



Mini-Circuits

COAXIAL

# Variable Gain Amplifier

**ZVA-20543VG+**  
**ZVA-20543VGX+**

50Ω 20 to 54 GHz  $P_{SAT}$  +31 dBm 1.85mm-Female

## THE BIG DEAL

- Variable Gain Amplifier with Analog or TTL Control
- Interactive GUI with Telemetry
- Calibrated 17 dB Attenuation Range with Minimal Power Degradation
- High Gain, 50 dB Typ.
- High Psat, +31 dBm Typ.
- Ideal for Integrated Sub-Systems

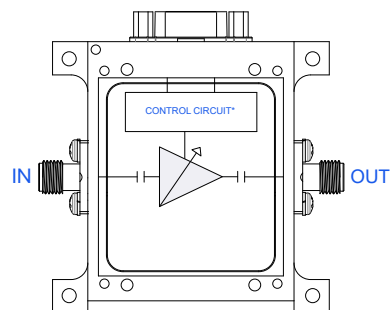


Generic photo used for illustration purposes only

## APPLICATIONS

- Wideband Test and Instrumentation
- 5G-FR2 Millimeter Wave Testing
- Aerospace & Defense
- Test and Measurement
- Broadband Telecom
- Ka-Band Satcom

## FUNCTIONAL DIAGRAM



## PRODUCT OVERVIEW

Mini-Circuits' ZVA-20543VG+ is a coaxial, wideband, variable gain, medium power amplifier with gain control, operating from 20 to 54 GHz. The model operates over a single supply range of +10 to +15 V, allowing users to choose their desired operating voltage. Internal DC-DC conversion circuitry maintains consistent efficiency over the full input voltage range. The amplifier incorporates a full suite of control and diagnostic tools, such as output power monitoring, amplifier fault tracking, internal temperature monitoring, enable/disable functionality for lower power consumption, and configurable digital or analog gain control.

The optional cable harness with integrated TTL to USB converter allows control of the amplifier from a PC moments after unboxing. Several DC-protection features such as over-voltage, reverse voltage, and in-rush current protection protect the amplifier from damage in case of unexpected spikes in voltage during operation. The high gain, low noise, medium power, and wideband frequency operation combined with digital control makes this amplifier an ideal choice for testing and instrumentation applications

## KEY FEATURES

| Features                                                                                                                         | Advantages                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Variable Gain, 17 dB Typ.                                                                                                        | A single amplifier can be used for a variety of applications, where gain or power levels may need to be adjusted for optimal performance in the users system.                                                                                                |
| Telemetry Reporting                                                                                                              | With built in temperature monitoring, power detection and alarm features, this amplifier gives the user valuable information that would otherwise require additional test equipment and control circuitry. See Telemetry Feature table for more information. |
| Wide DC Operating Voltage, +10 to +15 V                                                                                          | The device can operate from +10 to +15 V, maintaining consistent DC power consumption with no effect on RF performance, and facilitating ease of use in test setups with existing established voltage supplies.                                              |
| DC Protection <ul style="list-style-type: none"><li>• Over-voltage</li><li>• Reverse voltage</li><li>• In-rush current</li></ul> | The internal DC circuitry allows the amplifier to be protected from external mishandling or unexpected spikes in voltage that could lead to catastrophic failures in the field.                                                                              |

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[www.minicircuits.com](http://www.minicircuits.com) P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 [sales@minicircuits.com](mailto:sales@minicircuits.com)

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ZVA-20543VG+  
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**ZVA-20543VGX+**

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50Ω 20 to 54 GHz  $P_{SAT}$  +31 dBm 1.85mm-FemaleELECTRICAL SPECIFICATIONS AT +25 °C BASEPLATE,  $V_s = +10$  V

| Parameter                                                                | Condition (GHz) | Min. | Typ.      | Max.                   | Units |
|--------------------------------------------------------------------------|-----------------|------|-----------|------------------------|-------|
| Frequency Range                                                          |                 | 20   |           | 54                     | GHz   |
| Gain at Minimum Attenuation                                              | 20 - 54         | 42   | 50        | —                      | dB    |
| Gain at Maximum Attenuation                                              | 20 - 54         | 25   | 33        | —                      | dB    |
| Output Power at 1dB Compression at Minimum Attenuation                   | 20 - 35         | +27  | +31       | —                      | dBm   |
|                                                                          | 35 - 54         | +24  | +28       | —                      |       |
| Output Power at 1dB Compression at Maximum Attenuation                   | 20 - 35         | —    | +29       | —                      | dBm   |
|                                                                          | 35 - 54         | —    | +25       | —                      |       |
| Saturated Output Power ( $P_{SAT}$ ) <sup>1</sup> at Minimum Attenuation | 20 - 35         | —    | +32       | —                      | dBm   |
|                                                                          | 35 - 54         | —    | +30       | —                      |       |
| Saturated Output Power ( $P_{SAT}$ ) <sup>1</sup> at Maximum Attenuation | 20 - 35         | —    | +30       | —                      | dBm   |
|                                                                          | 35 - 54         | —    | +26       | —                      |       |
| Output IP3 (Output Power = +14 dBm/tone)                                 | 20 - 54         | —    | +37       | —                      | dBm   |
| Noise Figure                                                             | 20 - 35         | —    | 4         | —                      | dB    |
| Input Return Loss                                                        | 20 - 54         | —    | 15        | —                      | dB    |
| Output Return Loss                                                       | 20 - 54         | —    | 15        | —                      | dB    |
| DC Supply Voltage ( $V_s$ )                                              |                 | +10  | —         | +15                    | V     |
| DC Current at +10 V (ZVA-20543VGX+/ZVA-20543VG+)                         |                 | —    | 1700/1800 | 2700/2800 <sup>2</sup> | mA    |

1. At  $P_{SAT}$ ,  $P_{out}$  changes less than 0.1 dB for a 1 dB change in  $P_{in}$ 2. Max DC current is measured at  $P_{SAT}$ 

## TELEMETRY FEATURES

| Feature                               | Description                                                                                                                                                             |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature Monitoring                | Allows the user to continuously monitor the internal temperature of the amplifier (see page 5 for "TEMP MON OUTPUT VOLTAGE OVER INTERNAL TEMPERATURE OF MODULE" GRAPH). |
| Mute/Unmute                           | Allows the user to mute or unmute the amplifier.                                                                                                                        |
| Attenuation Control                   | Allows the user to adjust the internal attenuation in increments of 0.25 dB.                                                                                            |
| Output Power Detector                 | Allows the user to continuously monitor the output power of the amplifier.                                                                                              |
| Alarm                                 | Amplifier will go into alarm if internal temperature or current exceed factory set limits.                                                                              |
| Digital or Analog Attenuation Control | Allows the user to control the attenuation digitally or with a single analog voltage.                                                                                   |





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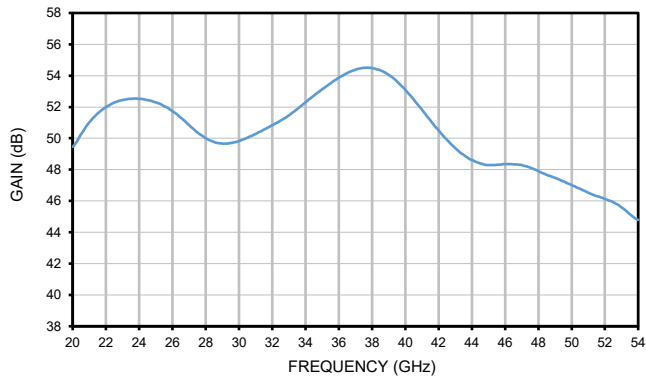
# Variable Gain Amplifier

**ZVA-20543VG+**  
**ZVA-20543VGX+**

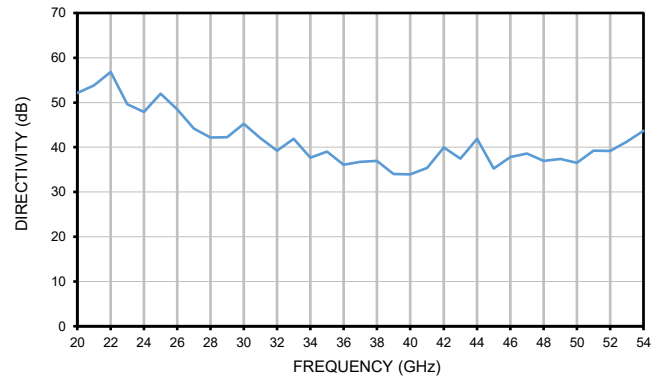
50Ω 20 to 54 GHz  $P_{SAT} +31$  dBm 1.85mm-Female

## TYPICAL PERFORMANCE GRAPHS

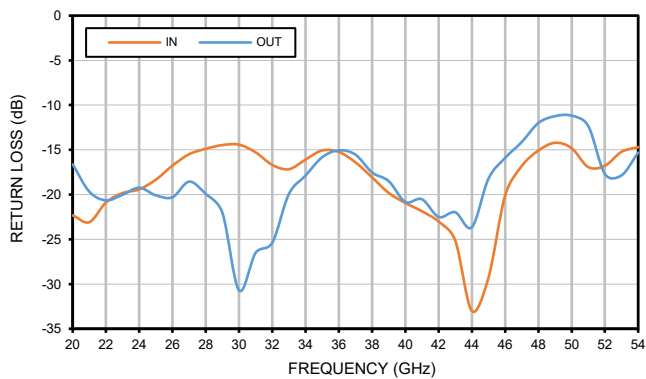
**GAIN @MINIMUM ATTENUATION**



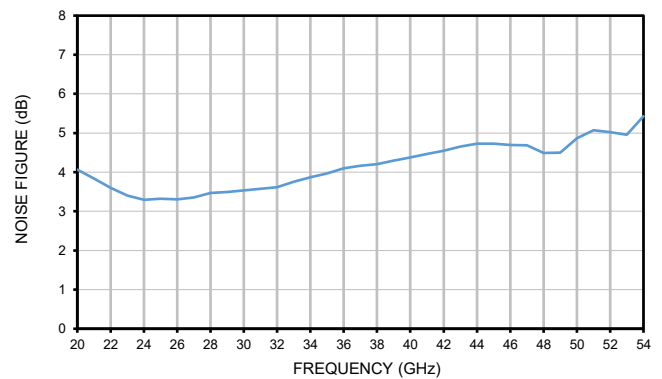
**DIRECTIVITY @MINIMUM ATTENUATION**



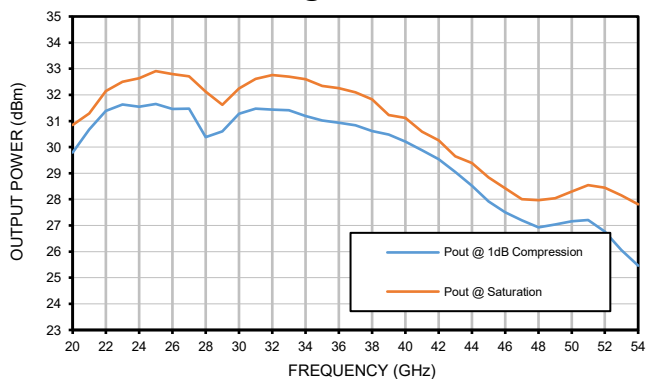
**RETURN LOSS @MINIMUM ATTENUATION**



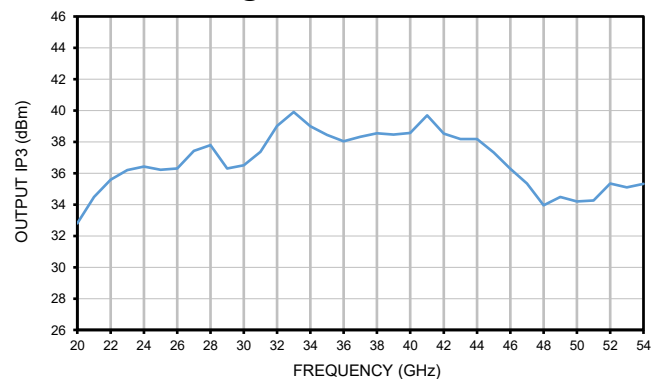
**NOISE FIGURE @MINIMUM ATTENUATION**



**OUTPUT POWER @MINIMUM ATTENUATION**



**OIP3 @MINIMUM ATTENUATION**





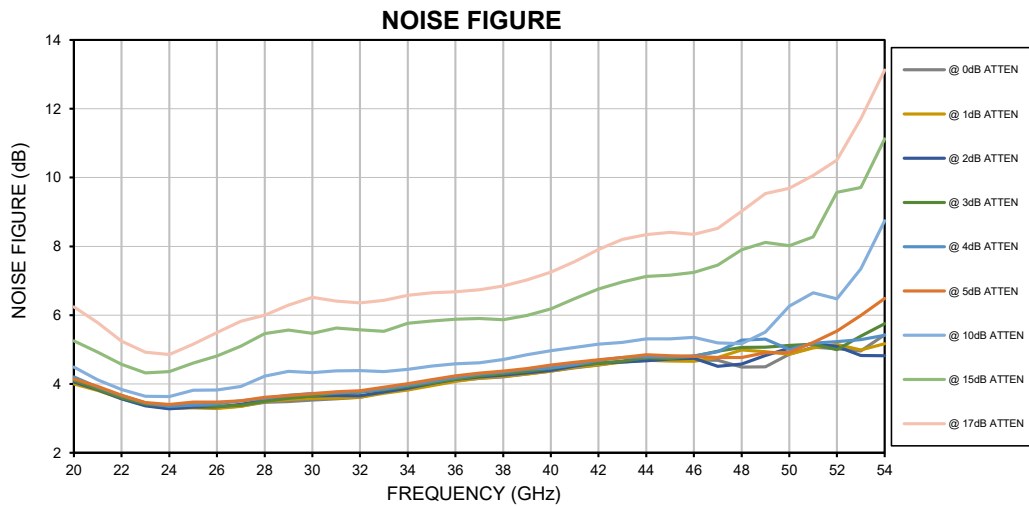
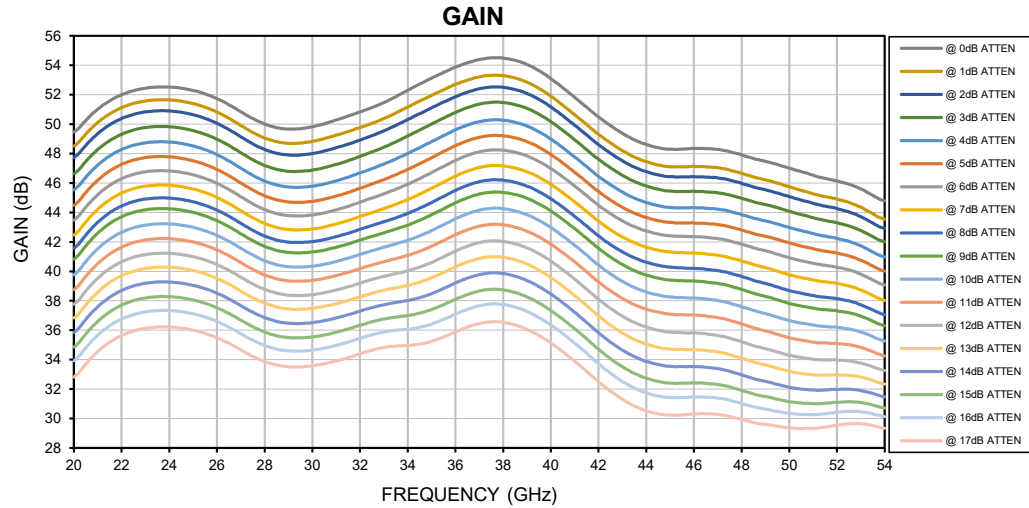
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## TYPICAL PERFORMANCE GRAPHS





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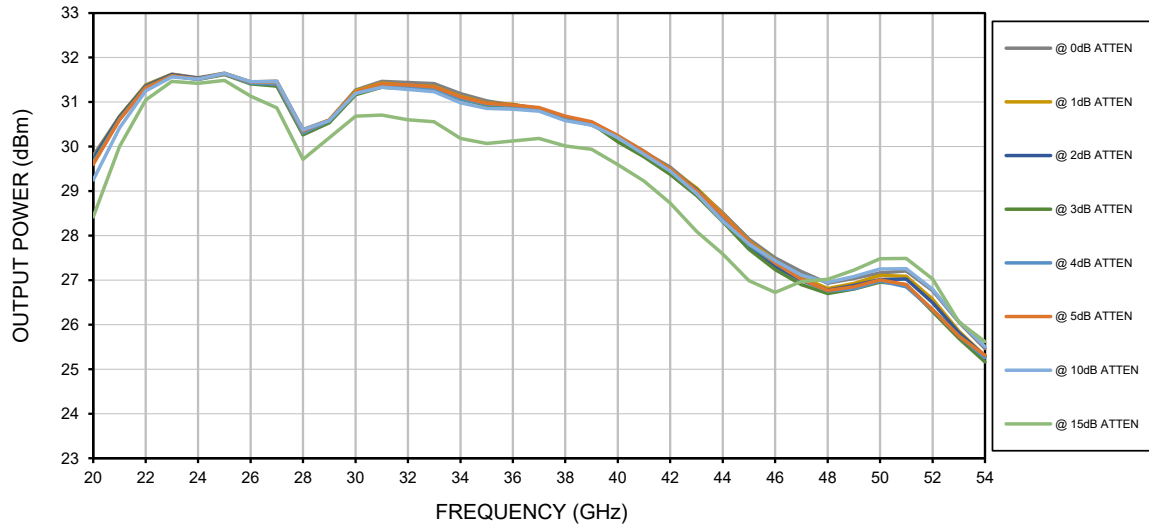
# Variable Gain Amplifier

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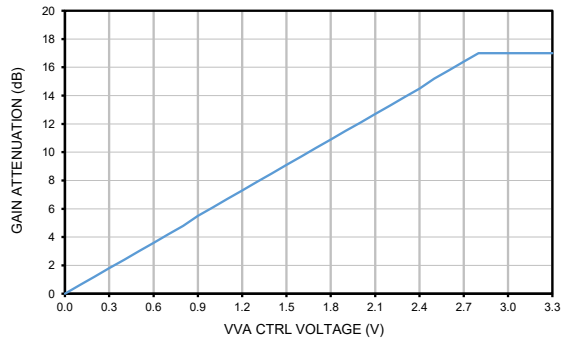
50Ω 20 to 54 GHz  $P_{SAT}$  +31 dBm 1.85mm-Female

## TYPICAL PERFORMANCE GRAPHS

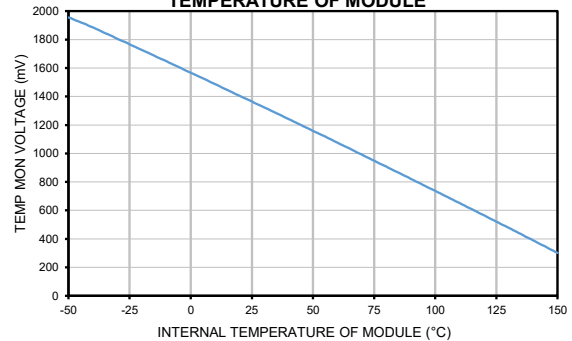
OUTPUT POWER AT 1dB COMPRESSION



GAIN ATTENUATION OVER VVA CTRL VOLTAGE



TEMP MON OUTPUT VOLTAGE OVER INTERNAL TEMPERATURE OF MODULE





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## Variable Gain Amplifier

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**ZVA-20543VGX+**50Ω 20 to 54 GHz  $P_{SAT}$  +31 dBm 1.85mm-FemaleABSOLUTE MAXIMUM RATINGS<sup>3</sup>

| Parameter                        | Ratings          |                  |           |
|----------------------------------|------------------|------------------|-----------|
| Operating Temperature            | ZVA-20543VG+     | -20 °C to +50 °C | Ambient   |
|                                  | ZVA-20543VGX+    | -20 °C to +60 °C | Baseplate |
| Storage Temperature              | -40 °C to +85 °C |                  |           |
| Total Power Dissipation          | 26 W             |                  |           |
| RF Input Power <sup>4</sup> (CW) | +5 dBm           |                  |           |
| DC Operating Voltage             | +16 V            |                  |           |
| Control Lines, J1-1 through J1-8 | +3.5 V           |                  |           |

3. Continuous operation is not recommended at these extremes. Permanent damage may occur if any of these limits are exceeded.

4. Specified under matched load to 50 ohms.

## DETERMINING MAXIMUM THERMAL RESISTANCE OF USERS' EXTERNAL HEAT SINK

|                                                                                                                                              |                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\text{MAXIMUM THERMAL RESISTANCE} = \frac{\text{MAXIMUM OPERATING CASE TEMP} - \text{MAXIMUM USER AMBIENT TEMP}}{\text{POWER DISSIPATION}}$ |                                                                                                                                                                                                                                                                           |
| <b>Example:</b>                                                                                                                              | MAXIMUM OPERATING CASE TEMP = +60 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE)<br>MAXIMUM USER AMBIENT TEMP = +30 °C (USER DEFINED)<br>POWER DISSIPATION = 26 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE)<br>THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = 2 °C/W |



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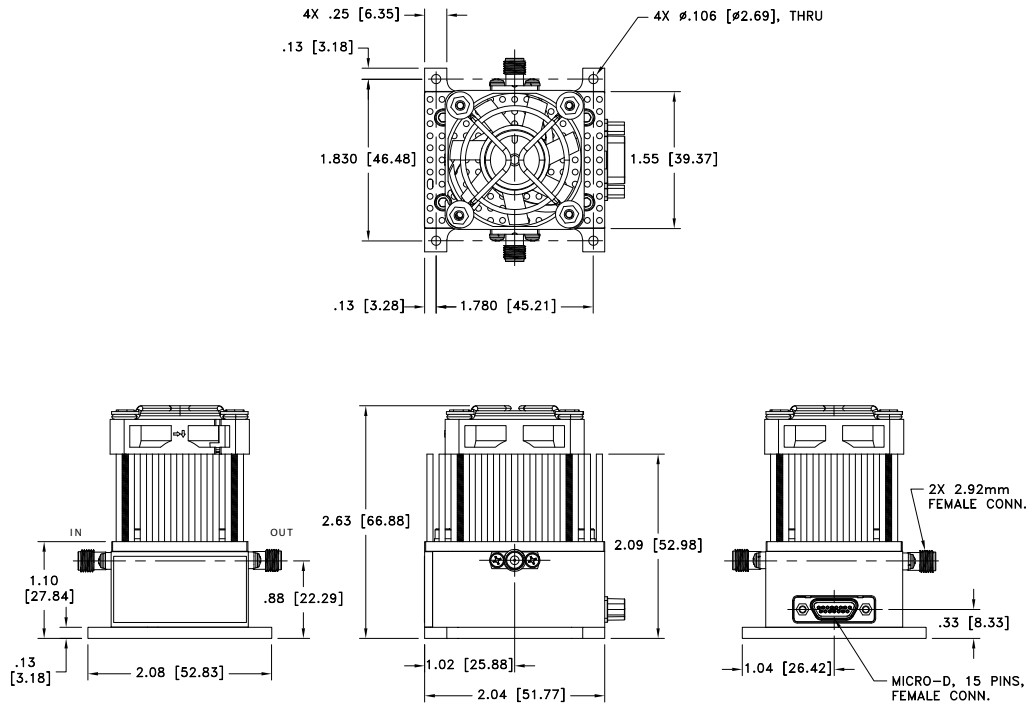
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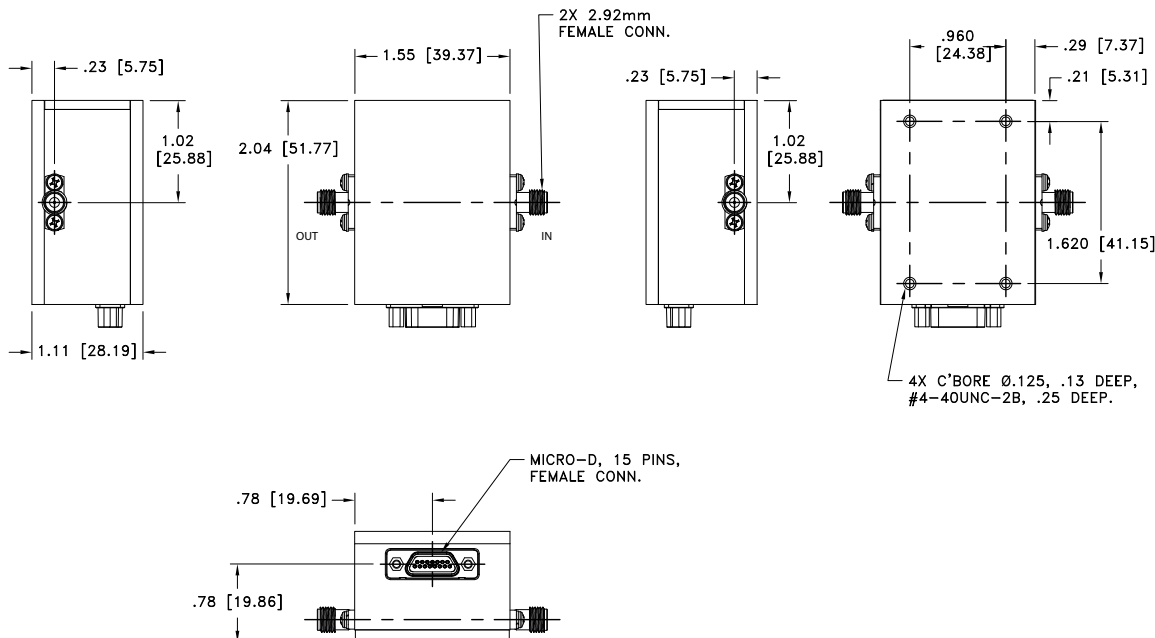
## CASE STYLE DRAWING FOR MODELS WITH HEATSINK (ZVA-20543VG+)



Weight: 6.8 oz. (193 grams)

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03; 3 Pl.±.015 Inch

## CASE STYLE DRAWING FOR MODELS WITHOUT HEATSINK (ZVA-20543VGX+)



Weight: 6.5 oz. (184 grams)

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03; 3 Pl.±.015 Inch

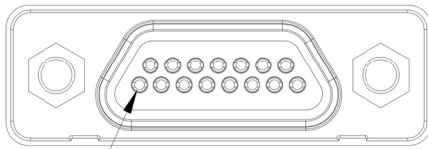
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## Variable Gain Amplifier

ZVA-20543VG+  
ZVA-20543VGX+50Ω 20 to 54 GHz  $P_{SAT}$  +31 dBm 1.85mm-Female

PIN 1

| Function               | Pin Number | Description                                                                         |
|------------------------|------------|-------------------------------------------------------------------------------------|
| ALARM OUT              | J1-1       | Normally logic low (0V), +3.3V when fault is present                                |
| ENABLE IN <sup>5</sup> | J1-2       | Logic low (0V) to unmute (enable), logic high to mute (disable)                     |
| TEMP MON               | J1-3       | Provides analog output voltage representing temperature of module                   |
| RXD                    | J1-4       | Connect to TXD of TTL to USB serial converter                                       |
| TXD                    | J1-5       | Connect to RXD of TTL to USB serial converter                                       |
| VVA CTRL               | J1-6       | Analog Input for gain control, +3.3V MAX (see figure 1 & figure 2)                  |
| +3.3V                  | J1-7       | Available voltage supply for analog gain control circuit (see figure 1)             |
| VVA/DCA <sup>6</sup>   | J1-8       | Logic low (0V) for analog gain control, logic high (+3.3V) for digital gain control |
| +VS                    | J1-9       | Positive Supply Voltage                                                             |
| +VS                    | J1-10      | Positive Supply Voltage                                                             |
| +VS                    | J1-11      | Positive Supply Voltage                                                             |
| N/C                    | J1-12      | NOT USED                                                                            |
| GND                    | J1-13      | Ground                                                                              |
| GND                    | J1-14      | Ground                                                                              |
| GND                    | J1-15      | Ground                                                                              |

5. J1-2 can also be left floating to disable the amplifier.

6. J1-8 can also be left floating for digital gain control option.

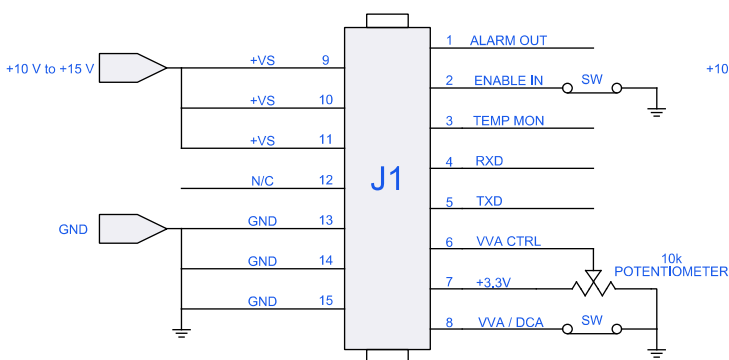


FIGURE 1

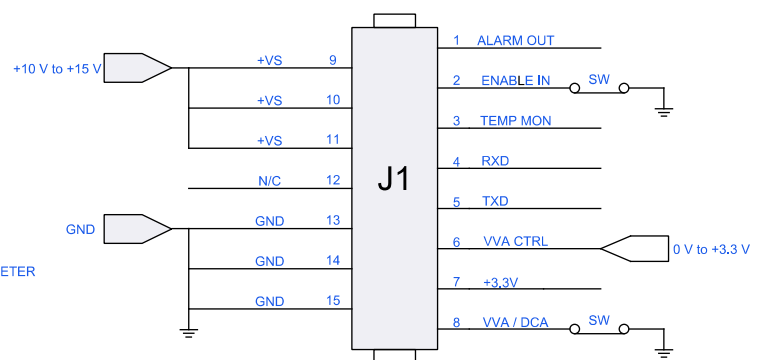


FIGURE 2

When J1-8 is grounded, the circuit shown in figure 1 can be used to provide an analog input voltage to J1-6. The user also has the option to provide their own control voltage to pin J1-6 per figure 2. See calculation below for gain attenuation control details:

$$\text{Gain Attenuation} = 20 * (\text{VVA CTRL VOLTAGE}) / 3.3 \text{ dB}$$

Example: If voltage on J1-6 is 1V, then gain will be attenuated by 6dB. See page 5 for "GAIN ATTENUATION OVER VVA CTRL VOLTAGE" graph.

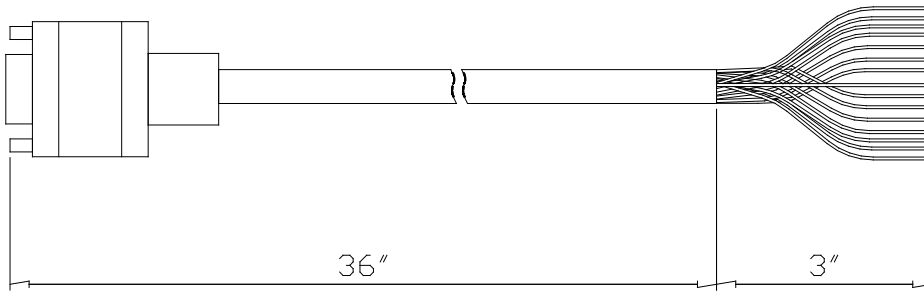




## Variable Gain Amplifier

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**ZVA-20543VGX+**50Ω 20 to 54 GHz  $P_{SAT}$  +31 dBm 1.85mm-Female**INCLUDED ACCESSORIES**

B20-9-0065-15 is a "Pigtail" connector included with every purchase of ZVA-20543VG(X)+. B20-9-0065-15 is a shielded cable with stripped wires (#28AWG) on one end and a connector on the other end designed to mate to the ZVA-20543VG(X)+. These bare wires enable the customer to assemble their own cable as required to interface with the ZVA-20543VG(X)+ (cable length is 3ft/ 0.9meters).

**B20-9-0065-15 WIRING INFORMATION**

| Function  | Pin Number | Description                                                                         | Wire Color   |
|-----------|------------|-------------------------------------------------------------------------------------|--------------|
| ALARM OUT | J1-1       | Normally logic low (0V), +3.3V when fault is present                                | White        |
| ENABLE IN | J1-2       | Logic low (0V) to unmute (enable), logic high to mute (disable)                     | Black        |
| TEMP MON  | J1-3       | Provides analog output voltage representing temperature of module                   | Red          |
| RXD       | J1-4       | Connect to TXD of TTL to USB serial converter                                       | Green        |
| TXD       | J1-5       | Connect to RXD of TTL to USB serial converter                                       | Orange       |
| VVA CTRL  | J1-6       | Analog Input for gain control, +3.3V MAX                                            | Light Blue   |
| +3.3V     | J1-7       | Available voltage supply for analog gain control circuit (see figure 1)             | White/Black  |
| VVA/DCA   | J1-8       | Logic low (0V) for analog gain control, logic high (+3.3V) for digital gain control | Red/Black    |
| +VS       | J1-9       | Positive Supply Voltage                                                             | Green/Black  |
| +VS       | J1-10      | Positive Supply Voltage                                                             | Orange/Black |
| +VS       | J1-11      | Positive Supply Voltage                                                             | Blue/Black   |
| N/C       | J1-12      | NOT USED                                                                            | Black/White  |
| GND       | J1-13      | Ground                                                                              | Red/White    |
| GND       | J1-14      | Ground                                                                              | Green/White  |
| GND       | Shield     | Ground                                                                              | Shield       |



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## GRAPHICAL USER INTERFACE (GUI) FOR WINDOWS – KEY FEATURES

- Connect via USB (see Figure 3)
- Mute and Unmute the amplifier
- Monitor internal temperature of the amplifier
- Monitor output power of the amplifier
- Adjust attenuation via the slider shown below
- Monitor Alarm for any potential faults exhibited by the amplifier

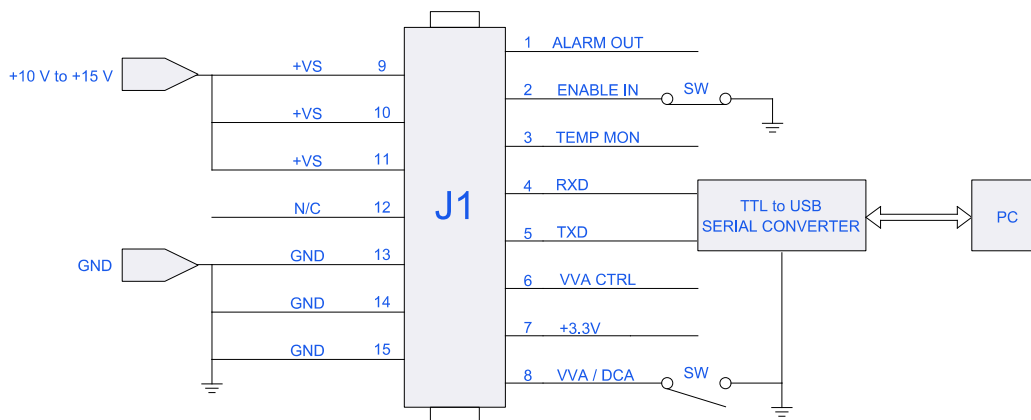
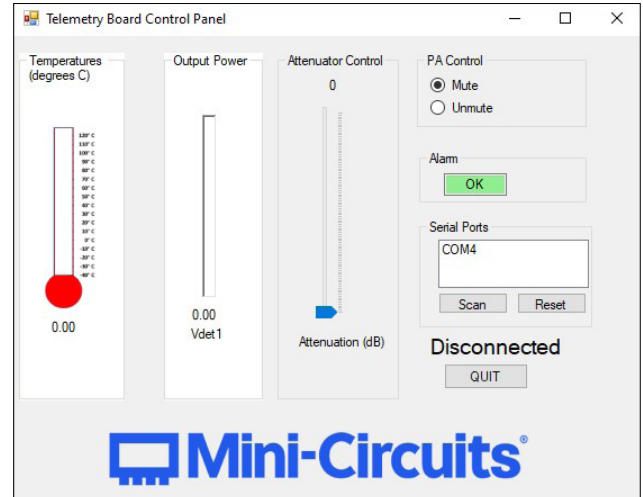


Figure 3

Suggest using TTL-232RG-VSW5V-WE from DigiKey for TTL to USB SERIAL CONVERTER

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## ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

|                           |                                                                                                 |
|---------------------------|-------------------------------------------------------------------------------------------------|
| Performance Data & Graphs | Data                                                                                            |
|                           | Graphs                                                                                          |
|                           | S-Parameter (S2P Files) Data Set (.zip file)                                                    |
| RoHS Status               | Compliant                                                                                       |
| Environmental Ratings     | ENV130                                                                                          |
| Export Information        | ECCN # 3A001.B.4<br>This item will require an export license when shipped to certain countries. |

## ORDERING INFORMATION

|                 |                              |                               |
|-----------------|------------------------------|-------------------------------|
| Model No. Links | <a href="#">ZVA-20543VG+</a> | <a href="#">ZVA-20543VGX+</a> |
| Option          | With heatsink                | Without heatsink              |
| Product Marking | ZVA-20543VG+                 | ZVA-20543VGX+                 |
| Case Style      | YU3369                       | YU3369-1                      |
| Connector       | 1.85mm-Female                |                               |



Typical Performance Data @ 0dB Attenuation

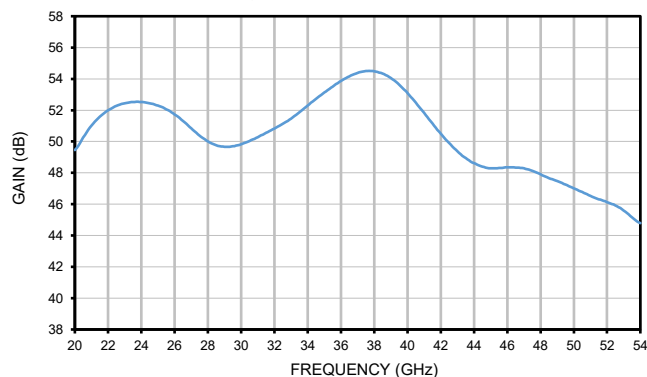
| FREQUENCY<br>(GHz) | GAIN<br>(dB) | DIRECTIVITY<br>(dB) | RETURN LOSS (dB) |       | Pout @ 1 dB<br>COMPRESSION<br>(dBm) | Pout at SATURATION<br>(dBm) | Output IP3<br>(dBm) | Noise Figure<br>(dB) |
|--------------------|--------------|---------------------|------------------|-------|-------------------------------------|-----------------------------|---------------------|----------------------|
|                    |              |                     | IN               | OUT   |                                     |                             |                     |                      |
| 20                 | 49.46        | 52.13               | 22.32            | 16.62 | 29.79                               | 30.84                       | 32.80               | 4.07                 |
| 21                 | 51.02        | 53.86               | 23.58            | 17.55 | 30.68                               | 31.29                       | 34.49               | 3.84                 |
| 22                 | 52.00        | 56.82               | 23.08            | 19.67 | 31.38                               | 32.14                       | 35.58               | 3.60                 |
| 23                 | 52.45        | 49.62               | 21.83            | 21.13 | 31.63                               | 32.50                       | 36.19               | 3.40                 |
| 24                 | 52.52        | 47.90               | 20.88            | 20.65 | 31.55                               | 32.64                       | 36.43               | 3.29                 |
| 25                 | 52.29        | 52.00               | 20.22            | 20.24 | 31.65                               | 32.91                       | 36.22               | 3.33                 |
| 26                 | 51.73        | 48.48               | 19.83            | 20.02 | 31.45                               | 32.80                       | 36.30               | 3.31                 |
| 27                 | 50.84        | 44.15               | 19.64            | 19.94 | 31.47                               | 32.71                       | 37.43               | 3.36                 |
| 28                 | 50.01        | 42.19               | 19.42            | 19.23 | 30.38                               | 32.12                       | 37.79               | 3.47                 |
| 29                 | 49.66        | 42.26               | 19.00            | 18.92 | 30.60                               | 31.62                       | 36.31               | 3.49                 |
| 30                 | 49.82        | 45.21               | 18.34            | 20.08 | 31.27                               | 32.24                       | 36.50               | 3.53                 |
| 31                 | 50.28        | 42.03               | 17.54            | 20.79 | 31.47                               | 32.61                       | 37.36               | 3.57                 |
| 32                 | 50.83        | 39.26               | 16.76            | 20.30 | 31.44                               | 32.76                       | 39.01               | 3.62                 |
| 33                 | 51.46        | 41.88               | 16.04            | 19.01 | 31.41                               | 32.70                       | 39.91               | 3.76                 |
| 34                 | 52.30        | 37.66               | 15.49            | 18.55 | 31.19                               | 32.60                       | 39.00               | 3.87                 |
| 35                 | 53.13        | 39.05               | 15.13            | 18.96 | 31.02                               | 32.35                       | 38.44               | 3.97                 |
| 36                 | 53.87        | 36.12               | 14.89            | 19.93 | 30.93                               | 32.26                       | 38.04               | 4.10                 |
| 37                 | 54.38        | 36.76               | 14.65            | 20.70 | 30.84                               | 32.09                       | 38.33               | 4.16                 |
| 38                 | 54.48        | 36.97               | 14.47            | 22.03 | 30.62                               | 31.83                       | 38.55               | 4.21                 |
| 39                 | 54.05        | 34.03               | 14.36            | 26.02 | 30.48                               | 31.23                       | 38.46               | 4.29                 |
| 40                 | 53.10        | 33.94               | 14.42            | 30.71 | 30.21                               | 31.12                       | 38.57               | 4.38                 |
| 41                 | 51.82        | 35.34               | 14.73            | 28.94 | 29.88                               | 30.59                       | 39.69               | 4.47                 |
| 42                 | 50.49        | 39.98               | 15.28            | 26.50 | 29.54                               | 30.26                       | 38.53               | 4.55                 |
| 43                 | 49.37        | 37.43               | 15.99            | 27.19 | 29.05                               | 29.65                       | 38.18               | 4.65                 |
| 44                 | 48.62        | 41.86               | 16.68            | 25.38 | 28.52                               | 29.39                       | 38.18               | 4.73                 |
| 45                 | 48.30        | 35.26               | 17.15            | 22.24 | 27.92                               | 28.84                       | 37.32               | 4.73                 |
| 46                 | 48.35        | 37.83               | 17.17            | 19.93 | 27.50                               | 28.43                       | 36.29               | 4.70                 |
| 47                 | 48.28        | 38.59               | 16.75            | 18.61 | 27.20                               | 28.01                       | 35.33               | 4.69                 |
| 48                 | 47.91        | 36.99               | 16.09            | 17.88 | 26.93                               | 27.97                       | 33.96               | 4.49                 |
| 49                 | 47.47        | 37.38               | 15.48            | 17.09 | 27.04                               | 28.04                       | 34.48               | 4.50                 |
| 50                 | 47.01        | 36.50               | 15.07            | 15.83 | 27.17                               | 28.29                       | 34.20               | 4.86                 |
| 51                 | 46.53        | 39.23               | 15.00            | 14.95 | 27.21                               | 28.54                       | 34.25               | 5.07                 |
| 52                 | 46.14        | 39.15               | 15.24            | 15.06 | 26.76                               | 28.45                       | 35.34               | 5.03                 |
| 53                 | 45.60        | 41.24               | 15.73            | 15.25 | 26.06                               | 28.16                       | 35.10               | 4.96                 |
| 54                 | 44.79        | 43.65               | 16.40            | 15.53 | 25.46                               | 27.81                       | 35.32               | 5.43                 |

Typical Gain over Attenuation

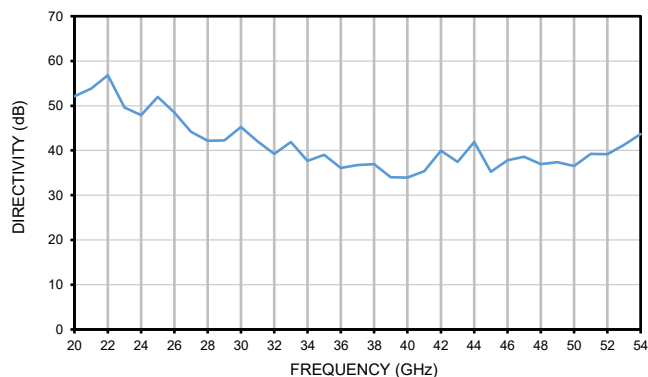
| FREQUENCY<br>(GHz) | GAIN  |       |       |       |       |       |       |       |
|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|
|                    | 1 dB  | 2 dB  | 3 dB  | 4 dB  | 5 dB  | 10 dB | 15 dB | 17 dB |
| 20                 | 48.51 | 47.73 | 46.61 | 45.54 | 44.48 | 39.76 | 34.85 | 32.82 |
| 21                 | 50.11 | 49.36 | 48.28 | 47.22 | 46.20 | 41.54 | 36.60 | 34.55 |
| 22                 | 51.12 | 50.38 | 49.31 | 48.27 | 47.26 | 42.65 | 37.70 | 35.64 |
| 23                 | 51.57 | 50.83 | 49.77 | 48.73 | 47.73 | 43.14 | 38.19 | 36.13 |
| 24                 | 51.64 | 50.89 | 49.82 | 48.79 | 47.78 | 43.22 | 38.28 | 36.22 |
| 25                 | 51.40 | 50.64 | 49.56 | 48.52 | 47.51 | 42.99 | 38.06 | 36.00 |
| 26                 | 50.82 | 50.05 | 48.97 | 47.93 | 46.92 | 42.44 | 37.53 | 35.48 |
| 27                 | 49.91 | 49.14 | 48.06 | 47.01 | 46.00 | 41.57 | 36.68 | 34.66 |
| 28                 | 49.05 | 48.28 | 47.19 | 46.13 | 45.13 | 40.72 | 35.88 | 33.87 |
| 29                 | 48.70 | 47.90 | 46.80 | 45.72 | 44.71 | 40.32 | 35.50 | 33.51 |
| 30                 | 48.83 | 48.00 | 46.88 | 45.78 | 44.76 | 40.34 | 35.55 | 33.58 |
| 31                 | 49.25 | 48.40 | 47.26 | 46.15 | 45.11 | 40.67 | 35.86 | 33.91 |
| 32                 | 49.77 | 48.92 | 47.81 | 46.68 | 45.64 | 41.15 | 36.33 | 34.40 |
| 33                 | 50.38 | 49.55 | 48.44 | 47.29 | 46.24 | 41.64 | 36.76 | 34.83 |
| 34                 | 51.16 | 50.31 | 49.19 | 48.01 | 46.93 | 42.11 | 37.00 | 34.96 |
| 35                 | 51.96 | 51.11 | 50.01 | 48.81 | 47.72 | 42.77 | 37.40 | 35.24 |
| 36                 | 52.70 | 51.86 | 50.80 | 49.61 | 48.54 | 43.57 | 38.10 | 35.89 |
| 37                 | 53.21 | 52.40 | 51.36 | 50.17 | 49.11 | 44.16 | 38.66 | 36.45 |
| 38                 | 53.30 | 52.50 | 51.47 | 50.27 | 49.21 | 44.26 | 38.74 | 36.54 |
| 39                 | 52.85 | 52.08 | 51.07 | 49.87 | 48.81 | 43.84 | 38.26 | 36.06 |
| 40                 | 51.90 | 51.17 | 50.17 | 48.99 | 47.94 | 42.98 | 37.34 | 35.13 |
| 41                 | 50.64 | 49.92 | 48.94 | 47.77 | 46.73 | 41.77 | 36.10 | 33.90 |
| 42                 | 49.31 | 48.61 | 47.61 | 46.46 | 45.42 | 40.43 | 34.71 | 32.51 |
| 43                 | 48.20 | 47.51 | 46.53 | 45.38 | 44.35 | 39.32 | 33.51 | 31.30 |
| 44                 | 47.45 | 46.78 | 45.80 | 44.68 | 43.66 | 38.60 | 32.74 | 30.53 |
| 45                 | 47.11 | 46.43 | 45.45 | 44.34 | 43.32 | 38.26 | 32.41 | 30.23 |
| 46                 | 47.13 | 46.43 | 45.44 | 44.32 | 43.29 | 38.19 | 32.42 | 30.31 |
| 47                 | 47.04 | 46.35 | 45.34 | 44.22 | 43.18 | 38.02 | 32.31 | 30.28 |
| 48                 | 46.66 | 45.98 | 44.97 | 43.86 | 42.81 | 37.60 | 31.91 | 29.94 |
| 49                 | 46.22 | 45.54 | 44.53 | 43.43 | 42.38 | 37.13 | 31.50 | 29.60 |
| 50                 | 45.74 | 45.08 | 44.08 | 42.98 | 41.93 | 36.66 | 31.15 | 29.36 |
| 51                 | 45.27 | 44.62 | 43.64 | 42.56 | 41.53 | 36.35 | 31.01 | 29.34 |
| 52                 | 44.91 | 44.26 | 43.30 | 42.24 | 41.24 | 36.20 | 31.11 | 29.55 |
| 53                 | 44.36 | 43.72 | 42.77 | 41.73 | 40.76 | 35.88 | 31.09 | 29.65 |
| 54                 | 43.54 | 42.91 | 42.01 | 40.97 | 40.02 | 35.26 | 30.72 | 29.34 |

## Typical Performance Curves

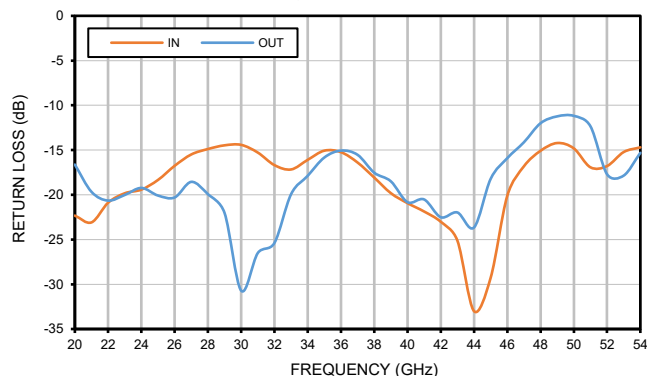
**GAIN @MINIMUM ATTENUATION**



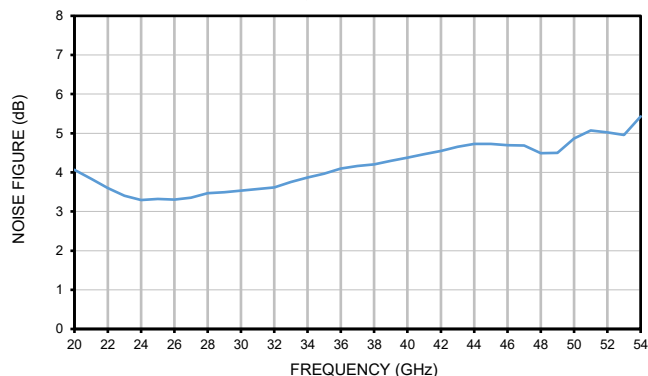
**DIRECTIVITY @MINIMUM ATTENUATION**



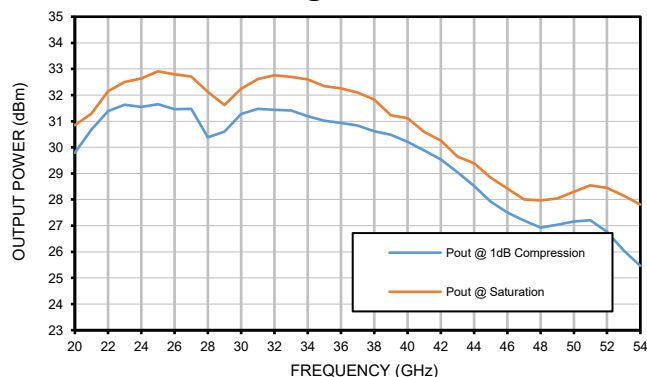
**RETURN LOSS @MINIMUM ATTENUATION**



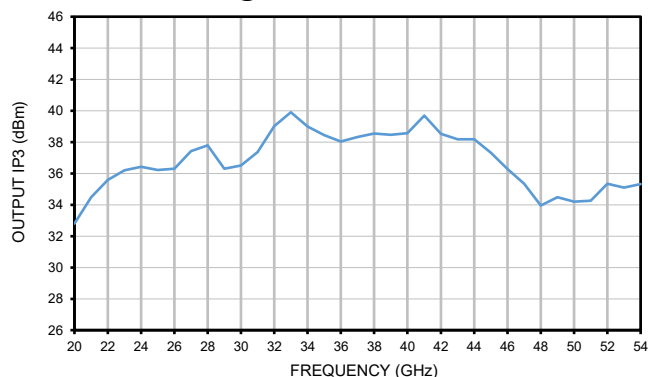
**NOISE FIGURE @MINIMUM ATTENUATION**



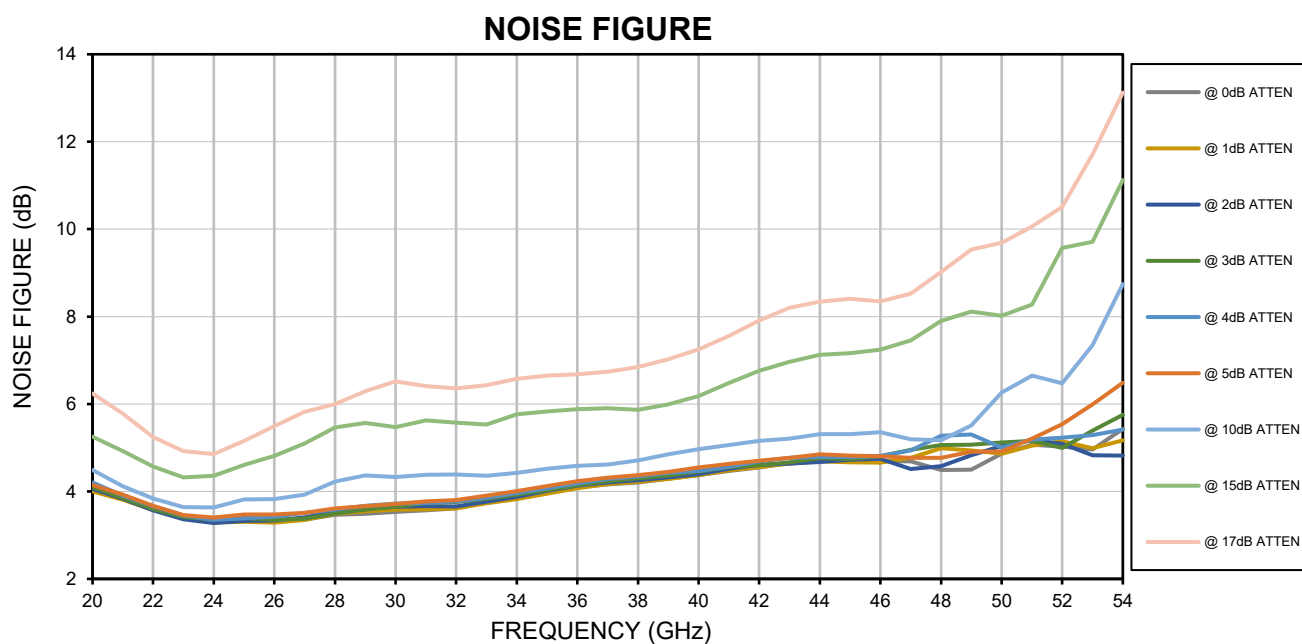
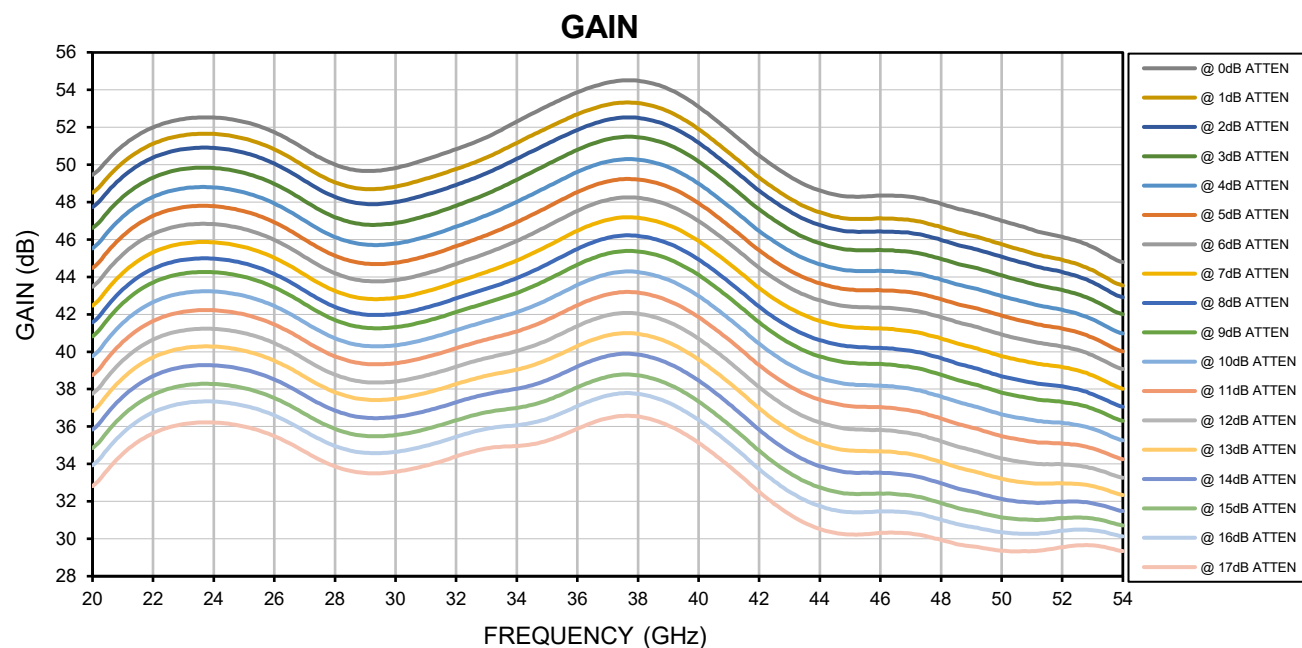
**OUTPUT POWER @MINIMUM ATTENUATION**



**OIP3 @MINIMUM ATTENUATION**

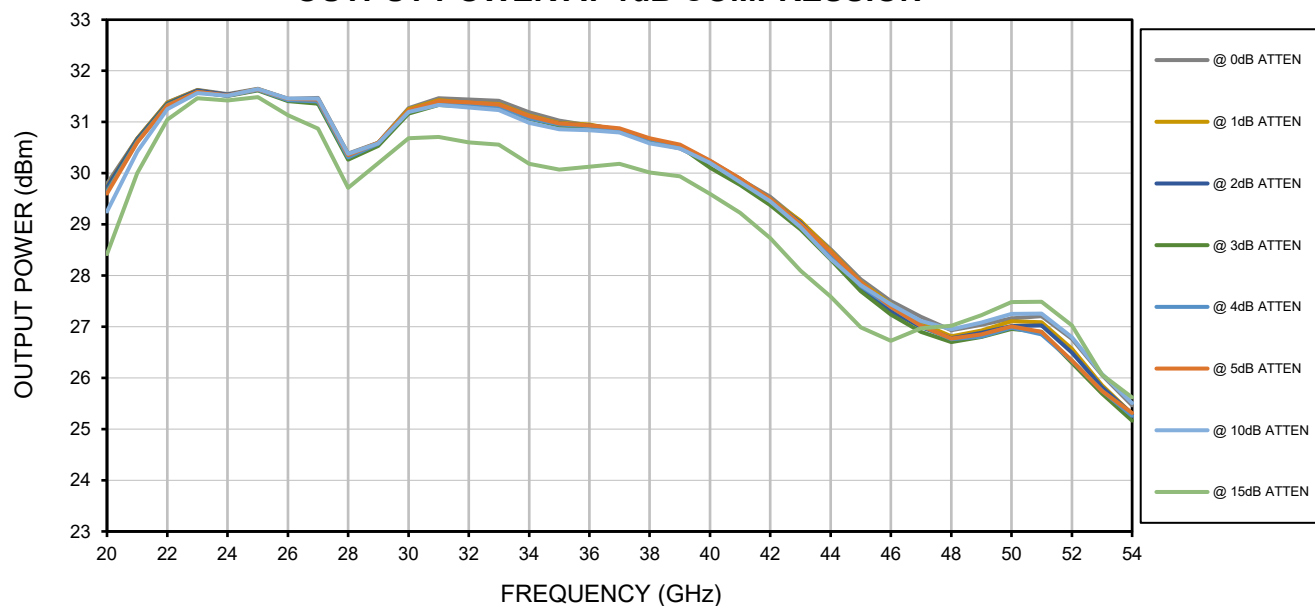


## Typical Performance Curves

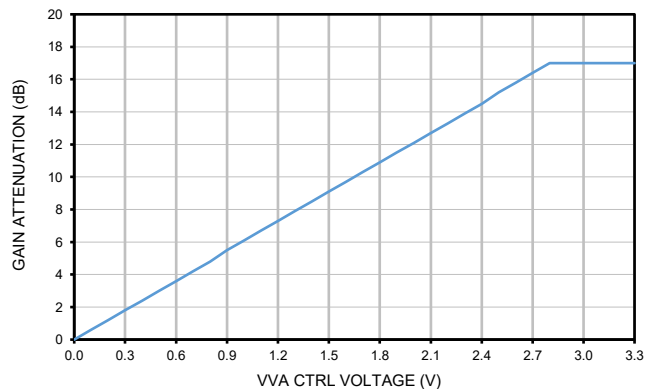


## Typical Performance Curves

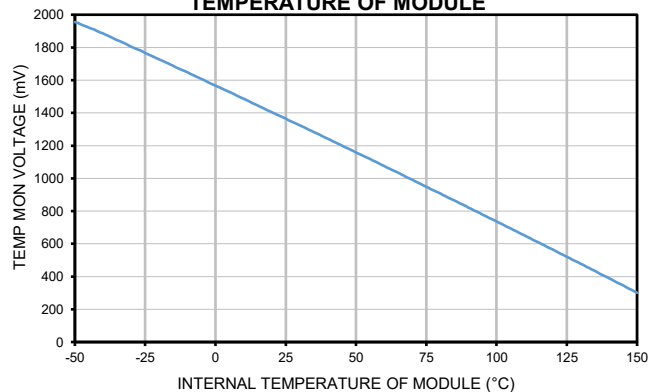
OUTPUT POWER AT 1dB COMPRESSION

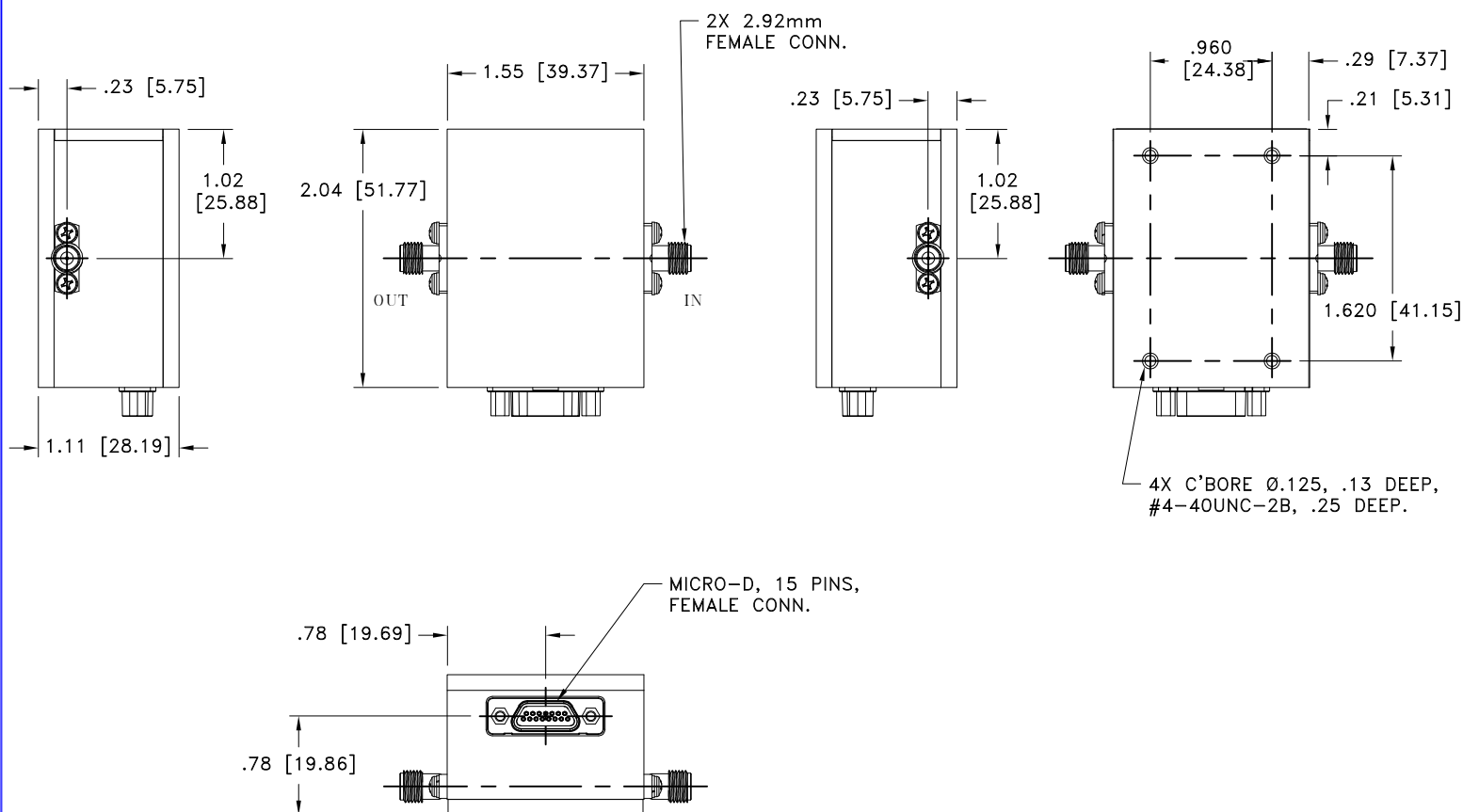


GAIN ATTENUATION OVER VVA CTRL VOLTAGE



TEMP MON OUTPUT VOLTAGE OVER INTERNAL TEMPERATURE OF MODULE





Weight: 6.5oz. (184 grams)

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03; 3 Pl. ±.015 Inch

### Notes:

Case material: Aluminum.  
Case Finish: Gold plated.

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RF/IF MICROWAVE COMPONENTS



All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

| Specification         | Test/Inspection Condition             | Reference/Spec                                 |
|-----------------------|---------------------------------------|------------------------------------------------|
| Operating Temperature | -40° to +60° C<br>Baseplate Temp      | Individual Model Data Sheet                    |
| Storage Temperature   | -40° to +85° C<br>Ambient Environment | Individual Model Data Sheet                    |
| Burn-in               | (DC on)<br>72 hours at 25°C           | ----                                           |
| Thermal Shock         | -40° C to +85°C, 100 cycles           | Transition time = 5 mins, Dwell time = 30 mins |
| Vibration             | Random Vibration<br>(non-operating)   | MIL-STD-883K, Method 2025, Cond. 1A            |