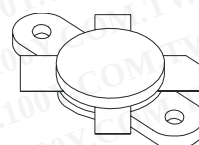
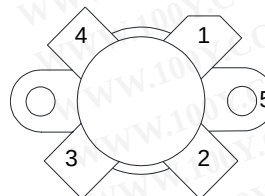


**SD2933****RF POWER TRANSISTORS  
HF/VHF/UHF N-CHANNEL MOSFETs**

- GOLD METALLIZATION
- EXCELLENT THERMAL STABILITY
- COMMON SOURCE CONFIGURATION
- $P_{OUT} = 300\text{ W MIN. WITH } 20\text{ dB GAIN @ } 30\text{ MHz}$
- THERMALLY ENHANCED PACKAGING FOR LOWER JUNCTION TEMPERATURES

**DESCRIPTION**

The SD2933 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. Its special low thermal resistance package, makes it ideal for ISM applications where reliability and ruggedness are critical factors.

**M177**  
epoxy sealed**PIN CONNECTION**

1. Drain  
2. Source  
3. Gate

4. Source  
5. Source

**ORDER CODES**

| Order Codes | Marking | Package | Packaging    |
|-------------|---------|---------|--------------|
| SD2933      | SD2933  | M177    | Plastic Tray |

**ABSOLUTE MAXIMUM RATINGS** ( $T_{CASE} = 25\text{ }^{\circ}\text{C}$ )

| Symbol         | Parameter                                              | Value       | Unit               |
|----------------|--------------------------------------------------------|-------------|--------------------|
| $V_{(BR)DSS}$  | Drain Source Voltage                                   | 125         | V                  |
| $V_{DGR}$      | Drain-Gate Voltage ( $R_{GS} = 1\text{ M}\Omega$ )     | 125         | V                  |
| $V_{GS}$       | Gate-Source Voltage                                    | $\pm 20$    | V                  |
| $I_D$          | Drain Current                                          | 40          | A                  |
| $P_{DISS}$     | Power Dissipation                                      | 648         | W                  |
| $T_j$          | Max. Operating Junction Temperature                    | 200         | $^{\circ}\text{C}$ |
| $E_{AS}$       | Avalanche Energy, Single Pulse ( $I_D = 60\text{ A}$ ) | 1500        | mJ                 |
| $E_{AR}^{(1)}$ | Avalanche Energy, Repetitive                           | 50          | mJ                 |
| $T_{STG}$      | Storage Temperature                                    | -65 to +150 | $^{\circ}\text{C}$ |

(1) Repetitive rating: Pulse width limited by maximum junction temperature

Repetitive avalanche causes additional power losses that can be calculated as:  $P_{AV} = E_{AR} \cdot f$

**THERMAL DATA**

|               |                                   |      |                      |
|---------------|-----------------------------------|------|----------------------|
| $R_{th(j-c)}$ | Junction -Case Thermal Resistance | 0.27 | $^{\circ}\text{C/W}$ |
|---------------|-----------------------------------|------|----------------------|

ELECTRICAL SPECIFICATION ( $T_{CASE} = 25^{\circ}C$ )

## STATIC

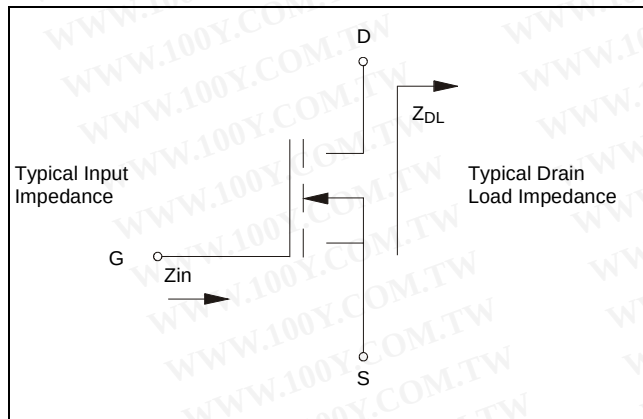
| Symbol        | Test Conditions        |                          | Min. | Typ. | Max. | Unit          |
|---------------|------------------------|--------------------------|------|------|------|---------------|
| $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}$  | $I_{DS} = 200\text{ mA}$ | 125  |      |      | V             |
| $I_{DSS}$     | $V_{GS} = 0\text{ V}$  | $V_{DS} = 50\text{ V}$   |      |      | 100  | $\mu\text{A}$ |
| $I_{GSS}$     | $V_{GS} = 20\text{ V}$ | $V_{DS} = 0\text{ V}$    |      |      | 500  | nA            |
| $V_{GS(Q)}$   | $V_{DS} = 10\text{ V}$ | $I_D = 250\text{ mA}$    | 1.5  |      | 4    | V             |
| $V_{DS(ON)}$  | $V_{GS} = 10\text{ V}$ | $I_D = 20\text{ A}$      |      |      | 3    | V             |
| $G_{FS}$      | $V_{DS} = 10\text{ V}$ | $I_D = 10\text{ A}$      | 10   |      |      | mho           |
| $C_{ISS}$     | $V_{GS} = 0\text{ V}$  | $V_{DS} = 50\text{ V}$   |      | 1000 |      | pF            |
| $C_{OSS}$     | $V_{GS} = 0\text{ V}$  | $V_{DS} = 50\text{ V}$   |      | 372  |      | pF            |
| $C_{RSS}$     | $V_{GS} = 0\text{ V}$  | $V_{DS} = 50\text{ V}$   |      | 29   |      | pF            |

G<sub>FS</sub> sorts for each unit

## DYNAMIC

| Symbol        | Test Conditions        |                          |                          | Min. | Typ. | Max. | Unit |
|---------------|------------------------|--------------------------|--------------------------|------|------|------|------|
| $P_{OUT}$     | $V_{DD} = 50\text{ V}$ | $I_{DQ} = 250\text{ mA}$ | $f = 30\text{ MHz}$      | 300  | 400  |      | W    |
| $G_{PS}$      | $V_{DD} = 50\text{ V}$ | $I_{DQ} = 250\text{ mA}$ | $P_{OUT} = 300\text{ W}$ | 20   | 23.5 |      | dB   |
| $\eta_D$      | $V_{DD} = 50\text{ V}$ | $I_{DQ} = 250\text{ mA}$ | $P_{OUT} = 300\text{ W}$ | 50   | 65   |      | %    |
| Load Mismatch | $V_{DD} = 50\text{ V}$ | $I_{DQ} = 250\text{ mA}$ | $P_{OUT} = 300\text{ W}$ | 3:1  |      |      | VSWR |

## IMPEDANCE DATA



| FREQ    | $Z_{IN} (\Omega)$ | $Z_{DL} (\Omega)$ |
|---------|-------------------|-------------------|
| 30 MHz  | $1.8 - j 0.2$     | $2.8 + j 2.3$     |
| 108 MHz | $1.9 + j 0.2$     | $1.6 + j 1.4$     |
| 175 MHz | $1.9 + j 0.3$     | $1.5 + j 1.6$     |

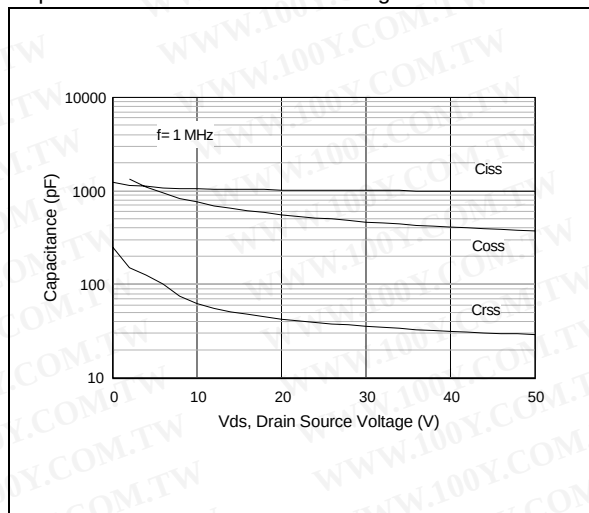
G<sub>FS</sub> SORTS

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

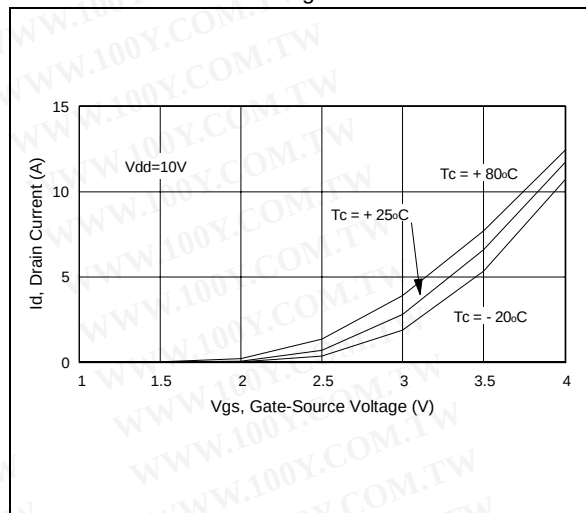
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## TYPICAL PERFORMANCE

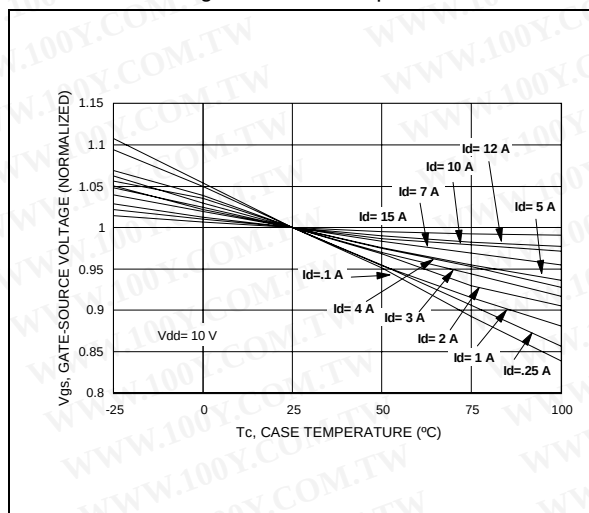
Capacitance vs. Drain-Source Voltage



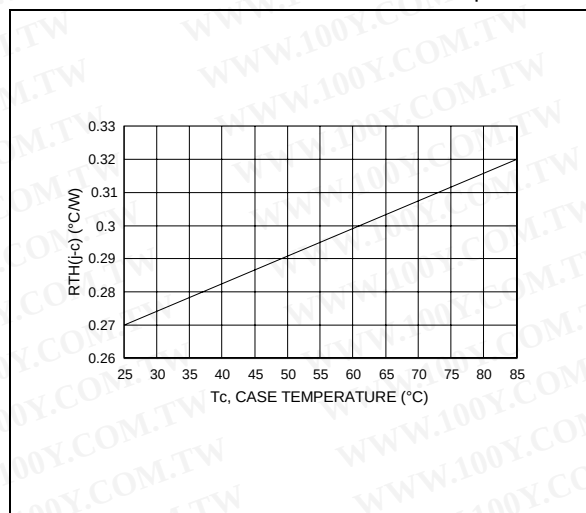
Drain Current vs. Gate Voltage



Gate-Source Voltage vs. Case Temperature



Maximum Thermal Resistance vs. Case Temperature

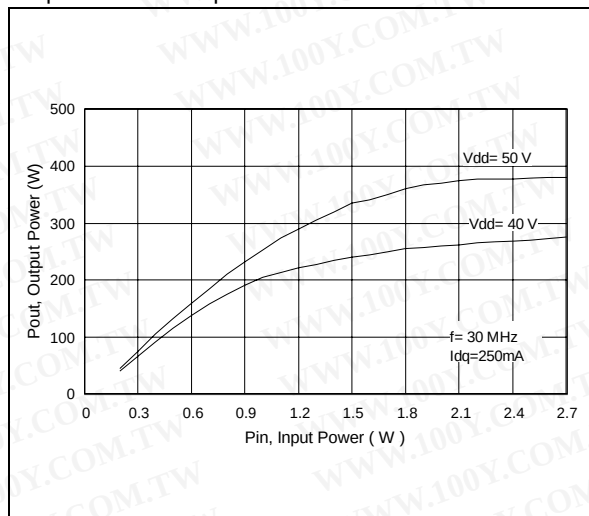


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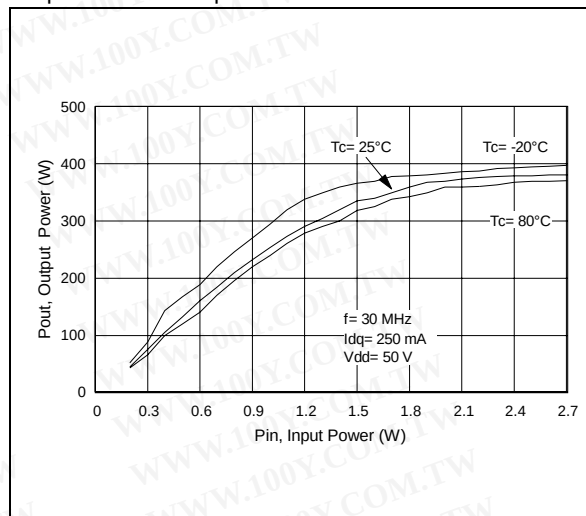
## SD2933

### TYPICAL PERFORMANCE

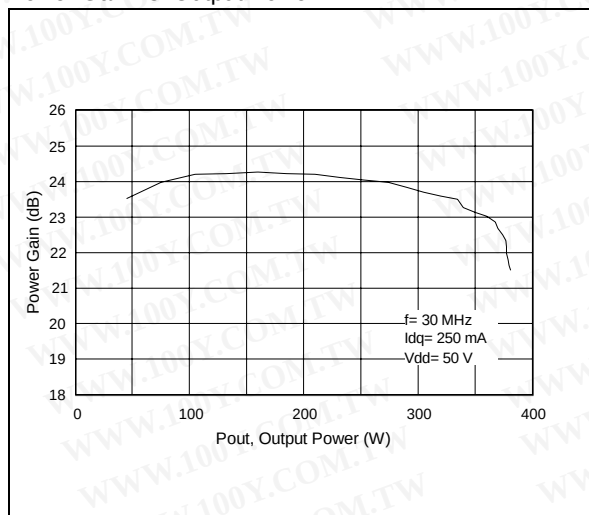
Output Power vs. Input Power



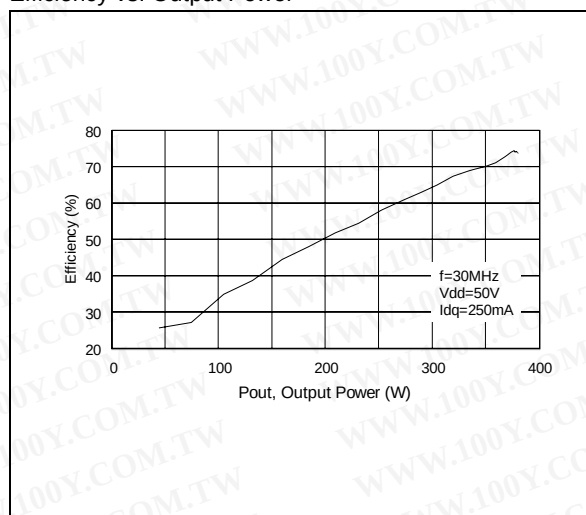
Output Power vs. Input Power



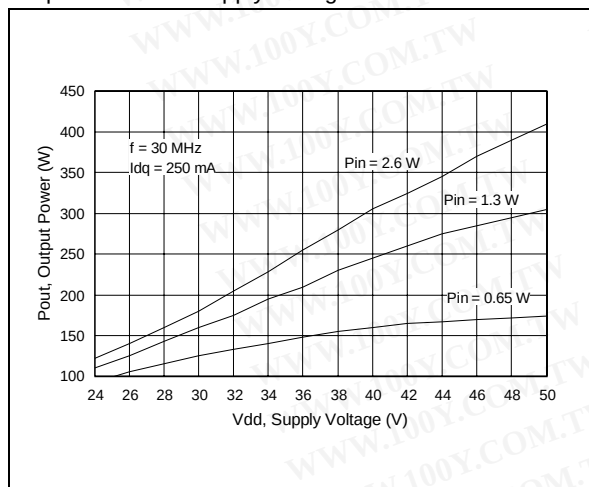
Power Gain vs. Output Power



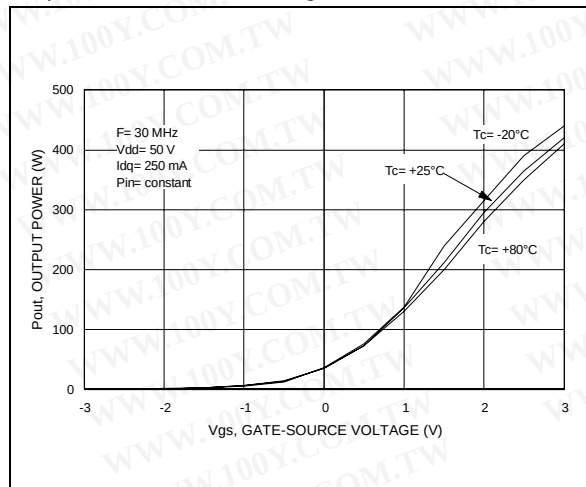
Efficiency vs. Output Power



Output Power vs. Supply Voltage

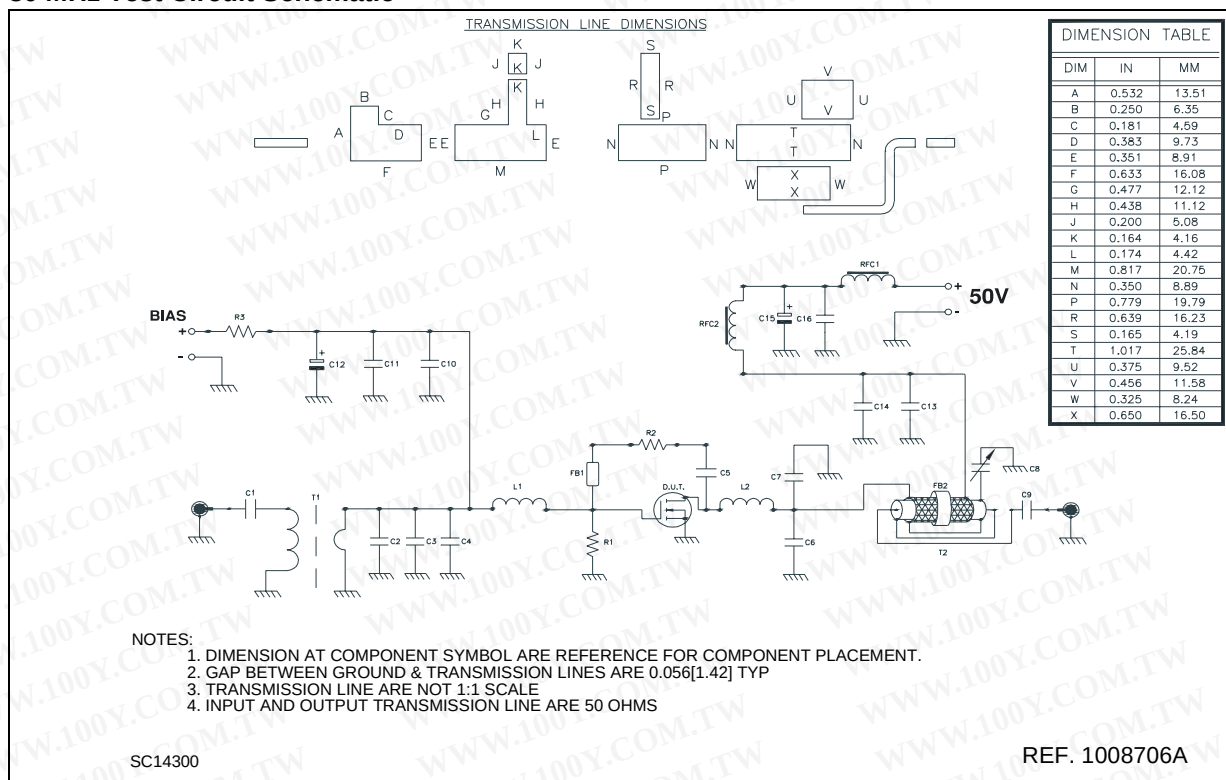


Output Power vs. Gate Voltage





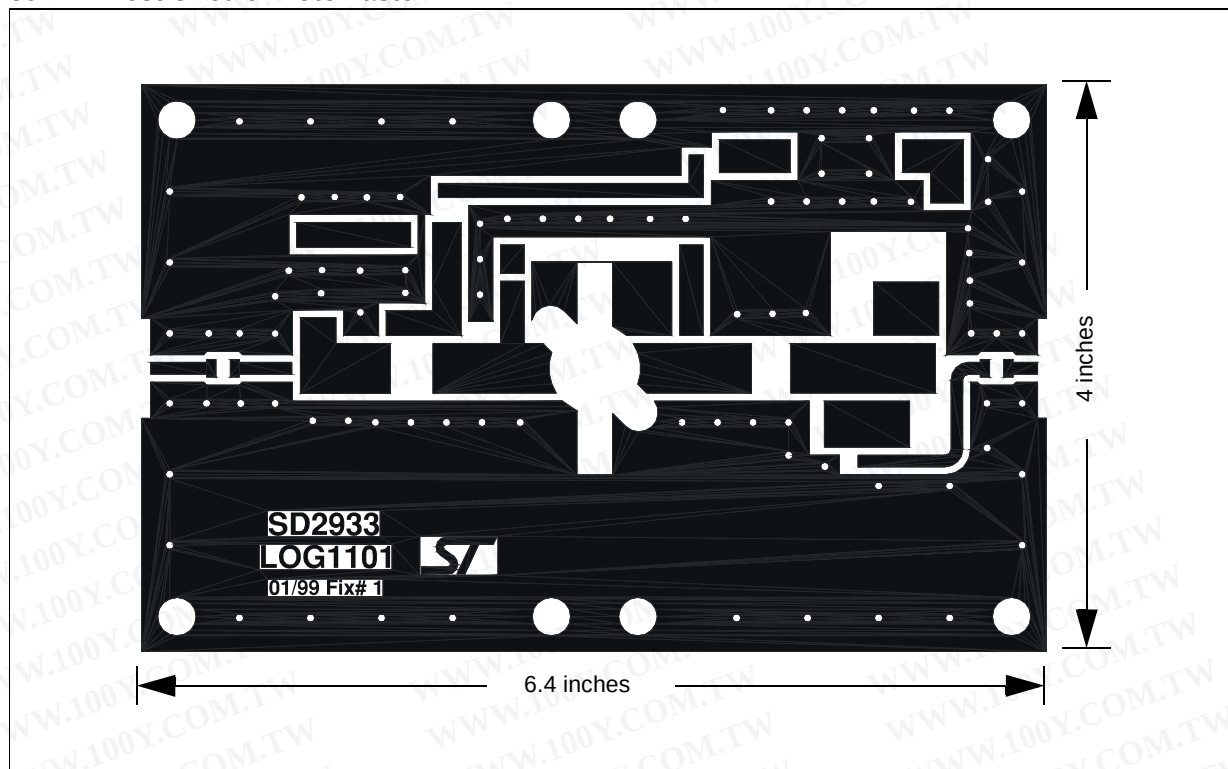
## 30 MHz Test Circuit Schematic



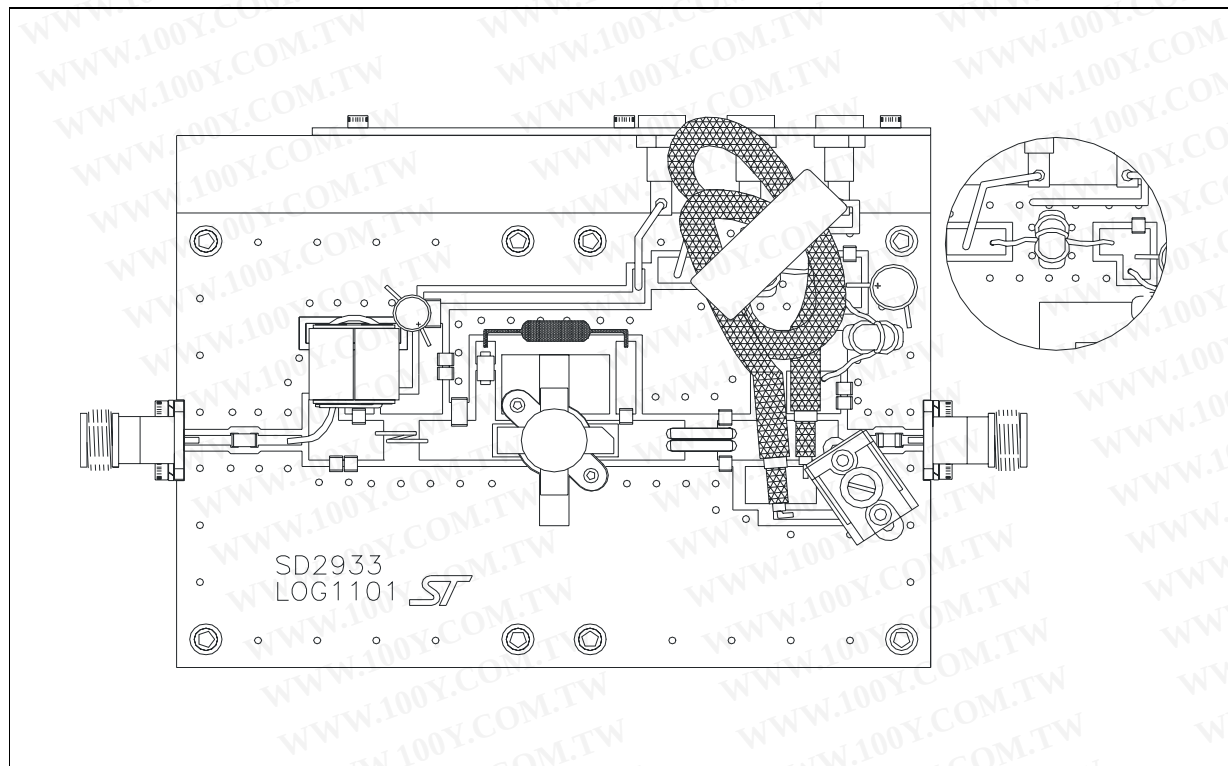
## 30 MHz Test Circuit Component Part List

|                    |                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| C1,C9              | 0.01 $\mu$ 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 $\mu$ F / 63 V ALUMINUM ELECTROLYTIC RADIAL LEAD CAPACITOR                                                                           |
| C13                | 1200 pF ATC 700B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                                                   |
| C15                | 100 $\mu$ F / 63 V ALUMINUM ELECTROLYTIC RADIAL LEAD CAPACITOR                                                                          |
| R1,R3              | 1 K OHM 1 W SURFACE MOUNT CHIP RESISTOR                                                                                                 |
| R2                 | 560 OHM 2 W WIRE-WOUND AXIAL LEAD RESISTOR                                                                                              |
| T1                 | HF 2-30 MHz SURFACE MOUNT 9:1 TRANSFORMER                                                                                               |
| T2                 | RG - 142B/U 50 OHM 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                                                                  |

### 30 MHz Test Circuit Photomaster



### 30 MHz Test Circuit



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