

C4159 series, C5185-02

Low noise amplifiers for infrared detector (InSb, InAs, InAsSb, InGaAs)

These are high gain and low noise amplifiers for Hamamatsu various infrared detectors. By connecting a detector and supplying the power, analog voltage output can be obtained and the signal can be easily observed with a voltmeter or the like. Amplifiers that match the characteristics of infrared detectors are available.

Features

- Voltage output for easy handling
- Conversion impedance: 3 ranges switchable (C4159 series)
- Compact: business card size

Applications

- Spectrophotometers
- Radiation thermometers
- Laser power monitor

Accessories

- Instruction manual
- Power cable A4372-02 (one end with 4-pin connector for connection to amplifier and the other end unterminated, 2 m)

Required power supply specifications

- Output voltage: $\pm 15\text{ V} \pm 0.5$
- Current capacity: 1.5 times or more of amplifier's maximum current consumption
- Ripple noise: 5 mVp-p or less
- Analog power supply only
Recommended DC power supply: PW18-3AD (TEXIO)
E3630A (Keysight Technologies)

Applicable detectors

Type	Type no.	Applicable detectors*1 *2 *3
Amplifier for photovoltaic detectors	C4159-01	Dewar type InSb (P5968-060/-100), Non-cooled type InAsSb (P13243-011MA/-013CA/-015CF/-016CF/-033CF/-033MF/-039CF/-039MF/-043CF/-043MF, P13894-011CN/-011MA/-011NA), TE-cooled type InAsSb (P13243-122MS/-222MS, P13894-211MA), Dewar type Type II (P15409-901)
	C4159-04	Dewar type InSb (P5968-200)
	C4159-05	Dewar type InAs (P7163)
	C4159-06	TE-cooled type InAs (P10090-11/-21)
	C4159-07	Non-cooled type InAs (P10090-01), TE-cooled type InAsSb (P11120-201, P12691-201G)
Amplifier for InGaAs PIN photodiodes	C4159-03	Non/TE-cooled type InGaAs (G12180/G12181/G12182/G12183 series)
Amplifier for photoconductive detectors	C5185-02	TE-cooled type InSb (P6606-110/-210/-305/-310/-320)

*1: These amplifiers cannot operate multiple detectors.

*2: Consult us before purchasing if you want to use with a detector other than listed here.

*3: Consult us before purchasing if you want to use with a multi-element detector.

Absolute maximum ratings (Ta=25 °C)

Parameter	Value	Unit
Supply voltage	18.0 max.	V
Operating temperature*4	0 to +40	°C
Storage temperature*4	-20 to +70	°C

*4: 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.

Amplifiers for photovoltaic detectors (Typ.)

Parameter	C4159-01	C4159-04	C4159-05	C4159-06	C4159-07	Unit
Conversion impedance	10 ⁸ , 10 ⁷ , 10 ⁶ (3 ranges switchable)	2 × 10 ⁷ , 2 × 10 ⁶ , 2 × 10 ⁵ (3 ranges switchable)	10 ⁸ , 10 ⁷ , 10 ⁶ (3 ranges switchable)	10 ⁶ , 10 ⁵ , 10 ⁴ (3 ranges switchable)	10 ⁶ , 10 ⁵ , 10 ⁴ (3 ranges switchable)	V/A
Frequency response (amplifier only, -3 dB)	DC to 100 kHz*5	DC to 45 kHz	DC to 15 kHz	DC to 100 kHz	DC to 100 kHz	-
Output impedance	50	50	50	50	50	Ω
Maximum output voltage (1 kΩ load)	+10	+10	+10	+10	+10	V
Output offset voltage	±5	±5	±10	±5	±5	mV
Equivalent input noise current*6 (f=1 kHz)	0.15 (10 ⁸ , 10 ⁷ range) 0.65 (10 ⁶ range)	0.55	0.15 (10 ⁸ , 10 ⁷ range) 0.65 (10 ⁶ range)	6	10	pA/Hz ^{1/2}
Reverse voltage	Limited to 0 V operation. Cannot be applied from external unit.					-
External power supply*7	±15					V
Current consumption	+30, -10 max.			+30, -22 max.		mA

*5: When connected to a detector, frequency response becomes 60 kHz or less (φ0.6 mm: 60 kHz or less, φ1 mm: 25 kHz or less). Ringing occurs in the output if the rise time tr (10 to 90%) of incident light is approximately 100 μs or less. The ringing becomes larger as the rise time becomes shorter. However, ringing does not occur for sine wave light. (For information on the ringing specifications, see the figure below.)

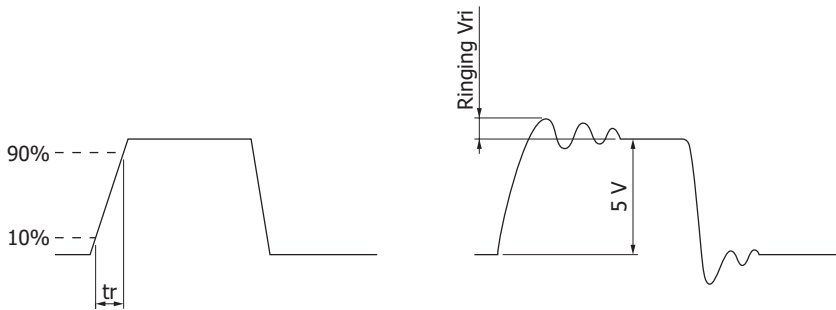
*6: Input resistance: 1 MΩ (C4159-01/-04/-05), 500 Ω (C4159-06/-07)

*7: Recommended DC power supply (analog power supply): ±15 V
Current capacity: 1.5 times the maximum current consumption or more
Ripple noise: 5 mVp-p or less

Note: Output noise voltage = Equivalent input noise current × Conversion impedance

For information about accessories except for the amplifiers, refer to the datasheet "Accessories for infrared detector".

Ringing specifications



Incident light

Output waveform when tr=40 μs and photosensitive area is φ0.6 mm
Ringing Vri ≤ 1.5 V
Oscillating cycle ≤ 3 cycles

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■ Amplifier for InGaAs PIN photodiodes (Typ.)

Parameter	C4159-03	Unit
Conversion impedance	10 ⁷ , 10 ⁶ , 10 ⁵ (3 ranges switchable)	V/A
Frequency response (amp only, -3 dB)	DC to 15 kHz	-
Output impedance	50	Ω
Maximum output voltage (1 kΩ load)	+10	V
Output offset voltage	±5	mV
Equivalent input noise current (f=1 kHz)	2.5	pA/Hz ^{1/2}
Reverse voltage	Can be applied from external unit.	-
External power supply*8	±15	V
Current consumption	±15 max.	mA

■ Amplifier for photoconductive detectors (Typ.)*9

Parameter	C5185-02	Unit
Input impedance	5	kΩ
Voltage gain	66 (× 2000)	dB
Frequency response (amp only, -3 dB)	5 Hz to 250 kHz	-
Detector bias current	5 mA, 10 mA, 15 mA (3 ranges switchable)	-
Output impedance	50	Ω
Maximum output voltage (1 kΩ load)	±10	V
Equivalent input noise voltage (f=1 kHz)	2.6*10	nV/Hz ^{1/2}
External power supply*8	±15	V
Current consumption	+100, -30 max.	mA

*8: Recommended DC power supply (analog power supply): ±15 V

Current capacity: More than 1.5 times the maximum current consumption

Ripple noise: 5 mVp-p or less

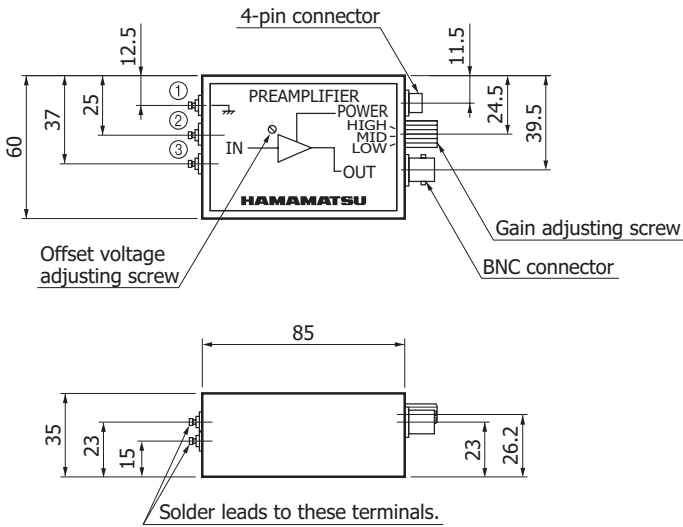
*9: Before purchasing, make sure the bias current to the detector matches the detector bias current specified in the above table.

*10: At the maximum detector bias current

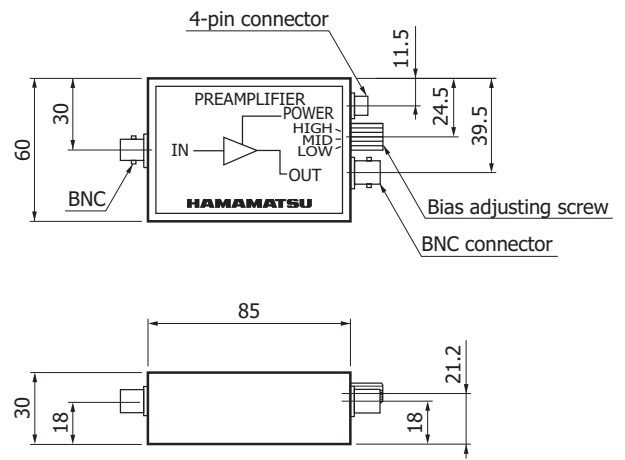
Note: Output noise voltage = Equivalent input noise voltage × Voltage gain

Dimensional outlines (unit: mm)

C4159-01/-03/-04/-05/-06/-07



C5185-02



Tolerance unless otherwise noted: ±1

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PIN connections

- ① GND
- ② Cathode
- ③ Anode

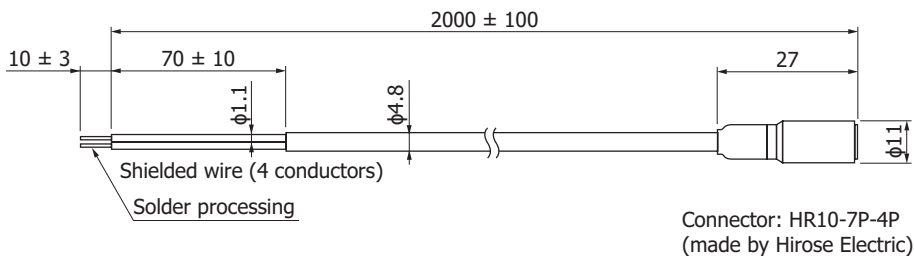
Tolerance unless otherwise noted: ±1

Note: Socket for lead attachment is not provided.

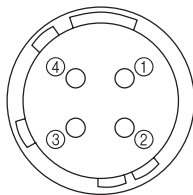
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Type no.	Weight
C4159-01/-03/-04/-05	320 g
C4159-06/-07	330 g
C5189-02	290 g

A4372-02



Connector: HR10-7P-4P
(made by Hirose Electric)



As viewed from connector side

Pin no.	Pin connection	Lead color
①	-Vs	Blue
②	GND	Black/white/blue stranded wire
③	GND	
④	+Vs	White

Tolerance unless otherwise noted: ±1

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Related information

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

- Precautions
- Disclaimer

Information described in this material is current as of June 2020.

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.

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