## The RF Line

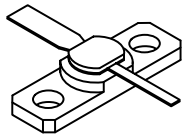
# Microwave Linear Power Transistors

Designed for Class A, common emitter linear power amplifiers.

- Specified 20 Volt, 1.6 GHz Characteristics
  Output Power — 0.5, 0.8, 1.6 Watts
  Gain — 9.0–12 dB
- Low Parasitic Microwave Stripline Package
- Gold Metallization Diffused Emitter Ballast Resistors
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.

# MRF3094
# MRF3095

**9.0–12 dB**
**1.55–1.65 GHz**
**0.5–1.6 WATTS**
**MICROWAVE LINEAR**
**POWER TRANSISTORS**



**CASE 328A–03, STYLE 2**

**MAXIMUM RATINGS**

| Rating | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Collector Base Voltage | | $V_{CES}$ | 50 | Vdc |
| Emitter Base Voltage | | $V_{EBO}$ | 3.5 | Vdc |
| Collector Emitter Voltage | | $V_{CEO}$ | 22 | Vdc |
| Collector Current | MRF3094, 3095 | $I_C$ | 0.4 | Adc |
| Operating Junction Temperature | | $T_J$ | 200 | °C |
| Storage Temperature | | $T_{stg}$ | –65 to +150 | °C |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | | Unit |
|---|---|---|---|---|
| | | MRF3094 | MRF3095 | |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 40 | 35 | °C/W |

## ELECTRICAL CHARACTERISTICS

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector–Emitter Breakdown Voltage ($I_C$ = 10 mA) | MRF3094, MRF3095 | $V_{(BR)CES}$ | 50 | — | — | Vdc |
| Emitter Base Breakdown Voltage ($I_E$ = 0.25 mA) | MRF3094, MRF3095 | $V_{(BR)EBO}$ | 3.5 | — | — | Vdc |
| Collector Base Breakdown Voltage ($I_C$ = 1.0 mA) | MRF3094, MRF3095 | $V_{(BR)CBO}$ | 45 | — | — | Vdc |
| Collector–Emitter Breakdown Voltage ($I_C$ = 10 mA) | MRF3094, MRF3095 | $V_{(BR)CEO}$ | 22 | — | — | Vdc |
| Collector Cutoff Current ($V_{CB}$ = 28 V) | MRF3094, MRF3095 | $I_{CBO}$ | — | — | 0.25 | mAdc |
| **ON CHARACTERISTICS** | | | | | | |
| DC Current Gain ($V_{CE}$ = 5.0 V, $I_C$ = 100 mA) | MRF3094, MRF3095 | $h_{fe}$ | 20 | 35 | 120 | — |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Output Capacitance ($V_{CB}$ = 28 V, f = 1.0 MHz) | MRF3094, MRF3095 | $C_{ob}$ | — | — | 3.5 | pF |
| Functional Tests | | $G_{PE}$ | | | | dB |
| ($V_{CE}$ = 20 V, $I_C$ = 120 mA, $P_o$ = 0.5 W, f = 1.6 GHz) | MRF3094 | | 10.5 | 11.5 | — | |
| ($V_{CE}$ = 20 V, $I_C$ = 120 mA, $P_o$ = 0.8 W, f = 1.6 GHz) | MRF3095 | | 9.0 | 10 | — | |
| Output Load Mismatch | | $\psi$ | No degradation in output power | | | |
| ($V_{CE}$ = 20 V, $I_C$ = 120 mA, $P_o$ = 0.5 W, f = 1.6 GHz, Load VSWR = ∞:1) | MRF3094 | | | | | |
| ($V_{CE}$ = 20 V, $I_C$ = 120 mA, $P_o$ = 0.8 W, f = 1.6 GHz, Load VSWR = ∞:1) | MRF3095 | | | | | |
| Gain Linearity | | $L_G$ | | | | dB |
| ($V_{CE}$ = 20 V, $I_C$ = 120 mA, f = 1.6 GHz, $P_{o1}$ = 0.5 W, $P_{o2}$ = 0.5 mW) | MRF3094 | | — | — | –0.2 to +1.0 | |
| ($V_{CE}$ = 20 V, $I_C$ = 120 mA, f = 1.6 GHz, $P_{o1}$ = 0.8 W, $P_{o2}$ = 0.8 mW) | MRF3095 | | — | — | –0.2 to +1.0 | |

## TYPICAL CHARACTERISTICS

| $V_{CE}$ (Volts) | $I_C$ (mA) | f (MHz) | $S_{11}$ | | $S_{21}$ | | $S_{12}$ | | $S_{22}$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mag | ∠ϕ | Mag | ∠ϕ | Mag | ∠ϕ | Mag | ∠ϕ |
| 20 | 100 | 500 | 0.77 | −177.9 | 6.16 | 83.7 | 0.36 | 31.9 | 0.32 | −57.1 |
| | | 600 | 0.78 | 176.7 | 5.20 | 77.2 | 0.38 | 32.2 | 0.30 | −60.3 |
| | | 700 | 0.78 | 171.8 | 4.48 | 71.1 | 0.40 | 33.4 | 0.29 | −62.6 |
| | | 800 | 0.78 | 167.4 | 3.90 | 66.3 | 0.41 | 35.0 | 0.29 | −67.3 |
| | | 900 | 0.79 | 163.3 | 3.46 | 61.2 | 0.42 | 36.6 | 0.28 | −70.8 |
| | | 1000 | 0.79 | 159.3 | 3.11 | 56.4 | 0.46 | 38.1 | 0.29 | −74.5 |
| | | 1100 | 0.80 | 155.7 | 2.81 | 52.0 | 0.48 | 39.2 | 0.29 | −79.3 |
| | | 1200 | 0.80 | 152.4 | 2.60 | 47.5 | 0.50 | 40.1 | 0.29 | −83.3 |
| | | 1300 | 0.80 | 149.3 | 2.40 | 43.5 | 0.53 | 40.7 | 0.30 | −88.3 |
| | | 1400 | 0.80 | 147.1 | 2.18 | 40.6 | 0.57 | 42.2 | 0.30 | −93.3 |
| | | 1500 | 0.81 | 143.6 | 2.06 | 34.3 | 0.59 | 41.0 | 0.30 | −97.7 |
| | | 1600 | 0.81 | 140.8 | 1.92 | 30.8 | 0.62 | 41.9 | 0.30 | −103.4 |
| | | 1700 | 0.82 | 137.9 | 1.81 | 27.9 | 0.66 | 42.5 | 0.31 | −107.6 |
| | | 1800 | 0.82 | 135.2 | 1.67 | 22.7 | 0.68 | 41.9 | 0.32 | −112.7 |
| | | 1900 | 0.83 | 132.7 | 1.61 | 19.4 | 0.71 | 41.9 | 0.33 | −117.8 |
| | | 2000 | 0.83 | 130.2 | 1.52 | 16.3 | 0.75 | 41.8 | 0.34 | −121.3 |

**Table 1. MRF3094 Common Emitter S–Parameters**

## MRF3094

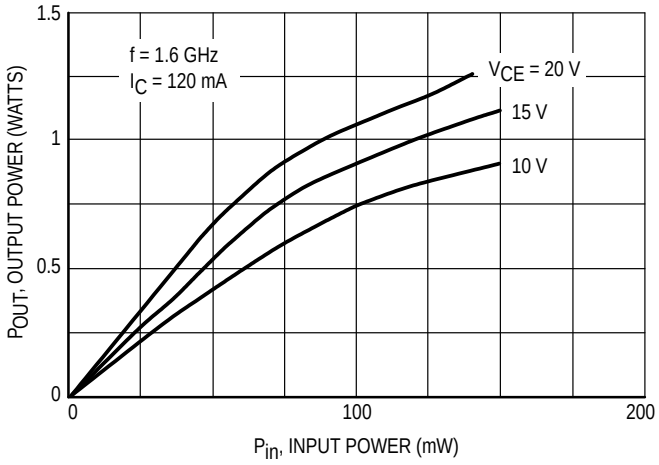



**Figure 1. Output Power versus Input Power**

| f GHz | $Z_{in}$ Ohms | | $Z_{OL}$* Ohms | |
|---|---|---|---|---|
| | R | jx | R | jx |
| 1.55 | 5.9 | 11.9 | 10.2 | 0.23 |
| 1.60 | 5.8 | 11.3 | 11.3 | −2.4 |
| 1.65 | 5.6 | 10.6 | 12.4 | −6.0 |

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

**Figure 2. Series Equivalent Input and Output Impedance**

## TYPICAL CHARACTERISTICS

| $V_{CE}$ (Volts) | $I_C$ (mA) | f (MHz) | $S_{11}$ | | $S_{21}$ | | $S_{12}$ | | $S_{22}$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mag | ∠ϕ | Mag | ∠ϕ | Mag | ∠ϕ | Mag | ∠ϕ |
| 20 | 120 | 500 | 0.83 | −177.4 | 4.90 | 71.1 | 0.29 | 21.7 | 0.36 | −81.6 |
| | | 600 | 0.83 | 179.6 | 4.08 | 64.4 | 0.30 | 22.1 | 0.37 | −87.2 |
| | | 700 | 0.83 | 176.9 | 3.48 | 59.3 | 0.31 | 23.6 | 0.39 | −92.3 |
| | | 800 | 0.83 | 175.0 | 3.20 | 52.8 | 0.34 | 23.2 | 0.42 | −96.4 |
| | | 900 | 0.82 | 171.6 | 2.70 | 48.6 | 0.33 | 25.0 | 0.43 | −103.2 |
| | | 1000 | 0.82 | 169.5 | 2.49 | 42.3 | 0.36 | 24.9 | 0.46 | −107.6 |
| | | 1100 | 0.83 | 167.4 | 2.26 | 37.0 | 0.38 | 25.2 | 0.48 | −112.5 |
| | | 1200 | 0.80 | 164.3 | 2.10 | 29.4 | 0.39 | 22.1 | 0.51 | −117.7 |
| | | 1300 | 0.81 | 162.2 | 1.87 | 27.9 | 0.41 | 25.9 | 0.54 | −121.6 |
| | | 1400 | 0.81 | 160.1 | 1.77 | 21.7 | 0.44 | 24.4 | 0.57 | −125.3 |
| | | 1500 | 0.80 | 157.8 | 1.63 | 15.2 | 0.45 | 22.4 | 0.58 | −129.3 |
| | | 1600 | 0.80 | 155.2 | 1.46 | 11.1 | 0.46 | 22.6 | 0.61 | −131.7 |
| | | 1700 | 0.80 | 152.3 | 1.42 | 9.6 | 0.48 | 23.9 | 0.66 | −133.9 |
| | | 1800 | 0.78 | 148.5 | 1.36 | 2.5 | 0.53 | 21.6 | 0.66 | −136.6 |
| | | 1900 | 0.77 | 144.5 | 1.25 | −3.1 | 0.54 | 19.7 | 0.66 | −139.3 |
| | | 2000 | 0.78 | 141.0 | 1.17 | −5.6 | 0.58 | 20.3 | 0.67 | −141.9 |

**Table 2. MRF3095 Common Emitter S–Parameters**



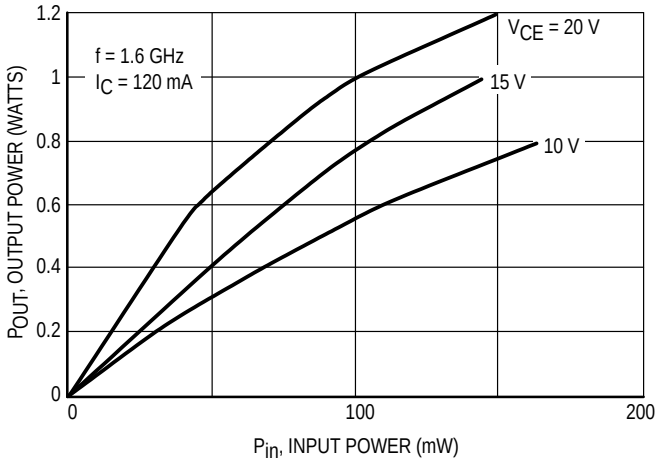


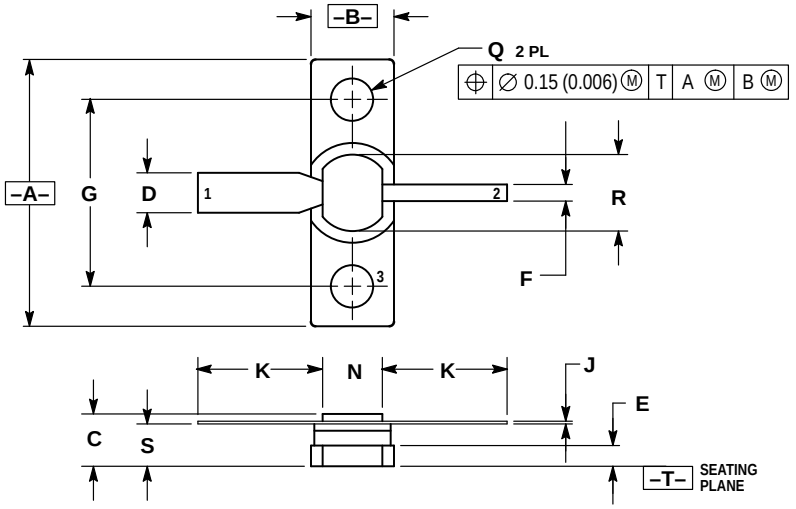

**Figure 3. Output Power versus Input Power**

| f GHz | $Z_{in}$ Ohms | | $Z_{OL}$* Ohms | |
|---|---|---|---|---|
| | R | jx | R | jx |
| 1.55 | 5.2 | 10.6 | 8.6 | −22.4 |
| 1.60 | 4.9 | 9.9 | 9.6 | −25.4 |
| 1.65 | 4.8 | 9.3 | 10.3 | −27.8 |

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

**Figure 4. Series Equivalent Input and 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 | 0.795 | 0.805 | 20.20 | 20.45 |
| B | 0.245 | 0.255 | 6.23 | 6.47 |
| C | 0.145 | 0.170 | 3.69 | 4.31 |
| D | 0.115 | 0.125 | 2.93 | 3.17 |
| E | 0.055 | 0.065 | 1.40 | 1.65 |
| F | 0.045 | 0.055 | 1.15 | 1.39 |
| G | 0.562 BSC | | 14.27 BSC | |
| J | 0.003 | 0.006 | 0.08 | 0.15 |
| K | 0.260 | 0.375 | 6.60 | 9.52 |
| N | 0.175 | 0.185 | 4.45 | 4.69 |
| Q | 0.120 | 0.135 | 3.05 | 3.42 |
| R | 0.225 | 0.235 | 5.72 | 5.97 |
| S | 0.120 | 0.130 | 3.05 | 3.30 |

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

**CASE 328A–03**
**ISSUE E**

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