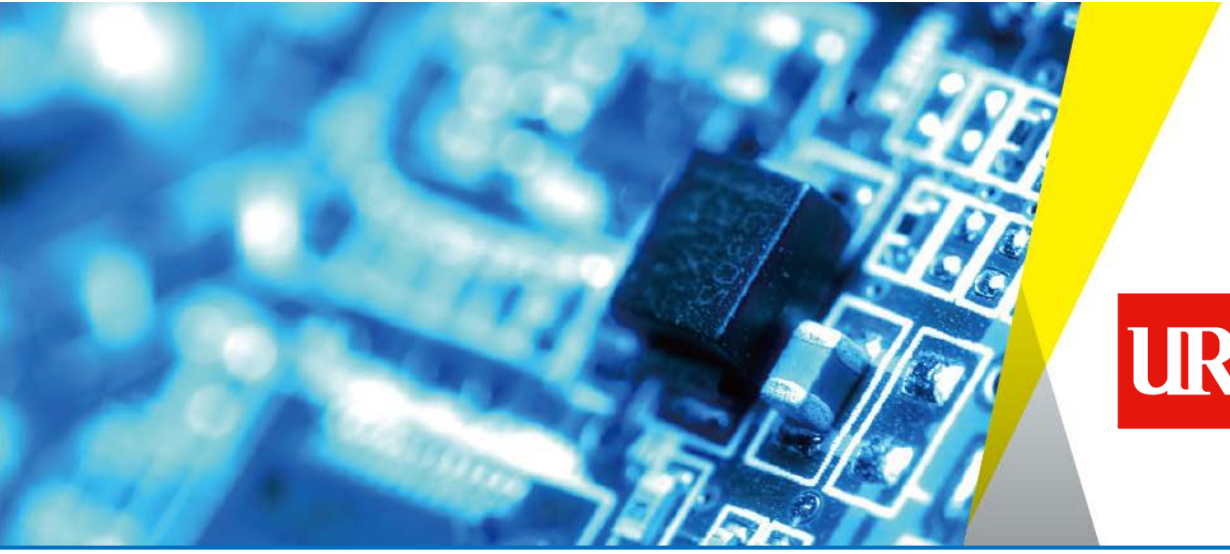

DATA SHEET

Product Name	**Fusible Resistors**
Part Name	**FRN Series**
File No.	**DIP-SP-007**

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 Fusible Resistors manufactured by UNI-ROYAL.

1.2 Ideal circuit opening controller， disconnecting units from overload rating specified

1.3 Too low or too high ohmic value can be supplied on a case to case to case basis

1.4 UL items available （File NO:E306074、E245468）

2. Part No. System

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

2.1 Coated type, the 1st to 3rd digits are to indicate the product type and 4th digit is the special feature. Example: FRN0= Fusible 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; “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

1W~16W (≧1W)

Wattage	1	2	3	5	7	8	9	10	15
Normal Size	1W	2W	3W	5W	7W	8W	9W	AW	FW

2.2.2 For power rating less than 1 watt, the 5th digit will be the letters W to represent the size required & the 6th digit will be a number or a letter code.

Example: W4=1/4W

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.

Example: AW=10W

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 E-24 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 is 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. Except for Chip products Bulk packing, this digit should be filled“0”or other products with Bulk/Box packing requirement. The following letter code is to be used for some packing quantities:

A=500pcs B=2500pcs C=10000pcs D=20000pcs G=25000pcs H=50000pcs

2.4.5 For the FORMED type products, the 13th & 14th digits are used to denote the forming types of the product with the following letter codes:

MF=M-type with flattened lead wire F0= F-type

MK= M-type with kinked lead wire F1= F1-type

ML= M-type with normal lead wire F2= F2-type

MC= M-type with bending lead wire F3= F3-type

2.4.6 For some items, the 14th digit alone can use to denote special features of additional information with the following codes:

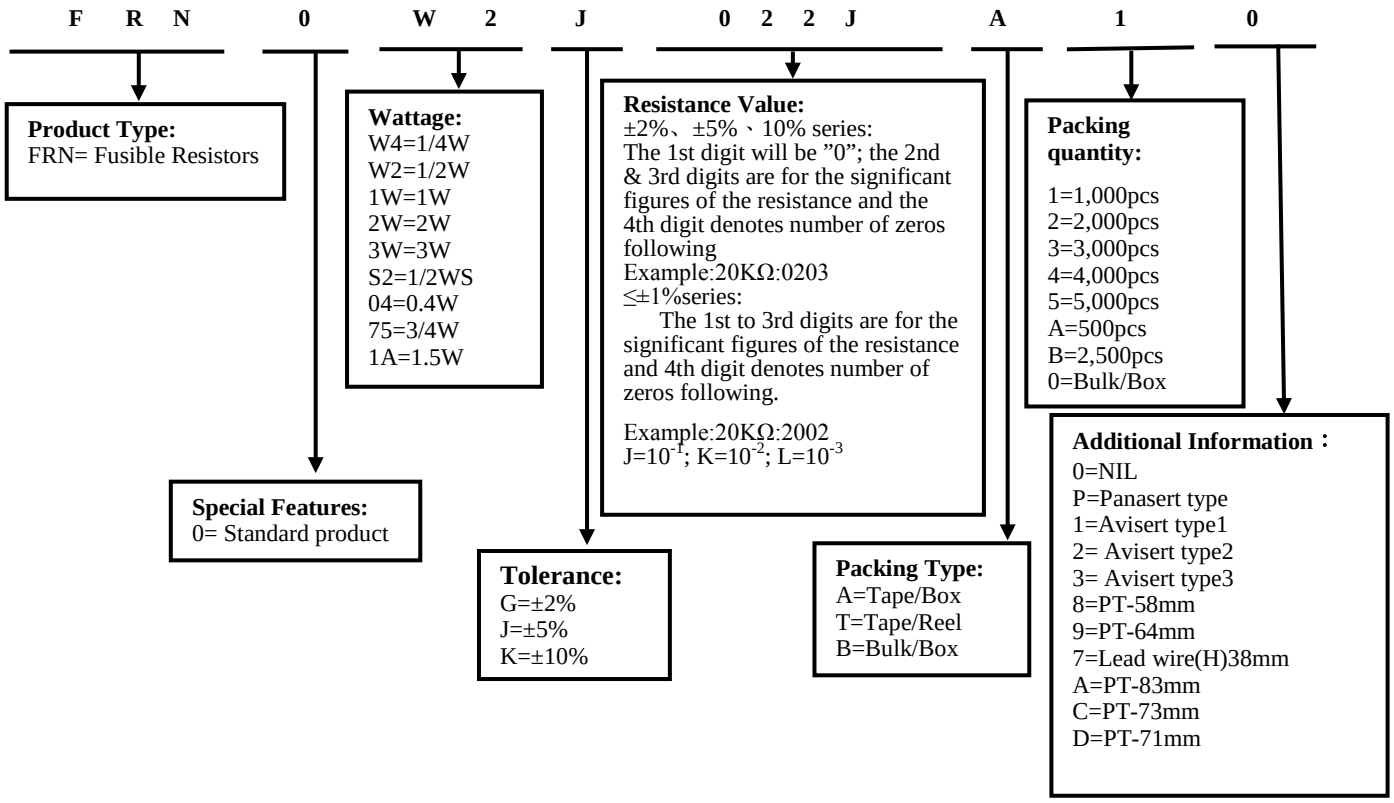
0=NIL P=Panasert type 1=Avisert type 1 2=Avisert type 2

3=Avisert type 3 8=PT-58mm 9=PT-64mm 7=Lead wire(H)38mm

A=PT-83mm C=PT-73mm D=PT-71mm

3. Ordering Procedure

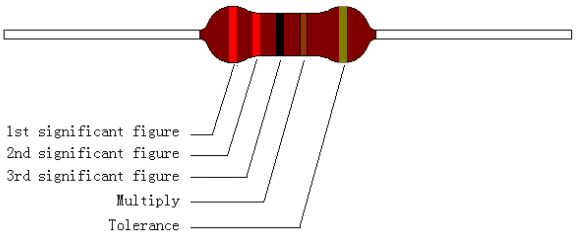
(Example: FRN 1/2W ±5% 2.2Ω T/B-1000)



4. Marking

Resistors shall be marked with color coding

Colors shall be in accordance with JIS C 0802



4.1 Label:

Label shall be marked with following items:

(1) Type and style

(2) Nominal resistance

(3) Resistance tolerance

(4) Quantity

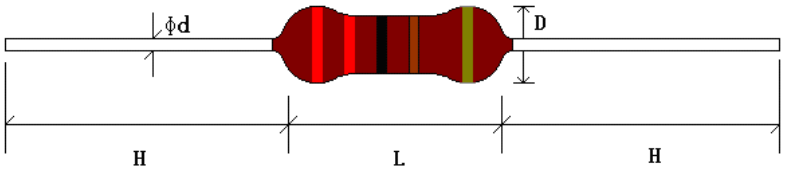
(5) Lot number

(6) PPM

Example:

FUSIBLE RESISTORS	
WATT: 1/2W	VAL: 2.2Ω
Q'TY: 2,000	TOL: 5%
LOT: 3021548	PPM:

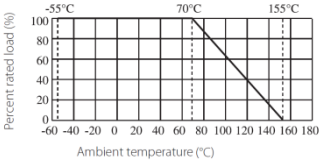
5. Ratings & Dimension



Type	Dimension(mm)					Dielectric Withstanding Voltage	Tolerance	Resistance Range
	D	L	d±0.05	H±3	PT			
FRN 1/4W	2.2±0.5	6.5±1.0	0.60	28	52	300V	±2%、±5%、±10%	0.22Ω~10KΩ
FRN 1/2WS	2.2±0.5	6.5±1.0	0.60	28	52	300V	±2%、±5%、±10%	0.22Ω~10KΩ
FRN 0.4W	2.2±0.5	6.5±1.0	0.60	28	52	300V	±2%、±5%、±10%	0.22Ω~10KΩ
FRN 1/2W	3.0±0.5	9.0±1.0	0.60	28	52	350V	±2%、±5%、±10%	0.22Ω~10KΩ
FRN 3/4W	3.5±0.6	9.5±1.0	0.54	28	52	350V	±2%、±5%、±10%	0.22Ω~10KΩ
FRN 1W	3.5±0.6	9.5±1.0	0.54	28	52	350V	±2%、±5%、±10%	0.22Ω~10KΩ
FRN 1.5W	4.5±0.6	11.5±1.0	0.70	25	52	600V	±2%、±5%、±10%	0.22Ω~10KΩ
FRN 2W	4.5±0.6	11.5±1.0	0.70	25	52	600V	±2%、±5%、±10%	0.22Ω~10KΩ
FRN 3W	5.0±0.6	15.5±1.0	0.80	28	64	600V	±2%、±5%、±10%	0.22Ω~10KΩ

6. Derating Curve

Power rating will change based on continuous load at ambient temperature from -55 to 155℃.
It is constant between -55 to 70℃, and derate to zero when temperature rise from 70 to 155℃.

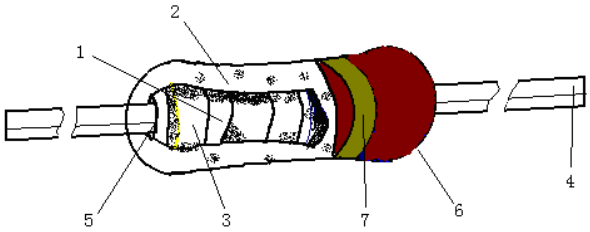


Voltage rating:
Resistors shall have a rated direct-current (DC) continuous working voltage or an approximate sine-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage at commercial-line frequency and waveform corresponding to the power rating, as determined from the following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

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

Remark: RCWV: Rating Continuous Working Voltage (Volt.) P: power rating (Watt) R: nominal resistance (Ω)
In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.
The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is lower.

7. Structure



No.	Name	Material
1	Basic body	Rod type ceramics
2	Resistor	Nickel plated
3	End cap	Steel (Tin plated iron surface)
4	Lead wire	Tin solder coated copper wire
5	Joint	By welding
6	Coating	Insulated resin Color: Normal Size :Rust ; Small Size : Pink
7	Color code	Epoxy resin

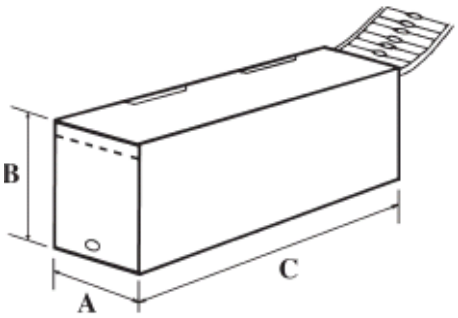
8. Performance Specification

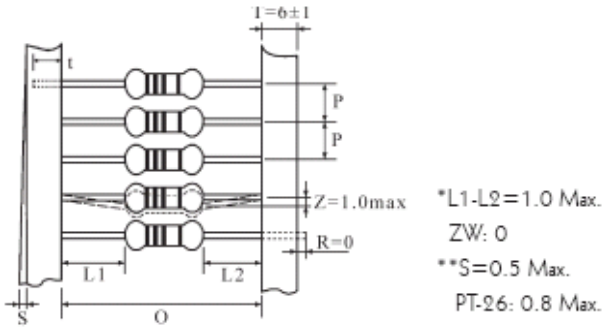
Characteristic	Limits	Test Methods (GB/T5729&JIS-C-5201&IEC60115-1)
Temperature Coefficient	±350PPM/℃	4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) R_1: Resistance Value at room temperature （t_1）; R_2: Resistance at test temperature （t_2） t_1: +25°C or specified room temperature t_2: Test temperature（-55℃or 125℃）
Short-time overload	ΔR/R ≤ ±(2%+0.05 Ω),with no evidence of mechanical damage	4.13 Permanent resistance change after the application of a potential of 2.5 times rcwv for 5 seconds.
Dielectric withstanding voltage	With no evidence of flashover, mechanical damage, arcing or insulation breakdown	4.7 Resistors shall be clamped in the trough of a 90°metallic v-block and shall be tested at ac potential respectively specified in the above list for 60-70 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	ΔR/R ≤ ±(1%+0.05 Ω) with no evidence of 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℃±3℃ Dwell time in solder: 2~3seconds.
Rapid change of temperature	ΔR/R ≤ ±(2%+0.05 Ω） with no evidence of mechanical damage	4.19 30 min at -55 °C and 30 min at 155°C; 100 cycles.
Load life in humidity	ΔR/R ≤ ±(5%+0.05 Ω） with no evidence of 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.
Load life	ΔR/R ≤ ±(5%+0.05 Ω） with no evidence of 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.
Flame retardant	Resistor insulation is self-extinguishing within 10 seconds after externally applied flame is removed	4.26 the burner is placed remote from resistor ignited and adjusted to produce a blue flame 38mm in height and a top of flame 127mm above the top of burner tube. Resistor is supported from its lead at 45 degree from the horizontal so that the lower end of resistor is the top of blue flame; the test flame is placed to remain for 15 seconds and removed for 15 seconds .the operation is to be repeated until resistor has been subjected to 5 application of test flame.

Fusing test	Excess 50 times than actual value.	Fusing times and the contrast: Resistance Range / Test Power / Fusing Time ≦ 2.2Ω / 32×Power Rating / 60 seconds ＞2.2Ω / 16×Power Rating / 60 seconds $V = \sqrt{R \times W \times Times}$ (Fusing Voltage)
Low Temperature Storage	ΔR/R ≤ ±(5%+0.05 Ω) with no evidence of mechanical damage	IEC 60068-2-1 (Aa) Lower limit temperature，for 2H.
High Temperature Exposure	ΔR/R ≤ ±(5%+0.05 Ω) with no evidence of mechanical damage	MIL-STD-202 108A Upper limit temperature ，for 16H.

9. Packing

9.1 Tapes in Box Packing

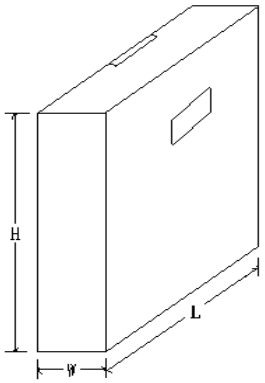


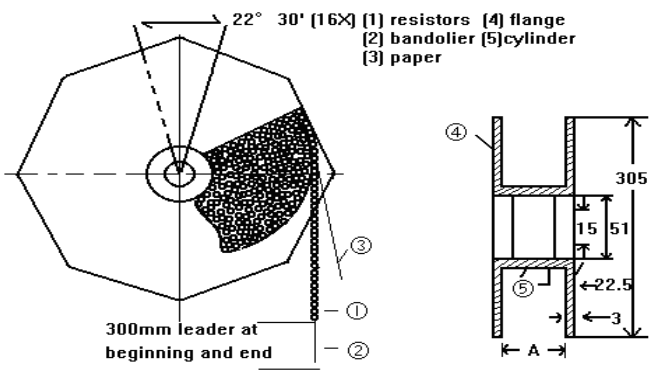


Dimension of T/B (mm)

Type	O	P	A±5	B±5	C±5	Qty./Box
FRN 1/4W	52±1	5±0.3	75	116	255	5,000 PCS
FRN 1/2WS	52±1	5±0.3	75	116	255	5,000 PCS
FRN 0.4W	52±1	5±0.3	75	116	255	5,000 PCS
FRN 1/2W	52±1	5±0.3	75	45	255	1,000 PCS
FRN 3/4W	52±1	5±0.3	80	70	255	1,000 PCS
FRN 1W	52±1	5±0.3	80	70	255	1,000 PCS
FRN 1.5W	52±1	5±0.3	86	82	255	1,000 PCS
FRN 2W	52±1	5±0.3	86	82	255	1,000 PCS
FRN 3W	64±5	10±0.5	90	119	255	1,000 PCS

9.2 Tapes in Reel Packing

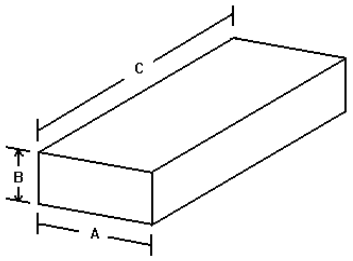




Dimension of Reel (mm)

Type	O	A	W±5	H±5	L±5	Qty./Box
FRN 1/4W	52±1	73±2	85	295	293	5,000 PCS
FRN 1/2WS	52±1	73±2	85	295	293	5,000 PCS
FRN 0.4W	52±1	73±2	85	295	293	5,000 PCS
FRN 1/2W	52±1	73±2	85	295	293	2,500 PCS
FRN 3/4W	52±1	73±2	85	295	293	2,500 PCS
FRN 1W	52±1	73±2	85	295	293	2,500 PCS
FRN 1.5W	52±1	73±2	85	295	293	2,500 PCS
FRN 2W	52±1	73±2	85	295	293	2,500 PCS
FRN 3W	64±5	80±5	95	295	293	1,000 PCS

9.3 Bulk in Box Packing



Dimension of Box (mm)

Part No.	A±5	B±5	C±5	Qty.of Bag/Box
FRN 1/4W	140	80	240	500/10,000pcs
FRN 1/2WS	140	80	240	500/10,000pcs
FRN 0.4W	140	80	240	500/10,000pcs
FRN 1/2W	140	80	240	250/5,000pcs
FRN 3/4W	140	80	240	250/5,000pcs
FRN 1W	140	80	240	250/5,000pcs
FRN 1.5W	140	80	240	100/2,500pcs
FRN 2W	140	80	240	100/2,500pcs
FRN 3W	140	80	240	100/1,500pcs

10. Note

10.1 UNI-ROYAL recommend the storage condition temperature: 15℃~35℃, humidity :25%~75%.
(Put condition for individual product)
Even under UNI-ROYAL recommended storage condition, solderability of products over 1 year old.
(Put condition for each product) may be degraded.

10.2 Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.
Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

10.3 Product performance and soldered connections may deteriorate if the products are stored in the following places:
a. Storage in high Electrostatic
b. Storage in direct sunshine、rain and snow or condensation
c. Where the products are exposed to sea winds or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, NO_2, Br etc.

11. Record

Version	Description	Page	Date	Amended by	Checked by
1	First version	1~8	Mar.20, 2018	Haiyan Chen	Nana Chen
2	Modify characteristic	5~6	Feb.19, 2019	Haiyan Chen	Yuhua Xu
3	Modify the temperature coefficient test conditions	4	Oct.28, 2022	Haiyan Chen	Yuhua Xu