

# Surface Mount Monolithic Amplifier

## DC-1 GHz

### Product Features

- Wideband, DC to 1GHz
- Exact foot print substitute for Avago's MSA-0186
- Internally Matched to 50 Ohms
- Low current, 17mA
- Unconditionally stable
- Protected by US Patent, 6,943,629



Generic photo used for illustration purposes only

## MAR-1SM+

CASE STYLE: WW107

**+RoHS Compliant**

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

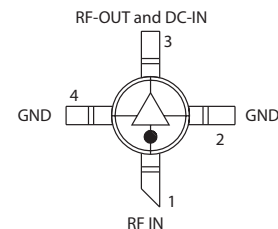
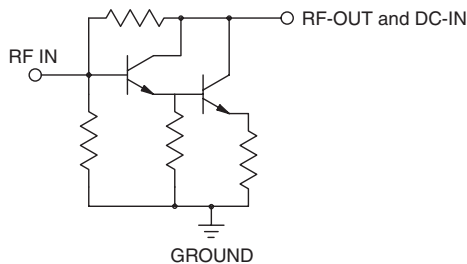
### Typical Applications

- Cellular
- Instrumentation
- VHF/UHF receivers/transmitters

### General Description

MAR-1SM+ (RoHS compliant) is a wideband amplifier offering high dynamic range. It has repeatable performance from lot to lot. It is enclosed in a Micro-X package. MAR-1SM+ uses Darlington configuration and is fabricated using InGaP HBT technology. Expected MTTF is 14,000 years at 85°C case temperature.

### simplified schematic and pin description



| Function         | Pin Number | Description  |
|------------------|------------|--|
| RF IN            | 1          | RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.  |
| RF-OUT and DC-IN | 3          | RF output and bias pin. DC voltage is present on this pin; therefore a DC blocking capacitor is necessary for proper operation. An RF choke is needed to feed DC bias without loss of RF signal due to the bias connection, as shown in "Recommended Application Circuit". |
| GND              | 2,4        | Connections to ground. Use via holes as shown in "Suggested Layout for PCB Design" to reduce ground path inductance for best performance.  |

#### Notes

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.  
 B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.  
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## Electrical Specifications at 25°C and 17mA, unless noted

| Parameter   | Min.                 | Typ.                 | Max.         | Units  |       |
|---|----------------------|----------------------|--------------|--------|-------|
| Frequency Range*                                  | DC                   |                      | 1            | GHz    |       |
| Gain  | f=0.1 GHz<br>f=1 GHz | —<br>15 <sup>2</sup> | 17.8<br>16.5 | —<br>— | dB    |
| Input Return Loss                                 | f=DC to 1 GHz        |                      | 17.5         |        | dB    |
| Output Return Loss                                | f=DC to 1 GHz        |                      | 21           |        | dB    |
| Output Power @ 1 dB compression                   | f=0.5 GHz            |                      | +2.5         |        | dBm   |
| Output IP3  | f=0.5 GHz            |                      | +14          |        | dBm   |
| Noise Figure                                      | f=0.5 GHz            |                      | 3.3          |        | dB    |
| Recommended Device Operating Current              |                      |                      | 17           |        | mA    |
| Device Operating Voltage                          |                      |                      | 5.0          |        | V     |
| Device Voltage Variation vs. Temperature at 17 mA |                      |                      | -2.9         |        | mV/°C |
| Device Voltage Variation vs. Current at 25°C      |                      |                      | 15.0         |        | mV/mA |
| Thermal Resistance, junction-to-case <sup>1</sup> |                      |                      | 208          |        | °C/W  |

\*Guaranteed specification DC-1 GHz. Low frequency cut off determined by external coupling capacitors.

## Absolute Maximum Ratings

| Parameter             | Ratings        |
|-----------------------|----------------|
| Operating Temperature | -40°C to 85°C  |
| Storage Temperature   | -55°C to 100°C |
| Operating Current     | 40mA           |
| Power Dissipation     | 200mW          |
| Input Power           | 13dBm          |

Note: Permanent damage may occur if any of these limits are exceeded.

These ratings are not intended for continuous normal operation.

<sup>1</sup>Case is defined as ground leads.

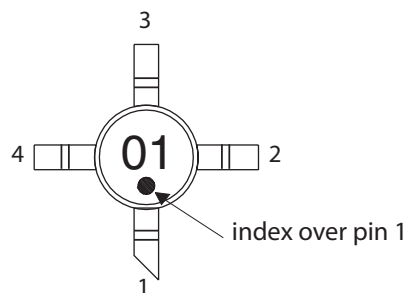
<sup>2</sup>Full temperature range.

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**Product Marking**



Markings in addition to model number designation may appear for internal quality control purposes.

**Additional Detailed Technical Information**

Additional information is available on our web site. To access this information enter the model number on our web site home page.

**Performance data, graphs, s-parameter data set (.zip file)**

**Case Style: WW107**

Plastic micro-x, .085 body diameter, lead finish: Matte-Tin

**Tape & Reel: F4**

7" Reels with 20, 50, 100, 200, 500, 1K devices

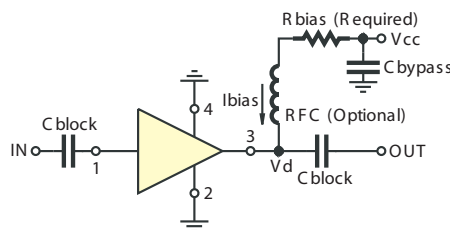
13" Reels with 2K, 4K devices

**Suggested Layout for PCB Design: PL-253**

**Evaluation Board: TB-411-1+**

**Environmental Ratings: ENV08T3**

**Recommended Application Circuit**



Test Board includes case, connectors, and components (in bold) soldered to PCB

| R BIAS |   |
|--------|---|
| Vcc    | "1%" Res. Values (ohms) for Optimum Biasing |
| 7      | 118   |
| 8      | 178   |
| 9      | 237   |
| 10     | 294   |
| 11     | 357   |
| 12     | 412   |
| 13     | 464   |
| 14     | 536   |
| 15     | 590   |

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**ESD Rating**

Human Body Model (HBM): Class 1B (500 v to < 1000 v) in accordance with ANSI/ESD STM 5.1 - 2001

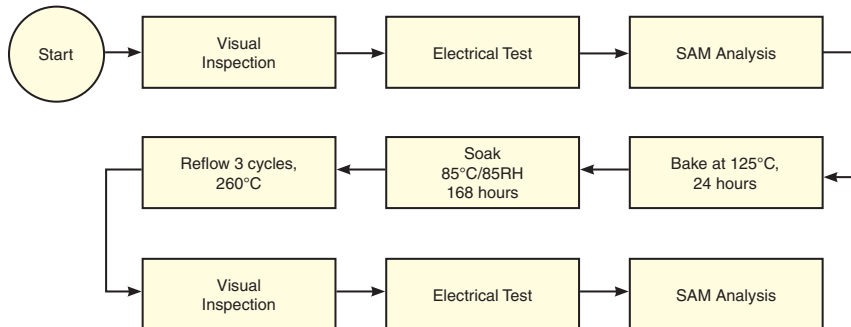
Machine Model (MM): Class M1 (<100 v) in accordance with ANSI/ESD STM 5.2 - 1999

**MSL Rating**

Moisture Sensitivity: MSL1 in accordance with IPC/JEDECJ-STD-020C

| No. | Test Required                | Condition   | Standard                    | Quantity |
|-----|------------------------------|---|-----------------------------|----------|
| 1   | Visual Inspection            | Low Power Microscope Magnification 40x  | MIP-IN-0003 (MCT spec)      | 45 units |
| 2   | Electrical Test              | Room Temperature  | SCD (MCL spec)              | 45 units |
| 3   | SAM Analysis                 | Less than 10% growth in term of delamination  | J-Std-020C (Jedec Standard) | 45 units |
| 4   | Moisture Sensitivity Level 1 | Bake at 125°C for 24 hours<br>Soak at 85°C/85%RH for 168 hours<br>Reflow 3 cycles at 260°C peak | J-Std-020C (Jedec Standard) | 45 units |

**MSL Test Flow Chart**



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