

S9703-11

High sensitivity, high-speed response

The S9703-11 photo IC uses a high-speed PIN photodiode designed for laser beam synchronous detection. When compared to the S9703-01 previously marketed, the S9703-11 has reduced their reflection effects in the package. Tape-and-reel shipment (S9703-31) is available. Hamamatsu also provides the S9684 series photo ICs that use a dual-element Si PIN photodiode.

Features

- **High sensitivity**
Current amplifier gain: 6 times
- **Digital output**
- **Small package**
- **Suitable for lead-free solder reflow**
- **Photosensitive area: 2.84 × 0.5 mm**

Applications

- **Print start timing detection for laser printers, digital copiers, fax machines, etc.**

Absolute maximum ratings

Parameter	Symbol	Condition	Value	Unit
Supply voltage	Vcc	Ta=25 °C	-0.5 to +7	V
Power dissipation*1	P	Ta=25 °C	300	mW
Output voltage*2	Vo	Ta=25 °C	-0.5 to +7	V
Output current	Io	Ta=25 °C	5	mA
Ro terminal current	IRO	Ta=25 °C	3	mA
Operating temperature	Topr	No condensation	-25 to +80	°C
Storage temperature	Tstg	No condensation	-40 to +85	°C
Reflow soldering conditions	Tsol	JEDEC MSL 5a	Peak temperature: 240 °C max., 1 time	-

*1: Power dissipation decreases at a rate of 4 mW/°C above Ta=25 °C.

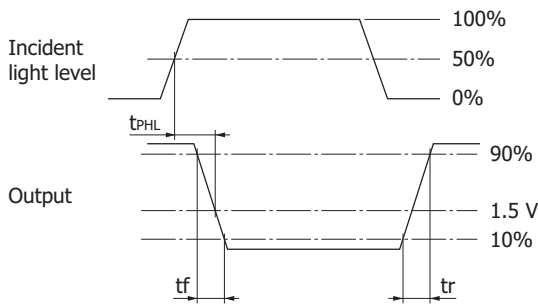
*2: Vcc=+0.5 V or less

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.

Electrical and optical characteristics (Ta=25 °C, λ=780 nm, Vcc=5 V, Ro=5.1 kΩ, unless otherwise noted)

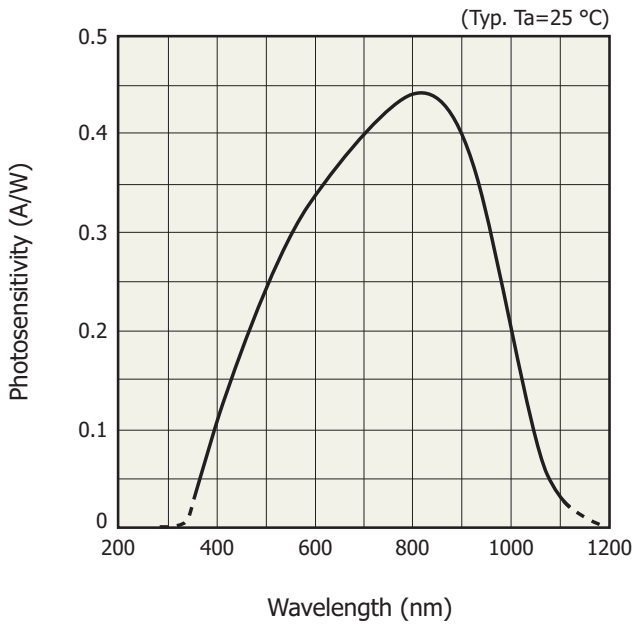
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Current consumption	I _{cc}	No input	-	0.9	1.5	mA
High level output voltage	V _{OH}	I _{OH} =4 mA	4.6	-	-	V
Low level output voltage	V _{OL}	I _{OL} =4 mA P _I =225 μW	-	-	0.3	V
Threshold input power	P _{TH}		60	75	90	μW
H→L propagation delay time	t _{PHL}	P _I =225 μW Duty ratio 1:1 C _L =15 pF*3	-	75	150	ns
L→H propagation delay time	t _{PLH}		-	150	200	
Rise time	t _r		-	4	7	
Fall time	t _f		-	4	7	
Maximum input power	PI max		-	-	P _{TH} × 8	μW

*3: Measured with a pulse-driven laser diode. Rise time and fall time of input light-pulse are 1 ns or less.



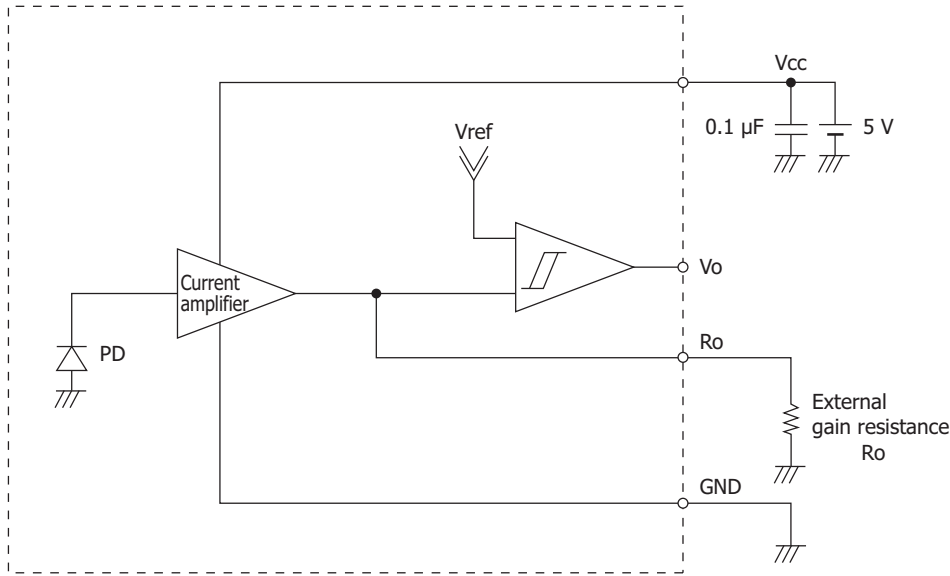
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Spectral response



KPICB0166EA

Block diagram



KPIC00113EA

Function

The S9703-11 photo IC integrates a photodiode chip and an IC chip into the same package. The photodiode chip is internally connected to the IC chip as shown in the block diagram. The S9703-11 should be used with terminal Ro connected to an external gain resistance Ro. A photocurrent is generated when a laser beam enters the photodiode. This photocurrent is fed to the input terminal of the IC and, after being amplified by the current amplifier, flows to the external gain resistance. At this time, voltages VRO at terminal Ro is given by the following expression.

$$V_{RO} = A \times S \times P_I \times R_o \text{ [V]} \dots\dots (1)$$

A: Current amplifier gain (6 times)

S: Photodiode sensitivity [A/W] (approx. 0.44 A/W at 780 nm)

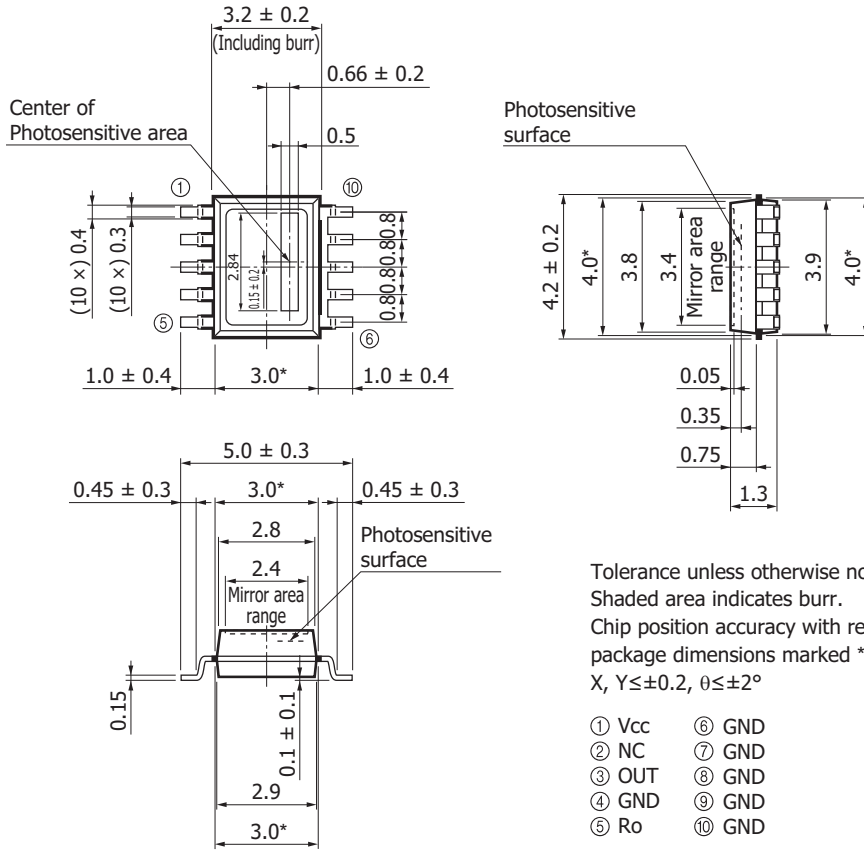
PI: Input power [W]

Ro: External gain resistance [Ω]; usable range 2 k Ω to 10 k Ω

VRO is input to the internal comparator and compared with the internal reference voltage Vref (approx. 1 V) so the output Vo is "High" when VRO < Vref or "Low" when VRO > Vref.

In equation (1), set the Ro value so that VRO will be 2 to 3 V.

Dimensional outline (unit: mm)

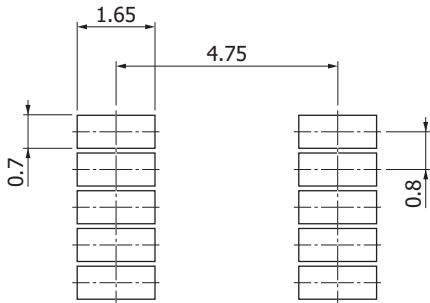


Tolerance unless otherwise noted: ± 0.1 , $\pm 2^\circ$
 Shaded area indicates burr.
 Chip position accuracy with respect to the package dimensions marked *
 $X, Y \leq \pm 0.2$, $\theta \leq \pm 2^\circ$

- ① Vcc ⑥ GND
- ② NC ⑦ GND
- ③ OUT ⑧ GND
- ④ GND ⑨ GND
- ⑤ Ro ⑩ GND

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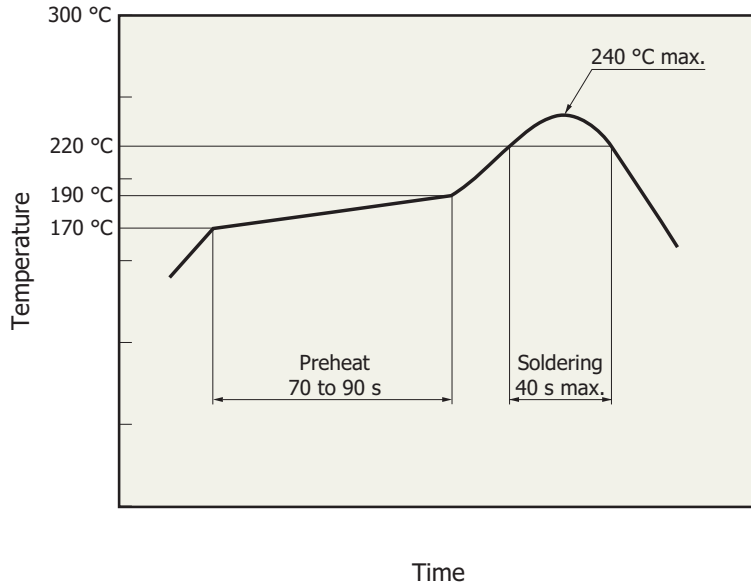
Recommended land pattern (unit: mm)



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Recommended reflow soldering conditions

The S9703-11 supports lead-free soldering. After unpacking, store them in an environment at a temperature of 30 °C or less and a humidity of 60% or less, and perform soldering within 24 hours.



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Related information

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

Precautions

- Notice
- Surface mount type products / Precautions

Information described in this material is current as of February 2020.

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