

Flat Gain, High IP3

# Monolithic Amplifier

CMA-63+

50Ω 0.01 to 6 GHz

## The Big Deal

- Ceramic, Hermetically Sealed, Nitrogen filled
- Low profile case, .045" high
- High Gain
- Broadband High Dynamic Range without external Matching Components



CASE STYLE: DL1721

MIL Screening Available  
Please consult Applications Dept.

## Product Overview

CMA-63+ (RoHS compliant) is a wideband amplifier fabricated using HBT technology and offers high gain over a broad frequency range and with high IP3. In addition, the CMA-63+, has good input and output return loss over a broad frequency range without the need for external matching components and has demonstrated excellent reliability. The MMIC amplifier is bonded to a multilayer integrated LTCC substrate, and then hermetically sealed under a controlled nitrogen atmosphere with gold-plated covers and eutectic AuSn solder. These amplifiers are capable of meeting MIL requirements for gross leak, fine leak, thermal shock, vibration, acceleration, mechanical shock, and HTOL. The testing can be done if requested.

## Key Features

| Feature                                                                                      | Advantages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Broad Band: 0.01 to 6.0 GHz                                                                  | Broadband covering primary wireless communications bands:<br>Cellular, PCS, LTE, WiMAX, SATELLITE IF                                                                                                                                                                                                                                                                                                                                                                                                         |
| Flat Gain                                                                                    | ±1.5 dB over 50 to 3000 MHz; eliminates need for gain flattening for most applications                                                                                                                                                                                                                                                                                                                                                                                                                       |
| High IP3 vs. DC power Consumption<br>35 dBm typical at 0.05 GHz<br>35 dBm typical at 0.8 GHz | The CMA-63+ matches industry leading IP3 performance relative to device size and power consumption. The combination of the design and HBT Structure provides enhanced linearity over a broad frequency range as evidence in the IP3 being typically 16 dB above the P 1dB point to 0.8 GHz. This feature makes this amplifier ideal for use in: <ul style="list-style-type: none"><li>• Driver amplifiers for complex waveform up converter paths</li><li>• Drivers in linearized transmit systems</li></ul> |
| No External Matching Components Required                                                     | CMA-63+ provides Input and Output Return Loss of 15 dB up to 3 GHz without the need for any external matching components                                                                                                                                                                                                                                                                                                                                                                                     |
| Ceramic Hermetic Package                                                                     | Low Inductance, repeatable performance, excellent reliability.                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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Flat Gain, High IP3

# Monolithic Amplifier

0.01-6 GHz

## Product Features

- Flat Gain,  $\pm 1.0$  dB over 50-3000 MHz
- Gain, 20 dB typ. at 2 GHz
- High Pout, P1dB 18.4 dBm typ. at 2 GHz
- High IP3, 34.6 dBm typ. at 50 MHz; 32.0 dBm at 2GHz
- Excellent ESD protection, Class 1C for HBM
- Small size - 3mm x 3mm x 1.14mm
- Ceramic, hermetic, Nitrogen filled
- No external matching components required
- May be used as a replacement for SPF5043Z <sup>a,b</sup>

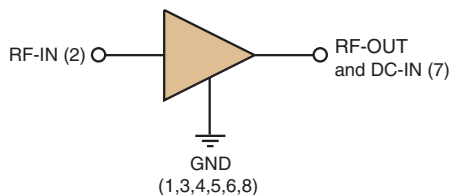
## Typical Applications

- Base station infrastructure
- Portable Wireless
- CATV & DBS
- MMDS & Wireless LAN
- LTE

## General Description

CMA-63+ (RoHS compliant) is an advanced wideband amplifier fabricated using HBT technology and offers ultra flat gain over a broad frequency range and with high IP3. In addition, the CMA-63+ has good input and output return loss over a broad frequency range without the need for external matching components. Terminal finish is Ni-pd-Au and it has repeatable performance from lot to lot due to fully automated, tightly controlled semiconductor and assembly processes.

## simplified schematic and pin description



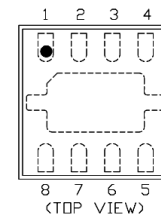
Generic photo used for illustration purposes only

CASE STYLE: DL1721

## CMA-63+

**+RoHS Compliant**

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



| Function         | Pin Number                              | Description                                                                                                                                                                                                                                                                       |
|------------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RF IN            | 2                                       | RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.                                                                                                                                                               |
| RF-OUT and DC-IN | 7                                       | RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit", Fig. 2 |
| GND              | 1,3,4,5,6,8,<br>Bottom Center<br>Paddle | Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.                                                                                                                                         |

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Electrical Specifications<sup>1,2</sup> at 25°C, unless noted

| Parameter                                             | Condition (GHz)                         | Min. | Typ.                                         | Max. | Units |
|-------------------------------------------------------|-----------------------------------------|------|----------------------------------------------|------|-------|
| Frequency Range <sup>2</sup>                          |                                         | 0.01 |                                              | 6    | GHz   |
| Gain                                                  | 0.05<br>0.8<br>2.0<br>3.0<br>4.0<br>6.0 | 19.0 | 21.9<br>21.2<br>20.3<br>19.0<br>17.5<br>14.4 |      | dB    |
| Gain Flatness                                         | 0.05 - 3.0<br>0.7 - 2.6                 |      | ±1.5<br>±1.2                                 |      | dB    |
| Input Return Loss                                     | 0.05<br>0.8<br>2.0<br>3.0<br>4.0<br>6.0 |      | 16.6<br>20.2<br>30.0<br>16.2<br>11.5<br>8.9  |      | dB    |
| Output Return Loss                                    | 0.05<br>0.8<br>2.0<br>3.0<br>4.0<br>6.0 |      | 15.9<br>19.8<br>14.9<br>15.8<br>16.2<br>18.5 |      | dB    |
| Reverse Isolation                                     | 2.0                                     |      | 23.7                                         |      | dB    |
| Output Power @1 dB compression                        | 0.05<br>0.8<br>2.0<br>3.0<br>4.0<br>6.0 |      | 18.7<br>18.9<br>18.4<br>16.3<br>14.3<br>11.7 |      | dBm   |
| Output IP3                                            | 0.05<br>1.0<br>2.0<br>3.0<br>4.0<br>6.0 |      | 34.6<br>34.4<br>32.0<br>29.2<br>27.5<br>25.3 |      | dB    |
| Noise Figure                                          | 0.05<br>1.0<br>2.0<br>3.0<br>4.0<br>6.0 |      | 3.7<br>3.9<br>3.9<br>3.9<br>4.1<br>4.6       |      | dB    |
| Device Operating Voltage                              |                                         | 4.8  | 5.0                                          | 5.2  | V     |
| Device Operating Current                              |                                         | 58   | 69                                           | 78   | mA    |
| Device Current Variation vs. Temperature <sup>3</sup> |                                         |      | 62                                           |      | μA/°C |
| Device Current Variation vs. Voltage                  |                                         |      | 0.035                                        |      | mA/mV |
| Thermal Resistance, junction-to-ground lead           |                                         |      | 64                                           |      | °C/W  |

(1) Measured on Mini-Circuits Characterization test board TB-656-63+. See Characterization Test Circuit (Fig. 1)

(2) Low Frequency cut-off determined by external coupling capacitors and external bias choke.

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

## Absolute Maximum Ratings

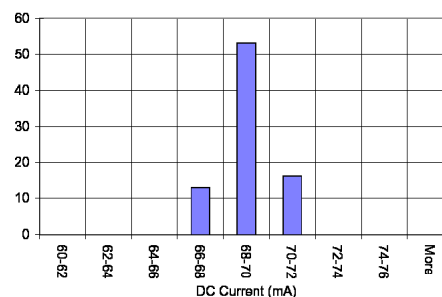
| Parameter                           | Ratings        |
|-------------------------------------|----------------|
| Operating Temperature (ground lead) | -55°C to 85°C  |
| Storage Temperature                 | -65°C to 125°C |
| Operating Current at 5V             | 120 mA         |
| Power Dissipation                   | 0.5 W          |
| Input Power (CW)                    | 13 dBm         |
| DC Voltage on Pin 3                 | 6V             |

## Note:

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

Electrical maximum ratings are not intended for continuous normal operation.

For continuous operation, do not exceed 5.2V device voltage.

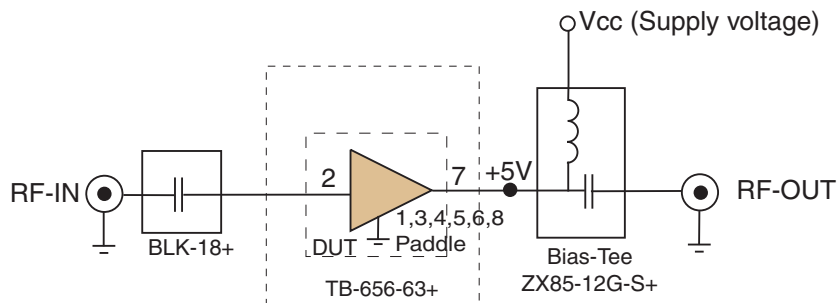


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## Characterization Test Circuit

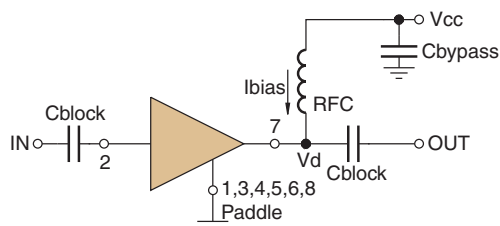


**Fig 1.** Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-656-63+) Gain, Return loss, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

## Conditions:

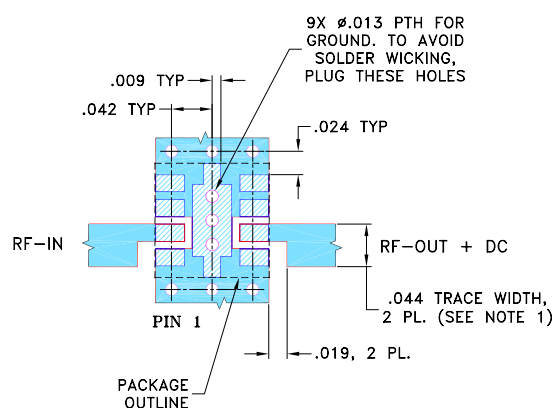
1. Gain and Return loss: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.

## Recommended Application Circuit



**Fig 2.** Test Board includes case, connectors, and components soldered to PCB for component values, please see evaluation board drawing.

## Suggested PCB Layout (PL-366)

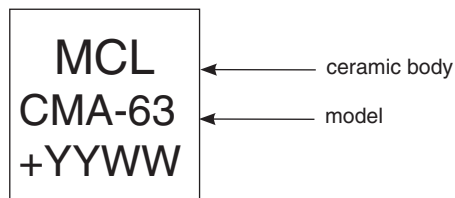


## NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .020"  $\pm$  .0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. 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

## Product Marking



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**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>                                               | DL1721 Ceramic package, exposed paddle, Terminal finish: Ni,Pd,Au |
| <b>Tape &amp; Reel</b><br>Standard quantities available on reel | F66-1<br>7" reels with 20, 50, 100, 200, 500 or 1K, 2K devices.   |
| <b>Suggested Layout for PCB Design</b>                          | PL-366                                                            |
| <b>Evaluation Board</b>                                         | TB-656-63+                                                        |
| <b>Environmental Ratings</b>                                    | ENV-68                                                            |

**ESD Rating**

Human Body Model (HBM): Class 1C (1000 to <2000V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M2 (100 to <200V) in accordance with ANSI/ESD STM5.2-1999

**MSL Rating**

Moisture Sensitivity: MSL1 (these parts are hermetic, air cavity and therefore, MSL ratings do not strictly apply. For handling purpose, use MSL1)

**Qualification Testing**

The table below shows the initial qualification testing performed. If required, parts can be subjected to 100% screening and qualifications testing per MIL standard requirement.

| Test Description |                                                    | Test Method/Process                 | Results |
|------------------|----------------------------------------------------|-------------------------------------|---------|
| 1                | Hermeticity (fine and gross leak)                  | MIL-STD-202 Method 112, Cond. C & D | Pass    |
| 2                | Acceleration, 30Kg, Y1 Direction                   | MIL-STD-883 Method 2001 Cond. E     | Pass    |
| 3                | Vibration, 10-2000Hz sine, 20g, 3 axis             | MIL-STD-202 Method 204, Cond. D     | Pass    |
| 4                | Mechanical shock                                   | MIL-STD-202 Method 213, Cond. A     | Pass    |
| 5                | PIND 20G's @ 130 Hz                                | MIL-STD-750 Method 2052.2           | Pass    |
| 6                | Temp Cycle -55C/+125C, 1000 Cycles                 | MIL-STD-202 Method 107              | Pass    |
| 7                | Autoclave, 121C, RH 100%, 15 Psig, 96 hrs          | JESD22-A102C                        | Pass    |
| 8                | HTOL, 1000hrs, 105C at rated Voltage condition     | MIL-STD-202 Method 108, Cond. D     | Pass    |
| 9                | Bend Test                                          | JESD22-B113                         | Pass    |
| 10               | Resistance to soldering heat, 3x reflow, 260C peak | JESD22-B102                         | Pass    |
| 11               | Drop Test                                          | JESD22-B111                         | Pass    |
| 12               | Adhesion Strength                                  | Push Test>10 lb                     | Pass    |

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## Typical Performance Data

**NOTE: Use PDF Bookmarks to view DATA at required conditions**

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5V, Id = 71.91 mA @ Temperature = +25degC

| 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)            |
| 10.00   | 24.51 | 27.33     | 8.75                    | 8.60                     | 0.89      | 0.43    | --             | 18.34                  | 3.04            |
| 50.00   | 21.91 | 24.71     | 15.36                   | 16.95                    | 0.99      | 0.52    | 34.65          | 19.28                  | 3.68            |
| 100.00  | 21.52 | 24.48     | 16.96                   | 21.46                    | 1.03      | 0.52    | 34.64          | 19.40                  | 3.69            |
| 200.00  | 21.40 | 24.37     | 17.64                   | 24.06                    | 1.04      | 0.51    | 34.90          | 19.17                  | 3.61            |
| 300.00  | 21.35 | 24.35     | 17.79                   | 24.06                    | 1.05      | 0.51    | 35.72          | 19.11                  | 3.83            |
| 400.00  | 21.33 | 24.30     | 17.86                   | 23.30                    | 1.05      | 0.50    | 35.09          | 19.32                  | 3.81            |
| 500.00  | 21.28 | 24.26     | 17.98                   | 22.93                    | 1.05      | 0.49    | 34.72          | 19.35                  | 3.89            |
| 600.00  | 21.28 | 24.24     | 17.86                   | 21.84                    | 1.05      | 0.49    | 35.41          | 19.38                  | 3.84            |
| 700.00  | 21.25 | 24.21     | 17.87                   | 20.94                    | 1.05      | 0.49    | 36.20          | 19.42                  | 3.84            |
| 800.00  | 21.20 | 24.16     | 17.99                   | 20.26                    | 1.04      | 0.49    | 35.42          | 19.42                  | 3.79            |
| 900.00  | 21.19 | 24.15     | 18.25                   | 19.23                    | 1.04      | 0.50    | 35.08          | 19.28                  | 3.83            |
| 1000.00 | 21.16 | 24.08     | 18.42                   | 18.41                    | 1.03      | 0.50    | 34.39          | 19.33                  | 3.78            |
| 1250.00 | 21.07 | 23.93     | 19.00                   | 16.70                    | 1.01      | 0.50    | 34.91          | 19.53                  | 3.82            |
| 1500.00 | 20.94 | 23.76     | 20.36                   | 15.55                    | 1.02      | 0.48    | 34.04          | 19.50                  | 3.75            |
| 1750.00 | 20.76 | 23.60     | 22.28                   | 14.76                    | 1.02      | 0.46    | 33.01          | 19.21                  | 3.81            |
| 2000.00 | 20.50 | 23.48     | 24.39                   | 14.27                    | 1.03      | 0.46    | 32.49          | 18.82                  | 3.73            |
| 2250.00 | 20.23 | 23.31     | 25.45                   | 14.00                    | 1.04      | 0.46    | 31.90          | 18.35                  | 3.80            |
| 2500.00 | 19.93 | 23.22     | 24.01                   | 14.18                    | 1.05      | 0.49    | 30.96          | 17.92                  | 3.78            |
| 2750.00 | 19.59 | 23.12     | 21.24                   | 14.32                    | 1.06      | 0.51    | 30.39          | 17.20                  | 3.84            |
| 3000.00 | 19.24 | 23.06     | 19.20                   | 14.62                    | 1.08      | 0.54    | 29.86          | 16.82                  | 3.76            |
| 3250.00 | 18.88 | 22.95     | 17.76                   | 14.87                    | 1.09      | 0.57    | 29.25          | 16.40                  | 3.98            |
| 3500.00 | 18.51 | 22.89     | 16.55                   | 15.13                    | 1.10      | 0.62    | 28.87          | 15.74                  | 3.90            |
| 3750.00 | 18.13 | 22.91     | 15.49                   | 15.27                    | 1.10      | 0.67    | 28.36          | 15.28                  | 3.95            |
| 4000.00 | 17.71 | 22.92     | 14.70                   | 15.32                    | 1.10      | 0.73    | 28.15          | 14.94                  | 4.09            |
| 4250.00 | 17.29 | 22.92     | 14.01                   | 15.20                    | 1.12      | 0.77    | 27.95          | 14.39                  | 4.15            |
| 4500.00 | 16.89 | 22.95     | 13.48                   | 15.04                    | 1.15      | 0.79    | 27.47          | 14.09                  | 4.23            |
| 4750.00 | 16.48 | 22.97     | 13.18                   | 14.93                    | 1.20      | 0.80    | 27.46          | 13.76                  | 4.24            |
| 5000.00 | 16.08 | 22.92     | 12.76                   | 14.69                    | 1.25      | 0.79    | 27.03          | 13.30                  | 4.29            |
| 5250.00 | 15.70 | 22.93     | 12.37                   | 14.44                    | 1.30      | 0.79    | 26.44          | 12.75                  | 4.38            |
| 5500.00 | 15.32 | 22.89     | 12.17                   | 14.29                    | 1.33      | 0.81    | 26.23          | 12.64                  | 4.52            |
| 5750.00 | 14.92 | 22.93     | 11.94                   | 14.27                    | 1.34      | 0.86    | 26.19          | 12.29                  | 4.57            |
| 6000.00 | 14.50 | 22.93     | 11.82                   | 14.42                    | 1.35      | 0.91    | 25.91          | 11.96                  | 4.60            |
| 6250.00 | 14.01 | 22.96     | 11.49                   | 14.49                    | 1.38      | 0.94    | 25.59          | 11.56                  | 4.74            |
| 6500.00 | 13.49 | 23.02     | 11.05                   | 14.65                    | 1.47      | 0.95    | 25.21          | 11.11                  | 4.88            |
| 6750.00 | 12.82 | 23.21     | 10.49                   | 14.93                    | 1.63      | 0.95    | 24.77          | 10.53                  | 5.03            |
| 7000.00 | 12.19 | 23.16     | 9.60                    | 14.75                    | 1.72      | 0.96    | 24.04          | 10.14                  | 5.20            |

## 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 = 4.8V, Id = 63.68 mA @ Temperature = +25degC

| FREQ    | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
| (MHz)   | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 10.00   | 24.41 | 27.73     | 8.79              | 9.02               | 0.89      | 0.54    | --          | 17.46            | 2.96         |
| 50.00   | 21.81 | 24.51     | 15.58             | 16.70              | 0.99      | 0.50    | 33.17       | 18.10            | 3.59         |
| 100.00  | 21.42 | 24.29     | 17.53             | 20.90              | 1.03      | 0.51    | 33.43       | 18.30            | 3.60         |
| 200.00  | 21.30 | 24.25     | 18.32             | 23.26              | 1.04      | 0.51    | 33.56       | 17.95            | 3.58         |
| 300.00  | 21.25 | 24.25     | 18.54             | 23.42              | 1.05      | 0.50    | 33.28       | 17.92            | 3.70         |
| 400.00  | 21.23 | 24.18     | 18.56             | 22.75              | 1.05      | 0.49    | 34.07       | 18.20            | 3.73         |
| 500.00  | 21.19 | 24.18     | 18.72             | 22.45              | 1.06      | 0.49    | 33.55       | 18.20            | 3.81         |
| 600.00  | 21.18 | 24.16     | 18.58             | 21.50              | 1.05      | 0.49    | 33.99       | 18.24            | 3.70         |
| 700.00  | 21.16 | 24.16     | 18.58             | 20.66              | 1.05      | 0.49    | 34.44       | 18.35            | 3.73         |
| 800.00  | 21.11 | 24.13     | 18.69             | 19.99              | 1.05      | 0.50    | 33.97       | 18.32            | 3.68         |
| 900.00  | 21.10 | 24.06     | 18.99             | 19.00              | 1.04      | 0.50    | 33.41       | 18.11            | 3.75         |
| 1000.00 | 21.08 | 23.96     | 19.13             | 18.19              | 1.03      | 0.49    | 33.08       | 18.15            | 3.74         |
| 1250.00 | 20.98 | 23.81     | 19.74             | 16.55              | 1.02      | 0.49    | 33.67       | 18.52            | 3.73         |
| 1500.00 | 20.85 | 23.67     | 21.16             | 15.40              | 1.02      | 0.47    | 32.94       | 18.57            | 3.65         |
| 1750.00 | 20.67 | 23.48     | 23.19             | 14.59              | 1.02      | 0.45    | 32.35       | 18.37            | 3.71         |
| 2000.00 | 20.41 | 23.40     | 25.04             | 14.09              | 1.03      | 0.46    | 31.54       | 18.12            | 3.66         |
| 2250.00 | 20.14 | 23.27     | 25.39             | 13.78              | 1.04      | 0.47    | 31.06       | 17.74            | 3.68         |
| 2500.00 | 19.84 | 23.14     | 23.41             | 13.93              | 1.05      | 0.49    | 30.35       | 17.41            | 3.70         |
| 2750.00 | 19.50 | 23.06     | 20.72             | 14.01              | 1.06      | 0.51    | 30.04       | 16.76            | 3.73         |
| 3000.00 | 19.15 | 22.98     | 18.81             | 14.27              | 1.08      | 0.53    | 29.45       | 16.41            | 3.65         |
| 3250.00 | 18.79 | 22.94     | 17.48             | 14.47              | 1.09      | 0.57    | 28.82       | 16.03            | 3.87         |
| 3500.00 | 18.42 | 22.84     | 16.35             | 14.67              | 1.10      | 0.61    | 28.52       | 15.39            | 3.76         |
| 3750.00 | 18.04 | 22.86     | 15.33             | 14.78              | 1.10      | 0.67    | 28.01       | 14.96            | 3.87         |
| 4000.00 | 17.62 | 22.86     | 14.57             | 14.80              | 1.10      | 0.73    | 27.85       | 14.62            | 3.98         |
| 4250.00 | 17.20 | 22.85     | 13.93             | 14.68              | 1.11      | 0.77    | 27.61       | 14.08            | 3.99         |
| 4500.00 | 16.81 | 22.88     | 13.40             | 14.55              | 1.14      | 0.79    | 27.26       | 13.79            | 4.09         |
| 4750.00 | 16.40 | 22.86     | 13.12             | 14.46              | 1.20      | 0.79    | 27.15       | 13.49            | 4.09         |
| 5000.00 | 16.00 | 22.78     | 12.73             | 14.21              | 1.25      | 0.78    | 26.75       | 13.02            | 4.16         |
| 5250.00 | 15.63 | 22.84     | 12.36             | 14.00              | 1.30      | 0.79    | 26.19       | 12.45            | 4.28         |
| 5500.00 | 15.25 | 22.83     | 12.14             | 13.86              | 1.33      | 0.81    | 25.93       | 12.36            | 4.39         |
| 5750.00 | 14.86 | 22.88     | 11.94             | 13.85              | 1.34      | 0.85    | 25.94       | 12.02            | 4.39         |
| 6000.00 | 14.44 | 22.83     | 11.83             | 13.98              | 1.34      | 0.90    | 25.66       | 11.66            | 4.43         |
| 6250.00 | 13.95 | 22.85     | 11.51             | 14.04              | 1.37      | 0.94    | 25.28       | 11.27            | 4.63         |
| 6500.00 | 13.43 | 22.95     | 11.08             | 14.20              | 1.47      | 0.94    | 24.83       | 10.83            | 4.76         |
| 6750.00 | 12.76 | 23.13     | 10.52             | 14.48              | 1.62      | 0.94    | 24.40       | 10.23            | 4.86         |
| 7000.00 | 12.13 | 23.06     | 9.63              | 14.33              | 1.71      | 0.95    | 23.66       | 9.87             | 4.97         |

## 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 = 5.2V, Id = 80.57 mA @ Temperature = +25degC

| FREQ    | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
| (MHz)   | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 10.00   | 24.59 | 28.18     | 8.60              | 8.85               | 0.91      | 0.54    | --          | 19.12            | 3.14         |
| 50.00   | 21.99 | 24.89     | 15.13             | 17.20              | 1.00      | 0.53    | 35.78       | 20.24            | 3.77         |
| 100.00  | 21.59 | 24.53     | 16.55             | 21.82              | 1.03      | 0.52    | 36.47       | 20.31            | 3.78         |
| 200.00  | 21.47 | 24.42     | 17.15             | 24.58              | 1.04      | 0.51    | 37.79       | 20.18            | 3.73         |
| 300.00  | 21.42 | 24.36     | 17.26             | 24.52              | 1.05      | 0.50    | 37.99       | 20.10            | 3.88         |
| 400.00  | 21.40 | 24.37     | 17.35             | 23.66              | 1.05      | 0.50    | 37.09       | 20.27            | 3.93         |
| 500.00  | 21.35 | 24.36     | 17.48             | 23.25              | 1.05      | 0.50    | 37.12       | 20.33            | 3.97         |
| 600.00  | 21.35 | 24.37     | 17.36             | 22.15              | 1.05      | 0.50    | 37.44       | 20.31            | 3.93         |
| 700.00  | 21.32 | 24.33     | 17.36             | 21.18              | 1.05      | 0.50    | 37.29       | 20.34            | 3.92         |
| 800.00  | 21.27 | 24.29     | 17.49             | 20.49              | 1.04      | 0.51    | 37.00       | 20.33            | 3.84         |
| 900.00  | 21.26 | 24.23     | 17.73             | 19.45              | 1.04      | 0.51    | 36.67       | 20.25            | 3.93         |
| 1000.00 | 21.23 | 24.15     | 17.90             | 18.59              | 1.03      | 0.50    | 35.60       | 20.31            | 3.90         |
| 1250.00 | 21.14 | 23.99     | 18.48             | 16.86              | 1.01      | 0.50    | 35.45       | 20.40            | 3.92         |
| 1500.00 | 21.01 | 23.87     | 19.79             | 15.68              | 1.02      | 0.48    | 34.69       | 20.25            | 3.82         |
| 1750.00 | 20.83 | 23.69     | 21.72             | 14.90              | 1.03      | 0.46    | 33.80       | 19.88            | 3.88         |
| 2000.00 | 20.57 | 23.52     | 23.82             | 14.45              | 1.03      | 0.46    | 32.84       | 19.38            | 3.84         |
| 2250.00 | 20.30 | 23.37     | 25.32             | 14.21              | 1.04      | 0.46    | 32.03       | 18.82            | 3.90         |
| 2500.00 | 20.00 | 23.25     | 24.36             | 14.45              | 1.05      | 0.48    | 31.20       | 18.32            | 3.89         |
| 2750.00 | 19.66 | 23.20     | 21.52             | 14.64              | 1.07      | 0.51    | 30.76       | 17.55            | 3.96         |
| 3000.00 | 19.31 | 23.09     | 19.43             | 15.00              | 1.08      | 0.54    | 30.06       | 17.12            | 3.84         |
| 3250.00 | 18.95 | 22.96     | 17.94             | 15.31              | 1.09      | 0.57    | 29.40       | 16.69            | 4.10         |
| 3500.00 | 18.58 | 22.97     | 16.68             | 15.63              | 1.10      | 0.62    | 29.12       | 16.00            | 4.01         |
| 3750.00 | 18.20 | 22.95     | 15.59             | 15.83              | 1.10      | 0.68    | 28.56       | 15.53            | 4.09         |
| 4000.00 | 17.78 | 22.97     | 14.76             | 15.89              | 1.11      | 0.73    | 28.30       | 15.17            | 4.19         |
| 4250.00 | 17.36 | 22.99     | 14.05             | 15.76              | 1.12      | 0.77    | 28.03       | 14.58            | 4.24         |
| 4500.00 | 16.96 | 23.04     | 13.50             | 15.61              | 1.16      | 0.80    | 27.71       | 14.30            | 4.37         |
| 4750.00 | 16.54 | 23.00     | 13.18             | 15.47              | 1.20      | 0.80    | 27.55       | 14.00            | 4.39         |
| 5000.00 | 16.14 | 22.94     | 12.75             | 15.18              | 1.25      | 0.79    | 27.02       | 13.52            | 4.43         |
| 5250.00 | 15.76 | 22.98     | 12.37             | 14.91              | 1.31      | 0.80    | 26.50       | 12.94            | 4.56         |
| 5500.00 | 15.37 | 23.02     | 12.13             | 14.73              | 1.34      | 0.82    | 26.36       | 12.86            | 4.67         |
| 5750.00 | 14.97 | 23.01     | 11.91             | 14.71              | 1.35      | 0.86    | 26.27       | 12.49            | 4.73         |
| 6000.00 | 14.55 | 22.96     | 11.78             | 14.87              | 1.35      | 0.91    | 26.05       | 12.16            | 4.77         |
| 6250.00 | 14.06 | 23.00     | 11.44             | 14.92              | 1.39      | 0.94    | 25.62       | 11.76            | 4.98         |
| 6500.00 | 13.54 | 23.08     | 11.00             | 15.12              | 1.48      | 0.95    | 25.28       | 11.34            | 5.07         |
| 6750.00 | 12.87 | 23.27     | 10.43             | 15.40              | 1.63      | 0.96    | 24.81       | 10.74            | 5.20         |
| 7000.00 | 12.23 | 23.18     | 9.54              | 15.20              | 1.72      | 0.97    | 24.17       | 10.42            | 5.40         |

## 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 = 5V, Id = 65.05 mA @ Temperature = -55degC

| 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)            |
| 10.0   | 24.66 | 28.02     | 8.52                    | 9.41                     | 0.88      | 0.58    |                | 18.13                  | 3.31            |
| 50.0   | 22.06 | 24.71     | 14.90                   | 17.12                    | 0.99      | 0.51    | 33.39          | 18.39                  | 2.92            |
| 100.0  | 21.67 | 24.55     | 17.06                   | 21.05                    | 1.03      | 0.51    | 34.51          | 18.57                  | 2.94            |
| 200.0  | 21.57 | 24.51     | 17.90                   | 23.34                    | 1.04      | 0.50    | 34.60          | 18.15                  | 2.88            |
| 300.0  | 21.51 | 24.43     | 17.29                   | 24.02                    | 1.05      | 0.50    | 35.21          | 18.19                  | 3.04            |
| 400.0  | 21.49 | 24.40     | 16.80                   | 22.93                    | 1.05      | 0.49    | 35.04          | 18.56                  | 3.07            |
| 500.0  | 21.44 | 24.47     | 17.06                   | 21.94                    | 1.05      | 0.50    | 35.10          | 18.50                  | 3.14            |
| 600.0  | 21.44 | 24.37     | 16.95                   | 20.94                    | 1.05      | 0.49    | 35.34          | 18.63                  | 3.07            |
| 700.0  | 21.42 | 24.37     | 17.03                   | 19.93                    | 1.04      | 0.49    | 35.64          | 18.80                  | 3.05            |
| 800.0  | 21.36 | 24.36     | 17.12                   | 19.36                    | 1.04      | 0.50    | 35.40          | 18.67                  | 2.99            |
| 900.0  | 21.34 | 24.29     | 17.45                   | 18.38                    | 1.03      | 0.50    | 34.63          | 18.34                  | 3.02            |
| 1000.0 | 21.33 | 24.27     | 17.46                   | 17.51                    | 1.02      | 0.51    | 34.49          | 18.58                  | 3.02            |
| 1250.0 | 21.23 | 24.14     | 17.16                   | 15.45                    | 1.00      | 0.51    | 34.95          | 18.86                  | 3.03            |
| 1500.0 | 21.10 | 23.99     | 17.81                   | 14.37                    | 1.00      | 0.49    | 34.36          | 19.05                  | 2.96            |
| 1750.0 | 20.95 | 23.84     | 19.12                   | 13.56                    | 1.02      | 0.45    | 33.77          | 18.92                  | 3.04            |
| 2000.0 | 20.70 | 23.68     | 20.06                   | 12.94                    | 1.03      | 0.44    | 33.09          | 18.72                  | 3.02            |
| 2250.0 | 20.45 | 23.59     | 21.24                   | 12.46                    | 1.04      | 0.44    | 32.44          | 18.63                  | 2.98            |
| 2500.0 | 20.21 | 23.40     | 22.38                   | 12.41                    | 1.04      | 0.44    | 31.84          | 18.23                  | 2.97            |
| 2750.0 | 19.92 | 23.32     | 22.15                   | 12.51                    | 1.05      | 0.47    | 31.48          | 17.82                  | 2.98            |
| 3000.0 | 19.62 | 23.22     | 20.63                   | 12.52                    | 1.05      | 0.50    | 30.75          | 17.44                  | 2.79            |
| 3250.0 | 19.30 | 23.12     | 19.36                   | 12.51                    | 1.04      | 0.55    | 30.05          | 17.18                  | 3.08            |
| 3500.0 | 18.98 | 23.12     | 18.55                   | 12.73                    | 1.04      | 0.60    | 29.72          | 16.64                  | 3.04            |
| 3750.0 | 18.64 | 23.02     | 17.53                   | 12.94                    | 1.04      | 0.64    | 28.99          | 16.28                  | 3.09            |
| 4000.0 | 18.29 | 23.00     | 16.78                   | 13.01                    | 1.06      | 0.66    | 29.02          | 15.83                  | 3.05            |
| 4250.0 | 17.92 | 23.00     | 16.02                   | 13.09                    | 1.10      | 0.68    | 28.81          | 15.20                  | 3.16            |
| 4500.0 | 17.56 | 23.07     | 15.65                   | 13.02                    | 1.15      | 0.68    | 28.54          | 15.07                  | 3.14            |
| 4750.0 | 17.24 | 23.02     | 15.36                   | 12.79                    | 1.19      | 0.68    | 28.32          | 14.79                  | 3.22            |
| 5000.0 | 16.94 | 22.97     | 14.89                   | 12.74                    | 1.21      | 0.69    | 28.11          | 14.46                  | 3.25            |
| 5250.0 | 16.63 | 22.88     | 14.61                   | 12.55                    | 1.21      | 0.71    | 27.71          | 13.82                  | 3.24            |
| 5500.0 | 16.35 | 22.73     | 14.59                   | 12.79                    | 1.18      | 0.76    | 27.27          | 13.75                  | 3.37            |
| 5750.0 | 16.07 | 22.76     | 14.07                   | 12.77                    | 1.17      | 0.81    | 27.24          | 13.36                  | 3.42            |
| 6000.0 | 15.67 | 22.76     | 13.36                   | 12.66                    | 1.20      | 0.83    | 26.89          | 13.03                  | 3.41            |
| 6250.0 | 15.28 | 22.73     | 12.92                   | 12.61                    | 1.27      | 0.81    | 26.58          | 12.50                  | 3.55            |
| 6500.0 | 14.80 | 22.81     | 12.25                   | 12.34                    | 1.36      | 0.80    | 26.56          | 12.19                  | 3.61            |
| 6750.0 | 14.25 | 22.96     | 11.54                   | 12.28                    | 1.44      | 0.83    | 26.42          | 11.53                  | 3.71            |
| 7000.0 | 13.65 | 22.81     | 10.82                   | 12.28                    | 1.44      | 0.88    | 26.16          | 11.09                  | 3.89            |

## 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 = 4.8V, Id =58.07 mA @ Temperature = -55degC

| 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)            |
| 10.0   | 24.58 | 27.56     | 8.60                    | 9.02                     | 0.87      | 0.52    |                | 18.13                  | 3.19            |
| 50.0   | 21.96 | 24.54     | 15.16                   | 16.82                    | 0.99      | 0.49    | 31.68          | 18.39                  | 2.88            |
| 100.0  | 21.57 | 24.44     | 17.57                   | 20.58                    | 1.03      | 0.51    | 32.31          | 18.57                  | 2.85            |
| 200.0  | 21.47 | 24.39     | 18.58                   | 22.63                    | 1.04      | 0.50    | 32.78          | 18.15                  | 2.86            |
| 300.0  | 21.41 | 24.42     | 17.93                   | 23.47                    | 1.05      | 0.50    | 33.22          | 18.19                  | 3.00            |
| 400.0  | 21.40 | 24.30     | 17.38                   | 22.58                    | 1.05      | 0.49    | 33.47          | 18.56                  | 2.97            |
| 500.0  | 21.35 | 24.33     | 17.65                   | 21.75                    | 1.05      | 0.49    | 33.33          | 18.50                  | 3.08            |
| 600.0  | 21.35 | 24.31     | 17.56                   | 20.77                    | 1.05      | 0.49    | 33.64          | 18.63                  | 3.01            |
| 700.0  | 21.33 | 24.25     | 17.62                   | 19.74                    | 1.05      | 0.49    | 33.58          | 18.80                  | 3.00            |
| 800.0  | 21.27 | 24.26     | 17.73                   | 19.20                    | 1.04      | 0.50    | 33.86          | 18.67                  | 2.94            |
| 900.0  | 21.26 | 24.21     | 18.07                   | 18.23                    | 1.03      | 0.50    | 32.88          | 18.34                  | 2.97            |
| 1000.0 | 21.25 | 24.15     | 18.06                   | 17.39                    | 1.02      | 0.50    | 32.66          | 18.58                  | 2.95            |
| 1250.0 | 21.15 | 24.03     | 17.73                   | 15.39                    | 1.00      | 0.50    | 33.47          | 18.86                  | 2.98            |
| 1500.0 | 21.02 | 23.85     | 18.37                   | 14.31                    | 1.00      | 0.48    | 32.98          | 19.05                  | 2.90            |
| 1750.0 | 20.87 | 23.73     | 19.64                   | 13.49                    | 1.01      | 0.45    | 32.68          | 18.92                  | 3.01            |
| 2000.0 | 20.61 | 23.60     | 20.52                   | 12.84                    | 1.03      | 0.44    | 32.22          | 18.72                  | 2.93            |
| 2250.0 | 20.37 | 23.49     | 21.47                   | 12.35                    | 1.04      | 0.44    | 31.96          | 18.63                  | 2.91            |
| 2500.0 | 20.12 | 23.35     | 22.33                   | 12.25                    | 1.04      | 0.44    | 30.99          | 18.23                  | 2.91            |
| 2750.0 | 19.83 | 23.25     | 21.80                   | 12.33                    | 1.05      | 0.47    | 30.62          | 17.82                  | 2.93            |
| 3000.0 | 19.53 | 23.11     | 20.27                   | 12.31                    | 1.05      | 0.49    | 30.21          | 17.44                  | 2.75            |
| 3250.0 | 19.20 | 23.06     | 19.05                   | 12.30                    | 1.04      | 0.55    | 29.55          | 17.18                  | 2.99            |
| 3500.0 | 18.88 | 23.03     | 18.25                   | 12.51                    | 1.04      | 0.60    | 29.11          | 16.64                  | 2.97            |
| 3750.0 | 18.56 | 22.93     | 17.26                   | 12.66                    | 1.04      | 0.64    | 28.49          | 16.28                  | 3.01            |
| 4000.0 | 18.20 | 22.93     | 16.57                   | 12.72                    | 1.06      | 0.66    | 28.53          | 15.83                  | 3.04            |
| 4250.0 | 17.82 | 22.91     | 15.85                   | 12.81                    | 1.10      | 0.68    | 28.31          | 15.20                  | 3.10            |
| 4500.0 | 17.46 | 22.97     | 15.52                   | 12.73                    | 1.14      | 0.68    | 28.17          | 15.07                  | 3.07            |
| 4750.0 | 17.14 | 22.92     | 15.23                   | 12.51                    | 1.18      | 0.67    | 27.96          | 14.79                  | 3.15            |
| 5000.0 | 16.85 | 22.89     | 14.80                   | 12.44                    | 1.21      | 0.68    | 27.77          | 14.46                  | 3.18            |
| 5250.0 | 16.54 | 22.79     | 14.55                   | 12.26                    | 1.20      | 0.71    | 27.35          | 13.82                  | 3.16            |
| 5500.0 | 16.26 | 22.66     | 14.53                   | 12.48                    | 1.18      | 0.76    | 26.91          | 13.75                  | 3.24            |
| 5750.0 | 15.98 | 22.69     | 14.05                   | 12.47                    | 1.17      | 0.81    | 26.83          | 13.36                  | 3.30            |
| 6000.0 | 15.59 | 22.70     | 13.35                   | 12.36                    | 1.20      | 0.83    | 26.58          | 13.03                  | 3.30            |
| 6250.0 | 15.19 | 22.64     | 12.91                   | 12.33                    | 1.27      | 0.81    | 26.18          | 12.50                  | 3.44            |
| 6500.0 | 14.72 | 22.73     | 12.26                   | 12.08                    | 1.36      | 0.79    | 26.25          | 12.19                  | 3.49            |
| 6750.0 | 14.16 | 22.91     | 11.54                   | 12.03                    | 1.44      | 0.83    | 26.00          | 11.53                  | 3.62            |
| 7000.0 | 13.56 | 22.73     | 10.84                   | 12.06                    | 1.44      | 0.88    | 25.68          | 11.09                  | 3.71            |

## 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 = 5.2V, Id = 73.72 mA @ Temperature = -55degC

| FREQ   | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|--------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
| (MHz)  | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 10.0   | 24.76 | 28.09     | 8.25              | 8.94               | 0.90      | 0.52    |             | 19.06            | 3.39         |
| 50.0   | 22.16 | 25.02     | 14.68             | 17.28              | 0.99      | 0.53    | 36.21       | 19.68            | 3.00         |
| 100.0  | 21.76 | 24.67     | 16.58             | 21.52              | 1.03      | 0.51    | 36.01       | 19.78            | 3.02         |
| 200.0  | 21.65 | 24.51     | 17.31             | 23.89              | 1.04      | 0.50    | 36.29       | 19.45            | 2.97         |
| 300.0  | 21.58 | 24.59     | 16.73             | 24.41              | 1.05      | 0.51    | 36.50       | 19.49            | 3.10         |
| 400.0  | 21.57 | 24.50     | 16.29             | 23.10              | 1.05      | 0.49    | 37.17       | 19.75            | 3.11         |
| 500.0  | 21.52 | 24.57     | 16.54             | 22.09              | 1.05      | 0.51    | 36.85       | 19.74            | 3.20         |
| 600.0  | 21.52 | 24.45     | 16.46             | 21.09              | 1.05      | 0.49    | 37.17       | 19.81            | 3.14         |
| 700.0  | 21.50 | 24.45     | 16.51             | 20.09              | 1.04      | 0.50    | 37.23       | 19.94            | 3.15         |
| 800.0  | 21.44 | 24.43     | 16.61             | 19.48              | 1.04      | 0.51    | 37.39       | 19.85            | 3.08         |
| 900.0  | 21.42 | 24.42     | 16.94             | 18.52              | 1.03      | 0.51    | 36.26       | 19.60            | 3.13         |
| 1000.0 | 21.41 | 24.30     | 16.96             | 17.63              | 1.02      | 0.51    | 35.78       | 19.81            | 3.09         |
| 1250.0 | 21.31 | 24.22     | 16.70             | 15.54              | 1.00      | 0.52    | 36.66       | 19.98            | 3.09         |
| 1500.0 | 21.18 | 24.04     | 17.34             | 14.44              | 1.00      | 0.49    | 35.48       | 20.07            | 3.08         |
| 1750.0 | 21.03 | 23.91     | 18.65             | 13.67              | 1.02      | 0.45    | 34.82       | 19.88            | 3.14         |
| 2000.0 | 20.78 | 23.80     | 19.65             | 13.06              | 1.03      | 0.44    | 34.20       | 19.56            | 3.08         |
| 2250.0 | 20.54 | 23.65     | 20.91             | 12.61              | 1.04      | 0.44    | 33.21       | 19.33            | 3.04         |
| 2500.0 | 20.30 | 23.49     | 22.38             | 12.59              | 1.04      | 0.45    | 32.33       | 18.85            | 3.04         |
| 2750.0 | 20.00 | 23.40     | 22.34             | 12.73              | 1.05      | 0.47    | 31.86       | 18.32            | 3.10         |
| 3000.0 | 19.71 | 23.28     | 20.87             | 12.76              | 1.05      | 0.50    | 31.29       | 17.86            | 2.93         |
| 3250.0 | 19.39 | 23.21     | 19.56             | 12.76              | 1.04      | 0.55    | 30.41       | 17.61            | 3.13         |
| 3500.0 | 19.07 | 23.19     | 18.78             | 13.02              | 1.05      | 0.60    | 30.13       | 17.04            | 3.13         |
| 3750.0 | 18.74 | 23.07     | 17.68             | 13.26              | 1.05      | 0.63    | 29.36       | 16.63            | 3.16         |
| 4000.0 | 18.39 | 23.06     | 16.91             | 13.34              | 1.07      | 0.66    | 29.26       | 16.18            | 3.13         |
| 4250.0 | 18.01 | 23.09     | 16.14             | 13.46              | 1.11      | 0.68    | 28.96       | 15.55            | 3.28         |
| 4500.0 | 17.65 | 23.10     | 15.72             | 13.41              | 1.15      | 0.68    | 28.91       | 15.44            | 3.25         |
| 4750.0 | 17.33 | 23.06     | 15.40             | 13.19              | 1.18      | 0.68    | 28.69       | 15.14            | 3.33         |
| 5000.0 | 17.04 | 23.07     | 14.94             | 13.09              | 1.21      | 0.69    | 28.36       | 14.81            | 3.36         |
| 5250.0 | 16.72 | 22.91     | 14.63             | 12.90              | 1.20      | 0.72    | 28.05       | 14.16            | 3.38         |
| 5500.0 | 16.44 | 22.78     | 14.60             | 13.15              | 1.18      | 0.76    | 27.71       | 14.10            | 3.48         |
| 5750.0 | 16.16 | 22.86     | 14.08             | 13.13              | 1.18      | 0.81    | 27.55       | 13.72            | 3.54         |
| 6000.0 | 15.76 | 22.83     | 13.34             | 13.01              | 1.20      | 0.83    | 27.20       | 13.37            | 3.53         |
| 6250.0 | 15.37 | 22.81     | 12.87             | 12.97              | 1.27      | 0.82    | 26.81       | 12.83            | 3.67         |
| 6500.0 | 14.89 | 22.90     | 12.18             | 12.67              | 1.37      | 0.81    | 26.90       | 12.51            | 3.76         |
| 6750.0 | 14.34 | 23.07     | 11.47             | 12.58              | 1.44      | 0.84    | 26.82       | 11.87            | 3.86         |
| 7000.0 | 13.74 | 22.88     | 10.75             | 12.58              | 1.44      | 0.89    | 26.62       | 11.42            | 3.99         |

## 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 = 5V, Id = 74.97 mA @ Temperature = +105degC

| 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)            |
| 10.00   | 24.35 | 27.29     | 8.94                    | 8.91                     | 0.87      | 0.50    | --             | 18.83                  | 3.67            |
| 50.00   | 21.74 | 24.40     | 15.54                   | 16.98                    | 0.99      | 0.50    | 36.04          | 19.55                  | 4.31            |
| 100.00  | 21.33 | 24.21     | 17.27                   | 21.76                    | 1.03      | 0.51    | 35.66          | 19.63                  | 4.30            |
| 200.00  | 21.19 | 24.20     | 17.63                   | 24.15                    | 1.05      | 0.51    | 36.00          | 19.48                  | 4.26            |
| 300.00  | 21.13 | 24.18     | 18.17                   | 24.00                    | 1.05      | 0.51    | 35.74          | 19.50                  | 4.46            |
| 400.00  | 21.11 | 24.14     | 18.69                   | 24.01                    | 1.05      | 0.50    | 36.54          | 19.47                  | 4.45            |
| 500.00  | 21.08 | 24.10     | 19.15                   | 23.42                    | 1.06      | 0.50    | 36.34          | 19.56                  | 4.60            |
| 600.00  | 21.07 | 24.11     | 19.27                   | 22.47                    | 1.06      | 0.50    | 36.14          | 19.50                  | 4.48            |
| 700.00  | 21.03 | 24.03     | 19.41                   | 21.76                    | 1.05      | 0.49    | 36.06          | 19.59                  | 4.47            |
| 800.00  | 20.99 | 23.99     | 19.68                   | 21.14                    | 1.05      | 0.50    | 35.42          | 19.54                  | 4.44            |
| 900.00  | 20.97 | 23.96     | 20.18                   | 20.38                    | 1.05      | 0.50    | 35.38          | 19.50                  | 4.39            |
| 1000.00 | 20.95 | 23.86     | 20.67                   | 19.78                    | 1.04      | 0.49    | 34.13          | 19.54                  | 4.44            |
| 1250.00 | 20.84 | 23.70     | 22.07                   | 18.38                    | 1.03      | 0.49    | 34.42          | 19.55                  | 4.39            |
| 1500.00 | 20.69 | 23.53     | 24.49                   | 17.30                    | 1.03      | 0.47    | 33.29          | 19.33                  | 4.35            |
| 1750.00 | 20.47 | 23.34     | 28.83                   | 16.50                    | 1.04      | 0.46    | 32.34          | 18.92                  | 4.47            |
| 2000.00 | 20.19 | 23.16     | 31.46                   | 16.09                    | 1.04      | 0.48    | 31.56          | 18.25                  | 4.45            |
| 2250.00 | 19.85 | 23.01     | 25.83                   | 16.10                    | 1.04      | 0.50    | 30.75          | 17.64                  | 4.52            |
| 2500.00 | 19.46 | 22.95     | 20.97                   | 16.62                    | 1.06      | 0.54    | 29.60          | 16.92                  | 4.54            |
| 2750.00 | 19.04 | 22.85     | 17.89                   | 17.27                    | 1.08      | 0.57    | 29.05          | 16.11                  | 4.56            |
| 3000.00 | 18.61 | 22.82     | 15.99                   | 17.87                    | 1.10      | 0.61    | 28.43          | 15.65                  | 4.51            |
| 3250.00 | 18.16 | 22.80     | 14.71                   | 18.48                    | 1.13      | 0.65    | 27.53          | 15.02                  | 4.79            |
| 3500.00 | 17.72 | 22.82     | 13.72                   | 18.66                    | 1.15      | 0.69    | 26.81          | 14.34                  | 4.85            |
| 3750.00 | 17.24 | 22.82     | 13.00                   | 18.34                    | 1.17      | 0.74    | 26.22          | 13.88                  | 4.90            |
| 4000.00 | 16.75 | 22.78     | 12.33                   | 17.75                    | 1.18      | 0.79    | 25.88          | 13.49                  | 4.99            |
| 4250.00 | 16.27 | 22.87     | 11.88                   | 17.25                    | 1.20      | 0.84    | 25.23          | 12.88                  | 5.13            |
| 4500.00 | 15.78 | 22.94     | 11.47                   | 16.70                    | 1.22      | 0.89    | 24.90          | 12.54                  | 5.22            |
| 4750.00 | 15.29 | 22.98     | 11.03                   | 16.23                    | 1.26      | 0.92    | 24.74          | 12.39                  | 5.19            |
| 5000.00 | 14.79 | 22.96     | 10.71                   | 15.94                    | 1.32      | 0.92    | 24.05          | 11.70                  | 5.41            |
| 5250.00 | 14.30 | 23.01     | 10.40                   | 15.61                    | 1.40      | 0.92    | 23.58          | 11.32                  | 5.54            |
| 5500.00 | 13.83 | 23.00     | 10.18                   | 15.57                    | 1.48      | 0.91    | 23.78          | 11.26                  | 5.55            |
| 5750.00 | 13.36 | 23.04     | 10.09                   | 15.52                    | 1.55      | 0.93    | 23.25          | 10.84                  | 5.77            |
| 6000.00 | 12.88 | 23.00     | 10.14                   | 15.75                    | 1.59      | 0.95    | 22.81          | 10.38                  | 5.85            |
| 6250.00 | 12.35 | 23.13     | 10.16                   | 16.20                    | 1.65      | 1.00    | 22.51          | 10.03                  | 5.98            |
| 6500.00 | 11.80 | 23.17     | 10.14                   | 16.92                    | 1.73      | 1.02    | 21.93          | 9.67                   | 6.17            |
| 6750.00 | 11.07 | 23.27     | 9.72                    | 17.58                    | 1.88      | 1.04    | 21.27          | 9.01                   | 6.30            |
| 7000.00 | 10.44 | 23.26     | 9.06                    | 16.86                    | 1.99      | 1.05    | 21.00          | 8.98                   | 6.50            |

## 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 = 4.8V, Id = 66.38 mA @ Temperature = +105degC

| 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)            |
| 10.00   | 24.19 | 26.98     | 8.82                    | 8.19                     | 0.89      | 0.41    | --             | 18.00                  | 3.60            |
| 50.00   | 21.64 | 24.42     | 15.93                   | 16.57                    | 1.00      | 0.51    | 32.77          | 18.51                  | 4.17            |
| 100.00  | 21.23 | 24.16     | 17.84                   | 21.25                    | 1.03      | 0.51    | 33.30          | 18.65                  | 4.18            |
| 200.00  | 21.09 | 24.12     | 18.32                   | 23.46                    | 1.05      | 0.51    | 33.84          | 18.40                  | 4.17            |
| 300.00  | 21.04 | 24.06     | 18.92                   | 23.29                    | 1.05      | 0.51    | 33.27          | 18.40                  | 4.32            |
| 400.00  | 21.02 | 24.02     | 19.44                   | 23.15                    | 1.05      | 0.50    | 34.15          | 18.45                  | 4.32            |
| 500.00  | 20.98 | 24.02     | 19.96                   | 22.64                    | 1.06      | 0.50    | 33.61          | 18.51                  | 4.46            |
| 600.00  | 20.98 | 23.95     | 20.10                   | 21.79                    | 1.06      | 0.49    | 33.82          | 18.47                  | 4.37            |
| 700.00  | 20.94 | 23.92     | 20.24                   | 21.14                    | 1.05      | 0.49    | 34.32          | 18.61                  | 4.40            |
| 800.00  | 20.90 | 23.88     | 20.54                   | 20.52                    | 1.05      | 0.49    | 34.13          | 18.54                  | 4.29            |
| 900.00  | 20.88 | 23.82     | 21.07                   | 19.88                    | 1.05      | 0.49    | 33.53          | 18.41                  | 4.32            |
| 1000.00 | 20.86 | 23.77     | 21.56                   | 19.29                    | 1.04      | 0.49    | 32.77          | 18.48                  | 4.35            |
| 1250.00 | 20.76 | 23.60     | 23.10                   | 17.98                    | 1.03      | 0.48    | 33.17          | 18.61                  | 4.30            |
| 1500.00 | 20.61 | 23.44     | 25.73                   | 16.95                    | 1.03      | 0.47    | 32.47          | 18.51                  | 4.26            |
| 1750.00 | 20.40 | 23.22     | 30.19                   | 16.14                    | 1.03      | 0.46    | 31.94          | 18.24                  | 4.34            |
| 2000.00 | 20.11 | 23.09     | 30.82                   | 15.66                    | 1.04      | 0.47    | 31.09          | 17.69                  | 4.33            |
| 2250.00 | 19.78 | 22.99     | 24.94                   | 15.63                    | 1.04      | 0.51    | 30.49          | 17.16                  | 4.41            |
| 2500.00 | 19.40 | 22.89     | 20.62                   | 16.04                    | 1.05      | 0.54    | 29.54          | 16.54                  | 4.42            |
| 2750.00 | 18.98 | 22.85     | 17.68                   | 16.55                    | 1.08      | 0.58    | 28.92          | 15.81                  | 4.43            |
| 3000.00 | 18.56 | 22.77     | 15.90                   | 16.99                    | 1.10      | 0.61    | 28.30          | 15.36                  | 4.38            |
| 3250.00 | 18.12 | 22.77     | 14.68                   | 17.44                    | 1.13      | 0.64    | 27.51          | 14.76                  | 4.65            |
| 3500.00 | 17.69 | 22.76     | 13.72                   | 17.55                    | 1.15      | 0.68    | 26.88          | 14.15                  | 4.67            |
| 3750.00 | 17.22 | 22.71     | 13.03                   | 17.32                    | 1.16      | 0.73    | 26.23          | 13.65                  | 4.74            |
| 4000.00 | 16.74 | 22.75     | 12.39                   | 16.80                    | 1.17      | 0.78    | 25.87          | 13.27                  | 4.86            |
| 4250.00 | 16.27 | 22.80     | 11.95                   | 16.40                    | 1.18      | 0.84    | 25.21          | 12.68                  | 4.99            |
| 4500.00 | 15.78 | 22.87     | 11.54                   | 15.96                    | 1.20      | 0.88    | 24.88          | 12.38                  | 5.03            |
| 4750.00 | 15.31 | 22.92     | 11.10                   | 15.55                    | 1.24      | 0.91    | 24.72          | 12.19                  | 5.08            |
| 5000.00 | 14.82 | 22.90     | 10.78                   | 15.33                    | 1.31      | 0.91    | 24.09          | 11.52                  | 5.23            |
| 5250.00 | 14.34 | 22.92     | 10.47                   | 15.06                    | 1.39      | 0.90    | 23.58          | 11.12                  | 5.33            |
| 5500.00 | 13.87 | 22.94     | 10.26                   | 15.05                    | 1.47      | 0.90    | 23.71          | 11.06                  | 5.35            |
| 5750.00 | 13.42 | 23.00     | 10.16                   | 15.06                    | 1.54      | 0.92    | 23.20          | 10.60                  | 5.55            |
| 6000.00 | 12.94 | 22.96     | 10.22                   | 15.26                    | 1.57      | 0.95    | 22.74          | 10.17                  | 5.64            |
| 6250.00 | 12.41 | 23.08     | 10.23                   | 15.66                    | 1.63      | 0.99    | 22.36          | 9.82                   | 5.77            |
| 6500.00 | 11.87 | 23.08     | 10.23                   | 16.30                    | 1.70      | 1.02    | 21.76          | 9.41                   | 5.95            |
| 6750.00 | 11.13 | 23.22     | 9.80                    | 16.85                    | 1.85      | 1.04    | 21.07          | 8.80                   | 6.02            |
| 7000.00 | 10.51 | 23.21     | 9.13                    | 16.18                    | 1.97      | 1.04    | 20.78          | 8.72                   | 6.24            |

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

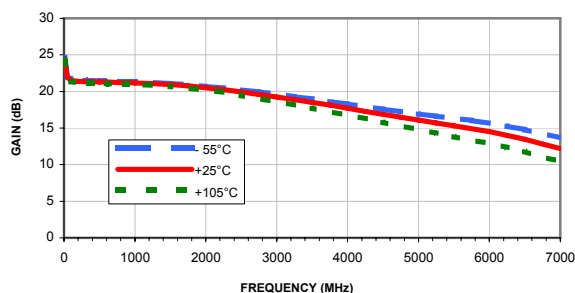
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.2V, Id = 83.97 mA @ Temperature = +105degC

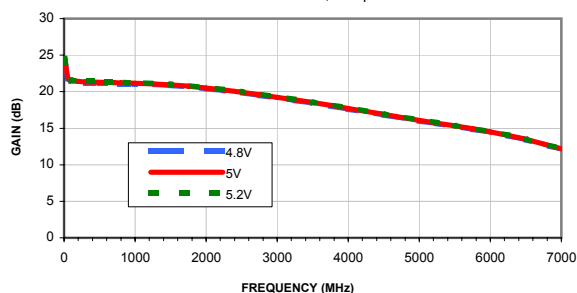
| FREQ    | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|---------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz)   | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 10.00   | 24.41 | 27.20     | 8.78                    | 8.45                     | 0.89      | 0.43    | --             | 19.63                  | 3.79            |
| 50.00   | 21.81 | 24.57     | 15.38                   | 17.17                    | 0.99      | 0.51    | 37.84          | 20.43                  | 4.38            |
| 100.00  | 21.40 | 24.36     | 16.87                   | 22.22                    | 1.03      | 0.52    | 38.17          | 20.50                  | 4.41            |
| 200.00  | 21.26 | 24.26     | 17.13                   | 24.64                    | 1.05      | 0.51    | 38.31          | 20.41                  | 4.38            |
| 300.00  | 21.20 | 24.21     | 17.66                   | 24.72                    | 1.05      | 0.51    | 37.36          | 20.43                  | 4.59            |
| 400.00  | 21.18 | 24.21     | 18.12                   | 24.67                    | 1.05      | 0.51    | 38.26          | 20.38                  | 4.54            |
| 500.00  | 21.14 | 24.17     | 18.56                   | 24.10                    | 1.06      | 0.50    | 37.53          | 20.46                  | 4.68            |
| 600.00  | 21.14 | 24.14     | 18.70                   | 23.12                    | 1.05      | 0.50    | 37.45          | 20.41                  | 4.60            |
| 700.00  | 21.10 | 24.10     | 18.83                   | 22.36                    | 1.05      | 0.50    | 37.10          | 20.47                  | 4.64            |
| 800.00  | 21.06 | 24.07     | 19.10                   | 21.72                    | 1.05      | 0.50    | 37.07          | 20.41                  | 4.52            |
| 900.00  | 21.03 | 23.98     | 19.60                   | 20.97                    | 1.04      | 0.50    | 36.08          | 20.41                  | 4.54            |
| 1000.00 | 21.01 | 23.92     | 20.04                   | 20.37                    | 1.04      | 0.50    | 34.95          | 20.43                  | 4.55            |
| 1250.00 | 20.90 | 23.72     | 21.44                   | 18.87                    | 1.03      | 0.49    | 34.53          | 20.33                  | 4.51            |
| 1500.00 | 20.74 | 23.57     | 23.77                   | 17.79                    | 1.03      | 0.47    | 33.22          | 19.98                  | 4.47            |
| 1750.00 | 20.52 | 23.34     | 28.20                   | 16.98                    | 1.04      | 0.46    | 32.25          | 19.45                  | 4.56            |
| 2000.00 | 20.22 | 23.19     | 32.60                   | 16.60                    | 1.04      | 0.48    | 31.37          | 18.68                  | 4.54            |
| 2250.00 | 19.88 | 23.05     | 26.33                   | 16.71                    | 1.05      | 0.50    | 30.37          | 17.99                  | 4.64            |
| 2500.00 | 19.49 | 22.95     | 21.11                   | 17.40                    | 1.06      | 0.54    | 29.44          | 17.20                  | 4.69            |
| 2750.00 | 19.05 | 22.87     | 17.88                   | 18.26                    | 1.08      | 0.58    | 28.72          | 16.33                  | 4.73            |
| 3000.00 | 18.61 | 22.84     | 15.89                   | 19.08                    | 1.10      | 0.62    | 28.04          | 15.85                  | 4.66            |
| 3250.00 | 18.15 | 22.77     | 14.57                   | 19.88                    | 1.13      | 0.66    | 27.21          | 15.17                  | 4.92            |
| 3500.00 | 17.69 | 22.83     | 13.56                   | 20.11                    | 1.15      | 0.71    | 26.56          | 14.44                  | 4.99            |
| 3750.00 | 17.20 | 22.83     | 12.83                   | 19.70                    | 1.17      | 0.75    | 26.03          | 14.00                  | 5.08            |
| 4000.00 | 16.69 | 22.82     | 12.18                   | 18.92                    | 1.19      | 0.80    | 25.66          | 13.59                  | 5.20            |
| 4250.00 | 16.20 | 22.88     | 11.73                   | 18.23                    | 1.21      | 0.85    | 24.97          | 12.96                  | 5.33            |
| 4500.00 | 15.69 | 22.96     | 11.31                   | 17.52                    | 1.23      | 0.90    | 24.63          | 12.68                  | 5.41            |
| 4750.00 | 15.20 | 23.02     | 10.87                   | 16.88                    | 1.27      | 0.93    | 24.51          | 12.49                  | 5.43            |
| 5000.00 | 14.69 | 23.02     | 10.56                   | 16.51                    | 1.33      | 0.94    | 23.82          | 11.80                  | 5.59            |
| 5250.00 | 14.18 | 23.03     | 10.26                   | 16.10                    | 1.41      | 0.93    | 23.43          | 11.43                  | 5.77            |
| 5500.00 | 13.70 | 23.07     | 10.06                   | 16.01                    | 1.50      | 0.93    | 23.62          | 11.36                  | 5.79            |
| 5750.00 | 13.23 | 23.07     | 9.96                    | 15.94                    | 1.57      | 0.94    | 23.08          | 10.88                  | 5.96            |
| 6000.00 | 12.74 | 23.07     | 10.02                   | 16.18                    | 1.62      | 0.96    | 22.69          | 10.49                  | 6.09            |
| 6250.00 | 12.21 | 23.17     | 10.04                   | 16.70                    | 1.69      | 1.00    | 22.41          | 10.15                  | 6.27            |
| 6500.00 | 11.66 | 23.17     | 10.02                   | 17.56                    | 1.76      | 1.03    | 21.88          | 9.82                   | 6.44            |
| 6750.00 | 10.93 | 23.35     | 9.60                    | 18.34                    | 1.92      | 1.05    | 21.27          | 9.18                   | 6.59            |
| 7000.00 | 10.30 | 23.30     | 8.94                    | 17.62                    | 2.02      | 1.06    | 21.06          | 9.14                   | 6.77            |

## Typical Performance Curves

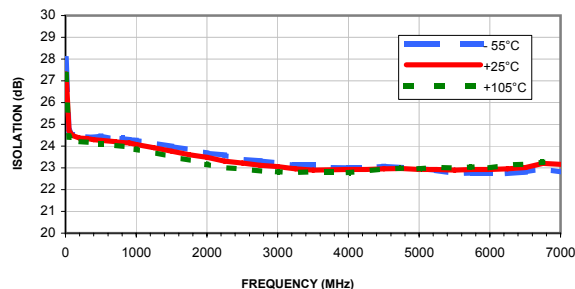
**GAIN vs. FREQUENCY & TEMPERATURE**  
INPUT POWER = -25dBm, Vd = 5V



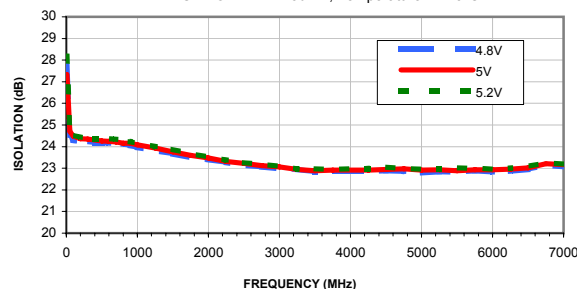
**GAIN vs. FREQUENCY & DEVICE VOLTAGE**  
INPUT POWER = -25dBm, Temperature = +25°C



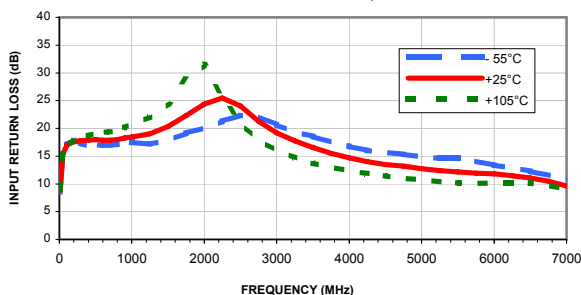
**ISOLATION vs. FREQUENCY & TEMPERATURE**  
INPUT POWER = -25dBm, Vd = 5V



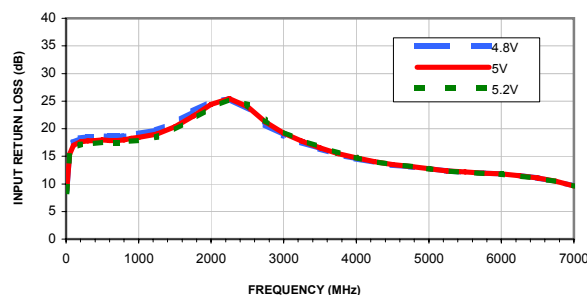
**ISOLATION vs. FREQUENCY & DEVICE VOLTAGE**  
INPUT POWER = -25dBm, Temperature = +25°C



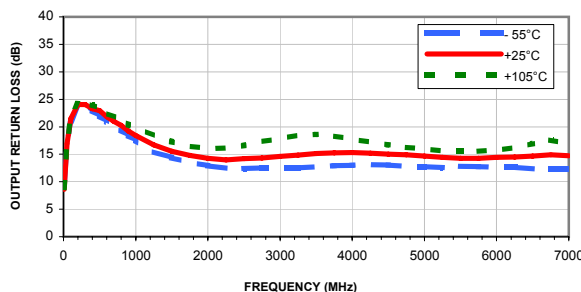
**INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE**  
INPUT POWER = -25dBm, Vd = 5V



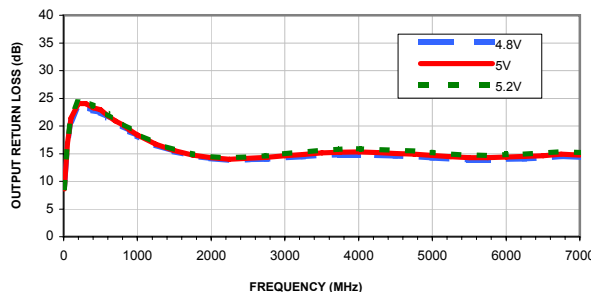
**INPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE**  
INPUT POWER = -25dBm, Temperature = +25°C



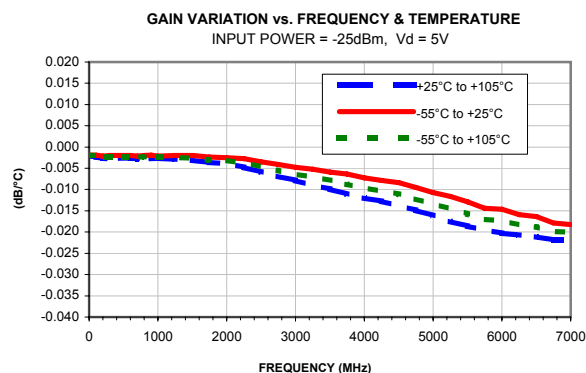
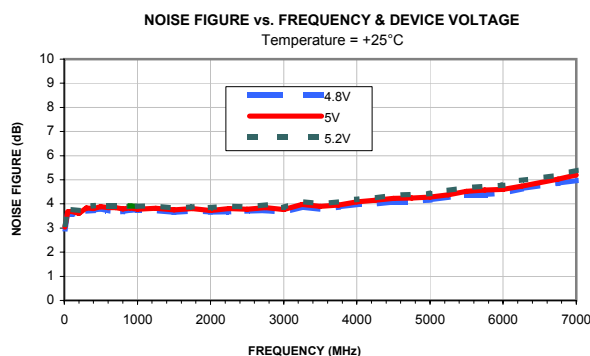
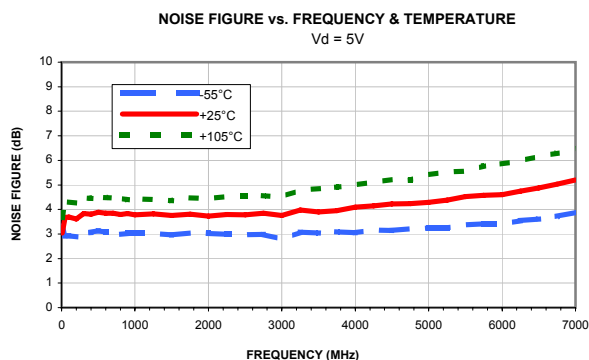
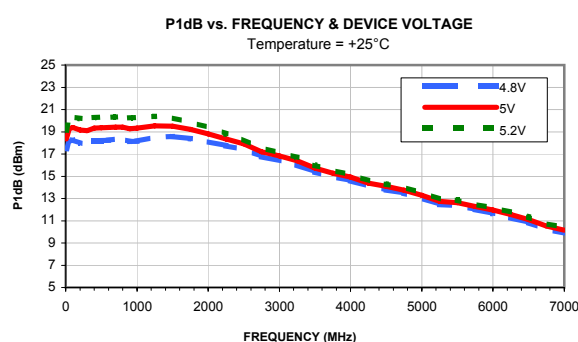
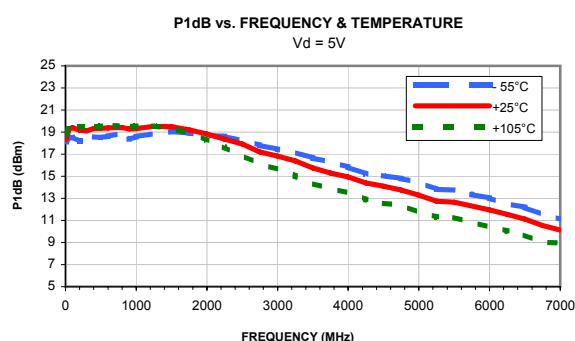
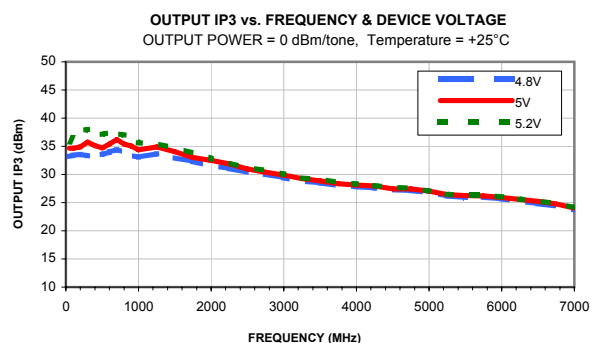
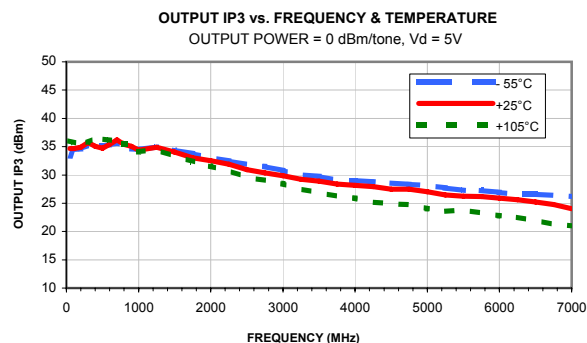
**OUTPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE**  
INPUT POWER = -25dBm, Vd = 5V



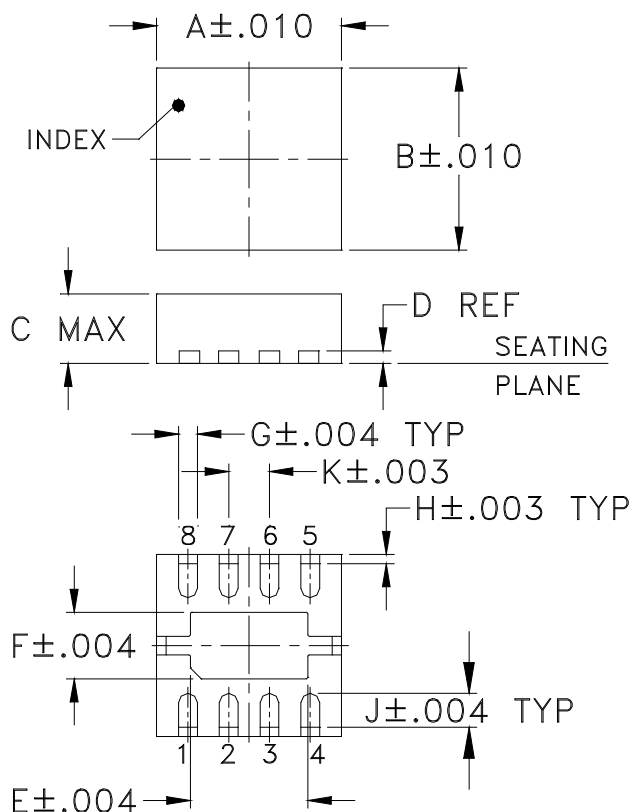
**OUTPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE**  
INPUT POWER = -25dBm, Temperature = +25°C



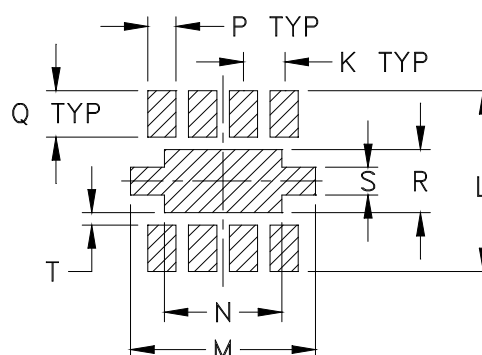
## Typical Performance Curves



## Outline Dimensions



## PCB Land Pattern



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

| CASE # | A              | B              | C              | D              | E              | F              | G              | H              | J              | K              | L              | M              | N              |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| DL1721 | .118<br>(3.00) | .118<br>(3.00) | .045<br>(1.14) | .008<br>(0.20) | .075<br>(1.91) | .043<br>(1.09) | .012<br>(0.30) | .006<br>(0.15) | .022<br>(0.56) | .026<br>(0.66) | .117<br>(2.97) | .118<br>(3.00) | .075<br>(1.91) |

| CASE # | P              | Q              | R              | S              | T              | WT. GRAM |
|--------|----------------|----------------|----------------|----------------|----------------|----------|
| DL1721 | .018<br>(0.46) | .030<br>(0.76) | .041<br>(1.04) | .018<br>(0.46) | .008<br>(0.20) | .02      |

Dimensions are in inches (mm). Tolerances: 3Pl.  $\pm .004$ , unless otherwise specified.

### Notes:

1. Case material: LTCC.
2. Termination finish: Nickel-Palladium-Gold plating.



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

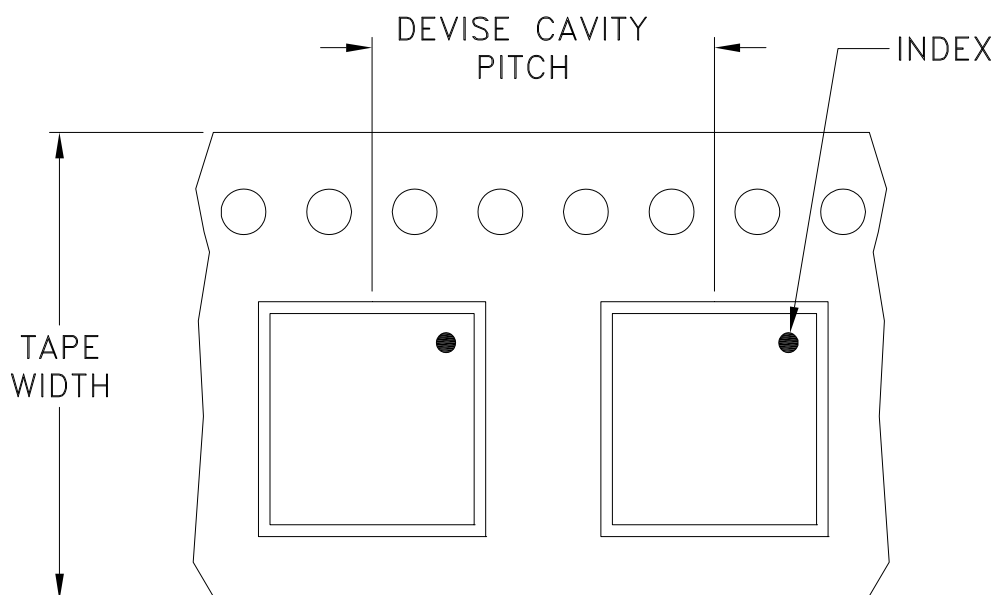


Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS



# Tape & Reel Packaging TR-F66-1



| 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 |

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

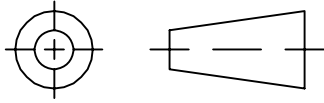
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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



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Mini-Circuits ISO 9001 & ISO 14001 Certified

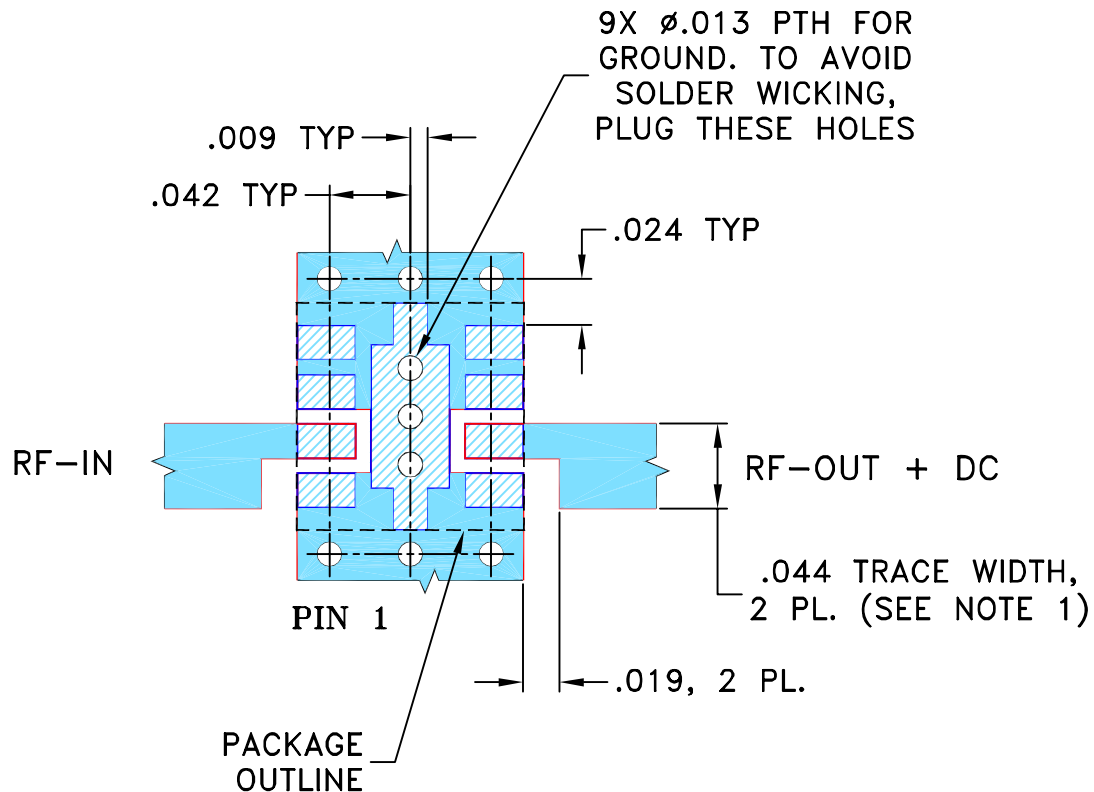
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION | DATE     | DR | AUTH |
|-----|---------|-------------|----------|----|------|
| OR  | M136376 | NEW RELEASE | 06/12/12 | PW | DJ   |
|     |         |             |          |    |      |
|     |         |             |          |    |      |

### SUGGESTED MOUNTING CONFIGURATION FOR DL1721 CASE STYLE, "08AM09" PIN CONNECTION



## NOTES:

1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS  $.020'' \pm .0015''$ ; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



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



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

## UNLESS OTHERWISE SPECIFIED

## INITIALS

## DATE

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS  $\pm .005$ 3 PL DECIMALS  $\pm .005$ ANGLES  $\pm 1^\circ$ FRACTIONS  $\pm$ 

DRAWN

PW

05/18/12

CHECKED

IL

06/05/12

APPROVED

DJ

06/12/12



# Mini-Circuits®

13 Neptune Avenue  
Brooklyn NY 11235

## PL, 08AM09, DL1721, CMA TB-656+

Mini-Circuits®

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ASHEETA1.DWG REV:A DATE:01/12/95

SIZE  
A

CODE IDENT  
15542

DRAWING NO:  
98-PL-366

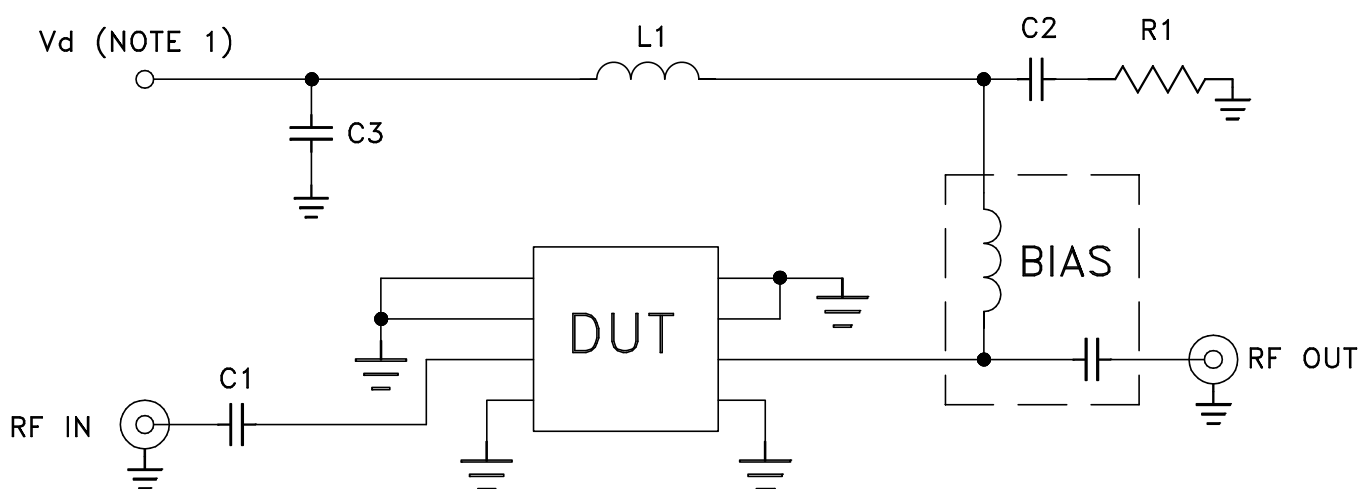
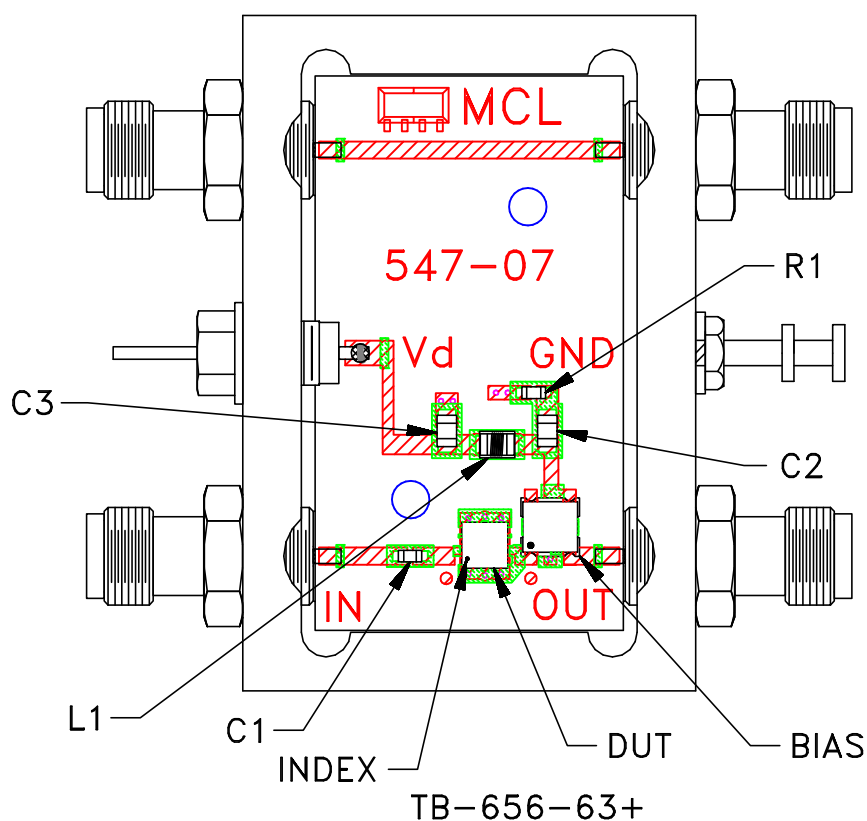
REV:  
OR

FILE: 98PL366

SCALE: 10:1

SHEET: 1 OF 1

# Evaluation Board and Circuit



| COMPONENT | DESCRIPTION            |
|-----------|------------------------|
| DUT       | CMA-63+                |
| C1        | 2.2 nF                 |
| C2,C3     | .1 uF                  |
| L1        | 15 nH                  |
| R1        | 11.5 Ohm               |
| BIAS TEE  | Mini-Circuits TCBT-14+ |

## NOTES:

1. Vd voltage: +5V.
2. SMA Female connectors.
3. PCB material: Rogers R04350 or equivalent, dielectric constant=3.5, dielectric thickness=.020 inch.

## Schematic Diagram

 **Mini-Circuits®**



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        | -55° to 105°C                                            | Individual Model Data Sheet        |
| Storage Temperature          | -65° to 125° C                                           | Individual Model Data Sheet        |
| Thermal Shock (device level) | -55° to 125°C, 100 cycles                                | MIL-STD-202, Method 107            |
| Thermal Shock (board level)  | -55° to 125°C, 1000 cycles                               | MIL-STD-202, Method 107            |
| Constant Acceleration        | Y1 plane only, 30 Kg                                     | MIL-STD-883, Method 2001, Cond. E  |
| Vibration                    | 10-2000MHz sine, 20g, 3 axis                             | MIL-STD-202, Method 204, Cond. D   |
| Mechanical Shock             | Y1 plane, 5 pulses, .5ms, 1.5 Kg                         | MIL-STD-202, Method 213, Cond. A   |
| PIND                         | 20G's @130 Hz                                            | MIL-STD-750, Method 2052.2         |
| Resistance to Soldering Heat | 3X Reflow, Peak Temperature 260°C, electrical End points | JESD22-B102                        |
| Resistance to Solvent        | 15 pieces, 5 pieces each solvent, marking permanency     | MIL-STD-202, Method 215            |
| Moisture Sensitivity Level   | Hermetic device, MSL-1 by construction                   | JESD22-A113, MSL1/260              |
| Hermeticity                  | Fine Leak, Gross Leak                                    | MIL-STD-202, Method 112, Cond. C&D |



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| Specification | Test/Inspection Condition         | Reference/Spec              |
|---------------|-----------------------------------|-----------------------------|
| Autoclave     | 15 psig, 100% RH, 121°C, 96 hours | JEDEC-STD-22-B, Method A102 |