

**Low Noise Amplifier**  
1400 - 2000 MHz

**AM50-0006**  
**V3**

**Features**

- Low Noise Figure: 1.6 dB
- High Input IP3: -6 dBm at 3 V, 6.5 mA bias
- High Gain: 18 dB
- Single Supply: +3 to +8 VDC
- Adjustable current: 3 to 20 mA with external resistor
- SOT-26 Plastic Package

**Description**

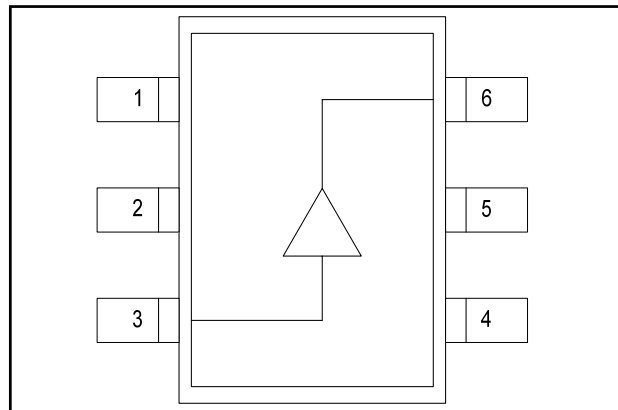
M/A-COM's AM50-0006 is a high dynamic range, GaAs MMIC, low noise amplifier in a SOT-26 surface mount plastic package. It employs external input matching to obtain optimum noise figure performance and operating frequency flexibility.

The AM50-0006 also features flexible biasing to control the current consumption vs. dynamic range trade-off. The AM50-0006 can operate from any positive supply voltage in the 3 V to 8 V range. Its current can be controlled over a range of 3 mA to 20 mA with an external resistor.

The AM50-0006 is ideally suited for use where low noise figure, high gain, high dynamic range, and low power consumption are required. Typical applications included receiver front ends in PDC-1500, DCS-1800, DCS-1900 and other PCN/PCS applications. It is also useful as a gain block, buffer, driver, and IF amplifier in both fixed or portable PDC, PHS, and PCN/PCS systems.

The AM50-0006 is fabricated using a low-cost 0.5-micron gate length GaAs process. The process features full passivation for increased performance and reliability. The AM50-0006 is 100% RF tested to ensure performance specification compliance.

**Functional Block Diagram**



**Pin Configuration**

Pin No.	Pin Name	Description
1	GND	RF and DC Ground
2	R <sub>EXT</sub> C <sub>EXT</sub>	External Current Control By-Pass Capacitor
3	RF Input	RF Input of the amplifier
4	V <sub>DD</sub>	Positive supply voltage
5	GND	RF and DC Ground
6	RF Output	RF Output of the amplifier

**Ordering Information <sup>1</sup>**

Part Number	Package
AM50-0006	SOT-26 Plastic Package
AM50-0006TR	Forward Tape and Reel
AM50-0006PDC	1400-1520 MHz Designer's Kit
AM50-0006PCS	1700-2000 MHz Designer's Kit

1. Reference Application Note M513 for reel size information.

**Electrical Specifications<sup>2</sup>:  $T_A = +25^\circ\text{C}$ ,  $Z_0 = 50 \Omega$ ,  $P_{in} = -30 \text{ dBm}$**

Parameter	Test Conditions	Units	1500 MHz			1900 MHz		
			Min.	Typ.	Max.	Min.	Typ.	Max.
Gain	$V_{DD} = 3 \text{ Volts}$	dB	15	18	20	15	17.5	20
Noise Figure	$V_{DD} = 3 \text{ Volts}$	dB	—	1.60	2.00	—	1.65	2.00
Input VSWR	—	Ratio	—	2.2:1	—	—	1.5:1	—
Output VSWR	—	Ratio	—	1.5:1	—	—	1.5:1	—
Output 1 dB Compression	$V_{DD} = 3 \text{ Volts}$	dBm	—	1	—	—	0	—
Input IP3	$V_{DD} = 3 \text{ Volts}$	dBm	—	-5.0	—	—	-6.0	—
Reverse Isolation	—	dB	—	35	—	—	35	—
Drain Current	$V_{DD} = 3 \text{ Volts}$	mA	4.5	6.5	10	4.5	6.5	10

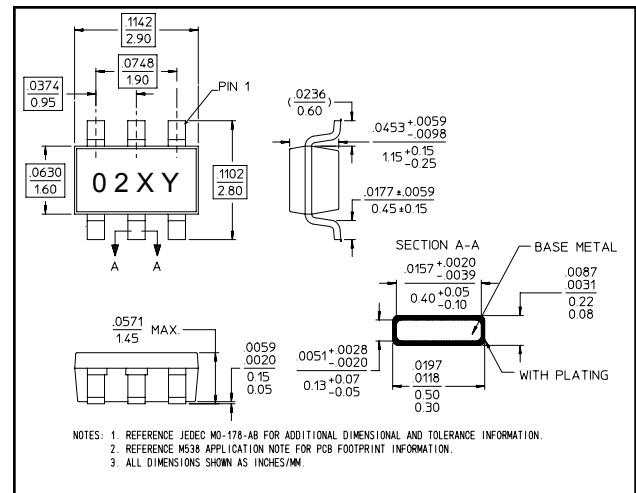
2. Using external 120 ohm resistor. See Functional Schematics.

**Absolute Maximum Ratings<sup>3,4</sup>**

Parameter	Absolute Maximum
$V_{DD}$	+10 VDC
Input Power	+17 dBm
Current <sup>5</sup>	30 mA
Channel Temperature <sup>6</sup>	+150°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM does not recommend sustained operation near these survivability limits.
- When pin #2 is used to increase current (see note 8).
- Thermal resistance ( $\theta_{jc}$ ) = +150°C/W.

**SOT-26<sup>†</sup>**



<sup>†</sup> Meets JEDEC moisture sensitivity level 1 requirements.

**Handling Procedures**

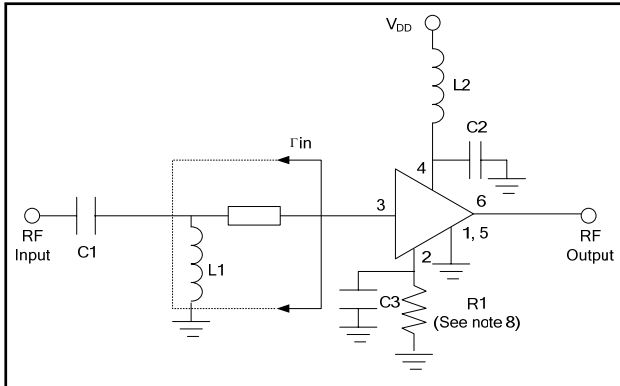
Please observe the following precautions to avoid damage:

**Static Sensitivity**

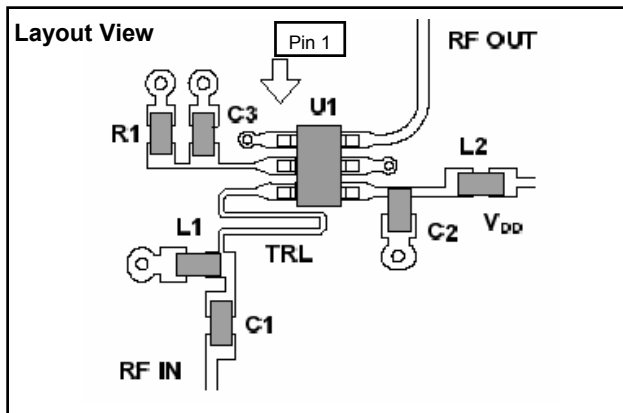
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

**Data for 1700 - 2000 MHz Operation**

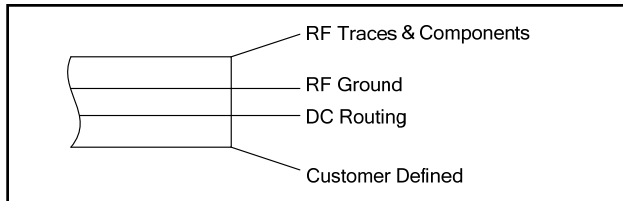
**Functional Schematic**



**Recommended PCB Configuration**



**Cross Section View**



The PCB dielectric between RF traces and RF ground layers should be chosen to reduce RF discontinuities between 50 Ω lines and package pins. M/A-COM recommends an FR-4 dielectric thickness of 0.008" (0.20 mm) yielding a 50 Ω line width of 0.015" (0.38 mm). The recommended RF metalization thickness is 1 ounce copper.

**Input Reflection Coefficient**

Frequency	1700 MHz	1850 MHz	2000 MHz
Γ <sub>in</sub> (mag)	0.699	0.674	0.649
Γ <sub>in</sub> (ang)	48.47°	38.68°	29.27°

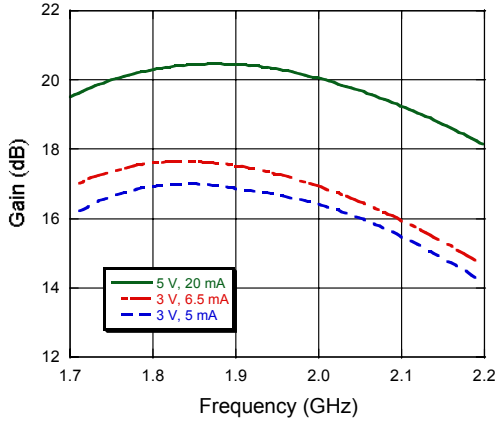
**External Circuitry Parts List <sup>7</sup>**

Part	Value	Purpose
C1	47 pF	DC Block
C2	470 pF	By-Pass
L1	2.7 nH	Tuning
L2	22 nH	RF Choke
R1	See note 8	Current control
C3	470 pF	By-Pass

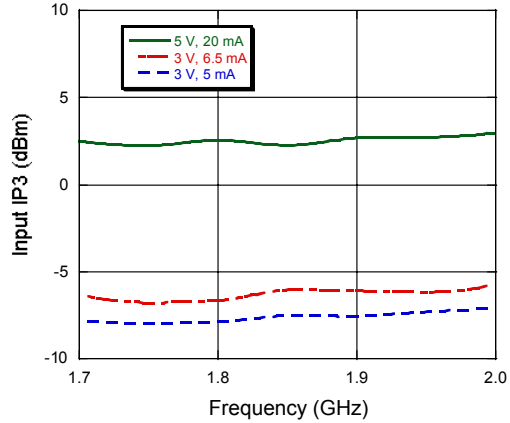
- All external circuitry parts are readily available, low cost surface mount components (.060 in. x .030 in. or .080 in. x .050 in.)
- Pin 2 allows use of an external resistor to ground for optional, higher current.  
For  $I_{DD} \sim 5$  mA,  $R1 = 150$  ohms;  
 $I_{DD} \sim 6.5$  mA,  $R1 = 120$  ohms;  
 $I_{DD} \sim 20$  mA,  $R1 = 27$  ohms.

**Typical Performance Curves, 1700 - 2000 MHz**

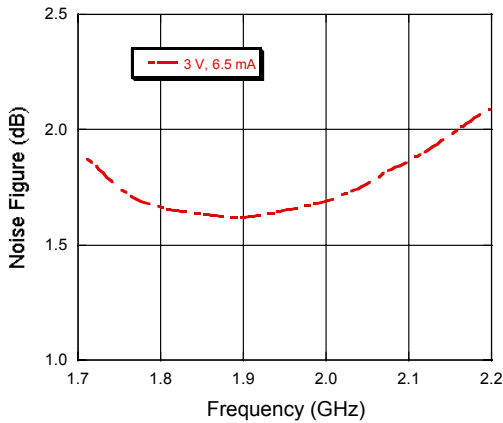
**Gain vs. Bias @ +25°C**



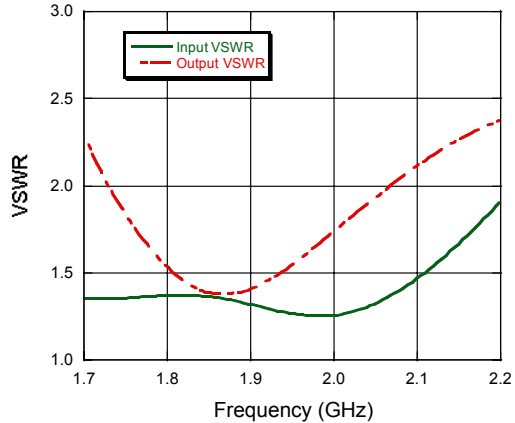
**Input IP3 vs. Bias @ +25°C**



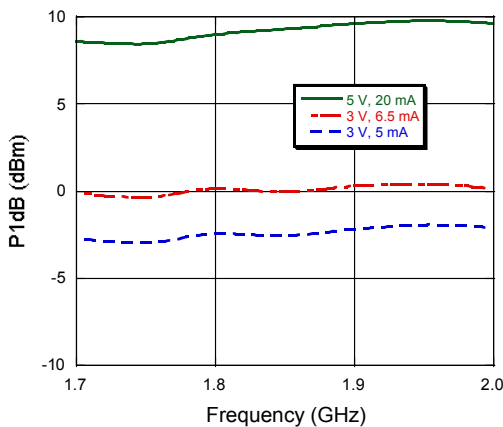
**Noise Figure (Bias = 3V, 6.5 mA)**



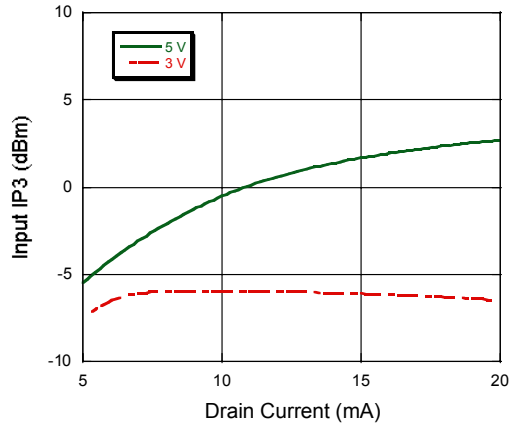
**VSWR (Bias = 3V, 6.5 mA)**



**Output P1 dB vs. Bias @ +25°C**

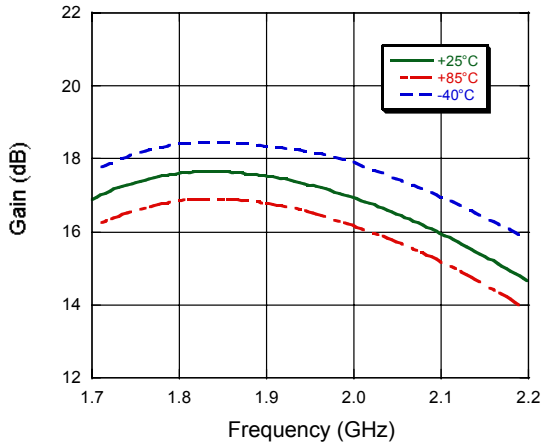


**Input IP3 vs. Drain Current (Frequency = 1900 MHz)**

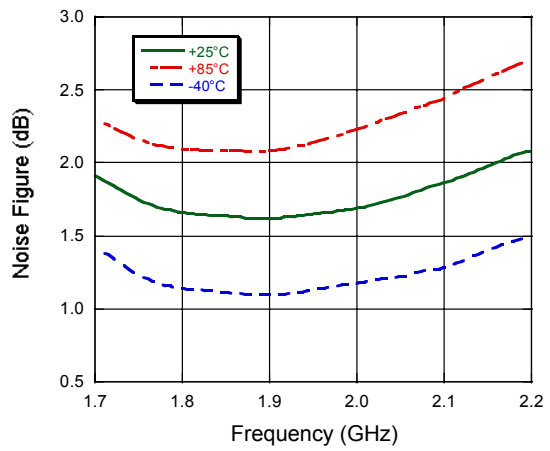


**Typical Performance Curves, 1700 - 2000 MHz**

*Gain vs. Temperature (Bias = 3V, 6.5 mA)*

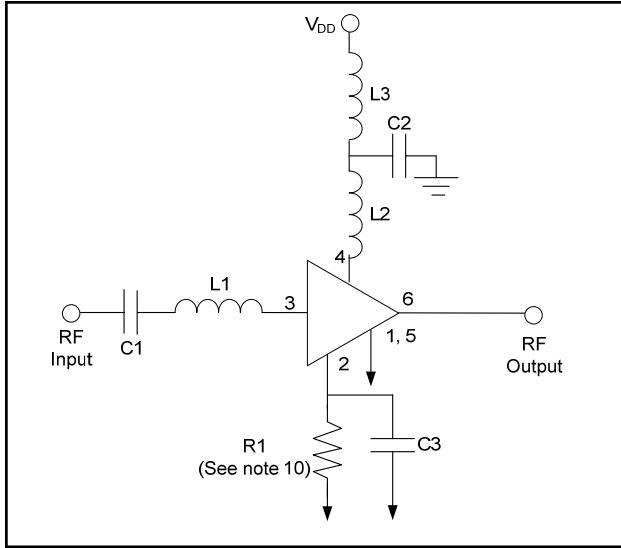


*Noise Figure vs. Temperature (Bias = 3V, 6.5 mA)*



**Data for 1400 - 1520 MHz Operation**

**Functional Schematic**

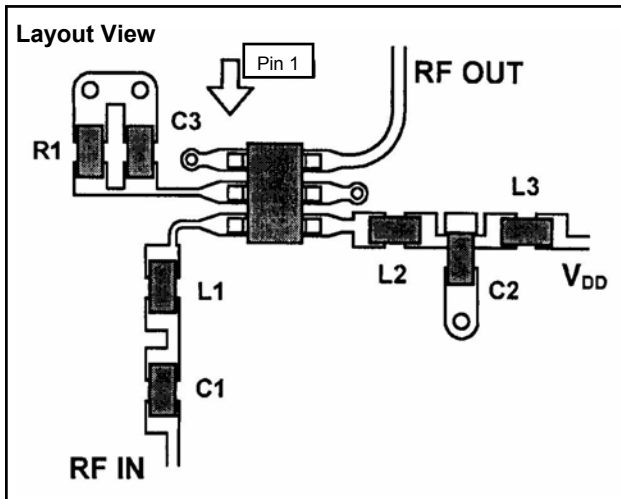


**External Circuitry Parts List<sup>9</sup>**

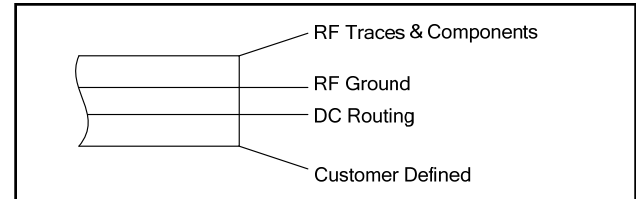
Part	Value	Purpose
C1	47 pF	DC Block
C2	470 pF	By-Pass
L1	10 nH	Tuning
L2	3.9 nH	Tuning
L3	22 nH	RF Choke
R1	See note 10	Current control
C3	470 pF	By-Pass

9. All external circuitry parts are readily available, low cost surface mount components (.060 in. x .030 in. or .080 in. x .050 in.)
10. Pin 2 allows use of an external resistor to ground for optional, higher current.  
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**Recommended PCB Configuration**



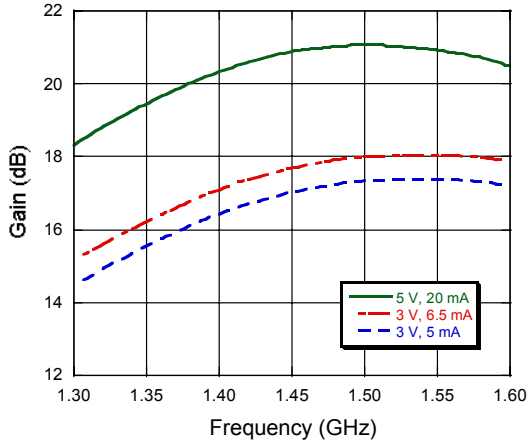
**Cross Section View**



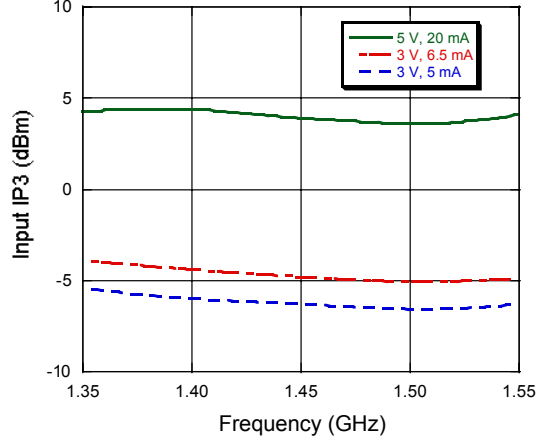
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**Typical Performance Curves, 1400 - 1520 MHz**

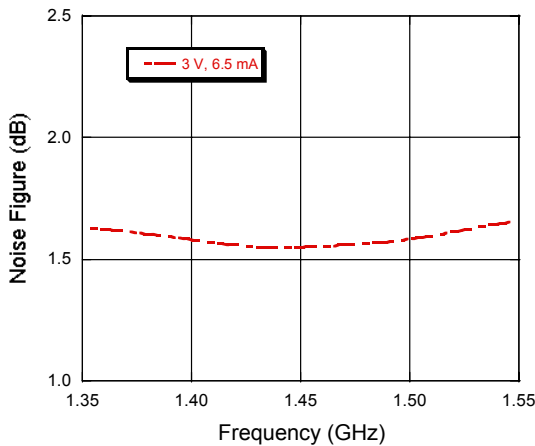
**Gain vs. Bias @ +25°C**



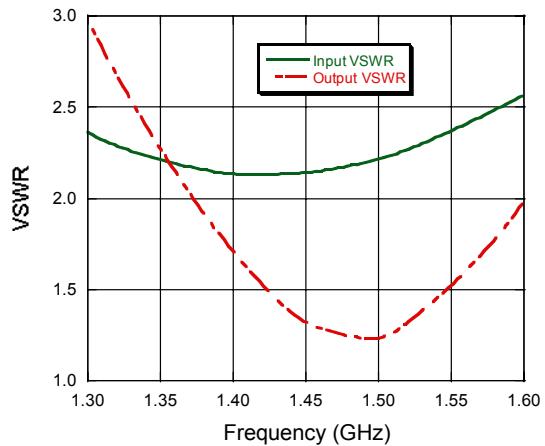
**Input IP3 vs. Bias @ +25°C**



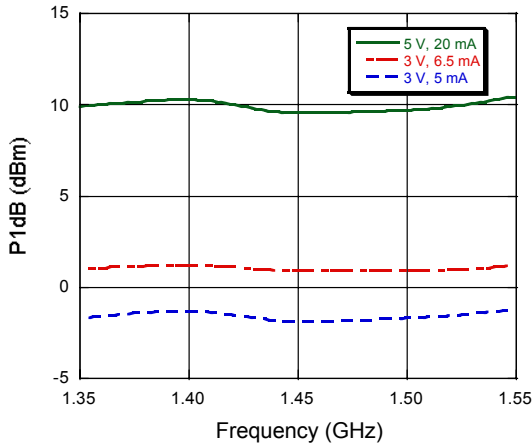
**Noise Figure (Bias = 3V, 6.5 mA)**



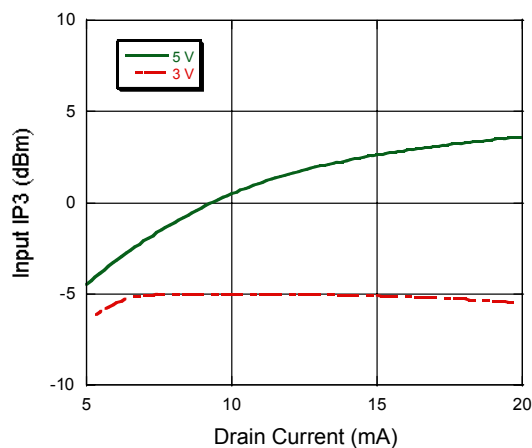
**VSWR (Bias = 3V, 6.5 mA)**



**Output P1 dB vs. Bias @ +25°C**

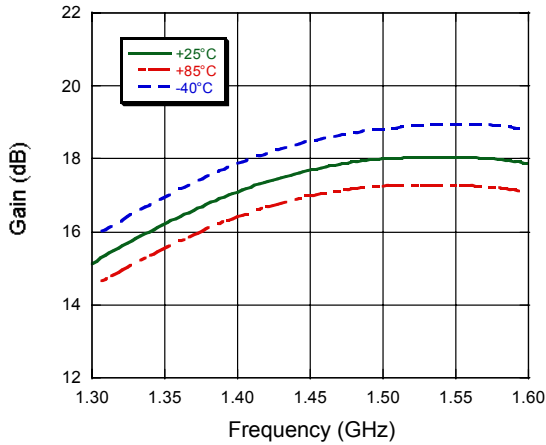


**Input IP3 vs. Drain Current (Frequency = 1500 MHz)**



**Typical Performance Curves, 1400 - 1520 MHz**

*Gain vs. Temperature (Bias = 3V, 6.5 mA)*



*Noise Figure vs. Temperature (Bias = 3V, 6.5 mA)*

