MOTOROLA
SEMICONDUCTOR TECHNICAL DATA

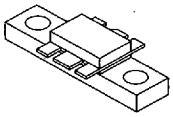
The RF Line
UHF Power Transistor

The TP3021 is designed for 24 V common emitter base station amplifiers. Operating in the 820–960 MHz bandwidth, it has been specifically designed for use in analog and digital (GSM) systems as a medium power output device.

- Specified 24 Volts, 960 MHz Characteristics
  Output Power = 10 Watts
  Minimum Gain = 10 dB
  Class AB
  I_Q = 60 mA
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

TP3021

10 W, 960 MHz
UHF POWER
TRANSISTOR
NPN SILICON



CASE 319–07, STYLE 2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	27	Vdc
Collector–Base Voltage	V_{CBO}	48	Vdc
Emitter–Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	2.0	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	35 0.35	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	$R_{\theta JC}$	5.0	°C/W

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

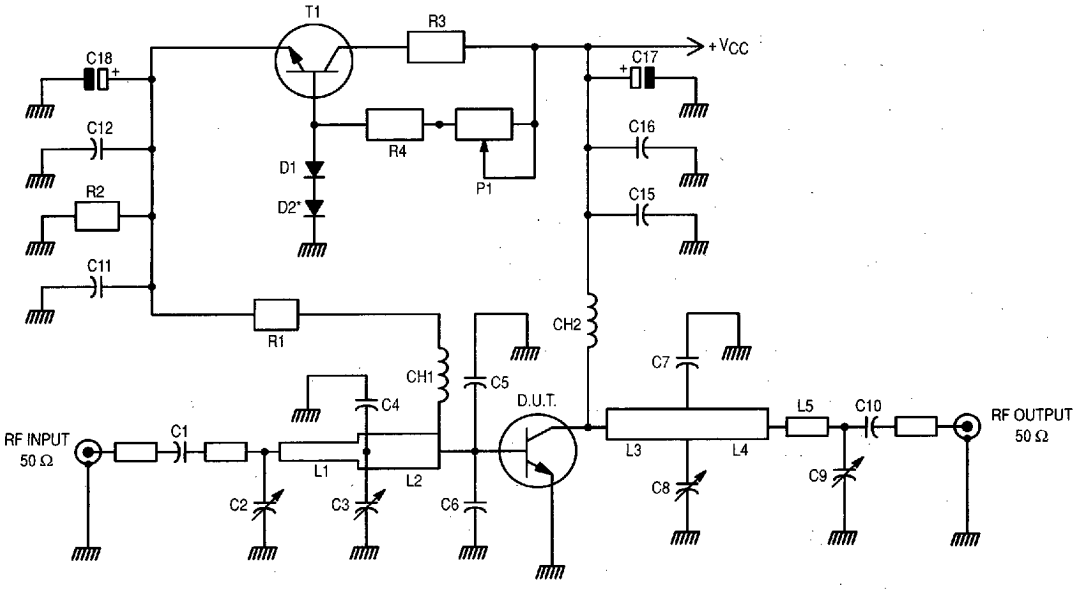
Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I_C = 25 mA, R_{BE} = 75 Ω)	$V_{(BR)CER}$	40	—	—	Vdc
Emitter–Base Breakdown Voltage (I_C = 5.0 mAdc)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector–Base Breakdown Voltage (I_E = 50 mAdc)	$V_{(BR)CBO}$	48	—	—	Vdc
Collector–Emitter Leakage (V_{CE} = 26 V, R_{BE} = 75 Ω)	I_{CER}	—	—	5.0	mA
ON CHARACTERISTICS					
DC Current Gain (I_C = 1.0 Adc, V_{CE} = 10 Vdc)	h_{FE}	15	—	100	—

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
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 24 V, I_E = 0, f = 1.0 MHz)	C_{ob}	15	—	25	pF
FUNCTIONAL TESTS					
Common–Emitter Amplifier Power Gain (V_{CC} = 24 V, P_{out} = 10 W, I_{CQ} = 60 mA, f = 960 MHz)	G_p	10	—	—	dB
Load Mismatch (V_{CC} = 26 V, P_{out} = 10 W, I_{CQ} = 60 mA, Load VSWR = 20:1, at all phase angles)	ψ	No Degradation in Output Power Before and After Test			
Collector Efficiency (V_{CC} = 24 V, P_{out} = 10 W, f = 960 MHz)	η_c	50	55	—	%



*D2 is in Physical Contact with RF Transistor

C1, C10, C11, C15 — Capacitor Chip 0805 330 pF 5%
C2, C4, C8, C9 — Trimmer Capacitor 0.5–4.0 pF
C4 — Capacitor Chip 0805 3.9 pF 5%
C5, C6 — Capacitor Chip 15 pF HQ
C7 — Chip Resistor 0805 8.2 pF
C12, C16 — Capacitor Chip 0805 15 nF 5%
C17, C18 — Capacitor Chip 0805 6.0, 8.0 µF 35 V
CH1 — Microstrip Line 80 Ω L = 40 mm
CH2 — Microstrip Line 80 Ω L = 23 mm
D1, D2 — Diode 1N4148

L1 — Microstrip Line 50 Ω L = 20 mm
L2 — Microstrip Line 25 Ω L = 13 mm
L3 — Microstrip Line 25 Ω L = 10 mm
L4 — Microstrip Line 50 Ω L = 5 mm
L5 — Microstrip Line 50 Ω L = 7 mm
P1 — Trimmer 5.0 kΩ
R1 — Chip Resistor 2.2 Ω 1206 5%
R2 — Chip Resistor 75 Ω 0805 5%
R3 — Resistor 100 Ω 2.0 W
R4 — Resistor 1.0 kΩ 5%
T1 — Transistor BD135 or Similar
Board Material — 1/50″, Teflon Glass, Cu Clad 2 Sides, 35 µm Thick

Figure 1. 960 MHz Test Circuit

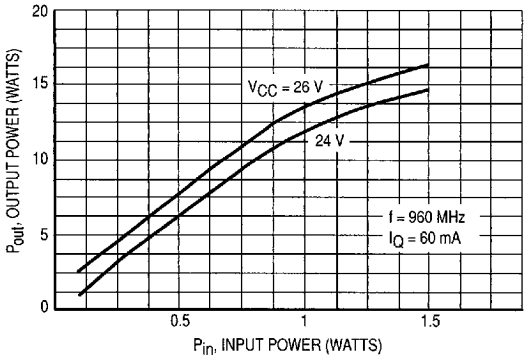
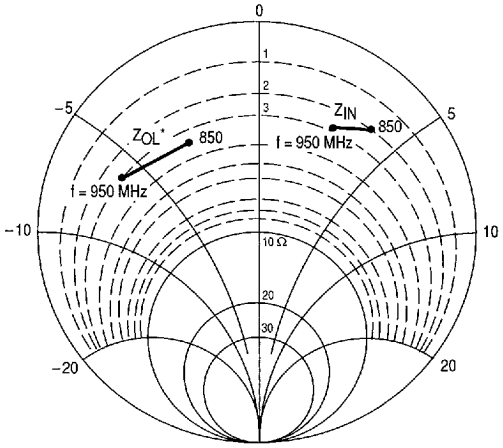


Figure 2. Output Power versus Input Power



P_{out} = 10 W V_{CE} = 24 V

f MHz	Z_{IN} OHMS	Z_{OL}* OHMS
850	2.4 + j3.5	3.4 – j3.2
900	2.6 + j3.4	3.1 – j4.4
950	2.8 + j3.4	2.7 – j6.2

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

Figure 3. Series Equivalent Input/Output Impedances

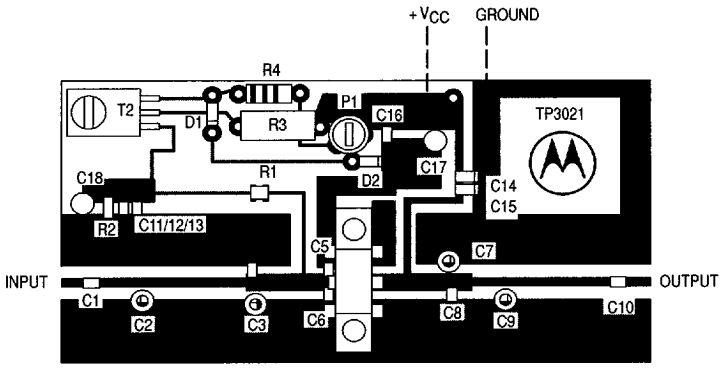


Figure 4. Test Circuit — Component Locations