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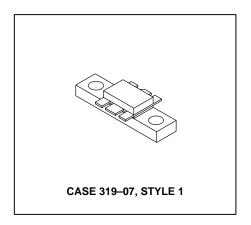
### The RF Line NPN Silicon RF Power Transistor

... 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 = 20 Watts
   Power Gain = 6.0 dB Min
   Efficiency = 50% Min
- Series Equivalent Large-Signal Characterization
- · Internally Matched Input for Broadband Operation
- 100% 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

### **MRF842**

20 W, 870 MHz RF POWER TRANSISTOR NPN SILICON



### **MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	VCEO	16	Vdc
Collector–Base Voltage	VCBO	36	Vdc
Emitter–Base Voltage	VEBO	4.0	Vdc
Collector Current — Continuous	IC	7.6	Adc
Total Device Dissipation @ T <sub>C</sub> = 25°C (1)  Derate above 25°C	PD	80 0.64	Watts W/°C
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	1.5	°C/W

### **ELECTRICAL CHARACTERISTICS** (T<sub>C</sub> = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Тур	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I <sub>C</sub> = 50 mAdc, I <sub>B</sub> = 0)	V(BR)CEO	16	_	_	Vdc
Collector–Emitter Breakdown Voltage (IC = 50 mAdc, VBE = 0)	V(BR)CES	36	_	_	Vdc
Emitter–Base Breakdown Voltage (I <sub>E</sub> = 10 mAdc, I <sub>C</sub> = 0)	V(BR)EBO	4.0	_	_	Vdc
Collector Cutoff Current (V <sub>CB</sub> = 15 Vdc, I <sub>E</sub> = 0)	ІСВО	_	_	5.0	mAdc

NOTES:

(continued)

- 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.

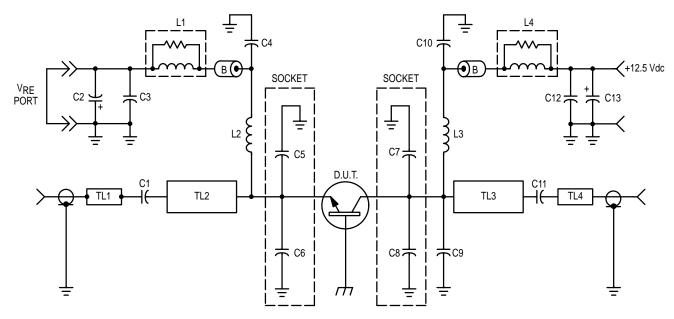




**ELECTRICAL CHARACTERISTICS** — **continued** ( $T_C = 25$ °C unless otherwise noted.)

Characteristic	Symbol	Min	Тур	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I <sub>C</sub> = 2.0 Adc, V <sub>CE</sub> = 5.0 Vdc)	hFE	10	_	_	_
DYNAMIC CHARACTERISTICS	DYNAMIC CHARACTERISTICS				
Output Capacitance (V <sub>CB</sub> = 12.5 Vdc, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>ob</sub>	_	45	65	pF
FUNCTIONAL TESTS					
Common–Base Amplifier Power Gain (P <sub>Out</sub> = 20 W, V <sub>CC</sub> = 12.5 Vdc, f = 870 MHz)	G <sub>PB</sub>	6.0	7.0	_	dB
Collector Efficiency (P <sub>Out</sub> = 20 W, V <sub>CC</sub> = 12.5 Vdc, f = 870 MHz)	η	50	55	_	%
Load Mismatch Stress (V <sub>CC</sub> = 15.5 Vdc, P <sub>in</sub> (3) = 6.0 W, f = 870 MHz, VSWR = 20:1, all phase angles)	_	No Degradation in Output Power			

### NOTE:



B — Ferrite Bead, Ferroxcube 56-590-65-3B

C1, C11 — 51 pF, 100 Mil Chip Capacitor

C2, C13 — 15  $\mu$ F, 20 WV Tantalum

C3, C12 — 1000 pF Unelco J101

C4, C10 — 91 pF Mini-Underwood

C5 — 15 pF Mini-Underwood

C6 — 12 pF Mini-Underwood

C7, C8 — 21 pF Mini–Underwood

C9 — 11 pF Mini-Underwood

L1, L4 — 11 Turns #20 AWG Over 10 ohm 1/2 W Carbon L2, L3 — 4 Turns #20 AWG, 200 Mil ID

TL1, TL4 — Micro Strip,  $Z_0$  = 50  $\Omega$ 

TL2 — Micro Strip,  $Z_0 = 38 \Omega$ ,  $\lambda/4 @ 838 MHz$ 

TL3 — Micro Strip,  $Z_0 = 24 \Omega$ ,  $\lambda/4$  @ 838 MHz

Board — 0.032" Glass Teflon

2 oz. Cu CLAD,  $\varepsilon_r = 2.55$ 

Figure 1. 870 MHz Test Circuit Schematic

<sup>3.</sup>  $P_{in}$  = 150% of the typical input power requirement for 20 W output power @ 12.5 Vdc.



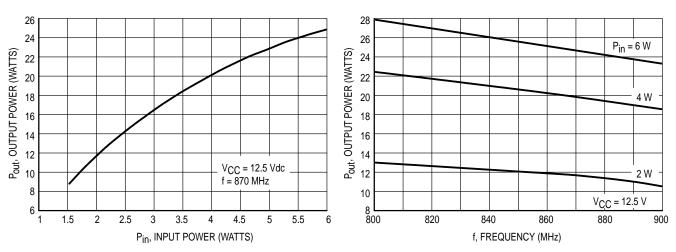


Figure 2. Output Power versus Input Power

Figure 3. Output Power versus Frequency

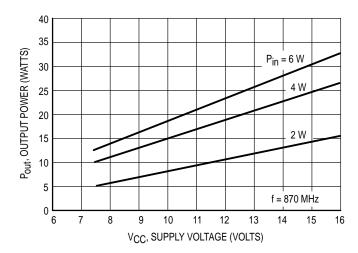
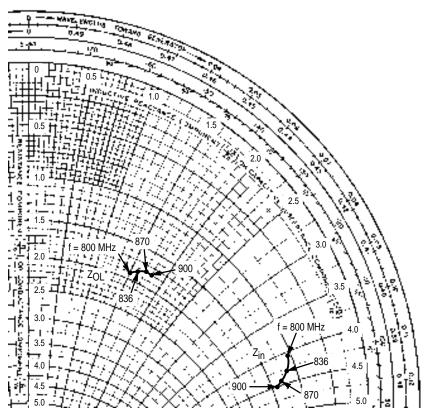


Figure 4. Output Power versus Supply Voltage



 $P_{out}$  = 20 W,  $V_{CC}$  = 12.5 Vdc

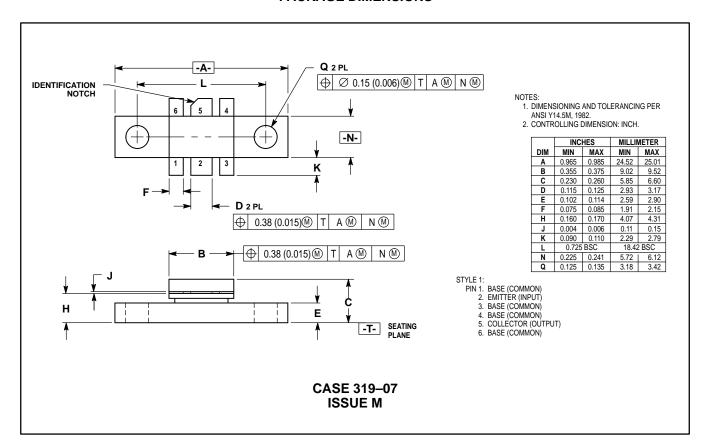
f MHz	Z <sub>in</sub> Ohms	Z <sub>OL</sub> * Ohms
800	1.1 + j4.1	1.9 + j1.5
836	1.2 + j4.3	1.85 + j1.6
870	1.4 + j4.4	1.8 + j1.7
900	1.6 + j4.5	1.8 + j1.8

Z<sub>OL</sub>\* = 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

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