MRF321

The RF Line NPN Silicon Power Transistor
10W, 400MHz, 28V

Designed primarily for wideband large-signal driver and predriver amplifier stages in 200–500 MHz frequency range.

- Guaranteed performance at 400 MHz, 28 Vdc
  Output power = 10 W
  Power gain = 12 dB min.
  Efficiency = 50% min.
- 100% tested for load mismatch at all phase angles with 30:1 VSWR
- Gold metallization system for high reliability
- Computer-controlled wirebonding gives consistent input impedance

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_{CEO} )</td>
<td>33</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector-Base Voltage</td>
<td>( V_{CBO} )</td>
<td>60</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter-Base Voltage</td>
<td>( V_{EBO} )</td>
<td>4.0</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Current — Continuous</td>
<td>( I_C )</td>
<td>1.1</td>
<td>Adc</td>
</tr>
<tr>
<td>— Peak</td>
<td></td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Total Device Dissipation @ ( T_A = 25°C )</td>
<td>( P_D )</td>
<td>27</td>
<td>Watts</td>
</tr>
<tr>
<td>Derate above 25°C</td>
<td></td>
<td>160</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</td>
<td>( R_{JAC} )</td>
<td>6.4</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 = 20 \text{ mA}, I_B = 0 ))</td>
<td>( V_{BRCEO} )</td>
<td>33</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector-Emitter Breakdown Voltage (( I_C = 20 \text{ mA}, V_{BE} = 0 ))</td>
<td>( V_{BRCES} )</td>
<td>60</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector-Base Breakdown Voltage (( I_C = 20 \text{ mA}, I_E = 0 ))</td>
<td>( V_{BRBBO} )</td>
<td>60</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter-Base Breakdown Voltage (( I_E = 2.0 \text{ mA}, I_C = 0 ))</td>
<td>( V_{BRBBO} )</td>
<td>4.0</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Cutoff Current (( V_{CB} = 30 \text{ Vdc}, I_E = 0 ))</td>
<td>( I_{CEO} )</td>
<td>—</td>
<td>—</td>
<td>1.0</td>
<td>mAdc</td>
</tr>
</tbody>
</table>

OFF CHARACTERISTICS

ON CHARACTERISTICS

DC Current Gain
(\( I_C = 500 \text{ mA}, V_{CE} = 5.0 \text{ Vdc} \))

\[ h_{FE} \]

20

—

80

—

NOTE:
1. This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.

(continued)
**ELECTRICAL CHARACTERISTICS — continued (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>Output Capacitance</td>
<td>( C_{ob} )</td>
<td>—</td>
<td>10</td>
<td>12</td>
<td>pF</td>
</tr>
</tbody>
</table>

**DYNAMIC 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>Common-Emitter Amplifier Power Gain</td>
<td>( G_{PE} )</td>
<td>12</td>
<td>13</td>
<td>—</td>
<td>dB</td>
</tr>
<tr>
<td>Collector Efficiency</td>
<td>( \eta )</td>
<td>50</td>
<td>60</td>
<td>—</td>
<td>%</td>
</tr>
</tbody>
</table>

**FUNCTIONAL TESTS (Figure 1)**

1. **Load Mismatch**
   \( V_{CC} = 28 \text{ Vdc}, P_{out} = 10 \text{ W}, f = 400 \text{ MHz} \)
   - No Degradation in Output Power

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**Figure 1. 400 MHz Test Circuit Schematic**

- **C1, C2, C3**: 1.0–20 pF Johanson Trimmer (JMC5501)
- **C3, C4**: 47 pF ATC Chip Capacitor
- **C5, C10**: 0.1 μF Erié Redcap
- **C7**: 0.5–10 pF Johanson Trimmer (JMC5201)
- **C9**: 0.018 μF Varitron Chip Capacitor
- **C9**: 200 pF UNELCO Capacitor
- **C11, C12**: 680 pF Feedthru
- **C13**: 1.0 μF, 50 Volt Tantalum Capacitor
- **D1**: 1N4001
- **L1**: 0.33 μH Molded Choke with Ferroxcube Bead (Ferroxcube 56–590–65/4B) on Ground End of Coil
- **L2**: 4 Turns #20 Enamel, 1/8” ID
- **L3**: 6 Turns #20 Enamel, 1/4” ID
- **L4**: Ferroxcube V/K200–19/4B
- **R1**: 5.1 Ω, 1/4 Watt
- **R2**: 120 Ω, 1.0 Watt
- **R3**: 20 Ω, 1/2 Watt
- **R4**: 47 Ω, 1/2 Watt
- **Z1**: Microstrip 0.1” W x 1.35” L
- **Z2**: Microstrip 0.1” W x 0.55” L
- **Z3**: Microstrip 0.1” W x 0.8” L
- **Z4**: Microstrip 0.1” W x 1.75” L
- **Board**: Glass Teflon, \( r_F = 2.56, t = 0.062” \)

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Rev. V1

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Figure 2. Output Power versus Frequency

Figure 3. Output Power versus Input Power

Figure 4. Output Power versus Supply Voltage

Figure 5. Power Gain versus Frequency
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Figure 6. Series Equivalent Impedance
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PACKAGE DIMENSIONS

MRF321

CASE 244-04
ISSUE J
MRF321

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