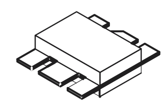
The RF Line
NPN Silicon
RF Power Transistor

MRF858S

**CLASS A
800–960 MHz
3.6 W (CW), 24 V
NPN SILICON
RF POWER TRANSISTOR**

Designed for 24 Volt UHF large–signal, common emitter, class A linear amplifier applications in industrial and commercial equipment operating in the range of 800–960 MHz.

- Specified for V_{CE} = 24 Vdc, I_C = 0.5 Adc Characteristics
  Output Power = 3.6 Watts CW
  Minimum Power Gain = 11 dB
  Minimum ITO = +44.5 dBm
  Typical Noise Figure = 6 dB
- Characterized with Small–Signal S–Parameters and Series Equivalent Large–Signal Parameters from 800–960 MHz
- Silicon Nitride Passivated
- 100% Tested for Load Mismatch Stress at All Phase Angles with 30:1 VSWR @ 24 Vdc, I_C = 0.5 Adc and Rated Output Power
- Will Withstand RF Input Overdrive of 0.85 W CW
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.



CASE 319A–02, STYLE 2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	30	Vdc
Collector–Base Voltage	V_{CBO}	55	Vdc
Emitter–Base Voltage	V_{EBO}	4	Vdc
Total Device Dissipation @ T_C = 50°C Derate above 50°C	P_D	20 0.138	Watts W/°C
Operating Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{stg}	–65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance (T_J = 150°C, T_C = 50°C)	$R_{\theta JC}$	6.9	°C/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I_C = 20 mA, I_B = 0)	$V_{(BR)CEO}$	28	35	—	Vdc
Collector–Emitter Breakdown Voltage (I_C = 20 mA, V_{BE} = 0)	$V_{(BR)CES}$	55	85	—	Vdc
Collector–Base Breakdown Voltage (I_C = 20 mA, I_E = 0)	$V_{(BR)CBO}$	55	85	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 1 mA, I_C = 0)	$V_{(BR)EBO}$	4	5	—	Vdc
Collector Cutoff Current (V_{CB} = 24 V, I_E = 0)	I_{CES}	—	—	1	mA

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REV 3

ELECTRICAL CHARACTERISTICS — continued

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.1 A, V_{CE} = 5 V)	h_{FE}	30	60	120	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 24 V, f = 1 MHz)	C_{ob}	—	6.5	8	pF
FUNCTIONAL CHARACTERISTICS					
Common–Emitter Power Gain (V_{CE} = 24 V, I_C = 0.5 A, f = 840–900 MHz, Power Output = 3.6 W)	P_g	11	12	—	dB
Load Mismatch (P_o = 3.6 W) (V_{CE} = 24 V, I_C = 0.5 A, f = 840 MHz, Load VSWR = 30:1, All Phase Angles)	ψ	No Degradation in Output Power			
RF Input Overdrive (V_{CE} = 24 V, I_C = 0.5 A, f = 840 MHz) No degradation	$P_{in(over)}$	—	—	0.85	W
Third Order Intercept Point (V_{CE} = 24 V, I_C = 0.5 A) (f1 = 900 MHz, f2 = 900.1 MHz, Meas. @ IMD 3rd Order = –40 dBc)	ITO	+44.5	+45.5	—	dBm
Noise Figure (V_{CE} = 24 V, I_C = 0.5 A, f = 900 MHz)	NF	—	6	—	dB
Input Return Loss (V_{CE} = 24 V, I_C = 0.5 A, f = 840–900 MHz, Power Output = 3.6 W)	IRL	—	–12	–9	dB

Table 1. Common Emitter S–Parameters

V_{CE} (V)	I_C (A)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			$\|S_{11}\|$	∠ φ	$\|S_{21}\|$	∠ φ	$\|S_{12}\|$	∠ φ	$\|S_{22}\|$	∠ φ
24	0.5	800	0.942	167	1.493	50	0.027	58	0.538	–165
		820	0.942	166	1.453	50	0.027	58	0.541	–164
		840	0.941	166	1.415	49	0.028	59	0.545	–165
		860	0.940	166	1.379	48	0.028	59	0.550	–165
		880	0.941	165	1.351	47	0.029	59	0.553	–165
		900	0.940	165	1.320	46	0.030	59	0.557	–165
		920	0.940	165	1.289	45	0.030	59	0.562	–165
		940	0.940	164	1.252	44	0.031	59	0.566	–165
		960	0.940	164	1.222	43	0.031	59	0.570	–165

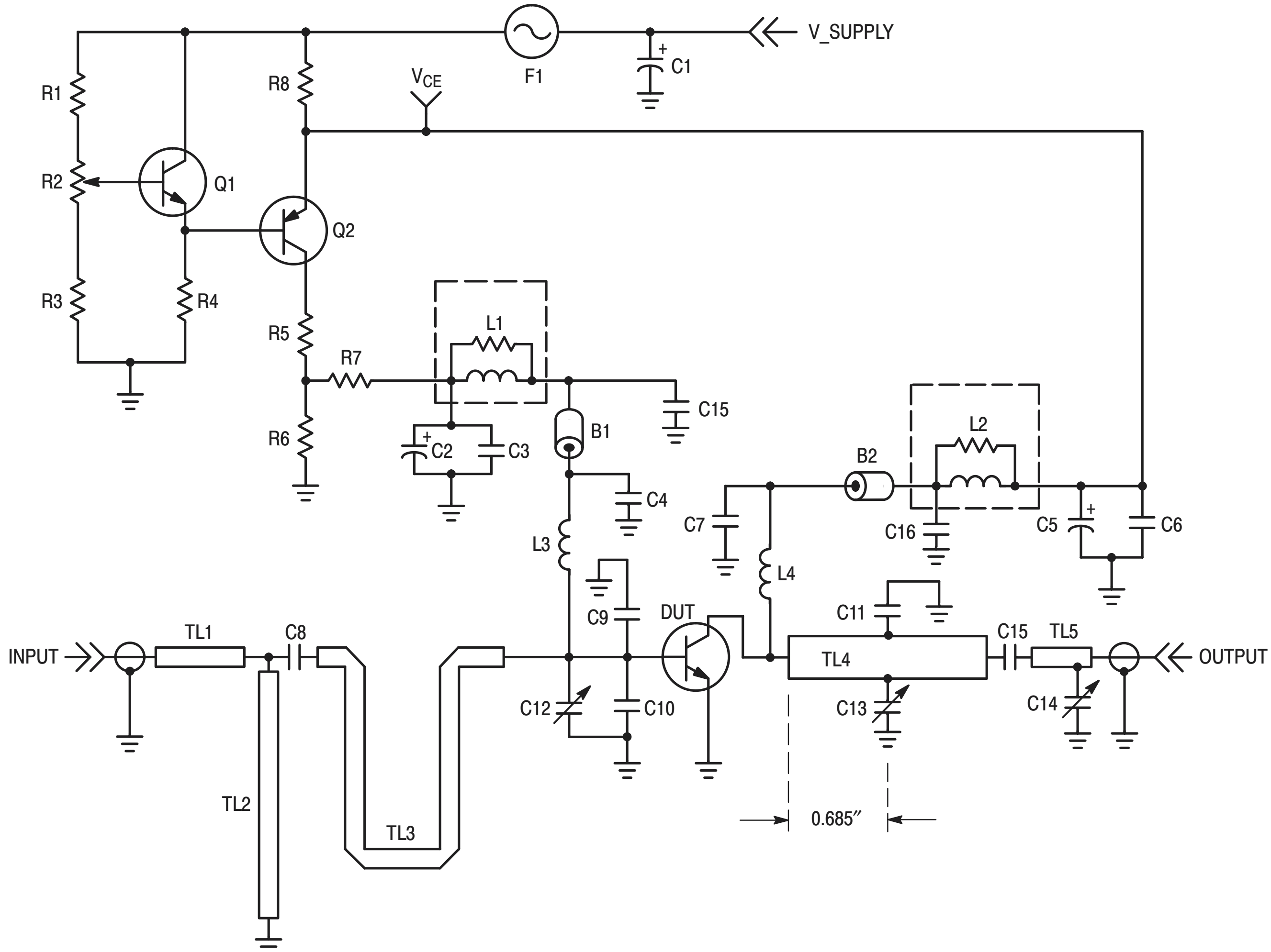
Table 2. Z_{in} and Z_{OL}* versus Frequency

f (MHz)	Z_{in} (Ohms)		Z_{OL}* (Ohms)	
840	1.1	2.9	9.9	–14.4
870	1.1	3.5	9.5	–14.6
900	1.2	3.5	9	–14.5

V_{CE} = 24 V, I_C = 0.5 A, P_o = 3.6 W

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

ARCHIVE INFORMATION



B1, B2	Short Ferrite Bead, Fair Rite (2743021447)	R1	390 Ω, 1/4 W
C1	250 µF, 50 Vdc Electrolytic Capacitor	R2	500 Ω Potentiometer, 1/4 W
C2, C5	10 µF, 50 Vdc Electrolytic Capacitor	R3	7.5K Ω, 1/4 W
C3, C6	0.1 µF, Chip Capacitor	R4	2 x 4.7K Ω, 1/4 W
C4, C7	100 pF, Chip Capacitor	R5	56 Ω, 2 W
C8, C15	43 pF, 100 Mil Chip Capacitor	R6	75 Ω, 1/4 W
C9, C10	10 pF, Mini–Unelco	R7	4.7 Ω, 1/4 W
C11	5 pF, Mini–Unelco	R8	4 Ω, 10 W
C12, C13, C14	0.8–8.0 pF, Johanson Gigatrim	TL1, TL5	50 Ω, Microstrip Transmission Line
C15, C16	1000 pF, Chip Capacitor	TL2	Microstrip Transmission Line
F1	1 A Micro–Fuse	TL3	Microstrip Transmission Line
L1, L2	10 Turns, 20 AWG, 0.150″ ID (10 Ω 1/2 W Resistor)	TL4	Microstrip Transmission Line
L3	4 Turns, 16 AWG, 0.101″ ID	V_Supply	+26 Vdc ±0.5 Vdc Due to Resistor Tolerance
L4	0.5″ 18 AWG Wire	V_{CE}	+24 Vdc @ 0.5 A
Q1	MMBT2222ALT1, NPN Transistor	Board	0.030″ Glass–Teflon® 2 oz. Cu, ε_r = 2.55
Q2	BD136, PNP Transistor		

Figure 1. MRF858S Class A RF Test Fixture Schematic

ARCHIVE INFORMATION

TYPICAL CHARACTERISTICS

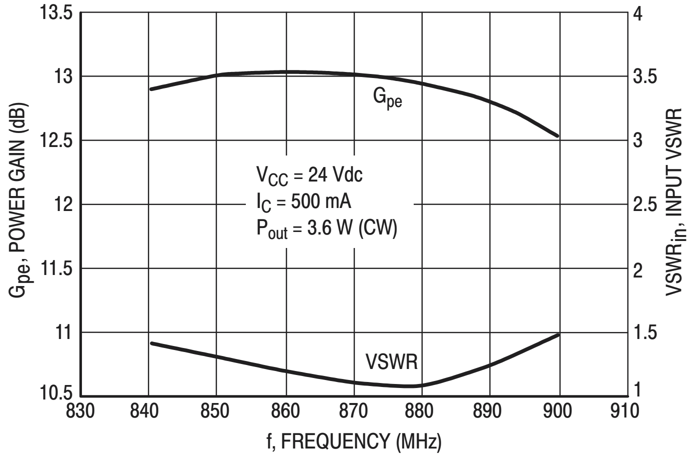


Figure 2. Performance in Broadband Circuit

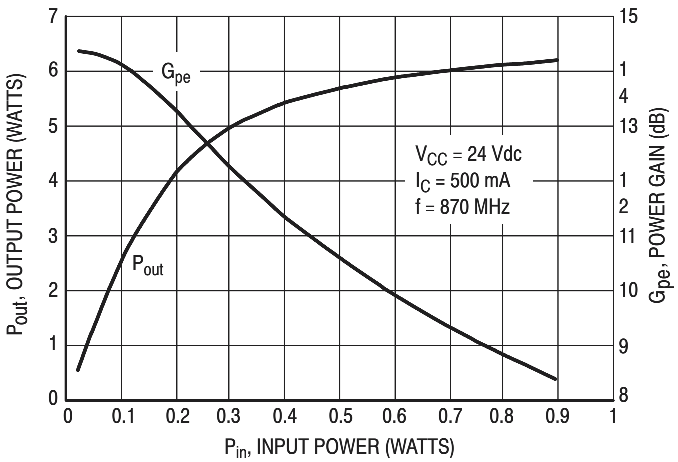


Figure 3. Output Power & Power Gain versus Input Power

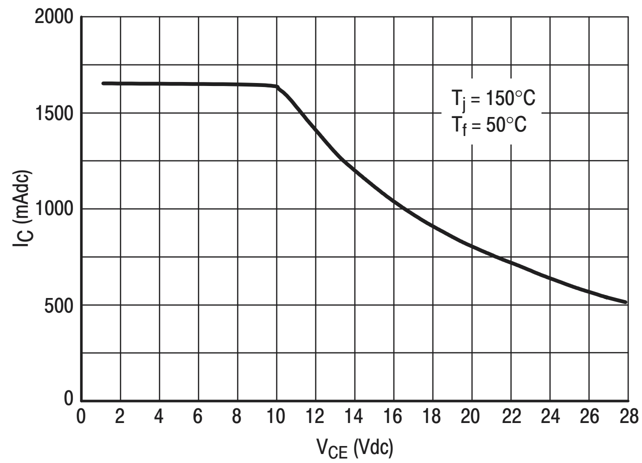


Figure 4. DC SOA

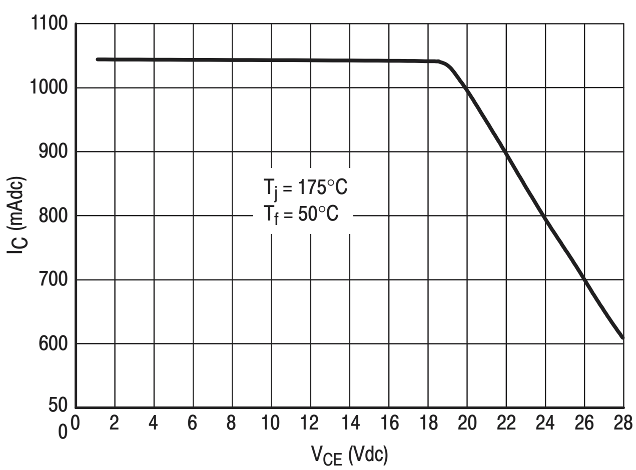


Figure 5. DC SOA
(This device is MTBF limited for $V_{CE} < 20$ Vdc.)

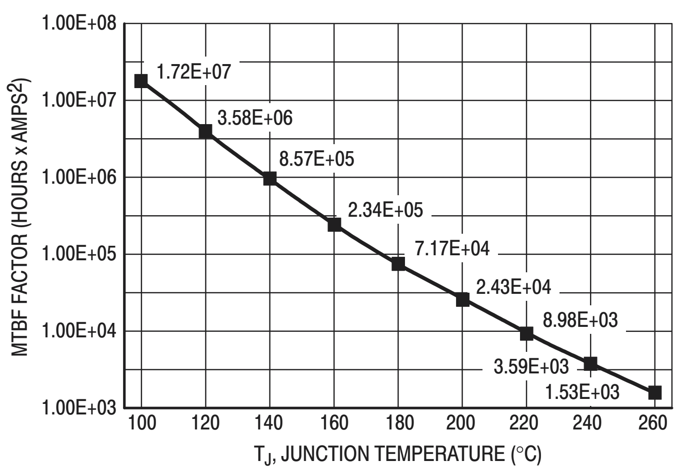


Figure 6. MTBF Factor versus Junction Temperature

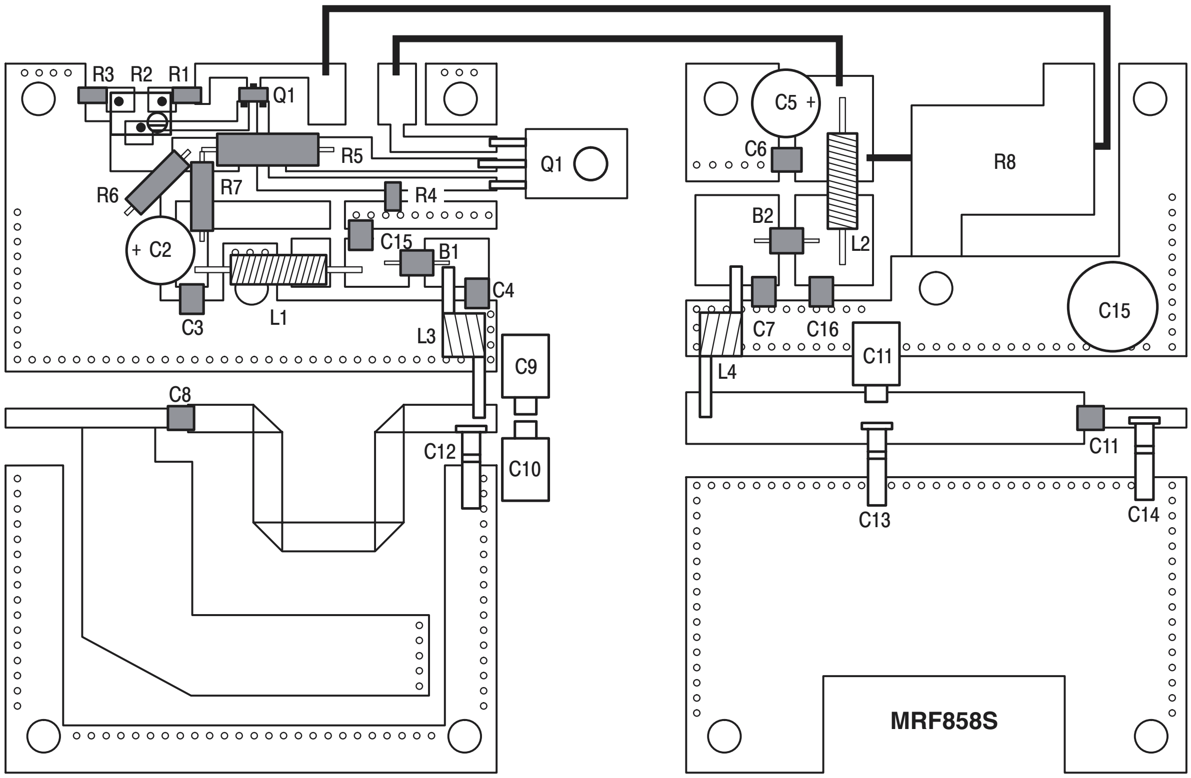
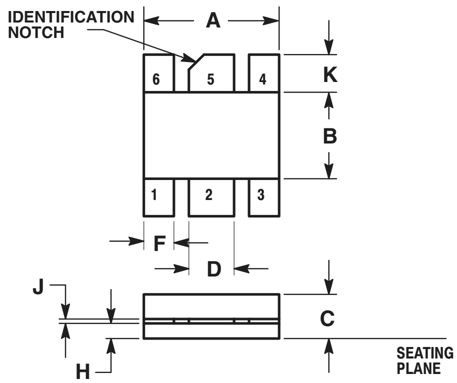


Figure 7. MRF858S Test Fixture Component Layout

ARCHIVE INFORMATION

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.355	0.365	9.02	9.27
B	0.225	0.235	5.72	5.96
C	0.110	0.125	2.80	3.17
D	0.115	0.125	2.93	3.17
F	0.075	0.085	1.91	2.15
H	0.035	0.045	0.89	1.14
J	0.004	0.006	0.11	0.15
K	0.090	0.110	2.29	2.79

STYLE 2:
PIN 1. EMITTER
2. BASE
3. EMITTER
4. EMITTER
5. COLLECTOR
6. EMITTER

CASE 319A–02
ISSUE B

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