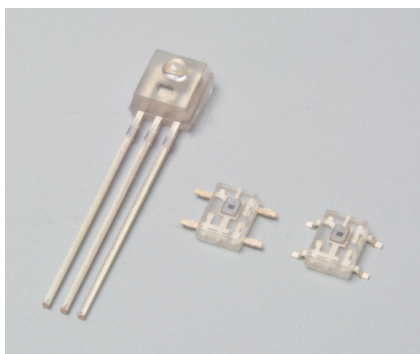


# Low-voltage operation photo IC



S7610-10

S12558-01DT

S12558-02DT

## High reliability photo IC operable at 2.2 V

The S7610-10, S12558-01DT and S12558-02DT are photo ICs comprised of a photodiode, amplifier, schmitt trigger circuit and output transistor, all integrated onto a single chip and molded with clear resin into a miniature package. An optical encoder resistant to tough environmental conditions can be configured by combining the S7610-10, S12558-01DT or S12558-02DT with infrared LED L6895-10 (made by Hamamatsu).

### Features

- Low voltage operation (2.2 V)
- Open collector output
- "L" level output at light input

### Applications

- Rotary encoders, etc.

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

| Parameter                                       | Symbol | S7610-10  | S12558-01DT            | Unit |
|---|--------|---|------------------------|------|
|   |        |   | <b>NEW</b> S12558-02DT |      |
| Supply voltage                                  | Vcc    | -0.5 to +7  |                        | V    |
| Output voltage                                  | Vo     | -0.5 to +7  |                        | V    |
| Low level output current                        | Io     | 8   |                        | mA   |
| Power dissipation*1                             | P      | 250   |                        | mW   |
| Operating temperature                           | Topr   | -30 to +85  | -25 to +80             | °C   |
| Storage temperature                             | Tstg   | -40 to +90  | -30 to +85             | °C   |
| Reflow soldering conditions*2<br>(JEDEC MSL 5a) | Tsol   | Peak temperature 240 °C max., 1 time (see page 8) |                        | -    |

\*1: Power dissipation decreases at a rate of 3.3 mW/°C above Ta=25 °C .

\*2: S12558-01DT/-02DT

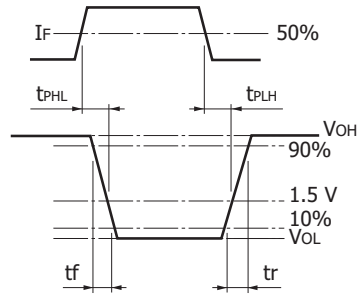
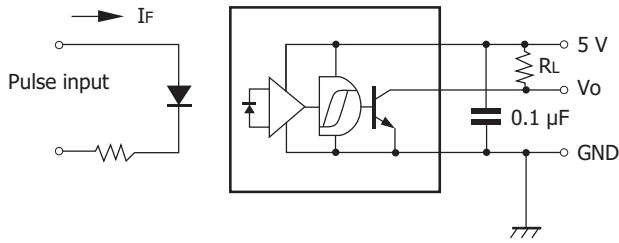
Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

### Electrical and optical characteristics (Ta=25 °C, Vcc=5 V, unless otherwise noted, light source: λp=890 nm LED)

| Parameter                   | Symbol | Condition                          | Min. | Typ. | Max. | Unit               |
|-----------------------------|--------|------------------------------------|------|------|------|--------------------|
| Supply voltage              | Vcc    |                                    | 2.2  | -    | 7.0  | V                  |
| Low level output voltage    | VOL    | IoL=4 mA, E=0.4 μW/mm <sup>2</sup> | -    | 0.05 | 0.4  | V                  |
| High level output current   | IOH    | E=0 μW/mm <sup>2</sup> , Vo=5 V    | -    | -    | 10   | μA                 |
| Current consumption         | Icc    |                                    | -    | 1.3  | 3    | mA                 |
| H→L threshold illuminance   | EHL    | RL=1.2 kΩ                          | -    | 0.10 | 0.25 | μW/mm <sup>2</sup> |
| S7610-10                    |        |                                    | -    | 1.0  | 2.0  |                    |
| S12558-01DT/-02DT           |        |                                    |      |      |      |                    |
| Hysteresis                  | Hys    | ELH/EHL                            | 0.75 | 0.85 | 0.95 | -                  |
| L→H propagation delay time  | tPLH   | *3                                 | -    | 4    | 15   | μs                 |
| H→L propagation delay time  | tPHL   |                                    | -    | 1.5  | 10   | μs                 |
| Peak sensitivity wavelength | λp     |                                    | -    | 850  | -    | nm                 |
| Rise time                   | tr     | *3                                 | -    | 0.07 | 1    | μs                 |
| Fall time                   | tf     |                                    | -    | 0.03 | 1    | μs                 |

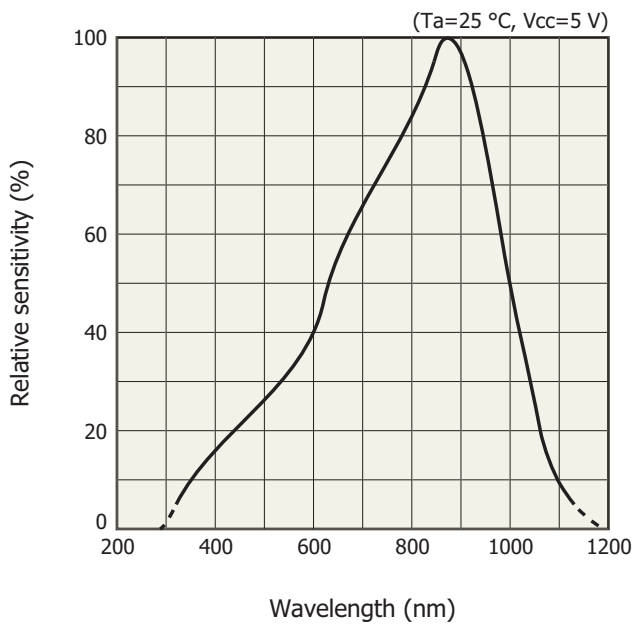
\*3: E0=0 μW/mm<sup>2</sup>, E1=0.4 μW/mm<sup>2</sup>, RL=1.2 kΩ, CL=10 pF (S7610-10)  
 E0=0 μW/mm<sup>2</sup>, E1=4 μW/mm<sup>2</sup>, RL=1.2 kΩ, CL=10 pF (S12558-01DT/-02DT)  
 CL includes probe capacitance.

**Response time measurement circuit**



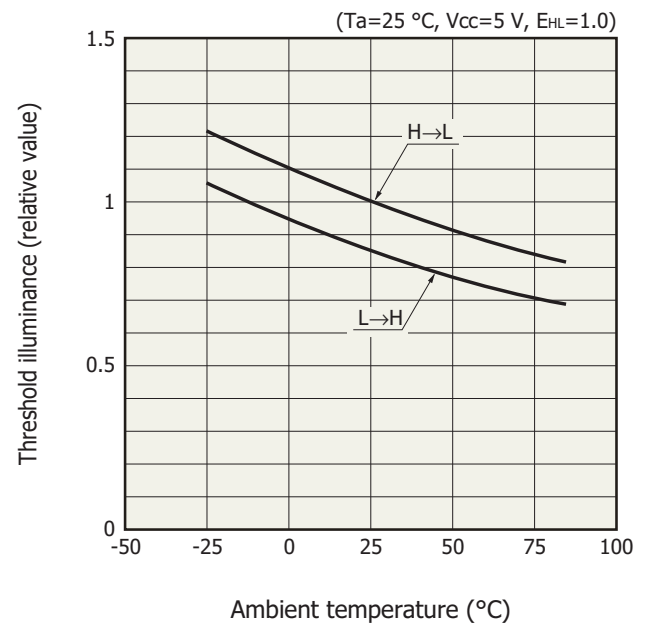
KPIC0038EB

**Spectral response (typical example)**



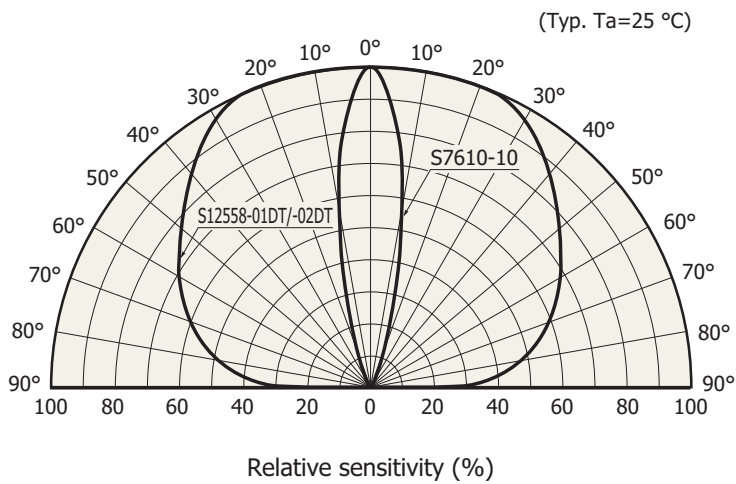
KPIC0181EB

**Threshold illuminance vs. ambient temperature (typical example)**



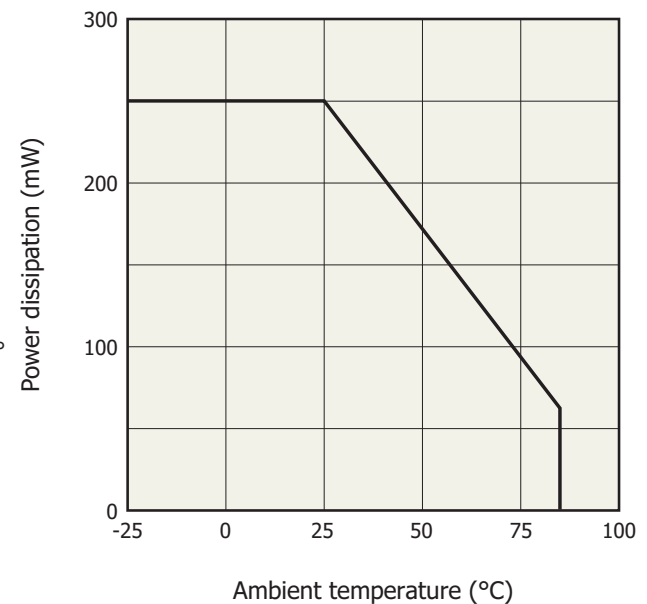
KPIC0029EB

**Directivity**



KPIC0182EC

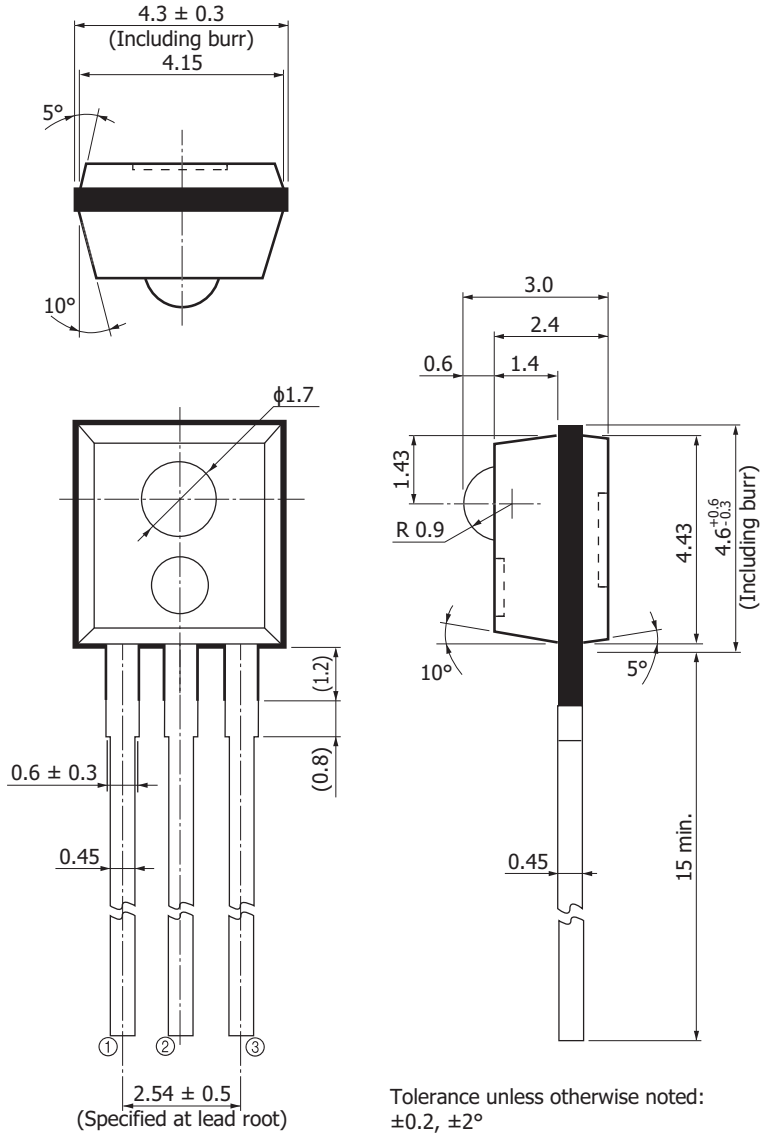
**Power dissipation vs. ambient temperature (typical example)**



KPIC0049EA

**Dimensional outlines (unit: mm)**

S7610-10



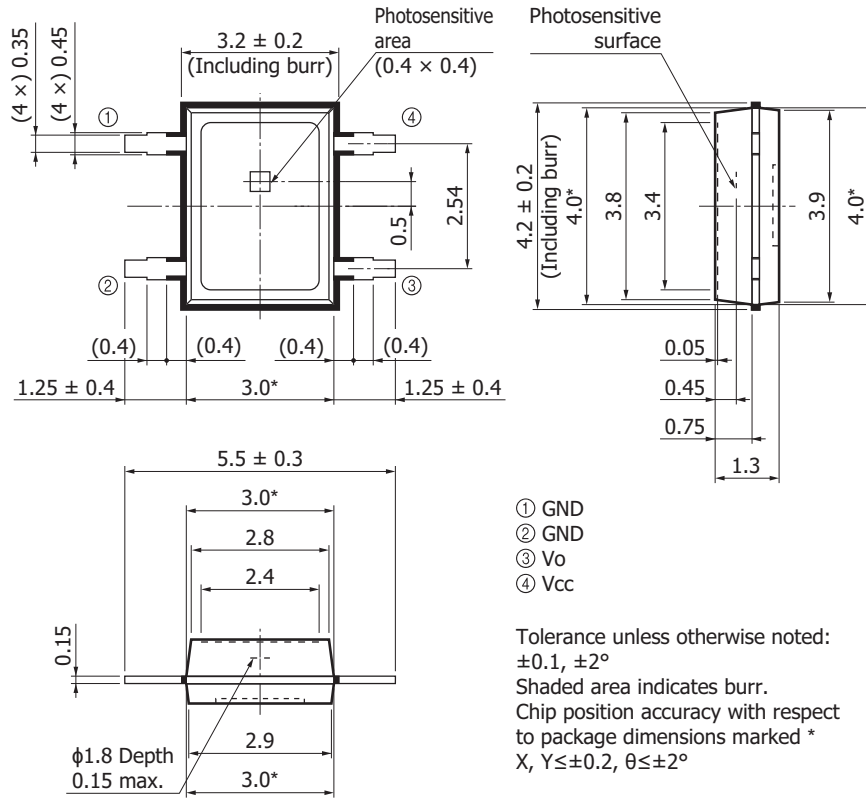
(Specified at lead root)

- ① GND
- ② Vo
- ③ Vcc

Tolerance unless otherwise noted:  
 $\pm 0.2, \pm 2^\circ$   
Shaded area indicates burr.  
Values in parentheses are reference values.

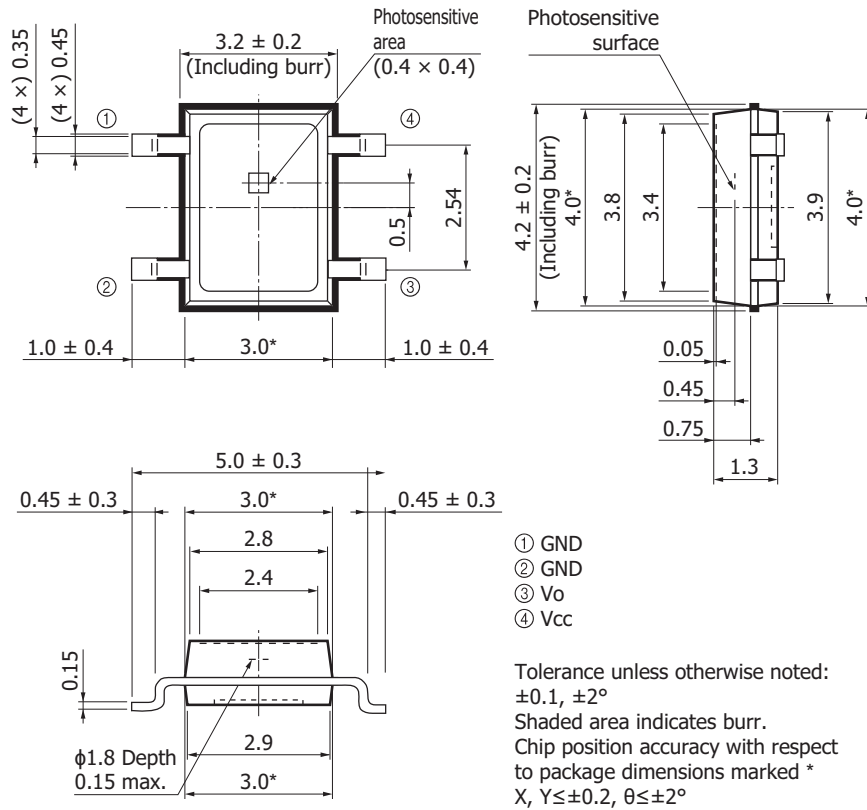
KPICA0044ED

S12558-01DT



KP1CA0093EA

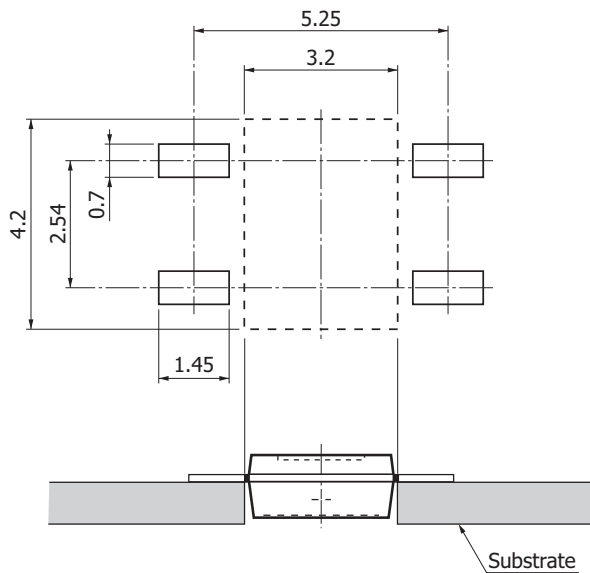
S12558-02DT



KPIC0110EA

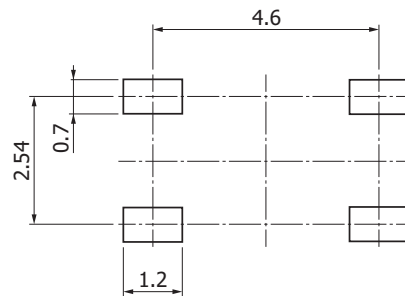
Recommended land patterns (unit: mm)

S12558-01DT



KPIC0239EB

S12558-02DT



KPIC0191EA

**Standard packing specifications**

S7610-10

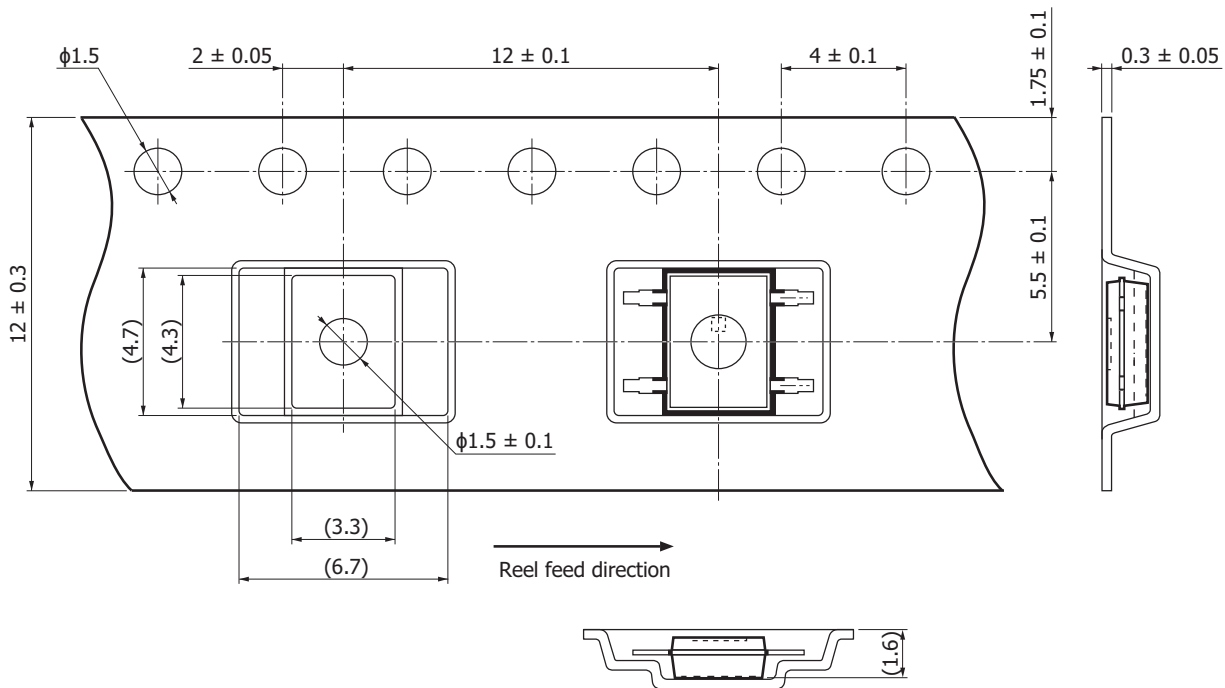
- Packing type  
Polyethylene bag (antistatic type)  
500 pcs/bag

S12558-01DT

- Reel (conforms to JEITA ET-7200)

| Dimensions | Hub diameter | Tape width | Material | Electrostatic characteristics |
|------------|--------------|------------|----------|-------------------------------|
| 254 mm     | 80 mm        | 12 mm      | PS       | Conductive                    |

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



KPIC00240EB

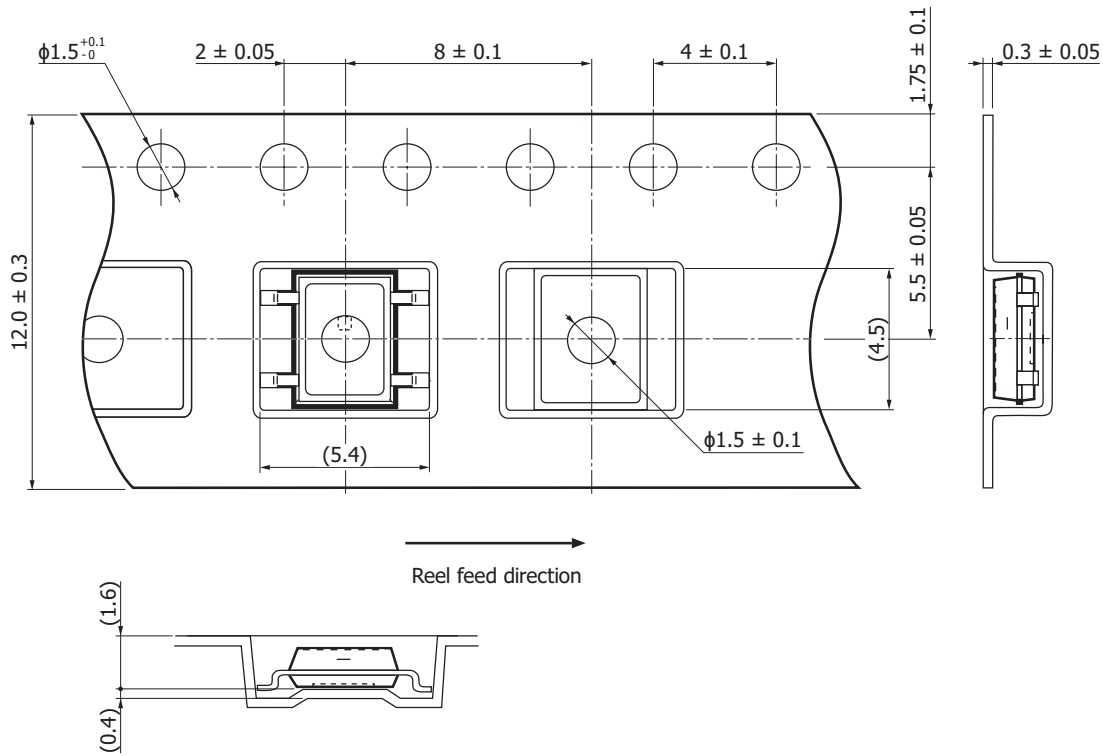
- Packing quantity  
1500 pcs/reel
- Packing type  
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

S12558-02DT

■ Reel (conforms to JEITA ET-7200)

| Dimensions | Hub diameter | Tape width | Material | Electrostatic characteristics |
|------------|--------------|------------|----------|-------------------------------|
| 254 mm     | 80 mm        | 12 mm      | PS       | Conductive                    |

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

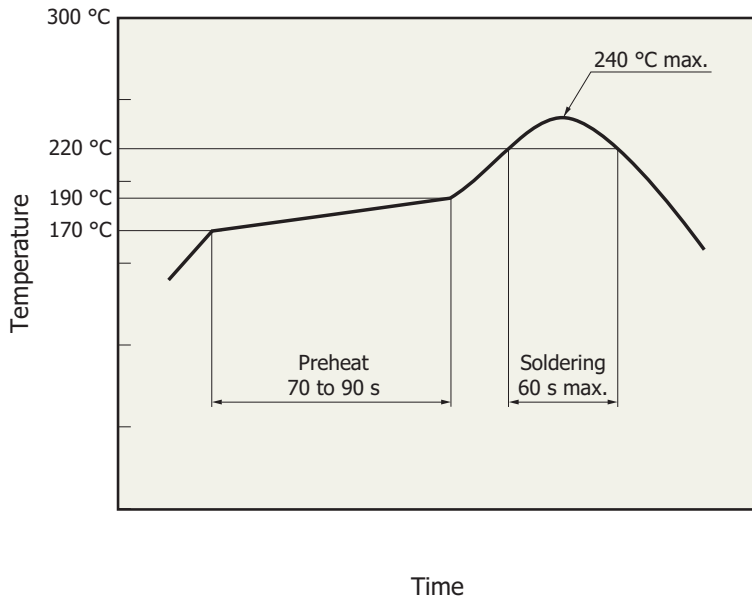


KPIC0337EA

■ Packing quantity  
2000 pcs/reel

■ Packing type  
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

**Recommended reflow soldering conditions (S12558-01DT/-02DT)**



KPIC00194EA

- The S12558-01DT/-02DT support 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. When setting the reflow soldering conditions, check for any problems by testing out the reflow soldering methods in advance.

**Related information**

[www.hamamatsu.com/sp/ssd/doc\\_en.html](http://www.hamamatsu.com/sp/ssd/doc_en.html)

**Precautions**

- Notice
- Metal, ceramic, plastic package products
- Surface mount type products

Information described in this material is current as of November 2019.

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.

The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use. Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.