

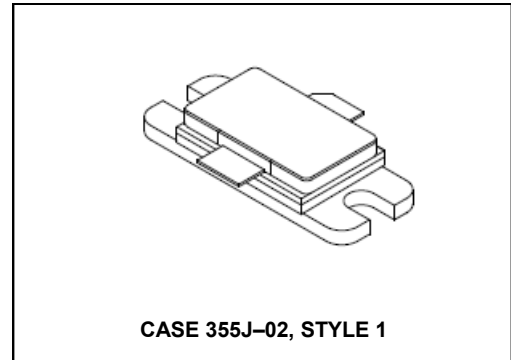
## Microwave Pulse Power Silicon NPN Transistor 500W (peak), 1025–1150MHz

Rev. V1

Designed for 1025–1150 MHz pulse common base amplifier applications such as TCAS, TACAN and Mode-S transmitters.

- Guaranteed performance @ 1090 MHz  
Output power = 500 W peak  
Gain = 8.5 dB min, 9.0 dB (typ.)
- 100% tested for load mismatch at all phase angles with 10:1 VSWR
- Hermetically sealed industry package
- Silicon nitride passivated
- Gold metalized, emitter ballasted for long life and resistance to metal migration
- Internal input and output matching
- Characterized with 10 $\mu$ s, 1% duty cycle pulses

### Product Image



### MAXIMUM RATINGS

| Rating   | Symbol    | Value       | Unit                         |
|--|-----------|-------------|------------------------------|
| Collector–Emitter Voltage  | $V_{CES}$ | 65          | Vdc                          |
| Collector–Base Voltage   | $V_{CBO}$ | 65          | Vdc                          |
| Emitter–Base Voltage   | $V_{EBO}$ | 3.5         | Vdc                          |
| Collector Current — Peak (1)   | $I_C$     | 29          | Adc                          |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1), (2)<br>Derate above 25 $^\circ\text{C}$ | $P_D$     | 1460<br>8.3 | Watts<br>W/ $^\circ\text{C}$ |
| Storage Temperature Range  | $T_{stg}$ | –65 to +200 | $^\circ\text{C}$             |
| Junction Temperature   | $T_J$     | 200         | $^\circ\text{C}$             |

### THERMAL CHARACTERISTICS

| Characteristic                           | Symbol          | Max  | Unit                      |
|--|-----------------|------|---------------------------|
| Thermal Resistance, Junction to Case (3) | $R_{\theta JC}$ | 0.12 | $^\circ\text{C}/\text{W}$ |

#### NOTES:

1. Under pulse RF operating conditions.
2. These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as pulsed RF amplifiers.
3. Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques. (Worst case  $\theta_{JC}$  value measured @ 32  $\mu$ s, 2%.)

## Microwave Pulse Power Silicon NPN Transistor 500W (peak), 1025–1150MHz

Rev. V1

### ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted.)

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

#### OFF CHARACTERISTICS

|   |                      |     |   |    |      |
|---|----------------------|-----|---|----|------|
| Collector–Emitter Breakdown Voltage (I <sub>C</sub> = 60 mAdc, V <sub>BE</sub> = 0) | V <sub>(BR)CES</sub> | 65  | — | —  | Vdc  |
| Collector–Base Breakdown Voltage (I <sub>C</sub> = 60 mAdc, I <sub>E</sub> = 0)     | V <sub>(BR)CBO</sub> | 65  | — | —  | Vdc  |
| Emitter–Base Breakdown Voltage (I <sub>E</sub> = 10 mAdc, I <sub>C</sub> = 0)       | V <sub>(BR)EBO</sub> | 3.5 | — | —  | Vdc  |
| Collector Cutoff Current (V <sub>CB</sub> = 36 Vdc, I <sub>E</sub> = 0)             | I <sub>CBO</sub>     | —   | — | 25 | mAdc |

#### ON CHARACTERISTICS

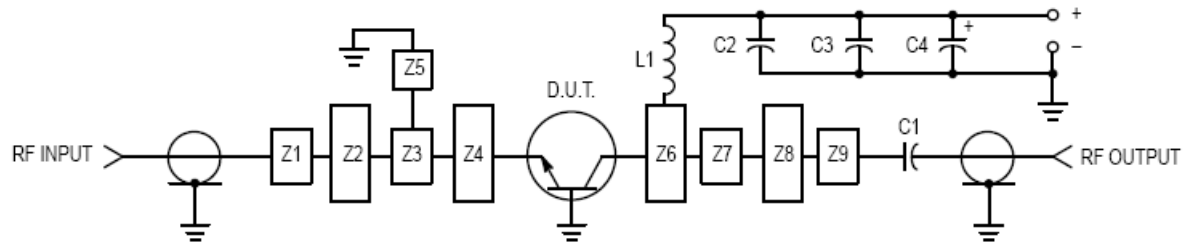
|   |                 |    |   |   |   |
|---|-----------------|----|---|---|---|
| DC Current Gain (I <sub>C</sub> = 5.0 Adc, V <sub>CE</sub> = 5.0 Vdc) | h <sub>FE</sub> | 20 | — | — | — |
|---|-----------------|----|---|---|---|

#### FUNCTIONAL TESTS

|   |                 |                                |     |   |    |
|---|-----------------|--------------------------------|-----|---|----|
| Common–Base Amplifier Power Gain<br>(V <sub>CC</sub> = 50 Vdc, P <sub>out</sub> = 500 W Peak, f = 1090 MHz)               | G <sub>PB</sub> | 8.5                            | 9.0 | — | dB |
| Collector Efficiency<br>(V <sub>CC</sub> = 50 Vdc, P <sub>out</sub> = 500 W Peak, f = 1090 MHz)                           | η               | 40                             | 45  | — | %  |
| Load Mismatch<br>(V <sub>CC</sub> = 50 Vdc, P <sub>out</sub> = 500 W Peak, f = 1090 MHz,<br>VSWR = 10:1 All Phase Angles) | ψ               | No Degradation in Output Power |     |   |    |

## Microwave Pulse Power Silicon NPN Transistor 500W (peak), 1025–1150MHz

Rev. V1



C1 — 82 pF 100 Mil Chip Capacitor  
 C2 — 39 pF 100 Mil Chip Capacitor  
 C3 — 0.1  $\mu$ F  
 C4 — 100  $\mu$ F, 100 Vdc, Electrolytic  
 L1 — 3 Turns #18 AWG, 1/8" ID, 0.18 Long

Z1–Z9 — Microstrip, See Details  
 Board Material — Teflon, Glass Laminate  
 Dielectric Thickness = 0.030"  
 $\epsilon_r = 2.55$ , 2 Oz. Copper

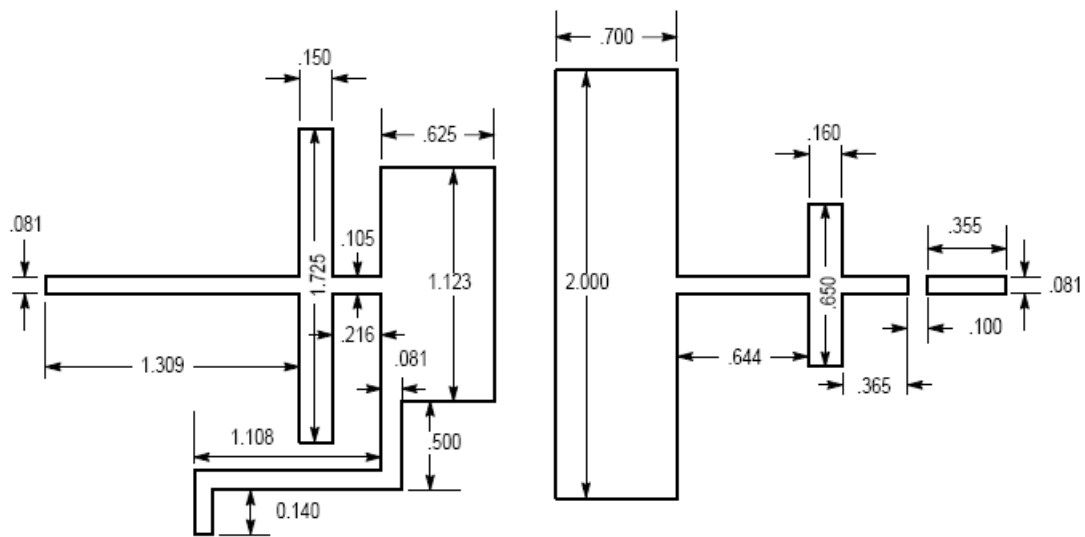
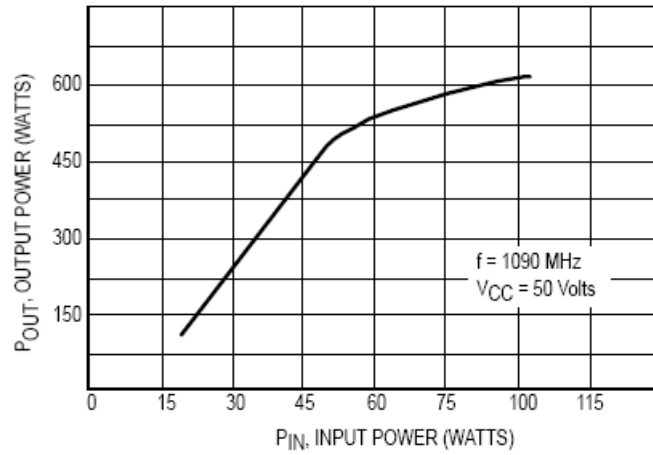
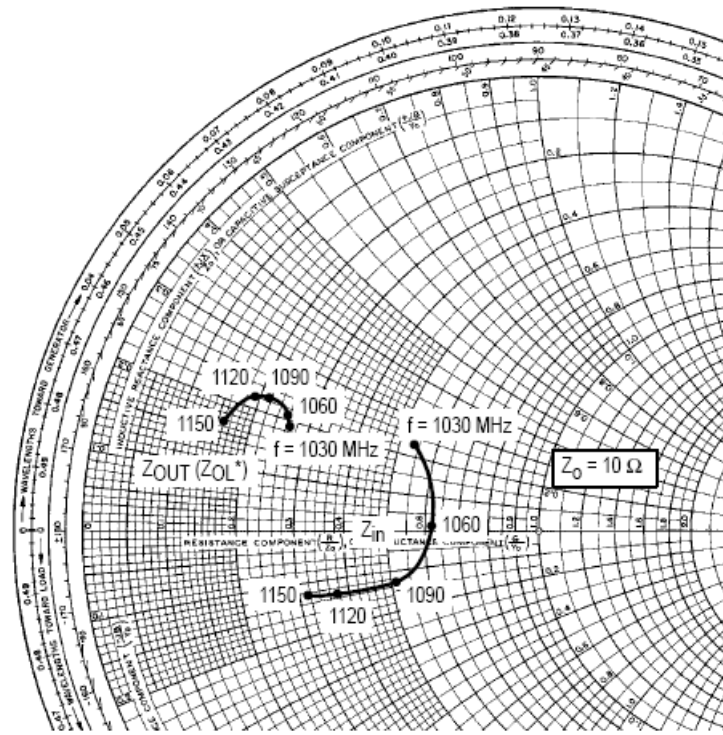


Figure 1. Test Circuit



**Figure 2. Output Power versus Input Power**



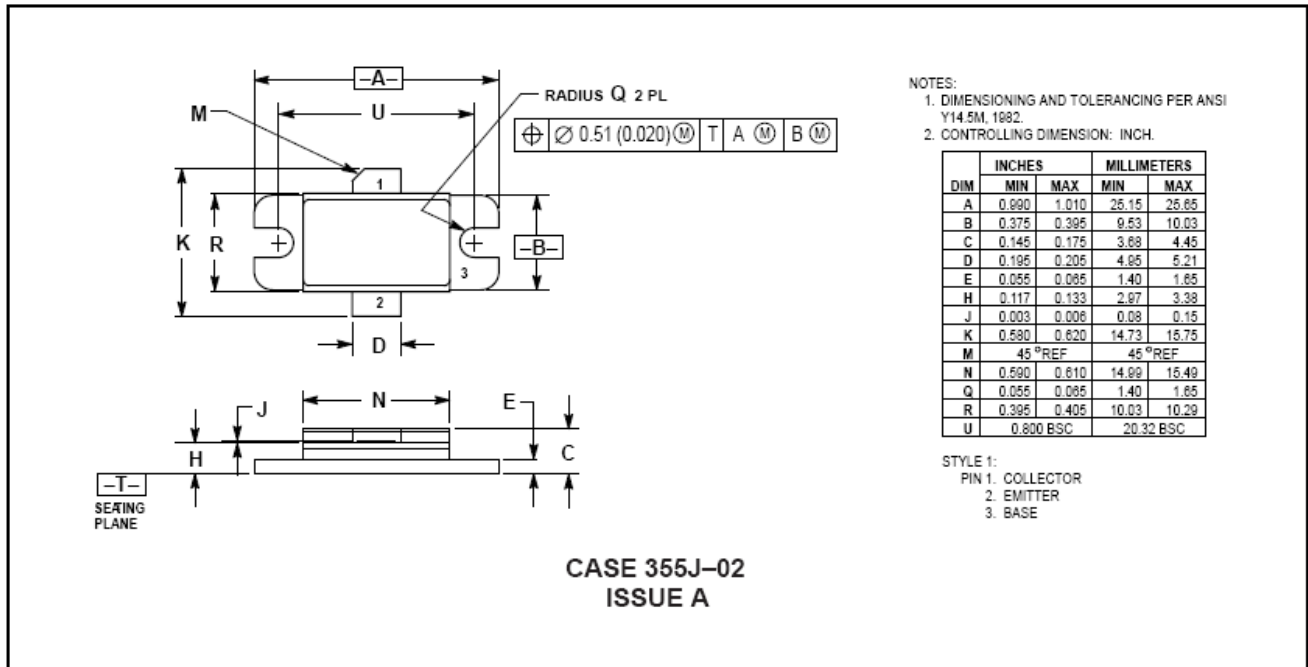
$P_{OUT} = 500 \text{ W Pk}$   $V_{CC} = 50 \text{ V}$

| f<br>MHz | $Z_{in}$<br>OHMS | $Z_{OL}^*$ ( $Z_{OUT}$ )<br>OHMS |
|----------|------------------|----------------------------------|
| 1030     | $5.3 + j2.25$    | $2.6 + j1.89$                    |
| 1060     | $6.2 + j0.2$     | $2.56 + j2.0$                    |
| 1090     | $5.2 - j1.4$     | $2.12 + j2.2$                    |
| 1120     | $3.7 - j1.35$    | $1.9 + j2.15$                    |
| 1150     | $3.15 - j1.3$    | $1.6 + j1.62$                    |

$Z_{OL}^*$  is the conjugate of the optimum load impedance into which the device operates at a given output power voltage and frequency.

**Figure 3. Series Equivalent Input/Output Impedances**

**PACKAGE DIMENSIONS**



M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.