The RF Line NPN Silicon Power Transistor
100W(PEP), 30MHz, 28V

M/A-COM Products
Released - Rev. 07.07

Designed primarily for application as a high–power linear amplifier from 2.0 to 30 MHz.

- Specified 12.5 V, 30 MHz characteristics —
  - Output power = 100 W (PEP)
  - Minimum gain = 10 dB
  - Efficiency = 40%
- Intermodulation distortion @ 100 W (PEP) — IMD = –30 dB (min.)
- 100% tested for load mismatch at all phase angles with 30:1 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>20</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Base Voltage</td>
<td>$V_{CBO}$</td>
<td>45</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Voltage</td>
<td>$V_{EBO}$</td>
<td>3.0</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Current — Continuous</td>
<td>$I_C$</td>
<td>20</td>
<td>Adc</td>
</tr>
<tr>
<td>Withstand Current — 10 s</td>
<td>—</td>
<td>30</td>
<td>Adc</td>
</tr>
<tr>
<td>Total Device Dissipation @ $T_C = 25^\circ C$</td>
<td>$P_D$</td>
<td>290</td>
<td>Watts</td>
</tr>
<tr>
<td>Derate above $25^\circ C$</td>
<td></td>
<td>1.66</td>
<td>Watts/W°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>$T_{sto}$</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>$R_{WJC}$</td>
<td>0.5</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

### ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ C$ 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>Collector–Emitter Breakdown Voltage ($I_C = 50$ mA, $I_B = 0$)</td>
<td>$V_{(BR)CEO}$</td>
<td>20</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Emitter Breakdown Voltage ($I_C = 200$ mA, $V_{BE} = 0$)</td>
<td>$V_{(BR)CES}$</td>
<td>45</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Base Breakdown Voltage ($I_C = 200$ mA, $I_E = 0$)</td>
<td>$V_{(BR)CBO}$</td>
<td>45</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Breakdown Voltage ($I_E = 10$ mA, $I_C = 0$)</td>
<td>$V_{(BR)EBO}$</td>
<td>3.0</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Cutoff Current ($V_{CE} = 16$ V, $I_{BE} = 0$, $T_C = 25^\circ C$)</td>
<td>$I_{CES}$</td>
<td>—</td>
<td>—</td>
<td>10</td>
<td>mAdc</td>
</tr>
</tbody>
</table>

(continued)
### Electrical Characteristics – continued (T_c = 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><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 Adc, V_CBE = 5.0 Vdc)</td>
<td>h_FE</td>
<td>10</td>
<td>70</td>
<td></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_CE = 12.5 Vdc, I_E = 0, f = 1.0 MHz)</td>
<td>C_OB</td>
<td>—</td>
<td>560</td>
<td>800</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_CCE = 12.5 Vdc, P_OUT = 100 W, I_C(max) = 10 Adc, I_CQ = 150 mA, f = 30, 30.001 MHz)</td>
<td>G_FE</td>
<td>10</td>
<td>12</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>Collector Efficiency (V_CCE = 12.5 Vdc, P_OUT = 100 W, I_C(max) = 10 Adc, I_CQ = 150 mA, f = 30, 30.001 MHz)</td>
<td>η</td>
<td>40</td>
<td></td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Intermodulation Distortion (I) (V_CE = 12.5 Vdc, P_OUT = 100 W, I_C = 10 Adc, I_CQ = 150 mA, f = 30, 30.001 MHz)</td>
<td>IMD</td>
<td>—</td>
<td>—33</td>
<td>—30</td>
<td>dB</td>
</tr>
</tbody>
</table>

**NOTE:**
1. To proposed EIA method of measurement. Reference peak envelope power.

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![RF Line NPN Silicon Power Transistor Schematic](image)

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**Figure 1. 30 MHz Test Circuit Schematic**

- **COMPONENTS:**
  - C1, C2, C4: 170–780 pF, ARCO 469
  - C3: 80–480 pF, ARCO 466
  - C5, C7, C10: 0.1 µF, 100 V
  - C6: MALLORY 500 µF @ 15 V Electrolytic
  - C9: 100 µF, 15 V Electrolytic
  - C8: 1000 pF, 350 V UNDERWOOD
  - R1: 10 Ω, 25 Watt Wirewound
  - R2: 10 Ω, 1.0 Watt Carbon
  - CR1: 1N4997
  - L1: 3 Turns, #16 Wire, 5/16” I.D., 5/16” Long
  - L2: 12 Turns, Enameled Wire Closewound, 1/4” I.D.
  - L3: 1–3/4 Turns, 1/8” Tubing, 3/8” I.D., 3/8” Long
  - L4: 10 µH Molded Choke
  - L5: 10 Ferrite Beads – FERROXCUBE #56–590–65/3B

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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. Intermodulation Distortion versus Output Power**

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Figure 6. DC Safe Operating Area

Figure 7. Series Equivalent Impedance

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Figure 8. Output Capacitance versus Frequency
Figure 9. Output Resistance versus Frequency

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