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PHOTON IS OUR BUSINESS

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.

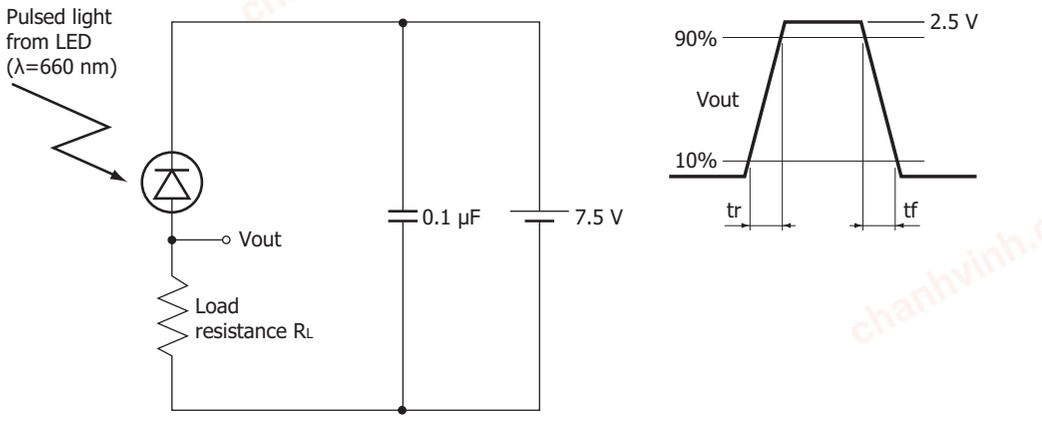
Electrical and optical characteristics (Ta=25 °C)

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.

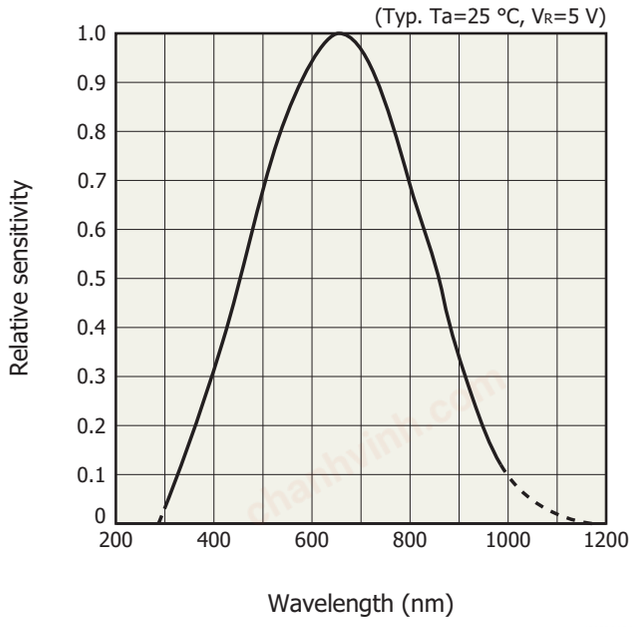
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Rise/fall time measurement method



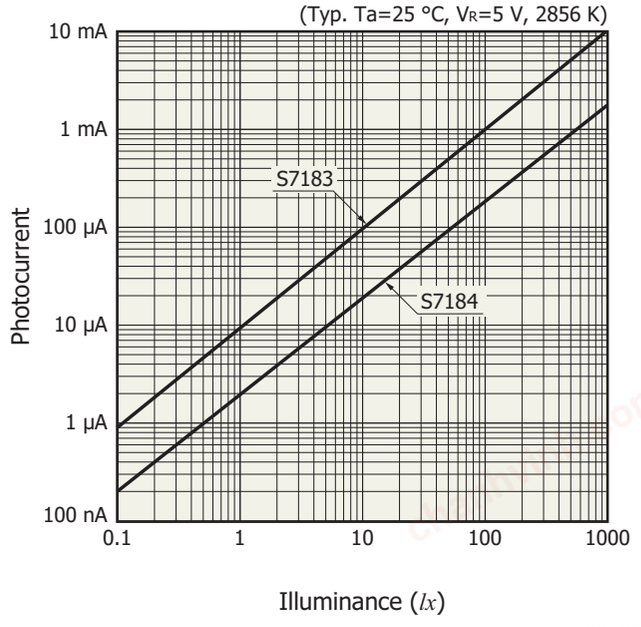
KPICC0041EB

Spectral response



KPICB0036EA

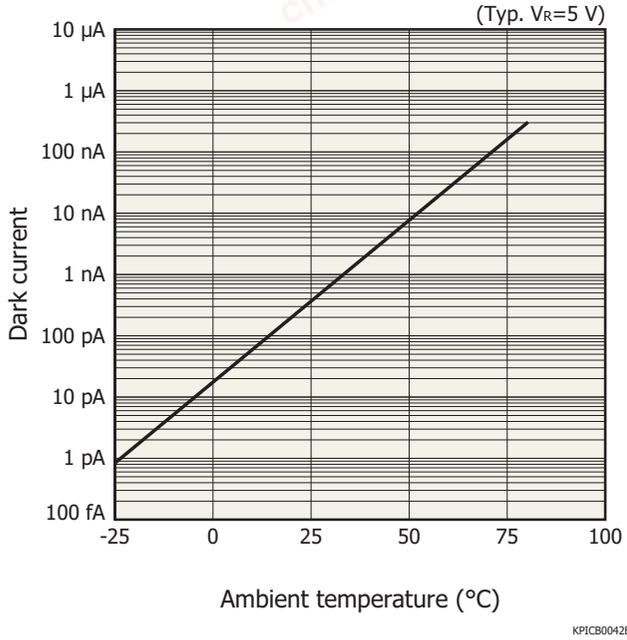
Linearity



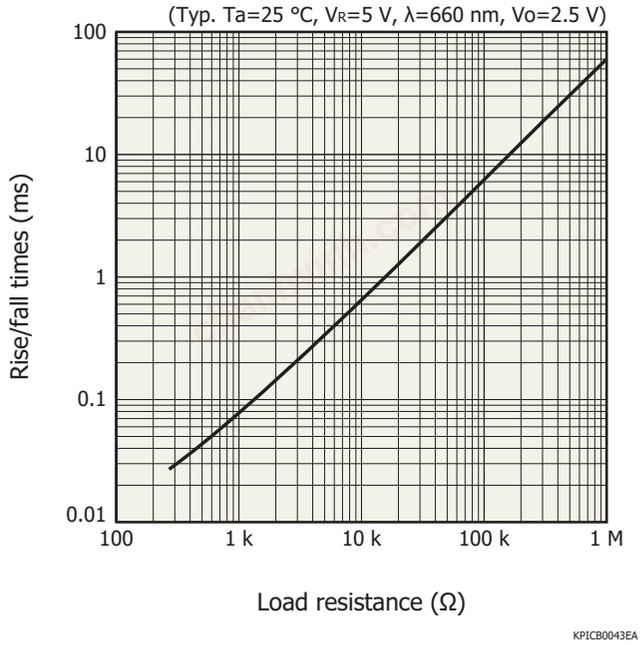
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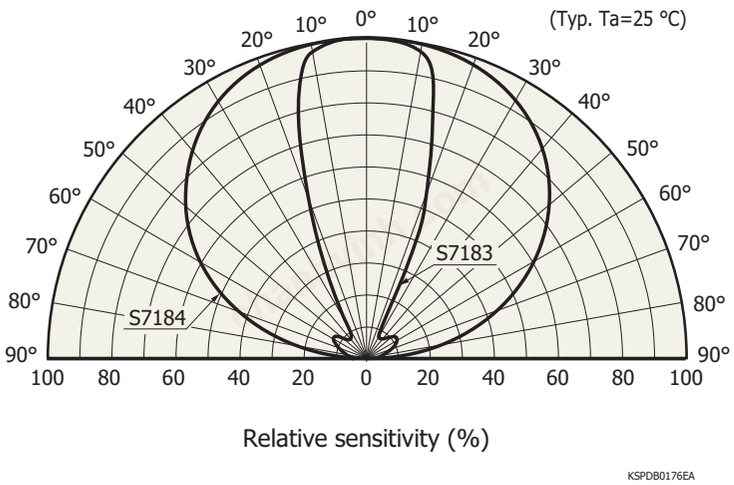
Dark current vs. ambient temperature



Rise/fall times vs. load resistance

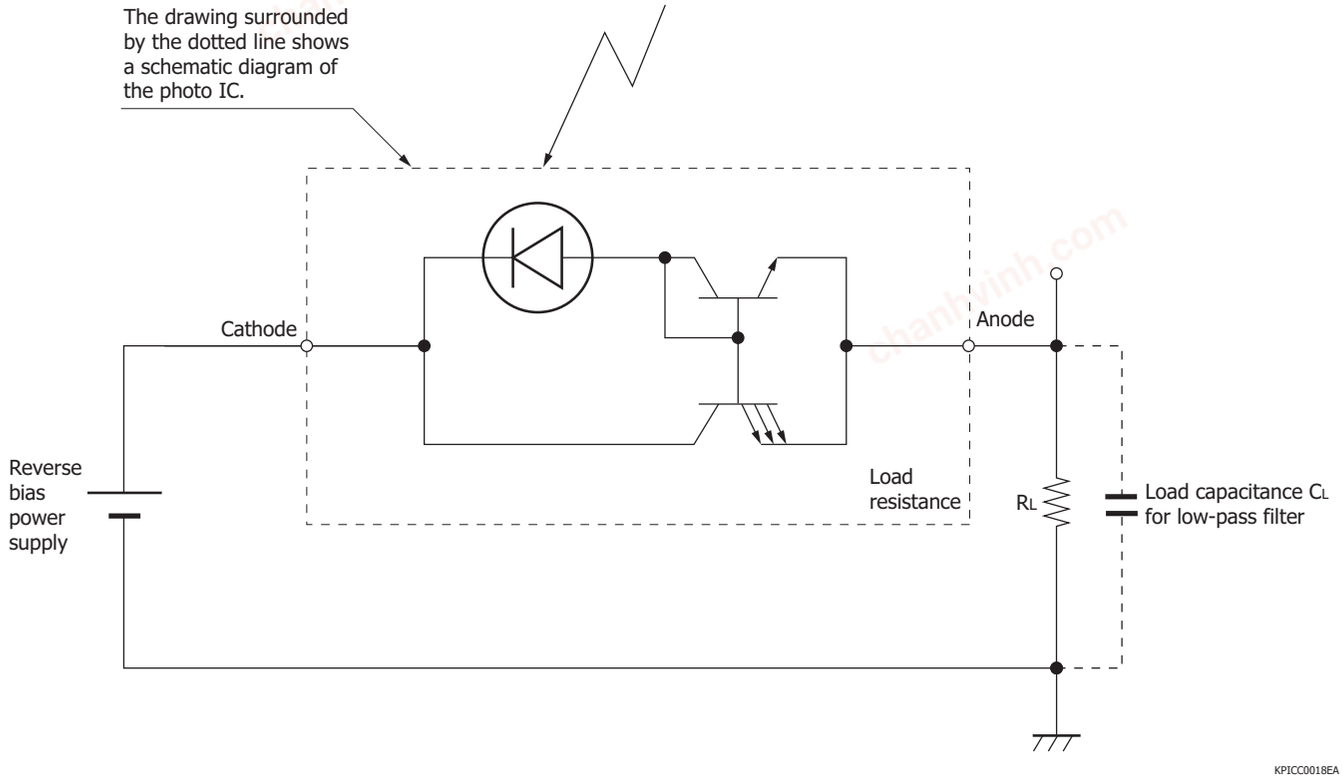


Directivity



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Operating circuit example



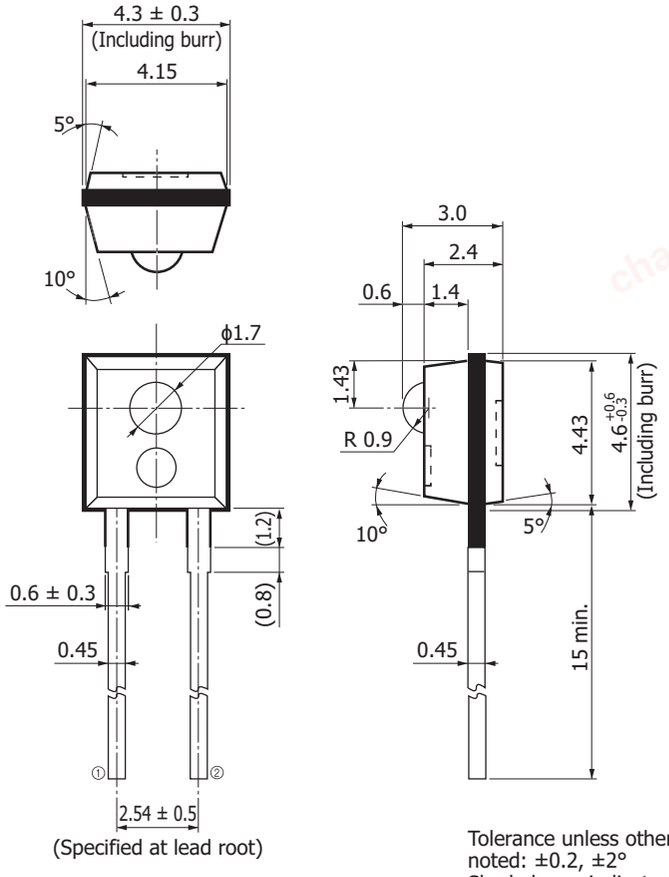
The photodiode must be reverse-biased so that a positive potential is applied to the cathode. To eliminate high-frequency components, we recommend placing a load capacitance C_L in parallel with load resistance R_L as a low-pass filter.

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

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Dimensional outlines (unit: mm)

S7183



(Specified at lead root)

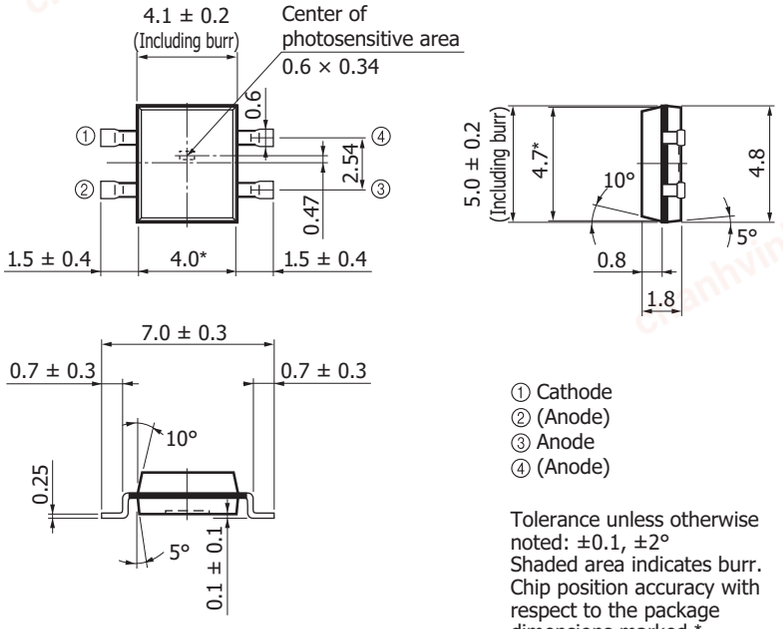
Tolerance unless otherwise noted: ±0.2, ±2°
Shaded area indicates burr.
Values in parentheses are not guaranteed, but for reference.

Packing type: Polyethylene bag (antistatic type)

KPICA0017EC

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S7184



Pins ② and ④ must be connected to ③ on the PC board.

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°

Packing type: Stick

KPICA0018ED

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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)].

$$V_R = Vbe(ON) + I_L \times Rin \quad \text{..... (1)}$$

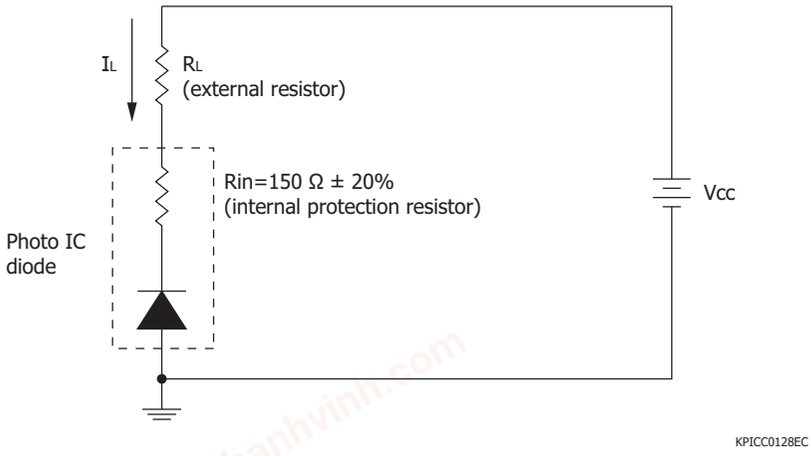
The photodiode's reverse voltage (V_R) is expressed by Equation (2) according to the voltage drop across the external resistor. This is indicated as load lines in Figure 2.

$$V_R = Vcc - I_L \times R_L \quad \text{..... (2)}$$

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.

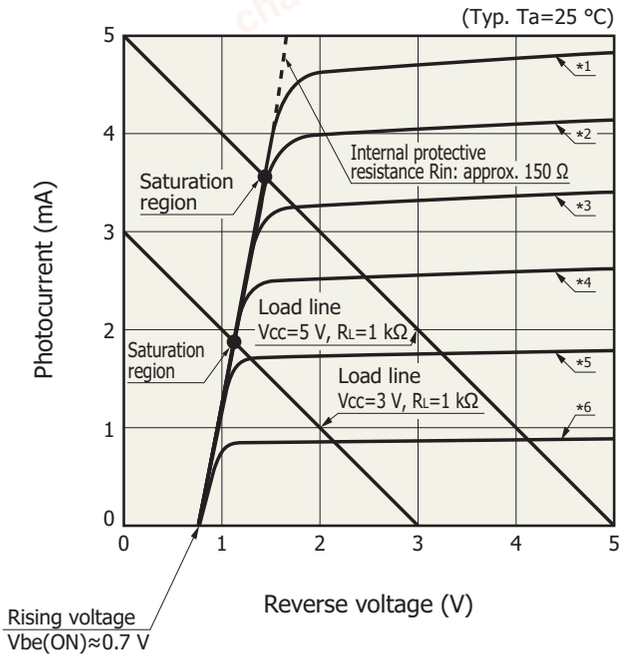
Note: The temperature characteristics of Vbe(ON) is approximately -2 mV/°C, and that of the protection resistor is approximately 0.1%/°C.

[Figure 1] Measurement circuit example



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[Figure 2] Photocurrent vs. reverse voltage



KPICB0195EC

(Unit: lx)

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

Recommended soldering conditions

Type No.	Solder temperature	Remarks
S7183	260 °C (less than 3 s) max.	at least 2.5 mm away from lead roots
S7184	*4	-

*4: Contact us for detailed information.
Note: When setting the soldering conditions, check for any problems by testing out the soldering methods in advance.

Related information

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

■ Precautions
· Disclaimer
· Metal, ceramic, plastic package products
· Surface mount type products

Information described in this material is current as of March 2021.
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.
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