PIN Diodes for RF Switching and Attenuating

Technical Data

Features

• Low Harmonic Distortion
• Large Dynamic Range
• Low Series Resistance
• Low Capacitance

Description/Applications

These general purpose switching diodes are intended for low power switching applications such as RF duplexers, antenna switching matrices, digital phase shifters, and time multiplexer filters. The 5082-3188 is optimized for VHF/UHF bandswitching.

The RF resistance of a PIN diode is a function of the current flowing in the diode. These current controlled resistors are specified for use in control applications such as variable RF attenuators, automatic gain control circuits, RF modulators, electrically tuned filters, analog phase shifters, and RF limiters.

Outline 15 diodes are available on tape and reel. The tape and reel specification is patterned after RS-296-D.

Maximum Ratings

Junction Operating and Storage Temperature Range ......................................... -65°C to +150°C
Power Dissipation 25°C ........................................................................... 250 mW
(Derate linearly to zero at 150°C)
Peak Inverse Voltage (PIV) ................................................................. same as \( V_{BR} \)
Maximum Soldering Temperature ......................................................... 260°C for 5 sec
Mechanical Specifications

The HP Outline 15 package has a glass hermetic seal with dumet leads. The lead finish is 95-5 tin-lead (SnPb) for all PIN diodes. The leads on the Outline 15 package should be restricted so that the bend starts at least 1/16 inch (1.6 mm) from the glass body. Typical package inductance and capacitance are 2.5 nH and 0.13 pF, respectively. Marking is by digital coding with a cathode band.

General Purpose Diodes

Electrical Specifications at $T_A = 25^\circ$C

<table>
<thead>
<tr>
<th>Part Number 5082-</th>
<th>Maximum Total Capacitance $C_T$ (pF)</th>
<th>Minimum Breakdown Voltage $V_{BR}$ (V)</th>
<th>Maximum Residual Series Resistance $R_S$ (Ω)</th>
<th>Effective Carrier Lifetime $\tau$ (ns)</th>
<th>Reverse Recovery Time $t_{rr}$ (ns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Purpose Switching and Attenuating 3001</td>
<td>0.25</td>
<td>200</td>
<td>1.0</td>
<td>100 (min.)</td>
<td>100 (typ.)</td>
</tr>
<tr>
<td>3039</td>
<td>0.25</td>
<td>150</td>
<td>1.25</td>
<td>100 (min.)</td>
<td>100 (typ.)</td>
</tr>
<tr>
<td>1N5719</td>
<td>0.3**</td>
<td>150</td>
<td>1.25</td>
<td>100 (min.)</td>
<td>100 (typ.)</td>
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<tr>
<td>3077</td>
<td>0.3</td>
<td>200</td>
<td>1.5</td>
<td>100 (min.)</td>
<td>100 (typ.)</td>
</tr>
<tr>
<td>Fast Switching 3042</td>
<td>0.4*</td>
<td>70</td>
<td>1.0*</td>
<td>35 (typ.)*</td>
<td>5 (max.)</td>
</tr>
<tr>
<td>3043</td>
<td>0.4*</td>
<td>50</td>
<td>1.5*</td>
<td>35 (typ.)*</td>
<td>10 (max.)</td>
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<tr>
<td>Band Switching 3188</td>
<td>1.0*</td>
<td>35</td>
<td>0.6**</td>
<td>70 (typ.)*</td>
<td>12 (typ.)</td>
</tr>
<tr>
<td>Test Conditions</td>
<td>$V_R = 50$ V</td>
<td>$V_R = V_{BR}$ Measure</td>
<td>$I_R \leq 10$ mA</td>
<td>$I_F = 100$ mA</td>
<td>$I_R = 50$ mA</td>
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<tr>
<td></td>
<td>$* V_R = 20$ V</td>
<td>$* I_F = 20$ mA</td>
<td>$** V_R = 100$ V</td>
<td>$** I_F = 10$ mA</td>
<td>$* I_R = 250$ mA</td>
</tr>
<tr>
<td></td>
<td>$** V_R = 100$ V</td>
<td>$* I_F = 10$ mA</td>
<td>$f = 1$ MHz</td>
<td>$f = 100$ MHz</td>
<td>$* I_R = 6$ mA</td>
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<td></td>
<td>$V_R = 10$ V</td>
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</tbody>
</table>

Notes:
Typical CW power switching capability for a shunt switch in a 50 Ω system is 2.5 W. Part marking on glass package diodes, outline 15 is:

5082-xxxx
HPx
xxx
yww

For example, 1N5767 made in 1996 work week 35 would be marked:
HP5
767
635
RF Current Controlled Resistor Diodes

Electrical Specifications at TA = 25°C

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<thead>
<tr>
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<tbody>
<tr>
<td>5082-3080</td>
<td>1300 (typ.)</td>
<td>100</td>
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<td>1000</td>
<td>8**</td>
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<tr>
<td>1N5767*</td>
<td>1300 (typ.)</td>
<td>100</td>
<td>2.5</td>
<td>0.4</td>
<td>1000</td>
<td>8**</td>
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<tr>
<td>5082-3379</td>
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<td>0.4</td>
<td>8**</td>
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<tr>
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<td>2500 (typ.)</td>
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<td>3.5</td>
<td>0.4</td>
<td>1500</td>
<td>8**</td>
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Test Conditions
IF = 50 mA
VR = VBR
IR = 100 mA
f = 100 MHz

I_F = 0.01 mA
f = 100 MHz
I_F = 0.1 mA
f = 1 MHz
I_F = 1.0 mA
f = 1 MHz
I_F = 0.01 mA
f = 100 MHz
I_F = 0.1 mA
f = 100 MHz

Typical Parameters at TA = 25°C (unless otherwise noted)

*The 1N5767 has the additional specifications:
τ = 1.0 msec minimum
IR = 1 µA maximum at VR = 50 V
VF = 1 V maximum at IF = 100 mA.

Figure 1. Forward Current vs. Forward Voltage.

Figure 2. Typical RF Resistance vs. Forward Bias Current.

Figure 3. Typical RF Resistance vs. Forward Bias Current.

tau = 1.0 msec minimum
IR = 1 µA maximum at VR = 50 V
VF = 1 V maximum at IF = 100 mA.
Typical Parameters at $T_A = 25^\circ C$ (cont.)