

Photodiode PR5030



Two Triangular shaped Silicon Junctions on a single Die

PR5030 is a dual silicon photodiode with two separate cathodes and one common anode. Each photodiode has a triangular shape to form an interface along the diagonal of the die. Therefore, the two segments allow to resolve a position of a slit or an edge above. Both types offer a low dark current combined with a high sensitivity. The dies are molded into a small plastic leadless optical DFN package.

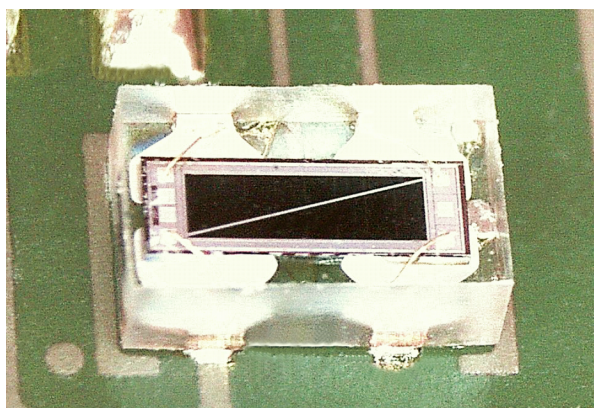
FEATURES

- triangular-shaped photodiodes for higher variability
- low dark current
- anti-reflective coating (ARC)

TYPICAL APPLICATIONS

- LASER beam alignment
- position detection
- ambient light detection

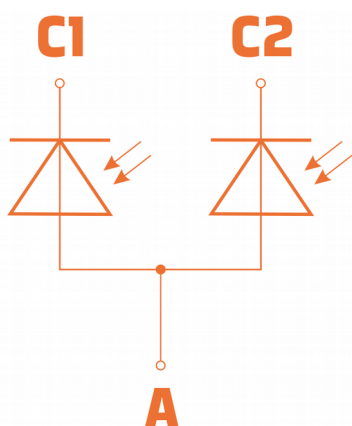
PR5030



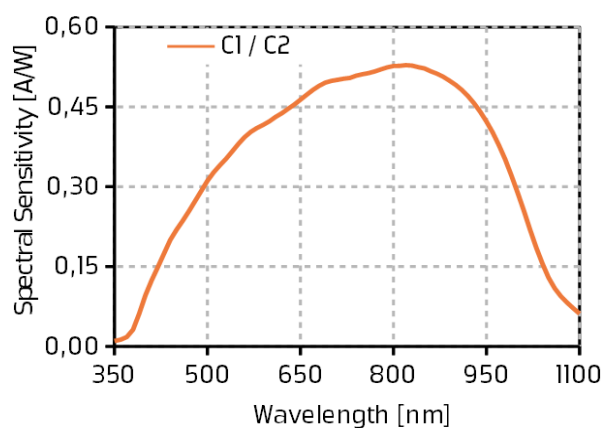
KEY CHARACTERISTICS

Parameter	Typ	Unit
package size	2.9 x 1.8 x 0.9	mm ³
photodiode size	2 x 0.535	mm ²
peak wavelength	830	nm
dark current @ 40°C / Vr = 1V	14	pA
capacitance @ Vr = 2 V	40	pF

CIRCUIT



SPECTRAL SENSITIVITY



Photodiode PR5030



Electrical and optical Characteristics

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Min	Max	Units
V_{C-A}	$V(C1, C2) - V(A)$	-0.3	35	V
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

$T_a = 27^\circ\text{C}$

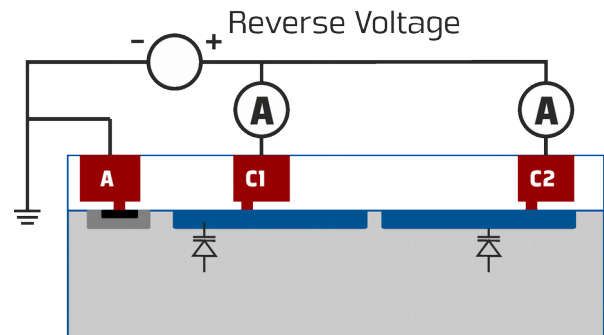
Symbol	Parameter	Conditions	Min	Typ	Max	Units
T_{amb}	operating temperature range		-40		85	°C
$V_{r(C-A)}$	reverse voltage $V(C1, C2) - V(A)$				30	V
A_{PD}	active area (geometrical)	C1 / C2		0.535		mm ²
$I_{d/A}$	dark current (C1/C2)	$T_{amb} = 40^\circ\text{C}$	$V_{r(C-A)} = 1\text{ V}$	14		pA
			$V_{r(C-A)} = 30\text{ V}$	44		pA
		$T_{amb} = 80^\circ\text{C}$	$V_{r(C-A)} = 1\text{ V}$	1.7		nA
			$V_{r(C-A)} = 30\text{ V}$	2.8		nA
$\Delta I_d / \Delta T$	temperature coefficient of I_d @ $T_{amb} > 40^\circ\text{C}$	$V_{r(C-A)} = 1\text{ V}$		12.5		%/K
		$V_{r(C-A)} = 30\text{ V}$		11.5		%/K
λ_{peak}	peak sensitivity wavelength			830		nm
S_{peak}	peak sensitivity			0.5		A/W
C_{j0}	zero-bias junction capacitance	$f = 1\text{ MHz}$		79		pF

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Dark Current

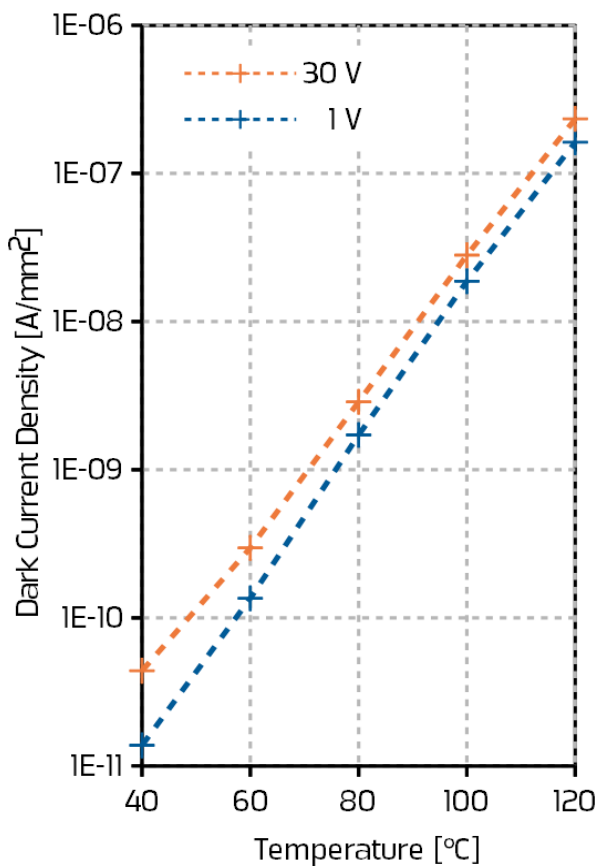
MEASUREMENT SETUP

Dark currents of the C1- and C2-photodiode are measured as a function of reverse voltage and temperature. The substrate (A) is connected to ground, while a positive voltage is applied to Cx. Symmetric photodiodes C1 and C2 result in similar dark currents. The dark current for a single photodiode is shown.



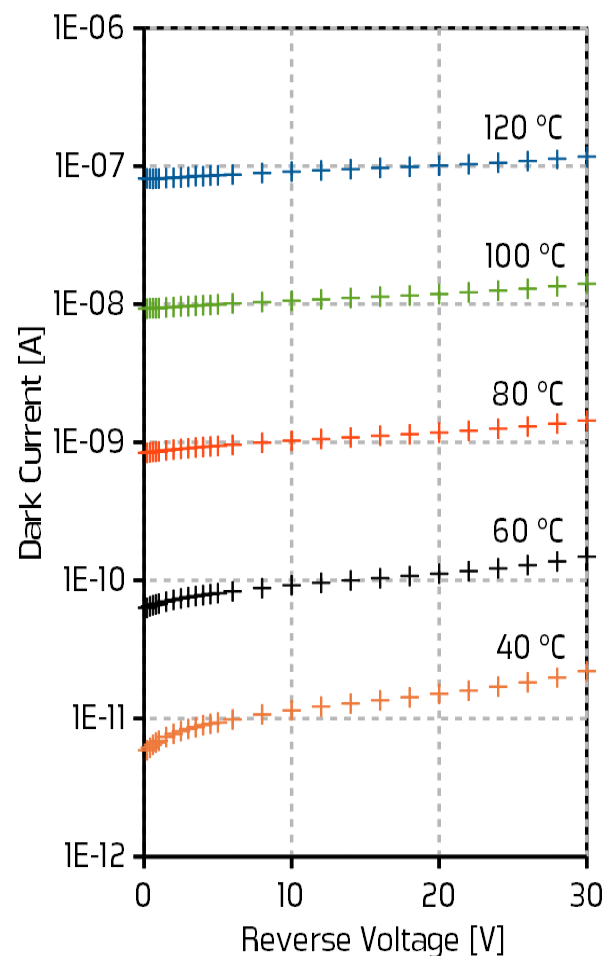
OVER TEMPERATURE

Dark currents for one triangular shaped photodiode of the PR5030 are shown that were measured at reverse voltages of 1 V (blue) and 30 V (orange). In general, the dark current rises by a factor of about 10 every 20 °C.



AS A FUNCTION OF REVERSE VOLTAGE

The diagram shows the dependency of dark currents on reverse voltage at different temperatures (given in the diagram). Below 30 V the dark currents barely vary with reverse voltage.



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Electrical and optical Characteristics

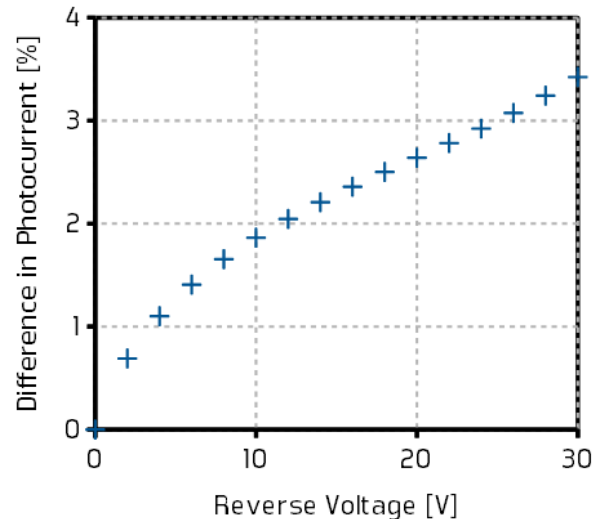
SENSITIVITY AFFECTED BY REVERSE VOLTAGE

The spectral sensitivity increases by a few percent when reverse voltages are applied to the photodiodes.

The diagram shows the relative deviation of the photocurrent to the zero-bias value. The deviation changes insignificantly when illumination is changed.

Please notice that the relative deviation increases if the adjacent photodiode is not biased.

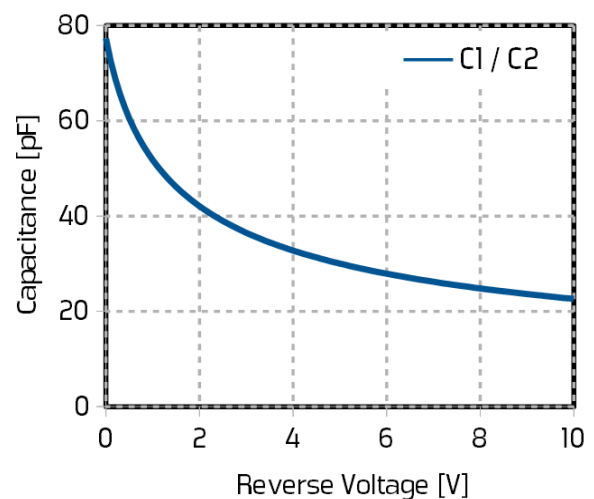
The measurement setup was identical to the one used to determine dark currents above.



CAPACITANCE

The diagram illustrates the dependency of the capacitances on the applied reverse voltage of the PR5030. The capacitance of the photodiodes is proportional to area and decrease with reverse voltage due to the reduction of the space-charge region.

Taking the area of each photodiode into account leads to a capacitance density of about 158 pF/mm² at zero reverse voltage.

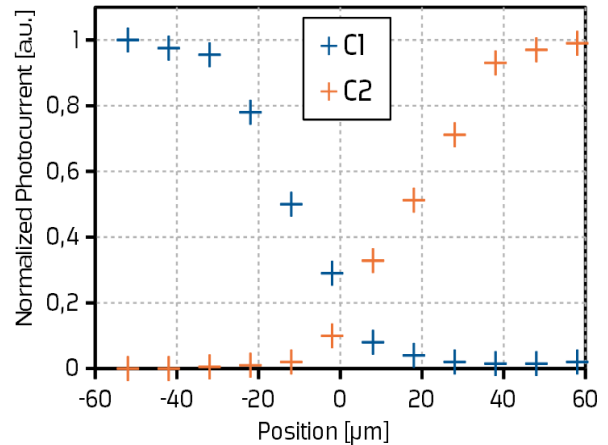


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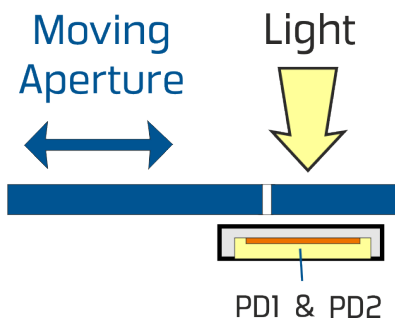
Application Notes

CHANNEL SEPARATION

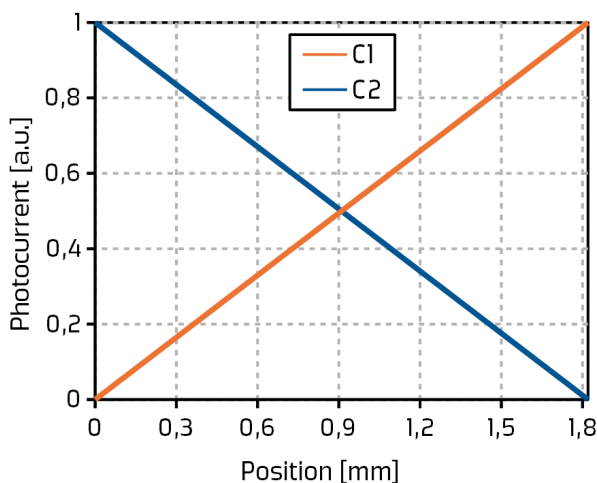
A perpendicular crossover of a light beam between photodiodes C1 and C2 is illustrated. Increments of 10 μm were performed using red light with a diameter of 50 μm . The position of 0 μm is related to the center of the metal line between both photodiodes. The photocurrent was measured with zero applied voltage. Considering a gap between the photodiodes of 20 μm , the observed behavior is consistent with a sharp channel separation.



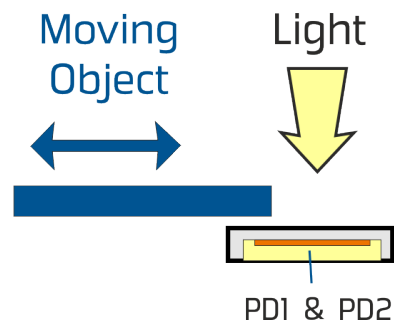
MOVING APERTURE



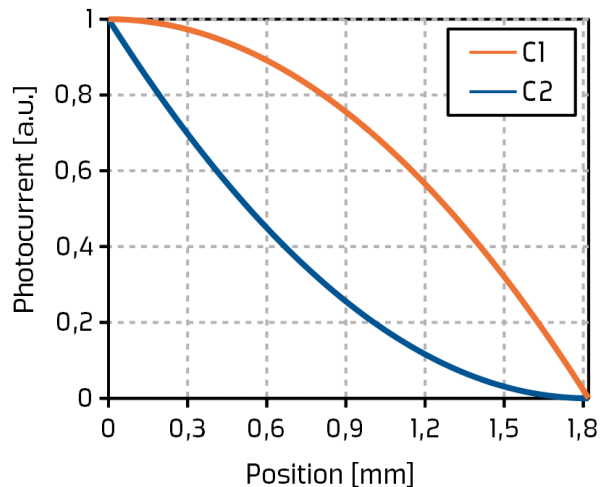
By shining light on aperture, the passing light can be detected. Due to the geometry of the photodiodes, the position of the aperture can be detected as given in the diagram.



MOVING OBJECT



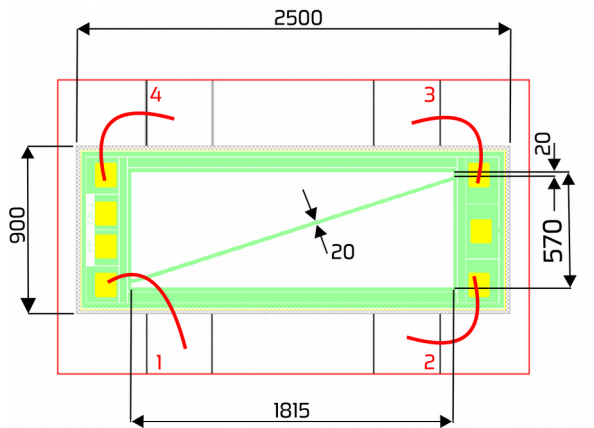
The location of an object moving above the triangular shaped photodiodes can be detected. According to the position of the edge, at C1 and C2 the following signals are received.



Photodiode PR5030

Dimensions

PR5030



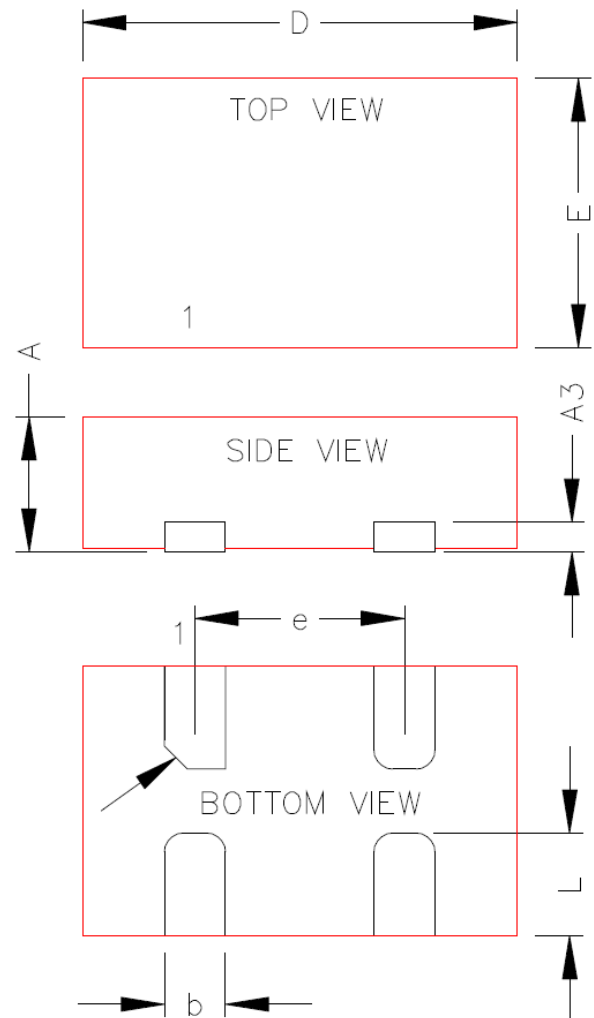
PIN CONFIGURATION

Pin No.	Pin Name	PIN Function Description
1	A	Common Anode
2		Not connected
3	C1	Cathode photodiode 'right'
4	C2	Cathode photodiode 'left'

ODFN-4L – PACKAGE

	MIN	TYP	MAX	Unit
A	0,85	0,9	0,95	mm
A3		0,20 REF.		mm
b	0,35	0,4	0,45	mm
D	2,8	2,9	3	mm
E	1,7	1,8	1,9	mm
e		1,4 BSC*		mm
L	0,6	0,7	0,8	mm

* Basic Spacing Between Centers



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Package Information

SOLDERING INFORMATION

A lead-free solder profile with a peak temperature of 260°C or less, according to J-STD-020 should be followed.

Parts should be handled in accordance with the moisture sensitivity level as indicated on the moisture barrier bag, but at least to MSL 3.

Any parts without or with unsealed moisture barrier bag must be dry-baked according to JEDEC guidelines before soldering. Manual soldering must be done with utmost care.

Direct infrared heating should be avoided; pure convection heating is recommended.

TAPE & REEL

Reel diameter: 7" (178 mm)

Tape width: 8 mm

Quantity per reel: 3,000

Packaging: moisture barrier bag

Orientation of ICs in tape: Pins 3 and 4 towards sprocket holes

BARE DIES

PR5030 is available as bare dies on request on tested and sawn wafers or in waferpack.

Please contact us for minimum order quantities and delivery times.

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