

## Microwave Power Silicon NPN Transistor

### 30W (peak), 960–1215MHz, 36V

M/A-COM Products  
Released - Rev. 05.30.07

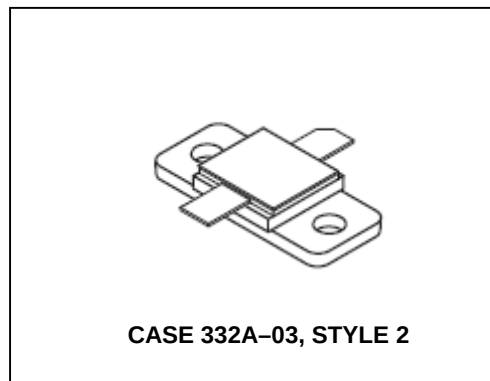
#### Features

- Guaranteed performance @ 960-1215MHz, 36Vdc
- Output power: 30W peak
- Minimum gain: 9.0dB min., 9.5dB typ.
- 100% tested for load mismatch at all phase angles with 10:1 VSWR
- Hermetically sealed, industry standard package
- Silicon nitride passivated
- Gold metallized, emitter ballasted for long life and resistance to metal migration
- Internal input matching for broadband operation

#### Description and Applications

Designed for 960–1215 MHz long or short pulse common base amplifier applications such as JTIDS and Mode-S transmitters.

#### Product Image



#### Maximum Ratings

| Rating                                                                                          | Symbol    | Value         | Unit                          |
|-------------------------------------------------------------------------------------------------|-----------|---------------|-------------------------------|
| Collector–Emitter Voltage                                                                       | $V_{CES}$ | 55            | Vdc                           |
| Collector–Base Voltage (1)                                                                      | $V_{CBO}$ | 55            | Vdc                           |
| Emitter–Base Voltage                                                                            | $V_{EBO}$ | 3.5           | Vdc                           |
| Collector Current — Continuous (1)                                                              | $I_C$     | 3.0           | Adc                           |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1), (2)<br>Derate above $25^\circ\text{C}$ | $P_D$     | 110<br>0.625  | Watts<br>mW/ $^\circ\text{C}$ |
| 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) | $R_{\theta JC}$ | 1.6 | $^\circ\text{C/W}$ |

#### 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 @ 23% duty cycle)

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

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

#### OFF CHARACTERISTICS

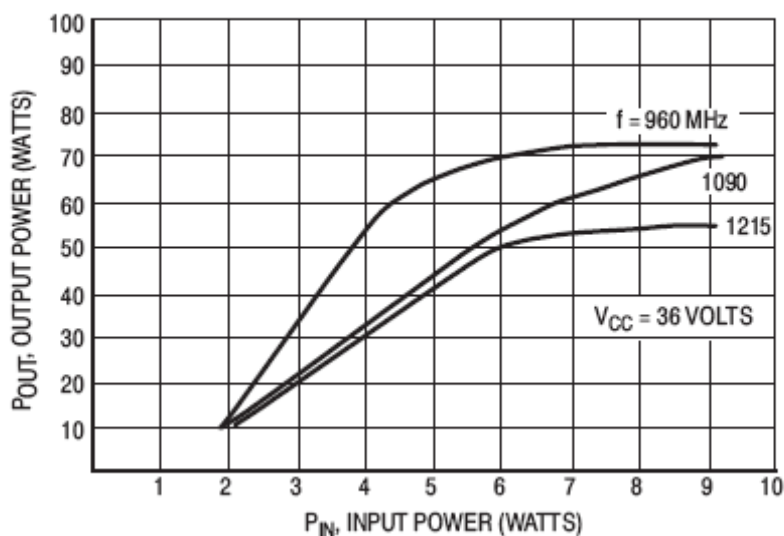
|                                                                               |               |     |   |     |      |
|-------------------------------------------------------------------------------|---------------|-----|---|-----|------|
| Collector–Emitter Breakdown Voltage ( $I_C = 25\text{ mAdc}$ , $V_{BE} = 0$ ) | $V_{(BR)CES}$ | 55  | — | —   | Vdc  |
| Collector–Base Breakdown Voltage ( $I_C = 25\text{ mAdc}$ , $I_E = 0$ )       | $V_{(BR)CBO}$ | 55  | — | —   | Vdc  |
| Emitter–Base Breakdown Voltage ( $I_E = 5.0\text{ mAdc}$ , $I_C = 0$ )        | $V_{(BR)EBO}$ | 3.5 | — | —   | Vdc  |
| Collector Cutoff Current ( $V_{CB} = 36\text{ Vdc}$ , $I_E = 0$ )             | $I_{CBO}$     | —   | — | 2.0 | mAdc |

#### ON CHARACTERISTICS

|                                                                         |          |    |   |   |   |
|-------------------------------------------------------------------------|----------|----|---|---|---|
| DC Current Gain ( $I_C = 500\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ ) | $h_{FE}$ | 20 | — | — | — |
|-------------------------------------------------------------------------|----------|----|---|---|---|

#### FUNCTIONAL TESTS (10 $\mu\text{s}$ Pulses @ 50% duty cycle for 3.5 ms; overall duty cycle – 25%)

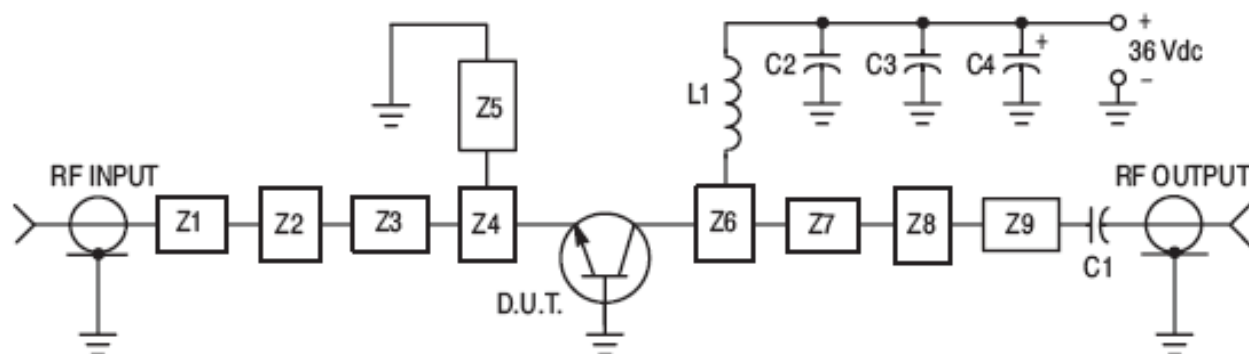
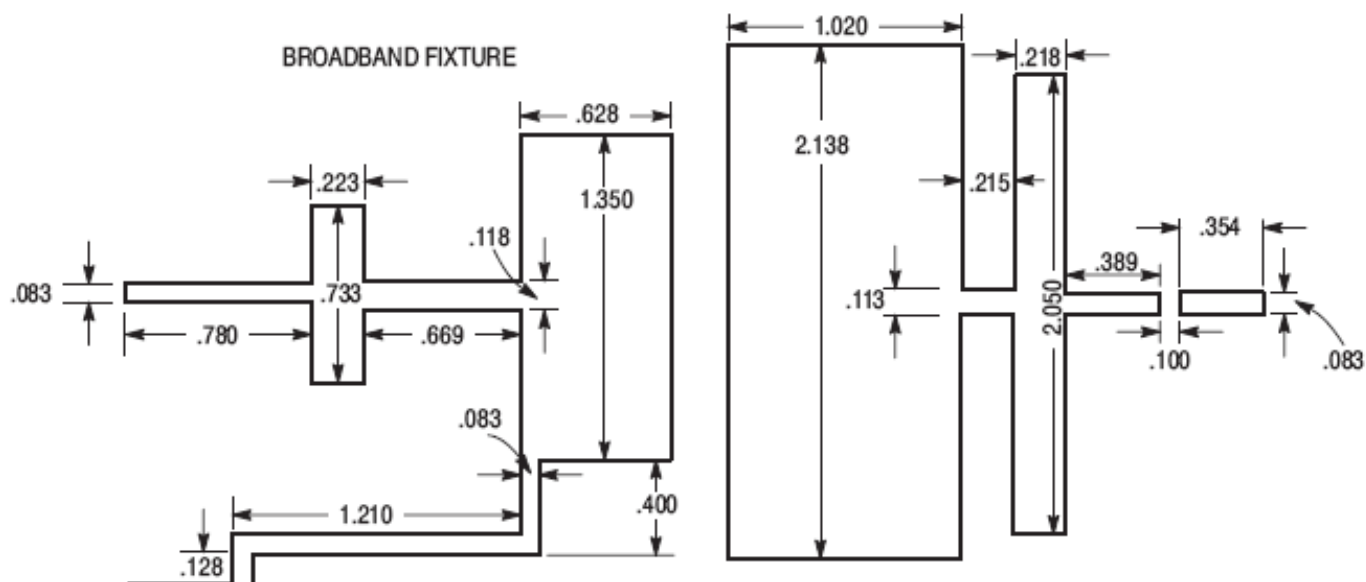
|                                                                                                                                      |          |                                |     |   |    |
|--------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------|-----|---|----|
| Common–Base Amplifier Power Gain<br>( $V_{CC} = 36\text{ Vdc}$ , $P_{out} = 30\text{ W Peak}$ , $f = 960\text{ MHz}$ )               | $G_{PB}$ | 9.0                            | 9.5 | — | dB |
| Collector Efficiency<br>( $V_{CC} = 36\text{ Vdc}$ , $P_{out} = 30\text{ W Peak}$ , $f = 960\text{ MHz}$ )                           | $\eta$   | 40                             | 45  | — | %  |
| Load Mismatch<br>( $V_{CC} = 36\text{ Vdc}$ , $P_{out} = 30\text{ W Peak}$ , $f = 960\text{ MHz}$ ,<br>VSWR = 10:1 All Phase Angles) | $\psi$   | No Degradation in Output Power |     |   |    |



Output power versus input power

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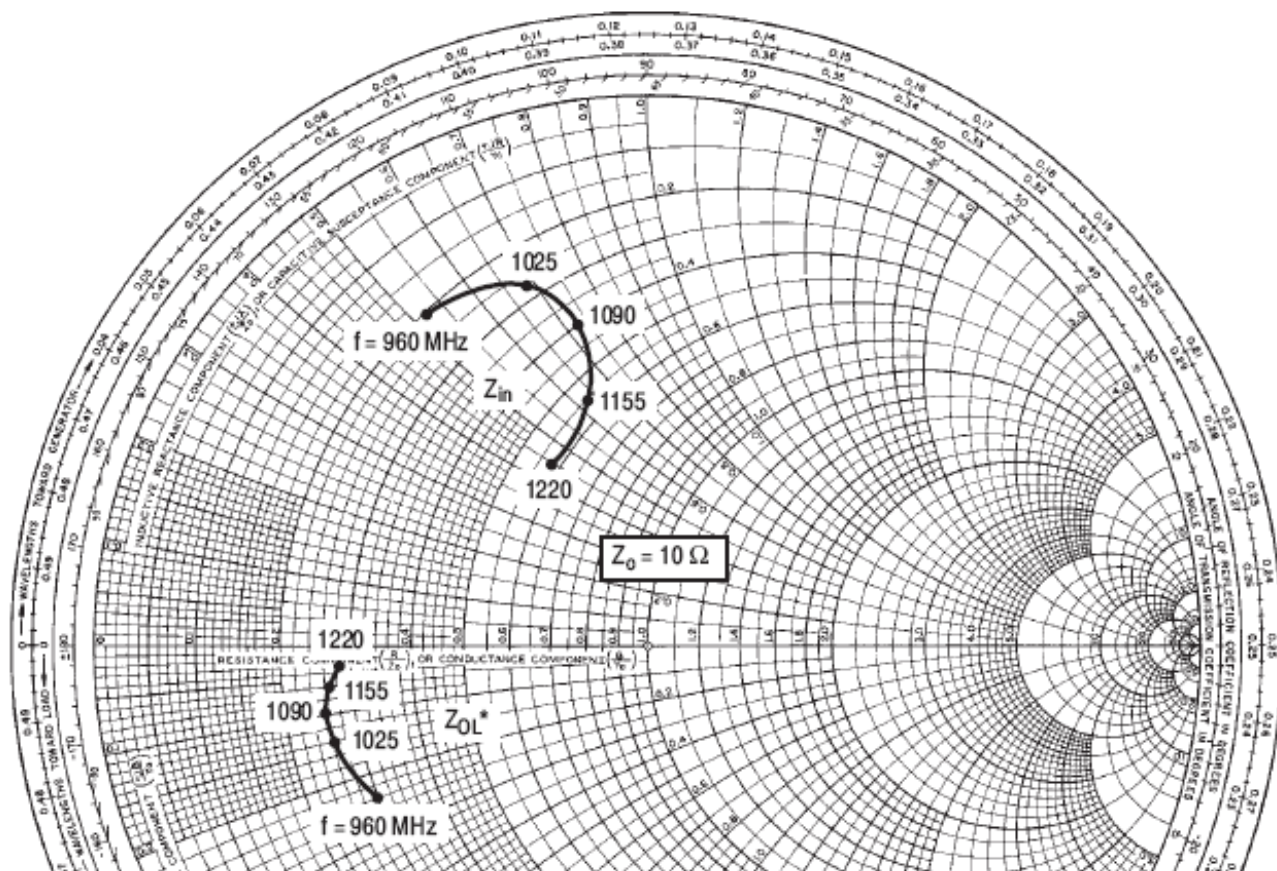


C1 — 75 pF 100 Mil Chip Capacitor  
C2 — 39 pF 100 Mil Chip Capacitor  
C3 — 0.1  $\mu$ F  
C4 — 1000  $\mu$ F, 50 Vdc, Electrolytic  
L1 — 3 Turns #18 AWG, 1/8" ID, 0.18 Long

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

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$P_{out} = 30 \text{ Wpk}$   $V_{CC} = 36 \text{ V}$

| f<br>MHz | Z <sub>in</sub><br>Ohms | Z <sub>OL</sub> *<br>Ohms |
|----------|-------------------------|---------------------------|
| 960      | 2.05 + j5.2             | 2.9 - j2.35               |
| 1025     | 2.67 + j6.34            | 2.55 - j1.3               |
| 1090     | 4.0 + j7.1              | 2.52 - j0.9               |
| 1155     | 5.5 + j6.2              | 2.6 - j0.6                |
| 1220     | 5.7 + j4.3              | 2.8 - j0.3                |

Z<sub>OL</sub>\* = Conjugate of the optimum load impedance into which the device operates at a given output power, voltage, and frequency.

## Series equivalent input/output impedances

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## PACKAGE DIMENSIONS

