**MRF448A**

The RF Line NPN Silicon Power Transistor

**250 W, 30 MHz, 50 V**

**Description**

Designed primarily for high voltage applications as a high power linear amplifiers from 2 to 30 MHz. Ideal for marine and base station equipment.

- Specified 50 V, 30 MHz characteristics
  - Output power = 250 W
  - Minimum gain = 12 dB
  - Efficiency = 45%
- Intermodulation distortion @ 250 W (PEP) - IMD = -30 dB (max.)
- 100% tested for load mismatch at all phase angles with 3:1 VSWR

**MAXIMUM RATINGS**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-Emitter Voltage</td>
<td>$V_{CEO}$</td>
<td>50</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector-Base Voltage</td>
<td>$V_{CBO}$</td>
<td>100</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter-Base Voltage</td>
<td>$V_{EBO}$</td>
<td>4</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Current - Continuous</td>
<td>$I_C$</td>
<td>16</td>
<td>Adc</td>
</tr>
<tr>
<td>Withstand Current - 10 s</td>
<td>-</td>
<td>20</td>
<td>Adc</td>
</tr>
<tr>
<td>Total Device Dissipation @ Tc =25°C (1)</td>
<td>$P_D$</td>
<td>290</td>
<td>Watts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.67</td>
<td>W/°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>$T_{stg}$</td>
<td>-65 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

**THERMAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Resistance, Junction to Case</td>
<td>$R_{eJC}$</td>
<td>0.6</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

**ELECTRICAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-Emitter Breakdown Voltage (I_C = 200 mAdc, I_E = 0)</td>
<td>$V_{(BR)CEO}$</td>
<td>50</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector-Emitter Breakdown Voltage (I_C = 100 mAdc, V_{BE} = 0)</td>
<td>$V_{(BR)CES}$</td>
<td>100</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector-Base Breakdown Voltage (I_C = 100 mAdc, I_E = 0)</td>
<td>$V_{(BR)CBO}$</td>
<td>100</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter-Base Breakdown Voltage (I_E = 10 mAdc, I_C = 0)</td>
<td>$V_{(BR)EBO}$</td>
<td>4</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
</tbody>
</table>

**Note:**
1. PD is a measurement reflecting short term maximum condition. See SOAR curve for operating conditions.
ELECTRICAL CHARACTERISTICS - continued (T<sub>C</sub> = 25°C unless otherwise noted)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Current Gain (I&lt;sub&gt;C&lt;/sub&gt; = 5.0 Adc, V&lt;sub&gt;CE&lt;/sub&gt; = 10 Vdc)</td>
<td>h&lt;sub&gt;FE&lt;/sub&gt;</td>
<td>25</td>
<td>—</td>
<td>50</td>
<td>—</td>
</tr>
<tr>
<td>DYNAMIC CHARACTERISTICS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Capacitance (V&lt;sub&gt;CB&lt;/sub&gt; = 50 Vdc, I&lt;sub&gt;E&lt;/sub&gt; = 0, f = 1.0 MHz)</td>
<td>C&lt;sub&gt;ob&lt;/sub&gt;</td>
<td>—</td>
<td>350</td>
<td>450</td>
<td>pF</td>
</tr>
<tr>
<td>FUNCTIONAL TESTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common-Emitter Amplifier Power Gain (V&lt;sub&gt;CC&lt;/sub&gt; = 50 Vdc, P&lt;sub&gt;out&lt;/sub&gt; = 250 W CW, f = 30 MHz, I&lt;sub&gt;CQ&lt;/sub&gt; =250 mA)</td>
<td>G&lt;sub&gt;PE&lt;/sub&gt;</td>
<td>12</td>
<td>14</td>
<td>—</td>
<td>dB</td>
</tr>
</tbody>
</table>
| Collector Efficiency (V<sub>CC</sub> = 50 Vdc, P<sub>out</sub> = 250 W, f = 30 MHz, I<sub>CQ</sub> = 250 mA) | η      | —    | 45   | 65   | —    % (PEP)%
| Intermodulation Distortion (2) (V<sub>CE</sub> = 50 Vdc, P<sub>out</sub> = 250 W (PEP), I<sub>CQ</sub> = 250mA, f = 30 MHz) | IMD    | —    | -33  | -30  | dB   |
| Electrical Ruggedness (V<sub>CC</sub> = 50 Vdc, P<sub>out</sub> = 250 W CW, f =30 MHz, VSWR 3:1 at all Phases Angles) | Ψ      | No Degradation in Output Power |

Note:
2. To Mil–Std-1311 Version A, Test Method 2204, Two Tone, Reference Each Tone
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C1, C2, C5, C7 — 170–780 pF, Arco 469
C3, C8, C9 — 0.1 µF, 100 V Ene
C4 — 500 µF @ 6.0 V
C6 — 360 pF, 3 x 120 pF, 3.0 kV in parallel
C10 — 10 µF, 100 V
R1 — 10 Ω, 10 Watt
R2 — 10 Ω, 1.0 Watt

CR1 — 1N4997 or equivalent
L1 — 3 Turns, #16 Wire, 0.4" I.D., 0.3" Long
L2 — 0.8 µH, Ohmite Z-235 or equivalent
L3 — 12 Turns, #16 Enamelled Wire Closed wound 0.25" I.D.
L4 — 4 Turns, 1/8" Copper Tubing, 0.6" I.D., 1.0" Long
L5, L6 — 2.0 µH, Fair-Rite 264.3021801 Ferrite bead each or equivalent

Figure 1. 30 MHz Test Circuit Schematic
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Figure 2. Output Power versus Input Power

Figure 3. Output Power versus Supply Voltage

Figure 4. Power Gain versus Frequency

Figure 5. RF SOAR (Class AB)  
$P_{out}$ versus Output VSWR

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Figure 6. \( f_T \) versus Collector Current

Figure 7. IMD versus \( P_{out} \)
Figure 8. Output Resistance and Capacitance versus Frequency

Figure 9. Series Equivalent Impedance
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Unless otherwise noted, tolerances are inches ±0.005" [millimeters ±0.13mm]
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