

The RF Line

NPN Silicon

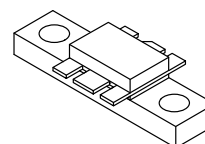
RF Power Transistor

The MRF6402 is designed for 1.8 GHz Personal Communications Network (PCN) base stations applications. It incorporates high value emitter ballast resistors, gold metallizations and offers a high degree of reliability and ruggedness. For ease of design, this transistor has an internally matched input.

- To be used in Class AB for PCN and Cellular Radio Applications
- Specified 26 V, 1.88 GHz Characteristics
 - Output Power — 4.5 Watts
 - Gain — 10 dB Typ
 - Efficiency — 45% Typ
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

MRF6402

4.5 W, 1.88 GHz
RF POWER TRANSISTOR
NPN SILICON



CASE 319-07, STYLE 2

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|-----------|-------------|------------------------------|
| Collector-Emitter Voltage | V_{CER} | 40 | Vdc |
| Collector-Base Voltage | V_{CBO} | 45 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 3.5 | Vdc |
| Collector-Current — Continuous | I_C | 0.7 | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 15 0.2 | Watts W/ $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -65 to +150 | $^\circ\text{C}$ |
| Operating Junction Temperature | T_J | 200 | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--|-----------------|-----|--------------------|
| Thermal Resistance, Junction to Case (1) | $R_{\theta JC}$ | 5 | $^\circ\text{C/W}$ |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|---|---------------|-----|---|---|-----|
| Collector-Emitter Breakdown Voltage ($I_C = 10\text{ mA}$, $R_{BE} = 75\ \Omega$) | $V_{(BR)CER}$ | 40 | — | — | Vdc |
| Emitter-Base Breakdown Voltage ($I_E = 5\text{ mAdc}$) | $V_{(BR)EBO}$ | 3.5 | — | — | Vdc |
| Collector-Base Breakdown Voltage ($I_C = 10\text{ mAdc}$) | $V_{(BR)CBO}$ | 40 | — | — | Vdc |
| Collector-Emitter Leakage ($V_{CE} = 26\text{ V}$, $R_{BE} = 75\ \Omega$) | I_{CER} | — | — | 5 | mA |

(1) Thermal resistance is determined under specified RF operating condition.

(continued)

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

ON CHARACTERISTICS

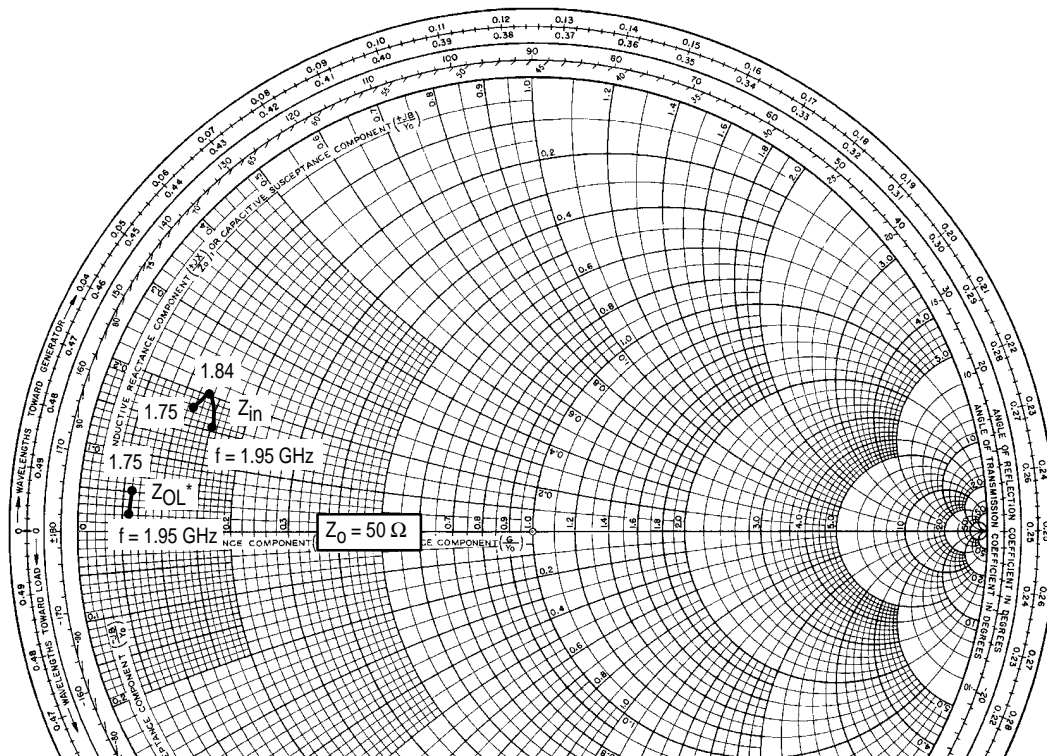
| | | | | | |
|--|----------|----|---|-----|---|
| DC Current Gain ($I_C = 0.1 \text{ Adc}$, $V_{CE} = 20 \text{ Vdc}$) | h_{FE} | 50 | — | 200 | — |
|--|----------|----|---|-----|---|

DYNAMIC CHARACTERISTICS

| | | | | | |
|---|----------|---|---|---|----|
| Output Capacitance ($V_{CB} = 26 \text{ V}$, $I_E = 0$, $f = 1 \text{ MHz}$) | C_{ob} | — | 6 | — | pF |
|---|----------|---|---|---|----|

FUNCTIONAL TESTS

| | | | | | |
|---|--------|--------------------------------|----|---|----|
| Common-Emitter Amplifier Power Gain ($V_{CC} = 26 \text{ V}$, $P_{out} = 4 \text{ W}$, $I_{CQ} = 40 \text{ mA}$, $f = 1.88 \text{ GHz}$) | G_p | 9 | 10 | — | dB |
| Collector Efficiency ($V_{CC} = 26 \text{ V}$, $P_{out} = 4 \text{ W}$, $f = 1.88 \text{ GHz}$) | η | 40 | 43 | — | % |
| Load Mismatch ($V_{CC} = 26 \text{ V}$, $P_{out} = 4.5 \text{ W}$, $I_{CQ} = 40 \text{ mA}$, $f = 1.88 \text{ GHz}$, Load VSWR = 3:1, All Phase Angles at Frequency of Test) | Ψ | No Degradation in Output Power | | | |



| f (GHz) | Z_{in} (Ω) | Z_{OL}^* (Ω) |
|------------|--------------------------|----------------------------|
| 1.75 | $0.12 + j0.18$ | $0.06 + j0.05$ |
| 1.84 | $0.13 + j0.2$ | $0.06 + j0.04$ |
| 1.95 | $0.15 + j0.16$ | $0.06 + j0.02$ |

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

**Figure 1. Input and Output Impedances with Circuit Tuned for Maximum Gain
@ $V_{CE} = 26 \text{ V}$, $I_{CQ} = 40 \text{ mA}$, $P_{out} = 4.5 \text{ W}$**

TYPICAL CHARACTERISTICS

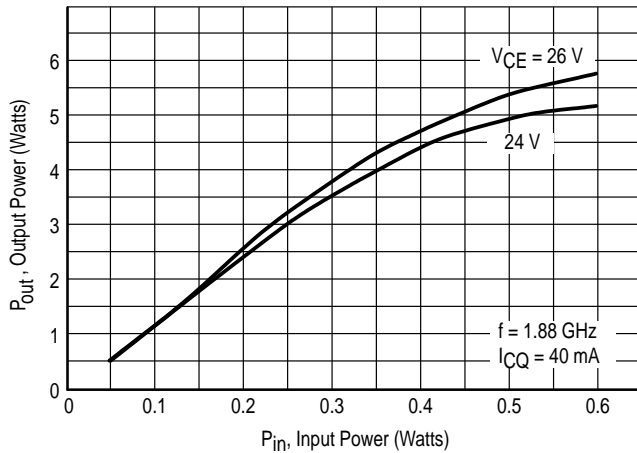


Figure 2. Typical Output Power versus Input Power

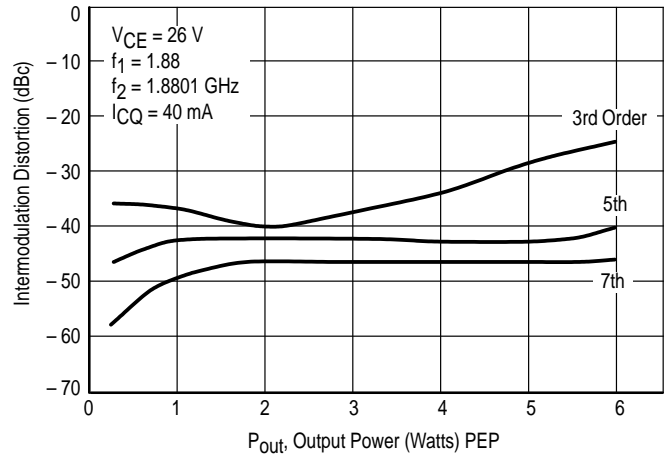
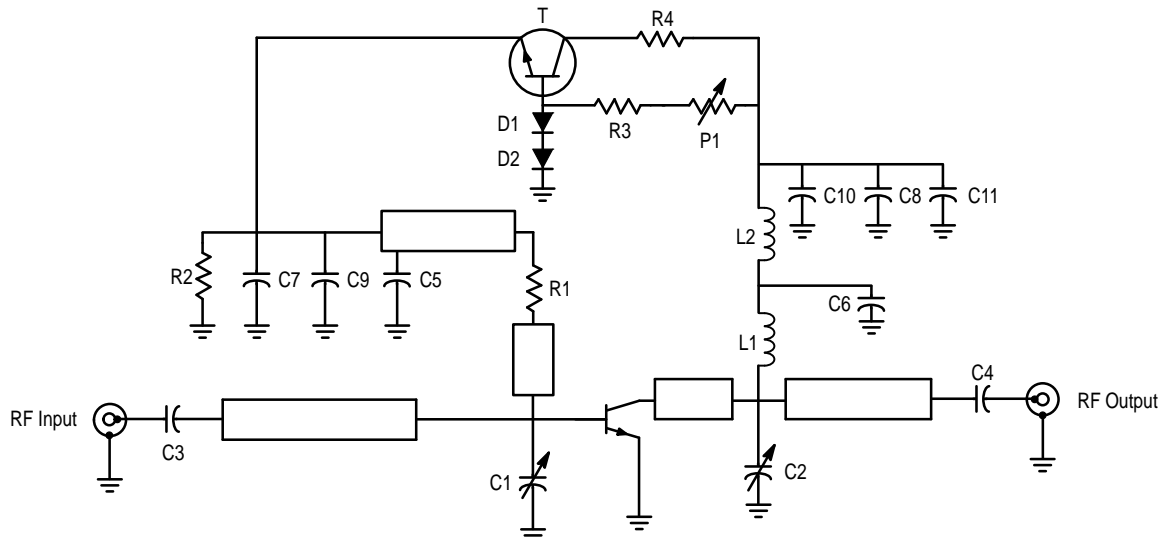


Figure 3. IMD versus Output Power



C1, C2 1 to 5 pF, Trimmer Capacitor, Johanson
 C3, C4 100A, 68 pF, Chip Capacitor, ATC
 C5, C6 100A, 82 pF, Chip Capacitor, ATC
 C7, C8 15 nF, Chip Capacitor, 0805
 C9, C10 330 pF, Chip Capacitor, 0805
 C11 4.7 μ F, 35 V, Capacitor
 D1, D2 Diode, 1N4148

L1 2 Turns, Wire 0.5 mm, ID 2 mm
 L2 Ferrite Bead, SMD Fair-Rite
 P1 10 k Ω , Trimmer
 R1 2.2 Ω , Chip Resistor, 0805
 R2 56 Ω , Chip Resistor, 1206
 R3 1.2 k Ω , 1/4 W, 5%, Resistor
 R4 100 Ω , 3 W, Power Resistor
 T Transistor, BD135

Figure 4. 1.80–1.88 GHz Test Circuit Electrical Schematic

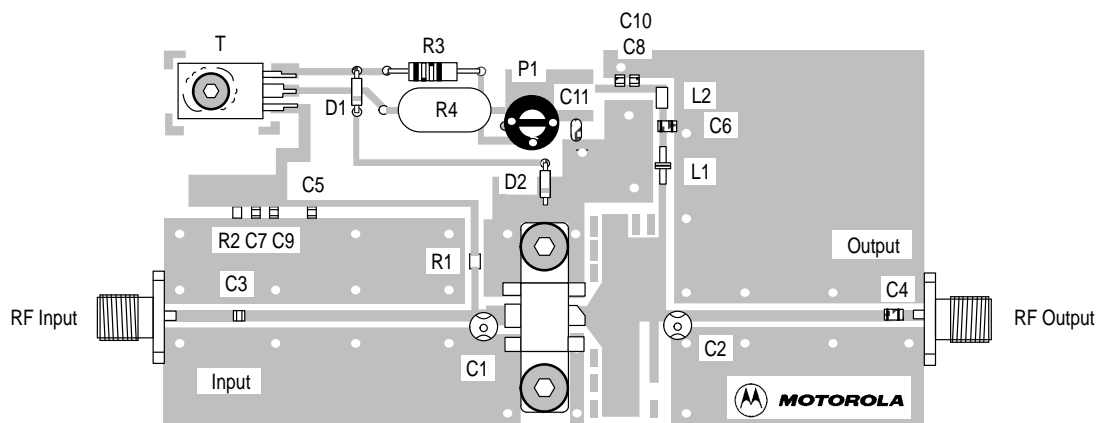
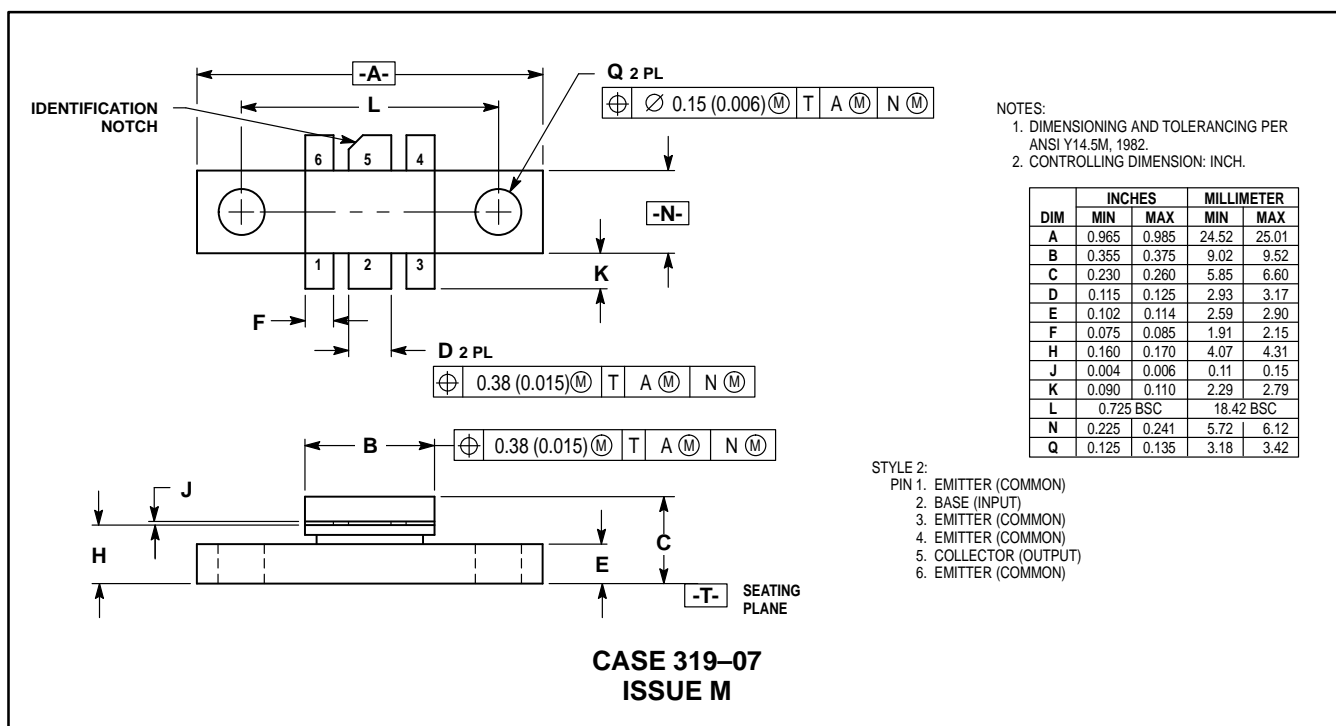


Figure 5. Test Circuit Components View and Parts List

PACKAGE DIMENSIONS



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