# MRF10120

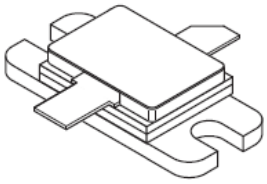
## Microwave Long Pulse Power Silicon NPN Transistor 120W (peak), 960–1215MHz

M/A-COM Products
Released - Rev. 07.07

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

- Guaranteed performance @ 1.215 GHz, 36 Vdc
  Output power = 120 W Peak
  Gain = 7.6 dB min., 8 .5 dB (typ.)
- 100% tested for load mismatch at all phase angles with 3:1 VSWR
- Hermetically sealed industry standard package
- Silicon nitride passivated
- Gold metalized, emitter ballasted for long life and resistance to metal migration
- Internal input and output matching for broadband operation

**Product Image**



**CASE 355C–02, STYLE 1**

### 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) | $I_C$ | 15 | Adc |
| Total Device Dissipation @ $T_C$ = 25°C (1), (2)<br>Derate above 25°C | $P_D$ | 380<br>2.17 | Watts<br>W/°C |
| Storage Temperature Range | $T_{stg}$ | –65 to +200 | °C |
| Junction Temperature | $T_J$ | 200 | |

### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case (3) | $R_{\theta JC}$ | 0.46 | °C/W |

### ELECTRICAL CHARACTERISTICS ($T_C$ = 25°C unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector–Emitter Breakdown Voltage ($I_C$ = 60 mAdc, $V_{BE}$ = 0) | $V_{(BR)CES}$ | 55 | — | — | Vdc |
| Collector–Base Breakdown Voltage ($I_C$ = 60 mAdc, $I_E$ = 0) | $V_{(BR)CBO}$ | 55 | — | — | Vdc |
| Emitter–Base Breakdown Voltage ($I_E$ = 10 mAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | 3.5 | — | — | Vdc |
| Collector Cutoff Current ($V_{CB}$ = 36 Vdc, $I_E$ = 0) | $I_{CBO}$ | — | — | 25 | mAdc |

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





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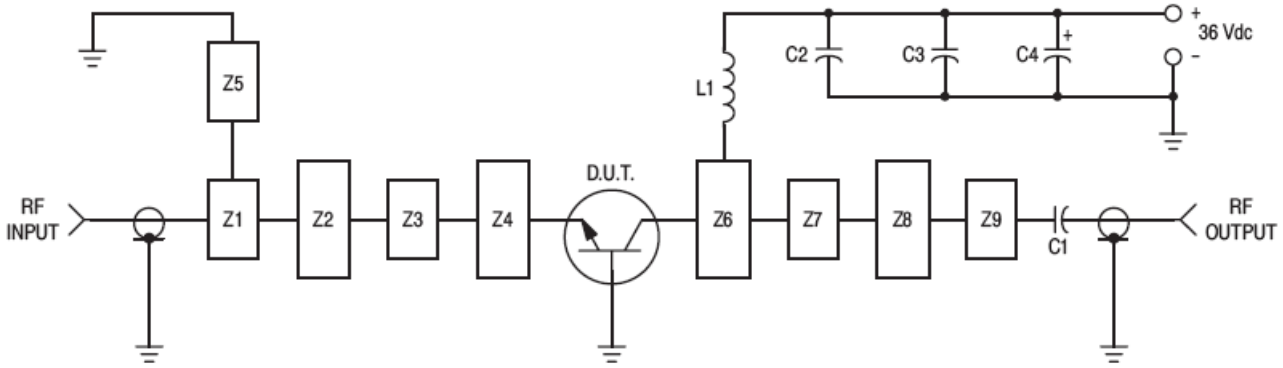
• **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
• **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298
Visit www.macomtech.com for additional data sheets and product information.

**ELECTRICAL CHARACTERISTICS — continued** ($T_C$ = 25°C unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain ($I_C$ = 5.0 Adc, $V_{CE}$ = 5.0 Vdc) | $h_{FE}$ | 20 | — | — | — |
| **FUNCTIONAL TESTS** (7.0 µs Pulses @ 54% duty cycle for 3.4 ms; then off for 4.5 ms; overall duty cycle = 23%) | | | | | |
| Common–Base Amplifier Power Gain ($V_{CC}$ = 36 Vdc, $P_{out}$ = 120 W Peak, f = 1215 MHz) | $G_{PB}$ | 7.6 | 8.5 | — | dB |
| Collector Efficiency ($V_{CC}$ = 36 Vdc, $P_{out}$ = 120 W Peak, f = 1215 MHz) | η | 50 | 55 | — | % |
| Load Mismatch ($V_{CC}$ = 36 Vdc, $P_{out}$ = 120 W Peak, f = 1215 MHz, VSWR = 3:1 All Phase Angles) | ψ | No Degradation in Output Power | | | |




C1 — 270 pF 100 Mil Chip Capacitor
C2 — 220 pF 100 Mil Chip Capacitor
C3 — 0.1 µF
C4 — 47 µF 50 V 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″,
$\varepsilon_r$ = 2.55, 2 Oz. Copper

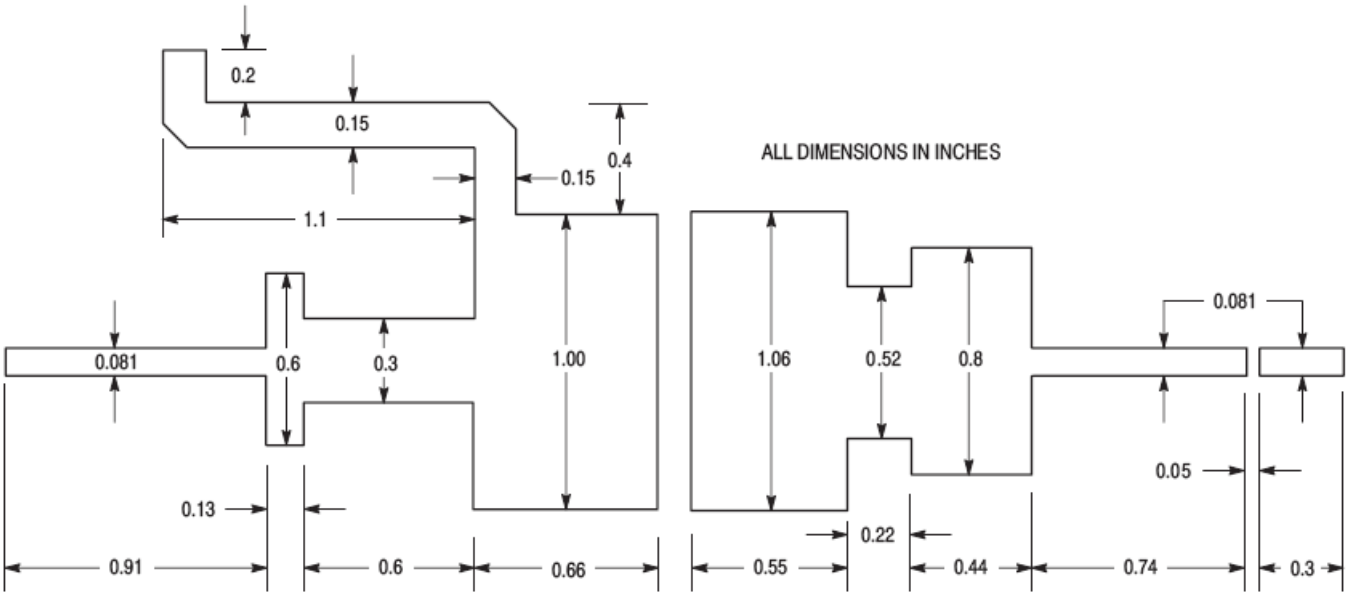



**Figure 1. Test Circuit**

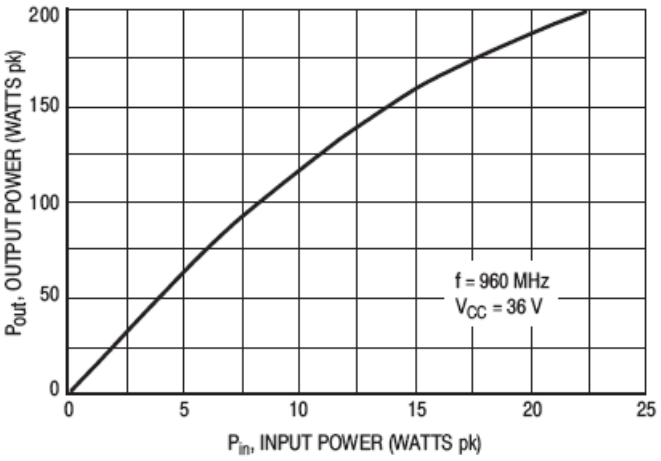



Figure 2. Output Power versus Input Power

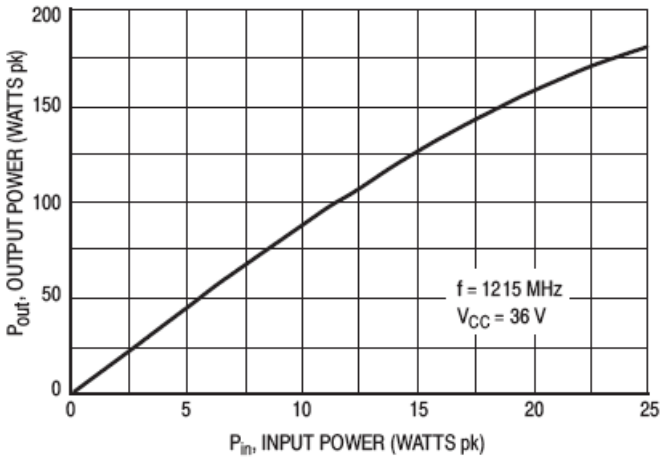
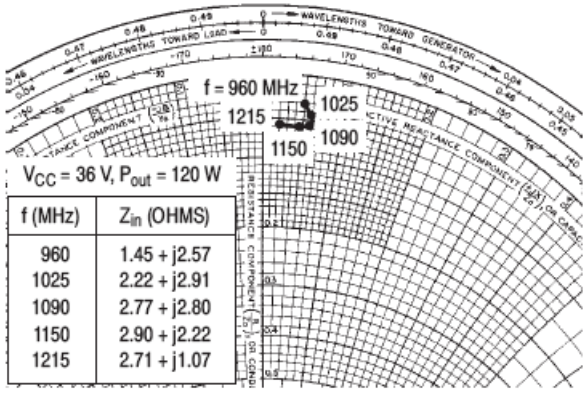
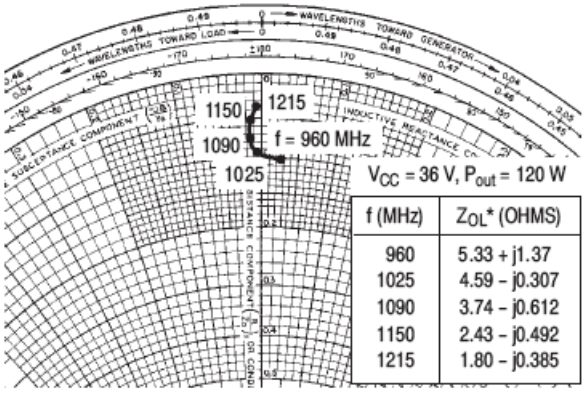



Figure 3. Output Power versus Input Power




| f (MHz) | $Z_{in}$ (OHMS) |
|---|---|
| 960 | 1.45 + j2.57 |
| 1025 | 2.22 + j2.91 |
| 1090 | 2.77 + j2.80 |
| 1150 | 2.90 + j2.22 |
| 1215 | 2.71 + j1.07 |

Figure 4. Series Equivalent Input Impedances

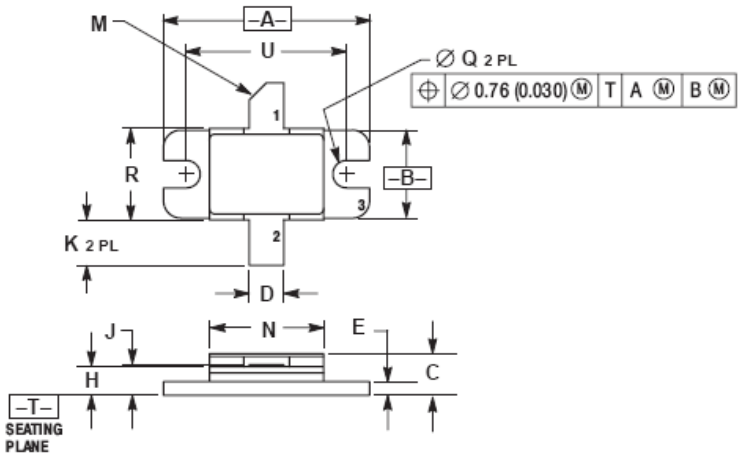



| f (MHz) | $Z_{OL}$* (OHMS) |
|---|---|
| 960 | 5.33 + j1.37 |
| 1025 | 4.59 – j0.307 |
| 1090 | 3.74 – j0.612 |
| 1150 | 2.43 – j0.492 |
| 1215 | 1.80 – j0.385 |

$Z_{OL}$* = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

Figure 5. Series Equivalent Output Impedance

## PACKAGE DIMENSIONS




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

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.890 | 0.910 | 22.61 | 23.11 |
| B | 0.375 | 0.395 | 9.53 | 10.03 |
| C | 0.150 | 0.165 | 3.81 | 4.19 |
| D | 0.145 | 0.155 | 3.69 | 3.93 |
| E | 0.055 | 0.065 | 1.40 | 1.65 |
| H | 0.120 | 0.130 | 3.05 | 3.30 |
| J | 0.003 | 0.006 | 0.08 | 0.15 |
| K | 0.185 | 0.215 | 4.70 | 5.46 |
| M | 45° REF | | 45° REF | |
| N | 0.490 | 0.510 | 12.45 | 12.95 |
| Q | 0.115 | 0.125 | 2.93 | 3.17 |
| R | 0.395 | 0.405 | 10.04 | 10.28 |
| U | 0.700 BSC | | 17.78 BSC | |

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

CASE 355C–02
ISSUE C





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