The RF Line NPN Silicon Power Transistor
250 W, 30 MHz, 50 V
Rev. V1

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</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>
</tbody>
</table>

Storage Temperature Range

| T_{stg} | -65 to +150 °C |

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 \( (T_C = 25^\circ C \text{ unless otherwise noted}) \)

<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><strong>ON CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Current Gain ( (I_C = 5.0 \text{ Adc, } V_{CE} = 10 \text{ Vdc}) )</td>
<td>( h_{FE} )</td>
<td>25</td>
<td>—</td>
<td>50</td>
<td>—</td>
</tr>
<tr>
<td><strong>DYNAMIC CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Capacitance ( (V_{CB} = 50 \text{ Vdc, } I_C = 0, \ f = 1.0 \text{ MHz}) )</td>
<td>( C_{ob} )</td>
<td>—</td>
<td>350</td>
<td>450</td>
<td>pF</td>
</tr>
<tr>
<td><strong>FUNCTIONAL TESTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common-Emitter Amplifier Power Gain ( (V_{CC} = 50 \text{ Vdc, } P_{out} = 250 \text{ W CW, } f = 30 \text{ MHz, } I_{CQ} = 250 \text{ mA}) )</td>
<td>( G_{PE} )</td>
<td>12</td>
<td>14</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>Collector Efficiency ( (V_{CC} = 50 \text{ Vdc, } P_{out} = 250 \text{ W, } f = 30 \text{ MHz, } I_{CQ} = 250 \text{ mA}) )</td>
<td>( \eta )</td>
<td>—</td>
<td>45</td>
<td>65</td>
<td>—</td>
</tr>
<tr>
<td>Intermodulation Distortion (2) ( (V_{CE} = 50 \text{ Vdc, } P_{out} = 250 \text{ W (PEP), } I_{CQ} = 250m\text{A, } f = 30 \text{ MHz}) )</td>
<td>( \text{IMD} )</td>
<td>—</td>
<td>-33</td>
<td>-30</td>
<td>dB</td>
</tr>
<tr>
<td>Electrical Ruggedness ( (V_{CC} = 50 \text{ Vdc, } P_{out} = 250 \text{ W CW, } f =30 \text{ MHz, } \text{VSWR 3:1 at all Phases Angles}) )</td>
<td>( \Psi )</td>
<td>No Degradation in Output Power</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
2. To Mil–Std-1311 Version A, Test Method 2204, Two Tone, Reference Each Tone
MRF448A

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C1, C2, C5, C7 — 170–780 pF, Arco 469
C3, C6, C9 — 0.1 µF, 100 V Elna
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 Closewound 0.25" I.D.
L4 — 4 Turns, 1/8" Copper Tubing, 0.6" I.D., 1.0" Long
L5, L6 — 2.0 µH, Fas-Rite 2643021881 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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DC-0017303
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Figure 6. fT versus Collector Current

Figure 7. IMD versus Pout
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Figure 8. Output Resistance and Capacitance versus Frequency

Figure 9. Series Equivalent Impedance
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