MOTOROLA
SEMICONDUCTOR TECHNICAL DATA

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by MRF842/D

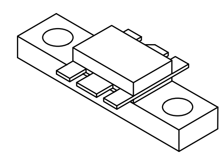
The RF Line
NPN Silicon
RF Power Transistor

. . . 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



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	7.6	Adc
Total Device Dissipation @ T_C = 25°C (1) Derate above 25°C	P_D	80 0.64	Watts W/°C
Storage Temperature Range	T_{stg}	–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 (TC = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I_C = 50 mAdc, I_B = 0)	$V_{(BR)CEO}$	16	—	—	Vdc
Collector–Emitter Breakdown Voltage (I_C = 50 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	—	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 10 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 15 Vdc, I_E = 0)	I_{CBO}	—	—	5.0	mAdc

(continued)

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.

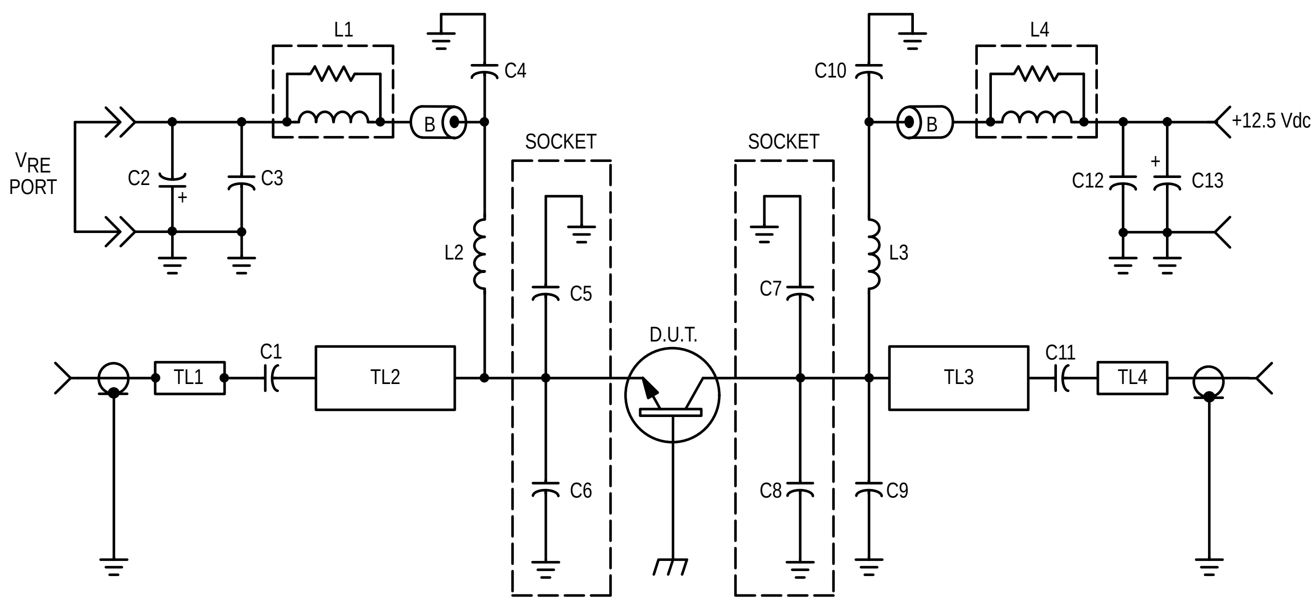
REV 6

MOTOROLA

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_C = 2.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	10	—	—	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 12.5 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	—	45	65	pF
FUNCTIONAL TESTS					
Common–Base Amplifier Power Gain (P_{out} = 20 W, V_{CC} = 12.5 Vdc, f = 870 MHz)	G_{PB}	6.0	7.0	—	dB
Collector Efficiency (P_{out} = 20 W, V_{CC} = 12.5 Vdc, f = 870 MHz)	η	50	55	—	%
Load Mismatch Stress (V_{CC} = 15.5 Vdc, P_{in} (3) = 6.0 W, f = 870 MHz, VSWR = 20:1, all phase angles)	—	No Degradation in Output Power			

NOTE:
3. P_{in} = 150% of the typical input power requirement for 20 W output power @ 12.5 Vdc.



B — Ferrite Bead, Ferroxcube 56–590–65–3B
C1, C11 — 51 pF, 100 Mil Chip Capacitor
C2, C13 — 15 µF, 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_O = 50 Ω
TL2 — Micro Strip, Z_O = 38 Ω, λ/4 @ 838 MHz
TL3 — Micro Strip, Z_O = 24 Ω, λ/4 @ 838 MHz
Board — 0.032″ Glass Teflon
2 oz. Cu CLAD, ε_r = 2.55

Figure 1. 870 MHz Test Circuit Schematic

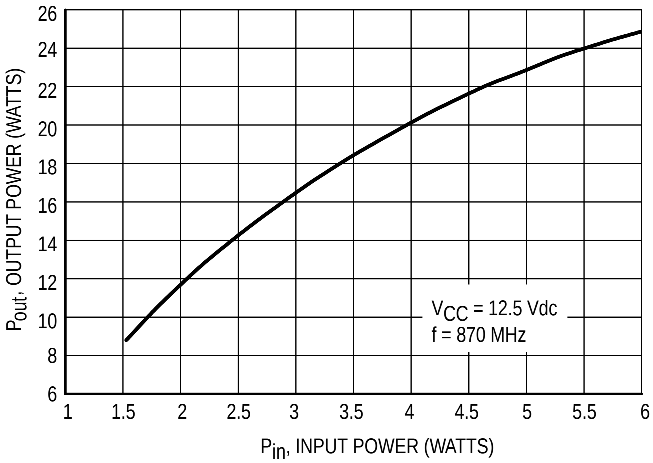


Figure 2. Output Power versus Input Power

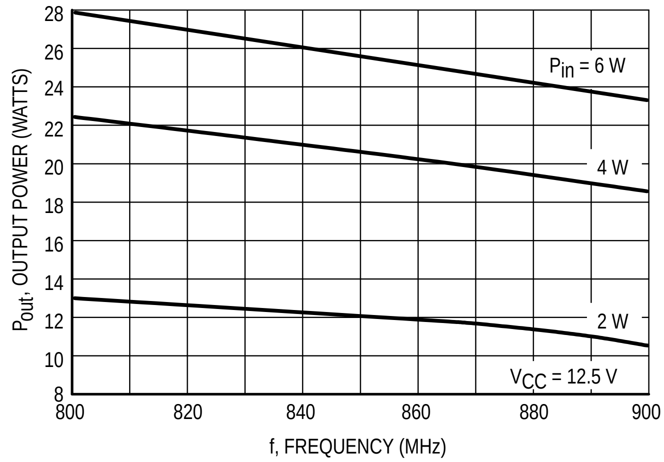


Figure 3. Output Power versus Frequency

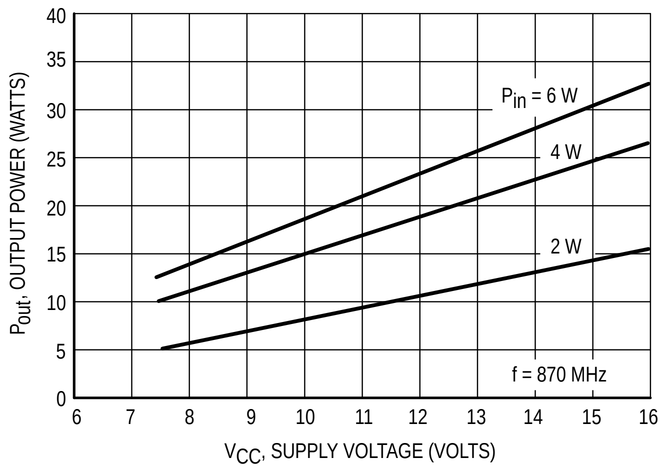
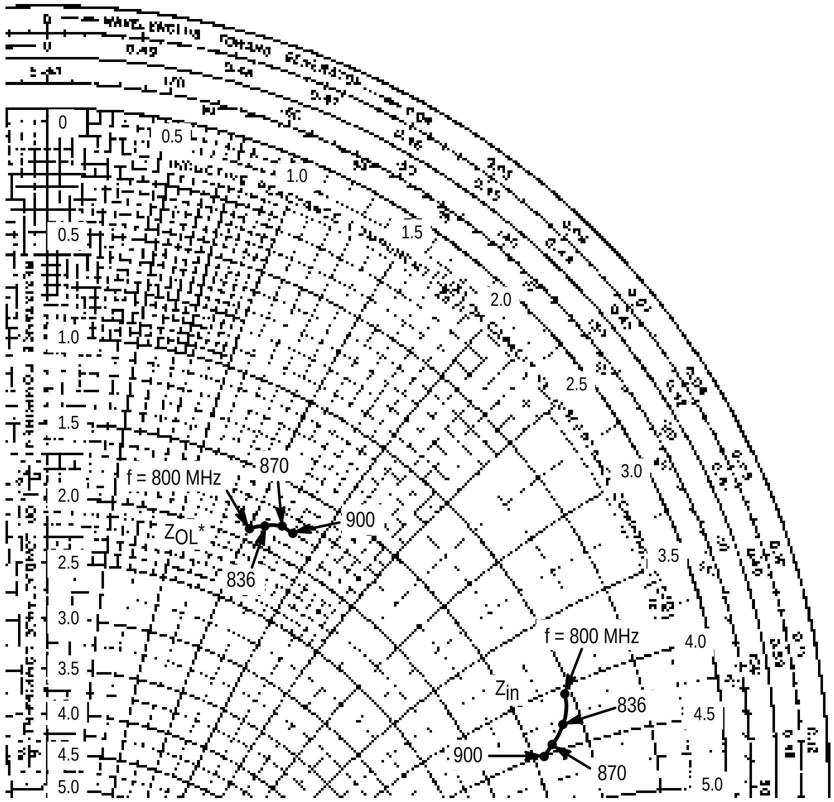


Figure 4. Output Power versus Supply Voltage



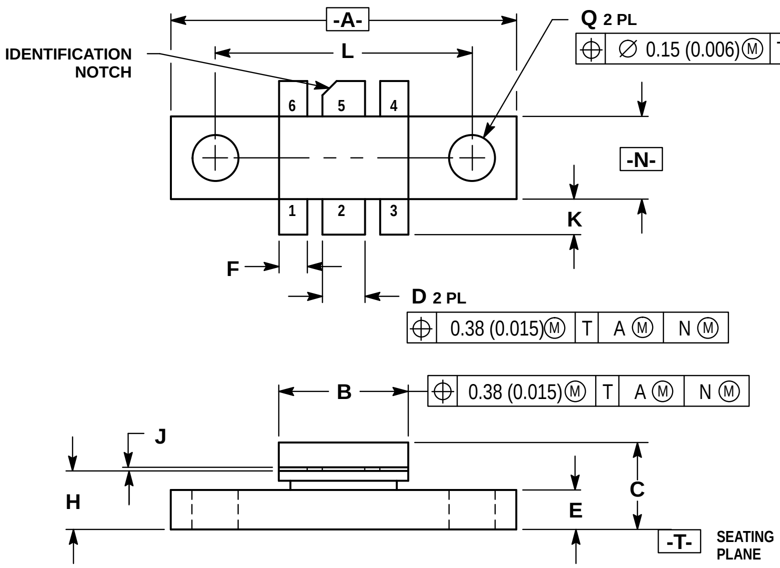
P_{out} = 20 W, V_{CC} = 12.5 Vdc

f MHz	Z_{in} Ohms	Z_{OL}* 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_{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

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES MIN	INCHES MAX	MILLIMETER MIN	MILLIMETER MAX
A	0.965	0.985	24.52	25.01
B	0.355	0.375	9.02	9.52
C	0.230	0.260	5.85	6.60
D	0.115	0.125	2.93	3.17
E	0.102	0.114	2.59	2.90
F	0.075	0.085	1.91	2.15
H	0.160	0.170	4.07	4.31
J	0.004	0.006	0.11	0.15
K	0.090	0.110	2.29	2.79
L	0.725 BSC		18.42 BSC	
N	0.225	0.241	5.72	6.12
Q	0.125	0.135	3.18	3.42

STYLE 1:
PIN 1. BASE (COMMON)
2. EMITTER (INPUT)
3. BASE (COMMON)
4. BASE (COMMON)
5. COLLECTOR (OUTPUT)
6. BASE (COMMON)

CASE 319–07
ISSUE M

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