# MRF8004

**CASE 79-02, STYLE 1**
**TO-39 (TO-205AD)**

## RF AMPLIFIER TRANSISTOR

**NPN SILICON**

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Emitter Voltage | $V_{CEO}$ | 30 | Vdc |
| Collector-Base Voltage | $V_{CBO}$ | 60 | Vdc |
| Emitter-Base Voltage | $V_{EBO}$ | 3.0 | Vdc |
| Collector Current — Continuous | $I_C$ | 1.0 | Adc |
| Total Device Dissipation @ $T_C$ = 25°C(1)<br>Derate above 25°C | $P_D$ | 5.0<br>28.6 | Watts<br>mW/°C |
| Storage Temperature | $T_{stg}$ | −65 to +200 | °C |

(1) This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.

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

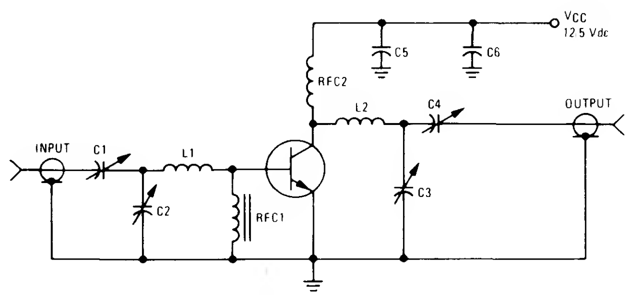
| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector-Emitter Breakdown Voltage ($I_C$ = 50 mAdc, $I_B$ = 0) | $V_{(BR)CEO}$ | 30 | — | — | Vdc |
| Collector-Emitter Breakdown Voltage ($I_C$ = 200 mAdc, $V_{BE}$ = 0) | $V_{(BR)CES}$ | 60 | — | — | Vdc |
| Emitter-Base Breakdown Voltage ($I_E$ = 1.0 mAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | 3.0 | — | — | Vdc |
| Collector Cutoff Current ($V_{CB}$ = 15 Vdc, $I_E$ = 0) | $I_{CBO}$ | — | — | 0.01 | mAdc |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain ($I_C$ = 400 mAdc, $V_{CE}$ = 2.0 Vdc) | $h_{FE}$ | 10 | — | — | — |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | |
| Output Capacitance ($V_{CB}$ = 12.5 Vdc, $I_E$ = 0, f = 1.0 MHz) | $C_{obo}$ | — | 35 | 70 | pF |
| **FUNCTIONAL TEST** | | | | | |
| Common-Emitter Amplifier Power Gain (See Figure 1) ($P_{out}$ = 3.5 W, $V_{CC}$ = 12.5 Vdc, f = 27 MHz) | $G_{PE}$ | 10 | — | — | dB |
| Collector Efficiency(2) (See Figure 1) ($P_{out}$ = 3.5 W, $V_{CC}$ = 12.5 Vdc, f = 27 MHz) | $\eta$ | 62.5 | 70 | — | % |
| Percentage Up-Modulation(1) (See Figure 1) (f = 27 MHz) | — | — | 85 | — | % |
| Parallel Equivalent Input Resistance ($P_{out}$ = 3.5 W, $V_{CC}$ = 12.5 Vdc, f = 27 MHz) | $R_{in}$ | — | 21 | — | Ohms |
| Parallel Equivalent Input Capacitance ($P_{out}$ = 3.5 W, $V_{CC}$ = 12.5 Vdc, f = 27 MHz) | $C_{in}$ | — | 900 | — | pF |
| Parallel Equivalent Output Capacitance ($P_{out}$ = 3.5 W, $V_{CC}$ = 12.5 Vdc, f = 27 MHz) | $C_{out}$ | — | 200 | — | pF |

(1) Percentage Up-Modulation is measured in the test circuit (Figure 1) by setting the Carrier Power ($P_c$) to 3.5 Watts with $V_{CC}$ = 12.5 Vdc and noting the power input. Then the Peak Envelope Power (PEP) is noted after doubling the original power input to simulate driver modulation (at a 25% duty cycle for thermal considerations) and raising the $V_{CC}$ to 25 Vdc (to simulate the modulating voltage). Percentage Up-Modulation is then determined by the relation:

$$\text{Percentage Up-Modulation} = \left[\left(\frac{PEP}{P_c}\right)^{1/2} - 1\right] \cdot 100$$

(2) $$\eta = \frac{R_F\,P_{out}}{(V_{CC})\,(I_C)} \cdot 100$$

FIGURE 1 – 27 MHz TEST CIRCUIT




| | | | |
|---|---|---|---|
| C1, C2 | 9.0-180 pF ARCO 463 or Equivalent | RFC2 | 26 Turns #22 Enameled Wire (2 Layers 13 Turns Each Layer) ¼" Inner Diameter |
| C3, C4 | 5.0-80 pF ARCO 462 or Equivalent | L1 | 0.22 μH Molded Choke |
| C5 | 0.02 μF Ceramic Disc | L2 | 0.68 μH Molded Choke |
| C6 | 0.1 μF Ceramic Disc | | |
| RFC1 | 4 Turns #30 Enameled Wire Wound on Ferroxcube Bead Type 56-590-65/3B | | |

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FIGURE 2 – CIRCUIT TUNED AT 25 V, 25% DUTY CYCLE, $P_{out}$ = 15 W PEAK

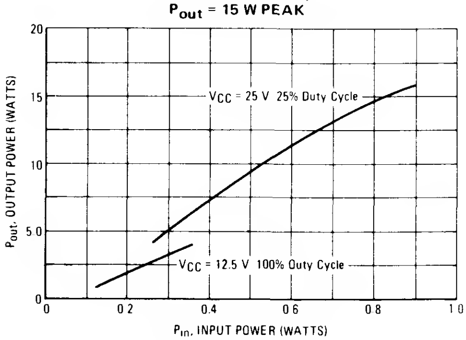


FIGURE 3 – CIRCUIT TUNED AT 12.5 V, $P_{out}$ = 4 W