Position-Sensitive SiPM 11-2727PS Series

Features

In contrast with a conventional SiPM, NDL SiPM employs intrinsic epitaxial layer to form the quenching resistors, using a continuous silicon caping layer as an anode to connect all the APD cells. As a result, the device has more compact structure and simpler fabrication technology, allows larger micro-cell density (larger dynamic range) while retaining adequate photon detection efficiency (PDE). Furthermore, NDL SiPM benefits to implement a two-dimensional (2D) tetra-lateral position-sensitive (PS) SiPM, which has attractive advantages of less output electrodes, simple readout electronics and high position resolution.

- ❖ **Simple Readout Electronics**
- ❖ **High Position Resolution**
- ❖ **Large Dynamic Range While High PDE**
- ❖ **Fast Rise Time and Short Pulse Width**
- ❖ **Short Recovery Time and High Time Resolution**
- ❖ **Cost Effective**

Applications

- ❖ **High Energy Physics**
- ❖ **Scintillation Measurement**
- ❖ **Nuclear Medical Imaging (PET, SPECT, CT)**
- ❖ **Radiation Detection and Imaging**
- ❖ **Optical Spectroscope**
- ❖ **Other Low Level Light Detection**

Specifications

Parameter	Value	Parameter	Value
Effective Active Area	2.77×2.77 mm^2	Peak PDE@420nm*	>31%
Effective Pitch	~10 μm	Dark Count Rate*	~6 MHz
Micro-cell Number	~76729	Gain	≥2×10^5
Operating Temperature Down to LN2 (77 K)	Yes	Breakdown Voltage (V_b)	25.5±0.4 V
Max. Overvoltage (ΔV_{max})	8 V	Sheet Impedance (R_0)	~440 Ω
Position Algorithm (X)	$x_0 = \frac{L}{2}\cdot\frac{\left(\frac{R_0}{R_s}+8.7492\right)(Q_4-Q_3)\left[\left(\frac{1.7R_0}{R_s}+5.8156\right)(Q_1+Q_2)+\left(\frac{R_0}{R_s}-5.8156\right)(Q_3+Q_4)\right]}{\left[\frac{R_0}{R_s}(Q_1+Q_2+Q_3+Q_4)\right]^2-\left[1.02\left(\frac{R_0}{R_s}+8.7492\right)(Q_2-Q_1)\right]^2}$		
Position Algorithm (Y)	$y_0 = \frac{L}{2}\cdot\frac{\left(\frac{R_0}{R_s}+8.7492\right)(Q_2-Q_1)\left[\left(\frac{R_0}{R_s}-5.8156\right)(Q_1+Q_2)+\left(\frac{1.7R_0}{R_s}+5.8156\right)(Q_3+Q_4)\right]}{\left[\frac{R_0}{R_s}(Q_1+Q_2+Q_3+Q_4)\right]^2-\left[1.02\left(\frac{R_0}{R_s}+8.7492\right)(Q_4-Q_3)\right]^2}$		

* Measured at overvoltage close to 5V. L is the length of the active area (i.e., 2.77mm).
Rs is the input impedance. Qi, (i = 1, 2, 3, 4) is the shared charge of the corresponding anode.

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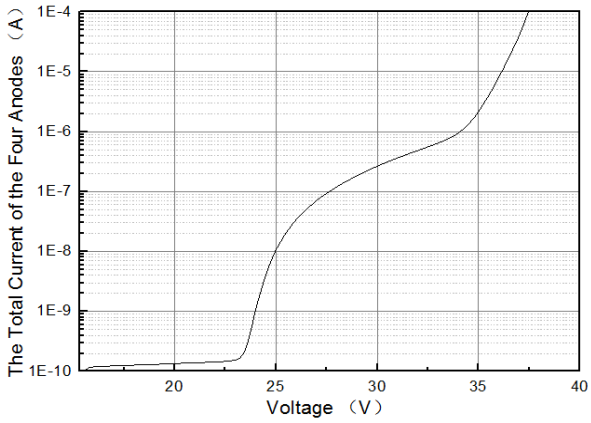
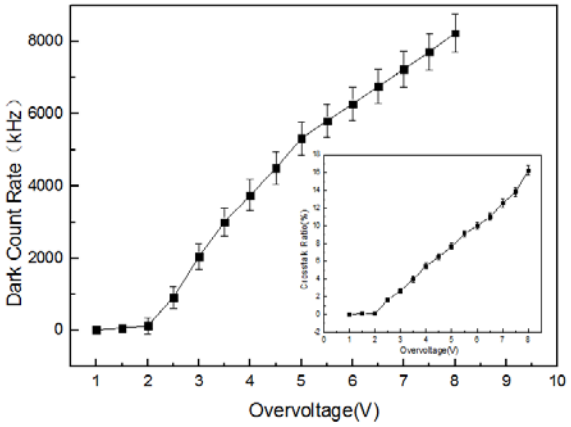
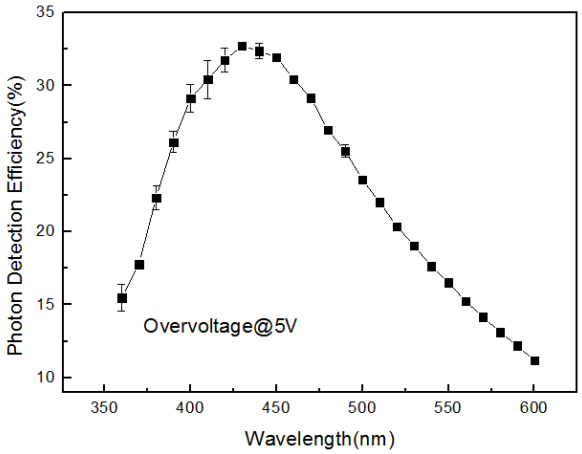
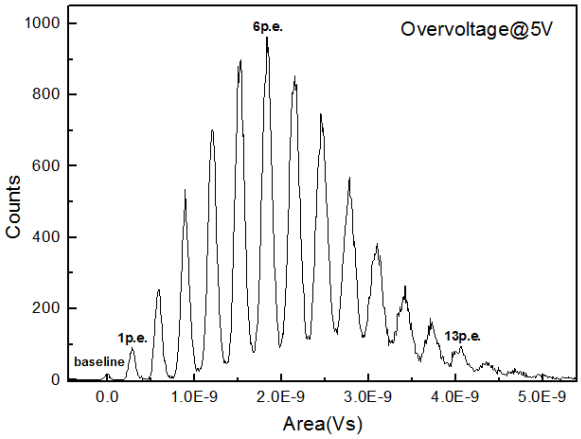
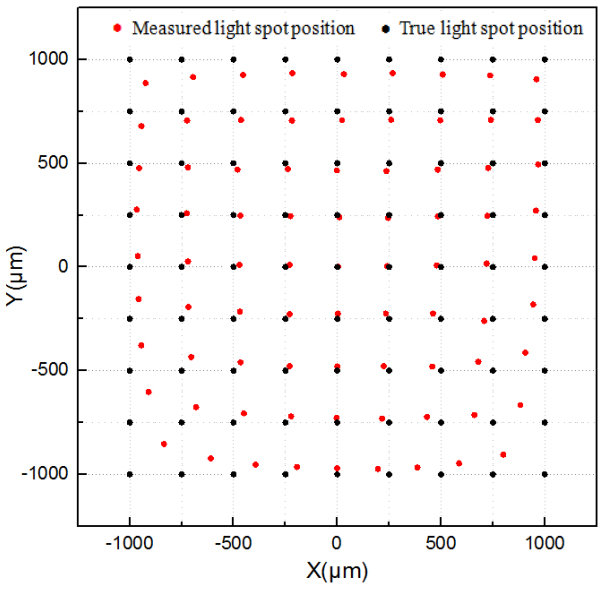
Characteristic Curves（Temperature: 20℃）

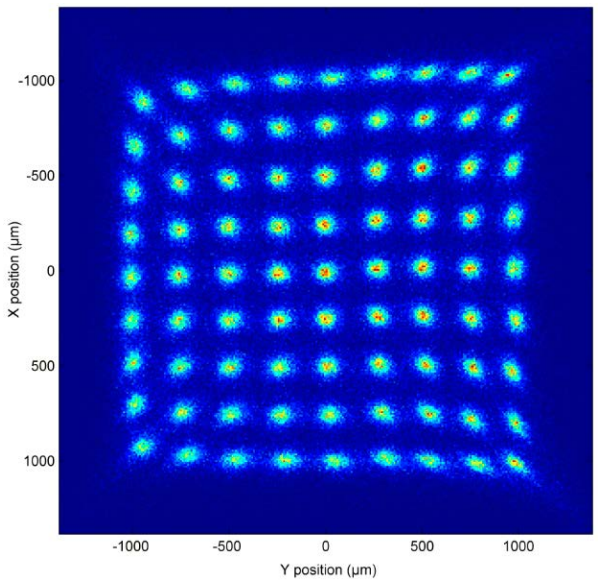


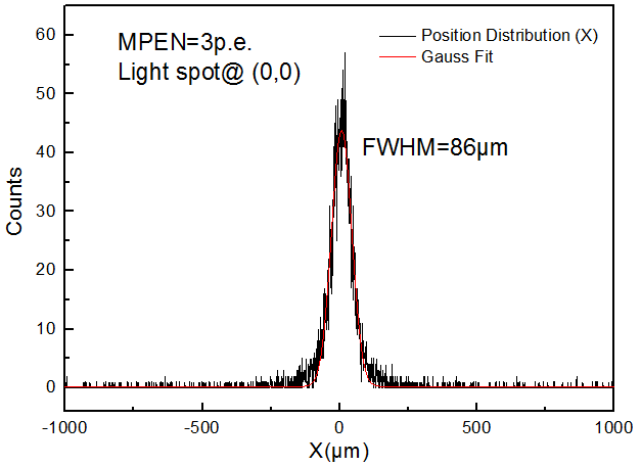


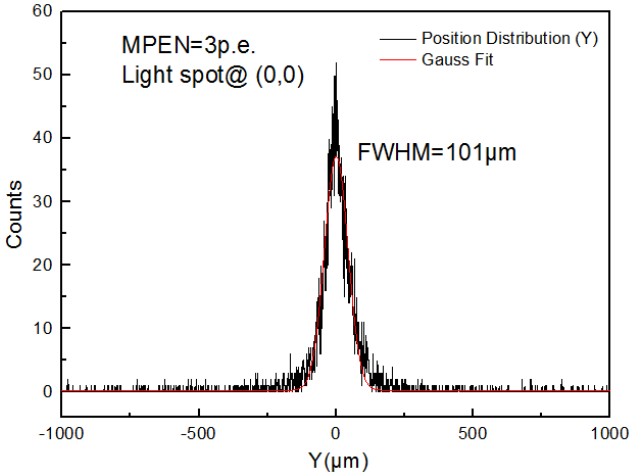




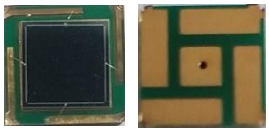








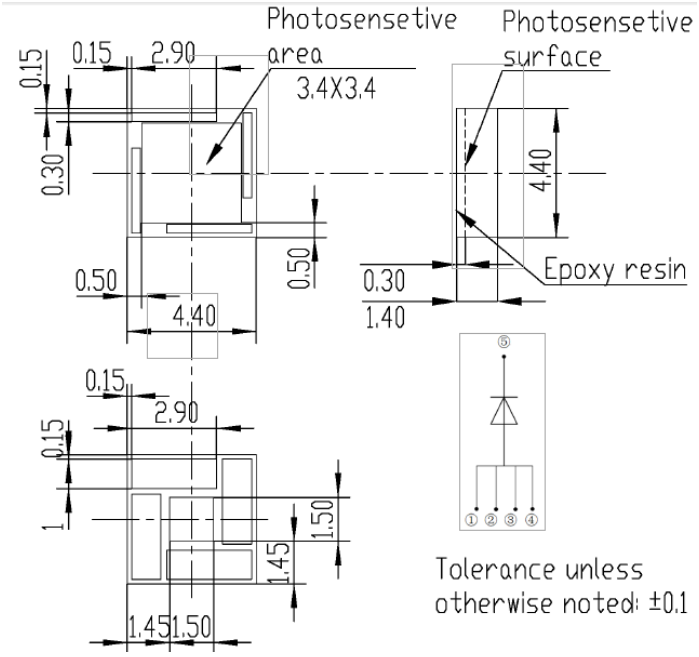
Dimensional outlines (unit: mm)

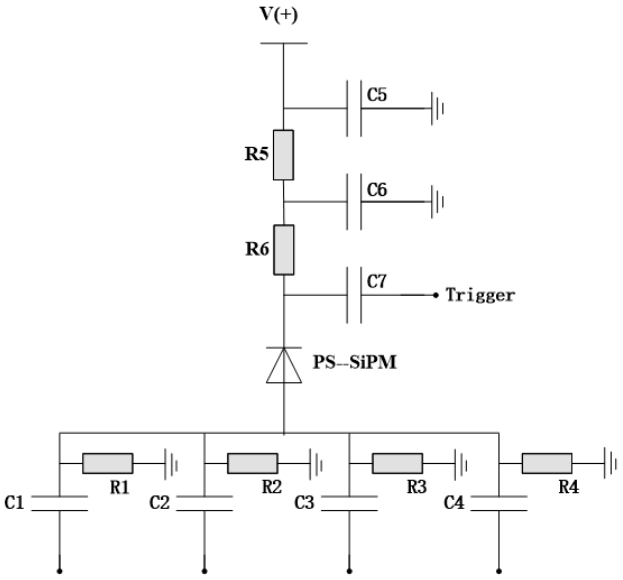


11-2727PS-S

Basic connection diagram for PS Evaluation Board

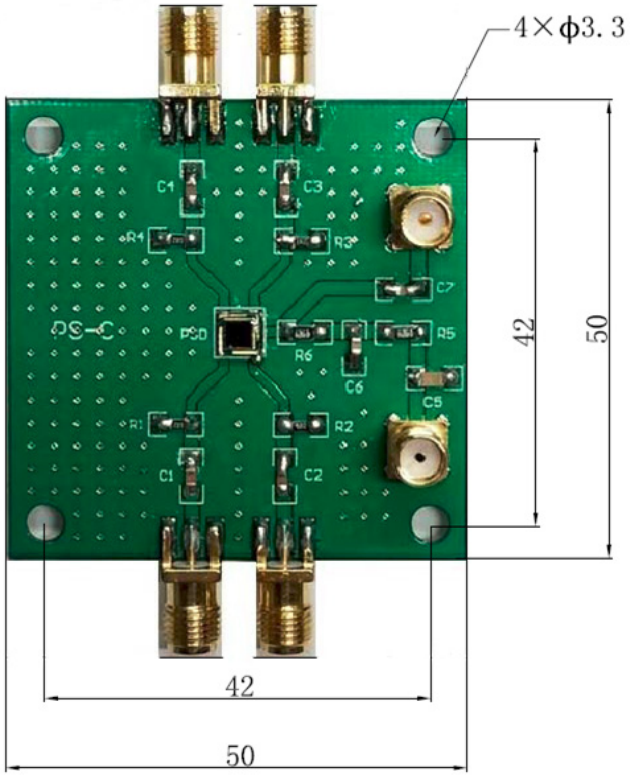
NDL SiPM: 11-2727PS





11-2727PS-E

References



1. "New Distortion Correction Algorithm for Two-Dimensional Tetra-Lateral Position-Sensitive Silicon Photomultiplier." *IEEE Electron Device Letters* 38 (2017): 228-231.

2. "High-Time Resolved Two-Dimensional Tetra-Lateral Position-Sensitive Silicon Photomultiplier." *IEEE Electron Device Letters* 39 (2018): 232-235.

3. "One-dimensional single-photon position-sensitive silicon photomultiplier and its application in Raman spectroscopy." *Optics. Express* 25 (2017): 22820-22828.

Note: Performance and device structure of 11-2727PS products may be different from those published in references!