# PC110L/PC111L PC112L/PC113L

## Long Creepage Distance Type Photocoupler

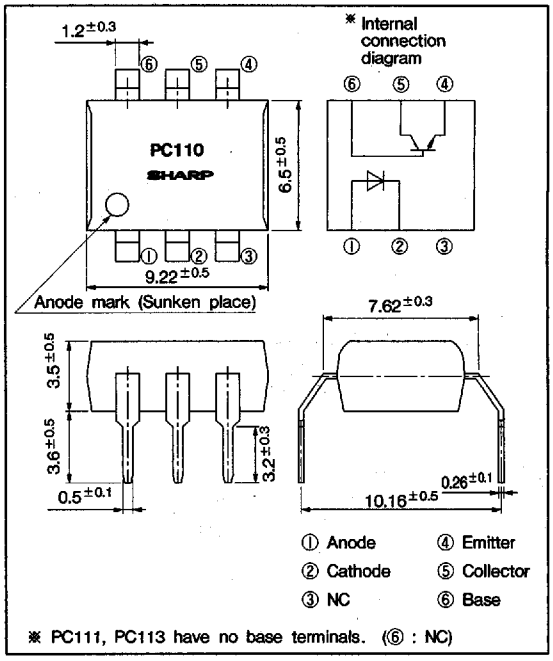
※ Lead forming type (I type) and taping reel type (P type) are also available. (PC110LI/PC111LI/PC112LI/PC113LI, PC110LP0/PC111LP0/PC112LP0/PC113LP0) (Page 656)
※ DIN-VDE0884 approved type is also available as an option.

### ■ 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 BSI (BS415 : 6690, BS7002 : 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 ($V_{CEO}$ : 70V) : **PC112L/PC113L**
5. High isolation voltage between input and output ($V_{iso}$ : 5 000$V_{rms}$)
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℃)

| Parameter | | | Symbol | Rating | Unit |
|---|---|---|---|---|---|
| Input | Forward current | | $I_F$ | 50 | mA |
| | *2Peak forward current | | $I_{FM}$ | 1 | A |
| | Reverse Voltage | | $V_R$ | 6 | V |
| | Power dissipation | | P | 70 | mW |
| Output | Collector-emitter voltage | PC110L/PC111L | $V_{CEO}$ | 35 | V |
| | | PC112L/PC113L | | 70 | |
| | Emitter-collector voltage | | $V_{ECO}$ | 6 | V |
| | *3Collector-base voltage | PC110L | $V_{CBO}$ | 35 | V |
| | | PC112L | | 70 | |
| | *3Emitter-base voltage | PC110L/PC112L | $V_{EBO}$ | 6 | V |
| | Collector current | | $I_C$ | 50 | mA |
| | Collector power dissipation | PC110L/PC111L | $P_C$ | 150 | mW |
| | | PC112L/PC113L | | 160 | |
| | Total power dissipation | PC110L/PC111L | $P_{tot}$ | 170 | mW |
| | | PC112L/PC113L | | 200 | |
| *4Isolation voltage | | | $V_{iso}$ | 5 000 | Vrms |
| Operating temperature | | | $T_{opr}$ | −30 to +100 | ℃ |
| Storage temperature | | | $T_{stg}$ | −55 to +125 | ℃ |
| *5Soldering temperature | | | $T_{sol}$ | 260 | ℃ |

*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 10 seconds

## ■ Electro-optical Characteristics (Ta=25℃)

| Parameter | | | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|---|---|
| Input | Forward voltage | | $V_F$ | $I_F$=20mA | − | 1.2 | 1.4 | V |
| | Reverse current | | $I_R$ | $V_R$=4V | − | − | 10 | μA |
| | Terminal capacitance | | $C_t$ | V=0,f=1kHz | − | 30 | 250 | pF |
| Output | Collector dark current | | $I_{CEO}$ | $V_{CE}$=20V, $I_F$=0, $R_{BE}$=∞ | − | − | $10^{-7}$ | A |
| | Collector-emitter brakedown voltage | PC110L/PC111L | $BV_{CEO}$ | $I_C$=0.1mA, $I_F$=0 | 35 | − | − | V |
| | | PC112L/PC113L | | | 70 | − | − | |
| | Emitter-collector breakdown voltage | | $BV_{ECO}$ | $I_E$=10 μA, $I_F$=0 | 6 | − | − | V |
| | Collector-base breakdown voltage | PC110L | $BV_{CBO}$ | $I_C$=0.1mA, $I_F$=0 | 35 | − | − | V |
| | | PC112L | | | 70 | − | − | |
| Transfer characteristics | Current transfer ratio | PC110L | CTR | $I_F$=5mA, $V_{CE}$=5V, $R_{BE}$=∞ | 50 | − | 600 | % |
| | | PC111L | | | 50 | 100 | 400 | |
| | | PC112L/PC113L | | $I_F$=10mA, $V_{CE}$=5mA, $R_{BE}$=∞ | 40 | − | 320 | |
| | Collector-emitter saturation voltage | | $V_{CE(sat)}$ | $I_F$=20mA, $I_C$=1mA, $R_{BE}$=∞ | − | 0.1 | 0.2 | V |
| | Isolation resistance | | $R_{ISO}$ | DC500V, 40 to 60%RH | $5\times10^{10}$ | $1\times10^{11}$ | − | Ω |
| | Floating resistance | | $C_f$ | V=0, f=1MHz | − | 0.6 | 1.0 | pF |
| | Cut-off frequency | | $f_C$ | $V_{CE}$=5V, $I_C$=2mA, $R_L$=100Ω, −3dB | − | 80 | − | kHz |
| | Response time Rise time | PC110L/PC111L | $t_r$ | $V_{CE}$=2V, $I_C$=2mA, $R_L$=100Ω | − | 4 | 18 | μs |
| | | PC112L/PC113L | | | − | 4 | 15 | |
| | Response time Fall time | PC110L/PC111L | $t_f$ | | − | 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**

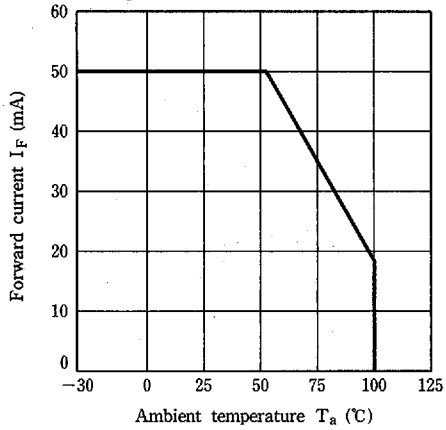



**Fig. 2 Diode Power Dissipation vs. Ambient Temperature**

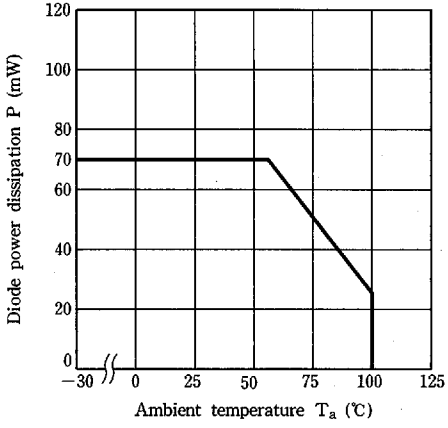



**Fig. 3 Collector Power Dissipation vs. Ambient Temperature**

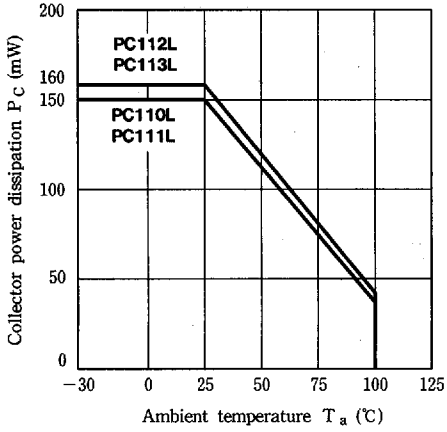



**Fig. 4 Power Dissipation vs. Ambient Temperature**

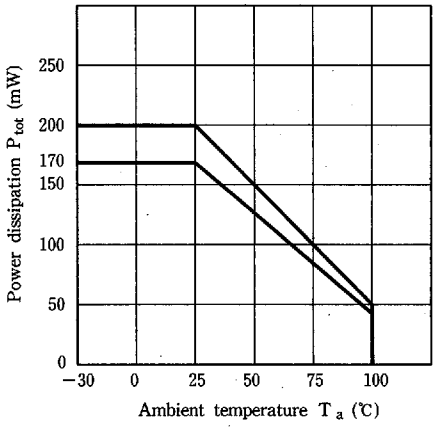



**Fig. 5 Peak Forward Current vs. Duty Ratio**

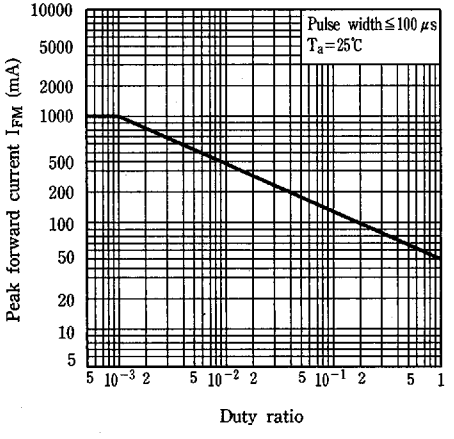



**Fig. 6 Forward Current vs. Forward Voltage**

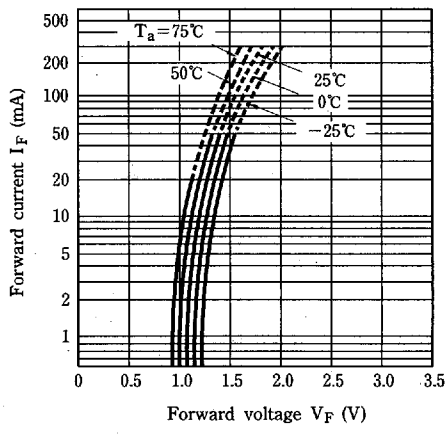


**Fig. 7-a Current Transfer Ratio vs. Forward Current (PC110L, PC111L*) (*Applies only to $R_{BE}=\infty$)**

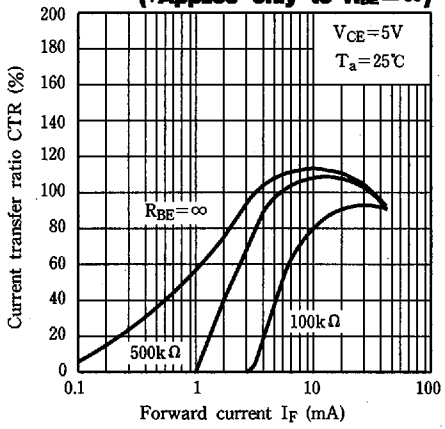



**Fig. 7-b Current Transfer Ratio vs. Forward Current (PC112L, PC113L*) (*Applies only to $R_{BE}=\infty$)**

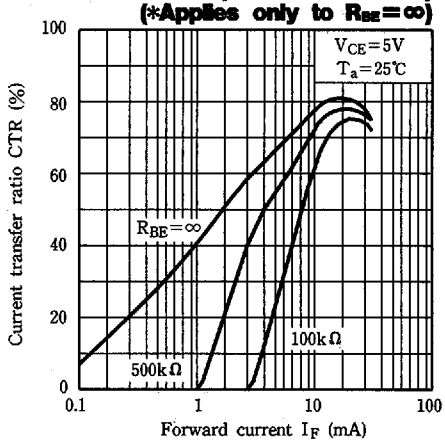



**Fig. 8-a Collector Current vs. Collector-emitter Voltage (PC110L, PC111L)**

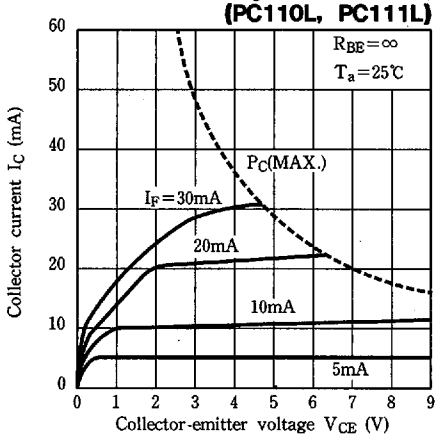



**Fig. 8-b Collector Current vs. Collector-emitter Voltage (PC112L, PC113L)**

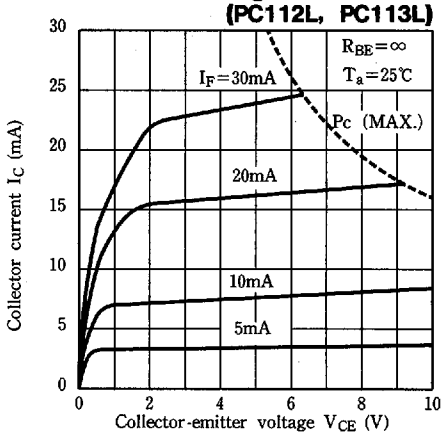



**Fig. 9-a Relative Current Transfer Ratio vs. Ambient Temperature (PC110, PC111L)**

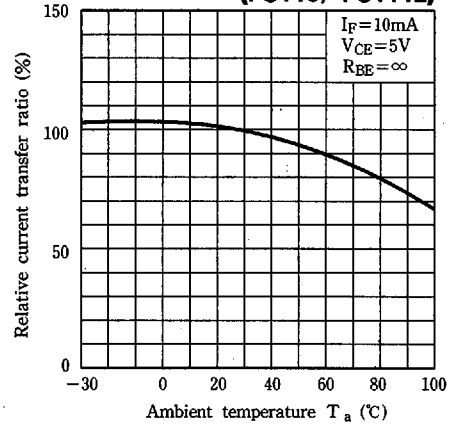



**Fig. 9-b Relative Current Transfer Ratio vs. Ambient Temperature (PC112L, PC113L)**

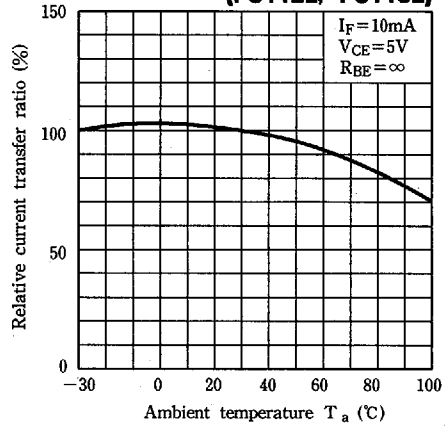


**Fig.10-a Collector-emitter Saturation Voltage vs. Ambient Temperature (PC110L, PC111L)**

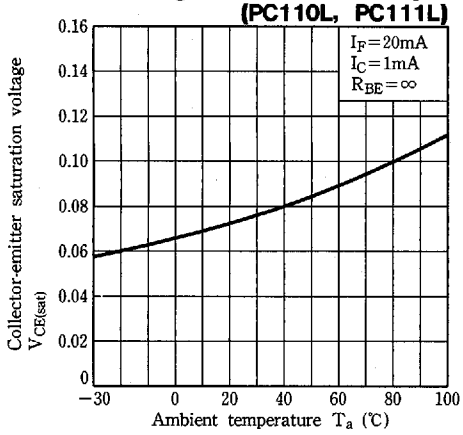



**Fig.10-b Collector-emitter Saturation Voltage vs. Ambient Temperature (PC112L, PC113L)**

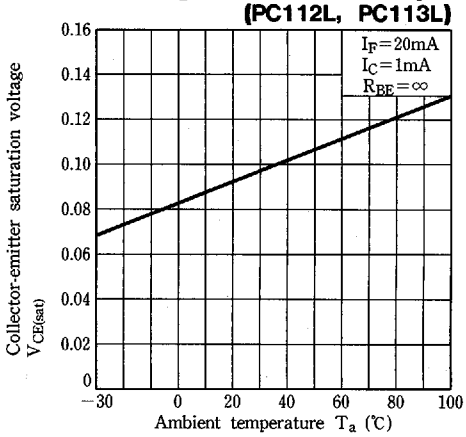



**Fig.11-a Collector Dark Current vs. Ambient Temperature (PC110L, PC111L)**

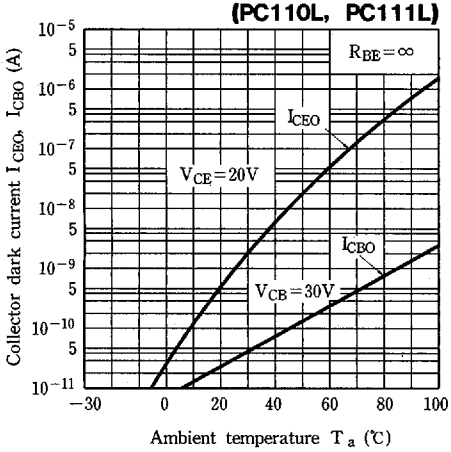



**Fig.11-b Collector Dark Current vs. Ambient Temperature (PC112L, PC113L)**

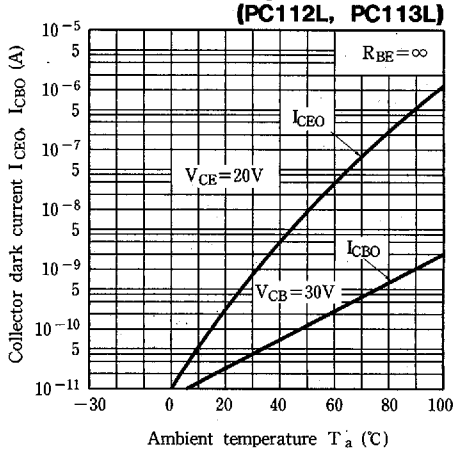



**Fig.12-a Response Time vs. Load Resistance (PC110L, PC111L)**

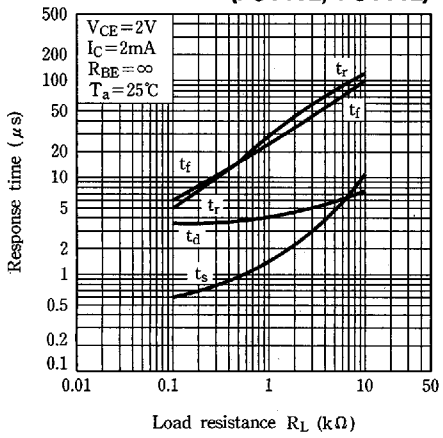
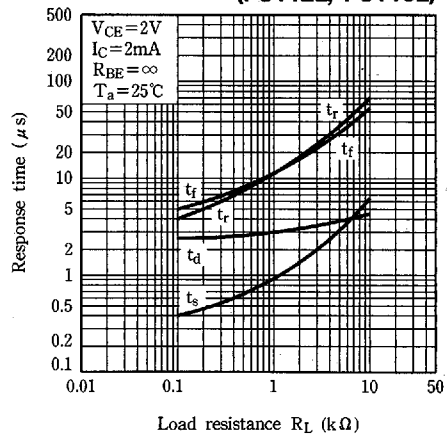
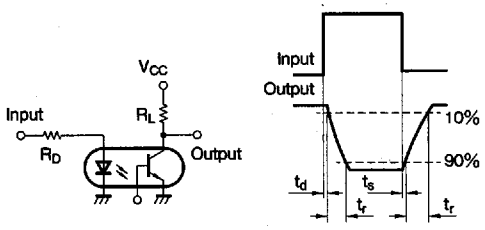



**Fig.12-b Response Time vs. Load Resistance (PC112L, PC113L)**



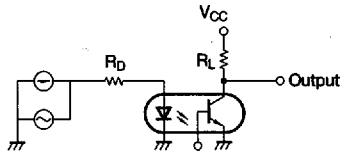

6 Photocouplers

**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)**

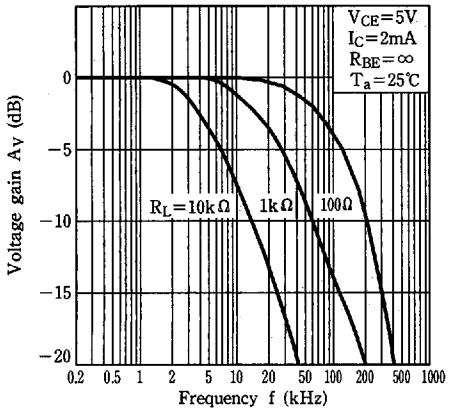



**Fig.13-b Frequency Response (PC112L, PC113L)**

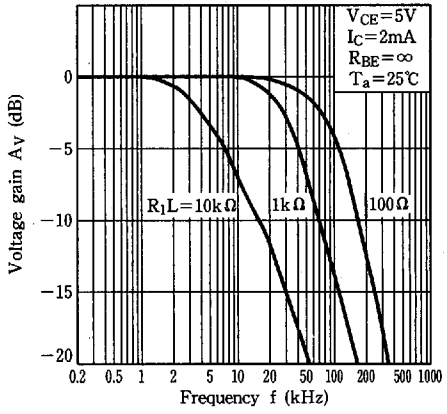



**Fig.14-a Collector-emitter Saturation Voltage vs. Forward Current (PC110L, PC111L)**

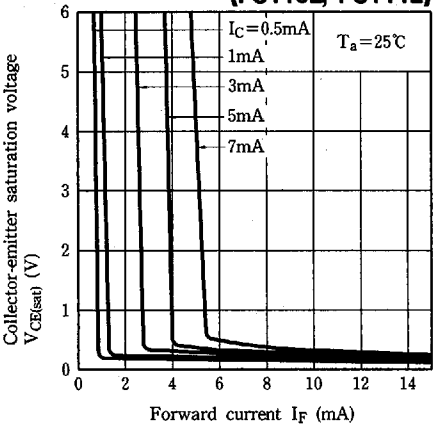
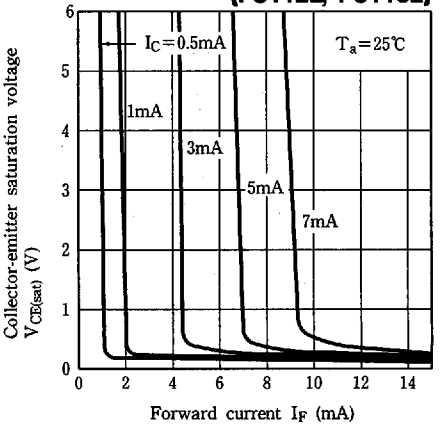



**Fig.14-b Collector-emitter Saturation Voltage vs. Forward Current (PC112L, PC113L)**




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