

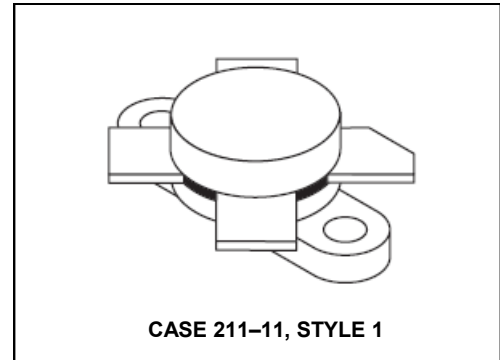
## The RF Line NPN Silicon Power Transistor 250W, 30MHz, 50V

Rev. V1

Designed primarily for high-voltage applications as a high-power linear amplifiers from 2.0 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   | $V_{EBO}$ | 4.0         | Vdc                          |
| Collector Current — Continuous   | $I_C$     | 16          | Adc                          |
| Withstand Current — 10 s   | —         | 20          | Adc                          |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1)<br>Derate above $25^\circ\text{C}$ | $P_D$     | 290<br>1.67 | Watts<br>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 | $R_{\theta JC}$ | 0.6 | $^\circ\text{C/W}$ |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|   |               |     |   |   |     |
|---|---------------|-----|---|---|-----|
| Collector-Emitter Breakdown Voltage ( $I_C = 200 \text{ mAdc}$ , $I_B = 0$ )    | $V_{(BR)CEO}$ | 50  | — | — | Vdc |
| Collector-Emitter Breakdown Voltage ( $I_C = 100 \text{ mAdc}$ , $V_{BE} = 0$ ) | $V_{(BR)CES}$ | 100 | — | — | Vdc |
| Collector-Base Breakdown Voltage ( $I_C = 100 \text{ mAdc}$ , $I_E = 0$ )       | $V_{(BR)CBO}$ | 100 | — | — | Vdc |
| Emitter-Base Breakdown Voltage ( $I_E = 10 \text{ mAdc}$ , $I_C = 0$ )          | $V_{(BR)EBO}$ | 4.0 | — | — | Vdc |

NOTE:

- $P_D$  is a measurement reflecting short term maximum condition. See SOAR curve for operating conditions.

(continued)

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

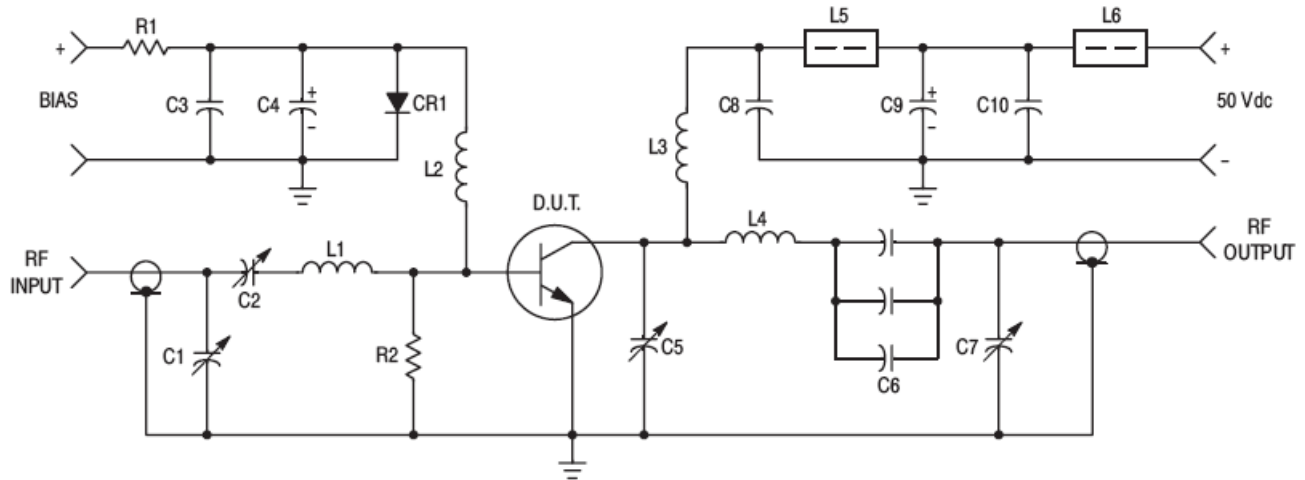
| Characteristic   | Symbol   | Min                            | Typ      | Max    | Unit              |
|--|----------|--------------------------------|----------|--------|-------------------|
| <b>ON CHARACTERISTICS</b>  |          |                                |          |        |            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

**NOTE:**

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

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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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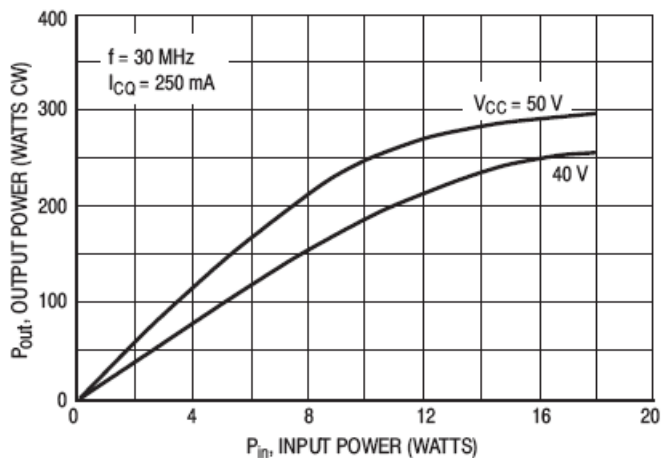


Figure 2. Output Power versus Input Power

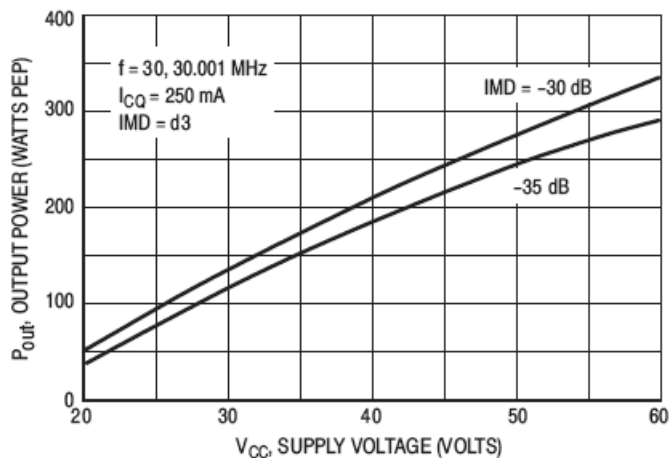


Figure 3. Output Power versus Supply Voltage

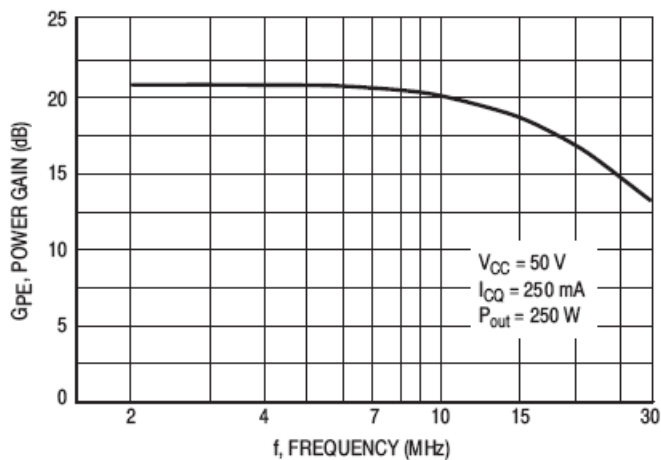


Figure 4. Power Gain versus Frequency

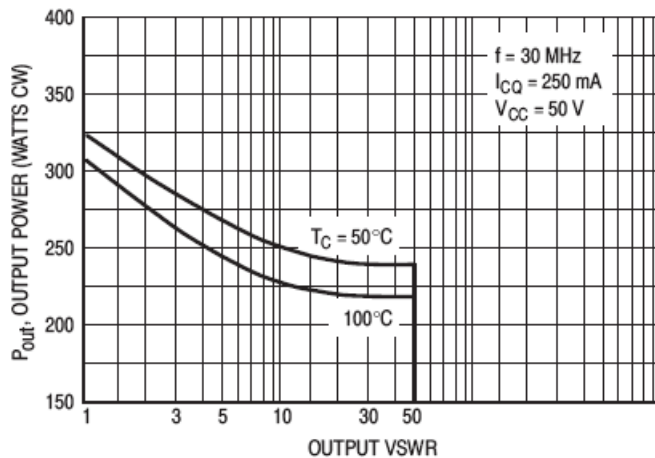


Figure 5. RF SOAR (Class AB)  
 $P_{out}$  versus Output VSWR

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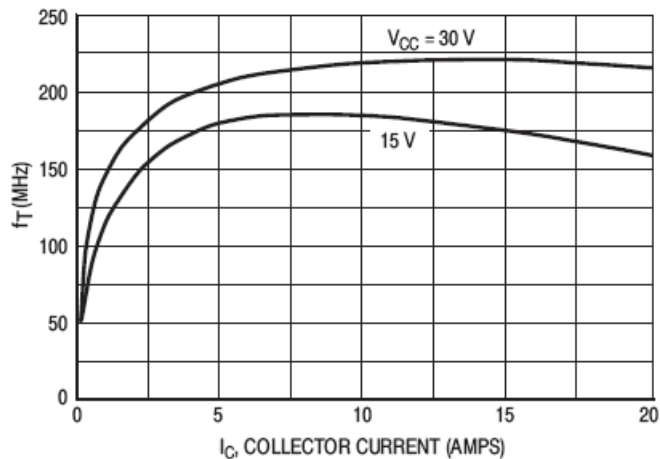


Figure 6.  $f_T$  versus Collector Current

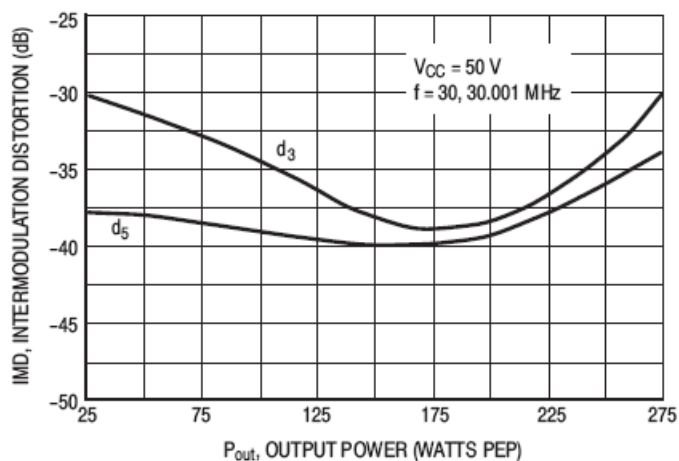


Figure 7. IMD versus  $P_{Out}$

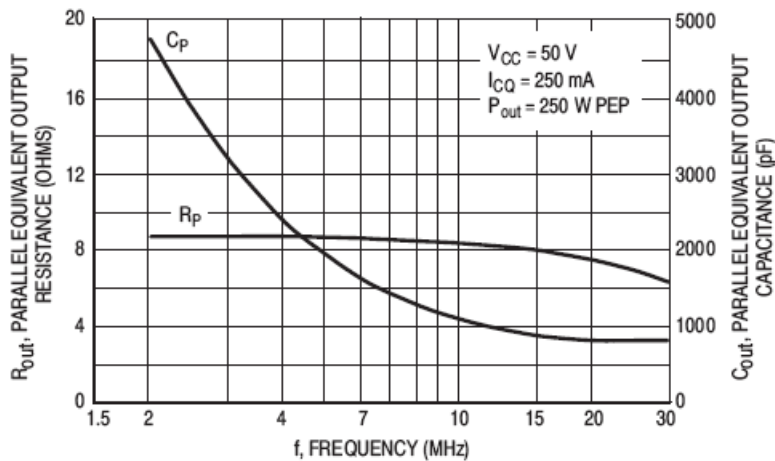


Figure 8. Output Resistance and Capacitance versus Frequency

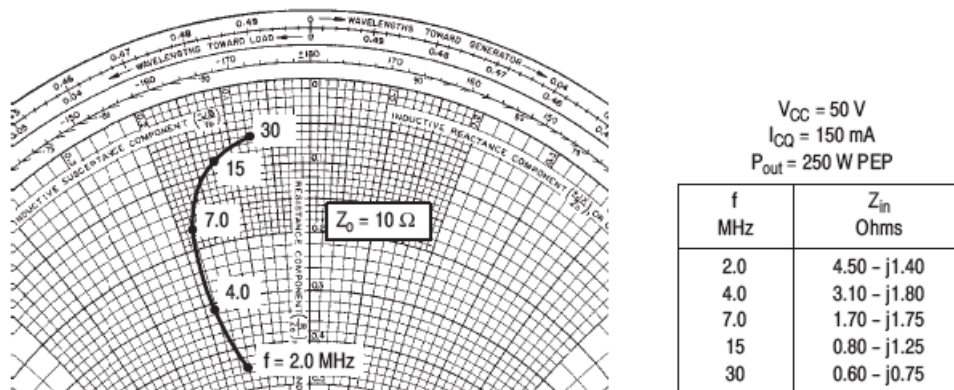
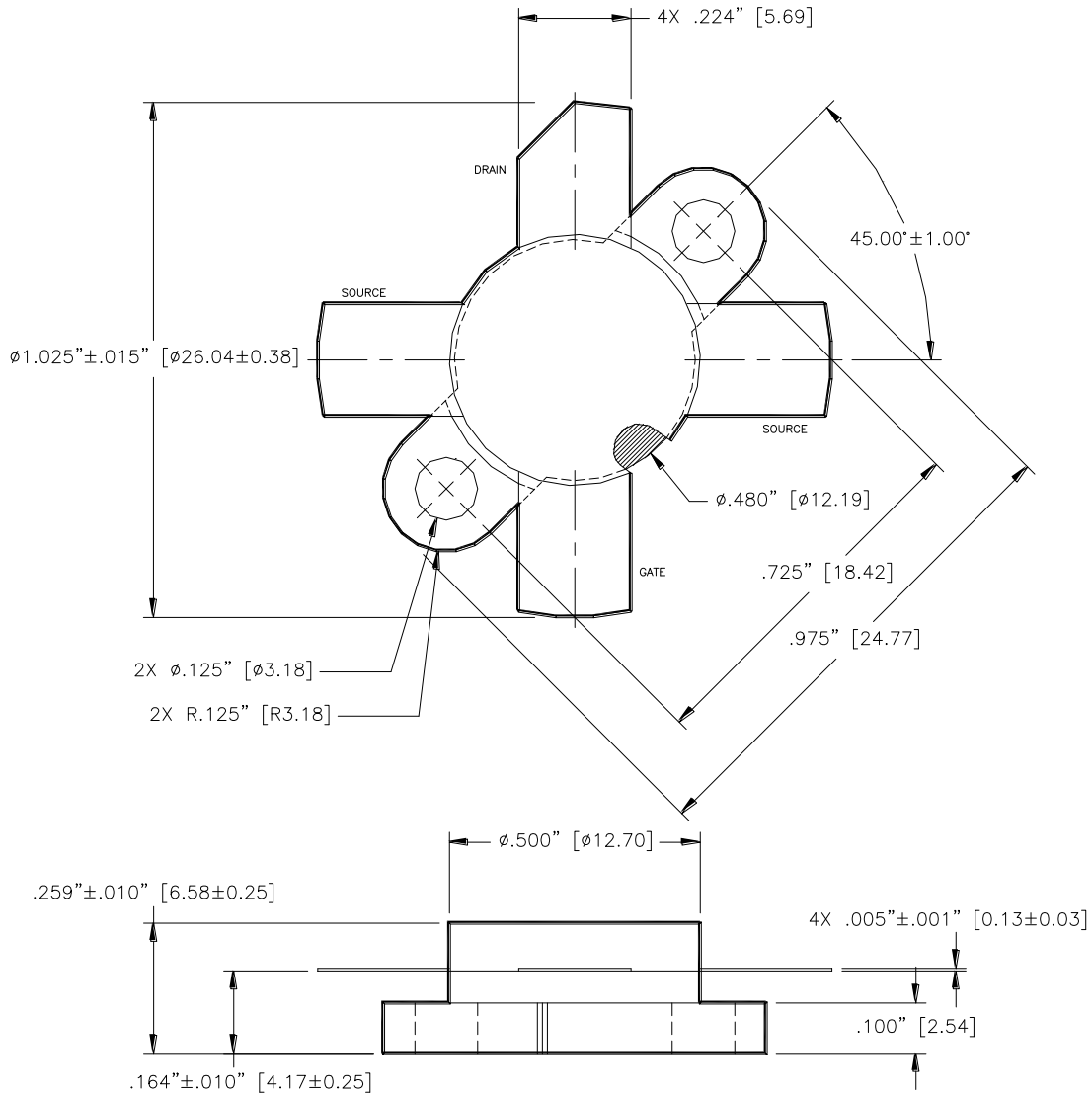


Figure 9. Series Equivalent Impedance

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Unless otherwise noted, tolerances are inches  $\pm 0.005''$  [millimeters  $\pm 0.13\text{mm}$ ]

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