MODULE

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.

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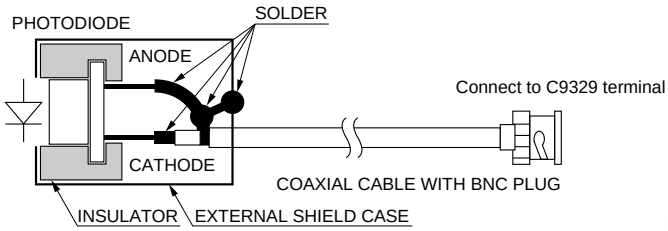
■ Typical connection to photodiode

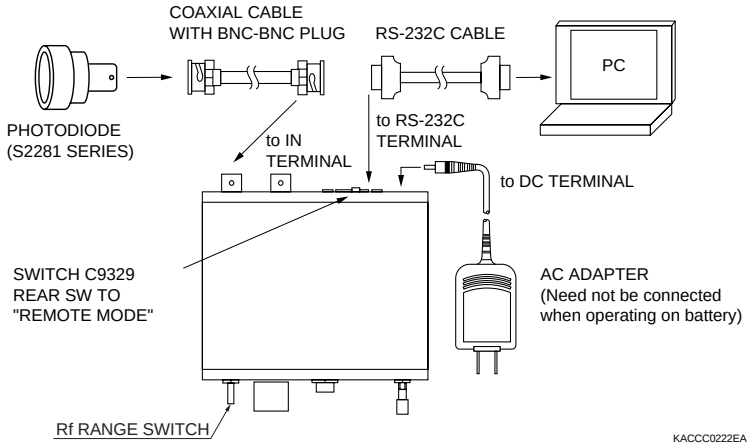
This is an example using a photodiode whose cathode is internally connected to its metal package.
When you use a photodiode metal package, use an insulator to electrically insulate and also hold the package in a shield case as shown in the figure at right. Connect the anode to the shield case.
Any single-element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



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

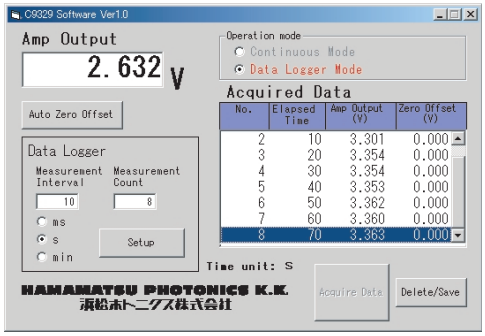
■ Connection example

Operation example by digital output (REMOTE MODE)



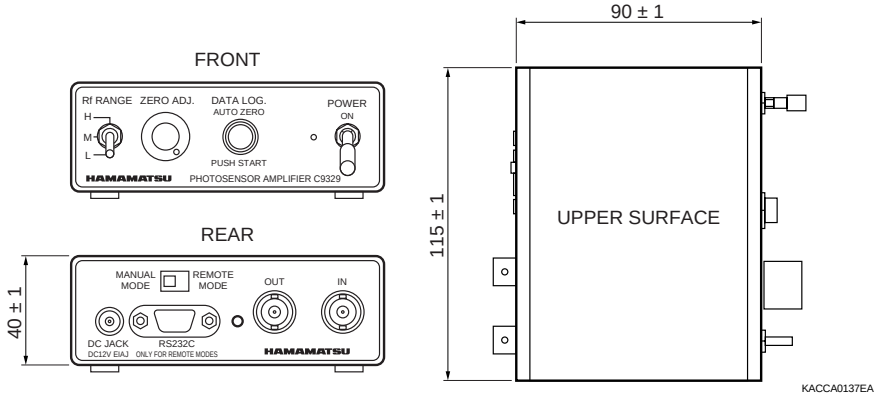
Note: Use the Rf RANGE switch to change the detection sensitivity.
(Detection sensitivity cannot be changed from the PC.)

■ 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.

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



■ 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: Resistered 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			-

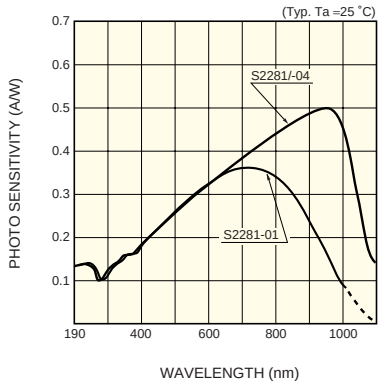
■ Absolute maximum ratings

Parameter	Symbol	S2281	S2281-01	S2281-04	Unit
Reverse voltage	V_R 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	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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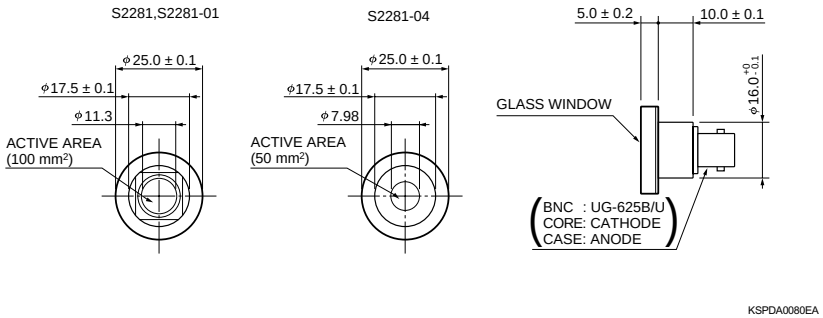
■ Dimensional outline (unit: mm)



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