



Mini-Circuits

HIGH DIRECTIVITY

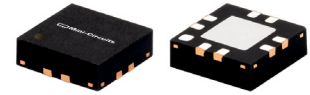
# Monolithic Amplifier

**MNA-5W+**

50Ω 0.5 to 4.5 GHz

## THE BIG DEAL

- Integrated matching, DC Blocks and bias circuits
- Excellent Active Directivity, 17-23 dB typ.
- Choice of supply voltage, +2.8V to +5V
- Micro-miniature size .120"X.120"
- Low noise figure, 3.1 dB typ. at 2 GHz
- Output power, up to +14 dBm typ.
- Aqueous washable



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

- Buffer amplifier
- Cellular infrastructure
- Communications satellite
- Defense

## PRODUCT OVERVIEW

MNA-5W+ is a wideband PHEMT based MMIC amplifier with high active Directivity. MNA integrates the entire matching network and majority of the bias circuit inside the package, reducing the need for complicated external circuits. This approach makes the MNA amplifier extremely straightforward to use. This design operates on a single 2.8 to 5V supply, is well matched for 50Ω and comes in a tiny, low profile 3x3mm 8-lead MCLP package accommodating dense circuit board layouts. [MNA-5W+ belongs to MNA series of models available in Die and packaged form.](#)

## KEY FEATURES

| Feature                                                       | Advantages                                                                                                                                    |
|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Excellent Active Directivity<br>(Isolation- Gain)<br>17-23 dB | Ideal for use as a buffer amplifier minimizing interaction of adjacent circuits                                                               |
| Integrates DC blocks and RF choke                             | Minimizes external components, component count and circuit area.                                                                              |
| Single +2.8 to +5V operation                                  | Amplifier can be used at low voltage such as +3V or standard +5V.<br>+5V operation results in higher P1dB and OIP3.                           |
| 3 x 3mm 8-lead MCLP package                                   | Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB. |

Mini-Circuits



HIGH DIRECTIVITY

## Monolithic Amplifier

MNA-5W+

ELECTRICAL SPECIFICATIONS<sup>1</sup> AT 25°C

| Parameter                                             | Condition (GHz) | Min. | Vs=5V<br>Typ.       | Max. | Vs=2.8V<br>Typ.     | Units |
|-------------------------------------------------------|-----------------|------|---------------------|------|---------------------|-------|
| Frequency Range                                       |                 | 0.5  |                     | 4.5  | 0.5-4.5             | GHz   |
| Gain                                                  | 0.5             | —    | 21.6                | —    | 20.5                | dB    |
|                                                       | 1.0             | —    | 23.5                | —    | 21.9                |       |
|                                                       | 2.0             | 19.1 | 21.3                | 23.4 | 19.4                |       |
|                                                       | 2.5             | —    | 19.2                | —    | 17.4                |       |
|                                                       | 3.5             | —    | 14.5                | —    | 13.1                |       |
|                                                       | 4.5             | 9.3  | 10.3                | 12.8 | 9.1                 |       |
| Input Return Loss                                     | 0.5             |      | 5.4                 |      | 5.6                 | dB    |
|                                                       | 1.0             |      | 14.9                |      | 15.3                |       |
|                                                       | 2.0             |      | 21.6                |      | 21.1                |       |
|                                                       | 2.5             |      | 17.1                |      | 17.2                |       |
|                                                       | 3.5             |      | 10.3                |      | 10.4                |       |
|                                                       | 4.5             |      | 6.5                 |      | 6.6                 |       |
| Output Return Loss                                    | 0.5             |      | 14.5                |      | 14.4                | dB    |
|                                                       | 1.0             |      | 12.8                |      | 17.4                |       |
|                                                       | 2.0             |      | 12.2                |      | 15.3                |       |
|                                                       | 2.5             |      | 12.8                |      | 15.7                |       |
|                                                       | 3.5             |      | 13.9                |      | 17.1                |       |
|                                                       | 4.5             |      | 13.7                |      | 16.8                |       |
| Output Power at P1dB                                  | 0.5             |      | 12.6                |      | 11.0                | dBm   |
|                                                       | 1.0             |      | 11.1                |      | 10.1                |       |
|                                                       | 2.0             |      | 9.6                 |      | 8.4                 |       |
|                                                       | 2.5             |      | 8.7                 |      | 7.5                 |       |
|                                                       | 3.5             |      | 7.2                 |      | 5.8                 |       |
|                                                       | 4.5             |      | 5.5                 |      | 4.1                 |       |
| Output IP3                                            | 0.5             |      | 23.8                |      | 21.8                | dBm   |
|                                                       | 1.0             |      | 22.3                |      | 20.6                |       |
|                                                       | 2.0             |      | 20.1                |      | 18.5                |       |
|                                                       | 2.5             |      | 19.1                |      | 17.5                |       |
|                                                       | 3.5             |      | 17.8                |      | 15.9                |       |
|                                                       | 4.5             |      | 16.0                |      | 14.1                |       |
| Noise Figure                                          | 0.5             |      | 3.2                 |      | 3.3                 | dB    |
|                                                       | 1.0             |      | 3.0                 |      | 3.0                 |       |
|                                                       | 2.0             |      | 3.1                 |      | 3.2                 |       |
|                                                       | 2.5             |      | 3.2                 |      | 3.2                 |       |
|                                                       | 3.5             |      | 3.4                 |      | 3.6                 |       |
|                                                       | 4.5             |      | 4.3                 |      | 4.6                 |       |
| Active Directivity<br>(Isolation-Gain)                | 0.5             |      | 20.3                |      | 22.5                | dB    |
|                                                       | 1.0             |      | 19.7                |      | 19.3                |       |
|                                                       | 2.0             |      | 16.6                |      | 16.2                |       |
|                                                       | 2.5             |      | 17.3                |      | 16.6                |       |
|                                                       | 3.5             |      | 20.0                |      | 18.9                |       |
|                                                       | 4.5             |      | 22.9                |      | 21.7                |       |
| DC Current                                            |                 | —    | 34                  | 43   | 32                  | mA    |
| Device Current Variation vs. Temperature <sup>2</sup> |                 |      | 15                  |      | 5                   | μA/°C |
| Device Current Variation vs Voltage                   |                 |      | 0.0004 <sup>3</sup> |      | 0.0014 <sup>4</sup> | mA/mV |
| Thermal resistance at 85°C (Junction to Lead)         |                 |      | 64                  |      | 64                  | °C/W  |

1. Measured on Mini-Circuits Characterization test board TB-186+. See Characterization Test Circuit (Fig. 1)

2. (Current at 85°C - Current at -45°C)/130

3. (Current at 5.25V - Current at 3.9V)/1.35

4. (Current at 3.9V - Current at 2.66V)/1.24





Mini-Circuits

HIGH DIRECTIVITY

# Monolithic Amplifier

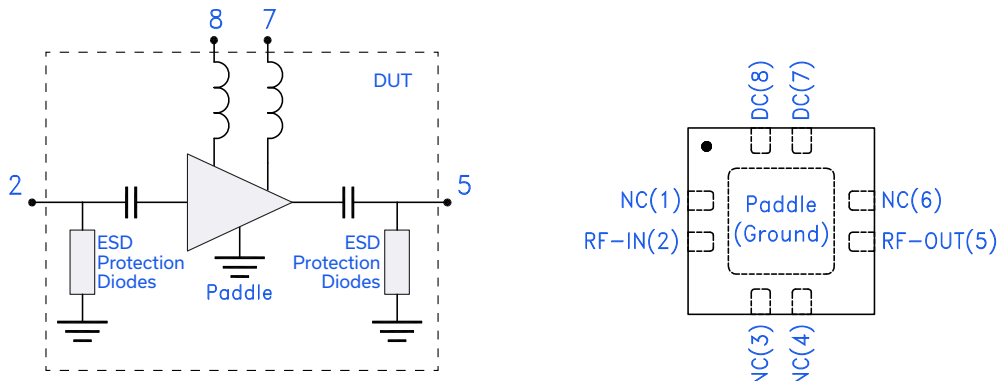
MNA-5W+

## MAXIMUM RATINGS<sup>5</sup>

| Parameter             | Ratings                                              |
|-----------------------|------------------------------------------------------|
| Operating Temperature | -40°C to 85°C                                        |
| Storage Temperature   | -55°C to 100°C                                       |
| DC Voltage            | 7V at pad 7 (on TB-186+)<br>1V at pads 2 & 5         |
| Power Dissipation     | 700 mW                                               |
| Input Power           | 5dBm (continuous operation)<br>28dBm (5 minutes max) |

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

## SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



| Function | Pad Number | Description (See Fig 1)                                                                          |
|----------|------------|--------------------------------------------------------------------------------------------------|
| RF-IN    | 2          | RF input pin                                                                                     |
| RF-OUT   | 5          | RF output pin                                                                                    |
| DC       | 7,8        | DC Bias pads 7,8. Pad 7 connected to ground via 1000 pF. Pad 8 connected to pad 7 via 33.2 ohms. |
| NC       | 1,3,4,6    | Not Connected, connect pad 3 and 4 to ground externally                                          |
| GND      | Paddle     | Ground                                                                                           |
| OPTIONAL | 1,6        | No internal connection; recommended use: per PCB Layout PL-078                                   |

Mini-Circuits



HIGH DIRECTIVITY

# Monolithic Amplifier

**MNA-5W+**

## CHARACTERIZATION & APPLICATION TEST CIRCUIT

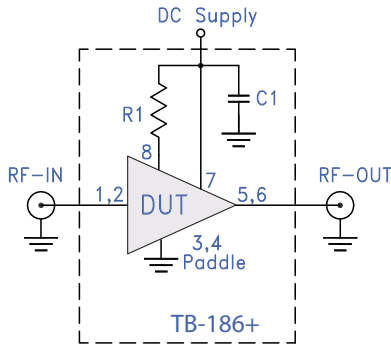


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization test board TB-186+)

Gain, Return loss, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and noise figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain and Return loss: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, -5 dBm/tone at output.

| Component | Size | Value | Units    |
|-----------|------|-------|----------|
| R1        | 0805 | 33.2  | $\Omega$ |
| C1        | 0402 | 1000  | $\mu F$  |

## RECOMMENDED APPLICATION CIRCUIT

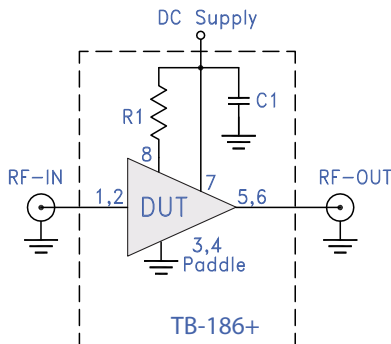
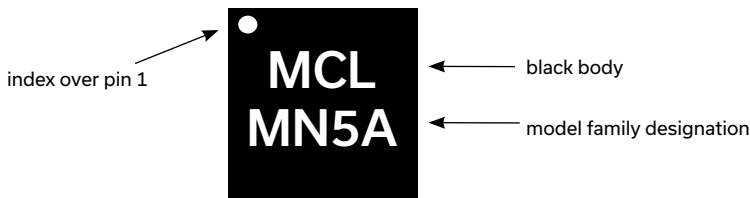


Fig 2. Test Board includes case, connectors, and components soldered to PCB

| Component | Size | Value | Units    |
|-----------|------|-------|----------|
| R1        | 0805 | 33.2  | $\Omega$ |
| C1        | 0402 | 1000  | $\mu F$  |

## PRODUCT MARKING



Marking may contain other features or characters for internal lot control





HIGH DIRECTIVITY

# Monolithic Amplifier

MNA-5W+

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)      |
| Case Style                                           | DQ849 3x3x0.9 mm MCLP Plastic package, exposed paddle<br>lead finish: Matte-Tin |
| Tape & Reel<br>Standard quantities available on reel | F104<br>7" reels with 20, 50, 100, 200, 500, 1K, or 2K devices                  |
| Suggested Layout for PCB Design                      | PL-078                                                                          |
| Evaluation Board                                     | TB-186-5W+                                                                      |
| Environmental Ratings                                | ENV08T1                                                                         |

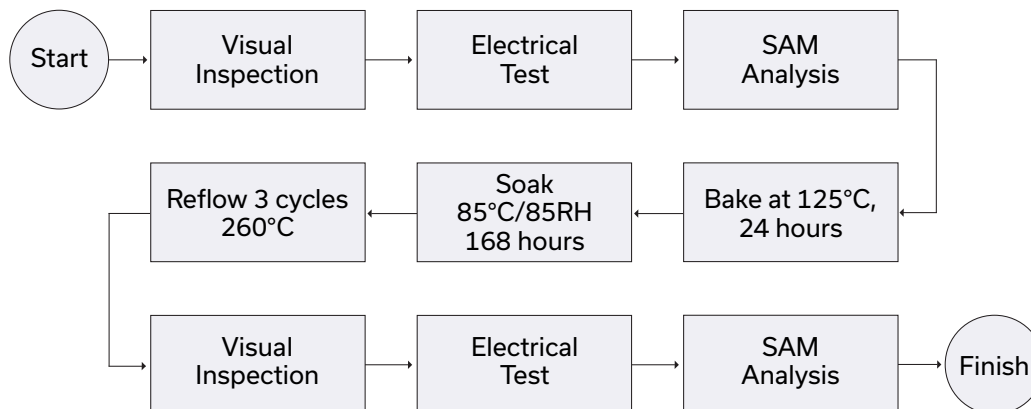
## ESD RATING

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

## MSL RATING

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

## MSL TEST FLOW CHART



## NOTES

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard. Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



# MMIC Amplifier

# MNA-5W+

## 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 = 3.9V, Id = 33.77 mA @ Temperature = +25degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
|       |       |           |                         |                          | K         | Measure |                |                        |                 |
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     |           |         | (dBm)          | (dBm)                  | (dB)            |
| 200   | 4.46  | 45.30     | 1.75                    | 2.32                     | 7.36      | 0.69    | 9.45           | 1.65                   | 5.54            |
| 300   | 14.54 | 41.54     | 2.22                    | 5.87                     | 2.97      | 1.22    | 19.87          | 9.06                   | 4.13            |
| 400   | 19.14 | 41.31     | 3.56                    | 9.76                     | 3.04      | 1.32    | 23.26          | 12.24                  | 3.51            |
| 500   | 21.26 | 42.74     | 5.44                    | 14.49                    | 4.03      | 1.25    | 24.20          | 13.17                  | 3.58            |
| 600   | 22.27 | 43.43     | 7.49                    | 20.63                    | 4.66      | 1.17    | 24.79          | 13.35                  | 3.08            |
| 700   | 22.75 | 43.95     | 9.49                    | 23.64                    | 5.11      | 1.10    | 24.60          | 13.19                  | 3.06            |
| 800   | 23.06 | 44.49     | 11.44                   | 19.41                    | 5.48      | 1.05    | 24.16          | 12.88                  | 3.08            |
| 900   | 23.06 | 43.34     | 13.40                   | 18.26                    | 4.92      | 1.02    | 23.46          | 12.40                  | 2.98            |
| 1000  | 23.09 | 42.78     | 15.08                   | 16.61                    | 4.65      | 0.99    | 23.30          | 12.20                  | 2.99            |
| 1100  | 23.05 | 41.91     | 16.76                   | 15.81                    | 4.26      | 0.98    | 23.15          | 12.08                  | 2.99            |
| 1200  | 22.97 | 41.28     | 18.32                   | 15.29                    | 4.02      | 0.96    | 23.19          | 11.96                  | 2.97            |
| 1300  | 22.84 | 40.52     | 19.70                   | 14.86                    | 3.75      | 0.96    | 22.56          | 11.70                  | 2.91            |
| 1400  | 22.69 | 40.10     | 20.91                   | 14.48                    | 3.63      | 0.95    | 22.26          | 11.43                  | 2.91            |
| 1500  | 22.49 | 39.77     | 22.12                   | 14.18                    | 3.58      | 0.94    | 22.27          | 11.40                  | 2.93            |
| 1600  | 22.32 | 39.10     | 22.07                   | 14.32                    | 3.39      | 0.94    | 22.02          | 11.30                  | 2.99            |
| 1700  | 22.06 | 38.60     | 22.75                   | 14.17                    | 3.30      | 0.94    | 21.56          | 10.93                  | 2.96            |
| 1800  | 21.81 | 38.51     | 22.60                   | 13.99                    | 3.35      | 0.94    | 21.42          | 10.73                  | 3.03            |
| 1900  | 21.53 | 37.80     | 22.12                   | 13.96                    | 3.20      | 0.94    | 20.93          | 10.41                  | 3.01            |
| 2000  | 21.23 | 37.56     | 22.15                   | 13.68                    | 3.21      | 0.93    | 20.94          | 10.42                  | 3.04            |
| 2100  | 20.91 | 37.26     | 21.05                   | 13.84                    | 3.22      | 0.94    | 20.94          | 10.37                  | 2.97            |
| 2200  | 20.55 | 37.17     | 20.09                   | 14.17                    | 3.32      | 0.94    | 20.69          | 10.18                  | 3.01            |
| 2300  | 20.19 | 36.45     | 19.57                   | 14.06                    | 3.19      | 0.94    | 20.43          | 9.94                   | 3.02            |
| 2400  | 19.81 | 36.40     | 18.67                   | 14.18                    | 3.30      | 0.95    | 20.37          | 9.81                   | 2.93            |
| 2500  | 19.43 | 36.46     | 17.30                   | 14.41                    | 3.46      | 0.95    | 19.85          | 9.43                   | 3.05            |
| 2600  | 19.07 | 35.88     | 16.78                   | 14.27                    | 3.36      | 0.95    | 19.99          | 9.46                   | 3.10            |
| 2700  | 18.59 | 35.68     | 15.77                   | 14.63                    | 3.46      | 0.96    | 19.95          | 9.35                   | 3.15            |
| 2800  | 18.17 | 35.62     | 14.89                   | 14.56                    | 3.58      | 0.97    | 19.68          | 9.06                   | 3.14            |
| 2900  | 17.72 | 35.96     | 14.01                   | 15.17                    | 3.90      | 0.98    | 19.45          | 9.03                   | 3.23            |
| 3000  | 17.30 | 35.26     | 13.30                   | 14.83                    | 3.75      | 0.99    | 19.32          | 8.71                   | 3.21            |
| 3100  | 16.92 | 34.63     | 12.76                   | 14.69                    | 3.62      | 0.99    | 19.37          | 8.83                   | 3.24            |
| 3200  | 16.45 | 34.78     | 11.96                   | 15.19                    | 3.85      | 1.01    | 18.61          | 8.60                   | 3.35            |
| 3300  | 16.05 | 34.47     | 11.45                   | 15.07                    | 3.86      | 1.01    | 18.68          | 8.50                   | 3.24            |
| 3400  | 15.50 | 34.61     | 10.70                   | 15.94                    | 4.13      | 1.04    | 18.59          | 8.33                   | 3.43            |
| 3500  | 15.12 | 34.21     | 10.33                   | 15.66                    | 4.08      | 1.04    | 18.25          | 8.13                   | 3.45            |
| 3600  | 14.79 | 33.87     | 9.98                    | 15.38                    | 4.03      | 1.04    | 18.29          | 7.87                   | 3.52            |
| 3700  | 14.31 | 33.67     | 9.52                    | 15.92                    | 4.12      | 1.06    | 17.99          | 7.86                   | 3.55            |
| 3800  | 13.86 | 33.94     | 8.96                    | 16.08                    | 4.40      | 1.08    | 18.01          | 7.58                   | 3.67            |
| 3900  | 13.37 | 33.66     | 8.65                    | 16.15                    | 4.45      | 1.09    | 17.52          | 7.41                   | 3.70            |
| 4000  | 12.92 | 34.20     | 8.02                    | 16.10                    | 4.85      | 1.11    | 17.50          | 7.25                   | 3.83            |
| 4100  | 12.66 | 35.13     | 7.48                    | 15.33                    | 5.39      | 1.13    | 17.18          | 7.24                   | 3.87            |
| 4200  | 12.23 | 33.82     | 7.12                    | 15.94                    | 4.82      | 1.15    | 17.09          | 7.05                   | 3.89            |
| 4300  | 11.90 | 33.37     | 6.94                    | 15.97                    | 4.71      | 1.15    | 17.10          | 6.86                   | 4.02            |
| 4400  | 11.48 | 32.73     | 6.64                    | 16.36                    | 4.52      | 1.17    | 16.53          | 6.72                   | 4.12            |
| 4500  | 11.23 | 33.35     | 6.34                    | 16.09                    | 4.88      | 1.19    | 16.52          | 6.55                   | 4.21            |
| 4600  | 10.86 | 33.04     | 6.14                    | 16.23                    | 4.85      | 1.20    | 16.52          | 6.43                   | 4.30            |
| 4700  | 10.49 | 33.45     | 5.89                    | 16.33                    | 5.19      | 1.22    | 16.04          | 6.19                   | 4.39            |
| 4800  | 10.10 | 32.82     | 5.76                    | 16.16                    | 5.00      | 1.22    | 15.93          | 5.97                   | 4.51            |
| 4900  | 9.72  | 32.35     | 5.55                    | 16.62                    | 4.87      | 1.24    | 15.61          | 5.78                   | 4.62            |
| 5000  | 9.33  | 31.87     | 5.20                    | 16.66                    | 4.65      | 1.26    | 14.92          | 5.39                   | 4.83            |
| 5100  | 8.89  | 32.10     | 5.15                    | 16.58                    | 4.99      | 1.27    | 14.88          | 5.19                   | 4.95            |
| 5200  | 8.47  | 33.22     | 4.76                    | 16.38                    | 5.69      | 1.30    | 14.47          | 4.84                   | 5.17            |
| 5300  | 8.04  | 35.03     | 4.79                    | 15.69                    | 7.34      | 1.29    | 13.93          | 4.41                   | 5.17            |
| 5400  | 7.40  | 34.05     | 4.58                    | 15.35                    | 6.86      | 1.30    | 13.48          | 4.08                   | 5.44            |
| 5500  | 6.91  | 36.20     | 4.45                    | 13.43                    | 8.97      | 1.29    | 13.43          | 3.98                   | 5.74            |



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site  
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)



IF/RF MICROWAVE COMPONENTS

REV. OR  
MNA-5W+  
3/21/2016  
Page 1 of 9

# MMIC Amplifier

# MNA-5W+

## 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 = 2.8V, Id =32.63 mA @ Temperature = +25degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 200   | 4.21  | 45.11     | 1.79                    | 2.39                     | 7.68      | 0.71    | 9.05           | 1.18                   | 5.63            |
| 300   | 14.09 | 42.07     | 2.28                    | 5.93                     | 3.45      | 1.21    | 18.47          | 8.14                   | 4.18            |
| 400   | 18.54 | 41.78     | 3.66                    | 9.71                     | 3.52      | 1.30    | 21.58          | 10.79                  | 3.56            |
| 500   | 20.54 | 42.91     | 5.61                    | 14.33                    | 4.53      | 1.24    | 22.53          | 11.71                  | 3.65            |
| 600   | 21.47 | 44.30     | 7.72                    | 20.87                    | 5.71      | 1.16    | 22.89          | 11.89                  | 3.15            |
| 700   | 21.88 | 44.13     | 9.78                    | 34.56                    | 5.83      | 1.10    | 22.77          | 11.79                  | 3.15            |
| 800   | 22.12 | 43.78     | 11.75                   | 26.61                    | 5.69      | 1.06    | 22.43          | 11.60                  | 3.12            |
| 900   | 22.09 | 42.28     | 13.70                   | 23.33                    | 4.94      | 1.03    | 22.05          | 11.38                  | 3.04            |
| 1000  | 22.07 | 41.84     | 15.38                   | 20.64                    | 4.75      | 1.01    | 21.78          | 11.17                  | 3.02            |
| 1100  | 21.98 | 40.67     | 17.04                   | 19.31                    | 4.24      | 0.99    | 21.74          | 11.08                  | 3.03            |
| 1200  | 21.85 | 40.13     | 18.57                   | 18.30                    | 4.06      | 0.98    | 21.76          | 10.95                  | 3.04            |
| 1300  | 21.69 | 39.41     | 19.87                   | 17.72                    | 3.82      | 0.97    | 21.22          | 10.76                  | 2.97            |
| 1400  | 21.51 | 38.61     | 20.96                   | 17.17                    | 3.57      | 0.97    | 20.96          | 10.45                  | 2.98            |
| 1500  | 21.28 | 38.45     | 22.05                   | 16.81                    | 3.59      | 0.96    | 20.98          | 10.43                  | 3.00            |
| 1600  | 21.07 | 37.70     | 22.04                   | 16.80                    | 3.38      | 0.96    | 20.69          | 10.33                  | 3.03            |
| 1700  | 20.79 | 37.35     | 22.56                   | 16.56                    | 3.35      | 0.96    | 20.28          | 10.01                  | 3.01            |
| 1800  | 20.52 | 36.83     | 22.42                   | 16.27                    | 3.26      | 0.96    | 20.15          | 9.80                   | 3.12            |
| 1900  | 20.23 | 36.49     | 21.99                   | 16.19                    | 3.24      | 0.95    | 19.77          | 9.54                   | 3.11            |
| 2000  | 19.92 | 36.02     | 21.95                   | 15.93                    | 3.18      | 0.95    | 19.78          | 9.48                   | 3.09            |
| 2100  | 19.60 | 35.72     | 20.92                   | 15.90                    | 3.18      | 0.95    | 19.68          | 9.51                   | 3.04            |
| 2200  | 19.25 | 35.67     | 20.02                   | 16.23                    | 3.29      | 0.96    | 19.45          | 9.22                   | 3.08            |
| 2300  | 18.89 | 35.13     | 19.47                   | 16.08                    | 3.22      | 0.96    | 19.25          | 8.95                   | 3.11            |
| 2400  | 18.53 | 35.03     | 18.63                   | 16.26                    | 3.31      | 0.96    | 19.12          | 8.85                   | 3.05            |
| 2500  | 18.15 | 35.01     | 17.38                   | 16.45                    | 3.43      | 0.97    | 18.74          | 8.57                   | 3.16            |
| 2600  | 17.81 | 34.18     | 16.83                   | 16.31                    | 3.24      | 0.97    | 18.79          | 8.46                   | 3.19            |
| 2700  | 17.35 | 34.27     | 15.84                   | 16.88                    | 3.44      | 0.98    | 18.72          | 8.37                   | 3.25            |
| 2800  | 16.95 | 34.05     | 14.97                   | 16.75                    | 3.49      | 0.98    | 18.48          | 8.10                   | 3.26            |
| 2900  | 16.52 | 34.32     | 14.11                   | 17.24                    | 3.75      | 1.00    | 18.23          | 8.00                   | 3.36            |
| 3000  | 16.12 | 33.81     | 13.40                   | 17.26                    | 3.68      | 1.00    | 18.09          | 7.78                   | 3.31            |
| 3100  | 15.77 | 33.07     | 12.83                   | 17.16                    | 3.51      | 1.00    | 18.11          | 7.76                   | 3.35            |
| 3200  | 15.32 | 33.21     | 12.06                   | 17.73                    | 3.71      | 1.02    | 17.38          | 7.61                   | 3.47            |
| 3300  | 14.93 | 32.91     | 11.54                   | 17.63                    | 3.72      | 1.03    | 17.34          | 7.55                   | 3.42            |
| 3400  | 14.41 | 33.11     | 10.79                   | 18.46                    | 3.98      | 1.05    | 17.27          | 7.35                   | 3.54            |
| 3500  | 14.05 | 32.66     | 10.42                   | 18.49                    | 3.91      | 1.05    | 17.00          | 7.19                   | 3.55            |
| 3600  | 13.73 | 32.33     | 10.06                   | 18.34                    | 3.88      | 1.06    | 16.94          | 6.82                   | 3.67            |
| 3700  | 13.26 | 32.25     | 9.59                    | 19.00                    | 4.01      | 1.07    | 16.68          | 6.91                   | 3.74            |
| 3800  | 12.82 | 32.47     | 9.03                    | 19.26                    | 4.24      | 1.09    | 16.65          | 6.74                   | 3.82            |
| 3900  | 12.35 | 32.38     | 8.68                    | 19.21                    | 4.38      | 1.10    | 16.20          | 6.42                   | 3.89            |
| 4000  | 11.92 | 32.88     | 8.06                    | 19.04                    | 4.74      | 1.13    | 16.16          | 6.28                   | 4.02            |
| 4100  | 11.67 | 33.55     | 7.52                    | 18.31                    | 5.13      | 1.15    | 15.92          | 6.21                   | 4.03            |
| 4200  | 11.26 | 32.40     | 7.16                    | 18.78                    | 4.64      | 1.16    | 15.77          | 6.09                   | 4.07            |
| 4300  | 10.95 | 31.91     | 6.96                    | 18.48                    | 4.49      | 1.17    | 15.74          | 5.81                   | 4.20            |
| 4400  | 10.54 | 31.41     | 6.68                    | 18.80                    | 4.38      | 1.18    | 15.27          | 5.55                   | 4.28            |
| 4500  | 10.28 | 31.75     | 6.38                    | 18.89                    | 4.59      | 1.20    | 15.21          | 5.64                   | 4.41            |
| 4600  | 9.92  | 31.76     | 6.20                    | 18.96                    | 4.73      | 1.21    | 15.18          | 5.39                   | 4.52            |
| 4700  | 9.55  | 31.94     | 5.93                    | 19.09                    | 4.93      | 1.23    | 14.70          | 5.32                   | 4.63            |
| 4800  | 9.18  | 31.57     | 5.79                    | 18.40                    | 4.87      | 1.23    | 14.60          | 4.98                   | 4.74            |
| 4900  | 8.80  | 31.10     | 5.60                    | 18.61                    | 4.75      | 1.24    | 14.30          | 4.72                   | 4.84            |
| 5000  | 8.43  | 30.73     | 5.25                    | 18.79                    | 4.60      | 1.27    | 13.73          | 4.37                   | 5.02            |
| 5100  | 8.01  | 31.04     | 5.20                    | 18.51                    | 4.97      | 1.27    | 13.62          | 4.25                   | 5.15            |
| 5200  | 7.60  | 32.14     | 4.81                    | 18.22                    | 5.65      | 1.30    | 13.23          | 3.86                   | 5.33            |
| 5300  | 7.18  | 33.46     | 4.83                    | 17.34                    | 6.87      | 1.30    | 12.75          | 3.51                   | 5.39            |
| 5400  | 6.56  | 32.86     | 4.63                    | 17.04                    | 6.71      | 1.31    | 12.39          | 3.01                   | 5.65            |
| 5500  | 6.08  | 34.59     | 4.49                    | 15.06                    | 8.39      | 1.31    | 12.22          | 2.93                   | 5.98            |



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site  
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

IF/RF MICROWAVE COMPONENTS

REV. OR  
MNA-5W+  
3/21/2016  
Page 2 of 9

# MMIC Amplifier

# MNA-5W+

## 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 = 34.20 mA @ Temperature = +25degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 200   | 4.51  | 45.20     | 1.74                    | 2.27                     | 7.12      | 0.68    | 9.55           | 1.77                   | 5.52            |
| 300   | 14.69 | 41.33     | 2.21                    | 5.83                     | 2.82      | 1.21    | 20.40          | 9.39                   | 4.11            |
| 400   | 19.37 | 41.08     | 3.53                    | 9.77                     | 2.85      | 1.32    | 23.83          | 12.65                  | 3.49            |
| 500   | 21.56 | 42.07     | 5.38                    | 14.33                    | 3.57      | 1.25    | 24.82          | 13.55                  | 3.53            |
| 600   | 22.63 | 43.27     | 7.41                    | 18.91                    | 4.36      | 1.17    | 25.49          | 13.76                  | 3.08            |
| 700   | 23.15 | 44.12     | 9.40                    | 19.26                    | 4.93      | 1.09    | 25.35          | 13.59                  | 3.05            |
| 800   | 23.50 | 45.18     | 11.35                   | 16.27                    | 5.56      | 1.04    | 24.77          | 13.29                  | 3.06            |
| 900   | 23.54 | 43.91     | 13.38                   | 15.52                    | 4.92      | 1.00    | 24.12          | 12.73                  | 3.20            |
| 1000  | 23.59 | 43.54     | 15.09                   | 14.28                    | 4.71      | 0.98    | 23.91          | 12.55                  | 2.96            |
| 1100  | 23.58 | 43.07     | 16.86                   | 13.68                    | 4.50      | 0.96    | 23.78          | 12.44                  | 2.96            |
| 1200  | 23.53 | 42.34     | 18.57                   | 13.29                    | 4.18      | 0.95    | 23.79          | 12.35                  | 2.94            |
| 1300  | 23.43 | 41.44     | 20.08                   | 12.96                    | 3.82      | 0.94    | 23.11          | 12.00                  | 2.90            |
| 1400  | 23.31 | 41.01     | 21.43                   | 12.65                    | 3.69      | 0.93    | 22.84          | 11.76                  | 2.89            |
| 1500  | 23.13 | 40.70     | 22.88                   | 12.43                    | 3.63      | 0.93    | 22.79          | 11.68                  | 2.92            |
| 1600  | 22.98 | 40.21     | 22.86                   | 12.58                    | 3.50      | 0.93    | 22.59          | 11.65                  | 2.94            |
| 1700  | 22.73 | 39.76     | 23.60                   | 12.50                    | 3.42      | 0.92    | 22.09          | 11.29                  | 2.90            |
| 1800  | 22.48 | 39.25     | 23.56                   | 12.39                    | 3.32      | 0.92    | 21.92          | 11.13                  | 3.01            |
| 1900  | 22.21 | 39.10     | 23.00                   | 12.39                    | 3.37      | 0.92    | 21.38          | 10.75                  | 3.01            |
| 2000  | 21.91 | 38.67     | 23.06                   | 12.14                    | 3.31      | 0.92    | 21.45          | 10.74                  | 3.01            |
| 2100  | 21.59 | 38.52     | 21.77                   | 12.33                    | 3.37      | 0.92    | 21.37          | 10.74                  | 2.94            |
| 2200  | 21.22 | 38.54     | 20.68                   | 12.67                    | 3.53      | 0.93    | 21.19          | 10.55                  | 2.96            |
| 2300  | 20.85 | 37.76     | 20.08                   | 12.59                    | 3.37      | 0.93    | 20.90          | 10.24                  | 2.98            |
| 2400  | 20.46 | 37.64     | 19.14                   | 12.71                    | 3.47      | 0.93    | 20.85          | 10.17                  | 2.96            |
| 2500  | 20.05 | 37.81     | 17.58                   | 12.93                    | 3.70      | 0.94    | 20.27          | 9.85                   | 3.04            |
| 2600  | 19.68 | 37.23     | 17.01                   | 12.85                    | 3.60      | 0.94    | 20.45          | 9.81                   | 3.05            |
| 2700  | 19.18 | 36.93     | 15.89                   | 13.08                    | 3.68      | 0.95    | 20.44          | 9.73                   | 3.11            |
| 2800  | 18.74 | 36.71     | 14.98                   | 13.05                    | 3.74      | 0.95    | 20.16          | 9.50                   | 3.11            |
| 2900  | 18.27 | 37.34     | 14.02                   | 13.69                    | 4.23      | 0.97    | 19.97          | 9.38                   | 3.19            |
| 3000  | 17.82 | 36.67     | 13.31                   | 13.26                    | 4.08      | 0.97    | 19.81          | 9.14                   | 3.17            |
| 3100  | 17.43 | 35.86     | 12.75                   | 13.09                    | 3.87      | 0.97    | 19.89          | 9.24                   | 3.20            |
| 3200  | 16.93 | 36.12     | 11.90                   | 13.52                    | 4.18      | 0.99    | 19.16          | 8.90                   | 3.27            |
| 3300  | 16.51 | 35.86     | 11.38                   | 13.43                    | 4.21      | 1.00    | 19.29          | 8.93                   | 3.21            |
| 3400  | 15.93 | 35.94     | 10.59                   | 14.22                    | 4.49      | 1.03    | 19.16          | 8.66                   | 3.38            |
| 3500  | 15.54 | 35.37     | 10.22                   | 13.83                    | 4.36      | 1.03    | 18.80          | 8.47                   | 3.37            |
| 3600  | 15.21 | 34.94     | 9.85                    | 13.54                    | 4.27      | 1.03    | 18.89          | 8.29                   | 3.47            |
| 3700  | 14.70 | 34.90     | 9.38                    | 14.00                    | 4.45      | 1.05    | 18.59          | 8.24                   | 3.51            |
| 3800  | 14.24 | 35.08     | 8.83                    | 14.10                    | 4.70      | 1.07    | 18.63          | 8.09                   | 3.60            |
| 3900  | 13.74 | 34.50     | 8.51                    | 14.20                    | 4.61      | 1.08    | 18.12          | 7.82                   | 3.64            |
| 4000  | 13.27 | 35.23     | 7.88                    | 14.21                    | 5.13      | 1.10    | 18.11          | 7.70                   | 3.78            |
| 4100  | 12.99 | 36.34     | 7.36                    | 13.47                    | 5.83      | 1.12    | 17.76          | 7.59                   | 3.78            |
| 4200  | 12.54 | 35.10     | 7.00                    | 14.03                    | 5.26      | 1.14    | 17.66          | 7.54                   | 3.85            |
| 4300  | 12.20 | 34.35     | 6.82                    | 14.17                    | 4.99      | 1.14    | 17.72          | 7.31                   | 3.94            |
| 4400  | 11.77 | 33.74     | 6.52                    | 14.47                    | 4.80      | 1.16    | 17.08          | 7.14                   | 4.04            |
| 4500  | 11.51 | 34.49     | 6.21                    | 14.11                    | 5.25      | 1.18    | 17.11          | 6.93                   | 4.13            |
| 4600  | 11.13 | 33.94     | 6.02                    | 14.22                    | 5.08      | 1.19    | 17.14          | 6.94                   | 4.24            |
| 4700  | 10.75 | 34.66     | 5.76                    | 14.29                    | 5.63      | 1.21    | 16.64          | 6.63                   | 4.32            |
| 4800  | 10.35 | 33.83     | 5.64                    | 14.30                    | 5.32      | 1.21    | 16.53          | 6.33                   | 4.46            |
| 4900  | 9.96  | 33.20     | 5.43                    | 14.75                    | 5.10      | 1.23    | 16.22          | 6.12                   | 4.53            |
| 5000  | 9.56  | 32.77     | 5.07                    | 14.74                    | 4.88      | 1.26    | 15.46          | 5.70                   | 4.73            |
| 5100  | 9.10  | 33.01     | 5.04                    | 14.78                    | 5.28      | 1.26    | 15.46          | 5.70                   | 4.84            |
| 5200  | 8.66  | 34.18     | 4.65                    | 14.62                    | 6.04      | 1.29    | 15.06          | 5.16                   | 5.06            |
| 5300  | 8.21  | 36.50     | 4.69                    | 14.15                    | 8.30      | 1.28    | 14.49          | 4.93                   | 5.12            |
| 5400  | 7.55  | 35.02     | 4.47                    | 13.85                    | 7.33      | 1.30    | 13.97          | 4.27                   | 5.37            |
| 5500  | 7.05  | 37.64     | 4.34                    | 12.13                    | 10.07     | 1.28    | 14.03          | 4.15                   | 5.71            |



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site  
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

IF/RF MICROWAVE COMPONENTS

REV. OR  
MNA-5W+  
3/21/2016  
Page 3 of 9

# MMIC Amplifier

# MNA-5W+

## 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 = 3.9V, Id =32.60 mA @ Temperature = -45degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 200   | 4.71  | 45.52     | 1.62                    | 2.27                     | 6.81      | 0.69    | 9.21           | 1.34                   | 4.57            |
| 300   | 15.01 | 41.42     | 2.04                    | 5.90                     | 2.57      | 1.24    | 19.98          | 9.01                   | 3.35            |
| 400   | 19.64 | 41.53     | 3.34                    | 9.60                     | 2.78      | 1.33    | 23.37          | 12.18                  | 2.86            |
| 500   | 21.77 | 42.32     | 5.13                    | 14.14                    | 3.49      | 1.27    | 24.38          | 12.94                  | 2.96            |
| 600   | 22.79 | 43.96     | 7.13                    | 19.08                    | 4.55      | 1.18    | 24.93          | 13.17                  | 2.46            |
| 700   | 23.30 | 44.30     | 9.07                    | 20.43                    | 4.91      | 1.11    | 24.77          | 13.01                  | 2.46            |
| 800   | 23.65 | 45.51     | 10.85                   | 16.99                    | 5.64      | 1.05    | 24.28          | 12.64                  | 2.54            |
| 900   | 23.65 | 43.73     | 12.83                   | 16.37                    | 4.75      | 1.01    | 23.53          | 12.13                  | 2.37            |
| 1000  | 23.69 | 43.49     | 14.40                   | 14.94                    | 4.64      | 0.99    | 23.29          | 11.94                  | 2.40            |
| 1100  | 23.69 | 42.48     | 15.86                   | 14.42                    | 4.17      | 0.97    | 23.19          | 11.94                  | 2.38            |
| 1200  | 23.64 | 42.01     | 17.19                   | 14.15                    | 3.99      | 0.96    | 23.25          | 11.85                  | 2.39            |
| 1300  | 23.54 | 41.32     | 18.11                   | 13.67                    | 3.74      | 0.95    | 22.64          | 11.50                  | 2.29            |
| 1400  | 23.42 | 40.59     | 18.73                   | 13.31                    | 3.49      | 0.94    | 22.35          | 11.29                  | 2.30            |
| 1500  | 23.25 | 40.25     | 19.82                   | 13.17                    | 3.43      | 0.94    | 22.45          | 11.24                  | 2.31            |
| 1600  | 23.12 | 39.73     | 19.86                   | 13.32                    | 3.29      | 0.94    | 22.16          | 11.21                  | 2.34            |
| 1700  | 22.88 | 39.31     | 20.26                   | 13.03                    | 3.22      | 0.93    | 21.63          | 10.82                  | 2.29            |
| 1800  | 22.64 | 38.98     | 20.12                   | 12.86                    | 3.18      | 0.93    | 21.49          | 10.65                  | 2.40            |
| 1900  | 22.40 | 38.36     | 20.11                   | 12.85                    | 3.05      | 0.92    | 21.01          | 10.36                  | 2.40            |
| 2000  | 22.14 | 38.16     | 20.48                   | 12.60                    | 3.06      | 0.92    | 21.06          | 10.39                  | 2.41            |
| 2100  | 21.82 | 37.65     | 19.49                   | 12.72                    | 3.00      | 0.92    | 21.08          | 10.42                  | 2.33            |
| 2200  | 21.46 | 37.58     | 18.53                   | 13.23                    | 3.11      | 0.93    | 20.86          | 10.28                  | 2.35            |
| 2300  | 21.13 | 36.78     | 18.22                   | 12.91                    | 2.94      | 0.93    | 20.57          | 9.97                   | 2.39            |
| 2400  | 20.78 | 36.62     | 17.77                   | 12.90                    | 3.00      | 0.93    | 20.50          | 9.86                   | 2.32            |
| 2500  | 20.36 | 36.82     | 16.42                   | 13.24                    | 3.20      | 0.94    | 20.00          | 9.57                   | 2.39            |
| 2600  | 20.03 | 36.27     | 16.15                   | 13.00                    | 3.12      | 0.94    | 20.06          | 9.54                   | 2.45            |
| 2700  | 19.51 | 36.14     | 15.01                   | 13.59                    | 3.25      | 0.95    | 20.11          | 9.53                   | 2.49            |
| 2800  | 19.12 | 35.93     | 14.41                   | 13.26                    | 3.29      | 0.95    | 19.82          | 9.24                   | 2.52            |
| 2900  | 18.73 | 36.17     | 13.87                   | 13.67                    | 3.53      | 0.97    | 19.58          | 9.18                   | 2.59            |
| 3000  | 18.23 | 35.97     | 12.84                   | 13.73                    | 3.61      | 0.98    | 19.49          | 8.89                   | 2.55            |
| 3100  | 17.88 | 35.02     | 12.38                   | 13.56                    | 3.36      | 0.98    | 19.60          | 8.96                   | 2.55            |
| 3200  | 17.42 | 34.99     | 11.64                   | 13.93                    | 3.50      | 0.99    | 18.81          | 8.67                   | 2.62            |
| 3300  | 17.00 | 34.69     | 11.17                   | 14.03                    | 3.52      | 1.00    | 18.85          | 8.76                   | 2.59            |
| 3400  | 16.47 | 34.82     | 10.48                   | 14.67                    | 3.75      | 1.02    | 18.82          | 8.47                   | 2.69            |
| 3500  | 16.03 | 34.54     | 10.09                   | 14.64                    | 3.78      | 1.03    | 18.46          | 8.25                   | 2.70            |
| 3600  | 15.71 | 34.27     | 9.78                    | 14.32                    | 3.77      | 1.04    | 18.54          | 8.08                   | 2.80            |
| 3700  | 15.21 | 34.25     | 9.29                    | 14.60                    | 3.93      | 1.05    | 18.23          | 8.00                   | 2.84            |
| 3800  | 14.77 | 34.67     | 8.82                    | 14.62                    | 4.25      | 1.07    | 18.25          | 7.87                   | 2.93            |
| 3900  | 14.27 | 34.10     | 8.47                    | 14.74                    | 4.17      | 1.08    | 17.72          | 7.61                   | 2.97            |
| 4000  | 13.82 | 35.00     | 7.79                    | 14.71                    | 4.71      | 1.11    | 17.78          | 7.52                   | 3.10            |
| 4100  | 13.54 | 35.70     | 7.24                    | 13.95                    | 5.10      | 1.12    | 17.47          | 7.32                   | 3.12            |
| 4200  | 13.17 | 34.07     | 6.92                    | 14.54                    | 4.38      | 1.14    | 17.38          | 7.33                   | 3.13            |
| 4300  | 12.75 | 33.36     | 6.76                    | 15.08                    | 4.22      | 1.15    | 17.35          | 7.10                   | 3.28            |
| 4400  | 12.37 | 33.68     | 6.32                    | 15.13                    | 4.43      | 1.18    | 16.82          | 6.79                   | 3.38            |
| 4500  | 12.17 | 33.89     | 6.18                    | 14.34                    | 4.57      | 1.18    | 16.81          | 6.79                   | 3.37            |
| 4600  | 11.76 | 32.96     | 6.10                    | 14.77                    | 4.29      | 1.18    | 16.80          | 6.66                   | 3.47            |
| 4700  | 11.36 | 33.41     | 5.82                    | 15.20                    | 4.62      | 1.21    | 16.34          | 6.28                   | 3.55            |
| 4800  | 10.99 | 32.66     | 5.77                    | 14.81                    | 4.42      | 1.21    | 16.22          | 6.20                   | 3.63            |
| 4900  | 10.63 | 32.73     | 5.49                    | 14.93                    | 4.52      | 1.23    | 15.91          | 5.89                   | 3.77            |
| 5000  | 10.29 | 31.85     | 5.16                    | 15.05                    | 4.11      | 1.25    | 15.33          | 5.54                   | 3.90            |
| 5100  | 9.90  | 32.78     | 5.17                    | 14.56                    | 4.76      | 1.25    | 15.24          | 5.50                   | 3.97            |
| 5200  | 9.61  | 34.15     | 4.73                    | 14.29                    | 5.44      | 1.28    | 14.82          | 4.99                   | 4.11            |
| 5300  | 9.13  | 36.00     | 4.76                    | 13.69                    | 7.11      | 1.27    | 14.39          | 4.59                   | 4.19            |
| 5400  | 8.48  | 33.44     | 4.49                    | 13.89                    | 5.54      | 1.29    | 13.81          | 4.20                   | 4.42            |
| 5500  | 7.93  | 35.62     | 4.54                    | 12.25                    | 7.46      | 1.27    | 13.60          | 4.05                   | 4.64            |



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site  
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)



IF/RF MICROWAVE COMPONENTS

REV. OR  
MNA-5W+  
3/21/2016  
Page 4 of 9

## 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 = 2.8V, Id =31.82 mA @ Temperature = -45degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 200   | 4.52  | 44.71     | 1.65                    | 2.36                     | 6.55      | 0.71    | 8.96           | 1.13                   | 4.56            |
| 300   | 14.63 | 41.73     | 2.09                    | 5.97                     | 2.87      | 1.24    | 18.67          | 8.15                   | 3.39            |
| 400   | 19.11 | 41.63     | 3.43                    | 9.63                     | 3.07      | 1.32    | 21.71          | 10.98                  | 2.90            |
| 500   | 21.11 | 43.51     | 5.30                    | 14.24                    | 4.41      | 1.26    | 22.53          | 11.81                  | 2.99            |
| 600   | 22.04 | 43.71     | 7.34                    | 20.76                    | 4.90      | 1.17    | 22.86          | 11.94                  | 2.51            |
| 700   | 22.47 | 44.41     | 9.32                    | 30.43                    | 5.55      | 1.11    | 22.71          | 11.84                  | 2.54            |
| 800   | 22.75 | 44.51     | 11.13                   | 23.44                    | 5.69      | 1.06    | 22.38          | 11.61                  | 2.58            |
| 900   | 22.71 | 43.06     | 13.03                   | 21.56                    | 4.98      | 1.03    | 21.99          | 11.35                  | 3.28            |
| 1000  | 22.71 | 42.30     | 14.59                   | 19.29                    | 4.62      | 1.01    | 21.69          | 11.15                  | 2.40            |
| 1100  | 22.66 | 41.33     | 16.04                   | 18.44                    | 4.20      | 0.99    | 21.68          | 11.12                  | 2.41            |
| 1200  | 22.56 | 40.66     | 17.27                   | 17.74                    | 3.96      | 0.98    | 21.73          | 11.05                  | 2.40            |
| 1300  | 22.41 | 39.90     | 18.13                   | 17.00                    | 3.70      | 0.97    | 21.24          | 10.85                  | 2.32            |
| 1400  | 22.25 | 39.31     | 18.66                   | 16.51                    | 3.52      | 0.97    | 20.97          | 10.62                  | 2.33            |
| 1500  | 22.04 | 38.96     | 19.54                   | 16.27                    | 3.47      | 0.96    | 20.98          | 10.60                  | 2.38            |
| 1600  | 21.87 | 38.22     | 19.55                   | 16.24                    | 3.26      | 0.96    | 20.79          | 10.48                  | 2.33            |
| 1700  | 21.61 | 37.58     | 19.86                   | 15.85                    | 3.12      | 0.95    | 20.33          | 10.19                  | 2.34            |
| 1800  | 21.36 | 37.34     | 19.62                   | 15.53                    | 3.12      | 0.95    | 20.22          | 10.04                  | 2.47            |
| 1900  | 21.09 | 36.89     | 19.50                   | 15.53                    | 3.06      | 0.95    | 19.91          | 9.82                   | 2.44            |
| 2000  | 20.82 | 36.55     | 19.80                   | 15.19                    | 3.03      | 0.95    | 19.95          | 9.78                   | 2.47            |
| 2100  | 20.50 | 36.02     | 18.96                   | 15.22                    | 2.96      | 0.95    | 19.87          | 9.76                   | 2.38            |
| 2200  | 20.15 | 36.00     | 18.07                   | 15.69                    | 3.07      | 0.96    | 19.67          | 9.60                   | 2.40            |
| 2300  | 19.82 | 35.50     | 17.72                   | 15.28                    | 3.00      | 0.95    | 19.46          | 9.30                   | 2.42            |
| 2400  | 19.48 | 34.98     | 17.27                   | 15.21                    | 2.94      | 0.95    | 19.35          | 9.24                   | 2.36            |
| 2500  | 19.08 | 35.01     | 16.10                   | 15.63                    | 3.07      | 0.96    | 19.00          | 8.98                   | 2.44            |
| 2600  | 18.77 | 34.61     | 15.77                   | 15.31                    | 3.03      | 0.96    | 19.00          | 8.94                   | 2.49            |
| 2700  | 18.28 | 34.52     | 14.79                   | 16.12                    | 3.16      | 0.98    | 18.95          | 8.82                   | 2.55            |
| 2800  | 17.92 | 34.26     | 14.19                   | 15.78                    | 3.18      | 0.98    | 18.76          | 8.60                   | 2.58            |
| 2900  | 17.53 | 34.43     | 13.62                   | 16.11                    | 3.37      | 0.99    | 18.47          | 8.49                   | 2.67            |
| 3000  | 17.06 | 34.18     | 12.65                   | 16.51                    | 3.42      | 1.00    | 18.36          | 8.22                   | 2.62            |
| 3100  | 16.74 | 33.43     | 12.25                   | 16.37                    | 3.25      | 1.00    | 18.44          | 8.30                   | 2.61            |
| 3200  | 16.31 | 33.33     | 11.55                   | 16.83                    | 3.34      | 1.02    | 17.66          | 8.05                   | 2.73            |
| 3300  | 15.91 | 33.05     | 11.08                   | 16.85                    | 3.36      | 1.03    | 17.60          | 8.03                   | 2.66            |
| 3400  | 15.42 | 33.18     | 10.42                   | 17.55                    | 3.56      | 1.04    | 17.58          | 7.78                   | 2.82            |
| 3500  | 15.00 | 33.01     | 10.01                   | 17.83                    | 3.63      | 1.06    | 17.31          | 7.61                   | 2.81            |
| 3600  | 14.68 | 32.65     | 9.70                    | 17.52                    | 3.58      | 1.06    | 17.26          | 7.33                   | 2.91            |
| 3700  | 14.22 | 32.73     | 9.24                    | 17.97                    | 3.75      | 1.08    | 17.01          | 7.29                   | 2.95            |
| 3800  | 13.81 | 32.86     | 8.82                    | 18.04                    | 3.94      | 1.09    | 16.96          | 7.27                   | 3.07            |
| 3900  | 13.30 | 32.46     | 8.40                    | 18.13                    | 3.92      | 1.11    | 16.50          | 6.93                   | 3.06            |
| 4000  | 12.90 | 33.23     | 7.79                    | 18.09                    | 4.35      | 1.13    | 16.49          | 6.87                   | 3.24            |
| 4100  | 12.62 | 33.90     | 7.28                    | 17.12                    | 4.72      | 1.15    | 16.27          | 6.63                   | 3.22            |
| 4200  | 12.25 | 32.50     | 6.93                    | 17.57                    | 4.14      | 1.16    | 16.14          | 6.62                   | 3.24            |
| 4300  | 11.85 | 31.80     | 6.72                    | 17.96                    | 3.96      | 1.17    | 16.06          | 6.37                   | 3.40            |
| 4400  | 11.53 | 32.00     | 6.30                    | 18.14                    | 4.08      | 1.20    | 15.64          | 6.08                   | 3.48            |
| 4500  | 11.30 | 32.05     | 6.19                    | 17.40                    | 4.17      | 1.20    | 15.59          | 6.05                   | 3.54            |
| 4600  | 10.87 | 31.51     | 6.08                    | 17.81                    | 4.09      | 1.21    | 15.51          | 5.85                   | 3.63            |
| 4700  | 10.55 | 31.77     | 5.84                    | 18.32                    | 4.29      | 1.22    | 15.08          | 5.75                   | 3.72            |
| 4800  | 10.17 | 31.32     | 5.72                    | 17.39                    | 4.21      | 1.23    | 14.99          | 5.43                   | 3.79            |
| 4900  | 9.83  | 31.29     | 5.43                    | 17.51                    | 4.25      | 1.25    | 14.67          | 5.11                   | 3.91            |
| 5000  | 9.49  | 30.55     | 5.11                    | 17.96                    | 3.94      | 1.27    | 14.16          | 4.82                   | 4.13            |
| 5100  | 9.12  | 31.46     | 5.18                    | 17.18                    | 4.56      | 1.26    | 14.06          | 4.70                   | 4.17            |
| 5200  | 8.83  | 32.42     | 4.82                    | 17.07                    | 5.05      | 1.29    | 13.64          | 4.31                   | 4.29            |
| 5300  | 8.39  | 33.72     | 4.80                    | 15.96                    | 6.12      | 1.29    | 13.25          | 4.02                   | 4.35            |
| 5400  | 7.78  | 31.86     | 4.50                    | 16.24                    | 5.12      | 1.31    | 12.80          | 3.47                   | 4.57            |
| 5500  | 7.20  | 33.60     | 4.56                    | 14.42                    | 6.62      | 1.29    | 12.46          | 3.33                   | 4.76            |

# MMIC Amplifier

# MNA-5W+

## 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 = 33.01 mA @ Temperature = -45degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 200   | 4.76  | 44.95     | 1.62                    | 2.24                     | 6.21      | 0.68    | 9.31           | 1.59                   | 4.55            |
| 300   | 15.14 | 40.98     | 2.04                    | 5.87                     | 2.37      | 1.24    | 20.44          | 9.27                   | 3.31            |
| 400   | 19.84 | 41.30     | 3.31                    | 9.58                     | 2.62      | 1.34    | 23.87          | 12.45                  | 2.86            |
| 500   | 22.02 | 42.16     | 5.09                    | 13.96                    | 3.30      | 1.27    | 24.93          | 13.21                  | 2.93            |
| 600   | 23.10 | 43.47     | 7.07                    | 17.94                    | 4.13      | 1.18    | 25.54          | 13.43                  | 2.47            |
| 700   | 23.64 | 44.41     | 9.02                    | 18.16                    | 4.74      | 1.10    | 25.43          | 13.25                  | 2.47            |
| 800   | 24.03 | 45.81     | 10.82                   | 15.22                    | 5.53      | 1.04    | 24.88          | 12.93                  | 2.51            |
| 900   | 24.06 | 44.34     | 12.86                   | 14.74                    | 4.81      | 1.00    | 24.07          | 12.36                  | 2.38            |
| 1000  | 24.13 | 44.10     | 14.52                   | 13.51                    | 4.68      | 0.97    | 23.83          | 12.19                  | 2.38            |
| 1100  | 24.16 | 43.42     | 16.07                   | 13.06                    | 4.34      | 0.96    | 23.75          | 12.13                  | 2.39            |
| 1200  | 24.14 | 42.74     | 17.48                   | 12.84                    | 4.05      | 0.94    | 23.77          | 12.05                  | 2.38            |
| 1300  | 24.06 | 42.34     | 18.49                   | 12.44                    | 3.90      | 0.93    | 23.07          | 11.75                  | 2.28            |
| 1400  | 23.97 | 41.58     | 19.20                   | 12.17                    | 3.62      | 0.93    | 22.85          | 11.48                  | 2.28            |
| 1500  | 23.82 | 40.81     | 20.45                   | 12.05                    | 3.38      | 0.92    | 22.86          | 11.53                  | 2.31            |
| 1600  | 23.71 | 40.79     | 20.56                   | 12.24                    | 3.42      | 0.92    | 22.61          | 11.47                  | 2.31            |
| 1700  | 23.48 | 40.08     | 21.06                   | 12.05                    | 3.24      | 0.92    | 22.06          | 11.06                  | 2.27            |
| 1800  | 23.25 | 39.91     | 20.94                   | 11.90                    | 3.25      | 0.91    | 21.89          | 10.93                  | 2.42            |
| 1900  | 23.01 | 39.36     | 20.91                   | 11.93                    | 3.15      | 0.91    | 21.40          | 10.59                  | 2.38            |
| 2000  | 22.75 | 39.06     | 21.32                   | 11.70                    | 3.12      | 0.91    | 21.47          | 10.64                  | 2.38            |
| 2100  | 22.43 | 38.58     | 20.10                   | 11.88                    | 3.07      | 0.91    | 21.47          | 10.67                  | 2.32            |
| 2200  | 22.07 | 38.84     | 19.08                   | 12.41                    | 3.31      | 0.93    | 21.31          | 10.53                  | 2.35            |
| 2300  | 21.72 | 37.79     | 18.72                   | 12.14                    | 3.05      | 0.92    | 20.99          | 10.18                  | 2.35            |
| 2400  | 21.35 | 37.56     | 18.11                   | 12.11                    | 3.09      | 0.92    | 20.93          | 10.14                  | 2.31            |
| 2500  | 20.91 | 37.85     | 16.63                   | 12.49                    | 3.35      | 0.93    | 20.39          | 9.82                   | 2.38            |
| 2600  | 20.56 | 37.36     | 16.25                   | 12.27                    | 3.29      | 0.93    | 20.50          | 9.78                   | 2.41            |
| 2700  | 20.02 | 37.25     | 15.11                   | 12.81                    | 3.45      | 0.95    | 20.54          | 9.75                   | 2.47            |
| 2800  | 19.62 | 36.95     | 14.46                   | 12.49                    | 3.46      | 0.95    | 20.25          | 9.45                   | 2.45            |
| 2900  | 19.20 | 37.26     | 13.76                   | 12.94                    | 3.75      | 0.96    | 20.01          | 9.42                   | 2.55            |
| 3000  | 18.68 | 36.94     | 12.79                   | 12.95                    | 3.79      | 0.97    | 19.87          | 9.07                   | 2.49            |
| 3100  | 18.30 | 36.05     | 12.29                   | 12.75                    | 3.56      | 0.97    | 20.05          | 9.24                   | 2.49            |
| 3200  | 17.82 | 36.02     | 11.50                   | 13.06                    | 3.71      | 0.99    | 19.26          | 8.99                   | 2.59            |
| 3300  | 17.38 | 35.76     | 10.99                   | 13.15                    | 3.75      | 1.00    | 19.36          | 8.93                   | 2.52            |
| 3400  | 16.82 | 36.10     | 10.28                   | 13.80                    | 4.11      | 1.02    | 19.31          | 8.74                   | 2.67            |
| 3500  | 16.37 | 35.59     | 9.87                    | 13.66                    | 4.04      | 1.03    | 18.93          | 8.56                   | 2.69            |
| 3600  | 16.04 | 35.28     | 9.53                    | 13.32                    | 4.00      | 1.03    | 19.06          | 8.35                   | 2.74            |
| 3700  | 15.52 | 35.01     | 9.03                    | 13.64                    | 4.06      | 1.05    | 18.72          | 8.32                   | 2.81            |
| 3800  | 15.08 | 35.48     | 8.56                    | 13.66                    | 4.42      | 1.07    | 18.76          | 8.20                   | 2.85            |
| 3900  | 14.56 | 34.62     | 8.22                    | 13.84                    | 4.20      | 1.08    | 18.19          | 7.88                   | 2.93            |
| 4000  | 14.09 | 35.56     | 7.55                    | 13.88                    | 4.78      | 1.11    | 18.27          | 7.82                   | 3.06            |
| 4100  | 13.80 | 36.59     | 7.03                    | 13.11                    | 5.36      | 1.12    | 17.93          | 7.57                   | 3.06            |
| 4200  | 13.40 | 35.06     | 6.72                    | 13.69                    | 4.67      | 1.14    | 17.86          | 7.52                   | 3.09            |
| 4300  | 12.96 | 34.17     | 6.55                    | 14.25                    | 4.42      | 1.16    | 17.85          | 7.35                   | 3.20            |
| 4400  | 12.56 | 34.44     | 6.12                    | 14.19                    | 4.61      | 1.18    | 17.28          | 7.10                   | 3.28            |
| 4500  | 12.37 | 34.95     | 5.95                    | 13.40                    | 4.90      | 1.18    | 17.28          | 7.03                   | 3.33            |
| 4600  | 11.95 | 33.75     | 5.86                    | 13.84                    | 4.47      | 1.19    | 17.29          | 6.90                   | 3.41            |
| 4700  | 11.54 | 34.03     | 5.58                    | 14.30                    | 4.73      | 1.22    | 16.84          | 6.72                   | 3.52            |
| 4800  | 11.16 | 33.32     | 5.54                    | 14.09                    | 4.55      | 1.21    | 16.73          | 6.39                   | 3.56            |
| 4900  | 10.79 | 33.27     | 5.24                    | 14.19                    | 4.58      | 1.24    | 16.41          | 6.24                   | 3.62            |
| 5000  | 10.44 | 32.38     | 4.94                    | 14.33                    | 4.16      | 1.26    | 15.77          | 5.84                   | 3.85            |
| 5100  | 10.03 | 33.36     | 4.94                    | 13.98                    | 4.85      | 1.26    | 15.72          | 5.81                   | 3.90            |
| 5200  | 9.71  | 34.87     | 4.52                    | 13.76                    | 5.65      | 1.29    | 15.25          | 5.28                   | 4.05            |
| 5300  | 9.20  | 37.06     | 4.56                    | 13.29                    | 7.72      | 1.28    | 14.85          | 4.95                   | 4.15            |
| 5400  | 8.53  | 33.76     | 4.28                    | 13.75                    | 5.53      | 1.31    | 14.21          | 4.37                   | 4.35            |
| 5500  | 7.96  | 36.09     | 4.32                    | 12.06                    | 7.58      | 1.28    | 14.09          | 4.26                   | 4.53            |



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site  
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)



IF/RF MICROWAVE COMPONENTS

REV. OR  
MNA-5W+  
3/21/2016  
Page 6 of 9

# MMIC Amplifier

# MNA-5W+

## 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 = 3.9V, Id = 34.12mA @ Temperature = +85degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 200   | 4.18  | 44.61     | 1.88                    | 2.34                     | 7.44      | 0.69    | 9.43           | 1.46                   | 6.25            |
| 300   | 14.08 | 41.36     | 2.42                    | 5.82                     | 3.30      | 1.19    | 19.64          | 8.82                   | 4.67            |
| 400   | 18.64 | 41.26     | 3.75                    | 9.83                     | 3.33      | 1.30    | 23.05          | 12.15                  | 4.03            |
| 500   | 20.77 | 42.25     | 5.61                    | 14.81                    | 4.10      | 1.24    | 24.08          | 13.14                  | 4.17            |
| 600   | 21.80 | 43.57     | 7.71                    | 21.18                    | 5.06      | 1.16    | 24.65          | 13.37                  | 3.62            |
| 700   | 22.29 | 43.46     | 9.76                    | 24.02                    | 5.14      | 1.09    | 24.54          | 13.23                  | 3.58            |
| 800   | 22.55 | 44.22     | 11.85                   | 19.76                    | 5.67      | 1.04    | 24.06          | 12.93                  | 3.49            |
| 900   | 22.59 | 43.04     | 13.91                   | 17.73                    | 5.04      | 1.01    | 23.43          | 12.43                  | 3.44            |
| 1000  | 22.60 | 42.48     | 15.86                   | 16.14                    | 4.76      | 0.99    | 23.17          | 12.26                  | 3.46            |
| 1100  | 22.55 | 41.54     | 17.85                   | 15.25                    | 4.32      | 0.97    | 23.13          | 12.15                  | 3.48            |
| 1200  | 22.44 | 40.91     | 19.77                   | 14.80                    | 4.09      | 0.96    | 23.11          | 12.00                  | 3.48            |
| 1300  | 22.29 | 40.33     | 21.68                   | 14.32                    | 3.89      | 0.95    | 22.49          | 11.72                  | 3.39            |
| 1400  | 22.12 | 40.04     | 23.36                   | 14.01                    | 3.83      | 0.95    | 22.26          | 11.45                  | 3.40            |
| 1500  | 21.91 | 39.68     | 25.10                   | 13.77                    | 3.77      | 0.94    | 22.18          | 11.32                  | 3.43            |
| 1600  | 21.72 | 39.05     | 25.15                   | 13.97                    | 3.60      | 0.94    | 21.92          | 11.29                  | 3.42            |
| 1700  | 21.46 | 38.43     | 25.85                   | 13.82                    | 3.46      | 0.94    | 21.51          | 10.95                  | 3.41            |
| 1800  | 21.17 | 38.11     | 25.60                   | 13.79                    | 3.44      | 0.94    | 21.34          | 10.73                  | 3.49            |
| 1900  | 20.88 | 37.91     | 24.87                   | 13.77                    | 3.47      | 0.94    | 20.84          | 10.41                  | 3.52            |
| 2000  | 20.58 | 37.61     | 24.69                   | 13.50                    | 3.47      | 0.94    | 20.85          | 10.41                  | 3.51            |
| 2100  | 20.23 | 37.19     | 23.03                   | 13.99                    | 3.45      | 0.94    | 20.83          | 10.36                  | 3.46            |
| 2200  | 19.89 | 37.04     | 21.76                   | 13.95                    | 3.52      | 0.94    | 20.57          | 10.16                  | 3.51            |
| 2300  | 19.50 | 36.83     | 20.96                   | 14.02                    | 3.59      | 0.94    | 20.31          | 9.81                   | 3.50            |
| 2400  | 19.13 | 36.23     | 20.05                   | 13.88                    | 3.49      | 0.94    | 20.24          | 9.74                   | 3.44            |
| 2500  | 18.73 | 36.33     | 18.40                   | 14.15                    | 3.68      | 0.95    | 19.72          | 9.43                   | 3.56            |
| 2600  | 18.36 | 35.91     | 17.63                   | 14.23                    | 3.66      | 0.95    | 19.86          | 9.29                   | 3.60            |
| 2700  | 17.89 | 35.78     | 16.53                   | 14.50                    | 3.79      | 0.96    | 19.78          | 9.26                   | 3.66            |
| 2800  | 17.47 | 35.62     | 15.58                   | 14.36                    | 3.88      | 0.97    | 19.50          | 8.98                   | 3.69            |
| 2900  | 17.01 | 36.13     | 14.53                   | 14.75                    | 4.30      | 0.98    | 19.27          | 8.82                   | 3.77            |
| 3000  | 16.61 | 35.18     | 13.89                   | 14.29                    | 4.01      | 0.98    | 19.12          | 8.58                   | 3.69            |
| 3100  | 16.21 | 34.83     | 13.16                   | 14.35                    | 4.01      | 0.99    | 19.11          | 8.65                   | 3.77            |
| 3200  | 15.76 | 34.97     | 12.35                   | 14.75                    | 4.25      | 1.00    | 18.39          | 8.36                   | 3.83            |
| 3300  | 15.36 | 34.31     | 11.80                   | 14.60                    | 4.10      | 1.01    | 18.49          | 8.34                   | 3.79            |
| 3400  | 14.84 | 34.61     | 11.08                   | 15.05                    | 4.45      | 1.02    | 18.32          | 8.06                   | 3.98            |
| 3500  | 14.43 | 34.45     | 10.57                   | 15.04                    | 4.53      | 1.03    | 18.00          | 7.85                   | 3.97            |
| 3600  | 14.08 | 34.02     | 10.13                   | 14.88                    | 4.44      | 1.04    | 18.02          | 7.67                   | 4.07            |
| 3700  | 13.59 | 33.69     | 9.66                    | 15.62                    | 4.48      | 1.06    | 17.71          | 7.64                   | 4.11            |
| 3800  | 13.20 | 34.09     | 9.14                    | 15.54                    | 4.82      | 1.07    | 17.75          | 7.47                   | 4.19            |
| 3900  | 12.70 | 33.88     | 8.72                    | 15.53                    | 4.91      | 1.09    | 17.28          | 7.22                   | 4.27            |
| 4000  | 12.26 | 34.33     | 8.11                    | 15.43                    | 5.30      | 1.11    | 17.20          | 7.03                   | 4.42            |
| 4100  | 11.98 | 35.31     | 7.61                    | 14.90                    | 5.96      | 1.12    | 16.94          | 6.91                   | 4.44            |
| 4200  | 11.55 | 34.11     | 7.20                    | 15.54                    | 5.37      | 1.14    | 16.78          | 6.92                   | 4.49            |
| 4300  | 11.18 | 33.05     | 7.03                    | 16.07                    | 4.95      | 1.15    | 16.83          | 6.60                   | 4.58            |
| 4400  | 10.82 | 33.01     | 6.72                    | 15.86                    | 5.03      | 1.17    | 16.26          | 6.42                   | 4.71            |
| 4500  | 10.56 | 33.55     | 6.44                    | 15.54                    | 5.41      | 1.18    | 16.22          | 6.30                   | 4.82            |
| 4600  | 10.17 | 33.37     | 6.20                    | 15.78                    | 5.44      | 1.19    | 16.23          | 6.14                   | 4.94            |
| 4700  | 9.78  | 33.61     | 5.83                    | 16.16                    | 5.69      | 1.22    | 15.71          | 6.03                   | 5.03            |
| 4800  | 9.38  | 32.87     | 5.82                    | 16.00                    | 5.48      | 1.22    | 15.60          | 5.65                   | 5.19            |
| 4900  | 9.00  | 32.64     | 5.53                    | 16.30                    | 5.43      | 1.24    | 15.32          | 5.39                   | 5.26            |
| 5000  | 8.65  | 32.16     | 5.18                    | 16.05                    | 5.16      | 1.26    | 14.59          | 5.05                   | 5.49            |
| 5100  | 8.12  | 33.00     | 5.15                    | 15.81                    | 6.01      | 1.26    | 14.50          | 4.84                   | 5.60            |
| 5200  | 7.72  | 33.58     | 4.83                    | 15.74                    | 6.49      | 1.29    | 14.22          | 4.50                   | 5.84            |
| 5300  | 7.13  | 35.35     | 4.74                    | 15.48                    | 8.38      | 1.29    | 13.50          | 4.14                   | 5.96            |
| 5400  | 6.59  | 34.86     | 4.50                    | 14.51                    | 8.13      | 1.30    | 13.17          | 3.60                   | 6.25            |
| 5500  | 6.22  | 36.00     | 4.49                    | 12.62                    | 9.47      | 1.28    | 13.40          | 3.55                   | 6.58            |



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site  
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

IF/RF MICROWAVE COMPONENTS

REV. OR  
MNA-5W+  
3/21/2016  
Page 7 of 9

# MMIC Amplifier

# MNA-5W+

## 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 = 2.8V, Id = 32.57 mA @ Temperature = +85degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 200   | 3.93  | 45.25     | 1.92                    | 2.39                     | 8.52      | 0.70    | 8.96           | 0.63                   | 6.30            |
| 300   | 13.66 | 41.73     | 2.46                    | 5.87                     | 3.71      | 1.19    | 18.19          | 7.79                   | 4.72            |
| 400   | 18.08 | 42.13     | 3.84                    | 9.79                     | 4.02      | 1.29    | 21.34          | 10.56                  | 4.11            |
| 500   | 20.10 | 42.67     | 5.75                    | 14.72                    | 4.71      | 1.23    | 22.30          | 11.57                  | 4.30            |
| 600   | 21.05 | 43.36     | 7.88                    | 21.79                    | 5.43      | 1.15    | 22.76          | 11.76                  | 3.65            |
| 700   | 21.47 | 43.16     | 9.98                    | 39.28                    | 5.50      | 1.09    | 22.63          | 11.68                  | 3.62            |
| 800   | 21.67 | 42.94     | 12.08                   | 25.33                    | 5.47      | 1.05    | 22.34          | 11.51                  | 3.56            |
| 900   | 21.67 | 41.85     | 14.09                   | 21.54                    | 4.93      | 1.02    | 21.93          | 11.28                  | 3.50            |
| 1000  | 21.64 | 41.44     | 16.02                   | 19.21                    | 4.77      | 1.00    | 21.60          | 11.09                  | 3.49            |
| 1100  | 21.55 | 40.44     | 17.90                   | 18.04                    | 4.34      | 0.98    | 21.59          | 10.97                  | 3.53            |
| 1200  | 21.40 | 39.86     | 19.65                   | 17.31                    | 4.14      | 0.97    | 21.57          | 10.86                  | 3.52            |
| 1300  | 21.22 | 39.23     | 21.33                   | 16.73                    | 3.94      | 0.97    | 21.04          | 10.64                  | 3.45            |
| 1400  | 21.02 | 38.74     | 22.78                   | 16.34                    | 3.81      | 0.96    | 20.83          | 10.39                  | 3.46            |
| 1500  | 20.78 | 38.31     | 24.21                   | 16.05                    | 3.73      | 0.96    | 20.79          | 10.31                  | 3.50            |
| 1600  | 20.55 | 37.72     | 24.33                   | 16.20                    | 3.59      | 0.96    | 20.51          | 10.21                  | 3.50            |
| 1700  | 20.27 | 37.17     | 24.92                   | 15.97                    | 3.48      | 0.95    | 20.12          | 9.92                   | 3.50            |
| 1800  | 19.97 | 36.83     | 24.69                   | 15.90                    | 3.46      | 0.95    | 20.01          | 9.68                   | 3.56            |
| 1900  | 19.67 | 36.60     | 24.10                   | 15.83                    | 3.49      | 0.95    | 19.58          | 9.45                   | 3.58            |
| 2000  | 19.36 | 35.90     | 23.88                   | 15.53                    | 3.34      | 0.95    | 19.58          | 9.37                   | 3.60            |
| 2100  | 19.01 | 35.78     | 22.45                   | 15.95                    | 3.42      | 0.96    | 19.52          | 9.29                   | 3.54            |
| 2200  | 18.67 | 35.68     | 21.30                   | 15.80                    | 3.51      | 0.96    | 19.28          | 9.02                   | 3.59            |
| 2300  | 18.29 | 35.12     | 20.61                   | 15.81                    | 3.44      | 0.96    | 19.04          | 8.76                   | 3.60            |
| 2400  | 17.93 | 34.94     | 19.72                   | 15.71                    | 3.50      | 0.96    | 18.95          | 8.63                   | 3.56            |
| 2500  | 17.54 | 35.01     | 18.27                   | 15.98                    | 3.67      | 0.97    | 18.55          | 8.38                   | 3.65            |
| 2600  | 17.19 | 34.61     | 17.55                   | 15.98                    | 3.65      | 0.97    | 18.60          | 8.25                   | 3.72            |
| 2700  | 16.74 | 34.24     | 16.47                   | 16.42                    | 3.67      | 0.98    | 18.51          | 8.17                   | 3.76            |
| 2800  | 16.33 | 34.12     | 15.55                   | 16.20                    | 3.76      | 0.98    | 18.23          | 7.90                   | 3.79            |
| 2900  | 15.89 | 34.54     | 14.56                   | 16.50                    | 4.12      | 0.99    | 18.01          | 7.75                   | 3.86            |
| 3000  | 15.52 | 33.74     | 13.91                   | 16.26                    | 3.91      | 0.99    | 17.84          | 7.47                   | 3.79            |
| 3100  | 15.14 | 33.33     | 13.17                   | 16.39                    | 3.87      | 1.00    | 17.84          | 7.49                   | 3.85            |
| 3200  | 14.70 | 33.34     | 12.39                   | 16.83                    | 4.03      | 1.01    | 17.12          | 7.28                   | 3.96            |
| 3300  | 14.32 | 33.02     | 11.85                   | 16.62                    | 4.03      | 1.02    | 17.11          | 7.24                   | 3.92            |
| 3400  | 13.84 | 32.94     | 11.13                   | 16.99                    | 4.17      | 1.03    | 17.01          | 6.99                   | 4.06            |
| 3500  | 13.44 | 32.97     | 10.64                   | 17.39                    | 4.34      | 1.05    | 16.74          | 6.91                   | 4.08            |
| 3600  | 13.10 | 32.58     | 10.19                   | 17.32                    | 4.27      | 1.06    | 16.67          | 6.64                   | 4.20            |
| 3700  | 12.62 | 32.41     | 9.71                    | 18.13                    | 4.38      | 1.07    | 16.41          | 6.53                   | 4.28            |
| 3800  | 12.24 | 32.80     | 9.19                    | 18.18                    | 4.71      | 1.09    | 16.40          | 6.40                   | 4.34            |
| 3900  | 11.76 | 32.60     | 8.75                    | 18.08                    | 4.78      | 1.10    | 15.95          | 6.15                   | 4.43            |
| 4000  | 11.35 | 33.12     | 8.13                    | 17.90                    | 5.19      | 1.12    | 15.86          | 5.94                   | 4.56            |
| 4100  | 11.07 | 33.77     | 7.63                    | 17.52                    | 5.63      | 1.14    | 15.64          | 5.93                   | 4.59            |
| 4200  | 10.67 | 32.63     | 7.23                    | 18.07                    | 5.09      | 1.16    | 15.47          | 5.85                   | 4.65            |
| 4300  | 10.31 | 31.87     | 7.07                    | 18.29                    | 4.83      | 1.16    | 15.48          | 5.57                   | 4.81            |
| 4400  | 9.97  | 31.81     | 6.76                    | 18.00                    | 4.89      | 1.18    | 15.01          | 5.42                   | 4.87            |
| 4500  | 9.69  | 32.21     | 6.49                    | 17.90                    | 5.19      | 1.19    | 14.92          | 5.27                   | 4.98            |
| 4600  | 9.31  | 31.99     | 6.24                    | 18.23                    | 5.20      | 1.21    | 14.92          | 4.97                   | 5.12            |
| 4700  | 8.92  | 32.25     | 5.88                    | 18.77                    | 5.45      | 1.23    | 14.40          | 4.78                   | 5.23            |
| 4800  | 8.54  | 31.84     | 5.85                    | 17.96                    | 5.41      | 1.23    | 14.29          | 4.62                   | 5.36            |
| 4900  | 8.17  | 31.56     | 5.56                    | 18.09                    | 5.35      | 1.25    | 14.02          | 4.48                   | 5.47            |
| 5000  | 7.82  | 30.92     | 5.24                    | 18.05                    | 5.02      | 1.27    | 13.42          | 4.10                   | 5.66            |
| 5100  | 7.32  | 31.84     | 5.19                    | 17.46                    | 5.85      | 1.27    | 13.29          | 3.89                   | 5.82            |
| 5200  | 6.93  | 32.28     | 4.88                    | 17.42                    | 6.22      | 1.29    | 13.00          | 3.49                   | 6.06            |
| 5300  | 6.36  | 33.71     | 4.79                    | 16.98                    | 7.71      | 1.30    | 12.39          | 2.98                   | 6.15            |
| 5400  | 5.83  | 33.53     | 4.54                    | 16.01                    | 7.75      | 1.31    | 12.12          | 2.74                   | 6.51            |
| 5500  | 5.46  | 34.63     | 4.54                    | 13.96                    | 9.03      | 1.29    | 12.22          | 2.78                   | 6.77            |



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site  
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

IF/RF MICROWAVE COMPONENTS

REV. OR  
MNA-5W+  
3/21/2016  
Page 8 of 9

# MMIC Amplifier

# MNA-5W+

## 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 = 34.91 mA @ Temperature = +85degC

| FREQ  | Gain  | Isolation | Input<br>Return<br>Loss | Output<br>Return<br>Loss | Stability |         | IP-3<br>Output | 1dB<br>Comp.<br>Output | Noise<br>Figure |
|-------|-------|-----------|-------------------------|--------------------------|-----------|---------|----------------|------------------------|-----------------|
| (MHz) | (dB)  | (dB)      | (dB)                    | (dB)                     | K         | Measure | (dBm)          | (dBm)                  | (dB)            |
| 200   | 4.26  | 44.39     | 1.87                    | 2.29                     | 7.04      | 0.68    | 9.65           | 1.61                   | 6.21            |
| 300   | 14.26 | 40.96     | 2.39                    | 5.78                     | 3.03      | 1.19    | 20.28          | 9.35                   | 4.62            |
| 400   | 18.90 | 40.86     | 3.71                    | 9.82                     | 3.05      | 1.30    | 23.75          | 12.73                  | 4.01            |
| 500   | 21.10 | 41.99     | 5.54                    | 14.61                    | 3.80      | 1.24    | 24.74          | 13.60                  | 4.15            |
| 600   | 22.18 | 42.95     | 7.60                    | 19.22                    | 4.47      | 1.16    | 25.43          | 13.87                  | 3.60            |
| 700   | 22.71 | 43.76     | 9.65                    | 19.39                    | 5.01      | 1.09    | 25.28          | 13.66                  | 3.53            |
| 800   | 23.01 | 44.45     | 11.74                   | 16.56                    | 5.45      | 1.03    | 24.85          | 13.39                  | 3.49            |
| 900   | 23.08 | 43.62     | 13.85                   | 15.16                    | 5.02      | 1.00    | 24.06          | 12.82                  | 4.10            |
| 1000  | 23.13 | 43.25     | 15.83                   | 13.93                    | 4.81      | 0.97    | 23.91          | 12.60                  | 3.38            |
| 1100  | 23.10 | 42.69     | 17.90                   | 13.24                    | 4.55      | 0.95    | 23.77          | 12.51                  | 3.45            |
| 1200  | 23.02 | 41.96     | 19.98                   | 12.91                    | 4.24      | 0.94    | 23.73          | 12.40                  | 3.42            |
| 1300  | 22.90 | 41.21     | 22.03                   | 12.52                    | 3.94      | 0.93    | 23.06          | 12.05                  | 3.36            |
| 1400  | 22.75 | 41.11     | 23.94                   | 12.26                    | 3.95      | 0.93    | 22.83          | 11.81                  | 3.38            |
| 1500  | 22.56 | 40.74     | 25.99                   | 12.05                    | 3.86      | 0.92    | 22.74          | 11.74                  | 3.37            |
| 1600  | 22.39 | 40.28     | 25.95                   | 12.25                    | 3.75      | 0.92    | 22.56          | 11.67                  | 3.39            |
| 1700  | 22.14 | 39.52     | 26.88                   | 12.12                    | 3.54      | 0.92    | 22.10          | 11.37                  | 3.37            |
| 1800  | 21.86 | 39.47     | 26.60                   | 12.15                    | 3.63      | 0.92    | 21.96          | 11.16                  | 3.47            |
| 1900  | 21.58 | 39.07     | 25.72                   | 12.14                    | 3.59      | 0.92    | 21.40          | 10.80                  | 3.48            |
| 2000  | 21.28 | 38.41     | 25.55                   | 11.91                    | 3.44      | 0.92    | 21.39          | 10.84                  | 3.51            |
| 2100  | 20.92 | 38.53     | 23.60                   | 12.39                    | 3.64      | 0.92    | 21.39          | 10.79                  | 3.43            |
| 2200  | 20.58 | 38.32     | 22.15                   | 12.41                    | 3.70      | 0.93    | 21.17          | 10.52                  | 3.45            |
| 2300  | 20.17 | 38.01     | 21.25                   | 12.51                    | 3.74      | 0.93    | 20.90          | 10.27                  | 3.46            |
| 2400  | 19.79 | 37.55     | 20.27                   | 12.38                    | 3.69      | 0.93    | 20.84          | 10.21                  | 3.44            |
| 2500  | 19.37 | 37.71     | 18.49                   | 12.66                    | 3.94      | 0.94    | 20.25          | 9.87                   | 3.53            |
| 2600  | 18.99 | 37.10     | 17.65                   | 12.76                    | 3.84      | 0.94    | 20.45          | 9.83                   | 3.57            |
| 2700  | 18.50 | 37.03     | 16.51                   | 12.95                    | 4.01      | 0.95    | 20.39          | 9.70                   | 3.63            |
| 2800  | 18.06 | 36.75     | 15.53                   | 12.86                    | 4.06      | 0.95    | 20.09          | 9.44                   | 3.65            |
| 2900  | 17.57 | 37.44     | 14.44                   | 13.27                    | 4.61      | 0.97    | 19.90          | 9.32                   | 3.72            |
| 3000  | 17.16 | 36.33     | 13.80                   | 12.76                    | 4.22      | 0.96    | 19.75          | 9.05                   | 3.65            |
| 3100  | 16.74 | 36.02     | 13.05                   | 12.78                    | 4.25      | 0.97    | 19.74          | 9.11                   | 3.68            |
| 3200  | 16.26 | 36.12     | 12.21                   | 13.11                    | 4.50      | 0.99    | 19.06          | 8.86                   | 3.77            |
| 3300  | 15.84 | 35.62     | 11.68                   | 13.00                    | 4.42      | 0.99    | 19.20          | 8.87                   | 3.74            |
| 3400  | 15.30 | 35.83     | 10.92                   | 13.48                    | 4.76      | 1.01    | 19.02          | 8.59                   | 3.90            |
| 3500  | 14.87 | 35.54     | 10.43                   | 13.30                    | 4.78      | 1.02    | 18.67          | 8.48                   | 3.89            |
| 3600  | 14.52 | 35.17     | 10.00                   | 13.13                    | 4.72      | 1.03    | 18.76          | 8.13                   | 3.97            |
| 3700  | 14.01 | 34.67     | 9.52                    | 13.75                    | 4.69      | 1.05    | 18.44          | 8.12                   | 4.04            |
| 3800  | 13.60 | 35.29     | 8.99                    | 13.61                    | 5.17      | 1.06    | 18.50          | 8.06                   | 4.10            |
| 3900  | 13.09 | 34.89     | 8.57                    | 13.62                    | 5.16      | 1.07    | 18.00          | 7.79                   | 4.18            |
| 4000  | 12.63 | 35.61     | 7.97                    | 13.60                    | 5.75      | 1.10    | 17.95          | 7.63                   | 4.33            |
| 4100  | 12.33 | 36.31     | 7.49                    | 13.03                    | 6.27      | 1.11    | 17.63          | 7.46                   | 4.35            |
| 4200  | 11.89 | 35.20     | 7.07                    | 13.61                    | 5.72      | 1.13    | 17.50          | 7.39                   | 4.44            |
| 4300  | 11.51 | 34.05     | 6.91                    | 14.12                    | 5.23      | 1.14    | 17.60          | 7.17                   | 4.55            |
| 4400  | 11.14 | 33.99     | 6.60                    | 13.95                    | 5.31      | 1.15    | 16.96          | 7.01                   | 4.63            |
| 4500  | 10.87 | 34.66     | 6.33                    | 13.61                    | 5.78      | 1.17    | 16.95          | 6.91                   | 4.71            |
| 4600  | 10.47 | 34.38     | 6.08                    | 13.77                    | 5.76      | 1.18    | 16.96          | 6.71                   | 4.84            |
| 4700  | 10.07 | 34.94     | 5.72                    | 14.01                    | 6.23      | 1.21    | 16.46          | 6.40                   | 4.94            |
| 4800  | 9.65  | 33.79     | 5.71                    | 14.12                    | 5.76      | 1.21    | 16.34          | 6.29                   | 5.09            |
| 4900  | 9.28  | 33.70     | 5.42                    | 14.40                    | 5.80      | 1.23    | 16.07          | 6.04                   | 5.19            |
| 5000  | 8.91  | 33.20     | 5.08                    | 14.12                    | 5.49      | 1.25    | 15.24          | 5.50                   | 5.36            |
| 5100  | 8.36  | 33.87     | 5.05                    | 14.09                    | 6.30      | 1.25    | 15.22          | 5.46                   | 5.54            |
| 5200  | 7.94  | 34.67     | 4.74                    | 14.04                    | 6.97      | 1.28    | 14.93          | 5.10                   | 5.71            |
| 5300  | 7.34  | 36.63     | 4.66                    | 13.93                    | 9.24      | 1.28    | 14.17          | 4.70                   | 5.88            |
| 5400  | 6.78  | 36.02     | 4.42                    | 13.07                    | 8.84      | 1.29    | 13.80          | 4.17                   | 6.16            |
| 5500  | 6.41  | 37.15     | 4.42                    | 11.42                    | 10.26     | 1.26    | 14.14          | 4.33                   | 6.49            |



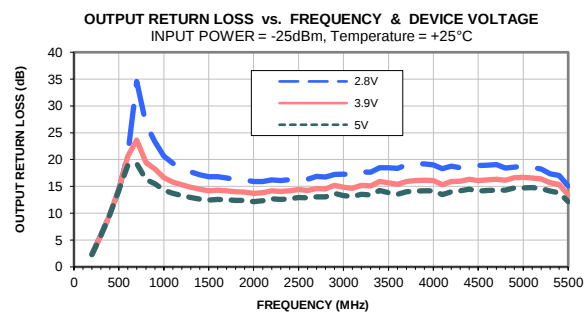
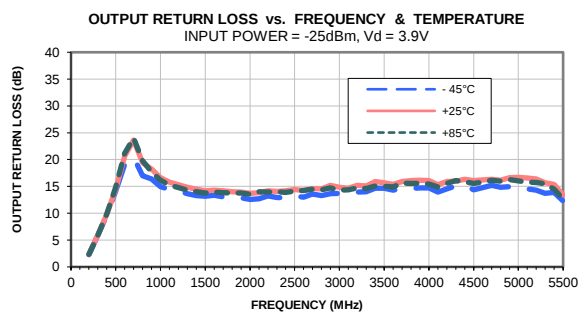
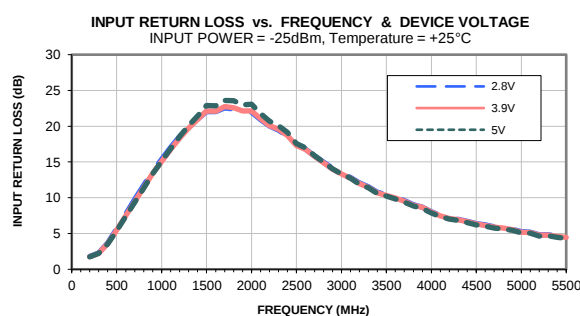
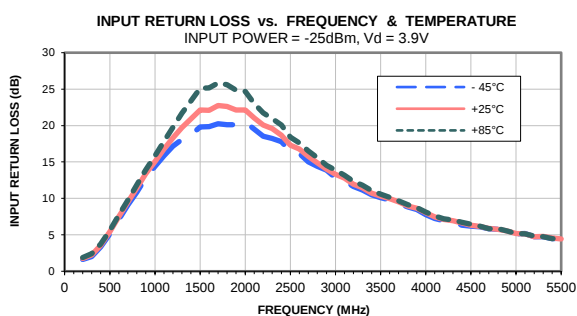
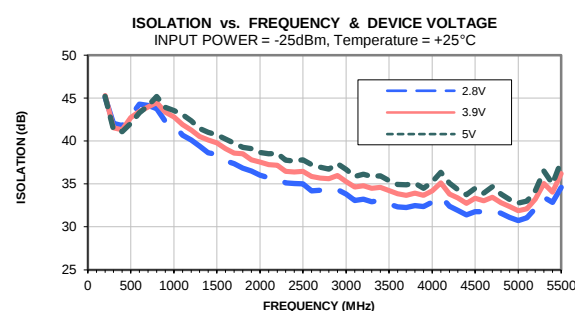
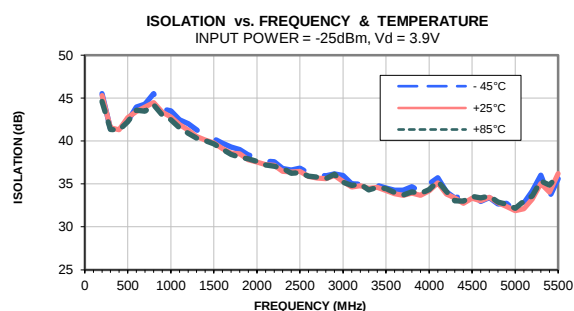
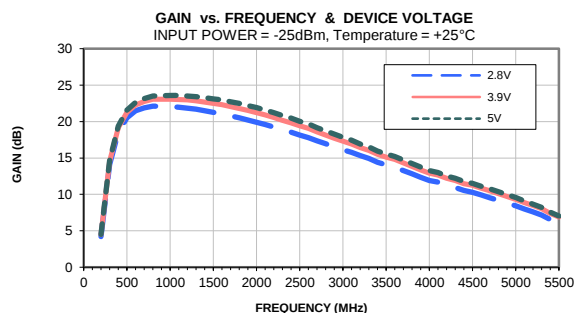
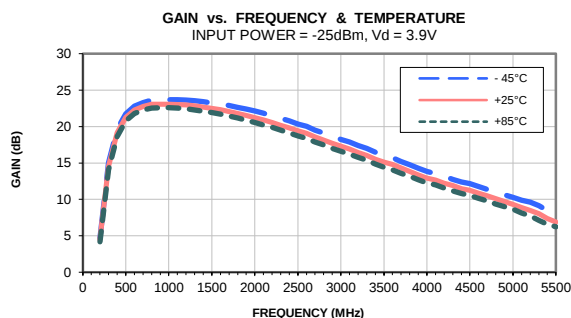
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 • Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site  
The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)



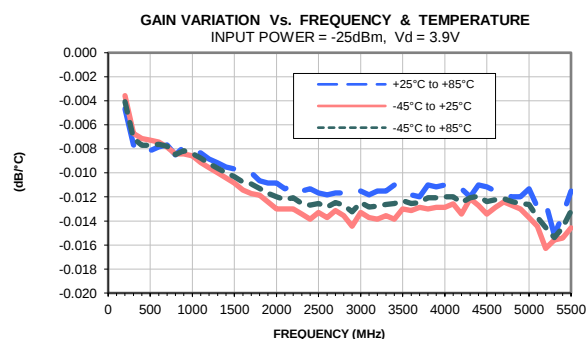
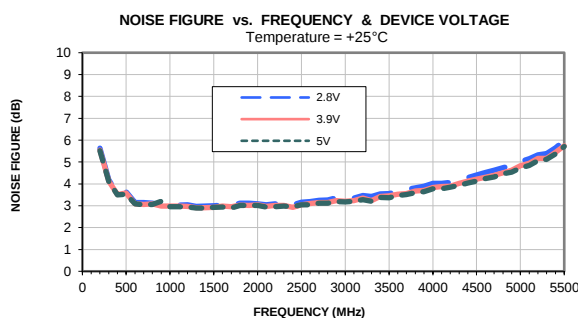
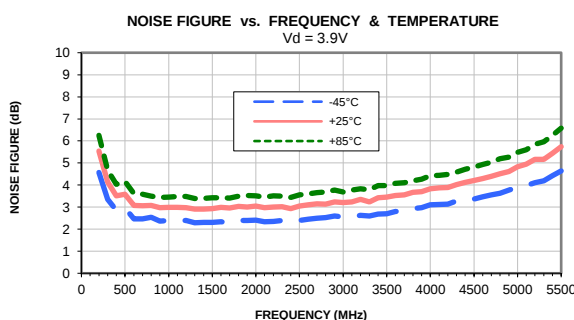
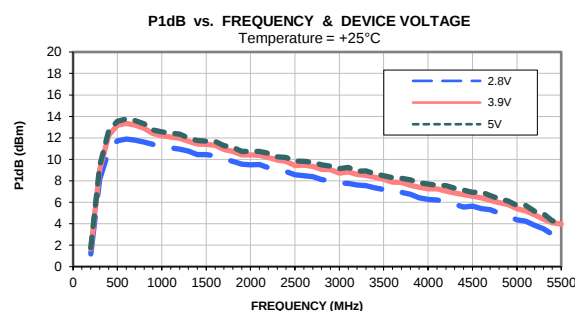
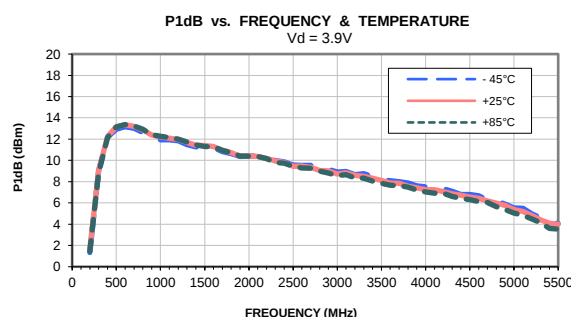
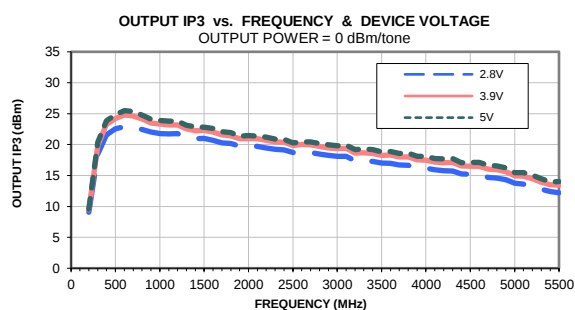
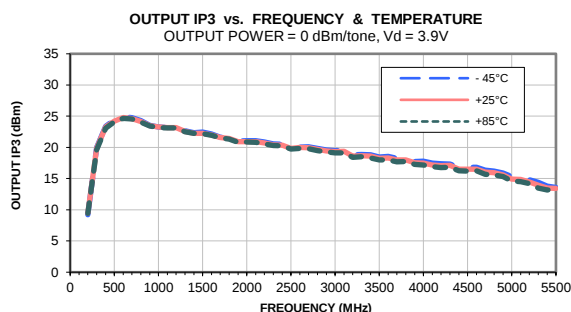
IF/RF MICROWAVE COMPONENTS

REV. OR  
MNA-5W+  
3/21/2016  
Page 9 of 9

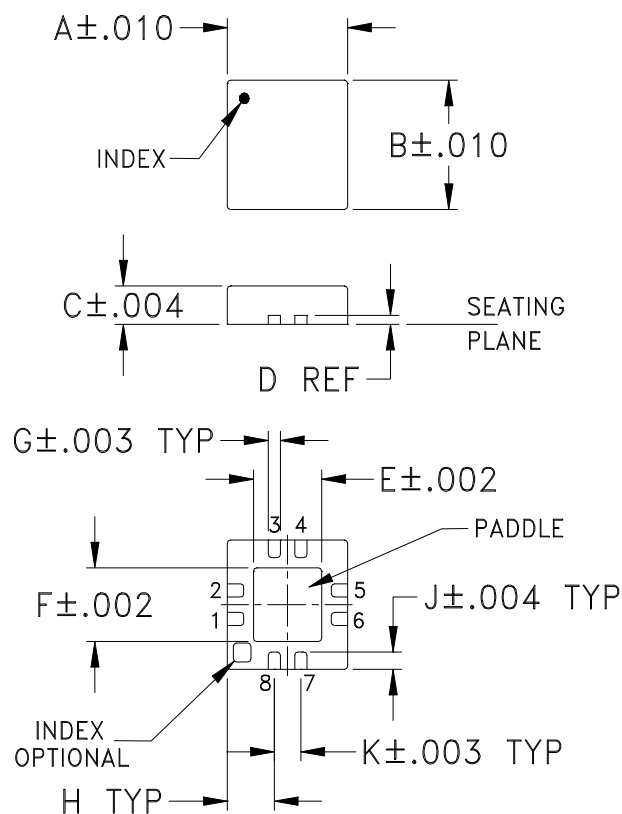
## Typical Performance Curves



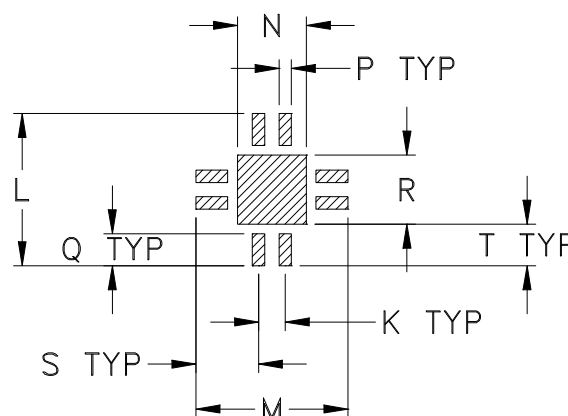
## Typical Performance Curves



### 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<br>(3.00) | .118<br>(3.00) | .035<br>(0.89) | .008<br>(0.20) | .067<br>(1.70) | .067<br>(1.70) | .012<br>(0.30) | .046<br>(1.17) | .016<br>(0.41) | .026<br>(0.66) | .148<br>(3.76) | .148<br>(3.76) | .067<br>(1.70) |

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



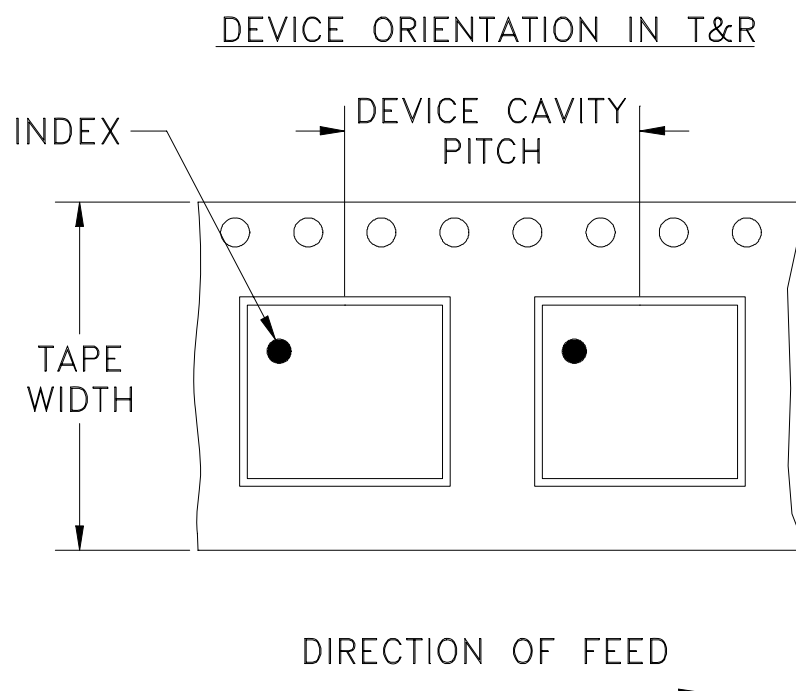
INTERNET <http://www.minicircuits.com>

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

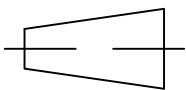


INTERNET <http://www.minicircuits.com>

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



| REV | ECN No.    | DESCRIPTION                                         | DATE     | DR  | AUTH |
|-----|------------|-----------------------------------------------------|----------|-----|------|
| OR  | M82272     | NEW RELEASE                                         | 08/05/02 | GF  | DJ   |
| A   | M82598     | MODIFIED LAYOUT                                     | 08/12/02 | GF  | MM   |
| B   | M102713    | ADDED "...WITH SMOBC"                               | 01/14/06 | GF  | IL   |
| C   | ECO-003400 | REMOVED COMP. VALUE, ADDED NOTE REF. TO EVAL. BOARD | 07/23/20 | ITG | IL   |

.049  
 .039  
 .119  
 .084  
 .069  
 47° TYP  
 R1  
 C1  
 .024  
 .037  
 .040  
 6 X  $\phi$ .015 PTH, FOR GROUND  
 .020  
 .040  
 .020  
 .051  
 .041  
 .012  
 .113  
 .061  
 .015 TYP  
 .067  
 .044 2 PL. TRACE WIDTH (SEE NOTE BELOW)  
 PACKAGE OUTLINE  
 TRACE WIDTH (SEE NOTE BELOW)

 DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

| UNLESS OTHERWISE SPECIFIED |      | INITIALS |    | DATE     |
|----------------------------|------|----------|----|----------|
| DIMENSIONS ARE IN INCHES   |      | DRAWN    | GF | 07/19/02 |
| TOLERANCES ON:             |      | CHECKED  | LC | 08/01/02 |
| 2 PL DECIMALS ±            | .005 | APPROVED | DJ | 08/05/02 |
| 3 PL DECIMALS ±            |      |          |    |          |
| ANGLES ±                   |      |          |    |          |
| FRACTIONS ±                |      |          |    |          |

 Mini-Circuits®

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE, MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

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

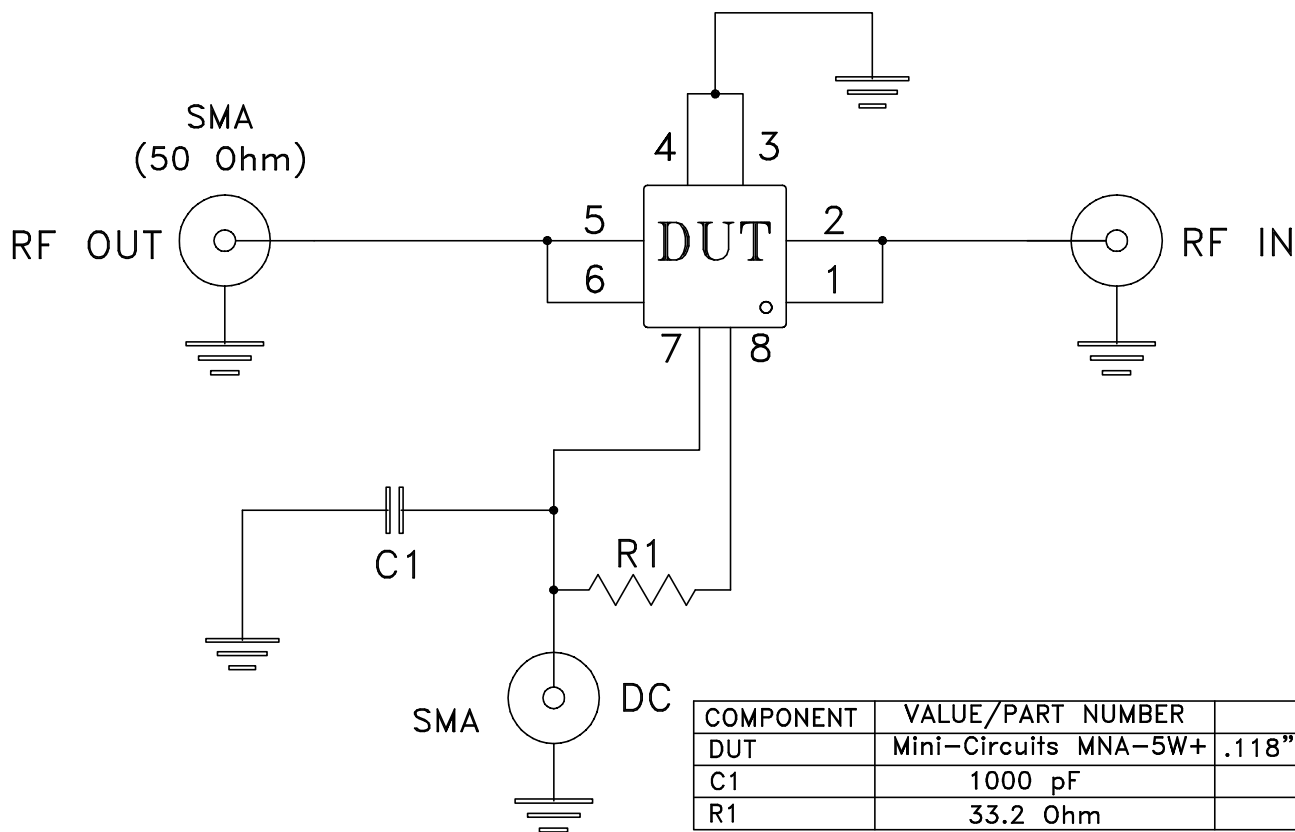
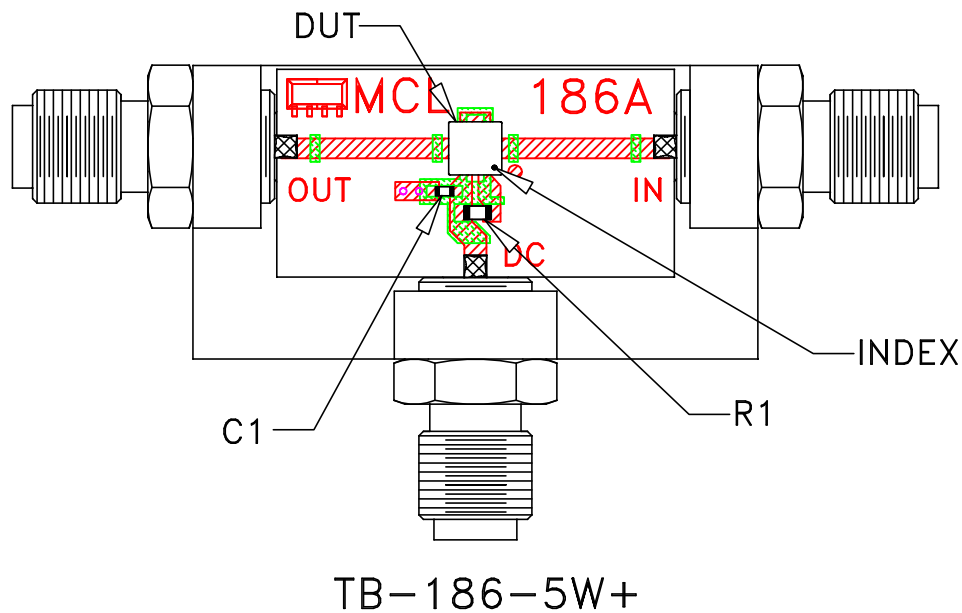


Mini-Circuits® 13 Neptune Avenue  
Brooklyn NY 11235

PL, DQ849, TB-186-XX+

|                      |                            |                                 |                      |                  |
|----------------------|----------------------------|---------------------------------|----------------------|------------------|
| SIZE<br><b>A</b>     | CODE IDENT<br><b>15542</b> | DRAWING NO:<br><b>98-PL-078</b> |                      | REV:<br><b>C</b> |
| FILE: <b>98PL078</b> |                            | SCALE: <b>15:1</b>              | SHEET: <b>1 OF 1</b> |                  |

# Evaluation Board and Circuit



Schematic Diagram

## Notes:

1. SMA Female connectors.
2. PCB Material: Rogers R04350 or equivalent, Dielectric Constant=3.5, Thickness=.020 inch.
3. Pins 1 and 6 have no internal connecton.
4. Paddle underneath DUT must be grounded.

 **Mini-Circuits®**



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



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

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