

# PC110L/PC111L PC112L/PC113L

## Long Creepage Distance Type Photocoupler

⌘ Lead forming type (I type) and taping reel type (P type) are also available. (PC110LI / PC111LI / PC112LI / PC113LI, PC110LP0 / PC111LP0 / PC112LP0 / PC113LP0)

⌘ 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(No. E64380)  
Approved by VDE (DIN-VDE0884 : No. 77292)  
Approved by BSI (BS415 : 6690, BS7002 : 7421)  
Approved by SEMKO (**PC110L** : No. 8705118  
**PC111L** : No. 8705119  
**PC112L** : No. 8705120  
**PC113L** : No. 8705121)

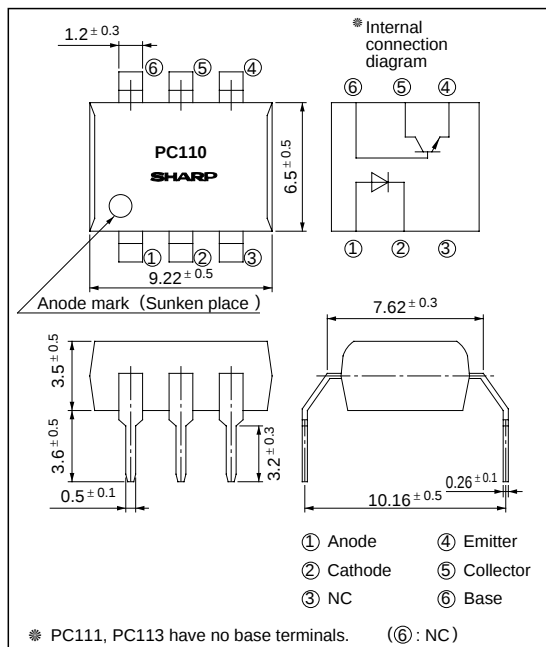
Approved by DEMKO (No. 37150)

4. High collector-emitter voltage  
( $V_{CEO}$  : 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

## ■ 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    |
|                         | *3Collector-base voltage    | PC110L        | V <sub>CBO</sub> | 35            | V    |
|                         |                             | PC112L        |                  | 70            |      |
|                         | *3Emitter-base voltage      | PC110L/PC112L | 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 | P <sub>tot</sub> | 170           | mW   |
| PC112L/PC113L           |                             | 200           |                  |               |      |
| *4Isolation 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>sol</sub> | 260           | °C   |

\*2 Pulse width  $\leq 100 \mu s$ , Duty ratio: 0.001\*3 Applies only to **PC110L, PC112L**.

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

\*5 For 10 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               | μ A  |     |
|                                  | 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                                                                  | -                    | 400              | %    |     |
|                                  |                                        | 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> = 100Ω | -                    | 4                | 18   | μ s |
|                                  |                                        |               | PC112L/PC113L        |                                                                          |                                                                     | -                    | 4                | 15   |     |
|                                  |                                        | Fall time     | PC110L/PC111L        | t <sub>f</sub>                                                           |                                                                     | -                    | 3                | 18   | μ s |
| PC112L/PC113L                    |                                        |               | -                    |                                                                          |                                                                     | 3                    | 15               |      |     |

## PC110L/PC111L

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

## PC112L/PC113L

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

Fig. 1 Forward Current vs. Ambient Temperature

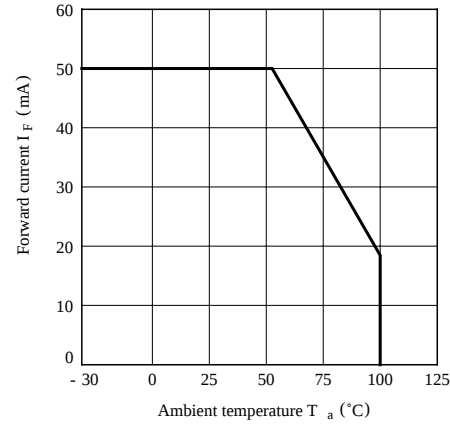


Fig. 2 Diode Power Dissipation vs. Ambient Temperature

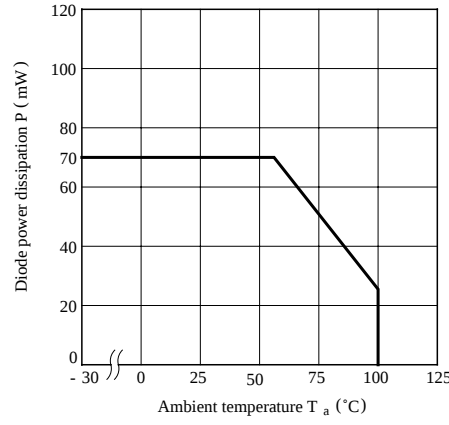


Fig. 3 Collector Power Dissipation vs. Ambient Temperature

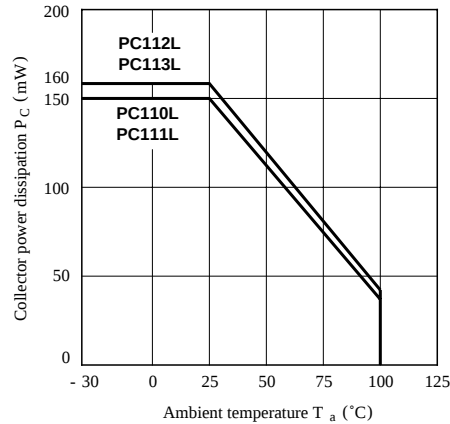


Fig. 4 Power Dissipation vs. Ambient Temperature

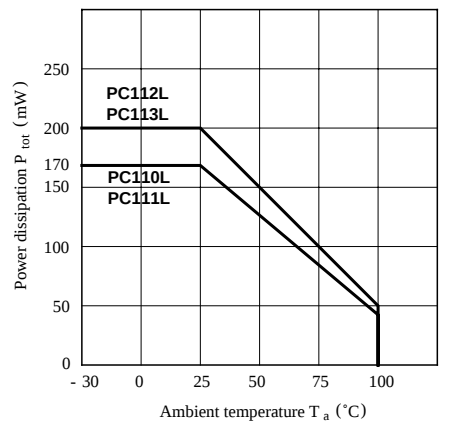


Fig. 5 Peak Forward Current vs. Duty Ratio

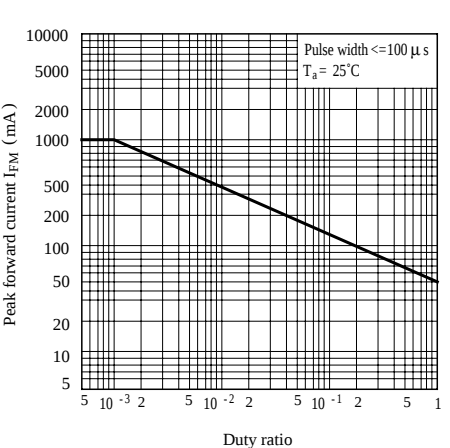
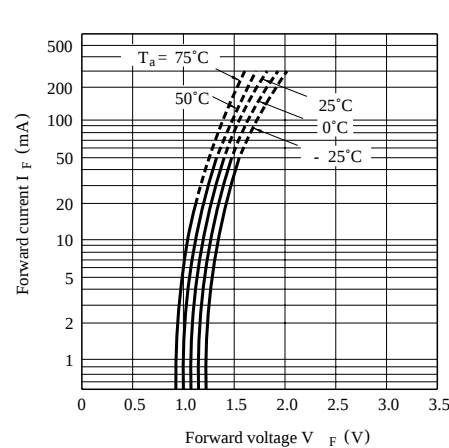
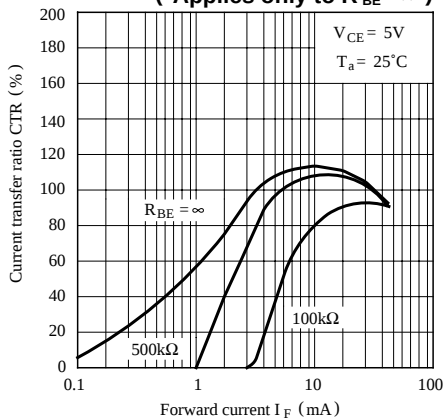


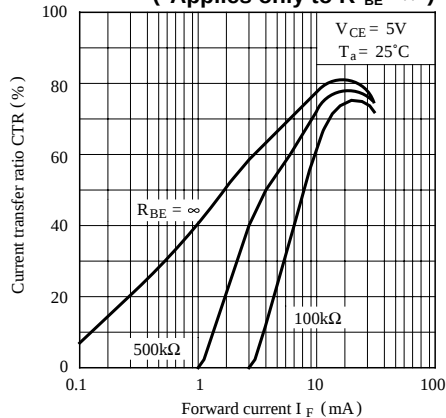
Fig. 6 Forward Current vs. Forward Voltage



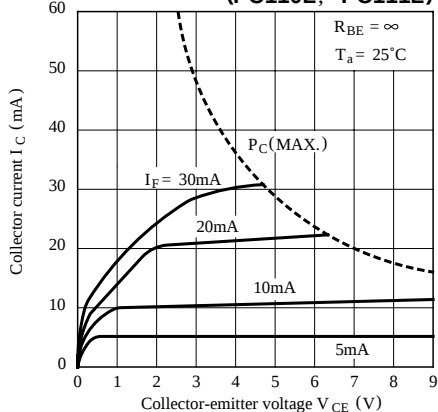
**Fig. 7-a Current Transfer Ratio vs. Forward Current (PC110L, PC111L\*)**  
(\*Applies only to  $R_{BE} = \infty$ )



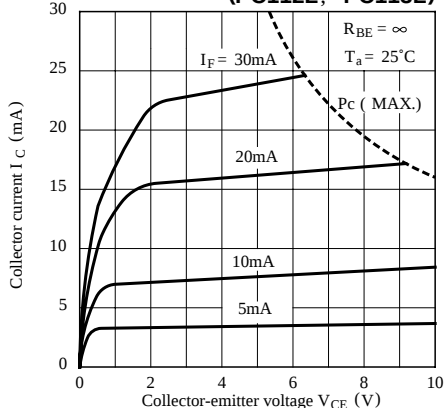
**Fig. 7-b Current Transfer Ratio vs. Forward Current (PC112L, PC113L\*)**  
(\*Applies only to  $R_{BE} = \infty$ )



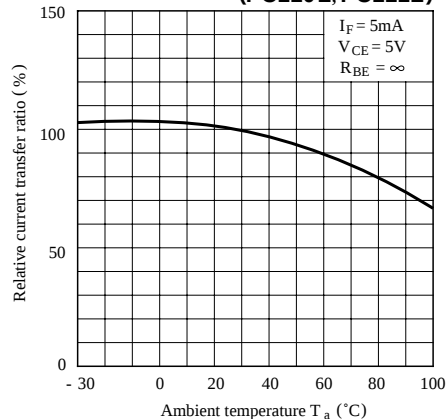
**Fig. 8-a Collector Current vs. Collector-emitter Voltage (PC110L, PC111L)**



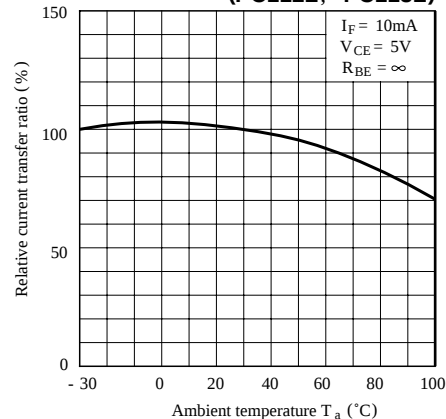
**Fig. 8-b Collector Current vs. Collector-emitter Voltage (PC112L, PC113L)**



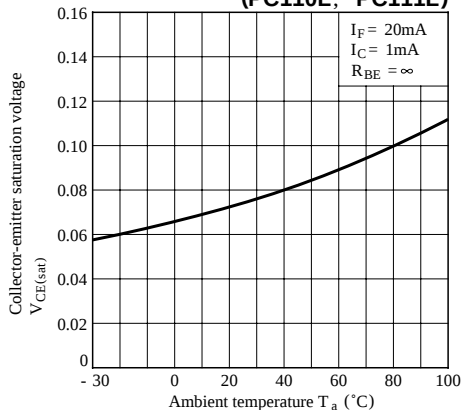
**Fig. 9-a Relative Current Transfer Ratio vs. Ambient Temperature (PC110L, PC111L)**



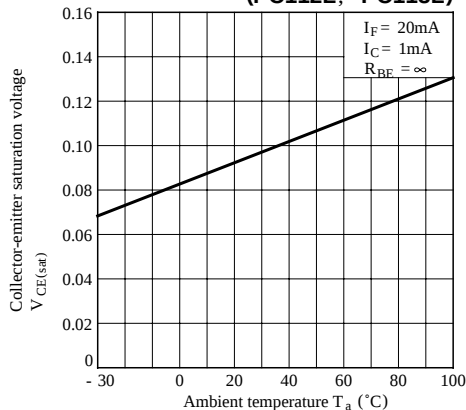
**Fig. 9-b Relative Current Transfer Ratio vs. Ambient Temperature (PC112L, PC113L)**



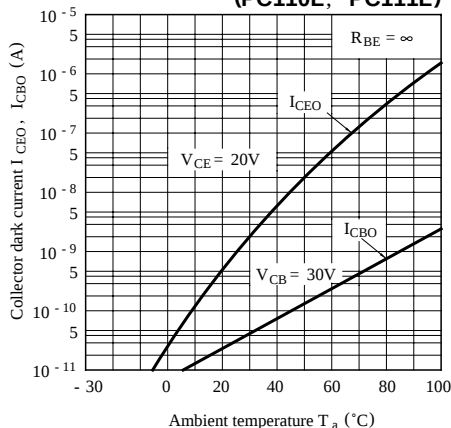
**Fig.10-a Collector-emitter Saturation Voltage vs. Ambient Temperature (PC110L, PC111L)**



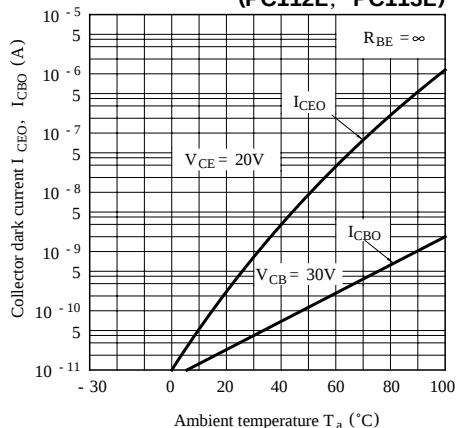
**Fig.10-b Collector-emitter Saturation Voltage vs. Ambient Temperature (PC112L, PC113L)**



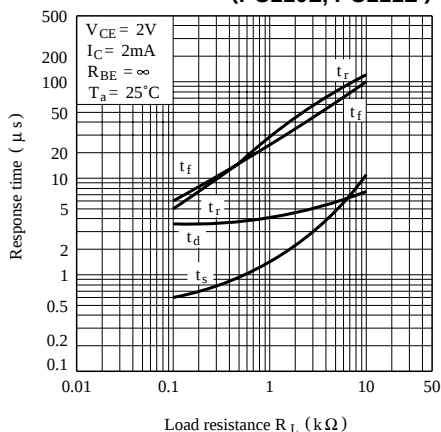
**Fig.11-a Collector Dark Current vs. Ambient Temperature (PC110L, PC111L)**



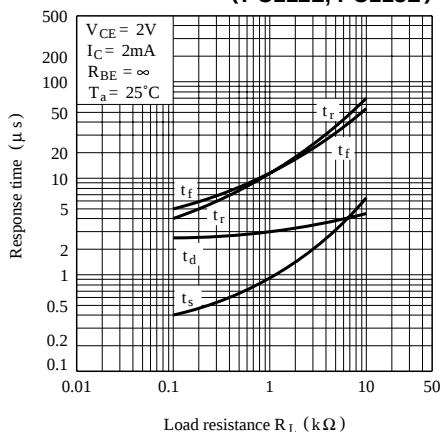
**Fig.11-b Collector Dark Current vs. Ambient Temperature (PC112L, PC113L)**



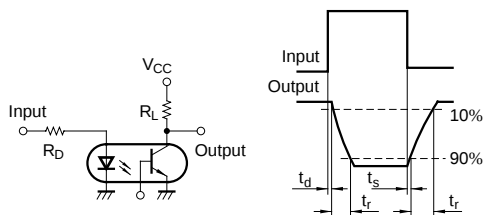
**Fig.12-a Response Time vs. Load Resistance (PC110L, PC111L)**



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

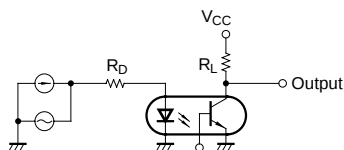


## Test Circuit for Response Time



PC111L and PC113L have no base terminal.

## Test Circuit for Frequency Response



PC111L and PC113L have no base terminal.

Fig.13-a Frequency Response  
(PC110L, PC111L)

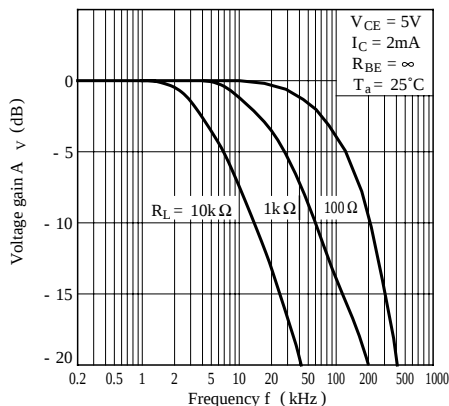


Fig.13-b Frequency Response  
(PC112L, PC113L)

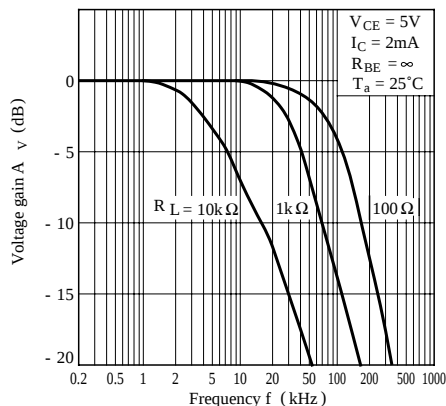


Fig.14-a Collector-emitter Saturation Voltage  
vs. Forward Current  
(PC110L, PC111L)

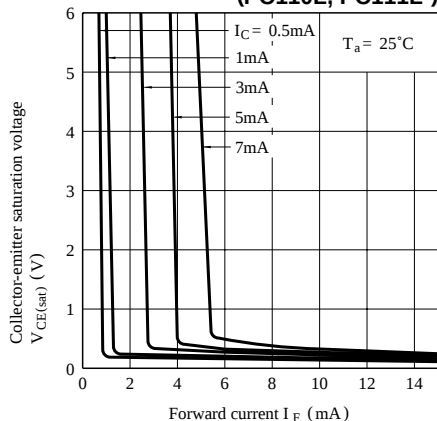


Fig.14-b Collector-emitter Saturation Voltage  
vs. Forward Current  
(PC112L, PC113L)

