

Silicon Photomultipliers (SiPM), RDM-Series 1 x 12 Monolithic Array

Advance Information ArrayRDM-0112A20-QFN

The ArrayRDM-0112A20-QFN is a monolithic 1 × 12 array of Silicon Photomultiplier (SiPM) pixels based on the market-leading RDM process. The RDM process has been specifically developed to create products that give high PDE at the NIR wavelengths used for LiDAR and 3D ranging applications.

In order to meet the requirements for automotive LiDAR applications, this product is qualified to AEC-Q102 and developed in accordance with IATF 16949.

An evaluation board (ArrayRDM-0112A20-GEVB) is also available for this product.

KEY SENSOR AND PACKAGE SPECIFICATIONS

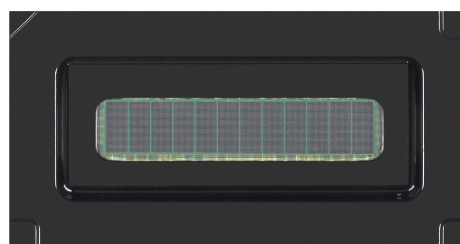
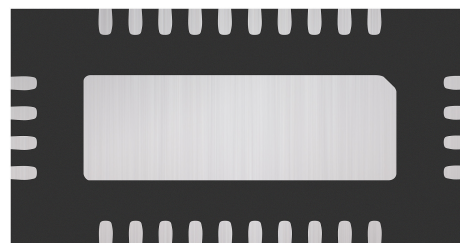
Parameter	Value	Comments
Silicon Process	RDM	
Number of Pixels	12	
Array Configuration	1 × 12	Monolithic silicon array
Pixel Size	1.12 × 0.47 mm	
Pixel Pitch	0.49 mm	
Microcell Size	20 μm	
Number of Microcells per Pixel	806	
Package Size	5.2 × 10.0 × 1.85 mm	W × L × H (see case outline on page 5 for more details)
Output Type	Analog	Standard output per pixel

PERFORMANCE SPECIFICATIONS

Typical values are measured at 21°C. Minimum and Maximum values take into account operation over the full temperature range of -40°C to 105°C. All measurements made at V_{br} + 7.9 V.

Parameter	Min	Typ	Max	Unit	Comment
PDE at 905 nm	8	14	23	%	
Total Noise Rate	< 0.05	0.1	40	Mcps	Total noise rate is the count of all noise events arising from thermal noise, crosstalk and afterpulsing. It is measured by counting distinct event peaks per unit time with no incident light and minimum threshold set just above the electronic noise floor. Per pixel
Optical Crosstalk	23	28	33	%	
Gain	1.1 × 10 ⁶	1.2 × 10 ⁶	1.4 × 10 ⁶		
Microcell Recovery Time Constant	24	34	45	ns	RC time constant
Microcell Rise Time	–	200	–	ps	
Terminal Capacitance	19	20	22	pF	Per pixel
Peak Pulsed Saturation Current	3.2	–	7.5	mA	Per pixel
Continuous Saturation Current	1.4	–	3.4	mA	Per pixel

This document contains information on a new product. Specifications and information herein are subject to change without notice.



The ArrayRDM-0112A20-QFN28 Product
Case 485FZ

ORDERING INFORMATION

See detailed ordering and shipping information in the ordering information section on page 4 of this data sheet.

ArrayRDM-0112A20-QFN

BIAS PARAMETERS

Parameter	Min	Typ	Max	Unit	Comment
Breakdown Voltage (Vbr)	19.8	21.6	25.5	V	See Figure 1 for a plot of typical breakdown voltages at different temperatures
Over Voltage (Vov)	–	7.9	12.0	V	Typical values recommended for operation and used for characterization
Operating Bias (Vop)	Vop = Vbr + Vov				
Temperature Coefficient of Vbr	Refer to Figure 1			mV/°C	

ABSOLUTE MAXIMUM RATINGS

Parameter	Value	Unit	Comment
Maximum Bias	37.5	V	
Maximum Current	20	mA	For whole array at typical Vop
Maximum Storage Temperature	125	°C	
Operating Temperature Range	–40 to +105	°C	Ambient temperature

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

PACKAGE SPECIFICATIONS

Parameter	Value	Unit	Comment
ESD – HBM	1	kV	Class 1C
ESD – CDM	500	V	Class 4C
θ_{JC}	4	°C/W	
θ_{JA}	150	°C/W	
MSL	3		For all part numbers

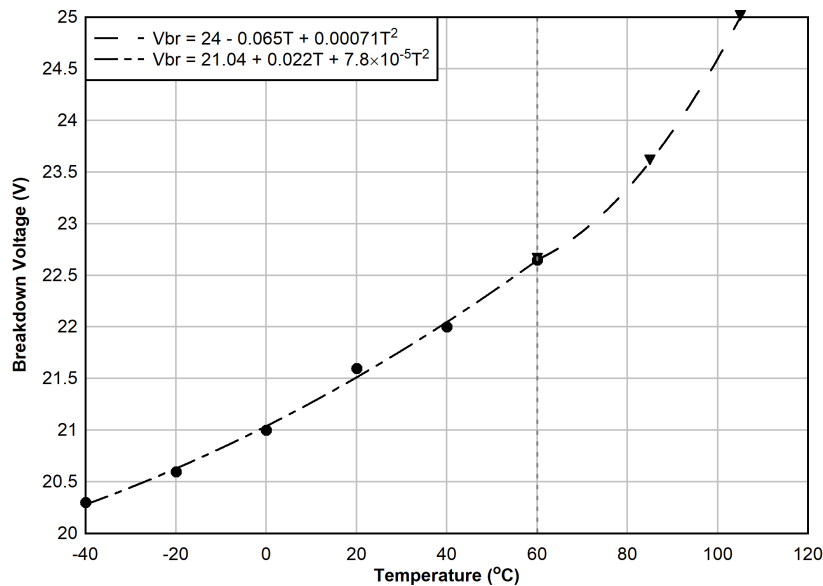
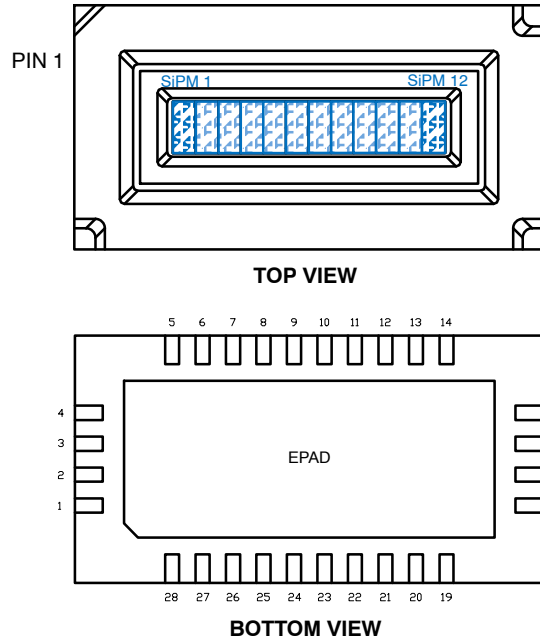


Figure 1. Breakdown Voltage vs Temperature

ArrayRDM-0112A20-QFN

PIN ASSIGNMENT



Pin #	Pin Name	Pin Function
1	Cathode 1	SiPM 1 standard output
28	Cathode 2	SiPM 2 standard output
27	Cathode 3	SiPM 3 standard output
26	Cathode 4	SiPM 4 standard output
25	Cathode 5	SiPM 5 standard output
24	Cathode 6	SiPM 6 standard output
23	Cathode 7	SiPM 7 standard output
22	Cathode 8	SiPM 8 standard output
21	Cathode 9	SiPM 9 standard output
20	Cathode 10	SiPM 10 standard output
19	Cathode 11	SiPM 11 standard output
18	Cathode 12	SiPM 12 standard output
EPAD	Anode	Common Anode
2-17	NC	No Connect

APPLICATION ADVICE

The ArrayRDM-0112A20-QFN is formed of a linear array of 12 SiPM pixels. The QFN package provides a connection to each pixel cathode (for access to the individual signals) and a common anode. The common anode allows the provision of a single bias supply for all 12 pixels. The recommended test connections and biasing are as per the evaluation board that is detailed in the following section.

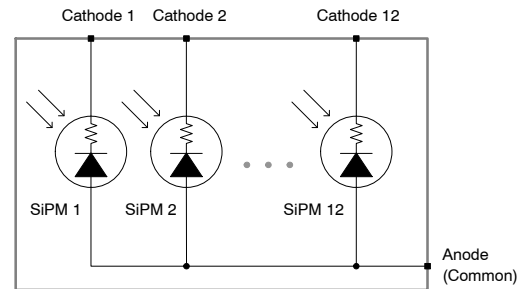


Figure 2. Array Schematic Showing Pixel Connections

ArrayRDM-0112A20-QFN

EVALUATION BOARD

The ArrayRDM-0112A20-GEVB evaluation board consists of:

- ArrayRDM-0112A20-DFN SiPM array
- 12 U.FL connectors for access to each pixel cathode for signal readout
- An SMA connector for applying the bias to the common anode
- Bias filtering circuit
- Decoupling capacitors (12 x 10 nF and 4 x 100 nF decoupling capacitors from anode to ground – not shown)

This product allows users to quickly and easily set up an evaluation of the array product.

Note that a negative bias supply should be supplied via the SMA connector (J13) and the U.FL connectors (J1 to J12) should be 50 Ω terminated.

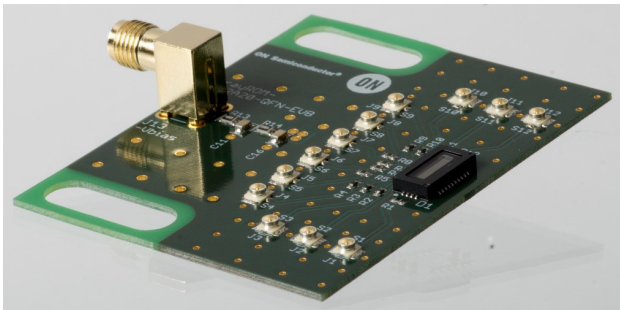


Figure 3. ArrayRDM-0112A20-GEVB Top Side View Showing the 1x12 Sensor

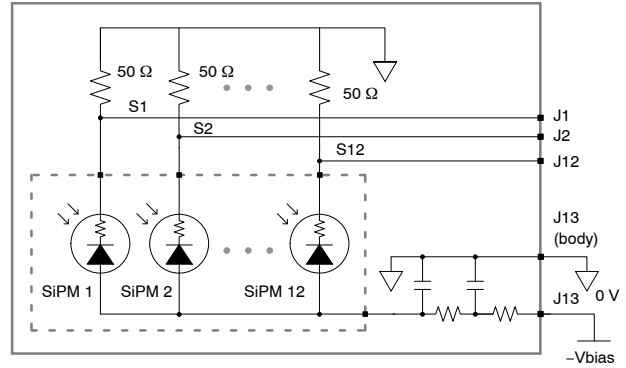


Figure 4. ArrayRDM-0112A20-GEVB Board Schematic

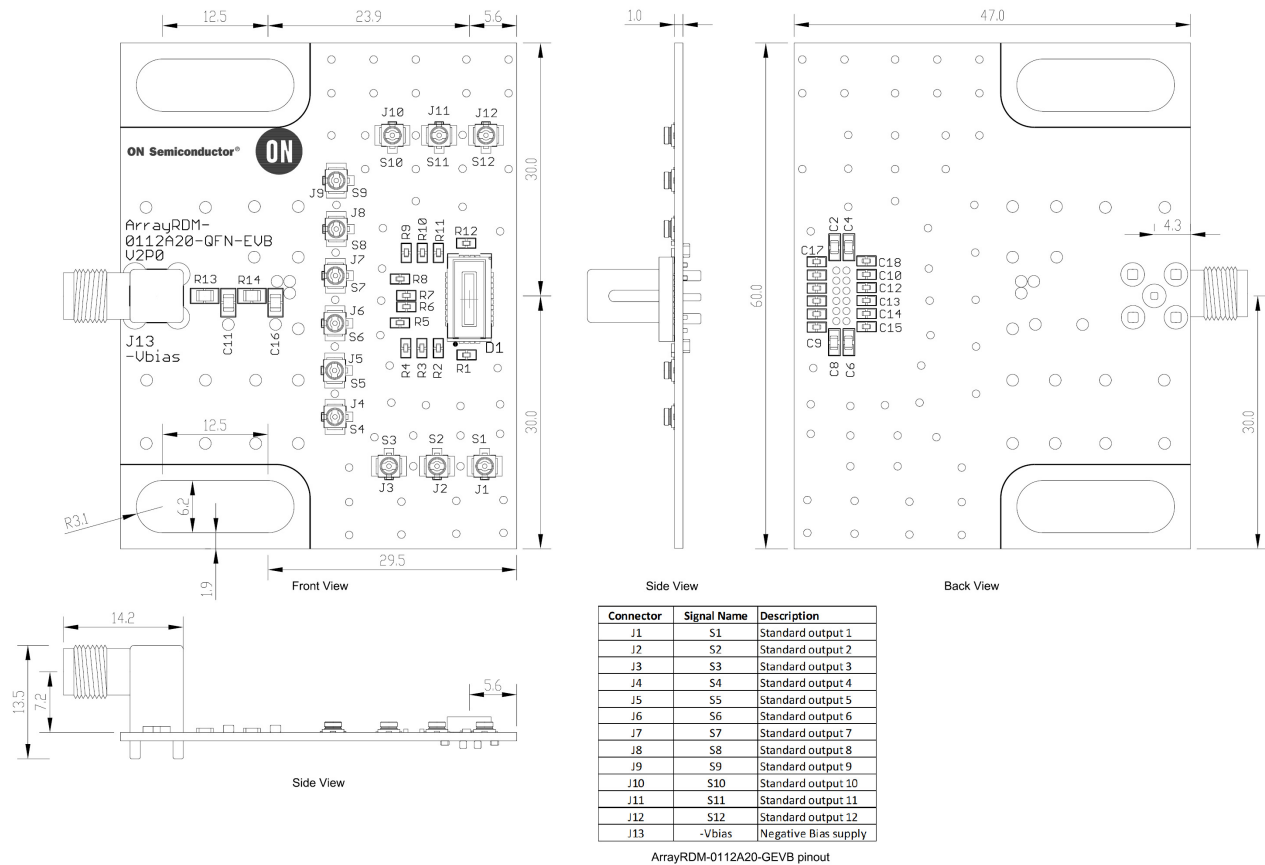
Connector	Style
J1-J12	U.FL Receptacle (Hirose U.FL-R-SMT)
J13	SMA Jack (F)

ORDERING INFORMATION

Part Number	Product Description	Shipping Format
ArrayRDM-0112A20-QFN-TR	Monolithic 1 × 12 array of NiR sensitive SiPM pixels formed using the RDM process. Individual cathode connection per pixel and a common anode available via the 28-pin QFN package.	Tape and Reel
ArrayRDM-0112A20-QFN-TR1		Cut Tape
ArrayRDM-0112A20-QFN-TR-E	Unqualified prototype part of the ArrayRDM-0112A20-QFN-TR	Depends on Quantity Ordered
ArrayRDM-0112A20-GEVB	Evaluation board consisting of an ArrayRDM-0112A20-QFN mounted onto PCB. A U.FL connector gives access to each pixel output (cathode). The bias is supplied via an SMA connector to the common anode.	ESD Package

ArrayRDM-0112A20-QFN

EVALUATION BOARD DRAWING



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