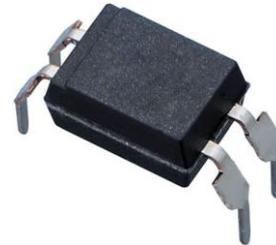


# PC3SH13YFZAX

$V_{DRM}$  : 600V, Reinforced insulation type  
**Non-zero cross type**  
**DIP 4 pin**  
**Phototriac Coupler for triggering**



## ■Description

**PC3SH13YFZAX** reinforced insulation type Phototriac Coupler include an infrared emitting diode (IRED) optically coupled to an output Phototriac. These devices feature full wave control and are ideal isolated drivers for medium to high current Triacs. DIP package provides 5.0kV isolation from input to output with superior commutative noise immunity.

## ■Features

1. High repetitive peak off-state voltage ( $V_{DRM}$  : 600V)
2. Non-zero crossing functionality
3. 4 pin DIP package
4. Reinforced insulation type (MIN. 0.4mm internal separation)
5. Double transfer mold construction (Ideal for Flow Soldering)
6. High isolation voltage between input and output (Viso(rms) : 5.0kV)
7. RoHS directive compliant

## ■Agency approvals/Compliance

1. Recognized by UL1577 (Double protection isolation), file No. E64380 (as model No. **3SH13**)
2. Approved by CSA, file No. CA95323 (as model No. **3SH13**)
3. Approved by BSI : file No.6690/7421 (BS EN60065/BS EN60950-1), (as model No. **3SH13**)
4. Approved by SEMKO, EN60065/EN60335-1/EN60950-1 (as model No. **3SH13**)
5. Approved by DEMKO, EN60065/EN60335-1/EN60950-1 (as model No. **3SH13**)
6. Approved by FIMKO, EN60065/EN60335-1/EN60950-1 (as model No. **3SH13**)
7. Approved by VDE (DIN EN 60747-5-5), file No. 40008087 (as model No. **3SH13**)
8. Package resin : UL flammability grade (94V-0)

## ■Applications

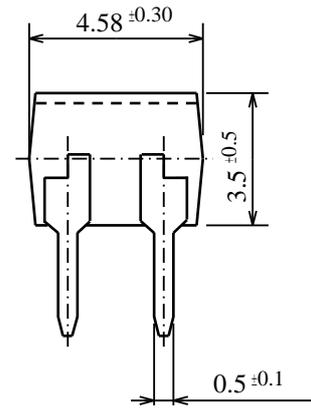
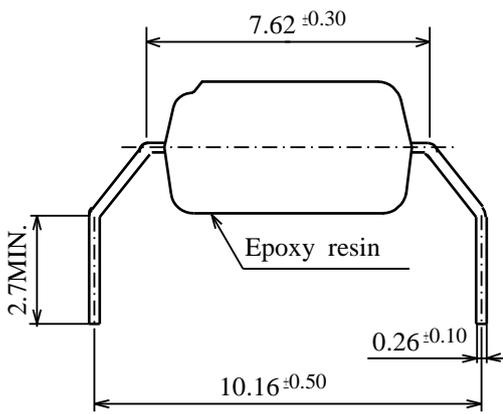
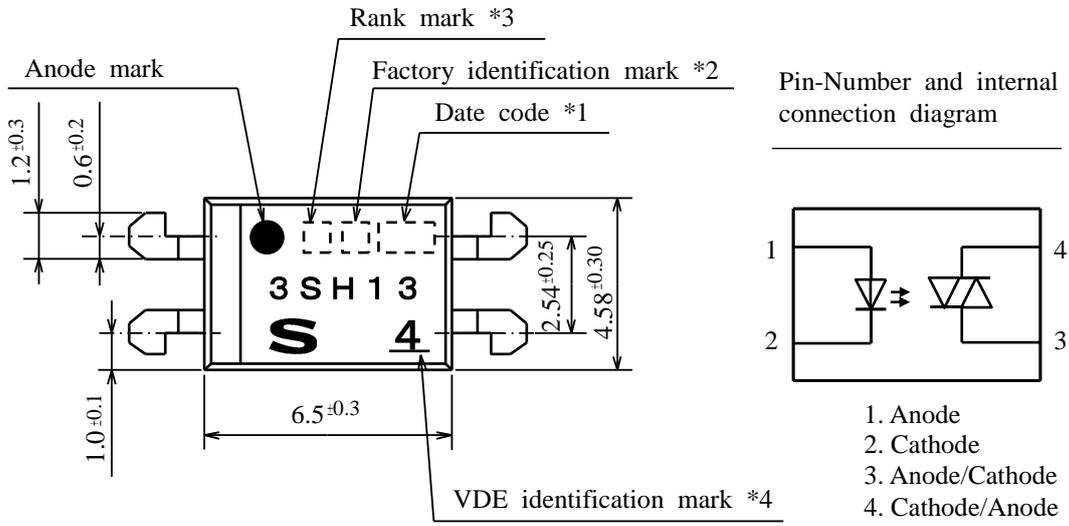
1. Triggering for Triacs used to switch on and off devices which require AC loads. For example heaters, fans, motors, solenoids, and valves.
2. Triggering for Triacs used for implementing phase control in applications such as lighting control and temperature control (HVAC).
3. AC line control in power supply applications.

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Sheet No.: OP14020EN

■ Outline



\*1) 2-digit number shall be marked according to OLD DIN standard.  
 \*2) Factory identification mark applies to the below.



\*3) Rank mark : "A"  
 \*4) VDE identification mark shall be marked "4".  
 \*5) Pin material : Copper Alloy  
 Pin finish : SnCu plating (Cu : TYP. 2%)

Product mass : Approx.0.23g

Unit : 1/1mm	
Name	3SH13 Outline Dimensions (Business dealing name : PC3SH13YFZAX)

## ■ Absolute maximum ratings

Ta=25°C

Parameter		Symbol	Rating	Unit
Input	Forward current *1	I <sub>F</sub>	50	mA
	Reverse voltage	V <sub>R</sub>	6	V
Output	RMS on-state current *1	I <sub>T(rms)</sub>	0.1	A
	Peak one cycle surge current *2	I <sub>surge</sub>	1.2	A
	Repetitive peak off-state voltage	V <sub>DRM</sub>	600	V
Isolation voltage *3		V <sub>iso(rms)</sub>	5	kV
Operating temperature		T <sub>opr</sub>	-30 to +100	°C
Storage temperature		T <sub>stg</sub>	-55 to +125	°C
Soldering temperature *4		T <sub>sol</sub>	270	°C

\*1 The derating factors of absolute maximum rating due to ambient temperature are shown in Fig.3, 4.

\*2 50Hz sine wave

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

\*4 For 10s

## ■ Electrical characteristics

Ta=25°C

Parameter		Symbol	MIN.	TYP.	MAX.	Unit	Conditions
Input	Forward voltage	V <sub>F</sub>	-	1.2	1.4	V	I <sub>F</sub> =20mA
	Reverse current	I <sub>R</sub>	-	-	10 <sup>-5</sup>	A	V <sub>R</sub> =3V
Output	Repetitive peak off-state current	I <sub>DRM</sub>	-	-	10 <sup>-6</sup>	A	V <sub>D</sub> =V <sub>DRM</sub>
	On-state voltage	V <sub>T</sub>	-	-	3.0	V	I <sub>T</sub> =0.1A
	Holding current	I <sub>H</sub>	0.1	-	3.5	mA	V <sub>D</sub> =6V
	Critical rate of rise of off-state voltage	dv/dt	500	-	-	V/μs	V <sub>D</sub> =1/√2 · V <sub>DRM</sub>
Transfer characteristics	Minimum trigger current	I <sub>FT</sub>	-	-	10	mA	V <sub>D</sub> =6V, R <sub>L</sub> =100Ω
	Isolation resistance	R <sub>ISO</sub>	5×10 <sup>10</sup>	10 <sup>11</sup>	-	Ω	DC500V 40 to 60%RH
	Turn on time	t <sub>ON</sub>	-	-	100	μs	V <sub>D</sub> =6V, R <sub>L</sub> =100Ω, I <sub>F</sub> =20mA

Fig.3 Forward current vs. ambient temperature

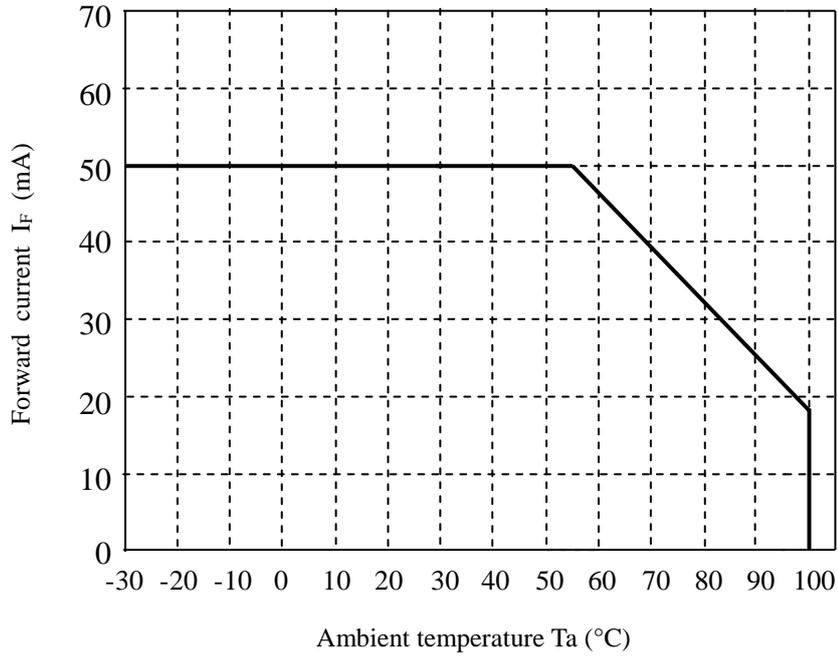
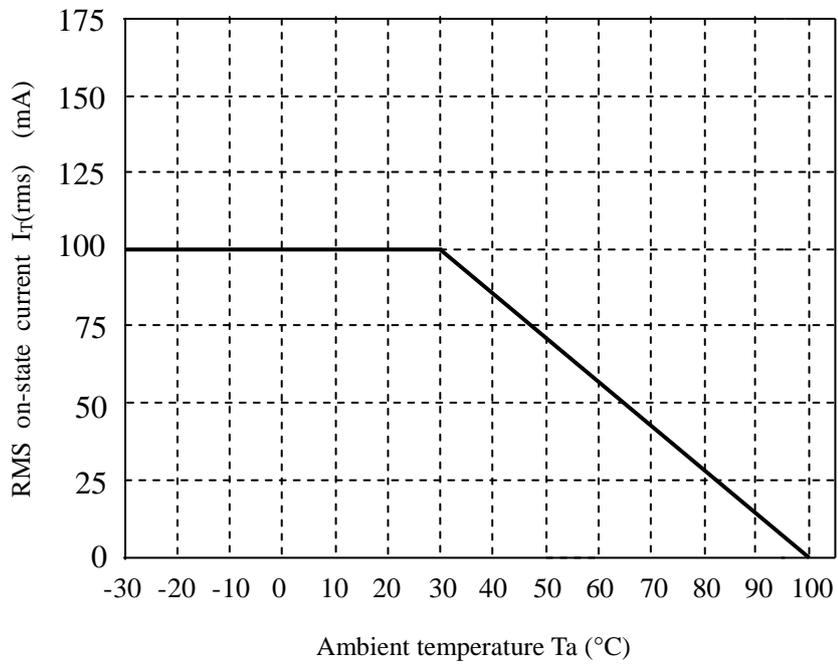


Fig.4 RMS on-state current vs. ambient temperature



■ **Supplement**

- Business dealing name  
The business dealing name used for this product when ordered or delivered shall be PC3SH13YFZAX.
- Package specification  
Refer to the attached sheet, page 8 to 9.
- Isolation voltage shall be measured in the following method.
  - (1) Short between pins 1 to 2 on the primary side and between pins 3 to 4 on the secondary side.
  - (2) The dielectric withstanding 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.)
- The relevant models are the models Approved by VDE according to DIN EN 60747-5-5.  
Approved Model No. : 3SH13  
VDE approved No. : 40008087 (According to the specification DIN EN 60747-5-5 )
  - Operating isolation voltage  $V_{IORM(PEAK)}$  : 1140V
  - Transient voltage : 9000V
  - Pollution : 2
  - Clearances distance (Between input and output) : 8.0 mm (MIN.)
  - Creepage distance (Between input and output) : 8.0 mm (MIN.)
  - Isolation thickness between input and output : 0.4 mm (MIN.)
  - Tracking-proof : CTI 175
  - Safety limit values
    - Current (Isi) : 200mA (Diode side)
    - Power (Psi) : 400mW (Phototransistor side)
    - Temperature (Tsi) : 150°C

In order to keep safety electric isolation of photocoupler, please set the protective circuit to keep within safety limit values when the actual application equipment troubled.

- Indication of VDE approval "  " is printed on minimum unit package.

Isolation specification according to EN 60747-5-5.

Parameter	Symbol	Conditions	Rating	Unit	Remark					
Class of environmental test	-	-	40/100/21	-	Refer to the Diagram 1, 2 (Page 8/11)					
Pollution	-	-	2	-						
Maximum operating isolation voltage	$V_{IORM(PEAK)}$	-	1140	V						
Partial discharge test voltage (Between input and output)	$V_{m(PEAK)}$	Diagram 1	$t_m=10s, q_c < 5pC$	1830		V				
		Diagram 2	$t_{st1}=1s, q_c < 5pC$	2140		V				
Maximum over-voltage	$V_{ini,a(PEAK)}$	$t_{ini}=60 s$	9000	V						
Safety maximum ratings										
1) Case temperature	Tsi	$I_F=0, P_c=0$	150	°C	Refer to Fig.1, 2 (Page 8/11)					
						2) Input current	Isi	$P_c=0$	200	mA
						3) Electric power (Output or Total power dissipation)	Psi	-	400	mW
Isolation resistance (Test voltage between input and output ; DC 500V)	$R_{ISO}$	Tamb=Tsi	MIN. $10^9$	Ω						
		Tamb=100°C	MIN. $10^{11}$							
		Tamb= 25°C	MIN. $10^{12}$							

Precautions in performing isolation test

- (1) Partial discharge test methods shall be the ones according to the specifications of EN 60747-5-5
- (2) Please don't carry out isolation test ( $V_{iso}$ ) over  $V_{ini,a}$ .  
This product deteriorates isolation characteristics by partial discharge due to applying high voltage (ex.  $V_{ini,a}$ ).  
And there is possibility that partial discharge occurs in operating isolation voltage. ( $V_{IORM}$ ).

- This Model is approved by UL, CSA.  
 Approved Model No. : 3SH13  
 UL file No. : E64380  
 CSA file No. : CA95323  
 CSA approved mark “  ” shall be indicated on minimum unit package.
- This product is approved by BSI.  
 Approved Model No. : 3SH13  
 BSI Certificate No. : file No.6690/7421(BS EN60065/BS EN60950-1)
- This product is approved by SEMKO, DEMKO and FIMKO.
- This product is not designed against irradiation.  
 This product incorporates non-coherent light emitting diode.  
 This product is assembled with electrical input and output.
- ODS materials
  - (1) This product shall not contain the following materials.
  - (2) The following materials shall not be used in the production process for this product.  
 Materials for ODS : CFCs, Halon, Carbon tetrachloride, 1.1.1-Trichloroethane (Methylchloroform)
- Specific brominated flame retardants (PBB and PBDE) are not used in this device at all.
- Compliance with each regulation
  - (1) The RoHS directive(2002/95/EC)  
 This product complies with the RoHS directive(2002/95/EC) .  
 Object substances: mercury, lead, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE)
  - (2) Content of six substances specified in Management Methods for Control of Pollution Caused by Electronic Information Products Regulation (Chinese : 电子信息产品污染控制管理办法).

Category	Toxic and hazardous substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr <sup>6+</sup> )	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Phototriac coupler	✓	✓	✓	✓	✓	✓

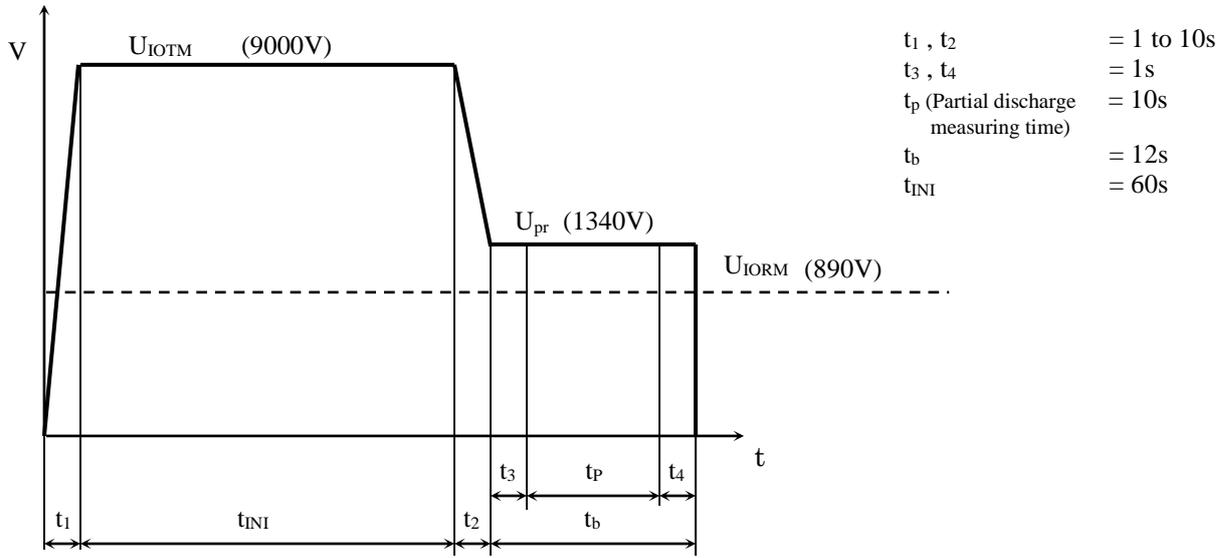
✓ : indicates that the content of the toxic and hazardous substance in all the homogeneous materials of the part is below the concentration limit requirement as described in SJ/T 11363-2006 standard.

**■Notes**

- Circuit design
  - (1) The LED used in the Phototriac coupler generally decreases the light emission power by operation.  
In case of long operation time, please decide  $I_F$  value so that  $I_F$  is more than 2 times of the Maximum value of the Minimum triggering current at circuit design with considering the decreases of the light emission power of the LED. (50% / 5years)
  - (2) Input current ( $I_F$ ) at off-state shall be set 0.1mA or less.
  - (3) In case that pulse drive is carried out, the pulse width of input signal should be 1ms or more
- Usage

Triggering medium power triac and high power triac.  
(This model shall be used under the conditions on which power triac turns on.)
- 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, PCB size or device mounting condition etc.  
Please test it in actual using condition and confirm that any defect doesn't occur before starting the ultrasonic cleaning.
  - (3) Applicable solvent : Ethyl alcohol, Methyl alcohol, Isopropyl alcohol  
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.
- Precautions for Soldering Phototriac couplers
  - (1) In case of flow solder (Whole dipping is possible)  
It is recommended that flow soldering be carried out at 270°C or less and within 10s  
(Pre-heating : 100 to 150°C, 30 to 80s) : Within 2 times
  - (2) It is recommended that hand soldering be carried out at 400°C or less and within 3s: Within 2 times
  - (3) Other notes  
Depending on equipment and soldering conditions (temperature, Using solder etc.), the effect to the device and the PCB is different.  
Please confirm that there is no problem on the actual use conditions in advance.

Method of Diagram 1: Breakdown test (Apply to type test and sampling test)



Method of Diagram 2 : Non breakdown test (Apply to all device test)

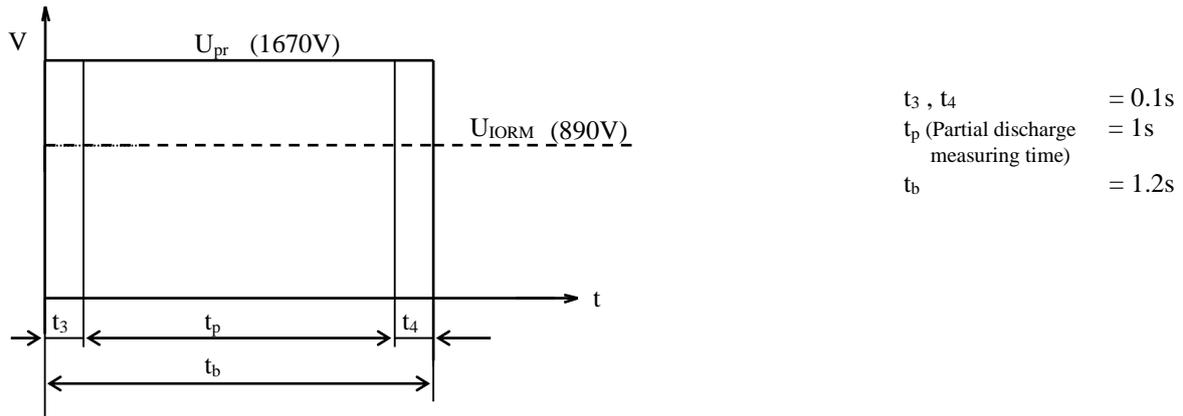


Fig. 1 Safety maximum power dissipation vs. ambient temperature (When failed)

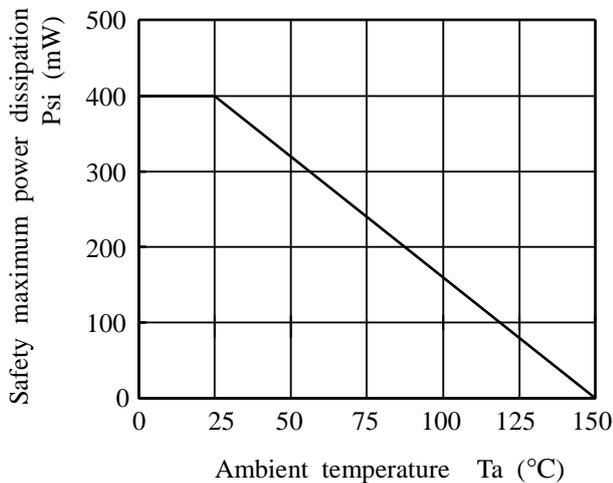
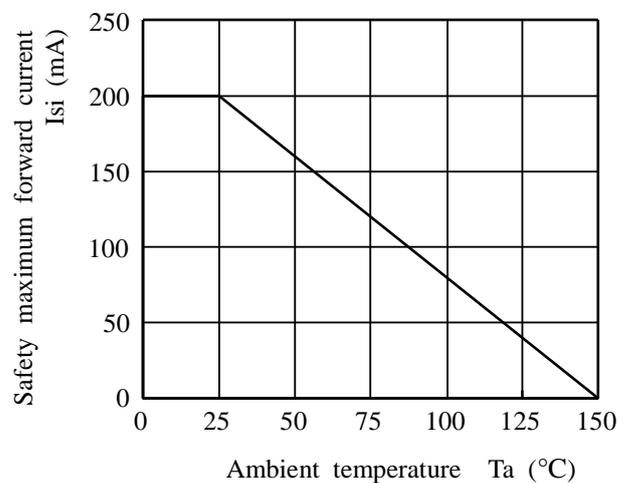


Fig. 2 Safety maximum forward current vs. ambient temperature (When failed)



■ Package specification

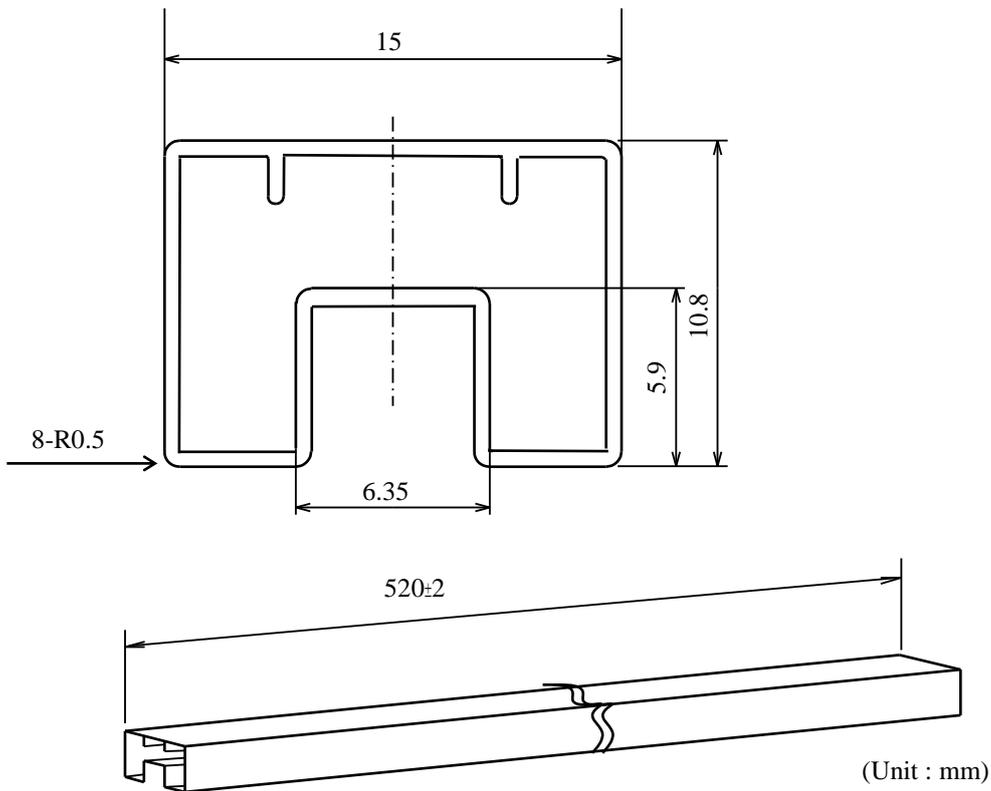
● Package materials

No.	Name	Materials	Purposes
①	Sleeve	HIPS or ABS with preventing static electricity	Products packaged
②	Stopper	Styrene-Elastomer	Products fixed
③	Packing case	Corrugated cardboard	Sleeve packaged
④	Cushioning material	Urethane	Sleeve fixed
⑤	Kraft tape	Paper	Lid of packaged case fixed
⑥	Label	Paper	Model No.,(Business dealing name), Lot No., Quantity, Country of origin, Company name and Inspection date specified

● Package method

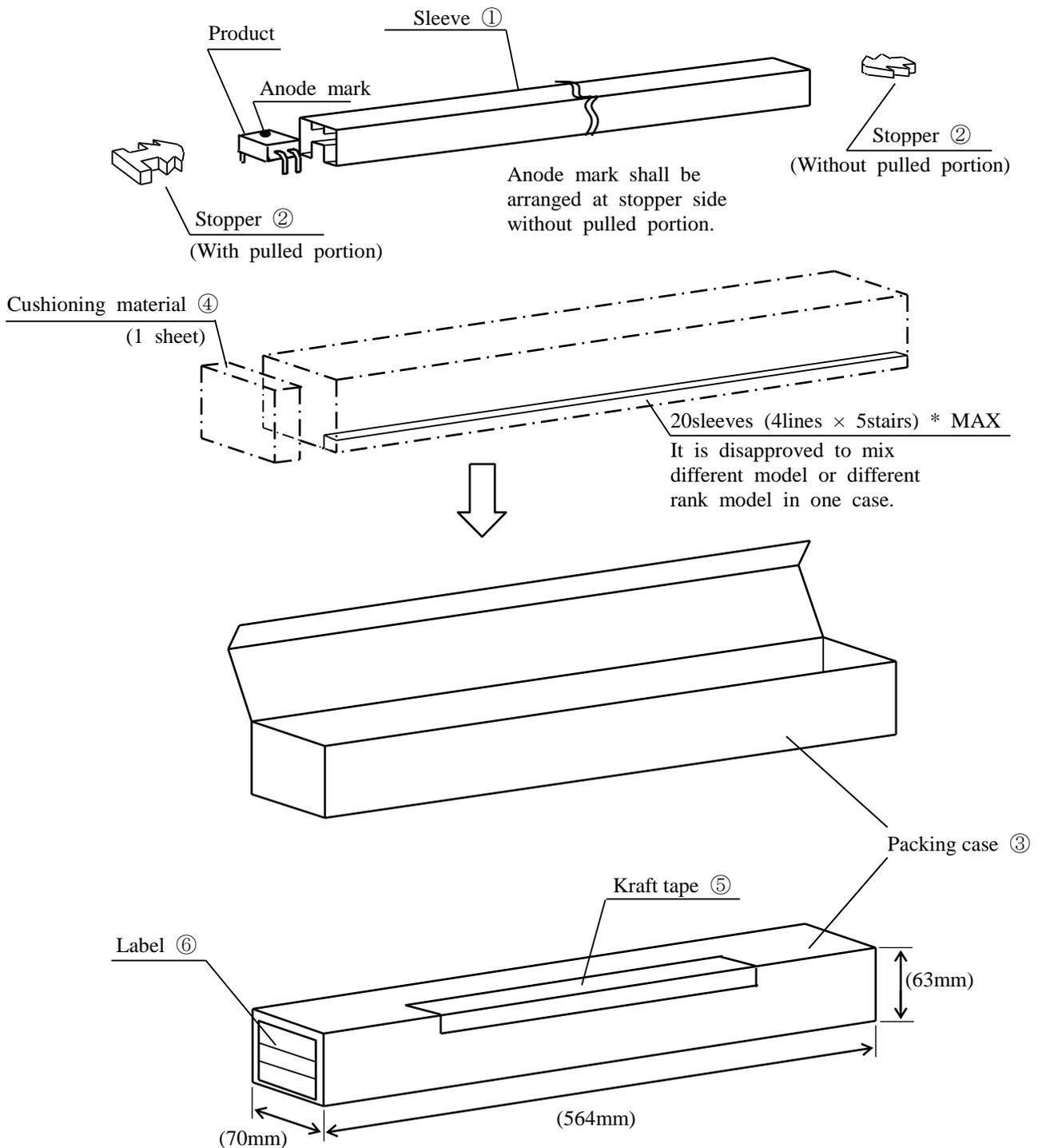
- (1) MAX. 100pcs. of products shall be packaged in a sleeve ① and both of sleeve edges shall be fixed by stoppers ②.
- (2) MAX. 20 sleeves (product : 2000pcs.) above shall be packaged in a packing case ③ and pack a sheet of cushioning material ④ at one side.
- (3) The label ⑥ shall be put on the side of the packing case.
- (4) Case shall be closed with the lid and enclosed with kraft tape ⑤.

● Sleeve package ① outline dimensions



- Note
- 1) Thickness : 0.5±0.2mm
  - 2) Process with applying antistatic agent.
  - 3) Unless otherwise specified tolerances shall be ±0.5mm. (However except for deformation due to the stopper in sleeve.)

● Packing case outline dimensions



Regular packing mass : Approx. 910g  
 ( ) : Reference dimensions

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- Personal computers
- Office automation equipment
- Telecommunication equipment [terminal]
- Test and measurement equipment
- Industrial control
- Audio visual equipment
- Consumer electronics

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection

with equipment that requires higher reliability such as:

- Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
- Traffic signals
- Gas leakage sensor breakers
- Alarm equipment
- Various safety devices, etc.

(iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:

- Space applications
- Telecommunication equipment [trunk lines]
- Nuclear power control equipment
- Medical and other life support equipment (e.g., scuba).

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