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>Collector Current — Peak</td>
<td>I_C</td>
<td>1.5</td>
<td>Adc</td>
</tr>
<tr>
<td>Total Device Dissipation @ T_A = 25°C (1)</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 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 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 mA, I_B = 0)</td>
<td>V_{BRBO}</td>
<td>60</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Emitter–Base Breakdown Voltage (I_E = 2.0 mA, I_C = 0)</td>
<td>V_{BREBO}</td>
<td>4.0</td>
<td>—</td>
<td>—</td>
<td>Vdc</td>
</tr>
<tr>
<td>Collector Cutoff Current (V_CB = 30 Vdc, I_E = 0)</td>
<td>I_{CBO}</td>
<td>—</td>
<td>—</td>
<td>1.0</td>
<td>mAdc</td>
</tr>
</tbody>
</table>

ON CHARACTERISTICS

DC Current Gain (I_C = 500 mA, V_{CE} = 5.0 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.
The RF Line NPN Silicon Power Transistor
10W, 400MHz, 28V

<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**

**FUNCTIONAL TESTS** (Figure 1)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>G_{PE}</th>
<th>η</th>
<th>Load Mismatch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common–Emitter Amplifier Power Gain</td>
<td></td>
<td>12</td>
<td>50</td>
<td>No Degradation in Output Power</td>
</tr>
<tr>
<td>Collector Efficiency</td>
<td></td>
<td>13</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

<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>(V_{cc} = 28 Vdc, P_{out} = 10 W, f = 400 MHz)</td>
<td>G_{PE}</td>
<td>12</td>
<td>13</td>
<td>---</td>
<td>dB</td>
</tr>
<tr>
<td>(V_{cc} = 28 Vdc, P_{out} = 10 W, f = 400 MHz)</td>
<td>η</td>
<td>50</td>
<td>60</td>
<td>---</td>
<td>%</td>
</tr>
</tbody>
</table>

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

C1, C2, C3 — 1.0–20 pF Johanson Trimmer (JMC 5501)
C3, C4 — 47 pF ATC Chip Capacitor
C5, C10 — 0.1 μF Eriq Redcap
C7 — 0.5–10 pF Johanson Trimmer (JMC 5201)
C6 — 0.018 μF Vtranon Chip Capacitor
C9 — 200 pF UNELCO Capacitor
C11, C12 — 690 pF Feedthru
C13 — 1.0 μF, 50 Volt Tantalum Capacitor
D1 — 1N4004
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 VK200-19/4B
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 0.65” L
Z3 — Microstrip 0.1” W x 0.8” L
Z4 — Microstrip 0.1” W x 1.75” L
Board — Glass Teflon, ε_r = 2.56, t = 0.062”
Input/Output Connectors — Type N

MA-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. Visit www.macom.com for additional data sheets and product information.
The RF Line NPN Silicon Power Transistor
10W, 400MHz, 28V

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

Figure 6. Series Equivalent Impedance
The RF Line NPN Silicon Power Transistor
10W, 400MHz, 28V

PACKAGE DIMENSIONS

MILLIMETERS | INCHES
---|---
A | 7.06 | 0.28 |
B | 0.20 | 0.08 |
C | 1.99 | 0.08 |
D | 5.48 | 0.22 |
E | 1.40 | 0.06 |
F | 1.52 | 0.06 |
G | 0.68 | 0.03 |
H | 11.55 | 0.45 |
I | 4.5 | 0.18 |
J | 3.69 | 0.15 |
K | 1.49 | 0.06 |
L | 2.92 | 0.11 |
M | 6.35 | 0.25 |
N | 5.08 | 0.20 |
O | 1.97 | 0.08 |

STYLE:
1. Emitter
2. Base
3. Collector
4. Collector

CASE 244-04
ISSUE J
The RF Line NPN Silicon Power Transistor
10W, 400MHz, 28V

M/A-COM Technology Solutions Inc. All rights reserved.
Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.