

**MRF10350H\***

**Microwave Pulse Power Transistor**  
**350 Watts Peak NPN 1025–1150 MHz**



- Designed for 1025–1150 MHz pulse common base amplifiers.
- Guaranteed Performance at 1090 MHz
    - Output Power = 350 Watts Peak
    - Gain = 8.5 dB Min
  - 100% Tested for Load Mismatch at All Phase Angles with 10:1 VSWR
  - Characterized with Mode S Pulse Format
  - Silicon Nitride Passivated
  - Gold Metallized, Emitter Ballasted for Long Life
  - Internal Input and Output Matching
  - Hermetically Sealed Package

**AVAILABLE AS**

- 1) JANTX: MRF10350HX
  - 2) JANTXV: MRF10350HXV
  - 3) JANS: MRF10350HS
  - 4) COML+: MRF10350HC
- PACKAGE: Case 355E-01**

**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)	$I_C$	31	Adc
Device Dissipation at $T_C = 25^\circ\text{C}$ (1 & 2) Derate above $25^\circ\text{C}$	$P_D$	1590 9.1	W W/°C
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to + 200	°C

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (3)	$R_{\theta JC}$	0.11	°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 operated as RF amplifier.
3. Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques. (Worst case  $\theta_{JC}$  measured using Mode-S pulse train, 128  $\mu\text{s}$  burst 0.5  $\mu\text{s}$  on, 0.5  $\mu\text{s}$  off repeating at 6.4 ms interval.)

\*Motorola Preferred Device. **Preferred** devices are Motorola recommended choices for future use and best overall value.

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

Characteristic	Symbol	Min	Max	Unit
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**OFF CHARACTERISTICS**

Collector-Emitter Breakdown Voltage ( $I_C = 60\text{ mAdc}$ , $V_{BE} = 0$ )	$V_{(BR)CES}$	65	–	Vdc
Collector-Base Breakdown Voltage ( $I_C = 60\text{ mAdc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	65	–	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 10\text{ mAdc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	3.5	–	Vdc
Collector Cutoff Current ( $V_{CB} = 36\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	–	25	mAdc

**ON CHARACTERISTICS**

DC Current Gain ( $I_C = 5.0\text{ Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$h_{FE}$	20	–	–
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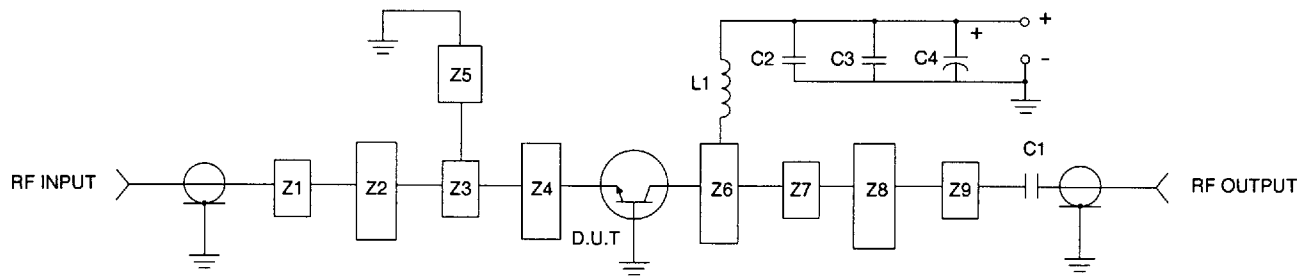
**FUNCTIONAL TESTS**

Common-Base Amplifier Power Gain ( $V_{CC} = 50\text{ Vdc}$ , $P_{OUT} = 350\text{ W Peak}$ , $f = 1090\text{ MHz}$ )	$G_{PB}$	8.5	–	dB
Collector Efficiency ( $V_{CC} = 50\text{ Vdc}$ , $P_{OUT} = 350\text{ W Peak}$ , $f = 1090\text{ MHz}$ )	$\eta$	40	–	%
Load Mismatch ( $V_{CC} = 50\text{ Vdc}$ , $P_{OUT} = 350\text{ W Peak}$ , $f = 1090\text{ MHz}$ , $V_{SWR} = 10:1$ All Phase Angles)	$\psi$	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 ( $V_{CB} = 50\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	–	25	mAdc
DC Current Gain ( $I_C = 5.0\text{ Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$h_{FE}$	20	–	–



C1 – 75 pF 100 mil Chip Capacitor  
 C2 – 39 pF 100 mil Chip Capacitor  
 C3 – 0.1  $\mu$ F  
 C4 – 100  $\mu$ F, 100 Vdc, Electrolytic

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

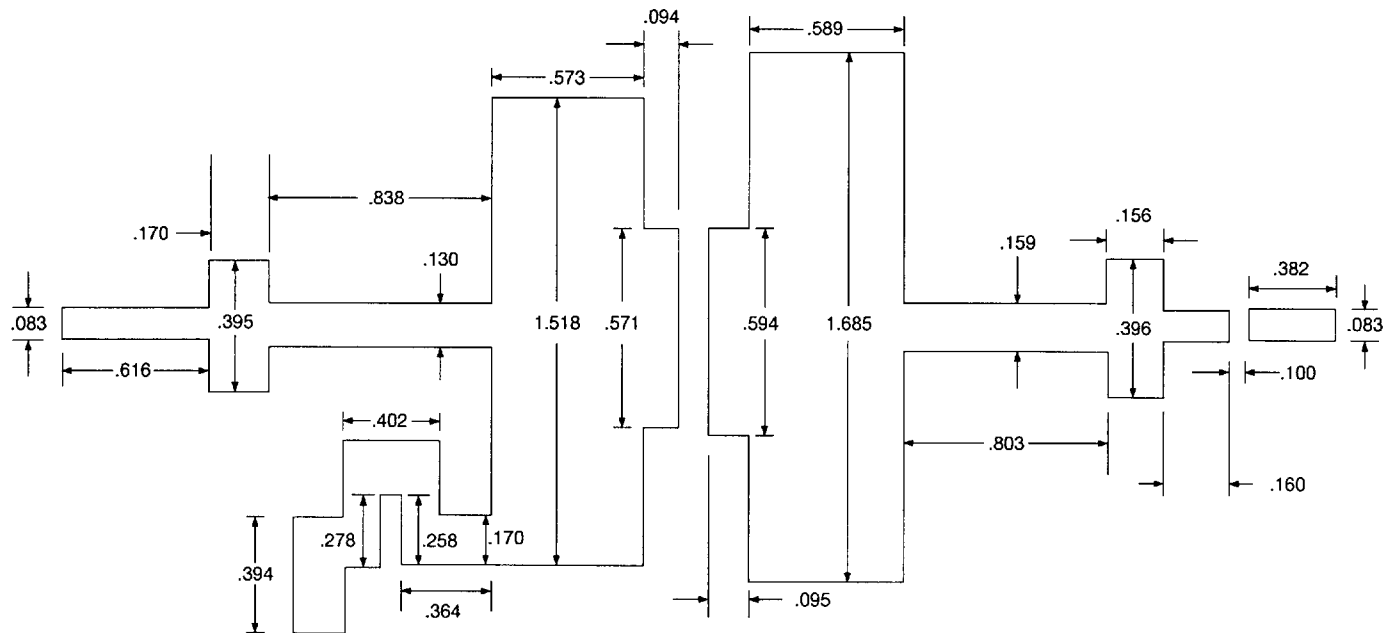
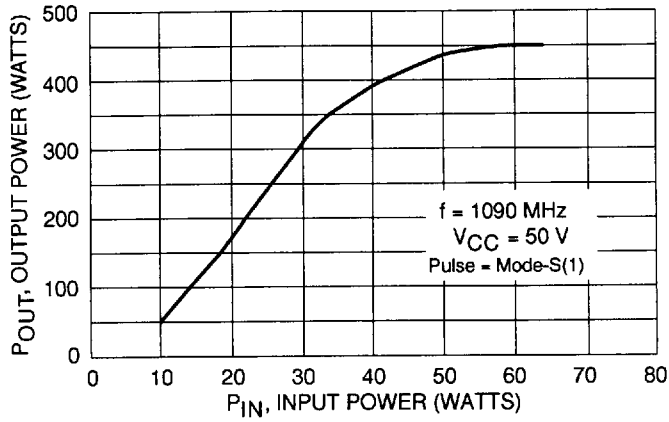
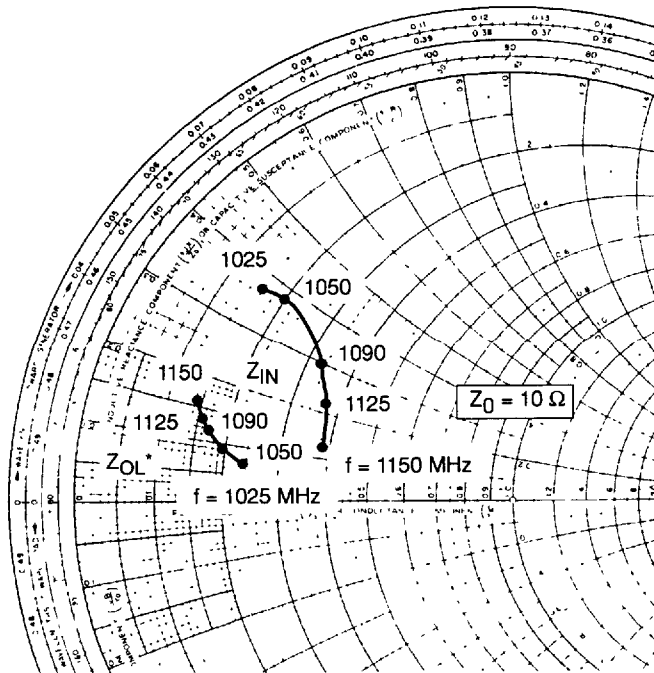


Figure 1. Test Circuit



(1) 128  $\mu$ s burst 0.5  $\mu$ s on, 0.5  $\mu$ s off repeating at 6.4 ms interval

Figure 2. Output Power versus Input Power



$P_{OUT} = 350$  W Pk,  $V_{CC} = 50$  V

f MHz	$Z_{IN}$ OHMS	$Z_{OL}^*$ (1) OHMS
1025	$1.92 + j3.80$	$2.52 + j0.70$
1050	$2.44 + j3.92$	$2.18 + j0.85$
1090	$3.55 + j3.02$	$1.94 + j1.13$
1125	$4.11 + j2.27$	$1.80 + j1.22$
1150	$4.13 + j1.35$	$1.71 + j1.31$

$Z_{OL}^*$  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)(1)	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 <sub>CBO</sub> h <sub>FE</sub>	Hi/Lo Temp Not Applicable	AC Tests G <sub>PB</sub> η

**GROUP B TEST SEQUENCE**

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

\* The tests in this subgroup are preceded and followed by I<sub>CBO</sub> and h<sub>FE</sub> electrical tests.

\*\* Separate samples may be used for each test.

(1) Omit Steam Aging requirements.

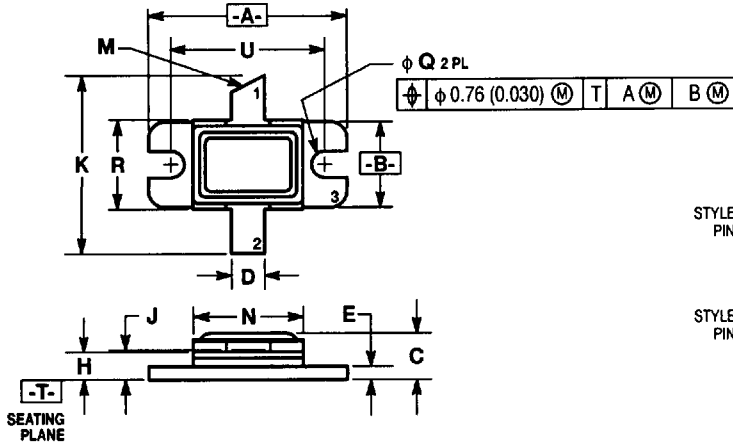
**GROUP C TEST SEQUENCE\***

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<sub>CBO</sub> and h<sub>FE</sub> electrical tests.

## OUTLINE DIMENSIONS



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

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

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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	22.61	23.11	0.890	0.910
B	9.53	10.03	0.375	0.395
C	4.83	5.33	0.190	0.210
D	3.69	3.93	0.145	0.155
E	1.40	1.65	0.055	0.065
H	3.05	3.30	0.120	0.130
J	0.08	0.15	0.003	0.006
K	19.56	21.08	0.770	0.830
M	45° REF		45° REF	
N	12.45	12.95	0.490	0.510
Q	2.93	3.17	0.115	0.125
R	10.04	10.28	0.395	0.405
U	17.78 BSC		0.700 BSC	

CASE 355E-01

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