

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

T-33-05

The RF Line**UHF Power Transistors**

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The TP3010/S are designed for 12.5 V, 900 MHz common-emitter amplifiers operating in the 820–960 MHz frequency region.

- 900 MHz
- 1.5 W — P_{out}
- 12.5 V — V_{CC}
- 7 dB Min Gain

TP3010
TP3010S
1.5 W to 900 MHz
UHF POWER
TRANSISTORS
NPN SILICON
MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	16	Vdc
Collector-Base Voltage	V_{CBO}	30	Vdc
Emitter-Base Voltage	V_{EBO}	3	Vdc
Collector Current — Continuous	I_C	2	Adc
Operating Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{stg}	–50 to +200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	14	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage ($I_C = 25\text{ mA}$, $I_B = 0$)	$V_{(BR)CEO}$	16	—	—	Vdc
Collector-Base Breakdown Voltage ($I_C = 4\text{ mA}$, $I_E = 0$)	$V_{(BR)CBO}$	30	—	—	Vdc
Emitter-Base Breakdown Voltage ($I_E = 1\text{ mA}$, $I_C = 0$)	$V_{(BR)EBO}$	3	—	—	Vdc
Collector Cutoff Current ($V_{CB} = 15\text{ V}$, $I_E = 0$)	I_{CBO}	—	—	0.4	mAdc

ON CHARACTERISTICS

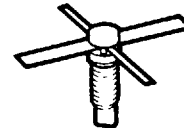
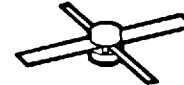
DC Current Gain ($I_C = 320\text{ mA}$, $V_{CE} = 10\text{ V}$)	h_{FE}	25	—	—	—
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DYNAMIC CHARACTERISTICS

Output Capacitance ($V_{CB} = 12.5\text{ V}$, $I_E = 0$, $f = 1\text{ MHz}$)	C_{ob}	—	—	8	pF
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FUNCTIONAL TESTS

Common-Emitter Amplifier Power Gain ($V_{CE} = 12.5\text{ V}$, $P_{out} = 1.5\text{ W}$, $f = 900\text{ MHz}$)	G_{PE}	7	—	—	dB
Collector Efficiency ($V_{CE} = 12.5\text{ V}$, $P_{out} = 1.5\text{ W}$, $f = 900\text{ MHz}$)	η_c	55	—	—	%
Load Mismatch ($V_{CE} = 16\text{ V}$, $P_{out} = 1.5\text{ W}$, $f = 900\text{ MHz}$, Load VSWR = $\infty:1$, All Phase Angles)	ψ	No Degradation in Output Power			


CASE 305B-01, STYLE 1
(.200 SOE)
TP3010

CASE 305C-01, STYLE 1
(.200 SOE S)
TP3010S

TYPICAL CHARACTERISTICS

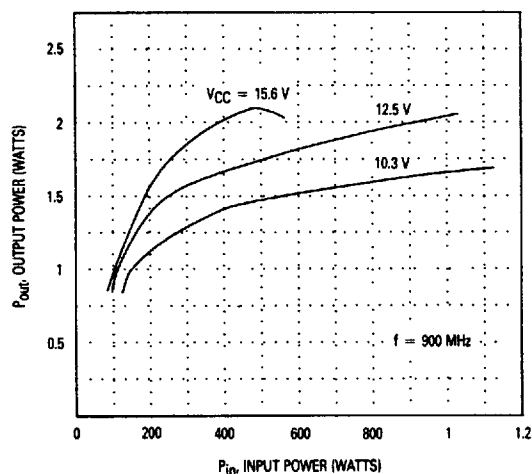
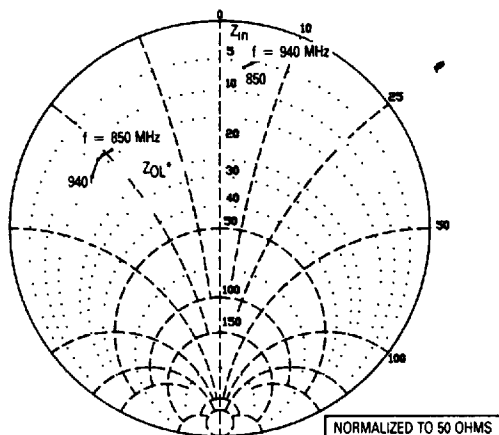


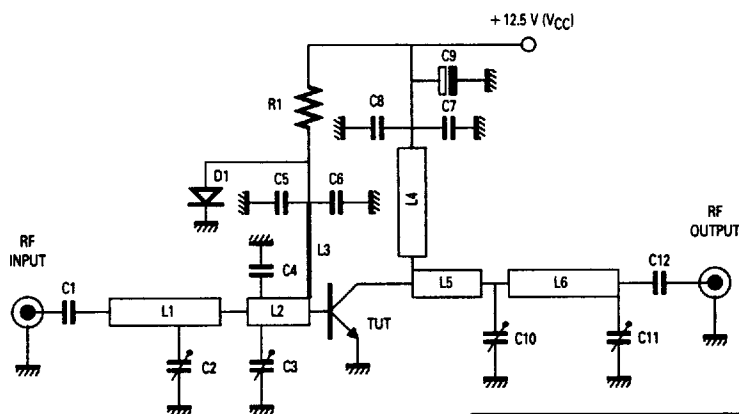
Figure 1. Output Power versus Input Power

Z_{OL}^* = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency



f (MHz)	Z_{in} (Ohm)	Z_{OL}^* (Ohms)
850	$6.6 + j3.4$	$14 - j24$
880	$5.9 + j4.7$	$13.9 - j26$
900	$5.4 + j5.6$	$13.8 - j27$
940	$4.7 + j7.85$	$15.2 - j32$

Figure 2. Series Equivalent Input/Output Impedances



Note: Amplifier tunable from 820 to 960 MHz.
 Instantaneous Bandwidth — 40 MHz Typ.

C1, C5, C7, C12	Capacitor Chip 330 pF CGO SMT
C2, C3, C10, C11	0.5-5 pF GGU Trimmer Capacitor
C4	Capacitor Chip 3.9 pF
C6, C8	Capacitor Chip 15 nF
C9	Electrolytic Capacitor 10 MF 16 V
R1	Resistor // 2 x 270 Ohms 1/2 W
D1	0.57 for Class B Operation
L1	15 mm $Z_0 = 50$ Ohm
L2, L5	7 mm $Z_0 = 25$ Ohm
L3	27 mm $Z_0 = 75$ Ohm
L4	20 mm $Z_0 = 50$ Ohm
L6	28 mm $Z_0 = 50$ Ohm
Board Material	020 In. $\epsilon_r = 2.55$, Teflon Glass

Figure 3. Broadband Amplifier Circuit

MOTOROLA RF DEVICE DATA

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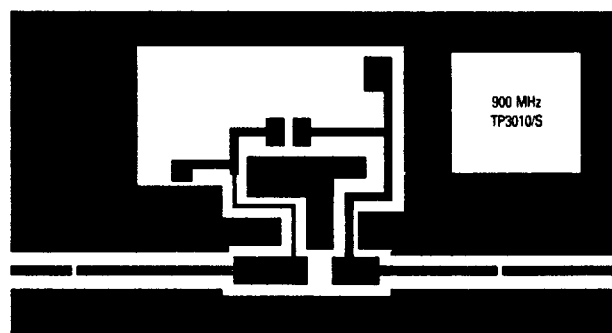
Board Material: .020 in. Glass Teflon $\epsilon_r = 2.55$

Figure 4. Printed Circuit Board Layout (Not to Scale)

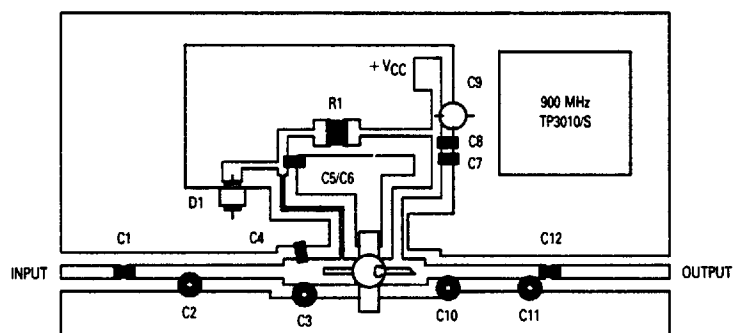


Figure 5. Component Layout