# MRF1000MB

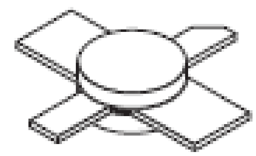
# Class A, Class AB Microwave Power Silicon NPN Transistor
## 0.7 W, 960–1215 MHz, 18V

Rev. V1

### Features

- Guaranteed performance @ 1090 MHz, 18 Vdc — Class A
- Output power: 0.2W
- Minimum gain: 10dB
- 100% tested for load mismatch at all phase angles with 10:1 VSWR
- Industry standard package
- Nitride passivated
- Gold metallized, emitter ballasted for long life and resistance to metal migration
- Internal input matching for broadband operation

### Product Image



**CASE 332A–03, STYLE 2**

### Description and Applications

Designed for Class A and AB common emitter amplifier applications in the low–power stages of IFF, DME, TACAN, radar transmitters, and CW systems.

**MAXIMUM RATINGS**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector–Emitter Voltage | $V_{CEO}$ | 20 | Vdc |
| Collector–Base Voltage | $V_{CBO}$ | 50 | Vdc |
| Emitter–Base Voltage | $V_{EBO}$ | 3.5 | Vdc |
| Collector Current — Continuous | $I_C$ | 200 | mAdc |
| Total Device Dissipation @ $T_C$ = 25°C (1)<br>Derate above 25°C | $P_D$ | 7.0<br>40 | Watts<br>mW/°C |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case (2) | $R_{\theta JC}$ | 25 | °C/W |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector–Emitter Breakdown Voltage ($I_C$ = 5.0 mAdc, $I_B$ = 0) | $V_{(BR)CEO}$ | 20 | — | — | Vdc |
| Collector–Emitter Breakdown Voltage ($I_C$ = 5.0 mAdc, $V_{BE}$ = 0) | $V_{(BR)CES}$ | 50 | — | — | Vdc |
| Collector–Base Breakdown Voltage ($I_C$ = 5.0 mAdc, $I_E$ = 0) | $V_{(BR)CBO}$ | 50 | — | — | Vdc |
| Emitter–Base Breakdown Voltage ($I_E$ = 1.0 mAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | 3.5 | — | — | Vdc |
| Collector Cutoff Current ($V_{CB}$ = 20 Vdc, $I_E$ = 0) | $I_{CBO}$ | — | — | 0.5 | mAdc |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain ($I_C$ = 100 mAdc, $V_{CE}$ = 5.0 Vdc) | $h_{FE}$ | 10 | — | 100 | — |

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

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Output Capacitance ($V_{CB}$ = 28 Vdc, $I_E$ = 0, f = 1.0 MHz) | $C_{ob}$ | — | 2.0 | 5.0 | pF |
| **FUNCTIONAL TESTS** | | | | | |
| Common–Emitter Power Gain — Class A ($V_{CE}$ = 18 Vdc, $I_C$ = 100 mAdc, f = 1090 MHz, $P_{out}$ = 200 mW) | $G_{PE}$ | 10 | 12 | — | dB |
| Common–Emitter Power Gain — Class AB ($V_{CE}$ = 18 Vdc, $I_{CQ}$ = 10 mAdc, f = 1090 MHz, $P_{out}$ = 0.7 W) | $G_{PE}$ | — | 10.7 | — | dB |
| Load Mismatch — Class A ($V_{CE}$ = 18 Vdc, $I_C$ = 100 mAdc, f = 1090 MHz, $P_{out}$ = 200 mW, VSWR = 10:1 All Phase Angles) | ψ | No Degradation in Power Output | | | |

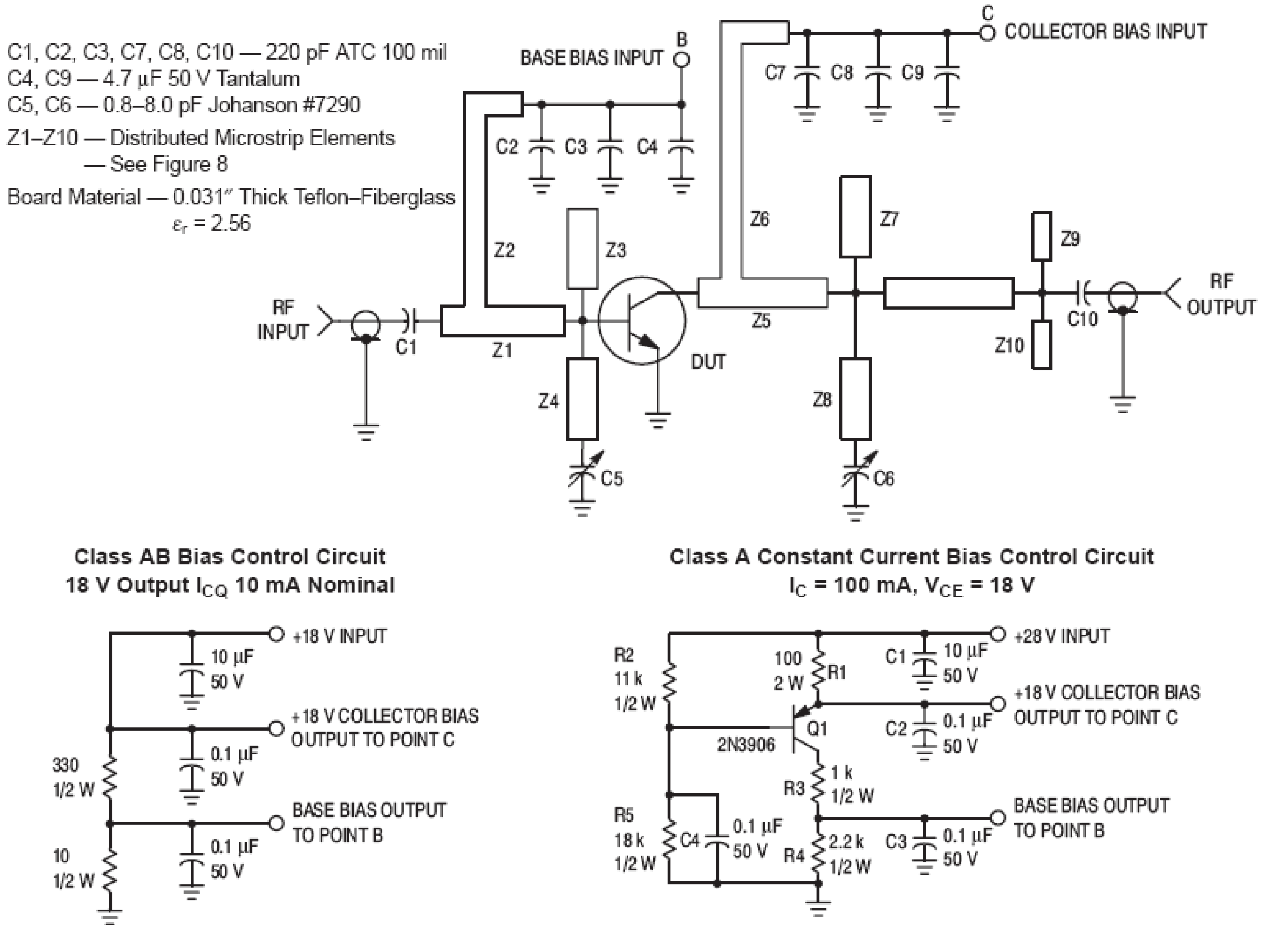


**Figure 1. 1090 MHz Test Circuit**

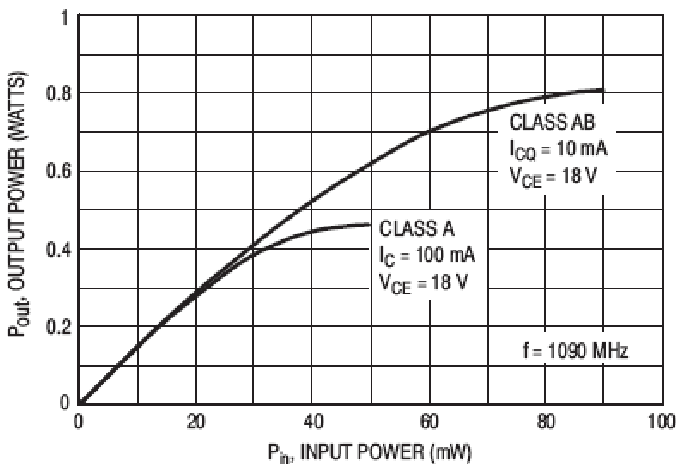


**Figure 2. Output Power versus Input Power**

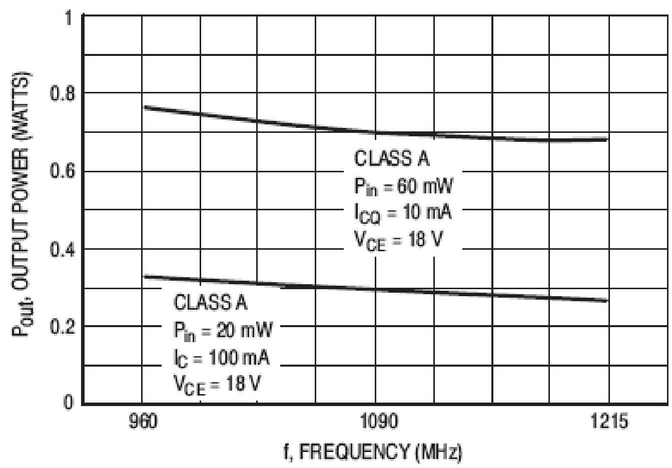


**Figure 3. Output Power versus Frequency**

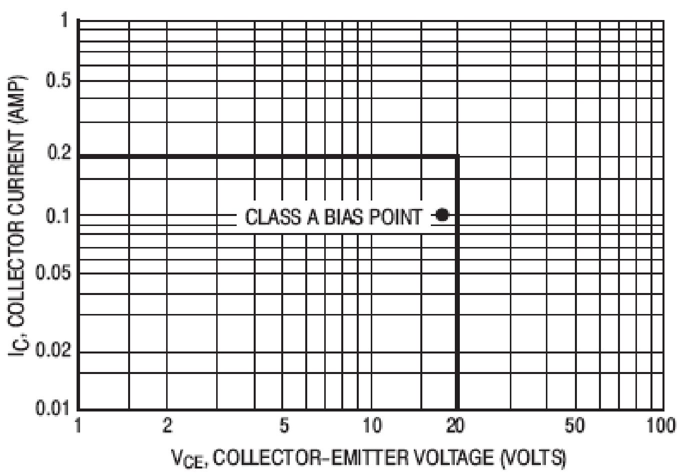


**Figure 4. DC Safe Operating Area**

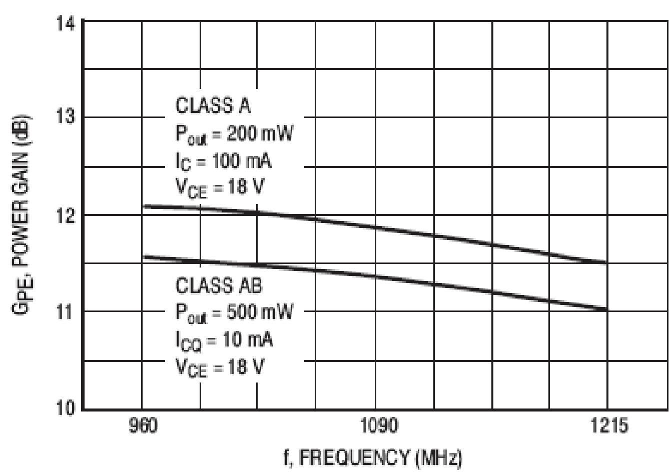


**Figure 5. Power Gain versus Frequency**

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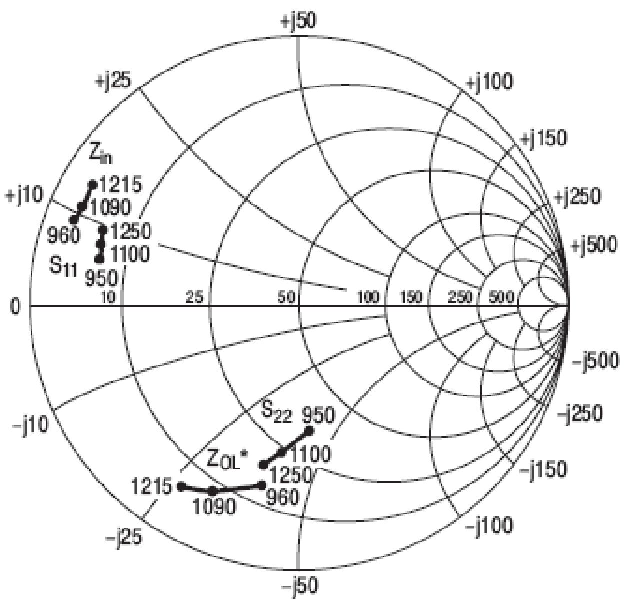



SERIES EQUIVALENT IMPEDANCES
$P_{out}$ = 0.5 W, $V_{CE}$ = 18 Vdc,
$I_{CQ}$ = 10 mAdc, Class AB

| f MHz | $Z_{in}$ Ohms | $Z_{OL}$* Ohms |
|---|---|---|
| 960 | 3.0 + j9.0 | 16 – j40 |
| 1090 | 3.2 + j10 | 8.5 – j31 |
| 1215 | 2.8 + j12 | 7.0 – j26 |

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

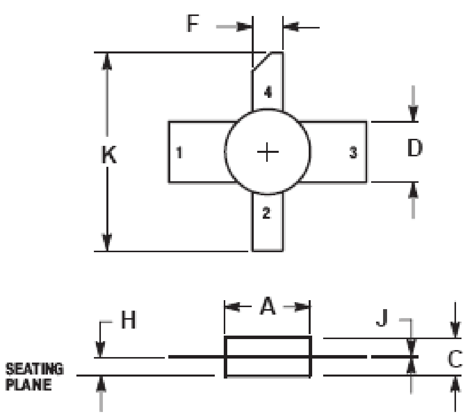
S–PARAMETERS — $V_{CE}$ = 18 Vdc, $I_C$ = 100 mAdc, Class A

| f (MHz) | $S_{11}$ | | $S_{21}$ | | $S_{12}$ | | $S_{22}$ | |
|---|---|---|---|---|---|---|---|---|
| | $\|S_{11}\|$ | $\angle \phi$ | $\|S_{21}\|$ | $\angle \phi$ | $\|S_{12}\|$ | $\angle \phi$ | $\|S_{22}\|$ | $\angle \phi$ |
| 950 | 0.77 | 166 | 2.42 | 40 | 0.016 | 42 | 0.48 | –87 |
| 1000 | 0.78 | 165 | 2.36 | 38 | 0.016 | 48 | 0.50 | –90 |
| 1050 | 0.77 | 163 | 2.31 | 33 | 0.016 | 46 | 0.51 | –94 |
| 1100 | 0.77 | 162 | 2.31 | 28 | 0.016 | 46 | 0.54 | –97 |
| 1150 | 0.78 | 161 | 2.20 | 23 | 0.015 | 46 | 0.57 | –100 |
| 1200 | 0.78 | 159 | 2.20 | 19 | 0.016 | 47 | 0.59 | –103 |
| 1250 | 0.78 | 158 | 2.12 | 12 | 0.016 | 42 | 0.61 | –106 |

**Figure 6. Common–Emitter S–Parameters and Series Equivalent Input/Output Impedances**

Replaces MRF1000MA/D

## PACKAGE DIMENSIONS




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

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

| DIM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | 0.270 | 0.290 | 6.86 | 7.36 |
| C | 0.115 | 0.135 | 2.93 | 3.42 |
| D | 0.195 | 0.205 | 4.96 | 5.20 |
| F | 0.095 | 0.105 | 2.42 | 2.66 |
| H | 0.050 | 0.070 | 1.27 | 1.77 |
| J | 0.003 | 0.007 | 0.08 | 0.17 |
| K | 0.600 | --- | 15.24 | --- |

CASE 332A–03
ISSUE D