

*Low Noise, Wideband, High IP3*

# Monolithic Amplifier

CMA-83LN+

50Ω 0.5 to 8.0 GHz

## The Big Deal

- Ceramic, hermetically sealed, nitrogen filled
- Low profile case, 0.045"
- Flat gain over wideband
- Low noise figure, 1.3 dB
- High IP3, up to +30 dBm



CASE STYLE: DL1721

*MIL Screening Available  
Please consult Applications Dept.*

## Product Overview

The CMA-83LN+ is a PHEMT based wideband, low noise MMIC amplifier with a unique combination of low noise, high IP3, and flat gain over wideband making it ideal for sensitive, high-dynamic-range receiver applications. This design operates on a single 5V or 6V supply, is well matched for 50Ω and comes in a tiny, low profile package (0.12 x 0.12 x 0.045"), accommodating dense circuit board layouts. The amplifier is bonded to a multilayer integrated LTCC substrate, then hermetically sealed under a controlled Nitrogen atmosphere with gold-plated cover, eutectic Au-Sn solder, and Ni-Pd-Au termination finish. CMA-series 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   |
|---|--|
| Hermetically Sealed   | Ideal for use anywhere long-term reliability adds bottom-line value: high moisture areas, busy production lines, high-speed distribution centers, heavy industry, outdoor settings, and unmanned facilities, as well as military applications. |
| Low noise, 1.3 dB at 2 GHz  | Enables lower system noise figure performance.   |
| High IP3<br>• +30 dBm at 2 GHz<br>• +26.7 dBm at 8 GHz                                      | Combination of low noise and high IP3 makes this MMIC amplifier ideal for use in low noise receiver front end (RFE) as it gives the user advantages of sensitivity and two-tone IM performance at both ends of the dynamic range.              |
| Low operating voltage, 5V/6V.   | Achieves high IP3 using low voltage.   |
| Wide bandwidth with flat gain<br>• ±1.2 dB over 0.5 to 7 GHz<br>• ±1.5 dB over 0.5 to 8 GHz | Enables a single amplifier to be used in many wideband applications including defense, instrumentation and more.   |
| Ceramic, hermetic package   | Low inductance, repeatable performance, outstanding reliability in tough operating conditions, and small size (0.12 x 0.12 x 0.045")   |

*Low Noise, Wideband, High IP3*

# Monolithic Amplifier

0.5-8.0 GHz

## Product Features

- Ceramic, hermetically sealed, high reliability
- Low profile case, .045" high
- Low Noise figure, 1.3 dB at 2 GHz
- High IP3, 30 dBm typ. at 2 GHz
- High Pout, P1dB 20.3 dBm typ. at 2 GHz and 6V
- Excellent Gain flatness,  $\pm 1.2$  dB over 0.5 to 7 GHz and 6V



Generic photo used for illustration purposes only

CASE STYLE: DL1721

## CMA-83LN+

## Typical Applications

- High Rel Systems
- Defense and Aerospace
- WiFi
- WLAN
- UMTS
- LTE
- WiMAX
- S-band Radar
- C-band Satcom

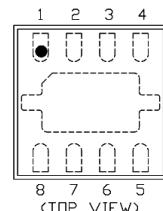
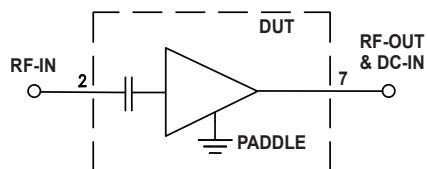
### +RoHS Compliant

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

## General Description

The CMA-83LN+ is a PHEMT based wideband, low noise MMIC amplifier with a unique combination of low noise, high IP3, and flat gain over wideband making it ideal for sensitive, high-dynamic-range receiver applications. This design operates on a single 5V or 6V supply, is well matched for  $50\Omega$  and comes in a tiny, low profile package ( $0.12 \times 0.12 \times 0.045"$ ), accommodating dense circuit board layouts. The MMIC amplifier is bonded to a multilayer integrated LTCC substrate and then hermetically sealed under a controlled Nitrogen atmosphere with gold plated cover and eutectic Au-Sn solder. Terminal finish is Ni-Pd-Au. It has repeatable lot to lot performance due to tightly controlled semiconductor and assembly processes. These amplifiers are capable of meeting MIL requirements and have been tested for hermeticity.

### *simplified schematic and pad description*



| Function         | Pad Number            | Description  |
|------------------|-----------------------|--|
| RF IN            | 2                     | Connects to RF input and to ground via L1 (optional blocking capacitor of 100pF may be used) |
| RF-OUT and DC-IN | 7                     | Connects to RF out via C3 and VDD via L2   |
| GND              | 1, 3, 5, 6, 8, Paddle | Connects to ground   |
| NC               | 4                     | Not used internally. Connected to ground on test board.                                      |

\* Enhancement mode pseudomorphic High Electron Mobility Transistor.

**Electrical Specifications<sup>(1)</sup> at 25°C and 5V/6V, unless noted**

| Parameter                                     | Condition (GHz) | V <sub>DD</sub> =6.0 |       |      | V <sub>DD</sub> =5.0 |       |      | Units |
|---|-----------------|----------------------|-------|------|----------------------|-------|------|-------|
|   |                 | Min.                 | Typ.  | Max. | Min.                 | Typ.  | Max. |       |
| Frequency Range                               |                 | 0.5                  |       | 8.0  | 0.5                  |       | 8.0  |       |
| Noise Figure                                  | 0.5             | —                    | 1.6   | —    | —                    | 1.6   | —    | dB    |
|   | 2.0             | —                    | 1.3   | 1.8  | —                    | 1.3   | —    |       |
|   | 4.0             | —                    | 1.5   | —    | —                    | 1.5   | —    |       |
|   | 5.0             | —                    | 1.6   | —    | —                    | 1.6   | 2.2  |       |
|   | 8.0             | —                    | 1.8   | —    | —                    | 1.8   | —    |       |
| Gain  | 0.5             | —                    | 21.2  | —    | —                    | 20.2  | —    | dB    |
|   | 2.0             | 18.5                 | 21.5  | 24.4 | —                    | 20.8  | —    |       |
|   | 4.0             | —                    | 20.6  | —    | —                    | 19.7  | —    |       |
|   | 5.0             | —                    | 20.1  | —    | 14.9                 | 19.3  | —    |       |
|   | 8.0             | —                    | 19.2  | —    | —                    | 18.7  | —    |       |
| Input Return Loss                             | 0.5             |                      | 12.3  |      |                      | 11.2  |      | dB    |
|   | 2.0             |                      | 17.2  |      |                      | 16.3  |      |       |
|   | 4.0             |                      | 10.0  |      |                      | 9.2   |      |       |
|   | 5.0             |                      | 8.3   |      |                      | 7.7   |      |       |
|   | 8.0             |                      | 6.5   |      |                      | 6.0   |      |       |
| Output Return Loss                            | 0.5             |                      | 14.4  |      |                      | 15.0  |      | dB    |
|   | 2.0             |                      | 17.5  |      |                      | 21.4  |      |       |
|   | 4.0             |                      | 20.1  |      |                      | 17.4  |      |       |
|   | 5.0             |                      | 13.6  |      |                      | 12.4  |      |       |
|   | 8.0             |                      | 6.4   |      |                      | 6.3   |      |       |
| Output Power @ 1dB compression                | 0.5             |                      | 17.6  |      |                      | 16.0  |      | dBm   |
|   | 2.0             |                      | 20.3  |      |                      | 19.5  |      |       |
|   | 4.0             |                      | 18.0  |      |                      | 16.0  |      |       |
|   | 5.0             |                      | 18.8  |      | 13.0                 | 16.6  | —    |       |
|   | 8.0             |                      | 16.9  |      |                      | 16.4  |      |       |
| Output IP3                                    | 0.5             |                      | 29.4  |      |                      | 26.1  |      | dBm   |
|   | 2.0             |                      | 30.1  |      |                      | 26.6  |      |       |
|   | 4.0             |                      | 28.1  |      |                      | 24.8  |      |       |
|   | 5.0             |                      | 27.2  |      | 12.3                 | 24.0  | —    |       |
|   | 8.0             |                      | 26.7  |      |                      | 24.5  |      |       |
| Device Operating Voltage                      |                 |                      | 6.0   |      |                      | 5.0   |      | V     |
| Device Operating Current                      |                 |                      | 62    | 94   |                      | 50    |      | mA    |
| DC Current Variation Vs. Temp. <sup>(2)</sup> |                 |                      | -157  |      |                      | -109  |      | µA/°C |
| DC Current Variation Vs. Voltage at 25°C      |                 |                      | 0.016 |      |                      | 0.016 |      | mA/mV |
| Thermal Resistance                            |                 |                      | 70    |      |                      | 70    |      | °C/W  |

1. Measured on Mini-Circuits Characterization test board TB-994+. See Characterization Test Circuit (Fig. 1)

2. (Current at 125°C - Current at -45°C)/170

**Absolute Maximum Ratings<sup>(3)</sup>**

| Parameter                                | Ratings  |
|--|--|
| Operating Temperature (ground lead)      | -40°C to 125°C                                   |
| Storage Temperature                      | -65°C to 150°C                                   |
| Junction Temperature                     | 150°C  |
| Total Power Dissipation                  | 0.95 W   |
| Input Power (CW), Vd=5,6V <sup>(4)</sup> | +19 dBm (5 minutes max.)<br>+16 dBm (continuous) |
| DC Voltage                               | 7 V  |

Note:

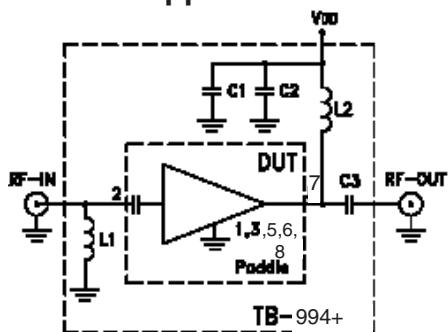
3. Permanent damage may occur if any of these limits are exceeded.

Electrical maximum ratings are not intended for continuous normal operation.

4. Measured on Mini-Circuits test board, TB-994+



## Recommended Application and Characterization Test Circuit



| Component | Vendor    | Vendor P/N         | Value  | Size |
|-----------|-----------|--------------------|--------|------|
| C1        | Murata    | GRM155R71E103KA01D | 0.01µF | 0402 |
| C2        | Murata    | GJM1555C1H100JB01D | 10pF   | 0402 |
| C3        | Murata    | GRM1555C1H101JA01D | 100pF  | 0402 |
| L1        | Murata    | LQG15HS18NJ02D     | 18nH   | 0402 |
| L2        | Coilcraft | 0402CS-39NXGLW     | 39nH   | 0402 |

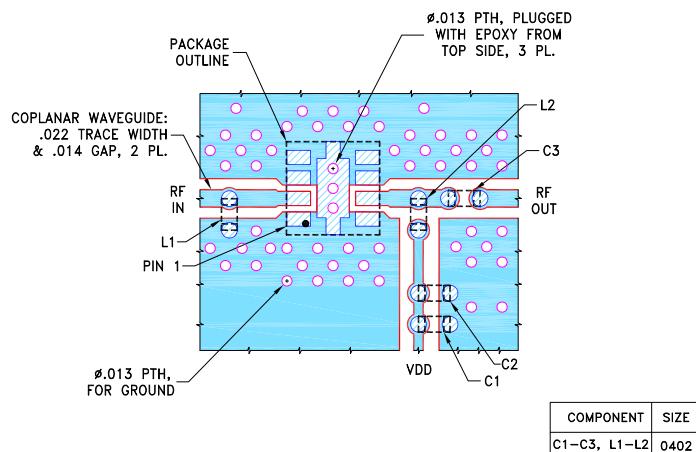
Fig 1. Application and Characterization Circuit

Note: This block diagram is used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-994+) 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.

## Suggested PCB Layout (PL-606)

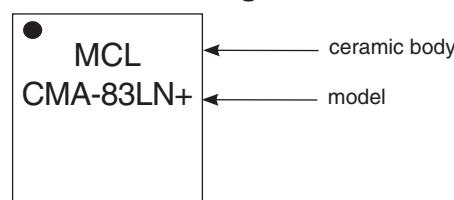


NOTES:

1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS ".010"±.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-994+.
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.

## Product Marking



| <b>Additional Detailed Technical Information</b>   |   |
|--|---|
| additional information is available on our dash board. To access this information <a href="#">click here</a> |   |
| <b>Performance Data</b>  | Data Table  |
|  | Swept Graphs  |
|  | S-Parameter (S2P Files) Data Set (.zip file)                              |
| <b>Case Style</b>  | DL1721<br><i>Ceramic package, exposed paddle, Terminal finish: NiPdAu</i> |
| <b>Tape &amp; Reel</b><br>Standard quantities available on reel  | F66-1<br><i>7" reels with 20, 50, 100, 200, 500 or 1K, 2K devices.</i>    |
| <b>Suggested Layout for PCB Design</b>   | PL-606  |
| <b>Evaluation Board</b>  | TB-994+   |
| <b>Environmental Ratings</b>   | ENV-71  |

## ESD Rating

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

Machine Model (MM): Class M1 (pass 50V) 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    |

## Additional Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/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 = 6.00V, Id = 63.81mA @ Temperature = +25°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400           | 20.35        | 27.43             | 7.98                            | 10.15                            | 1.15      | 0.79    | 28.74                   | 16.96                           | 1.91                    |
| 600           | 21.48        | 26.16             | 17.85                           | 16.16                            | 1.11      | 0.66    | 30.38                   | 18.47                           | 1.44                    |
| 800           | 21.68        | 25.90             | 33.38                           | 15.28                            | 1.10      | 0.59    | 31.43                   | 19.76                           | 1.31                    |
| 1000          | 21.71        | 25.83             | 26.15                           | 14.28                            | 1.09      | 0.57    | 32.28                   | 20.49                           | 1.27                    |
| 1200          | 21.69        | 25.81             | 22.30                           | 13.94                            | 1.09      | 0.56    | 33.03                   | 20.72                           | 1.30                    |
| 1400          | 21.65        | 25.82             | 20.58                           | 14.03                            | 1.09      | 0.57    | 33.17                   | 20.95                           | 1.29                    |
| 1600          | 21.59        | 25.86             | 19.67                           | 14.38                            | 1.10      | 0.58    | 32.08                   | 20.74                           | 1.38                    |
| 1800          | 21.57        | 25.86             | 18.67                           | 14.84                            | 1.10      | 0.59    | 31.82                   | 20.67                           | 1.38                    |
| 2000          | 21.51        | 25.89             | 18.05                           | 15.63                            | 1.10      | 0.61    | 30.54                   | 20.49                           | 1.34                    |
| 2200          | 21.45        | 25.93             | 17.38                           | 16.62                            | 1.11      | 0.63    | 31.05                   | 20.20                           | 1.35                    |
| 2400          | 21.38        | 25.99             | 16.64                           | 17.85                            | 1.12      | 0.65    | 31.36                   | 20.40                           | 1.36                    |
| 2600          | 21.28        | 26.07             | 16.00                           | 19.39                            | 1.13      | 0.68    | 30.01                   | 19.89                           | 1.37                    |
| 2800          | 21.18        | 26.16             | 15.31                           | 21.57                            | 1.14      | 0.70    | 29.99                   | 19.85                           | 1.41                    |
| 3000          | 21.12        | 26.22             | 14.43                           | 24.80                            | 1.14      | 0.72    | 28.90                   | 19.27                           | 1.43                    |
| 3200          | 21.07        | 26.26             | 13.57                           | 29.73                            | 1.14      | 0.74    | 29.55                   | 19.48                           | 1.42                    |
| 3400          | 20.99        | 26.34             | 12.86                           | 40.87                            | 1.15      | 0.76    | 29.24                   | 19.23                           | 1.41                    |
| 3600          | 20.91        | 26.43             | 12.21                           | 35.70                            | 1.15      | 0.78    | 29.28                   | 19.31                           | 1.46                    |
| 3800          | 20.82        | 26.53             | 11.59                           | 27.72                            | 1.16      | 0.80    | 28.60                   | 19.07                           | 1.42                    |
| 4000          | 20.73        | 26.61             | 11.05                           | 23.68                            | 1.16      | 0.81    | 28.60                   | 18.55                           | 1.51                    |
| 4200          | 20.62        | 26.74             | 10.57                           | 20.96                            | 1.17      | 0.83    | 28.58                   | 18.51                           | 1.51                    |
| 4400          | 20.52        | 26.90             | 10.02                           | 18.66                            | 1.18      | 0.84    | 28.21                   | 18.25                           | 1.52                    |
| 4600          | 20.41        | 27.01             | 9.59                            | 16.96                            | 1.19      | 0.85    | 28.37                   | 18.51                           | 1.50                    |
| 4800          | 20.30        | 27.22             | 9.20                            | 15.72                            | 1.20      | 0.86    | 27.85                   | 18.64                           | 1.51                    |
| 5000          | 20.21        | 27.38             | 8.85                            | 14.48                            | 1.21      | 0.87    | 27.48                   | 19.11                           | 1.54                    |
| 5200          | 20.08        | 27.54             | 8.47                            | 13.41                            | 1.22      | 0.88    | 27.29                   | 18.69                           | 1.49                    |
| 5400          | 19.98        | 27.71             | 8.18                            | 12.50                            | 1.23      | 0.88    | 27.05                   | 18.53                           | 1.53                    |
| 5600          | 19.90        | 27.93             | 7.92                            | 11.71                            | 1.24      | 0.88    | 27.79                   | 19.05                           | 1.56                    |
| 5800          | 19.80        | 28.07             | 7.74                            | 10.94                            | 1.25      | 0.88    | 27.62                   | 19.02                           | 1.63                    |
| 6000          | 19.74        | 28.33             | 7.46                            | 10.18                            | 1.26      | 0.87    | 26.87                   | 18.77                           | 1.58                    |
| 6200          | 19.66        | 28.59             | 7.25                            | 9.54                             | 1.27      | 0.87    | 26.56                   | 18.35                           | 1.58                    |
| 6400          | 19.54        | 28.72             | 7.10                            | 8.99                             | 1.27      | 0.87    | 26.80                   | 18.26                           | 1.62                    |
| 6600          | 19.48        | 29.04             | 6.93                            | 8.46                             | 1.28      | 0.86    | 27.05                   | 18.46                           | 1.65                    |
| 6800          | 19.27        | 29.26             | 6.85                            | 8.27                             | 1.31      | 0.87    | 26.44                   | 17.94                           | 1.68                    |
| 7000          | 19.37        | 29.54             | 6.85                            | 8.02                             | 1.32      | 0.87    | 26.47                   | 17.80                           | 1.62                    |
| 7200          | 19.13        | 29.94             | 6.79                            | 7.52                             | 1.36      | 0.86    | 26.29                   | 17.55                           | 1.72                    |
| 7400          | 19.17        | 29.88             | 6.41                            | 7.06                             | 1.28      | 0.86    | 26.17                   | 17.28                           | 1.70                    |
| 7600          | 19.17        | 30.06             | 6.27                            | 6.67                             | 1.25      | 0.85    | 26.22                   | 17.37                           | 1.76                    |
| 7800          | 19.13        | 30.15             | 6.16                            | 6.37                             | 1.22      | 0.85    | 25.95                   | 17.04                           | 1.75                    |
| 8000          | 19.03        | 30.19             | 6.02                            | 6.14                             | 1.18      | 0.86    | 26.20                   | 16.77                           | 1.88                    |



ISO 9001 ISO 14001 AS 9100 CERTIFIED

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

IF/RF MICROWAVE COMPONENTS



*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 = 5.00V, Id = 50.75mA @ Temperature = +25°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400           | 19.43        | 26.71             | 7.48                            | 10.32                            | 1.16      | 0.81    | 25.58                   | 14.58                           | 1.93                    |
| 600           | 20.61        | 25.39             | 15.77                           | 17.89                            | 1.11      | 0.68    | 26.81                   | 15.82                           | 1.48                    |
| 800           | 20.84        | 25.10             | 25.49                           | 17.71                            | 1.10      | 0.62    | 27.45                   | 17.04                           | 1.35                    |
| 1000          | 20.89        | 25.01             | 28.53                           | 16.51                            | 1.10      | 0.59    | 28.05                   | 18.40                           | 1.26                    |
| 1200          | 20.88        | 25.00             | 24.21                           | 16.06                            | 1.10      | 0.58    | 28.56                   | 18.83                           | 1.33                    |
| 1400          | 20.85        | 25.01             | 21.59                           | 16.18                            | 1.10      | 0.59    | 28.57                   | 19.21                           | 1.31                    |
| 1600          | 20.78        | 25.07             | 19.93                           | 16.60                            | 1.10      | 0.61    | 28.24                   | 19.03                           | 1.39                    |
| 1800          | 20.76        | 25.09             | 18.51                           | 17.20                            | 1.10      | 0.62    | 27.92                   | 19.09                           | 1.41                    |
| 2000          | 20.70        | 25.13             | 17.47                           | 18.24                            | 1.11      | 0.64    | 27.16                   | 19.18                           | 1.34                    |
| 2200          | 20.64        | 25.19             | 16.51                           | 19.57                            | 1.11      | 0.66    | 27.47                   | 18.57                           | 1.37                    |
| 2400          | 20.56        | 25.27             | 15.60                           | 21.32                            | 1.12      | 0.68    | 27.70                   | 18.75                           | 1.42                    |
| 2600          | 20.47        | 25.37             | 14.85                           | 23.65                            | 1.13      | 0.71    | 26.68                   | 18.09                           | 1.46                    |
| 2800          | 20.36        | 25.48             | 14.10                           | 27.41                            | 1.14      | 0.73    | 26.64                   | 17.62                           | 1.51                    |
| 3000          | 20.30        | 25.56             | 13.25                           | 35.05                            | 1.14      | 0.75    | 25.71                   | 17.17                           | 1.39                    |
| 3200          | 20.25        | 25.62             | 12.45                           | 39.28                            | 1.14      | 0.77    | 26.25                   | 17.38                           | 1.52                    |
| 3400          | 20.17        | 25.71             | 11.80                           | 29.78                            | 1.15      | 0.79    | 26.00                   | 16.73                           | 1.52                    |
| 3600          | 20.09        | 25.83             | 11.22                           | 25.02                            | 1.15      | 0.80    | 26.00                   | 16.92                           | 1.49                    |
| 3800          | 20.01        | 25.94             | 10.67                           | 21.93                            | 1.16      | 0.82    | 25.47                   | 16.64                           | 1.46                    |
| 4000          | 19.93        | 26.04             | 10.19                           | 19.72                            | 1.16      | 0.83    | 25.41                   | 15.97                           | 1.50                    |
| 4200          | 19.82        | 26.18             | 9.77                            | 17.98                            | 1.17      | 0.84    | 25.46                   | 15.80                           | 1.56                    |
| 4400          | 19.72        | 26.36             | 9.28                            | 16.36                            | 1.18      | 0.86    | 25.11                   | 15.33                           | 1.54                    |
| 4600          | 19.62        | 26.48             | 8.90                            | 15.10                            | 1.18      | 0.87    | 25.35                   | 15.76                           | 1.54                    |
| 4800          | 19.53        | 26.70             | 8.55                            | 14.15                            | 1.19      | 0.88    | 24.87                   | 15.98                           | 1.62                    |
| 5000          | 19.44        | 26.86             | 8.24                            | 13.17                            | 1.20      | 0.88    | 24.42                   | 16.58                           | 1.63                    |
| 5200          | 19.33        | 27.03             | 7.91                            | 12.29                            | 1.21      | 0.89    | 24.30                   | 16.57                           | 1.60                    |
| 5400          | 19.24        | 27.21             | 7.64                            | 11.55                            | 1.22      | 0.89    | 24.18                   | 16.64                           | 1.65                    |
| 5600          | 19.17        | 27.43             | 7.42                            | 10.89                            | 1.23      | 0.89    | 24.89                   | 17.61                           | 1.62                    |
| 5800          | 19.09        | 27.58             | 7.26                            | 10.24                            | 1.23      | 0.88    | 24.76                   | 17.58                           | 1.58                    |
| 6000          | 19.03        | 27.84             | 7.01                            | 9.59                             | 1.24      | 0.88    | 24.07                   | 17.59                           | 1.67                    |
| 6200          | 18.97        | 28.10             | 6.82                            | 9.06                             | 1.25      | 0.88    | 23.65                   | 17.21                           | 1.64                    |
| 6400          | 18.87        | 28.25             | 6.68                            | 8.56                             | 1.25      | 0.87    | 23.99                   | 17.00                           | 1.65                    |
| 6600          | 18.82        | 28.56             | 6.53                            | 8.11                             | 1.26      | 0.87    | 24.28                   | 17.51                           | 1.64                    |
| 6800          | 18.63        | 28.79             | 6.45                            | 7.95                             | 1.28      | 0.88    | 23.73                   | 17.02                           | 1.77                    |
| 7000          | 18.75        | 29.06             | 6.46                            | 7.77                             | 1.29      | 0.88    | 23.85                   | 16.86                           | 1.78                    |
| 7200          | 18.53        | 29.48             | 6.42                            | 7.31                             | 1.34      | 0.87    | 23.77                   | 16.67                           | 2.00                    |
| 7400          | 18.58        | 29.46             | 6.02                            | 6.89                             | 1.26      | 0.87    | 23.76                   | 16.45                           | 1.81                    |
| 7600          | 18.60        | 29.64             | 5.89                            | 6.56                             | 1.23      | 0.87    | 23.86                   | 16.69                           | 1.80                    |
| 7800          | 18.57        | 29.77             | 5.79                            | 6.28                             | 1.20      | 0.87    | 23.84                   | 16.42                           | 1.80                    |
| 8000          | 18.49        | 29.85             | 5.64                            | 6.07                             | 1.17      | 0.87    | 24.32                   | 16.11                           | 1.86                    |



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IF/RF MICROWAVE COMPONENTS



*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 = 6.25V, Id = 67.35mA @ Temperature = +25°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400           | 20.57        | 27.62             | 8.02                            | 10.10                            | 1.15      | 0.79    | 29.36                   | 17.65                           | 1.88                    |
| 600           | 21.70        | 26.37             | 18.06                           | 15.94                            | 1.11      | 0.66    | 31.09                   | 19.01                           | 1.45                    |
| 800           | 21.89        | 26.10             | 34.22                           | 15.04                            | 1.09      | 0.59    | 32.13                   | 20.17                           | 1.31                    |
| 1000          | 21.92        | 26.03             | 25.78                           | 14.07                            | 1.09      | 0.56    | 33.31                   | 20.80                           | 1.24                    |
| 1200          | 21.89        | 26.01             | 22.08                           | 13.75                            | 1.09      | 0.56    | 33.89                   | 21.08                           | 1.29                    |
| 1400          | 21.86        | 26.02             | 20.43                           | 13.84                            | 1.09      | 0.56    | 34.33                   | 21.31                           | 1.30                    |
| 1600          | 21.80        | 26.06             | 19.59                           | 14.18                            | 1.10      | 0.58    | 32.96                   | 21.09                           | 1.34                    |
| 1800          | 21.77        | 26.06             | 18.64                           | 14.64                            | 1.10      | 0.59    | 32.61                   | 21.02                           | 1.38                    |
| 2000          | 21.71        | 26.09             | 18.06                           | 15.41                            | 1.10      | 0.61    | 31.44                   | 20.84                           | 1.31                    |
| 2200          | 21.65        | 26.12             | 17.40                           | 16.37                            | 1.11      | 0.63    | 31.68                   | 20.58                           | 1.36                    |
| 2400          | 21.57        | 26.18             | 16.69                           | 17.57                            | 1.12      | 0.65    | 32.14                   | 20.75                           | 1.40                    |
| 2600          | 21.48        | 26.25             | 16.04                           | 19.07                            | 1.13      | 0.68    | 30.75                   | 20.26                           | 1.41                    |
| 2800          | 21.37        | 26.34             | 15.37                           | 21.16                            | 1.14      | 0.70    | 30.71                   | 20.21                           | 1.49                    |
| 3000          | 21.31        | 26.40             | 14.50                           | 24.22                            | 1.14      | 0.72    | 29.62                   | 19.64                           | 1.39                    |
| 3200          | 21.25        | 26.44             | 13.62                           | 28.80                            | 1.14      | 0.74    | 30.14                   | 19.86                           | 1.46                    |
| 3400          | 21.17        | 26.51             | 12.91                           | 38.24                            | 1.15      | 0.76    | 29.91                   | 19.67                           | 1.49                    |
| 3600          | 21.08        | 26.61             | 12.25                           | 37.93                            | 1.15      | 0.78    | 29.81                   | 19.68                           | 1.47                    |
| 3800          | 20.99        | 26.70             | 11.63                           | 28.43                            | 1.16      | 0.80    | 29.33                   | 19.35                           | 1.44                    |
| 4000          | 20.90        | 26.78             | 11.08                           | 24.12                            | 1.16      | 0.81    | 29.21                   | 18.99                           | 1.49                    |
| 4200          | 20.78        | 26.91             | 10.61                           | 21.28                            | 1.17      | 0.83    | 29.17                   | 18.94                           | 1.55                    |
| 4400          | 20.67        | 27.07             | 10.06                           | 18.88                            | 1.18      | 0.84    | 28.75                   | 18.72                           | 1.52                    |
| 4600          | 20.56        | 27.17             | 9.62                            | 17.14                            | 1.19      | 0.85    | 28.93                   | 18.97                           | 1.52                    |
| 4800          | 20.45        | 27.38             | 9.23                            | 15.86                            | 1.20      | 0.86    | 28.48                   | 19.09                           | 1.62                    |
| 5000          | 20.35        | 27.53             | 8.87                            | 14.59                            | 1.21      | 0.87    | 28.11                   | 19.53                           | 1.60                    |
| 5200          | 20.23        | 27.69             | 8.50                            | 13.50                            | 1.22      | 0.88    | 27.89                   | 19.05                           | 1.57                    |
| 5400          | 20.12        | 27.86             | 8.21                            | 12.57                            | 1.23      | 0.88    | 27.59                   | 18.86                           | 1.58                    |
| 5600          | 20.03        | 28.08             | 7.95                            | 11.75                            | 1.25      | 0.88    | 28.26                   | 19.23                           | 1.59                    |
| 5800          | 19.93        | 28.22             | 7.76                            | 10.98                            | 1.25      | 0.88    | 28.18                   | 19.16                           | 1.54                    |
| 6000          | 19.86        | 28.48             | 7.49                            | 10.21                            | 1.26      | 0.88    | 27.42                   | 18.89                           | 1.62                    |
| 6200          | 19.78        | 28.74             | 7.28                            | 9.56                             | 1.27      | 0.87    | 27.09                   | 18.59                           | 1.64                    |
| 6400          | 19.65        | 28.86             | 7.14                            | 9.00                             | 1.27      | 0.87    | 27.30                   | 18.46                           | 1.66                    |
| 6600          | 19.58        | 29.17             | 6.97                            | 8.46                             | 1.29      | 0.86    | 27.59                   | 18.60                           | 1.62                    |
| 6800          | 19.37        | 29.39             | 6.89                            | 8.27                             | 1.31      | 0.88    | 26.93                   | 18.08                           | 1.73                    |
| 7000          | 19.47        | 29.66             | 6.89                            | 8.01                             | 1.32      | 0.87    | 26.94                   | 17.92                           | 1.77                    |
| 7200          | 19.23        | 30.04             | 6.83                            | 7.51                             | 1.36      | 0.86    | 26.70                   | 17.68                           | 1.96                    |
| 7400          | 19.26        | 29.97             | 6.46                            | 7.04                             | 1.28      | 0.86    | 26.55                   | 17.39                           | 1.77                    |
| 7600          | 19.26        | 30.13             | 6.30                            | 6.66                             | 1.25      | 0.85    | 26.62                   | 17.37                           | 1.74                    |
| 7800          | 19.21        | 30.20             | 6.20                            | 6.35                             | 1.21      | 0.85    | 26.36                   | 17.11                           | 1.80                    |
| 8000          | 19.10        | 30.22             | 6.06                            | 6.12                             | 1.17      | 0.86    | 26.55                   | 16.86                           | 1.84                    |



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IF/RF MICROWAVE COMPONENTS



*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 = 6.00V, Id = 72.73mA @ Temperature = -45°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400           | 19.97        | 26.72             | 10.33                           | 9.01                             | 1.13      | 0.71    | 31.81                   | 19.31                           | 1.46                    |
| 600           | 20.86        | 25.70             | 26.69                           | 10.71                            | 1.10      | 0.57    | 33.13                   | 21.34                           | 1.13                    |
| 800           | 20.92        | 25.56             | 16.30                           | 9.77                             | 1.09      | 0.51    | 33.83                   | 21.91                           | 1.05                    |
| 1000          | 20.91        | 25.52             | 13.94                           | 9.26                             | 1.08      | 0.49    | 34.20                   | 22.13                           | 0.98                    |
| 1200          | 20.89        | 25.51             | 13.17                           | 9.08                             | 1.08      | 0.48    | 32.38                   | 22.20                           | 1.03                    |
| 1400          | 20.84        | 25.52             | 12.52                           | 8.84                             | 1.08      | 0.48    | 31.85                   | 22.30                           | 1.02                    |
| 1600          | 20.83        | 25.52             | 12.62                           | 8.98                             | 1.08      | 0.49    | 31.69                   | 22.33                           | 1.10                    |
| 1800          | 20.85        | 25.49             | 12.78                           | 9.14                             | 1.08      | 0.49    | 32.69                   | 22.37                           | 1.11                    |
| 2000          | 20.87        | 25.45             | 13.28                           | 9.53                             | 1.08      | 0.50    | 31.81                   | 22.12                           | 1.02                    |
| 2200          | 20.88        | 25.42             | 13.88                           | 9.89                             | 1.09      | 0.51    | 30.96                   | 21.93                           | 1.03                    |
| 2400          | 20.87        | 25.41             | 14.25                           | 10.19                            | 1.09      | 0.52    | 31.20                   | 22.07                           | 1.11                    |
| 2600          | 20.85        | 25.42             | 15.08                           | 10.71                            | 1.10      | 0.53    | 31.76                   | 21.90                           | 1.12                    |
| 2800          | 20.84        | 25.43             | 16.11                           | 11.54                            | 1.10      | 0.56    | 32.10                   | 21.72                           | 1.19                    |
| 3000          | 20.88        | 25.39             | 17.92                           | 12.74                            | 1.11      | 0.58    | 31.02                   | 20.89                           | 1.06                    |
| 3200          | 20.94        | 25.33             | 19.20                           | 13.60                            | 1.10      | 0.58    | 30.92                   | 20.83                           | 1.11                    |
| 3400          | 20.95        | 25.32             | 19.94                           | 14.39                            | 1.10      | 0.59    | 30.87                   | 20.55                           | 1.11                    |
| 3600          | 20.96        | 25.33             | 20.78                           | 15.62                            | 1.11      | 0.61    | 30.79                   | 20.26                           | 1.10                    |
| 3800          | 20.96        | 25.34             | 20.63                           | 17.24                            | 1.11      | 0.62    | 30.26                   | 19.44                           | 1.06                    |
| 4000          | 20.97        | 25.35             | 20.13                           | 19.41                            | 1.11      | 0.64    | 29.97                   | 18.47                           | 1.09                    |
| 4200          | 20.94        | 25.40             | 19.60                           | 21.25                            | 1.12      | 0.65    | 29.42                   | 18.27                           | 1.12                    |
| 4400          | 20.92        | 25.47             | 18.56                           | 23.48                            | 1.12      | 0.66    | 29.32                   | 17.78                           | 1.08                    |
| 4600          | 20.90        | 25.50             | 17.90                           | 26.67                            | 1.12      | 0.67    | 29.08                   | 18.07                           | 1.09                    |
| 4800          | 20.88        | 25.63             | 16.47                           | 33.06                            | 1.13      | 0.69    | 28.63                   | 17.68                           | 1.15                    |
| 5000          | 20.86        | 25.71             | 15.41                           | 33.75                            | 1.13      | 0.70    | 28.83                   | 17.96                           | 1.15                    |
| 5200          | 20.80        | 25.81             | 14.29                           | 28.03                            | 1.14      | 0.72    | 28.35                   | 17.26                           | 1.15                    |
| 5400          | 20.78        | 25.92             | 13.63                           | 23.70                            | 1.15      | 0.72    | 27.32                   | 16.80                           | 1.25                    |
| 5600          | 20.76        | 26.09             | 12.70                           | 20.58                            | 1.15      | 0.73    | 28.62                   | 17.91                           | 1.15                    |
| 5800          | 20.71        | 26.23             | 11.72                           | 17.60                            | 1.16      | 0.74    | 28.71                   | 18.05                           | 1.09                    |
| 6000          | 20.68        | 26.43             | 10.91                           | 15.54                            | 1.17      | 0.74    | 27.88                   | 17.43                           | 1.16                    |
| 6200          | 20.66        | 26.67             | 10.29                           | 14.07                            | 1.18      | 0.74    | 27.73                   | 17.05                           | 1.16                    |
| 6400          | 20.59        | 26.85             | 9.94                            | 12.88                            | 1.18      | 0.74    | 28.00                   | 16.98                           | 1.19                    |
| 6600          | 20.54        | 27.13             | 9.20                            | 11.53                            | 1.19      | 0.74    | 28.75                   | 18.31                           | 1.16                    |
| 6800          | 20.42        | 27.36             | 8.99                            | 10.70                            | 1.21      | 0.74    | 28.00                   | 17.85                           | 1.25                    |
| 7000          | 20.42        | 27.79             | 8.78                            | 11.07                            | 1.24      | 0.78    | 28.15                   | 18.04                           | 1.24                    |
| 7200          | 20.38        | 28.18             | 8.63                            | 9.93                             | 1.27      | 0.76    | 28.00                   | 17.86                           | 1.46                    |
| 7400          | 20.49        | 28.27             | 8.39                            | 9.16                             | 1.25      | 0.74    | 27.66                   | 17.58                           | 1.28                    |
| 7600          | 20.56        | 28.68             | 8.30                            | 8.51                             | 1.26      | 0.73    | 28.20                   | 18.24                           | 1.26                    |
| 7800          | 20.63        | 29.01             | 8.31                            | 8.07                             | 1.27      | 0.72    | 27.74                   | 18.13                           | 1.24                    |
| 8000          | 20.68        | 29.30             | 8.22                            | 7.77                             | 1.27      | 0.72    | 27.86                   | 17.74                           | 1.31                    |



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IF/RF MICROWAVE COMPONENTS



# MMIC Amplifier

CMA-83LN+

## 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 = 5.00V, Id = 55.19mA @ 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)            |
| 400   | 19.07 | 25.93     | 9.43                    | 9.76                     | 1.15      | 0.75    | 26.78          | 14.97                  | 1.50            |
| 600   | 20.04 | 24.82     | 31.99                   | 12.58                    | 1.11      | 0.61    | 28.73          | 17.90                  | 1.13            |
| 800   | 20.16 | 24.64     | 20.12                   | 11.51                    | 1.10      | 0.55    | 30.00          | 19.81                  | 1.07            |
| 1000  | 20.17 | 24.60     | 16.60                   | 10.88                    | 1.09      | 0.53    | 31.31          | 20.21                  | 1.00            |
| 1200  | 20.15 | 24.59     | 15.50                   | 10.65                    | 1.09      | 0.52    | 31.99          | 20.26                  | 1.10            |
| 1400  | 20.12 | 24.61     | 14.57                   | 10.35                    | 1.09      | 0.52    | 32.60          | 20.39                  | 1.07            |
| 1600  | 20.10 | 24.63     | 14.56                   | 10.51                    | 1.09      | 0.53    | 30.54          | 20.41                  | 1.16            |
| 1800  | 20.11 | 24.62     | 14.66                   | 10.72                    | 1.09      | 0.53    | 30.47          | 20.46                  | 1.15            |
| 2000  | 20.12 | 24.61     | 15.10                   | 11.20                    | 1.10      | 0.54    | 28.53          | 20.27                  | 1.06            |
| 2200  | 20.12 | 24.61     | 15.64                   | 11.65                    | 1.10      | 0.55    | 28.70          | 19.84                  | 1.06            |
| 2400  | 20.11 | 24.63     | 15.84                   | 12.03                    | 1.10      | 0.57    | 29.43          | 20.00                  | 1.13            |
| 2600  | 20.08 | 24.67     | 16.58                   | 12.68                    | 1.11      | 0.59    | 28.10          | 19.89                  | 1.15            |
| 2800  | 20.05 | 24.72     | 17.32                   | 13.72                    | 1.12      | 0.61    | 28.17          | 19.67                  | 1.19            |
| 3000  | 20.08 | 24.73     | 18.25                   | 15.31                    | 1.12      | 0.63    | 26.54          | 18.93                  | 1.09            |
| 3200  | 20.13 | 24.70     | 18.54                   | 16.46                    | 1.12      | 0.64    | 27.18          | 18.79                  | 1.16            |
| 3400  | 20.13 | 24.72     | 18.37                   | 17.54                    | 1.12      | 0.65    | 26.92          | 18.23                  | 1.11            |
| 3600  | 20.14 | 24.76     | 18.17                   | 19.21                    | 1.12      | 0.66    | 26.86          | 17.91                  | 1.12            |
| 3800  | 20.13 | 24.81     | 17.34                   | 21.54                    | 1.12      | 0.68    | 26.15          | 16.84                  | 1.07            |
| 4000  | 20.13 | 24.85     | 16.61                   | 24.71                    | 1.12      | 0.69    | 25.99          | 16.00                  | 1.13            |
| 4200  | 20.11 | 24.92     | 16.13                   | 27.20                    | 1.13      | 0.70    | 25.86          | 15.64                  | 1.13            |
| 4400  | 20.09 | 25.01     | 15.43                   | 28.40                    | 1.13      | 0.71    | 25.50          | 15.03                  | 1.11            |
| 4600  | 20.07 | 25.07     | 15.02                   | 26.42                    | 1.14      | 0.72    | 25.64          | 15.46                  | 1.10            |
| 4800  | 20.04 | 25.22     | 14.06                   | 24.77                    | 1.14      | 0.73    | 25.04          | 15.06                  | 1.20            |
| 5000  | 20.03 | 25.34     | 13.32                   | 22.61                    | 1.15      | 0.74    | 24.89          | 15.65                  | 1.17            |
| 5200  | 19.98 | 25.46     | 12.51                   | 20.71                    | 1.15      | 0.75    | 24.56          | 15.11                  | 1.16            |
| 5400  | 19.96 | 25.59     | 12.06                   | 18.81                    | 1.16      | 0.76    | 23.98          | 14.93                  | 1.20            |
| 5600  | 19.95 | 25.77     | 11.34                   | 17.17                    | 1.17      | 0.77    | 25.18          | 16.03                  | 1.17            |
| 5800  | 19.90 | 25.93     | 10.57                   | 15.25                    | 1.17      | 0.77    | 25.11          | 16.16                  | 1.12            |
| 6000  | 19.88 | 26.14     | 9.92                    | 13.84                    | 1.18      | 0.77    | 24.23          | 16.03                  | 1.18            |
| 6200  | 19.87 | 26.39     | 9.42                    | 12.76                    | 1.19      | 0.77    | 23.95          | 15.64                  | 1.18            |
| 6400  | 19.82 | 26.58     | 9.13                    | 11.81                    | 1.19      | 0.77    | 24.21          | 15.56                  | 1.19            |
| 6600  | 19.77 | 26.86     | 8.50                    | 10.75                    | 1.20      | 0.77    | 24.84          | 16.81                  | 1.17            |
| 6800  | 19.68 | 27.09     | 8.33                    | 10.07                    | 1.22      | 0.77    | 24.21          | 16.78                  | 1.28            |
| 7000  | 19.70 | 27.49     | 8.15                    | 10.50                    | 1.25      | 0.80    | 24.32          | 17.29                  | 1.28            |
| 7200  | 19.68 | 27.88     | 8.08                    | 9.54                     | 1.28      | 0.78    | 24.37          | 17.44                  | 1.48            |
| 7400  | 19.81 | 27.98     | 7.80                    | 8.90                     | 1.25      | 0.76    | 24.24          | 17.15                  | 1.29            |
| 7600  | 19.90 | 28.37     | 7.69                    | 8.33                     | 1.26      | 0.76    | 24.73          | 18.17                  | 1.26            |
| 7800  | 19.99 | 28.68     | 7.67                    | 7.97                     | 1.26      | 0.75    | 24.60          | 18.13                  | 1.28            |
| 8000  | 20.06 | 28.98     | 7.57                    | 7.72                     | 1.27      | 0.76    | 25.29          | 17.61                  | 1.31            |

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IF/RF MICROWAVE COMPONENTS



*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 = 6.25V, Id = 76.65mA @ Temperature = -45°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400           | 20.14        | 26.85             | 10.47                           | 8.91                             | 1.13      | 0.70    | 32.60                   | 20.25                           | 1.44                    |
| 600           | 21.01        | 25.85             | 25.52                           | 10.52                            | 1.10      | 0.57    | 33.37                   | 21.83                           | 1.13                    |
| 800           | 21.07        | 25.71             | 15.89                           | 9.59                             | 1.08      | 0.51    | 33.16                   | 22.38                           | 1.05                    |
| 1000          | 21.05        | 25.68             | 13.65                           | 9.10                             | 1.08      | 0.49    | 33.42                   | 22.56                           | 1.02                    |
| 1200          | 21.02        | 25.66             | 12.91                           | 8.92                             | 1.08      | 0.48    | 31.98                   | 22.64                           | 1.05                    |
| 1400          | 20.98        | 25.68             | 12.30                           | 8.69                             | 1.08      | 0.47    | 31.59                   | 22.74                           | 1.02                    |
| 1600          | 20.96        | 25.67             | 12.41                           | 8.82                             | 1.08      | 0.48    | 31.56                   | 22.76                           | 1.10                    |
| 1800          | 20.98        | 25.64             | 12.57                           | 8.98                             | 1.08      | 0.48    | 32.26                   | 22.81                           | 1.13                    |
| 2000          | 21.00        | 25.59             | 13.09                           | 9.36                             | 1.08      | 0.49    | 31.87                   | 22.57                           | 1.03                    |
| 2200          | 21.02        | 25.56             | 13.68                           | 9.71                             | 1.08      | 0.50    | 30.96                   | 22.43                           | 1.05                    |
| 2400          | 21.01        | 25.55             | 14.05                           | 10.00                            | 1.09      | 0.51    | 31.26                   | 22.54                           | 1.10                    |
| 2600          | 21.00        | 25.55             | 14.89                           | 10.52                            | 1.09      | 0.53    | 32.12                   | 22.42                           | 1.08                    |
| 2800          | 20.98        | 25.56             | 15.93                           | 11.33                            | 1.10      | 0.55    | 32.24                   | 22.24                           | 1.13                    |
| 3000          | 21.03        | 25.51             | 17.84                           | 12.50                            | 1.10      | 0.57    | 31.49                   | 21.47                           | 1.06                    |
| 3200          | 21.09        | 25.45             | 19.19                           | 13.33                            | 1.10      | 0.57    | 31.40                   | 21.39                           | 1.09                    |
| 3400          | 21.10        | 25.43             | 20.05                           | 14.11                            | 1.10      | 0.59    | 31.30                   | 21.15                           | 1.12                    |
| 3600          | 21.11        | 25.44             | 21.08                           | 15.30                            | 1.10      | 0.60    | 31.33                   | 20.86                           | 1.08                    |
| 3800          | 21.11        | 25.44             | 21.09                           | 16.87                            | 1.11      | 0.62    | 30.83                   | 20.17                           | 1.05                    |
| 4000          | 21.11        | 25.45             | 20.65                           | 18.98                            | 1.11      | 0.63    | 30.47                   | 19.20                           | 1.09                    |
| 4200          | 21.08        | 25.49             | 20.11                           | 20.76                            | 1.11      | 0.64    | 30.06                   | 18.99                           | 1.12                    |
| 4400          | 21.06        | 25.56             | 18.98                           | 22.92                            | 1.12      | 0.66    | 29.87                   | 18.51                           | 1.07                    |
| 4600          | 21.04        | 25.59             | 18.29                           | 26.24                            | 1.12      | 0.67    | 29.58                   | 18.77                           | 1.08                    |
| 4800          | 21.02        | 25.71             | 16.77                           | 33.30                            | 1.13      | 0.68    | 29.14                   | 18.35                           | 1.14                    |
| 5000          | 20.99        | 25.80             | 15.64                           | 37.18                            | 1.13      | 0.70    | 29.35                   | 18.61                           | 1.15                    |
| 5200          | 20.94        | 25.90             | 14.47                           | 29.27                            | 1.14      | 0.71    | 28.99                   | 17.90                           | 1.16                    |
| 5400          | 20.91        | 26.00             | 13.79                           | 24.31                            | 1.15      | 0.72    | 27.82                   | 17.38                           | 1.15                    |
| 5600          | 20.89        | 26.17             | 12.84                           | 20.89                            | 1.15      | 0.73    | 29.18                   | 18.42                           | 1.15                    |
| 5800          | 20.84        | 26.31             | 11.82                           | 17.79                            | 1.16      | 0.73    | 29.20                   | 18.58                           | 1.09                    |
| 6000          | 20.81        | 26.50             | 10.99                           | 15.66                            | 1.16      | 0.74    | 28.44                   | 17.96                           | 1.17                    |
| 6200          | 20.78        | 26.74             | 10.37                           | 14.14                            | 1.17      | 0.74    | 28.36                   | 17.50                           | 1.15                    |
| 6400          | 20.71        | 26.93             | 10.02                           | 12.92                            | 1.18      | 0.74    | 28.59                   | 17.42                           | 1.18                    |
| 6600          | 20.66        | 27.20             | 9.25                            | 11.56                            | 1.19      | 0.74    | 29.37                   | 18.71                           | 1.15                    |
| 6800          | 20.53        | 27.44             | 9.04                            | 10.71                            | 1.21      | 0.74    | 28.55                   | 18.12                           | 1.25                    |
| 7000          | 20.53        | 27.87             | 8.82                            | 11.05                            | 1.24      | 0.78    | 28.70                   | 18.30                           | 1.25                    |
| 7200          | 20.49        | 28.26             | 8.67                            | 9.90                             | 1.27      | 0.76    | 28.55                   | 18.07                           | 1.46                    |
| 7400          | 20.60        | 28.35             | 8.44                            | 9.13                             | 1.25      | 0.73    | 28.22                   | 17.81                           | 1.26                    |
| 7600          | 20.66        | 28.78             | 8.34                            | 8.46                             | 1.26      | 0.73    | 28.74                   | 18.36                           | 1.24                    |
| 7800          | 20.72        | 29.09             | 8.36                            | 8.02                             | 1.27      | 0.72    | 28.15                   | 18.23                           | 1.22                    |
| 8000          | 20.77        | 29.39             | 8.26                            | 7.72                             | 1.27      | 0.72    | 28.14                   | 17.81                           | 1.28                    |



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IF/RF MICROWAVE COMPONENTS



*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 = 6.00V, Id = 46.88mA @ Temperature = +125°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400           | 20.04        | 28.73             | 5.14                            | 8.66                             | 1.18      | 0.86    | 25.36                   | 18.17                           | 2.60                    |
| 600           | 21.51        | 27.17             | 8.72                            | 14.23                            | 1.13      | 0.75    | 26.29                   | 18.97                           | 1.95                    |
| 800           | 21.92        | 26.70             | 11.08                           | 18.31                            | 1.11      | 0.69    | 26.62                   | 19.73                           | 1.76                    |
| 1000          | 22.01        | 26.55             | 11.85                           | 20.16                            | 1.10      | 0.68    | 27.02                   | 20.43                           | 1.70                    |
| 1200          | 21.97        | 26.54             | 11.63                           | 20.15                            | 1.10      | 0.68    | 27.26                   | 20.45                           | 1.73                    |
| 1400          | 21.87        | 26.59             | 10.96                           | 19.32                            | 1.10      | 0.70    | 27.10                   | 20.67                           | 1.73                    |
| 1600          | 21.71        | 26.69             | 10.19                           | 18.62                            | 1.10      | 0.73    | 26.91                   | 20.51                           | 1.80                    |
| 1800          | 21.60        | 26.74             | 9.63                            | 17.77                            | 1.10      | 0.75    | 26.73                   | 20.54                           | 1.83                    |
| 2000          | 21.44        | 26.84             | 9.07                            | 16.99                            | 1.10      | 0.77    | 26.43                   | 20.76                           | 1.78                    |
| 2200          | 21.27        | 26.93             | 8.62                            | 16.41                            | 1.11      | 0.80    | 26.80                   | 20.25                           | 1.83                    |
| 2400          | 21.10        | 27.04             | 8.24                            | 15.93                            | 1.11      | 0.83    | 26.84                   | 20.39                           | 1.89                    |
| 2600          | 20.91        | 27.16             | 7.91                            | 15.52                            | 1.12      | 0.85    | 26.15                   | 20.17                           | 1.91                    |
| 2800          | 20.71        | 27.30             | 7.59                            | 15.03                            | 1.13      | 0.88    | 26.05                   | 20.05                           | 2.01                    |
| 3000          | 20.52        | 27.41             | 7.25                            | 14.39                            | 1.13      | 0.90    | 25.49                   | 19.93                           | 1.92                    |
| 3200          | 20.33        | 27.53             | 6.92                            | 13.68                            | 1.13      | 0.93    | 26.03                   | 19.85                           | 2.06                    |
| 3400          | 20.11        | 27.67             | 6.63                            | 12.97                            | 1.14      | 0.95    | 25.78                   | 19.50                           | 2.05                    |
| 3600          | 19.88        | 27.84             | 6.34                            | 12.23                            | 1.14      | 0.97    | 25.67                   | 19.57                           | 2.08                    |
| 3800          | 19.64        | 28.00             | 5.99                            | 11.39                            | 1.14      | 0.98    | 25.19                   | 19.47                           | 2.09                    |
| 4000          | 19.38        | 28.17             | 5.68                            | 10.68                            | 1.14      | 1.00    | 25.20                   | 19.02                           | 2.14                    |
| 4200          | 19.11        | 28.35             | 5.46                            | 10.06                            | 1.15      | 1.01    | 25.23                   | 18.75                           | 2.21                    |
| 4400          | 18.85        | 28.57             | 5.17                            | 9.36                             | 1.15      | 1.01    | 24.84                   | 18.46                           | 2.24                    |
| 4600          | 18.60        | 28.70             | 4.95                            | 8.85                             | 1.16      | 1.02    | 24.89                   | 18.17                           | 2.26                    |
| 4800          | 18.37        | 28.89             | 4.76                            | 8.39                             | 1.16      | 1.02    | 24.38                   | 17.91                           | 2.33                    |
| 5000          | 18.17        | 29.02             | 4.63                            | 7.96                             | 1.16      | 1.02    | 23.62                   | 17.58                           | 2.36                    |
| 5200          | 17.97        | 29.07             | 4.55                            | 7.64                             | 1.16      | 1.01    | 23.59                   | 16.96                           | 2.36                    |
| 5400          | 17.83        | 29.13             | 4.49                            | 7.36                             | 1.15      | 1.01    | 23.64                   | 16.59                           | 2.37                    |
| 5600          | 17.70        | 29.24             | 4.43                            | 7.07                             | 1.15      | 1.00    | 23.63                   | 16.21                           | 2.38                    |
| 5800          | 17.57        | 29.14             | 4.46                            | 6.84                             | 1.13      | 0.99    | 23.29                   | 15.71                           | 2.30                    |
| 6000          | 17.47        | 29.14             | 4.44                            | 6.58                             | 1.10      | 0.99    | 22.74                   | 15.56                           | 2.40                    |
| 6200          | 17.36        | 29.07             | 4.46                            | 6.36                             | 1.08      | 0.98    | 22.32                   | 15.22                           | 2.40                    |
| 6400          | 17.22        | 28.93             | 4.52                            | 6.21                             | 1.06      | 0.97    | 22.41                   | 14.72                           | 2.42                    |
| 6600          | 17.06        | 28.93             | 4.49                            | 6.06                             | 1.03      | 0.98    | 22.21                   | 14.33                           | 2.40                    |
| 6800          | 16.92        | 28.89             | 4.48                            | 6.02                             | 1.02      | 0.99    | 21.74                   | 14.04                           | 2.55                    |
| 7000          | 16.74        | 28.71             | 4.63                            | 5.75                             | 1.00      | 0.97    | 21.56                   | 13.71                           | 2.63                    |
| 7200          | 16.36        | 28.69             | 4.62                            | 5.57                             | 1.00      | 0.96    | 21.33                   | 13.44                           | 2.78                    |
| 7400          | 16.28        | 28.46             | 4.26                            | 5.30                             | 0.89      | 0.97    | 21.31                   | 13.08                           | 2.63                    |
| 7600          | 16.07        | 28.18             | 4.17                            | 5.09                             | 0.83      | 0.97    | 20.81                   | 12.89                           | 2.67                    |
| 7800          | 15.80        | 27.92             | 4.11                            | 4.91                             | 0.78      | 0.97    | 20.72                   | 12.63                           | 2.69                    |
| 8000          | 15.53        | 27.73             | 4.04                            | 4.77                             | 0.75      | 0.97    | 20.91                   | 12.27                           | 2.77                    |



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IF/RF MICROWAVE COMPONENTS



*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 = 5.00V, Id = 37.29mA @ Temperature = +125°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400           | 18.87        | 27.97             | 4.84                            | 8.23                             | 1.19      | 0.86    | 23.06                   | 18.11                           | 2.70                    |
| 600           | 20.38        | 26.36             | 8.09                            | 12.88                            | 1.14      | 0.76    | 23.91                   | 19.07                           | 2.01                    |
| 800           | 20.82        | 25.87             | 10.20                           | 15.95                            | 1.12      | 0.70    | 24.17                   | 19.81                           | 1.84                    |
| 1000          | 20.93        | 25.71             | 10.89                           | 17.21                            | 1.11      | 0.68    | 24.56                   | 20.16                           | 1.72                    |
| 1200          | 20.90        | 25.70             | 10.72                           | 17.18                            | 1.10      | 0.69    | 24.73                   | 20.01                           | 1.79                    |
| 1400          | 20.81        | 25.75             | 10.14                           | 16.60                            | 1.10      | 0.71    | 24.62                   | 20.16                           | 1.80                    |
| 1600          | 20.66        | 25.87             | 9.47                            | 16.11                            | 1.10      | 0.74    | 24.47                   | 20.11                           | 1.87                    |
| 1800          | 20.56        | 25.92             | 8.98                            | 15.50                            | 1.10      | 0.76    | 24.27                   | 20.30                           | 1.89                    |
| 2000          | 20.41        | 26.02             | 8.48                            | 14.92                            | 1.10      | 0.78    | 23.95                   | 20.35                           | 1.84                    |
| 2200          | 20.25        | 26.13             | 8.06                            | 14.49                            | 1.11      | 0.81    | 24.33                   | 19.81                           | 1.88                    |
| 2400          | 20.08        | 26.24             | 7.71                            | 14.13                            | 1.11      | 0.83    | 24.38                   | 19.89                           | 1.95                    |
| 2600          | 19.91        | 26.37             | 7.42                            | 13.82                            | 1.12      | 0.86    | 23.69                   | 20.22                           | 1.98                    |
| 2800          | 19.71        | 26.51             | 7.13                            | 13.45                            | 1.12      | 0.88    | 23.59                   | 19.99                           | 2.08                    |
| 3000          | 19.53        | 26.64             | 6.81                            | 12.94                            | 1.12      | 0.91    | 23.05                   | 20.05                           | 2.00                    |
| 3200          | 19.36        | 26.76             | 6.50                            | 12.34                            | 1.12      | 0.93    | 23.58                   | 19.46                           | 2.10                    |
| 3400          | 19.15        | 26.92             | 6.24                            | 11.76                            | 1.13      | 0.95    | 23.30                   | 19.35                           | 2.09                    |
| 3600          | 18.93        | 27.09             | 5.96                            | 11.13                            | 1.13      | 0.96    | 23.23                   | 19.30                           | 2.13                    |
| 3800          | 18.69        | 27.27             | 5.64                            | 10.42                            | 1.13      | 0.98    | 22.75                   | 19.41                           | 2.13                    |
| 4000          | 18.45        | 27.44             | 5.35                            | 9.81                             | 1.13      | 0.99    | 22.78                   | 18.84                           | 2.19                    |
| 4200          | 18.19        | 27.63             | 5.14                            | 9.27                             | 1.14      | 1.00    | 22.89                   | 18.46                           | 2.28                    |
| 4400          | 17.94        | 27.86             | 4.87                            | 8.66                             | 1.13      | 1.00    | 22.49                   | 18.31                           | 2.30                    |
| 4600          | 17.69        | 28.00             | 4.67                            | 8.20                             | 1.14      | 1.00    | 22.56                   | 18.08                           | 2.31                    |
| 4800          | 17.48        | 28.20             | 4.48                            | 7.81                             | 1.14      | 1.01    | 22.13                   | 17.83                           | 2.45                    |
| 5000          | 17.29        | 28.34             | 4.36                            | 7.43                             | 1.13      | 1.00    | 21.35                   | 17.82                           | 2.44                    |
| 5200          | 17.11        | 28.40             | 4.28                            | 7.15                             | 1.13      | 1.00    | 21.44                   | 17.14                           | 2.44                    |
| 5400          | 16.98        | 28.47             | 4.22                            | 6.91                             | 1.13      | 0.99    | 21.61                   | 16.76                           | 2.42                    |
| 5600          | 16.87        | 28.58             | 4.17                            | 6.66                             | 1.12      | 0.99    | 21.63                   | 16.26                           | 2.43                    |
| 5800          | 16.75        | 28.50             | 4.19                            | 6.44                             | 1.10      | 0.98    | 21.28                   | 15.92                           | 2.40                    |
| 6000          | 16.67        | 28.51             | 4.17                            | 6.22                             | 1.07      | 0.97    | 20.80                   | 15.84                           | 2.45                    |
| 6200          | 16.58        | 28.47             | 4.19                            | 6.03                             | 1.05      | 0.97    | 20.42                   | 15.37                           | 2.47                    |
| 6400          | 16.45        | 28.34             | 4.24                            | 5.91                             | 1.03      | 0.96    | 20.58                   | 14.74                           | 2.46                    |
| 6600          | 16.31        | 28.37             | 4.22                            | 5.77                             | 1.01      | 0.97    | 20.37                   | 14.11                           | 2.49                    |
| 6800          | 16.19        | 28.35             | 4.21                            | 5.76                             | 0.99      | 0.98    | 19.97                   | 13.82                           | 2.61                    |
| 7000          | 16.02        | 28.21             | 4.36                            | 5.51                             | 0.98      | 0.96    | 19.85                   | 13.49                           | 2.69                    |
| 7200          | 15.65        | 28.23             | 4.36                            | 5.35                             | 0.99      | 0.95    | 19.66                   | 13.19                           | 2.85                    |
| 7400          | 15.59        | 28.04             | 4.01                            | 5.11                             | 0.88      | 0.96    | 19.69                   | 12.78                           | 2.68                    |
| 7600          | 15.39        | 27.80             | 3.92                            | 4.92                             | 0.82      | 0.96    | 19.22                   | 12.63                           | 2.76                    |
| 7800          | 15.14        | 27.59             | 3.87                            | 4.76                             | 0.78      | 0.96    | 19.17                   | 12.34                           | 2.74                    |
| 8000          | 14.88        | 27.43             | 3.81                            | 4.63                             | 0.75      | 0.96    | 19.39                   | 11.94                           | 2.85                    |



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IF/RF MICROWAVE COMPONENTS



*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 = 6.25V, Id = 49.61mA @ Temperature = +125°C

| FREQ<br>(MHz) | Gain<br>(dB) | Isolation<br>(dB) | Input<br>Return<br>Loss<br>(dB) | Output<br>Return<br>Loss<br>(dB) | Stability |         | IP-3<br>Output<br>(dBm) | 1dB<br>Comp.<br>Output<br>(dBm) | Noise<br>Figure<br>(dB) |
|---------------|--------------|-------------------|---------------------------------|----------------------------------|-----------|---------|-------------------------|---------------------------------|-------------------------|
|               |              |                   |                                 |                                  | K         | Measure |                         |                                 |                         |
| 400           | 20.29        | 28.90             | 5.21                            | 8.76                             | 1.18      | 0.86    | 25.90                   | 18.33                           | 2.59                    |
| 600           | 21.75        | 27.34             | 8.87                            | 14.56                            | 1.13      | 0.75    | 26.89                   | 19.13                           | 1.95                    |
| 800           | 22.15        | 26.88             | 11.29                           | 18.92                            | 1.11      | 0.69    | 27.21                   | 19.81                           | 1.77                    |
| 1000          | 22.23        | 26.74             | 12.08                           | 20.96                            | 1.10      | 0.67    | 27.62                   | 20.36                           | 1.67                    |
| 1200          | 22.19        | 26.73             | 11.83                           | 20.97                            | 1.10      | 0.68    | 27.85                   | 20.42                           | 1.71                    |
| 1400          | 22.09        | 26.77             | 11.14                           | 20.04                            | 1.10      | 0.70    | 27.71                   | 20.69                           | 1.71                    |
| 1600          | 21.93        | 26.87             | 10.35                           | 19.29                            | 1.10      | 0.73    | 27.47                   | 20.56                           | 1.81                    |
| 1800          | 21.82        | 26.92             | 9.78                            | 18.35                            | 1.10      | 0.75    | 27.33                   | 20.58                           | 1.82                    |
| 2000          | 21.66        | 27.01             | 9.22                            | 17.51                            | 1.10      | 0.77    | 27.00                   | 20.77                           | 1.78                    |
| 2200          | 21.49        | 27.11             | 8.75                            | 16.90                            | 1.11      | 0.80    | 27.45                   | 20.32                           | 1.82                    |
| 2400          | 21.31        | 27.21             | 8.35                            | 16.39                            | 1.11      | 0.83    | 27.48                   | 20.40                           | 1.88                    |
| 2600          | 21.12        | 27.33             | 8.02                            | 15.95                            | 1.12      | 0.85    | 26.71                   | 20.17                           | 1.91                    |
| 2800          | 20.91        | 27.46             | 7.70                            | 15.43                            | 1.13      | 0.88    | 26.61                   | 19.92                           | 2.01                    |
| 3000          | 20.72        | 27.58             | 7.35                            | 14.75                            | 1.13      | 0.90    | 26.07                   | 19.80                           | 1.92                    |
| 3200          | 20.53        | 27.69             | 7.01                            | 14.00                            | 1.13      | 0.93    | 26.57                   | 19.81                           | 2.05                    |
| 3400          | 20.31        | 27.83             | 6.73                            | 13.27                            | 1.14      | 0.95    | 26.34                   | 19.47                           | 2.00                    |
| 3600          | 20.08        | 28.00             | 6.43                            | 12.49                            | 1.14      | 0.97    | 26.25                   | 19.52                           | 2.07                    |
| 3800          | 19.83        | 28.16             | 6.07                            | 11.63                            | 1.14      | 0.98    | 25.75                   | 19.37                           | 2.05                    |
| 4000          | 19.57        | 28.32             | 5.76                            | 10.89                            | 1.15      | 1.00    | 25.73                   | 19.09                           | 2.17                    |
| 4200          | 19.30        | 28.50             | 5.54                            | 10.24                            | 1.16      | 1.01    | 25.76                   | 18.85                           | 2.22                    |
| 4400          | 19.04        | 28.71             | 5.24                            | 9.52                             | 1.16      | 1.02    | 25.35                   | 18.50                           | 2.23                    |
| 4600          | 18.78        | 28.85             | 5.02                            | 8.99                             | 1.16      | 1.02    | 25.35                   | 18.27                           | 2.24                    |
| 4800          | 18.55        | 29.03             | 4.83                            | 8.52                             | 1.17      | 1.02    | 24.87                   | 17.86                           | 2.35                    |
| 5000          | 18.35        | 29.16             | 4.69                            | 8.08                             | 1.16      | 1.02    | 24.10                   | 17.45                           | 2.36                    |
| 5200          | 18.15        | 29.21             | 4.61                            | 7.75                             | 1.17      | 1.01    | 24.06                   | 17.01                           | 2.32                    |
| 5400          | 18.00        | 29.27             | 4.55                            | 7.46                             | 1.16      | 1.01    | 24.07                   | 16.67                           | 2.36                    |
| 5600          | 17.87        | 29.36             | 4.50                            | 7.17                             | 1.15      | 1.00    | 24.10                   | 16.22                           | 2.35                    |
| 5800          | 17.73        | 29.27             | 4.52                            | 6.92                             | 1.13      | 0.99    | 23.74                   | 15.84                           | 2.28                    |
| 6000          | 17.62        | 29.26             | 4.51                            | 6.66                             | 1.11      | 0.99    | 23.16                   | 15.68                           | 2.38                    |
| 6200          | 17.52        | 29.18             | 4.53                            | 6.43                             | 1.08      | 0.98    | 22.74                   | 15.31                           | 2.42                    |
| 6400          | 17.37        | 29.04             | 4.59                            | 6.28                             | 1.06      | 0.97    | 22.83                   | 14.85                           | 2.41                    |
| 6600          | 17.20        | 29.03             | 4.57                            | 6.12                             | 1.04      | 0.98    | 22.60                   | 14.46                           | 2.39                    |
| 6800          | 17.07        | 28.99             | 4.55                            | 6.08                             | 1.02      | 0.99    | 22.11                   | 14.15                           | 2.54                    |
| 7000          | 16.88        | 28.81             | 4.70                            | 5.80                             | 1.00      | 0.97    | 21.94                   | 13.85                           | 2.62                    |
| 7200          | 16.49        | 28.77             | 4.69                            | 5.62                             | 1.01      | 0.96    | 21.68                   | 13.56                           | 2.77                    |
| 7400          | 16.41        | 28.54             | 4.32                            | 5.35                             | 0.90      | 0.97    | 21.64                   | 13.19                           | 2.62                    |
| 7600          | 16.20        | 28.24             | 4.23                            | 5.13                             | 0.83      | 0.97    | 21.15                   | 12.99                           | 2.65                    |
| 7800          | 15.93        | 27.98             | 4.17                            | 4.95                             | 0.79      | 0.97    | 21.06                   | 12.77                           | 2.69                    |
| 8000          | 15.65        | 27.77             | 4.09                            | 4.80                             | 0.75      | 0.97    | 21.22                   | 12.39                           | 2.75                    |



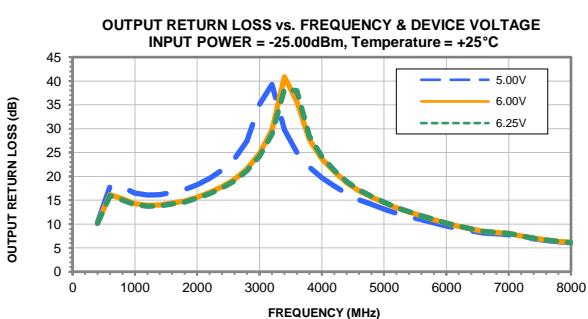
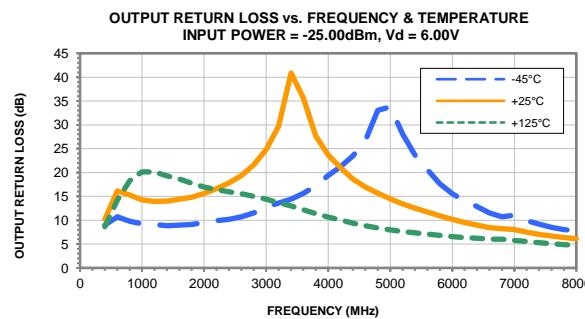
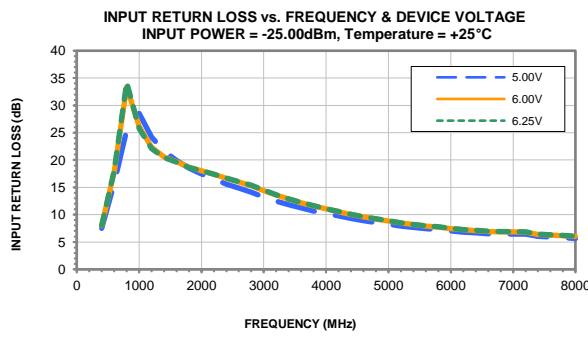
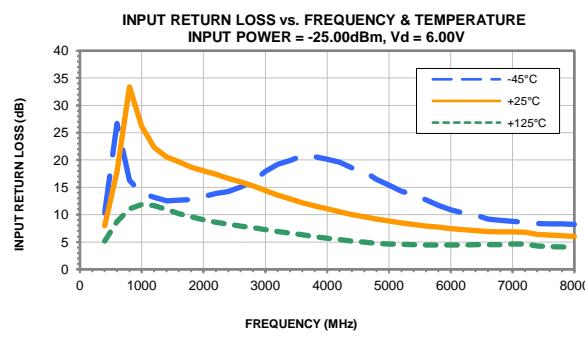
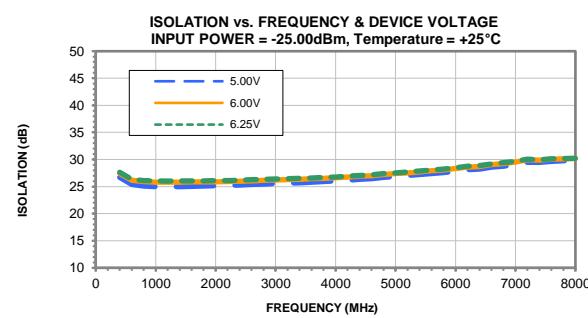
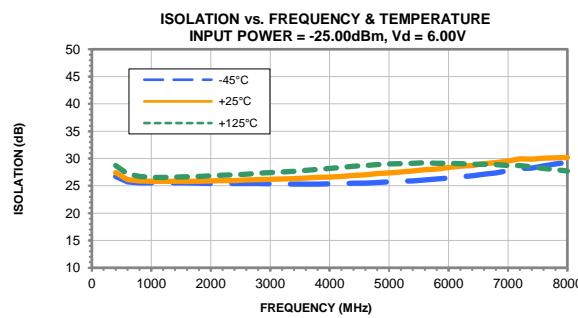
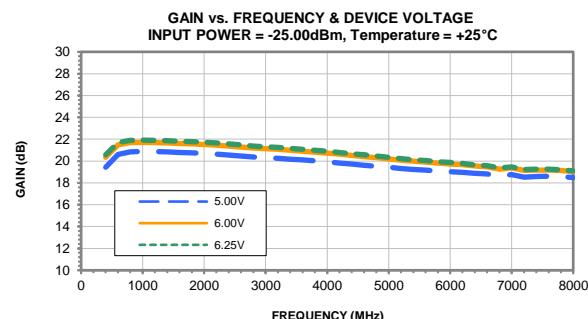
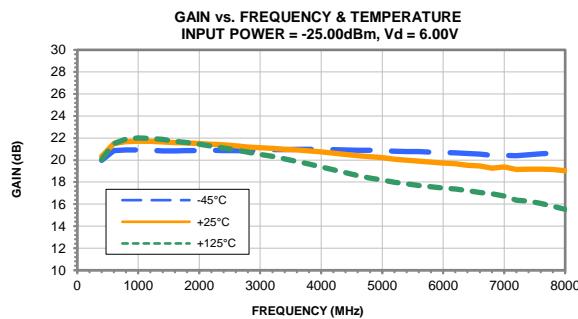
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## Typical Performance Curves



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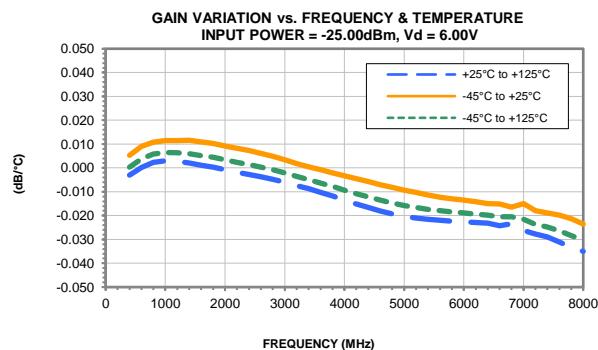
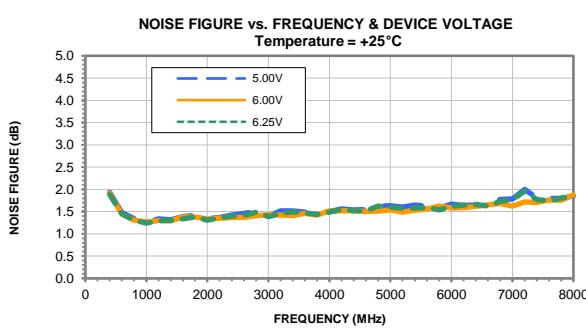
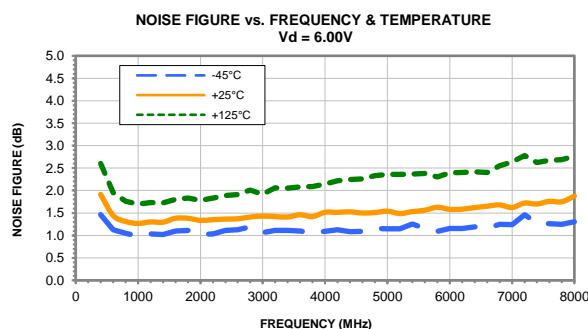
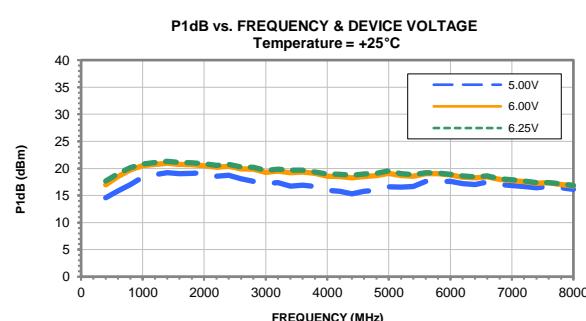
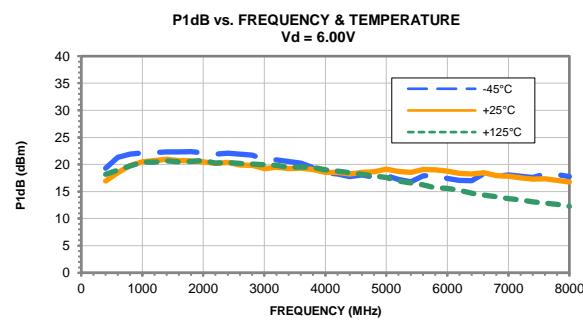
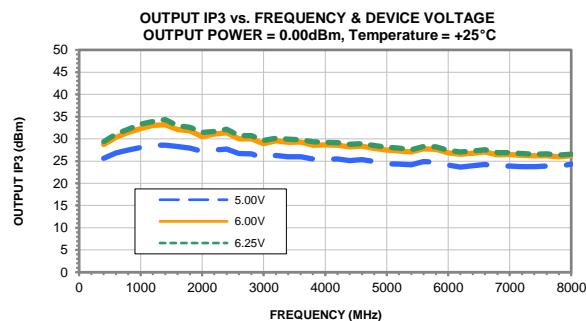
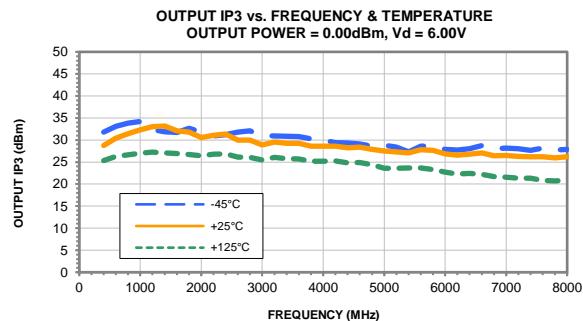
REV. OR

CMA-83LN+

9/27/2018

Page 1 of 2

## Typical Performance Curves

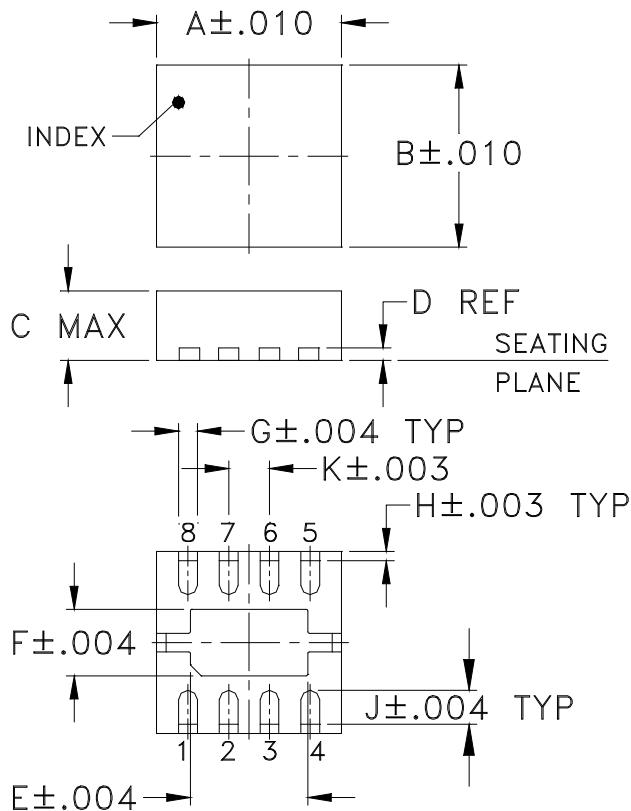


# Case Style

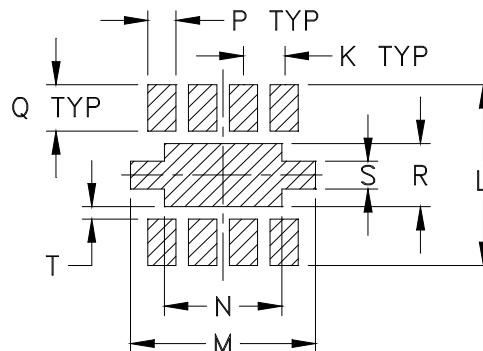
**DL**

**DL1721**

## Outline Dimensions



## PCB Land Pattern



Suggested Layout,  
Tolerance to be within ±.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. ± .004, unless otherwise specified.

### Notes:

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

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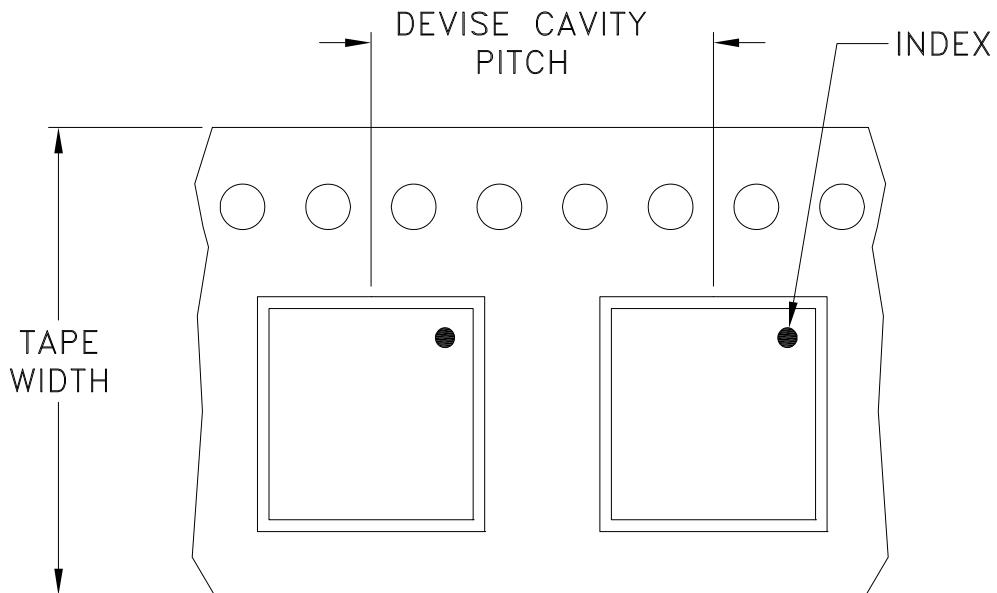
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RF/IF MICROWAVE COMPONENTS

# 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.

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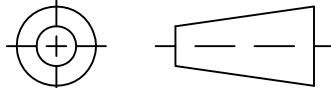
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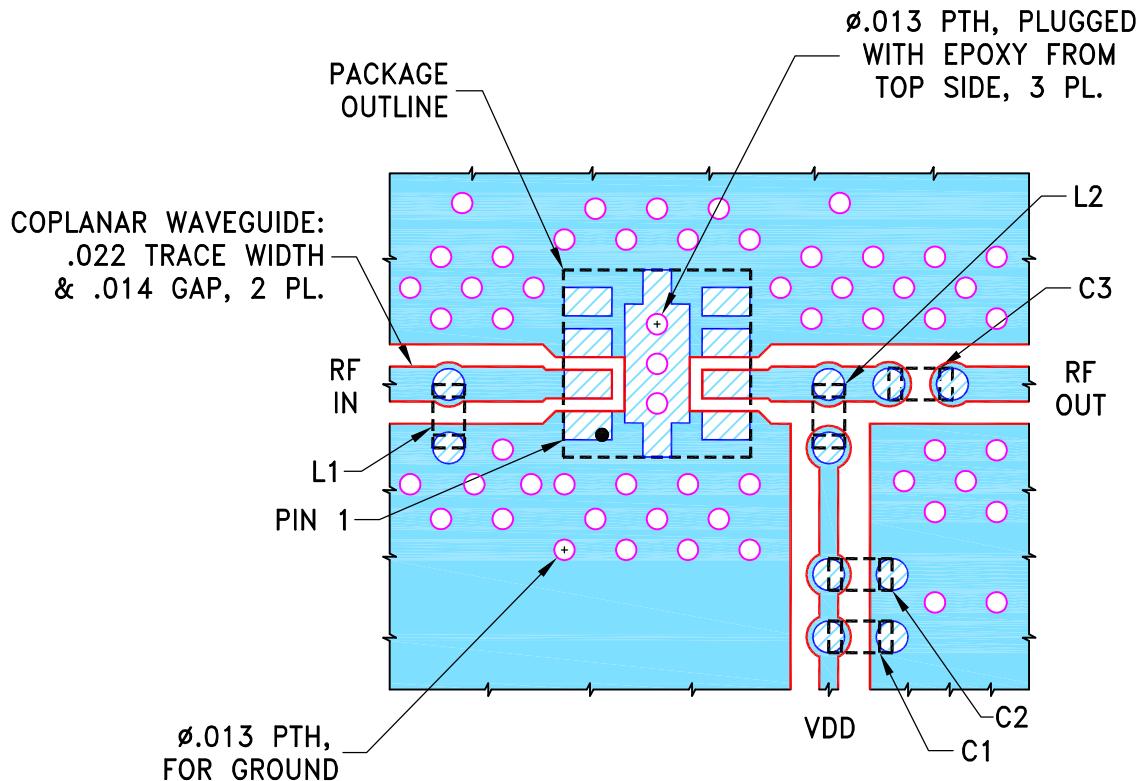
## THIRD ANGLE PROJECTION



## REVISI

| REV OR | ECN No. | DESCRIPTION | DATE     | DR | AUTH |
|--------|---------|-------------|----------|----|------|
|        | M169377 | NEW RELEASE | 08/08/18 | GF | DL   |
|        |         |             |          |    |      |
|        |         |             |          |    |      |
|        |         |             |          |    |      |

SUGGESTED MOUNTING CONFIGURATION  
FOR DL1721 CASE STYLE, "08AM20" PIN CODE



| COMPONENT    | SIZE |
|--------------|------|
| C1-C3, L1-L2 | 0402 |

## 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-994+.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.



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



DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

| UNLESS OTHERWISE SPECIFIED                 | INITIALS |    | DATE     |
|--|----------|----|----------|
| DIMENSIONS ARE IN INCHES                   | DRAWN    | GF | 08/03/18 |
| TOLERANCES ON:<br>2 PL DECIMALS $\pm .005$ | CHECKED  | IL | 08/08/18 |
| 3 PL DECIMALS $\pm .005$                   | APPROVED | DL | 08/08/18 |
| FRACTIONS $\pm$                            |          |    |          |

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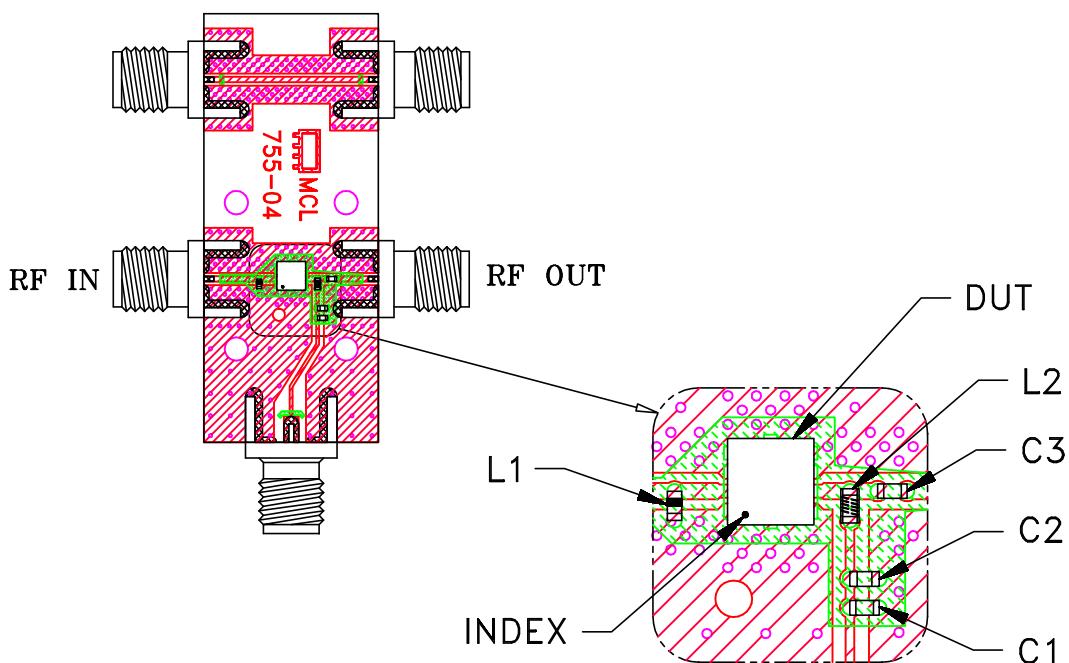
13 Neptune Avenue  
Brooklyn NY 11235

PL, 08AM20, DL1721, TB-994+

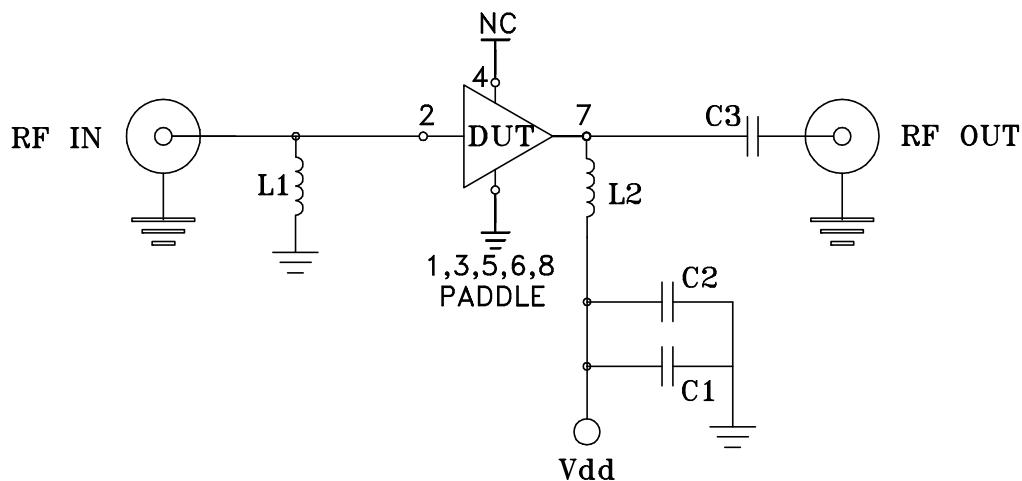
| SIZE          | CODE IDENT | DRAWING NO: | REV: |
|---------------|------------|-------------|------|
| A             | 15542      | 98-PL-606   | OR   |
| FILE: 98PL606 | SCALE: 8:1 | SHEET: 1    | OF 1 |

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# Evaluation Board and Circuit



TB-994+



| COMPONENT | VALUE       | SIZE   |
|-----------|-------------|--------|
| DUT       | CMA-83LN+   | 3X3 MM |
| C1        | 0.1 $\mu$ F | 0402   |
| C2        | 10 pF       |        |
| C3        | 100 pF      |        |
| L1        | 18 nH       |        |
| L2        | 39 nH       |        |

Schematic Diagram

Notes:

1. 50 Ohm SMA Female connectors.
2. PCB Material: R04350 or equivalent, Dielectric Constant=3.5, Thickness=.010 inch.

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**Environmental Specifications****ENV68**

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 |

**Environmental Specifications****ENV68**

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              |
|---------------|-----------------------------------|-----------------------------|
| Autoclave     | 15 psig, 100% RH, 121°C, 96 hours | JEDEC-STD-22-B, Method A102 |