

# PC123XxYSZ1B Series

## DIP 4pin Reinforced Insulation Type Photocoupler



### ■ Description

PC123XxYSZ1B Series contains an IRED optically coupled to a phototransistor.

It is packaged in a 4-pin DIP, available in wide-lead spacing option and SMT gullwing lead-form option.

Input-output isolation voltage(rms) is 5kV.

CTR is 50% to 400% (at  $I_F=5\text{mA}$ ,  $V_{CE}=5\text{V}$ ,  $T_a=25^\circ\text{C}$ )

### ■ Features

1. 4-pin DIP package
2. Double transfer mold package  
(Ideal for Flow Soldering)
3. Current transfer ratio  
(CTR : MIN. 50% at  $I_F=5\text{ mA}$ ,  $V_{CE}=5\text{V}$ ,  $T_a=25^\circ\text{C}$ )
4. Several CTR ranks available
5. Reinforced insulation type  
(Isolation distance : MIN. 0.4mm)
6. Long creepage distance type  
(wide lead-form type only : MIN. 8mm)
7. High isolation voltage between input and output  
( $V_{iso}(\text{rms})$  : 5kV)
8. RoHS directive compliant

### ■ Agency approvals/Compliance

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **PC123**)
2. Approved by BSI, BS-EN62368  
(as model No. **PC123**)
3. Approved by SEMKO, EN60065, EN60335-1, EN60950  
(as model No. **PC123**)
4. Approved by DEMKO, EN60065, EN60335-1, EN60950,  
(as model No. **PC123**)
5. Approved by NEMKO, EN60065, EN60335-1, EN60950  
(as model No. **PC123**)
6. Approved by FIMKO, EN60065, EN60335-1, EN60950,  
(as model No. **PC123**)
7. Recognized by CSA file No. CA95323  
(as model No. **PC123**)
8. Approved by VDE, DIN EN60747-5-5( \* ) (as an option)  
File No. 40008087 (as model No. **PC123**)
9. Package resin : UL flammability grade (94V - 0)

(\*) DIN EN60747-5-5 : successor standard of DIN VDE0884.

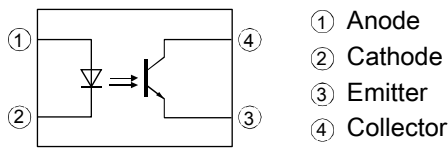
### ■ Applications

1. I/O isolation for MCUs (Micro Controller Units)
2. Noise suppression in switching circuits
3. Signal transmission between circuits of different potentials and impedances
4. Over voltage detection

Notice: The content of data sheet is subject to change without prior notice.

In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that may occur in equipment using any SHARP devices shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device.

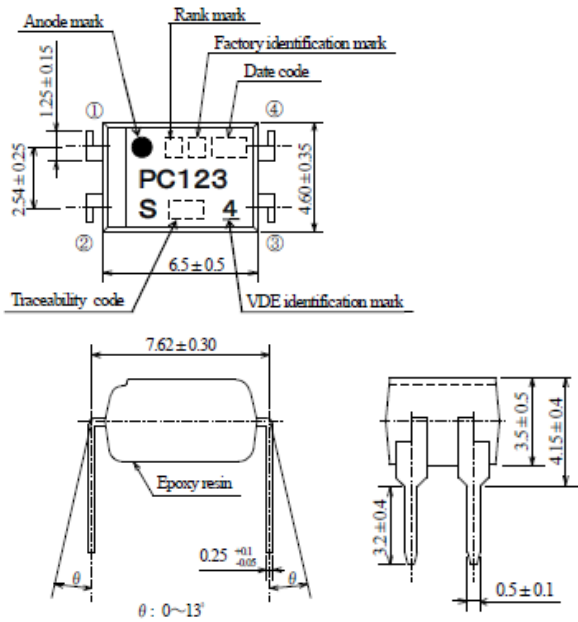
## Internal Connection Diagram



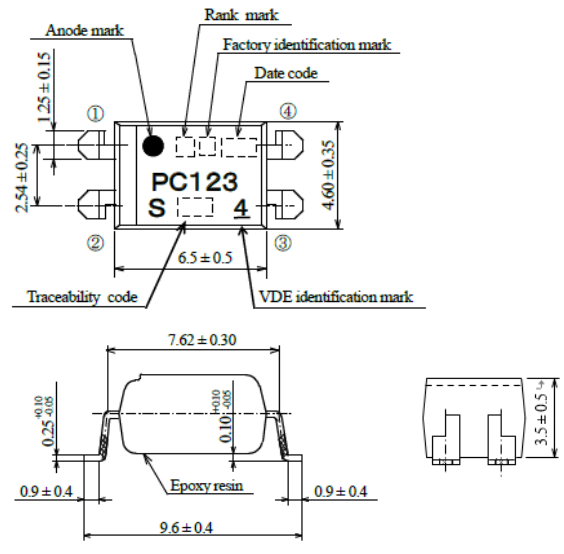
## Outline Dimensions

(Unit : mm)

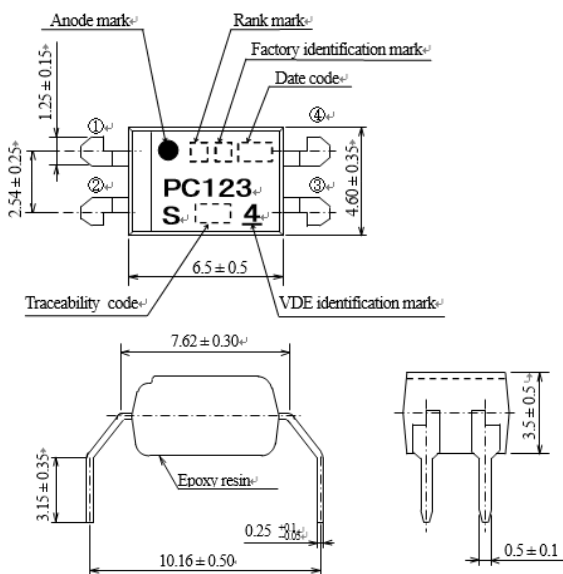
### 1 . Through-Hole [ex. PC123XNYSZ1B]



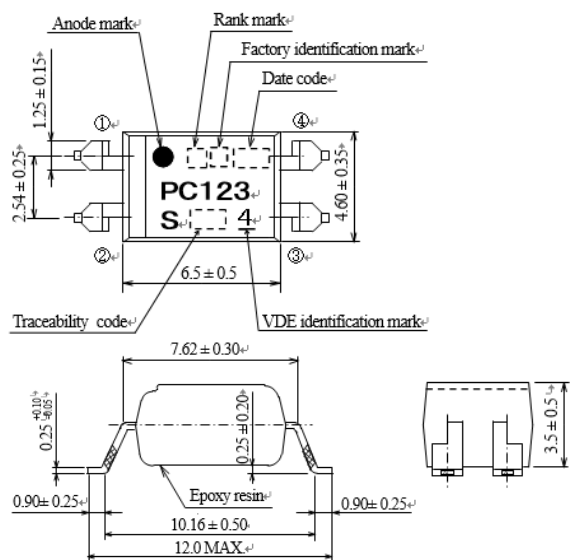
### 2 . SMT Gullwing Lead-Form [ex. PC123XNYIP1B]



### 3 . Wide Through-Hole Lead-Form [ex. PC123XNYFZ1B]



### 4 . Wide SMT Gullwing Lead-Form [ex. PC123XNYUP1B]



### Date code indication (Ex.)

3-digit number shall be marked the age indication of 1-digit number, and week code of 2-digit number.

Week code "01" indicate the week including the first Thursday of January. And later, Monday is the starting point.

Year	Week
------	------

Date code	MON	TUE	WED	THU	FRI	SAT	SUN
652	12/26	12/27	12/28	12/29	12/30	12/31	1/1
701	1/2	1/3	1/4	1/5	1/6	1/7	1/8
702	1/9	1/10	1/11	1/12	1/13	1/14	1/15
703	1/16	1/17	1/18	1/19	1/20	1/21	1/22
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
752	12/11	12/12	12/13	12/14	12/15	12/16	12/17
751	12/18	12/19	12/20	12/21	12/22	12/23	12/24
752	12/25	12/26	12/27	12/28	12/29	12/30	12/31
801	1/1	1/2	1/3	1/4	1/5	1/6	1/7

### Factory identification mark and Plating material

Factory identification Mark	Country of origin	Plating material
K	Japan	SnBi (Bi : 1~4%)

### Rank mark

Refer to the Model Line-up table.

### Absolute Maximum Ratings

(T<sub>a</sub>=25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	I <sub>F</sub>	50	mA
	*1 Peak forward current	I <sub>FM</sub>	1	A
	Reverse voltage	V <sub>R</sub>	6	V
	Power dissipation	P	70	mW
Output	Collector-emitter voltage	V <sub>CEO</sub>	80	V
	Emitter-collector voltage	V <sub>ECO</sub>	6	V
	Collector current	I <sub>C</sub>	50	mA
	Collector power dissipation	P <sub>C</sub>	150	mW
Total power dissipation		P <sub>tot</sub>	200	mW
*2 Isolation voltage		V <sub>iso(rms)</sub>	5	kV
Operating temperature		T <sub>opr</sub>	-30 to +100	°C
Storage temperature		T <sub>stg</sub>	-55 to +125	°C
*2 Soldering temperature		T <sub>sol</sub>	270	°C

\*1 Pulse width ≤ 100μs, Duty ratio : 0.001

\*2 40 to 60%RH, AC for 1 minute

\*3 For 10s

### 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> =4V	–	–	10	μA
	Terminal capacitance	C <sub>t</sub>	V=0, f=1kHz	–	30	250	pF
Output	Dark current	I <sub>CEO</sub>	V <sub>CE</sub> =50V, I <sub>F</sub> =0	–	–	100	nA
	Collector-emitter breakdown voltage	BV <sub>CEO</sub>	I <sub>C</sub> =0.1mA, I <sub>F</sub> =0	80	–	–	V
	Emitter-collector breakdown voltage	BV <sub>ECO</sub>	I <sub>E</sub> =10μA, I <sub>F</sub> =0	6	–	–	V
Transfer characteristics	Collector current	I <sub>C</sub>	I <sub>F</sub> =5mA, V <sub>CE</sub> =5V	2.5	–	20	mA
	Collector-emitter saturation voltage	V <sub>CE(sat)</sub>	I <sub>F</sub> =20mA, I <sub>C</sub> =1mA	–	0.1	0.2	V
	Isolation resistance	R <sub>ISO</sub>	DC500V, 40 to 60%RH	5×10 <sup>10</sup>	1×10 <sup>11</sup>	–	Ω
	Floating capacitance	C <sub>f</sub>	V=0, f=1MHz	–	0.6	1.0	pF
	Cut-off frequency	f <sub>c</sub>	V <sub>CE</sub> =5V, I <sub>C</sub> =2mA, R <sub>L</sub> =100Ω, -3dB	–	80	–	kHz
	Response time	Risetime	t <sub>r</sub>	V <sub>CE</sub> =2V, I <sub>C</sub> =2mA, R <sub>L</sub> =100Ω	–	4	18
Fall time		t <sub>f</sub>	–		3	18	μs

### ■ Model Line-up

Lead Form	Through-Hole	Rank mark	I <sub>c</sub> [mA] (I <sub>F</sub> =5mA, V <sub>CE</sub> =5V, T <sub>a</sub> =25°C)
Package	Sleeve		
	100pcs/sleeve		
Model No.	<b>PC123XNYSZ1B</b>	with or “ _ ”	2.5 ~ 20
	<b>PC123X1YSZ1B</b>	L	2.5 ~ 7.5
	<b>PC123X2YSZ1B</b>	M	5.0 ~ 12.5
	<b>PC123X5YSZ1B</b>	N	10 ~ 20
	<b>PC123X8YSZ1B</b>	E	5.0 ~ 10

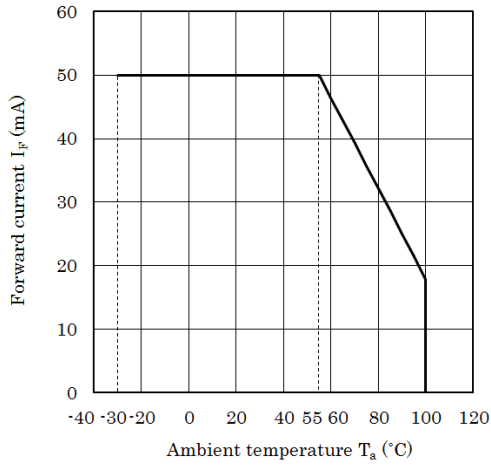
Lead Form	Wide Through-Hole	Rank mark	I <sub>c</sub> [mA] (I <sub>F</sub> =5mA, V <sub>CE</sub> =5V, T <sub>a</sub> =25°C)
Package	Sleeve		
	100pcs/sleeve		
Model No.	<b>PC123XNYFZ1B</b>	with or “ _ ”	2.5 ~ 20
	<b>PC123X1YFZ1B</b>	L	2.5 ~ 7.5
	<b>PC123X2YFZ1B</b>	M	5.0 ~ 12.5
	<b>PC123X5YFZ1B</b>	N	10 ~ 20
	<b>PC123X8YFZ1B</b>	E	5.0 ~ 10

Lead Form	SMT Gullwing	Rank mark	I <sub>c</sub> [mA] (I <sub>F</sub> =5mA, V <sub>CE</sub> =5V, T <sub>a</sub> =25°C)
Package	Taping		
	2,000pcs/reel		
Model No.	<b>PC123XNYIP1B</b>	with or “ _ ”	2.5 ~ 20
	<b>PC123X1YIP1B</b>	L	2.5 ~ 7.5
	<b>PC123X2YIP1B</b>	M	5.0 ~ 12.5
	<b>PC123X5YIP1B</b>	N	10 ~ 20
	<b>PC123X8YIP1B</b>	E	5.0 ~ 10

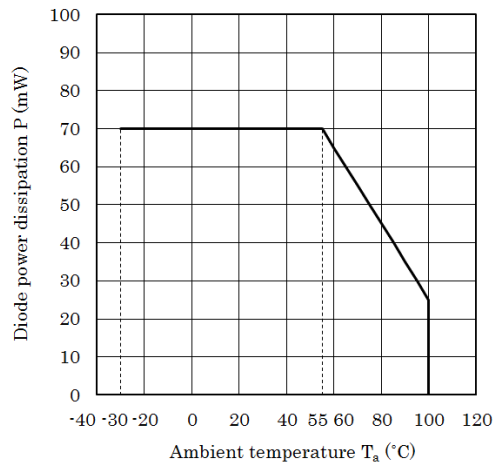
Lead Form	Wide SMT Gullwing	Rank mark	I <sub>c</sub> [mA] (I <sub>F</sub> =5mA, V <sub>CE</sub> =5V, T <sub>a</sub> =25°C)
Package	Taping		
	2,000pcs/reel		
Model No.	<b>PC123XNYUP1B</b>	with or “ _ ”	2.5 ~ 20
	<b>PC123X1YUP1B</b>	L	2.5 ~ 7.5
	<b>PC123X2YUP1B</b>	M	5.0 ~ 12.5
	<b>PC123X5YUP1B</b>	N	10 ~ 20
	<b>PC123X8YUP1B</b>	E	5.0 ~ 10

Please contact a local SHARP sales representative to inquire about production status.

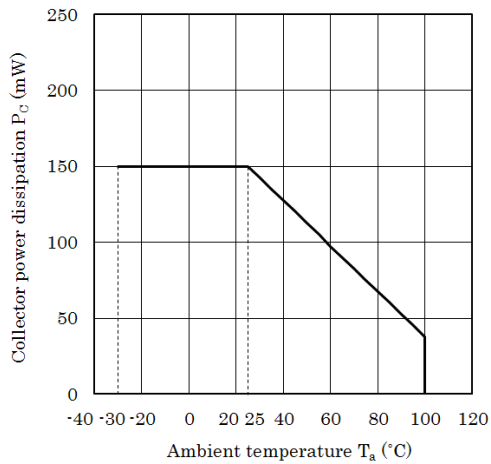
**Fig.1 Forward Current vs. Ambient Temperature**



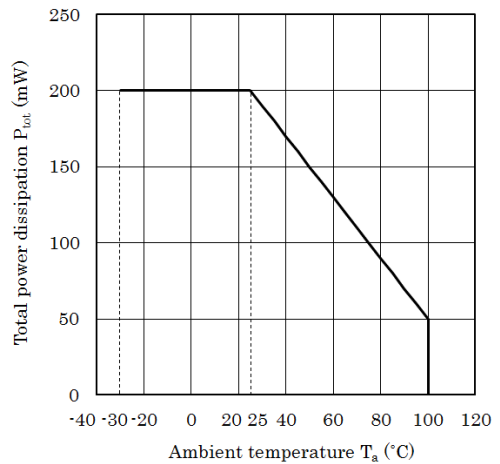
**Fig.2 Diode Power Dissipation vs. Ambient Temperature**



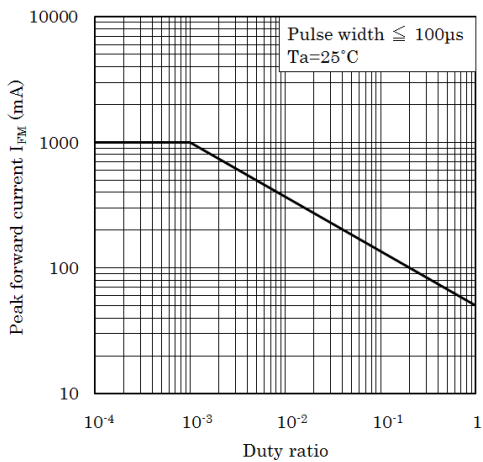
**Fig.3 Collector Power Dissipation vs. Ambient Temperature**



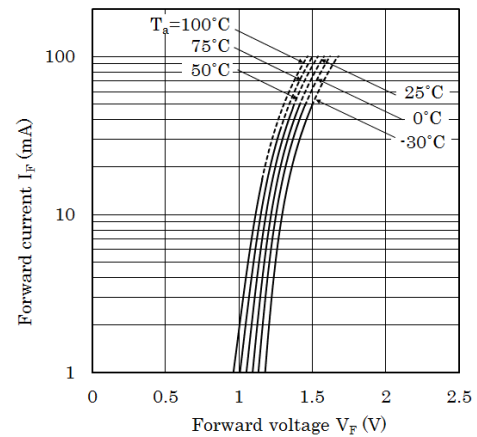
**Fig.4 Total Power Dissipation vs. Ambient Temperature**



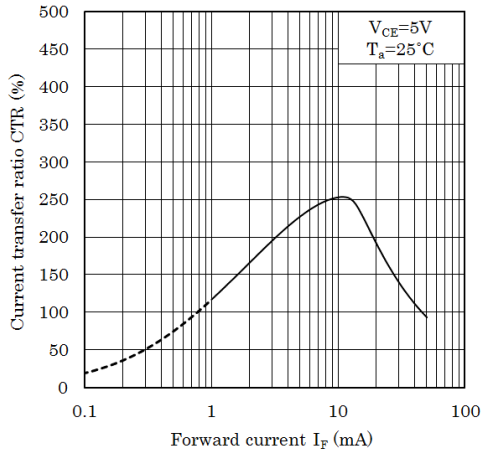
**Fig.5 Peak Forward Current vs. Duty Ratio**



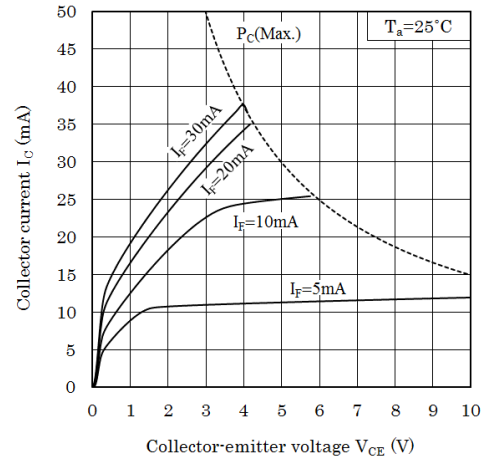
**Fig.6 Forward Current vs. Forward Voltage**



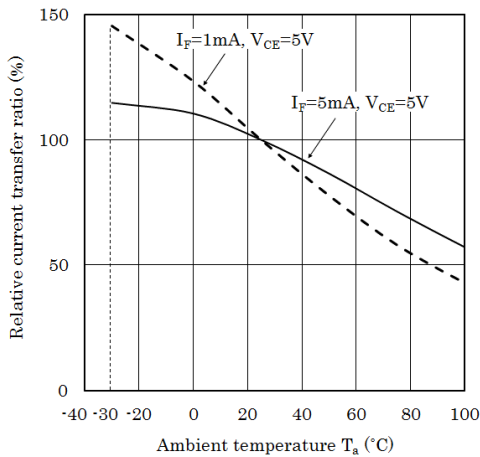
**Fig.7 Current Transfer Ratio vs. Forward Current**



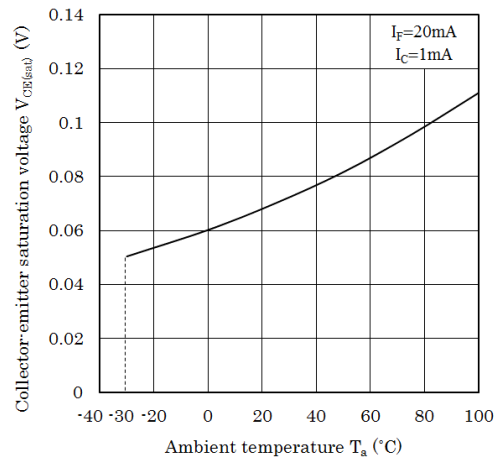
**Fig.8 Collector Current vs. Collector-emitter Voltage**



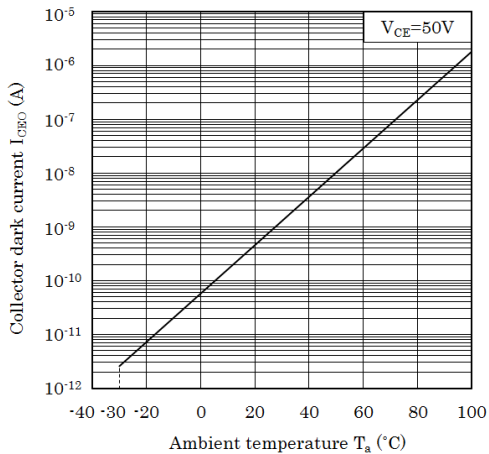
**Fig.9 Relative Current Transfer Ratio vs. Ambient Temperature**



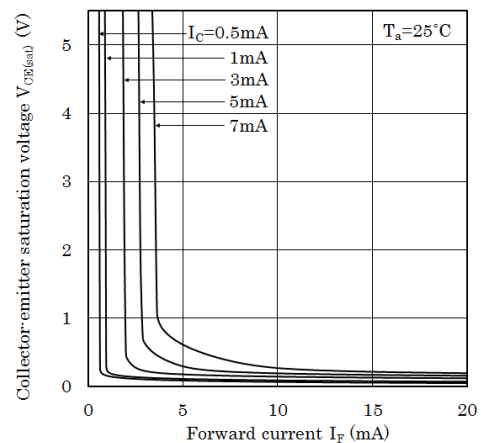
**Fig.10 Collector - emitter Saturation Voltage vs. Ambient Temperature**



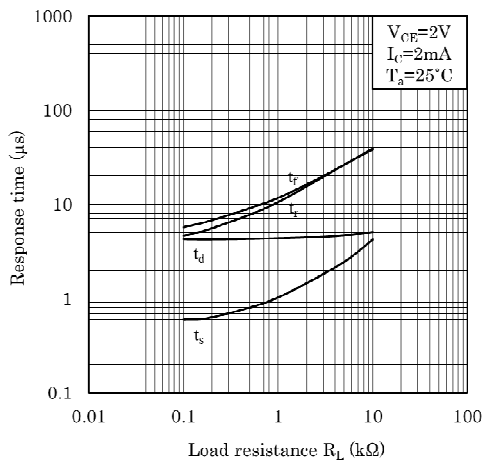
**Fig.11 Collector Dark Current vs. Ambient Temperature**



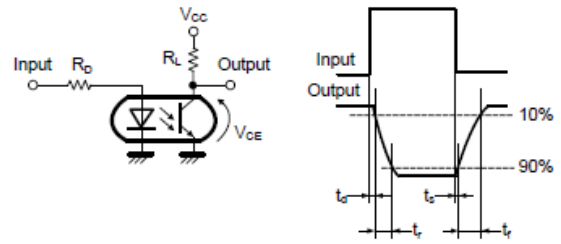
**Fig.12 Collector-emitter Saturation Voltage vs. Forward Current**



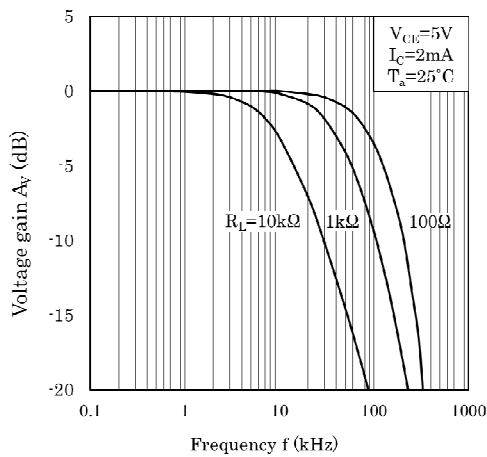
**Fig.13 Response Time vs. Load Resistance**



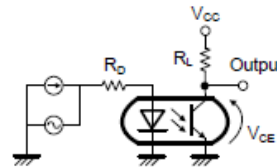
**Fig.14 Test Circuit for Response Time**



**Fig.15 Frequency Response**



**Fig.16 Test Circuit for Frequency Response**



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



## ■ Design Considerations

### ● Design guide

While operating at  $I_F < 1\text{mA}$ , CTR variation may increase.  
Please make design considering this fact.

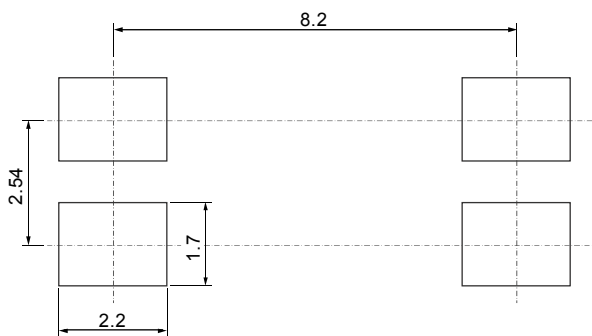
This product is not designed against irradiation and incorporates non-coherent IRED.

### ● Degradation

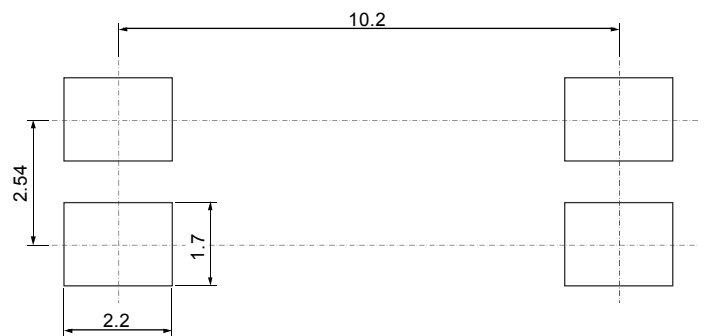
In general, the emission of the IRED used in photocouplers will degrade over time.  
In the case of long term operation, please take the general IRED degradation (50% degradation over 5 years) into the design consideration.

### ● Recommended foot print (reference)

SMT Gullwing lead-form



Wide SMT Gullwing lead-form



(Unit : mm)

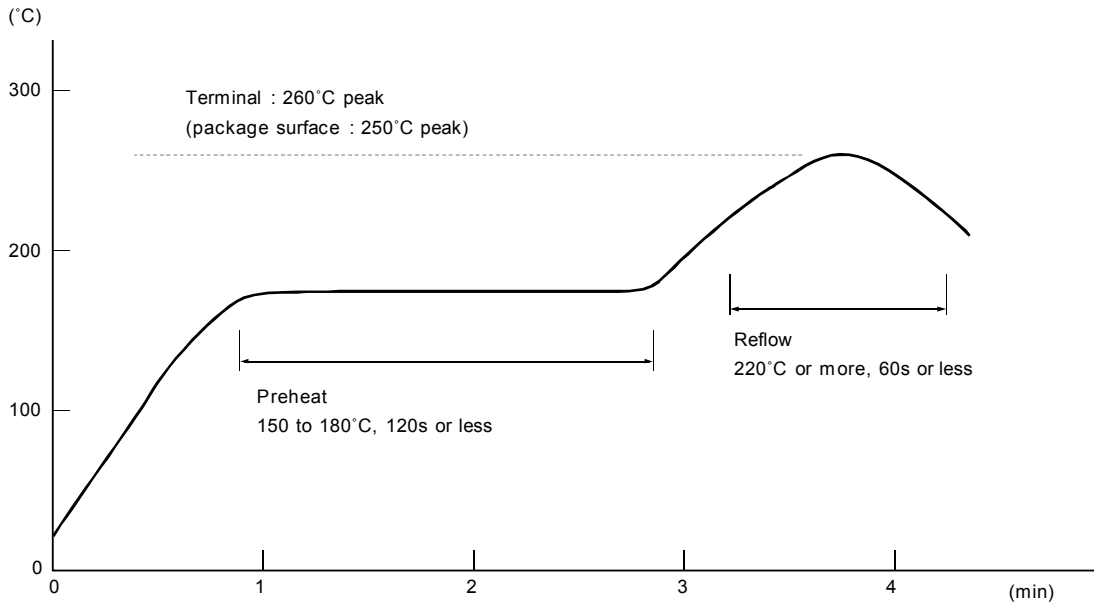
☆ For additional design assistance, please review our corresponding Optoelectronic Application Notes.

■ **Manufacturing Guidelines**

● **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 don't solder more than twice.



Flow Soldering :

Due to SHARP's double transfer mold construction submersion in flow solder bath is allowed under the below listed guidelines.

Flow soldering should be completed below 270°C and within 10s.  
 Preheating is within the bounds of 100 to 150°C and 30 to 80s.  
 Please don't solder more than twice.

Hand soldering

Hand soldering should be completed within 3s when the point of solder iron is below 400°C.  
 Please don't solder more than twice.

Other notice

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 tooling 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 :

The impact on the device varies depending on the size of the cleaning bath, ultrasonic output, cleaning time, size of PCB and mounting method of the device.

Therefore, please make sure the device withstands the ultrasonic cleaning in actual conditions in advance of mass production.

Recommended solvent materials :

Ethyl alcohol, Methyl alcohol and Isopropyl alcohol.

In case the other type of solvent materials are intended to be used, please make sure they work fine in actual using conditions since some materials may erode the packaging resin.

• **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 PBB and PBDE are not used in this product at all.

(1) The RoHS directive(2011/65/EU)

This product complies with the RoHS directive(2011/65/EU)

Object substances: mercury, lead, cadmium, hexavalent chromium, polybrominated biphenyls ( PBB ) and polybrominated diphenyl ethers ( PBDE )

(2) 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).

Marking Styles for the Names and Contents of the Hazardous Substances

Category	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr <sup>6+</sup> )	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Photocoupler	○	○	○	○	○	○

This table is prepared in accordance with the provisions of SJ/T 11364.

○ : Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

■ Package specification

● Sleeve package

1. Through-Hole, Wide Through-Hole

Package materials

Sleeve : HIPS/PS or PC (with anti-static material)

Stopper : EPM

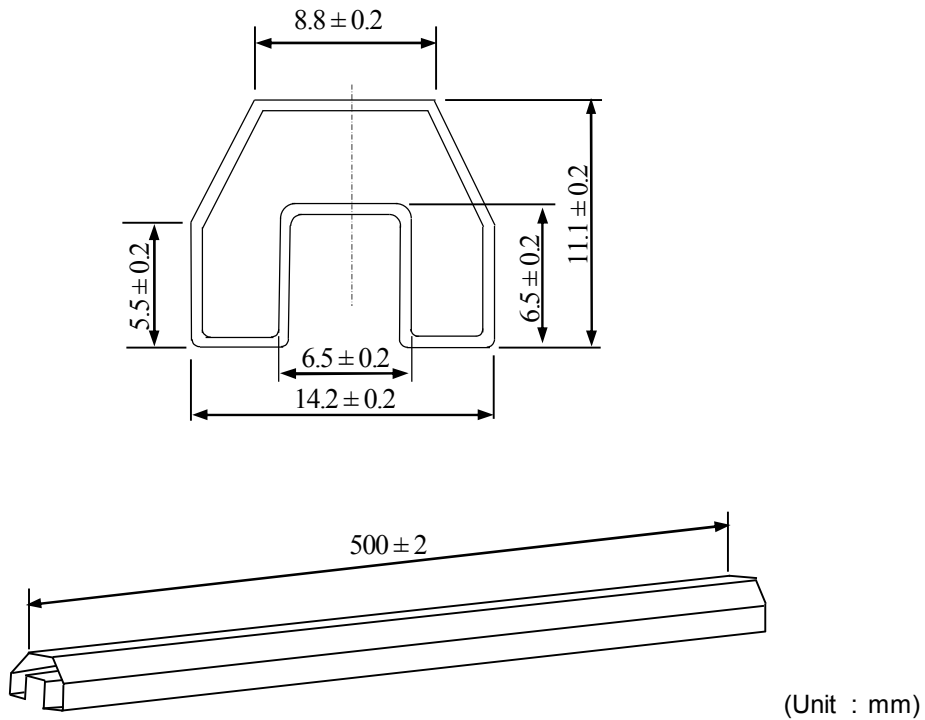
Package method

MAX. 100pcs. of products shall be packaged in a sleeve and both of sleeve edges shall be fixed by stoppers.

MAX. 25 sleeves (Product : 2,500pcs.) above shall be packaged in inner case and sealed by tape .

Max 2 bags(product : 5,000pcs) above shall be packaged in packing case , and put a cushioning material inside.

Sleeve outline dimensions



• Tape and Reel package

1. SMT Gullwing

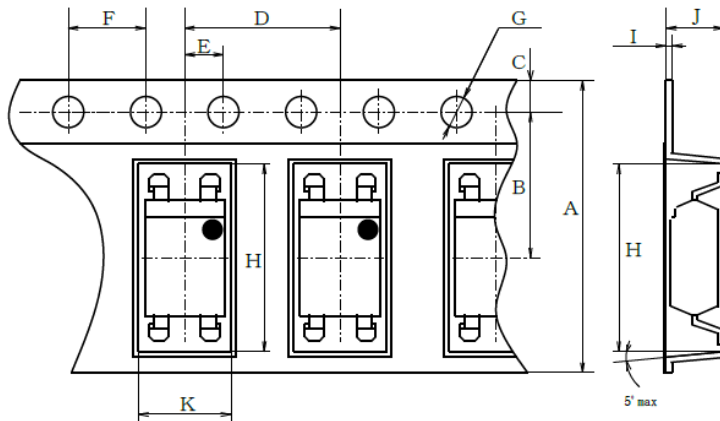
Package materials

Carrier tape : PS

Cover tape : PET (three layer system)

Reel : PS

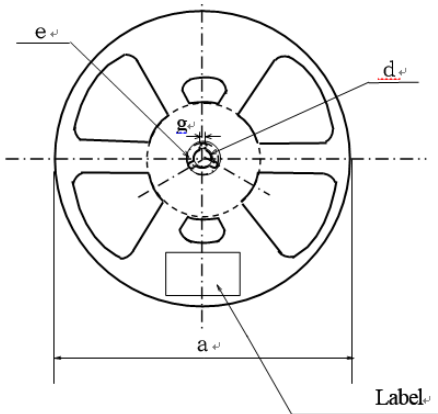
Carrier tape structure and Dimensions



Dimensions List (Unit : mm)

A	B	C	D	E	F	G
16.0 $\pm$ 0.3	7.5 $\pm$ 0.1	1.75 $\pm$ 0.10	8.0 $\pm$ 0.1	2.0 $\pm$ 0.1	4.0 $\pm$ 0.1	$\phi$ 1.5 $\pm$ 0.1 -0.0
H	I	J	K			
10.3 $\pm$ 0.1	0.40 $\pm$ 0.05	4.0 $\pm$ 0.1	5.3 $\pm$ 0.1			

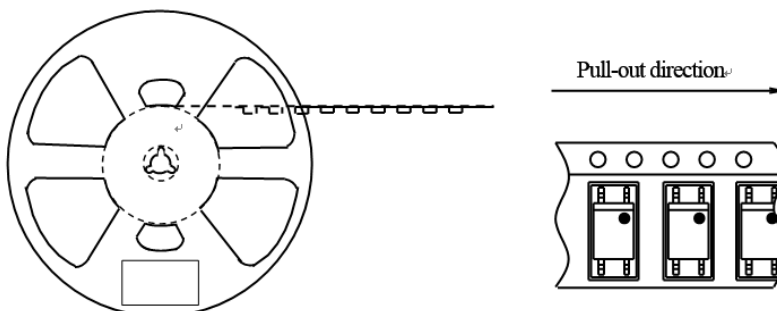
Reel structure and Dimensions



Dimensions List (Unit : mm)

a	b	c	d
$\phi$ 330	17.5 $\pm$ 1.5	$\phi$ 100 $\pm$ 1	$\phi$ 13.0 $\pm$ 0.5
e	f	g	
$\phi$ 21.0 $\pm$ 1	2.0 $\pm$ 0.5	2.0 $\pm$ 0.5	

Direction of product insertion



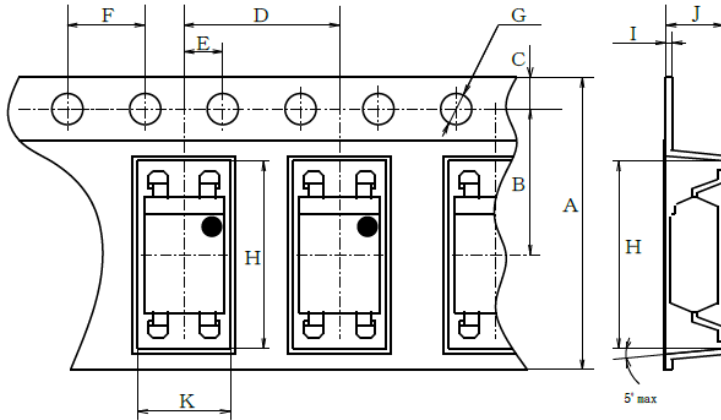
[Packing : 2,000pcs/reel]

**2. Wide SMT Gullwing**

Package materials

- Carrier tape : PS
- Cover tape : PET (three layer system)
- Reel : PS

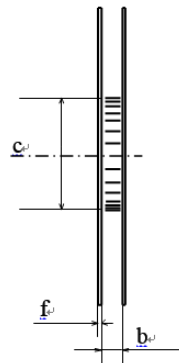
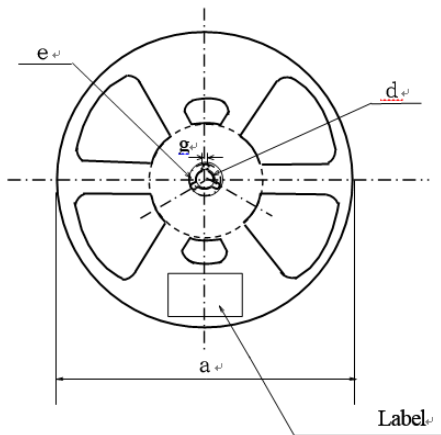
Carrier tape structure and Dimensions



Dimensions List (Unit : mm)

A	B	C	D	E	F	G
24.0 $\pm$ 0.3	11.5 $\pm$ 0.1	1.75 $\pm$ 0.10	8.0 $\pm$ 0.1	2.0 $\pm$ 0.1	4.0 $\pm$ 0.1	$\phi$ 1.5 $^{+0.1}_{-0.0}$
H	I	J	K			
12.5 $\pm$ 0.1	0.40 $\pm$ 0.05	4.05 $\pm$ 0.1	5.3 $\pm$ 0.1			

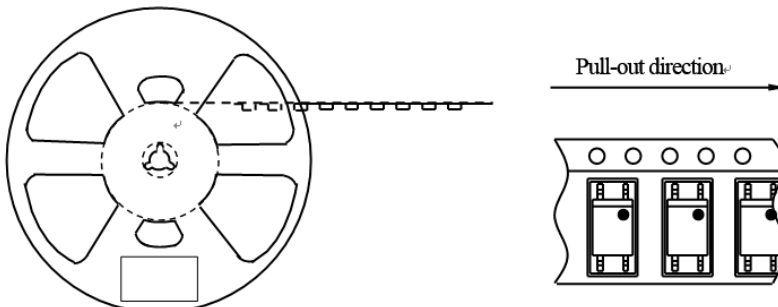
Reel structure and Dimensions



Dimensions List (Unit : mm)

a	b	c	d
$\phi$ 330	25.5 $\pm$ 1.5	$\phi$ 100 $\pm$ 1	$\phi$ 13.0 $\pm$ 0.5
e	f	g	
$\phi$ 23 $\pm$ 1	2.0 $\pm$ 0.5	2.0 $\pm$ 0.5	

Direction of product insertion



[Packing : 2,000pcs/reel]

**■ 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.

·Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structure, and other contents described herein at any time without notice in order to improve design or reliability. Manufacturing locations are also subject to change without notice.

·Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which does not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:

(i) The devices in this publication are designed for use in general electronic equipment designs such as:

- Personal computers
- 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

with equipment that requires higher reliability such as:

- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)

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

(iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:

- Space applications
- Telecommunication equipment [trunk lines]
- Nuclear power control equipment
- Medical and other life support equipment (e.g., scuba).

·If the SHARP devices listed in this publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Law of Japan, it is necessary to obtain approval to export such SHARP devices.

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