

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

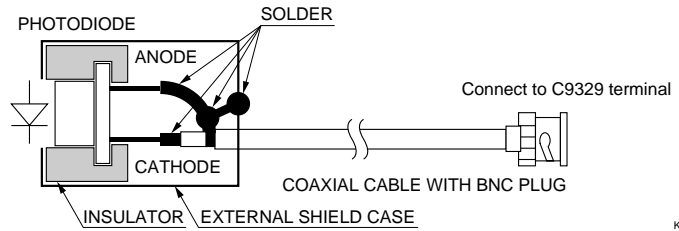
This is an example using a photodiode whose cathode is internally connected to its metal package.

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.

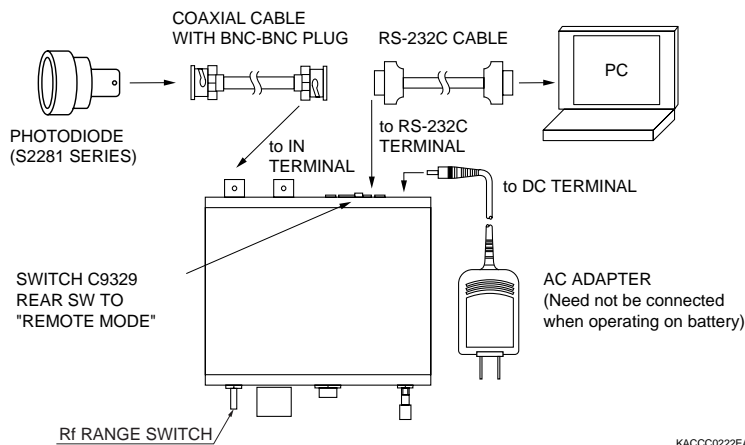


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Anode: Connect to the shield wire of the cable and shield case.
Cathode: Connect to the core wire of the cable.

■ Connection example

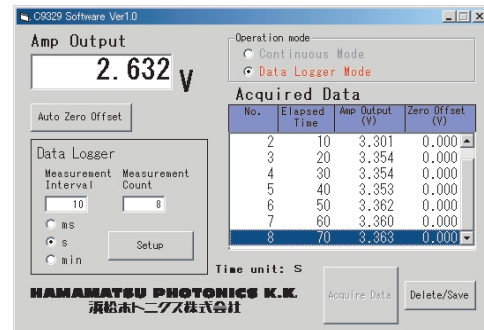
Operation example by digital output (REMOTE MODE)



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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



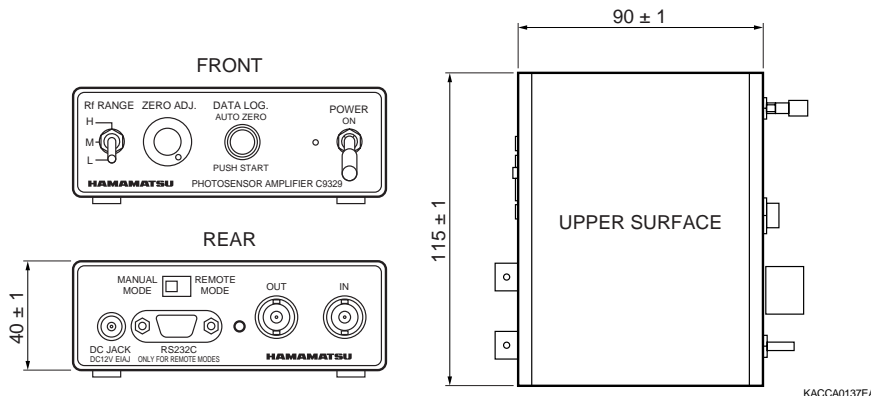
Data logger setting range

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: Windows98SE/Me/2000/Xp *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.

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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			-

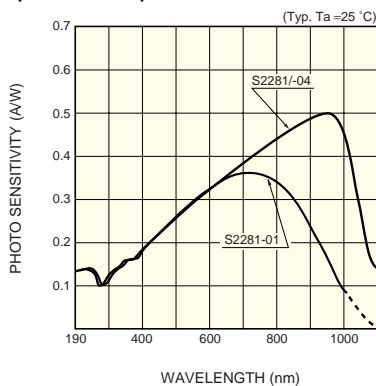
Absolute maximum ratings

Parameter	Symbol	S2281	S2281-01	S2281-04	Unit
Reverse voltage	V _R Max.	5			V
Operating temperature	T _{opr}	-10 to +60			°C
Storage temperature	T _{stg}	-20 to +70			°C

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

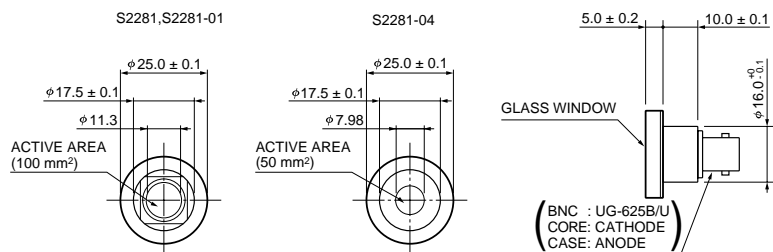
Parameter	Symbol	Condition	S2281			S2281-01			S2281-04			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
Spectral response range	λ		-	190 to 1100	-	-	190 to 1000	-	-	190 to 1100	-	nm
Peak sensitivity wavelength	λ _p		-	960	-	-	720	-	-	960	-	nm
Photo sensitivity	S	λ=200 nm λ=λ _p	0.10 -	0.12 0.5	-	0.10 -	0.12 0.36	-	0.10 -	0.12 0.5	-	A/W
Short circuit current	I _{sc}	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	R _{sh}	V _R =10 mV	20	200	-	30	1700	-	20	200	-	MΩ
Rise time	t _r	V _R =0 V R _L =1 kΩ	-	3	-	-	7	-	-	3	-	μs
Terminal capacitance	C _t	V _R =0 V f=10 kHz	-	1300	-	-	3200	-	-	1300	-	pF
Noise equivalent power	NEP	V _R =0 V, λ=λ _p	-	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)



KSPDA0080EA

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