



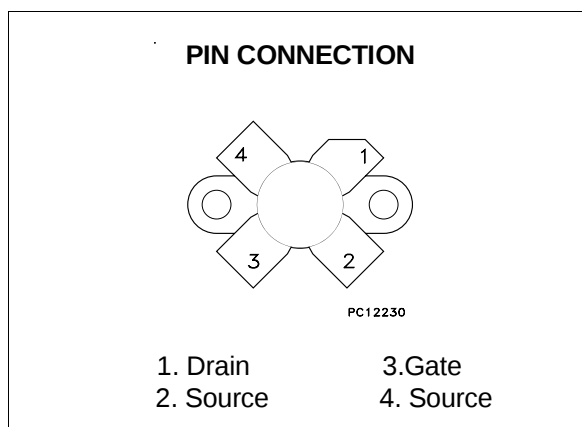
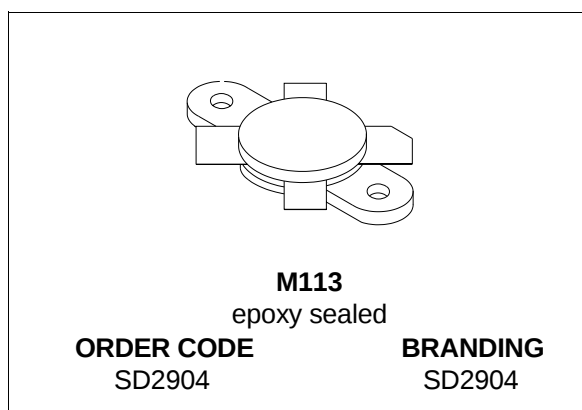
# SD2904

## RF POWER TRANSISTORS HF/VHF/UHF N-CHANNEL MOSFETs

- GOLD METALLIZATION
- COMMON SOURCE CONFIGURATION
- 2 - 500 MHz
- 30 WATTS
- 28 VOLTS
- 9.5 dB MIN. AT 400 MHz
- CLASS A OR AB OPERATION
- EXCELLENT THERMAL STABILITY

### DESCRIPTION

The SD2904 is a gold metallized N-Channel MOS field-effect RF power transistor. It is intended for use in 28 V DC large signal applications up to 500 MHz



### ABSOLUTE MAXIMUM RATINGS ( $T_{case} = 25^{\circ}C$ )

| Symbol        | Parameter                                | Value      | Unit        |
|---------------|------------------------------------------|------------|-------------|
| $V_{(BR)DSS}$ | Drain Source Voltage                     | 65         | V           |
| $V_{DGR}$     | Drain-Gate Voltage ( $R_{GS}=1M\Omega$ ) | 65         | V           |
| $V_{GS}$      | Gate-Source Voltage                      | $\pm 20$   | V           |
| $I_D$         | Drain Current                            | 5          | A           |
| $P_{DISS}$    | Power Dissipation                        | 100        | W           |
| $T_j$         | Max. Operating Junction Temperature      | 200        | $^{\circ}C$ |
| $T_{STG}$     | Storage Temperature                      | -65 to 150 | $^{\circ}C$ |

### THERMAL DATA

|               |                                    |      |               |
|---------------|------------------------------------|------|---------------|
| $R_{th(j-c)}$ | Junction-Case Thermal Resistance   | 1.75 | $^{\circ}C/W$ |
| $R_{th(c-s)}$ | Case-Heatsink Thermal Resistance * | 0.30 | $^{\circ}C/W$ |

\* Determined using a flat aluminum or copper heatsink with thermal compound applied (Dow Corning 340 or equivalent).

ELECTRICAL SPECIFICATION (T<sub>case</sub> = 25 °C)

STATIC

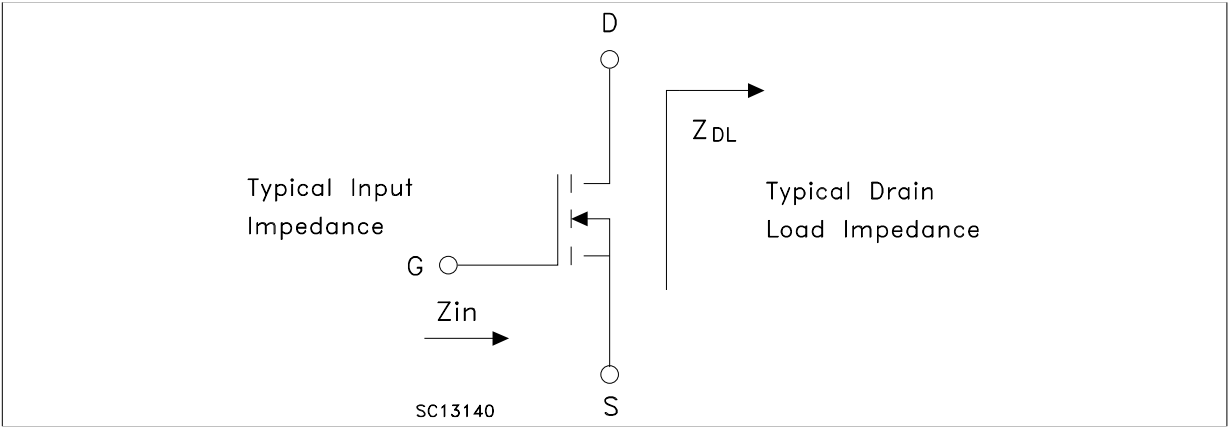
| Symbol               | Parameter             |                         | Min.      | Typ. | Max. | Unit |
|----------------------|-----------------------|-------------------------|-----------|------|------|------|
| V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V  | I <sub>DS</sub> = 30 mA | 65        |      |      | V    |
| I <sub>DSS</sub>     | V <sub>GS</sub> = 0V  | V <sub>DS</sub> = 28 V  |           |      | 3    | mA   |
| I <sub>GSS</sub>     | V <sub>GS</sub> = 20V | V <sub>DS</sub> = 0 V   |           |      | 2    | μA   |
| V <sub>GS(Q)</sub>   | V <sub>DS</sub> = 10V | I <sub>D</sub> = 60 mA  | 1.0       |      | 6.0  | V    |
| V <sub>DS(ON)</sub>  | V <sub>GS</sub> = 10V | I <sub>D</sub> = 3 A    |           |      | 1.6  | V    |
| g <sub>FS</sub>      | V <sub>DS</sub> = 10V | I <sub>D</sub> = 3 A    | 1.2       |      |      | mho  |
| C <sub>ISS</sub>     | V <sub>GS</sub> = 0V  | V <sub>DS</sub> = 28 V  | f = 1 MHz |      | 47   | pF   |
| C <sub>OSS</sub>     | V <sub>GS</sub> = 0V  | V <sub>DS</sub> = 28 V  | f = 1 MHz |      | 35   | pF   |
| C <sub>RSS</sub>     | V <sub>GS</sub> = 0V  | V <sub>DS</sub> = 28 V  | f = 1 MHz |      | 7    | pF   |

REF. 1021310H

DYNAMIC

| Symbol           | Parameter   |                        |                         |                         | Min. | Typ. | Max. | Unit |
|------------------|-------------|------------------------|-------------------------|-------------------------|------|------|------|------|
| P <sub>OUT</sub> | f = 400 MHz | V <sub>DD</sub> = 28 V | I <sub>DQ</sub> = 50 mA |                         | 30   |      |      | W    |
| G <sub>PS</sub>  | f = 400 MHz | V <sub>DD</sub> = 28 V | P <sub>out</sub> = 30 W | I <sub>DQ</sub> = 50 mA | 9.5  | 11.5 |      | dB   |
| η <sub>D</sub>   | f = 400 MHz | V <sub>DD</sub> = 28 V | P <sub>out</sub> = 30 W | I <sub>DQ</sub> = 50 mA | 45   | 55   |      | %    |
| Load Mismatch    | f = 400 MHz | V <sub>DD</sub> = 28 V | P <sub>out</sub> = 30 W | I <sub>DQ</sub> = 50 mA | 10:1 |      |      | VSWR |
| All Angles       |             |                        |                         |                         |      |      |      |      |

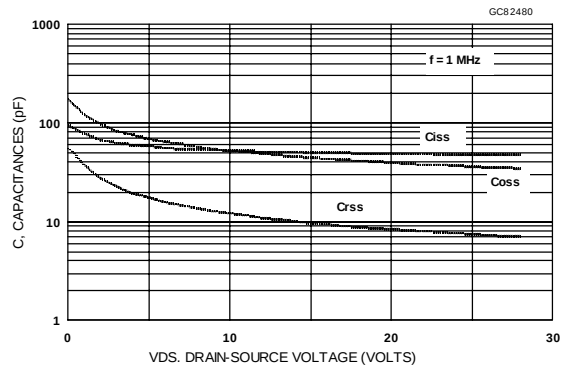
IMPEDANCE DATA



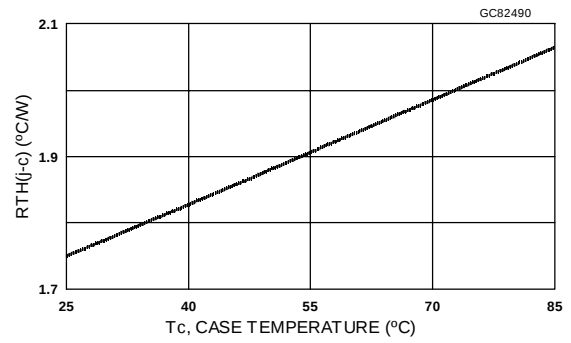
| FREQ.   | Z <sub>IN</sub> (Ω) | Z <sub>DL</sub> (Ω) |
|---------|---------------------|---------------------|
| 400 MHz | 2.0 - j 2.4         | 5.6 + j 0.4         |

## TYPICAL PERFORMANCE

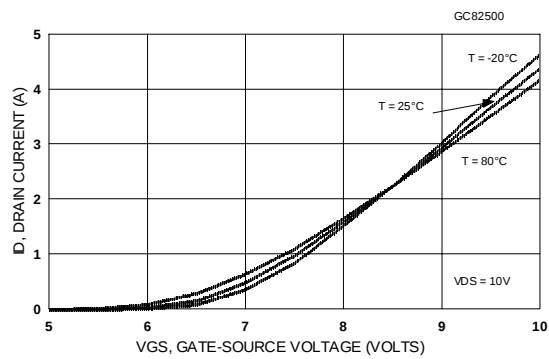
Capacitance vs Drain-Source Voltage



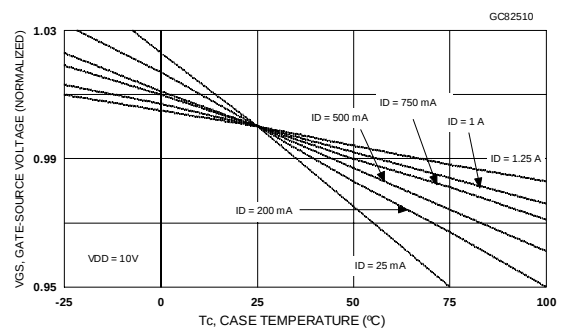
Maximum Thermal Resistance vs Case Temperature



Drain Current vs Gate Voltage

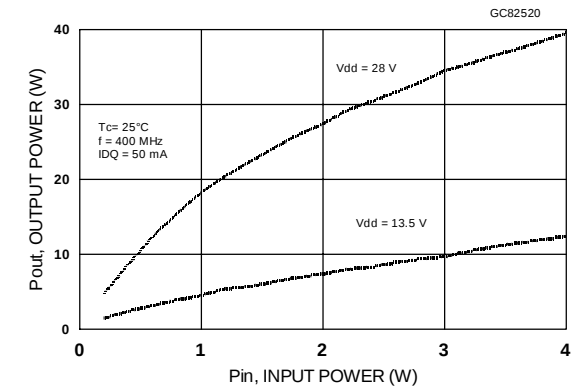


Gate-Source Voltages vs Case Temperature

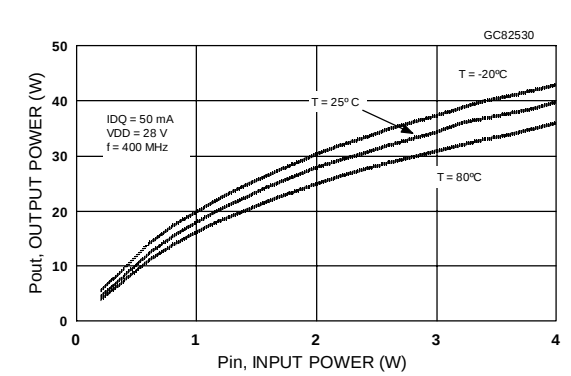


TYPICAL PERFORMANCE

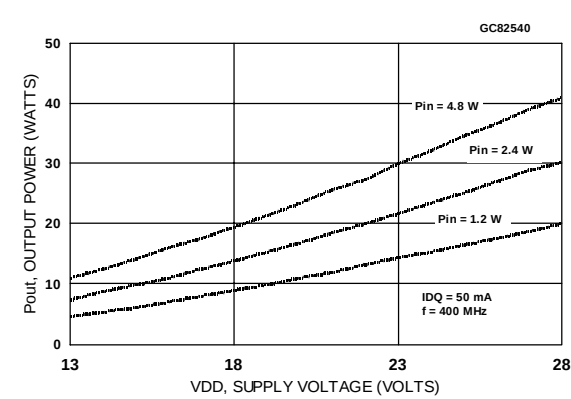
Output Power vs Input Power



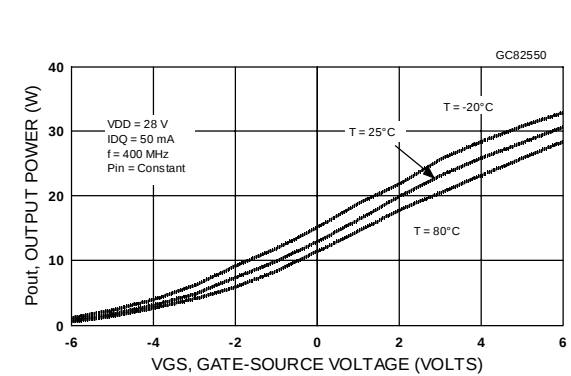
Output Power vs Input Power



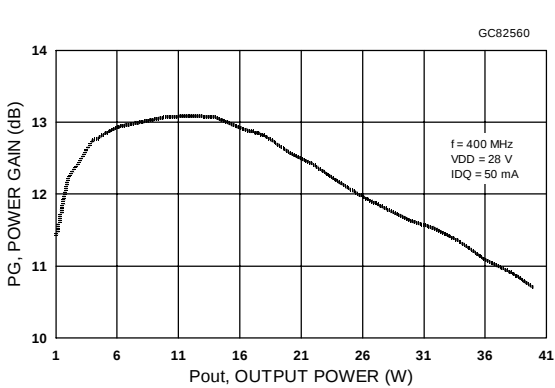
Output Power vs Voltage Supply



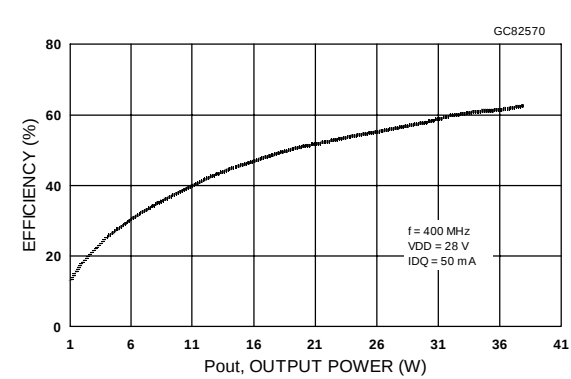
Output Power vs Gate Voltage



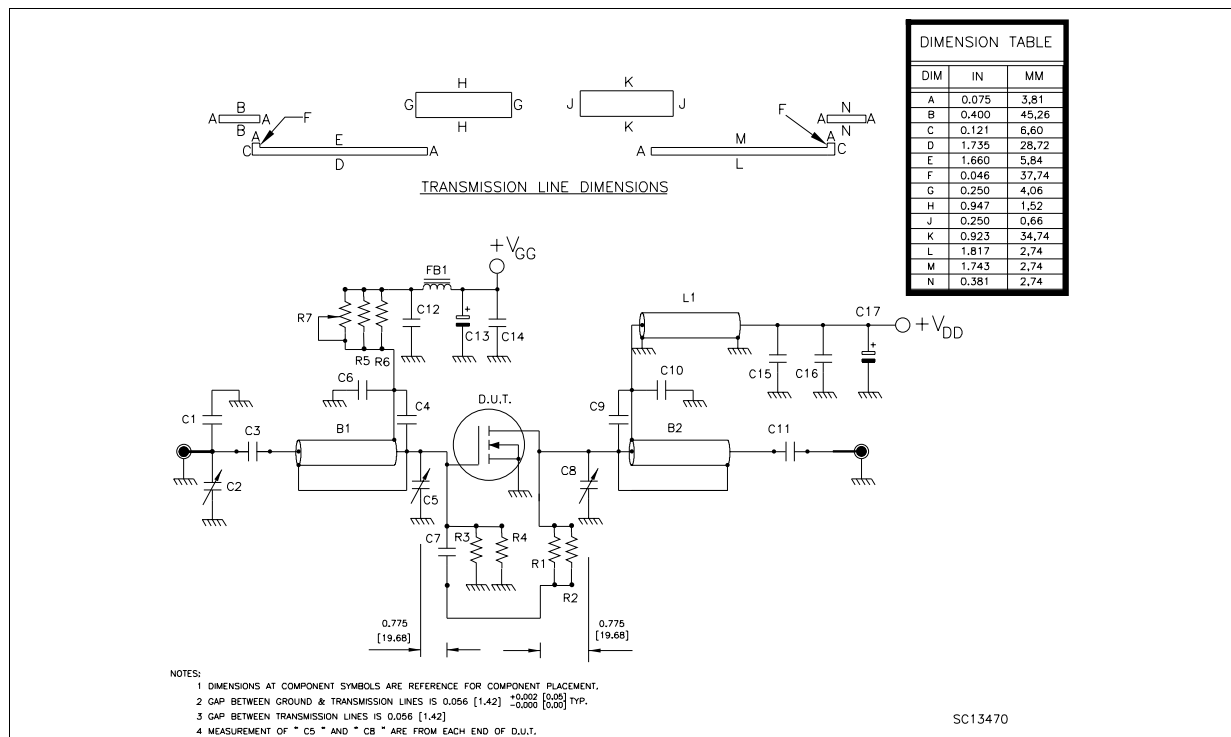
Power Gain vs Output Power



Efficiency vs Output Power



## 400 MHz Test Circuit Schematic

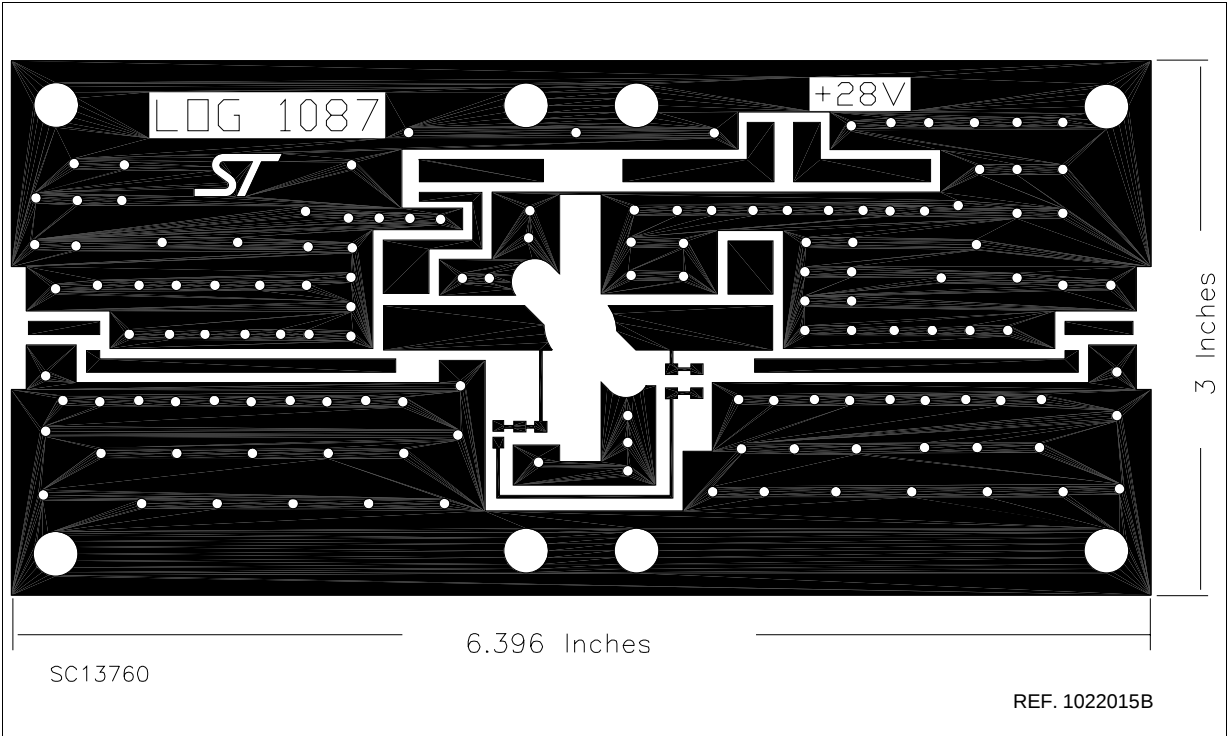


## 400 MHz Test Circuit Component Part List

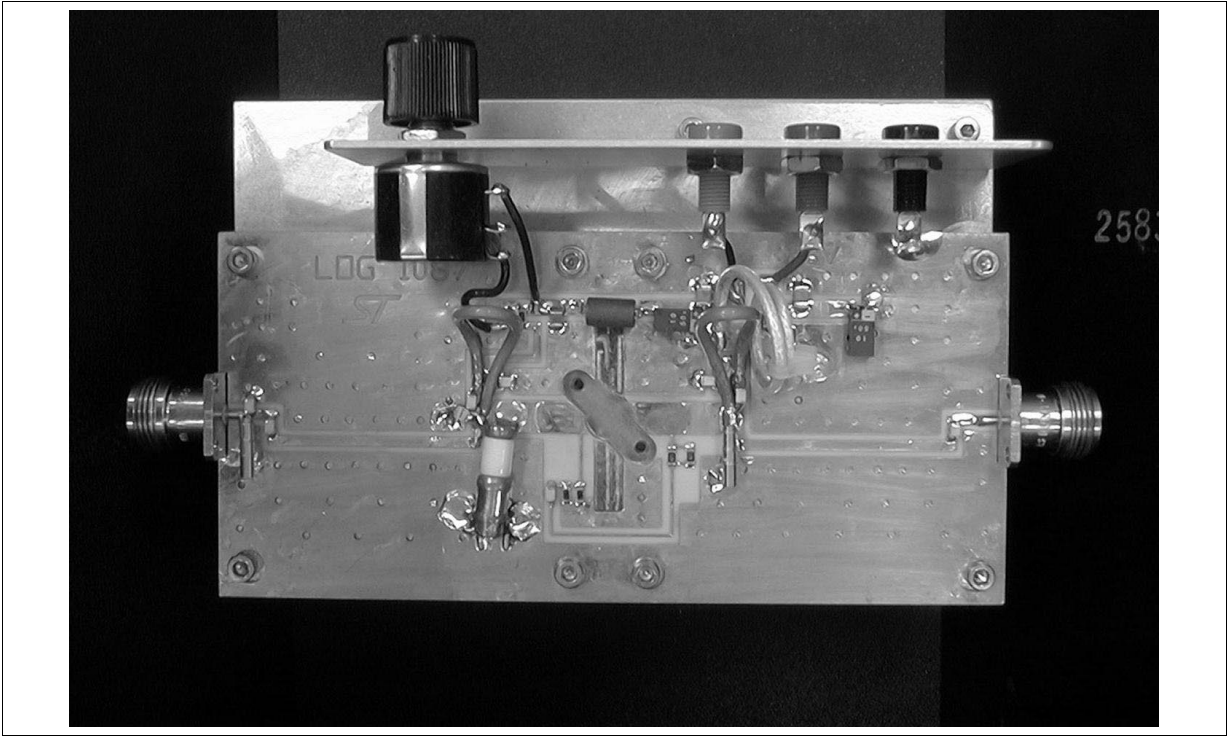
|           |                    |                 |                                                                                                      |
|-----------|--------------------|-----------------|------------------------------------------------------------------------------------------------------|
| R7        | 534-1-1-203        | SPECTROL        | 534 SERIES 3.09W, 10 TURN WIREWOUND PRECISION POTENTIOMETER                                          |
| R6        | CR1206-4W-471JT    | VENKEL          | 470K OHM 1/4 W SURFACE MOUNT CHIP RESISTOR                                                           |
| R5        | CR1206-4W-471JT    | VENKEL          | 470K OHM 1/4 W SURFACE MOUNT CHIP RESISTOR                                                           |
| R4        | CR1206-4W-471JT    | VENKEL          | 470K OHM 1/4 W SURFACE MOUNT CHIP RESISTOR                                                           |
| R3        | CR1206-4W-471JT    | VENKEL          | 470K OHM 1/4 W SURFACE MOUNT CHIP RESISTOR                                                           |
| R2        | CR1206-4W-821JT    | VENKEL          | 820K OHM 1/4 W SURFACE MOUNT CHIP RESISTOR                                                           |
| R1        | CR1206-4W-821JT    | VENKEL          | 820K OHM 1/4 W SURFACE MOUNT CHIP RESISTOR                                                           |
| FB1       | 2943666671         | FAIR-RITE CORP. | EMI SHIELD BEAD, 2 1/2 WOUND WITH TINNED COPPER WIRE #24 AWG                                         |
| L1        | RG316              |                 | INDUCTOR, RG316, 50 OHMS, NOM. O.D. 0.090[2.29] 5.5[139.70] LG. FLEXIBLE COAXIAL CABLE OR EQUIVALENT |
| B2        | RG316-25           |                 | BALUN, RG316-25, 25 OHM, NOM. O.D. 0.090[2.29], L=3.00[76.20] FLEXIBLE COAXIAL CABLE OR EQUIVALENT   |
| B1        | RG316-25           |                 | BALUN, RG316-25, 25 OHM, NOM. O.D. 0.090[2.29], L=3.00[76.20] FLEXIBLE COAXIAL CABLE OR EQUIVALENT   |
| C17       | SKR100M1HD11       | MALLORY         | 10μF/50V ALUMINUM ELECTROLYTIC RADIAL LEAD CAPACITOR                                                 |
| C16       | C1812X7R501-104KNE | VENKEL          | 0.1μ/500V SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                       |
| C15       | ATC200B103MW50X    | ATC             | 10000pF ATC 200B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                |
| C14       | C1812X7R501-104KNE | VENKEL          | 0.1μ/500V SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                       |
| C13       | SKR100M1HD11       | MALLORY         | 10μF/50V ALUMINUM ELECTROLYTIC RADIAL LEAD CAPACITOR                                                 |
| C12       | ATC200B103MW50X    | ATC             | 10000pF ATC 200B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                |
| C11       | ATC100B121KP300X   | ATC             | 120pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                  |
| C10       | ATC100B121KP300X   | ATC             | 120pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                  |
| C9        | ATC100B300KW500K   | ATC             | 30pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                   |
| C8        | 27291PC            | JOHANSON        | 0.8-8.0pF GIGA-TRIM VARIABLE CAPACITOR                                                               |
| C7        | ATC100B121KP300X   | ATC             | 120pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                  |
| C6        | ATC100B121KP300X   | ATC             | 120pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                  |
| C5        | 5601PC             | JOHANSON        | 1-30pF STANDARD AIR DIELECT. VARIABLE CAPACITOR                                                      |
| C4        | ATC100B470KW500X   | ATC             | 47pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                   |
| C3        | ATC100B121KP300X   | ATC             | 120pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                  |
| C2        | 27291PC            | JOHANSON        | 0.8-8.0pF GIGA-TRIM VARIABLE CAPACITOR                                                               |
| C1        | ATC100B4R3CP500X   | ATC             | 4.3pF ATC 100B SURFACE MOUNT CERAMIC CHIP CAPACITOR                                                  |
| PCB       | N0320X1011HE       | ROGERS CORP.    | WOVEN GLASS REINFORCED HYDROCARBON CERAMIC 0.032" THK, ε <sub>r</sub> = 3.38, 1 Oz ED Cu BOTH SIDES  |
| COMPONENT | PART NO            | VENDOR          | DESCRIPTION                                                                                          |

SC13750

400MHz Test Circuit Photomaster

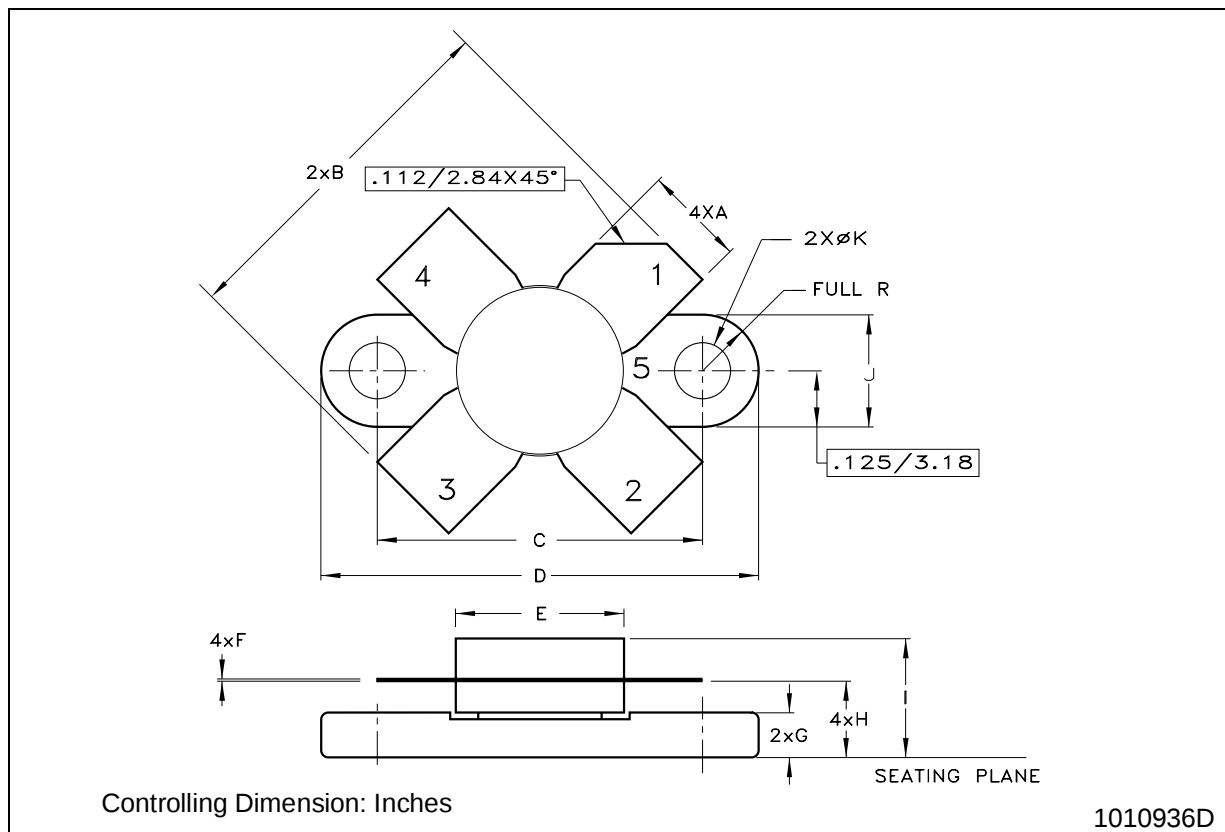


Production Test Fixture



**M113 (.380 DIA 4/L N/HERM W/FLG) MECHANICAL DATA**

| DIM. | mm    |      |       | inch  |      |       |
|------|-------|------|-------|-------|------|-------|
|      | MIN.  | TYP. | MAX.  | MIN.  | TYP. | MAX.  |
| A    | 5.59  |      | 5.84  | 0.220 |      | 0.230 |
| B    | 19.81 |      | 20.83 | 0.780 |      | 0.820 |
| C    | 18.29 |      | 18.54 | 0.720 |      | 0.730 |
| D    | 24.64 |      | 24.89 | 0.970 |      | 0.980 |
| E    | 9.40  |      | 9.78  | 0.370 |      | 0.385 |
| F    | 0.10  |      | 0.15  | 0.004 |      | 0.006 |
| G    | 2.16  |      | 2.67  | 0.085 |      | 0.105 |
| H    | 4.06  |      | 4.57  | 0.160 |      | 0.180 |
| I    |       |      | 7.14  |       |      | 0.281 |
| J    | 6.22  |      | 6.48  | 0.245 |      | 0.255 |
| K    | 3.05  |      | 3.30  | 0.120 |      | 0.130 |



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