

General Description

16 channels (4x4) SiPM array with 4x4 mm² active area SiPMs with independent anode and cathode connection.

The Silicon PhotoMultiplier (SiPM) is an innovative solid state silicon detector with single photon sensitivity. SiPMs are a valid solid state alternative to photomultiplier tubes (PMT detectors). The main benefits of this detector are: high gain, extremely good timing performance, low operative voltage, insensitivity to magnetic field and high integration level.

ASD-NUV SiPMs are based on the AdvanSiD "P-on-N" silicon technology for detection of Near Ultraviolet Light. NUV-SiPMs have peak efficiency at 420 nm, with detection spectrum extending from 350 nm to 900 nm.

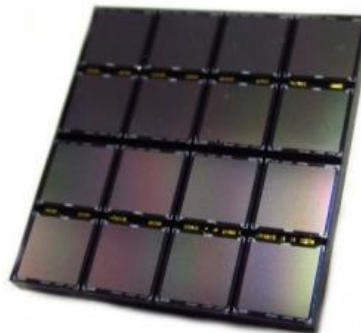
Application

- High Energy Physics
- Medical Imaging
- Nuclear Medicine
- DNA Sequencing
- Homeland Security
- Flow Cytometry
- Biological Sensors
- Analytical Instruments
- SEM Microscopy
- Confocal Microscopy

Ordering Information

ASD-NUV4S-P-4x4T

4x4 array of 4x4 mm² active area SiPM with 40x40 μm² cell size. S indicates square SiPM, P indicates plastic package, T tile.



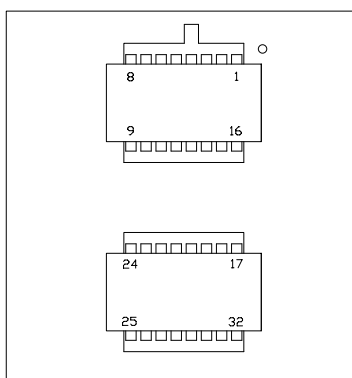
Features

- Detection of extremely faint light
- Very high gain (10⁶)
- Extremely good timing performance
- Insensitive to magnetic fields
- Not damaged by ambient light
- Small and compact
- CSP Nickel free

NUV-SiPMs Features

- Near Ultra Violet light detection
- Superior breakdown voltage uniformity
- Excellent temperature stability

Pins function



Array bottom view

N°	Name	Channel
1-2	K1-A1	Ch.1
3-4	A2-K2	Ch.2
5-6	A3-K3	Ch.3
7-8	K4-A4	Ch.4
9-10	K5-A5	Ch.5
11-12	A6-K6	Ch.6
13-14	A7-K7	Ch.7
15-16	K8-A8	Ch.8
17-18	K9-A9	Ch.9
19-20	A10-K10	Ch.10
21-22	A11-K11	Ch.11
23-24	K12-A12	Ch.12
25-26	K13-A13	Ch.13
27-28	A14-K14	Ch.14
29-30	A15-K15	Ch.15
31-32	K16-A16	Ch.16

K = cathode, A = anode

ASD-NUV4S-P-4x4T

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Min	Max	Unit
T _A	Operating Temperature Range	-25	+40	°C
T _s	Storage temperature	-40	+60	°C
M _{VW}	Max voltage working range	BV ⁽¹⁾ + 3		V
ASD-SiPM4S-P-4x4T is not compatible with SMT assembly process				

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

GEOMETRICAL, ELECTRICAL AND OPTICAL TYPICAL CHARACTERISTICS (T_A=20°C)

Symbol	Parameter	ASD-NUV4S-P-4x4T (4x4 SiPMs tile with 4x4 mm ² active area SiPM in plastic package)	Unit
AA	Effective Active Area	4x4x16	mm ²
CS	Cell Size	40x40	µm ²
FF	Cell Fill Factor	60 %	-
N	SiPM cells number	9340	-
S _R	Spectral response range	350 to 900	nm
λ _p	Peak sensitivity wavelength	420	nm
PDE	Photon Detection Efficiency ⁽²⁾	32.5 %	%
BV	Breakdown voltage	26 ± 2 ⁽³⁾	V
Wvr	Work voltage range	BV ⁽¹⁾ + 2 to BV + 3	V
D _c	SiPM dark count ⁽⁴⁾	< 200	kCps/mm ²
G	Gain ⁽⁵⁾	2.1 · 10 ⁶	-
ΔBV _{MAX}	BV uniformity ⁽⁶⁾	0.4 (max)	V
BV _{TS}	BV temperature sensitivity	26	mV/°C

(1) BV = Breakdown voltage.

(2) Measured at peak sensitivity wavelength (λ = λ_p) at +3 V Overvoltage (not including afterpulse and crosstalk).

(3) Refer to the data provided with each product.

(4) 0.5 p.e. threshold level at 20 °C and +3 V Overvoltage (primary dark count rate not including afterpulse).

(5) Measured at 20 °C at +3 V Overvoltage.

(6) Maximum variation in SiPM breakdown voltage within each tile.

DIMENSIONAL OUTLINES

Units = mm Mechanical tolerance = ±0.15 mm unless otherwise noted.

Description	Top View	Side View	Bottom View
4x4 SiPMs tile with 4x4 mm ² SiPM active area size Material: FR4 + transparent epoxy layer			

ASD-NUV4S-P-4x4T

DEVICE CHARACTERISTICS

This section reports typical SiPM reverse and forward I/V curves and the dependences on overvoltage, temperature, and wavelength of most relevant device parameters. Refer to the data accompanying each shipped product for more detailed information.

All measurements are performed in a tight-light climatic chamber at T=20°C, unless otherwise noted.

SiPM output signals are amplified with ASD-EP-EB-N or ASD-EP-EB-PZ evaluation boards and acquired with fast oscilloscopes; the digitized data is then processed with dedicated PC programs.

Explanation of SiPM working principle and details on SiPM properties parameters can be found on the [Introduction to SiPMs](http://advansid.com/resources/the-silicon-photmultiplier) available at <http://advansid.com/resources/the-silicon-photmultiplier>.

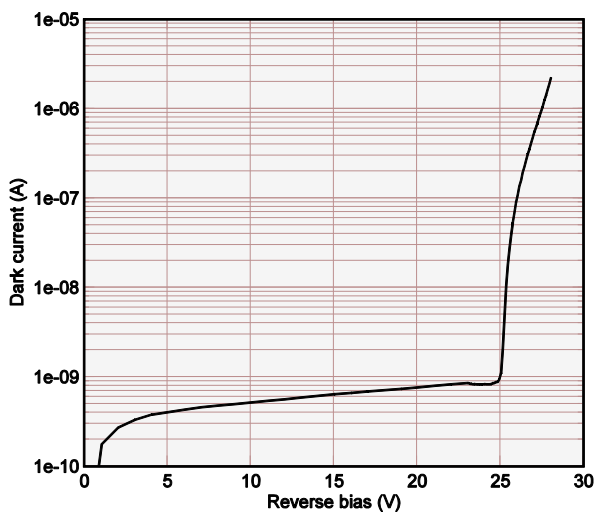


Fig.1 ASD-NUV4S-P-4x4T typical reverse IV curve (one channel).

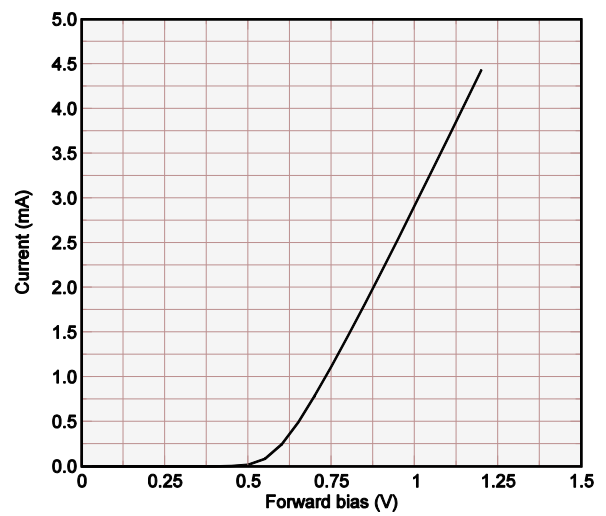


Fig.2 ASD-NUV4S-P-4x4T typical forward IV curve (one channel).

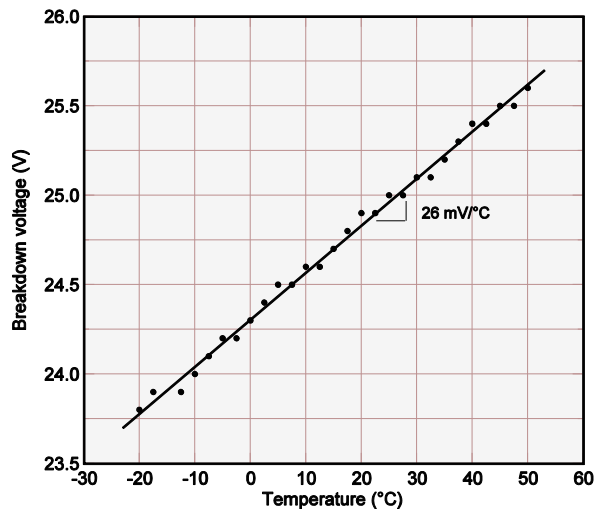


Fig.3 NUV-SiPMs breakdown voltage temperature dependence.

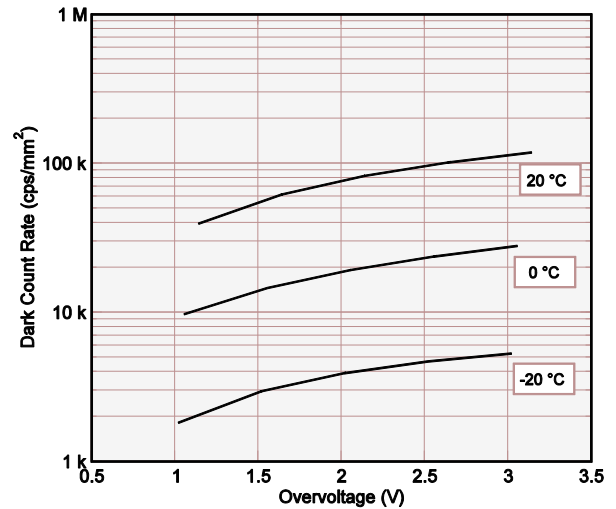


Fig.4 Dark count rate per square mm in NUV-SiPMs as a function of overvoltage and temperature.

ASD-NUV4S-P-4x4T

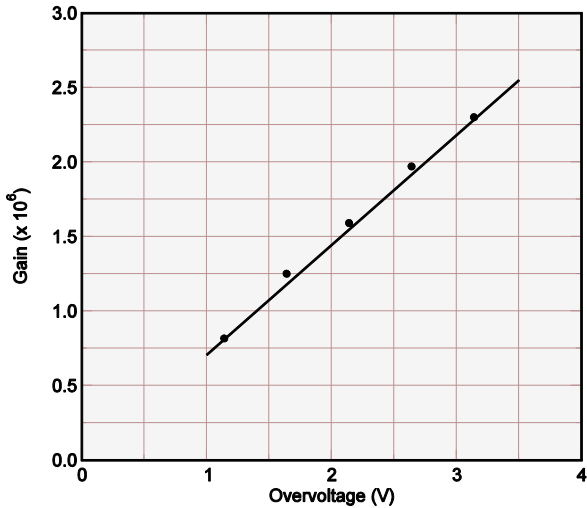


Fig.5 Gain of NUV-SiPMs as a function of overvoltage.

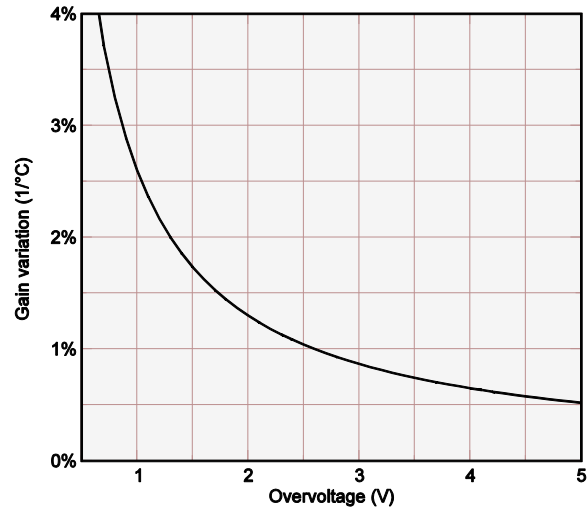


Fig.6 Relative variation of gain with temperature in NUV-SiPMs as a function of overvoltage.

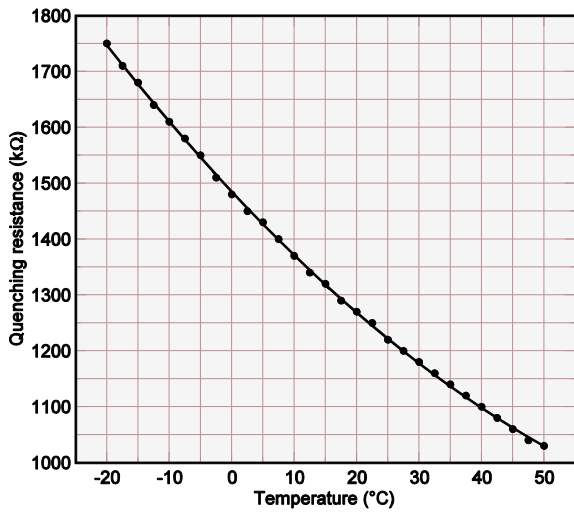


Fig.7 Temperature dependence of poly-silicon quenching resistance in NUV-SiPMs.

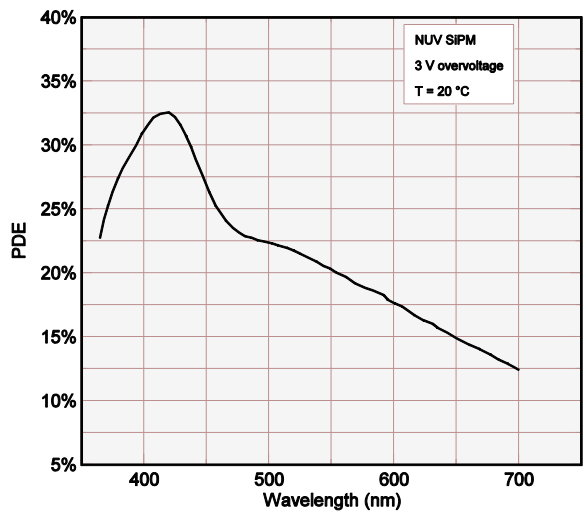


Fig.8 Photo detection efficiency (PDE) in NUV-SiPMs as a function of wavelength (crosstalk and afterpulse not included).

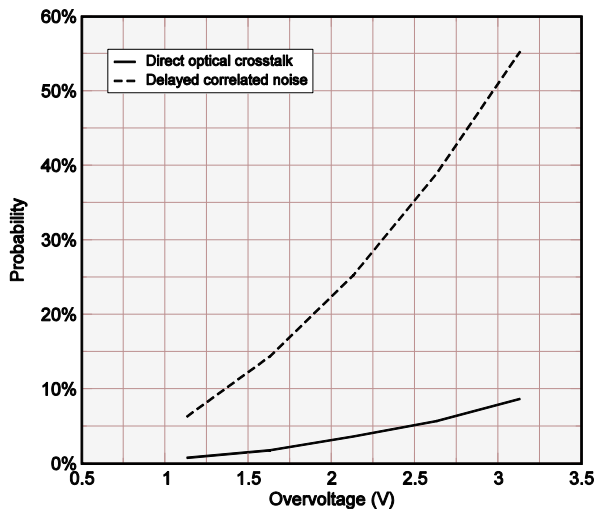


Fig.9 Correlated noise probability in NUV-SiPMs as a function of overvoltage. Delayed correlated noise includes delayed crosstalk and afterpulse.

ASD-NUV4S-P-4x4T

CONNECTOR

JAE 0.8mm pitch IL-WX series. One pin header connector mounted on the back of the module (part number JAE IL-WX-16P-VF-BE). One receptacle (socket) provided with each shipped SiPM array (part number JAE IL-WX-16S-VF-BE). SMT mounting of sockets should follow constructor's indications.

Datasheet and mechanical information available at [this link](#) (JAE website).

General Specifications (JAE IL-WX-16P-VF-BE)

Parameter	Value	Unit
Number of contacts	16	-
Rated current	0.5	A
Dielectric withstanding voltage	500 (1 minute)	V (AC rms)
Insulation resistance	100 (min)	MΩ
Contact resistance	20 (max)	mΩ
Operating temperature range	-40 to +85	°C

Information in this datasheet is believed to be reliable. However, no responsibility is assumed for possible inaccuracies or omissions. Specifications are subject to change without notice.