MRF8004 (SILICON)

The RF Line

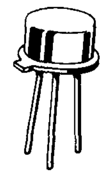
NPN SILICON RF POWER TRANSISTOR

. . . designed primarily for use in large-signal output amplifier stages. Intended for use in Citizen-Band communications equipment operating to 30 MHz. High breakdown voltages allow a high percentage of up-modulation in AM circuits.

- Specified 12.5 V, 27 MHz Characterisitcs –
  - Power Output = 3.5 W
  - Power Gain = 10 dB
  - Efficiency = 70% Typical

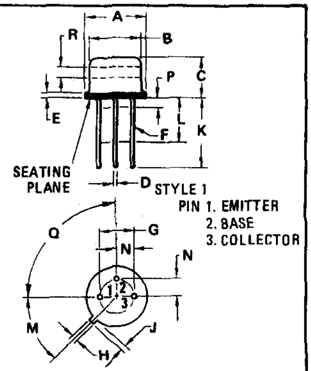
3.5 W – 27 MHz RF POWER TRANSISTOR

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) Derate above 25°C	P_D	5.0 28.6	Watts mW/°C
Storage Temperature Range	T_{stg}	-65 to +200	°C

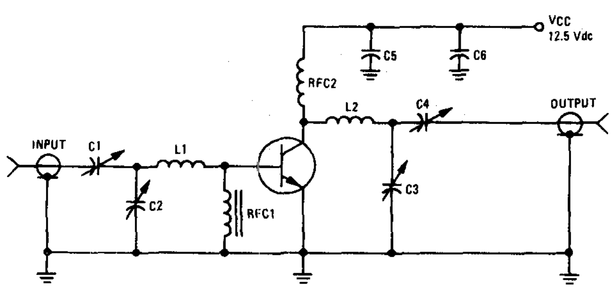


DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	8.89	9.40	0.350	0.370
B	8.00	8.51	0.315	0.335
C	6.10	6.60	0.240	0.260
D	0.406	0.533	0.016	0.021
E	0.229	3.18	0.009	0.125
F	0.406	0.483	0.016	0.019
G	4.83	5.33	0.190	0.210
H	0.711	0.864	0.028	0.034
J	0.737	1.02	0.029	0.040
K	12.70	–	0.500	–
L	6.35	–	0.250	–
M	45° NOM		45° NOM	
P	–	1.27	–	0.050
Q	90° NOM		90° NOM	
R	2.54	–	0.100	–

All JEDEC dimensions and notes apply.

CASE 79-02
TO-39

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		

(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)	BV_{CEO}	30	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 200 mAdc, V_{BE} = 0)	BV_{CES}	60	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 1.0 mAdc, I_C = 0)	BV_{EBO}	3.0	–	–	Vdc
Collector Cutoff Current (V_{CB} = 50 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	–	–	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 12.5 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	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)	η	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:

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

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

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

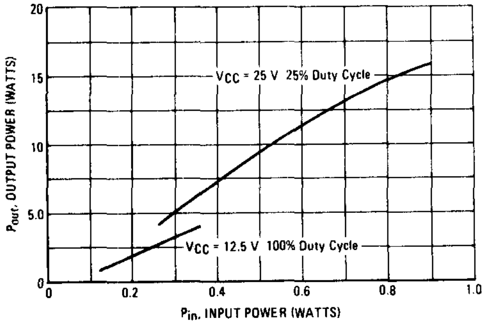


FIGURE 3 – CIRCUIT TUNED AT 12.5 V, P_{out} = 4 W