The RF Line Controlled “Q” Broadband Power Transistor
100W, 30 to 500MHz, 28V

Designed primarily for wideband large-signal output and driver amplifier stages in the 30 to 500 MHz frequency range.

- Specified 28 V, 500 MHz characteristics —
  - Output power = 100 W
  - Typical gain = 9.5 dB (Class AB); 8.5 dB (Class C)
  - Efficiency = 55% (typ.)
- Built-in input impedance matching networks for broadband operation
- Push–pull configuration reduces even numbered harmonics
- Gold metallization system for high reliability
- 100% tested for load mismatch

The MRF393 is two transistors in a single package with separate base and collector leads and emitters common. This arrangement provides the designer with a space saving device capable of operation in a push–pull configuration.

### PUSH–PULL TRANSISTORS

#### 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>VCEO</td>
<td>30</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Base Voltage</td>
<td>VCEO</td>
<td>60</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Voltage</td>
<td>VEOB</td>
<td>4.0</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Current — Continuous</td>
<td>Ic</td>
<td>16</td>
<td>Acd</td>
</tr>
<tr>
<td>Total Device Dissipation @ Tc = 25°C (1)</td>
<td>PD</td>
<td>270</td>
<td>Watts</td>
</tr>
<tr>
<td>Derate above 25°C</td>
<td></td>
<td>1.54</td>
<td>W/°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>Tstg</td>
<td>-65 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>TJ</td>
<td>200</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>RthJC</td>
<td>0.65</td>
<td>°C/W</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 push–pull amplifier.
**ELECTRICAL CHARACTERISTICS** (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>Collector–Emitter Breakdown Voltage (I&lt;sub&gt;C&lt;/sub&gt; = 50 mAdc, I&lt;sub&gt;B&lt;/sub&gt; = 0)</td>
<td>V&lt;sub&gt;(BR)CEO&lt;/sub&gt;</td>
<td>30</td>
<td></td>
<td></td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Emitter Breakdown Voltage (I&lt;sub&gt;C&lt;/sub&gt; = 50 mAdc, V&lt;sub&gt;BE&lt;/sub&gt; = 0)</td>
<td>V&lt;sub&gt;(BR)CES&lt;/sub&gt;</td>
<td>60</td>
<td></td>
<td></td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Breakdown Voltage (I&lt;sub&gt;E&lt;/sub&gt; = 5.0 mAdc, I&lt;sub&gt;C&lt;/sub&gt; = 0)</td>
<td>V&lt;sub&gt;(BR)EBO&lt;/sub&gt;</td>
<td>4.0</td>
<td></td>
<td></td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Cutoff Current (V&lt;sub&gt;CB&lt;/sub&gt; = 30 Vdc, I&lt;sub&gt;E&lt;/sub&gt; = 0)</td>
<td>I&lt;sub&gt;CBO&lt;/sub&gt;</td>
<td></td>
<td></td>
<td>5.0</td>
<td>mAdc</td>
</tr>
</tbody>
</table>

**OFF CHARACTERISTICS** (1)

**ON CHARACTERISTICS** (1)

| DC Current Gain (I<sub>C</sub> = 1.0 Adc, V<sub>CE</sub> = 5.0 Vdc) | h<sub>FE</sub> | 20  |     | 100 | —    |

**DYNAMIC CHARACTERISTICS** (1)

| Output Capacitance (V<sub>CB</sub> = 28 Vdc, I<sub>E</sub> = 0, f = 1.0 MHz) | C<sub>OB</sub> | 40  | 75  | 96  | pF    |

**FUNCTIONAL TESTS** (2) — See Figure 1

| Common–Emitter Amplifier Power Gain (V<sub>CC</sub> = 28 Vdc, P<sub>out</sub> = 100 W, f = 500 MHz) | Q<sub>pe</sub> | 7.5 | 6.5 |    | dB    |
| Collector Efficiency (V<sub>CC</sub> = 28 Vdc, P<sub>out</sub> = 100 W, f = 500 MHz) | η             | 50  | 55  |    | %     |
| Load Mismatch (V<sub>CC</sub> = 28 Vdc, P<sub>out</sub> = 100 W, f = 500 MHz, VSWR = 30:1, all phase angles) | Ψ             | No Degradation in Output Power |

**NOTES:**
1. Each transistor chip measured separately.
2. Both transistor chips operating in push–pull amplifier.
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Figure 1. 600 MHz Test Fixture

C1, C2, C7, C8 — 240 pF 100 mil Chip Cap
C3 — 15 pF 100 mil Chip Cap
C4 — 24 pF 100 mil Chip Cap
C5 — 33 pF 100 mil Chip Cap
C6 — 12 pF 100 mil Chip Cap
C9, C13 — 1000 pF 100 mil Chip Cap
C10, C14 — 680 pF Feedthru Cap
C11, C15 — 0.1 μF Ceramic Disc Cap
C12, C16 — 50 μF 50 V

L1, L2 — 0.15 μH Molded Choke with Ferrite Bead
L3, L4 — 2–1/2 Turns #20 AWG 0.200” ID
L5, L6 — 3–1/2 Turns #18 AWG 0.200” ID
B1, B2 — Balun 50 Ω Semi Rigid Coax, 86 mil OD, 4” Long
Z1, Z2 — 860 mil Long x 125 mil W. Microstrip
Z3, Z4 — 200 mil Long x 125 mil W. Microstrip
Z5, Z6 — 800 mil Long x 125 mil W. Microstrip

Board Material — 0.0325” Teflon–Fiberglass, εᵣ = 2.56,
1 oz. Copper Clad both sides.
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CLASS C

Figure 2. Output Power versus Input Power

Figure 3. Output Power versus Input Power

CLASS C

Figure 4. Output Power versus Supply Voltage

Figure 5. Output Power versus Supply Voltage

Visit www.macom.com for additional data sheets and product information.

For further information and support please visit: https://www.macom.com/support
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NOTE: $Z_{in}$ & $Z_{OL^*}$ are given from base-to-base and collector-to-collector respectively.

Figure 6. Series Equivalent Input/Output Impedance

Figure 7. Class AB Output Power versus Input Power
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