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 non-contact sensing. The compact package series is a result of unique technology, combing 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, with gullwing leads
   - Tape and Reel (T&R) 1 000 pcs per reel
3. Key Parameters :
   - Optimal Sensing Distance : 0.7mm
   - Package : 4×3×1.7mm
   - Visible light cut resin to prevent
4. Lead free and 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.
3. Example : printer, optical storage

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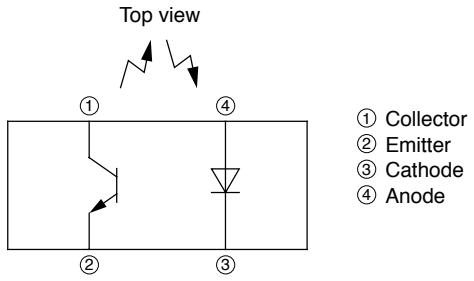
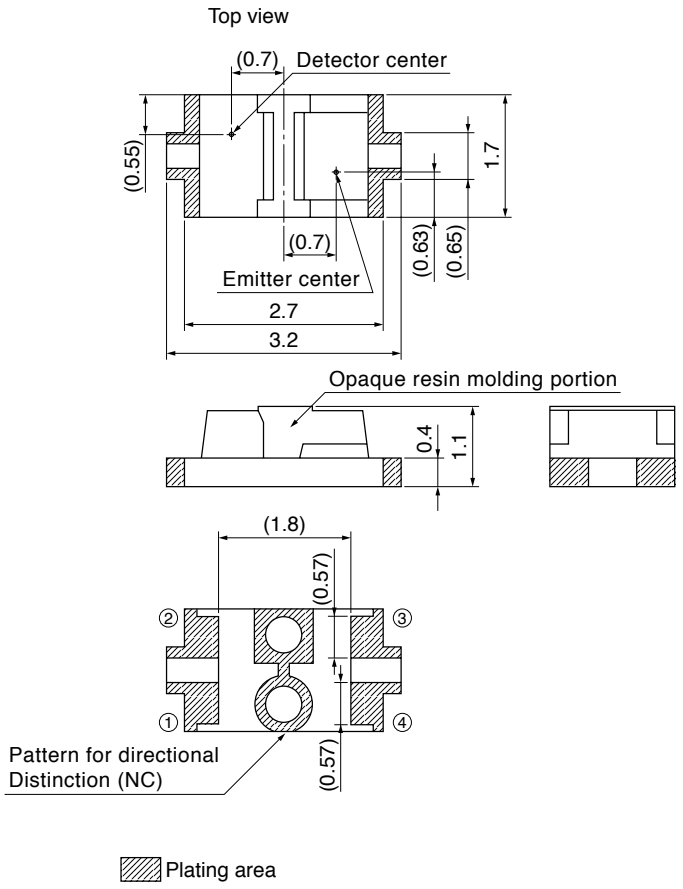
Date Oct. 3. 2005

■ Internal Connection Diagram



■ Outline Dimensions

(Unit : mm)



- Unspecified tolerance : ±0.15mm.
- Dimensions in parenthesis are shown for reference.
- Dimensions on the outline drawing is the maximum value excluding burr.
- The dimensions shown do not include burr.
  Burr's dimension : 0.15mm MAX.

Product mass : approx. 0.01g

Plating material : Au

Country of origin

Japan

■ Absolute Maximum Ratings

(T_a=25°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	°C
Storage temperature		T_{stg}	−40 to +100	°C
*1Soldering temperature		T_{sol}	260	°C

*1 For 5s or less

■ Electro-optical Characteristics

(T_a=25°C)

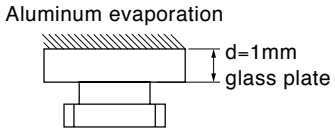
Parameter			Symbol	Condition	MIN.	TYP.	MAX.	Unit
Input	Forward voltage		V_F	I_F=20mA	–	1.2	1.4	V
	Reverse current		I_R	V_R=6V	–	–	10	μA
Output	Collector dark current		I_{CEO}	V_{CE}=20V	–	1	100	nA
Transfer characteristics	*2 Collector Current		I_C	I_F=4mA, V_{CE}=2V	40	85	130	μA
	*3 Leak current		I_{LEAK}	I_F=4mA, V_{CE}=2V	–	–	500	nA
	Response time	Rise time	t_r	V_{CE}=2V, I_C=100μA,	–	20	100	μs
		Fall time	t_f	R_L=1kΩ, d=1mm	–	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=4mA, V_{CE}=2V)
A	40 to 80
B	65 to 130

*3 Without reflective object.

● Test Condition and Arrangement for Collector Current



■ Model Line-up

Model No.	Rank	I_C(μA)	Conditions
GP2S60	A or B	40 to 130	I_F=4mA
GP2S60A	A	40 to 80	V_{CE}=2V
GP2S60B	B	65 to 130	T_a=25°C

Please contact a local SHARP sales representative to see the actial status of the produiction.

Fig.1 Forward Current vs. Ambient Temperature

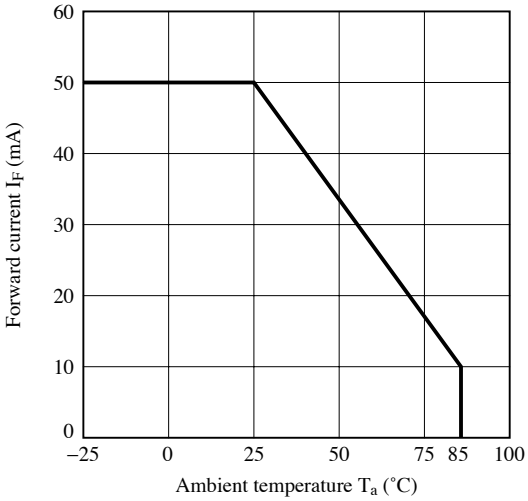


Fig.2 Collector Power Dissipation vs. Ambient Temperature

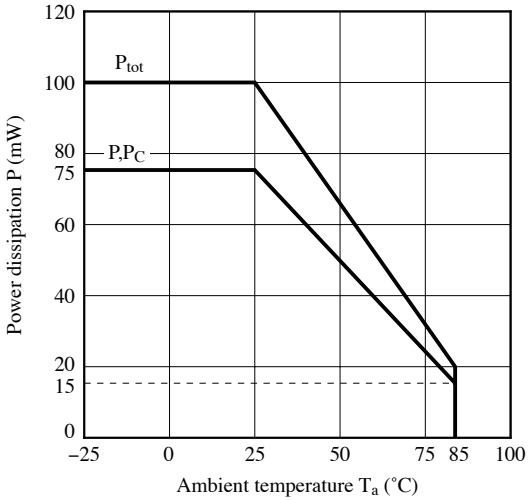


Fig.3 Forward Current vs. Forward Voltage

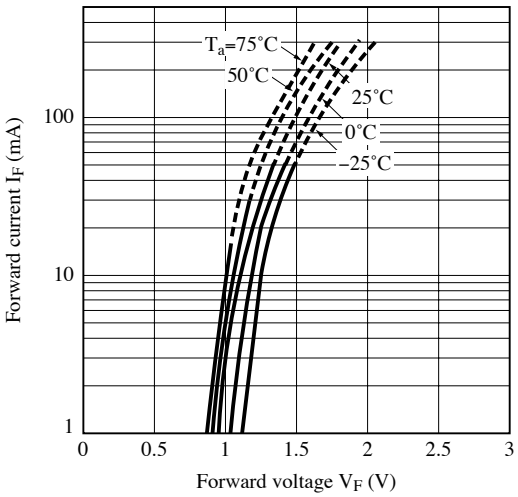


Fig.4 Collector Current vs. Forward Current

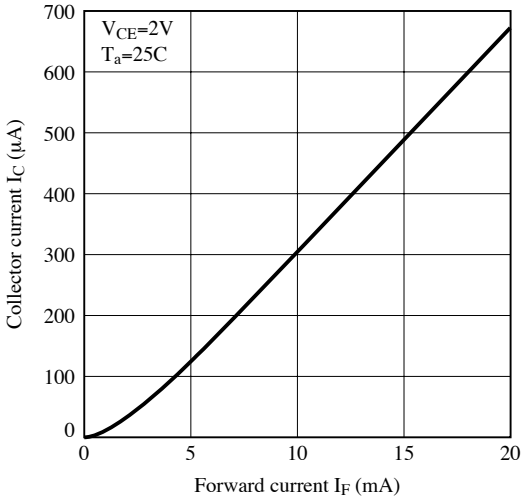


Fig.5 Collector Current vs. Collector-Emitter Voltage

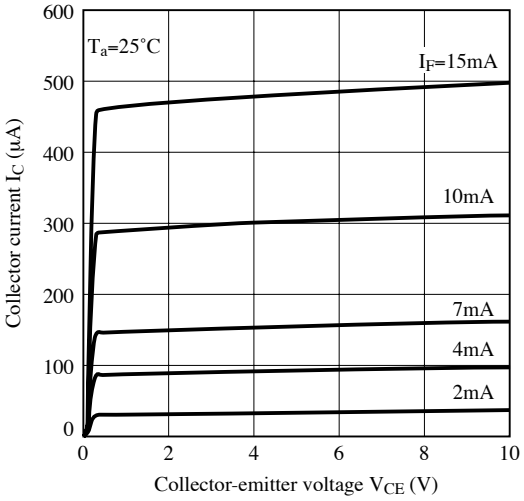


Fig.6 Relative Collector Current vs. Ambient Temperature

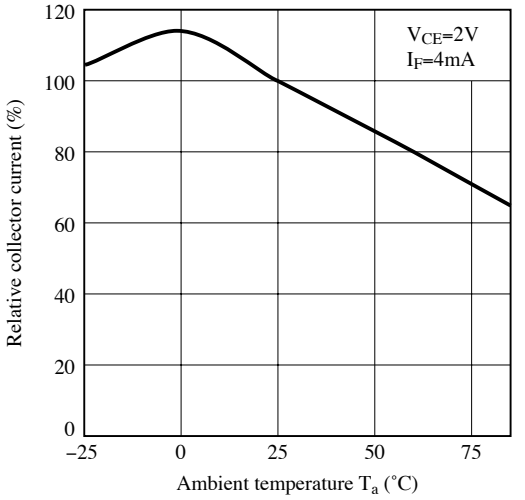


Fig.7 Collector Dark Current vs. Ambient Temperature

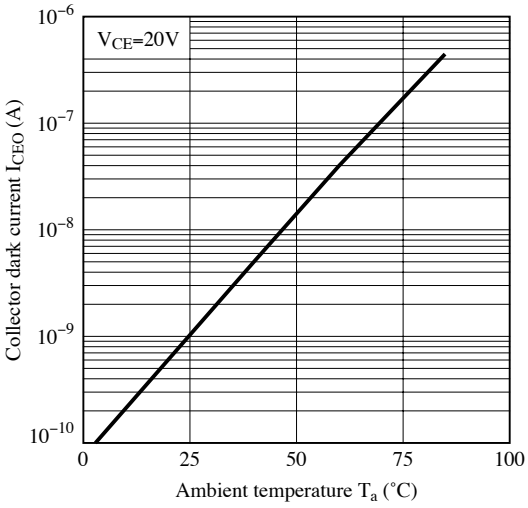


Fig.8 Response Time vs. Load Resistance

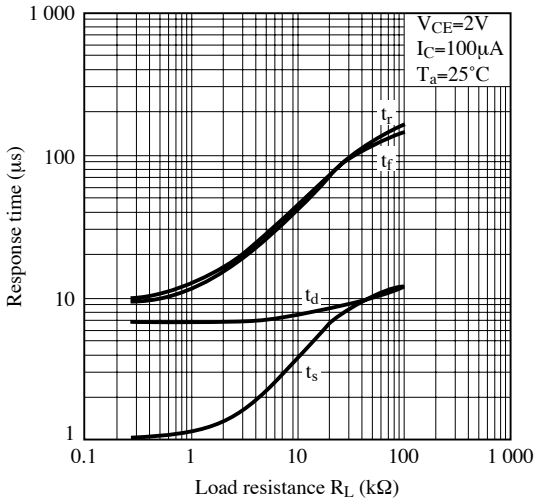


Fig.9 Test Circuit for Response Time

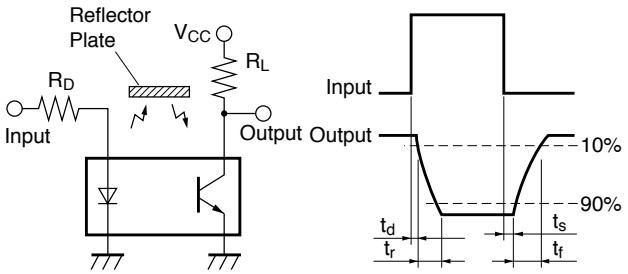


Fig.10 Relative Collector Current vs. Distance

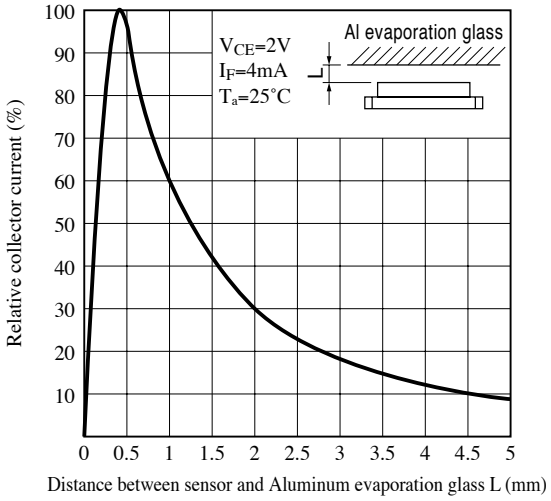


Fig.11 Spectral Sensitivity

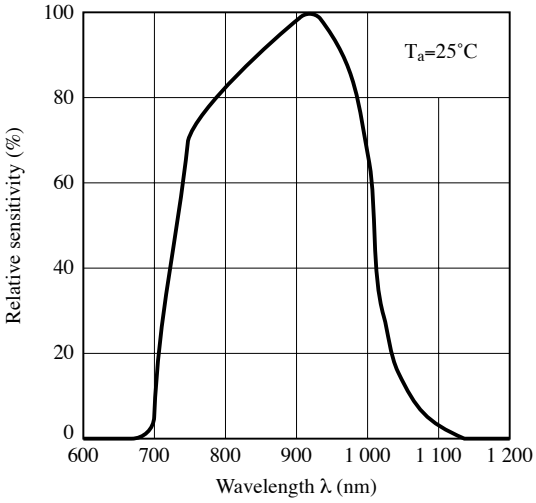


Fig.12 Detecting Position Characteristics (1)

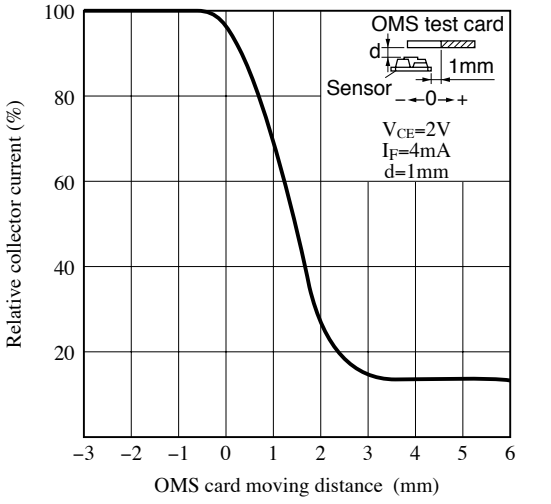
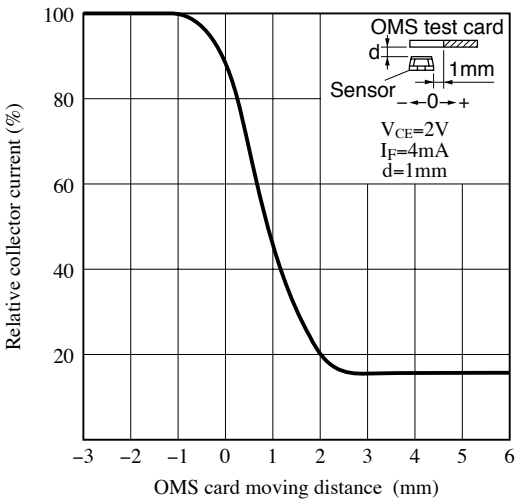


Fig.13 Detecting Position Characteristics (2)



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)

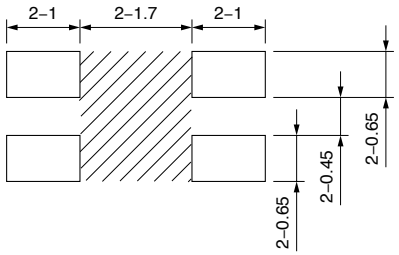
Category	Material	Maximum light emitting wavelength (nm)	I/O Frequency (MHz)
Infrared emitting diode (non-coherent)	Gallium arsenide (GaAs)	950	0.3

• Material

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

● Recommended pattern

(Unit : mm)



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 70%RH or less in humidity within 4 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.

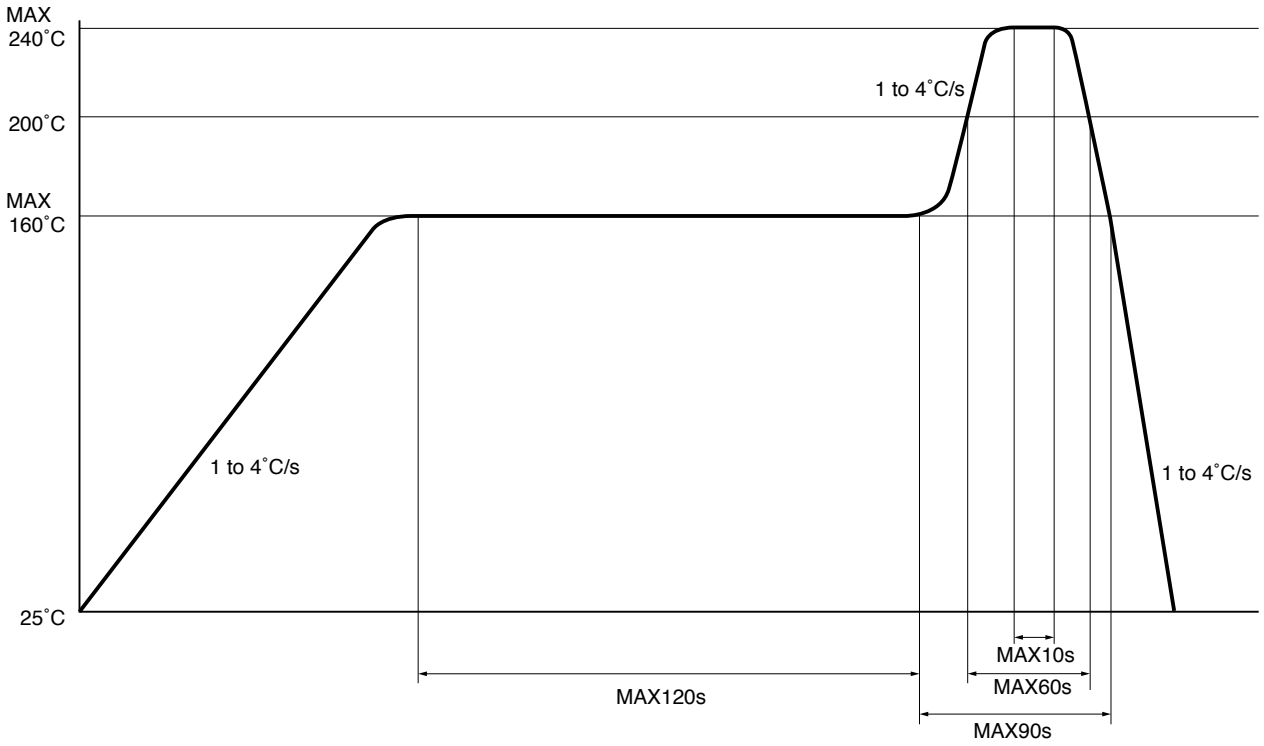
Recommended condition : 125˚C, 16 to 24 hours

∗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 PBBOs 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).

■ Package specification

● Tape and Reel package

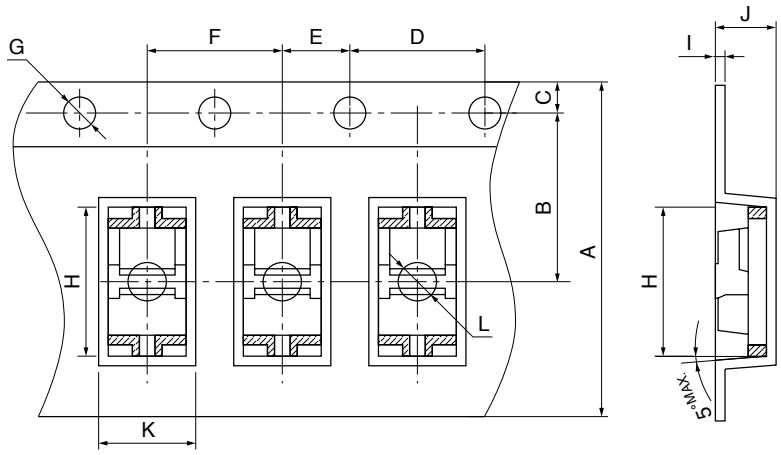
Package materials

Carrier tape : PS (with anti-static material)
Cover tape : PET (three layer system)
Reel : PS

Package method

2 000 pcs of products shall be packaged in a reel. One reed with silicagel is endased in aluminum laminated bag. After sealing up the bag, it encased in one case (5 bags/case).

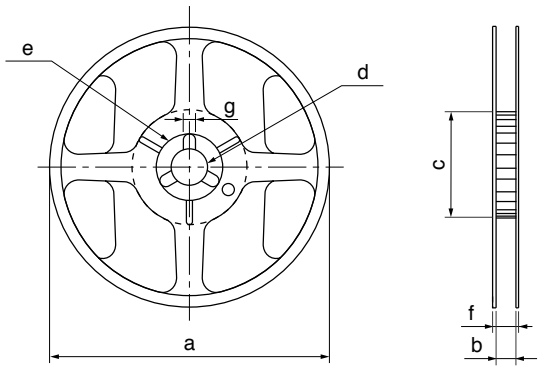
Carrier tape structure and Dimensions



Dimensions List (Unit : mm)

A	B	C	D	E	F
$8^{\pm0.3}$	$3.5^{\pm0.05}$	$1.75^{\pm0.1}$	$4^{\pm0.1}$	$2^{\pm0.1}$	$4^{\pm0.1}$
G	H	I	J	K	L
$\phi1.55^{\pm0.05}$	$3.6^{\pm0.1}$	$0.3^{\pm0.05}$	$1.25^{\pm0.1}$	$2.2^{\pm0.1}$	$\phi1.1^{\pm0.1}$

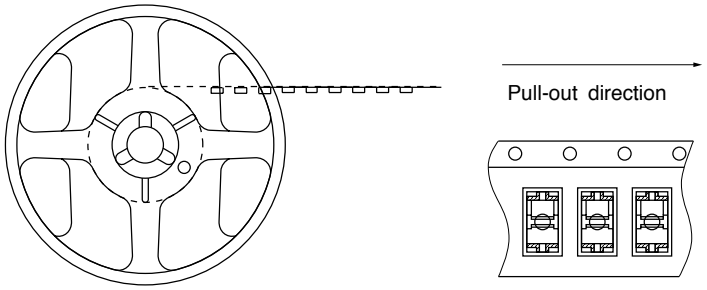
Reel structure and Dimensions



Dimensions List (Unit : mm)

a	b	c	d
180	$9^{\pm1}$	$60^{+0.5}_{-0}$	$\phi13^{\pm0.2}$
e	f	g	
$\phi21^{\pm0.8}$	$11.4^{\pm1}$	$2^{+0.3}_{-0}$	

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 hunidity : 70%RH or less

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--- Office automation equipment
--- Telecommunication equipment [terminal]
--- Test and measurement equipment
--- Industrial control
--- Audio visual equipment
--- Consumer electronics

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--- Traffic signals
--- Gas leakage sensor breakers
--- Alarm equipment
--- Various safety devices, etc.

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--- Telecommunication equipment [trunk lines]
--- Nuclear power control equipment
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