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sensL

SPMArray4

Scalable Silicon Photomultiplier Array

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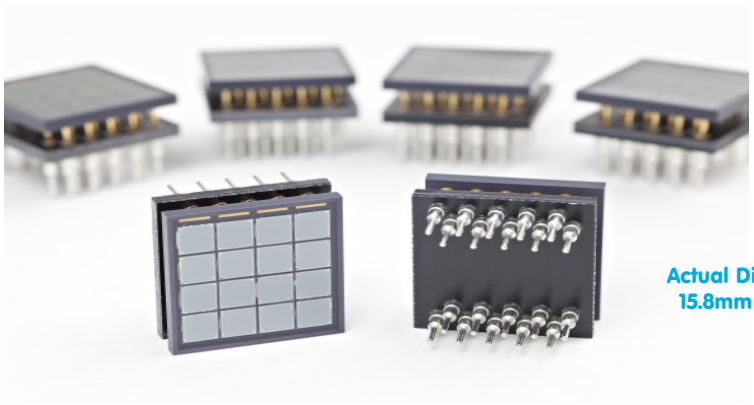
Overview



Actual Dimensions
15.8mm x 15.3mm

4 Side Scalable Silicon Photomultiplier Array

Applications

- Medical Imaging
- PET/MR
- Radiation Detection
- Cytometry
- Gamma Camera
- High Energy Physics
- X-Ray Detection
- Fluorescence Spectrometry
- Fluorescence Imaging

SensL's Scalable Silicon Photomultiplier Array (SPMArray4) is the first commercially available, solid-state, large array detector based on silicon photomultiplier technology. The SPMArray4 will be of particular interest to developers of detector systems for applications such as PET, Gamma Camera, and Radiation Detection for medical and security purposes and to those working with fluorescence applications requiring very sensitive detector arrays. SensL introduces it's 16 element 4-side tile SPMArray based on SPM pixels tiled in a 4x4 Array which are mounted in a low profile ceramic package. The solution offers 4 side tileable packaging to allow the SPMArray to be tiled for larger area detection systems.

A non-magnetic sensitive package has been developed using Ni free processing and low magnetic susceptible materials. A 20 pin grid array (PGA) is employed for electrical I/O's to a printed electronics board or to a standard test socket connector included. The pixel array is over-molded with epoxy to completely encapsulate the pixels, bondwires and substrate bondpads. The pixel bias and readout configuration has been designed for both differential and single channel readout electronics to maximize signal to noise ratios.

The performance and specification characteristics of each pixel are identical to SensL's standard range of SPM products (http://sensl.com/products/silicon-photomultipliers). SPMArray4 is sensitive to visible light in the range of 400nm to 850nm and is suited to applications requiring direct light detection at these wavelengths or for radiation detection via scintillators. Whether your application requires a 1D array for spectrometry or a 2D array for large area detectio and spatial sensitivity, the SPMArray4 is a detector solution and the ideal replacement for MCPs, multi-anode PMTs, APDs, and existing discrete SPM products.

Features and Benefits

- Form Factor – Smallest Form Factor package on market today using a unique low profile ceramic package with minimal deadspace on all four sides.
- Pixel Array Fill Factor – Best Fill factor in market today with 200microns deadspace between pixels
- Proven Performance – 14% Energy Resolution at 511keV peak for medical imaging , for nuclear medical applications
- Uniformity – Superior uniformity compared to PMT's; i.e < 1:2.5 (max).
- Tile SPMArray4 on all four sides – The SPMArray4 design allows arrays to be assembled together to form large area detection footprints.
- The SPMArray4 design is compatible with both pixellated and summed readout and can be configured with Single ended, differential and X-Y differential pre-amplification electronics.
- Magnetic Free Package Design – Magnetic free materials used in package. Ni free processing and Cu pin Alumina ceramic package not visible to MR I systems at 1.5 and 3 Tesla.
- External Cooling – Package has been designed where an external TEC controller can be placed under the package for moderate cooling applications, i.e reduced temperature operation (5-10°C) and/or temperature stabilization.
- Interface Connections – Pin compatible Package design with standard tests sockets available on market today.

+ 1 650 641 3278 (USA)
+ 353 21 435 0442 (Int'l)
sales@sensl.com
www.sensL.com

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SPMArray4
Scalable Silicon Photomultiplier Array

SPM Detector (Pixel) Specifications

Typical Values	Part Number SPMArray 3035G16	Units	Test Conditions
Pixel Chip Area	3.16 x 3.16	mm^2	3.16 ±0.01mm to account for scribe cut of die (kerf)
Pixel Active Area	2.85x2.85	mm^2	-
Operating Voltage (typical)	29.5	V	+2V above Vbr,
Array Details	4 x 4	Pixels	Number of Pixels
Microcell Gain	$1x10^6$	-	-
Total Pixel Effective Area	13.4 x 13.4	mm^2	
Number of Microcells	3640	Per pixel	-
Photon Detection Efficiency	10-20	%	+1V to +4V above Vbr, λ = 520nm
Dark Rate	8	MHz	Per pixel
Detailed Specifications of Pixel	SPMMicro3035X13	-	See Datasheet - available on www.SensL.com

Ceramic Module Specifications

100Values	SPMArray (Module)	Units	Comments
Pixel to Pixel Spacing	200	µm	Deadspace. See layout drawings for tiled array
Pixel Pitch	3.36	mm	-
Pixel Thickness	450 + 25	µm	-
Ceramic Type	Alumina Al2O3	-	-
Ceramic Color	Black	-	-
Ceramic Base	500	µm	-
Ceramic Package Size	15.81 x 15.31	mm^2	-
Electrical I/O's	Cu Pin Grid Array (PGA)	-	See Drawings
Ceramic Package Height	1.5	mm	Includes Ceramic Base Thickness
Pin Type	Cu	-	
Frame Height	1000	µm	Al_2O_3 frame which surrounds tiled array
Pin Spacing	1.27	mm	Standard pin spacing— sockets see www.e-tec.co.uk [Part No. POS-520-E118-95-I]
Epoxy Encapsulate	Epotek 301-2	-	See Mechanical Drawings
Epoxy Thickness	<500	µm	Thickness coated over the surface of the die
Epoxy: Refractive Index	1.5318	-	Measured at 589nm
Epoxy: Spectral Transmission	>98	%	Measured at 550-900nm

Note: SensL reserves the right to change all product specification and functionality without notification. Information on this datasheet is believed to be accurate, however, no responsibility is assumed for any inaccuracies or omissions.

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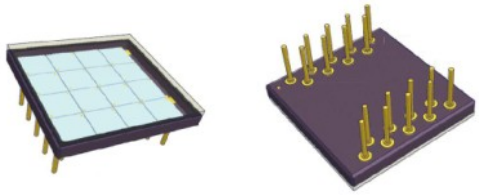
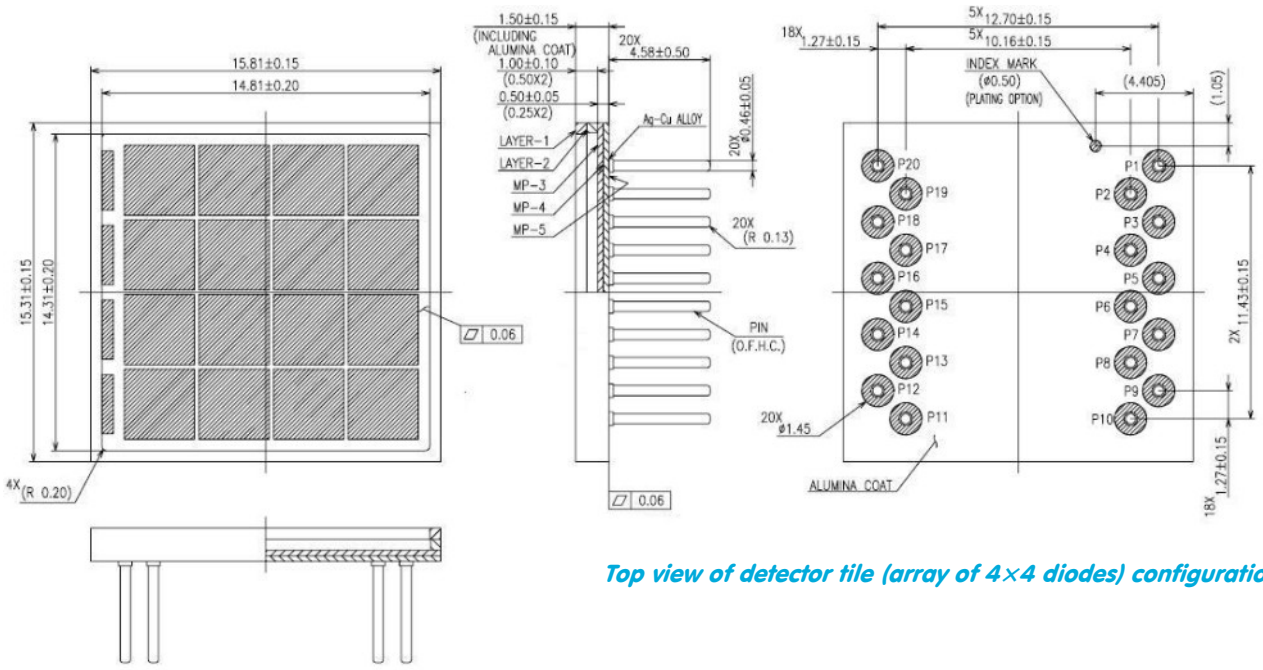
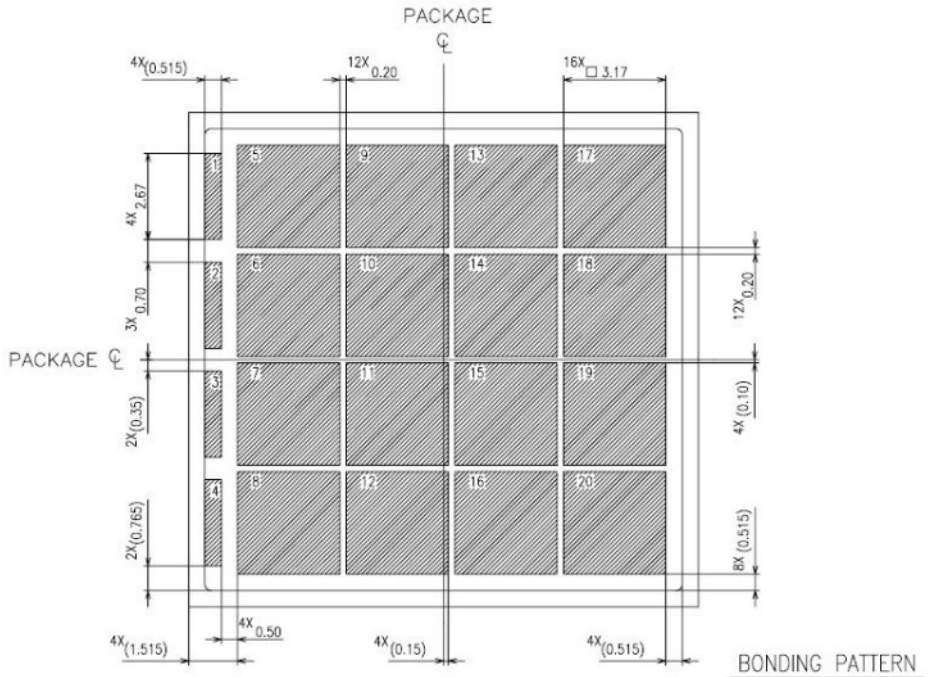
Mechanical Design for SPMArray





Top view of detector tile (array of 4×4 diodes) configuration



BONDING PATTERN

INTERCONNECTION PLAN

W/B PAD No.	PIN No.
1	1
2	4
3	7
4	10
5	2
6	3
7	6
8	9
9	18
10	5
11	8
12	13
13	19
14	16
15	14
16	11
17	20
18	17
19	15
20	12

Interconnection Bond Pad/Pin No. Plan for Package. Each row of pixels can be biased separately using wirebond pads (W/B Pad No. 1,2,3 &4)

All dimensions shown in mm

***Note**: Each pixel is read out using pins 5-20.*

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Ordering Information

Product Code	Description
SPMArray4	4X4 element Array of SPMMicro3035x13 detectors mounted in 20 pin. PGA Package with test socket. Transparent Substrate with Mechanical Housing and Multi-pixel Output FPC Connector and
SPMArray4-A0	Multi Channel Pre-amplification electronics for SPMArray 4
SPMArray4-A1	Evaluation board for SPMArray 4 for Pixellated/Summed Pixel Output.

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