

|                                  |                              |                                                                                                                                                                                    |                                                                          |
|----------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| PREPARED BY:<br><i>Y. Yasuda</i> | DATE:<br><i>Oct 21, 1998</i> | <h1 style="text-align: center;">SHARP</h1> <p style="text-align: center;">ELECTRONIC COMPONENTS<br/>GROUP SHARP CORPORATION</p> <h2 style="text-align: center;">SPECIFICATION</h2> | SPEC. No. ED-98183                                                       |
| APPROVED BY:<br><i>M. Katake</i> | DATE:<br><i>Oct 21, 1998</i> |                                                                                                                                                                                    | ISSUE<br>October 20, 1998                                                |
|                                  |                              |                                                                                                                                                                                    | PAGE 10 Pages<br>REPRESENTATIVE DIVISION<br>OPTO-ELECTRONIC DEVICES DIV. |

DEVICE SPECIFICATION FOR

### PHOTOCOUPLER

Business dealing name

|           |         |
|-----------|---------|
| MODEL No. | PC844X  |
| PC844     | PC844X1 |

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- When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets, as well as the precautions mentioned below. Sharp assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets, and the precautions mentioned below.
 

(Precautions)

  - This product is designed for use in the following application areas ;
 

- OA equipment    • Audio visual equipment    • Home appliances
    - Telecommunication equipment (Terminal)    • Measuring equipment
    - Tooling machines    • Computers

If the use of the product in the above application areas is for equipment listed in paragraphs (2) or (3), please be sure to observe the precautions given in those respective paragraphs.
  - Appropriate measures, such as fail-safe design and redundant design considering the safety design of the overall system and equipment, should be taken to ensure reliability and safety when this product is used for equipment which demands high reliability and safety in function and precision, such as ;
 

- Transportation control and safety equipment (aircraft, train, automobile etc.)
    - Traffic signals    • Gas leakage sensor breakers    • Rescue and security equipment
    - Other safety equipment
  - Please do not use this product for equipment which require extremely high reliability and safety in function and precision, such as ;
 

- Space equipment    • Telecommunication equipment (for trunk lines)
    - Nuclear power control equipment    • Medical equipment
  - Please contact and consult with a Sharp sales representative if there are any questions regarding interpretation of the above three paragraphs.
- Please contact and consult with a Sharp sales representative for any questions about this product.

CUSTOMER'S APPROVAL

DATE \_\_\_\_\_

BY \_\_\_\_\_

DATE *Oct 21 98*

PRESENTED BY *T. Matsumura*

T. Matsumura,  
Department General Manager of  
Engineering Dept., II  
Opto-Electronic Devices Div.  
ELECOM Group  
SHARP CORPORATION

## 1. Application

This specification applies to the outline and characteristics of photocoupler  
Model No. PC844.

## 2. Outline

Refer to the attached drawing No. CY8594K02.

## 3. Ratings and characteristics

Refer to the attached sheet, page 4 to 6.

## 4. Reliability

Refer to the attached sheet, page 7.

## 5. Incoming inspection

Refer to the attached sheet, page 8.

## 6. Supplement

## 6.1 Isolation voltage shall be measured in the following method.

- (1) Short between anode and cathode on the primary side, and between collector and emitter on the secondary side.
- (2) The dielectric withstand 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.)

## 6.2 Collector current (Ic) Delivery rank table

("○" mark indicates business dealing name of ordered product)

| Ordered product | Business dealing name | Rank mark    | Ic (mA)    |
|-----------------|-----------------------|--------------|------------|
|                 | PC844X                | A or no mark | 0.2 to 3.0 |
|                 | PC844X1               | A            | 0.5 to 1.5 |

| Test conditions           |
|---------------------------|
| $I_F = \pm 1 \text{ mA}$  |
| $V_{CE} = 5 \text{ V}$    |
| $T_a = 25^\circ \text{C}$ |

6.3 This Model is approved by UL.

Approved Model No. : PC844

UL file No. : E64380

6.4 This photocoupler is designed for AC input..

6.5 This product is not designed against irradiation.

This product is assembled with electrical input and output.

This product incorporates non-coherent light emitting diode.

6.6 ODS materials

This product shall not contain the following materials.

Also, the following materials shall not be used in the production process for this product.

Materials for ODS : CFC<sub>s</sub>, Halon, Carbon tetrachloride,  
1.1.1-Trichloroethane (Methylchloroform)

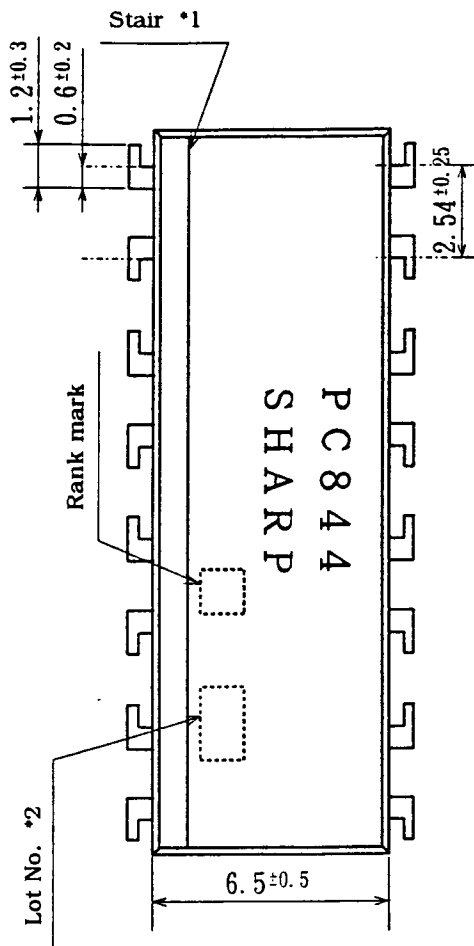
6.7 Brominated flame retardants

Specific brominated flame retardants such as the PBBO<sub>s</sub> and PBB<sub>s</sub> are not used in this device at all.

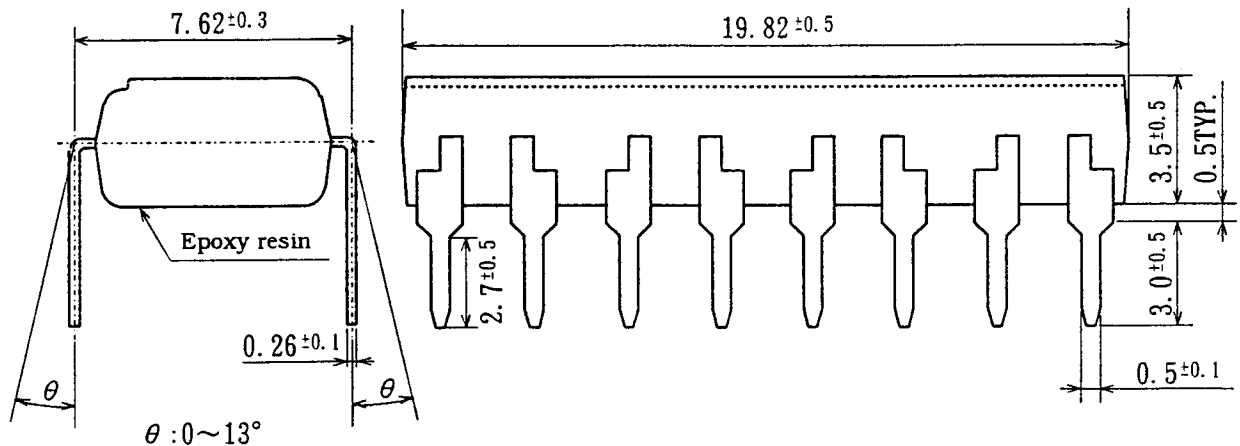
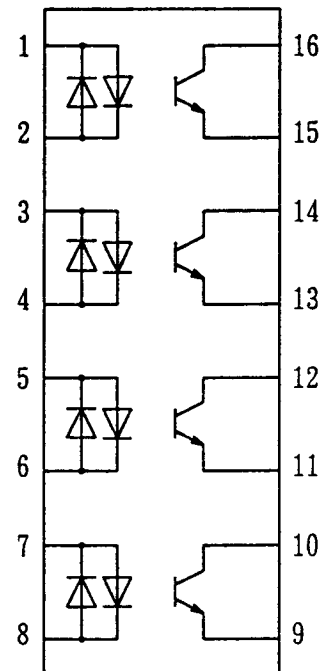
## 7. Notes

Refer to the attached sheet-1.

## 2. Outline



Pin Nos. and internal connection diagram



\*1) Input terminals are lining along the stair side.

\*2) 2-digit number shall be marked according to DIN standard.

Product mass : Approx. 1.0g

UNIT : 1/1 mm

Name

PC844  
Outline Dimensions  
(Business dealing  
name : PC844X)

Drawing  
No.

CY8594K02

## 3. Ratings and characteristics

## 3.1 Absolute maximum ratings

Ta=25°C

| Parameter                  |                                | Symbol    | Rating      | Unit  |
|----------------------------|--------------------------------|-----------|-------------|-------|
| Input                      | *1 Forward current             | $I_F$     | $\pm 50$    | mA    |
|                            | *2 Peak forward current        | $I_{FM}$  | $\pm 1$     | A     |
|                            | *1 Power dissipation           | P         | 70          | mW    |
| Output                     | Collector-emitter voltage      | $V_{CEO}$ | 35          | V     |
|                            | Emitter-collector voltage      | $V_{ECO}$ | 6           | V     |
|                            | Collector current              | $I_c$     | 50          | mA    |
|                            | *1 Collector power dissipation | $P_c$     | 150         | mW    |
| *1 Total power dissipation |                                | $P_{tot}$ | 200         | mW    |
| Operating temperature      |                                | $T_{opr}$ | -30 to +100 | °C    |
| Storage temperature        |                                | $T_{stg}$ | -55 to +125 | °C    |
| *3 Isolation voltage       |                                | $V_{iso}$ | 5           | kVrms |
| *4 Soldering temperature   |                                | $T_{sol}$ | 260         | °C    |

\*1 The derating factors of absolute maximum ratings due to ambient temperature are shown in Fig. 1 to 4.

\*2 Pulse width  $\leq 100 \mu s$ , Duty ratio : 0.001 (Refer to Fig. 5)

\*3 AC for 1 min, 40 to 60%RH

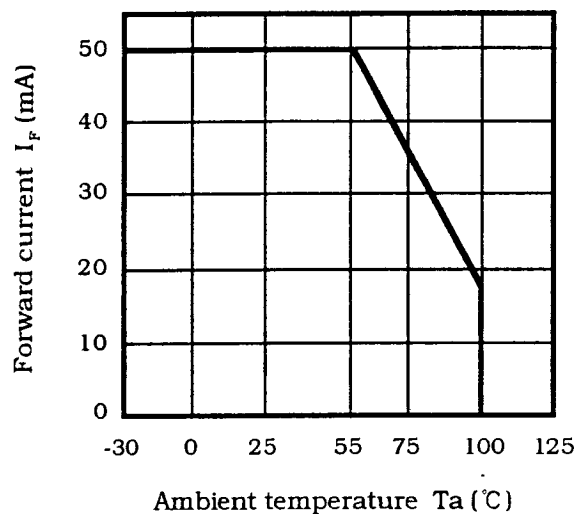
\*4 For 10 s

## 3.2 Electro-optical characteristics

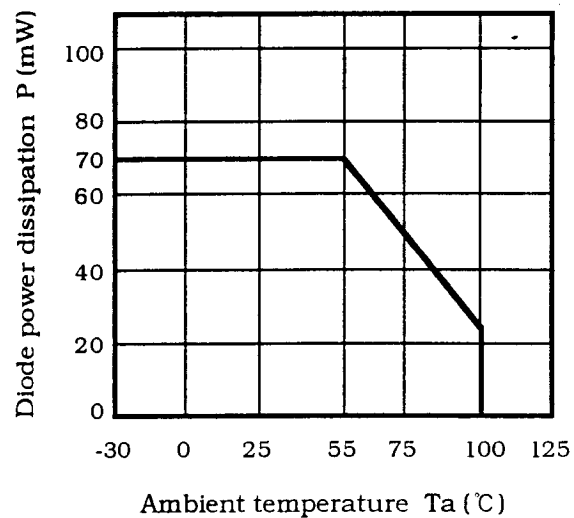
Ta=25°C

| Parameter                |                                      | Symbol        | Conditions                                                                 | MIN.               | TYP.      | MAX. | Unit          |
|--------------------------|--------------------------------------|---------------|----------------------------------------------------------------------------|--------------------|-----------|------|---------------|
| Input                    | Forward voltage                      | $V_F$         | $I_F = \pm 20\text{mA}$                                                    | -                  | 1.2       | 1.4  | V             |
|                          | Peak forward voltage                 | $V_{FM}$      | $I_{FM} = \pm 0.5\text{A}$                                                 | -                  | -         | 3.0  | V             |
|                          | Terminal capacitance                 | $C_t$         | $V=0, f=1\text{kHz}$                                                       | -                  | 50        | 250  | pF            |
| Output                   | Dark current                         | $I_{CEO}$     | $V_{CE}=20\text{V}, I_F=0$                                                 | -                  | -         | 100  | nA            |
|                          | Collector-emitter breakdown voltage  | $BV_{CEO}$    | $I_C=0.1\text{mA}$<br>$I_F=0$                                              | 35                 | -         | -    | V             |
|                          | Emitter-collector breakdown voltage  | $BV_{ECO}$    | $I_E=10\text{ }\mu\text{A}, I_F=0$                                         | 6                  | -         | -    | V             |
| Transfer characteristics | Collector current                    | $I_C$         | $I_F = \pm 1\text{mA}$<br>$V_{CE}=5\text{V}$                               | 0.2                | -         | 3.0  | mA            |
|                          | Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_F = \pm 20\text{mA}$<br>$I_C=1\text{mA}$                                | -                  | 0.1       | 0.2  | V             |
|                          | Isolation resistance                 | $R_{iso}$     | DC500V<br>40 to 60%RH                                                      | $5 \times 10^{10}$ | $10^{11}$ | -    | $\Omega$      |
|                          | Floating capacitance                 | $C_f$         | $V=0, f=1\text{MHz}$                                                       | -                  | 0.6       | 1.0  | pF            |
|                          | Cut-off frequency                    | $f_c$         | $V_{CE}=5\text{V}, I_C=2\text{mA}$<br>$R_L=100\text{ }\Omega, -3\text{dB}$ | 15                 | 80        | -    | kHz           |
|                          | Response time (Rise)                 | $t_r$         | $V_{CE}=2\text{V}$<br>$I_C=2\text{mA}$<br>$R_L=100\text{ }\Omega$          | -                  | 4         | 18   | $\mu\text{s}$ |
|                          | Response time (Fall)                 | $t_f$         |                                                                            | -                  | 3         | 18   | $\mu\text{s}$ |

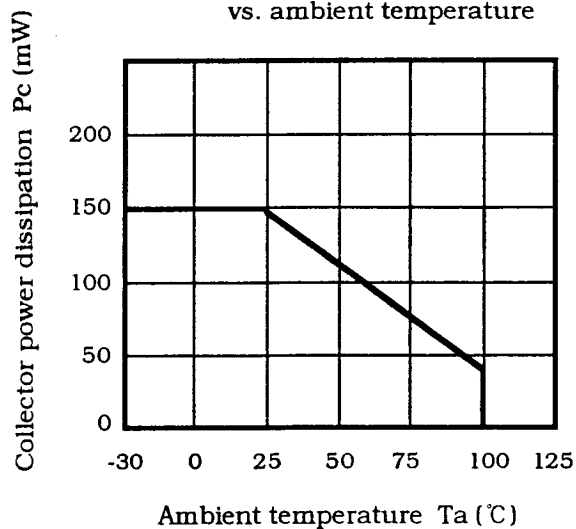
(Fig. 1) Forward current vs. ambient temperature



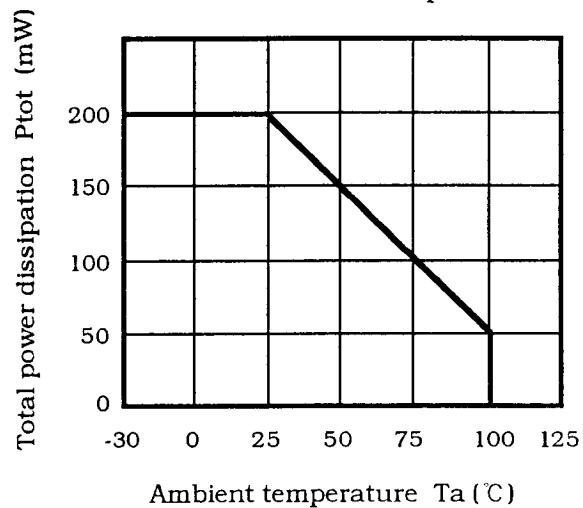
(Fig. 2) Diode power dissipation vs. ambient temperature



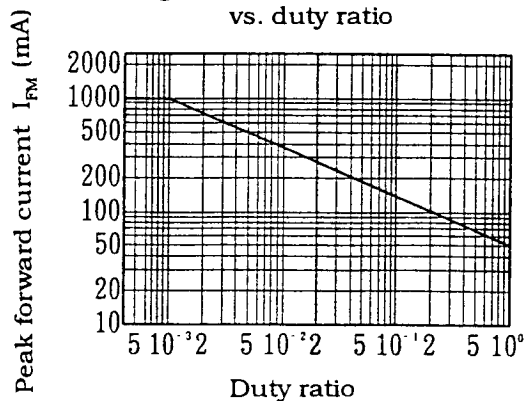
(Fig. 3) Collector power dissipation vs. ambient temperature



(Fig. 4) Total power dissipation vs. ambient temperature



(Fig. 5) Peak forward current vs. duty ratio



Pulse width  $\leq 100 \mu s$   
 $T_a = 25^\circ C$

## 4. Reliability

The reliability of products shall satisfy items listed below.

Confidence level : 90%

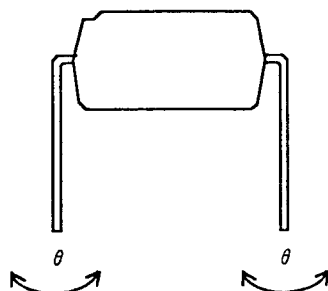
LTPD : 10%/20%

| Test Items                              | Test Conditions<br>*1                                                              | Failure Judgement<br>Criteria                                                                                                                                                                | Samples (n)<br>Defective(C) |
|-----------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Solderability *2                        | 230 °C, 5 s                                                                        | —                                                                                                                                                                                            | n=11, C=0                   |
| Soldering heat                          | 260 °C, 10 s                                                                       | $V_F > U \times 1.2$<br>$I_{CEO} > U \times 2$<br>$I_C < L \times 0.7$<br>$V_{CE(sat)} > U \times 1.2$<br><br>U : Upper<br>specification<br>limit<br><br>L : Lower<br>specification<br>limit | n=11, C=0                   |
| Terminal strength<br>(Tension)          | Weight : 5N<br>5 s/each terminal                                                   |                                                                                                                                                                                              | n=11, C=0                   |
| Terminal strength<br>(Bending) *3       | Weight : 2.5N<br>2 times/each terminal                                             |                                                                                                                                                                                              | n=11, C=0                   |
| Mechanical shock                        | 15000m/s <sup>2</sup> , 0.5ms<br>3 times/ ±X, ±Y, ±Z direction                     |                                                                                                                                                                                              | n=11, C=0                   |
| Variable frequency<br>vibration         | 100 to 2000 to 100Hz/4min<br>200m/s <sup>2</sup><br>4 times/ X, Y, Z direction     |                                                                                                                                                                                              | n=11, C=0                   |
| Temperature<br>cycling                  | 1 cycle -55 °C to +125 °C<br>(30min) (30min)<br>20 cycles test                     |                                                                                                                                                                                              | n=22, C=0                   |
| High temp. and high<br>humidity storage | +60 °C, 90%RH, 1000h                                                               |                                                                                                                                                                                              | n=22, C=0                   |
| High temp. storage                      | +125 °C, 1000h                                                                     |                                                                                                                                                                                              | n=22, C=0                   |
| Low temp. storage                       | -55 °C, 1000h                                                                      |                                                                                                                                                                                              | n=22, C=0                   |
| Operation life                          | $I_F = \pm 50\text{mA}$ , $P_{tot} = 200\text{mW}$<br>$T_a = 25\text{ °C}$ , 1000h |                                                                                                                                                                                              | n=22, C=0                   |

\*1 Test method, conforms to JIS C 7021.

\*2 Solder shall adhere at the area of 95% or more of immersed portion of lead, and pin hole or other holes shall not be concentrated on one portion.

\*3 Terminal bending direction is shown below.





## 5. Incoming inspection

### 5.1 Inspection items

#### (1) Electrical characteristics

$V_F$ ,  $I_{CEO}$ ,  $V_{CE(sat)}$ ,  $I_C$ ,  $R_{iso}$ ,  $V_{iso}$

#### (2) Appearance

### 5.2 Sampling method and Inspection level

A single sampling plan, normal inspection level II based on ISO 2859 is applied. The AQL according to the inspection items are shown below.

| Defect       | Inspection item                                  | AQL (%) |
|--------------|--------------------------------------------------|---------|
| Major defect | Electrical characteristics<br>Unreadable marking | 0.1     |
| Minor defect | Appearance defect except<br>the above mentioned. | 0.4     |

Precautions for Photocouplers

## 1 For cleaning

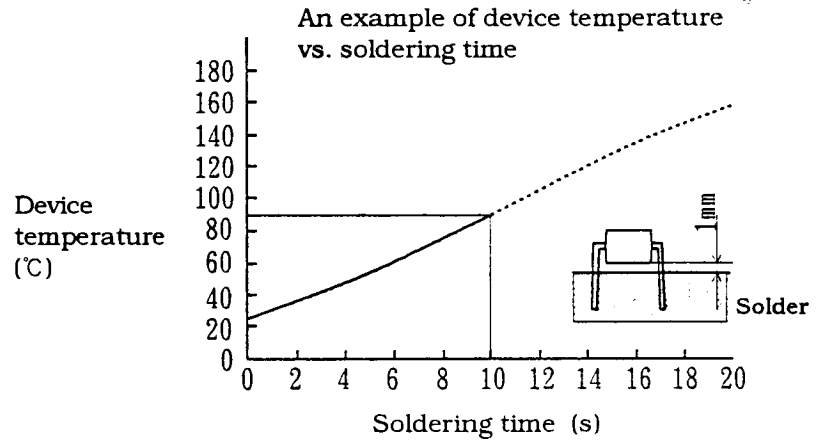
- (1) Solvent cleaning : Solvent temperature 45°C or less  
Immersion for 3 min or less
- (2) Ultrasonic cleaning : The effect to device by ultrasonic cleaning differs  
by cleaning bath size, ultrasonic power  
output, cleaning time, PWB size or device mounting  
condition etc. Please test it in actual using condition  
and confirm that doesn't occur any defect before starting  
the ultrasonic cleaning.
- (3) Applicable solvent : Ethyl alcohol, Methyl alcohol, Isopropyl alcohol

In case 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.

- 2. The LED used in the Photocoupler generally decreases the light emission power  
by operation. In case of long operation time, please design the circuit with considering  
the degradation of the light emission power of the LED. (50%/5years)

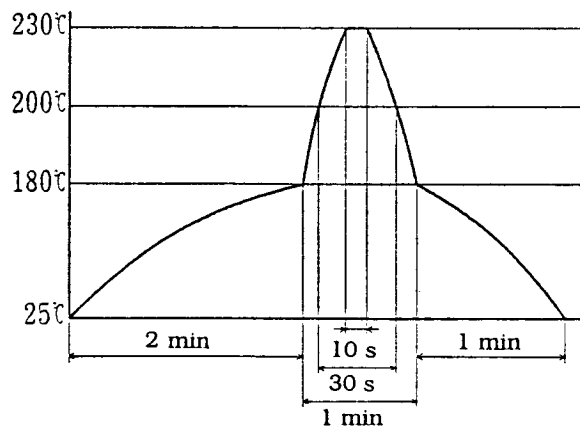
### 3. Precautions for Soldering Photocouplers

- (1) In case of soldering  
to lead  
260 °C 10 s or less



- (2) If solder reflow :

It is recommended that only one soldering be done at the temperature and the time within the temperature profile as shown in the figure.



- (3) Other precautions

An infrared lamp used to heat up for soldering may cause a localized temperature rise in the resin. So keep the package temperature within that specified in Item (2). Also avoid immersing the resin part in the solder.

photocoupler, PC844