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

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>VCBO</td>
<td>60</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Voltage</td>
<td>VEBO</td>
<td>4.0</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Current — Continuous</td>
<td>IC</td>
<td>16</td>
<td>Adc</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.

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ELECTRICAL CHARACTERISTICS (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>Collector–Emitter Breakdown Voltage (I_C = 50 mA, 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 mA, V_CE = 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 mA, 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 A, 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>
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</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 (V_CC = 28 Vdc, P_out = 100 W, f = 500 MHz)</td>
<td>Q_pe</td>
<td>7.5</td>
<td>8.5</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>Collector Efficiency (V_CC = 28 Vdc, P_out = 100 W, f = 500 MHz)</td>
<td>η</td>
<td>50</td>
<td>55</td>
<td>—</td>
<td>%</td>
</tr>
<tr>
<td>Load Mismatch (V_CC = 28 Vdc, P_out = 100 W, f = 500 MHz, VSWR = 30:1, all phase angles)</td>
<td>Ψ</td>
<td>—</td>
<td>—</td>
<td>No Degradation in Output Power</td>
<td></td>
</tr>
</tbody>
</table>

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, eᵣ = 2.56, 1 oz. Copper Clad both sides.
MRF393

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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 and Z_out 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

Rev. V1

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PACKAGE DIMENSIONS

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982

<table>
<thead>
<tr>
<th>MILLIMETERS</th>
<th>INCHES</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>MIN</td>
</tr>
<tr>
<td>B</td>
<td>10.05</td>
</tr>
<tr>
<td>C</td>
<td>2.86</td>
</tr>
<tr>
<td>D</td>
<td>4.01</td>
</tr>
<tr>
<td>E</td>
<td>3.04</td>
</tr>
<tr>
<td>F</td>
<td>2.22</td>
</tr>
<tr>
<td>G</td>
<td>16.16</td>
</tr>
<tr>
<td>H</td>
<td>4.06</td>
</tr>
<tr>
<td>J</td>
<td>2.03</td>
</tr>
<tr>
<td>K</td>
<td>6.35</td>
</tr>
<tr>
<td>L</td>
<td>12.75</td>
</tr>
<tr>
<td>M</td>
<td>45.00</td>
</tr>
<tr>
<td>N</td>
<td>1.02</td>
</tr>
<tr>
<td>O</td>
<td>3.04</td>
</tr>
<tr>
<td>R</td>
<td>6.35</td>
</tr>
<tr>
<td>S</td>
<td>1.27</td>
</tr>
</tbody>
</table>

STYLE 1:
1. Emitter (common)
2. Collector
3. Collector
4. Emitter (common)
5. Emitter (common)
6. Base
7. Base
8. Emitter (common)

CASE 744A–01
ISSUE C

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