# MAAM-007239

## Broadband CATV Single Ended 3-Way Active Splitter
## 50 - 1100 MHz

Rev. V1

### Features

- 3-Way Splitter
- Single Ended Input and Outputs
- 4.5 dB and 6 dB Gain Configurations
- Single +5 Volt Supply
- Lead-Free 3 mm 16-Lead PQFN Package
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

### Description

M/A-COM's MAAM-007239 CATV 3-way active splitter is a GaAs MMIC which exhibits low noise figure and distortion in a lead-free 3mm 16-lead PQFN plastic package. The design employs a low noise, high linearity amplifier and power splitter functionality. The design features 75 Ω inputs and outputs.

The MAAM-007239 is ideally suited for multi-tuner set top boxes, home gateways, and other broadband internet based appliances.

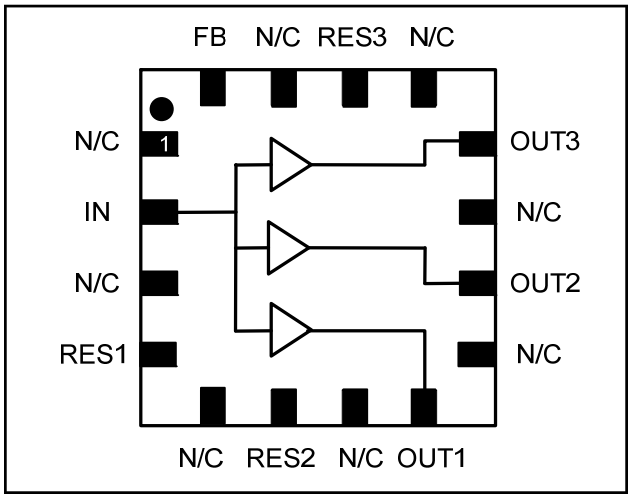
The MAAM-007239 is fabricated using M/A-COM's PHEMT process to realize low noise and low distortion. The process features full passivation for robust performance and reliability.

### Ordering Information [1,2]

| Part Number | Package |
|---|---|
| MAAM-007239-TR1000 | 1000 piece reel |
| MAAM-007239-TR3000 | 3000 piece reel |
| MAAM-007239-001SMB | High Isolation Configuration |
| MAAM-007239-002SMB | Low Current Configuration |

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

### Functional Schematic




### Pin Configuration

| Pin No. | Pin Name | Description |
|---|---|---|
| 1 | N/C | No Connection |
| 2 | IN | RF Input |
| 3 | N/C | No Connection |
| 4 | RES1 | Resistor 1 |
| 5 | N/C | No Connection |
| 6 | RES2 | Resistor 2 |
| 7 | N/C | No Connection |
| 8 | OUT1 | RF Output 1 |
| 9 | N/C | No Connection |
| 10 | OUT2 | RF Output 2 |
| 11 | N/C | No Connection |
| 12 | OUT3 | RF Output 3 |
| 13 | N/C | No Connection |
| 14 | RES3 | Resistor 3 |
| 15 | N/C | No Connection |
| 16 | FB | Feedback |
| 17 | Paddle [3] | RF and DC Ground |

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

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.





- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macomtech.com for additional data sheets and product information.

## Low Current Configuration

### Electrical Specifications: F = 50 - 1000 MHz, $T_A$ = 25° C, $V_{DD}$ = +5 Volts, $Z_0$ = 75 Ω

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|
| Gain | IN to OUT1, IN to OUT2, IN to OUT3 | dB | 5.0 | 6.0 | 7.0 |
| Gain Flatness | IN to OUT1, IN to OUT2, IN to OUT3 | dB | - | 1.0 | 1.8 |
| Noise Figure | IN to OUT1, IN to OUT2, IN to OUT3 | dB | - | 4.5 | 5.0 |
| Input Return Loss | IN | dB | - | 15 | - |
| Output Return Loss | OUT1, OUT2, OUT3 | dB | - | 20 | - |
| Composite Triple Beat, CTB | 132 channels, +15 dBmV/channel at the input | dBc | - | -77 | -70 |
| Composite Second Order, CSO | 132 channels, +15 dBmV/channel at the input | dBc | - | -65 | -56 |
| Crossmodulation, XMOD | 132 channels, +15 dBmV/channel at the input | dBc | - | -65 | - |
| Reverse Isolation | OUT1 to IN, OUT2 to IN, OUT3 to IN | dB | - | 23 | - |
| Output to Output Isolation | OUT1 to OUT2 or OUT3 | dB | - | 22 | - |
| P1dB | 400 MHz | dBm | - | 17 | - |
| OIP3 | 50 MHz / 1 GHz<br>Two Tones at 6 MHz Spacing, $P_{IN}$ = -10 dBm per Tone | dBm | - | 23 | - |
| OIP2 | 50 MHz / 1 GHz<br>Two Tones at 6 MHz Spacing, $P_{IN}$ = -10 dBm per Tone | dBm | - | 48 | - |
| $I_{DD}$ | $V_{DD}$= +5 Volts | mA | - | 125 | 150 |

## High Isolation Configuration

### Typical Performance: F = 50 - 1000 MHz, $T_A$ = 25° C, $V_{DD}$ = +5 Volts, $Z_0$ = 75 Ω

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|
| Gain | IN to OUT1, IN to OUT2, IN to OUT3 | dB | - | 4.6 | - |
| Gain Flatness | IN to OUT1, IN to OUT2, IN to OUT3 | dB | - | 0.8 | - |
| Noise Figure | IN to OUT1, IN to OUT2, IN to OUT3 | dB | - | 4.5 | - |
| Input Return Loss | IN | dB | - | 17 | - |
| Output Return Loss | OUT1, OUT2, OUT3 | dB | - | 12 | - |
| Composite Triple Beat, CTB | 132 channels, +15 dBmV/channel at the input | dBc | - | -83 | - |
| Composite Second Order, CSO | 132 channels, +15 dBmV/channel at the input | dBc | - | -70 | - |
| Crossmodulation, XMOD | 132 channels, +15 dBmV/channel at the input | dBc | - | -65 | - |
| Reverse Isolation | OUT1 to IN, OUT2 to IN, OUT3 to IN | dB | - | 25 | - |
| Output to Output Isolation | OUT1 to OUT2 or OUT3 | dB | - | 32 | - |
| P1dB | 400 MHz | dBm | - | 19 | - |
| OIP3 | 50 MHz / 1 GHz<br>Two Tones at 6 MHz Spacing, $P_{IN}$ = -10 dBm per Tone | dBm | - | 27 | - |
| OIP2 | 50 MHz / 1 GHz<br>Two Tones at 6 MHz Spacing, $P_{IN}$ = -10 dBm per Tone | dBm | - | 52 | - |
| $I_{DD}$ | $V_{DD}$= +5 Volts | mA | - | 210 | - |

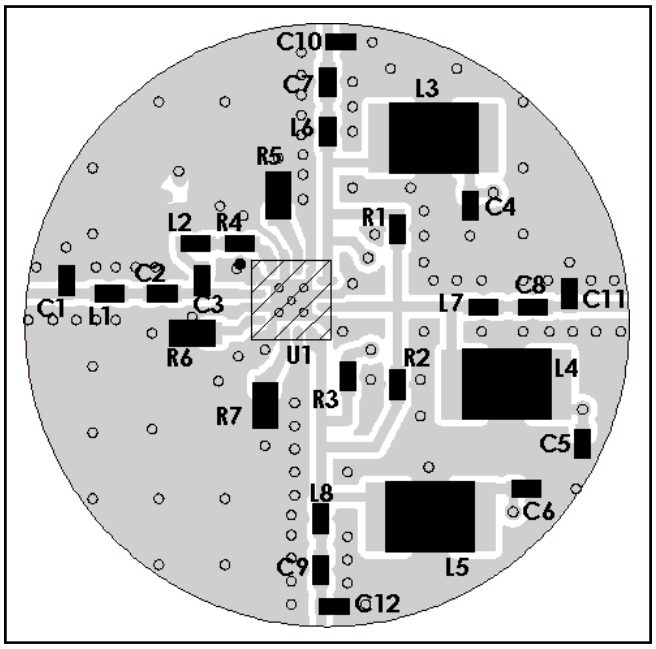




- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macomtech.com for additional data sheets and product information.

## Recommended PCB configuration
## Low Current Configuration

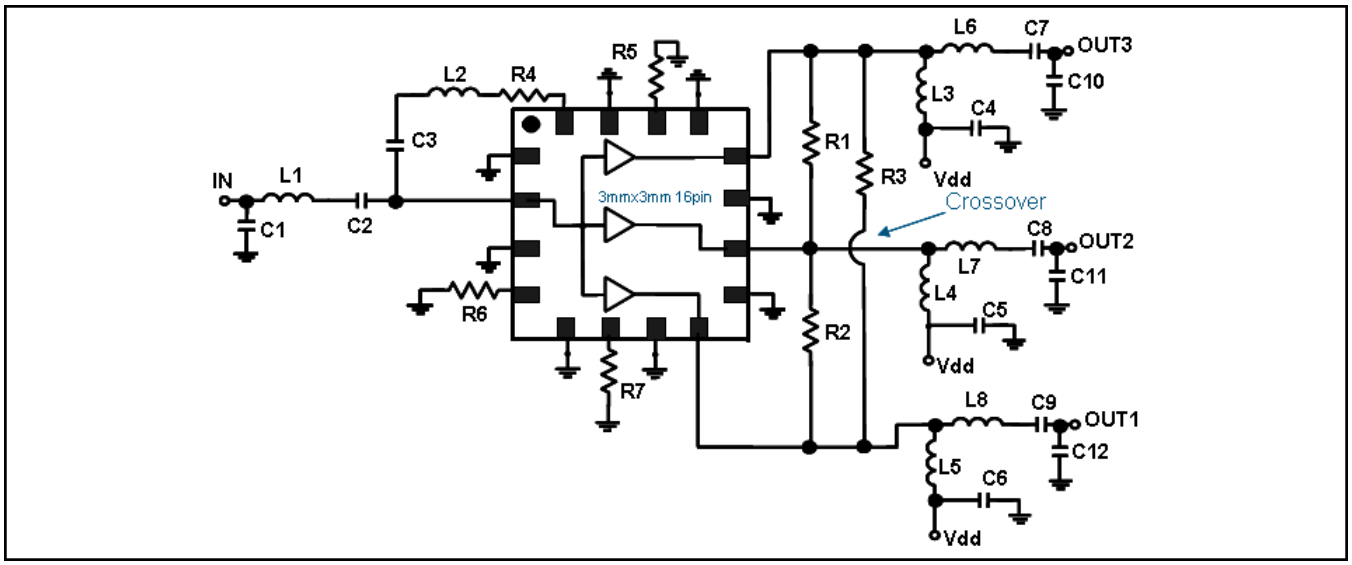



## Off-Chip Component Values [4]
## Low Current Configuration

| Component | Value | Package |
|---|---|---|
| C1 | 1 pF | 0402 |
| C2 - C9 | 0.01 µF | 0402 |
| C10 - C12 | 0.5 pF | 0402 |
| L1, L2 | 11 nH | 0402 |
| L3 - L5 | 1 µH | 1210 |
| L6 - L8 | 12 nH | 0402 |
| R1 - R3 | 620 Ω | 0402 |
| R4 | 68 Ω | 0402 |
| R5 - R7 | 18 Ω | 0603 |

4. L3 - L5 supplied from EPCOS, part number B82422A1102K100

## Schematic Including Off-Chip Components
## Low Current Configuration








- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298
  Visit www.macomtech.com for additional data sheets and product information.

## Absolute Maximum Ratings [5,6,7]

| Parameter | Absolute Maximum |
|---|---|
| Max Input Power | +12 dBm |
| Vbias | +10.0 V |
| Operating Temperature | -40°C to +85°C |
| Junction Temperature[8] | 150°C |
| Storage Temperature | -65°C to +125°C |

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. M/A-COM does not recommend sustained operation near these survivability limits.
7. These operating conditions will ensure MTTF > 1 x $10^6$ hours.
8. Junction Temperature ($T_J$) = $T_C$ + (Θjc) * (V*I)
   Typical thermal resistance (Θjc) = 42° C/W.
   a) For $T_C$ = 25°C,
   (Low Current Configuration) $T_J$ = 51 °C @ 5 V, 125 mA
   (High Current Configuration) $T_J$ = 69 °C @ 5 V, 210 mA
   b) For $T_C$= 85°C,
   (Low Current Configuration) $T_J$ = 111 °C @ 5 V, 125 mA
   (High Current Configuration) $T_J$ = 129 °C @ 5 V, 210 mA

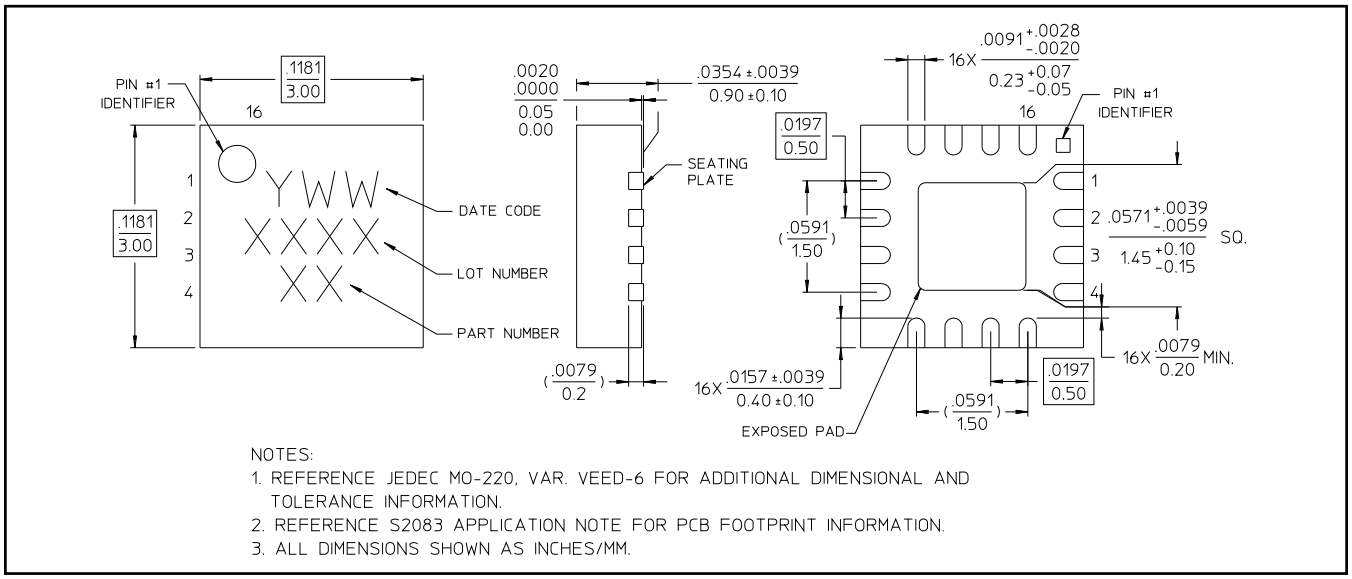
## Handling Procedures

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.

## *Lead-Free* 3 mm 16-Lead PQFN†




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

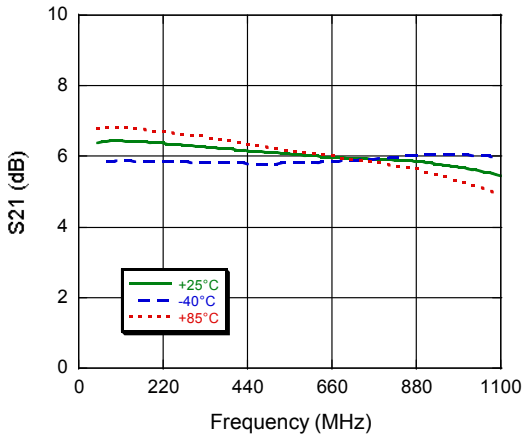




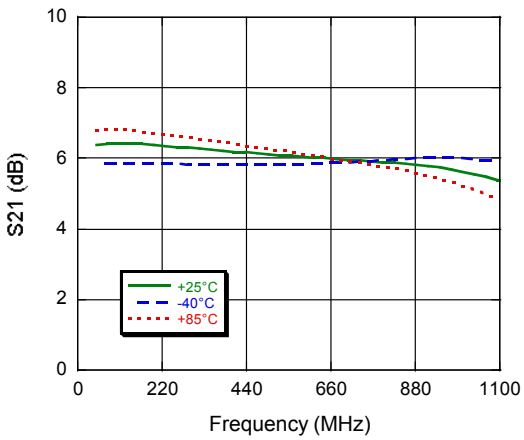
- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298
  Visit www.macomtech.com for additional data sheets and product information.

## Typical Performance Curves: Low Current Configuration

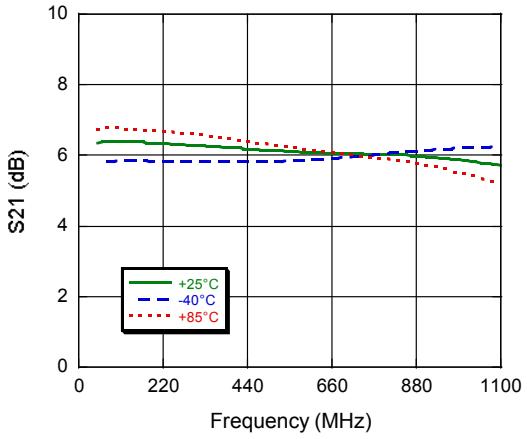
### *Gain - OUT1*



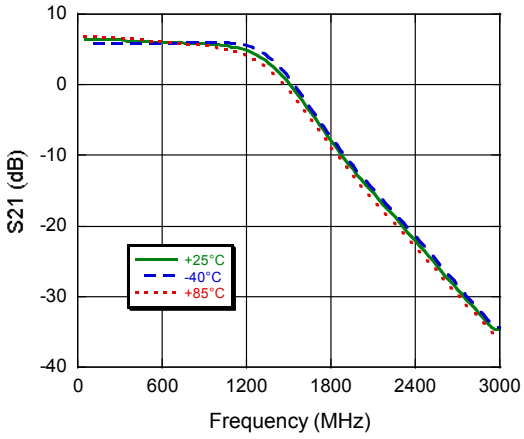

### *Gain - OUT2*



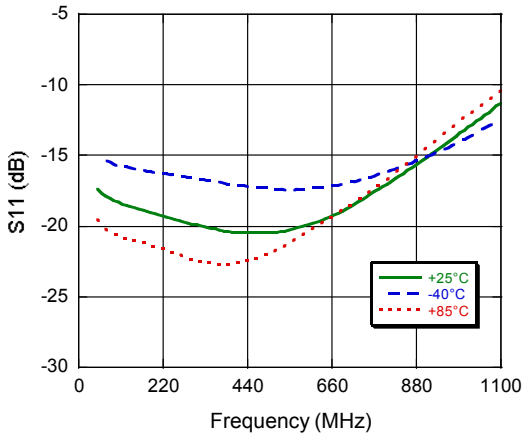

### *Gain - OUT3*



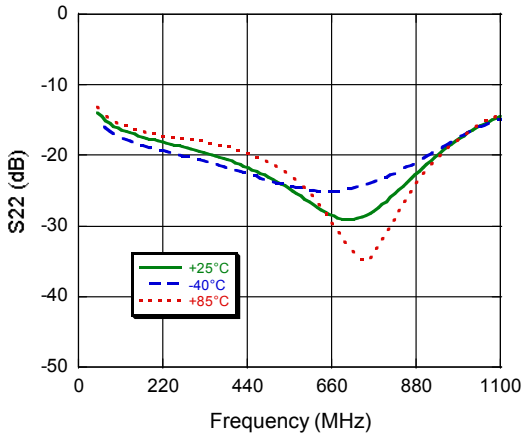

### *Gain - typical all ports - to 3 GHz*




### *Input Return Loss*




### *Out1 - Return Loss*





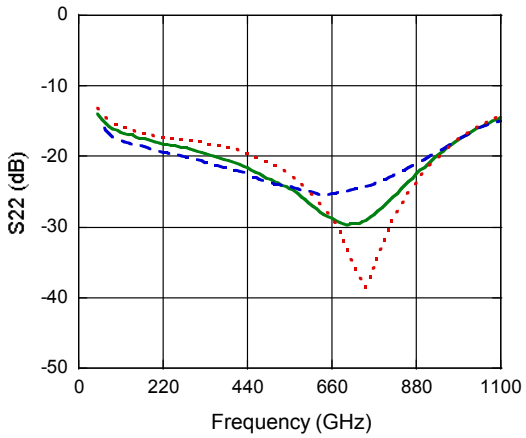



- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

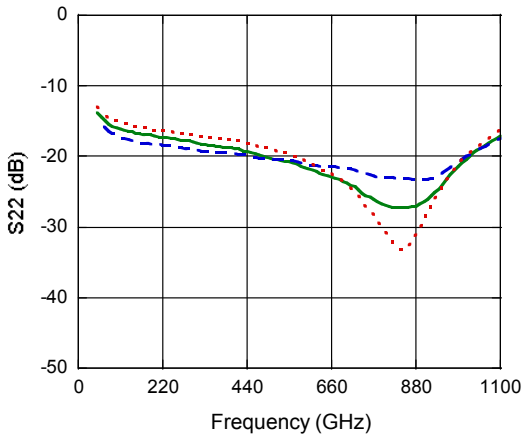
Visit www.macomtech.com for additional data sheets and product information.

## Typical Performance Curves: Low Current Configuration

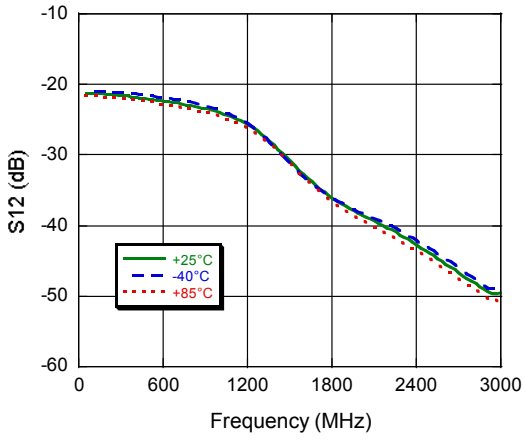
### *Out2 - Return Loss*



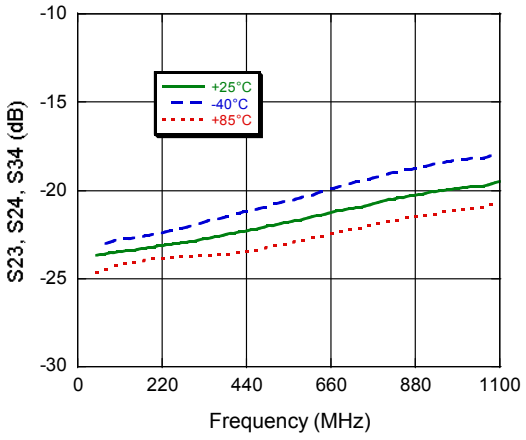

### *Out3 - Return Loss*



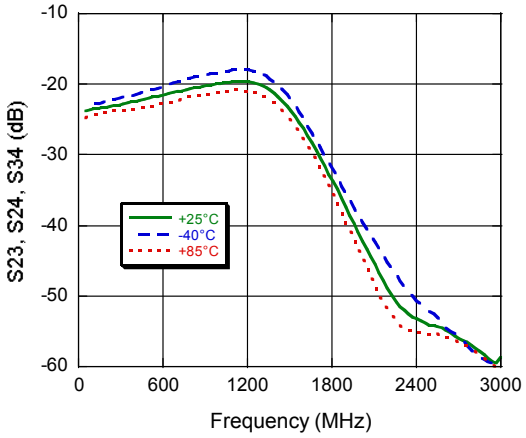

### *Reverse Isolation*



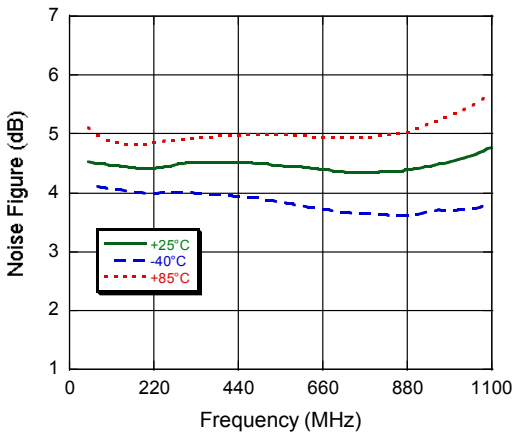

### *OUT - OUT Isolation - to 1 GHZ*




### *OUT - OUT Isolation - to 3 GHZ*




### *Noise Figure - Typical for all ports*



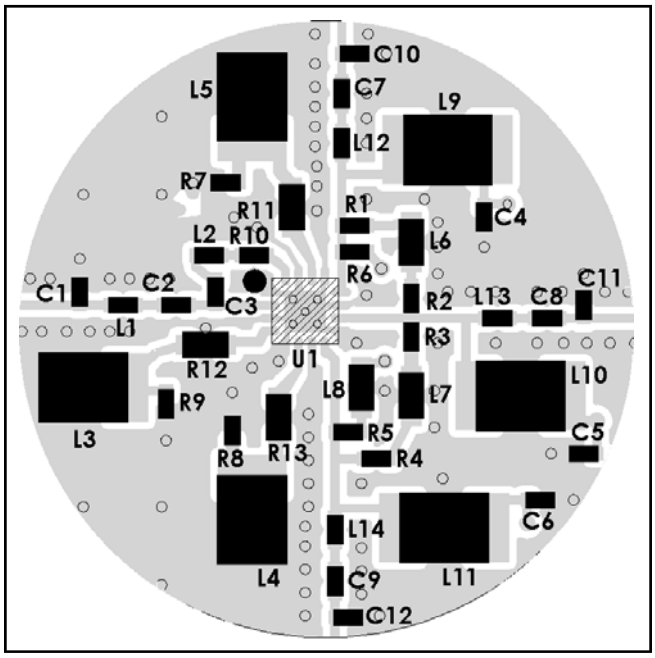





- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macomtech.com for additional data sheets and product information.

## Recommended PCB configuration
## High Isolation Configuration

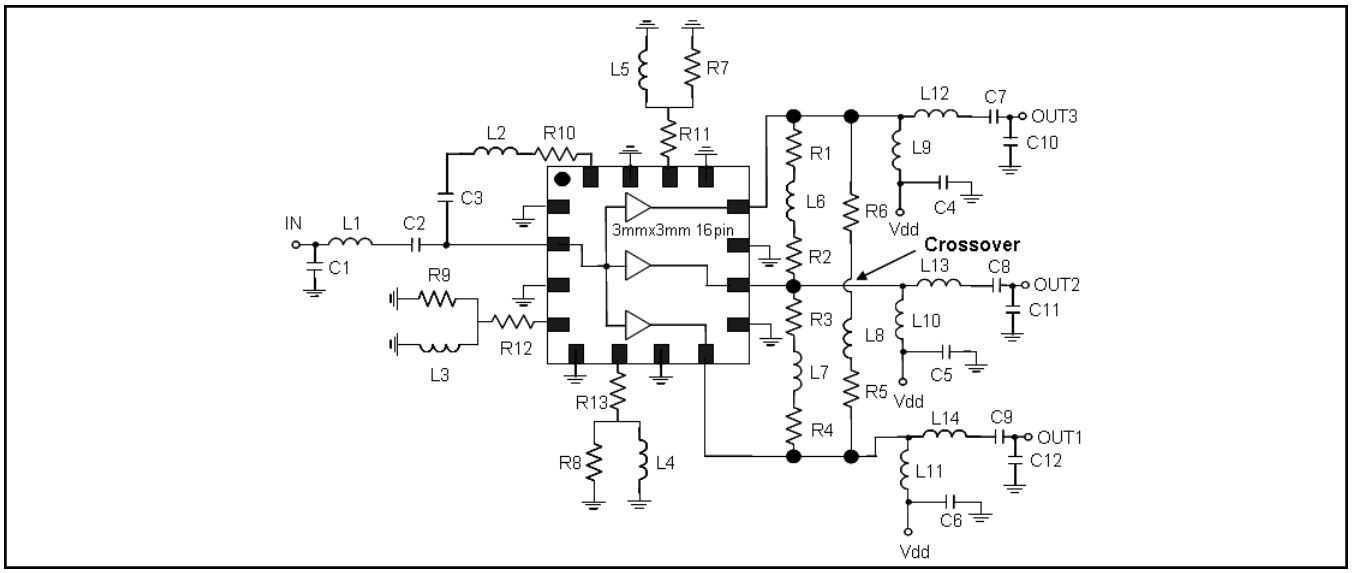



## Off-Chip Component Values [9]
## High Isolation Configuration

| Component | Value | Package |
|---|---|---|
| C1 | 1 pF | 0402 |
| C2 - C9 | 0.01 µF | 0402 |
| C10 - C12 | 0.5 pF | 0402 |
| L1 | 11 nH | 0402 |
| L2 | 19 nH | 0402 |
| L3 - L5, L9 - L11 | 1 µH | 1210 |
| L6 | 100 nH | 0603 |
| L7 | 110 nH | 0603 |
| L8 | 82 nH | 0603 |
| L12 - L14 | 12 nH | 0402 |
| R1 - R6 | 270 Ω | 0402 |
| R7 - R9 | 22 Ω | 0402 |
| R10 | 100 Ω | 0402 |
| R11 - R13 | 8.2 Ω | 0603 |

9. L3 - L5 and L9 - L11 supplied from EPCOS, part number B82422A1102K100.

## Schematic Including Off-Chip Components
## High Isolation Configuration



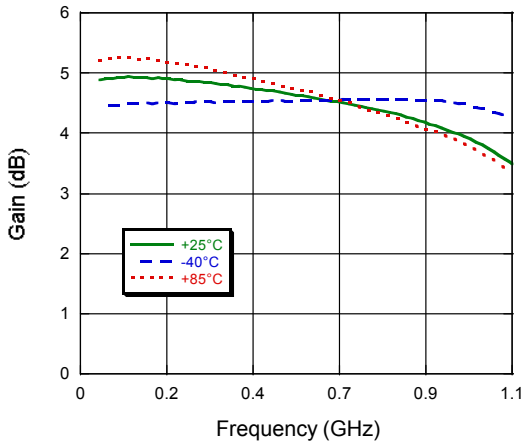




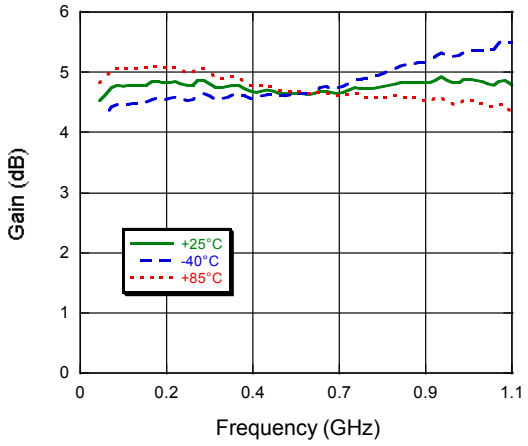

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298
  Visit www.macomtech.com for additional data sheets and product information.

## Typical Performance Curves: High Isolation Configuration

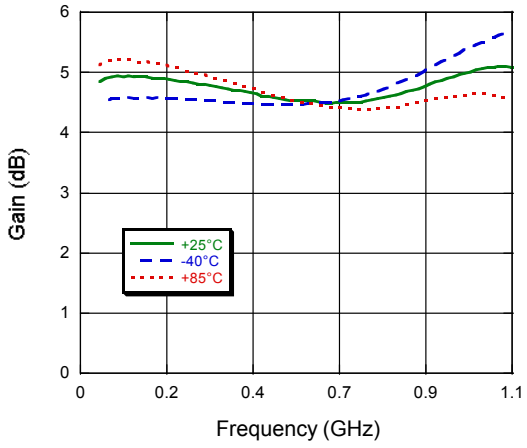
### *Gain - OUT1*



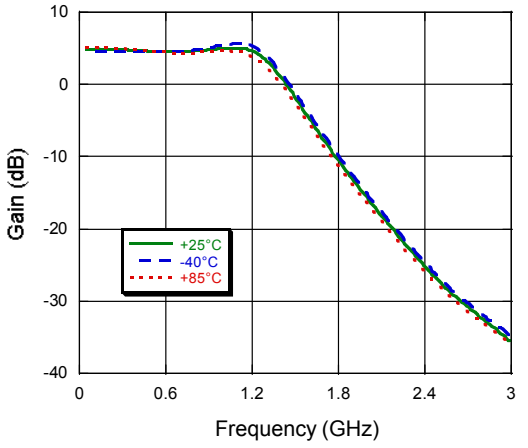

### *Gain - OUT2*



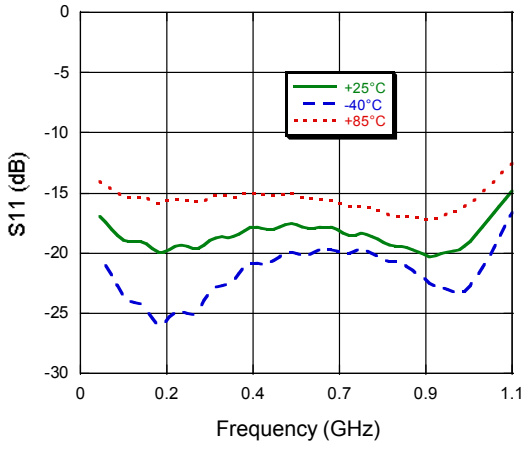

### *Gain - OUT3*



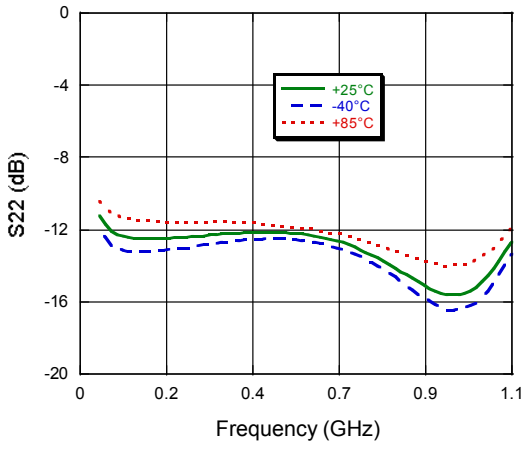

### *Gain - typical all ports - to 3 GHz*




### *Input Return Loss*




### *Out1 - Return Loss*





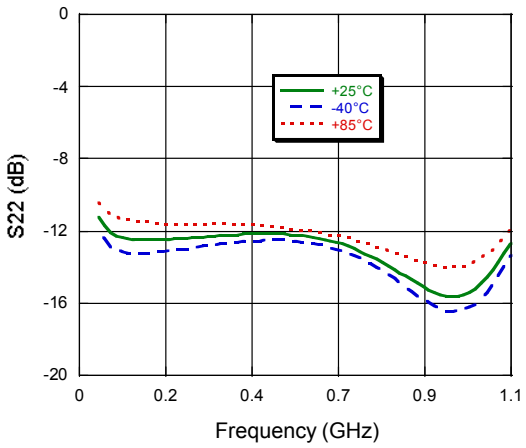



- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

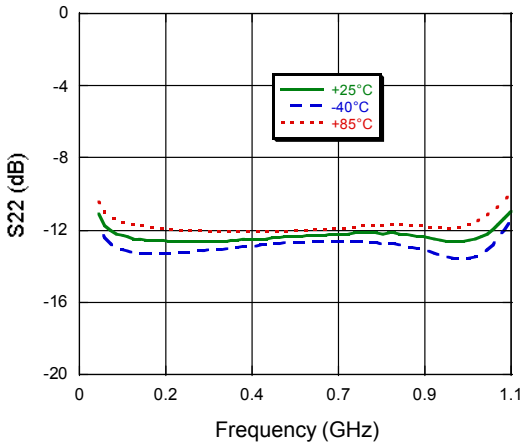
Visit www.macomtech.com for additional data sheets and product information.

## Typical Performance Curves: High Isolation Configuration

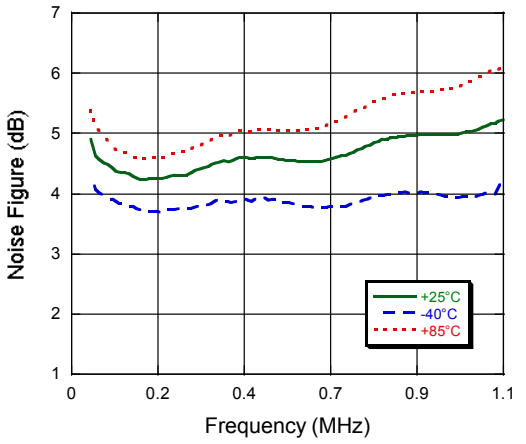
### *OUT2 - Return Loss*



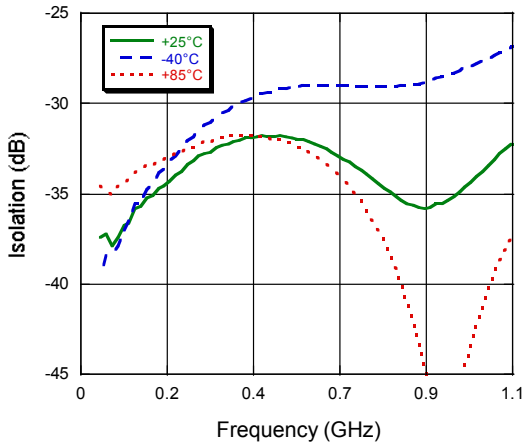

### *OUT3 - Return Loss*



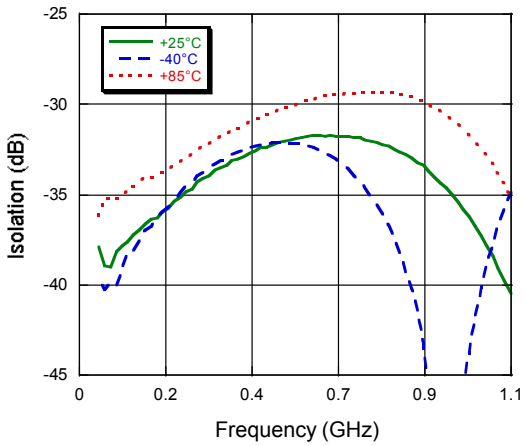

### *Noise Figure - Typical for all ports*




### *OUT1 - OUT2 Isolation*




### *OUT1 - OUT3 Isolation*




### *OUT2 - OUT3 Isolation*