

## 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  $\Omega$  inputs and outputs.

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

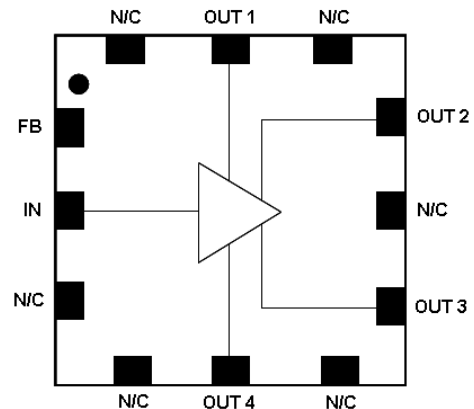
The MAAM-008820 is fabricated using MACOM's pHEMT process to realize low noise and low distortion. The process features full passivation for robust performance and reliability.

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

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 <sup>3</sup>	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.

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

Rev. V4

**Electrical Specifications: Freq. = 50 - 1000 MHz, T<sub>A</sub> = 25°C, V<sub>DD</sub> = 5 Volts, Z<sub>0</sub> = 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 <sub>OUT</sub>	dBm	-	25	-
OIP2	500 MHz, 2-tone, 6 MHz spacing, -15 dBm P <sub>OUT</sub>	dBm	-	48	-
I <sub>DD</sub>	V <sub>DD</sub> = +5 Volts	mA	-	120	150

### Absolute Maximum Ratings<sup>4,5,6</sup>

Parameter	Absolute Maximum
Input Power	12 dBm
V <sub>BIAS</sub>	10 V
Operating Temperature	-20°C to +85°C
Junction Temperature <sup>7</sup>	+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 10<sup>5</sup> hours
7. Junction Temperature (T<sub>J</sub>) = T<sub>C</sub> + Θ<sub>JC</sub> \* ((V \* I) - (P<sub>OUT</sub> - P<sub>IN</sub>))  
Typical thermal resistance (Θ<sub>JC</sub>) = 77° C/W.  
a) For T<sub>C</sub> = 25°C,  
T<sub>J</sub> = 71 °C @ 5 V, 120 mA  
b) For T<sub>C</sub> = 85°C,  
T<sub>J</sub> = 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.

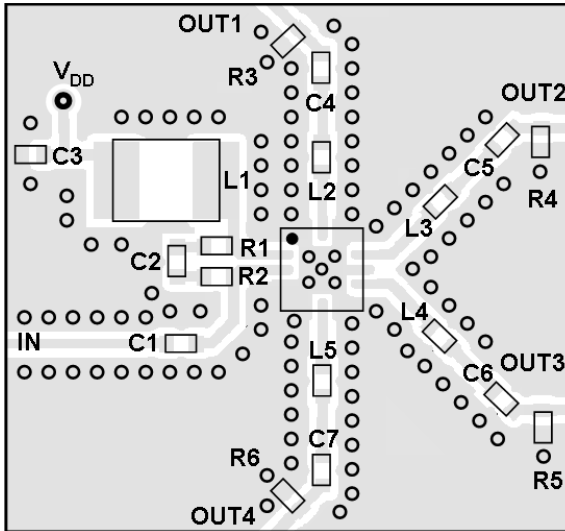
## Broadband CATV Single Ended 4-Way Active Splitter 50 - 1100 MHz

Rev. V4

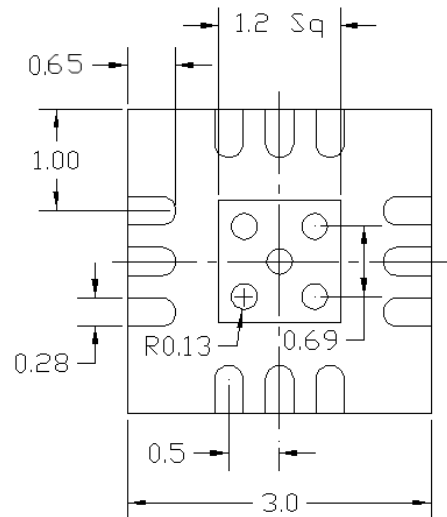
**Electrical Specifications: Freq. = 50 - 1000 MHz,  $V_{DD} = 8$  Volts,  $Z_0 = 75 \Omega$**

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

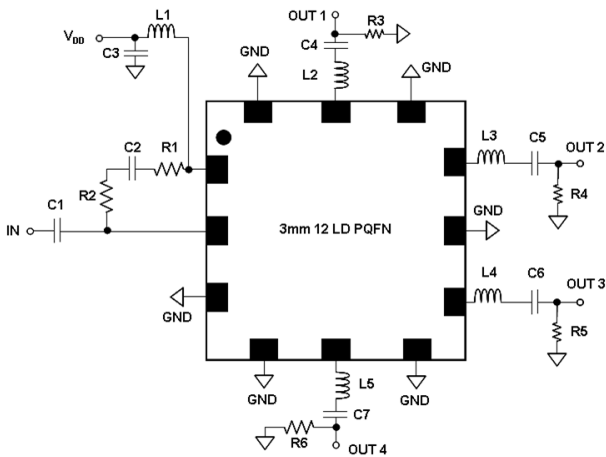
## Recommended PCB



## PCB Land Pattern



## Schematic Including Off-Chip Components<sup>8</sup>



## Off-Chip Component Values

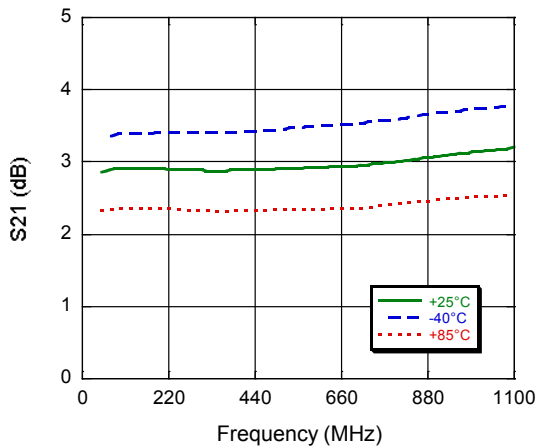
Component	Value	Package
C1 - C7	0.01 $\mu$ F	0402
L1 <sup>9</sup>	1 $\mu$ H	1210
L2 - L5	6.8 nH	0402
R1, R2	180 $\Omega$	0402
R3 - R6	750 $\Omega$	0402

9. L1 supplied from EPCOS, part number B82422A1102K100

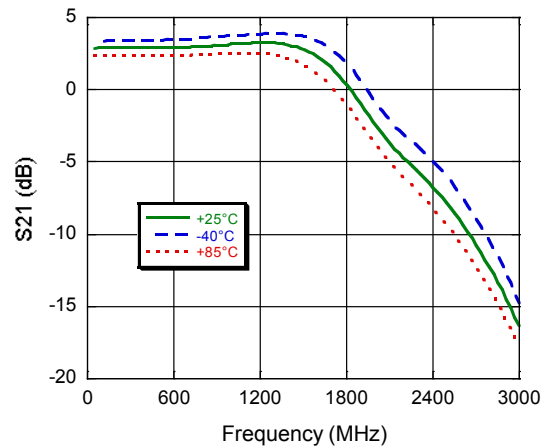
8. The exposed pad centered on the package bottom must be connected to ground for RF, DC and thermal considerations.

### Typical Performance Curves

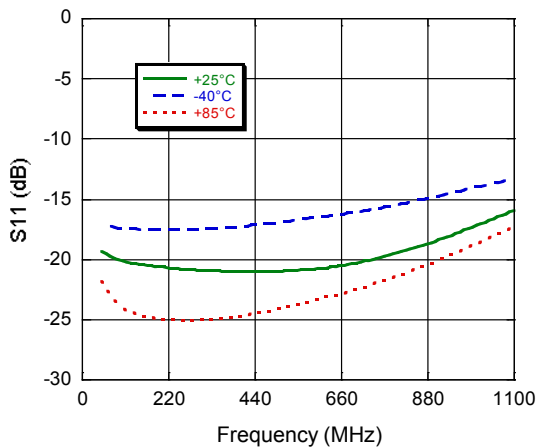
**Gain to 1100 MHz**  
Typical All Outputs



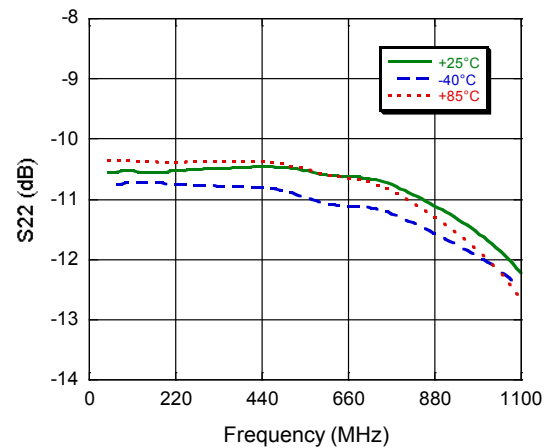
**Gain to 3000 MHz**  
Typical All Outputs



**Input Return Loss**



**Output Return Loss**  
Typical All Outputs

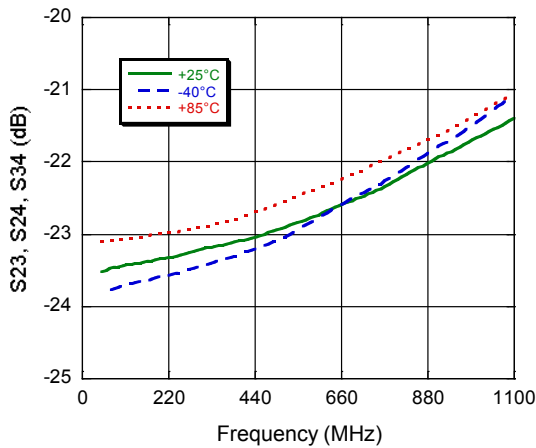


## Broadband CATV Single Ended 4-Way Active Splitter 50 - 1100 MHz

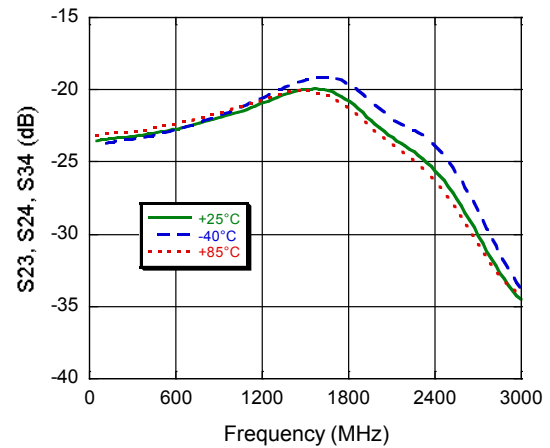
Rev. V4

### Typical Performance Curves

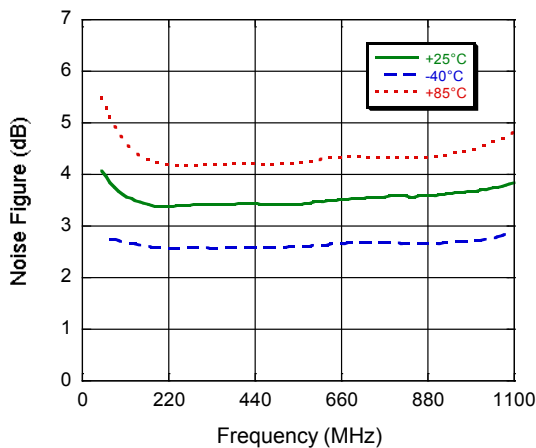
**OUT-OUT Isolation to 1100 MHz**  
Typical Between All Outputs



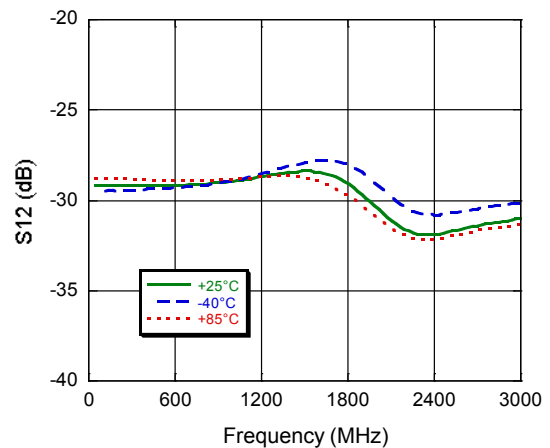
**OUT-OUT Isolation to 3000 MHz**  
Typical Between All Outputs



**Noise Figure**  
Typical All Outputs



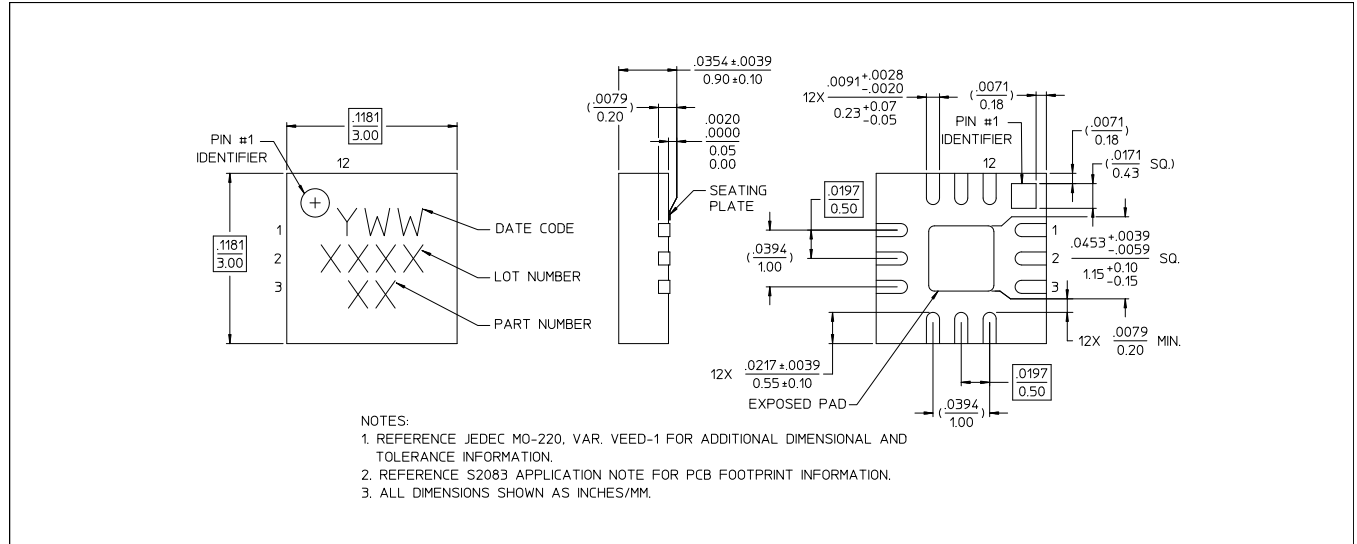
**Reverse Isolation to 3000 MHz**  
Typical From All Outputs to Input



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

Rev. V4

### Lead-Free 3 mm 12-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.

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.