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Photosensor amplifier

C9329

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

The C9329 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 level (H, M, L) are selectable to match the input signal. The C9329 operates on the built-in dry batteries so it can be easily used anywhere. The C9329 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 AC adapter**

Applications

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

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

Parameter	Symbol	Value	Unit
Maximum supply voltage	Vcc max	+14	V
Operating temperature*1	Topr	0 to +50	°C
Storage temperature*1	Tstg	-10 to +60	°C

*1: No dew condensation
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 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.

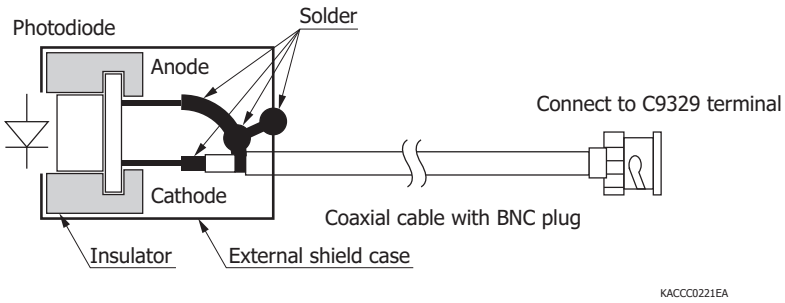
Electrical and optical characteristics (Ta=25 °C)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit
Conversion impedance	H	Rf		-	1×10^9	-	V/A
	M			-	1×10^7	-	
	L			-	1×10^5	-	
Input photo current range	H	Ic		0	-	±5	nA
	M			0	-	±500	
	L			0	-	±50000	
Frequency bandwidth (-3 dB)	H	fc		DC	16	-	Hz
	M			DC	1.6 k	-	
	L			DC	1.6 k	-	
Offset drift		-	*2	-	-	±0.5	mV/day
Temperature drift		-		-	-	25	µV/°C
Analog output (Manual mode)	Maximum output amplitude	V_{FS}	R_L=2 kΩ	±5	-	-	V
	Output noise	Vn	Frequency bandwidth*3	-	-	0.5	mVp-p
	Output resistance	Ro		-	100	-	Ω
	Maximum input capacitance	Ct	Overshoot 30% max.	-	-	5000	pF
	Maximum capacitive load	C_L		-	-	1000	pF
Digital output (Remote mode)	Interface	-		RS-232C, 19200 bps, 8-bit, non-parity, 2-stop bit			-
	A/D conversion voltage range	-		±5			V
	A/D read cycle	-		-	50	-	ms
Consumption current		Is	*4	-	-	20	mA
Battery lifetime		-	R_L > 10 kΩ*4	-	50	-	hr

*2: Without photodiode. Maximum output variation measured at 25 °C after 10-minute warm-up after power ON.
*3: Analog output measured after amplified 10 times (through 1.6 kHz low-pass filter)
*4: Without photodiode. When using one alkaline dry battery 6LR61 (006P, 9 V) in analog output.

Typical connection to photodiode

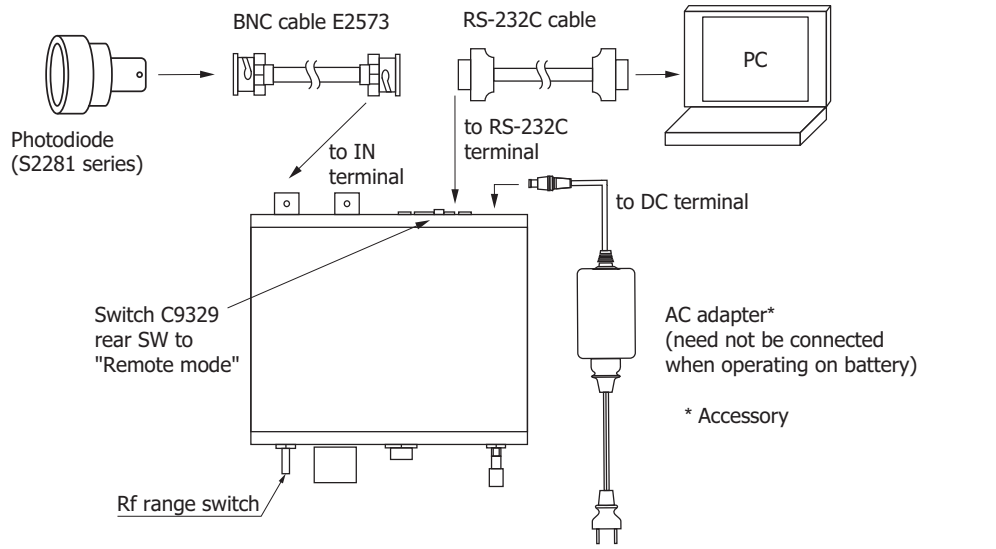
This is an example using a photodiode whose cathode is internally connected to its metal package.
When you use a photodiode metal package, use an insulator to electrically insulate and also hold the package in a shield case as shown in the figure at right. Connect the anode to the shield case.
Any single-element 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 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.

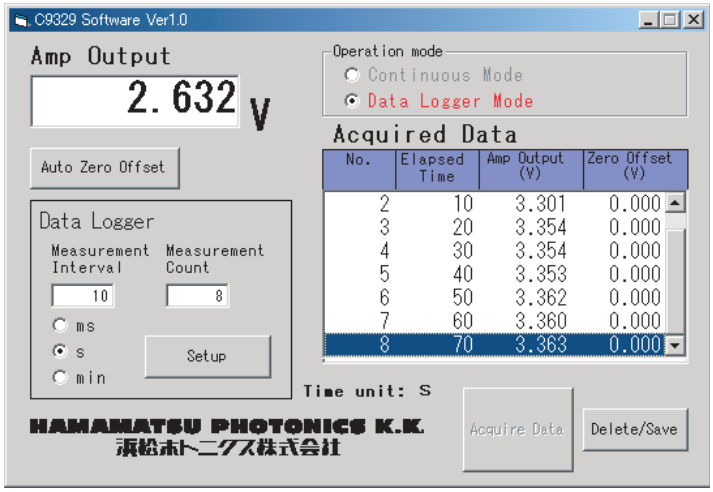
Connection example

Operation example by digital output (Remote mode)



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

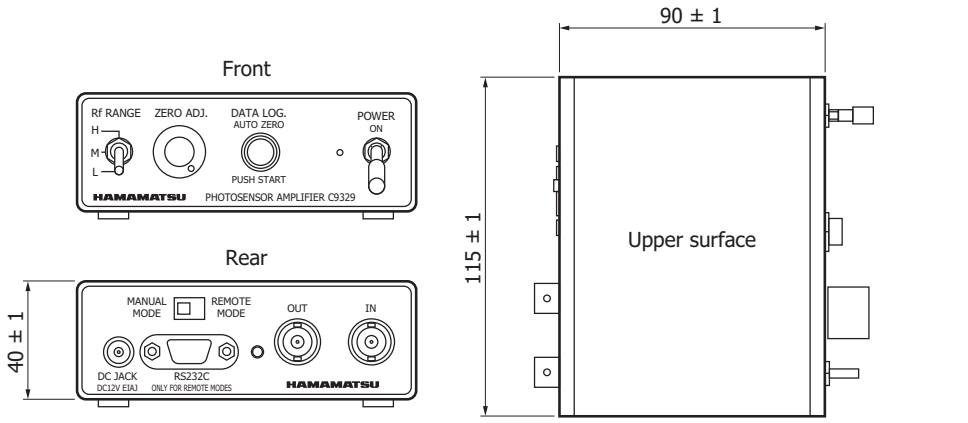
Display example of accessory sample software



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.

Microsoft® Windows® 7 Professional SPI (32-bit, 64-bit)
Microsoft Windows 8 Professional (32-bit, 64-bit)
Microsoft Windows 10 Professional (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)



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Accessories

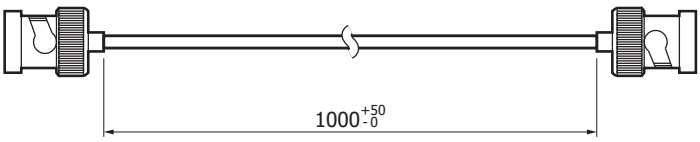
· Instruction manual
· Sample software CD-ROM
· AC adapter (plug type: A-2 plug)*5
· Dry battery (built into the unit)

*5: Caution
Depending on the country, an adapter plug might be required when connecting to the AC outlet.
If so, please purchase a proper adapter plug from an electronics supply house.

Photodiode, coaxial cable with BNC-BNC plug and RS-232C cable are not supplied with the C9329. 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



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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 photosensor amplifier. Two different spectral response ranges are provided. The large photosensitive area makes the S2281 series suitable for optical power meters. A variant type the S9219 with a visual compensation filter is also available.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

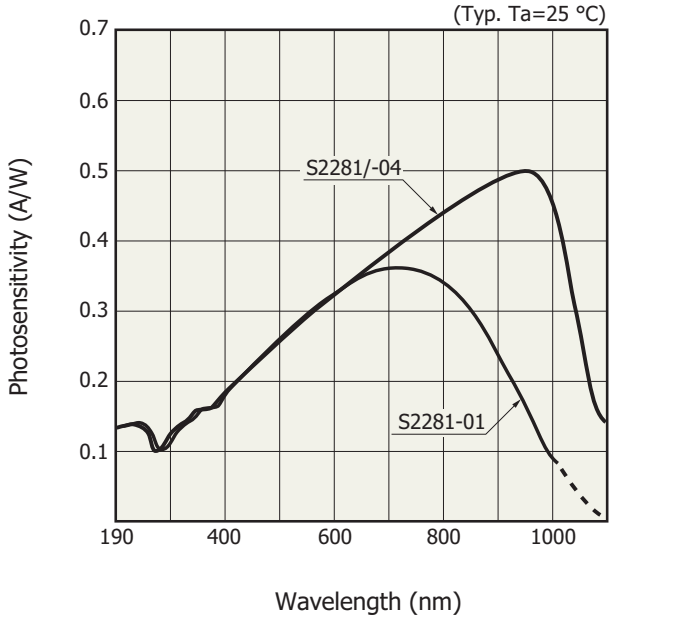
Parameter	Symbol	S2281	S2281-01	S2281-04	Unit
Reverse voltage	VR max	5			V
Operating temperature	Topr	-10 to +60			°C
Storage temperature	Tstg	-20 to +70			°C

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	ID	VR=10 mV	-	50	500	-	6	300	-	50	500	pA
Shunt resistance	Rsh	VR=10 mV	20	200	-	30	1700	-	20	200	-	MΩ
Rise time	tr	VR=0 V RL=1 kΩ	-	3	-	-	7	-	-	3	-	μs
Terminal capacitance	Ct	VR=0 V f=10 kHz	-	1300	-	-	3200	-	-	1300	-	pF
Noise equivalent power	NEP	VR=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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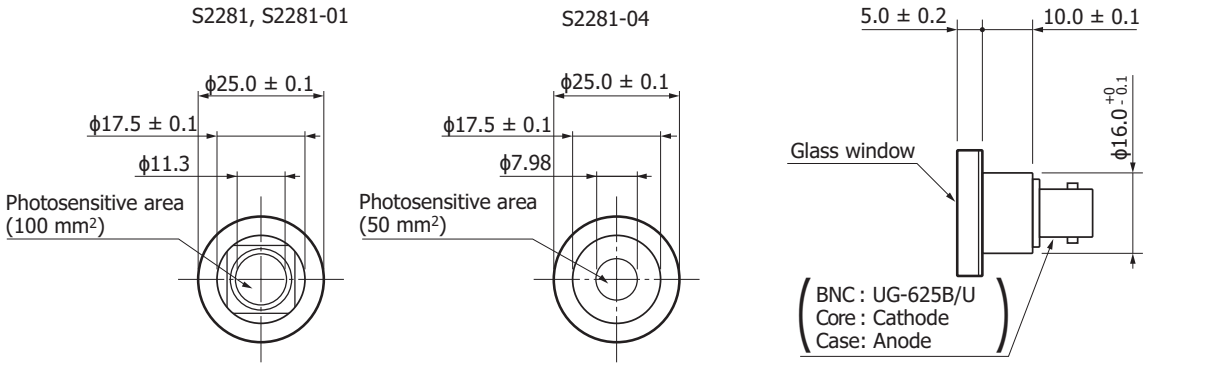
Dimensional outline (unit: mm)



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Related information

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

■ Precautions
· Disclaimer

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Cat. No. KACC1100E07 Jul. 2018 DN