

# PC110L/PC111L PC112L/PC113L

## Long Creepage Distance Type Photocoupler

\* Lead fitting type (I type) and taping reel type (P type) are also available. (PC110L/PC111L/PC112L/PC113L, PC110LP/PC111LP/PC112LP/PC113LP) (Page 656)

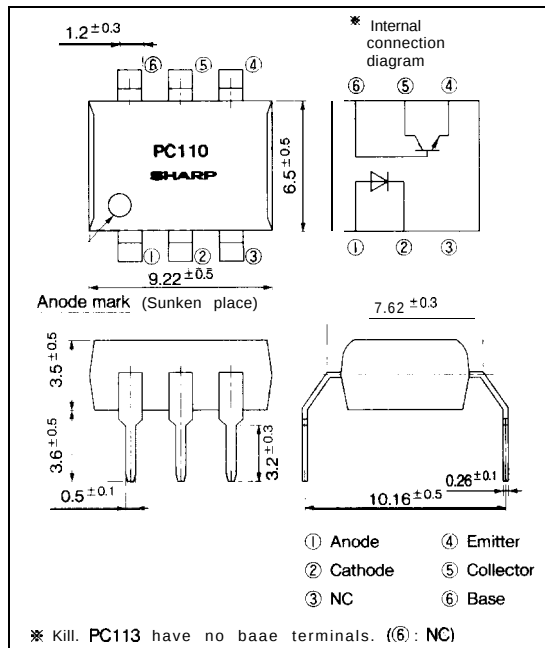
\* DIN -VDE0884 approved type is also available as an option

### ■ Features

1. Long creepage distance type (Creepage distance : 8mm or more)\*1
  2. Internal insulation distance : 0.5mm or more
  3. Recognized by UL file No. E64380  
Approved by VDE (DIN -VDE0884; No. 77292)  
Approved by BS7000 (BS4156690, BS7000/7421)  
Approved by SEMKO (No. 9303049)  
Approved by EI (PC110: No. 099447-01  
PC111: No. 099448-01  
PC112: No. 099449-01  
PC113: No. 099450-01)  
Approved by DEMKO (No. 84859)
  4. High collector-emitter voltage  
( $V_{CE0}$  : 70V) : PC112L/PC113L
  5. High isolation voltage between input and output ( $V_{iso}$  : 5 000V<sub>rms</sub>)
  6. Dual-in-line package
- \*1 Allows pin-to-pin distance minus PWB land space to be 8mm or more.

### ■ Outline Dimensions

(Unit : mm)



### ■ Applications

1. Switching power supplies
2. Home appliances and OA equipment for export to Europe
3. System appliances, measuring instruments

6

Photocouplers

## ■ Absolute Maximum Ratings

(Ta = 25°C)

| Parameter               |                                |                  | Symbol           | Rating      | Unit |
|-------------------------|--------------------------------|------------------|------------------|-------------|------|
| Input                   | Forward current                |                  | I <sub>F</sub>   | 50          | mA   |
|                         | *2Peak forward current         |                  | I <sub>FM</sub>  | 1           | A    |
|                         | Reverse Voltage                |                  | V <sub>R</sub>   | 6           | v    |
|                         | Power dissipation              |                  | P                | 70          | mW   |
| output                  | Collector -emitter voltage     | PC110L/PC111L    | V <sub>CEO</sub> | 35          | v    |
|                         |                                | PC112L/PC113L    |                  | 70          |      |
|                         | Emitter-collector voltage      |                  | V <sub>ECO</sub> | 6           | V    |
|                         | Collector -base voltage        | PC110L           | V <sub>CBO</sub> | 35          | v    |
|                         |                                | PC112L           |                  | 70          |      |
|                         | Emitter-base voltage           |                  | V <sub>EBO</sub> | 6           | v    |
|                         | Collector current              |                  | I <sub>C</sub>   | 50          | mA   |
|                         | Collector power dissipation    | PC110L/PC111L    | P <sub>C</sub>   | 150         | mW   |
|                         |                                | PC112L/PC113L    |                  | 160         |      |
| Total power dissipation | PC110L/PC111L<br>PC112L/PC113L | P <sub>tot</sub> | 170              | mW          |      |
|                         |                                |                  | 200              |             |      |
| Insulation voltage      |                                |                  | V <sub>iso</sub> | 5 000       | Vrms |
| Operating temperature   |                                |                  | T <sub>opr</sub> | -30 to +100 | °C   |
| Storage temperature     |                                |                  | T <sub>stg</sub> | -55 to +125 | °C   |
| *5Soldering temperature |                                |                  | T <sub>sld</sub> | 260         | °C   |

\*2 Pulse width ≤ 100 μs, Duty ratio = 0.001

\*3 Applies only to PC110L, PC112L.

\*4 40 to 60 %RH, AC for 1 minute

\*5 For 1(1 seconds)

## ■ Electro-optical Characteristics

(Ta = 25°C)

| Parameter                       |                                         |               | Symbol               | Conditions                                                              | MIN.                                                                 | TYP.                 | MAX.             | Unit |    |
|---------------------------------|-----------------------------------------|---------------|----------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------|------------------|------|----|
| Input                           | Forward voltage                         |               | V <sub>F</sub>       | I <sub>F</sub> = 20mA                                                   | —                                                                    | 1.2                  | 1.4              | V    |    |
|                                 | Reverse current                         |               | I <sub>R</sub>       | V <sub>R</sub> = 4V                                                     | —                                                                    | —                    | 10               | μA   |    |
|                                 | Terminal capacitance                    |               | C <sub>t</sub>       | V = 0, f = 1kHz                                                         | —                                                                    | 30                   | 250              | pF   |    |
| output                          | Collector dark current                  |               | I <sub>CEO</sub>     | V <sub>CE</sub> = 20V, I <sub>F</sub> = 0, R <sub>BE</sub> = ∞          | —                                                                    | —                    | 10 <sup>-7</sup> | A    |    |
|                                 | Collector -emitter<br>brakedown voltage | PC110L/PC111L | BV <sub>CEO</sub>    | I <sub>C</sub> = 0.1mA, I <sub>F</sub> = 0                              | 35                                                                   | —                    | —                | V    |    |
|                                 |                                         | PC112L/PC113L |                      |                                                                         | 70                                                                   | —                    | —                |      |    |
|                                 | Emitter-collector breakdown voltage     |               | BV <sub>ECO</sub>    | I <sub>E</sub> = 10 μA, I <sub>F</sub> = 0                              | 6                                                                    | —                    | —                | v    |    |
|                                 | Collector -base<br>breakdown voltage    | PC110L        | BV <sub>CBO</sub>    | I <sub>C</sub> = 0.1mA, I <sub>F</sub> = 0                              | 35                                                                   | —                    | —                | v    |    |
|                                 |                                         | PC112L        |                      |                                                                         | 70                                                                   | —                    | —                |      |    |
| Transfer<br>charac<br>teristics | Current<br>transfer ratio               | PC110L        | CTR                  | I <sub>F</sub> = 5mA, V <sub>CE</sub> = 5V, R <sub>BE</sub> = ∞         | 50                                                                   | —                    | 600              | %    |    |
|                                 |                                         | PC111L        |                      |                                                                         | 50                                                                   | 100                  | 400              |      |    |
|                                 |                                         | PC112L/PC113L |                      |                                                                         | 40                                                                   | —                    | 320              |      |    |
|                                 | Collector -emitter saturation voltage   |               | V <sub>CE(sat)</sub> | I <sub>F</sub> = 20mA, I <sub>C</sub> = 1mA, R <sub>BE</sub> = ∞        | —                                                                    | 0.1                  | 0.2              | v    |    |
|                                 | Isolation resistance                    |               | R <sub>ISO</sub>     | DC500V, 40 to 60%RH                                                     | 5 x 10 <sup>10</sup>                                                 | 1 x 10 <sup>11</sup> | —                | Ω    |    |
|                                 | Floating resistance                     |               | C <sub>f</sub>       | V = 0, f = 1MHz                                                         | —                                                                    | 0.6                  | 1.0              | pF   |    |
|                                 | Cut-off frequency                       |               | f <sub>C</sub>       | V <sub>CE</sub> = 5V, I <sub>C</sub> = 2mA, R <sub>L</sub> = 100Ω, -3dB | —                                                                    | 80                   | —                | kHz  |    |
|                                 | Response time                           | Rise time     | PC110L/PC111L        | t <sub>r</sub>                                                          | V <sub>CE</sub> = 2V, I <sub>C</sub> = 2mA<br>R <sub>L</sub> = 100 Ω | —                    | 4                | 18   | μs |
|                                 |                                         |               | PC112L/PC113L        |                                                                         |                                                                      | —                    | 4                | 15   |    |
| Fall time                       |                                         | PC110L/PC111L | t <sub>f</sub>       |                                                                         |                                                                      | —                    | 3                | 18   | μs |
|                                 |                                         | PC112L/PC113L |                      |                                                                         |                                                                      | —                    | 3                | 15   |    |

## PC110L/PC111L

| Model No.       | CTR(%)     |
|-----------------|------------|
| PC110L1/PC111L1 | 50 to 125  |
| PC110L2/PC111L2 | 100 to 250 |
| PC110L5/PC111L5 | 50 to 250  |
| PC110L/PC111L   | 50 to 400  |

## PC112L/PC113L

| Model No.       | CTR(%)    |
|-----------------|-----------|
| PC112L1/PC113L1 | 40 to 120 |
| PC112L2/PC113L2 | 80 to 200 |
| PC112L5/PC113L5 | 40 to 200 |
| PC112L/PC113L   | 40 to 320 |

Fig. 1 Forward Current vs. Ambient Temperature

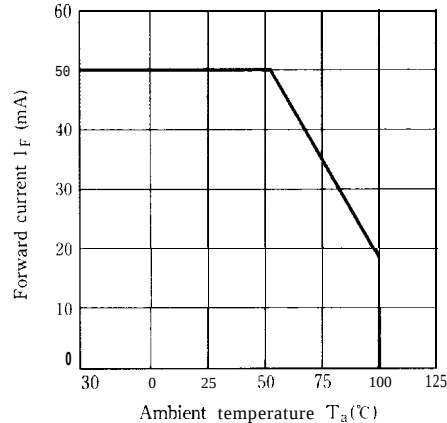


Fig. 2 Diode Power Dissipation vs. Ambient Temperature

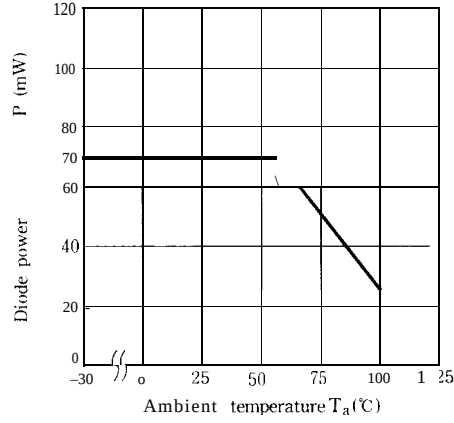


Fig. 3 Collector Power Dissipation vs. Ambient Temperature

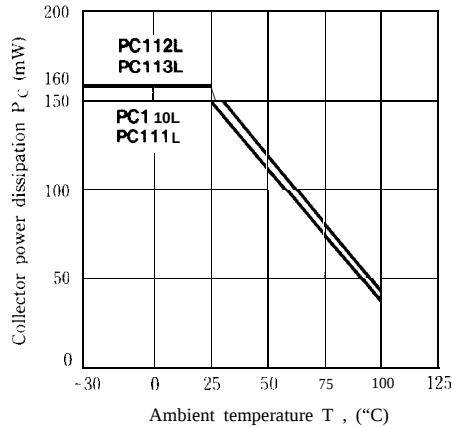


Fig. 4 Power Dissipation vs. Ambient Temperature

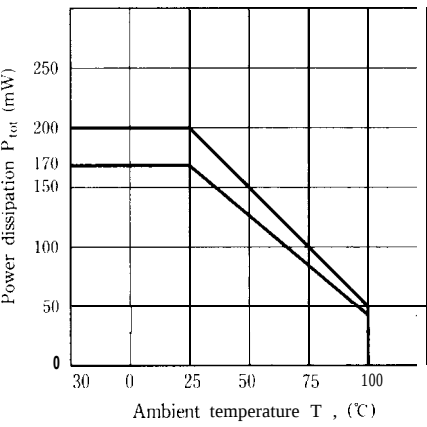


Fig. 5 Peak Forward Current vs. Duty

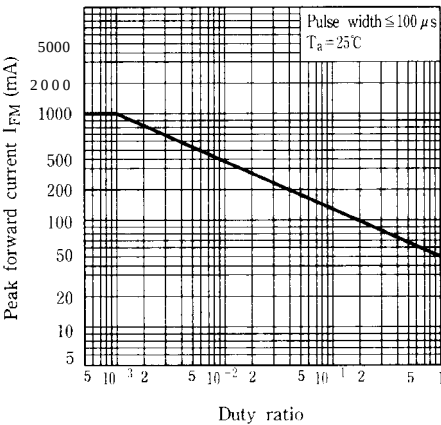
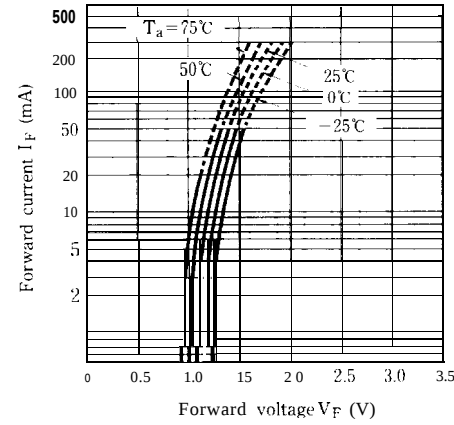
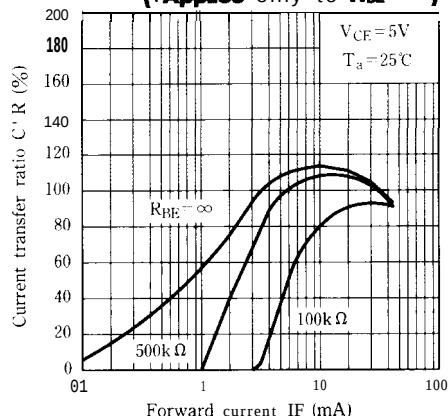


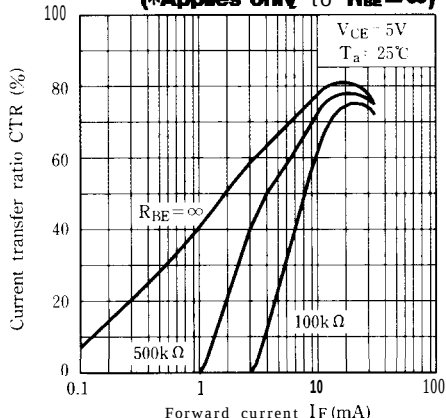
Fig. 6 Forward Current vs. Forward Voltage



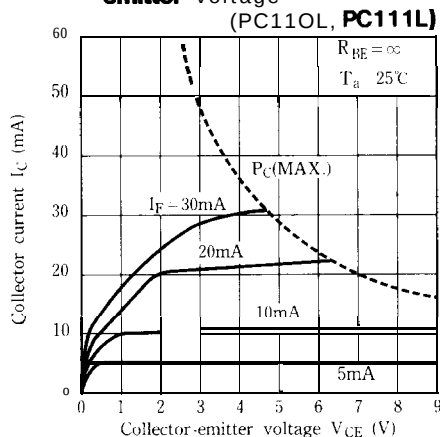
**Fig. 7-a Current Transfer Ratio vs. Forward Current (PC110L, PC111L\*)**  
(\*Applies only to  $R_{BE} = \infty$ )



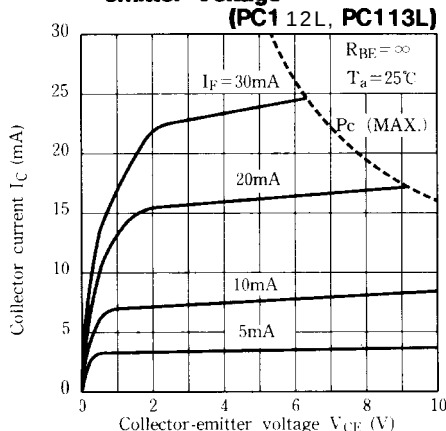
**Fig. 7-b Current Transfer Ratio vs. Forward Current (PC112L, PC113L\*)**  
(\*Applies only to  $R_{BE} = \infty$ )



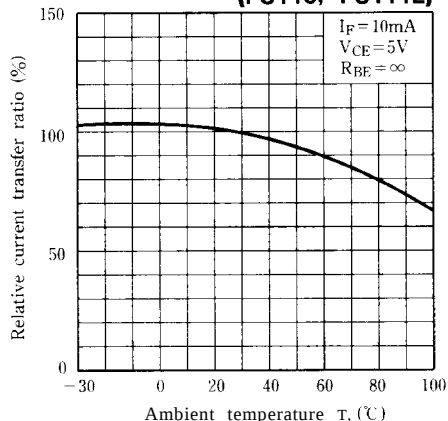
**Fig. 8-a Collector current vs. Collector-emitter voltage (PC110L, PC111L)**



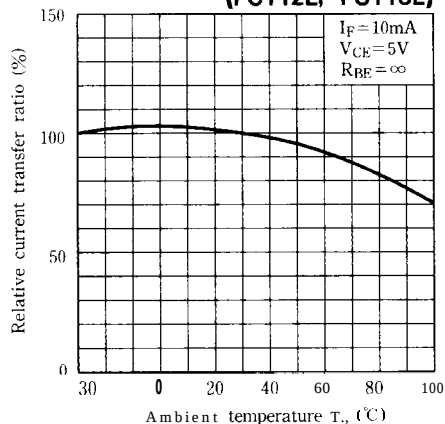
**Fig. 8-b Collector Current vs. Collector-emitter Voltage (PC112L, PC113L)**



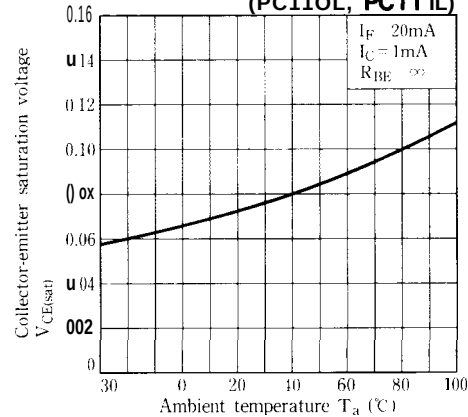
**Fig. 9-a Relative Current Transfer Ratio vs. Ambient Temperature (PC110, PC111L)**



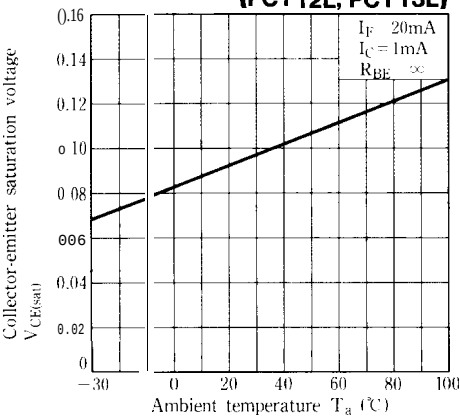
**Fig. 9-b Relative Current Transfer Ratio vs. Ambient Temperature (PC112L, PC113L)**



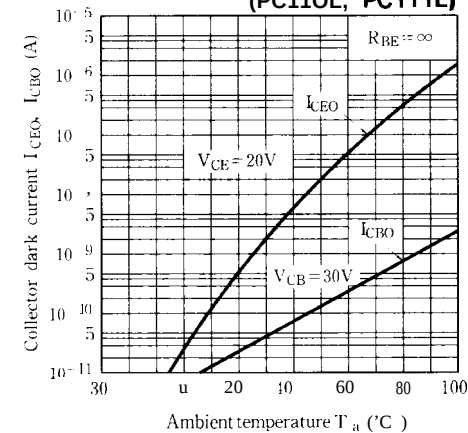
**Fig. 10-a Collector-emitter Saturation Voltage vs. Ambient Temperature (PC110L, PC111L)**



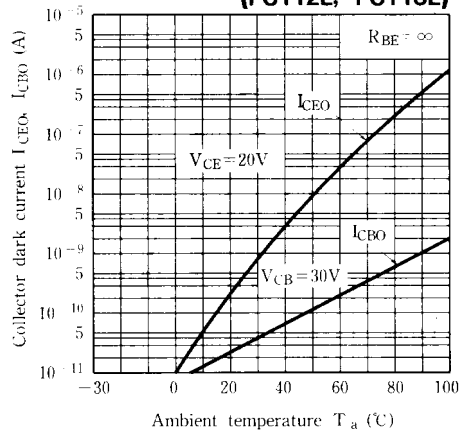
**Fig.10-b Collector-emitter Saturation Voltage vs. Ambient Temperature (PC112L, PC113L)**



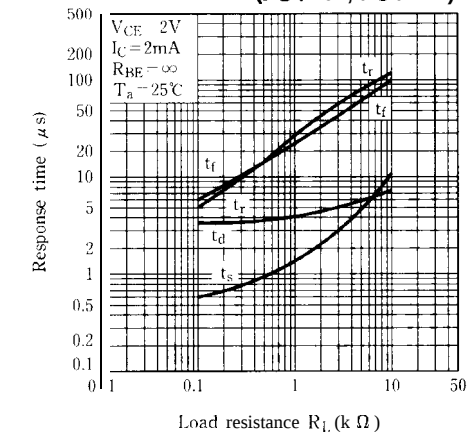
**Fig.1 I-a Collector Dark Current vs. Ambient Temperature (PC110L, PC111L)**



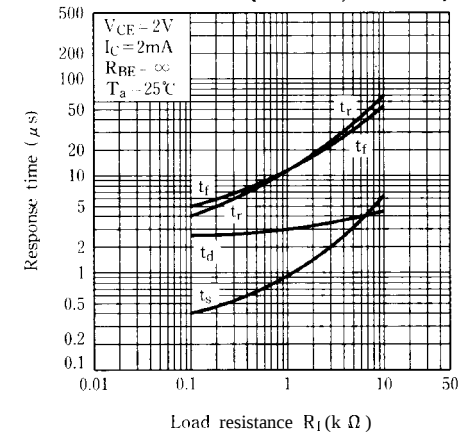
**Fig.1 I-b Collector Dark current vs. Ambient Temperature (PC112L, PC113L)**



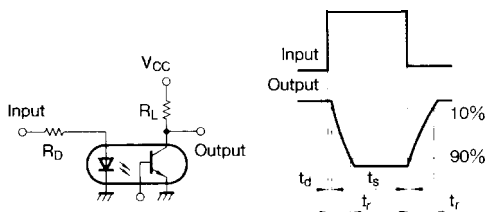
**Fig.1 2-a Response Time vs. Load Resistance (PC110L, PC111L)**



**Fig.12-b Response Time vs. Load Resistance (PC112L, PC113L)**

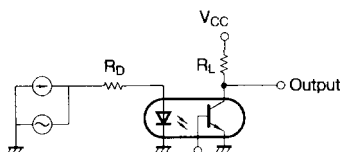


## Test Circuit for Response Time



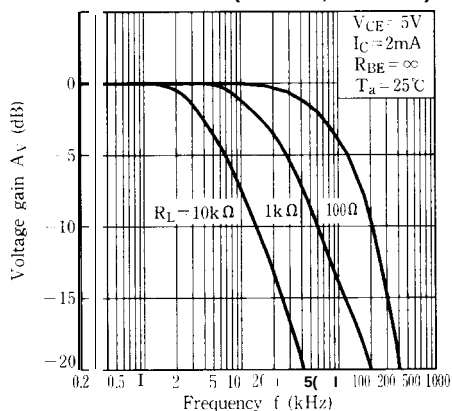
PC111L and PC113L have no base terminal.

## Test Circuit for Frequency Response

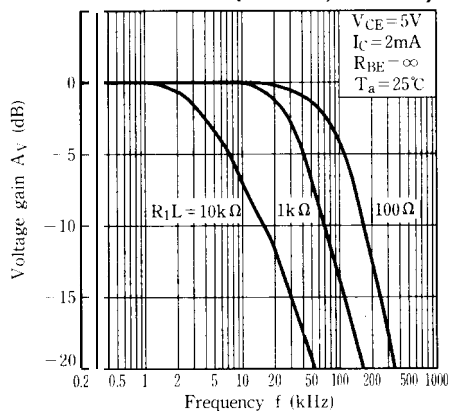


PC111L and PC113L have no base terminal.

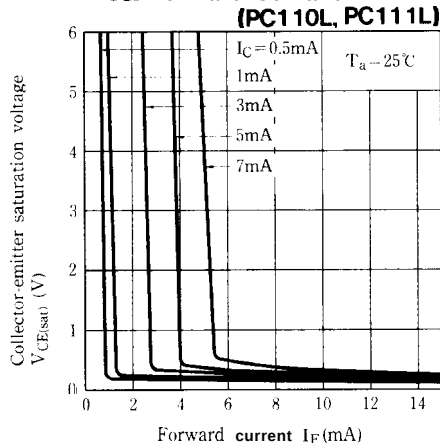
**Fig.1 3-a Frequency Response**  
(PC110L, PC111L)



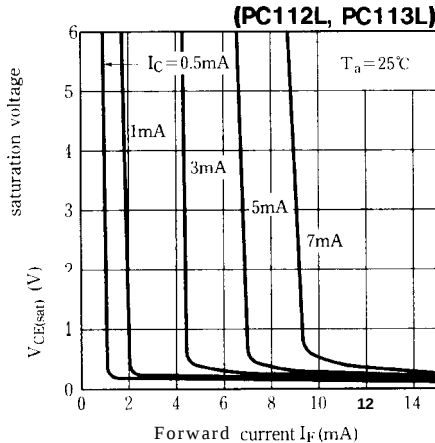
**Fig.1 3-b Frequency Response**  
(PC112L, PC113L)



**Fig.14-a Collector-emitter Saturation Voltage vs. Forward Current**  
(PC110L, PC111L)



**Fig.14-b Collector-emitter Saturation Voltage vs. Forward Current**  
(PC112L, PC113L)



● Please refer to the chapter "Precautions for Use" (Page 78 to 93)