

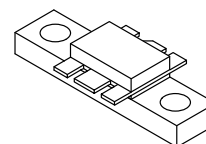
The RF Line

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 = 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

MRF847
45 W, 870 MHz
RF POWER
TRANSISTOR
NPN SILICON

CASE 319-07, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	16.5	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°C	P_D	150 0.85	Watts 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	$^\circ\text{C/W}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

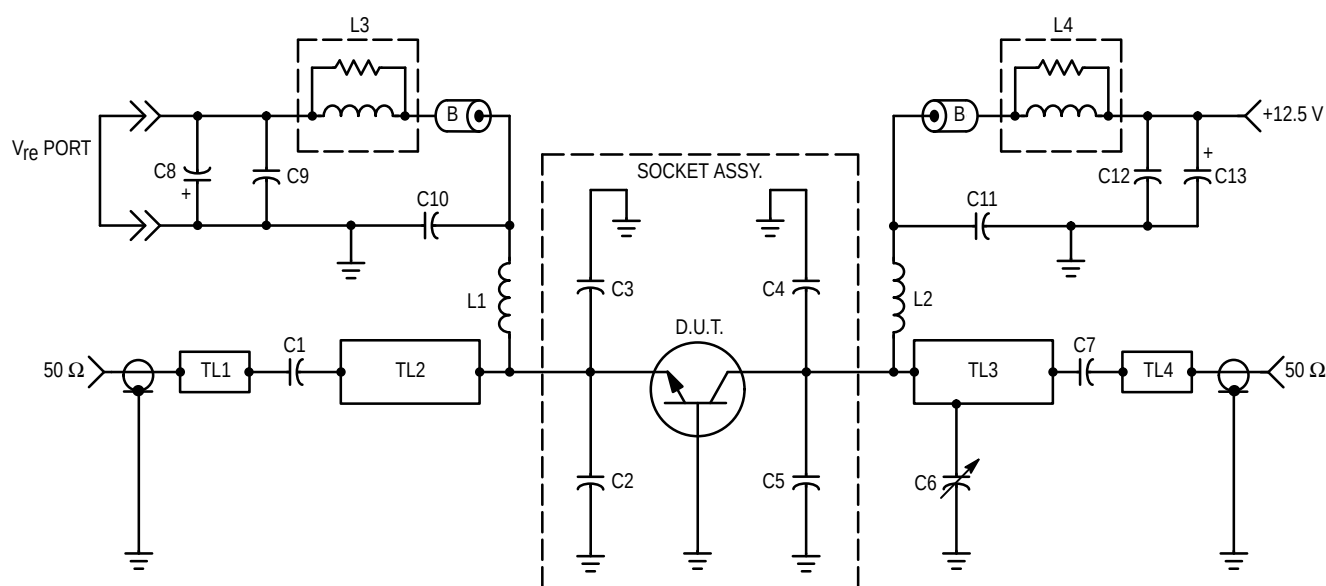
Emitter–Base Breakdown Voltage ($I_E = 5.0$ mAdc, $I_C = 0$)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector–Emitter Breakdown Voltage ($I_C = 50$ mAdc, $I_B = 0$)	$V_{(BR)CEO}$	16.5	—	—	Vdc
Collector–Emitter Breakdown Voltage ($I_C = 50$ mAdc, $V_{BE} = 0$)	$V_{(BR)CES}$	38	—	—	Vdc
Collector Cutoff Current ($V_{CE} = 15$ 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
ON CHARACTERISTICS					
DC Current Gain ($I_C = 2.0\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	40	65	120	—
DYNAMIC CHARACTERISTICS					
Output Capacitance ($V_{CB} = 12.5\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}	—	75	90	pF
FUNCTIONAL TESTS					
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 ($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 45\text{ W}$, $f = 870\text{ MHz}$)	η_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)	ψ	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 μF , 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 Ω Resistor
 TL1, TL4 — 50 Ω 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

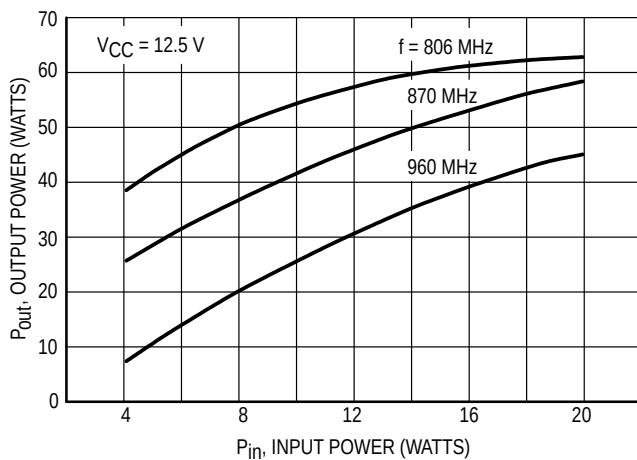


Figure 2. Output Power versus Input Power

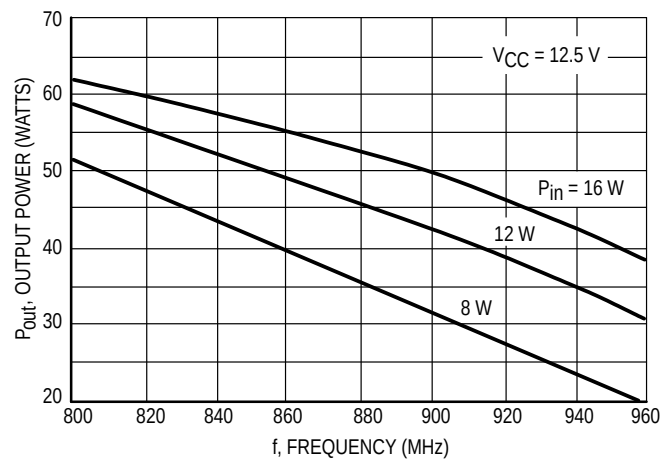


Figure 3. Output Power versus Frequency

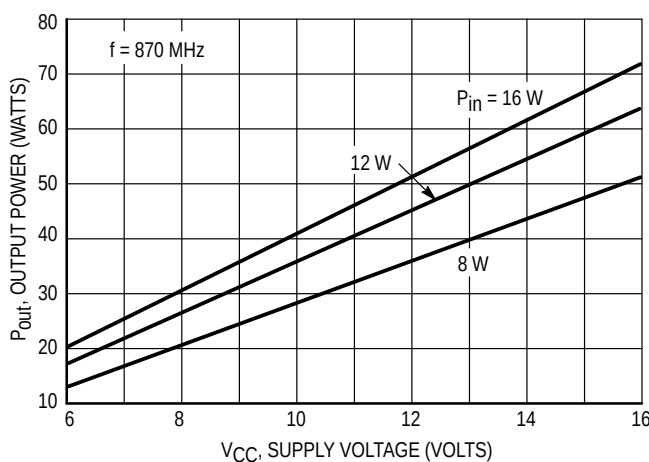


Figure 4. Output Power versus Supply Voltage

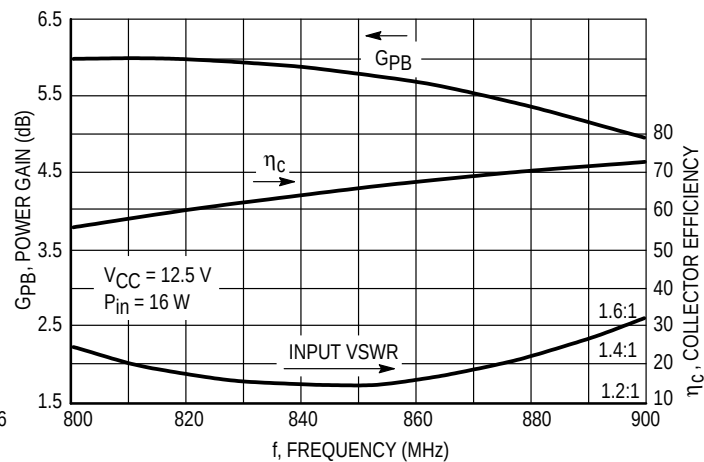


Figure 5. Typical Broadband Circuit Performance

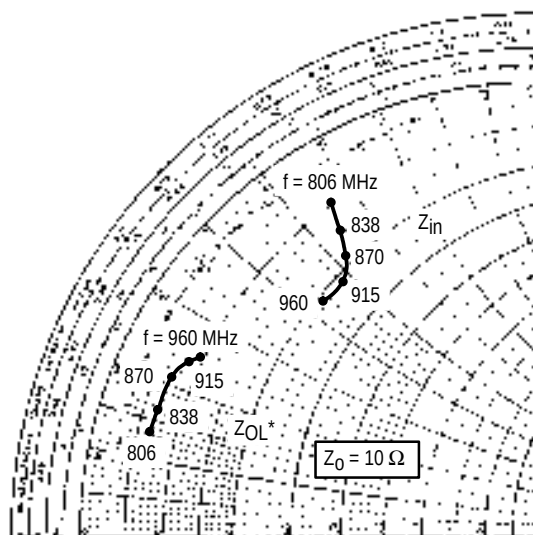


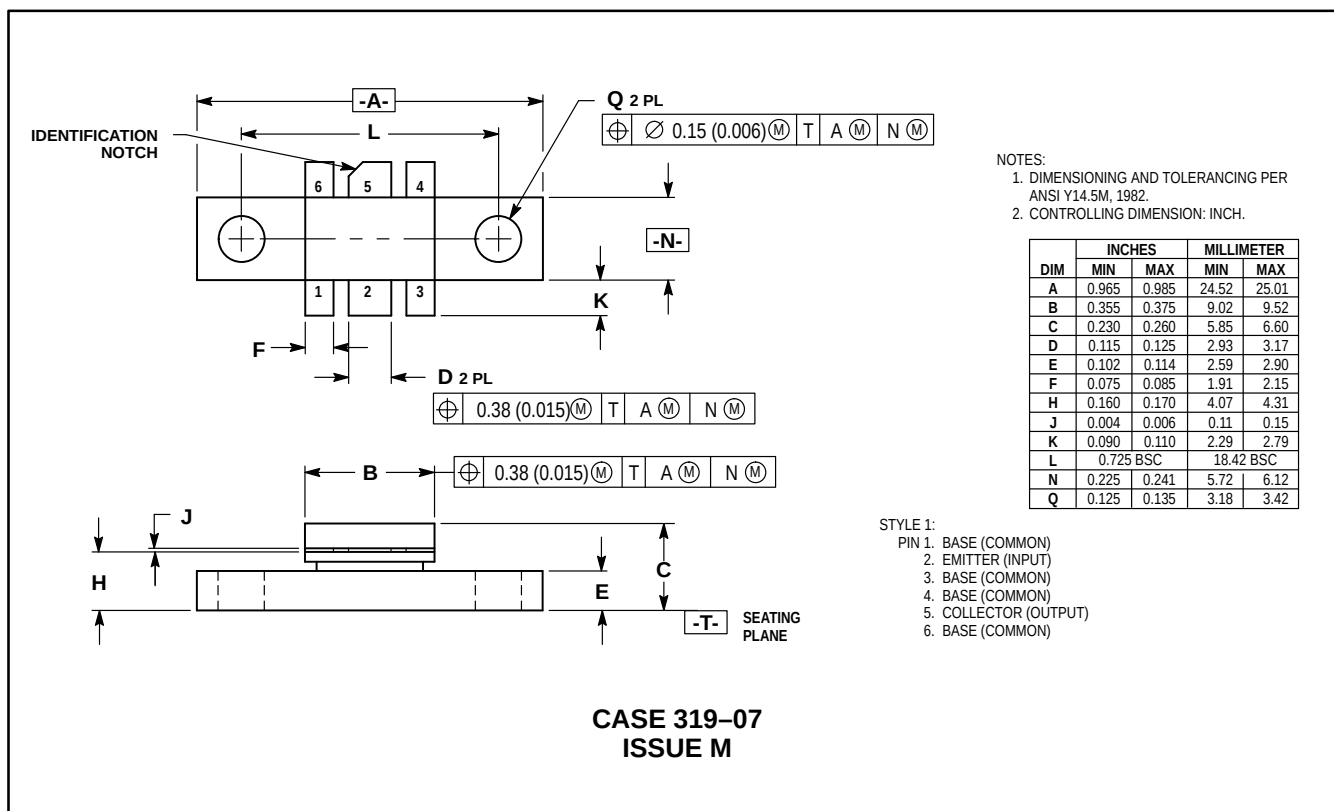
Figure 6. Series Equivalent Input/Output Impedances

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

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.

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