



## MMIC SURFACE MOUNT

# Wideband Amplifier

## PMA4-9163+

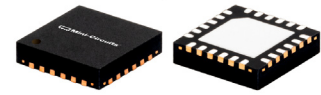
50Ω 9 to 16 GHz Medium Power Driver Amplifier

### THE BIG DEAL

- $P_{SAT}$ , Typ. +24.6 dBm
- Linear Gain, Typ. 23.5 dB
- Gain Flatness  $< \pm 1.5$  dB
- IM3, Typ. -38 dBc @  $P_{OUT} = +12$  dBm/tone
- Supply Voltage, +5 V at 145 mA
- 4×4 mm 24-Lead QFN-Style Package

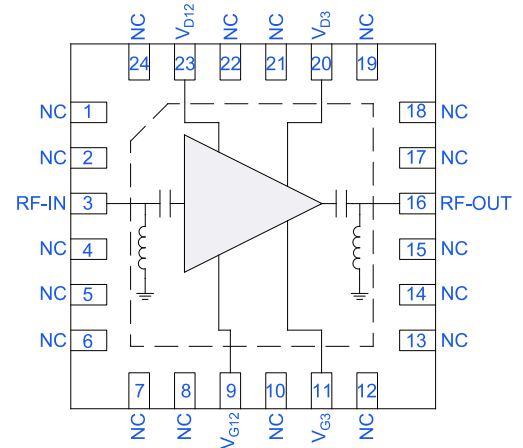
### APPLICATIONS

- Backhaul Radio Systems
- Satellite Communication
- Test & Measurement Equipment
- Radar, EW, and ECM Defense Systems



Generic photo used for illustration purposes only

### FUNCTIONAL DIAGRAM (TOP VIEW)



### PRODUCT OVERVIEW

The PMA4-9163+ is a GaAs MMIC multi-stage medium power driver amplifier operating from 9 to 16 GHz. The amplifier provides 23.5 dB of linear gain, greater than 0.2 W of saturated output power with 28% power-added efficiency, +52 dBm OIP2, and +30.6 dBm OIP3 at 12 GHz. The device operates on a +5 V supply and consumes 145 mA of quiescent current. The amplifier is 50Ω matched at the input and output, making it easy to implement and comes in an industry standard 4×4 mm 24-lead QFN-Style package for ease of integration into dense circuit board layouts.

### KEY FEATURES

| Feature                                          | Advantages                                                                                                                                                                                                                                     |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gain, Typ. 23.5 dB<br>$P_{SAT}$ , Typ. +24.6 dBm | Flat, broadband gain and output power make this device excellent for wideband systems from 9 to 16 GHz that require at least 0.2 W of operating output power over the full band.                                                               |
| OIP2, Typ. +52 dBm<br>OIP3, Typ. +30.6 dBm       | High operating OIP2 and OIP3 provide low in-band IM distortion products, enabling minimal signal-to-noise degradation in high fidelity measurement systems and communication systems.                                                          |
| 4×4 mm 24-Lead QFN-Style Package                 | Small footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB. Industry standard packaging allows for ease of assembly in high volume manufacturing processes. |

ELECTRICAL SPECIFICATIONS<sup>1</sup> AT +25 °C,  $V_{DD} = +5$  V, AND  $Z_0 = 50\Omega$  UNLESS NOTED OTHERWISE

| Parameter                                                                   | Condition (GHz) | Min. | Typ.  | Max. | Units |
|-----------------------------------------------------------------------------|-----------------|------|-------|------|-------|
| Frequency Range                                                             |                 | 9    |       | 16   | GHz   |
| Gain                                                                        | 9               | 21.8 | 23.5  |      | dB    |
|                                                                             | 10              | 21.8 | 23.5  |      |       |
|                                                                             | 12              | 21.9 | 23.5  |      |       |
|                                                                             | 14              | 21.5 | 22.9  |      |       |
|                                                                             | 16              | 20.2 | 22.2  |      |       |
| Input Return Loss                                                           | 9               |      | 16    |      | dB    |
|                                                                             | 10              |      | 29    |      |       |
|                                                                             | 12              |      | 14    |      |       |
|                                                                             | 14              |      | 22    |      |       |
|                                                                             | 16              |      | 16    |      |       |
| Output Return Loss                                                          | 9               |      | 11    |      | dB    |
|                                                                             | 10              |      | 18    |      |       |
|                                                                             | 12              |      | 15    |      |       |
|                                                                             | 14              |      | 34    |      |       |
|                                                                             | 16              |      | 16    |      |       |
| Isolation                                                                   | 9-16            |      | 56    |      | dB    |
| Output Power at 1 dB Compression (P1dB)                                     | 9               |      | +21.5 |      | dBm   |
|                                                                             | 10              |      | +22.0 |      |       |
|                                                                             | 12              |      | +23.2 |      |       |
|                                                                             | 14              |      | +22.6 |      |       |
|                                                                             | 16              |      | +21.5 |      |       |
| Output Power at Saturation ( $P_{SAT}$ ) <sup>2</sup>                       | 9               |      | +22.9 |      | dBm   |
|                                                                             | 10              |      | +23.1 |      |       |
|                                                                             | 12              |      | +24.6 |      |       |
|                                                                             | 14              |      | +23.9 |      |       |
|                                                                             | 16              |      | +22.7 |      |       |
| Output Third-Order Intercept (OIP3)<br>( $P_{OUT} = +12$ dBm/Tone)          | 9               |      | +31.0 |      | dBm   |
|                                                                             | 10              |      | +31.4 |      |       |
|                                                                             | 12              |      | +30.6 |      |       |
|                                                                             | 14              |      | +29.5 |      |       |
|                                                                             | 16              |      | +27.5 |      |       |
| Third-Order Intermodulation Distortion (IM3)<br>( $P_{OUT} = +12$ dBm/Tone) | 9               |      | -37.3 |      | dBc   |
|                                                                             | 10              |      | -38.4 |      |       |
|                                                                             | 12              |      | -37.1 |      |       |
|                                                                             | 14              |      | -34.7 |      |       |
|                                                                             | 16              |      | -30.5 |      |       |
| Output Second-Order Intercept (OIP2)<br>( $P_{OUT} = +12$ dBm/Tone)         | 9               |      | +34.3 |      | dBm   |
|                                                                             | 10              |      | +40.7 |      |       |
|                                                                             | 12              |      | +51.6 |      |       |
|                                                                             | 14              |      | +68.6 |      |       |
|                                                                             | 16              |      | +55.4 |      |       |
| Noise Figure                                                                | 9               |      | 5.9   |      | dB    |
|                                                                             | 10              |      | 5.4   |      |       |
|                                                                             | 12              |      | 5.1   |      |       |
|                                                                             | 14              |      | 4.9   |      |       |
|                                                                             | 16              |      | 4.6   |      |       |
| Device Operating Voltage ( $V_{DD}$ ) <sup>3</sup>                          |                 | +4   | +5    | +6   | V     |
| Device Operating Current ( $I_{DD}$ ) <sup>4</sup>                          |                 |      | 145   |      | mA    |
| Gate Voltage ( $V_{GG}$ ) <sup>5</sup>                                      |                 |      | -0.82 |      | V     |
| Gate Current ( $I_{GG}$ ) <sup>6</sup>                                      |                 |      | 8     |      | μA    |
| Device Current Variation vs. Temperature <sup>7</sup>                       |                 |      | 0.021 |      | mA/°C |

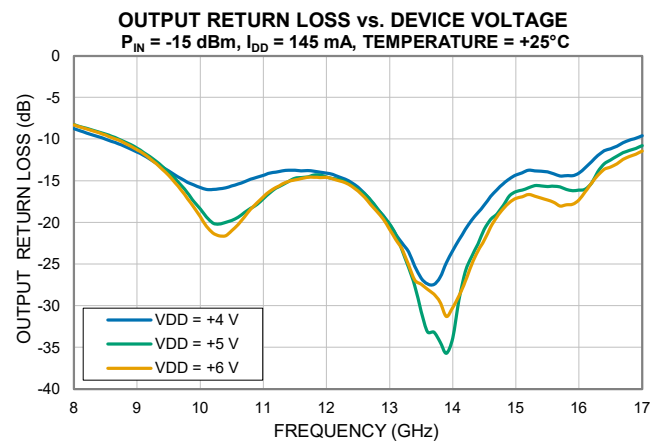
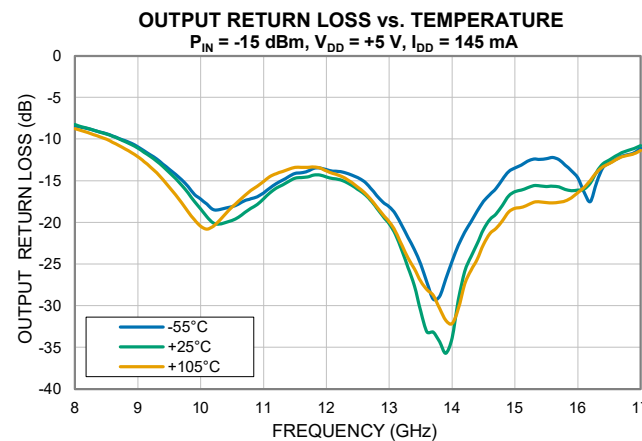
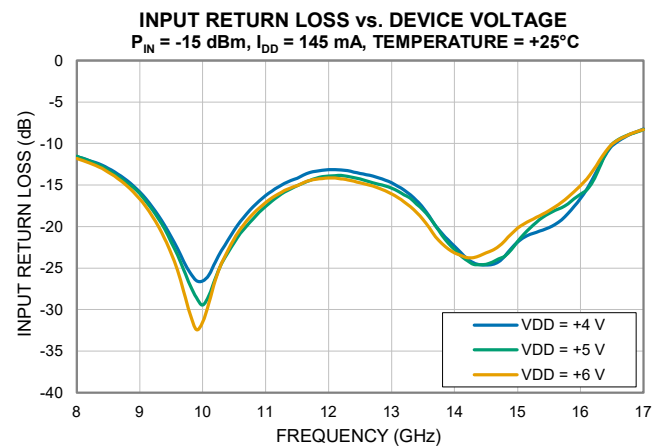
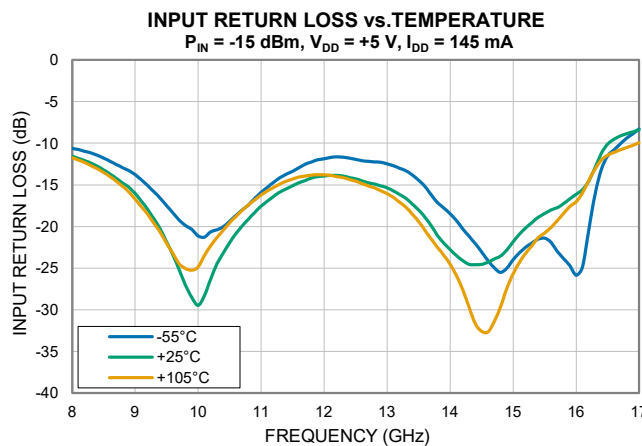
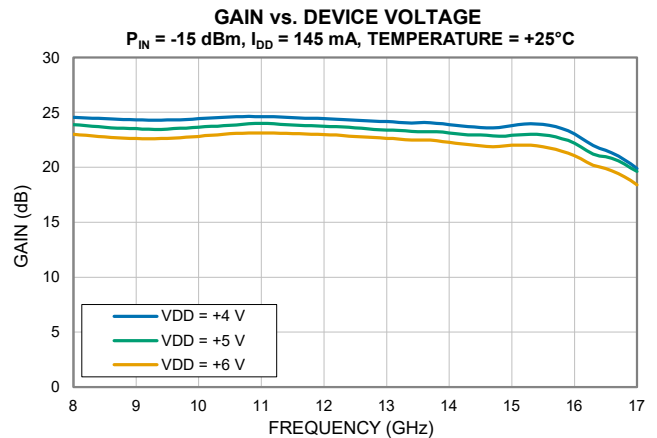
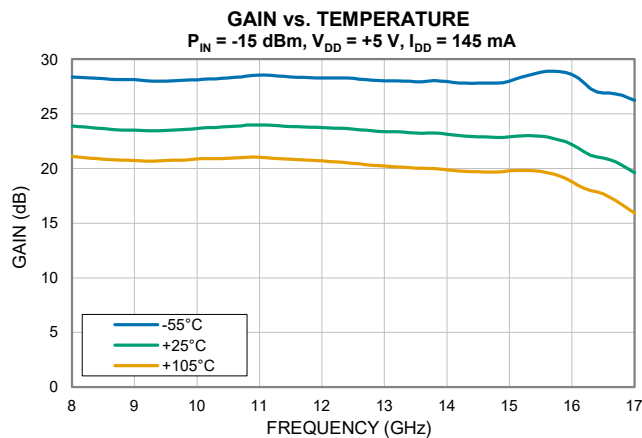
1. Tested on Mini-Circuits Evaluation Test Board TB-PMA4-9163C+. See Figure 2. Board loss de-embedded to the device.

2. Defined as output power at which change is 0.1 per 1 dB change in input power.

3.  $V_{DD} = V_{D12} = V_{D3}$ 4. Current at  $P_{IN} = -15$  dBm. Increases to 200 mA at  $P_{SAT}$ .  $I_{DD} = I_{D12} + I_{D3}$ .5.  $V_{GG} = V_{G12} = V_{G3}$ 6.  $I_{GG} = I_{G12} + I_{G3}$ 7. (Current at +105 °C - Current at -55 °C)/(160 °C).  $V_G$  held constant over temperature.

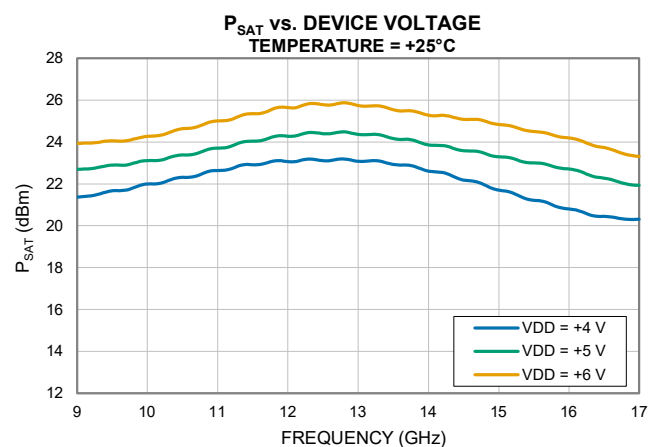
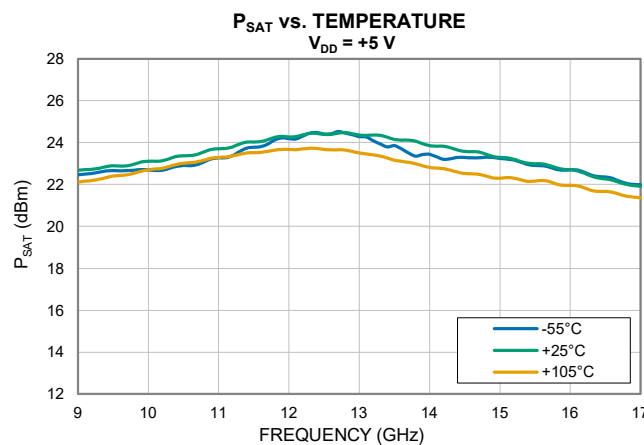
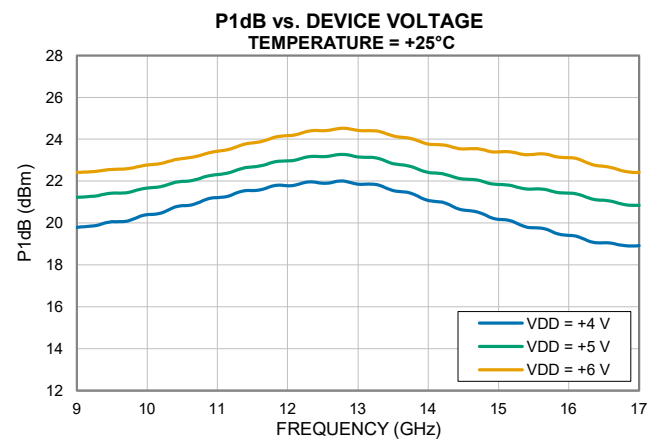
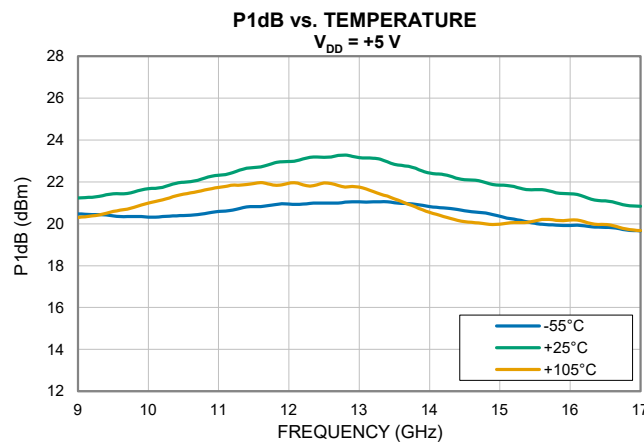
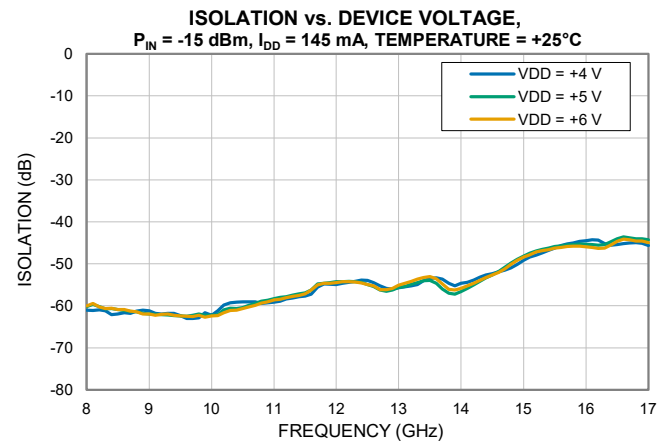
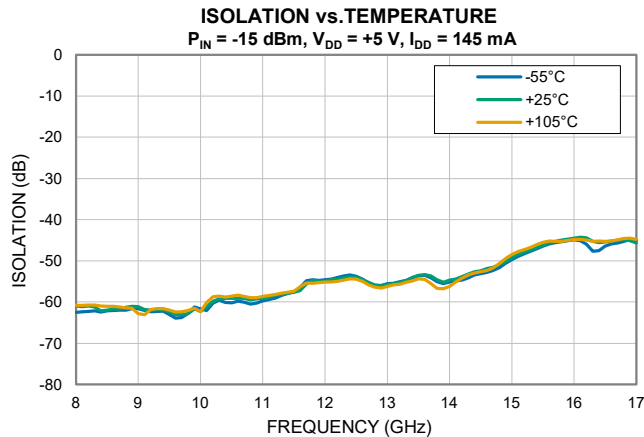


## TYPICAL PERFORMANCE GRAPHS



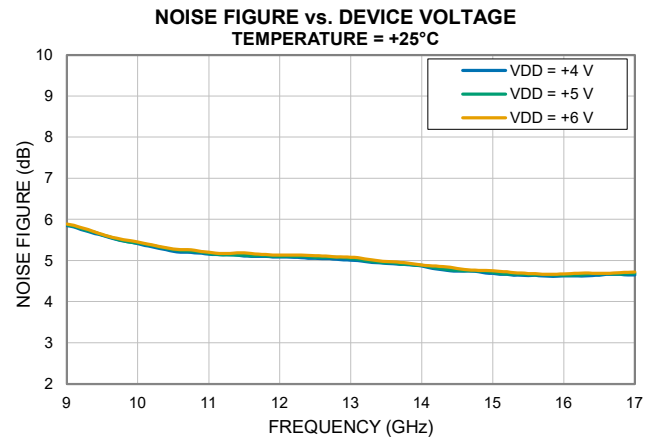
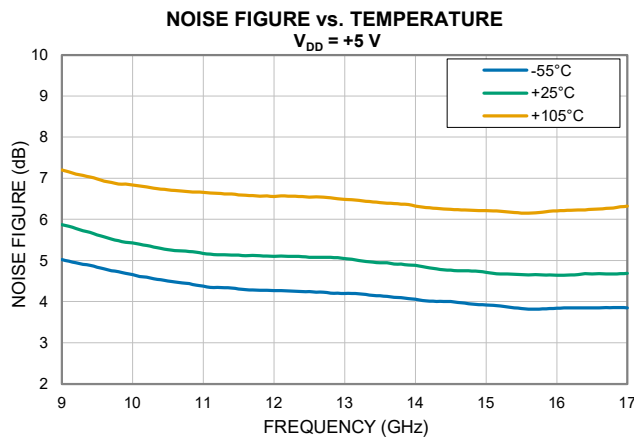
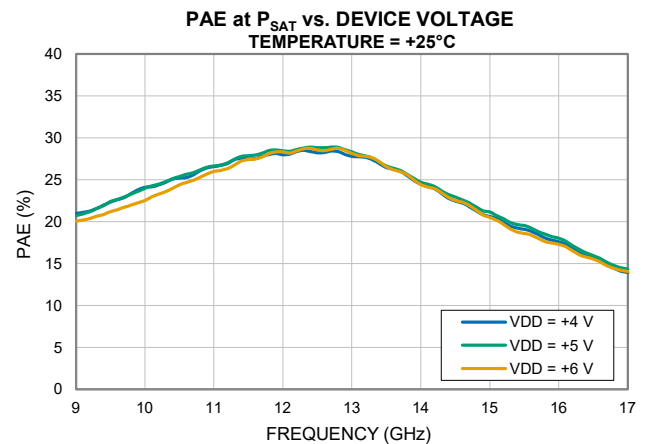
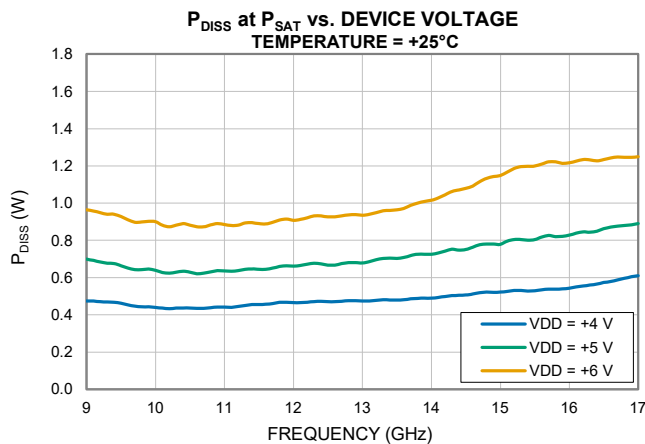
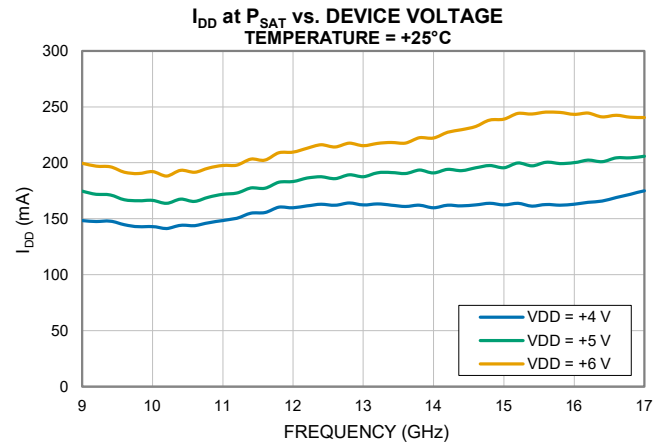
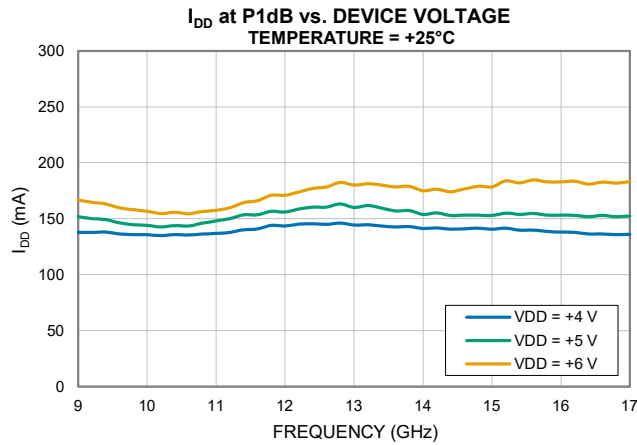


## TYPICAL PERFORMANCE GRAPHS





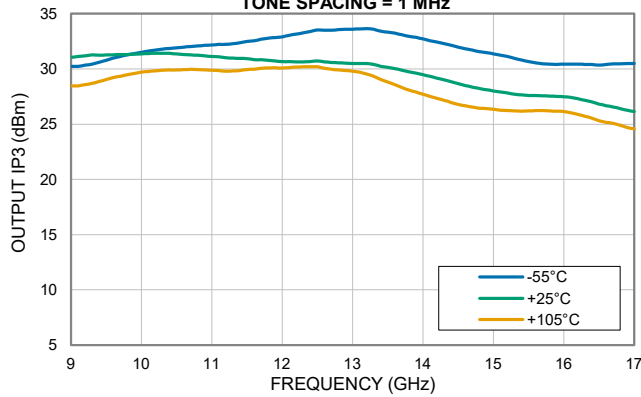
## TYPICAL PERFORMANCE GRAPHS



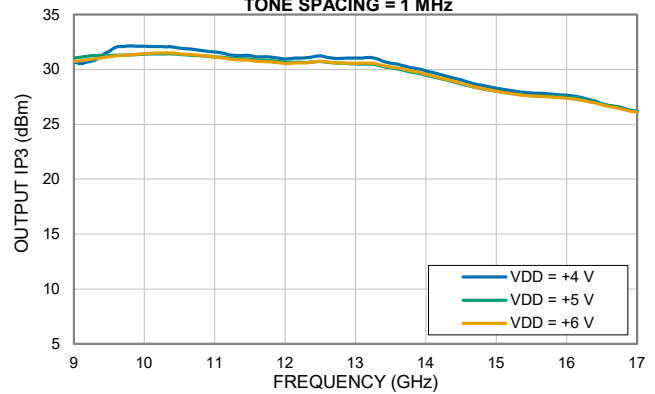


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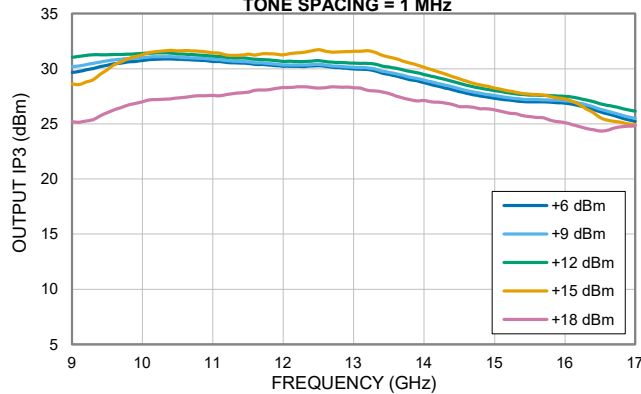
OUTPUT IP3 vs. TEMPERATURE

 $P_{OUT} = +12$  dBm/TONE,  $V_{DD} = +5$  V  
TONE SPACING = 1 MHz

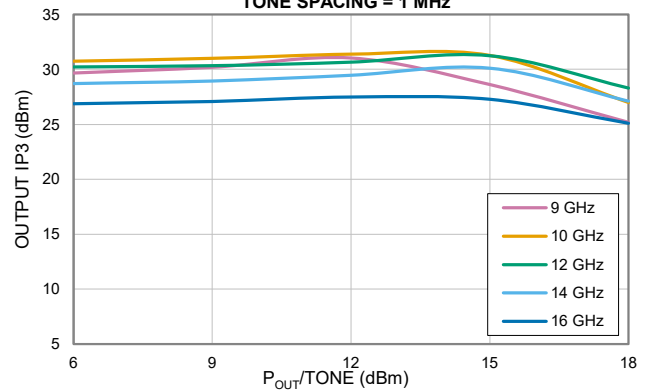
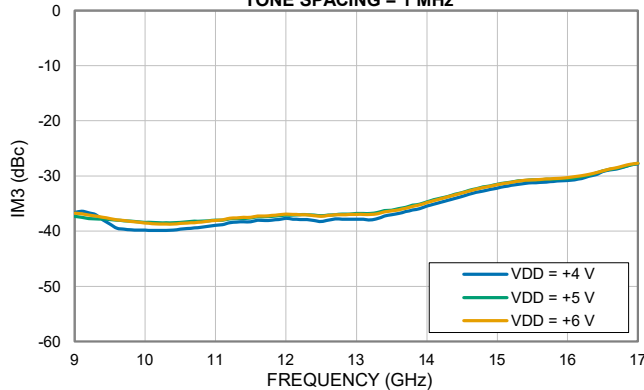
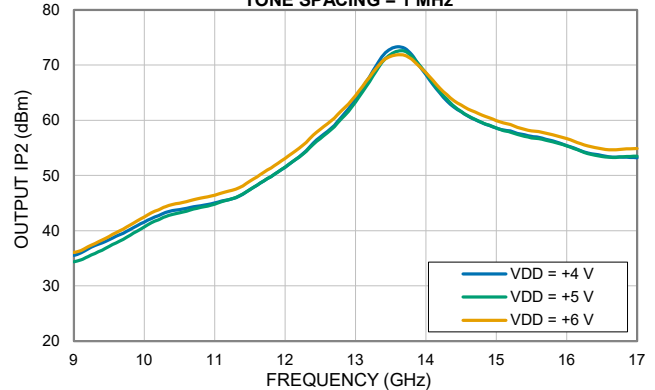
OUTPUT IP3 vs. DEVICE VOLTAGE,

 $P_{OUT} = +12$  dBm/TONE, TEMPERATURE = +25°C  
TONE SPACING = 1 MHz

OUTPUT IP3 vs. OUTPUT POWER

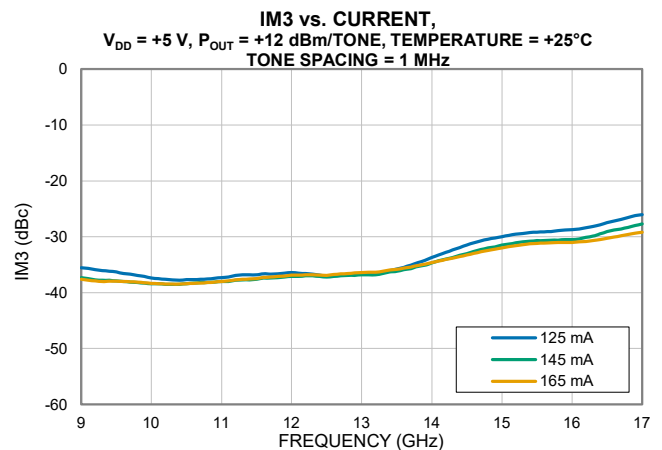
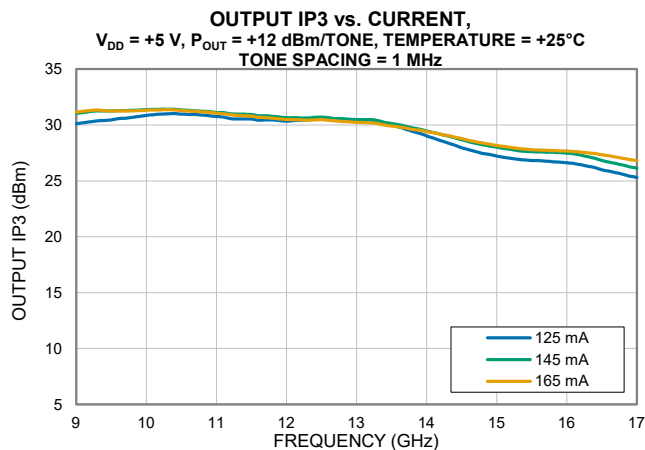
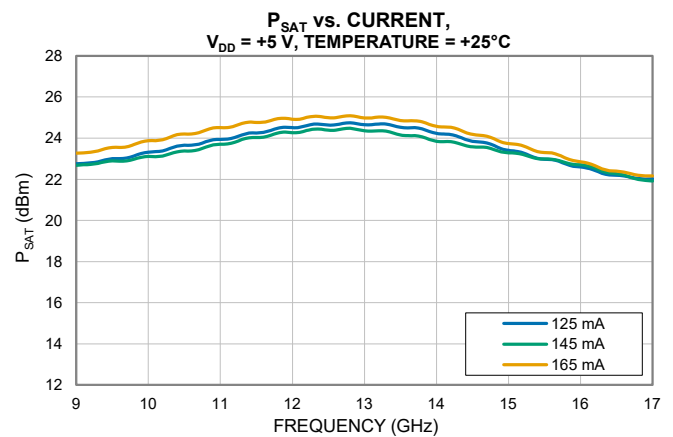
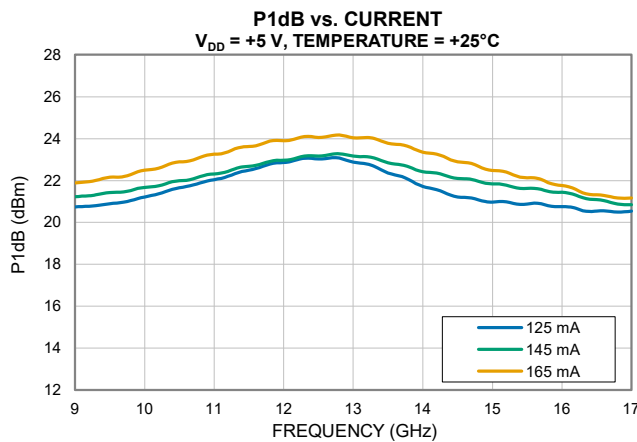
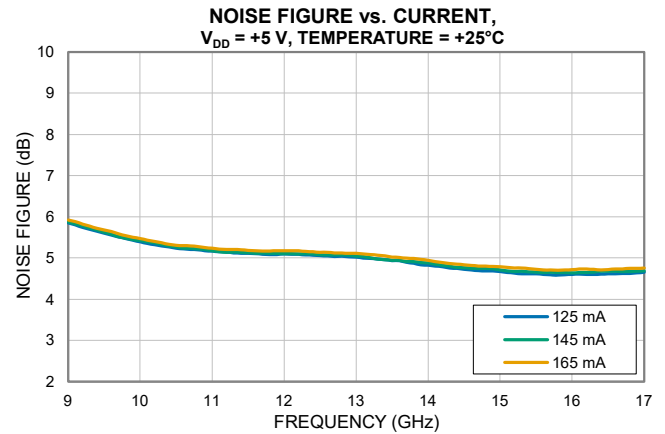
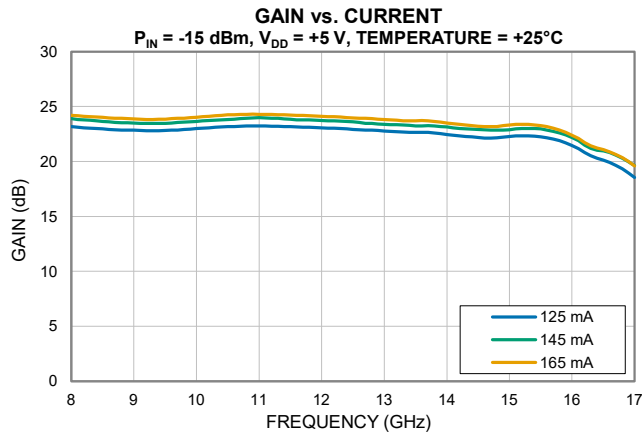
 $V_{DD} = +5$  V, TEMPERATURE = +25°C  
TONE SPACING = 1 MHz

OUTPUT IP3 vs. FREQUENCY

 $V_{DD} = +5$  V, TEMPERATURE = +25°C  
TONE SPACING = 1 MHzIM3 vs. DEVICE VOLTAGE,  
 $P_{OUT} = +12$  dBm/TONE, TEMPERATURE = +25°C  
TONE SPACING = 1 MHzOUTPUT IP2 vs. DEVICE VOLTAGE,  
 $P_{OUT} = +12$  dBm/TONE, TEMPERATURE = +25°C  
TONE SPACING = 1 MHz

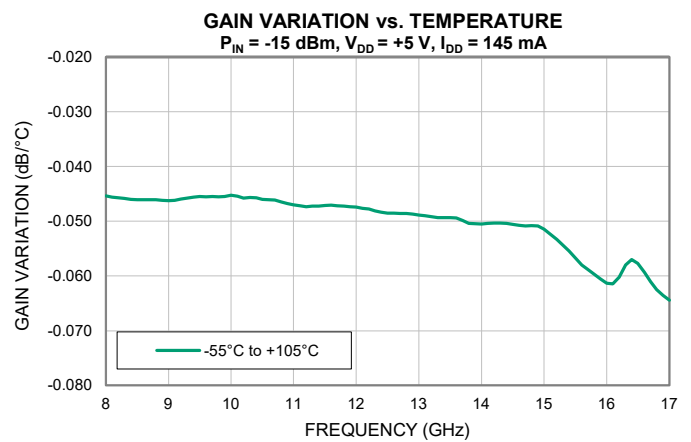
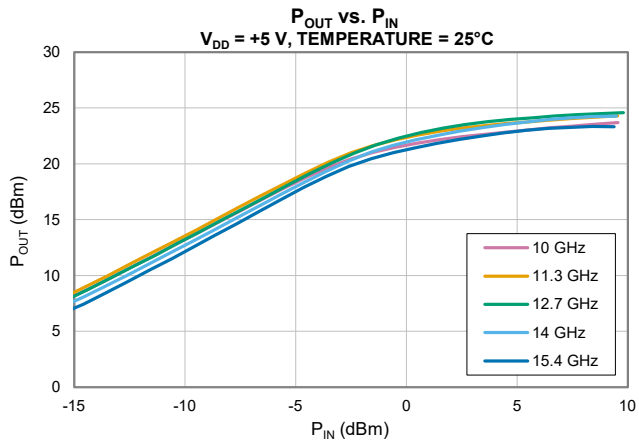
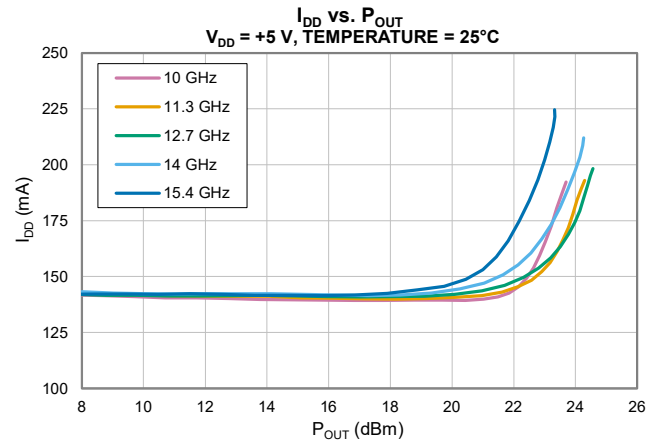
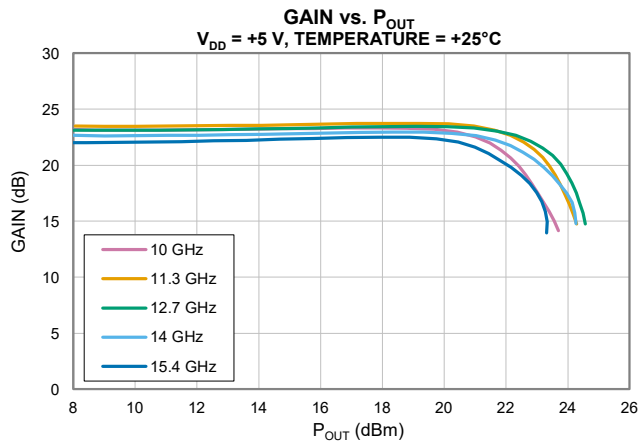


## TYPICAL PERFORMANCE GRAPHS





## TYPICAL PERFORMANCE GRAPHS





ABSOLUTE MAXIMUM RATINGS<sup>8</sup>

| Parameter                                      | Ratings                  |
|------------------------------------------------|--------------------------|
| Operating Temperature (ground lead)            | -55 °C to +105 °C        |
| Storage Temperature                            | -65 °C to +150 °C        |
| Junction Temperature <sup>9</sup>              | +175 °C                  |
| Total Power Dissipation                        | 1.81 W                   |
| Input Power (CW), $V_{DD} = +5$ V              | +27 dBm                  |
| DC Drain Voltage on $V_{DD}$ <sup>10</sup>     | +8 V                     |
| DC Drain Current $I_{DD}$ <sup>11</sup>        | 300 mA                   |
| DC Gate Voltage at $V_{GG} = V_{G12} = V_{G3}$ | -3 V < $V_{GG}$ < -0.4 V |
| DC Gate Current $I_{GG}$                       | 1.6 mA                   |

8. Permanent damage may occur if any of these limits are exceeded. Maximum ratings are not intended for continuous normal operation.

9. Peak Temperature on top of Die.

10.  $V_{DD} = V_{D12} = V_{D3}$ .

11.  $I_{DD} = I_{D12} + I_{D3}$ .

## THERMAL RESISTANCE

| Parameter                                          | Ratings   |
|----------------------------------------------------|-----------|
| Thermal Resistance ( $\Theta_{JC}$ ) <sup>12</sup> | 38.7 °C/W |

12.  $\Theta_{JC}$  = (Hot Spot Temperature on Die - Temperature at Ground Lead) / Dissipated Power

## ESD RATING

|     | Class | Voltage Range      | Reference Standard          |
|-----|-------|--------------------|-----------------------------|
| HBM | 1C    | 1000 V to < 2000 V | ANSI/ESDA/JEDEC JS-001-2023 |
| CDM | C1    | 250 V to < 500 V   | ANSI/ESDA/JEDEC JS-002-2022 |



ESD HANDLING PRECAUTION: This device is designed to be Class 1C for HBM. Static charges may easily produce potentials higher than this with improper handling and can discharge into DUT and damage it. As a preventive measure Industry standard ESD handling precautions should be used at all times to protect the device from ESD damage.

## MSL RATING

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020E/JEDEC J-STD-033C



## FUNCTIONAL DIAGRAM (TOP VIEW)

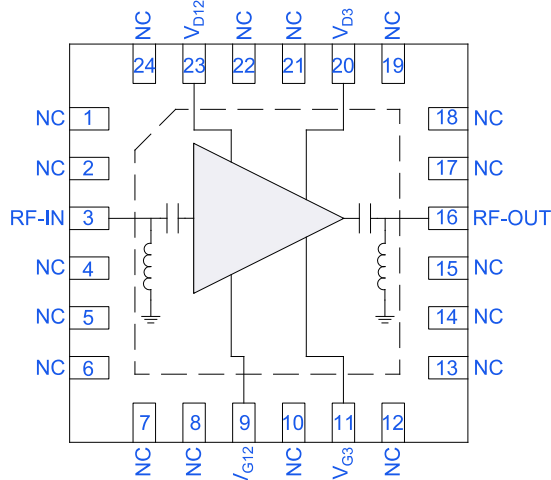


Figure 1. PMA4-9163+ Functional Diagram

## PAD DESCRIPTION

| Function  | Pad Number                            | Description (Refer to Figure 2)                                 |
|-----------|---------------------------------------|-----------------------------------------------------------------|
| RF-IN     | 3                                     | RF-IN Pad connects to RF Input port.                            |
| RF-OUT    | 16                                    | RF-OUT Pad connects to RF Output port.                          |
| $V_{D12}$ | 23                                    | DC Input pad connects to First/Second Stage Drain Voltage port. |
| $V_{G12}$ | 9                                     | DC Input pad connects to First/Second Stage Gate Voltage port.  |
| $V_{D3}$  | 20                                    | DC Input pad connects to Third Stage Drain Voltage port.        |
| $V_{G3}$  | 11                                    | DC Input pad connects to Third Stage Gate Voltage port.         |
| NC        | 1-2, 4-8, 10, 12-15, 17-19, 21-22, 24 | Not used internally. Connected to ground on test board.         |
| GND       | Paddle                                | Connects to ground.                                             |

## EVALUATION TEST BOARD

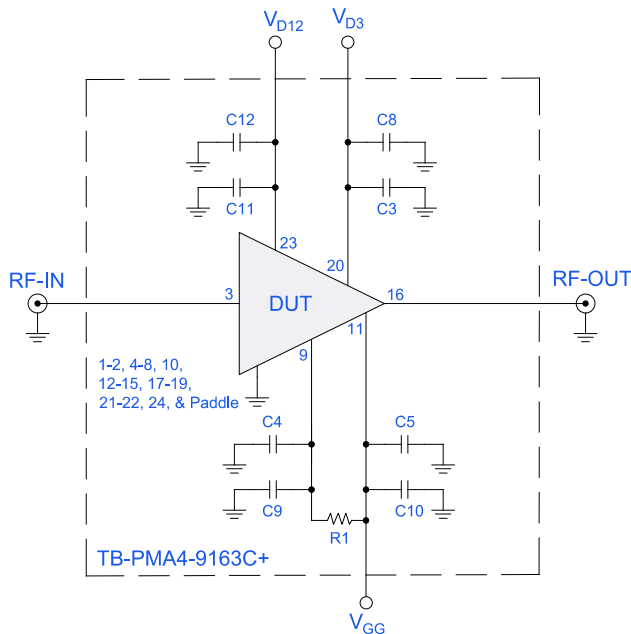


Figure 2. PMA4-9163+ Evaluation and Application Circuit

## Electrical Parameters and Conditions

Gain, Return Loss, Output Power at 1 dB Compression ( $P_{1dB}$ ), Output IP3 (OIP3), and Noise Figure measured using N5245B PNA-X Microwave Network Analyzer.

## Conditions:

- Gain and Return Loss:  $P_{IN} = -15$  dBm
- Output IP3 (OIP3): Two tones, spaced 1 MHz apart, +12 dBm/Tone at output.

## Power ON/Power OFF Sequence:

Caution: Permanent damage to the device will occur if the Power ON and Power OFF sequences are not followed.

## POWER ON:

- Set  $V_{GG} = -2$  V and Turn ON.
- Set  $V_{D12} = +5$  V and Turn ON.
- Set  $V_{D3} = +5$  V and Turn ON.
- Increase  $V_{GG}$  to desired nominal current  $I_{DD} = 145$  mA.  $I_{DD} = I_{D12} + I_{D3}$ .
- Turn ON RF signal.

## POWER OFF:

- Turn OFF RF signal.
- Decrease  $V_{GG}$  to -2 V.
- Turn OFF  $V_{D12}$ ,  $V_{D3}$ .
- Turn OFF  $V_{GG}$ .

| Component        | Value  | Size | Part Number        | Manufacturer |
|------------------|--------|------|--------------------|--------------|
| C3, C4, C5, C11  | 1 nF   | 0402 | GRM1555C1H102JA01D | Murata       |
| C8, C9, C10, C12 | 0.1 uF | 0402 | GRM155R71E104KE14D | Murata       |
| R1               | 100 Ω  | 0402 | RK73H1ETTP1000F    | KOA          |



MMIC SURFACE MOUNT

# Wideband Amplifier

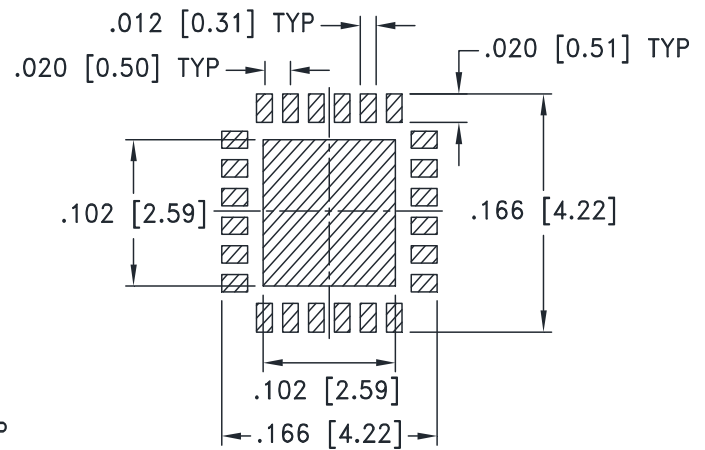
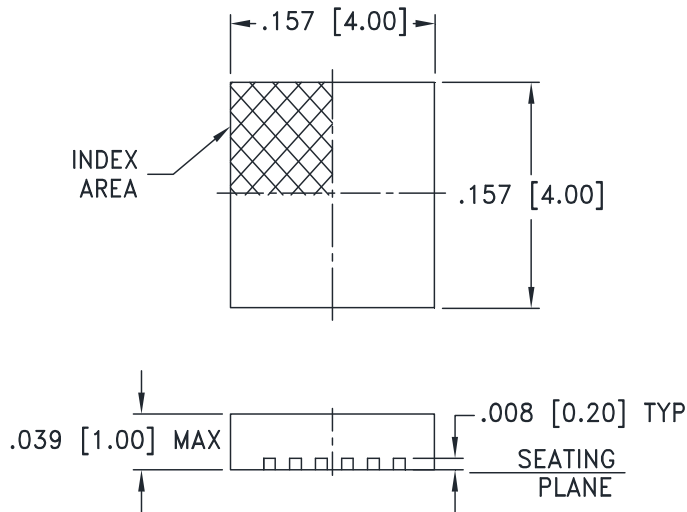
**PMA4-9163+**

Mini-Circuits

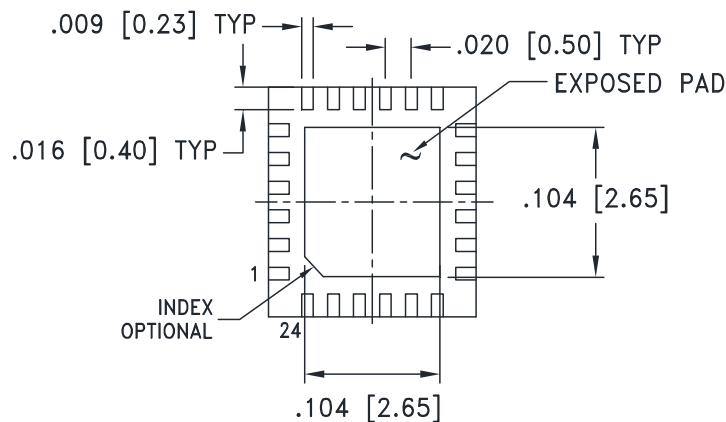
50Ω 9 to 16 GHz Medium Power Driver Amplifier

## CASE STYLE DRAWING

### PCB Land Pattern



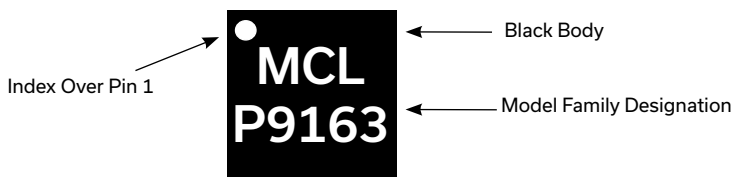
SUGGESTED LAYOUT,  
TOLERANCE TO BE WITHIN  $\pm 0.002$



Weight: .04 Grams

Dimensions are in inches [mm]. Tolerances in inches: 2 Pl.  $\pm .01$ ; 3 Pl.  $\pm .005$  inches

## PRODUCT MARKING



Marking may contain other features or characters for internal lot control.





Mini-Circuits

MMIC SURFACE MOUNT

# Wideband Amplifier

**PMA4-9163+**

50Ω 9 to 16 GHz Medium Power Driver Amplifier

ADDITIONAL DETAILED INFORMATION IS AVAILABLE ON OUR DASHBOARD

[CLICK HERE](#)

|                                       |                                                                                                    |
|---------------------------------------|----------------------------------------------------------------------------------------------------|
| Performance Data & Graphs             | Data                                                                                               |
|                                       | Graphs                                                                                             |
|                                       | S-Parameter (S2P Files) Data Set (.zip file)                                                       |
| Case Style                            | DG1847 Plastic package, exposed paddle, Lead Finish: Matte-Tin                                     |
| RoHS Status                           | Compliant                                                                                          |
| Tape & Reel                           | F68                                                                                                |
| Standard Quantities Available on Reel | 7" Reels with 20, 50, 100, 200, 500, or 1000 devices<br>13" Reels with 2000, 3000, or 4000 devices |
| Suggested Layout for PCB Design       | PL-871                                                                                             |
| Evaluation Board                      | TB-PMA4-9163C+                                                                                     |
|                                       | Gerber File                                                                                        |
| Environmental Ratings                 | ENV08T1                                                                                            |

## NOTES

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.
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*Typical Performance Data***NOTE: Use PDF Bookmarks to view DATA at required conditions****Definitions:**

Input Return Loss = S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = S12 (dB)

Output Return Loss = S22 (dB)

TEST CONDITIONS:  $V_{DD} = +4\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature = +25°C

| FREQ  | Gain  | Isolation | Input<br>Return Loss | Output<br>Return Loss | Stability |         |
|-------|-------|-----------|----------------------|-----------------------|-----------|---------|
| (GHz) | (dB)  | (dB)      | (dB)                 | (dB)                  | K         | Measure |
| 8     | 24.55 | 60.25     | 11.56                | 8.73                  | 24.49     | 0.93    |
| 8.2   | 24.51 | 60.20     | 12.05                | 9.26                  | 25.16     | 0.94    |
| 8.4   | 24.46 | 60.71     | 12.60                | 9.73                  | 27.44     | 0.94    |
| 8.6   | 24.40 | 61.15     | 13.42                | 10.28                 | 29.78     | 0.95    |
| 8.8   | 24.36 | 61.45     | 14.47                | 10.86                 | 31.70     | 0.95    |
| 9     | 24.33 | 61.96     | 15.84                | 11.54                 | 34.51     | 0.95    |
| 9.2   | 24.28 | 62.12     | 17.65                | 12.40                 | 36.14     | 0.96    |
| 9.4   | 24.27 | 62.35     | 19.90                | 13.35                 | 37.84     | 0.96    |
| 9.6   | 24.31 | 62.46     | 22.65                | 14.31                 | 38.71     | 0.97    |
| 9.8   | 24.36 | 61.97     | 25.56                | 15.18                 | 36.76     | 0.97    |
| 10    | 24.41 | 62.21     | 26.55                | 15.81                 | 37.69     | 0.98    |
| 10.2  | 24.49 | 60.92     | 24.27                | 16.05                 | 32.23     | 0.98    |
| 10.4  | 24.55 | 60.69     | 21.68                | 15.86                 | 31.06     | 0.98    |
| 10.6  | 24.60 | 59.88     | 19.40                | 15.40                 | 27.91     | 0.98    |
| 10.8  | 24.62 | 58.91     | 17.63                | 14.81                 | 24.63     | 0.98    |
| 11    | 24.61 | 58.33     | 16.27                | 14.34                 | 22.82     | 0.99    |
| 11.2  | 24.58 | 57.79     | 15.25                | 13.96                 | 21.30     | 0.99    |
| 11.4  | 24.54 | 57.18     | 14.47                | 13.73                 | 19.80     | 0.99    |
| 11.6  | 24.49 | 56.19     | 13.82                | 13.79                 | 17.68     | 1.00    |
| 11.8  | 24.45 | 54.58     | 13.35                | 13.85                 | 14.66     | 1.00    |
| 12    | 24.42 | 54.30     | 13.16                | 14.07                 | 14.24     | 1.01    |
| 12.2  | 24.38 | 54.14     | 13.19                | 14.55                 | 14.12     | 1.01    |
| 12.4  | 24.31 | 54.40     | 13.44                | 15.23                 | 14.76     | 1.02    |
| 12.6  | 24.25 | 55.43     | 13.75                | 16.50                 | 16.95     | 1.02    |
| 12.8  | 24.21 | 56.50     | 14.14                | 18.35                 | 19.49     | 1.02    |
| 13    | 24.15 | 55.65     | 14.75                | 20.28                 | 17.98     | 1.02    |
| 13.2  | 24.08 | 54.85     | 15.63                | 22.49                 | 16.72     | 1.02    |
| 13.4  | 24.04 | 54.05     | 16.87                | 25.24                 | 15.48     | 1.02    |
| 13.6  | 24.07 | 54.61     | 18.78                | 27.39                 | 16.59     | 1.01    |
| 13.8  | 24.02 | 57.01     | 20.82                | 26.61                 | 22.09     | 1.01    |
| 14    | 23.88 | 56.63     | 22.37                | 23.36                 | 21.49     | 1.00    |
| 14.2  | 23.76 | 54.97     | 23.87                | 20.85                 | 17.96     | 0.99    |
| 14.4  | 23.66 | 53.29     | 24.60                | 18.82                 | 14.92     | 0.99    |
| 14.6  | 23.58 | 51.80     | 24.56                | 16.90                 | 12.59     | 0.98    |
| 14.8  | 23.63 | 49.86     | 23.54                | 15.35                 | 9.92      | 0.97    |
| 15    | 23.80 | 48.15     | 21.87                | 14.31                 | 7.93      | 0.97    |
| 15.2  | 23.92 | 46.94     | 20.95                | 13.72                 | 6.76      | 0.96    |
| 15.4  | 23.94 | 46.20     | 20.43                | 13.86                 | 6.21      | 0.96    |
| 15.6  | 23.81 | 45.67     | 19.72                | 14.16                 | 5.95      | 0.96    |
| 15.8  | 23.52 | 45.39     | 18.44                | 14.37                 | 5.95      | 0.97    |
| 16    | 23.04 | 45.32     | 16.61                | 14.07                 | 6.18      | 0.97    |
| 16.2  | 22.31 | 45.55     | 14.17                | 12.68                 | 6.67      | 0.97    |
| 16.4  | 21.72 | 44.76     | 11.32                | 11.40                 | 6.18      | 0.98    |
| 16.6  | 21.31 | 43.60     | 9.72                 | 10.86                 | 5.42      | 1.00    |
| 16.8  | 20.68 | 44.01     | 8.87                 | 10.10                 | 5.82      | 1.01    |
| 17    | 19.88 | 44.27     | 8.28                 | 9.59                  | 6.31      | 1.02    |

## Typical Performance Data

NOTE: Use PDF Bookmarks to view DATA at required

TEST CONDITIONS:  $V_{DD} = +4\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature = +25°C

| FREQ  | 1dB<br>Comp.<br>Output | Psat<br>Output | IP3<br>Output | IM3<br>Output | IP2<br>Output | IDD at<br>P1dB | IDD<br>at PSat | Pdiss at<br>Psat | PAE at<br>Psat | Noise<br>Figure |
|-------|------------------------|----------------|---------------|---------------|---------------|----------------|----------------|------------------|----------------|-----------------|
| (GHz) | (dBm)                  | (dBm)          | (dBm)         | (dBc)         | (dBm)         | (mA)           | (mA)           | (W)              | (%)            | (dB)            |
| 9     | 19.79                  | 21.36          | 30.67         | -36.63        | 35.50         | 137.69         | 148.38         | 0.47             | 21.00          | 5.85            |
| 9.2   | 19.85                  | 21.43          | 30.69         | -36.68        | 36.69         | 137.71         | 147.56         | 0.47             | 21.29          | 5.76            |
| 9.4   | 20.00                  | 21.60          | 31.30         | -37.96        | 37.76         | 138.02         | 147.88         | 0.47             | 21.98          | 5.66            |
| 9.6   | 20.06                  | 21.68          | 32.03         | -39.48        | 38.99         | 136.46         | 144.58         | 0.45             | 22.63          | 5.56            |
| 9.8   | 20.18                  | 21.81          | 32.13         | -39.78        | 40.21         | 135.82         | 142.80         | 0.44             | 23.38          | 5.47            |
| 10    | 20.40                  | 21.99          | 32.10         | -39.83        | 41.57         | 135.68         | 143.03         | 0.44             | 24.11          | 5.41            |
| 10.2  | 20.48                  | 22.04          | 32.09         | -39.88        | 42.71         | 134.95         | 141.34         | 0.43             | 24.39          | 5.34            |
| 10.4  | 20.76                  | 22.27          | 32.05         | -39.84        | 43.63         | 135.89         | 144.19         | 0.44             | 25.09          | 5.26            |
| 10.6  | 20.85                  | 22.31          | 31.88         | -39.54        | 44.05         | 135.40         | 143.87         | 0.44             | 25.27          | 5.20            |
| 10.8  | 21.07                  | 22.51          | 31.73         | -39.28        | 44.53         | 136.22         | 146.46         | 0.44             | 26.10          | 5.19            |
| 11    | 21.22                  | 22.63          | 31.57         | -38.96        | 45.01         | 136.81         | 148.43         | 0.44             | 26.58          | 5.15            |
| 11.2  | 21.33                  | 22.73          | 31.33         | -38.47        | 45.62         | 137.69         | 150.50         | 0.45             | 26.95          | 5.14            |
| 11.4  | 21.55                  | 22.92          | 31.25         | -38.29        | 46.59         | 140.20         | 155.01         | 0.45             | 27.56          | 5.13            |
| 11.6  | 21.58                  | 22.92          | 31.13         | -38.04        | 48.21         | 140.81         | 155.55         | 0.46             | 27.54          | 5.11            |
| 11.8  | 21.78                  | 23.09          | 31.11         | -38.01        | 49.82         | 144.01         | 160.30         | 0.47             | 28.03          | 5.10            |
| 12    | 21.78                  | 23.05          | 30.94         | -37.69        | 51.48         | 143.63         | 159.81         | 0.47             | 27.98          | 5.09            |
| 12.2  | 21.90                  | 23.13          | 31.02         | -37.87        | 53.40         | 145.08         | 161.39         | 0.47             | 28.38          | 5.08            |
| 12.4  | 21.95                  | 23.16          | 31.14         | -38.10        | 55.85         | 145.56         | 162.94         | 0.47             | 28.37          | 5.06            |
| 12.6  | 21.92                  | 23.11          | 31.10         | -38.01        | 57.96         | 144.95         | 162.00         | 0.47             | 28.25          | 5.05            |
| 12.8  | 22.00                  | 23.19          | 31.01         | -37.81        | 60.60         | 146.20         | 164.18         | 0.48             | 28.36          | 5.03            |
| 13    | 21.86                  | 23.07          | 31.03         | -37.85        | 63.84         | 144.24         | 162.24         | 0.47             | 27.80          | 5.01            |
| 13.2  | 21.86                  | 23.11          | 31.09         | -37.97        | 67.90         | 144.56         | 163.29         | 0.48             | 27.68          | 4.97            |
| 13.4  | 21.68                  | 23.00          | 30.72         | -37.29        | 71.91         | 143.43         | 162.20         | 0.48             | 26.91          | 4.95            |
| 13.6  | 21.50                  | 22.90          | 30.46         | -36.82        | 73.32         | 142.69         | 160.95         | 0.48             | 26.27          | 4.92            |
| 13.8  | 21.37                  | 22.83          | 30.14         | -36.17        | 71.91         | 143.07         | 162.06         | 0.49             | 25.53          | 4.90            |
| 14    | 21.08                  | 22.61          | 29.85         | -35.47        | 68.29         | 141.30         | 159.92         | 0.49             | 24.47          | 4.87            |
| 14.2  | 20.99                  | 22.54          | 29.54         | -34.78        | 64.93         | 141.72         | 162.05         | 0.50             | 23.93          | 4.80            |
| 14.4  | 20.72                  | 22.28          | 29.20         | -34.05        | 62.38         | 140.74         | 161.39         | 0.50             | 22.79          | 4.75            |
| 14.6  | 20.58                  | 22.14          | 28.84         | -33.33        | 60.73         | 141.00         | 162.39         | 0.51             | 22.24          | 4.74            |
| 14.8  | 20.40                  | 21.94          | 28.54         | -32.71        | 59.55         | 141.62         | 163.72         | 0.52             | 21.29          | 4.73            |
| 15    | 20.18                  | 21.70          | 28.29         | -32.18        | 58.59         | 140.68         | 162.38         | 0.52             | 20.63          | 4.69            |
| 15.2  | 20.08                  | 21.56          | 28.08         | -31.71        | 58.06         | 141.58         | 163.72         | 0.53             | 19.94          | 4.66            |
| 15.4  | 19.81                  | 21.28          | 27.90         | -31.34        | 57.38         | 139.74         | 161.32         | 0.53             | 19.23          | 4.64            |
| 15.6  | 19.76                  | 21.18          | 27.83         | -31.18        | 56.95         | 139.86         | 162.67         | 0.53             | 18.87          | 4.64            |
| 15.8  | 19.53                  | 20.94          | 27.73         | -30.98        | 56.31         | 138.55         | 162.10         | 0.54             | 18.07          | 4.62            |
| 16    | 19.41                  | 20.80          | 27.64         | -30.82        | 55.44         | 138.08         | 162.98         | 0.54             | 17.62          | 4.63            |
| 16.2  | 19.26                  | 20.65          | 27.46         | -30.45        | 54.51         | 137.83         | 164.56         | 0.55             | 16.83          | 4.63            |
| 16.4  | 19.05                  | 20.45          | 27.14         | -29.78        | 53.83         | 136.39         | 165.85         | 0.56             | 15.92          | 4.64            |
| 16.6  | 19.04                  | 20.42          | 26.73         | -28.91        | 53.41         | 136.46         | 168.87         | 0.58             | 15.37          | 4.66            |
| 16.8  | 18.92                  | 20.32          | 26.48         | -28.40        | 53.35         | 135.74         | 171.94         | 0.60             | 14.43          | 4.66            |
| 17    | 18.91                  | 20.31          | 26.19         | -27.81        | 53.22         | 136.19         | 175.05         | 0.61             | 13.94          | 4.65            |

*Typical Performance Data***NOTE: Use PDF Bookmarks to view DATA at required conditions****Definitions:**

Input Return Loss = S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = S12 (dB)

Output Return Loss = S22 (dB)

TEST CONDITIONS:  $V_{DD} = +5\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature = +25°C

| FREQ  | Gain  | Isolation | Input<br>Return Loss | Output<br>Return Loss | Stability |         |
|-------|-------|-----------|----------------------|-----------------------|-----------|---------|
| (GHz) | (dB)  | (dB)      | (dB)                 | (dB)                  | K         | Measure |
| 8     | 23.89 | 60.98     | 11.54                | 8.25                  | 28.25     | 0.91    |
| 8.2   | 23.78 | 60.95     | 12.08                | 8.70                  | 29.26     | 0.92    |
| 8.4   | 23.69 | 62.09     | 12.75                | 9.15                  | 34.62     | 0.92    |
| 8.6   | 23.59 | 61.64     | 13.69                | 9.65                  | 34.11     | 0.93    |
| 8.8   | 23.53 | 61.28     | 14.76                | 10.31                 | 33.86     | 0.94    |
| 9     | 23.51 | 61.17     | 16.05                | 11.08                 | 34.37     | 0.94    |
| 9.2   | 23.46 | 61.98     | 17.96                | 12.09                 | 38.97     | 0.95    |
| 9.4   | 23.45 | 61.84     | 20.33                | 13.29                 | 39.26     | 0.96    |
| 9.6   | 23.51 | 63.03     | 23.45                | 14.74                 | 45.51     | 0.97    |
| 9.8   | 23.58 | 62.86     | 27.07                | 16.45                 | 44.92     | 0.98    |
| 10    | 23.65 | 62.23     | 29.46                | 18.37                 | 41.80     | 0.99    |
| 10.2  | 23.73 | 59.77     | 26.26                | 20.08                 | 31.29     | 0.99    |
| 10.4  | 23.78 | 59.12     | 23.15                | 19.99                 | 28.81     | 0.99    |
| 10.6  | 23.86 | 59.07     | 20.83                | 19.38                 | 28.25     | 1.00    |
| 10.8  | 23.96 | 59.42     | 19.08                | 18.30                 | 28.87     | 1.00    |
| 11    | 23.99 | 59.13     | 17.56                | 17.17                 | 27.55     | 1.00    |
| 11.2  | 23.95 | 58.37     | 16.36                | 15.90                 | 25.04     | 1.00    |
| 11.4  | 23.88 | 57.84     | 15.47                | 15.06                 | 23.49     | 1.00    |
| 11.6  | 23.81 | 57.20     | 14.76                | 14.61                 | 21.79     | 1.00    |
| 11.8  | 23.78 | 54.76     | 14.18                | 14.29                 | 16.37     | 1.00    |
| 12    | 23.74 | 54.94     | 13.93                | 14.55                 | 16.80     | 1.01    |
| 12.2  | 23.69 | 54.41     | 13.86                | 14.84                 | 15.90     | 1.01    |
| 12.4  | 23.64 | 53.92     | 14.11                | 15.54                 | 15.24     | 1.01    |
| 12.6  | 23.55 | 54.47     | 14.49                | 16.56                 | 16.56     | 1.01    |
| 12.8  | 23.45 | 55.85     | 14.91                | 18.25                 | 19.87     | 1.02    |
| 13    | 23.38 | 55.68     | 15.37                | 20.16                 | 19.79     | 1.02    |
| 13.2  | 23.35 | 55.22     | 16.18                | 23.36                 | 19.05     | 1.02    |
| 13.4  | 23.28 | 54.03     | 17.33                | 27.61                 | 16.89     | 1.02    |
| 13.6  | 23.24 | 53.34     | 18.88                | 33.13                 | 15.79     | 1.01    |
| 13.8  | 23.25 | 54.60     | 21.07                | 34.32                 | 18.34     | 1.01    |
| 14    | 23.13 | 54.66     | 22.76                | 33.85                 | 18.75     | 1.00    |
| 14.2  | 23.00 | 53.86     | 24.09                | 25.89                 | 17.37     | 1.00    |
| 14.4  | 22.94 | 52.68     | 24.58                | 22.57                 | 15.24     | 1.00    |
| 14.6  | 22.90 | 51.89     | 24.29                | 19.66                 | 13.89     | 0.99    |
| 14.8  | 22.84 | 50.94     | 23.56                | 17.96                 | 12.47     | 0.99    |
| 15    | 22.90 | 49.13     | 21.82                | 16.30                 | 9.96      | 0.98    |
| 15.2  | 22.99 | 47.93     | 20.16                | 15.85                 | 8.55      | 0.98    |
| 15.4  | 22.99 | 46.76     | 18.88                | 15.60                 | 7.43      | 0.98    |
| 15.6  | 22.88 | 45.66     | 18.03                | 15.64                 | 6.64      | 0.98    |
| 15.8  | 22.60 | 44.96     | 17.25                | 16.03                 | 6.33      | 0.99    |
| 16    | 22.19 | 44.51     | 16.12                | 16.13                 | 6.27      | 0.99    |
| 16.2  | 21.50 | 44.38     | 14.55                | 15.28                 | 6.58      | 1.00    |
| 16.4  | 21.03 | 45.58     | 11.22                | 12.96                 | 7.47      | 1.01    |
| 16.6  | 20.82 | 45.18     | 9.52                 | 12.06                 | 6.95      | 1.03    |
| 16.8  | 20.29 | 44.92     | 8.85                 | 11.37                 | 6.93      | 1.04    |
| 17    | 19.61 | 45.65     | 8.35                 | 10.77                 | 7.87      | 1.05    |

## Typical Performance Data

NOTE: Use PDF Bookmarks to view DATA at required

TEST CONDITIONS:  $V_{DD} = +5\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature = +25°C

| FREQ  | 1dB<br>Comp.<br>Output | Psat<br>Output | IP3<br>Output | IM3<br>Output | IP2<br>Output | IDD at<br>P1dB | IDD<br>at PSat | Pdiss at<br>Psat | PAE at<br>Psat | Noise<br>Figure |
|-------|------------------------|----------------|---------------|---------------|---------------|----------------|----------------|------------------|----------------|-----------------|
| (GHz) | (dBm)                  | (dBm)          | (dBm)         | (dBc)         | (dBm)         | (mA)           | (mA)           | (W)              | (%)            | (dB)            |
| 9     | 21.22                  | 22.69          | 31.04         | -37.30        | 34.34         | 151.73         | 174.52         | 0.70             | 20.73          | 5.87            |
| 9.2   | 21.27                  | 22.73          | 31.20         | -37.70        | 35.30         | 150.12         | 171.91         | 0.68             | 21.20          | 5.78            |
| 9.4   | 21.38                  | 22.85          | 31.25         | -37.80        | 36.47         | 149.29         | 171.35         | 0.68             | 21.93          | 5.68            |
| 9.6   | 21.43                  | 22.88          | 31.29         | -38.00        | 37.80         | 146.23         | 166.91         | 0.65             | 22.66          | 5.58            |
| 9.8   | 21.52                  | 22.98          | 31.31         | -38.20        | 39.20         | 144.79         | 165.95         | 0.64             | 23.29          | 5.48            |
| 10    | 21.67                  | 23.11          | 31.38         | -38.40        | 40.66         | 144.04         | 166.45         | 0.64             | 23.98          | 5.43            |
| 10.2  | 21.74                  | 23.14          | 31.42         | -38.50        | 41.97         | 142.55         | 163.71         | 0.62             | 24.49          | 5.37            |
| 10.4  | 21.94                  | 23.34          | 31.41         | -38.50        | 42.94         | 143.86         | 167.52         | 0.63             | 25.13          | 5.30            |
| 10.6  | 22.01                  | 23.38          | 31.31         | -38.30        | 43.54         | 143.48         | 165.38         | 0.62             | 25.66          | 5.24            |
| 10.8  | 22.18                  | 23.57          | 31.23         | -38.20        | 44.20         | 145.95         | 169.31         | 0.63             | 26.20          | 5.22            |
| 11    | 22.32                  | 23.71          | 31.13         | -38.00        | 44.82         | 147.95         | 171.76         | 0.64             | 26.67          | 5.18            |
| 11.2  | 22.44                  | 23.80          | 31.01         | -37.80        | 45.62         | 150.09         | 172.99         | 0.64             | 27.05          | 5.14            |
| 11.4  | 22.65                  | 24.02          | 30.96         | -37.70        | 46.63         | 153.63         | 177.43         | 0.65             | 27.79          | 5.13            |
| 11.6  | 22.72                  | 24.05          | 30.84         | -37.40        | 48.24         | 153.55         | 177.10         | 0.64             | 27.95          | 5.12            |
| 11.8  | 22.91                  | 24.26          | 30.78         | -37.30        | 49.80         | 156.51         | 182.54         | 0.66             | 28.50          | 5.11            |
| 12    | 22.97                  | 24.27          | 30.65         | -37.10        | 51.55         | 155.97         | 183.16         | 0.66             | 28.46          | 5.10            |
| 12.2  | 23.09                  | 24.37          | 30.64         | -37.00        | 53.34         | 158.60         | 186.35         | 0.67             | 28.61          | 5.10            |
| 12.4  | 23.18                  | 24.44          | 30.68         | -37.10        | 55.65         | 160.28         | 187.45         | 0.67             | 28.91          | 5.10            |
| 12.6  | 23.19                  | 24.39          | 30.65         | -37.10        | 57.72         | 160.38         | 185.73         | 0.67             | 28.83          | 5.08            |
| 12.8  | 23.28                  | 24.48          | 30.56         | -36.90        | 60.26         | 163.11         | 189.28         | 0.68             | 28.88          | 5.08            |
| 13    | 23.16                  | 24.36          | 30.49         | -36.80        | 63.31         | 160.04         | 187.45         | 0.68             | 28.32          | 5.05            |
| 13.2  | 23.13                  | 24.37          | 30.48         | -36.80        | 67.01         | 161.79         | 191.06         | 0.70             | 27.85          | 5.00            |
| 13.4  | 22.95                  | 24.25          | 30.24         | -36.30        | 70.84         | 159.46         | 191.30         | 0.70             | 27.09          | 4.96            |
| 13.6  | 22.78                  | 24.12          | 30.03         | -35.90        | 72.54         | 157.03         | 190.35         | 0.71             | 26.38          | 4.95            |
| 13.8  | 22.65                  | 24.06          | 29.74         | -35.30        | 71.60         | 157.36         | 193.39         | 0.73             | 25.66          | 4.91            |
| 14    | 22.42                  | 23.85          | 29.47         | -34.70        | 68.59         | 153.92         | 190.88         | 0.73             | 24.71          | 4.88            |
| 14.2  | 22.35                  | 23.83          | 29.17         | -34.00        | 65.18         | 155.13         | 194.12         | 0.74             | 24.21          | 4.82            |
| 14.4  | 22.16                  | 23.64          | 28.85         | -33.30        | 62.54         | 152.81         | 192.98         | 0.75             | 23.26          | 4.77            |
| 14.6  | 22.09                  | 23.57          | 28.51         | -32.60        | 60.81         | 153.15         | 195.42         | 0.76             | 22.61          | 4.75            |
| 14.8  | 21.96                  | 23.45          | 28.23         | -32.00        | 59.56         | 153.11         | 197.50         | 0.78             | 21.77          | 4.75            |
| 15    | 21.84                  | 23.29          | 28.01         | -31.50        | 58.59         | 152.91         | 195.55         | 0.78             | 21.16          | 4.71            |
| 15.2  | 21.77                  | 23.21          | 27.82         | -31.10        | 57.88         | 154.94         | 199.89         | 0.80             | 20.35          | 4.67            |
| 15.4  | 21.62                  | 23.01          | 27.65         | -30.80        | 57.12         | 153.92         | 197.28         | 0.80             | 19.66          | 4.67            |
| 15.6  | 21.63                  | 22.98          | 27.59         | -30.70        | 56.70         | 154.76         | 200.47         | 0.82             | 19.26          | 4.65            |
| 15.8  | 21.48                  | 22.80          | 27.55         | -30.60        | 56.12         | 153.22         | 199.36         | 0.82             | 18.51          | 4.65            |
| 16    | 21.43                  | 22.71          | 27.49         | -30.50        | 55.38         | 153.28         | 200.04         | 0.83             | 18.04          | 4.64            |
| 16.2  | 21.30                  | 22.54          | 27.31         | -30.10        | 54.43         | 153.04         | 202.26         | 0.85             | 17.14          | 4.65            |
| 16.4  | 21.10                  | 22.31          | 27.01         | -29.50        | 53.69         | 151.83         | 200.98         | 0.85             | 16.27          | 4.68            |
| 16.6  | 21.04                  | 22.21          | 26.68         | -28.80        | 53.31         | 153.04         | 204.27         | 0.87             | 15.61          | 4.68            |
| 16.8  | 20.88                  | 22.00          | 26.41         | -28.30        | 53.41         | 151.81         | 204.39         | 0.88             | 14.77          | 4.67            |
| 17    | 20.84                  | 21.92          | 26.15         | -27.70        | 53.51         | 152.46         | 205.81         | 0.89             | 14.34          | 4.69            |



*Typical Performance Data***NOTE: Use PDF Bookmarks to view DATA at required conditions****Definitions:**

Input Return Loss = S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = S12 (dB)

Output Return Loss = S22 (dB)

TEST CONDITIONS:  $V_{DD} = +6\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature = +25°C

| FREQ  | Gain  | Isolation | Input<br>Return Loss | Output<br>Return Loss | Stability |         |
|-------|-------|-----------|----------------------|-----------------------|-----------|---------|
| (GHz) | (dB)  | (dB)      | (dB)                 | (dB)                  | K         | Measure |
| 8     | 22.99 | 60.06     | 11.80                | 8.30                  | 28.33     | 0.91    |
| 8.2   | 22.90 | 60.29     | 12.36                | 8.79                  | 30.28     | 0.92    |
| 8.4   | 22.80 | 60.52     | 13.01                | 9.25                  | 32.21     | 0.92    |
| 8.6   | 22.72 | 60.84     | 13.93                | 9.82                  | 34.66     | 0.93    |
| 8.8   | 22.66 | 61.39     | 15.12                | 10.45                 | 38.15     | 0.94    |
| 9     | 22.62 | 61.97     | 16.68                | 11.26                 | 42.05     | 0.94    |
| 9.2   | 22.59 | 62.02     | 18.76                | 12.31                 | 43.52     | 0.95    |
| 9.4   | 22.60 | 62.20     | 21.49                | 13.62                 | 45.39     | 0.96    |
| 9.6   | 22.66 | 62.49     | 25.27                | 15.22                 | 47.44     | 0.97    |
| 9.8   | 22.73 | 62.24     | 30.52                | 17.15                 | 46.30     | 0.98    |
| 10    | 22.82 | 62.38     | 31.54                | 19.32                 | 46.95     | 0.99    |
| 10.2  | 22.92 | 61.63     | 26.46                | 21.25                 | 42.67     | 0.99    |
| 10.4  | 23.00 | 61.01     | 22.89                | 21.60                 | 39.32     | 1.00    |
| 10.6  | 23.07 | 60.32     | 20.32                | 20.25                 | 35.77     | 1.00    |
| 10.8  | 23.12 | 59.35     | 18.47                | 18.40                 | 31.50     | 1.00    |
| 11    | 23.13 | 58.58     | 17.10                | 16.92                 | 28.45     | 1.00    |
| 11.2  | 23.12 | 58.07     | 16.09                | 15.82                 | 26.56     | 1.00    |
| 11.4  | 23.09 | 57.52     | 15.34                | 15.06                 | 24.77     | 1.00    |
| 11.6  | 23.04 | 56.24     | 14.72                | 14.74                 | 21.33     | 1.00    |
| 11.8  | 23.01 | 54.67     | 14.31                | 14.56                 | 17.77     | 1.00    |
| 12    | 22.97 | 54.46     | 14.16                | 14.60                 | 17.40     | 1.00    |
| 12.2  | 22.92 | 54.26     | 14.25                | 15.01                 | 17.16     | 1.01    |
| 12.4  | 22.84 | 54.50     | 14.55                | 15.66                 | 17.95     | 1.01    |
| 12.6  | 22.77 | 55.24     | 14.92                | 16.96                 | 19.92     | 1.01    |
| 12.8  | 22.71 | 56.16     | 15.39                | 18.71                 | 22.51     | 1.02    |
| 13    | 22.64 | 55.12     | 16.08                | 20.81                 | 20.35     | 1.02    |
| 13.2  | 22.56 | 54.16     | 17.03                | 23.24                 | 18.57     | 1.01    |
| 13.4  | 22.50 | 53.26     | 18.31                | 26.90                 | 16.97     | 1.01    |
| 13.6  | 22.50 | 53.59     | 20.18                | 28.02                 | 17.74     | 1.01    |
| 13.8  | 22.41 | 56.09     | 22.05                | 29.55                 | 23.98     | 1.00    |
| 14    | 22.26 | 55.81     | 23.15                | 30.20                 | 23.65     | 1.00    |
| 14.2  | 22.13 | 54.65     | 23.75                | 27.08                 | 21.00     | 1.00    |
| 14.4  | 22.02 | 53.23     | 23.51                | 23.41                 | 18.04     | 1.00    |
| 14.6  | 21.91 | 52.01     | 22.86                | 20.56                 | 15.78     | 1.00    |
| 14.8  | 21.91 | 50.11     | 21.70                | 18.35                 | 12.59     | 0.99    |
| 15    | 22.00 | 48.41     | 20.21                | 17.10                 | 10.18     | 0.99    |
| 15.2  | 22.02 | 47.20     | 19.27                | 16.64                 | 8.80      | 0.99    |
| 15.4  | 21.95 | 46.57     | 18.52                | 17.08                 | 8.26      | 0.99    |
| 15.6  | 21.76 | 46.08     | 17.62                | 17.58                 | 7.98      | 0.99    |
| 15.8  | 21.47 | 45.85     | 16.46                | 17.88                 | 8.01      | 1.00    |
| 16    | 21.05 | 45.95     | 15.07                | 17.30                 | 8.40      | 1.01    |
| 16.2  | 20.46 | 46.33     | 13.26                | 15.26                 | 9.14      | 1.01    |
| 16.4  | 20.01 | 45.50     | 10.96                | 13.63                 | 8.34      | 1.03    |
| 16.6  | 19.68 | 44.14     | 9.58                 | 12.97                 | 7.12      | 1.05    |
| 16.8  | 19.14 | 44.55     | 8.83                 | 12.07                 | 7.64      | 1.06    |
| 17    | 18.40 | 44.90     | 8.32                 | 11.43                 | 8.37      | 1.06    |

## Typical Performance Data

NOTE: Use PDF Bookmarks to view DATA at required

TEST CONDITIONS:  $V_{DD} = +6\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature = +25°C

| FREQ  | 1dB<br>Comp.<br>Output | Psat<br>Output | IP3<br>Output | IM3<br>Output | IP2<br>Output | IDD at<br>P1dB | IDD<br>at PSat | Pdiss at<br>Psat | PAE at<br>Psat | Noise<br>Figure |
|-------|------------------------|----------------|---------------|---------------|---------------|----------------|----------------|------------------|----------------|-----------------|
| (GHz) | (dBm)                  | (dBm)          | (dBm)         | (dBc)         | (dBm)         | (mA)           | (mA)           | (W)              | (%)            | (dB)            |
| 9     | 22.41                  | 23.93          | 30.73         | -36.73        | 36.05         | 166.74         | 199.47         | 0.96             | 20.07          | 5.89            |
| 9.2   | 22.45                  | 23.95          | 30.89         | -37.07        | 37.06         | 164.65         | 196.94         | 0.95             | 20.38          | 5.80            |
| 9.4   | 22.52                  | 24.03          | 31.06         | -37.49        | 38.29         | 163.18         | 196.41         | 0.94             | 20.86          | 5.69            |
| 9.6   | 22.57                  | 24.05          | 31.23         | -37.94        | 39.66         | 159.75         | 191.59         | 0.91             | 21.44          | 5.58            |
| 9.8   | 22.64                  | 24.12          | 31.33         | -38.24        | 41.02         | 157.99         | 190.28         | 0.90             | 21.99          | 5.51            |
| 10    | 22.77                  | 24.27          | 31.43         | -38.51        | 42.47         | 156.78         | 192.16         | 0.90             | 22.53          | 5.45            |
| 10.2  | 22.85                  | 24.32          | 31.50         | -38.71        | 43.76         | 154.64         | 188.19         | 0.87             | 23.28          | 5.38            |
| 10.4  | 23.02                  | 24.56          | 31.49         | -38.73        | 44.73         | 155.81         | 193.34         | 0.89             | 23.97          | 5.31            |
| 10.6  | 23.12                  | 24.65          | 31.37         | -38.53        | 45.28         | 154.45         | 191.57         | 0.87             | 24.68          | 5.27            |
| 10.8  | 23.28                  | 24.84          | 31.28         | -38.34        | 45.89         | 156.47         | 195.29         | 0.88             | 25.31          | 5.25            |
| 11    | 23.43                  | 25.00          | 31.13         | -38.04        | 46.44         | 157.45         | 197.67         | 0.89             | 26.00          | 5.20            |
| 11.2  | 23.55                  | 25.08          | 30.94         | -37.69        | 47.15         | 159.67         | 197.89         | 0.88             | 26.36          | 5.17            |
| 11.4  | 23.78                  | 25.33          | 30.85         | -37.52        | 48.13         | 164.36         | 203.24         | 0.89             | 27.25          | 5.19            |
| 11.6  | 23.87                  | 25.36          | 30.73         | -37.28        | 49.75         | 166.12         | 202.34         | 0.89             | 27.49          | 5.17            |
| 11.8  | 24.08                  | 25.59          | 30.67         | -37.16        | 51.37         | 171.00         | 209.06         | 0.91             | 28.14          | 5.15            |
| 12    | 24.17                  | 25.64          | 30.54         | -36.91        | 53.09         | 170.97         | 209.41         | 0.91             | 28.33          | 5.14            |
| 12.2  | 24.30                  | 25.73          | 30.58         | -37.01        | 54.94         | 173.94         | 212.95         | 0.92             | 28.45          | 5.14            |
| 12.4  | 24.42                  | 25.83          | 30.67         | -37.18        | 57.30         | 176.97         | 216.01         | 0.93             | 28.76          | 5.12            |
| 12.6  | 24.43                  | 25.76          | 30.66         | -37.17        | 59.36         | 178.33         | 214.17         | 0.93             | 28.48          | 5.11            |
| 12.8  | 24.53                  | 25.87          | 30.59         | -37.02        | 61.74         | 182.33         | 217.48         | 0.94             | 28.77          | 5.09            |
| 13    | 24.43                  | 25.74          | 30.55         | -36.94        | 64.47         | 180.09         | 215.23         | 0.94             | 28.16          | 5.08            |
| 13.2  | 24.41                  | 25.72          | 30.56         | -36.98        | 67.84         | 181.30         | 217.29         | 0.95             | 27.80          | 5.04            |
| 13.4  | 24.27                  | 25.64          | 30.32         | -36.52        | 70.87         | 180.07         | 218.18         | 0.96             | 27.16          | 4.99            |
| 13.6  | 24.10                  | 25.48          | 30.12         | -36.13        | 71.86         | 178.47         | 217.64         | 0.97             | 26.20          | 4.97            |
| 13.8  | 24.00                  | 25.46          | 29.84         | -35.52        | 71.05         | 178.85         | 222.32         | 1.00             | 25.61          | 4.94            |
| 14    | 23.77                  | 25.27          | 29.55         | -34.84        | 68.64         | 175.05         | 222.06         | 1.02             | 24.44          | 4.89            |
| 14.2  | 23.74                  | 25.27          | 29.23         | -34.14        | 65.81         | 176.27         | 227.13         | 1.05             | 23.94          | 4.87            |
| 14.4  | 23.58                  | 25.13          | 28.90         | -33.44        | 63.56         | 174.07         | 229.59         | 1.07             | 22.91          | 4.84            |
| 14.6  | 23.55                  | 25.07          | 28.55         | -32.72        | 62.05         | 176.52         | 232.31         | 1.09             | 22.33          | 4.78            |
| 14.8  | 23.48                  | 24.99          | 28.25         | -32.11        | 60.94         | 179.06         | 238.22         | 1.13             | 21.39          | 4.76            |
| 15    | 23.39                  | 24.83          | 28.01         | -31.60        | 59.96         | 178.45         | 238.86         | 1.15             | 20.51          | 4.75            |
| 15.2  | 23.39                  | 24.74          | 27.81         | -31.15        | 59.22         | 183.80         | 244.04         | 1.19             | 19.69          | 4.73            |
| 15.4  | 23.26                  | 24.53          | 27.63         | -30.78        | 58.39         | 181.96         | 243.55         | 1.20             | 18.76          | 4.70            |
| 15.6  | 23.31                  | 24.47          | 27.55         | -30.64        | 57.96         | 184.63         | 245.14         | 1.21             | 18.41          | 4.68            |
| 15.8  | 23.18                  | 24.29          | 27.47         | -30.48        | 57.38         | 182.91         | 245.03         | 1.22             | 17.62          | 4.66            |
| 16    | 23.12                  | 24.19          | 27.37         | -30.29        | 56.68         | 182.87         | 243.20         | 1.22             | 17.31          | 4.67            |
| 16.2  | 22.97                  | 24.02          | 27.19         | -29.96        | 55.76         | 183.56         | 244.36         | 1.23             | 16.53          | 4.69            |
| 16.4  | 22.74                  | 23.78          | 26.94         | -29.43        | 55.08         | 180.86         | 240.93         | 1.23             | 15.78          | 4.69            |
| 16.6  | 22.66                  | 23.65          | 26.62         | -28.75        | 54.68         | 182.79         | 242.32         | 1.24             | 15.20          | 4.69            |
| 16.8  | 22.47                  | 23.41          | 26.35         | -28.16        | 54.79         | 181.76         | 240.74         | 1.25             | 14.42          | 4.71            |
| 17    | 22.41                  | 23.31          | 26.10         | -27.67        | 54.91         | 183.11         | 240.39         | 1.25             | 14.07          | 4.72            |

## Typical Performance Data

### Definitions:

Input Return Loss = S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = S12 (dB)

Output Return Loss = S22 (dB)

TEST CONDITIONS:  $V_{DD} = +5\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature =  $-55^{\circ}\text{C}$

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|
| (GHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure |
| 8     | 28.36 | 62.53     | 10.62             | 8.43               | 19.90     | 0.93    |
| 8.2   | 28.31 | 62.23     | 10.96             | 8.74               | 19.74     | 0.94    |
| 8.4   | 28.26 | 62.48     | 11.44             | 9.15               | 20.93     | 0.94    |
| 8.6   | 28.18 | 62.03     | 12.16             | 9.61               | 20.61     | 0.94    |
| 8.8   | 28.13 | 61.95     | 12.92             | 10.22              | 21.09     | 0.95    |
| 9     | 28.11 | 61.59     | 13.79             | 10.92              | 20.81     | 0.96    |
| 9.2   | 28.03 | 62.32     | 15.10             | 11.88              | 23.50     | 0.96    |
| 9.4   | 27.99 | 62.18     | 16.61             | 12.99              | 23.84     | 0.97    |
| 9.6   | 28.02 | 63.90     | 18.39             | 14.24              | 29.52     | 0.98    |
| 9.8   | 28.07 | 62.73     | 19.88             | 15.68              | 26.07     | 0.98    |
| 10    | 28.10 | 61.65     | 21.12             | 17.21              | 23.19     | 0.99    |
| 10.2  | 28.21 | 60.26     | 20.64             | 18.47              | 19.59     | 0.99    |
| 10.4  | 28.24 | 60.10     | 20.03             | 18.26              | 19.11     | 0.99    |
| 10.6  | 28.34 | 59.76     | 18.67             | 17.79              | 18.10     | 1.00    |
| 10.8  | 28.46 | 60.52     | 17.38             | 17.17              | 19.30     | 1.00    |
| 11    | 28.54 | 59.72     | 15.90             | 16.44              | 17.26     | 1.00    |
| 11.2  | 28.52 | 58.97     | 14.66             | 15.36              | 15.63     | 1.00    |
| 11.4  | 28.42 | 57.98     | 13.71             | 14.50              | 13.87     | 1.01    |
| 11.6  | 28.34 | 56.46     | 12.95             | 14.04              | 11.62     | 1.01    |
| 11.8  | 28.31 | 54.62     | 12.23             | 13.51              | 9.28      | 1.01    |
| 12    | 28.28 | 54.60     | 11.86             | 13.67              | 9.25      | 1.02    |
| 12.2  | 28.27 | 54.01     | 11.63             | 13.87              | 8.63      | 1.03    |
| 12.4  | 28.27 | 53.44     | 11.78             | 14.31              | 8.14      | 1.03    |
| 12.6  | 28.18 | 54.40     | 12.09             | 15.08              | 9.28      | 1.03    |
| 12.8  | 28.09 | 56.07     | 12.23             | 16.75              | 11.53     | 1.04    |
| 13    | 28.04 | 55.56     | 12.47             | 18.11              | 11.04     | 1.04    |
| 13.2  | 28.02 | 55.01     | 13.01             | 20.37              | 10.53     | 1.04    |
| 13.4  | 27.97 | 54.13     | 13.82             | 23.27              | 9.71      | 1.03    |
| 13.6  | 27.93 | 53.48     | 15.19             | 27.19              | 9.20      | 1.03    |
| 13.8  | 28.04 | 55.02     | 17.13             | 28.88              | 10.96     | 1.02    |
| 14    | 27.96 | 55.14     | 18.46             | 24.65              | 11.26     | 1.01    |
| 14.2  | 27.82 | 54.66     | 20.28             | 21.19              | 10.83     | 1.00    |
| 14.4  | 27.79 | 53.47     | 22.09             | 18.67              | 9.46      | 0.99    |
| 14.6  | 27.81 | 52.82     | 24.08             | 16.64              | 8.71      | 0.98    |
| 14.8  | 27.82 | 51.64     | 25.50             | 14.84              | 7.52      | 0.97    |
| 15    | 28.01 | 49.67     | 23.95             | 13.45              | 5.79      | 0.95    |
| 15.2  | 28.37 | 48.28     | 22.48             | 12.66              | 4.70      | 0.94    |
| 15.4  | 28.66 | 47.08     | 21.51             | 12.44              | 3.96      | 0.94    |
| 15.6  | 28.90 | 45.85     | 21.88             | 12.20              | 3.35      | 0.93    |
| 15.8  | 28.87 | 45.38     | 23.85             | 13.10              | 3.25      | 0.93    |
| 16    | 28.62 | 44.90     | 25.84             | 14.66              | 3.22      | 0.94    |
| 16.2  | 27.83 | 45.92     | 20.44             | 17.50              | 3.97      | 0.97    |
| 16.4  | 26.98 | 47.51     | 13.15             | 13.43              | 4.89      | 0.99    |
| 16.6  | 26.88 | 45.89     | 10.79             | 12.48              | 3.95      | 1.00    |
| 16.8  | 26.69 | 45.20     | 9.39              | 11.87              | 3.58      | 1.02    |
| 17    | 26.23 | 45.03     | 8.28              | 11.08              | 3.49      | 1.04    |

| FREQ  | 1dB Comp. Output | Psat Output | IP3 Output | Noise Figure |
|-------|------------------|-------------|------------|--------------|
| (GHz) | (dBm)            | (dBm)       | (dBm)      | (dB)         |
| 9     | 20.47            | 22.47       | 30.23      | 5.03         |
| 9.2   | 20.44            | 22.53       | 30.33      | 4.95         |
| 9.4   | 20.42            | 22.64       | 30.62      | 4.89         |
| 9.6   | 20.34            | 22.66       | 30.98      | 4.80         |
| 9.8   | 20.35            | 22.69       | 31.28      | 4.73         |
| 10    | 20.32            | 22.70       | 31.51      | 4.66         |
| 10.2  | 20.34            | 22.69       | 31.71      | 4.60         |
| 10.4  | 20.38            | 22.87       | 31.87      | 4.54         |
| 10.6  | 20.41            | 22.90       | 31.98      | 4.48         |
| 10.8  | 20.49            | 23.09       | 32.08      | 4.44         |
| 11    | 20.59            | 23.27       | 32.16      | 4.38         |
| 11.2  | 20.65            | 23.38       | 32.22      | 4.35         |
| 11.4  | 20.80            | 23.74       | 32.38      | 4.34         |
| 11.6  | 20.82            | 23.80       | 32.54      | 4.29         |
| 11.8  | 20.91            | 24.14       | 32.79      | 4.28         |
| 12    | 20.94            | 24.19       | 32.91      | 4.27         |
| 12.2  | 20.94            | 24.32       | 33.17      | 4.26         |
| 12.4  | 20.99            | 24.48       | 33.40      | 4.24         |
| 12.6  | 20.99            | 24.42       | 33.51      | 4.23         |
| 12.8  | 21.03            | 24.45       | 33.56      | 4.21         |
| 13    | 21.04            | 24.29       | 33.60      | 4.20         |
| 13.2  | 21.05            | 24.08       | 33.65      | 4.19         |
| 13.4  | 21.05            | 23.79       | 33.41      | 4.15         |
| 13.6  | 20.98            | 23.70       | 33.24      | 4.13         |
| 13.8  | 20.92            | 23.35       | 32.94      | 4.09         |
| 14    | 20.82            | 23.44       | 32.71      | 4.06         |
| 14.2  | 20.76            | 23.20       | 32.42      | 4.01         |
| 14.4  | 20.68            | 23.29       | 32.14      | 4.01         |
| 14.6  | 20.57            | 23.27       | 31.83      | 3.98         |
| 14.8  | 20.51            | 23.30       | 31.57      | 3.94         |
| 15    | 20.35            | 23.24       | 31.37      | 3.92         |
| 15.2  | 20.22            | 23.16       | 31.12      | 3.89         |
| 15.4  | 20.08            | 22.95       | 30.80      | 3.85         |
| 15.6  | 19.97            | 22.90       | 30.56      | 3.82         |
| 15.8  | 19.94            | 22.73       | 30.43      | 3.82         |
| 16    | 19.92            | 22.70       | 30.44      | 3.84         |
| 16.2  | 19.90            | 22.58       | 30.43      | 3.85         |
| 16.4  | 19.83            | 22.38       | 30.40      | 3.85         |
| 16.6  | 19.82            | 22.29       | 30.40      | 3.85         |
| 16.8  | 19.70            | 22.05       | 30.48      | 3.85         |
| 17    | 19.66            | 21.99       | 30.51      | 3.85         |

## Typical Performance Data

### Definitions:

Input Return Loss = S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = S12 (dB)

Output Return Loss = S22 (dB)

TEST CONDITIONS:  $V_{DD} = +5\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature =  $+105^{\circ}\text{C}$

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|
| (GHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure |
| 8     | 21.11 | 60.79     | 11.73             | 8.74               | 38.91     | 0.93    |
| 8.2   | 21.00 | 60.66     | 12.31             | 9.21               | 39.83     | 0.93    |
| 8.4   | 20.89 | 60.97     | 13.06             | 9.73               | 42.88     | 0.94    |
| 8.6   | 20.81 | 61.02     | 14.00             | 10.37              | 44.71     | 0.94    |
| 8.8   | 20.76 | 61.41     | 15.17             | 11.19              | 48.32     | 0.95    |
| 9     | 20.71 | 62.82     | 16.74             | 12.11              | 58.55     | 0.96    |
| 9.2   | 20.68 | 61.77     | 18.54             | 13.34              | 53.34     | 0.97    |
| 9.4   | 20.69 | 61.54     | 20.72             | 14.87              | 52.91     | 0.98    |
| 9.6   | 20.74 | 62.42     | 23.27             | 16.69              | 59.13     | 0.98    |
| 9.8   | 20.78 | 62.03     | 25.06             | 18.72              | 56.79     | 0.99    |
| 10    | 20.86 | 62.41     | 24.85             | 20.44              | 59.10     | 0.99    |
| 10.2  | 20.89 | 58.67     | 22.27             | 20.45              | 38.17     | 1.00    |
| 10.4  | 20.93 | 58.81     | 20.41             | 18.92              | 38.35     | 1.00    |
| 10.6  | 20.97 | 58.36     | 18.76             | 17.47              | 35.90     | 0.99    |
| 10.8  | 21.03 | 58.95     | 17.39             | 16.16              | 37.72     | 0.99    |
| 11    | 21.02 | 58.59     | 16.22             | 15.07              | 35.71     | 0.99    |
| 11.2  | 20.95 | 58.13     | 15.29             | 14.14              | 33.70     | 0.99    |
| 11.4  | 20.87 | 57.59     | 14.57             | 13.61              | 31.63     | 0.99    |
| 11.6  | 20.81 | 56.30     | 14.07             | 13.39              | 27.25     | 0.99    |
| 11.8  | 20.75 | 55.38     | 13.83             | 13.34              | 24.58     | 0.99    |
| 12    | 20.69 | 55.15     | 13.80             | 13.82              | 24.23     | 1.00    |
| 12.2  | 20.62 | 54.95     | 14.00             | 14.33              | 24.04     | 1.00    |
| 12.4  | 20.53 | 54.35     | 14.35             | 15.20              | 22.92     | 1.01    |
| 12.6  | 20.42 | 54.97     | 14.84             | 16.38              | 25.23     | 1.01    |
| 12.8  | 20.30 | 56.36     | 15.38             | 18.11              | 30.34     | 1.01    |
| 13    | 20.22 | 56.27     | 16.05             | 19.90              | 30.64     | 1.01    |
| 13.2  | 20.15 | 55.65     | 17.10             | 22.74              | 29.04     | 1.01    |
| 13.4  | 20.07 | 54.89     | 18.54             | 25.57              | 27.06     | 1.01    |
| 13.6  | 20.03 | 54.48     | 20.47             | 28.08              | 26.13     | 1.01    |
| 13.8  | 19.98 | 56.66     | 22.49             | 30.32              | 33.90     | 1.00    |
| 14    | 19.88 | 56.20     | 24.53             | 32.12              | 32.63     | 1.00    |
| 14.2  | 19.77 | 54.15     | 27.59             | 27.42              | 26.08     | 1.00    |
| 14.4  | 19.72 | 52.91     | 31.70             | 24.45              | 22.73     | 1.00    |
| 14.6  | 19.69 | 52.31     | 32.67             | 21.35              | 21.22     | 0.99    |
| 14.8  | 19.69 | 50.67     | 29.67             | 19.81              | 17.53     | 0.99    |
| 15    | 19.78 | 48.44     | 25.66             | 18.30              | 13.34     | 0.99    |
| 15.2  | 19.84 | 47.33     | 23.19             | 17.92              | 11.62     | 0.99    |
| 15.4  | 19.79 | 46.07     | 21.33             | 17.52              | 10.07     | 0.99    |
| 15.6  | 19.62 | 45.19     | 20.11             | 17.65              | 9.27      | 0.99    |
| 15.8  | 19.32 | 45.29     | 18.42             | 17.43              | 9.67      | 0.99    |
| 16    | 18.81 | 44.82     | 17.00             | 16.41              | 9.62      | 0.99    |
| 16.2  | 18.18 | 44.95     | 14.49             | 14.95              | 10.21     | 1.00    |
| 16.4  | 17.86 | 45.17     | 12.00             | 13.32              | 10.41     | 1.01    |
| 16.6  | 17.39 | 45.16     | 11.07             | 12.51              | 10.70     | 1.01    |
| 16.8  | 16.69 | 44.57     | 10.52             | 11.95              | 10.61     | 1.02    |
| 17    | 15.93 | 44.82     | 9.95              | 11.36              | 11.62     | 1.02    |

| FREQ  | 1dB Comp. Output | Psat Output | IP3 Output | Noise Figure |
|-------|------------------|-------------|------------|--------------|
| (GHz) | (dBm)            | (dBm)       | (dBm)      | (dB)         |
| 9     | 20.30            | 22.12       | 28.45      | 7.20         |
| 9.2   | 20.37            | 22.19       | 28.58      | 7.10         |
| 9.4   | 20.50            | 22.33       | 28.86      | 7.03         |
| 9.6   | 20.64            | 22.43       | 29.23      | 6.93         |
| 9.8   | 20.79            | 22.54       | 29.48      | 6.86         |
| 10    | 20.99            | 22.70       | 29.70      | 6.84         |
| 10.2  | 21.14            | 22.78       | 29.84      | 6.79         |
| 10.4  | 21.34            | 22.96       | 29.91      | 6.74         |
| 10.6  | 21.47            | 23.04       | 29.94      | 6.70         |
| 10.8  | 21.61            | 23.17       | 29.95      | 6.67         |
| 11    | 21.74            | 23.29       | 29.88      | 6.66         |
| 11.2  | 21.84            | 23.36       | 29.79      | 6.64         |
| 11.4  | 21.88            | 23.51       | 29.86      | 6.62         |
| 11.6  | 21.96            | 23.54       | 29.98      | 6.58         |
| 11.8  | 21.84            | 23.65       | 30.09      | 6.57         |
| 12    | 21.94            | 23.67       | 30.08      | 6.56         |
| 12.2  | 21.86            | 23.70       | 30.17      | 6.57         |
| 12.4  | 21.86            | 23.72       | 30.21      | 6.56         |
| 12.6  | 21.92            | 23.65       | 30.06      | 6.55         |
| 12.8  | 21.76            | 23.65       | 29.90      | 6.52         |
| 13    | 21.75            | 23.51       | 29.79      | 6.49         |
| 13.2  | 21.54            | 23.42       | 29.55      | 6.46         |
| 13.4  | 21.32            | 23.26       | 29.05      | 6.43         |
| 13.6  | 21.07            | 23.10       | 28.58      | 6.40         |
| 13.8  | 20.80            | 22.99       | 28.09      | 6.37         |
| 14    | 20.54            | 22.81       | 27.71      | 6.33         |
| 14.2  | 20.35            | 22.75       | 27.34      | 6.28         |
| 14.4  | 20.16            | 22.58       | 26.97      | 6.26         |
| 14.6  | 20.06            | 22.51       | 26.66      | 6.23         |
| 14.8  | 19.99            | 22.41       | 26.45      | 6.22         |
| 15    | 19.98            | 22.30       | 26.34      | 6.21         |
| 15.2  | 20.05            | 22.31       | 26.23      | 6.20         |
| 15.4  | 20.07            | 22.15       | 26.18      | 6.17         |
| 15.6  | 20.20            | 22.20       | 26.23      | 6.15         |
| 15.8  | 20.17            | 22.03       | 26.20      | 6.18         |
| 16    | 20.18            | 21.96       | 26.14      | 6.21         |
| 16.2  | 20.10            | 21.84       | 25.89      | 6.22         |
| 16.4  | 19.97            | 21.67       | 25.55      | 6.23         |
| 16.6  | 19.92            | 21.63       | 25.18      | 6.25         |
| 16.8  | 19.75            | 21.44       | 24.91      | 6.28         |
| 17    | 19.67            | 21.37       | 24.59      | 6.32         |

## Typical Performance Data

TEST CONDITIONS:  $V_{DD} = +5\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature =  $+25^{\circ}\text{C}$

| FREQ                           | OIP3 @<br>+6 dBm/Tone | OIP3 @<br>+9 dBm/Tone | OIP3 @<br>+12 dBm/Tone | OIP3 @<br>+15 dBm/Tone | OIP3 @<br>+18 dBm/Tone |
|--------------------------------|-----------------------|-----------------------|------------------------|------------------------|------------------------|
| (GHz)                          | (dBm)                 | (dBm)                 | (dBm)                  | (dBm)                  | (dBm)                  |
| 9                              | 29.66                 | 30.19                 | 31.04                  | 28.61                  | 25.19                  |
| 9.2                            | 29.89                 | 30.37                 | 31.20                  | 28.78                  | 25.26                  |
| 9.4                            | 30.18                 | 30.60                 | 31.25                  | 29.48                  | 25.72                  |
| 9.6                            | 30.44                 | 30.80                 | 31.29                  | 30.35                  | 26.27                  |
| 9.8                            | 30.60                 | 30.92                 | 31.31                  | 30.91                  | 26.72                  |
| 10                             | 30.75                 | 31.00                 | 31.38                  | 31.27                  | 26.99                  |
| 10.2                           | 30.85                 | 31.08                 | 31.42                  | 31.55                  | 27.19                  |
| 10.4                           | 30.88                 | 31.09                 | 31.41                  | 31.65                  | 27.26                  |
| 10.6                           | 30.83                 | 31.00                 | 31.31                  | 31.63                  | 27.40                  |
| 10.8                           | 30.76                 | 30.94                 | 31.23                  | 31.58                  | 27.55                  |
| 11                             | 30.66                 | 30.85                 | 31.13                  | 31.44                  | 27.57                  |
| 11.2                           | 30.56                 | 30.72                 | 31.01                  | 31.22                  | 27.66                  |
| 11.4                           | 30.51                 | 30.66                 | 30.96                  | 31.22                  | 27.81                  |
| 11.6                           | 30.39                 | 30.54                 | 30.84                  | 31.24                  | 28.04                  |
| 11.8                           | 30.33                 | 30.46                 | 30.78                  | 31.35                  | 28.09                  |
| 12                             | 30.22                 | 30.34                 | 30.65                  | 31.24                  | 28.29                  |
| 12.2                           | 30.21                 | 30.33                 | 30.64                  | 31.42                  | 28.35                  |
| 12.4                           | 30.24                 | 30.36                 | 30.68                  | 31.60                  | 28.29                  |
| 12.6                           | 30.21                 | 30.32                 | 30.65                  | 31.58                  | 28.28                  |
| 12.8                           | 30.09                 | 30.21                 | 30.56                  | 31.52                  | 28.31                  |
| 13                             | 29.98                 | 30.11                 | 30.49                  | 31.56                  | 28.27                  |
| 13.2                           | 29.92                 | 30.06                 | 30.48                  | 31.62                  | 28.03                  |
| 13.4                           | 29.60                 | 29.78                 | 30.24                  | 31.22                  | 27.90                  |
| 13.6                           | 29.33                 | 29.54                 | 30.03                  | 30.90                  | 27.53                  |
| 13.8                           | 29.00                 | 29.22                 | 29.74                  | 30.49                  | 27.19                  |
| 14                             | 28.72                 | 28.95                 | 29.47                  | 30.12                  | 27.12                  |
| 14.2                           | 28.41                 | 28.65                 | 29.17                  | 29.72                  | 26.96                  |
| 14.4                           | 28.09                 | 28.35                 | 28.85                  | 29.29                  | 26.76                  |
| 14.6                           | 27.78                 | 28.02                 | 28.51                  | 28.87                  | 26.55                  |
| 14.8                           | 27.52                 | 27.76                 | 28.23                  | 28.53                  | 26.37                  |
| 15                             | 27.32                 | 27.57                 | 28.01                  | 28.25                  | 26.26                  |
| 15.2                           | 27.16                 | 27.38                 | 27.82                  | 27.98                  | 25.97                  |
| 15.4                           | 27.02                 | 27.22                 | 27.65                  | 27.75                  | 25.74                  |
| 15.6                           | 27.00                 | 27.19                 | 27.59                  | 27.65                  | 25.58                  |
| 15.8                           | 26.96                 | 27.15                 | 27.55                  | 27.47                  | 25.32                  |
| 16                             | 26.88                 | 27.09                 | 27.49                  | 27.27                  | 25.11                  |
| 16.2                           | 26.65                 | 26.89                 | 27.31                  | 26.76                  | 24.77                  |
| 16.4                           | 26.32                 | 26.55                 | 27.01                  | 26.03                  | 24.47                  |
| 16.6                           | 25.91                 | 26.15                 | 26.68                  | 25.33                  | 24.40                  |
| 16.8                           | 25.54                 | 25.80                 | 26.41                  | 25.13                  | 24.72                  |
| 17                             | 25.23                 | 25.48                 | 26.15                  | 24.93                  | 24.81                  |
| $P_{OUT}/\text{Tone}$<br>(dBm) | @9 GHz                | @10 GHz               | @12 GHz                | @14 GHz                | @16 GHz                |
| 6                              | 29.66                 | 30.75                 | 30.22                  | 28.72                  | 26.88                  |
| 9                              | 30.19                 | 31.00                 | 30.34                  | 28.95                  | 27.09                  |
| 12                             | 31.04                 | 31.38                 | 30.65                  | 29.47                  | 27.49                  |
| 15                             | 28.61                 | 31.27                 | 31.24                  | 30.12                  | 27.27                  |
| 18                             | 25.19                 | 26.99                 | 28.29                  | 27.12                  | 25.11                  |

## Typical Performance Data

TEST CONDITIONS:  $V_{DD} = +5\text{ V}$ ,  $I_{DD} = 125\text{ mA}$ ,  $145\text{ mA}$ ,  $165\text{ mA}$  @ Temperature =  $+25^{\circ}\text{C}$ 

| FREQ  | Gain @<br>125 mA | Gain @<br>145 mA | Gain @<br>165 mA |
|-------|------------------|------------------|------------------|
| (GHz) | (dB)             | (dB)             | (dB)             |
| 8     | 23.15            | 23.89            | 24.20            |
| 8.2   | 23.08            | 23.78            | 24.12            |
| 8.4   | 23.00            | 23.69            | 24.04            |
| 8.6   | 22.92            | 23.59            | 23.97            |
| 8.8   | 22.87            | 23.53            | 23.92            |
| 9     | 22.84            | 23.51            | 23.88            |
| 9.2   | 22.80            | 23.46            | 23.83            |
| 9.4   | 22.80            | 23.45            | 23.84            |
| 9.6   | 22.86            | 23.51            | 23.89            |
| 9.8   | 22.91            | 23.58            | 23.95            |
| 10    | 22.98            | 23.65            | 24.02            |
| 10.2  | 23.07            | 23.73            | 24.12            |
| 10.4  | 23.14            | 23.78            | 24.19            |
| 10.6  | 23.20            | 23.86            | 24.26            |
| 10.8  | 23.23            | 23.96            | 24.29            |
| 11    | 23.23            | 23.99            | 24.30            |
| 11.2  | 23.22            | 23.95            | 24.28            |
| 11.4  | 23.18            | 23.88            | 24.24            |
| 11.6  | 23.14            | 23.81            | 24.19            |
| 11.8  | 23.11            | 23.78            | 24.16            |
| 12    | 23.07            | 23.74            | 24.12            |
| 12.2  | 23.03            | 23.69            | 24.08            |
| 12.4  | 22.95            | 23.64            | 24.00            |
| 12.6  | 22.89            | 23.55            | 23.93            |
| 12.8  | 22.84            | 23.45            | 23.89            |
| 13    | 22.78            | 23.38            | 23.82            |
| 13.2  | 22.70            | 23.35            | 23.74            |
| 13.4  | 22.65            | 23.28            | 23.70            |
| 13.6  | 22.66            | 23.24            | 23.72            |
| 13.8  | 22.59            | 23.25            | 23.65            |
| 14    | 22.45            | 23.13            | 23.50            |
| 14.2  | 22.33            | 23.00            | 23.38            |
| 14.4  | 22.23            | 22.94            | 23.27            |
| 14.6  | 22.13            | 22.90            | 23.17            |
| 14.8  | 22.16            | 22.84            | 23.20            |
| 15    | 22.27            | 22.90            | 23.33            |
| 15.2  | 22.34            | 22.99            | 23.39            |
| 15.4  | 22.31            | 22.99            | 23.34            |
| 15.6  | 22.16            | 22.88            | 23.16            |
| 15.8  | 21.89            | 22.60            | 22.85            |
| 16    | 21.46            | 22.19            | 22.39            |
| 16.2  | 20.82            | 21.50            | 21.73            |
| 16.4  | 20.30            | 21.03            | 21.23            |
| 16.6  | 19.92            | 20.82            | 20.89            |
| 16.8  | 19.32            | 20.29            | 20.34            |
| 17    | 18.54            | 19.61            | 19.60            |

| FREQ  | 1dB<br>Comp.<br>Output @<br>125 mA | 1dB<br>Comp.<br>Output @<br>145 mA | 1dB<br>Comp.<br>Output @<br>165 mA | Saturation<br>Output @<br>125 mA | Saturation<br>Output @<br>145 mA | Saturation<br>Output @<br>165 mA |
|-------|------------------------------------|------------------------------------|------------------------------------|----------------------------------|----------------------------------|----------------------------------|
| (GHz) | (dBm)                              | (dBm)                              | (dBm)                              | (dBm)                            | (dBm)                            | (dBm)                            |
| 9     | 20.74                              | 21.22                              | 21.88                              | 22.75                            | 22.69                            | 23.27                            |
| 9.2   | 20.77                              | 21.27                              | 21.94                              | 22.80                            | 22.73                            | 23.32                            |
| 9.4   | 20.85                              | 21.38                              | 22.09                              | 22.94                            | 22.85                            | 23.49                            |
| 9.6   | 20.93                              | 21.43                              | 22.16                              | 23.01                            | 22.88                            | 23.55                            |
| 9.8   | 21.04                              | 21.52                              | 22.29                              | 23.14                            | 22.98                            | 23.69                            |
| 10    | 21.22                              | 21.67                              | 22.49                              | 23.33                            | 23.11                            | 23.88                            |
| 10.2  | 21.36                              | 21.74                              | 22.58                              | 23.39                            | 23.14                            | 23.93                            |
| 10.4  | 21.57                              | 21.94                              | 22.83                              | 23.61                            | 23.34                            | 24.17                            |
| 10.6  | 21.71                              | 22.01                              | 22.91                              | 23.66                            | 23.38                            | 24.21                            |
| 10.8  | 21.88                              | 22.18                              | 23.11                              | 23.83                            | 23.57                            | 24.40                            |
| 11    | 22.04                              | 22.32                              | 23.25                              | 23.95                            | 23.71                            | 24.52                            |
| 11.2  | 22.20                              | 22.44                              | 23.37                              | 24.03                            | 23.80                            | 24.59                            |
| 11.4  | 22.43                              | 22.65                              | 23.60                              | 24.25                            | 24.02                            | 24.78                            |
| 11.6  | 22.57                              | 22.72                              | 23.66                              | 24.29                            | 24.05                            | 24.78                            |
| 11.8  | 22.79                              | 22.91                              | 23.88                              | 24.49                            | 24.26                            | 24.96                            |
| 12    | 22.86                              | 22.97                              | 23.90                              | 24.51                            | 24.27                            | 24.93                            |
| 12.2  | 23.00                              | 23.09                              | 24.02                              | 24.62                            | 24.37                            | 25.01                            |
| 12.4  | 23.06                              | 23.18                              | 24.09                              | 24.68                            | 24.44                            | 25.05                            |
| 12.6  | 23.04                              | 23.19                              | 24.08                              | 24.65                            | 24.39                            | 25.00                            |
| 12.8  | 23.07                              | 23.28                              | 24.17                              | 24.75                            | 24.48                            | 25.09                            |
| 13    | 22.88                              | 23.16                              | 24.04                              | 24.65                            | 24.36                            | 24.99                            |
| 13.2  | 22.79                              | 23.13                              | 24.05                              | 24.70                            | 24.37                            | 25.03                            |
| 13.4  | 22.52                              | 22.95                              | 23.89                              | 24.61                            | 24.25                            | 24.94                            |
| 13.6  | 22.26                              | 22.78                              | 23.73                              | 24.51                            | 24.12                            | 24.84                            |
| 13.8  | 22.04                              | 22.65                              | 23.61                              | 24.45                            | 24.06                            | 24.80                            |
| 14    | 21.72                              | 22.42                              | 23.35                              | 24.23                            | 23.85                            | 24.58                            |
| 14.2  | 21.57                              | 22.35                              | 23.26                              | 24.18                            | 23.83                            | 24.53                            |
| 14.4  | 21.30                              | 22.16                              | 22.99                              | 23.95                            | 23.64                            | 24.28                            |
| 14.6  | 21.19                              | 22.09                              | 22.86                              | 23.82                            | 23.57                            | 24.15                            |
| 14.8  | 21.08                              | 21.96                              | 22.68                              | 23.64                            | 23.45                            | 23.97                            |
| 15    | 20.97                              | 21.84                              | 22.48                              | 23.41                            | 23.29                            | 23.74                            |
| 15.2  | 20.98                              | 21.77                              | 22.40                              | 23.30                            | 23.21                            | 23.63                            |
| 15.4  | 20.86                              | 21.62                              | 22.16                              | 23.02                            | 23.01                            | 23.35                            |
| 15.6  | 20.91                              | 21.63                              | 22.13                              | 22.96                            | 22.98                            | 23.28                            |
| 15.8  | 20.80                              | 21.48                              | 21.90                              | 22.74                            | 22.80                            | 23.02                            |
| 16    | 20.76                              | 21.43                              | 21.76                              | 22.60                            | 22.71                            | 22.86                            |
| 16.2  | 20.67                              | 21.30                              | 21.57                              | 22.44                            | 22.54                            | 22.67                            |
| 16.4  | 20.52                              | 21.10                              | 21.33                              | 22.22                            | 22.31                            | 22.42                            |
| 16.6  | 20.55                              | 21.04                              | 21.29                              | 22.17                            | 22.21                            | 22.36                            |
| 16.8  | 20.50                              | 20.88                              | 21.17                              | 22.04                            | 22.00                            | 22.20                            |
| 17    | 20.53                              | 20.84                              | 21.17                              | 22.02                            | 21.92                            | 22.17                            |

## Typical Performance Data

TEST CONDITIONS:  $V_{DD} = +5\text{ V}$ ,  $I_{DD} = 125\text{ mA}$ ,  $145\text{ mA}$ ,  $165\text{ mA}$  @ Temperature =  $+25^{\circ}\text{C}$ 

| FREQ  | OIP3 @<br>125 mA | OIP3 @<br>145 mA | OIP3 @<br>165 mA | IM3 @<br>125 mA | IM3 @<br>145 mA | IM3 @<br>165 mA | Noise Figure<br>@ 125 mA | Noise Figure<br>@ 145 mA | Noise Figure<br>@ 165 mA |
|-------|------------------|------------------|------------------|-----------------|-----------------|-----------------|--------------------------|--------------------------|--------------------------|
| (GHz) | (dBm)            | (dBm)            | (dBm)            | (dBc)           | (dBc)           | (dBc)           | (dB)                     | (dB)                     | (dB)                     |
| 9     | 30.13            | 31.04            | 31.14            | -35.53          | -37.30          | -37.59          | 5.85                     | 5.87                     | 5.92                     |
| 9.2   | 30.30            | 31.20            | 31.30            | -35.89          | -37.70          | -37.92          | 5.74                     | 5.78                     | 5.82                     |
| 9.4   | 30.41            | 31.25            | 31.28            | -36.15          | -37.80          | -37.95          | 5.65                     | 5.68                     | 5.72                     |
| 9.6   | 30.57            | 31.29            | 31.25            | -36.56          | -38.00          | -38.00          | 5.56                     | 5.58                     | 5.64                     |
| 9.8   | 30.69            | 31.31            | 31.27            | -36.91          | -38.20          | -38.12          | 5.47                     | 5.48                     | 5.54                     |
| 10    | 30.87            | 31.38            | 31.33            | -37.36          | -38.40          | -38.33          | 5.39                     | 5.43                     | 5.47                     |
| 10.2  | 30.97            | 31.42            | 31.36            | -37.63          | -38.50          | -38.45          | 5.33                     | 5.37                     | 5.40                     |
| 10.4  | 31.03            | 31.41            | 31.35            | -37.77          | -38.50          | -38.48          | 5.27                     | 5.30                     | 5.33                     |
| 10.6  | 30.95            | 31.31            | 31.26            | -37.65          | -38.30          | -38.34          | 5.22                     | 5.24                     | 5.30                     |
| 10.8  | 30.89            | 31.23            | 31.18            | -37.56          | -38.20          | -38.21          | 5.20                     | 5.22                     | 5.28                     |
| 11    | 30.76            | 31.13            | 31.07            | -37.29          | -38.00          | -37.99          | 5.17                     | 5.18                     | 5.24                     |
| 11.2  | 30.58            | 31.01            | 30.92            | -36.93          | -37.80          | -37.73          | 5.15                     | 5.14                     | 5.21                     |
| 11.4  | 30.53            | 30.96            | 30.83            | -36.81          | -37.70          | -37.55          | 5.12                     | 5.13                     | 5.20                     |
| 11.6  | 30.44            | 30.84            | 30.70            | -36.63          | -37.40          | -37.28          | 5.11                     | 5.12                     | 5.18                     |
| 11.8  | 30.44            | 30.78            | 30.62            | -36.61          | -37.30          | -37.11          | 5.09                     | 5.11                     | 5.17                     |
| 12    | 30.34            | 30.65            | 30.49            | -36.40          | -37.10          | -36.89          | 5.10                     | 5.10                     | 5.18                     |
| 12.2  | 30.43            | 30.64            | 30.46            | -36.59          | -37.00          | -36.83          | 5.09                     | 5.10                     | 5.17                     |
| 12.4  | 30.57            | 30.68            | 30.46            | -36.87          | -37.10          | -36.86          | 5.07                     | 5.10                     | 5.15                     |
| 12.6  | 30.58            | 30.65            | 30.42            | -36.91          | -37.10          | -36.77          | 5.05                     | 5.08                     | 5.14                     |
| 12.8  | 30.50            | 30.56            | 30.33            | -36.77          | -36.90          | -36.58          | 5.05                     | 5.08                     | 5.12                     |
| 13    | 30.46            | 30.49            | 30.23            | -36.69          | -36.80          | -36.40          | 5.02                     | 5.05                     | 5.11                     |
| 13.2  | 30.46            | 30.48            | 30.19            | -36.66          | -36.80          | -36.32          | 4.99                     | 5.00                     | 5.09                     |
| 13.4  | 30.14            | 30.24            | 29.99            | -36.04          | -36.30          | -35.95          | 4.96                     | 4.96                     | 5.05                     |
| 13.6  | 29.83            | 30.03            | 29.83            | -35.46          | -35.90          | -35.62          | 4.93                     | 4.95                     | 5.01                     |
| 13.8  | 29.42            | 29.74            | 29.61            | -34.63          | -35.30          | -35.13          | 4.87                     | 4.91                     | 4.99                     |
| 14    | 29.03            | 29.47            | 29.41            | -33.72          | -34.70          | -34.61          | 4.83                     | 4.88                     | 4.95                     |
| 14.2  | 28.61            | 29.17            | 29.17            | -32.81          | -34.00          | -34.08          | 4.79                     | 4.82                     | 4.89                     |
| 14.4  | 28.19            | 28.85            | 28.92            | -31.91          | -33.30          | -33.56          | 4.75                     | 4.77                     | 4.85                     |
| 14.6  | 27.79            | 28.51            | 28.64            | -31.08          | -32.60          | -32.98          | 4.71                     | 4.75                     | 4.82                     |
| 14.8  | 27.46            | 28.23            | 28.39            | -30.42          | -32.00          | -32.45          | 4.69                     | 4.75                     | 4.80                     |
| 15    | 27.23            | 28.01            | 28.17            | -29.98          | -31.50          | -31.99          | 4.67                     | 4.71                     | 4.79                     |
| 15.2  | 27.02            | 27.82            | 28.00            | -29.54          | -31.10          | -31.59          | 4.63                     | 4.67                     | 4.76                     |
| 15.4  | 26.87            | 27.65            | 27.84            | -29.24          | -30.80          | -31.27          | 4.62                     | 4.67                     | 4.74                     |
| 15.6  | 26.81            | 27.59            | 27.76            | -29.10          | -30.70          | -31.13          | 4.60                     | 4.65                     | 4.71                     |
| 15.8  | 26.72            | 27.55            | 27.72            | -28.90          | -30.60          | -31.03          | 4.58                     | 4.65                     | 4.71                     |
| 16    | 26.63            | 27.49            | 27.67            | -28.72          | -30.50          | -30.99          | 4.60                     | 4.64                     | 4.72                     |
| 16.2  | 26.45            | 27.31            | 27.58            | -28.39          | -30.10          | -30.82          | 4.60                     | 4.65                     | 4.73                     |
| 16.4  | 26.19            | 27.01            | 27.45            | -27.88          | -29.50          | -30.52          | 4.61                     | 4.68                     | 4.71                     |
| 16.6  | 25.86            | 26.68            | 27.24            | -27.18          | -28.80          | -30.04          | 4.62                     | 4.68                     | 4.73                     |
| 16.8  | 25.59            | 26.41            | 27.02            | -26.57          | -28.30          | -29.58          | 4.63                     | 4.67                     | 4.75                     |
| 17    | 25.32            | 26.15            | 26.82            | -26.01          | -27.70          | -29.20          | 4.65                     | 4.69                     | 4.75                     |



## Typical Performance Data

## Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS:  $V_{DD} = +5\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature = +25°C

| $P_{IN}$<br>(dBm) | $P_{OUT}$<br>(@10 GHz)<br>(dBm) | Gain<br>(@10 GHz)<br>(dB) | $I_{DD}$<br>(@10 GHz)<br>(mA) | $P_{Diss}$<br>(@10 GHz)<br>(W) | $P_{IN}$<br>(dBm) | $P_{OUT}$<br>(@11.3 GHz)<br>(dBm) | Gain<br>(@11.3 GHz)<br>(dB) | $I_{DD}$<br>(@11.3 GHz)<br>(mA) | $P_{Diss}$<br>(@11.3 GHz)<br>(W) | $P_{IN}$<br>(dBm) | $P_{OUT}$<br>(@12.7 GHz)<br>(dBm) | Gain<br>(@12.7 GHz)<br>(dB) | $I_{DD}$<br>(@12.7 GHz)<br>(mA) | $P_{Diss}$<br>(@12.7 GHz)<br>(W) |
|-------------------|---------------------------------|---------------------------|-------------------------------|--------------------------------|-------------------|-----------------------------------|-----------------------------|---------------------------------|----------------------------------|-------------------|-----------------------------------|-----------------------------|---------------------------------|----------------------------------|
| -15.41            | 7.79                            | 23.20                     | 141.89                        | 0.70                           | -15.43            | 8.06                              | 23.49                       | 142.37                          | 0.71                             | -15.32            | 7.83                              | 23.14                       | 142.08                          | 0.70                             |
| -14.43            | 8.71                            | 23.14                     | 141.48                        | 0.70                           | -14.46            | 9.01                              | 23.46                       | 141.89                          | 0.70                             | -14.33            | 8.77                              | 23.11                       | 141.69                          | 0.70                             |
| -13.45            | 9.70                            | 23.14                     | 141.00                        | 0.70                           | -13.47            | 10.01                             | 23.47                       | 141.76                          | 0.70                             | -13.34            | 9.78                              | 23.11                       | 141.58                          | 0.70                             |
| -12.45            | 10.69                           | 23.14                     | 140.52                        | 0.69                           | -12.47            | 11.02                             | 23.49                       | 141.43                          | 0.69                             | -12.34            | 10.79                             | 23.13                       | 141.37                          | 0.69                             |
| -11.45            | 11.71                           | 23.16                     | 140.52                        | 0.69                           | -11.48            | 12.04                             | 23.51                       | 141.28                          | 0.69                             | -11.34            | 11.82                             | 23.16                       | 141.37                          | 0.69                             |
| -10.45            | 12.74                           | 23.19                     | 140.17                        | 0.68                           | -10.48            | 13.07                             | 23.54                       | 141.32                          | 0.69                             | -10.36            | 12.83                             | 23.19                       | 141.46                          | 0.69                             |
| -9.47             | 13.75                           | 23.22                     | 139.89                        | 0.68                           | -9.50             | 14.08                             | 23.58                       | 141.28                          | 0.68                             | -9.37             | 13.86                             | 23.23                       | 141.65                          | 0.68                             |
| -8.49             | 14.76                           | 23.25                     | 139.74                        | 0.67                           | -8.52             | 15.10                             | 23.62                       | 140.58                          | 0.67                             | -8.38             | 14.90                             | 23.28                       | 141.37                          | 0.68                             |
| -7.50             | 15.78                           | 23.28                     | 139.63                        | 0.66                           | -7.53             | 16.13                             | 23.66                       | 140.41                          | 0.66                             | -7.38             | 15.96                             | 23.34                       | 140.98                          | 0.67                             |
| -6.52             | 16.80                           | 23.32                     | 139.39                        | 0.65                           | -6.54             | 17.17                             | 23.70                       | 140.13                          | 0.65                             | -6.38             | 17.02                             | 23.40                       | 140.89                          | 0.65                             |
| -5.52             | 17.82                           | 23.34                     | 139.39                        | 0.64                           | -5.54             | 18.20                             | 23.73                       | 140.02                          | 0.63                             | -5.38             | 18.07                             | 23.45                       | 140.98                          | 0.64                             |
| -4.52             | 18.79                           | 23.31                     | 139.61                        | 0.62                           | -4.54             | 19.20                             | 23.74                       | 140.22                          | 0.62                             | -4.37             | 19.10                             | 23.47                       | 141.24                          | 0.63                             |
| -3.52             | 19.68                           | 23.20                     | 139.50                        | 0.61                           | -3.53             | 20.14                             | 23.68                       | 140.76                          | 0.60                             | -3.36             | 20.08                             | 23.45                       | 142.08                          | 0.61                             |
| -2.52             | 20.43                           | 22.94                     | 139.33                        | 0.59                           | -2.53             | 20.97                             | 23.49                       | 141.48                          | 0.58                             | -2.35             | 20.97                             | 23.32                       | 143.72                          | 0.59                             |
| -1.51             | 21.02                           | 22.53                     | 139.91                        | 0.57                           | -1.52             | 21.62                             | 23.14                       | 143.09                          | 0.57                             | -1.34             | 21.71                             | 23.05                       | 146.08                          | 0.58                             |
| -0.50             | 21.48                           | 21.98                     | 140.91                        | 0.56                           | -0.51             | 22.14                             | 22.65                       | 145.48                          | 0.56                             | -0.33             | 22.31                             | 22.65                       | 149.69                          | 0.58                             |
| 0.52              | 21.85                           | 21.33                     | 142.74                        | 0.56                           | 0.50              | 22.57                             | 22.06                       | 148.32                          | 0.56                             | 0.67              | 22.80                             | 22.13                       | 153.75                          | 0.58                             |
| 1.52              | 22.16                           | 20.63                     | 145.60                        | 0.57                           | 1.50              | 22.91                             | 21.40                       | 152.15                          | 0.57                             | 1.67              | 23.20                             | 21.53                       | 158.36                          | 0.58                             |
| 2.52              | 22.42                           | 19.90                     | 149.43                        | 0.57                           | 2.50              | 23.18                             | 20.68                       | 156.32                          | 0.58                             | 2.66              | 23.51                             | 20.85                       | 163.42                          | 0.59                             |
| 3.52              | 22.64                           | 19.12                     | 153.93                        | 0.59                           | 3.49              | 23.40                             | 19.91                       | 161.21                          | 0.59                             | 3.68              | 23.76                             | 20.08                       | 168.87                          | 0.61                             |
| 4.51              | 22.83                           | 18.33                     | 159.40                        | 0.61                           | 4.47              | 23.59                             | 19.12                       | 166.37                          | 0.61                             | 4.71              | 23.97                             | 19.26                       | 174.09                          | 0.62                             |
| 5.50              | 23.02                           | 17.52                     | 165.57                        | 0.63                           | 5.49              | 23.76                             | 18.27                       | 171.76                          | 0.62                             | 5.73              | 24.13                             | 18.40                       | 179.52                          | 0.64                             |
| 6.51              | 23.21                           | 16.70                     | 172.79                        | 0.66                           | 6.50              | 23.91                             | 17.41                       | 177.82                          | 0.65                             | 6.75              | 24.27                             | 17.52                       | 185.19                          | 0.66                             |
| 7.53              | 23.39                           | 15.86                     | 180.63                        | 0.69                           | 7.52              | 24.05                             | 16.53                       | 184.11                          | 0.67                             | 7.76              | 24.39                             | 16.63                       | 190.78                          | 0.69                             |
| 8.54              | 23.56                           | 15.02                     | 187.21                        | 0.72                           | 8.53              | 24.18                             | 15.65                       | 189.12                          | 0.69                             | 8.78              | 24.49                             | 15.71                       | 195.06                          | 0.70                             |
| 9.55              | 23.70                           | 14.15                     | 192.36                        | 0.74                           | 9.54              | 24.29                             | 14.75                       | 192.97                          | 0.71                             | 9.80              | 24.56                             | 14.77                       | 198.32                          | 0.72                             |



## Typical Performance Data

## Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

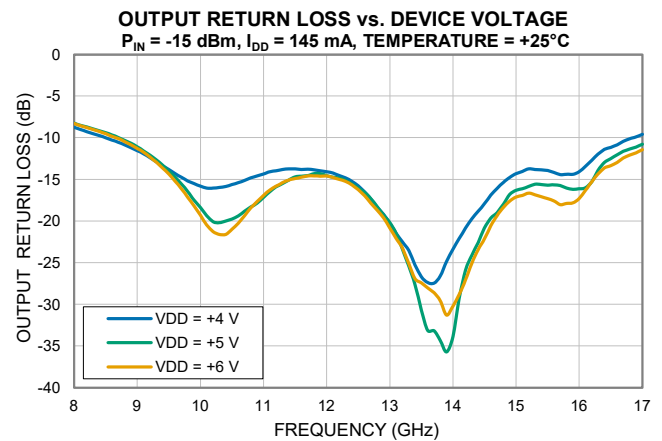
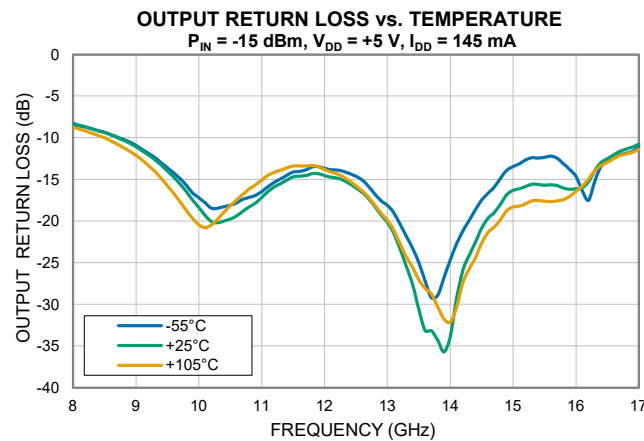
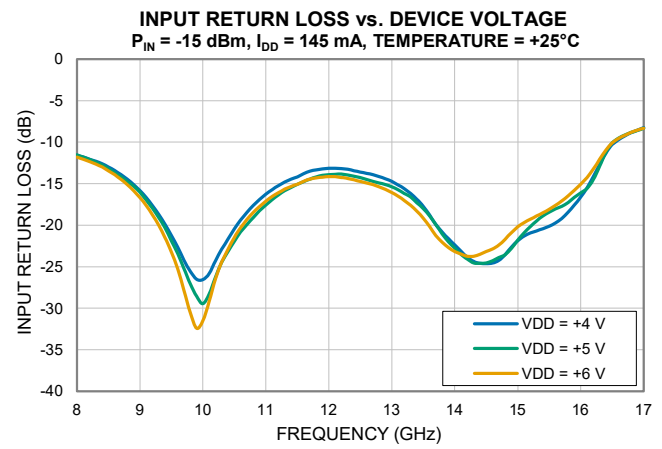
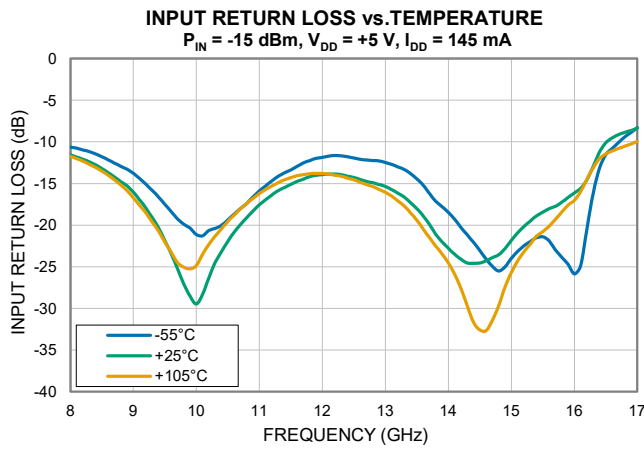
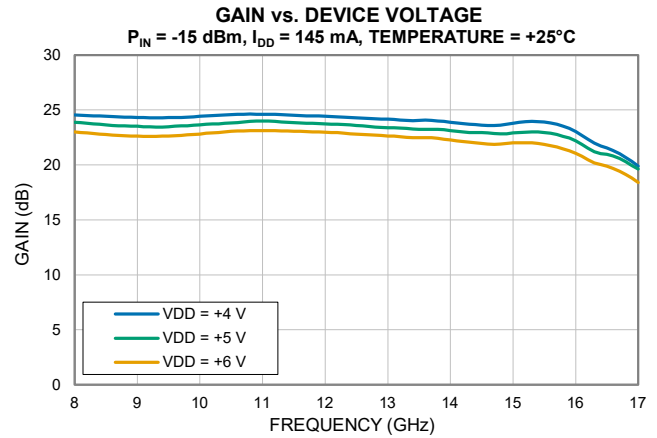
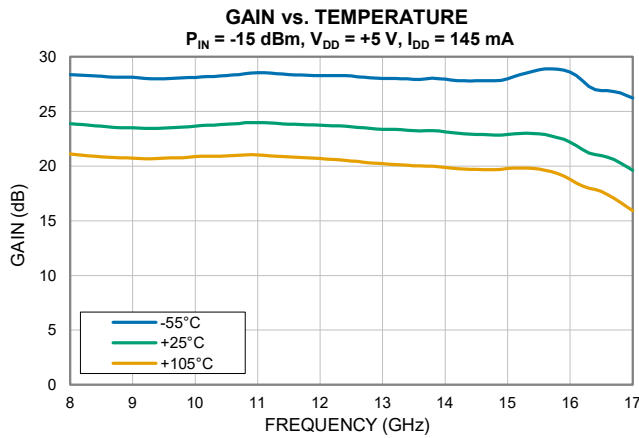
Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

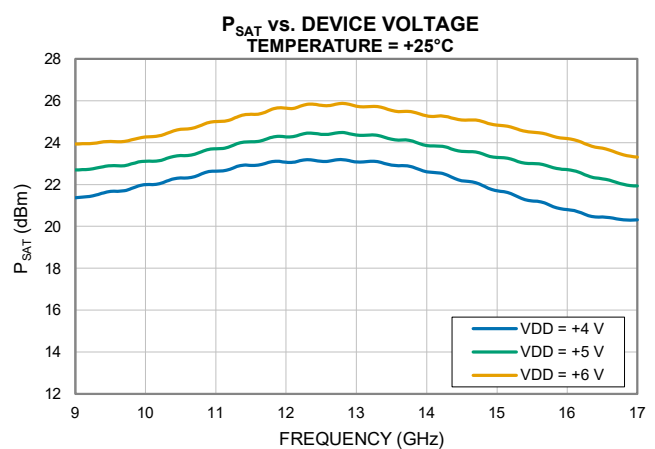
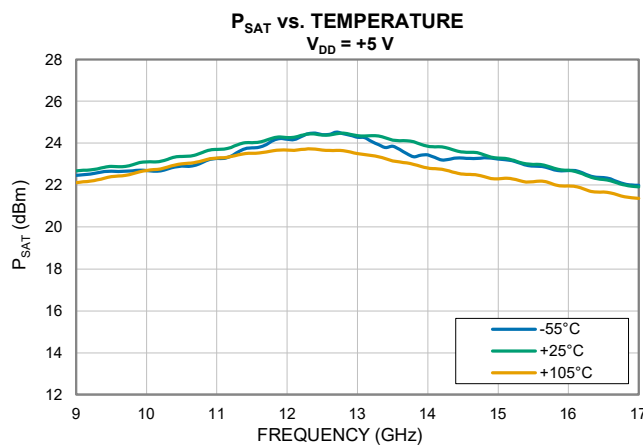
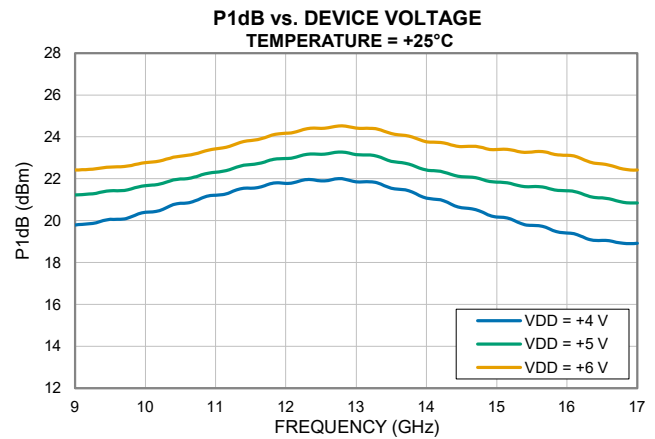
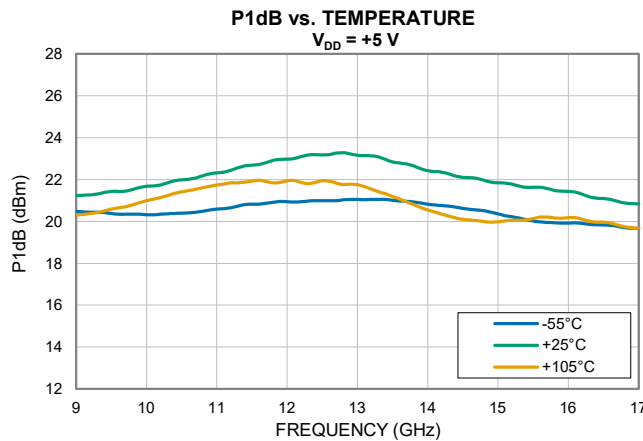
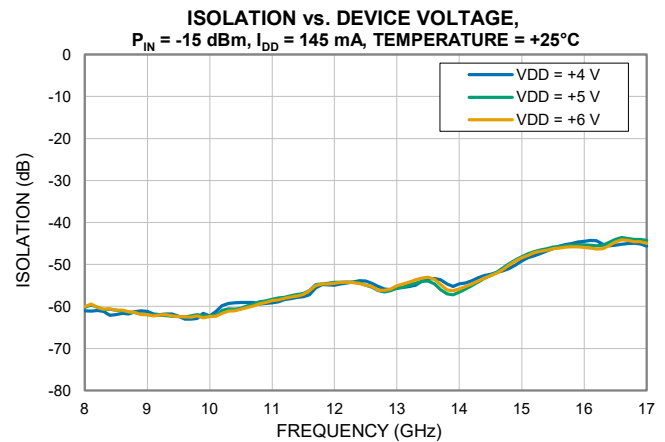
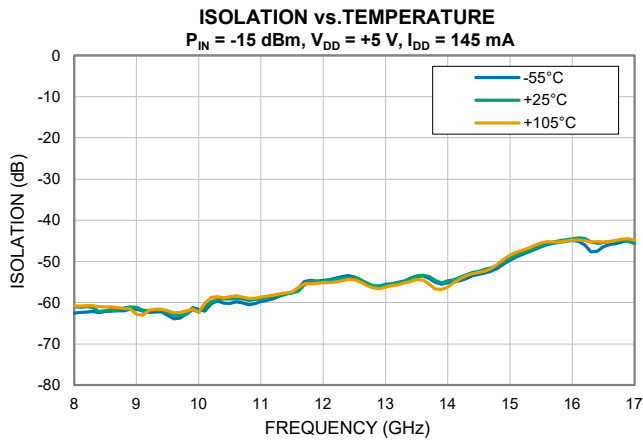
TEST CONDITIONS:  $V_{DD} = +5\text{ V}$ ,  $I_{DD} = 145\text{ mA}$  @ Temperature = +25°C

| $P_{IN}$ | $P_{OUT}$<br>(@14 GHz) | Gain<br>(@14 GHz) | $I_{DD}$<br>(@14 GHz) | $P_{Diss}$<br>(@14 GHz) | $P_{IN}$ | $P_{OUT}$<br>(@15.35 GHz) | Gain<br>(@15.35 GHz) | $I_{DD}$<br>(@15.35 GHz) | $P_{Diss}$<br>(@15.35 GHz) |
|----------|------------------------|-------------------|-----------------------|-------------------------|----------|---------------------------|----------------------|--------------------------|----------------------------|
| (dBm)    | (dBm)                  | (dB)              | (mA)                  | (W)                     | (dBm)    | (dBm)                     | (dB)                 | (mA)                     | (W)                        |
| -15.57   | 7.19                   | 22.77             | 143.47                | 0.71                    | -15.56   | 6.62                      | 22.18                | 142.19                   | 0.71                       |
| -14.60   | 8.05                   | 22.65             | 143.17                | 0.71                    | -14.59   | 7.41                      | 22.00                | 142.13                   | 0.71                       |
| -13.60   | 9.02                   | 22.62             | 142.71                | 0.71                    | -13.59   | 8.42                      | 22.01                | 142.26                   | 0.70                       |
| -12.60   | 10.04                  | 22.63             | 142.35                | 0.70                    | -12.59   | 9.45                      | 22.04                | 142.19                   | 0.70                       |
| -11.59   | 11.06                  | 22.66             | 142.24                | 0.70                    | -11.59   | 10.47                     | 22.07                | 142.11                   | 0.70                       |
| -10.61   | 12.07                  | 22.68             | 142.39                | 0.70                    | -10.61   | 11.50                     | 22.11                | 142.34                   | 0.70                       |
| -9.62    | 13.09                  | 22.72             | 142.32                | 0.69                    | -9.62    | 12.55                     | 22.17                | 142.17                   | 0.69                       |
| -8.63    | 14.13                  | 22.76             | 142.34                | 0.69                    | -8.63    | 13.60                     | 22.23                | 141.67                   | 0.69                       |
| -7.64    | 15.17                  | 22.81             | 142.08                | 0.68                    | -7.63    | 14.68                     | 22.31                | 141.69                   | 0.68                       |
| -6.64    | 16.23                  | 22.87             | 141.89                | 0.67                    | -6.63    | 15.76                     | 22.39                | 141.48                   | 0.67                       |
| -5.63    | 17.29                  | 22.92             | 141.58                | 0.65                    | -5.62    | 16.84                     | 22.46                | 141.76                   | 0.66                       |
| -4.62    | 18.33                  | 22.95             | 141.93                | 0.64                    | -4.61    | 17.89                     | 22.51                | 142.52                   | 0.65                       |
| -3.61    | 19.33                  | 22.94             | 142.67                | 0.63                    | -3.61    | 18.88                     | 22.48                | 143.98                   | 0.64                       |
| -2.61    | 20.25                  | 22.85             | 144.47                | 0.62                    | -2.60    | 19.75                     | 22.35                | 145.76                   | 0.63                       |
| -1.60    | 21.04                  | 22.64             | 147.04                | 0.61                    | -1.60    | 20.46                     | 22.05                | 148.80                   | 0.63                       |
| -0.59    | 21.66                  | 22.25             | 150.77                | 0.61                    | -0.60    | 21.00                     | 21.60                | 153.08                   | 0.64                       |
| 0.41     | 22.14                  | 21.74             | 155.19                | 0.61                    | 0.39     | 21.43                     | 21.04                | 158.79                   | 0.66                       |
| 1.40     | 22.55                  | 21.15             | 160.64                | 0.62                    | 1.38     | 21.81                     | 20.43                | 165.99                   | 0.68                       |
| 2.39     | 22.90                  | 20.51             | 166.81                | 0.64                    | 2.37     | 22.17                     | 19.80                | 174.68                   | 0.71                       |
| 3.40     | 23.22                  | 19.81             | 173.46                | 0.66                    | 3.39     | 22.50                     | 19.11                | 184.04                   | 0.74                       |
| 4.44     | 23.50                  | 19.06             | 180.93                | 0.68                    | 4.41     | 22.78                     | 18.36                | 193.32                   | 0.78                       |
| 5.46     | 23.74                  | 18.28             | 188.89                | 0.71                    | 5.42     | 23.00                     | 17.58                | 202.22                   | 0.82                       |
| 6.48     | 23.96                  | 17.49             | 196.40                | 0.74                    | 6.42     | 23.16                     | 16.74                | 210.29                   | 0.85                       |
| 7.48     | 24.14                  | 16.65             | 203.25                | 0.76                    | 7.41     | 23.27                     | 15.87                | 216.72                   | 0.88                       |
| 8.48     | 24.23                  | 15.75             | 208.59                | 0.79                    | 8.39     | 23.33                     | 14.94                | 221.45                   | 0.90                       |
| 9.48     | 24.26                  | 14.78             | 212.11                | 0.80                    | 9.37     | 23.32                     | 13.95                | 224.60                   | 0.92                       |

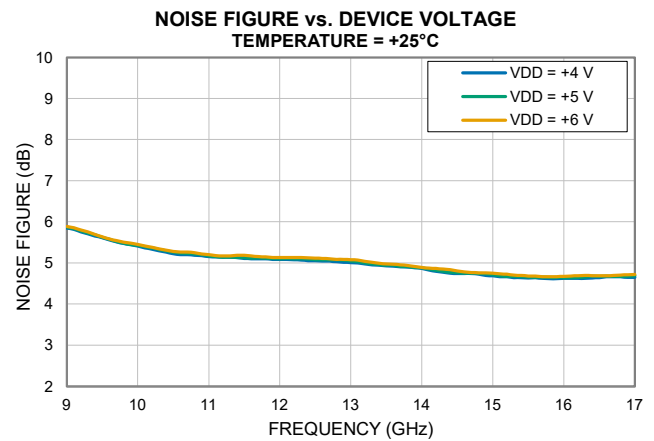
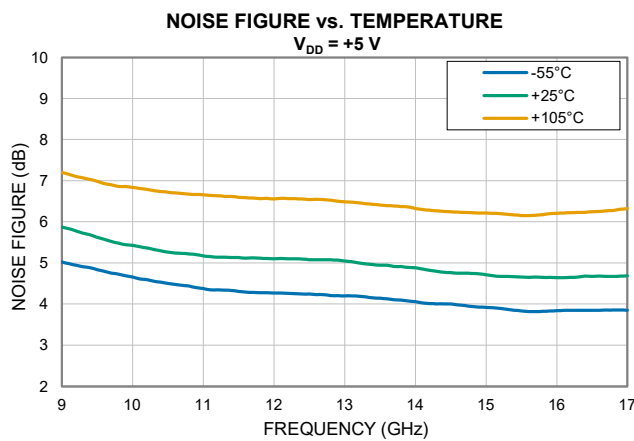
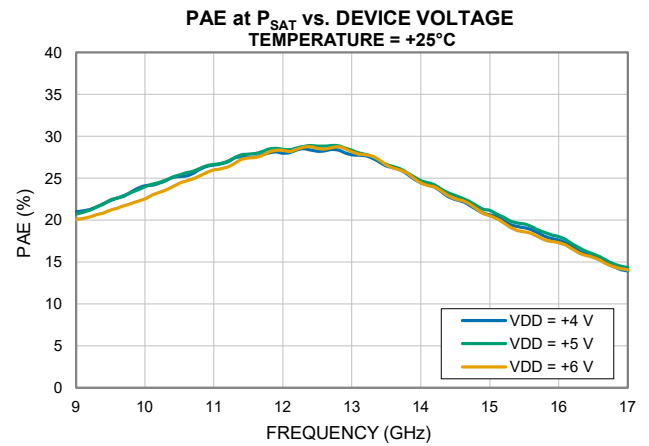
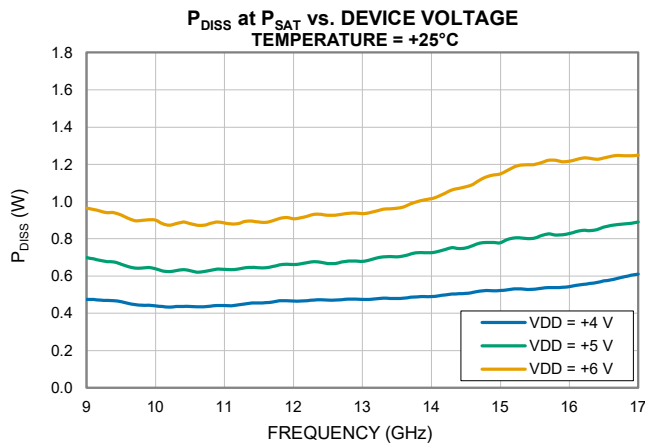
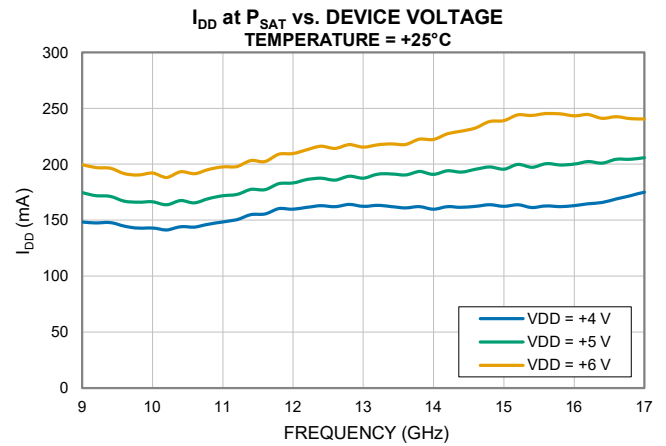
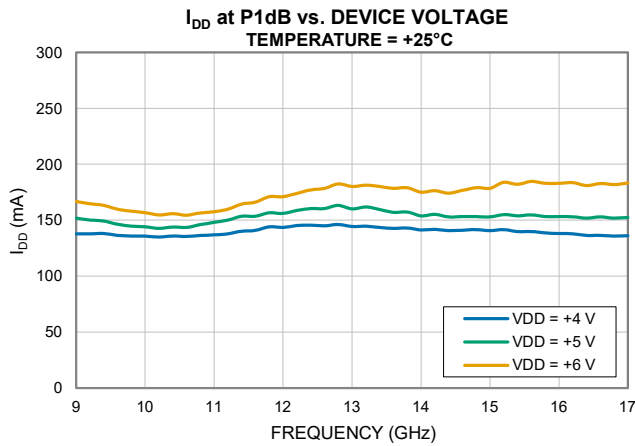
## Typical Performance Curves



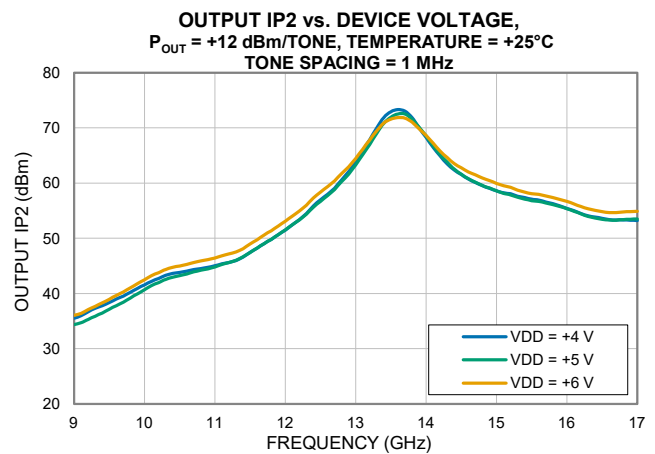
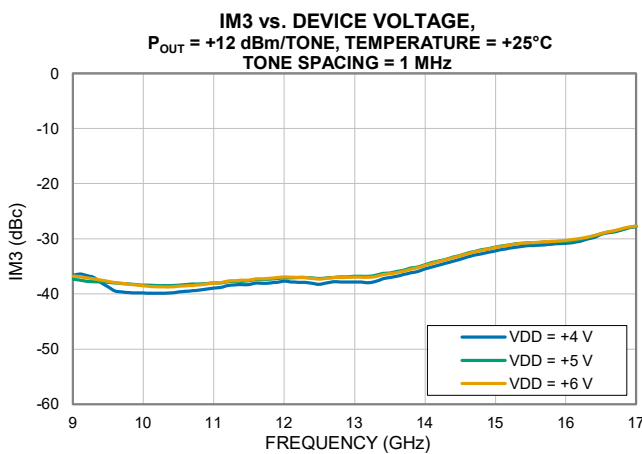
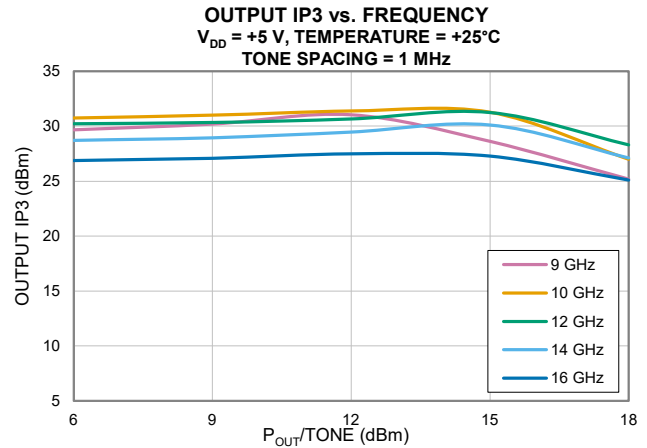
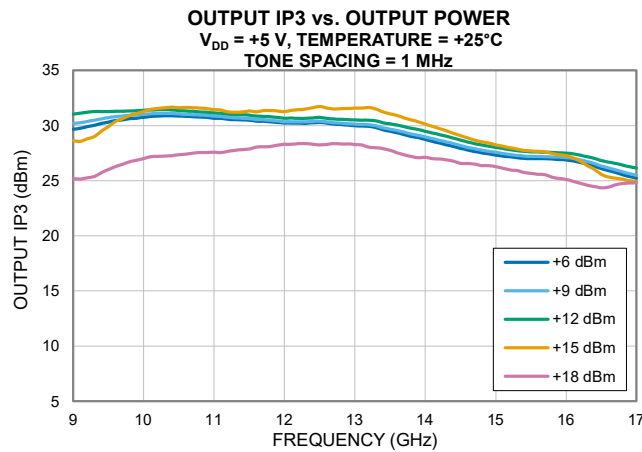
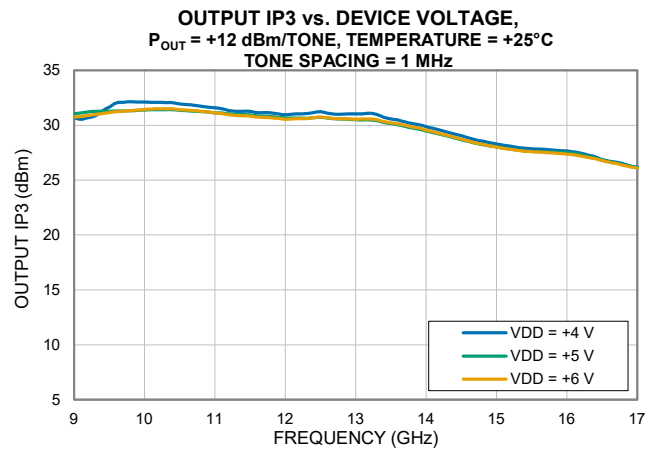
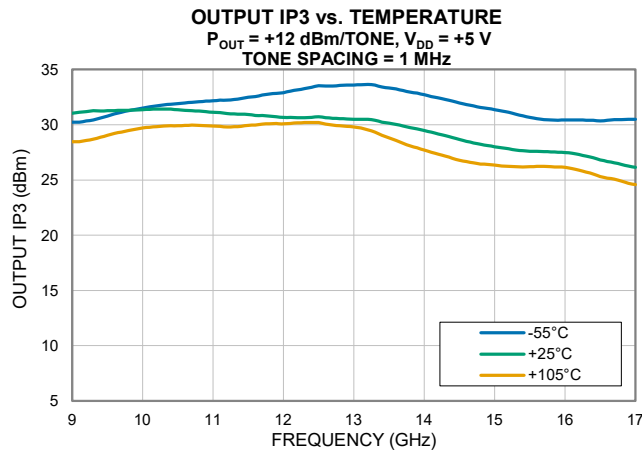
## Typical Performance Curves



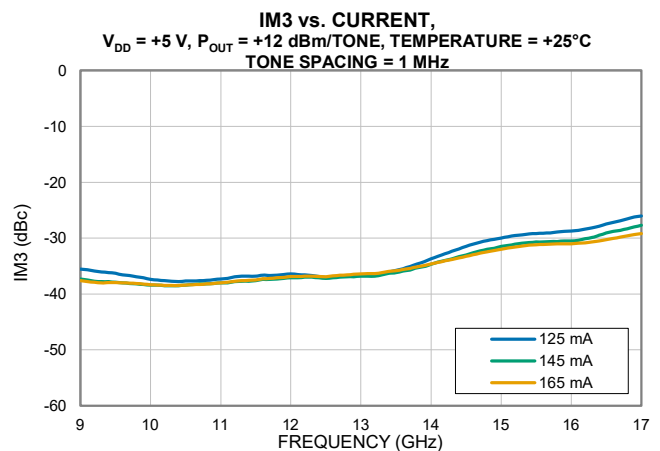
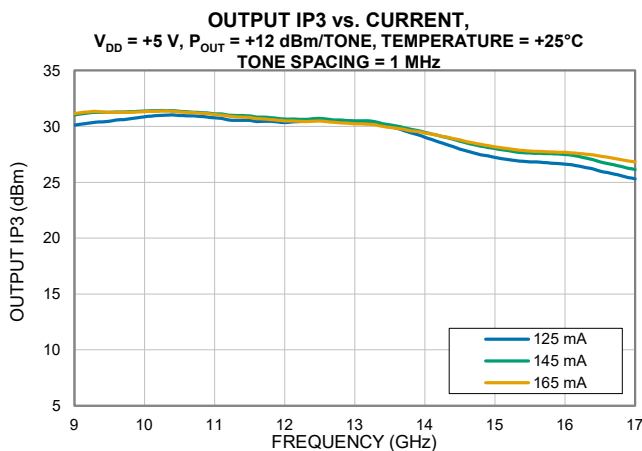
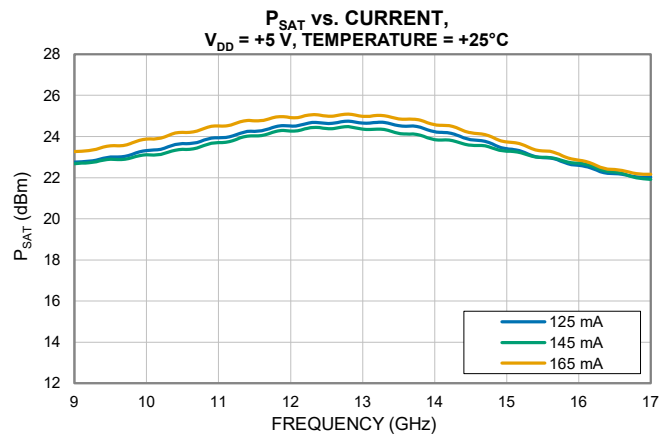
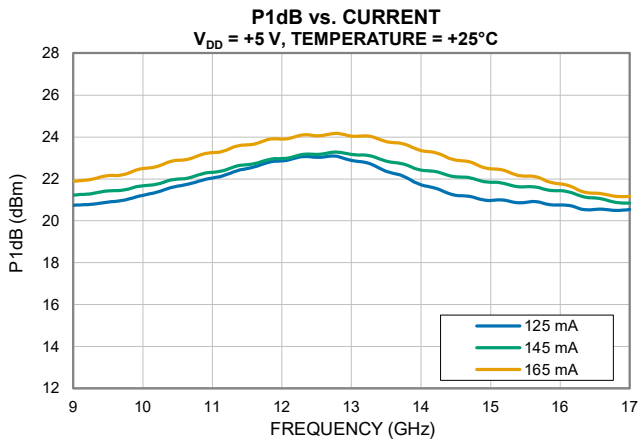
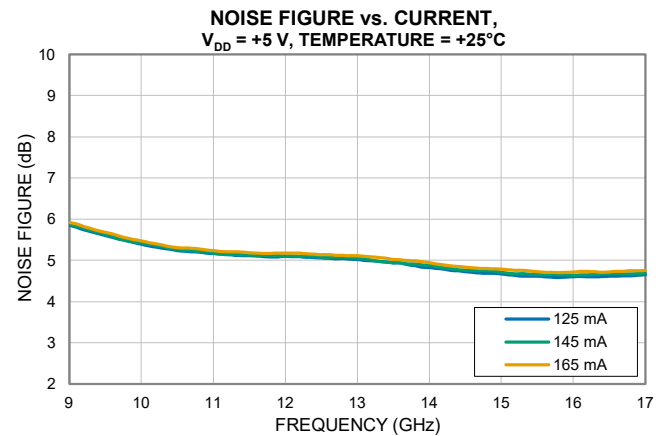
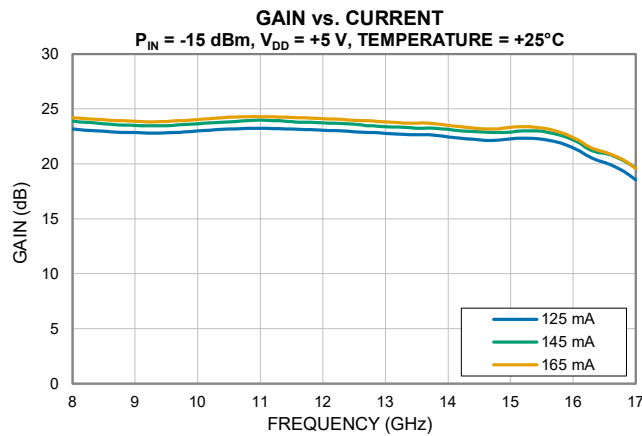
## Typical Performance Curves



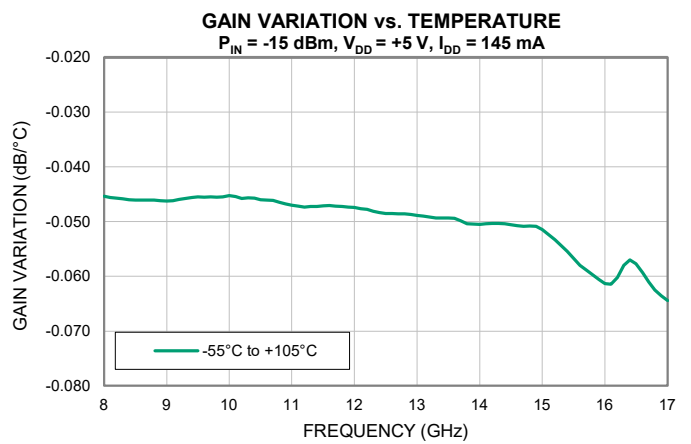
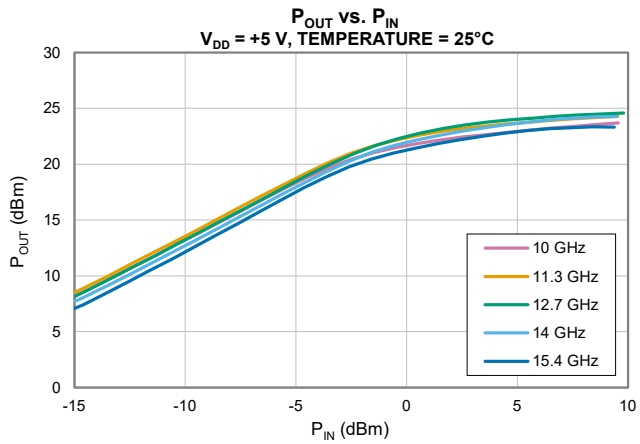
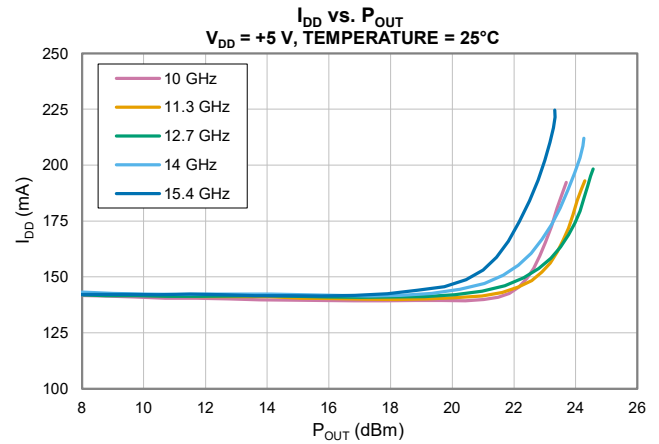
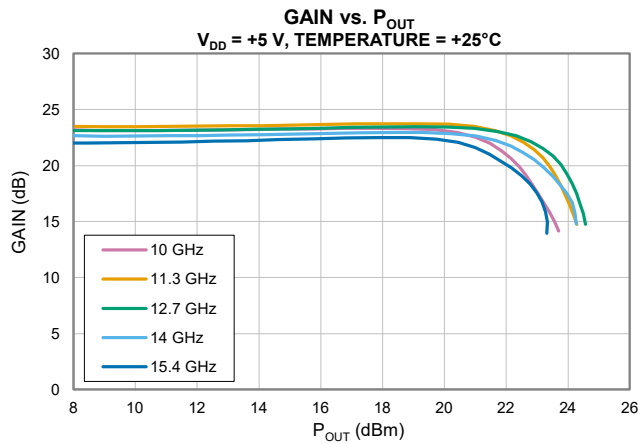
## Typical Performance Curves

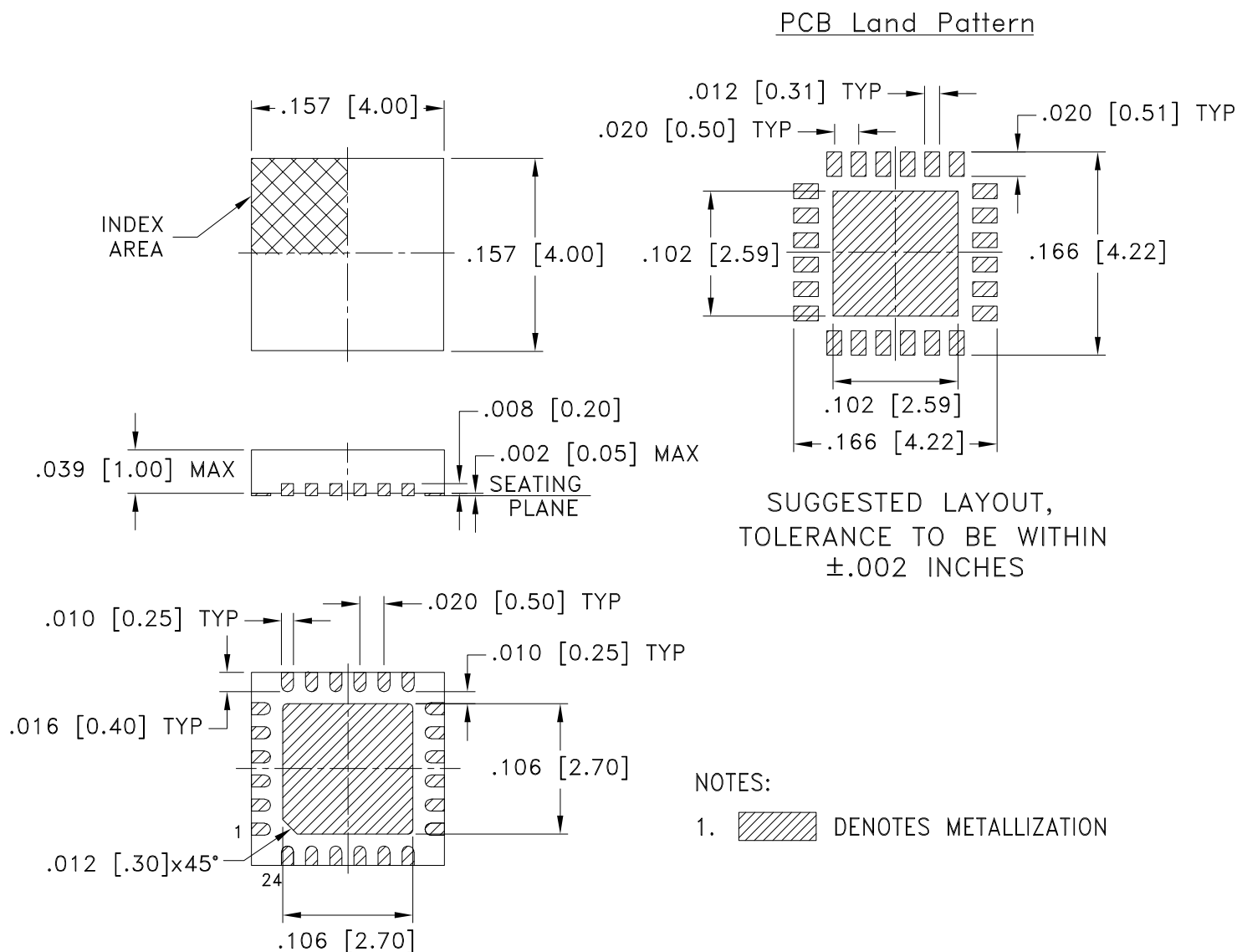


## Typical Performance Curves



## Typical Performance Curves





Weight: .04 grams

Dimensions are in inches [mm]. Tolerances: 2 Pl.±.01; 3 Pl.±.005 Inches

### Notes:

1. Case material: Plastic.
2. Termination finish:

For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin or NiPdAu  
All models, (+) suffix. See model Data sheet.

For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

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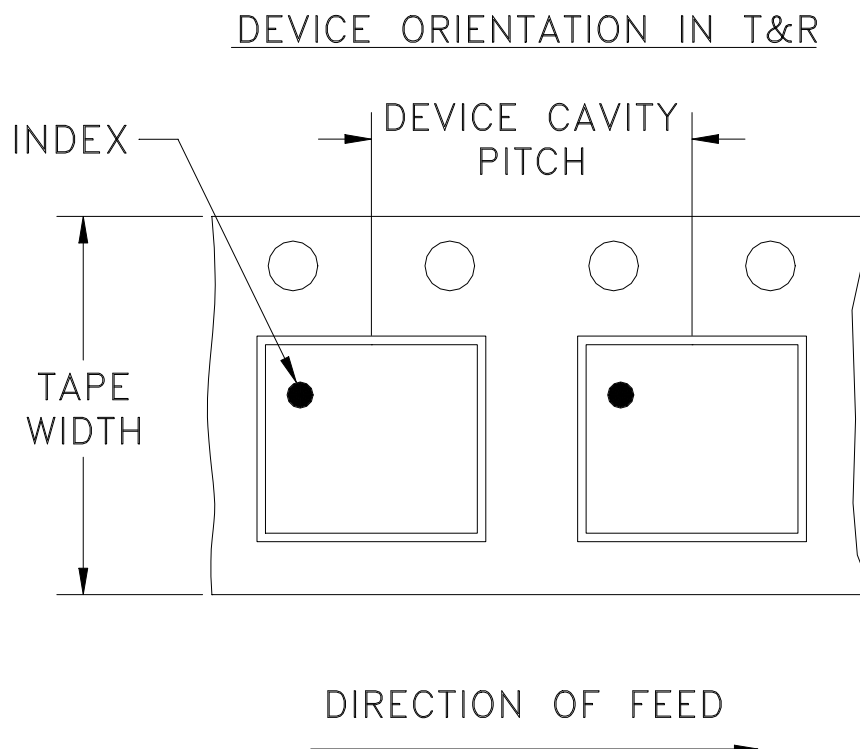


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RF/IF MICROWAVE COMPONENTS



# Tape & Reel Packaging TR-F68



| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel see note |      |
|----------------|-------------------------|-------------------|---------------------------|------|
| 12             | 8                       | 7                 | Small quantity standard   | 20   |
|                |                         |                   |                           | 50   |
|                |                         |                   |                           | 100  |
|                |                         |                   |                           | 200  |
|                |                         |                   |                           | 500  |
|                |                         | 7                 | Standard                  | 1000 |
|                |                         | 13                | Standard                  | 2000 |
|                |                         |                   |                           | 3000 |
|                |                         |                   |                           | 4000 |

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: [www.minicircuits.com/pages/pdfs/tape.pdf](http://www.minicircuits.com/pages/pdfs/tape.pdf)



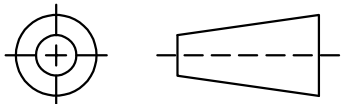
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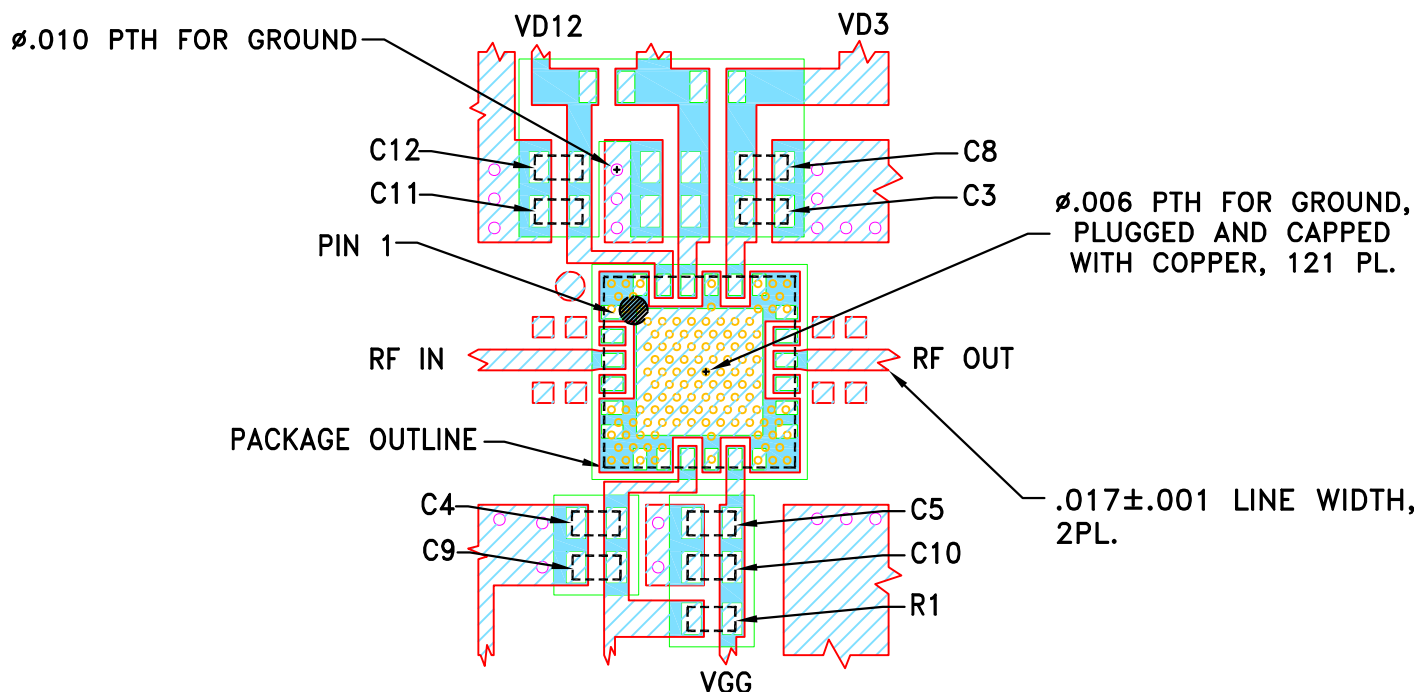
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No.    | DESCRIPTION | DATE     | DR | AUTH |
|-----|------------|-------------|----------|----|------|
| OR  | ECO-029711 | NEW RELEASE | 05.29.26 | TP | IL   |
|     |            |             |          |    |      |
|     |            |             |          |    |      |

SUGGESTED MOUNTING CONFIGURATION  
FOR DG1847 CASE STYLE



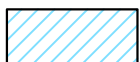
| COMPONENT      | SIZE |
|----------------|------|
| R1,C3,C4,C5,C8 | 0402 |
| C9,C10,C11,C12 |      |

**NOTES:**

1. TRACE WIDTH & GAP ARE SHOWN FOR ROGER R04003C LoPro FOIL WITH DIELECTRIC THICKNESS  $0.0087 \pm 0.001$ ; COPPER 1 OZ. ON EACH SIDE.  
FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. CHIP COMPONENT FOOT PRINTS SHOWN FOR REFERENCE. FOR COMPONENT VALUES, REFER TO TB-PMA4-9163C+
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE



DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

| UNLESS OTHERWISE SPECIFIED | INITIALS    | DATE     |
|----------------------------|-------------|----------|
| DIMENSIONS ARE IN INCHES   | DRAWN TP    | 05.29.26 |
| TOLERANCES ON:             | CHECKED NP  | 05.29.26 |
| 2 PL DECIMALS $\pm$        | APPROVED IL | 05.29.26 |
| 3 PL DECIMALS $\pm$ .005   |             |          |
| ANGLES $\pm$               |             |          |
| FRACTIONS $\pm$            |             |          |

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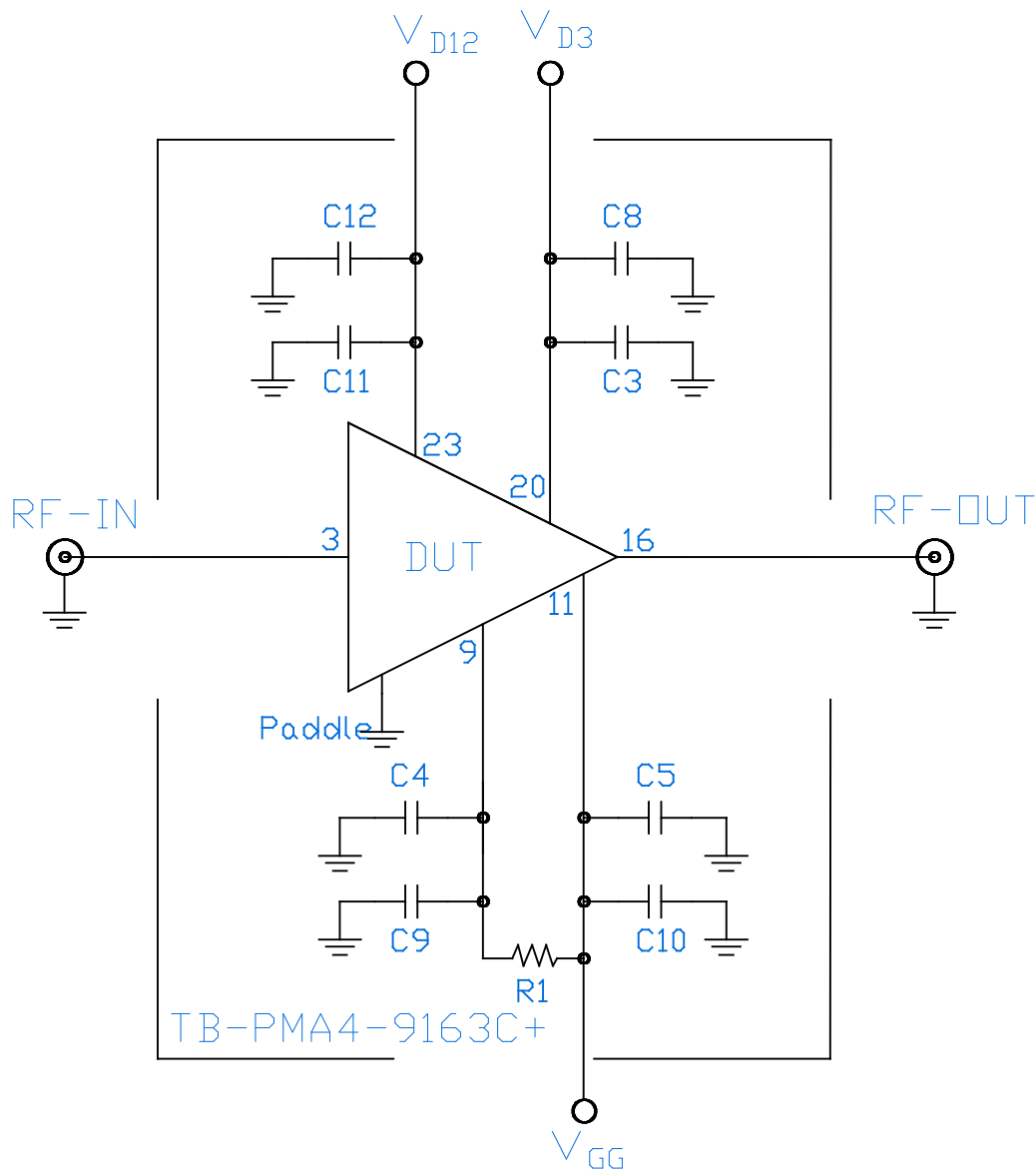


**Mini-Circuits®** 13 Neptune Avenue  
Brooklyn NY 11235

**PL, DG1847, TB-PMA4-9163C+**

| SIZE  | CODE IDENT | DRAWING NO: | REV:          |
|-------|------------|-------------|---------------|
| A     | 15542      | 98-PL-871   | OR            |
| FILE: | 98PL871    | SCALE: 16:1 | SHEET: 1 OF 1 |

# Evaluation Board and Circuit



SCHEMATIC DIAGRAM

| Component     | Size | Value        | PartNumber         | Manufacturer          |
|---------------|------|--------------|--------------------|-----------------------|
| C3,C4,C5,C11  | 0402 | 1nf          | GRM1555C1H102JA01D | MURATA                |
| C8,C9,C10,C12 | 0402 | 0.1 $\mu$ F  | GRM155R71E104KE14D | MURATA                |
| R1            | 0402 | 100 $\Omega$ | RK73H1ETTP1000F    | KOA SPEER ELECTRONICS |

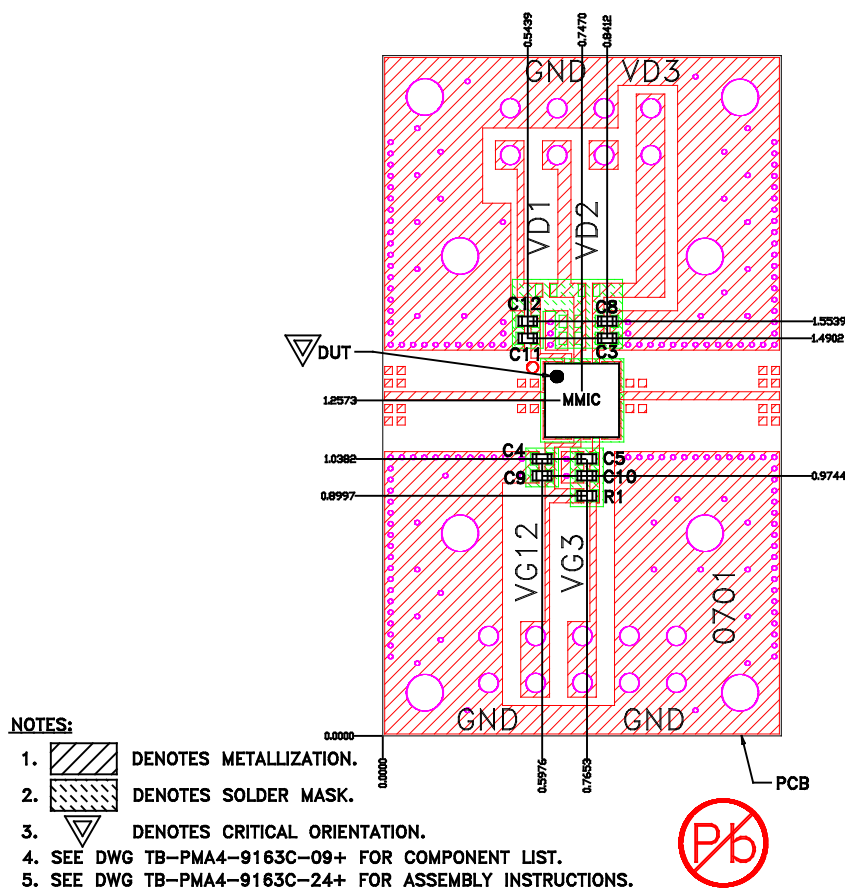
## Notes:

- 2.92mm Female Connectors.
- PCB Material: Roger RO4003C LOPRO or equivalent, Thickness=0.0087 $\pm$ .001 inch



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## TEST BIASING SEQUENCES



## POWER ON/OFF SEQUENCES

**Caution:** Permanent damage to the device will occur if the Power ON and Power OFF sequences are not followed.

### POWER ON

1. Set VGG = -2V and Turn ON.
2. Set VD12 = +5V and Turn ON.
3. Set VD3 = +5V and Turn ON.
4. Increase VGG to desired nominal IDD=145mA.
5. Turn ON RF Signal.

### POWER OFF

6. Turn OFF RF Signal
7. Decrease VGG to -2V.
8. Turn OFF VD12, VD3.
9. Turn OFF VGG.

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ALL DIMENSIONS ARE IN INCHES EXCEPT OTHERWISE SPECIFIED

| SIZE   | CODE IDENT       | DRAWING NO:       | REV: |
|--------|------------------|-------------------|------|
| A      | 15542            | TB-PMA4-9163C-20+ | OR   |
| FILE:  | WTB-AVA-6123MPC+ | SCALE:            | 4:1  |
| SHEET: | 8                | OF                | 8    |



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 85° C or -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C<br>Ambient Environment | Individual Model Data Sheet                                     |
| Storage Temperature            | -55° to 100° C or -65° to 150°<br>Ambient Environment                                                      | Individual Model Data Sheet                                     |
| HTOL                           | 1000 hours at 125°C                                                                                        | MIL-STD-883, Method 1005, Condition B                           |
| Thermal Shock                  | -55° to 100°C, 100 cycles                                                                                  | MIL-STD-202, Method 107, Condition A-3, except +100°C           |
| Mechanical Shock               | 1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only                                                           | MIL-STD-883, Method 2002, Condition B, except Y1 direction only |
| Vibration (Variable Frequency) | 50g peak                                                                                                   | MIL-STD-883, Method 2007, Condition B                           |
| Autoclave                      | 15 psig, 100% RH, 121°C, 96 hours                                                                          | JESD22-A102, Condition C                                        |
| HAST                           | 130°C, 85% RH, 96 hours                                                                                    | JESD22-A110                                                     |
| Solderability                  | 10X Magnification                                                                                          | J-STD-002, Para 4.2.5, Test S, 95% Coverage                     |
| Solder Reflow Heat             | Sn-Pb Eutetic Process: 240°C peak<br>Pb-Free Process: 260°C peak                                           | J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1                   |
| Moisture Sensitivity: Level 1  | Bake at 125°C for 24 hours<br>Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak             | J-STD-020                                                       |



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          |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215 |