The RF Line NPN Silicon Power Transistor
80W, 3.0-200MHz, 28V

MRF316

Designed primarily for wideband large-signal output amplifier stages in the 30–200 MHz frequency range.

- Guaranteed performance at 150 MHz, 28 Vdc
  - Output power = 80 W
  - Minimum gain = 10 dB
- Built-in matching network for broadband operation
- 100% tested for load mismatch at all phase angles with 30:1 VSWR
- Gold metallization system for high reliability applications

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>35</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Base Voltage</td>
<td>( V_{CBO} )</td>
<td>65</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Voltage</td>
<td>( V_{EBO} )</td>
<td>4.0</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Current — Continuous Peak</td>
<td>( I_C )</td>
<td>9.0</td>
<td>Adc</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13.5</td>
<td></td>
</tr>
<tr>
<td>Total Device Dissipation @ ( T_C = 25^\circ C ) (1)</td>
<td>( P_D )</td>
<td>220</td>
<td>Watts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.26</td>
<td>W/(^\circ C)</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>( T_{stg} )</td>
<td>-65 to +150</td>
<td>(^\circ 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_{JUC} )</td>
<td>0.8</td>
<td>(^\circ 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 \mathrm{mADC}, I_B = 0 ))</td>
<td>( V_{BRICEO} )</td>
<td>35</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Emitter Breakdown Voltage (( I_C = 50 \mathrm{mADC}, V_{BE} = 0 ))</td>
<td>( V_{BRICE} )</td>
<td>65</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Base Breakdown Voltage (( I_C = 50 \mathrm{mADC}, I_E = 0 ))</td>
<td>( V_{BRICBO} )</td>
<td>65</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Breakdown Voltage (( I_E = 5.0 \mathrm{mADC}, I_C = 0 ))</td>
<td>( V_{BRIBEBO} )</td>
<td>4.0</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Cutoff Current (( V_{CE} = 30 \mathrm{VDC}, I_E = 0 ))</td>
<td>( I_{CBO} )</td>
<td>—</td>
<td>—</td>
<td>5.0</td>
<td>mAdc</td>
</tr>
</tbody>
</table>

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**DC Current Gain**

\( I_c = 4.0 \ A_{dc}, V_{CE} = 5.0 \ V_{dc} \)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>( h_{FE} )</td>
<td>10</td>
<td>—</td>
<td>80</td>
</tr>
</tbody>
</table>

**Output Capacitance**

\( V_{CB} = 28 \ V_{dc}, I_E = 0, f = 1.0 \ MHz \)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_{CE} )</td>
<td>—</td>
<td>100</td>
<td>130</td>
</tr>
</tbody>
</table>

**NOTE.**

1. This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.

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**ELECTRICAL CHARACTERISTICS — continued**

<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>Narrow Band Functional Tests (Figure 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common-Emitter Amplifier Power Gain</td>
<td>( Q_{PE} )</td>
<td>10</td>
<td>13</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>Collector Efficiency</td>
<td>( \eta )</td>
<td>55</td>
<td>—</td>
<td>—</td>
<td>%</td>
</tr>
<tr>
<td>Load Mismatch</td>
<td>( \psi )</td>
<td>No Degradation in Output Power</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Figure 1. 150 MHz Test Amplifier

C1 — 22 pF 100 mil ATC
C2, C3 — 24 pF 100 mil ATC
C4, C11 — 0.8–20 pF JMC #5501 Johanson
C5 — 200 pF 100 mil ATC
C6 — 240 pF 100 mil ATC
C7 — Dipped Mica 1000 pF
C8 — 0.1 µF Ene Red Cap
C9, C10, C12 — 30 pF 100 mil ATC
C13 — 1.0 µF Tantalum

L1 — 0.8", #20 Wire
L2 — 1.0", #20 Wire
RFC1, RFC4 — 0.15 µH Molded Coil
RFC2, RFC3 — Ferroxcube Bead 56–560–56–3B
RFC5 — 2.5", #20 Wire, 1.5 Turns
RFC6 — Ferroxcube VK200–19/4B
R1 — 10 Ω, 1/2 W
R2, R3 — 10 Ω, 1.0 W

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TYPICAL PERFORMANCE CURVES

Figure 2. Output Power versus Input Power

![Graph showing Output Power versus Input Power at different frequencies: 30 MHz, 50 MHz, 100 MHz, 150 MHz, 200 MHz.]

Figure 3. Power Gain versus Frequency

![Graph showing Power Gain versus Frequency from 20 MHz to 220 MHz with Output Power of 80 W and Supply Voltage of 28 V.]

Figure 4. Output Power versus Supply Voltage

![Graph showing Output Power versus Supply Voltage for different values of Input Power: 2 W, 4 W, 6 W, 8 W. Frequency 100 MHz and 150 MHz are marked.]

Figure 5. Output Power versus Supply Voltage

![Graph showing Output Power versus Supply Voltage for different values of Input Power: 2 W, 4 W, 6 W, 8 W. Frequency 150 MHz is marked.]

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Figure 6. Output Power versus Supply Voltage

Figure 7. Series Equivalent Input–Output Impedance