

Wideband

# Monolithic Amplifier

TSY-13LNB+

50Ω    0.03 to 1 GHz



2mm x 2mm

## The Big Deal

- Very wideband, 30 MHz – 1 GHz
- Low NF over entire frequency band, 1.2 dB
- Low current and low voltage (2.7V and 7.7 mA)
- Internal bypass switching

## Product Overview

TSY-13LNB+ (RoHS compliant) is an advanced Low Voltage, Low Current, Low Noise wideband Bypass amplifier fabricated using GaAs E-PHEMT technology offering extremely high dynamic range over a broad frequency range. It has integrated switches enabling users to bypass the amplifier. TSY is enclosed in a 8-lead 2 x 2 mm MCLP package for good thermal performance.

## Key Features

| Feature                                    | Advantages                                                                                                          |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Ultra-wideband: 30 MHz – 1 GHz             | Ideal for a wide range of receiver applications including military, commercial wireless, and instrumentation.       |
| Low Voltage & Low Current<br>2.7V & 7.7 mA | Ideal for Battery operates systems                                                                                  |
| High IP3<br>26.4 dBm typ at 0.5 GHz        | Provides enhanced linearity over broad frequency range under high signal conditions.                                |
| Bypass feature<br>Low insertion loss       | Unlike other amplifiers, insertion loss is low in Bypass mode. (For Bypass, both $V_{DD}$ and $V_e$ are set to 0V.) |
| Compact size: 2 x 2 x 1 mm                 | Saves space in dense system layouts. Low inductance, repeatable transitions, and excellent thermal contact.         |



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# Monolithic Amplifier

TSY-13LNB+

50Ω 0.03 to 1 GHz

## Product Features

- Wideband: 0.03-1 GHz
- Built-in Bypass switching
- Low Noise figure: 1.2 dB typ.
- P1dB: +17.1 dBm typ.
- Low current and low voltage (2.7V and 7.7 mA)



Generic photo used for illustration purposes only

CASE STYLE: MC1631-1

**+RoHS Compliant**

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

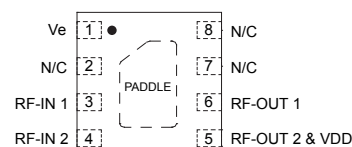
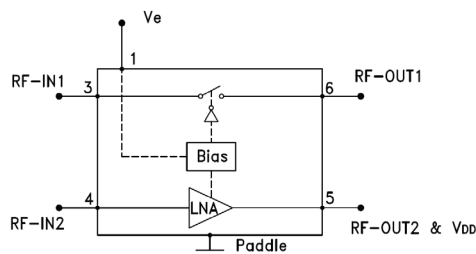
## Typical Applications

- Wireless Base Station Systems
- Test and Measurement Systems
- Multi-Band Receivers

## General Description

TSY-13LNB+(RoHS compliant) is an advanced Low Voltage, Low Current, Low Noise wideband Bypass amplifier fabricated using GaAs E-PHEMT technology offering extremely high dynamic range over a broad frequency range. It has integrated switches enabling users to bypass the amplifier. TSY is enclosed in a 8-lead 2 x 2 mm MCLP package for good thermal performance.

## simplified schematic & pad description



| Function                 | Pad Number | Description (See Figure 1)                                                                                                                      |
|--------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| RF-IN 1 & RF-IN 2        | 3,4        | RF-Input pads. Pad 4 is connected to Pad 3 via two 0.1μF Capacitors                                                                             |
| RF-OUT 1 & RF-OUT2 & VDD | 5,6        | RF-Output pads.<br>Pad 6 is connected to Pad 5 via 0.1μF Capacitor.                                                                             |
| Voltage Enable (Ve)      | 1          | Enable Voltage pad. Ve is always connected to V <sub>DD</sub> . For amplifier bypass, V <sub>DD</sub> & Ve should be turned OFF simultaneously. |
| Ground                   | Paddle     | Connect to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.           |
| N/C                      | 2,7,8      | No connection                                                                                                                                   |



**Electrical Specifications<sup>1</sup> at 25°C,  $Z_0=50\Omega$  &  $V_{DD}=2.7V$  unless otherwise noted**

| Parameter                                             | Condition (GHz) | Amplifier - ON |        |      | Amplifier - Bypass | Units            |
|-------------------------------------------------------|-----------------|----------------|--------|------|--------------------|------------------|
|                                                       |                 | Min.           | Typ.   | Max. | Typ.               |                  |
| Frequency Range                                       |                 | 0.03           |        | 1    | 0.03 - 1           | GHz              |
| Noise Figure                                          | 0.03            |                | 1.3    |      | 0.5                | dB               |
|                                                       | 0.3             |                | 1.2    |      | 0.6                |                  |
|                                                       | 0.5             |                | 1.2    |      | 0.8                |                  |
|                                                       | 0.8             |                | 1.4    |      | 1.8                |                  |
|                                                       | 1.0             |                | 1.4    |      | 1.9                |                  |
| Gain                                                  | 0.03            | —              | 15.3   | —    | -0.5               | dB               |
|                                                       | 0.3             | —              | 15.1   | —    | -0.6               |                  |
|                                                       | 0.5             | 13.3           | 14.7   | 16.3 | -0.8               |                  |
|                                                       | 0.8             | —              | 13.9   | —    | -1.8               |                  |
|                                                       | 1.0             | —              | 13.1   | —    | -1.9               |                  |
| Input Return Loss                                     | 0.03            |                | 13     |      | 19                 | dB               |
|                                                       | 0.3             |                | 14     |      | 19                 |                  |
|                                                       | 0.5             |                | 14     |      | 14                 |                  |
|                                                       | 0.8             |                | 11     |      | 10                 |                  |
|                                                       | 1.0             |                | 10     |      | 8                  |                  |
| Output Return Loss                                    | 0.03            |                | 16     |      | 18                 | dB               |
|                                                       | 0.3             |                | 20     |      | 18                 |                  |
|                                                       | 0.5             |                | 18     |      | 13                 |                  |
|                                                       | 0.8             |                | 16     |      | 9                  |                  |
|                                                       | 1.0             |                | 14     |      | 7                  |                  |
| Output Power at 1dB Compression, AMP-ON <sup>2</sup>  | 0.03            |                | 15.9   |      | 1.2                | dBm              |
|                                                       | 0.3             |                | 16.8   |      | 2.6                |                  |
|                                                       | 0.5             |                | 17.1   |      | 2.7                |                  |
|                                                       | 0.8             |                | 17.3   |      | 1.9                |                  |
|                                                       | 1.0             |                | 17.6   |      | 3.1                |                  |
| Output IP <sub>3</sub> <sup>3</sup>                   | 0.03            |                | 25.6   |      | 24.9               | dBm              |
|                                                       | 0.3             |                | 27.5   |      | 27.6               |                  |
|                                                       | 0.5             |                | 26.4   |      | 28.4               |                  |
|                                                       | 0.8             |                | 27.8   |      | 26.9               |                  |
|                                                       | 1.0             |                | 24.7   |      | 30.4               |                  |
| Device Operating Voltage ( $V_{DD}$ ) <sup>5</sup>    |                 | 2.5            | 2.7    | 2.9  | 0                  | V                |
| Device Operating Current ( $I_{D+I_e}$ )              |                 | —              | 7.7    | 10.6 | 0                  | mA               |
| Enable Voltage ( $V_e$ ) <sup>5</sup>                 |                 | 2.5            | 2.7    | 2.9  | 0                  | V                |
| Device Current Variation vs. Temperature <sup>4</sup> |                 |                | 1.5    |      | —                  | $\mu A/^\circ C$ |
| Device Current Variation vs. Voltage                  |                 |                | 0.0067 |      | —                  | mA/mV            |
| Thermal Resistance, junction-to-ground lead           |                 |                | 229    |      | —                  | $^\circ C/W$     |

1. Measured on Mini-Circuits Characterization Test Board TB-943-13LNB+. See Characterization Test Circuit (Fig. 1)

2. Current increases to 28-54 mA typ. at P1dB

3. Tested at  $P_{out}=+6$  dBm/100Hz

4.  $((\text{Current at } 85^\circ C - \text{Current at } -45^\circ C)/130)$

5.  $V_{DD}$  is always connected to  $V_e$

**Absolute Maximum Ratings<sup>6</sup>**

| Parameter                           | Ratings                                                                                                                |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Operating Temperature (ground lead) | -40°C to 85°C                                                                                                          |
| Storage Temperature                 | -65°C to 150°C                                                                                                         |
| Total Power Dissipation             | 0.2W                                                                                                                   |
| Input Power                         | Amplifier - ON 10 dBm (continuous), +23 dBm (5 min. max)<br>Amplifier Bypass 15 dBm (continuous), +22 dBm (5 min. max) |
| DC Voltage $V_{DD}$ (Pad 5)         | 6V                                                                                                                     |
| DC Voltage $V_e$ (Pad 1)            | 6V                                                                                                                     |

|                                       | Min. | Typ. | Max. | Units |
|---------------------------------------|------|------|------|-------|
| Amplifier-ON ( $V_{DD}$ , $V_e$ )     | 2.5  | 2.7  | 2.9  | V     |
| Amplifier-Bypass ( $V_{DD}$ , $V_e$ ) | —    | —    | 0.3  |       |

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

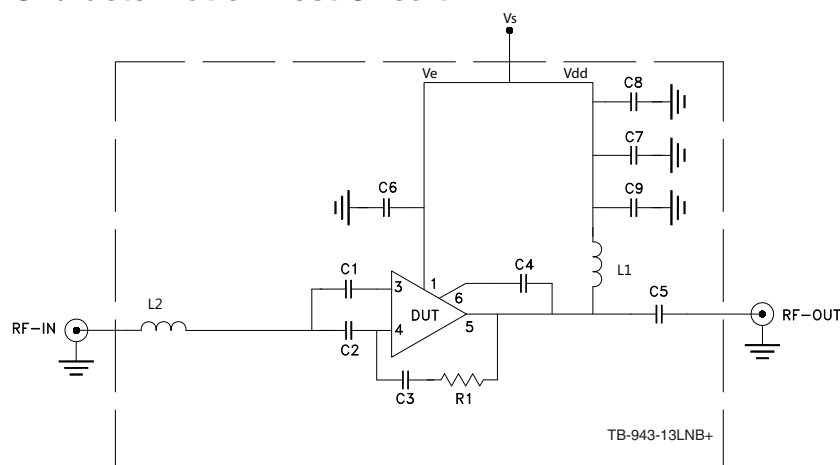
Electrical maximum ratings are not intended for continuous normal operation.



## Switching Specifications

| Parameter               |                                  | Min. | Typ. | Max. | Units   |
|-------------------------|----------------------------------|------|------|------|---------|
| Amplifier ON to Bypass  | OFF TIME (50% Control to 10% RF) | —    | 6    | —    | $\mu$ S |
|                         | FALL TIME (90 TO 10% RF)         | —    | 7    | —    |         |
| Amplifier Bypass to ON  | ON TIME (50% Control to 90% RF)  | —    | 59   | —    | $\mu$ S |
|                         | RISE TIME (10% to 90% RF)        | —    | 20   | —    |         |
| Control Voltage Leakage |                                  | —    | 443  | —    | mV      |

## Characterization Test Circuit



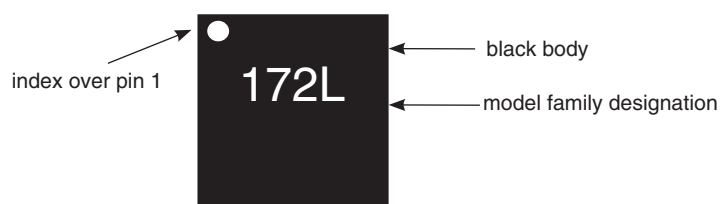
| Component | P/N                | Supplier  | Value        | Size           |
|-----------|--------------------|-----------|--------------|----------------|
| L1        | 1008CS-102XJLC     | Coilcraft | 1uH          | 0.115" x 0.11" |
| L2        | LQG15HS3N0S02D     | Murata    | 3nH          | 0402           |
| C1 to C8  | GRM155R71C104KA88D | Murata    | 0.1uF        | 0402           |
| C9        | GRM1555C1H102JA01D | Murata    | 1000pF       | 0402           |
| R1        | RK73H1ETTP4320F    | KOA       | 432 $\Omega$ | 0402           |

**Fig 1.** Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-943-13LNB+) Gain, Return loss, Output power at 1dB compression (P1dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

## Conditions:

1. Gain and Return loss: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, +6 dBm/tone at output.
3. Switching Time RF Signal: Pin=-10 dBm at 500 MHz.  $V_{DD}=V_{EE}=0$  to 2.5 / 2.7 / 2.9V, Pulse Signal=500 Hz, 50% duty cycle.

## Product Marking



**Additional Detailed Technical Information**

additional information is available on our dash board. To access this information [click here](#)

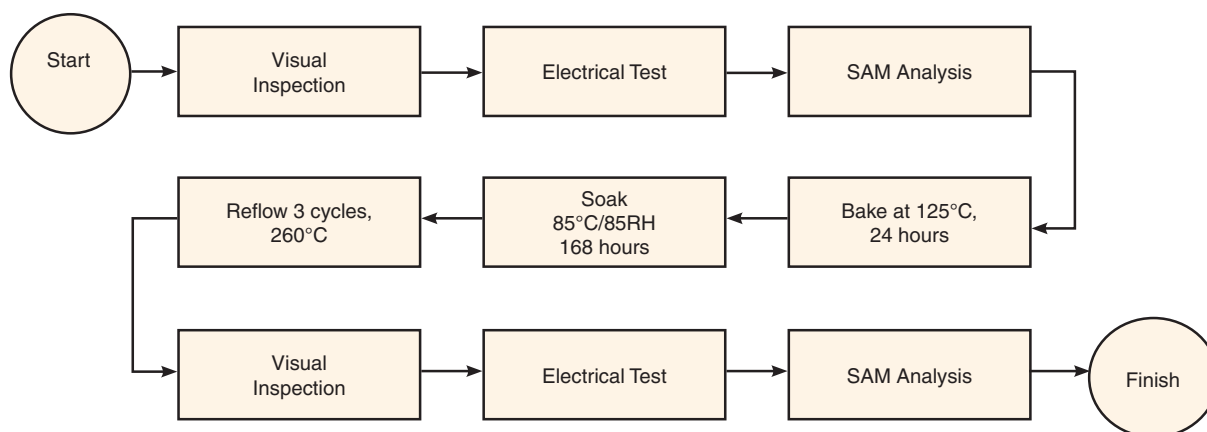
|                                                                 |                                                                  |
|-----------------------------------------------------------------|------------------------------------------------------------------|
| <b>Performance Data</b>                                         | Data Table                                                       |
|                                                                 | Swept Graphs                                                     |
|                                                                 | S-Parameter (S2P Files) Data Set (.zip file)                     |
| <b>Case Style</b>                                               | MC1631-1 Plastic package, exposed paddle, lead finish: matte-tin |
| <b>Tape &amp; Reel</b><br>Standard quantities available on reel | F66<br>7" reels with 20, 50, 100, 200, 500, 1K or 2K devices     |
| <b>Suggested Layout for PCB Design</b>                          | PL-536                                                           |
| <b>Evaluation Board</b>                                         | TB-943-13LNB+                                                    |
| <b>Environmental Ratings</b>                                    | ENV08T1                                                          |

**ESD Rating**

Human Body Model (HBM): Class 1A (Pass 250) in accordance with ANSI/ESD STM 5.1 - 2001 Machine.

**MSL Rating**

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

**MSL Test Flow Chart****Additional Notes**

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

## 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 = 2.70V, Id = 7.97mA @ Temperature = +25°C

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 10    | 14.51 | 20.00     | 8.64                    | 7.65                     | 1.08      | 0.50    | 30.75          | 15.13                  | 1.74            |
| 20    | 15.26 | 19.32     | 12.44                   | 12.85                    | 1.08      | 0.55    | 27.96          | 15.68                  | 1.31            |
| 30    | 15.39 | 19.18     | 13.59                   | 15.85                    | 1.07      | 0.56    | 26.81          | 16.01                  | 1.27            |
| 40    | 15.45 | 19.12     | 14.14                   | 17.82                    | 1.07      | 0.56    | 26.60          | 16.71                  | 1.24            |
| 50    | 15.46 | 19.11     | 14.64                   | 19.13                    | 1.07      | 0.56    | 25.89          | 17.01                  | 1.22            |
| 60    | 15.47 | 19.09     | 14.85                   | 20.01                    | 1.07      | 0.57    | 26.79          | 16.80                  | 1.17            |
| 70    | 15.47 | 19.08     | 14.89                   | 20.58                    | 1.07      | 0.57    | 27.29          | 16.72                  | 1.19            |
| 80    | 15.46 | 19.07     | 14.95                   | 20.97                    | 1.07      | 0.57    | 28.00          | 16.77                  | 1.15            |
| 90    | 15.46 | 19.06     | 15.08                   | 21.19                    | 1.07      | 0.57    | 27.74          | 16.95                  | 1.15            |
| 100   | 15.46 | 19.05     | 15.11                   | 21.34                    | 1.07      | 0.57    | 27.91          | 16.57                  | 1.16            |
| 150   | 15.42 | 19.06     | 15.09                   | 21.39                    | 1.07      | 0.57    | 31.46          | 16.75                  | 1.18            |
| 200   | 15.37 | 19.03     | 15.09                   | 20.62                    | 1.07      | 0.58    | 28.28          | 16.73                  | 1.14            |
| 250   | 15.31 | 19.05     | 15.09                   | 20.11                    | 1.07      | 0.59    | 36.03          | 16.98                  | 1.18            |
| 300   | 15.24 | 19.02     | 15.07                   | 19.23                    | 1.07      | 0.59    | 28.04          | 16.94                  | 1.15            |
| 350   | 15.15 | 19.03     | 14.97                   | 18.64                    | 1.07      | 0.60    | 33.82          | 16.85                  | 1.20            |
| 400   | 15.05 | 19.00     | 14.80                   | 17.95                    | 1.07      | 0.61    | 28.48          | 16.98                  | 1.22            |
| 450   | 14.95 | 18.98     | 14.63                   | 17.23                    | 1.06      | 0.62    | 27.57          | 17.21                  | 1.22            |
| 500   | 14.83 | 18.97     | 14.36                   | 16.65                    | 1.06      | 0.64    | 33.07          | 17.39                  | 1.22            |
| 550   | 14.70 | 18.98     | 14.04                   | 16.17                    | 1.06      | 0.65    | 30.16          | 17.13                  | 1.25            |
| 600   | 14.56 | 18.97     | 13.72                   | 15.70                    | 1.06      | 0.67    | 28.52          | 17.17                  | 1.29            |
| 650   | 14.41 | 18.96     | 13.31                   | 15.20                    | 1.06      | 0.69    | 29.00          | 17.32                  | 1.30            |
| 700   | 14.23 | 18.98     | 12.85                   | 14.75                    | 1.06      | 0.71    | 29.57          | 17.19                  | 1.31            |
| 750   | 14.09 | 18.96     | 12.47                   | 14.52                    | 1.06      | 0.72    | 29.69          | 17.57                  | 1.29            |
| 800   | 13.92 | 18.97     | 12.02                   | 14.21                    | 1.06      | 0.74    | 30.49          | 17.47                  | 1.36            |
| 850   | 13.74 | 18.97     | 11.57                   | 13.86                    | 1.06      | 0.76    | 29.93          | 17.28                  | 1.36            |
| 900   | 13.54 | 18.99     | 11.10                   | 13.49                    | 1.05      | 0.78    | 28.79          | 17.37                  | 1.39            |
| 950   | 13.34 | 19.01     | 10.64                   | 13.16                    | 1.05      | 0.81    | 28.75          | 17.76                  | 1.40            |
| 1000  | 13.12 | 19.06     | 10.20                   | 12.80                    | 1.06      | 0.83    | 33.08          | 17.87                  | 1.40            |
| 1100  | 12.50 | 19.34     | 9.11                    | 12.10                    | 1.08      | 0.90    | 27.48          | 17.63                  | 1.48            |
| 1200  | 12.25 | 19.22     | 8.32                    | 12.77                    | 1.07      | 0.94    | 26.96          | 17.81                  | 1.56            |
| 1300  | 11.86 | 19.25     | 7.76                    | 11.77                    | 1.07      | 0.96    | 27.01          | 17.86                  | 1.65            |
| 1400  | 11.40 | 19.35     | 7.13                    | 10.98                    | 1.07      | 0.99    | 26.64          | 17.76                  | 1.69            |
| 1500  | 10.93 | 19.48     | 6.54                    | 10.25                    | 1.07      | 1.01    | 24.66          | 18.36                  | 1.75            |
| 1600  | 10.44 | 19.62     | 6.02                    | 9.51                     | 1.08      | 1.03    | 23.52          | 18.36                  | 1.80            |
| 1700  | 9.95  | 19.79     | 5.56                    | 8.83                     | 1.09      | 1.04    | 22.65          | 17.89                  | 1.93            |
| 1800  | 9.46  | 19.94     | 5.14                    | 8.16                     | 1.10      | 1.04    | 22.24          | 17.66                  | 2.05            |
| 1900  | 8.97  | 20.13     | 4.76                    | 7.51                     | 1.11      | 1.03    | 21.17          | 17.36                  | 2.15            |
| 2000  | 8.47  | 20.35     | 4.42                    | 6.91                     | 1.12      | 1.02    | 20.74          | 17.19                  | 2.21            |

## 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 = 2.50V, Id = 6.69mA @ Temperature = +25°C

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 10    | 13.81 | 19.70     | 8.06                    | 7.17                     | 1.09      | 0.51    | 25.08          | 14.59                  | 1.83            |
| 20    | 14.59 | 18.95     | 11.17                   | 11.88                    | 1.08      | 0.56    | 24.80          | 15.14                  | 1.38            |
| 30    | 14.74 | 18.81     | 12.11                   | 14.29                    | 1.08      | 0.57    | 24.43          | 15.44                  | 1.34            |
| 40    | 14.79 | 18.74     | 12.53                   | 15.66                    | 1.08      | 0.58    | 23.87          | 16.15                  | 1.27            |
| 50    | 14.81 | 18.73     | 12.87                   | 16.45                    | 1.08      | 0.58    | 23.33          | 16.48                  | 1.29            |
| 60    | 14.82 | 18.71     | 13.02                   | 16.91                    | 1.08      | 0.58    | 23.98          | 16.27                  | 1.24            |
| 70    | 14.82 | 18.69     | 13.07                   | 17.17                    | 1.08      | 0.58    | 25.14          | 16.19                  | 1.28            |
| 80    | 14.82 | 18.69     | 13.09                   | 17.34                    | 1.08      | 0.58    | 26.18          | 16.24                  | 1.23            |
| 90    | 14.82 | 18.67     | 13.17                   | 17.41                    | 1.08      | 0.58    | 26.97          | 16.44                  | 1.21            |
| 100   | 14.81 | 18.66     | 13.19                   | 17.45                    | 1.08      | 0.58    | 29.32          | 16.05                  | 1.22            |
| 150   | 14.77 | 18.67     | 13.22                   | 17.50                    | 1.08      | 0.59    | 28.57          | 16.23                  | 1.23            |
| 200   | 14.72 | 18.64     | 13.25                   | 17.07                    | 1.08      | 0.59    | 29.06          | 16.22                  | 1.22            |
| 250   | 14.67 | 18.65     | 13.28                   | 16.87                    | 1.07      | 0.60    | 27.18          | 16.47                  | 1.26            |
| 300   | 14.60 | 18.62     | 13.31                   | 16.33                    | 1.07      | 0.60    | 26.77          | 16.43                  | 1.29            |
| 350   | 14.51 | 18.62     | 13.27                   | 15.99                    | 1.07      | 0.62    | 27.50          | 16.34                  | 1.27            |
| 400   | 14.42 | 18.60     | 13.18                   | 15.52                    | 1.07      | 0.62    | 26.45          | 16.48                  | 1.28            |
| 450   | 14.31 | 18.57     | 13.11                   | 15.02                    | 1.06      | 0.63    | 25.99          | 16.73                  | 1.30            |
| 500   | 14.20 | 18.56     | 12.95                   | 14.60                    | 1.06      | 0.65    | 27.53          | 16.90                  | 1.24            |
| 550   | 14.06 | 18.57     | 12.75                   | 14.24                    | 1.06      | 0.66    | 28.64          | 16.64                  | 1.29            |
| 600   | 13.93 | 18.55     | 12.54                   | 13.87                    | 1.06      | 0.68    | 27.77          | 16.66                  | 1.33            |
| 650   | 13.77 | 18.55     | 12.22                   | 13.47                    | 1.05      | 0.69    | 27.82          | 16.86                  | 1.33            |
| 700   | 13.60 | 18.56     | 11.88                   | 13.12                    | 1.05      | 0.71    | 27.68          | 16.71                  | 1.38            |
| 750   | 13.46 | 18.54     | 11.59                   | 12.93                    | 1.05      | 0.73    | 27.01          | 17.10                  | 1.39            |
| 800   | 13.28 | 18.55     | 11.21                   | 12.67                    | 1.05      | 0.75    | 26.83          | 16.98                  | 1.44            |
| 850   | 13.10 | 18.55     | 10.84                   | 12.36                    | 1.05      | 0.77    | 26.30          | 16.76                  | 1.42            |
| 900   | 12.90 | 18.57     | 10.45                   | 12.06                    | 1.04      | 0.79    | 25.92          | 16.86                  | 1.44            |
| 950   | 12.70 | 18.60     | 10.02                   | 11.78                    | 1.04      | 0.81    | 25.43          | 17.24                  | 1.47            |
| 1000  | 12.48 | 18.65     | 9.63                    | 11.47                    | 1.04      | 0.83    | 26.20          | 17.35                  | 1.48            |
| 1100  | 11.85 | 18.95     | 8.60                    | 10.95                    | 1.06      | 0.90    | 24.23          | 17.09                  | 1.56            |
| 1200  | 11.61 | 18.82     | 7.91                    | 11.49                    | 1.05      | 0.94    | 24.10          | 17.24                  | 1.62            |
| 1300  | 11.21 | 18.87     | 7.36                    | 10.61                    | 1.05      | 0.96    | 24.21          | 17.29                  | 1.71            |
| 1400  | 10.74 | 18.99     | 6.75                    | 9.95                     | 1.05      | 0.99    | 23.81          | 17.14                  | 1.76            |
| 1500  | 10.26 | 19.14     | 6.17                    | 9.34                     | 1.05      | 1.01    | 22.74          | 17.93                  | 1.83            |
| 1600  | 9.77  | 19.31     | 5.66                    | 8.71                     | 1.06      | 1.02    | 22.14          | 17.95                  | 1.89            |
| 1700  | 9.27  | 19.50     | 5.21                    | 8.12                     | 1.07      | 1.03    | 21.47          | 17.57                  | 2.01            |
| 1800  | 8.77  | 19.68     | 4.81                    | 7.55                     | 1.08      | 1.03    | 21.20          | 17.20                  | 2.13            |
| 1900  | 8.28  | 19.90     | 4.44                    | 6.98                     | 1.09      | 1.03    | 20.35          | 16.84                  | 2.25            |
| 2000  | 7.77  | 20.15     | 4.10                    | 6.47                     | 1.10      | 1.02    | 19.93          | 16.70                  | 2.34            |

## 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 = 2.90V, Id = 9.31mA @ Temperature = +25°C

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 10    | 15.11 | 20.25     | 9.33                    | 7.98                     | 1.08      | 0.49    | 28.88          | 15.61                  | 1.71            |
| 20    | 15.78 | 19.62     | 13.40                   | 13.47                    | 1.07      | 0.53    | 28.43          | 16.10                  | 1.28            |
| 30    | 15.91 | 19.50     | 14.99                   | 16.93                    | 1.07      | 0.54    | 27.55          | 16.45                  | 1.22            |
| 40    | 15.96 | 19.44     | 15.75                   | 19.46                    | 1.07      | 0.55    | 28.14          | 17.15                  | 1.18            |
| 50    | 15.97 | 19.43     | 16.34                   | 21.41                    | 1.07      | 0.55    | 27.58          | 17.42                  | 1.17            |
| 60    | 15.98 | 19.41     | 16.63                   | 22.89                    | 1.07      | 0.55    | 28.02          | 17.22                  | 1.12            |
| 70    | 15.98 | 19.40     | 16.76                   | 24.14                    | 1.07      | 0.55    | 26.69          | 17.14                  | 1.13            |
| 80    | 15.98 | 19.39     | 16.84                   | 25.12                    | 1.07      | 0.55    | 26.34          | 17.20                  | 1.11            |
| 90    | 15.97 | 19.38     | 16.95                   | 25.82                    | 1.07      | 0.55    | 25.77          | 17.35                  | 1.08            |
| 100   | 15.96 | 19.38     | 16.97                   | 26.32                    | 1.07      | 0.55    | 25.53          | 17.00                  | 1.09            |
| 150   | 15.93 | 19.38     | 17.00                   | 26.69                    | 1.07      | 0.56    | 26.52          | 17.17                  | 1.10            |
| 200   | 15.88 | 19.36     | 16.97                   | 24.96                    | 1.07      | 0.56    | 25.58          | 17.14                  | 1.10            |
| 250   | 15.82 | 19.38     | 16.89                   | 23.71                    | 1.07      | 0.57    | 27.33          | 17.39                  | 1.13            |
| 300   | 15.74 | 19.35     | 16.80                   | 22.26                    | 1.07      | 0.58    | 26.05          | 17.33                  | 1.17            |
| 350   | 15.66 | 19.36     | 16.57                   | 21.23                    | 1.07      | 0.59    | 27.37          | 17.27                  | 1.16            |
| 400   | 15.56 | 19.34     | 16.30                   | 20.28                    | 1.07      | 0.60    | 26.66          | 17.38                  | 1.16            |
| 450   | 15.45 | 19.32     | 16.00                   | 19.33                    | 1.07      | 0.61    | 26.01          | 17.58                  | 1.16            |
| 500   | 15.33 | 19.32     | 15.59                   | 18.58                    | 1.06      | 0.63    | 27.13          | 17.76                  | 1.19            |
| 550   | 15.20 | 19.33     | 15.13                   | 17.96                    | 1.06      | 0.64    | 26.63          | 17.51                  | 1.19            |
| 600   | 15.07 | 19.32     | 14.70                   | 17.39                    | 1.06      | 0.66    | 26.02          | 17.56                  | 1.20            |
| 650   | 14.92 | 19.31     | 14.16                   | 16.81                    | 1.06      | 0.68    | 26.20          | 17.66                  | 1.24            |
| 700   | 14.74 | 19.33     | 13.61                   | 16.28                    | 1.06      | 0.70    | 26.48          | 17.58                  | 1.26            |
| 750   | 14.60 | 19.31     | 13.14                   | 16.01                    | 1.06      | 0.72    | 26.91          | 17.94                  | 1.30            |
| 800   | 14.43 | 19.32     | 12.62                   | 15.65                    | 1.06      | 0.74    | 27.34          | 17.85                  | 1.29            |
| 850   | 14.25 | 19.32     | 12.11                   | 15.25                    | 1.06      | 0.76    | 27.79          | 17.70                  | 1.31            |
| 900   | 14.05 | 19.34     | 11.61                   | 14.83                    | 1.06      | 0.78    | 27.46          | 17.79                  | 1.34            |
| 950   | 13.85 | 19.36     | 11.10                   | 14.45                    | 1.06      | 0.80    | 28.01          | 18.17                  | 1.34            |
| 1000  | 13.64 | 19.40     | 10.64                   | 14.02                    | 1.07      | 0.82    | 28.09          | 18.28                  | 1.33            |
| 1100  | 13.02 | 19.67     | 9.50                    | 13.13                    | 1.09      | 0.89    | 30.59          | 18.07                  | 1.42            |
| 1200  | 12.76 | 19.55     | 8.63                    | 13.93                    | 1.08      | 0.93    | 28.90          | 18.25                  | 1.50            |
| 1300  | 12.38 | 19.57     | 8.07                    | 12.78                    | 1.08      | 0.95    | 28.43          | 18.31                  | 1.59            |
| 1400  | 11.93 | 19.65     | 7.44                    | 11.84                    | 1.08      | 0.98    | 29.34          | 18.24                  | 1.66            |
| 1500  | 11.46 | 19.76     | 6.84                    | 10.98                    | 1.09      | 1.01    | 26.30          | 18.65                  | 1.69            |
| 1600  | 10.98 | 19.89     | 6.32                    | 10.12                    | 1.09      | 1.02    | 24.68          | 18.61                  | 1.76            |
| 1700  | 10.50 | 20.03     | 5.85                    | 9.34                     | 1.10      | 1.03    | 23.72          | 18.08                  | 1.88            |
| 1800  | 10.01 | 20.16     | 5.42                    | 8.58                     | 1.11      | 1.03    | 23.19          | 17.99                  | 1.97            |
| 1900  | 9.52  | 20.34     | 5.03                    | 7.86                     | 1.12      | 1.03    | 21.93          | 17.73                  | 2.07            |
| 2000  | 9.02  | 20.53     | 4.68                    | 7.19                     | 1.13      | 1.02    | 21.47          | 17.52                  | 2.15            |

## 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 = 7.01mA @ Temperature = -45°C

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 10    | 14.56 | 19.98     | 8.67                    | 7.48                     | 1.08      | 0.49    | 27.62          | 15.14                  | 1.47            |
| 20    | 15.30 | 19.30     | 12.32                   | 12.64                    | 1.07      | 0.54    | 27.11          | 15.53                  | 1.05            |
| 30    | 15.43 | 19.18     | 13.44                   | 15.55                    | 1.07      | 0.55    | 26.33          | 15.97                  | 1.01            |
| 40    | 15.48 | 19.12     | 13.98                   | 17.39                    | 1.07      | 0.55    | 26.05          | 16.81                  | 0.96            |
| 50    | 15.50 | 19.10     | 14.41                   | 18.51                    | 1.07      | 0.56    | 25.30          | 17.17                  | 0.93            |
| 60    | 15.51 | 19.09     | 14.58                   | 19.17                    | 1.07      | 0.56    | 26.16          | 16.92                  | 0.93            |
| 70    | 15.50 | 19.07     | 14.56                   | 19.51                    | 1.07      | 0.56    | 27.25          | 16.80                  | 0.96            |
| 80    | 15.50 | 19.07     | 14.54                   | 19.69                    | 1.07      | 0.56    | 28.47          | 16.91                  | 0.91            |
| 90    | 15.50 | 19.06     | 14.59                   | 19.72                    | 1.07      | 0.56    | 28.68          | 17.04                  | 0.88            |
| 100   | 15.49 | 19.05     | 14.55                   | 19.72                    | 1.07      | 0.56    | 29.10          | 16.60                  | 0.90            |
| 150   | 15.45 | 19.06     | 14.37                   | 19.45                    | 1.07      | 0.57    | 33.23          | 16.83                  | 0.92            |
| 200   | 15.41 | 19.03     | 14.43                   | 18.94                    | 1.07      | 0.57    | 29.90          | 16.76                  | 0.89            |
| 250   | 15.37 | 19.03     | 14.67                   | 19.07                    | 1.07      | 0.58    | 33.19          | 17.08                  | 0.92            |
| 300   | 15.31 | 18.99     | 14.97                   | 18.81                    | 1.07      | 0.58    | 29.46          | 16.94                  | 0.95            |
| 350   | 15.24 | 19.00     | 15.11                   | 18.68                    | 1.07      | 0.59    | 37.21          | 16.86                  | 0.90            |
| 400   | 15.15 | 18.97     | 15.02                   | 18.17                    | 1.06      | 0.60    | 29.82          | 16.94                  | 0.92            |
| 450   | 15.05 | 18.96     | 14.78                   | 17.48                    | 1.06      | 0.61    | 28.68          | 17.23                  | 0.92            |
| 500   | 14.93 | 18.96     | 14.44                   | 16.87                    | 1.06      | 0.63    | 37.52          | 17.47                  | 0.90            |
| 550   | 14.80 | 18.98     | 14.02                   | 16.34                    | 1.06      | 0.64    | 34.05          | 17.08                  | 0.91            |
| 600   | 14.66 | 18.97     | 13.66                   | 15.79                    | 1.06      | 0.66    | 30.83          | 17.20                  | 0.98            |
| 650   | 14.52 | 18.98     | 13.22                   | 15.17                    | 1.05      | 0.68    | 32.36          | 17.33                  | 0.99            |
| 700   | 14.35 | 18.99     | 12.80                   | 14.61                    | 1.05      | 0.70    | 34.07          | 17.27                  | 1.00            |
| 750   | 14.20 | 18.99     | 12.41                   | 14.30                    | 1.05      | 0.71    | 32.92          | 17.69                  | 1.01            |
| 800   | 14.04 | 19.00     | 11.96                   | 13.94                    | 1.05      | 0.73    | 32.80          | 17.57                  | 1.03            |
| 850   | 13.87 | 19.00     | 11.52                   | 13.61                    | 1.05      | 0.75    | 30.55          | 17.38                  | 1.02            |
| 900   | 13.68 | 19.02     | 11.03                   | 13.31                    | 1.05      | 0.77    | 29.66          | 17.47                  | 1.05            |
| 950   | 13.49 | 19.04     | 10.53                   | 13.07                    | 1.05      | 0.79    | 28.91          | 18.01                  | 1.06            |
| 1000  | 13.28 | 19.09     | 10.08                   | 12.76                    | 1.05      | 0.82    | 27.71          | 18.23                  | 1.07            |
| 1100  | 12.73 | 19.32     | 9.09                    | 11.97                    | 1.06      | 0.88    | 26.35          | 18.03                  | 1.12            |
| 1200  | 12.39 | 19.30     | 8.11                    | 13.07                    | 1.06      | 0.94    | 26.34          | 18.16                  | 1.22            |
| 1300  | 12.02 | 19.32     | 7.60                    | 11.77                    | 1.06      | 0.96    | 26.30          | 18.28                  | 1.28            |
| 1400  | 11.56 | 19.44     | 6.96                    | 10.83                    | 1.06      | 0.98    | 25.24          | 18.17                  | 1.30            |
| 1500  | 11.09 | 19.58     | 6.39                    | 10.03                    | 1.06      | 1.01    | 23.94          | 19.29                  | 1.35            |
| 1600  | 10.61 | 19.73     | 5.88                    | 9.26                     | 1.06      | 1.02    | 23.24          | 19.22                  | 1.39            |
| 1700  | 10.12 | 19.92     | 5.43                    | 8.56                     | 1.07      | 1.03    | 22.40          | 18.99                  | 1.53            |
| 1800  | 9.63  | 20.08     | 5.02                    | 7.88                     | 1.07      | 1.03    | 22.19          | 18.56                  | 1.58            |
| 1900  | 9.14  | 20.28     | 4.63                    | 7.24                     | 1.08      | 1.02    | 21.23          | 18.18                  | 1.67            |
| 2000  | 8.66  | 20.49     | 4.28                    | 6.67                     | 1.09      | 1.01    | 20.61          | 18.08                  | 1.73            |

## 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 = 2.50V, Id = 5.74mA @ Temperature = -45°C

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 10    | 13.79 | 19.67     | 8.01                    | 7.01                     | 1.09      | 0.50    | 23.71          | 14.81                  | 1.56            |
| 20    | 14.57 | 18.95     | 10.95                   | 11.67                    | 1.08      | 0.56    | 23.95          | 15.28                  | 1.12            |
| 30    | 14.72 | 18.80     | 11.88                   | 13.99                    | 1.08      | 0.57    | 23.71          | 15.55                  | 1.05            |
| 40    | 14.77 | 18.74     | 12.28                   | 15.26                    | 1.08      | 0.57    | 23.13          | 16.38                  | 1.05            |
| 50    | 14.78 | 18.72     | 12.55                   | 15.93                    | 1.08      | 0.58    | 22.61          | 16.77                  | 1.00            |
| 60    | 14.80 | 18.71     | 12.65                   | 16.28                    | 1.08      | 0.58    | 23.20          | 16.53                  | 0.97            |
| 70    | 14.80 | 18.69     | 12.66                   | 16.42                    | 1.08      | 0.58    | 24.39          | 16.41                  | 1.01            |
| 80    | 14.79 | 18.69     | 12.66                   | 16.48                    | 1.08      | 0.58    | 25.34          | 16.50                  | 0.97            |
| 90    | 14.78 | 18.67     | 12.66                   | 16.45                    | 1.08      | 0.58    | 26.10          | 16.67                  | 0.93            |
| 100   | 14.77 | 18.67     | 12.63                   | 16.42                    | 1.08      | 0.58    | 28.01          | 16.22                  | 0.95            |
| 150   | 14.74 | 18.68     | 12.51                   | 16.20                    | 1.08      | 0.58    | 26.41          | 16.44                  | 0.96            |
| 200   | 14.70 | 18.64     | 12.57                   | 15.88                    | 1.07      | 0.58    | 27.56          | 16.40                  | 0.96            |
| 250   | 14.66 | 18.64     | 12.79                   | 16.05                    | 1.07      | 0.59    | 25.55          | 16.70                  | 0.98            |
| 300   | 14.61 | 18.59     | 13.06                   | 15.90                    | 1.07      | 0.60    | 26.06          | 16.56                  | 0.99            |
| 350   | 14.54 | 18.59     | 13.21                   | 15.91                    | 1.07      | 0.61    | 25.95          | 16.47                  | 0.96            |
| 400   | 14.45 | 18.56     | 13.21                   | 15.57                    | 1.07      | 0.62    | 25.77          | 16.57                  | 1.01            |
| 450   | 14.35 | 18.53     | 13.11                   | 15.08                    | 1.06      | 0.63    | 25.35          | 16.89                  | 1.00            |
| 500   | 14.23 | 18.53     | 12.89                   | 14.65                    | 1.06      | 0.64    | 25.95          | 17.11                  | 0.94            |
| 550   | 14.10 | 18.55     | 12.61                   | 14.27                    | 1.06      | 0.66    | 27.11          | 16.71                  | 0.98            |
| 600   | 13.96 | 18.54     | 12.36                   | 13.83                    | 1.05      | 0.67    | 26.78          | 16.83                  | 1.02            |
| 650   | 13.82 | 18.54     | 12.03                   | 13.34                    | 1.05      | 0.69    | 26.63          | 17.01                  | 1.07            |
| 700   | 13.64 | 18.55     | 11.70                   | 12.90                    | 1.05      | 0.71    | 26.36          | 16.96                  | 1.08            |
| 750   | 13.50 | 18.55     | 11.41                   | 12.64                    | 1.04      | 0.72    | 25.80          | 17.36                  | 1.10            |
| 800   | 13.33 | 18.55     | 11.04                   | 12.35                    | 1.04      | 0.74    | 25.52          | 17.24                  | 1.07            |
| 850   | 13.16 | 18.55     | 10.68                   | 12.07                    | 1.04      | 0.76    | 25.04          | 17.01                  | 1.09            |
| 900   | 12.97 | 18.57     | 10.27                   | 11.83                    | 1.04      | 0.78    | 24.84          | 17.11                  | 1.09            |
| 950   | 12.78 | 18.60     | 9.83                    | 11.63                    | 1.04      | 0.80    | 24.33          | 17.58                  | 1.11            |
| 1000  | 12.57 | 18.64     | 9.43                    | 11.39                    | 1.04      | 0.82    | 24.15          | 17.74                  | 1.12            |
| 1100  | 12.00 | 18.88     | 8.52                    | 10.77                    | 1.05      | 0.89    | 23.15          | 17.51                  | 1.19            |
| 1200  | 11.68 | 18.85     | 7.67                    | 11.72                    | 1.04      | 0.95    | 23.20          | 17.61                  | 1.28            |
| 1300  | 11.30 | 18.88     | 7.17                    | 10.62                    | 1.04      | 0.96    | 23.17          | 17.71                  | 1.33            |
| 1400  | 10.83 | 19.02     | 6.55                    | 9.85                     | 1.04      | 0.99    | 22.54          | 17.54                  | 1.37            |
| 1500  | 10.35 | 19.18     | 5.99                    | 9.18                     | 1.04      | 1.01    | 21.78          | 18.71                  | 1.45            |
| 1600  | 9.85  | 19.35     | 5.49                    | 8.54                     | 1.04      | 1.02    | 21.45          | 18.65                  | 1.47            |
| 1700  | 9.35  | 19.55     | 5.06                    | 7.94                     | 1.05      | 1.03    | 20.96          | 18.49                  | 1.59            |
| 1800  | 8.86  | 19.73     | 4.66                    | 7.35                     | 1.05      | 1.03    | 20.91          | 18.00                  | 1.69            |
| 1900  | 8.36  | 19.96     | 4.28                    | 6.79                     | 1.06      | 1.02    | 20.25          | 17.57                  | 1.78            |
| 2000  | 7.87  | 20.20     | 3.95                    | 6.29                     | 1.07      | 1.01    | 19.76          | 17.46                  | 1.84            |

## 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 = 2.90V, Id = 8.38mA @ Temperature = -45°C

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 10    | 15.24 | 20.27     | 9.39                    | 7.88                     | 1.07      | 0.47    | 33.18          | 15.40                  | 1.39            |
| 20    | 15.90 | 19.65     | 13.44                   | 13.40                    | 1.07      | 0.52    | 28.67          | 15.56                  | 1.02            |
| 30    | 16.02 | 19.53     | 15.03                   | 16.83                    | 1.07      | 0.53    | 27.46          | 16.19                  | 0.96            |
| 40    | 16.07 | 19.48     | 15.82                   | 19.32                    | 1.07      | 0.54    | 28.26          | 17.04                  | 0.93            |
| 50    | 16.08 | 19.47     | 16.29                   | 21.13                    | 1.07      | 0.54    | 27.81          | 17.36                  | 0.87            |
| 60    | 16.09 | 19.45     | 16.56                   | 22.41                    | 1.07      | 0.54    | 28.26          | 17.13                  | 0.85            |
| 70    | 16.09 | 19.44     | 16.64                   | 23.35                    | 1.07      | 0.54    | 26.84          | 17.02                  | 0.89            |
| 80    | 16.09 | 19.43     | 16.65                   | 23.95                    | 1.07      | 0.54    | 26.48          | 17.14                  | 0.81            |
| 90    | 16.08 | 19.42     | 16.66                   | 24.30                    | 1.07      | 0.54    | 25.95          | 17.24                  | 0.81            |
| 100   | 16.07 | 19.41     | 16.64                   | 24.46                    | 1.07      | 0.54    | 25.59          | 16.84                  | 0.84            |
| 150   | 16.04 | 19.43     | 16.42                   | 24.10                    | 1.07      | 0.55    | 26.57          | 17.08                  | 0.84            |
| 200   | 15.99 | 19.40     | 16.47                   | 23.14                    | 1.06      | 0.55    | 25.68          | 16.96                  | 0.81            |
| 250   | 15.95 | 19.40     | 16.74                   | 23.00                    | 1.06      | 0.56    | 27.37          | 17.31                  | 0.86            |
| 300   | 15.89 | 19.37     | 17.02                   | 22.35                    | 1.06      | 0.56    | 26.32          | 17.17                  | 0.86            |
| 350   | 15.81 | 19.38     | 17.03                   | 21.78                    | 1.06      | 0.58    | 27.51          | 17.10                  | 0.86            |
| 400   | 15.72 | 19.36     | 16.80                   | 20.95                    | 1.06      | 0.59    | 27.05          | 17.19                  | 0.87            |
| 450   | 15.62 | 19.34     | 16.40                   | 19.98                    | 1.06      | 0.60    | 26.49          | 17.41                  | 0.88            |
| 500   | 15.50 | 19.35     | 15.86                   | 19.15                    | 1.06      | 0.61    | 27.41          | 17.68                  | 0.84            |
| 550   | 15.37 | 19.36     | 15.29                   | 18.44                    | 1.06      | 0.63    | 26.85          | 17.29                  | 0.90            |
| 600   | 15.24 | 19.36     | 14.81                   | 17.77                    | 1.06      | 0.65    | 26.32          | 17.42                  | 0.91            |
| 650   | 15.09 | 19.36     | 14.25                   | 17.02                    | 1.06      | 0.67    | 26.66          | 17.49                  | 0.92            |
| 700   | 14.93 | 19.38     | 13.73                   | 16.35                    | 1.06      | 0.69    | 27.04          | 17.45                  | 0.95            |
| 750   | 14.78 | 19.38     | 13.25                   | 15.98                    | 1.06      | 0.70    | 27.76          | 17.88                  | 0.94            |
| 800   | 14.62 | 19.38     | 12.74                   | 15.56                    | 1.06      | 0.72    | 28.20          | 17.77                  | 0.97            |
| 850   | 14.45 | 19.38     | 12.21                   | 15.18                    | 1.06      | 0.74    | 28.98          | 17.66                  | 0.97            |
| 900   | 14.26 | 19.40     | 11.67                   | 14.84                    | 1.06      | 0.76    | 28.89          | 17.75                  | 1.00            |
| 950   | 14.07 | 19.42     | 11.11                   | 14.54                    | 1.06      | 0.79    | 30.33          | 18.33                  | 0.98            |
| 1000  | 13.87 | 19.46     | 10.63                   | 14.18                    | 1.06      | 0.81    | 27.59          | 18.61                  | 1.01            |
| 1100  | 13.32 | 19.68     | 9.60                    | 13.17                    | 1.07      | 0.87    | 35.42          | 18.44                  | 1.08            |
| 1200  | 12.97 | 19.66     | 8.50                    | 14.45                    | 1.08      | 0.93    | 32.88          | 18.60                  | 1.12            |
| 1300  | 12.62 | 19.66     | 7.99                    | 12.93                    | 1.07      | 0.95    | 32.52          | 18.75                  | 1.20            |
| 1400  | 12.17 | 19.76     | 7.35                    | 11.82                    | 1.07      | 0.98    | 30.42          | 18.67                  | 1.23            |
| 1500  | 11.71 | 19.87     | 6.76                    | 10.87                    | 1.07      | 1.00    | 27.05          | 19.72                  | 1.28            |
| 1600  | 11.23 | 20.00     | 6.25                    | 9.97                     | 1.08      | 1.01    | 25.26          | 19.67                  | 1.33            |
| 1700  | 10.75 | 20.16     | 5.79                    | 9.16                     | 1.08      | 1.02    | 24.00          | 19.37                  | 1.44            |
| 1800  | 10.27 | 20.29     | 5.37                    | 8.38                     | 1.09      | 1.02    | 23.56          | 19.03                  | 1.52            |
| 1900  | 9.78  | 20.47     | 4.95                    | 7.66                     | 1.09      | 1.02    | 22.20          | 18.68                  | 1.58            |
| 2000  | 9.29  | 20.65     | 4.60                    | 7.00                     | 1.10      | 1.00    | 21.51          | 18.58                  | 1.61            |

## 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 = 8.93mA @ Temperature = +85°C

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 10    | 14.43 | 19.96     | 8.66                    | 7.65                     | 1.08      | 0.51    | 33.40          | 14.38                  | 2.03            |
| 20    | 15.17 | 19.28     | 12.24                   | 12.80                    | 1.08      | 0.55    | 28.97          | 15.03                  | 1.55            |
| 30    | 15.31 | 19.14     | 13.42                   | 15.80                    | 1.08      | 0.56    | 27.51          | 15.46                  | 1.53            |
| 40    | 15.36 | 19.08     | 13.99                   | 17.76                    | 1.07      | 0.57    | 27.46          | 16.06                  | 1.48            |
| 50    | 15.37 | 19.06     | 14.49                   | 19.09                    | 1.08      | 0.57    | 26.66          | 16.27                  | 1.44            |
| 60    | 15.39 | 19.05     | 14.75                   | 20.00                    | 1.07      | 0.57    | 27.60          | 16.12                  | 1.41            |
| 70    | 15.39 | 19.03     | 14.84                   | 20.68                    | 1.07      | 0.57    | 27.57          | 16.08                  | 1.44            |
| 80    | 15.39 | 19.02     | 14.95                   | 21.19                    | 1.07      | 0.57    | 27.89          | 16.10                  | 1.41            |
| 90    | 15.39 | 19.01     | 15.12                   | 21.58                    | 1.07      | 0.57    | 27.35          | 16.26                  | 1.37            |
| 100   | 15.38 | 19.00     | 15.20                   | 21.90                    | 1.07      | 0.57    | 27.18          | 15.95                  | 1.40            |
| 150   | 15.35 | 19.00     | 15.44                   | 22.59                    | 1.07      | 0.58    | 29.18          | 16.09                  | 1.40            |
| 200   | 15.30 | 18.98     | 15.51                   | 21.87                    | 1.07      | 0.58    | 27.44          | 16.08                  | 1.40            |
| 250   | 15.23 | 19.00     | 15.37                   | 20.88                    | 1.07      | 0.59    | 31.32          | 16.27                  | 1.42            |
| 300   | 15.14 | 18.98     | 15.17                   | 19.55                    | 1.07      | 0.60    | 27.65          | 16.26                  | 1.45            |
| 350   | 15.05 | 18.99     | 14.88                   | 18.57                    | 1.07      | 0.61    | 31.02          | 16.20                  | 1.45            |
| 400   | 14.94 | 18.97     | 14.62                   | 17.67                    | 1.07      | 0.62    | 28.18          | 16.32                  | 1.46            |
| 450   | 14.83 | 18.95     | 14.39                   | 16.84                    | 1.07      | 0.63    | 27.25          | 16.44                  | 1.48            |
| 500   | 14.71 | 18.94     | 14.15                   | 16.25                    | 1.06      | 0.65    | 30.60          | 16.59                  | 1.43            |
| 550   | 14.57 | 18.95     | 13.84                   | 15.74                    | 1.06      | 0.66    | 28.77          | 16.43                  | 1.49            |
| 600   | 14.43 | 18.93     | 13.54                   | 15.28                    | 1.06      | 0.68    | 27.70          | 16.44                  | 1.55            |
| 650   | 14.27 | 18.93     | 13.13                   | 14.80                    | 1.06      | 0.69    | 27.96          | 16.53                  | 1.55            |
| 700   | 14.09 | 18.94     | 12.69                   | 14.37                    | 1.06      | 0.72    | 28.40          | 16.42                  | 1.61            |
| 750   | 13.95 | 18.92     | 12.34                   | 14.11                    | 1.06      | 0.73    | 28.73          | 16.75                  | 1.62            |
| 800   | 13.77 | 18.92     | 11.90                   | 13.77                    | 1.06      | 0.75    | 29.43          | 16.69                  | 1.65            |
| 850   | 13.59 | 18.93     | 11.48                   | 13.41                    | 1.06      | 0.77    | 29.50          | 16.56                  | 1.64            |
| 900   | 13.38 | 18.94     | 11.06                   | 13.05                    | 1.06      | 0.79    | 28.39          | 16.61                  | 1.67            |
| 950   | 13.18 | 18.97     | 10.61                   | 12.73                    | 1.06      | 0.81    | 28.69          | 16.87                  | 1.71            |
| 1000  | 12.96 | 19.01     | 10.19                   | 12.38                    | 1.06      | 0.83    | 33.23          | 16.88                  | 1.69            |
| 1100  | 12.32 | 19.30     | 9.05                    | 11.99                    | 1.08      | 0.91    | 28.76          | 16.63                  | 1.78            |
| 1200  | 12.11 | 19.12     | 8.43                    | 12.29                    | 1.07      | 0.93    | 27.71          | 16.80                  | 1.86            |
| 1300  | 11.71 | 19.16     | 7.85                    | 11.49                    | 1.07      | 0.95    | 27.62          | 16.82                  | 1.95            |
| 1400  | 11.25 | 19.25     | 7.22                    | 10.82                    | 1.07      | 0.98    | 27.58          | 16.74                  | 2.01            |
| 1500  | 10.78 | 19.37     | 6.63                    | 10.17                    | 1.08      | 1.01    | 25.11          | 16.80                  | 2.07            |
| 1600  | 10.30 | 19.51     | 6.10                    | 9.50                     | 1.09      | 1.02    | 23.94          | 16.74                  | 2.19            |
| 1700  | 9.81  | 19.68     | 5.63                    | 8.87                     | 1.10      | 1.04    | 22.96          | 16.24                  | 2.25            |
| 1800  | 9.32  | 19.83     | 5.20                    | 8.25                     | 1.11      | 1.04    | 22.45          | 16.21                  | 2.44            |
| 1900  | 8.82  | 20.02     | 4.80                    | 7.63                     | 1.12      | 1.04    | 21.31          | 15.99                  | 2.51            |
| 2000  | 8.30  | 20.25     | 4.45                    | 7.06                     | 1.13      | 1.03    | 20.81          | 15.71                  | 2.64            |

## 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 = 2.50V, Id = 7.61mA @ Temperature = +85°C

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 10    | 13.79 | 19.67     | 8.09                    | 7.22                     | 1.09      | 0.51    | 26.14          | 13.92                  | 2.11            |
| 20    | 14.57 | 18.95     | 11.12                   | 11.92                    | 1.08      | 0.56    | 25.83          | 14.51                  | 1.64            |
| 30    | 14.71 | 18.80     | 12.09                   | 14.36                    | 1.08      | 0.58    | 25.33          | 14.88                  | 1.58            |
| 40    | 14.77 | 18.74     | 12.57                   | 15.77                    | 1.08      | 0.58    | 24.78          | 15.54                  | 1.54            |
| 50    | 14.79 | 18.71     | 12.91                   | 16.63                    | 1.08      | 0.58    | 24.18          | 15.79                  | 1.50            |
| 60    | 14.80 | 18.70     | 13.09                   | 17.16                    | 1.08      | 0.58    | 24.95          | 15.63                  | 1.48            |
| 70    | 14.81 | 18.68     | 13.20                   | 17.52                    | 1.08      | 0.58    | 26.18          | 15.58                  | 1.49            |
| 80    | 14.81 | 18.67     | 13.29                   | 17.77                    | 1.08      | 0.58    | 27.45          | 15.59                  | 1.48            |
| 90    | 14.81 | 18.65     | 13.40                   | 17.96                    | 1.08      | 0.58    | 28.20          | 15.79                  | 1.47            |
| 100   | 14.80 | 18.64     | 13.46                   | 18.11                    | 1.08      | 0.58    | 30.51          | 15.45                  | 1.47            |
| 150   | 14.78 | 18.64     | 13.69                   | 18.56                    | 1.08      | 0.59    | 32.42          | 15.60                  | 1.49            |
| 200   | 14.72 | 18.61     | 13.78                   | 18.20                    | 1.08      | 0.59    | 31.11          | 15.60                  | 1.48            |
| 250   | 14.66 | 18.63     | 13.71                   | 17.74                    | 1.08      | 0.61    | 29.70          | 15.81                  | 1.47            |
| 300   | 14.57 | 18.61     | 13.58                   | 16.88                    | 1.07      | 0.61    | 28.02          | 15.79                  | 1.50            |
| 350   | 14.47 | 18.63     | 13.38                   | 16.24                    | 1.07      | 0.62    | 30.06          | 15.71                  | 1.51            |
| 400   | 14.37 | 18.61     | 13.21                   | 15.59                    | 1.07      | 0.63    | 27.64          | 15.85                  | 1.53            |
| 450   | 14.26 | 18.59     | 13.07                   | 14.96                    | 1.07      | 0.64    | 26.94          | 16.02                  | 1.56            |
| 500   | 14.14 | 18.58     | 12.90                   | 14.50                    | 1.06      | 0.65    | 29.93          | 16.17                  | 1.53            |
| 550   | 14.00 | 18.58     | 12.71                   | 14.12                    | 1.06      | 0.67    | 30.76          | 15.99                  | 1.58            |
| 600   | 13.86 | 18.57     | 12.50                   | 13.76                    | 1.06      | 0.68    | 28.93          | 15.99                  | 1.59            |
| 650   | 13.71 | 18.56     | 12.19                   | 13.35                    | 1.06      | 0.70    | 29.14          | 16.12                  | 1.63            |
| 700   | 13.52 | 18.58     | 11.85                   | 13.00                    | 1.06      | 0.72    | 29.20          | 15.98                  | 1.67            |
| 750   | 13.38 | 18.56     | 11.56                   | 12.77                    | 1.05      | 0.73    | 28.37          | 16.34                  | 1.68            |
| 800   | 13.20 | 18.56     | 11.20                   | 12.47                    | 1.05      | 0.75    | 28.32          | 16.26                  | 1.69            |
| 850   | 13.02 | 18.57     | 10.85                   | 12.16                    | 1.05      | 0.77    | 27.64          | 16.10                  | 1.73            |
| 900   | 12.82 | 18.59     | 10.46                   | 11.85                    | 1.05      | 0.79    | 26.93          | 16.17                  | 1.74            |
| 950   | 12.62 | 18.62     | 10.06                   | 11.56                    | 1.05      | 0.81    | 26.43          | 16.48                  | 1.74            |
| 1000  | 12.39 | 18.67     | 9.67                    | 11.25                    | 1.05      | 0.83    | 27.95          | 16.52                  | 1.74            |
| 1100  | 11.75 | 18.96     | 8.62                    | 10.98                    | 1.07      | 0.91    | 25.28          | 16.22                  | 1.85            |
| 1200  | 11.55 | 18.79     | 8.07                    | 11.18                    | 1.06      | 0.93    | 24.99          | 16.40                  | 1.95            |
| 1300  | 11.14 | 18.85     | 7.50                    | 10.47                    | 1.06      | 0.95    | 25.18          | 16.43                  | 2.00            |
| 1400  | 10.68 | 18.97     | 6.88                    | 9.88                     | 1.06      | 0.98    | 24.83          | 16.30                  | 2.11            |
| 1500  | 10.20 | 19.10     | 6.30                    | 9.32                     | 1.06      | 1.00    | 23.38          | 16.55                  | 2.16            |
| 1600  | 9.71  | 19.27     | 5.79                    | 8.74                     | 1.07      | 1.02    | 22.66          | 16.55                  | 2.27            |
| 1700  | 9.21  | 19.46     | 5.33                    | 8.19                     | 1.08      | 1.03    | 21.87          | 16.07                  | 2.39            |
| 1800  | 8.71  | 19.63     | 4.91                    | 7.65                     | 1.09      | 1.03    | 21.52          | 15.93                  | 2.53            |
| 1900  | 8.20  | 19.86     | 4.52                    | 7.11                     | 1.11      | 1.03    | 20.56          | 15.67                  | 2.65            |
| 2000  | 7.69  | 20.11     | 4.18                    | 6.61                     | 1.12      | 1.03    | 20.09          | 15.45                  | 2.74            |

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

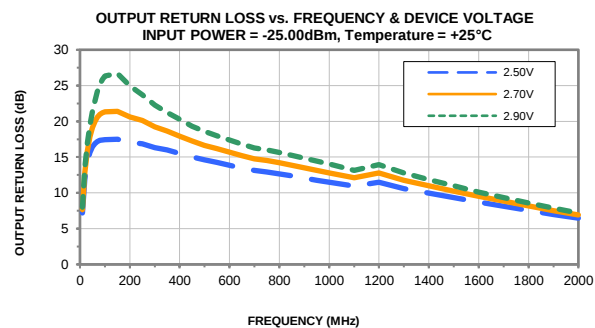
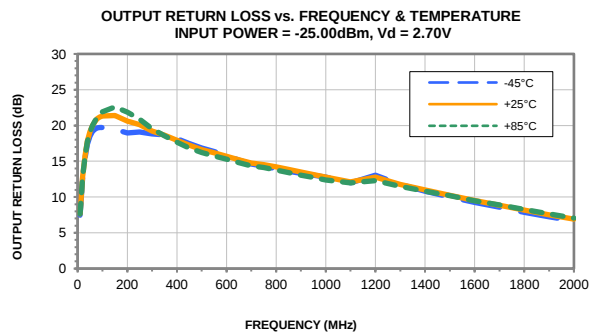
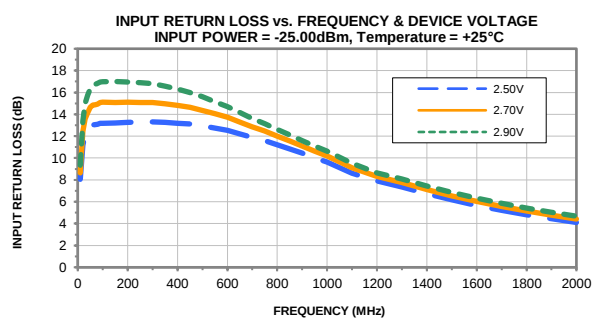
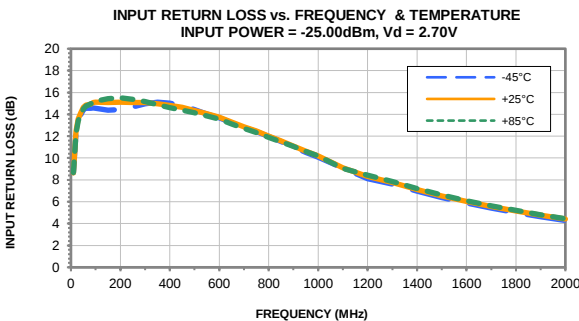
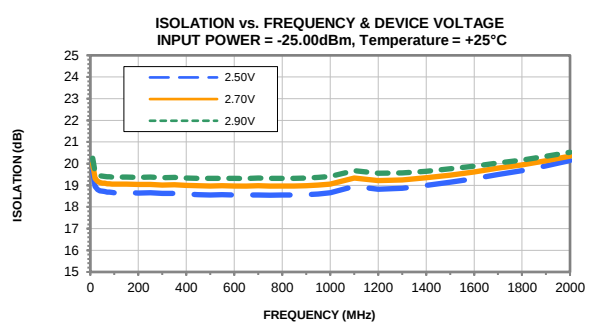
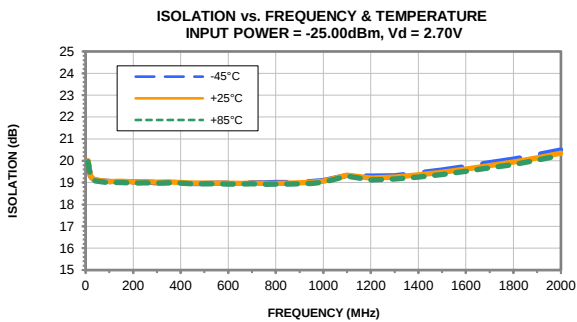
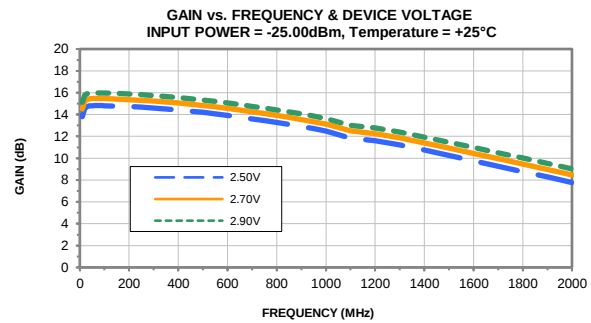
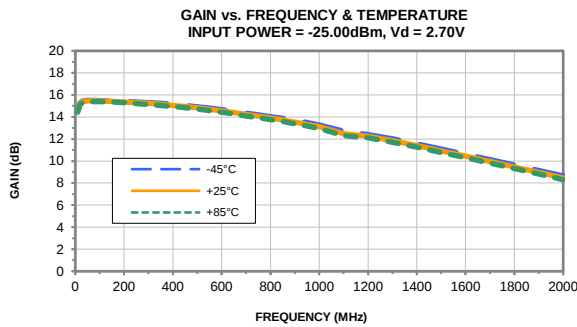
Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

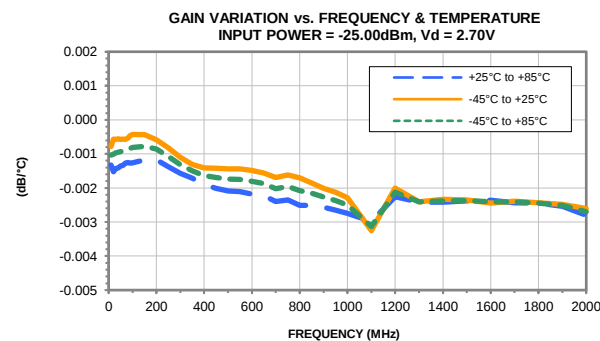
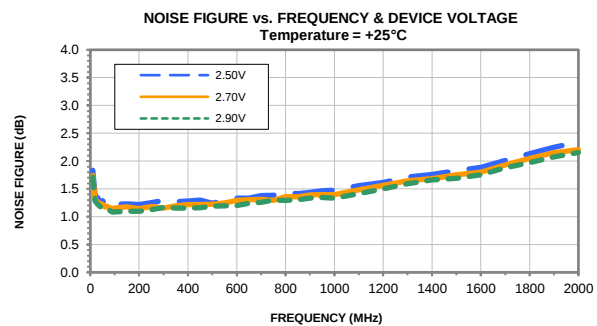
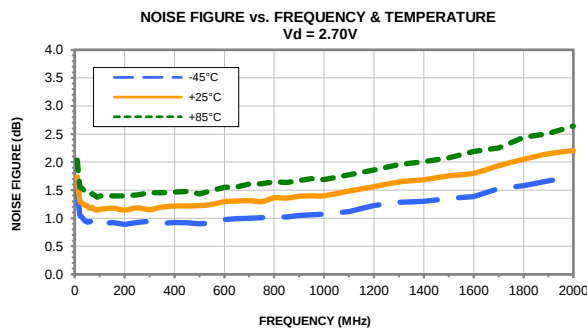
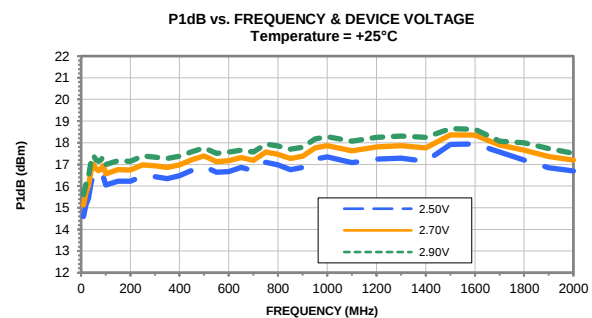
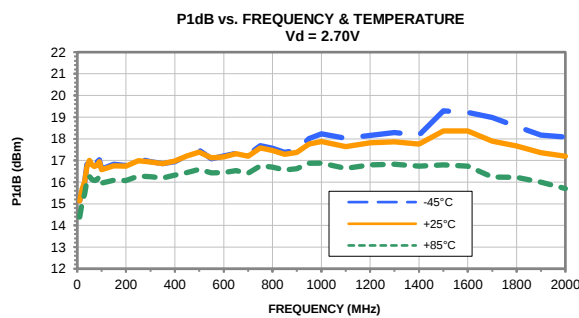
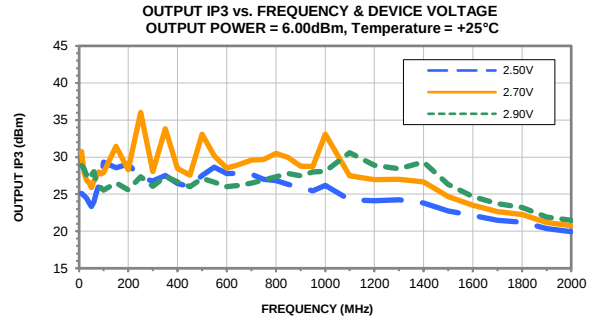
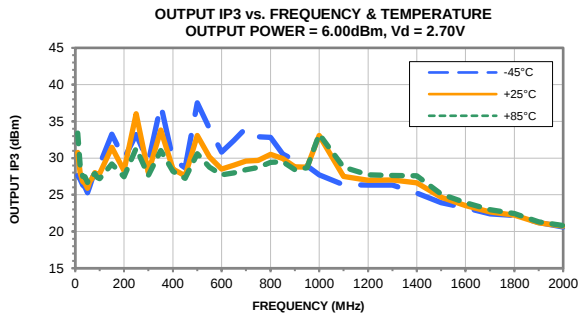
TEST CONDITIONS: Vd = 2.90V, Id = 10.24mA @ Temperature = +85°C

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 10    | 14.95 | 20.17     | 9.28                    | 7.95                     | 1.08      | 0.50    | 28.32          | 14.71                  | 1.98            |
| 20    | 15.63 | 19.54     | 13.11                   | 13.36                    | 1.07      | 0.54    | 28.62          | 15.43                  | 1.51            |
| 30    | 15.76 | 19.41     | 14.62                   | 16.74                    | 1.07      | 0.55    | 27.90          | 15.92                  | 1.45            |
| 40    | 15.82 | 19.35     | 15.38                   | 19.18                    | 1.07      | 0.55    | 28.49          | 16.48                  | 1.44            |
| 50    | 15.82 | 19.34     | 15.94                   | 21.02                    | 1.07      | 0.56    | 27.85          | 16.63                  | 1.39            |
| 60    | 15.84 | 19.32     | 16.27                   | 22.45                    | 1.07      | 0.56    | 28.04          | 16.51                  | 1.38            |
| 70    | 15.84 | 19.30     | 16.46                   | 23.68                    | 1.07      | 0.56    | 26.58          | 16.48                  | 1.37            |
| 80    | 15.84 | 19.30     | 16.62                   | 24.69                    | 1.07      | 0.56    | 26.15          | 16.51                  | 1.34            |
| 90    | 15.83 | 19.29     | 16.77                   | 25.57                    | 1.07      | 0.56    | 25.58          | 16.62                  | 1.32            |
| 100   | 15.83 | 19.28     | 16.86                   | 26.26                    | 1.07      | 0.56    | 25.33          | 16.36                  | 1.34            |
| 150   | 15.80 | 19.28     | 17.18                   | 27.81                    | 1.07      | 0.56    | 26.14          | 16.49                  | 1.34            |
| 200   | 15.74 | 19.27     | 17.22                   | 26.03                    | 1.07      | 0.57    | 25.38          | 16.46                  | 1.34            |
| 250   | 15.67 | 19.28     | 16.97                   | 24.02                    | 1.07      | 0.58    | 26.87          | 16.64                  | 1.35            |
| 300   | 15.59 | 19.27     | 16.63                   | 22.16                    | 1.07      | 0.59    | 25.87          | 16.63                  | 1.41            |
| 350   | 15.49 | 19.28     | 16.25                   | 20.74                    | 1.07      | 0.60    | 26.96          | 16.58                  | 1.40            |
| 400   | 15.39 | 19.27     | 15.89                   | 19.64                    | 1.07      | 0.61    | 26.44          | 16.68                  | 1.42            |
| 450   | 15.27 | 19.25     | 15.57                   | 18.64                    | 1.07      | 0.62    | 25.75          | 16.74                  | 1.40            |
| 500   | 15.16 | 19.25     | 15.21                   | 17.91                    | 1.07      | 0.64    | 26.68          | 16.88                  | 1.44            |
| 550   | 15.02 | 19.25     | 14.82                   | 17.30                    | 1.07      | 0.65    | 26.23          | 16.77                  | 1.41            |
| 600   | 14.88 | 19.25     | 14.41                   | 16.77                    | 1.07      | 0.67    | 25.71          | 16.80                  | 1.52            |
| 650   | 14.72 | 19.24     | 13.91                   | 16.21                    | 1.07      | 0.69    | 25.80          | 16.81                  | 1.50            |
| 700   | 14.54 | 19.26     | 13.39                   | 15.70                    | 1.07      | 0.71    | 26.02          | 16.76                  | 1.54            |
| 750   | 14.40 | 19.25     | 12.94                   | 15.41                    | 1.06      | 0.72    | 26.38          | 17.02                  | 1.56            |
| 800   | 14.22 | 19.25     | 12.47                   | 15.02                    | 1.07      | 0.74    | 26.74          | 17.01                  | 1.59            |
| 850   | 14.04 | 19.25     | 11.99                   | 14.61                    | 1.07      | 0.76    | 27.18          | 16.93                  | 1.58            |
| 900   | 13.84 | 19.27     | 11.53                   | 14.20                    | 1.07      | 0.78    | 26.84          | 16.94                  | 1.61            |
| 950   | 13.64 | 19.29     | 11.04                   | 13.81                    | 1.07      | 0.80    | 27.26          | 17.11                  | 1.62            |
| 1000  | 13.42 | 19.34     | 10.59                   | 13.40                    | 1.07      | 0.83    | 27.35          | 17.07                  | 1.64            |
| 1100  | 12.78 | 19.63     | 9.40                    | 12.87                    | 1.09      | 0.90    | 29.90          | 16.89                  | 1.71            |
| 1200  | 12.57 | 19.45     | 8.72                    | 13.23                    | 1.08      | 0.92    | 28.33          | 17.02                  | 1.80            |
| 1300  | 12.17 | 19.48     | 8.13                    | 12.30                    | 1.08      | 0.95    | 27.76          | 17.05                  | 1.86            |
| 1400  | 11.72 | 19.57     | 7.49                    | 11.50                    | 1.09      | 0.98    | 28.75          | 17.01                  | 1.92            |
| 1500  | 11.25 | 19.68     | 6.88                    | 10.74                    | 1.09      | 1.00    | 26.25          | 16.91                  | 2.00            |
| 1600  | 10.77 | 19.81     | 6.35                    | 9.96                     | 1.10      | 1.02    | 24.91          | 16.82                  | 2.06            |
| 1700  | 10.28 | 19.96     | 5.87                    | 9.25                     | 1.11      | 1.03    | 23.88          | 16.31                  | 2.22            |
| 1800  | 9.79  | 20.09     | 5.43                    | 8.55                     | 1.12      | 1.03    | 23.27          | 16.36                  | 2.34            |
| 1900  | 9.29  | 20.28     | 5.03                    | 7.87                     | 1.14      | 1.03    | 21.96          | 16.15                  | 2.43            |
| 2000  | 8.79  | 20.48     | 4.67                    | 7.24                     | 1.15      | 1.02    | 21.44          | 15.74                  | 2.55            |

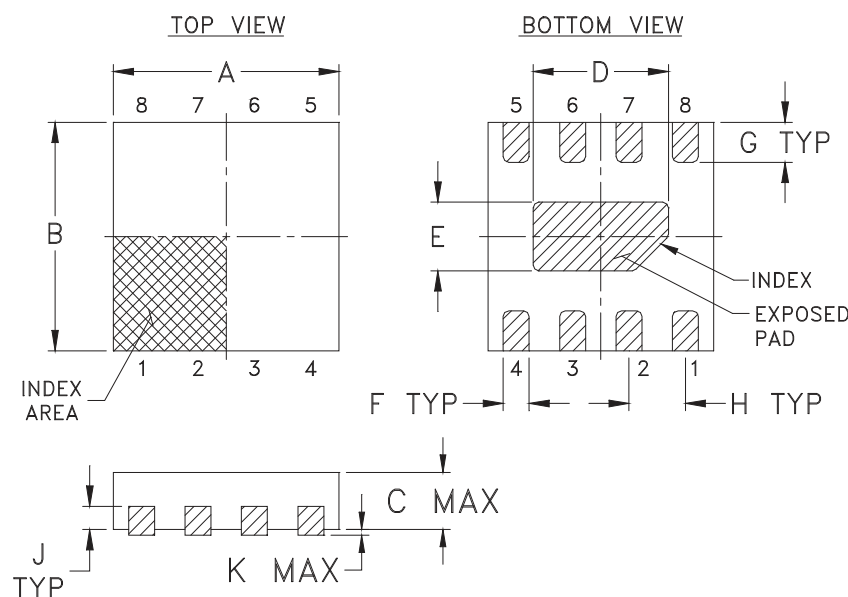
## Typical Performance Curves



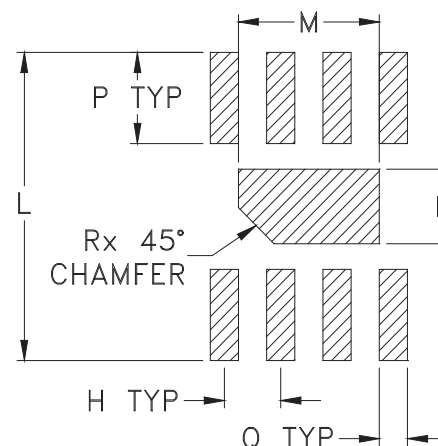
## Typical Performance Curves



### Outline Dimensions



### PCB Land Pattern



Suggested Layout,  
Tolerance to be within  $\pm 0.002$

| 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) |

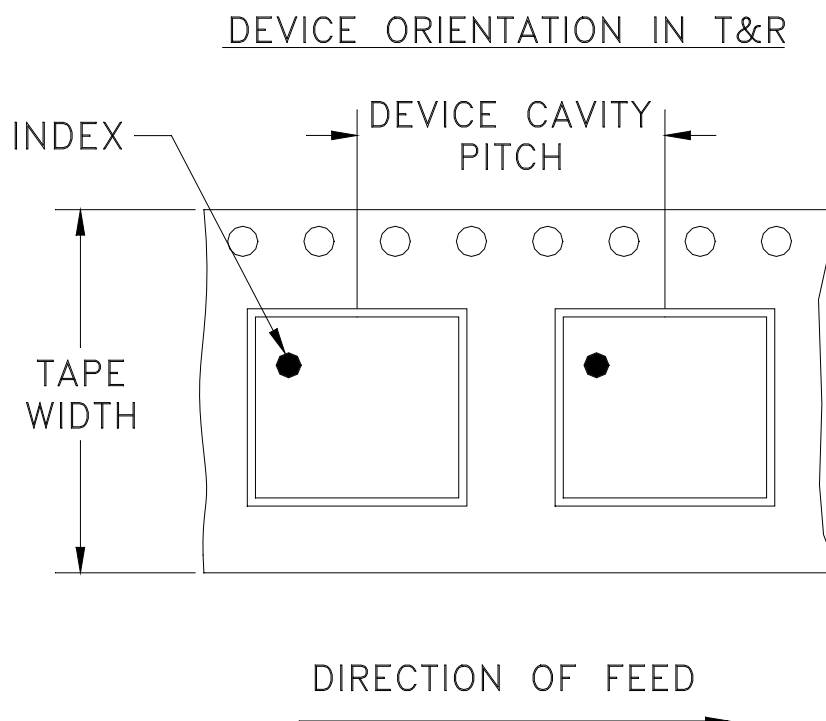
| CASE #.  | Q             | R             | WT, GRAM |
|----------|---------------|---------------|----------|
| MC1631-1 | .010<br>(.25) | .012<br>(.30) | .006     |

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

#### Notes:

- Case material: Plastic.
- Termination finish:  
For RoHS Case Styles: Tin-Silver over Nickel plated or Matte-Tin Plated (See Data sheet).  
All models, (+) suffix.
- Lead #1 identifier shall be located in the cross-hatched area shown.  
Identifier may be either a molded or marked feature.

# Tape & Reel Packaging TR-F66



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel<br>see note  |                  |
|-------------------|----------------------------|----------------------|-------------------------------|------------------|
| 8                 | 4                          | 7                    | Small<br>quantity<br>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)



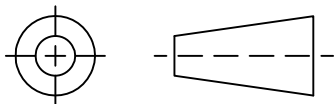
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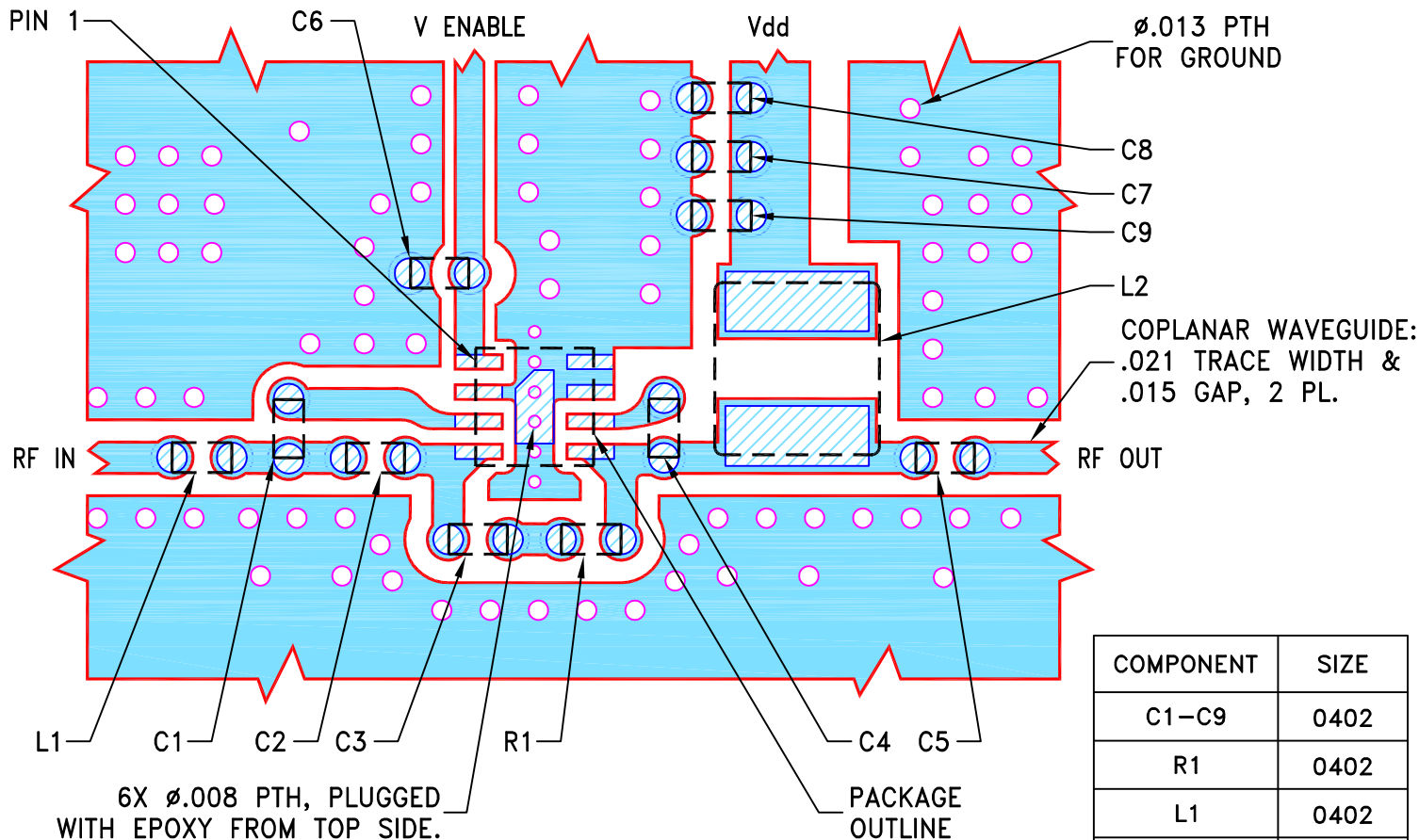
## THIRD ANGLE PROJECTION



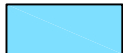
## REVISIONS

| REV OR | ECN No. | DESCRIPTION | DATE     | DR  | AUTH |
|--------|---------|-------------|----------|-----|------|
|        | M165468 | NEW RELEASE | 01/05/18 | ITG | GH   |
|        |         |             |          |     |      |
|        |         |             |          |     |      |

**SUGGESTED MOUNTING CONFIGURATION  
FOR MC1631-1 CASE STYLE, "08AM17" PIN CODE**

**NOTES:**

1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS  $.010" \pm .001"$ . COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. CHIP COMPONENT FOOT PRINTS SHOWN FOR REFERENCE. FOR COMPONENT VALUES REFER TO TB-943+ & TB-943-13LNB+.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



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



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

| UNLESS OTHERWISE SPECIFIED | INITIALS | DATE     |
|----------------------------|----------|----------|
| DRAWN                      | ITG      | 01/03/17 |
| CHECKED                    | IL       | 01/05/18 |
| APPROVED                   | GH       | 01/05/18 |

DIMENSIONS ARE IN INCHES  
TOLERANCES ON:  
2 PL DECIMALS  $\pm$   
3 PL DECIMALS  $\pm$  .005  
ANGLES  $\pm$   
FRACTIONS  $\pm$

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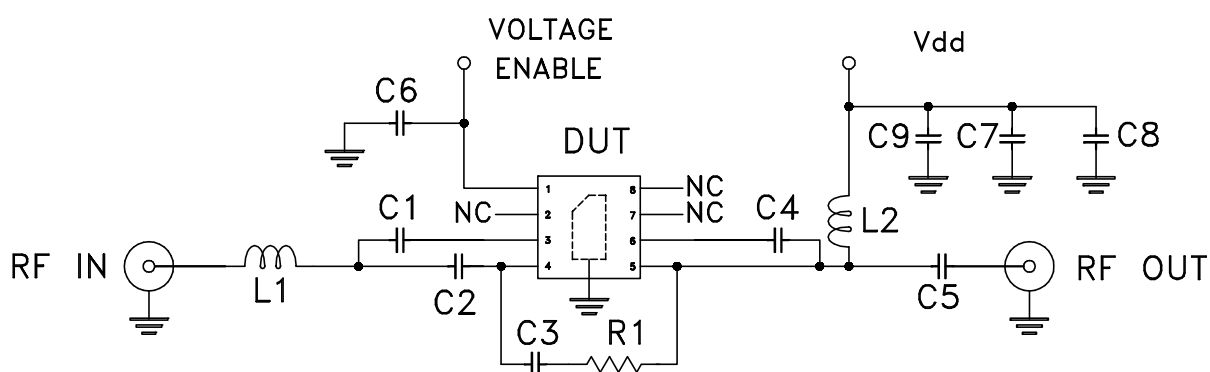
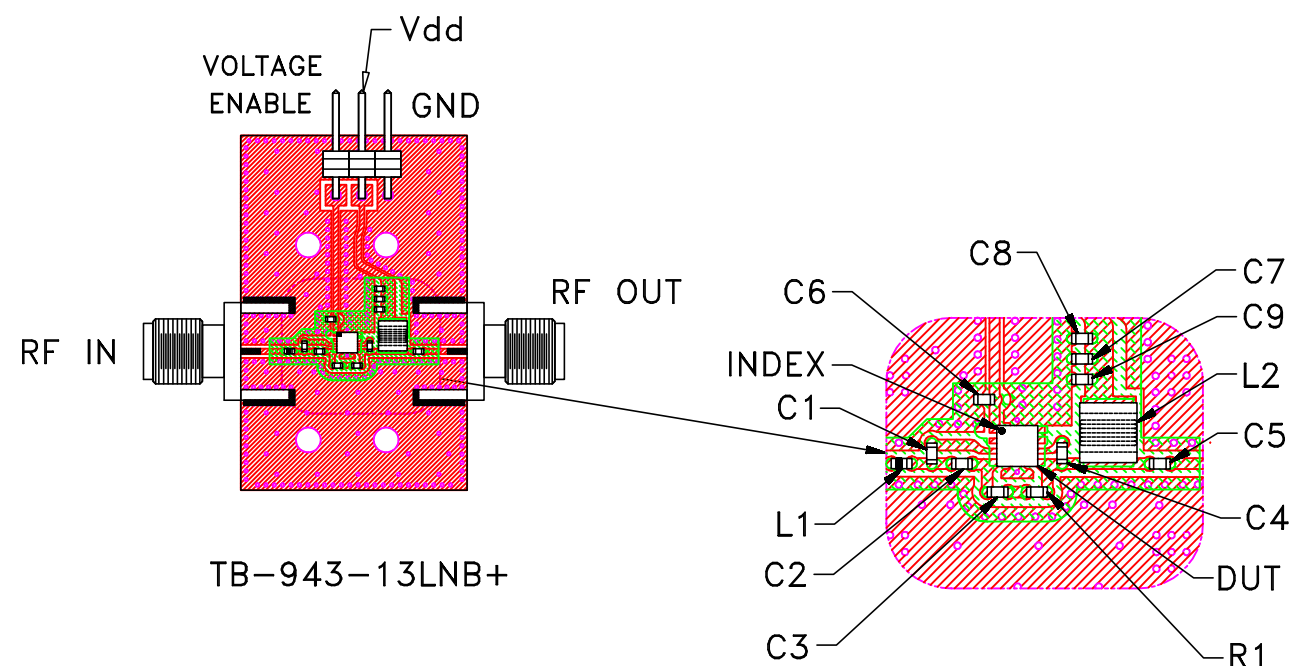


**Mini-Circuits®** 13 Neptune Avenue  
Brooklyn NY 11235

**PL, 08AM17, MC1631-1, TB-943+**

| SIZE  | CODE IDENT | DRAWING NO: | REV:          |
|-------|------------|-------------|---------------|
| A     | 15542      | 98-PL-536   | OR            |
| FILE: | 98PL536    | SCALE: 8:1  | SHEET: 1 OF 1 |

# Evaluation Board and Circuit



| ITEM  | DESCRIPTION  | SIZE        |
|-------|--------------|-------------|
| C1-C8 | CAP, 0,1 uF  | .04"x02"    |
| C9    | CAP, 1000 pF |             |
| R1    | RES, 432 Ohm |             |
| L1    | IND, 3 nH    |             |
| L2    | IND, 1000 nH | .115"x.110" |
| DUT   | TSY-13LNB+   |             |

Schematic Diagram

## NOTES:

1. SMA Female connectors.
2. PCB material: Rogers R04350 or equivalent,  
dielectric constant=3.5,  
dielectric thickness=.010 inch.

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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 + proylene glycol monomethyl ether + | MIL-STD-202, Method 215                                         |



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| Specification | Test/Inspection Condition        | Reference/Spec |
|---------------|----------------------------------|----------------|
|               | monoethanolamine at 63°C to 70°C |                |