

Si photodiode arrays

S4111/S4114 series

16, 35, 46-element Si photodiode arrays for UV to NIR

The S4111/S4114 series are Si photodiode linear arrays mounted in ceramic DIPs (dual inline packages). These photodiode arrays are primarily developed for low-light-level detection such as spectrophotometry, and cover a wide spectral range from UV to near infrared light. Since all elements can be used with a reverse bias for charge storage readout, the S4111/S4114 series are able to detect low level light with high sensitivity. Crosstalk between elements is minimized to maintain signal purity. Special filters can be attached as the input window (custom order products).

Features

- Large photosensitive area
- Low crosstalk
- **S4111 series: Enhanced infrared sensitivity, low dark current**
- **S4114 series: NIR sensitivity suppressed type, low terminal capacitance, high-speed response**

Applications

- Multichannel spectrophotometers
- Color analyzers
- Light spectrum analyzers
- Light position detection

Structure / Absolute maximum ratings

Type no.	Window material	Package (mm)	Photosensitive area (per 1 element)		Between elements measure (mm)	Between elements pitch (mm)	Number of elements	Absolute maximum ratings		
			Size (mm)	Effective area (mm ²)				Reverse voltage V _R max (V)	Operating temperature* ² Topr (°C)	Storage temperature* ² Tstg (°C)
S4111-16R	Resin potting	18 pin DIP	1.45 × 0.9	1.305	0.1	1.0	16	15	-20 to +60	-20 to +80
S4111-16Q* ¹	Quartz	40 pin DIP	4.4 × 0.9	3.96			35			
S4111-35Q* ¹		48 pin DIP					46			
S4111-46Q* ¹		40 pin DIP					35			
S4114-35Q* ¹		48 pin DIP					46			
S4114-46Q* ¹										

*1: See P.6. "Precautions against UV light exposure"

*2: No dew condensation.

When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.

Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

Electrical and optical characteristics (Typ. T_a=25 °C, per 1 element, unless otherwise noted)

Type no.	Spectral response range λ (nm)	Peak sensitivity wavelength λ _p (nm)	Photosensitivity S			Dark current I _D Max.		Shunt resistance R _{sh} V _R =10 mV		Terminal capacitance C _t		Rise time t _r R _L =1 kΩ λ=655 nm		NEP λ=λ _p	
			λ _p (A/W)	200 nm (A/W)	633 nm (A/W)	V _R =10 mV (pA)	V _R =10 V (pA)	Min (GΩ)	Typ. (GΩ)	V _R =0 V (pF)	V _R =10 V (pF)	V _R =0 V (μs)	V _R =10 V (μs)	V _R =0 V (W/Hz ^{1/2})	V _R =10 V (W/Hz ^{1/2})
S4111-16R	340 to 1100	960	0.58	-	0.39	5	25	2.0	250	200	50	0.5	0.1	4.4 × 10 ⁻¹⁶	1.7 × 10 ⁻¹⁵
S4111-16Q				0.08	0.43										
S4111-35Q	190 to 1100			0.08	0.43	10	50	1.0	30	550	120	1.2	0.3	1.3 × 10 ⁻¹⁵	3.1 × 10 ⁻¹⁵
S4111-46Q															
S4114-35Q	190 to 1000	800	0.50			60	300	0.15	2	35	20	0.1	0.05	5.7 × 10 ⁻¹⁵	8.0 × 10 ⁻¹⁵
S4114-46Q															

Spectral response

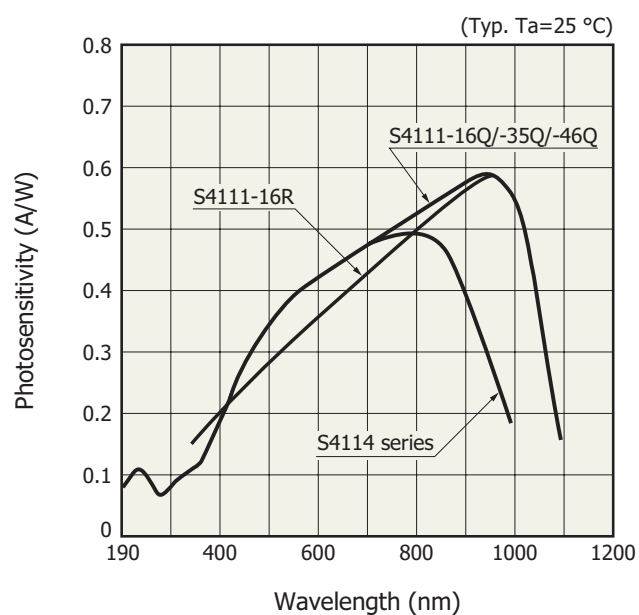
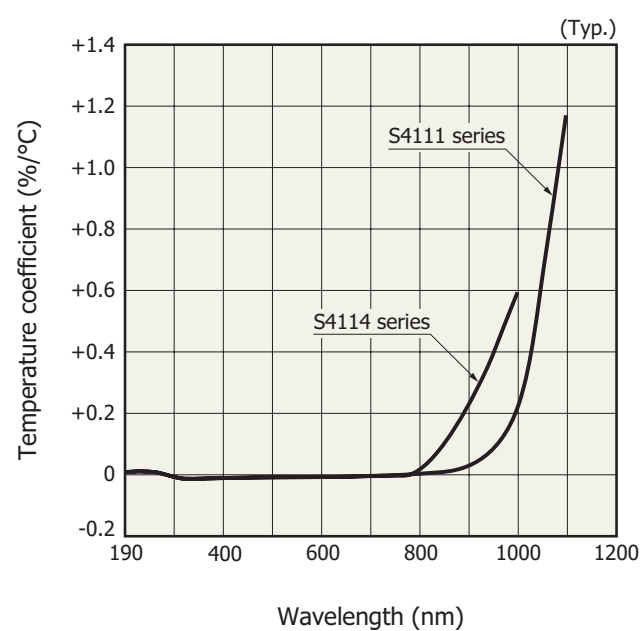
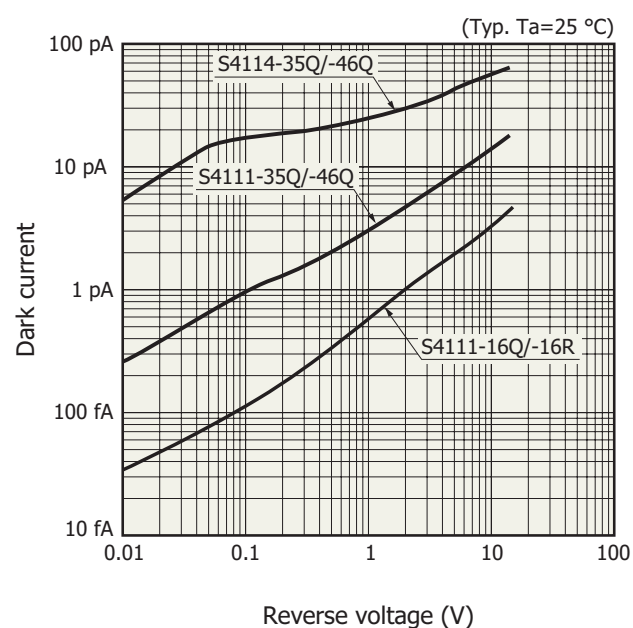


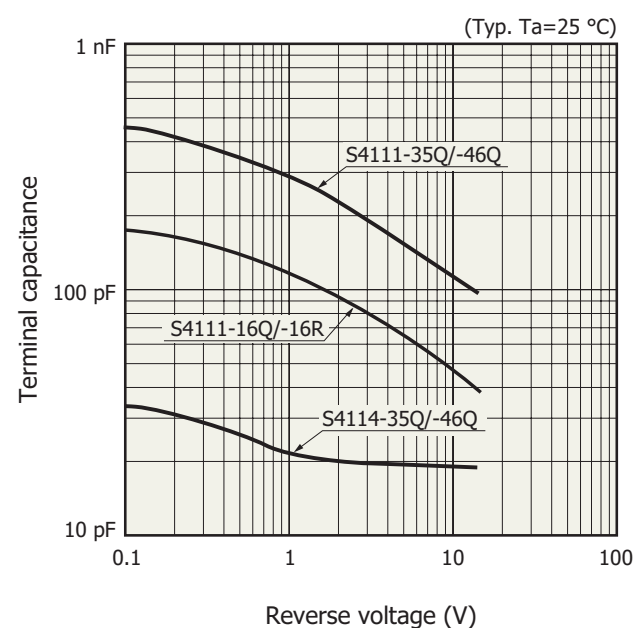
Photo sensitivity temperature characteristics



Dark current vs. reverse voltage (per element)

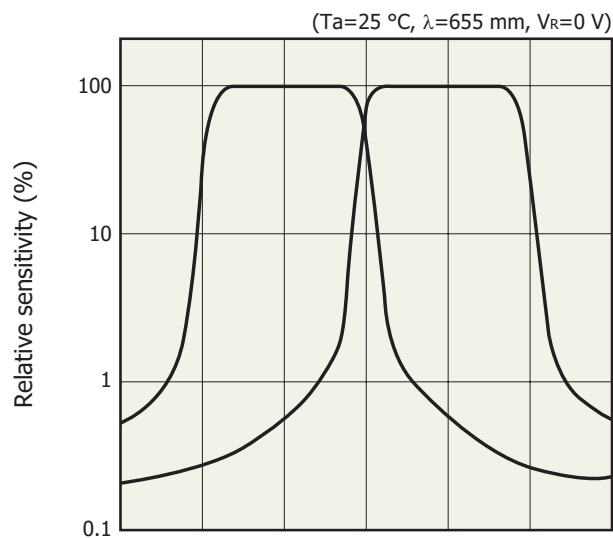


Terminal capacitance vs. reverse voltage (per element)



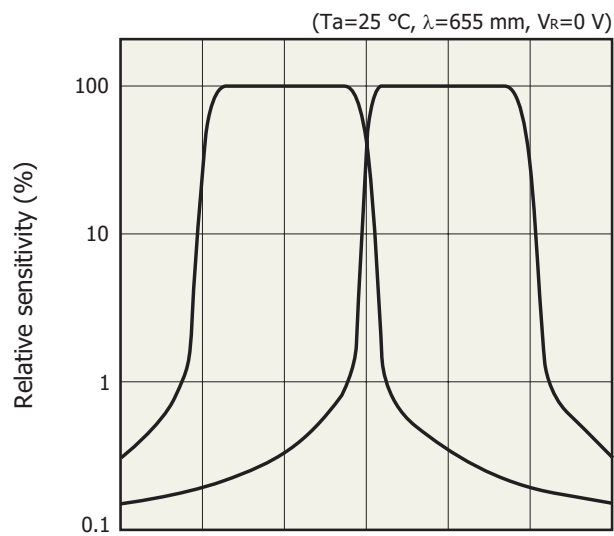
Example of crosstalk

S4111 series

Light position on photosensitive area (500 $\mu\text{m}/\text{div.}$)

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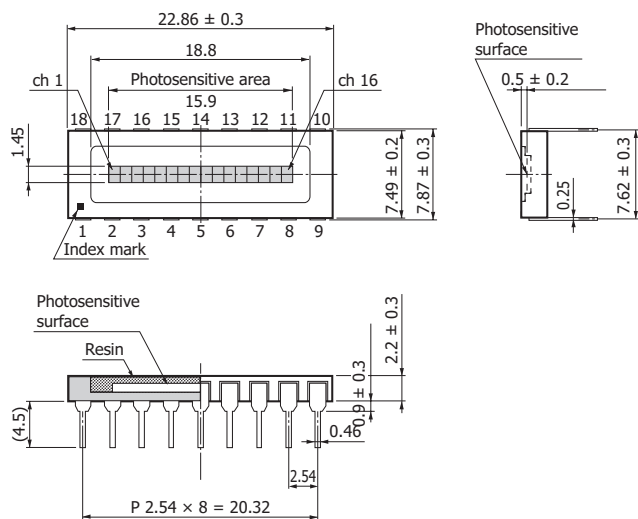
S4114 series

Light position on photosensitive area (500 $\mu\text{m}/\text{div.}$)

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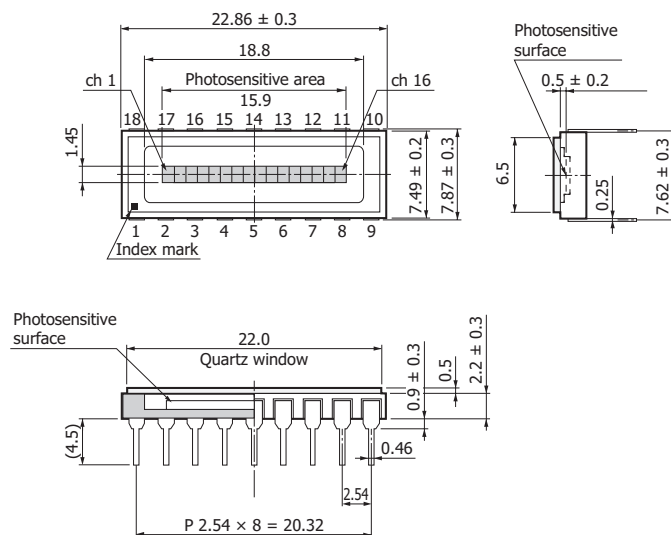
Dimensional outline (unit: mm)

S4111-16R



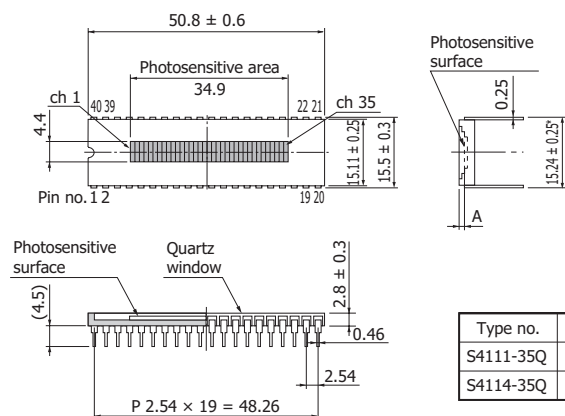
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S4111-16Q



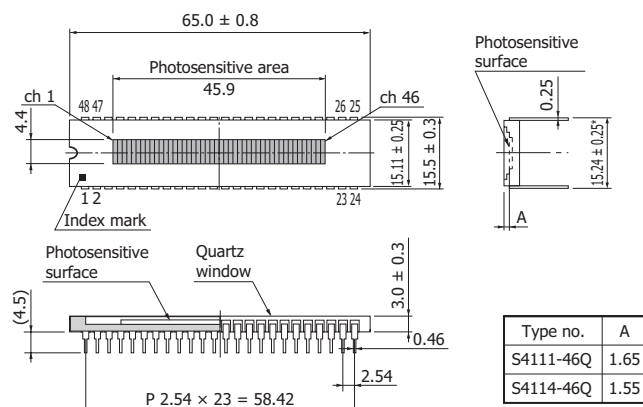
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S4111-35Q, S4114-35Q



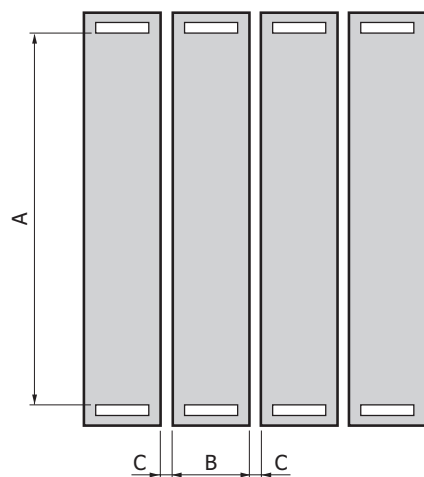
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S4111-46Q, S4114-46Q



KMPDA0021ED

Details of elements (for all types)



	A	B	C
S4111-16Q/16R	1.45	0.9	0.1
S4111-35Q/46Q S4114-35Q/46Q	4.4	0.9	0.1

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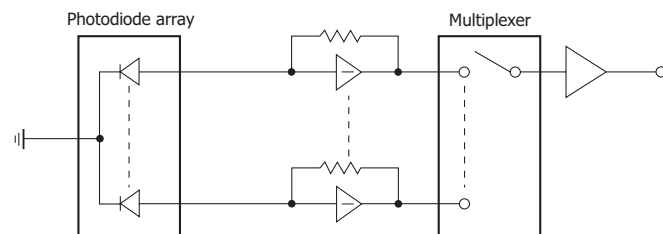
Pin connections

Pin no.	16-element type	35-element type	46-element type
1	KC	KC	KC
2	2	2	2
3	4	4	4
4	6	6	6
5	8	8	8
6	10	10	10
7	12	12	12
8	14	14	14
9	16	16	16
10	KC	18	18
11	15	NC	20
12	13	20	22
13	11	22	24
14	9	24	26
15	7	26	28
16	5	28	30
17	3	30	32
18	1	32	34
19		34	36
20		NC	38
21		KC	40
22		35	42
23		33	44
24		31	46
25		29	KC
26		27	45
27		25	43
28		23	41
29		21	39
30		19	37
31		17	35
32		15	33
33		13	31
34		11	29
35		9	27
36		7	25
37		5	23
38		3	21
39		1	19
40		NC	17
41			15
42			13
43			11
44			9
45			7
46			5
47			3
48			1

Note: KC=cathode common, NC=no connection

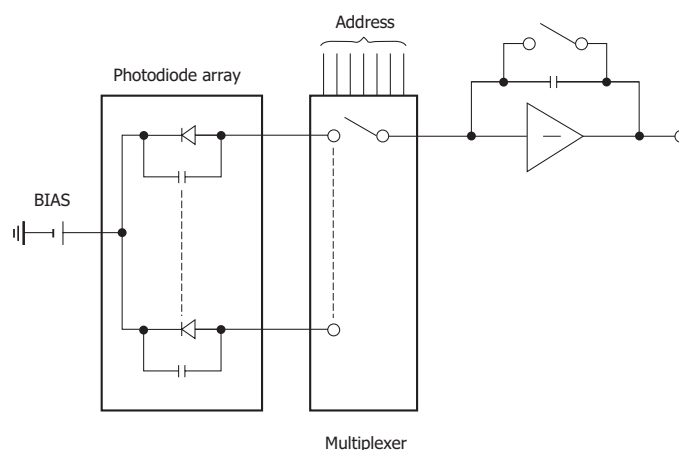
Operating circuits

- ① In the most generally used circuit, operational amplifiers are connected to each channel to read the output in real time. The output of an operational amplifier is of low impedance and thus can be easily multiplexed.



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- ② In the charge storage readout method, the charge stored in the junction capacitance of each channel, which is proportional to the incident light intensity, can be read out in sequence by a multiplexer. With this method, reverse voltage must be applied to the photodiodes, so S4111 and S4114 series are suitable. One amplifier is sufficient but care should be taken regarding noise, dynamic range, etc.



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Hamamatsu also provides the C9004-01 driver circuit for Si photodiode arrays, that allows direct mounting of the S4111-16Q/R on the circuit board.

Precautions against UV light exposure

- When UV light irradiation is applied, the product characteristics may degrade. Such examples include degradation of the product's UV sensitivity and increase in dark current. This phenomenon varies depending on the irradiation level, irradiation intensity, usage time, and ambient environment and also varies depending on the product model. Before employing the product, we recommend that you check the tolerance under the ultraviolet light environment that the product will be used in.
- Exposure to UV light may cause the characteristics to degrade due to gas released from the resin bonding the product's component materials. As such, we recommend that you avoid applying UV light directly on the resin and apply it on only the inside of the photosensitive area by using an aperture or the like.

Related information

www.hamamatsu.com/sp/ssd/doc_en.html

■ Precautions

- Disclaimer
- Metal, ceramic, plastic package products

■ Technical note

- Si photodiode

Information described in this material is current as of September 2023.

Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.

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