

6367254 MOTOROLA SC (XSTRS/R F)

89D 78932 D

T-33-09

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA
MRF331**The RF Line****NPN SILICON RF POWER TRANSISTOR**

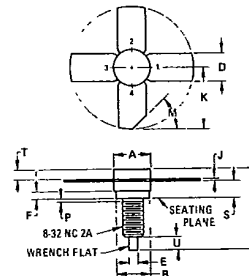
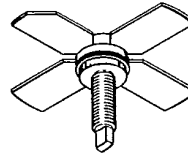
... designed primarily for wideband large-signal driver and predriver amplifier stages in the 100–500 MHz frequency range.

- Guaranteed Performance at 400 MHz and 28 Vdc
Output Power = 10 Watts
Minimum Gain = 8 dB
Efficiency = 55%
- 100% Tested for Load Mismatch at All Phase Angles
With 30:1 VSWR
- Broadband Version of MRF321
- Gold Metallization System for High Reliability
- Controlled Wirebonding Gives High Input Impedance
- See EB74 for Broadband Circuit Details

10 W – 400 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	7.05	7.26	0.278	0.286
B	6.20	6.50	0.244	0.256
C	14.99	16.51	0.590	0.650
D	5.46	5.97	0.215	0.235
E	1.40	1.65	0.055	0.065
F	1.52	—	0.060	—
J	0.08	0.18	0.003	0.007
K	11.05	—	0.435	—
M	45° NOM	—	45°	NOM
P	—	1.27	—	0.050
S	3.00	3.25	0.118	0.128
T	1.40	1.78	0.055	0.070
U	2.92	3.68	0.115	0.145

CASE 244-04

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CE0}	33	Vdc
Collector-Base Voltage	V_{CBO}	60	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector Current – Continuous	I_C	1.1	Adc
– Peak		1.5	
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ (1)	P_D	27	Watts
Derate above 25°C		160	mW/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	–65 to +150	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	6.4	$^\circ\text{C/W}$

(1) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.

(2) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

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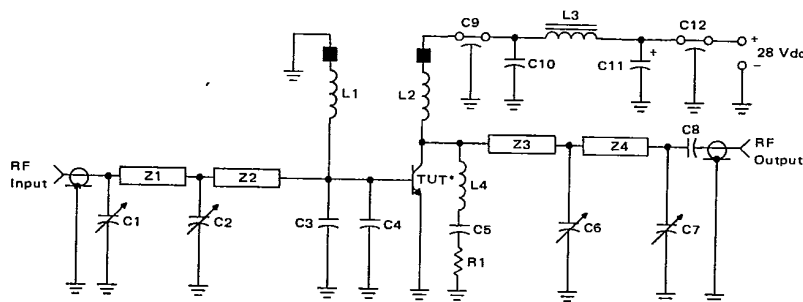
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ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ($I_C = 20\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	33	—	—	Vdc
Collector-Emitter Breakdown Voltage ($I_C = 20\text{ mA}$, $V_{BE} = 0$)	$V_{(BR)CES}$	60	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 20\text{ mA}$, $I_E = 0$)	$V_{(BR)CBO}$	60	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 2.0\text{ mA}$, $I_C = 0$)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 30\text{ Vdc}$, $I_E = 0$)	I_{CBO}	—	—	1.0	mA
ON CHARACTERISTICS					
DC Current Gain ($I_C = 500\text{ mA}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	20	—	80	—
DYNAMIC CHARACTERISTICS					
Output Capacitance ($V_{CB} = 28\text{ Vdc}$, $I_E = 0$, $f = 1.0\text{ MHz}$)	C_{ob}	—	10	12	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain ($V_{CC} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $f = 400\text{ MHz}$)	G_{PE}	8.0	10.5	—	dB
Collector Efficiency ($V_{CC} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $f = 400\text{ MHz}$)	η	55	65	—	%
Load Mismatch ($V_{CC} = 28\text{ Vdc}$, $P_{out} = 10\text{ W}$, $f = 400\text{ MHz}$, $V_{SWR} = 30:1$ all phase angles)	ψ	No Degradation in Power Output			

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FIGURE 1 — 400 MHz TEST CIRCUIT



C1, C2, C6 — 1.0–20 pF Johanson Trimmer (JMC5501)
 C3, C4 — 50 pF Chip Capacitor
 C5, C10 — 0.1 μF Erie Redcap
 C7 — 0.5–10 pF Johanson Trimmer (JMC5201)
 C8 — 270 pF Chip Capacitor
 C9, C12 — 680 pF Feedthru
 C11 — 1.0 μF 50 V Tantalum
 R1 — 5.1 Ω 1/4 Watt
 L1, L2 — 0.15 μH Molded Choke with Ferrite Bead
 (Ferroxcube 56-590-65/4B)

L3 — VK-200-19/4B
 L4 — 4 Turns #20 Enamel, 1/8" ID
 Z1 — Microstrip 0.1" W X 1.35" L
 Z2 — Microstrip 0.1" W X 0.55" L
 Z3 — Microstrip 0.1" W X 0.8" L
 Z4 — Microstrip 0.1" W X 1.75" L
 Board — Glass Teflon $\epsilon_r = 2.56$, $t = 0.062"$
 Input/Output Connectors — Type N

*Transistor Under Test

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FIGURE 2 — POWER GAIN versus FREQUENCY

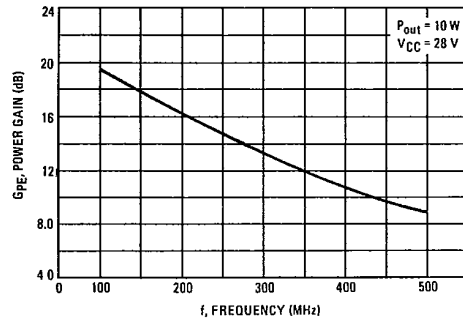


FIGURE 3 — OUTPUT POWER versus INPUT POWER

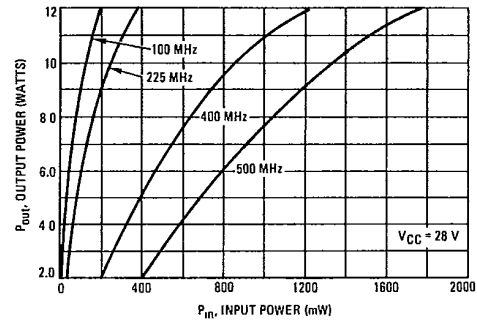


FIGURE 4 — OUTPUT POWER versus SUPPLY VOLTAGE

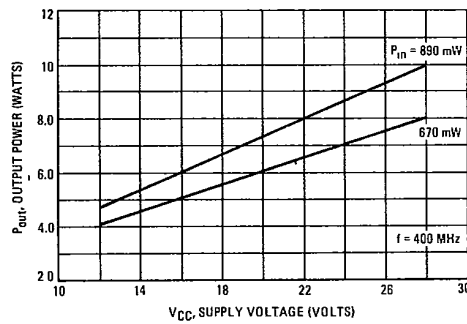
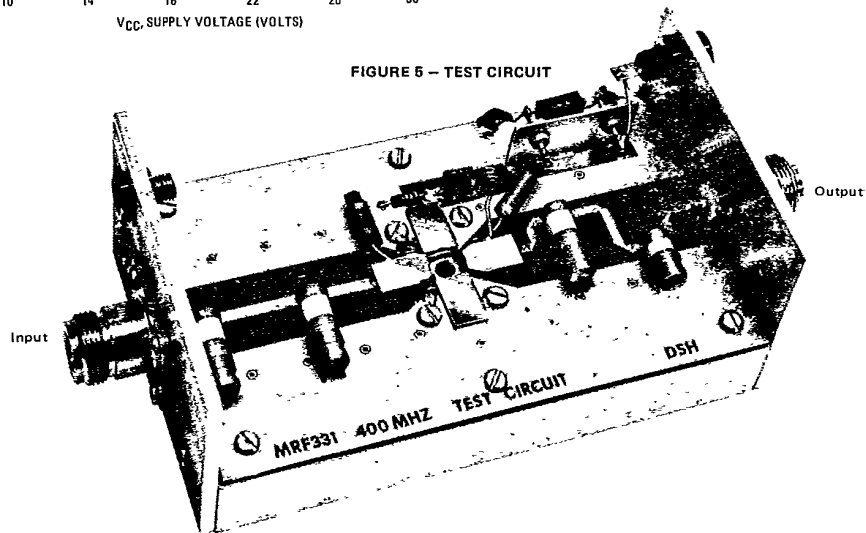


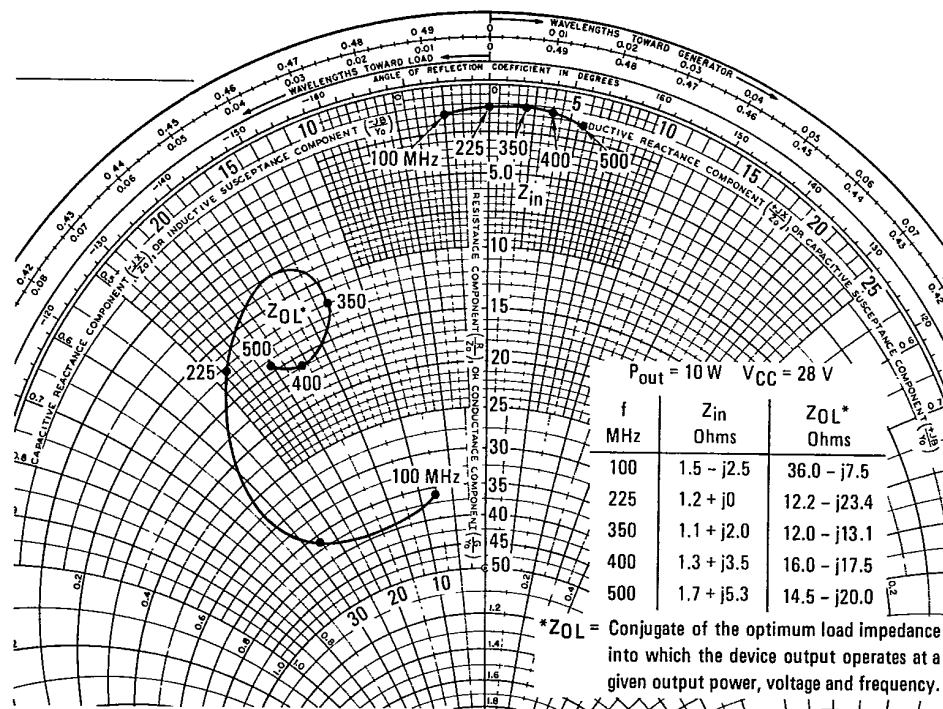
FIGURE 5 — TEST CIRCUIT



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FIGURE 6 - SERIES EQUIVALENT INPUT/OUTPUT IMPEDANCE



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