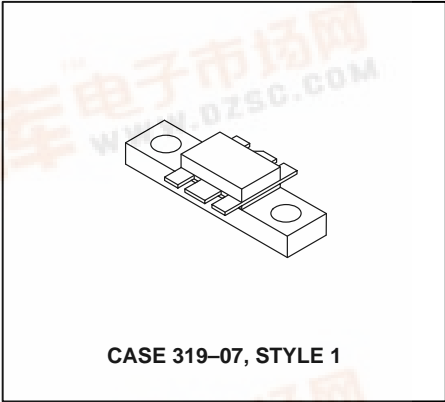


The RF Line NPN Silicon RF Power Transistor



**20 W, 870 MHz
 RF POWER
 TRANSISTOR
 NPN SILICON**



... 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

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 @ $T_C = 25^\circ\text{C}$ (1) Derate above 25°C	P_D	80 0.64	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)	$R_{\theta JC}$	1.5	$^\circ\text{C/W}$

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 ($I_C = 50$ 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

NOTES:

(continued)

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

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 ($I_C = 2.0 \text{ Adc}$, $V_{CE} = 5.0 \text{ Vdc}$)	h_{FE}	10	—	—	—
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DYNAMIC CHARACTERISTICS

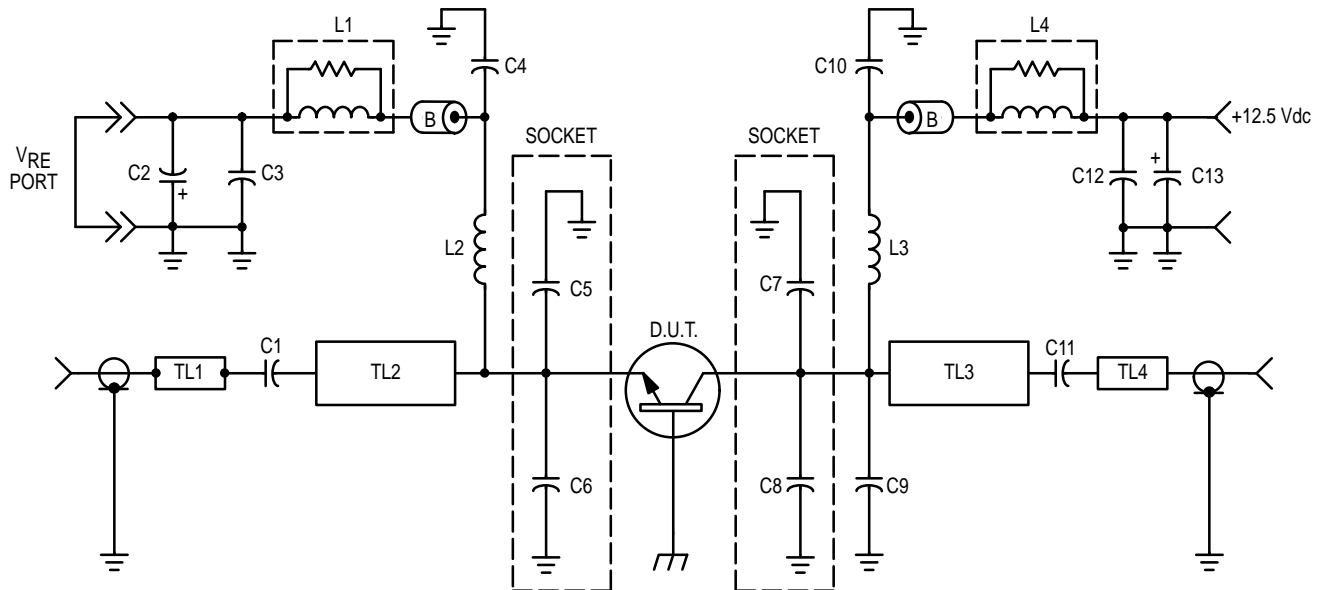
Output Capacitance ($V_{CB} = 12.5 \text{ Vdc}$, $I_E = 0$, $f = 1.0 \text{ MHz}$)	C_{ob}	—	45	65	pF
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FUNCTIONAL TESTS

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

NOTE:

3. $P_{in} = 150\%$ of the typical input power requirement for 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, $Z_0 = 50 \Omega$
 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, $\epsilon_r = 2.55$

Figure 1. 870 MHz Test Circuit Schematic

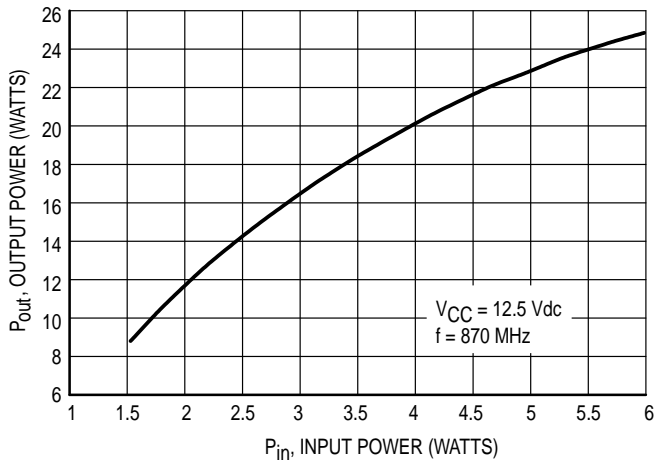


Figure 2. Output Power versus Input Power

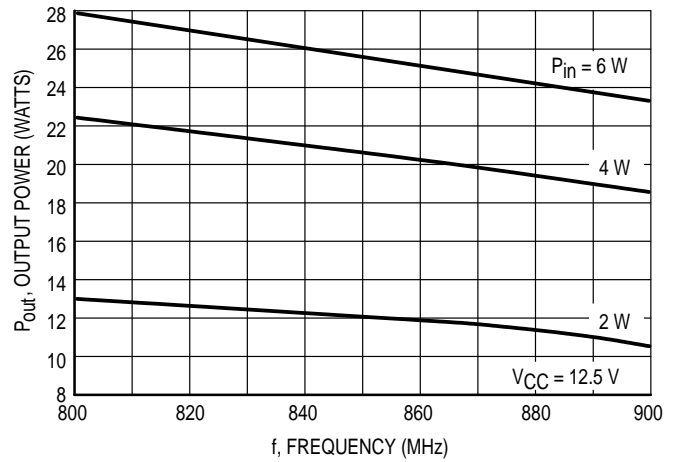


Figure 3. Output Power versus Frequency

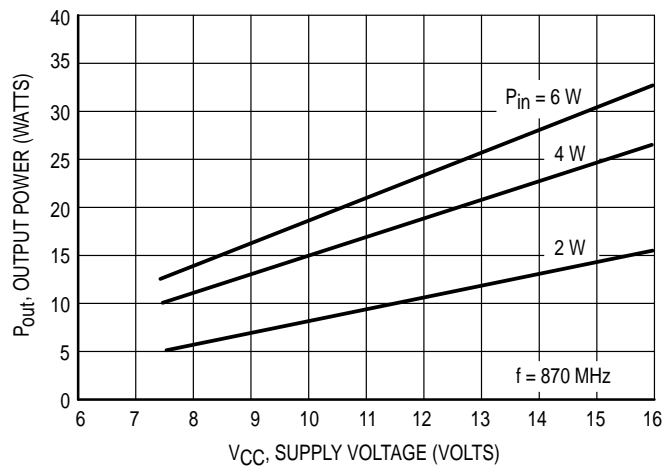
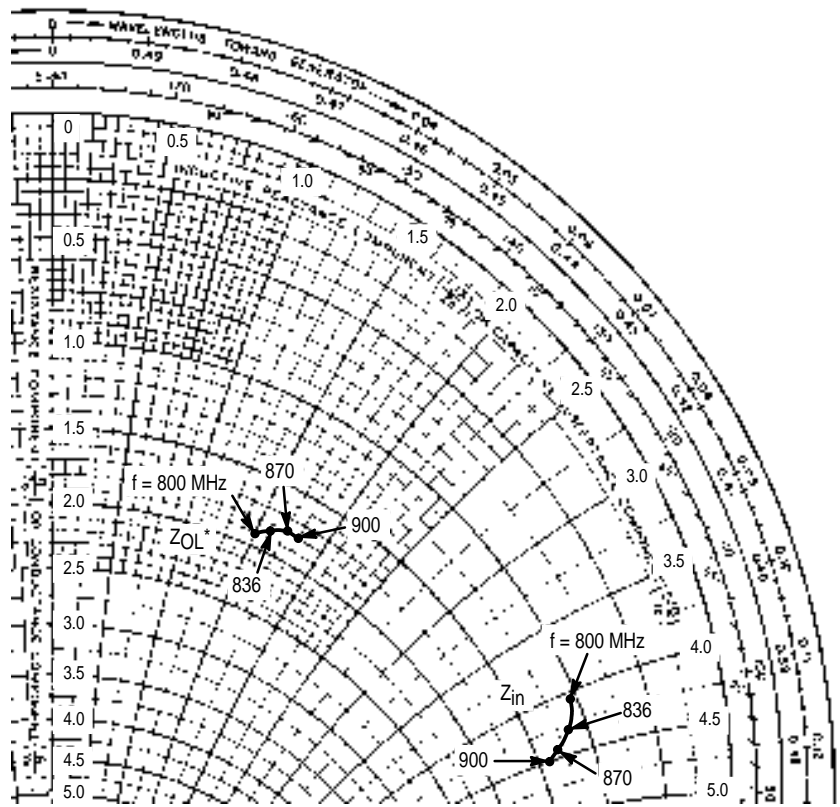


Figure 4. Output Power versus Supply Voltage



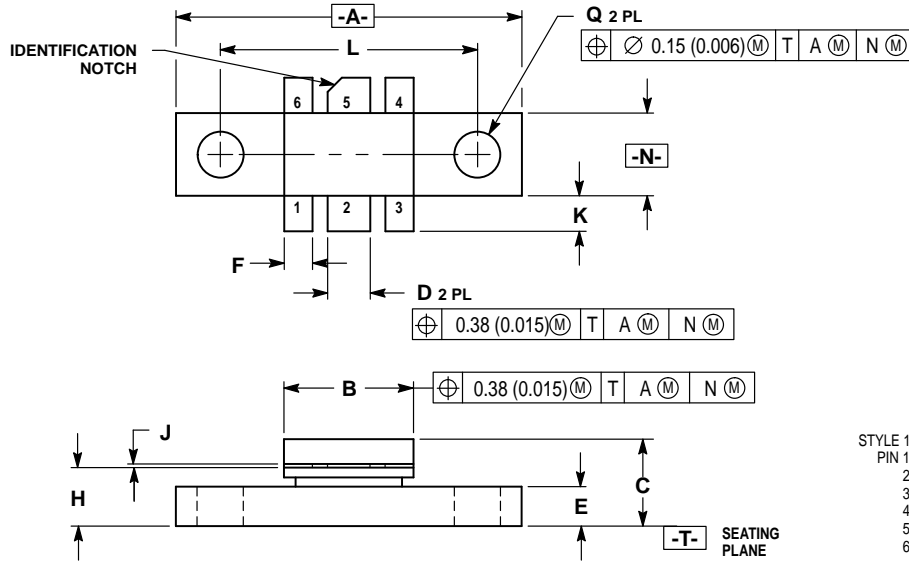
$P_{out} = 20\text{ W}$, $V_{CC} = 12.5\text{ Vdc}$

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		MILLIMETER	
	MIN	MAX	MIN	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)
 PIN 2. EMITTER (INPUT)
 PIN 3. BASE (COMMON)
 PIN 4. BASE (COMMON)
 PIN 5. COLLECTOR (OUTPUT)
 PIN 6. BASE (COMMON)

**CASE 319-07
 ISSUE M**

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