



ULTRA LOW NOISE, HIGH IP3

# Monolithic Amplifier

**PMA2-33LN+**

50Ω 0.4 to 3.0 GHz

**THE BIG DEAL**

- Ultra Low Noise Figure, 0.38 dB typ. at 0.9 GHz
- High Gain IP3, 34 dBm typ. at 0.9 GHz, +39 dBm at 3 GHz
- High Pout, P1dB +17.2 dBm at 0.9 GHz
- Small Size, 2 x 2 x 1mm
- Class 1A HBM ESD Rating (250V)



Generic photo used for illustration purposes only

CASE STYLE: MC1631-1

**+RoHS Compliant**

The +Suffix identifies RoHS Compliance.  
See our website for methodologies and qualifications

**APPLICATIONS**

- Base station infrastructure
- Portable Wireless
- LTE
- GPS
- GSM
- Airborne radar

**PRODUCT OVERVIEW**

Mini-Circuits PMA2-33LN+ is an E-PHEMT\* based, ultra-low noise MMIC amplifier with a unique combination of low noise and high IP3, making this amplifier ideal for sensitive, high-dynamic range receiver applications. This design operates on a single +3V supply, is well matched for 50Ω systems, and comes in a tiny, low-profile package accommodating dense circuit board layouts.

**KEY FEATURES**

| Feature   | Advantages  |
|---|---|
| Ultra Low Noise, 0.38 dB at 0.9 GHz                                       | Enables lower system noise figure performance.  |
| High IP3,<br>• +34 dBm at 0.9 GHz<br>• +39 dBm at 3 GHz                   | Combination of low noise and high IP3 makes this MMIC amplifier ideal for use in low noise receiver front end (RFE) as it gives the user advantages of sensitivity & two-tone IM performance at both ends of the dynamic range. |
| Low operating voltage, +3V  | Achieves high IP3 using lower voltage compared to other devices of its kind.  |
| 2 x 2mm 8-lead MCP package  | Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to PCB.   |
| Max input power<br>• +27 dBm (5 minutes)<br>• +14 to +22 dBm (Continuous) | Ruggedized design provides high power handling for input powers common at receiver inputs, eliminating the need for an external limiter in most cases   |
| High reliability  | Low signal operating current of 56 mA nominal maintains junction temperatures typically below 93°C at 85°C ground lead temperature.   |

\*Enhancement mode Pseudomorphic High Electron Mobility Transistor

REV. B  
ECO-011027  
PMA2-33LN+  
TH/RS/CP  
240327

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ELECTRICAL SPECIFICATIONS<sup>1</sup> AT +25°C AND +3V, UNLESS NOTED OTHERWISE

| Parameter   | Condition (GHz) | Min. | Typ.  | Max. | Units |
|---|-----------------|------|-------|------|-------|
| Frequency Range   |                 | 0.4  |       | 3.0  | GHz   |
| Noise Figure  | 0.4             | —    | 0.78  | —    | dB    |
|   | 0.9             | —    | 0.38  | 0.6  |       |
|   | 1.5             | —    | 0.36  | —    |       |
|   | 2.0             | —    | 0.46  | —    |       |
|   | 3.0             | —    | 0.78  | —    |       |
| Gain  | 0.4             |      | 24.4  |      | dB    |
|   | 0.9             |      | 19.1  |      |       |
|   | 1.5             |      | 14.9  |      |       |
|   | 2.0             |      | 12.5  |      |       |
|   | 3.0             |      | 9.1   |      |       |
| Input Return Loss   | 0.4             |      | 9.5   |      | dB    |
|   | 0.9             |      | 10.2  |      |       |
|   | 1.5             |      | 10.0  |      |       |
|   | 2.0             |      | 10.4  |      |       |
|   | 3.0             |      | 12.3  |      |       |
| Output Return Loss  | 0.4             |      | 20.1  |      | dB    |
|   | 0.9             |      | 19.3  |      |       |
|   | 1.5             |      | 17.4  |      |       |
|   | 2.0             |      | 17.3  |      |       |
|   | 3.0             |      | 18.2  |      |       |
| Output Power @1 dB compression <sup>2</sup>                 | 0.4             |      | +17.0 |      | dBm   |
|   | 0.9             |      | +17.2 |      |       |
|   | 1.5             |      | +17.0 |      |       |
|   | 2.0             |      | +17.5 |      |       |
|   | 3.0             |      | +17.3 |      |       |
| Output IP3  | 0.4             |      | +30.4 |      | dBm   |
|   | 0.9             |      | +34.5 |      |       |
|   | 1.5             |      | +35.6 |      |       |
|   | 2.0             |      | +37.5 |      |       |
|   | 3.0             |      | +38.6 |      |       |
| Device Operating Voltage                                    |                 |      | 3.0   |      | V     |
| Device Operating Current at 3V <sup>2</sup>                 |                 |      | 56    | 67   | mA    |
| Device Current Variation vs. Temperature at 3V <sup>3</sup> |                 |      | -27   |      | µA/°C |
| Device Current Variation vs. Voltage at 25°C                |                 |      | 0.025 |      | mA/mV |
| Thermal Resistance, junction-to-ground lead                 |                 |      | 54    |      | °C/W  |

1. Measured on Mini-Circuits Characterization test board TB-736+. See Characterization Test Circuit (Fig. 1)

2. Current increases at P1dB

3. (Current at 85°C - Current at -45°C)/130

ABSOLUTE MAXIMUM RATINGS<sup>4</sup>

| Parameter                            | Ratings   |
|--------------------------------------|---|
| Operating Temperature (ground lead)  | -40°C to +85°C  |
| Storage Temperature                  | -65°C to +150°C   |
| Junction Temperature                 | +150°C  |
| Total Power Dissipation              | 0.5 W   |
| Input Power (CW), Vd=3V <sup>5</sup> | +27dBm (5minutes max)<br>+14 dBm to 1.5 GHz and +22 dBm over 1.5 to 3 GHz (continuos) |
| DC Voltage                           | +5.5 V  |

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

Electrical maximum ratings are not intended for continuous normal operation.

5. Measured on Mini-Circuits test board, TB-736+



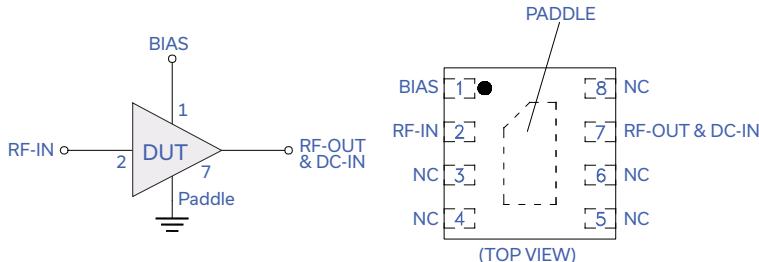
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50Ω 0.4 to 3.0 GHz

## SIMPLIFIED SCHEMATIC &amp; PAD DESCRIPTION



| Function       | Pad Number | Description (See Figure 1)                             |
|----------------|------------|--|
| RF IN          | 2          | Connects to RF input via C1 and Pad 1 via L1           |
| RF-OUT & DC-IN | 7          | Connects to RF out via C2 and $V_s$ via L2 & R2        |
| Ground         | Paddle     | Connects to ground                                     |
| Bias           | 1          | Connects to Supply voltage ( $V_{DD}$ ) via R1 & R6    |
| No Connection  | 3,4,5,6,8  | Not used internally. Connected to ground on test board |

## RECOMMENDED APPLICATION AND CHARACTERIZATION TEST CIRCUIT

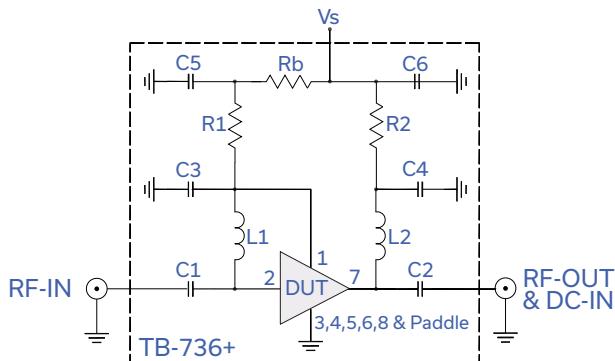


Fig 1. Application and Characterization Circuit

Note: This block diagram is used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-736+)

Gain, Return loss, Output power at 1dB compression ( $P_{1\text{ dB}}$ ), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

## Conditions:

1. Gain and Return loss:  $\text{Pin} = -25\text{dBm}$
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.

| Component | Value    | Size |
|-----------|----------|------|
| C1, C2    | 100pF    | 0402 |
| C3, C6    | 4.7μF    | 0402 |
| C4        | 33pF     | 0402 |
| C5        | Not Used | —    |
| L1, L2    | 33nH     | 0402 |
| R1        | 0Ω       | 0402 |
| R2        | 10Ω      | 0603 |
| Rb        | 4.02kΩ   | 0402 |

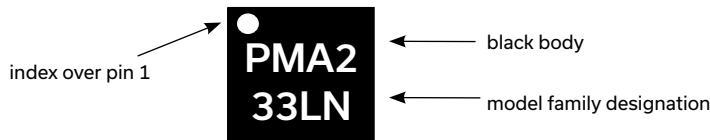
## NOISE PARAMETERS

| Frequency (MHz) | Fmin (dB) | Γopt Magnitude | Γopt Angle | Rn/50 |
|-----------------|-----------|----------------|------------|-------|
| 800             | 0.26      | 0.066          | 79.6       | 0.039 |
| 900             | 0.22      | 0.086          | 98.2       | 0.032 |
| 1000            | 0.22      | 0.108          | 102.9      | 0.032 |
| 1500            | 0.25      | 0.214          | 135.0      | 0.021 |
| 2000            | 0.27      | 0.237          | -169.4     | 0.028 |
| 2500            | 0.32      | 0.317          | -162.8     | 0.022 |
| 3000            | 0.43      | 0.381          | -141.7     | 0.035 |

1) DUT soldered on test board (50 ohm input and output)

2) reference plane is at the end of the RF-IN pad and the output reference plane is at the end of the RF-OUT pad as shown in figure below

## PRODUCT MARKING



Marking may contain other features or characters for internal lot control

Mini-Circuits®



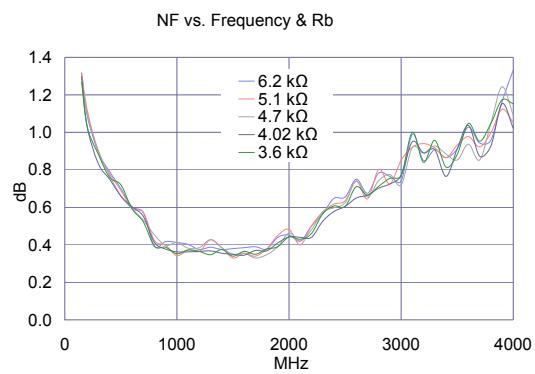
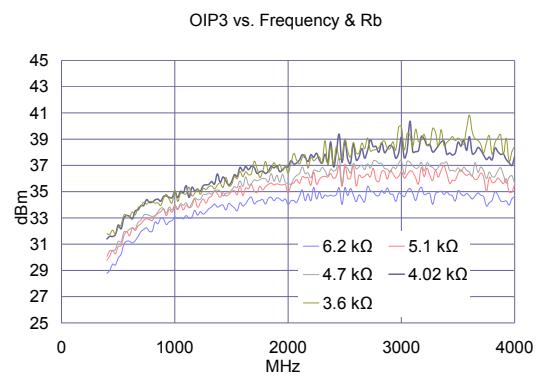
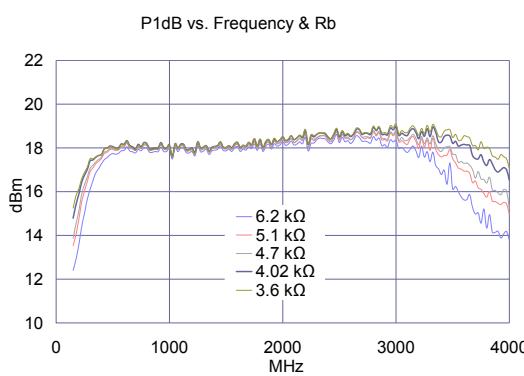
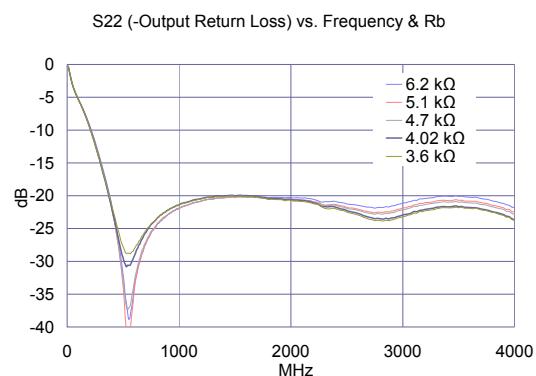
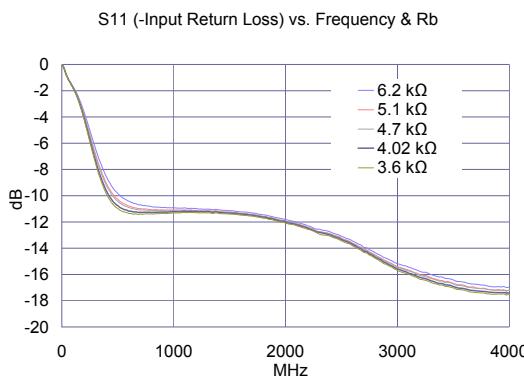
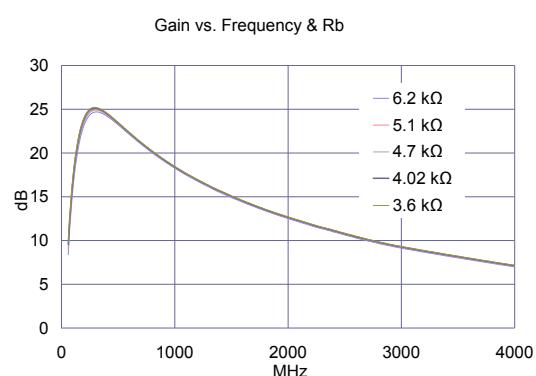
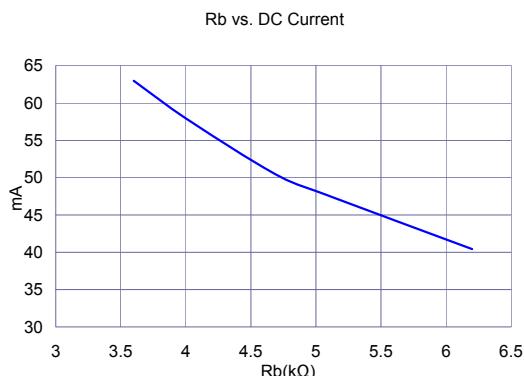
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## ELECTRICAL PERFORMANCE VS. RB



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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS [CLICK HERE](#)

|                                       |  |
|---------------------------------------|--|
| Performance Data                      | Data Table<br>Swept Graphs<br>S-Parameter (S2P Files) Data Set (.zip file) |
| Case Style                            | MC1631-1 Plastic package, exposed paddle, lead finish: tin silver nickel   |
| Tape & Reel                           | F66  |
| Standard quantities available on reel | 7" reels with 20, 50, 100, 200, 500, 1K, 2K or 3K devices                  |
| Suggested Layout for PCB Design       | PL-400   |
| Evaluation Board                      | TB-736+  |
| Environmental Ratings                 | ENV08T1  |

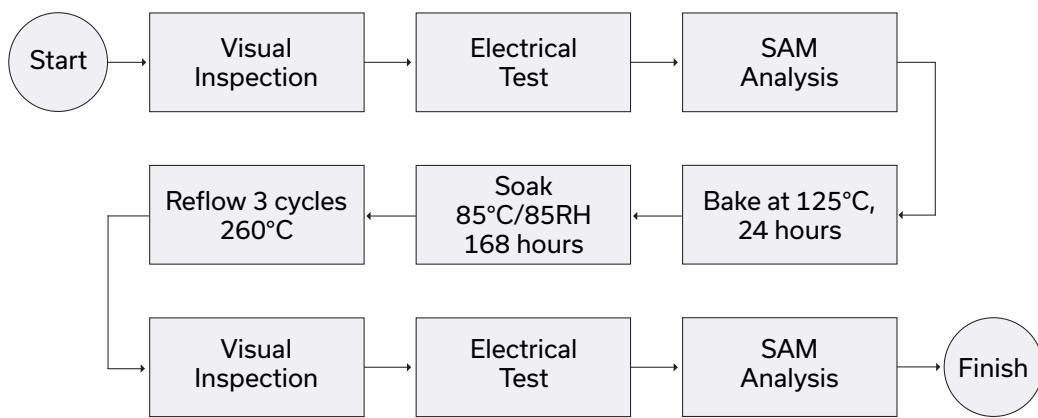
**ESD RATING**

Human Body Model (HBM): Class 1A (250 to &lt;500V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M1 (pass 25V) in accordance with ANSI/ESD STM5.2-1999

**MSL RATING**

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

**MSL TEST FLOW CHART****NOTES**

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

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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: Vd = 3.00V, Id = 56.23mA @ Temperature = +25°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400.0         | 24.53        | 28.53             | 9.65                            | 21.72                            | 1.04      | 0.67    | 31.06                   | 17.52                           | 0.72                    |
| 450.0         | 23.99        | 27.65             | 10.18                           | 24.83                            | 1.03      | 0.64    | 31.72                   | 17.49                           | 0.68                    |
| 500.0         | 23.42        | 26.89             | 10.47                           | 27.06                            | 1.02      | 0.62    | 32.18                   | 17.63                           | 0.68                    |
| 550.0         | 22.84        | 26.23             | 10.61                           | 27.21                            | 1.02      | 0.61    | 32.52                   | 17.53                           | 0.64                    |
| 600.0         | 22.26        | 25.62             | 10.66                           | 26.47                            | 1.02      | 0.61    | 32.94                   | 17.70                           | 0.60                    |
| 650.0         | 21.70        | 25.06             | 10.69                           | 25.32                            | 1.02      | 0.61    | 33.18                   | 17.68                           | 0.57                    |
| 700.0         | 21.15        | 24.53             | 10.71                           | 24.49                            | 1.02      | 0.61    | 33.47                   | 17.80                           | 0.54                    |
| 750.0         | 20.63        | 24.05             | 10.74                           | 23.62                            | 1.02      | 0.61    | 34.66                   | 17.98                           | 0.50                    |
| 800.0         | 20.13        | 23.58             | 10.77                           | 23.13                            | 1.02      | 0.62    | 34.37                   | 17.90                           | 0.46                    |
| 850.0         | 19.66        | 23.14             | 10.80                           | 22.82                            | 1.02      | 0.62    | 34.32                   | 17.90                           | 0.42                    |
| 900.0         | 19.21        | 22.73             | 10.85                           | 22.59                            | 1.02      | 0.62    | 34.58                   | 17.88                           | 0.39                    |
| 950.0         | 18.78        | 22.33             | 10.89                           | 22.47                            | 1.03      | 0.63    | 35.01                   | 17.85                           | 0.38                    |
| 1000.0        | 18.37        | 21.95             | 10.93                           | 22.34                            | 1.03      | 0.63    | 34.82                   | 17.77                           | 0.39                    |
| 1050.0        | 17.98        | 21.58             | 11.01                           | 22.26                            | 1.03      | 0.63    | 34.64                   | 17.79                           | 0.39                    |
| 1100.0        | 17.59        | 21.23             | 11.03                           | 22.17                            | 1.03      | 0.63    | 35.27                   | 17.90                           | 0.38                    |
| 1150.0        | 17.23        | 20.89             | 11.10                           | 22.07                            | 1.03      | 0.63    | 36.23                   | 17.67                           | 0.36                    |
| 1200.0        | 16.88        | 20.57             | 11.16                           | 22.07                            | 1.03      | 0.64    | 35.30                   | 17.89                           | 0.37                    |
| 1300.0        | 16.23        | 19.95             | 11.40                           | 22.32                            | 1.04      | 0.64    | 35.75                   | 17.90                           | 0.38                    |
| 1400.0        | 15.63        | 19.36             | 11.67                           | 22.65                            | 1.04      | 0.64    | 36.08                   | 17.97                           | 0.38                    |
| 1500.0        | 15.06        | 18.82             | 11.91                           | 22.95                            | 1.04      | 0.64    | 36.25                   | 17.84                           | 0.37                    |
| 1600.0        | 14.54        | 18.31             | 12.11                           | 23.15                            | 1.04      | 0.64    | 36.79                   | 18.29                           | 0.36                    |
| 1700.0        | 14.04        | 17.83             | 12.39                           | 23.16                            | 1.04      | 0.64    | 37.09                   | 18.45                           | 0.37                    |
| 1800.0        | 13.57        | 17.37             | 12.83                           | 23.10                            | 1.05      | 0.64    | 36.90                   | 18.23                           | 0.39                    |
| 1900.0        | 13.13        | 16.94             | 13.23                           | 22.96                            | 1.05      | 0.64    | 36.53                   | 18.55                           | 0.41                    |
| 2000.0        | 12.71        | 16.53             | 13.55                           | 22.89                            | 1.05      | 0.64    | 37.72                   | 18.33                           | 0.43                    |
| 2100.0        | 12.31        | 16.15             | 13.99                           | 22.73                            | 1.05      | 0.64    | 36.29                   | 18.51                           | 0.46                    |
| 2200.0        | 11.92        | 15.78             | 14.40                           | 22.32                            | 1.05      | 0.64    | 38.59                   | 18.60                           | 0.44                    |
| 2300.0        | 11.54        | 15.46             | 15.01                           | 21.63                            | 1.06      | 0.64    | 37.37                   | 18.49                           | 0.48                    |
| 2400.0        | 11.15        | 15.17             | 15.74                           | 21.41                            | 1.07      | 0.64    | 40.66                   | 18.78                           | 0.53                    |
| 2500.0        | 10.84        | 14.82             | 15.98                           | 20.67                            | 1.07      | 0.64    | 37.38                   | 18.78                           | 0.51                    |
| 2600.0        | 10.49        | 14.54             | 16.61                           | 20.21                            | 1.07      | 0.64    | 39.93                   | 18.80                           | 0.57                    |
| 2700.0        | 10.16        | 14.26             | 17.25                           | 19.72                            | 1.08      | 0.64    | 39.05                   | 19.06                           | 0.60                    |
| 2800.0        | 9.87         | 13.99             | 17.96                           | 19.07                            | 1.08      | 0.63    | 39.66                   | 19.04                           | 0.59                    |
| 2900.0        | 9.59         | 13.72             | 18.52                           | 18.42                            | 1.08      | 0.63    | 40.06                   | 19.16                           | 0.63                    |
| 3000.0        | 9.33         | 13.44             | 18.80                           | 17.92                            | 1.08      | 0.62    | 38.80                   | 18.89                           | 0.68                    |
| 3100.0        | 9.10         | 13.16             | 18.97                           | 17.53                            | 1.08      | 0.61    | 40.06                   | 18.76                           | 0.58                    |
| 3200.0        | 8.87         | 12.89             | 19.28                           | 17.28                            | 1.08      | 0.61    | 38.64                   | 19.18                           | 0.67                    |
| 3300.0        | 8.64         | 12.64             | 19.46                           | 17.18                            | 1.08      | 0.60    | 38.33                   | 18.57                           | 0.72                    |
| 3400.0        | 8.43         | 12.39             | 19.72                           | 17.31                            | 1.08      | 0.60    | 38.81                   | 18.81                           | 0.90                    |
| 3500.0        | 8.22         | 12.16             | 19.65                           | 17.62                            | 1.07      | 0.60    | 38.36                   | 18.33                           | 0.81                    |



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

IF/RF MICROWAVE COMPONENTS



# MMIC Amplifier

# PMA2-33LN+

## 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: Vd = 2.70V, Id = 48.88mA @ Temperature = +25°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400.0         | 24.40        | 28.32             | 9.22                            | 22.63                            | 1.03      | 0.68    | 29.98                   | 16.62                           | 0.72                    |
| 450.0         | 23.87        | 27.45             | 9.75                            | 26.67                            | 1.02      | 0.65    | 30.99                   | 16.61                           | 0.69                    |
| 500.0         | 23.31        | 26.72             | 10.08                           | 29.63                            | 1.01      | 0.63    | 31.26                   | 16.76                           | 0.67                    |
| 550.0         | 22.73        | 26.07             | 10.25                           | 28.99                            | 1.01      | 0.62    | 31.66                   | 16.68                           | 0.65                    |
| 600.0         | 22.15        | 25.48             | 10.34                           | 27.25                            | 1.01      | 0.62    | 31.91                   | 16.84                           | 0.63                    |
| 650.0         | 21.59        | 24.93             | 10.38                           | 25.56                            | 1.01      | 0.62    | 32.18                   | 16.85                           | 0.57                    |
| 700.0         | 21.04        | 24.42             | 10.42                           | 24.46                            | 1.01      | 0.62    | 32.63                   | 16.96                           | 0.54                    |
| 750.0         | 20.52        | 23.95             | 10.46                           | 23.43                            | 1.01      | 0.62    | 33.23                   | 17.16                           | 0.49                    |
| 800.0         | 20.02        | 23.50             | 10.53                           | 22.85                            | 1.02      | 0.63    | 33.23                   | 17.10                           | 0.48                    |
| 850.0         | 19.55        | 23.07             | 10.57                           | 22.47                            | 1.02      | 0.63    | 33.30                   | 17.10                           | 0.42                    |
| 900.0         | 19.10        | 22.65             | 10.61                           | 22.19                            | 1.02      | 0.63    | 33.66                   | 17.10                           | 0.41                    |
| 950.0         | 18.67        | 22.27             | 10.67                           | 22.04                            | 1.02      | 0.64    | 33.86                   | 17.10                           | 0.37                    |
| 1000.0        | 18.26        | 21.89             | 10.71                           | 21.88                            | 1.02      | 0.64    | 33.87                   | 17.03                           | 0.38                    |
| 1050.0        | 17.87        | 21.53             | 10.79                           | 21.79                            | 1.03      | 0.64    | 33.55                   | 17.05                           | 0.39                    |
| 1100.0        | 17.48        | 21.18             | 10.81                           | 21.70                            | 1.03      | 0.64    | 34.00                   | 17.15                           | 0.37                    |
| 1150.0        | 17.12        | 20.85             | 10.88                           | 21.58                            | 1.03      | 0.65    | 33.85                   | 16.94                           | 0.38                    |
| 1200.0        | 16.77        | 20.53             | 10.96                           | 21.58                            | 1.03      | 0.65    | 34.43                   | 17.16                           | 0.37                    |
| 1300.0        | 16.12        | 19.91             | 11.19                           | 21.77                            | 1.03      | 0.65    | 34.33                   | 17.17                           | 0.38                    |
| 1400.0        | 15.52        | 19.33             | 11.45                           | 22.07                            | 1.04      | 0.65    | 34.77                   | 17.25                           | 0.37                    |
| 1500.0        | 14.96        | 18.79             | 11.68                           | 22.33                            | 1.04      | 0.65    | 34.52                   | 17.14                           | 0.35                    |
| 1600.0        | 14.43        | 18.28             | 11.88                           | 22.53                            | 1.04      | 0.65    | 35.05                   | 17.55                           | 0.37                    |
| 1700.0        | 13.94        | 17.81             | 12.16                           | 22.57                            | 1.04      | 0.65    | 34.62                   | 17.71                           | 0.36                    |
| 1800.0        | 13.47        | 17.35             | 12.60                           | 22.55                            | 1.05      | 0.65    | 35.66                   | 17.50                           | 0.39                    |
| 1900.0        | 13.03        | 16.92             | 12.97                           | 22.46                            | 1.05      | 0.65    | 34.97                   | 17.80                           | 0.42                    |
| 2000.0        | 12.61        | 16.51             | 13.30                           | 22.45                            | 1.05      | 0.65    | 35.51                   | 17.63                           | 0.40                    |
| 2100.0        | 12.20        | 16.13             | 13.71                           | 22.35                            | 1.05      | 0.65    | 35.27                   | 17.79                           | 0.44                    |
| 2200.0        | 11.82        | 15.77             | 14.08                           | 22.03                            | 1.06      | 0.65    | 36.69                   | 17.86                           | 0.42                    |
| 2300.0        | 11.44        | 15.44             | 14.70                           | 21.42                            | 1.06      | 0.65    | 36.39                   | 17.74                           | 0.47                    |
| 2400.0        | 11.05        | 15.16             | 15.40                           | 21.29                            | 1.07      | 0.65    | 38.15                   | 18.01                           | 0.53                    |
| 2500.0        | 10.74        | 14.80             | 15.63                           | 20.64                            | 1.07      | 0.65    | 35.35                   | 18.07                           | 0.53                    |
| 2600.0        | 10.40        | 14.52             | 16.24                           | 20.23                            | 1.07      | 0.65    | 37.43                   | 18.07                           | 0.57                    |
| 2700.0        | 10.07        | 14.25             | 16.87                           | 19.76                            | 1.08      | 0.64    | 38.43                   | 18.30                           | 0.62                    |
| 2800.0        | 9.77         | 13.97             | 17.55                           | 19.15                            | 1.08      | 0.64    | 38.08                   | 18.29                           | 0.62                    |
| 2900.0        | 9.50         | 13.70             | 18.10                           | 18.53                            | 1.08      | 0.64    | 37.91                   | 18.38                           | 0.64                    |
| 3000.0        | 9.24         | 13.42             | 18.36                           | 18.03                            | 1.08      | 0.63    | 38.28                   | 18.11                           | 0.66                    |
| 3100.0        | 9.01         | 13.14             | 18.59                           | 17.64                            | 1.08      | 0.62    | 37.57                   | 17.97                           | 0.58                    |
| 3200.0        | 8.79         | 12.87             | 18.88                           | 17.41                            | 1.08      | 0.62    | 36.20                   | 18.34                           | 0.65                    |
| 3300.0        | 8.56         | 12.62             | 19.08                           | 17.33                            | 1.08      | 0.61    | 36.75                   | 17.77                           | 0.71                    |
| 3400.0        | 8.34         | 12.37             | 19.37                           | 17.46                            | 1.08      | 0.61    | 36.95                   | 17.92                           | 0.86                    |
| 3500.0        | 8.14         | 12.14             | 19.29                           | 17.75                            | 1.08      | 0.61    | 36.92                   | 17.38                           | 0.81                    |



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*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: Vd = 3.30V, Id = 63.90mA @ Temperature = +25°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400.0         | 24.63        | 28.69             | 10.04                           | 20.97                            | 1.05      | 0.66    | 31.24                   | 18.32                           | 0.72                    |
| 450.0         | 24.08        | 27.80             | 10.54                           | 23.57                            | 1.04      | 0.63    | 31.95                   | 18.30                           | 0.67                    |
| 500.0         | 23.52        | 27.03             | 10.80                           | 25.50                            | 1.03      | 0.62    | 32.15                   | 18.41                           | 0.68                    |
| 550.0         | 22.93        | 26.35             | 10.91                           | 25.98                            | 1.03      | 0.61    | 32.45                   | 18.29                           | 0.63                    |
| 600.0         | 22.35        | 25.73             | 10.94                           | 25.77                            | 1.03      | 0.60    | 33.01                   | 18.43                           | 0.59                    |
| 650.0         | 21.78        | 25.15             | 10.95                           | 25.01                            | 1.02      | 0.60    | 33.74                   | 18.39                           | 0.58                    |
| 700.0         | 21.24        | 24.62             | 10.92                           | 24.43                            | 1.02      | 0.61    | 33.98                   | 18.49                           | 0.54                    |
| 750.0         | 20.72        | 24.12             | 10.93                           | 23.72                            | 1.02      | 0.61    | 34.47                   | 18.67                           | 0.50                    |
| 800.0         | 20.22        | 23.65             | 10.98                           | 23.33                            | 1.03      | 0.61    | 34.33                   | 18.57                           | 0.45                    |
| 850.0         | 19.75        | 23.21             | 10.99                           | 23.08                            | 1.03      | 0.61    | 34.38                   | 18.55                           | 0.41                    |
| 900.0         | 19.30        | 22.78             | 11.02                           | 22.89                            | 1.03      | 0.61    | 34.58                   | 18.53                           | 0.39                    |
| 950.0         | 18.87        | 22.38             | 11.08                           | 22.80                            | 1.03      | 0.62    | 35.52                   | 18.50                           | 0.37                    |
| 1000.0        | 18.46        | 21.99             | 11.11                           | 22.69                            | 1.03      | 0.62    | 34.99                   | 18.40                           | 0.38                    |
| 1050.0        | 18.06        | 21.63             | 11.19                           | 22.62                            | 1.03      | 0.62    | 35.65                   | 18.40                           | 0.39                    |
| 1100.0        | 17.68        | 21.27             | 11.20                           | 22.56                            | 1.03      | 0.62    | 35.64                   | 18.52                           | 0.37                    |
| 1150.0        | 17.32        | 20.93             | 11.26                           | 22.47                            | 1.03      | 0.63    | 35.83                   | 18.28                           | 0.34                    |
| 1200.0        | 16.97        | 20.60             | 11.34                           | 22.50                            | 1.03      | 0.63    | 35.50                   | 18.51                           | 0.38                    |
| 1300.0        | 16.32        | 19.97             | 11.57                           | 22.77                            | 1.04      | 0.63    | 36.07                   | 18.51                           | 0.38                    |
| 1400.0        | 15.71        | 19.39             | 11.85                           | 23.14                            | 1.04      | 0.63    | 36.71                   | 18.58                           | 0.36                    |
| 1500.0        | 15.15        | 18.84             | 12.07                           | 23.46                            | 1.04      | 0.63    | 37.32                   | 18.44                           | 0.37                    |
| 1600.0        | 14.62        | 18.33             | 12.29                           | 23.67                            | 1.04      | 0.63    | 37.88                   | 18.92                           | 0.36                    |
| 1700.0        | 14.13        | 17.85             | 12.58                           | 23.67                            | 1.04      | 0.63    | 37.32                   | 19.08                           | 0.37                    |
| 1800.0        | 13.66        | 17.38             | 13.03                           | 23.57                            | 1.04      | 0.63    | 37.39                   | 18.84                           | 0.37                    |
| 1900.0        | 13.21        | 16.95             | 13.44                           | 23.37                            | 1.05      | 0.63    | 37.82                   | 19.16                           | 0.39                    |
| 2000.0        | 12.79        | 16.54             | 13.78                           | 23.23                            | 1.05      | 0.63    | 37.77                   | 18.94                           | 0.42                    |
| 2100.0        | 12.39        | 16.16             | 14.21                           | 22.98                            | 1.05      | 0.63    | 37.67                   | 19.13                           | 0.44                    |
| 2200.0        | 12.00        | 15.79             | 14.62                           | 22.51                            | 1.05      | 0.63    | 39.53                   | 19.22                           | 0.43                    |
| 2300.0        | 11.62        | 15.47             | 15.27                           | 21.76                            | 1.06      | 0.63    | 38.54                   | 19.11                           | 0.47                    |
| 2400.0        | 11.23        | 15.18             | 16.01                           | 21.48                            | 1.07      | 0.63    | 42.79                   | 19.43                           | 0.53                    |
| 2500.0        | 10.91        | 14.83             | 16.26                           | 20.68                            | 1.06      | 0.63    | 36.65                   | 19.42                           | 0.54                    |
| 2600.0        | 10.57        | 14.55             | 16.91                           | 20.16                            | 1.07      | 0.63    | 39.56                   | 19.40                           | 0.57                    |
| 2700.0        | 10.24        | 14.28             | 17.57                           | 19.63                            | 1.07      | 0.63    | 40.57                   | 19.69                           | 0.62                    |
| 2800.0        | 9.94         | 14.00             | 18.27                           | 18.99                            | 1.08      | 0.62    | 41.08                   | 19.67                           | 0.64                    |
| 2900.0        | 9.66         | 13.73             | 18.81                           | 18.36                            | 1.08      | 0.62    | 40.33                   | 19.78                           | 0.61                    |
| 3000.0        | 9.40         | 13.45             | 19.11                           | 17.82                            | 1.08      | 0.61    | 38.63                   | 19.53                           | 0.68                    |
| 3100.0        | 9.17         | 13.18             | 19.28                           | 17.39                            | 1.08      | 0.61    | 40.16                   | 19.41                           | 0.57                    |
| 3200.0        | 8.95         | 12.91             | 19.58                           | 17.16                            | 1.07      | 0.60    | 39.33                   | 19.85                           | 0.62                    |
| 3300.0        | 8.72         | 12.66             | 19.74                           | 17.08                            | 1.07      | 0.60    | 38.69                   | 19.24                           | 0.69                    |
| 3400.0        | 8.50         | 12.41             | 20.04                           | 17.19                            | 1.07      | 0.59    | 40.91                   | 19.50                           | 0.84                    |
| 3500.0        | 8.29         | 12.18             | 19.92                           | 17.45                            | 1.07      | 0.59    | 40.43                   | 19.02                           | 0.84                    |



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*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: Vd = 3.00V, Id = 58.68mA @ Temperature = -45°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400.0         | 24.88        | 28.91             | 10.39                           | 19.37                            | 1.06      | 0.64    | 32.33                   | 17.24                           | 0.60                    |
| 450.0         | 24.32        | 27.98             | 10.96                           | 21.23                            | 1.05      | 0.61    | 33.39                   | 17.21                           | 0.58                    |
| 500.0         | 23.74        | 27.18             | 11.20                           | 22.57                            | 1.04      | 0.59    | 33.78                   | 17.32                           | 0.57                    |
| 550.0         | 23.15        | 26.47             | 11.28                           | 23.11                            | 1.03      | 0.58    | 33.40                   | 17.22                           | 0.51                    |
| 600.0         | 22.57        | 25.83             | 11.28                           | 23.38                            | 1.03      | 0.58    | 34.16                   | 17.41                           | 0.50                    |
| 650.0         | 22.00        | 25.23             | 11.25                           | 23.24                            | 1.03      | 0.57    | 34.45                   | 17.42                           | 0.45                    |
| 700.0         | 21.46        | 24.68             | 11.25                           | 23.13                            | 1.03      | 0.57    | 35.08                   | 17.55                           | 0.41                    |
| 750.0         | 20.94        | 24.16             | 11.23                           | 22.76                            | 1.02      | 0.57    | 35.58                   | 17.79                           | 0.37                    |
| 800.0         | 20.44        | 23.66             | 11.27                           | 22.51                            | 1.03      | 0.57    | 35.50                   | 17.72                           | 0.36                    |
| 850.0         | 19.97        | 23.21             | 11.26                           | 22.30                            | 1.03      | 0.58    | 35.25                   | 17.71                           | 0.30                    |
| 900.0         | 19.52        | 22.77             | 11.24                           | 22.09                            | 1.03      | 0.58    | 35.91                   | 17.73                           | 0.31                    |
| 950.0         | 19.08        | 22.36             | 11.27                           | 21.98                            | 1.03      | 0.58    | 36.07                   | 17.72                           | 0.26                    |
| 1000.0        | 18.67        | 21.96             | 11.27                           | 21.91                            | 1.03      | 0.58    | 36.14                   | 17.68                           | 0.27                    |
| 1050.0        | 18.28        | 21.59             | 11.34                           | 21.97                            | 1.03      | 0.58    | 36.05                   | 17.70                           | 0.28                    |
| 1100.0        | 17.90        | 21.22             | 11.35                           | 22.04                            | 1.03      | 0.58    | 36.65                   | 17.82                           | 0.26                    |
| 1150.0        | 17.54        | 20.87             | 11.43                           | 22.10                            | 1.03      | 0.59    | 36.79                   | 17.59                           | 0.27                    |
| 1200.0        | 17.19        | 20.53             | 11.53                           | 22.20                            | 1.03      | 0.59    | 36.57                   | 17.83                           | 0.25                    |
| 1300.0        | 16.54        | 19.89             | 11.73                           | 22.48                            | 1.03      | 0.59    | 36.75                   | 17.85                           | 0.24                    |
| 1400.0        | 15.94        | 19.30             | 11.92                           | 22.92                            | 1.03      | 0.59    | 37.21                   | 17.94                           | 0.25                    |
| 1500.0        | 15.38        | 18.74             | 12.14                           | 23.56                            | 1.03      | 0.59    | 37.74                   | 17.81                           | 0.26                    |
| 1600.0        | 14.85        | 18.22             | 12.37                           | 24.09                            | 1.03      | 0.59    | 38.55                   | 18.24                           | 0.25                    |
| 1700.0        | 14.36        | 17.73             | 12.68                           | 24.20                            | 1.03      | 0.59    | 37.78                   | 18.43                           | 0.28                    |
| 1800.0        | 13.89        | 17.26             | 13.07                           | 24.32                            | 1.03      | 0.59    | 37.78                   | 18.21                           | 0.27                    |
| 1900.0        | 13.45        | 16.83             | 13.39                           | 24.55                            | 1.04      | 0.59    | 39.23                   | 18.51                           | 0.27                    |
| 2000.0        | 13.03        | 16.41             | 13.74                           | 24.62                            | 1.04      | 0.59    | 38.44                   | 18.31                           | 0.27                    |
| 2100.0        | 12.64        | 16.02             | 14.26                           | 24.12                            | 1.04      | 0.59    | 37.97                   | 18.50                           | 0.29                    |
| 2200.0        | 12.25        | 15.64             | 14.75                           | 23.41                            | 1.04      | 0.58    | 40.40                   | 18.61                           | 0.30                    |
| 2300.0        | 11.88        | 15.31             | 15.36                           | 22.88                            | 1.04      | 0.58    | 40.96                   | 18.50                           | 0.32                    |
| 2400.0        | 11.49        | 15.02             | 15.97                           | 23.05                            | 1.05      | 0.59    | 42.77                   | 18.76                           | 0.37                    |
| 2500.0        | 11.18        | 14.67             | 16.15                           | 22.18                            | 1.05      | 0.59    | 37.87                   | 18.77                           | 0.35                    |
| 2600.0        | 10.83        | 14.38             | 17.00                           | 21.31                            | 1.05      | 0.59    | 41.95                   | 18.77                           | 0.40                    |
| 2700.0        | 10.49        | 14.12             | 17.89                           | 20.64                            | 1.06      | 0.59    | 41.12                   | 19.04                           | 0.43                    |
| 2800.0        | 10.17        | 13.86             | 18.61                           | 20.09                            | 1.06      | 0.59    | 40.16                   | 19.05                           | 0.45                    |
| 2900.0        | 9.89         | 13.60             | 19.08                           | 19.40                            | 1.06      | 0.59    | 41.70                   | 19.16                           | 0.45                    |
| 3000.0        | 9.63         | 13.32             | 19.36                           | 18.51                            | 1.06      | 0.58    | 42.00                   | 18.93                           | 0.48                    |
| 3100.0        | 9.41         | 13.03             | 19.64                           | 17.73                            | 1.06      | 0.57    | 41.81                   | 18.82                           | 0.39                    |
| 3200.0        | 9.20         | 12.74             | 19.99                           | 17.43                            | 1.06      | 0.56    | 40.36                   | 19.23                           | 0.46                    |
| 3300.0        | 8.98         | 12.49             | 20.05                           | 17.34                            | 1.05      | 0.55    | 40.03                   | 18.67                           | 0.51                    |
| 3400.0        | 8.75         | 12.24             | 20.22                           | 17.14                            | 1.05      | 0.55    | 45.96                   | 18.97                           | 0.64                    |
| 3500.0        | 8.55         | 12.00             | 20.09                           | 16.92                            | 1.05      | 0.54    | 42.05                   | 18.50                           | 0.58                    |



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*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: Vd = 2.70V, Id = 50.25mA @ Temperature = -45°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400.0         | 24.77        | 28.74             | 9.94                            | 20.24                            | 1.05      | 0.65    | 31.30                   | 16.45                           | 0.57                    |
| 450.0         | 24.22        | 27.83             | 10.51                           | 22.48                            | 1.04      | 0.62    | 31.94                   | 16.43                           | 0.57                    |
| 500.0         | 23.65        | 27.04             | 10.80                           | 24.00                            | 1.03      | 0.60    | 33.13                   | 16.56                           | 0.58                    |
| 550.0         | 23.06        | 26.35             | 10.92                           | 24.40                            | 1.03      | 0.59    | 33.21                   | 16.46                           | 0.53                    |
| 600.0         | 22.48        | 25.72             | 10.95                           | 24.40                            | 1.02      | 0.58    | 33.39                   | 16.65                           | 0.50                    |
| 650.0         | 21.91        | 25.14             | 10.95                           | 23.95                            | 1.02      | 0.58    | 34.21                   | 16.67                           | 0.46                    |
| 700.0         | 21.37        | 24.59             | 10.97                           | 23.61                            | 1.02      | 0.58    | 34.40                   | 16.80                           | 0.42                    |
| 750.0         | 20.85        | 24.08             | 10.98                           | 23.05                            | 1.02      | 0.58    | 35.39                   | 17.04                           | 0.38                    |
| 800.0         | 20.35        | 23.61             | 11.02                           | 22.67                            | 1.02      | 0.58    | 34.74                   | 16.98                           | 0.36                    |
| 850.0         | 19.88        | 23.15             | 11.03                           | 22.35                            | 1.02      | 0.59    | 34.69                   | 16.97                           | 0.32                    |
| 900.0         | 19.43        | 22.73             | 11.02                           | 22.07                            | 1.02      | 0.59    | 35.18                   | 16.99                           | 0.29                    |
| 950.0         | 18.99        | 22.32             | 11.05                           | 21.92                            | 1.02      | 0.59    | 35.31                   | 16.98                           | 0.28                    |
| 1000.0        | 18.58        | 21.93             | 11.06                           | 21.81                            | 1.02      | 0.59    | 35.48                   | 16.94                           | 0.26                    |
| 1050.0        | 18.19        | 21.56             | 11.13                           | 21.81                            | 1.03      | 0.60    | 35.86                   | 16.97                           | 0.27                    |
| 1100.0        | 17.81        | 21.19             | 11.15                           | 21.85                            | 1.03      | 0.60    | 36.03                   | 17.07                           | 0.28                    |
| 1150.0        | 17.45        | 20.85             | 11.24                           | 21.87                            | 1.03      | 0.60    | 36.18                   | 16.85                           | 0.25                    |
| 1200.0        | 17.10        | 20.51             | 11.33                           | 21.94                            | 1.03      | 0.60    | 35.79                   | 17.10                           | 0.23                    |
| 1300.0        | 16.45        | 19.88             | 11.54                           | 22.17                            | 1.03      | 0.60    | 36.20                   | 17.14                           | 0.27                    |
| 1400.0        | 15.85        | 19.29             | 11.72                           | 22.56                            | 1.03      | 0.60    | 36.25                   | 17.21                           | 0.26                    |
| 1500.0        | 15.28        | 18.74             | 11.92                           | 23.11                            | 1.03      | 0.60    | 36.68                   | 17.08                           | 0.26                    |
| 1600.0        | 14.76        | 18.21             | 12.16                           | 23.56                            | 1.03      | 0.60    | 37.61                   | 17.49                           | 0.25                    |
| 1700.0        | 14.28        | 17.73             | 12.47                           | 23.66                            | 1.03      | 0.60    | 36.91                   | 17.68                           | 0.26                    |
| 1800.0        | 13.80        | 17.26             | 12.85                           | 23.78                            | 1.03      | 0.60    | 37.82                   | 17.49                           | 0.25                    |
| 1900.0        | 13.36        | 16.83             | 13.16                           | 23.98                            | 1.04      | 0.60    | 37.95                   | 17.75                           | 0.28                    |
| 2000.0        | 12.95        | 16.41             | 13.48                           | 24.02                            | 1.04      | 0.60    | 38.17                   | 17.61                           | 0.28                    |
| 2100.0        | 12.55        | 16.02             | 14.00                           | 23.59                            | 1.04      | 0.60    | 38.11                   | 17.77                           | 0.30                    |
| 2200.0        | 12.17        | 15.65             | 14.48                           | 23.02                            | 1.04      | 0.60    | 39.89                   | 17.87                           | 0.31                    |
| 2300.0        | 11.79        | 15.31             | 15.08                           | 22.57                            | 1.04      | 0.60    | 37.81                   | 17.74                           | 0.34                    |
| 2400.0        | 11.40        | 15.03             | 15.63                           | 22.77                            | 1.05      | 0.60    | 41.86                   | 17.99                           | 0.39                    |
| 2500.0        | 11.09        | 14.67             | 15.85                           | 21.97                            | 1.05      | 0.60    | 37.59                   | 18.03                           | 0.38                    |
| 2600.0        | 10.74        | 14.38             | 16.65                           | 21.17                            | 1.05      | 0.60    | 39.81                   | 18.04                           | 0.38                    |
| 2700.0        | 10.41        | 14.12             | 17.53                           | 20.57                            | 1.06      | 0.60    | 40.58                   | 18.28                           | 0.43                    |
| 2800.0        | 10.09        | 13.86             | 18.20                           | 20.08                            | 1.07      | 0.60    | 40.70                   | 18.30                           | 0.44                    |
| 2900.0        | 9.81         | 13.60             | 18.66                           | 19.41                            | 1.07      | 0.60    | 39.82                   | 18.41                           | 0.46                    |
| 3000.0        | 9.55         | 13.31             | 18.96                           | 18.51                            | 1.06      | 0.59    | 40.64                   | 18.15                           | 0.47                    |
| 3100.0        | 9.33         | 13.02             | 19.25                           | 17.74                            | 1.06      | 0.58    | 39.69                   | 18.04                           | 0.41                    |
| 3200.0        | 9.12         | 12.74             | 19.57                           | 17.48                            | 1.06      | 0.57    | 38.72                   | 18.43                           | 0.50                    |
| 3300.0        | 8.90         | 12.48             | 19.66                           | 17.40                            | 1.06      | 0.57    | 39.42                   | 17.89                           | 0.52                    |
| 3400.0        | 8.68         | 12.23             | 19.82                           | 17.18                            | 1.06      | 0.56    | 39.70                   | 18.12                           | 0.63                    |
| 3500.0        | 8.48         | 12.00             | 19.79                           | 16.95                            | 1.05      | 0.55    | 39.08                   | 17.68                           | 0.60                    |



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*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: Vd = 3.30V, Id = 67.32mA @ Temperature = -45°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400.0         | 24.96        | 29.04             | 10.79                           | 18.77                            | 1.07      | 0.64    | 32.64                   | 18.07                           | 0.55                    |
| 450.0         | 24.40        | 28.10             | 11.31                           | 20.44                            | 1.05      | 0.61    | 33.11                   | 18.03                           | 0.57                    |
| 500.0         | 23.82        | 27.28             | 11.53                           | 21.69                            | 1.04      | 0.59    | 34.06                   | 18.14                           | 0.56                    |
| 550.0         | 23.23        | 26.56             | 11.58                           | 22.30                            | 1.04      | 0.57    | 33.67                   | 18.03                           | 0.53                    |
| 600.0         | 22.64        | 25.90             | 11.54                           | 22.69                            | 1.03      | 0.57    | 34.33                   | 18.22                           | 0.48                    |
| 650.0         | 22.08        | 25.29             | 11.48                           | 22.71                            | 1.03      | 0.57    | 35.19                   | 18.23                           | 0.46                    |
| 700.0         | 21.53        | 24.73             | 11.44                           | 22.73                            | 1.03      | 0.57    | 35.16                   | 18.35                           | 0.41                    |
| 750.0         | 21.02        | 24.21             | 11.43                           | 22.51                            | 1.03      | 0.56    | 35.46                   | 18.58                           | 0.39                    |
| 800.0         | 20.52        | 23.71             | 11.46                           | 22.38                            | 1.03      | 0.57    | 35.14                   | 18.50                           | 0.34                    |
| 850.0         | 20.05        | 23.25             | 11.43                           | 22.25                            | 1.03      | 0.57    | 35.61                   | 18.48                           | 0.31                    |
| 900.0         | 19.59        | 22.80             | 11.42                           | 22.10                            | 1.03      | 0.57    | 35.68                   | 18.49                           | 0.29                    |
| 950.0         | 19.16        | 22.39             | 11.43                           | 22.03                            | 1.03      | 0.57    | 35.86                   | 18.48                           | 0.30                    |
| 1000.0        | 18.75        | 21.99             | 11.43                           | 21.99                            | 1.03      | 0.57    | 35.88                   | 18.41                           | 0.26                    |
| 1050.0        | 18.35        | 21.61             | 11.48                           | 22.06                            | 1.03      | 0.57    | 36.47                   | 18.43                           | 0.27                    |
| 1100.0        | 17.98        | 21.24             | 11.50                           | 22.15                            | 1.03      | 0.58    | 36.71                   | 18.55                           | 0.27                    |
| 1150.0        | 17.62        | 20.89             | 11.57                           | 22.23                            | 1.03      | 0.58    | 36.26                   | 18.32                           | 0.24                    |
| 1200.0        | 17.27        | 20.55             | 11.67                           | 22.37                            | 1.03      | 0.58    | 36.28                   | 18.53                           | 0.24                    |
| 1300.0        | 16.62        | 19.90             | 11.88                           | 22.73                            | 1.03      | 0.58    | 37.01                   | 18.54                           | 0.26                    |
| 1400.0        | 16.02        | 19.31             | 12.08                           | 23.22                            | 1.03      | 0.58    | 37.34                   | 18.63                           | 0.25                    |
| 1500.0        | 15.45        | 18.75             | 12.27                           | 23.89                            | 1.03      | 0.58    | 37.34                   | 18.48                           | 0.25                    |
| 1600.0        | 14.93        | 18.22             | 12.54                           | 24.45                            | 1.03      | 0.58    | 38.69                   | 18.94                           | 0.26                    |
| 1700.0        | 14.44        | 17.73             | 12.85                           | 24.63                            | 1.03      | 0.58    | 39.34                   | 19.13                           | 0.25                    |
| 1800.0        | 13.97        | 17.26             | 13.25                           | 24.79                            | 1.03      | 0.58    | 37.83                   | 18.87                           | 0.26                    |
| 1900.0        | 13.52        | 16.83             | 13.57                           | 25.02                            | 1.03      | 0.58    | 37.91                   | 19.20                           | 0.27                    |
| 2000.0        | 13.11        | 16.41             | 13.91                           | 25.02                            | 1.03      | 0.58    | 37.76                   | 18.96                           | 0.31                    |
| 2100.0        | 12.71        | 16.02             | 14.46                           | 24.45                            | 1.04      | 0.58    | 38.00                   | 19.16                           | 0.31                    |
| 2200.0        | 12.32        | 15.65             | 14.97                           | 23.72                            | 1.04      | 0.58    | 39.65                   | 19.27                           | 0.32                    |
| 2300.0        | 11.95        | 15.31             | 15.60                           | 23.15                            | 1.04      | 0.58    | 40.13                   | 19.20                           | 0.33                    |
| 2400.0        | 11.56        | 15.02             | 16.20                           | 23.25                            | 1.05      | 0.58    | 40.56                   | 19.44                           | 0.36                    |
| 2500.0        | 11.24        | 14.67             | 16.40                           | 22.26                            | 1.05      | 0.58    | 38.31                   | 19.44                           | 0.39                    |
| 2600.0        | 10.90        | 14.39             | 17.30                           | 21.33                            | 1.05      | 0.58    | 41.55                   | 19.44                           | 0.40                    |
| 2700.0        | 10.56        | 14.12             | 18.20                           | 20.64                            | 1.06      | 0.58    | 42.10                   | 19.73                           | 0.43                    |
| 2800.0        | 10.24        | 13.86             | 18.94                           | 20.10                            | 1.06      | 0.58    | 41.09                   | 19.73                           | 0.44                    |
| 2900.0        | 9.95         | 13.60             | 19.42                           | 19.38                            | 1.06      | 0.58    | 41.12                   | 19.83                           | 0.47                    |
| 3000.0        | 9.70         | 13.32             | 19.68                           | 18.44                            | 1.06      | 0.57    | 40.83                   | 19.60                           | 0.48                    |
| 3100.0        | 9.47         | 13.03             | 19.94                           | 17.66                            | 1.06      | 0.56    | 41.04                   | 19.49                           | 0.41                    |
| 3200.0        | 9.26         | 12.75             | 20.27                           | 17.40                            | 1.05      | 0.55    | 43.75                   | 19.94                           | 0.47                    |
| 3300.0        | 9.04         | 12.49             | 20.30                           | 17.32                            | 1.05      | 0.55    | 40.73                   | 19.37                           | 0.54                    |
| 3400.0        | 8.82         | 12.24             | 20.43                           | 17.07                            | 1.05      | 0.54    | 43.56                   | 19.71                           | 0.65                    |
| 3500.0        | 8.61         | 12.01             | 20.32                           | 16.82                            | 1.05      | 0.54    | 41.67                   | 19.21                           | 0.60                    |



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*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: Vd = 3.00V, Id = 55.73mA @ Temperature = +85°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400.0         | 24.17        | 28.19             | 9.13                            | 23.61                            | 1.03      | 0.69    | 29.32                   | 17.38                           | 0.89                    |
| 450.0         | 23.66        | 27.35             | 9.61                            | 29.07                            | 1.02      | 0.67    | 30.03                   | 17.35                           | 0.86                    |
| 500.0         | 23.11        | 26.62             | 9.91                            | 35.84                            | 1.01      | 0.65    | 30.64                   | 17.44                           | 0.80                    |
| 550.0         | 22.54        | 25.99             | 10.09                           | 33.70                            | 1.01      | 0.64    | 30.76                   | 17.28                           | 0.78                    |
| 600.0         | 21.97        | 25.42             | 10.19                           | 29.49                            | 1.01      | 0.64    | 31.17                   | 17.41                           | 0.72                    |
| 650.0         | 21.41        | 24.89             | 10.24                           | 26.74                            | 1.01      | 0.64    | 31.74                   | 17.35                           | 0.69                    |
| 700.0         | 20.87        | 24.40             | 10.27                           | 25.14                            | 1.01      | 0.65    | 32.05                   | 17.44                           | 0.63                    |
| 750.0         | 20.35        | 23.93             | 10.30                           | 23.86                            | 1.01      | 0.65    | 32.78                   | 17.61                           | 0.57                    |
| 800.0         | 19.85        | 23.50             | 10.38                           | 23.20                            | 1.02      | 0.66    | 32.60                   | 17.52                           | 0.58                    |
| 850.0         | 19.38        | 23.08             | 10.44                           | 22.82                            | 1.02      | 0.66    | 32.75                   | 17.52                           | 0.52                    |
| 900.0         | 18.93        | 22.68             | 10.50                           | 22.59                            | 1.02      | 0.66    | 33.11                   | 17.49                           | 0.50                    |
| 950.0         | 18.50        | 22.30             | 10.60                           | 22.51                            | 1.02      | 0.67    | 33.51                   | 17.48                           | 0.50                    |
| 1000.0        | 18.09        | 21.93             | 10.67                           | 22.40                            | 1.03      | 0.67    | 33.69                   | 17.39                           | 0.47                    |
| 1050.0        | 17.70        | 21.57             | 10.76                           | 22.31                            | 1.03      | 0.67    | 33.56                   | 17.40                           | 0.49                    |
| 1100.0        | 17.32        | 21.23             | 10.79                           | 22.18                            | 1.03      | 0.67    | 34.15                   | 17.53                           | 0.48                    |
| 1150.0        | 16.96        | 20.91             | 10.85                           | 22.00                            | 1.03      | 0.68    | 34.61                   | 17.30                           | 0.47                    |
| 1200.0        | 16.61        | 20.59             | 10.93                           | 21.88                            | 1.04      | 0.68    | 34.06                   | 17.52                           | 0.46                    |
| 1300.0        | 15.95        | 19.99             | 11.17                           | 21.88                            | 1.04      | 0.68    | 34.31                   | 17.53                           | 0.48                    |
| 1400.0        | 15.35        | 19.42             | 11.49                           | 21.98                            | 1.04      | 0.68    | 35.14                   | 17.60                           | 0.49                    |
| 1500.0        | 14.79        | 18.88             | 11.74                           | 22.12                            | 1.05      | 0.68    | 34.99                   | 17.49                           | 0.48                    |
| 1600.0        | 14.26        | 18.39             | 11.93                           | 22.24                            | 1.05      | 0.68    | 35.81                   | 17.96                           | 0.50                    |
| 1700.0        | 13.76        | 17.92             | 12.17                           | 22.16                            | 1.05      | 0.69    | 35.72                   | 18.11                           | 0.53                    |
| 1800.0        | 13.28        | 17.47             | 12.63                           | 21.83                            | 1.06      | 0.68    | 35.84                   | 17.88                           | 0.52                    |
| 1900.0        | 12.84        | 17.04             | 13.08                           | 21.40                            | 1.06      | 0.68    | 35.85                   | 18.20                           | 0.52                    |
| 2000.0        | 12.42        | 16.64             | 13.47                           | 21.20                            | 1.06      | 0.68    | 36.81                   | 17.98                           | 0.55                    |
| 2100.0        | 12.01        | 16.27             | 13.84                           | 21.11                            | 1.07      | 0.68    | 35.76                   | 18.17                           | 0.57                    |
| 2200.0        | 11.63        | 15.91             | 14.23                           | 20.80                            | 1.07      | 0.68    | 37.97                   | 18.23                           | 0.60                    |
| 2300.0        | 11.25        | 15.59             | 14.87                           | 20.14                            | 1.08      | 0.68    | 36.76                   | 18.11                           | 0.64                    |
| 2400.0        | 10.86        | 15.30             | 15.55                           | 19.83                            | 1.08      | 0.68    | 39.74                   | 18.44                           | 0.69                    |
| 2500.0        | 10.54        | 14.95             | 15.79                           | 19.30                            | 1.08      | 0.67    | 36.13                   | 18.44                           | 0.69                    |
| 2600.0        | 10.20        | 14.67             | 16.27                           | 19.04                            | 1.09      | 0.67    | 39.64                   | 18.43                           | 0.75                    |
| 2700.0        | 9.88         | 14.39             | 16.81                           | 18.68                            | 1.09      | 0.67    | 38.56                   | 18.68                           | 0.78                    |
| 2800.0        | 9.59         | 14.11             | 17.56                           | 18.17                            | 1.10      | 0.67    | 39.82                   | 18.65                           | 0.81                    |
| 2900.0        | 9.32         | 13.84             | 18.20                           | 17.77                            | 1.10      | 0.66    | 38.74                   | 18.74                           | 0.83                    |
| 3000.0        | 9.05         | 13.57             | 18.49                           | 17.57                            | 1.10      | 0.66    | 39.19                   | 18.46                           | 0.89                    |
| 3100.0        | 8.81         | 13.30             | 18.59                           | 17.46                            | 1.10      | 0.65    | 38.22                   | 18.31                           | 0.81                    |
| 3200.0        | 8.58         | 13.04             | 18.83                           | 17.44                            | 1.10      | 0.65    | 37.56                   | 18.70                           | 0.85                    |
| 3300.0        | 8.35         | 12.79             | 19.02                           | 17.57                            | 1.10      | 0.65    | 37.67                   | 18.09                           | 0.97                    |
| 3400.0        | 8.12         | 12.55             | 19.29                           | 17.88                            | 1.10      | 0.65    | 39.04                   | 18.28                           | 1.13                    |
| 3500.0        | 7.91         | 12.33             | 19.22                           | 18.32                            | 1.10      | 0.65    | 38.30                   | 17.76                           | 1.10                    |



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*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: Vd = 2.70V, Id = 48.67mA @ Temperature = +85°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400.0         | 24.03        | 27.96             | 8.69                            | 24.14                            | 1.02      | 0.70    | 28.67                   | 16.45                           | 0.87                    |
| 450.0         | 23.52        | 27.13             | 9.19                            | 30.93                            | 1.00      | 0.67    | 29.30                   | 16.43                           | 0.82                    |
| 500.0         | 22.98        | 26.43             | 9.52                            | 45.98                            | 1.00      | 0.66    | 29.51                   | 16.57                           | 0.81                    |
| 550.0         | 22.41        | 25.81             | 9.73                            | 34.29                            | 1.00      | 0.65    | 29.76                   | 16.45                           | 0.76                    |
| 600.0         | 21.85        | 25.25             | 9.86                            | 28.90                            | 1.00      | 0.65    | 30.11                   | 16.59                           | 0.72                    |
| 650.0         | 21.28        | 24.74             | 9.92                            | 26.12                            | 1.00      | 0.65    | 30.78                   | 16.56                           | 0.69                    |
| 700.0         | 20.74        | 24.26             | 9.99                            | 24.49                            | 1.00      | 0.66    | 31.10                   | 16.64                           | 0.65                    |
| 750.0         | 20.22        | 23.81             | 10.03                           | 23.23                            | 1.01      | 0.66    | 31.57                   | 16.82                           | 0.61                    |
| 800.0         | 19.72        | 23.39             | 10.13                           | 22.55                            | 1.01      | 0.66    | 31.77                   | 16.76                           | 0.56                    |
| 850.0         | 19.25        | 22.98             | 10.19                           | 22.16                            | 1.01      | 0.67    | 31.65                   | 16.75                           | 0.53                    |
| 900.0         | 18.80        | 22.58             | 10.26                           | 21.92                            | 1.02      | 0.67    | 32.04                   | 16.74                           | 0.50                    |
| 950.0         | 18.37        | 22.21             | 10.37                           | 21.83                            | 1.02      | 0.68    | 32.31                   | 16.73                           | 0.51                    |
| 1000.0        | 17.96        | 21.84             | 10.44                           | 21.73                            | 1.02      | 0.68    | 32.42                   | 16.66                           | 0.49                    |
| 1050.0        | 17.57        | 21.50             | 10.53                           | 21.64                            | 1.03      | 0.68    | 32.28                   | 16.68                           | 0.50                    |
| 1100.0        | 17.19        | 21.16             | 10.56                           | 21.51                            | 1.03      | 0.68    | 32.81                   | 16.78                           | 0.49                    |
| 1150.0        | 16.83        | 20.84             | 10.63                           | 21.35                            | 1.03      | 0.69    | 32.91                   | 16.57                           | 0.49                    |
| 1200.0        | 16.48        | 20.53             | 10.70                           | 21.24                            | 1.03      | 0.69    | 32.80                   | 16.78                           | 0.47                    |
| 1300.0        | 15.82        | 19.94             | 10.95                           | 21.23                            | 1.04      | 0.69    | 33.08                   | 16.79                           | 0.50                    |
| 1400.0        | 15.23        | 19.37             | 11.25                           | 21.35                            | 1.04      | 0.69    | 33.76                   | 16.88                           | 0.49                    |
| 1500.0        | 14.66        | 18.84             | 11.51                           | 21.51                            | 1.05      | 0.69    | 33.69                   | 16.76                           | 0.51                    |
| 1600.0        | 14.13        | 18.35             | 11.69                           | 21.65                            | 1.05      | 0.69    | 34.21                   | 17.20                           | 0.48                    |
| 1700.0        | 13.64        | 17.89             | 11.92                           | 21.62                            | 1.05      | 0.70    | 33.88                   | 17.35                           | 0.50                    |
| 1800.0        | 13.16        | 17.44             | 12.37                           | 21.38                            | 1.06      | 0.69    | 34.08                   | 17.14                           | 0.51                    |
| 1900.0        | 12.72        | 17.01             | 12.83                           | 21.05                            | 1.06      | 0.69    | 34.40                   | 17.43                           | 0.53                    |
| 2000.0        | 12.31        | 16.61             | 13.18                           | 20.94                            | 1.06      | 0.69    | 34.76                   | 17.25                           | 0.57                    |
| 2100.0        | 11.90        | 16.24             | 13.56                           | 20.92                            | 1.07      | 0.69    | 34.66                   | 17.41                           | 0.57                    |
| 2200.0        | 11.51        | 15.88             | 13.92                           | 20.67                            | 1.07      | 0.69    | 35.47                   | 17.48                           | 0.59                    |
| 2300.0        | 11.13        | 15.56             | 14.54                           | 20.08                            | 1.08      | 0.69    | 35.84                   | 17.36                           | 0.63                    |
| 2400.0        | 10.75        | 15.27             | 15.22                           | 19.84                            | 1.09      | 0.69    | 37.63                   | 17.67                           | 0.68                    |
| 2500.0        | 10.43        | 14.93             | 15.45                           | 19.36                            | 1.09      | 0.68    | 34.91                   | 17.69                           | 0.68                    |
| 2600.0        | 10.09        | 14.64             | 15.91                           | 19.15                            | 1.09      | 0.68    | 37.23                   | 17.69                           | 0.72                    |
| 2700.0        | 9.78         | 14.36             | 16.43                           | 18.83                            | 1.10      | 0.68    | 37.90                   | 17.93                           | 0.79                    |
| 2800.0        | 9.49         | 14.08             | 17.14                           | 18.33                            | 1.10      | 0.67    | 37.73                   | 17.89                           | 0.79                    |
| 2900.0        | 9.21         | 13.81             | 17.79                           | 17.93                            | 1.10      | 0.67    | 37.48                   | 17.95                           | 0.85                    |
| 3000.0        | 8.95         | 13.54             | 18.06                           | 17.75                            | 1.10      | 0.67    | 37.44                   | 17.68                           | 0.88                    |
| 3100.0        | 8.71         | 13.27             | 18.19                           | 17.66                            | 1.10      | 0.66    | 38.09                   | 17.56                           | 0.83                    |
| 3200.0        | 8.48         | 13.01             | 18.41                           | 17.64                            | 1.10      | 0.66    | 36.40                   | 17.91                           | 0.88                    |
| 3300.0        | 8.25         | 12.76             | 18.59                           | 17.77                            | 1.10      | 0.66    | 35.88                   | 17.32                           | 1.00                    |
| 3400.0        | 8.02         | 12.52             | 18.90                           | 18.10                            | 1.10      | 0.65    | 37.18                   | 17.48                           | 1.08                    |
| 3500.0        | 7.81         | 12.30             | 18.78                           | 18.57                            | 1.10      | 0.66    | 37.03                   | 16.97                           | 1.11                    |



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*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: Vd = 3.30V, Id= 62.82mA @ Temperature = +85°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400.0         | 24.28        | 28.37             | 9.50                            | 22.94                            | 1.04      | 0.69    | 30.22                   | 18.19                           | 0.85                    |
| 450.0         | 23.76        | 27.52             | 9.96                            | 27.41                            | 1.03      | 0.66    | 30.91                   | 18.12                           | 0.87                    |
| 500.0         | 23.21        | 26.78             | 10.24                           | 32.15                            | 1.02      | 0.65    | 31.33                   | 18.16                           | 0.83                    |
| 550.0         | 22.63        | 26.14             | 10.39                           | 32.44                            | 1.02      | 0.64    | 31.29                   | 17.98                           | 0.75                    |
| 600.0         | 22.06        | 25.55             | 10.47                           | 29.80                            | 1.02      | 0.64    | 32.00                   | 18.08                           | 0.72                    |
| 650.0         | 21.50        | 25.01             | 10.49                           | 27.30                            | 1.02      | 0.64    | 32.20                   | 17.99                           | 0.69                    |
| 700.0         | 20.96        | 24.51             | 10.50                           | 25.77                            | 1.02      | 0.64    | 32.86                   | 18.08                           | 0.65                    |
| 750.0         | 20.44        | 24.04             | 10.53                           | 24.49                            | 1.02      | 0.65    | 33.93                   | 18.24                           | 0.61                    |
| 800.0         | 19.94        | 23.59             | 10.58                           | 23.82                            | 1.02      | 0.65    | 33.65                   | 18.15                           | 0.55                    |
| 850.0         | 19.47        | 23.17             | 10.65                           | 23.46                            | 1.02      | 0.65    | 33.60                   | 18.16                           | 0.53                    |
| 900.0         | 19.02        | 22.76             | 10.71                           | 23.25                            | 1.03      | 0.66    | 33.99                   | 18.11                           | 0.52                    |
| 950.0         | 18.59        | 22.37             | 10.81                           | 23.19                            | 1.03      | 0.66    | 34.60                   | 18.11                           | 0.50                    |
| 1000.0        | 18.18        | 22.00             | 10.89                           | 23.09                            | 1.03      | 0.66    | 34.48                   | 18.00                           | 0.48                    |
| 1050.0        | 17.79        | 21.64             | 10.96                           | 22.99                            | 1.03      | 0.66    | 34.56                   | 18.02                           | 0.48                    |
| 1100.0        | 17.41        | 21.29             | 10.98                           | 22.84                            | 1.03      | 0.67    | 34.67                   | 18.15                           | 0.47                    |
| 1150.0        | 17.05        | 20.96             | 11.05                           | 22.63                            | 1.04      | 0.67    | 34.92                   | 17.91                           | 0.49                    |
| 1200.0        | 16.70        | 20.64             | 11.11                           | 22.49                            | 1.04      | 0.67    | 34.93                   | 18.15                           | 0.49                    |
| 1300.0        | 16.04        | 20.04             | 11.36                           | 22.47                            | 1.04      | 0.67    | 35.46                   | 18.15                           | 0.50                    |
| 1400.0        | 15.44        | 19.47             | 11.68                           | 22.55                            | 1.04      | 0.67    | 35.94                   | 18.23                           | 0.48                    |
| 1500.0        | 14.88        | 18.93             | 11.95                           | 22.65                            | 1.05      | 0.68    | 36.09                   | 18.11                           | 0.49                    |
| 1600.0        | 14.34        | 18.43             | 12.13                           | 22.72                            | 1.05      | 0.68    | 36.63                   | 18.60                           | 0.50                    |
| 1700.0        | 13.84        | 17.96             | 12.36                           | 22.58                            | 1.05      | 0.68    | 36.38                   | 18.75                           | 0.50                    |
| 1800.0        | 13.37        | 17.51             | 12.84                           | 22.16                            | 1.06      | 0.68    | 37.01                   | 18.51                           | 0.52                    |
| 1900.0        | 12.93        | 17.08             | 13.32                           | 21.62                            | 1.06      | 0.67    | 36.90                   | 18.83                           | 0.54                    |
| 2000.0        | 12.51        | 16.68             | 13.71                           | 21.35                            | 1.06      | 0.67    | 37.38                   | 18.62                           | 0.57                    |
| 2100.0        | 12.10        | 16.30             | 14.09                           | 21.20                            | 1.07      | 0.67    | 37.33                   | 18.79                           | 0.59                    |
| 2200.0        | 11.71        | 15.94             | 14.47                           | 20.83                            | 1.07      | 0.67    | 39.02                   | 18.86                           | 0.57                    |
| 2300.0        | 11.33        | 15.62             | 15.13                           | 20.12                            | 1.07      | 0.67    | 37.74                   | 18.74                           | 0.64                    |
| 2400.0        | 10.94        | 15.33             | 15.83                           | 19.74                            | 1.08      | 0.67    | 42.51                   | 19.09                           | 0.68                    |
| 2500.0        | 10.62        | 14.99             | 16.09                           | 19.17                            | 1.08      | 0.67    | 36.78                   | 19.09                           | 0.69                    |
| 2600.0        | 10.28        | 14.70             | 16.55                           | 18.89                            | 1.09      | 0.67    | 39.41                   | 19.06                           | 0.72                    |
| 2700.0        | 9.96         | 14.42             | 17.10                           | 18.50                            | 1.09      | 0.66    | 40.25                   | 19.32                           | 0.78                    |
| 2800.0        | 9.67         | 14.14             | 17.87                           | 17.99                            | 1.10      | 0.66    | 40.29                   | 19.28                           | 0.82                    |
| 2900.0        | 9.39         | 13.87             | 18.55                           | 17.57                            | 1.10      | 0.65    | 39.37                   | 19.35                           | 0.85                    |
| 3000.0        | 9.12         | 13.60             | 18.85                           | 17.38                            | 1.10      | 0.65    | 40.29                   | 19.07                           | 0.85                    |
| 3100.0        | 8.88         | 13.34             | 18.95                           | 17.26                            | 1.10      | 0.65    | 39.51                   | 18.97                           | 0.78                    |
| 3200.0        | 8.65         | 13.07             | 19.11                           | 17.22                            | 1.10      | 0.64    | 39.14                   | 19.41                           | 0.87                    |
| 3300.0        | 8.42         | 12.83             | 19.29                           | 17.33                            | 1.10      | 0.64    | 38.21                   | 18.76                           | 0.93                    |
| 3400.0        | 8.19         | 12.59             | 19.61                           | 17.63                            | 1.10      | 0.64    | 39.22                   | 18.96                           | 1.09                    |
| 3500.0        | 7.98         | 12.36             | 19.49                           | 18.07                            | 1.10      | 0.64    | 38.92                   | 18.48                           | 1.10                    |



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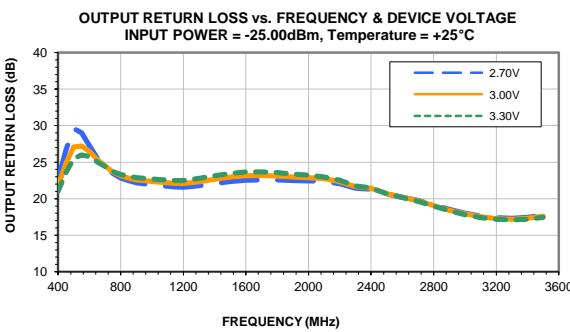
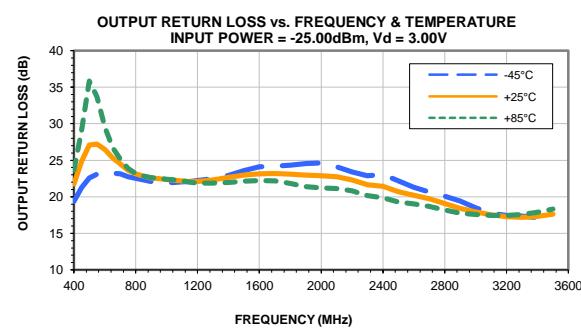
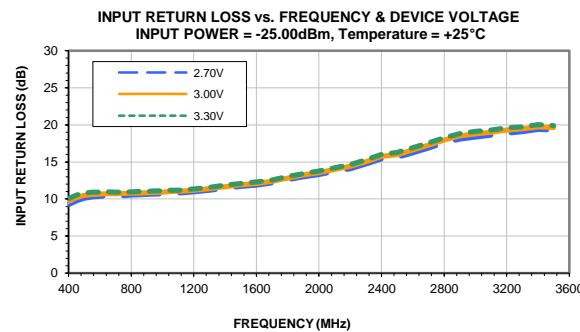
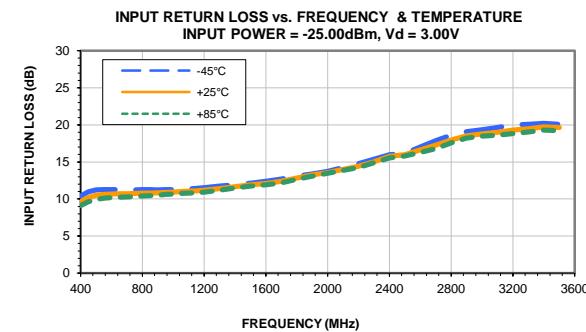
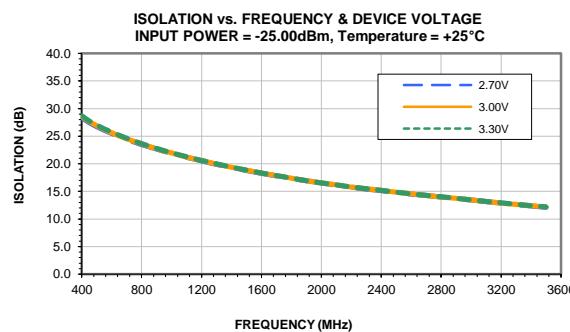
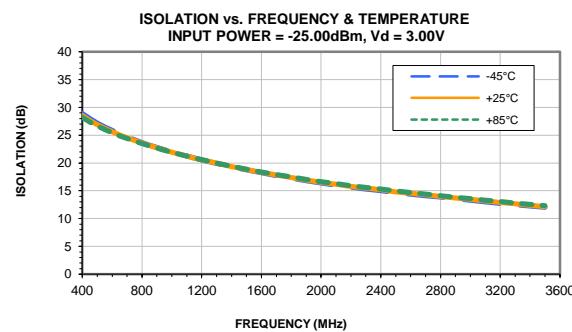
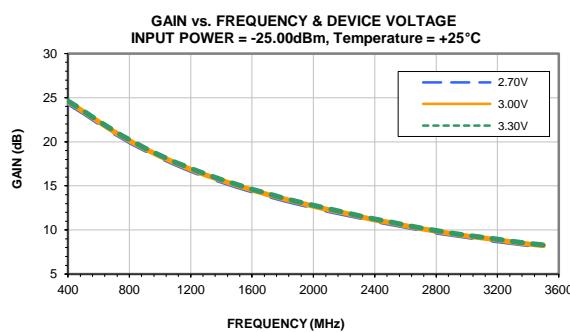
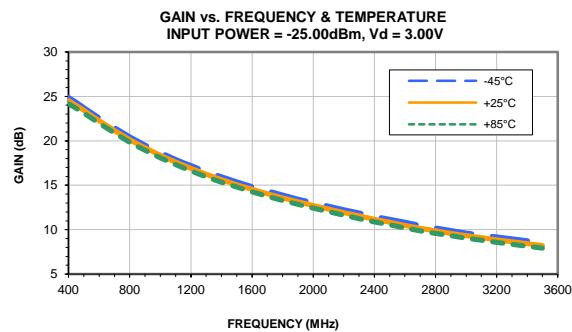
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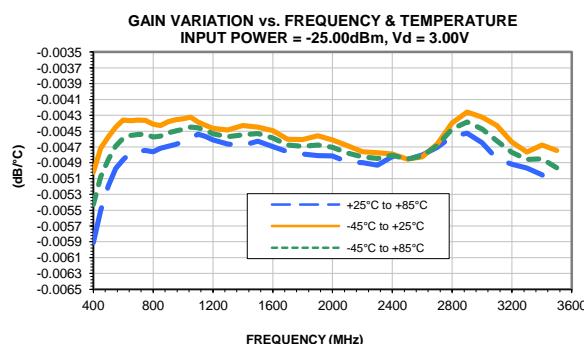
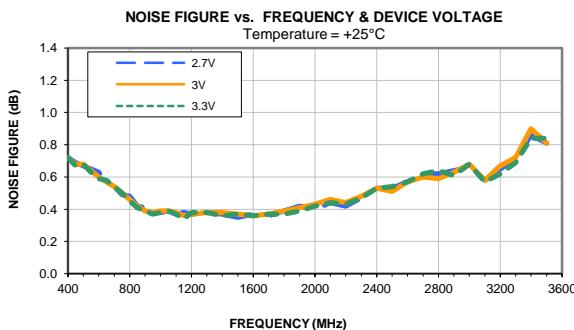
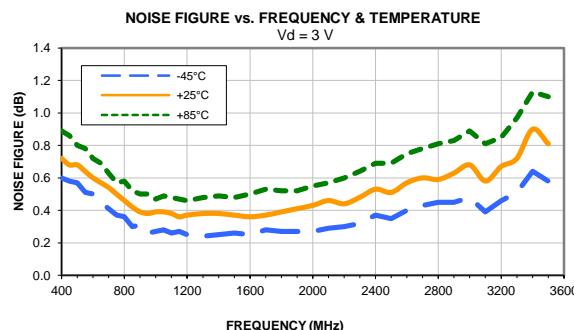
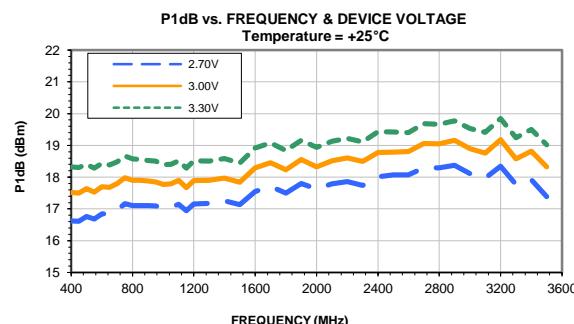
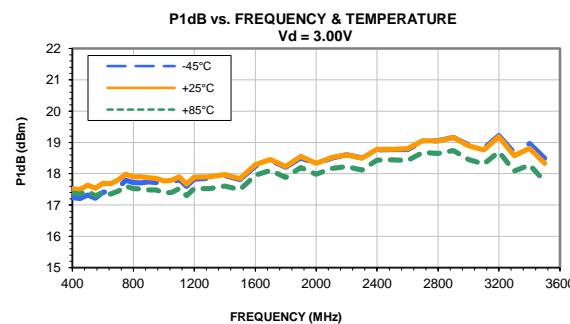
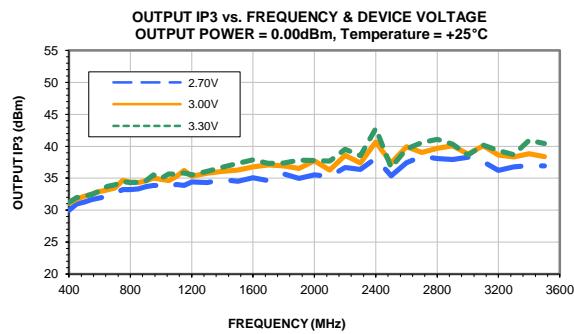
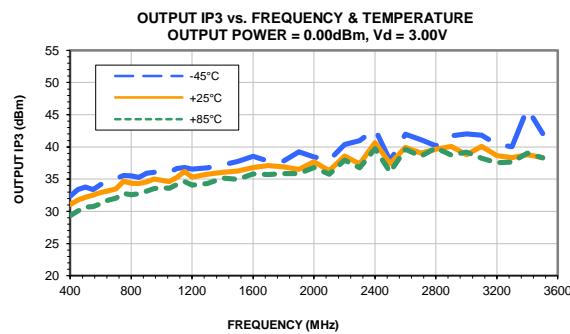
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## Typical Performance Curves



## Typical Performance Curves



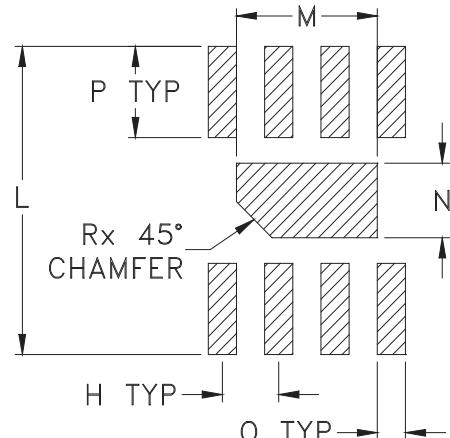
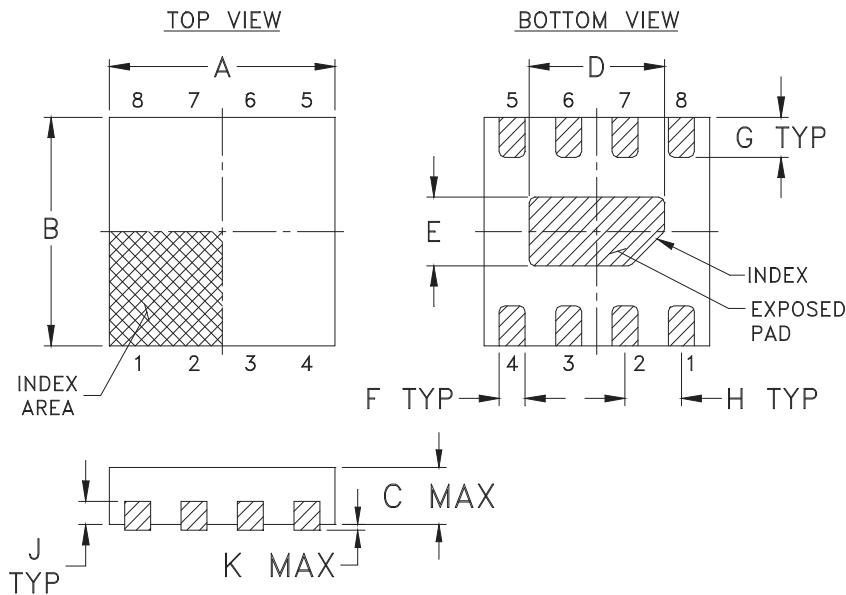
# Case Style

MC

MC1631-1

## Outline Dimensions

### PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm .002$

| SE #.    | A              | B              | C              | D              | E             | F             | G             | H             | J             | K             | L              | M              | N             | P             |
|----------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|----------------|---------------|---------------|
| MC1631-1 | .079<br>(2.00) | .079<br>(2.00) | .039<br>(1.00) | .047<br>(1.20) | .024<br>(.60) | .009<br>(.23) | .014<br>(.35) | .020<br>(.50) | .008<br>(.20) | .002<br>(.05) | .106<br>(2.70) | .049<br>(1.25) | .026<br>(.65) | .031<br>(.80) |

| CASE #.  | Q             | R             | WT, GRAM |
|----------|---------------|---------------|----------|
| MC1631-1 | .010<br>(.25) | .012<br>(.30) | .006     |

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

#### Notes:

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

For RoHS Case Styles: Tin-Silver over Nickel plated or Matte-Tin Plated (See Data sheet).  
All models, (+) suffix.

3. Lead #1 identifier shall be located in the cross-hatched area shown.  
Identifier may be either a molded or marked feature.

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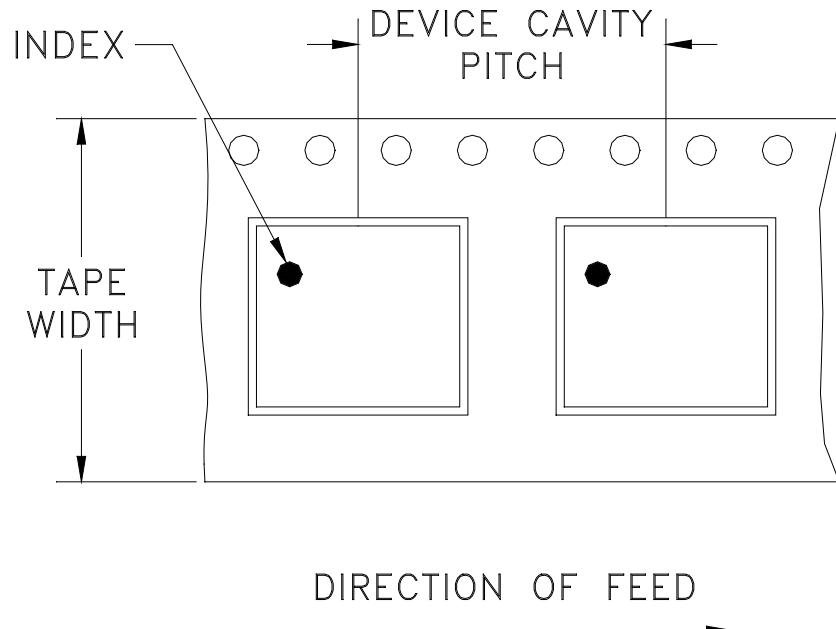


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RF/I/F MICROWAVE COMPONENTS

# Tape & Reel Packaging TR-F66

## DEVICE ORIENTATION IN T&R



| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel see note |                  |
|----------------|-------------------------|-------------------|---------------------------|------------------|
| 8              | 4                       | 7                 | Small quantity standard   | 20               |
|                |                         |                   |                           | 50               |
|                |                         |                   |                           | 100              |
|                |                         |                   |                           | 200              |
|                |                         |                   |                           | 500              |
|                |                         | 7                 | Standard                  | 1000, 2000, 3000 |

Note: Please consult individual model data sheet to determine device per reel availability.

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)



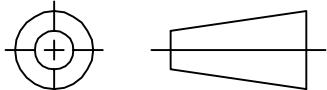
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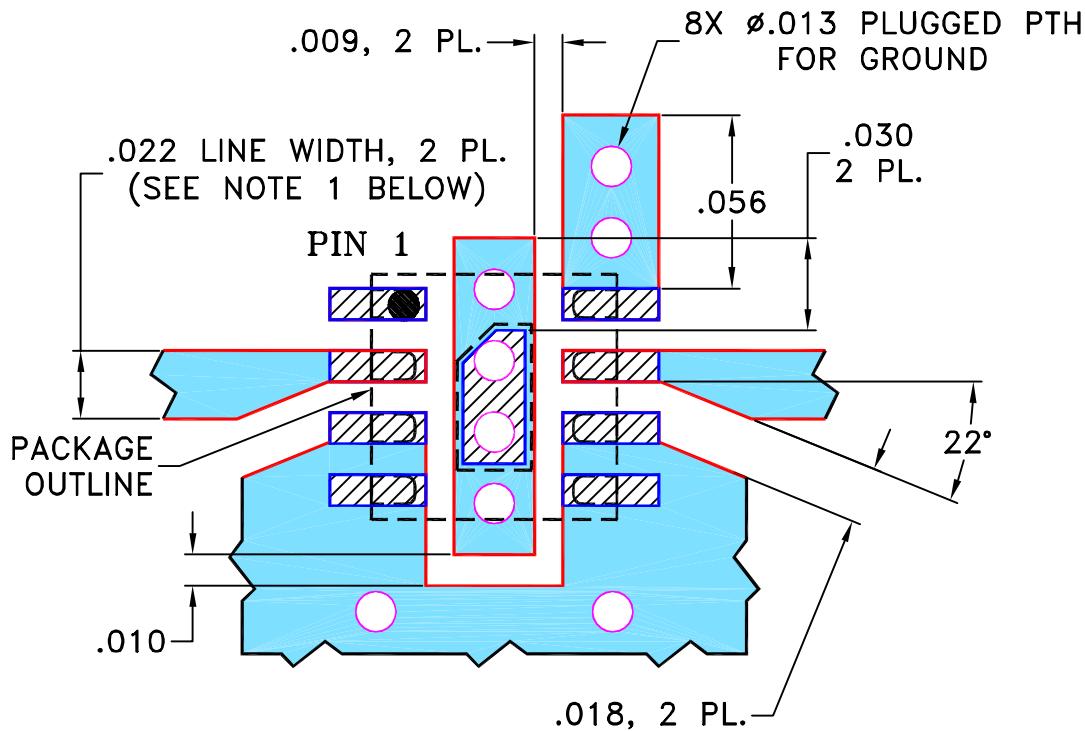
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION | DATE     | DR | AUTH |
|-----|---------|-------------|----------|----|------|
| OR  | M143800 | NEW RELEASE | 11/11/13 | AV | RS   |
|     |         |             |          |    |      |
|     |         |             |          |    |      |
|     |         |             |          |    |      |

SUGGESTED MOUNTING CONFIGURATION FOR  
MC1631-1 CASE STYLE, "08AM11" PIN CODE



- NOTES: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS  $.010" \pm .001"$ ; COPPER: 1/2 OZ. EACH SIDE.  
FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.  
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

[Solid Blue Box] DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

[Hatched Box] DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

INITIALS

DATE

DIMENSIONS ARE IN INCHES

DRAWN

AV

10/21/13

TOLERANCES ON:

CHECKED

IL

11/07/13

2 PL DECIMALS  $\pm$ 

APPROVED

RS

11/11/13

3 PL DECIMALS  $\pm .005$ ANGLES  $\pm$ FRACTIONS  $\pm$ 

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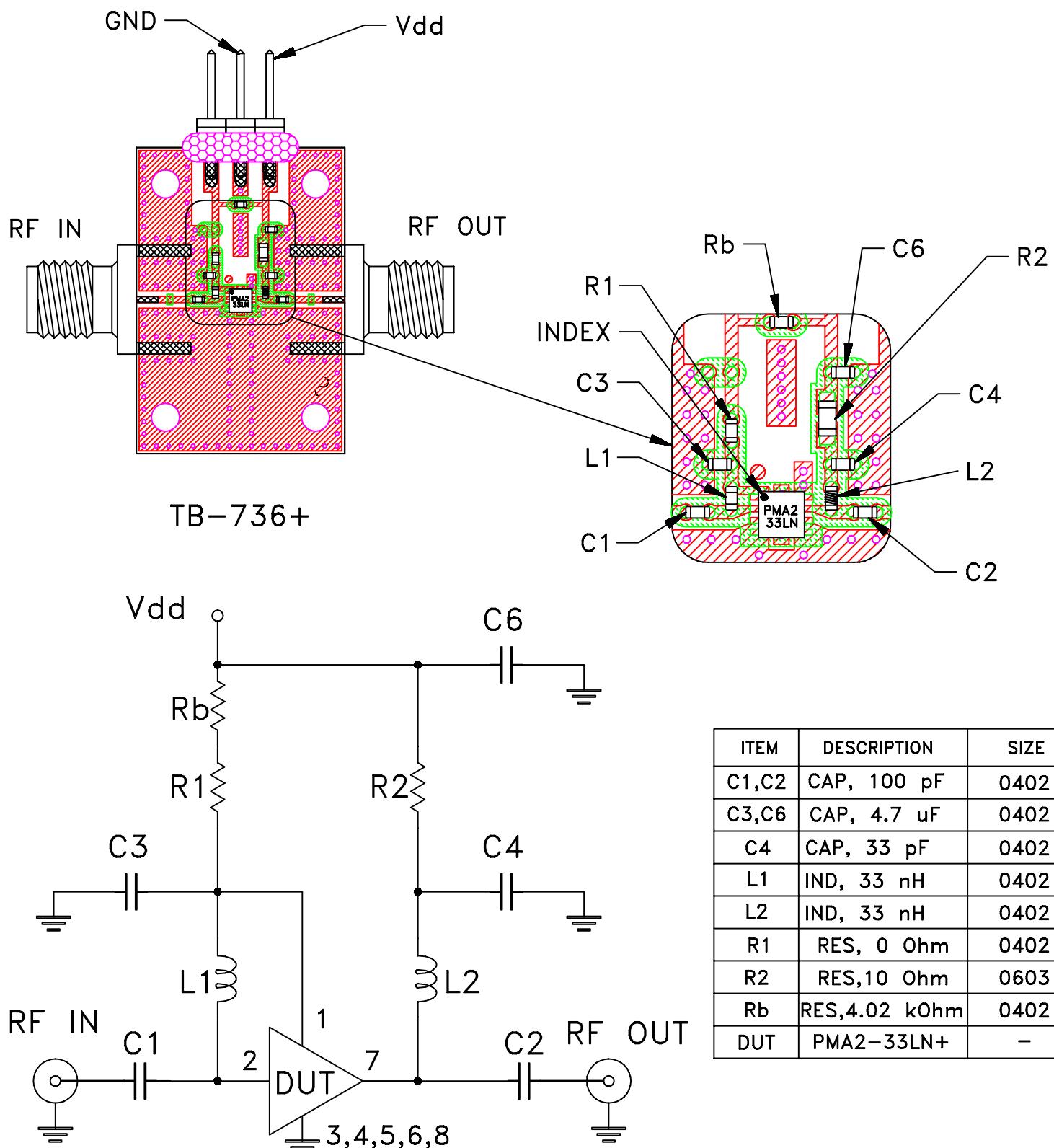
PL, 08AM11, MC1631-1, TB-736+

| SIZE          | CODE IDENT  | DRAWING NO:   | REV: |
|---------------|-------------|---------------|------|
| A             | 15542       | 98-PL-400     | OR   |
| FILE: 98PL400 | SCALE: 16:1 | SHEET: 1 OF 1 |      |

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ASHEET1.DWG REV:A DATE:01/12/95

# Evaluation Board and Circuit



Schematic Diagram

NOTES:

1. SMA Female connectors.
2. PCB material: Rogers RO4350 or equivalent,  
dielectric constant=3.5,  
dielectric thickness=.010 inch.

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## Environmental Specifications

## ENV08T1

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<br>Ambient Environment   | Individual Model Data Sheet                                     |
| Storage Temperature            | -55° to 100° C or -65° to 150°<br>Ambient Environment   | Individual Model Data Sheet                                     |
| 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   |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + propylene glycol monomethyl ether + | MIL-STD-202, Method 215   |



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 |
|---------------|----------------------------------|----------------|
|               | monoethanolamine at 63°C to 70°C |                |