

**UNI-ROYAL**  
厚聲集團

# DATA SHEET

**Product Name** Wire-wound Anti-Surge Fixed Resistors

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**Part Name** KNPA Series

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Manufacture Plant Uniroyal Electronics Industry Co., Ltd.

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

## 2. Part No. System

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

- 2.1 Wire-Wound Fixed Resistors type, the 1<sup>st</sup> to 3<sup>rd</sup> digits are to indicate the product type and 4<sup>th</sup> digit is the special feature.

Example: KNPA= Wire-Wound Anti-Surge Fixed Resistors type.

- 2.2 5<sup>th</sup>~6<sup>th</sup> 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 5<sup>th</sup> digit will be the letters W, S or U to represent the size required & the 6<sup>th</sup> 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 5<sup>th</sup> digit will be a number or a letter code and the 6<sup>th</sup> digit will be the letters of W or S.

Example: AS=10W-S; 3S=3W-S

- 2.3 The 7<sup>th</sup> 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 8<sup>th</sup> to 11<sup>th</sup> digits is to denote the Resistance Value.

- 2.4.1 For the standard resistance values of 5% series, the 8<sup>th</sup> digit is “0”, the 9<sup>th</sup> & 10<sup>th</sup> digits are to denote the significant figures of the resistance and the 11<sup>th</sup> 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 11<sup>th</sup> digit:

0=10<sup>0</sup> 1=10<sup>1</sup> 2=10<sup>2</sup> 3=10<sup>3</sup> 4=10<sup>4</sup> 5=10<sup>5</sup>

6=10<sup>6</sup> J=10<sup>-1</sup> K=10<sup>-2</sup> L=10<sup>-3</sup> M=10<sup>-4</sup>

- 2.4.3 The 12<sup>th</sup>, 13<sup>th</sup> & 14<sup>th</sup> digits.

The 12<sup>th</sup> 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 13<sup>th</sup> 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

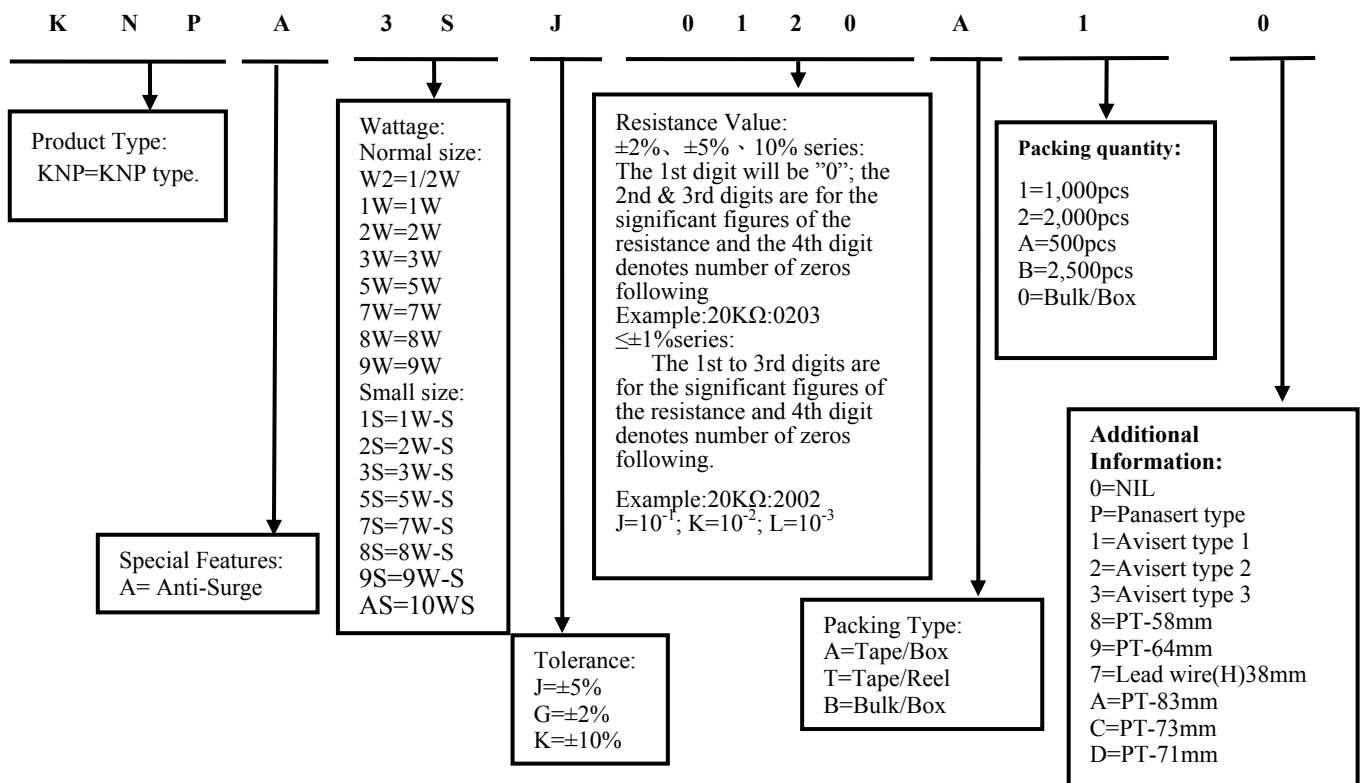
- 2.4.5 For some items, the 14<sup>th</sup> digit alone can use to denote special features of additional information with the following codes:

0=NIL P=Panasert type 0=NIL 1=Avisert type 1 2=Avisert type 2

3=Avisert type 3 A=Cutting type CO 1/4W-A type B= Cutting type CO 1/4W-B type

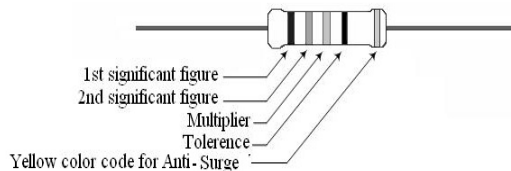
**3. Ordering Procedure**

(Example: KNPA 3WS ±5% 12Ω T/B-1000 )

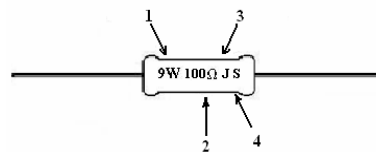


**4. Marking**

4.1 For KNPA normal size: 1/2W, 1W, 2W, 3W and KNPA small size : 1W-S, 2W-S, 3W-S, 5W-S Resistors shall be marked with color coding , colors shall be in accordance with JIS C 0802



4.2 For KNPA normal size: 5W, 7W, 8W, 9W and KNPA small size : 7W-S, 8W-S, 9W-S, 10W-S



Code description and regulation

1. Wattage rating.
2. Nominal resistance value.
3. Resistance Tolerance.
4. S = Product KNPA

Example:

4.3 Label:

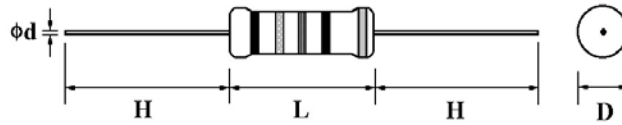
Label shall be marked with following items:

- (1) Type and style
- (2) Nominal resistance
- (3) Resistance tolerance
- (4) Quantity
- (5) Lot number
- (6) PPM

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

## 5. Ratings & Dimension

### 5.1 Dimension:



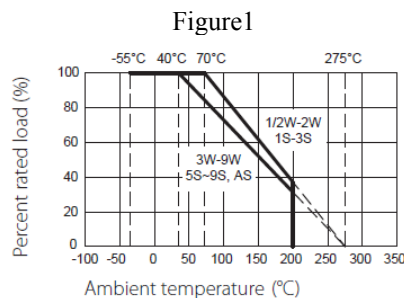
Type	Dimension(mm)					Resistance Range	Tolerance
	D±1	L±1	d±0.05	H±3	PT		
KNPA 1/2W,1WS	3.5	9.5	0.54	28	52	10Ω~820Ω	±5%
KNPA 1W,2WS	4.5	11.5	0.70	25	52	10Ω~1.2KΩ	
KNPA 2W,3WS	5.5	15.5	0.70	28	64	10Ω~3.0KΩ	
KNPA 3W,5WS	6.5	17.5	0.75	28	64	10Ω~3.9KΩ	
KNPA 5W,7WS	8.5	24.5	0.75	38	90	10Ω~5.6KΩ	
KNPA 7W,8WS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

### 5.2 Rating :

Type	Low Resistance Range	Maximum Surge Voltage	Medium Resistance Range	Maximum Surge Voltage	High Resistance Range	Maximum Surge Voltage
KNPA 1/2W,1WS	10Ω~40Ω	2KV	43Ω~240Ω	3KV	270Ω~820Ω	4KV
KNPA 1W,2WS	10Ω~50Ω	3KV	51Ω~240Ω	4KV	270Ω~1.2KΩ	5KV
KNPA 2W,3WS	10Ω~100Ω	4KV	110Ω~240Ω	5KV	270Ω~3.0KΩ	6KV
KNPA 3W,5WS	10Ω~100Ω	6KV	110Ω~680Ω	7KV	750Ω~3.9KΩ	8KV
KNPA 5W,7WS	10Ω~160Ω	7KV	180Ω~680Ω	8KV	750Ω~5.6KΩ	9KV
KNPA 7W,8WS	10Ω~160Ω	8KV	180Ω~680Ω	9KV	750Ω~8.2KΩ	10KV
KNPA 8W,9WS	10Ω~160Ω	9KV	180Ω~680Ω	10KV	750Ω~10KΩ	10KV
KNPA 9W,AS	10Ω~160Ω	10KV	180Ω~680Ω	10KV	750KΩ~15KΩ	10KV

## 6. Derating Curve

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



### 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:

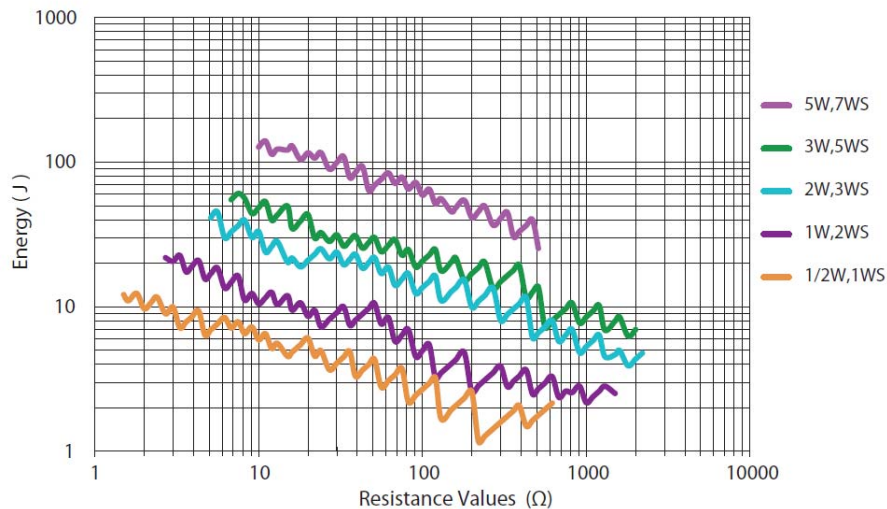
$$RCWV = \sqrt{P \times R}$$

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

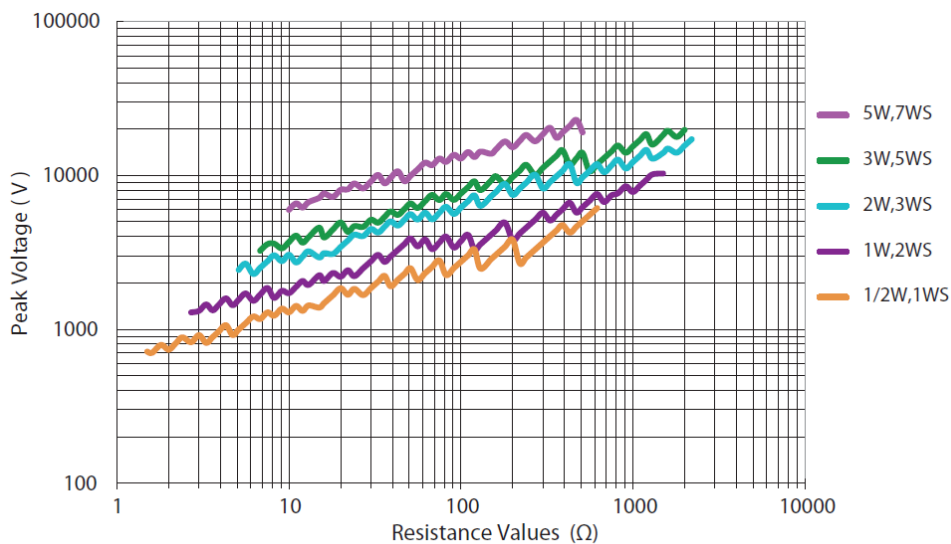
P = power rating (WATT.)

R = nominal resistance (OHM)

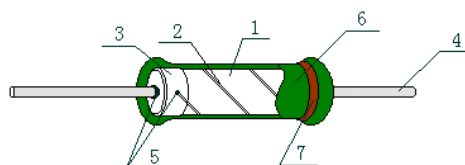
**7. Pulses Energy Curve**



**8. Pulses Voltage Curve**

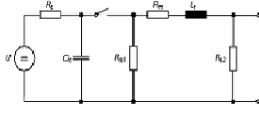
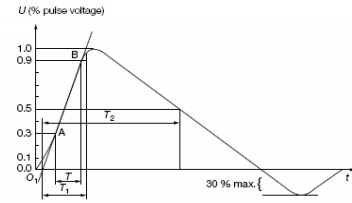


**9. Structure**



No.	Name	Raw materials
1	Basic body	Rod Type Ceramics
2	Resistor	Ni-Cr & Cu-Ni Alloys
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

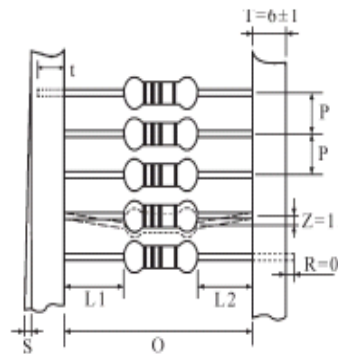
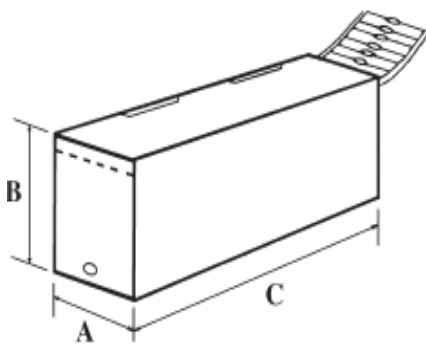
## 10. Performance Specification

Characteristic	Limits	Test Methods (GB/T5729&JIS-C-5201&IEC60115-1)
Temperature Coefficient	±200PPM/°C	4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (PPM/°C)}$ R <sub>1</sub> : Resistance Value at room temperature (t <sub>1</sub> ) ; R <sub>2</sub> : Resistance at test temperature (Upper limit temperature or Lower limit temperature) t <sub>1</sub> : +25°C or specified room temperature t <sub>2</sub> : Upper limit temperature or Lower limit temperature test temperature
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 10 times Power 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°C±5°C 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°C±3°C 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 °C and 30 min at 155°C; 100 cycles.
Humidity ( steady state )	Resistance change rate must be in ±(2%+0.05Ω) , and no mechanical damage.	4.24 Temporary resistance change after 240 hours exposure in a humidity test chamber controlled at 40±2°C 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 1,000 hours (1.5 hours “ON”, 0.5 hour “OFF”) at RCWV in a humidity test chamber controlled at 40°C±2 °C and 90 to 95% relative humidity.
Surge Immunity	Resistance change rate is: ±(5%+0.05Ω Max	Surge voltage as per the 1.2 μs/50 μs exponential open circuit voltage waveform according to IEC 61000-4-5 standard as shown below:   <p style="font-size: small;">Front time: T<sub>1</sub> = 1.67 x T = 1.2 μs ± 30 %            Time to half-value: T<sub>2</sub> = 50 μs ± 20 %</p>

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 $\pm(5\%+0.05\Omega)$ , and no mechanical damage.	4.25.1 permanent resistance change after 1,000 hours operating at RCWV with duty cycle of 1.5 hours "ON", 0.5 hour "OFF" at 70 °C $\pm$ 2°C ambient.
Low Temperature Storage	Resistance change rate must be in $\pm(5\%+0.05\Omega)$ , and no mechanical damage.	4.23.4 Lower limit temperature , for 2H.
High Temperature Exposure	Resistance change rate must be in $\pm(5\%+0.05\Omega)$ , and no mechanical damage.	4.23.2 Upper limit temperature , for 16H.

**11. Packing**

11.1 Tapes in Box Packing:



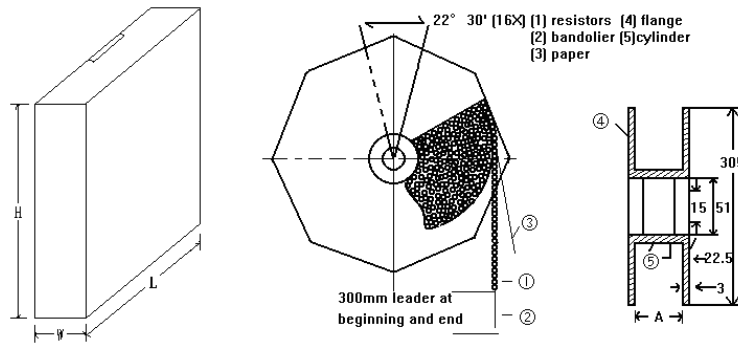
\*L1-L2=1.0 Max.  
 ZW: 0  
 \*\*S=0.5 Max.  
 PT-26: 0.8 Max.

**Dimension of T/B (mm)**

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



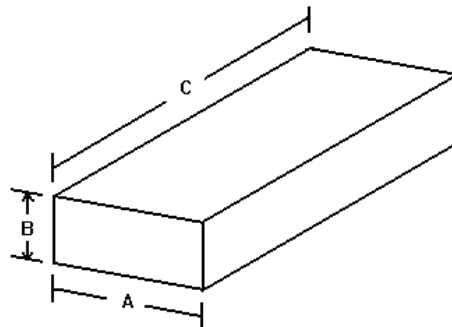
## 11.2 Tapes in Reel Packing:



**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°C 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:
- Stored in high electrostatic environment
  - Stored in direct sunshine, rain, snow or condensation.
  - Exposed to sea wind or corrosive gases, such as Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>2</sub>, etc.

## 13. Record

Version	Description	Page	Date	Amended by	Checked by
1	First version	1~8	Mar.20, 2018	Chen Haiyan	Chen Nana
2	1.Modify the Derating Curve	4	Feb.23, 2019	Chen Haiyan	Xu Yuhua
	2. Add the Pulses Energy Curve and Pulses Voltage Curve	5			
	3. Modify characteristic	6~7			
3	Modify the Paint color	5	Jun.24, 2019	Chen Haiyan	Xu Yuhua

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