

## Broadband CATV 8-Way Active Splitter with default loop-through Switch 50 - 1100 MHz

Rev. V1

### Features

- Always ON loop-through path
- 8-Way Splitter
- 1.5 dB Gain
- +15 dBm V /Channel Input
- Single 5 Volt Bias
- Lead-Free 4 mm 24-Lead PQFN Package
- RoHS\* Compliant and 260°C Reflow Compatible

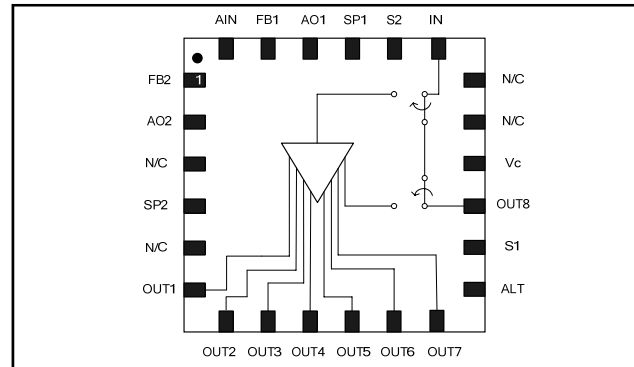
### Description

The MAAM-010237 CATV 8-way active splitter with the default loop-through path is a GaAs MMIC which exhibits low noise figure and distortion in a lead-free 4mm 24-lead PQFN plastic package. The design features 75  $\Omega$  inputs and outputs.

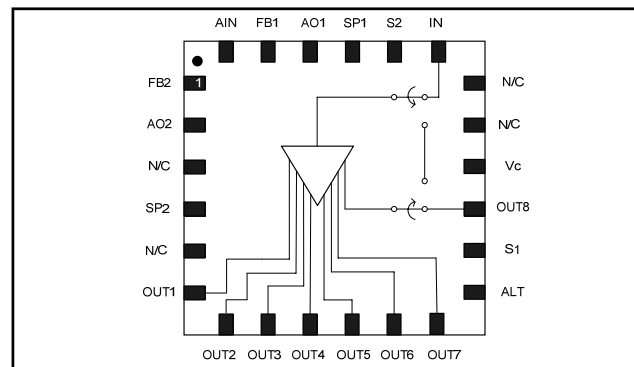
This device is ideally suited for multi-tuner set top boxes, home gateways, and other broadband internet based applications.

The MAAM-010237 is fabricated using M/A-COM Technology Solutions' E/D pHEMT process to realize default loop-through operation, low noise and low distortion. The process features full passivation for robust performance and reliability.

### Functional Schematic, Default On, Power Off



### Functional Schematic, Power On



### Pin Configuration

| Pin No. | Function           | Pin No. | Function            |
|---------|--------------------|---------|---------------------|
| 1       | Feedback 2         | 13      | Alternate Output    |
| 2       | Amplifier Output 2 | 14      | Switch In           |
| 3       | No Connection      | 15      | RF Output 8         |
| 4       | Splitter 2         | 16      | Voltage Control     |
| 5       | No Connection      | 17      | No Connection       |
| 6       | RF Output 1        | 18      | No Connection       |
| 7       | RF Output 2        | 19      | RF Input            |
| 8       | RF Output 3        | 20      | Switch Output       |
| 9       | RF Output 4        | 21      | Splitter 1          |
| 10      | RF Output 5        | 22      | Amplifier Output 1  |
| 11      | RF Output 6        | 23      | Feedback 1          |
| 12      | RF Output 7        | 24      | Amplifier Input     |
|         |                    | 25      | Paddle <sup>3</sup> |

### Ordering Information<sup>1,2</sup>

| Part Number        | Package           |
|--------------------|-------------------|
| MAAM-010237-TR1000 | 1000 piece reel   |
| MAAM-010237-TR3000 | 3000 piece reel   |
| MAAM-010237-001SMB | Sample Test Board |

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

\*Restrictions on Hazardous Substances, European Union Directive 02/95/EC.

3. The exposed paddle centered on the package bottom must be connected to RF, DC and thermal ground.

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Electrical Specifications:  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 75 \Omega$

| Parameter            | Test Conditions  | V <sub>DD</sub> (V) | V <sub>C</sub> (V) | Units | Min.   | Typ.       | Max.     |
|----------------------|--|---------------------|--------------------|-------|--------|------------|----------|
| Gain                 | In to Out1, 2, 3, 4, 5, 6, 7, or 8<br>400 MHz<br>900 MHz | 5                   | 3.3                | dB    | 0<br>- | 1.5<br>4.0 | 2.6<br>- |
| Insertion Loss       | In to Out8<br>400 MHz<br>900 MHz                         | 0                   | 0                  | dB    | -<br>- | 0.6<br>1.0 | -<br>1.2 |
| Noise Figure         | In to Out1, 2, 3, 4, 5, 6, 7, or 8                       | 5                   | 3.3                | dB    | -      | 4.75       | -        |
| Input Return Loss    | Input  | 5                   | 3.3                | dB    | -      | 10         | -        |
| Input Return Loss    | Input  | 0                   | 0                  | dB    | -      | 16         | -        |
| Output Return Loss   | Output   | 5                   | 3.3                | dB    | -      | 10         | -        |
| Output Return Loss   | Output   | 0                   | 0                  | dB    | -      | 9.5        | -        |
| Out to Out Isolation | Out1 to Out2, 3, 4, 5, 6, 7, or 8                        | 5                   | 3.3                | dB    | -      | 22         | -        |
| Out to Out Isolation | Out1 to 2, 3, 4, 5, 6, or 7                              | 0                   | 0                  | dB    | -      | 20         | -        |
| CTB                  | 132 Ch, +15 dBmV/Ch at the Input                         | 5                   | 3.3                | dBc   | -      | -65        | -        |
| CSO                  | 132 Ch, +15 dBmV/Ch at the Input                         | 5                   | 3.3                | dBc   | -      | -50        | -        |
| Reverse Isolation    | Out1, 2, 3, 4, 5, 6, 7 to In                             | 5                   | 3.3                | dB    | -      | 35         | -        |
| Reverse Isolation    | Out8 to In   | 5                   | 3.3                | dB    | -      | 30         | -        |
| Reverse Isolation    | Out1, 2, 3, 4, 5, 6, 7 to In                             | 0                   | 0                  | dB    | -      | 42         | -        |
| OIP2                 | 400 MHz, 2-tone,<br>6 MHz spacing, -10 dBm Pout          | 5                   | 3.3/0              | dBm   | -      | 30         | -        |
| OIP3                 | 400 MHz, 2-tone,<br>6 MHz spacing, -10 dBm Pout          | 5                   | 3.3/0              | dBm   | -      | 22         | -        |
| P1dB                 | 400 MHz  | 5                   | 3.3                | dBm   | -      | 6          | -        |
| P1dB                 | 400 MHz  | 5                   | 0                  | dBm   | -      | 25         | -        |
| I <sub>DD</sub>      |  | 5                   | 3.3                | mA    | -      | 190        | 220      |
| I <sub>C</sub>       |  | 5                   | 3.3                | μA    | -      | 230        | 300      |

4. The unpowered state is the same as V<sub>control</sub> = 0 V

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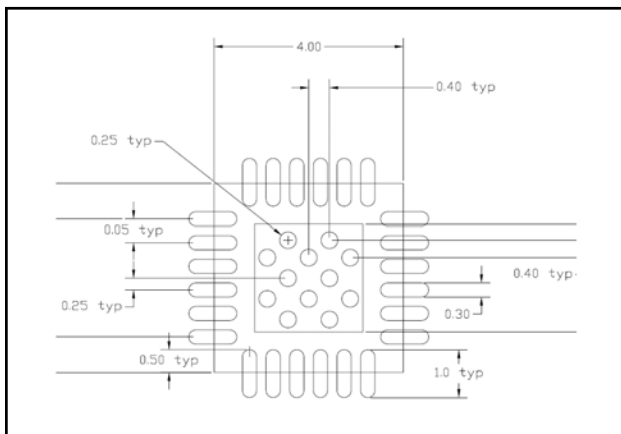
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### Absolute Maximum Ratings<sup>5,6</sup>

| Parameter                           | Absolute Maximum |
|-------------------------------------|------------------|
| Max Input Power                     | +5 dBm           |
| V <sub>DD</sub>                     | +10.0 V          |
| V <sub>CONTROL</sub>                | +8.5 V           |
| Junction Temperature <sup>7,8</sup> | +150°C           |
| Operating Temperature               | -20°C to +85°C   |
| Storage Temperature                 | -65°C to +150°C  |

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.
- Operating at nominal conditions with T<sub>J</sub> ≤ +150°C will ensure MTTF > 1 x 10<sup>6</sup> hours.
- Junction Temperature (T<sub>J</sub>) = T<sub>A</sub> + Θ<sub>JC</sub> \* (V \* I)  
Typical thermal resistance (Θ<sub>JC</sub>) = 73 °C/W.
  - For T<sub>A</sub> = 25°C,  
T<sub>J</sub> = 95 °C @ 5.0 V, 190 mA
  - For T<sub>A</sub> = 85°C,  
T<sub>J</sub> = 149 °C @ 5.0 V, 175 mA

### PCB Land Pattern



### Truth Table<sup>9</sup>

| V <sub>DD</sub> | V <sub>CONTROL</sub> | IN - OUT1, 2, 3, 4, 5, 6 or 7 | IN - OUT8 |
|-----------------|----------------------|-------------------------------|-----------|
| 5 V             | 1                    | On                            | On        |
| 0 V             | 0                    | Off                           | On        |

9. V<sub>CONTROL</sub> for Logic "1" = +3 to +5 volts, Logic "0" = 0 ± 0.2 volts.

### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

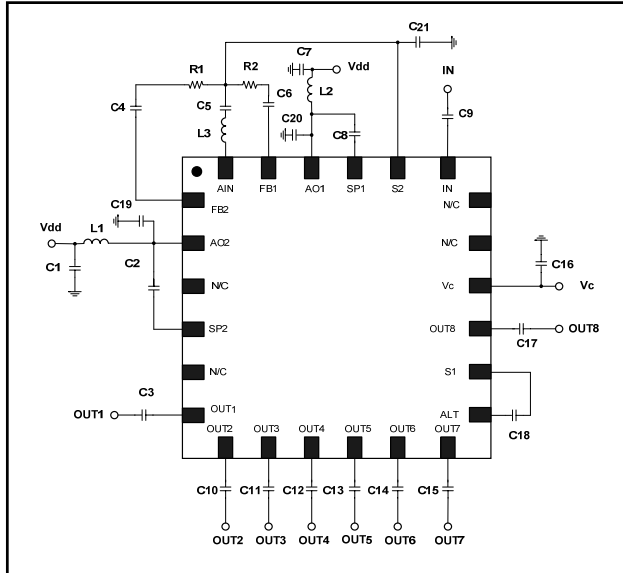
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices. An external protection circuit using an anti-parallel diode pair can be used to protect the IC.

Please reference application note AN3028 on <http://www.macomtech.com> for further detail.

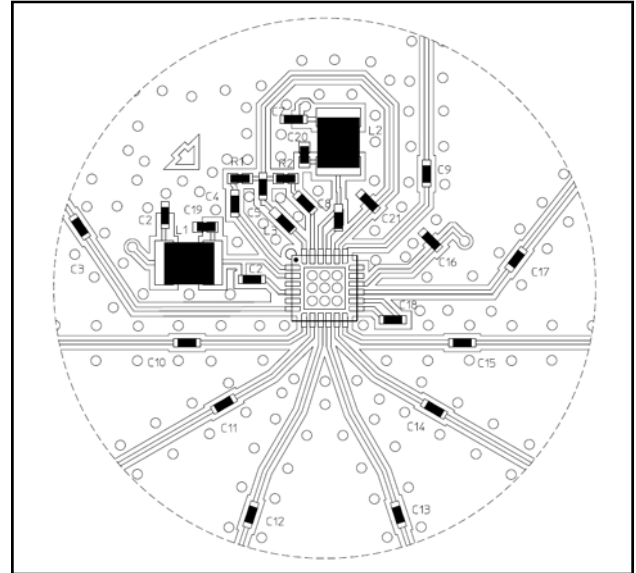
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### Schematic Including Off-Chip Components



### Recommended PCB Layout

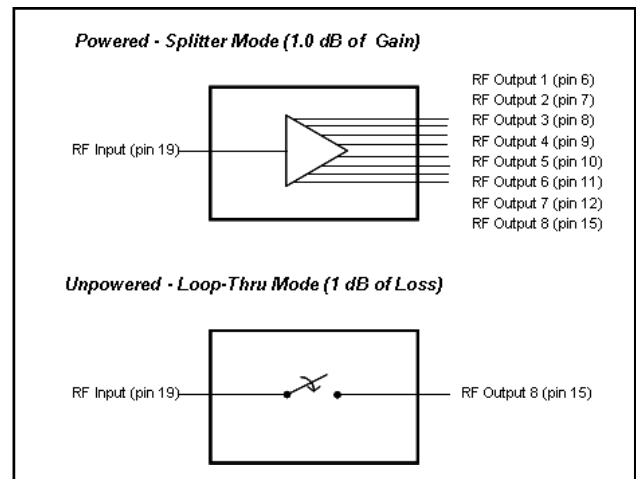


### Off-Chip Component Values

| Component             | Value        | Package |
|-----------------------|--------------|---------|
| C1 - C18              | 0.01 $\mu$ F | 0402    |
| C19, C20              | 2.2 pF       | 0402    |
| C21                   | 1.5 pF       | 0402    |
| L1 & L2 <sup>10</sup> | 1 $\mu$ H    | 1210    |
| L3                    | 6.8 nH       | 0402    |
| R1, R2                | 390 $\Omega$ | 0402    |

10. L1 & L2 supplied from EPCOS, part number B82422A1102K100

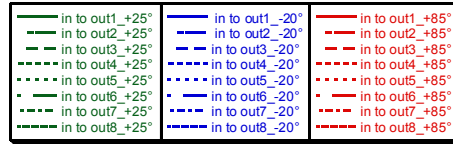
### Block Diagram RF Signal Flow



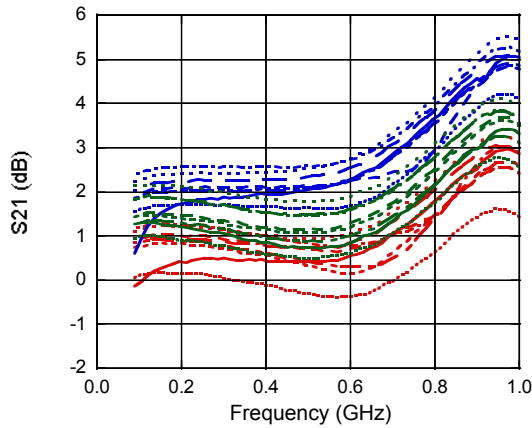
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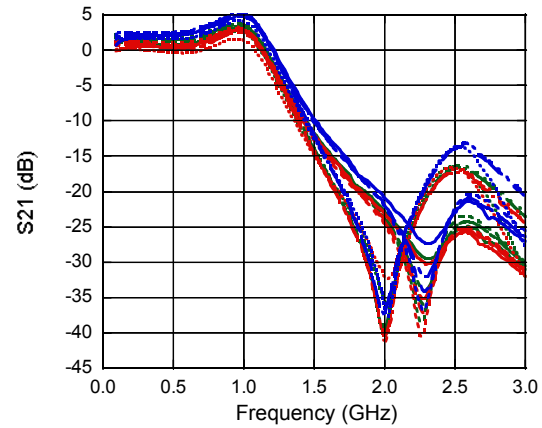
### Typical Performance Curves



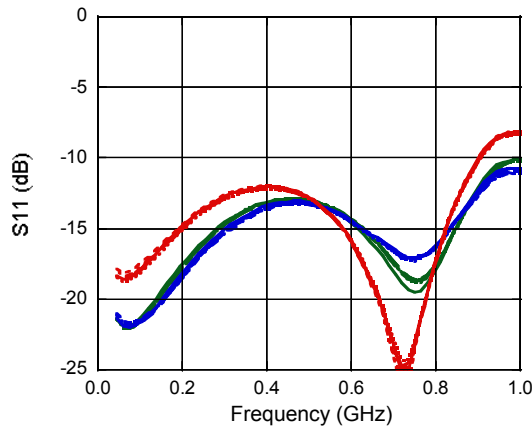
#### Gain



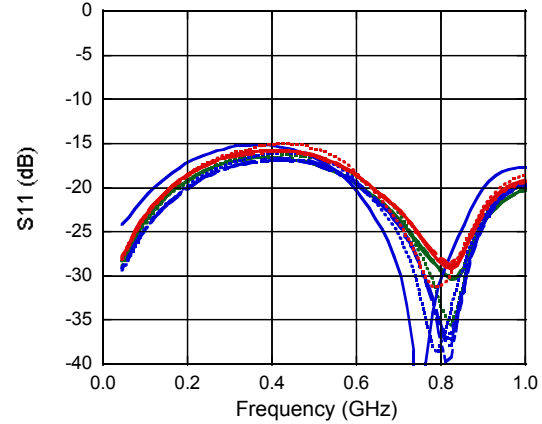
#### Gain to 3 GHz



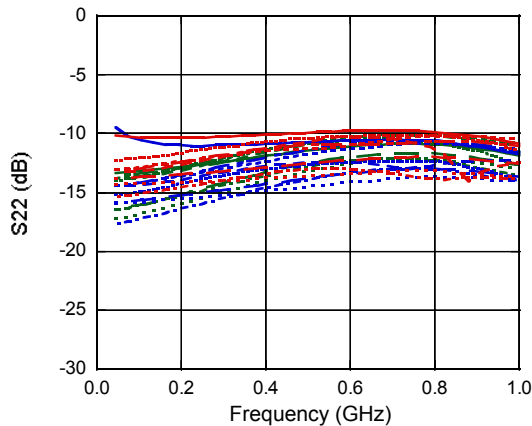
#### Input Return Loss (power on)



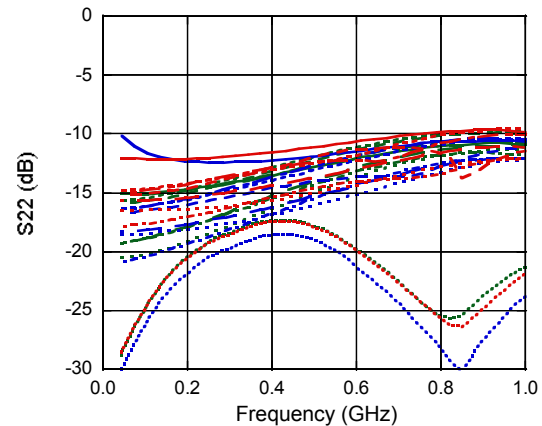
#### Input Return Loss (power off)



#### Output Return Loss (power on)



#### Output Return Loss (power off)



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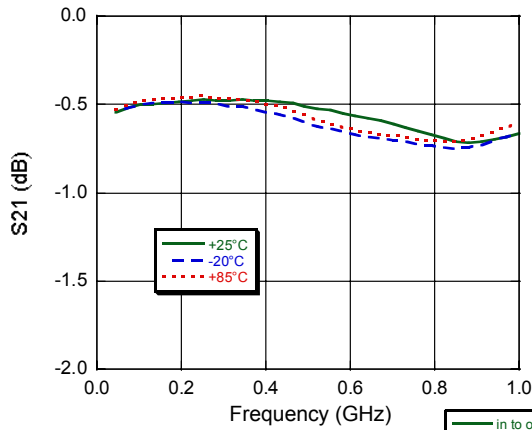
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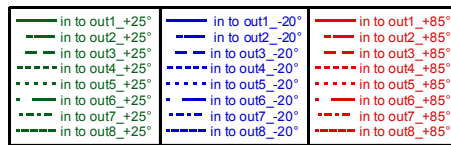
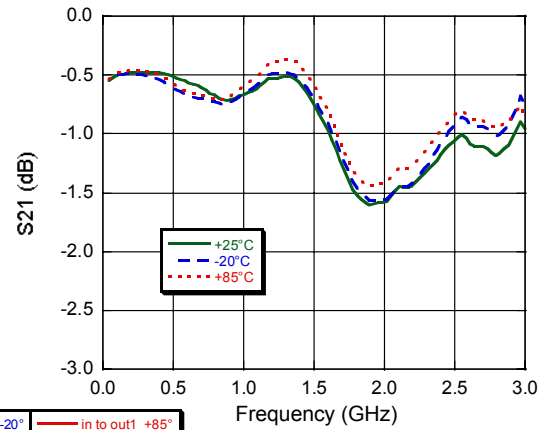
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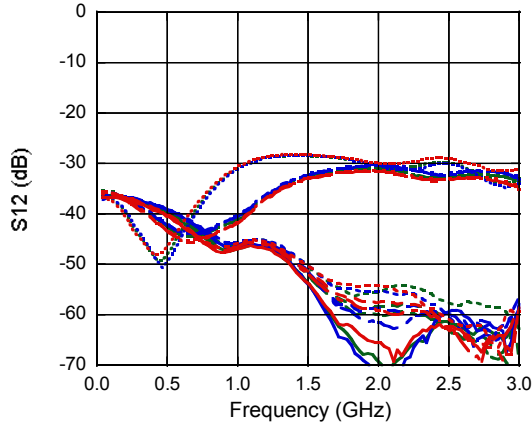
Insertion Loss to 1 GHz (power off)



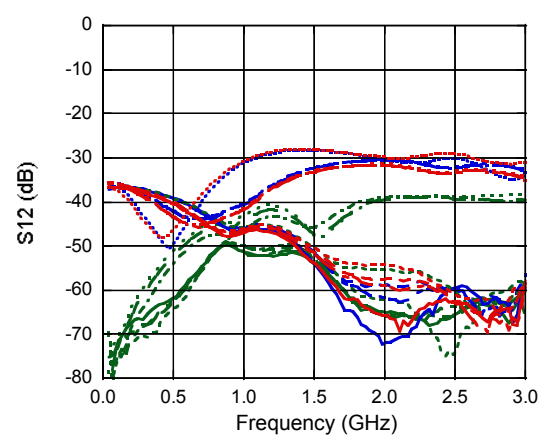
Insertion Loss to 3 GHz (power off)



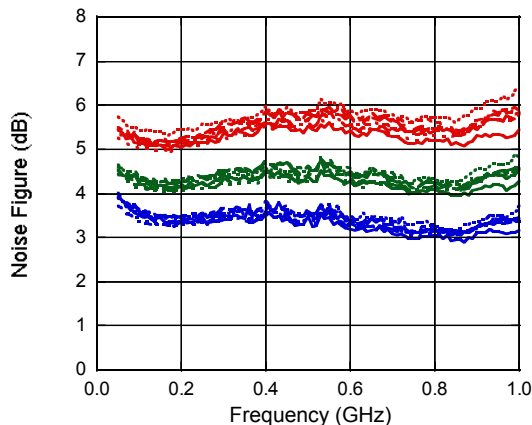
Reverse Isolation to 3 GHz (power on)



Reverse Isolation to 3 GHz (power off)



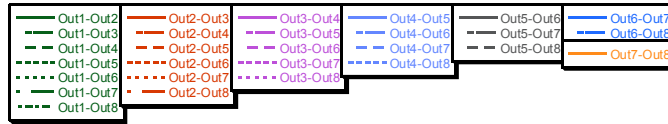
### Noise Figure



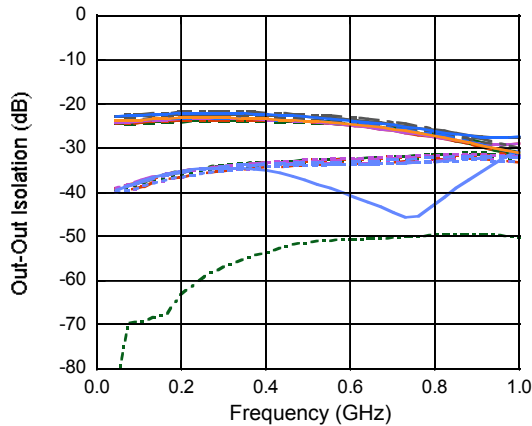
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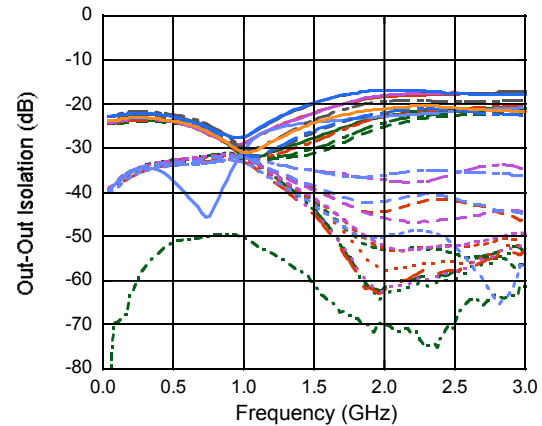
### Typical Performance Curves



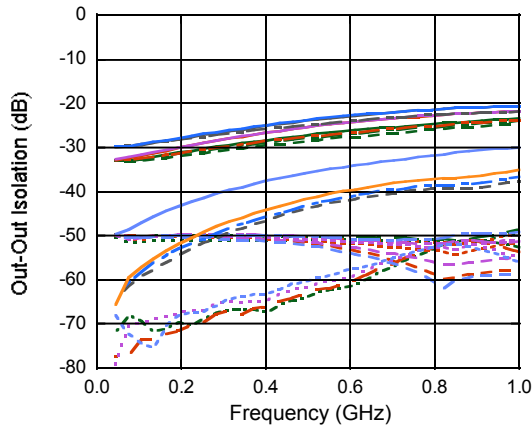
**Out to Out Isolation to 1 GHz (power on)**



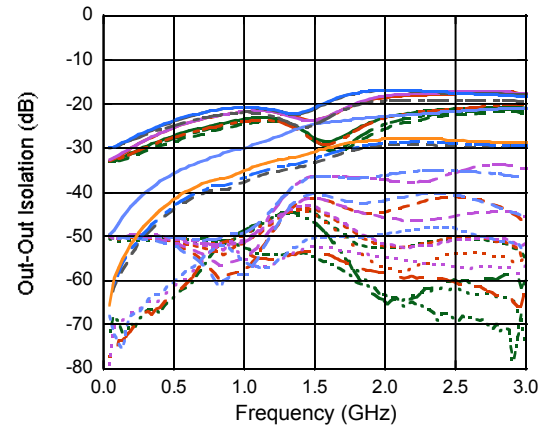
**Out to Out Isolation to 3 GHz (power on)**



**Out to Out Isolation to 1 GHz (power off)**



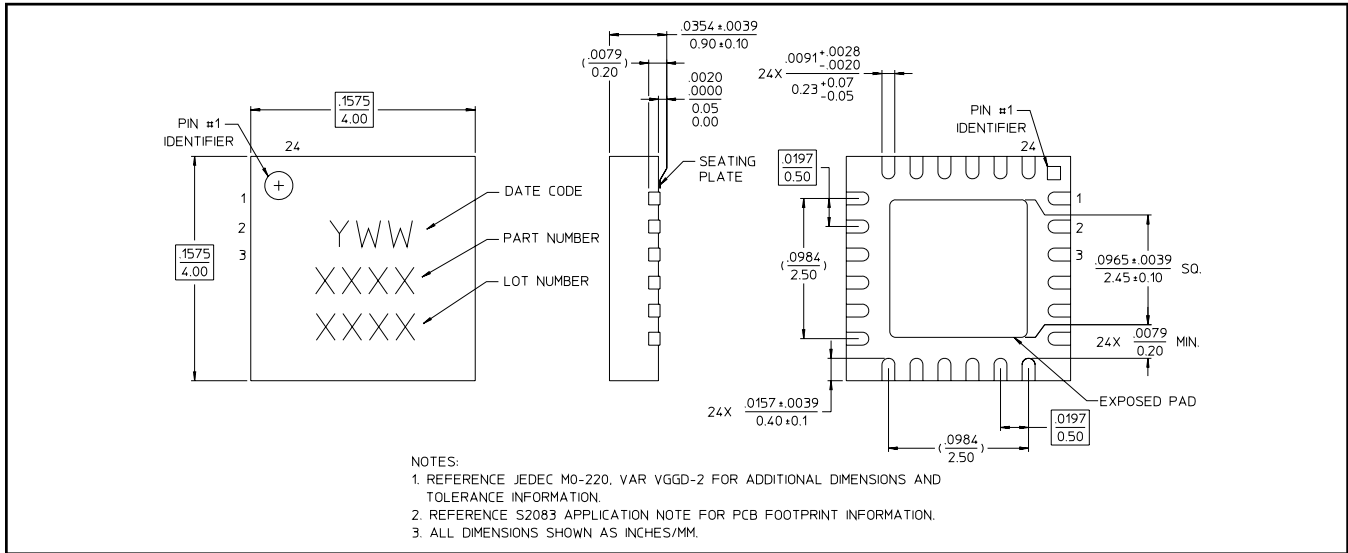
**Out to Out Isolation to 3 GHz (power off)**



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### Lead-Free 4 mm 24-Lead PQFN<sup>†</sup>



<sup>†</sup> Reference Application Note S2083 for lead-free solder reflow recommendations.  
 Meets JEDEC moisture sensitivity level 1 requirements.  
 Plating is 100% matte tin over copper.