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 |
|-----------------|-----------------|-----------------|-----------------|
| **Rating**      | **Symbol**      | **Value**       | **Unit**        |
| Collector–Emitter Voltage | VCEO          | 30              | Vdc             |
| Collector–Base Voltage       | VCEO          | 60              | Vdc             |
| Emitter–Base Voltage         | VCEO          | 4.0             | Vdc             |
| Collector Current — Continuous | IC            | 16              | Adc             |
| Total Device Dissipation @ T_C = 25°C (1) | PD            | 270             | Watts           |
| Derate above 25°C             |               | 1.54            | Watts/W°C       |
| Storage Temperature Range    | Tstg           | –65 to +150℃    | °C              |
| Junction Temperature         | TJ             | 200             | °C              |

**THERMAL CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th><strong>Symbol</strong></th>
<th><strong>Max</strong></th>
<th><strong>Unit</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Resistance, Junction to Case</td>
<td>R_AJC</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.

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https://www.macom.com/support
### 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) mAdc, (I_B = 0))</td>
<td>(V_{(BR)CEO})</td>
<td>30</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Emitter Breakdown Voltage ((I_C = 50) mAdc, (V_{BE} = 0))</td>
<td>(V_{(BR)CES})</td>
<td>60</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Breakdown Voltage ((I_E = 5.0) mAdc, (I_C = 0))</td>
<td>(V_{(BR)EBO})</td>
<td>4.0</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Cutoff Current ((V_{CB} = 30) Vdc, (I_E = 0))</td>
<td>(I_{CBO})</td>
<td>—</td>
<td>—</td>
<td>5.0</td>
<td>mAdc</td>
</tr>
</tbody>
</table>

### ON CHARACTERISTICS (1)

<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>DC Current Gain ((I_C = 1.0) Adc, (V_{CE} = 5.0) Vdc)</td>
<td>(hFE)</td>
<td>20</td>
<td>—</td>
<td>100</td>
<td>—</td>
</tr>
</tbody>
</table>

### DYNAMIC CHARACTERISTICS (1)

<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>Output Capacitance ((V_{CB} = 28) Vdc, (I_E = 0), (f = 1.0) MHz)</td>
<td>(C_{ob})</td>
<td>40</td>
<td>75</td>
<td>95</td>
<td>pF</td>
</tr>
</tbody>
</table>

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

<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>Common–Emitter Amplifier Power Gain</td>
<td>(Q_{pe})</td>
<td>7.5</td>
<td>8.5</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>((V_{CC} = 28) Vdc, (P_{out} = 100) W, (f = 500) MHz)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector Efficiency</td>
<td>(\eta)</td>
<td>50</td>
<td>55</td>
<td>—</td>
<td>%</td>
</tr>
<tr>
<td>((V_{CC} = 28) Vdc, (P_{out} = 100) W, (f = 500) MHz)</td>
<td></td>
<td></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>
<tr>
<td>((V_{CC} = 28) Vdc, (P_{out} = 100) W, (f = 500) MHz, (VSWR = 30:1, \text{all phase angles}))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
1. Each transistor chip measured separately.
2. Both transistor chips operating in push–pull amplifier.
MRF393

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Figure 1. 600 MHz Test Fixture

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.

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
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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

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NOTE: \( Z_{\text{in}} \) & \( Z_{\text{OL}} \) are given from base-to-base and collector-to-collector respectively.

**Figure 6. Series Equivalent Input/Output Impedance**

\[
\begin{array}{|c|c|c|}
\hline
 f (MHz) & Z_{\text{in}} & Z_{\text{OL}}^* \\
\hline
 100 & 0.85 + j0 & 7.8 - j5.6 \\
 225 & 0.50 + j2.6 & 5.0 - j2.2 \\
 400 & 3.00 + j5.0 & 3.2 - j0.6 \\
 500 & 4.80 + j3.0 & 2.9 + j1.2 \\
\hline
\end{array}
\]

**Figure 7. Class AB Output Power versus Input Power**
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PACKAGE DIMENSIONS

CASE 744A–01
ISSUE C
MRF393

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Rev. V1

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