

REFERENCE

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SHARP

OPTO-ANALOG DEVICES DIVISION
ELECTRONIC COMPONENTS GROUP
SHARP CORPORATION

SPECIFICATION

DEVICE SPECIFICATION FOR

PHOTOTRIAC COUPLER

MODEL No.

3SF21

(Business dealing name : PC3SF21YVZBF)

Specified for _____

Enclosed please find copies of the Specifications which consists of 13 pages including cover.
This specification sheets and attached sheets shall be both side copy.
After confirmation of the contents, please be sure to send back copies of the Specifications
with approving signature on each.

CUSTOMER'S APPROVAL

DATE

BY

PRESENTED

DATE

Feb. 22, 2007

BY

H. Imanaka

H. Imanaka,
Department General Manager of
Engineering Dept., II
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ELECOM Group
SHARP CORPORATION

Product name : PHOTOTRIAC COUPLER

Model No. : 3SF21

(Business dealing name : PC3SF21YVZBF)

1. These specification sheets include materials protected under copyright of Sharp Corporation ("Sharp"). Please do not reproduce or cause anyone to reproduce them without Sharp's consent.
2. 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)

- (1) 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.

- (2) 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
· Other safety equipment	· Rescue and security equipment

- (3) 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

- (4) Please contact and consult with a Sharp sales representative if there are any questions regarding interpretation of the above three paragraphs.

3. Please contact and consult with a Sharp sales representative for any questions about this product.

1. Application

This specification applies to the outline and characteristics of lead free type phototriac coupler Model No. 3SF21
[Apply line voltage 200V AC(sine wave)].

2. Outline

Refer to the attached sheet, page 6.

3. Ratings and characteristics

Refer to the attached sheet, page 7 to 8.

4. Reliability

Refer to the attached sheet, page 9.

5. Outgoing inspection

Refer to the attached sheet, page 10.

6. Supplement

6.1 Business dealing name

The business dealing name used for this product when ordered or delivered shall be PC3SF21YVZBF.

6.2 Package specification

Refer to the attached sheet, page 11 to 12.

6.3 Isolation voltage shall be measured in the following method.

- (1) Short between pins 1 to 3 on the primary side and between pins 4 to 6 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.)


6.4 The relevant models are the models Approved by VDE according to DIN EN 60747-5-2.

Approved Model No. : 3SF21

VDE approved No. : 40008189 (According to the specification DIN EN 60747-5-2)

- Operating isolation voltage U_{IORM} : 1140V_(peak)
- Transient voltage : 9000V_(peak)
- 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 : 0.40 mm (MIN.)
- Tracking-proof : CTI 175
- Safety limit values
 - Current (I_{si}) : 200mA (Diode side)
 - Power (P_{si}) : 400mW (Phototransistor side)
 - Temperature (T_{si}) : 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 the minimum packing box.

Isolation specification according to EN 60747-5-2.

Parameter	Symbol	Conditions	Rating	Unit	Remark
Class of environmental test	-	-	40/100/21	-	Refer to the Diagram 1, 2 (Page 5/12)
Pollution	-	-	2	-	
Maximum operating isolation voltage	$U_{IORM(PEAK)}$	-	1140	V	
Partial discharge test voltage (Between input and output)	Diagram 1	$t_p=10\text{ s}, q_c<5\text{pC}$	1710	V	
	Diagram 2	$t_p=1\text{ s}, q_c<5\text{pC}$	2140	V	
Maximum over-voltage	$U_{IOTM(PEAK)}$	$t_{INI}=60\text{ s}$	9000	V	
Safety maximum ratings					Refer to Fig.1, 2 (Page 5/12)
1) Case temperature	T_{si}	$I_p=0, P_c=0$	150	°C	
2) Input current	I_{si}	$P_c=0$	200	mA	
3) Electric power (Output or Total power dissipation)	P_{si}	-	400	mW	
Isolation resistance (Test voltage between input and output ; DC 500V)	R_{ISO}	$T_a=T_{si}$	MIN. 10^9	Ω	
		$T_a=T_{opr}(\text{MAX.})$	MIN. 10^{11}		
		$T_a=25^\circ\text{C}$	MIN. 10^{12}		

Precautions in performing isolation test


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

6.5 This Model is approved by UL, CSA.

Approved Model No. : 3SF21

UL file No. : E64380

CSA file No. : CA95323

CSA approved mark “  ” shall be indicated on minimum unit package.

6.6 This product is approved by BSI, SEMKO, DEMKO and FIMKO

Approved Model No. : 3SF21

BSI Certificate No. : 6690/7421 (BS EN60065/BS EN60950)

SEMKO Certificate No. : 501744

DEMKO Certificate No. : 313322

FIMKO Certificate No. : 21600

6.7 This product is not designed against irradiation.

This product incorporates non-coherent light emitting diode.

This product is assembled with electrical input and output.

6.8 ODS materials

- This product shall not contain the following materials.
- 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)

6.9 Specified brominated flame retardants (PBB and PBDE) are not used in this device at all.

7. Notes

7.1 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 twice or more 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 L (Inductance) load such as motor etc. is used, please use this device after confirming whether this device operates normally in actual condition since there is a case that the zero-cross circuit works and the load does not turn on due to the phase difference of load current.
- (4) If the voltage exceeding the repetitive peak off-state voltage (V_{DRM}) in the absolute maximum ratings is applied to the phototriac, it may cause not only faulty operation but breakdown. Make sure that the surge voltage exceeding V_{DRM} shall not be applied by using the varistor, CR.

7.2 Usage

Only for triggering medium power triac and high power triac.

(This model shall be used under the conditions on which power triac turns on.)

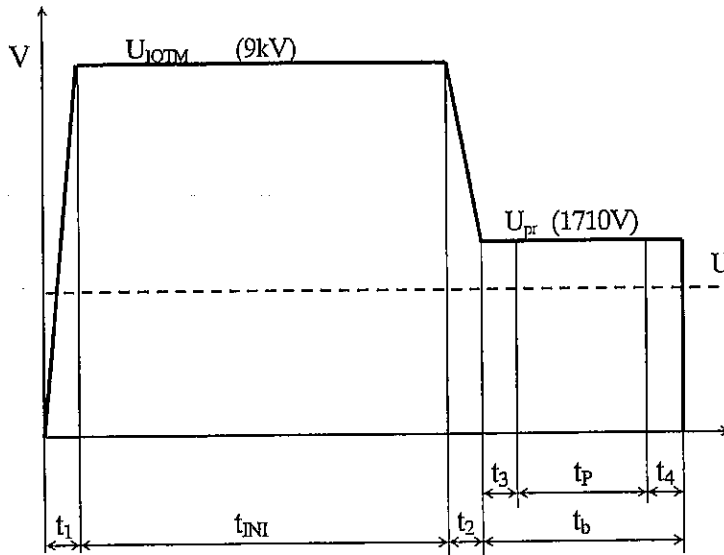
7.3 Cleaning

- (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.

7.4 Precautions for Soldering Phototriac couplers

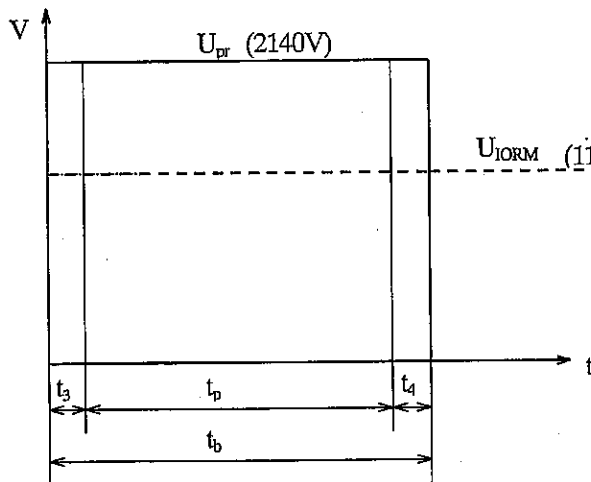
- (1) In case of flow solder (Whole dipping is possible)
It is recommended that flow soldering be carried out at 270°C or less and within 10s
(Pre-heating : 100 to 150°C, 30 to 80s) : Within 2 times
- (2) It is recommended that hand soldering be carried out at 400°C or less and within 3s: Within 2 times
- (3) Other notes
Depending on equipment and soldering conditions (temperature, Using solder etc.), the effect to junction between PCB and lead pins of photocoupler is different.
Please confirm that there is no problem on the actual use conditions.

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



t_1, t_2	= 1 to 10 s
t_3, t_4	= 1 s
t_p (Partial discharge measuring time)	= 10 s
t_b	= 12 s
t_{NI}	= 60 s

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



t_3, t_4	=0.1 s
t_p (Partial discharge measuring time)	=1 s
t_b	=1.2 s

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

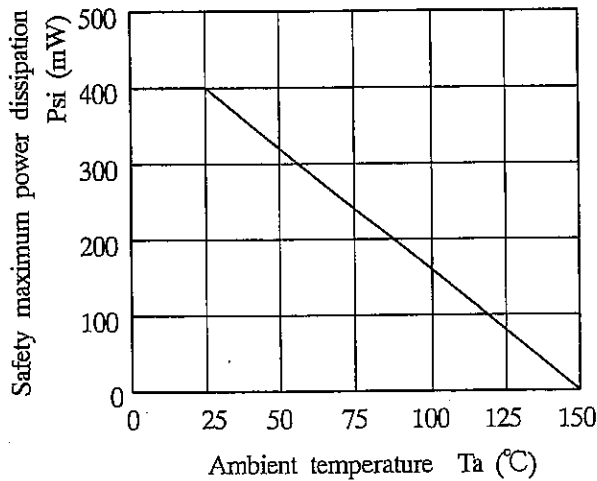
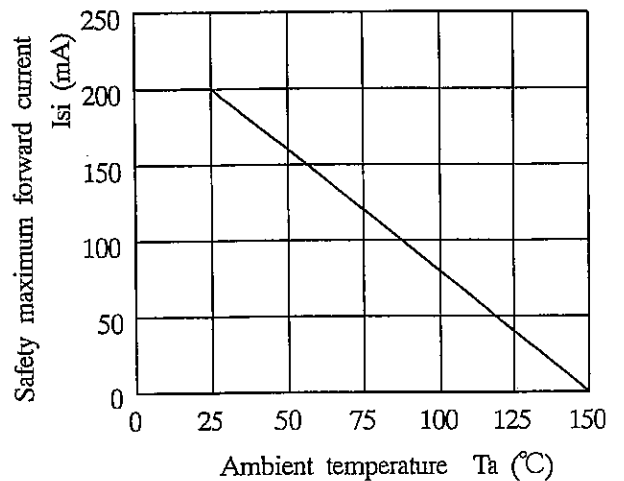
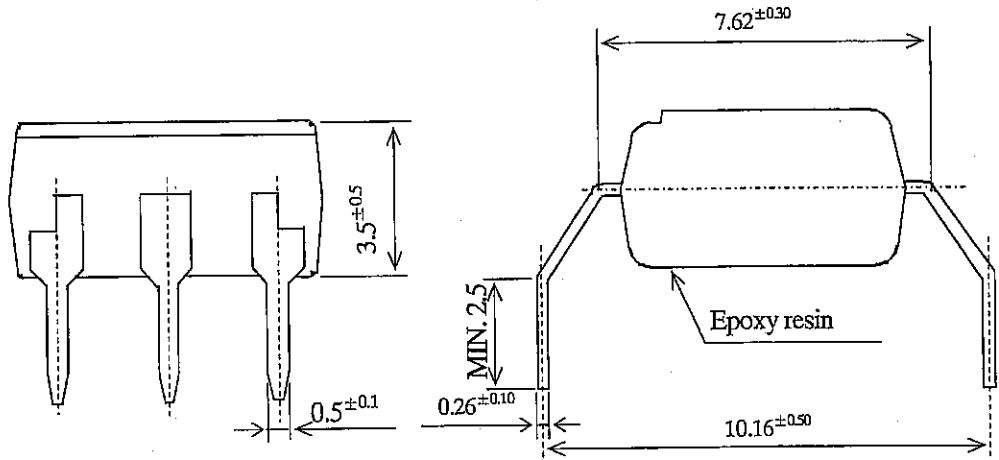
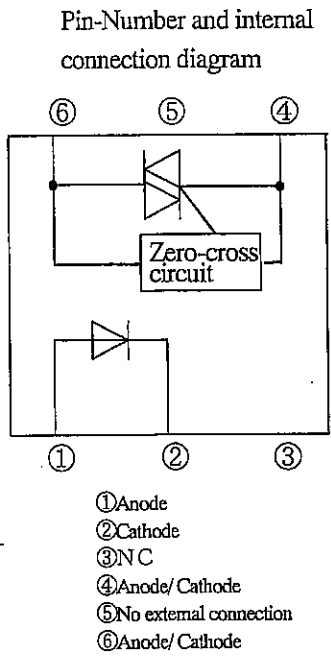
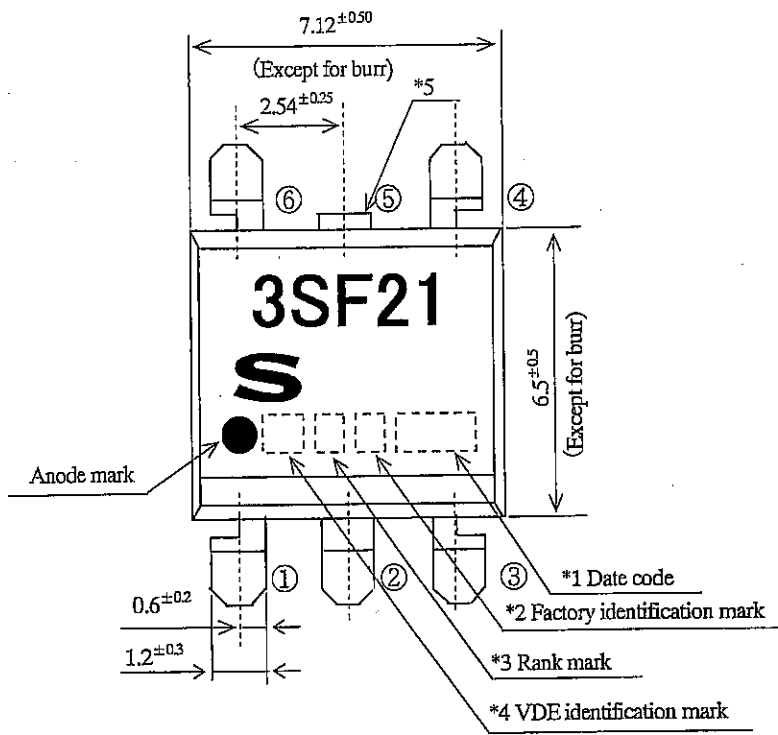


Fig. 2 Safety maximum forward current vs. ambient temperature (When failed)



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- *1) 2-digit number shall be marked according to OLD DIN standard.
- *2) Factory identification mark applies to the below.
 Without : SUN-S Corporation(Japan)
 : SUN-S Electronic Technology (KUNSHAN) Co. Ltd (China)
- *3) Rank mark : "B"
- *4) VDE identification mark shall be marked "4".
- *5) Pin 5 is cut at outside of package.
- *6) Pin material : Copper Alloy
 Pin finish : SnCu plating (Cu : TYP. 2%)

Product mass : 約0.35g

UNIT : 1/1mm	
3SF21 Outline Dimensions	
Name	(Business dealing name:PC3SF21YVZBF)

3.1 Absolute maximum ratings

Ta=25°C

Parameter		Symbol	Rating	Unit
Input	Forward current *1	I_F	50	mA
	Reverse voltage	V_R	6	V
Output	RMS on-state current *1	$I_T(\text{rms})$	0.1	A
	Peak one cycle surge current	I_{surge}	1.2 (50Hz sine wave)	A
	Repetitive peak off-state voltage	V_{DRM}	600	V
Isolation voltage *2		$V_{\text{iso}}(\text{rms})$	5	kV
Operating temperature		T_{opr}	-30 to +100	°C
Storage temperature		T_{stg}	-55 to +125	°C
Soldering temperature		T_{sol}	270 (For 10s)	°C

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

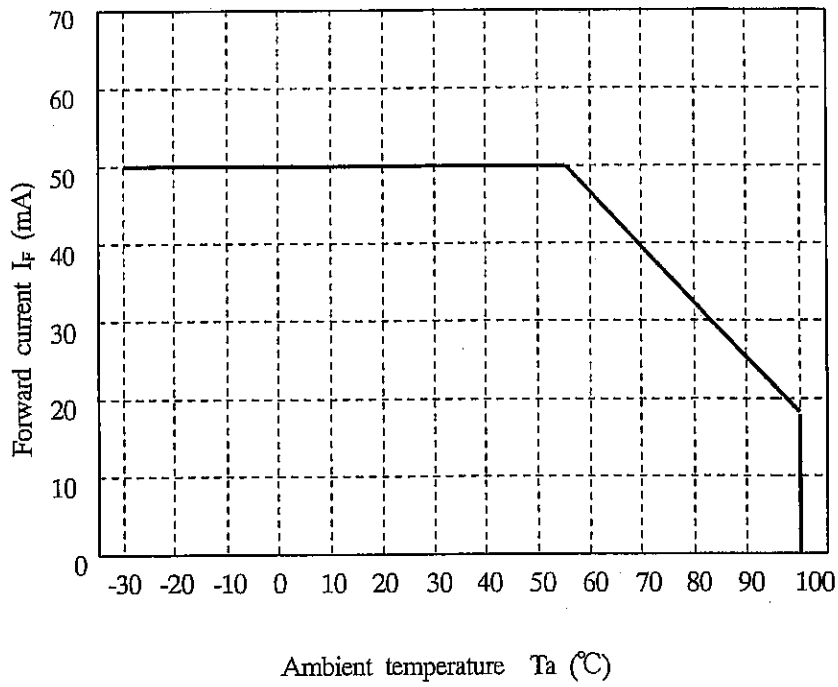
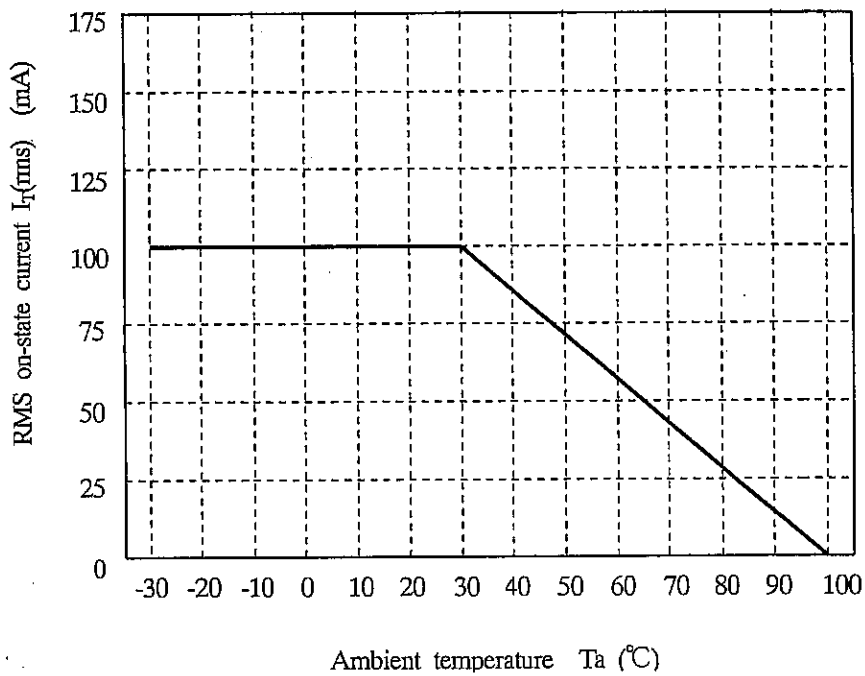
*2 AC for 1min, 40 to 60%RH, f=60Hz

3.2 Electrical characteristics

Ta=25°C

Parameter		Symbol	MIN.	TYP.	MAX.	Unit	Conditions
Input	Forward voltage	V_F	-	1.2	1.4	V	$I_F=20\text{mA}$
	Reverse current	I_R	-	-	10^{-5}	A	$V_R=3\text{V}$
Output	Repetitive peak off-state current	I_{DRM}	-	-	10^{-6}	A	$V_D=V_{\text{DRM}}$
	On-state voltage	V_T	-	-	2.5	V	$I_T=0.1\text{A}$
	Holding current	I_H	0.1	-	3.5	mA	$V_D=4\text{V}$
	Critical rate of rise of off-state voltage	dv/dt	1000	2000	-	V/ μs	$V_D=1/\sqrt{2} \cdot V_{\text{DRM}}$
	Zero-cross voltage	V_{ox}	-	-	20	V	$I_F=15\text{mA}$, R load
Transfer characteristics	Minimum trigger current	I_{FT}	-	-	7	mA	$V_D=4\text{V}$, $R_L=100\Omega$
	Isolation resistance	R_{ISO}	5×10^{10}	10^{11}	-	Ω	DC500V 40 to 60%RH
	Turn on time	t_{ON}	-	-	50	μs	$V_D=4\text{V}$, $R_L=100\Omega$, $I_F=20\text{mA}$

Fig.3 Forward current vs. ambient temperature

Fig.4 RMS on-state current I_T (rms) vs. ambient temperature

4. Reliability

The reliability of products shall satisfy items listed below.

Confidence level : 90%

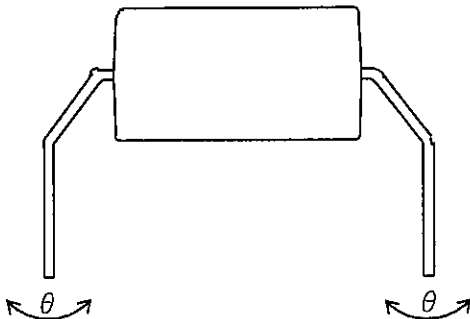
LTPD : 10 or 20

Test Items	Test Conditions *1	Failure Judgement Criteria	Samples (n)
			Defective(C)
Solderability *2	245±3°C, 5s	—	n=11, C=0
Soldering heat	(Flow soldering) 270°C, 10 s	$V_F > U \times 1.2$ $V_T > U \times 1.2$ $I_{FT} > U \times 1.3$ $I_R > U \times 2.0$ $I_{DRM} > U \times 2.0$ U : Upper specification limit L : Lower specification limit	n=11, C=0
	(Soldering by hand) 400°C, 3 s		n=11, C=0
Terminal strength (Tension)	Weight : 5.0N 5 s/each terminal		n=11, C=0
Terminal strength (Bending) *3	Weight : 2.5N 2 times/each terminal		n=11, C=0
Mechanical shock	15km/s ² , 0.5ms 3 times/±X, ±Y, ±Z direction		n=11, C=0
Variable frequency vibration	100 to 2000 to 100Hz/4min 200m/s ² 4 times/X, Y, Z direction		n=11, C=0
Temperature cycling	1 cycle -55°C to +125°C (30min) (30min) 20 cycles test Without Load		n=22, C=0
High temp. and high humidity storage	+85°C, 85%RH, 500h		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 =50mA, I _T =100mA T _a =25°C, 1000h		n=22, C=0

*1 Test method, conforms to EIAJ ED 4701.

*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. Outgoing inspection

5.1 Inspection items

(1) Electrical characteristics

V_F , I_R , I_{DRM} , V_T , I_{FT} , 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 Unreadable marking	0.065
Minor defect	Appearance defect except the above mentioned.	0.25

6.2 Package specification

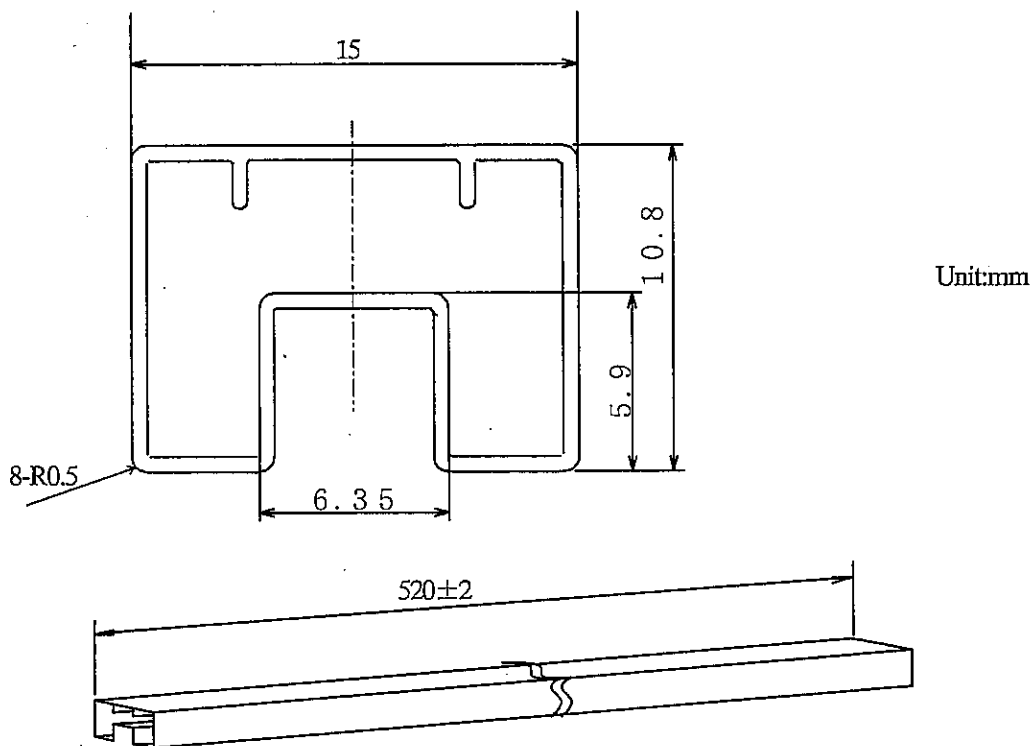
6.2.1 Package materials

No.	Name	Materials	Purposes
①	Sleeve	HIPS 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

6.2.2 Package method

- (1) MAX. 50pcs. 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 : 1000pcs.) 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 packaging case.
- (4) Case shall be closed with the lid and enclosed with kraft tape ⑤.

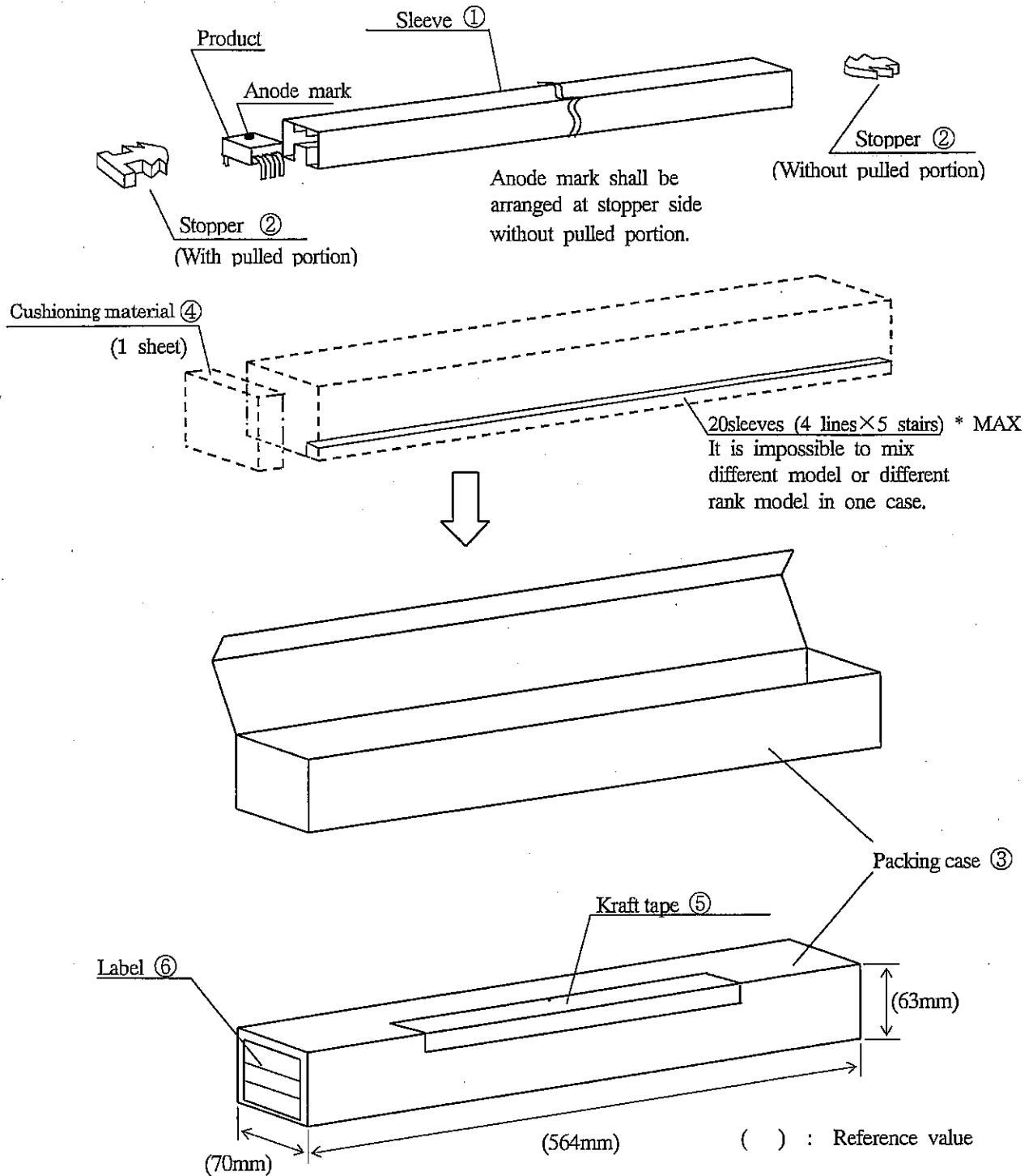
6.2.3 Sleeve package ① outline dimensions



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

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6.2.4. Packing case outline dimensions



Regular packing mass: Approx. 800g