

MOTOROLA SEMICONDUCTOR TECHNICAL DATA

MOTOROLA SC XSTRS/R F

MRF309

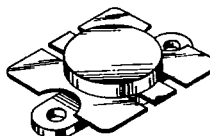
The RF Line

NPN SILICON RF POWER TRANSISTOR

... designed primarily for wideband large-signal output amplifier stages in the 420-450 MHz frequency range.

- Guaranteed Performance in 450 MHz Amplifier @ 28 Vdc
Output Power = 50 Watts
Minimum Gain = 7.0 dB @ 450 MHz
- Built-In Matching Network for Broadband Operation Using Double Match Technique
- 100% Tested for Load Mismatch at all Phase Angles with 20:1 VSWR

50 W-450 MHz
**CONTROLLED "Q"
BROADBAND RF POWER
TRANSISTOR**
NPN SILICON



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V _{CEO}	33	Vdc
Collector-Base Voltage	V _{CBO}	60	Vdc
Emitter-Base Voltage	V _{EBO}	4.0	Vdc
Total Device Dissipation @ T _C = 25°C (1) Derate above 25°C	P _D	146	Watts
		0.83	W/°C
Storage Temperature Range	T _{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	R _{θJC}	1.2	°C/W

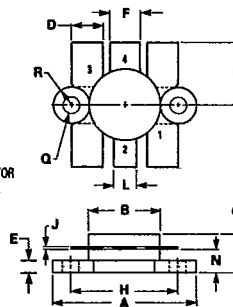
(1) This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.

MATCHING PROCEDURE

In the push-pull circuit configuration it is preferred that the transistors are used as matched pairs to obtain optimum performance.

The matching procedure used by Motorola consists of measuring h_{FE} at the data sheet conditions and color coding the device to predetermined h_{FE} ranges within the normal h_{FE} limits. A color dot is added to the marking on top of the cap. Any two devices with the same color dot can be paired together to form a matched set of units.

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



NOTE:
FLANGE IS ISOLATED IN ALL STYLES.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	24.38	25.14	0.960	0.990
B	12.45	12.95	0.490	0.510
C	5.97	7.62	0.235	0.300
D	5.33	5.58	0.210	0.220
E	2.16	3.04	0.085	0.120
F	5.08	5.33	0.200	0.210
H	18.29	18.54	0.720	0.730
J	0.10	0.15	0.004	0.006
K	10.29	11.17	0.406	0.440
L	3.81	4.06	0.150	0.160
M	3.81	4.31	0.150	0.170
Q	2.92	3.30	0.115	0.130
R	3.05	3.30	0.120	0.130
U	11.94	12.57	0.470	0.496

CASE 316-01

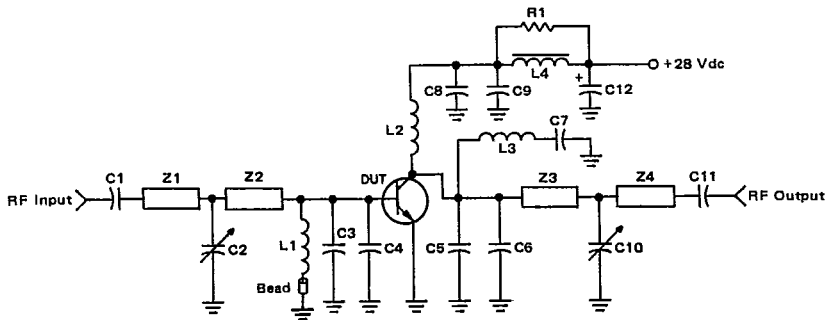
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristics	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I _C = 50 mA, I _B = 0)	V(BR)CEO	33	-	-	Vdc
Collector-Emitter Breakdown Voltage (I _C = 50 mA, V _{BE} = 0)	V(BR)CES	60	-	-	Vdc
Emitter-Base Breakdown Voltage (I _E = 5.0 mA, I _C = 0)	V(BR)EBO	4.0	-	-	Vdc
Collector Cutoff Current (V _{CB} = 30 Vdc, I _E = 0)	I _{CBO}	-	-	2.0	mA
ON CHARACTERISTICS					
DC Current Gain (I _C = 5.0 A, V _{CE} = 5.0 Vdc)	h _{FE}	10	-	100	-
FUNCTIONAL TESTS (Figure 1)					
Common-Emitter Amplifier Power Gain (V _{CC} = 28 Vdc, P _{out} = 50 W, f = 450 MHz)	G _{pE}	7.0	8.0	-	dB
Collector Efficiency (V _{CC} = 28 Vdc, P _{out} = 50 W, f = 450 MHz)	η	50	-	-	%
Electrical Ruggedness (P _{out} = 50 W, V _{CC} = 28 Vdc, f = 450 MHz, VSWR 20:1 all phase angles)	-	No Degradation in P _{out}			
Series Equivalent Input/Output Impedance (V _{CC} = 28 Vdc, P _{out} = 50 W, f = 450 MHz)	Z _{in}	0.7 + j1.6		Z _{OL} * 1.9 + j0.9	

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NOTE: For linear operation, apply forward bias such that I_{CQ} (no RF signal) is 6.0-50 mA.
*Z_{OL} = Conjugate of the load impedance into which the device output operates at a given output power, supply voltage and frequency.

FIGURE 1 - 450 MHz TEST AMPLIFIER



- C3, C4, C5 - Underwood 25 pF
- C2, C10 - Johanson #JMC 5501 1-20 pF
- C6 - Underwood 15 pF
- C7, C8 - 0.1 μF Erie Rad Cap, 100 V
- C9 - Underwood 80 pF
- C1, C11 - Underwood 40 pF
- C12 - 1.0 μF Tantalum

- Z1 - Microstrip 0.200" W X 0.900" L
- Z2 - Microstrip 0.200" W X 0.200" L
- Z3 - Microstrip 0.200" W X 0.500" L
- Z4 - Microstrip 0.200" W X 0.650" L
- L1, L3 - RFC, 0.15 μH Molded Coil
- L2 - RFC, 4 Turns #20 Wire, 3/8" ID, 1/2" long
- L4 - RFC, Ferroxcube VK200 19/4B

- R1 - 5.6 Ω
- Bead - Ferroxcube 66-590-65/4B
- Board Material - 0.062" Thick glass - Teflon, ε_r = 2.56