

# GP1S092HCPIF

SMT, Gap : 2mm, Slit : 0.3mm  
Phototransistor Output,  
Compact Transmissive  
Photointerrupter



## ■ Description

**GP1S092HCPIF** is a compact-package, phototransistor output, transmissive photointerrupter, with opposing emitter and detector in a molding that provides non-contact sensing. The compact package series is a result of unique technology combining transfer and injection molding.

This surface mount device has a shaped positioning pin to assure accurate PCB placement, of the emitter and detector. It is unique, because it is one of the few photointerrupters that comes in Tape and Reel packaging, for use with highly automated pick and place equipment.

## ■ Features

1. Transmissive with phototransistor output
2. Highlights:
  - Compact Size
  - Positioning Pin "D" shaped to prevent misalignment
  - Surface Mount Type (SMT)
  - Tape and Reel (T&R) 2 000 pcs per reel
3. Key Parameters:
  - Gap Width : 2mm
  - Slit Width (detector side): 0.3mm
  - Package : 4.5×2.6×2.9 mm
4. RoHS directive compliant

## ■ Agency approvals/Compliance

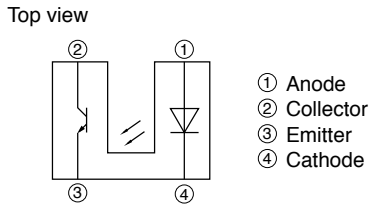
1. Compliant with RoHS directive

## ■ Applications

1. General purpose detection of object presence or motion.
2. Example: printer, lens control for camera

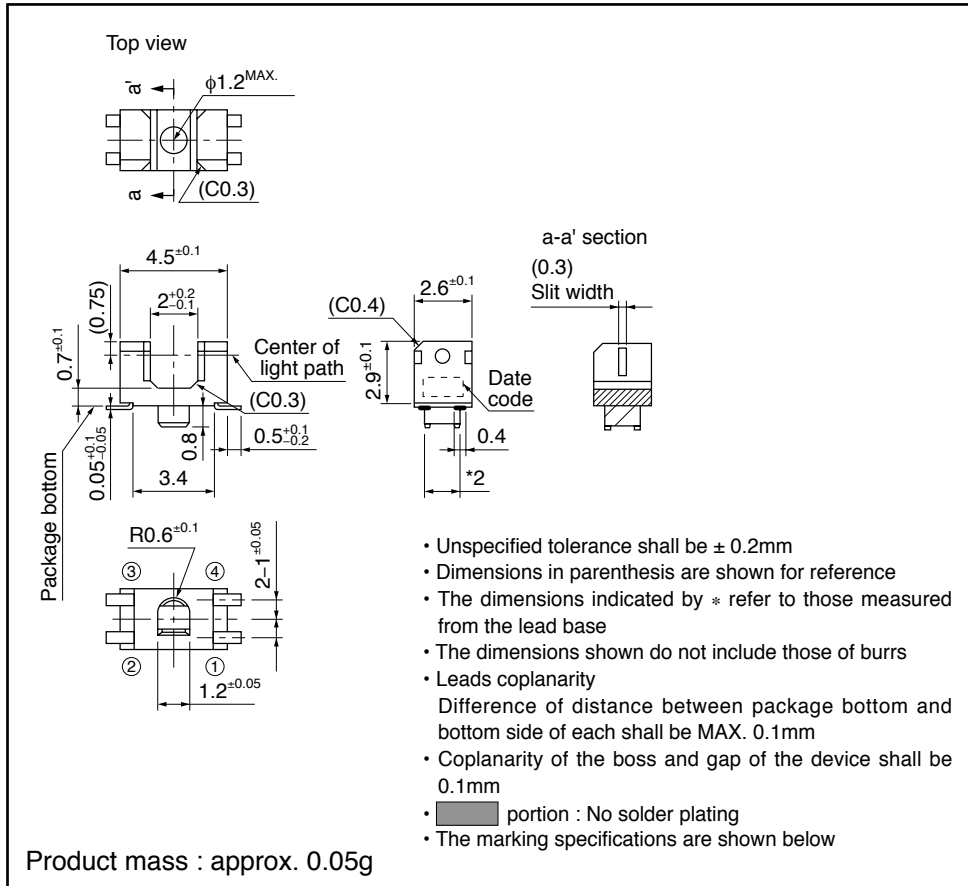
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## Internal Connection Diagram



## Outline Dimensions

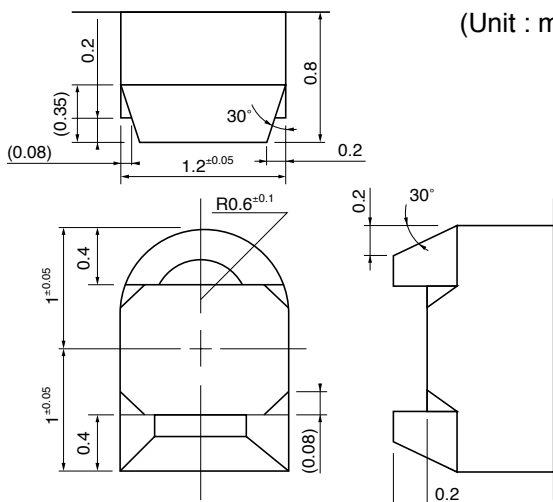
(Unit : mm)



Plating material : SnCu (Cu : TYP. 2%)

## Details of positioning pin dimensions

(Unit : mm)



**Date code (2 digit)**

1st digit		2nd digit	
Year of production		Month of production	
A.D.	Mark	Month	Mark
2000	0	1	1
2001	1	2	2
2002	2	3	3
2003	3	4	4
2004	4	5	5
2005	5	6	6
2006	6	7	7
2007	7	8	8
2008	8	9	9
2009	9	10	X
2010	0	11	Y
:	:	12	Z

repeats in a 10 year cycle

**Rank mark**

There is no rank indicator.

**Country of origin**

Japan

## ■ Absolute Maximum Ratings (T<sub>a</sub>=25°C)

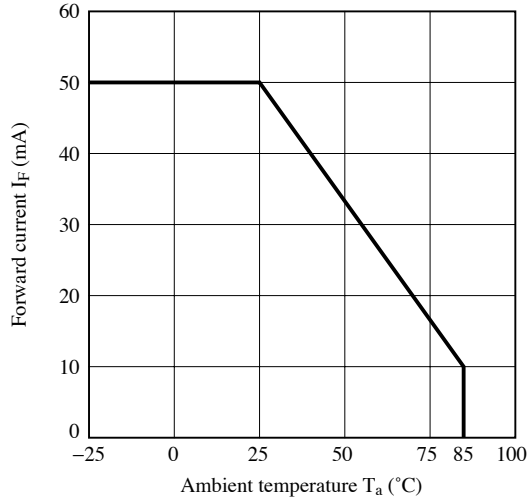
Parameter		Symbol	Rating	Unit
Input	Forward current	I <sub>F</sub>	50	mA
	Reverse voltage	V <sub>R</sub>	6	V
	Power dissipation	P	75	mW
Output	Collector-emitter voltage	V <sub>CEO</sub>	35	V
	Emitter-collector voltage	V <sub>ECO</sub>	6	V
	Collector current	I <sub>C</sub>	20	mA
	Collector power dissipation	P <sub>C</sub>	75	mW
Total power dissipation		P <sub>tot</sub>	100	mW
Operating temperature		T <sub>opr</sub>	-25 to +85	°C
Storage temperature		T <sub>stg</sub>	-40 to +100	°C
*1 Soldering temperature		T <sub>sol</sub>	260	°C

\*1 For 5s or less

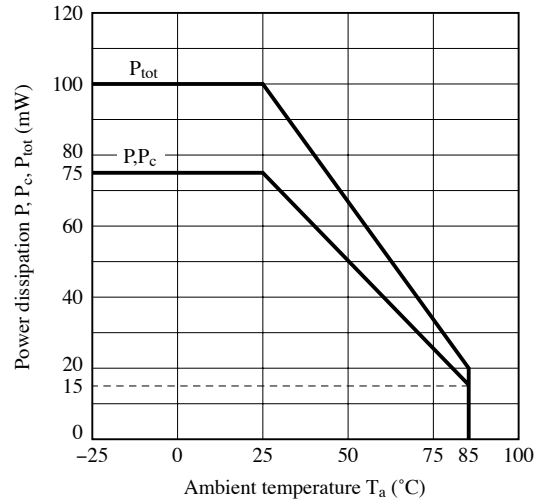
## ■ Electro-optical Characteristics (T<sub>a</sub>=25°C)

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	
Input	Forward voltage	V <sub>F</sub>	I <sub>F</sub> =20mA	-	1.2	1.4	V	
	Reverse current	I <sub>R</sub>	V <sub>R</sub> =3V	-	-	10	μA	
Output	Collector dark current	I <sub>CEO</sub>	V <sub>CE</sub> =20V	-	-	100	nA	
Transfer characteristics	Collector current	I <sub>C</sub>	V <sub>CE</sub> =5V, I <sub>F</sub> =5mA	100	-	400	μA	
	Collector-emitter saturation voltage	V <sub>CE(sat)</sub>	I <sub>F</sub> =10mA, I <sub>C</sub> =40μA	-	-	0.4	V	
	Response time	Rise time	t <sub>r</sub>	V <sub>CE</sub> =5V, I <sub>C</sub> =100μA, R <sub>L</sub> =1kΩ	-	50	150	μs
		Fall time	t <sub>f</sub>		-	50	150	μs

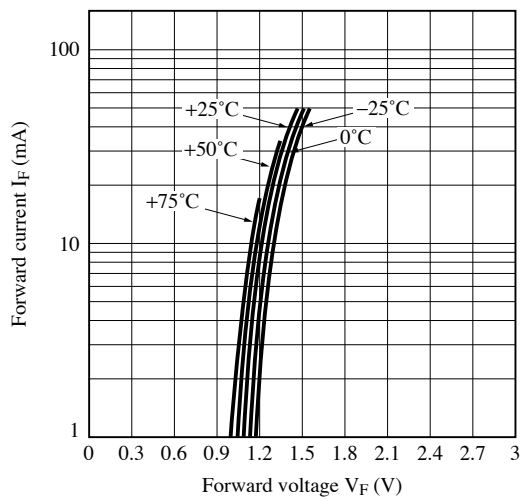
**Fig.1 Forward Current vs. Ambient Temperature**



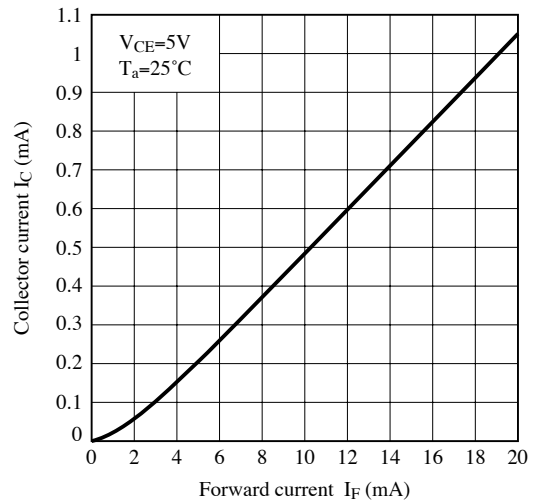
**Fig.2 Power Dissipation vs. Ambient Temperature**



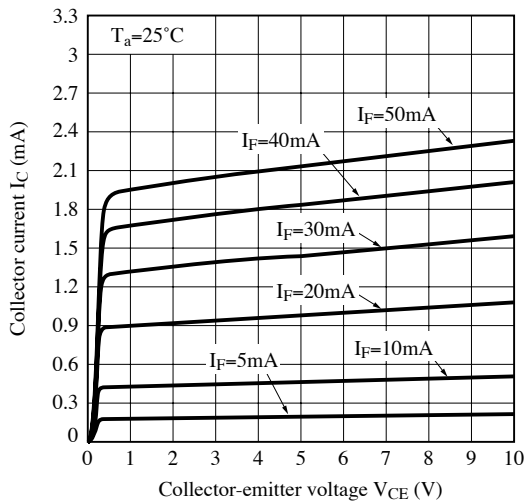
**Fig.3 Forward Current vs. Forward Voltage**



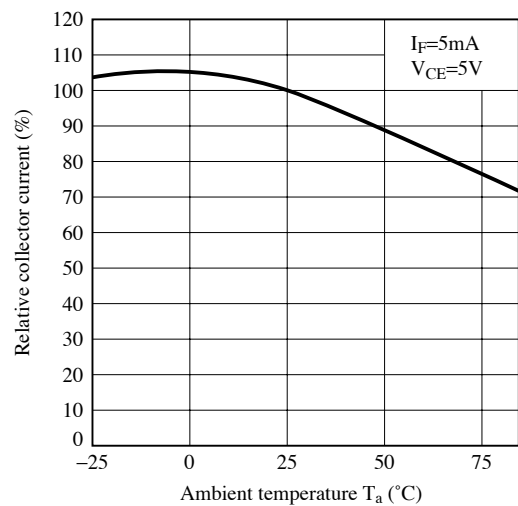
**Fig.4 Collector Current vs. Forward Current**



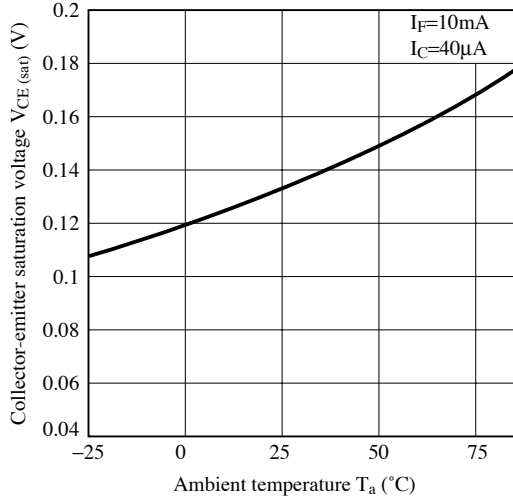
**Fig.5 Collector Current vs. Collector-emitter Voltage**



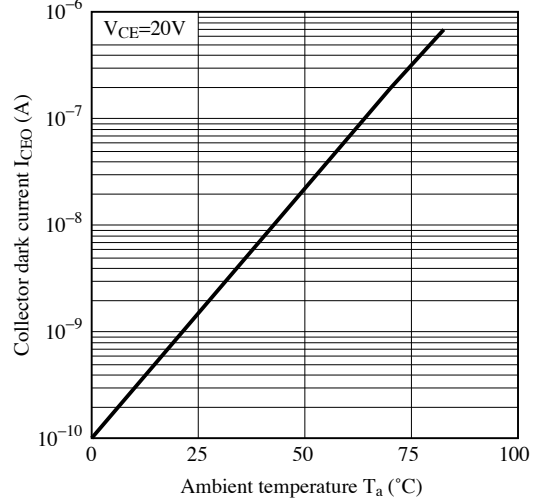
**Fig.6 Relative Collector Current vs. Ambient Temperature**



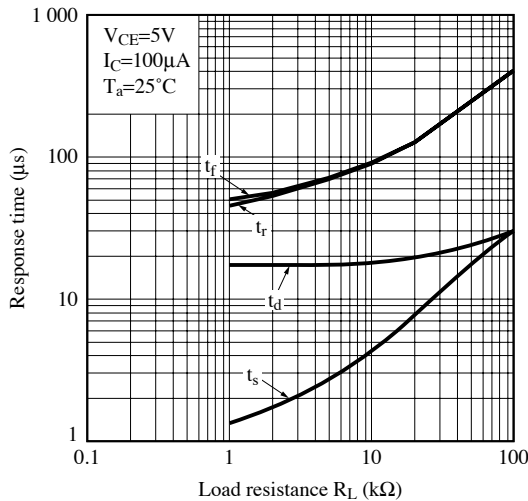
**Fig.7 Collector-emitter Saturation Voltage vs. Ambient Temperature**



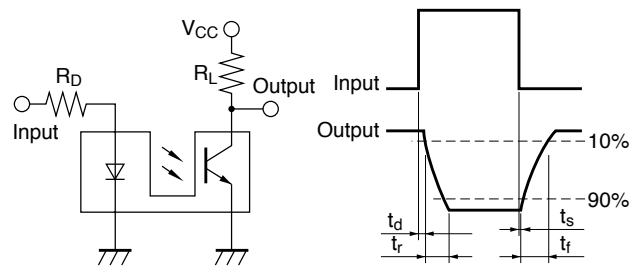
**Fig.8 Collector Dark Current vs. Ambient Temperature**



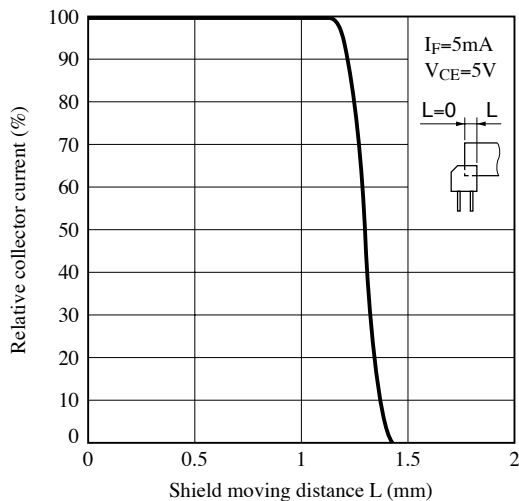
**Fig.9 Response Time vs. Load Resistance**



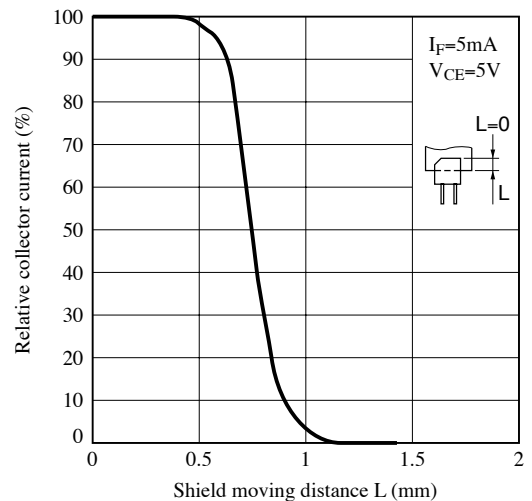
**Fig.10 Test Circuit for Response Time**



**Fig.11 Detecting Position Characteristics (1)**



**Fig.12 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**

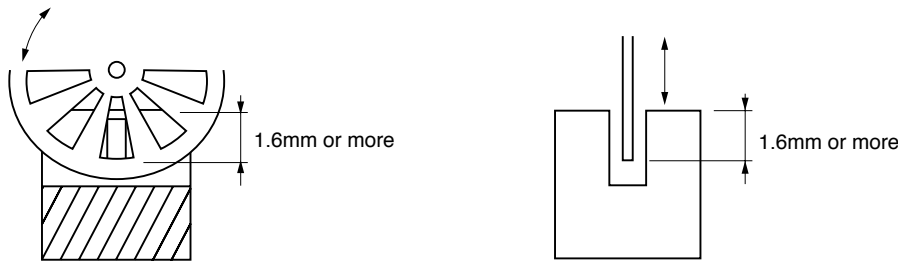
1) Prevention of detection error

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

2) Position of opaque board

Opaque board shall be installed at place 1.6mm or more from the top of elements.

(Example)



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

**● Degradation**

In general, the emission of the IRED used in photointerrupter will degrade over time.

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

**● Used parts**

This product is assembled using the below parts.

• Photodetector (qty. : 1)

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

• Photo 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	Lead frame	Lead frame plating
Black polyphernylene sulfide resin (UL94 V-0)	42Alloy	SnCu plating

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**■ 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

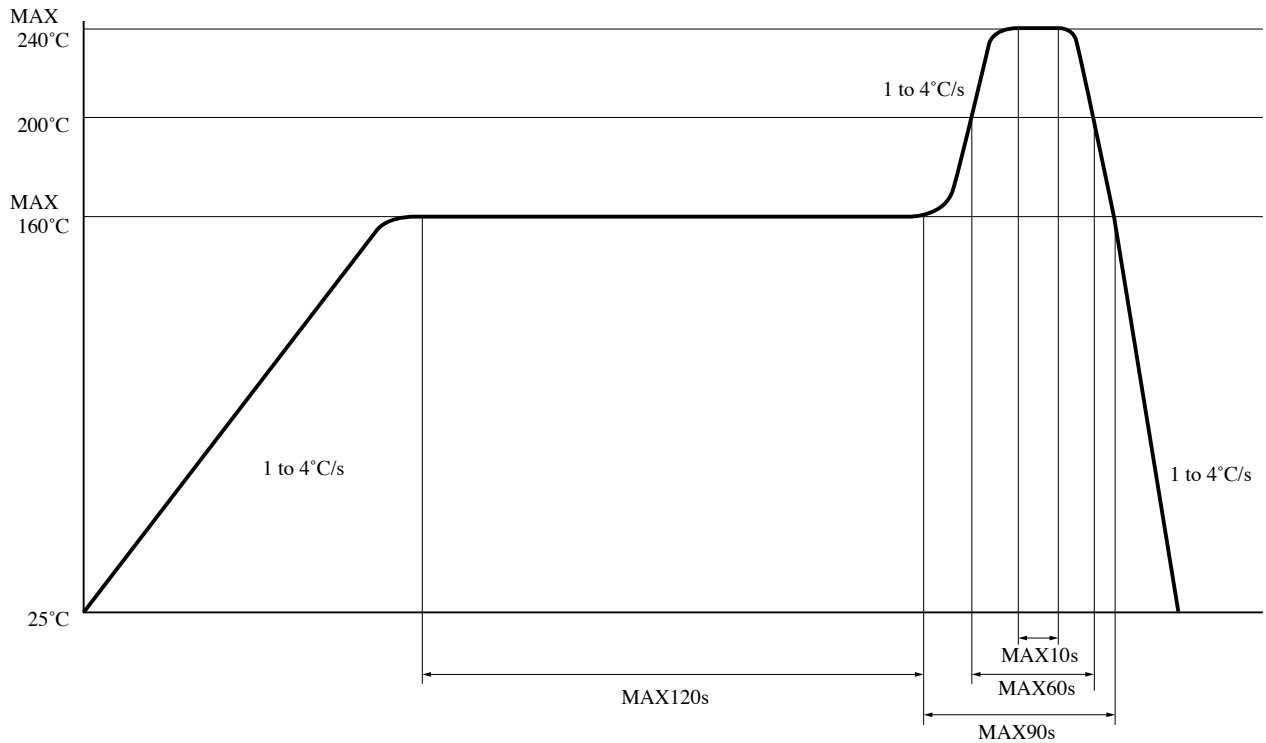
\*Do not process the baking treatment with the product wrapped. When the baking treatment processing, you should move the products to a metallic tray or fix temporarily the products to substrate.



● **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.



**Hand soldering**

Hand soldering should be completed within 3 s when the point of solder iron is below 350°C.  
 Please solder within one time.  
 Please don't touch the terminals directly by soldering iron.  
 Soldered product shall treat at normal temperature.

**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.

**Lead terminals**

Lead terminals of this product are tin copper alloy plated. Before usage, please evaluate solderability with actual conditions and confirm. And the uniformity in color for the lead terminals are not specified.

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**● 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**

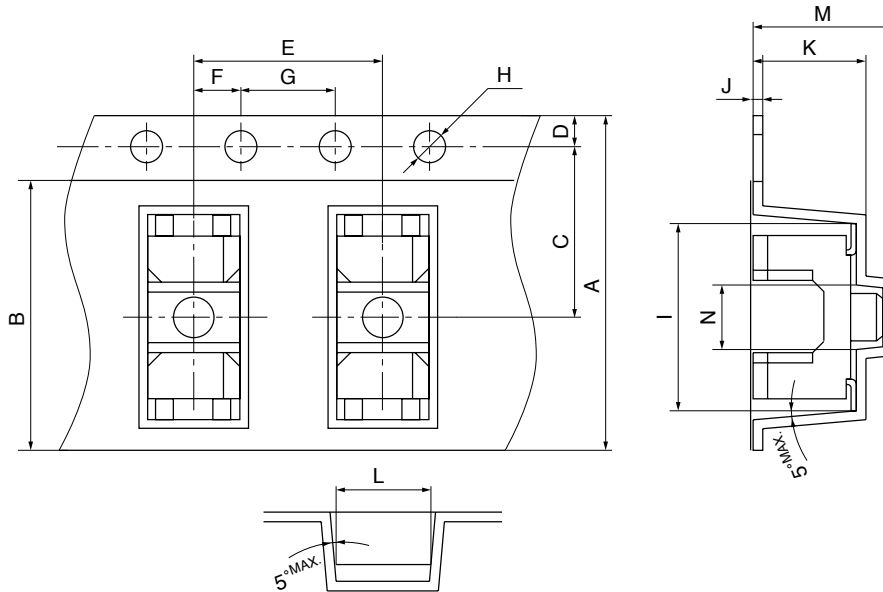
**Package materials**

- 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 reel with silicagel is enclosed in aluminum laminated bag. After sealing up the bag, it enclosed in one case (5 bags/case).

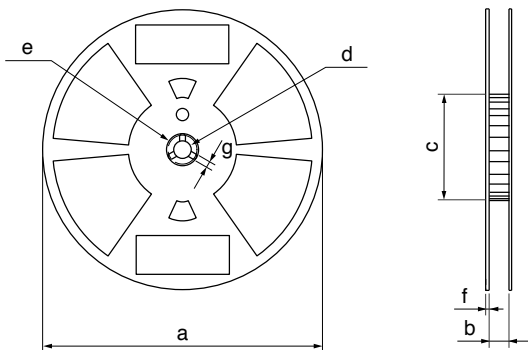
**Carrier tape structure and Dimensions**



Dimensions List (Unit : mm)

A	B	C	D	E	F	G
12±0.3	9.5 <sup>+0.3</sup> <sub>-0.2</sub>	5.5±0.05	1.75±0.1	8±0.1	2±0.05	4±0.1
H	I	J	K	L	M	N
φ1.5 <sup>+0.1</sup> <sub>-0</sub>	6.1±0.1	0.4±0.05	3.2±0.1	2.8±0.1	4.3±0.1	1.45±0.1

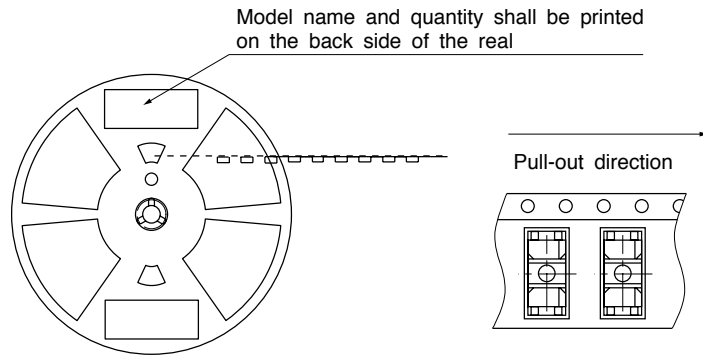
**Reel structure and Dimensions**



Dimensions List (Unit : mm)

a	b	c	d
330±1	13±1	80±1	13±0.5
e	f	g	
21±1	2±0.5	2±0.5	

## 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

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

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection

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

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- Telecommunication equipment [trunk lines]
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