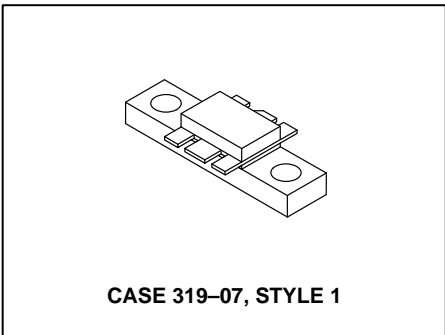


# The RF Line

## 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 = 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

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	16	Vdc
Collector-Base Voltage	V <sub>CB0</sub>	36	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	4.0	Vdc
Collector Current — Continuous	I <sub>C</sub>	3.8	Adc
Total Device Dissipation @ T <sub>C</sub> = 25°C (1) Derate above 25°C	P <sub>D</sub>	40 0.32	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 <sub>θJC</sub>	3.1	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
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#### OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage (I <sub>C</sub> = 50 mAdc, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	16	—	—	Vdc
Collector-Emitter Breakdown Voltage (I <sub>C</sub> = 50 mAdc, V <sub>BE</sub> = 0)	V <sub>(BR)CES</sub>	36	—	—	Vdc
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 5.0 mAdc, I <sub>C</sub> = 0)	V <sub>(BR)EBO</sub>	4.0	—	—	Vdc
Collector Cutoff Current (V <sub>CB</sub> = 15 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	—	—	2.0	mAdc

#### NOTES:

(continued)

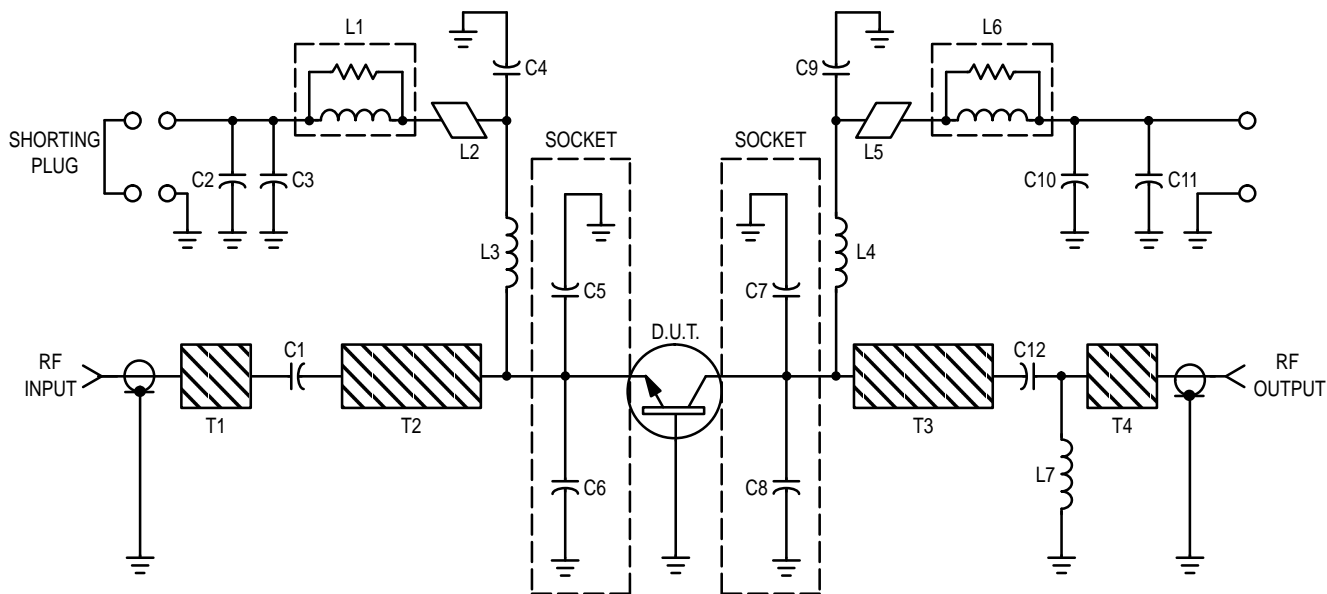
- This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.
- Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

**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 ( $I_C = 1.0 \text{ Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	$h_{FE}$	10	—	—	—
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance ( $V_{CB} = 12.5 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ob}$	—	24	35	pF
<b>FUNCTIONAL TESTS</b>					
Common-Base Amplifier Power Gain ( $P_{out} = 10 \text{ W}$ , $V_{CC} = 12.5 \text{ Vdc}$ , $f = 870 \text{ MHz}$ )	$G_{PE}$	6.0	7.0	—	dB
Collector Efficiency ( $P_{out} = 10 \text{ W}$ , $V_{CC} = 12.5 \text{ Vdc}$ , $f = 870 \text{ MHz}$ )	$\eta$	50	55	—	%
Load Mismatch Stress ( $V_{CC} = 15.5 \text{ Vdc}$ , $P_{in} = 3.0 \text{ W}$ , (3) $f = 870 \text{ MHz}$ , $VSWR = 20:1$ , all phase angles)	—	No Degradation in Output Power			

**NOTE:**

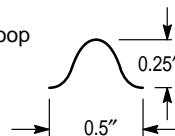
3.  $P_{in}$  = 150% of the typical input power requirement for 10 W output power @ 12.5 Vdc.



C1, C12 — 50 pF, 100 Mil Chip Capacitor  
 C2, C11 — 15  $\mu\text{F}$ , 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  $\Omega$  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**

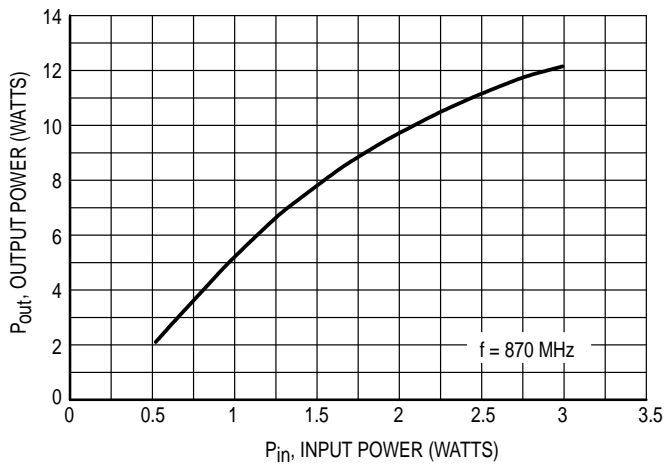


Figure 2. Output Power versus Input Power

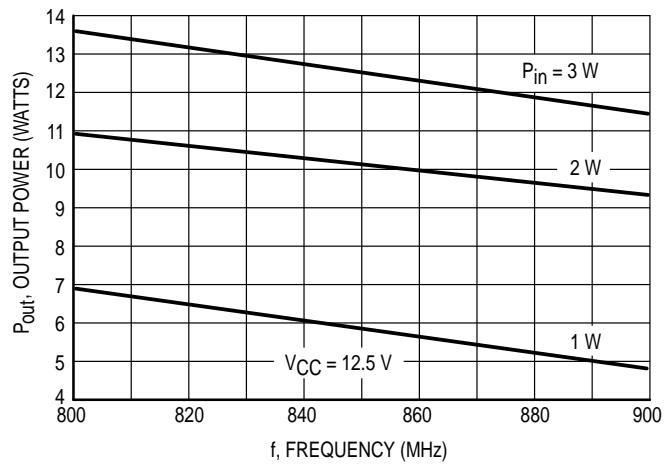


Figure 3. Output Power versus Frequency

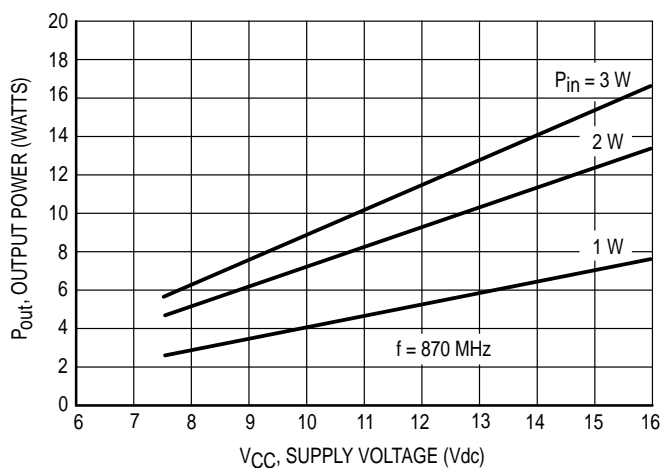
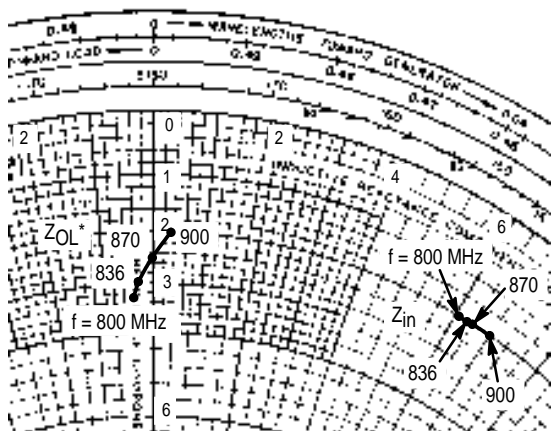


Figure 4. Output Power versus Supply Voltage



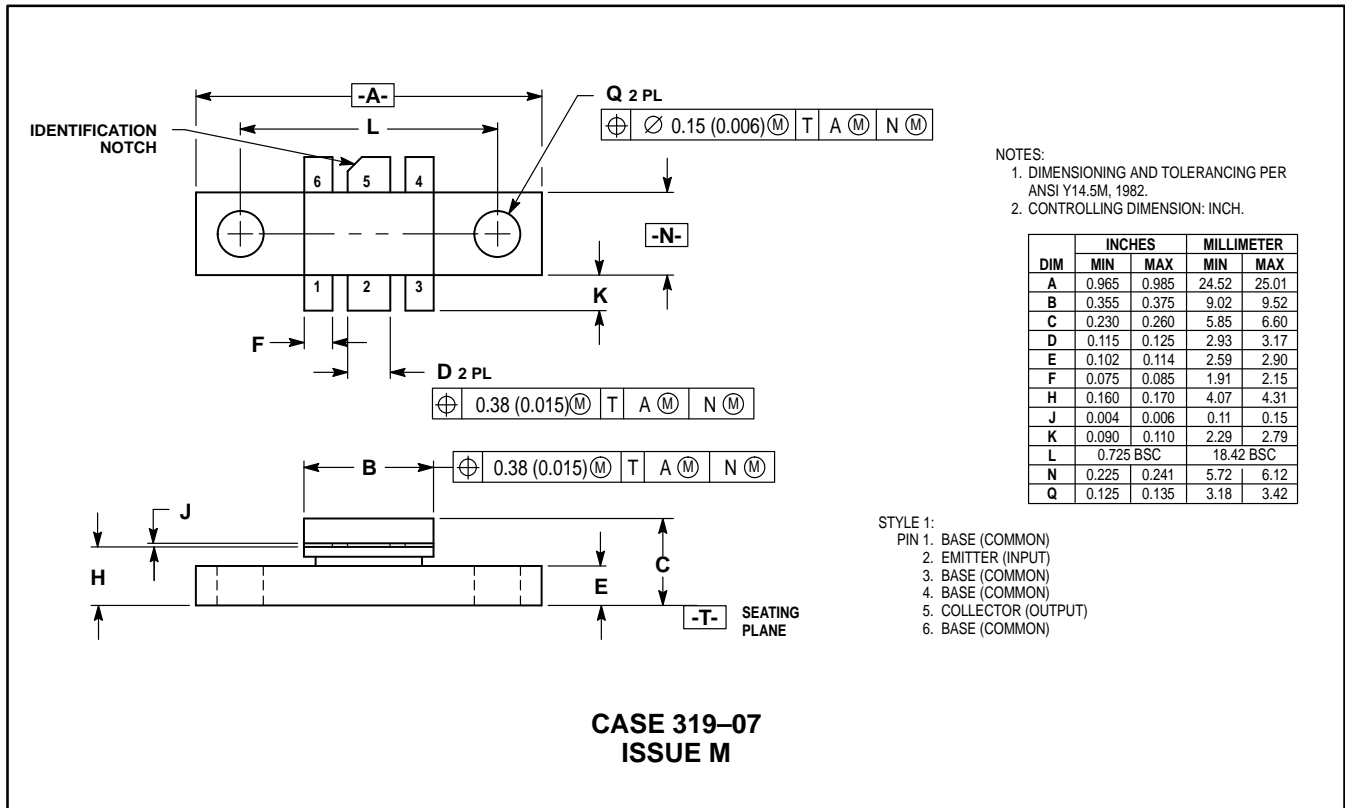
$P_{out} = 10\text{ W}, V_{CC} = 12.5\text{ Vdc}$

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

## 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)

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