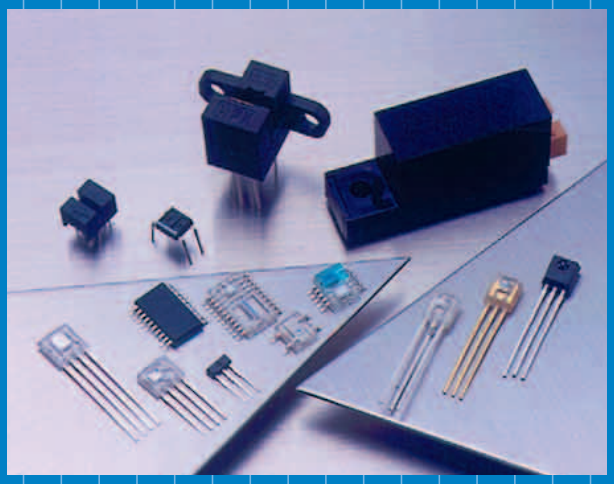
SOLID STATE DIVISION

PHOTO IC



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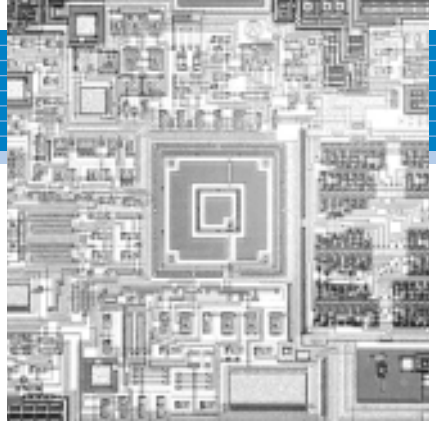


PHOTO IC

Photo Integrated Circuit

Types of Photo IC

Photo ICs are integrated circuits that function by the input of light. The photo IC output changes according to the light striking the photosensitive area. The output mode differs depending on the signal processing circuit function.

Photo ICs can be grouped by structure into monolithic and hybrid types. Photo ICs are also classified by application into general-purpose and special use devices. Digital output and analog output are both available.

(1) Monolithic photo IC

The photosensitive area and signal processing circuit are formed on the same IC chip.

(2) Hybrid photo IC

A photodiode chip and a signal processing IC chip are discrete but connected to each other and assembled in the same package.

Photo IC features

Compared to devices consisting of a discrete photodiode and an op-amp circuit, photo ICs offer the following features.

(1) Compact and lightweight

(2) High resistance to electromagnetic induction noise

(3) High reliability

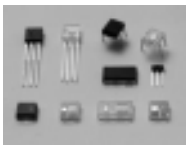
Monolithic photo IC does not have wiring leads between the photosensitive area and signal processing circuit. This makes the photo IC highly resistant to electromagnetic noise.

In the hybrid photo IC on the other hand, the shape and spectral response of the photodiode can be redesigned in a relatively easy process, because the photosensitive area is formed on a chip separate from the signal processing IC chip.

In applications such as optical communications, monolithic photo ICs with their high resistance to electromagnetic noise and high-speed response are in increasing demand. To meet this demand, Hamamatsu Photonics offers monolithic photo ICs with higher response speed made possible by our unique, state-of-the-art PIN bipolar process.

CONTENTS

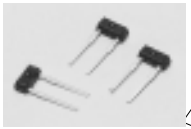
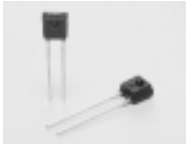
Photo IC



● Prepares for the various packages.

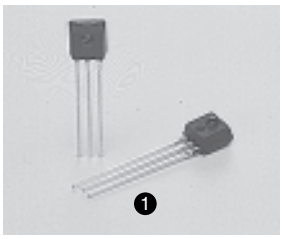
Application	Output	Feature	Page
General use	Digital	The digital output is inverted when the input light intensity exceeds a preset level in the photo IC. A DC light detection type and a light modulation type for detecting pulsed signal light are available. The light modulation type is also available as synchronous or asynchronous detection types.	1
Special use	Digital	Photo ICs designed for specific applications such as industrial optical switches, optical encoders, sync detection in laser beam printers, POF (Plastic Optical Fiber) communications, object (human body, etc.) proximity detection (range-finding type), and pulsed light detection are provided.	2
General use	Analog	These photo ICs are available in two types: a current output type that has two terminals like photodiodes and provides a large output current with excellent linearity and a voltage output type consisting of a photodiode and a preamp.	4
Special use	Analog	Photo ICs specifically designed for exposure control in still cameras. Output is obtained in proportion to the log of the light intensity level.	

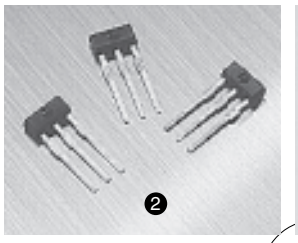
Related product

	Product name	Feature	Page
	Photoreflector	Photoreflectors are reflection type sensors incorporating an infrared LED and a photosensor in the same package. Photoreflectors detect an object when it comes close in proximity, by emitting a light beam and detecting the reflected light. Two types of photosensors, digital output photo ICs and analog output photo IC diodes are used. The digital output photo ICs include a long-distance type using a light modulation photo IC.	5
	Photointerrupter	Photointerrupters are transmission type sensors incorporating an infrared LED and a photosensor in the same package. Photointerrupters detect an object when it interrupts the light beam emitted from the LED. Phototransistors or digital output photo ICs can be selected as the photosensor. Hamamatsu also provides photointerrupters that act as encoders when used in conjunction with a codestrip.	
 	Phototransistor	Phototransistors amplify the current generated by the input of light. Compared to photodiodes, a large output current can be derived even from a small active area.	

Digital output type photo IC for general use

Photo IC for DC light detection





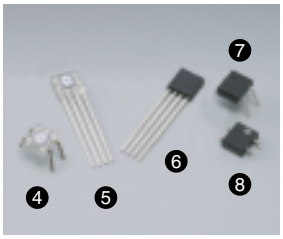
(Typ.)

Type No.	Package (mm)			Threshold illuminance (μW/mm²)	Feature	
S4825	❶	Visible-cut plastic package SIP with lens	4.15 × 4.43	1 *1	Transistor output with built-in pull-up resistor “H” level output at light input	
S4826					Transistor output with built-in pull-up resistor “L” level output at light input	
S4827	❷	Visible-cut plastic package SIP with lens	3.5 × 1.6	2 *1	Open collector output “H” level output at light input	
S4828					Open collector output “L” level output at light input	
S5767	❸	Clear plastic package SIP with lens	4.15 × 4.43	1 *2	Low-voltage operation (2.2 to 7 V)	Transistor output with built-in pull-up resistor “H” level output at light input
S5768						Transistor output with built-in pull-up resistor “L” level output at light input
S7610-10				0.1 *1		Open collector output “L” level output at light input
S4810	❷	Visible-cut plastic package SIP with lens	3.5 × 1.6	1.5 *1 Max.		Open collector output “H” level output at light input
S6289						Open collector output “L” level output at light input

*1: λ=890 nm
*2: λ=660 nm

Light modulation photo IC

Light modulation photo ICs allow reliable optical detection even under disturbance background light by detecting pulsed signals in synchronous mode.
(S4289-61 is an asynchronous type.)



(Typ.)

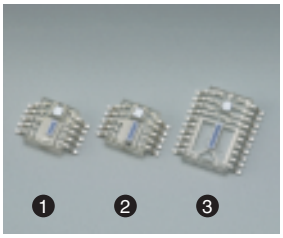
Type No.	Package (mm)			Threshold illuminance *3 (μW/mm²)	Allowable background illuminance (lx)	Feature
S4282-51	❹	Clear plastic package DIP	4.5 × 5.5	0.7	10,000	-
S6986	❺	Clear plastic package SIP	5.0 × 5.0			
S6809	❻	Visible-cut plastic package SIP	5.0 × 5.0	0.2	3,000	Small hysteresis
S6846						-
S7136	❼	Visible-cut plastic package DIP	4.5 × 5.5			
S7136-10	❽	Visible-cut plastic gull-wing package	4.5 × 5.5			
S4289-61	❼	Visible-cut plastic package DIP	4.5 × 5.5		4,000	Asynchronous detection

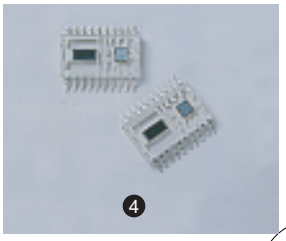
*3: λ=940 nm

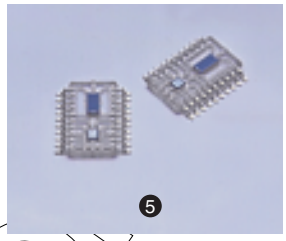
Digital output type photo IC for special use

Photo IC for laser beam sync detection

These photo ICs provide the start timing for laser beam scan in laser beam printers and digital copiers. Dual photodiode types are also provided that maintain stable output even if the laser power or ambient temperature fluctuates.





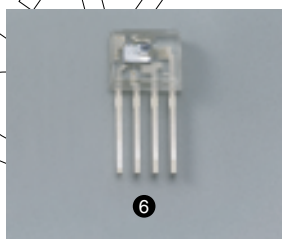


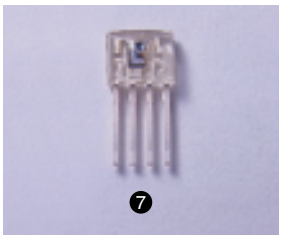
(Typ.)

Type No.	Package (mm)			Photodiode length (mm)	Feature	
S6174	❶	Clear plastic gull-wing package	4.5 × 5.5	1.65	-	
S6874-10	❷			2.17		
S8041	❸		9.5 × 5.2	3.0		
S7858	❹		9.5 × 5.2	2.4	Dual-element photodiode	Switchable gain function
S5049-02	❺					High-speed
S5049-03						For low laser power

Photo IC for POF communication

These photo ICs are specifically developed as receivers for fiber optic communications. Digital output is obtained from these photo ICs when they detect red light emitted through a POF (Plastic Optical Fiber).



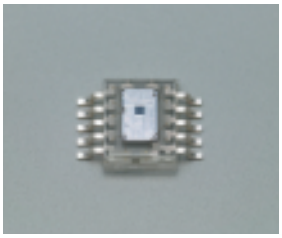


(Typ.)

Type No.	Package (mm)			Data rate (Mbps)	Feature
S7141-10	❻	Clear plastic package SIP with lens	5.0 × 4.3	DC to 50	Designed to be used with L7140-10
S7727	❼			4 to 156	Designed to be used with L7726
S8046	❻			4 to 50	High reliability, standby mode, designed to be used with L8045

Photo IC for optical switch

Functions needed for industrial optical switches are implemented into these photo ICs.



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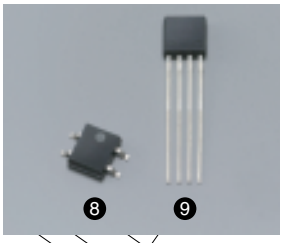
Type No.	Package (mm)			Threshold illuminance ($\mu W/mm^2$)	Allowable background light level (lx)
S6841		Clear plastic gull-wing package	4.5 × 5.5	0.05 *4	5,000
S8119				0.1	10,000

*4: λ=850 nm

Photo IC for rangefinder

When used with an infrared LED and light emitting/receiving lenses, etc., these photo ICs detect the distance (near or far) to an object by triangular distance measurement.

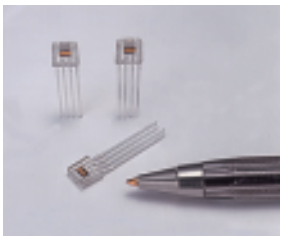


(Typ. unless otherwise noted)

Type No.	Package (mm)			Threshold input difference current (nA)	Allowable background light level (*lx*)
S8030	❽	Visible-cut plastic gull-wing package	4.5 × 5.5	5	3,000 Min.
S8064	❾	Visible-cut plastic package SIP	5.0 × 5.0		

Photo IC for encoder

Linear encoders or rotary encoders having a 2-phase digital output can be configured by using this photo IC along with a codestrip or codewheel and a light source such as tungsten lamp and LED.



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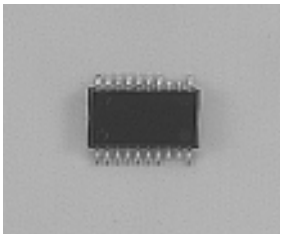
Type No.	Package (mm)		Threshold illuminance (*lx*)	Feature
S4506	Clear plastic package SIP	5.0 × 5.0	30	Two-phase output with 90° phase difference

Photo IC for pulsed light detection

This photo IC is specifically designed to detect pulsed light emitted from an infrared LED or laser.



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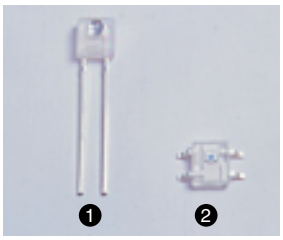
Type No.	Package (mm)		Threshold input current (nA)	Feature
S6467	Visible-cut plastic gull-wing package	9.5 × 5.2	350	Active area: 2.77 × 2.77 mm Bandwidth: 60 kHz to 8 MHz

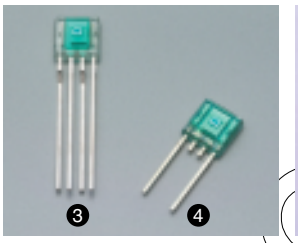
Analog output type photo IC

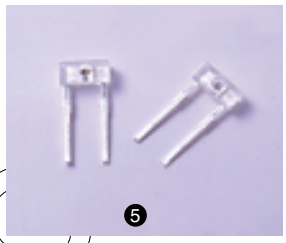
■ General use type

Photo IC diode

Photo IC diodes have two terminals like photodiodes and amplify the photocurrent generated by the input of light.





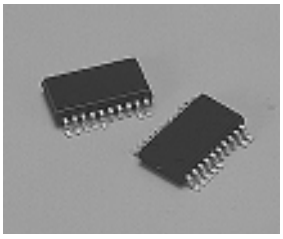


(Typ.)

Type No.	Package (mm)			Photocurrent 1000 *lx* (mA)	Feature
S7183	❶	Clear plastic package SIP with lens	4.15 × 4.43	10	High sensitivity
S7184	❷	Clear plastic gull-wing package	4.0 × 4.8	1.8	Surface mount
S7565	❸	Clear plastic package SIP	5.0 × 5.0	0.32	With visual-compensation filter
S7805-10	❹			3	
S7815	❺	Clear plastic package SIP with lens	3.5 × 1.6	2.3	Subminiature package

Voltage output type (Si PIN photodiode with preamp) .....

This photo IC incorporates a large area (2.77 × 2.77 mm) photodiode and a high-speed preamp (voltage output) chip in the same package.



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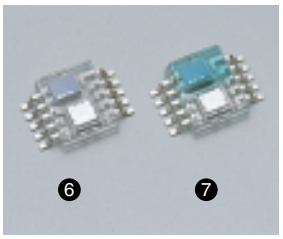
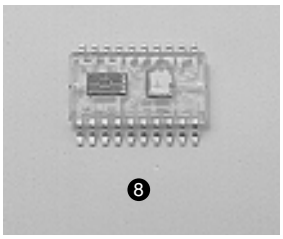
Type No.	Package (mm)		Feature
S5905-02	Visible-cut plastic gull-wing package	9.5 × 5.2	Photodiode bandwidth: 16 MHz, preamp bandwidth: 25 MHz trans-impedance: 30 kΩ

■ Special use type

Photo IC for photometry .....

These photo ICs are specifically designed for exposure control in still cameras. Voltage output is obtained in reverse proportion to the log of the light intensity level.





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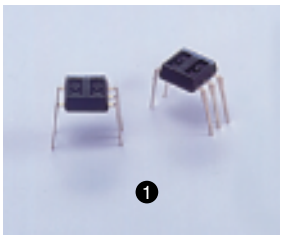
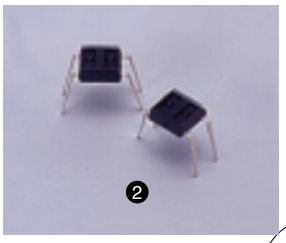
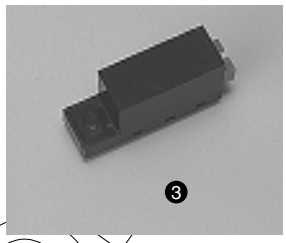
Type No.	Package (mm)			Photodiode	Feature
S6446	❻	Clear plastic gull-wing package	4.5 × 5.5	Photo IC incorporating a dual-element	-
S6446-20	❼				With visual-compensation filter
S6969	❻			1.2 x 1.8 mm, single-element photodiode	-
S6975	❻			Photo IC incorporating a dual-element	High gain type of S6446
S6840	❽		9.5 × 5.2	5-element photodiode	-

Photoreflector







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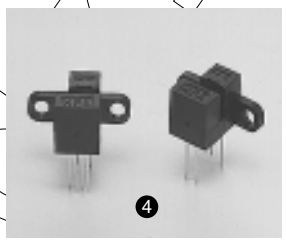
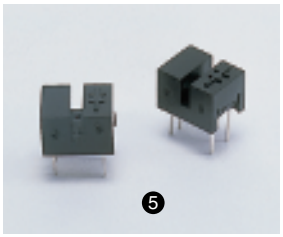
Type No.	Package (mm)			Output	Detection distance
P4855	❶	Visible-cut plastic package DIP	4.0 × 4.2	Photo IC	to 3 mm
P5587	❶			Low voltage photo IC	
P7816	❷			Photo IC diode	
P6448	❸	Visible-cut plastic package	35 × 10 × 17	Light modulation photo IC	30 cm

Photointerrupter





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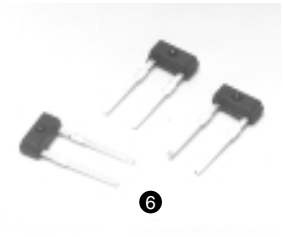
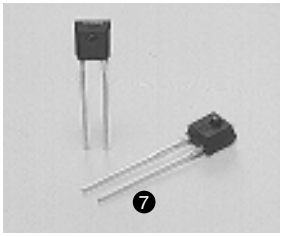
Type No.	Package (mm)			Feature
P5747	❹	Plastic	20.2 × 11.4 × 12	Encoder that provides incremental two-phase digital outputs, resolution: 42 µm
P6291	❺		4.9 × 4.5 × 6.6	Photo IC output

Phototransistor





(Typ. unless otherwise noted)

Type No.	Package (mm)			Photocurrent 1000 *lx* (mA)	Feature
S2829	❻	Visible-cut plastic package SIP with lens	3.5 × 1.6	1.0	-
S4404-01	❼	Visible-cut plastic package SIP with lens	4.15 × 4.43	2.8	-

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- The products described in this catalog should be used by persons who are accustomed to the properties of photoelectronics devices, and have expertise in handling and operating them.
  They should not be used by persons who are not experienced or trained in the necessary precations surrounding their use.

- The information in this catalog is subject to change without prior notice.

- Information furnished by HAMAMATSU is believed to be reliable. However, no responsibility is assumed for possible inaccuracies or ommission.

- No patent rights are granted to any of the circuits described herein.

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Light emitting diodes
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