## The RF Line

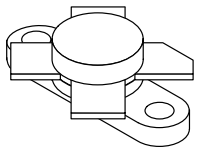
# NPN Silicon RF Power Transistor

. . . designed for 12.5 Volt VHF large–signal power amplifier applications required in commercial and industrial equipment operating to VHF frequencies.

- Specified 12.5 Volt, 175 MHz Characteristics —
  Output Power = 40 W
  Power Gain = 4.5 dB Min
  Efficiency = 70% Min

**MRF224**

**40 W, 175 MHz**
**RF POWER**
**TRANSISTOR**
**NPN SILICON**



**CASE 211–07, STYLE 1**

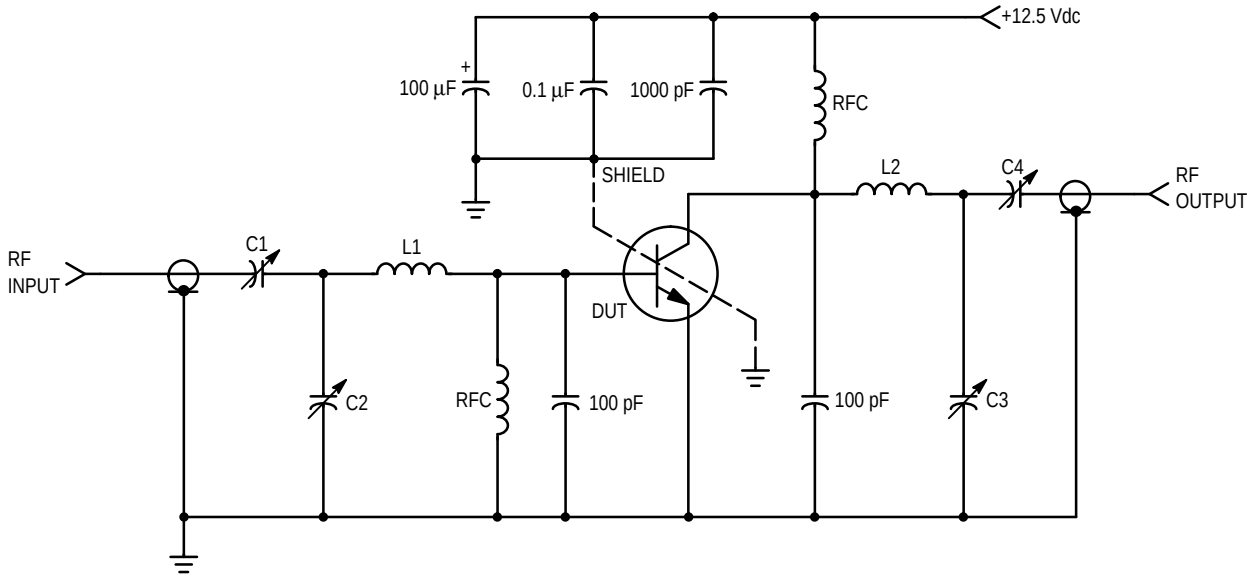
**MAXIMUM RATINGS**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector–Emitter Voltage | $V_{CEO}$ | 18 | Vdc |
| Collector–Base Voltage | $V_{CBO}$ | 36 | Vdc |
| Emitter–Base Voltage | $V_{EBO}$ | 4.0 | Vdc |
| Collector Current — Continuous | $I_C$ | 7.0 | Adc |
| Total Device Dissipation @ $T_C$ = 25°C (2)<br>Derate above 25°C | $P_D$ | 80<br>0.46 | Watts<br>W/°C |
| Storage Temperature Range | $T_{stg}$ | –65 to +200 | °C |
| Stud Torque (1) | — | 6.5 | in. lb. |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector–Emitter Breakdown Voltage ($I_C$ = 100 mAdc, $I_B$ = 0) | $V_{(BR)CEO}$ | 18 | — | — | Vdc |
| Collector–Emitter Breakdown Voltage ($I_C$ = 20 mAdc, $V_{BE}$ = 0) | $V_{(BR)CES}$ | 36 | — | — | Vdc |
| Emitter–Base Breakdown Voltage ($I_E$ = 10 mAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | 4.0 | — | — | Vdc |
| Collector Cutoff Current ($V_{CE}$ = 15 Vdc, $V_{BE}$ = 0, $T_C$ = +55°C) | $I_{CES}$ | — | — | 10 | mAdc |
| Collector Cutoff Current ($V_{CB}$ = 15 Vdc, $I_E$ = 0) | $I_{CBO}$ | — | — | 2.5 | mAdc |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain<br>($I_C$ = 1.0 Adc, $V_{CE}$ = 5.0 Vdc) | $h_{FE}$ | 5.0 | — | — | — |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Output Capacitance<br>($V_{CB}$ = 15 Vdc, $I_E$ = 0, f = 0.1 MHz) | $C_{ob}$ | — | 170 | 200 | pF |
| **FUNCTIONAL TESTS** | | | | | |
| Common–Emitter Amplifier Power Gain<br>($P_{out}$ = 40 W, $V_{CC}$ = 12.5 Vdc, f = 175 MHz) | $G_{PE}$ | 4.5 | — | — | dB |
| Collector Efficiency<br>($P_{out}$ = 40 W, $V_{CC}$ = 12.5 Vdc, f = 175 MHz) | η | 70 | — | — | % |

NOTES:
1. For repeated assembly use 5 in. lb.
2. These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.




C1, C2, C3, C4 — 5.0–80 pF ARCO 462
L1 — Straight Wire, #14 AWG, 1–3/8″ Long
L2 — 1 Turn, #14 AWG, 3/8″ ID, Length Plus Leads = 1″
RFC — VK200–20/4B, FERROXCUBE

**Figure 1. 175 MHz Test Circuit**

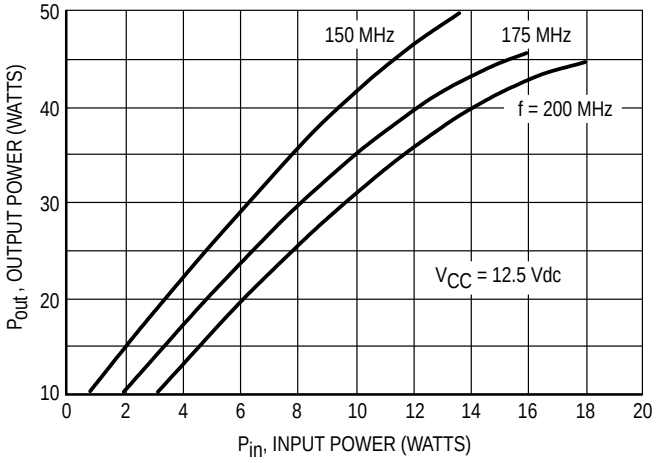



**Figure 2. Output Power versus Input Power**

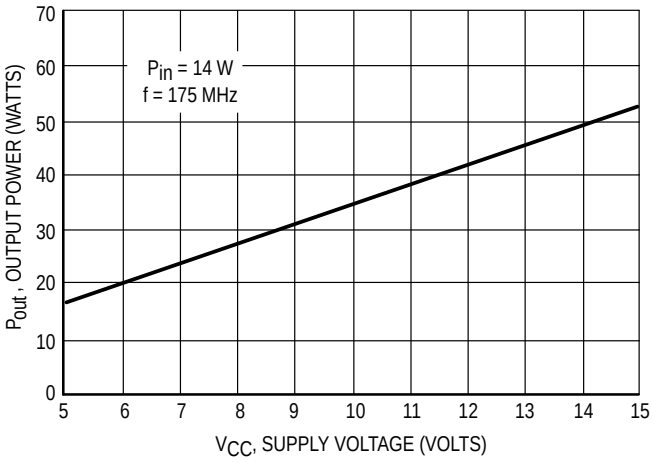
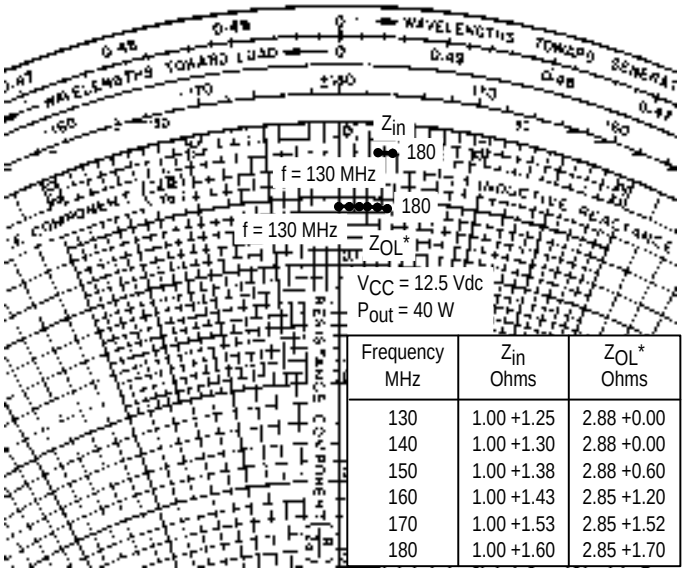



**Figure 3. Output Power versus Supply Voltage**

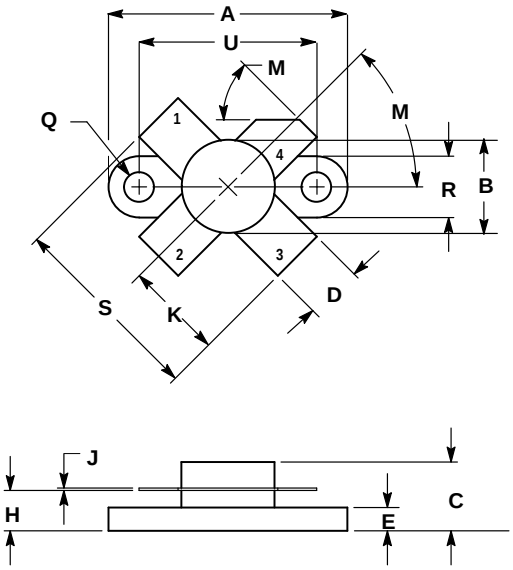


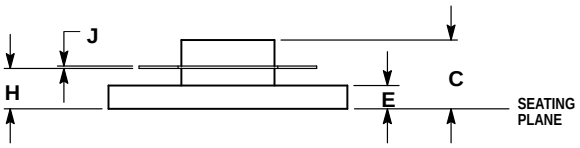

| Frequency MHz | $Z_{in}$ Ohms | $Z_{OL}^*$ Ohms |
|---|---|---|
| 130 | 1.00 +1.25 | 2.88 +0.00 |
| 140 | 1.00 +1.30 | 2.88 +0.00 |
| 150 | 1.00 +1.38 | 2.88 +0.60 |
| 160 | 1.00 +1.43 | 2.85 +1.20 |
| 170 | 1.00 +1.53 | 2.85 +1.52 |
| 180 | 1.00 +1.60 | 2.85 +1.70 |

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

**Figure 4. Series Equivalent 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 | 0.960 | 0.990 | 24.39 | 25.14 |
| B | 0.370 | 0.390 | 9.40 | 9.90 |
| C | 0.229 | 0.281 | 5.82 | 7.13 |
| D | 0.215 | 0.235 | 5.47 | 5.96 |
| E | 0.085 | 0.105 | 2.16 | 2.66 |
| H | 0.150 | 0.108 | 3.81 | 4.57 |
| J | 0.004 | 0.006 | 0.11 | 0.15 |
| K | 0.395 | 0.405 | 10.04 | 10.28 |
| M | 40° | 50° | 40° | 50° |
| Q | 0.113 | 0.130 | 2.88 | 3.30 |
| R | 0.245 | 0.255 | 6.23 | 6.47 |
| S | 0.790 | 0.810 | 20.07 | 20.57 |
| U | 0.720 | 0.730 | 18.29 | 18.54 |

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

**CASE 211–07**
**ISSUE N**



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