

Surface Mount

# Monolithic Amplifier

DC-4 GHz

## Features

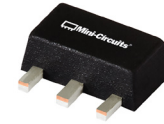
- InGaP HBT microwave amplifier
- Miniature SOT-89 package
- Internally Matched to 50 Ohms
- Frequency range, DC to 4 GHz
- Output power, 15.9 dBm typ.
- Excellent package for heat dissipation, exposed metal bottom
- Low thermal resistance for high reliability
- Aqueous washable
- Protected by US Patent 6,943,629

## Applications

- Cellular
- PCS
- Communication receivers & transmitters

## General Description

Gali $\square$ 51F+ (RoHS compliant) is a wideband amplifier offering high dynamic range. Lead finish is SnAgNi. It has repeatable performance from lot to lot, and is enclosed in a SOT-89 package. It uses patented Transient Protected Darlington configuration and is fabricated using InGaP HBT technology. Expected MTTF is 15,000 years at 85°C case temperature. Gali $\square$ 51F+ is designed to be rugged for ESD and supply switch-on transients.



Generic photo used for illustration purposes only

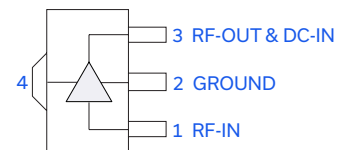
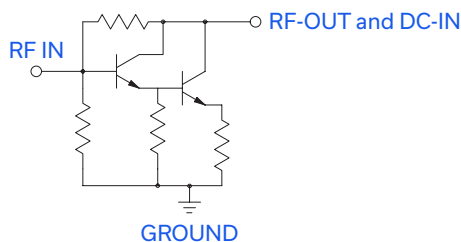
**Gali $\square$ 51F+**

CASE STYLE: DF782

**+RoHS Compliant**

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

## simplified schematic and pin description



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

## Notes

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REV. S  
M151107  
D60129  
EE-7974Q  
GALI-51F+  
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Page 1 of 4

**Electrical Specifications at 25°C and 50mA, unless noted**

| Parameter                                         |                | Min. | Typ. | Max. | Units |
|---------------------------------------------------|----------------|------|------|------|-------|
| Frequency Range*                                  |                | DC   |      | 4    | GHz   |
| Gain                                              | f=0.1 GHz      | —    | 18.0 | —    | dB    |
|                                                   | f=1 GHz        | —    | 17.3 | —    |       |
|                                                   | f=2 GHz        | 14   | 15.9 | —    |       |
|                                                   | f=3 GHz        | —    | 14.8 | —    |       |
|                                                   | f=4 GHz        | —    | 13.4 | —    |       |
|                                                   | f=6 GHz        | —    | 13.3 | —    |       |
| Input Return Loss                                 | f= DC to 3 GHz |      | 21   |      | dB    |
|                                                   | f= 3 to 4 GHz  |      | 17.5 |      |       |
| Output Return Loss                                | f= DC to 3 GHz |      | 14   |      | dB    |
|                                                   | f= 3 to 4 GHz  |      | 11.5 |      |       |
| Output Power @ 1 dB compression                   | f=1 GHz        | 14.4 | 15.9 | —    | dBm   |
| Output IP3                                        | f=1 GHz        |      | 32   |      | dBm   |
| Noise Figure                                      | f=1 GHz        |      | 3.5  |      | dB    |
| Recommended Device Operating Current              |                |      | 50   |      | mA    |
| Device Operating Voltage                          |                | 4.0  | 4.4  | 5.0  | V     |
| Device Voltage Variation vs. Temperature at 50 mA |                |      | -3.2 |      | mV/°C |
| Device Voltage Variation vs. Current at 25°C      |                |      | 6.5  |      | mV/mA |
| Thermal Resistance, junction-to-case <sup>1</sup> |                |      | 78   |      | °C/W  |

\*Guaranteed specification DC-4 GHz. Low frequency cut off determined by external coupling capacitors.

**Absolute Maximum Ratings**

| Parameter              | Ratings        |
|------------------------|----------------|
| Operating Temperature* | -45°C to 85°C  |
| Storage Temperature    | -65°C to 150°C |
| Operating Current      | 65mA           |
| Input Power            | 13dBm          |

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

These ratings are not intended for continuous normal operation.

<sup>1</sup>Case is defined as ground leads.

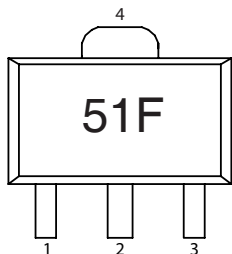
\*Based on typical case temperature rise 3°C above ambient.

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Product Marking



Markings in addition to model number designation may appear for internal quality control purposes.

Additional Detailed Technical Information

Additional information is available on our web site. To access this information enter the model number on our web site home page.

Performance data, graphs, s-parameter data set (.zip file)

Case Style: DF782

Plastic package, exposed paddle, lead finish: Matte-Tin

Tape & Reel: F55

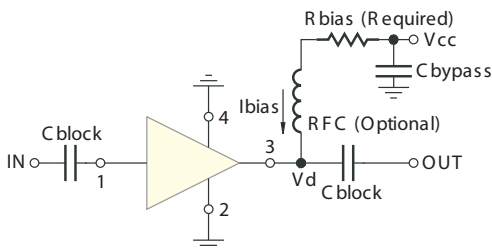
7” reels with 20, 50, 100, 200, 500, 1K devices.

Suggested Layout for PCB Design: PL-019

Evaluation Board: TB-409-51F+

Environmental Ratings: ENV08T2

Recommended Application Circuit



Test Board includes case, connectors, and components (in bold) soldered to PCB

| R BIAS |                                                |
|--------|------------------------------------------------|
| Vcc    | “1%” Res. Values (ohms)<br>for Optimum Biasing |
| 7      | 52.3                                           |
| 8      | 71.5                                           |
| 9      | 90.9                                           |
| 10     | 110                                            |
| 11     | 130                                            |
| 12     | 150                                            |
| 13     | 169                                            |
| 14     | 191                                            |
| 15     | 210                                            |
| 16     | 232                                            |
| 17     | 249                                            |
| 18     | 274                                            |
| 19     | 294                                            |
| 20     | 316                                            |

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**ESD Rating**

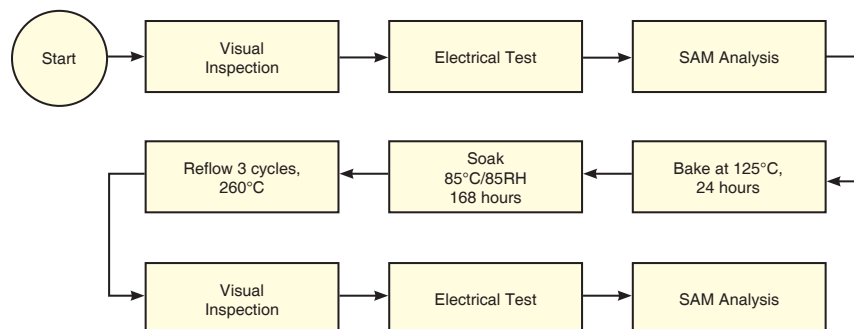
Human Body Model (HBM): Class 1B (500v to &lt; 1000v) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M1 (&lt; 100v) in accordance with ANSI/ESD STM 5.2 - 1999

**MSL Rating**

Moisture Sensitivity: MSL1 in accordance with IPC/JEDECJ-STD-020C

| No. | Test Required                | Condition                                                                                       | Standard                    | Quantity |
|-----|------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------|----------|
| 1   | Visual Inspection            | Low Power Microscope Magnification 40x                                                          | MIP-IN-0003 (MCT spec)      | 45 units |
| 2   | Electrical Test              | Room Temperature                                                                                | SCD (MCL spec)              | 45 units |
| 3   | SAM Analysis                 | Less than 10% growth in term of delamination                                                    | J-Std-020C (Jedec Standard) | 45 units |
| 4   | Moisture Sensitivity Level 1 | Bake at 125°C for 24 hours<br>Soak at 85°C/85%RH for 168 hours<br>Reflow 3 cycles at 260°C peak | J-Std-020C (Jedec Standard) | 45 units |

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

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## Typical Performance Data

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

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Icc = 50mA, Vd = 4.46V @Temperature = +25degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |       | FREQ  | IP3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|-------|-------|---------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Delta | (MHz) | (dBm)         | (dBm)                  | (dB)            |
| 50    | 17.98 | 21.95     | 27.14                   | 32.83                    | 1.10      | 0.63  | 50    | 30.81         | 15.76                  | 3.47            |
| 100   | 17.97 | 21.85     | 26.69                   | 31.53                    | 1.10      | 0.64  | 100   | 30.95         | 15.88                  | 3.64            |
| 200   | 17.94 | 21.90     | 26.23                   | 31.53                    | 1.10      | 0.63  | 200   | 30.98         | 15.77                  | 3.48            |
| 400   | 17.83 | 21.93     | 26.21                   | 29.77                    | 1.11      | 0.62  | 300   | 30.98         | 15.63                  | 3.78            |
| 600   | 17.68 | 21.93     | 25.97                   | 28.14                    | 1.12      | 0.61  | 400   | 30.44         | 15.89                  | 3.64            |
| 800   | 17.51 | 21.93     | 25.09                   | 26.80                    | 1.13      | 0.60  | 500   | 30.40         | 15.82                  | 3.65            |
| 1000  | 17.34 | 21.98     | 24.31                   | 25.65                    | 1.14      | 0.58  | 600   | 30.40         | 15.66                  | 3.68            |
| 1200  | 17.14 | 22.01     | 23.49                   | 24.59                    | 1.15      | 0.57  | 700   | 30.79         | 15.84                  | 3.57            |
| 1400  | 16.93 | 21.98     | 22.33                   | 23.53                    | 1.16      | 0.55  | 800   | 31.08         | 15.87                  | 3.65            |
| 1600  | 16.72 | 22.07     | 21.54                   | 22.57                    | 1.18      | 0.53  | 900   | 31.18         | 15.81                  | 3.59            |
| 1800  | 16.49 | 22.07     | 20.45                   | 21.72                    | 1.19      | 0.52  | 1000  | 31.00         | 15.80                  | 3.59            |
| 2000  | 16.27 | 22.10     | 19.47                   | 21.11                    | 1.21      | 0.50  | 1100  | 30.86         | 15.56                  | 3.56            |
| 2200  | 16.05 | 22.15     | 18.69                   | 20.70                    | 1.22      | 0.49  | 1200  | 30.81         | 15.18                  | 3.64            |
| 2400  | 15.82 | 22.23     | 17.79                   | 20.43                    | 1.25      | 0.47  | 1300  | 30.74         | 15.30                  | 3.67            |
| 2600  | 15.61 | 22.28     | 16.93                   | 20.07                    | 1.26      | 0.45  | 1400  | 30.39         | 15.23                  | 3.70            |
| 2800  | 15.38 | 22.34     | 16.14                   | 19.77                    | 1.29      | 0.44  | 1500  | 30.36         | 15.17                  | 3.74            |
| 3000  | 15.19 | 22.41     | 15.41                   | 19.43                    | 1.31      | 0.42  | 1600  | 30.65         | 15.20                  | 3.68            |
| 3200  | 14.99 | 22.43     | 14.89                   | 19.16                    | 1.32      | 0.41  | 1700  | 31.20         | 15.39                  | 3.65            |
| 3400  | 14.84 | 22.52     | 14.27                   | 18.80                    | 1.34      | 0.40  | 1800  | 31.18         | 15.23                  | 3.83            |
| 3600  | 14.66 | 22.59     | 13.85                   | 18.73                    | 1.37      | 0.39  | 1900  | 30.84         | 15.35                  | 3.66            |
| 3800  | 14.53 | 22.57     | 13.47                   | 18.42                    | 1.37      | 0.38  | 2000  | 30.62         | 15.35                  | 3.52            |
| 4000  | 14.39 | 22.68     | 13.22                   | 18.81                    | 1.40      | 0.37  | 2100  | 30.45         | 15.25                  | 3.73            |
| 4200  | 14.29 | 22.68     | 13.10                   | 18.85                    | 1.41      | 0.37  | 2200  | 30.36         | 15.34                  | 3.56            |
| 4400  | 14.19 | 22.68     | 13.11                   | 19.15                    | 1.43      | 0.37  | 2300  | 30.39         | 15.48                  | 3.74            |
| 4600  | 14.14 | 22.71     | 13.05                   | 19.33                    | 1.44      | 0.36  | 2400  | 30.29         | 15.48                  | 3.68            |
| 5000  | 14.12 | 22.81     | 13.02                   | 20.55                    | 1.46      | 0.36  | 2500  | 30.22         | 15.47                  | 3.66            |
| 5500  | 14.17 | 22.68     | 13.01                   | 22.61                    | 1.44      | 0.37  | 2600  | 30.20         | 15.41                  | 3.67            |
| 6000  | 14.40 | 22.41     | 12.77                   | 24.93                    | 1.37      | 0.38  | 2700  | 30.19         | 15.38                  | 3.71            |
| 6500  | 14.52 | 21.87     | 12.95                   | 20.69                    | 1.30      | 0.42  | 2800  | 30.12         | 15.38                  | 3.67            |
| 7000  | 14.31 | 21.36     | 12.35                   | 15.42                    | 1.25      | 0.44  | 2900  | 30.04         | 15.36                  | 3.75            |
| 7500  | 13.30 | 20.96     | 11.25                   | 11.94                    | 1.27      | 0.44  | 3000  | 29.89         | 15.31                  | 3.58            |
| 8000  | 11.78 | 20.51     | 10.73                   | 9.55                     | 1.35      | 0.43  | 3100  | 29.67         | 15.26                  | 3.87            |
| 9000  | 8.08  | 19.00     | 9.24                    | 7.29                     | 1.51      | 0.41  | 3200  | 29.52         | 15.33                  | 3.63            |
| 10000 | 5.04  | 16.77     | 8.00                    | 6.73                     | 1.52      | 0.40  | 3300  | 29.48         | 15.38                  | 3.93            |
| 11000 | 3.13  | 14.08     | 8.29                    | 7.21                     | 1.40      | 0.37  | 3400  | 29.30         | 15.31                  | 3.76            |
| 12000 | 2.05  | 11.11     | 9.19                    | 8.37                     | 1.24      | 0.37  | 3500  | 29.08         | 15.07                  | 3.70            |
| 13000 | 1.15  | 7.63      | 10.92                   | 11.35                    | 1.11      | 0.45  | 3600  | 28.74         | 14.98                  | 3.87            |
| 14000 | 0.05  | 4.95      | 8.80                    | 10.04                    | 1.00      | 0.61  | 3700  | 28.52         | 14.89                  | 3.70            |
| 15000 | -3.06 | 5.43      | 4.22                    | 4.80                     | 1.00      | 0.68  | 3800  | 28.38         | 14.78                  | 3.90            |
| 16000 | -5.91 | 6.90      | 3.06                    | 3.42                     | 1.12      | 0.68  | 4000  | 28.27         | 14.52                  | 3.74            |

REV. X1

GALI-51F+

120123

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## Typical Performance Data

## Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Icc = 40mA, Vd = 4.39V @Temperature = +25degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |       | FREQ  | IP3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|-------|-------|---------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Delta | (MHz) | (dBm)         | (dBm)                  | (dB)            |
| 50    | 17.73 | 21.68     | 23.57                   | 48.45                    | 1.10      | 0.64  | 50    | 26.99         | 12.91                  | 3.41            |
| 100   | 17.70 | 21.64     | 23.43                   | 49.46                    | 1.10      | 0.64  | 100   | 27.14         | 13.10                  | 3.58            |
| 200   | 17.67 | 21.67     | 23.05                   | 42.76                    | 1.10      | 0.63  | 200   | 27.16         | 12.97                  | 3.47            |
| 400   | 17.54 | 21.68     | 23.24                   | 35.15                    | 1.11      | 0.62  | 300   | 27.12         | 12.82                  | 3.65            |
| 600   | 17.42 | 21.66     | 23.24                   | 31.67                    | 1.12      | 0.61  | 400   | 26.73         | 13.13                  | 3.58            |
| 800   | 17.25 | 21.71     | 22.76                   | 29.31                    | 1.13      | 0.60  | 500   | 26.74         | 13.02                  | 3.58            |
| 1000  | 17.09 | 21.73     | 22.12                   | 27.48                    | 1.14      | 0.58  | 600   | 26.73         | 12.91                  | 3.62            |
| 1200  | 16.90 | 21.73     | 21.47                   | 26.05                    | 1.15      | 0.57  | 700   | 27.10         | 13.00                  | 3.53            |
| 1400  | 16.70 | 21.79     | 20.61                   | 24.46                    | 1.16      | 0.55  | 800   | 27.40         | 13.08                  | 3.63            |
| 1600  | 16.49 | 21.78     | 20.00                   | 23.17                    | 1.17      | 0.54  | 900   | 27.47         | 13.13                  | 3.53            |
| 1800  | 16.28 | 21.88     | 19.02                   | 22.08                    | 1.19      | 0.52  | 1000  | 27.32         | 13.06                  | 3.55            |
| 2000  | 16.06 | 21.89     | 18.14                   | 21.22                    | 1.20      | 0.50  | 1100  | 27.17         | 12.80                  | 3.53            |
| 2200  | 15.83 | 21.94     | 17.51                   | 20.64                    | 1.22      | 0.48  | 1200  | 27.14         | 12.48                  | 3.58            |
| 2400  | 15.62 | 22.02     | 16.68                   | 20.18                    | 1.24      | 0.47  | 1300  | 27.08         | 12.59                  | 3.56            |
| 2600  | 15.41 | 22.05     | 15.90                   | 19.74                    | 1.26      | 0.45  | 1400  | 26.83         | 12.57                  | 3.64            |
| 2800  | 15.19 | 22.15     | 15.20                   | 19.38                    | 1.28      | 0.44  | 1500  | 26.83         | 12.53                  | 3.68            |
| 3000  | 14.99 | 22.21     | 14.53                   | 18.92                    | 1.30      | 0.42  | 1600  | 27.10         | 12.51                  | 3.62            |
| 3200  | 14.80 | 22.27     | 14.04                   | 18.61                    | 1.32      | 0.41  | 1700  | 27.54         | 12.66                  | 3.61            |
| 3400  | 14.64 | 22.33     | 13.47                   | 18.19                    | 1.33      | 0.40  | 1800  | 27.53         | 12.54                  | 3.78            |
| 3600  | 14.46 | 22.39     | 13.12                   | 18.08                    | 1.36      | 0.39  | 1900  | 27.28         | 12.70                  | 3.62            |
| 3800  | 14.34 | 22.37     | 12.78                   | 17.78                    | 1.36      | 0.39  | 2000  | 27.13         | 12.70                  | 3.46            |
| 4000  | 14.21 | 22.52     | 12.55                   | 18.13                    | 1.39      | 0.38  | 2100  | 27.04         | 12.63                  | 3.69            |
| 4200  | 14.10 | 22.53     | 12.38                   | 18.11                    | 1.40      | 0.37  | 2200  | 27.03         | 12.72                  | 3.50            |
| 4400  | 14.00 | 22.50     | 12.45                   | 18.44                    | 1.42      | 0.37  | 2300  | 27.15         | 12.85                  | 3.70            |
| 4600  | 13.97 | 22.48     | 12.37                   | 18.73                    | 1.42      | 0.37  | 2400  | 27.23         | 12.87                  | 3.58            |
| 5000  | 13.94 | 22.61     | 12.36                   | 19.91                    | 1.44      | 0.36  | 2500  | 27.31         | 12.95                  | 3.61            |
| 5500  | 14.00 | 22.48     | 12.31                   | 22.14                    | 1.42      | 0.37  | 2600  | 27.37         | 12.88                  | 3.60            |
| 6000  | 14.21 | 22.21     | 12.12                   | 25.51                    | 1.36      | 0.39  | 2700  | 27.47         | 12.88                  | 3.68            |
| 6500  | 14.33 | 21.68     | 12.22                   | 22.05                    | 1.29      | 0.42  | 2800  | 27.48         | 12.84                  | 3.60            |
| 7000  | 14.07 | 21.16     | 11.74                   | 16.24                    | 1.25      | 0.44  | 2900  | 27.49         | 12.83                  | 3.69            |
| 7500  | 13.08 | 20.77     | 10.81                   | 12.42                    | 1.27      | 0.44  | 3000  | 27.45         | 12.86                  | 3.51            |
| 8000  | 11.56 | 20.35     | 10.44                   | 9.90                     | 1.36      | 0.42  | 3100  | 27.34         | 12.88                  | 3.83            |
| 9000  | 7.90  | 18.88     | 9.14                    | 7.53                     | 1.53      | 0.40  | 3200  | 27.35         | 13.06                  | 3.55            |
| 10000 | 4.89  | 16.75     | 7.94                    | 6.92                     | 1.54      | 0.39  | 3300  | 27.40         | 13.11                  | 3.86            |
| 11000 | 2.98  | 14.11     | 8.22                    | 7.39                     | 1.43      | 0.35  | 3400  | 27.35         | 13.03                  | 3.66            |
| 12000 | 1.89  | 11.17     | 9.06                    | 8.50                     | 1.26      | 0.36  | 3500  | 27.08         | 12.78                  | 3.65            |
| 13000 | 1.02  | 7.67      | 10.72                   | 11.38                    | 1.11      | 0.44  | 3600  | 26.76         | 12.76                  | 3.80            |
| 14000 | -0.08 | 4.97      | 8.68                    | 10.07                    | 1.01      | 0.60  | 3700  | 26.45         | 12.79                  | 3.66            |
| 15000 | -3.16 | 5.43      | 4.20                    | 4.82                     | 1.01      | 0.68  | 3800  | 26.32         | 12.75                  | 3.83            |
| 16000 | -5.98 | 6.88      | 3.06                    | 3.43                     | 1.12      | 0.68  | 4000  | 26.38         | 12.69                  | 3.68            |

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## Typical Performance Data

## Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Icc = 60mA, Vd = 4.52V @Temperature = +25degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |       | FREQ  | IP3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|-------|-------|---------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Delta | (MHz) | (dBm)         | (dBm)                  | (dB)            |
| 50    | 18.15 | 21.96     | 30.30                   | 28.36                    | 1.09      | 0.64  | 50    | 33.49         | 17.59                  | 3.53            |
| 100   | 18.14 | 22.07     | 29.96                   | 27.78                    | 1.10      | 0.63  | 100   | 33.65         | 17.68                  | 3.72            |
| 200   | 18.10 | 22.06     | 28.90                   | 27.85                    | 1.10      | 0.63  | 200   | 33.71         | 17.61                  | 3.54            |
| 400   | 17.98 | 22.04     | 28.57                   | 26.60                    | 1.11      | 0.62  | 300   | 33.65         | 17.54                  | 3.85            |
| 600   | 17.84 | 22.07     | 28.02                   | 25.62                    | 1.12      | 0.61  | 400   | 33.06         | 17.71                  | 3.67            |
| 800   | 17.66 | 22.05     | 26.91                   | 24.82                    | 1.12      | 0.60  | 500   | 33.00         | 17.60                  | 3.71            |
| 1000  | 17.49 | 22.12     | 25.74                   | 24.03                    | 1.14      | 0.58  | 600   | 32.93         | 17.50                  | 3.68            |
| 1200  | 17.28 | 22.12     | 24.71                   | 23.39                    | 1.15      | 0.57  | 700   | 33.37         | 17.58                  | 3.64            |
| 1400  | 17.07 | 22.16     | 23.52                   | 22.61                    | 1.16      | 0.55  | 800   | 33.63         | 17.60                  | 3.71            |
| 1600  | 16.87 | 22.19     | 22.55                   | 21.88                    | 1.18      | 0.54  | 900   | 33.74         | 17.52                  | 3.64            |
| 1800  | 16.62 | 22.21     | 21.45                   | 21.25                    | 1.19      | 0.52  | 1000  | 33.56         | 17.56                  | 3.63            |
| 2000  | 16.41 | 22.27     | 20.31                   | 20.85                    | 1.21      | 0.50  | 1100  | 33.40         | 17.37                  | 3.63            |
| 2200  | 16.18 | 22.31     | 19.50                   | 20.53                    | 1.23      | 0.48  | 1200  | 33.31         | 17.11                  | 3.68            |
| 2400  | 15.95 | 22.36     | 18.52                   | 20.36                    | 1.25      | 0.47  | 1300  | 33.20         | 17.18                  | 3.66            |
| 2600  | 15.74 | 22.41     | 17.60                   | 20.06                    | 1.27      | 0.45  | 1400  | 32.80         | 17.13                  | 3.76            |
| 2800  | 15.50 | 22.48     | 16.83                   | 19.87                    | 1.29      | 0.43  | 1500  | 32.74         | 17.08                  | 3.81            |
| 3000  | 15.31 | 22.51     | 16.05                   | 19.60                    | 1.31      | 0.42  | 1600  | 33.07         | 17.11                  | 3.75            |
| 3200  | 15.11 | 22.59     | 15.45                   | 19.36                    | 1.33      | 0.41  | 1700  | 33.68         | 17.19                  | 3.68            |
| 3400  | 14.96 | 22.64     | 14.82                   | 19.05                    | 1.35      | 0.40  | 1800  | 33.55         | 17.10                  | 3.90            |
| 3600  | 14.77 | 22.72     | 14.41                   | 19.03                    | 1.38      | 0.39  | 1900  | 33.12         | 17.19                  | 3.71            |
| 3800  | 14.65 | 22.67     | 13.95                   | 18.72                    | 1.38      | 0.38  | 2000  | 32.88         | 17.19                  | 3.58            |
| 4000  | 14.50 | 22.81     | 13.75                   | 19.10                    | 1.41      | 0.37  | 2100  | 32.61         | 17.13                  | 3.78            |
| 4200  | 14.40 | 22.81     | 13.59                   | 19.16                    | 1.42      | 0.37  | 2200  | 32.39         | 17.14                  | 3.63            |
| 4400  | 14.31 | 22.83     | 13.60                   | 19.43                    | 1.44      | 0.36  | 2300  | 32.30         | 17.20                  | 3.79            |
| 4600  | 14.25 | 22.81     | 13.55                   | 19.63                    | 1.44      | 0.36  | 2400  | 32.07         | 17.15                  | 3.77            |
| 5000  | 14.24 | 22.92     | 13.52                   | 20.82                    | 1.46      | 0.36  | 2500  | 31.87         | 17.10                  | 3.70            |
| 5500  | 14.30 | 22.79     | 13.53                   | 22.59                    | 1.44      | 0.37  | 2600  | 31.68         | 17.09                  | 3.73            |
| 6000  | 14.52 | 22.53     | 13.27                   | 24.14                    | 1.38      | 0.38  | 2700  | 31.58         | 17.03                  | 3.77            |
| 6500  | 14.68 | 22.00     | 13.49                   | 19.94                    | 1.30      | 0.42  | 2800  | 31.50         | 16.99                  | 3.73            |
| 7000  | 14.49 | 21.50     | 12.81                   | 14.97                    | 1.25      | 0.44  | 2900  | 31.32         | 16.95                  | 3.78            |
| 7500  | 13.50 | 21.07     | 11.60                   | 11.65                    | 1.26      | 0.44  | 3000  | 31.09         | 16.85                  | 3.63            |
| 8000  | 11.99 | 20.60     | 10.94                   | 9.32                     | 1.34      | 0.44  | 3100  | 30.80         | 16.67                  | 3.91            |
| 9000  | 8.27  | 19.02     | 9.32                    | 7.12                     | 1.49      | 0.42  | 3200  | 30.52         | 16.69                  | 3.69            |
| 10000 | 5.18  | 16.79     | 8.05                    | 6.59                     | 1.50      | 0.41  | 3300  | 30.51         | 16.69                  | 3.98            |
| 11000 | 3.26  | 14.06     | 8.34                    | 7.09                     | 1.39      | 0.38  | 3400  | 30.26         | 16.58                  | 3.81            |
| 12000 | 2.16  | 11.07     | 9.31                    | 8.27                     | 1.23      | 0.38  | 3500  | 30.04         | 16.36                  | 3.76            |
| 13000 | 1.26  | 7.58      | 11.09                   | 11.33                    | 1.10      | 0.46  | 3600  | 29.80         | 16.23                  | 3.93            |
| 14000 | 0.13  | 4.94      | 8.91                    | 10.04                    | 1.00      | 0.62  | 3700  | 29.54         | 16.07                  | 3.75            |
| 15000 | -2.98 | 5.43      | 4.25                    | 4.80                     | 1.00      | 0.68  | 3800  | 29.41         | 15.86                  | 3.97            |
| 16000 | -5.86 | 6.89      | 3.07                    | 3.40                     | 1.11      | 0.68  | 4000  | 29.26         | 15.38                  | 3.81            |

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## Typical Performance Data

## Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Icc = 50mA, Vd = 4.69V @Temperature = -45degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |       | FREQ  | IP3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|-------|-------|---------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Delta | (MHz) | (dBm)         | (dBm)                  | (dB)            |
| 50    | 18.09 | 21.91     | 26.15                   | 33.35                    | 1.10      | 0.64  | 50    | 31.42         | 15.61                  | 3.01            |
| 100   | 18.08 | 21.86     | 25.14                   | 34.44                    | 1.09      | 0.65  | 100   | 31.55         | 15.73                  | 3.16            |
| 200   | 18.05 | 21.87     | 24.05                   | 36.74                    | 1.09      | 0.64  | 200   | 31.49         | 15.58                  | 3.01            |
| 400   | 17.93 | 21.94     | 26.71                   | 28.59                    | 1.10      | 0.63  | 300   | 31.59         | 15.48                  | 3.26            |
| 600   | 17.80 | 21.93     | 26.19                   | 27.47                    | 1.11      | 0.62  | 400   | 31.17         | 15.84                  | 3.12            |
| 800   | 17.64 | 21.94     | 25.64                   | 25.96                    | 1.12      | 0.61  | 500   | 31.20         | 15.74                  | 3.11            |
| 1000  | 17.47 | 21.93     | 24.67                   | 25.52                    | 1.13      | 0.60  | 600   | 31.17         | 15.60                  | 3.18            |
| 1200  | 17.29 | 21.95     | 24.24                   | 24.22                    | 1.14      | 0.58  | 700   | 31.57         | 15.73                  | 3.06            |
| 1400  | 17.10 | 22.00     | 22.65                   | 23.45                    | 1.15      | 0.56  | 800   | 31.91         | 15.74                  | 3.15            |
| 1600  | 16.88 | 22.01     | 21.86                   | 22.53                    | 1.16      | 0.55  | 900   | 31.95         | 15.69                  | 3.05            |
| 1800  | 16.66 | 22.05     | 20.72                   | 21.85                    | 1.18      | 0.53  | 1000  | 31.82         | 15.71                  | 3.05            |
| 2000  | 16.47 | 22.10     | 20.28                   | 21.11                    | 1.19      | 0.51  | 1100  | 31.71         | 15.44                  | 3.02            |
| 2200  | 16.24 | 22.15     | 19.76                   | 20.41                    | 1.21      | 0.50  | 1200  | 31.67         | 15.11                  | 3.08            |
| 2400  | 16.01 | 22.17     | 18.79                   | 20.12                    | 1.23      | 0.48  | 1300  | 31.62         | 15.25                  | 3.06            |
| 2600  | 15.81 | 22.19     | 17.88                   | 19.68                    | 1.24      | 0.47  | 1400  | 31.35         | 15.20                  | 3.13            |
| 2800  | 15.58 | 22.28     | 16.94                   | 19.57                    | 1.27      | 0.45  | 1500  | 31.31         | 15.11                  | 3.18            |
| 3000  | 15.39 | 22.34     | 16.05                   | 19.47                    | 1.28      | 0.44  | 1600  | 31.58         | 15.11                  | 3.13            |
| 3200  | 15.20 | 22.36     | 15.21                   | 19.55                    | 1.30      | 0.42  | 1700  | 32.13         | 15.31                  | 3.09            |
| 3400  | 15.06 | 22.43     | 14.86                   | 19.17                    | 1.32      | 0.41  | 1800  | 32.10         | 15.19                  | 3.26            |
| 3600  | 14.86 | 22.50     | 14.62                   | 18.94                    | 1.34      | 0.40  | 1900  | 31.83         | 15.28                  | 3.09            |
| 3800  | 14.75 | 22.49     | 14.32                   | 18.51                    | 1.35      | 0.40  | 2000  | 31.73         | 15.34                  | 2.96            |
| 4000  | 14.62 | 22.62     | 14.01                   | 19.08                    | 1.38      | 0.39  | 2100  | 31.63         | 15.21                  | 3.15            |
| 4200  | 14.53 | 22.59     | 13.91                   | 19.25                    | 1.38      | 0.38  | 2200  | 31.58         | 15.39                  | 2.99            |
| 4400  | 14.43 | 22.61     | 13.76                   | 19.57                    | 1.40      | 0.38  | 2300  | 31.62         | 15.48                  | 3.17            |
| 4600  | 14.36 | 22.64     | 13.54                   | 19.56                    | 1.41      | 0.37  | 2400  | 31.58         | 15.51                  | 3.09            |
| 5000  | 14.32 | 22.74     | 13.40                   | 20.26                    | 1.43      | 0.37  | 2500  | 31.49         | 15.57                  | 3.09            |
| 5500  | 14.43 | 22.62     | 13.64                   | 20.73                    | 1.40      | 0.38  | 2600  | 31.67         | 15.53                  | 3.07            |
| 6000  | 14.73 | 22.39     | 13.62                   | 24.72                    | 1.35      | 0.40  | 2700  | 31.50         | 15.46                  | 3.14            |
| 6500  | 14.98 | 21.77     | 14.05                   | 19.90                    | 1.25      | 0.44  | 2800  | 31.48         | 15.43                  | 3.05            |
| 7000  | 14.90 | 21.33     | 12.75                   | 14.44                    | 1.19      | 0.47  | 2900  | 31.45         | 15.45                  | 3.16            |
| 7500  | 14.11 | 20.85     | 11.33                   | 11.36                    | 1.18      | 0.48  | 3000  | 31.28         | 15.46                  | 3.06            |
| 8000  | 12.81 | 20.39     | 10.96                   | 9.38                     | 1.23      | 0.47  | 3100  | 31.17         | 15.42                  | 3.26            |
| 9000  | 9.20  | 18.89     | 9.39                    | 7.04                     | 1.37      | 0.46  | 3200  | 30.98         | 15.44                  | 3.05            |
| 10000 | 5.82  | 16.93     | 7.57                    | 5.85                     | 1.38      | 0.45  | 3300  | 31.04         | 15.52                  | 3.32            |
| 11000 | 3.86  | 14.19     | 8.08                    | 6.51                     | 1.29      | 0.40  | 3400  | 30.89         | 15.53                  | 3.12            |
| 12000 | 3.01  | 10.95     | 9.34                    | 8.61                     | 1.15      | 0.42  | 3500  | 30.72         | 15.33                  | 3.09            |
| 13000 | 1.81  | 7.72      | 9.85                    | 9.53                     | 1.03      | 0.51  | 3600  | 30.45         | 15.26                  | 3.20            |
| 14000 | 0.78  | 4.81      | 10.13                   | 10.06                    | 0.95      | 0.62  | 3700  | 30.11         | 15.21                  | 3.11            |
| 15000 | -1.99 | 4.75      | 3.92                    | 4.86                     | 0.93      | 0.77  | 3800  | 29.80         | 15.13                  | 3.24            |
| 16000 | -6.52 | 7.70      | 2.09                    | 2.29                     | 1.00      | 0.77  | 4000  | 29.77         | 15.03                  | 3.13            |

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## Typical Performance Data

## Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Icc = 40mA, Vd = 4.61V @Temperature = -45degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |       | FREQ  | IP3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|-------|-------|---------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Delta | (MHz) | (dBm)         | (dBm)                  | (dB)            |
| 50    | 17.85 | 21.64     | 23.44                   | 55.81                    | 1.09      | 0.65  | 50    | 27.43         | 12.77                  | 2.97            |
| 100   | 17.84 | 21.76     | 22.40                   | 43.69                    | 1.10      | 0.64  | 100   | 27.55         | 12.85                  | 3.10            |
| 200   | 17.81 | 21.73     | 21.68                   | 39.90                    | 1.10      | 0.64  | 200   | 27.50         | 12.76                  | 2.98            |
| 400   | 17.70 | 21.72     | 23.72                   | 34.59                    | 1.10      | 0.63  | 300   | 27.54         | 12.67                  | 3.21            |
| 600   | 17.57 | 21.72     | 23.65                   | 31.04                    | 1.11      | 0.62  | 400   | 27.25         | 13.02                  | 3.10            |
| 800   | 17.43 | 21.75     | 23.21                   | 28.40                    | 1.12      | 0.61  | 500   | 27.30         | 12.91                  | 3.06            |
| 1000  | 17.26 | 21.71     | 22.59                   | 27.23                    | 1.12      | 0.60  | 600   | 27.29         | 12.81                  | 3.14            |
| 1200  | 17.07 | 21.75     | 22.40                   | 25.81                    | 1.14      | 0.58  | 700   | 27.70         | 12.91                  | 3.00            |
| 1400  | 16.89 | 21.77     | 21.19                   | 24.68                    | 1.15      | 0.56  | 800   | 27.97         | 12.90                  | 3.11            |
| 1600  | 16.68 | 21.80     | 20.48                   | 23.39                    | 1.16      | 0.55  | 900   | 28.07         | 12.87                  | 2.99            |
| 1800  | 16.47 | 21.86     | 19.56                   | 22.33                    | 1.18      | 0.53  | 1000  | 27.94         | 12.93                  | 3.04            |
| 2000  | 16.28 | 21.90     | 18.97                   | 21.35                    | 1.19      | 0.51  | 1100  | 27.78         | 12.65                  | 2.98            |
| 2200  | 16.05 | 21.96     | 18.55                   | 20.55                    | 1.21      | 0.50  | 1200  | 27.75         | 12.32                  | 3.04            |
| 2400  | 15.83 | 21.96     | 17.74                   | 20.07                    | 1.22      | 0.48  | 1300  | 27.71         | 12.48                  | 3.02            |
| 2600  | 15.62 | 21.98     | 16.90                   | 19.56                    | 1.23      | 0.47  | 1400  | 27.49         | 12.38                  | 3.10            |
| 2800  | 15.40 | 22.11     | 16.09                   | 19.32                    | 1.26      | 0.45  | 1500  | 27.49         | 12.40                  | 3.12            |
| 3000  | 15.22 | 22.17     | 15.22                   | 19.09                    | 1.28      | 0.44  | 1600  | 27.71         | 12.40                  | 3.08            |
| 3200  | 15.03 | 22.18     | 14.49                   | 19.09                    | 1.29      | 0.43  | 1700  | 28.12         | 12.46                  | 3.05            |
| 3400  | 14.89 | 22.26     | 14.11                   | 18.71                    | 1.31      | 0.42  | 1800  | 28.14         | 12.45                  | 3.21            |
| 3600  | 14.71 | 22.32     | 13.89                   | 18.45                    | 1.33      | 0.40  | 1900  | 27.97         | 12.59                  | 3.06            |
| 3800  | 14.59 | 22.31     | 13.63                   | 18.03                    | 1.34      | 0.40  | 2000  | 27.86         | 12.57                  | 2.92            |
| 4000  | 14.47 | 22.42     | 13.38                   | 18.54                    | 1.36      | 0.39  | 2100  | 27.78         | 12.53                  | 3.10            |
| 4200  | 14.37 | 22.47     | 13.22                   | 18.73                    | 1.38      | 0.38  | 2200  | 27.82         | 12.62                  | 2.92            |
| 4400  | 14.28 | 22.45     | 13.06                   | 19.05                    | 1.39      | 0.38  | 2300  | 27.94         | 12.77                  | 3.13            |
| 4600  | 14.21 | 22.43     | 12.94                   | 19.10                    | 1.39      | 0.38  | 2400  | 28.07         | 12.85                  | 3.10            |
| 5000  | 14.17 | 22.57     | 12.79                   | 19.80                    | 1.41      | 0.37  | 2500  | 28.17         | 12.91                  | 3.04            |
| 5500  | 14.27 | 22.43     | 12.97                   | 20.44                    | 1.39      | 0.38  | 2600  | 28.42         | 12.83                  | 3.03            |
| 6000  | 14.57 | 22.20     | 12.97                   | 24.91                    | 1.34      | 0.41  | 2700  | 28.39         | 12.74                  | 3.09            |
| 6500  | 14.82 | 21.57     | 13.34                   | 20.94                    | 1.24      | 0.45  | 2800  | 28.42         | 12.82                  | 3.01            |
| 7000  | 14.70 | 21.15     | 12.07                   | 15.06                    | 1.19      | 0.47  | 2900  | 28.45         | 12.80                  | 3.11            |
| 7500  | 13.90 | 20.69     | 10.92                   | 11.78                    | 1.18      | 0.48  | 3000  | 28.46         | 12.85                  | 3.06            |
| 8000  | 12.59 | 20.26     | 10.65                   | 9.71                     | 1.24      | 0.46  | 3100  | 28.43         | 12.89                  | 3.22            |
| 9000  | 9.01  | 18.78     | 9.28                    | 7.24                     | 1.38      | 0.45  | 3200  | 28.52         | 12.96                  | 2.96            |
| 10000 | 5.68  | 16.93     | 7.53                    | 6.01                     | 1.40      | 0.44  | 3300  | 28.64         | 13.03                  | 3.27            |
| 11000 | 3.74  | 14.20     | 8.02                    | 6.66                     | 1.30      | 0.39  | 3400  | 28.59         | 13.05                  | 3.06            |
| 12000 | 2.89  | 11.00     | 9.20                    | 8.75                     | 1.16      | 0.41  | 3500  | 28.44         | 12.80                  | 3.04            |
| 13000 | 1.70  | 7.77      | 9.68                    | 9.58                     | 1.04      | 0.50  | 3600  | 28.07         | 12.77                  | 3.14            |
| 14000 | 0.69  | 4.83      | 9.98                    | 10.05                    | 0.95      | 0.61  | 3700  | 27.70         | 12.77                  | 3.05            |
| 15000 | -2.06 | 4.77      | 3.89                    | 4.87                     | 0.93      | 0.76  | 3800  | 27.50         | 12.70                  | 3.18            |
| 16000 | -6.59 | 7.72      | 2.08                    | 2.30                     | 1.00      | 0.77  | 4000  | 27.53         | 12.70                  | 3.08            |

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## Typical Performance Data

## Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Icc = 60mA, Vd = 4.75V @Temperature = -45degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |       | FREQ  | IP3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|-------|-------|---------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Delta | (MHz) | (dBm)         | (dBm)                  | (dB)            |
| 50    | 18.22 | 21.84     | 28.64                   | 29.03                    | 1.08      | 0.66  | 50    | 34.24         | 17.67                  | 3.07            |
| 100   | 18.22 | 21.97     | 27.02                   | 29.62                    | 1.09      | 0.65  | 100   | 34.41         | 17.76                  | 3.22            |
| 200   | 18.18 | 22.09     | 25.78                   | 31.22                    | 1.10      | 0.64  | 200   | 34.44         | 17.64                  | 3.05            |
| 400   | 18.07 | 22.04     | 28.91                   | 25.92                    | 1.10      | 0.63  | 300   | 34.48         | 17.58                  | 3.30            |
| 600   | 17.94 | 22.04     | 28.10                   | 25.35                    | 1.11      | 0.62  | 400   | 33.96         | 17.84                  | 3.17            |
| 800   | 17.78 | 22.05     | 27.31                   | 24.36                    | 1.12      | 0.61  | 500   | 33.93         | 17.76                  | 3.19            |
| 1000  | 17.61 | 22.05     | 26.07                   | 24.12                    | 1.12      | 0.60  | 600   | 33.91         | 17.63                  | 3.19            |
| 1200  | 17.42 | 22.08     | 25.45                   | 23.05                    | 1.14      | 0.58  | 700   | 34.31         | 17.69                  | 3.12            |
| 1400  | 17.21 | 22.11     | 23.65                   | 22.52                    | 1.15      | 0.56  | 800   | 34.72         | 17.74                  | 3.20            |
| 1600  | 17.01 | 22.12     | 22.80                   | 21.80                    | 1.16      | 0.55  | 900   | 34.77         | 17.68                  | 3.11            |
| 1800  | 16.78 | 22.20     | 21.62                   | 21.35                    | 1.18      | 0.53  | 1000  | 34.60         | 17.69                  | 3.09            |
| 2000  | 16.57 | 22.19     | 21.12                   | 20.79                    | 1.19      | 0.52  | 1100  | 34.49         | 17.47                  | 3.07            |
| 2200  | 16.35 | 22.25     | 20.60                   | 20.16                    | 1.21      | 0.50  | 1200  | 34.46         | 17.16                  | 3.15            |
| 2400  | 16.13 | 22.25     | 19.56                   | 19.97                    | 1.23      | 0.48  | 1300  | 34.32         | 17.32                  | 3.12            |
| 2600  | 15.92 | 22.33     | 18.56                   | 19.62                    | 1.25      | 0.47  | 1400  | 34.02         | 17.24                  | 3.19            |
| 2800  | 15.68 | 22.42     | 17.59                   | 19.64                    | 1.27      | 0.45  | 1500  | 33.99         | 17.16                  | 3.22            |
| 3000  | 15.49 | 22.46     | 16.65                   | 19.59                    | 1.29      | 0.43  | 1600  | 34.27         | 17.19                  | 3.17            |
| 3200  | 15.30 | 22.51     | 15.74                   | 19.76                    | 1.31      | 0.42  | 1700  | 34.86         | 17.29                  | 3.15            |
| 3400  | 15.16 | 22.55     | 15.40                   | 19.37                    | 1.32      | 0.41  | 1800  | 34.86         | 17.20                  | 3.32            |
| 3600  | 14.97 | 22.60     | 15.14                   | 19.15                    | 1.35      | 0.40  | 1900  | 34.56         | 17.31                  | 3.14            |
| 3800  | 14.86 | 22.62     | 14.82                   | 18.72                    | 1.36      | 0.40  | 2000  | 34.34         | 17.36                  | 3.03            |
| 4000  | 14.71 | 22.72     | 14.51                   | 19.33                    | 1.39      | 0.39  | 2100  | 34.15         | 17.24                  | 3.19            |
| 4200  | 14.62 | 22.73     | 14.39                   | 19.45                    | 1.40      | 0.38  | 2200  | 33.99         | 17.35                  | 3.05            |
| 4400  | 14.53 | 22.71     | 14.24                   | 19.77                    | 1.40      | 0.38  | 2300  | 33.86         | 17.41                  | 3.20            |
| 4600  | 14.46 | 22.76     | 14.01                   | 19.73                    | 1.42      | 0.37  | 2400  | 33.74         | 17.41                  | 3.15            |
| 5000  | 14.43 | 22.87     | 13.86                   | 20.44                    | 1.43      | 0.37  | 2500  | 33.46         | 17.42                  | 3.12            |
| 5500  | 14.51 | 22.73     | 14.14                   | 20.75                    | 1.41      | 0.38  | 2600  | 33.53         | 17.36                  | 3.11            |
| 6000  | 14.84 | 22.49     | 14.15                   | 24.29                    | 1.35      | 0.40  | 2700  | 33.25         | 17.31                  | 3.18            |
| 6500  | 15.10 | 21.87     | 14.65                   | 19.35                    | 1.26      | 0.44  | 2800  | 33.22         | 17.28                  | 3.11            |
| 7000  | 15.05 | 21.41     | 13.25                   | 14.11                    | 1.19      | 0.48  | 2900  | 33.00         | 17.30                  | 3.20            |
| 7500  | 14.28 | 20.97     | 11.65                   | 11.11                    | 1.18      | 0.48  | 3000  | 32.78         | 17.24                  | 3.15            |
| 8000  | 13.00 | 20.49     | 11.20                   | 9.17                     | 1.22      | 0.48  | 3100  | 32.59         | 17.09                  | 3.32            |
| 9000  | 9.36  | 18.93     | 9.48                    | 6.89                     | 1.35      | 0.46  | 3200  | 32.39         | 17.11                  | 3.14            |
| 10000 | 5.96  | 16.94     | 7.60                    | 5.73                     | 1.36      | 0.46  | 3300  | 32.36         | 17.14                  | 3.36            |
| 11000 | 3.98  | 14.16     | 8.14                    | 6.41                     | 1.27      | 0.41  | 3400  | 32.08         | 17.12                  | 3.17            |
| 12000 | 3.13  | 10.92     | 9.48                    | 8.52                     | 1.14      | 0.43  | 3500  | 31.86         | 16.91                  | 3.15            |
| 13000 | 1.90  | 7.69      | 10.00                   | 9.50                     | 1.03      | 0.52  | 3600  | 31.64         | 16.82                  | 3.28            |
| 14000 | 0.84  | 4.81      | 10.28                   | 10.06                    | 0.95      | 0.63  | 3700  | 31.21         | 16.72                  | 3.17            |
| 15000 | -1.91 | 4.74      | 3.96                    | 4.85                     | 0.93      | 0.77  | 3800  | 31.02         | 16.55                  | 3.30            |
| 16000 | -6.45 | 7.69      | 2.10                    | 2.29                     | 0.99      | 0.77  | 4000  | 30.92         | 16.21                  | 3.20            |

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## Typical Performance Data

## Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Icc = 50mA, Vd = 4.27V @Temperature = +85degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |       | FREQ  | IP3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|-------|-------|---------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Delta | (MHz) | (dBm)         | (dBm)                  | (dB)            |
| 50    | 17.87 | 21.94     | 26.87                   | 35.09                    | 1.11      | 0.62  | 50    | 30.55         | 15.83                  | 3.87            |
| 100   | 17.84 | 21.84     | 27.54                   | 31.12                    | 1.10      | 0.63  | 100   | 30.69         | 15.98                  | 4.05            |
| 200   | 17.81 | 21.77     | 28.80                   | 29.31                    | 1.10      | 0.63  | 200   | 30.83         | 15.90                  | 3.90            |
| 400   | 17.68 | 21.83     | 25.84                   | 29.92                    | 1.11      | 0.62  | 300   | 30.75         | 15.73                  | 4.19            |
| 600   | 17.54 | 21.82     | 24.76                   | 29.48                    | 1.12      | 0.61  | 400   | 30.15         | 15.98                  | 4.05            |
| 800   | 17.37 | 21.84     | 23.73                   | 28.08                    | 1.13      | 0.59  | 500   | 30.06         | 15.85                  | 4.09            |
| 1000  | 17.19 | 21.85     | 22.75                   | 26.95                    | 1.14      | 0.58  | 600   | 30.03         | 15.72                  | 4.09            |
| 1200  | 16.98 | 21.91     | 22.02                   | 25.63                    | 1.15      | 0.56  | 700   | 30.38         | 15.84                  | 4.04            |
| 1400  | 16.77 | 21.95     | 21.31                   | 24.21                    | 1.17      | 0.55  | 800   | 30.65         | 15.86                  | 4.11            |
| 1600  | 16.55 | 21.98     | 20.57                   | 22.90                    | 1.18      | 0.53  | 900   | 30.66         | 15.78                  | 4.05            |
| 1800  | 16.32 | 22.06     | 19.72                   | 21.87                    | 1.20      | 0.51  | 1000  | 30.48         | 15.83                  | 4.03            |
| 2000  | 16.10 | 22.05     | 18.76                   | 21.18                    | 1.21      | 0.49  | 1100  | 30.31         | 15.56                  | 4.03            |
| 2200  | 15.87 | 22.13     | 17.91                   | 20.78                    | 1.24      | 0.48  | 1200  | 30.24         | 15.22                  | 4.09            |
| 2400  | 15.64 | 22.17     | 16.99                   | 20.42                    | 1.25      | 0.46  | 1300  | 30.14         | 15.31                  | 4.08            |
| 2600  | 15.41 | 22.25     | 16.13                   | 20.00                    | 1.28      | 0.44  | 1400  | 29.83         | 15.28                  | 4.16            |
| 2800  | 15.17 | 22.33     | 15.46                   | 19.65                    | 1.30      | 0.42  | 1500  | 29.80         | 15.19                  | 4.22            |
| 3000  | 14.98 | 22.37     | 14.79                   | 19.17                    | 1.32      | 0.41  | 1600  | 30.10         | 15.20                  | 4.17            |
| 3200  | 14.75 | 22.43     | 14.20                   | 18.70                    | 1.34      | 0.40  | 1700  | 30.66         | 15.38                  | 4.14            |
| 3400  | 14.59 | 22.54     | 13.58                   | 18.26                    | 1.36      | 0.39  | 1800  | 30.52         | 15.21                  | 4.32            |
| 3600  | 14.40 | 22.59     | 13.16                   | 18.18                    | 1.39      | 0.38  | 1900  | 30.17         | 15.32                  | 4.18            |
| 3800  | 14.27 | 22.62     | 12.67                   | 17.92                    | 1.40      | 0.37  | 2000  | 29.96         | 15.31                  | 3.99            |
| 4000  | 14.12 | 22.74     | 12.41                   | 18.29                    | 1.43      | 0.36  | 2100  | 29.79         | 15.28                  | 4.23            |
| 4200  | 14.01 | 22.73     | 12.27                   | 18.62                    | 1.44      | 0.36  | 2200  | 29.66         | 15.28                  | 4.02            |
| 4400  | 13.93 | 22.71     | 12.29                   | 19.17                    | 1.45      | 0.36  | 2300  | 29.54         | 15.44                  | 4.23            |
| 4600  | 13.87 | 22.74     | 12.34                   | 19.67                    | 1.47      | 0.35  | 2400  | 29.47         | 15.42                  | 4.17            |
| 5000  | 13.85 | 22.82     | 12.36                   | 21.04                    | 1.48      | 0.35  | 2500  | 29.23         | 15.37                  | 4.16            |
| 5500  | 13.87 | 22.69     | 12.32                   | 23.43                    | 1.46      | 0.35  | 2600  | 29.29         | 15.32                  | 4.19            |
| 6000  | 13.97 | 22.41     | 11.93                   | 25.32                    | 1.41      | 0.36  | 2700  | 29.00         | 15.27                  | 4.23            |
| 6500  | 13.92 | 21.89     | 11.98                   | 21.56                    | 1.35      | 0.39  | 2800  | 28.96         | 15.24                  | 4.18            |
| 7000  | 13.50 | 21.39     | 11.78                   | 16.73                    | 1.33      | 0.40  | 2900  | 28.88         | 15.22                  | 4.24            |
| 7500  | 12.33 | 20.97     | 11.11                   | 12.85                    | 1.39      | 0.40  | 3000  | 28.71         | 15.13                  | 4.09            |
| 8000  | 10.68 | 20.57     | 10.56                   | 9.93                     | 1.50      | 0.39  | 3100  | 28.47         | 14.98                  | 4.42            |
| 9000  | 6.96  | 19.02     | 9.13                    | 7.32                     | 1.67      | 0.37  | 3200  | 28.30         | 15.06                  | 4.14            |
| 10000 | 4.18  | 16.65     | 8.11                    | 7.43                     | 1.65      | 0.35  | 3300  | 28.23         | 15.09                  | 4.45            |
| 11000 | 2.41  | 13.91     | 8.46                    | 8.11                     | 1.53      | 0.33  | 3400  | 28.10         | 14.98                  | 4.29            |
| 12000 | 1.06  | 11.22     | 8.93                    | 8.08                     | 1.35      | 0.35  | 3500  | 27.86         | 14.68                  | 4.22            |
| 13000 | 0.28  | 7.73      | 11.06                   | 11.57                    | 1.19      | 0.39  | 3600  | 27.62         | 14.53                  | 4.41            |
| 14000 | -0.65 | 5.02      | 8.51                    | 10.70                    | 1.07      | 0.58  | 3700  | 27.39         | 14.42                  | 4.24            |
| 15000 | -4.25 | 6.27      | 3.98                    | 4.30                     | 1.08      | 0.64  | 3800  | 27.20         | 14.26                  | 4.47            |
| 16000 | -5.75 | 6.51      | 3.98                    | 4.49                     | 1.22      | 0.59  | 4000  | 26.94         | 13.92                  | 4.31            |

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## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Icc = 40mA, Vd = 4.20V @Temperature = +85degC

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |       | FREQ  | IP3 Output | 1dB Comp. Output | Noise Figure |
|-------|-------|-----------|-------------------|--------------------|-----------|-------|-------|------------|------------------|--------------|
| (MHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Delta | (MHz) | (dBm)      | (dBm)            | (dB)         |
| 50    | 17.58 | 21.50     | 23.24             | 39.73              | 1.10      | 0.64  | 50    | 26.94      | 13.17            | 3.83         |
| 100   | 17.55 | 21.54     | 23.76             | 52.29              | 1.10      | 0.63  | 100   | 27.11      | 13.32            | 3.98         |
| 200   | 17.51 | 21.54     | 24.33             | 41.51              | 1.11      | 0.63  | 200   | 27.20      | 13.25            | 3.87         |
| 400   | 17.37 | 21.64     | 22.62             | 33.01              | 1.12      | 0.61  | 300   | 27.12      | 13.14            | 4.11         |
| 600   | 17.25 | 21.58     | 22.15             | 31.05              | 1.12      | 0.61  | 400   | 26.61      | 13.36            | 4.03         |
| 800   | 17.08 | 21.60     | 21.33             | 29.03              | 1.13      | 0.59  | 500   | 26.58      | 13.21            | 4.03         |
| 1000  | 16.90 | 21.62     | 20.70             | 27.51              | 1.14      | 0.58  | 600   | 26.56      | 13.12            | 4.06         |
| 1200  | 16.71 | 21.67     | 20.18             | 26.11              | 1.15      | 0.56  | 700   | 26.92      | 13.20            | 3.96         |
| 1400  | 16.52 | 21.66     | 19.56             | 24.50              | 1.16      | 0.55  | 800   | 27.19      | 13.24            | 4.07         |
| 1600  | 16.31 | 21.73     | 19.01             | 23.08              | 1.18      | 0.53  | 900   | 27.22      | 13.18            | 4.00         |
| 1800  | 16.08 | 21.77     | 18.30             | 21.86              | 1.19      | 0.51  | 1000  | 27.09      | 13.20            | 4.00         |
| 2000  | 15.86 | 21.82     | 17.41             | 21.00              | 1.21      | 0.49  | 1100  | 26.89      | 12.92            | 3.98         |
| 2200  | 15.62 | 21.88     | 16.68             | 20.45              | 1.23      | 0.48  | 1200  | 26.86      | 12.59            | 4.05         |
| 2400  | 15.40 | 21.96     | 15.94             | 19.98              | 1.25      | 0.46  | 1300  | 26.79      | 12.68            | 4.02         |
| 2600  | 15.19 | 22.00     | 15.17             | 19.51              | 1.27      | 0.44  | 1400  | 26.56      | 12.67            | 4.14         |
| 2800  | 14.96 | 22.08     | 14.55             | 19.15              | 1.29      | 0.43  | 1500  | 26.56      | 12.63            | 4.16         |
| 3000  | 14.74 | 22.15     | 13.90             | 18.54              | 1.31      | 0.41  | 1600  | 26.82      | 12.67            | 4.09         |
| 3200  | 14.55 | 22.24     | 13.42             | 18.07              | 1.33      | 0.40  | 1700  | 27.31      | 12.82            | 4.09         |
| 3400  | 14.38 | 22.31     | 12.80             | 17.58              | 1.35      | 0.39  | 1800  | 27.29      | 12.71            | 4.27         |
| 3600  | 14.18 | 22.41     | 12.40             | 17.41              | 1.38      | 0.38  | 1900  | 27.02      | 12.85            | 4.11         |
| 3800  | 14.05 | 22.42     | 11.99             | 17.13              | 1.39      | 0.37  | 2000  | 26.86      | 12.88            | 3.95         |
| 4000  | 13.92 | 22.49     | 11.75             | 17.51              | 1.41      | 0.37  | 2100  | 26.76      | 12.66            | 4.20         |
| 4200  | 13.80 | 22.49     | 11.62             | 17.73              | 1.42      | 0.36  | 2200  | 26.75      | 12.78            | 3.97         |
| 4400  | 13.71 | 22.49     | 11.64             | 18.26              | 1.44      | 0.36  | 2300  | 26.82      | 12.96            | 4.20         |
| 4600  | 13.68 | 22.50     | 11.73             | 18.82              | 1.45      | 0.36  | 2400  | 26.87      | 13.02            | 4.10         |
| 5000  | 13.65 | 22.61     | 11.74             | 20.15              | 1.47      | 0.35  | 2500  | 26.82      | 12.98            | 4.10         |
| 5500  | 13.67 | 22.47     | 11.65             | 22.78              | 1.45      | 0.35  | 2600  | 27.04      | 12.96            | 4.12         |
| 6000  | 13.77 | 22.18     | 11.35             | 25.93              | 1.40      | 0.37  | 2700  | 26.79      | 12.94            | 4.18         |
| 6500  | 13.71 | 21.67     | 11.40             | 23.23              | 1.34      | 0.39  | 2800  | 26.85      | 12.92            | 4.08         |
| 7000  | 13.25 | 21.17     | 11.25             | 17.76              | 1.33      | 0.40  | 2900  | 26.80      | 12.96            | 4.20         |
| 7500  | 12.11 | 20.76     | 10.74             | 13.38              | 1.39      | 0.39  | 3000  | 26.74      | 12.91            | 4.01         |
| 8000  | 10.47 | 20.38     | 10.32             | 10.30              | 1.50      | 0.38  | 3100  | 26.66      | 12.88            | 4.37         |
| 9000  | 6.80  | 18.90     | 9.06              | 7.53               | 1.68      | 0.37  | 3200  | 26.60      | 13.05            | 4.08         |
| 10000 | 4.05  | 16.62     | 8.07              | 7.65               | 1.67      | 0.34  | 3300  | 26.61      | 13.06            | 4.41         |
| 11000 | 2.28  | 13.95     | 8.38              | 8.30               | 1.55      | 0.32  | 3400  | 26.51      | 13.02            | 4.21         |
| 12000 | 0.93  | 11.29     | 8.83              | 8.19               | 1.37      | 0.33  | 3500  | 26.26      | 12.74            | 4.15         |
| 13000 | 0.16  | 7.78      | 10.88             | 11.55              | 1.20      | 0.38  | 3600  | 25.96      | 12.69            | 4.36         |
| 14000 | -0.75 | 5.04      | 8.42              | 10.73              | 1.07      | 0.58  | 3700  | 25.74      | 12.64            | 4.17         |
| 15000 | -4.35 | 6.28      | 3.97              | 4.30               | 1.09      | 0.64  | 3800  | 25.57      | 12.60            | 4.40         |
| 16000 | -5.81 | 6.52      | 3.98              | 4.49               | 1.23      | 0.59  | 4000  | 25.54      | 12.46            | 4.23         |

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## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Icc = 60mA, Vd = 4.33V @Temperature = +85degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |       | FREQ  | IP3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|-------|-------|---------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Delta | (MHz) | (dBm)         | (dBm)                  | (dB)            |
| 50    | 18.04 | 21.85     | 30.22                   | 29.06                    | 1.09      | 0.64  | 50    | 33.16         | 17.51                  | 3.91            |
| 100   | 18.04 | 21.96     | 31.09                   | 27.00                    | 1.10      | 0.64  | 100   | 33.34         | 17.57                  | 4.13            |
| 200   | 17.99 | 21.99     | 32.64                   | 25.90                    | 1.10      | 0.63  | 200   | 33.43         | 17.55                  | 3.93            |
| 400   | 17.85 | 22.01     | 28.29                   | 26.79                    | 1.11      | 0.62  | 300   | 33.34         | 17.43                  | 4.25            |
| 600   | 17.71 | 21.99     | 27.01                   | 26.77                    | 1.12      | 0.61  | 400   | 32.70         | 17.60                  | 4.11            |
| 800   | 17.53 | 22.02     | 25.47                   | 26.10                    | 1.13      | 0.59  | 500   | 32.50         | 17.46                  | 4.18            |
| 1000  | 17.34 | 22.03     | 24.29                   | 25.55                    | 1.14      | 0.58  | 600   | 32.40         | 17.35                  | 4.14            |
| 1200  | 17.14 | 22.06     | 23.42                   | 24.49                    | 1.15      | 0.56  | 700   | 32.78         | 17.39                  | 4.09            |
| 1400  | 16.92 | 22.08     | 22.49                   | 23.44                    | 1.17      | 0.55  | 800   | 32.98         | 17.43                  | 4.16            |
| 1600  | 16.71 | 22.13     | 21.72                   | 22.36                    | 1.18      | 0.53  | 900   | 33.01         | 17.33                  | 4.13            |
| 1800  | 16.47 | 22.19     | 20.72                   | 21.53                    | 1.20      | 0.51  | 1000  | 32.74         | 17.35                  | 4.09            |
| 2000  | 16.26 | 22.24     | 19.60                   | 21.04                    | 1.22      | 0.49  | 1100  | 32.59         | 17.23                  | 4.10            |
| 2200  | 16.01 | 22.27     | 18.73                   | 20.70                    | 1.24      | 0.48  | 1200  | 32.47         | 16.98                  | 4.16            |
| 2400  | 15.77 | 22.34     | 17.75                   | 20.47                    | 1.26      | 0.46  | 1300  | 32.33         | 17.03                  | 4.13            |
| 2600  | 15.56 | 22.39     | 16.84                   | 20.13                    | 1.28      | 0.44  | 1400  | 31.97         | 17.00                  | 4.23            |
| 2800  | 15.31 | 22.47     | 16.11                   | 19.84                    | 1.31      | 0.42  | 1500  | 31.86         | 16.97                  | 4.28            |
| 3000  | 15.09 | 22.51     | 15.38                   | 19.41                    | 1.33      | 0.41  | 1600  | 32.24         | 16.96                  | 4.22            |
| 3200  | 14.89 | 22.62     | 14.78                   | 18.99                    | 1.35      | 0.40  | 1700  | 32.75         | 17.03                  | 4.18            |
| 3400  | 14.73 | 22.65     | 14.08                   | 18.62                    | 1.37      | 0.39  | 1800  | 32.49         | 16.92                  | 4.38            |
| 3600  | 14.52 | 22.71     | 13.64                   | 18.57                    | 1.39      | 0.38  | 1900  | 32.05         | 16.96                  | 4.22            |
| 3800  | 14.39 | 22.76     | 13.13                   | 18.33                    | 1.41      | 0.37  | 2000  | 31.83         | 17.01                  | 4.06            |
| 4000  | 14.25 | 22.85     | 12.86                   | 18.75                    | 1.44      | 0.36  | 2100  | 31.49         | 16.93                  | 4.29            |
| 4200  | 14.15 | 22.86     | 12.70                   | 19.04                    | 1.45      | 0.36  | 2200  | 31.25         | 16.91                  | 4.10            |
| 4400  | 14.05 | 22.84     | 12.75                   | 19.63                    | 1.46      | 0.36  | 2300  | 31.00         | 16.92                  | 4.31            |
| 4600  | 14.00 | 22.87     | 12.80                   | 20.10                    | 1.48      | 0.35  | 2400  | 30.71         | 16.83                  | 4.22            |
| 5000  | 13.96 | 22.93     | 12.82                   | 21.40                    | 1.49      | 0.35  | 2500  | 30.40         | 16.74                  | 4.21            |
| 5500  | 14.02 | 22.84     | 12.75                   | 23.46                    | 1.47      | 0.35  | 2600  | 30.31         | 16.74                  | 4.26            |
| 6000  | 14.11 | 22.53     | 12.39                   | 24.54                    | 1.41      | 0.37  | 2700  | 29.96         | 16.65                  | 4.28            |
| 6500  | 14.09 | 22.03     | 12.40                   | 20.66                    | 1.35      | 0.39  | 2800  | 29.90         | 16.57                  | 4.26            |
| 7000  | 13.67 | 21.51     | 12.15                   | 16.18                    | 1.33      | 0.40  | 2900  | 29.74         | 16.50                  | 4.32            |
| 7500  | 12.52 | 21.06     | 11.38                   | 12.51                    | 1.38      | 0.40  | 3000  | 29.48         | 16.38                  | 4.15            |
| 8000  | 10.86 | 20.66     | 10.74                   | 9.71                     | 1.49      | 0.39  | 3100  | 29.28         | 16.17                  | 4.45            |
| 9000  | 7.11  | 19.09     | 9.18                    | 7.16                     | 1.65      | 0.38  | 3200  | 28.99         | 16.15                  | 4.22            |
| 10000 | 4.30  | 16.66     | 8.14                    | 7.28                     | 1.63      | 0.36  | 3300  | 28.86         | 16.12                  | 4.50            |
| 11000 | 2.52  | 13.89     | 8.50                    | 7.98                     | 1.51      | 0.34  | 3400  | 28.73         | 15.98                  | 4.35            |
| 12000 | 1.15  | 11.17     | 8.99                    | 8.00                     | 1.33      | 0.36  | 3500  | 28.46         | 15.69                  | 4.30            |
| 13000 | 0.37  | 7.69      | 11.20                   | 11.56                    | 1.18      | 0.40  | 3600  | 28.29         | 15.52                  | 4.49            |
| 14000 | -0.58 | 5.02      | 8.58                    | 10.68                    | 1.07      | 0.59  | 3700  | 28.03         | 15.30                  | 4.31            |
| 15000 | -4.20 | 6.28      | 3.99                    | 4.29                     | 1.08      | 0.65  | 3800  | 27.79         | 15.15                  | 4.56            |
| 16000 | -5.71 | 6.51      | 3.99                    | 4.48                     | 1.22      | 0.59  | 4000  | 27.48         | 14.70                  | 4.39            |

REV. X1

GALI-51F+

120123

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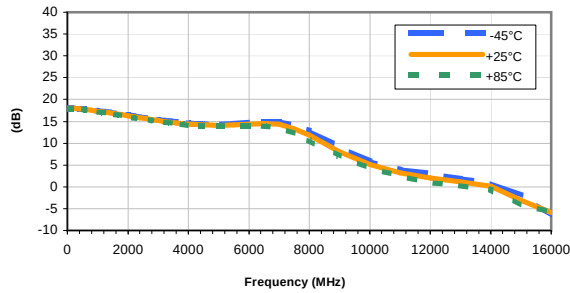
The Design Engineers Search Engine finds the model you need, Instantly • For detailed performance specs & shopping online see



## Typical Performance Curves

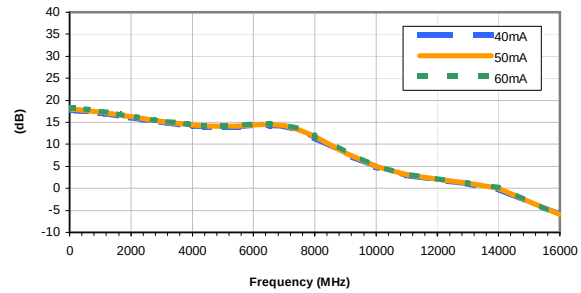
**GAIN vs. TEMPERATURE**

INPUT POWER = -20dBm, CURRENT = 50mA



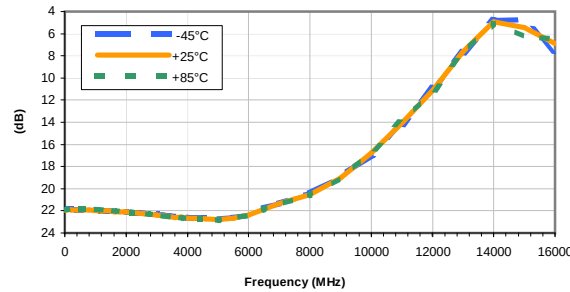
**GAIN vs. CURRENT**

INPUT POWER = -20dBm, Temperature = +25°C



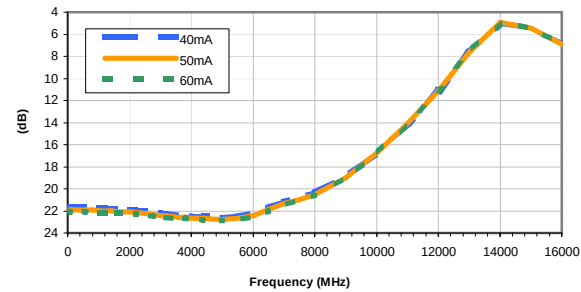
**ISOLATION vs. TEMPERATURE**

INPUT POWER = -20dBm, CURRENT = 50mA



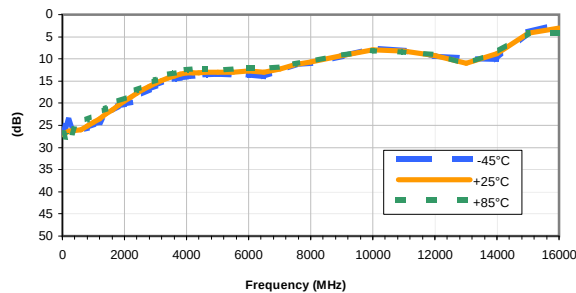
**ISOLATION vs. CURRENT**

INPUT POWER = -20dBm, Temperature = +25°C



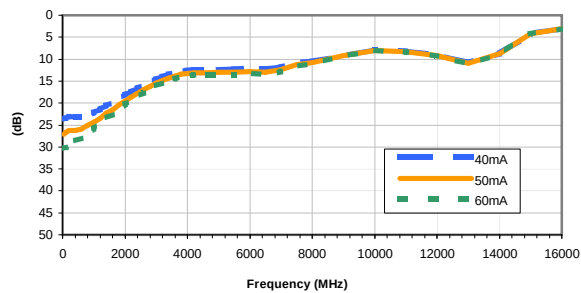
**INPUT RETURN LOSS vs. TEMPERATURE**

INPUT POWER = -20dBm, CURRENT = 50mA



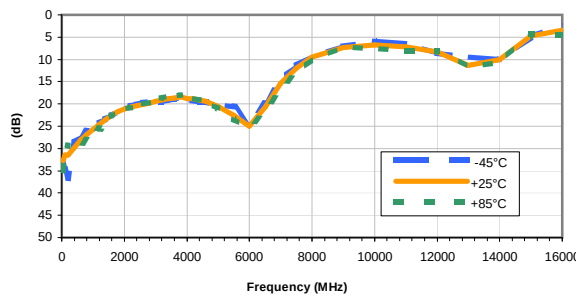
**INPUT RETURN LOSS vs. CURRENT**

INPUT POWER = -20dBm, Temperature = +25°C



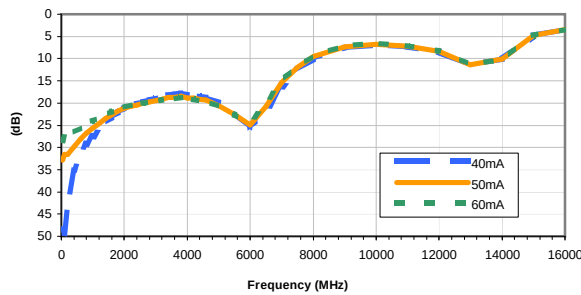
**OUTPUT RETURN LOSS vs. TEMPERATURE**

INPUT POWER = -20dBm, CURRENT = 50mA



**OUTPUT RETURN LOSS vs. CURRENT**

INPUT POWER = -20dBm, Temperature = +25°C



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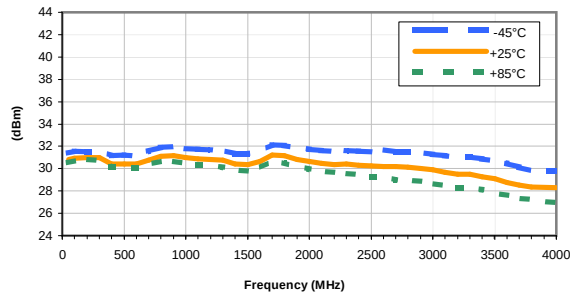
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## Typical Performance Curves

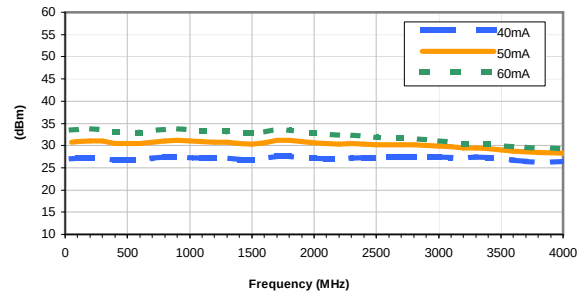
OUTPUT IP3 vs. TEMPERATURE

INPUT POWER = -20dBm, CURRENT = 50mA



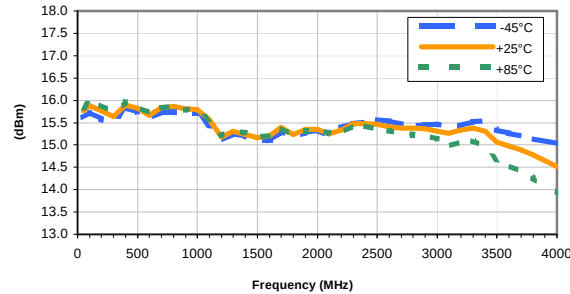
OUTPUT IP3 vs. CURRENT

INPUT POWER = -20dBm, Temperature = +25°C



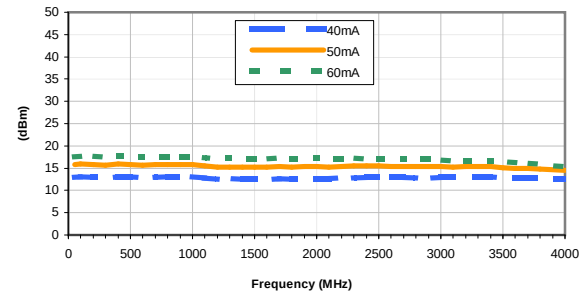
OUTPUT POWER at 1dB Compression vs. TEMPERATURE

CURRENT = 50mA



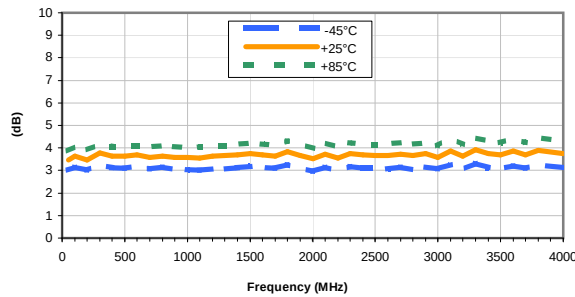
OUTPUT POWER at 1dB Compression vs. CURRENT

Temperature = +25°C



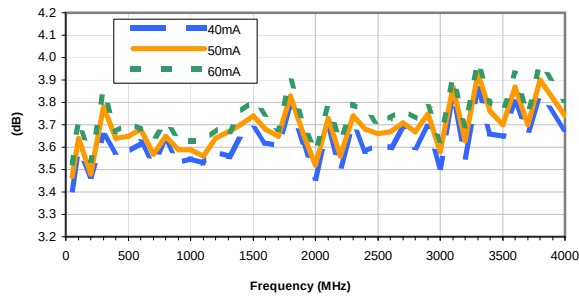
Noise Figure vs. TEMPERATURE

CURRENT = 50mA



Noise Figure vs. CURRENT

Temperature = +25°C

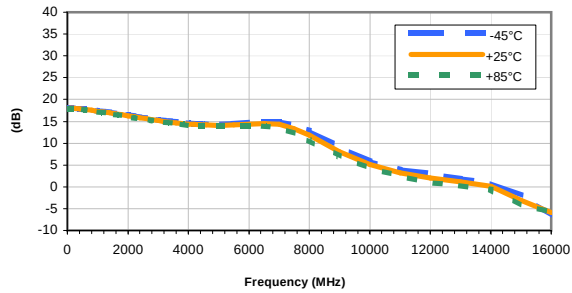




## Typical Performance Curves

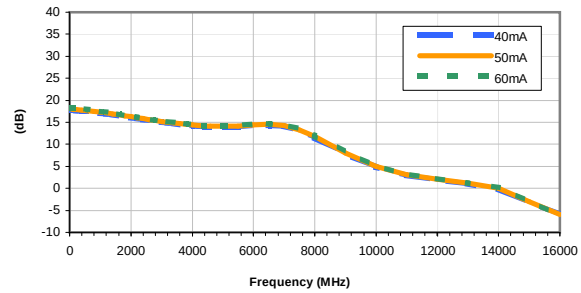
**GAIN vs. TEMPERATURE**

INPUT POWER = -20dBm, CURRENT = 50mA



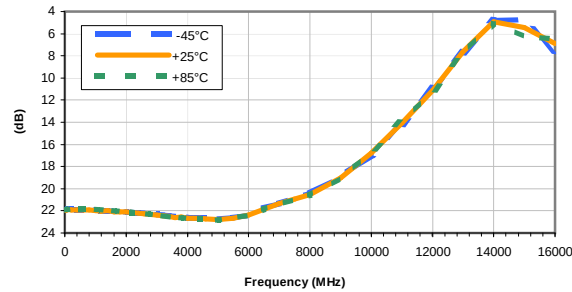
**GAIN vs. CURRENT**

INPUT POWER = -20dBm, Temperature = +25°C



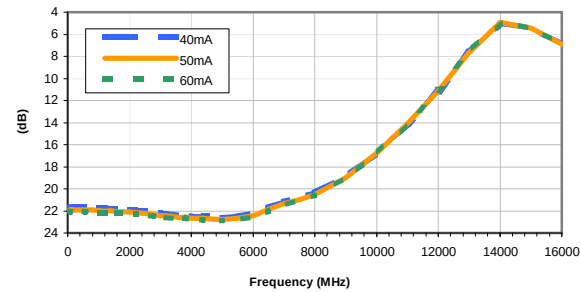
**ISOLATION vs. TEMPERATURE**

INPUT POWER = -20dBm, CURRENT = 50mA



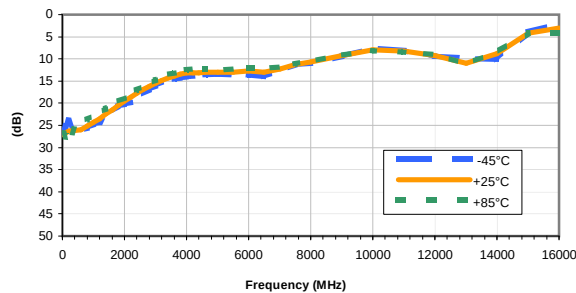
**ISOLATION vs. CURRENT**

INPUT POWER = -20dBm, Temperature = +25°C



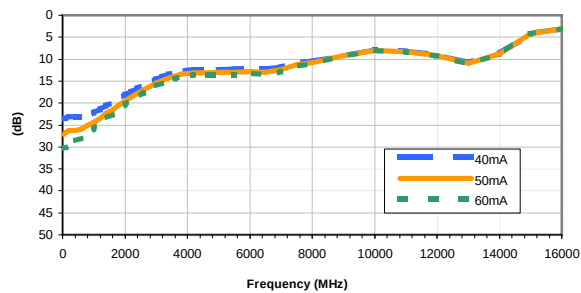
**INPUT RETURN LOSS vs. TEMPERATURE**

INPUT POWER = -20dBm, CURRENT = 50mA



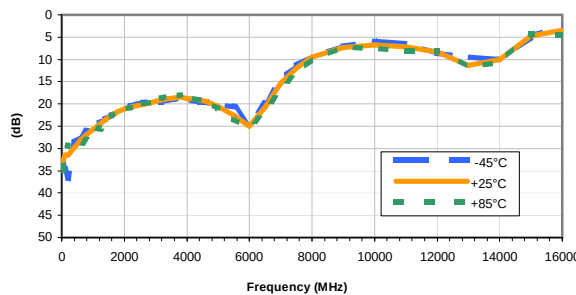
**INPUT RETURN LOSS vs. CURRENT**

INPUT POWER = -20dBm, Temperature = +25°C



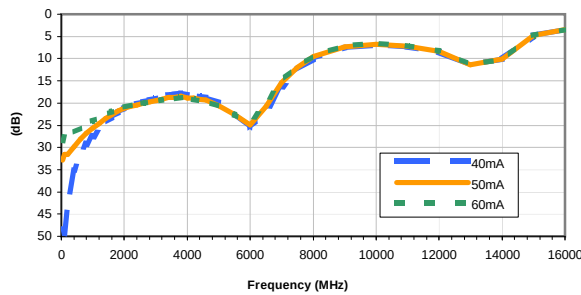
**OUTPUT RETURN LOSS vs. TEMPERATURE**

INPUT POWER = -20dBm, CURRENT = 50mA



**OUTPUT RETURN LOSS vs. CURRENT**

INPUT POWER = -20dBm, Temperature = +25°C



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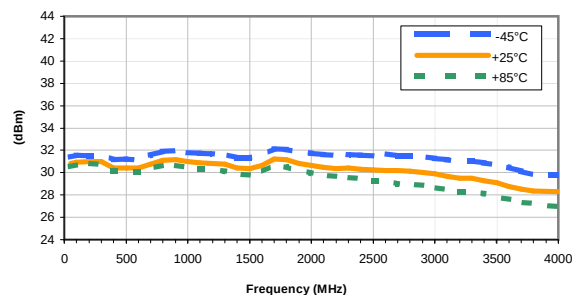




## Typical Performance Curves

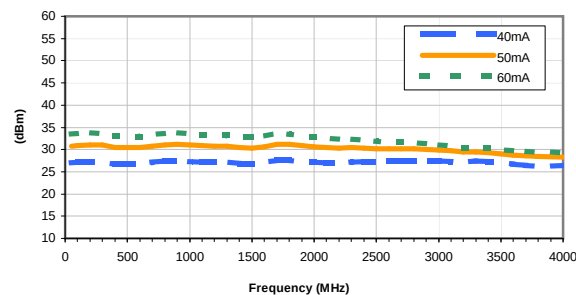
OUTPUT IP3 vs. TEMPERATURE

INPUT POWER = -20dBm, CURRENT = 50mA



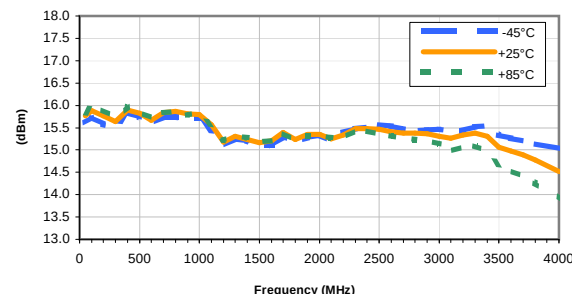
OUTPUT IP3 vs. CURRENT

INPUT POWER = -20dBm, Temperature = +25°C



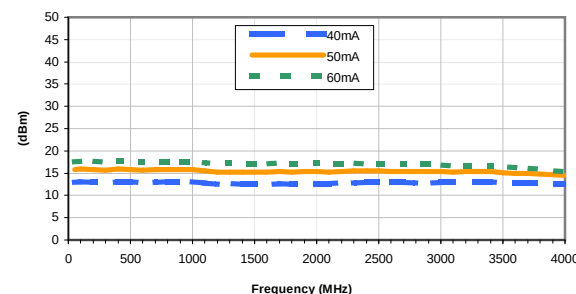
OUTPUT POWER at 1dB Compression vs. TEMPERATURE

CURRENT = 50mA



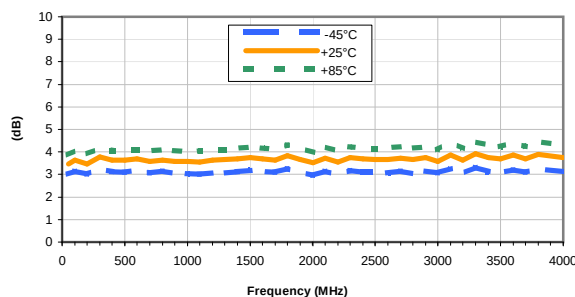
OUTPUT POWER at 1dB Compression vs. CURRENT

Temperature = +25°C



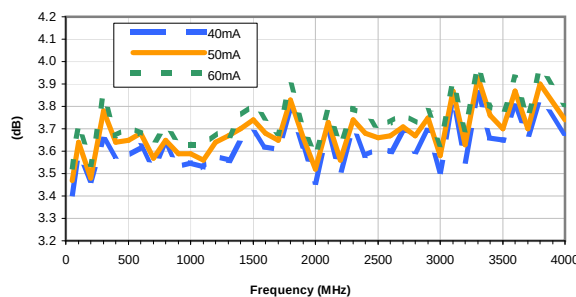
Noise Figure vs. TEMPERATURE

CURRENT = 50mA

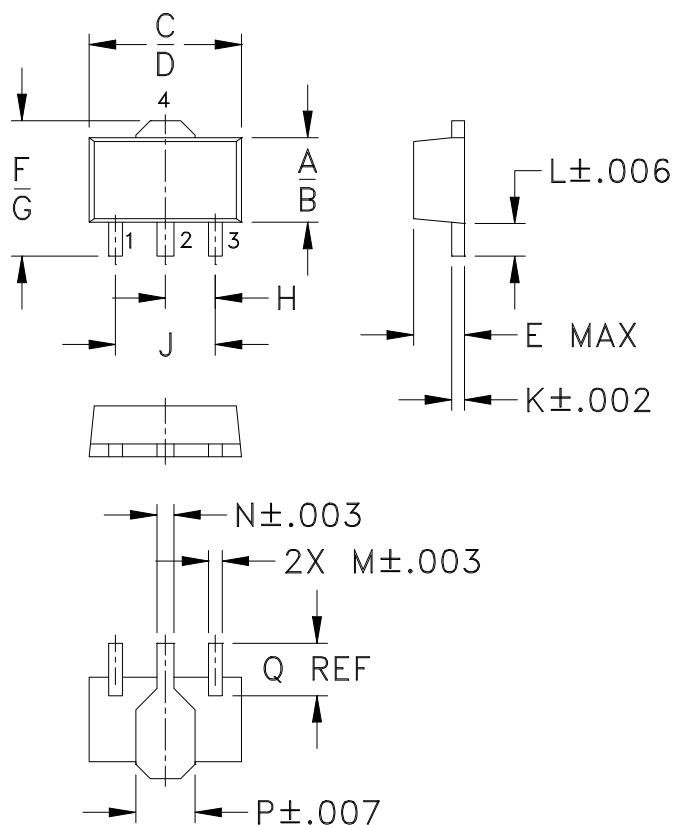


Noise Figure vs. CURRENT

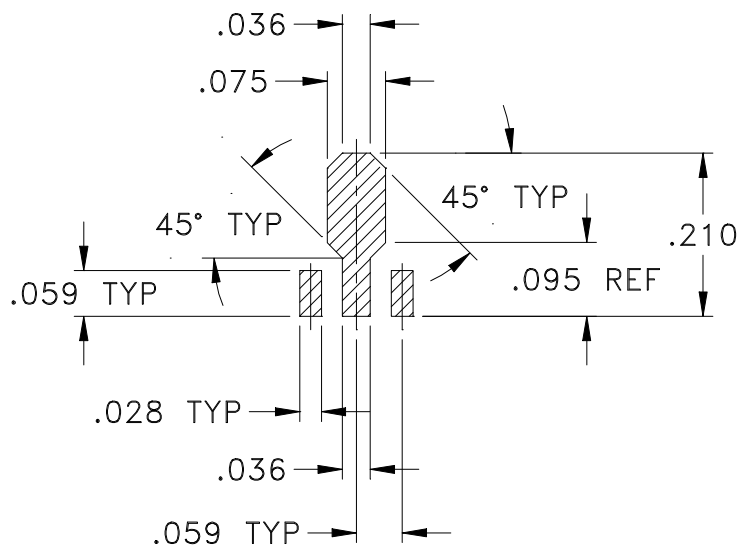
Temperature = +25°C



### Outline Dimensions



### PCB Land Pattern



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

| CASE # | A              | B              | C              | D              | E              | F              | G              | H              | J              | K              | L              | M              |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| DF782  | .102<br>(2.59) | .090<br>(2.29) | .181<br>(4.60) | .173<br>(4.39) | .063<br>(1.60) | .167<br>(4.24) | .155<br>(3.94) | .059<br>(1.50) | .118<br>(3.00) | .015<br>(0.38) | .041<br>(1.04) | .016<br>(0.41) |

| CASE # | N              | P              | Q              | WT. GRAM |
|--------|----------------|----------------|----------------|----------|
| DF782  | .019<br>(0.48) | .065<br>(1.65) | .062<br>(1.57) | .2       |

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

### Notes:

- Case material: Plastic.
- Termination finish:  
For RoHS Case Styles: Tin-Silver alloy plate over Nickel barrier or Matte-Tin.  
All models, (+) suffix. See model Data sheet.  
For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.



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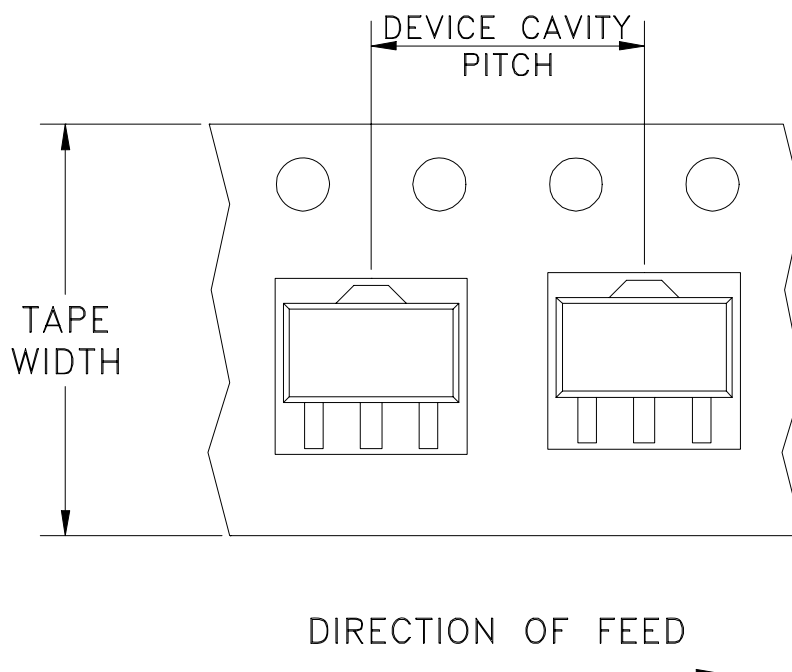
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# Tape & Reel Packaging TR-F55

## DEVICE ORIENTATION IN T&R



| Tape Width,<br>mm | Device Cavity<br>Pitch, mm | Reel Size,<br>inches | Devices per Reel                            |      |
|-------------------|----------------------------|----------------------|---------------------------------------------|------|
| 12                | 8                          | 7                    | Small<br>quantity<br>standard<br>(see note) | 20   |
|                   |                            |                      |                                             | 50   |
|                   |                            |                      |                                             | 100  |
|                   |                            |                      |                                             | 200  |
|                   |                            |                      |                                             | 500  |
|                   |                            |                      | Standard                                    | 1000 |

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

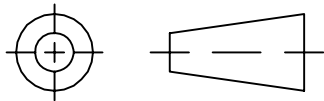
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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



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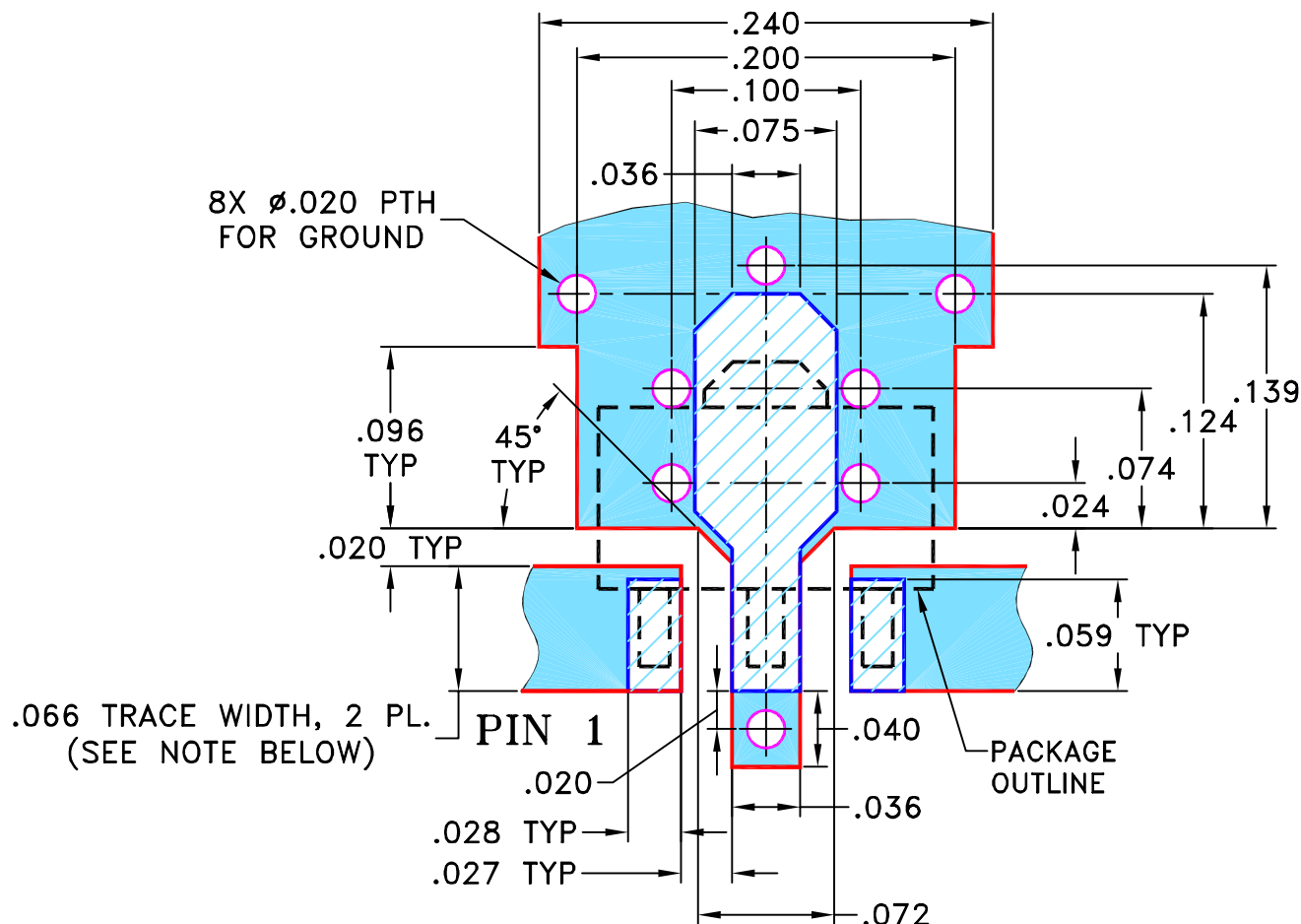
## THIRD ANGLE PROJECTION



## REVISIONS

| REV | ECN No. | DESCRIPTION                    | DATE     | DR  | AUTH |
|-----|---------|--------------------------------|----------|-----|------|
| A   | M76190  | CHANGED DISCRIPTION            | 04/01    | GF  | CT   |
| B   | M82575  | UPDATED DRAWING                | 08/05/02 | AV  | LC   |
| C   | M102713 | ADDED NOTE 2 & "...WITH SMOBC" | 01/17/06 | MMG | IL   |
| D   | M108434 | UPDATED DRAWING PER TB-409+    | 11/14/06 | PW  | IG   |

**SUGGESTED MOUNTING CONFIGURATION  
FOR DF782 CASE STYLE, "mz" PIN CONNECTION**



- NOTES:** 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .030" ± .002"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

 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    | AY 01/15/01 |
| TOLERANCES ON:             | CHECKED  | YB 01/23/01 |
| 2 PL DECIMALS ±            | APPROVED | DB 01/23/01 |
| 3 PL DECIMALS ± .005       |          |             |
| ANGLES ±                   |          |             |
| FRACTIONS ±                |          |             |

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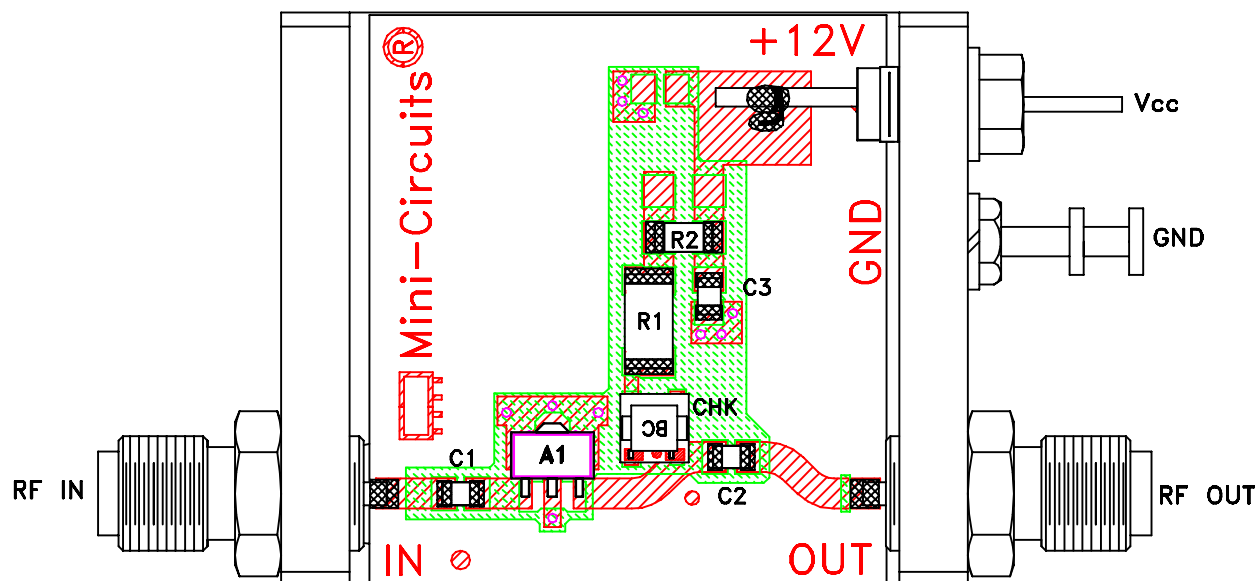
ASHEETA1.DWG REV:A DATE:01/12/95

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Brooklyn NY 11235

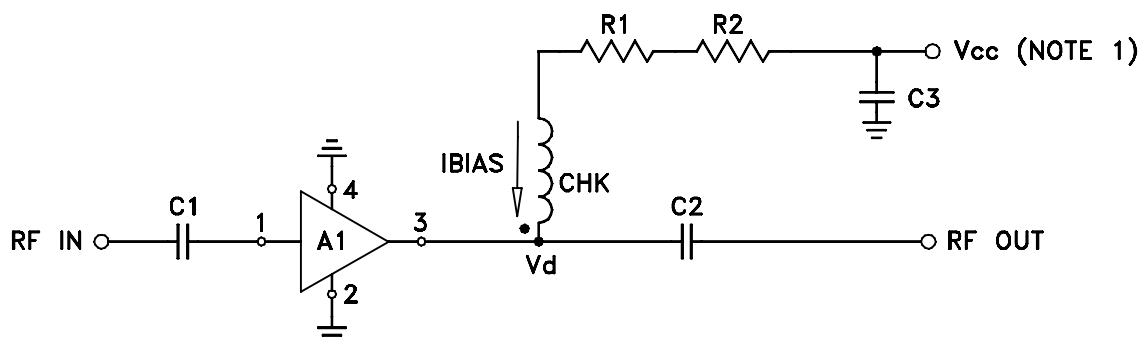
PL, mz, DF782, GALI, TB-409-XXX+

| SIZE  | CODE IDENT | DRAWING NO: | REV:   |
|-------|------------|-------------|--------|
| A     | 15542      | 98-PL-019   | D      |
| FILE: | 98PL019    | SCALE:      | 10:1   |
|       |            | SHEET:      | 1 OF 1 |

# Evaluation Board and Circuit



TB-409-51F+



| COMPONENT   | VALUE                  |
|-------------|------------------------|
| A1          | Gali-51F(+)            |
| C1 (NOTE 4) | 2400 pF                |
| C2 (NOTE 4) | 2400 pF                |
| C3 (bypass) | 0.1 uF                 |
| R1          | 143 Ohms, 0.75W        |
| R2          | 8.25 Ohms, 0.25W       |
| CHK         | Mini-Circuits TCCH-80+ |

Schematic Diagram

## NOTE:

1. Vcc voltage:  $+12 \pm 0.2V$ .
2. SMA Female connectors.
3. PCB material: Rogers RO4350 or equivalent, dielectric constant=3.5, dielectric thickness=.030 inch.
4. Capacitors, C1 & C2 should be free of resonance up to the highest frequency specified.

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| Specification                  | Test/Inspection Condition                                                                                                      | Reference/Spec                                                  |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Operating Temperature          | -45° to 85°C or -40° to 85°C<br>Ambient Environment                                                                            | Individual Model Data Sheet                                     |
| Storage Temperature            | -65° to 150° C<br>Ambient Environment                                                                                          | Individual Model Data Sheet                                     |
| Thermal Shock                  | -55° to 100°C, 100 cycles                                                                                                      | MIL-STD-202, Method 107, Condition A-3, except +100°C           |
| Mechanical Shock               | 1.5Kg, 0.5 ms, 5 shock pulses, Y1 direction only                                                                               | MIL-STD-883, Method 2002, Condition B, except Y1 direction only |
| Vibration (Variable Frequency) | 50g peak                                                                                                                       | MIL-STD-883, Method 2007, Condition B                           |
| Autoclave                      | 15 psig, 100% RH, 121°C, 96 hours                                                                                              | JESD22-A102, Condition C                                        |
| HAST                           | 130°C, 85% RH, 96 hours                                                                                                        | JESD22-A110                                                     |
| Solderability                  | 10X Magnification                                                                                                              | J-STD-002, Para 4.2.5, Test S, 95% Coverage                     |
| Solder Reflow Heat             | Sn-Pb Eutetic Process: 240°C peak<br>Pb-Free Process: 260°C peak                                                               | J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1                   |
| Moisture Sensitivity: Level 1  | Bake at 125°C for 24 hours<br>Soak at 85°C/85% RH for 168 hours, Reflow 3 cycles at 260°C peak                                 | J-STD-020                                                       |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + | MIL-STD-202, Method 215                                         |



All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

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