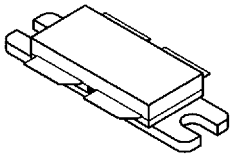
MRF862

The RF Line
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 = 5 Adc Characteristics
  Output Power = 36 Watts CW
  Minimum Power Gain = 9 dB
  Minimum ITO = +55 dBm
  Typical Noise Figure = 6.5 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 = 5 Adc and Rated Output Power
- Will Withstand RF Input Overdrive of 13.6 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.

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



CASE 375A–01, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	30	Vdc
Collector–Base Voltage	V_{CBO}	60	Vdc
Emitter–Base Voltage	V_{EBO}	4	Vdc
Total Device Dissipation @ T_C = 70°C Derate above 70°C	P_D	164 1.27	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 = 70°C)	$R_{\theta JC}$	0.75	°C/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS (1)					
Collector–Emitter Breakdown Voltage (I_C = 100 mA, I_B = 0)	$V_{(BR)CEO}$	28	37	—	Vdc
Collector–Emitter Breakdown Voltage (I_C = 50 mA, V_{BE} = 0)	$V_{(BR)CES}$	60	75	—	Vdc
Collector–Base Breakdown Voltage (I_C = 50 mA, I_E = 0)	$V_{(BR)CBO}$	60	75	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 10 mA, I_C = 0)	$V_{(BR)EBO}$	4	4.5	—	Vdc
Collector Cutoff Current (V_{CB} = 24 V, I_E = 0)	I_{CES}	—	—	10	mA

(1) All DC tests are per side.

(continued)

REV 2

ELECTRICAL CHARACTERISTICS — continued

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS (1)					
DC Current Gain (I_C = 1 A, V_{CE} = 5 V)	h_{FE}	30	75	120	—
DYNAMIC CHARACTERISTICS (1)					
Output Capacitance (V_{CB} = 24 V, f = 1 MHz) (3)	C_{ob}	—	75	—	pF
FUNCTIONAL CHARACTERISTICS (2)					
Common–Emitter Power Gain (V_{CE} = 24 V, I_C = 5 A, f = 840–900 MHz, P_{out} = 36 W)	P_g	9	10	—	dB
Load Mismatch (V_{CE} = 24 V, I_C = 5 A, f = 840 MHz, P_{out} = 36 W, Load VSWR = 30:1, All Phase Angles)	ψ	No Degradation in Output Power			
RF Input Overdrive (V_{CE} = 24 V, I_C = 5 A, f = 840 MHz) No degradation	$P_{in(over)}$	—	—	13.6	W
Third Order Intercept Point (V_{CE} = 24 V, I_C = 5 A, f1 = 900 MHz, f2 = 900.1 MHz, Meas. @ IMD 3rd Order = −40 dBc)	ITO	+55	+56	—	dBm
Noise Figure (V_{CE} = 24 V, I_C = 5 A, f = 900 MHz)	NF	—	6.5	—	dB
Input Return Loss (V_{CE} = 24 V, I_C = 5 A, f = 840–900 MHz, P_{out} = 36 W)	IRL	—	—	−8	dB

(1) All DC tests are per side.
(2) Operating bias point I_C is the total for both halves.
(3) C_{ob} measurement is for reference only. This device is collector matched.

Table 1. MRF862 Common Emitter S–Parameters (Per Side)

V_{CE} (V)	I_C (A)	f (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
			$\lvert S_{11}\rvert$	∠ϕ	$\lvert S_{21}\rvert$	∠ϕ	$\lvert S_{12}\rvert$	∠ϕ	$\lvert S_{22}\rvert$	∠ϕ
24	2.5	800	0.934	161	0.679	55	0.021	44	0.883	169
		820	0.911	160	0.766	46	0.021	36	0.873	169
		840	0.877	160	0.852	34	0.020	26	0.867	170
		860	0.843	161	0.936	21	0.018	14	0.871	171
		880	0.813	163	0.971	4	0.015	−1	0.891	172
		900	0.807	166	0.942	−12	0.010	−15	0.920	173
		920	0.823	168	0.868	−28	0.005	−24	0.947	173
		940	0.847	169	0.769	−40	0.002	50	0.967	172
		960	0.873	169	0.671	−50	0.004	124	0.978	171

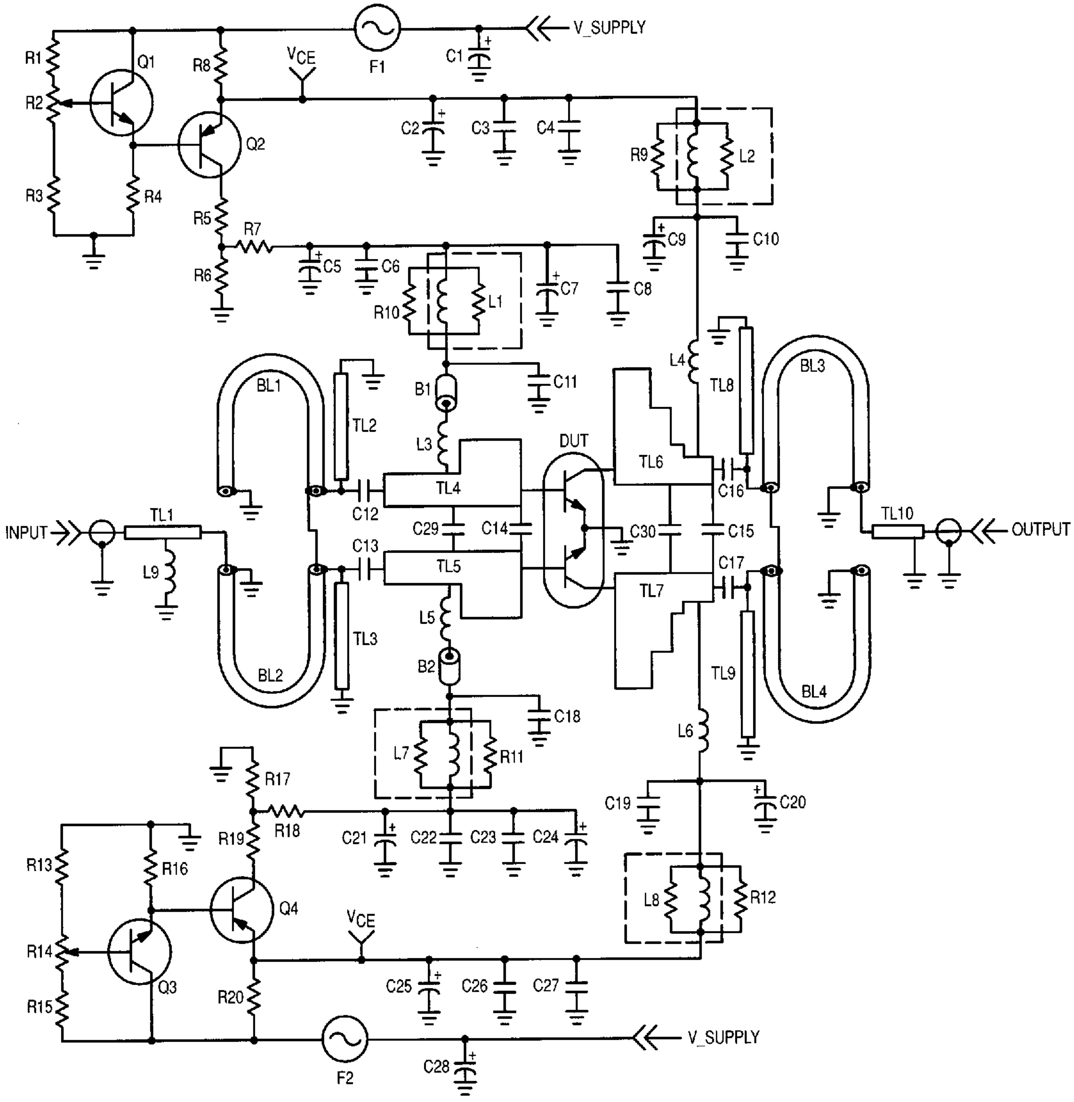
Table 2. Z_{in} and Z_{OL}* versus Frequency

f (MHz)	Z_{in} (Ohms)		Z_{OL}* (Ohms)	
840	4.3	11.8	6.4	−1.3
870	5.7	12.4	5.1	−1.3
900	7.6	11.7	4.5	−1.1

V_{CE} = 24 V, I_C = 5 A, P_o = 36 W

Z_{in} is a balanced base–to–base measurement.

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



B1, B2	Short Ferrite Bead, Fair Rite (2743019447)
BL1–BL4	2.20″, 50 Ω, 0.085″ OD, Semi–Rigid Coax
C1, C5, C21, C28	470 µF, 50 Vdc Electrolytic Capacitor
C2, C7, C9, C20, C24, C25	10 µF, 50 Vdc Electrolytic Capacitor
C3, C8, C23, C26	0.1 µF, Chip Capacitor
C4, C6, C22, C27	1000 pF Chip Capacitor
C10, C11, C18, C19	100 pF, 100 Mil, Chip Capacitor
C12, C13, C16, C17	43 pF, 100 Mil, Chip Capacitor
C14	5.6 pF, 50 Mil, Chip Capacitor
C15	0.8 pF, 100 Mil, Chip Capacitor
C29	3.0 pF, 100 Mil, Chip Capacitor
C30	3.9 pF, 100 Mil, Chip Capacitor
F1, F2	5 A Micro–Fuse
L1, L2, L7, L8	12 Turns, 22 AWG, 0.150″ ID (Wrapped around 10 Ω, 1/2 W Resistor)
L3, L4, L5, L6	4 Turns, 20 AWG, 0.163″ ID
L9	3 Turns, 20 AWG, 0.102″ ID

Q1, Q3	MMBT2222ALT1, NPN Transistor
Q2, Q4	BD136, PNP Transistor
R1, R15	330 Ω, 1/4 W
R2, R14	500 Ω Potentiometer, 1/4 W
R3, R13	5.6K Ω, 1/4 W
R4, R16	2 x 4.7K Ω, 1/4 W
R5, R19	56 Ω, 2 W
R6, R17	75 Ω, 1/4 W
R7, R18	3.3 Ω, 1/4 W
R8, R20	1 Ω, 10 W
R9, R10, R11, R12	4 x 39 Ω 1/8 W Chip Resistors in Parallel
TL1, TL10	50 Ω, Microstrip Transmission Line
TL2–TL9	Microstrip Transmission Line
V_Supply	+26.5 Vdc ±0.5 Vdc Due to Resistor Tolerance
V_{CE}	+24 Vdc @ 2.5 A
Board	0.030″ Glass–Teflon® 2 oz. Cu, ε_r = 2.55

Figure 1. Class A RF Test Fixture Schematic

TYPICAL CHARACTERISTICS

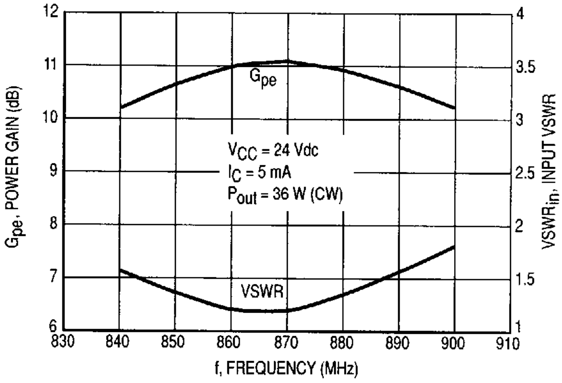


Figure 2. Performance in Broadband Circuit

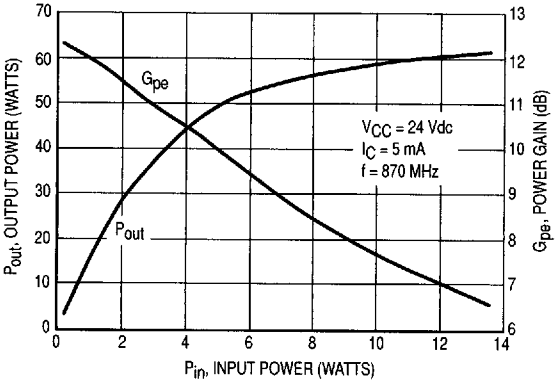


Figure 3. Output Power & Power Gain versus Input Power

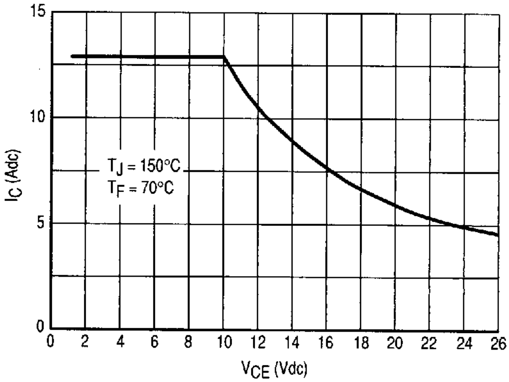


Figure 4. DC SOA (Total I_C for both halves operating.)

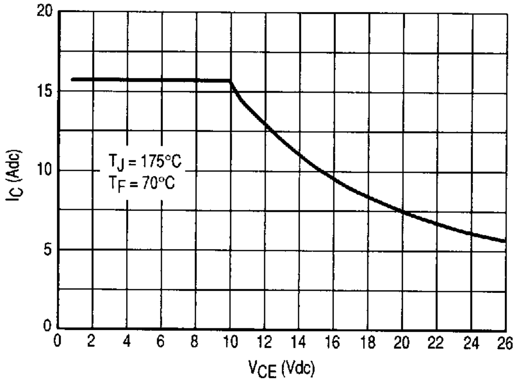


Figure 5. DC SOA (Total I_C for both halves operating.)

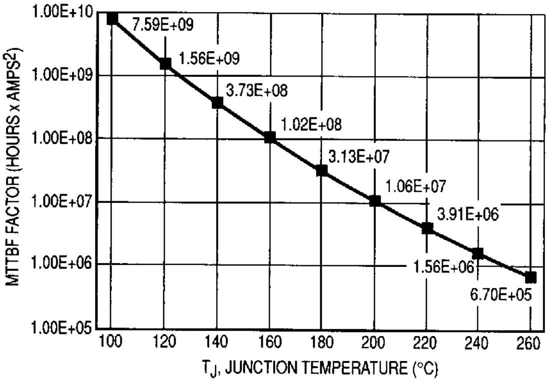


Figure 6. MTBF Factor versus Junction Temperature

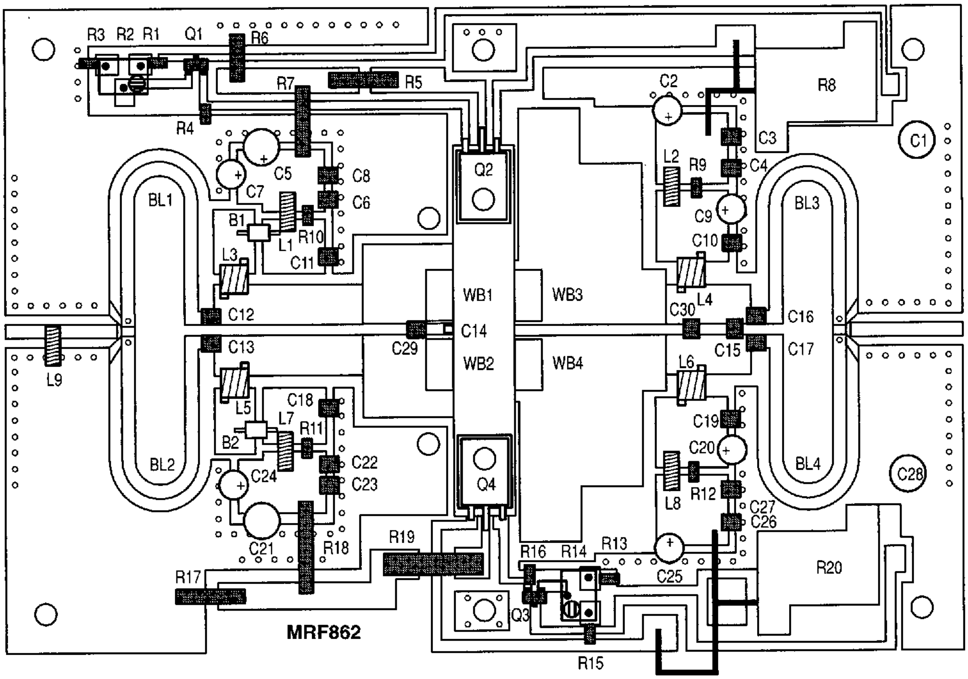


Figure 7. MRF862 Test Fixture Component Layout

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