

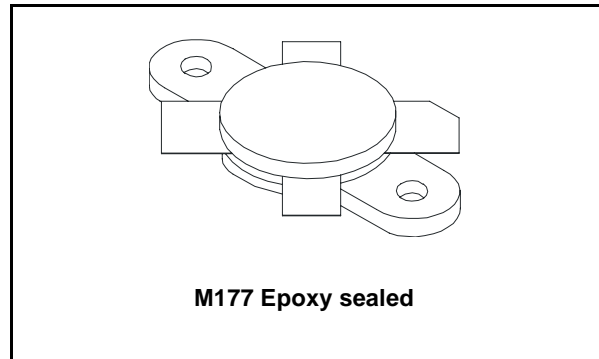


SD2943

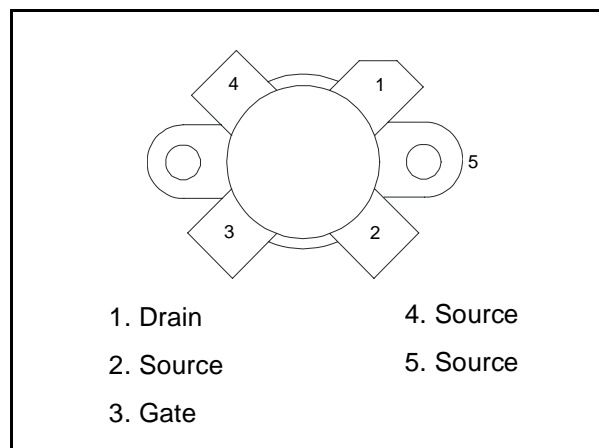
RF Power Transistor HF/VHF/UHF N - Channel MOSFETs

General Features

- HIGH POWER CAPABILITY
- POUT = 350W MIN. WITH 22dB GAIN @ 30 MHz
- PSAT = 450 W
- LOW $R_{DS(on)}$
- THERMALLY ENHANCED PACKAGING FOR LOWER JUNCTION TEMPERATURES
- GOLD METALLIZATION
- EXCELLENT THERMAL STABILITY
- COMMON SOURCE CONFIGURATION



Pin Connection



Description

The SD2943 is a gold metallized N-Channel MOS field-effect RF power transistor. It is intended for use in 50 V dc large signal applications up to 150 MHz. SD2943 offers a 20% higher power saturation than SD2933, it is ideal for ISM applications where reliability and ruggedness are critical factors.

Order Codes

| Part Number | Marking | Package | Packaging |
|-------------|---------|---------|--------------|
| SD2943 | SD2943 | M177 | Plastic Tray |

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1 Electrical Data

1.1 Maximum Rating

Table 1. Absolute Maximum Rating ($T_{CASE} = 25^{\circ}C$)

| Symbol | Parameter | Value | Unit |
|---------------------|--|-------------|-------------|
| $V_{(BR)DSS}^{(1)}$ | Drain Source Voltage | 130 | V |
| $V_{DGR}^{(2)}$ | Drain-Gate Voltage ($R_{GS} = 1M\Omega$) | 130 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| I_D | Drain Current | 40 | A |
| P_{DISS} | Power Dissipation | 648 | W |
| T_j | Max. Operating Junction Temperature | 200 | $^{\circ}C$ |
| E_{AS} | Avalanche Energy, Single Pulse ($I_D = 60A$) | 1500 | mJ |
| $E_{AR}^{(2)}$ | Avalanche Energy, Repetitive | 50 | mJ |
| T_{STG} | Storage Temperature | -65 to +150 | $^{\circ}C$ |

1. $T_j = 150^{\circ}C$

2. Repetitive rating: Pulse width limited by maximum junction temperature; Repetitive avalanche causes additional power losses that can be calculated as: $PAV = EAR * f$

1.2 Thermal Data

Table 2. Thermal data

| Symbol | Parameter | Value | Unit |
|------------|-------------------------------------|-------|---------------|
| R_{thJC} | Junction to Case thermal resistance | 0.27 | $^{\circ}C/W$ |

1.3 Electrical Characteristics ($T_{CASE} = 25^{\circ}C$)

Table 3. Static

| Symbol | Test Conditions | | Min. | Typ. | Max. | Unit |
|---------------------|------------------------|--------------------------|------|------|------|---------------|
| $V_{(BR)DSS}^{(1)}$ | $V_{GS} = 0\text{ V}$ | $I_{DS} = 200\text{ mA}$ | 130 | | | V |
| I_{DSS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 50\text{ V}$ | | | 200 | μA |
| I_{GSS} | $V_{GS} = 20\text{ V}$ | $V_{DS} = 0\text{ V}$ | | | 500 | nA |
| $V_{GS(Q)}$ | $V_{DS} = 10\text{ V}$ | $I_D = 250\text{ mA}$ | 2 | | 4 | V |
| $V_{DS(ON)}$ | $V_{GS} = 10\text{ V}$ | $I_D = 20\text{ A}$ | | | 2 | V |
| $G_{FS}^{(2)}$ | $V_{DS} = 10\text{ V}$ | $I_D = 10\text{ A}$ | 10 | | | mho |
| C_{ISS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 50\text{ V}$ | | 830 | | pF |
| C_{OSS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 50\text{ V}$ | | 470 | | pF |
| C_{RSS} | $V_{GS} = 0\text{ V}$ | $V_{DS} = 50\text{ V}$ | | 35 | | pF |

1. $T_J = 150^{\circ}C$

2. GFS sorts for each unit see [Table 5](#)

Table 4. Dynamic

| Symbol | Test Conditions | | Min. | Typ. | Max. | Unit |
|---------------|------------------------|---|------|------|------|------|
| P_{OUT} | $V_{DD} = 50\text{ V}$ | $I_{DQ} = 250\text{ mA}$ $f = 30\text{ MHz}$ | 350 | 450 | | W |
| G_{PS} | $V_{DD} = 50\text{ V}$ | $I_{DQ} = 250\text{ mA}$ $P_{OUT} = 350\text{ W}$ $f = 30\text{ MHz}$ | 22 | 25 | | dB |
| h_D | $V_{DD} = 50\text{ V}$ | $I_{DQ} = 250\text{ mA}$ $P_{OUT} = 350\text{ W}$ $f = 30\text{ MHz}$ | 60 | 65 | | % |
| Load Mismatch | $V_{DD} = 50\text{ V}$ | $I_{DQ} = 250\text{ mA}$ $P_{OUT} = 350\text{ W}$ $f = 30\text{ MHz}$ All Phase Angles | 3:1 | | | VSWR |

Table 5. G_{FS} SORTS

| Symbol | Value |
|--------|------------|
| A | 10 ÷ 10.99 |
| B | 11 ÷ 11.99 |
| C | 12 ÷ 12.99 |
| D | 13 ÷ 13.99 |
| E | 14 ÷ 14.99 |
| F | 15 ÷ 15.99 |
| G | 16 ÷ 16.99 |
| H | 17 ÷ 18 |

2 Impedance

Figure 1. Impedance Data Schematic

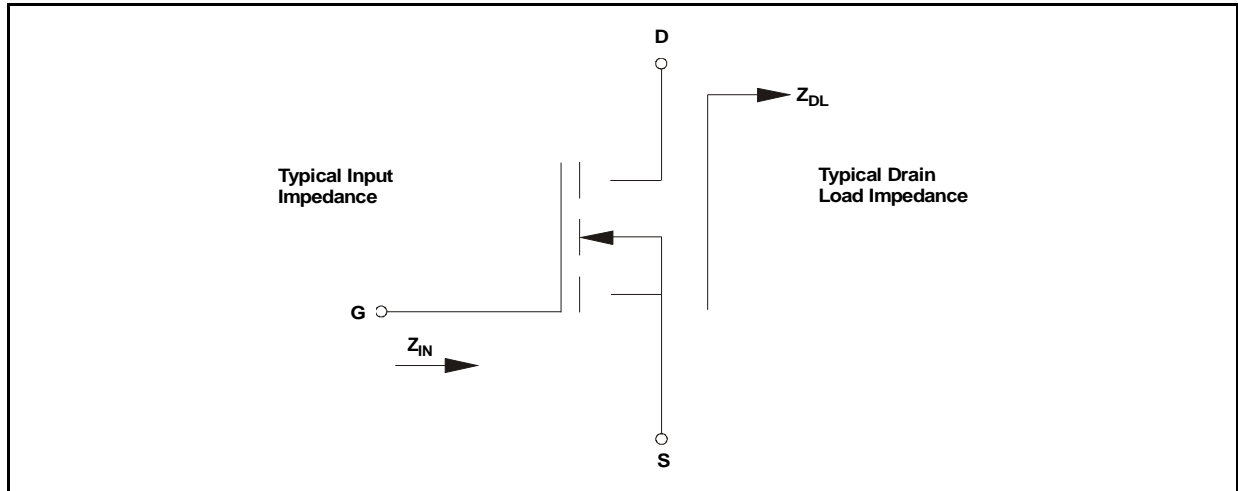


Table 6. Impedance Data

| f | Z_{IN} (Ω) | Z_{DL} (Ω) |
|---------|-----------------------|-----------------------|
| 30 MHz | $1.3 - j 2.9$ | $3.1 + j 2.3$ |
| 108 MHz | $1.4 - j 2.4$ | $1.9 + j 1.4$ |
| 175 MHz | $1.4 - j 2.2$ | $1.7 + j 1.6$ |

3 Typical Performance

Figure 2. Capacitance Vs Drain Voltage

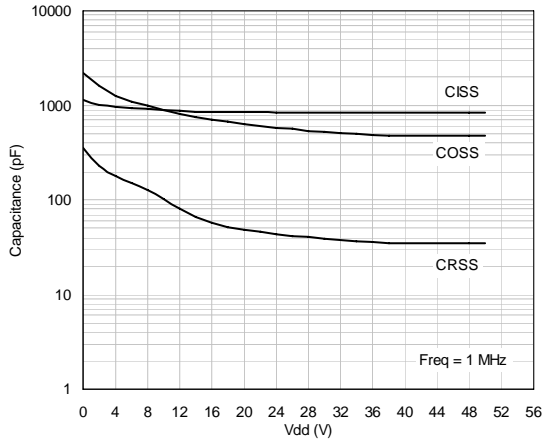


Figure 3. Drain Current Vs Gate Voltage

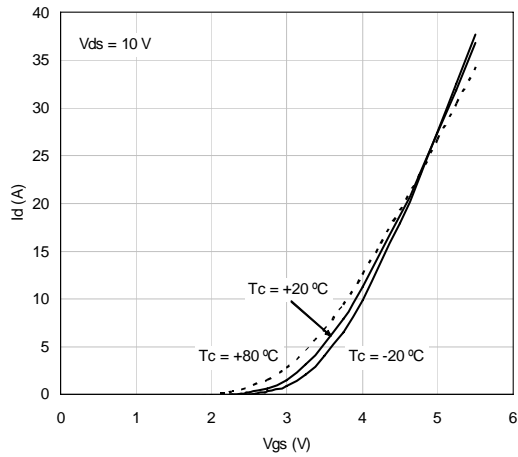


Figure 4. Gate-Source Voltage Vs Case Temp. Figure 5. Max. Therm. Resist. Vs Case Temp.

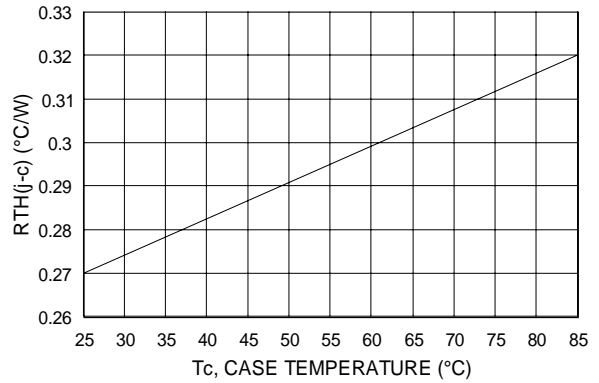
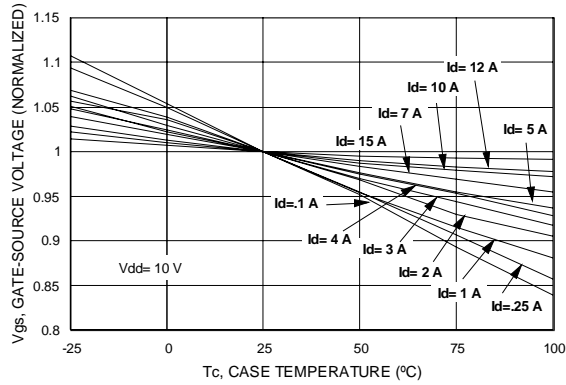


Figure 6. Pout Vs Input Power & Drain Voltage Figure 7. Pout Vs Input Power & Case Temp.

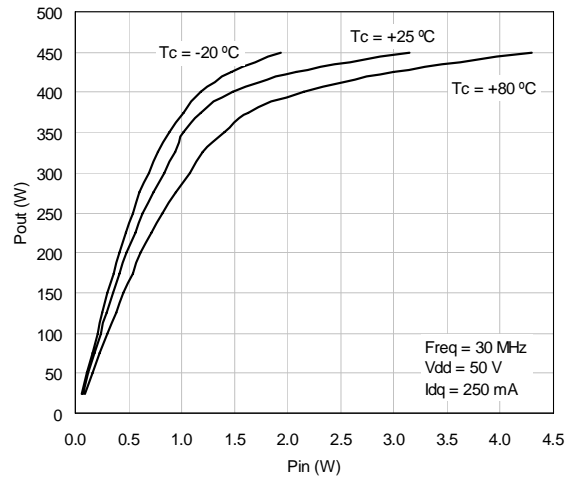
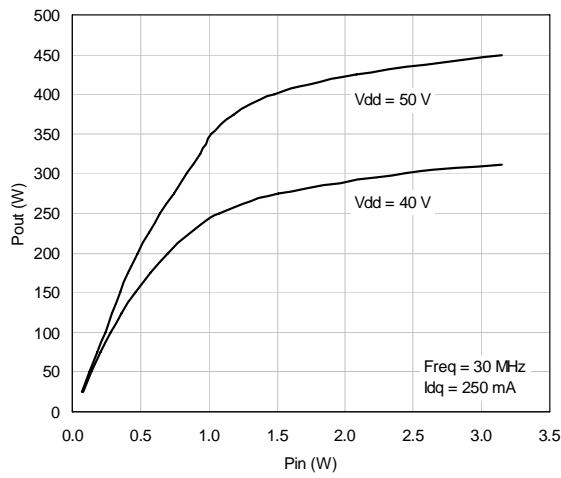


Table 7. Efficiency Vs Pout

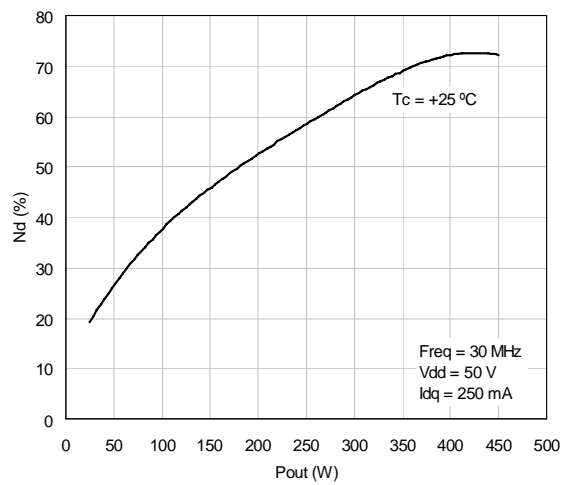


Figure 8. Power Gain Vs Pout & Case Temp.

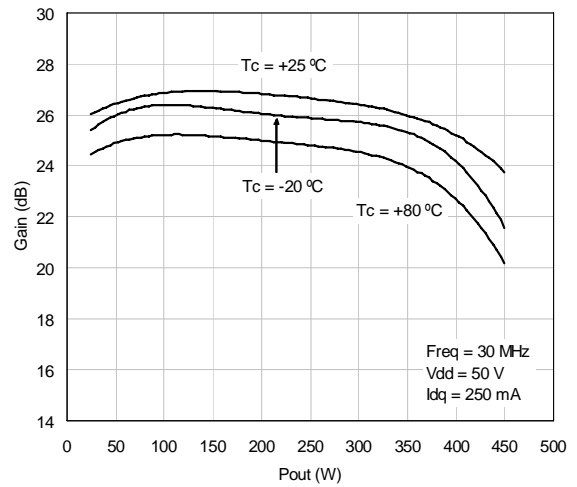


Figure 9. Pout Vs Gate Voltage

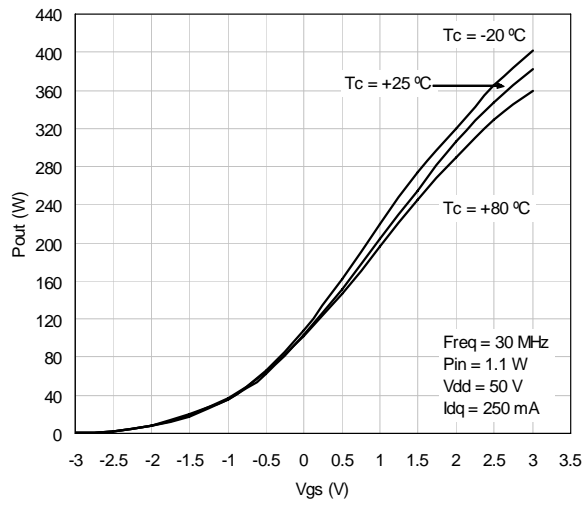
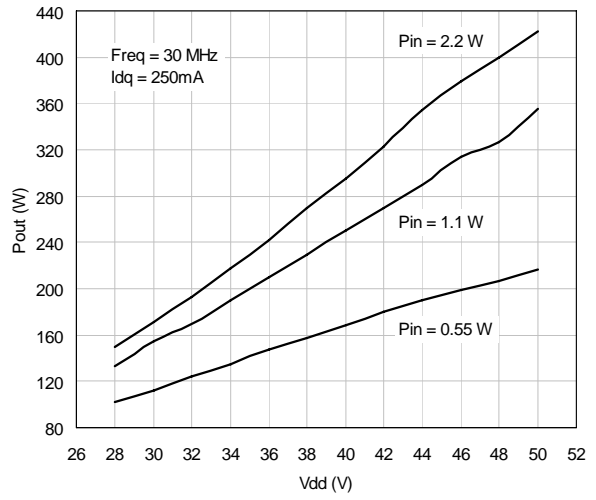
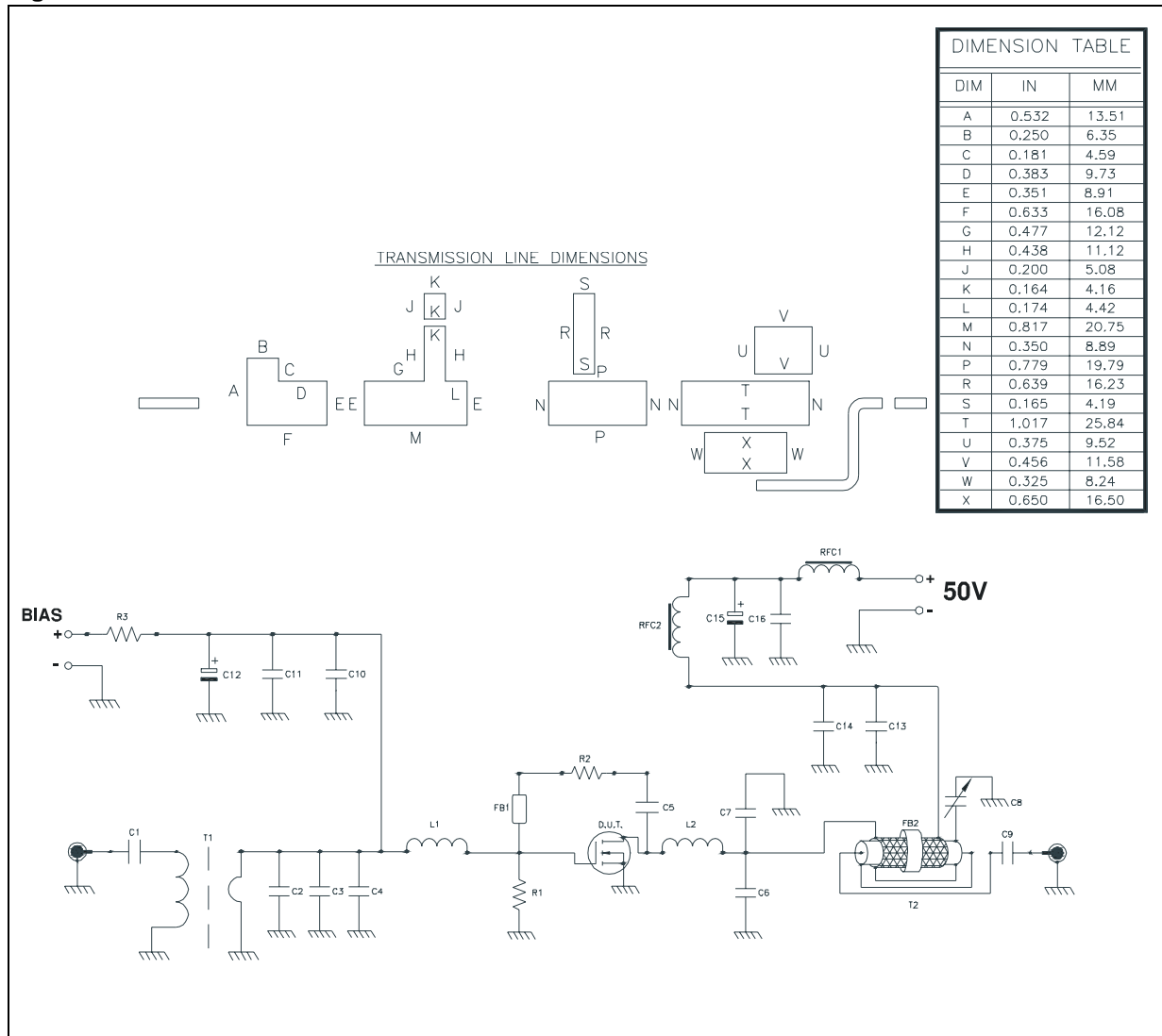


Figure 10. Pout Vs Drain Voltage



4 Test Circuit

Figure 11. 30 MHz Test Circuit Schematic



- Note: 1 Dimension at component symbol are reference for component placement.
- 2 Gap between group and trasmission files are 0.056[1.42] typ.
- 3 Transmission lime are not 1:1 scale.
- 4 Input and output trasmission line are 50Ω

Table 8. 30 MHz Test Circuit Component Part List

| Symbol | Description |
|--------------------|--|
| C1,C9 | 0.01 μ F / 500 V SURFACE MOUNT CERAMIC CHIP CAPACITOR |
| C2, C3 | 750 pF ATC 700B SURFACE MOUNT CERAMIC CHIP CAPACITOR |
| C4 | 300 pF ATC 700B SURFACE MOUNT CERAMIC CHIP CAPACITOR |
| C5,C10,C11,C14,C16 | 10000 pF ATC 200B SURFACE MOUNT CERAMIC CHIP CAPACITOR |
| C6 | 510 pF ATC 700B SURFACE MOUNT CERAMIC CHIP CAPACITOR |
| C7 | 300 pF ATC 700B SURFACE MOUNT CERAMIC CHIP CAPACITOR |
| C8 | 175-680 pF TYPE 46 STANDARD TRIMMER CAPACITOR |
| C12 | 47 μ F / 63 V ALUMINUM ELECTROLYTIC RADIAL LEAD CAPACITOR |
| C13 | 1200 pF ATC 700B SURFACE MOUNT CERAMIC CHIP CAPACITOR |
| C15 | 100 μ F / 63 V ALUMINUM ELECTROLYTIC RADIAL LEAD CAPACITOR |
| R1,R3 | 1 K Ω 1 W SURFACE MOUNT CHIP RESISTOR |
| R2 | 560 Ω 2 W WIRE-WOUND AXIAL LEAD RESISTOR |
| T1 | HF 2-30 MHz SURFACE MOUNT 9:1 TRANSFORMER |
| T2 | RG - 142B/U 50 Ω COAXIAL CABLE OD = 0.165[4.18] L 15"[381.00] COVERED WITH 15"[381.00] TINNED COPPER TUBULAR BRAND 13/65" [5.1] WIDTH |
| L1 | 1 3/4 TURN AIR-WOUND 16 AWG ID = 0.219 [5.56] POLY-COATED MAGNET WIRE |
| L2 | 1 3/4 TURN AIR-WOUND 12 AWG ID = 0.250 [6.34] BUS BAR WIRE |
| RFC1,RFC2 | 3 TURNS 14 AWG WIRE THROUGH FAIR RITE TOROID |
| FB1 | SURFACE MOUNT EMI SHIELD BEAD |
| FB2 | TOROID |
| PCB | ULTRALAM 2000. 0.030" THK, $\epsilon_r = 2.55$, 2 Oz ED CU BOTH SIDES |

Figure 12. 30 MHz Test Circuit Photomaster

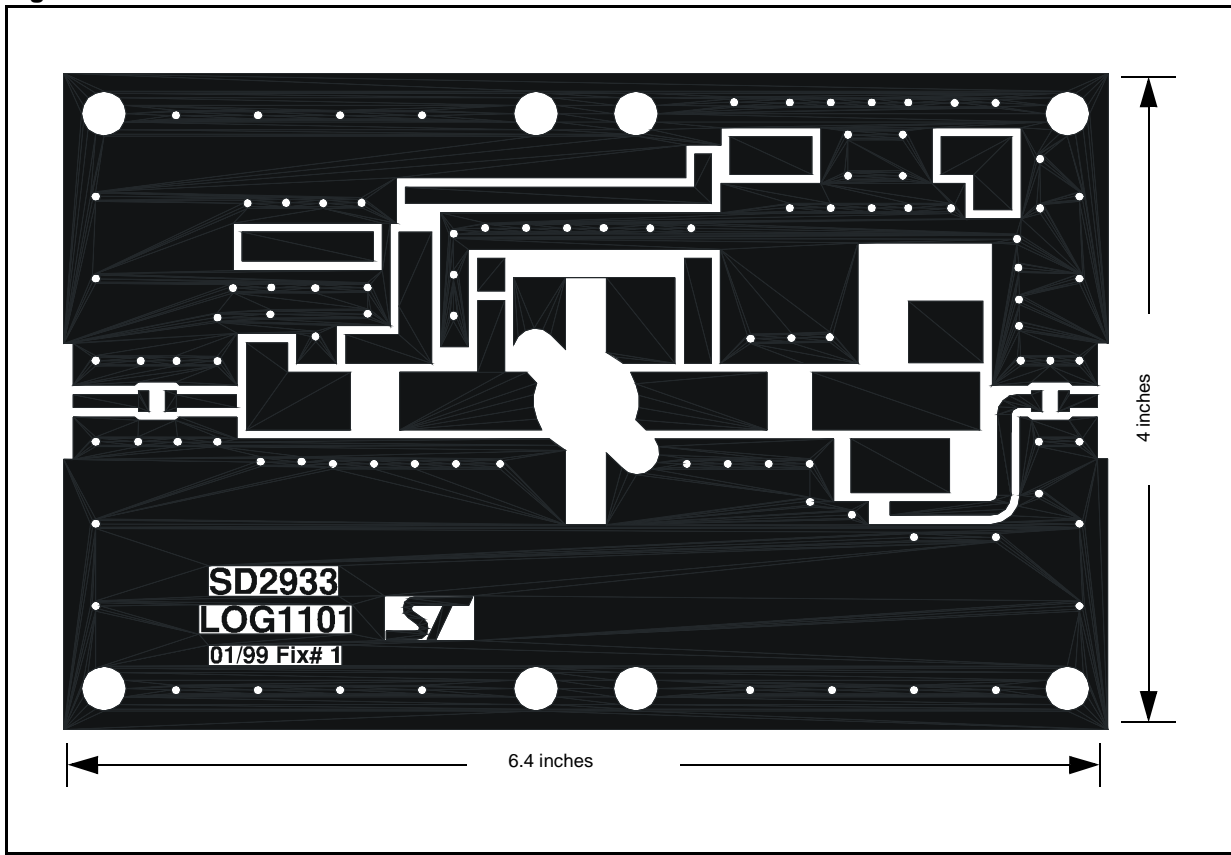
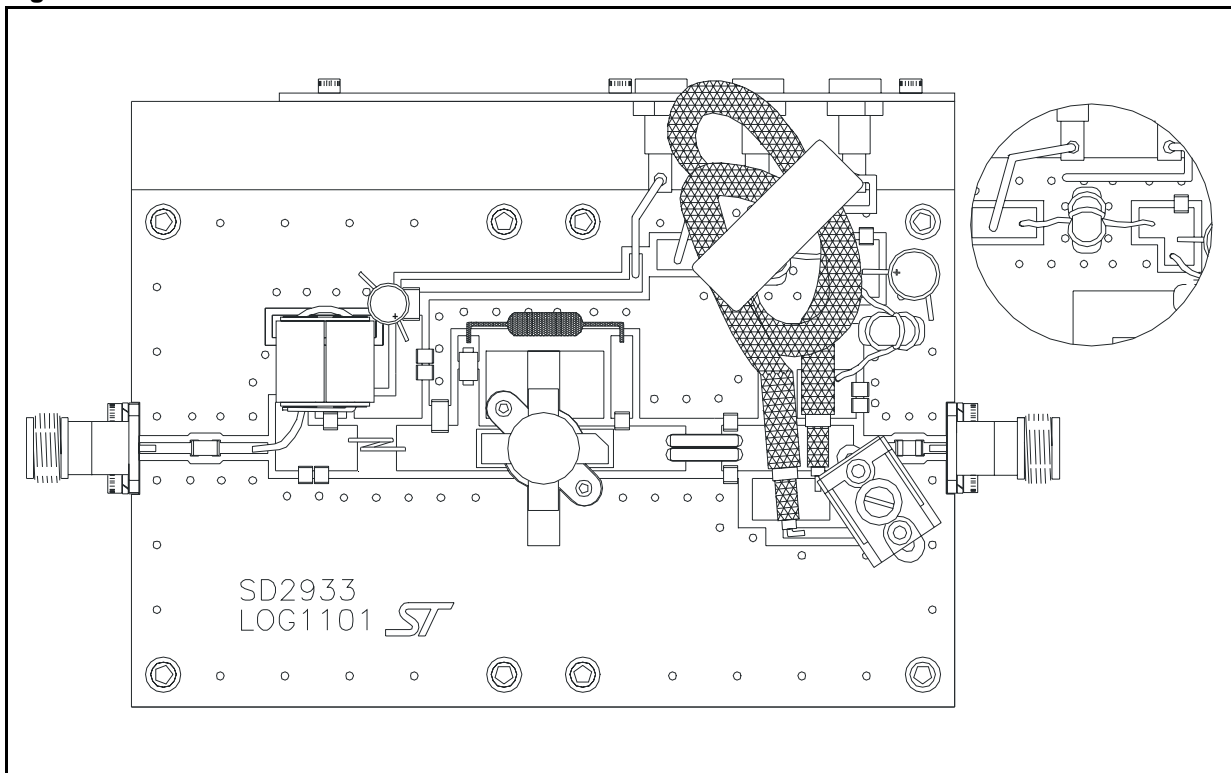


Figure 13. 30 MHz Test Circuit

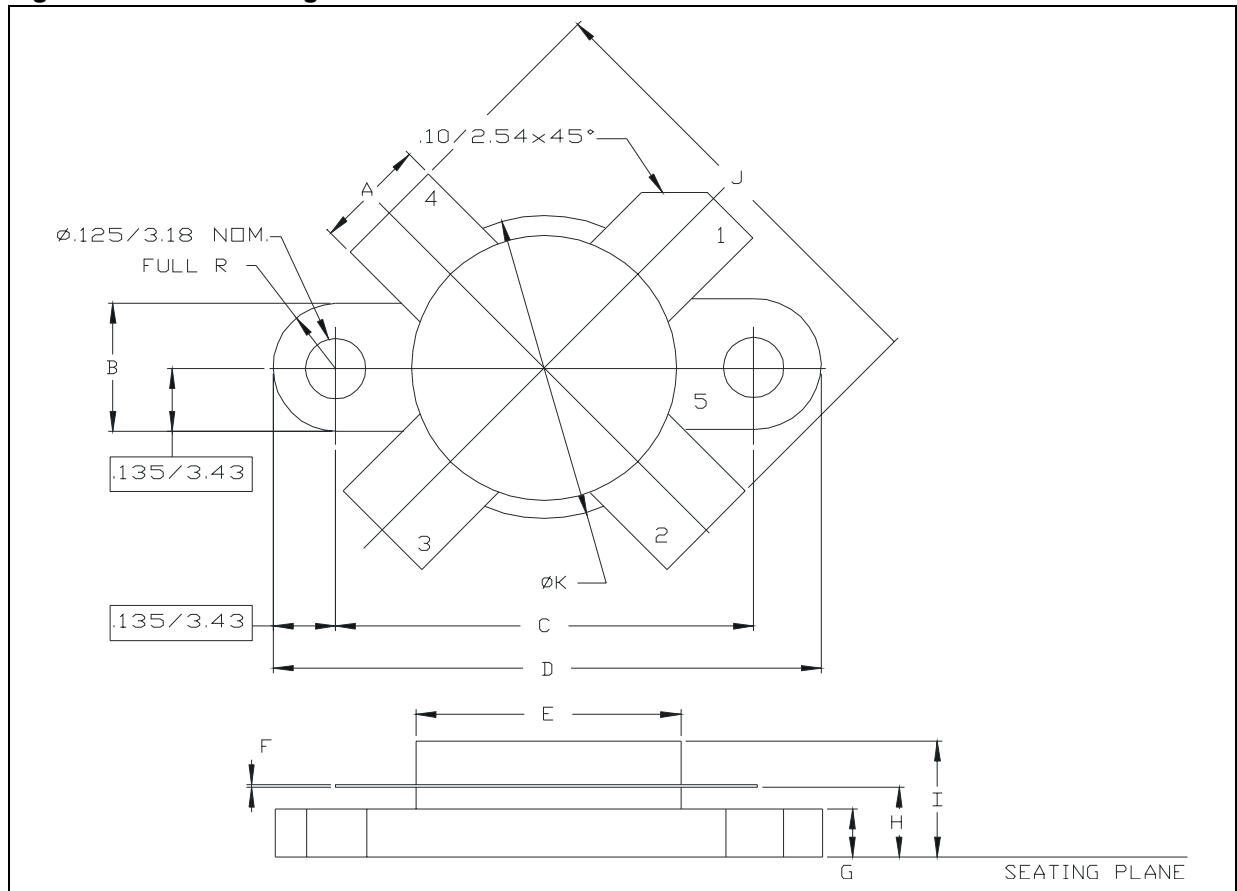


5 Mechanical Data

Table 9. M177 (.550 DIA 4/L N/HERM W/FLG)

| DIM. | mm. | | | inch | | |
|------|-------|-----|-------|-------|-----|-------|
| | MIN. | TYP | MAX. | MIN. | TYP | MAX. |
| A | 5.72 | | 5.97 | 0.225 | | 0.235 |
| B | 6.73 | | 6.96 | 0.265 | | 0.275 |
| C | 21.84 | | 22.10 | 0.860 | | 0.870 |
| D | 28.70 | | 28.96 | 1.130 | | 1.140 |
| E | 13.84 | | 14.10 | 0.545 | | 0.555 |
| F | 0.08 | | 0.18 | 0.003 | | 0.007 |
| G | 2.49 | | 2.74 | 0.098 | | 0.108 |
| H | 3.81 | | 4.32 | 0.150 | | 0.170 |
| I | | | 7.11 | | | 0.280 |
| J | 27.43 | | 28.45 | 1.080 | | 1.120 |
| K | 15.88 | | 16.13 | 0.625 | | 0.635 |

Figure 14. M177 Package Dimensions



6 Revision History

| Date | Revision | Description of Changes |
|-------------|----------|------------------------|
| 18-Oct-2005 | 1 | First Issue. |
| 04-Jan-2006 | 2 | Complete version |

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