

sensL



ScintPack1

SPM Scintillator Demonstrator Pack

Overview

The SensL SPM Scintillator Demonstration Pack



(ScintPack1) contains essential gear necessary to perform testing and evaluation of the SensL SPM detectors for use in radiation detection with scintillators. A variety of both detectors and scintillation crystals have been provided, along with the necessary accessories, to give the widest scope of evaluation. The ScintPack1 is suitable for demonstration of the SPM's capabilities, evaluation of the SPM technology for OEM or research applications and educational purposes.

Silicon Photomultiplier technology is the first solid state alternative to the long established Photomultiplier Tube (PMT). It combines the high gain ($\sim 10^6$) and quantum efficiency of the PMT with the well appreciated benefits of silicon sensors including low operating voltage, robustness, reliability, magnetic field insensitivity, tolerance of excess/ambient light, and suitability for miniaturization.

The SPM consists of an array of Photon Counting APDs, each with its own integrated quench resistor. Each Geiger mode APD is sensitive to single photons due to the high internal gain, and outputs a uniform, fixed current pulse for each photon detected. This array of Geiger mode APDs is connected in parallel resulting in a large area device. The SPMMicro is SensL's low cost version of the SPM detector series, and comes in a variety of packages (see [SPMMicro datasheet](#) for further details). The ceramic package with epoxy fill (package code X13) has been specifically designed to facilitate efficient coupling to scintillators. The epoxy is highly transparent, flat and flush with the top of package and fully protects the silicon and wire bonds connections. The maximum distance between the top of the epoxy and the detector's sensitive surface is $<250\mu\text{m}$. This maximizes the light coupling from scintillator to SensL SPM.

Contents

- SPMMicro3035X13 (9mm², 35 μm cell SPM)
- SPMMicro3020X13 (9mm², 20 μm cell SPM)
- SPMMicro6035X13 (9mm², 35 μm cell SPM)
- SPMA4 (preamplifier and power supply boards)
- 5mL optical grease (BC-630)
- 3 x 3 x 15mm³ BGO (white epoxy covered on 5 sides)
- 3 x 3 x 15mm³ LYSO (white epoxy covered on 5 sides)
- 3 x 3 x 15mm³ CsI(Tl) (white epoxy covered on 5 sides)
- 6 x 6 x 30mm³ CsI(Tl) (white epoxy covered on 5 sides)
- CD with all product datasheets, user manuals and measurement instructions
- Mains adapter cable
- Storage case



Additional Hardware (required)

- Oscilloscope and/or multichannel analyzer
- Multimeter
- Radioactive sources

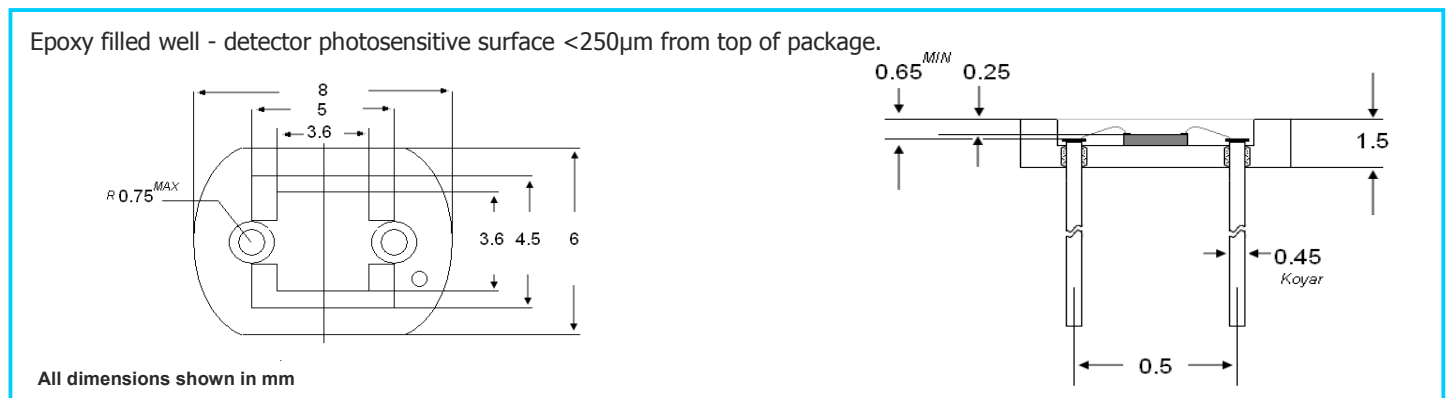
SPM General Specifications

Parameter	Value	Units	Notes
Spectral Range (λ)	400-850	nm	
Peak Spectral Response (λ)	490	nm	
Breakdown Voltage (V_{br})	Typ. 28	V	$\pm 0.5V$ variation across all SPM detector designs $\pm 0.2V$ variation across any one SPM detector design See test sheets for detector details
Operating Voltage (V)	Typ. @ +2V above V_{br}	V	
Maximum Output Voltage	2	V	When used with SensL preamp
Max Storage Temperature	40	$^{\circ}C$	
Epoxy: Refractive Index	1.5318 at 589nm	—	
Epoxy: Spectral Transmission	>98 at 550-900nm	%	

SPM Performance Specifications

Detector Parameter @ +2V	SPM Type			Notes
	3020	3035	6035	
SPM Pixel Active Area (mm^2)	3 x 3		6 x 6 *	* The 6mm SPM is composed of four 3mm SPM die arranged in a 2x2 configuration
Number of Microcells per SPM Pixel	8640	3640	14,560	
Microcell Gain	5×10^5	1×10^6	1×10^6	Approx. at +2V above V_{br}
PDE (%)	10-20			+1V to +4V above V_{br}

SPMMicro3000 Series Package Schematic (2 pin TO5 pin compatible package)



See SPMMicro datasheet for package specification of the SPMMicro6000 series package included

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.

Ordering Information

PRODUCT CODE	DESCRIPTION
ScintPack1	SPM Scintillator Demo Pack: SPMMicro3035X13, SPMMicro3020X13, SPMMicro6035X13, Optical grease, BGO, LYSO and CsI(Tl) crystals, SPMA4, Mains adapter cable, CD, Storage case.

SPM Electronics

Transimpedance Preamplifier Board

The transimpedance preamplifier converts the raw current from the SPM into a voltage and is suitable for signal detection where, in addition to the high frequency components, the signal also contains DC and low frequency components. The typical gain for a SensL transimpedance amplifier is matched to provide a 2V output swing across the dynamic range of the detector.

Power Board

The power supply board simplifies the input power requirements of the SPM detectors. Instead of the requirement for the user to supply separate voltages of +5V, -5V and bias voltage, the power board included as part of the SPMA4 option only requires a single +5V input and generates the other two voltages. The power module plugs onto the base of transimpedance preamp board to neatly distribute power. An input jack socket enables power to be input from the 5VDC mains adapter (supplied) or a bench supply. The bias voltage is optimally set during production, however, upon request, details of how to adjust the bias voltage via a potentiometer can be made available.

Scintillation Crystals

Two sizes of crystal are provided, to included the ideal fit to the two sizes of SPM (3mm and 6mm). The 3mm crystals (3 x 3 x 15 mm³) are BGO, LYSO and CsI(Tl). The single 6mm (6 x 6 x 30 mm³) crystal is of CsI(Tl). All of the crystals are polished and have a white loaded epoxy coating on five faces to act as an optical isolator and diffuse, reflective medium for maximizing the light output to the detector.

	BGO	LYSO(Ce)	CsI(Tl)
Light Yield (Ph./MeV)	8,200	27,000	52,000
Density (g/cc)	7.13	7.4	4.51
Decay Time (ns)	300	40	1000
Peak Emission (nm)	480	420	560

Optical Grease

The optical grease is a clear, colorless, silicone coupling compound which features excellent light transmission and low evaporation and blend at 25°C. It has a specific gravity of 1.06 and an Index of Refraction of 1.465. The optical grease is supplied in a sealed plastic syringe for ease of storage and application. When coupling crystals to the detector surface, a small amount of the optical grease can be used to provide a better index matching medium for optimum light transfer.

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