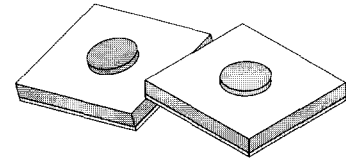


CSB7XXX, CSN92XX, CSG7203, CSG7204 Series

Features

- Optimized for a Wide Range of Applications
- Low Lifetime, Low Resistance for Medium Power
- Longer Lifetime, Low Resistance for Medium Power
- Low Lifetime, High Resistance for Attenuators and Modulators
- Long Lifetime for Very Low Frequency Attenuators and Switches
- Four Junction NIP Chips for Multi-Throw Switches
- High Reverse Breakdown Available for Multi-Kilowatt, Long Pulse Length Systems



Maximum Ratings

Storage Temperature: -65°C to $+200^{\circ}\text{C}$ Operating Temperature: -65°C to $+175^{\circ}\text{C}$

Description

Alpha's PIN chips are supplied in chip or packaged form for all types of low-loss applications in stripline, microstrip, coaxial, and waveguide circuits. They are silicon-oxide passivated for highest reliability and are also available in hermetically sealed metal-ceramic and glass packages for use in extreme environmental conditions. Alpha's High Voltage PIN diodes are passivated with not only the silicon-oxide, but also a layer of hard glass.

There are four basic type of RF switching applications, and Alpha offers diodes optimized for each type.

Fast Switching Diodes

Diodes for these applications have thin I-regions and low lifetime. Switching speed is under 5 ns, and the diodes have low series resistance at low bias current, offering a steep isolation versus bias characteristics. Suitable for 0.1 to 26 GHz at low power.

Slower Switching

These diodes have moderately thick I-regions and longer lifetime. They also have a steep isolation curve, but switch in 20 to 100 ns and can be used with low distortion at power levels to +30 dBm.

High Speed Modulators and Attenuators

These are low lifetime, thick I-region diodes with gradual isolation curves, making them more suitable for continuously variable attenuators. Low lifetime makes them ideal for switches or attenuators with high modulation rates.

Low Frequency Attenuators and Switches

For these applications, Alpha has developed thick I-region, long lifetime diodes. Minority carrier lifetime to 10 μs makes them suitable down to 100 MHz. They are also suitable for higher power pulsed or CW switches, duplexers, and phase shifters.

In the case of the multi-junction NIP chips, it can serve as the series diode for each of the ports of a multi-throw switch section. In the "off" state, the low capacitance of the diode provides high isolation between ports. In the "on" state, the forward biased resistance of the diode is low enough to provide low insertion loss.

The physical proximity of the junctions compared to a wavelength at the intended frequency of use makes the device look like a true point junction. This reduces undesirable parasitic effects that can result from the interconnection of several discrete devices. The low thermal resistance achieved through this approach produces a device usable for applications where the power dissipation of beam-lead equivalents might be exceeded.

The table of specifications list the microwave characteristics of the basic semiconductor chips. The circuit designer may use the data with the package parasitic characteristics, in modeling the diode in the particular circuit environment. For more information, refer to The PIN Diode Basics section in the Application Notes.

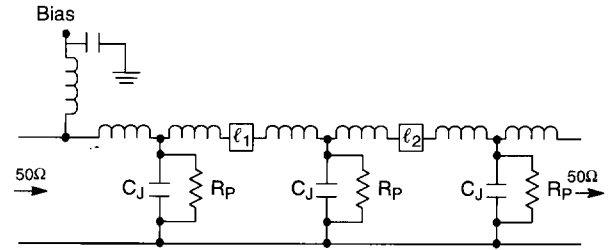


Figure 1. Zero or Reverse Bias Equivalent Circuit

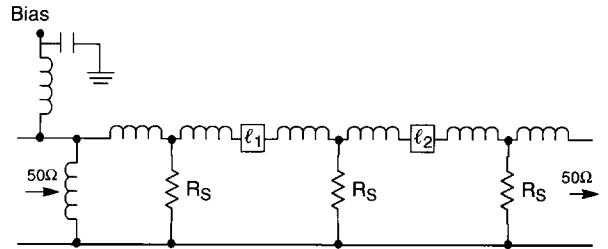


Figure 2. Forward Bias Equivalent Circuit

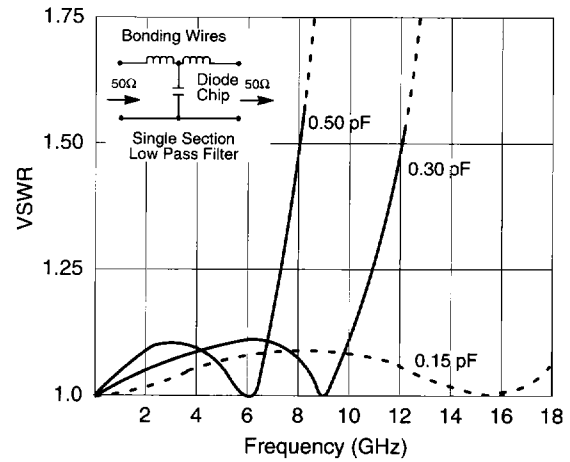


Figure 3. Typical VSWR for Low Pass Filters

Electrical Specifications

Part Number	V _B 10 μ A (V) Min.	C _J ¹ 50V (pF) Max.	Series Resistance ² (Ohms) Typ.			T _S ³ (ns) Typ.	T _L ⁴ (ns) Typ.	R _p ⁵ (K Ω) Typ.	O _{cw} ⁶ (C/W) Typ.	Outline Drawing Number
			1 mA	10 mA	50 mA					
Industry Standard										
CSB7151-01	150	0.12	6.0	2.2	1.0	100	400			149-815
CSB7152-01	70	0.16	2.5	1.0	0.75	5	40			150-813
CSB7156-01	35	0.5	1.5	0.5 Max.	0.4	12	50			149-815
Switching Diodes										
CSB7002-05	25	0.03-0.08*	3.0		1.5	5	20	10	100	150-806
CSB7002-06	25	0.8-0.13*	2.5		1.2	5	20	10	80	150-801
CSB7002-07	25	0.13-0.23*	2.0		1.0	5	20	10	80	150-801
CSB7002-01	80	0.03-0.08	8.0		1.8	5	50	3.0	80	150-801
CSB7002-02	80	0.08-0.13	2.5		1.5	5	80	1.5	60	150-801
CSB7002-03	80	0.13-0.23	2.5		1.2	5	80	1.5	40	150-801
CSB7002-04	80	0.23-0.33	2.0		1.0	5	100	1.0	40	150-802
CSB7003-01	100	0.03-0.08	2.5		1.5	20	150	2	80	150-801
CSB7003-02	100	0.08-0.13	2.5		1.2	20	200	2	60	150-801
CSB7003-03	100	0.13-0.23	2.5		0.9	20	250	2	40	150-802
CSB7003-04	100	0.23-0.33	2.5		0.8	20	300	1	40	150-802
High Speed Attenuator Diodes										
CSB7401-01	100	0.10 Max.	15		1.4	5	50	5	80	150-801
CSB7401-02	100	0.15 Max.	10		1.2	5	80	5	60	150-801
Low Frequency Attenuator Diodes										
CSB7201-01	200	0.10 Max.	50		1.5	20	750	3	50	149-802
CSB7401-02	200	0.20 Max.	30		1.2	20	800	3	40	149-802
CSB7401-03	200	0.5 Max.	20		0.7		1000	2	30	149-802
Multi-Junction NIP Diodes										
CSN9250	100	0.3 Max.		3.5		20	100			150-824
CSN9260	100	0.5 Max.		3.5		20	125			150-824
High Voltage Diodes^{7,10}										
CSG7203-01	500	0.20 Max.			0.6		2000		20	
CSG7203-02	500	0.40 Max.			0.4		2000		15	
CSG7203-03	500	0.60 Max.			0.35		3000		10	
CSG7203-04	500	1.0 Max.			0.25		3000		10	
CSG7204-01	1000	0.20 Max.			1.2		3000		20	
CSG7204-02	1000	0.35 Max.			0.8		4000		15	
CSG7204-03	1000	0.60 Max.			0.7		4000		10	
CSG7204-04	1000	1.5 Max.			0.35 ⁸		5000		5	
CSG7204-05	1000	3.0 Max.			0.35 ⁹		7000		3	
<ol style="list-style-type: none"> C_J is measured at 1 MHz, * at -6V, ** at -100V. R_S is measured at 500 MHz. T_S is the RF switching time from 90% to 10% and 10% to 90% transmission. The bias conditions are +10 mA/-10V. T_L is the minority carrier lifetime measured with I_F=10 mA, I_R=6 mA, recovering to -3 mA. Diode dissipative loss can be represented as a shunt resistance across the junction capacitance. Data presented for 3.0 GHz, zero bias. Typical CW thermal impedance in package 023-001. R_S for high voltage diodes is at 100 mA bias, 100 MHz min, C_J is at -100V, 1 MHz. I_F = 150 mA, 100 MHz. I_F = 250 mA, 100 MHz. Packages available upon request. 										

Performance Data for Low Power PIN Switching and Attenuator Diodes

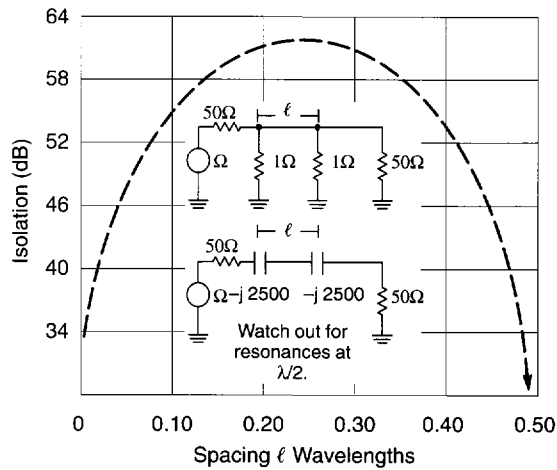


Figure 4. Isolation as a Function of PIN Diode Spacing

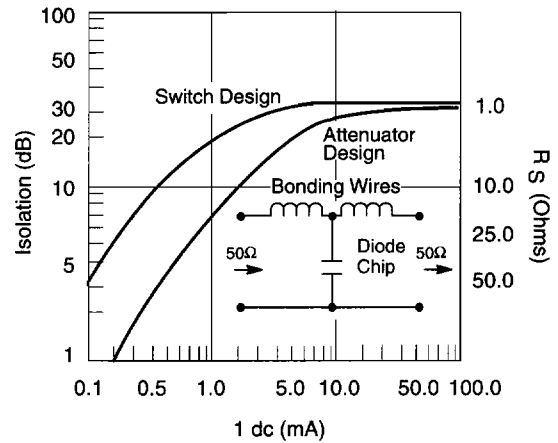


Figure 6. General Curves of Isolation and R_S vs. Bias for Attenuator and Switch Designs

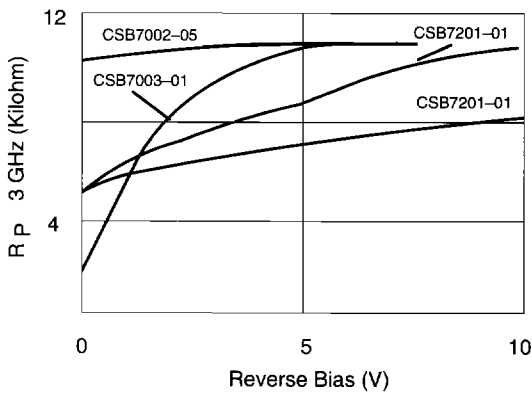


Figure 5. Parallel Resistance vs. Bias

Performance Data for High Voltage PIN Switching Diodes

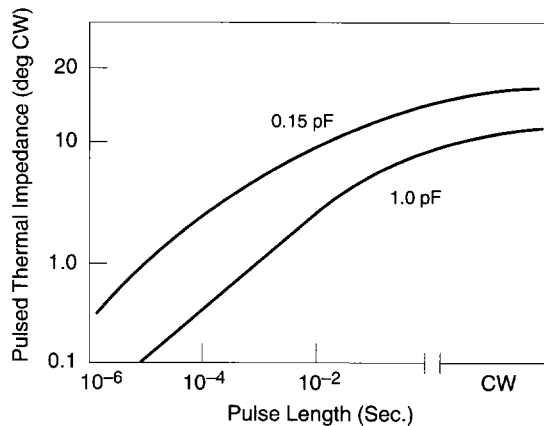


Figure 7. Pulsed Thermal Impedance for CSG7203, CSG7204 Series

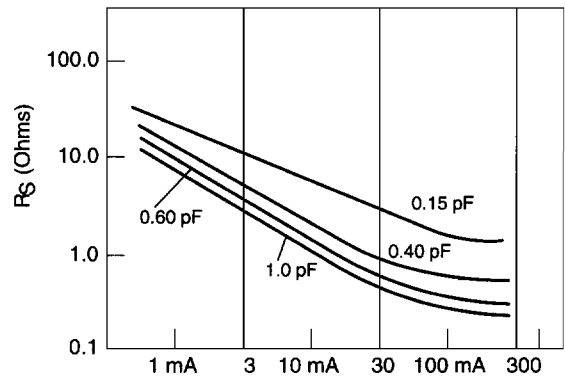
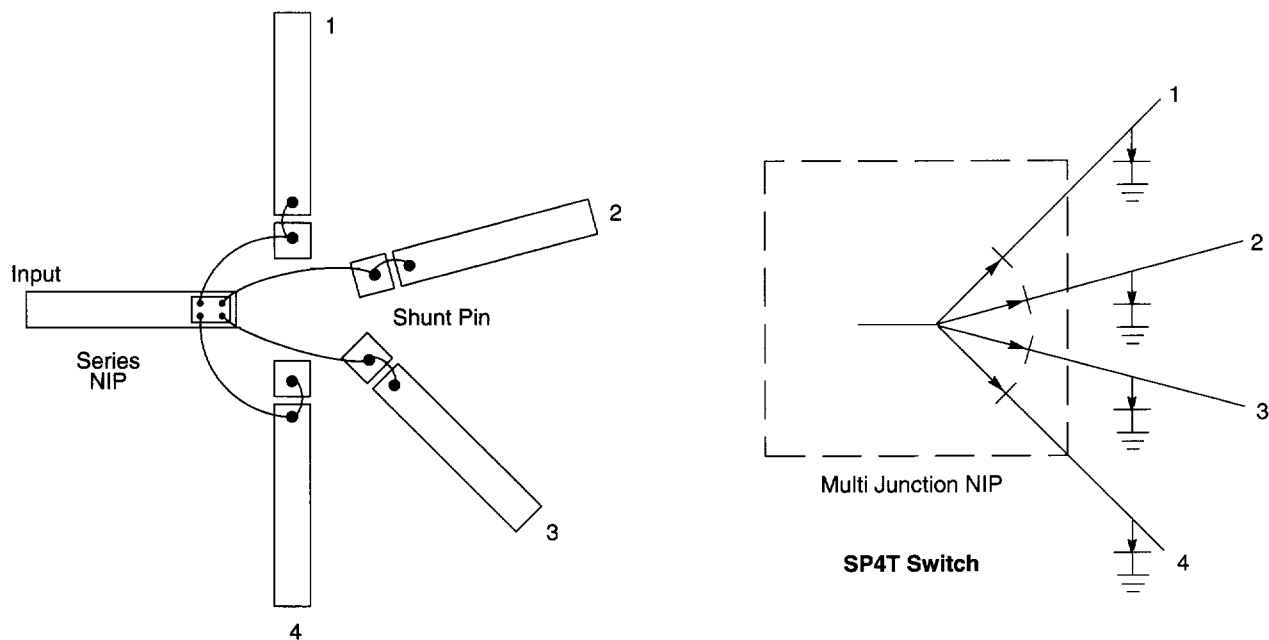


Figure 8. Typical Series Resistance vs. Bias Current CSG7204

Typical Application SP4T Switching for PIN/NIP Switching Diode Multi-Junction Chips



Ordering Information

To order the chip alone simply use the part number as it is listed in the table of electrical specifications. To order a packaged diode, add the six digit package number to the part number.

The more commonly used packages are outline drawing numbers 023-001, 247-001 and 325-001. Refer to the Outline Drawing section for the dimensions of each package.