

PC852XNNSZ1H Series

DIP 4pin Darlington Phototransistor Output, High Collector-emitter Voltage Photocoupler



■ Description

PC852XNNSZ1H Series contains an IRED optically coupled to a phototransistor.

It is packaged in a 4-pin DIP, available in SMT gull-wing lead-form option.

Input-output isolation voltage(rms) is 5.0kV.

Collector-emitter voltage is 350V and CTR is MIN. 1,000% at input current of 1mA.

■ Features

1. 4pin DIP package
2. Double transfer mold package
(Ideal for Flow Soldering)
3. High collector-emitter voltage (V_{CEO} : 350V)
4. Darlington phototransistor output
(CTR : MIN. 1,000% at $I_F=1mA$, $V_{CE}=2V$)
5. High isolation voltage between input and output
($V_{iso(rms)}$: 5kV)
6. Lead-free and RoHS directive compliant

■ Agency approvals/Compliance

1. Recognized by UL1577, file No. E64380
(as model No. **PC852**)
2. Package resin : UL flammability grade (94V-0)

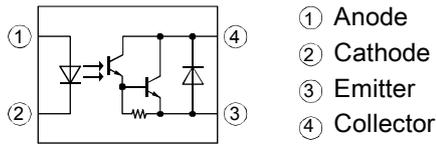
■ Applications

1. Telephone line interface/isolation
2. Interface to power supply circuit
3. Controller for SSRs, DC motors

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.

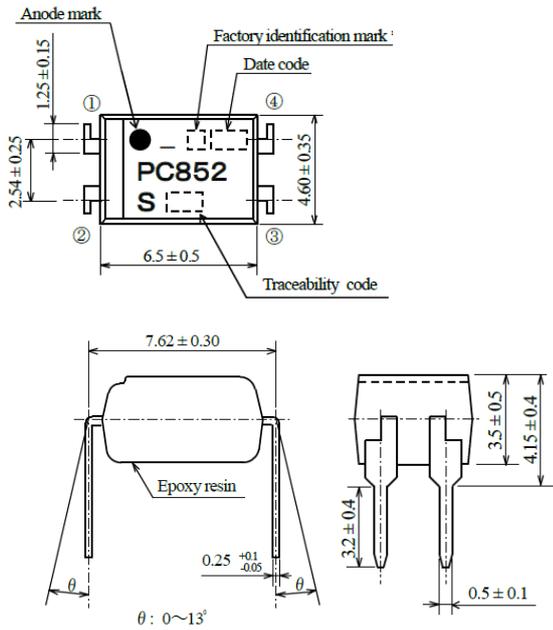
■ Internal Connection Diagram



■ Outline

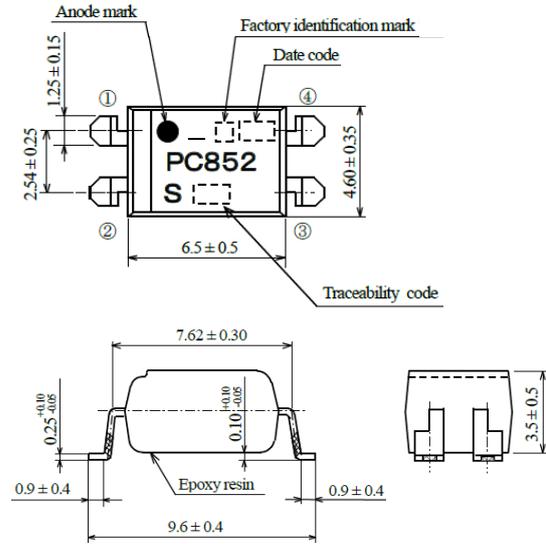
(Unit : mm)

1 . Through-Hole
[ex. PC852XNNSZ1H]



Product mass : approx. 0.23g

2 . SMT Gullwing Lead-Form
[ex . PC852XNNIP1H]



Product mass : approx. 0.22g

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_a=25°C)

| | Parameter | Symbol | Rating | Unit |
|--------|-----------------------------|-----------------------|-------------|------|
| Input | Forward current | I _F | 50 | mA |
| | *1 Peak forward current | I _{FM} | 1 | A |
| | Reverse voltage | V _R | 6 | V |
| | Power dissipation | P | 70 | mW |
| Output | Collector-emitter voltage | V _{CEO} | 350 | V |
| | Emitter-collector voltage | V _{ECO} | 0.1 | V |
| | Collector current | I _C | 150 | mA |
| | Collector power dissipation | P _C | 150 | mW |
| | Total power dissipation | P _{tot} | 200 | mW |
| | *2 Isolation voltage | V _{iso (ms)} | 5.0 | kV |
| | Operating temperature | T _{opr} | -30 to +100 | °C |
| | Storage temperature | T _{stg} | -55 to +125 | °C |
| | *3 Soldering temperature | T _{sol} | 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_a=25°C)

| Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit | |
|--------------------------|--------------------------------------|----------------------|---|---|--------------------|------|------|----|
| Input | Forward voltage | V _F | I _F =10mA | - | 1.2 | 1.4 | V | |
| | Reverse Current | I _R | V _R =4V | - | - | 10 | μA | |
| | Terminal capacitance | C _t | V=0, f=1kHz | - | 30 | 250 | pF | |
| Output | Dark current | I _{CEO} | V _{CE} =200V, I _F =0 | - | - | 200 | nA | |
| | Collector-emitter breakdown voltage | BV _{CEO} | I _C =0.1mA, I _F =0 | 350 | - | - | V | |
| Transfer characteristics | Collector current | I _C | I _F =1mA, V _{CE} =2V | 10 | 40 | 150 | mA | |
| | Collector-emitter saturation voltage | V _{CE(sat)} | I _F =20mA, I _C =100mA | - | - | 1.2 | V | |
| | Isolation resistance | R _{ISO} | DC500V, 40 to 60%RH | 5×10 ¹⁰ | 1×10 ¹¹ | - | Ω | |
| | Floating capacitance | C _f | V=0, f=1MHz | - | 0.6 | 1.0 | pF | |
| | Cut-off frequency | f _c | V _{CE} =2V, I _C =20mA, R _L =100Ω, -3dB | 1 | 7 | - | kHz | |
| | Response time | Rise time | t _r | V _{CE} =2V, I _C =20mA, R _L =100Ω | - | 100 | 300 | μs |
| | | Fall time | t _f | | - | 20 | 100 | μs |

■ Model Line-up

| | | | |
|-----------|---------------------|-------------|---|
| Lead Form | Through-Hole | Rank mark | I _C [mA] (I _F =1mA, V _{CE} =2V, T _a =25°C) |
| Package | Sleeve | | |
| | 100pcs/sleeve | | |
| Model No. | PC852XNNSZ1H | with or “_” | 10 ~ 150 |
| | PC852X1NSZ1H | J | 40 ~ 150 |

| | | | |
|-----------|---------------------|-----------|---|
| Lead Form | SMT Gullwing | Rank mark | I _C [mA] (I _F =1mA, V _{CE} =2V, T _a =25°C) |
| Package | Taping | | |
| | 2,000pcs/reel | | |
| Model No. | PC852XNNIP1H | “_” | 10 ~ 150 |

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

Fig.1 Forward Current vs. Ambient Temperature

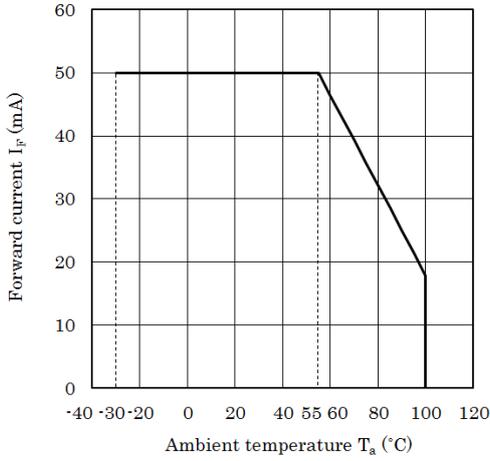


Fig.2 Diode Power Dissipation vs. Ambient Temperature

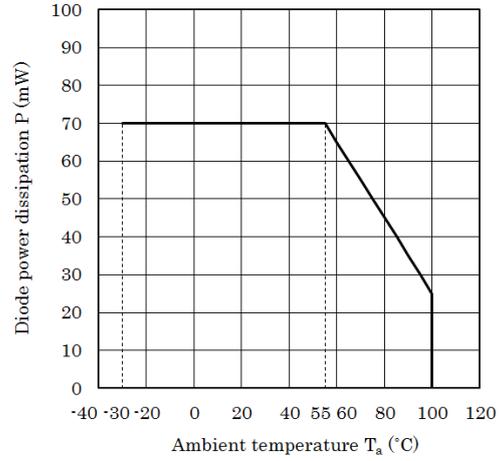


Fig.3 Collector Power Dissipation vs. Ambient Temperature

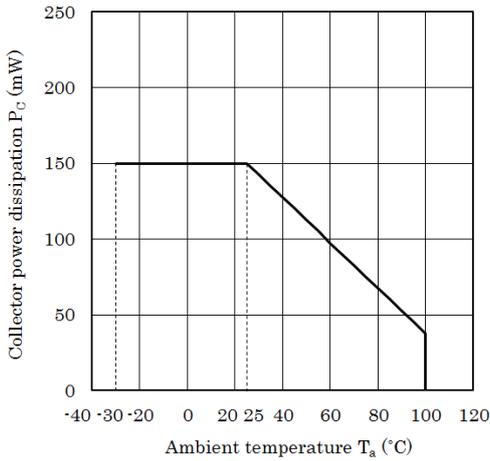


Fig.4 Total Power Dissipation vs. Ambient Temperature

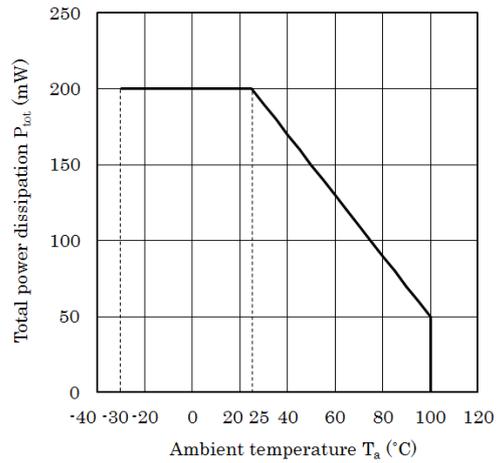


Fig.5 Peak Forward Current vs. Duty Ratio

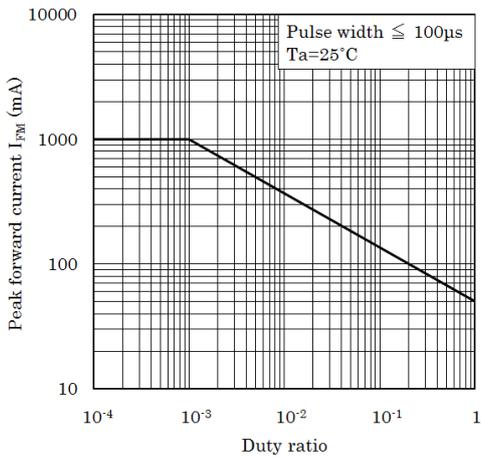


Fig.6 Forward Current vs. Forward Voltage

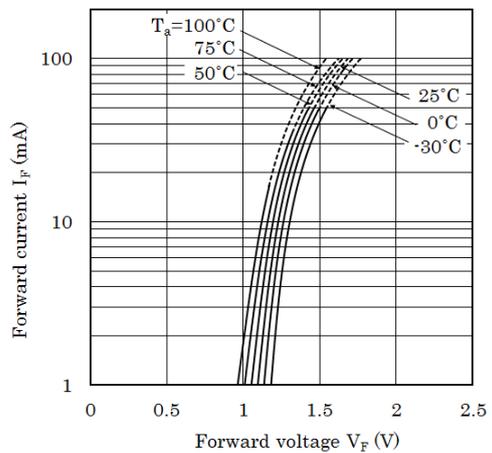


Fig.7 Current Transfer Ratio vs. Forward Current

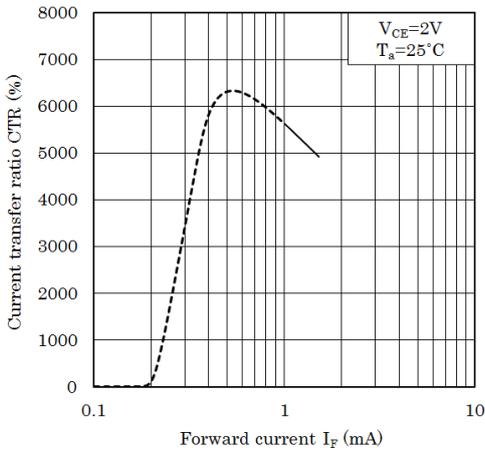


Fig.8 Collector Current vs. Collector-emitter Voltage

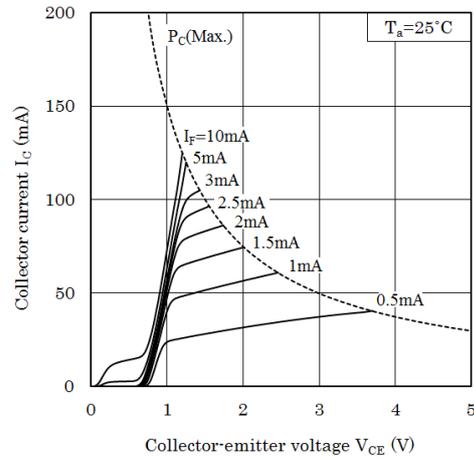


Fig.9 Relative Current Transfer Ratio vs. Ambient Temperature

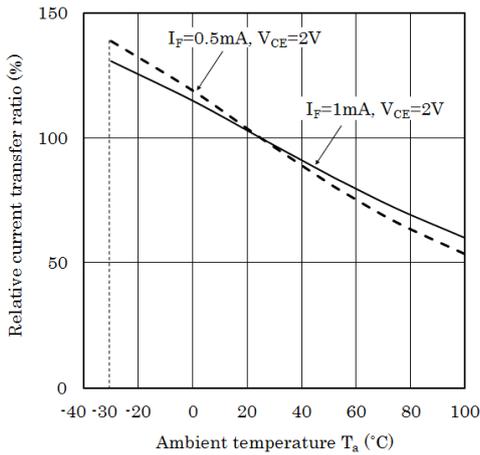


Fig.10 Collector - emitter Saturation Voltage vs. Ambient Temperature

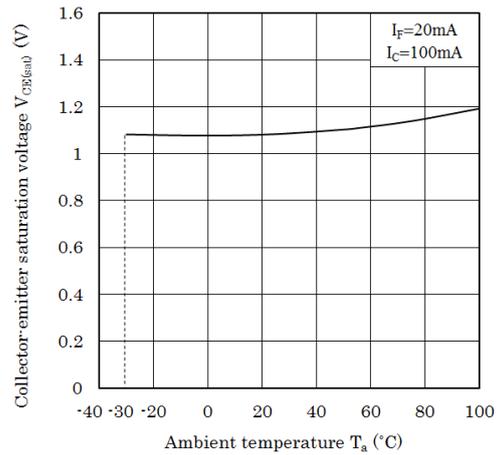


Fig.11 Collector Dark Current vs. Ambient Temperature

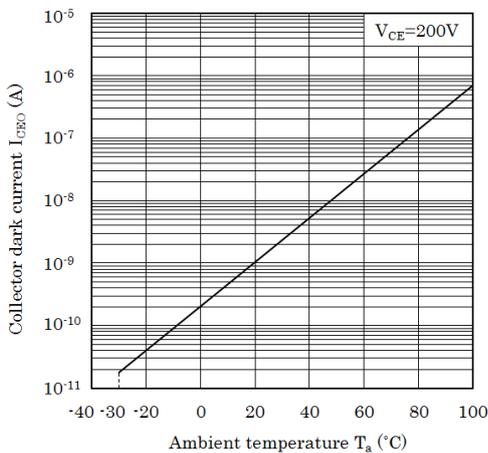


Fig.12 Collector-emitter Saturation Voltage vs. Forward Current

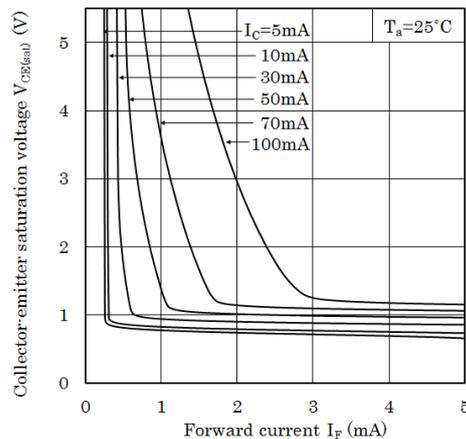


Fig.13 Response Time vs. Load Resistance

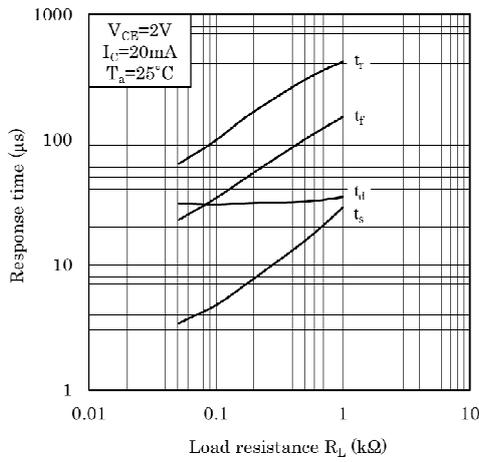


Fig.14 Test Circuit for Response Time

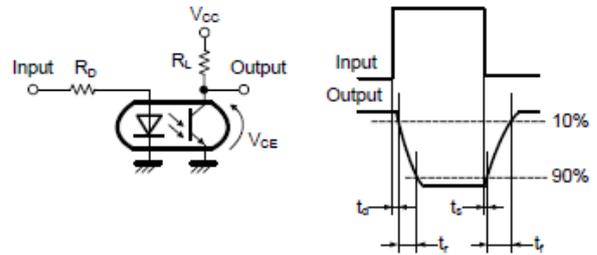


Fig.15 Frequency Response

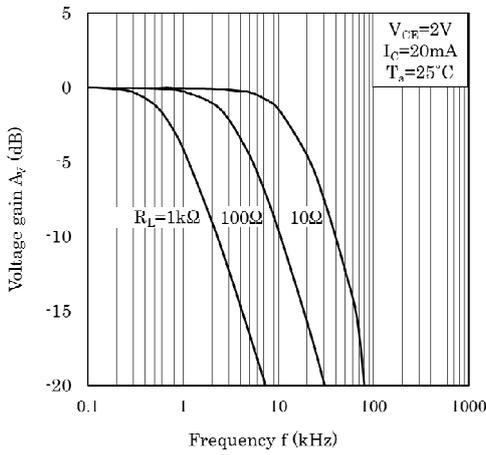
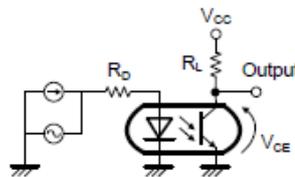


Fig.16 Test Circuit for Frequency Response



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.

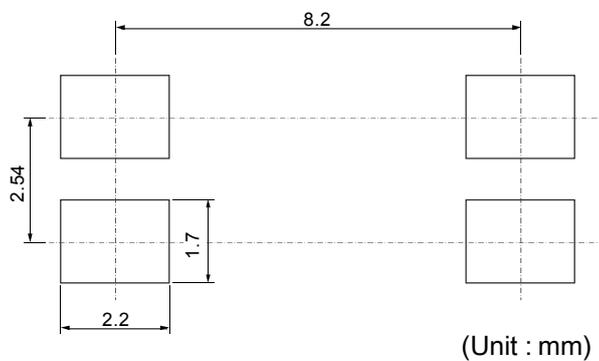
This product is not designed against irradiation and incorporates non-coherent IRED.

● 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



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

■ Manufacturing Guidelines

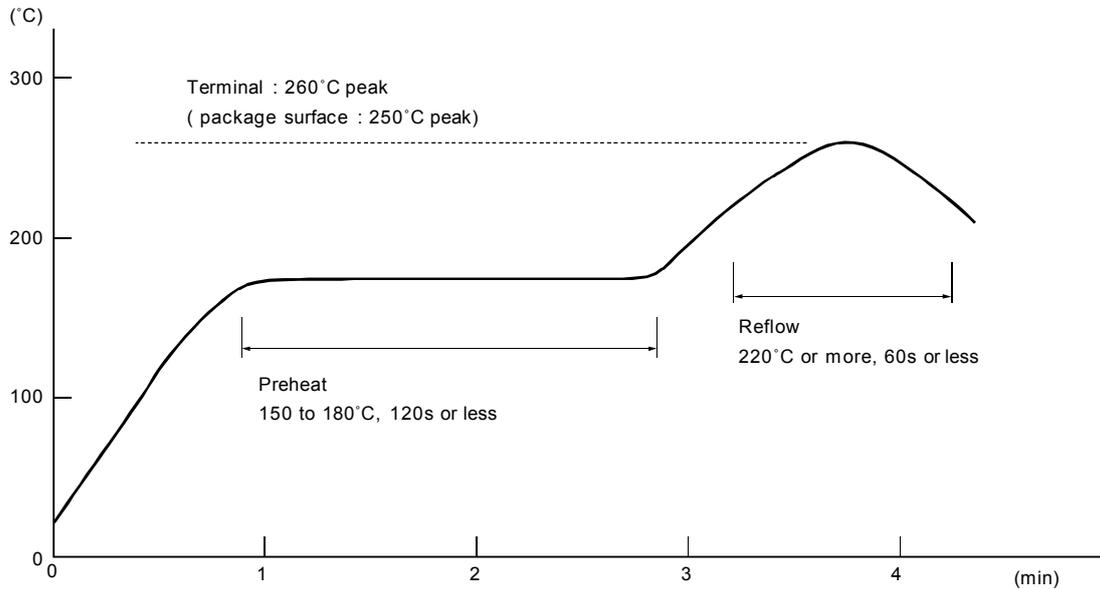
● Soldering Method

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 notices

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).

| Category | Hazardous Substances | | | | | |
|--------------|----------------------|--------------|--------------|---|--------------------------------|---------------------------------------|
| | Lead (Pb) | Mercury (Hg) | Cadmium (Cd) | Hexavalent chromium (Cr ⁶⁺) | 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

Through-Hole

Package materials

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

Stopper : EPM

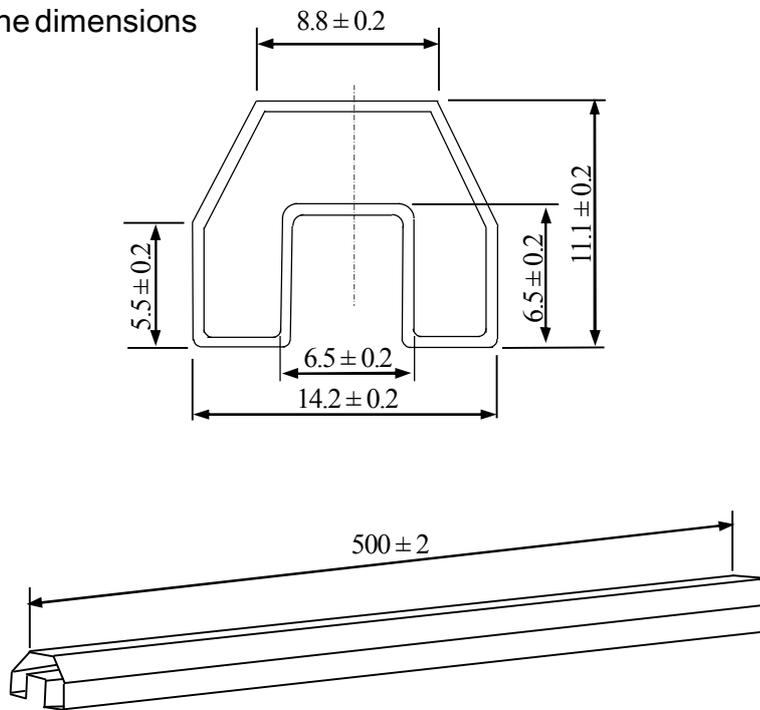
Package method

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



(Unit : mm)

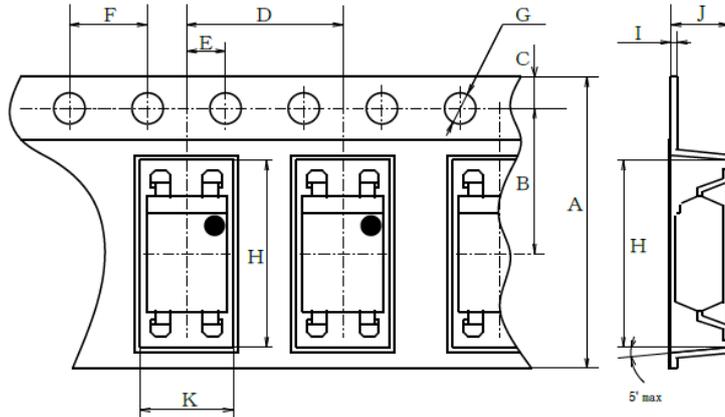
• **Tape and Reel package**

SMT Gullwing

Package materials

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

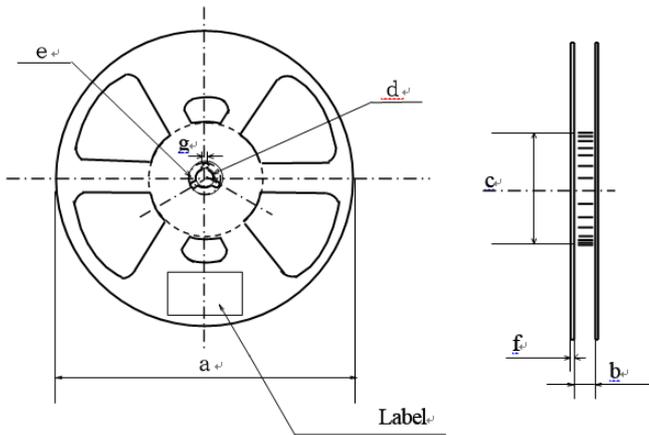
Carrier tape structure and Dimensions



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 | ϕ 1.5 $^{+0.1}_{-0.0}$ |
| H | I | J | K | | | |
| 10.3 \pm 0.1 | 0.40 \pm 0.05 | 4.0 \pm 0.1 | 5.3 \pm 0.1 | | | |

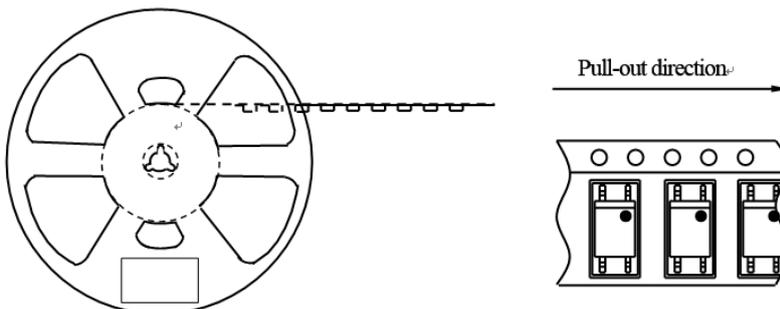
Reel structure and Dimensions



Dimensions List (Unit : mm)

| | | | |
|---------------------|----------------|--------------------|-----------------------|
| a | b | c | d |
| ϕ 330 | 17.5 \pm 1.5 | ϕ 100 \pm 1 | ϕ 13.0 \pm 0.5 |
| e | f | g | |
| ϕ 21.0 \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.

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(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).

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