

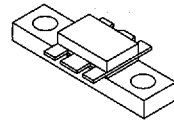
The RF Line
NPN Silicon
RF Power Transistor

MRF840

... designed for 12.5 volt UHF large-signal, common-base amplifier applications in industrial and commercial FM equipment operating in the range of 806–960 MHz.

- Specified 12.5 Volt, 870 MHz Characteristics
Output Power = 10 Watts
Power Gain = 6.0 dB Min
Efficiency = 50% Min
- Series Equivalent Large-Signal Characterization
- Internally Matched Input for Broadband Operation
- Tested for Load Mismatch Stress at All Phase Angles with 20:1 VSWR @ 15.5 Volt Supply and 50% RF Overdrive
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Silicon Nitride Passivated

10 W, 870 MHz
RF POWER
TRANSISTOR
NPN SILICON



CASE 319-07, STYLE 1

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	3.8	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate above 25°C	P_D	40 0.32	Watts W/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	3.1	$^\circ\text{C}/\text{W}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ($I_C = 50 \text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	16	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 50 \text{ mAdc}$, $V_{BE} = 0$)	$V_{(BR)CES}$	36	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 5.0 \text{ mAdc}$, $I_C = 0$)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 15 \text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	—	2.0	mAdc

NOTES:

1. This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.
2. Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

(continued)

ELECTRICAL CHARACTERISTICS — continued ($T_C = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
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ON CHARACTERISTICS

DC Current Gain ($I_C = 1.0 \text{ Adc}$, $V_{CE} = 5.0 \text{ Vdc}$)	h_{FE}	10	—	—	—
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DYNAMIC CHARACTERISTICS

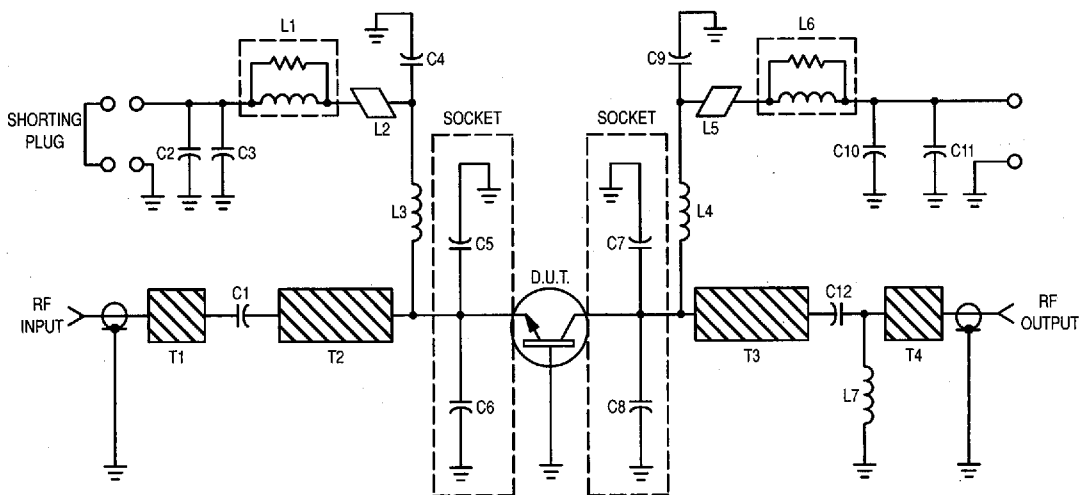
Output Capacitance ($V_{CB} = 12.5 \text{ Vdc}$, $I_E = 0$, $f = 1.0 \text{ MHz}$)	C_{ob}	—	24	35	pF
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FUNCTIONAL TESTS

Common-Base Amplifier Power Gain ($P_{out} = 10 \text{ W}$, $V_{CC} = 12.5 \text{ Vdc}$, $f = 870 \text{ MHz}$)	G_{PB}	6.0	7.0	—	dB
Collector Efficiency ($P_{out} = 10 \text{ W}$, $V_{CC} = 12.5 \text{ Vdc}$, $f = 870 \text{ MHz}$)	η	50	55	—	%
Load Mismatch Stress ($V_{CC} = 15.5 \text{ Vdc}$, $P_{in} = 3.0 \text{ W}$, (3) $f = 870 \text{ MHz}$, VSWR = 20:1, all phase angles)	—	No Degradation in Output Power			

NOTE:

3. $P_{in} = 150\%$ of the typical input power requirement for 10 W output power @ 12.5 Vdc.



- C1, C12 — 50 pF, 100 Mil Chip Capacitor
- C2, C11 — 15 μF , 20 V Tantalum
- C3, C10 — 1000 pF, 350 V UNELCO
- C4, C9 — 91 pF Mini-Underwood
- C5 — 15 pF
- C6 — 15 pF
- C7 — 15 pF
- C8 — 15 pF

- L1, L6 — 11 Turns 20 AWG Around 10 Ω 1/2 W Resistor
- L2, L5 — Ferrite Bead
- L3, L4 — 4 Turn 20 AWG 0.2" I.D.
- T1, T4 — $Z_O = 50 \Omega$
- T2 — $Z_O = 30 \Omega$ $\ell = \lambda/4$ @ 838 MHz
- T3 — $Z_O = 13.5 \Omega$ $\ell = \lambda/4$ @ 838 MHz

L7 — 18 AWG Wire Loop

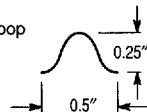


Figure 1. 870 MHz Test Circuit

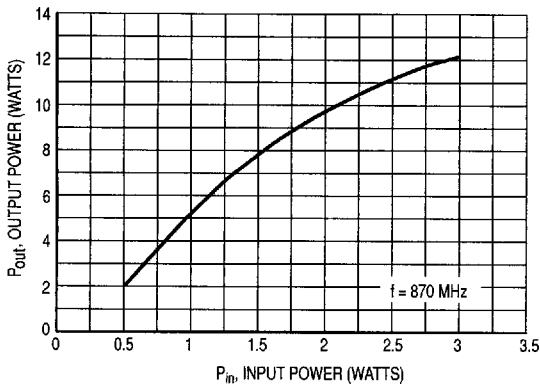


Figure 2. Output Power versus Input Power

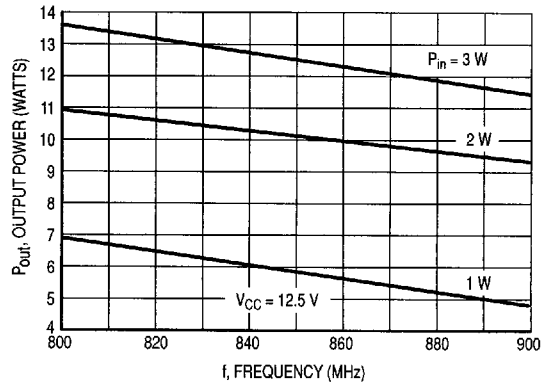


Figure 3. Output Power versus Frequency

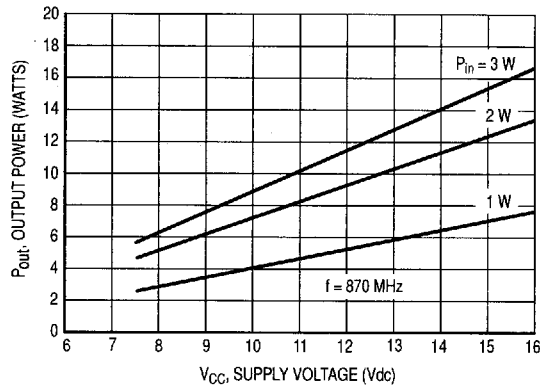
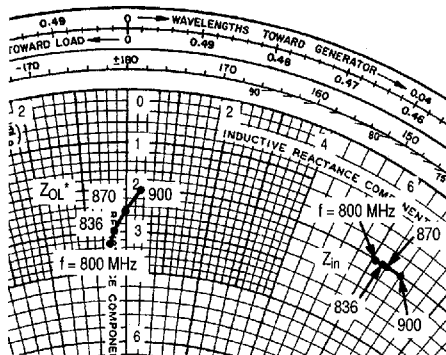


Figure 4. Output Power versus Supply Voltage



$P_{out} = 10\text{ W}$, $V_{CC} = 12.5\text{ Vdc}$

f MHz	Z_{in} Ohms	Z_{OL}^* Ohms
800	$2.0 + j6.1$	$3.3 - j0.4$
836	$2.0 + j6.2$	$3.0 - j0.3$
870	$2.0 + j6.4$	$2.5 + j0.0$
900	$2.0 + j6.8$	$2.0 + j0.3$

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

Figure 5. Series Equivalent Input/Output Impedance