HEWLETT hp PACKARD

COMPONENTS

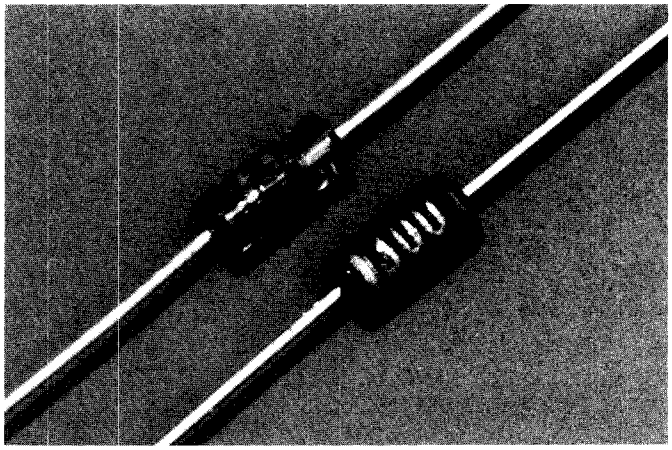
# PIN DIODES FOR RF SWITCHING AND ATTENUATING

5082-3001/02
HPND-4165/66 NEW
5082-3039(1N5719)
5082-3042/43
5082-3077
5082-3080(1N5767)
5082-3081
5082-3168/88



## Features

- **LOW HARMONIC DISTORTION**
- **LARGE DYNAMIC RANGE**
- **LOW SERIES RESISTANCE**
- **LOW CAPACITANCE**
- **LOW TEMPERATURE COEFFICIENT**
  - **Typically Less Than 20% Resistance Change from 25°C to 100°C**



## 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 multiplex filters. The 5082-3168/3188 are optimized for VHF/UHF bandswitching.

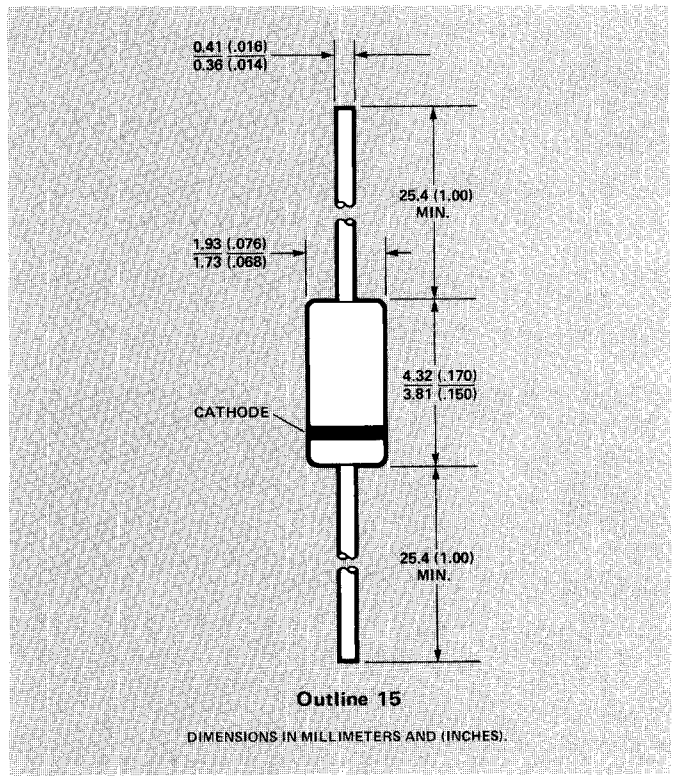
The RF resistance of a PIN diode is a function of the current flowing in the diode. These current controlled resistors are specified for use in control applications such as variable RF attenuators, automatic gain control circuits, RF modulators, electrically tuned filters, analog phase shifters, and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

| | Lead Finish | Body Finish |
|---|---|---|
| 5082-3001/02 | Tin | Painted |
| HPND-4165/66 | Tin | Painted |
| 5082-3039 (1N5719) | Tin | Painted |
| 5082-3042/43 | Gold | Painted |
| 5082-3077 | Tin | Clear |
| 5082-3080 (1N5767) | Tin | Clear |
| 5082-3081 | Tin | Clear |
| 5082-3168/88 | Tin | Clear |

## Mechanical Specifications

The HP Outline 15 package has a glass hermetic seal with dumet leads. The leads on the Outline 15 package should be restricted so that the bend starts at least 1/16 inch (1.6mm) from the glass body. With this restriction, Outline 15 package will meet MIL-STD-750, Method 2036, Conditions A (4 lbs., [1.8 kg.], tension for 30 minutes) and E. The maximum soldering temperature is 230° C for five seconds. Typical package inductance and capacitance are 2.5 nH and 0.13pF, respectively. Marking is by digital coding with a cathode band.

## Package Dimensions




**Outline 15**

DIMENSIONS IN MILLIMETERS AND (INCHES).

## Maximum Ratings at $T_{CASE}$ = 25°C

Junction Operating and Storage Temperature Range ..... -65°C to +150°C

*Operation of these devices within the above temperature ratings will assure a device Mean Time Between Failure (MTBF) of approximately 1 x $10^7$ hours.*

Power Dissipation ..... 250mW
(Derate linearly to zero at 150°C)

Peak Inverse Voltage (PIV) ..... $V_{BR}$

# General Purpose Diodes
## Electrical Specifications at $T_A$=25°C

| Part Number 5082- | Maximum Total Capacitance $C_T$ (pF) | Minimum Breakdown Voltage $V_{BR}$ (V) | Maximum Residual Series Resistance $R_S$ (Ω) | Minimum Effective Carrier Lifetime $\tau$ (ns) | Maximum Reverse Recovery Time $t_{rr}$ (ns) |
|---|---|---|---|---|---|
| GENERAL PURPOSE SWITCHING AND ATTENUATING | | | | | |
| 3002 | 0.2 | 300 | 1.0 | 100 | 100 (typ) |
| 3001 | 0.25 | 200 | 1.0 | 100 | 100 (typ) |
| 3039 | 0.25 | 150 | 1.25 | 100 | 100 (typ) |
| IN5719 | 0.3** | 150 | 1.25 | 100 | 100 (typ) |
| 3077 | 0.3 | 200 | 1.5 | 100 | 100 (typ) |
| FAST SWITCHING | | | | | |
| 3042 | 0.4* | 70 | 1.0* | 15 (typ) | 5 |
| 3043 | 0.4* | 50 | 1.5* | 15 (typ) | 10 |
| BAND SWITCHING | | | | | |
| 3188 | 1.0* | 35 | 0.6** | 40 (typ) | 12 (typ) |
| 3168 | 2.0* | 35 | 0.5** | 40 (typ) | 12 (typ) |
| Test Conditions | $V_R$ = 50V<br>*$V_R$ = 20V<br>**$V_R$ = 100V<br>f = 1 MHz | $V_R = V_{BR}$<br>Measure<br>$I_R \leq 10\mu A$ | $I_F$ = 100mA<br>*$I_F$ = 20mA<br>**$I_F$ = 10mA<br>f = 100 MHz | $I_F$ = 50mA<br>$I_R$ = 250mA | $I_F$ = 20mA<br>$V_R$ = 10V<br>90% Recovery |

Note: Typical CW power switching capability for a shunt switch in a 50Ω system is 2.5W.

# RF Current Controlled Resistor Diodes
## Electrical Specifications at $T_A$=25°C

| Part Number | Minimum Effective Carrier Lifetime $\tau$ | Minimum Breakdown Voltage $V_{BR}$ | Maximum Residual Series Resistance $R_S$ | Maximum Total Capacitance $C_T$ | High Resistance Limit, $R_H$ | | Low Resistance Limit, $R_L$ | | Maximum Difference in Resistance vs. Bias Slope, $\Delta\chi$ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Min. | Max. | Min. | Max. | |
| HPND-4165 | 100 | 100 | 1.5 | 0.3 | 1100 | 1660 | 16 | 24 | .04 |
| HPND-4166 | 100 | 100 | 1.5 | 0.3 | 830 | 1250 | 12 | 18 | .04 |
| 5082-3080* | 1300(typ) | 100 | 2.5 | 0.4 | 1000 | — | | 8** | |
| 5082-3081 | 2000(typ) | 100 | 3.5 | 0.4 | 1500 | | | 8** | |
| Units | ns | V | Ω | pF | Ω | | Ω | | — |
| Test Conditions | $I_F$=50mA<br>$I_R$=250mA | $V_R = V_{BR}$,<br>Measure<br>$I_R \leq 10\mu A$ | $I_F$=100mA<br>f=100mHz | $V_R$=50V<br>f=1mHz | $I_F$=0.01mA<br>f=100mHz | | $I_F$=1.0mA<br>**$I_F$=20mA<br>f=100mHz | | Batch Matched at $I_F$=0.01mA and 1.0mA f=100mHz |

*The 1N5767 has the additional specifications: $\tau$ = 1.0 μsec minimum
$I_R$ = 1 μA maximum at $V_R$ = 50V
$V_F$ = 1V maximum at $I_F$ = 100mA.

# Typical Parameters

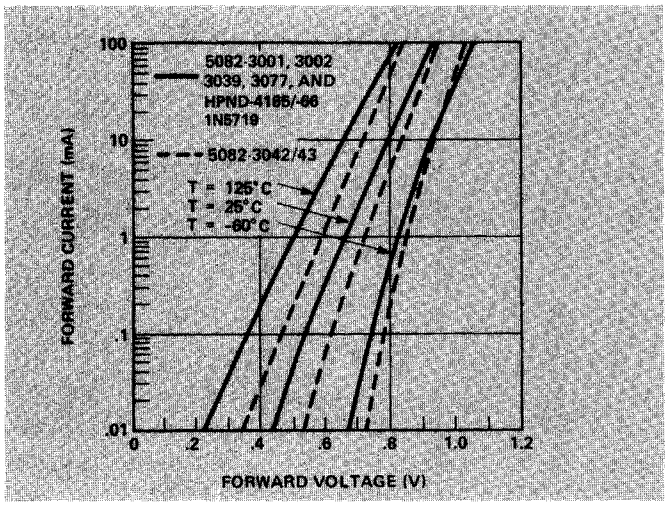



Figure 1. Typical Forward Current vs. Forward Voltage.

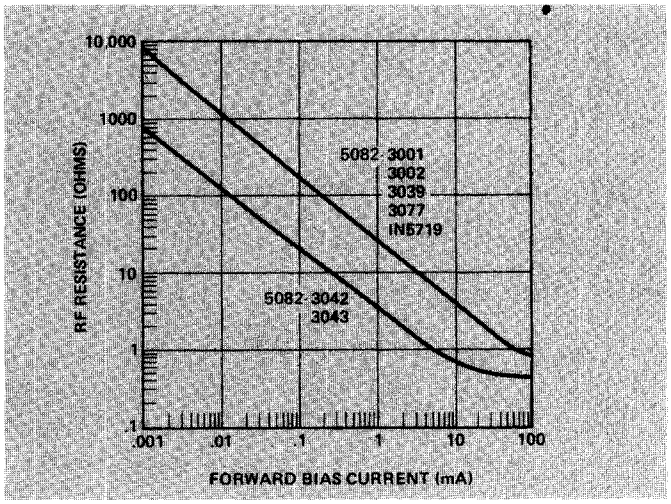



Figure 2. Typical RF Resistance vs. Forward Bias Current.

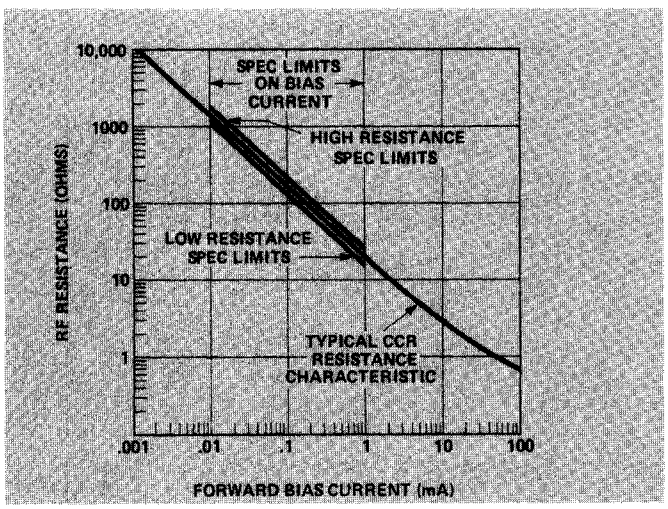



Figure 3. Typical RF Resistance vs. Bias for HPND-4165.

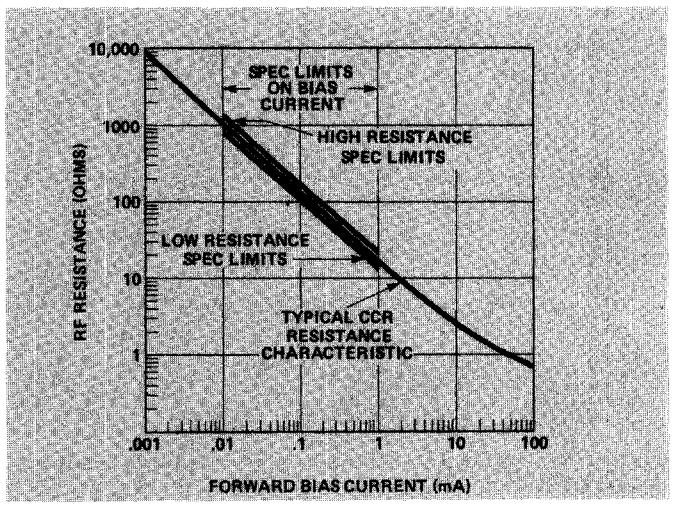



Figure 4. Typical RF Resistance vs. Bias for HPND-4166.

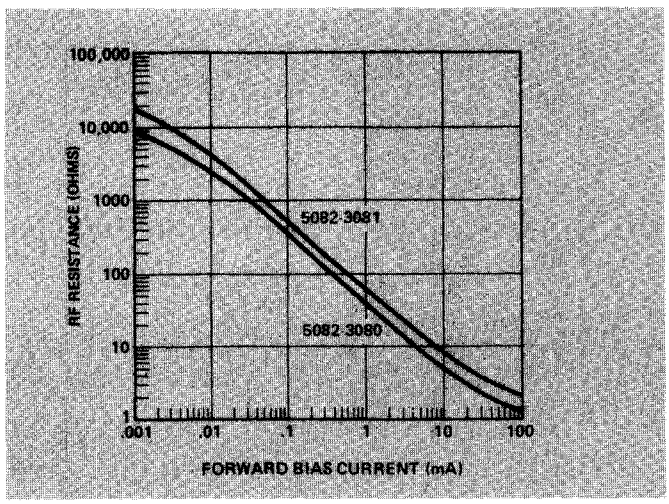



Figure 5. Typical RF Resistance vs. Forward Bias Current.

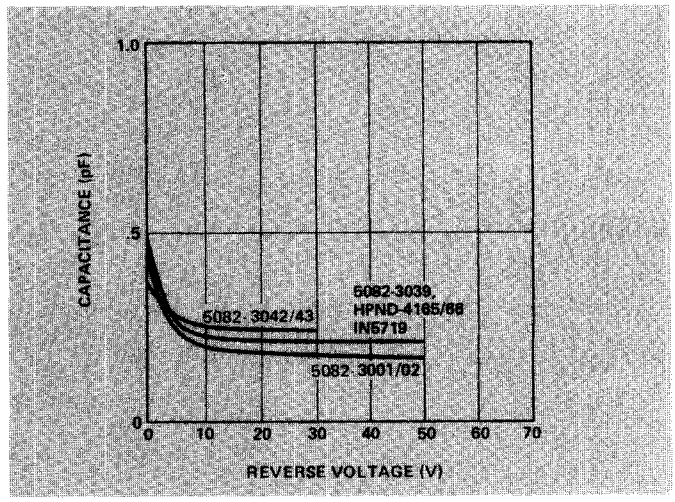



Figure 6. Typical Capacitance vs. Reverse Voltage.

# Typical Parameters (Continued)

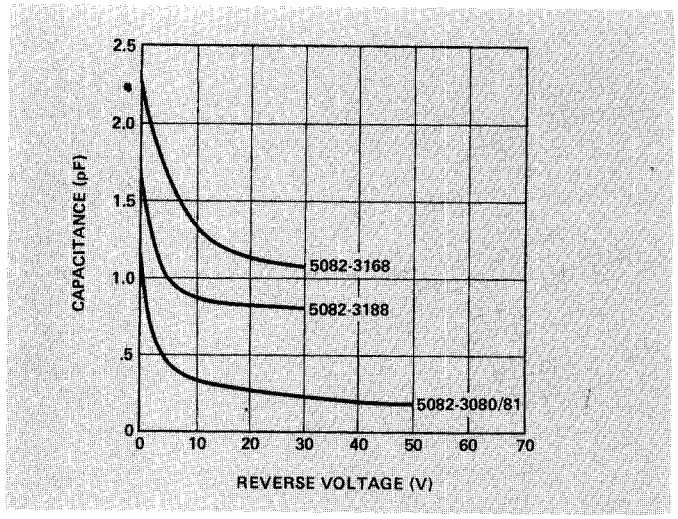



Figure 7. Typical Capacitance vs. Reverse Voltage 5082-3080, 3081, 3168, 3188.

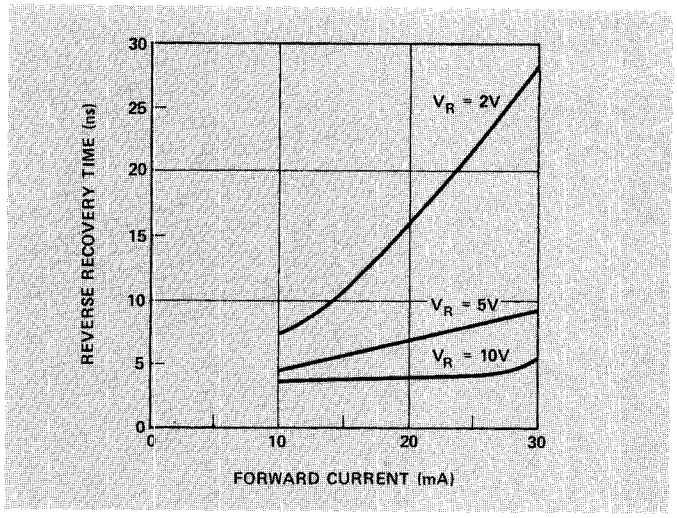



Figure 8. Typical Reverse Recovery Time vs. Forward Current for Various Reverse Driving Voltages, 5082-3042, 3043.

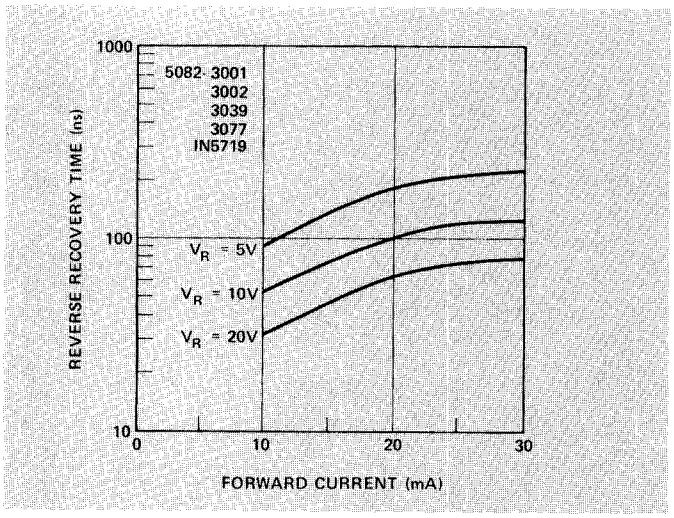



Figure 9. Typical Reverse Recovery Time vs. Forward Current for Various Reverse Driving Voltages.

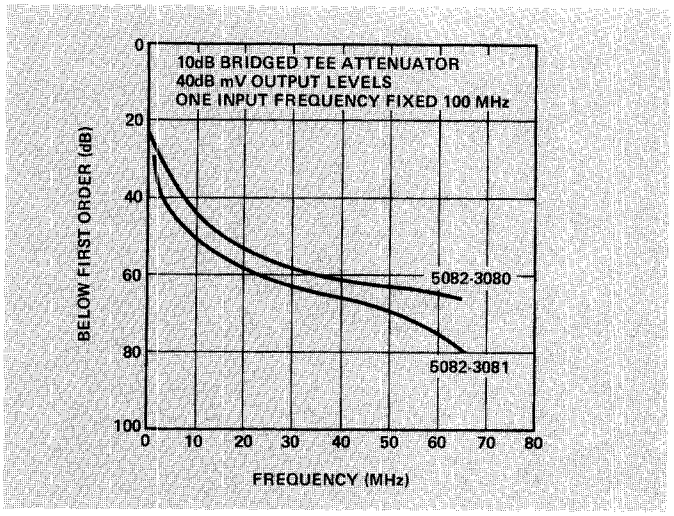



Figure 10. Typical Second Order Intermodulation Distortion.

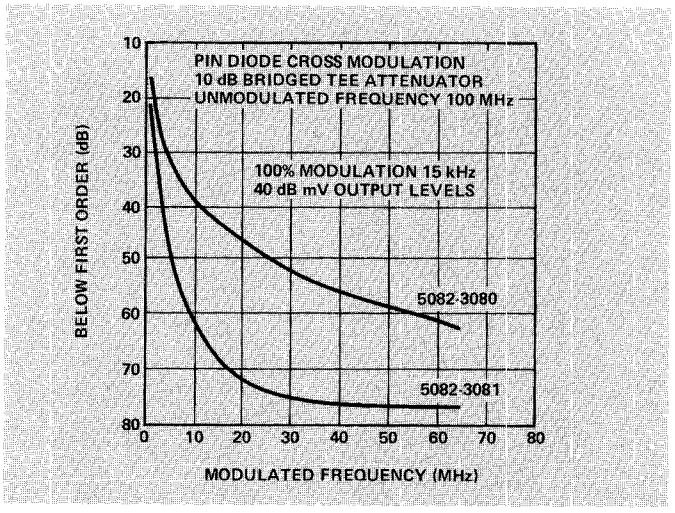



Figure 11. Typical Cross Modulation Distortion.