PC3H4J00000F Series

Mini-flat Half Pitch Package, AC Input Photocoupler

■ Description
PC3H4J00000F Series contains an IRED optically coupled to a phototransistor.
It is packaged in a 4-pin Mini-flat, half pitch type.
Input-output isolation voltage (rms) is 2.5kV.
Collector-emitter voltage is 80V and CTR is 20% to 400% at input current of ±1mA.

■ Features
1. 4-pin Mini-flat Half pitch package (Lead pitch : 1.27mm)
2. Double transfer mold package (Ideal for Flow Soldering)
3. AC input type
4. High collector-emitter voltage (V_{CE} : 80V)
5. Isolation voltage between input and output (V_{iso(rms)} : 2.5kV)
6. RoHS directive compliant

■ Agency approvals/Compliance
1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. PC3H4)
2. Approved by VDE, DIN EN60747-5-2(1) (as an option), file No. 40009162 (as model No. PC3H4)
3. Package resin : UL flammability grade (94V-0)

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

■ Applications
1. Programmable controllers

Notice The content of data sheet is subject to change without prior notice.
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### Internal Connection Diagram

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

### Outline Dimensions

(Unit: mm)

**SHARP mark “S”**
- Rank mark
- Date code

**Primary side mark**

**Rank mark**

**Date code**

**Epoxy resin**

*( ) : Reference Dimensions

Product mass: approx. 0.05g

**VDE option**

**SHARP mark “S”**
- Rank mark
- Date code

**VDE Indentification mark**

*( ) : Reference Dimensions

Product mass: approx. 0.05g

Plating material: SnCu (Cu: TYP. 2%)
### Date code (2 digit)

<table>
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<th>Mark</th>
<th>A.D.</th>
<th>Mark</th>
<th>Month</th>
<th>Mark</th>
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<td>1998</td>
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<td>A</td>
<td>September</td>
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<td>B</td>
<td>October</td>
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<td>2000</td>
<td>M</td>
<td>2012</td>
<td>C</td>
<td>November</td>
<td>N</td>
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<tr>
<td>2001</td>
<td>N</td>
<td>:</td>
<td>:</td>
<td>December</td>
<td>D</td>
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Repeats in a 20 year cycle

### Country of origin

Japan

### Rank mark

Refer to the Model Line-up table
### Absolute Maximum Ratings (Ta=25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
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<tr>
<td>Forward current</td>
<td>IF</td>
<td>±50</td>
<td>mA</td>
</tr>
<tr>
<td>*1 Peak forward current</td>
<td>IFM</td>
<td>±1</td>
<td>A</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>P</td>
<td>70</td>
<td>mW</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>VCEO</td>
<td>80</td>
<td>V</td>
</tr>
<tr>
<td>Emitter-collector voltage</td>
<td>VECO</td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td>IC</td>
<td>50</td>
<td>mA</td>
</tr>
<tr>
<td>Collector power dissipation</td>
<td>PC</td>
<td>150</td>
<td>mW</td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>Ptot</td>
<td>170</td>
<td>mW</td>
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<tr>
<td>Operating temperature</td>
<td>Toper</td>
<td>−30 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>Tstg</td>
<td>−40 to +125</td>
<td>°C</td>
</tr>
<tr>
<td>*2 Isolation voltage</td>
<td>VISO</td>
<td>2.5</td>
<td>kV</td>
</tr>
<tr>
<td>*3 Soldering temperature</td>
<td>Tsold</td>
<td>260</td>
<td>°C</td>
</tr>
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</table>

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

### Electro-optical Characteristics (Ta=25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>Unit</th>
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<tr>
<td>Input</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Forward voltage</td>
<td>VF</td>
<td>I_F=±20mA</td>
<td>−</td>
<td>1.2</td>
<td>1.4</td>
<td>V</td>
</tr>
<tr>
<td>Terminal capacitance</td>
<td>C_t</td>
<td>V=0, f=1kHz</td>
<td>−</td>
<td>30</td>
<td>250</td>
<td>pF</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Collector dark current</td>
<td>ICEO</td>
<td>V_CE=50V, I_F=0</td>
<td>−</td>
<td>−</td>
<td>100</td>
<td>nA</td>
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<tr>
<td>Collector-emitter breakdown voltage</td>
<td>BVCEO</td>
<td>I_E=0.1mA, I_F=0</td>
<td>80</td>
<td>−</td>
<td>−</td>
<td>V</td>
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<tr>
<td>Emitter-collector breakdown voltage</td>
<td>BVECO</td>
<td>I_E=10μA, I_F=0</td>
<td>6</td>
<td>−</td>
<td>−</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td>IC</td>
<td>I_F=±1mA, V_CE=5V</td>
<td>0.2</td>
<td>−</td>
<td>4.0</td>
<td>mA</td>
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<tr>
<td>Collector-emitter saturation voltage</td>
<td>VCE(sat)</td>
<td>I_F=±20mA, I_C=1mA</td>
<td>−</td>
<td>0.1</td>
<td>0.2</td>
<td>V</td>
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<tr>
<td>Isolation resistance</td>
<td>RISO</td>
<td>DC500V, 40 to 60%RH</td>
<td>5×10&lt;sup&gt;10&lt;/sup&gt;</td>
<td>1×10&lt;sup&gt;11&lt;/sup&gt;</td>
<td>−</td>
<td>Ω</td>
</tr>
<tr>
<td>Floating capacitance</td>
<td>C_f</td>
<td>V=0, f=1MHz</td>
<td>−</td>
<td>0.6</td>
<td>1.0</td>
<td>pF</td>
</tr>
<tr>
<td>Transfer characteristics</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rise time</td>
<td>tr</td>
<td>V_CE=2V, I_C=2mA, R_L=100Ω</td>
<td>−</td>
<td>4</td>
<td>18</td>
<td>µs</td>
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<tr>
<td>Fall time</td>
<td>tf</td>
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<td>−</td>
<td>3</td>
<td>18</td>
<td>µs</td>
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## Model Line-up

<table>
<thead>
<tr>
<th>Package</th>
<th>Taping</th>
<th>Rank mark</th>
<th>$I_C$ [mA] $(I_D=±1 mA, V_{CE}=5 V, T_a=25^\circ C)$</th>
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<tr>
<td>DIN EN60747-5-2</td>
<td>3 000pcs/reel</td>
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<td>Model No.</td>
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<tr>
<td>PC3H4J00000F</td>
<td>PC3H4Y00000F</td>
<td>with or without</td>
<td>0.2 to 4.0</td>
</tr>
<tr>
<td>PC3H4AJ0000F</td>
<td>PC3H4Y10000F</td>
<td>A</td>
<td>0.5 to 1.5</td>
</tr>
</tbody>
</table>

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**

- Current transfer ratio CTR (%)
- Forward current IF (mA)
- Collector-emitter saturation voltage $V_{CE}$ (V)

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

- Collector current $I_C$ (mA)
- Collector-emitter voltage $V_{CE}$ (V)

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

- Relative current transfer ratio (%)
- Ambient temperature $T_a$ (°C)

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

- Collector-emitter saturation voltage $V_{CE}$ (sat) (V)
- Ambient temperature $T_a$ (°C)

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

- Collector dark current $I_{CEO}$ (A)
- Ambient temperature $T_a$ (°C)

**Fig. 12 Response Time vs. Load Resistance**

- Response time (µs)
- Load resistance $R_L$ (kΩ)

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**PC3H4J00000F Series**
Please refer to the conditions in Fig.12.

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 $I_r < 1.0\text{mA}$, 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)

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.

  ![Temperature Profile Graph]

  - Terminal: 260°C peak
  - Package surface: 250°C peak

  - Preheat: 150 to 180°C, 120s or less
  - Reflow: 220°C or more, 60s or less

  - Preheat
  - Reflow

**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 260°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

● Tape and Reel package

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

Carrier tape structure and Dimensions

Dimensions List (Unit : mm)

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<tbody>
<tr>
<td>12.0±0.3</td>
<td>5.5±0.1</td>
<td>1.75±0.1</td>
<td>8.0±0.1</td>
<td>2.0±0.1</td>
<td>4.0±0.1</td>
<td>φ1.5±0.1</td>
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<tr>
<td>H</td>
<td>I</td>
<td>J</td>
<td>K</td>
<td>L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.5±0.1</td>
<td>0.3±0.05</td>
<td>2.3±0.1</td>
<td>3.1±0.1</td>
<td></td>
<td></td>
<td>φ1.6±0.1</td>
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</table>

Reel structure and Dimensions

Dimensions List (Unit : mm)

<table>
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<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>330</td>
<td>13.5±1.5</td>
<td>100±1.0</td>
<td>13±5.5</td>
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Direction of product insertion

Pull-out direction

[Packing : 3 000pcs/reel]
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      --- 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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