PC817X Series

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. PC817)
2. Package resin : UL flammability grade (94V-0)

■ Features
1. I/O isolation for MCUs (Micro Controller Units)
2. Noise suppression in switching circuits
3. Signal transmission between circuits of different potentials and impedances

■ Description
PC817X Series contains an IRED optically coupled to a phototransistor.
It is packaged in a 4pin DIP, available in wide-lead spacing option and SMT gullwing lead-form option.
Input-output isolation voltage(rms) is 5.0kV.
Collector-emitter voltage is 80V(*) and CTR is 50% to 600% at input current of 5mA.

■ Agency approvals/Compliance
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■ Features
1. 4pin DIP package
2. Double transfer mold package (Ideal for Flow Soldering)
3. High collector-emitter voltage ($V_{CEO}$:80V*)
4. Current transfer ratio (CTR : MIN. 50% at $I_F$=5 mA, $V_{CE}$=5V)
5. Several CTR ranks available
6. High isolation voltage between input and output ($V_{iso(rms)}$ : 5.0 kV)

(*) Up to Date code “P7” (July 2002) $V_{CEO}$ : 35V.
From the production Date code “J5” (May 1997) to “P7” (July 2002), however the products were screened by $BV_{CEO}$≥70V.

DIP 4pin General Purpose Photocoupler

PC817X Series

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

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

### Outline Dimensions

(Unit: mm)

#### 1. Through-Hole [ex. PC817X]
- Anode mark
- Rank mark
- Factory identification mark
- Date code
- 6.5 ± 0.5
- 7.62 ± 0.3
- 4.58 ± 0.5
- θ: 0 to 13°
- Epoxy resin

#### 2. SMT Gullwing Lead-Form [ex. PC817XI]
- Anode mark
- Rank mark
- Factory identification mark
- Date code
- 6.5 ± 0.5
- 7.62 ± 0.3
- 4.58 ± 0.5
- Epoxy resin

#### 3. Wide Through-Hole Lead-Form [ex. PC817XF]
- Anode mark
- Rank mark
- Factory identification mark
- Date code
- 6.5 ± 0.5
- 7.62 ± 0.3
- 4.58 ± 0.5
- 10.16 ± 0.5
- Epoxy resin

#### 4. Wide SMT Gullwing Lead-Form [ex. PC817XFP]
- Anode mark
- Rank mark
- Factory identification mark
- Date code
- 6.5 ± 0.5
- 7.62 ± 0.3
- 4.58 ± 0.5
- Epoxy resin

#### Product mass
- approx. 0.21g
Date code (2 digit)

<table>
<thead>
<tr>
<th>Year of production</th>
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<td>1990 A 2002 P</td>
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<td>1991 B 2003 R</td>
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<td>2001 N</td>
<td>December D</td>
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repeats in a 20 year cycle

Factory identification mark

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<td>Philippines</td>
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<td>China</td>
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* This factory marking is for identification purpose only. Please contact the local SHARP sales representative to see the actual status of the production.

Rank mark

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>Forward current</td>
<td>I_F</td>
<td>mA</td>
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<tr>
<td>Peak forward current</td>
<td>I_{FM}</td>
<td>A</td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>V_R</td>
<td>V</td>
</tr>
<tr>
<td>Power dissipation</td>
<td>P</td>
<td>mW</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>V_{CEO}</td>
<td>V</td>
</tr>
<tr>
<td>Emitter-collector voltage</td>
<td>V_{ECO}</td>
<td>V</td>
</tr>
<tr>
<td>Collector current</td>
<td>I_C</td>
<td>mA</td>
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<tr>
<td>Collector power dissipation</td>
<td>P_C</td>
<td>mW</td>
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<tr>
<td>Total power dissipation</td>
<td>P_{tot}</td>
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<tr>
<td>Isolation voltage</td>
<td>V_{iso (rms)}</td>
<td>kV</td>
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<td>Operating temperature</td>
<td>T_{op}</td>
<td>°C</td>
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<tr>
<td>Storage temperature</td>
<td>T_{stg}</td>
<td>°C</td>
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<tr>
<td>Soldering temperature</td>
<td>T_{sol}</td>
<td>°C</td>
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</tbody>
</table>

*1 Pulse width 100µs, Duty ratio : 0.001
*2 40 to 60%RH, AC for 1 minute, f=60Hz
*3 For 10s
*4 Up to Date code "P7" (July 2002) V_{CEO} : 35V.

### Electro-optical Characteristics (T_a=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>Forward voltage</td>
<td>V_F</td>
<td>I_F=20mA</td>
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<td>1.4</td>
<td>V</td>
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<tr>
<td>Peak forward voltage</td>
<td>V_{FM}</td>
<td>I_{FM}=0.5A</td>
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<td>–</td>
<td>3.0</td>
<td>V</td>
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<tr>
<td>Reverse voltage</td>
<td>I_R</td>
<td>V_R=4V</td>
<td>–</td>
<td>–</td>
<td>10</td>
<td>µA</td>
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<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>
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<tr>
<td>Collector dark current</td>
<td>I_C</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>BV_{CEO}</td>
<td>I_C=0.1mA, I_F=0</td>
<td>*5</td>
<td>80</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Emitter-collector breakdown voltage</td>
<td>BV_{ECO}</td>
<td>I_E=10µA, I_F=0</td>
<td></td>
<td>6</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Collector current</td>
<td>I_C</td>
<td>V_{CE}=5V</td>
<td>2.5</td>
<td>–</td>
<td>30.0</td>
<td>mA</td>
</tr>
<tr>
<td>Collector-emitter saturation voltage</td>
<td>V_{CE (sat)}</td>
<td>I_P=20mA, I_C=1mA</td>
<td>–</td>
<td>0.1</td>
<td>0.2</td>
<td>V</td>
</tr>
<tr>
<td>Isolation resistance</td>
<td>R_{ISO}</td>
<td>DC500V, 40 to 60%RH</td>
<td>5x10^{10}</td>
<td>1x10^{11}</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>
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<td>Cut-off frequency</td>
<td>f_c</td>
<td>V_{CE}=5V, I_c=2mA, R_L=100Ω, –3dB</td>
<td>–</td>
<td>80</td>
<td>–</td>
<td>kHz</td>
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<td>Response time</td>
<td>Rise time</td>
<td>t_r</td>
<td>–</td>
<td>4</td>
<td>18</td>
<td>µs</td>
</tr>
<tr>
<td></td>
<td>Fall time</td>
<td>t_f</td>
<td>–</td>
<td>3</td>
<td>18</td>
<td>µs</td>
</tr>
</tbody>
</table>

*1 Pulse width 100µs, Duty ratio : 0.001
*2 40 to 60%RH, AC for 1 minute, f=60Hz
*3 For 10s
*4 Up to Date code "P7" (July 2002) V_{CEO} : 35V.
*5 From the production Date code "J5" (May 1997) to "P7" (July 2002), however the products were screened by BV_{CEO}≥70V.
## Model Line-up

| Model No. | Lead Form | Package | Through-Hole | Wide Through-Hole | SMT Gullwing | Wide SMT Gullwing | Taping | Sleeve | Taping | SMT Gullwing | Rank mark | $I_C$ [mA]  

($I_F=5mA$, $V_CE=5V$, $T_A=25˚C$) |
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PC817X</td>
<td>PC817XF</td>
<td>PC817XI</td>
<td>PC817XP</td>
<td>PC817XFP</td>
<td>with or without</td>
<td>2.5 to 30.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC817X1</td>
<td>PC817XF1</td>
<td>PC817XI1</td>
<td>PC817XP1</td>
<td>–</td>
<td>A</td>
<td>4.0 to 8.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>PC817X2</td>
<td>PC817XF2</td>
<td>PC817XI2</td>
<td>PC817XP2</td>
<td>–</td>
<td>B</td>
<td>6.5 to 13.0</td>
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<td>PC817X3</td>
<td>PC817XF3</td>
<td>PC817XI3</td>
<td>PC817XP3</td>
<td>–</td>
<td>C</td>
<td>10.0 to 20.0</td>
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<td>PC817X4</td>
<td>PC817XF4</td>
<td>PC817XI4</td>
<td>PC817XP4</td>
<td>–</td>
<td>D</td>
<td>15.0 to 30.0</td>
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<td>PC817X5</td>
<td>PC817XF5</td>
<td>PC817XI5</td>
<td>PC817XP5</td>
<td>–</td>
<td>A or B</td>
<td>4.0 to 13.0</td>
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</tr>
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<td>PC817X6</td>
<td>PC817XF6</td>
<td>PC817XI6</td>
<td>PC817XP6</td>
<td>–</td>
<td>B or C</td>
<td>6.5 to 20.0</td>
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<td>PC817X7</td>
<td>PC817XF7</td>
<td>PC817XI7</td>
<td>PC817XP7</td>
<td>–</td>
<td>C or D</td>
<td>10.0 to 30.0</td>
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<td>PC817X8</td>
<td>PC817XF8</td>
<td>PC817XI8</td>
<td>PC817XP8</td>
<td>–</td>
<td>A, B or C</td>
<td>4.0 to 20.0</td>
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<td>PC817X9</td>
<td>PC817XF9</td>
<td>PC817XI9</td>
<td>PC817XP9</td>
<td>–</td>
<td>B, C or D</td>
<td>6.5 to 30.0</td>
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<tr>
<td>PC817X0</td>
<td>PC817XF0</td>
<td>PC817X10</td>
<td>PC817XP0</td>
<td>–</td>
<td>A, B, C or D</td>
<td>4.0 to 30.0</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Please contact a local SHARP sales representative to inquire about production status and Lead-Free options.
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 Current Transfer Ratio vs. Forward Current
**PC817X Series**

**Fig. 7** Forward Current vs. Forward Voltage

![Forward Current vs. Forward Voltage](image1)

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

![Collector Current vs. Collector-emitter Voltage](image2)

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

![Relative Current Transfer Ratio vs. Ambient Temperature](image3)

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

![Collector-emitter Saturation Voltage vs. Ambient Temperature](image4)

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

![Collector Dark Current vs. Ambient Temperature](image5)

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

![Collector-emitter Saturation Voltage vs. Forward Current](image6)
Fig. 13 Response Time vs. Load Resistance

Fig. 14 Test Circuit for Response Time

Please refer to the conditions in Fig. 13.

Fig. 15 Frequency Response

Fig. 16 Test Circuit for Frequency Response

Please refer to the conditions in Fig. 15.

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

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 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 Lead-Form
   Package materials
   Sleeve : HIPS (with anti-static material)
   Stopper : Styrene-Elastomer

Package method
   MAX. 100pcs of products shall be packaged in a sleeve.
   Both ends shall be closed by tabbed and tableless stoppers.
   The product shall be arranged in the sleeve with its anode mark on the tableless stopper side.
   MAX. 20 sleeves in one case.

Sleeve outline dimensions

2. Wide Through-Hole Lead-Form or Wide SMT Gullwing Lead-Form
   Package materials
   Sleeve : HIPS (with anti-static material)
   Stopper : Styrene-Elastomer

Package method
   MAX. 100pcs of products shall be packaged in a sleeve.
   Both ends shall be closed by tabbed and tableless stoppers.
   The product shall be arranged in the sleeve with its anode mark on the tableless stopper side.
   MAX. 20 sleeves in one case.

Sleeve outline dimensions
● Tape and Reel package

1. SMT Gullwing

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

Carrier tape structure and Dimensions

<table>
<thead>
<tr>
<th>Dimensions List (Unit : mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
<tr>
<td>16.0±0.3</td>
</tr>
<tr>
<td>H</td>
</tr>
<tr>
<td>10.4±0.1</td>
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Reel structure and Dimensions

<table>
<thead>
<tr>
<th>Dimensions List (Unit : mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
</tr>
<tr>
<td>330</td>
</tr>
<tr>
<td>e</td>
</tr>
<tr>
<td>23±1.0</td>
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</tbody>
</table>

Direction of product insertion

Pull-out direction

[Packing: 2,000pcs/reel]
2. Wide SMT Gullwing

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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<td>24.0⁺⁻₀.₃</td>
<td>11.5⁺⁻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>
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<tr>
<td>12.4⁺⁻₀.₁</td>
<td>0.4⁺⁻₀.₀₅</td>
<td>4.1⁺⁻₀.₁</td>
<td>5.1⁺⁻₀.₁</td>
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Reel structure and Dimensions

Dimensions List (Unit : mm)

<table>
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<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
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<tbody>
<tr>
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<td>25.5⁺⁻₁.₅</td>
<td>100⁺⁻₁.₀</td>
<td>13⁺⁻₀.₅</td>
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<td>f</td>
<td>g</td>
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<tr>
<td>23⁺⁻₁.₀</td>
<td>2.₀⁺⁻₀.₅</td>
<td>2.₀⁺⁻₀.₅</td>
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</table>

Direction of product insertion

Pull-out direction

[Packing : 2 000pcs/reel]
Important Notices

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