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Photosensor amplifier

C9329-01

Digital output function, current-to-voltage conversion amplifier for amplifying very slight photocurrent with low noise

The C9329-01 is a current-to-voltage conversion amplifier used to amplify very slight photocurrent from a photodiode with very low noise. Three ranges of photocurrent detection sensitivity levels (H, M, L) are selectable to match the input signal. The C9329-01 operates on the built-in dry batteries so it can be easily used anywhere. The C9329-01 can be directly connected to a personal computer through the RS-232C interface allowing you to acquire high-resolution (16-bit) digital output signals and use the data logger function.

Features

- **Three sensitivity ranges**
  H: 1 × 10^9 (V/A)
  M: 1 × 10^7 (V/A)
  L : 1 × 10^5 (V/A)
- **Selectable operation modes (analog output/digital output)**
- **Serial connection (RS-232C) with PC**
- **Data logger function, low battery function**
- **Operates on either dry battery or stabilized DC power supply**

Applications

- **Precision photometry**
- **Laser monitors**
- **Optical power meters**
- **Low signal current preamplifiers**

Absolute maximum ratings (Ta=25 °C unless otherwise noted)

Parameter	Symbol	Conditions	Rated value	Unit
Supply voltage	Vs Max		13	V
Supply input current	Iin Max		2	A
Operating temperature (main unit)*1	Topr	No dew condensation*2	0 to +50	°C
Storage temperature (main unit)*1	Tstg	No dew condensation*2	-10 to +60	°C

*1: When using with dry battery, check the temperature range of the dry battery before use
*2: When there is a temperature difference between a product and the surrounding area in high humidity environment,dew condensation may occur on the product surface. Dew condensation on the product may cause deterloration in characteristics and rellability.
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.

Recommended operating range (Ta=25 °C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Supply Voltage*3	-	+6	+12	+13	V

*3: A stabilized DC power supply of 12 V and 1.25 A or more is recommended. The electric current for operating this product varies depending on the use environment. Please check in advance. Recommended power supply: PW18-1.8AQ (TEXIO)

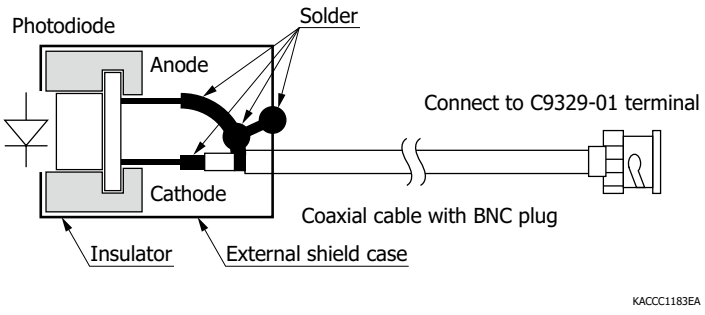
Electrical characteristics (Ta=25 °C, Vs=+12 V)

Parameter		Symbol	Condition			Min.	Typ.	Max.	Unit
Conversion impedance		Zt	H			-	1×10^9	-	V/A
			M			-	1×10^7	-	
			L			-	1×10^5	-	
Input photocurrent		Ip	H			0	-	±5	nA
			M			0	-	±500	
			L			0	-	±50000	
Cutoff frequency		fc	-3 dB	H	Lower	-	DC	-	Hz
					Upper	-	16	-	
				M	Lower	-	DC	-	
					Upper	-	1.6 k	-	
				L	Lower	-	DC	-	
					Upper	-	1.6 k	-	
Output offset voltage drift		-	*4			-	-	±0.5	mV/day
Output offset voltage temperature drift		-				-	-	25	μV/°C
Analog output (Manual mode)	Maximum output amplitude voltage	Vfs	RL=2 kΩ			±5	-	-	V
	Output noise voltage	Vn	Frequency bandwidth*5			-	-	0.5	mVp-p
	Output resistance	Ro				-	100	-	Ω
	Input capacitance	Cin	Overshoot 30% max.			-	-	5000	pF
	Capacitive load	CL				-	-	1000	pF
Digital output (Remote mode)	Interface	-				RS-232C, 19200 bps, 8-bit, non-parity, 2-stop bit			-
	A/D conversion voltage range	-				-5	-	+5	V
	A/D conversion cycle	-				50	-	-	ms
Current consumption		Is				-	20	-	mA

*4: Without photodiode. Maximum output variation measured at 25 °C after 10-minute warm-up after power ON.
*5: Analog output measured after amplified 10 times (through 1.6 kHz low-pass filter)

Typical connection to photodiode

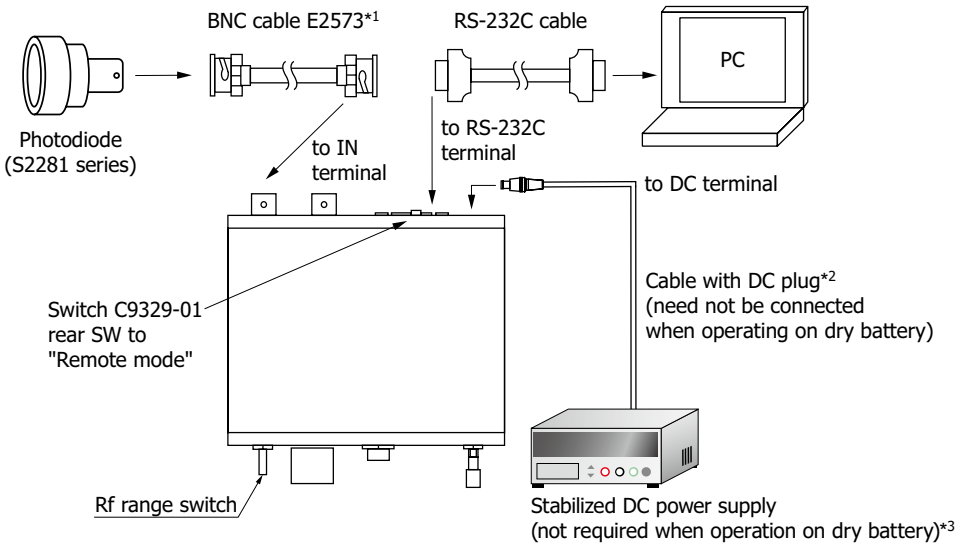
This is an example using a photodiode whose cathode is internally connected to its metal package.
When you use a photodiode metal package, use an insulator to electrically insulate and also hold the package in a shield case as shown in the figure at right. Connect the anode to the shield case.
Any single-element photodiode with a terminal capacitance below 5000 pF can be used.
Using a photodiode with anode grounded is recommended.
Using a photodiode with a BNC connector (S2281 series) allows you to easily make measurements because it connects to the C9329-01 with a BNC-BNC plug coaxial cable.



Anode: Connect to the shield wire of the cable and shield case.
Cathode: Connect to the core wire of the cable.

Connection example

Operation example by digital output (Remote mode)



*1: Sold separately.
If you are using an off-the-shelf cable, make sure that it is within 3 m in length.
*2: Accessories
*3: Please refer to the instruction manual for dry battery installation and replacement.

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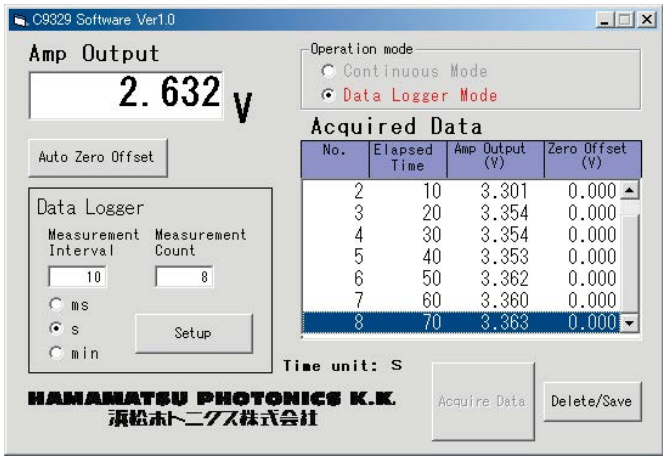
Note: Use the Rf range switch to change the detection sensitivity.
(Detection sensitivity cannot be changed from the PC.)

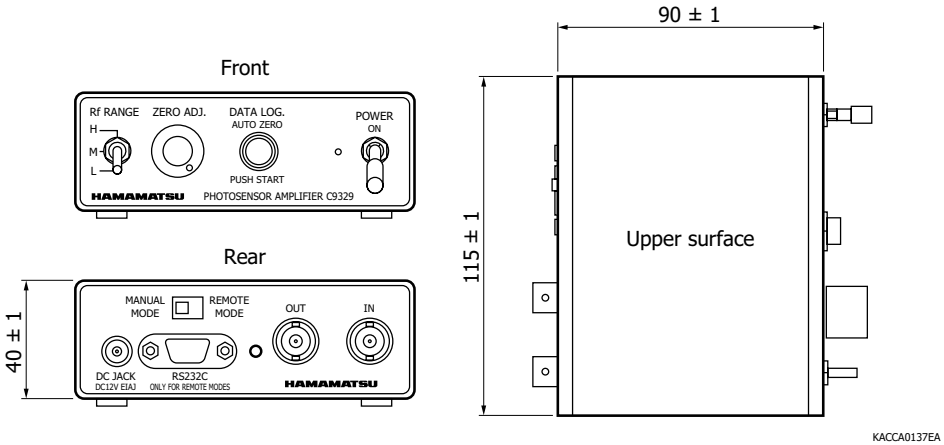
Display example of accessory sample software



Data logger setting range
Measurement interval: 50 ms to 1 min (50 ms interval)
Measurement count: 32000 max.
Measurement interval × Meassurement count: 20 hours max.

Compatible OS: Microsoft® Windows® 10 Pro (32-bit, 64-bit)
Note: Microsoft and Windows are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

Dimensional outline (unit: mm)



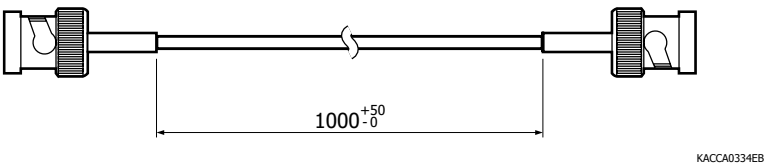
Accessories

· Instruction manual
· Sample software CD-ROM
· Cable with DC plug

Note: A photodiode, coaxial cable with BNC-BNC plug, RS-232C cable and dry battery are not supplied with the C9329-01. You will need an RS-232C cable (straight cable terminated with a D-sub 9-pin female connector at both ends) available from electronics supply houses.

Options (sold separately, unit: mm)

· BNC cable E2573
Cable: 1.5D-QEV



Si photodiodes with BNC connector S2281 series

The S2281 series photodiodes are sealed in a metal package with Photosensitive a BNC connector and designed to connect to The C9329-01 photosensor amplifier. Two different spectral response ranges are provided. The large photosensitive area makes the S2281 series suitable for optical power meters. Hamamatsu also provides the E2573 BNC cable (length: 1 m) as an option.

Structure

Parameter	S2281	S2281-01	S2281-04	Unit
Photosensitive area size	ϕ11.3	ϕ11.3	ϕ7.98	mm
Photosensitive area	100	100	50	mm^2
Package	Metal package with BNC connector			-
Window material	Quartz glass			-

Absolute maximum ratings

Parameter	Symbol	S2281	S2281-01	S2281-04	Unit
Reverse voltage	V_R max	5			V
Operating temperature*6	Topr	-10 to +60			°C
Storage temperature*6	Tstg	-20 to +70			°C

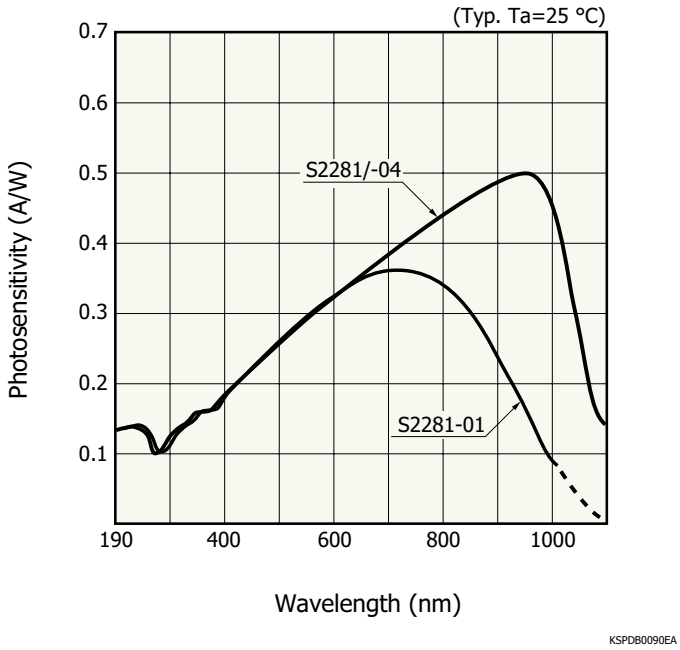
*6: No dew condensation
When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.

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 (Ta=25 °C unless otherwise noted)

Parameter	Symbol	Condition	S2281			S2281-01			S2281-04			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Spectral response range	λ		-	190 to 1100	-	-	190 to 1000	-	-	190 to 1100	-	nm
Peak sensitivity wavelength	λp		-	960	-	-	720	-	-	960	-	nm
Photosensitivity	S	λ=200 nm	0.10	0.12	-	0.10	0.12	-	0.10	0.12	-	A/W
		λ=λp	-	0.5	-	-	0.36	-	-	0.5	-	
Short circuit current	Isc	100 *lx*	64	80	-	32	40	-	32	40	-	μA
Dark current	I_D	V_R=10 mV	-	50	500	-	6	300	-	50	500	pA
Shunt resistance	Rsh	V_R=10 mV	20	200	-	30	1700	-	20	200	-	MΩ
Rise time	tr	V_R=0 V R_L=1 kΩ	-	3	-	-	7	-	-	3	-	μs
Terminal capacitance	Ct	V_R=0 V f=10 kHz	-	1300	-	-	3200	-	-	1300	-	pF
Noise equivalent power	NEP	V_R=0 V, λ=λp	-	1.8×10^{-14}	-	-	8.6×10^{-15}	-	-	1.8×10^{-14}	-	$W/Hz^{1/2}$

Spectral response



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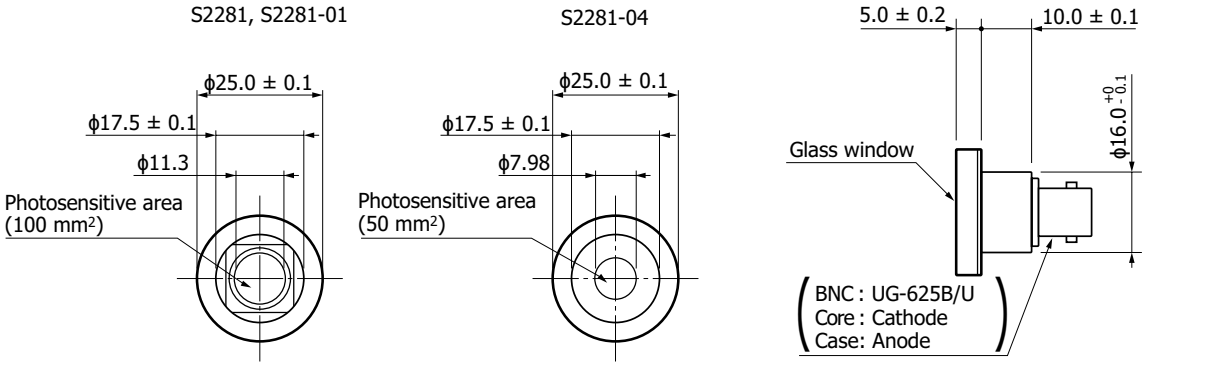
Dimensional outline (unit: mm)



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Related information

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

■ Precaution
· Disclaimer

■ Catalog
· Technical note / Photosensor amplifiers, Photodiode modules

Information described in this material is current as of March 2025.
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.
The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use.
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