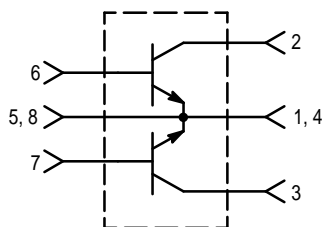


## The RF Line NPN Silicon Push-Pull RF Power Transistor

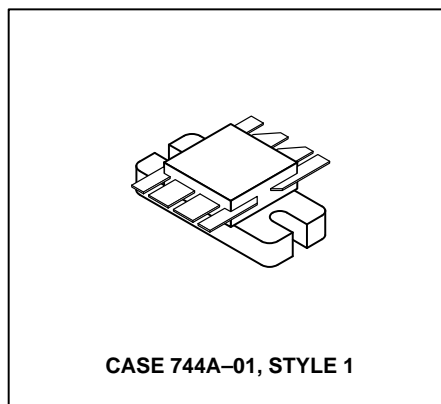
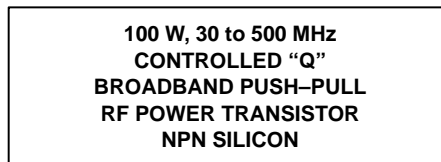
... designed primarily for wideband large-signal output and driver amplifier stages in the 30 to 500 MHz frequency range.

- 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



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



### 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 @ $T_C = 25^\circ\text{C}$ (1) Derate above $25^\circ\text{C}$	$P_D$	270 1.54	Watts W/ $^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$
Junction Temperature	$T_J$	200	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

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

NOTE:

- 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.

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS (1)</b>					
Collector–Emitter Breakdown Voltage ( $I_C = 50\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	30	—	—	Vdc
Collector–Emitter Breakdown Voltage ( $I_C = 50\text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	60	—	—	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 5.0\text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 30\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	—	—	5.0	mAdc

**ON CHARACTERISTICS (1)**

DC Current Gain ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$h_{FE}$	20	—	100	—
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**DYNAMIC CHARACTERISTICS (1)**

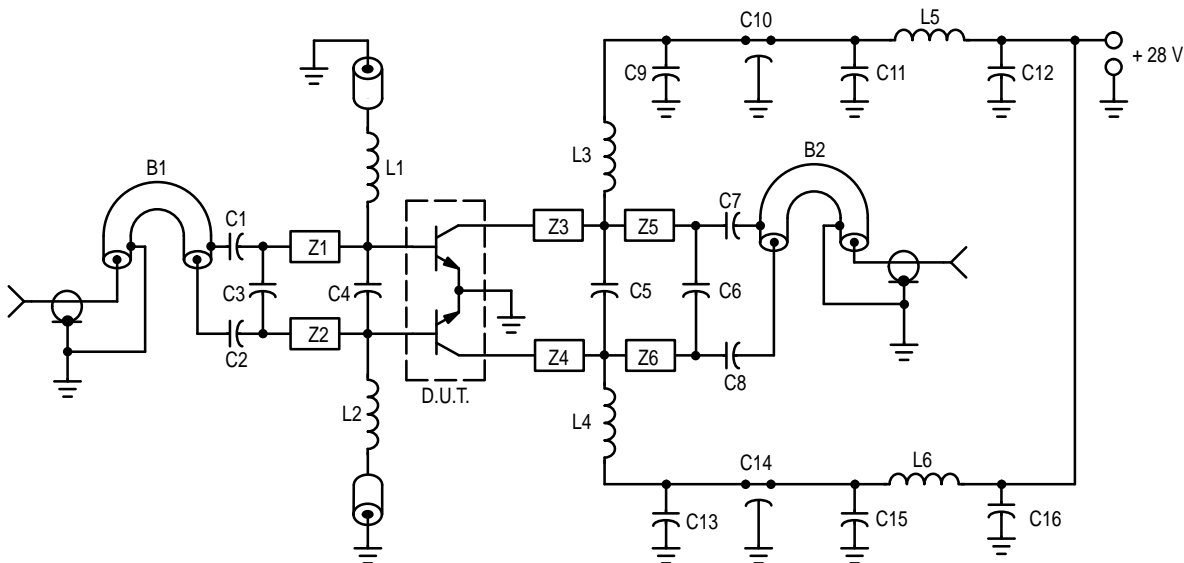
Output Capacitance ( $V_{CB} = 28\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ob}$	40	75	95	pF
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**FUNCTIONAL TESTS (2) — See Figure 1**

Common–Emitter Amplifier Power Gain ( $V_{CC} = 28\text{ Vdc}$ , $P_{out} = 100\text{ W}$ , $f = 500\text{ MHz}$ )	$G_{pe}$	7.5	8.5	—	dB
Collector Efficiency ( $V_{CC} = 28\text{ Vdc}$ , $P_{out} = 100\text{ W}$ , $f = 500\text{ MHz}$ )	$\eta$	50	55	—	%
Load Mismatch ( $V_{CC} = 28\text{ Vdc}$ , $P_{out} = 100\text{ W}$ , $f = 500\text{ MHz}$ , $VSWR = 30:1$ , all phase angles)	$\psi$	No Degradation in Output Power			

**NOTES:**

- Each transistor chip measured separately.
- 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  $\mu\text{F}$  Ceramic Disc Cap  
 C12, C16 — 50  $\mu\text{F}$  50 V

L1, L2 — 0.15  $\mu\text{H}$  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

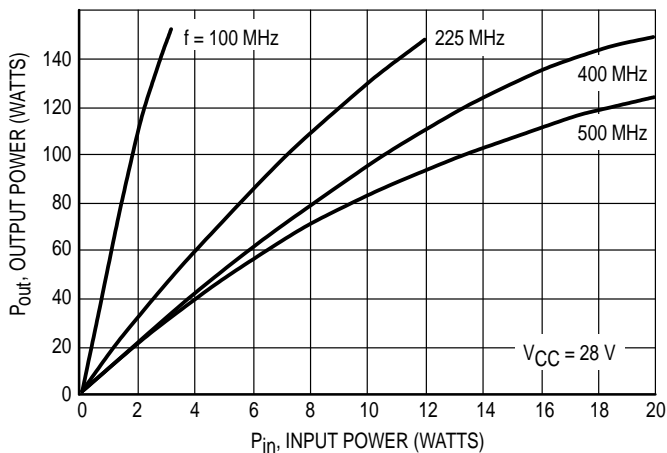
B1, B2 — Balun 50  $\Omega$  Semi Rigid Coax, 86 mil OD, 4" Long

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

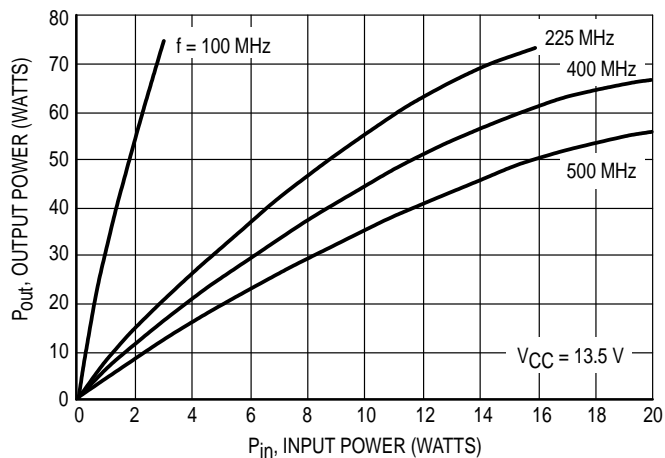
Board Material — 0.0325" Teflon–Fiberglass,  $\epsilon_r = 2.56$ ,  
 1 oz. Copper Clad both sides.

**Figure 1. 500 MHz Test Fixture**

**CLASS C**

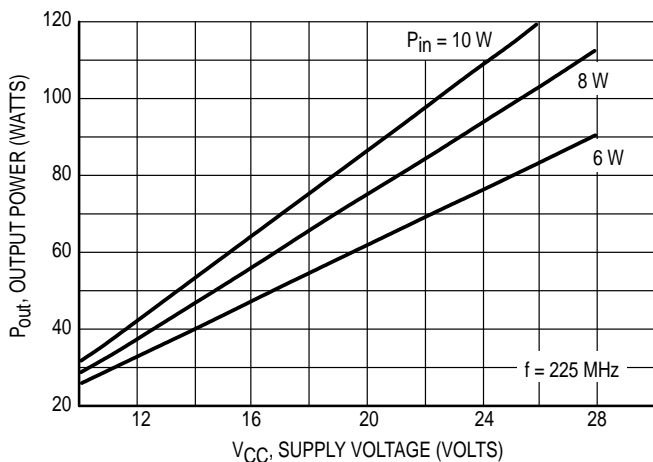


**Figure 2. Output Power versus Input Power**

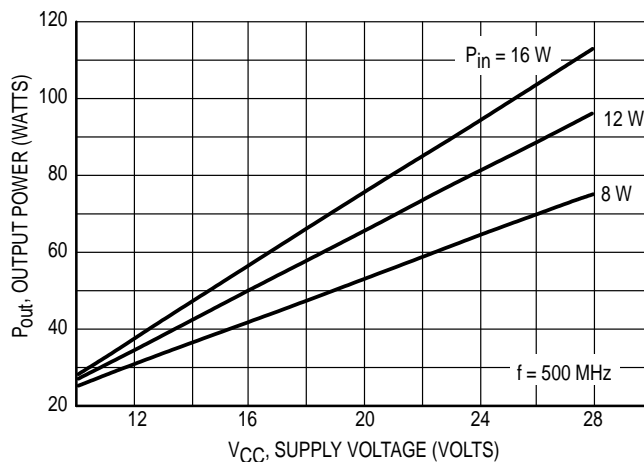


**Figure 3. Output Power versus Input Power**

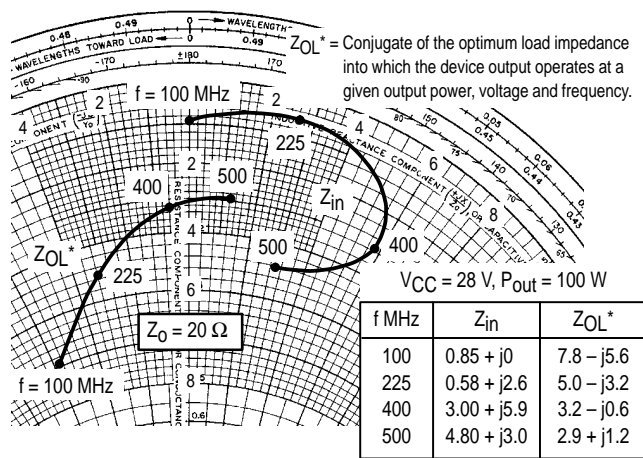
**CLASS C**



**Figure 4. Output Power versus Supply Voltage**

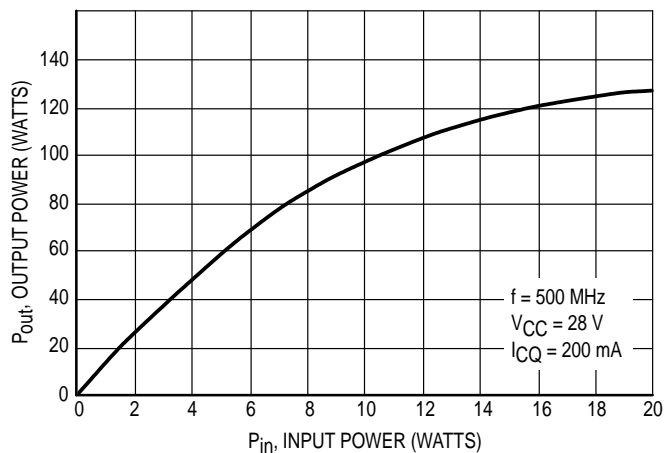


**Figure 5. Output Power versus Supply Voltage**



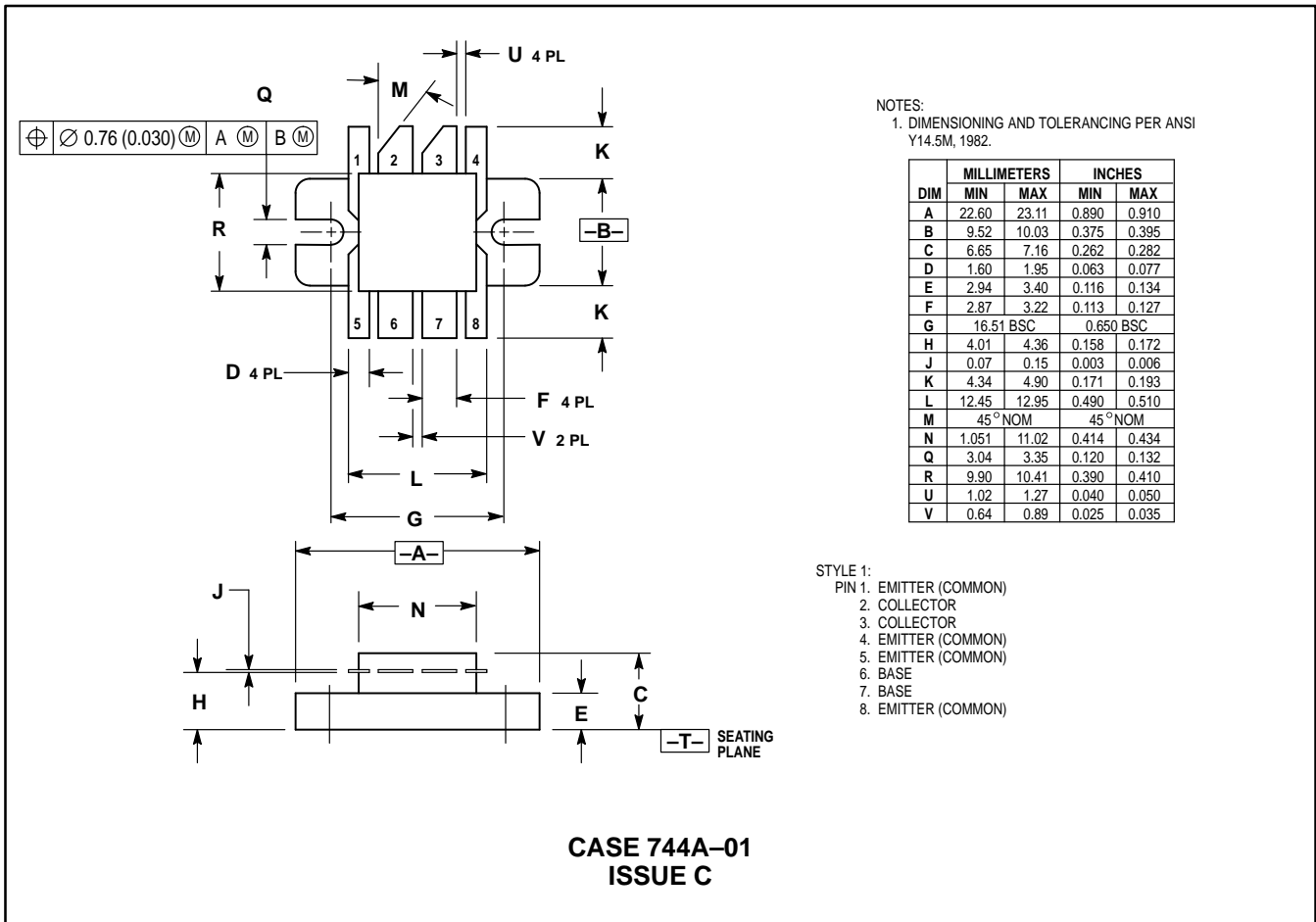
NOTE: Z<sub>in</sub> & Z<sub>OL</sub>\* are given from base-to-base and collector-to-collector respectively.

**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		INCHES	
	MIN	MAX	MIN	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)

-T- SEATING PLANE

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