AM50-0006

Low Noise Amplifier
1400 - 2000 MHz

Rev. V4

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

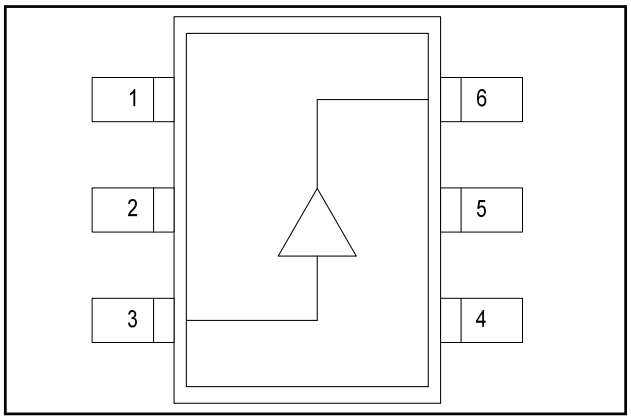
M/A-COM's AM50-0006 is a high dynamic range, GaAs MMIC, low noise amplifier in a SOT-26 surface mount plastic package. It employs external input matching to obtain optimum noise figure performance and operating frequency flexibility.

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_{EXT} C_{EXT}	External Current Control By-Pass Capacitor
3	RF Input	RF Input of the amplifier
4	V_{DD}	Positive supply voltage
5	GND	RF and DC Ground
6	RF Output	RF Output of the amplifier

Ordering Information [1]

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.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macomtech.com for additional data sheets and product information.

Low Noise Amplifier
1400 - 2000 MHz

Electrical Specifications[2]: T_A = +25°C, Z_0 = 50 Ω, P_{in} = -30 dBm

Parameter	Test Conditions	Units	1500 MHz			1900 MHz		
			Min.	Typ.	Max.	Min.	Typ.	Max.
Gain	V_{DD} = 3 Volts	dB	15	18	20	15	17.5	20
Noise Figure	V_{DD} = 3 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 Volts	dBm	—	1	—	—	0	—
Input IP3	V_{DD} = 3 Volts	dBm	—	-5.0	—	—	-6.0	—
Reverse Isolation	—	dB	—	35	—	—	35	—
Drain Current	V_{DD} = 3 Volts	mA	4.5	6.5	10	4.5	6.5	10

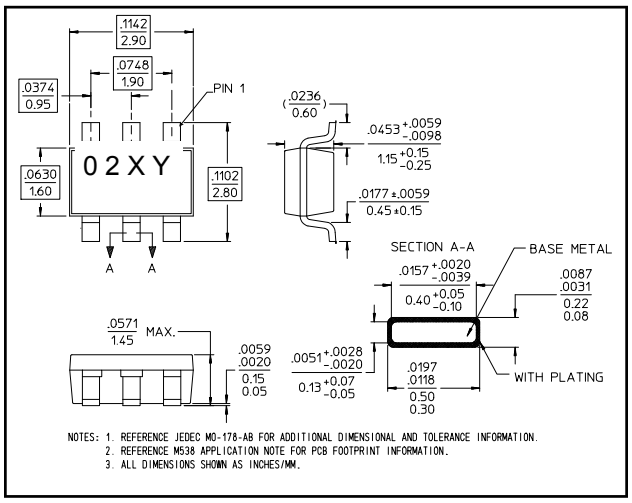
2. Using external 120 ohm resistor. See Functional Schematics.

Absolute Maximum Ratings [3,4]

Parameter	Absolute Maximum
V_{DD}	+10 VDC
Input Power	+17 dBm
Current[5]	30 mA
Channel Temperature[6]	+150°C
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 does not recommend sustained operation near these survivability limits.
5. When pin #2 is used to increase current (see note 8).
6. Thermal resistance (θjc) = +150°C/W.

SOT-26†



† 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.

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

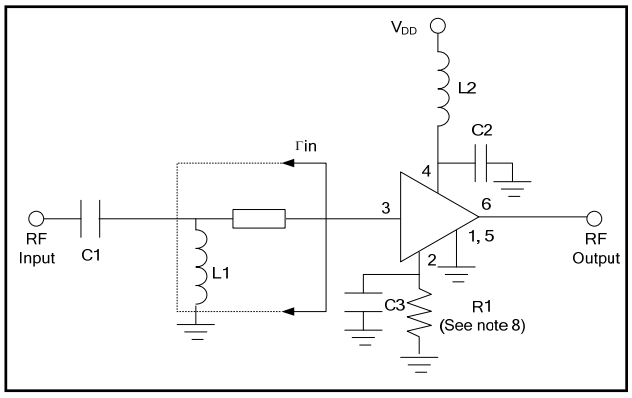
Visit www.macomtech.com for additional data sheets and product information.

Low Noise Amplifier
1400 - 2000 MHz

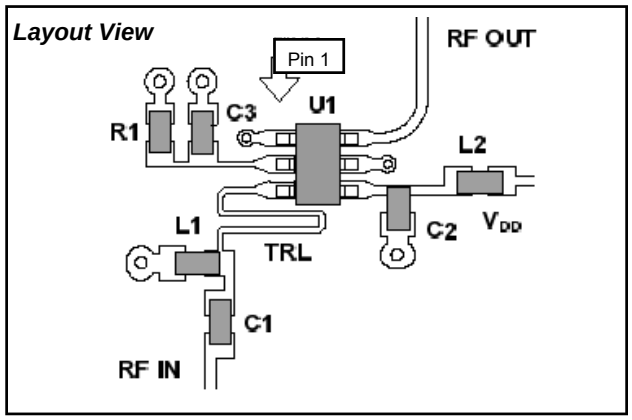
Rev. V4

Data for 1700 - 2000 MHz Operation

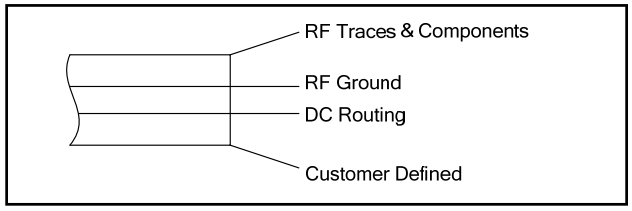
Functional Schematic



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 di-electric 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
Γin (mag)	0.699	0.674	0.649
Γin (ang)	48.47°	38.68°	29.27°

External Circuitry Parts List [7]

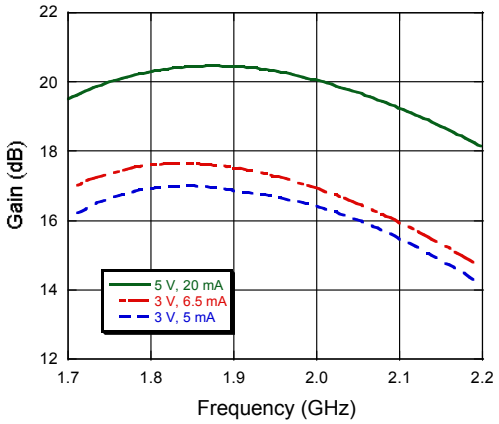
Part	Value	Purpose
C1	47 pF	DC Block
C2	470 pF	By-Pass
L1	2.7 nH	Tuning
L2	22 nH	RF Choke
R1	See note 8	Current control
C3	470 pF	By-Pass

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

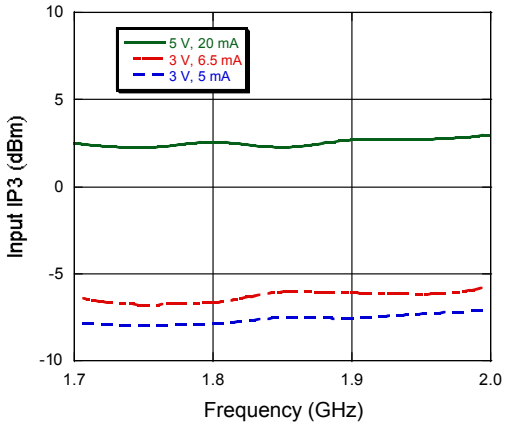
- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298
  Visit www.macomtech.com for additional data sheets and product information.

Typical Performance Curves, 1700 - 2000 MHz

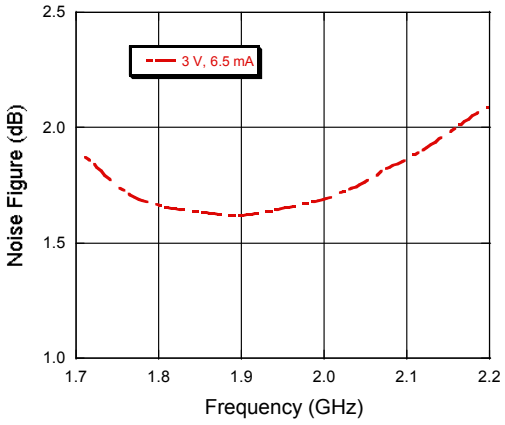
Gain vs. Bias @ +25°C



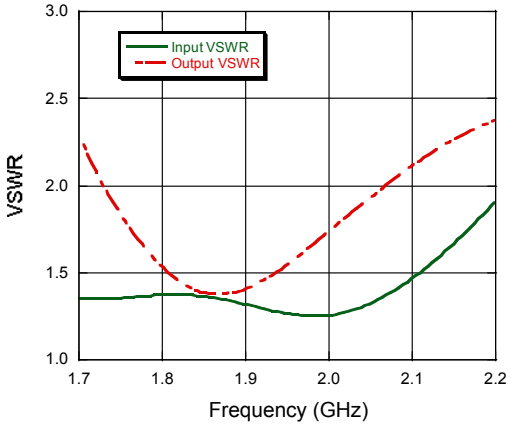
Input IP3 vs. Bias @ +25°C



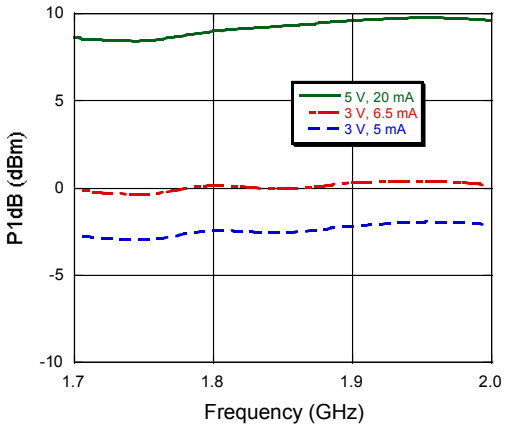
Noise Figure (Bias = 3V, 6.5 mA)



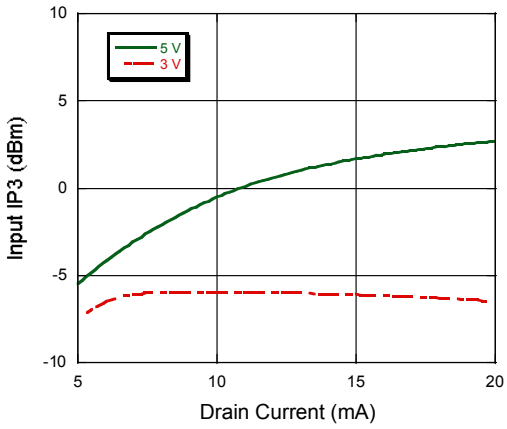
VSWR (Bias = 3V, 6.5 mA)



Output P1 dB vs. Bias @+25°C



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

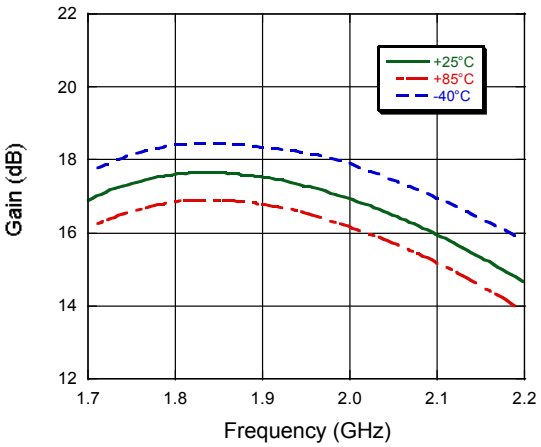


- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

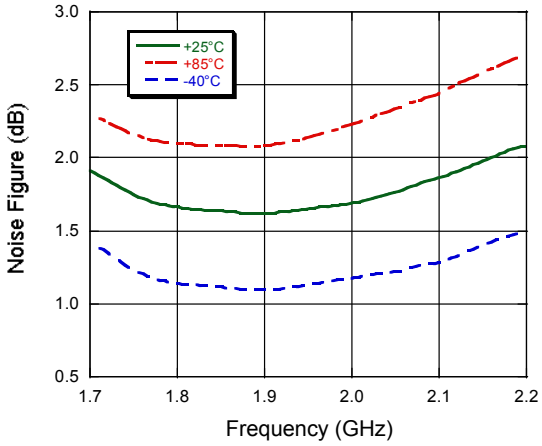
Visit www.macomtech.com for additional data sheets and product information.

Typical Performance Curves, 1700 - 2000 MHz

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



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



- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

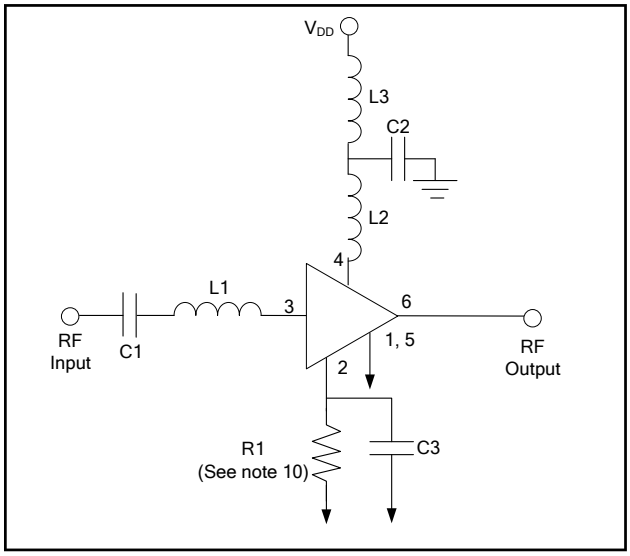
Visit www.macomtech.com for additional data sheets and product information.

Low Noise Amplifier
1400 - 2000 MHz

Rev. V4

Data for 1400 - 1520 MHz Operation

Functional Schematic

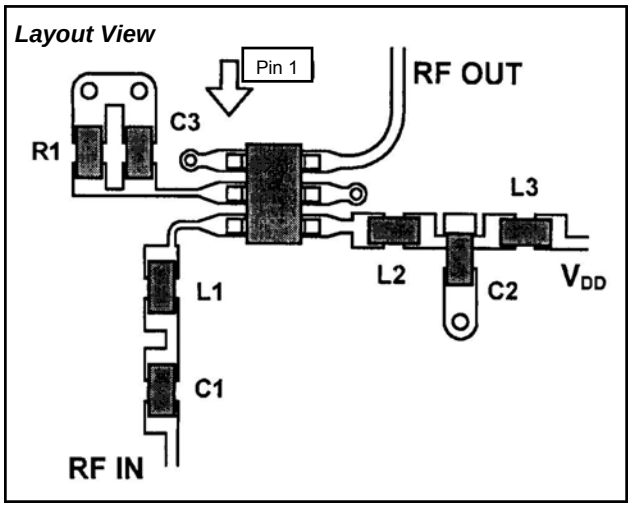


External Circuitry Parts List[9]

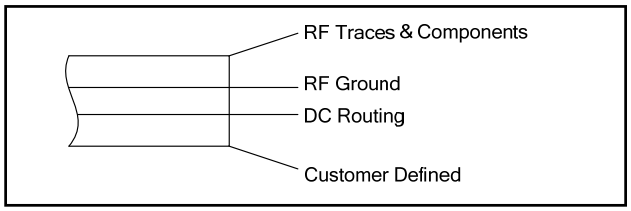
Part	Value	Purpose
C1	47 pF	DC Block
C2	470 pF	By-Pass
L1	10 nH	Tuning
L2	3.9 nH	Tuning
L3	22 nH	RF Choke
R1	See note 10	Current control
C3	470 pF	By-Pass

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.
    For IDD ~ 5 mA, R1 = 150 ohms;
    IDD ~ 6.5 mA, R1 = 120 ohms;
    IDD ~ 20 mA, R1 = 27 ohms.

Recommended PCB Configuration



Cross Section View

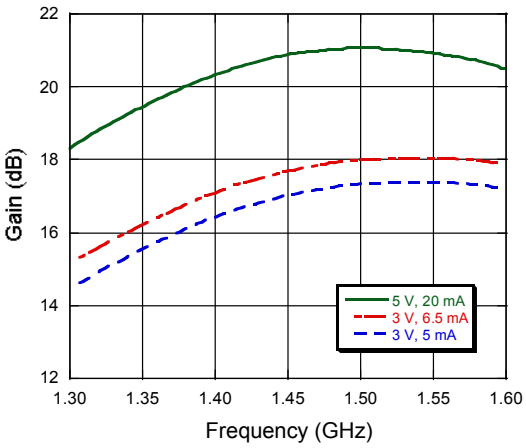


The PCB dielectric between RF traces and RF ground layers should be chosen to reduce RF discontinuities between 50 Ω lines and package pins. M/A-COM recommends an FR-4 dielectric thickness of 0.008" (0.20 mm) yielding a 50 Ω line width of 0.015" (0.38 mm). The recommended RF metalization thickness is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

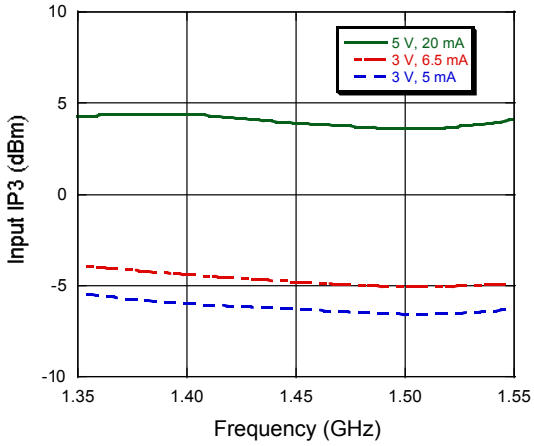
- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298
  Visit www.macomtech.com for additional data sheets and product information.

Typical Performance Curves, 1400 - 1520 MHz

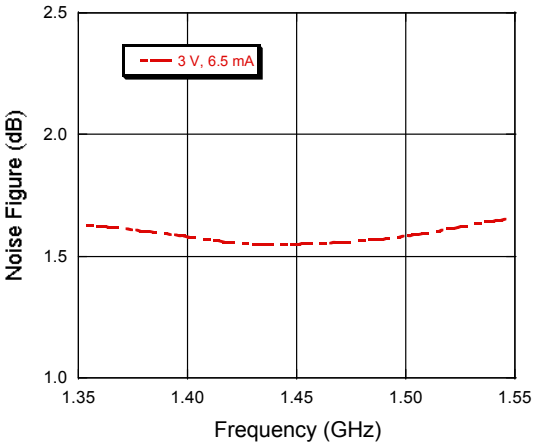
Gain vs. Bias @ +25°C



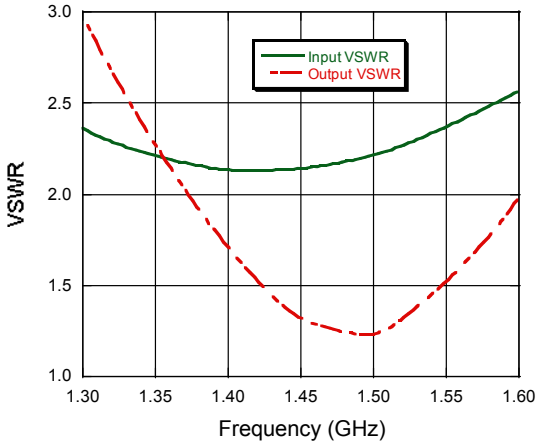
Input IP3 vs. Bias @ +25°C



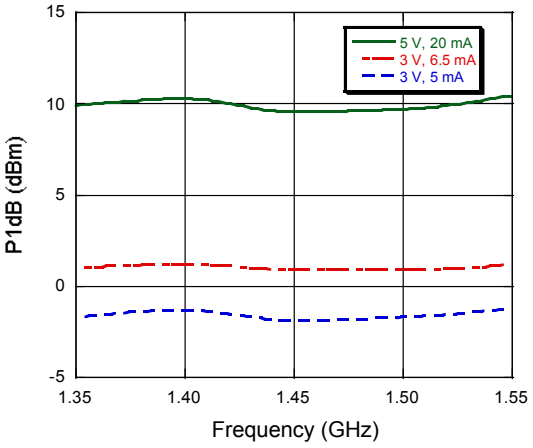
Noise Figure (Bias = 3V, 6.5 mA)



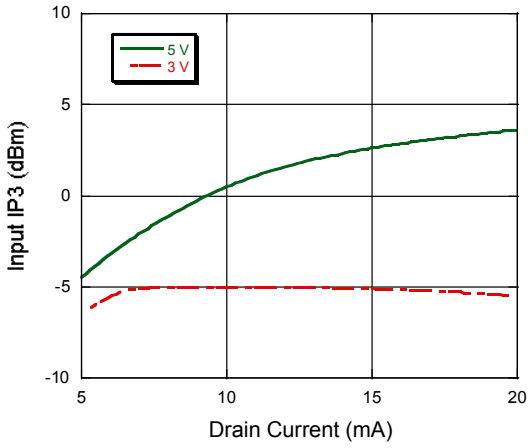
VSWR (Bias = 3V, 6.5 mA)



Output P1 dB vs. Bias @+25°C



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

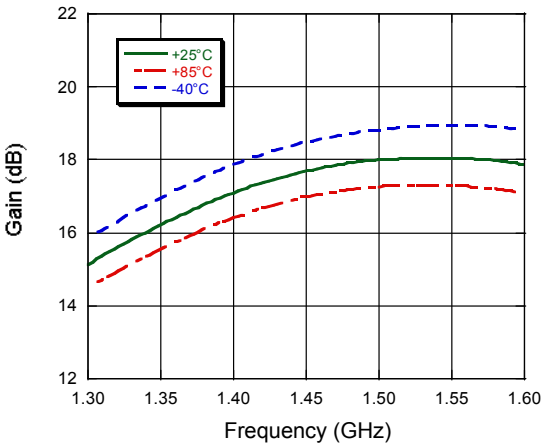


- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

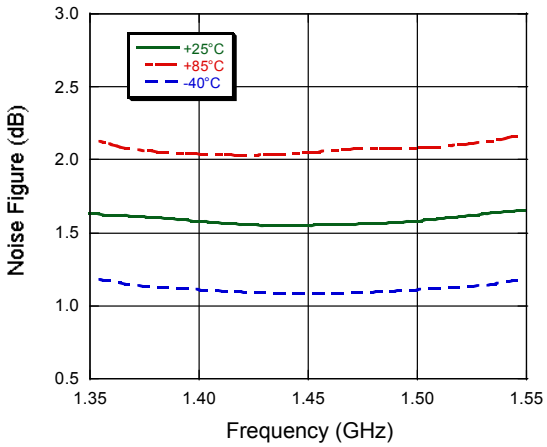
Visit www.macomtech.com for additional data sheets and product information.

Typical Performance Curves, 1400 - 1520 MHz

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



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



- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macomtech.com for additional data sheets and product information.