**PC3SH13YFZAX**

**V_{DRM} : 600V, Reinforced insulation type**  
**Non-zero cross type**  
**DIP 4 pin**  
**Phototriac Coupler for triggering**

### Description

**PC3SH13YFZAX** 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. 4 pin DIP package
4. Reinforced insulation type  
   (MIN. 0.4mm internal separation)
5. Double transfer mold construction  
   (Ideal for Flow Soldering)
6. High isolation voltage between input and output  
   ($Viso(rms) : 5.0kV$)
7. RoHS directive compliant

### Agency approvals/Compliance

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. 3SH13)
2. Approved by CSA, file No. CA95323  
   (as model No. 3SH13)
3. Approved by BSI : file No.6690/7421  
   (BS EN60065/BS EN60950-1),  
   (as model No. 3SH13)
4. Approved by SEMKO, EN60065/EN60335-1/  
   EN60950-1 (as model No. 3SH13)
5. Approved by DEMKO, EN60065/EN60335-1/  
   EN60950-1 (as model No. 3SH13)
6. Approved by FIMKO, EN60065/EN60335-1/  
   EN60950-1 (as model No. 3SH13)
7. Approved by VDE  
   (DIN EN 60747-5-5), file No. 40008087  
   (as model No. 3SH13)
8. Package resin : UL flammability grade (94V-0)

### 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.
### Outline

#### Pin-Number and internal connection diagram

1. Anode  
2. Cathode  
3. Anode/Cathode  
4. Cathode/Anode

#### Outline Name

**Unit:** 1/1mm

<table>
<thead>
<tr>
<th>Name</th>
<th>3SH13 Outline Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Business dealing name: PC3SH13YFZAX)</td>
</tr>
</tbody>
</table>

#### Epoxy resin

- **Dimensions:** 7.62 ± 0.30
- **Dimensions:** 10.16 ± 0.50
- **Dimensions:** 2.7MIN.
- **Dimensions:** 0.26 ± 0.10

#### VDE identification mark

- **Dimensions:** 4.58 ± 0.30
- **Dimensions:** 3.5 ± 0.5
- **Dimensions:** 0.5 ± 0.1

#### Factory identification mark

- **Dimensions:** 2.6 ± 0.2
- **Dimensions:** 0.26 ± 0.10

#### Date code

- **Dimensions:** 1.0 ± 0.1 ± 0.3 ± 0.30

#### Anode mark

- **Dimensions:** 6.5 ± 0.3

#### Rank mark

- **3SH13**

---

*1) 2-digit number shall be marked according to OLD DIN standard.  
*2) Factory identification mark applies to the below.  
*3) Rank mark: "A"  
*4) VDE identification mark shall be marked "4".  
*5) Pin material: Copper Alloy  
Pin finish: SnCu plating (Cu: TYP. 2%)  

---

**Product mass**: Approx. 0.23g

**Unit**: 1/1mm

---

© SHARP Corporation
### Absolute maximum ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward current *1</td>
<td>$I_F$</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>$V_R$</td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>RMS on-state current *1</td>
<td>$I_{F\text{rms}}$</td>
<td>0.1</td>
<td>A</td>
</tr>
<tr>
<td>Peak one cycle surge current *2</td>
<td>$I_{\text{surge}}$</td>
<td>1.2</td>
<td>A</td>
</tr>
<tr>
<td>Repetitive peak off-state voltage</td>
<td>$V_{\text{DRM}}$</td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>Isolation voltage *3</td>
<td>$V_{\text{ISO\text{rms}}}$</td>
<td>5</td>
<td>kV</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>$T_{\text{opr}}$</td>
<td>-30 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>$T_{\text{tsg}}$</td>
<td>-55 to +125</td>
<td>°C</td>
</tr>
<tr>
<td>Soldering temperature *4</td>
<td>$T_{\text{Sol}}$</td>
<td>270</td>
<td>°C</td>
</tr>
</tbody>
</table>

*1 The derating factors of absolute maximum rating due to ambient temperature are shown in Fig.3, 4.

*2 50Hz sine wave

*3 AC for 1min, 40 to 60%RH, f=60Hz

*4 For 10s

### Electrical characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>Unit</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward voltage</td>
<td>$V_F$</td>
<td>-</td>
<td>1.2</td>
<td>1.4</td>
<td>V</td>
<td>$I_F=20mA$</td>
</tr>
<tr>
<td>Reverse current</td>
<td>$I_R$</td>
<td>-</td>
<td>-</td>
<td>$10^{-5}$</td>
<td>A</td>
<td>$V_R=3V$</td>
</tr>
<tr>
<td>Repetitive peak off-state current</td>
<td>$I_{\text{DRM}}$</td>
<td>-</td>
<td>-</td>
<td>$10^{-6}$</td>
<td>A</td>
<td>$V_D=V_{\text{DRM}}$</td>
</tr>
<tr>
<td>On-state voltage</td>
<td>$V_T$</td>
<td>-</td>
<td>-</td>
<td>3.0</td>
<td>V</td>
<td>$I_F=0.1A$</td>
</tr>
<tr>
<td>Holding current</td>
<td>$I_H$</td>
<td>0.1</td>
<td>-</td>
<td>3.5</td>
<td>mA</td>
<td>$V_D=6V$</td>
</tr>
<tr>
<td>Critical rate of rise of off-state voltage</td>
<td>$dv/dt$</td>
<td>500</td>
<td>-</td>
<td>-</td>
<td>V/μs</td>
<td>$V_D=I/\sqrt{2} \cdot V_{\text{DRM}}$</td>
</tr>
<tr>
<td>Minimum trigger current</td>
<td>$I_{\text{FT}}$</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>mA</td>
<td>$V_D=6V$, $R_L=100Ω$</td>
</tr>
<tr>
<td>Isolation resistance</td>
<td>$R_{\text{ISO}}$</td>
<td>$5\times10^{10}$</td>
<td>$10^{11}$</td>
<td>-</td>
<td>Ω</td>
<td>DC500V 40 to 60%RH</td>
</tr>
<tr>
<td>Turn on time</td>
<td>$I_{\text{ON}}$</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>μs</td>
<td>$V_D=6V$, $R_L=100Ω$, $I_F=20mA$</td>
</tr>
</tbody>
</table>
Fig. 3 Forward current vs. ambient temperature

Fig. 4 RMS on-state current vs. ambient temperature
## Supplement

- **Business dealing name**
  The business dealing name used for this product when ordered or delivered shall be PC3SH13YFZAX.

- **Package specification**
  Refer to the attached sheet, page 8 to 9.

- **Isolation voltage shall be measured in the following method.**
  1. Short between pins 1 to 2 on the primary side and between pins 3 to 4 on the secondary side.
  2. The dielectric withstanding tester with zero-cross circuit shall be used.
  3. The wave form of applied voltage shall be a sine wave.
  (It is recommended that the isolation voltage be measured in insulation oil.)

- **The relevant models are the models Approved by VDE according to DIN EN 60747-5-5.**
  **Approved Model No. : 3SH13**
  VDE approved No. : 40008087 (According to the specification DIN EN 60747-5-5)
  - Operating isolation voltage \( V_{IORM, \text{PEAK}} \) : 1140V
  - Transient voltage : 9000V
  - Pollution : 2
  - Clearances distance (Between input and output) : 8.0 mm (MIN.)
  - Creepage distance (Between input and output) : 8.0 mm (MIN.)
  - Isolation thickness between input and output : 0.4 mm (MIN.)
  - Tracking-proof : CTI 175
  - Safety limit values
    - Current (Isi) : 200mA (Diode side)
    - Power (Psi) : 400mW (Phototransistor side)
    - Temperature (Tsi) : 150°C

In order to keep safety electric isolation of photocoupler, please set the protective circuit to keep within safety limit values when the actual application equipment troubled.

- **Indication of VDE approval "\[\]" is printed on minimum unit package.**

### Isolation specification according to EN 60747-5-5.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Rating</th>
<th>Unit</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class of environmental test</td>
<td></td>
<td>-</td>
<td>40/100/21</td>
<td></td>
<td>Refer to the Diagram 1, 2 (Page 8/11)</td>
</tr>
<tr>
<td>Pollution</td>
<td></td>
<td>-</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum operating isolation voltage</td>
<td></td>
<td>-</td>
<td>1140V</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Partial discharge test voltage (Between input and output)</td>
<td></td>
<td>Diagram 1</td>
<td>( t_m = 10\text{s}, q_c &lt; 5\text{pC} )</td>
<td>1830</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diagram 2</td>
<td>( t_{st1} = 1\text{s}, q_c &lt; 5\text{pC} )</td>
<td>2140</td>
<td>V</td>
</tr>
<tr>
<td>Maximum over-voltage</td>
<td></td>
<td>Vini,a(PEAK)</td>
<td>tini=60 s</td>
<td>9000</td>
<td>V</td>
</tr>
<tr>
<td>Safety maximum ratings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Refer to Fig. 1, 2 (Page 8/11)</td>
</tr>
<tr>
<td>1) Case temperature</td>
<td></td>
<td>Tsi</td>
<td>I_t=0, P_c=0</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>2) Input current</td>
<td></td>
<td>Isi</td>
<td>P_c=0</td>
<td>200</td>
<td>mA</td>
</tr>
<tr>
<td>3) Electric power (Output or Total power dissipation)</td>
<td></td>
<td>Psi</td>
<td></td>
<td>400</td>
<td>mW</td>
</tr>
<tr>
<td>Isolation resistance (Test voltage between input and output : DC 500V)</td>
<td></td>
<td>R_ISO</td>
<td>Tamb=Tsi</td>
<td>( 10^9 )</td>
<td>Ω</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tamb=100°C</td>
<td>MIN.</td>
<td>MIN. 10^11</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tamb=25°C</td>
<td>MIN.</td>
<td>MIN. 10^12</td>
</tr>
</tbody>
</table>

**Precautions in performing isolation test**

1. Partial discharge test methods shall be the ones according to the specifications of EN 60747-5-5
2. Please don't carry out isolation test \( (V_{iso}) \) over \( V_{ini,a} \).
   This product deteriorates isolation characteristics by partial discharge due to applying high voltage (ex. \( V_{ini,a} \)).
   And there is possibility that partial discharge occurs in operating isolation voltage. \( V_{IORM} \).
● This Model is approved by UL, CSA.
Approved Model No. : 3SH13
UL file No. : E64380
CSA file No. : CA95323
CSA approved mark “ ” shall be indicated on minimum unit package.

● This product is approved by BSI.
Approved Model No. : 3SH13
BSI Certificate No. : file No.6690/7421(BS EN60065/BS EN60950-1)

● This product is approved by SEMKO, DEMKO and FIMKO.

● This product is not designed against irradiation.
  This product incorporates non-coherent light emitting diode.
  This product is assembled with electrical input and output.

● ODS materials
  (1) This product shall not contain the following materials.
  (2) The following materials shall not be used in the production process for this product.
  
  Materials for ODS : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform)

● Specific brominated flame retardants (PBB and PBDE) are not used in this device at all.

● Compliance with each regulation
  (1) The RoHS directive(2002/95/EC)
    This product complies with the RoHS directive(2002/95/EC).
    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).

<table>
<thead>
<tr>
<th>Category</th>
<th>Toxic and hazardous substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phototriac coupler</td>
<td>Lead (Pb)</td>
</tr>
<tr>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

✓ : indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ/T 11363-2006 standard.
Notes

- Circuit design
  (1) The LED used in the Phototriac coupler generally decreases the light emission power by operation. In case of long operation time, please decide $I_F$ value so that $I_F$ is more than 2 times of the Maximum value of the Minimum triggering current at circuit design with considering the decreases of the light emission power of the LED. (50% / 5 years)
  (2) Input current ($I_F$) at off-state shall be set 0.1mA or less.
  (3) In case that pulse drive is carried out, the pulse width of input signal should be 1ms or more

- Usage
  Triggering medium power triac and high power triac.
  (This model shall be used under the conditions on which power triac turns on.)

- Cleaning
  (1) Solvent cleaning : Solvent temperature 45°C or less, Immersion for 3 min or less
  (2) Ultrasonic cleaning : The effect to device by ultrasonic cleaning differs by cleaning bath size, ultrasonic power output, cleaning time, PCB size or device mounting condition etc.
     Please test it in actual using condition and confirm that any defect doesn’t occur before starting the ultrasonic cleaning.
  (3) Applicable solvent : Ethyl alcohol, Methyl alcohol, Isopropyl alcohol
     When the other solvent is used, there are cases that the packaging resin is eroded.
     Please use the other solvent after thorough confirmation is performed in actual using condition.

- Precautions for Soldering Phototriac couplers
  (1) In case of flow solder (Whole dipping is possible)
     It is recommended that flow soldering be carried out at 270°C or less and within 10s
     (Pre-heating : 100 to 150°C, 30 to 80s) : Within 2 times
  (2) It is recommended that hand soldering be carried out at 400°C or less and within 3s: Within 2 times
  (3) Other notes
     Depending on equipment and soldering conditions (temperature, Using solder etc.),
     the effect to the device and the PCB is different.
     Please confirm that there is no problem on the actual use conditions in advance.
Method of Diagram 1: Breakdown test (Apply to type test and sampling test)

\[ t_1 \text{, } t_2 = 1 \text{ to } 10 \text{s} \]
\[ t_3 \text{, } t_4 = 1 \text{s} \]
\[ t_p \text{ (Partial discharge measuring time)} = 10 \text{s} \]
\[ t_b = 12 \text{s} \]
\[ t_{INI} = 60 \text{s} \]

---

Method of Diagram 2: Non breakdown test (Apply to all device test)

\[ t_3 \text{, } t_4 = 0.1 \text{s} \]
\[ t_p \text{ (Partial discharge measuring time)} = 1 \text{s} \]
\[ t_b = 1.2 \text{s} \]

---

Fig. 1 Safety maximum power dissipation vs. ambient temperature (When failed)

Fig. 2 Safety maximum forward current vs. ambient temperature (When failed)
Package specification

- Package materials

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Materials</th>
<th>Purposes</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Sleeve</td>
<td>HIPS or ABS with preventing static electricity</td>
<td>Products packaged</td>
</tr>
<tr>
<td>②</td>
<td>Stopper</td>
<td>Styrene-Elastomer</td>
<td>Products fixed</td>
</tr>
<tr>
<td>③</td>
<td>Packing case</td>
<td>Corrugated cardboard</td>
<td>Sleeve packaged</td>
</tr>
<tr>
<td>④</td>
<td>Cushioning material</td>
<td>Urethane</td>
<td>Sleeve fixed</td>
</tr>
<tr>
<td>⑤</td>
<td>Kraft tape</td>
<td>Paper</td>
<td>Lid of packaged case fixed</td>
</tr>
<tr>
<td>⑥</td>
<td>Label</td>
<td>Paper</td>
<td>Model No.,(Business dealing name), Lot No., Quantity, Country of origin, Company name and Inspection date specified</td>
</tr>
</tbody>
</table>

- Package method

1. MAX. 100 pcs. of products shall be packaged in a sleeve ① and both of sleeve edges shall be fixed by stoppers ②.
2. MAX. 20 sleeves (product: 2000 pcs.) above shall be packaged in a packing case ③ and pack a sheet of cushioning material ④ at one side.
3. The label ⑥ shall be put on the side of the packing case.
4. Case shall be closed with the lid and enclosed with kraft tape ⑤.

- Sleeve package ① outline dimensions

![Diagram of sleeve package](image_url)

Note
1) Thickness: 0.5±0.2mm
2) Process with applying antistatic agent.
3) Unless otherwise specified tolerances shall be ±0.5mm.
(However except for deformation due to the stopper in sleeve.)
• Packing case outline dimensions

Anode mark shall be arranged at stopper side without pulled portion.

It is disapproved to mix different model or different rank model in one case.

Regular packing mass: Approx. 910g

( ) : Reference dimensions
### 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.

- This publication is the proprietary product of SHARP and is copyrighted, with all rights reserved. Under the copyright laws, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, in whole or in part, without the express written permission of SHARP. Express written permission is also required before any use of this publication may be made by a third party.

- Contact and consult with a SHARP representative if there are any questions about the contents of this publication.