

Broadband CATV Single Ended 4-Way Active Splitter 50 - 1100 MHz

Rev. V4

Features

- 4-Way Splitter
- Single Ended Input and Outputs
- 3.0 dB Gain
- +15 dBmV / Channel Input
- 3.8 dB Noise Figure
- Single +5 Volt Supply
- Lead-Free 3 mm 12-Lead PQFN Package
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MAAM-008820 CATV 4-way active splitter is a GaAs MMIC which exhibits low noise figure and distortion in a lead-free 3 mm 12-lead PQFN plastic package. The design features 75 Ω inputs and outputs.

The MAAM-008820 is ideally suited for multi-tuner set top boxes, home gateways, and other broadband internet based appliances.

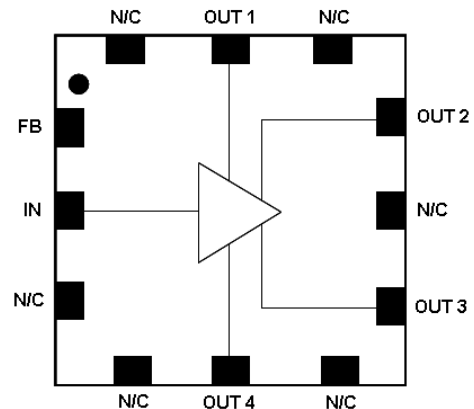
The MAAM-008820 is fabricated using MACOM's pHEMT process to realize low noise and low distortion. The process features full passivation for robust performance and reliability.

Ordering Information ^{1,2}

| Part Number | Package |
|--------------------|-------------------|
| MAAM-008820-TR1000 | 1000 piece reel |
| MAAM-008820-TR3000 | 3000 piece reel |
| MAAM-008820-001SMB | Sample Test Board |

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 | FB | Feedback/Bias |
| 2 | IN | RF Input |
| 3 | N/C | No Connection |
| 4 | N/C | No Connection |
| 5 | OUT4 | RF Output 4 |
| 6 | N/C | No Connection |
| 7 | OUT3 | RF Output 3 |
| 8 | N/C | No Connection |
| 9 | OUT2 | RF Output 2 |
| 10 | N/C | No Connection |
| 11 | OUT1 | RF Output 1 |
| 12 | N/C | No Connection |
| 13 | Paddle ³ | RF and DC Ground |

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

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

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Electrical Specifications: Freq. = 50 - 1000 MHz, T_A = 25°C, V_{DD} = 5 Volts, Z₀ = 75 Ω

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|-----------------------------|--|-------|------|------|------|
| Gain | IN to OUT1, OUT2, OUT3 & OUT4 | dB | 1.8 | 3.0 | 3.8 |
| Gain Flatness | IN to OUT1, OUT2, OUT3 & OUT4 | dB | - | 0.5 | 1.0 |
| Noise Figure | IN to OUT1, OUT2, OUT3 & OUT4 | dB | - | 3.8 | - |
| Input Return Loss | IN | dB | - | 15 | - |
| Output Return Loss | OUT1, OUT2, OUT3, OUT4 | dB | - | 11 | - |
| Composite Triple Beat, CTB | 132 channels, +15 dBmV/channel at the input | dBc | - | -70 | - |
| Composite Second Order, CSO | 132 channels, +15 dBmV/channel at the input | dBc | - | -62 | - |
| Reverse Isolation | OUT1, OUT2, OUT3 & OUT4 to IN | dB | - | 29 | - |
| Output to Output Isolation | Isolation between all RF outputs | dB | - | 21 | - |
| P1dB | IN to OUT1, OUT2, OUT3, OUT4 | dB | - | 10 | - |
| OIP3 | 500 MHz, 2-tone, 6 MHz spacing, -15 dBm P _{OUT} | dBm | - | 25 | - |
| OIP2 | 500 MHz, 2-tone, 6 MHz spacing, -15 dBm P _{OUT} | dBm | - | 48 | - |
| I _{DD} | V _{DD} = +5 Volts | mA | - | 120 | 150 |

Absolute Maximum Ratings^{4,5,6}

| Parameter | Absolute Maximum |
|-----------------------------------|------------------|
| Input Power | 12 dBm |
| V _{BIAS} | 10 V |
| Operating Temperature | -20°C to +85°C |
| Junction Temperature ⁷ | +160°C |
| Storage Temperature | -65°C to +150°C |

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. M/A-COM does not recommend sustained operation near these survivability limits.
6. These operating conditions will ensure MTTF > 8 x 10⁵ hours
7. Junction Temperature (T_J) = T_C + Θ_{JC} * ((V * I) - (P_{OUT} - P_{IN}))
Typical thermal resistance (Θ_{JC}) = 77° C/W.
a) For T_C = 25°C,
T_J = 71 °C @ 5 V, 120 mA
b) For T_C = 85°C,
T_J = 127 °C @ 5 V, 110 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.

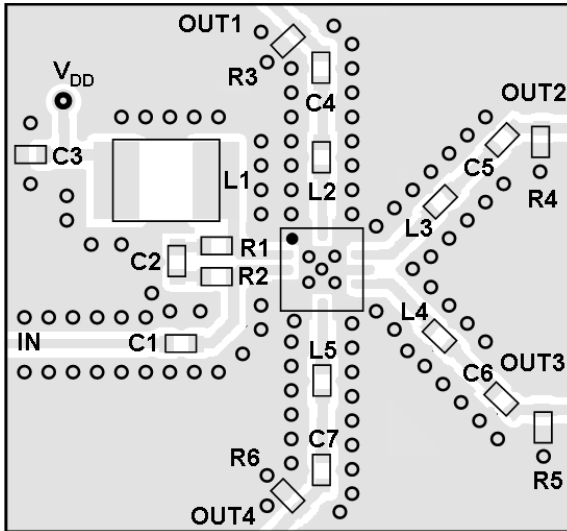
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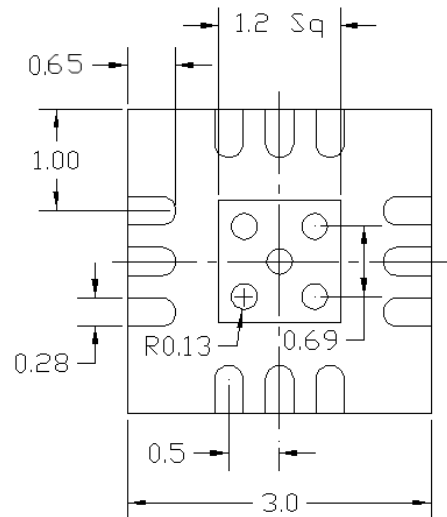
Electrical Specifications: Freq. = 50 - 1000 MHz, $V_{DD} = 8$ Volts, $Z_0 = 75 \Omega$

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|-----------------------------|--|-------|------|------|------|
| Gain | IN to OUT1, OUT2, OUT3 & OUT4 | dB | 1.8 | 3.0 | 3.8 |
| Gain Flatness | IN to OUT1, OUT2, OUT3 & OUT4 | dB | - | 0.5 | 1.0 |
| Noise Figure | IN to OUT1, OUT2, OUT3 & OUT4 | dB | - | 4.0 | - |
| Input Return Loss | IN | dB | - | 15 | - |
| Output Return Loss | OUT1, OUT2, OUT3, OUT4 | dB | - | 11 | - |
| Composite Triple Beat, CTB | 132 channels, 15 dBmV/channel at the input | dBc | - | -71 | - |
| Composite Second Order, CSO | 132 channels, 15 dBmV/channel at the input | dBc | - | -63 | - |
| Reverse Isolation | OUT1, OUT2, OUT3 & OUT4 to IN | dB | - | 29 | - |
| Output to Output Isolation | Isolation between all RF outputs | dB | - | 21 | - |
| P1dB | IN to OUT1, OUT2, OUT3, OUT4 | dB | - | 12 | - |
| OIP3 | 500 MHz, 2-tone, 6 MHz spacing, -15 dBm P_{OUT} | dBm | - | 27 | - |
| OIP2 | 500 MHz, 2-tone, 6 MHz spacing, -15 dBm P_{OUT} | dBm | - | 49 | - |
| Harmonics | Third Harmonic of 470 MHz at input, $P_{IN} = 0$ dBm | dBm | - | -70 | - |
| Harmonics | Third Harmonic of 700 MHz at input, $P_{IN} = 0$ dBm | dBm | - | -70 | - |
| I_{DD} | $V_{DD} = 8$ Volts | mA | - | 120 | 150 |

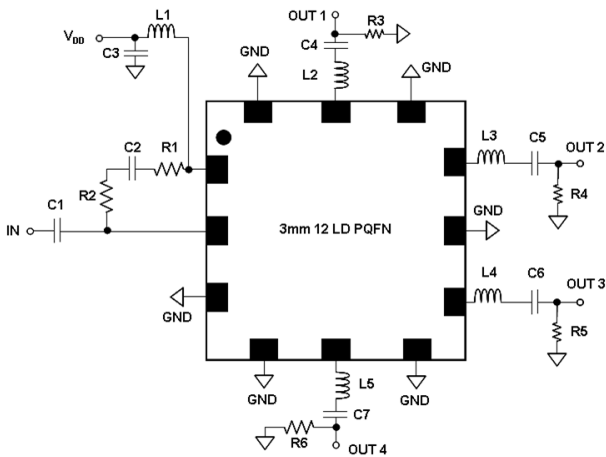
Recommended PCB



PCB Land Pattern



Schematic Including Off-Chip Components⁸



Off-Chip Component Values

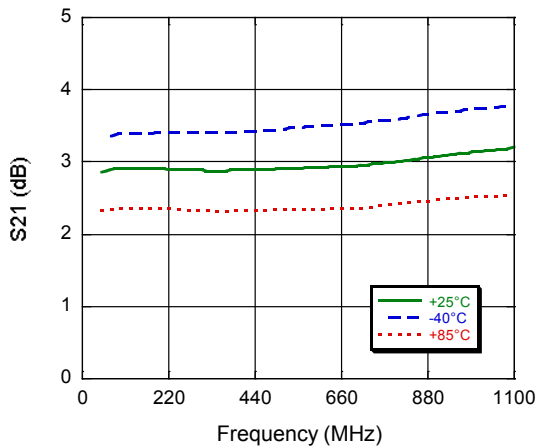
| Component | Value | Package |
|-----------------|--------------|---------|
| C1 - C7 | 0.01 μ F | 0402 |
| L1 ⁹ | 1 μ H | 1210 |
| L2 - L5 | 6.8 nH | 0402 |
| R1, R2 | 180 Ω | 0402 |
| R3 - R6 | 750 Ω | 0402 |

9. L1 supplied from EPCOS, part number B82422A1102K100

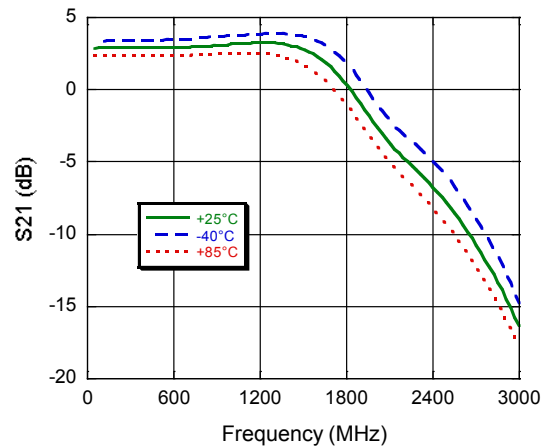
8. The exposed pad centered on the package bottom must be connected to ground for RF, DC and thermal considerations.

Typical Performance Curves

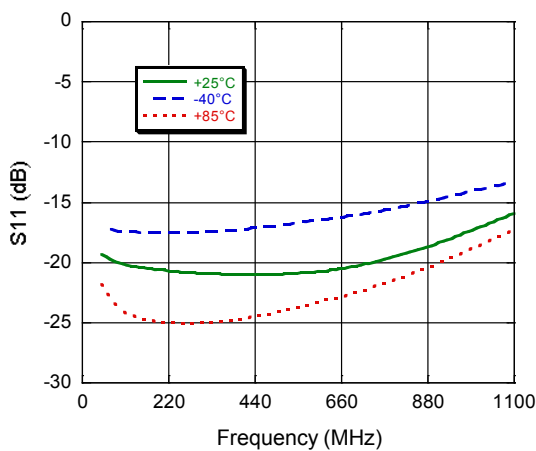
Gain to 1100 MHz
Typical All Outputs



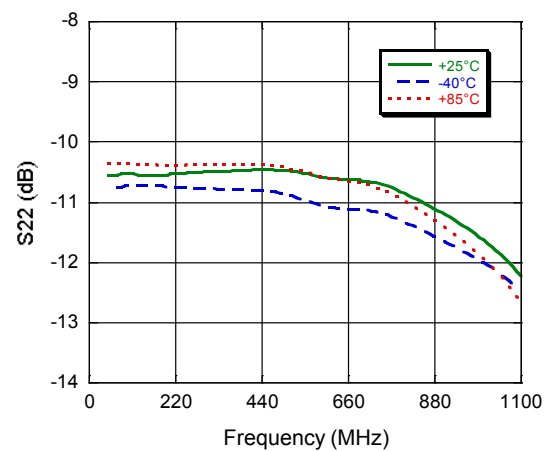
Gain to 3000 MHz
Typical All Outputs



Input Return Loss



Output Return Loss
Typical All Outputs

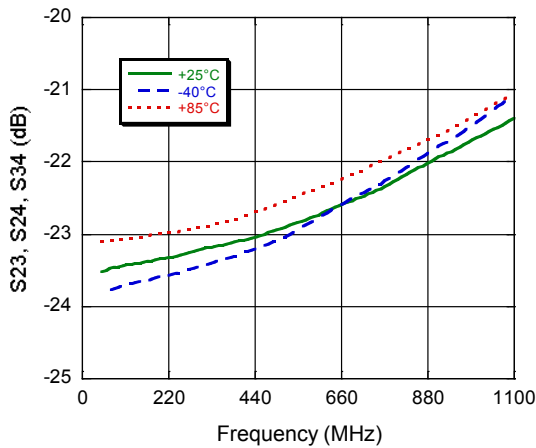


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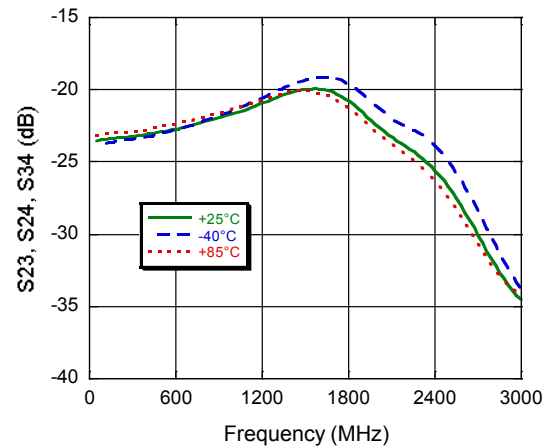
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Typical Performance Curves

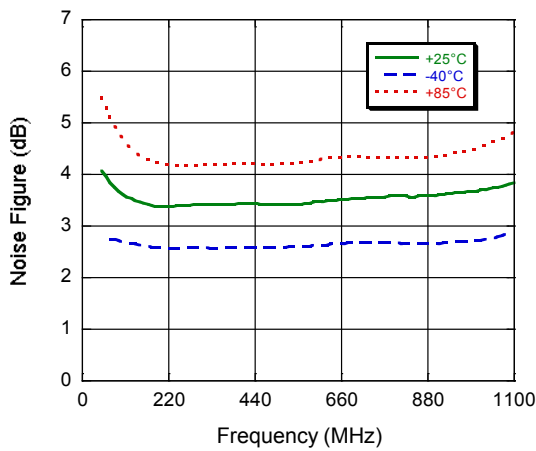
OUT-OUT Isolation to 1100 MHz
Typical Between All Outputs



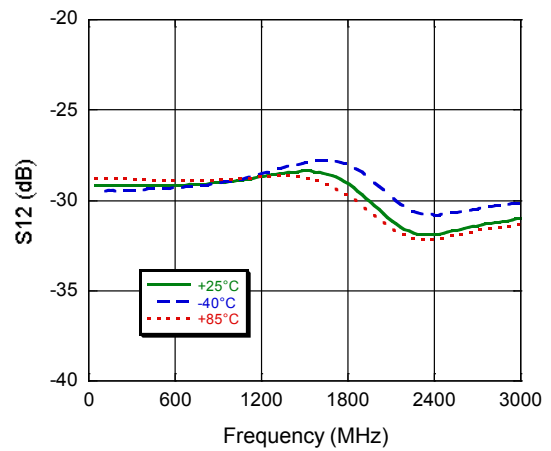
OUT-OUT Isolation to 3000 MHz
Typical Between All Outputs



Noise Figure
Typical All Outputs



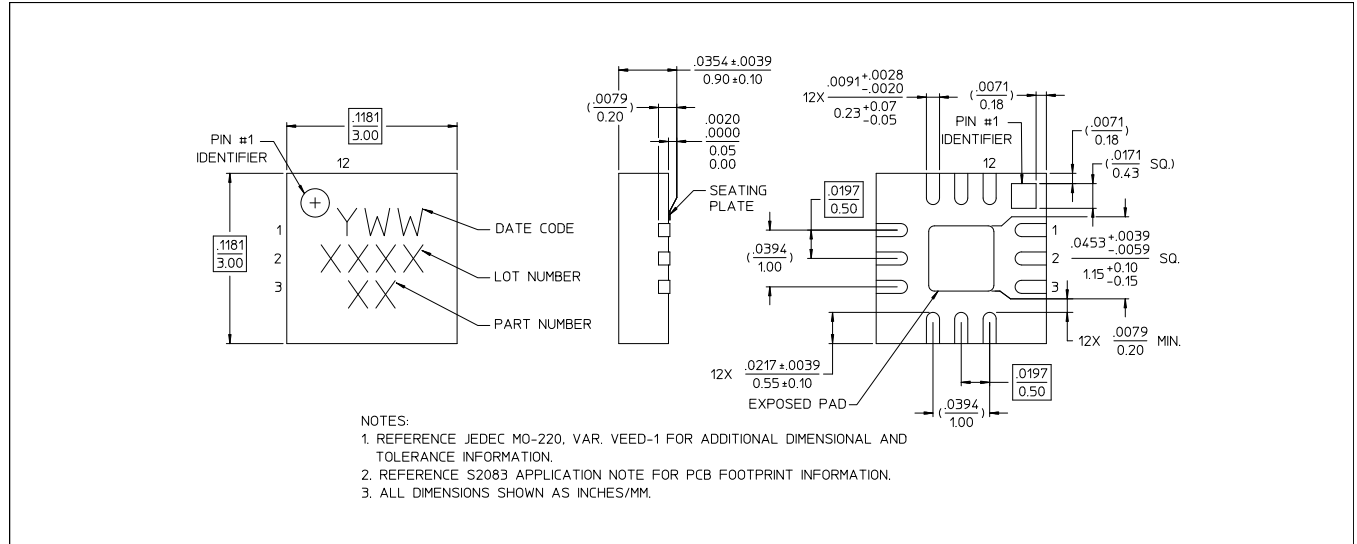
Reverse Isolation to 3000 MHz
Typical From All Outputs to Input



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Lead-Free 3 mm 12-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.

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