

The RF Line

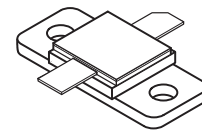
Microwave Long Pulse Power Transistor

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

- Guaranteed Performance @ 960 MHz, 36 Vdc
Output Power = 30 Watts Peak
Minimum Gain = 9.0 dB Min (9.5 dB 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

MRF10031

**30 W (PEAK)
960–1215 MHz
MICROWAVE POWER
TRANSISTOR
NPN SILICON**



CASE 376B-02, STYLE 1

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) Derate above 25°C | P_D | 110 0.625 | Watts $\text{mW}/^\circ\text{C}$ |
| 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 | $^\circ\text{C}/\text{W}$ |

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 θ_{JC} value measured @ 23% duty cycle)

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

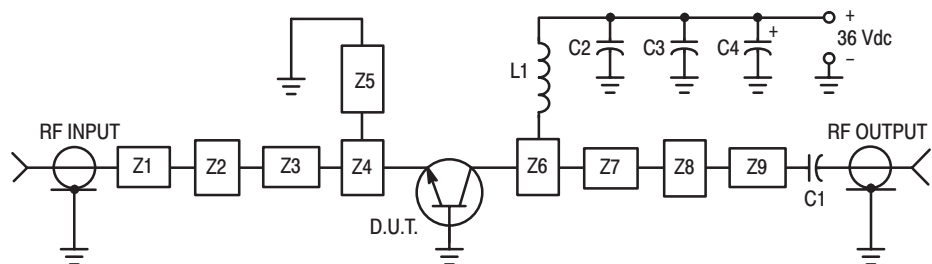
| Characteristic | Symbol | Min | Typ | Max | Unit |
|--|---------------|-----|-----|-----|------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Emitter Breakdown Voltage ($I_C = 25 \text{ mAdc}$, $V_{BE} = 0$) | $V_{(BR)CES}$ | 55 | — | — | Vdc |
| Collector–Base Breakdown Voltage ($I_C = 25 \text{ mAdc}$, $I_E = 0$) | $V_{(BR)CBO}$ | 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 μs Pulses @ 50% duty cycle for 3.5 ms; overall duty cycle – 25%)

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



C1 — 75 pF 100 Mil Chip Capacitor
 C2 — 39 pF 100 Mil Chip Capacitor
 C3 — 0.1 μF
 C4 — 1000 μF , 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

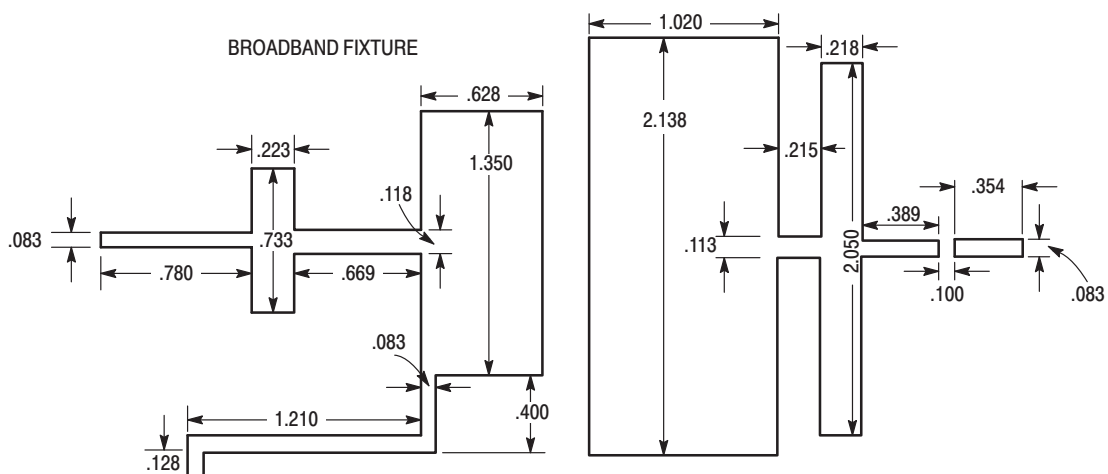


Figure 1. Test Circuit

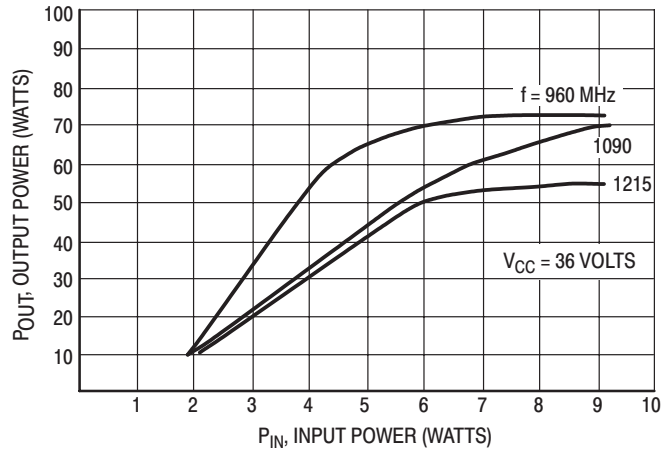
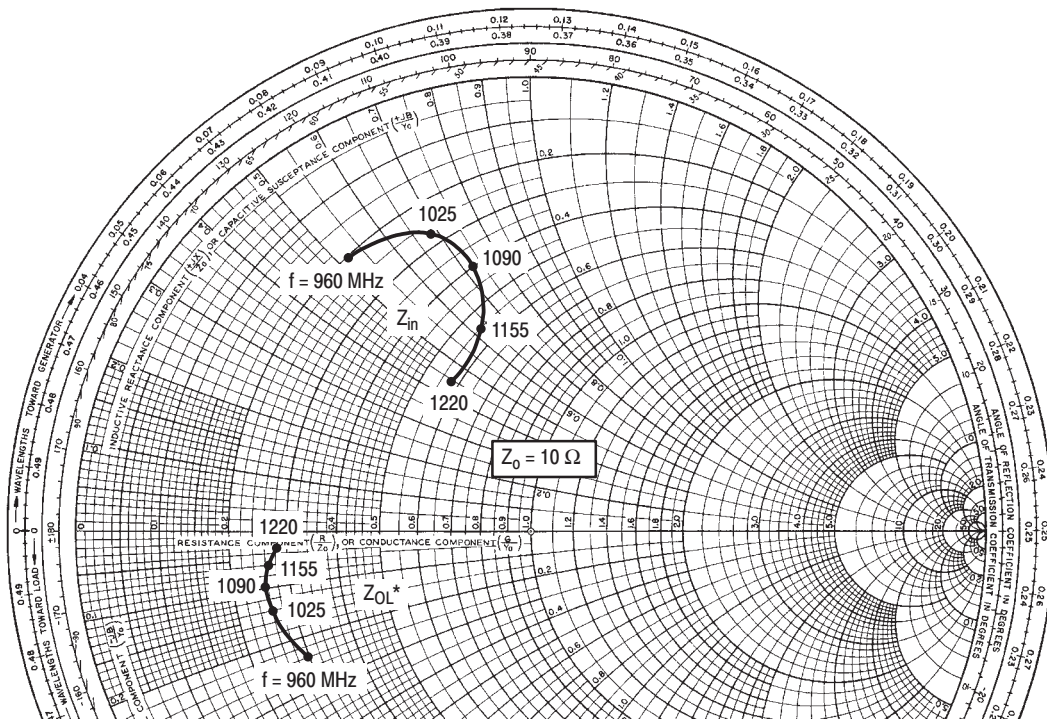


Figure 2. Output Power versus Input Power



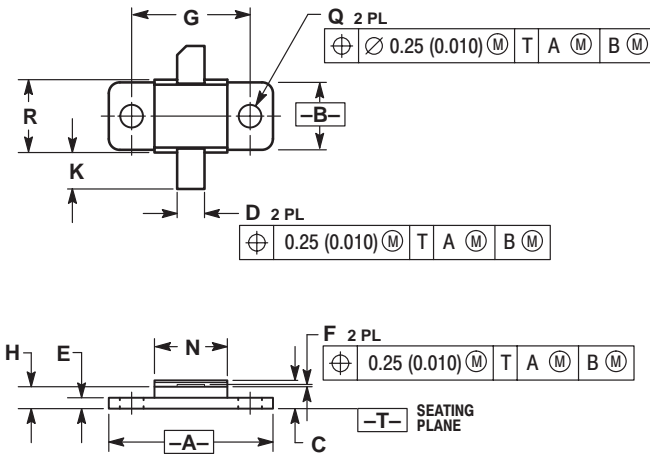
$P_{out} = 30 \text{ W Pk}$ $V_{CC} = 36 \text{ V}$

| f MHz | Z_{in} Ohms | Z_{OL}^* 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_{OL}^* = 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



- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.890 | 0.910 | 22.61 | 23.11 |
| B | 0.370 | 0.400 | 9.40 | 10.16 |
| C | 0.145 | 0.160 | 3.69 | 4.06 |
| D | 0.140 | 0.160 | 3.56 | 4.06 |
| E | 0.055 | 0.065 | 1.40 | 1.65 |
| F | 0.003 | 0.006 | 0.08 | 0.15 |
| G | 0.650 BSC | | 16.51 BSC | |
| H | 0.110 | 0.130 | 2.80 | 3.30 |
| K | 0.180 | 0.220 | 4.57 | 5.59 |
| N | 0.390 | 0.410 | 9.91 | 10.41 |
| Q | 0.115 | 0.135 | 2.93 | 3.42 |
| R | 0.390 | 0.140 | 9.91 | 10.41 |

- STYLE 1:
 PIN 1. COLLECTOR
 2. EMITTER
 3. BASE

**CASE 376B-02
 ISSUE B**

Specifications subject to change without notice.

- **North America:** Tel. (800) 366-2266, Fax (800) 618-8883
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