

## Push Pull CATV Amplifier 50 - 1000 MHz

Rev. V1

### Features

- 20.5 dB Gain
- +8 V DC Bias
- Differential Inputs and Outputs
- Low Distortion
- Lead-Free TSSOP-16LD exposed paddle
- Halogen-Free “Green” Mold Compound
- RoHS\* Compliant and 260°C Reflow Compatible

### Description

The MAAM-010144 is a GaAs MESFET MMIC amplifier in a lead-free TSSOP-16LD exposed paddle package. The MMIC design is configured as a pair of cascode MESFET amplifiers for broadband performance. It is designed for integration in a 75  $\Omega$  push-pull, low distortion, amplifier circuit.

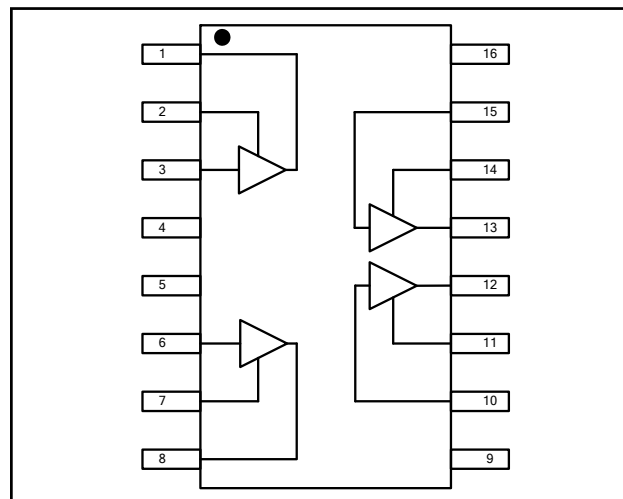
The device is ideally suited for use in CATV, FTTX, DBS, and HDTV applications where low noise figure and low distortion are required.

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

Part Number	Package
MAAM-010144-000000	Bulk Packaging
MAAM-010144-TR1000	1000 Piece Reel
MAAM-010144-TR3000	3000 Piece Reel
MAAM-010144-001SMB	Sample Test Board

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

### Functional Schematic



### Pin Configuration <sup>3</sup>

Pin No.	Pin Name	Description
1	OUT1+	Output 1+
2	FB1+	Feedback 1+
3	IN1+	Input 1+
4	N/C	No Connection
5	N/C	No Connection
6	IN1-	Input 1-
7	FB1-	Feedback 1-
8	OUT1-	Output 1-
9	BIAS-	DC Bias
10	IN2-	Input 2-
11	FB2-	Feedback 2-
12	OUT2-	Output 2-
13	OUT2+	Output 2+
14	FB2+	Feedback 2+
15	IN2+	Input 2+
16	BIAS+	DC Bias
Paddle <sup>4</sup>	RF and DC Ground	

3. It is recommended, but not absolutely compulsory, that all No Connections (N/C) within the IC are connected to ground on the printed circuit board.
4. 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.

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**50 - 1000 MHz**

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**Electrical Specifications:  $T_A = 25^\circ\text{C}$ , Freq: 50 - 1000 MHz,  $V_{DD} = +8$  Volts,  $Z_0 = 75 \Omega$ ,  
Test Circuit with M/A-COM Technology Balun MABA-009210-CT1760**

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	—	dB	19	20.5	23
Gain Flatness	—	dB	—	0.6	—
Noise Figure	—	dB	—	5.5	—
Input Return Loss	—	dB	—	18	—
Output Return Loss	—	dB	—	15	—
Reverse Isolation	—	dB	—	36	—
Output IP2	500 MHz, +8 dBm output	dBm	—	80	—
Output IP3	Two tones at 500 & 506 MHz, +8 dBm output/tones	dBm	41	43	—
Composite Triple Beat, CTB	77 Channels, +39 dBm V / Channel at the output	dBc	—	-70	—
Composite Second Order, CSO	77 Channels, +39 dBm V / Channel at the output	dBc	—	-70	—
Cross modulation	77 Channels, +39 dBm V / Channel at the output	dBc	—	-70	—
P1dB	500 MHz	dBm	—	26	—
$I_{DD}$	+8 Volts	mA	—	325	385

**Electrical Specifications: Frequency = 500 MHz, 256 QAM**

Parameter	Test Conditions	Units	Ref Spec <sup>5</sup>	Typical data
Adjacent channel up to 750 KHz from channel block edge	$P_{OUT} = +60$ dBmV, N=1 $P_{OUT} = +56$ dBmV, N=2 $P_{OUT} = +52$ dBmV, N=4	dBc	<-58 <-58 <-58	-65 -65 -66
Adjacent channel (750 kHz from channel block edge to 6 MHz from channel block edge)	$P_{OUT} = +60$ dBmV, N=1 $P_{OUT} = +56$ dBmV, N=2 $P_{OUT} = +52$ dBmV, N=4	dBc	<-62 <-60 <-60	-67 -64 -63
Next-adjacent channel (6 MHz from channel block edge to 18 MHz from channel block edge)	$P_{OUT} = +60$ dBmV, N=1 $P_{OUT} = +56$ dBmV, N=2 $P_{OUT} = +52$ dBmV, N=4	dBc	<-65 <-64 <-63	-75 -70 -65
Third-adjacent channel (12 MHz from channel block edge to 18 MHz from channel block edge)	$P_{OUT} = +60$ dBmV, N=1 $P_{OUT} = +56$ dBmV, N=2 $P_{OUT} = +52$ dBmV, N=4	dBc	<-73 <-70 <-65	-76 -73 -68
In each of 2N contiguous 6 MHz channels or in each of 3N contiguous 6 MHz channels coinciding with 2nd harmonic and with 3rd harmonic components respectively (up to 1000 MHz)	$P_{OUT} = +60$ dBmV, N=1, 2nd Harmonic $P_{OUT} = +60$ dBmV, N=1, 3rd Harmonic	dBc	-63 -63	-70 -65

5. Reference Specification Data-Over-Cable Service Interface Specifications, DOCSIS. Downstream RF Interface Specification, DRFI.

## Rev. V1

## Land Pattern<sup>10</sup>

6. Exceeding any one or combination of these limits may cause permanent damage to this device.
7. M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.
8. Operating at nominal conditions with  $T_J \leq +150^{\circ}\text{C}$  will ensure  $\text{MTTF} > 1 \times 10^6$  hours.
9. Junction Temperature ( $T_J$ ) =  $T_C + \Theta_{jc} * (V * I)$   
Typical thermal resistance ( $\Theta_{jc}$ ) =  $13^{\circ}\text{C/W}$ .
  - a) For  $T_C = 25^{\circ}\text{C}$ ,  
 $T_J = 65^{\circ}\text{C}$  @ 8 V, 385 mA
  - b) For  $T_C = 85^{\circ}\text{C}$ ,  
 $T_J = 124^{\circ}\text{C}$  @ 8 V, 375 mA

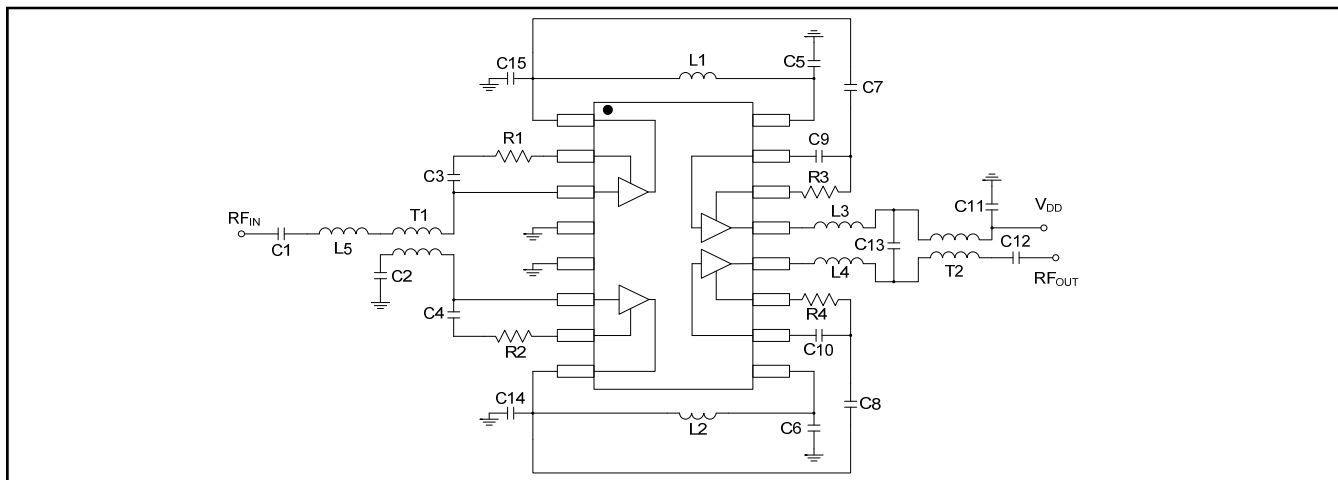


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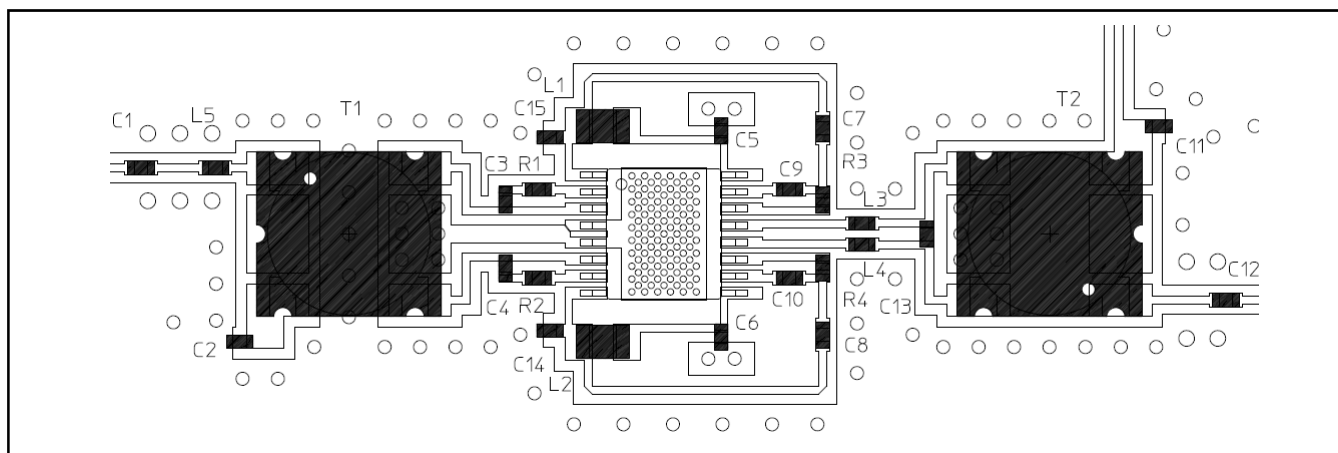
## Push Pull CATV Amplifier 50 - 1000 MHz

Rev. V1

### Application Schematic



### Recommended PCB



### Parts List<sup>11</sup>

Component	Value	Package
C1 - C12	0.01 $\mu$ F	0402
C13	2.7 pF	0402
C14, C15	2.0 pF	0402
R1 - R4	0 $\Omega$	0402
L1, L2	390 nH	0805
L3, L4	2.0 nH	0402
L5	5.6 nH	0402
T1, T2	1:1 Baluns	

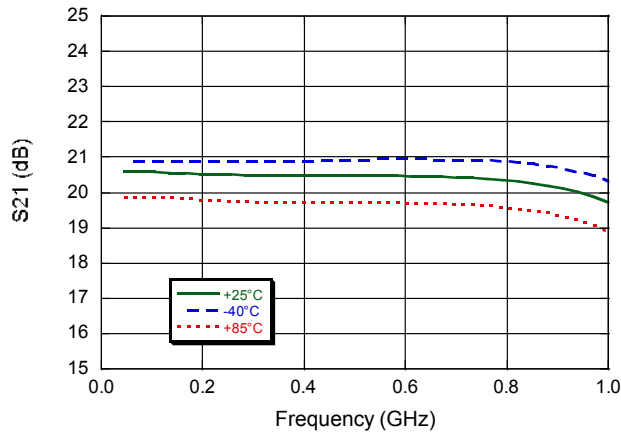
11. The 1:1 baluns, T1 & T2 are M/A-COM Technology Solutions part number MABA-009210-CT1760

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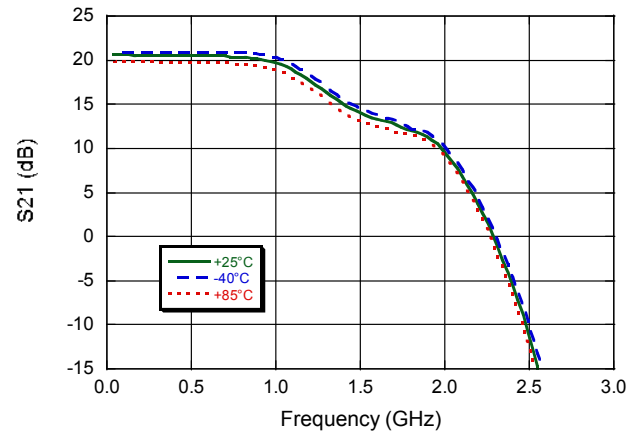
Rev. V1

### Typical Performance Curves Over Temperature

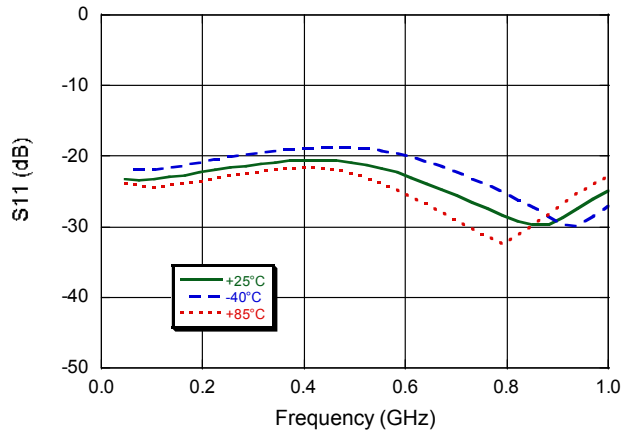
Gain to 1 GHz



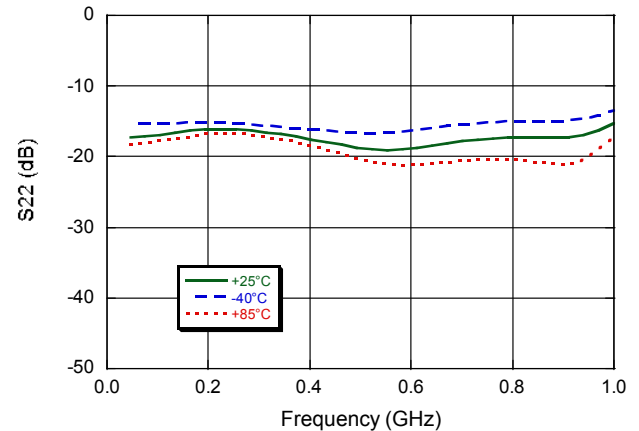
Gain to 3 GHz



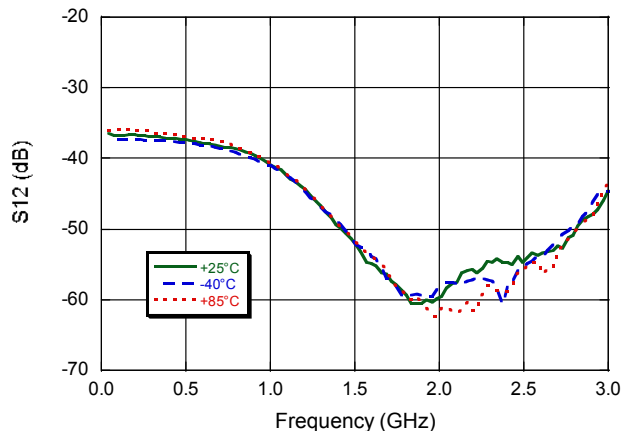
Input Return Loss



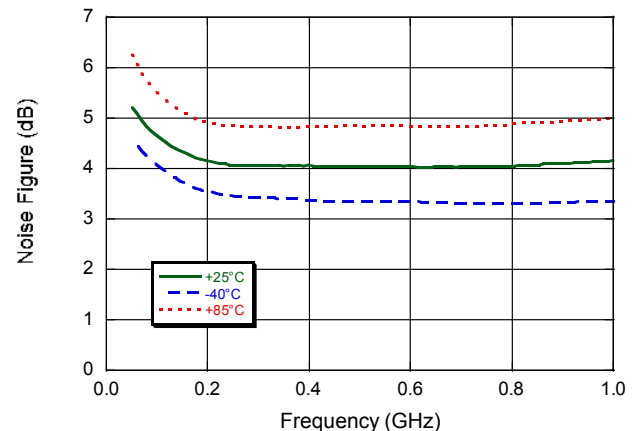
Output Return Loss



Reverse Isolation to 3 GHz



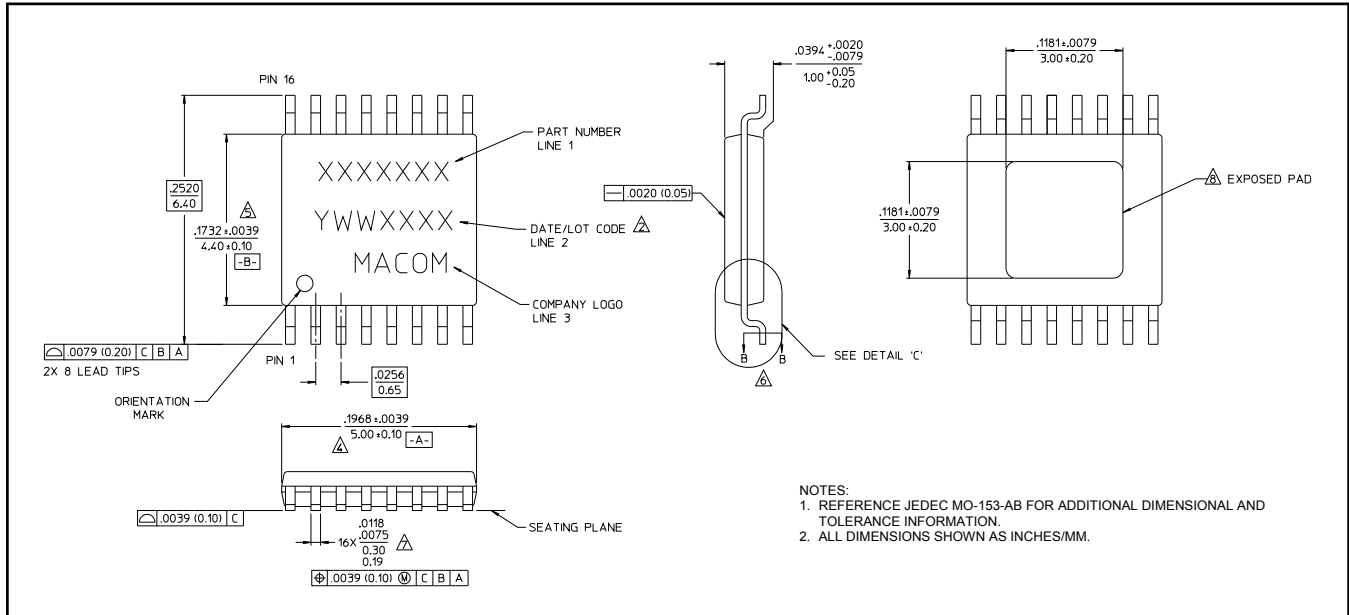
Noise Figure



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Rev. V1

### Lead Free TSSOP 16-lead exposed paddle<sup>†</sup>



<sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations and PCB footprint information.  
Meets JEDEC moisture sensitivity level 1 requirements.  
Plating is 100% matte tin over copper.