

DATA SHEET

Product Name Anti- Electro Static Discharge Thick Film Chip Resistors

Part Name ES Series

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Aeon Technology Corporation
Uniroyal Electronics Global Co.,Ltd Xiamen Branch
Kunshan Foss Electronic material Co., Ltd.

Brands *RoyalOhm* *UniOhm*



1. Scope

- 1.1 This specification for approve relates to the Anti- Electro Static Discharge Thick Film Chip Resistors manufactured by UNI-ROYAL.
- 1.2 High voltage
- 1.3 Suitable for reflow & wave soldering
- 1.4 Application Medical Devices, Industrial Controls, AV adapter, Flash lamp of camera Automotive Industry, Outdoor Equipments.

2. Part No. System

Part No. includes 14 codes shown as below:

2.1 1st~4th codes: Part name. E.g.: ES01、ES02、ES03、ES05、ES06、ES07

2.2 5th~6th codes: Power rating.

E.g.: W=Normal Size "1~G" = "1~16"

Wattage	1/32	3/4	1/2	1/3	1/4	1/8	1/10	1/16	1/20	1
Normal Size	WH	07	W2	W3	W4	W8	WA	WG	WM	1W

If power rating is lower or equal than 1 watt, 5th code would be "W" and 6th code would be a number or letter.

E.g.: WA=1/10W W4=1/4W

2.3 7th code: Tolerance. E.g.: D=±0.5% F=±1% G=±2% J=±5% K= ±10%

2.4 8th~11th codes: Resistance Value.

2.4.1 If value belongs to standard value of ≥5% series, 8th code would be zero, 9th~10th codes are significant figures of the resistance and 11th code is the power of ten.

2.4.2 If value belongs to standard value of ≤2% series, 8th~10th codes are significant figures of the resistance, and 11th code is the power of ten.

2.4.3 11th codes listed as following:

0=10⁰ 1=10¹ 2=10² 3=10³ 4=10⁴ 5=10⁵ 6=10⁶ J=10⁻¹ K=10⁻² L=10⁻³ M=10⁻⁴

2.5 12th~14th codes.

2.5.1 12th code: Packaging Type. E.g.: C=Bulk T=Tape/Reel

2.5.2 13th code: Standard Packing Quantity.

4=4000pcs 5=5000pcs C=10000pcs D=20000pcs E=15000pcs

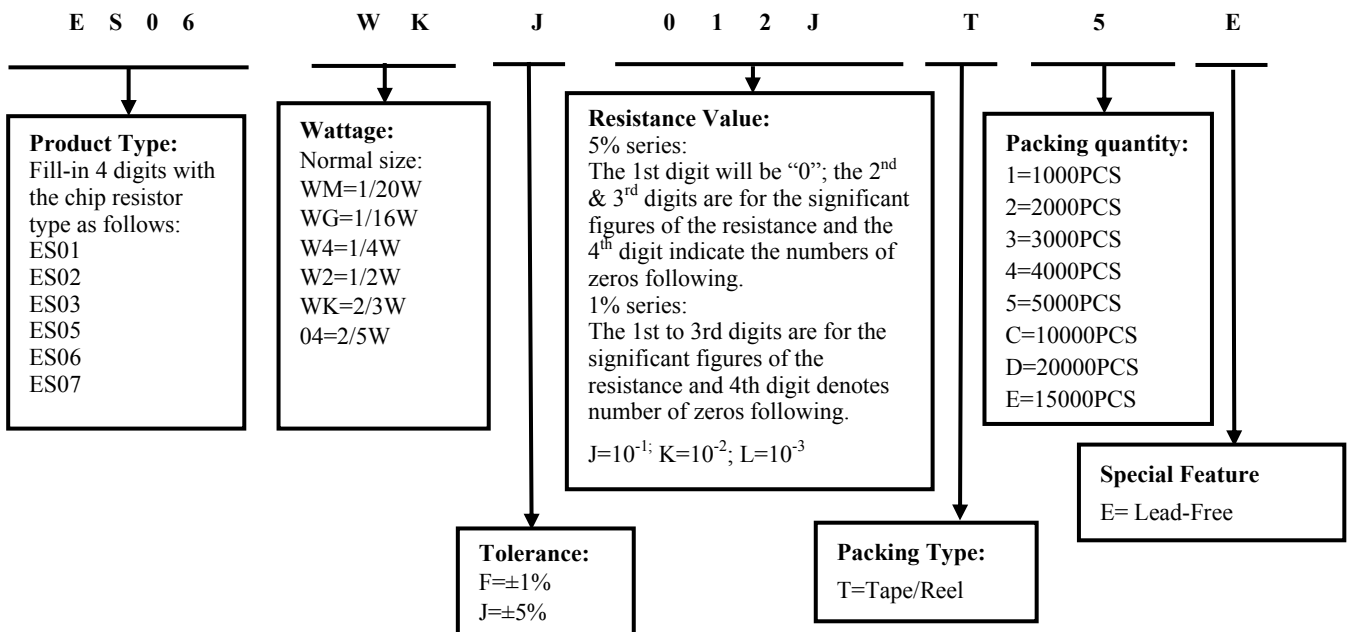
Chip Product: BD=B/B-20000pcs TC=T/R-10000pcs

2.5.3 14th code: Special features.

E = Environmental Protection, Lead Free, or Standard type.

3. Ordering Procedure

(Example: ES06 2/3W ±5% 1.2Ω T/R-5000)



4. Marking

(1) For ES01 and ES02 size. Due to the very ES01、ES02 small size of the resistor’s body, there is no marking on the body.



(2) ±5%Tolerance:The first two digits are significant figures of resistance and the third denotes number of zeros following



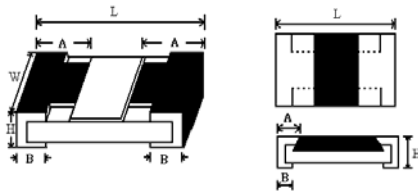
333 → 33KΩ

(3) ±1% Tolerance: 4 digits, first three digits are significant; fourth digit is number of zeros. Letter r is decimal point.



2701 → 2.7KΩ

5. Dimension

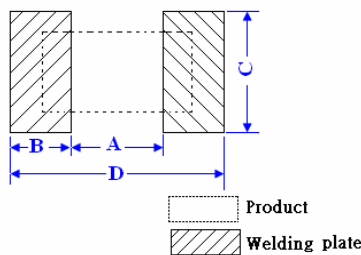


Type	Dimension(mm)				
	L	W	H	A	B
ES01(0201)	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
ES02(0402)	1.00±0.10	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
ES03(0603)	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
ES05(0805)	2.00±0.15	1.25+0.15/-0.10	0.55±0.10	0.40±0.20	0.40±0.20
ES06(1206)	3.10±0.15	1.55+0.15/-0.10	0.55±0.10	0.45±0.20	0.45±0.20
ES07(1210)	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20

6. Resistance Range

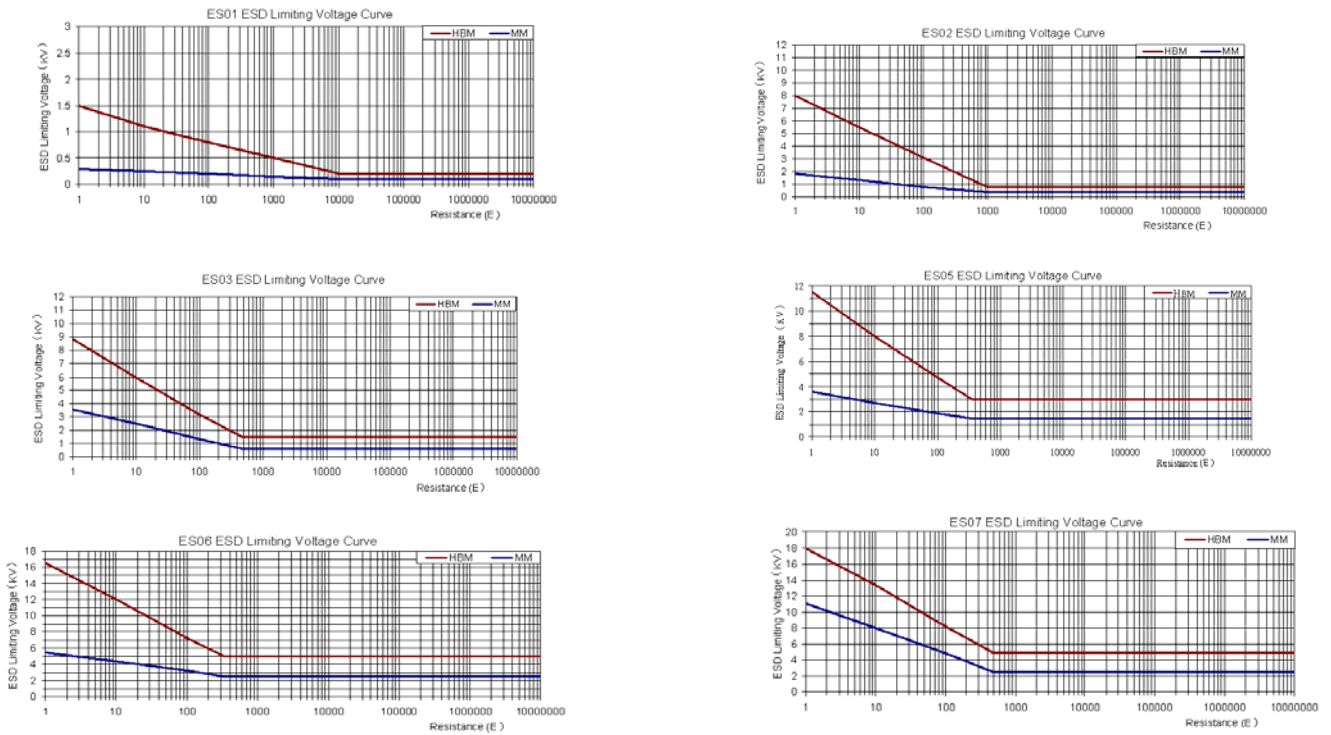
Type	Power Rating at 70°C	Max. Working Voltage	Max. Overload Voltage	Dielectric withstanding Voltage	Resistance Range 1%&5%	Operating Temperature
ES01	1/20W	25V	50V	--	1Ω~10MΩ	-55 ~ +155°C
ES02	1/16W	50V	100V	100V		
ES03	1/4W	150V	200V	300V		
ES05	2/5W	200V	400V	500V		
ES06	2/3W	500V	1000V	500V		
ES07	1/2W	800V	1500V	500V		

7. Recommend the size of welding plate



Type	Dimension(mm)			
	A	B	C	D
ES01	0.3±0.05	0.35±0.05	0.4±0.05	1.0±0.05
ES02	0.5±0.05	0.5±0.05	0.6±0.05	1.5±0.05
ES03	0.8±0.05	0.8±0.05	0.9±0.05	2.4±0.05
ES05	1.0±0.1	1±0.1	1.4±0.1	3±0.1
ES06	2.0±0.1	1.1±0.1	1.8±0.1	4.2±0.1
ES07	2.0±0.1	1.1±0.1	2.9±0.1	4.2±0.1

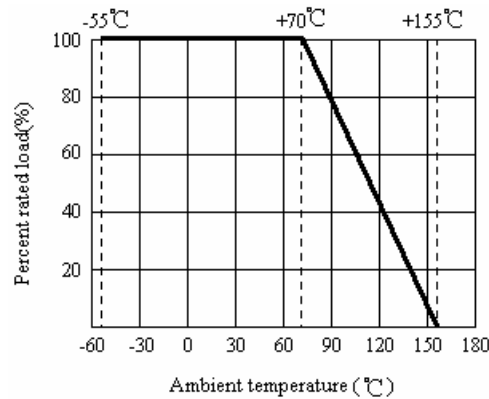
8. ESD Limiting Voltage Curve



9. 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 derated as shown in figure 1

Figure 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:

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

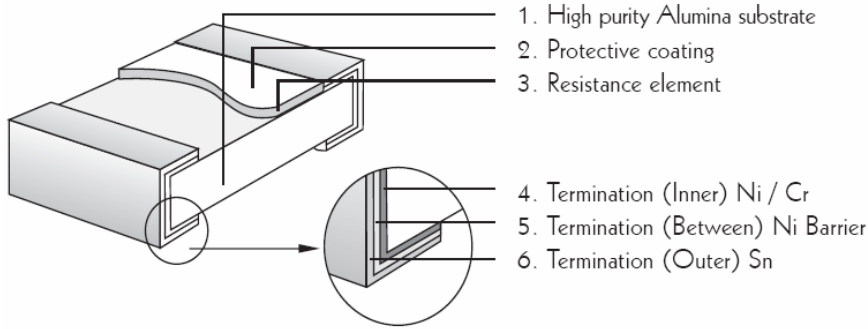
Where: RCWV commercial-line frequency and waveform (Volt.)

P = power rating (WATT.) R = nominal resistance (OHM)

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 less

10. Structure



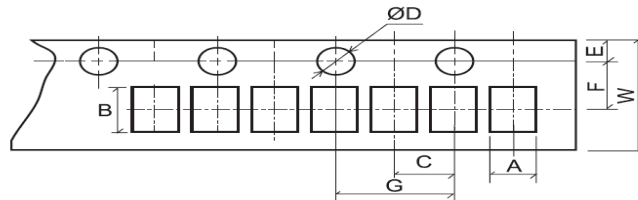
11. Performance Specification

Characteristic	Limits		Test Method (GB/T5729&JIS-C-5201&IEC60115)
Temperature Coefficient	ES01: 1Ω≤R≤10Ω: ±400PPM/°C 10Ω<R≤10MΩ: ±200PPM/°C		4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6 \text{ (PPM/°C)}$ $\frac{R_3-R_1}{R_1(t_3-t_1)} \times 10^6 \text{ (PPM/°C)}$ R ₁ : Resistance Value at room temperature (t ₁) ; R ₂ : Resistance Value at upper limit temperature ± 2°C (t ₂) R ₃ : Resistance Value at lower limit temperature ± 3°C (t ₃) Test pattern : Room temperature : (t ₁) Upper limit temperature : (t ₂) Lower limit temperature : (t ₃)
	ES02、ES03、ES05、ES06、ES07: 1Ω≤R≤10Ω: ±200PPM/°C 10Ω<R≤10MΩ: ±100PPM/°C		
Short-time overload	±5%	±(2.0%+0.1Ω) Max	4.13 Permanent resistance change after the application of 2.5 times RCWV for 5 seconds.
	±1%	±(1.0%+0.1Ω) Max	
Terminal bending	±(1.0%+0.05Ω) Max		4.33 Twist of test board: Y/X = 3/90 mm for 60 Seconds
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation breaks done.		4.7 Clamped in the trough of a 90° metallic v-block and shall be tested at ac potential respectively specified in the type for 60-70 seconds
Soldering heat	±(1.0%+0.05Ω) Max		4.18 Dipping the resistor into a solder bath having a temperature of 260°C±5°C and hold it for 10±1 seconds
Solderability	95% coverage Min.		Wave solder: Test temperature of solder: 245°C±3°C dipping time in solder: 2-3 seconds.
			Reflow:
Rapid change of temperature	±5%	±(3.0%+0.1Ω) Max.	4.19 30 min at lower limit temperature and 30 min at upper limit temperature , 5 cycles.
	±1%	±(1.0%+0.1Ω) Max.	
Humidity (Steady State)	±5%	±(3.0%+0.1Ω) Max.	4.24 Temporary resistance change after 240 hours exposure in a humidity test chamber controlled at 40±2°C and 90-95% relative

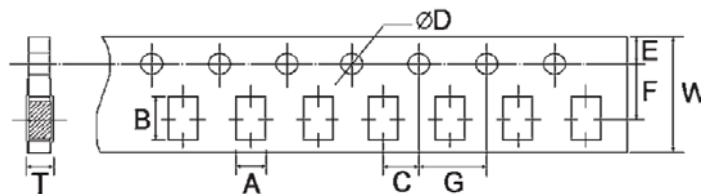
	±1%	±(0.5%+0.1Ω) Max.	humidity,
Load life	±5%	±(3.0%+0.1Ω) Max.	4.25.1 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle 1.5 hours "ON", 0.5 hour "OFF" at 70°C±2 °C ambient.
	±1%	±(1.0%+0.1Ω) Max.	
ESD	±(1.0%+0.05Ω) Max		HBM:100PF 1K5 1Cycle MM: 200PF 0E 1Cycle Note: ESD Voltag Refer to 4.0
Low Temperature Storage	±5%	±(3.0%+0.1Ω) Max.	4.23.4 - 55 °C for 2hrs
	±1%	±(1.0%+0.1Ω) Max.	
High Temperature Exposure	±5%	±(3.0%+0.1Ω) Max.	4.23.2 155°C for 16hrs
	±1%	±(1.0%+0.1Ω) Max.	
Leaching	No visible damage		J-STD-002 test D Lead free solder ,260°C, 30 seconds immersion time

12. Packing of Surface Mount Resistors

12.1 Dimension of Paper Taping :(Unit: mm)

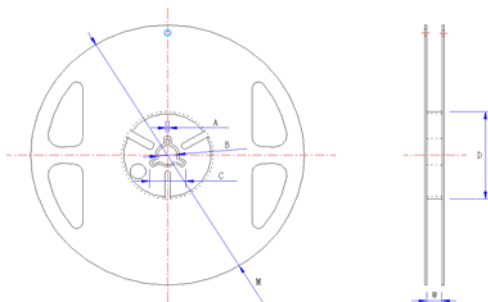


Type	A	B	C ±0.05	ΦD +0.1 -0	E ±0.1	F ±0.05	G ±0.1	W ±0.2	T
ES01	0.40±0.05	0.70±0.05	2.00	1.50	1.75	3.50	4.00	8.00	0.42±0.1
ES02	0.65±0.10	1.20±0.10	2.00	1.50	1.75	3.50	4.00	8.00	0.42±0.05



Type	A ±0.2	B ±0.2	C ±0.05	ΦD +0.1 -0	E ±0.1	F ±0.05	G ±0.1	W ±0.2	T ±0.1
ES03	1.10	1.90	2.00	1.50	1.75	3.50	4.00	8.00	0.67
ES05	1.65	2.40	2.00	1.50	1.75	3.50	4.00	8.00	0.81
ES06	2.00	3.60	2.00	1.50	1.75	3.50	4.00	8.00	0.81
ES07	2.80	3.50	2.00	1.50	1.75	3.50	4.00	8.00	0.75

12.2 Dimension of Reel : (Unit: mm)



Type	Taping	Qty/Reel	A ±0.5	B ±0.5	C ±0.5	D ±1	M ±2	W ±1
ES01	Paper	15,000pcs	2.0	13.0	21.0	60.0	178.0	10.0
ES02	Paper	10,000pcs	2.0	13.0	21.0	60.0	178.0	10.0
ES03	Paper	5,000pcs	2.0	13.0	21.0	60.0	178.0	10.0
ES05	Paper	5,000pcs	2.0	13.0	21.0	60.0	178.0	10.0
ES06	Paper	5,000pcs	2.0	13.0	21.0	60.0	178.0	10.0
ES07	Paper	5,000pcs	2.0	13.0	21.0	60.0	178.0	10.0

13. Note

- 13.1. UNI-ROYAL recommend the storage condition temperature: 15°C~35°C, 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.
- 13.2. 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.
- 13.3. 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 Cl₂, H₂S₃ NH₃, SO₂, NO₂.

14. Record

Version	Description of amendment	Page	Date	Amended by	Checked by
1	First issue of this specification	1~7	Mar.20, 2018	Chen Haiyan	Chen Nana
2	Modify ES01 packing quantity	7	Jun.06, 2018	Chen Haiyan	Chen Nana

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