Point | $TK_{LOW}$ | | -91 | -87 | -83 | dBV |
| Maximum Compression Knee Point | $TK_{HI}$ | R2 - Tap 0 | -54 | -50 | -46 | dBV |
| AGC - I Attack Time | $\tau_{ATT-I}$ | $V_{IN}$ = -65 to -40dBV, (4dB from final value) $f$ = 2kHz, R1 - Tap 0 | 4 | 8 | 12 | ms |
| AGC - I Release Time | $\tau_{REL-I}$ | $V_{IN}$ = -40 to -65dBV, (2dB from final value) $f$ = 2kHz, R1 - Tap 0 | 300 | 450 | 600 | ms |
| HIGH PASS (Note 1) | | | | | | |
| Max. High Pass Compression Ratio | $HP_{CRMAX}$ | $V_{IN}$ = -80 to -60dBV | 3.7 | 4.2 | 4.7 | ratio |
| Min. High Pass Compression Ratio | $HP_{CRMIN}$ | $V_{IN}$ = -80 to -60dBV, R4 - Tap 0 | 0.8 | 1 | 1.2 | ratio |
| Maximum Upper Threshold | $HP_{UMAX}$ | | -35 | -31 | -27 | dBV |
| High Pass Gain Control Range | $HP_{RANGE}$ | $V_{IN}$ = -95dBV, R3 - Tap 0 to Tap 15 | 40 | 44 | 48 | dB |
| LOW PASS (Note 1, R1 - Tap 0, R3 - Tap 15, R4 - Tap 0, R6 - Tap 0, $f$ = 1kHz | | | | | | |
| Low Pass Compression Ratio | $LP_{CR}$ | $V_{IN}$ = -80 to -60dBV, R6 - Tap15 | 2.5 | 3 | 3.5 | ratio |
| Maximum Upper Threshold | $LP_{UMAX}$ | | -32 | -28 | -24 | dBV |
| Low Pass Gain Control Range | $LP_{RANGE}$ | $V_{IN}$ = -95dBV, R6 - Tap 0 to Tap 15 | 36 | 40 | 44 | dB |

NOTE 1: Measured at output of Stage B

## ELECTRICAL CHARACTERISTICS (CONTINUED)

Conditions: Supply Voltage $V_B$ = 1.3VDC, Frequency = 3kHz, Temperature = 25°C

The programmable parameters are adjusted to the following set values unless otherwise specified:

(FC) R1 - Tap 15; (TH) R2 - Tap 15; ($G_{HI}$) R3 - Tap 0; ($CR_{HI}$) R4 - Tap 15; (MPO) R5 - Tap 4; ($G_{LO}$) R6 - Tap 15;

(NOTCH) R7 - Tap 24; (VC) R8 - Tap 23; (Squelch) SW - CLOSED (0).

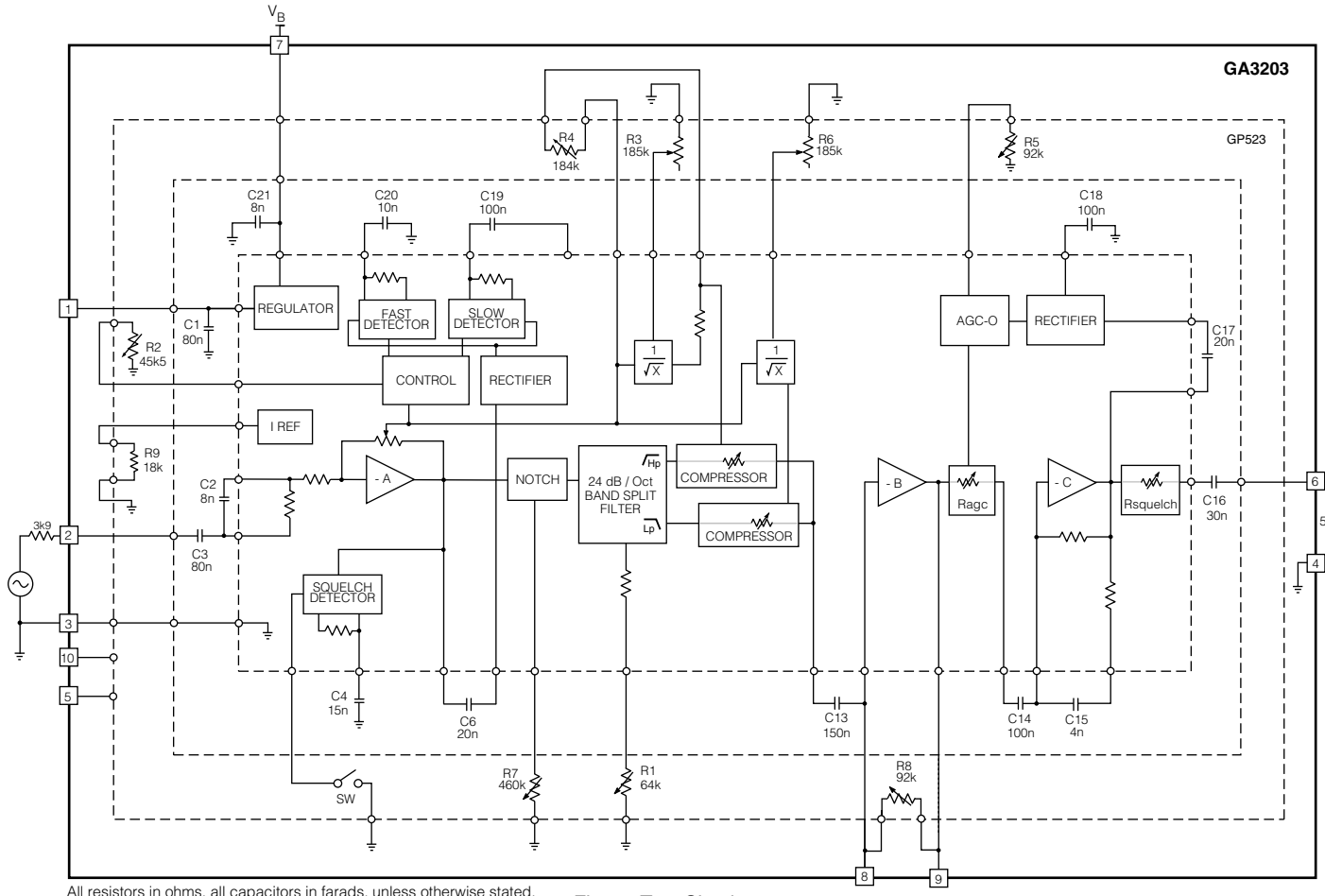
| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| AGC - O (R3 - Tap 15, R4 - Tap 0, R6 - Tap 15) | | | | | | |
| Compression Ratio | $CR_{AGC-O}$ | $V_{IN}$ = -40 to -25dBV, R5 - Tap15 | 6.7 | 7.7 | 8.7 | ratio |
| Maximum Threshold | $TH_{MAX}$ | | -34 | -31 | -28 | dBV |
| Minimum Threshold | $TH_{MIN}$ | R5 - Tap15 | -50 | -47 | -44 | dBV |
| Threshold Range | $\Delta TH$ | | 12 | 15 | 18 | dB |
| Attack Time | $\tau_{ATT-O}$ | $V_{IN}$ = -50 to -25dBV (2dB from final value)<br>$f$ = 2kHz, R5 - Tap15, R1 - Tap 0 | 12 | 18 | 24 | ms |
| Release Time | $\tau_{REL-O}$ | $V_{IN}$ = -25 to -50dBV (2dB from final value)<br>$f$ = 2kHz, R5 - Tap15, R1 - Tap 0 | 80 | 135 | 200 | ms |
| SQUELCH | | | | | | |
| Squelch Expansion Ratio | $SQ_{EXP}$ | $V_{IN}$ = -95 to -92dBV, SW - Open, R2 - Tap 8 | 1.8 | 2.2 | 3.0 | ratio |
| Squelch Threshold | $SQ_{TH}$ | SW - Open, R2 - Tap 8 | -93 | -89 | -85 | dBV |
| PRE and POST EMPHASIS | | | | | | |
| Low Cut Corner Frequency (Pre-Emphasis) | $PRE_{3dB}$ | | - | 1 | - | kHz |
| Low Boost Corner Frequency (Post-Emphasis) | $POST_{3dB}$ | | - | 1 | - | kHz |
| STATE VARIABLE FILTER | | | | | | |
| Minimum Crossover Frequency | $FC_{MIN}$ | R1 - Tap 15 | - | 0.9 | 1.4 | kHz |
| Maximum Crossover Frequency | $FC_{MAX}$ | R1 - Tap 0 | 3 | 3.9 | - | kHz |
| Nominal Crossover Frequency | $FC_{NOM}$ | R1 - Tap 8 | 1.3 | 1.7 | 2.4 | kHz |
| NOTCH FILTER | | | | | | |
| Minimum Notch Frequency | $FN_{MIN}$ | R7 - Tap 23 | - | 2.2 | 2.8 | kHz |
| Maximum Notch Frequency | $FN_{MAX}$ | R7 - Tap 0 | 5 | 7.5 | - | kHz |
| Nominal Notch Frequency | $FN_{NOM}$ | R7 - Tap 18 | 1.5 | 2.5 | 3.6 | kHz |
| Notch Bandwidth | $FN_{BW}$ | R7 - Tap 23 | 0.3 | 0.6 | 0.9 | kHz |
| Notch Attenuation | $FN_{ATTN}$ | R7 - Tap 23 | 7 | 12 | 17 | dB |

NOTE 1: Measured at output of Stage B

## SUPPORT SOFTWARE

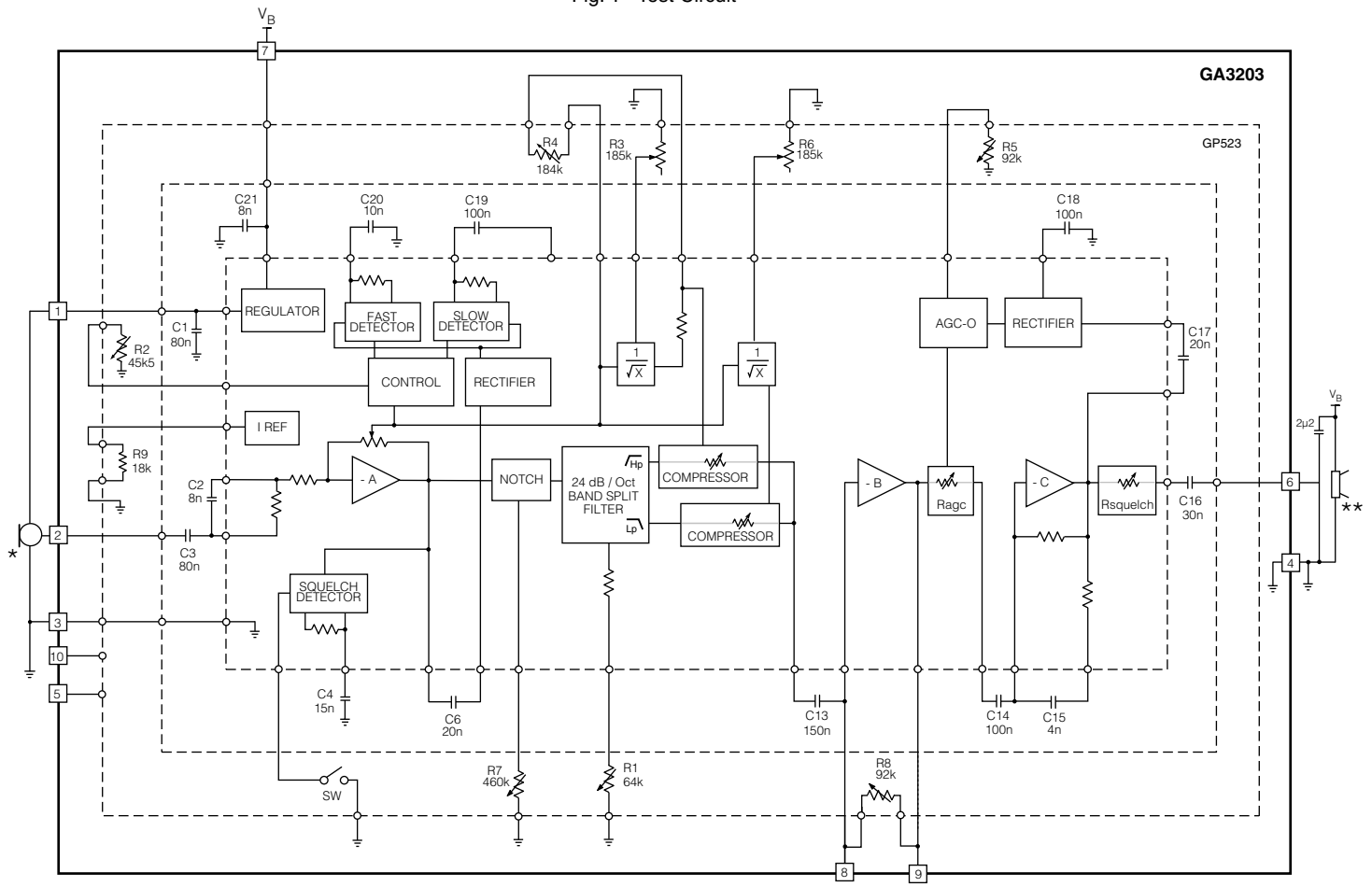
All support software for the GA3203 and the GP523 is available from Gennum's website:

www.gennum.com/hip/software



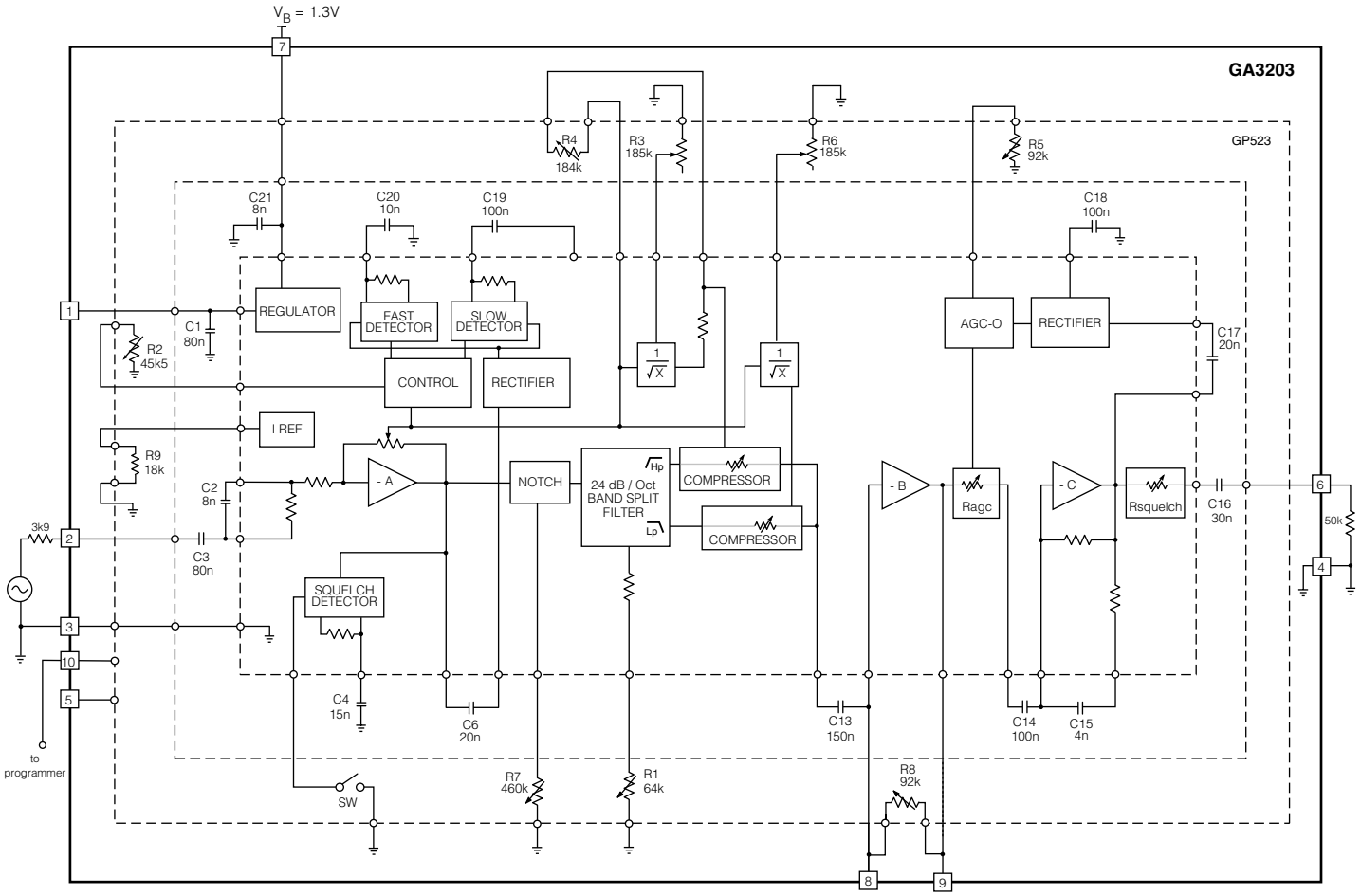

All resistors in ohms, all capacitors in farads, unless otherwise stated.

Fig. 1 Test Circuit




*Any Knowles or Microtronic microphone
**Any Knowles Class D integrated receiver
All resistors in ohms, all capacitors in farads, unless otherwise stated.

Fig. 2 Typical Application circuit




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

Fig. 3 Characterization circuit (used to generate typical curves)

TABLE OF DEFAULTS

| | |
|---|---|
| R1 - Tap 15 | R5 - Tap 4 |
| R2 - Tap 15 | R6 - Tap 0 |
| R3 - Tap 0 | R7 - Tap 24 |
| R4 - Tap 15 | R8 - Tap 23 |
| SW - CLOSED | |

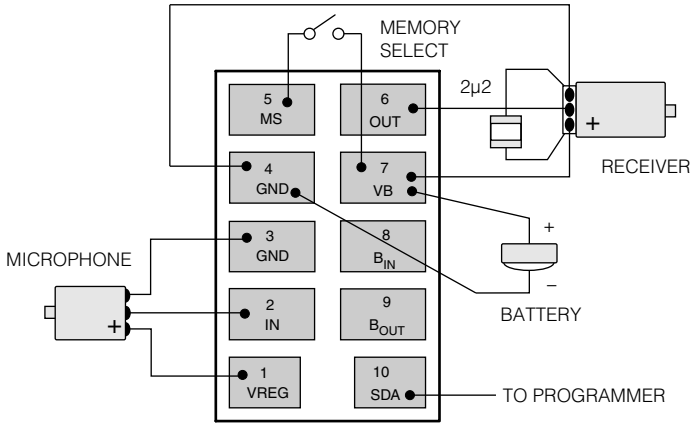



Fig. 4 Typical Assembly Diagram

## TYPICAL PERFORMANCE CURVES

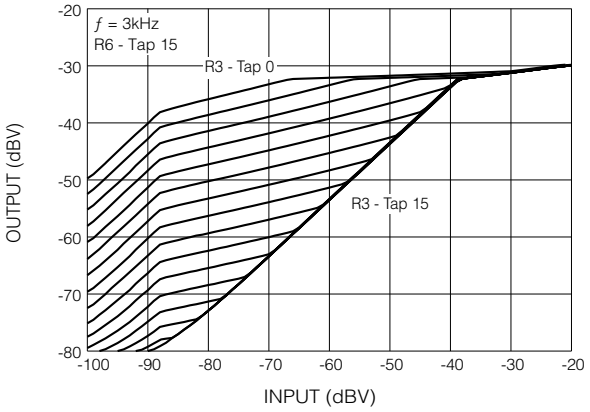



Fig. 5 High Frequency Gain Control
(Tap 0 - 185kΩ, Tap 15 - 0kΩ)

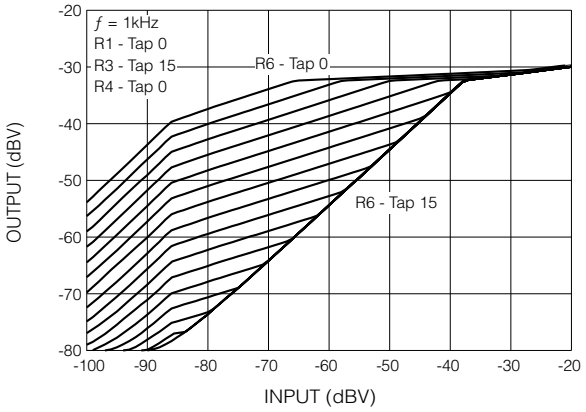



Fig. 6 Low Frequency Gain Control
(Tap 0 - 185kΩ, Tap 15 - 0kΩ)

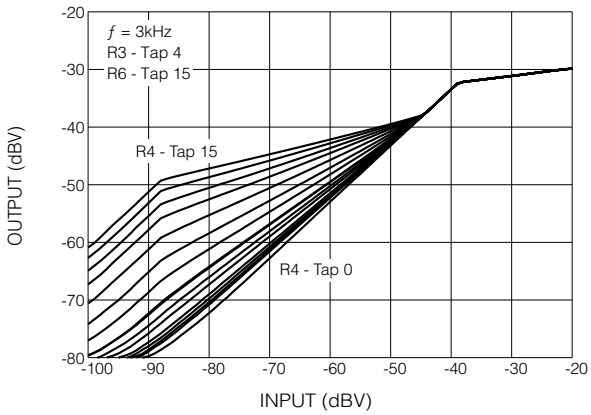



Fig. 7 High Frequency Compression Ratio Control
(Tap 0 - 0kΩ, Tap 15 - 184kΩ)

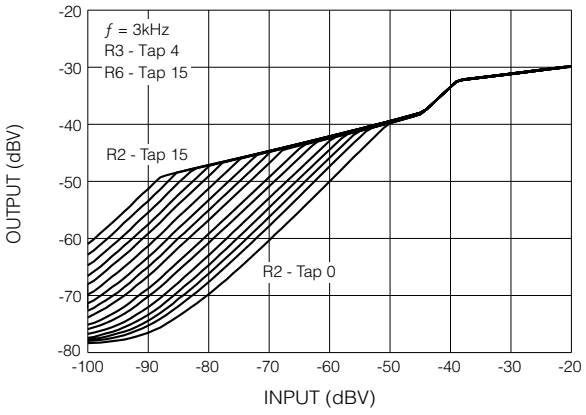



Fig. 8 AGC-I Threshold Control
(Tap 0 - 0kΩ, Tap 15 - 45.5kΩ)

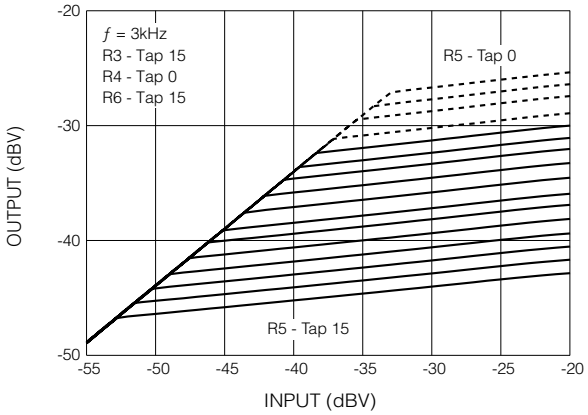



Fig. 9 AGC-O Threshold Control
(Tap 0 - 7.3kΩ, Tap 15 - 92kΩ)

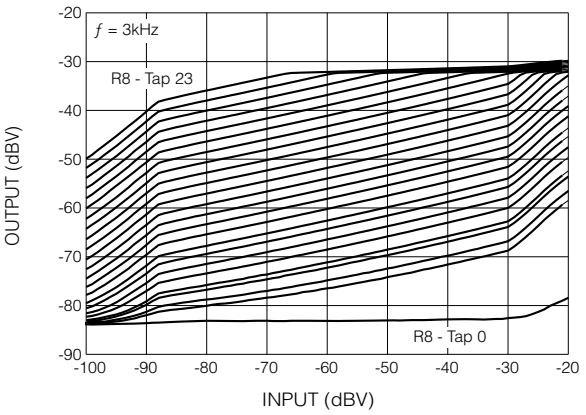



Fig. 10 System Volume Control
(Tap 0 - 0kΩ, Tap 23 - 92kΩ)

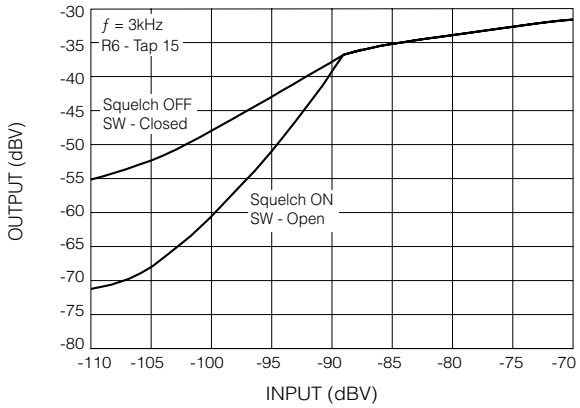



Fig.11 Low Level Squelch Control

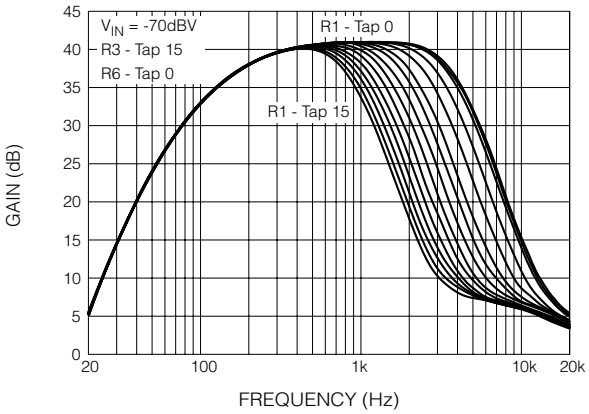



Fig. 12 SVF Crossover Frequency - Low Pass
(Tap 0 - 0kΩ, Tap 15 - 64kΩ)

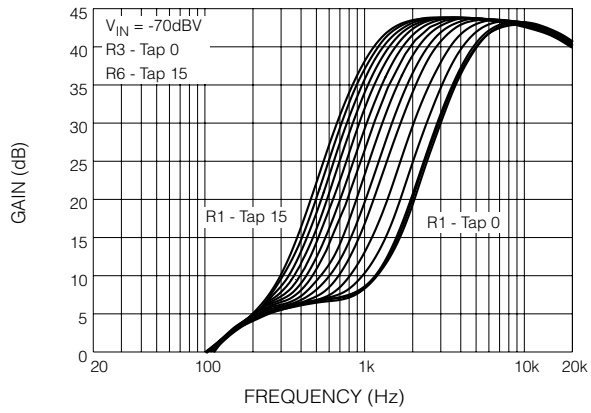



Fig. 13 SVF Crossover Frequency - High Pass
(Tap 0 - 0kΩ, Tap 15 - 64kΩ)

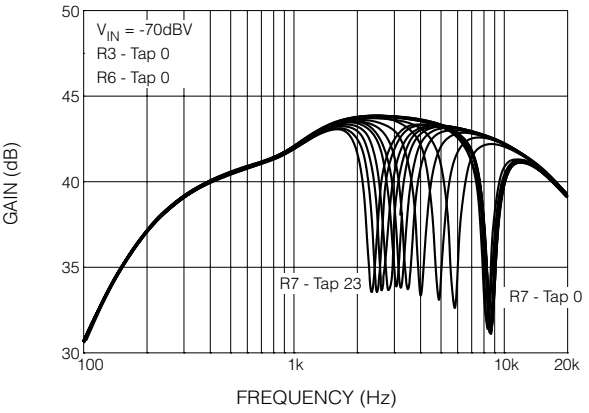



Fig. 14 Notch Frequency Control
(Tap 0 - 0kΩ, Tap 15 - 460kΩ)

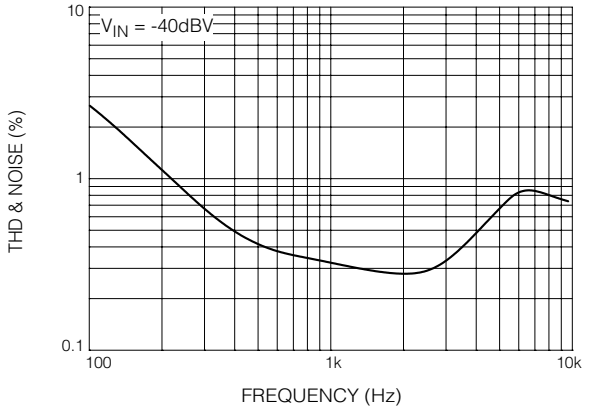



Fig. 15 THD and Noise vs. Frequency

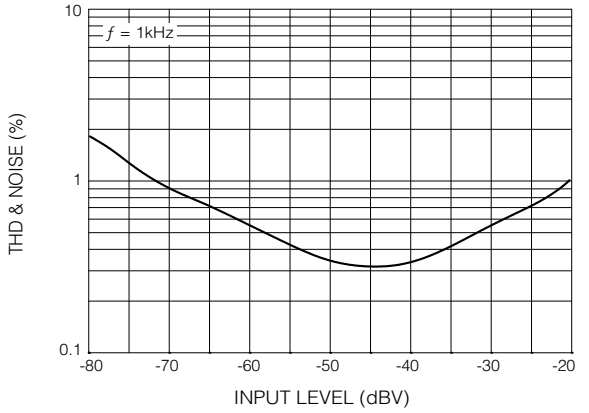



Fig. 16 THD and Noise vs. Input Level

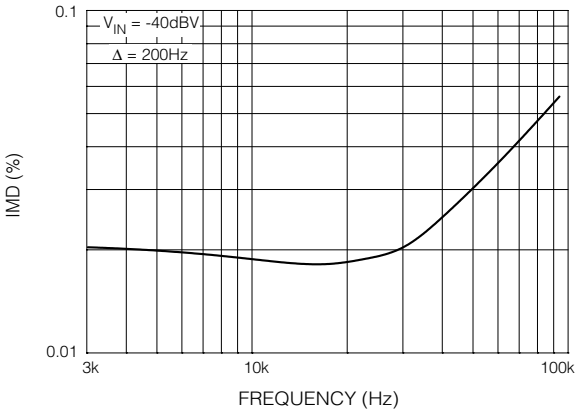



Fig. 17 Intermodulation Distortion (CCIF) vs. Frequency

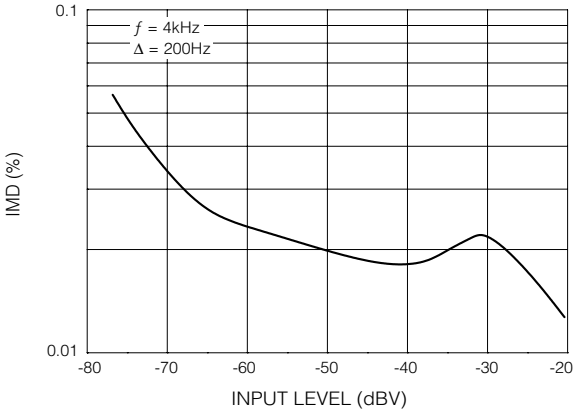



Fig. 18 Intermodulation Distortion (CCIF) vs. Input Level

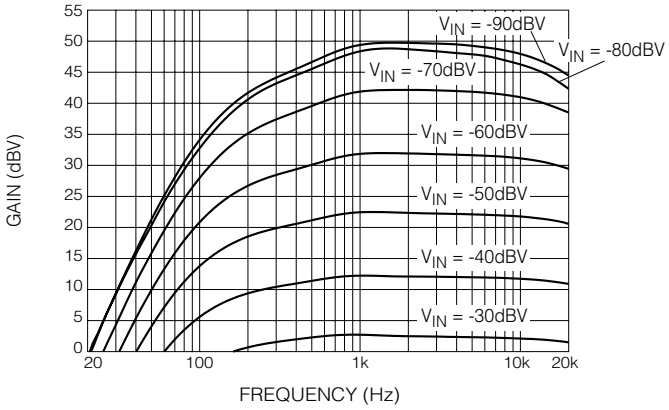



Fig. 19 Frequency Response for Different Input Levels

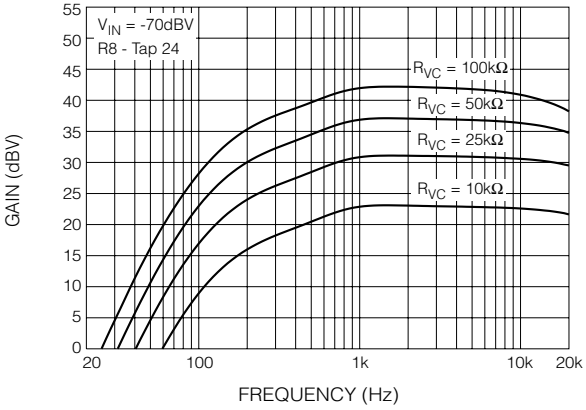
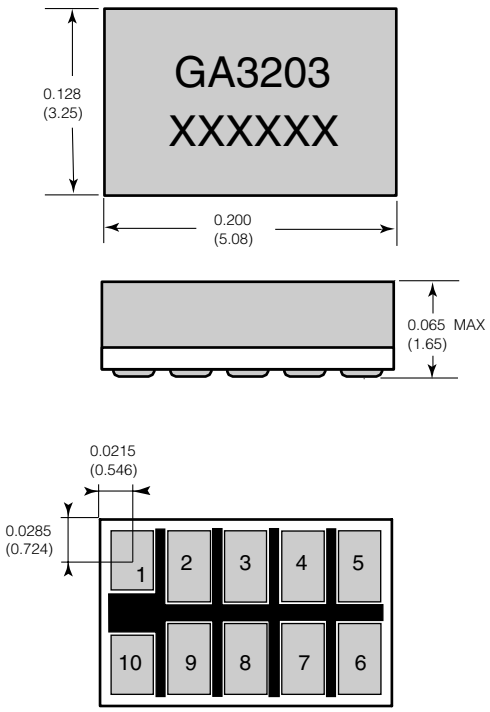



Fig. 20 Frequency Response for Different External Volume Control Resistor Values

## PACKAGE DIMENSIONS




Dimensions are in inches.

Dimensions in parenthesis are in millimetres converted from inches and include minor rounding errors.

1.0000 inches = 25.400mm

Dimension tolerances: ± 0.003 (±0.08) unless otherwise stated.

Minimum pad sizes: 0.0290 x 0.0400 (0.737 x 1.016).

XXXXXX: work order number.

This hybrid is designed for either point-to-point soldering or reflow according to Gennum's recommended reflow process (Information Note 521-45).

## PAD LOCATIONS

| PAD NO. | PAD POSITION | | PAD DIMENSION | | |
|---|---|---|---|---|---|
| | X | Y | Xdim | Ydim | |
| 1 | 0 | 0 | 29.0 | 41.0 | MIL |
| 2 | 39.5 | -4.0 | 30.0 | 49.0 | |
| 3 | 78.5 | -4.0 | 28.0 | 49.0 | |
| 4 | 117.0 | -4.0 | 29.0 | 49.0 | |
| 5 | 156.5 | -4.0 | 30.0 | 49.0 | |
| 6 | 156.5 | -67.5 | 30.0 | 48.0 | |
| 7 | 117.0 | -67.5 | 29.0 | 48.0 | |
| 8 | 78.5 | -67.5 | 28.0 | 48.0 | |
| 9 | 39.5 | -67.5 | 30.0 | 48.0 | |
| 10 | 0 | -71.5 | 29.0 | 40.0 | |
| 1 | 0 | 0 | 0.737 | 1.041 | mm |
| 2 | 1.003 | -0.102 | 0.762 | 1.245 | |
| 3 | 1.994 | -0.102 | 0.711 | 1.245 | |
| 4 | 2.972 | -0.102 | 0.737 | 1.245 | |
| 5 | 3.975 | -0.102 | 0.762 | 1.245 | |
| 6 | 3.975 | -1.715 | 0.762 | 1.219 | |
| 7 | 2.972 | -1.715 | 0.737 | 1.219 | |
| 8 | 1.994 | -1.715 | 0.711 | 1.219 | |
| 9 | 1.003 | -1.715 | 0.762 | 1.219 | |
| 10 | 0 | -1.816 | 0.737 | 1.016 | |

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REVISION NOTES:
Updated Electrical Characteristics table.

*For latest product information, visit www.gennum.com*

DOCUMENT IDENTIFICATION

PRELIMINARY DATA SHEET
The product is in pre-production phase and specifications are subject to change without notice.