

# DATA SHEET

**Product Name** Fusible Wire-Wound Fixed Resistors

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**Part Name** FWRA Series

**File No.** DIP-SP-067

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## 1. Scope

- 1.1 This datasheet is the characteristics of Fusible Wire-Wound Fixed Resistors manufactured by UNI-ROYAL.
- 1.2 FWRA According to UL1412 UL approved-No.E306074 (Until 3W)
- 1.3 Surge Voltage up to 10kV
- 1.4 Fuse function
- 1.5 Surge function base on IEC 61000-4-5
- 1.6 Excellent Flame Retardant
- 1.6 Compliant with RoHS directive.
- 1.7 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 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: FWRA= Fusible Wire-Wound Fixed Resistors.

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

Wattage	1	2	3	5
Normal Size	1W	2W	3W	5W
Small Size	1S	2S	3S	5WS

2.2.2 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: 1W=1W; 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.

J=±5%

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 8th 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.

2.4.1 The 12<sup>th</sup> digit is to denote the Packaging Type with the following codes:

A=Tape/Box B=Bulk/Box

2.4.2 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:

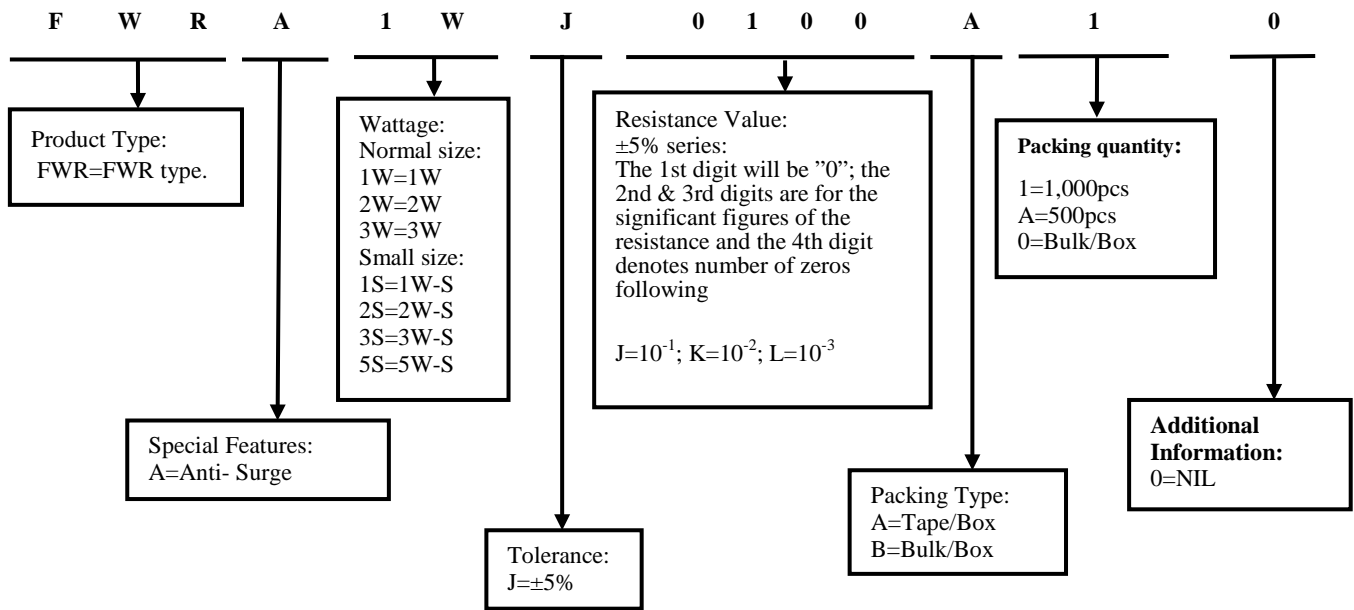
A=500pcs 1=1000pcs

2.4.3 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

3. Ordering Procedure

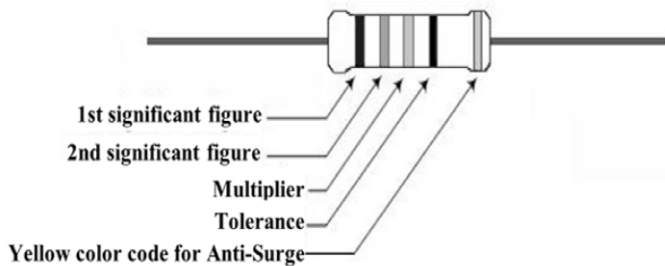
(Example: FWRA 1W ±5% 10Ω T/B-1000 )



4. Marking

4.1 Resistor :

Resistors shall be marked with color coding colors shall be in accordance with JIS C 0802



4.3 Label:

Label shall be marked with following items:

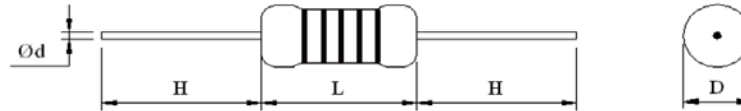
- (1) Type and style
- (2) Nominal resistance
- (3) Resistance tolerance
- (4) Quantity
- (5) Lot number
- (6) PPM

Example:

Fusible Wire-Wound Fixed Resistors with Anti-Surge	
WATT : 1W	VAL: 10Ω
Q'TY: 1,000	TOL: 5%
LOT: 7021528	PPM:

## 5. Ratings & Dimension

### 5.1 Dimension:



Type	Dimension(mm)				
	D±1	L±1	d±0.05	H±3	PT
FWRA 1W-S	3.5	9.5	0.54	28	52
FWRA 1W,2W-S	5.0	12.0	0.70	25	52
FWRA 2W,3W-S	5.5	16	0.70	28	64
FWRA 3W	6.5	17.5	0.75	28	64
FWRA 5W-S	7.2max	19.5max	0.80	38	83

### 5.2 Rating :

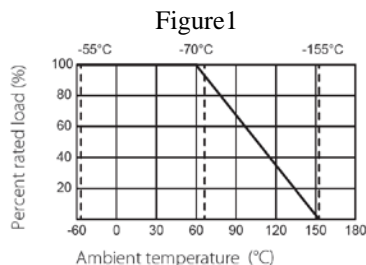
Type	Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance	Resistance Range
FWRA 1W-S	500V	1000V	350V	±5%	0.47Ω~470Ω
FWRA 1W,2W-S	500V	1000V	500V		
FWRA 2W,3W-S	500V	1000V	500V		
FWRA 3W	500V	1000V	500V	±5%	10Ω~1KΩ
FWRA 5W-S	500V	1000V	500V		

## 6. Surge Rating

Type	Low Resistance Range	Max. Surge Voltage	Medium Resistance Range	Max. Surge Voltage	High Resistance Range	Max. Surge Voltage
FWRA 1W-S	0.47Ω~40Ω	2kV	43Ω~240Ω	3kV	270Ω~470Ω	4kV
FWRA 1W,2W-S	0.47Ω~50Ω	3kV	51Ω~240Ω	4kV	270Ω~470Ω	5kV
FWRA 2W,3W-S	0.47Ω~100Ω	4kV	110Ω~240Ω	5kV	270Ω~470Ω	6kV
FWRA 3W	0.47Ω~100Ω	6kV	110Ω~470Ω	7kV	-	-
FWRA 5W-S	10Ω~50Ω	9kV	51Ω~1KΩ	10kV	-	-

## 7. 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:

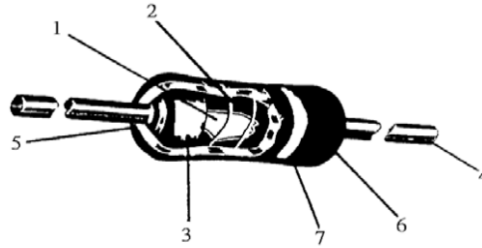
$$RCWV = \sqrt{P \times R}$$

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)

## 8. Structure



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

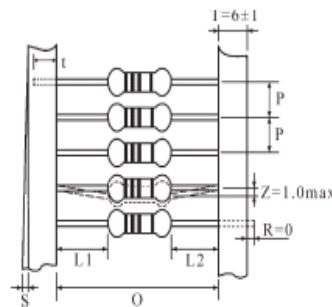
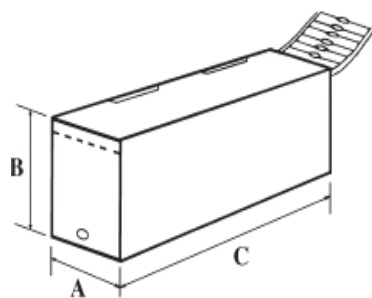
## 8. Performance Specification

Characteristic	Limits	Test Methods (GB/T5729&JIS-C-5201&IEC60115-1)
Temperature Coefficient	$< 20 \Omega : \pm 400 \text{ PPM}/^\circ\text{C Max.}$ $\geq 20 \Omega : \pm 300 \text{ PPM}/^\circ\text{C Max.}$	4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (PPM}/^\circ\text{C)}$ $R_1$ : 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 (+125°C)
Short-Time Overload	Resistance change rate must be in $\pm(2\%+0.05\Omega)\text{Max}$ , and no mechanical damage.	4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV or Max. Overload Voltage whichever less for 5seconds.
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 $\pm(1\%+0.05\Omega)$ , 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 $\pm(2\%+0.05\Omega)$ , and no mechanical damage.	4.19 30 min at $-55^\circ\text{C}$ and 30 min at $155^\circ\text{C}$ ; 100 cycles.				
Load life in humidity	Resistance change rate must be in $\pm(5\%+0.05\Omega)$ , and no mechanical damage.	4.24.2.1 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 $40\pm 2^\circ\text{C}$ and $93\% \pm 3\% \text{RH}$ .				
Load life	Resistance change rate must be in $\pm(5\%+0.05\Omega)$ , 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 $70\pm 2^\circ\text{C}$ ambient.				
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				
Fusing test (No guarantee that it will not burst, burn or smoke when the resistor fuse)	Resistance should be opened (The resistance value is over than 50 times from before test value) follow fusing curve condition	<table border="1"> <tr> <th>Fusing</th> <th>Fusing times</th> </tr> <tr> <td>32 times</td> <td>60 Sec</td> </tr> </table>	Fusing	Fusing times	32 times	60 Sec
Fusing	Fusing times					
32 times	60 Sec					
Surge immunity test (Resistor stand alone-Not sync to phase angle and polarity)	Resistance change rate is $\pm(5\% + 0.05\Omega)$ Max.	<p>Refer to IEC61000-4-5</p> <p>1.2<math>\mu\text{sec}</math> rising time and 50<math>\mu\text{sec}</math> discharge; 10 cycles every 1 minute</p>				

## 9. Packing

### 9.1 Tapes in Box Packing:

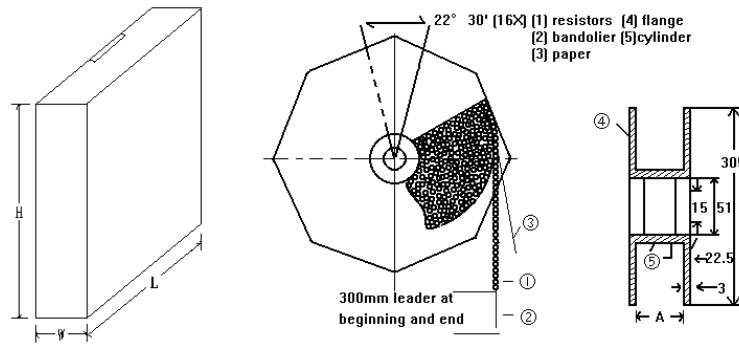


\*L1-L2=1.0 Max.  
ZW: 0  
\*\*S=0.5 Max.  
PT-26: 0.8 Max.

Dimension of T/B (mm)

Part No.	O	P	A $\pm 5$	B $\pm 5$	C $\pm 5$	Qty/Box
FWRA 1W-S	52 $\pm 1$	5 $\pm 0.3$	85	70	260	1,000pcs
FWRA 1W,2W-S	52 $\pm 1$	5 $\pm 0.3$	86	80	262	1,000pcs
FWRA 2W,3W-S	64 $\pm 5$	10 $\pm 0.5$	92	108	262	1,000pcs
FWRA 3W	64 $\pm 5$	10 $\pm 0.5$	92	108	256	500pcs
FWRA 5W-S	83 $\pm 5$	10 $\pm 0.5$	110	145	260	500pcs

9.2 Tapes in Reel Packing:



Dimension of Reel (mm)		
Part No.	A	Qty/Box
FWR 1W-S	73±2	2,500pcs
FWR 1W,2W-S	73±2	2,500pcs
FWR 2W,3W-S	81±5	1,000pcs
FWR 3W	81±5	500pcs

10. Note

- 10.1. 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.
- 10.2. Cartons must be placed in correct direction which indicated on carton, otherwise the reel or wire will be deformed.
- 10.3. 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<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, NO<sub>2</sub>, Br etc.

11. Record

Version	Description	Page	Date	Amended by	Checked by
1	First version	1~7	Jul.22, 2023	Haiyan Chen	Yuhua Xu
2	Add the 5WS	1~7	May.25, 2024	Haiyan Chen	Yuhua Xu

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