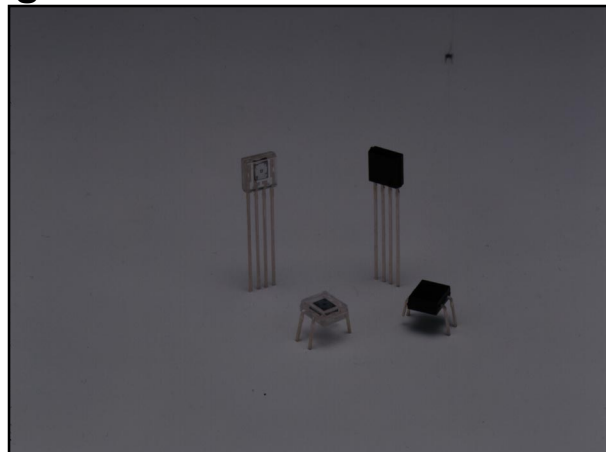


For optical synchronous detection under high background light condition

FEATURES

- Superior allowable background light level
S6986, S4282-51: 10000 lx Typ.
S6846, S7136: 4000 lx Typ.
- Photodiode, LED driver circuit, signal processing circuit, etc. are integrated in one chip.
- Minimum detectable level
S6986, S4282-51: 1 $\mu\text{W}/\text{mm}^2$ Typ.
S6846, S7136: 0.3 $\mu\text{W}/\text{mm}^2$ Typ.
- Digital output
- Miniature size epoxy-molded package



APPLICATIONS

- Detection for copiers, printers, etc.
- Optical switches, etc.

The light modulation photo ICs contain an oscillator, LED driver, photodiode, pre-amplifier, comparator, and signal processing circuit all integrated in a single chip. By connecting an infrared LED externally, photoreflectors and photointerrupters which perform optical synchronous detection can be easily configured. Using our own original circuit design, the S6986 and S4282-51 achieve superior allowable background light level (10000 lx typical 2856 K), and S6846 and S7136 feature a minimum detectable level of 0.3 $\mu\text{W}/\text{mm}^2$ typical ($\lambda=940$ nm).

■ABSOLUTE MAXIMUM RATINGS (Ta=25 °C)

Parameter	Symbol	S6986, S4282-51	S6846, S7136	Unit
Supply Voltage	Vcc	-0.5 to +16	-0.5 to +16	V
Output Voltage	Vo	-0.5 to +16	-0.5 to +16	V
Output Current	Io	50	50	mA
Cathode Output Voltage	Vcath	-0.5 to +16	-0.5 to +16	V
Cathode Pulsed Output Current	Icath		70	mA
Power Dissipation *1	P	250	250	mW
Operating Temperature	Topr	-25 to +60	-25 to +60	°C
Storage Temperature	Tstg	-40 to +100	-40 to +100	°C

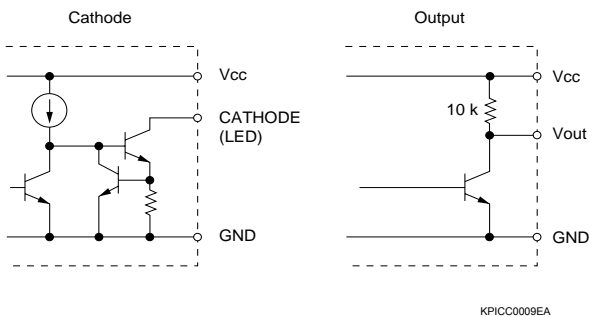
*1: The derating is -3.3 mW/°C above Ta=25 °C.

LIGHT MODULATION PHOTO ICs S6986, S6846, S4282-51, S7136

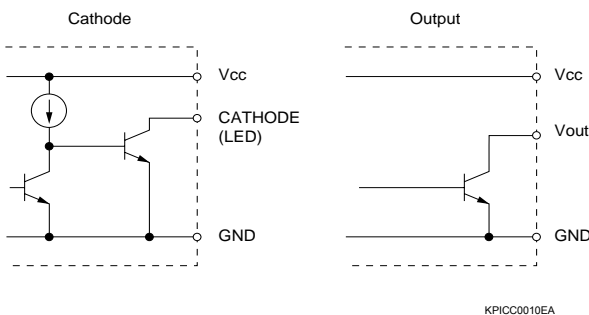
■ELECTRICAL AND OPTICAL CHARACTERISTICS (Vcc=5 V, Ta=25 °C)

Parameter	Symbol	Condition	S6986, S4282-51 *1			S6846, S7136 *2			Unit	
			output: built-in pull-up resistor LED : constant current drive			output: open collector LED : open collector drive				
			Min.	Typ.	Max.	Min.	Typ.	Max.		
Supply Voltage	Vcc		4.5	-	16	4.5	-	16	V	
Current Consumption	Icc	Vo, LED terminal is open	-	4	11	-	4	11	mA	
Output	Low Level Output Voltage	VOL	IoL=16 mA	-	0.2	0.4	-	0.2	0.4	V
	High Level Output Voltage	VOH	4.7 kΩ between Vcc-Vo	4.9	-	-	/			V
				/						4.9
Output Short Circuit Current	Ios		-	0.5	-	/			mA	
Cathode	Low Level Output Voltage	Vcath	Icath=40 mA	/			-	-	0.8	V
	Low Level Output Current	Icath	Vcath=1.2 V	15	35	60	/			mA
	Pulse Period	Tp		65	130	220	65	130	220	μs
	Pulse Width	Tw		4	8	13.7	4	8	13.7	μs
H→L Threshold Illuminance	Eep	λ=940 nm No background light	-	1	2	-	0.3	1.0	μW/mm ²	
Hysteresis	-		0.45	0.65	0.95	0.45	0.65	0.95	-	
Frequency Response	f		0.5	1.25	-	0.5	1.25	-	kHz	
Allowable Background Light Level	Ex	Signal light: 5 μW/mm ² λp=940 nm Background light: A lamp	5000	10000	-	2000	4000	-	lx	

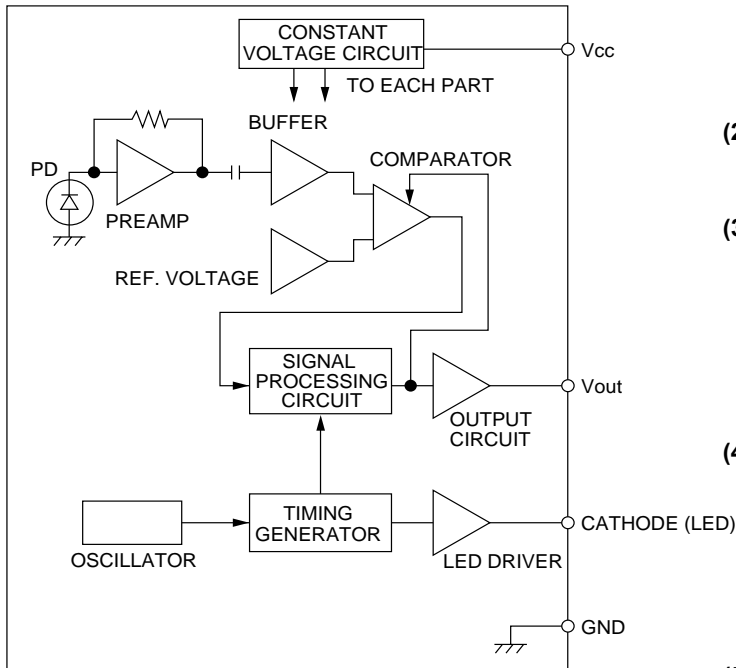
*1:



*2:



■BLOCK DIAGRAM AND FUNCTIONS



Truth Table

Input	Output Level
Light ON	Low
Light OFF	High

KPIC0002EA

(1) Oscillator/Timing Signal Generator Circuit

A reference oscillation output is obtained by charging and discharging the built-in capacitor with constant current. The oscillation output is fed to the timing signal generator circuit to create an LED drive pulse.

(2) LED Driver Circuit

This circuit gives the output of the LED-driving signal created by the timing signal generator circuit. The duty ratio is 1/16.

(3) Photodiode/Pre-amplifier Circuit

The photodiode is formed on the same chip. The photocurrent of the photodiode is converted to a voltage through the pre-amplifier circuit. A specially designed amplifier circuit is used in the pre-amplifier circuit to expand the dynamic range in response to DC or low-frequency background light, and also boost the sensitivity.

(4) Capacitive Coupling/Buffer Amplifier/Reference Voltage Generator Circuit

Low-frequency background and DC offset in the preamplifier section are eliminated by the capacitive coupling. Amplification up to the comparator level is carried out by the buffer amplifier, and a comparator-level signal is produced by the reference voltage generator circuit.

(5) Comparator Circuit

The comparator circuit has a hysteresis function to prevent chattering caused by small fluctuations in the input light.

(6) Signal Processing Circuit

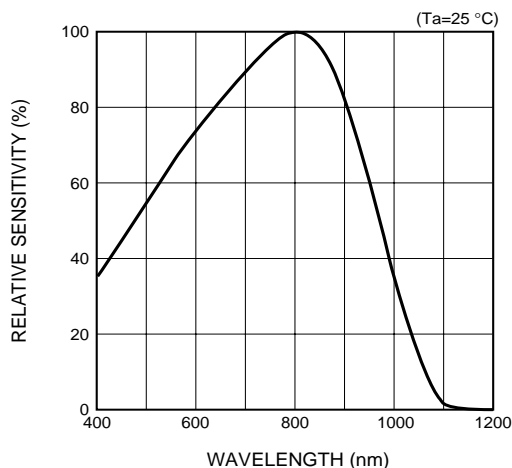
The signal processing circuit is configured as a gate circuit and a digital integrator circuit. The gate circuit discriminates input pulses detected when synchronous detection is carried out, to prevent operation errors due to a synchronous back-ground light. Furthermore, any synchronized back-ground light that cannot be eliminated by the gate circuit will be cancelled by the digital integrator circuit at the next stage.

(7) Output Circuit

The output signal of the signal processing circuit is buffered and derived through this circuit.

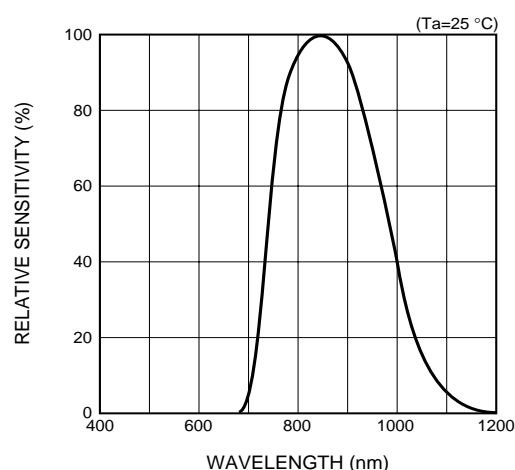
Figure 1: Spectral Response

S6986, S4282-51



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S6846, S7136



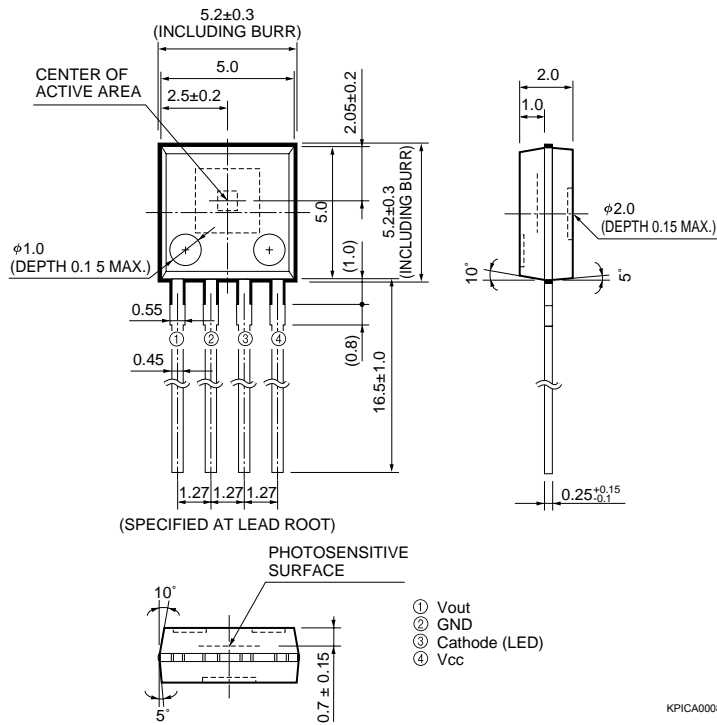
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LIGHT MODULATION PHOTO ICs S6986, S6846, S4282-51, S7136

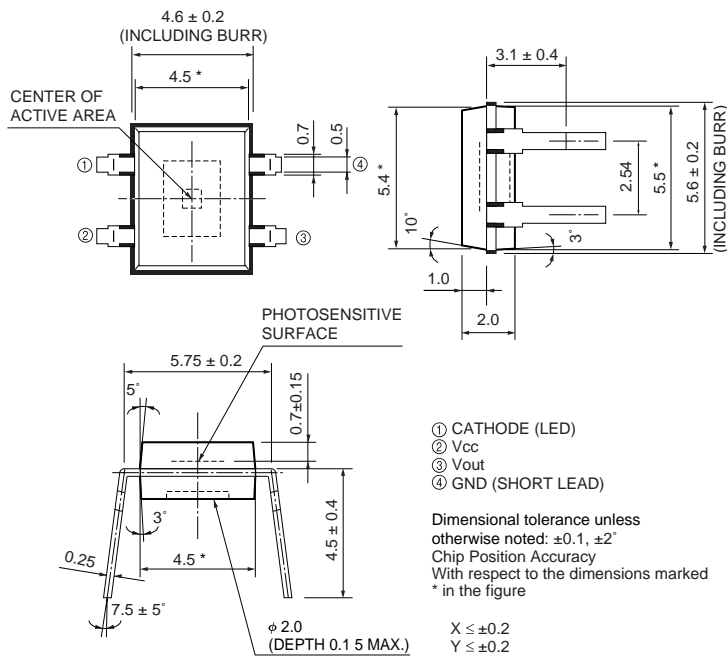
Figure 2: Dimensional Outlines and Connections (Unit: mm)

Values in parentheses indicate reference values.

S6986, S6846



S4282-51, S7136



HAMAMATSU

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Hamamatsu City, 435-91 Japan, Telephone: (81)053-434-3311, Fax: (81)053-434-5184

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.: 8, 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: Lough Point, 2 Gladbeck Way, Windmill Hill, Enfield, Middlesex EN2 7JA, United Kingdom, Telephone: (44)0181-367-3560, Fax: (44)0181-367-6384

North Europe: Hamamatsu Photonics Norden AB: Färögatan 7, S-164 40 Kista, Sweden, Telephone: (46)08-703-2950, Fax: (46)08-750-5895

Italy: Hamamatsu Photonics Italia S.R.L.: Via della Moia, 1/E, 20020 Arese, Milano, Italy, Telephone: (39)02 935 81 733, Fax: (39)02 935 81 741

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