

# Differential Centre Detector PR5510



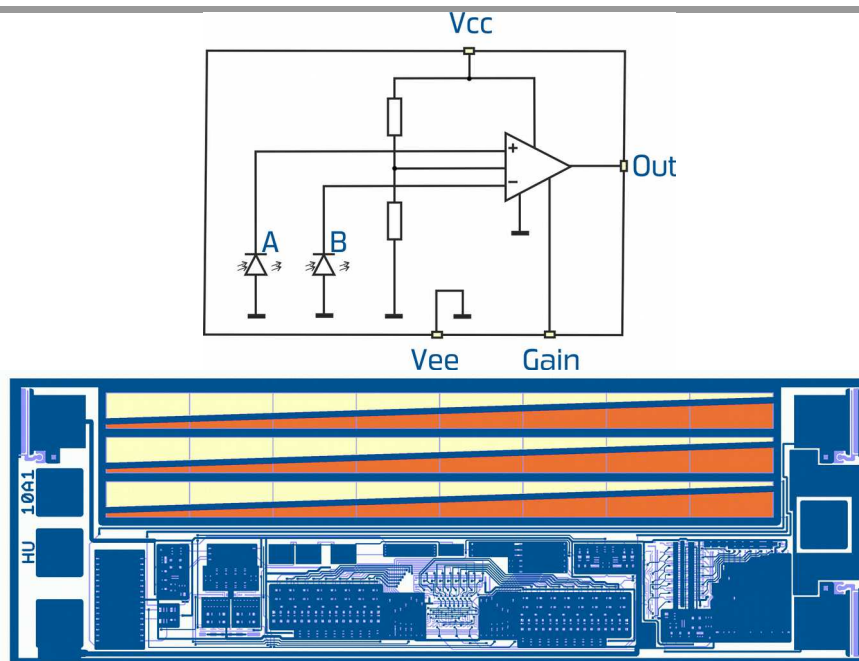
Sensor IC for centre detection of a light source.

PR5510 consists of two triplets of triangular photodiodes with reciprocal orientation, together with a differential transimpedance amplifier. If illuminated uniformly, the output is  $V_{cc}/2$ , but depends on the balance of illumination of the triplets.

## APPLICATIONS

- Light beam alignment
- Optical potentiometers
- Vibration sensors
- Optical position detectors

## BLOCK DIAGRAM

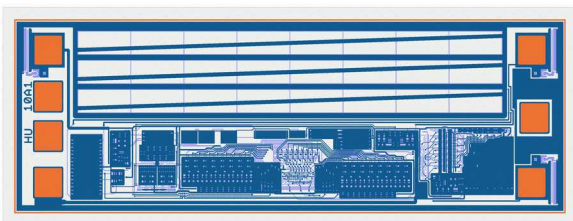


Yellow: A photodiodes; orange: B photodiodes

## PACKAGES

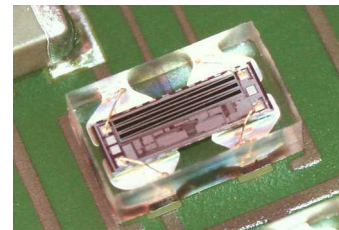
The PR5510 is offered as bare die or in a tiny optical DFN package.

a) IC as bare die – PR5510-BD



Die size: 2,500  $\mu\text{m}$  x 900  $\mu\text{m}$

b) In optical DFN package - PR5510-TM

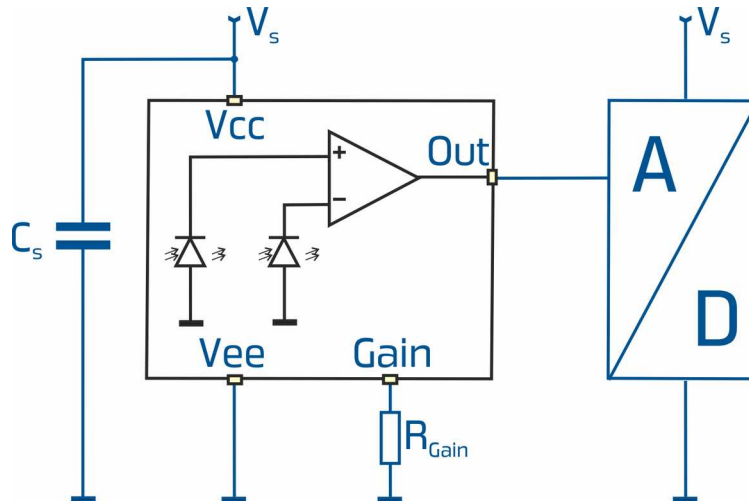


ODFN-4L 1.8mm x 2.9mm package.

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## Application Circuit



$R_{Gain}$  sets the gain of the photocurrent amplifier.  
The output is usually connected to a power amplifier or an analog-digital converter.

## Electrical Characteristics

### ABSOLUTE MAXIMUM RATINGS

Parameter		Min	Typ	Max	Units
$V_{CC}$ (supply voltage)		-0.3		8	V
$V_{PIN}$ (voltage @ other pins)		-0.3		$V_{CC}+0.3$	V
Operating Temperature	PR5510-BD	-40		85	°C
	PR5510-TM	-40		85	°C
Storage Temperature Range	PR5510-BD	-55		125	°C
	PR5510-TM	-40		100	°C
$T_J$ (Junction Temperature)	PR5201-BD/OC	-40		85	°C
	PR5201-CB/TM	-40		85	°C
Electrostatic Discharge (ESD) Protection @ all pins	HBM	4			kV

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## OPERATING CHARACTERISTICS

$V_{CC} = 3.3\text{ V}$ ,  $T_J = -40..85^\circ\text{C}$  (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$V_{CC}$	Supply voltage		3	3.3	4	V
$I_{CC}$	Supply current (no load)	$R_{gain} = 10\text{k}\Omega$	0.4		3.2	mA
		$R_{gain} = 150\text{k}\Omega$	0.4		0.8	mA
		$R_{gain} = \text{open}$	0.4		0.7	mA

### Output characteristics

$I_{Load}(Lo)$	Out current (Out vs. GND)				0.1	mA
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### Photosensors

$\lambda_{ar}$	Spectral application range	$Se(\lambda_{ar}) = 0.25 * \lambda_{peak}$	500		950	nm
$\lambda_{peak}$	Peak sensitivity			800		nm

### Gain setting

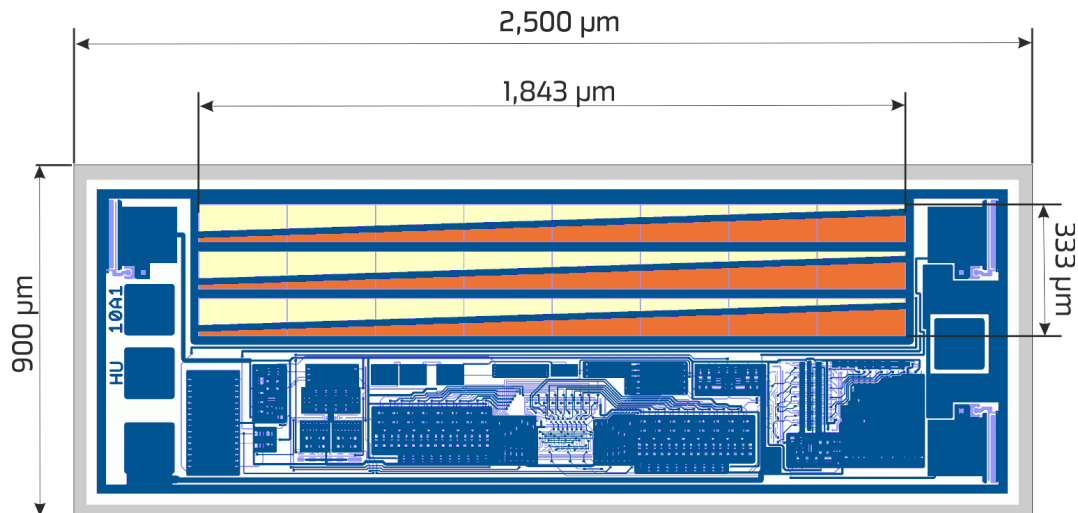
The gain is set by a resistor  $R_{gain}$  between pin Gain and ground.

Gain Resistor Value	Photocurrent Multiplier	
10k $\Omega$	X 9.7	
150/180k $\Omega$	X 3.7	150k $\Omega$ $\rightarrow V_{CC} > 3.5\text{V}$ ; 180k $\Omega$ $\rightarrow V_{CC} < 3.5\text{V}$
open	x 1.0	

# Differential Centre Detector PR5510



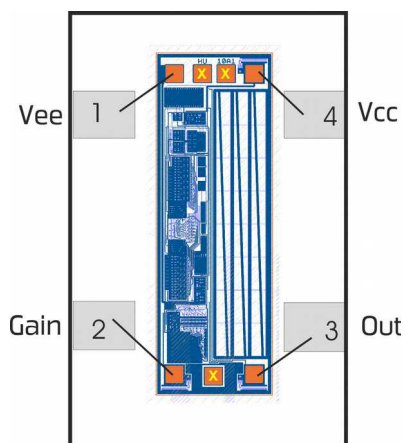
## Photodiodes – Dimensions



General dimensions:

- Die size: 2,500 µm x 900 µm (measured between centres of scribe lane)
- photodiodes track width: 333 µm
- photodiodes track length: 1843 µm
- Photodiode size : 2 x 0,2175 mm<sup>2</sup>
- Pad window: 120 µm x 120 µm
- For ODFN-4L package: Chip centre may be offset by up to 200 µm from package centre in any direction.

## PIN DESCRIPTION



Pin No	Pin Name	Pin Function Description
1	Vee	negative supply voltage
2	Gain	gain setting
3	Out	amplifier output
4	Vcc	positive supply voltage

Test pins are for chip test only and not described in this document.

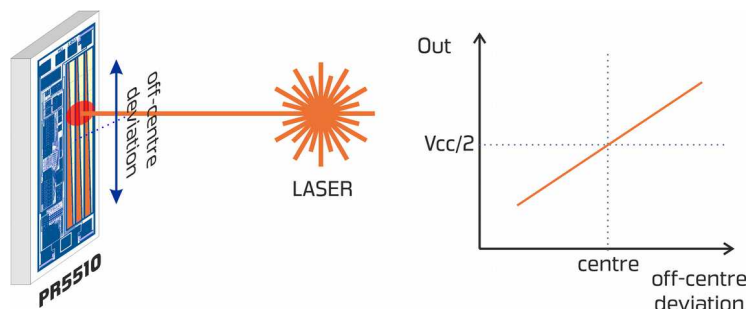
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## Application Examples

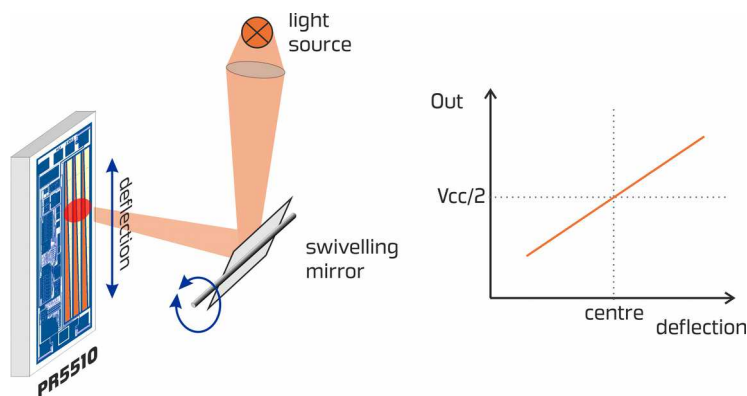
The following applications examples are meant as suggestions. PREMA does not guarantee usability and cannot give application support for the use in specific devices.

### OPTICAL BEAM CENTERING



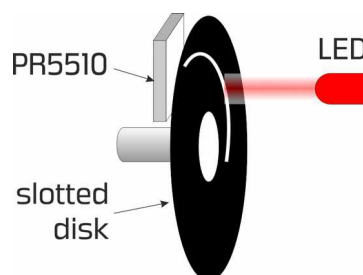
In this application PR5510 detects the position of the laser light beam on the detector.

### ANGLE OR VIBRATION DETECTOR



PR5510 can be used to measure the angle of a swivelling mirror. In a similar way, when the mirror picks up the vibration of a surface, PR5510 can be used to detect vibrations or small displacements. The wide bandwidth of the detector can measure vibration frequencies of several 100 kHz.

### OPTICAL POTENTIOMETER



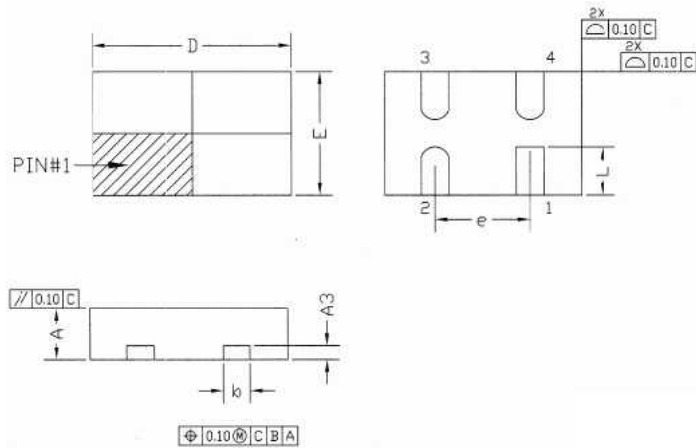
By the use of a helically slotted disk, PR5510 can be used in optical potentiometers, or for low-resolution absolute position encoders.

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## PR5510-TM - Package Dimensions

### ODFN-4L-1.8x2.9 PACKAGE



SYM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.85	0.90	0.95	0.033	0.035	0.037
A3	0.20 REF.			0.008 REF.		
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

#### NOTES:

1. CONTROLLING DIMENSION IN MM.
2. PACKAGE DIMENSION DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS, BURRS OR METAL SMEARING.
3. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE EXPOSED TERMINALS.  
MAXIMUM COPLANARITY SHALL BE 0.003 [0.08].
4. WARPAGE SHALL NOT EXCEED 0.004 [0.10].

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

Samples shipped without moisture barrier bag must be dry-baked according to JEDEC guide-

lines before soldering. Manual soldering must be done with utmost care.

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

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