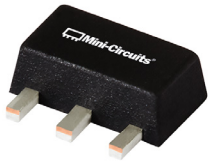
FLAT GAIN, ULTRA-WIDEBAND

# Monolithic Amplifier GVA-123+

50Ω 0.01 to 12 GHz

## THE BIG DEAL

- Ultra broadband performance
- Excellent Gain Flatness, ±0.7 dB, 0.05-8 GHz
- Gain, 16.9 dB typ. at 2 GHz
- Excellent return loss, 20 dB typ., 2 GHz
- Low additive phase noise, typically -169 dBc/Hz @10 KHz
- Broadband without external matching components
- Suitable for low phase noise applications



*Generic photo used for illustration purposes only*

CASE STYLE: DF782

***+RoHS Compliant***

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

## APPLICATIONS

- Low phase noise applications
- Base station infrastructure
- Test instruments
- MMDS & Wireless LAN
- LTE
- Satellite communication
- Avionics

## PRODUCT OVERVIEW

GVA-123+ (RoHS compliant) is an advanced ultra-wideband amplifier fabricated using GaAs HBT technology and offers excellent gain flatness over a broad frequency range. In addition, the GVA-123+ has good input and output return loss over this frequency range without the need for external matching components. Lead finish is tin-silver over nickel. It has repeatable performance from lot to lot and is enclosed in a SOT-89 package for very good thermal performance.

## KEY FEATURES

| Feature | Advantages |
|---|---|
| Ultra Broad Band: 0.01 to 12 GHz | Broadband covering primary wireless communications bands:<br>Cellular, PCS, LTE, WiMAX in a single amplifier. |
| Ultra Flat Gain<br>±0.7 dB typ: 0.05 - 8 GHz | Ultra Flat Gain, eliminates need for compensation networks to achieve published results |
| Low additive phase noise | Extremely low additive phase noise of -169 dBc/Hz at 10 KHz offset from 2 GHz carrier, with +1 dBm of input power. |
| No External Matching Components Required | GVA-123+ provides good Input and Output Return Loss of 12-28 dB over 0.05 - 6 GHz without the need for any external matching components |
| Excellent ESD<br>HBM: class 1C (1000 to <2000V)<br>MM: class M2 (100 to <200V) | Simplifies ESD handling. |

REV. D
ECO-018885
GVA-123+
TH/RS/CP
230815

## ELECTRICAL SPECIFICATIONS AT 25°C AND VCC=5V, R= 16.5Ω UNLESS NOTED

| Parameter | Condition (GHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Frequency Range | | 0.01 | | 12.0 | GHz |
| Gain | 0.05 | — | 16.2 | — | dB |
| | 0.85 | — | 17.2 | — | |
| | 2.0 | 15.2 | 16.9 | 18.6 | |
| | 6.0 | — | 16.4 | — | |
| | 8.0 | — | 16.3 | — | |
| | 10.0 | — | 12.5 | — | |
| | 12.0 | — | 7.1 | — | |
| Gain Flatness | 0.05-8 | | ±0.7 | | dB |
| Input Return Loss | 0.05 | — | 12.7 | — | dB |
| | 0.85 | — | 24.9 | — | |
| | 2.0 | 16.0 | 23.8 | — | |
| | 6.0 | — | 22.2 | — | |
| | 8.0 | — | 9.2 | — | |
| | 10.0 | — | 7.5 | — | |
| | 12.0 | — | 6.3 | — | |
| Output Return Loss | 0.05 | | 14.4 | | dB |
| | 0.85 | | 31.0 | | |
| | 2.0 | | 23.5 | | |
| | 6.0 | | 15.5 | | |
| | 8.0 | | 9.0 | | |
| | 10.0 | | 7.4 | | |
| | 12.0 | | 6.0 | | |
| Reverse Isolation | 6.0 | | 20.7 | | dB |
| Output Power at 1dB Compression | 0.05 | | 15.9 | | dBm |
| | 0.85 | | 16.3 | | |
| | 2.0 | | 16.2 | | |
| | 6.0 | | 13.4 | | |
| | 8.0 | | 10.3 | | |
| | 10.0 | | 7.4 | | |
| | 12.0 | | 5.1 | | |
| Output IP3 | 0.2 | | 30.2 | | dBm |
| | 0.85 | | 31.1 | | |
| | 2.0 | | 29.9 | | |
| | 6.0 | | 24.5 | | |
| | 8.0 | | 21.8 | | |
| | 10.0 | | 19.1 | | |
| | 12.0 | | 14.9 | | |
| Noise Figure | 0.2 | | 3.8 | | dB |
| | 0.85 | | 3.9 | | |
| | 2.0 | | 4.0 | | |
| | 6.0 | | 4.4 | | |
| | 8.0 | | 4.9 | | |
| | 12.0 | | 6.9 | | |
| Additive Phase Noise 2 GHz, 10 KHz offset | | | -169.2 | dBc/Hz | |
| Supply Operating Voltage (Vcc) | | 4.8 | 5.0 | 5.2 | V |
| Device Operating Current | | | 52 | 57 | mA |
| Device Current Variation vs. Temperature[2] | | | 56 | | µA/°C |
| Device Current Variation vs. Voltage | | | 0.020 | | mA/mW |
| Thermal Resistance, junction-to-ground lead | | | 156 | | °C/W |

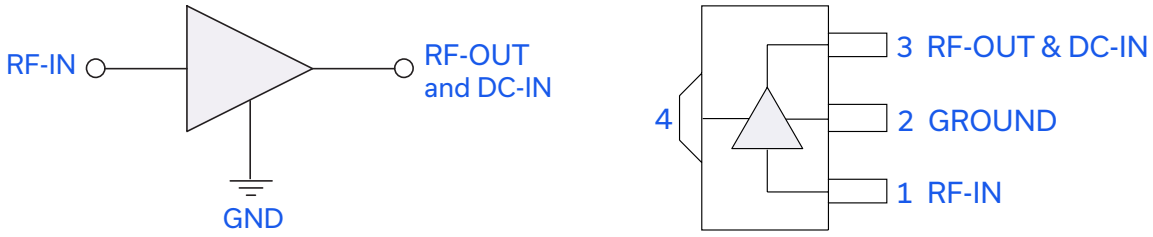
(1) Measured on Mini-Circuits Characterization test board TB-665+. See Characterization Test Circuit (Fig. 1)
(2) (Current at 85°C — Current at -45°C)/130

## MAXIMUM RATINGS

| Parameter | Ratings |
|---|---|
| Operating Temperature (ground lead) | -40°C to 85°C |
| Storage Temperature | -65°C to 150°C |
| Operating Current at 5V (Vcc) & 16.5Ω resistor | 100 mA |
| Power Dissipation | 0.34 W |
| Input Power (CW) | 28 dBm (5 min max.)<br>11 dBm (continuous) |
| DC Voltage on Pin 3 | 6 V |

Permanent damage may occur if any of these limits are exceeded.
Electrical maximum ratings are not intended for continuous normal operation.

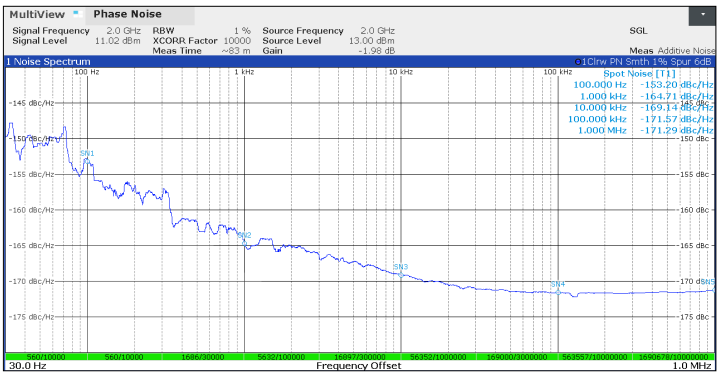
## SIMPLIFIED SCHEMATIC AND PIN DESCRIPTION




| 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", Fig. 2 |
| 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. |

## ADDITIVE PHASE NOISE VS. OFFSET FREQUENCY

(RF Frequency = 2GHz, RF Input Power = +1dBm)



## CHARACTERIZATION TEST CIRCUIT

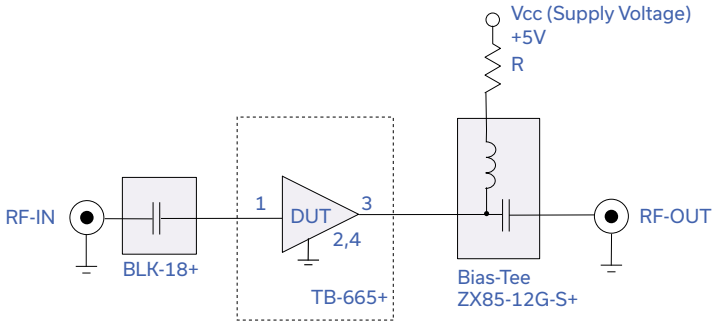



Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-665+)
Gain, Return loss, Output power at 1dB compression (P1 dB) , output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.
(R=16.5Ω)

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

## RECOMMENDED APPLICATION CIRCUIT

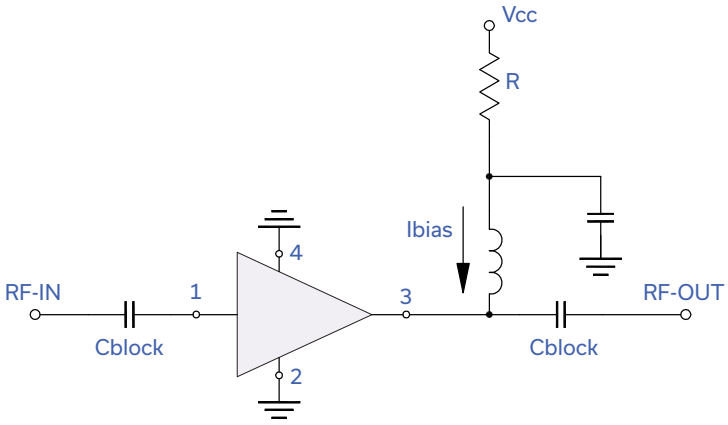
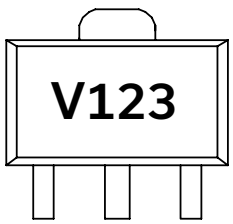



Fig 2. Test Board includes case, connectors, and components soldered to PCB (Cblock=0.001 µF, Cbypass=0.1 µF, R=16.5Ω)

## PRODUCT MARKING




Marking may contain other features or characters for internal lot control

## ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASH BOARD. TO ACCESS CLICK HERE

| | |
|---|---|
| **Performance Data** | Data Table<br>Swept Graphs<br>S-Parameter (S2P Files) Data Set (.zip file) |
| **5-200 MHz Operation** | See Application Note AN-60-087 |
| **Case Style** | DF782 (SOT 89)<br>Plastic package, exposed paddle lead finish: Matte-tin |
| **Tape & Reel**<br>**Standard quantities available on reel** | F55<br>7" reels with 20, 50, 100, 200, 500 or 1K devices |
| **Suggested Layout for PCB Design** | PL-370 |
| **Evaluation Board** | TB-781+ |
| **Environmental Ratings** | ENV08T1 |

## ESD RATING

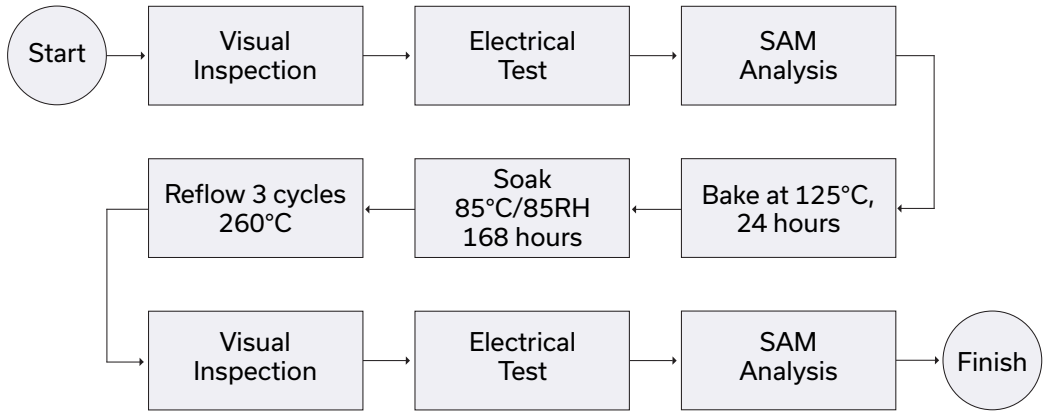
Human Body Model (HBM): Class 1C (1000 to <2000V) in accordance with ANSI/ESD STM 5.1 - 2001

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

## MSL RATING

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

## MSL TEST FLOW CHART




NOTES

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

# MMIC Amplifier GVA-123+

## *Typical Performance Data*

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

**Definitions:**
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5V, Id = 48.08 mA @ Temperature = +25degC

| FREQ | Gain | Isolation | Input Return Loss | Output Return Loss | Stability | | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | (dB) | (dB) | (dB) | K | Measure | (dBm) | (dBm) | (dB) |
| 10 | 14.30 | 23.80 | 9.90 | 12.23 | 1.36 | 0.97 | -- | 16.00 | 7.62 |
| 20 | 14.67 | 22.53 | 10.49 | 12.50 | 1.23 | 0.89 | 16.79 | 16.60 | 7.65 |
| 30 | 15.22 | 22.04 | 11.08 | 13.02 | 1.18 | 0.82 | 17.69 | 16.89 | 6.74 |
| 40 | 15.74 | 21.51 | 11.84 | 13.69 | 1.14 | 0.74 | 18.65 | 16.89 | 6.10 |
| 50 | 16.20 | 21.15 | 12.66 | 14.48 | 1.11 | 0.67 | 19.61 | 16.60 | 5.69 |
| 60 | 16.51 | 20.62 | 13.62 | 15.35 | 1.08 | 0.59 | 21.50 | 16.55 | 5.33 |
| 70 | 16.79 | 20.49 | 14.60 | 16.15 | 1.07 | 0.55 | 23.39 | 16.52 | 4.97 |
| 80 | 17.00 | 20.28 | 15.60 | 17.10 | 1.06 | 0.51 | 25.52 | 16.15 | 4.68 |
| 90 | 17.15 | 20.13 | 16.63 | 17.97 | 1.05 | 0.48 | 26.97 | 15.99 | 4.58 |
| 100 | 17.26 | 20.04 | 17.68 | 18.88 | 1.05 | 0.46 | 28.22 | 16.00 | 4.33 |
| 200 | 17.50 | 19.87 | 27.36 | 26.73 | 1.04 | 0.42 | 30.52 | 15.75 | 3.84 |
| 250 | 17.45 | 19.99 | 29.89 | 29.42 | 1.04 | 0.44 | 31.03 | 16.18 | 3.81 |
| 300 | 17.41 | 20.01 | 29.70 | 31.52 | 1.04 | 0.45 | 30.99 | 16.14 | 3.86 |
| 350 | 17.37 | 20.06 | 28.74 | 32.64 | 1.05 | 0.46 | 30.94 | 16.35 | 3.92 |
| 400 | 17.33 | 20.11 | 28.16 | 33.25 | 1.05 | 0.47 | 31.22 | 16.39 | 3.94 |
| 450 | 17.30 | 20.16 | 27.32 | 33.36 | 1.05 | 0.48 | 31.51 | 16.51 | 3.88 |
| 500 | 17.28 | 20.20 | 26.91 | 33.57 | 1.06 | 0.49 | 30.96 | 16.45 | 3.91 |
| 550 | 17.26 | 20.18 | 26.44 | 33.31 | 1.06 | 0.49 | 30.93 | 16.34 | 3.97 |
| 600 | 17.24 | 20.23 | 26.00 | 32.83 | 1.06 | 0.50 | 31.27 | 16.43 | 3.90 |
| 650 | 17.23 | 20.24 | 25.91 | 32.52 | 1.06 | 0.50 | 31.21 | 16.46 | 3.95 |
| 700 | 17.22 | 20.24 | 25.49 | 32.10 | 1.06 | 0.50 | 31.51 | 16.52 | 3.93 |
| 750 | 17.20 | 20.29 | 25.31 | 31.95 | 1.06 | 0.51 | 31.64 | 16.45 | 3.87 |
| 800 | 17.19 | 20.27 | 25.06 | 31.32 | 1.06 | 0.51 | 31.55 | 16.45 | 3.89 |
| 850 | 17.18 | 20.26 | 24.90 | 30.99 | 1.06 | 0.51 | 31.14 | 16.40 | 3.88 |
| 1000 | 17.14 | 20.30 | 24.53 | 29.76 | 1.06 | 0.52 | 30.48 | 16.36 | 3.93 |
| 1500 | 17.03 | 20.40 | 23.97 | 26.18 | 1.07 | 0.54 | 30.62 | 16.32 | 3.93 |
| 2000 | 16.91 | 20.44 | 24.28 | 23.48 | 1.08 | 0.55 | 29.87 | 16.21 | 3.98 |
| 2500 | 16.77 | 20.53 | 25.33 | 21.30 | 1.09 | 0.57 | 28.99 | 15.80 | 4.02 |
| 3000 | 16.65 | 20.58 | 25.25 | 19.45 | 1.10 | 0.58 | 28.47 | 15.69 | 4.08 |
| 3500 | 16.56 | 20.63 | 24.06 | 18.04 | 1.10 | 0.59 | 27.42 | 15.56 | 4.09 |
| 4000 | 16.45 | 20.70 | 22.24 | 17.34 | 1.11 | 0.60 | 26.64 | 15.22 | 4.13 |
| 4500 | 16.37 | 20.79 | 21.61 | 17.32 | 1.12 | 0.62 | 25.94 | 14.98 | 4.13 |
| 5000 | 16.38 | 20.81 | 22.95 | 17.31 | 1.12 | 0.62 | 25.25 | 14.54 | 4.27 |
| 5500 | 16.39 | 20.73 | 27.29 | 16.67 | 1.11 | 0.60 | 24.66 | 14.05 | 4.33 |
| 6000 | 16.38 | 20.66 | 22.15 | 15.96 | 1.11 | 0.59 | 24.63 | 13.56 | 4.39 |
| 6500 | 16.51 | 20.68 | 17.68 | 13.85 | 1.09 | 0.57 | 24.08 | 12.91 | 4.55 |
| 7000 | 16.50 | 20.79 | 13.70 | 11.90 | 1.07 | 0.57 | 23.45 | 12.16 | 4.57 |
| 7500 | 16.53 | 20.80 | 11.01 | 10.39 | 1.04 | 0.55 | 23.03 | 11.38 | 4.76 |
| 8000 | 16.39 | 21.00 | 9.22 | 9.07 | 1.01 | 0.56 | 21.97 | 10.46 | 4.92 |
| 8500 | 15.98 | 21.29 | 8.02 | 8.63 | 1.01 | 0.63 | 21.53 | 9.61 | 5.08 |
| 9000 | 15.17 | 21.88 | 7.11 | 8.26 | 1.03 | 0.75 | 20.90 | 9.22 | 5.30 |
| 9500 | 14.14 | 22.22 | 7.12 | 8.30 | 1.11 | 0.83 | 19.68 | 8.37 | 5.47 |
| 10000 | 12.73 | 22.01 | 7.47 | 9.27 | 1.23 | 0.92 | 19.78 | 7.79 | 5.67 |
| 10500 | 11.38 | 23.09 | 7.19 | 9.18 | 1.45 | 1.00 | 18.12 | 7.16 | 6.03 |
| 11000 | 9.90 | 23.94 | 7.21 | 9.49 | 1.82 | 1.05 | 17.32 | 6.69 | 6.36 |
| 11500 | 8.74 | 23.21 | 6.10 | 8.14 | 1.60 | 1.09 | 16.82 | 6.10 | 6.51 |
| 12000 | 7.26 | 25.60 | 6.26 | 7.86 | 2.50 | 1.07 | 16.08 | 5.79 | 6.89 |

## *Typical Performance Data*

**Definitions:**
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.75V, Id =43.25 mA @ Temperature = +25degC

| FREQ | Gain | Isolation | Input Return Loss | Output Return Loss | Stability | | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | (dB) | (dB) | (dB) | K | Measure | (dBm) | (dBm) | (dB) |
| 10 | 14.23 | 23.53 | 10.21 | 12.16 | 1.35 | 0.96 | -- | 15.44 | 7.48 |
| 20 | 14.60 | 22.49 | 10.73 | 12.35 | 1.24 | 0.89 | 18.63 | 15.65 | 7.49 |
| 30 | 15.14 | 21.92 | 11.31 | 12.90 | 1.18 | 0.81 | 20.59 | 15.95 | 6.62 |
| 40 | 15.65 | 21.46 | 12.07 | 13.60 | 1.14 | 0.74 | 22.73 | 15.82 | 5.99 |
| 50 | 16.11 | 20.99 | 12.89 | 14.36 | 1.11 | 0.66 | 25.69 | 15.42 | 5.60 |
| 60 | 16.42 | 20.56 | 13.78 | 15.25 | 1.08 | 0.60 | 28.81 | 15.26 | 5.24 |
| 70 | 16.69 | 20.39 | 14.80 | 16.08 | 1.07 | 0.55 | 28.64 | 15.16 | 4.89 |
| 80 | 16.90 | 20.23 | 15.80 | 17.04 | 1.06 | 0.51 | 28.57 | 14.58 | 4.60 |
| 90 | 17.05 | 20.06 | 16.84 | 17.92 | 1.05 | 0.48 | 28.88 | 14.47 | 4.50 |
| 100 | 17.16 | 19.96 | 17.88 | 18.87 | 1.05 | 0.46 | 28.49 | 14.52 | 4.25 |
| 200 | 17.39 | 19.79 | 27.97 | 26.74 | 1.04 | 0.42 | 29.06 | 14.51 | 3.79 |
| 250 | 17.35 | 19.89 | 31.19 | 29.23 | 1.04 | 0.44 | 29.53 | 15.11 | 3.76 |
| 300 | 17.31 | 19.97 | 31.71 | 30.97 | 1.05 | 0.46 | 29.30 | 15.08 | 3.85 |
| 350 | 17.27 | 19.99 | 30.84 | 31.69 | 1.05 | 0.47 | 29.52 | 15.27 | 3.88 |
| 400 | 17.23 | 20.06 | 30.12 | 31.83 | 1.05 | 0.48 | 29.74 | 15.39 | 3.86 |
| 450 | 17.21 | 20.10 | 28.93 | 31.80 | 1.05 | 0.49 | 29.79 | 15.50 | 3.87 |
| 500 | 17.18 | 20.11 | 28.60 | 31.68 | 1.06 | 0.49 | 29.42 | 15.47 | 3.87 |
| 550 | 17.17 | 20.12 | 27.94 | 31.47 | 1.06 | 0.49 | 29.36 | 15.31 | 3.95 |
| 600 | 17.14 | 20.16 | 27.49 | 31.11 | 1.06 | 0.50 | 29.71 | 15.46 | 3.84 |
| 650 | 17.13 | 20.16 | 27.27 | 30.98 | 1.06 | 0.50 | 29.71 | 15.51 | 3.92 |
| 700 | 17.12 | 20.19 | 26.79 | 30.52 | 1.06 | 0.51 | 30.09 | 15.58 | 3.87 |
| 750 | 17.10 | 20.19 | 26.59 | 30.31 | 1.06 | 0.51 | 30.08 | 15.50 | 3.87 |
| 800 | 17.09 | 20.20 | 26.31 | 29.89 | 1.06 | 0.51 | 29.96 | 15.50 | 3.83 |
| 850 | 17.08 | 20.22 | 26.10 | 29.53 | 1.06 | 0.52 | 29.65 | 15.45 | 3.82 |
| 1000 | 17.04 | 20.22 | 25.60 | 28.62 | 1.06 | 0.52 | 29.14 | 15.41 | 3.86 |
| 1500 | 16.93 | 20.30 | 24.95 | 25.51 | 1.07 | 0.54 | 29.28 | 15.35 | 3.88 |
| 2000 | 16.81 | 20.34 | 25.25 | 22.88 | 1.08 | 0.55 | 28.67 | 15.27 | 3.93 |
| 2500 | 16.67 | 20.46 | 26.20 | 20.71 | 1.09 | 0.57 | 27.91 | 14.86 | 4.01 |
| 3000 | 16.55 | 20.51 | 25.71 | 18.85 | 1.10 | 0.58 | 27.59 | 14.77 | 3.98 |
| 3500 | 16.45 | 20.56 | 24.11 | 17.47 | 1.10 | 0.59 | 26.80 | 14.74 | 4.03 |
| 4000 | 16.34 | 20.64 | 22.22 | 16.77 | 1.11 | 0.60 | 26.09 | 14.45 | 4.01 |
| 4500 | 16.26 | 20.66 | 21.66 | 16.71 | 1.12 | 0.61 | 25.50 | 14.31 | 4.07 |
| 5000 | 16.26 | 20.69 | 23.24 | 16.68 | 1.12 | 0.61 | 24.87 | 13.98 | 4.24 |
| 5500 | 16.27 | 20.61 | 28.41 | 16.15 | 1.11 | 0.60 | 24.32 | 13.43 | 4.28 |
| 6000 | 16.25 | 20.55 | 22.65 | 15.53 | 1.11 | 0.59 | 24.29 | 13.05 | 4.37 |
| 6500 | 16.38 | 20.55 | 17.83 | 13.56 | 1.09 | 0.57 | 23.84 | 12.49 | 4.44 |
| 7000 | 16.36 | 20.65 | 13.70 | 11.66 | 1.06 | 0.57 | 23.19 | 11.76 | 4.50 |
| 7500 | 16.36 | 20.68 | 10.99 | 10.21 | 1.03 | 0.56 | 22.72 | 11.02 | 4.69 |
| 8000 | 16.20 | 20.88 | 9.21 | 8.89 | 1.01 | 0.57 | 21.65 | 10.10 | 4.80 |
| 8500 | 15.77 | 21.20 | 8.03 | 8.41 | 1.01 | 0.64 | 21.19 | 9.31 | 5.00 |
| 9000 | 14.96 | 21.76 | 7.12 | 8.04 | 1.02 | 0.75 | 20.49 | 8.89 | 5.20 |
| 9500 | 13.94 | 22.13 | 7.13 | 8.04 | 1.10 | 0.83 | 19.26 | 8.02 | 5.37 |
| 10000 | 12.54 | 21.93 | 7.45 | 8.96 | 1.23 | 0.91 | 19.34 | 7.44 | 5.56 |
| 10500 | 11.21 | 22.97 | 7.17 | 8.90 | 1.44 | 1.00 | 17.61 | 6.81 | 5.87 |
| 11000 | 9.75 | 23.83 | 7.17 | 9.24 | 1.80 | 1.05 | 16.80 | 6.31 | 6.21 |
| 11500 | 8.60 | 23.03 | 6.06 | 8.00 | 1.57 | 1.08 | 16.29 | 5.74 | 6.35 |
| 12000 | 7.14 | 25.46 | 6.22 | 7.77 | 2.47 | 1.07 | 15.57 | 5.41 | 6.73 |

## *Typical Performance Data*

**Definitions:**
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.25V, Id = 53.14 mA @ Temperature = +25degC

| FREQ | Gain | Isolation | Input Return Loss | Output Return Loss | Stability | | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | (dB) | (dB) | (dB) | K | Measure | (dBm) | (dBm) | (dB) |
| 10 | 14.69 | 23.46 | 10.77 | 12.96 | 1.32 | 0.94 | -- | 16.55 | 7.29 |
| 20 | 15.00 | 22.56 | 11.13 | 13.10 | 1.22 | 0.88 | 18.76 | 17.35 | 7.24 |
| 30 | 15.43 | 22.06 | 11.66 | 13.63 | 1.18 | 0.81 | 19.38 | 17.66 | 6.57 |
| 40 | 15.85 | 21.60 | 12.31 | 14.25 | 1.14 | 0.75 | 20.01 | 17.73 | 6.03 |
| 50 | 16.25 | 21.18 | 13.09 | 14.96 | 1.11 | 0.67 | 20.23 | 17.53 | 5.64 |
| 60 | 16.54 | 20.73 | 13.83 | 15.77 | 1.08 | 0.61 | 20.56 | 17.53 | 5.30 |
| 70 | 16.81 | 20.58 | 14.73 | 16.52 | 1.07 | 0.56 | 21.36 | 17.51 | 4.98 |
| 80 | 17.02 | 20.37 | 15.69 | 17.40 | 1.06 | 0.52 | 22.01 | 17.31 | 4.74 |
| 90 | 17.17 | 20.24 | 16.68 | 18.22 | 1.05 | 0.49 | 22.24 | 17.18 | 4.61 |
| 100 | 17.29 | 20.14 | 17.69 | 19.08 | 1.05 | 0.47 | 23.39 | 17.21 | 4.36 |
| 200 | 17.56 | 19.94 | 26.76 | 26.57 | 1.04 | 0.42 | 29.99 | 16.94 | 3.84 |
| 250 | 17.52 | 20.04 | 28.54 | 29.28 | 1.04 | 0.44 | 31.95 | 17.19 | 3.87 |
| 300 | 17.48 | 20.11 | 28.30 | 31.45 | 1.05 | 0.45 | 32.09 | 17.14 | 3.95 |
| 350 | 17.44 | 20.08 | 27.50 | 32.89 | 1.05 | 0.46 | 32.45 | 17.27 | 3.96 |
| 400 | 17.40 | 20.19 | 26.89 | 33.72 | 1.05 | 0.47 | 32.60 | 17.27 | 3.96 |
| 450 | 17.38 | 20.20 | 26.20 | 34.17 | 1.05 | 0.48 | 32.82 | 17.37 | 3.97 |
| 500 | 17.35 | 20.22 | 25.78 | 34.37 | 1.05 | 0.48 | 32.32 | 17.35 | 3.90 |
| 550 | 17.34 | 20.27 | 25.42 | 34.30 | 1.06 | 0.49 | 32.15 | 17.24 | 4.03 |
| 600 | 17.31 | 20.30 | 25.01 | 33.90 | 1.06 | 0.50 | 32.55 | 17.29 | 3.98 |
| 650 | 17.30 | 20.31 | 24.90 | 33.60 | 1.06 | 0.50 | 32.65 | 17.33 | 4.00 |
| 700 | 17.29 | 20.31 | 24.56 | 33.07 | 1.06 | 0.50 | 32.85 | 17.38 | 3.94 |
| 750 | 17.27 | 20.30 | 24.35 | 33.03 | 1.06 | 0.51 | 33.16 | 17.31 | 3.89 |
| 800 | 17.26 | 20.33 | 24.17 | 32.34 | 1.06 | 0.51 | 32.68 | 17.30 | 3.89 |
| 850 | 17.25 | 20.36 | 24.04 | 31.79 | 1.06 | 0.51 | 32.55 | 17.26 | 3.94 |
| 1000 | 17.21 | 20.39 | 23.65 | 30.52 | 1.07 | 0.52 | 31.86 | 17.22 | 3.99 |
| 1500 | 17.10 | 20.44 | 23.20 | 26.87 | 1.07 | 0.54 | 31.89 | 17.16 | 3.98 |
| 2000 | 16.98 | 20.49 | 23.58 | 24.08 | 1.08 | 0.55 | 31.03 | 17.08 | 4.03 |
| 2500 | 16.86 | 20.57 | 24.66 | 22.00 | 1.09 | 0.57 | 29.72 | 16.70 | 4.10 |
| 3000 | 16.74 | 20.63 | 24.83 | 20.11 | 1.10 | 0.58 | 29.19 | 16.48 | 4.08 |
| 3500 | 16.65 | 20.69 | 23.85 | 18.67 | 1.10 | 0.59 | 27.96 | 16.25 | 4.13 |
| 4000 | 16.55 | 20.77 | 22.11 | 17.97 | 1.11 | 0.60 | 27.02 | 15.86 | 4.17 |
| 4500 | 16.48 | 20.87 | 21.44 | 17.96 | 1.12 | 0.62 | 26.29 | 15.54 | 4.20 |
| 5000 | 16.49 | 20.88 | 22.62 | 17.99 | 1.12 | 0.62 | 25.59 | 15.03 | 4.35 |
| 5500 | 16.50 | 20.84 | 26.43 | 17.33 | 1.12 | 0.61 | 25.03 | 14.50 | 4.39 |
| 6000 | 16.50 | 20.73 | 21.90 | 16.46 | 1.11 | 0.59 | 24.92 | 13.95 | 4.47 |
| 6500 | 16.65 | 20.80 | 17.72 | 14.20 | 1.09 | 0.57 | 24.33 | 13.23 | 4.59 |
| 7000 | 16.65 | 20.88 | 13.77 | 12.17 | 1.07 | 0.57 | 23.67 | 12.44 | 4.61 |
| 7500 | 16.70 | 20.91 | 11.04 | 10.61 | 1.04 | 0.55 | 23.24 | 11.66 | 4.86 |
| 8000 | 16.58 | 21.09 | 9.24 | 9.26 | 1.02 | 0.55 | 22.17 | 10.71 | 4.97 |
| 8500 | 16.19 | 21.41 | 8.04 | 8.83 | 1.01 | 0.63 | 21.74 | 9.88 | 5.17 |
| 9000 | 15.39 | 21.99 | 7.11 | 8.51 | 1.03 | 0.75 | 21.15 | 9.47 | 5.41 |
| 9500 | 14.36 | 22.37 | 7.15 | 8.56 | 1.12 | 0.83 | 20.03 | 8.64 | 5.60 |
| 10000 | 12.94 | 22.11 | 7.50 | 9.61 | 1.24 | 0.92 | 20.16 | 8.08 | 5.82 |
| 10500 | 11.58 | 23.20 | 7.24 | 9.53 | 1.46 | 1.01 | 18.60 | 7.48 | 6.17 |
| 11000 | 10.08 | 23.94 | 7.25 | 9.76 | 1.80 | 1.06 | 17.83 | 6.94 | 6.46 |
| 11500 | 8.90 | 23.34 | 6.09 | 8.26 | 1.60 | 1.09 | 17.34 | 6.38 | 6.67 |
| 12000 | 7.40 | 25.74 | 6.24 | 7.87 | 2.50 | 1.07 | 16.59 | 5.99 | 7.07 |

## *Typical Performance Data*

**Definitions:**
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5V, Id =44.11 mA @ Temperature = -45degC

| FREQ | Gain | Isolation | Input Return Loss | Output Return Loss | Stability | | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | (dB) | (dB) | (dB) | K | Measure | (dBm) | (dBm) | (dB) |
| 10 | 14.35 | 24.02 | 9.76 | 12.22 | 1.37 | 0.98 | -- | 15.90 | 6.65 |
| 20 | 14.74 | 22.68 | 10.18 | 12.44 | 1.23 | 0.90 | 19.64 | 16.22 | 6.75 |
| 30 | 15.31 | 22.13 | 10.79 | 12.93 | 1.18 | 0.82 | 22.70 | 16.52 | 5.87 |
| 40 | 15.84 | 21.63 | 11.58 | 13.54 | 1.14 | 0.74 | 25.95 | 16.33 | 5.24 |
| 50 | 16.31 | 21.28 | 12.47 | 14.25 | 1.11 | 0.67 | 29.58 | 15.57 | 4.82 |
| 60 | 16.64 | 20.70 | 13.35 | 15.09 | 1.08 | 0.59 | 30.67 | 15.37 | 4.50 |
| 70 | 16.93 | 20.57 | 14.45 | 15.82 | 1.07 | 0.54 | 30.04 | 15.27 | 4.15 |
| 80 | 17.14 | 20.35 | 15.48 | 16.74 | 1.06 | 0.50 | 29.74 | 14.67 | 3.88 |
| 90 | 17.30 | 20.22 | 16.56 | 17.57 | 1.05 | 0.47 | 29.70 | 14.52 | 3.77 |
| 100 | 17.42 | 20.12 | 17.64 | 18.46 | 1.04 | 0.44 | 29.33 | 14.60 | 3.55 |
| 200 | 17.68 | 19.95 | 27.64 | 26.25 | 1.03 | 0.40 | 29.88 | 14.66 | 3.06 |
| 250 | 17.64 | 20.05 | 29.59 | 28.55 | 1.04 | 0.42 | 30.34 | 15.31 | 3.09 |
| 300 | 17.60 | 20.10 | 28.13 | 29.82 | 1.04 | 0.44 | 30.16 | 15.21 | 3.16 |
| 350 | 17.56 | 20.14 | 26.64 | 30.38 | 1.04 | 0.45 | 30.40 | 15.57 | 3.21 |
| 400 | 17.53 | 20.19 | 25.85 | 30.99 | 1.05 | 0.46 | 30.58 | 15.73 | 3.19 |
| 450 | 17.50 | 20.21 | 25.29 | 31.49 | 1.05 | 0.47 | 30.82 | 15.79 | 3.17 |
| 500 | 17.48 | 20.25 | 25.18 | 32.25 | 1.05 | 0.47 | 30.35 | 15.70 | 3.16 |
| 550 | 17.47 | 20.26 | 25.02 | 32.08 | 1.05 | 0.48 | 30.30 | 15.55 | 3.17 |
| 600 | 17.45 | 20.27 | 24.77 | 31.52 | 1.05 | 0.48 | 30.66 | 15.77 | 3.13 |
| 650 | 17.44 | 20.31 | 24.67 | 30.77 | 1.05 | 0.49 | 30.66 | 15.85 | 3.19 |
| 700 | 17.43 | 20.32 | 24.23 | 30.13 | 1.05 | 0.49 | 30.91 | 15.90 | 3.18 |
| 750 | 17.42 | 20.34 | 23.95 | 30.08 | 1.05 | 0.49 | 30.83 | 15.78 | 3.12 |
| 800 | 17.40 | 20.32 | 23.83 | 29.78 | 1.05 | 0.49 | 30.86 | 15.82 | 3.10 |
| 850 | 17.39 | 20.33 | 23.92 | 29.96 | 1.05 | 0.49 | 30.44 | 15.69 | 3.11 |
| 1000 | 17.36 | 20.38 | 24.55 | 29.09 | 1.06 | 0.50 | 29.97 | 15.65 | 3.16 |
| 1500 | 17.26 | 20.40 | 22.20 | 24.59 | 1.06 | 0.51 | 30.24 | 15.69 | 3.14 |
| 2000 | 17.16 | 20.47 | 22.67 | 22.86 | 1.07 | 0.53 | 29.78 | 15.55 | 3.19 |
| 2500 | 17.04 | 20.54 | 23.65 | 20.25 | 1.08 | 0.54 | 29.05 | 15.13 | 3.28 |
| 3000 | 16.94 | 20.58 | 25.37 | 18.48 | 1.08 | 0.55 | 28.90 | 15.15 | 3.23 |
| 3500 | 16.86 | 20.62 | 25.29 | 16.99 | 1.09 | 0.55 | 28.06 | 15.13 | 3.23 |
| 4000 | 16.77 | 20.69 | 23.44 | 16.17 | 1.09 | 0.56 | 27.44 | 15.10 | 3.24 |
| 4500 | 16.72 | 20.72 | 22.49 | 15.84 | 1.09 | 0.57 | 26.72 | 14.94 | 3.29 |
| 5000 | 16.73 | 20.72 | 22.81 | 15.68 | 1.09 | 0.56 | 26.01 | 14.87 | 3.43 |
| 5500 | 16.74 | 20.64 | 22.48 | 14.65 | 1.08 | 0.55 | 25.54 | 14.27 | 3.44 |
| 6000 | 16.82 | 20.65 | 19.06 | 13.99 | 1.08 | 0.53 | 25.44 | 14.16 | 3.53 |
| 6500 | 17.03 | 20.72 | 16.21 | 12.00 | 1.06 | 0.49 | 25.11 | 13.76 | 3.60 |
| 7000 | 17.04 | 20.75 | 13.04 | 10.08 | 1.03 | 0.46 | 24.46 | 13.16 | 3.65 |
| 7500 | 17.20 | 20.80 | 10.07 | 8.39 | 1.00 | 0.39 | 23.85 | 12.47 | 3.86 |
| 8000 | 17.20 | 21.04 | 8.58 | 7.29 | 0.96 | 0.39 | 22.94 | 11.46 | 3.96 |
| 8500 | 17.13 | 21.21 | 7.55 | 6.59 | 0.94 | 0.39 | 22.43 | 10.59 | 4.10 |
| 9000 | 16.80 | 21.94 | 6.74 | 6.08 | 0.92 | 0.49 | 21.59 | 10.06 | 4.28 |
| 9500 | 16.13 | 22.39 | 6.76 | 6.09 | 0.97 | 0.56 | 20.58 | 9.14 | 4.40 |
| 10000 | 14.82 | 22.00 | 7.79 | 7.38 | 1.11 | 0.66 | 20.79 | 8.59 | 4.62 |
| 10500 | 13.31 | 22.60 | 7.73 | 7.73 | 1.25 | 0.81 | 19.29 | 7.85 | 4.96 |
| 11000 | 11.90 | 23.84 | 7.21 | 8.79 | 1.53 | 0.96 | 18.08 | 7.17 | 5.32 |
| 11500 | 10.54 | 23.81 | 6.58 | 8.64 | 1.57 | 1.05 | 17.57 | 6.55 | 5.63 |
| 12000 | 9.40 | 23.55 | 5.70 | 7.32 | 1.40 | 1.08 | 17.14 | 6.29 | 5.82 |

## *Typical Performance Data*

**Definitions:**
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.75V, Id =39.04 mA @ Temperature = -45degC

| FREQ | Gain | Isolation | Input Return Loss | Output Return Loss | Stability | | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | (dB) | (dB) | (dB) | K | Measure | (dBm) | (dBm) | (dB) |
| 10 | 14.30 | 23.78 | 9.87 | 12.10 | 1.35 | 0.97 | -- | 14.81 | 6.50 |
| 20 | 14.66 | 22.50 | 10.47 | 12.28 | 1.22 | 0.89 | 33.28 | 15.20 | 6.57 |
| 30 | 15.22 | 22.13 | 11.05 | 12.82 | 1.19 | 0.82 | 29.82 | 15.24 | 5.75 |
| 40 | 15.75 | 21.55 | 11.84 | 13.42 | 1.14 | 0.74 | 27.99 | 14.00 | 5.11 |
| 50 | 16.21 | 21.15 | 12.70 | 14.16 | 1.11 | 0.67 | 27.93 | 13.37 | 4.76 |
| 60 | 16.54 | 20.62 | 13.69 | 14.99 | 1.08 | 0.59 | 28.32 | 13.21 | 4.41 |
| 70 | 16.82 | 20.49 | 14.71 | 15.76 | 1.07 | 0.55 | 27.90 | 13.20 | 4.08 |
| 80 | 17.03 | 20.29 | 15.75 | 16.68 | 1.06 | 0.50 | 27.45 | 12.81 | 3.82 |
| 90 | 17.19 | 20.15 | 16.79 | 17.54 | 1.05 | 0.47 | 27.74 | 12.83 | 3.71 |
| 100 | 17.31 | 20.02 | 17.84 | 18.44 | 1.04 | 0.44 | 27.17 | 12.99 | 3.49 |
| 200 | 17.56 | 19.87 | 27.99 | 26.26 | 1.03 | 0.41 | 27.62 | 13.23 | 3.04 |
| 250 | 17.53 | 19.96 | 31.29 | 28.65 | 1.04 | 0.43 | 28.42 | 13.86 | 3.05 |
| 300 | 17.49 | 20.02 | 30.19 | 30.18 | 1.04 | 0.44 | 28.14 | 13.80 | 3.19 |
| 350 | 17.45 | 20.04 | 28.40 | 30.64 | 1.04 | 0.45 | 28.49 | 14.16 | 3.17 |
| 400 | 17.42 | 20.12 | 27.54 | 31.18 | 1.05 | 0.46 | 28.46 | 14.26 | 3.13 |
| 450 | 17.39 | 20.14 | 26.81 | 31.65 | 1.05 | 0.47 | 28.76 | 14.45 | 3.10 |
| 500 | 17.37 | 20.15 | 26.71 | 31.94 | 1.05 | 0.47 | 28.34 | 14.35 | 3.12 |
| 550 | 17.36 | 20.20 | 26.48 | 31.58 | 1.05 | 0.48 | 28.26 | 14.19 | 3.15 |
| 600 | 17.34 | 20.21 | 26.17 | 30.90 | 1.05 | 0.49 | 28.53 | 14.49 | 3.14 |
| 650 | 17.33 | 20.22 | 26.06 | 30.04 | 1.05 | 0.49 | 28.61 | 14.50 | 3.16 |
| 700 | 17.32 | 20.24 | 25.60 | 29.35 | 1.05 | 0.49 | 28.86 | 14.58 | 3.10 |
| 750 | 17.31 | 20.24 | 25.28 | 29.36 | 1.05 | 0.49 | 28.90 | 14.42 | 3.09 |
| 800 | 17.30 | 20.28 | 25.10 | 29.14 | 1.06 | 0.50 | 28.86 | 14.52 | 3.06 |
| 850 | 17.29 | 20.26 | 25.21 | 29.10 | 1.06 | 0.50 | 28.55 | 14.37 | 3.07 |
| 1000 | 17.26 | 20.27 | 25.92 | 28.04 | 1.06 | 0.50 | 28.02 | 14.32 | 3.14 |
| 1500 | 17.15 | 20.32 | 23.16 | 24.23 | 1.06 | 0.52 | 28.50 | 14.34 | 3.12 |
| 2000 | 17.05 | 20.36 | 23.72 | 22.45 | 1.07 | 0.53 | 27.92 | 14.24 | 3.13 |
| 2500 | 16.92 | 20.44 | 24.76 | 19.75 | 1.08 | 0.54 | 27.35 | 13.85 | 3.19 |
| 3000 | 16.82 | 20.52 | 26.46 | 17.95 | 1.08 | 0.55 | 27.39 | 13.94 | 3.18 |
| 3500 | 16.73 | 20.51 | 25.93 | 16.44 | 1.08 | 0.55 | 26.90 | 13.97 | 3.19 |
| 4000 | 16.64 | 20.57 | 23.70 | 15.61 | 1.09 | 0.56 | 26.46 | 14.01 | 3.19 |
| 4500 | 16.60 | 20.62 | 22.84 | 15.29 | 1.09 | 0.56 | 25.96 | 13.99 | 3.22 |
| 5000 | 16.60 | 20.61 | 23.51 | 15.12 | 1.09 | 0.56 | 25.35 | 14.05 | 3.36 |
| 5500 | 16.61 | 20.50 | 23.21 | 14.19 | 1.08 | 0.54 | 24.82 | 13.39 | 3.42 |
| 6000 | 16.68 | 20.53 | 19.39 | 13.61 | 1.08 | 0.53 | 24.83 | 13.46 | 3.47 |
| 6500 | 16.88 | 20.56 | 16.29 | 11.71 | 1.05 | 0.49 | 24.58 | 13.14 | 3.56 |
| 7000 | 16.87 | 20.58 | 13.02 | 9.87 | 1.02 | 0.46 | 23.97 | 12.63 | 3.59 |
| 7500 | 17.03 | 20.61 | 10.06 | 8.24 | 0.99 | 0.39 | 23.33 | 12.01 | 3.81 |
| 8000 | 16.99 | 20.83 | 8.57 | 7.11 | 0.95 | 0.39 | 22.50 | 11.08 | 3.90 |
| 8500 | 16.89 | 21.06 | 7.55 | 6.43 | 0.93 | 0.39 | 21.98 | 10.17 | 4.02 |
| 9000 | 16.54 | 21.75 | 6.78 | 5.95 | 0.91 | 0.49 | 21.08 | 9.72 | 4.20 |
| 9500 | 15.85 | 22.19 | 6.79 | 5.89 | 0.96 | 0.56 | 20.09 | 8.82 | 4.32 |
| 10000 | 14.58 | 21.93 | 7.69 | 7.06 | 1.11 | 0.66 | 20.24 | 8.24 | 4.55 |
| 10500 | 13.08 | 22.73 | 7.62 | 7.39 | 1.26 | 0.80 | 18.68 | 7.50 | 4.87 |
| 11000 | 11.73 | 23.64 | 7.06 | 8.46 | 1.50 | 0.95 | 17.53 | 6.78 | 5.16 |
| 11500 | 10.35 | 23.57 | 6.56 | 8.34 | 1.53 | 1.04 | 16.91 | 6.12 | 5.50 |
| 12000 | 9.25 | 23.43 | 5.68 | 7.28 | 1.40 | 1.08 | 16.45 | 5.86 | 5.72 |

## *Typical Performance Data*

**Definitions:**
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.25V, Id = 48.74 mA @ Temperature = -45degC

| FREQ | Gain | Isolation | Input Return Loss | Output Return Loss | Stability | | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | (dB) | (dB) | (dB) | K | Measure | (dBm) | (dBm) | (dB) |
| 10 | 14.39 | 22.94 | 9.64 | 11.84 | 1.23 | 0.95 | -- | 16.37 | 6.82 |
| 20 | 14.79 | 22.81 | 9.99 | 12.52 | 1.23 | 0.91 | 16.54 | 17.10 | 6.88 |
| 30 | 15.37 | 22.21 | 10.62 | 13.01 | 1.18 | 0.83 | 17.65 | 17.41 | 5.96 |
| 40 | 15.90 | 21.69 | 11.41 | 13.60 | 1.14 | 0.75 | 18.83 | 17.38 | 5.32 |
| 50 | 16.38 | 21.36 | 12.26 | 14.25 | 1.11 | 0.67 | 20.33 | 17.11 | 4.90 |
| 60 | 16.71 | 21.02 | 13.29 | 15.11 | 1.09 | 0.61 | 23.53 | 17.01 | 4.59 |
| 70 | 17.00 | 20.65 | 14.29 | 15.87 | 1.07 | 0.55 | 26.67 | 16.93 | 4.20 |
| 80 | 17.21 | 20.47 | 15.34 | 16.77 | 1.06 | 0.50 | 29.62 | 16.28 | 3.94 |
| 90 | 17.38 | 20.31 | 16.40 | 17.61 | 1.05 | 0.47 | 30.49 | 16.12 | 3.83 |
| 100 | 17.49 | 20.21 | 17.47 | 18.44 | 1.04 | 0.44 | 30.58 | 16.12 | 3.63 |
| 200 | 17.75 | 20.03 | 27.11 | 26.08 | 1.03 | 0.40 | 31.20 | 15.80 | 3.16 |
| 250 | 17.72 | 20.07 | 28.53 | 28.36 | 1.04 | 0.42 | 31.92 | 16.40 | 3.11 |
| 300 | 17.67 | 20.17 | 27.04 | 29.27 | 1.04 | 0.44 | 31.85 | 16.33 | 3.21 |
| 350 | 17.63 | 20.26 | 25.51 | 29.39 | 1.04 | 0.45 | 31.74 | 16.62 | 3.25 |
| 400 | 17.60 | 20.25 | 24.91 | 30.19 | 1.05 | 0.46 | 32.07 | 16.70 | 3.18 |
| 450 | 17.57 | 20.27 | 24.36 | 30.83 | 1.05 | 0.46 | 32.50 | 16.81 | 3.19 |
| 500 | 17.55 | 20.34 | 24.30 | 31.55 | 1.05 | 0.47 | 31.80 | 16.75 | 3.18 |
| 550 | 17.54 | 20.32 | 24.14 | 31.67 | 1.05 | 0.47 | 31.85 | 16.62 | 3.26 |
| 600 | 17.52 | 20.31 | 23.94 | 31.31 | 1.05 | 0.48 | 31.76 | 16.75 | 3.18 |
| 650 | 17.51 | 20.36 | 23.84 | 30.59 | 1.05 | 0.48 | 32.00 | 16.82 | 3.23 |
| 700 | 17.50 | 20.36 | 23.42 | 30.10 | 1.05 | 0.48 | 32.44 | 16.87 | 3.19 |
| 750 | 17.48 | 20.38 | 23.21 | 30.15 | 1.05 | 0.49 | 32.40 | 16.78 | 3.16 |
| 800 | 17.47 | 20.39 | 23.04 | 30.00 | 1.05 | 0.49 | 32.37 | 16.80 | 3.14 |
| 850 | 17.46 | 20.41 | 23.19 | 30.12 | 1.06 | 0.49 | 32.09 | 16.71 | 3.13 |
| 1000 | 17.43 | 20.41 | 23.75 | 29.62 | 1.06 | 0.50 | 31.34 | 16.65 | 3.21 |
| 1500 | 17.33 | 20.45 | 21.57 | 24.79 | 1.06 | 0.51 | 31.67 | 16.69 | 3.18 |
| 2000 | 17.23 | 20.52 | 22.07 | 23.14 | 1.07 | 0.53 | 31.00 | 16.55 | 3.21 |
| 2500 | 17.12 | 20.57 | 22.97 | 20.61 | 1.08 | 0.54 | 30.07 | 16.11 | 3.30 |
| 3000 | 17.02 | 20.63 | 24.73 | 18.95 | 1.08 | 0.55 | 29.86 | 16.10 | 3.28 |
| 3500 | 16.94 | 20.65 | 24.82 | 17.45 | 1.08 | 0.55 | 28.95 | 15.99 | 3.26 |
| 4000 | 16.86 | 20.76 | 23.19 | 16.62 | 1.09 | 0.56 | 28.12 | 15.83 | 3.29 |
| 4500 | 16.81 | 20.80 | 22.13 | 16.32 | 1.10 | 0.57 | 27.21 | 15.61 | 3.30 |
| 5000 | 16.82 | 20.81 | 22.41 | 16.14 | 1.10 | 0.57 | 26.42 | 15.48 | 3.49 |
| 5500 | 16.85 | 20.71 | 22.04 | 15.04 | 1.09 | 0.55 | 25.88 | 14.95 | 3.48 |
| 6000 | 16.92 | 20.76 | 18.71 | 14.36 | 1.08 | 0.54 | 25.76 | 14.69 | 3.56 |
| 6500 | 17.16 | 20.81 | 16.13 | 12.26 | 1.06 | 0.49 | 25.38 | 14.25 | 3.66 |
| 7000 | 17.17 | 20.87 | 13.05 | 10.29 | 1.03 | 0.46 | 24.70 | 13.56 | 3.69 |
| 7500 | 17.35 | 20.88 | 10.11 | 8.56 | 1.00 | 0.39 | 24.16 | 12.83 | 3.93 |
| 8000 | 17.40 | 21.12 | 8.60 | 7.41 | 0.96 | 0.38 | 23.21 | 11.78 | 4.01 |
| 8500 | 17.34 | 21.34 | 7.57 | 6.72 | 0.94 | 0.38 | 22.71 | 10.88 | 4.19 |
| 9000 | 17.00 | 21.99 | 6.78 | 6.29 | 0.93 | 0.49 | 21.96 | 10.41 | 4.33 |
| 9500 | 16.33 | 22.41 | 6.80 | 6.26 | 0.97 | 0.56 | 20.97 | 9.45 | 4.45 |
| 10000 | 15.05 | 22.18 | 7.74 | 7.56 | 1.11 | 0.67 | 21.12 | 8.93 | 4.71 |
| 10500 | 13.53 | 23.02 | 7.65 | 7.95 | 1.28 | 0.82 | 19.72 | 8.14 | 5.04 |
| 11000 | 12.14 | 23.91 | 7.14 | 8.81 | 1.49 | 0.97 | 18.65 | 7.52 | 5.32 |
| 11500 | 10.68 | 24.10 | 6.70 | 8.77 | 1.61 | 1.05 | 18.14 | 6.79 | 5.74 |
| 12000 | 9.53 | 23.60 | 5.69 | 7.42 | 1.40 | 1.08 | 17.78 | 6.62 | 5.94 |

## *Typical Performance Data*

**Definitions:**
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5V, Id = 51.35 mA @ Temperature = +85degC

| FREQ | Gain | Isolation | Input Return Loss | Output Return Loss | Stability | | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | (dB) | (dB) | (dB) | K | Measure | (dBm) | (dBm) | (dB) |
| 10 | 14.59 | 22.78 | 11.62 | 12.64 | 1.27 | 0.90 | -- | 16.21 | 7.58 |
| 20 | 14.90 | 22.17 | 11.63 | 13.19 | 1.21 | 0.86 | 19.01 | 16.86 | 7.64 |
| 30 | 15.31 | 21.84 | 12.15 | 13.73 | 1.18 | 0.80 | 19.62 | 17.19 | 6.94 |
| 40 | 15.72 | 21.41 | 12.79 | 14.38 | 1.14 | 0.74 | 20.26 | 17.26 | 6.46 |
| 50 | 16.10 | 21.16 | 13.54 | 15.10 | 1.12 | 0.68 | 20.54 | 17.07 | 6.10 |
| 60 | 16.37 | 20.69 | 14.19 | 15.99 | 1.09 | 0.62 | 20.96 | 17.03 | 5.77 |
| 70 | 16.63 | 20.45 | 15.10 | 16.81 | 1.08 | 0.57 | 21.81 | 17.01 | 5.49 |
| 80 | 16.83 | 20.25 | 16.01 | 17.74 | 1.06 | 0.53 | 22.52 | 16.81 | 5.21 |
| 90 | 16.98 | 20.13 | 16.94 | 18.61 | 1.06 | 0.50 | 22.73 | 16.71 | 5.10 |
| 100 | 17.10 | 20.04 | 17.92 | 19.54 | 1.05 | 0.48 | 23.94 | 16.71 | 4.84 |
| 200 | 17.35 | 19.85 | 26.66 | 27.12 | 1.04 | 0.43 | 29.90 | 16.54 | 4.30 |
| 250 | 17.31 | 19.90 | 28.58 | 30.03 | 1.04 | 0.45 | 31.36 | 16.72 | 4.37 |
| 300 | 17.27 | 19.97 | 29.04 | 32.41 | 1.05 | 0.46 | 31.73 | 16.71 | 4.50 |
| 350 | 17.23 | 20.04 | 28.81 | 33.47 | 1.05 | 0.48 | 31.58 | 16.82 | 4.50 |
| 400 | 17.19 | 20.05 | 28.62 | 33.75 | 1.05 | 0.48 | 32.06 | 16.80 | 4.49 |
| 450 | 17.17 | 20.08 | 27.78 | 33.85 | 1.06 | 0.49 | 32.36 | 16.89 | 4.47 |
| 500 | 17.14 | 20.14 | 27.37 | 33.81 | 1.06 | 0.50 | 31.73 | 16.88 | 4.47 |
| 550 | 17.12 | 20.14 | 26.83 | 33.10 | 1.06 | 0.50 | 31.46 | 16.76 | 4.53 |
| 600 | 17.10 | 20.14 | 26.38 | 32.94 | 1.06 | 0.51 | 31.97 | 16.79 | 4.46 |
| 650 | 17.09 | 20.15 | 26.40 | 32.62 | 1.06 | 0.51 | 32.17 | 16.83 | 4.53 |
| 700 | 17.07 | 20.22 | 26.10 | 32.03 | 1.06 | 0.52 | 32.14 | 16.87 | 4.50 |
| 750 | 17.06 | 20.18 | 26.18 | 31.82 | 1.06 | 0.51 | 31.97 | 16.80 | 4.40 |
| 800 | 17.04 | 20.20 | 26.11 | 31.15 | 1.06 | 0.52 | 32.33 | 16.79 | 4.42 |
| 850 | 17.03 | 20.24 | 25.93 | 31.00 | 1.07 | 0.52 | 31.81 | 16.77 | 4.46 |
| 1000 | 16.99 | 20.22 | 25.65 | 29.85 | 1.07 | 0.53 | 30.87 | 16.69 | 4.51 |
| 1500 | 16.87 | 20.30 | 25.49 | 27.08 | 1.08 | 0.54 | 30.95 | 16.64 | 4.55 |
| 2000 | 16.75 | 20.36 | 25.22 | 24.65 | 1.09 | 0.56 | 29.95 | 16.53 | 4.59 |
| 2500 | 16.61 | 20.47 | 25.34 | 22.45 | 1.10 | 0.58 | 28.93 | 16.14 | 4.66 |
| 3000 | 16.48 | 20.54 | 24.47 | 20.55 | 1.11 | 0.60 | 28.16 | 15.84 | 4.70 |
| 3500 | 16.36 | 20.59 | 22.77 | 19.15 | 1.11 | 0.61 | 27.18 | 15.53 | 4.67 |
| 4000 | 16.23 | 20.68 | 20.77 | 18.41 | 1.12 | 0.62 | 26.47 | 15.03 | 4.75 |
| 4500 | 16.14 | 20.69 | 20.64 | 18.59 | 1.13 | 0.63 | 25.77 | 14.62 | 4.78 |
| 5000 | 16.11 | 20.79 | 22.08 | 19.14 | 1.14 | 0.65 | 25.11 | 13.95 | 4.96 |
| 5500 | 16.07 | 20.67 | 33.03 | 18.76 | 1.13 | 0.64 | 24.61 | 13.25 | 4.97 |
| 6000 | 16.07 | 20.69 | 25.38 | 18.19 | 1.13 | 0.64 | 24.16 | 12.62 | 5.07 |
| 6500 | 15.92 | 20.49 | 17.21 | 15.57 | 1.12 | 0.63 | 23.46 | 11.87 | 5.24 |
| 7000 | 15.87 | 20.87 | 13.34 | 14.04 | 1.11 | 0.68 | 22.64 | 11.11 | 5.21 |
| 7500 | 15.82 | 20.76 | 10.99 | 12.81 | 1.08 | 0.67 | 21.99 | 10.35 | 5.47 |
| 8000 | 15.39 | 21.07 | 9.46 | 11.74 | 1.08 | 0.74 | 20.92 | 9.56 | 5.59 |
| 8500 | 14.84 | 21.30 | 8.30 | 11.17 | 1.10 | 0.80 | 20.22 | 8.76 | 5.78 |
| 9000 | 13.85 | 22.05 | 7.20 | 10.14 | 1.16 | 0.91 | 19.66 | 8.38 | 6.09 |
| 9500 | 12.53 | 22.25 | 7.28 | 10.36 | 1.31 | 0.96 | 18.48 | 7.61 | 6.33 |
| 10000 | 10.93 | 22.09 | 7.38 | 11.02 | 1.47 | 1.03 | 18.34 | 7.00 | 6.62 |
| 10500 | 9.51 | 23.11 | 7.13 | 10.15 | 1.76 | 1.07 | 16.99 | 6.57 | 6.97 |
| 11000 | 8.11 | 24.72 | 7.00 | 9.80 | 2.37 | 1.09 | 16.41 | 5.97 | 7.33 |
| 11500 | 6.92 | 23.90 | 6.22 | 8.08 | 2.15 | 1.08 | 15.98 | 5.56 | 7.55 |
| 12000 | 5.85 | 25.51 | 5.97 | 7.30 | 2.76 | 1.05 | 15.24 | 5.10 | 7.75 |

## *Typical Performance Data*

**Definitions:**
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 4.75V, Id = 46.26 mA @ Temperature = +85degC

| FREQ | Gain | Isolation | Input Return Loss | Output Return Loss | Stability | | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | (dB) | (dB) | (dB) | K | Measure | (dBm) | (dBm) | (dB) |
| 10 | 14.16 | 22.16 | 10.85 | 11.57 | 1.20 | 0.90 | -- | 15.92 | 8.03 |
| 20 | 14.56 | 22.34 | 10.98 | 12.45 | 1.23 | 0.88 | 17.15 | 16.08 | 8.08 |
| 30 | 15.09 | 21.82 | 11.56 | 13.00 | 1.18 | 0.81 | 18.09 | 16.37 | 7.19 |
| 40 | 15.59 | 21.35 | 12.31 | 13.71 | 1.14 | 0.74 | 19.05 | 16.37 | 6.57 |
| 50 | 16.03 | 20.94 | 13.12 | 14.49 | 1.11 | 0.67 | 20.03 | 16.06 | 6.19 |
| 60 | 16.33 | 20.69 | 13.98 | 15.47 | 1.10 | 0.62 | 21.78 | 16.01 | 5.79 |
| 70 | 16.59 | 20.34 | 14.96 | 16.35 | 1.07 | 0.56 | 23.46 | 15.97 | 5.44 |
| 80 | 16.79 | 20.14 | 15.94 | 17.36 | 1.06 | 0.52 | 25.30 | 15.65 | 5.18 |
| 90 | 16.94 | 20.04 | 16.93 | 18.31 | 1.06 | 0.49 | 26.38 | 15.51 | 5.07 |
| 100 | 17.05 | 19.94 | 17.91 | 19.26 | 1.05 | 0.47 | 27.42 | 15.52 | 4.82 |
| 200 | 17.27 | 19.77 | 27.48 | 27.32 | 1.04 | 0.44 | 29.73 | 15.37 | 4.31 |
| 250 | 17.23 | 19.81 | 30.23 | 30.18 | 1.04 | 0.45 | 30.17 | 15.73 | 4.35 |
| 300 | 17.18 | 19.89 | 30.96 | 31.97 | 1.05 | 0.46 | 30.13 | 15.70 | 4.44 |
| 350 | 17.13 | 19.97 | 30.83 | 32.08 | 1.05 | 0.48 | 29.98 | 15.90 | 4.43 |
| 400 | 17.10 | 20.00 | 30.55 | 31.71 | 1.06 | 0.49 | 30.37 | 15.92 | 4.44 |
| 450 | 17.07 | 20.02 | 29.49 | 31.86 | 1.06 | 0.49 | 30.55 | 15.98 | 4.43 |
| 500 | 17.05 | 20.05 | 28.98 | 31.50 | 1.06 | 0.50 | 30.16 | 15.99 | 4.48 |
| 550 | 17.03 | 20.06 | 28.35 | 31.10 | 1.06 | 0.50 | 30.17 | 15.87 | 4.47 |
| 600 | 17.01 | 20.08 | 27.76 | 30.94 | 1.06 | 0.51 | 30.37 | 15.91 | 4.44 |
| 650 | 16.99 | 20.11 | 27.79 | 30.51 | 1.06 | 0.51 | 30.57 | 15.95 | 4.47 |
| 700 | 16.98 | 20.10 | 27.57 | 30.05 | 1.06 | 0.51 | 30.52 | 16.01 | 4.48 |
| 750 | 16.96 | 20.12 | 27.51 | 29.78 | 1.06 | 0.52 | 30.57 | 15.92 | 4.38 |
| 800 | 16.95 | 20.15 | 27.51 | 29.33 | 1.07 | 0.52 | 30.62 | 15.90 | 4.38 |
| 850 | 16.94 | 20.15 | 27.27 | 29.09 | 1.07 | 0.52 | 30.29 | 15.90 | 4.42 |
| 1000 | 16.89 | 20.16 | 26.87 | 28.26 | 1.07 | 0.53 | 29.73 | 15.82 | 4.49 |
| 1500 | 16.78 | 20.23 | 26.58 | 25.81 | 1.08 | 0.55 | 29.72 | 15.75 | 4.51 |
| 2000 | 16.65 | 20.31 | 26.08 | 23.65 | 1.09 | 0.56 | 29.06 | 15.67 | 4.54 |
| 2500 | 16.50 | 20.36 | 25.96 | 21.60 | 1.10 | 0.58 | 27.98 | 15.29 | 4.61 |
| 3000 | 16.37 | 20.42 | 24.76 | 19.68 | 1.11 | 0.59 | 27.60 | 15.08 | 4.63 |
| 3500 | 16.24 | 20.53 | 22.74 | 18.37 | 1.12 | 0.61 | 26.61 | 14.89 | 4.65 |
| 4000 | 16.12 | 20.60 | 20.75 | 17.70 | 1.13 | 0.62 | 26.02 | 14.45 | 4.70 |
| 4500 | 16.02 | 20.64 | 20.65 | 17.79 | 1.13 | 0.64 | 25.46 | 14.10 | 4.74 |
| 5000 | 15.99 | 20.70 | 22.23 | 18.19 | 1.14 | 0.64 | 24.83 | 13.52 | 4.88 |
| 5500 | 15.95 | 20.56 | 34.47 | 17.88 | 1.13 | 0.64 | 24.34 | 12.88 | 4.90 |
| 6000 | 15.94 | 20.58 | 25.54 | 17.46 | 1.13 | 0.64 | 23.96 | 12.29 | 4.99 |
| 6500 | 15.88 | 20.39 | 17.82 | 15.64 | 1.11 | 0.62 | 23.24 | 11.56 | 5.15 |
| 7000 | 15.72 | 20.71 | 13.30 | 13.64 | 1.10 | 0.68 | 22.51 | 10.82 | 5.14 |
| 7500 | 15.66 | 20.63 | 11.00 | 12.54 | 1.07 | 0.67 | 21.79 | 10.08 | 5.37 |
| 8000 | 15.22 | 20.88 | 9.49 | 11.41 | 1.07 | 0.74 | 20.68 | 9.37 | 5.49 |
| 8500 | 14.65 | 21.13 | 8.34 | 10.77 | 1.10 | 0.79 | 19.97 | 8.49 | 5.68 |
| 9000 | 13.66 | 21.94 | 7.20 | 9.74 | 1.15 | 0.90 | 19.35 | 8.15 | 5.98 |
| 9500 | 12.32 | 22.12 | 7.33 | 9.97 | 1.31 | 0.95 | 18.16 | 7.36 | 6.19 |
| 10000 | 10.74 | 21.96 | 7.36 | 10.60 | 1.47 | 1.02 | 17.97 | 6.67 | 6.49 |
| 10500 | 9.37 | 22.92 | 7.04 | 9.74 | 1.72 | 1.07 | 16.59 | 6.23 | 6.82 |
| 11000 | 7.92 | 24.68 | 7.02 | 9.66 | 2.41 | 1.08 | 15.99 | 5.67 | 7.18 |
| 11500 | 6.76 | 23.85 | 6.29 | 8.00 | 2.18 | 1.07 | 15.57 | 5.15 | 7.39 |
| 12000 | 5.70 | 25.52 | 6.02 | 7.32 | 2.83 | 1.05 | 14.81 | 4.85 | 7.59 |

## *Typical Performance Data*

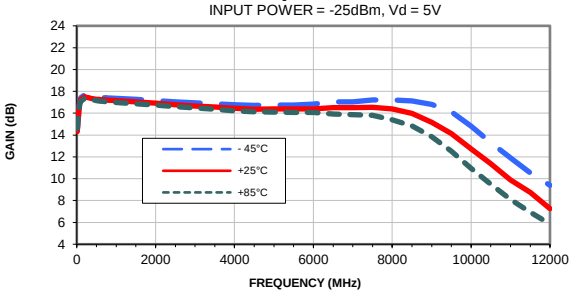
**Definitions:**
Input Return Loss = -S11 (dB)
Gain(Power Gain) = S21 (dB)
Reverse Isolation = -S12 (dB)
Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.25V, Id = 57.82 mA @ Temperature = +85degC

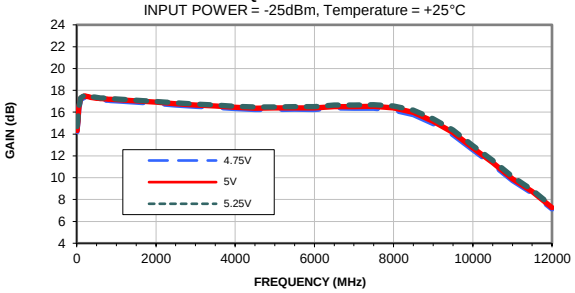
| FREQ | Gain | Isolation | Input Return Loss | Output Return Loss | Stability | | IP-3 Output | 1dB Comp. Output | Noise Figure |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | (dB) | (dB) | (dB) | K | Measure | (dBm) | (dBm) | (dB) |
| 10 | 16.25 | 20.64 | 17.54 | 19.35 | 1.09 | 0.66 | -- | 16.34 | 5.06 |
| 20 | 16.27 | 20.97 | 17.03 | 20.65 | 1.11 | 0.69 | 22.19 | 16.91 | 5.20 |
| 30 | 16.36 | 20.97 | 17.26 | 20.87 | 1.11 | 0.68 | 22.29 | 17.40 | 5.09 |
| 40 | 16.45 | 20.83 | 17.60 | 21.09 | 1.10 | 0.65 | 22.72 | 17.70 | 5.01 |
| 50 | 16.57 | 20.78 | 18.06 | 21.41 | 1.10 | 0.64 | 22.99 | 17.69 | 4.96 |
| 60 | 16.63 | 20.76 | 18.43 | 22.09 | 1.10 | 0.63 | 23.55 | 17.80 | 4.88 |
| 70 | 16.73 | 20.55 | 18.87 | 22.54 | 1.08 | 0.59 | 24.49 | 17.84 | 4.80 |
| 80 | 16.82 | 20.51 | 19.32 | 23.24 | 1.08 | 0.58 | 25.08 | 17.76 | 4.73 |
| 90 | 16.90 | 20.41 | 19.84 | 23.79 | 1.07 | 0.56 | 25.40 | 17.72 | 4.73 |
| 100 | 16.98 | 20.36 | 20.34 | 24.43 | 1.07 | 0.54 | 26.82 | 17.76 | 4.59 |
| 200 | 17.28 | 20.10 | 24.88 | 29.91 | 1.05 | 0.48 | 37.37 | 17.66 | 4.43 |
| 250 | 17.29 | 20.05 | 25.96 | 32.10 | 1.05 | 0.47 | 37.05 | 17.72 | 4.44 |
| 300 | 17.27 | 20.13 | 26.42 | 34.24 | 1.05 | 0.48 | 34.35 | 17.75 | 4.52 |
| 350 | 17.25 | 20.15 | 26.43 | 35.09 | 1.05 | 0.49 | 34.37 | 17.74 | 4.56 |
| 400 | 17.23 | 20.13 | 26.35 | 35.53 | 1.05 | 0.49 | 34.74 | 17.72 | 4.55 |
| 450 | 17.21 | 20.19 | 25.91 | 35.93 | 1.06 | 0.50 | 34.73 | 17.76 | 4.51 |
| 500 | 17.19 | 20.20 | 25.61 | 35.82 | 1.06 | 0.50 | 33.50 | 17.78 | 4.57 |
| 550 | 17.18 | 20.22 | 25.33 | 35.27 | 1.06 | 0.51 | 33.82 | 17.64 | 4.59 |
| 600 | 17.16 | 20.26 | 24.98 | 35.05 | 1.06 | 0.51 | 33.52 | 17.64 | 4.58 |
| 650 | 17.15 | 20.26 | 25.00 | 34.54 | 1.06 | 0.51 | 33.81 | 17.67 | 4.59 |
| 700 | 17.14 | 20.28 | 24.84 | 34.02 | 1.06 | 0.52 | 33.48 | 17.73 | 4.56 |
| 750 | 17.13 | 20.29 | 24.93 | 33.98 | 1.06 | 0.52 | 33.52 | 17.63 | 4.52 |
| 800 | 17.11 | 20.29 | 24.89 | 33.24 | 1.07 | 0.52 | 33.60 | 17.62 | 4.49 |
| 850 | 17.10 | 20.29 | 24.75 | 32.92 | 1.07 | 0.52 | 33.09 | 17.63 | 4.53 |
| 1000 | 17.06 | 20.32 | 24.62 | 31.73 | 1.07 | 0.53 | 31.97 | 17.53 | 4.58 |
| 1500 | 16.95 | 20.35 | 24.63 | 28.50 | 1.08 | 0.54 | 31.68 | 17.48 | 4.59 |
| 2000 | 16.83 | 20.40 | 24.44 | 25.80 | 1.08 | 0.56 | 30.57 | 17.36 | 4.66 |
| 2500 | 16.69 | 20.49 | 24.71 | 23.52 | 1.10 | 0.58 | 29.13 | 16.93 | 4.75 |
| 3000 | 16.56 | 20.53 | 24.20 | 21.49 | 1.10 | 0.59 | 28.42 | 16.56 | 4.79 |
| 3500 | 16.44 | 20.63 | 22.73 | 20.09 | 1.11 | 0.61 | 27.27 | 16.12 | 4.78 |
| 4000 | 16.32 | 20.76 | 20.80 | 19.32 | 1.13 | 0.63 | 26.51 | 15.55 | 4.82 |
| 4500 | 16.22 | 20.74 | 20.60 | 19.64 | 1.13 | 0.63 | 25.82 | 15.03 | 4.89 |
| 5000 | 16.19 | 20.87 | 22.01 | 20.29 | 1.14 | 0.65 | 25.11 | 14.32 | 5.01 |
| 5500 | 16.14 | 20.76 | 31.89 | 19.94 | 1.14 | 0.64 | 24.66 | 13.49 | 5.11 |
| 6000 | 16.15 | 20.73 | 25.33 | 19.18 | 1.13 | 0.64 | 24.02 | 12.86 | 5.17 |
| 6500 | 16.20 | 20.65 | 18.44 | 17.02 | 1.12 | 0.62 | 23.18 | 12.07 | 5.32 |
| 7000 | 15.95 | 20.96 | 13.35 | 14.56 | 1.11 | 0.68 | 22.47 | 11.32 | 5.33 |
| 7500 | 15.93 | 20.87 | 11.05 | 13.38 | 1.09 | 0.68 | 21.75 | 10.56 | 5.56 |
| 8000 | 15.50 | 21.13 | 9.53 | 12.28 | 1.09 | 0.74 | 20.80 | 9.80 | 5.75 |
| 8500 | 14.95 | 21.35 | 8.41 | 11.65 | 1.11 | 0.80 | 20.12 | 8.95 | 5.94 |
| 9000 | 13.97 | 22.22 | 7.18 | 10.52 | 1.18 | 0.91 | 19.61 | 8.59 | 6.21 |
| 9500 | 12.59 | 22.20 | 7.41 | 10.96 | 1.32 | 0.97 | 18.55 | 7.85 | 6.53 |
| 10000 | 11.00 | 22.07 | 7.41 | 11.52 | 1.47 | 1.04 | 18.43 | 7.20 | 6.86 |
| 10500 | 9.63 | 23.16 | 7.02 | 10.42 | 1.75 | 1.08 | 17.17 | 6.73 | 7.19 |
| 11000 | 8.12 | 24.82 | 7.09 | 10.21 | 2.44 | 1.10 | 16.59 | 6.20 | 7.60 |
| 11500 | 6.92 | 24.07 | 6.37 | 8.19 | 2.23 | 1.08 | 16.18 | 5.69 | 7.74 |
| 12000 | 5.85 | 26.19 | 6.07 | 7.48 | 3.06 | 1.05 | 15.34 | 5.39 | 8.03 |

## *Typical Performance Curves*

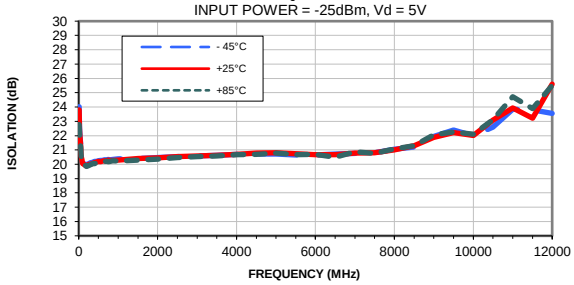
**GAIN vs. FREQUENCY & TEMPERATURE**
INPUT POWER = -25dBm, Vd = 5V



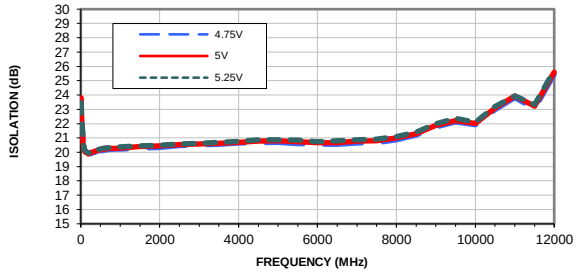

**GAIN vs. FREQUENCY & DEVICE VOLTAGE**
INPUT POWER = -25dBm, Temperature = +25°C



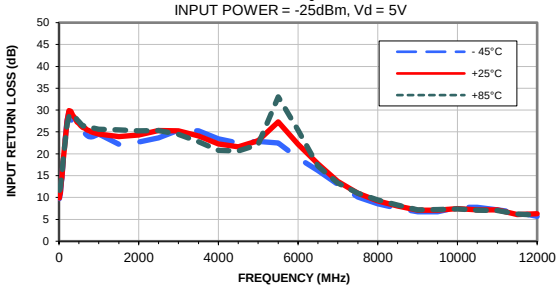

**ISOLATION vs. FREQUENCY & TEMPERATURE**
INPUT POWER = -25dBm, Vd = 5V



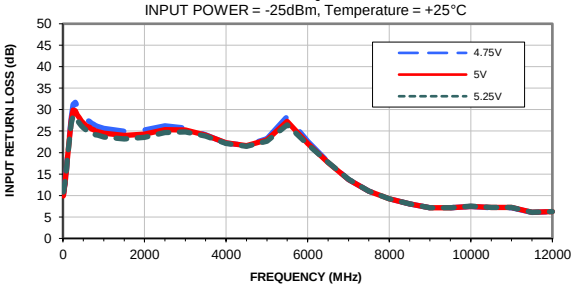

**ISOLATION vs. FREQUENCY & DEVICE VOLTAGE**
INPUT POWER = -25dBm, Temperature = +25°C



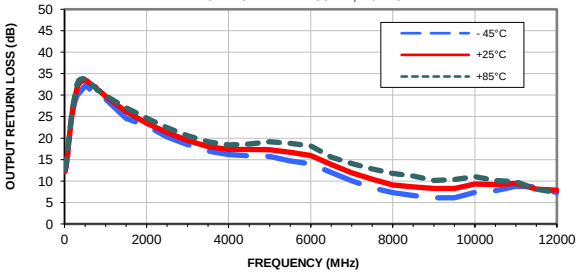

**INPUT RETURN LOSS vs. FREQUENCY & TEMPERATURE**
INPUT POWER = -25dBm, Vd = 5V



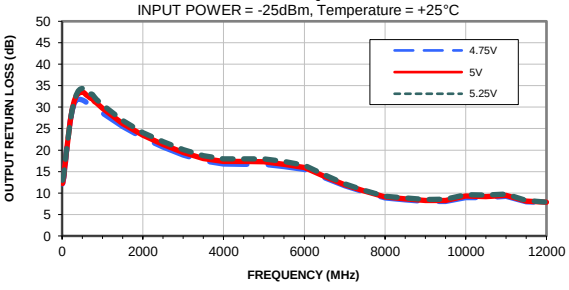

**INPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE**
INPUT POWER = -25dBm, Temperature = +25°C




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

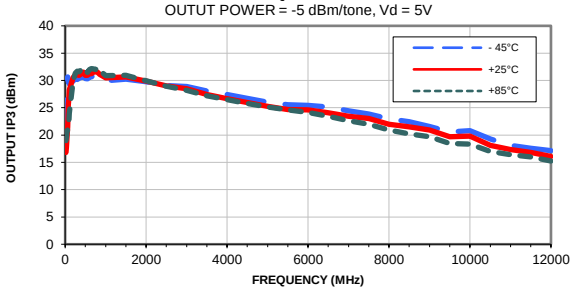



**OUTPUT RETURN LOSS vs. FREQUENCY & DEVICE VOLTAGE**
INPUT POWER = -25dBm, Temperature = +25°C

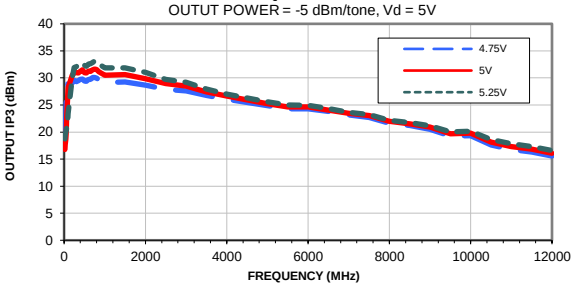


## *Typical Performance Curves*

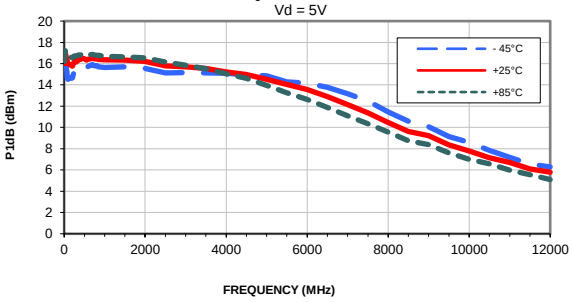
**OUTPUT IP3 vs. FREQUENCY & TEMPERATURE**
OUTUT POWER = -5 dBm/tone, Vd = 5V



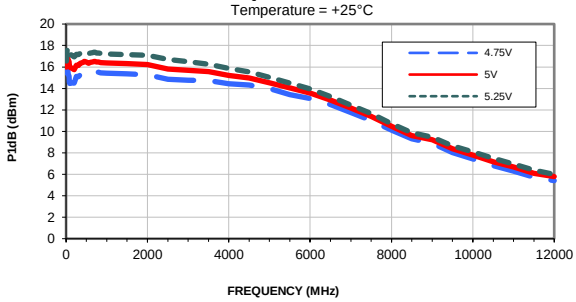

**OUTPUT IP3 vs. FREQUENCY & DEVICE VOLTAGE**
OUTUT POWER = -5 dBm/tone, Vd = 5V



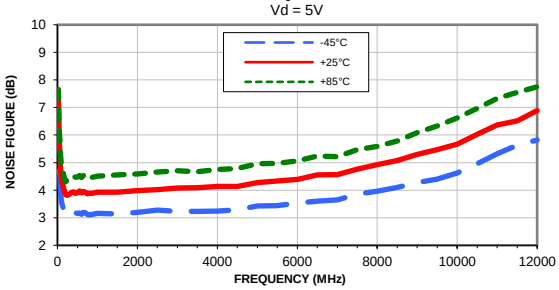

**P1dB vs. FREQUENCY & TEMPERATURE**
Vd = 5V



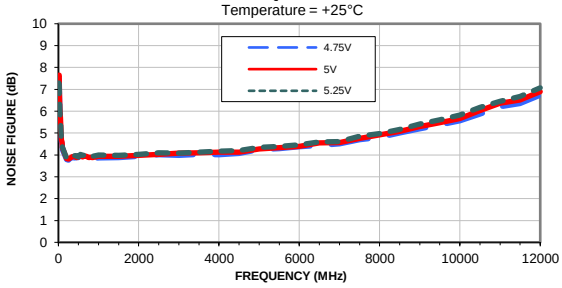

**P1dB vs. FREQUENCY & DEVICE VOLTAGE**
Temperature = +25°C



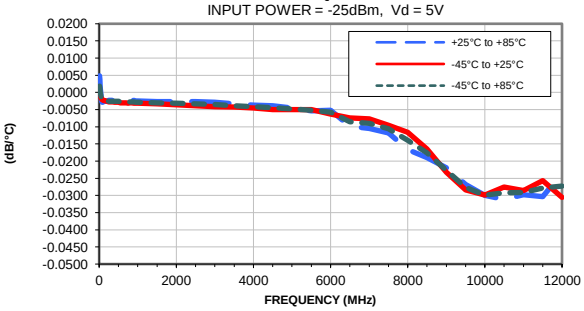

**NOISE FIGURE vs. FREQUENCY & TEMPERATURE**
Vd = 5V




**NOISE FIGURE vs. FREQUENCY & DEVICE VOLTAGE**
Temperature = +25°C



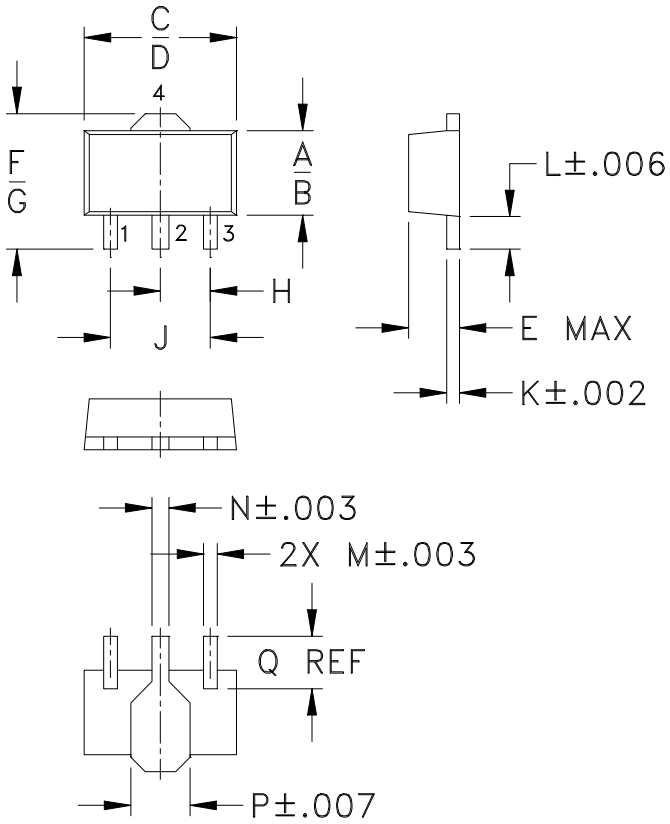

**GAIN VARIATION vs. FREQUENCY & TEMPERATURE**
INPUT POWER = -25dBm, Vd = 5V



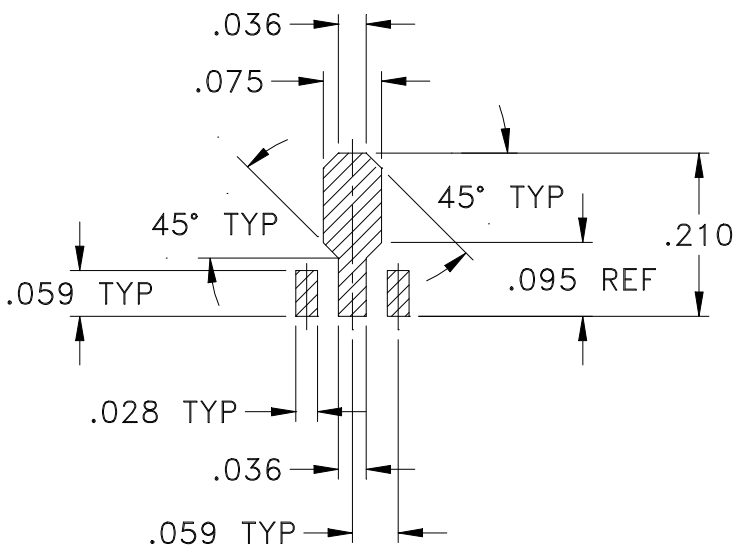
# Case Style DF

**DF782**

## Outline Dimensions




## PCB Land Pattern




Suggested Layout,
Tolerance to be within ±.002

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

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

**Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3Pl. ± .005**

### Notes:

1. Case material: Plastic.
2. 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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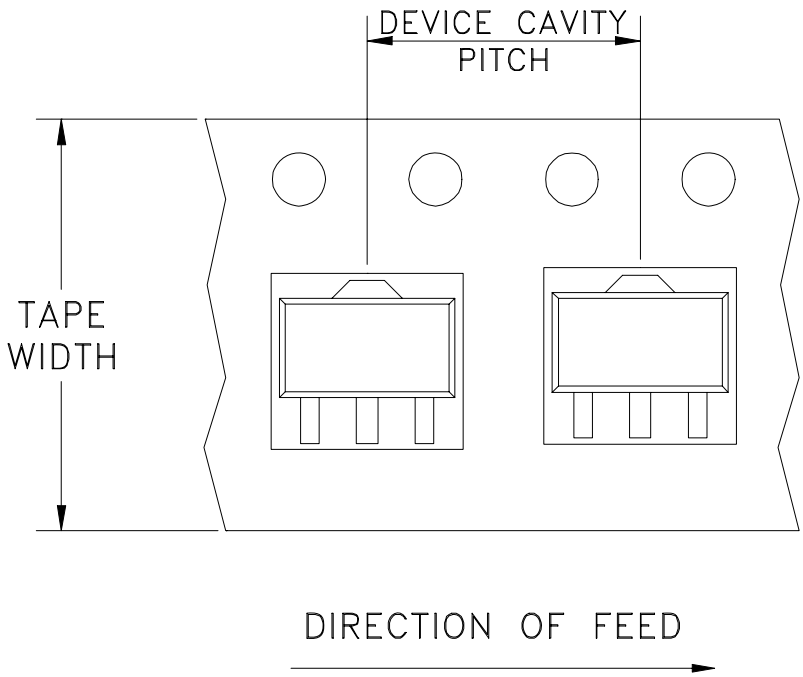
# Tape & Reel Packaging TR-F55

DEVICE ORIENTATION IN T&R




| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel | |
|---|---|---|---|---|
| 12 | 8 | 7 | Small quantity standard (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

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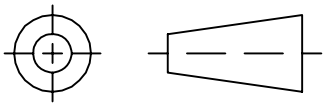
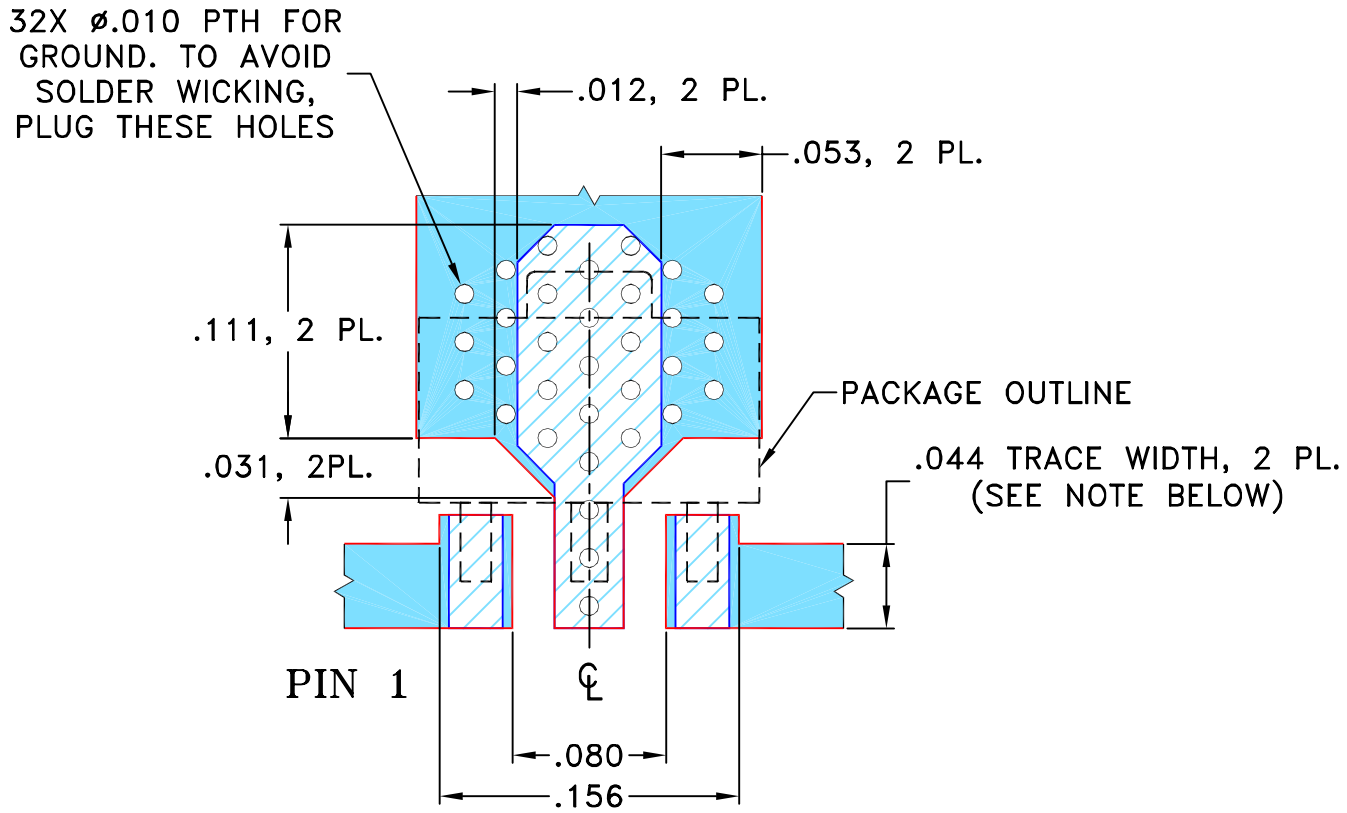
THIRD ANGLE PROJECTION



REVISIONS

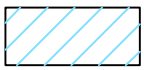
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
|---|---|---|---|---|---|
| OR | M137326 | NEW RELEASE | 07/10/12 | PW | DJ |
| | | | | | |
| | | | | | |
| | | | | | |

# SUGGESTED MOUNTING CONFIGURATION FOR DF782 CASE STYLE, "04AM03" PIN CODE




NOTES:
1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; 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 | PW | 06/01/12 |
| TOLERANCES ON: | CHECKED | IL | 07/10/12 |
| 2 PL DECIMALS ± | APPROVED | DJ | 07/10/12 |
| 3 PL DECIMALS ± .005 | | | |
| ANGLES ± | | | |
| FRACTIONS ± | | | |



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

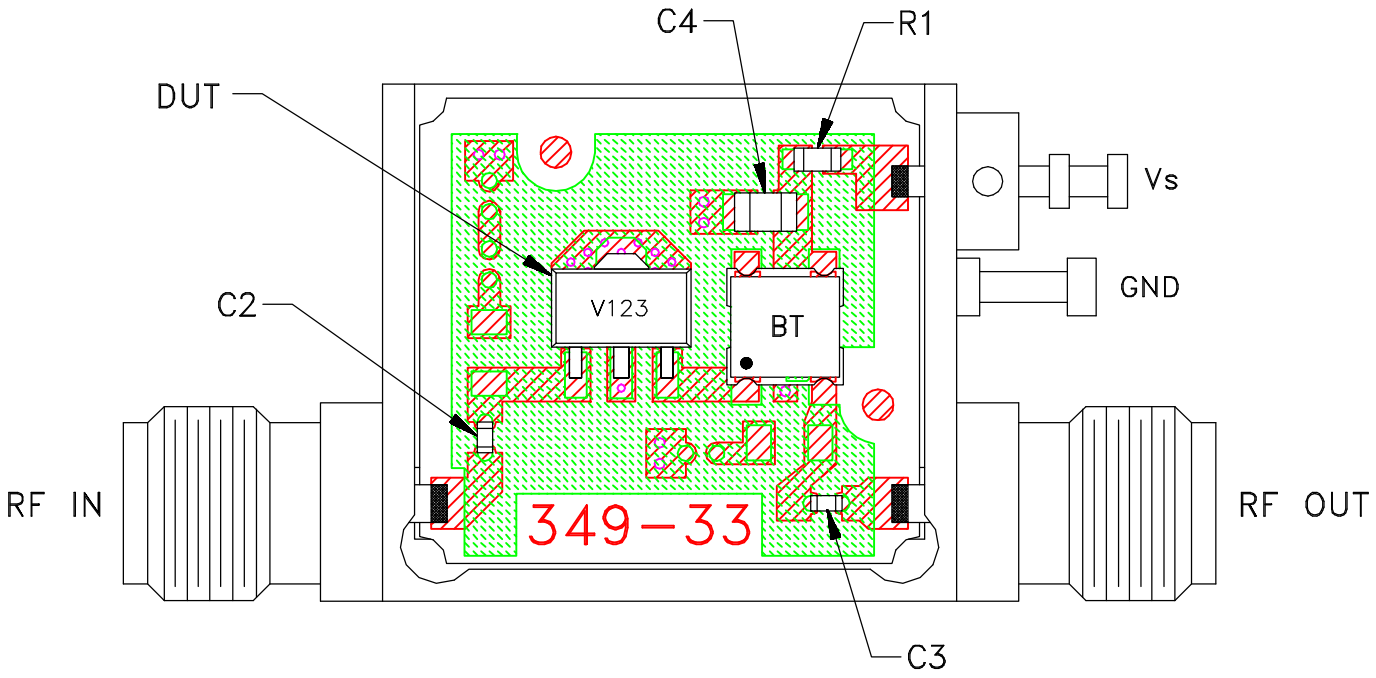
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, 04AM03, DF782, TB-678-105+

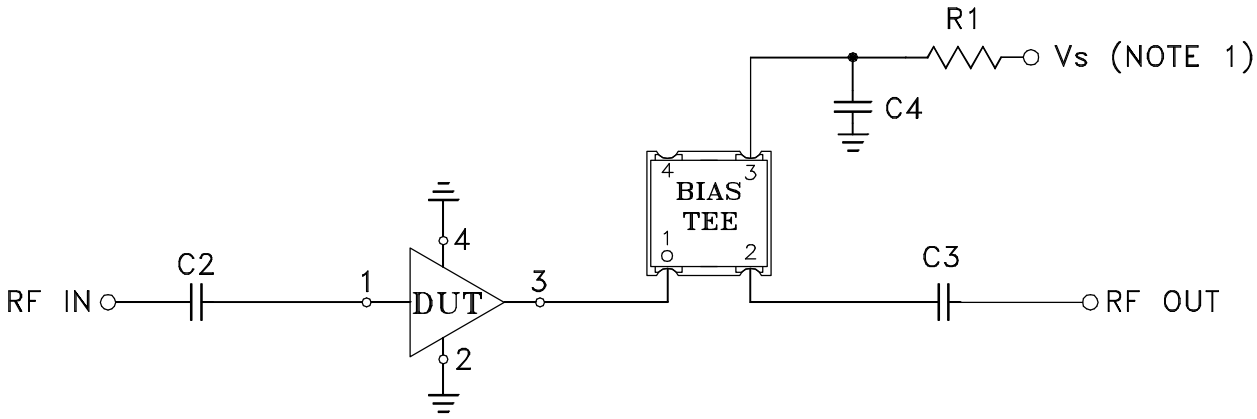
| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---|---|---|---|
| A | 15542 | 98-PL-370 | OR |

| FILE: | SCALE: | SHEET: |
|---|---|---|
| 98PL370 | 10:1 | 1 OF 1 |

# Evaluation Board and Circuit




TB-781+




| COMPONENT | VALUE | SIZE |
|---|---|---|
| DUT | GVA-123+ | SOT-89 |
| C1 | NOT USED | |
| C2,C3 | 0.001 uF | 0402 |
| C4 | 0.1 uF | 0805 |
| R1 | 16.5 Ohm | 0603 |
| BIAS TEE | Mini-Circuits TCBT-14+ | |

## Schematic Diagram

NOTES:

1. Vs voltage: +5±0.2V.
2. SMA Female connectors.
3. PCB material: Rogers RO4350 or equivalent, dielectric constant=3.5, dielectric thickness=.020 inch.

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# Environmental Specifications ENV08T1

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

| Specification | Test/Inspection Condition | Reference/Spec |
|---|---|---|
| Operating Temperature | -40° to 85° C or -45° to 85° C or -55° to 105° C or -40° to 105° C or -40° to 95° C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C or -65° to 150°<br>Ambient Environment | Individual Model Data Sheet |
| HTOL | 1000 hours at 125°C | MIL-STD-883, Method 1005, Condition B |
| 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 |

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 |
|---|---|---|
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215 |