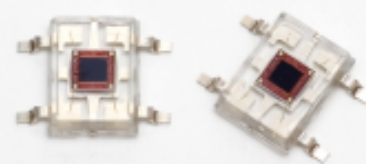


NEW

PHOTO IC

# Light-to-frequency converter photo IC S9705

## Converts light intensity to frequency of output pulse



S9705 is a photo IC that combines a photodiode and a current-to-frequency converter on a monolithic CMOS chip. Output is a square wave (50 % duty ratio) with frequency directly proportional to light intensity incident on the photodiode. The CMOS level digital output allows direct connection to a microcomputer or other logic circuitry. S9705 has wide dynamic range and light intensity can be easily measured when used with a digital counter. Light intensity can be measured at high speeds even under low illumination by counting the output frequency.

### Features

- Converts light intensity to frequency
- Wide dynamic range: 5 orders of magnitude
- Excellent linearity
- Output timing reset function
- Digital output for direct interface to microcomputer
- 4-pin plastic package

### Applications

- Liquid crystal monitor backlight dimmer for mobile devices
- Brightness adjustment for large-screen liquid crystal TV
- Lighting dimmer
- Replacement for CdS photoconductive cells

#### ■ Absolute maximum ratings (Ta=25 °C)

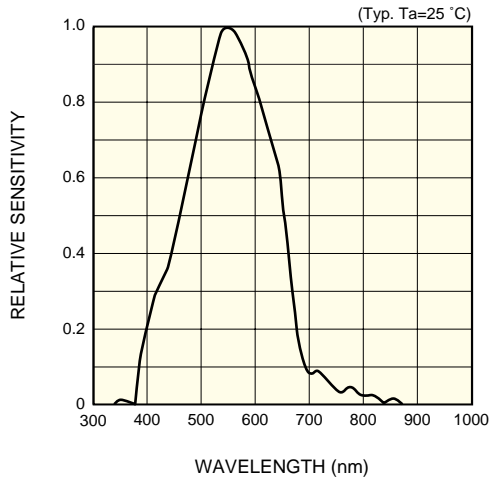
Parameter	Symbol	Value	Unit
Supply voltage	Vdd	-0.3 to 6	V
Load current	Io	±10	mA
Power dissipation	P	50	mW
Operating temperature	Topr	-30 to +80	°C
Storage temperature	Tstg	-40 to +85	°C

#### ■ Electrical and optical characteristics (RESET="L", Vdd=5 V, Ta=25 °C, A light source, unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Active area	-		-	0.9 × 0.9	-	mm
Peak sensitivity wavelength	$\lambda_p$		-	550	-	nm
Supply voltage	Vdd		2.7	5	5.5	V
Current consumption	Idd	Dark state, no load	-	1.5	3.0	mA
Output frequency (sensitivity)	fo		280	350	420	Hz/lx
Maximum output frequency	fmax		500	-	1000	kHz
Response time	tfl	5 lx to 5 m/lx, 90 %	-	0.01	0.1	s
Dark frequency	fd		-	0.1	-	Hz
Linearity	-	fo=10 kHz *	-	±1	-	%
Power supply voltage dependence of output frequency	-	Vdd=5 ± 0.5 V	-	±0.5	-	%/V
Temperature coefficient of output frequency	-	Ta=25 ± 10 °C, fo=10 kHz $\lambda=530$ nm	-	±0.1	-	%/°C
Reset time	tres		1	-	-	μs
Delay time 1	t1		-	-	0.1	μs
Delay time 2	t2		-	-	0.1	μs
High level output voltage	Voh	Ioh= -0.5 mA	4.5	-	-	V
Low level output voltage	Vol	Iol=0.5 mA	-	-	0.5	V
Output impedance	Ro	RESET="H"	1	-	-	MΩ
High level input voltage	Vih	RESET	4.0	-	-	V
Low level input voltage	Vil	RESET	-	-	1.0	V
Input pull-up resistance	Rin	RESET	100	500	-	kΩ

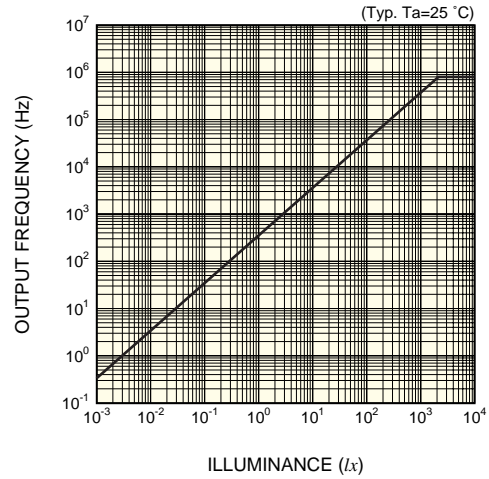
\* Deviation from the straight line connecting the origin point to the fmax point, normalized by the fmax value.

## ■ Spectral response



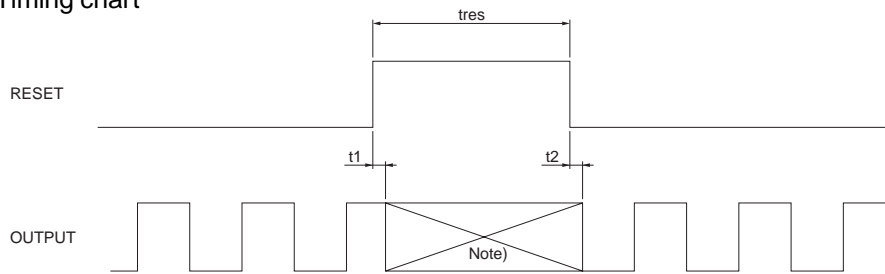
KPICB0093EA

## ■ Output frequency vs. illuminance



KPICB0091EB

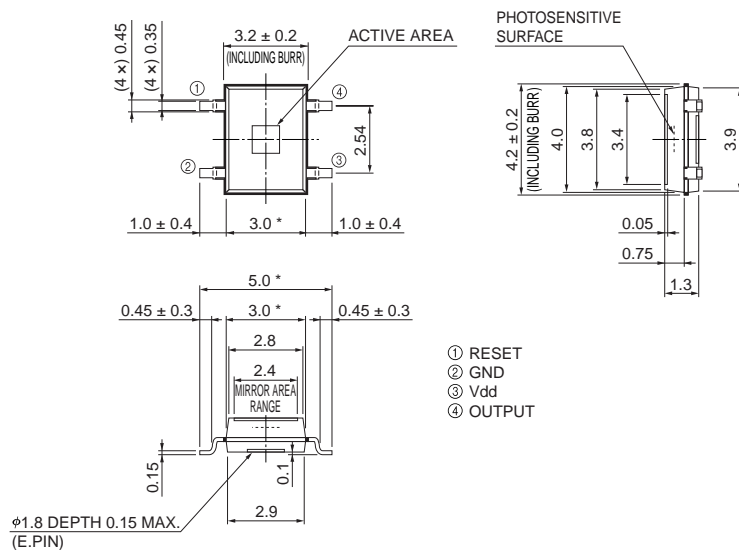
## ■ Timing chart



Note) OUTPUT terminal is set to a "High" impedance state during RESET ("High" state).

KPICC0120EA

## ■ Dimensional outline (unit: mm, tolerance: reference value)



KPICA0063EA

## ■ Pin connection

Pin No.	Symbol	Function	I/O	Digital/ Analog
1	RESET	Reset of output pulse timing	I	D
2	GND	Ground	-	-
3	Vdd	Supply terminal	-	-
4	OUTPUT	Output terminal	O	D

# HAMAMATSU

Information furnished by HAMAMATSU is believed to be reliable. However, no responsibility is assumed for possible inaccuracies or omissions. Specifications are subject to change without notice. No patent rights are granted to any of the circuits described herein. ©2005 Hamamatsu Photonics K.K.

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Hamamatsu City, 435-8558 Japan, Telephone: (81) 053-434-3311, Fax: (81) 053-434-5184, 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.: 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: 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: Smidsvågen 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