HEWLETT PACKARD

PIN Diodes for RF Switching and Attenuating

Technical Data

1N5719, JAN1N5719/TX
1N5767
5082-3001/02
5082-3039
5082-3042/43
5082-3077
5082-3080/81
5082-3168/88
5082-3379
HPND-4165/66

Features

- **Low Harmonic Distortion**
- **Large Dynamic Range**
- **Low Series Resistance**
- **Low Capacitance**

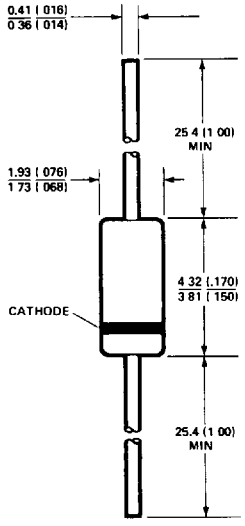
Description/ Applications

These general purpose switching diodes are intended for low power switching applications such as RF duplexers, antenna switching matrices, digital phase shifters, and time 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.

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

Note: The JAN Series 1N5719 devices are well suited for applications that require the high reliability of a JAN/TX device. The TX devices have solder dipped leads. The JAN1N5719 and JAN1N5719TX undergo testing per MIL-STD-750. More information about these devices can be obtained through your local Hewlett-Packard field sales engineer.



DIMENSIONS IN MILLIMETERS AND (INCHES)

Outline 15

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 diode products except the 5082-3042 and -3043, which have gold plated leads. 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°C

Part Number 5082-	Maximum Total Capacitance C_T (pF)	Minimum Breakdown Voltage V_{BR} (V)	Maximum Residual Series Resistance R_S (Ω)	Effective Carrier Lifetime τ (ns)	Reverse Recovery Time t_{rr} (ns)
General Purpose Switching and Attenuating					
3002	0.25	300	1.0	100 (min.)	100 (typ.)
3001	0.25	200	1.0	100 (min.)	100 (typ.)
3039	0.25	150	1.25	100 (min.)	100 (typ.)
1N5719	0.3**	150	1.25	100 (min.)	100 (typ.)
3077	0.3	200	1.5	100 (min.)	100 (typ)
Fast Switching					
3042	0.4*	70	1.0*	35 (typ.)*	5 (max.)
3043	0.4*	50	1.5*	35 (typ.)*	10 (max.)
Band Switching					
3188	1.0*	35	0.6**	70 (typ.)*	12 (typ.)
3168	2.0*	35	0.5**	70 (typ.)*	12 (typ.)
Test Conditions	V_R = 50 V *V_R = 20 V **V_R = 100 V f = 1 MHz	$V_R = V_{BR}$ Measure $I_R \leq 10$ μA	I_F =100 mA *I_F = 20 mA **I_F = 10 mA f = 100 MHz	I_F = 50 mA I_R = 250 mA *I_F = 10 mA *I_R = 6 mA	I_F = 20 mA V_R = 10 V 90% Recovery

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

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

Part Number	Effective Carrier Lifetime τ (ns)	Min. Breakdown Voltage V_{BR} (V)	Max. Residual Series Resistance R_S (Ω)	Max. Total Capacitance C_T (pF)	High Resistance Limit, R_H (Ω)		Low Resistance Limit, R_L (Ω)		Max. Difference in Resistance vs. Bias Slope, Δχ
					Min.	Max.	Min.	Max.	
HPND-4165	100 (min.)	100	1.5	0.3	1100	1660	16	24	0.04
HPND-4166	100 (min.)	100	1.5	0.3	830	1250	12	18	0.04
5082-3080	1300 (typ.)	100	2.5	0.4	1000			8**	
1N5767*	1300 (typ.)	100	2.5	0.4	1000			8**	
5082-3379	1300 (typ.)	50		0.4				8**	
5082-3081	2500 (typ.)	100	3.5	0.4	1500			8**	
Test Conditions	I_F = 50 mA I_R = 250 mA	$V_R = V_{BR}$, Measure $I_R \leq 10$ μA	I_F = 100 mA f = 100 MHz	V_R = 50 V f = 1 MHz	I_F = 0.01 mA f = 100 MHz		I_F = 1.0 mA I_F = 20 mA** f = 100 MHz		Batch Matched at I_F = 0.01 mA and 1.0 mA f = 100 MHz

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

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

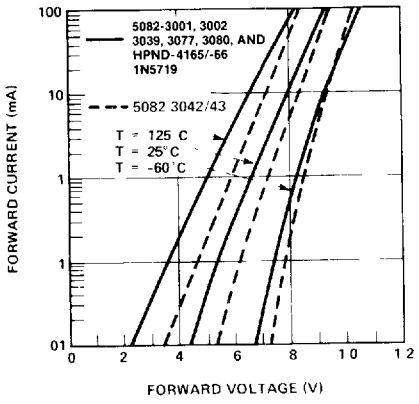


Figure 1. Typical Forward Current vs. Forward Voltage.

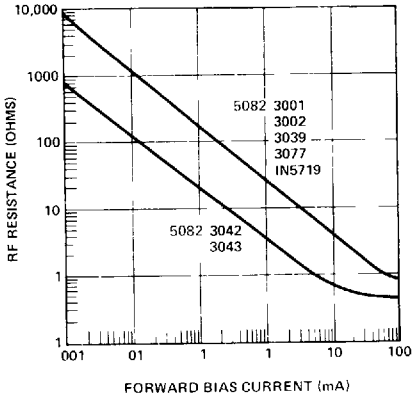


Figure 2. Typical RF Resistance vs. Forward Bias Current.

Typical Parameters at $T_A = 25°C$ (cont.)

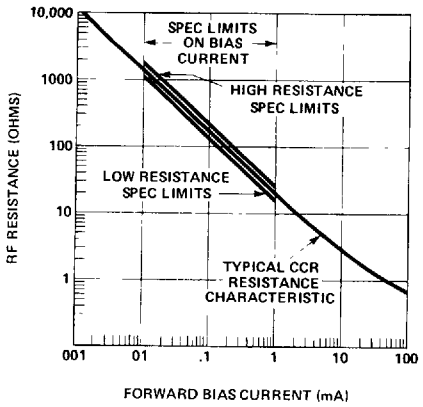


Figure 3. Typical RF Resistance vs. Bias for HPND-4165.

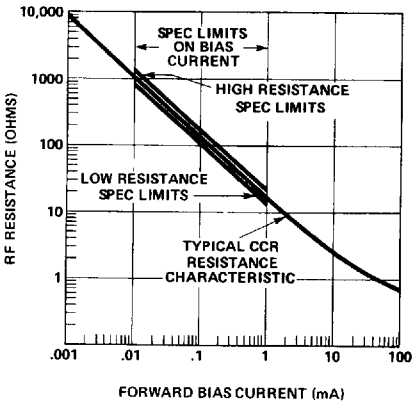


Figure 4. Typical RF Resistance vs. Bias for HPND-4166.

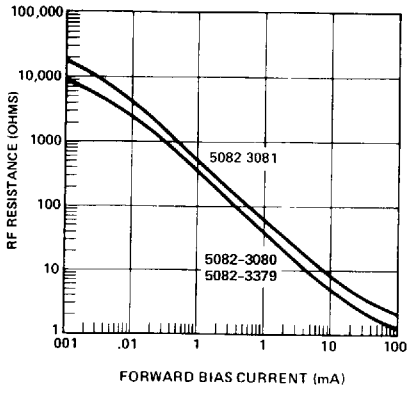


Figure 5. Typical RF Resistance vs. Forward Bias Current.

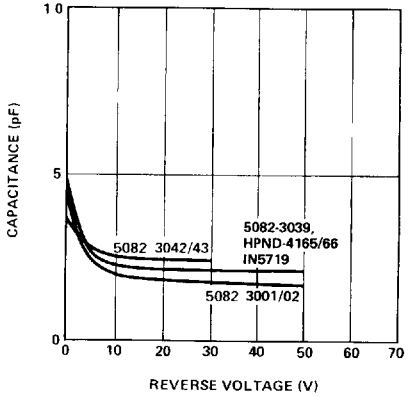


Figure 6. Typical Capacitance vs. Reverse Voltage.

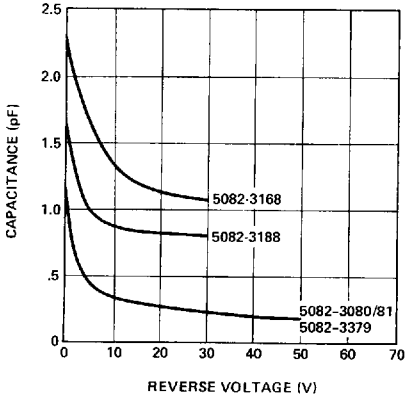


Figure 7. Typical Capacitance vs. Reverse Voltage.

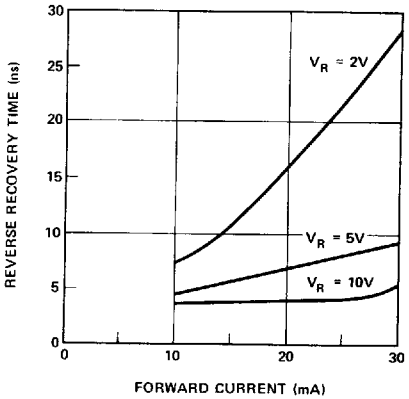


Figure 8. Typical Reverse Recovery Time vs. Forward Current for Various Reverse Driving Voltages, 5082-3042, 3043.

Typical Parameters at $T_A = 25°C$ (cont.)

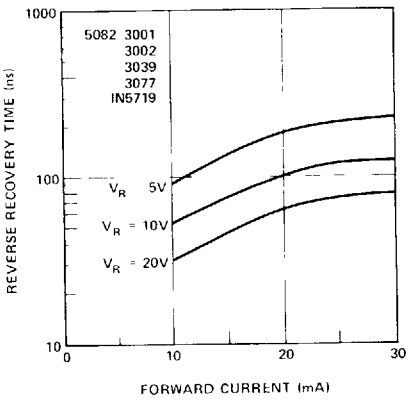


Figure 9. Typical Reverse Recovery Time vs. Forward Current for Various Reverse Driving Voltages.

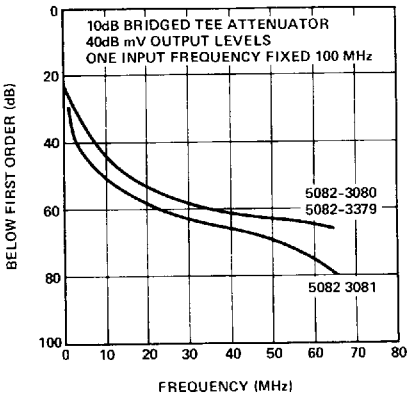


Figure 10. Typical Second Order Intermodulation Distortion.

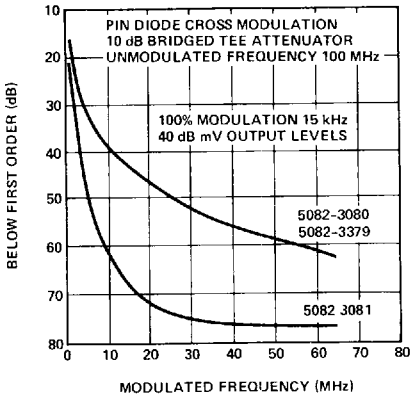


Figure 11. Typical Cross Modulation Distortion.