

GP2S60

**SMT, Detecting Distance : 0.5mm
Phototransistor Output,
Compact Reflective
Photointerrupter**



■ Description

GP2S60 is a compact-package, phototransistor output, reflective photointerrupter, with emitter and detector facing the same direction in a molding that provides noncontact sensing. The compact package series is a result of unique technology, combining transfer and injection molding, that also blocks visible light to minimize false detection.

This photointerrupter can be ordered in different CTR ranks, and has a thin, leadless (T&R) package, suitable for reflow soldering.

■ Features

1. Reflective with Phototransistor Output
2. Highlights :
 - Compact Size
 - Surface Mount Type (SMT), reflow soldering
 - Tape and Reel (T&R) 2 000 pcs per reel
3. Key Parameters :
 - Optimal Sensing Distance : 0.5mm
 - Package : 3.2×1.7×1.1mm
 - Visible light cut resin to prevent
4. RoHS directive compliant

■ Agency approvals/Compliance

1. Compliant with RoHS directive

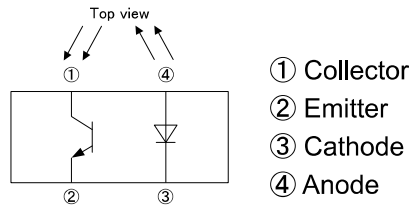
■ Applications

1. Detection of object presence or motion.
2. Any application, which production is migrating to 100% surface mount components.

Example : printer, optical storage

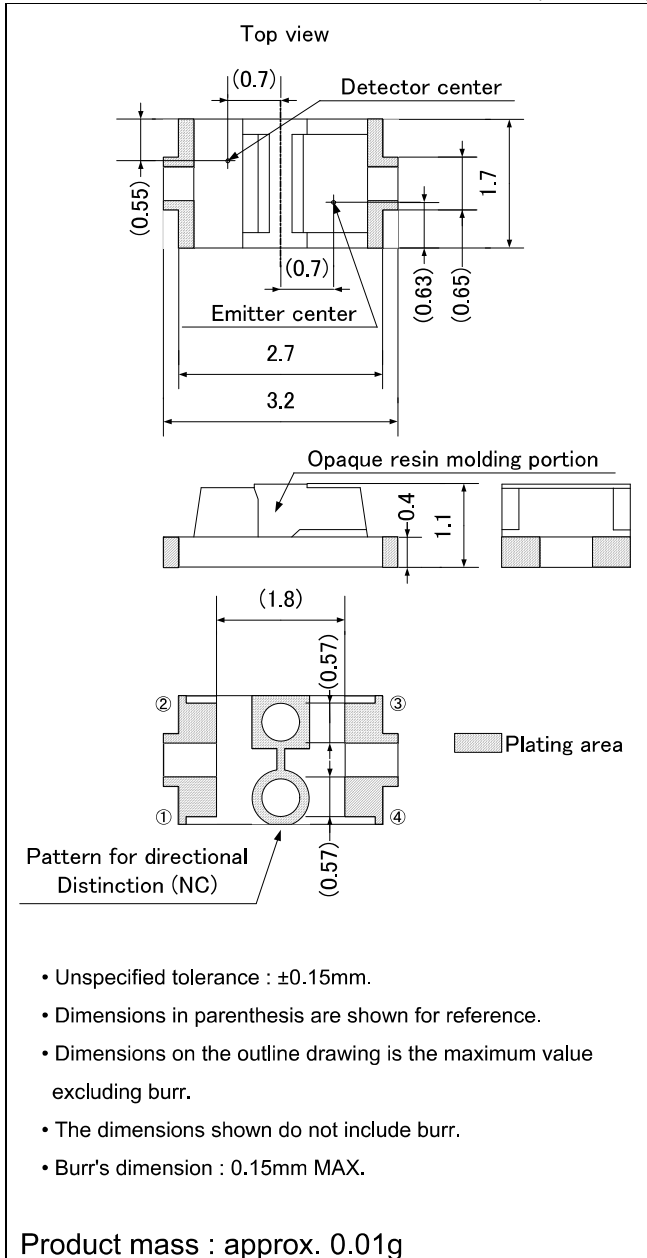
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Internal Connection Diagram



Outline Dimensions

(Unit : mm)



Plating material : Au

Absolute Maximum Ratings

($T_a=25^\circ\text{C}$)

Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	Reverse voltage	V_R	6	V
	Power dissipation	P_D	75	mW
Output	Collector-emitter voltage	V_{CEO}	35	V
	Emitter-collector voltage	V_{ECO}	6	V
	Collector current	I_C	20	mA
	Collector power dissipation	P_C	75	mW
Total power dissipation		P_{tot}	100	mW
Operating temperature		T_{opr}	-25 to +85	$^\circ\text{C}$
Storage temperature		T_{stg}	-40 to +100	$^\circ\text{C}$
*1 Soldering temperature		T_{sol}	260	$^\circ\text{C}$

*1 For 5s or less

Electro-optical Characteristics

($T_a=25^\circ\text{C}$)

Parameter			Symbol	Condition	MIN.	TYP.	MAX.	Unit
Input	Forward voltage		V_F	$I_F=20\text{mA}$	—	1.2	1.4	V
	Reverse current		I_R	$V_R=6\text{V}$	—	—	10	μA
Output	Collector dark current		I_{CEO}	$V_{CE}=20\text{V}$	—	1	100	nA
Transfer characteristics	*2 Collector Current		I_C	$I_F=4\text{mA}, V_{CE}=2\text{V}$	40	85	130	μA
	*3 Leak current		I_{LEAK}	$I_F=4\text{mA}, V_{CE}=2\text{V}$	—	—	500	nA
	Response time	Rise time	t_r	$V_{CE}=2\text{V}, I_C=100\mu\text{A},$ $R_L=1\text{k}\Omega, d=1\text{mm}$	—	20	100	μs
		Fall time	t_f		—	20	100	

*2 The condition and arrangement of the reflective object are shown below.

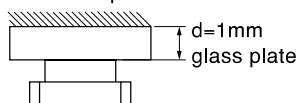
The rank splitting of collector current (I_C) shall be executed according to the table below.

Rank	Collector current, I_C [μA] ($I_F=4\text{mA}, V_{CE}=2\text{V}$)
A	40 to 80
B	65 to 130

*3 Without reflective object.

Test Condition and Arrangement for Collector Current

Aluminum evaporation



■ Model Line-up

Model No.	Rank	I _c (μA)	Conditions
GP2S60	A or B	40 to 130	I _F =4mA V _{CE} =2V T _a =25°C
GP2S60A	A	40 to 80	
GP2S60B	B	65 to 130	

Please contact a local SHARP sales representative to see the actual status of the production.

Fig.1 Forward Current vs. Ambient Temperature

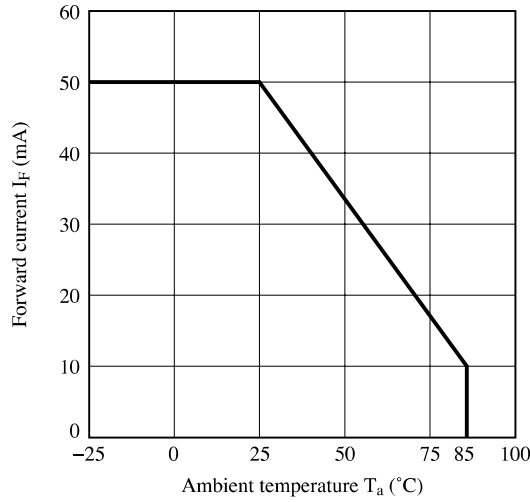


Fig.2 Power Dissipation vs. Ambient Temperature

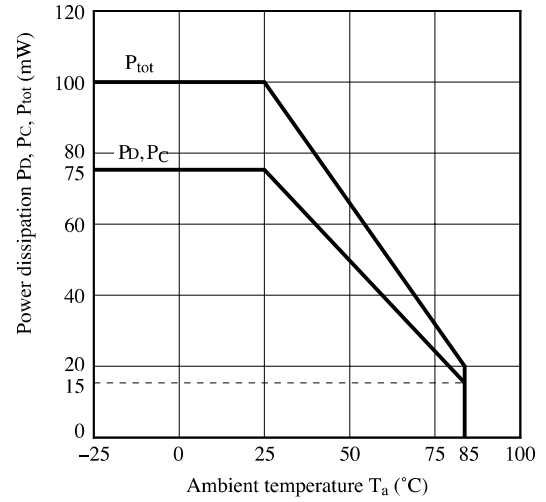


Fig.3 Forward Current vs. Forward Voltage

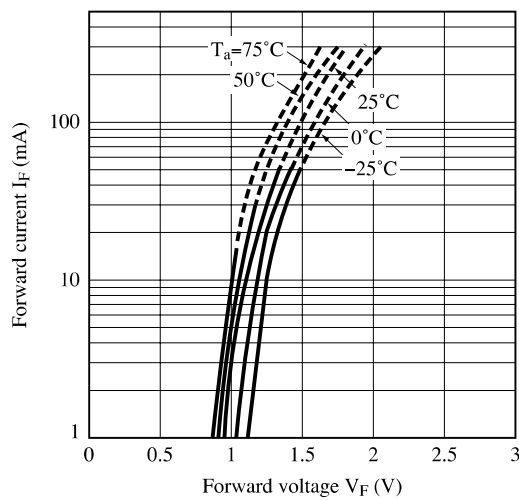


Fig.4 Collector Current vs. Forward Current

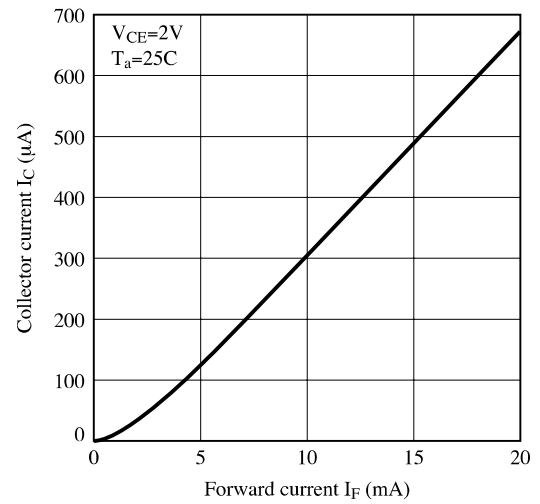


Fig.5 Collector Current vs. Collector-Emitter Voltage

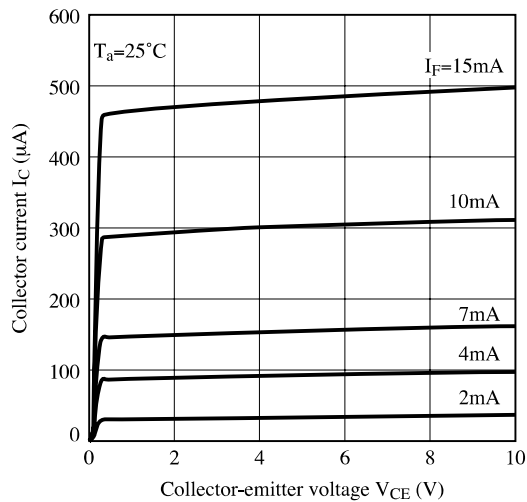


Fig.6 Relative Collector Current vs. Ambient Temperature

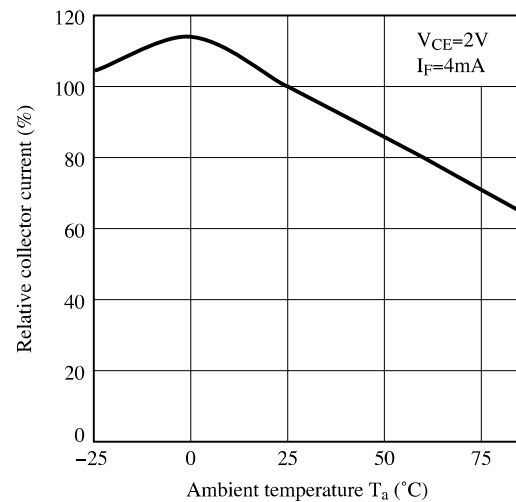


Fig.7 Collector Dark Current vs. Ambient Temperature

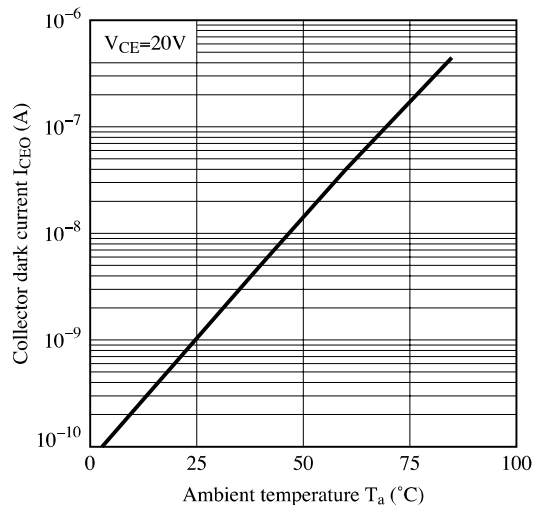


Fig.8 Response Time vs. Load Resistance

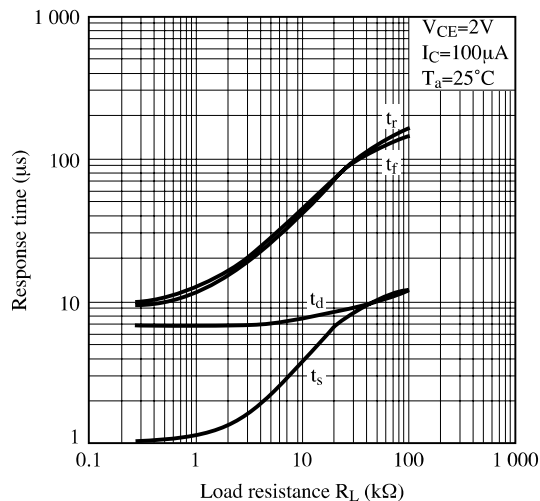


Fig.9 Test Circuit for Response Time

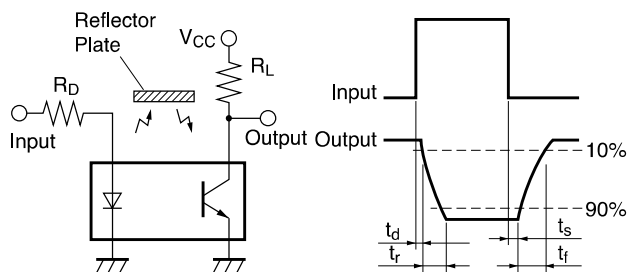


Fig.10 Relative Collector Current vs. Distance

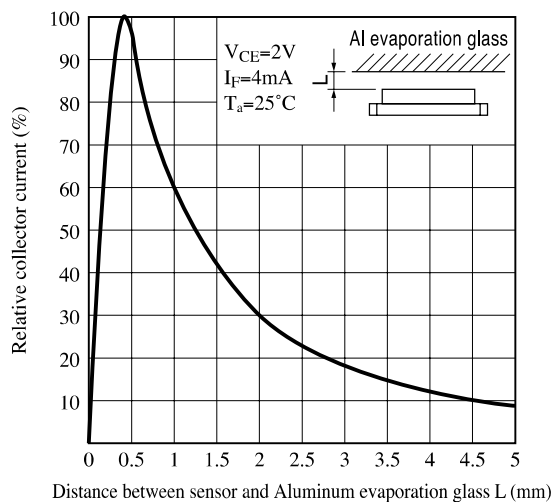


Fig.11 Spectral Sensitivity

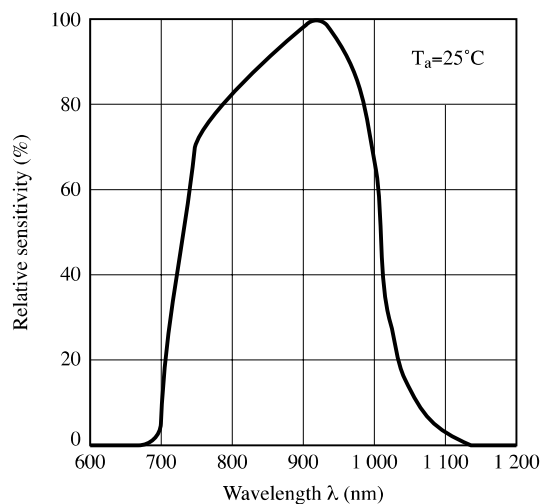


Fig.12 Detecting Position Characteristics (1)

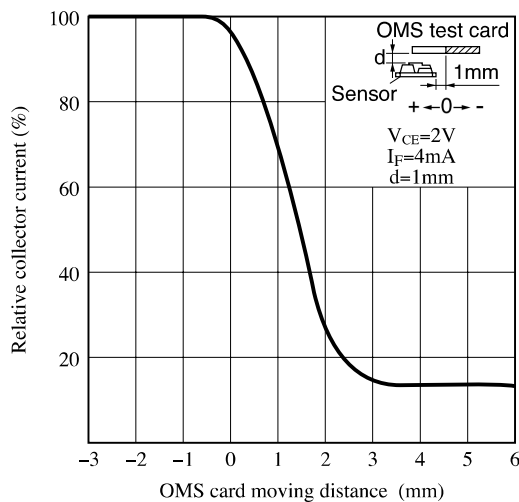
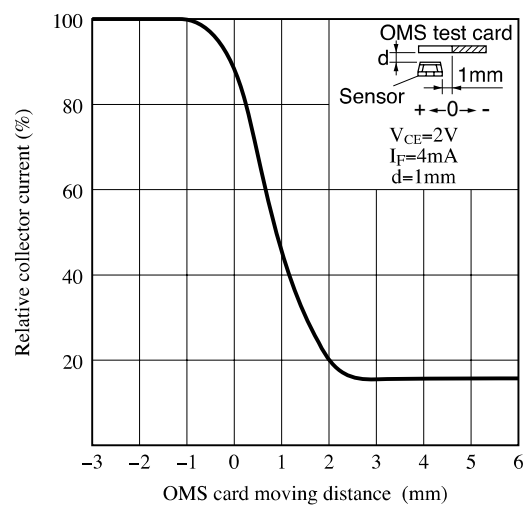


Fig.13 Detecting Position Characteristics (2)



Remarks : Please be aware that all data in the graph are just for reference and not for guarantee.

■ Design Considerations

● Design guide

1) Regarding to prevention of malfunction

To prevent photointerrupter from faulty operation caused by external light, do not set the detecting face to the external light.

2) Distance characteristic

The distance between the photointerrupter and the object to be detected shall be determined the distance by referencing Fig.10 "Relative collector current vs. distance".

3) For wiring on a mounting PCB

To avoid possibility for short, please do not apply pattern wiring on the back side of the device.

4) Regarding to mounting this product

There is a possibility that the opaque molded resin portion may have a crack by force at mounting etc.
Please use this product after well confirmation of conditions in your production line.

This product is not designed against irradiation and incorporates non-coherent IRED.

● Degradation

In the case of long term operation, please take the general IRED degradation (50% degradation over 5 years) into the design consideration.

● Parts

This product is assembled using the below parts.

• Light detector (qty. : 1)

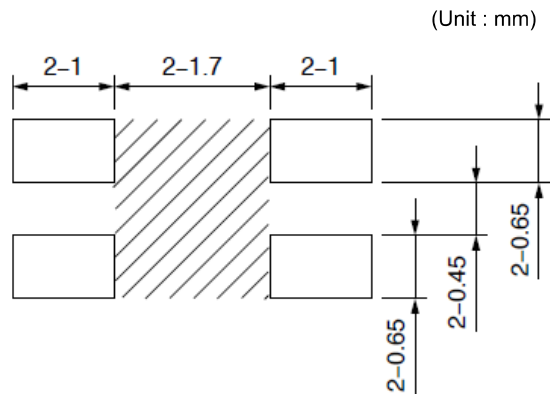
Category	Material	Maximum Sensitivity wavelength (nm)	Sensitivity wavelength (nm)	Response time (μs)
Phototransister	Silicon (Si)	930	700 to 1 200	20

• Light emitter (qty. : 1)

Category	Material	Maximum light emitting wavelength (nm)	I/O Frequency (MHz)
Infrared emitting diode (non-coherent)	Gallium arsenide (GaAs)	950	0.3

• Material

Case	PCB	Lead frame plating
Epoxy resin Black polyphenylene sulfide	Glass epoxy resin	Au plating

● Recommended pattern

measure tolerance : ± 0.1



area : Please do not apply the pattern wiring to avoid the possibility of short circuit.

Regarding amount of solder, if there is solder leakage in terminal wiring pattern between PCB and housing main body, the reliability will be deteriorated.

Please check the proper amount of solder in advance not to have solder leakage into terminal wiring pattern between PCB and housing main body.

■ Manufacturing Guidelines**● Storage and management after open****Storage condition**

Storage temp.: 5 to 30°C, Storage humidity : 70%RH or less at regular packaging.

Treatment after opening the moisture-proof package

After opening, you should mount the products while keeping them on the condition of 5 to 25°C and 60%RH or less in humidity within 2 days.

After opening the bag once even if the prolonged storage is necessary, you should mount the products within two weeks.

And when you store the rest of products you should put into a DRY BOX. Otherwise after the rest of products and silicagel are sealed up again, you should keep them under the condition of 5 to 30°C and 70%RH or less in humidity.

Baking before mounting

When the above-mentioned storage method could not be executed, please process the baking treatment before mounting the products.

However the baking treatment is permitted within one time.

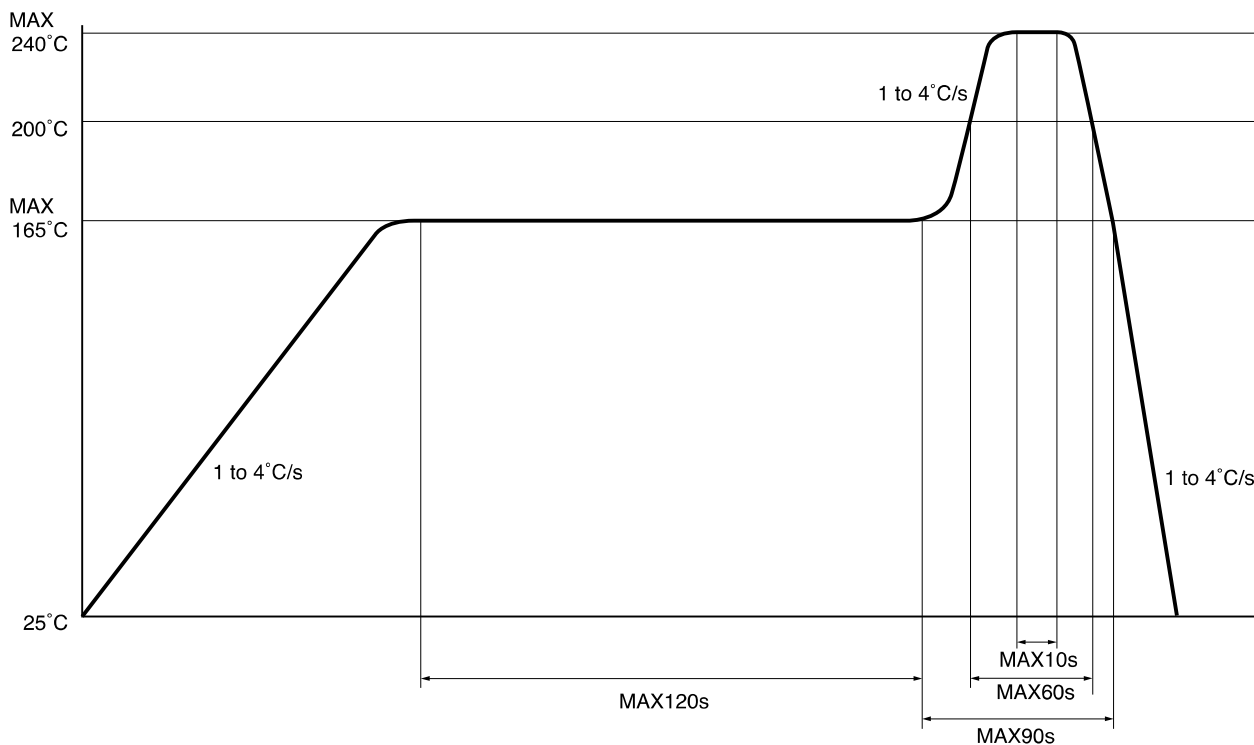
Recommended condition : 125°C, 16 to 24 hours

*Do not process the baking treatment with the product wrapped. When the baking treatment processing, you should move the products to a metallic tray or fix temporarily the products to substrate.

● Soldering Method

Reflow Soldering:

Reflow soldering should follow the temperature profile shown below.
Soldering should not exceed the curve of temperature profile and time.
Please solder within one time.



Other notice

Please take care not to let any external force exert on lead pins.
Please test the soldering method in actual condition and make sure the soldering works fine, since the impact on the junction between the device and PCB varies depending on the cooling and soldering conditions.

● Cleaning instructions

Solvent cleaning :

Solvent temperature should be 45°C or below. Immersion time should be 3 minutes or less.

Ultrasonic cleaning :

Do not execute ultrasonic cleaning.

Recommended solvent materials :

Ethyl alcohol, Methyl alcohol and Isopropyl alcohol.

● Presence of ODC

This product shall not contain the following materials.

And they are not used in the production process for this product.

Regulation substances : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform)

Specific brominated flame retardants such as the PBBs and PBBs are not used in this product at all.

This product shall not contain the following materials banned in the RoHS Directive (2002/95/EC).

- Lead, Mercury, Cadmium, Hexavalent chromium, Polybrominated biphenyls (PBB), Polybrominated diphenyl ethers (PBDE).

Content of six substances specified in Management Methods for Control of Pollution Caused by Electronic Information Products Regulation (Chinese : 电子信息产品污染控制管理办法).

Category	Toxic and hazardous substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr ⁶⁺)	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Photointerrupter	✓	✓	✓	✓	✓	✓

✓ : indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ/T 11363-2006 standard.

■ Package specification

● Tape and Reel package

Package materials

Carrier tape : PS (with anti-static material)

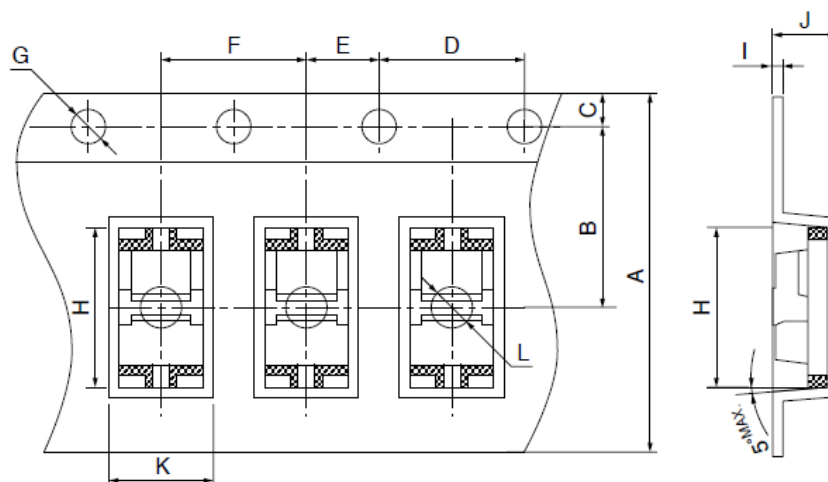
Reel : PS

Package method

2 000 pcs of products shall be packaged in a reel. One reel is endased in aluminum laminated bag.

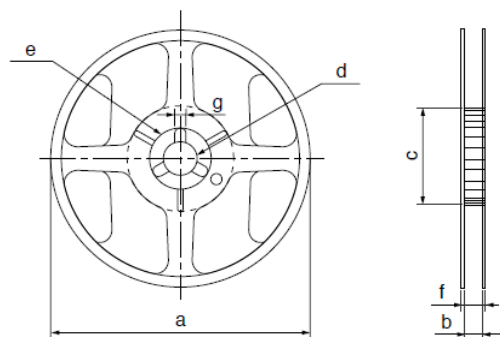
After sealing up the bag, it encased in one case (5 bags/case).

Carrier tape structure and Dimensions



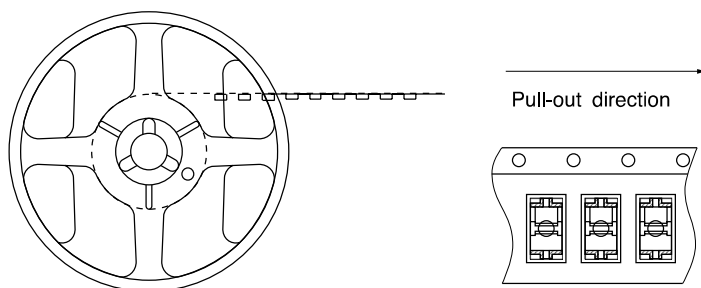
Dimensions List (Unit: mm)					
A	B	C	D	E	F
$8^{+0.3}$	$3.5^{+0.05}$	$1.75^{+0.1}$	$4^{+0.1}$	$2^{+0.1}$	$4^{+0.1}$
G	H	I	J	K	L
$\Phi 1.55^{+0.05}$	$3.6^{+0.1}$	$0.3^{+0.05}$	$1.25^{+0.1}$	$2.2^{+0.1}$	$\Phi 1.1^{+0.1}$

Reel structure and Dimensions



Dimensions List (Unit: mm)			
a	b	c	d
$180^{+2.0}$	$9^{+1.0}$	$60^{+0.5}_{-0}$	$\Phi 13^{+0.2}$
e	f	g	
$\Phi 21^{+0.8}$	$11.4^{+1.0}$	$2^{+0.3}_{-0}$	

Direction of product insertion



[Packing : 2 000pcs/reel]

Storage method

Storage conditions should follow the condition shown below.

Storage temperature : 5 to 30°C

Storage humidity : 70%RH or less

■ Important Notices

· The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property rights. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP's devices.

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(Precautions)

(1) This product is designed for use in the following application areas ;

- OA equipment · Audio visual equipment
- Home appliances

- Telecommunication equipment (Terminal)
- Measuring equipment
- Tooling machines · Computers

If the use of the product in the above application areas is for equipment listed in paragraphs (2) or (3), please be sure to observe the precautions given in those respective paragraphs.

(2) Appropriate measures, such as fail-safe design and redundant design considering the safety design of the overall system and equipment, should be taken to ensure reliability and safety when this product is used for equipment which demands high reliability and safety in function and precision, such as ;

- Transportation control and safety equipment (aircraft, train, automobile etc.)
- Traffic signals · Gas leakage sensor breakers
- Rescue and security equipment
- Other safety equipment

(3) Please do not use this product for equipment which require extremely high reliability and safety in function and precision, such as ;

- Space equipment
- Telecommunication equipment (for trunk lines)
- Nuclear power control equipment · Medical equipment
- Power generation and power transmission control system (Key system)

(4) Please contact and consult with a Sharp sales representative if there are any questions regarding interpretation of the above four paragraphs.

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