

Features

- Low Noise Figure: 1.2 dB
- High Input: +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 3V to 8V 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.

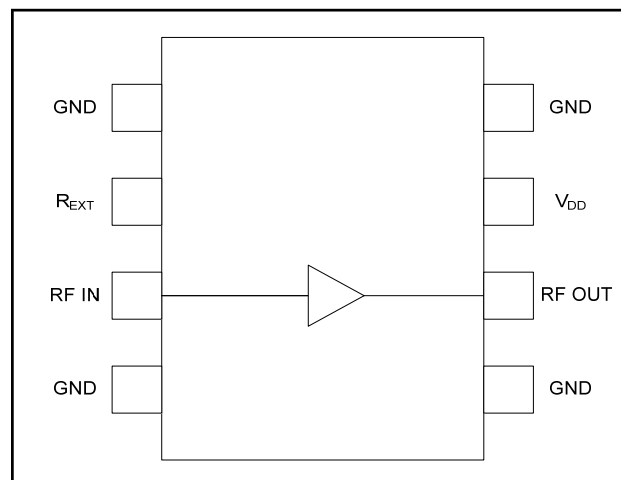
The AM50-0003 is fabricated using a low-cost 0.5-micron gate length GaAs process. The process features full passivation for increased performance reliability. The AM50-0003 is 100% RF tested to ensure performance specification compliance.

Ordering Information ¹

| Part Number | Package |
|--------------|-------------------|
| AM50-0003 | Bulk Packaging |
| AM50-0003TR | 1000 piece reel |
| AM50-0003SMB | Sample Test Board |

1. Reference Application Note M513 for reel size information.

Functional Block Diagram



Pin Configuration

| Pin No. | Pin Name | Description |
|---------|------------------|-------------------------------------|
| 1 | GND | RF and DC Ground |
| 2 | R _{EXT} | External Current Control (optional) |
| 3 | RF IN | RF Input of the amplifier |
| 4 | GND | RF and DC Ground |
| 5 | GND | RF and DC Ground |
| 6 | RF OUT | RF Output of the amplifier |
| 7 | V _{DD} | Positive supply voltage |
| 8 | GND | RF and DC Ground |

Absolute Maximum Ratings ²

| Parameter | Absolute Maximum |
|----------------------------------|------------------|
| VDD | +10 VDC |
| Input Power | +17 dBm |
| Current ³ | 120 mA |
| Channel Temperature ⁴ | +150°C |
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -65°C to +150°C |

2. Exceeding any one or combination of these limits may cause permanent damage.
3. When pin #2 is used to increase current. (see note 6)
4. Thermal resistance (θ_{jc}) = +88°C/W

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

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High Dynamic Range Low Noise Amplifier 800 - 1000 MHz

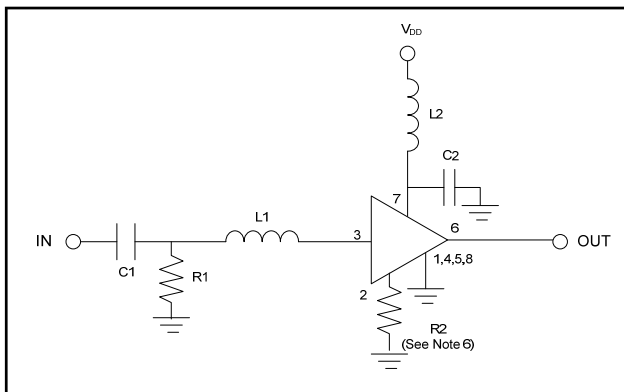
Rev. V5

Electrical Specifications: $T_A = +25^\circ\text{C}$, $Z_0 = 50 \Omega$, $F=900 \text{ MHz}$, $P_{in} = -30 \text{ dBm}$

| Parameter | Test Conditions | Units | Min | Typ | Max |
|-------------------------|-------------------------|-------|------|-------|------|
| Gain | 5 V, 60 mA ⁵ | dB | 13 | 15 | — |
| | 3 V, 20 mA | dB | 12 | 13.5 | — |
| Noise Figure | 5 V, 60 mA ⁵ | dB | — | 1.20 | 1.50 |
| | 3 V, 20 mA | dB | — | 1.25 | 1.50 |
| Input VSWR | — | Ratio | — | 2.0:1 | — |
| Output VSWR | — | Ratio | — | 1.5:1 | — |
| Output 1 dB Compression | 5 V, 60 mA ⁵ | dBm | — | 16.5 | — |
| | 3 V, 20 mA | dBm | — | 8.5 | — |
| Input IP3 | 5 V, 60 mA ⁵ | dBm | 12.5 | 15 | — |
| | 3 V, 20 mA | dBm | 4.0 | 6.5 | — |
| Reverse Location | — | dB | — | 25 | — |

5. Using external 15 Ω resistor. See functional block diagram herein.

Functional Schematic



Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

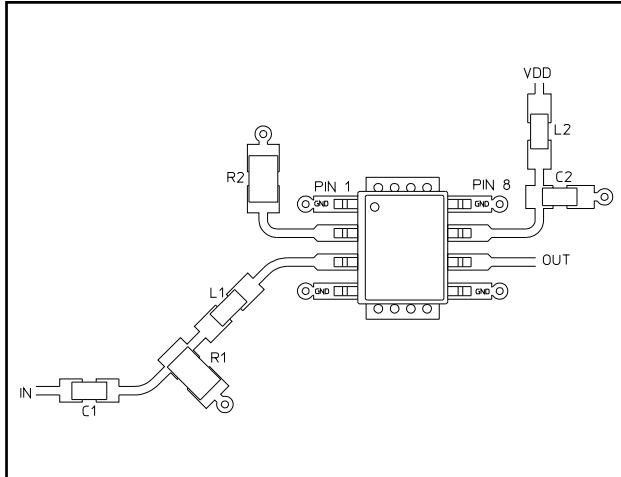
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Component List ⁶

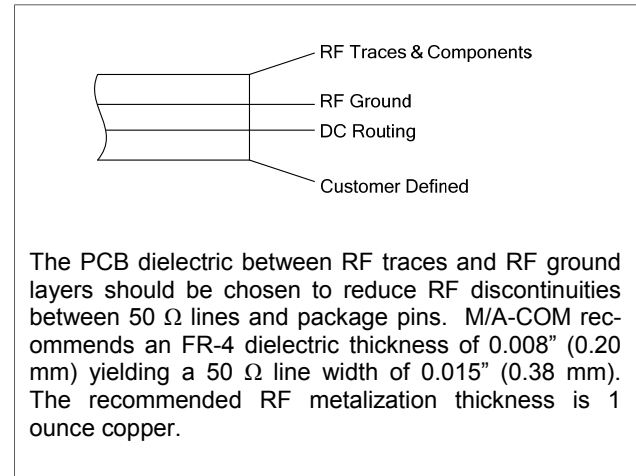
| Part | Value | Case Size | Manufacturer | Purpose |
|------|---------------|-----------|--------------|--------------------------|
| C1 | 47 pF | 0603 | Murata | DC Block |
| C2 | 470 pF | 0603 | Murata | By-Pass |
| L1 | 12 nH | 0603 | Coilcraft | Tuning |
| L2 | 12 nH | 0603 | Coilcraft | RF Choke |
| R1 | 5.1K Ω | 0603 | Panasonic | DC Return |
| R2 | See Note 7 | 0603 | Panasonic | Optional current control |

- All external circuitry parts are readily available, in 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 $I_{DD} \sim 40 \text{ mA}$, $R2 = 43 \text{ ohms}$;
 $I_{DD} \sim 60 \text{ mA}$, $R2 = 15 \text{ ohms}$;
 $I_{DD} \sim 80 \text{ mA}$, $R2 = 10 \text{ ohms}$.

Recommended PCB Configuration



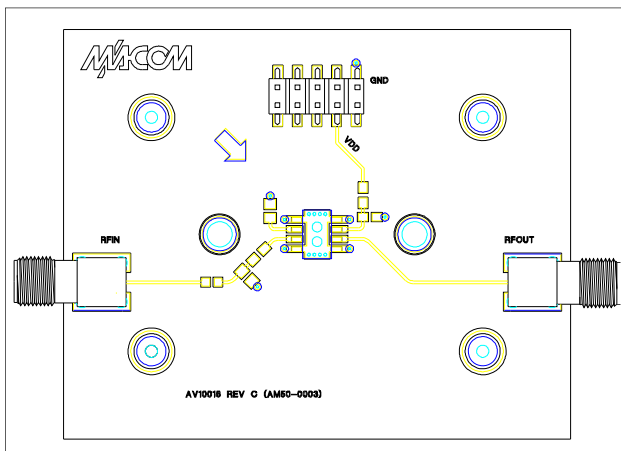
Cross Section View



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 evaluation board with mounted AM50-0003 and five loose AM50-0003's. 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 |

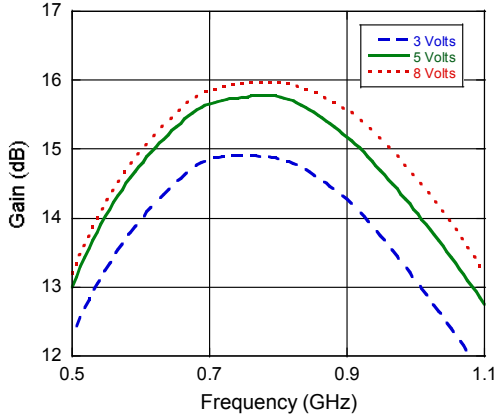
The DC connector on the Designer's Kit PCB allows convenient DC line access. This is accomplished by one or more of the following methods:

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

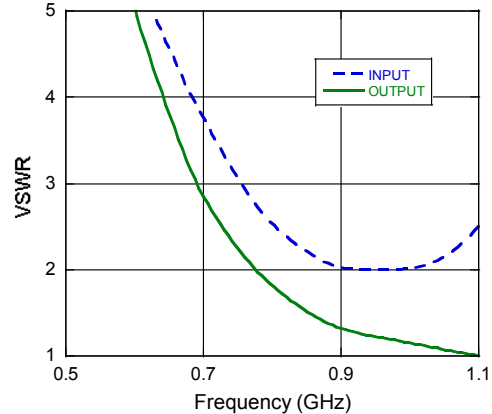
Typical Performance Curves:

$T_A = +25^\circ\text{C}$, $Z_0 = 50 \Omega$, $V_{DD} = 5 \text{ V}$, $I_{DD} = 60 \text{ mA}$ unless otherwise specified

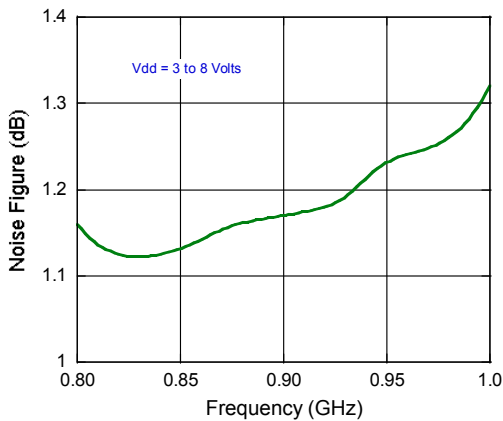
Gain vs. Frequency



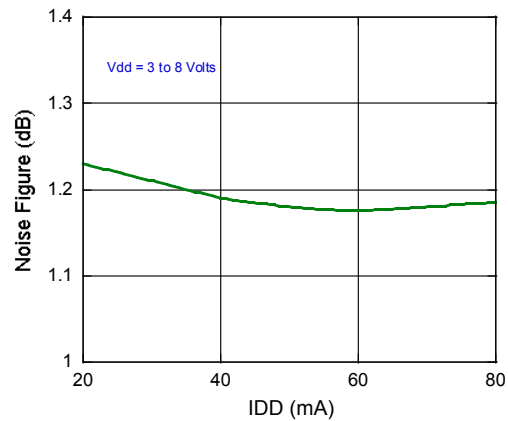
VSWR vs. Frequency



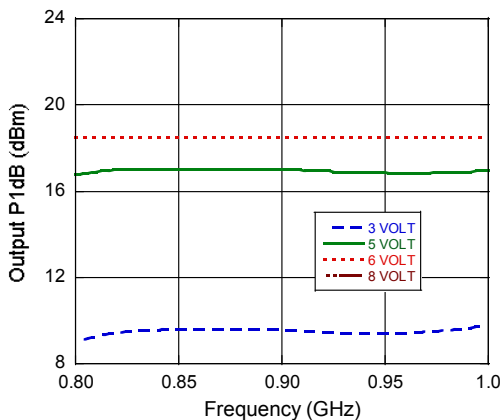
Noise Figure vs. Frequency



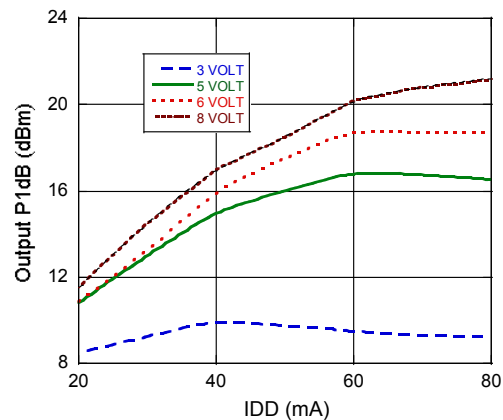
Noise Figure vs. Current, F = 900 MHz



Output P1dB vs. Frequency



Output P1dB vs. Current, F = 900 MHz



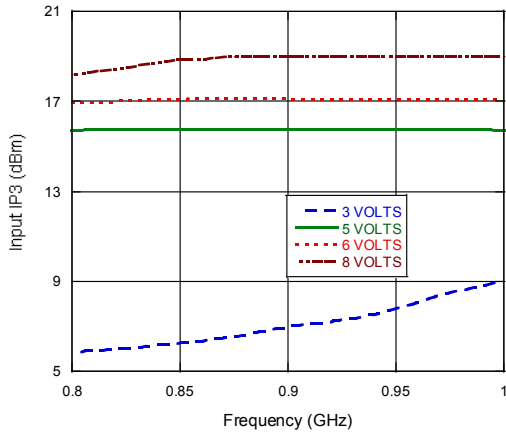
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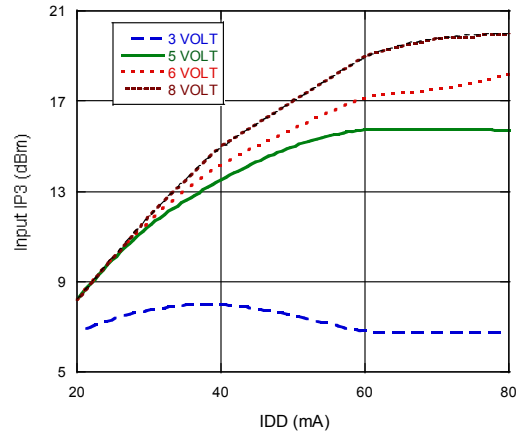
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Input IP3 vs. Frequency



Input IP3 vs. Current, F = 900 MHz



SOIC-8

PART NUMBER: XX-XXX
 DATE/LOT CODE: YYWWXXXX
 COMPANY LOGO: MACOM
 ORIENTATION MARK: (circle with dot)
 COUNTRY CODE: XXXXXXXX

Dimensions (Inches/Millimeters):
 .0075/.0098 (1.91/25)
 .2284/.2440 (5.80/6.20)
 .1497/.1574 (3.80/4.00)
 .1890/.1968 (4.80/5.00)
 .0040/.0098 (1.0/25)
 .0532/.0688 (1.35/1.75)
 .016/.050 (0.40/1.27)
 .050 (1.27)
 8X .013/.020 (33/51)

NOTES:
 1. REFERENCE JEDEC MS-012-AA, FOR ADDITIONAL DIMENSIONAL AND TOLERANCE INFORMATION.
 2. REFERENCE M538 APPLICATION NOTE FOR FOOTPRINT INFORMATION.
 3. ALL DIMENSIONS SHOWN AS INCHES/MM.

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