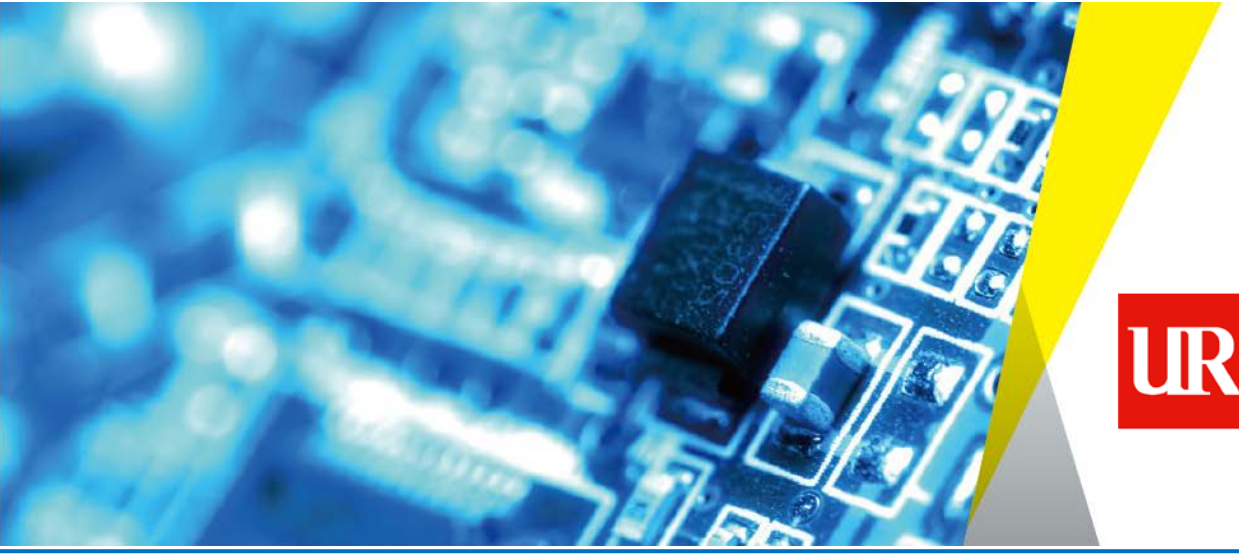

DATA SHEET

Product Name	**High Voltage Flat Resistors**
Part Name	**HFR Series**
File No.	**DIP-SP-024**

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

1. Scope

1.1 This datasheet is the characteristics of High Voltage Flat Resistors manufactured by UNI-ROYAL.

1.2 Small size，Light weight

1.3 High stability Reliability

1.4 Max working voltage 10KV

1.5 Used in Microwave Ovens，induction Cooker，High Voltage Power supply, Laser Light control

2. Part No. System

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

2.1 These 3 digits are to indicate the product type.

Example:

HFR0=High Voltage Flat Resistor

2.2 4^{th}~6^{th} digits:

2.2.1 This is to indicate the wattage or power rating. the 4^{th} digit to the 6^{th} digit is to denote the significant figures of the wattage.

Example:

050=0.5W 075=0.75W 100=1.0W

2.3 The 7^{th} digit is to denote the Resistance Tolerance. The following letter code is to be used for indicating the standard Resistance Tolerance.

G=±2% J=±5% K=±10%

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

2.4.1 The following number s and the letter codes are to be used to indicate the number of zeros in the 11^{th} digit:

$0=10^0$ $1=10^1$ $2=10^2$ $3=10^3$

$4=10^4$ $5=10^5$ $J=10^{-1}$

2.5 The 12^{th}, 13^{th} & 14^{th} digits.

2.5.1 The 12^{th} digit is to denote the Packaging Type with the following codes:

B=Bulk/Box

2.5.2 The 13^{th} digit is normally to indicate the Packing Quantity, This digit should be filled with “0”for the Cement products with “Bulk/Box” packing requirements.

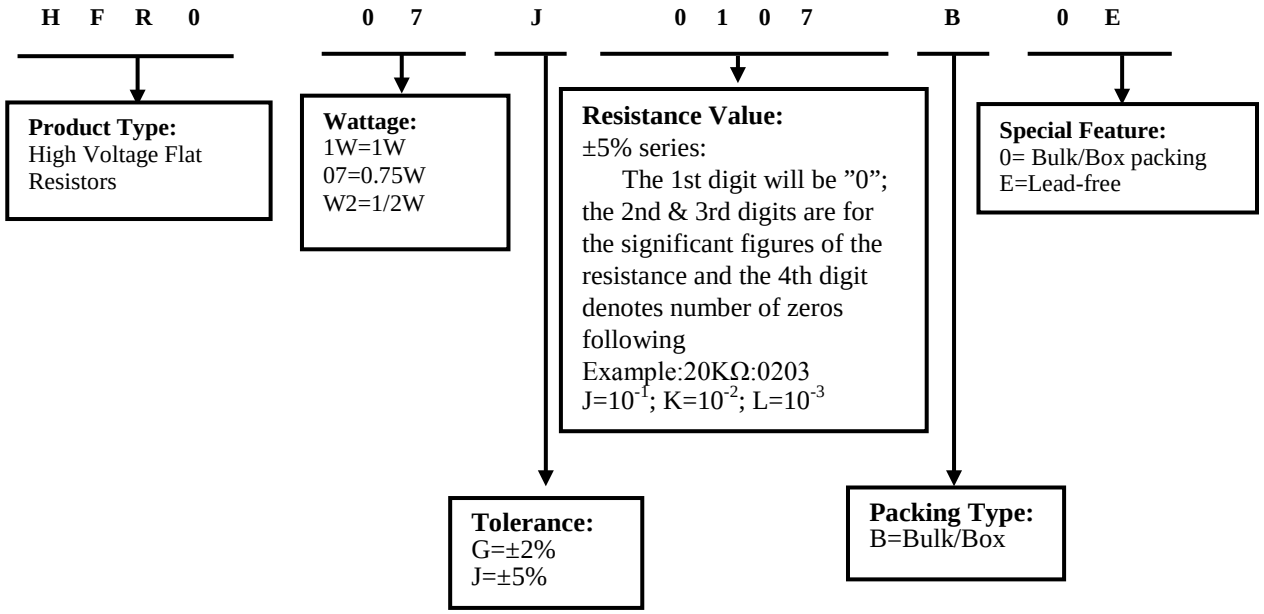
2.5.3 For Network, the 14^{th} digit alone can use to denote special features of additional information with the following codes or standard product

Example:

E=For “Environmental Protection, Lead Free type” of Network Resistors.

3. Ordering Procedure

(Example: HFR 0.75W ±5% 100MΩ B/B))



4. Ratings & Dimension

Type	Max Working Voltage	Dielectric Withstanding Voltage	Resistance Range	Tolerance	Operating temperature
HFR 0.5W	5KV	500V	1MΩ~1GΩ	±5% ±10% ±20%	-55℃~155℃
HFR 0.75W	10KV	500V	1MΩ~1GΩ		
HFR 1W	10KV	500V	1MΩ~1GΩ		

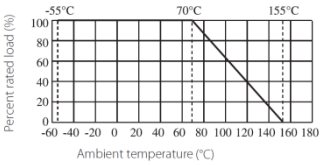
5. Derating Curve

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:



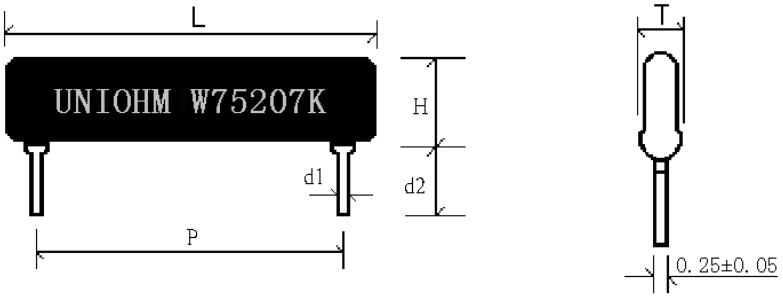
$$RCWV = \sqrt{P \times R}$$

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.

6. Structure



Unit: mm

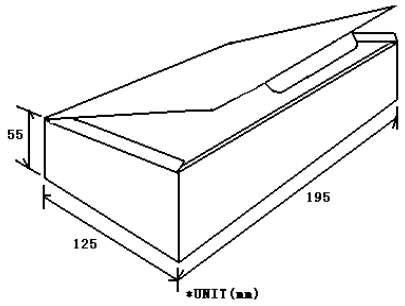
Type	P±0.5	L(MAX)	d1±0.1	d2 +0.5 -0.2	H (MAX)	T (MAX)
HFR 0.5W	17.8	20.4	0.5	3.5	5.08	2.5
HFR 0.75W	22.9	25.4	0.5	3.5	5.08	2.5
HFR 1W	27.9	30.5	0.5	3.5	5.08	2.5

7. 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°C or specified room temperature t_2: Test temperature（-55℃or 125℃）

Terminal strength	ΔR/R±(1%+0.1Ω)	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.
Resistance to soldering heat	ΔR/R±(1%+0.1Ω)	4.18 Dip the resistor into a solder bath having a temperatuer of 260℃±5℃ and hold it for 10±1seconds.
Solderability	Min.95% coverage	Wave Solder: Test temperature of solder: 245℃±3℃, Dipping time in solder: 2-3seconds
Rapid change of temperature	ΔR/R±(1%+0.1Ω)	4.19 30 min at -55 °C and 30 min at 155°C; 100 cycles.
Humidity (Steady State)	ΔR/R±(1.0%+0.1Ω)	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	ΔR/R±(3%+0.1Ω)	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±(3%+0.1Ω)	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.
Insulation Resistance	≥10,000MΩ	4.6 Apply 100V DC between protective coating and termination for 1 Min then measure
Low Temperature Storage	ΔR/R±(3%+0.1Ω)	IEC 60068-2-1 (Aa) Lower limit temperature，for 2H.
High Temperature Exposure	ΔR/R±(3%+0.1Ω)	MIL-STD-202 108A Upper limit temperature ，for 16H.

8. Packing



TYPE	Quantity Per Bag (pcs)	Quantity Per Box (pcs)	Quantity Per Carton (pcs)
HFR 0.5W	200	2,000	30,000
HFR 0.75W	150	1,500	22,500
HFR 1W	100	1,000	15,000

9. Note

9.1. 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.

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

9.3. 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.

10. Record

Version	Description	Page	Date	Amended by	Checked by
1	First version	1~5	Mar.20, 2018	Haiyan Chen	Nana Chen
2	Modify characteristic	4	Feb.20, 2019	Haiyan Chen	Yuhua Xu
3	Modify the temperature coefficient test conditions	4	Nov.07, 2022	Haiyan Chen	Yuhua Xu