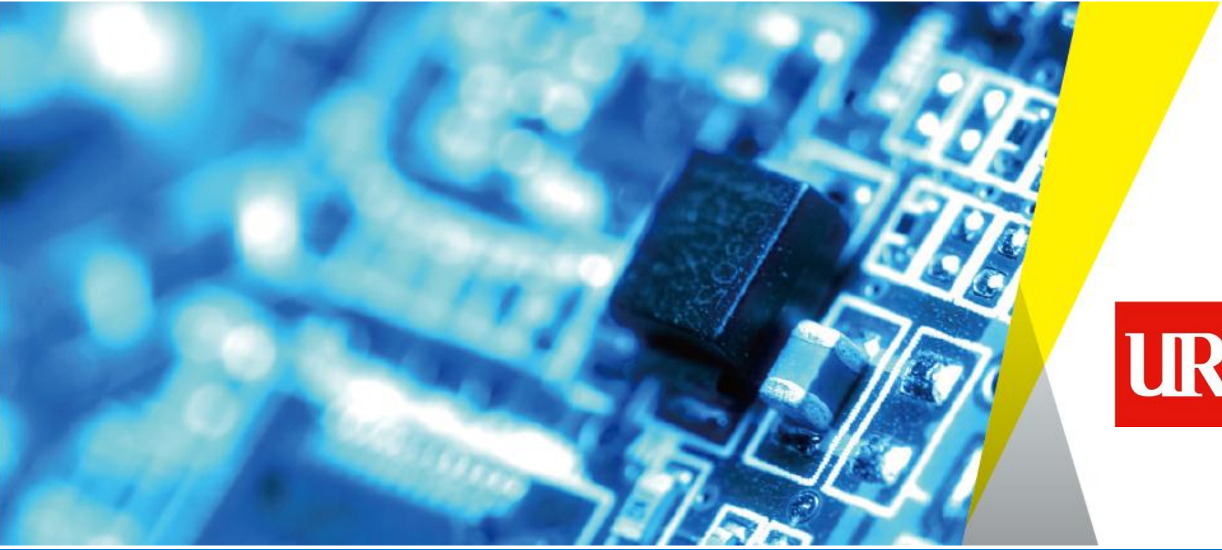

DATA SHEET

Product Name	**Wire-wound Anti-Surge Fixed Resistors**
Part Name	**KNPA Series**
File No.	**DIP-SP-012**

Uniroyal Electronics Global Co., Ltd.

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	Aeon Technology Corporation
	Royal Electronic Factory (Thailand) Co., Ltd.
	Royal Technology (Thailand) Co., Ltd.

1. Scope

1.1 This datasheet is the characteristics of Wire-wound Anti-Surge Fixed Resistors manufactured by UNI-ROYAL.
1.2 Excellent flame retardant coating
1.3 According to IEC 61000-4-5
1.4 Applies to electricity meters，home appliance and ballast
1.5 Compliant with RoHS directive.
1.6 Halogen free requirement.

2. Part No. System

The standard Part No. includes 14 digits with the following explanation:

2.1 Wire-Wound Fixed Resistors type, the 1st to 3rd digits are to indicate the product type and 4th digit is the special feature.
Example: KNPA= Wire-Wound Anti-Surge Fixed Resistors type.

2.2 5th~6th digits:

2.2.1 This is to indicate the wattage or power rating. To dieting the size and the numbers,
The following codes are used; and please refer to the following chart for detail:
W=Normal Size; S=Small Size; U=Extra Small Size; “1”~“G”to denotes“1”~“16”as
Hexadecimal:

1/16W~1/2W (＜1W)

Wattage	1/2	1/3	1/4	1/5	1/6	1/8	1/10	1/16
Normal Size	W2	W3	W4	W5	W6	W8	WA	WG
Small Size	S2	S3	S4	S5	S6	S8	SA	SG

1W~16W (≧1W)

Wattage	1	2	3	5	7	8	9	10	15
Normal Size	1W	2W	3W	5W	7W	8W	9W	AW	FW
Small Size	1S	2S	3S	5S	7S	8S	9S	AS	FS

2.2.2 For power rating less than 1 watt, the 5th digit will be the letters W, S or U to represent the size required & the 6th digit will be a number or a letter code.
Example: WA=1/10W

2.2.3 For power of 1 watt to 16 watt, the 5th digit will be a number or a letter code and the 6th digit will be the letters of W or S.
Example: AS=10W-S; 3S=3W-S

2.3 The 7th digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resistance Tolerance.
F=±1% G=±2% J=±5% K= ±10%

2.4 The 8th to 11th digits is to denote the Resistance Value.

2.4.1 For the standard resistance values of 5% series, the 8th digit is “0”,the 9th & 10th digits are to denote the significant figures of the resistance and the 11th digit is the number of zeros following.;

2.4.2 The following number s and the letter codes are to be used to indicate the number of zeros in the 11th digit:
$0=10^0$ $1=10^1$ $2=10^2$ $3=10^3$ $4=10^4$ $5=10^5$
$6=10^6$ $J=10^{-1}$ $K=10^{-2}$ $L=10^{-3}$ $M=10^{-4}$

2.4.3 The 12th, 13th & 14th digits.
The 12th digit is to denote the Packaging Type with the following codes:
A=Tape/Box (Ammo pack) B=Bulk/Box
T=Tape/Reel P=Tape/Box of PT-26 products

2.4.4 The 13th digit is normally to indicate the Packing Quantity of Tape/Box & Tape/Reel packaging types. The following letter code or number code is to be used for some packing quantities:
A=500pcs 1=1000pcs 2=2000pcs 5=5000pcs

2.4.5 For some items, the 14th digit alone can use to denote special features of additional information with the following codes:
0=NIL P=Panasert type 0=NIL 1=Avisert type 1 2=Avisert type 2
3=Avisert type 3

3. Ordering Procedure

(Example: KNPA 3WS ±5% 12Ω T/B-1000)

K	N	P	A	3	S	J	0	1	2	0	A	1	0

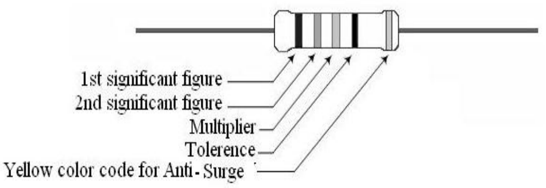
- **K N P** — Product Type: KNP=KNP type.
- **A** — Special Features: A= Anti-Surge
- **3 S** — Wattage:
  Normal size: W2=1/2W, 1W=1W, 2W=2W, 3W=3W, 5W=5W, 7W=7W, 8W=8W, 9W=9W
  Small size: 1S=1W-S, 2S=2W-S, 3S=3W-S, 5S=5W-S, 7S=7W-S, 8S=8W-S, 9S=9W-S, AS=10WS
- **J** — Tolerance: F=±1%, J=±5%, G=±2%, K=±10%
- **0 1 2 0** — Resistance Value:
  ±2%、±5%、10% series: The 1st digit will be ”0”; the 2nd & 3rd digits are for the significant figures of the resistance and the 4th digit denotes number of zeros following
  Example:20KΩ:0203
  ≤±1%series: The 1st to 3rd digits are for the significant figures of the resistance and 4th digit denotes number of zeros following.
  Example:20KΩ:2002
  $J=10^{-1}$; $K=10^{-2}$; $L=10^{-3}$
- **A** — Packing Type: A=Tape/Box, T=Tape/Reel, B=Bulk/Box
- **1** — **Packing quantity:** 1=1,000pcs, 2=2,000pcs, A=500pcs, B=2,500pcs, 0=Bulk/Box
- **0** — **Additional Information:** 0=NIL, P=Panasert type, 1=Avisert type 1, 2=Avisert type 2, 3=Avisert type 3, 8=PT-58mm, 9=PT-64mm, 7=Lead wire(H)38mm, A=PT-83mm, C=PT-73mm, D=PT-71mm

4. Color Code

Resistors shall be marked with color coding

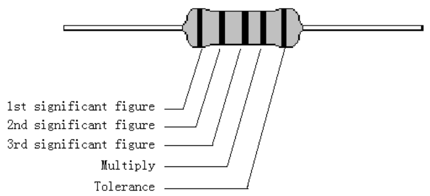
Colors shall be in accordance with JIS C 0802

≥±2% Series



1st Band		2nd Band		3rd Band		4th Band		5th Band	
Black	=0	Black	=0	Black	= Multiply by 1 (10^0)	Red	=±2%	Yellow	
Brown	=1	Brown	=1	Brown	= Multiply by 10 (10^1)	Gold	=±5%		
Red	=2	Red	=2	Red	= Multiply by 100 (10^2)	Silver	=±10%		
Orange	=3	Orange	=3	Orange	= Multiply by 1,000 (10^3)				
Yellow	=4	Yellow	=4	Yellow	= Multiply by 10,000 (10^4)				
Green	=5	Green	=5	Green	= Multiply by 100,000 (10^5)				
Blue	=6	Blue	=6	Blue	= Multiply by 1,000,000 (10^6)				
Violet	=7	Violet	=7	Violet	= Multiply by 10,000,000 (10^7)				
Gray	=8	Gray	=8	Gold	= Multiply by 0.1 (10^{-1})				
White	=9	White	=9	Silver	= Multiply by 0.01 (10^{-2})				

±1% Series



1st Band		2nd Band		3rd Band		4th Band		5th Band	
Black	=0	Black	=0	Black	=0	Black	= Multiply by 1 (10^0)	Brown	=±1%
Brown	=1	Brown	=1	Brown	=1	Brown	= Multiply by 10 (10^1)		
Red	=2	Red	=2	Red	=2	Red	= Multiply by 100 (10^2)		
Orange	=3	Orange	=3	Orange	=3	Orange	= Multiply by 1,000 (10^3)		
Yellow	=4	Yellow	=4	Yellow	=4	Yellow	= Multiply by 10,000 (10^4)		
Green	=5	Green	=5	Green	=5	Green	= Multiply by 100,000 (10^5)		
Blue	=6	Blue	=6	Blue	=6	Blue	= Multiply by 1,000,000 (10^6)		
Violet	=7	Violet	=7	Violet	=7	Violet	= Multiply by 10,000,000 (10^7)		
Gray	=8	Gray	=8	Gray	=8	Gold	= Multiply by 0.1 (10^{-1})		
White	=9	White	=9	White	=9	Silver	= Multiply by 0.01 (10^{-2})		

4.3 Label:

Label shall be marked with following items:

(1) Type and style

(2) Nominal resistance

(3) Resistance tolerance

(4) Quantity

(5) Lot number

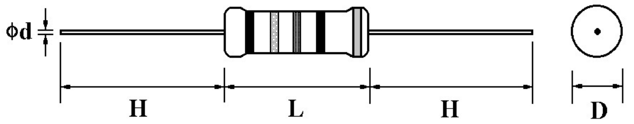
(6) PPM

Example:

Wire-wound Anti-Surge Fixed Resistors	
WATT : 8W	VAL: 22Ω
Q’TY: 25	TOL: 5%
LOT: 7021528	PPM:

5. Ratings & Dimension

5.1 Dimension:

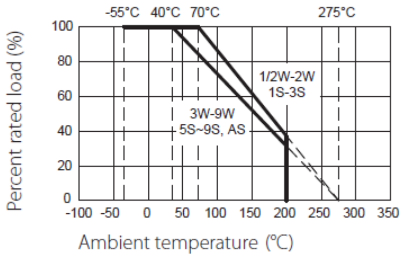


Type	Dimension(mm)					Resistance Range	Tolerance
	D±1	L±1	d±0.05	H±3	PT		
KNPA 1/2W,1WS	3.5	9.5	0.54	28	52	10Ω~820Ω	±1% ±2% ±5% ±10%
KNPA 1W,2WS	4.5	11.5	0.70	25	52	10Ω~1.2KΩ	
KNPA 2W,3WS	5.5	15.5	0.70	28	64	10Ω~3.0KΩ	
KNPA 3W,5WS	6.5	17.5	0.75	28	64	10Ω~3.9KΩ	
KNPA 5W,7WS	8.5	24.5	0.75	38	90	10Ω~5.6KΩ	
KNPA 7W,8WS	8.5	29.5	0.75	38	B/B	10Ω~8.2KΩ	
KNPA 8W,9WS	8.5	39.5	1.00	38	B/B	10Ω~10KΩ	
KNPA 9W,AS	8.5	52.5	1.00	38	B/B	10Ω~15KΩ	

6. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55℃ to 70℃. For temperature in excess of 70℃, the load shall be derate as shown in figure 1

Figure1



6.1 Voltage rating:

Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following formula:

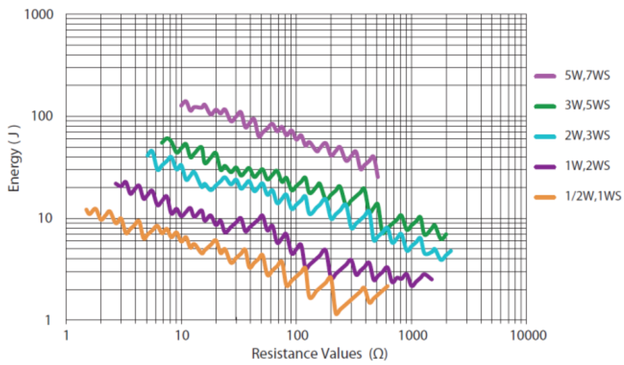
$RCWV = \sqrt{P \times R}$

Where: RCWV = rated dc or RMS ac continuous working voltage at commercial-line frequency and waveform (VOLT.)

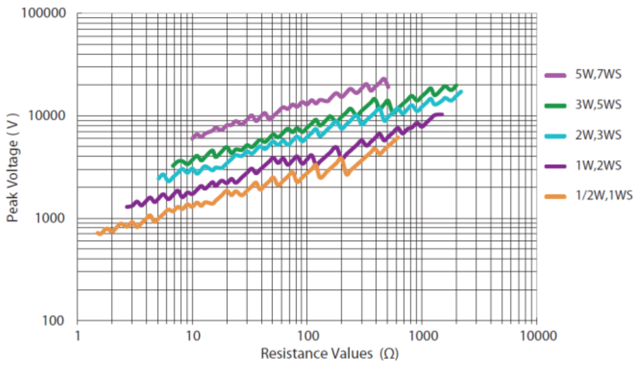
P = power rating (WATT.)

R= nominal resistance (OHM)

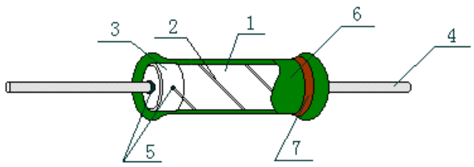
7. Pulses Energy Curve



8. 1.2/50us Pulses Voltage Curve



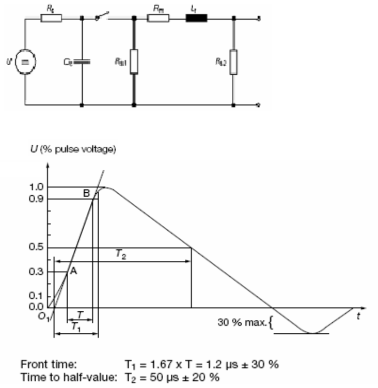
9. Structure



No.	Name	Raw materials
1	Basic body	Rod Type Ceramics
2	Resistor	Alloy
3	End cap	Steel (Tin Plated iron Surface)
4	Lead wire	Tin solder coated copper wire
5	Joint	By welding
6	Coating	Normal size & Insulated Non-Flame Paint Color: Deep Green (Normal size) Light Green (small size)
7	Marking	Epoxy Resin

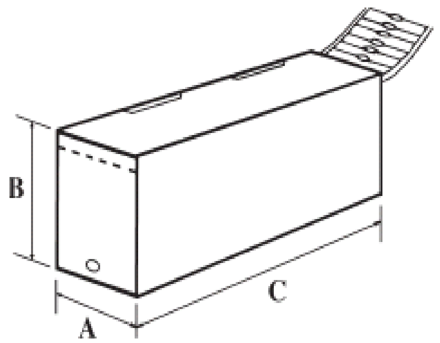
10. Performance Specification

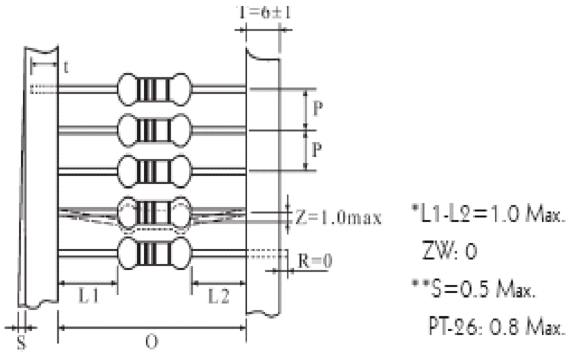
Characteristic	Limits	Test Methods (GB/T5729&JIS-C-5201&IEC60115-1)
Temperature Coefficient	±200PPM/℃	4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) R_1: Resistance Value at room temperature （t_1）; R_2: Resistance at test temperature （t_2） t_1: +25 ℃ or specified room temperature t_2: Test temperature（-55℃or 125℃）
Short-Time Overload	Resistance change rate must be in ±(2%+0.05Ω)Max , and no mechanical damage.	4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV or Max.Overload Votage whichever less for 5 seconds.
Terminal strength	No evidence of mechanical damage	4.16 Direct load: Resistance to a 2.5 kg direct load for 10 seconds in the direction of the longitudinal axis of the terminal leads. Twist test: Terminal leads shall be bent through 90°at a point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations.

Resistance to soldering heat	Resistance change rate must be in ± (1%+0.05Ω) , and no mechanical damage.	4.18 Permanent resistance change when leads immersed to a point 2.0-2.5mm from the body in 260℃±5℃ solder for 10±1 seconds.
Solderability	95% Coverage Min.	4.17 The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes. Temperature of solder:245℃ ±3℃ Dwell time in solder: 2~3seconds.
Rapid change of temperature	Resistance change rate must be in ±(2%+0.05Ω) , and no mechanical damage.	4.19 30 min at -55 ℃ and 30 min at 155 ℃; 100 cycles.
Humidity (steady state)	Resistance change rate must be in ±(2%+0.05Ω) , and no mechanical damage.	4.24Temporary resistance change after 240 hours exposure in a humidity test chamber controlled at 40±2℃ and 90-95% relative humidity,
Load life in humidity	Resistance change rate must be in ±(5%+0.05Ω) , and no mechanical damage.	7.9 Resistance change after 1000 hours (1.5hours "ON", 0.5hours "OFF") at RCWV or Max.Working Voltage whichever less in a humidity test chamber controlled at 40±2° C and 93%±3% RH.
Surge Immunity	Resistance change rate is: ±(5%+0.05Ω) Max	Surge voltageas per the 1.2 µs/50 µs exponential open circuit voltage waveform according to IEC 61000-4-5 standard as shown below: 
Resistance to solvent	No deterioration of protective coatings & markings	4.29 Specimens shall be immersed in a bath of trichloroethylene completely for 3 min. With ultrasonic
Load life	Resistance change rate must be in ±(5%+0.05Ω) , and no mechanical damage.	4.25.1 Permanent Resistance change after 1000 hours operating at RCWV or Max.Working Voltage whichever less with duty cycle of 1.5 hours "ON", 0.5 hour "OFF" at 70±2° C ambient.
Low Temperature Storage	Resistance change rate must be in ±(5%+0.05Ω) , and no mechanical damage.	IEC 60068-2-1 (Aa) Lower limit temperature，for 2H.
High Temperature Exposure	Resistance change rate must be in ±(5%+0.05Ω) , and no mechanical damage.	MIL-STD-202 108A Upper limit temperature ，for 16H.

11. Packing

11.1 Tapes in Box Packing:

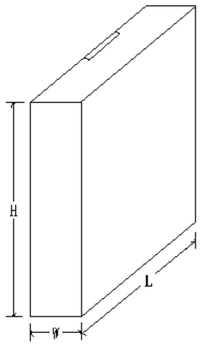


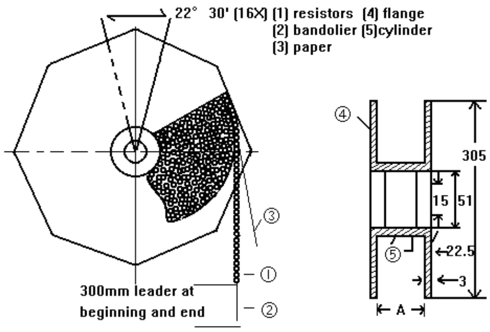


Dimension of T/B (mm)

Part No.	O	P	A±5	B±5	C±5	Qty/Box
KNPA 1/2W	52±1	5±0.3	75	45	255	1,000pcs
KNPA 1WS	52±1	5±0.3	75	45	255	1,000pcs
KNPA 1W	52±1	5±0.3	86	82	255	1,000pcs
KNPA 2WS	52±1	5±0.3	86	82	255	1,000pcs
KNPA 2W	64±5	10±0.5	90	119	255	1,000pcs
KNPA 3WS	64±5	10±0.5	90	119	255	1,000pcs
KNPA 3W	64±5	10±0.5	90	88	255	500pcs
KNPA 5WS	64±5	10±0.5	90	88	255	500pcs
KNPA 5W	90±5	10±0.5	115	124	500	500pcs
KNPA 7WS	90±5	10±0.5	115	124	500	500pcs

11.2 Tapes in Reel Packing:

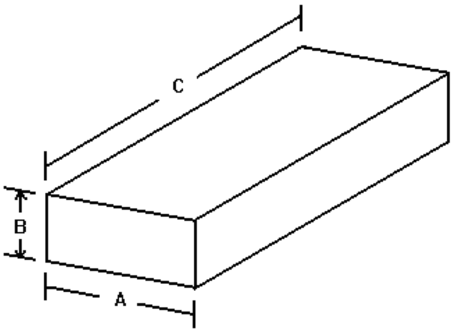




Dimension of Reel (mm)

Part No.	O	A	W±5	H±5	L±5	Qty/Box
KNPA 1/2W	52±1	73±2	85	295	293	2,500pcs
KNPA 1WS	52±1	73±2	85	295	293	2,500pcs
KNPA 1W	52±1	73±2	85	295	293	2,500pcs
KNPA 2WS	52±1	73±2	85	295	293	2,500pcs
KNPA 2W	64±5	80±5	95	295	293	1,000pcs
KNPA 3WS	64±5	80±5	95	295	293	1,000pcs
KNPA 3W	64±5	80±5	95	295	293	1,000pcs
KNPA 5WS	64±5	80±5	95	295	293	1,000pcs
KNPA 5W	90±5	115±5	121	310	310	700pcs
KNPA 7WS	90±5	115±5	121	310	310	700pcs

11.3 Bulk in Box Packing:



Dimension of Box (mm)

Part No.	A±5	B±5	C±5	Qty/Box
KNPA 1/2W	140	80	240	250/5,000pcs
KNPA 1WS	140	80	240	250/5,000pcs
KNPA 1W	140	80	240	100/2,500pcs
KNPA 2WS	140	80	240	100/2,500pcs
KNPA 2W	140	80	240	100/1,500pcs
KNPA 3WS	140	80	240	100/1,500pcs
KNPA 3W	140	80	240	100/1,000pcs
KNPA 5WS	140	80	240	100/1,000pcs
KNPA 5W	140	80	240	25/400pcs
KNPA 7WS	140	80	240	25/400pcs
KNPA 7W	140	80	240	25/300pcs
KNPA 8WS	140	80	240	25/300pcs
KNPA 8W	140	80	240	25/200pcs
KNPA 9WS	140	80	240	25/200pcs
KNPA 9W	140	80	240	25/200pcs
KNPA 10WS	140	80	240	25/200pcs

12. Note

12.1. UNI-ROYAL recommend products store in warehouse with temperature between 15 to 35℃ under humidity between 25 to 75%RH. Even under storage conditions recommended above, solder ability of products will be degraded stored over 1 year old.

12.2. Cartons must be placed in correct direction which indicated on carton, otherwise the reel or wire will be deformed.

12.3. Storage conditions as below are inappropriate:

a. Stored in high electrostatic environment

b. Stored in direct sunshine, rain, snow or condensation.

c. Exposed to sea wind or corrosive gases, such as Cl_2, H_2S, NH_3, SO_2, NO_2, Br etc.

13. Record

Version	Description	Page	Date	Amended by	Checked by
1	First version	1~8	Mar.20, 2018	Haiyan Chen	Nana Chen
2	1.Modify the Derating Curve 2. Add the Pulses Energy Curve and Pulses Voltage Curve 3. Modify characteristic	4 5 6~7	Feb.23, 2019	Haiyan Chen	Yuhua Xu
3	Modify the Paint color	5	Jun.24, 2019	Haiyan Chen	Yuhua Xu
4	Modify the size of 8W to 10WS wires from "0.75" to "1.00"	4	Mar.15, 2022	Haiyan Chen	Yuhua Xu
5	Modify the temperature coefficient test conditions	6	Oct.28, 2022	Haiyan Chen	Yuhua Xu
6	1. Modify the marking identifier 2. Cancel Surge Rating	3 4	Jul.27, 2023	Haiyan Chen	Yuhua Xu
7	1.Increased standard color code system 2.Add the 1% tolerance	3 3~4	Apr.01, 2024	Haiyan Chen	Yuhua Xu