

C4159 series, C5185-02

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

Accessories

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

Required power supply specifications

- C4159 series: $\pm 15\text{ V} \pm 0.5$
 - C5185-02: $\pm 15\text{ V} \pm 0.5$
 - Current-carrying 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: E3620A, E3630A (Agilent Technologies)

Amplifiers for photovoltaic detectors (Typ.)

Parameter	C4159-01	C4159-04	C4159-05	C4159-06	C4159-07	Unit
Applicable detector*1 *2 *3	Dewar type InSb (P5968-060, P5968-100) Dewar type InAsSb (P11120-901) Non-cooled type InAsSb (P13243-011MA, P13894-011MA) TE-cooled type InAsSb (P13894-211MA)	Dewar type InSb (P5968-200)	Dewar type InAs (P7163)	TE-cooled type InAs (P10090-11/-21)	Non-cooled type InAs (P10090-01) TE-cooled type InAsSb (P11120-201, P12691-201)	-
Conversion impedance	$10^8, 10^7, 10^6$ (3 ranges switchable)	$2 \times 10^7, 2 \times 10^6, 2 \times 10^5$ (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 (amp only, -3 dB)	DC to 100 kHz*4	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 k Ω load)	+10	+10	+10	+10	+10	V
Output offset voltage	± 5	± 5	± 10	± 5	± 5	mV
Equivalent input noise current*5 (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					-
External power supply*6	± 15					V
Current consumption	+30, -10 max.		+30, -22 max.			mA

*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.

*4: When connected to a detector, frequency response becomes 60 kHz or less depending on the detector active area. ($\phi 0.6$ mm: 60 kHz or less, $\phi 1$ mm: 25 kHz or less) Ringing occurs in the output if the rise time t_r (0 to 90%) of incident light is approximately 100 μ s or less. The ringing becomes larger as the rise time becomes shorter. No ringing occurs when detecting sine-wave light. (For information on the ringing specifications, see page 2.)

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

*6: Recommended DC power supply (analog power supply): $\pm 15\text{ V}$
Current capacity: More than 1.5 times the maximum current consumption
Ripple noise: 5 mVp-p or less

Note: Output noise voltage = Equivalent input noise current \times Conversion impedance

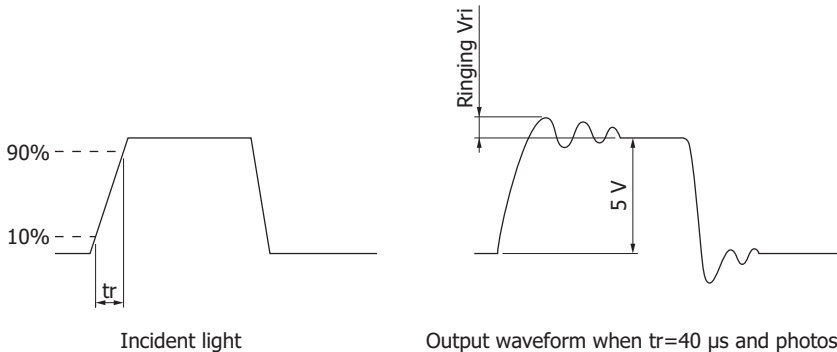
For information about accessories except for the amplifiers, refer to our datasheet "Accessories for infrared detector".

▣ Absolute maximum ratings (Ta=25 °C)

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

Note: Absolute maximum ratings are the values that must not be exceeded at any time. If even one of the absolute maximum ratings is exceeded even for a moment, the product quality may be impaired. Always be sure to use the product within the absolute maximum ratings.

▣ Ringing specifications



Output waveform when $t_r=40 \mu s$ and photosensitive area is $\phi 0.6 \text{ mm}$
 Ringing $V_{ri} \leq 1.5 \text{ V}$
 Oscillating cycle ≤ 3 cycles

KIRD0090EA

▣ Amplifier for InGaAs PIN photodiodes (Typ.)

Parameter	C4159-03	Unit
Applicable detector*7 *8	InGaAs	-
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 k Ω 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*9	± 15	V
Current consumption	± 15 max.	mA

Amplifiers for photoconductive detectors (Typ.)*10

Parameter	C5185-02	Unit
Applicable detector*7 *8 *11	InSb (P6606 series)	-
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*12	nV/Hz ^{1/2}
External power supply*9	±15	V
Current consumption	+100, -30 max.	mA

*7: These amplifiers cannot operate multiple detectors.

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

*9: 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

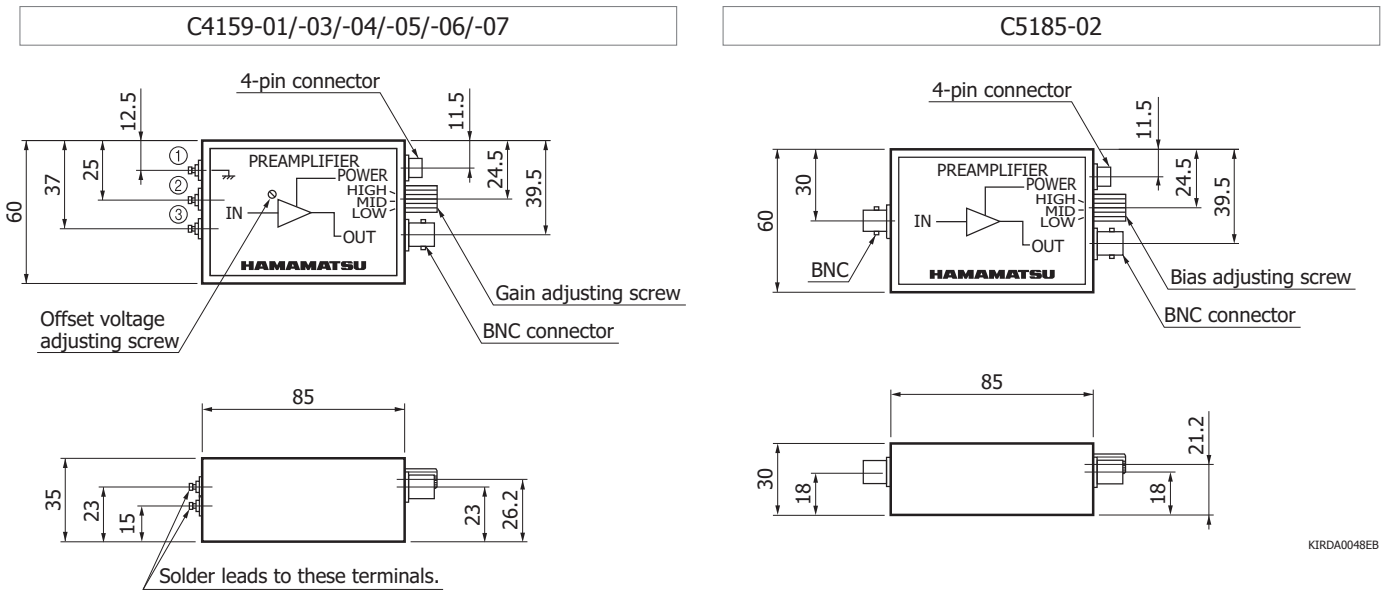
*10: Before purchasing, make sure the bias current to the detector matches the detector bias current specified in the above table.

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

*12: At detector bias current max.

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

Dimensional outlines (unit: mm, tolerance unless otherwise noted: ±1)



PIN connections

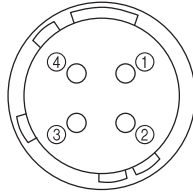
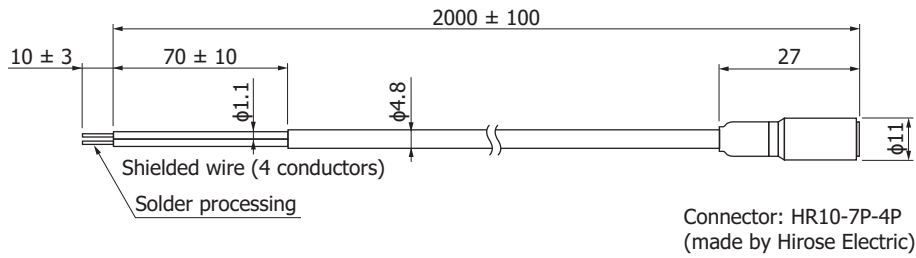
- ① GND
- ② Cathode
- ③ Anode

Note: Socket for lead attachment is not provided.

KIRDA0046EC

KIRDA0048EB

A4372-02



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

KIRDA0196EB

Related information

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

- Precautions
- Disclaimer

Information described in this material is current as of April 2017.

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. Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.

HAMAMATSU

www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Higashi-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81) 53-434-3311, Fax: (81) 53-434-5184

U.S.A.: Hamamatsu Corporation: 360 Foothill Road, Bridgewater, N.J. 08807, U.S.A., Telephone: (1) 908-231-0960, Fax: (1) 908-231-1218

Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49) 8152-375-0, Fax: (49) 8152-265-8

France: Hamamatsu Photonics France S.A.R.L.: 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: 33-(1) 69 53 71 00, Fax: 33-(1) 69 53 71 10

United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, United Kingdom, Telephone: (44) 1707-294888, Fax: (44) 1707-325777

North Europe: Hamamatsu Photonics Norden AB: Torshamnsgatan 35 16440 Kista, Sweden, Telephone: (46) 8-509-031-00, Fax: (46) 8-509-031-01

Italy: Hamamatsu Photonics Italia S.r.l.: Strada della Moia, 1 int. 6, 20020 Arese (Milano), Italy, Telephone: (39) 02-93581733, Fax: (39) 02-93581741

China: Hamamatsu Photonics (China) Co., Ltd.: B1201, Jiaming Center, No.27 Dongsanhuan Beilu, Chaoyang District, Beijing 100020, China, Telephone: (86) 10-6586-6006, Fax: (86) 10-6586-2866