T-33-09

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

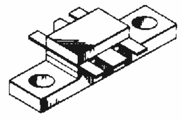
TP3031

The RF Line
UHF Power Transistor

25 W–960 MHz
UHF POWER
TRANSISTOR
NPN SILICON

The TP3031 is designed for 960 MHz base stations in both analog and digital applications. It incorporates high value emitter ballast resistors, gold metallizations and offers a high degree of reliability and ruggedness.

- Specified 26 Volts, 960 MHz Characteristics
  Output Power = 25 Watts
  Minimum Gain = 8.0 dB
  Class AB
  I_Q = 100 mA



CASE 319-06, STYLE 2

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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CER}	40	Vdc
Collector-Base Voltage	V_{CBO}	48	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector-Current — Continuous	I_C	4.0	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	70 0.6	Watts W/°C
Storage Temperature Range	T_{stg}	−65 to +150	°C
Operating Junction Temperature	T_J	200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (1) at 70°C Case	$R_{\theta JC}$	2.5	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 50 mA, R_{BE} = 75 Ω)	$V_{(BR)CER}$	45	—	—	Vdc
Emitter-Base Breakdown Voltage (I_C = 5.0 mAdc)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector-Base Breakdown Voltage (I_E = 50 mAdc)	$V_{(BR)CBO}$	55	—	—	Vdc
Collector-Emitter Leakage (V_{CE} = 26 V, R_{BE} = 75 Ω)	I_{CER}	—	—	10	mA

NOTE 1. Thermal resistance is determined under specified RF operating condition

(continued)

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

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_C = 1.0 Adc, V_{CE} = 10 Vdc)	h_{FE}	15	—	100	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 26 V, I_E = 0, f = 1.0 MHz)	C_{ob}	30	—	50	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CC} = 26 V, P_{out} = 25 W, I_{CQ} = 100 mA) (f = 960 MHz)	G_p	8.0	9.0	—	dB
Load Mismatch at all Phase Angles (V_{CC} = 26 V, P_{out} = 25 W, I_{CQ} = 100 mA) No degradation in Output Power	ψ	5:1	—	—	VSWR
Collector Efficiency (V_{CC} = 26 V, P_{out} = 25 W, f = 960 MHz)	η	50	55	—	%
Power Saturation Pin = 7.0 W	P_{sat}	27	—	—	W

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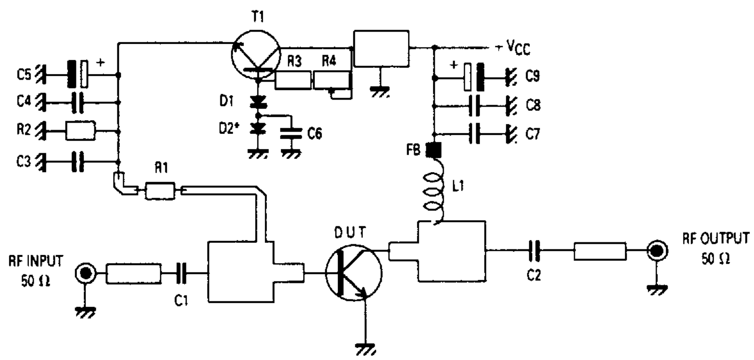


C1 — Capacitor Chip 0805 39 pF 5%
C2, C3, C6, C8 — Capacitor Chip 0805 330 pF 5%
C4, C7 — Capacitor Chip 0805 15 nF 5%
C5, C9 — Capacitor Chip 0805 6.0, 8.0 μF 35 V
R1 — Chip Resistor 2.2 Ω 1206 5%
FB Bead Ferroxcube 56-590-65-EB
R2 — Chip Resistor 51 Ω 0805 5%
R3 — Chip Resistor 220 Ω 0805 5%
R4 — Resistor Trimmer 1.0 kΩ
T1 — SMD Transistor BCX54 or Similar
T3 — Voltage Regulator 7805
D1, D2 — SMD Diode
Board Material — 0.5 mm, Teflon Glass, Cu Clad 2 Sides, 35 μm Thick

Figure 1. 960 MHz Test Circuit

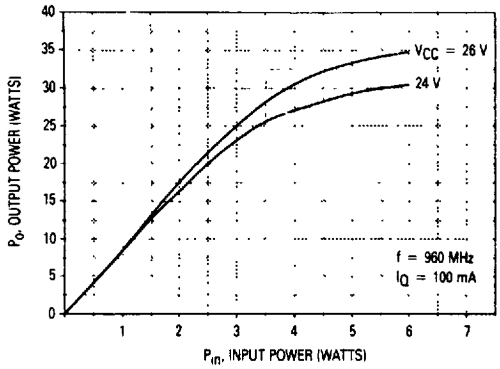


Figure 2. Output Power versus Input Power

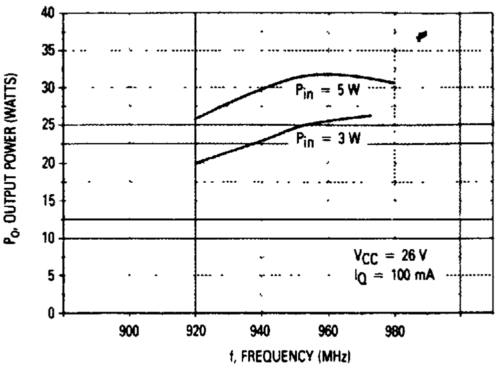


Figure 3. Output Power versus Frequency

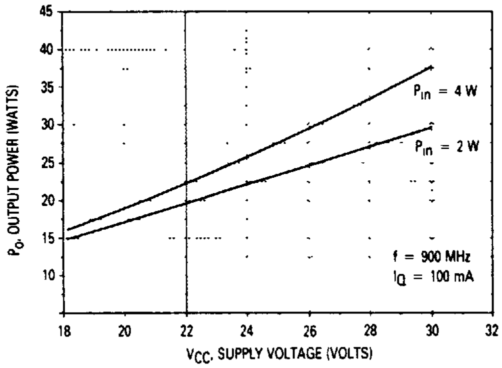


Figure 4. Output Power versus Supply Voltage

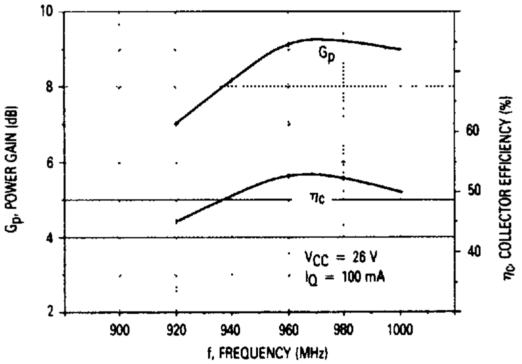
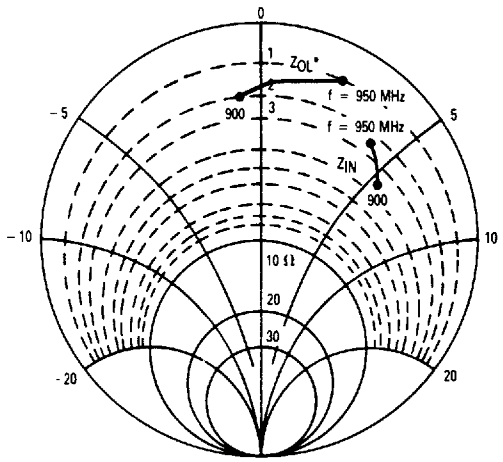


Figure 5. Typical Broadband Circuit Performance



P_{out} = 25 W V_{CE} = 26 V

f MHz	Z_{IN} OHMS	Z_{OL}* OHMS
900	4.2 + j5.2	1.9 − j0.8
950	2.3 + j3.9	1.0 + j2.9

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

Figure 6. Series Equivalent Input/Output Impedances

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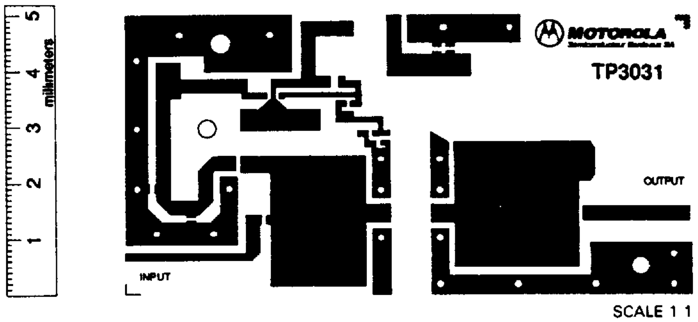

Figure 7. Test Circuit — Photomaster

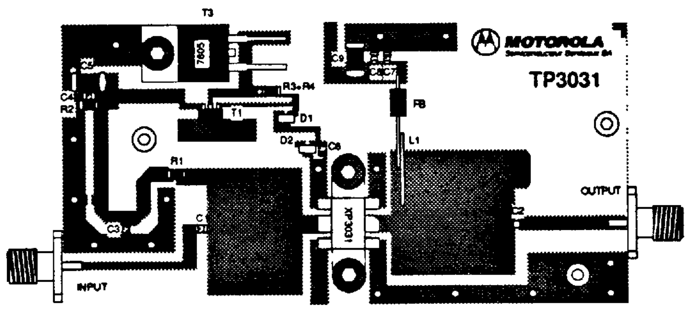

Figure 8. Test Circuit — Component Locations