# MOTOROLA
## SEMICONDUCTOR TECHNICAL DATA

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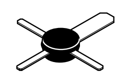
### The RF Line
# NPN Silicon RF Low Power Transistor

**MRF555**

Designed primarily for wideband large signal predriver stages in the UHF frequency range.

- Specified @ 12.5 V, 470 MHz Characteristics @ $P_{out}$ = 1.5 W
  Common Emitter Power Gain = 12.5 dB (Typ)
  Efficiency 60% (Typ)
- Cost Effective PowerMacro Package
- Electroless Tin Plated Leads for Improved Solderability
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

**1.5 W, 470 MHz
RF LOW POWER
TRANSISTOR
NPN SILICON**



**CASE 317D–02, STYLE 2**

**MAXIMUM RATINGS**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector–Emitter Voltage | $V_{CEO}$ | 16 | Vdc |
| Collector–Base Voltage | $V_{CBO}$ | 36 | Vdc |
| Emitter–Base Voltage | $V_{EBO}$ | 4.0 | Vdc |
| Collector Current — Continuous | $I_C$ | 400 | mAdc |
| Operating Junction Temperature | $T_J$ | 150 | °C |
| Total Device Dissipation @ $T_C$ = 75°C (1, 2)<br>Derate above 75°C | $P_D$ | 3.0<br>40 | Watts<br>mW/°C |
| Storage Temperature Range | $T_{stg}$ | –55 to +150 | °C |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 25 | °C/W |

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector–Emitter Breakdown Voltage<br>($I_C$ = 5.0 mAdc, $I_B$ = 0) | $V_{(BR)CEO}$ | 16 | — | — | Vdc |
| Collector–Emitter Breakdown Voltage<br>($I_C$ = 5.0 mAdc, $V_{BE}$ = 0) | $V_{(BR)CES}$ | 36 | — | — | Vdc |
| Emitter–Base Breakdown Voltage<br>($I_E$ = 0.1 mAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | 4.0 | — | — | Vdc |
| Collector Cutoff Current<br>($V_{CE}$ = 15 Vdc, $V_{BE}$ = 0, $T_C$ = 25°C) | $I_{CES}$ | — | — | 0.1 | mAdc |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain<br>($I_C$ = 100 mAdc, $V_{CE}$ = 5.0 Vdc) | $h_{FE}$ | 50 | 90 | 200 | — |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Output Capacitance<br>($V_{CB}$ = 15 Vdc, $I_E$ = 0, f = 1.0 MHz) | $C_{ob}$ | — | 3.5 | 5.0 | pF |

NOTES:
1. $T_C$, Case temperature measured on collector lead immediately adjacent to body of package.
2. The MRF555 PowerMacro must be properly mounted for reliable operation. AN938, “Mounting Techniques in PowerMacro Transistor,” discusses methods of mounting and heatsinking.

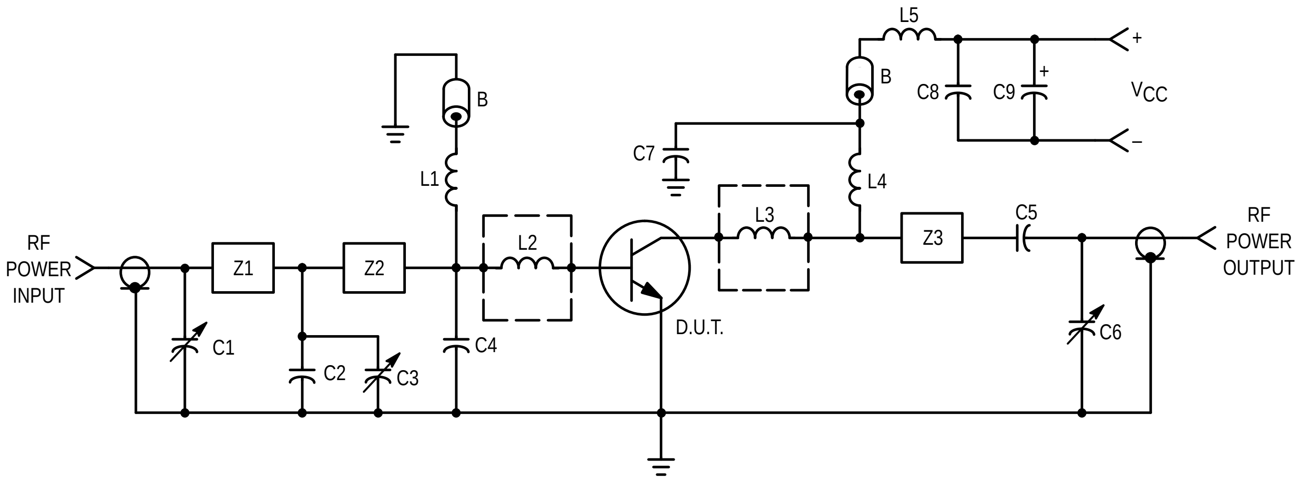
(continued)



MOTOROLA

**ELECTRICAL CHARACTERISTICS — continued** ($T_A$ = 25°C unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **FUNCTIONAL TESTS** (f = 470 MHz) | | | | | |
| Common–Emitter Power Gain ($V_{CC}$ = 12.5 Vdc, $P_{out}$ = 1.5 W) | $G_{pe}$ | 11 | 12.5 | — | dB |
| Collector Efficiency ($V_{CC}$ = 12.5 Vdc, $P_{out}$ = 1.5 W) | $\eta_c$ | 50 | 60 | — | % |
| Load Mismatch Stress ($V_{CC}$ = 15.5 Vdc, $P_{in}$ = 125 mW, VSWR ≥ 10:1 all phase angles) | ψ | No Degradation in Output Power | | | |




*C1, C3, C6 — 0.8 – 11 pF Johanson
C2 — 15 pF Clamped Mica, Mini–Underwood
C4 — 36 pF Clamped Mica, Mini–Underwood
C5 — 470 pF Ceramic Chip Capacitor
C7 — 91 pF Clamped Mica, Mini–Underwood
C8 — 68 pF Clamped Mica, Mini–Underwood
C9 — 1.0 µF, 25 V Tantalum
B — Bead, Ferroxcube 56–590–65/3B

*Fixed tuned for broadband response

L1 — 5 Turns #21 AWG, 5/32″ I.D.
L2, L3 — 60 x 125 x 250 Mils Copper Pad on 27 Mil Thick Alumina Substrate
L4, L5 — 7 Turns #21 AWG 5/32″ I.D.
Z1 — 1.29″ x 0.16″ Microstrip
Z2 — 0.70″ x 0.16″ Microstrip
Z3 — 2.18″ x 0.16″ Microstrip

PCB — 1/16″ Glass Teflon, 1 oz. cu. clad, double sided, $\varepsilon_r$ = 2.5

**Figure 1. 400 – 512 MHz Broadband Circuit**

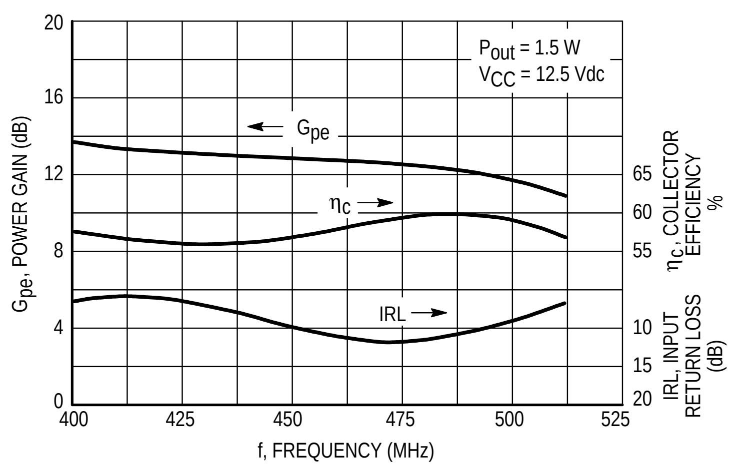



**Figure 2. Performance in Broadband Circuit**

| f Frequency MHz | $Z_{in}$ Ohms | | $Z_{OL}$* Ohms | |
|---|---|---|---|---|
| | $V_{CC}$ = 7.5 V | $V_{CC}$ = 12.5 V | $V_{CC}$ = 7.5 V | $V_{CC}$ = 12.5 V |
| | $P_{in}$ = 100 mW | $P_{in}$ = 50 mW | $P_{out}$ 400 MHz = 1.5 W<br>$P_{out}$ 450 MHz = 1.35 W<br>$P_{out}$ 512 MHz = 1.05 W | $P_{out}$ 400 MHz = 1.9 W<br>$P_{out}$ 450 MHz = 1.45 W<br>$P_{out}$ 512 MHz = 0.9 W |
| 400 | 2.9 – j2.7 | 1.9 – j3.1 | 18.0 – j13.4 | 12.2 – j19.7 |
| 450 | 2.2 – j0.8 | 2.6 – j4.0 | 21.6 = j9.9 | 20.2 – j18.6 |
| 512 | 3.5 – j1.2 | 2.6 – j2.6 | 20.1 – j1.0 | 23.4 – j23.0 |

$Z_{OL}$* = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

**Table 1. $Z_{in}$ and $Z_{OL}$ versus Collector Voltage, Input Power and Output Power**

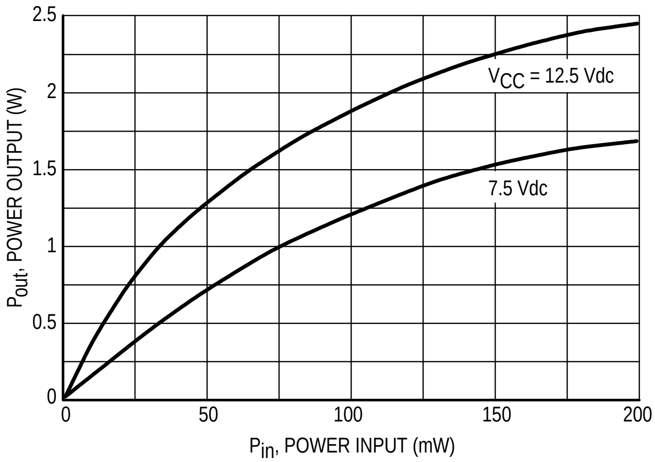



**Figure 3. Power Output versus Power Input**

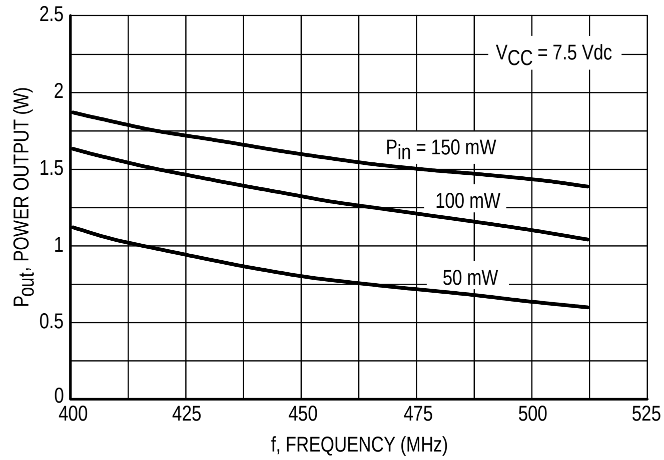



**Figure 4. Power Output versus Frequency**

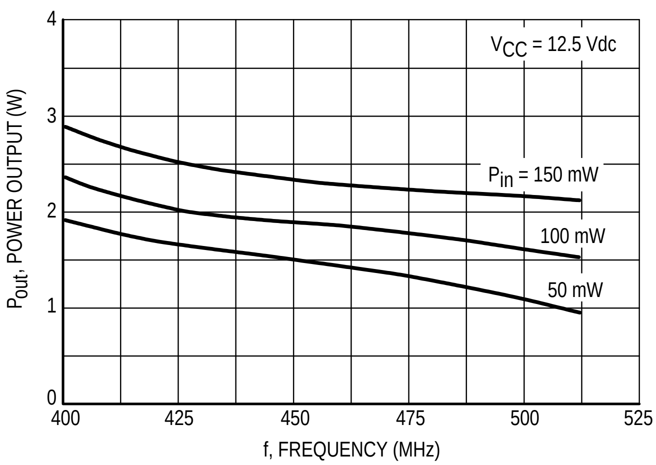



**Figure 5. Power Output versus Frequency**

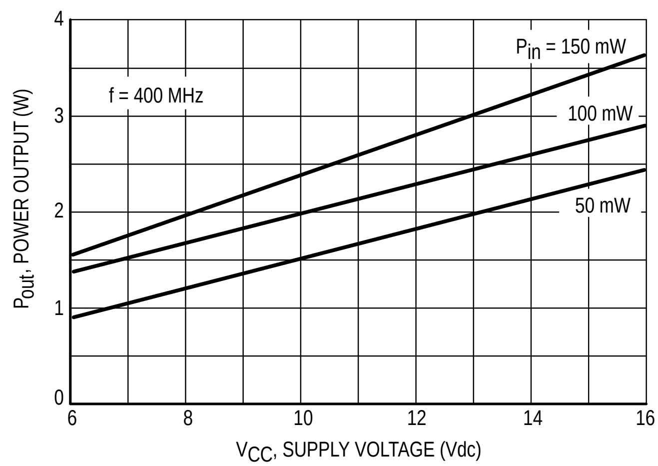



**Figure 6. Power Output versus Supply Voltage**

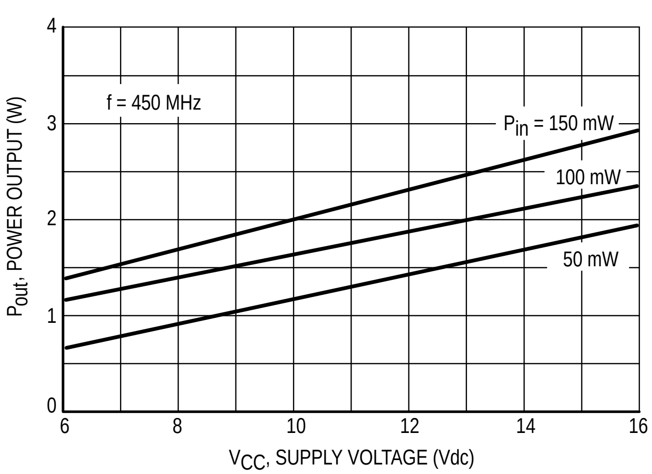



**Figure 7. Power Output versus Supply Voltage**

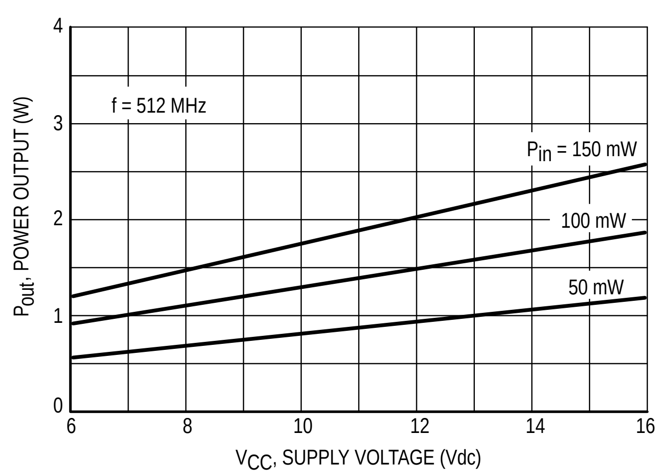
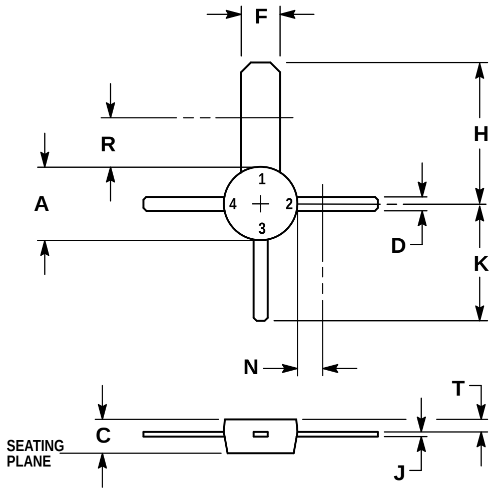



**Figure 8. Power Output versus Supply Voltage**

## PACKAGE DIMENSIONS




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. LEAD DIMENSIONS UNCONTROLLED WITHIN DIMENSION N AND R.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.175 | 0.205 | 4.45 | 5.20 |
| C | 0.075 | 0.100 | 1.91 | 2.54 |
| D | 0.033 | 0.039 | 0.84 | 0.99 |
| F | 0.097 | 0.104 | 2.46 | 2.64 |
| H | 0.348 | 0.383 | 8.84 | 9.72 |
| J | 0.008 | 0.012 | 0.24 | 0.30 |
| K | 0.285 | 0.320 | 7.24 | 8.12 |
| N | — | 0.065 | — | 1.65 |
| R | — | 0.128 | — | 3.25 |
| T | 0.025 | 0.040 | 0.64 | 1.01 |

STYLE 2:
PIN 1. COLLECTOR
2. EMITTER
3. BASE
4. EMITTER

**CASE 317D–02**
**ISSUE C**

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