MAAL-009120

Miniature Broadband Gain Stage
70 - 3000 MHz

Rev. V1

Features

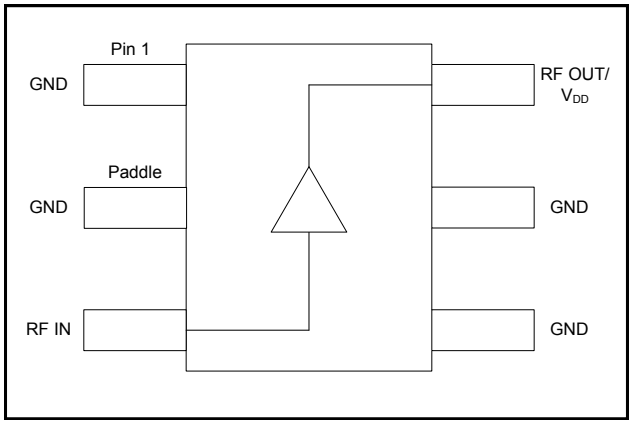
- Low Noise Figure
- High IP_3
- Single Supply +3 V, +5 V [6]
- RoHS* Compliant SC70- 6LD Package

Description

M/A-COM Technology's MAAL-009120 broadband gain stage is a GaAs MMIC amplifier in a lead-free SC70-6LD (SOT-363) surface mount plastic package. The MAAL-009120 employs a monolithic 1 -stage self-biased design featuring a convenient 50 Ω input/output impedance that minimizes the number of external components required. Its broadband design provides usable performance from 500 to 3000 MHz.

For operation below 500 MHz contact M/A-COM Tech's application group for support.

Functional Block Diagram



Pin Configuration

PIN	Function	Description
1	GND	Ground
2	GND	Ground
3	RF In	RF input
4	GND	Ground
5	GND	Ground
6	RF Out/V_{DD}	RF output & drain voltage input

Ordering Information [1,2]

Part Number	Package
MAAL-009120 -TR1000	1000 piece reel
MAAL-009120 -TR3000	3000 piece reel
MAAL-009120 -001SMB	Sample Test Board

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

Absolute Maximum Ratings [3,4,5]

Parameter	Absolute Maximum
Gain Compression	6 dB
Voltage	5.5 volts
Operating Temperature	-40 °C to +85 °C
Storage Temperature	-65 °C to +150 °C

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. M/A-COM Technology does not recommend sustained operation near these survivability limits.
5. Operating at 5 volts with no drain resistor will require the RF output power to be no greater than 10 dBm.

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

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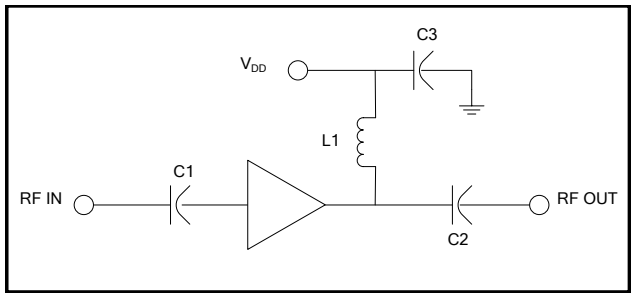
Electrical Specifications: Freq. = 500 - 3000 MHz, T_A = 25°C, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Bias Voltage			
			3 Volts			5 Volts[5]
			Min.	Typ.	Max.	Typ.
Gain	F = 0.9 GHz F = 1.9 GHz F = 3.0 GHz	dB	— 10.4 —	14 11 8	— 13.0 —	14.5 11.2 8.5
Noise Figure	F = 0.9 GHz F = 1.9 GHz F = 3.0 GHz	dB	— — —	1.4 1.4 1.5	— 1.8 —	1.5 1.5 1.6
Input Return Loss	F = 0.9 GHz F = 1.9 GHz F = 3.0 GHz	dB	— — —	7 11 11	— — —	7 11.0 10.5
Output Return Loss	F = 0.9 GHz F = 1.9 GHz F = 3.0 GHz	dB	— — —	22 20 15.5	— — —	26 18.5 17
Output P1dB	500 – 3000 MHz	dBm	—	18.5	—	—
Output IP_3	500 – 3000 MHz	dBm	—	35	—	35
Current	—	mA	60	80	100	95

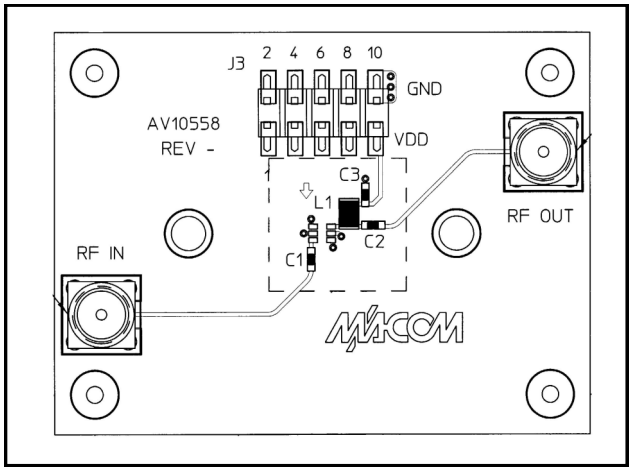
Baseline Application Schematic @ 3V, 5V



Component List @ 3V, 5V

Part	Value	Case Style	Purpose
C1	39 pF	0402	Input DC Block
C2	39 pF	0402	Output DC Block
C3	470 pF	0402	RF Bypass
L1	12 nH	0805	RF Choke/Tuning

Recommended PCB Configuration @ 3V, 5V



Handling Procedures

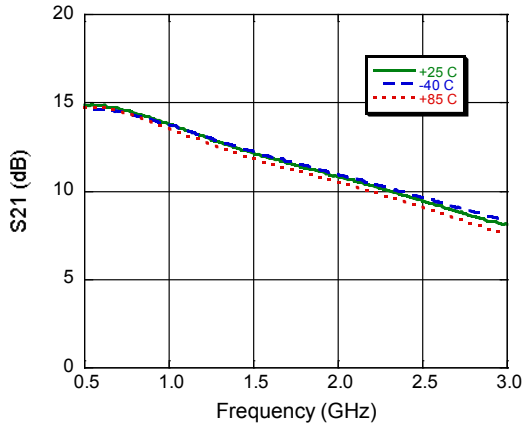
The following precautions should be observed to avoid damage:

Static Sensitivity

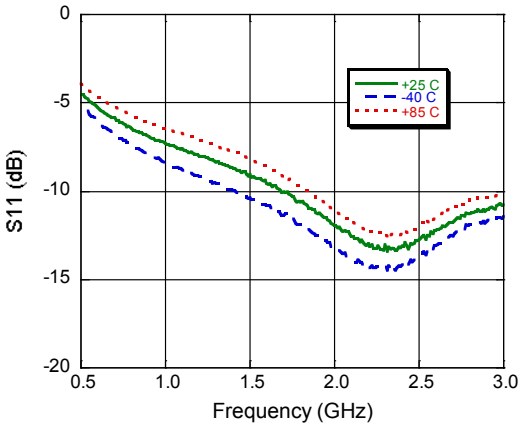
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Curves: V_{DD} = 3 V

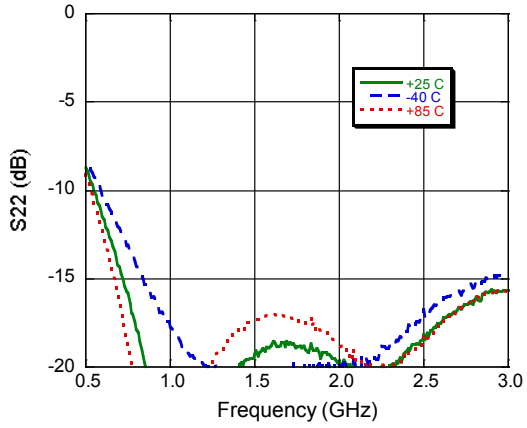
Gain



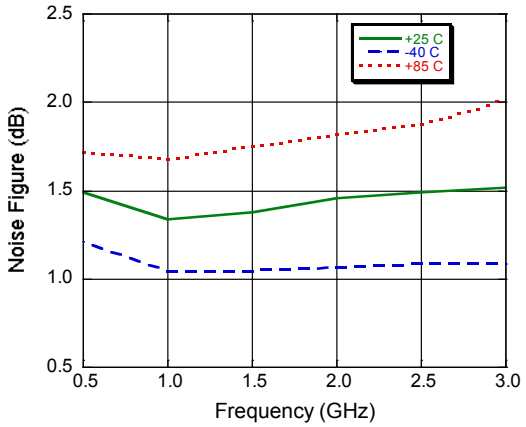
Input Return Loss



Output Return Loss

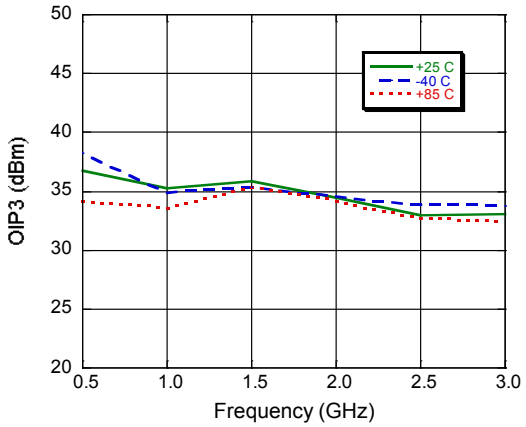


Noise Figure

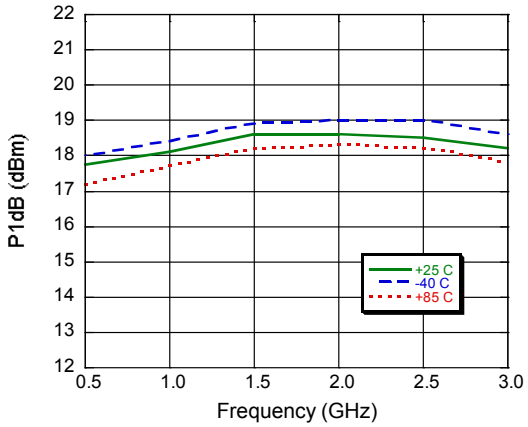


Typical Performance Curves: V_{DD} = 3 V

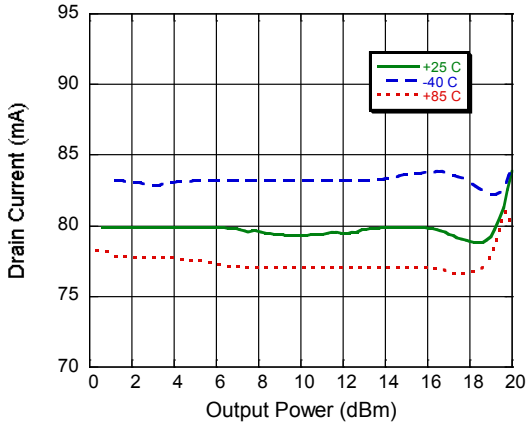
Output IP3, Input Power @ -12 dBm



P1dB

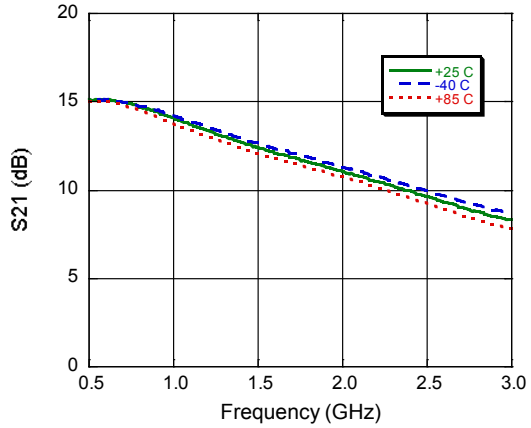


Current

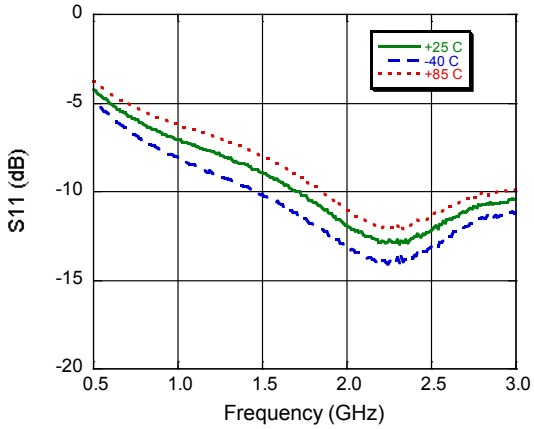


Typical Performance Curves: V_{DD} = 5 V[6]

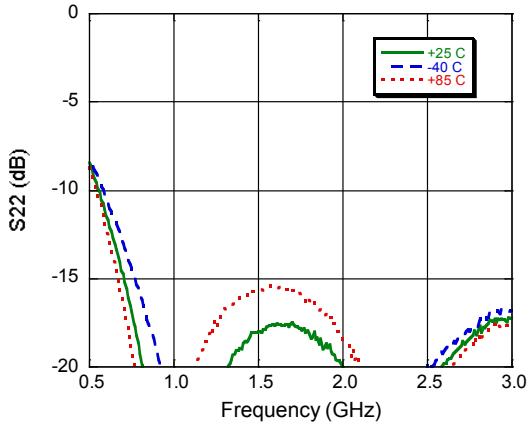
Gain



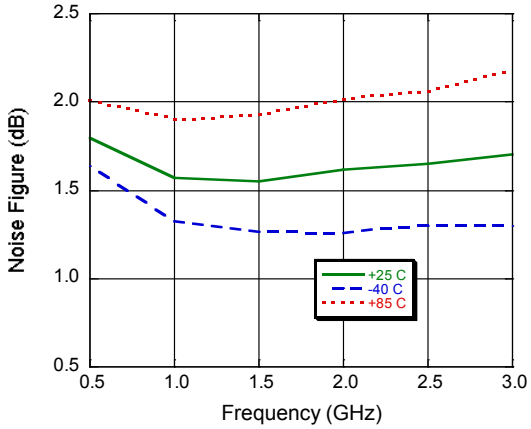
Input Return Loss



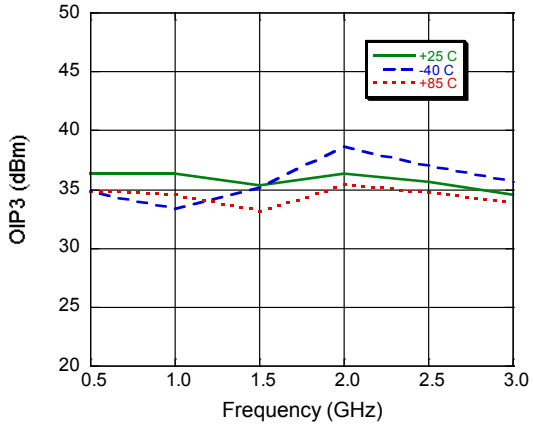
Output Return Loss



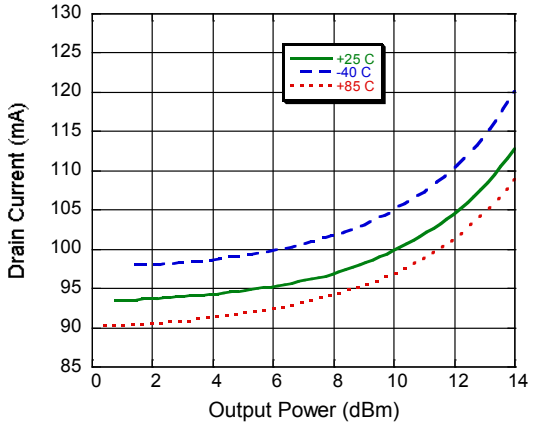
Noise Figure



Output IP3, Input Power = -12 dBm

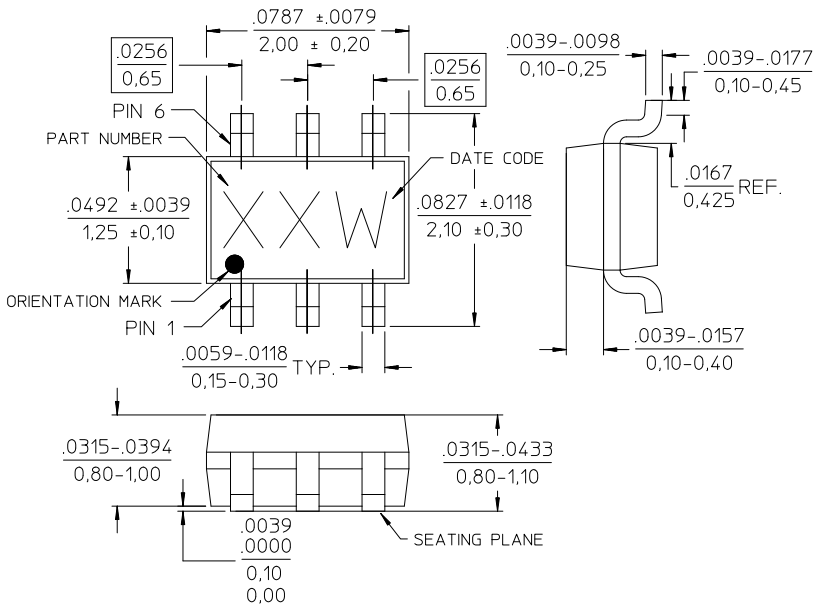


Current



6. This device can run from a single 5 volt supply, but for 1M hour MTTF the output power must be no greater than 10 dBm unless using a series resistor on the drain. See Application note 7 on page 7.

Lead-Free SC70-6LD (SOT-363)†

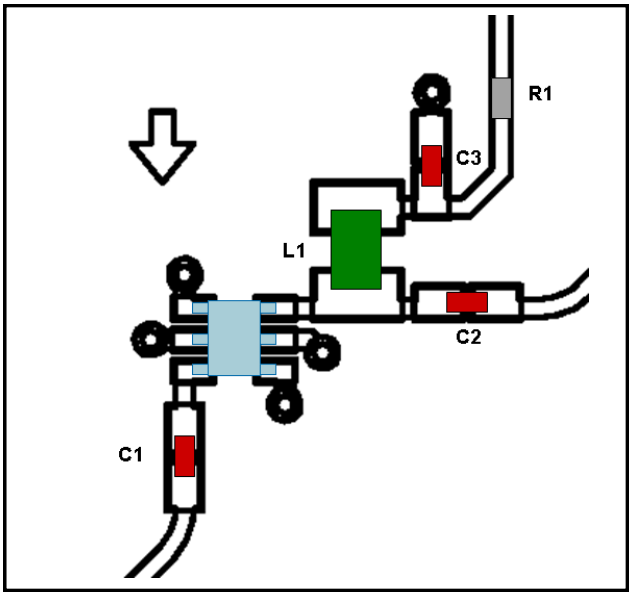


NOTES: 1. REFERENCE EIAJ SC-88 FOR ADDITIONAL DIMENSIONAL AND TOLERANCE INFORMATION.
2. REFERENCE M538 APPLICATION NOTE FOR PCB FOOTPRINT INFORMATION.
3. ALL DIMENSIONS SHOWN AS INCHES/MM.

† Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.

5 Volt Application Section for operation above 10 dBm output power

Application Layout Schematic @ 5V [6]

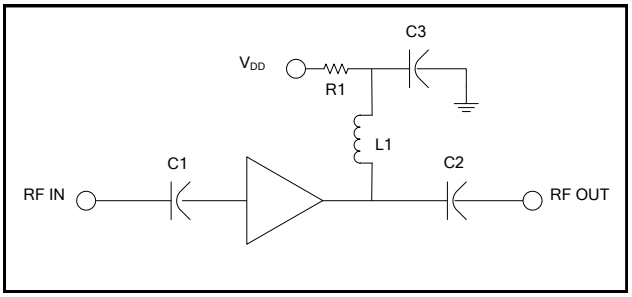


6. The addition of a 24.9 Ω series resistor on the drain line allows for 5 volt operation above 10 dBm output power, but no greater than 22 dBm of output power.

Component List @ 5V

Part	Value	Case Style	Purpose
C1	39 pF	0402	Input DC Block
C2	39 pF	0402	Output DC Block
C3	470 pF	0402	RF Bypass
L1	12 nH	0805	RF Choke/Tuning
R1	24.9 Ω	0402	Voltage Drop

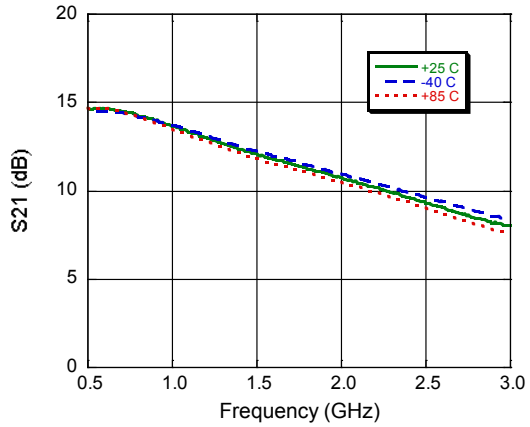
Application Schematic @ 5V



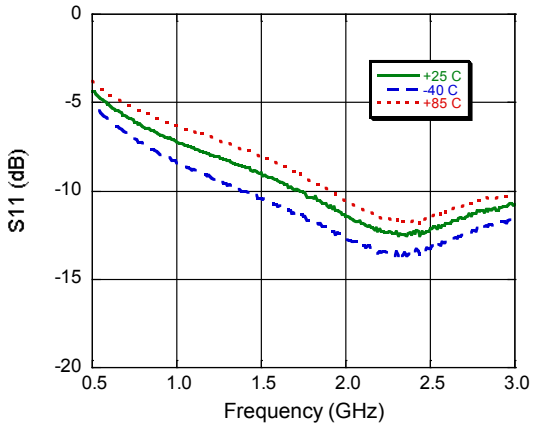
5 Volt Application Section for operation above 10 dBm output power

Typical Performance Curves: V_{DD} = 5 V

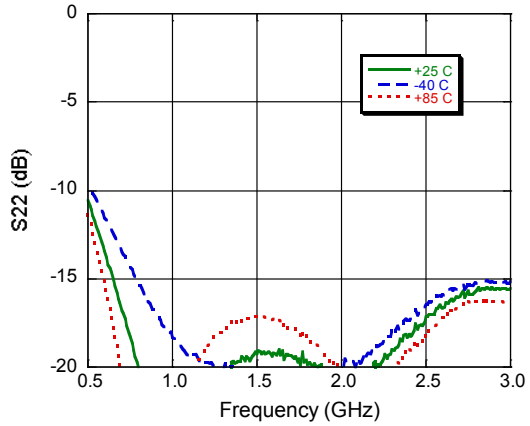
Gain



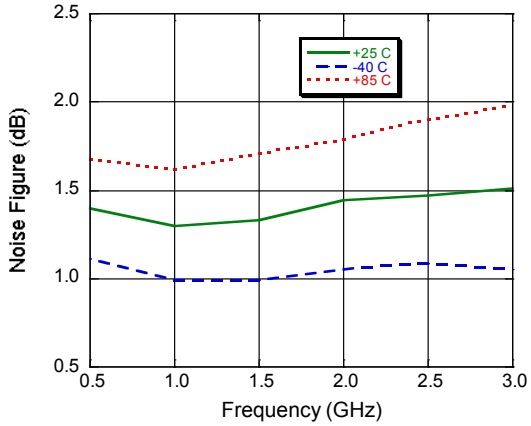
Input Return Loss



Output Return Loss



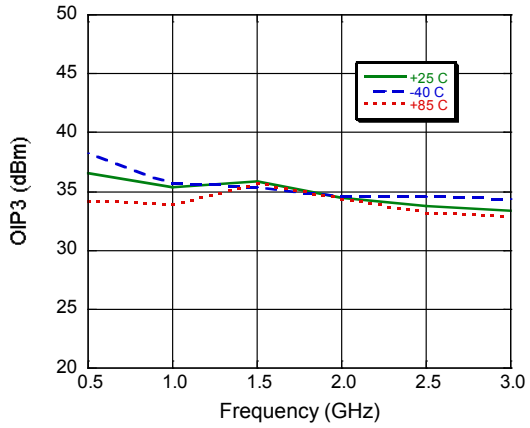
Noise Figure



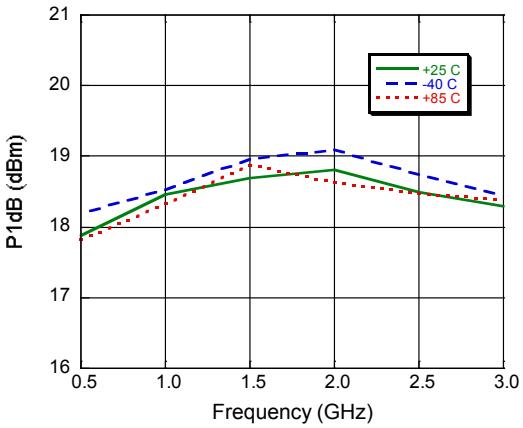
5 Volt Application Section for operation above 10 dBm output power

Typical Performance Curves: V_{DD} = 5 V

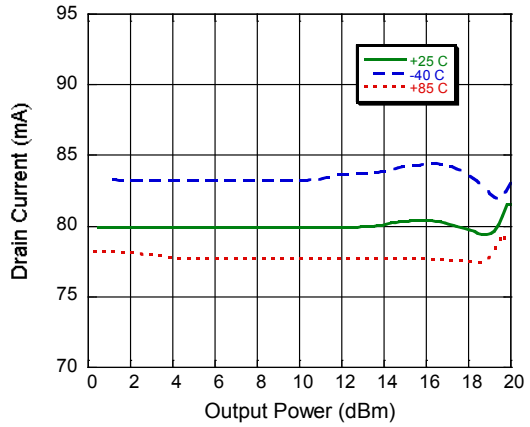
Output IP3, Input Power @ -12 dBm



P1dB

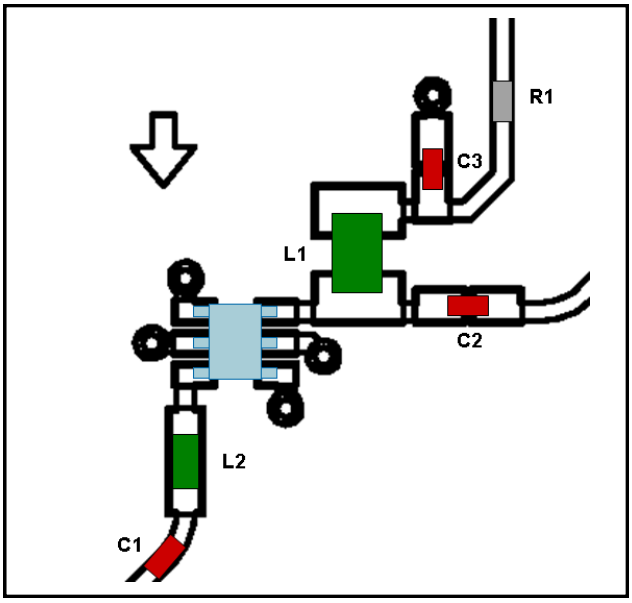


Current



3 Volt Application Section @ 70 MHz

Application Layout Schematic @ 3V

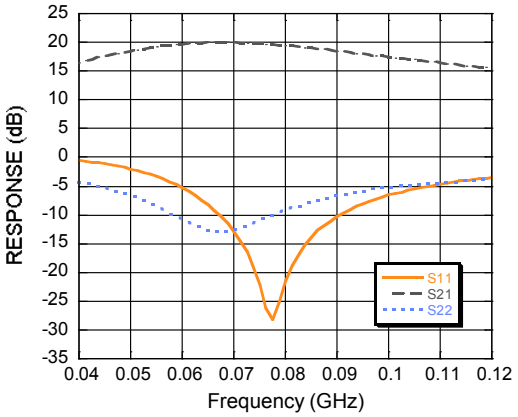


Component List @ 3V

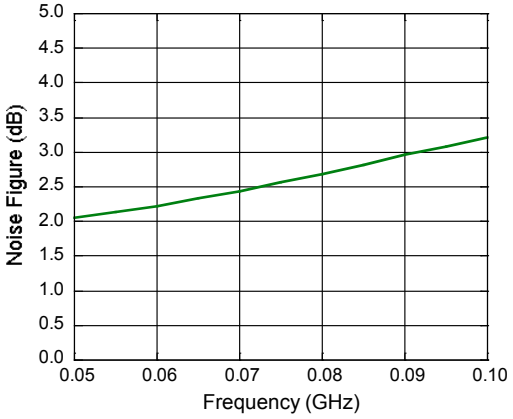
Part	Value	Case Style
C1 - C3	0.1 µF	0402
L1	80 nH	0805
L2	220 nH	0603
R1	3 Ω	0402

Typical Performance Curves: V_{DD} = 3 V

S-Parameter Response @ 3 Volts



Noise Figure



P1dB