MAAL-011119

Satellite TV Amplifier
900 - 2200 MHz

Rev. V2

Features

- 1.5 dB Noise Figure
- 32 dBm Output IP3
- Single +2.5 V Bias
- Lead-Free SC70 6-Lead (SOT-363) Package
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MAAL-011119 is a broadband gain block GaAs MMIC amplifier assembled in a lead-free SC70-6LD (SOT-363) surface mount plastic package. The topology is a monolithic single stage self-biased design featuring a convenient 50 Ω input/output impedance that minimizes the number of external components.

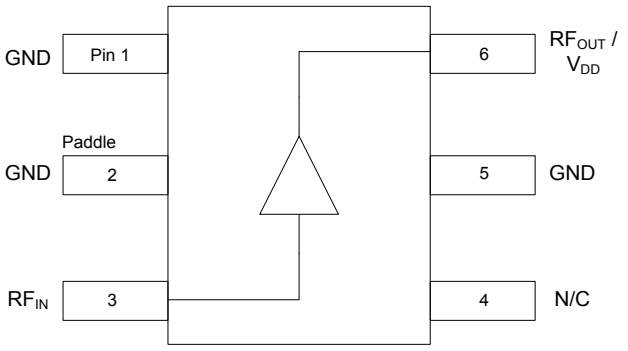
The MAAL-01119 is fabricated on MACOM's pHEMT process to help realize the complementary high IP3 and low noise figure. This process features full passivation for performance and reliability.

Ordering Information[1,2]

Part Number	Package
MAAL-011119-TR3000	3000 piece reel
MAAL-011119-001SMB	Sample Board

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

Functional Schematic



Pin Configuration[3]

Pin No.	Function	Description
1	GND	Ground
2	GND	Ground
3	RF_{IN}	RF Input
4	N/C	No Connection
5	GND	Ground
6[4]	RF_{OUT}/V_{DD}	RF Output / Drain Voltage

3. MACOM recommends connecting unused package pins to ground.
4. MACOM recommends connecting a series inductor and shunt capacitor to pin 6; reference schematic on page 3.

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

Electrical Specifications: T_A = +25°C, V_{DD} = 2.5 V, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	1900 MHz 2150 MHz	dB	9.4 —	10.5 10.0	12.0 —
Noise Figure	1900 MHz 2150 MHz	dB	—	1.5 1.4	2.1 —
Input Return Loss	1900 MHz 2150 MHz	dB	—	7 14	—
Output Return Loss	1900 MHz 2150 MHz	dB	—	20 20	—
Output P1dB	950-2150 MHz	dBm	—	16	—
Output IP3	950-2150 MHz	dBm	—	32	—
Current	—	mA	60	80	100

Absolute Maximum Ratings[5,6]

Parameter	Absolute Maximum
Gain Compression	6 dB
Voltage	5.5 V
Junction Temperature[7,8]	+150°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.
7. Operating at nominal conditions with $T_J \leq$ +150°C will ensure MTTF > 1 x 10^6 hours.
8. Junction Temperature (T_J) = T_C + Θ_{JC} * (V * I)
   Typical thermal resistance (Θ_{JC}) = 131°C/W
   a) For T_C = 25°C,
   T_J = 58°C @ 2.5 V, 100 mA
   b) For T_C = 85°C,
   T_J = 118°C @ 2.5 V, 100 mA

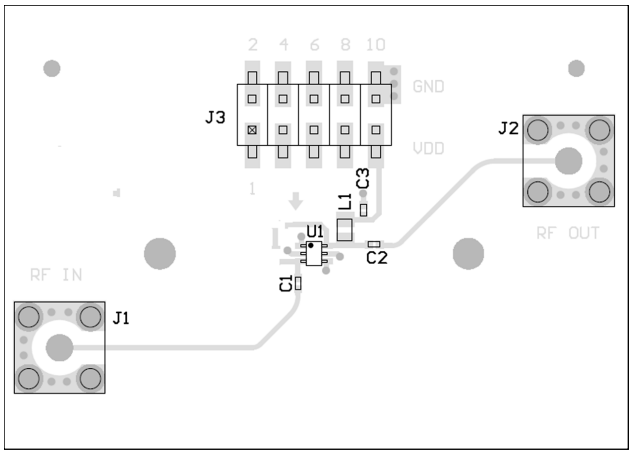
Handling Procedures

Please observe the following precautions to avoid damage:

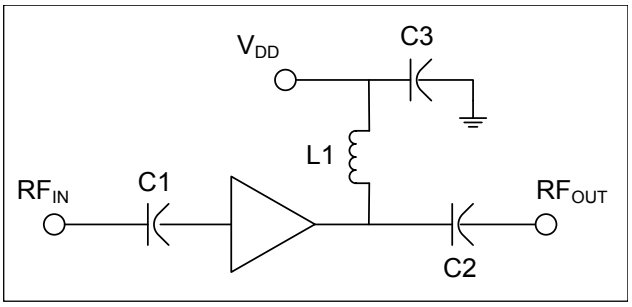
Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM class 1A devices.

PCB Layout



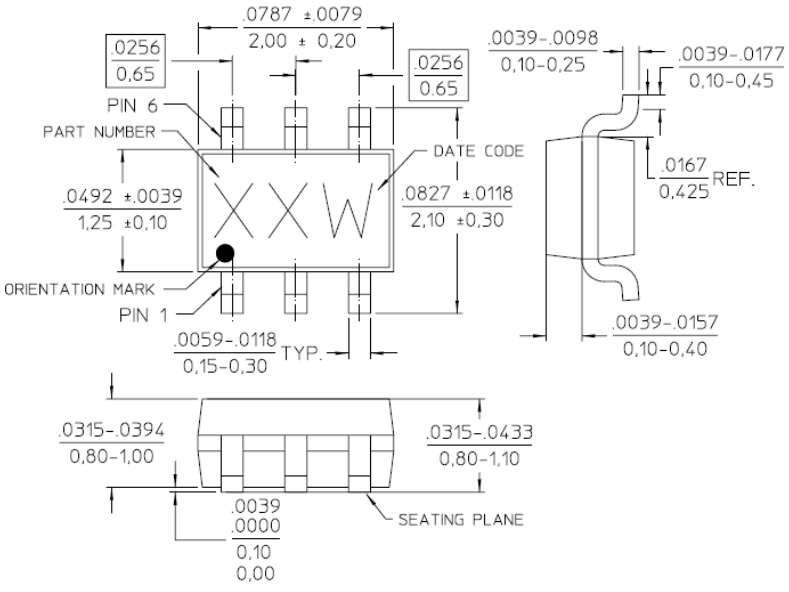
Schematic



Parts List

Part	Value	Case Style
C1	39 pF	0402
C2	39 pF	0402
C3	470 pF	0402
L1	12 nH	0402

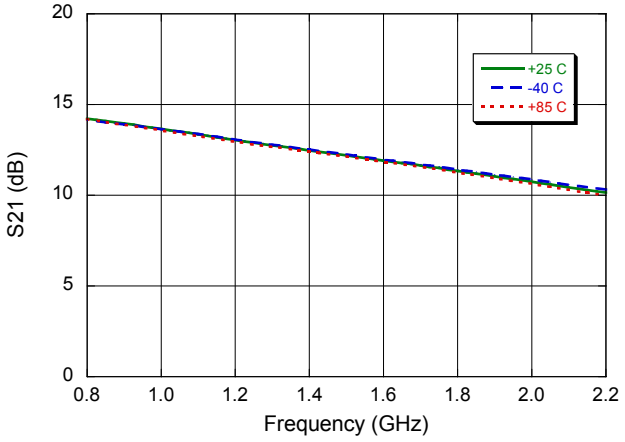
Lead-Free SC-70 6-Lead (SOT-363)†



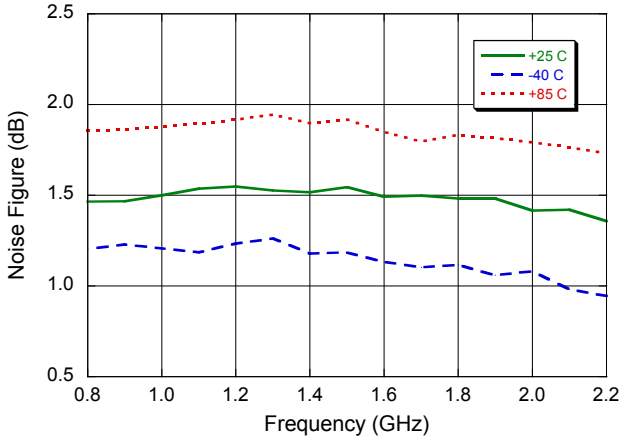
† Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is matte tin over copper.

Typical Performance Curves with V_{DD} = 2.5 V

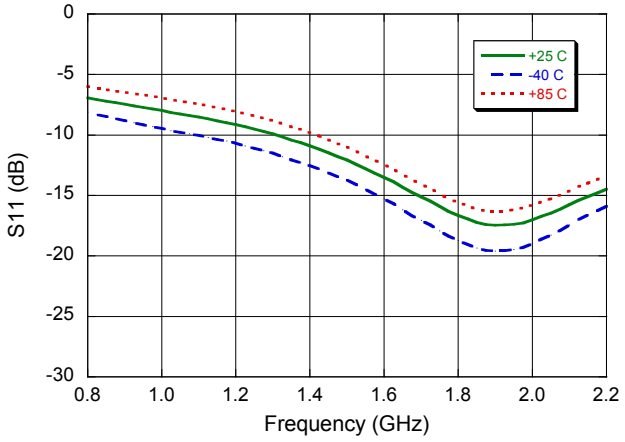
Gain



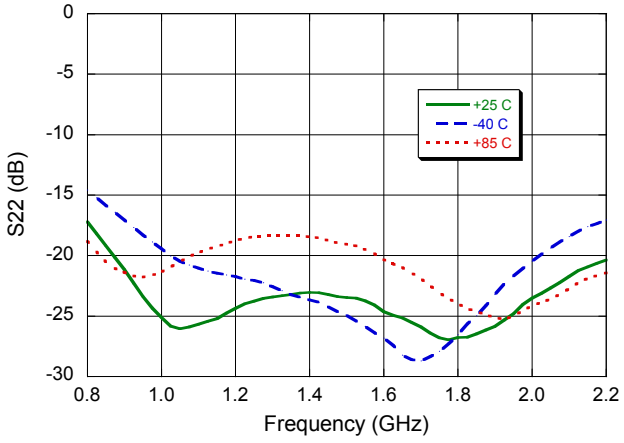
Noise Figure



Input Return Loss

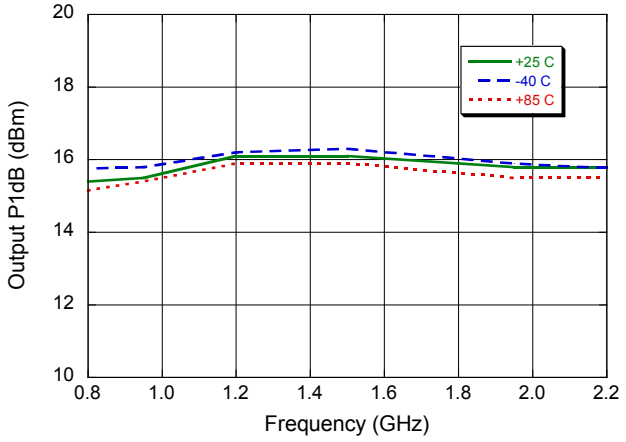


Output Return Loss

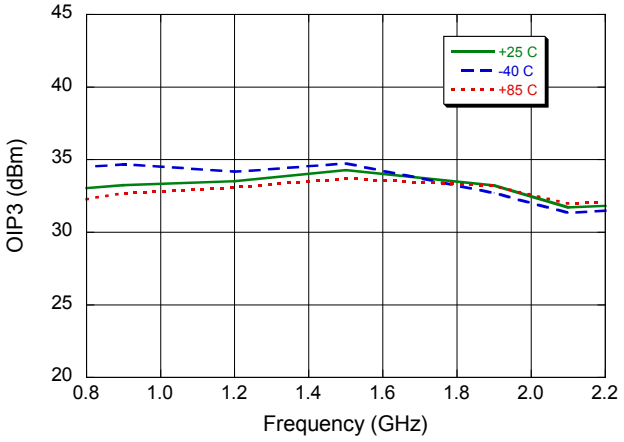


Typical Performance Curves with V_{DD} = 2.5 V

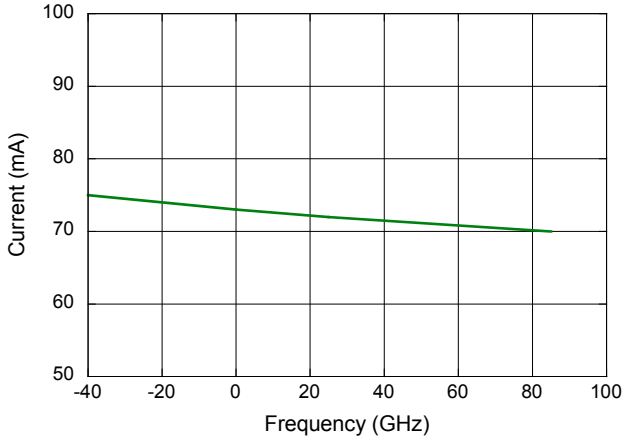
P1dB



Output IP3 @ -12 dBm Input Power



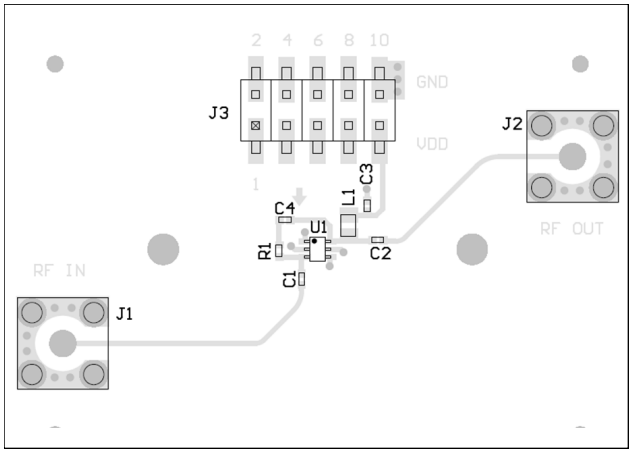
Current vs. Temperature



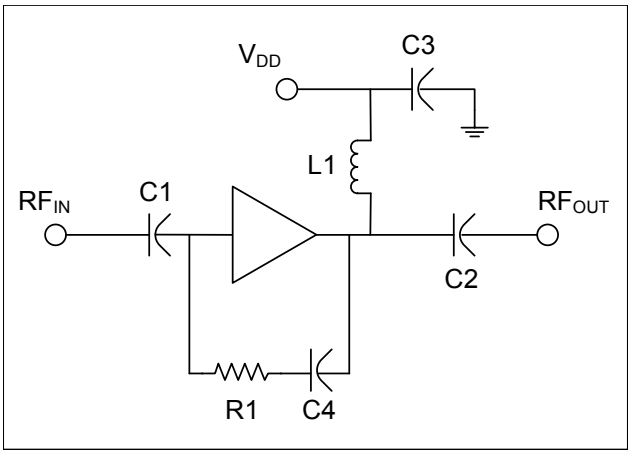
Feedback Circuit Application Section

The feedback circuit allows for the gain to be reduced at the low end of the frequency band providing a flatter gain response. The feedback components presented in the parts list below contributed to the results shown on Sheet 7.

PCB Layout



Schematic

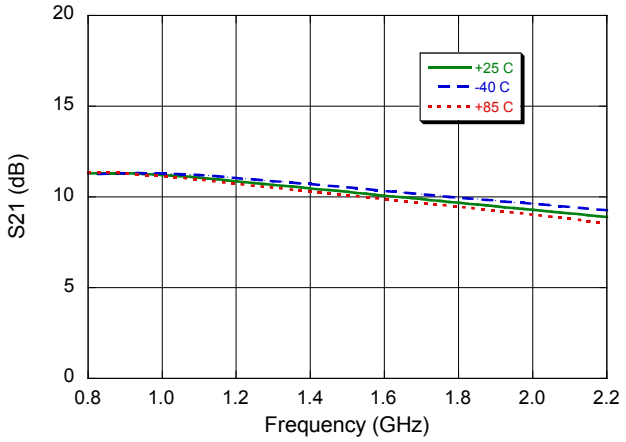


Parts List

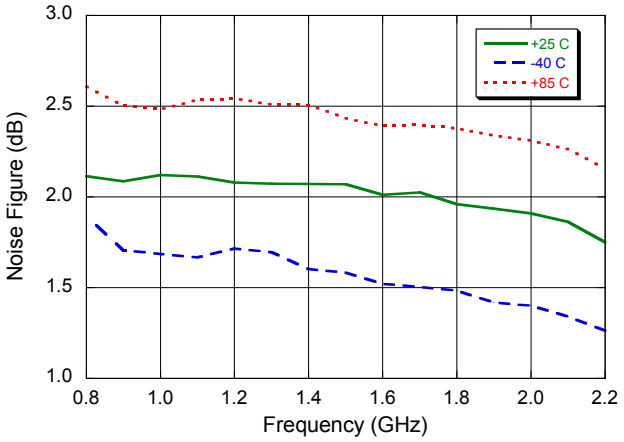
Part	Value	Case Style
C1	39 pF	0402
C2	39 pF	0402
C3	470 pF	0402
C4	68 pF	0402
L1	12 nH	0402
R1	450 Ω	0402

Feedback Circuit Application Section Performance Curves

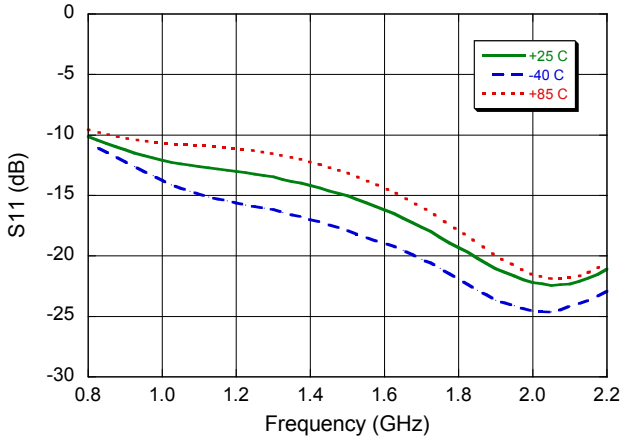
Gain



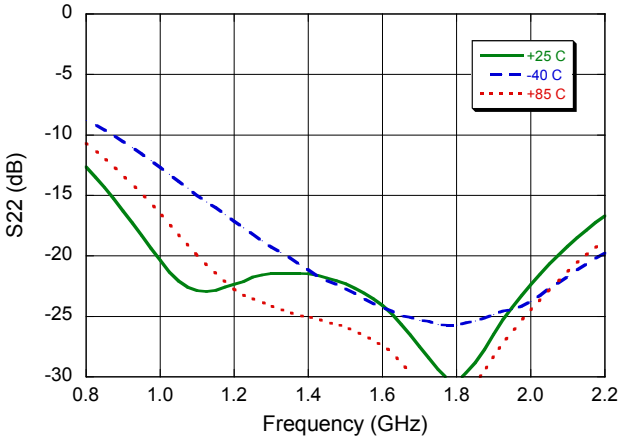
Noise Figure



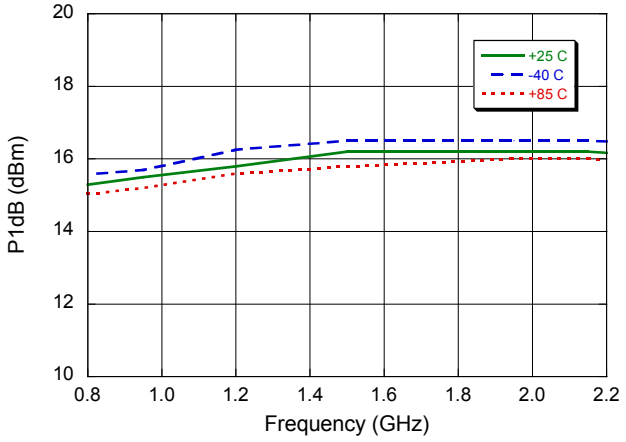
Input Return Loss



Output Return Loss



P1dB



Output IP3 @ -12 dBm Input Power