

The RF Line

NPN Silicon

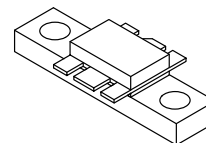
RF Power Transistor

... designed for 24 volt UHF large-signal, common-base amplifier applications in industrial and commercial FM equipment operating in the range of 804–960 MHz.

- Specified 24 Volt, 900 MHz Characteristics
 - Output Power = 30 Watts
 - Power Gain = 7.0 dB Min
 - Efficiency = 55% Min
- Series Equivalent Large-Signal Characterization
- Capable of 30:1 VSWR Load Mismatch at Rated Output Power and Supply Voltage
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Silicon Nitride Passivated

MRF894

**30 W, 900 MHz
RF POWER
TRANSISTOR
NPN SILICON**



CASE 319-07, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	30	Vdc
Collector–Base Voltage	V_{CBO}	50	Vdc
Emitter–Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	7.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate above 25°C	P_D	115 0.66	Watts $\text{W}/^\circ\text{C}$
Storage Temperature Range	T_{stg}	–65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	1.5	$^\circ\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ($I_C = 25 \text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	30	—	—	Vdc
Collector–Emitter Breakdown Voltage ($I_C = 25 \text{ mAdc}$, $V_{BE} = 0$)	$V_{(BR)CES}$	50	—	—	Vdc
Emitter–Base Breakdown Voltage ($I_E = 5.0 \text{ mAdc}$, $I_C = 0$)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 30 \text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	—	10	mAdc

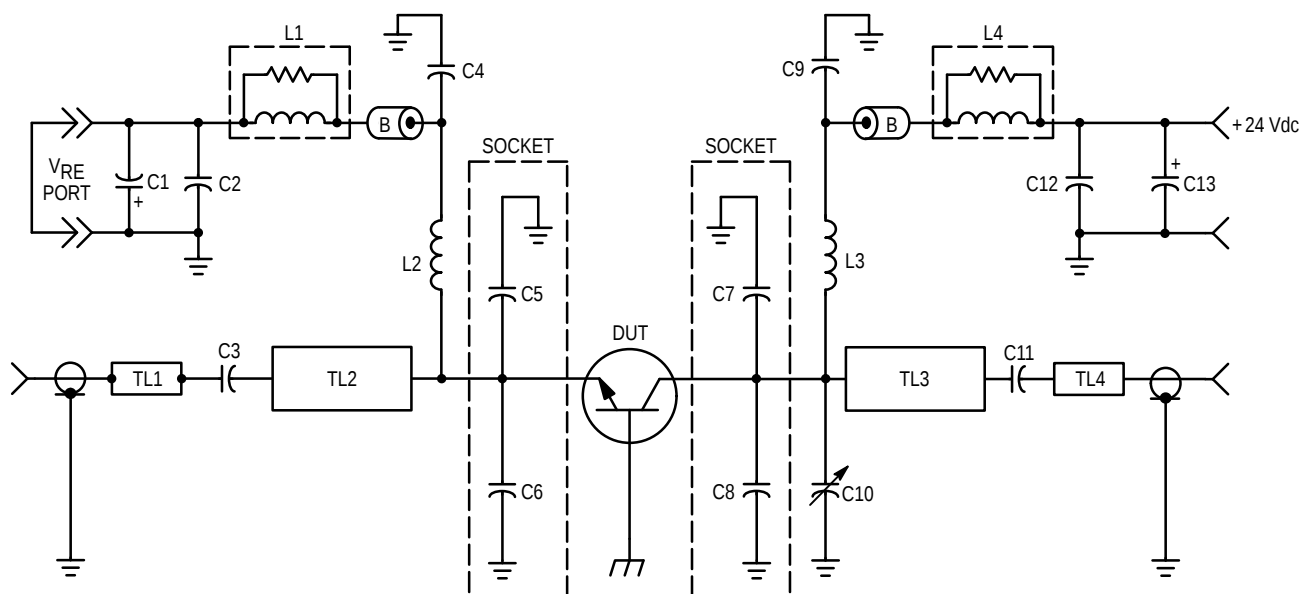
NOTES:

(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
ON CHARACTERISTICS					
DC Current Gain ($I_C = 2.0\text{ A dc}$, $V_{CE} = 5.0\text{ V dc}$)	h_{FE}	10	—	120	—
DYNAMIC CHARACTERISTICS					
Output Capacitance ($V_{CB} = 30\text{ V dc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}	—	45	—	pF
FUNCTIONAL TESTS					
Common-Base Amplifier Power Gain ($P_{out} = 30\text{ W}$, $V_{CC} = 24\text{ V dc}$, $f = 900\text{ MHz}$)	G_{PE}	7.0	8.5	—	dB
Collector Efficiency ($P_{out} = 30\text{ W}$, $V_{CC} = 24\text{ V dc}$, $f = 900\text{ MHz}$)	η	55	60	—	%



B — Ferrite Bead, Ferroxcube 56-590-65-3B
 C1, C13 — 5.0 μF , 50 Vdc
 C2, C12 — 1000 pF Unelco
 C3, C11 — 47 pF, 100 Mil Chip Capacitor
 C4, C9 — 91 pF, Mini-Underwood
 C5, C6 — 12 pF, Mini-Underwood
 C7 — 18 pF, Mini-Underwood
 C8 — 24 pF, Mini-Underwood
 C10 — 0.8-8.0 pF Johanson Gigatrim

L1, L4 — 11 Turns #20 Enameled Over 10 Ω Carbon Resistor
 L2, L3 — 4 Turns #20 Enameled, .15" ID
 TL1, TL4 — Micro Strip Line, 50 Ω
 TL2 — Micro Strip, $Z_0 = 30\ \Omega$, $\lambda/4$ @ 875 MHz
 TL3 — Micro Strip, $Z_0 = 22\ \Omega$, $\lambda/4$ @ 875 MHz
 Board — 0.032" Glass Teflon
 2 oz. Cu CLAD, $\epsilon_r = 2.55$

Figure 1. 850-900 MHz Broadband Circuit Schematic

TYPICAL CHARACTERISTICS

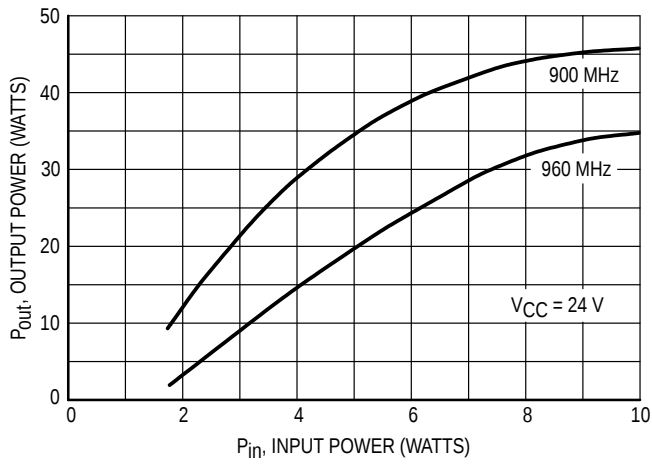


Figure 2. Output Power versus Input Power

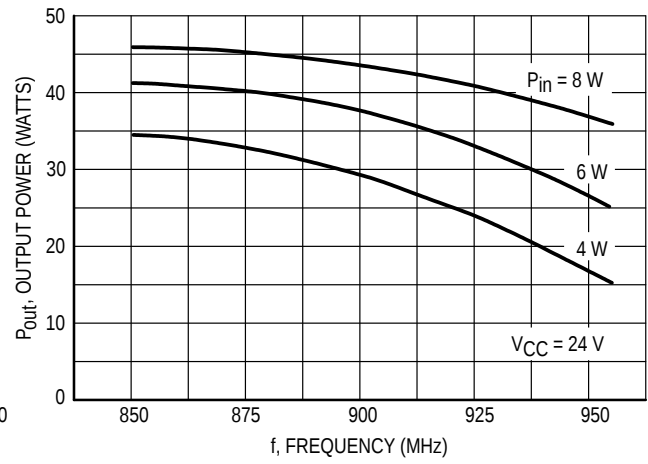


Figure 3. Output Power versus Frequency

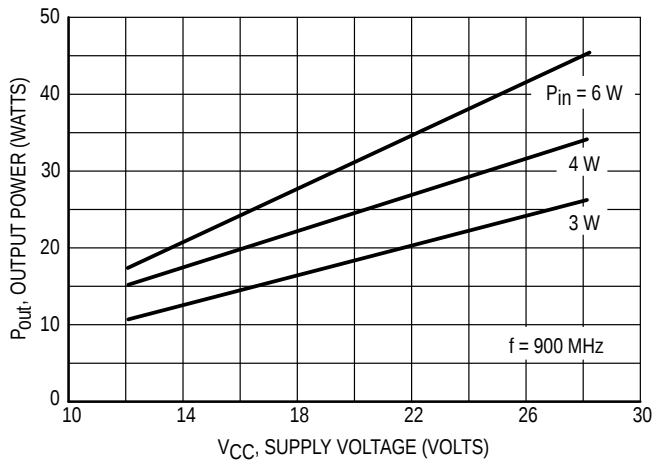


Figure 4. Output Power versus Supply Voltage

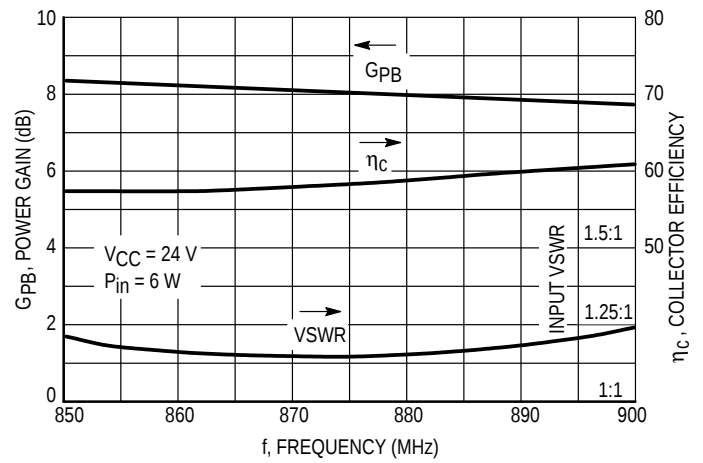
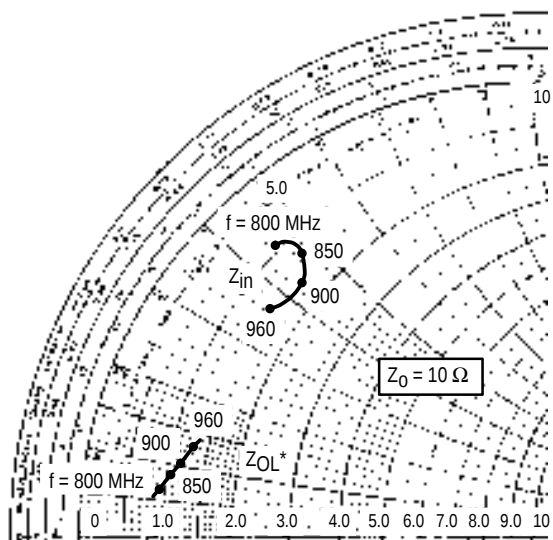


Figure 5. Typical Broadband Circuit Performance



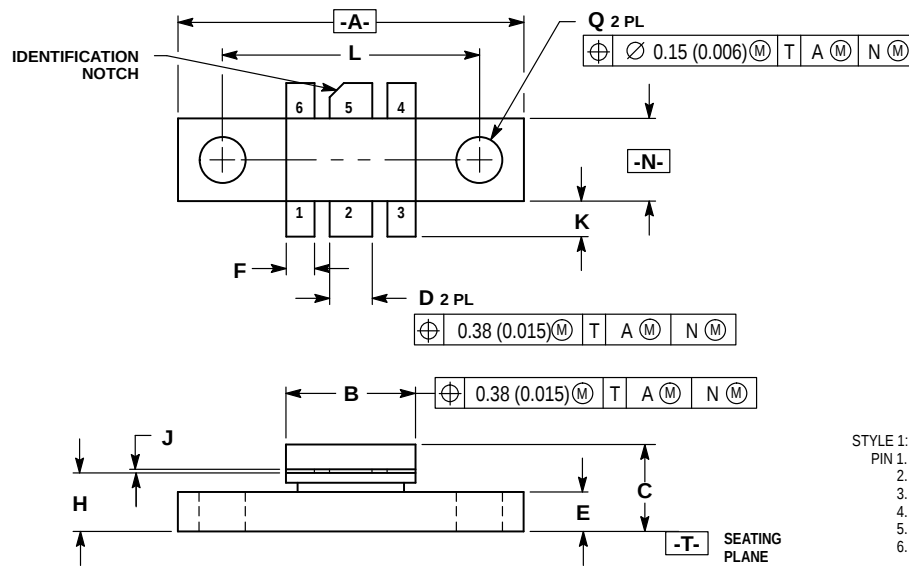
$V_{CC} = 24 \text{ Vdc}$, $P_{out} = 30 \text{ W}$

f Frequency MHz	Z_{in} Ohms	Z_{OL}^* Ohms
800	$0.9 + j4.5$	$1.0 + j0.7$
850	$1.3 + j4.7$	$1.1 + j0.9$
900	$1.6 + j4.4$	$1.2 + j1.1$
960	$1.5 + j3.7$	$1.2 + j1.3$

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

Figure 6. Series Equivalent 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)

**CASE 319-07
ISSUE M**

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Literature Distribution Centers:

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.

JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan.

ASIA PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.



MRF894/D

