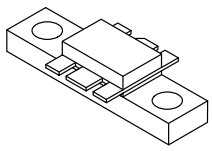
## The RF Line
# UHF Power Transistor

**TP3005**

The TP3005 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 = 4.0 Watts
  - Minimum Gain = 8.5 dB
  - Class AB
  - $I_Q$ = 60 mA
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

**4.0 W, 960 MHz**
**UHF POWER**
**TRANSISTOR**
**NPN SILICON**



**CASE 319–07, STYLE 2**

### 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 | $I_C$ | 2.0 | Adc |
| Total Device Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 25<br>0.2 | Watts<br>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 | $R_{\theta JC}$ | 7.0 | °C/W |

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

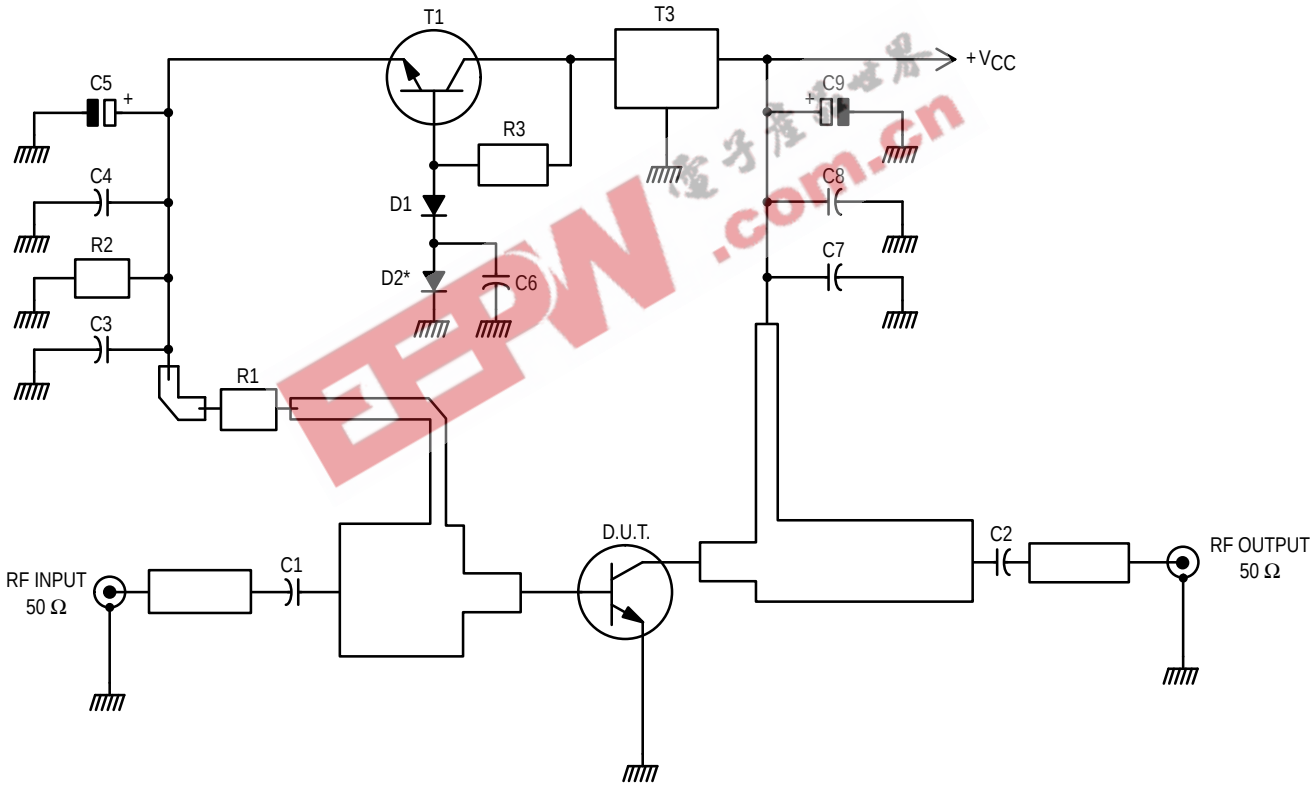
| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector–Emitter Breakdown Voltage ($I_C$ = 15 mA, $R_{BE}$ = 75 Ω) | $V_{(BR)CER}$ | 45 | — | — | Vdc |
| Emitter–Base Breakdown Voltage ($I_C$ = 3.0 mAdc) | $V_{(BR)EBO}$ | 4.0 | — | — | Vdc |
| Collector–Base Breakdown Voltage ($I_E$ = 15 mAdc) | $V_{(BR)CBO}$ | 55 | — | — | Vdc |
| Collector–Emitter Leakage ($V_{CE}$ = 26 V, $R_{BE}$ = 75 Ω) | $I_{CER}$ | — | — | 3.0 | mA |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain ($I_C$ = 0.5 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 ($V_{CB}$ = 26 V, $I_E$ = 0, f = 1.0 MHz) | $C_{ob}$ | 7.5 | — | 12.5 | pF |
| **FUNCTIONAL TESTS** | | | | | |
| Common–Emitter Amplifier Power Gain ($V_{CC}$ = 26 V, $P_{out}$ = 4.0 W, $I_{CQ}$ = 60 mA, f = 960 MHz) | $G_p$ | 8.5 | 9.5 | — | dB |
| Load Mismatch ($V_{CC}$ = 26 V, $P_{out}$ = 4.0 W, $I_{CQ}$ = 60 mA, Load VSWR = 5:1, at all phase angles) | ψ | No Degradation in Output Power Before and After Test | | | |
| Collector Efficiency ($V_{CC}$ = 26 V, $P_{out}$ = 4.0 W, f = 960 MHz) | $\eta_c$ | 50 | 55 | — | % |
| Power Saturation $P_{in}$ = 1.0 W | $P_{sat}$ | 7.0 | — | — | W |




*Contact with RF Transistor

C1 — Capacitor Chip 0805 22 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 nF 35 V
D1, D2 — SMD Diode

R1 — Chip Resistor 2.2 Ω 1206 5%
R2 — Chip Resistor 51 Ω 0805 5%
R3 — Chip Resistor 470 Ω 0805 5%
to be adjusted for $I_Q$ = 60 mA
T1 — SMD Transistor BCX54 or Similar
T3 — Voltage Regulator 7805
Board Material — 0.8 mm, Epoxy Glass, Cu Clad, 2 Sides, 35 μm Thick

**Figure 1. 960 MHz Test Circuit**

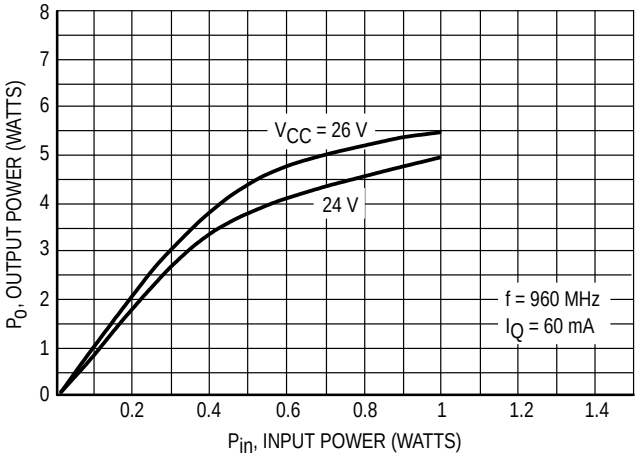



**Figure 2. Output Power versus Input Power**

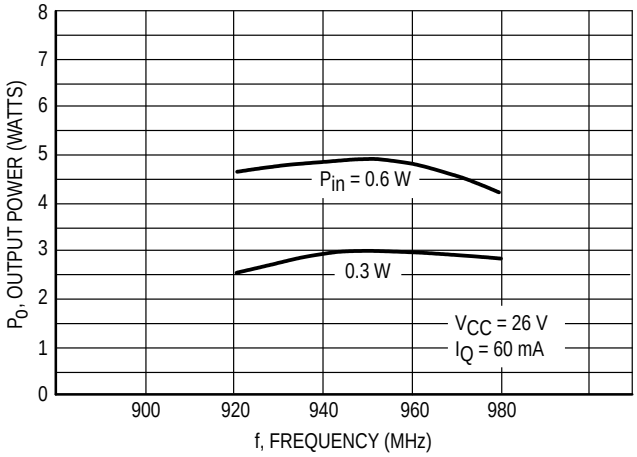



**Figure 3. Output Power versus Frequency**

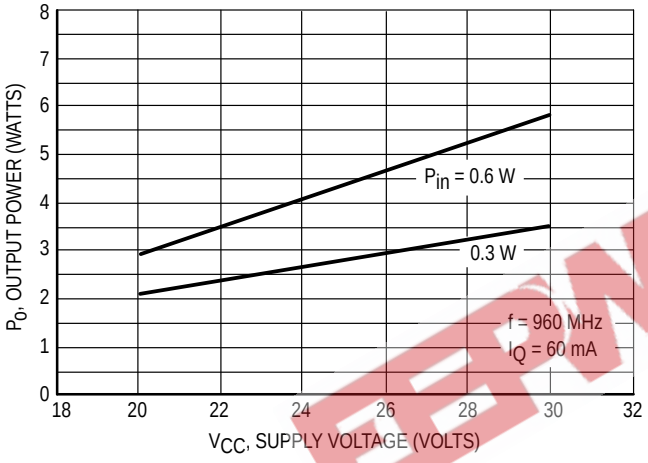



**Figure 4. Output Power versus Supply Voltage**

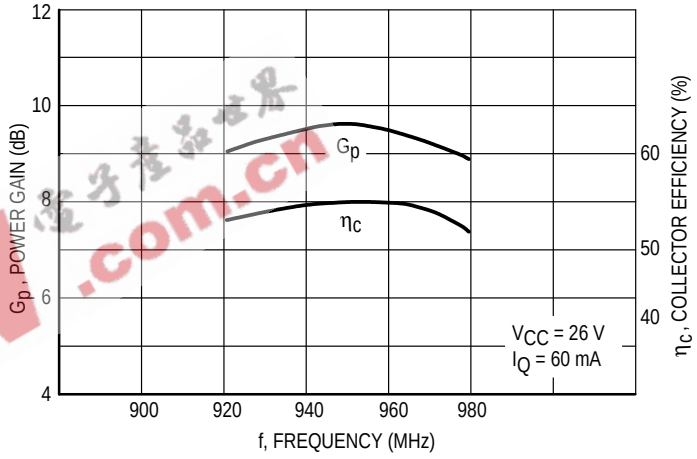
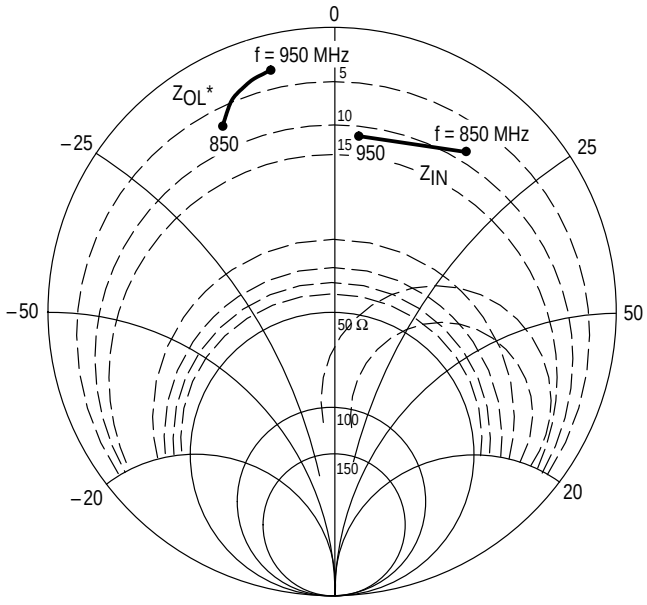



**Figure 5. Typical Broadband Circuit Performance**




$P_{out}$ = 4.0 W $V_{CE}$ = 26 V

| f MHz | $Z_{IN}$ OHMS | $Z_{OL}$* OHMS |
|---|---|---|
| 850 | 8.1 + j17 | 6.7 – j11 |
| 900 | 9.1 + j12.7 | 4.0 – j10 |
| 950 | 13.9 + j4.4 | 3.2 – j6.1 |

$Z_{OL}$* = 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**

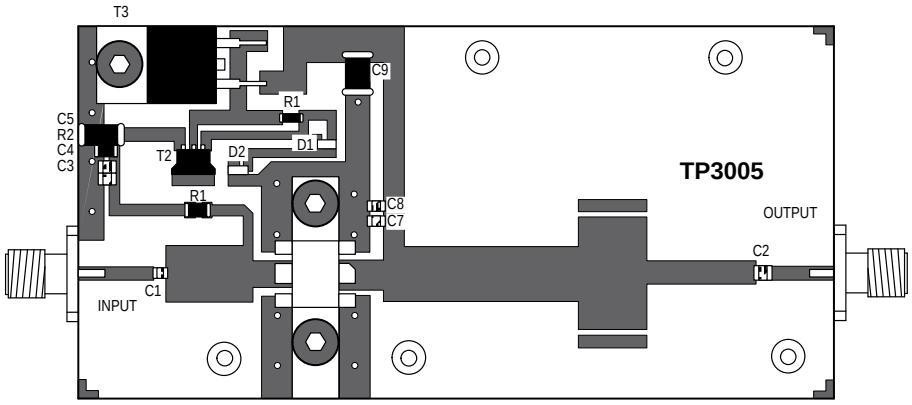
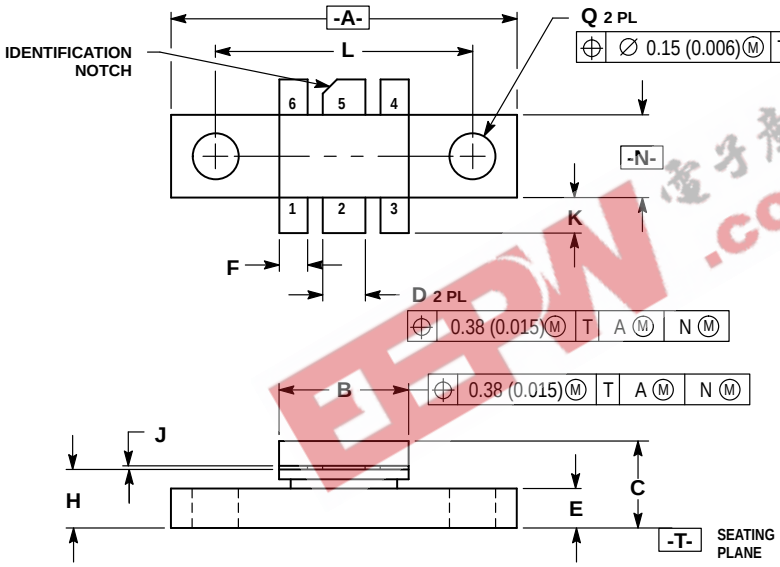



**Figure 7. Test Circuit — Component Locations**

## PACKAGE DIMENSIONS




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| | INCHES | | MILLIMETER | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.965 | 0.985 | 24.52 | 25.01 |
| B | 0.355 | 0.375 | 9.02 | 9.52 |
| C | 0.230 | 0.260 | 5.85 | 6.60 |
| D | 0.115 | 0.125 | 2.93 | 3.17 |
| E | 0.102 | 0.114 | 2.59 | 2.90 |
| F | 0.075 | 0.085 | 1.91 | 2.15 |
| H | 0.160 | 0.170 | 4.07 | 4.31 |
| J | 0.004 | 0.006 | 0.11 | 0.15 |
| K | 0.090 | 0.110 | 2.29 | 2.79 |
| L | 0.725 BSC | | 18.42 BSC | |
| N | 0.225 | 0.241 | 5.72 | 6.12 |
| Q | 0.125 | 0.135 | 3.18 | 3.42 |

STYLE 2:
PIN 1. EMITTER (COMMON)
2. BASE (INPUT)
3. EMITTER (COMMON)
4. EMITTER (COMMON)
5. COLLECTOR (OUTPUT)
6. EMITTER (COMMON)

**CASE 319–07**
**ISSUE M**



**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.