Microwave Power Silicon NPN Transistor
30W (peak), 960–1215MHz, 36V

Features
- Guaranteed performance @ 960-1215MHz, 36Vdc
- Output power: 30W peak
- Minimum gain: 9.0dB min., 9.5dB typ.
- 100% tested for load mismatch at all phase angles with 10:1 VSWR
- Hermetically sealed, industry standard package
- Silicon nitride passivated
- Gold metallized, emitter ballasted for long life and resistance to metal migration
- Internal input matching for broadband operation

Description and Applications
Designed for 960–1215 MHz long or short pulse common base amplifier applications such as JTIDS and Mode–S transmitters.

Maximum Ratings

<table>
<thead>
<tr>
<th>Rating</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-Emitter Voltage</td>
<td>V_CES</td>
<td>55</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector-Base Voltage (1)</td>
<td>V_CBO</td>
<td>55</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter-Base Voltage</td>
<td>V_EBO</td>
<td>3.5</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Current — Continuous (1)</td>
<td>I_C</td>
<td>3.0</td>
<td>Adc</td>
</tr>
<tr>
<td>Total Device Dissipation @ T_C = 25°C (1), (2)</td>
<td>P_D</td>
<td>110  0.625</td>
<td>Watts mW/°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>T_STG</td>
<td>– 65 to + 200</td>
<td>ºC</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>T_J</td>
<td>200</td>
<td>ºC</td>
</tr>
</tbody>
</table>

THERMAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Resistance, Junction to Case (3)</td>
<td>R_THC</td>
<td>1.6</td>
<td>ºC/W</td>
</tr>
</tbody>
</table>

NOTES:
1. Under pulse RF operating conditions.
2. These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as pulsed RF amplifiers.
3. Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques. ( Worst case θ_TH value measured @ 23% duty cycle)
### ELECTRICAL CHARACTERISTICS (\(T_c = 25^\circ C\) unless otherwise noted)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector–Emitter Breakdown Voltage ((I_c = 25 \text{ mA}, V_{BE} = 0))</td>
<td>(V_{\text{BRICES}})</td>
<td>66</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Base Breakdown Voltage ((I_c = 25 \text{ mA}, I_b = 0))</td>
<td>(V_{\text{BRICBO}})</td>
<td>55</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Breakdown Voltage ((I_b = 5.0 \text{ mA}, I_c = 0))</td>
<td>(V_{\text{BRIBEO}})</td>
<td>3.5</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Cutoff Current ((V_{CC} = 36 \text{ Vdc}, I_c = 0))</td>
<td>(I_{CEO})</td>
<td>—</td>
<td>—</td>
<td>2.0</td>
<td>mA dc</td>
</tr>
</tbody>
</table>

### ON CHARACTERISTICS

- DC Current Gain \((I_c = 500 \text{ mA}, V_{CE} = 5.0 \text{ Vdc})\): \(h_{FE}\)
  - Min: 20
  - Typ: —
  - Max: —

### FUNCTIONAL TESTS (10 \(\mu\)s Pulses @ 50% duty cycle for 3.5 ms; overall duty cycle = 25%)

| Common–Base Amplifier Power Gain \((V_{CC} = 36 \text{ Vdc}, P_{out} = 30 \text{ W Peak, } f = 960 \text{ MHz})\) | \(G_{PB}\) | 9.0  | 9.5  | —   | dB   |
| Collector Efficiency \((V_{CC} = 36 \text{ Vdc}, P_{out} = 30 \text{ W Peak, } f = 960 \text{ MHz})\) | \(\eta\) | 40   | 45   | —   | %    |
| Load Mismatch \((V_{CC} = 36 \text{ Vdc}, P_{out} = 30 \text{ W Peak, } f = 960 \text{ MHz, } VSWR = 10.1 \text{ All Phase Angles})\) | \(\psi\) | —    | No Degradation in Output Power |

### Output power versus input power

![Output power versus input power graph](image_url)
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MRF10031

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BROADBAND FIXTURE

RF INPUT
Z1 — 75 pF 100 Mil Chip Capacitor
Z2 — 39 pF 100 Mil Chip Capacitor
Z3 — 0.1 µF
Z4 — 1000 µF, 50 Vdc, Electrolytic
L1 — 3 Turns #18 AWG, 1/8” ID, 0.18 Long

D.U.T.
Z5

Z6 — 36 Vdc

Z7 — 36 Vdc

Z8 — 36 Vdc

Z9 — Microstrip, See Details
Board Material — Teflon, Glass Laminate
Dielectric Thickness = 0.030”
εr = 2.55, 2 Oz. Copper

C1 — 75 pF 100 Mil Chip Capacitor
C2 — 39 pF 100 Mil Chip Capacitor
C3 — 0.1 µF
C4 — 1000 µF, 50 Vdc, Electrolytic
L1 — 3 Turns #18 AWG, 1/8” ID, 0.18 Long
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Series equivalent input/output impedances

<table>
<thead>
<tr>
<th>f (MHz)</th>
<th>$Z_{in}$ (Ohms)</th>
<th>$Z_{OL}^*$ (Ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>960</td>
<td>$2.05 + j5.2$</td>
<td>$2.9 - j2.35$</td>
</tr>
<tr>
<td>1025</td>
<td>$2.67 + j6.34$</td>
<td>$2.55 - j1.3$</td>
</tr>
<tr>
<td>1090</td>
<td>$4.0 + j7.1$</td>
<td>$2.52 - j0.9$</td>
</tr>
<tr>
<td>1155</td>
<td>$5.5 + j6.2$</td>
<td>$2.6 - j0.6$</td>
</tr>
<tr>
<td>1220</td>
<td>$5.7 + j4.3$</td>
<td>$2.8 - j0.3$</td>
</tr>
</tbody>
</table>

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