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

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

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

<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>VCEO</td>
<td>20</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Base Voltage</td>
<td>VCBO</td>
<td>50</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Voltage</td>
<td>VCEO</td>
<td>3.5</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Current — Continuous</td>
<td>IC</td>
<td>200</td>
<td>mA dc</td>
</tr>
<tr>
<td>Total Device Dissipation @ T_C = 25°C (1)</td>
<td>PD</td>
<td>7.0</td>
<td>Watts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>mW°C</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 (2)</td>
<td>Rjc</td>
<td>25</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

ELECTRICAL CHARACTERISTICS (T_C = 25°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 = 5.0 mA dc, I_E = 0)</td>
<td>VBRCEO</td>
<td>20</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Emiter Breakdown Voltage (I_C = 5.0 mA dc, V_CE = 0)</td>
<td>VBRCE</td>
<td>50</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector–Base Breakdown Voltage (I_C = 5.0 mA dc, I_E = 0)</td>
<td>VBRCEO</td>
<td>50</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Breakdown Voltage (I_E = 1.0 mA dc, I_C = 0)</td>
<td>VBRCEO</td>
<td>3.5</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Cutoff Current (V_CE = 20 Vdc, I_E = 0)</td>
<td>ICBO</td>
<td>—</td>
<td>—</td>
<td>0.5</td>
<td>mA dc</td>
</tr>
</tbody>
</table>

ON CHARACTERISTICS

<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>DC Current Gain (I_C = 100 mA dc, V_CE = 5.0 Vdc)</td>
<td>h_FE</td>
<td>10</td>
<td>—</td>
<td>100</td>
<td>—</td>
</tr>
</tbody>
</table>

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.
### ELECTRICAL CHARACTERISTICS — continued  
(T<sub>c</sub> = 25°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>
</table>
| Output Capacitance  
(V<sub>CE</sub> = 28 Vdc, I<sub>E</sub> = 0, f = 1.0 MHz) | C<sub>ob</sub> | —   | 2.0 | 5.0 | pF   |

### DYNAMIC CHARACTERISTICS

<table>
<thead>
<tr>
<th>Functional Test</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
</table>
| Common–Emitter Power Gain — Class A  
(V<sub>CE</sub> = 18 Vdc, I<sub>CE</sub> = 100 mAdec, f = 1090 MHz, P<sub>out</sub> = 200 mW) | G<sub>FE</sub> | 10  | 12  | —   | dB   |
| Common–Emitter Power Gain — Class AB  
(V<sub>CE</sub> = 18 Vdc, I<sub>CQ</sub> = 10 mAdec, f = 1090 MHz, P<sub>out</sub> = 0.7 W) | G<sub>FE</sub> | —   | 10.7 | —   | dB   |
| Load Mismatch — Class A  
(V<sub>CE</sub> = 18 Vdc, I<sub>CE</sub> = 100 mAdec, f = 1090 MHz, P<sub>out</sub> = 200 mW, V<sub>SWR</sub> = 10.1 All Phase Angles) | ψ | No Degradation in Power Output |

C1, C2, C3, C7, C8, C10 — 220 pF ATC 100 mil  
C4, C9 — 4.7 μF 50 V Tantalum  
C5, C6 — 0.8–8.0 pF Johnson #7280  
Z1–Z10 — Distributed Microstrip Elements  
— See Figure 8  
Board Material — 0.031" Thick Teflon–Fiberglass  
ε<sub>r</sub> = 2.56

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**Figure 1. 1090 MHz Test Circuit**

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Figure 2. Output Power versus Input Power

![Figure 2. Output Power versus Input Power](image)

Figure 3. Output Power versus Frequency

![Figure 3. Output Power versus Frequency](image)

Figure 4. DC Safe Operating Area

![Figure 4. DC Safe Operating Area](image)

Figure 5. Power Gain versus Frequency

![Figure 5. Power Gain versus Frequency](image)
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SERIES EQUIVALENT IMPEDANCES
\[ P_{out} = 0.5 \text{ W}, \ V_{CE} = 18 \text{ Vdc}, \ I_{Q0} = 10 \text{ mA}dc, \text{ Class AB} \]

\[
\begin{array}{|c|c|c|}
\hline
f \text{ MHz} & Z_{in} \text{ Ohms} & Z_{out} \text{ Ohms} \\
\hline
960 & 3.0 + j9.0 & 16 - j40 \\
1090 & 3.2 + j10 & 8.5 - j31 \\
1215 & 2.8 + j12 & 7.0 - j25 \\
\hline
\end{array}
\]

\[ Z_{out}^* = \text{Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage, and frequency.} \]

S–PARAMETERS — \( V_{CE} = 18 \text{ Vdc}, \ I_{C} = 100 \text{ mA}dc, \text{ Class A} \)

\[
\begin{array}{|c|c|c|c|c|c|}
\hline
f \text{ (MHz)} & |S_{11}| & \angle \phi & |S_{21}| & \angle \phi & |S_{12}| & \angle \phi & |S_{22}| & \angle \phi \\
\hline
950 & 0.77 & 166 & 2.42 & 40 & 0.016 & 42 & 0.46 & -87 \\
1000 & 0.73 & 165 & 2.36 & 36 & 0.016 & 46 & 0.50 & -90 \\
1050 & 0.77 & 183 & 2.31 & 33 & 0.016 & 46 & 0.51 & -94 \\
1100 & 0.77 & 162 & 2.31 & 28 & 0.016 & 46 & 0.54 & -97 \\
1150 & 0.78 & 161 & 2.20 & 23 & 0.015 & 46 & 0.57 & -100 \\
1200 & 0.78 & 159 & 2.20 & 19 & 0.016 & 47 & 0.59 & -103 \\
1250 & 0.78 & 158 & 2.12 & 12 & 0.016 & 42 & 0.61 & -106 \\
\hline
\end{array}
\]

Figure 6. Common–Emitter S–Parameters and Series Equivalent Input/Output Impedances
Replaces MRF1000MA/D

PACKAGE DIMENSIONS

For further information and support please visit:
https://www.macom.com/support
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