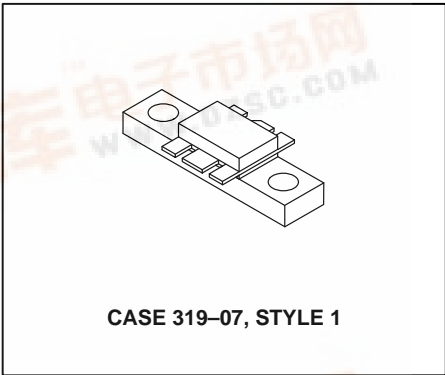


# The RF Line NPN Silicon RF Power Transistor



**45 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 = 45 Watts
  - Power Gain = 4.5 dB Min
  - Efficiency = 60% Min
- Series Equivalent Large-Signal Characterization
- Internally Matched Input for Broadband Operation
- Tested for Load Mismatch Stress at All Phase Angles with 10:1 VSWR @ High Line and Rated Drive
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Silicon Nitride Passivated

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	$V_{CEO}$	16.5	Vdc
Collector–Base Voltage	$V_{CBO}$	38	Vdc
Emitter–Base Voltage	$V_{EBO}$	4.0	Vdc
Collector Current — Continuous	$I_C$	12	Adc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	150 0.85	Watts $\text{W}/^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	–65 to +150	$^\circ\text{C}$
Junction Temperature	$T_J$	200	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.17	$^\circ\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

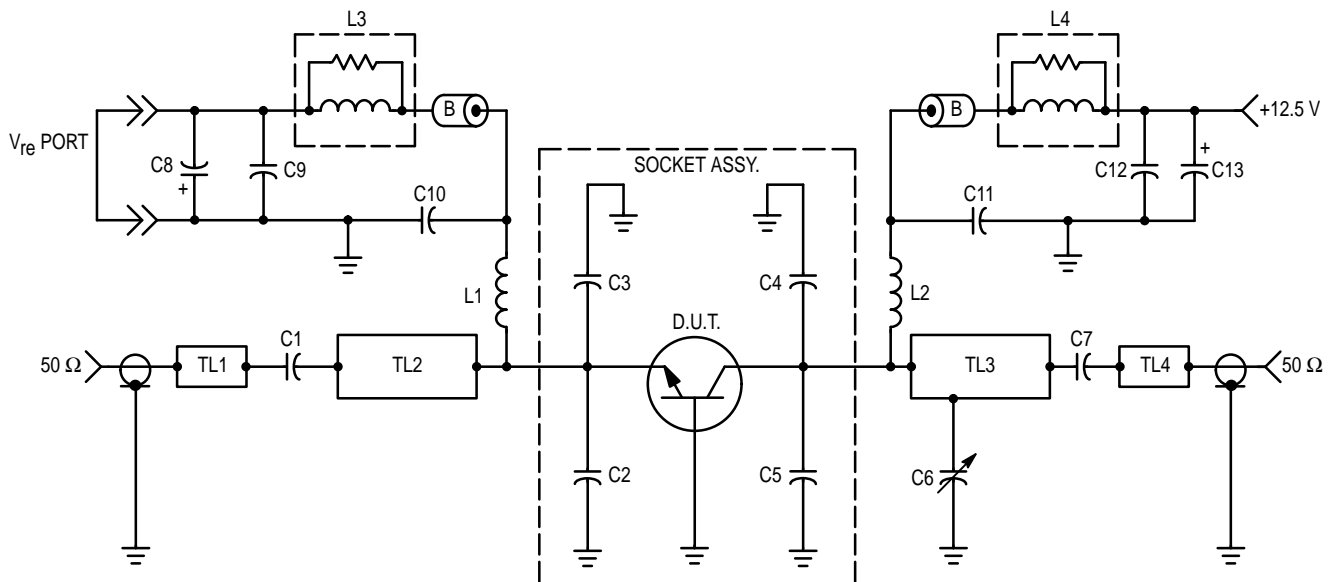
Emitter–Base Breakdown Voltage ( $I_E = 5.0 \text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector–Emitter Breakdown Voltage ( $I_C = 50 \text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	16.5	—	—	Vdc
Collector–Emitter Breakdown Voltage ( $I_C = 50 \text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	38	—	—	Vdc
Collector Cutoff Current ( $V_{CE} = 15 \text{ Vdc}$ , $V_{BE} = 0$ )	$I_{CES}$	—	—	10	mAdc

(continued)



**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 ( $I_C = 2.0 \text{ Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ )	$h_{FE}$	40	65	120	—
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance ( $V_{CB} = 12.5 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ob}$	—	75	90	pF
<b>FUNCTIONAL TESTS</b>					
Common-Base Amplifier Power Gain ( $V_{CC} = 12.5 \text{ Vdc}$ , $P_{out} = 45 \text{ W}$ , $f = 870 \text{ MHz}$ )	$G_{PB}$	4.5	5.5	—	dB
Collector Efficiency ( $V_{CC} = 12.5 \text{ Vdc}$ , $P_{out} = 45 \text{ W}$ , $f = 870 \text{ MHz}$ )	$\eta_c$	60	68	—	%
Load Mismatch ( $V_{CC} = 15.5 \text{ Vdc}$ , $P_{in} = 16 \text{ W}$ , $f = 870 \text{ MHz}$ , $VSWR = 10:1$ , All Phase Angles)	$\psi$	No Degradation in Output Power			



C1 — 51 pF, 100 mil Chip Capacitor  
 C2 — 12 pF, Mini-Underwood  
 C3 — 11 pF, Mini-Underwood  
 C4, C5 — 21 pF, Mini-Underwood  
 C6 — 0.08–8.0 pF Johansen Gigatrim  
 C7 — 47 pF, 100 mil Chip Capacitor  
 C8, C13 — 10  $\mu\text{F}$ , 25 WV Electrolytic Capacitor  
 C9, C12 — 1000 pF Unelco J101

C10, C11 — 91 pF Mini-Underwood  
 L1, L2 — 4 Turns #18 Enameled, 200 mil ID  
 L3, L4 — 12 Turns #22 Enameled, Wound Over 10  $\Omega$  Resistor  
 TL1, TL4 — 50  $\Omega$  Microstrip Line  
 TL2 — Microstrip ( $Z_0 = 38 \text{ ohms}$ ,  $\lambda/4$  @ 838 MHz)  
 TL3 — Microstrip ( $Z_0 = 28 \text{ ohms}$ ,  $\lambda/4$  @ 838 MHz)  
 Board Material — 0.032" Glass-Teflon, 2 oz. cu. clad,  $\epsilon_r = 2.56$   
 B — Ferrite Bead, Ferroxcube 56-590-65-3B

**Figure 1. 806–870 MHz Broadband Test Circuit**

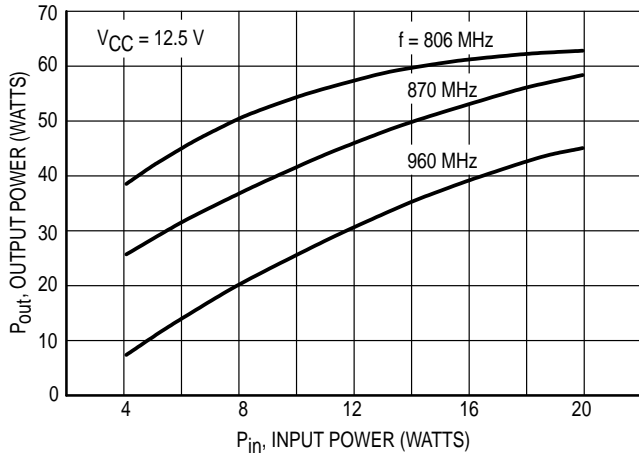


Figure 2. Output Power versus Input Power

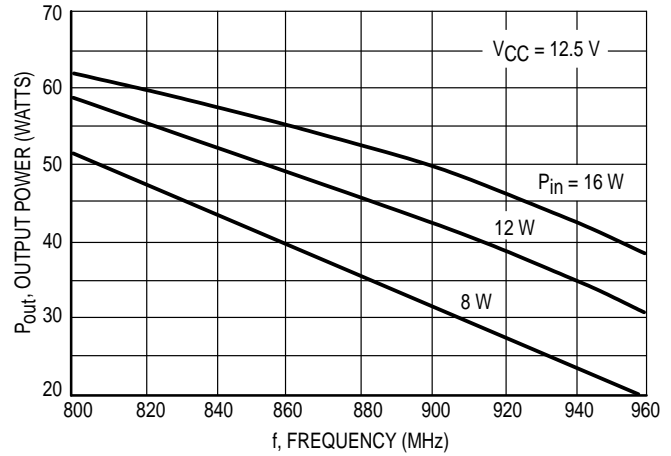


Figure 3. Output Power versus Frequency

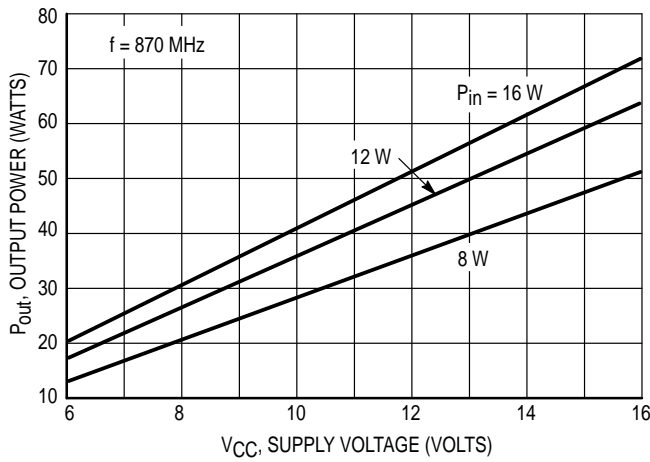


Figure 4. Output Power versus Supply Voltage

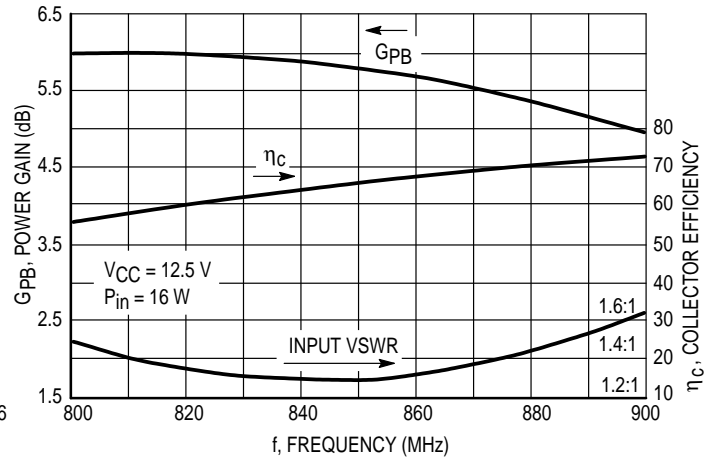


Figure 5. Typical Broadband Circuit Performance

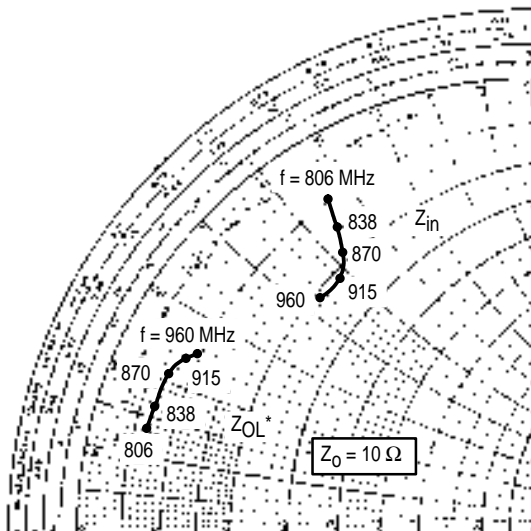


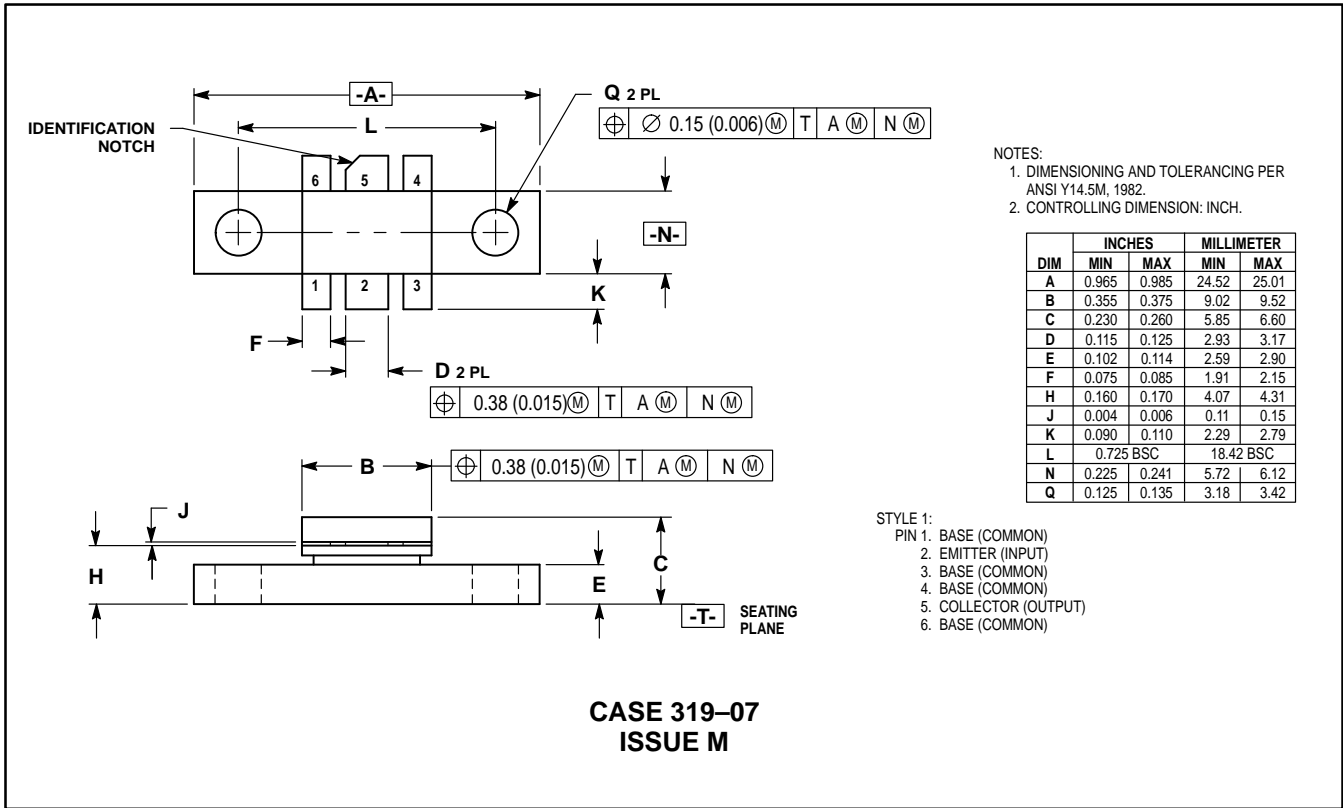
Figure 6. Series Equivalent Input/Output Impedances

$V_{CC} = 12.5 \text{ Vdc}, P_{in} = 16 \text{ W}, P_{out} = 45 \text{ W}$

f (MHz)	$Z_{in}$ (Ohms)	f (MHz)	$Z_{OL}^*$ (Ohms)
806	0.99 +j5.52	806	0.67 +j1.33
838	1.48 +j5.47	838	0.68 +j1.66
870	1.79 +j5.25	870	0.72 +j2.16
915	2.12 +j4.80	915	0.83 +j2.40
960	2.11 +j4.28	960	0.99 +j2.50

$Z_{OL}^*$  = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

## 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)

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