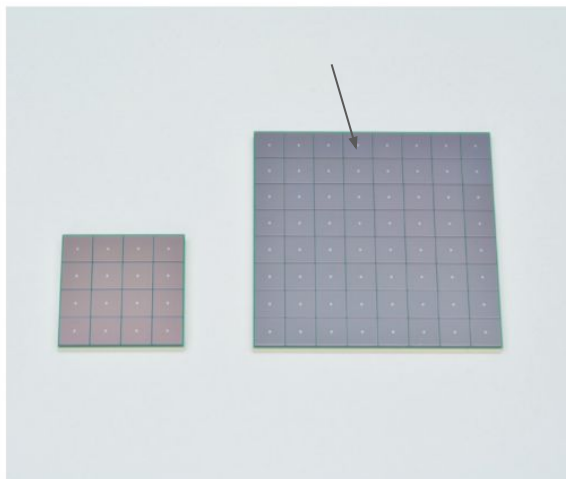


SiPM sensors for large area dRICH prototype

EIC_NET elettronica

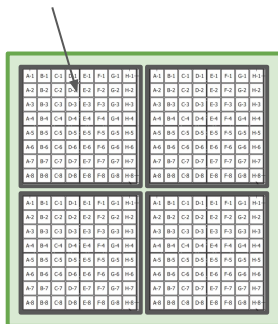
MPPC[®] (Multi-Pixel Photon Counter) arrays

S13361-3050 series

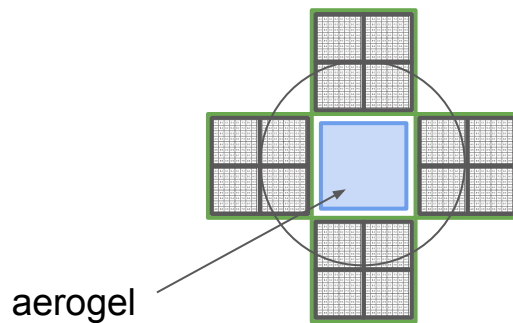


MPPC arrays in a chip size package miniaturized through the adoption of TSV structure

readout unit:
4 8x8 matrices

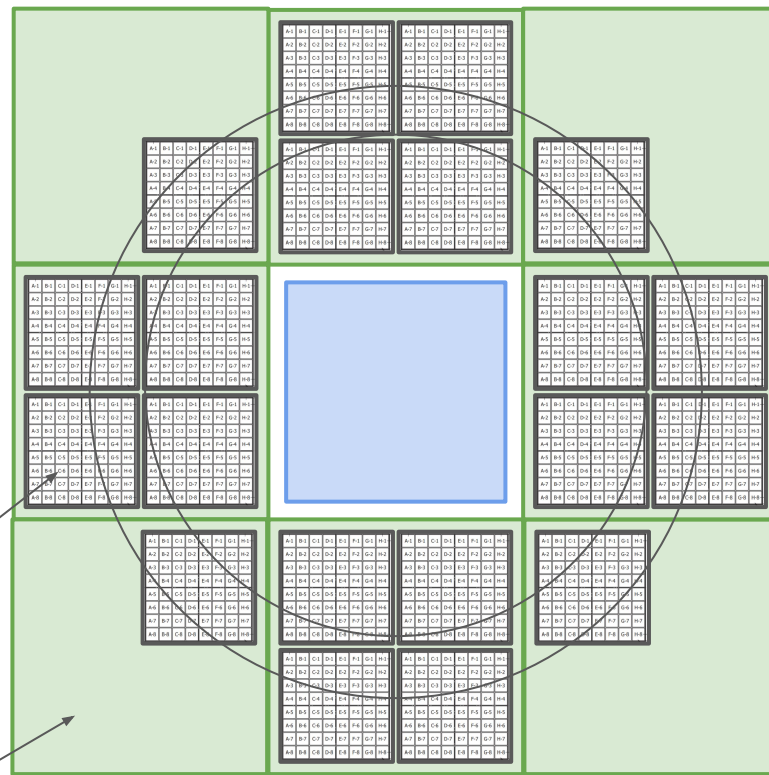
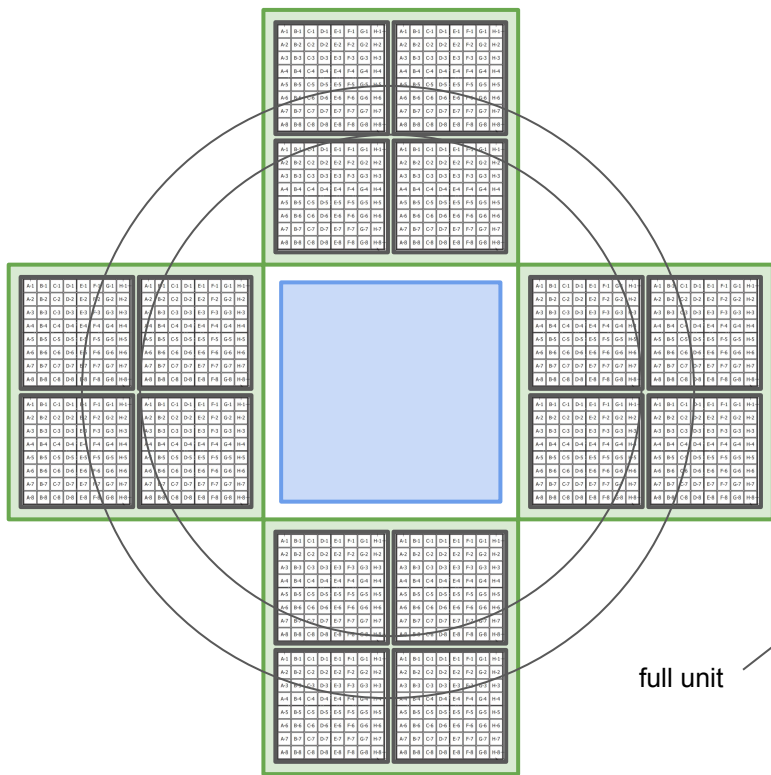


readout area:
4+ readout units
(and spares)



arrangement #1: 16 matrices (+ 4 spares)
4 full readout units (+ 1 spare)

arrangement #2: 20 matrices (+ 5 spares)
4 full (+ 1 spare) + 4 partial (+ 1 spare)



full unit

partial unit

configuration similar to MAPMT setup

will allow covering missing photons in the ring

Structure

Parameter	Symbol	S13361-3050NE-04	S13361-3050AE-04	S13361-3050NE-08	S13361-3050AE-08	Unit
Number of channels	-	16 (4 × 4)		64 (8 × 8)		-
Effective photosensitive area/channel	-	3 × 3				mm
Pixel pitch	-	50				µm
Number of pixels/channel	-	3584				-
Fill factor	-	74				%
Package type	-	Surface mount	With connector*1	Surface mount	With connector*1	-
Window	-	Silicone		Epoxy resin		-
Refractive index of window material	-	1.55				-

*1: A connector made by SAMTEC is mounted on the back side of the board.

ST4-20-1.00-L-D-P-TR (S13361-3050AE-04)

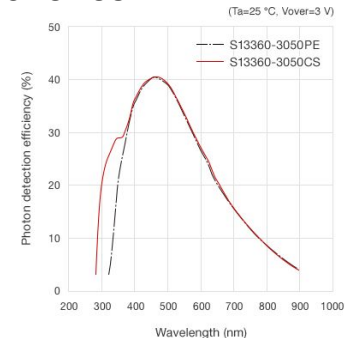
ST4-40-1.00-L-D-P-TR (S13361-3050AE-08)

These connectors mate with a SAMTEC receptacle (SS4-20-3.00-L-D-K-TR or SS4-40-3.00-L-D-K-TR).

See the following URL for detailed information.

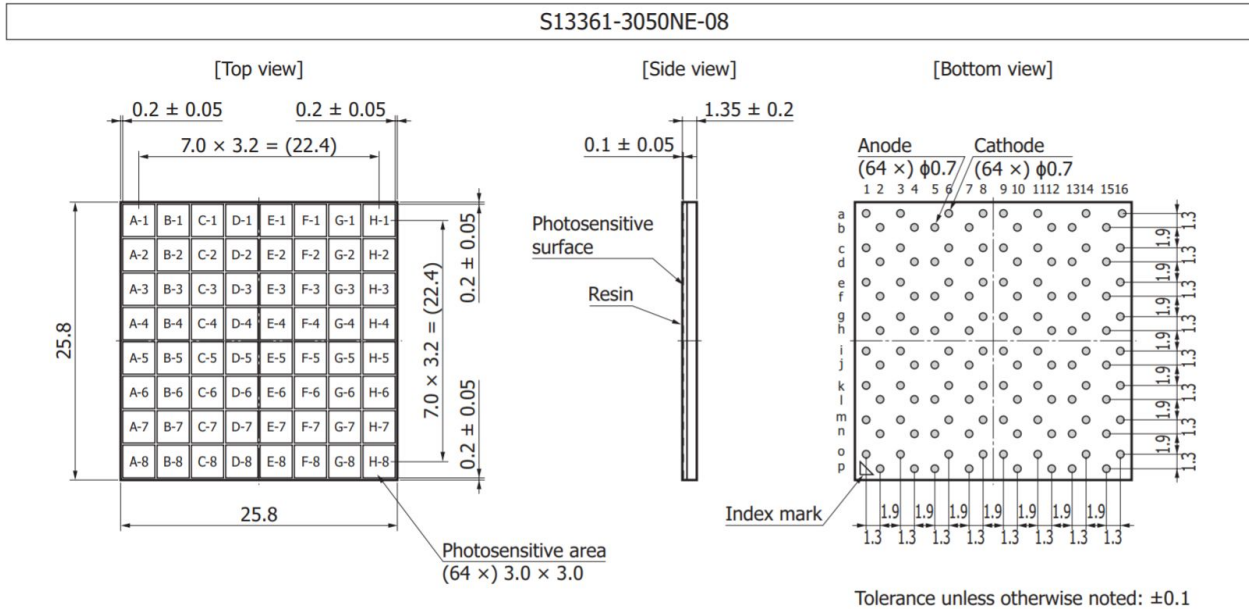
<http://www.samtec.com/ftppub/pdf/ss4.pdf>

request silicone resin

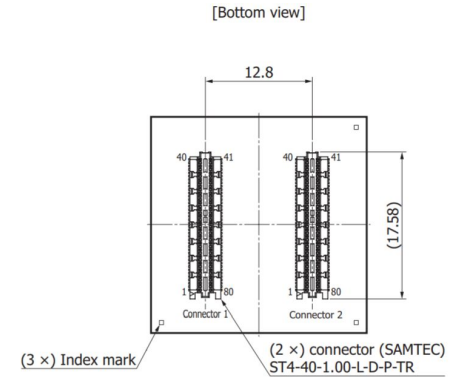


we want to have the full surface in contact for optimise the cooling of the matrix

bare matrix, without connector

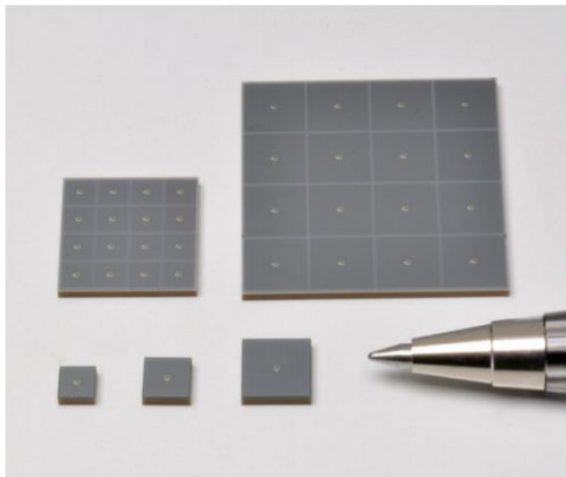


in the version with connector there are two SAMTEC ST4-40-1.00-L-D-P-TR connectors (~ 100 mm² each)



connectors would cover a total of > 200 mm² surface of the sensor, 1/3 of the sensor back side cannot be directly cooled

we want to have the full surface in contact for optimise the cooling of the matrix



MPPC[®] (Multi-Pixel Photon Counter)

S14160/S14161 series

Low breakdown voltage type MPPC for scintillation detector

Structure

Typ. no.	Number of channels (ch)	Effective photosensitive area/channel (mm ²)	Pixel pitch (μm)	Number of pixels/channel	Package	Window	Window refractive index	Geometrical fill factor (%)
S14160-3050HS	1	3.0 × 3.0	50	3531	Surface mount type	Silicone	1.57	74
S14160-4050HS		4.0 × 4.0		6331				
S14160-6050HS		6.0 × 6.0		14331				
S14161-3050HS-04	16 (4 × 4)	3.0 × 3.0		3531				
S14161-3050HS-08	64 (8 × 8)	3.0 × 3.0		3531				
S14161-4050HS-06	36 (6 × 6)	4.0 × 4.0		6331				
S14161-6050HS-04	16 (4 × 4)	6.0 × 6.0	14331					



series 14 is also available in 8x8 matrices, same form factor and landing pattern (probably cheaper sensors) higher PDE, higher DCR make one readout unit (4 matrices) based on this technology for comparison?

Electronics design challenges of the new SiPM carrier

**NOT
TODAY**

- **landing pattern and matrix arrangement**

- aim at minimal space between matrices (< 0.2 mm)
- and between matrices and PCB border (< 0.2 mm)

- **how to bring biases in and take signals out**

- flex PCB on each of the 4 sides
- how many lines
- smart (crossed) routing to reduce cross-talk
- connector on electronics side

- **high-temperature annealing compatible**

- do we want this? good to have
- high-T FR4 (180 C)
- kapton flex, edge connector

- **where do we put the temperature sensor**

- do we need this? I think we need it
- no room for LM73 on the front side
- can we put a NTC sensor inside the PCB stack-up? if not, it is small it can stay on the back

- **where to we put the other discrete components**

- resistors and capacitances used to decouple bias line
- perhaps we can avoid them
- otherwise try to put them on the flex PCB soon after bending

