

Product Description:

The PCL7152 is a novel line array image sensor based on the principle of Photon Counting Imaging (PCI). It employs Single Photon Avalanche Diodes (SPADs) as the photosensitive elements for single-photon detection. By recording the number of photons received, it captures information about the ambient light intensity, offering excellent sensitivity and high frame rates. The PCL7152 integrates functions such as pixel exposure, image digitization, data readout, and algorithm processing on-chip.

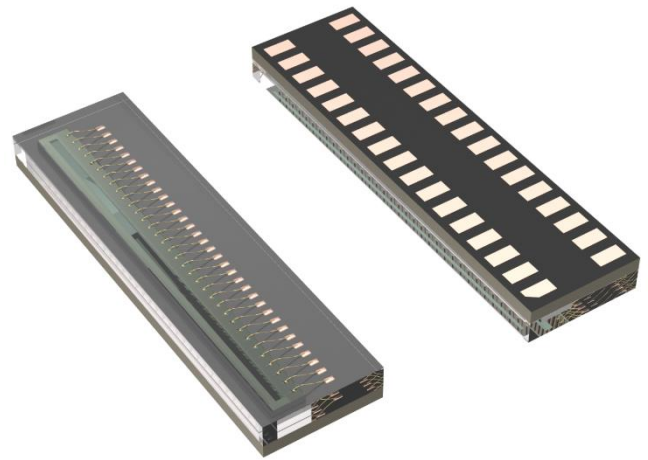
The PCL7152 features a 10-bit depth per pixel, allowing for flexible selection of any contiguous 8 bits as needed. Data is output via a parallel interface, with the line frequency significantly higher than that of similar CMOS image sensors of the same type.

The PCL7152 integrates a grayscale centroid algorithm internally, offering dual-peak output and rich centroid information such as centroid position, peak value, waveform integration, and more. Additionally, it includes configurable thresholding and baseline elimination functionalities.

Please visit the official website of PolarisIC at www.polarisic.com to access more product information.

Application Area:

- Laser Distance Sensor
- Liquid Level Detection Sensor
- Spectral Confocal Sensor
- Alignment Sensor
- Sweeper、AGV Obstacle Avoidance Radar
- Bar Code Scanner



PCL7152

Photon Counting Image Sensor

Product Features:

- Adopts a high sensitivity SPAD sensor with higher light sensitivity;
- To output digital signal directly, no need for AD conversion, reducing BOM cost;
- Integrated center-of-mass algorithm outputs rich center-of-mass information such as bimodal as well as peak positions, heights, integrals, etc;
- Supports parallel data output with count data frame rates up to 15kHz and center-of-mass output rates up to 53.8kHz;
- Integrated DCDC with 3.3V single power supply;
- With substrate deduction, configurable threshold function, easy to deal with a variety of complex scenarios;

1 Fundamental Principle

1.1 Introduction of Photon Counting Image Principles

PolarisIC's Photon Counting Image (PCI) is a new type of image sensor technology, PCI uses SPAD (Single Photon Avalanche Diode) for single-photon detection and digitizes the detected photon signals to form a digital signal, which realizes the conversion of the photon to a digital signal and stores it in the counter, so each pixel of PCI is a photon counter, as shown in the figure below:

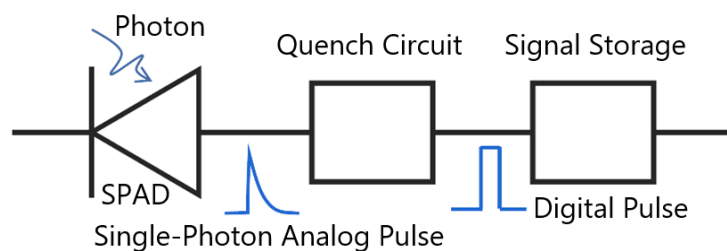


Figure 1 PCI Pixel Structure Diagram

Each pixel is integrated for a certain period of time to obtain the number of photons in that period of time, which is used to characterize the intensity of the optical signal, and the image can be captured by the one- or two-dimensional arrangement of the pixels.

1.2 PCL7152 System Block Diagram

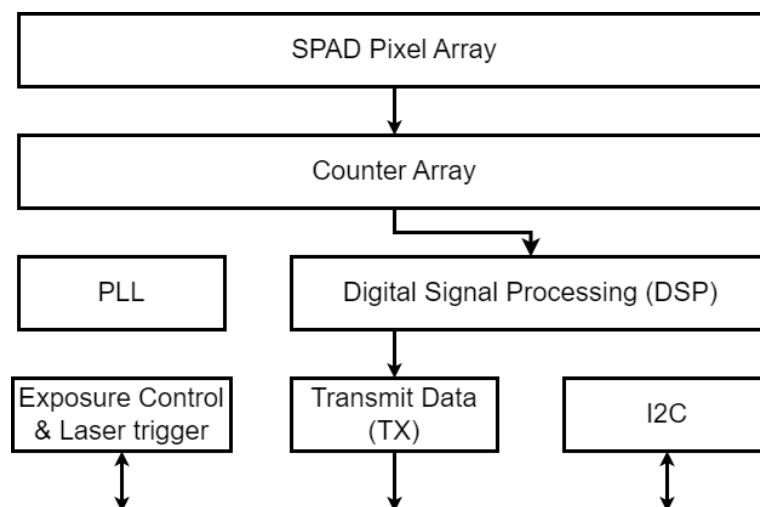


Figure 2 PCL7152 System Block Diagram

2 Parameter

2.1 Basic Parameter

Parameter	Detail
Pixel number	1536
Pixel pitch	5.5μm
Image area	8.45mm×0.017mm×2
Package size	9.2mm×2.5mm×0.8mm
Package type	Optical LGA
Light window material	Epoxy resin
Refractive index of window material	1.56@633nm

2.2 Performance Parameter

Parameter	Min.	Typ.	Max.	Unit
Spectral range	400	-	1100	nm
Detection efficiency	-	42% @ 550nm	-	-
	-	25% @ 650nm	-	-
	-	10% @ 850nm	-	-
Clock frequency	-	-	25	MHz
Output bit depth	-	8	-	bit/frame
Centroid result output speed (parallel)	-	53.8kfps	-	@25MHz
Raw rate output frame rate (parallel)	-	15kfps	-	@25MHz
Centroid result output accuracy	-	0.03125	-	Pixel

Test condition: 25°C

2.3 Conditions of Usage

Parameter	Details	Unit
Temperature(operation)	-40°C~85°C	°C
Temperature(storage)	-40°C~85°C	°C
Maximum temperature of solder reflow process	260	°C
ESD	Electrostatic discharge HBM	2000
	Electrostatic discharge MM	100
	Electrostatic discharge CDM	500
Input port limit voltage high	4	V
Input port limit voltage low	-0.5	V

Reference: HBM: JESD22-A114; CDM: JESD22-C101; MM: JESD22-A115