

# Photo IC diode assemblies



S10108, S10109

## For flame eye, using photo IC diode instead of CdS cell

The S10108 and S10109 sensors are designed specifically for flame detection (flame eye) in oil-fired hot water boilers and heaters. These sensors incorporate a photo IC diode instead of CdS cells and are available with 2 types of incident light direction (head-on type S10108: and side-on type: S10109). Each sensor is assembled in an easy-to-install package along with the cable.

### Features

- Spectral response suitable for detecting oil burner
- Easy-to-install assembly with cable
- Little variation in output current and good linearity (in comparison with conventional types using phototransistors and CdS cells)

### Applications

- Flame detection in oil boilers and heaters
- Safety devices and alarms for heat generating devices
- Photorelay control devices

### Absolute maximum ratings (Ta=25 °C unless otherwise noted)

Parameter	Symbol	Value	Unit
Maximum reverse voltage	VR max	-0.5 to +12	V
Photocurrent	IL	5	mA
Forward current	IF	5	mA
Power dissipation*1	P	250	mW
Operating temperature*2	Topr	-30 to +80	°C
Storage temperature*2	Tstg	-40 to +85	°C

\*1: Power dissipation decreases at a rate of 3.3 mW/°C above Ta=25 °C

\*2: No dew condensation

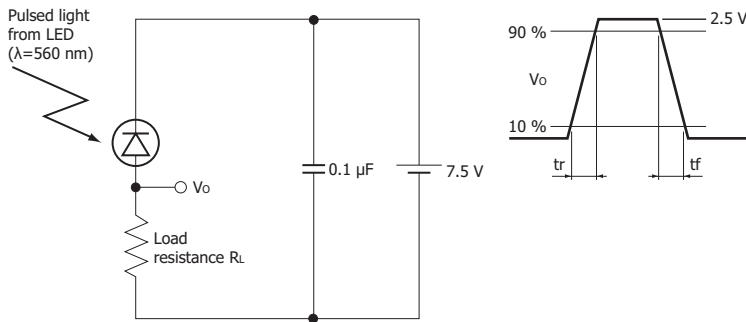
When there is a temperature difference between a product and the surrounding area in high humidity environment, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.

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.

**Electrical and optical characteristics (Ta=25 °C)**

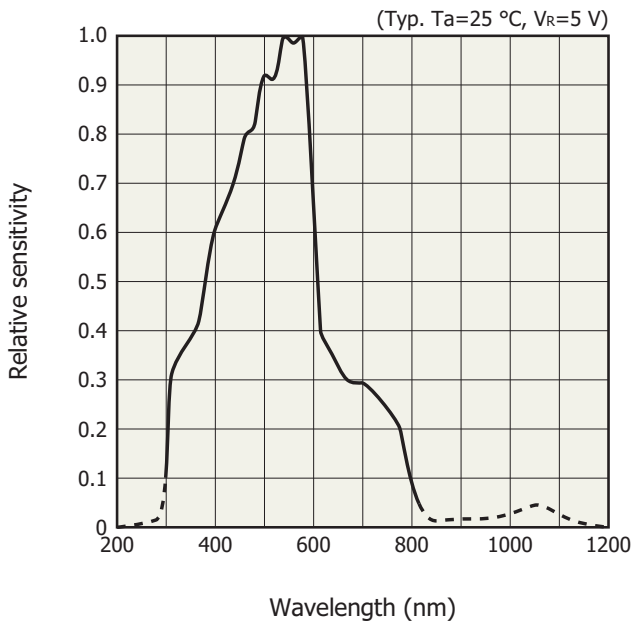
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Spectral response range	$\lambda$			300 to 820		nm
Peak sensitivity wavelength	$\lambda_p$		-	560	-	nm
Dark current	$I_D$	$V_R=5\text{ V}$	-	1.0	50	nA
Photocurrent	S10108	$V_R=5\text{ V}, 2856\text{ K}, 100\text{ lx}$	0.16	0.26	0.36	mA
	S10109		0.17	0.27	0.37	
Rise time*3	$t_r$	10 to 90%, $V_R=7.5\text{ V}$ $R_L=10\text{ k}\Omega, \lambda=560\text{ nm}$	-	6.0	-	ms
Fall time*3	$t_f$	10 to 90%, $V_R=7.5\text{ V}$ $R_L=10\text{ k}\Omega, \lambda=560\text{ nm}$	-	2.5	-	ms

\*3: Rise/fall time measurement method



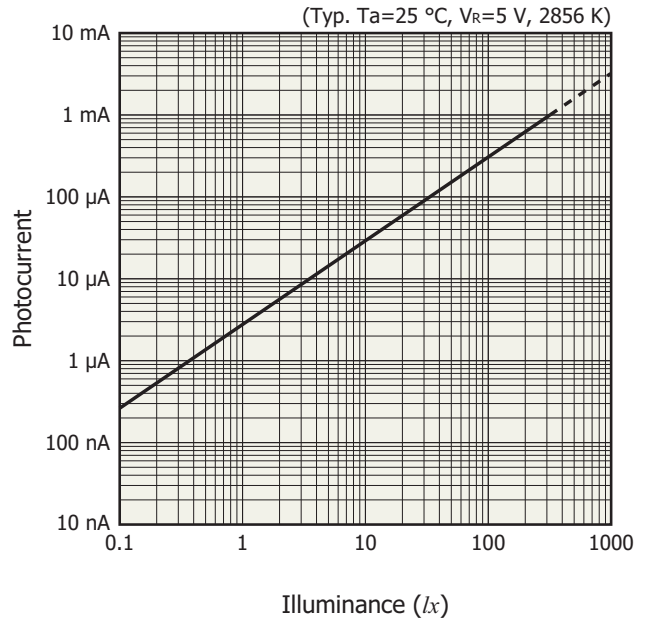
KPIC0041EA

**Spectral response**



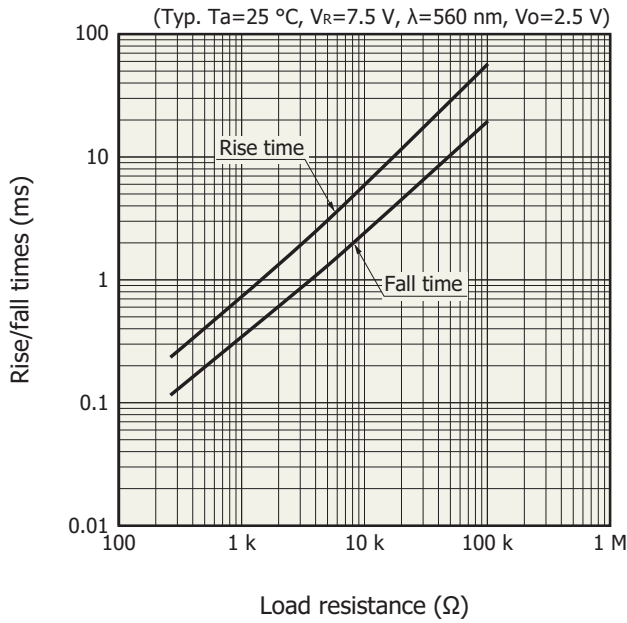
KPICB0101EA

**Linearity**



KPICB0086EB

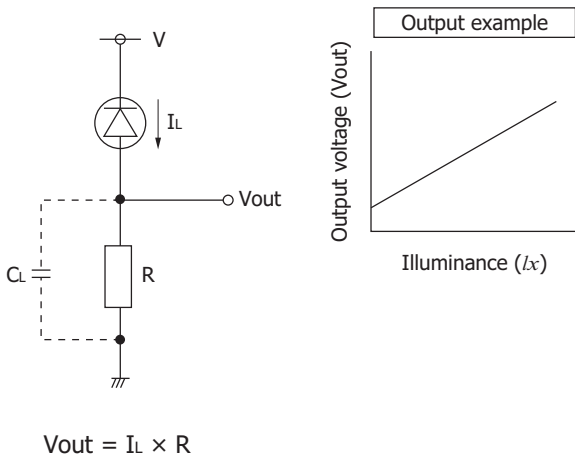
**Rise/fall times vs. load resistance**



KPICB0077EB

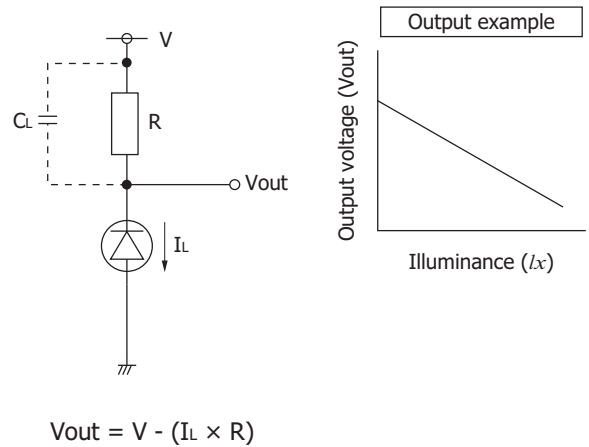
**Operating circuit examples**

Example 1



KPIC00125EA

Example 2



KPIC00126EA

Note:

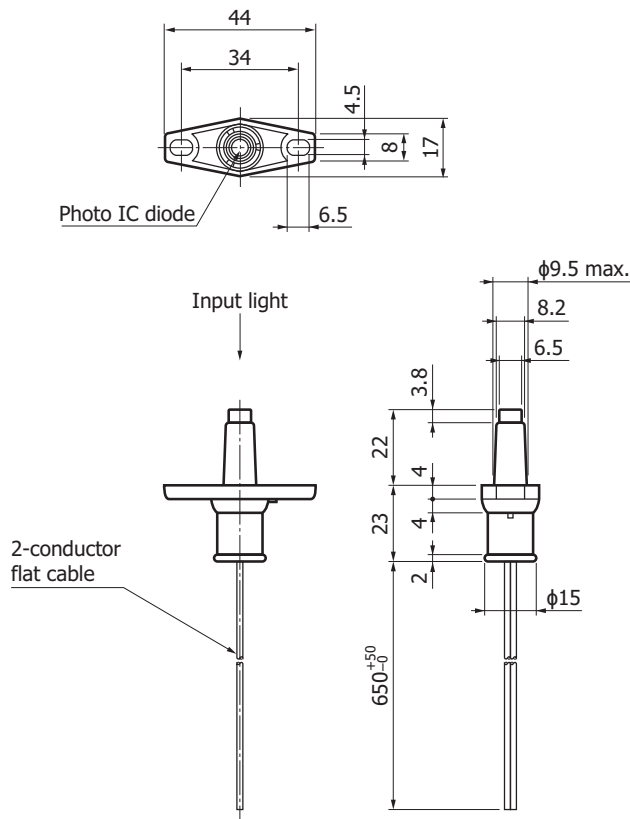
- The photo IC diode has a specific polarity (anode/cathode). Be careful to make the correct connection.
- The photo IC diode must be reverse-biased so that a positive potential is applied to the cathode.
- Set load resistance R by taking the latter circuit into account.
- To eliminate high-frequency components, we recommend placing a load capacitance  $C_L$  in parallel with load resistance  $R_L$  as a low-pass filter.

$$\text{Cutoff frequency } f_c \approx \frac{1}{2\pi C_L R_L}$$

- Before using, check whether noise is present in the location where this product is used. Take measures to prevent noise as needed, for example, by shielding the cable or adding a capacitor (about  $0.1\text{ }\mu\text{F}$  between the anode and cathode of the photo IC diode).

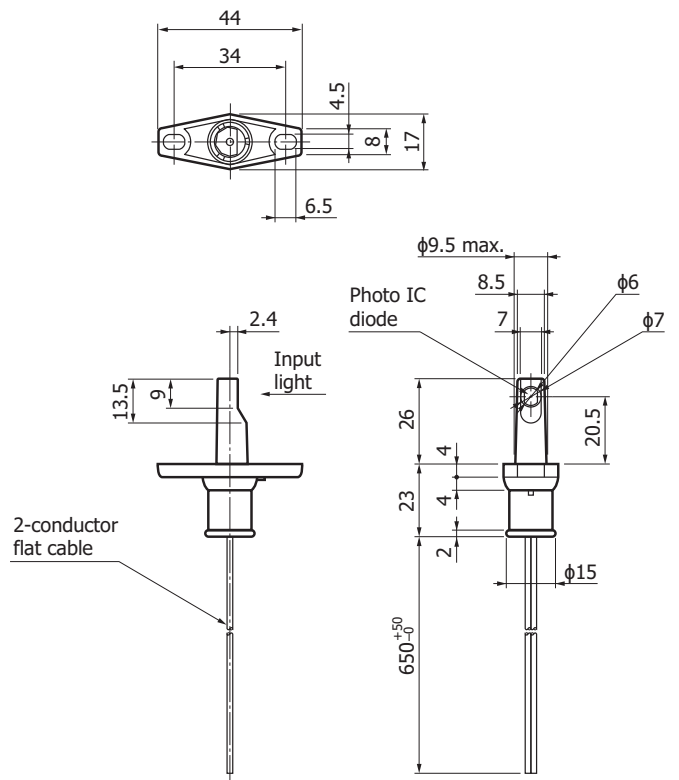
**Dimensional outlines (unit: mm)**

S10108 (head-on type)



Tolerance unless otherwise noted  
 $\leq 6$  :  $\pm 0.1$   
 $6 <$   $\leq 30$  :  $\pm 0.2$   
 $30 <$  :  $\pm 0.3$

S10109 (side-on type)



Tolerance unless otherwise noted  
 $\leq 6$  :  $\pm 0.1$   
 $6 <$   $\leq 30$  :  $\pm 0.2$   
 $30 <$  :  $\pm 0.3$

KPICA0069EB

KPICA0068EB

2-conductor flat cable

Color	Conductor cross-section area	Dimension	Pin connection
White	0.3 mm <sup>2</sup>	$\phi 1.6$ mm	Anode
With red line	0.3 mm <sup>2</sup>	$\phi 1.6$ mm	Cathode

Note (use in flame detection):

- This product is not waterproof.
- These products have a shape designed for specific use in flame detection applications. Before using, however, please test these products in actual equipment to ensure their characteristics and reliability.

**Related information**

[www.hamamatsu.com/sp/ssd/doc\\_en.html](http://www.hamamatsu.com/sp/ssd/doc_en.html)

- Precautions
- Disclaimer

Information described in this material is current as of April, 2016.

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](http://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