



MMIC DIE

# Wideband Amplifier

## AVA-054-D+

Mini-Circuits

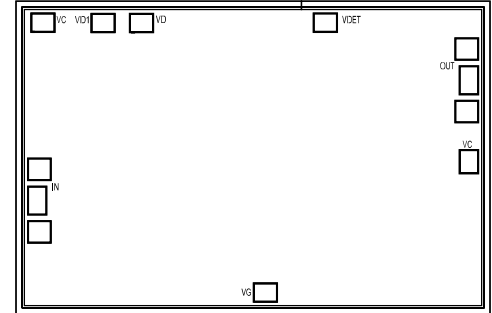
50Ω DC to 50 GHz

### THE BIG DEAL

- Wideband, DC to 50 GHz
- Gain Flatness,  $\pm 2.2$  dB
- Typical P1dB, +19 dBm

### APPLICATIONS

- 5G MIMO and Back Haul Radio Systems
- Satellite Ka-band Communications
- Test and Measurement Equipment
- Radar, EW, and ECM Defense Systems



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

SEE ORDERING INFORMATION ON THE LAST PAGE

### PRODUCT OVERVIEW

AVA-054-D+ is a GaAs PHEMT MMIC Distributed Amplifier designed for use in microwave and millimeter wave transceiver systems and signal sources operating from 0.05 to 50 GHz. The amplifier provides 16 dB of Gain, +19 dBm P1dB and +26 dBm OIP3 while operating from a +5V supply with 160 mA current consumption. The MMIC Amplifier includes an on chip power detector for power monitoring and the Gain can be varied over a 20 dB range with a control voltage. The AVA-054-D+ performance characteristics and features makes the device useful for a wide range of Test and Measurement Equipment and Defense Systems operating in frequency ranges from 0.05-50 GHz.

### KEY FEATURES

| Features                                       | Advantages   |
|--|--|
| Wideband: DC to 50 GHz                         | General purpose wideband amplifier is suitable for various applications.   |
| Gain: 16.5 dB $\pm$ 1.5 dB from 0.1 to 45 GHz. | Minimizes the number of gain stages required to achieve published Gain, reducing component count, cost and complexity. |
| P1dB: +19.5 dBm $\pm$ 1.6 dB                   | Useful as a driver amplifier. Can be used as a final amplifier in local oscillator chains to drive +17 dBm mixers.     |
| On Chip Power Detector                         | Enables power monitoring and AGC loops.  |
| Adjustable Gain with control voltage           | Useful temperature compensation and AGC of wide bandwidth signal chains.   |
| Unpackaged die                                 | Enables user to integrate it directly into hybrids.  |



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**ELECTRICAL SPECIFICATIONS<sup>1</sup> AT 25°C, V<sub>C</sub> = OPEN, V<sub>DD</sub> = +5V, Z<sub>o</sub> = 50Ω, UNLESS NOTED OTHERWISE**

| Parameter  | Condition (GHz) | V <sub>DD</sub> = +5V, I <sub>DD</sub> = 160mA |       |      | Units |
|--|-----------------|--|-------|------|-------|
|  |                 | Min.   | Typ.  | Max. |       |
| Frequency Range  |                 | DC   |       | 50   | GHz   |
| Gain <sup>2</sup>  | 0.1             |  | 17.3  |      | dB    |
|  | 10              |  | 15.6  |      |       |
|  | 20              |  | 16.1  |      |       |
|  | 30              |  | 17.4  |      |       |
|  | 40              |  | 17.4  |      |       |
|  | 50              |  | 13    |      |       |
| Input Return Loss  | 0.1             |  | 12    |      | dB    |
|  | 10              |  | 15    |      |       |
|  | 20              |  | 17    |      |       |
|  | 30              |  | 22    |      |       |
|  | 40              |  | 12    |      |       |
|  | 50              |  | 25    |      |       |
| Output Return Loss   | 0.1             |  | 27    |      | dB    |
|  | 10              |  | 21    |      |       |
|  | 20              |  | 16    |      |       |
|  | 30              |  | 16    |      |       |
|  | 40              |  | 14    |      |       |
|  | 50              |  | 12    |      |       |
| Reverse Isolation  | 0.1-50          |  | 36    |      | dB    |
| Output Power at 1 dB Compression                                 | 0.1             |  | +20.7 |      | dBm   |
|  | 10              |  | +20.0 |      |       |
|  | 20              |  | +19.3 |      |       |
|  | 30              |  | +17.9 |      |       |
|  | 40              |  | +17.0 |      |       |
|  | 50              |  | --    |      |       |
| Output Third-Order Intercept<br>(P <sub>OUT</sub> = +5 dBm/Tone) | 0.1             |  | +32   |      | dBm   |
|  | 10              |  | +27.3 |      |       |
|  | 20              |  | +26.9 |      |       |
|  | 30              |  | +22.5 |      |       |
|  | 40              |  | +20.8 |      |       |
|  | 50              |  | --    |      |       |
| Noise Figure   | 0.1             |  | 5.5   |      | dB    |
|  | 10              |  | 3.1   |      |       |
|  | 20              |  | 4.0   |      |       |
|  | 30              |  | 5.5   |      |       |
|  | 40              |  | 7.8   |      |       |
|  | 50              |  | 11.8  |      |       |
| Device Operating Voltage (V <sub>DD</sub> )                      |                 |  | +5.0  |      | V     |
| Device Operating Current (I <sub>DD</sub> )                      |                 |  | 160.0 |      | mA    |
| Device Gate Voltage (V <sub>GG</sub> )                           |                 |  | -0.76 |      | V     |
| Device Gate Current (I <sub>GG</sub> )                           |                 |  | -0.24 |      | μA    |
| Thermal Resistance, Junction-to-Ground Lead (Θ <sub>JC</sub> )   |                 |  | 17.8  |      | °C/W  |

1. Die is soldered and measured on Mini-Circuits die characterization board. See Characterization &amp; Application Circuit (Fig. 2).

2. If V<sub>C</sub> is open, the measured voltage is +1.33V.



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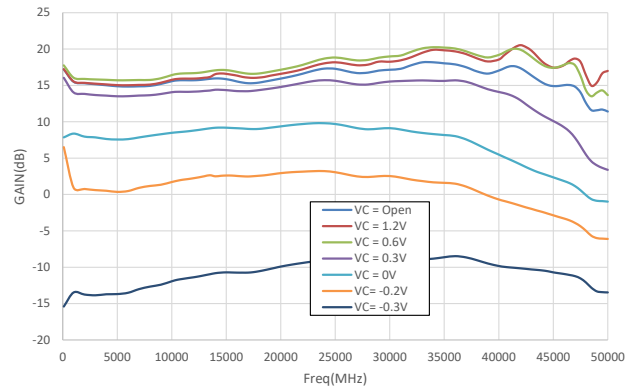
50Ω DC to 50 GHz

### MAXIMUM RATINGS<sup>3</sup>

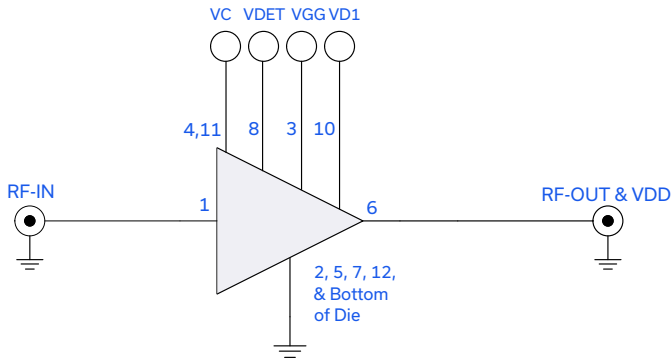
| Parameter                         | Ratings             |
|-----------------------------------|---------------------|
| Operating Temperature             | -40°C to +85°C      |
| Junction Temperature              | +150°C <sup>4</sup> |
| Total Power Dissipation           | 1.8 W               |
| Input Power (CW)                  | +17dBm              |
| Drain Voltage (V <sub>DD</sub> )  | +7.5 V              |
| Gate Voltage (V <sub>GG</sub> )   | -1.6 V to -0.5 V    |
| Drain Current (I <sub>DD</sub> )  | 240 mA              |
| Gate Current (I <sub>GG</sub> )   | -5 mA to 0 mA       |
| Control Voltage (V <sub>C</sub> ) | -1 V to 1.2 V       |

3. Permanent damage may occur if these limits are exceeded.  
 4.  $T_j = +85^\circ\text{C} + (\text{VDD}) \cdot (\text{IDD}) \cdot (\theta_{\text{JC}}) = +99^\circ\text{C}$ . Keeping T<sub>j</sub> below +99°C will ensure MTTF > 100 Years.

FIG 1. GAIN VS. CONTROL VOLTAGE (VC)

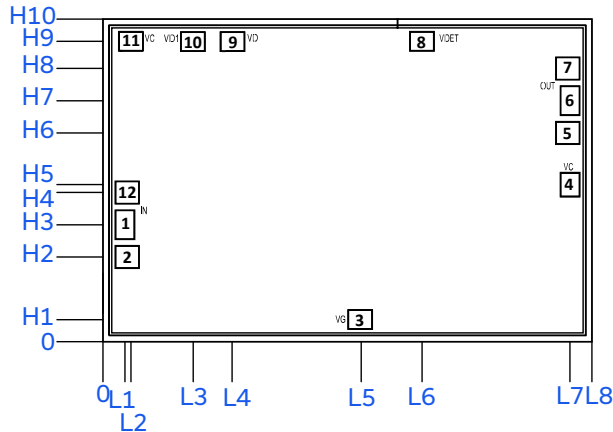


### SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



| Function     | Pad Number                   | Description  |
|--------------|------------------------------|--|
| RF-IN        | 1                            | RF Input Pad   |
| VGG          | 3                            | Gate Bias Pad  |
| VC           | 4, 11                        | Gain Control Pads  |
| RF-OUT & VDD | 6                            | RF Output and Drain Pad  |
| VDET         | 8                            | Voltage Detector Pad   |
| VD           | 9                            | Alternative Drain Bias Pad, connects to Pad #6 internally.   |
| VD1          | 10                           | Alternative Drain Bias Pad. It is terminated by C2   |
| GROUND       | 2, 5, 7, 12, & Bottom of die | The bond pads are connected to backside through vias and do not require wire-bond connections to ground. |

### BONDING PAD POSITION



### DIMENSIONS IN μm, TYP.

| L1 | L2  | L3  | L4  | L5   | L6   | L7   | L8   |
|----|-----|-----|-----|------|------|------|------|
| 88 | 112 | 363 | 520 | 1040 | 1285 | 1882 | 1970 |

| H1 | H2  | H3  | H4  | H5  | H6  | H7  | H8   | H9   | H10  |
|----|-----|-----|-----|-----|-----|-----|------|------|------|
| 89 | 341 | 471 | 601 | 633 | 841 | 971 | 1101 | 1211 | 1300 |

| Thickness | Die size    | Pad size 1,6 | Pad size 2, 5, 7, 12 | Pad size 3, 8, 9, 10, & 11 | Pad size 4 |
|-----------|-------------|--------------|----------------------|----------------------------|------------|
| 100       | 1970 x 1300 | 73 x 113     | 91 x 86              | 93 x 73                    | 73 x 93    |





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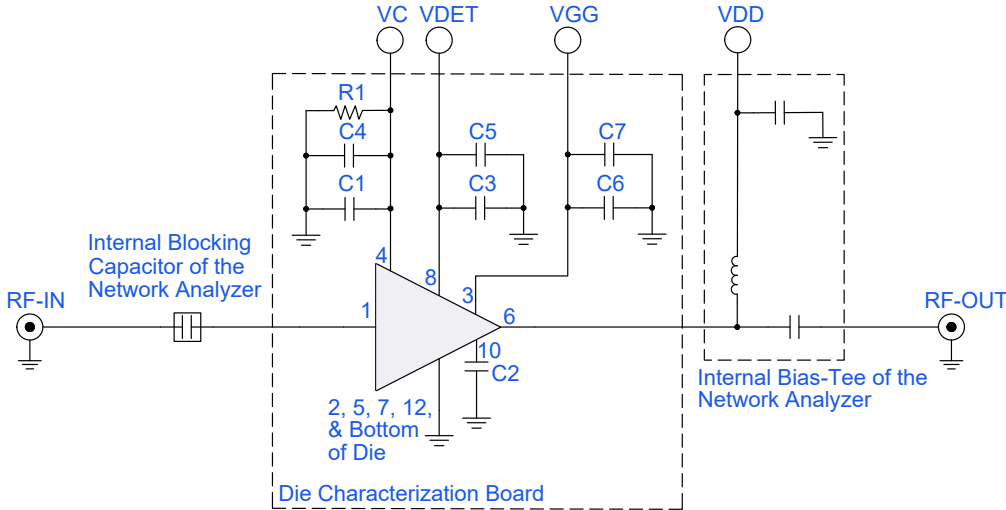
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## CHARACTERIZATION & APPLICATION CIRCUIT



| Component    | Size  | Value    | Part Number        | Manufacturer |
|--------------|-------|----------|--------------------|--------------|
| C1, C3, & C6 | 100pF | 22x22mil | MA4M3100           | MACOM Inc.   |
| C2           | 820pF | 20x20mil | SKT02C821M11A6     | TECDIA Inc.  |
| C4, C5, & C7 | 0.1μF | 0402     | GRM155R71C104KA88D | Murata       |
| R1           | 200Ω  | 0603     | RK73H1JT2001F      | KOA          |

Fig 2. Characterization & Application Circuit

Note: This block diagram is used for characterization (Die is attached and wire-bonded on die characterization test board). Gain, Return Loss, Output Power at 1dB Compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5245B Microwave Network Analyzer.

### Conditions:

1. VDD = +5V,
2. VGG is set to obtain desired IDD as shown in specification table.
3. Gain and Return Loss: Pin= -25 dBm
4. Output IP3 (OIP3): Two Tones, spaced 1 MHz apart, +5 dBm/Tone at output.

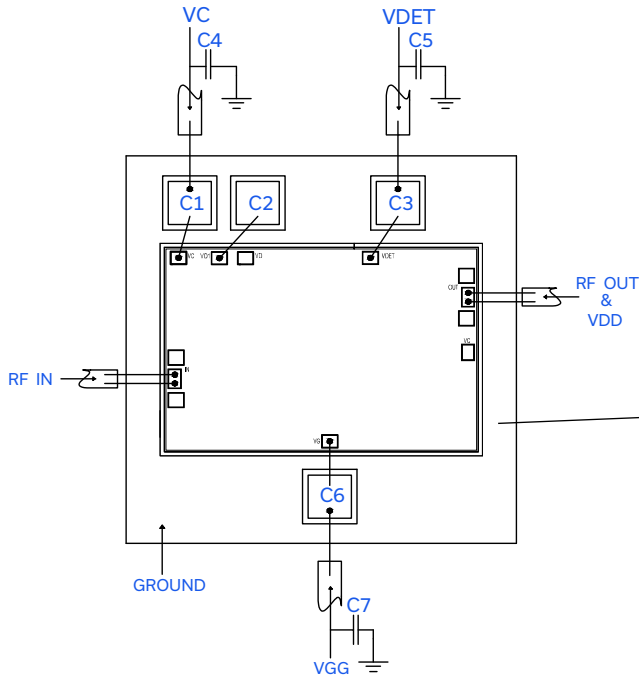
### Switch ON/OFF sequence:

1. To switch the amplifier ON:
  - a. Set VGG = -1.2V. Apply VGG.
  - b. Set VDD = +5V. Apply VDD
  - c. Adjust VGG to get IDD = 160mA (Typically, VGG = -0.76V)
  - d. Apply RF Signal.
2. To switch the amplifier OFF:
  - a. Turn off RF Signal
  - b. Adjust VGG down to -1.2V.
  - c. Turn off VDD.
  - d. Turn off VGG





### ASSEMBLY DRAWING



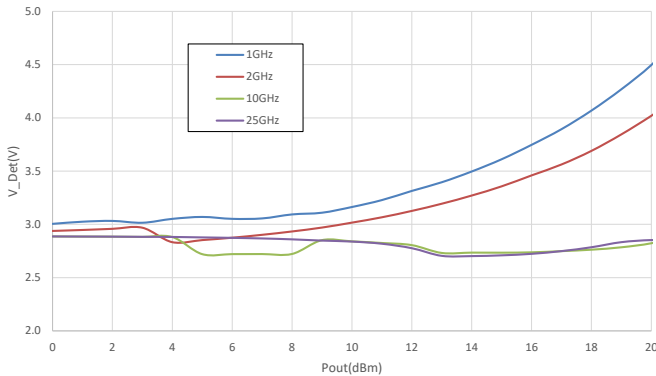
Note: Tested on die characterization board with following bond lengths:

1. Typical bond length for RF-IN: 360μm (14mils)
2. Typical bond length for RF-OUT & VDD: 360μm (14mils)
3. Typical bond lengths from die, capacitors, VGG, VDET, and VC were kept as short as possible.
4. Components list given in Figure 2.


Typical gap of 76μm (3mils) between edge of die and edge of ground pad.

### FIG. 3 OUTPUT POWER VS. VDET

Pout vs. V\_det



### ASSEMBLY PROCEDURE

1. Storage  
Die should be stored in a dry nitrogen purged desiccators or equivalent.
2.  ESD  
MMIC PHEMT amplifier die are susceptible to electrostatic and mechanical damage. Die are supplied in antistatic protected material, which should be open in clean room conditions at an appropriately grounded anti-static workstation.
3. Die Handling and Attachment  
Devices need careful handling using correctly designed collets, it is recommended to handle the chip along the edges with a custom design collet. The die mounting surface must be clean and flat. Using conductive silver filled epoxy, recommended epoxies are Ablestik 84-1 LMIS4 or equivalents. Apply sufficient epoxy to meet required epoxy bond line thickness, epoxy fillet height and epoxy coverage around total periphery. Parts shall be cured in a nitrogen filled atmosphere per manufacturer's cure condition. The surface of the chip has exposed air bridges and should not be touched with vacuum collet, tweezers or fingers.
4. Wire Bonding  
Bond pad openings in the surface passivation above the bond pads are provided to allow wire bonding to the die gold bond pads. Thermo-sonic bonding is used with minimized ultrasonic content. Bond force, time, ultrasonic power and temperature are all critical parameters. Suggested wire is pure gold, 1mil diameter. Bonds must be made from the bond pads on the die to the packaged or substrate. All bond wire length and bond wire height should be kept as short as possible unless specified by the Assembly Drawing to minimize performance degradation due to undesirable series inductance.



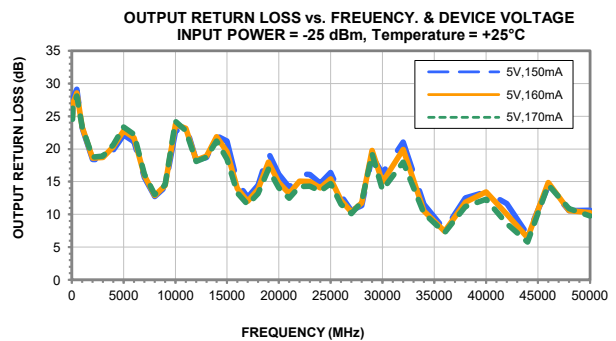
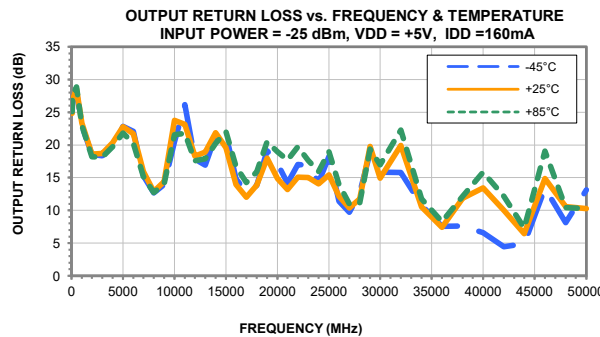
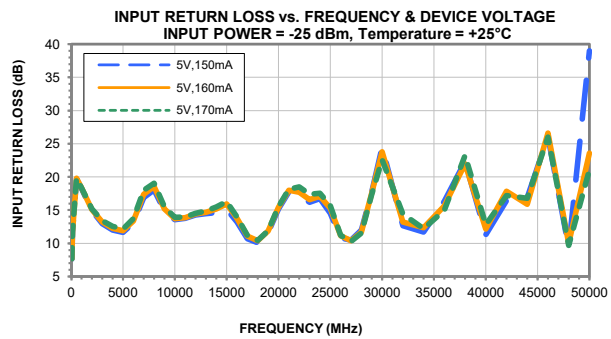
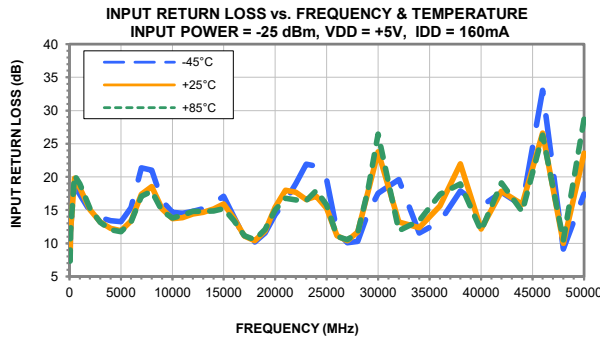
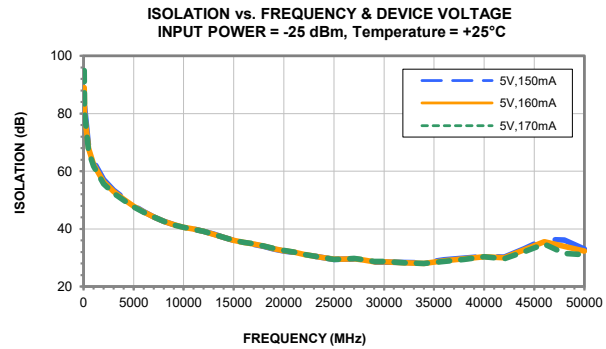
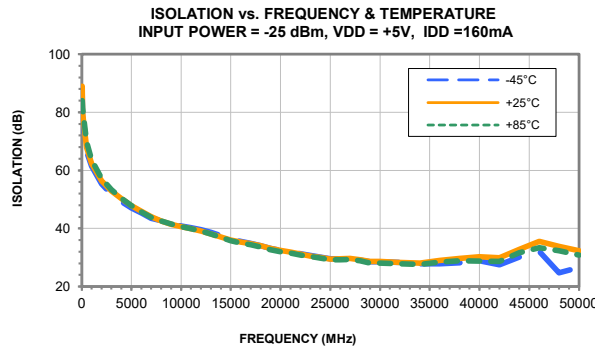
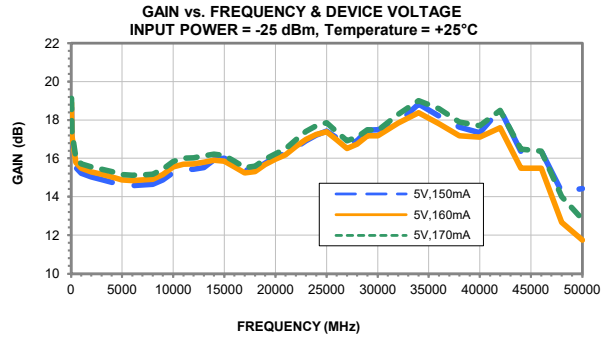
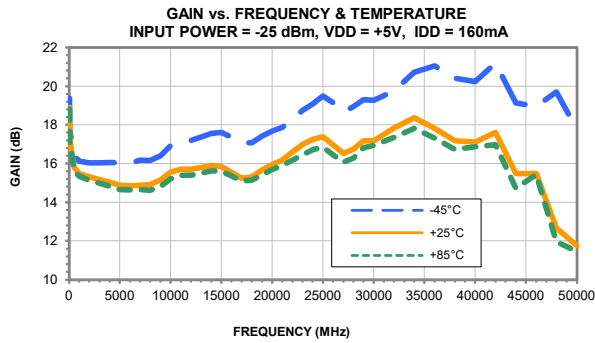
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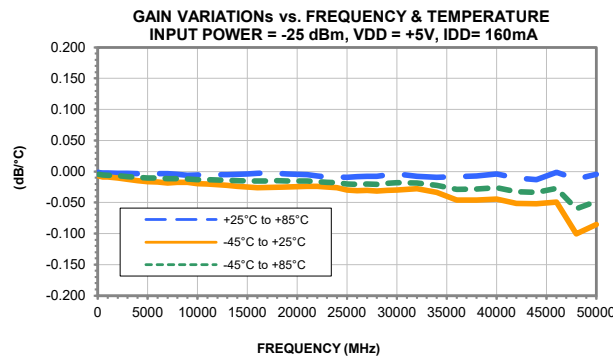
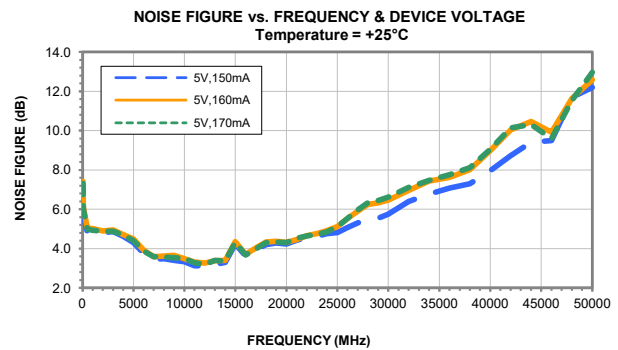
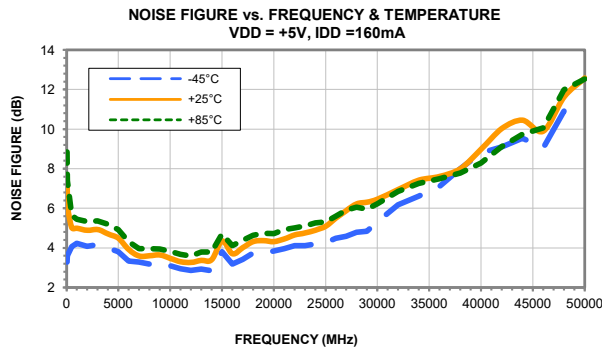
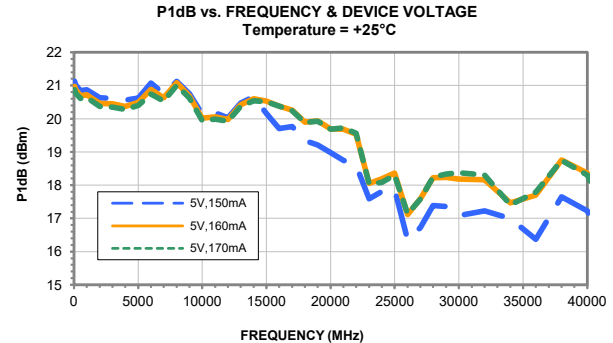
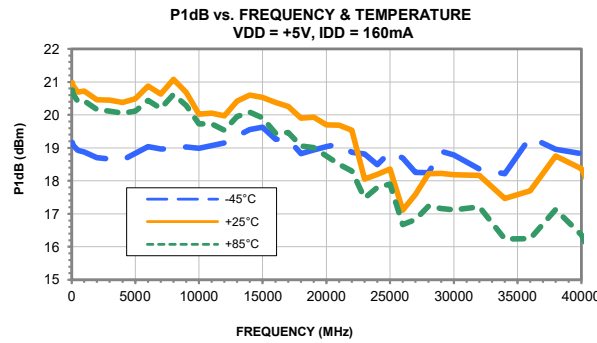
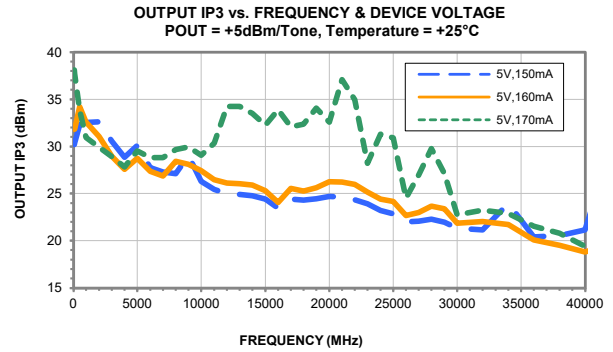
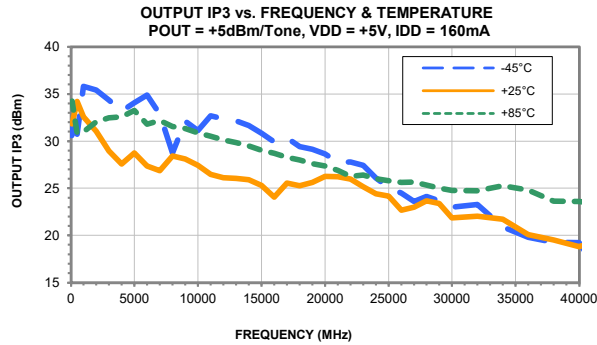
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ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD.

|  |  |                   |           |                                 |             |                                  |             |            |             |  |  |
|--|--|-------------------|-----------|---------------------------------|-------------|----------------------------------|-------------|------------|-------------|--|--|
| <b>Performance Data</b>  | Data Table<br>Swept Graphs<br>S-Parameter (S2P Files) Data Set with and without port extension(.zip file)  |                   |           |                                 |             |                                  |             |            |             |  |  |
| <b>Case Style</b>  | Die  |                   |           |                                 |             |                                  |             |            |             |  |  |
| <b>Die Ordering and packaging information</b>                              | <table border="0"> <tr> <td>Quantity, Package</td> <td>Model No.</td> </tr> <tr> <td>Gel – Pak: 5, 10, 50, 100, KGD*</td> <td>AVA-054-DG+</td> </tr> <tr> <td>Medium†, Partial wafer: KGD*&lt;768</td> <td>AVA-054-DP+</td> </tr> <tr> <td>Full Wafer</td> <td>AVA-054-DF+</td> </tr> <tr> <td colspan="2">†Available upon request contact sales representative<br/>Refer to AN-60-067</td> </tr> </table> | Quantity, Package | Model No. | Gel – Pak: 5, 10, 50, 100, KGD* | AVA-054-DG+ | Medium†, Partial wafer: KGD*<768 | AVA-054-DP+ | Full Wafer | AVA-054-DF+ | †Available upon request contact sales representative<br>Refer to AN-60-067 |  |
| Quantity, Package  | Model No.  |                   |           |                                 |             |                                  |             |            |             |  |  |
| Gel – Pak: 5, 10, 50, 100, KGD*  | AVA-054-DG+  |                   |           |                                 |             |                                  |             |            |             |  |  |
| Medium†, Partial wafer: KGD*<768   | AVA-054-DP+  |                   |           |                                 |             |                                  |             |            |             |  |  |
| Full Wafer   | AVA-054-DF+  |                   |           |                                 |             |                                  |             |            |             |  |  |
| †Available upon request contact sales representative<br>Refer to AN-60-067 |  |                   |           |                                 |             |                                  |             |            |             |  |  |
| <b>Die Marking</b>   | EL-AMP-13  |                   |           |                                 |             |                                  |             |            |             |  |  |
| <b>Environmental Ratings</b>   | ENV80  |                   |           |                                 |             |                                  |             |            |             |  |  |

\*Known Good Die ('KGD') means that the die in question have been subjected to Mini-Circuits DC test performance criteria and measurement instructions and that the parametric data of such die fall within predefined range. While DC testing is not definitive, it does provide a higher degree of confidence that die are capable of meeting typical RF electrical parameters specified by Mini-Circuits.

### NOTES

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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: Vdd = 5V, Idd = 160mA @ Temperature = +25°C

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
|       |       |           |                   |                    | K         | Measure |             |                  |              |
| (MHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 50    | 18.91 | 89.04     | 7.67              | 24.81              | 1326.15   | 1.17    | 31.83       | 20.97            | 7.41         |
| 100   | 17.19 | 79.82     | 11.77             | 26.94              | 630.52    | 1.06    | 31.84       | 20.89            | 6.10         |
| 500   | 15.79 | 67.89     | 19.81             | 28.57              | 198.98    | 1.01    | 34.24       | 20.69            | 5.04         |
| 1000  | 15.49 | 62.32     | 18.33             | 23.33              | 107.66    | 1.01    | 32.59       | 20.72            | 5.01         |
| 2000  | 15.30 | 56.33     | 15.05             | 18.62              | 53.80     | 1.02    | 31.06       | 20.46            | 4.90         |
| 3000  | 15.17 | 52.88     | 13.20             | 18.69              | 36.08     | 1.03    | 28.96       | 20.45            | 4.94         |
| 4000  | 15.04 | 50.29     | 12.25             | 20.32              | 26.96     | 1.05    | 27.56       | 20.37            | 4.71         |
| 5000  | 14.88 | 47.85     | 11.88             | 22.78              | 20.70     | 1.06    | 28.73       | 20.48            | 4.49         |
| 6000  | 14.84 | 45.85     | 13.34             | 21.73              | 16.83     | 1.04    | 27.34       | 20.88            | 3.92         |
| 7000  | 14.87 | 44.11     | 17.40             | 15.92              | 13.86     | 0.99    | 26.85       | 20.63            | 3.59         |
| 8000  | 14.91 | 42.58     | 18.55             | 12.88              | 11.32     | 0.96    | 28.42       | 21.09            | 3.61         |
| 9000  | 15.16 | 41.41     | 15.16             | 14.38              | 9.59      | 0.99    | 28.09       | 20.68            | 3.65         |
| 10000 | 15.55 | 40.56     | 13.73             | 23.75              | 8.50      | 1.04    | 27.43       | 20.02            | 3.49         |
| 11000 | 15.70 | 39.89     | 13.85             | 23.15              | 7.76      | 1.03    | 26.49       | 20.06            | 3.31         |
| 12000 | 15.71 | 39.10     | 14.42             | 18.31              | 7.03      | 1.02    | 26.11       | 19.98            | 3.27         |
| 13000 | 15.80 | 38.12     | 14.68             | 18.90              | 6.25      | 1.02    | 26.03       | 20.42            | 3.38         |
| 14000 | 15.90 | 37.05     | 15.20             | 21.85              | 5.53      | 1.02    | 25.91       | 20.60            | 3.40         |
| 15000 | 15.85 | 36.01     | 15.95             | 19.57              | 4.95      | 1.01    | 25.29       | 20.53            | 4.35         |
| 16000 | 15.55 | 35.30     | 13.77             | 13.96              | 4.52      | 0.99    | 24.06       | 20.38            | 3.71         |
| 17000 | 15.24 | 34.76     | 11.08             | 12.01              | 4.13      | 1.00    | 25.56       | 20.25            | 4.03         |
| 18000 | 15.31 | 33.99     | 10.37             | 13.83              | 3.76      | 1.04    | 25.26       | 19.90            | 4.33         |
| 19000 | 15.67 | 33.09     | 11.84             | 17.97              | 3.46      | 1.04    | 25.62       | 19.93            | 4.37         |
| 20000 | 15.95 | 32.44     | 15.44             | 14.87              | 3.20      | 0.98    | 26.27       | 19.69            | 4.32         |
| 21000 | 16.18 | 31.91     | 17.99             | 13.18              | 2.94      | 0.94    | 26.22       | 19.68            | 4.46         |
| 22000 | 16.61 | 31.13     | 17.71             | 15.09              | 2.61      | 0.96    | 25.97       | 19.53            | 4.66         |
| 23000 | 16.99 | 30.52     | 16.60             | 15.02              | 2.33      | 0.96    | 25.14       | 18.05            | 4.76         |
| 24000 | 17.25 | 29.97     | 17.07             | 14.04              | 2.13      | 0.94    | 24.42       | 18.19            | 4.91         |
| 25000 | 17.39 | 29.47     | 15.26             | 15.43              | 1.99      | 0.95    | 24.18       | 18.36            | 5.11         |
| 26000 | 16.96 | 29.53     | 11.12             | 12.17              | 1.91      | 0.98    | 22.68       | 17.11            | 5.52         |
| 27000 | 16.52 | 29.64     | 10.40             | 10.35              | 1.89      | 0.98    | 23.01       | 17.59            | 5.90         |
| 28000 | 16.74 | 29.19     | 11.71             | 11.73              | 1.91      | 0.96    | 23.68       | 18.22            | 6.24         |
| 29000 | 17.17 | 28.61     | 17.61             | 19.79              | 1.94      | 0.94    | 23.40       | 18.23            | 6.32         |
| 30000 | 17.18 | 28.61     | 23.78             | 14.90              | 1.92      | 0.90    | 21.87       | 18.19            | 6.47         |
| 32000 | 17.83 | 28.23     | 13.22             | 19.94              | 1.70      | 0.96    | 22.04       | 18.17            | 6.95         |
| 34000 | 18.37 | 28.09     | 12.37             | 10.53              | 1.41      | 0.90    | 21.71       | 17.47            | 7.43         |
| 36000 | 17.81 | 28.96     | 15.61             | 7.43               | 1.56      | 0.77    | 20.09       | 17.70            | 7.61         |
| 38000 | 17.18 | 29.66     | 21.97             | 11.87              | 2.07      | 0.89    | 19.53       | 18.75            | 8.02         |
| 40000 | 17.11 | 30.27     | 12.16             | 13.42              | 2.19      | 0.95    | 18.81       | 18.37            | 8.99         |
| 42000 | 17.60 | 29.92     | 17.83             | 10.00              | 1.91      | 0.87    | 19.65       | 16.81            | 10.03        |
| 44000 | 15.49 | 32.74     | 15.90             | 6.48               | 2.85      | 0.77    | --          | --               | 10.45        |
| 46000 | 15.49 | 35.53     | 26.62             | 14.86              | 4.91      | 0.96    | --          | --               | 9.91         |
| 48000 | 12.67 | 33.86     | 10.01             | 10.56              | 4.84      | 0.98    | --          | --               | 11.63        |
| 50000 | 11.75 | 32.33     | 23.56             | 10.28              | 4.87      | 0.90    | --          | --               | 12.59        |

## 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: Vdd = 5V, Idd = 150mA @ Temperature = +25°C

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
|       |       |           |                   |                    | K         | Measure |             |                  |              |
| (MHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 50    | 18.63 | 82.66     | 7.66              | 25.41              | 657.02    | 1.17    | 30.19       | 21.13            | 6.87         |
| 100   | 16.93 | 82.57     | 11.77             | 27.79              | 891.98    | 1.07    | 30.38       | 21.03            | 5.75         |
| 500   | 15.52 | 68.62     | 19.70             | 29.14              | 223.24    | 1.01    | 32.30       | 20.84            | 4.83         |
| 1000  | 15.22 | 63.40     | 18.23             | 23.20              | 125.70    | 1.01    | 32.55       | 20.88            | 4.87         |
| 2000  | 15.03 | 57.12     | 14.90             | 18.38              | 60.66     | 1.02    | 32.62       | 20.63            | 4.81         |
| 3000  | 14.90 | 53.44     | 12.97             | 18.32              | 39.54     | 1.04    | 30.54       | 20.61            | 4.85         |
| 4000  | 14.76 | 50.68     | 11.98             | 19.83              | 28.97     | 1.05    | 28.86       | 20.55            | 4.62         |
| 5000  | 14.61 | 48.08     | 11.63             | 22.11              | 21.82     | 1.06    | 30.11       | 20.62            | 4.29         |
| 6000  | 14.58 | 45.93     | 13.03             | 21.12              | 17.42     | 1.04    | 27.75       | 21.07            | 3.76         |
| 7000  | 14.62 | 44.11     | 16.90             | 15.64              | 14.21     | 0.99    | 27.28       | 20.75            | 3.44         |
| 8000  | 14.65 | 42.61     | 18.07             | 12.72              | 11.66     | 0.96    | 27.12       | 21.13            | 3.47         |
| 9000  | 14.88 | 41.46     | 14.88             | 14.16              | 9.92      | 0.99    | 29.03       | 20.75            | 3.40         |
| 10000 | 15.26 | 40.62     | 13.55             | 22.69              | 8.82      | 1.04    | 26.29       | 20.14            | 3.33         |
| 11000 | 15.42 | 39.93     | 13.75             | 23.55              | 8.04      | 1.03    | 25.46       | 20.18            | 3.12         |
| 12000 | 15.43 | 39.13     | 14.29             | 18.32              | 7.28      | 1.02    | 24.98       | 20.03            | 3.12         |
| 13000 | 15.52 | 38.16     | 14.49             | 18.70              | 6.46      | 1.02    | 24.91       | 20.47            | 3.20         |
| 14000 | 15.92 | 37.05     | 14.61             | 22.04              | 5.49      | 1.02    | 24.75       | 20.66            | 3.29         |
| 15000 | 16.00 | 35.96     | 15.15             | 21.20              | 4.83      | 1.01    | 24.40       | 20.16            | 4.24         |
| 16000 | 15.68 | 35.21     | 13.22             | 14.88              | 4.42      | 1.00    | 23.46       | 19.70            | 3.62         |
| 17000 | 15.38 | 34.64     | 10.69             | 12.64              | 4.01      | 1.02    | 24.40       | 19.76            | 3.94         |
| 18000 | 15.42 | 33.87     | 10.09             | 14.46              | 3.66      | 1.06    | 24.32       | 19.34            | 4.19         |
| 19000 | 15.75 | 32.97     | 11.61             | 19.42              | 3.39      | 1.04    | 24.46       | 19.21            | 4.28         |
| 20000 | 16.07 | 32.31     | 15.18             | 16.15              | 3.14      | 0.98    | 24.70       | 18.98            | 4.23         |
| 21000 | 16.26 | 31.79     | 17.72             | 14.14              | 2.90      | 0.95    | 24.64       | 18.75            | 4.41         |
| 22000 | 16.57 | 31.07     | 17.30             | 16.18              | 2.62      | 0.97    | 24.35       | 18.60            | 4.57         |
| 23000 | 16.92 | 30.49     | 16.18             | 16.08              | 2.35      | 0.97    | 23.91       | 17.59            | 4.62         |
| 24000 | 17.21 | 29.96     | 16.72             | 14.77              | 2.14      | 0.95    | 23.22       | 17.81            | 4.75         |
| 25000 | 17.42 | 29.45     | 14.54             | 16.39              | 1.98      | 0.96    | 22.86       | 17.88            | 4.82         |
| 26000 | 17.07 | 29.47     | 10.79             | 12.87              | 1.89      | 0.99    | 22.00       | 16.35            | 5.06         |
| 27000 | 16.70 | 29.55     | 10.49             | 10.57              | 1.85      | 0.98    | 22.08       | 16.72            | 5.30         |
| 28000 | 16.92 | 29.12     | 12.02             | 11.34              | 1.87      | 0.94    | 22.28       | 17.39            | 5.47         |
| 29000 | 17.47 | 28.52     | 17.73             | 18.86              | 1.87      | 0.93    | 21.97       | 17.36            | 5.54         |
| 30000 | 17.49 | 28.48     | 24.47             | 16.28              | 1.86      | 0.91    | 21.33       | 17.09            | 5.74         |
| 32000 | 17.86 | 28.29     | 12.65             | 21.03              | 1.71      | 0.96    | 21.13       | 17.23            | 6.40         |
| 34000 | 18.83 | 28.26     | 11.71             | 11.55              | 1.38      | 0.93    | 23.95       | 17.00            | 6.76         |
| 36000 | 18.21 | 29.22     | 16.34             | 7.68               | 1.57      | 0.77    | 20.42       | 16.37            | 7.07         |
| 38000 | 17.63 | 29.88     | 22.31             | 12.51              | 2.04      | 0.89    | 20.53       | 17.65            | 7.29         |
| 40000 | 17.33 | 30.39     | 11.27             | 13.41              | 2.15      | 0.95    | 21.15       | 17.23            | 7.96         |
| 42000 | 18.55 | 30.15     | 16.45             | 11.64              | 1.82      | 0.90    | 29.72       | 15.51            | 8.73         |
| 44000 | 16.36 | 33.12     | 16.89             | 6.94               | 2.79      | 0.79    | ---         | ---              | 9.40         |
| 46000 | 16.38 | 36.31     | 26.12             | 14.37              | 4.83      | 0.95    | ---         | ---              | 9.49         |
| 48000 | 14.27 | 36.09     | 9.35              | 10.59              | 5.11      | 1.00    | ---         | ---              | 11.69        |
| 50000 | 14.42 | 32.95     | 39.03             | 10.63              | 3.91      | 0.90    | ---         | ---              | 12.21        |

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vdd = 5V, Idd = 170mA @ Temperature = +25°C

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
|       |       |           |                   |                    | K         | Measure |             |                  |              |
| (MHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 50    | 19.13 | 94.96     | 7.70              | 24.51              | 2559.19   | 1.17    | 38.14       | 20.87            | 7.31         |
| 100   | 17.42 | 80.30     | 11.79             | 26.50              | 649.01    | 1.06    | 37.69       | 20.78            | 6.00         |
| 500   | 16.02 | 66.94     | 19.81             | 28.14              | 173.68    | 1.01    | 33.81       | 20.61            | 4.98         |
| 1000  | 15.72 | 61.79     | 18.33             | 23.33              | 98.64     | 1.01    | 30.95       | 20.64            | 4.93         |
| 2000  | 15.55 | 55.63     | 15.17             | 18.75              | 48.29     | 1.02    | 29.90       | 20.37            | 4.87         |
| 3000  | 15.44 | 52.32     | 13.43             | 18.91              | 32.90     | 1.03    | 28.93       | 20.35            | 4.88         |
| 4000  | 15.32 | 49.86     | 12.54             | 20.64              | 24.96     | 1.05    | 27.82       | 20.28            | 4.70         |
| 5000  | 15.16 | 47.60     | 12.18             | 23.33              | 19.58     | 1.06    | 29.51       | 20.40            | 4.39         |
| 6000  | 15.12 | 45.73     | 13.72             | 22.22              | 16.15     | 1.04    | 28.81       | 20.74            | 3.87         |
| 7000  | 15.13 | 44.07     | 17.98             | 16.14              | 13.44     | 0.99    | 28.82       | 20.53            | 3.58         |
| 8000  | 15.17 | 42.59     | 19.06             | 13.02              | 11.04     | 0.96    | 29.67       | 21.01            | 3.56         |
| 9000  | 15.44 | 41.39     | 15.48             | 14.49              | 9.30      | 0.99    | 29.95       | 20.62            | 3.54         |
| 10000 | 15.84 | 40.53     | 13.93             | 24.20              | 8.22      | 1.04    | 29.06       | 19.95            | 3.49         |
| 11000 | 16.00 | 39.88     | 13.97             | 22.79              | 7.50      | 1.03    | 30.33       | 19.99            | 3.28         |
| 12000 | 16.03 | 39.08     | 14.54             | 18.07              | 6.77      | 1.02    | 34.26       | 19.93            | 3.21         |
| 13000 | 16.13 | 38.09     | 14.87             | 18.73              | 6.00      | 1.02    | 34.24       | 20.37            | 3.39         |
| 14000 | 16.22 | 37.02     | 15.46             | 21.22              | 5.32      | 1.02    | 33.49       | 20.54            | 3.36         |
| 15000 | 16.15 | 36.03     | 16.29             | 18.43              | 4.79      | 1.00    | 32.24       | 20.51            | 4.32         |
| 16000 | 15.85 | 35.34     | 13.98             | 13.30              | 4.38      | 0.98    | 33.90       | 20.38            | 3.66         |
| 17000 | 15.52 | 34.83     | 11.20             | 11.48              | 4.01      | 0.99    | 32.09       | 20.24            | 3.98         |
| 18000 | 15.59 | 34.07     | 10.44             | 13.20              | 3.66      | 1.03    | 32.37       | 19.89            | 4.30         |
| 19000 | 15.96 | 33.17     | 11.91             | 16.89              | 3.37      | 1.03    | 34.05       | 19.93            | 4.34         |
| 20000 | 16.24 | 32.53     | 15.54             | 14.03              | 3.12      | 0.97    | 32.57       | 19.68            | 4.29         |
| 21000 | 16.49 | 31.99     | 18.16             | 12.49              | 2.85      | 0.93    | 37.07       | 19.72            | 4.51         |
| 22000 | 16.97 | 31.17     | 18.52             | 14.28              | 2.52      | 0.94    | 34.97       | 19.56            | 4.63         |
| 23000 | 17.40 | 30.53     | 17.39             | 14.33              | 2.23      | 0.94    | 28.22       | 18.04            | 4.72         |
| 24000 | 17.70 | 29.97     | 17.52             | 13.54              | 2.02      | 0.93    | 31.28       | 18.08            | 4.84         |
| 25000 | 17.86 | 29.44     | 15.68             | 14.71              | 1.89      | 0.94    | 30.91       | 18.30            | 5.11         |
| 26000 | 17.39 | 29.54     | 11.18             | 11.57              | 1.82      | 0.96    | 24.52       | 17.13            | 5.52         |
| 27000 | 16.92 | 29.68     | 10.29             | 10.14              | 1.80      | 0.98    | 26.98       | 17.58            | 5.96         |
| 28000 | 17.10 | 29.24     | 11.56             | 11.90              | 1.84      | 0.96    | 29.77       | 18.25            | 6.32         |
| 29000 | 17.49 | 28.68     | 17.38             | 19.25              | 1.89      | 0.94    | 27.10       | 18.33            | 6.45         |
| 30000 | 17.46 | 28.74     | 22.56             | 13.75              | 1.88      | 0.89    | 22.74       | 18.37            | 6.61         |
| 32000 | 18.29 | 28.23     | 14.41             | 17.97              | 1.63      | 0.93    | 23.24       | 18.30            | 7.11         |
| 34000 | 19.00 | 28.03     | 12.18             | 10.15              | 1.30      | 0.89    | 22.87       | 17.41            | 7.47         |
| 36000 | 18.59 | 28.75     | 14.99             | 7.20               | 1.38      | 0.76    | 21.55       | 17.79            | 7.76         |
| 38000 | 17.89 | 29.40     | 23.23             | 11.20              | 1.85      | 0.87    | 20.80       | 18.74            | 8.12         |
| 40000 | 17.70 | 30.29     | 12.81             | 12.29              | 2.04      | 0.92    | 19.43       | 18.31            | 9.04         |
| 42000 | 18.50 | 29.62     | 17.21             | 8.60               | 1.62      | 0.83    | 20.41       | 16.78            | 10.14        |
| 44000 | 16.47 | 32.08     | 16.77             | 5.80               | 2.27      | 0.72    | ---         | ---              | 10.31        |
| 46000 | 16.38 | 34.70     | 26.03             | 14.50              | 4.04      | 0.95    | ---         | ---              | 9.59         |
| 48000 | 14.00 | 31.48     | 9.69              | 10.90              | 3.22      | 0.98    | ---         | ---              | 11.54        |
| 50000 | 12.83 | 30.99     | 21.07             | 9.76               | 3.66      | 0.88    | ---         | ---              | 12.97        |

## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vdd =5V, Idd =160mA @ Temperature = -45°C

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
|       |       |           |                   |                    | K         | Measure |             |                  |              |
| (MHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 50    | 19.37 | 86.28     | 8.24              | 24.97              | 938.70    | 1.15    | 30.58       | 19.16            | 3.29         |
| 100   | 17.71 | 78.70     | 12.12             | 27.19              | 524.98    | 1.06    | 31.67       | 19.09            | 3.61         |
| 500   | 16.39 | 66.47     | 19.12             | 28.19              | 157.39    | 1.01    | 30.71       | 18.92            | 4.06         |
| 1000  | 16.12 | 61.42     | 17.35             | 22.93              | 89.90     | 1.01    | 35.82       | 18.88            | 4.23         |
| 2000  | 16.04 | 55.28     | 14.88             | 18.54              | 43.72     | 1.02    | 35.42       | 18.71            | 4.08         |
| 3000  | 16.04 | 51.81     | 13.85             | 18.34              | 29.04     | 1.03    | 34.34       | 18.67            | 4.16         |
| 4000  | 16.06 | 49.26     | 13.41             | 19.41              | 21.57     | 1.03    | 33.17       | 18.63            | 4.00         |
| 5000  | 16.04 | 47.05     | 13.26             | 22.85              | 16.84     | 1.04    | 34.06       | 18.84            | 3.81         |
| 6000  | 16.03 | 45.36     | 15.36             | 22.08              | 14.13     | 1.02    | 34.90       | 19.04            | 3.33         |
| 7000  | 16.18 | 43.54     | 21.38             | 15.29              | 11.25     | 0.98    | 32.88       | 18.96            | 3.29         |
| 8000  | 16.15 | 42.63     | 21.02             | 12.68              | 9.92      | 0.95    | 28.74       | 18.97            | 3.18         |
| 9000  | 16.40 | 41.72     | 16.38             | 13.95              | 8.66      | 0.98    | 32.13       | 19.03            | 3.25         |
| 10000 | 16.91 | 40.82     | 14.66             | 20.50              | 7.52      | 1.02    | 31.11       | 18.99            | 3.10         |
| 11000 | 17.13 | 40.26     | 14.51             | 26.14              | 6.93      | 1.03    | 32.68       | 19.07            | 2.94         |
| 12000 | 17.20 | 39.62     | 14.81             | 17.85              | 6.31      | 1.01    | 32.37       | 19.15            | 2.87         |
| 13000 | 17.36 | 38.69     | 15.20             | 16.90              | 5.55      | 1.01    | 32.13       | 19.37            | 2.92         |
| 14000 | 17.56 | 37.54     | 16.02             | 21.43              | 4.87      | 1.01    | 31.65       | 19.56            | 2.85         |
| 15000 | 17.60 | 36.38     | 17.08             | 21.59              | 4.28      | 1.00    | 30.82       | 19.63            | 3.82         |
| 16000 | 17.36 | 35.55     | 13.95             | 14.82              | 3.84      | 0.99    | 29.93       | 19.27            | 3.18         |
| 17000 | 17.07 | 34.88     | 10.84             | 12.77              | 3.44      | 1.01    | 30.34       | 19.26            | 3.41         |
| 18000 | 17.07 | 34.09     | 10.18             | 13.80              | 3.11      | 1.04    | 29.40       | 18.82            | 3.74         |
| 19000 | 17.41 | 33.14     | 11.55             | 19.13              | 2.87      | 1.04    | 29.12       | 18.94            | 3.74         |
| 20000 | 17.68 | 32.45     | 14.30             | 17.16              | 2.68      | 0.98    | 28.65       | 19.03            | 3.84         |
| 21000 | 17.86 | 31.98     | 16.38             | 14.15              | 2.49      | 0.94    | 27.74       | 19.12            | 3.96         |
| 22000 | 18.28 | 31.24     | 18.99             | 17.03              | 2.26      | 0.94    | 27.80       | 18.86            | 4.11         |
| 23000 | 18.74 | 30.68     | 21.90             | 16.85              | 2.04      | 0.93    | 27.43       | 18.82            | 4.11         |
| 24000 | 19.08 | 30.18     | 21.64             | 14.26              | 1.84      | 0.90    | 26.10       | 18.49            | 4.20         |
| 25000 | 19.49 | 29.51     | 19.62             | 18.23              | 1.69      | 0.90    | 25.10       | 18.88            | 4.27         |
| 26000 | 19.14 | 29.53     | 11.81             | 11.38              | 1.57      | 0.90    | 24.48       | 18.70            | 4.48         |
| 27000 | 18.66 | 29.68     | 10.08             | 9.72               | 1.48      | 0.95    | 23.59       | 18.25            | 4.58         |
| 28000 | 18.94 | 29.10     | 10.27             | 12.65              | 1.48      | 0.97    | 24.11       | 18.24            | 4.78         |
| 29000 | 19.30 | 28.51     | 14.48             | 18.85              | 1.53      | 0.92    | 23.68       | 18.89            | 4.84         |
| 30000 | 19.27 | 28.47     | 17.54             | 15.82              | 1.54      | 0.88    | 23.01       | 18.79            | 5.31         |
| 32000 | 19.75 | 28.25     | 19.62             | 15.77              | 1.46      | 0.85    | 23.27       | 18.35            | 6.18         |
| 34000 | 20.71 | 27.85     | 11.55             | 10.78              | 1.16      | 0.82    | 20.91       | 18.22            | 6.61         |
| 36000 | 21.04 | 27.87     | 13.24             | 7.58               | 1.03      | 0.72    | 19.79       | 19.33            | 7.10         |
| 38000 | 20.41 | 28.13     | 17.89             | 7.61               | 1.15      | 0.71    | 19.28       | 18.96            | 7.99         |
| 40000 | 20.23 | 28.90     | 15.56             | 6.61               | 1.18      | 0.69    | 19.21       | 18.82            | 8.79         |
| 42000 | 21.20 | 27.46     | 17.71             | 4.48               | 0.82      | 0.49    | 15.28       | 16.91            | 9.10         |
| 44000 | 19.12 | 30.12     | 15.70             | 4.90               | 1.24      | 0.65    | ---         | ---              | 9.54         |
| 46000 | 18.95 | 32.04     | 33.06             | 13.39              | 2.26      | 0.91    | ---         | ---              | 9.05         |
| 48000 | 19.70 | 24.78     | 9.12              | 8.11               | 0.96      | 0.62    | ---         | ---              | 10.92        |
| 50000 | 17.74 | 26.58     | 17.46             | 13.13              | 1.47      | 0.84    | ---         | ---              | 10.70        |

## 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: Vdd = 5V, Idd = 150mA @ Temperature = -45°C

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
|       |       |           |                   |                    | K         | Measure |             |                  |              |
| (MHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 50    | 19.30 | 90.11     | 8.24              | 25.06              | 1470.79   | 1.15    | 33.76       | 19.10            | 3.16         |
| 100   | 17.64 | 80.11     | 12.13             | 27.34              | 622.63    | 1.06    | 34.72       | 19.04            | 3.54         |
| 500   | 16.32 | 66.73     | 19.17             | 28.21              | 163.51    | 1.01    | 30.99       | 18.90            | 4.03         |
| 1000  | 16.05 | 61.49     | 17.33             | 22.83              | 91.34     | 1.01    | 34.85       | 18.84            | 4.17         |
| 2000  | 15.96 | 55.31     | 14.89             | 18.48              | 44.27     | 1.02    | 34.74       | 18.70            | 4.03         |
| 3000  | 15.97 | 51.88     | 13.85             | 18.30              | 29.50     | 1.03    | 33.83       | 18.65            | 4.10         |
| 4000  | 15.99 | 49.35     | 13.41             | 19.45              | 21.97     | 1.03    | 33.12       | 18.62            | 3.92         |
| 5000  | 15.97 | 47.12     | 13.27             | 22.73              | 17.11     | 1.04    | 34.11       | 18.79            | 3.72         |
| 6000  | 15.96 | 45.45     | 15.43             | 21.75              | 14.40     | 1.02    | 34.39       | 19.01            | 3.18         |
| 7000  | 16.11 | 43.63     | 21.48             | 15.17              | 11.46     | 0.98    | 33.08       | 18.90            | 2.99         |
| 8000  | 16.08 | 42.70     | 20.86             | 12.57              | 10.06     | 0.95    | 29.41       | 18.94            | 3.06         |
| 9000  | 16.34 | 41.80     | 16.27             | 13.93              | 8.79      | 0.98    | 32.60       | 18.96            | 3.12         |
| 10000 | 16.84 | 40.93     | 14.61             | 20.78              | 7.68      | 1.02    | 31.55       | 18.91            | 3.29         |
| 11000 | 17.08 | 40.31     | 14.53             | 25.95              | 7.01      | 1.03    | 30.91       | 19.05            | 2.84         |
| 12000 | 17.15 | 39.67     | 14.92             | 17.65              | 6.38      | 1.01    | 33.54       | 19.06            | 2.75         |
| 13000 | 17.31 | 38.72     | 15.20             | 16.82              | 5.60      | 1.01    | 33.25       | 19.24            | 2.74         |
| 14000 | 17.52 | 37.55     | 16.06             | 21.79              | 4.90      | 1.01    | 32.55       | 19.42            | 2.77         |
| 15000 | 17.55 | 36.38     | 17.11             | 21.83              | 4.31      | 1.00    | 31.96       | 19.15            | 3.64         |
| 16000 | 17.30 | 35.54     | 13.82             | 14.83              | 3.85      | 0.99    | 30.79       | 19.08            | 2.97         |
| 17000 | 17.01 | 34.88     | 10.69             | 12.63              | 3.44      | 1.01    | 31.05       | 19.03            | 3.36         |
| 18000 | 17.01 | 34.08     | 10.10             | 13.70              | 3.12      | 1.04    | 29.80       | 18.88            | 3.57         |
| 19000 | 17.36 | 33.11     | 11.45             | 19.55              | 2.88      | 1.04    | 29.44       | 19.03            | 3.61         |
| 20000 | 17.63 | 32.43     | 14.42             | 17.18              | 2.69      | 0.98    | 29.13       | 18.94            | 3.65         |
| 21000 | 17.80 | 31.97     | 16.59             | 13.82              | 2.50      | 0.94    | 27.94       | 19.04            | 3.79         |
| 22000 | 18.23 | 31.23     | 18.99             | 16.77              | 2.27      | 0.94    | 28.19       | 18.90            | 3.93         |
| 23000 | 18.70 | 30.67     | 21.40             | 17.10              | 2.05      | 0.93    | 27.93       | 18.42            | 3.98         |
| 24000 | 19.04 | 30.16     | 21.47             | 14.50              | 1.85      | 0.90    | 26.52       | 18.01            | 4.01         |
| 25000 | 19.44 | 29.51     | 19.40             | 18.12              | 1.70      | 0.91    | 25.34       | 18.21            | 4.08         |
| 26000 | 19.07 | 29.56     | 11.62             | 11.23              | 1.58      | 0.91    | 24.80       | 17.72            | 4.28         |
| 27000 | 18.63 | 29.69     | 9.95              | 9.70               | 1.48      | 0.96    | 23.74       | 17.36            | 4.35         |
| 28000 | 18.94 | 29.07     | 10.48             | 12.47              | 1.48      | 0.96    | 24.26       | 17.30            | 4.52         |
| 29000 | 19.28 | 28.51     | 14.79             | 18.56              | 1.53      | 0.91    | 24.05       | 18.19            | 4.60         |
| 30000 | 19.20 | 28.52     | 16.83             | 15.79              | 1.55      | 0.89    | 23.18       | 18.34            | 4.69         |
| 32000 | 19.69 | 28.31     | 19.96             | 15.28              | 1.47      | 0.85    | 23.11       | 18.16            | 5.82         |
| 34000 | 20.62 | 27.95     | 11.29             | 10.92              | 1.17      | 0.83    | 20.96       | 18.32            | 6.38         |
| 36000 | 21.03 | 27.90     | 13.52             | 7.39               | 1.03      | 0.71    | 20.49       | 18.88            | 6.73         |
| 38000 | 20.27 | 28.39     | 17.51             | 7.95               | 1.20      | 0.74    | 20.29       | 18.07            | 7.52         |
| 40000 | 19.99 | 29.26     | 14.82             | 7.02               | 1.27      | 0.73    | 19.06       | 17.76            | 8.20         |
| 42000 | 20.99 | 27.94     | 17.80             | 5.53               | 0.95      | 0.59    | 15.17       | 17.59            | 8.65         |
| 44000 | 19.16 | 30.43     | 15.36             | 4.88               | 1.27      | 0.66    | ---         | ---              | 9.04         |
| 46000 | 18.93 | 32.36     | 29.08             | 12.69              | 2.32      | 0.90    | ---         | ---              | 8.67         |
| 48000 | 19.49 | 25.16     | 9.37              | 9.46               | 1.04      | 0.70    | ---         | ---              | 10.36        |
| 50000 | 17.72 | 26.81     | 16.57             | 12.64              | 1.49      | 0.85    | ---         | ---              | 10.32        |

## 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: V<sub>dd</sub> = 5V, I<sub>dd</sub> = 170mA @ Temperature = -45°C

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
|       |       |           |                   |                    | K         | Measure |             |                  |              |
| (MHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 50    | 19.36 | 83.64     | 8.23              | 24.69              | 693.05    | 1.15    | 28.44       | 19.24            | 3.42         |
| 100   | 17.70 | 80.85     | 12.10             | 26.80              | 672.87    | 1.06    | 29.08       | 19.17            | 3.76         |
| 500   | 16.38 | 66.38     | 19.19             | 27.81              | 155.96    | 1.01    | 30.16       | 19.05            | 4.20         |
| 1000  | 16.11 | 61.26     | 17.35             | 22.94              | 88.36     | 1.01    | 37.33       | 18.93            | 4.33         |
| 2000  | 16.02 | 55.06     | 14.90             | 18.70              | 42.75     | 1.02    | 36.58       | 18.79            | 4.22         |
| 3000  | 16.02 | 51.63     | 13.86             | 18.58              | 28.53     | 1.03    | 34.79       | 18.74            | 4.27         |
| 4000  | 16.04 | 49.12     | 13.42             | 19.80              | 21.29     | 1.03    | 33.12       | 18.71            | 4.11         |
| 5000  | 16.01 | 46.94     | 13.23             | 23.39              | 16.69     | 1.04    | 33.89       | 18.91            | 4.01         |
| 6000  | 16.00 | 45.22     | 15.39             | 22.24              | 13.96     | 1.02    | 33.53       | 19.13            | 3.41         |
| 7000  | 16.16 | 43.33     | 21.39             | 15.38              | 11.02     | 0.98    | 32.56       | 19.07            | 3.44         |
| 8000  | 16.11 | 42.51     | 20.82             | 12.83              | 9.84      | 0.95    | 27.94       | 19.07            | 3.30         |
| 9000  | 16.35 | 41.61     | 16.20             | 14.25              | 8.62      | 0.98    | 31.30       | 19.15            | 3.34         |
| 10000 | 16.85 | 40.95     | 14.54             | 22.29              | 7.71      | 1.03    | 30.50       | 19.10            | 37.02        |
| 11000 | 17.05 | 40.20     | 14.41             | 25.94              | 6.94      | 1.03    | 34.77       | 19.28            | 3.05         |
| 12000 | 17.12 | 39.60     | 14.90             | 17.74              | 6.35      | 1.01    | 31.10       | 19.28            | 3.07         |
| 13000 | 17.28 | 38.71     | 15.28             | 17.04              | 5.63      | 1.01    | 30.95       | 19.53            | 3.13         |
| 14000 | 17.47 | 37.60     | 16.21             | 22.44              | 4.96      | 1.01    | 30.49       | 19.79            | 3.13         |
| 15000 | 17.49 | 36.47     | 17.28             | 21.34              | 4.39      | 1.00    | 29.77       | 19.42            | 4.02         |
| 16000 | 17.23 | 35.67     | 13.92             | 14.77              | 3.94      | 0.99    | 29.08       | 19.44            | 3.44         |
| 17000 | 16.94 | 35.02     | 10.78             | 12.69              | 3.53      | 1.01    | 29.53       | 19.39            | 3.75         |
| 18000 | 16.95 | 34.21     | 10.17             | 13.88              | 3.20      | 1.04    | 29.25       | 19.28            | 4.06         |
| 19000 | 17.30 | 33.26     | 11.54             | 20.11              | 2.95      | 1.04    | 28.70       | 19.29            | 4.07         |
| 20000 | 17.56 | 32.59     | 14.55             | 17.41              | 2.76      | 0.98    | 28.30       | 19.38            | 21.60        |
| 21000 | 17.73 | 32.10     | 16.72             | 13.90              | 2.56      | 0.94    | 27.39       | 19.47            | 4.21         |
| 22000 | 18.16 | 31.35     | 18.97             | 17.20              | 2.32      | 0.95    | 27.43       | 19.35            | 4.37         |
| 23000 | 18.61 | 30.78     | 21.34             | 17.25              | 2.09      | 0.93    | 27.08       | 19.05            | 4.34         |
| 24000 | 18.94 | 30.28     | 21.71             | 14.77              | 1.89      | 0.91    | 25.76       | 18.55            | 4.45         |
| 25000 | 19.30 | 29.64     | 19.62             | 18.33              | 1.74      | 0.91    | 24.79       | 18.73            | 4.54         |
| 26000 | 18.92 | 29.69     | 11.87             | 11.18              | 1.62      | 0.91    | 24.33       | 18.24            | 4.76         |
| 27000 | 18.50 | 29.80     | 10.12             | 9.96               | 1.53      | 0.96    | 23.51       | 18.00            | 4.93         |
| 28000 | 18.79 | 29.18     | 10.59             | 13.04              | 1.54      | 0.97    | 23.97       | 18.14            | 5.14         |
| 29000 | 19.13 | 28.61     | 14.99             | 19.68              | 1.58      | 0.92    | 23.88       | 18.91            | 5.20         |
| 30000 | 19.06 | 28.58     | 17.16             | 16.67              | 1.59      | 0.89    | 23.43       | 18.92            | 13.46        |
| 32000 | 19.62 | 28.27     | 19.40             | 16.18              | 1.48      | 0.86    | 22.79       | 18.93            | 6.48         |
| 34000 | 20.42 | 27.98     | 11.60             | 10.16              | 1.18      | 0.82    | 20.68       | 19.00            | 7.08         |
| 36000 | 20.79 | 27.90     | 13.68             | 7.96               | 1.08      | 0.73    | 19.98       | 19.10            | 7.49         |
| 38000 | 20.23 | 28.00     | 17.49             | 7.97               | 1.17      | 0.73    | 19.47       | 18.64            | 8.54         |
| 40000 | 20.19 | 28.55     | 14.82             | 6.00               | 1.10      | 0.65    | 18.87       | 17.89            | 17.52        |
| 42000 | 21.00 | 27.11     | 17.87             | 3.86               | 0.75      | 0.43    | 15.94       | 17.77            | 9.59         |
| 44000 | 18.75 | 29.70     | 16.02             | 5.06               | 1.27      | 0.66    | ---         | ---              | 10.14        |
| 46000 | 18.57 | 31.63     | 32.57             | 16.23              | 2.31      | 0.93    | ---         | ---              | 9.62         |
| 48000 | 19.00 | 24.95     | 8.42              | 7.04               | 0.96      | 0.64    | ---         | ---              | 11.46        |
| 50000 | 17.23 | 26.50     | 18.73             | 12.58              | 1.51      | 0.85    | ---         | ---              | 11.62        |

## 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: Vdd = 5V, Idd = 160mA @ Temperature = +85°C

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
|       |       |           |                   |                    | K         | Measure |             |                  |              |
| (MHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 50    | 18.82 | 84.01     | 7.35              | 25.10              | 739.25    | 1.18    | 34.03       | 20.76            | 8.85         |
| 100   | 17.10 | 81.50     | 11.58             | 27.46              | 770.74    | 1.07    | 34.25       | 20.65            | 7.40         |
| 500   | 15.64 | 69.85     | 20.28             | 28.89              | 254.00    | 1.01    | 30.85       | 20.40            | 5.66         |
| 1000  | 15.34 | 63.64     | 18.97             | 22.98              | 127.72    | 1.01    | 30.97       | 20.42            | 5.44         |
| 2000  | 15.14 | 57.20     | 15.26             | 18.20              | 60.58     | 1.01    | 32.05       | 20.16            | 5.32         |
| 3000  | 14.98 | 53.40     | 13.13             | 18.14              | 39.05     | 1.03    | 32.47       | 20.12            | 5.37         |
| 4000  | 14.82 | 50.41     | 12.03             | 19.70              | 27.90     | 1.05    | 32.56       | 20.05            | 5.20         |
| 5000  | 14.66 | 47.84     | 11.75             | 21.81              | 21.14     | 1.06    | 33.24       | 20.11            | 4.92         |
| 6000  | 14.64 | 45.64     | 13.23             | 20.26              | 16.74     | 1.04    | 31.80       | 20.44            | 4.31         |
| 7000  | 14.65 | 43.83     | 17.10             | 15.20              | 13.68     | 0.99    | 32.18       | 20.19            | 3.97         |
| 8000  | 14.62 | 42.51     | 17.85             | 12.70              | 11.55     | 0.96    | 31.54       | 20.62            | 3.97         |
| 9000  | 14.80 | 41.53     | 14.87             | 14.05              | 10.08     | 0.99    | 31.34       | 20.29            | 3.95         |
| 10000 | 15.20 | 40.63     | 13.80             | 21.57              | 8.90      | 1.03    | 30.86       | 19.72            | 3.82         |
| 11000 | 15.39 | 39.92     | 14.24             | 21.76              | 8.07      | 1.03    | 30.53       | 19.73            | 3.68         |
| 12000 | 15.40 | 39.13     | 14.82             | 17.60              | 7.31      | 1.01    | 30.11       | 19.54            | 3.59         |
| 13000 | 15.50 | 38.11     | 14.82             | 17.86              | 6.44      | 1.01    | 29.84       | 19.95            | 3.79         |
| 14000 | 15.62 | 36.94     | 14.86             | 20.24              | 5.60      | 1.02    | 29.49       | 20.08            | 3.80         |
| 15000 | 15.60 | 35.80     | 15.25             | 22.04              | 4.97      | 1.02    | 29.04       | 19.91            | 4.70         |
| 16000 | 15.36 | 34.98     | 13.40             | 16.72              | 4.51      | 1.01    | 28.71       | 19.44            | 4.12         |
| 17000 | 15.10 | 34.33     | 11.14             | 14.24              | 4.09      | 1.03    | 28.29       | 19.46            | 4.39         |
| 18000 | 15.13 | 33.53     | 10.56             | 15.89              | 3.72      | 1.06    | 27.99       | 19.06            | 4.64         |
| 19000 | 15.42 | 32.68     | 12.12             | 20.49              | 3.44      | 1.04    | 27.62       | 19.01            | 4.73         |
| 20000 | 15.69 | 32.01     | 15.01             | 18.94              | 3.20      | 1.00    | 27.35       | 18.75            | 4.72         |
| 21000 | 15.89 | 31.48     | 16.80             | 17.67              | 2.97      | 0.98    | 26.88       | 18.50            | 4.93         |
| 22000 | 16.17 | 30.82     | 16.52             | 19.72              | 2.69      | 0.98    | 26.25       | 18.30            | 5.01         |
| 23000 | 16.45 | 30.30     | 16.45             | 17.61              | 2.45      | 0.97    | 26.40       | 17.48            | 5.11         |
| 24000 | 16.70 | 29.76     | 17.96             | 15.97              | 2.25      | 0.95    | 25.99       | 17.80            | 5.26         |
| 25000 | 16.84 | 29.23     | 15.78             | 18.98              | 2.11      | 0.96    | 25.80       | 17.90            | 5.32         |
| 26000 | 16.45 | 29.25     | 11.06             | 13.94              | 2.01      | 1.00    | 25.63       | 16.67            | 5.60         |
| 27000 | 16.07 | 29.30     | 10.52             | 10.97              | 1.95      | 0.99    | 25.66       | 16.83            | 5.91         |
| 28000 | 16.27 | 28.82     | 11.61             | 11.16              | 1.93      | 0.94    | 25.34       | 17.23            | 6.05         |
| 29000 | 16.82 | 28.11     | 17.89             | 19.36              | 1.93      | 0.93    | 25.01       | 17.16            | 5.96         |
| 30000 | 16.94 | 28.01     | 26.47             | 16.94              | 1.88      | 0.91    | 24.78       | 17.12            | 6.23         |
| 32000 | 17.35 | 27.79     | 11.90             | 22.25              | 1.70      | 0.97    | 24.73       | 17.21            | 6.86         |
| 34000 | 17.81 | 27.67     | 13.41             | 11.73              | 1.49      | 0.91    | 25.25       | 16.23            | 7.26         |
| 36000 | 17.31 | 28.41     | 17.41             | 8.27               | 1.64      | 0.79    | 24.79       | 16.25            | 7.49         |
| 38000 | 16.73 | 28.83     | 18.97             | 12.15              | 2.00      | 0.89    | 23.64       | 17.13            | 7.78         |
| 40000 | 16.87 | 28.76     | 11.89             | 15.84              | 1.96      | 0.95    | 23.61       | 16.36            | 8.29         |
| 42000 | 16.97 | 28.69     | 19.08             | 12.15              | 1.89      | 0.90    | 23.30       | 14.86            | 9.11         |
| 44000 | 14.72 | 31.66     | 14.78             | 7.32               | 2.88      | 0.81    | ---         | ---              | 9.73         |
| 46000 | 15.43 | 33.39     | 26.30             | 19.08              | 3.96      | 0.97    | ---         | ---              | 10.06        |
| 48000 | 11.96 | 32.35     | 10.47             | 10.44              | 4.46      | 0.97    | ---         | ---              | 12.00        |
| 50000 | 11.47 | 30.88     | 28.76             | 10.26              | 4.28      | 0.90    | ---         | ---              | 12.54        |

## 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: Vdd = 5V, Idd = 150mA @ Temperature = +85°C

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
|       |       |           |                   |                    | K         | Measure |             |                  |              |
| (MHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 50    | 18.74 | 86.96     | 7.33              | 25.24              | 1046.81   | 1.18    | 34.13       | 20.61            | 8.47         |
| 100   | 17.00 | 80.07     | 11.58             | 27.69              | 661.38    | 1.07    | 33.19       | 20.48            | 7.09         |
| 500   | 15.55 | 70.11     | 20.23             | 29.16              | 264.43    | 1.01    | 32.28       | 20.29            | 5.44         |
| 1000  | 15.25 | 64.23     | 18.93             | 23.07              | 138.12    | 1.01    | 34.73       | 20.29            | 5.46         |
| 2000  | 15.04 | 57.66     | 15.21             | 18.27              | 64.60     | 1.02    | 34.51       | 20.04            | 5.32         |
| 3000  | 14.87 | 53.82     | 13.04             | 18.23              | 41.47     | 1.03    | 34.14       | 20.00            | 5.33         |
| 4000  | 14.70 | 50.85     | 11.93             | 19.83              | 29.72     | 1.05    | 33.67       | 19.93            | 5.16         |
| 5000  | 14.53 | 48.21     | 11.65             | 22.09              | 22.36     | 1.06    | 33.49       | 19.98            | 4.84         |
| 6000  | 14.50 | 45.94     | 13.11             | 20.59              | 17.60     | 1.04    | 33.20       | 20.31            | 4.22         |
| 7000  | 14.52 | 44.08     | 16.93             | 15.39              | 14.30     | 0.99    | 32.85       | 20.08            | 3.93         |
| 8000  | 14.49 | 42.75     | 17.64             | 12.86              | 12.07     | 0.96    | 32.52       | 20.47            | 3.89         |
| 9000  | 14.66 | 41.74     | 14.74             | 14.24              | 10.50     | 1.00    | 31.85       | 20.17            | 3.85         |
| 10000 | 15.05 | 40.86     | 13.70             | 22.02              | 9.30      | 1.04    | 31.29       | 19.62            | 3.77         |
| 11000 | 15.24 | 40.16     | 14.22             | 22.07              | 8.44      | 1.03    | 31.09       | 19.61            | 3.63         |
| 12000 | 15.24 | 39.36     | 14.78             | 17.78              | 7.65      | 1.02    | 30.67       | 19.40            | 3.56         |
| 13000 | 15.34 | 38.33     | 14.78             | 18.07              | 6.73      | 1.02    | 30.44       | 19.80            | 3.71         |
| 14000 | 15.45 | 37.16     | 14.85             | 20.53              | 5.86      | 1.02    | 30.15       | 19.92            | 3.70         |
| 15000 | 15.43 | 36.02     | 15.23             | 22.26              | 5.20      | 1.02    | 29.64       | 19.72            | 4.68         |
| 16000 | 15.19 | 35.19     | 13.38             | 16.80              | 4.71      | 1.02    | 29.31       | 19.26            | 4.06         |
| 17000 | 14.93 | 34.53     | 11.12             | 14.40              | 4.27      | 1.03    | 29.25       | 19.27            | 4.37         |
| 18000 | 14.97 | 33.72     | 10.56             | 16.17              | 3.87      | 1.06    | 28.71       | 18.85            | 4.63         |
| 19000 | 15.26 | 32.86     | 12.11             | 21.01              | 3.58      | 1.04    | 28.49       | 18.78            | 4.69         |
| 20000 | 15.52 | 32.20     | 14.95             | 19.52              | 3.33      | 1.00    | 28.29       | 18.55            | 4.63         |
| 21000 | 15.71 | 31.65     | 16.69             | 18.29              | 3.09      | 0.99    | 27.62       | 18.31            | 4.84         |
| 22000 | 15.98 | 31.01     | 16.24             | 20.49              | 2.81      | 0.99    | 26.93       | 18.13            | 4.97         |
| 23000 | 16.23 | 30.50     | 16.29             | 18.14              | 2.56      | 0.98    | 27.06       | 17.34            | 5.05         |
| 24000 | 16.47 | 29.95     | 17.86             | 16.52              | 2.36      | 0.96    | 26.66       | 17.66            | 5.18         |
| 25000 | 16.58 | 29.45     | 15.74             | 19.59              | 2.22      | 0.97    | 26.39       | 17.78            | 5.26         |
| 26000 | 16.18 | 29.46     | 11.15             | 14.14              | 2.12      | 1.00    | 26.21       | 16.60            | 5.57         |
| 27000 | 15.81 | 29.49     | 10.56             | 11.19              | 2.06      | 1.00    | 26.24       | 16.78            | 5.82         |
| 28000 | 16.02 | 29.02     | 11.52             | 11.39              | 2.03      | 0.95    | 26.21       | 17.10            | 6.03         |
| 29000 | 16.56 | 28.30     | 17.64             | 20.09              | 2.02      | 0.94    | 25.72       | 17.03            | 6.00         |
| 30000 | 16.69 | 28.18     | 26.33             | 17.50              | 1.97      | 0.92    | 25.23       | 17.04            | 6.11         |
| 32000 | 17.04 | 28.00     | 11.69             | 23.62              | 1.79      | 0.98    | 25.22       | 17.08            | 6.79         |
| 34000 | 17.40 | 27.95     | 13.72             | 11.89              | 1.61      | 0.92    | 25.93       | 16.05            | 7.17         |
| 36000 | 16.90 | 28.67     | 17.07             | 8.68               | 1.78      | 0.81    | 24.89       | 16.04            | 7.45         |
| 38000 | 16.35 | 29.04     | 18.08             | 12.88              | 2.14      | 0.91    | 23.84       | 16.92            | 7.71         |
| 40000 | 16.43 | 28.96     | 12.16             | 16.97              | 2.10      | 0.97    | 23.97       | 16.09            | 8.34         |
| 42000 | 16.27 | 29.09     | 19.99             | 12.77              | 2.14      | 0.92    | 23.55       | 14.66            | 9.11         |
| 44000 | 14.11 | 31.89     | 14.16             | 7.76               | 3.21      | 0.84    | ---         | ---              | 9.70         |
| 46000 | 14.70 | 33.62     | 27.35             | 20.12              | 4.43      | 0.98    | ---         | ---              | 10.07        |
| 48000 | 11.14 | 33.44     | 10.80             | 10.56              | 5.56      | 0.97    | ---         | ---              | 12.24        |
| 50000 | 10.43 | 31.70     | 29.63             | 10.02              | 5.25      | 0.89    | ---         | ---              | 12.42        |



## Typical Performance Data

### Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

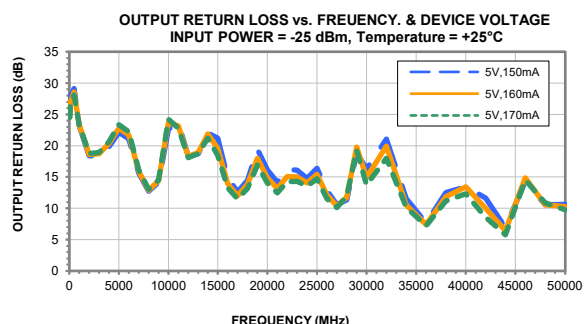
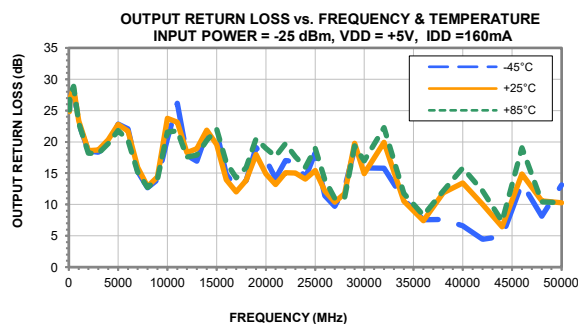
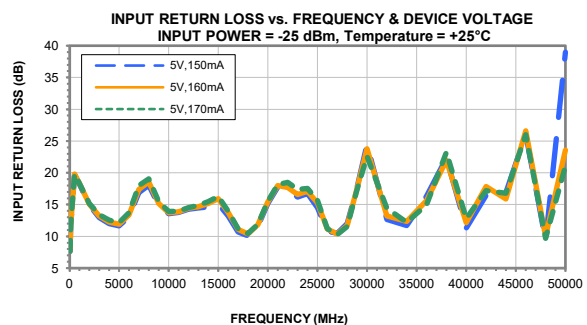
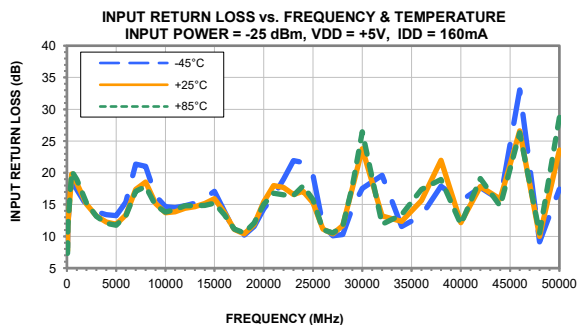
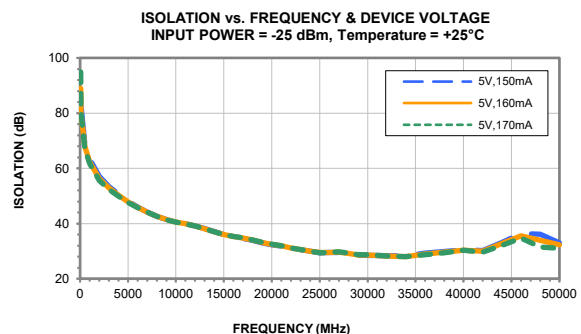
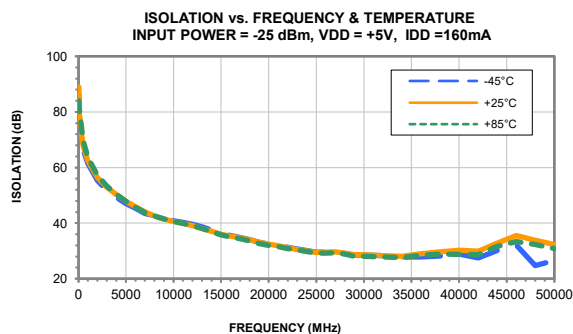
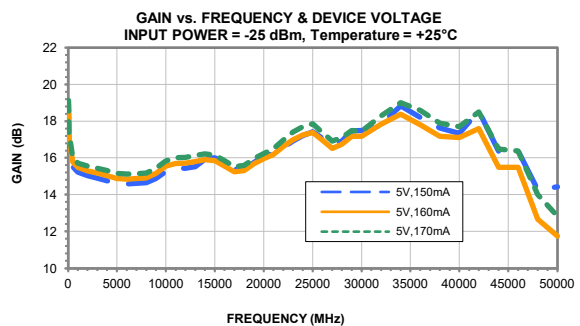
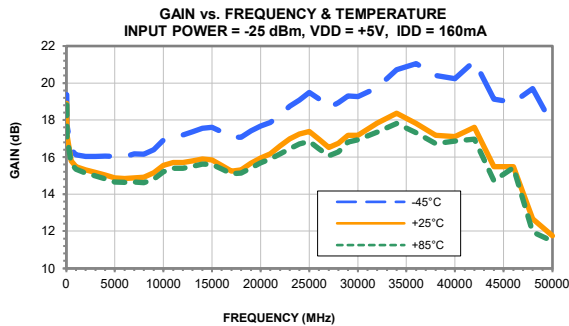
Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

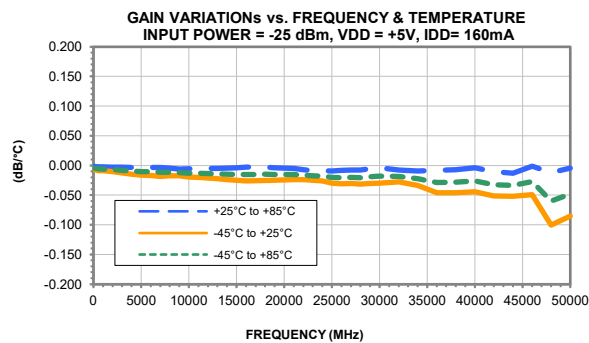
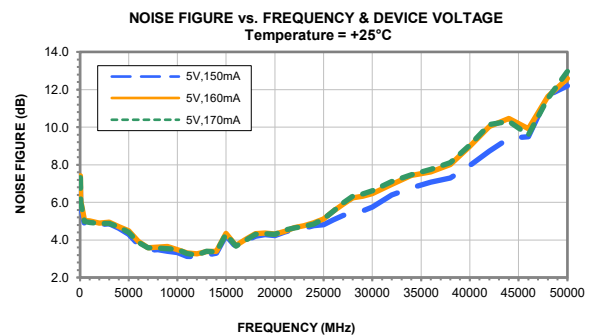
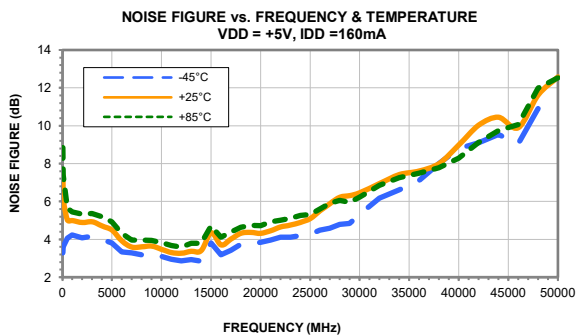
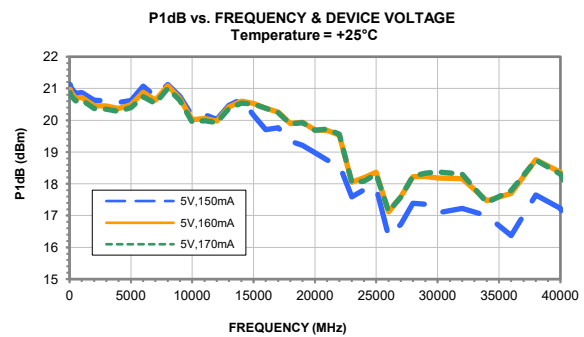
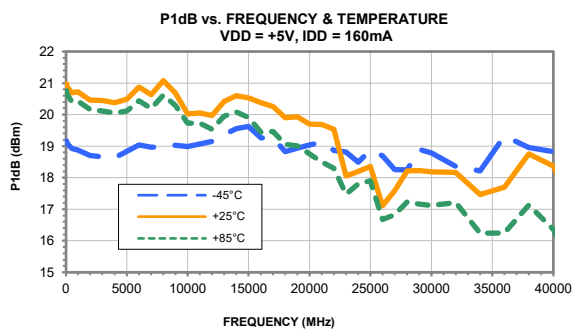
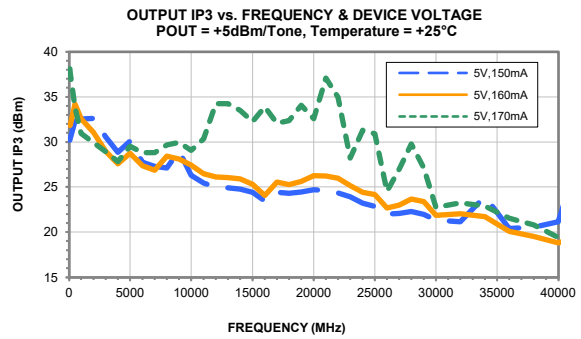
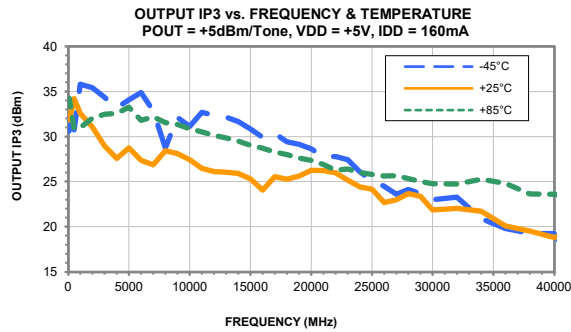
TEST CONDITIONS: Vdd = 5V, Idd = 170mA @ Temperature = +85°C

| FREQ  | Gain  | Isolation | Input Return Loss | Output Return Loss | Stability |         | IP-3 Output | 1dB Comp. Output | Noise Figure |
|-------|-------|-----------|-------------------|--------------------|-----------|---------|-------------|------------------|--------------|
|       |       |           |                   |                    | K         | Measure |             |                  |              |
| (MHz) | (dB)  | (dB)      | (dB)              | (dB)               | K         | Measure | (dBm)       | (dBm)            | (dB)         |
| 50    | 18.92 | 85.03     | 7.33              | 24.86              | 820.83    | 1.18    | 29.74       | 21.05            | 9.38         |
| 100   | 17.20 | 79.80     | 11.58             | 27.06              | 626.38    | 1.07    | 30.46       | 20.93            | 7.81         |
| 500   | 15.75 | 68.92     | 20.33             | 28.39              | 225.32    | 1.01    | 31.52       | 20.67            | 5.58         |
| 1000  | 15.45 | 62.94     | 19.01             | 22.84              | 116.35    | 1.01    | 31.25       | 20.68            | 5.50         |
| 2000  | 15.25 | 56.40     | 15.32             | 18.13              | 54.56     | 1.01    | 32.02       | 20.39            | 5.37         |
| 3000  | 15.10 | 52.66     | 13.25             | 18.02              | 35.40     | 1.03    | 33.33       | 20.31            | 5.43         |
| 4000  | 14.96 | 49.86     | 12.15             | 19.49              | 25.81     | 1.05    | 33.18       | 20.19            | 5.20         |
| 5000  | 14.80 | 47.32     | 11.89             | 21.48              | 19.63     | 1.06    | 39.76       | 20.23            | 4.93         |
| 6000  | 14.79 | 45.20     | 13.40             | 19.83              | 15.66     | 1.04    | 31.64       | 20.56            | 4.33         |
| 7000  | 14.80 | 43.43     | 17.30             | 14.95              | 12.83     | 0.99    | 31.18       | 20.28            | 4.04         |
| 8000  | 14.77 | 42.16     | 18.09             | 12.52              | 10.89     | 0.96    | 30.81       | 20.72            | 4.04         |
| 9000  | 14.97 | 41.16     | 15.05             | 13.83              | 9.47      | 0.99    | 35.42       | 20.34            | 3.98         |
| 10000 | 15.37 | 40.29     | 13.92             | 20.90              | 8.40      | 1.03    | 28.77       | 19.74            | 3.95         |
| 11000 | 15.57 | 39.56     | 14.27             | 21.26              | 7.59      | 1.03    | 27.97       | 19.78            | 3.76         |
| 12000 | 15.58 | 38.76     | 14.76             | 17.24              | 6.85      | 1.01    | 27.46       | 19.63            | 3.71         |
| 13000 | 15.69 | 37.74     | 14.79             | 17.48              | 6.03      | 1.01    | 27.08       | 20.09            | 3.84         |
| 14000 | 15.81 | 36.56     | 14.88             | 19.78              | 5.25      | 1.02    | 26.84       | 20.29            | 3.85         |
| 15000 | 15.80 | 35.45     | 15.24             | 21.73              | 4.67      | 1.02    | 26.59       | 19.81            | 4.76         |
| 16000 | 15.56 | 34.64     | 13.34             | 16.52              | 4.24      | 1.01    | 26.20       | 19.29            | 4.17         |
| 17000 | 15.28 | 34.03     | 11.08             | 13.98              | 3.87      | 1.03    | 26.87       | 19.40            | 4.43         |
| 18000 | 15.32 | 33.23     | 10.57             | 15.49              | 3.51      | 1.05    | 26.68       | 18.96            | 4.71         |
| 19000 | 15.61 | 32.39     | 12.15             | 19.58              | 3.26      | 1.04    | 26.68       | 18.93            | 4.80         |
| 20000 | 15.87 | 31.75     | 15.02             | 18.14              | 3.04      | 0.99    | 26.87       | 18.69            | 4.77         |
| 21000 | 16.07 | 31.21     | 16.93             | 16.84              | 2.82      | 0.97    | 26.94       | 18.48            | 4.97         |
| 22000 | 16.39 | 30.55     | 16.82             | 18.56              | 2.55      | 0.97    | 26.44       | 18.23            | 5.11         |
| 23000 | 16.69 | 30.03     | 16.67             | 16.80              | 2.31      | 0.96    | 25.81       | 17.28            | 5.20         |
| 24000 | 16.97 | 29.48     | 18.00             | 15.16              | 2.11      | 0.94    | 25.22       | 17.62            | 5.34         |
| 25000 | 17.15 | 28.93     | 15.82             | 17.84              | 1.97      | 0.95    | 25.10       | 17.70            | 5.40         |
| 26000 | 16.76 | 28.95     | 10.97             | 13.58              | 1.88      | 0.99    | 24.23       | 16.33            | 5.70         |
| 27000 | 16.35 | 29.04     | 10.44             | 10.66              | 1.82      | 0.98    | 24.12       | 16.55            | 5.94         |
| 28000 | 16.54 | 28.61     | 11.62             | 10.75              | 1.81      | 0.93    | 24.29       | 17.05            | 6.06         |
| 29000 | 17.11 | 27.89     | 17.95             | 18.06              | 1.82      | 0.92    | 23.72       | 16.96            | 6.04         |
| 30000 | 17.20 | 27.82     | 26.62             | 15.93              | 1.79      | 0.89    | 22.97       | 16.88            | 6.15         |
| 32000 | 17.71 | 27.57     | 12.09             | 20.10              | 1.60      | 0.95    | 22.70       | 17.00            | 6.93         |
| 34000 | 18.30 | 27.35     | 13.09             | 11.19              | 1.36      | 0.89    | 27.31       | 16.14            | 7.29         |
| 36000 | 17.77 | 28.14     | 17.56             | 7.63               | 1.49      | 0.75    | 22.20       | 16.02            | 7.54         |
| 38000 | 17.16 | 28.68     | 20.40             | 11.17              | 1.86      | 0.86    | 21.36       | 16.95            | 7.84         |
| 40000 | 17.35 | 28.67     | 11.65             | 13.91              | 1.82      | 0.93    | 21.69       | 16.28            | 8.38         |
| 42000 | 17.88 | 28.28     | 17.77             | 11.12              | 1.62      | 0.87    | 22.01       | 14.70            | 9.16         |
| 44000 | 15.44 | 31.57     | 15.71             | 6.59               | 2.54      | 0.77    | ---         | ---              | 9.74         |
| 46000 | 16.22 | 33.47     | 24.58             | 16.03              | 3.62      | 0.96    | ---         | ---              | 9.62         |
| 48000 | 13.05 | 30.85     | 9.84              | 10.38              | 3.32      | 0.96    | ---         | ---              | 11.93        |
| 50000 | 12.92 | 29.79     | 27.58             | 10.63              | 3.26      | 0.89    | ---         | ---              | 12.29        |

## Typical Performance Curves



## Typical Performance Curves



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

| Specification                  | Test/Inspection Condition  | Reference/Spec                       |
|--------------------------------|--|--------------------------------------|
| Operating Temperature          | -40° to 85° C or -40° to 105° C or -55° to 105° C or -45° to 105° C<br>Ambient Environment | Refer to Individual Model Data Sheet |
| Storage Environment (Die)      | -65° to 150°C  | Individual Model Data Sheet          |
| Storage Environment(Packaging) | -40° to 70°C and 40 to 60% humidity (In Factory Shipped Package)                           |                                      |