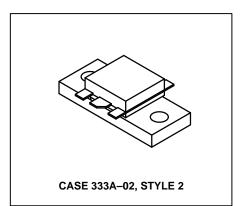
# The RF Line UHF Power Transistor

The TP3061 is designed for 960 MHz mobile 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. Including double input and output matching networks, the TP3060 features high impedances and is easy to match.

- Motorola Advanced Amplifier Concept Package
- Oxynitride Passivation
- Specified 26 Volts, 960 MHz Characteristics
   Output Power = 45 Watts
   Minimum Gain = 8.0 dB
   Efficiency = 50%
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

## **TP3061**

45 W, 960 MHz UHF POWER TRANSISTOR NPN SILICON



#### **MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	VCER	40	Vdc
Collector-Base Voltage	VCBO	48	Vdc
Emitter–Base Voltage	V <sub>EBO</sub>	4.0	Vdc
Collector Current — Continuous	IC	10	Adc
Total Device Dissipation @ T <sub>C</sub> = 25°C Derate above 25°C	PD	175 1.0	Watts W/°C
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C
Operating Junction Temperature	TJ	200	°C

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (1) at 70°C Case	$R_{\theta JC}$	1.2	°C/W

### **ELECTRICAL CHARACTERISTICS** (T<sub>C</sub> = 25°C unless otherwise noted.)

Characteristic	Symbol	Wilh	Тур	wax	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (IC = 60 mA, RBE = 75 $\Omega$ )	V(BR)CER	40	_	_	Vdc
Emitter–Base Breakdown Voltage (I <sub>C</sub> = 6.0 mAdc)	V(BR)EBO	3.5	_	_	Vdc
Collector–Base Breakdown Voltage (I <sub>E</sub> = 60 mAdc)	V(BR)CBO	48	_	_	Vdc
Collector–Emitter Leakage ( $V_{CE} = 26 \text{ V}, R_{BE} = 75 \Omega$ )	ICER	_	_	15	mA

NOTE:

(continued)

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

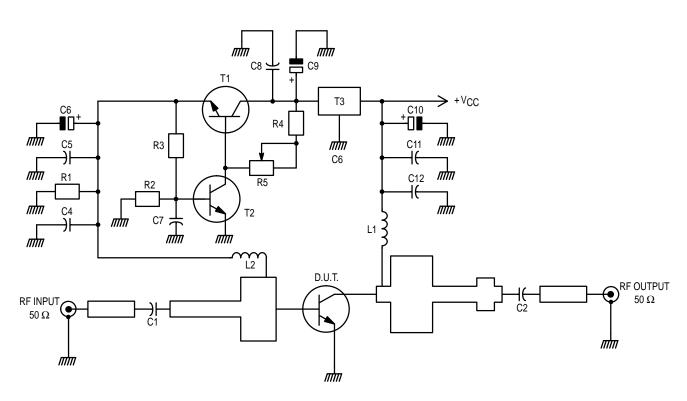


#### **ELECTRICAL CHARACTERISTICS** — **continued** (T<sub>C</sub> = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Тур	Max	Unit
ON CHARACTERISTICS	•	•			
DC Current Gain (IC = 1.0 Adc, VCE = 10 Vdc)	hFE	15	_	100	_
DYNAMIC CHARACTERISTICS	•				
Output Capacitance (2) (V <sub>CB</sub> = 26 V, I <sub>E</sub> = 0, f = 1.0 MHz)	C <sub>ob</sub>	45	60	_	pF
FUNCTIONAL TESTS	•	•			
Common–Emitter Amplifier Power Gain (V <sub>CC</sub> = 26 V, P <sub>out</sub> = 45 W, I <sub>CQ</sub> = 200 mA, f = 960 MHz)	Gp	8.0	8.8	_	dB
Collector Efficiency (V <sub>CC</sub> = 26 V, P <sub>out</sub> = 45 W, f = 960 MHz)	η	50	53	_	%
Load Mismatch (V <sub>CC</sub> = 26 V, P <sub>out</sub> = 45 W, I <sub>CQ</sub> = 200 mA, Load VSWR = 5:1, at all phase angles)	Ψ	No Degradation in Output Power Before and After Test			
Overdrive (V <sub>CC</sub> = 26 V, P <sub>in</sub> = 15 W, f = 960 MHz)	OD	No Degradation in Output Power			

#### NOTE:

<sup>2.</sup> Value of "Cob" is that of die only. It is not measurable in TP3061 because of internal matching network.



C1, C4, C7, C12 — Capacitor Chip 0805 330 pF 5%

C2 — Capacitor Chip 82 pF ATC

C5, C11, C8 — Capacitor Chip 0805 15 nF 5%

C6, C9, C10 — Capacitor Chip 0805 6.0, 8.0  $\mu$ F 35 V

L1, L2 — 1.5 Turns #18 AWG Choke

R1 — Chip Resistor 47  $\Omega$  1206 5%

R2 — Chip Resistor 270  $\Omega$  0805 5%

R3 — Chip Resistor 47  $\Omega$  0805 5%

R4 — Chip Resistor 100  $\Omega$  0805 5%

R5 — Trimmer 1.0 k $\Omega$ 

T1 — SMD Transistor MJD31C or Similar

T2 — SMD Transistor

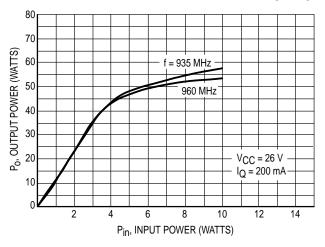
T3 — Voltage Regulator 7805

Board Material — 1/50", Teflon Glass,  $\epsilon_{\Gamma}$  = 2.5,

Cu Clad 2 Sides, 35  $\mu m$  Thick

Figure 1. 960 MHz Test Circuit

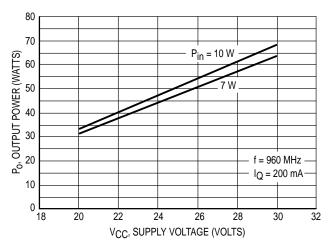
#### **TYPICAL CHARACTERISTICS**



80 70  $P_{in} = 10 W$ P<sub>0</sub>, OUTPUT POWER (WATTS) 7 W  $V_{CC} = 26 \text{ V} - 100 \text{ M}$ 10 0 880 900 920 940 960 980 1000 f, FREQUENCY (MHz)

Figure 2. Output Power versus Input Power

Figure 3. Output Power versus Frequency



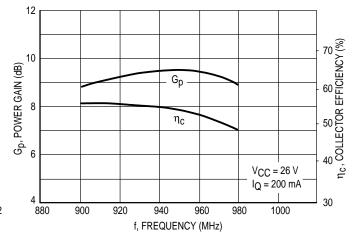
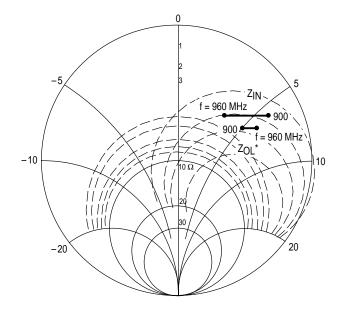


Figure 4. Power Output versus Supply Voltage

Figure 5. Typical Broadband Circuit Performance



$P_{out} = 45 \text{ W}  V_{CE} = 26 \text{ V}$			
f MHz	Z <sub>IN</sub> OHMS	Z <sub>OL</sub> * OHMS	
850	_	_	
900	2.8 + j6	4.1 + j5	
950	3.95 + j3.55	3.7 + i5.2	

ZOL\* = 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

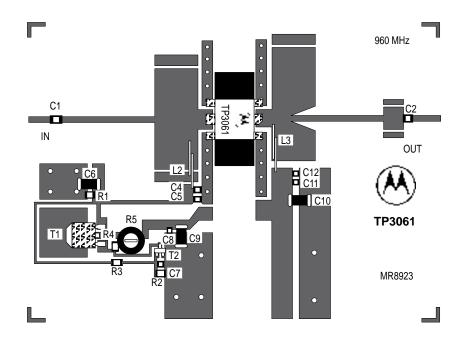
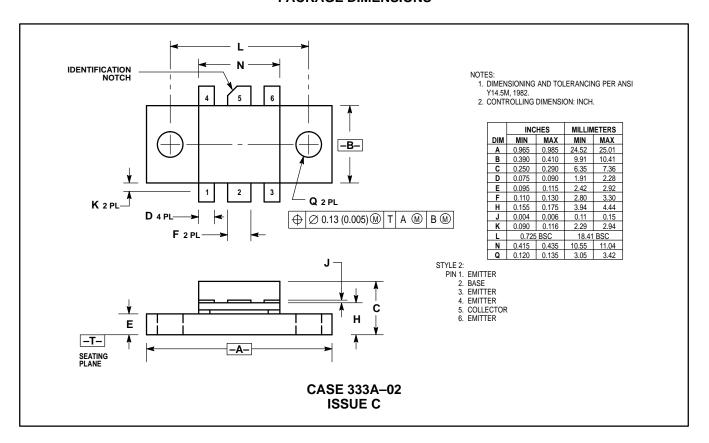


Figure 7. Test Circuit — Component Locations

#### **PACKAGE DIMENSIONS**



MOTOROLA RF DEVICE DATA

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and "a are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

#### Literature Distribution Centers:

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.

JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan.

ASIA PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.



