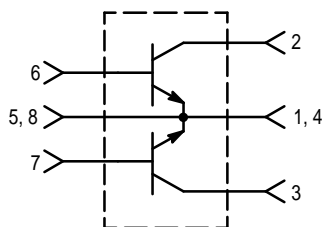


## The RF Line

# 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.

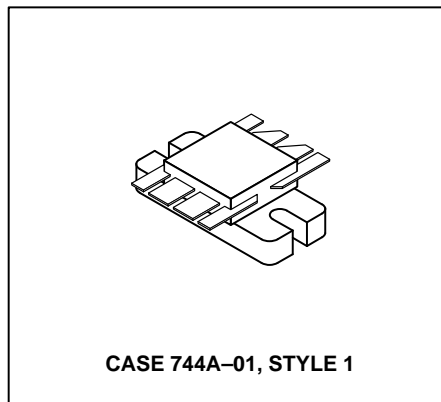


The MRF393 is two transistors in a single package with separate base and collector leads and emitters common. This arrangement provides the designer with a space saving device capable of operation in a push-pull configuration.

### PUSH-PULL TRANSISTORS



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



### 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	$^\circ\text{C/W}$

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.

**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)**

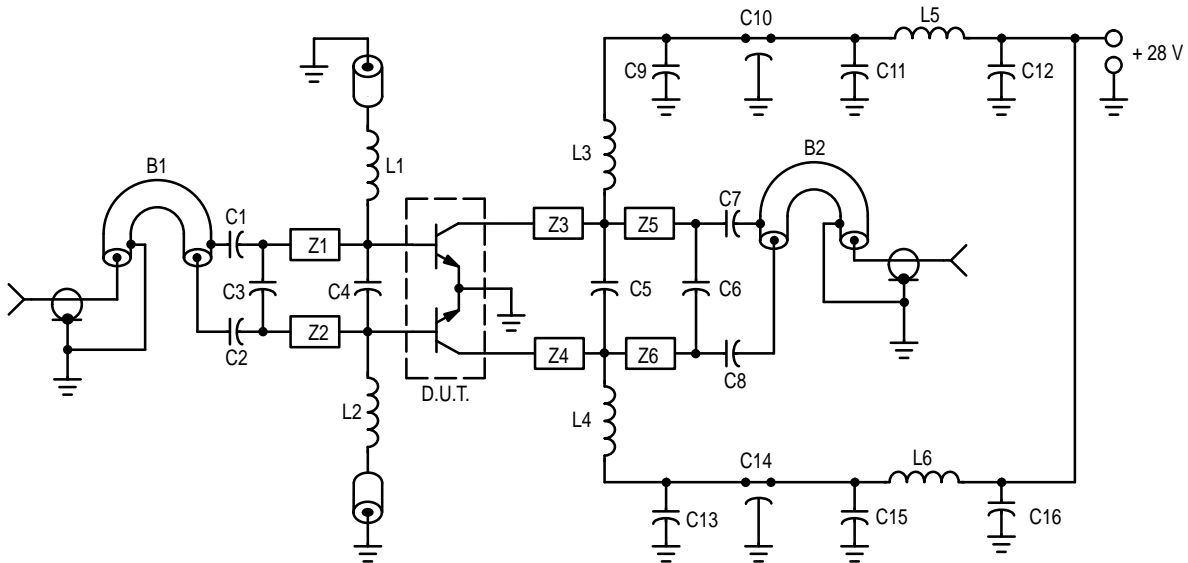
Output Capacitance ( $V_{CB} = 28\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{ob}$	40	75	95	pF
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**FUNCTIONAL TESTS (2) — See Figure 1**

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:**

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  $\mu\text{F}$  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

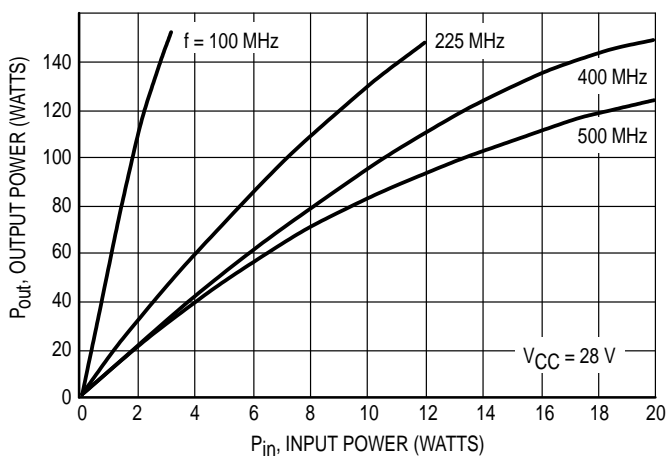


Figure 2. Output Power versus Input Power

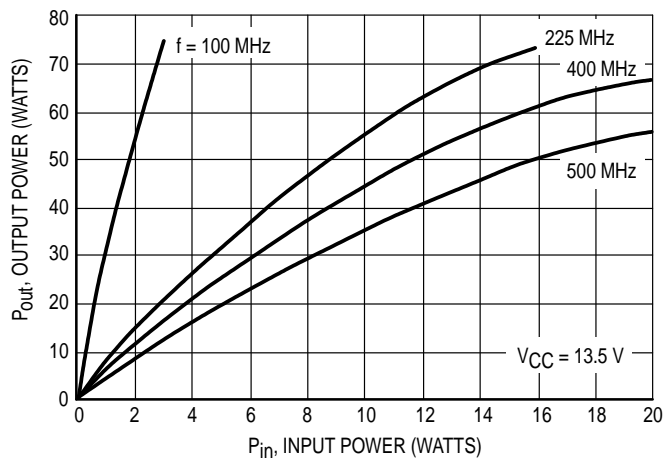


Figure 3. Output Power versus Input Power

### CLASS C

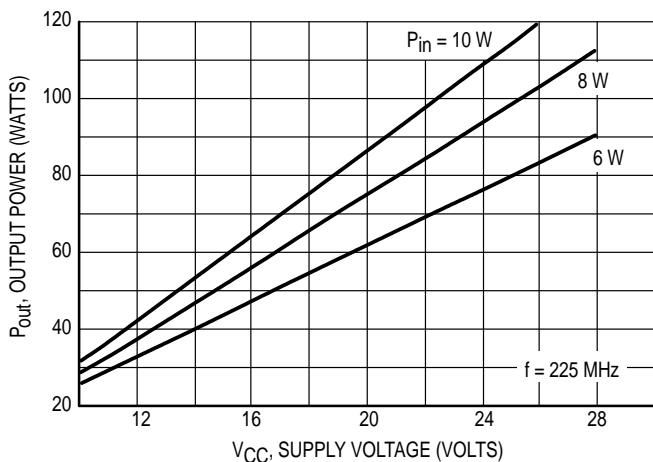


Figure 4. Output Power versus Supply Voltage

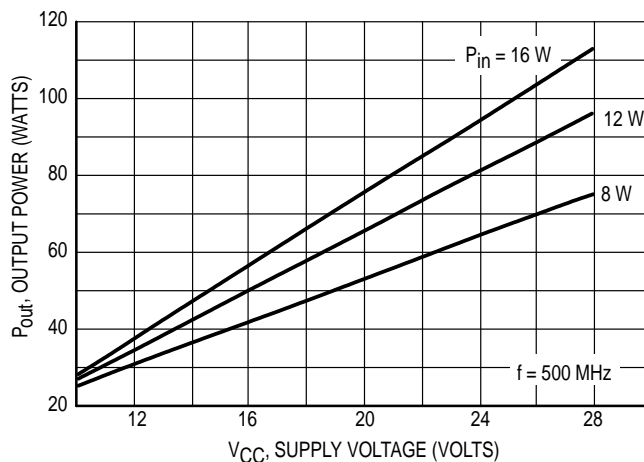
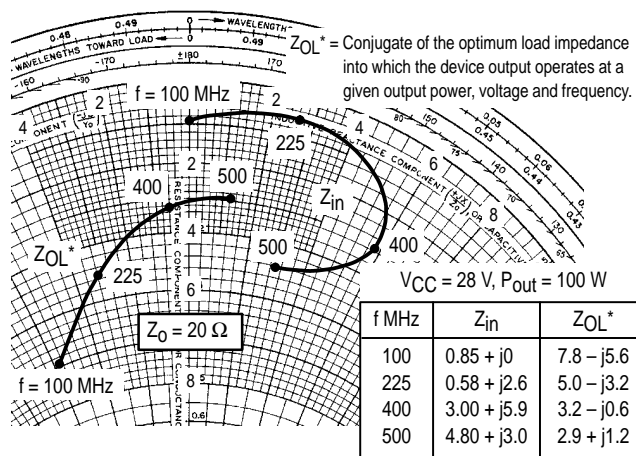


Figure 5. Output Power versus Supply Voltage



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

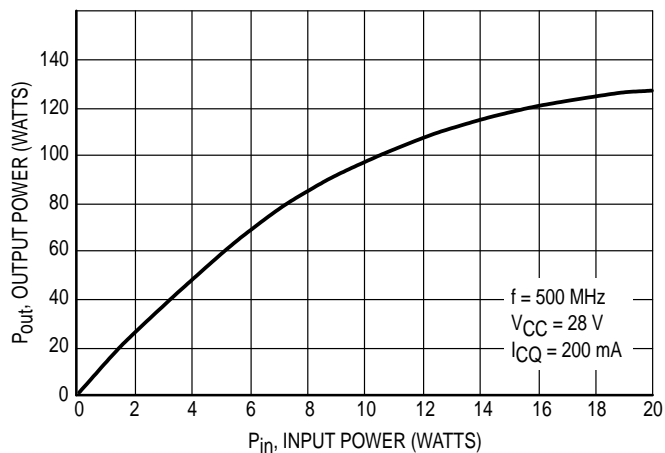
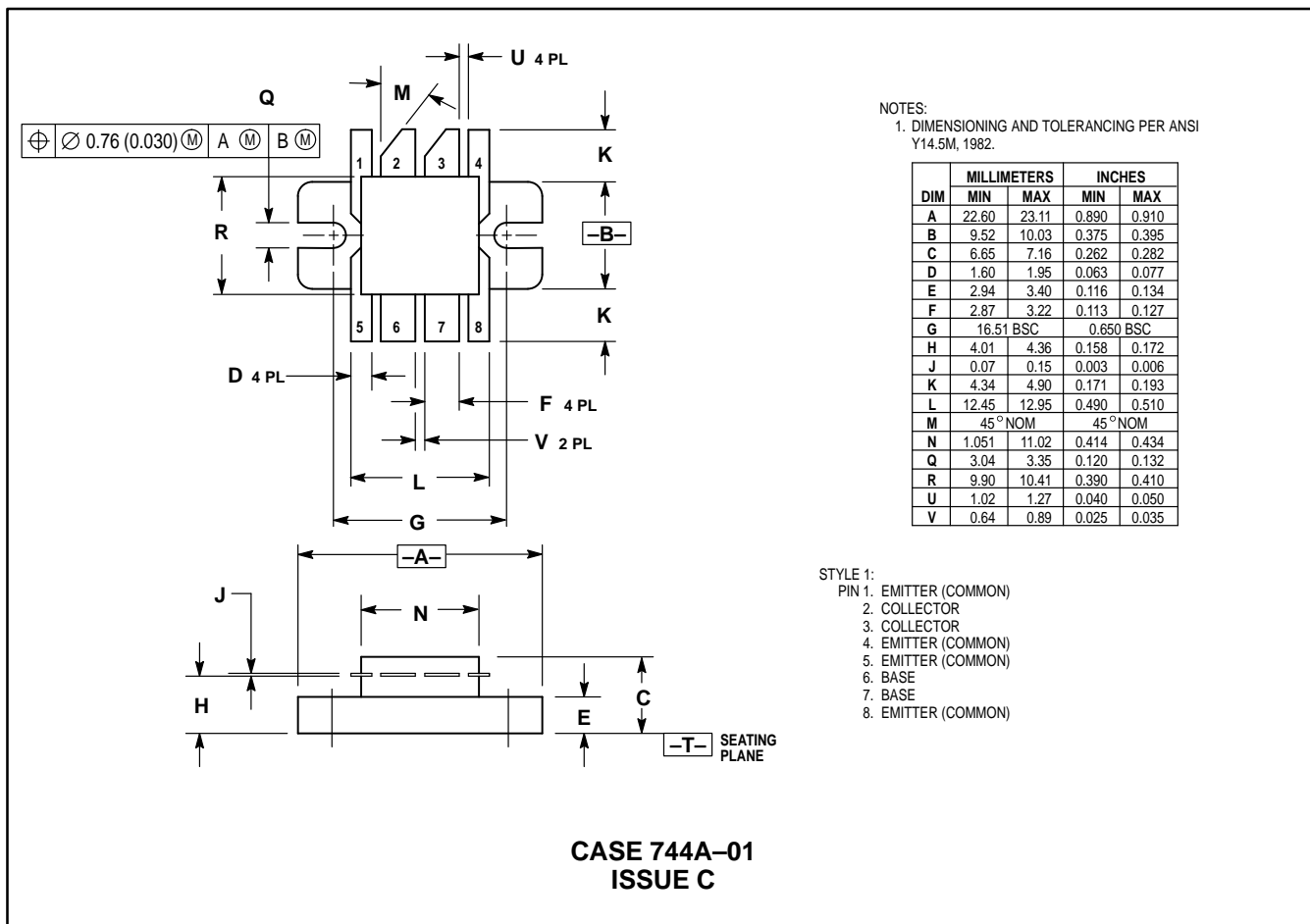


Figure 7. Class AB Output Power versus Input Power

# PACKAGE DIMENSIONS



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MRF393/D

