MOTOROLA
SEMICONDUCTOR TECHNICAL DATA

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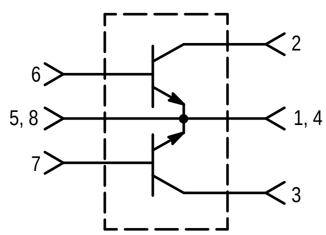
by MRF393/D

The RF Line
NPN Silicon Push-Pull RF Power Transistor

. . . designed primarily for wideband large–signal output and driver amplifier stages in the 30 to 500 MHz frequency range.

- Specified 28 Volt, 500 MHz Characteristics —
  Output Power = 100 W
  Typical Gain = 9.5 dB (Class AB); 8.5 dB (Class C)
  Efficiency = 55% (Typ)
- Built–In Input Impedance Matching Networks for Broadband Operation
- Push–Pull Configuration Reduces Even Numbered Harmonics
- Gold Metallization System for High Reliability
- 100% Tested for Load Mismatch
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

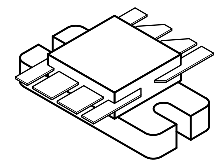


The MRF393 is two transistors in a single package with separate base and collector leads and emitters common. This arrangement provides the designer with a space saving device capable of operation in a push–pull configuration.

PUSH–PULL TRANSISTORS

MRF393

**100 W, 30 to 500 MHz
CONTROLLED "Q"
BROADBAND PUSH–PULL
RF POWER TRANSISTOR
NPN SILICON**



CASE 744A–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}	4.0	Vdc
Collector Current — Continuous	I_C	16	Adc
Total Device Dissipation @ T_C = 25°C (1) Derate above 25°C	P_D	270 1.54	Watts W/°C
Storage Temperature Range	T_{stg}	–65 to +150	°C
Junction Temperature	T_J	200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.65	°C/W

NOTE:
1. This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF push–pull amplifier.

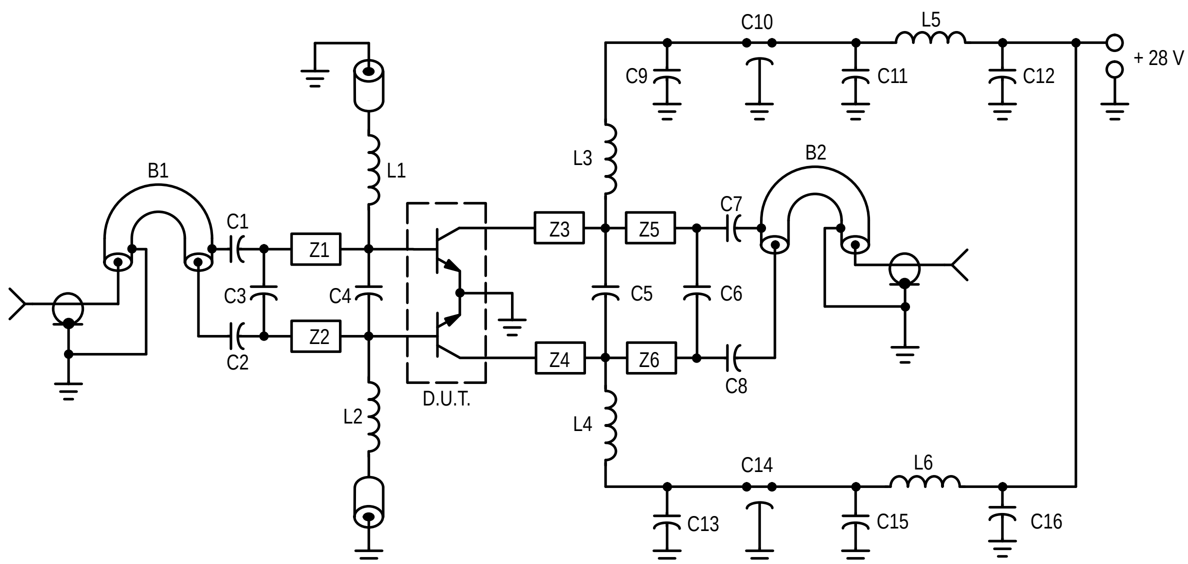
REV 7

MOTOROLA

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS (1)					
Collector–Emitter Breakdown Voltage (I_C = 50 mAdc, I_B = 0)	$V_{(BR)CEO}$	30	—	—	Vdc
Collector–Emitter Breakdown Voltage (I_C = 50 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	60	—	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 5.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}	—	—	5.0	mAdc
ON CHARACTERISTICS (1)					
DC Current Gain (I_C = 1.0 Adc, V_{CE} = 5.0 Vdc)	h_{FE}	20	—	100	—
DYNAMIC CHARACTERISTICS (1)					
Output Capacitance (V_{CB} = 28 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	40	75	95	pF
FUNCTIONAL TESTS (2) **— See Figure 1**					
Common–Emitter Amplifier Power Gain (V_{CC} = 28 Vdc, P_{out} = 100 W, f = 500 MHz)	G_{pe}	7.5	8.5	—	dB
Collector Efficiency (V_{CC} = 28 Vdc, P_{out} = 100 W, f = 500 MHz)	η	50	55	—	%
Load Mismatch (V_{CC} = 28 Vdc, P_{out} = 100 W, f = 500 MHz, VSWR = 30:1, all phase angles)	ψ	No Degradation in Output Power			

NOTES:
1. Each transistor chip measured separately.
2. Both transistor chips operating in push–pull amplifier.



C1, C2, C7, C8 — 240 pF 100 mil Chip Cap
C3 — 15 pF 100 mil Chip Cap
C4 — 24 pF 100 mil Chip Cap
C5 — 33 pF 100 mil Chip Cap
C6 — 12 pF 100 mil Chip Cap
C9, C13 — 1000 pF 100 mil Chip Cap
C10, C14 — 680 pF Feedthru Cap
C11, C15 — 0.1 µF Ceramic Disc Cap
C12, C16 — 50 µF 50 V

L1, L2 — 0.15 µH Molded Choke with Ferrite Bead
L3, L4 — 2–1/2 Turns #20 AWG 0.200″ ID
L5, L6 — 3–1/2 Turns #18 AWG 0.200″ ID
B1, B2 — Balun 50 Ω Semi Rigid Coax, 86 mil OD, 4″ Long
Z1, Z2 — 850 mil Long x 125 mil W. Microstrip
Z3, Z4 — 200 mil Long x 125 mil W. Microstrip
Z5, Z6 — 800 mil Long x 125 mil W. Microstrip
Board Material — 0.0325″ Teflon–Fiberglass, ε_r = 2.56, 1 oz. Copper Clad both sides.

Figure 1. 500 MHz Test Fixture

CLASS C

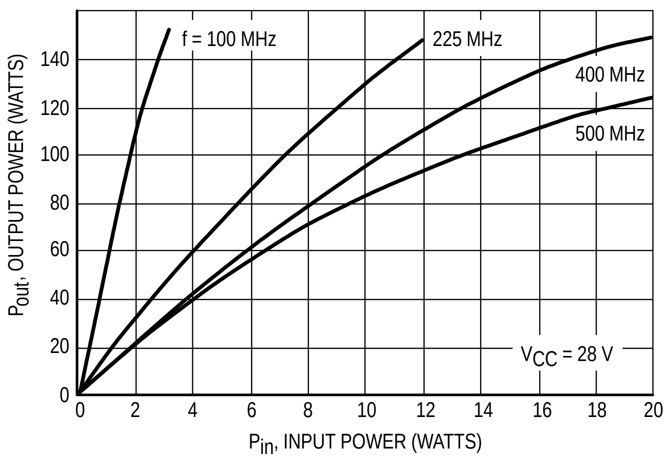


Figure 2. Output Power versus Input Power

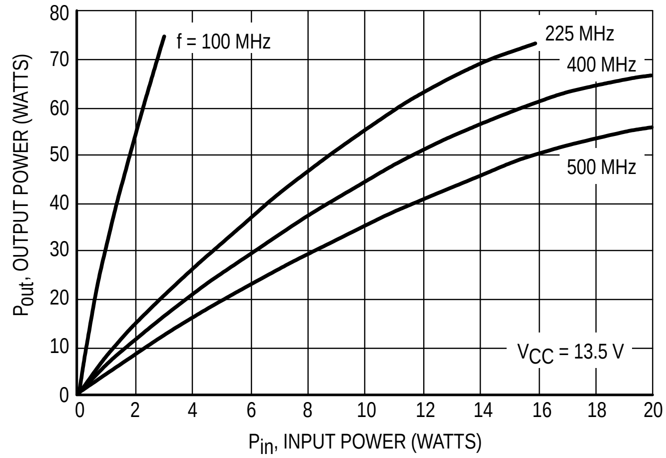


Figure 3. Output Power versus Input Power

CLASS C

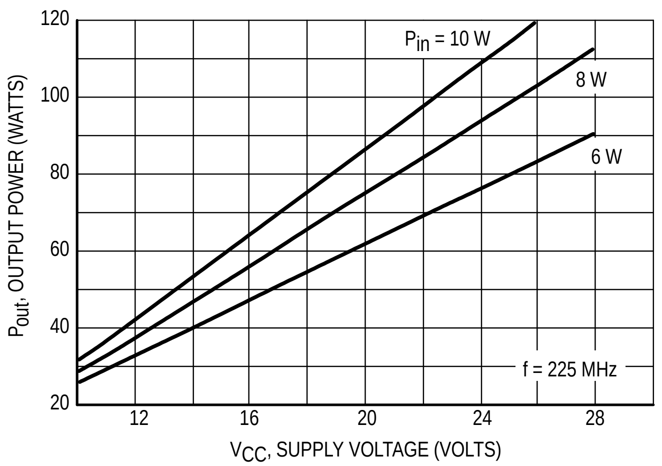


Figure 4. Output Power versus Supply Voltage

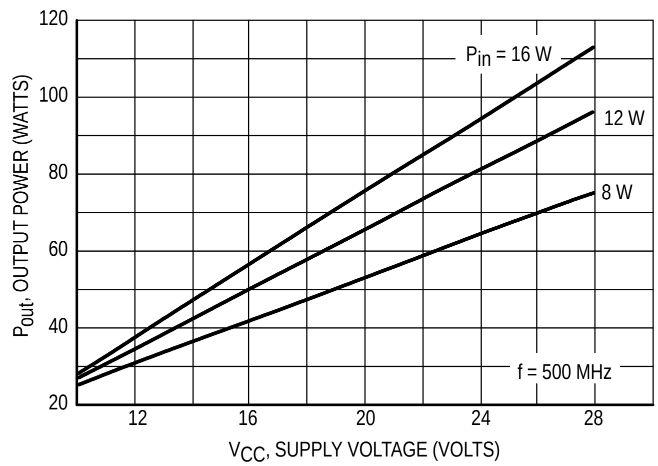
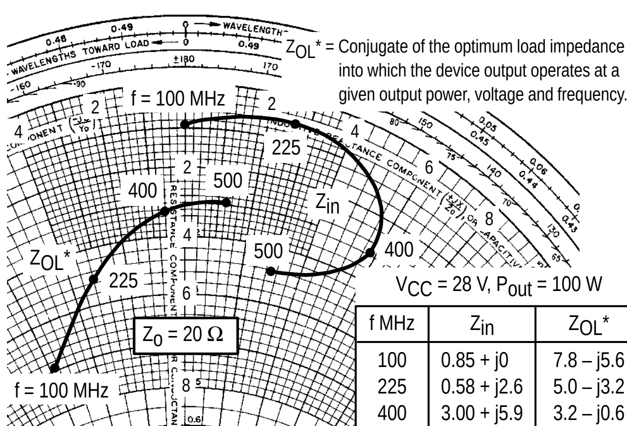


Figure 5. Output Power versus Supply Voltage



V_{CC} = 28 V, P_{out} = 100 W

f MHz	Z_{in}	Z_{OL}*
100	0.85 + j0	7.8 – j5.6
225	0.58 + j2.6	5.0 – j3.2
400	3.00 + j5.9	3.2 – j0.6
500	4.80 + j3.0	2.9 + j1.2

NOTE: Z_{in} & Z_{OL}* are given from base–to–base and collector–to–collector respectively.

Figure 6. Series Equivalent Input/Output Impedance

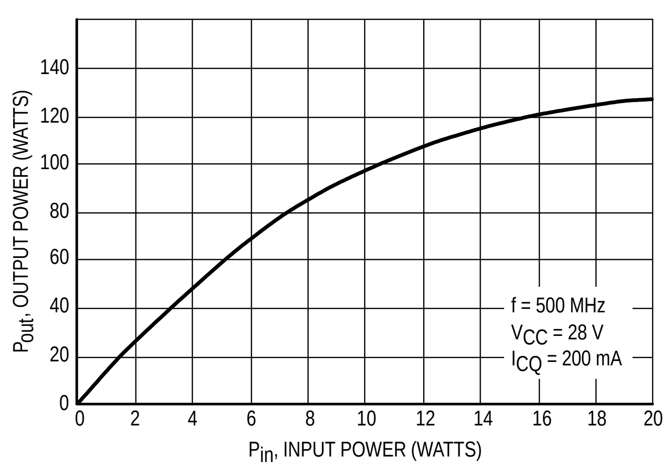
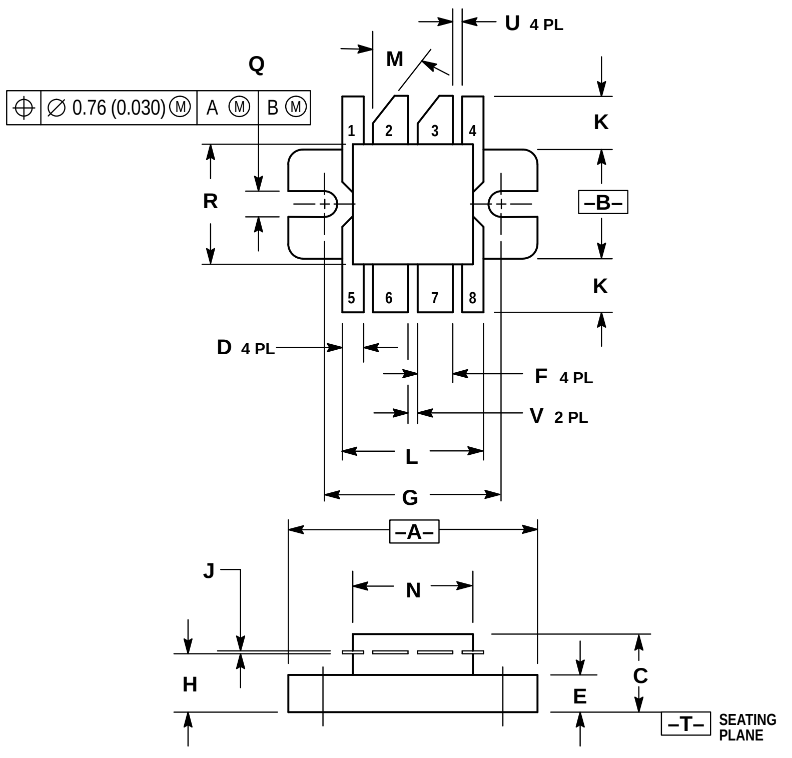


Figure 7. Class AB Output Power versus Input Power

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	22.60	23.11	0.890	0.910
B	9.52	10.03	0.375	0.395
C	6.65	7.16	0.262	0.282
D	1.60	1.95	0.063	0.077
E	2.94	3.40	0.116	0.134
F	2.87	3.22	0.113	0.127
G	16.51 BSC		0.650 BSC	
H	4.01	4.36	0.158	0.172
J	0.07	0.15	0.003	0.006
K	4.34	4.90	0.171	0.193
L	12.45	12.95	0.490	0.510
M	45° NOM		45° NOM	
N	1.051	11.02	0.414	0.434
Q	3.04	3.35	0.120	0.132
R	9.90	10.41	0.390	0.410
U	1.02	1.27	0.040	0.050
V	0.64	0.89	0.025	0.035

STYLE 1:
PIN 1. EMITTER (COMMON)
2. COLLECTOR
3. COLLECTOR
4. EMITTER (COMMON)
5. EMITTER (COMMON)
6. BASE
7. BASE
8. EMITTER (COMMON)

CASE 744A–01
ISSUE C

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