SPEC No. ED-06P053
ISSUE December 12, 2006

SHARP

SPECIFICATION

DEVICE SPECIFICATION FOR

SOLID STATE RELAY

MODEL No.

R32MA1

Business dealing name

	PR32MA11NXPF
	PR32MA11YXPF

Specified for _____

Enclosed please find copies of the Specifications which consists of 15 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 *Dec, 12, 2006*

BY *H. Imanaka*

H. Imanaka,
Department General Manager of
Engineering Dept.,II
Opto-Analog Devices Div.
ELECOM Group
SHARP CORPORATION

REFERENCE

PR32MA11YXPF

Product name :   SOLID STATE RELAY

Model No. :   R32MA1

(Business dealing name :   PR32MA11NXPF)
(Business dealing name :   PR32MA11YXPF)

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   · Rescue and security equipment
                  · Other safety 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.

1/11

1. Application

   This specification applies to the outline and characteristics of lead free type solid state relay
   Model No. R32MA1 [Apply line voltage 200V AC(sine wave)].

2. Outline

   Refer to the attached sheet, page 5.

3. Ratings and characteristics

   Refer to the attached sheet, page 6, 7.

4. Reliability

   Refer to the attached sheet, page 8.

5. Outgoing inspection

   Refer to the attached sheet, page 9.

6. Supplement

   6.1 Business dealing name

   ("○" mark indicates business dealing name of ordered product)

Product	Business dealing name	Remarks
	PR32MA11NXPF	
	PR32MA11YXPF	* Applied to products as an option (Attachment-1-1 to 1-3)

   6.2 Package specification

   Refer to the attached sheet, page 10, 11.

   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 This Model is approved by UL and CSA.

   Approved Model No. : R32MA1

   UL file No. : E64380

   CSA file No. : CA95323

   CSA approved mark " " shall be indicated on minimum unit package.

   6.5 This product is not designed against irradiation.

   This product is assembled with electrical input and output.

   This product incorporates non-coherent light emitting diode.

   6.6 ODS materials

   This product shall not contain the following materials.

   Also, the following materials shall not be used in the production process for this product.

   Materials for ODS   : CFC_S, Halon, Carbon tetrachloride,

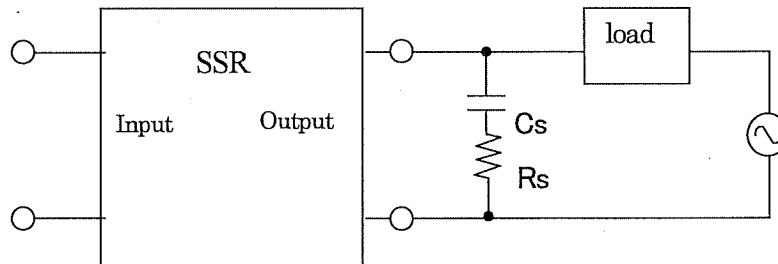   1.1.1-Trichloroethane (Methyl chloroform)

   6.7 Brominated flame retardants

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

REFERENCE

7. Notes
  7.1 Circuit design
  (1) The LED used in the solid state relay 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 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) This device doesn't have built-in snubber circuit.
    To avoid the false operation and protect SSR, please locate the appropriate snubber circuit between output pins base on the load. (Recommendable values : Rs=100Ω, Cs=0.01μF)
    Particularly, in case the device is used for the load such as solenoid valves and motors, false operation may happen in off-state due to rapid change of voltage at output pins caused by the phase difference of load current.
    So please be sure to locate the snubber circuit (Rs=100Ω, Cs=0.01μF) and make sure the device works properly in actual conditions.
    In addition, the values of snubber circuit may have to be changed if necessary after testing in actual conditions.

Please locate the snubber circuit as close as possible to the output pins.

  (3) Input current (I_F) at off state shall be set 0.1mA or less.
  (4) In case that pulse drive is carried out, the pulse width of input signal should be 1ms or more.
  (5) 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℃ 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.
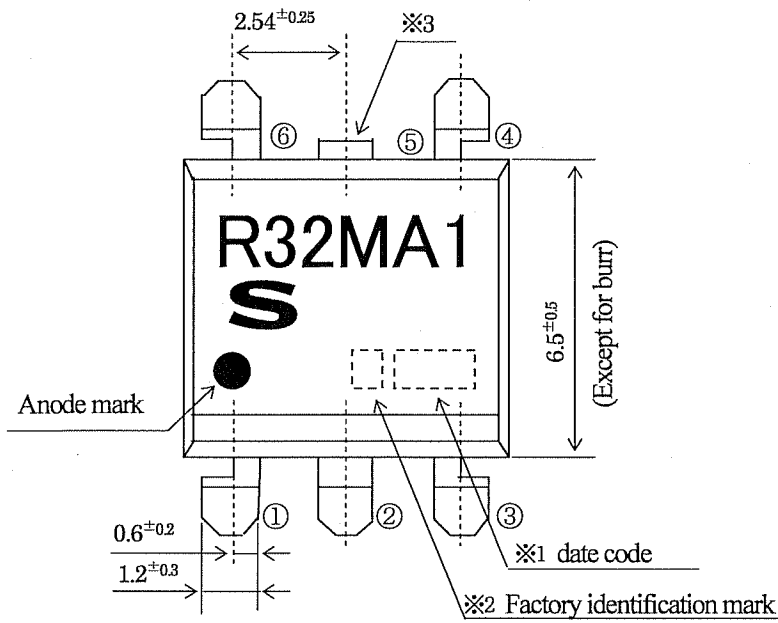
7.4 Precautions for Soldering
  (1) In the case of flow soldering (Whole dipping is possible.)
        It is recommended that flow soldering be carried out at 270℃ or less and within 10s
        (Pre-heating : 100 to 150℃, 30 to 80s):Within 2 time
  (2) In case of solder reflow
        It is recommended to be done at the temperature and the time within the temperature
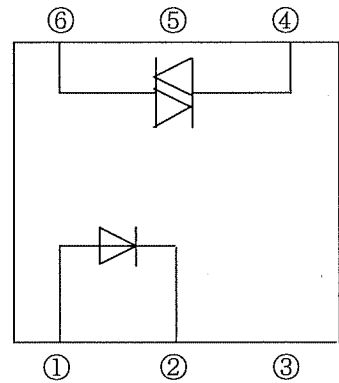   profile as shown in the figure below.(2 times or less)

Terminal : 260℃ peak
(Package surface : 250℃ peak)
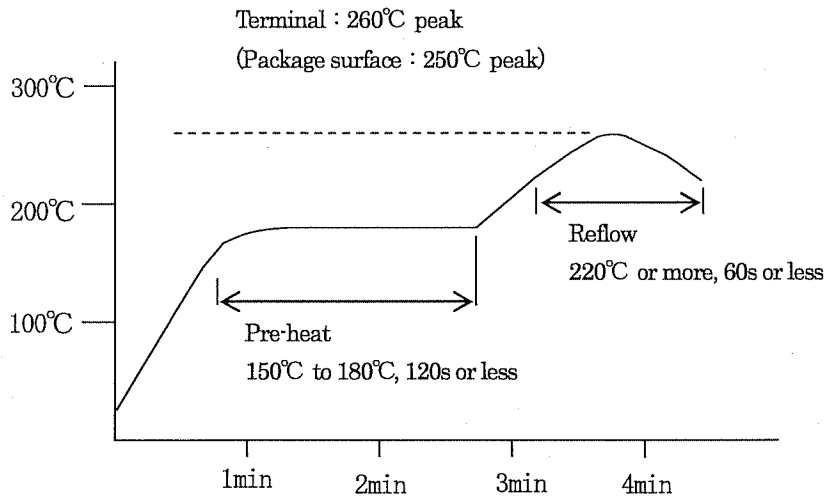
(3) In case of hand soldering
        It is recommended that hand soldering be carried out at 400℃ or less and within 3 s: Within 2 times
  (4) Other notes
        Depending on equipment and soldering conditions (temperature, Using solder etc.),
        the effect to junction between PCB and lead pins of solid state relay is different.
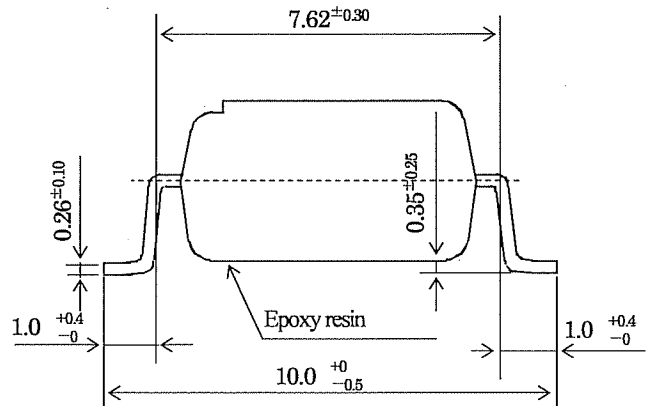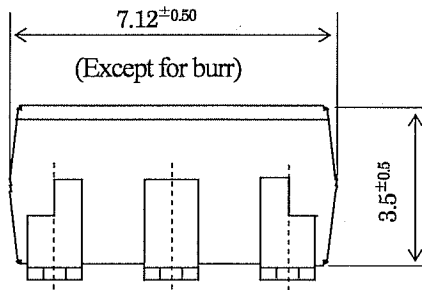   Please confirm that there is no problem on the actual use conditions.

REFERENCE

2.54±0.25   ※3

R32MA1

S

Anode mark

6.5±0.5 (Except for burr)

0.6±0.2

1.2±0.3

※1 date code

※2 Factory identification mark

⑥ ⑤ ④

① ② ③

Pin-Number and internal connection diagram

⑥   ⑤   ④

①   ②   ③

①Anode
②Cathode
③N C
④Anode/ Cathode
⑤No external connection
⑥Anode/ Cathode

7.12±0.50

(Except for burr)

3.5±0.5

7.62±0.30

0.26±0.10

0.35±0.25

1.0 +0.4 −0

Epoxy resin

1.0 +0.4 −0

10.0 +0 −0.5

*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) Pin 5 is cut at outside of package.

*4) Pin material : Copper Alloy
Pin finish : SnCu plating (Cu : TYP. 2%)

Product mass ： Approx.0.33g

Unit： 1/1mm	
Name	R32MA1 Outline Dimensions (Business dealing name : PR32MA11NXPF)

3.1 Absolute maximum ratings

Ta=25℃

Parameter		Symbol	Rating	Unit
Input	Forward current *1	I_F	50	mA
	Reverse voltage	V_R	6	V
Output	RMS on-state current *1	$I_T(rms)$	150	mA
	Peak one cycle surge current	Isurge	1.2 (50Hz sine wave)	A
	Repetitive peak off-state voltage	V_{DRM}	600	V
Isolation voltage *2		Viso(rms)	5	kV
Operating temperature		Topr	-30 to +85	℃
Storage temperature		Tstg	-40 to +125	℃
Soldering temperature		Tsol	270 (For 10s)	℃

*1   The derating factors of absolute maximum rating due to ambient temperature are shown in Fig.1, 2.

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

3.2 Electrical characteristics

Ta=25℃

Parameter		Symbol	MIN.	TYP.	MAX.	Unit	Conditions
Input	Forward voltage	V_F	-	1.2	1.4	V	I_F=20mA
	Reverse current	I_R	-	-	10^{-5}	A	V_R=3V
Output	Repetitive peak off-state current	I_{DRM}	-	-	2×10^{-6}	A	V_D=V_{DRM}
	On-state voltage	V_T	-	-	3.0	V	I_T=150mA
	Holding current	I_H	0.1	-	3.5	mA	V_D=6V
	Critical rate of rise of off-state voltage	dv/dt	100	-	-	V/μs	V_D=1/$\sqrt{2}\cdot V_{DRM}$
Transfer charac-teristics	Minimum trigger current	I_{FT}	-	-	10	mA	V_D=6V, R_L=100Ω
	Isolation resistance	R_{ISO}	5×10^{10}	10^{11}	-	Ω	DC500V 40 to 60%RH
	Turn on time	t_{ON}	-	-	100	μs	V_D=6V, R_L=100Ω, I_F=20mA

3.3 Recommend operating condition

Parameter		Symbol	MIN.	MAX.	Unit
Input	Input signal current at on-state	I_F(on)	20	25	mA
	Input signal current at off-state	I_F(off)	0	0.1	mA
Output	Supply voltage	Vout(rms)	—	240	V
	Load current	Iout(rms)	—	I_T(rms)×80% *3	mA
	Frequency	f	50	60	Hz
Operating temperature		Topr	-20	70	℃

*3 I_T(rms) derating at ambient temperature is show in Fig. 2.

Please locate the snubber circuit between output pins. (R_S=100Ω,C_S=0.01μF)

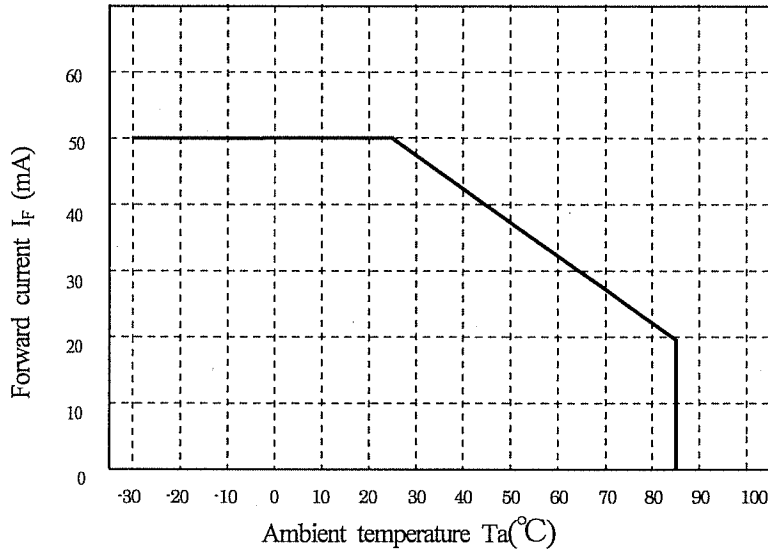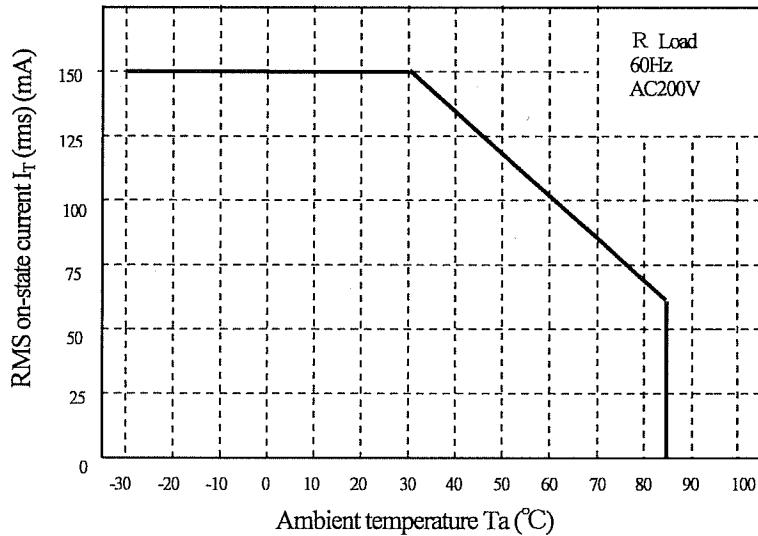Fig.1 Forward current vs. ambient temperature

Fig.2 RMS on-state current vs. ambient temperature

This device doesn't have built-in snubber circuit.

To avoid the false operation and protect SSR, please locate the appropriate snubber circuit between output pins base on the load. (Recommendable values : Rs=100 Ω, Cs=0.01 μ F)

Particularly, in case the device is used for the load such as solenoid valves and motors, false operation may happen in off-state due to rapid change of voltage at output pins caused by the phase difference of load current.

So please be sure to locate the snubber circuit (Rs=100 Ω, Cs=0.01 μ F) and make sure the device works properly in actual conditions.

In addition, the values of snubber circuit may have to be changed if necessary after testing in actual conditions.

REFERENCE

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	$V_F > U \times 1.2$	n=11, C=0
	(Soldering by hand) 400°C, 3 s		
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	$V_T > U \times 1.2$	n=11, C=0
Mechanical shock	15km/s², 0.5ms 3 times/±X, ±Y, ±Z direction	$I_{FT} > U \times 1.3$	n=11, C=0
Variable frequency vibration	100 to 2000 to 100Hz/4min 200m/s² 4 times/ X, Y, Z direction	$I_R > U \times 2.0$	n=11, C=0
Temperature cycling	1 cycle -40°C to +125°C (30min) (30min) 20 cycles test Without Load	$I_{DRM} > U \times 2.0$ U : Upper specification limit	n=22,C=0
High temp. and high humidity storage	+85°C, 85%RH, 500h	L : Lower specification limit	n=22,C=0
High temp. storage	+125°C, 1000h		n=22,C=0
Low temp. storage	-40°C, 1000h		n=22,C=0
Operation life	I_F=50mA, I_T=150mA Ta=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.

PR 2M 11N X F
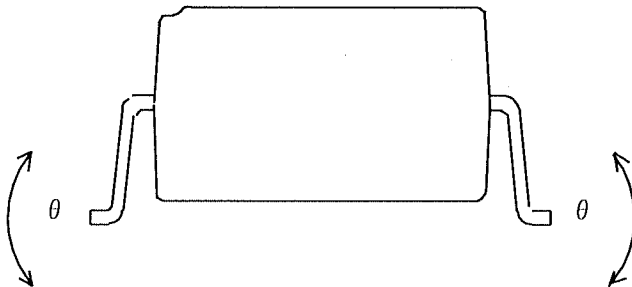
5. Outgoing inspection
  5.1 Inspection items
    (1) Electrical characteristics
        V_F, I_R, I_{DRM}, V_T, I_{FT}, R_{ISO}, Viso
    (2) Appearance

  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 specifications

6.2.1 Taping conditions

(1) Tape structure and Dimensions (Refer to the attached sheet, Page 9)

The carrier tape has the heat pressed structure of A-PET material carries tape with preventing static electricity and three layers cover tape (PET material base).

(2) Reel structure and Dimensions (Refer to the attached sheet, Page 10)

The taping reel shall be of plastic (PS material).

(3) Direction of product insertion (Refer to the attached sheet, Page 10)

(4) Joint of tape

The cover tape and carrier tape in one reel shall be joint less.

(5) To repair taped devices, cutting a bottom of carrier tape with a cutter.

After replacing the cut portion shall be sealed with adhesive tape.

6.2.2 Adhesiveness of cover tape

· The exfoliation force between carrier tape and cover tape shall be 0.2N to 0.7N for the angle 160° to 180° .

6.2.3 Rolling method and quantity

· Wind the tape back on the reel so that the cover tape will be outside the tape.

Attach more than 20cm of blank tape to the trailer and the leader of the tape and fix the both ends with adhesive tape.One reel basically shall contain 1000pcs.

6.2.4 Outer packing appearance (Refer to attached sheet, Page 10)

6.2.5 Marking

· The label with following information shall be pasted at appointed place of the outer packing case.

*Model No. *(Business dealing name) *lot No. *quantity * country of origin *Company name
*inspection date specified

6.2.6 Storage condition

· Taped products shall be stored at the temperature 5 to 30℃ and the humidity 70%RH or less.

away from direct sunlight.

6.2.7 Safety protection during shipping

· There shall be no deformation of component or degradation of electrical characteristics due to shipping.
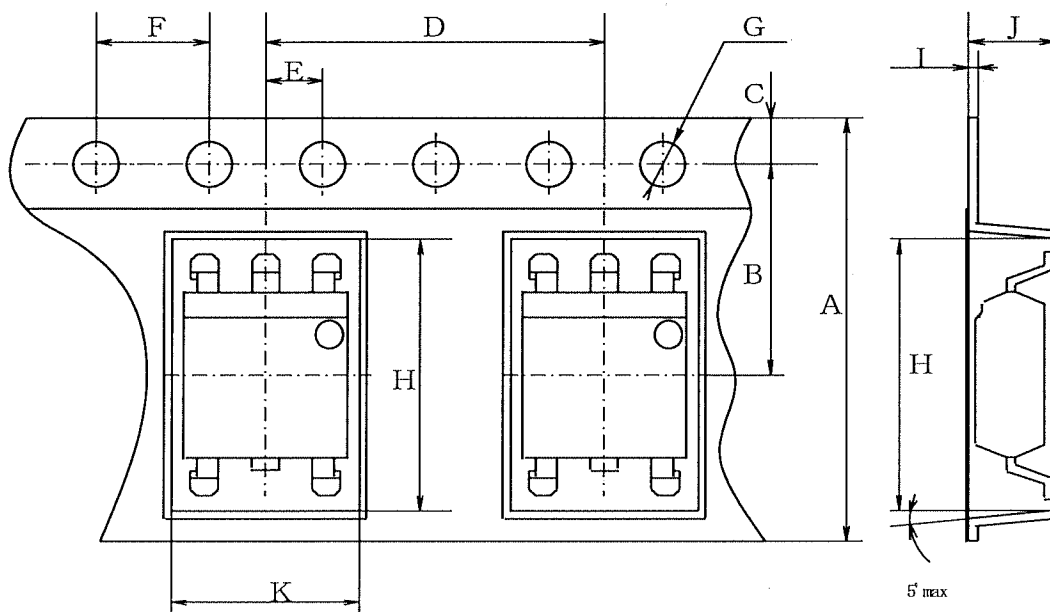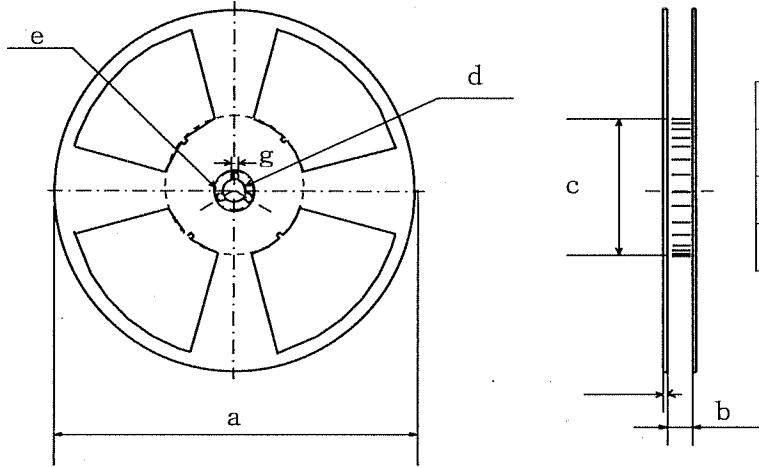

Dimensions list   (Unit : mm)

A	B	C	D	E	F	G	H	I	J	K
16.0±0.3	7.5±0.1	1.75±0.10	12.0±0.1	2.0±0.1	4.0±0.1	φ1.5 +0.1 -0.0	10.4±0.1	0.40±0.05	4.2±0.1	7.8±0.1

PR32MA11NXP

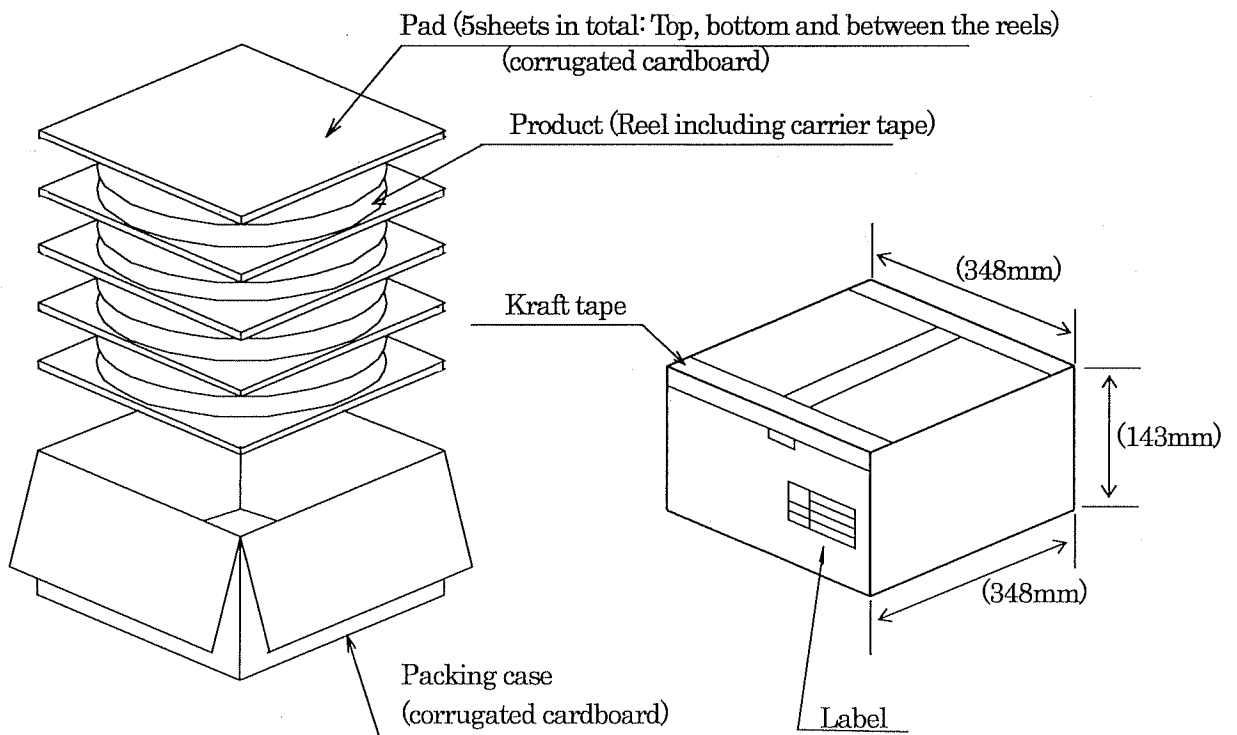Reel structure and Dimensions

Dimensions list   (Unit : mm)

a	b	c	d
330	17.5±1.5	φ100.0±1.0	φ13.0±0.5
e	f	g	
φ23.0±1.0	2.0±0.5	2.0±0.5	

Direction of product insertion

Pull-out direction
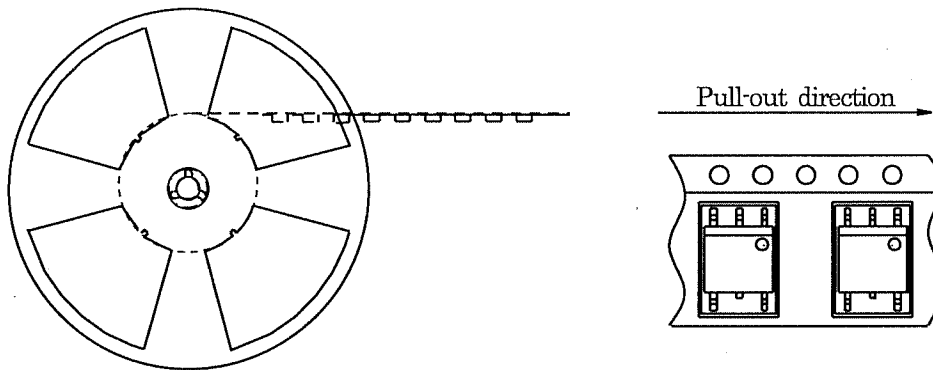
Outer packing appearance

(1) Carrier tape with 1,000pcs. of the devices (reeled) are packed in packing case.

(2) The packing case is sealed by kraft tape & the label is placed on it.

(Max. 4 reels are packed in one carton (Max. 4,000pcs of devices are in one carton))

Pad (5sheets in total: Top, bottom and between the reels)
(corrugated cardboard)

Product (Reel including carrier tape)

Kraft tape

(348mm)

(143mm)

(348mm)

Packing case
(corrugated cardboard)

Label

( ) : Reference dimensions

Regular packing mass:Approx.3.6kg

11/11

PR32MA11YXPF

1. This specification shall be applied to solid state relay, Model No. R32MA1 series as an option.
2. Applicable Models (Business dealing name)
   PR32MA11YXPF
3. The relevant models are the models Approved by VDE according to DIN EN 60747-5-2.
   Up to date code "RD" (December 2003), the relevant models are approved by VDE according to DIN VDE 0884/08.87.
   Approved Model No. : R32MA1
   VDE approved No. : 40008189 (According to the specification DIN EN 60747-5-2)
   · Operating isolation voltage $U_{IORM(Peak)}$: 890V
   · Transient voltage   : 7100V
   · Pollution : 2
   · Clearances distance (Between input and output) : 6.4   mm (MIN.)
   · Creepage distance (Between input and output) : 6.4   mm (MIN.)
   · Isolation thickness between input and output : 0.15   mm (MIN.)
   · Tracking-proof : CTI 175
   · Safety limit values   Current (Isi) : 200mA (Diode side)
                                 Power (Psi) : 400mW (Phototransistor side)
                                 Temperature (Tsi) : 150℃
   In order to keep safety electric isolation of solid state relay, please set the protective circuit to keep within safety limit values when the actual application equipment troubled.
   · Indication of VDE approval   " ⟨V̲D̲E⟩ " is printed on the minimum packing box.

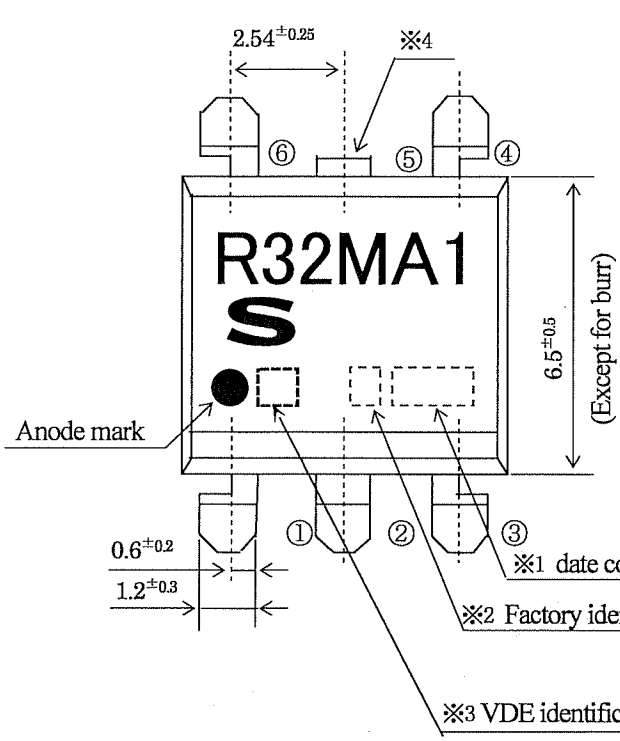4. · Outline
   Refer to the attachment-1-2.

5. Isolation specification according to EN 60747-5-2.

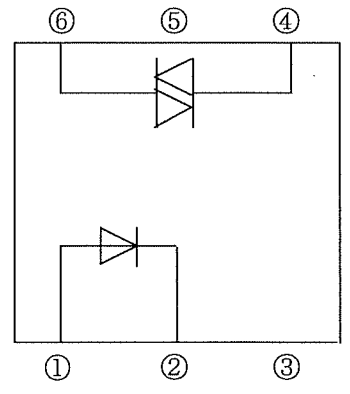| Parameter			Symbol	Conditions	Rating	Unit	Remark
Class of environmental test				-	40/100/21	-	
Pollution			-	-	2	-	Refer to the Diagram 1, 2 (Attachment -1-3)
Maximum operating isolation voltage			$U_{IORM(PEAK)}$	-	890	V	
Partial discharge test voltage (Between input and output)							
	Diagram 1		$U_{pr(PEAK)}$	tp=10 s, qc<5pC	1340	V	
	Diagram 2			tp=1 s, qc<5pC	1670	V	
Maximum over-voltage			$U_{IOTM(PEAK)}$	t_{INI}=60 s	7100	V	
Safety maximum ratings							Refer to Fig.1, 2 (Attachment -1-3)
	1)	Case temperature	Tsi	I_F=0, Pc=0	150	℃	
	2)	Input current	Isi	Pc=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}	Ta=Tsi	MIN. 10^9	Ω	
				Ta=Topr (MAX.)	MIN. 10^{11}		
				Ta=25℃	MIN. 10^{12}		

6. Precautions in performing isolation test
   6.1 Partial discharge test methods shall be the ones according to the specifications of EN 60747-5-2
   6.2 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}).

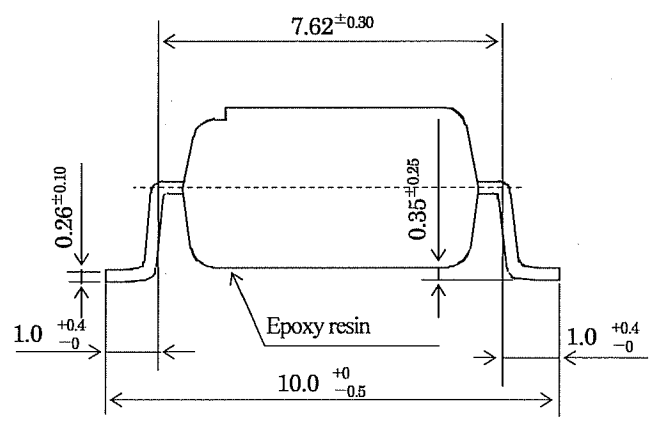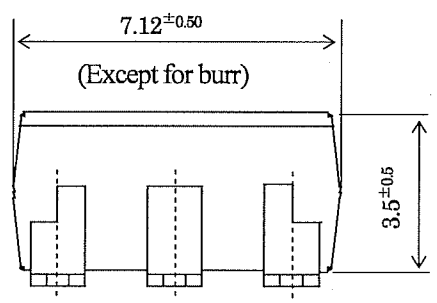PR32MA11YXPF

Pin-Number and internal connection diagram

2.54±0.25

※4

⑥ ⑤ ④

R32MA1
S

6.5±0.5 (Except for burr)

Anode mark

0.6±0.2
1.2±0.3

① ② ③

※1 date code

※2 Factory identification mark

※3 VDE identification mark

⑥ ⑤ ④

① ② ③

①Anode
②Cathode
③N C
④Anode/ Cathode
⑤No external connection
⑥Anode/ Cathode

7.12±0.50
(Except for burr)

3.5±0.5

7.62±0.30

0.26±0.10

0.35±0.25

Epoxy resin

1.0 +0.4 −0

10.0 +0 −0.5

1.0 +0.4 −0

*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) VDE identification mark shall be marked "4".
*4) Pin 5 is cut at outside of package.
*5) Pin material : Copper Alloy
　　Pin finish : SnCu plating (Cu : TYP. 2%)

Product mass　:　Approx.0.33g

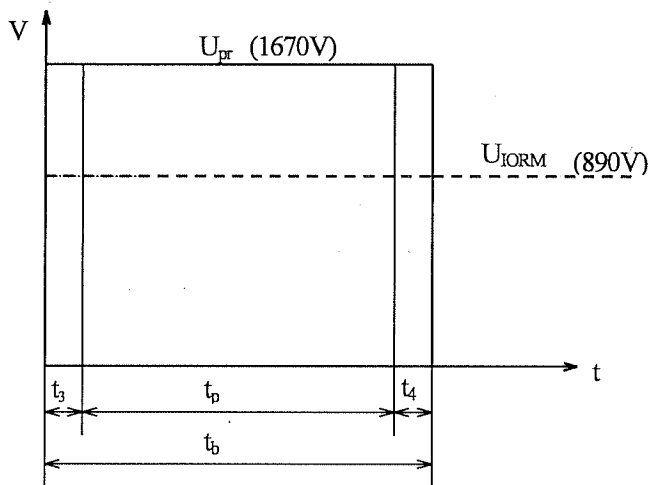|	Unit： 1/1mm
Name	R32MA1 Outline Dimensions (Business dealing name : PR32MA11YXPF)

Method of Diagram 1: Breakdown test (Apply to type test and sampling test)
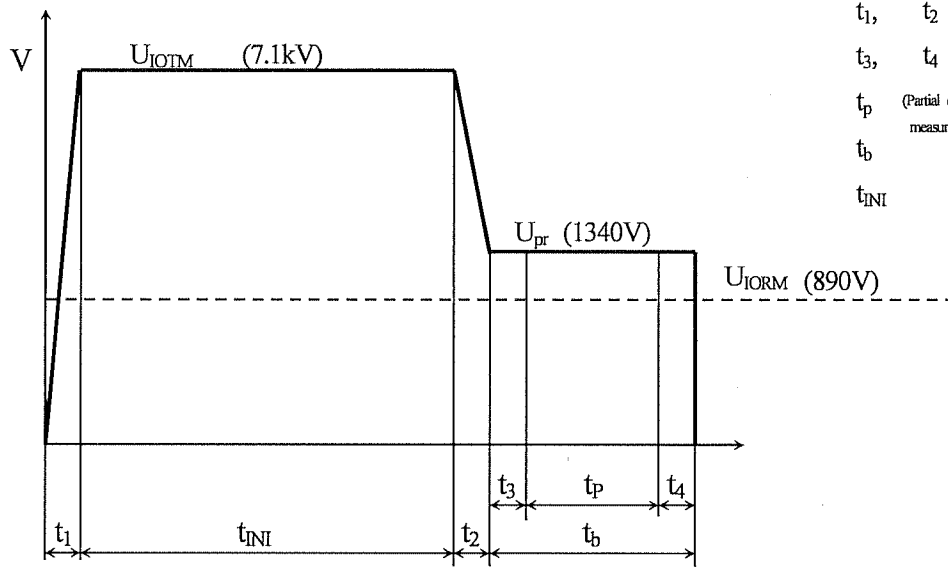
$t_1,$	t_2	= 1 to 10 s
$t_3,$	t_4	= 1 s
t_p (Partial discharge measuring time)		= 10 s
t_b		= 12 s
t_{INI}		= 60 s

U_IOTM (7.1kV)
U_pr (1340V)
U_IORM (890V)

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

U_pr (1670V)
U_IORM (890V)

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

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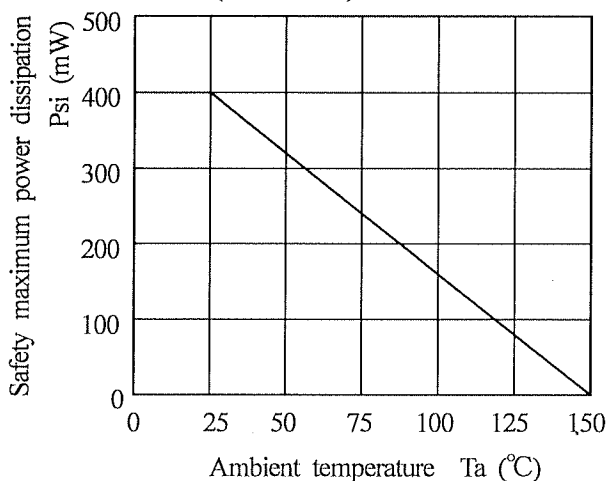vs. ambient temperature
(When failed)

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