



WIDEBAND, MICROWAVE

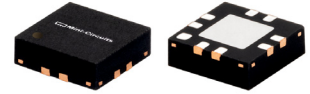
Monolithic Amplifier

AVA-24A+

50Ω 5 to 20 GHz

THE BIG DEAL

- Surface Mount Amplifier up to 20 GHz
- Integrated matching, DC Blocks and bias circuits
- High Reverse Isolation
- Gain, 12.3 dB typ. & Flatness, ±1.3 dB
- Output Power, up to +18.3 dBm typ.
- Excellent isolation, 36 dB typ.
- Single Positive Supply Voltage, +5V
- Integrated DC blocks, Bias-Tee & Microwave bypass capacitor
- Unconditionally Stable
- Aqueous washable; 3mm x 3mm SMT package



Generic photo used for illustration purposes only

CASE STYLE: DQ849

+RoHS Compliant

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

APPLICATIONS

- Military EW and Radar
- DBS
- Wideband Isolation amplifier
- Microwave point-to-point radios
- Satellite systems

PRODUCT OVERVIEW

The Mini-Circuits AVA-24A+ is a surface mount, microwave amplifier fabricated using InGaAs PHEMT technology and is fully integrated gain block up to 20 GHz. It is packaged in Mini-Circuits industry standard 3x3 mm MCLP (QFN) package, which provides excellent RF and thermal performance. The AVA-24A+ integrates the entire matching network with the majority of the bias circuit inside the package, reducing the need for complicated external circuits. This approach makes the AVA-24A+ extremely flexible and enables simple, straightforward use.

KEY FEATURES

| Feature | Advantages |
|-------------------------|---|
| Wideband, 5 to 20 GHz | Broad frequency range supports a wide array of applications from microwave radio and radar, to military communications and countermeasures. |
| Excellent Gain Flatness | Typical ±0.8 dB gain flatness across the entire frequency range minimizes the need for external equalizer networks making it a great fit for instrumentation and EW applications. |
| High Isolation | With reverse isolation of 36 dB (24 dB directivity), the AVA-24A+ is an excellent choice for buffering broadband circuits. It is an ideal LO driver amplifier and provides designers system flexibility and margin when integrating cascaded RF components. |
| Manufacturability | MSL1 and ESD Class1A (HBM) ratings minimize special handling on production lines. |



ELECTRICAL SPECIFICATIONS⁽¹⁾ AT 25°C, Z₀=50Ω, (REFER TO CHARACTERIZATION CIRCUIT, FIG. 1)

| Parameter | Condition (GHz) | Min. | Typ. | Max. | Units |
|---|-----------------|------|-------|------|-------|
| Frequency Range | | 5.0 | | 20.0 | GHz |
| DC Voltage (V _{D1} , V _{D2}) | | | 5.0 | | V |
| DC Current (I _{D1} +I _{D2}) | | | 120 | 147 | mA |
| Gain | 5.0 | — | 12.2 | | dB |
| | 8.0 | 10.0 | 12.8 | | |
| | 10.0 | 10.0 | 12.4 | | |
| | 12.0 | — | 11.8 | | |
| | 14.0 | — | 11.5 | | |
| | 16.0 | — | 11.6 | | |
| | 18.0 | — | 11.3 | | |
| Input Return Loss | 5.0 | — | 12.2 | | dB |
| | 8.0 | 10.0 | 14.5 | | |
| | 10.0 | 10.0 | 19.3 | | |
| | 12.0 | — | 15.9 | | |
| | 14.0 | — | 15.7 | | |
| | 16.0 | 10.0 | 13.8 | | |
| | 18.0 | — | 9.2 | | |
| Output Return Loss | 5.0 | — | 9.2 | | dB |
| | 8.0 | — | 10.6 | | |
| | 10.0 | — | 13.1 | | |
| | 12.0 | — | 11.6 | | |
| | 14.0 | — | 11.8 | | |
| | 16.0 | — | 11.3 | | |
| | 18.0 | — | 11.3 | | |
| Output IP3 | 5.0 | — | 27.2 | | dBm |
| | 8.0 | — | 26.6 | | |
| | 10.0 | — | 25.7 | | |
| | 12.0 | — | 25.0 | | |
| | 14.0 | — | 24.0 | | |
| | 16.0 | — | 22.9 | | |
| | 18.0 | — | 22.0 | | |
| Output Power @ 1 dB compression | 5.0 | — | 18.1 | | dBm |
| | 8.0 | — | 19.1 | | |
| | 10.0 | 16.0 | 18.9 | | |
| | 12.0 | — | 18.4 | | |
| | 14.0 | — | 18.7 | | |
| | 16.0 | — | 19.4 | | |
| | 18.0 | — | 20.0 | | |
| Noise Figure | 5.0 | — | 9.0 | | dB |
| | 8.0 | — | 5.1 | | |
| | 10.0 | — | 5.3 | | |
| | 12.0 | — | 5.7 | | |
| | 14.0 | — | 6.0 | | |
| | 16.0 | — | 6.3 | | |
| | 18.0 | — | 6.7 | | |
| 20.0 | — | 6.9 | | | |
| Directivity (Isolation-Gain) | | | 24.0 | | dB |
| DC Current Variation vs. Temperature ⁽²⁾ | | | 0.050 | | mA/°C |
| DC Current Variation vs. Voltage | | | 0.002 | | mA/mA |
| Thermal Resistance | | | 53 | | °C/W |

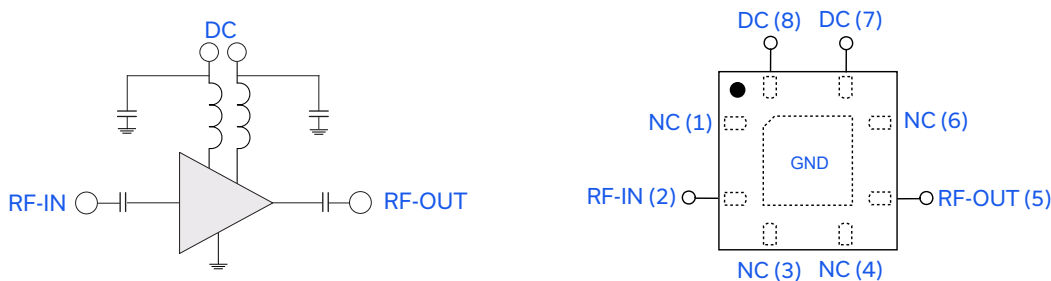


MAXIMUM RATINGS⁽³⁾

| Parameter | Ratings |
|--------------------------------------|----------------|
| Operating Temperature ⁽⁴⁾ | -40°C to 85°C |
| Storage Temperature | -55°C to 100°C |
| Channel Temperature | 150°C |
| DC Voltage (Pad 7,8) | +5.5V |
| Voltage (Pads 2, 5) | +10V |
| Power Dissipation | 860 mW |
| DC Current (Pad 7+8) at $V_D=5V$ | 160mA |
| Input Power | +20 dBm |

- (1) Measured on Mini-Circuits Characterization test fixture TB-547-1A+. See Characterization Test Circuit (Fig. 1)
- (2) (Current at 85°C - Current at -45°C)/130
- (3) Permanent damage may occur if any of these limits are exceeded. These maximum ratings are not intended for continuous normal operation.
- (4) Defined with reference to ground pad temperature.

SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION

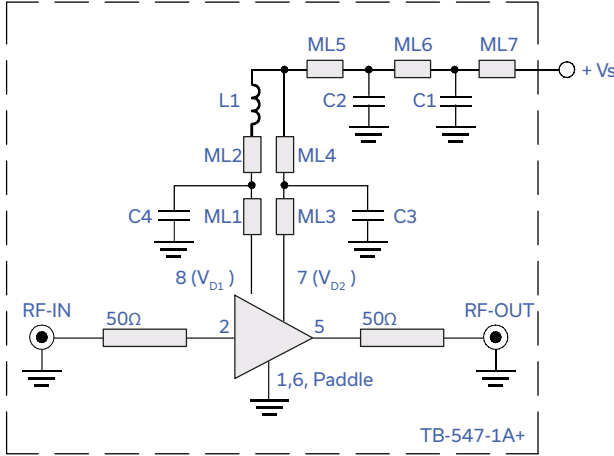


| Function | Pad Number | Description (See Application Circuit, Fig. 2) |
|----------|-------------------------------|--|
| RF-IN | 2 | RF input pad |
| RF-OUT | 5 | RF output pad |
| DC | 8(V_{D1}), 7 (V_{D2}) | DC power supply |
| GND | paddle in center of bottom | Connected to ground |
| NOT USED | 1,3,4,6 | No internal connection; recommended use: per PCB Layout PL-328 |

*Pseudomorphic High Electron Mobility Transistor.



CHARACTERIZATION TEST CIRCUIT



C1=5.6pF, 0402 (NPO)
C2=18pF, 0402 (NPO)
C3=0.001μF, 0402 (NPO)
C4=0.1 μF, 0402 (X7R)
L1=3.3nH, 0805 (wire wound)

ML1-ML7 are short microstrip lines
Refer to 98-PL-328

Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization Test Board TB-547-1A+) Gain, Output power at 1dB compression (P1dB), Noise Figure, Output IP3 (OIP3) are measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain: Pin=-25 dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, +8 dBm/tone at output.
3. Vs adjusted for 5V at device (VD1 and VD2), compensating loss of bias lines.

RECOMMENDED APPLICATION CIRCUIT

(refer to evaluation board for PCB Layout and component values)

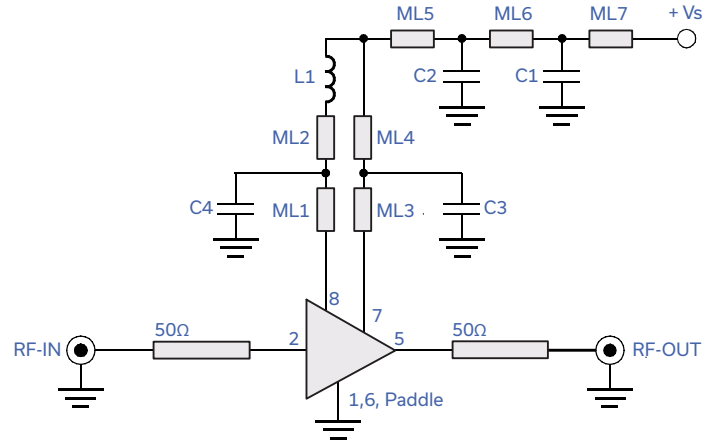


Fig 2. Recommended Application Circuit

PRODUCT MARKING



← black body
← model family designation

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 Swept Graphs S-Parameter (S2P Files) Data Set (.zip file) |
| Case Style | DQ849 Plastic package, exposed paddle, lead finish: tin silver nickel |
| Tape & Reel Standard quantities available on reel | F104 7" reels with 10, 20, 50, 100, 200, 500,1K, 2K |
| Suggested Layout for PCB Design | PL-328 |
| Evaluation Board | TB-547-1A+ |
| Environmental Ratings | ENV08T1 |

ESD RATING

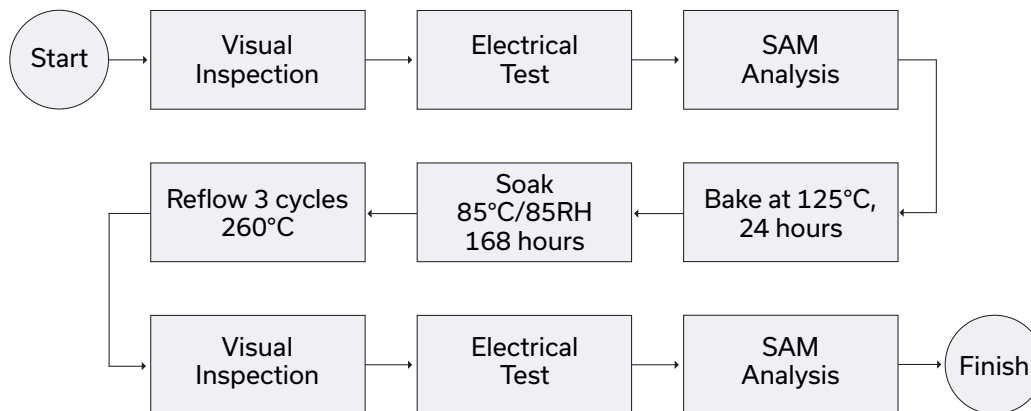
Human Body Model (HBM): 1A (250 to <500V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): M1 (Pass 50V) in accordance with ANSI/ESD STM5.2-1999; passes 25V

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

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 = 5.00V, Idd = 127.88mA @ 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) | | | (dBm) | (dBm) | (dB) |
| 4000 | 7.57 | 50.79 | 7.47 | 4.20 | 37.02 | 0.73 | 22.76 | 13.65 | 19.25 |
| 4500 | 11.70 | 42.94 | 9.29 | 6.45 | 12.62 | 0.86 | 27.86 | 17.20 | 12.59 |
| 5000 | 12.54 | 40.20 | 11.94 | 9.33 | 10.09 | 0.93 | 28.04 | 17.92 | 9.01 |
| 5500 | 13.12 | 38.39 | 15.53 | 11.26 | 8.30 | 0.94 | 27.77 | 18.51 | 7.09 |
| 6000 | 13.38 | 37.23 | 18.25 | 11.33 | 7.15 | 0.94 | 27.80 | 18.73 | 6.01 |
| 6500 | 13.41 | 36.59 | 18.23 | 10.63 | 6.50 | 0.93 | 27.70 | 19.35 | 5.56 |
| 7000 | 13.34 | 36.33 | 17.16 | 10.27 | 6.27 | 0.92 | 27.41 | 19.18 | 5.31 |
| 7500 | 13.24 | 36.14 | 16.33 | 10.38 | 6.20 | 0.93 | 27.36 | 19.95 | 5.12 |
| 8000 | 13.12 | 36.05 | 16.47 | 10.50 | 6.24 | 0.93 | 27.08 | 19.45 | 5.08 |
| 8500 | 12.98 | 36.03 | 17.34 | 10.70 | 6.39 | 0.93 | 26.90 | 19.37 | 4.98 |
| 9000 | 12.88 | 35.91 | 18.50 | 11.01 | 6.45 | 0.93 | 26.86 | 19.48 | 5.10 |
| 9500 | 12.75 | 35.98 | 21.04 | 11.72 | 6.74 | 0.94 | 26.43 | 18.46 | 5.20 |
| 10000 | 12.75 | 36.02 | 23.63 | 12.36 | 6.86 | 0.94 | 26.24 | 19.07 | 5.26 |
| 10500 | 12.68 | 35.83 | 25.11 | 12.62 | 6.81 | 0.94 | 26.33 | 20.11 | 5.37 |
| 11000 | 12.59 | 35.62 | 25.96 | 12.89 | 6.74 | 0.95 | 25.96 | 19.25 | 5.41 |
| 11500 | 12.56 | 35.47 | 23.81 | 13.23 | 6.68 | 0.95 | 25.44 | 19.40 | 5.46 |
| 12000 | 12.54 | 35.14 | 20.16 | 14.58 | 6.50 | 0.97 | 25.35 | 18.80 | 5.54 |
| 12500 | 12.49 | 34.60 | 17.27 | 17.13 | 6.19 | 0.99 | 25.25 | 18.29 | 5.59 |
| 13000 | 12.26 | 34.87 | 14.75 | 19.02 | 6.50 | 1.01 | 24.77 | 18.19 | 5.71 |
| 13500 | 12.17 | 34.40 | 14.17 | 15.98 | 6.13 | 1.00 | 24.39 | 19.21 | 5.84 |
| 14000 | 12.03 | 33.88 | 12.76 | 12.62 | 5.63 | 0.98 | 24.19 | 19.04 | 5.99 |
| 14500 | 11.85 | 33.04 | 12.63 | 10.92 | 5.09 | 0.95 | 23.84 | 19.83 | 6.12 |
| 15000 | 11.98 | 32.43 | 12.83 | 10.39 | 4.63 | 0.94 | 23.73 | 19.41 | 6.12 |
| 15500 | 12.22 | 32.41 | 12.40 | 10.40 | 4.46 | 0.94 | 23.43 | 19.45 | 6.17 |
| 16000 | 12.37 | 32.41 | 12.02 | 10.63 | 4.39 | 0.95 | 23.17 | 19.93 | 6.17 |
| 16500 | 12.35 | 32.17 | 11.61 | 10.76 | 4.26 | 0.96 | 23.05 | 19.74 | 6.33 |
| 17000 | 12.20 | 31.86 | 10.45 | 9.80 | 4.03 | 0.95 | 22.89 | 20.61 | 6.28 |
| 17500 | 11.73 | 31.71 | 9.53 | 8.45 | 3.90 | 0.93 | 22.93 | 20.11 | 6.34 |
| 18000 | 11.41 | 31.63 | 9.49 | 8.11 | 3.89 | 0.93 | 22.23 | 20.39 | 6.35 |
| 18500 | 11.31 | 31.39 | 10.05 | 8.95 | 3.95 | 0.96 | 21.85 | 19.90 | 6.37 |
| 19000 | 11.34 | 31.14 | 10.76 | 11.28 | 4.12 | 1.01 | 21.95 | 18.47 | 6.31 |
| 19500 | 11.60 | 32.82 | 11.39 | 15.14 | 5.19 | 1.04 | 23.64 | 16.92 | 6.10 |
| 20000 | 11.03 | 33.57 | 12.42 | 11.85 | 5.96 | 0.98 | 25.06 | 15.23 | 6.17 |
| 20500 | 9.53 | 34.69 | 11.58 | 9.06 | 7.40 | 0.93 | 24.07 | 14.26 | 6.35 |
| 21000 | 6.72 | 32.55 | 9.23 | 8.80 | 7.45 | 0.98 | 20.26 | 12.56 | 6.65 |

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, Idd = 127.36mA @ 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) |
| 4000 | 7.71 | 50.88 | 7.50 | 4.25 | 37.11 | 0.73 | 22.33 | 13.37 | 19.24 |
| 4500 | 11.87 | 42.85 | 9.29 | 6.49 | 12.28 | 0.86 | 30.42 | 16.74 | 12.59 |
| 5000 | 12.66 | 40.16 | 11.93 | 9.36 | 9.92 | 0.93 | 30.20 | 17.28 | 9.00 |
| 5500 | 13.24 | 38.36 | 15.63 | 11.38 | 8.19 | 0.95 | 29.02 | 17.91 | 7.06 |
| 6000 | 13.48 | 37.22 | 18.33 | 11.49 | 7.08 | 0.94 | 28.72 | 18.11 | 6.02 |
| 6500 | 13.51 | 36.59 | 18.26 | 10.77 | 6.45 | 0.93 | 28.33 | 18.75 | 5.55 |
| 7000 | 13.43 | 36.34 | 17.18 | 10.37 | 6.23 | 0.92 | 27.97 | 18.57 | 5.30 |
| 7500 | 13.33 | 36.15 | 16.37 | 10.47 | 6.15 | 0.93 | 27.73 | 19.42 | 5.11 |
| 8000 | 13.22 | 36.05 | 16.62 | 10.64 | 6.19 | 0.93 | 27.45 | 18.91 | 5.04 |
| 8500 | 13.08 | 36.02 | 17.32 | 10.90 | 6.34 | 0.93 | 27.29 | 18.76 | 4.95 |
| 9000 | 12.98 | 35.91 | 18.66 | 11.22 | 6.41 | 0.93 | 27.24 | 18.82 | 5.10 |
| 9500 | 12.83 | 35.98 | 20.84 | 11.86 | 6.68 | 0.94 | 26.99 | 17.85 | 5.20 |
| 10000 | 12.84 | 36.02 | 23.39 | 12.45 | 6.80 | 0.94 | 26.81 | 18.46 | 5.30 |
| 10500 | 12.77 | 35.81 | 24.63 | 12.79 | 6.73 | 0.95 | 26.71 | 19.51 | 5.38 |
| 11000 | 12.71 | 35.57 | 25.81 | 13.14 | 6.64 | 0.95 | 26.34 | 18.63 | 5.41 |
| 11500 | 12.68 | 35.43 | 23.32 | 13.54 | 6.57 | 0.95 | 25.83 | 18.78 | 5.41 |
| 12000 | 12.67 | 35.09 | 20.29 | 14.81 | 6.39 | 0.97 | 25.91 | 18.09 | 5.55 |
| 12500 | 12.62 | 34.54 | 17.69 | 17.10 | 6.07 | 0.99 | 25.79 | 17.59 | 5.56 |
| 13000 | 12.40 | 34.80 | 15.08 | 18.77 | 6.36 | 1.01 | 25.30 | 17.53 | 5.72 |
| 13500 | 12.31 | 34.33 | 14.71 | 16.23 | 6.01 | 1.00 | 24.74 | 18.62 | 5.81 |
| 14000 | 12.20 | 33.79 | 13.05 | 13.00 | 5.51 | 0.98 | 24.49 | 18.49 | 5.99 |
| 14500 | 12.03 | 32.97 | 13.17 | 11.24 | 5.01 | 0.95 | 24.13 | 19.33 | 6.11 |
| 15000 | 12.13 | 32.40 | 12.66 | 10.56 | 4.55 | 0.94 | 24.09 | 18.90 | 6.15 |
| 15500 | 12.34 | 32.40 | 12.56 | 10.27 | 4.40 | 0.94 | 23.87 | 18.87 | 6.25 |
| 16000 | 12.51 | 32.39 | 12.06 | 10.31 | 4.28 | 0.95 | 23.62 | 19.46 | 6.18 |
| 16500 | 12.48 | 32.16 | 12.15 | 10.37 | 4.19 | 0.95 | 23.63 | 19.12 | 6.39 |
| 17000 | 12.47 | 31.72 | 11.00 | 9.88 | 3.89 | 0.95 | 23.30 | 20.22 | 6.28 |
| 17500 | 12.08 | 31.48 | 10.52 | 8.80 | 3.78 | 0.93 | 23.26 | 19.70 | 6.36 |
| 18000 | 11.84 | 31.32 | 10.24 | 8.56 | 3.72 | 0.93 | 22.50 | 20.04 | 6.31 |
| 18500 | 11.73 | 31.12 | 10.66 | 9.49 | 3.78 | 0.96 | 22.21 | 19.45 | 6.35 |
| 19000 | 11.72 | 30.90 | 11.25 | 11.97 | 3.93 | 1.01 | 22.75 | 17.93 | 6.30 |
| 19500 | 11.93 | 32.64 | 11.16 | 16.37 | 4.92 | 1.05 | 25.99 | 16.40 | 6.15 |
| 20000 | 11.32 | 33.49 | 11.59 | 12.37 | 5.69 | 1.00 | 28.24 | 14.65 | 6.23 |
| 20500 | 9.89 | 34.74 | 11.26 | 9.16 | 7.15 | 0.94 | 22.36 | 13.63 | 6.29 |
| 21000 | 6.97 | 32.66 | 9.75 | 8.46 | 7.36 | 0.95 | 19.71 | 11.97 | 6.56 |

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, Idd = 128.47mA @ 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) |
| 4000 | 7.44 | 50.68 | 7.43 | 4.19 | 37.01 | 0.73 | 22.67 | 13.83 | 19.34 |
| 4500 | 11.50 | 43.04 | 9.22 | 6.45 | 13.02 | 0.86 | 26.90 | 17.56 | 12.68 |
| 5000 | 12.38 | 40.25 | 11.92 | 9.27 | 10.31 | 0.93 | 27.22 | 18.33 | 9.08 |
| 5500 | 13.00 | 38.39 | 15.67 | 11.21 | 8.43 | 0.94 | 27.36 | 18.96 | 7.13 |
| 6000 | 13.25 | 37.23 | 18.26 | 11.25 | 7.23 | 0.93 | 27.51 | 19.17 | 6.07 |
| 6500 | 13.28 | 36.59 | 17.96 | 10.51 | 6.57 | 0.92 | 27.54 | 19.78 | 5.61 |
| 7000 | 13.20 | 36.33 | 16.86 | 10.08 | 6.33 | 0.92 | 27.25 | 19.65 | 5.37 |
| 7500 | 13.10 | 36.14 | 16.15 | 10.13 | 6.25 | 0.93 | 27.29 | 20.47 | 5.14 |
| 8000 | 12.99 | 36.04 | 16.48 | 10.37 | 6.31 | 0.93 | 27.00 | 20.04 | 5.14 |
| 8500 | 12.85 | 36.02 | 17.26 | 10.69 | 6.46 | 0.93 | 26.82 | 19.87 | 5.06 |
| 9000 | 12.75 | 35.89 | 18.78 | 10.99 | 6.53 | 0.93 | 26.79 | 19.86 | 5.15 |
| 9500 | 12.60 | 35.99 | 20.85 | 11.54 | 6.84 | 0.93 | 26.31 | 18.97 | 5.27 |
| 10000 | 12.59 | 36.05 | 23.75 | 12.05 | 6.97 | 0.94 | 26.13 | 19.56 | 5.36 |
| 10500 | 12.52 | 35.85 | 25.86 | 12.41 | 6.93 | 0.94 | 26.26 | 20.61 | 5.44 |
| 11000 | 12.45 | 35.64 | 27.78 | 12.85 | 6.87 | 0.94 | 25.89 | 19.78 | 5.47 |
| 11500 | 12.41 | 35.49 | 24.66 | 13.34 | 6.82 | 0.95 | 25.44 | 19.90 | 5.53 |
| 12000 | 12.38 | 35.16 | 21.03 | 14.49 | 6.64 | 0.96 | 25.28 | 19.16 | 5.66 |
| 12500 | 12.32 | 34.64 | 18.03 | 16.36 | 6.34 | 0.98 | 25.08 | 18.70 | 5.65 |
| 13000 | 12.08 | 34.91 | 15.44 | 17.91 | 6.67 | 1.00 | 24.57 | 18.68 | 5.79 |
| 13500 | 11.97 | 34.43 | 14.46 | 16.11 | 6.31 | 1.00 | 24.32 | 19.77 | 5.92 |
| 14000 | 11.86 | 33.88 | 13.09 | 13.19 | 5.80 | 0.98 | 24.10 | 19.66 | 6.11 |
| 14500 | 11.68 | 33.07 | 12.76 | 11.54 | 5.27 | 0.96 | 23.76 | 20.33 | 6.20 |
| 15000 | 11.71 | 32.54 | 11.96 | 10.65 | 4.81 | 0.95 | 23.65 | 19.98 | 6.25 |
| 15500 | 11.85 | 32.60 | 11.88 | 10.12 | 4.69 | 0.95 | 23.20 | 19.85 | 6.34 |
| 16000 | 11.97 | 32.64 | 11.39 | 9.93 | 4.58 | 0.95 | 22.93 | 20.38 | 6.31 |
| 16500 | 11.93 | 32.44 | 11.35 | 10.00 | 4.50 | 0.95 | 22.68 | 19.95 | 6.50 |
| 17000 | 11.87 | 32.02 | 11.06 | 9.76 | 4.28 | 0.95 | 22.58 | 20.94 | 6.41 |
| 17500 | 11.57 | 31.71 | 10.78 | 9.16 | 4.16 | 0.94 | 22.86 | 20.62 | 6.43 |
| 18000 | 11.34 | 31.54 | 10.46 | 9.04 | 4.12 | 0.95 | 22.14 | 20.95 | 6.39 |
| 18500 | 11.16 | 31.42 | 11.51 | 9.92 | 4.30 | 0.96 | 21.83 | 20.55 | 6.51 |
| 19000 | 11.16 | 31.18 | 11.19 | 12.06 | 4.33 | 1.01 | 21.71 | 19.14 | 6.40 |
| 19500 | 11.38 | 32.89 | 11.61 | 16.51 | 5.43 | 1.04 | 22.57 | 17.63 | 6.31 |
| 20000 | 10.75 | 33.60 | 11.27 | 13.25 | 6.16 | 1.02 | 23.48 | 15.95 | 6.42 |
| 20500 | 9.30 | 34.64 | 10.72 | 9.75 | 7.59 | 0.97 | 25.04 | 14.88 | 6.43 |
| 21000 | 6.51 | 32.42 | 9.78 | 8.54 | 7.56 | 0.95 | 21.58 | 13.12 | 6.69 |

Typical Performance Data

Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.00V, Idd = 121.81mA @ 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) |
| 4000 | 8.94 | 53.06 | 7.40 | 4.23 | 40.84 | 0.74 | 21.52 | 12.66 | 18.55 |
| 4500 | 14.21 | 42.05 | 9.30 | 6.13 | 8.42 | 0.83 | 25.87 | 16.68 | 11.54 |
| 5000 | 14.36 | 39.92 | 11.56 | 8.92 | 7.80 | 0.92 | 28.81 | 17.73 | 7.97 |
| 5500 | 14.73 | 38.33 | 14.59 | 11.05 | 6.80 | 0.94 | 32.01 | 18.24 | 6.08 |
| 6000 | 14.94 | 37.25 | 18.10 | 11.51 | 6.02 | 0.94 | 32.86 | 18.48 | 5.01 |
| 6500 | 14.95 | 36.64 | 19.49 | 10.83 | 5.54 | 0.92 | 32.55 | 18.99 | 4.53 |
| 7000 | 14.89 | 36.40 | 18.66 | 10.48 | 5.36 | 0.92 | 32.89 | 19.01 | 4.31 |
| 7500 | 14.78 | 36.20 | 16.94 | 10.51 | 5.26 | 0.93 | 31.88 | 19.50 | 4.12 |
| 8000 | 14.65 | 36.13 | 16.71 | 10.40 | 5.28 | 0.93 | 32.89 | 19.16 | 4.09 |
| 8500 | 14.53 | 36.04 | 17.43 | 10.47 | 5.33 | 0.92 | 32.99 | 19.13 | 4.01 |
| 9000 | 14.45 | 35.91 | 17.66 | 10.89 | 5.36 | 0.93 | 33.21 | 19.25 | 4.10 |
| 9500 | 14.32 | 36.01 | 19.95 | 11.79 | 5.65 | 0.94 | 33.84 | 18.24 | 4.17 |
| 10000 | 14.40 | 36.00 | 21.65 | 12.34 | 5.66 | 0.94 | 33.67 | 18.73 | 4.28 |
| 10500 | 14.32 | 35.81 | 20.18 | 12.42 | 5.58 | 0.95 | 32.50 | 19.86 | 4.37 |
| 11000 | 14.27 | 35.58 | 18.55 | 12.55 | 5.46 | 0.95 | 32.87 | 19.37 | 4.37 |
| 11500 | 14.27 | 35.40 | 17.81 | 12.63 | 5.35 | 0.95 | 32.29 | 19.37 | 4.37 |
| 12000 | 14.29 | 35.09 | 14.64 | 14.62 | 5.19 | 0.98 | 33.31 | 18.91 | 4.51 |
| 12500 | 14.38 | 34.41 | 13.88 | 18.30 | 4.82 | 1.01 | 34.36 | 18.23 | 4.52 |
| 13000 | 14.25 | 34.58 | 13.11 | 21.29 | 4.97 | 1.03 | 33.60 | 17.94 | 4.64 |
| 13500 | 14.24 | 34.05 | 13.78 | 15.86 | 4.63 | 1.00 | 32.74 | 18.72 | 4.72 |
| 14000 | 14.21 | 33.53 | 13.49 | 11.80 | 4.23 | 0.95 | 32.63 | 18.43 | 4.90 |
| 14500 | 14.13 | 32.64 | 15.39 | 10.21 | 3.81 | 0.90 | 31.19 | 19.12 | 4.95 |
| 15000 | 14.36 | 32.06 | 16.55 | 9.97 | 3.49 | 0.89 | 31.62 | 18.60 | 4.95 |
| 15500 | 14.80 | 31.79 | 15.62 | 10.25 | 3.23 | 0.90 | 31.31 | 18.72 | 5.00 |
| 16000 | 15.19 | 31.59 | 13.56 | 10.54 | 3.01 | 0.91 | 30.52 | 18.52 | 5.02 |
| 16500 | 15.23 | 31.25 | 12.50 | 9.61 | 2.81 | 0.89 | 32.17 | 18.87 | 5.25 |
| 17000 | 14.89 | 31.16 | 9.87 | 7.18 | 2.56 | 0.83 | 31.04 | 19.36 | 5.40 |
| 17500 | 14.33 | 31.10 | 8.62 | 5.57 | 2.35 | 0.77 | 31.68 | 18.95 | 5.40 |
| 18000 | 14.03 | 30.90 | 8.99 | 5.47 | 2.29 | 0.78 | 30.41 | 19.36 | 5.42 |
| 18500 | 14.24 | 30.26 | 10.78 | 6.66 | 2.26 | 0.85 | 29.84 | 19.16 | 5.20 |
| 19000 | 14.66 | 29.46 | 11.44 | 9.38 | 2.26 | 0.95 | 29.29 | 18.28 | 5.01 |
| 19500 | 15.26 | 30.35 | 10.70 | 15.15 | 2.62 | 1.02 | 29.17 | 16.72 | 4.74 |
| 20000 | 15.07 | 31.32 | 14.00 | 12.12 | 3.05 | 0.94 | 26.76 | 14.77 | 4.94 |
| 20500 | 13.45 | 33.19 | 12.39 | 8.01 | 3.96 | 0.87 | 25.52 | 13.55 | 5.01 |
| 21000 | 11.04 | 33.26 | 8.49 | 8.46 | 4.81 | 0.97 | 21.28 | 12.39 | 5.37 |

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, Idd = 120.76mA @ 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) |
| 4000 | 9.30 | 53.59 | 7.44 | 4.32 | 42.31 | 0.74 | 20.61 | 12.26 | 18.55 |
| 4500 | 14.82 | 41.79 | 9.31 | 6.15 | 7.64 | 0.83 | 24.54 | 15.86 | 11.57 |
| 5000 | 14.81 | 39.86 | 11.52 | 8.93 | 7.37 | 0.92 | 26.12 | 16.87 | 7.97 |
| 5500 | 15.13 | 38.33 | 14.54 | 11.08 | 6.51 | 0.94 | 28.61 | 17.39 | 6.08 |
| 6000 | 15.31 | 37.29 | 18.06 | 11.56 | 5.80 | 0.94 | 29.20 | 17.65 | 5.03 |
| 6500 | 15.32 | 36.69 | 19.65 | 10.88 | 5.35 | 0.92 | 29.10 | 18.14 | 4.53 |
| 7000 | 15.26 | 36.44 | 19.01 | 10.54 | 5.18 | 0.92 | 29.11 | 18.17 | 4.32 |
| 7500 | 15.14 | 36.24 | 17.25 | 10.55 | 5.09 | 0.93 | 28.52 | 18.65 | 4.13 |
| 8000 | 15.01 | 36.16 | 16.92 | 10.41 | 5.10 | 0.93 | 28.94 | 18.32 | 4.08 |
| 8500 | 14.89 | 36.07 | 17.54 | 10.46 | 5.14 | 0.92 | 29.03 | 18.30 | 4.00 |
| 9000 | 14.80 | 35.92 | 17.61 | 10.89 | 5.16 | 0.93 | 29.08 | 18.43 | 4.11 |
| 9500 | 14.71 | 36.00 | 19.54 | 11.81 | 5.39 | 0.94 | 29.25 | 17.42 | 4.17 |
| 10000 | 14.74 | 36.01 | 21.07 | 12.38 | 5.45 | 0.94 | 29.03 | 17.78 | 4.27 |
| 10500 | 14.67 | 35.82 | 19.59 | 12.44 | 5.37 | 0.95 | 28.70 | 18.89 | 4.36 |
| 11000 | 14.61 | 35.58 | 17.80 | 12.54 | 5.25 | 0.95 | 28.85 | 18.49 | 4.39 |
| 11500 | 14.62 | 35.39 | 16.94 | 12.60 | 5.13 | 0.95 | 28.44 | 18.51 | 4.43 |
| 12000 | 14.65 | 35.07 | 14.02 | 14.58 | 4.95 | 0.99 | 28.75 | 18.08 | 4.53 |
| 12500 | 14.75 | 34.38 | 13.37 | 18.37 | 4.58 | 1.01 | 29.06 | 17.41 | 4.52 |
| 13000 | 14.63 | 34.52 | 12.82 | 21.51 | 4.71 | 1.03 | 28.66 | 17.10 | 4.65 |
| 13500 | 14.64 | 33.99 | 13.55 | 15.85 | 4.39 | 1.00 | 28.45 | 17.83 | 4.75 |
| 14000 | 14.60 | 33.46 | 13.55 | 11.75 | 4.01 | 0.95 | 28.44 | 17.51 | 4.90 |
| 14500 | 14.51 | 32.55 | 15.67 | 10.17 | 3.62 | 0.90 | 28.08 | 18.38 | 4.94 |
| 15000 | 14.78 | 32.00 | 16.98 | 9.92 | 3.31 | 0.88 | 28.59 | 17.69 | 4.98 |
| 15500 | 15.27 | 31.70 | 16.12 | 10.23 | 3.05 | 0.89 | 28.53 | 17.68 | 5.03 |
| 16000 | 15.71 | 31.44 | 14.14 | 10.44 | 2.82 | 0.90 | 28.25 | 17.31 | 5.07 |
| 16500 | 15.79 | 31.04 | 13.29 | 9.38 | 2.60 | 0.87 | 28.39 | 17.88 | 5.29 |
| 17000 | 15.50 | 30.92 | 10.54 | 6.83 | 2.34 | 0.79 | 28.06 | 18.19 | 5.40 |
| 17500 | 14.97 | 30.83 | 9.22 | 5.18 | 2.12 | 0.71 | 28.58 | 17.84 | 5.44 |
| 18000 | 14.69 | 30.60 | 9.69 | 5.09 | 2.05 | 0.72 | 28.29 | 18.14 | 5.42 |
| 18500 | 14.97 | 29.89 | 11.68 | 6.33 | 2.00 | 0.82 | 28.02 | 17.83 | 5.21 |
| 19000 | 15.41 | 29.01 | 11.91 | 9.22 | 1.99 | 0.93 | 28.35 | 17.03 | 5.03 |
| 19500 | 16.15 | 29.64 | 9.99 | 16.18 | 2.19 | 1.02 | 26.43 | 15.28 | 4.78 |
| 20000 | 15.98 | 30.76 | 12.99 | 12.64 | 2.61 | 0.94 | 23.92 | 13.90 | 4.93 |
| 20500 | 14.50 | 32.89 | 13.18 | 7.85 | 3.43 | 0.84 | 22.54 | 12.51 | 4.99 |
| 21000 | 12.14 | 33.28 | 9.10 | 8.22 | 4.34 | 0.94 | 20.25 | 11.72 | 5.35 |

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, Idd = 123.78mA @ 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) |
| 4000 | 8.46 | 52.51 | 7.32 | 4.10 | 39.76 | 0.72 | 22.18 | 13.10 | 18.54 |
| 4500 | 13.52 | 42.35 | 9.28 | 6.11 | 9.40 | 0.83 | 28.24 | 17.30 | 11.56 |
| 5000 | 13.86 | 40.01 | 11.61 | 8.89 | 8.34 | 0.92 | 32.75 | 18.45 | 7.99 |
| 5500 | 14.29 | 38.34 | 14.68 | 10.95 | 7.15 | 0.94 | 37.48 | 18.95 | 6.12 |
| 6000 | 14.52 | 37.23 | 18.10 | 11.37 | 6.28 | 0.93 | 35.51 | 19.21 | 5.02 |
| 6500 | 14.55 | 36.60 | 19.17 | 10.70 | 5.75 | 0.92 | 36.55 | 19.71 | 4.55 |
| 7000 | 14.49 | 36.32 | 18.18 | 10.37 | 5.54 | 0.92 | 36.12 | 19.76 | 4.34 |
| 7500 | 14.37 | 36.11 | 16.56 | 10.37 | 5.43 | 0.93 | 40.07 | 20.19 | 4.16 |
| 8000 | 14.24 | 36.05 | 16.49 | 10.22 | 5.45 | 0.92 | 36.31 | 19.85 | 4.10 |
| 8500 | 14.12 | 36.00 | 17.30 | 10.29 | 5.53 | 0.92 | 35.93 | 19.86 | 4.00 |
| 9000 | 14.03 | 35.86 | 17.79 | 10.72 | 5.58 | 0.93 | 35.34 | 19.98 | 4.12 |
| 9500 | 13.93 | 35.95 | 20.35 | 11.64 | 5.85 | 0.94 | 33.57 | 19.04 | 4.19 |
| 10000 | 13.98 | 35.99 | 22.44 | 12.19 | 5.92 | 0.94 | 33.49 | 19.59 | 4.27 |
| 10500 | 13.90 | 35.82 | 21.20 | 12.24 | 5.86 | 0.94 | 35.79 | 20.62 | 4.35 |
| 11000 | 13.84 | 35.62 | 19.81 | 12.34 | 5.76 | 0.94 | 34.93 | 20.07 | 4.42 |
| 11500 | 13.83 | 35.46 | 19.17 | 12.45 | 5.68 | 0.94 | 34.75 | 20.06 | 4.42 |
| 12000 | 13.85 | 35.11 | 15.65 | 14.47 | 5.50 | 0.98 | 33.49 | 19.70 | 4.52 |
| 12500 | 13.92 | 34.44 | 14.55 | 18.51 | 5.12 | 1.01 | 32.30 | 19.08 | 4.53 |
| 13000 | 13.76 | 34.65 | 13.41 | 21.06 | 5.30 | 1.03 | 31.79 | 18.78 | 4.68 |
| 13500 | 13.72 | 34.14 | 13.83 | 15.44 | 4.96 | 1.00 | 31.54 | 19.49 | 4.74 |
| 14000 | 13.65 | 33.65 | 13.12 | 11.55 | 4.53 | 0.95 | 30.85 | 19.26 | 4.88 |
| 14500 | 13.52 | 32.75 | 14.64 | 10.06 | 4.09 | 0.91 | 30.12 | 20.00 | 4.94 |
| 15000 | 13.77 | 32.18 | 15.70 | 9.92 | 3.74 | 0.90 | 29.45 | 19.53 | 4.93 |
| 15500 | 14.20 | 31.91 | 14.75 | 10.48 | 3.49 | 0.91 | 28.41 | 19.66 | 4.98 |
| 16000 | 14.51 | 31.78 | 12.79 | 10.97 | 3.31 | 0.93 | 27.68 | 19.63 | 5.05 |
| 16500 | 14.48 | 31.52 | 11.55 | 9.90 | 3.12 | 0.92 | 27.70 | 19.86 | 5.22 |
| 17000 | 14.02 | 31.56 | 9.10 | 7.30 | 2.89 | 0.86 | 27.74 | 20.24 | 5.36 |
| 17500 | 13.40 | 31.54 | 8.00 | 5.70 | 2.66 | 0.80 | 27.96 | 19.80 | 5.39 |
| 18000 | 13.07 | 31.38 | 8.34 | 5.61 | 2.62 | 0.81 | 27.00 | 20.18 | 5.37 |
| 18500 | 13.28 | 30.76 | 10.05 | 6.72 | 2.62 | 0.87 | 26.46 | 19.98 | 5.19 |
| 19000 | 13.70 | 30.01 | 11.00 | 9.16 | 2.62 | 0.95 | 25.96 | 19.27 | 4.99 |
| 19500 | 14.22 | 30.99 | 11.39 | 13.92 | 3.15 | 1.01 | 26.01 | 17.62 | 4.73 |
| 20000 | 13.91 | 32.10 | 14.67 | 11.59 | 3.75 | 0.94 | 27.61 | 15.80 | 4.87 |
| 20500 | 12.29 | 33.71 | 11.74 | 8.25 | 4.74 | 0.89 | 27.14 | 14.41 | 5.00 |
| 21000 | 9.89 | 33.06 | 8.01 | 9.23 | 5.36 | 1.02 | 22.29 | 13.34 | 5.40 |

Typical Performance Data

Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

TEST CONDITIONS: Vd = 5.00V, Idd = 127.39mA @ 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) |
| 4000 | 6.83 | 50.05 | 7.49 | 4.37 | 37.97 | 0.74 | 22.26 | 13.54 | 20.00 |
| 4500 | 10.58 | 43.10 | 9.26 | 6.72 | 14.82 | 0.87 | 30.09 | 16.86 | 13.59 |
| 5000 | 11.66 | 40.18 | 12.22 | 9.63 | 11.26 | 0.94 | 30.25 | 17.31 | 9.97 |
| 5500 | 12.36 | 38.27 | 16.36 | 11.76 | 9.05 | 0.95 | 29.56 | 18.12 | 8.04 |
| 6000 | 12.63 | 37.08 | 18.33 | 11.86 | 7.71 | 0.95 | 29.59 | 18.21 | 7.00 |
| 6500 | 12.63 | 36.48 | 17.01 | 10.98 | 7.03 | 0.94 | 29.32 | 18.84 | 6.51 |
| 7000 | 12.51 | 36.23 | 15.94 | 10.34 | 6.78 | 0.93 | 28.94 | 18.79 | 6.28 |
| 7500 | 12.39 | 36.05 | 16.20 | 10.15 | 6.72 | 0.93 | 28.81 | 19.73 | 6.04 |
| 8000 | 12.29 | 35.94 | 16.88 | 10.57 | 6.81 | 0.93 | 28.35 | 19.53 | 6.01 |
| 8500 | 12.19 | 35.86 | 17.66 | 11.37 | 6.96 | 0.94 | 28.09 | 18.93 | 5.97 |
| 9000 | 12.10 | 35.70 | 19.64 | 11.86 | 7.01 | 0.94 | 27.95 | 18.51 | 6.05 |
| 9500 | 11.90 | 35.90 | 21.37 | 11.84 | 7.37 | 0.94 | 27.37 | 18.37 | 6.17 |
| 10000 | 11.81 | 36.01 | 23.02 | 11.82 | 7.56 | 0.94 | 27.17 | 18.86 | 6.32 |
| 10500 | 11.74 | 35.83 | 27.26 | 12.41 | 7.56 | 0.94 | 27.13 | 19.39 | 6.37 |
| 11000 | 11.70 | 35.62 | 30.27 | 13.75 | 7.55 | 0.95 | 26.53 | 18.94 | 6.43 |
| 11500 | 11.68 | 35.31 | 26.66 | 15.71 | 7.41 | 0.97 | 26.04 | 18.62 | 6.48 |
| 12000 | 11.58 | 35.07 | 20.99 | 16.90 | 7.31 | 0.98 | 26.13 | 17.81 | 6.65 |
| 12500 | 11.42 | 34.74 | 19.06 | 15.71 | 7.09 | 0.98 | 25.87 | 17.86 | 6.66 |
| 13000 | 11.14 | 34.99 | 18.09 | 14.61 | 7.45 | 0.97 | 25.24 | 18.17 | 6.77 |
| 13500 | 11.08 | 34.43 | 16.76 | 14.00 | 6.98 | 0.97 | 24.96 | 18.68 | 6.89 |
| 14000 | 11.04 | 33.78 | 15.63 | 13.78 | 6.46 | 0.97 | 24.77 | 19.28 | 7.03 |
| 14500 | 11.00 | 32.89 | 15.02 | 14.50 | 5.87 | 0.98 | 24.38 | 19.24 | 7.15 |
| 15000 | 10.98 | 32.51 | 12.34 | 13.85 | 5.46 | 1.00 | 24.26 | 19.51 | 7.32 |
| 15500 | 10.86 | 32.62 | 10.67 | 11.27 | 5.28 | 0.99 | 24.21 | 19.08 | 7.47 |
| 16000 | 10.63 | 33.10 | 9.49 | 8.97 | 5.27 | 0.95 | 23.74 | 19.07 | 7.55 |
| 16500 | 10.25 | 33.22 | 9.47 | 7.44 | 5.21 | 0.90 | 23.61 | 18.77 | 7.70 |
| 17000 | 9.95 | 33.11 | 9.24 | 6.66 | 5.00 | 0.87 | 23.59 | 19.05 | 7.67 |
| 17500 | 9.84 | 32.66 | 10.31 | 6.93 | 4.96 | 0.88 | 23.43 | 19.81 | 7.58 |
| 18000 | 10.13 | 32.06 | 12.01 | 8.30 | 4.94 | 0.91 | 22.86 | 19.96 | 7.47 |
| 18500 | 10.33 | 31.53 | 14.04 | 10.75 | 5.03 | 0.95 | 22.69 | 19.69 | 7.39 |
| 19000 | 10.48 | 31.31 | 15.30 | 15.44 | 5.21 | 1.00 | 23.19 | 18.57 | 7.38 |
| 19500 | 10.20 | 33.24 | 13.40 | 21.74 | 6.76 | 1.03 | 24.95 | 16.68 | 7.45 |
| 20000 | 9.46 | 34.09 | 9.71 | 16.99 | 7.51 | 1.08 | 26.58 | 15.57 | 7.81 |
| 20500 | 7.71 | 35.47 | 7.85 | 15.70 | 9.95 | 1.13 | 23.34 | 13.88 | 8.00 |
| 21000 | 4.68 | 31.97 | 7.55 | 12.21 | 8.91 | 1.11 | 25.76 | 12.34 | 8.33 |

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, Idd = 127.14mA @ 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) |
| 4000 | 6.99 | 50.08 | 7.51 | 4.42 | 37.73 | 0.75 | 21.93 | 13.25 | 19.96 |
| 4500 | 10.75 | 42.92 | 9.28 | 6.76 | 14.30 | 0.87 | 34.89 | 16.38 | 13.56 |
| 5000 | 11.79 | 40.06 | 12.23 | 9.72 | 10.98 | 0.94 | 33.97 | 16.71 | 9.99 |
| 5500 | 12.48 | 38.19 | 16.40 | 11.98 | 8.88 | 0.95 | 30.87 | 17.53 | 8.00 |
| 6000 | 12.74 | 37.02 | 18.42 | 12.17 | 7.61 | 0.95 | 30.57 | 17.64 | 6.95 |
| 6500 | 12.73 | 36.43 | 17.12 | 11.28 | 6.96 | 0.94 | 29.84 | 18.26 | 6.48 |
| 7000 | 12.62 | 36.18 | 16.03 | 10.63 | 6.71 | 0.94 | 29.34 | 18.20 | 6.25 |
| 7500 | 12.49 | 36.00 | 16.29 | 10.43 | 6.65 | 0.93 | 28.98 | 19.18 | 6.03 |
| 8000 | 12.39 | 35.89 | 16.96 | 10.87 | 6.73 | 0.94 | 28.54 | 18.96 | 5.97 |
| 8500 | 12.30 | 35.80 | 17.73 | 11.71 | 6.87 | 0.95 | 28.35 | 18.34 | 5.92 |
| 9000 | 12.22 | 35.63 | 19.71 | 12.23 | 6.91 | 0.95 | 28.22 | 17.91 | 6.03 |
| 9500 | 12.01 | 35.84 | 21.38 | 12.19 | 7.26 | 0.94 | 27.72 | 17.79 | 6.15 |
| 10000 | 11.94 | 35.93 | 22.82 | 12.17 | 7.42 | 0.94 | 27.47 | 18.26 | 6.23 |
| 10500 | 11.87 | 35.73 | 26.45 | 12.77 | 7.41 | 0.95 | 27.33 | 18.78 | 6.33 |
| 11000 | 11.83 | 35.50 | 29.21 | 14.18 | 7.37 | 0.96 | 26.76 | 18.32 | 6.38 |
| 11500 | 11.81 | 35.20 | 26.37 | 16.26 | 7.24 | 0.97 | 26.26 | 18.00 | 6.45 |
| 12000 | 11.72 | 34.95 | 21.09 | 17.45 | 7.11 | 0.98 | 26.53 | 17.20 | 6.62 |
| 12500 | 11.57 | 34.61 | 19.29 | 16.02 | 6.89 | 0.98 | 26.20 | 17.25 | 6.61 |
| 13000 | 11.31 | 34.85 | 18.35 | 14.79 | 7.22 | 0.97 | 25.52 | 17.57 | 6.71 |
| 13500 | 11.25 | 34.29 | 17.00 | 14.18 | 6.75 | 0.97 | 25.16 | 18.10 | 6.84 |
| 14000 | 11.22 | 33.65 | 15.93 | 13.98 | 6.25 | 0.97 | 24.91 | 18.73 | 7.01 |
| 14500 | 11.20 | 32.77 | 15.34 | 14.72 | 5.68 | 0.98 | 24.58 | 18.69 | 7.09 |
| 15000 | 11.20 | 32.38 | 12.60 | 13.98 | 5.28 | 1.00 | 24.47 | 19.00 | 7.24 |
| 15500 | 11.09 | 32.48 | 10.87 | 11.29 | 5.09 | 0.98 | 24.56 | 18.57 | 7.41 |
| 16000 | 10.88 | 32.93 | 9.63 | 8.97 | 5.05 | 0.95 | 24.04 | 18.59 | 7.50 |
| 16500 | 10.51 | 33.05 | 9.60 | 7.44 | 4.99 | 0.90 | 23.92 | 18.27 | 7.62 |
| 17000 | 10.23 | 32.93 | 9.34 | 6.69 | 4.78 | 0.87 | 23.82 | 18.62 | 7.60 |
| 17500 | 10.12 | 32.48 | 10.41 | 7.02 | 4.75 | 0.88 | 23.53 | 19.40 | 7.53 |
| 18000 | 10.41 | 31.88 | 12.08 | 8.49 | 4.72 | 0.92 | 22.95 | 19.50 | 7.40 |
| 18500 | 10.61 | 31.35 | 14.07 | 11.10 | 4.82 | 0.96 | 22.88 | 19.14 | 7.35 |
| 19000 | 10.74 | 31.17 | 15.30 | 16.02 | 5.00 | 1.00 | 23.95 | 17.93 | 7.30 |
| 19500 | 10.43 | 33.16 | 13.45 | 20.85 | 6.53 | 1.03 | 27.51 | 16.03 | 7.39 |
| 20000 | 9.66 | 34.13 | 9.70 | 16.10 | 7.34 | 1.07 | 27.87 | 14.89 | 7.71 |
| 20500 | 7.88 | 35.57 | 7.81 | 15.19 | 9.83 | 1.13 | 21.62 | 13.19 | 7.99 |
| 21000 | 4.86 | 32.08 | 7.51 | 12.20 | 8.82 | 1.11 | 22.96 | 11.71 | 8.32 |

Typical Performance Data

Definitions:

Input Return Loss = -S11 (dB)

Gain(Power Gain) = S21 (dB)

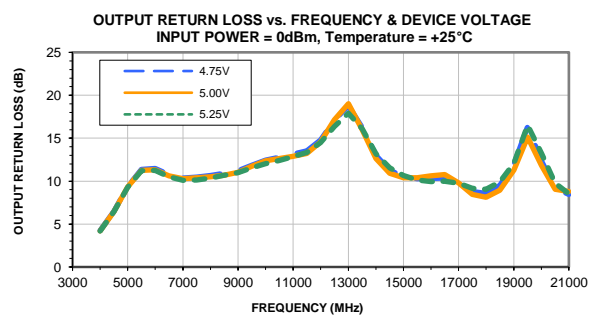
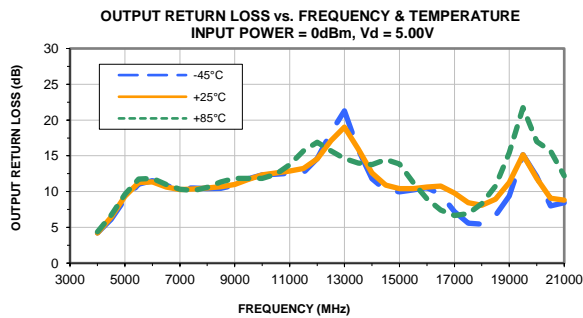
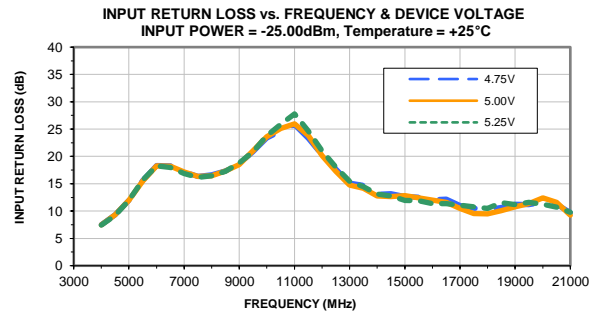
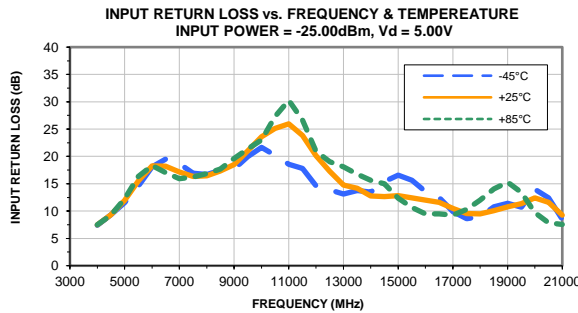
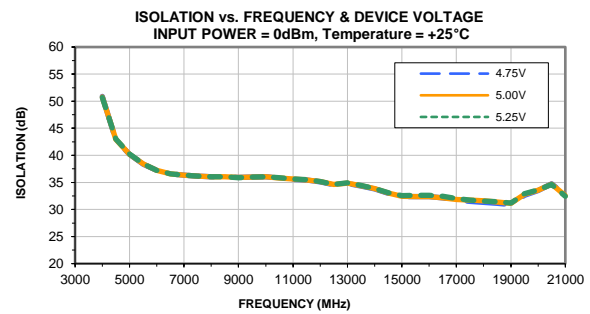
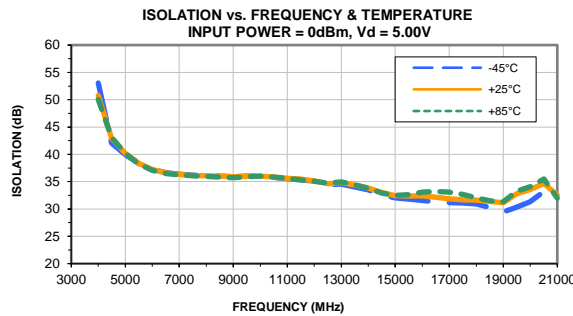
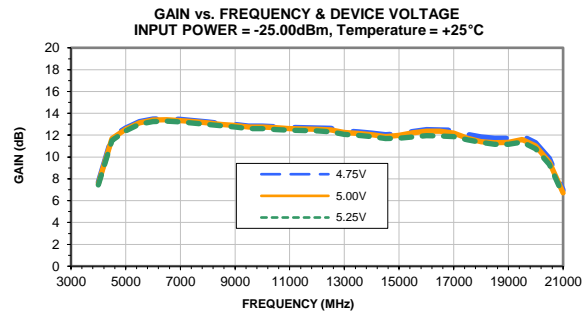
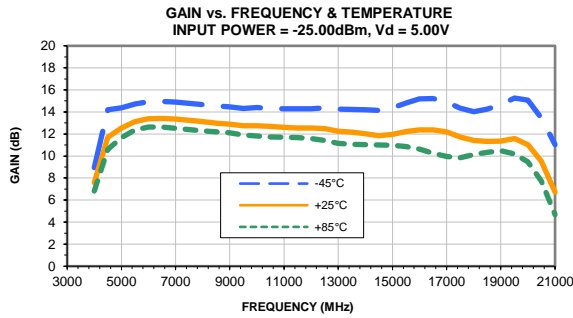
Reverse Isolation = -S12 (dB)

Output Return Loss = -S22 (dB)

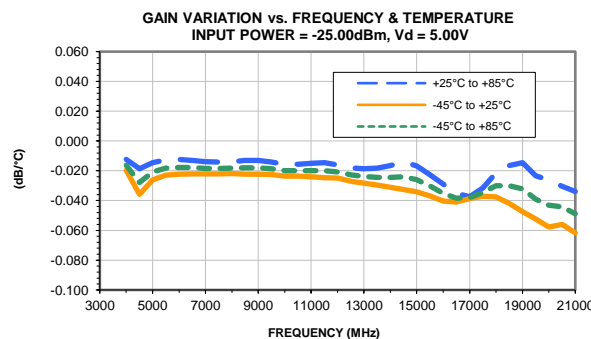
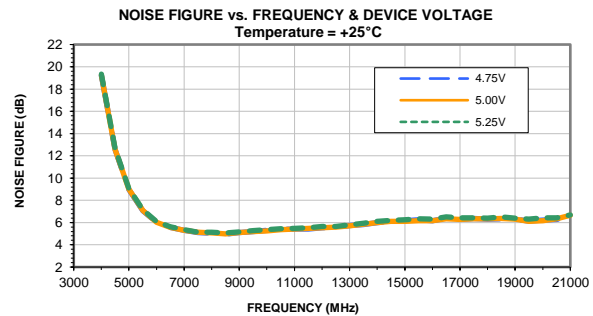
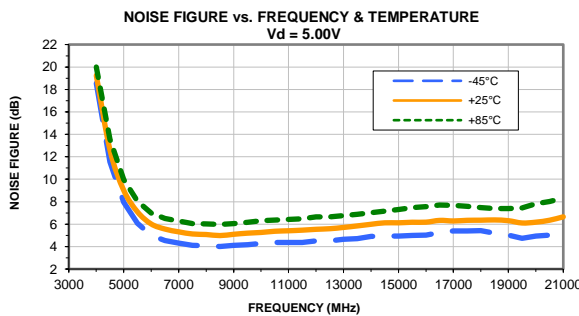
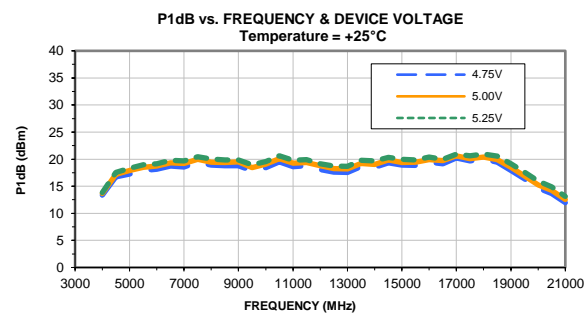
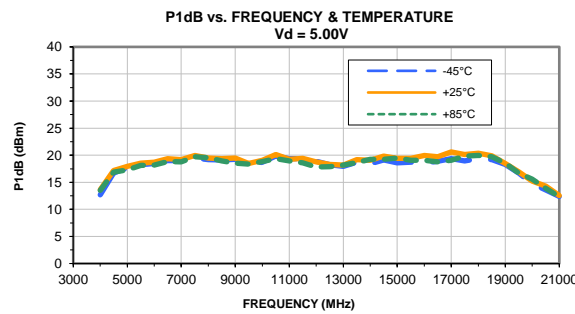
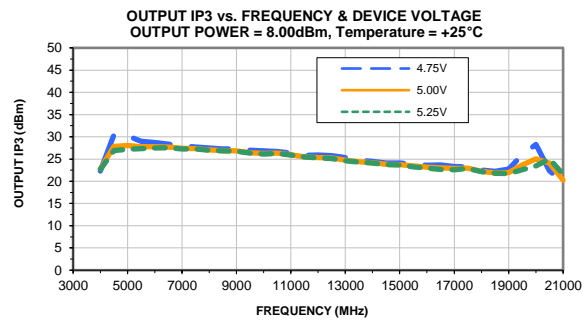
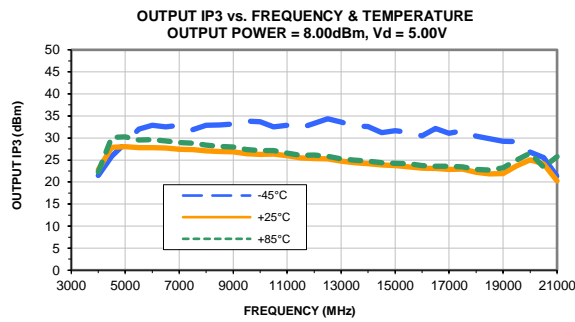
TEST CONDITIONS: Vd = 5.25V, Idd = 127.61mA @ Temperature = +85°C

| 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) |
| 4000 | 6.67 | 49.97 | 7.46 | 4.33 | 38.12 | 0.74 | 22.27 | 13.74 | 20.08 |
| 4500 | 10.39 | 43.26 | 9.24 | 6.69 | 15.40 | 0.87 | 28.85 | 17.25 | 13.63 |
| 5000 | 11.51 | 40.29 | 12.21 | 9.55 | 11.58 | 0.94 | 29.17 | 17.82 | 10.02 |
| 5500 | 12.23 | 38.34 | 16.34 | 11.54 | 9.23 | 0.95 | 29.13 | 18.62 | 8.08 |
| 6000 | 12.50 | 37.13 | 18.20 | 11.56 | 7.83 | 0.94 | 29.30 | 18.72 | 7.02 |
| 6500 | 12.50 | 36.52 | 16.84 | 10.68 | 7.12 | 0.93 | 29.21 | 19.35 | 6.58 |
| 7000 | 12.38 | 36.26 | 15.78 | 10.06 | 6.86 | 0.93 | 28.85 | 19.30 | 6.31 |
| 7500 | 12.25 | 36.08 | 16.07 | 9.87 | 6.80 | 0.92 | 28.87 | 20.18 | 6.10 |
| 8000 | 12.15 | 35.97 | 16.77 | 10.28 | 6.89 | 0.93 | 28.37 | 20.01 | 6.06 |
| 8500 | 12.05 | 35.90 | 17.56 | 11.05 | 7.06 | 0.94 | 28.11 | 19.45 | 6.03 |
| 9000 | 11.96 | 35.73 | 19.57 | 11.52 | 7.11 | 0.94 | 27.94 | 19.03 | 6.10 |
| 9500 | 11.75 | 35.97 | 21.30 | 11.49 | 7.51 | 0.93 | 27.32 | 18.89 | 6.23 |
| 10000 | 11.66 | 36.07 | 23.10 | 11.47 | 7.69 | 0.93 | 27.11 | 19.37 | 6.34 |
| 10500 | 11.58 | 35.91 | 28.11 | 12.02 | 7.73 | 0.93 | 27.14 | 19.90 | 6.45 |
| 11000 | 11.53 | 35.70 | 31.60 | 13.31 | 7.73 | 0.95 | 26.51 | 19.47 | 6.52 |
| 11500 | 11.51 | 35.40 | 27.05 | 15.18 | 7.61 | 0.97 | 26.02 | 19.15 | 6.58 |
| 12000 | 11.39 | 35.16 | 20.82 | 16.38 | 7.52 | 0.98 | 26.01 | 18.36 | 6.68 |
| 12500 | 11.22 | 34.84 | 18.82 | 15.34 | 7.32 | 0.98 | 25.81 | 18.42 | 6.72 |
| 13000 | 10.94 | 35.11 | 17.86 | 14.33 | 7.72 | 0.97 | 25.20 | 18.70 | 6.84 |
| 13500 | 10.86 | 34.56 | 16.56 | 13.68 | 7.23 | 0.97 | 24.96 | 19.20 | 6.94 |
| 14000 | 10.80 | 33.91 | 15.39 | 13.46 | 6.69 | 0.97 | 24.79 | 19.76 | 7.11 |
| 14500 | 10.76 | 33.00 | 14.78 | 14.21 | 6.09 | 0.98 | 24.36 | 19.70 | 7.22 |
| 15000 | 10.73 | 32.63 | 12.13 | 13.73 | 5.67 | 1.00 | 24.24 | 19.93 | 7.38 |
| 15500 | 10.59 | 32.73 | 10.50 | 11.27 | 5.50 | 0.99 | 24.07 | 19.53 | 7.55 |
| 16000 | 10.34 | 33.25 | 9.36 | 8.97 | 5.51 | 0.96 | 23.62 | 19.49 | 7.62 |
| 16500 | 9.94 | 33.38 | 9.35 | 7.40 | 5.46 | 0.90 | 23.50 | 19.22 | 7.77 |
| 17000 | 9.63 | 33.29 | 9.13 | 6.56 | 5.25 | 0.87 | 23.55 | 19.42 | 7.72 |
| 17500 | 9.50 | 32.85 | 10.21 | 6.77 | 5.21 | 0.87 | 23.44 | 20.15 | 7.66 |
| 18000 | 9.79 | 32.24 | 11.95 | 8.02 | 5.17 | 0.90 | 22.87 | 20.33 | 7.56 |
| 18500 | 10.02 | 31.69 | 14.07 | 10.32 | 5.26 | 0.95 | 22.69 | 20.17 | 7.50 |
| 19000 | 10.20 | 31.47 | 15.39 | 14.74 | 5.44 | 0.99 | 22.91 | 19.13 | 7.42 |
| 19500 | 9.96 | 33.32 | 13.44 | 21.92 | 7.02 | 1.03 | 23.84 | 17.27 | 7.48 |
| 20000 | 9.23 | 34.06 | 9.70 | 17.66 | 7.70 | 1.08 | 24.70 | 16.16 | 7.85 |
| 20500 | 7.49 | 35.34 | 7.83 | 16.20 | 10.08 | 1.14 | 24.69 | 14.43 | 8.09 |
| 21000 | 4.45 | 31.90 | 7.51 | 12.49 | 9.09 | 1.12 | 23.66 | 12.92 | 8.41 |

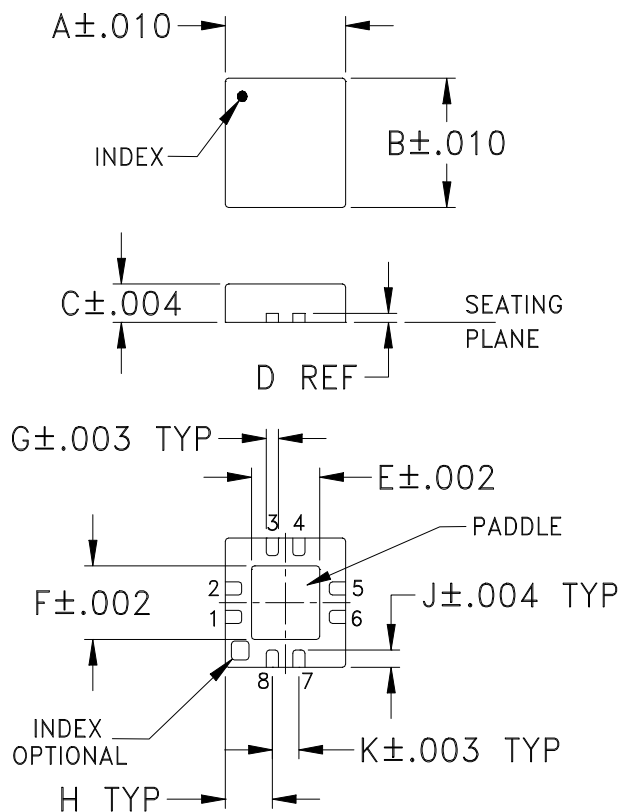
Typical Performance Curves



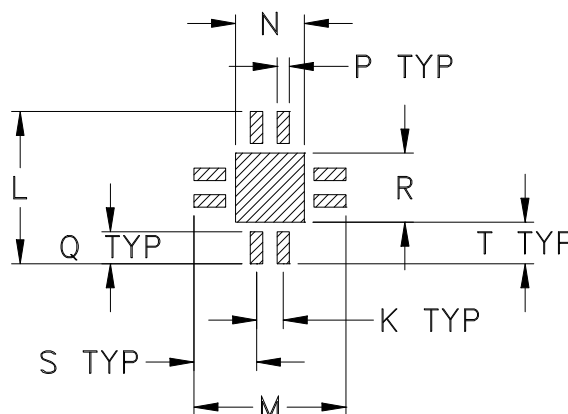
Typical Performance Curves



Outline Dimensions



PCB Land Pattern



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

| CASE # | A | B | C | D | E | F | G | H | J | K | L | M | N |
|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| DQ849 | .118 (3.00) | .118 (3.00) | .035 (0.89) | .008 (0.20) | .067 (1.70) | .067 (1.70) | .012 (0.30) | .046 (1.17) | .016 (0.41) | .026 (0.66) | .148 (3.76) | .148 (3.76) | .067 (1.70) |

| CASE # | P | Q | R | S | T | WT. GRAM |
|--------|----------------|----------------|----------------|----------------|----------------|----------|
| DQ849 | .012 (0.30) | .031 (0.79) | .067 (1.70) | .061 (1.55) | .041 (1.04) | .02 |

Dimensions are in inches (mm). Tolerances: 2Pl. $\pm.01$; 3 Pl. $\pm.004$

Notes:

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



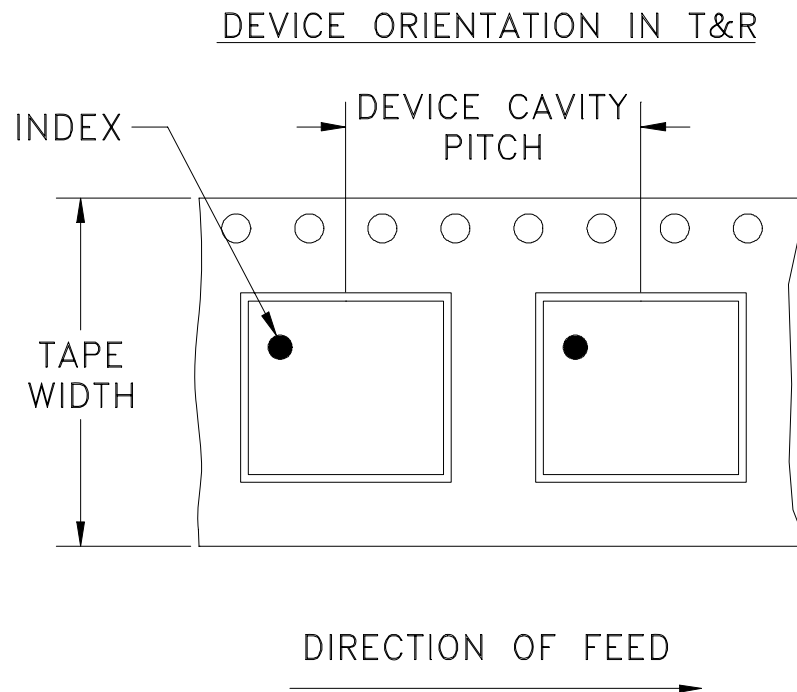
INTERNET <http://www.minicircuits.com>

P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661

Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010

Mini-Circuits ISO 9001 & ISO 14001 Certified

Tape & Reel Packaging TR-F104



| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel | |
|----------------|-------------------------|-------------------|-------------------------------------|------|
| 8 | 4 | 7 | Small quantity standards (see note) | 20 |
| | | | | 50 |
| | | | | 100 |
| | | | | 200 |
| | | | | 500 |
| | | | | 1000 |
| | | 7 | Standard | 2000 |

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

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

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

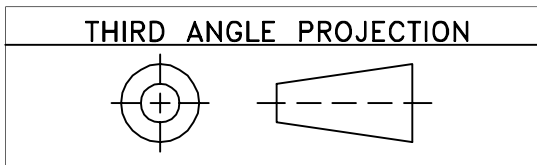
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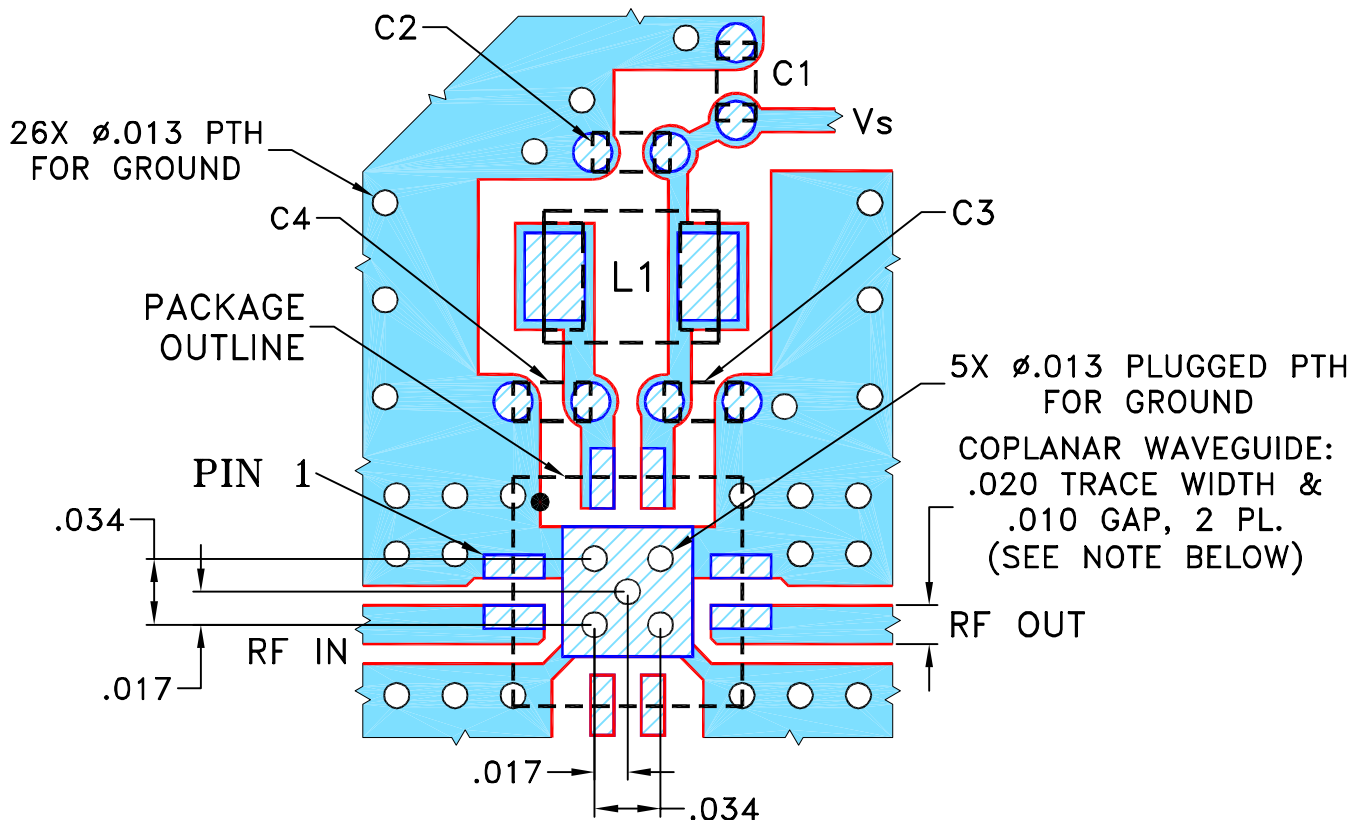
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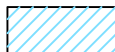
| REVISIONS | | | | | |
|-----------|---------|------------------------------|----------|-----|------|
| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
| OR | M125952 | NEW RELEASE | 01/08/10 | MMG | RD |
| A | M132664 | UPDATED PATTERN & COMPONENTS | 12/16/11 | PW | DJ |
| B | M135298 | UPDATED DESCRIPTION & NOTE 2 | 01/11/12 | AV | DJ |

**SUGGESTED MOUNTING CONFIGURATION FOR
DQ849 CASE STYLE, "08AM03" PIN CODE**



- NOTES: 1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010" ± .001"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. 0402 AND 0805 CHIP COMPONENTS FOOTPRINTS ARE SHOWN FOR REFERENCE. VALUE OF COMPONENTS AS PER TB-547-X+.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

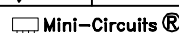
 DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER)

 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

| UNLESS OTHERWISE SPECIFIED | INITIALS | DATE |
|----------------------------|-------------|----------|
| DIMENSIONS ARE IN INCHES | DRAWN MMG | 01/06/10 |
| TOLERANCES ON: | CHECKED IL | 01/08/10 |
| 2 PL DECIMALS ± | APPROVED RD | 01/08/10 |
| 3 PL DECIMALS ± .005 | | |
| ANGLES ± | | |
| FRACTIONS ± | | |

 **Mini-Circuits®** 13 Neptune Avenue
Brooklyn NY 11235

PL, 08AM03, DQ849, TB-547-X+

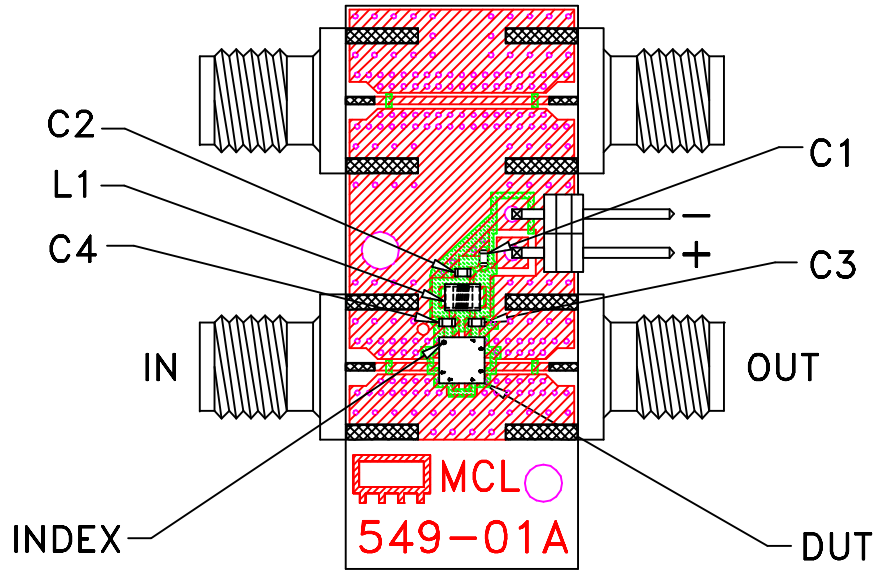
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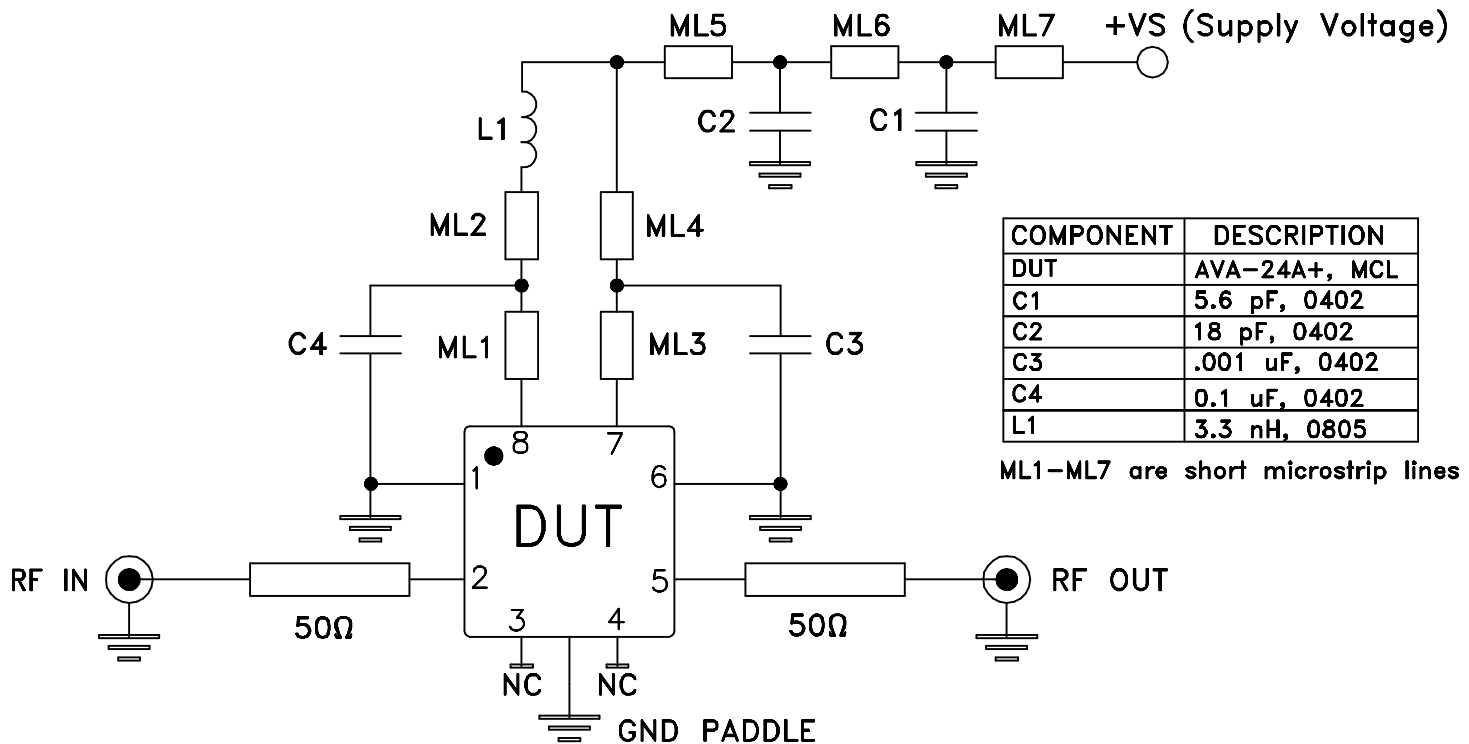
ASHEETA1.DWG REV:A DATE:01/12/95

| SIZE | CODE IDENT | DRAWING NO: | REV: |
|-------|------------|-------------|---------------|
| A | 15542 | 98-PL-328 | B |
| FILE: | 98PL328 | SCALE: 10:1 | SHEET: 1 OF 1 |

Evaluation Board and Circuit



TB-547-1A+



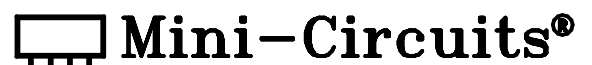
| COMPONENT | DESCRIPTION |
|-----------|---------------|
| DUT | AVA-24A+, MCL |
| C1 | 5.6 pF, 0402 |
| C2 | 18 pF, 0402 |
| C3 | .001 uF, 0402 |
| C4 | 0.1 uF, 0402 |
| L1 | 3.3 nH, 0805 |

ML1-ML7 are short microstrip lines

Schematic Diagram

NOTES:

1. SMA Female connectors.
2. PCB material: Rogers R04350 or equivalent, dielectric constant=3.5, dielectric thickness=.010 inch.



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



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