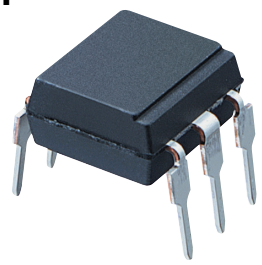
# PC725V0NSZXF Series

## DIP 6 pin Darlington Phototransistor output, High Collector-emitter Voltage, High Power Photocoupler



## ■ Description

**PC725V0NSZXF Series** contains an IRED optically coupled to a phototransistor.

It is packaged in a 6 pin DIP, available in SMT gullwing lead-form option.

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

Collector-emitter voltage is 300V, CTR is MIN. 1 000% at input current of 1mA and collector power dissipation is 300mW.

## ■ Features

1. 6 pin DIP package
2. Double transfer mold package (Ideal for Flow Soldering)
3. High collector-emitter voltage ($V_{CEO}$:300V)
4. Darlington phototransistor output (CTR : MIN. 1 000% at $I_F$=1mA, $V_{CE}$=2V)
5. Large collector power dissipation ($P_C$:300mW)
6. High isolation voltage between input and output ($V_{iso(rms)}$ : 5.0kV)
7. RoHS directive compliant

## ■ Agency approvals/Compliance

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **PC725V**)
2. Approved by VDE, DIN EN60747-5-2(*) (as an option), file No. 40008189 (as model No. **PC725V**)
3. Package resin : UL flammability grade (94V-0)

(*)DIN EN60747-5-2 : successor standard of DIN VDE0884

## ■ Applications

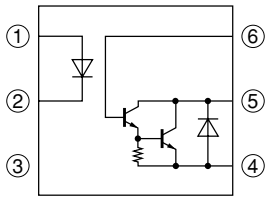
1. Home appliances
2. Programmable controllers
3. Personal computer peripherals





Sheet No.: D2-A04502FEN
Date Jun. 30. 2005

## ■ Internal Connection Diagram

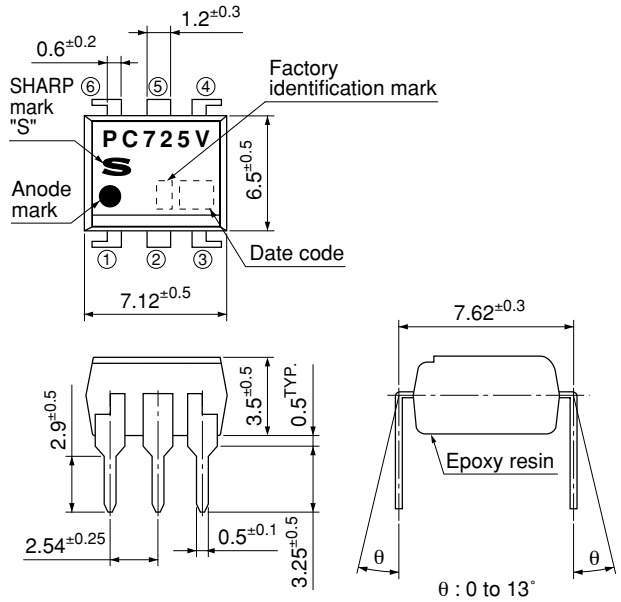



① Anode
② Cathode
③ NC
④ Emitter
⑤ Collector
⑥ Base

## ■ Outline Dimensions

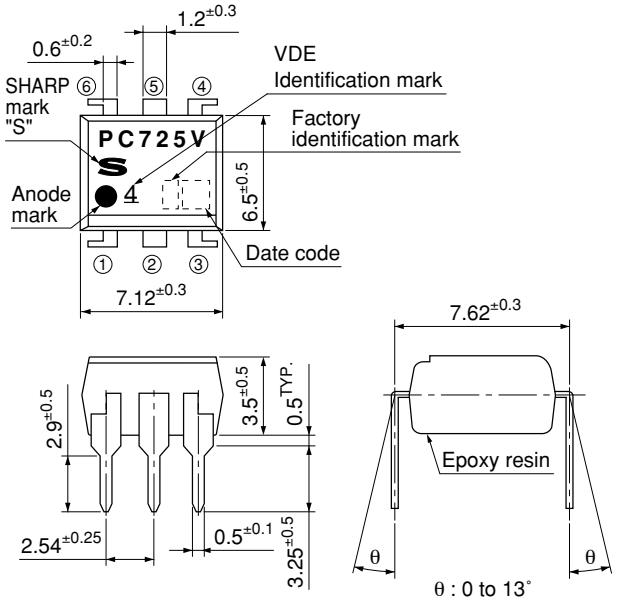
(Unit : mm)

1. Through-Hole [ex. **PC725V0NSZXF**]



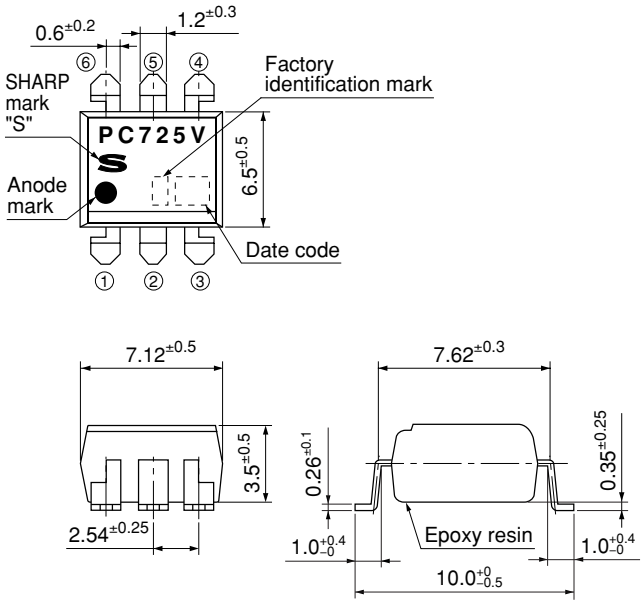

Product mass : approx. 0.36g

2. Through-Hole (VDE option) [ex. **PC725V0YSZXF**]



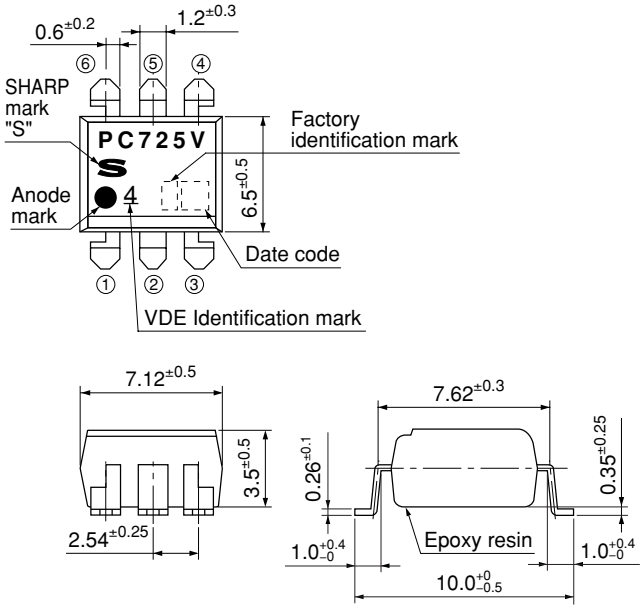

Product mass : approx. 0.36g

3. SMT Gullwing Lead-Form [ex. **PC725V0NIPXF**]




Product mass : approx. 0.35g

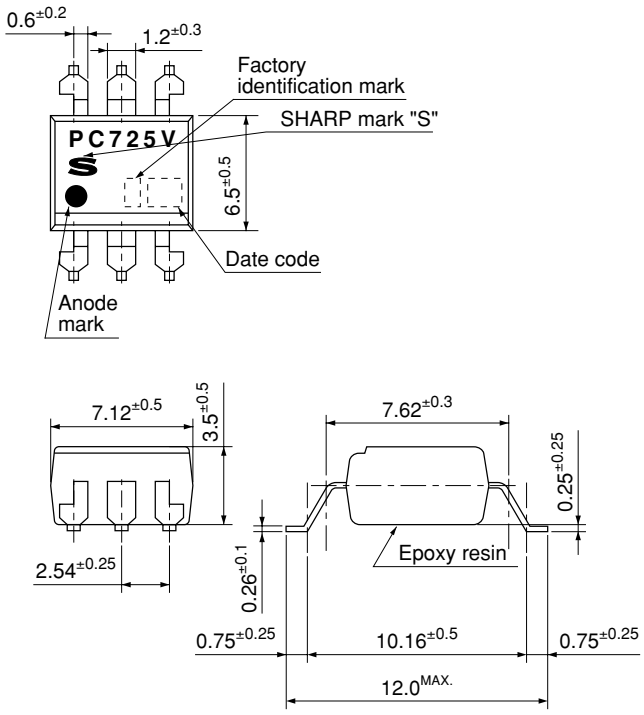
4. SMT Gullwing Lead-Form (VDE option) [ex. **PC725V0YIPXF**]




Product mass : approx. 0.35g

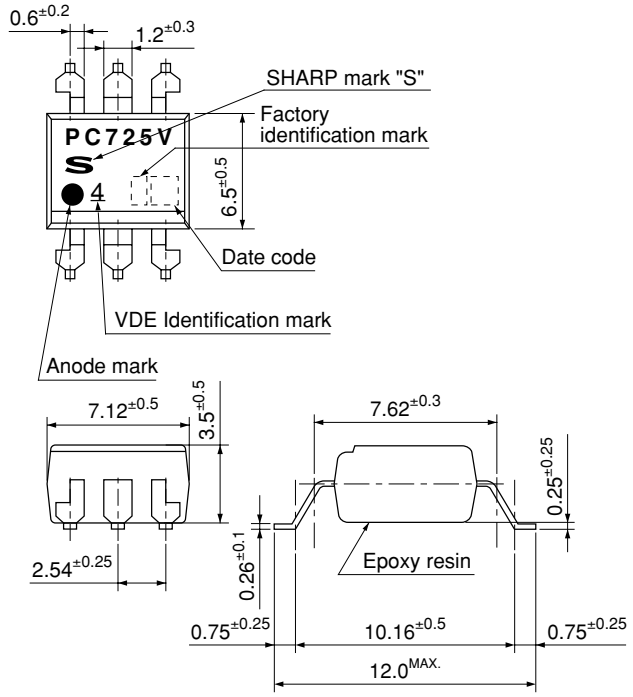
(Unit : mm)

5. Wide SMT Gullwing Lead-Form
[ex. **PC725V0NUZXF**]




Product mass : approx. 0.35g

6. Wide SMT Gullwing Lead-Form (VDE option)
[ex. **PC725V0YUZXF**]




Product mass : approx. 0.35g

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

## Date code (2 digit)

| 1st digit | | | | 2nd digit | |
|---|---|---|---|---|---|
| Year of production | | | | Month of production | |
| A.D. | Mark | A.D | Mark | Month | Mark |
| 1990 | A | 2002 | P | January | 1 |
| 1991 | B | 2003 | R | February | 2 |
| 1992 | C | 2004 | S | March | 3 |
| 1993 | D | 2005 | T | April | 4 |
| 1994 | E | 2006 | U | May | 5 |
| 1995 | F | 2007 | V | June | 6 |
| 1996 | H | 2008 | W | July | 7 |
| 1997 | J | 2009 | X | August | 8 |
| 1998 | K | 2010 | A | September | 9 |
| 1999 | L | 2011 | B | October | O |
| 2000 | M | 2012 | C | November | N |
| 2001 | N | ⋮ | ⋮ | December | D |

repeats in a 20 year cycle

## Factory identification mark

| Factory identification Mark | Country of origin |
|---|---|
| no mark | Japan |
| ■ | |
| ◢ | Indonesia |
| ◥ | China |

* This factory marking is for identification purpose only.
Please Contact the local SHARP sales reprsentative to see the actual status of the production.

## Rank mark

There is no rank mark indicator.

## ■ 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 | $V_{CEO}$ | 300 | V |
| | Collector-base voltage | $V_{CBO}$ | 300 | V |
| | Emitter-base voltage | $V_{EBO}$ | 6 | V |
| | Collector current | $I_C$ | 150 | mA |
| | Collector current (reverse) | $-I_C$ | 10 | mA |
| | Collector power dissipation | $P_C$ | 300 | mW |
| Total power dissipation | | $P_{tot}$ | 350 | mW |
| Operating temperature | | $T_{opr}$ | −25 to +100 | ˚C |
| Storage temperature | | $T_{stg}$ | −40 to +125 | ˚C |
| *2 Isolation voltage | | $V_{iso\ (rms)}$ | 5 | kV |
| *3 Soldering temperature | | $T_{sol}$ | 260 | ˚C |

*1 Pulse width≤100μs, Duty ratio : 0.001
*2 40 to 60%RH, AC for 1minute, f=60Hz
*3 For 10s

## ■ Electro-optical Characteristics

($T_a$=25˚C)

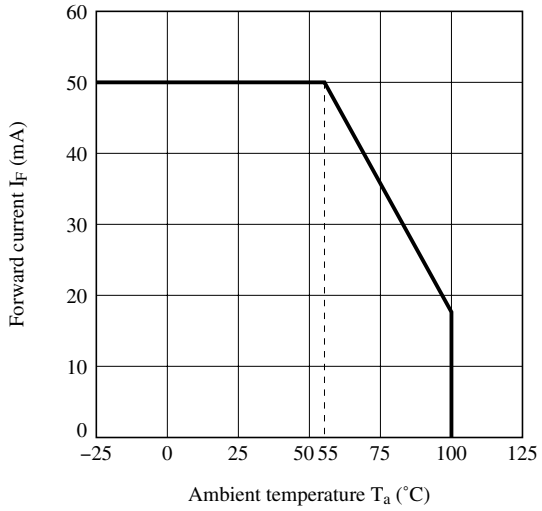
| | Parameter | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|---|
| Input | Forward voltage | | $V_F$ | $I_F$=10mA | – | 1.2 | 1.4 | V |
| | Peak forward voltage | | $V_{FM}$ | $I_{FM}$=0.5V | – | – | 3.0 | V |
| | Reverse current | | $I_R$ | $V_R$=4V | – | – | 10 | μA |
| | Terminal capacitance | | $C_t$ | V=0, f=1kHz | – | 30 | 250 | pF |
| Output | Collector dark current | | $I_{CEO}$ | $V_{CE}$=200V, $I_F$=0 | – | – | 1 000 | nA |
| | Collector-emitter breakdown voltage | | $BV_{CEO}$ | $I_C$=0.1mA, $I_F$=0 | 300 | – | – | V |
| | Emitter-base breakdown voltage | | $BV_{EBO}$ | $I_E$=10μA, $I_F$=0 | 6 | – | – | V |
| | Collector-base breakdown voltage | | $BV_{CBO}$ | $I_C$=0.1mA, $I_F$=0 | 300 | – | – | V |
| Transfer characteristics | Current transfer ratio | | $I_C$ | $I_F$=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 | $5\times10^{10}$ | $1\times10^{11}$ | – | 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

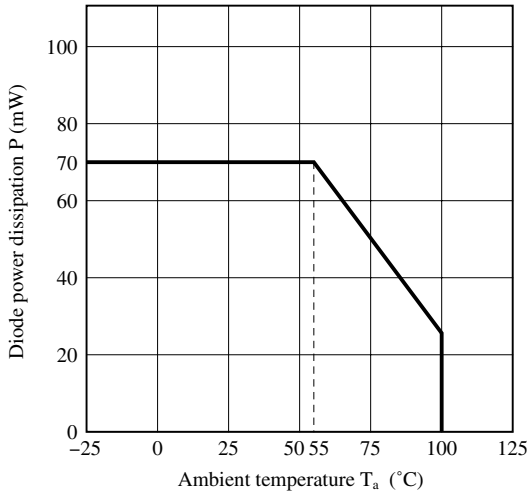
| Lead Form | Through-Hole | | SMT Gullwing | | Wide SMT Gullwing | | | |
|---|---|---|---|---|---|---|---|---|
| Package | Sleeve | | | | Taping | | | |
| | 50pcs/sleeve | | | | 1 000pcs/reel | | | |
| DIN EN60747-5-2 | ——— | Approved | ——— | Approved | ——— | Approved | ——— | Approved |
| Model No. | PC725V0NSZXF | PC725V0YSZXF | PC725V0NIZXF | PC725V0YIZXF | PC725V0NIPXF | PC725V0YIPXF | PC725V0NUZXF | PC725V0YUZXF |

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

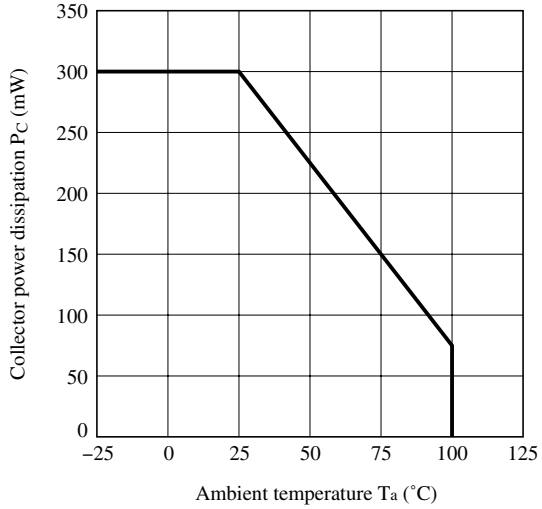
## Fig.1 Forward Current vs. Ambient Temperature



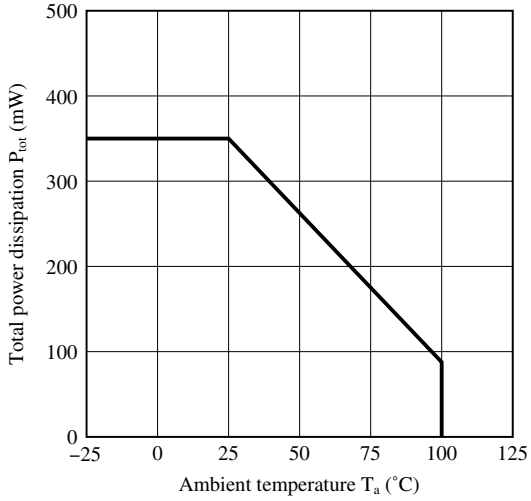

## Fig.2 Diode Power Dissipation vs. Ambient Temperature



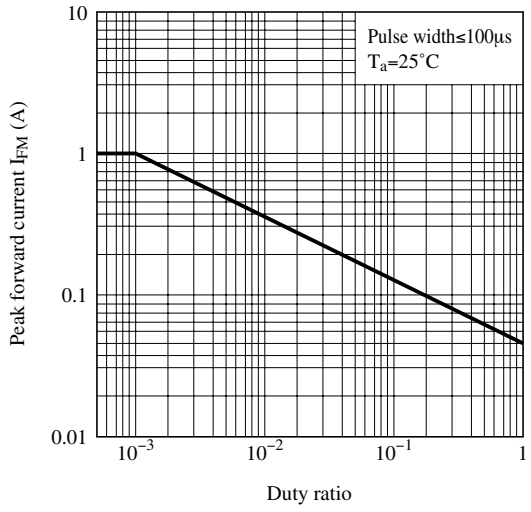

## Fig.3 Collector Power Dissipation vs. Ambient Temperature



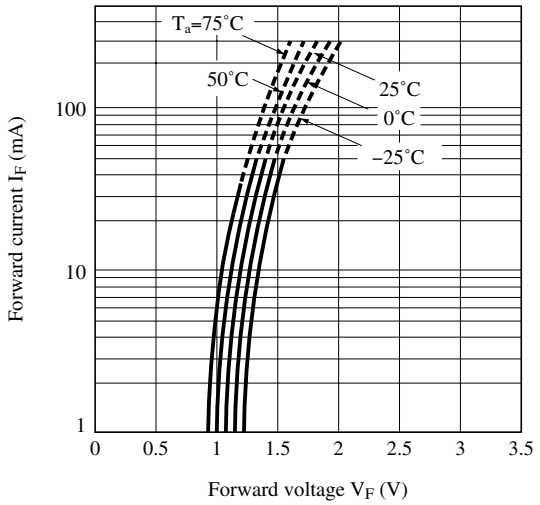

## Fig.4 Total Power Dissipation vs. Ambient Temperature



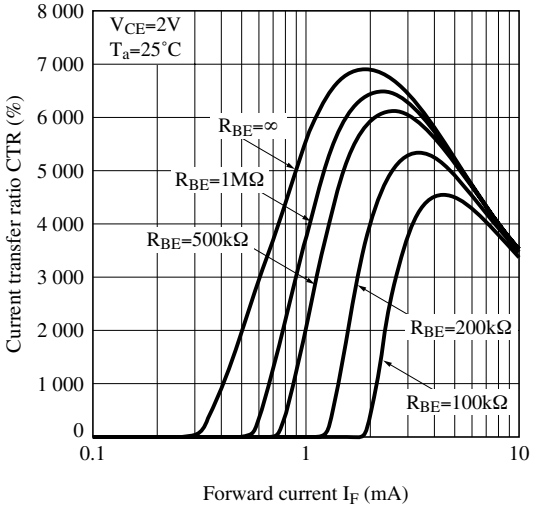

## Fig.5 Peak Forward Current vs. Duty Ratio



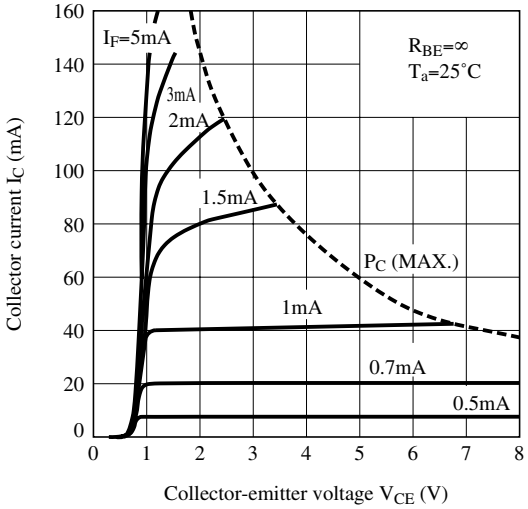

## Fig.6 Forward Current vs. Forward Voltage



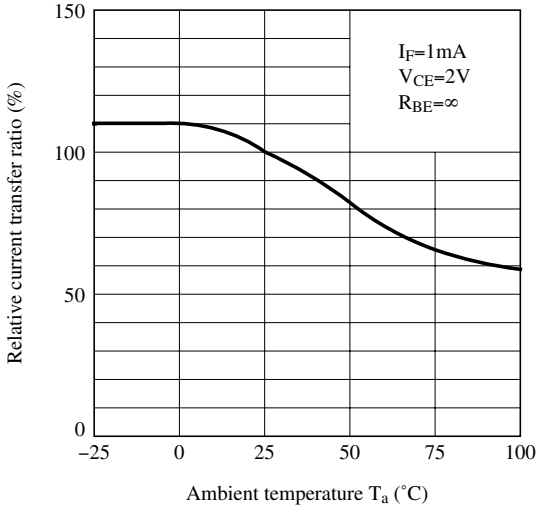
## Fig.7 Current Transfer Ratio vs. Forward Current



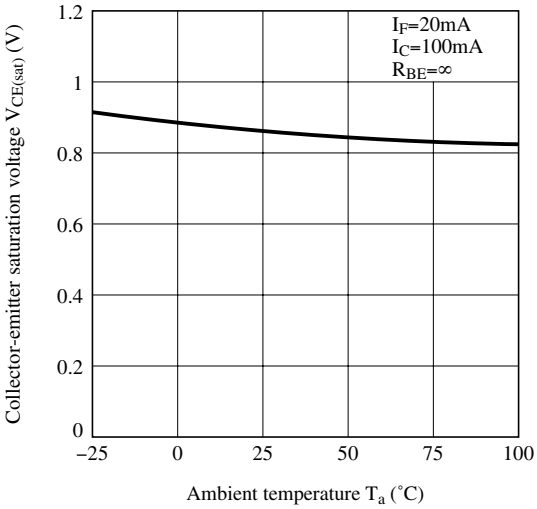

## Fig.8 Collector Current vs. Collector-emitter Voltage



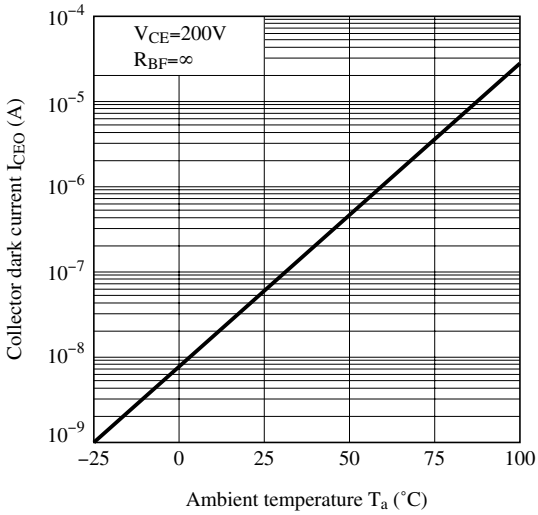

## Fig.9 Relative Current Transfer Ratio vs. Ambient Temperature



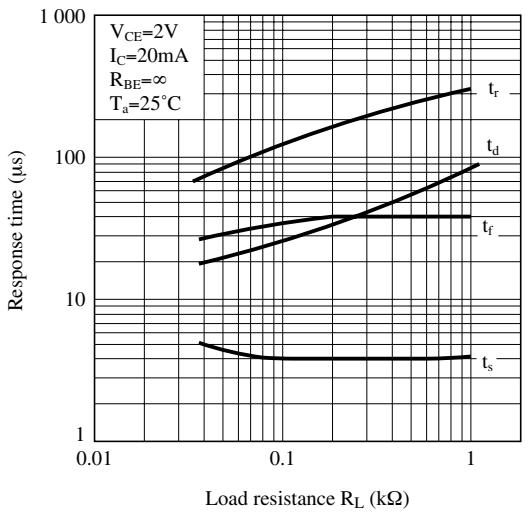

## Fig.10 Collector - emitter Saturation Voltage vs. Ambient Temperature



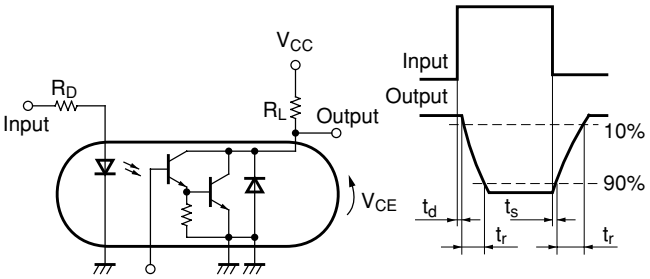

## Fig.11 Collector Dark Current vs. Ambient Temperature




## Fig.12 Response Time vs. Load Resistance

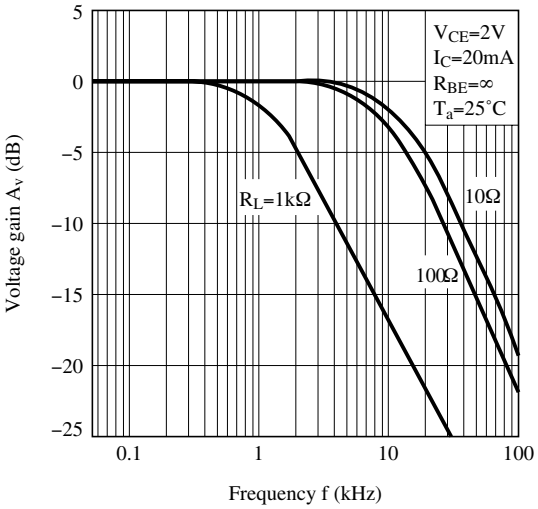


## Fig.13 Test Circuit for Response Time

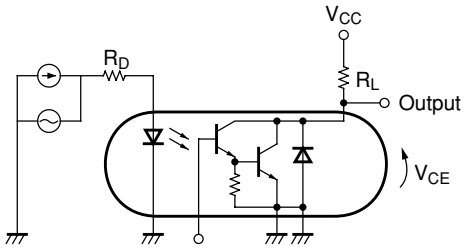



Please refer to the conditions in Fig.12

## Fig.14 Frequency Response




## Fig.15 Test Circuit for Frequency Response




Please refer to the conditions in Fig.14

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 $I_F$<1.0mA, CTR variation may increase.
Please make design considering this fact.

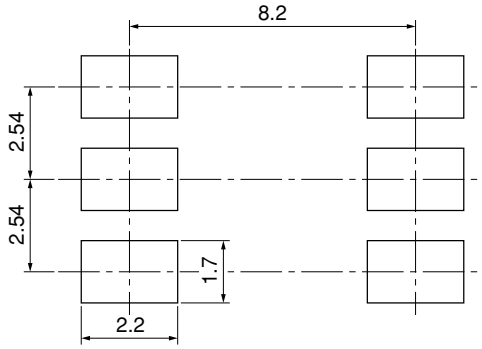
This product is not designed against irradiation and incorporates non-coherent IRED.

### ● Degradation

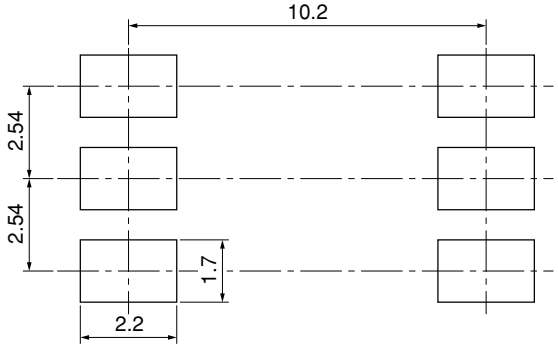
In general, the emission of the IRED used in photocouplers will degrade over time.
In the case of long term operation, please take the general IRED degradation (50% degradation over 5 years) into the design consideration.

### ● Recommended Foot Print (reference)

SMT Gullwing lead-form




Wide SMT Gullwing lead-form




(Unit : mm)

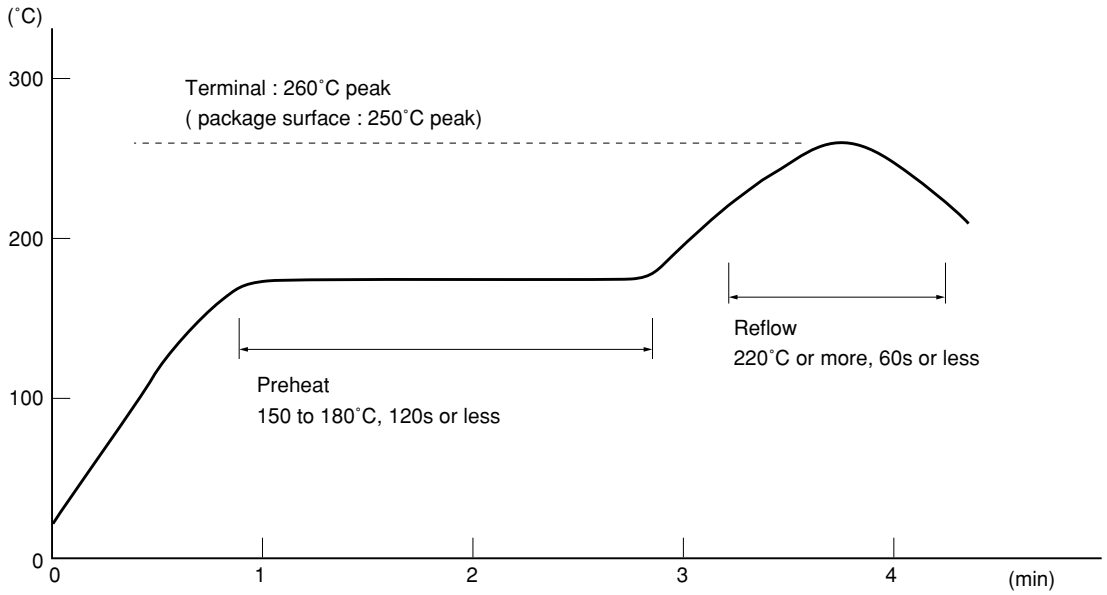
☆ For additional design assistance, please review our corresponding Optoelectronic Application Notes.

## ■ 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 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 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

### ● Sleeve package

Package materials

Sleeve : HIPS (with anti-static material)

Stopper : Styrene-Elastomer

Package method

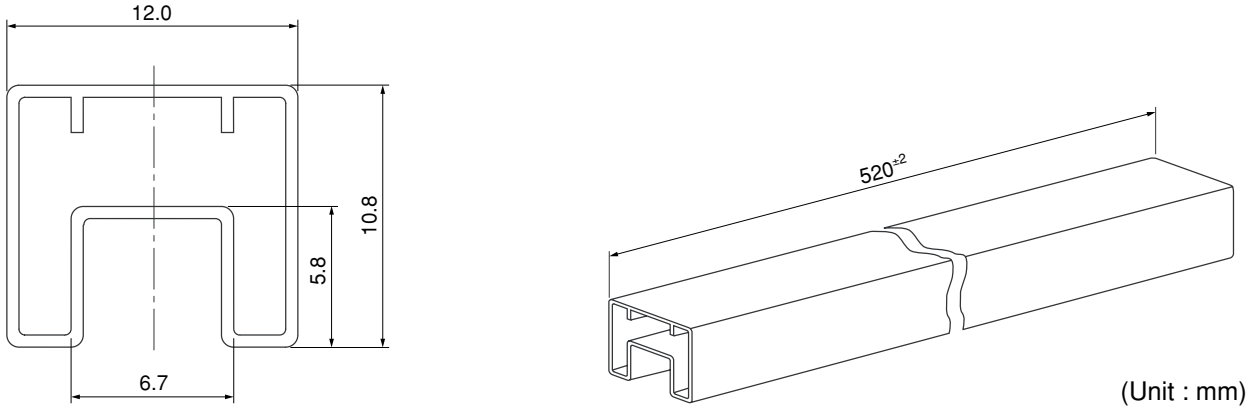
MAX. 50 pcs. of products shall be packaged in a sleeve.

Both ends shall be closed by tabbed and tabless stoppers.

The product shall be arranged in the sleeve with its anode mark on the tabless stopper side.

MAX. 20 sleeves in one case.

Sleeve outline dimensions




(Unit : mm)

(Unit : mm)

## ● Tape and Reel package

### 1. SMT Gullwing

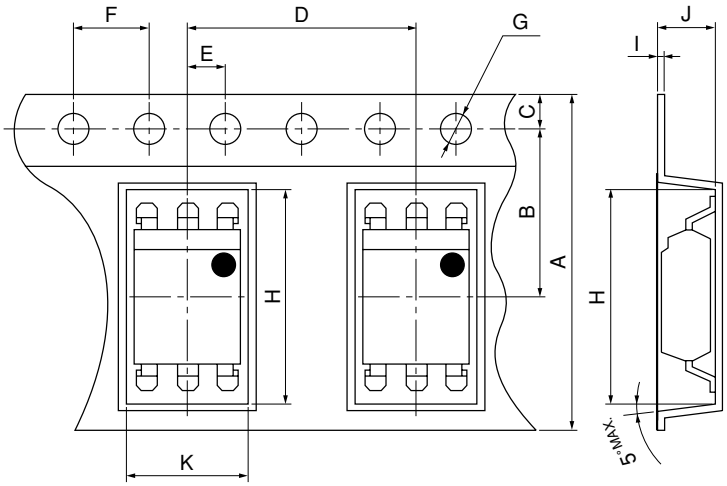
Package materials

Carrier tape : A-PET (with anti-static material)

Cover tape : PET (three layer system)

Reel : PS

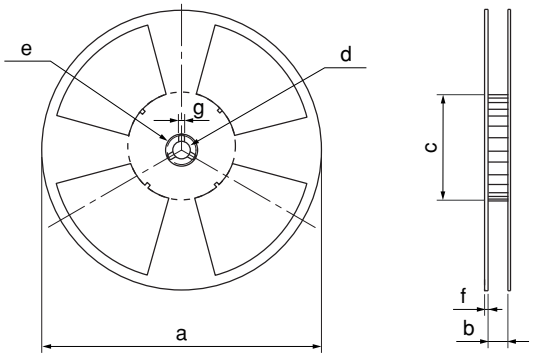
Carrier tape structure and Dimensions




Dimensions List (Unit:mm)

| A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|
| $16.0^{\pm0.3}$ | $7.5^{\pm0.1}$ | $1.75^{\pm0.1}$ | $12.0^{\pm0.1}$ | $2.0^{\pm0.1}$ | $4.0^{\pm0.1}$ | $\phi1.5^{+0.1}_{-0}$ |
| H | I | J | K | | | |
| $10.4^{\pm0.1}$ | $0.4^{\pm0.05}$ | $4.2^{\pm0.1}$ | $7.8^{\pm0.1}$ | | | |

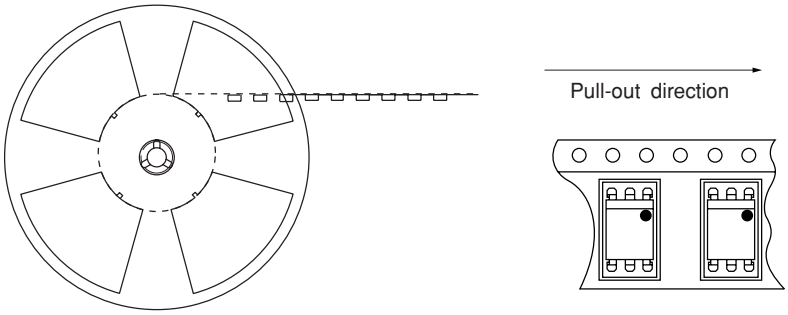
Reel structure and Dimensions




Dimensions List (Unit : mm)

| a | b | c | d |
|---|---|---|---|
| 330 | $17.5^{\pm1.5}$ | $100^{\pm1.0}$ | $13^{\pm0.5}$ |
| e | f | g | |
| $23^{\pm1.0}$ | $2.0^{\pm0.5}$ | $2.0^{\pm0.5}$ | |

Direction of product insertion




[Packing : 1 000pcs/reel]

## 2. Wide SMT Gullwing

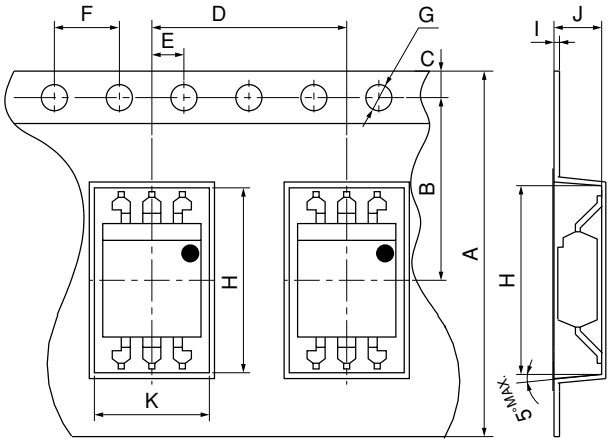
### Package materials

Carrier tape : A-PET (with anti-static material)

Cover tape : PET (three layer system)

Reel : PS

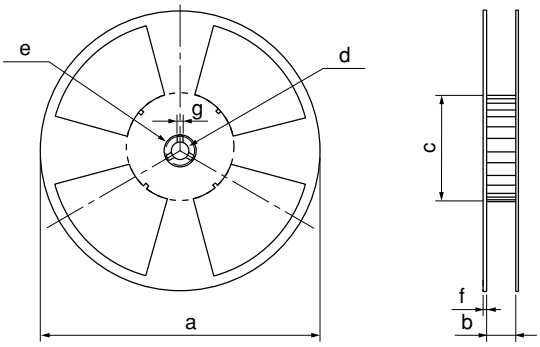
### Carrier tape structure and Dimensions




Dimensions List (Unit : mm)

| A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|
| $24.0^{\pm0.3}$ | $11.5^{\pm0.1}$ | $1.75^{\pm0.1}$ | $12.0^{\pm0.1}$ | $2.0^{\pm0.1}$ | $4.0^{\pm0.1}$ | $\phi1.5^{+0.1}_{-0}$ |
| H | I | J | K | | | |
| $12.2^{\pm0.1}$ | $0.4^{\pm0.05}$ | $4.1^{\pm0.1}$ | $7.6^{\pm0.1}$ | | | |

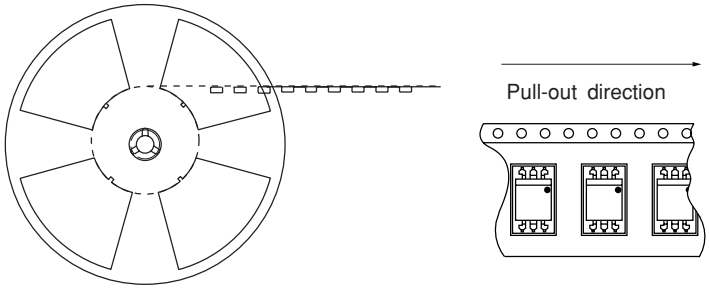
### Reel structure and Dimensions




Dimensions List (Unit : mm)

| a | b | c | d |
|---|---|---|---|
| 330 | $25.5^{\pm1.5}$ | $100^{\pm1.0}$ | $13^{\pm0.5}$ |
| e | f | g | |
| $23^{\pm1.0}$ | $2.0^{\pm0.5}$ | $2.0^{\pm0.5}$ | |

### Direction of product insertion




[Packing : 1 000pcs/reel]

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--- Telecommunication equipment [terminal]
--- Test and measurement equipment
--- Industrial control
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--- Gas leakage sensor breakers
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