

MRF10150H*

Microwave Pulse Power Transistor
150 Watts Peak NPN 1025–1150 MHz

Designed for 1025–1150 MHz pulse common base amplifiers.

- Guaranteed Performance at 1090 MHz
 - Output Power = 150 Watts Peak
 - Gain = 9.5 dB Min
- 100% Tested for Load Mismatch at All Phase Angles with 10:1 VSWR
- Characterized with 10 μ s, 10% Duty Cycle Pulses
- Silicon Nitride Passivated
- Gold Metallized, Emitter Ballasted for Long Life
- Internal Input and Output Matching
- Hermetically Sealed Package



AVAILABLE AS

- 1) JANTX: MRF10150HX
- 2) JANTXV: MRF10150HXV
- 3) JANS: MRF10150HS
- 4) COML+: MRF10150HC

PACKAGE: Case 376B-02

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 | 14 | Adc |
| Device Dissipation at $T_C = 25^\circ\text{C}$ (1 & 2) Derate above 25 $^\circ\text{C}$ | P_D | 700 4.0 | W W/ $^\circ\text{C}$ |
| 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) | $R_{\theta JC}$ | 0.25 | $^\circ\text{C}/\text{W}$ |

NOTES:

1. Under pulse RF operating conditions.
2. These devices are designed for RF operation. The total device dissipation rating applies only when operated as RF amplifier.
3. Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

(continued)

*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 |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

OFF CHARACTERISTICS

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

ON CHARACTERISTICS

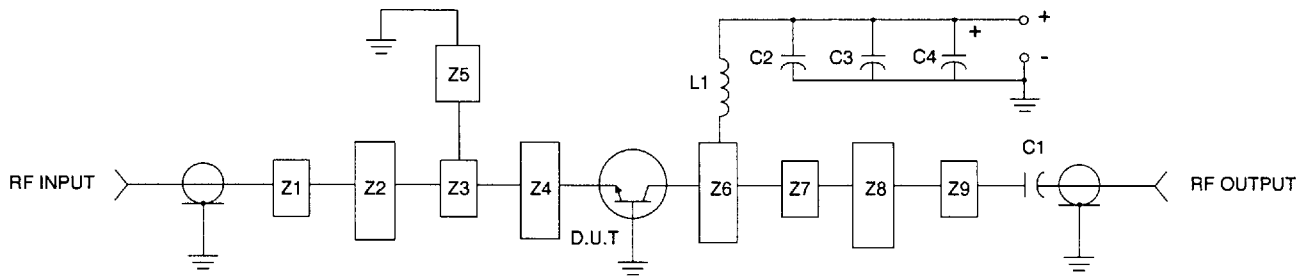
| | | | | |
|--|----------|----|---|---|
| DC Current Gain ($I_C = 5.0\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$) | h_{FE} | 20 | – | – |
|--|----------|----|---|---|

FUNCTIONAL TESTS

| | | | | |
|--|----------|--------------------------------|---|----|
| Common-Base Amplifier Power Gain ($V_{CC} = 50\text{ Vdc}$, $P_{OUT} = 150\text{ W Peak}$, $f = 1090\text{ MHz}$) | G_{PB} | 9.5 | – | dB |
| Collector Efficiency ($V_{CC} = 50\text{ Vdc}$, $P_{OUT} = 150\text{ W Peak}$, $f = 1090\text{ MHz}$) | η | 40 | – | % |
| Load Mismatch ($V_{CC} = 50\text{ Vdc}$, $P_{OUT} = 150\text{ W Peak}$, $f = 1090\text{ MHz}$) | 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 ($V_{CB} = 50\text{ Vdc}$, $I_E = 0$) | I_{CBO} | – | 25 | mAdc |
| DC Current Gain ($I_C = 5.0\text{ Adc}$, $V_{CE} = 5.0\text{ Vdc}$) | h_{FE} | 20 | – | – |



C1 – 82 pF 100 mil Chip Capacitor
 C2 – 39 pF 100 mil Chip Capacitor
 C3 – 0.1 μ F
 C4 – 100 μ 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®
 2 Oz. Copper, $\epsilon_r = 2.55$

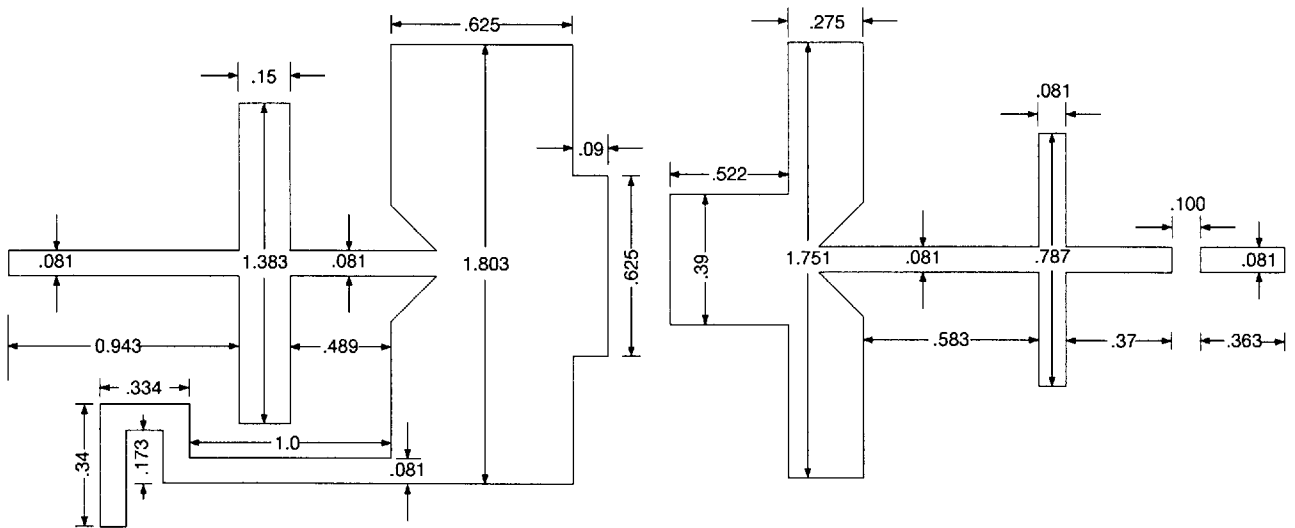


Figure 1. Test Circuit

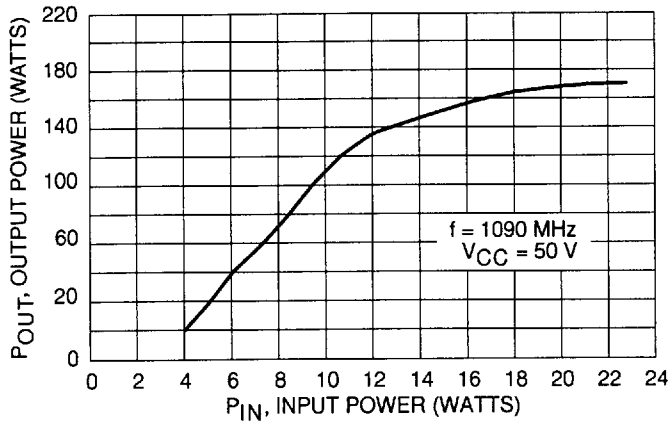
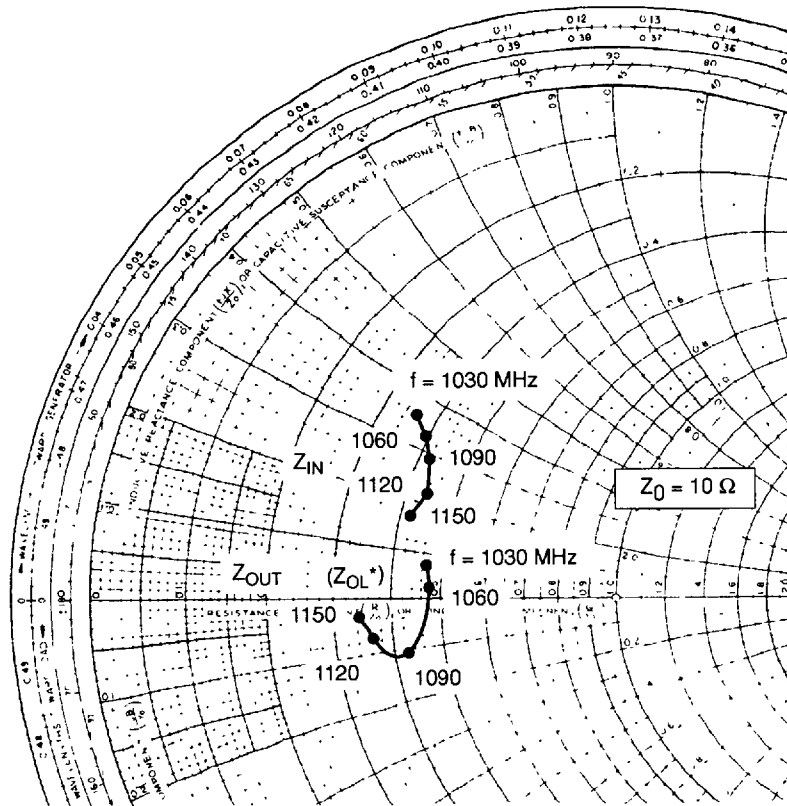


Figure 2. Output Power versus Input Power



$P_{OUT} = 150 \text{ W Pk}, V_{CC} = 50 \text{ V}$

| f MHz | Z_{IN} OHMS | $Z_{OL}^* (Z_{OUT})$ OHMS |
|----------|------------------|------------------------------|
| 1030 | $3.8 + j3.5$ | $4.6 + j0.7$ |
| 1060 | $4.0 + j3.3$ | $4.6 + j0.3$ |
| 1090 | $4.2 + j3.0$ | $4.1 - j1.0$ |
| 1120 | $4.4 + 2.3$ | $3.8 - j0.8$ |
| 1150 | $4.1 + j1.8$ | $3.6 - j0.3$ |

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 G _{PB} 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.

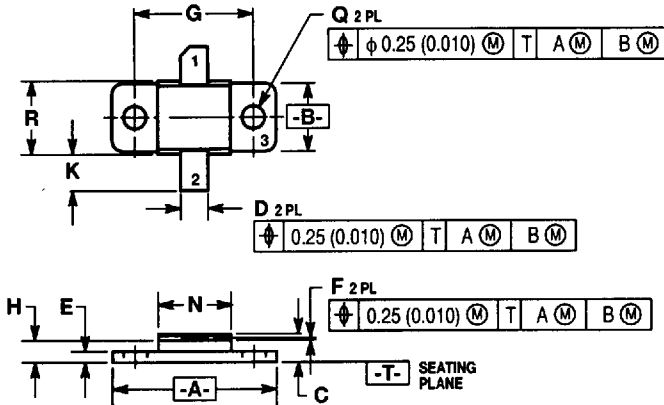
GROUP C TEST SEQUENCE*

| 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

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