

# High Dynamic Range Low Noise Amplifier 800 - 1000 MHz AM50-0003

**Features** 

• Low Noise Figure: 1.2 dB

High Input IP3: +18 dBm at 8 V, 60 mA bias +6.5 dBm at 3 V, 20 mA bias

High Gain: 15 dB

Single Supply: +3 to +8 VDC Low Cost SOIC-8 Plastic Package

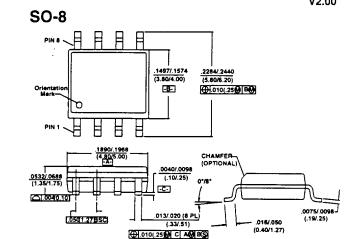
Adjustable current: 20 to 80 mA with external resistor

### Description

M/A-COM's AM50-0003 is a high dynamic range, GaAs MMIC, low noise amplifier in a low cost, SOIC 8-lead, surface mount, plastic package. It employs external input matching to obtain optimum noise figure performance and operating frequency flexibility. The AM50-0003 also features flexible biasing to control the current consumption vs. dynamic range trade-off. The AM50-0003 can operate from any supply voltage in the 3 V to 8 V range. Its current can be controlled over a range of 20 mA to 80 mA with an external resistor.

The AM50-0003 is ideally suited for use where low noise figure. high gain, high dynamic range, and low power consumption are required. Typical applications include receiver front ends in AMPS, GSM and ETACS base stations. It is also useful as a gain block, buffer, driver and IF amplifier in both fixed and portable cellular and 900 MHz ISM systems.

The AM50-0003 is fabricated using a low-cost 0.5-micron gate length GaAs process. The process features full passivation for increased performance reliability. The AM50-0003 is 100% RF tested to ensure performance specification compliance.



### Ordering Information

Part Number	Package
AM50-0003	SOIC 8-Lead Plastic
AM50-0003TR	Forward Tape and Reel*
AM50-0003RTR	Reverse Tape and Reel*
AM50-0003SMB	Designer's Kit

<sup>\*</sup> If specific reel size is required, consult factory for part number assignment.

# Electrical Specifications<sup>1</sup>: $T_A=+25^{\circ}C$ , $Z_0=50 \Omega$ , F=900 MHz, $P_{IN}=-30 dBm$

Parameter	Test Conditions	Units	Min.	Тур.	Max.
Gain	5 V, 60 mA <sup>2</sup>	dB	13	15	
	3 V, 20 mA	dB	12	13.5	
Noise Figure	5 V, 60 mA <sup>2</sup>	dB		1.20	1.50
	3 V, 20 mA	dB		1.25	1.50
Input VSWR				2.0:1	
Output VSWR				1.5:1	
Output 1 dB Compression	5 V, 60 mA <sup>2</sup>	dBm		16.5	
	3 V, 20 mA	dBm		8.5	
Input IP3	5 V, 60 mA <sup>2</sup>	dBm	12.5	15	
	3 V, 20 mA	dBm	4.0	6.5	
Reverse Isolation		dB		25	

1. See page 3 for performance versus frequency and bias.

2. Using external 15  $\Omega$  resistor. See functional block diagram on page 2.

Specifications Subject to Change Without Notice.

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## Absolute Maximum Ratings 1

Parameter	Absolute Maximum
$V_{DD}$	+10 VDC
Input Power	+17 dBm
Current <sup>2</sup>	120 mA
Channel Temperature <sup>3</sup>	+150°C
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

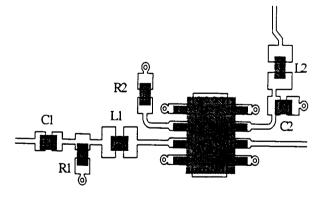
- Exceeding any one or combination of these limits may cause permanent damage.
- 2. When pin #2 is used to increase current. (See note 5.)
- 3. Thermal resistance ( $\theta$ jc) = +88°C/W.

## **Pin Configuration**

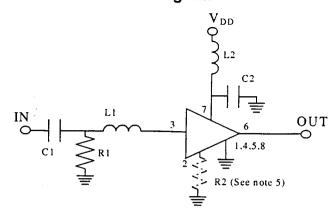
Pin No.	Pin Name	Description
11	GND	RF and DC Ground
2	REXT	External Current Control
		(optional)
3	IN	RF Input of the amplifier
4	GND	RF and DC Ground
5	GND	RF and DC Ground
6	OUT	RF Output of the amplifier
7	V <sub>DD</sub>	Positive supply voltage
8	GND	RF and DC Ground

## **Recommended PCB Configuration**

#### **Layout View**



### **Functional Block Diagram**



# External Circuitry Parts List 4

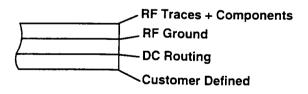
Part	Value	Purpose
C1	47 pF	DC Block
C2	470 pF	By-Pass
L1	12 nH	Tuning
L2	12 nH	RF Choke
R1	5.1 kΩ	DC Return
R2	see note 5	Optional current control

- 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 20 mA operation, no resistor is used. For I<sub>DD</sub> ~ 40 mA, R2 = 43 ohms;

 $I_{DD} \sim 60 \text{ mA}, R2 = 15 \text{ ohms};$ 

 $I_{DD} \sim 80 \text{ mA}, R2 = 10 \text{ ohms}.$ 

#### **Cross Section View**



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

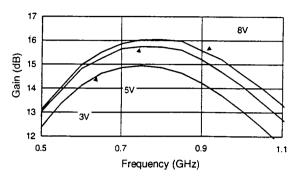
Specifications Subject to Change Without Notice.

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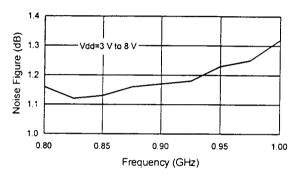
### **Typical Performance Data**

Test Conditions:  $T_A=+25$ °C,  $Z_0 = 50$   $\Omega$ ,  $V_{DD}=5$  V,  $I_{DD}=60$  mA unless otherwise specified.

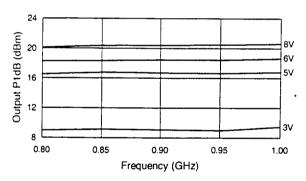
**GAIN vs. FREQUENCY** 



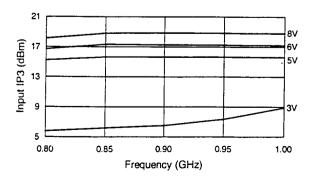
#### NOISE FIGURE vs. FREQUENCY



**OUTPUT P1dB vs. FREQUENCY** 

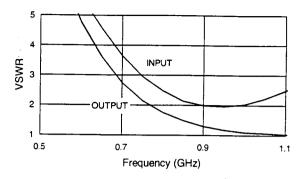


INPUT IP3 vs. FREQUENCY

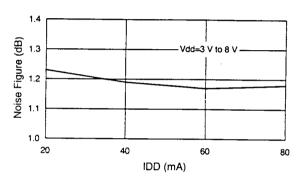


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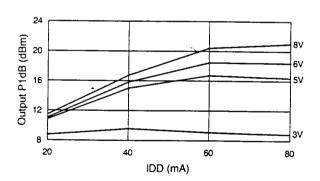




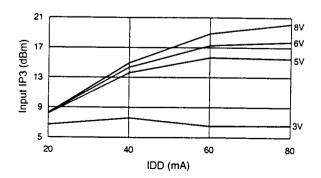
NOISE FIGURE vs. CURRENT, F=900 MHz



OUTPUT P1dB vs. CURRENT, F=900 MHz



INPUT IP3 vs. CURRENT, F=900 MHz



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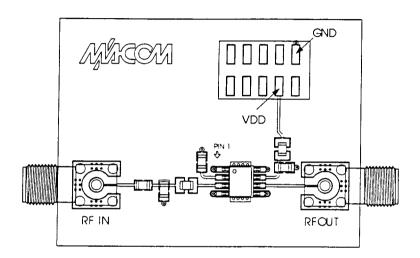
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#### Designer's Kit AM50-0003SMB

The AM50-0003SMB Designer's Kit allows for immediate evaluation of M/A-COM's AM50-0003. The Designer's Kit includes an AM50-0003, an evaluation board, and a floppy disk containing typical performance data and a DXF file of the recommended PCB layout.

The evaluation board consists of the recommended external surface mount circuitry, RF connectors, and a DC multi-pin connector, all mounted to a multi-layer FR-4 PCB. The AM50-0003SMB evaluation PCB is illustrated below with all functional ports labeled.



**AM50-0003 EVALUATION BOARD** 

## **Evaluation PCB + RF Connector Losses**

Port Reference	Approximate RF Loss	
LNA Input	0.1 dB @ 900 MHz	
LNA Output	0.1 dB @ 900 MHz	

The DC connector on the Designer's Kit PCB allows convenient DC line access. This is accomplished by of the one or more of the following methods:

- 1. A mating female multi-pin connector (Newark Electronics Stock # 46F-4658, not included).
- 2. Wires soldered to the necessary pins (not included).
- 3. Clip leads (not included).

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