Photo IC diodes

S7183 S7184

Linear current amplification of photodiode output

The S7183 and S7184 consist of a photodiode and a signal processing circuit for amplifying the photocurrent generated from the photodiode up to 1300 times. Despite a small active area, these photo ICs provide an output nearly equal to that from photodiodes with a 20 × 20 mm active area. Both S7183 and S7184 can be used the same way as a reverse-biased photodiode, and in most cases, they deliver a sufficient output voltage by just connecting a load resistor.

Features

- **Clear plastic package**
- **Operation just as easy as using photodiodes**
- **Large output current rivaling that of a phototransistor**
- **Good linearity**

Applications

- **Energy saving sensors for TV brightness controls, etc.**
- **Light dimmers for liquid crystal panels**
- **Various types of light level measurement**

Absolute maximum ratings (Ta=25 °C)

Parameter		Symbol	Condition	Value	Unit
Reverse voltage		V_R		-0.5 to +16	V
Photocurrent		I_L		10	mA
Forward current		I_F		10	mA
Power dissipation*1		P		250	mW
Operating temperature		Topr	No dew condensation*2	-30 to +80	°C
Storage temperature		Tstg	No dew condensation*2	-40 to +85	°C
Soldering	S7183	-		260 °C, 3 s, at least 2.5 mm away from package surface	-
	S7184			350 °C, 3 s	-

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.
*1: Power dissipation decreases at a rate of 3.3 mW/°C above Ta=25 °C
*2: 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.

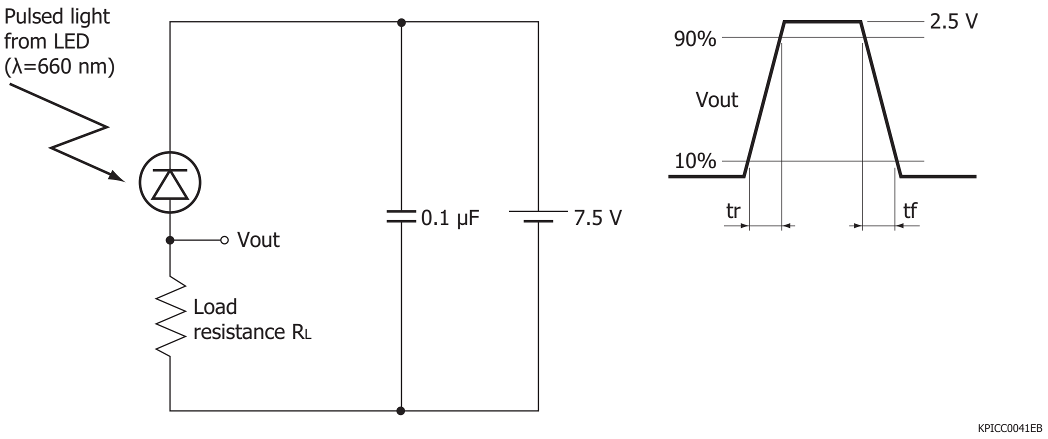
Electrical and optical characteristics (Ta=25 °C)

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
Spectral response range	λ			-	300 to 1000	-	nm
Peak sensitivity wavelength	λp			-	650	-	nm
Operating reverse voltage	V_R			3	-	12	V
Dark current	I_D	V_R=5 V		-	0.5	10	nA
Photocurrent	I_L	V_R=5 V 2856 K	S7183, 100 lx	0.75	1.0	1.25	mA
			S7184, 1000 lx	1.4	1.8	2.2	
Rise/fall times	tr, tf	10 to 90%,*3 V_R=5 V, R_L=10 kΩ λ=660 nm		-	0.6	-	ms

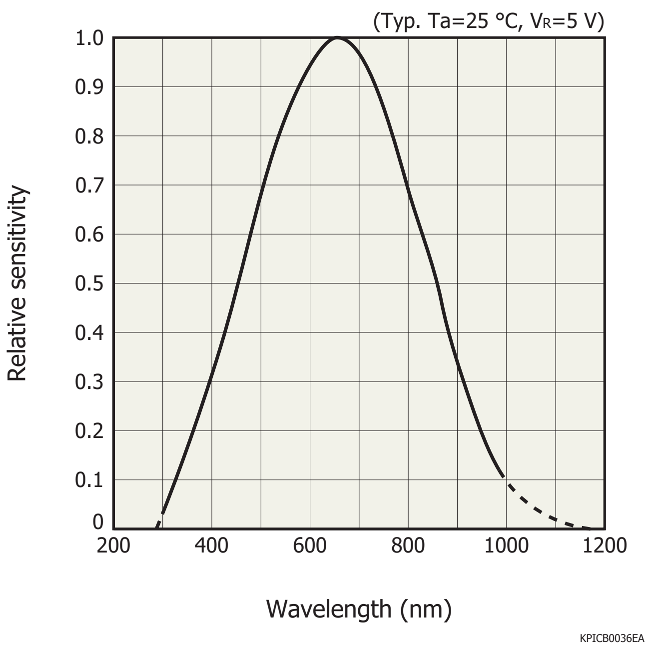
*3: Rise/fall time measurement method: Refer to P.2.

These products do not support lead-free soldering. For details on reflow soldering conditions for surface mount types, please contact our sales office.

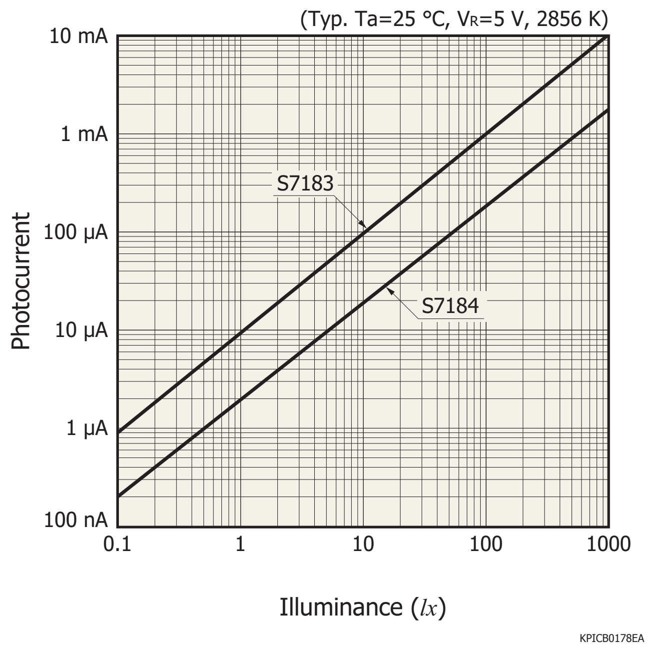
Rise/fall time measurement method



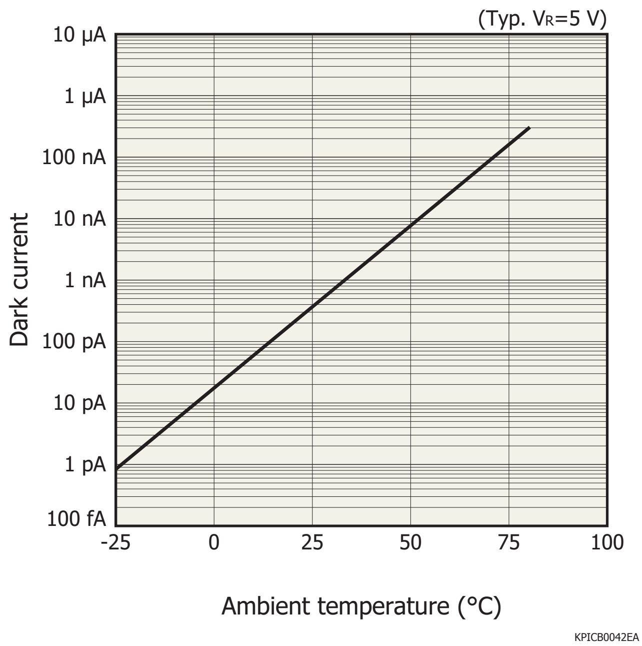
Spectral response



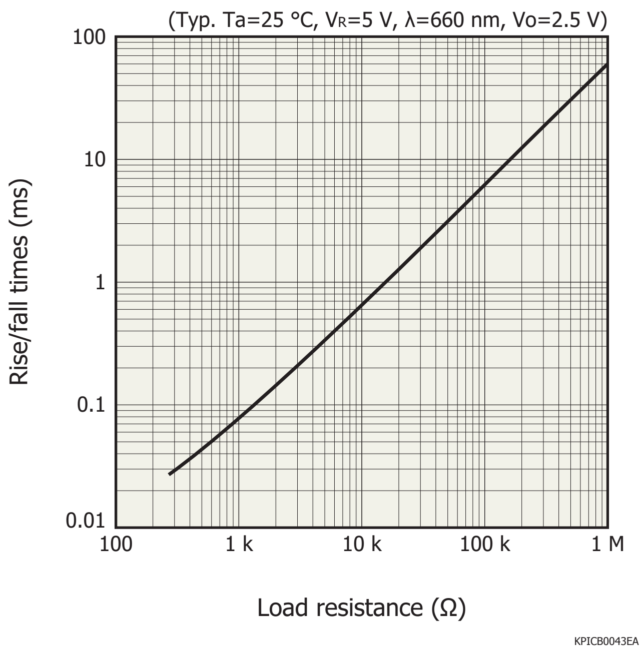
Linearity



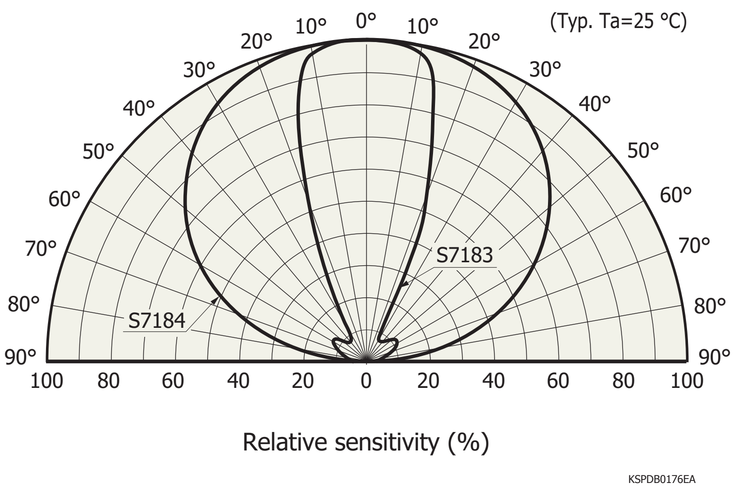
Dark current vs. ambient temperature



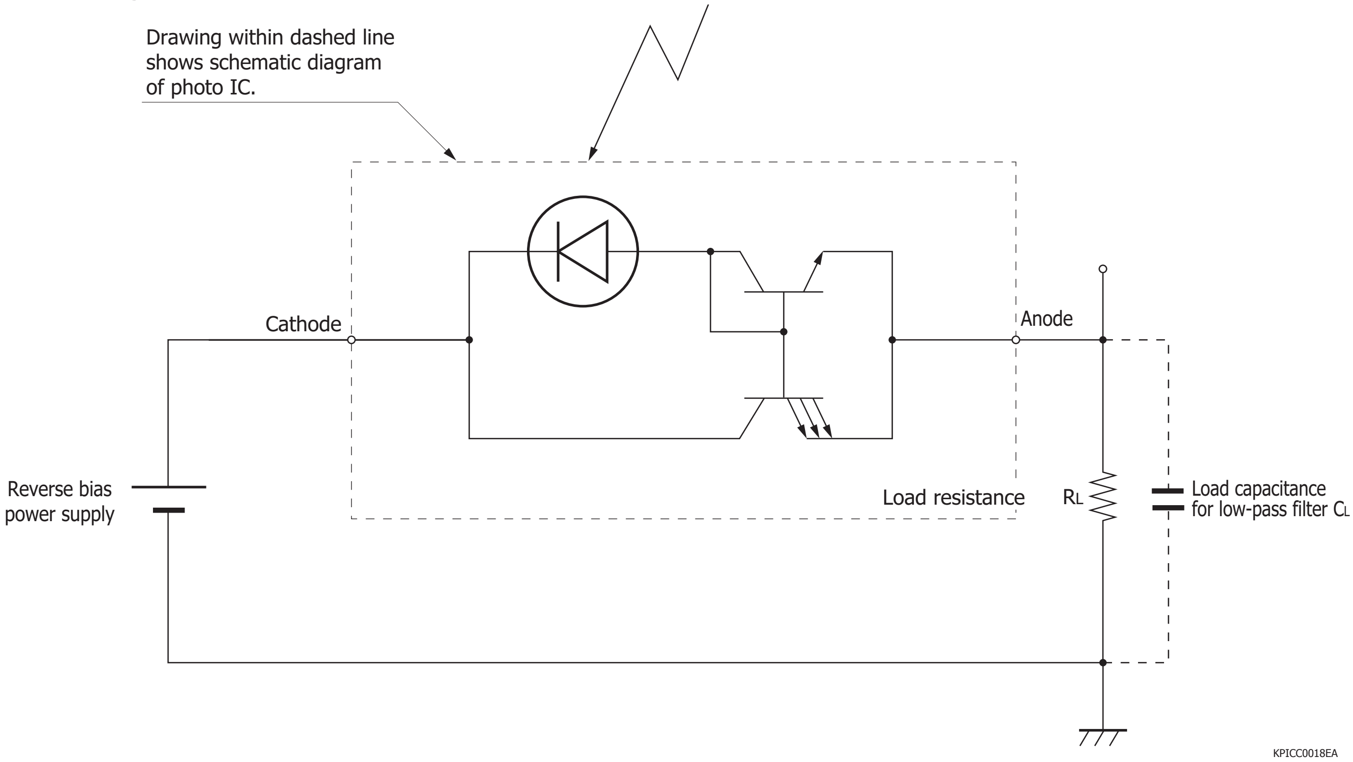
Rise/fall times vs. load resistance



Directivity



Operating circuit example

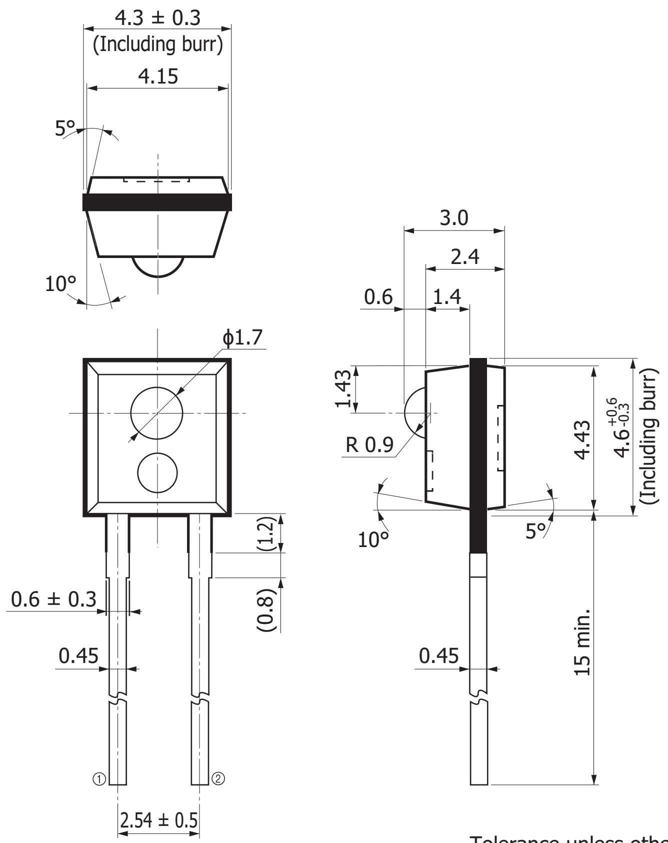


The photodiode must be reverse-biased so that a positive potential is applied to the cathode. To eliminate high-frequency components, we recommend placing a load capacitance C_L in parallel with load resistance R_L as a low-pass filter.

$$\text{Cutoff frequency (fc)} \approx \frac{1}{2\pi C_L R_L}$$

Dimensional outlines (unit: mm)

S7183



(Specified at lead root)

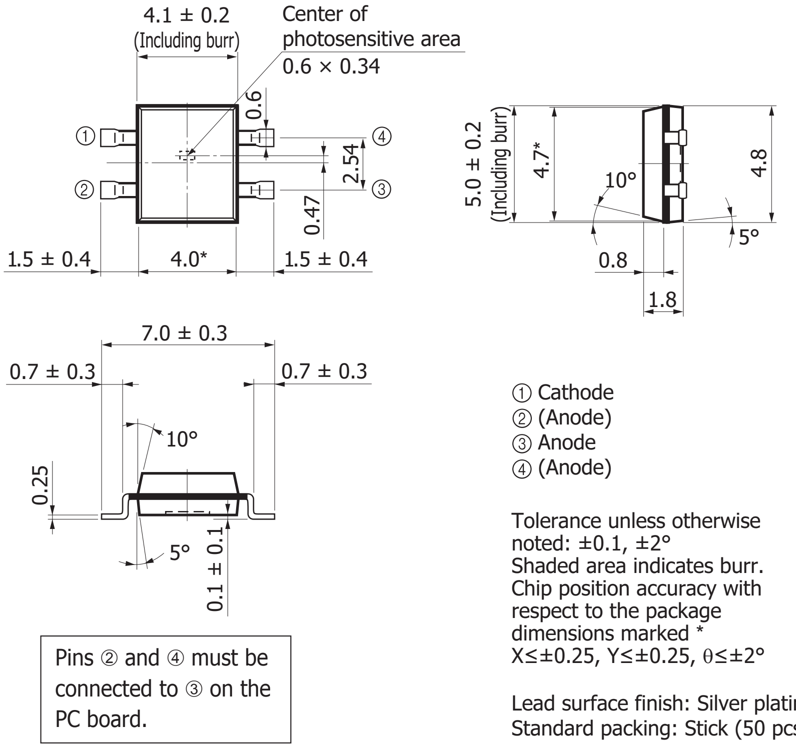
① Cathode
② Anode

Tolerance unless otherwise noted: ±0.2, ±2°
Shaded area indicates burr.
Values in parentheses are not guaranteed, but for reference.

Lead surface finish: Silver plating
Standard packing: Polyethylene pack [anti-static type] (500 pcs/pack)

KPICA0017EB

S7184



① Cathode
② (Anode)
③ Anode
④ (Anode)

Tolerance unless otherwise noted: ±0.1, ±2°
Shaded area indicates burr.
Chip position accuracy with respect to the package dimensions marked *
X≤±0.25, Y≤±0.25, θ≤±2°

Lead surface finish: Silver plating
Standard packing: Stick (50 pcs/stick)

KPICA0018EB

Operating voltage, output characteristics

Figure 2 shows the photocurrent vs. reverse voltage characteristics (light source: LED) for the measurement circuit example in Figure 1. The output curves are shown for illuminance levels. The output curves rise from a reverse voltage (rising voltage) of approximately 0.7 V (±10%).
To protect the photo IC diode from excessive current, a 150 Ω (±20%) protection resistor is inserted in the circuit. Reverse voltage V_R when the photo IC diode is saturated is the sum of Vbe(ON) and the voltage drop across the protection resistor Rin [Equation (1)].

V_R = Vbe(ON) + I_L × Rin .... (1)

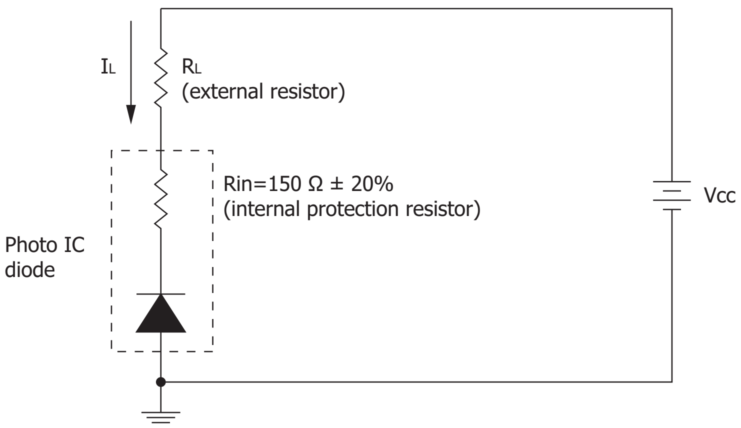
The photodiode’s reverse voltage (V_R) is expressed by Equation (2) according to the voltage drop across the external resistor. This is indicated as load lines in Figure 2.

V_R = Vcc - I_L × R_L .... (2)

In Figure 2, the intersections between the output curves and the load lines are the saturation points. From these points, the maximum detectable light level can be specified. Since the maximum light level is determined by the supply voltage (Vcc) and load resistance (R_L), adjust them according to the operating conditions.

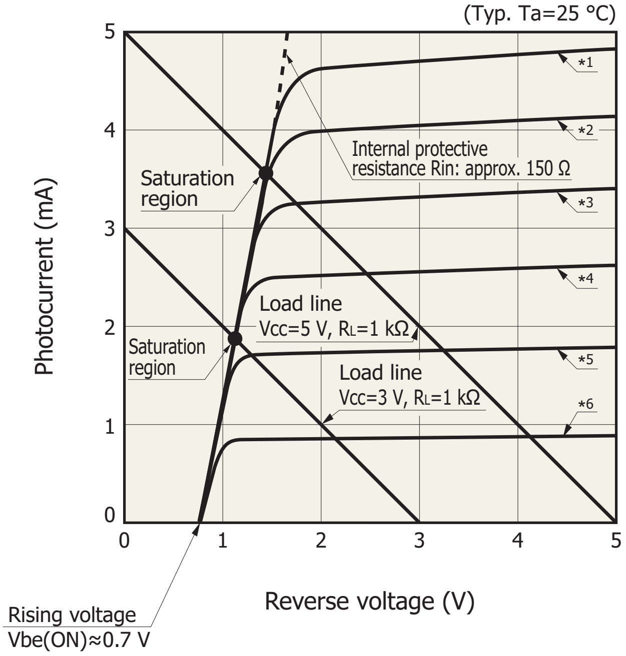
Note: The temperature characteristics of Vbe(ON) is approximately -2 mV/°C, and that of the protection resistor is approximately 0.1%/°C.

[Figure 1] Measurement circuit example



KPICC0128EC

[Figure 2] Photocurrent vs. reverse voltage



(Unit: lx)

Note	S7183	S7184
*1	480	2660
*2	410	2270
*3	340	1880
*4	260	1440
*5	180	1000
*6	90	500

Related information

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

■ Precautions
· Disclaimer
· Surface mount type products

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