

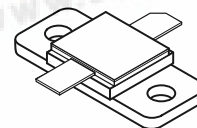
## The RF Line Microwave Long Pulse Power Transistor

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 <sub>CES</sub>	55	Vdc
Collector–Base Voltage (1)	V <sub>CB0</sub>	55	Vdc
Emitter–Base Voltage	V <sub>EBO</sub>	3.5	Vdc
Collector Current — Continuous (1)	I <sub>C</sub>	3.0	Adc
Total Device Dissipation @ T <sub>C</sub> = 25°C (1), (2) Derate above 25°C	P <sub>D</sub>	110 0.625	Watts mW/°C
Storage Temperature Range	T <sub>stg</sub>	– 65 to + 200	°C
Junction Temperature	T <sub>J</sub>	200	°C

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (3)	R <sub>θJC</sub>	1.6	°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 θ<sub>JC</sub> value measured @ 23% duty cycle)

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

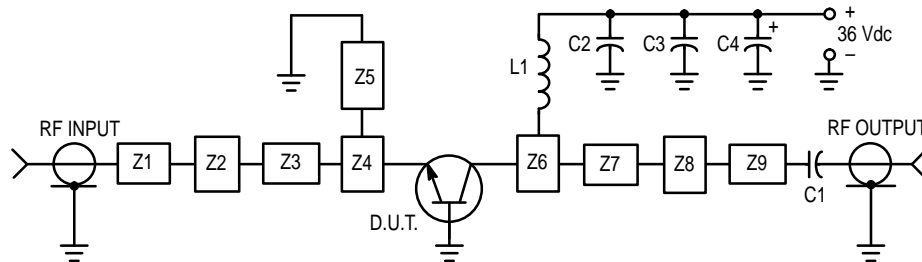
Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage ( $I_C = 25\text{ mA dc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	55	—	—	Vdc
Collector–Base Breakdown Voltage ( $I_C = 25\text{ mA dc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	55	—	—	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 5.0\text{ mA dc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 36\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	—	—	2.0	mA dc

**ON CHARACTERISTICS**

DC Current Gain ( $I_C = 500\text{ mA dc}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$h_{FE}$	20	—	—	—
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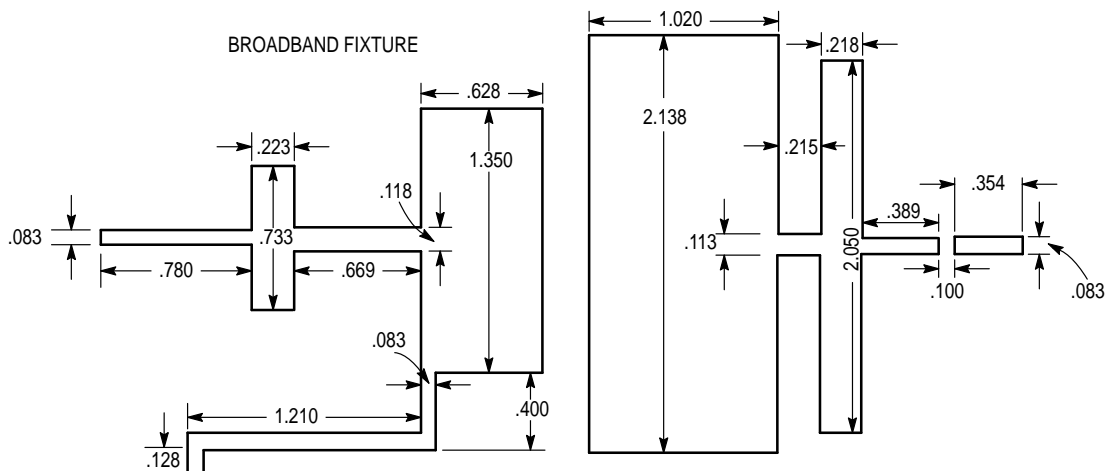
**FUNCTIONAL TESTS** (10  $\mu\text{s}$  Pulses @ 50% duty cycle for 3.5 ms; overall duty cycle – 25%)

Common–Base Amplifier Power Gain ( $V_{CC} = 36\text{ Vdc}$ , $P_{Out} = 30\text{ W Peak}$ , $f = 960\text{ MHz}$ )	G <sub>PB</sub>	9.0	9.5	—	dB
Collector Efficiency ( $V_{CC} = 36\text{ Vdc}$ , $P_{Out} = 30\text{ W Peak}$ , $f = 960\text{ MHz}$ )	$\eta$	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)	$\psi$	No Degradation in Output Power			



- C1 — 75 pF 100 Mil Chip Capacitor
- C2 — 39 pF 100 Mil Chip Capacitor
- C3 — 0.1  $\mu\text{F}$
- C4 — 1000  $\mu\text{F}$ , 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



**Figure 1. Test Circuit**

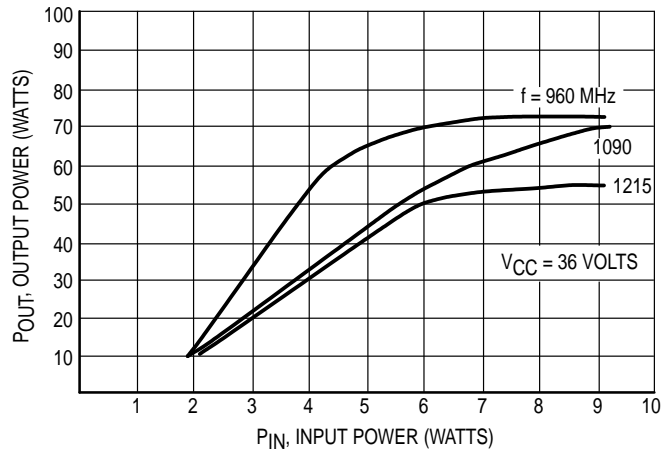
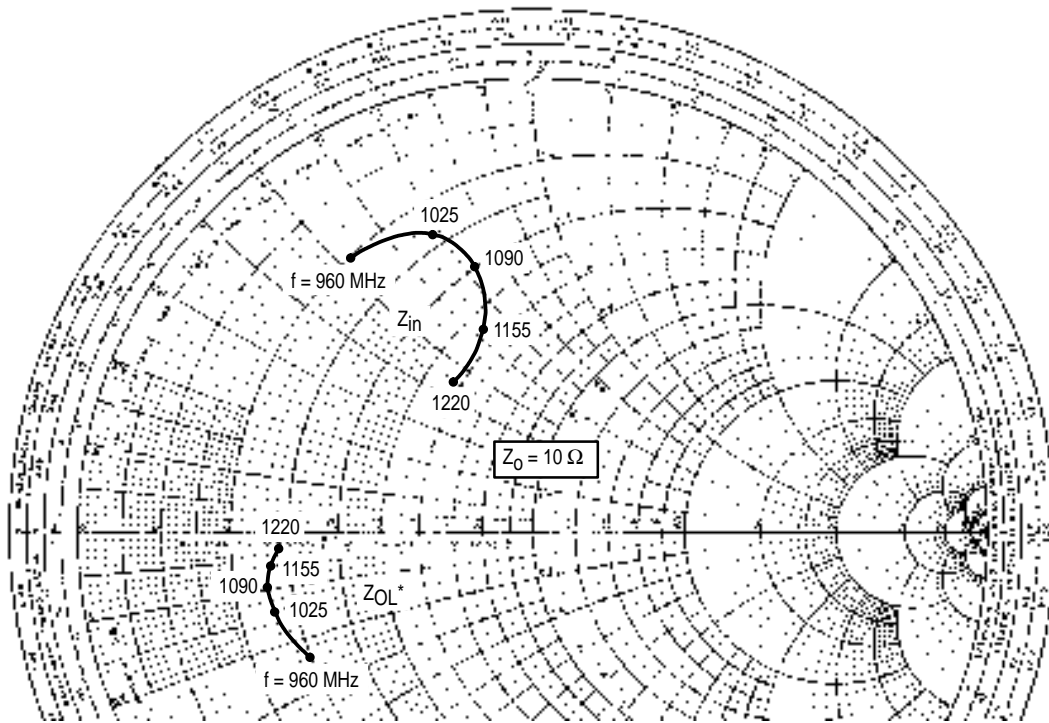


Figure 2. Output Power versus Input Power



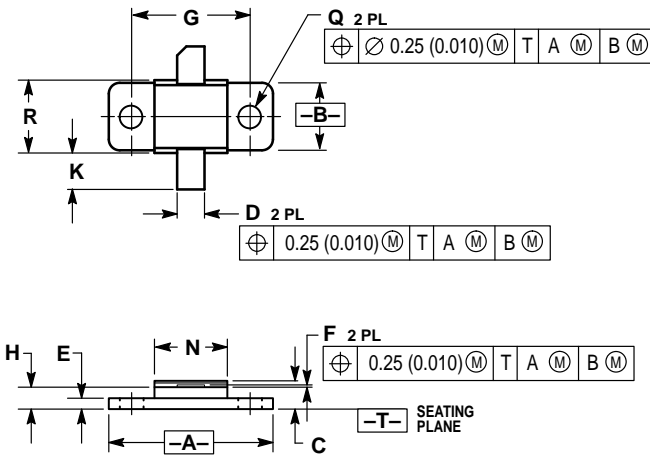
$P_{out} = 30 \text{ W Pk}$   $V_{CC} = 36 \text{ V}$

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

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