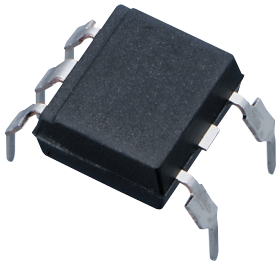
# PC3SF11YVZ Series

*Zero cross type is also available.
(**PC3SF21YVZ Series**)

## $V_{DRM}$ : 600V, Reinforced insulation type
## Non-zero cross type
## DIP 6pin
## Phototriac Coupler for triggering



## ■ Description

**PC3SF11YVZ Series** reinforced insulation type Phototriac Coupler include an infrared emitting diode (IRED) optically coupled to an output Phototriac.

These devices feature full wave control and are ideal isolated drivers for medium to high current Triacs.

DIP package provides 5.0kV isolation from input to output with superior commutative noise immunity.

## ■ Features

1. High repetitive peak off-state voltage ($V_{DRM}$ : 600V)
2. Non-zero crossing functionality
3. $I_{FT}$ ranks available (see Model Line-up section in this datasheet)
4. 6 pin DIP package
5. Reinforced insulation type (MIN. 0.4mm internal separation)
6. Superior noise immunity (dV/dt : MIN. 1 000V/μs)
7. Lead-free components are also available (see Model Line-up section in this datasheet)
8. Double transfer mold construction (Ideal for Flow Soldering)
9. High isolation voltage between input and output ($V_{iso}$(rms) : 5.0kV)

## ■ Agency approvals/Compliance

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **3SF11**)
2. Approved by CSA, file No. CA95323 (as model No. **3SF11**)
3. Approved by BSI : BS-EN60065, file No. 6690/BS-EN60950, file No. 7421, (as model No. **3SF11**)
4. Approved by SEMKO, EN60065/EN60950, file No. 0033029 (as model No. **3SF11**)
5. Approved by DEMKO, EN60065/EN60950, file No. 310107 (as model No. **3SF11**)
6. Approved by FIMKO, EN60065/EN60950, file No. 15795 (as model No. **3SF11**)
7. Approved by VDE (*)(DIN EN 60747-5-2), file No. 40008189 (as model No. **3SF11**)
8. Package resin : UL flammability grade (94V-0)

(*) DIN EN60747-5-2 : successor standard of DIN VDE0884
Up to Date code "RD" (December 2003), approval of DIN VDE0884.
From Date code "S1" (January 2004), approval of DIN EN60747-5-2.

## ■ Applications

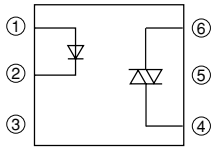
1. Triggering for Triacs used to switch on and off devices which require AC Loads.
   For example heaters, fans, motors, solenoids, and valves.
2. Triggering for Triacs used for implementing phase control in applications such as lighting control and temperature control (HVAC).
3. AC line control in power supply applications.





Sheet No.: D2-A08001EN
Date Mar. 31. 2004

## ■ Internal Connection Diagram

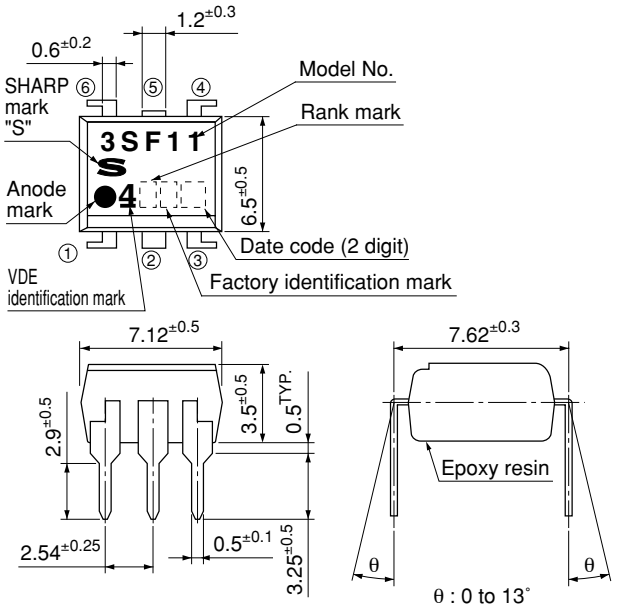


① Anode
② Cathode
③ NC
④ Anode/Cathode
⑤ No external connection
⑥ Cathode/Anode

## ■ Outline Dimensions

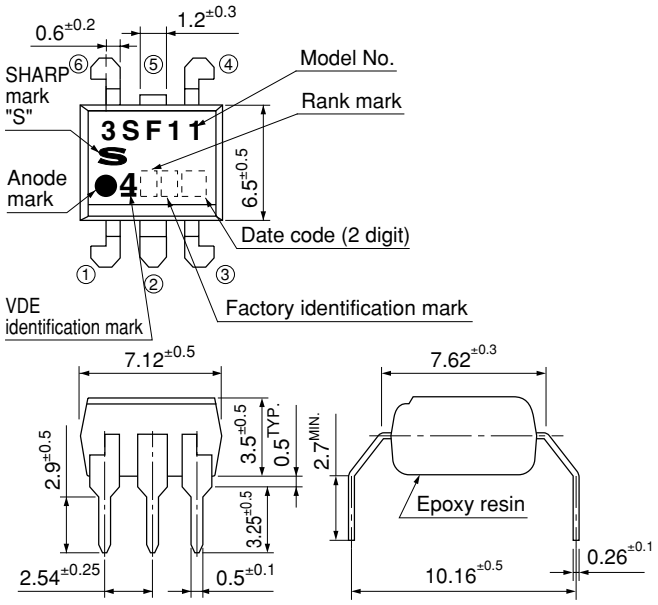
(Unit : mm)

1. Through-Hole [ex. **PC3SF11YTZ**]



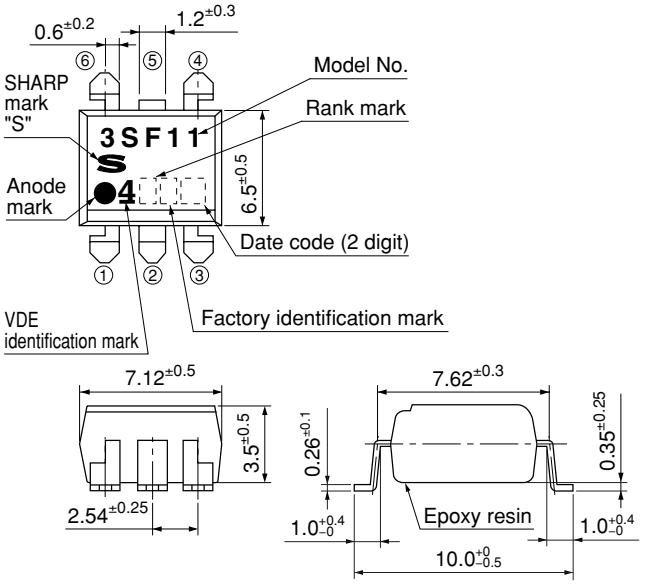

Product mass : approx. 0.35g

2. Wide Through-Hole Lead-Form [ex. **PC3SF11YVZ**]



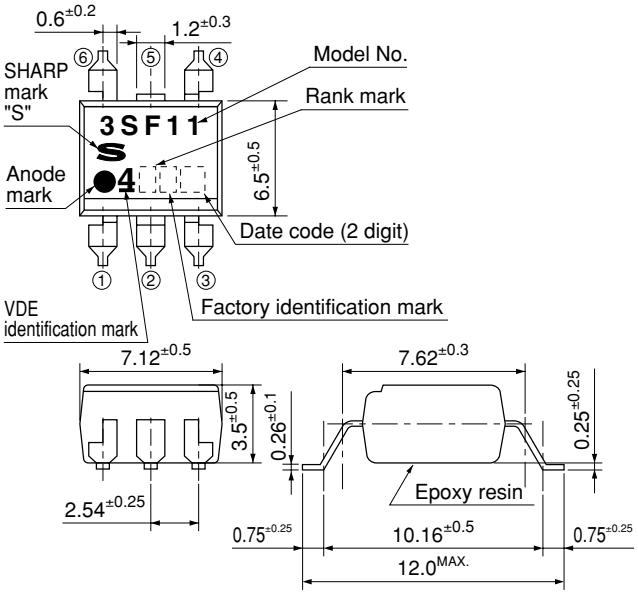

Product mass : approx. 0.35g

3. SMT Gullwing Lead-Form [ex. **PC3SF11YXP**]




Product mass : approx. 0.33g

4. Wide SMT Gullwing Lead-Form [ex. **PC3SF11YWP**]




Product mass : approx. 0.34g

∗Pin ⑤ is not allowed external connection

## 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 |
| ▽ | Philippines |
| ◥ | China |

* This factory marking is for identification purpose only.
Please contact the local SHARP sales representative to see the actural status of the production.

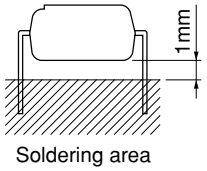
## Rank mark

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 |
| | Reverse voltage | $V_R$ | 6 | V |
| Output | RMS ON-state current | $I_T$(rms) | 0.1 | A |
| | Peak one cycle surge current | $I_{surge}$ | 1.2 *3 | A |
| | Repetitive peak OFF-state voltage | $V_{DRM}$ | 600 | V |
| *1 Isolation voltage | | $V_{iso}$(rms) | 5.0 | kV |
| Operating temperature | | $T_{opr}$ | −30 to +100 | ˚C |
| Storage temperature | | $T_{stg}$ | −55 to +125 | ˚C |
| *2 Soldering temperature | | $T_{sol}$ | 270 *4 | ˚C |




*1 40 to 60%RH, AC for 1minute, f=60Hz
*2 For 10s
*3 f=50Hz sine wave
*4 Lead solder plating models: 260˚C

## ■ Electro-optical Characteristics

($T_a$=25˚C)

| Parameter | | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|---|
| Input | Forward voltage | | $V_F$ | $I_F$=20mA | – | 1.2 | 1.4 | V |
| | Reverse current | | $I_R$ | $V_R$=3V | – | – | 10 | μA |
| Output | Repentitive peak OFF-state current | | $I_{DRM}$ | $V_D$=$V_{DRM}$ | – | – | 1 | μA |
| | ON-state voltage | | $V_T$ | $I_T$=0.1A | – | – | 2.5 | V |
| | Holding current | | $I_H$ | $V_D$=6V | 0.1 | – | 3.5 | mA |
| | Critical rate of rise of OFF-state voltage | | dV/dt | $V_D$=1/√2 ·$V_{DRM}$ | 1 000 | 2 000 | – | V/μs |
| Transfer characteristics | Minimum trigger current | Rank A | $I_{FT}$ | $V_D$=6V, $R_L$=100Ω | – | – | 10 | mA |
| | | Rank B | | | – | – | 7 | |
| | Isolation resistance | | $R_{ISO}$ | DC500V,40 to 60%RH | 5×$10^{10}$ | $10^{11}$ | – | Ω |
| | Turn-on time | | $t_{on}$ | $V_D$=6V, $R_L$=100Ω, $I_F$=20mA | – | – | 100 | μs |

## ■ Model Line-up (1) (Lead-free components)

| Lead Form | Through-Hole | | SMT Gullwing | | Wide Through-Hole | | Rank mark | $I_{FT}$[mA] ($V_D$=6V, $R_L$=100Ω) |
|---|---|---|---|---|---|---|---|---|
| Shipping Package | Sleeve 50pcs/sleeve | | | | | | | |
| DIN EN60747-5-2 | — | Approved | — | Approved | — | Approved | | |
| Model No. | — | PC3SF11YTZAF | — | PC3SF11YXZAF | — | PC3SF11YVZAF | A | MAX.10 |
| | — | PC3SF11YTZBF | — | PC3SF11YXZBF | — | PC3SF11YVZBF | B | MAX.7 |

| Lead Form | Wide SMT Gullwing | | SMT Gullwing | | Wide SMT Gullwing | | Rank mark | $I_{FT}$[mA] ($V_D$=6V, $R_L$=100Ω) |
|---|---|---|---|---|---|---|---|---|
| Shipping Package | Sleeve 50pcs/sleeve | | Taping 1 000pcs/reel | | | | | |
| DIN EN60747-5-2 | — | Approved | — | Approved | — | Approved | | |
| Model No. | — | PC3SF11YWZAF | — | PC3SF11YXPAF | — | PC3SF11YWPAF | A | MAX.10 |
| | — | PC3SF11YWZBF | — | PC3SF11YXPBF | — | PC3SF11YWPBF | B | MAX.7 |

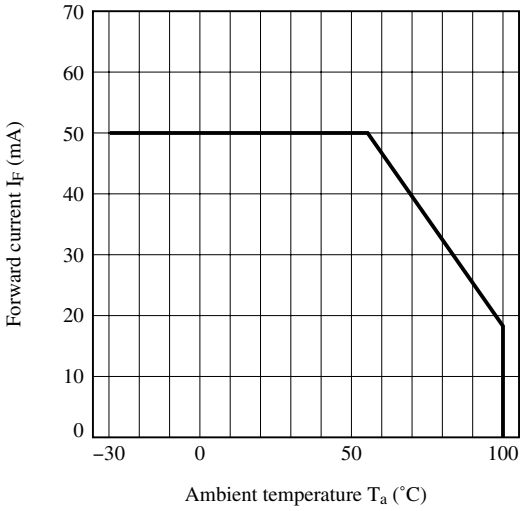
## ■ Model Line-up (2) (Lead solder plating components)

| Lead Form | Through-Hole | | SMT Gullwing | | Wide Through-Hole | | Rank mark | $I_{FT}$[mA] ($V_D$=6V, $R_L$=100Ω) |
|---|---|---|---|---|---|---|---|---|
| Shipping Package | Sleeve 50pcs/sleeve | | | | | | | |
| DIN EN60747-5-2 | — | Approved | — | Approved | — | Approved | | |
| Model No. | — | PC3SF11YTZA | — | PC3SF11YXZA | — | PC3SF11YVZA | A | MAX.10 |
| | — | PC3SF11YTZB | — | PC3SF11YXZB | — | PC3SF11YVZB | B | MAX.7 |

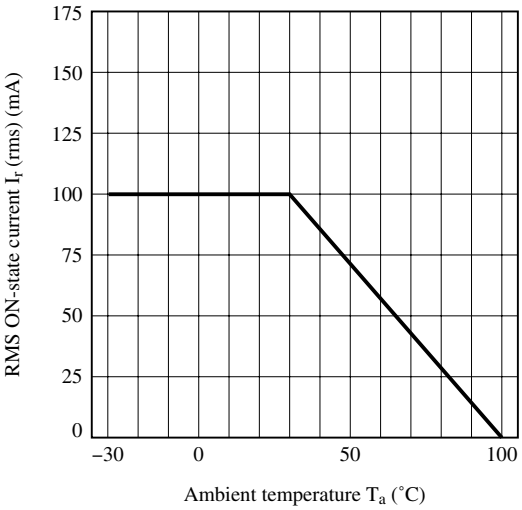
| Lead Form | Wide SMT Gullwing | | SMT Gullwing | | Wide SMT Gullwing | | Rank mark | $I_{FT}$[mA] ($V_D$=6V, $R_L$=100Ω) |
|---|---|---|---|---|---|---|---|---|
| Shipping Package | Sleeve 50pcs/sleeve | | Taping 1 000pcs/reel | | | | | |
| DIN EN60747-5-2 | — | Approved | — | Approved | — | Approved | | |
| Model No. | — | PC3SF11YWZA | — | PC3SF11YXPA | — | PC3SF11YWPA | A | MAX.10 |
| | — | PC3SF11YWZB | — | PC3SF11YXPB | — | PC3SF11YWPB | B | MAX.7 |

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

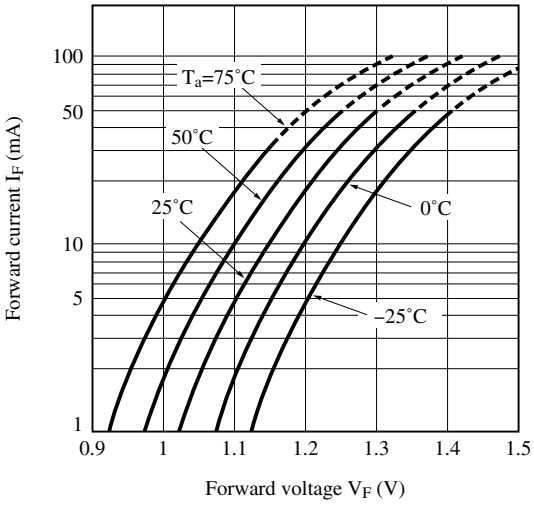
## Fig.1 Forward Current vs. Ambient Temperature



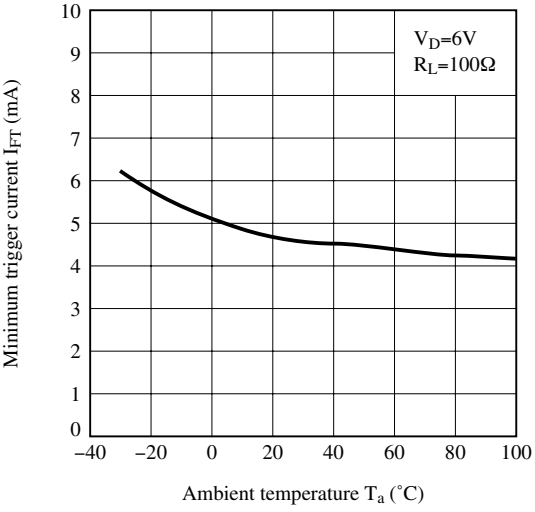

## Fig.2 RMS ON-state Current vs. Ambient Temperature



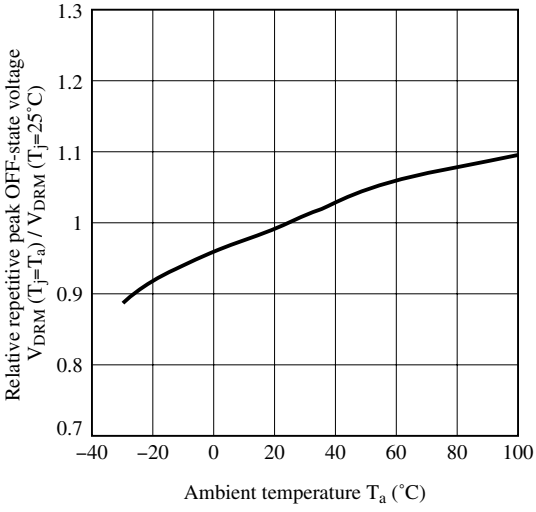

## Fig.3 Forward Current vs. Forward Voltage



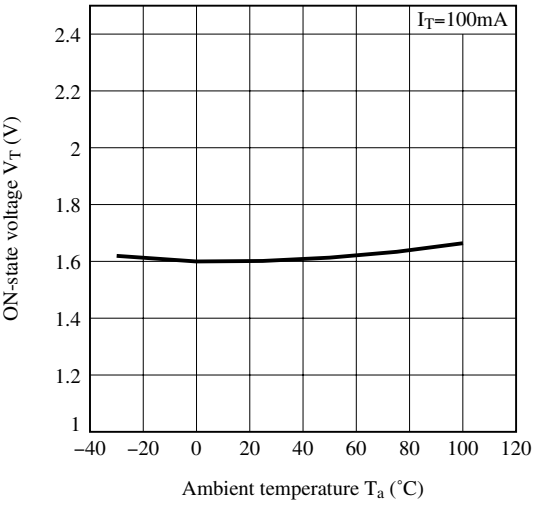

## Fig.4 Minimum Trigger Current vs. Ambient Temperature



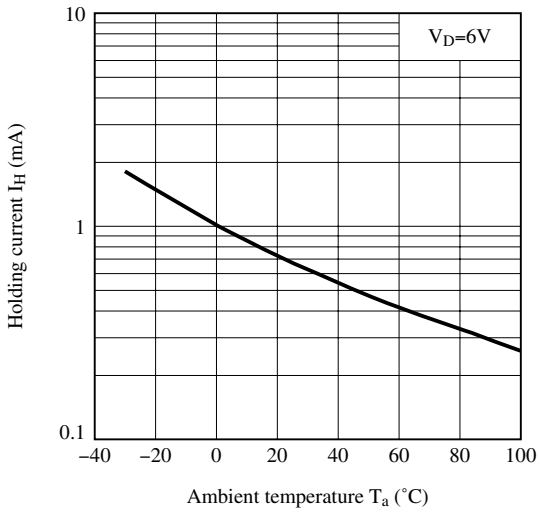

## Fig.5 Relative Repetitive Peak OFF-state Voltage vs. Ambient Temperature



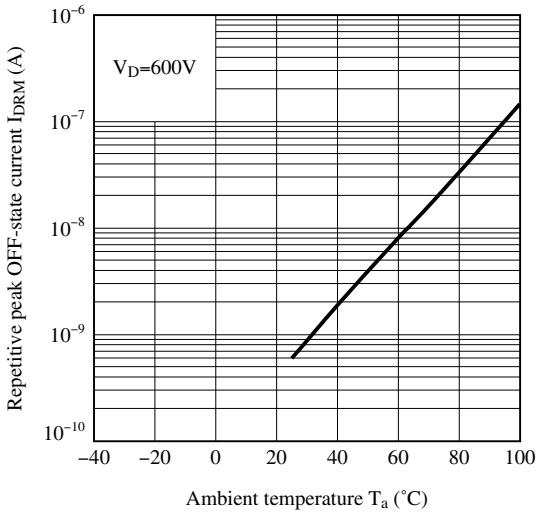

## Fig.6 ON-state Voltage vs. Ambient Temperature



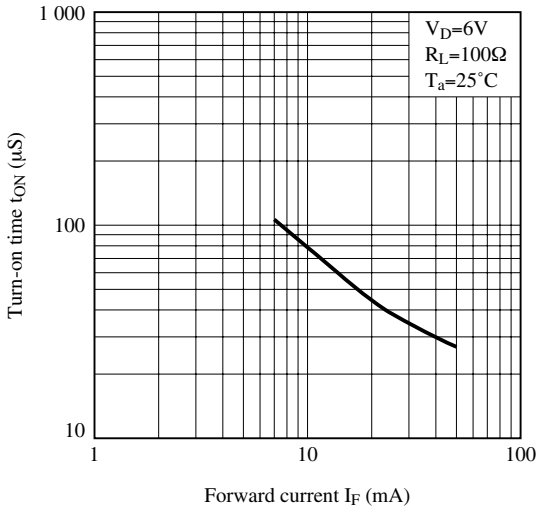
## Fig.7 Holding Current vs. Ambient Temperature




## Fig.8 Repetitive Peak OFF-state Current vs. Ambient Temperature




## Fig.9 Turn-on Time vs. Forward Current




Remarks : Please be aware that all data in the graph are just for reference.

## ■ Design Considerations

### ● Design guide

In order for the Phototriac to turn off, the triggering current ($I_F$) must be 0.1mA or less.

Please refrain from using these devices in a direct drive configuration.
These Phototriac Coupler are intended to be used as triggering device for main Triacs.
Please ensure that the output rating of these devices will be sufficient for triggering the main output Triac of your choice. Failure to do may result in malfunctions.

In phase control applications or where the Phototriac Coupler is being by a pulse signal, please ensure that the pulse width is a minimum of 1ms.

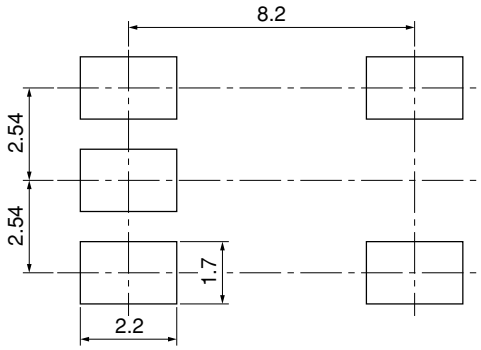
For designs that will experience excessive noise or sudden changes in load voltage, please include an appropriate snubber circuit as shown in the below circuit.
Please keep in mind that Sharp Phototriac Couplers incorporate superor dV/dt ratings which can often eliminate the need for a snubber circuit.

### ● Degradation

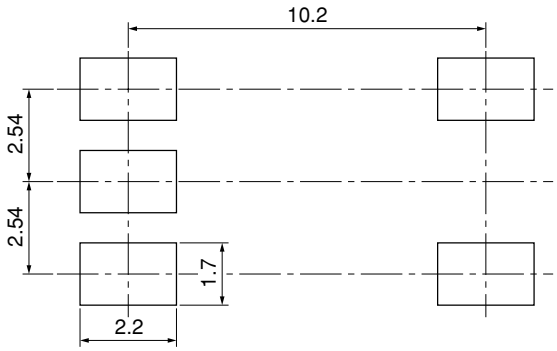
In general, the emission of the IRED used in Phototriac Couplers will degrade over time.
In the case where long term operation and / or constant extreme temperature fluctuations will be applied to the devices, please allow for a worst case scenario of 50% degradation over 5years.
Therefore in order to maintain proper operation, a design implementing these Phototriac Couplers should provide at least twice the minimum required triggering current from initial operation.

### ● Recommended Foot Print (reference)

SMT Gullwing Lead-form

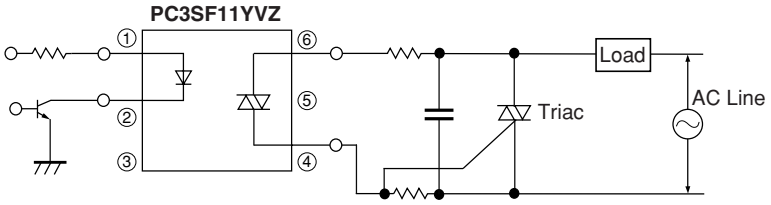



Wide SMT Gullwing Lead-form




(Unit : mm)

## ● Standard Circuit (Medium/High Power Triac Drive Circuit)




Note) Please add the snubber circuit according to a condition.
Any snubber or varistor used for the above mentioned scenarios should be located as close to the main output triac as possible.

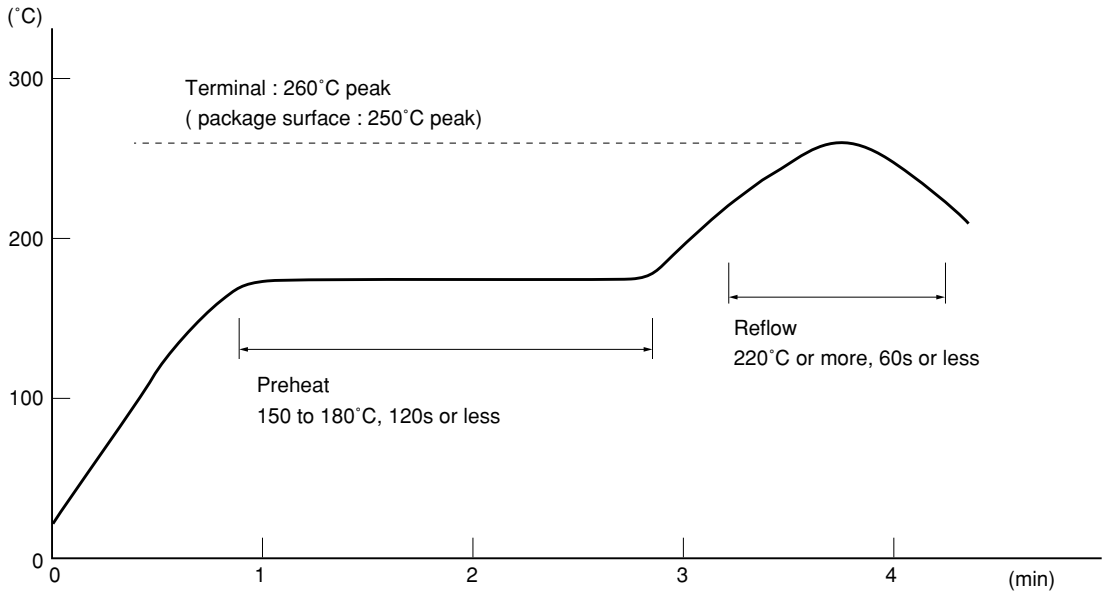
☆ For additional design assistance, please review our corresponding Optoelectronic Application Notes.

## ■ 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 3minutes 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 device.

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.

## ■ Package specification

### ● Sleeve package

### 1. Through-Hole or SMT Gullwing

Package materials

Sleeve : HIPS (with anti-static material)

Stopper : Styrene-Elastomer

Package method

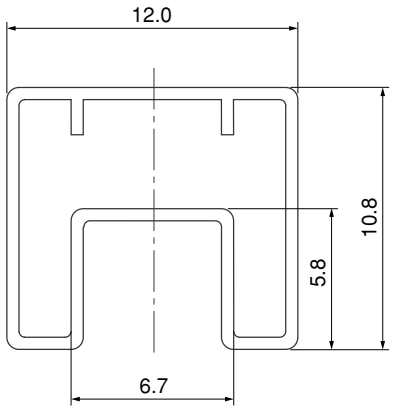
MAX. 50pcs of products shall be packaged in a sleeve.

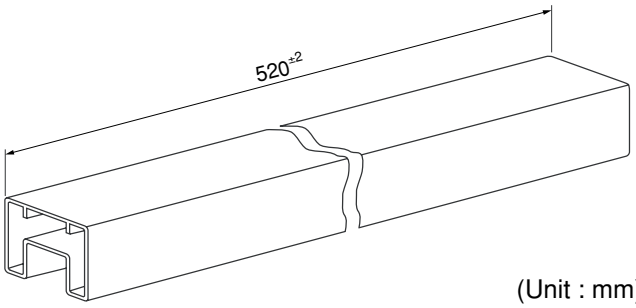
Both ends shall be closed by tabbed and tabless stoppers.

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)

### 2. Wide Through-Hole or Wide SMT Gullwing

Package materials

Sleeve : HIPS (with anti-static material)

Stopper : Styrene-Elastomer

Package method

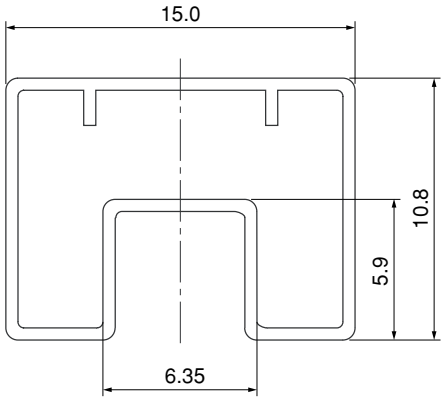
MAX. 50pcs of products shall be packaged in a sleeve.

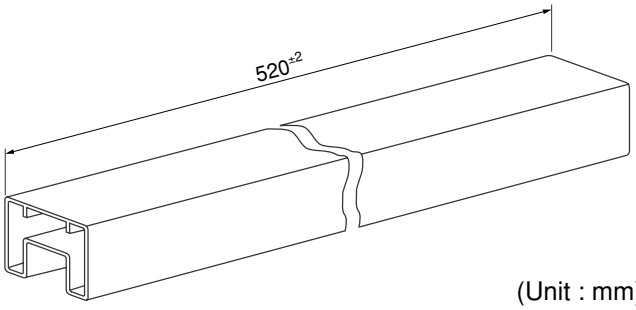
Both ends shall be closed by tabbed and tabless stoppers.

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)

## ● Tape and Reel package

### 1. SMT Gullwing

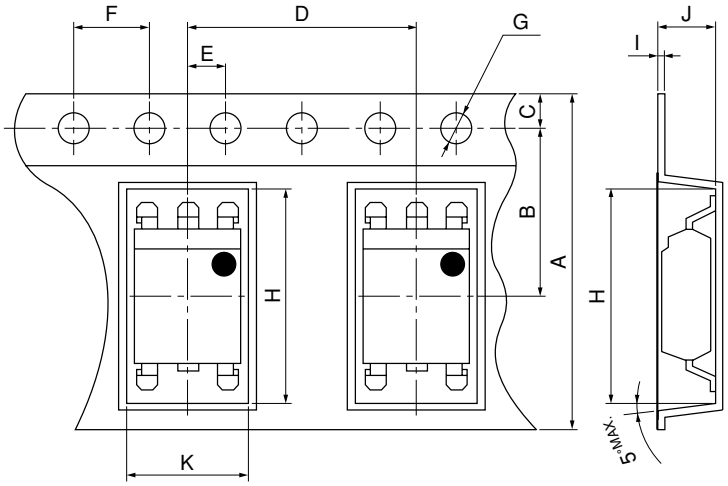
Package materials

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

Cover tape : PET (three layer system)

Reel : PS

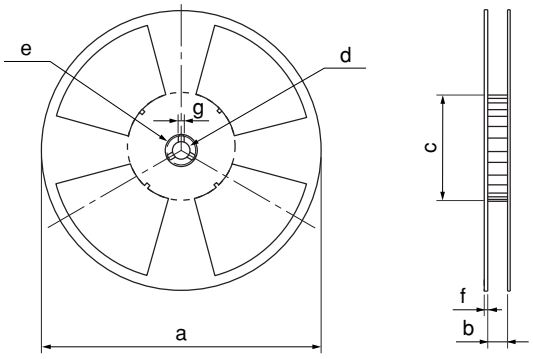
Carrier tape structure and Dimensions




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 | | | |
| $10.4^{\pm0.1}$ | $0.4^{\pm0.05}$ | $4.2^{\pm0.1}$ | $7.8^{\pm0.1}$ | | | |

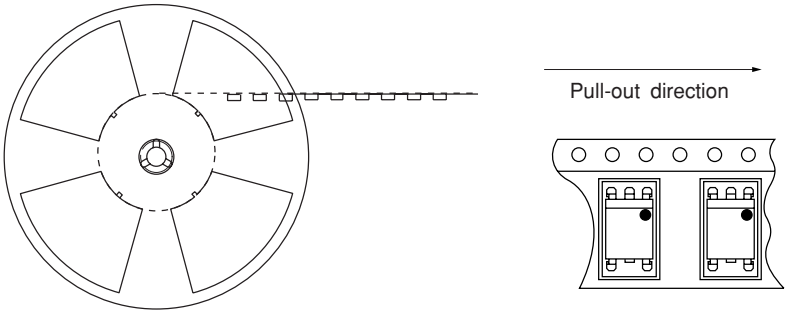
Reel structure and Dimensions




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

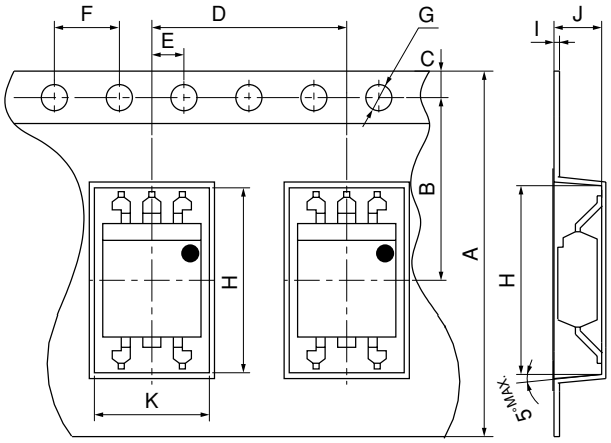
### Package materials

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

Cover tape : PET (three layer system)

Reel : PS

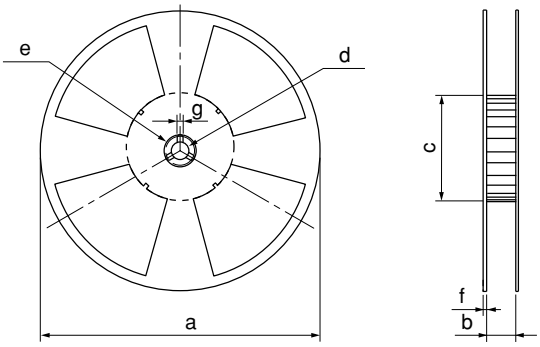
### Carrier tape structure and Dimensions




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 | | | |
| $12.2^{\pm0.1}$ | $0.4^{\pm0.05}$ | $4.15^{\pm0.1}$ | $7.6^{\pm0.1}$ | | | |

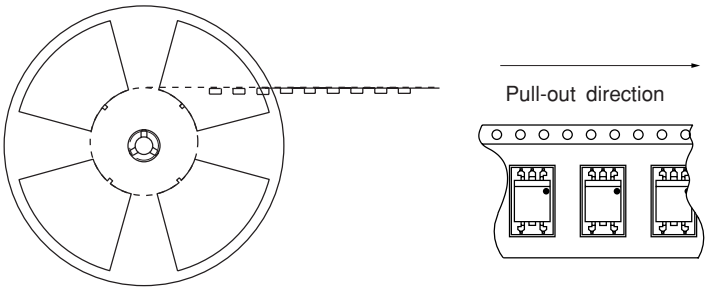
### Reel structure and Dimensions




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
--- Audio visual equipment
--- Consumer electronics

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