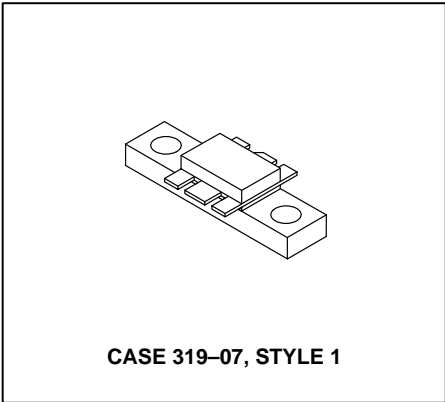


# The RF Line

## 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

#### 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 $25^\circ\text{C}$	$P_D$	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 ( $I_C = 50 \text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	16	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 50 \text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	36	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10 \text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 15 \text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	—	—	5.0	mAdc

#### NOTES:

(continued)

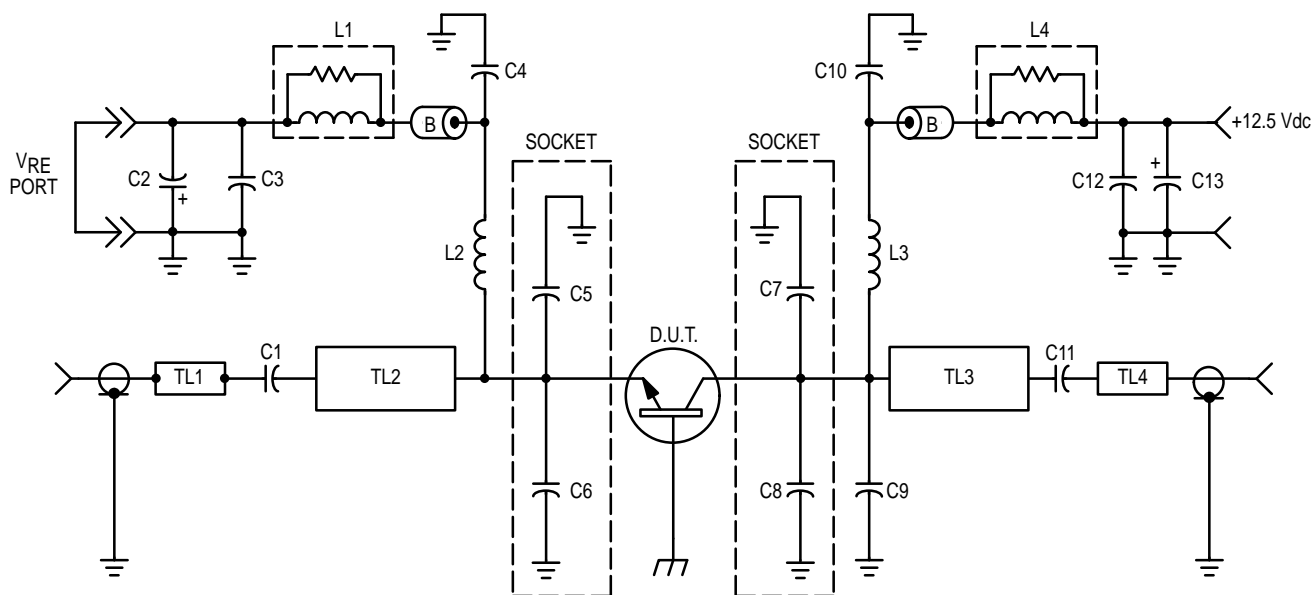
- This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.
- Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 2.0 \text{ Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	$h_{FE}$	10	—	—	—
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance ( $V_{CB} = 12.5 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ob}$	—	45	65	pF
<b>FUNCTIONAL TESTS</b>					
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 ( $P_{out} = 20 \text{ W}$ , $V_{CC} = 12.5 \text{ Vdc}$ , $f = 870 \text{ MHz}$ )	$\eta$	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  $\mu\text{F}$ , 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,  $\epsilon_r = 2.55$

**Figure 1. 870 MHz Test Circuit Schematic**

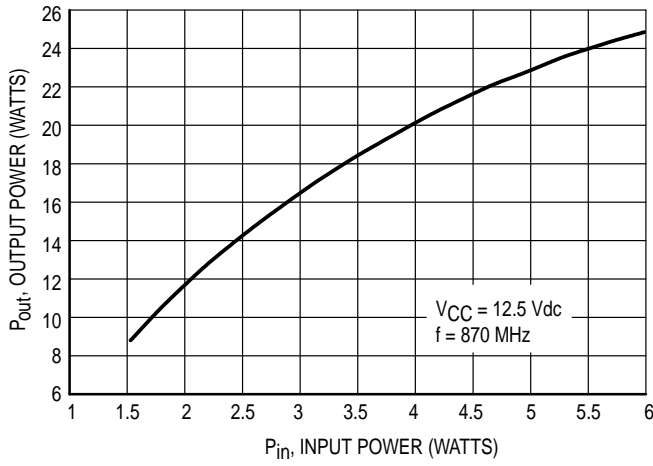


Figure 2. Output Power versus Input Power

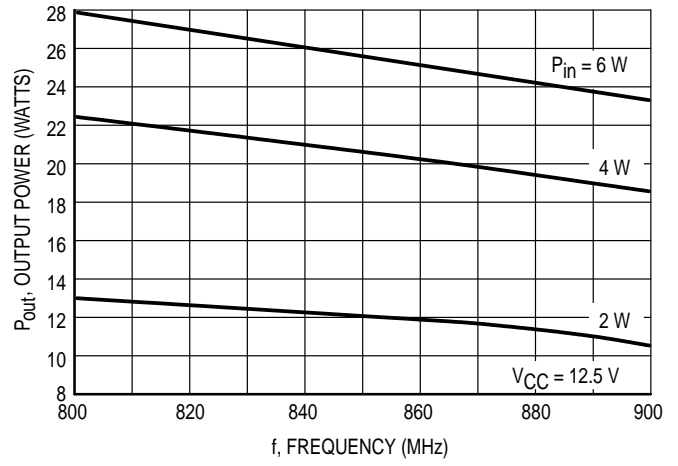


Figure 3. Output Power versus Frequency

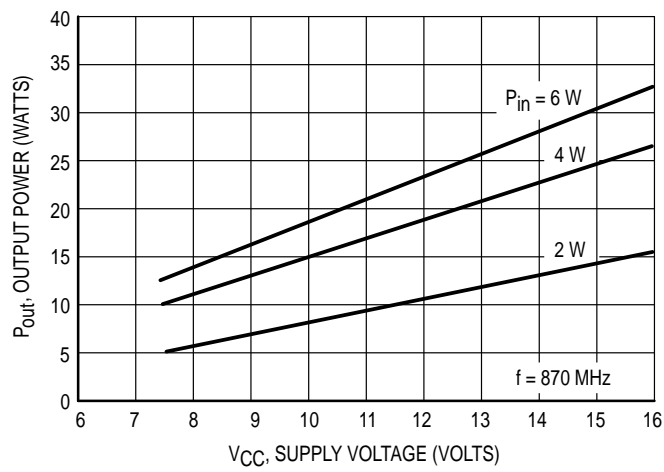
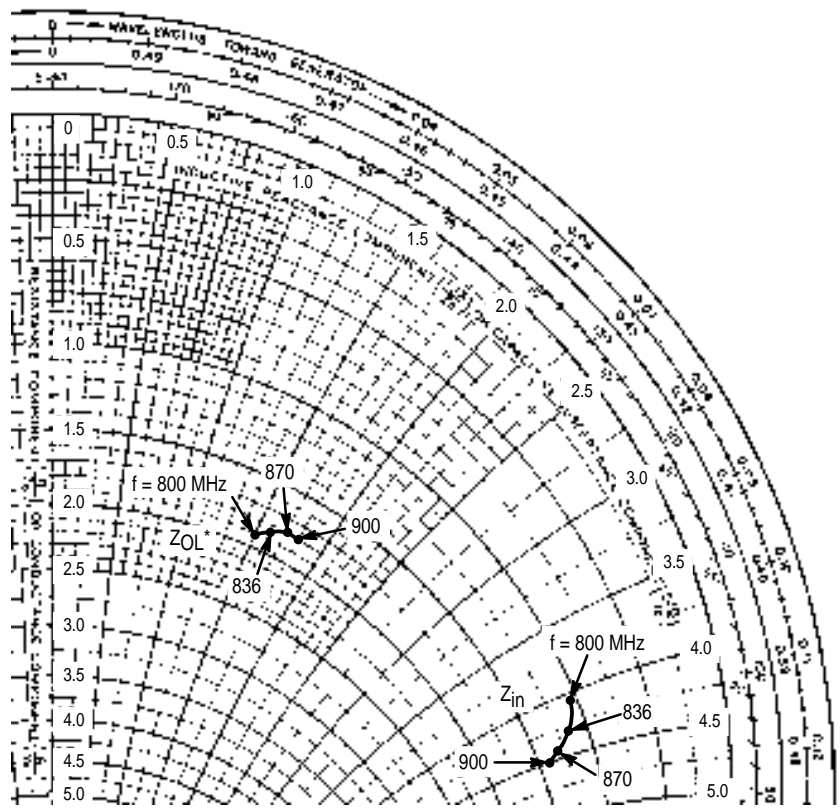


Figure 4. Output Power versus Supply Voltage



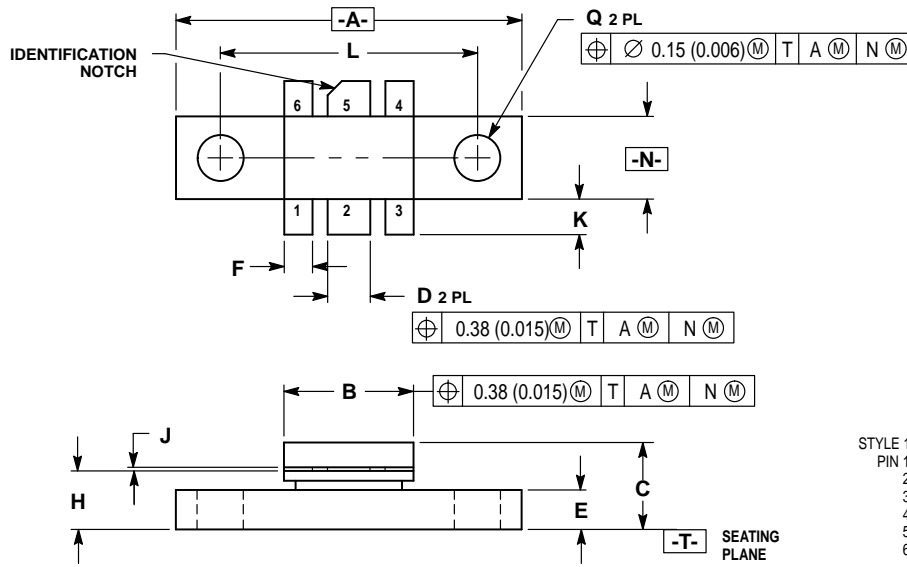
$P_{out} = 20 \text{ W}$ ,  $V_{CC} = 12.5 \text{ Vdc}$

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)
  2. EMITTER (INPUT)
  3. BASE (COMMON)
  4. BASE (COMMON)
  5. COLLECTOR (OUTPUT)
  6. BASE (COMMON)

CASE 319-07  
ISSUE M

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