**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>( V_{CEO} )</td>
<td>30</td>
<td>( V )</td>
</tr>
<tr>
<td>Collector–Base Voltage</td>
<td>( V_{CBO} )</td>
<td>60</td>
<td>( V )</td>
</tr>
<tr>
<td>Emitter–Base Voltage</td>
<td>( V_{EBO} )</td>
<td>4.0</td>
<td>( V )</td>
</tr>
<tr>
<td>Collector Current — Continuous</td>
<td>( I_C )</td>
<td>16</td>
<td>( A )</td>
</tr>
<tr>
<td>Total Device Dissipation @ ( T_C = 25^\circ C ) (1)</td>
<td>( P_D )</td>
<td>270</td>
<td>Watts</td>
</tr>
<tr>
<td>Derate above ( 25^\circ C )</td>
<td></td>
<td>1.54</td>
<td>Watts ( 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>
<tr>
<td>Junction Temperature</td>
<td>( T_J )</td>
<td>200</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_{thJC} )</td>
<td>0.65</td>
<td>( ^\circ 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.
# MRF393

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### ELECTRICAL CHARACTERISTICS (I<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 mA, 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>V&lt;sub&gt;dc&lt;/sub&gt;</td>
</tr>
<tr>
<td>Collector–Emitter Breakdown Voltage (I&lt;sub&gt;C&lt;/sub&gt; = 50 mA, 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>V&lt;sub&gt;dc&lt;/sub&gt;</td>
</tr>
<tr>
<td>Emitter–Base Breakdown Voltage (I&lt;sub&gt;E&lt;/sub&gt; = 5.0 mA, 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>V&lt;sub&gt;dc&lt;/sub&gt;</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>mA&lt;sub&gt;dc&lt;/sub&gt;</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 | 95 | 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 | 8.5 | —  | 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, V<sub>SWR</sub> = 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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Figure 2. Output Power versus Input Power

Figure 3. Output Power versus Input Power

Figure 4. Output Power versus Supply Voltage

Figure 5. Output Power versus Supply Voltage
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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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Rev. V1

PACKAGE DIMENSIONS

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