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QUALIFICATION SUMMARY REPORT PM11

Purpose: To provide qualification summary

Products: Silicon Photomultiplier KETEK SiPM PM11-WB-series (BGA package)

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1 Qualification Overview

The purpose of this report is to summarize qualification test procedures and results of the Silicon Photomultiplier SiPM PM11-WB series. The tests were done for KETEK at the Electronic Packaging and Sensor Lab of the University of Applied Sciences Munich.

2 Reliability Test Description

The reliability tests were performed according to the following qualification plan set by KETEK. Standard conditions for the use of the devices were assumed when the test conditions were defined.

The devices were classified as good in case of an electrical connection between BGA and chip (verified by a diode test). Optical inspection was done after each diode test.

Test	Method	Test Conditions	Qty	Target
PC	Pre-conditioning / MSL classification according to J-STD-020	MSL1 SAM inspection was replaced by optical inspection	26	0 failed parts
TC	Temperature Cycling according to JESD22-A104 on PCB	1000x @ -55°C/125°C without bias	26	0 failed parts
H ³ TS	High Humidity High Temperature Storage according to JESD22-A101	1000h @ 85°C/85% RH without bias	26	0 failed parts
HTS	High Temperature Storage according to JESD22-A103	1000h @ 125°C without bias	26	0 failed parts
ESD	ESD Test using human-body model	1000 V, 3 Pulses with positive and negative polarity each	10	0 failed parts

3 Qualification Results

MSL Pre-conditioning Results:

Test-condition	Devices tested	Date	Quantity	Result
MSL1	PM1125-WB-A0	04 / 2018	26	All passed

Temperature Cycling Results:

Test-condition	Devices tested	Date	Quantity	Result
MSL1 pre-conditioning incl. soldering on PCB 1000 x -55°C/+125°C	PM1125-WB-A0	05 / 2018	26	All passed
Soldering on Array PCB 1000 x -40°C/+85°C	PA1125-WB-B0-0808	05 /2019	64	All passed

High Temperature Storage Results:

Test-condition	Devices tested	Date	Quantity	Result
1000h @ 125°C	PM1125-WB-B0	06 / 2018	26	All passed
1000h @ 125°C	PA1125-WB-B0- 0808	05 /2019	64	All passed

High Humidity High Temperature Storage Results:

Test-condition	Devices tested	Date	Quantity	Result
1000h @ 85°C/85% RH	PM1125-WB-B0	06 / 2018	26	All passed
1000h @ 85°C/85% RH	PA1125-WB-B0- 0808	05 /2019	64	All passed

Mechanical Stability

Results:

The shear force needed to disassemble the devices soldered to a PCB was measured. The recommended soldering temperature profile, footprint and solder paste specified in the PM11-WB-series datasheet was used.

Mean shear force after soldering: 7.5 N; standard deviation: 0.6 N

Mean pulling force after soldering: 7.6 N; standard deviation: 1.3 N

Mean shear force after soldering and 1000 h @ 125 °C: 6.6 N; standard deviation: 0.5 N

Mean shear force after soldering and 1000 h @ 85°C/85%R.H.: 6.4 N; standard deviation: 0.6 N

Mean shear force after soldering and 1000x-40°C/85°C: 7.7 N; standard deviation: 0.25 N

ESD

Results:

Test-condition	Devices tested	Date	Quantity	Result
3 Pulses of each polarity @ 1000 V	M1125-WB-B0	04 / 2018	10	All passed.

4 Conclusion

The devices PM11xx-WB did pass the required reliability test conditions so they should withstand standard conditions for the use of electronic components.

If the devices are used under special conditions, additional tests should be defined.