



COAXIAL

## High Power Amplifier

ZHL-10M2G0005+  
ZHL-10M2G0005X+

Mini-Circuits

50Ω 10 to 2000 MHz Broadband 5W SMA-Female

## KEY FEATURES

- Broadband, 10 to 2000 MHz
- High Gain, 51 dB typ.
- High P1dB, +36 dBm, typ.
- High OIP3, +44 dBm typ

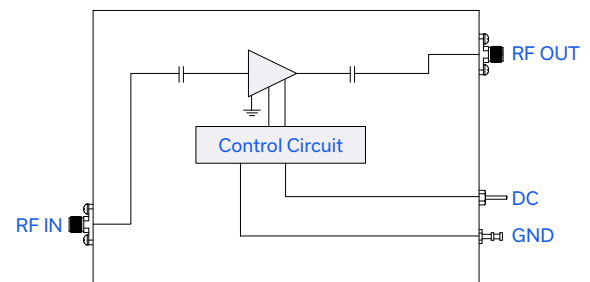


Generic photo used for illustration purposes only

## APPLICATIONS

- Communication Systems
- R&D, Production, and Test Systems
- Test & Measurement Equipment
- General Laboratory Applications

## FUNCTIONAL DIAGRAM



## PRODUCT OVERVIEW

The ZHL-10M2G0005(X)+ is a high-power broadband amplifier providing 5W of output power with a typical small signal gain of 51 dB over the 10 to 2000 MHz frequency band. The amplifier uses state-of-the-art semiconductor technology and can be used in a wide range of applications. A single supply voltage ensures ease of operation. The amplifier is made with a rugged aluminum housing and can be supplied with or without a heatsink.

ELECTRICAL SPECIFICATIONS AT  $T_{\text{MOUNTING BASE}} = +25^{\circ}\text{C}$ ,  $V_{\text{DC}} = +28\text{V}$ 

| Parameter                          | Symbol               | Condition                             | Min. | Typ.      | Max.      | Units |
|------------------------------------|----------------------|---------------------------------------|------|-----------|-----------|-------|
| Frequency Range                    | f                    |                                       | 10   |           | 2000      | MHz   |
| Small Signal Gain                  | $G_{\text{SS}}$      | $P_{\text{OUT}} = -25\text{dBm}$      | 45   | 51        | 55        | dB    |
| Small Signal Gain Flatness         | $G_{\text{SS-FLAT}}$ | $P_{\text{OUT}} = -25\text{dBm}$      |      | $\pm 1.0$ | $\pm 2.5$ | dB    |
| Output Power at 1dB compression    | $P_{1\text{dB}}$     | $P_{\text{OUT-REF}} = +35\text{dBm}$  |      | +36       |           | dBm   |
| Output Power at Saturation         | $P_{\text{SAT}}$     | $P_{\text{OUT-REF}} = +35\text{dBm}$  | +37  | +41       |           | dBm   |
| Noise Figure                       | NF                   |                                       |      | 10        |           | dB    |
| Output Third Order Intercept Point | OIP3                 | $P_{\text{OUT}} = +20\text{dBm/tone}$ | +40  | +44       |           | dBm   |
| Input Return Loss                  | I-RL                 | $P_{\text{OUT}} = -25\text{dBm}$      | 7.4  | 25        |           | dB    |
| Output Return Loss                 | O-RL                 | $P_{\text{OUT}} = -25\text{dBm}$      | 3.9  | 10        |           | dB    |
| DC Supply Voltage                  | $V_{\text{DC}}$      |                                       | 27   | 28        | 32        | V     |
| Supply Current                     | $I_{\text{DC}}$      | Without fan @ $P_{3\text{dB}}$        |      | 1.0       | 3.0       | A     |
|                                    |                      | With fan @ $P_{3\text{dB}}$           |      | 1.4       | 3.4       |       |

Mini-Circuits

www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

 REV. OR  
 ECO-019971  
 ZHL-10M2G0005+  
 MCL NY  
 250228

PAGE 1 OF 5



COAXIAL

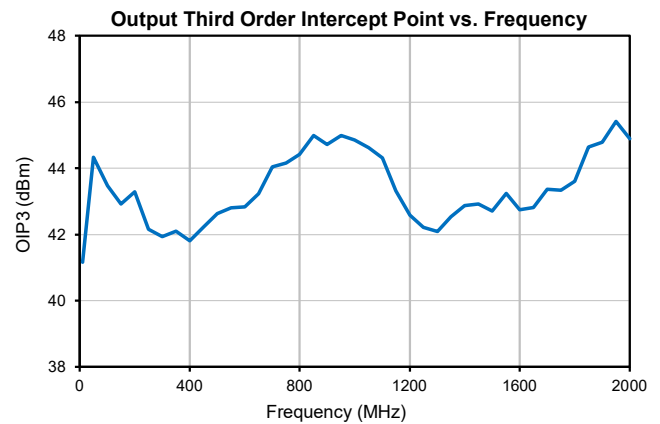
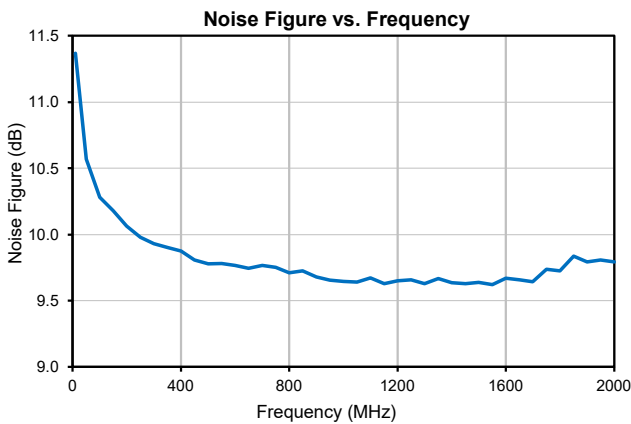
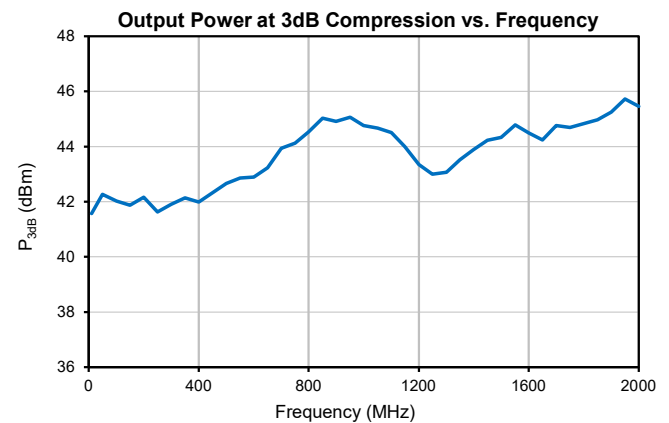
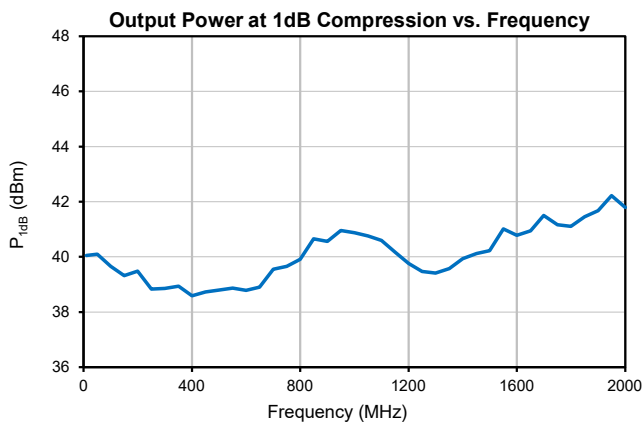
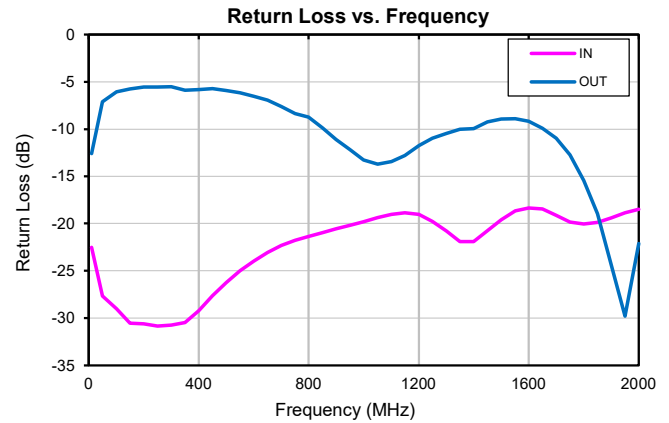
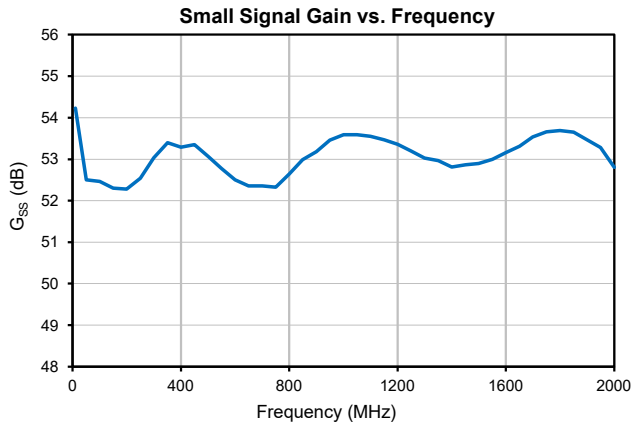
# High Power Amplifier

**ZHL-10M2G0005+**  
**ZHL-10M2G0005X+**

Mini-Circuits

50Ω 10 to 2000 MHz Broadband 5W SMA-Female

TYPICAL PERFORMANCE DATA AT  $T_{\text{MOUNTINGBASE}} = +25^{\circ}\text{C}$ ,  $V_{\text{DC}} = +28\text{V}$ , 50 OHM



Mini-Circuits



## High Power Amplifier

ZHL-10M2G0005+  
ZHL-10M2G0005X+

50Ω 10 to 2000 MHz Broadband 5W SMA-Female

## ABSOLUTE MAXIMUM RATINGS

| Parameter                                                                | Ratings                                                       |
|--------------------------------------------------------------------------|---------------------------------------------------------------|
| Operating Temperature                                                    | ZHL-10M2G0005+ $T_{\text{AMBIENT}}$ : -20 °C to +60 °C        |
|                                                                          | ZHL-10M2G0005X+ $T_{\text{MOUNTING BASE}}$ : -20 °C to +85 °C |
| Storage Temperature                                                      | 55 °C to +100 °C                                              |
| No damage with an open or short at $P_{\text{OUT}} = +37 \text{ dBm CW}$ |                                                               |
| RF Input Power (no damage)                                               | +5 dBm                                                        |
| DC Operating Voltage                                                     | ±32 V                                                         |

Permanent damage may occur if any of these limits are exceeded.

## 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 MOUNTING BASE TEMP = +85 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE)<br>MAXIMUM USER AMBIENT TEMP = +60 °C (USER DEFINED)<br>POWER DISSIPATION = 28 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE)<br>THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = 0.9 °C/W |



Mini-Circuits

COAXIAL

## High Power Amplifier

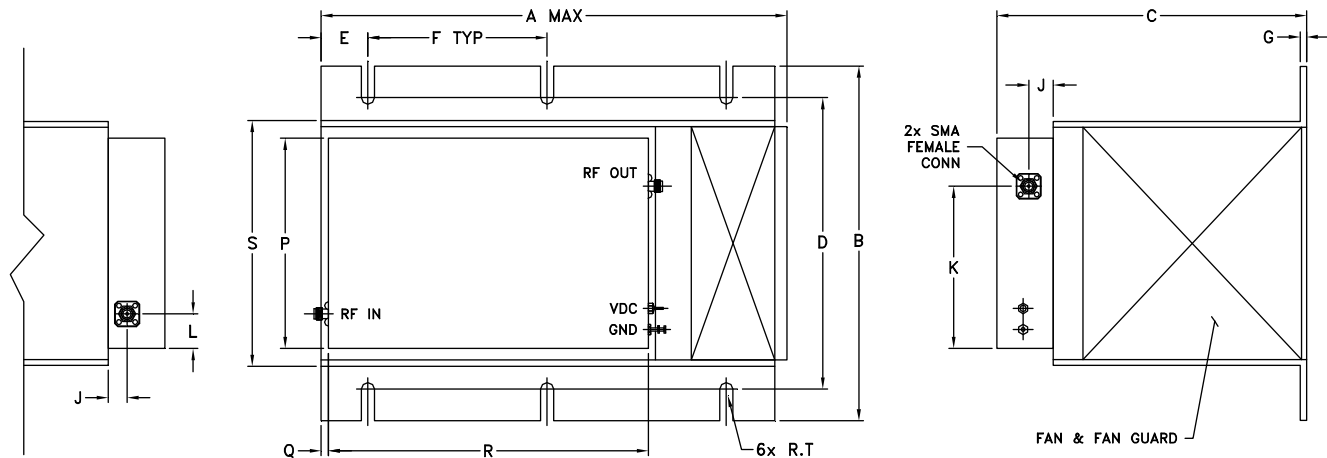
ZHL-10M2G0005+  
ZHL-10M2G0005X+

50Ω 10 to 2000 MHz Broadband 5W SMA-Female

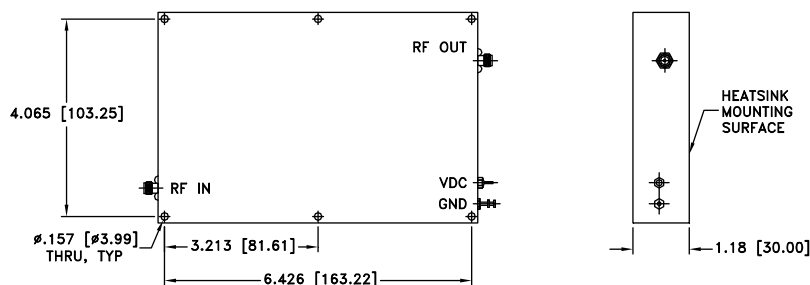
## COAXIAL CONNECTIONS

|              |            |
|--------------|------------|
| IN (RF IN)   | SMA-Female |
| OUT (RF OUT) | SMA-Female |

## CASE STYLE DRAWING WITH HEATSINK (ZHL-10M2G0005+)



## CASE STYLE DRAWING WITHOUT HEATSINK (ZHL-10M2G0005X+)



Weight: 4565 grams Weight without heatsink: 880 grams Dimensions are in inches [mm].

Tolerances: 2 Pl.  $\pm 0.03$ ; 3 Pl.  $\pm 0.015$  InchOUTLINE DIMENSIONS (Inch  
mm)

| A      | B      | C      | D     | E     | F     | G    | J     | K     | L     | M  | P      | Q    | R      | S      | T    | wt     |
|--------|--------|--------|-------|-------|-------|------|-------|-------|-------|----|--------|------|--------|--------|------|--------|
| 9.85   | 7.30   | 6.50   | 6.00  | 0.98  | 3.75  | 0.13 | 0.47  | 3.34  | 0.71  | -- | 4.33   | 0.20 | 6.69   | 5.10   | 0.14 | grams* |
| 250.19 | 185.42 | 167.64 | 152.4 | 24.89 | 95.25 | 3.30 | 12.00 | 84.80 | 18.00 | -- | 110.00 | 5.08 | 170.00 | 129.54 | 3.45 | 4565   |

\*880 grams without heatsink





Mini-Circuits

COAXIAL

# High Power Amplifier

**ZHL-10M2G0005+**  
**ZHL-10M2G0005X+**

50Ω 10 to 2000 MHz Broadband 5W SMA-Female

## ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

|                           |                                              |
|---------------------------|----------------------------------------------|
| Performance Data & Graphs | Table                                        |
|                           | Graphs                                       |
|                           | S-Parameter (S2P Files) Data Set (.zip file) |
| RoHS Status               | Compliant                                    |
| Environmental Ratings     | ENV23T19                                     |

## ORDERING INFORMATION

|                 |                                    |                                 |
|-----------------|------------------------------------|---------------------------------|
| Model No. Links | <a href="#">ZHL-10M2G0005+</a>     | <a href="#">ZHL-10M2G0005X+</a> |
| Option          | With heatsink                      | Without heatsink                |
| Case Style      | BT1689-1                           |                                 |
| Connector       | IN (SMA-Female) / OUT (SMA-Female) |                                 |

### NOTES

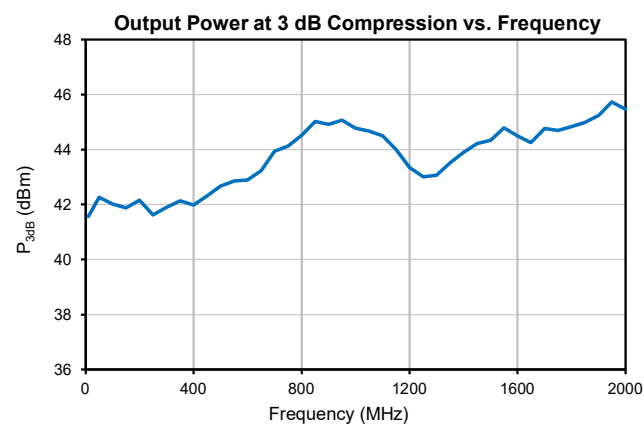
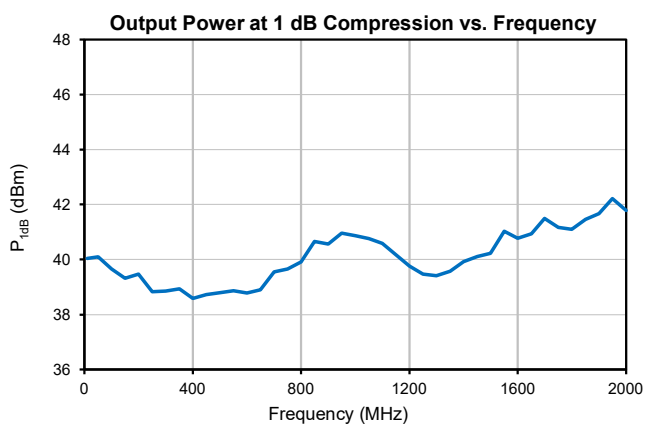
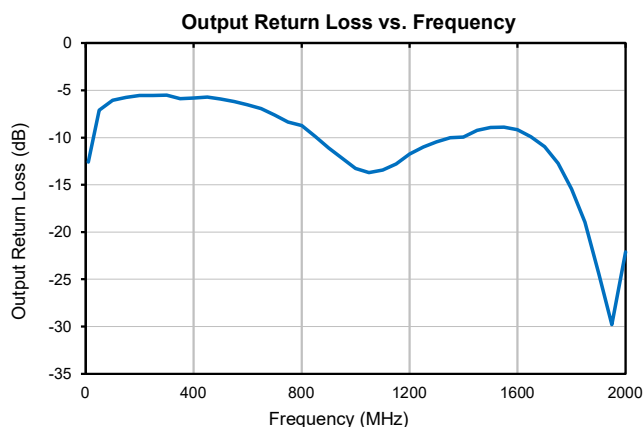
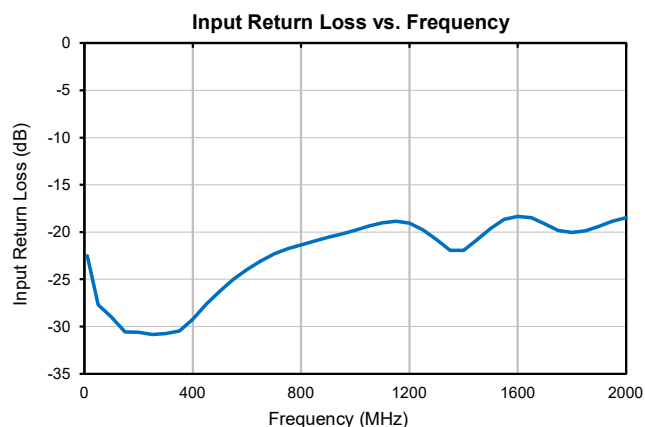
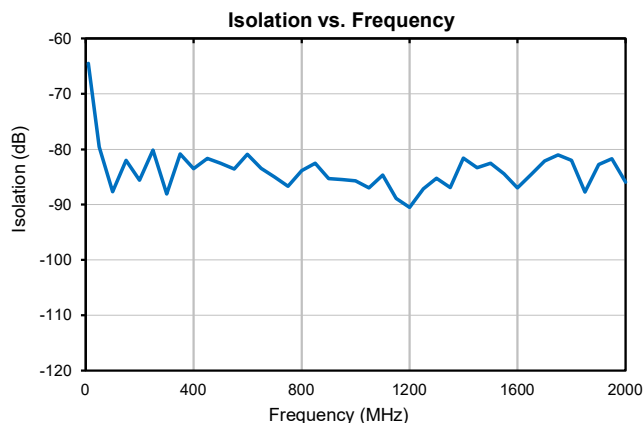
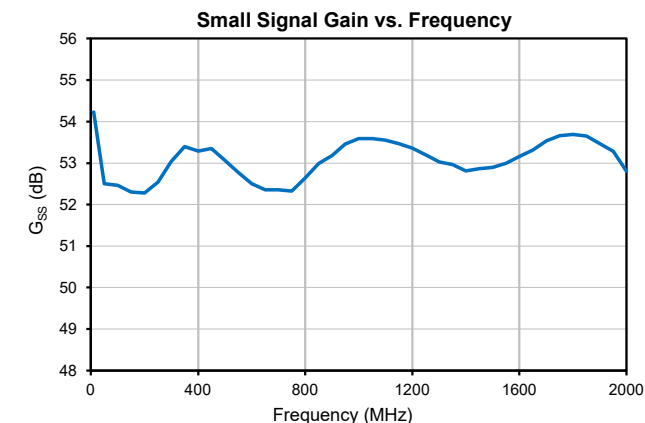
- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



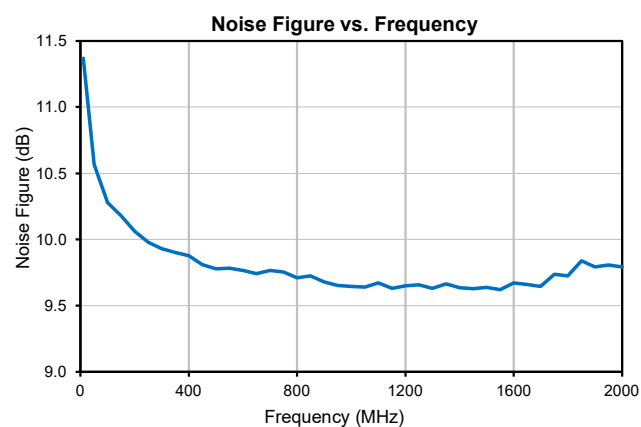
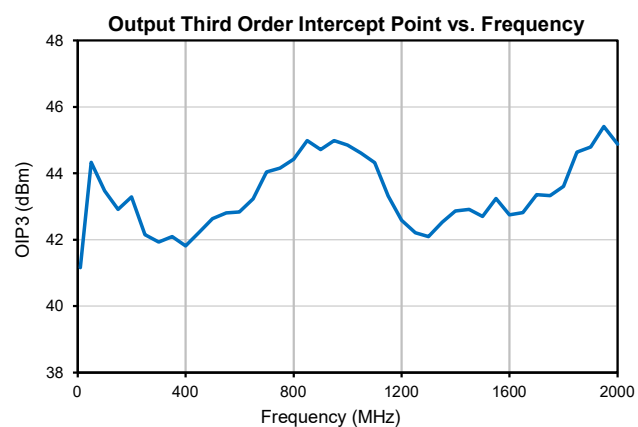
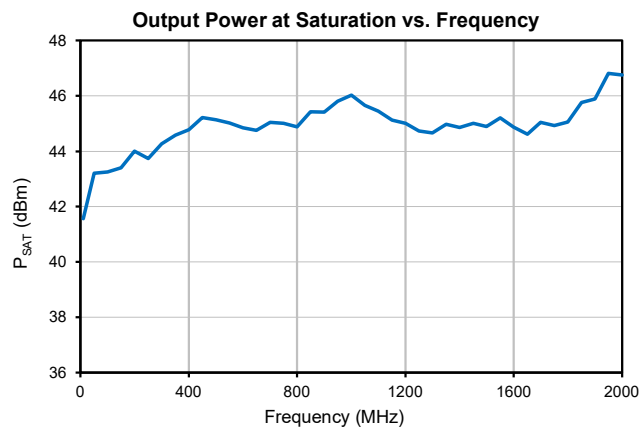
## Typical Performance Data

| Frequency<br>(MHz) | Gain  | Isolation | Return Loss (dB) |       | P <sub>OUT</sub> @ 1dB<br>Compression | P <sub>OUT</sub> @ 3dB<br>Compression | P <sub>OUT</sub> @<br>Saturation | OIP3  | Noise<br>Figure |
|--------------------|-------|-----------|------------------|-------|---------------------------------------|---------------------------------------|----------------------------------|-------|-----------------|
|                    | (dB)  | (dB)      | IN               | OUT   | (dBm)                                 | (dBm)                                 | (dBm)                            | (dBm) | (dB)            |
|                    | 28V   | 28V       | 28V              | 28V   | 28V                                   | 28V                                   | 28V                              | 28V   | 28V             |
| 10                 | 54.23 | 64.48     | 22.52            | 12.60 | 40.05                                 | 41.56                                 | 41.56                            | 41.16 | 11.37           |
| 50                 | 52.50 | 79.59     | 27.66            | 7.12  | 40.09                                 | 42.26                                 | 43.21                            | 44.33 | 10.57           |
| 100                | 52.46 | 87.68     | 29.03            | 6.08  | 39.66                                 | 42.02                                 | 43.25                            | 43.47 | 10.28           |
| 150                | 52.30 | 82.04     | 30.54            | 5.76  | 39.32                                 | 41.87                                 | 43.40                            | 42.92 | 10.18           |
| 200                | 52.28 | 85.61     | 30.62            | 5.56  | 39.47                                 | 42.16                                 | 44.01                            | 43.28 | 10.06           |
| 250                | 52.54 | 80.19     | 30.83            | 5.57  | 38.83                                 | 41.63                                 | 43.73                            | 42.15 | 9.98            |
| 300                | 53.04 | 88.08     | 30.77            | 5.53  | 38.86                                 | 41.90                                 | 44.28                            | 41.94 | 9.93            |
| 350                | 53.40 | 80.86     | 30.47            | 5.90  | 38.93                                 | 42.13                                 | 44.59                            | 42.10 | 9.90            |
| 400                | 53.29 | 83.52     | 29.22            | 5.84  | 38.58                                 | 41.98                                 | 44.77                            | 41.81 | 9.88            |
| 450                | 53.35 | 81.64     | 27.62            | 5.71  | 38.73                                 | 42.32                                 | 45.22                            | 42.23 | 9.81            |
| 500                | 53.07 | 82.53     | 26.24            | 5.91  | 38.80                                 | 42.66                                 | 45.13                            | 42.63 | 9.78            |
| 550                | 52.77 | 83.54     | 25.00            | 6.19  | 38.86                                 | 42.85                                 | 45.02                            | 42.80 | 9.78            |
| 600                | 52.50 | 80.89     | 23.97            | 6.52  | 38.79                                 | 42.89                                 | 44.85                            | 42.84 | 9.77            |
| 650                | 52.35 | 83.43     | 23.06            | 6.93  | 38.90                                 | 43.23                                 | 44.75                            | 43.23 | 9.74            |
| 700                | 52.36 | 85.05     | 22.32            | 7.61  | 39.55                                 | 43.94                                 | 45.04                            | 44.04 | 9.76            |
| 750                | 52.33 | 86.71     | 21.77            | 8.38  | 39.65                                 | 44.12                                 | 45.01                            | 44.16 | 9.75            |
| 800                | 52.65 | 83.85     | 21.37            | 8.74  | 39.91                                 | 44.53                                 | 44.88                            | 44.42 | 9.71            |
| 850                | 52.99 | 82.52     | 20.95            | 9.90  | 40.66                                 | 45.02                                 | 45.42                            | 44.98 | 9.72            |
| 900                | 53.18 | 85.34     | 20.53            | 11.10 | 40.57                                 | 44.92                                 | 45.41                            | 44.72 | 9.68            |
| 950                | 53.46 | 85.49     | 20.18            | 12.20 | 40.96                                 | 45.06                                 | 45.81                            | 44.99 | 9.65            |
| 1000               | 53.59 | 85.72     | 19.78            | 13.26 | 40.87                                 | 44.76                                 | 46.03                            | 44.85 | 9.65            |
| 1050               | 53.59 | 87.00     | 19.36            | 13.74 | 40.76                                 | 44.67                                 | 45.66                            | 44.62 | 9.64            |
| 1100               | 53.56 | 84.70     | 19.01            | 13.42 | 40.59                                 | 44.49                                 | 45.45                            | 44.32 | 9.67            |
| 1150               | 53.47 | 88.85     | 18.86            | 12.81 | 40.16                                 | 43.99                                 | 45.13                            | 43.32 | 9.63            |
| 1200               | 53.36 | 90.52     | 19.03            | 11.77 | 39.76                                 | 43.35                                 | 45.01                            | 42.58 | 9.65            |
| 1250               | 53.20 | 87.14     | 19.75            | 10.99 | 39.47                                 | 43.00                                 | 44.74                            | 42.21 | 9.66            |
| 1300               | 53.02 | 85.28     | 20.81            | 10.48 | 39.41                                 | 43.07                                 | 44.67                            | 42.09 | 9.63            |
| 1350               | 52.96 | 86.92     | 21.92            | 10.01 | 39.57                                 | 43.52                                 | 44.98                            | 42.53 | 9.67            |
| 1400               | 52.81 | 81.58     | 21.93            | 9.95  | 39.93                                 | 43.89                                 | 44.86                            | 42.87 | 9.64            |
| 1450               | 52.86 | 83.36     | 20.78            | 9.22  | 40.12                                 | 44.22                                 | 45.01                            | 42.92 | 9.63            |
| 1500               | 52.89 | 82.53     | 19.62            | 8.95  | 40.22                                 | 44.34                                 | 44.89                            | 42.71 | 9.64            |
| 1550               | 53.00 | 84.46     | 18.63            | 8.92  | 41.02                                 | 44.78                                 | 45.21                            | 43.24 | 9.62            |
| 1600               | 53.15 | 87.00     | 18.36            | 9.18  | 40.78                                 | 44.49                                 | 44.87                            | 42.74 | 9.67            |
| 1650               | 53.31 | 84.62     | 18.48            | 9.92  | 40.93                                 | 44.24                                 | 44.62                            | 42.82 | 9.66            |
| 1700               | 53.53 | 82.11     | 19.12            | 10.97 | 41.50                                 | 44.76                                 | 45.04                            | 43.36 | 9.64            |
| 1750               | 53.66 | 81.03     | 19.84            | 12.73 | 41.17                                 | 44.69                                 | 44.93                            | 43.33 | 9.74            |
| 1800               | 53.69 | 82.00     | 20.05            | 15.44 | 41.11                                 | 44.83                                 | 45.06                            | 43.61 | 9.73            |
| 1850               | 53.65 | 87.74     | 19.89            | 18.97 | 41.45                                 | 44.97                                 | 45.77                            | 44.64 | 9.84            |
| 1900               | 53.47 | 82.76     | 19.38            | 24.37 | 41.67                                 | 45.25                                 | 45.89                            | 44.79 | 9.79            |
| 1950               | 53.28 | 81.71     | 18.89            | 29.79 | 42.21                                 | 45.72                                 | 46.81                            | 45.41 | 9.81            |
| 2000               | 52.81 | 85.96     | 18.50            | 22.08 | 41.78                                 | 45.46                                 | 46.76                            | 44.89 | 9.79            |

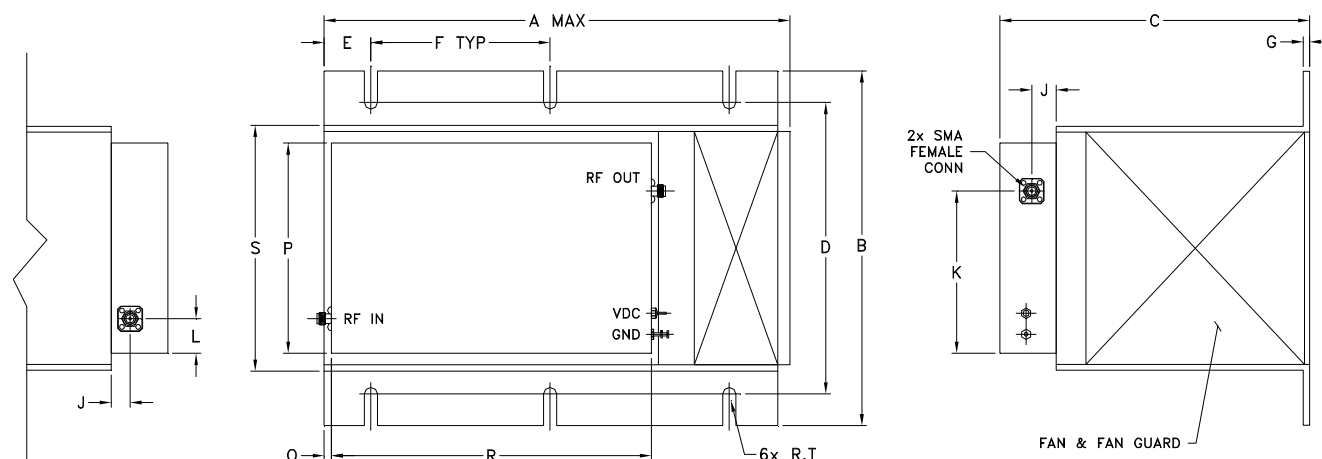
## Typical Performance Curves



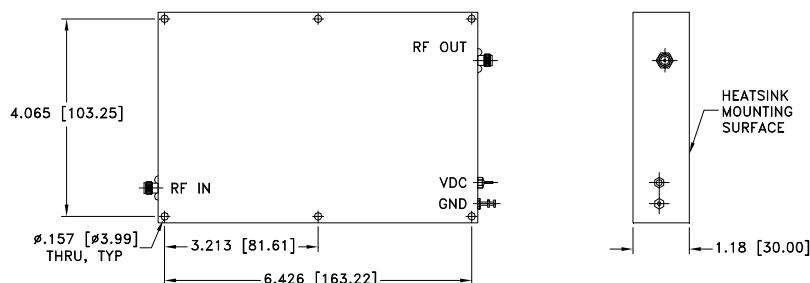
## Typical Performance Curves



### Outline Dimensions



### MOUNTING INFORMATION FOR MODELS WITHOUT HEATSINK



| CASE#    | A                | B               | C               | D                | E              | F               | G             | H | J             | K              | L             | M | N |
|----------|------------------|-----------------|-----------------|------------------|----------------|-----------------|---------------|---|---------------|----------------|---------------|---|---|
| BT1689-1 | 9.85<br>(250.19) | 7.3<br>(185.42) | 6.5<br>(165.10) | 6.00<br>(152.40) | .98<br>(24.89) | 3.75<br>(95.25) | .13<br>(3.30) | - | .47<br>(12.0) | 3.34<br>(84.8) | .71<br>(18.0) | - | - |

| CASE#    | P                | Q            | R                | S               | T              | WT, GRAM | WT WITHOUT HEATSINK, GRAM |
|----------|------------------|--------------|------------------|-----------------|----------------|----------|---------------------------|
| BT1689-1 | 4.33<br>(110.00) | .2<br>(5.08) | 6.69<br>(170.00) | 5.1<br>(129.54) | .136<br>(3.45) | 4565     | 880                       |

Dimensions in inches (mm). Tolerances: 1 Pl.  $\pm .1$ ; 2Pl.  $\pm .03$ ; 3 Pl.  $\pm .015$

### Notes:

- Case material: Aluminum alloy.
- Finish:  
For RoHS Case Styles: Clear Chemical conversion coating, non-chrome or trivalent chrome based.
- Heatsink finish: Black anodize.
- Refer to the individual model data sheet for the type of connectors available.
- Recommended screws for mounting model without heat sink on 3/32" thick sheet: #6-32, 1.50" Length.
- Shape of connector flange may vary.



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

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     | -20° to 45°C<br>Ambient Environment                  | Individual Model Data Sheet                        |
| Storage Temperature       | -55° to 100° C<br>Ambient Environment                | Individual Model Data Sheet                        |
| Stabilization Bake        | (non-operating)<br>125°C, 24 hours                   | - - -                                              |
| Burn-in at Elevated Temp. | (DC on)<br>160 hours at 60° C base plate Temperature | MIL-STD-202, Method 108                            |
| Thermal Shock             | -55° to 100°C, 5 cycles                              | MIL-STD-202, Method 107, Condition A, except 100°C |