

# Dual Photodiode PR5001

## 2 Photodiodes in One Chip for Spatially Resolved Light Detection.

The PR5001 is a dual-element Si photodiode moulded into a small plastic leadless optical package. Produced as one chip, the photodiodes offer a very good symmetry, low dark current and high sensitivity.

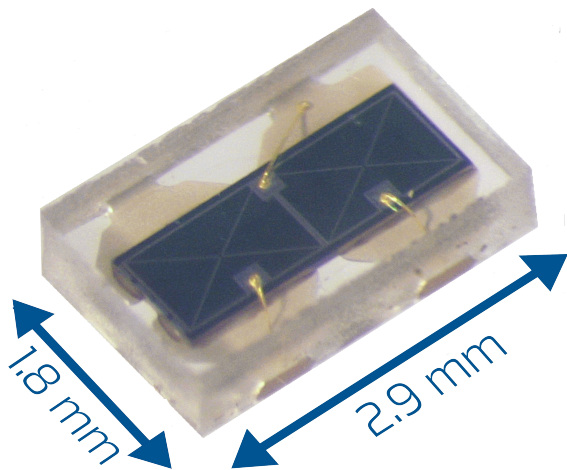
Apart from the standard version **PR5001**, the **PR5001-ARC** features an antireflective layer, smoothing the spectral sensitivity and providing a high good matching from part to part.

### FEATURES

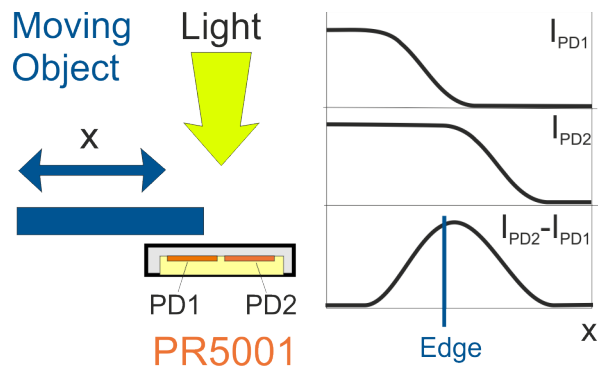
- Low dark current
- Low capacitance
- Good matching between photodiodes

### TYPICAL APPLICATIONS

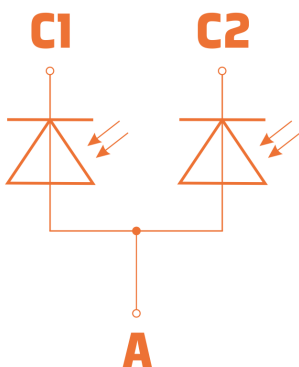
- Laser beam alignment
- Opto encoders
- Position detection



### EDGE DETECTOR



### CIRCUIT



### KEY CHARACTERISTICS

Parameter	Conditions	Typ	Units
Spectral response range		500 - 1000	nm
Peak sensitivity	820 nm	0.53	A/W
Area	C1, C2	0.84	mm <sup>2</sup>
Dark current I <sub>d</sub>	T = 27°C	10	pA
Terminal capacitance C <sub>t</sub>	V <sub>r</sub> = 10 V f = 1 MHz	34	pF

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## Electrical and optical Characteristics

All characteristics apply to both PR5001 and PR5001-ARC, unless noted otherwise.

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Min	Max	Units
$T_A$	Operating ambient temperature	-40	85	°C
$T_S$	Storage temperature	-40	85	°C
$T_{peak}$	Soldering peak temperature		260	°C
$P_{tot}$	Total Power Dissipation		100	mW

### ELECTRICAL CHARACTERISTICS

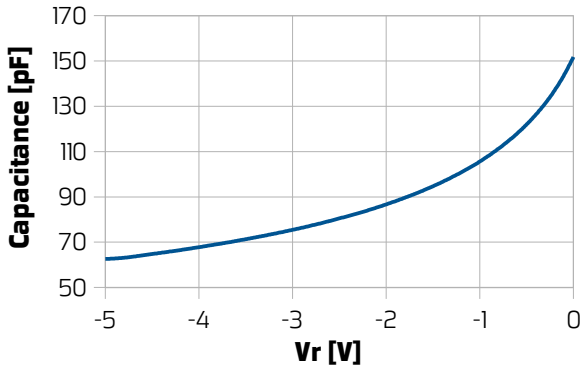
$T_a = 27^\circ\text{C}$ , unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$V_{r(A-C)}$	reverse voltage $V(A) - V(C)$				28	V
$A_{PD}$	active area (geometrical)	C1, C2 width		1.145		$\mu\text{m}$
		height		737		$\mu\text{m}$
		inactive area (pads)		0,05		$\text{mm}^2$
		effective active area		0.79		$\text{mm}^2$
$I_d$	dark current	C1, C2 $V_r = 10\text{V}$		10		$\mu\text{A}$
$\Delta I_d/\Delta T$	temperature coefficient of dark current	C1, C2 $V_r = 10\text{V}$		10.0		%/K
$\lambda_{peak}$	peak sensitivity wavelength	C1, C2		820		nm
$S_{peak}$	peak sensitivity	C1, C2		0.53		A/W
$C_{j0}$	zero-bias junction capacitance	C1, C2 $V_r = 0\text{V}$ , $f = 1\text{MHz}$		125		pF
$C_j$	biased junction capacitance	C1, C2 $V_r = 10\text{V}$ , $f = 1\text{MHz}$		34		pF

# Dual Photodiode PR5001

## Properties and Schematic Assembly

### CAPACITANCE VS. REVERSE VOLTAGE



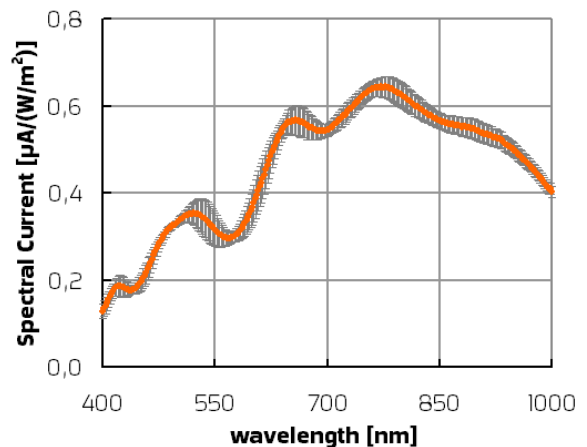
The graph on the left shows the dependency of the terminal capacitance of C1 or C2 vs. the reverse voltage.

### SPECTRAL SENSITIVITY

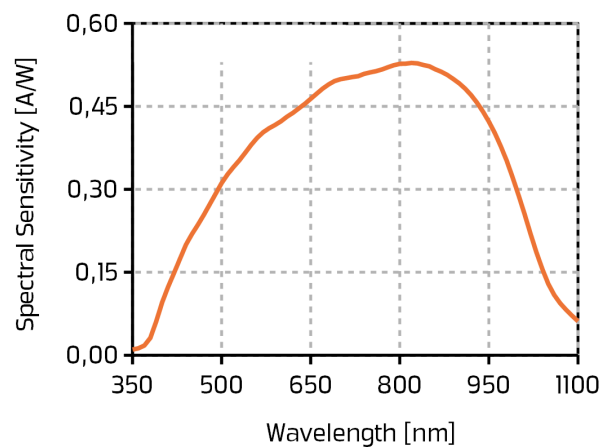
The sensitivity of a single photodiode (size: 0.75 x 1.2 mm<sup>2</sup>) is given as a function of wavelength obtained with 0 V forward bias (insignificant changes with voltages up to 10 V). The measurement was conducted with a halogen lamp. A well-known diode was used to calibrate the obtained current to a spectral irradiation density of 1 W/m<sup>2</sup>.

The periodical peaks for **PR5001** can be explained by interference effects within the layers on top of the photodiode. The orange curve illustrates the the average current measured from 10 photodiodes. In gray, the corresponding standard deviation is given. However, from part to part the wavelength corresponding to minima and maxima may vary.

For **PR5001-ARC** these layers are removed, and it features an antireflective layer instead. Therefore there are nearly no interference effects in the wavelength range shown here.



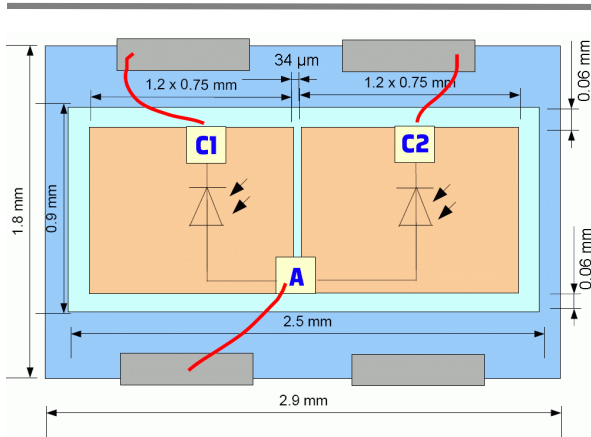
**Spectral sensitivity of PR5001 given in  $\mu\text{A}/(\text{W}/\text{m}^2) = (\text{A}/\text{W}) / 0.79$**



**Spectral sensitivity of PR5001-ARC given in  $\text{A}/\text{W} = 0.79 \cdot \mu\text{A}/(\text{W}/\text{m}^2)$**

# Dual Photodiode PR5001

## DIMENSIONAL OUTLINES AND LAYOUT



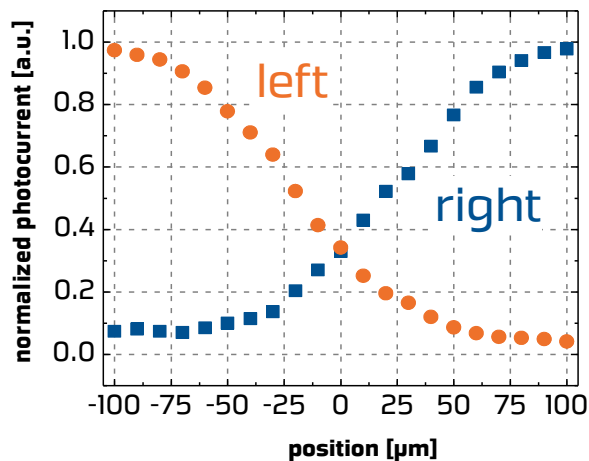
## PIN DESCRIPTION

Pin No.	Pin Name	PIN Function Description
1	A	Common Anode
2		Not connected
3	C2	Cathode photo diode 2
4	C1	Cathode photo diode 1

- = bond wires
- = pad area (178 x 192 µm<sup>2</sup>)
- = active area (0.75 x 1.2 mm<sup>2</sup>)
- = die (0.9 x 2.5 mm<sup>2</sup>)
- = clear package (leadless)

## Channel separation

### WHILE MOVING A BEAM FROM ONE TO THE OTHER PHOTODIODE

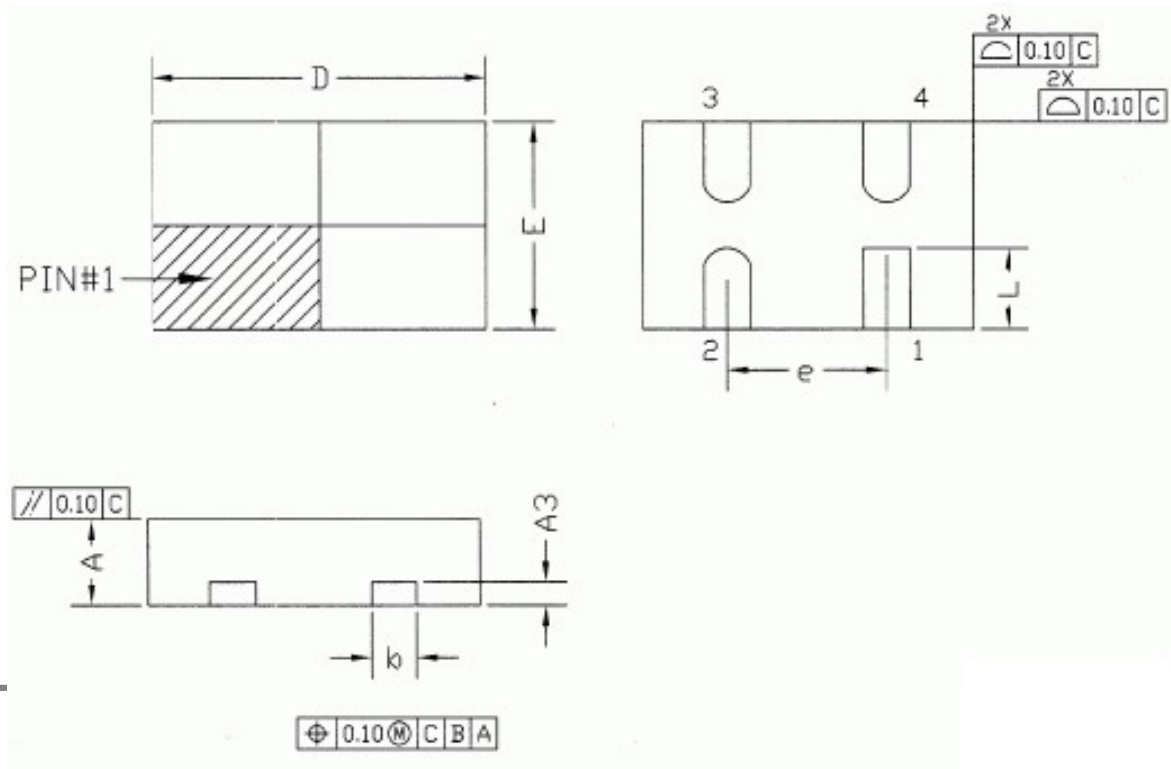


The sensitivity of the crossover between both single photodiodes was measured in detail. To resolve the crossover from one photodiode to the other, increments of 10 µm were performed using monochromatic light with a wavelength of about 660 nm (red) and a focus point with a diameter of about 100 µm. 0 µm correspond to the center of the die. The photocurrent was measured with an applied reverse voltage of about 4 V.

Considering a beam diameter of 100 µm and a gap between both photodiodes of > 30 µm (50 µm between inner of metal rings along the edge of each photodiode), the observed behaviour is consistent with a sharp channel separation.

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## Available Package



### DIMENSIONS

SYMBOL	COMMON					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	SEE VARIATIONS					
A3	0.195	0.203	0.211	0.0077	0.0080	0.0083
b	0.35	0.40	0.45	0.014	0.016	0.018
D	2.80	2.90	3.00	0.110	0.114	0.118
E	1.70	1.80	1.90	0.066	0.070	0.074
e	1.40 BSC.			0.055 BSC.		
L	0.60	0.70	0.80	0.023	0.027	0.031

PAD SIZE	VARIATIONS 'A'					
	DIMENSIONS MILLIMETER			DIMENSIONS INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
DFN	0.90	1.00	1.10	0.035	0.039	0.043

### NOTES

1. DIMENSION AND TOLERANCING CONFORM TO ASME Y14.5M-1994.
2. CONTROLLING DIMENSIONS IN MILLIMETER, CONVERTED INCH DIMENSION ARE NOT NECESSARILY EXACT.
3. DIMENSION  $b$  APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.18 AND 0.30 MM. FROM TERMINAL TIP.
4. INSULATION THICKNESS OF OVERLAP ARE USER DEFINED.
5. INSULATION NOT COMPLETELY SHOWN FOR REASONS OF CLARITY.

# Dual Photodiode PR5001

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## PREMA Semiconductor GmbH

Robert-Bosch-Str. 6

55129 Mainz Germany

Phone: +49-6131-5062-0

Fax: +49-6131-5062-220

Email: [prema@prema.com](mailto:prema@prema.com) Web site: [www.prema.com](http://www.prema.com)

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