

Miniature Broadband Gain Stage 70 - 3000 MHz

Rev. V1

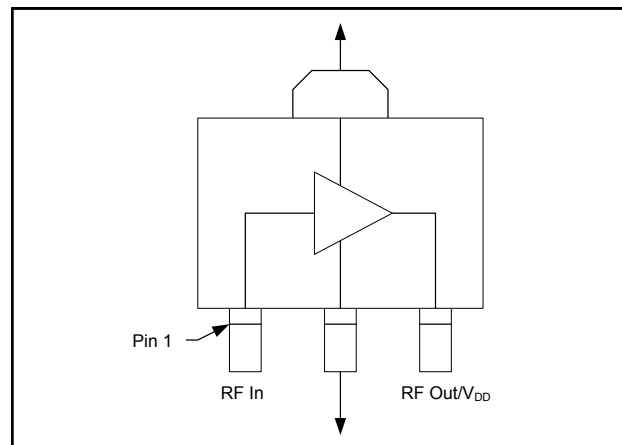
Features

- Low Noise Figure
- High IP_3
- Single Supply +3 V, +5 V⁶
- RoHS* Compliant SOT-89 Package

Description

M/A-COM Technology's MAAL-010200 broadband gain stage is a GaAs MMIC amplifier in a lead-free SOT-89 surface mount plastic package. The MAAL-010200 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 Technology's application group for support.

Functional Block Diagram



Pin Configuration

Pin	Pin Name	Description
1	RF In	RF Input
2	GND	Ground
3	RF Out/V _{DD}	RF Output & Voltage Bias

Ordering Information ^{1,2}

Part Number	Package
MAAL-010200 -TR3000	3000 piece reel
MAAL-010200-001SMB	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.

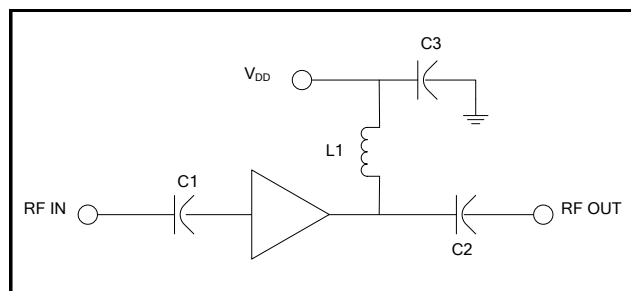
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Electrical Specifications: Freq. = 500 - 3000 MHz, $T_A = 25^\circ\text{C}$, $Z_0 = 50\ \Omega$

Parameter	Test Conditions	Units	Bias Voltage			
			3 Volts		5 Volts ⁶	
			Min.	Typ.	Max.	Typ.
Gain	F = 0.9 GHz	dB	—	14	—	14
	F = 1.9 GHz		10	11	13	11
	F = 3.0 GHz		—	8	—	8.5
Noise Figure	F = 0.9 GHz	dB	—	1.3	—	1.45
	F = 1.9 GHz		—	1.4	2	1.4
	F = 3.0 GHz		—	1.45	—	1.5
Input Return Loss	F = 0.9 GHz	dB	—	7.5	—	7.5
	F = 1.9 GHz		—	11	—	11
	F = 3.0 GHz		—	14	—	14
Output Return Loss	F = 0.9 GHz	dB	—	19.5	—	20
	F = 1.9 GHz		—	22	—	21.5
	F = 3.0 GHz		—	20	—	23
Output P1dB	500 – 3000 MHz	dBm		17.5		—
Output IP ₃	500 – 3000 MHz	dBm		36		36
Current	—	mA	50	77	100	90

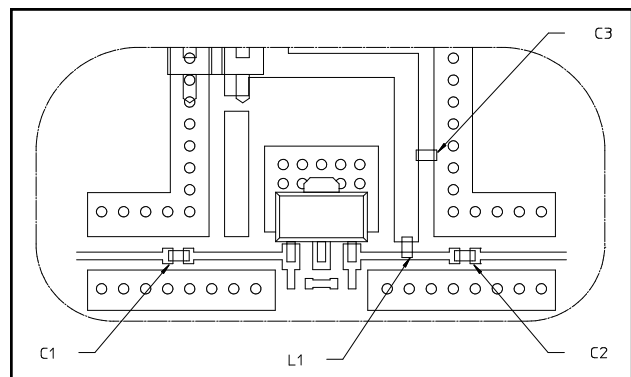
Baseline Application Schematic @ 3V, 5V



Component List @ 3V, 5V

Part	Value	Case Style	Purpose
C1,C2	39 pF	0402	DC Block
C3	0.1 μF	0402	RF Bypass
L1	12 nH	0402	RF Choke/Tuning

Recommended PCB Configuration @ 3V, 5V



Handling Procedures

The following precautions should be observed to avoid damage:

Static Sensitivity

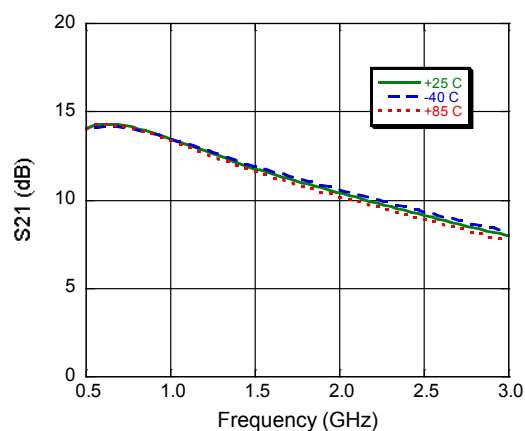
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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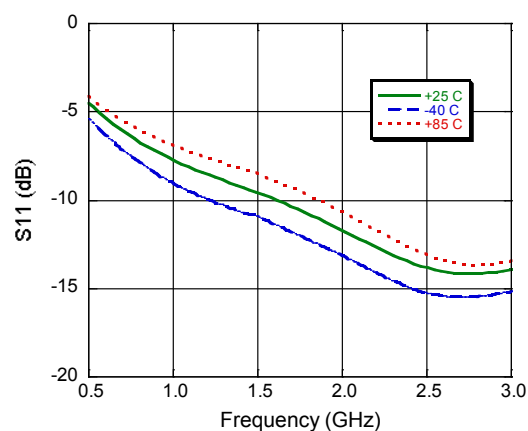
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Typical Performance Curves: $V_{DD} = 3\text{ V}$

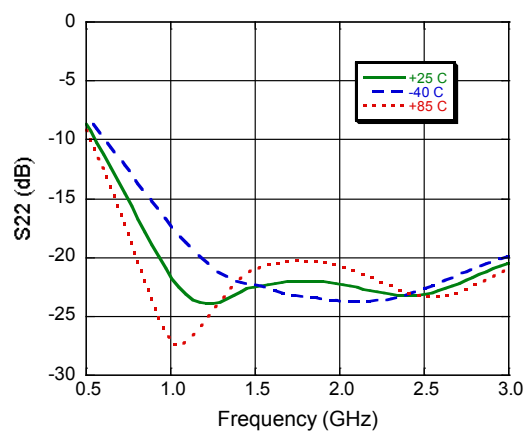
Gain



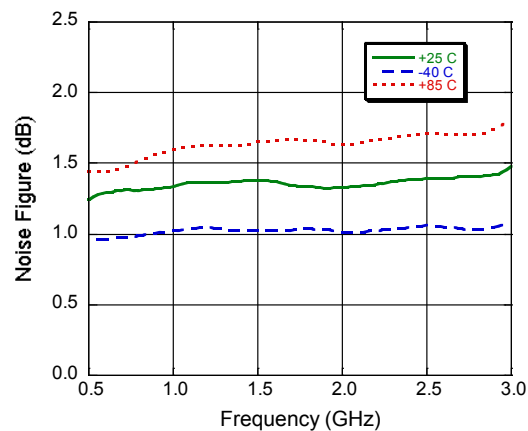
Input Return Loss



Output Return Loss



Noise Figure

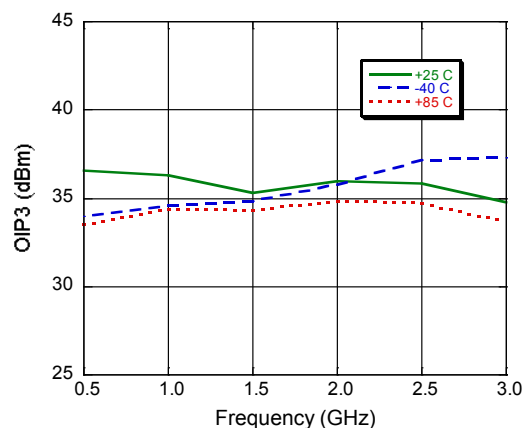


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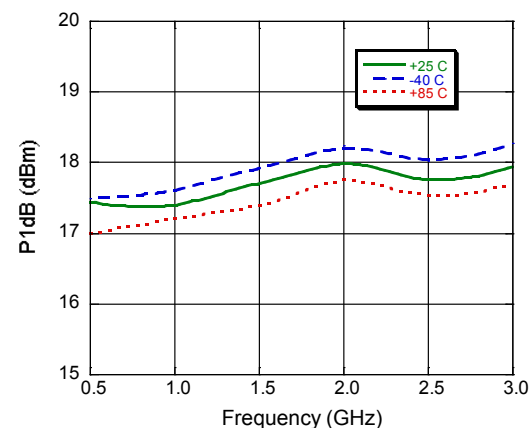
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Typical Performance Curves: $V_{DD} = 3\text{ V}$

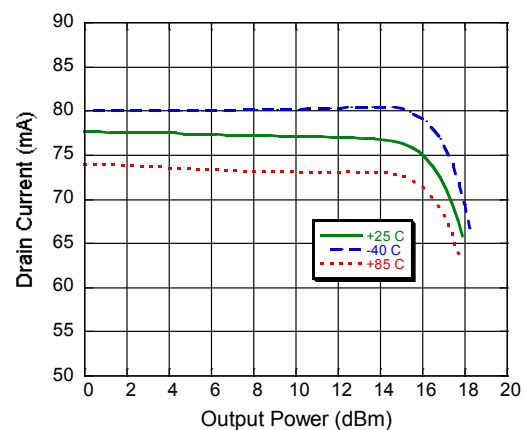
Output IP3, Input Power @ -12 dBm



P1dB



Current

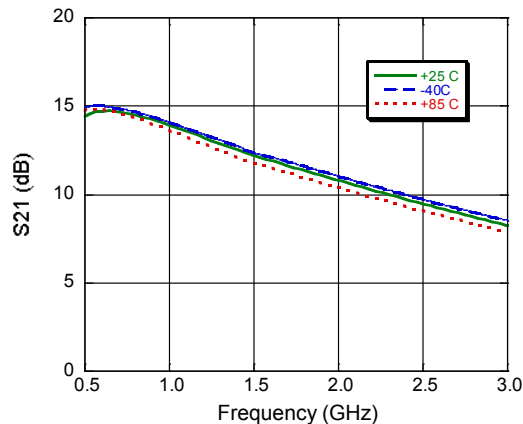


Miniature Broadband Gain Stage 70 - 3000 MHz

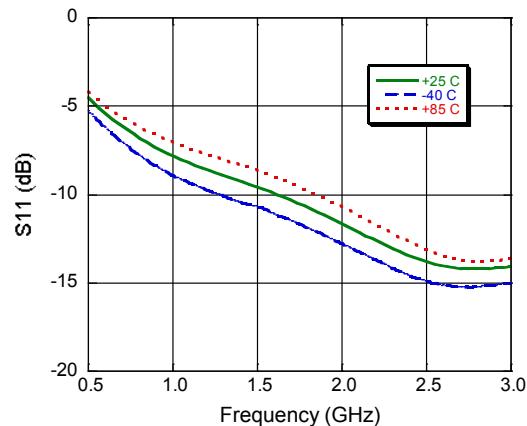
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Typical Performance Curves: $V_{DD} = 5\text{ V}^6$

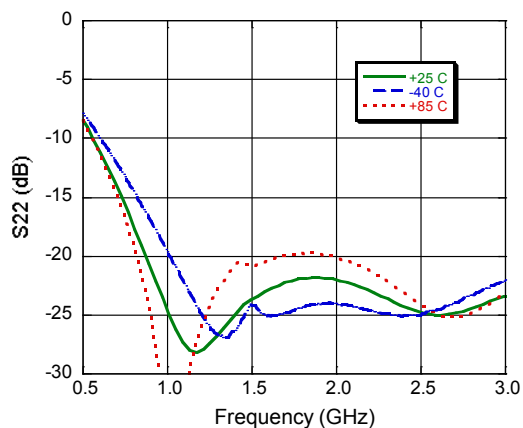
Gain



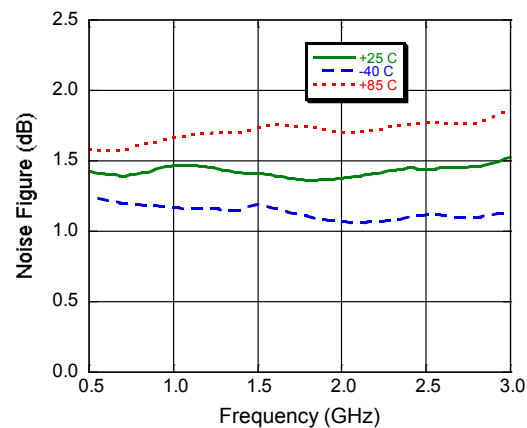
Input Return Loss



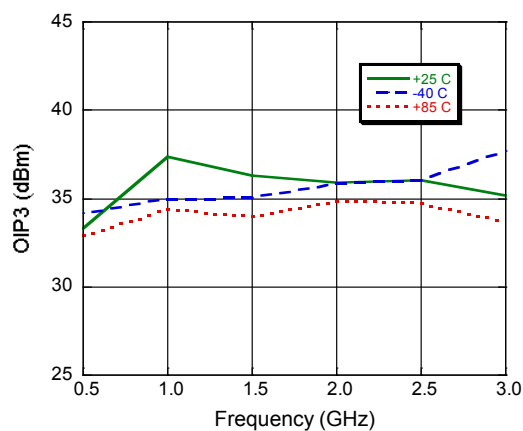
Output Return Loss



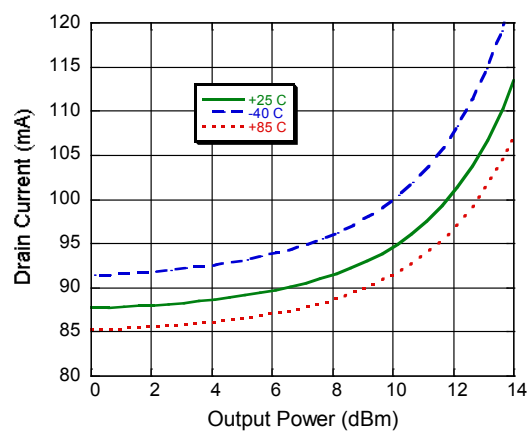
Noise Figure



Output IP3, Input Power = -12 dBm



Current

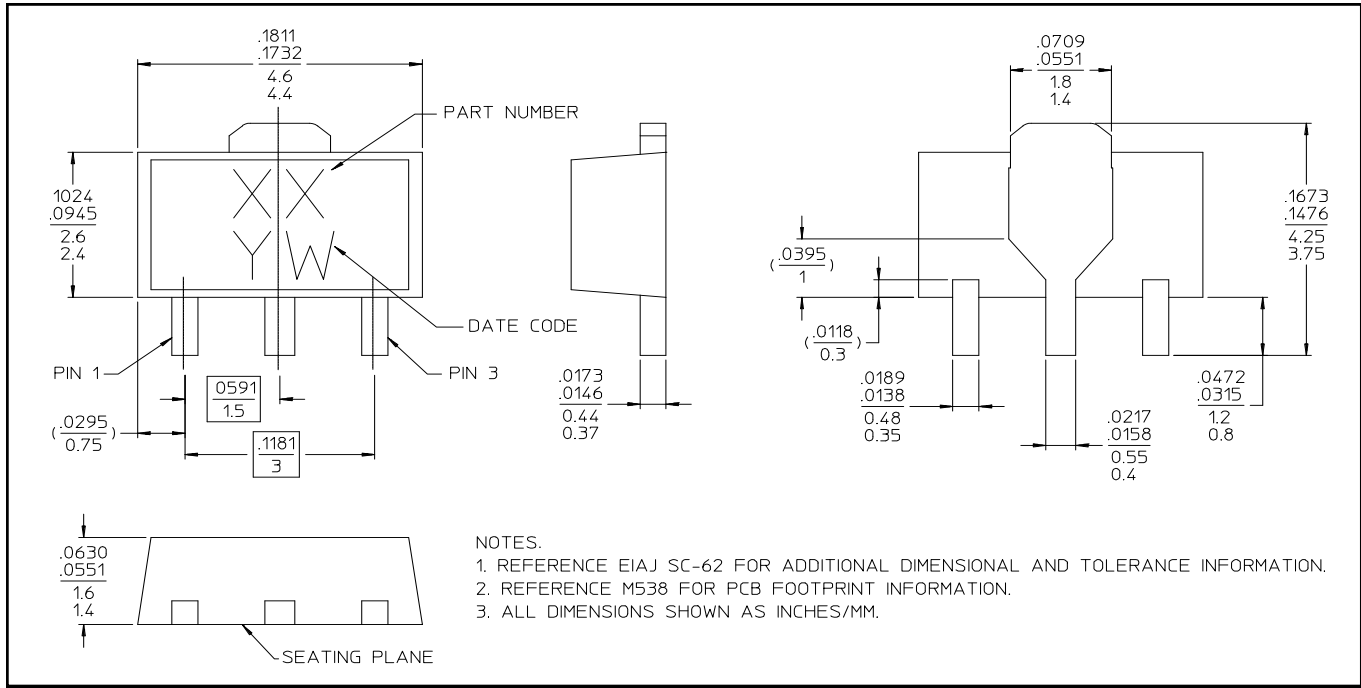


6. This device can run from a single 5 volt supply, but for 1M hour MTTF the output power must be no greater than 10 dBm unless using a series resistor on the drain. See Application note 7 on page 7.

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Lead-Free SOT-89[†]



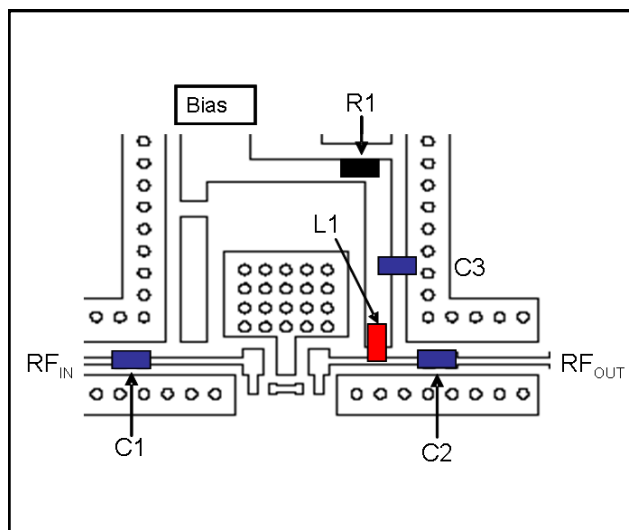
[†] Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.

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5 Volt Application Section for operation above 10 dBm output power

Application Layout Schematic @ 5V ⁷

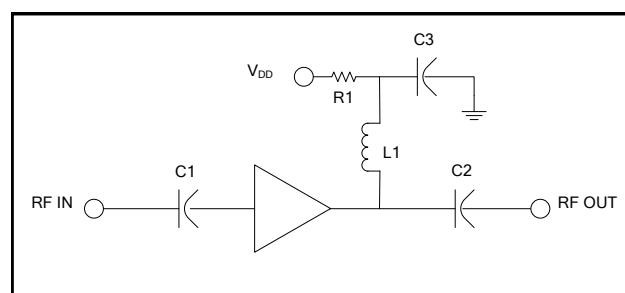


7. The addition of a 27 Ω series resistor on the drain line allows for 5 volt operation above 10 dBm output power, but no greater than 22 dBm of output power.

Component List @ 5V

Part	Value	Case Style	Purpose
C1	39 pF	0402	Input DC Block
C2	39 pF	0402	Output DC Block
C3	0.1 μ F	0402	RF Bypass
L1	12 nH	0805	RF Choke/Tuning
R1	27 Ω	0402	Voltage Drop

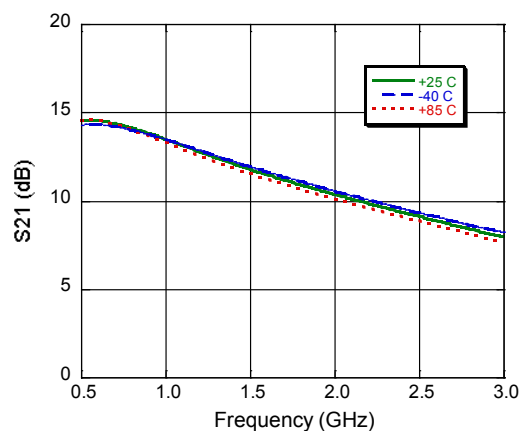
Application Schematic @ 5V



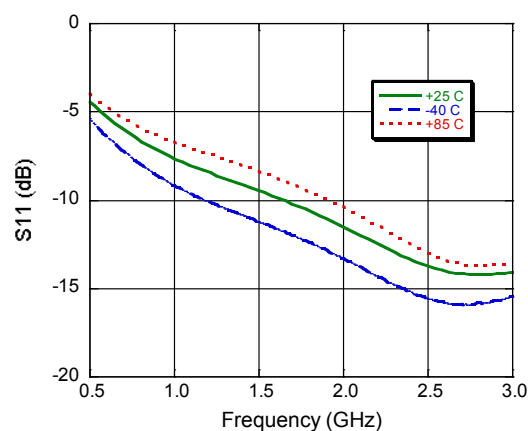
5 Volt Application Section for operation above 10 dBm output power

Typical Performance Curves: $V_{DD} = 5\text{ V}$

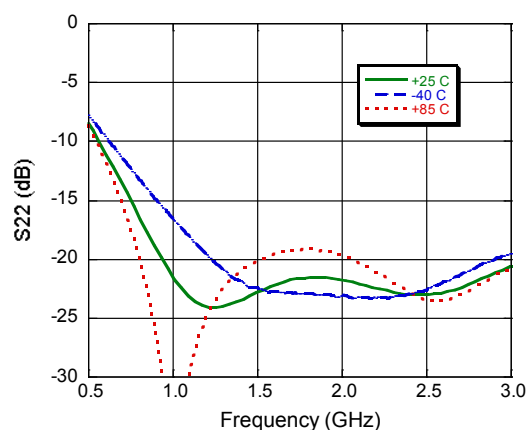
Gain



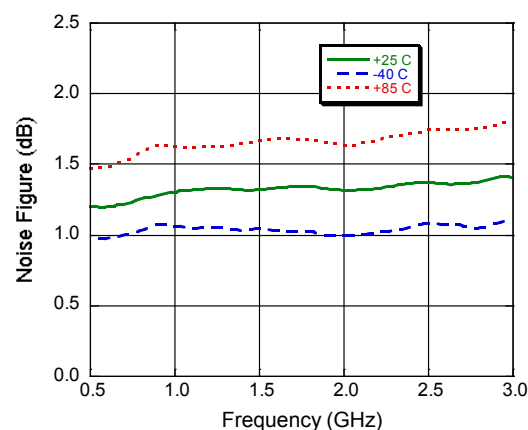
Input Return Loss



Output Return Loss



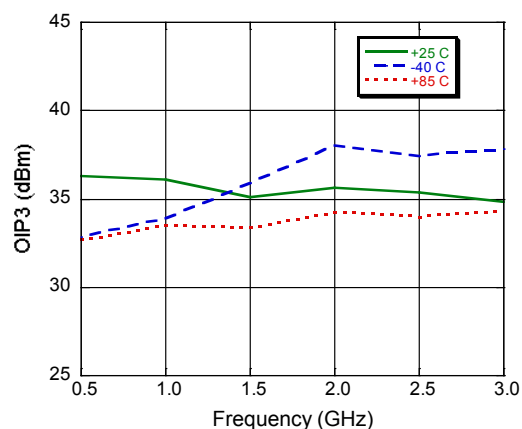
Noise Figure



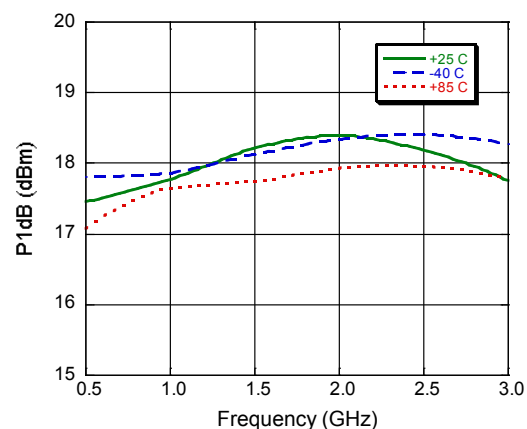
5 Volt Application Section for operation above 10 dBm output power

Typical Performance Curves: $V_{DD} = 5\text{ V}$

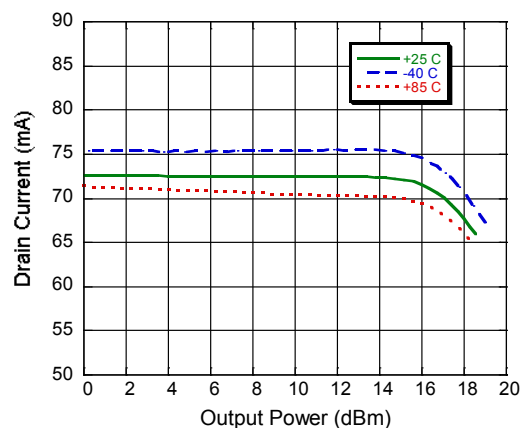
Output IP3, Input Power @ -12 dBm



P1dB



Current



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