Surface Mount 
Monolithic Amplifier

Product Features
- DC-2 GHz
- Single Voltage Supply
- Internally Matched to 50 Ohms
- Unconditionally Stable
- Low Performance Variation Over Temperature
- Transient Protected
- Aqueous washable
- Protected By US Patent 6,943,629

Typical Applications
- Cellular/PCS/3G Base Station
- CATV, Cable Modem & DBS
- Fixed Wireless & WLAN
- Microwave Radio & Test Equipment

General Description
ERA-8SM+ (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. ERA-8SM+ uses Darlington configuration and is fabricated using InGaP HBT technology. Expected MTTF is 13,000 years at 85°C case temperature.

simplified schematic and pin description

<table>
<thead>
<tr>
<th>Function</th>
<th>Pin Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF IN</td>
<td>1</td>
<td>RF input pin. This pin requires the use of an external DC blocking capacitor chosen for the frequency of operation.</td>
</tr>
<tr>
<td>RF-OUT and DC-IN</td>
<td>3</td>
<td>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”.</td>
</tr>
<tr>
<td>GND</td>
<td>2, 4</td>
<td>Connections to ground. Use via holes as shown in “Suggested Layout for PCB Design” to reduce ground path inductance for best performance.</td>
</tr>
</tbody>
</table>

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www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com
### Electrical Specifications at 25°C and 36mA, unless noted

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Cpk</th>
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<tr>
<td>Frequency Range*</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gain</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>f=0.1 GHz</td>
<td>29.3</td>
<td>31.5</td>
<td>32.3</td>
<td>dB</td>
<td>≥ 1.5</td>
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<tr>
<td>f=1 GHz</td>
<td>22.9</td>
<td>24.4</td>
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<tr>
<td>f=2 GHz</td>
<td>—</td>
<td>19</td>
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<tr>
<td>f=3 GHz</td>
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</tr>
<tr>
<td>f=4 GHz</td>
<td>—</td>
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<td>.0079</td>
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<tr>
<td>f=0.1 GHz</td>
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<td>—</td>
<td>dB</td>
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<tr>
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<td>—</td>
<td>—</td>
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<tr>
<td>f=2 GHz</td>
<td>15</td>
<td>—</td>
<td>—</td>
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<tr>
<td>f=3 GHz</td>
<td>13</td>
<td>—</td>
<td>—</td>
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<tr>
<td>f=4 GHz</td>
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<td>—</td>
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<td>Output Return Loss</td>
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<td>12</td>
<td>—</td>
<td>dB</td>
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<tr>
<td>f=1 GHz</td>
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<td>—</td>
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<td></td>
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<tr>
<td>f=3 GHz</td>
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<tr>
<td>f=4 GHz</td>
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<td>Reverse Isolation</td>
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<td>20</td>
<td>23</td>
<td>—</td>
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<td>Output Power @ 1 dB compression</td>
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<td>—</td>
<td>12.5</td>
<td>—</td>
<td>dBm</td>
<td>≥ 1.33</td>
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<td>12.5</td>
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<tr>
<td>f=1 GHz</td>
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<tr>
<td>Output IP3</td>
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<td>dBm</td>
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<td>f=0.1 GHz</td>
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<td>Noise Figure</td>
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<td>dB</td>
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<td>4</td>
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<td>Group Delay</td>
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<td>psec</td>
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<tr>
<td>f=1 GHz</td>
<td>130</td>
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<tr>
<td>Recommended Device Operating Current</td>
<td>36</td>
<td>mA</td>
<td></td>
<td></td>
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<tr>
<td>Device Operating Voltage</td>
<td>3.5</td>
<td>3.7</td>
<td>3.9</td>
<td>V</td>
<td>≥ 1.5</td>
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<tr>
<td>Device Voltage Variation vs. Temperature at 36mA</td>
<td>0.5</td>
<td>mV/°C</td>
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<td></td>
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<tr>
<td>Device Voltage Variation vs. Current at 25°C</td>
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<td>mV/mA</td>
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<tr>
<td>Thermal Resistance, junction-to-case1</td>
<td>140</td>
<td>°C/W</td>
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</table>

*Guaranteed specification DC-2 GHz. Low frequency cut off determined by external coupling capacitors.

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ratings</th>
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<tbody>
<tr>
<td>Operating Temperature*</td>
<td>-45°C to 85°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to 150°C</td>
</tr>
<tr>
<td>Operating Current</td>
<td>65mA</td>
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<tr>
<td>Power Dissipation</td>
<td>250mW</td>
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<tr>
<td>Input Power</td>
<td>13dBm</td>
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</tbody>
</table>

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Monolithic InGaP HBT MMIC Amplifier

Product Marking

![Recommended Application Circuit](Recommended%20Application%20Circuit.png)

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: tin-silver over nickel

Tape & Reel: F4
7" Reels with 20, 50, 100, 200, 500, 1K devices

Suggested Layout for PCB Design: PL-075

Evaluation Board: TB-408-8+

Environmental Ratings: ENV08T2

<table>
<thead>
<tr>
<th>R BIAS</th>
<th>Vcc</th>
<th>“1%” Res. Values (ohms) for Optimum Biasing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>7</td>
<td></td>
<td>88.7</td>
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<tr>
<td>8</td>
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<td>118</td>
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<td>9</td>
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<tr>
<td>11</td>
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</table>

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Monolithic InGaP HBT MMIC Amplifier

**ESD Rating**
Human Body Model (HBM): Class 1B (500 v to < 1,000 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/JEDEC J-STD-020C

<table>
<thead>
<tr>
<th>No.</th>
<th>Test Required</th>
<th>Condition</th>
<th>Standard</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual Inspection</td>
<td>Low Power Microscope Magnification 40x</td>
<td>MIP-IN-0003 (MCT spec)</td>
<td>45 units</td>
</tr>
<tr>
<td>2</td>
<td>Electrical Test</td>
<td>Room Temperature</td>
<td>SCD (MCL spec)</td>
<td>45 units</td>
</tr>
<tr>
<td>3</td>
<td>SAM Analysis</td>
<td>Less than 10% growth in term of delamination</td>
<td>J-Std-020C (Jedec Standard)</td>
<td>45 units</td>
</tr>
<tr>
<td>4</td>
<td>Moisture Sensitivity</td>
<td>Bake at 125°C for 24 hours</td>
<td>J-Std-020C (Jedec Standard)</td>
<td>45 units</td>
</tr>
</tbody>
</table>

**MSL Test Flow Chart**

<table>
<thead>
<tr>
<th>Start</th>
<th>Visual Inspection</th>
<th>Electrical Test</th>
<th>SAM Analysis</th>
<th>Reflow 3 cycles, 260°C</th>
<th>Soak 85°C/85%RH 168 hours</th>
<th>Bake at 125°C, 24 hours</th>
<th>Visual Inspection</th>
<th>Electrical Test</th>
<th>SAM Analysis</th>
<th>Stop</th>
</tr>
</thead>
</table>

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