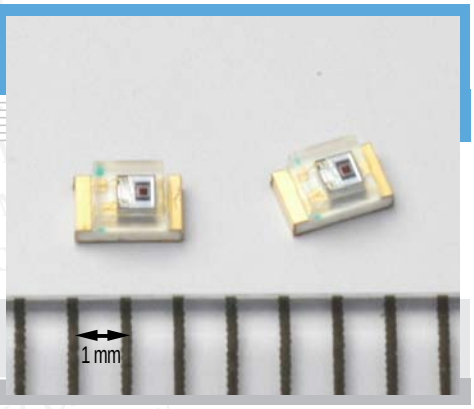
Photo IC diode
S10604

COB (Chip On Board) type, small package



S10604 photo IC has spectral response close to human eye sensitivity. Two active areas are made on a single chip. Almost only the visible range can be measured by finding the difference between the two output signals in the internal current amplifier circuit. Effects of infrared remote control light on sensitivity are reduced when compared to conventional types.

Features

- Spectral response close to human eye sensitivity
- Small package: 2.0 × 1.25 × 0.8^{t} mm
  About 1/5 the cubic volume of conventional type (S9067-01)
- Photocurrent produced by infrared remote control light (940 nm) is about 1/4 that of conventional type (S9067-01)
- Lower output-current fluctuations compared with phototransistors
- Excellent linearity
- Low output fluctuations for light sources producing the same illuminance at different color temperatures
- Suitable for lead-free reflow (RoHS compliance)

Applications

- Liquid crystal monitor backlight dimmer for cellular phone
- Energy-saving sensor for large-screen TVs, etc.
- Light dimmers for liquid crystal panels
- Various types of light level measurement

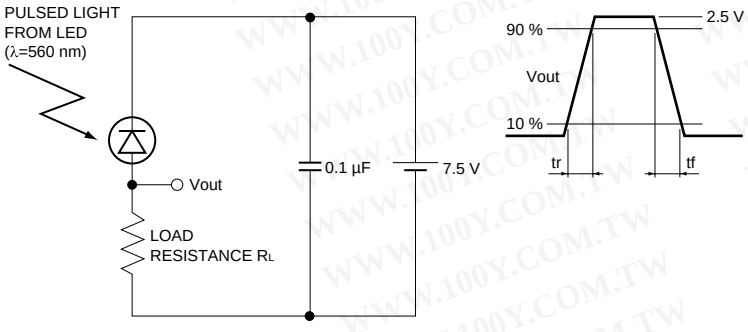
■ Absolute maximum ratings (Ta=25 °C)

Parameter	Symbol	Value	Unit
Reverse voltage	V_R	-0.5 to +12	V
Photocurrent	I_L	5	mA
Forward current	I_F	5	mA
Operating temperature	Topr	-30 to +80	°C
Storage temperature	Tstg	-40 to +85	°C

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

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Spectral response range	λ		-	300 to 820	-	nm
Peak sensitivity wavelength	λp		-	560	-	nm
Dark current	I_D	V_R=5 V	-	1.0	50	nA
Photocurrent	I_L	V_R=5 V, 2856 K 100 *lx*	0.21	0.30	0.39	mA
Rise time *	tr	10 to 90 %, V_R=7.5 V R_L=10 kΩ, λ=560 nm	-	6.0	-	ms
Fall time *	tf		-	2.5	-	ms

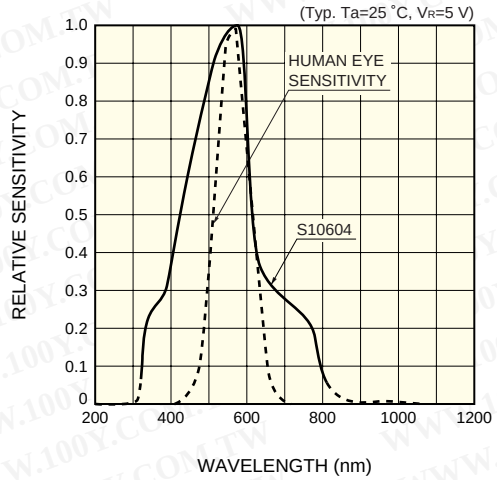
* Rise/fall time measurement method



KPICC0041EA

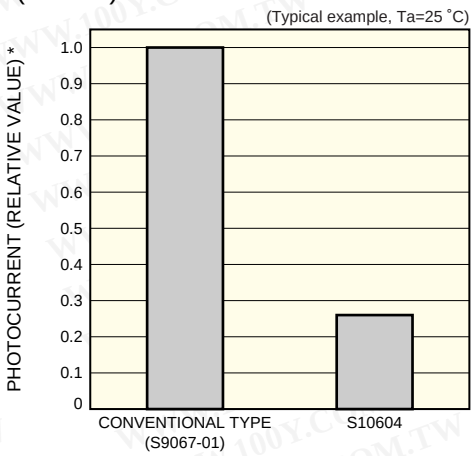
SOLID STATE DIVISION

■ Spectral response



KPICB0112EA

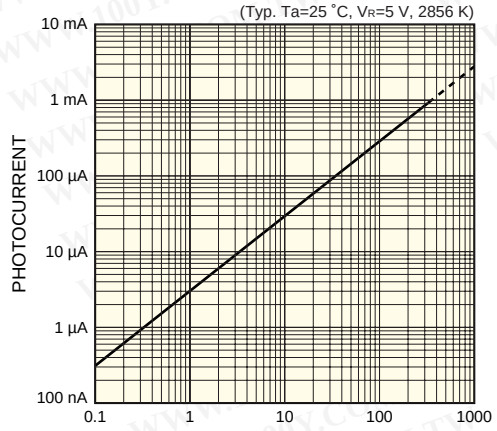
■ Photocurrent produced by infrared remote control light (940 nm)



* S9067-01 normalized to 1.

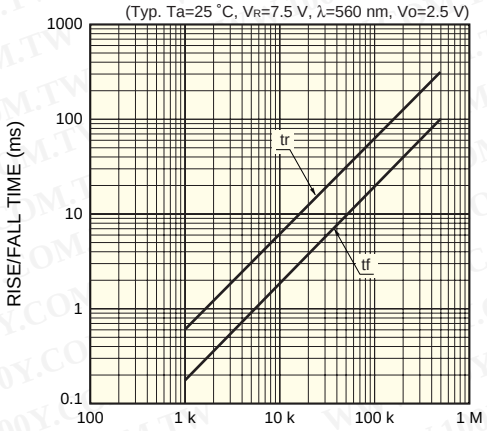
KPICB0113EB

■ Linearity



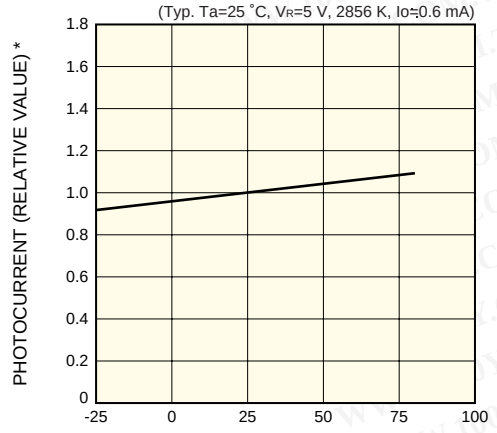
KPICB0114EB

■ Rise/fall time vs. load resistance



KPICB0115EA

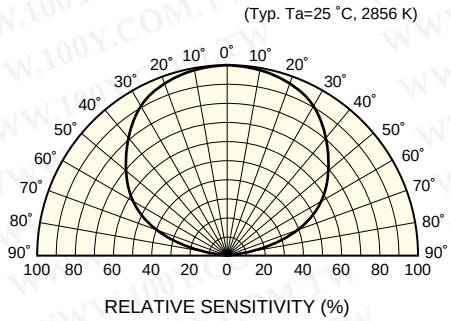
■ Photocurrent vs. ambient temperature



* At Ta=25 ˚C normalized to 1.

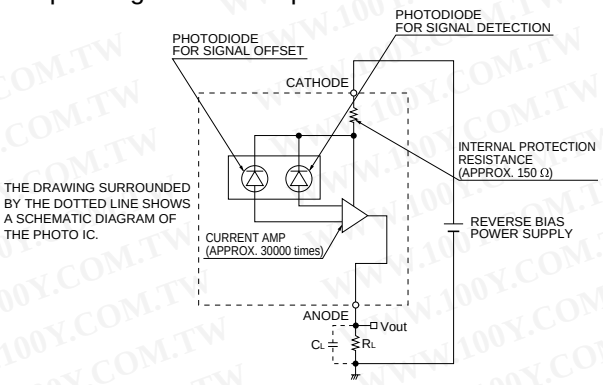
KPICB0116EA

■ Directivity



KPICB0117EA

■ Operating circuit example

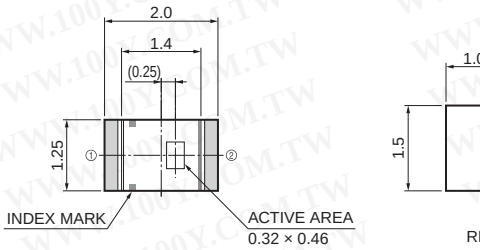


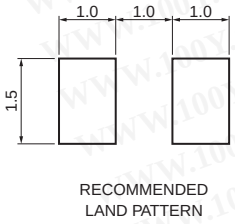
KPICC0132EA

The photo IC diode 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.

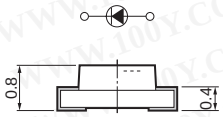
Cut-off frequency $fc \fallingdotseq \frac{1}{2\pi C_L R_L}$

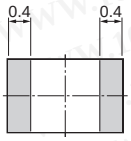
■ Dimensional outline (unit: mm)





RECOMMENDED LAND PATTERN



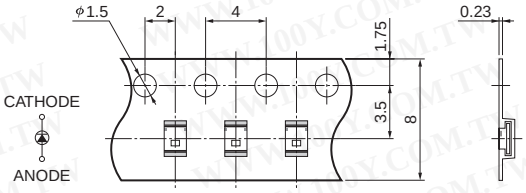


① CATHODE
② ANODE

Tolerance unless otherwise noted: ± 0.2
Values in parentheses indicate reference value
Electrode

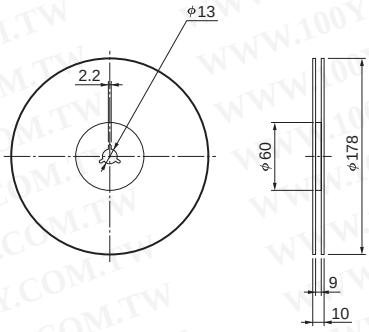
■ Packing specifications

Tape (3000 pcs./reel)



KPICA0073EA

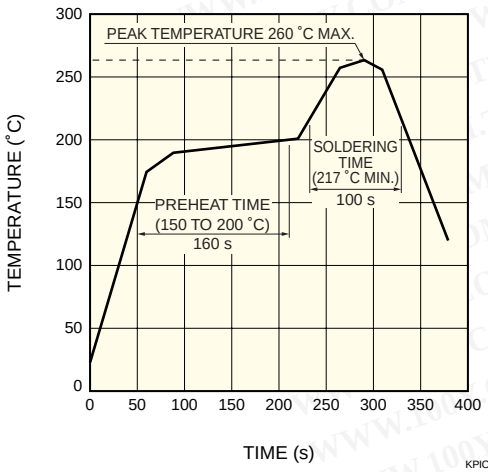
Reel



KPICA0072EA

KPICA0074EA

■ Recommended solder reflow condition



KPICB0119EA

· After unpacking, store this device in an environment at a temperature of 5 to 25 °C and a humidity below 60 %, and perform reflow soldering on this device within 168 hours (7 days).
· Thermal stress applied to the device during reflow soldering differs depending on the PC boards and reflow oven being used. When setting the reflow conditions, make sure that the reflow soldering process does not degrade device reliability.

■ Operating voltage, output characteristics

Figure 2 shows photocurrent vs. reverse voltage characteristics (light source: LED) measured using the circuit shown in Figure 1. Output curves are plotted at different illuminance levels equivalent to a standard source A. The output curves start rising at a reverse voltage of approx. 0.7 V (rising voltage).
Photo IC diode contains an internal resistance of approx. 150 Ω to protect against excessive current. The reverse voltage V_R of a photo IC diode is the sum of Vbe (ON) and the voltage drop across the protective resistance Rin.

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

Figure 1 Measurement circuit

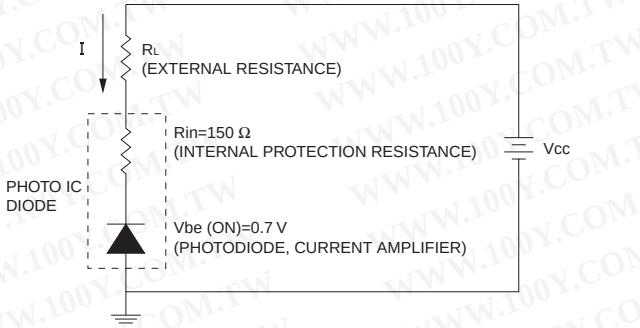
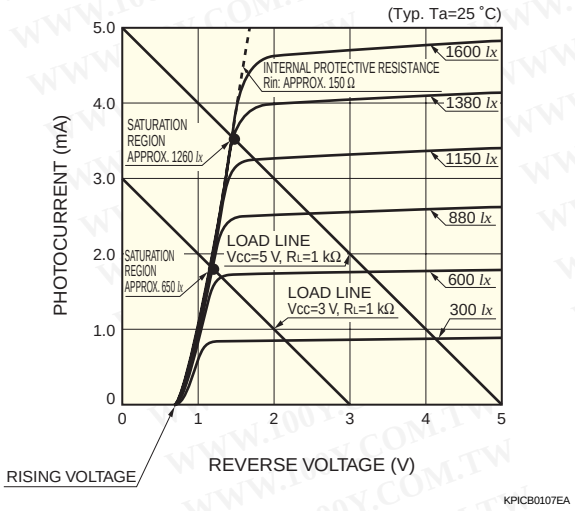


Figure 2 Photocurrent vs. reverse voltage



The voltage drop (V_L) caused by the external resistance is expressed by the following equation and is shown as load lines in Figure 2.

$$V_L = Vcc - I \times R_L \quad \text{..... (2)}$$

In Figure 2, the intersections between the output curves and load lines indicate the saturation region. Maximum detectable light levels can be estimated from this saturation point. Since the maximum detectable light level is determined by the power supply voltage (Vcc) and load resistance (R_L), change them to meet the required operating conditions.

Note: Vbe (ON) and internal protection resistance have a respective temperature dependence of approximately -2 mV/°C and 0.1 %/°C.

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, www.hamamatsu.com
U.S.A.: Hamamatsu Corporation: 360 Foothill Road, P.O.Box 6910, Bridgewater, N.J. 08807-0910, 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) 08152-3750, Fax: (49) 08152-2658
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: Smidesvägen 12, SE-171 41 Solna, Sweden, Telephone: (46) 8-509-031-00, Fax: (46) 8-509-031-01
Italy: Hamamatsu Photonics Italia S.R.L.: Strada della Moia, 1/E, 20020 Arese, (Milano), Italy, Telephone: (39) 02-935-81-733, Fax: (39) 02-935-81-741

Cat. No. KSPD1069E03
Aug. 2008 DN