

MRF233 (SILICON)

The RF Line

NPN SILICON RF POWER TRANSISTORS

... designed for 12.5 Volt, mid-band large-signal amplifier applications in industrial and commercial FM equipment operating in the 40 to 100 MHz range.

- Specified 12.5 Volt, 90 MHz Characteristics —
Output Power = 15 Watts
Minimum Gain = 10 dB
Efficiency = 55%
- 100% Tested for Load Mismatch at all Phase Angles with
30:1 VSWR
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Characterized with Parallel Equivalent Large-Signal Impedance Parameters

MAXIMUM RATINGS

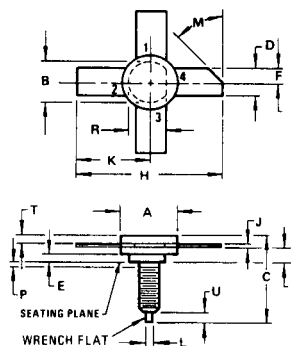
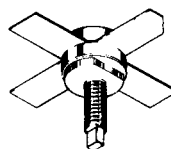
Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CE0}	18	Vdc
Collector-Base Voltage	V_{CB0}	36	Vdc
Emitter-Base Voltage	V_{EB0}	4.0	Vdc
Collector Current — Continuous	I_C	3.5	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate Above 25°C	P_D	50 285	Watts mW/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +200	$^\circ\text{C}$
Stud Torque (2)	—	6.5	In-lb

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	3.5	$^\circ\text{C/W}$

- (1) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as Class C RF amplifiers.
(2) For Repeated Assembly use 5 in. Lb.

15 W — 90 MHz RF POWER TRANSISTOR NPN SILICON



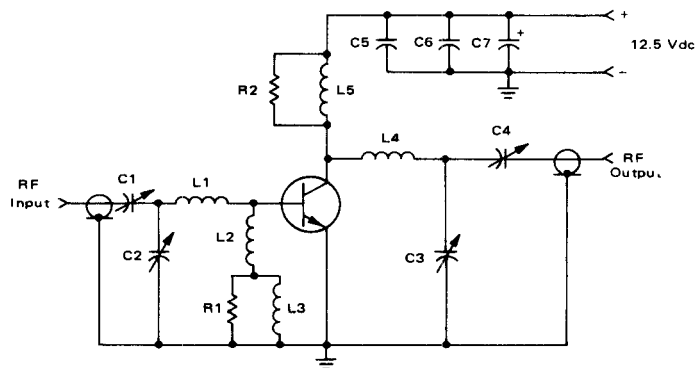
STYLE 1
PIN 1. EMITTER
2. BASE
3. EMITTER
4. COLLECTOR

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.40	9.78	0.370	0.385
B	8.13	8.38	0.320	0.330
C	18.03	19.05	0.710	0.750
D	5.59	5.84	0.220	0.230
E	1.78	2.03	0.070	0.080
F	2.79	2.92	0.110	0.115
H	26.42	28.70	1.040	1.130
J	0.10	0.15	0.004	0.006
K	13.21	14.35	0.520	0.565
L	1.40	1.65	0.055	0.065
M	45° NDM		45° NDM	
P	—	1.27	—	0.050
R	7.59	7.80	0.299	0.307
S	4.01	4.52	0.158	0.178
T	2.16	2.41	0.085	0.095
U	2.54	3.30	0.100	0.130

NOTE
CASE 145A 01 USE 8 32NC2A STUD
CASE 145A-01

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 100\text{ mAdc}$, $I_B = 0$)	BV_{CEO}	18	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 50\text{ mAdc}$, $V_{BE} = 0$)	BV_{CES}	36	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 5.0\text{ mAdc}$, $I_C = 0$)	BV_{EBO}	4.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 15\text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	—	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	5.0	—	—	—
DYNAMIC CHARACTERISTICS					
Output Capacitance ($V_{CB} = 12.5\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}	—	100	120	pF
FUNCTIONAL TESTS (Figure 1)					
Common-Emitter Amplifier Power Gain ($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 15\text{ W}$, $f = 90\text{ MHz}$)	G_{PE}	10	—	—	dB
Collector Efficiency ($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 15\text{ W}$, $f = 90\text{ MHz}$)	η	55	—	—	%
Load Mismatch ($V_{CC} = 12.5\text{ Vdc}$, $P_{out} = 15\text{ W}$, $f = 90\text{ MHz}$, $T_C \leq 25^\circ\text{C}$)	—	VSWR $> 30:1$ Through All Phase Angles in a 3 Second Interval After Which Devices Will Meet G_{PE} Test Limits			

FIGURE 1 — 90 MHz TEST CIRCUIT SCHEMATIC

C1, C3 9.0-180 pF, ARCO 463

C2, C4 25-280 pF ARCO 464

C5 1000 pF UNELCO

C6 0.01 μF ERIE Disc CeramicC7 1.0 μF , 35 Vdc TANTALUM

L1 2 Turns, #18 AWG, 3/8" I.D., 1/4" Long

L2 0.22 μH , 9230-04 MILLER Molded ChokeL3 2.2 μH , 9230-200 MILLER Molded Choke

L4 2 Turns, #18 AWG, 3/8" I.D., 3/8" Long

L5 10 Turns, #16 AWG, Wound On R2

R1 15 Ohm, 1/2 W, 10% Carbon

R2 68 Ohm, 1 Watt, 10% Carbon

Input/Output Connectors — Type BNC

FIGURE 2 – OUTPUT POWER versus INPUT POWER

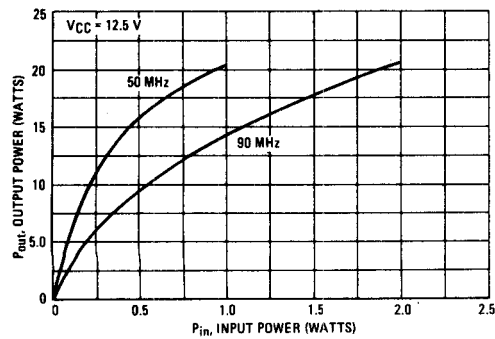


FIGURE 3 – OUTPUT POWER versus FREQUENCY

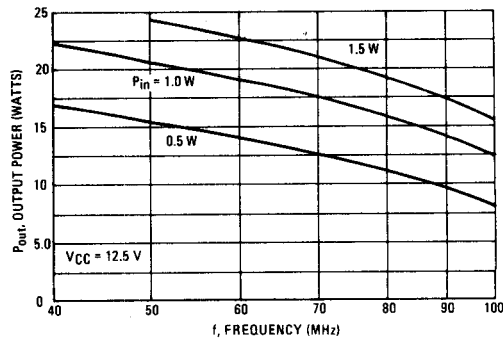


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE

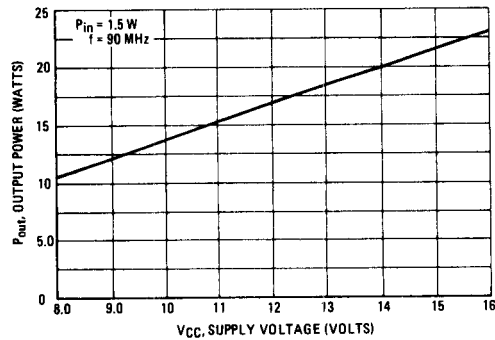
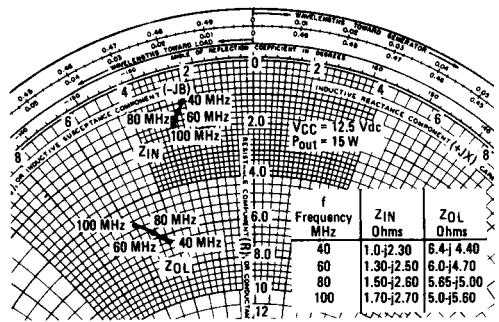
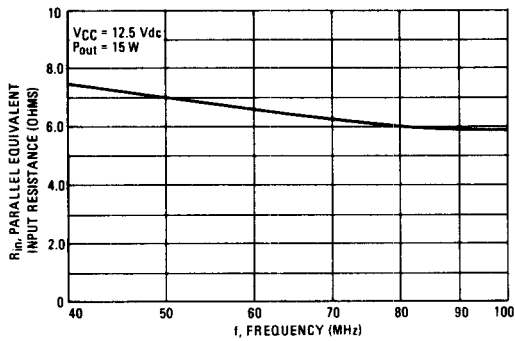


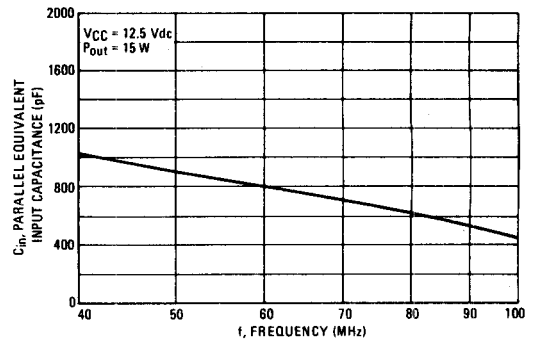
FIGURE 5 – SERIES EQUIVALENT IMPEDANCE



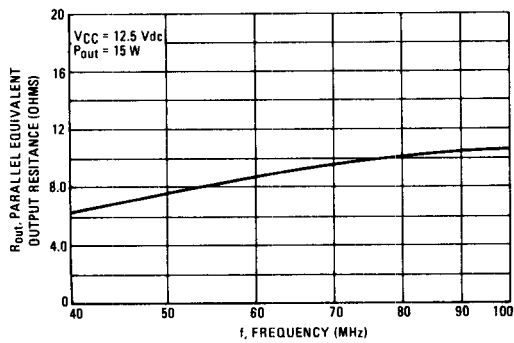
**FIGURE 6 – PARALLEL EQUIVALENT INPUT RESISTANCE
versus FREQUENCY**



**FIGURE 7 – PARALLEL EQUIVALENT INPUT CAPACITANCE
versus FREQUENCY**



**FIGURE 8 – PARALLEL EQUIVALENT OUTPUT RESISTANCE
versus FREQUENCY**



**FIGURE 9 – PARALLEL EQUIVALENT OUTPUT CAPACITANCE
versus FREQUENCY**

