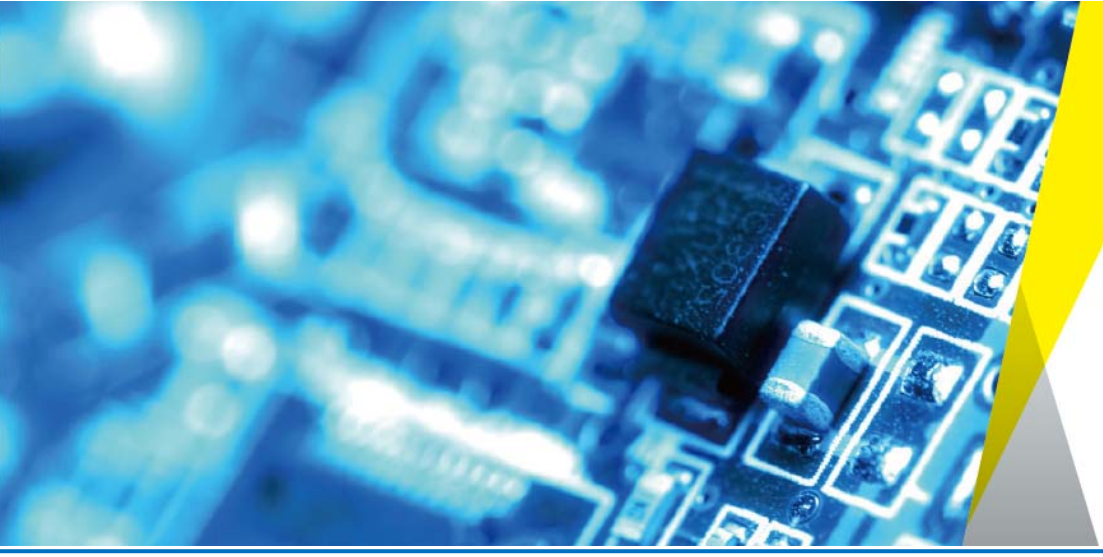

DATA SHEET

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

Part Name **KNPA Series**

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Manufacture Plant Uniroyal Electronics Industry Co., Ltd.

Aeon Technology Corporation

Royal Electronic Factory (Thailand) Co., Ltd.

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

3. Ordering Procedure

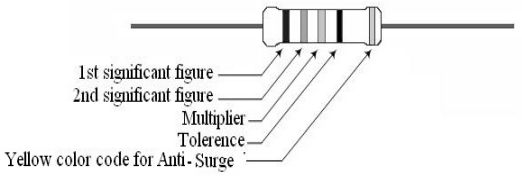
(Example: KNPA 3WS ±5% 12Ω T/B-1000)

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

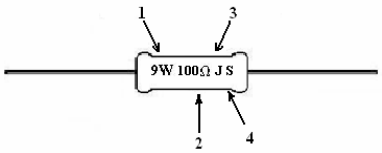
- **K N P** — Product Type: KNP=KNP type.
- **A** — Special Features: A= Anti-Surge
- **3 S** — Wattage: Normal size: W2=1/2W, 1W=1W, 2W=2W, 3W=3W, 5W=5W, 7W=7W, 8W=8W, 9W=9W; Small size: 1S=1W-S, 2S=2W-S, 3S=3W-S, 5S=5W-S, 7S=7W-S, 8S=8W-S, 9S=9W-S, AS=10WS
- **J** — Tolerance: J=±5%, G=±2%, K=±10%
- **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. 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: 8W, 9W and KNPA small size : 9W-S, 10W-S



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

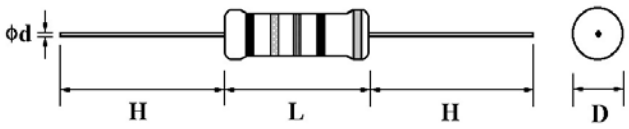
4.3 Label:
Label shall be marked with following items:
(1) Type and style
(2) Nominal resistance
(3) Resistance tolerance
(4) Quantity
(5) Lot number
(6) PPM

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	±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	

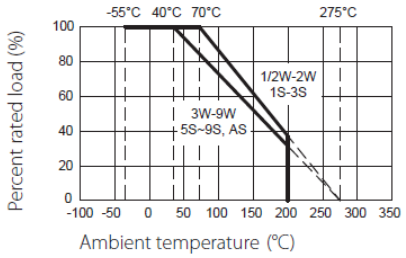
5.2 Rating：

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℃ 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:

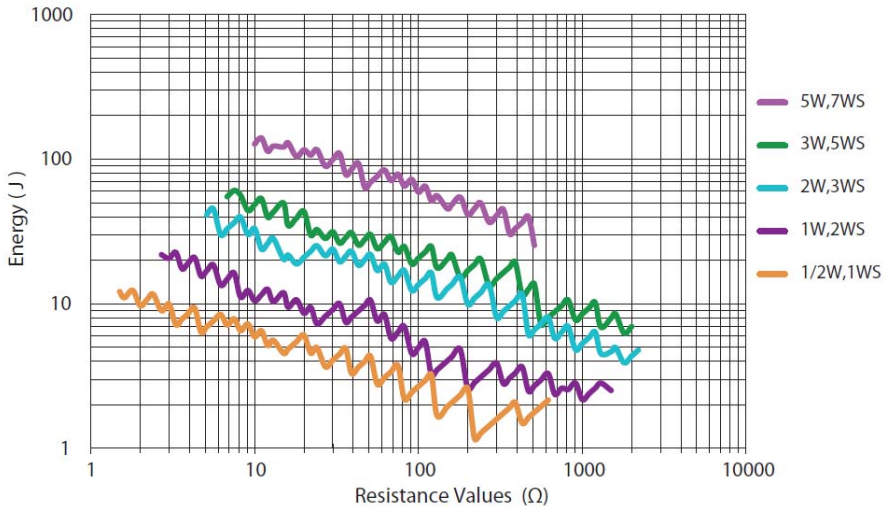
$RCWV = \sqrt{P \times R}$

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

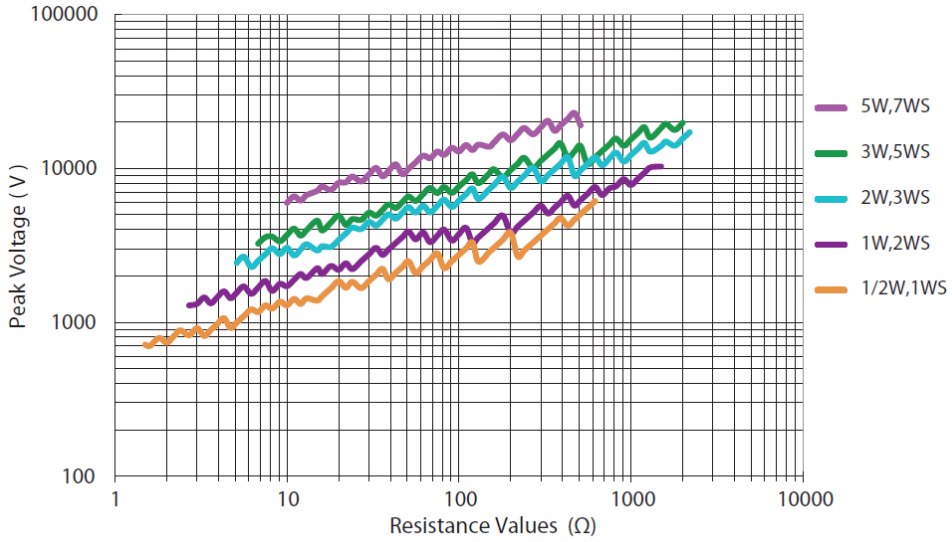
P = power rating (WATT.)

R= nominal resistance (OHM)

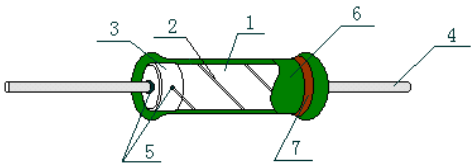
7. Pulses Energy Curve



8. Pulses Voltage Curve

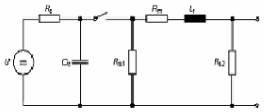
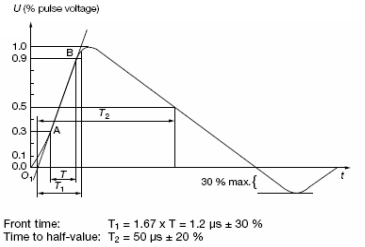


9. Structure



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

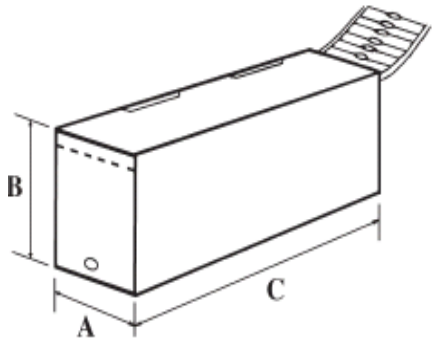
10. Performance Specification

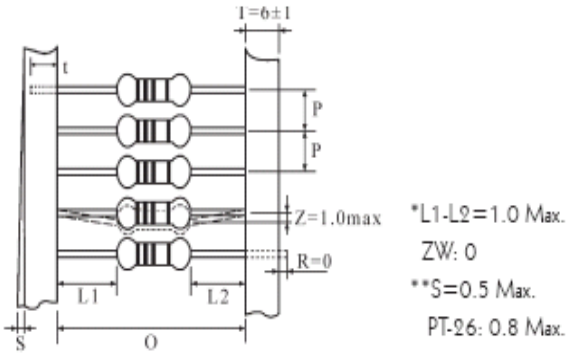
Characteristic	Limits	Test Methods (GB/T5729&JIS-C-5201&IEC60115-1)
Temperature Coefficient	±200PPM/℃	4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) R_1: Resistance Value at room temperature （t_1）; R_2: Resistance at test temperature (Upper limit temperature or Lower limit temperature) t_1: +25℃ or specified room temperature t_2: 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℃±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 °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.	4.24Temporary 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 1,000 hours (1.5 hours “ON”,0.5 hour “OFF”) at RCWV in a humidity test chamber controlled at 40℃±2℃ and 90 to 95% relative humidity.
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:   Front time: T_1 = 1.67 x T = 1.2 μs ± 30 % Time to half-value: T_2 = 50 μs ± 20 %

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 1,000 hours operating at RCWV with duty cycle of 1.5 hours "ON", 0.5 hour "OFF" at 70℃±2℃ 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:

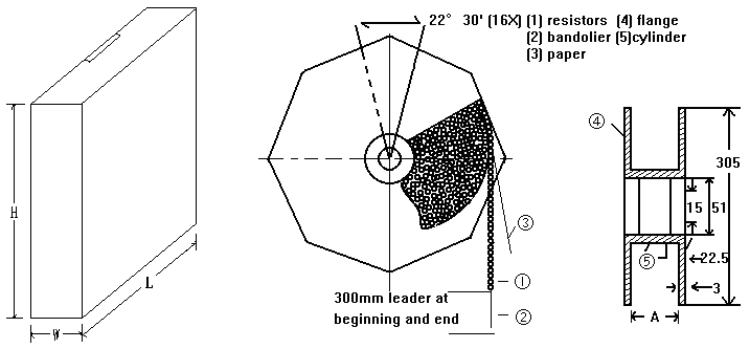




Dimension of T/B (mm)

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

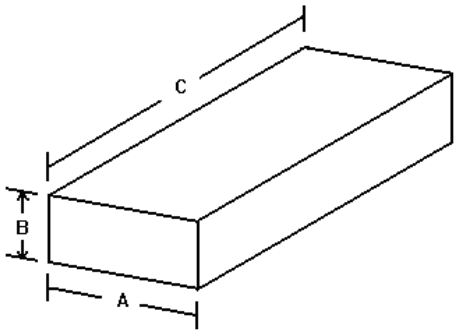
11.2 Tapes in Reel Packing:



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, 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