

Preliminary

IMX459-AAMV-W

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1. Description and Usage

The IMX459-AAMV-W is a 6.25-mm (1/2.9-inch) diagonal Single Photon Avalanche Diode (SPAD) ToF Depth Sensor with signal-amplifying pixels. It features two readout modes, line mode and array mode, and supports a variety of scanning methods. By arraying a large number of SPADs and summing their outputs, it achieves a measurement distance of up to 300 m. Its light emission timing control function is able to compensate for the delay in timing between laser emission and reception. Its ambient light elimination function ensures that it does not saturate even under sunlight and can achieve distance measurements with a high dynamic range. Equipped with echo and peak detection functions, ranging data output modes, digital signal processing, and more, it is optimized to meet the performance and functionality required by LiDAR.
Applications: LiDAR for automotive

2. Features and Functions

- ◆ SPAD signal-amplifying pixels
- ◆ Number of effective SPAD
 - 597 (H) × 168 (V) approx. 100K SPAD
- ◆ CRA: 0 degrees
- ◆ Input frequencies: 16, 20, 24, 30 MHz
- ◆ External communication interfaces
 - I²C communication
 - SPI communication
- ◆ Output interface
 - MIPI CSI-2 serial output (4 lanes/2 lanes)
- ◆ Readout modes
 - Line mode
 - Array mode
- ◆ Output formats
 - Ranging data output mode (RAW12, ToF width: 2024 bins, gray scale width: 12 bits)
 - Echo output mode (RAW12, ToF width: 2024 bins, gray scale width: 12 bits)
 - Histogram output mode (RAW12, ToF width: 2024 bins, gray scale width: 12 bits)
- ◆ Variable pixel size, region of interest (ROI) function
- ◆ Ambient light monitor function
 - Ambient light count width: 22 bits
- ◆ Emission timing control function
- ◆ Histogram generation function
- ◆ Echo and peak detection functions
- ◆ AEC-Q100 Grade 2 qualified
- ◆ Electrostatic rank
 - HBM (Grade 2): **T.B.D.**
 - CDM (Grade 2): **T.B.D.**

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3. Device Structure

- ◆ SPAD ToF Depth Sensor
- ◆ Image size: Diagonal 6.25 mm (1/2.9 inch)
- ◆ SPAD unit cell size: 10.08 μm (H) \times 10.08 μm (V)
- ◆ Element size: 3 (H) \times 3 (V) SPAD
- ◆ Number of physical active SPAD*1: 600 (H) \times 189 (V) approx. 110K SPAD
- ◆ Number of effective SPAD: 597 (H) \times 168 (V) approx. 100K SPAD
- ◆ Substrate material: Silicon

*1 Including non-effective pixels and monitor pixels

4. Absolute Maximum Ratings

Table 4 -1 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remarks
SPAD breakdown voltage power supply	VOP*1	-24.5	+0.3	V	—
SPAD excess voltage power supply	Vex*2	-0.3	4.0	V	—
Digital power supply	VDDD*3	-0.3	1.5	V	—
Analog power supply	VDDA*4	-0.3	4.0	V	—
I/O power supply	VDDIO*5	-0.3	2.5	V	—

5. Recommended Drive Conditions

Table 5 -1 Recommended Drive Conditions

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
SPAD breakdown voltage power supply	VOP*1	-24.5	-20.5	-17	V	—
SPAD excess voltage power supply	Vex*2	3.15	3.3	3.6	V	—
Digital power supply	VDDD*3	1.0	1.1	1.2	V	—
Analog power supply	VDDA*4	3.15	3.3	3.45	V	—
I/O power supply	VDDIO*5	1.7	1.8	1.9	V	—
Operating temperature	Topr	Ta = -40 to +105 Tj = -40 to +125			°C	—
Storage temperature	Tstg	Ta = -40 to +125			°C	—

*1 VOP: VRLD

*2 Vex: VDDHPF

*3 VDDD: VDDLSC, VDDLPL1, VDDLPL2, VDDLIF

*4 VDDA: VDDHAN

*5 VDDIO: VDDMIO, VDDMIF

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