

## The RF Line NPN Silicon Power Transistor 250 W, 30 MHz, 50 V

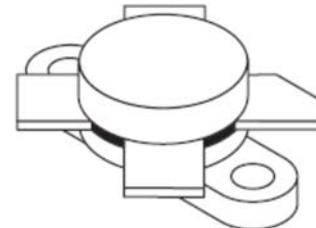
Rev. V2

### Description

Designed primarily for high voltage applications as a high power linear amplifiers from 2 to 30 MHz. Ideal for marine and base station equipment.

- Specified 50 V, 30 MHz characteristics
  - Output power = 250 W
  - Minimum gain = 12 dB
  - Efficiency = 45%
- Intermodulation distortion @ 250 W (PEP) - IMD = -30 dB (max.)
- 100% tested for load mismatch at all phase angles with 3:1 VSWR

### Product Image



### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	50	Vdc
Collector-Base Voltage	$V_{CBO}$	100	Vdc
Emitter-Base Voltage	$V_{EBO}$	4	Vdc
Collector Current - Continuous	$I_C$	16	Adc
Withstand Current - 10 s	-	20	Adc
Total Device Dissipation @ $T_c = 25^\circ\text{C}$ (1) Derate above $25^\circ\text{C}$	$P_D$	290 1.67	Watts W/ $^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max.	Unit
Thermal Resistance, Junction to Case	$R_{eJC}$	0.6	$^\circ\text{C/W}$

### ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Breakdown Voltage ( $I_C = 200 \text{ mA}$ , $I_B = 0$ )	$V_{(BR)CEO}$	50	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 100 \text{ mA}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	100	—	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = 100 \text{ mA}$ , $I_E = 0$ )	$V_{(BR)CBO}$	100	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10 \text{ mA}$ , $I_C = 0$ )	$V_{(BR)EBO}$	4	—	—	Vdc

(continued)

Note:

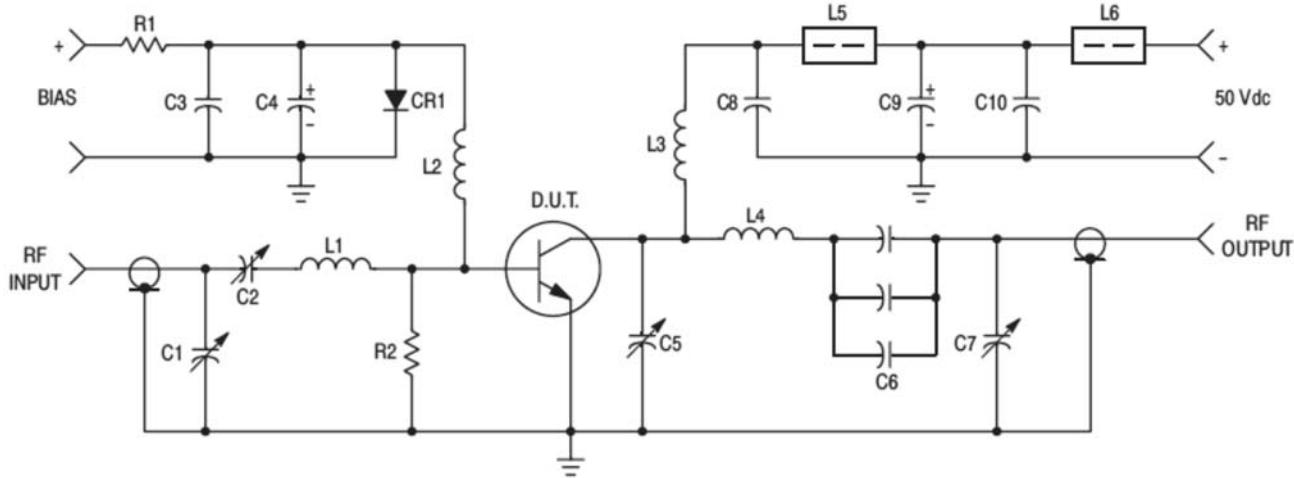
1. PD is a measurement reflecting short term maximum condition. See SOAR curve for operating conditions.

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

Characteristic	Symbol	Min.	Typ.	Max.	Unit
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 5.0 \text{ A}_{\text{dc}}$ , $V_{CE} = 10 \text{ V}_{\text{dc}}$ )	$h_{FE}$	25	—	50	—
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance ( $V_{CB} = 50 \text{ V}_{\text{dc}}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ )	$C_{ob}$	—	350	450	pF
<b>FUNCTIONAL TESTS</b>					
Common-Emitter Amplifier Power Gain ( $V_{CC} = 50 \text{ V}_{\text{dc}}$ , $P_{out} = 250 \text{ W}_{\text{CW}}$ , $f = 30 \text{ MHz}$ , $I_{CQ} = 250 \text{ mA}$ )	$G_{PE}$	12	14	—	dB
Collector Efficiency ( $V_{CC} = 50 \text{ V}_{\text{dc}}$ , $P_{out} = 250 \text{ W}$ , $f = 30 \text{ MHz}$ , $I_{CQ} = 250 \text{ mA}$ )	$\eta$	—	45 65	—	% (PEP) % (CW)
Intermodulation Distortion (2) ( $V_{CE} = 50 \text{ V}_{\text{dc}}$ , $P_{out} = 250 \text{ W}_{\text{(PEP)}}$ , $I_{CQ} = 250 \text{ mA}$ , $f = 30 \text{ MHz}$ )	IMD	—	-33	-30	dB
Electrical Ruggedness ( $V_{CC} = 50 \text{ V}_{\text{dc}}$ , $P_{out} = 250 \text{ W}_{\text{CW}}$ , $f = 30 \text{ MHz}$ , VSWR 3:1 at all Phases Angles)	$\Psi$	No Degradation in Output Power			

Note:

2. To Mil-Std-1311 Version A, Test Method 2204, Two Tone, Reference Each Tone



C1, C2, C5, C7 — 170–780 pF, Arco 469

C3, C8, C9 — 0.1  $\mu$ F, 100 V Erie

C4 — 500  $\mu$ F @ 6.0 V

C6 — 360 pF, 3 x 120 pF 3.0 kV in parallel

C10 — 10  $\mu$ F, 100 V

R1 — 10  $\Omega$ , 10 Watt

R2 — 10  $\Omega$ , 1.0 Watt

CR1 — 1N4997 or equivalent

L1 — 3 Turns, #16 Wire, 0.4" I.D., 0.3" Long

L2 — 0.8  $\mu$ H, Ohmite Z-235 or equivalent

L3 — 12 Turns, #16 Enameled Wire Closewound 0.25" I.D.

L4 — 4 Turns, 1/8" Copper Tubing, 0.6" I.D., 1.0" Long

L5, L6 — 2.0  $\mu$ H, Fair-Rite 2643021801 Ferrite bead each or equivalent

Figure 1. 30 MHz Test Circuit Schematic

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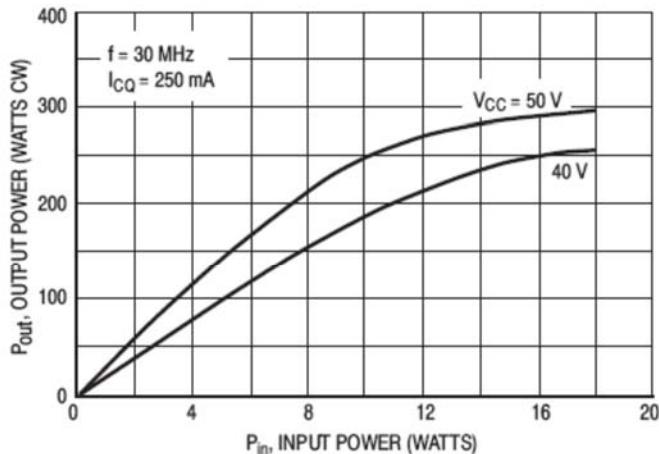


Figure 2. Output Power versus Input Power

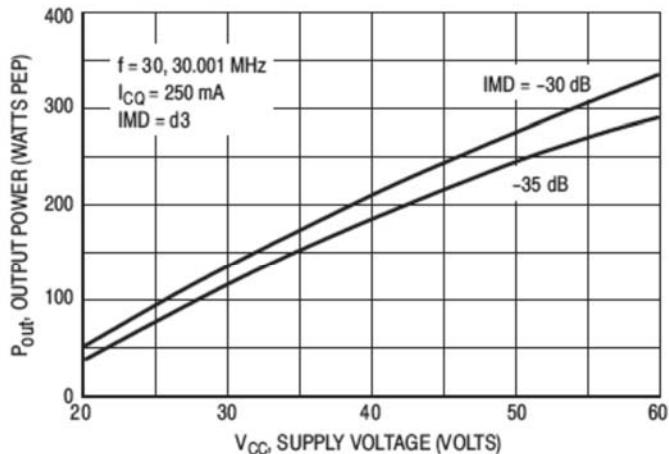


Figure 3. Output Power versus Supply Voltage

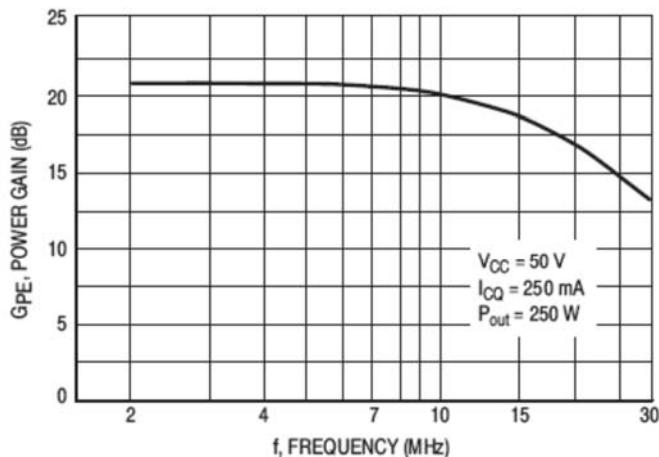


Figure 4. Power Gain versus Frequency

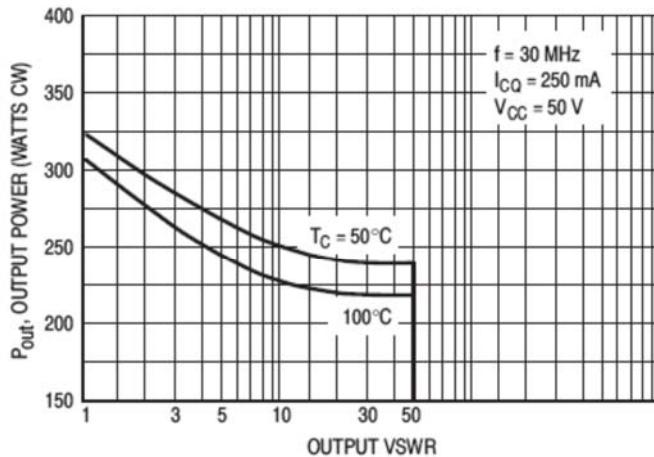


Figure 5. RF SOAR (Class AB)  
P<sub>out</sub> versus Output VSWR

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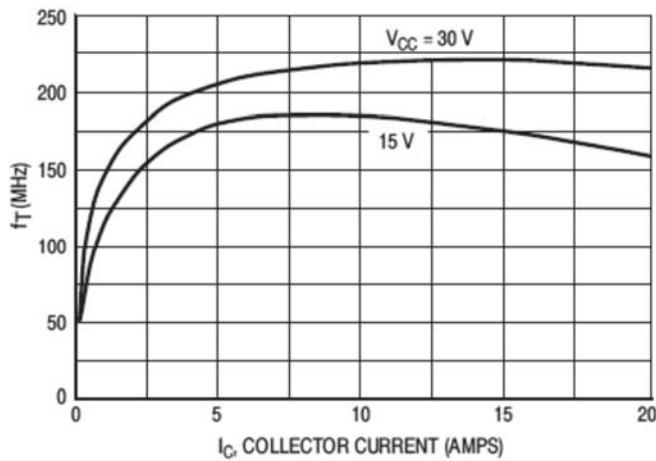


Figure 6.  $f_T$  versus Collector Current

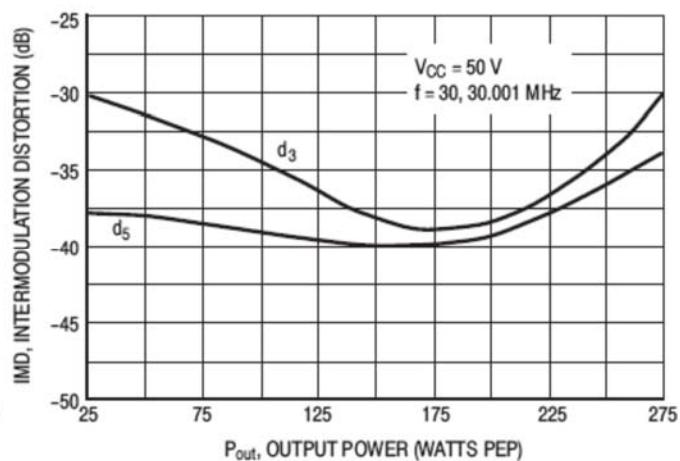


Figure 7. IMD versus  $P_{out}$

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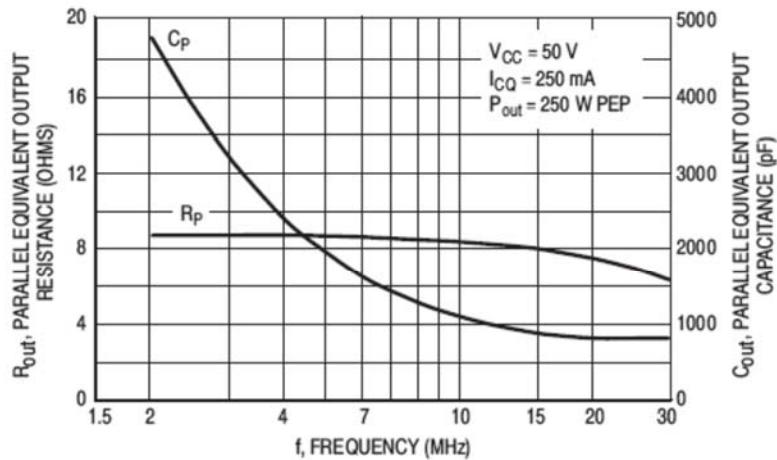


Figure 8. Output Resistance and Capacitance  
versus Frequency

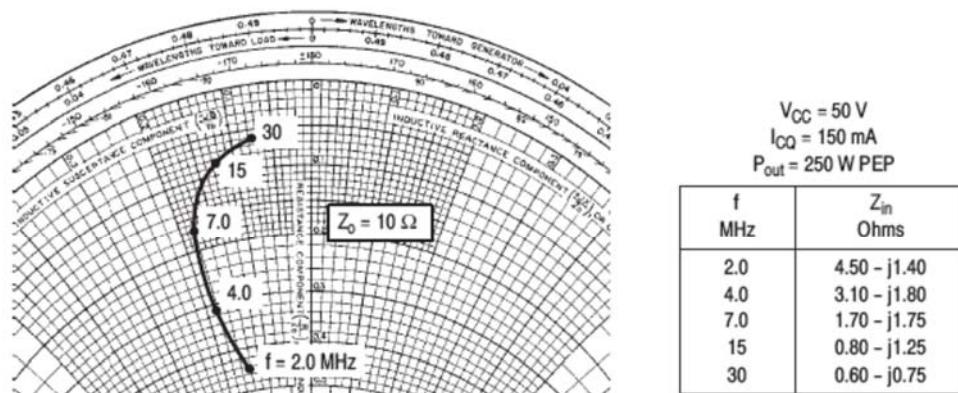
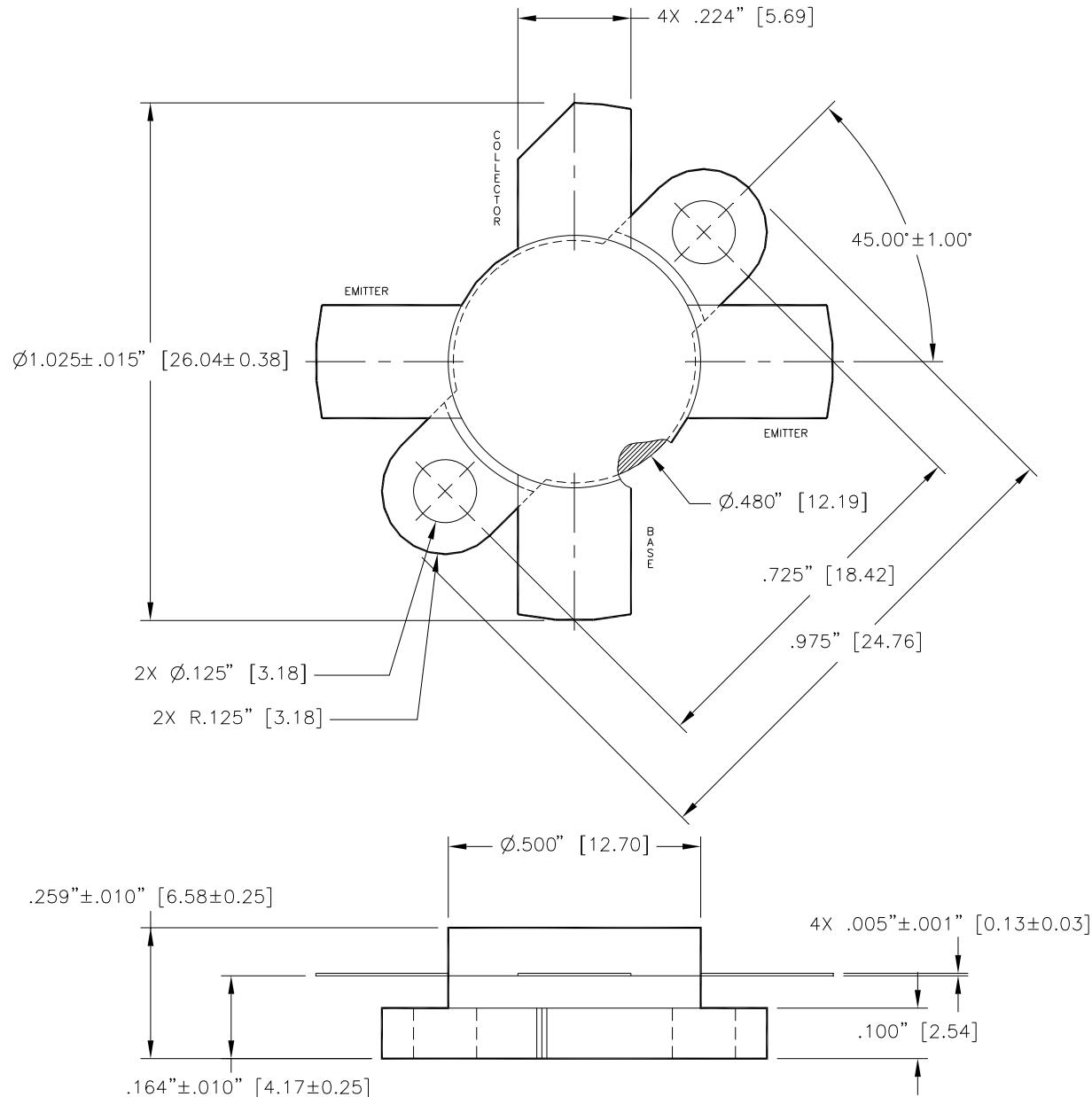


Figure 9. Series Equivalent Impedance

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Unless otherwise noted, tolerances are inches  $\pm .005$  [millimeters  $\pm 0.13$  mm]

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