

Photosensor amplifier

C9329

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



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. C9329 operates on the built-in dry batteries so it can be easily used anywhere. 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)

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 condensation

■ 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	VFS	RL=2 kΩ	±5	-	V	
	Output noise	Vn	Frequency bandwidth *3	-	-	0.5	mV p-p
	Output resistance	Ro	-	-	100	Ω	
	Maximum input capacitance	Ct	Overshoot 30 % Max.	-	-	5000	pF
	Maximum 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			V	
	A/D read cycle	-	-	50	-	ms	
Consumption current	Is	*4	-	-	20	mA	
Battery lifetime	-	RL > 10 kΩ *4	-	50	-	hr	

*2 : Without photodiode. Maximum output variation per day, 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

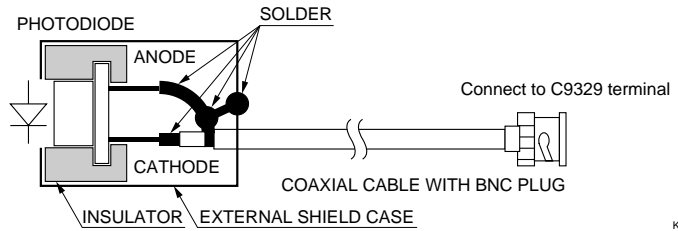
This is an example using a photodiode whose cathode is internally connected to its metal package.

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 C9329 with a BNC-BNC plug coaxial cable.

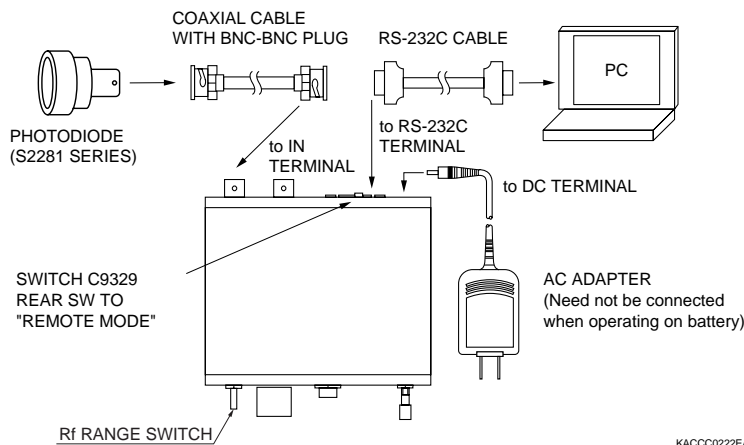


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Anode: Connect to the shield wire of the cable and shield case.
Cathode: Connect to the core wire of the cable.

■ Connection example

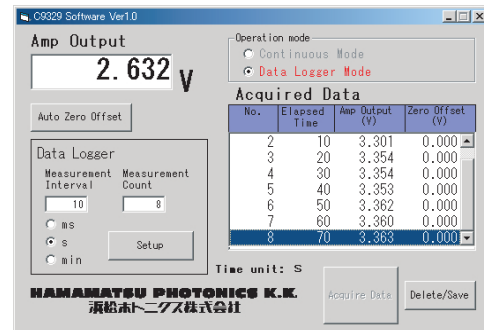
Operation example by digital output (REMOTE MODE)



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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



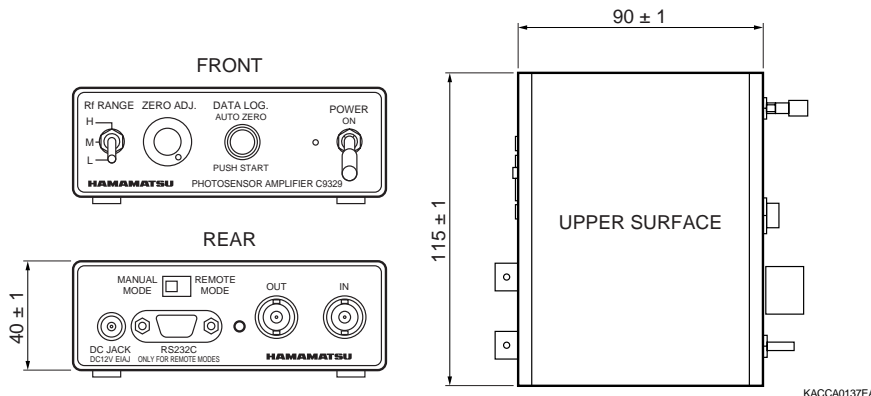
Data logger setting range

Measurement interval: 50 ms to 1 min
(50 ms interval)

Measurement count: 32000 Max.

Measurement interval × Measurement count:
20 hours Max.

■ Dimensional outline (unit: mm, excluding project parts)



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■ Accessories

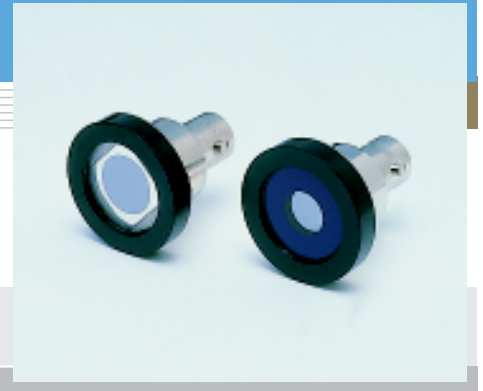
- AC adapter (Plug type: A-2 plug) *5
- Dry battery
- Sample software CD-ROM (OS: Windows 7 *6)
- Instruction manual

*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.

*6: Registered trademark of Microsoft Corporation in the United States.

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

Si photodiode S2281 series



Si photodiode with BNC connector

S2281 series photodiodes are sealed in a metal package with a BNC connector and designed to connect to C9329 photosensor amplifier. Two different spectral response ranges are provided. The large active area makes S2281 series suitable for optical power meters. A variant type S9219 with a visual compensation filter is also available. Hamamatsu also provides E2573 BNC-BNC coaxial cable (length: 1 m) as an option.

General ratings

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

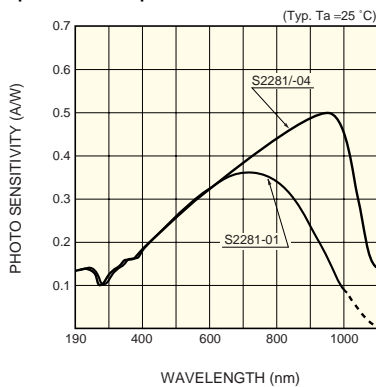
Absolute maximum ratings

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

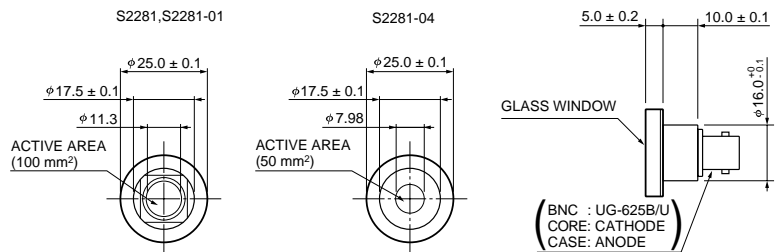
Electrical and optical characteristics (Ta=25 °C, unless otherwise noted)

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
Photo sensitivity	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



Dimensional outline (unit: mm)



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KSPDB0090EA

Information described in this material is current as of July, 2014.

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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