

## MRF233 (SILICON)

### The RF Line

#### NPN SILICON RF POWER TRANSISTORS

... designed for 12.5 Volt, mid-band large-signal amplifier applications in industrial and commercial FM equipment operating in the 40 to 100 MHz range.

- Specified 12.5 Volt, 90 MHz Characteristics —  
Output Power = 15 Watts  
Minimum Gain = 10 dB  
Efficiency = 55%
- 100% Tested for Load Mismatch at all Phase Angles with 30:1 VSWR
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Characterized with Parallel Equivalent Large-Signal Impedance Parameters

#### 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                          | $I_C$     | 3.5         | Adc                  |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) | $P_D$     | 50          | Watts                |
| Derate Above $25^\circ\text{C}$                         | —         | 285         | mW/ $^\circ\text{C}$ |
| Storage Temperature Range                               | $T_{stg}$ | -65 to +200 | $^\circ\text{C}$     |
| Stud Torque (2)                                         | —         | 6.5         | In-lb                |

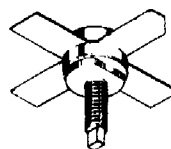
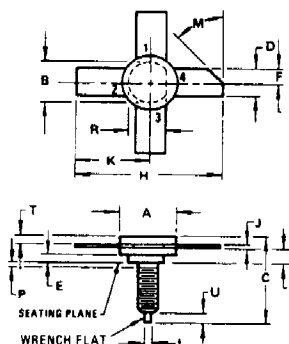
#### THERMAL CHARACTERISTICS

| Characteristic                       | Symbol          | Max | Unit               |
|--------------------------------------|-----------------|-----|--------------------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 3.5 | $^\circ\text{C/W}$ |

(1) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as Class C RF amplifiers.

(2) For Repeated Assembly use 5 in. Lb.

15 W — 90 MHz  
RF POWER  
TRANSISTOR  
NPN SILICON



STYLE 1  
PIN 1 EMITTER  
2 BASE  
3 EMITTER  
4 COLLECTOR

| DIM | MILLIMETERS |         | INCHES |       |
|-----|-------------|---------|--------|-------|
|     | MIN         | MAX     | MIN    | MAX   |
| A   | 9.40        | 9.78    | 0.370  | 0.385 |
| B   | 8.13        | 8.38    | 0.320  | 0.330 |
| C   | 18.03       | 19.05   | 0.710  | 0.750 |
| D   | 5.59        | 5.84    | 0.220  | 0.230 |
| E   | 1.78        | 2.03    | 0.070  | 0.080 |
| F   | 2.79        | 2.82    | 0.110  | 0.115 |
| H   | 26.42       | 28.70   | 1.040  | 1.130 |
| J   | 0.10        | 0.15    | 0.004  | 0.006 |
| K   | 13.21       | 14.35   | 0.520  | 0.565 |
| L   | 1.40        | 1.65    | 0.055  | 0.065 |
| M   | 45° NOM     | 45° NOM | —      | —     |
| P   | 1.27        | —       | 0.050  | —     |
| R   | 7.69        | 7.90    | 0.300  | 0.310 |
| S   | 4.01        | 4.52    | 0.158  | 0.178 |
| T   | 2.16        | 2.41    | 0.085  | 0.095 |
| U   | 2.54        | 3.30    | 0.100  | 0.130 |

NOTE  
CASE 145A-01 USE 8-32NC2A STUD

CASE 145A-01

NJ Semi-Conductors reserves the right to change test conditions, parameter limits and package dimensions without notice. Information furnished by NJ Semi-Conductors is believed to be both accurate and reliable at the time of going to press. However, NJ Semi-Conductors assumes no responsibility for any errors or omissions discovered in its use. NJ Semi-Conductors encourages customers to verify that datasheets are current before placing orders.

# MRF233 (continued)

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

| Characteristic                                                                                                                   | Symbol     | Min                                                                                                            | Typ | Max | Unit  |
|----------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------|-----|-----|-------|
| <b>OFF CHARACTERISTICS</b>                                                                                                       |            |                                                                                                                |     |     |       |
| Collector-Emitter Breakdown Voltage<br>( $I_C = 100\text{ mA dc}$ , $I_B = 0$ )                                                  | $BV_{CEO}$ | 18                                                                                                             | —   | —   | Vdc   |
| Collector-Emitter Breakdown Voltage<br>( $I_C = 50\text{ mA dc}$ , $V_{BE} = 0$ )                                                | $BV_{CES}$ | 36                                                                                                             | —   | —   | Vdc   |
| Emitter-Base Breakdown Voltage<br>( $I_E = 5.0\text{ mA dc}$ , $I_C = 0$ )                                                       | $BV_{EBO}$ | 4.0                                                                                                            | —   | —   | Vdc   |
| Collector Cutoff Current<br>( $V_{CB} = 15\text{ Vdc}$ , $I_E = 0$ )                                                             | $I_{CBO}$  | —                                                                                                              | —   | 1.0 | mA dc |
| <b>ON CHARACTERISTICS</b>                                                                                                        |            |                                                                                                                |     |     |       |
| DC Current Gain<br>( $I_C = 1.0\text{ A dc}$ , $V_{CE} = 5.0\text{ Vdc}$ )                                                       | $h_{FE}$   | 5.0                                                                                                            | —   | —   | —     |
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                   |            |                                                                                                                |     |     |       |
| Output Capacitance<br>( $V_{CB} = 12.5\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )                                          | $C_{ob}$   | —                                                                                                              | 100 | 120 | pF    |
| <b>FUNCTIONAL TESTS (Figure 1)</b>                                                                                               |            |                                                                                                                |     |     |       |
| Common-Emitter Amplifier Power Gain<br>( $V_{CC} = 12.5\text{ Vdc}$ , $P_{out} = 15\text{ W}$ , $f = 90\text{ MHz}$ )            | $G_{PE}$   | 10                                                                                                             | —   | —   | dB    |
| Collector Efficiency<br>( $V_{CC} = 12.5\text{ Vdc}$ , $P_{out} = 15\text{ W}$ , $f = 90\text{ MHz}$ )                           | $\eta$     | 55                                                                                                             | —   | —   | %     |
| Load Mismatch<br>( $V_{CC} = 12.5\text{ Vdc}$ , $P_{out} = 15\text{ W}$ ,<br>$f = 90\text{ MHz}$ , $T_C \leq 25^\circ\text{C}$ ) | —          | VSWR > 30:1 Through All Phase Angles in a 3 Second Interval After Which Devices Will Meet $G_{PE}$ Test Limits |     |     |       |

FIGURE 1 — 90 MHz TEST CIRCUIT SCHEMATIC

