

## Miniature Broadband Gain Stage 70 - 3000 MHz

Rev. V1

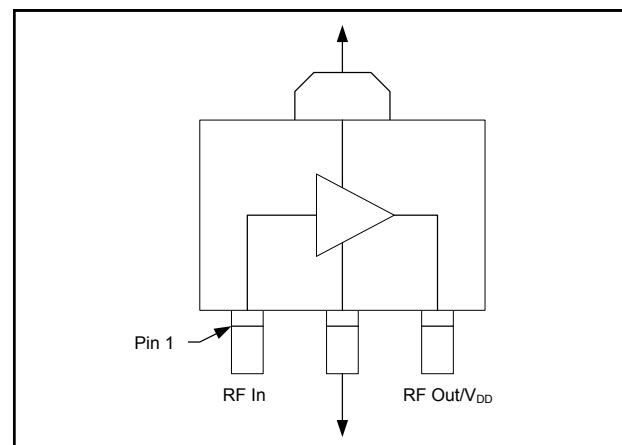
### Features

- Low Noise Figure
- High  $IP_3$
- Single Supply +3 V, +5 V<sup>6</sup>
- 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  $\Omega$  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 <sub>DD</sub>	RF Output & Voltage Bias

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

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 <sup>3,4,5</sup>

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.

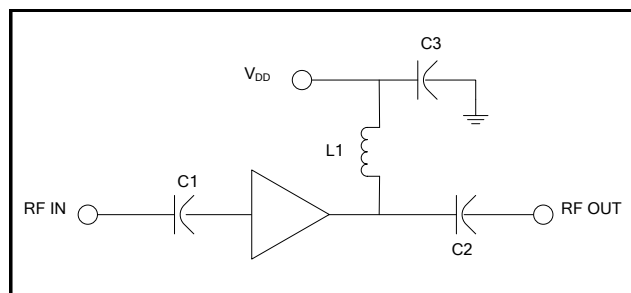
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**Electrical Specifications:** Freq. = 500 - 3000 MHz,  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50\ \Omega$

Parameter	Test Conditions	Units	Bias Voltage			
			3 Volts		5 Volts <sup>6</sup>	
			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 <sub>3</sub>	500 – 3000 MHz	dBm		36		36
Current	—	mA	50	77	100	90

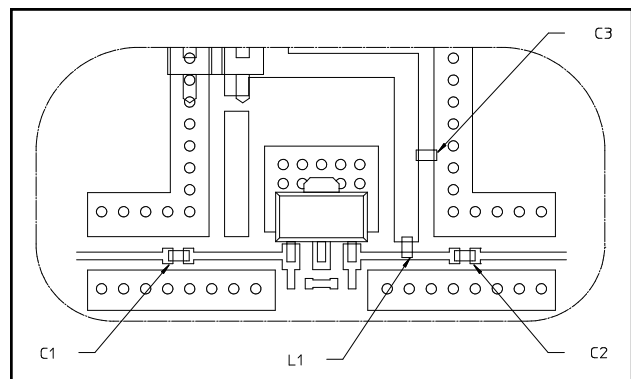
### Baseline Application Schematic @ 3V, 5V



### Component List @ 3V, 5V

Part	Value	Case Style	Purpose
C1,C2	39 pF	0402	DC Block
C3	0.1 $\mu\text{F}$	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

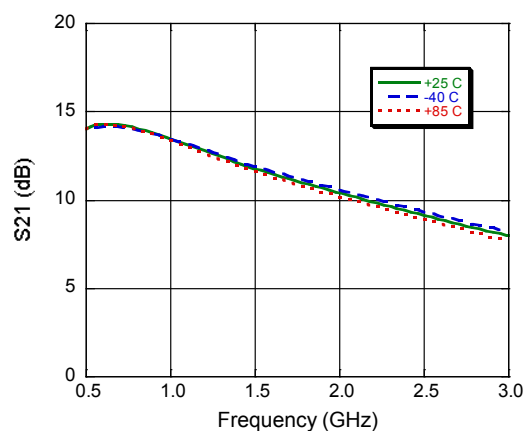
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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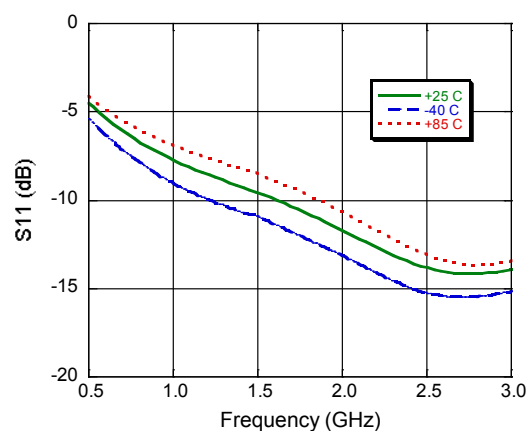
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Typical Performance Curves:  $V_{DD} = 3\text{ V}$

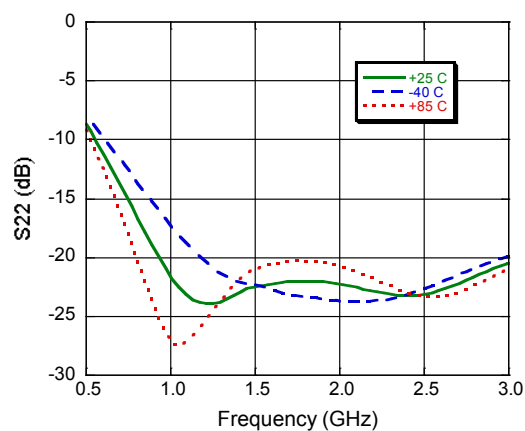
**Gain**



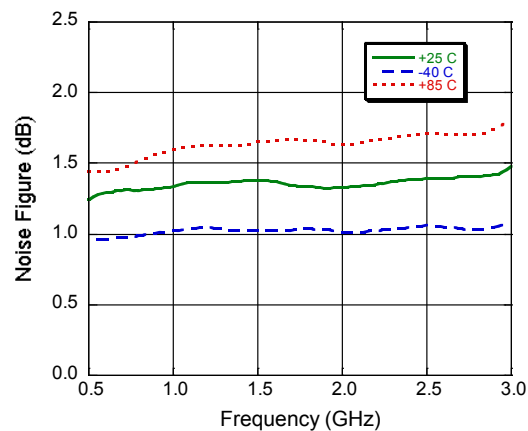
**Input Return Loss**



**Output Return Loss**



**Noise Figure**

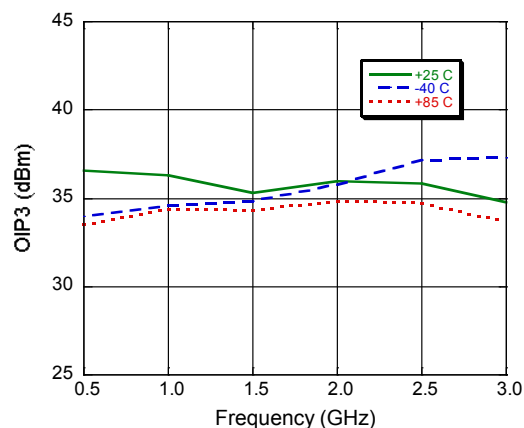


## Miniature Broadband Gain Stage 70 - 3000 MHz

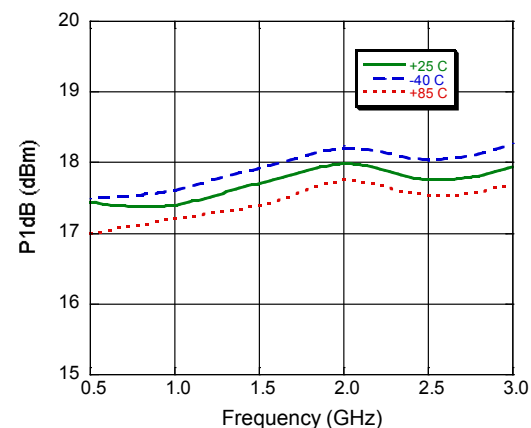
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### Typical Performance Curves: $V_{DD} = 3\text{ V}$

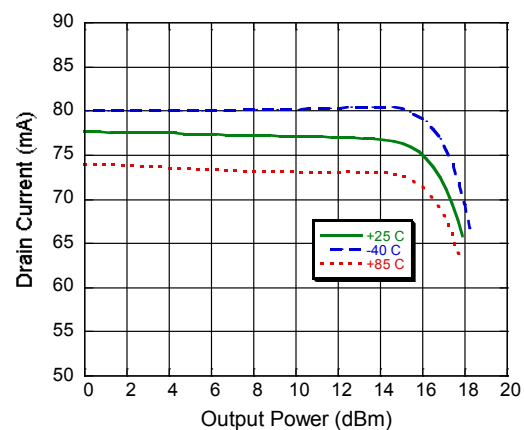
Output IP3, Input Power @ -12 dBm



P1dB



Current

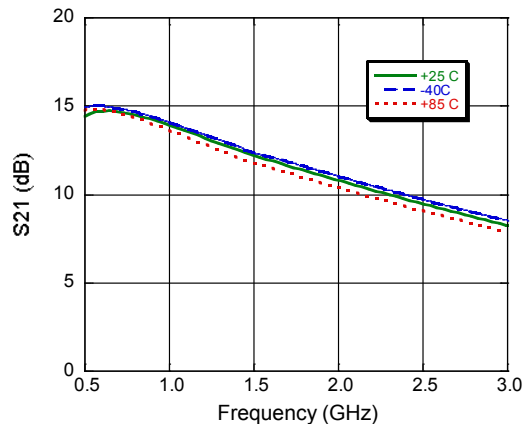


## Miniature Broadband Gain Stage 70 - 3000 MHz

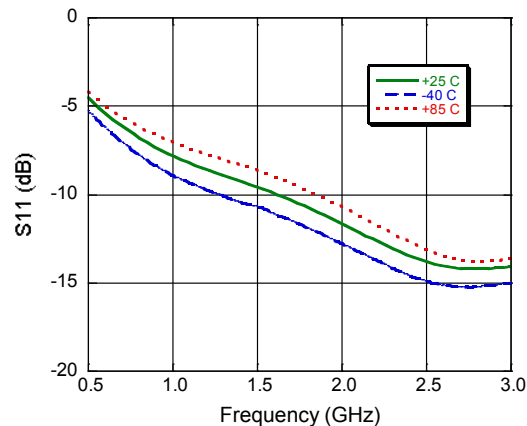
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Typical Performance Curves:  $V_{DD} = 5\text{ V}^6$

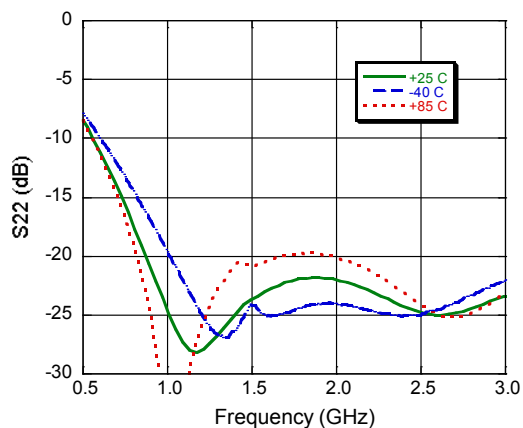
**Gain**



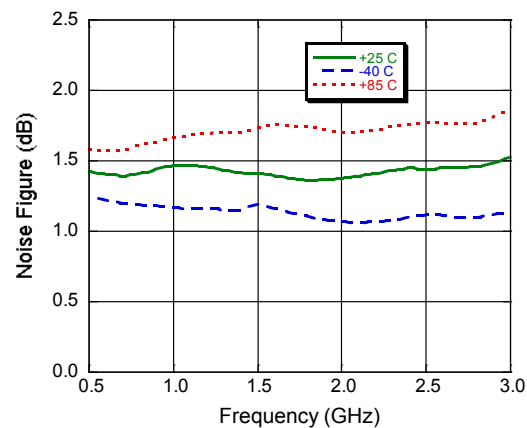
**Input Return Loss**



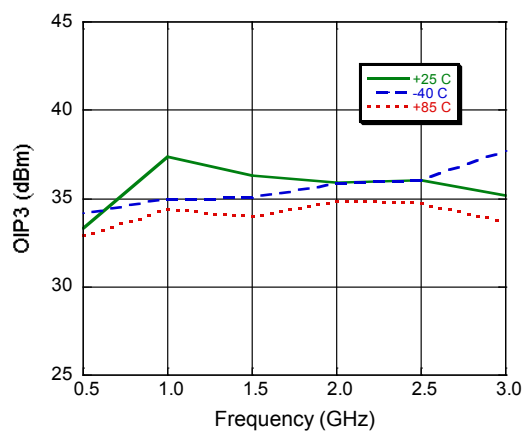
**Output Return Loss**



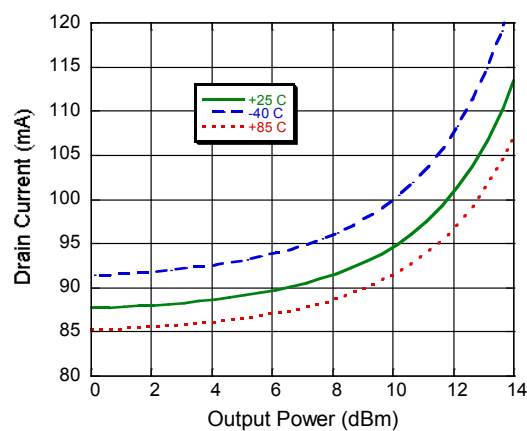
**Noise Figure**



**Output IP3, Input Power = -12 dBm**



**Current**

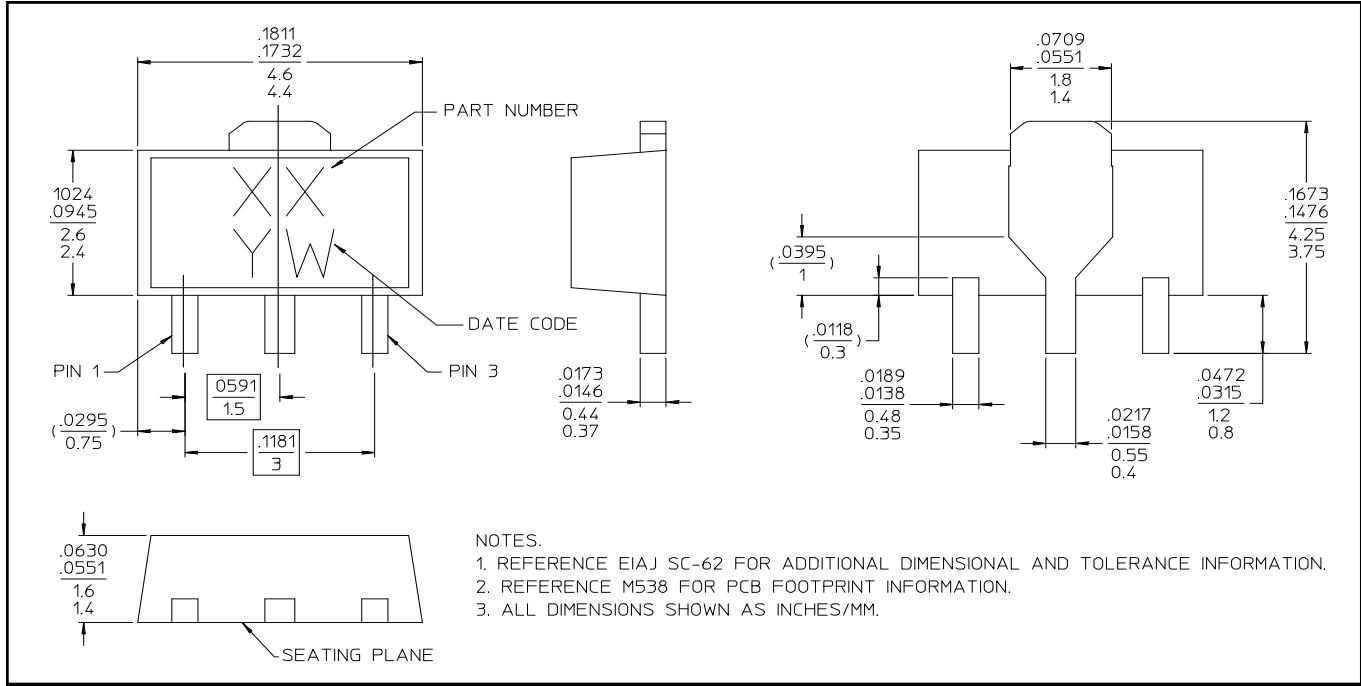


6. This device can run from a single 5 volt supply, but for 1M hour MTTF the output power must be no greater than 10 dBm unless using a series resistor on the drain. See Application note 7 on page 7.

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### Lead-Free SOT-89<sup>†</sup>



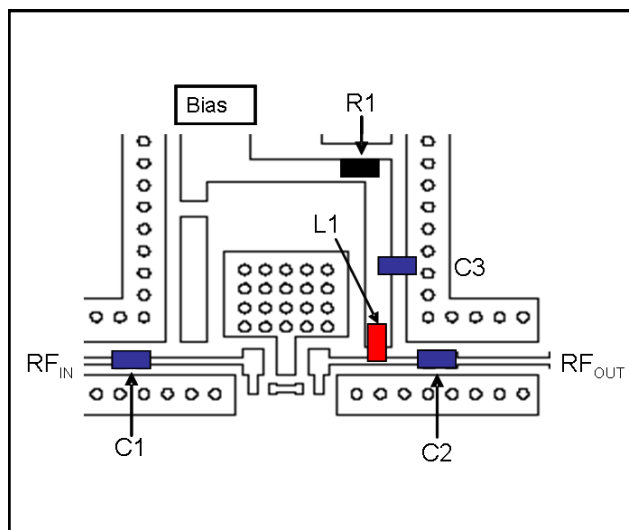
<sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.  
Plating is 100% matte tin over copper.

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**5 Volt Application Section for operation above 10 dBm output power**

### Application Layout Schematic @ 5V <sup>7</sup>

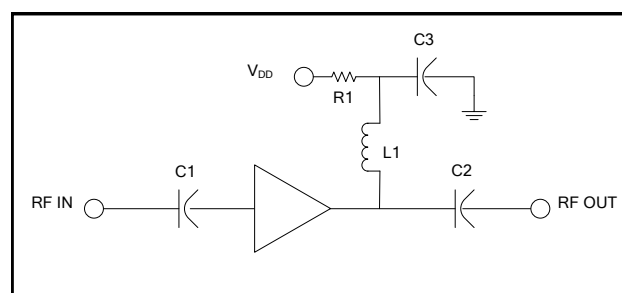


7. The addition of a 27  $\Omega$  series resistor on the drain line allows for 5 volt operation above 10 dBm output power, but no greater than 22 dBm of output power.

### 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 $\mu$ F	0402	RF Bypass
L1	12 nH	0805	RF Choke/Tuning
R1	27 $\Omega$	0402	Voltage Drop

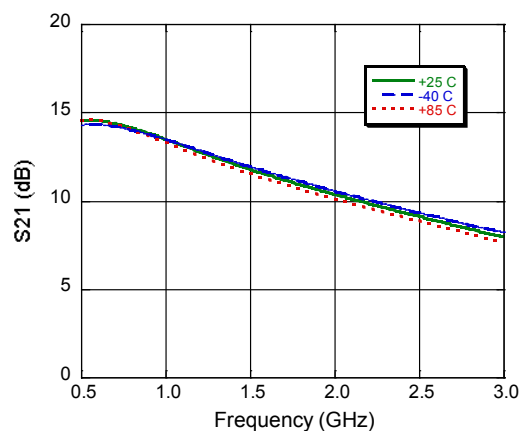
### Application Schematic @ 5V



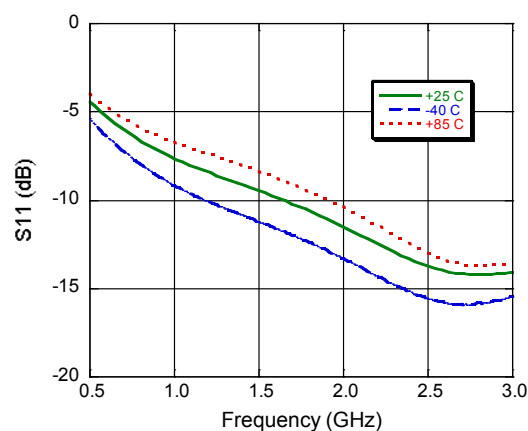
**5 Volt Application Section for operation above 10 dBm output power**

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

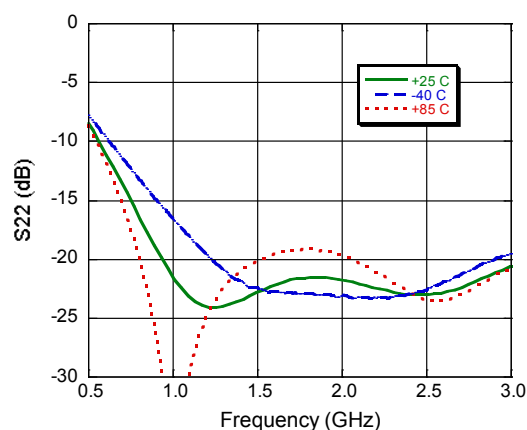
**Gain**



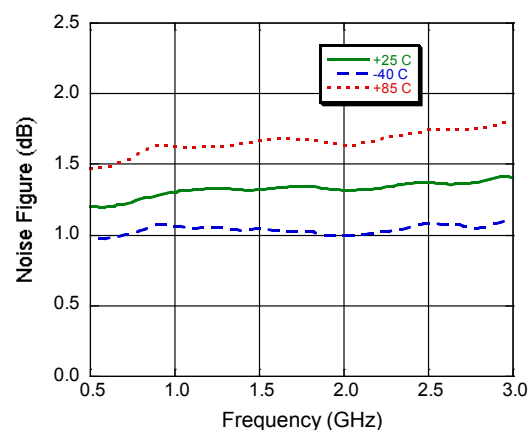
**Input Return Loss**



**Output Return Loss**



**Noise Figure**

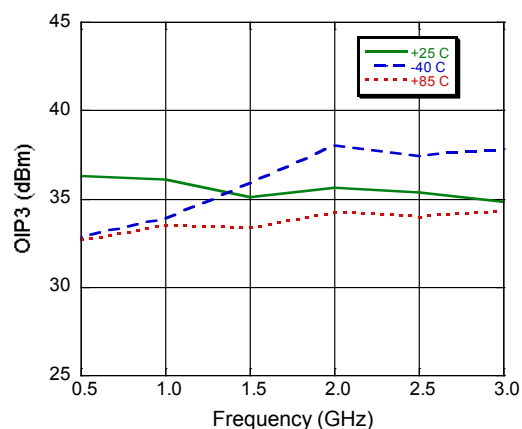




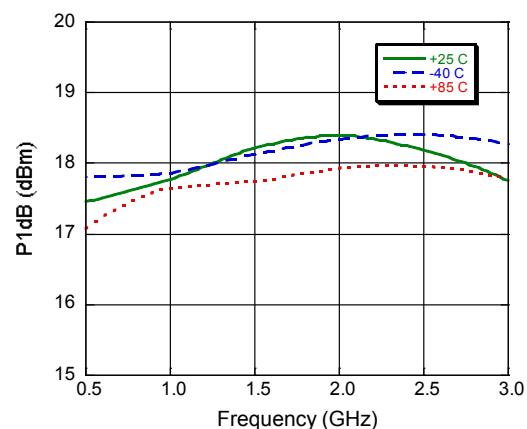
## 5 Volt Application Section for operation above 10 dBm output power

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

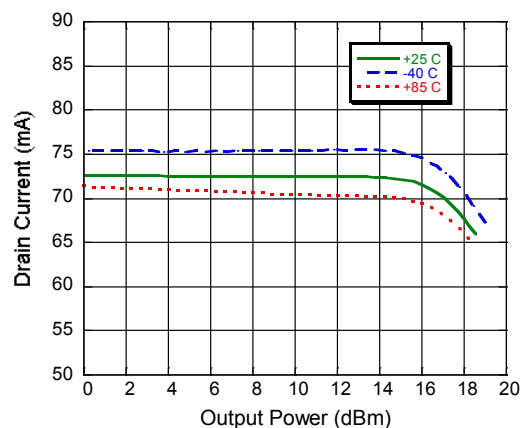
Output IP3, Input Power @ -12 dBm



P1dB



Current



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