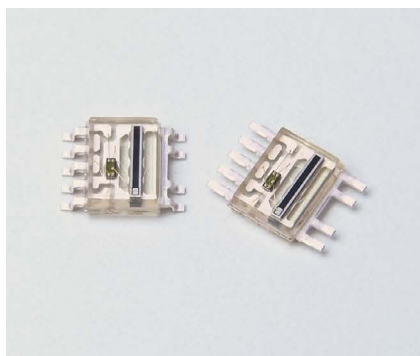


Photo IC for laser beam synchronous detection



S11257-01DT

NEW
S13114 series

Low voltage operation (3.3 V)

The S10317 series and S11257-01DT photo IC use a high-speed PIN photodiode designed for laser beam synchronous detection. They operate at a low voltage (3.3 V) compatible with low-voltage peripheral components mounted on the same PC board. Two types of current amplifiers are available with a gain of 6 times (S11257-01DT) and 20 times (S13114 series) that can be selected according to laser power to be used. HAMAMATSU also provides a 5 V operation type (S9703-11) and dual-element Si PIN photodiode types (S9684 series, S11282-01DS).

Features

- **Low voltage operation (3.3 V)**
- **High sensitivity**
Current amplifier gain: **6 times (S11257-01DT)**
20 times (S13114 series)
- **Digital output**
- **Small package**
- **Suitable for lead-free solder reflow**
- **Photosensitive area: 2.84 mm × 0.25 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
			5	
Operating temperature	Topr		-25 to +80	°C
Storage temperature	Tstg		-40 to +85	°C
Reflow soldering conditions*3	Tsol		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

*3: JEDEC level 5a

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.

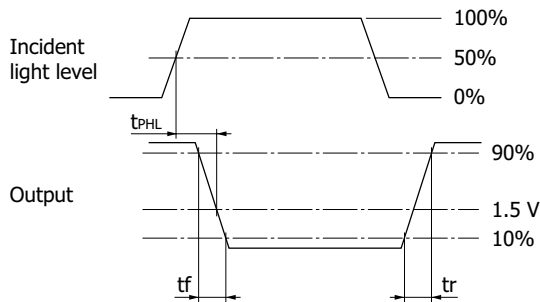
Electrical and optical characteristics

(Ta=25 °C, λ=780 nm, Vcc=3.3 V, Ro=5.1 kΩ, light incident angle=normal line direction ±0°, unless otherwise noted)

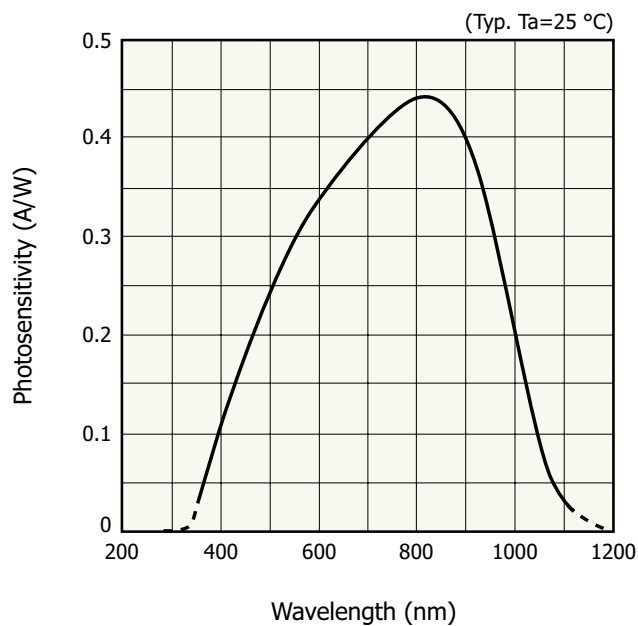
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Recommended operation voltage	S11257-01DT S13114 series	-	3.135	3.3	3.45	V
Current consumption	S11257-01DT S13114 series	Icc No input	-	0.7	1.5	mA
High level output voltage	VOH	IOH=4 mA	2.9	-	-	V
Low level output voltage	VOL	IOL=4 mA*4	-	-	0.3	V
Threshold input power	S11257-01DT S13114 series	PTH	49.5	62	74.5	μW
H→L propagation delay time	S11257-01DT S13114 series	tPHL PI=186 μW (S11257-01DT)	-	100	200	ns
L→H propagation delay time	S11257-01DT S13114 series	tPLH PI=57 μW (S13114 series)	-	130	250	ns
Rise time	tr	Duty ratio 1:1	-	150	250	ns
Fall time	tf	CL=15 pF*5	-	200	300	ns
Maximum input power	PI max.		-	4	7	ns
			-	-	PTH × 8	μW

*4: Input power PI=186 μW (S11257-01DT), 57 μW (S13114 series)

*5: Measured with a pulse-driven laser diode. Input light-pulse rise time and fall times are 1 ns or less.

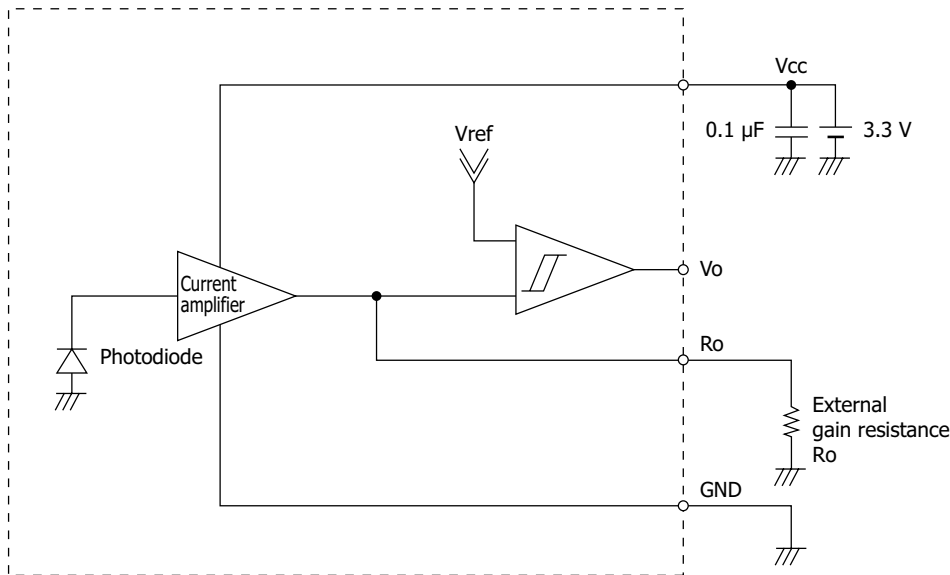


KPIC0112EA

Spectral response

KPICB0166EA

Block diagram



KPIC0127EA

Function

These products integrate 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 products 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.

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

A: Current amplifier gain (S11257-01DT: 6 times, S13114 series: 20 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 S11257-01DT: 2 k Ω to 10 k Ω , S13114 series: 1 k Ω to 8.5 k Ω

VRO is input to the internal comparator and compared with the internal reference voltage Vref (approx. 0.8 V) so the output Vo is "High" when $V_{RO} < V_{ref}$ or "Low" when $V_{RO} > V_{ref}$.

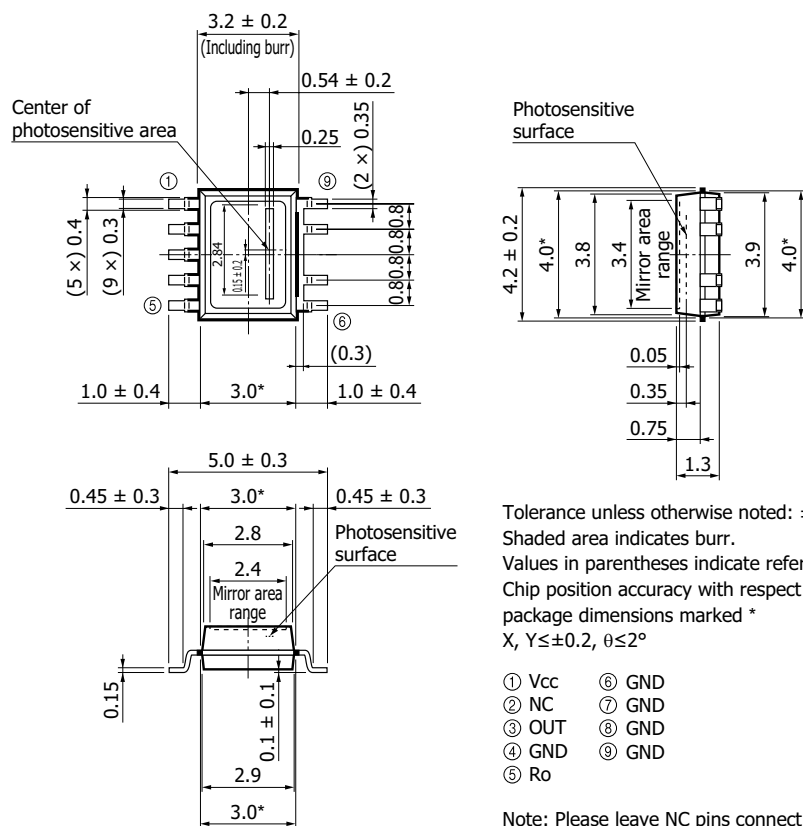
We recommend that VRO be set higher than 1.5 V but lower than 8 times of VRO calculated from equation (1) where PI is the threshold input power.

Also set the Ro resistance so that the Ro terminal current does not exceed the absolute maximum rating of S11257-01DT: 3 mA, S13114 series: 5 mA.

(Monitoring VRO shows that it is limited to about S11257-01DT: 2 V (with respect to GND), S13114 series: 3 V (with respect to GND) by the voltage limiting circuit. Keep this in mind when monitoring.)

Dimensional outlines (unit: mm)

S11257-01DT, S13114-01DT



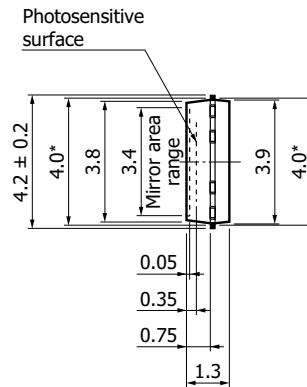
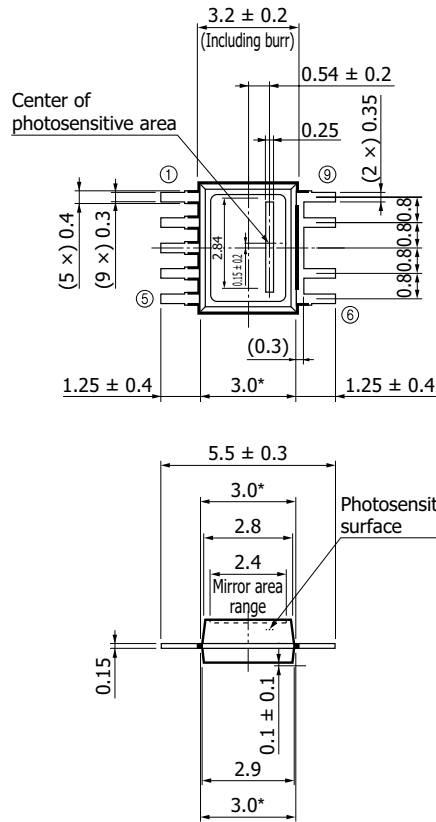
Tolerance unless otherwise noted: ± 0.1 , $\pm 2^\circ$
 Shaded area indicates burr.
 Values in parentheses indicate reference value.
 Chip position accuracy with respect to
 package dimensions marked *
 X, Y ± 0.2 , $\theta \leq 2^\circ$

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

Note: Please leave NC pins connect to open or GND.

KPICA0089ED

S13114-02DT



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

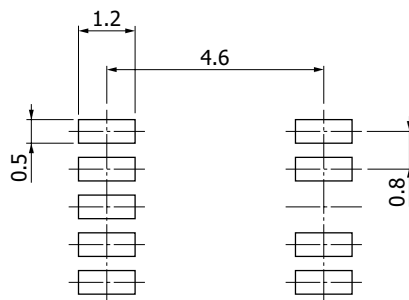
- | | |
|-------|-------|
| ① Vcc | ⑥ GND |
| ② NC | ⑦ GND |
| ③ OUT | ⑧ GND |
| ④ GND | ⑨ GND |
| ⑤ Ro | |

Note: Please leave NC pins connect to open or GND.

KPICA0122EA

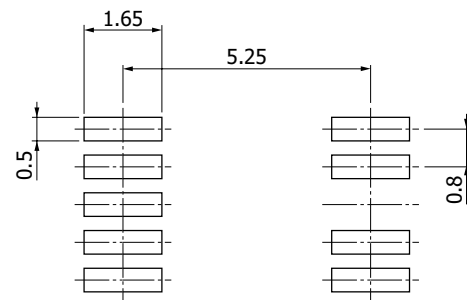
Recommended land patterns (unit: mm)

S11257-01DT, S13114-01DT



KPICC0402EA

S13114-02DT



KPICC0403EA

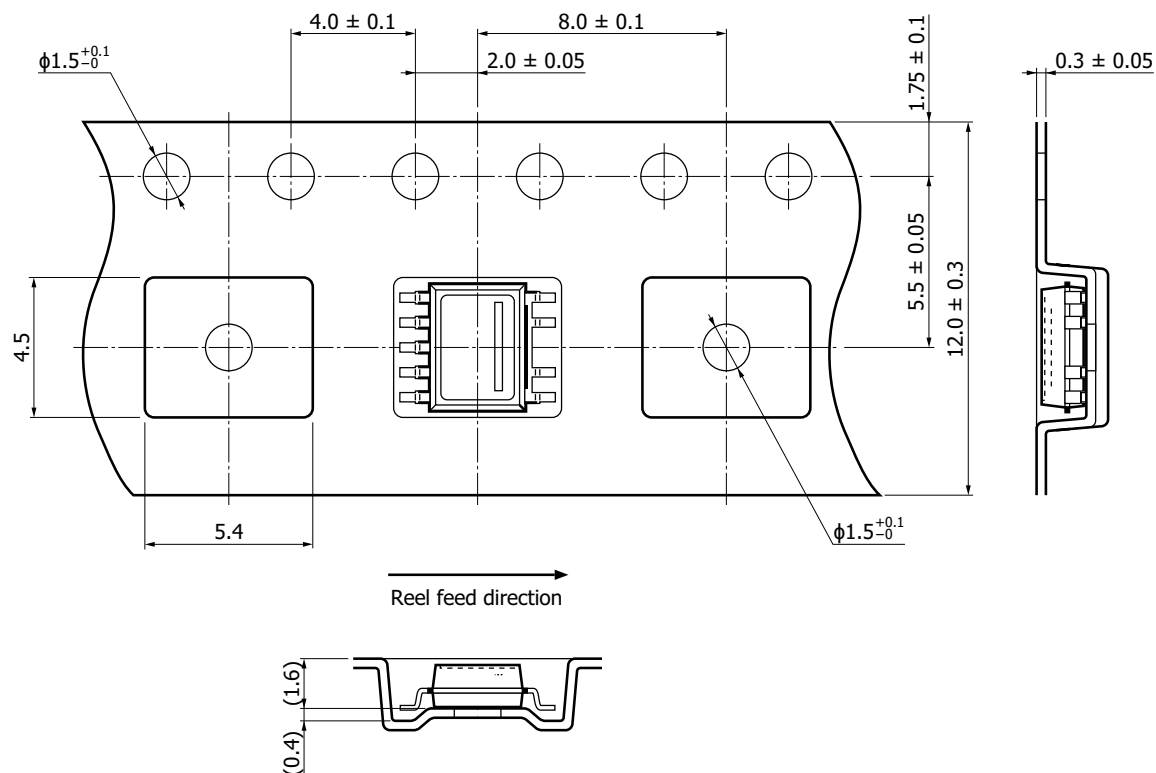
Standard packing specifications

S11257-01DT, S13114-01DT

- Reel (conformas to JETTA ET-7200)

Dimensions	Hub diameter	Tape width	Material	Electrostatic characteristics
254 mm	80 mm	12 mm	PS	Antarctic treatment

- Embossed tape (unit: mm, material: PS, conductive)



KPICC0404EA

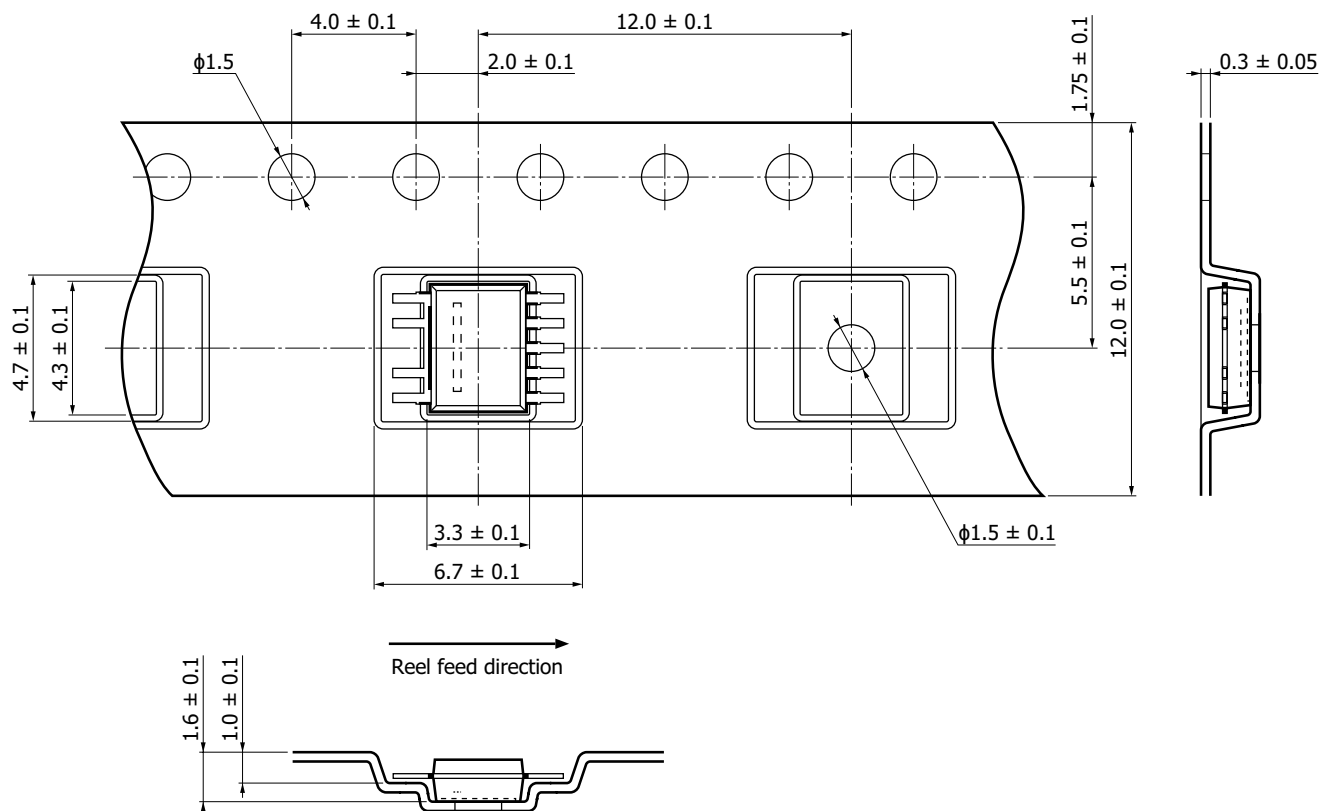
- Packing quantity
2000 pics/reel
- Packing type
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

S13114-02DT

■ Reel (conforms to JETTA ET-7200)

Dimensions	Hub diameter	Tape width	Material	Electrostatic characteristics
254 mm	80 mm	12 mm	PS	Antarctic treatment

■ Embossed tape (unit: mm, material: PS, conductive)



KPICCD405EA

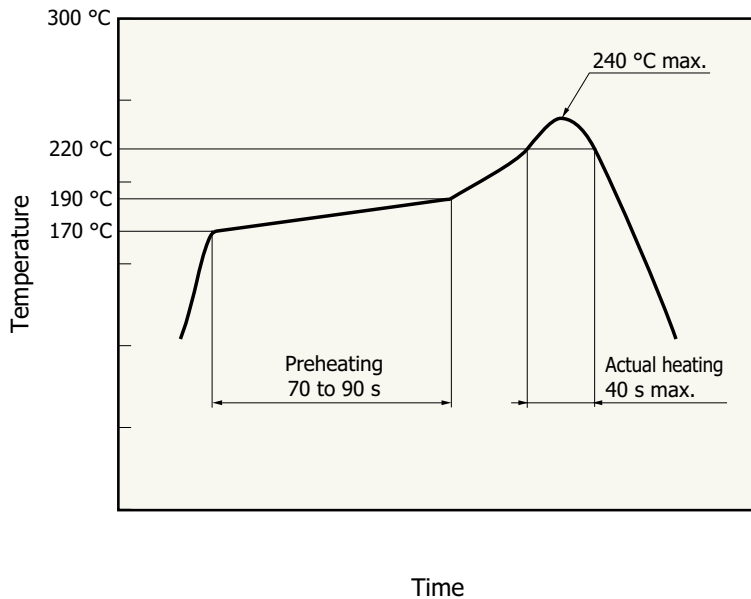
■ Packing quantity

1500 pics/reel

■ Packing type

Reel and desiccant in moisture-proof packaging (vacuum-sealed)
 Stored with the photosensitive area facing downwards

Recommended soldering conditions



KPICB0164EC

- This product supports lead-free soldering. After unpacking, store it in an environment at a temperature of 30 °C or less and a humidity of 60% or less, and perform soldering within 24 hours.
- The effect that the product receives during reflow soldering varies depending on the circuit board and reflow oven that are used. Before actual reflow soldering, check for any problems by testing out the reflow soldering methods in advance.

Related information

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

■ Precautions

- Notice
- Precautions / Surface mount type products

Information described in this material is current as of March 2025.

Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest specifications.

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