

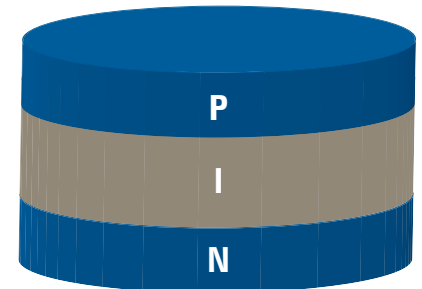
Introduction

SPD9441 Radiation Detector PIN Diodes are high efficiency detectors of nuclear and electromagnetic radiation including gamma radiation, electron radiation and x-rays. Utilizing a high reliability construction method, the SPD9441 has an operating and storage temperature range of -65°C to $+200^{\circ}\text{C}$ and will survive liquid to liquid cryogenic thermal cycling of -180°C to $+100^{\circ}\text{C}$. This device is a direct replacement for the UM9441 and is characterized by a high photocurrent sensitivity and ceramic frit glass construction noted for high reliability.

Description

The PIN diode silicon die is characterized with a high resistivity I-layer (intrinsic layer) and long carrier lifetime. The P+ and N+ region are simultaneously diffused into opposite sides of the I-layer producing a PIN structure. The die size is maximized for the package size to provide maximum protection from high radiation levels and damage caused by neutron bombardment. When the SPD9441 is exposed to radiation, electron-hole pairs are generated across the I-layer. With the SPD9441 reverse biased, generated electrons are moved to the P+ layer while the generated holes are moved to the N+ layer. This movement of the electron-hole pairs out of the I-layer is measured as photocurrent. The SPD9441 PIN structure is a more efficient detector than a standard P-N junction device because the high resistivity PIN structure enhances detector sensitivity as well as photocurrent accuracy. This structure also minimizes the effects of permanent damage caused by neutrons or other high energy radiation.

PIN Diode Chip Structure



The SPD9441 PIN diode has a double tungsten plug construction with high temperature Category I metallurgical bonds to the die. The silicon die is passivated and sealed with high temperature ceramic frit glass and has solid silver leads or copper end tabs to complete the high reliability hermetic package. The SPD9441 is available in axial lead, surface mount square tab, and button tab packages.

MAXIMUM RATINGS

RATING	SYMBOL	VALUE	UNIT
Peak Repetitive Reverse Voltage DC Blocking Voltage	V_R	100	Volts
Photocurrent	I_P	5	Amps
Operating & Storage Temperature	T_{OP} & T_{STG}	-65 to +200	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS

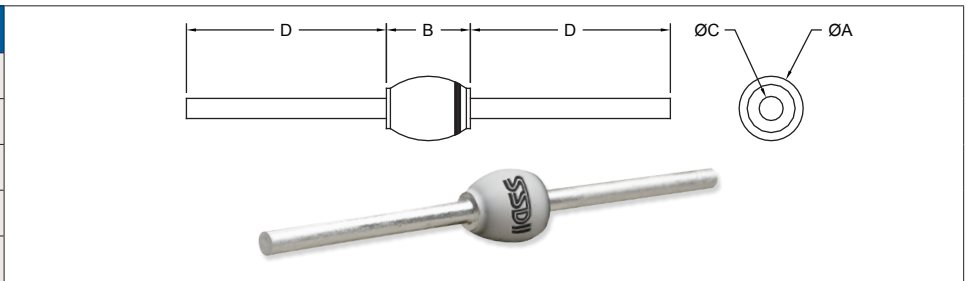
CHARACTERISTICS	SYMBOL	MIN	TYP	MAX	UNIT
Photocurrent, Bias = 50V min 10^6 (RAD(Si)/Sec) Gamma Radiation *Calc.	I_P^*	4	6	--	nQ/(RAD(Si)) mAdc
Capacitance ($V_R = 50\text{V}$, $f = 1\text{MHz}$)	C_J	--	--	11	pF
Reverse Leakage Current ($V_R = 50\text{V}$)	I_R	--	--	200	nAdc
Breakdown Voltage ($I_R = 100\mu\text{A}$)	BV_R	100	--	--	Vdc



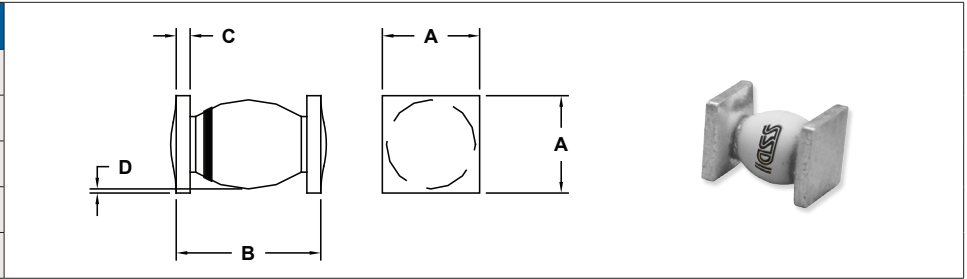
SPD9441 Radiation Detector PIN Diode

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Axial		
DIM	MIN	MAX
A	--	.200"
B	--	.300"
C	.037"	.041"
D	.75"	--



Surface Mount Square Tab (SMS)		
DIM	MIN	MAX
A	.195"	.200"
B	--	.350"
C	.019"	.027"
D	.002"	--



Button Tab		
DIM	MIN	MAX
A	--	.310"
A1	--	.020"
ØB	--	.190"
C	.190"	.210"
C1	.280" REF	
P1	.145"	.155"
P2	.055"	.075"
P3	.090"	.110"
P4	.060" REF	
T	.008"	.012"
R	.015" REF	

