

MRF10031H*

Microwave Pulse Power Transistor
30 Watts Peak NPN 960–1215 MHz



- Designed for 960–1215 MHz pulse common base amplifiers.
- Guaranteed Performance at 960 MHz, 36 Vdc
 - Output Power = 30 Watts Peak
 - Gain = 9.0 dB Minimum
- 100% Tested for Load Mismatch at All Phase Angles with 10:1 VSWR
- Silicon Nitride Passivated
- Gold Metallized, Emitter Ballasted for Long Life
- Internal Input Matching for Broadband Operation
- Hermetically Sealed Package

AVAILABLE AS

- 1) JANTX: MRF10031HX
 - 2) JANTXV: MRF10031HXV
 - 3) JANS: MRF10031HS
 - 4) COML+: MRF10031HC
- PACKAGE: Case 376B-02**

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	55	Vdc
Collector-Base Voltage	V_{CBO}	55	Vdc
Emitter-Base Voltage	V_{EBO}	3.5	Vdc
Collector Current – Peak (1)	I_C	3.0	Adc
Device Dissipation at $T_C = 25\text{ }^\circ\text{C}$ (1 & 2) Derate above 25 $^\circ\text{C}$	P_D	110 0.625	W mW/ $^\circ\text{C}$
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 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:

(continued)

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 RF amplifiers.
3. Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

* Motorola Preferred Device. **Preferred** devices are Motorola recommended choices for future use and best overall value.
 Teflon is a registered trademark of du Pont de Nemours & Co., Inc.



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

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

OFF CHARACTERISTICS

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

ON CHARACTERISTICS

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

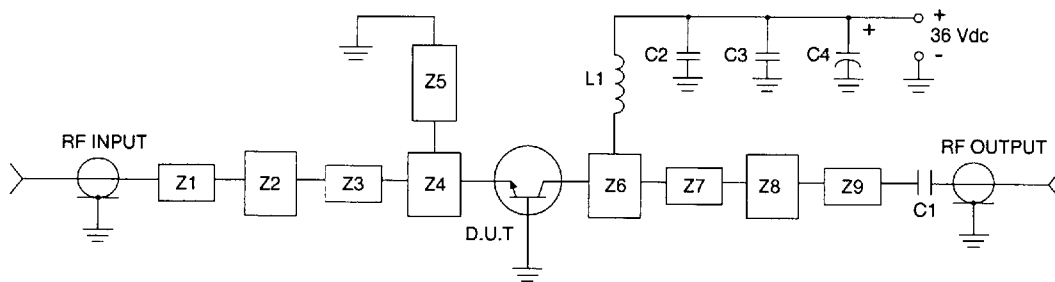
FUNCTIONAL TESTS (10 μs Pulses at 50% duty cycle for 3.5 ms, overall duty cycle = 25%)

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

ASSURANCE TESTING (Pre/Post Burn-In)

Burn-In Test Conditions: $V_{CB} \geq 10\text{ Vdc}$, $T_J = 162.5\text{ }^\circ\text{C} + 12.5\text{ }^\circ\text{C}$

Characteristic	Symbol	Min	Max	Unit
Collector Cutoff Current ($V_{CB} = 36\text{ Vdc}$, $I_E = 0$)	I_{CBO}	–	2.0	mA
DC Current Gain ($I_C = 500\text{ mA}$, $V_{CE} = 5.0\text{ Vdc}$)	h_{FE}	20	–	–



C1 – 75 pF 100 mil Chip Capacitor
 C2 – 39 pF 100 mil Chip Capacitor
 C3 – 0.1 μ F
 C4 – 1000 μ F, 50 Vdc, Electrolytic

L1 – 3 turns #18 AWG, 1/8" ID, 0.18" Long
 Z1- Z9 – Microstrip, see details below
 Board Material – 0.030" GlassTeflon[®]
 2 Oz. Copper, $\epsilon_r = 2.55$

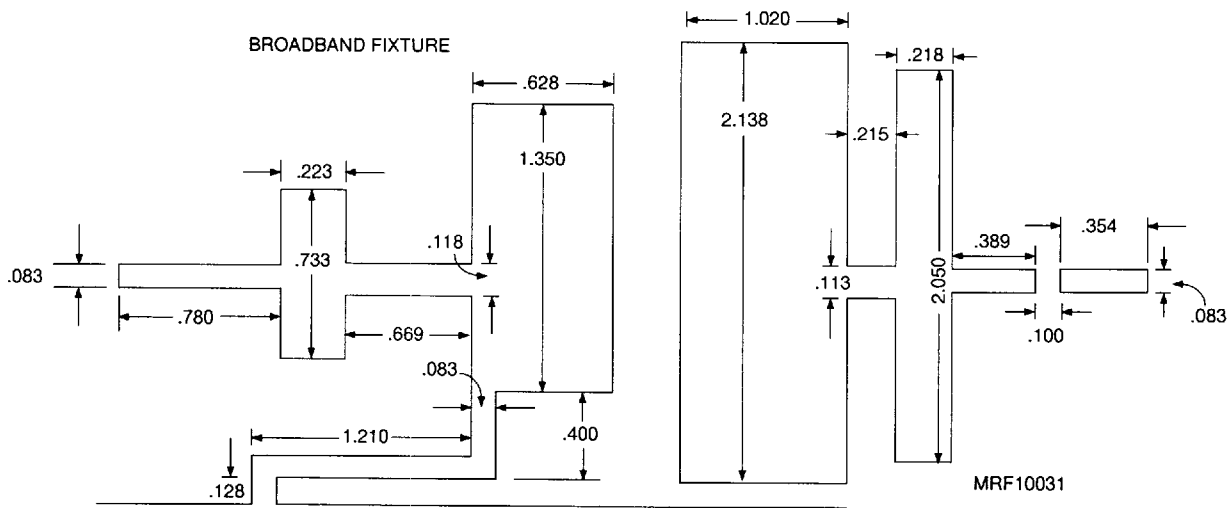


Figure 1. Test Circuit

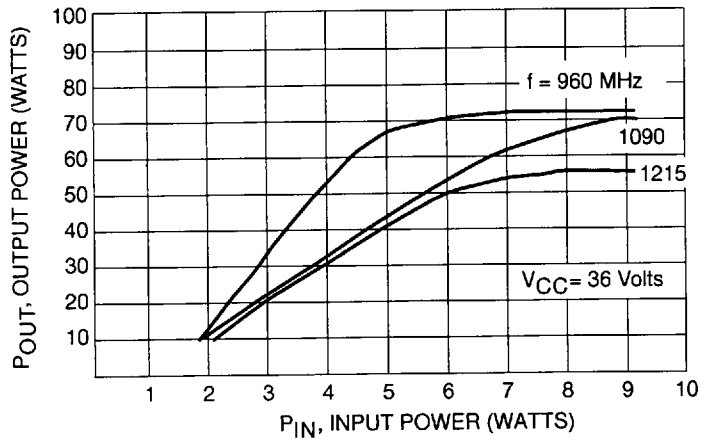
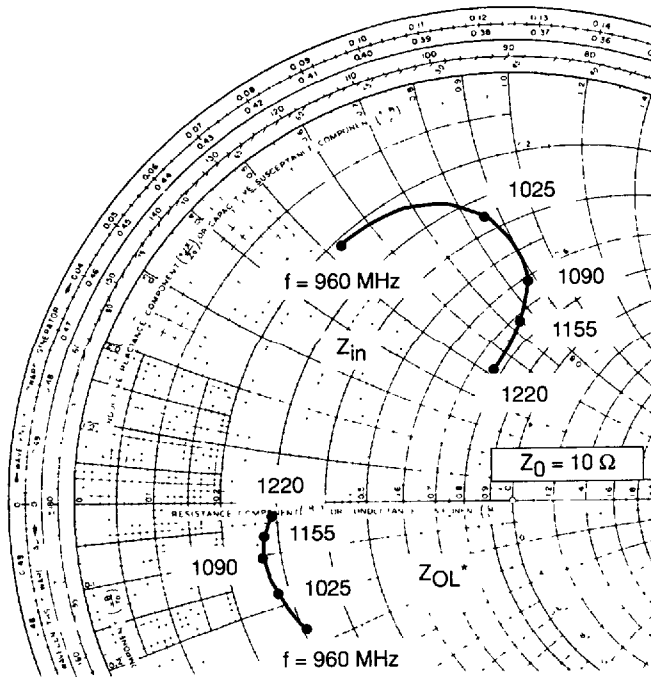


Figure 2. Output Power versus Input Power



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

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}^* 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

TABLE 1. SCREENING REQUIREMENTS

SCREEN	METHOD	HX	HXV
1. Internal visual inspection (precap)	2072	N/A	100%
2. High temperature non-operating life	1032	100%	100%
3. Temperature cycling	1051	100%	100%
4. Constant Acceleration (Gold wires only)	2006	100%	100%
5. Hermetic seal (Fine and Gross)	1071	100%	100%
6. Establish Unit Identity	none	100%	100%
7. Interim electrical parameters	as specified	100%	100%
8. High temperature reverse bias (HTRB)	1039	100%	100%
9. Interim electrical parameters	as specified	100%	100%
10. Power burn-in	1039	100%	100%
11. Final electrical parameters	as specified	100%	100%
12. Hermetic seal (Fine and Gross)	1071	optional	optional

GROUP A TEST SEQUENCE

Subgroups			
A1	A2	A3	A4
Type of Test			
Visual/Mechanical Package: Dimensions, Marking	DC Tests V _(BR) CBO V _(BR) CES V _(BR) EBO I _{CBO} h _{FE}	Hi/Lo Temp Not Applicable	AC Tests GpB η

GROUP B TEST SEQUENCE

Subgroups					
B1**	B2*	B3*	B4	B5	B6*
Type of Test					
Solderability (1) Resistance to Solvents	Temp. Cycling Hermetic Seal Fine Gross	Steady State Operating Life Bond Strength	Decap Visual	Not Required	High Temp. Life (Non-Operating)

* The tests in this subgroup are preceded and followed by I_{CBO} and h_{FE} electrical tests.

** Separate samples may be used for each test.

(1) Omit Steam Aging requirements.

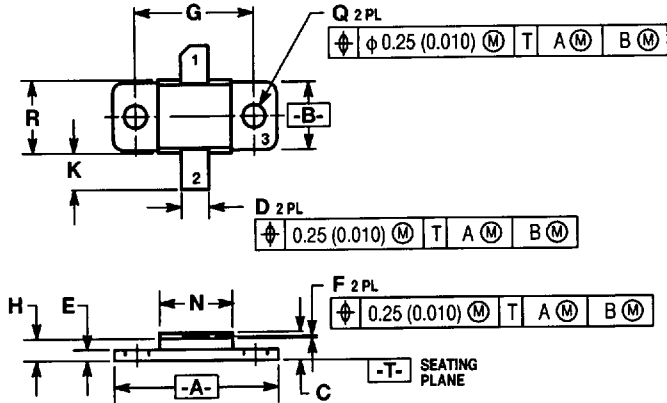
GROUP C TEST SEQUENCE*

Subgroups					
C1	C2**	C3**	C4	C5	C6**
Type of Test					
Physical Dimensions	Thermal Shock (Glass Strain) Terminal Strength Hermetic Seal Moist. Resistance	Mech. Shock Vibration (Var. Freq.) Const. Accel.	Salt Atmosphere	Not Applicable	Steady State Op Life

* Group C is performed on the initial lot and requalification only.

** The tests in this subgroup are preceded and followed by I_{CBO} and h_{FE} electrical tests.

OUTLINE DIMENSIONS



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

- NOTES:
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. 376B-01 OBSOLETE, NEW STANDARD 376B-02.

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

CASE 376B-02

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and (M) are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Literature Distribution Centers:

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.
 EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.
 JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan.
 ASIA PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.



MOTOROLA

1PHX31249-1 PRINTED IN USA 5/94 IMPERIAL LITHO 98144 15,000 BIP LOG YDAAA

42922

MRF10031H/D



6367254 0101919 136