

# DATA SHEET

**Product Name** Anti-Sulfurized Thick Film Chip Resistors Array-Convex Terminal

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**Part Name** 2S02/4S02/4S03 Series

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Kunshan Foss Electronic material Co., Ltd.

Brands *RoyalOhm* *UniOhm*



### 1. Scope

- 1.1 This specification for approve relates to the Anti-Sulfurized Thick Film Chip Resistors Array-Convex Terminal manufactured by UNI-ROYAL.
- 1.2 Anti-Sulfidation
- 1.3 Suitable for reflow & wave soldering
- 1.4 Application car, power

### 2. Part No. System

Part No. includes 14 codes shown as below:

- 2.1 1<sup>st</sup>~4<sup>th</sup> codes: Part name. E.g.: 2S02, 4S02, 4S03.
- 2.2 5<sup>th</sup>~6<sup>th</sup> 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, 5<sup>th</sup> code would be "W" and 6<sup>th</sup> code would be a number or letter.

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

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

2.4 8<sup>th</sup>~11<sup>th</sup> codes: Resistance Value.

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

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

2.4.3 11<sup>th</sup> codes listed as following:

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>

2.5 12<sup>th</sup>~14<sup>th</sup> codes.

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

2.5.2 13<sup>th</sup> code: Standard Packing Quantity.

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

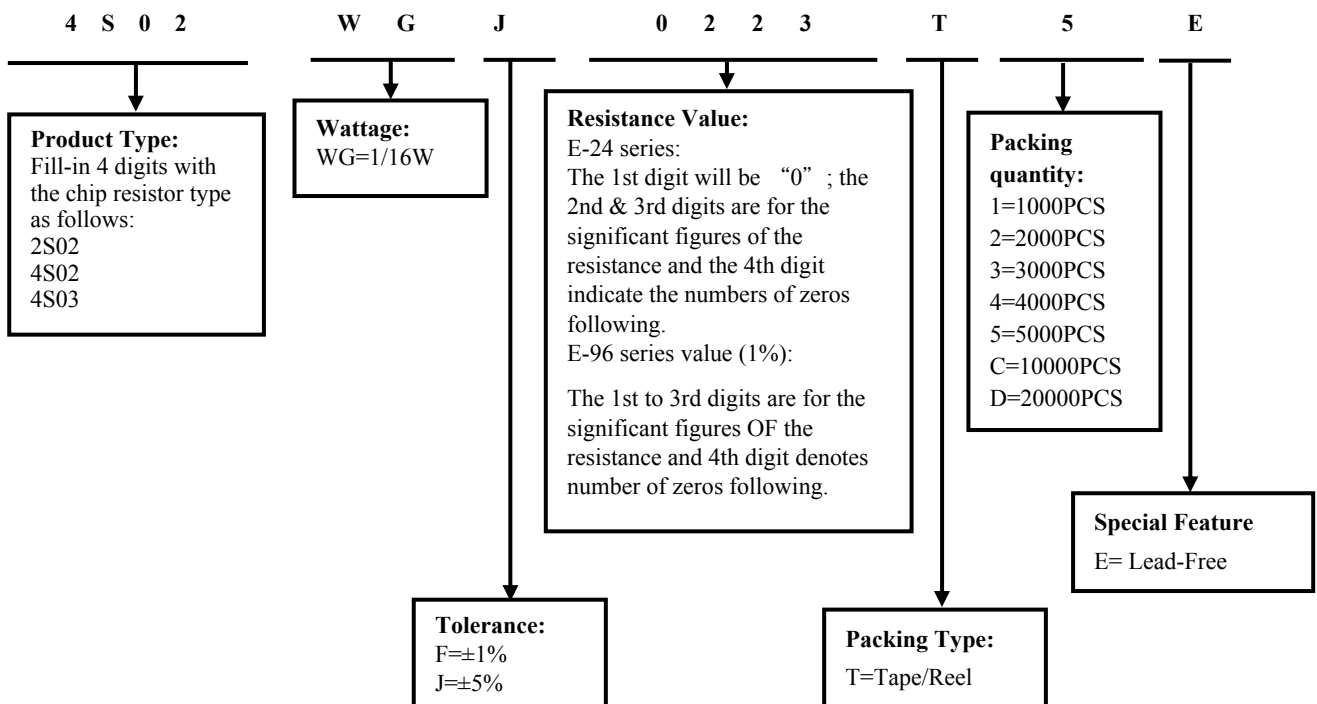
Chip Product: BD=B/B-20000pcs              TC=T/R-10000pcs

2.5.3 14<sup>th</sup> code: Special features.

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

### 3. Ordering Procedure

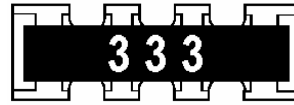
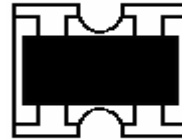
(Example: 4S02 1/16W ±5% 22KΩ T/R-5000)



**4. Marking**

(1) Normal for 2S02 sizes, no marking on the body. 0Ω resistors is no marking too

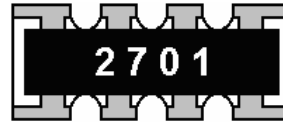
(2) ±5% Tolerance of 4S02、4S03 size: the first two digits are significant figures of resistance and the third denotes number of zeros following .



333 → 33KΩ

(3) ±1% Tolerance of 4S02、4S03 size: first three digits are significant figures of resistance and the fourth denotes number of zeros following

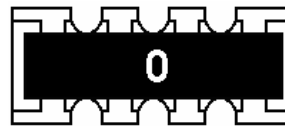
Example: 4S02、4S03



2701 → 2.7KΩ

(4) 0Ω: Normal of 4S02、4S03 size, the marking as following:

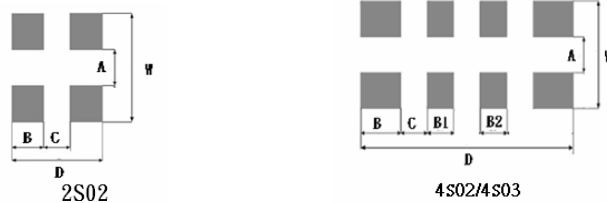
Example: 4S02、4S03


**5. Ratings & Dimension**

Type	2S02	4S02	4S03
Size	0402 × 2	0402 × 4	0603 × 4
Dimension (mm)			
Equivalent Circuit Diagram			

Type	2S02	4S02	4S03
Power Rating at 70°C	1/16W	1/16W	1/16W
Resistance Value of jumper	< 50mΩ	< 50mΩ	< 50mΩ
Jumper Rated Current	1A	1A	1A
Max Working Voltage	50V	50V	50V
Max Overload Voltage	100V	100V	100V
Dielectric Withstanding Voltage	100V	100V	300V
±1%	10Ω-1MΩ	10Ω-1MΩ	1Ω-1MΩ
±5%	10Ω-1MΩ	10Ω-1MΩ	1Ω-1MΩ
Operating Temperature	-55 ~ +155°C		

**6. Recommend the size of welding plate**

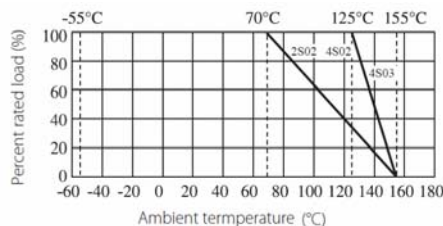


Type	Dimension(mm)						
	A	B	B1	B2	W	C	D
2S02	0.5±0.1	0.33±0.1	/	/	2.0±0.1	0.34±0.1	1.0±0.1
4S02	0.5±0.1	0.3±0.1	0.28±0.1	0.28±0.1	2.0±0.1	0.22±0.1	1.82±0.1
4S03	1.0±0.1	0.4±0.1	0.4±0.1	0.4±0.1	2.6±0.1	0.4±0.1	2.8±0.1

**7. Derating Curve**

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55°C to 125°C. For temperature in excess of 125°C, the load shall be derate as shown in figure 1

Figure 1



**7.1 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.)

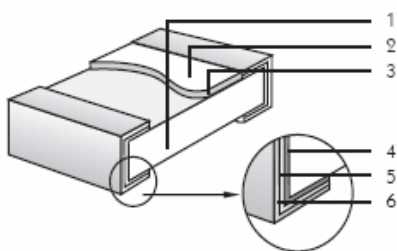
P = power rating (WATT.)

R = nominal resistance (OHM)

The overload voltage is 2.5 times RCWV or Max. Overload voltage whichever is less.

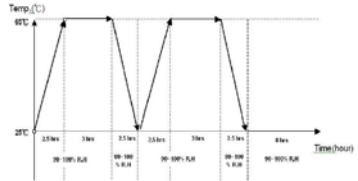
In no case shall the rated DC or RMS AC continuous working voltage be greater than the applicable maximum value.

**8. Structure**



- 1: High purity alumina substrate  
 (96%AL<sub>2</sub>O<sub>3</sub>、0.3±0.1%CaO、1.0±0.3%MgO、2.1±0.05%SiO<sub>2</sub>)
- 2: Protective covering
- 3: Resistive covering ( Ag for 0Ω )
- 4: Termination ( inner ) Ag/Pd
- 5: Termination ( between ) Ni plating
- 6: Termination ( outer ) Sn plating

## 9. Performance Specification

Characteristic	Limits	Ref. Standards	Test Method
Operational life	$\pm(3\% \pm 0.1\Omega)$ Max.	MIL-STD-202	125°C, at 36% of operating power, 1000H(1.5 hours "ON", 0.5 hour "OFF").
	<100mΩ		Apply to rate current for 0 Ω
Electrical Characterization	2S02、4S02	User Spec	Parametrically test per lot and sample size requirements, summary to show Min, Max, Mean and Standard deviation at room as well as Min and Max operating temperatures.
	4S03		
Short-time overload	$\pm(2\% \pm 0.1\Omega)$ Max.	JIS-C-5201 & JIS-C-5202	4.13 Permanent resistance change after the application of a potential of 2.5 times RCWV or Max. Overload Voltage whichever less for 5 seconds..
	<50mΩ		Apply max Overload current for 0Ω
External Visual	No Mechanical Pamage	MIL-STD-883 Method 2009	Electrical test not required. Inspect device construction, marking and workmanship
Physical Dimension	Reference 5. Dimension Standards	JESD22 MH Method JB-100	Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers spec. Electrical test not required.
Resistance to Solvent	Marking Unsmearred	MIL-STD-202 Method 215	Note: Add Aqueous wash chemical – OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	Not broken	JIS-C-6429	Force of 1.8kg for 60 seconds.
High Temperature Exposure (Storage)	$\pm(1\% \pm 0.1\Omega)$ max	MIL-STD-202 Method 108	1000hrs. @T=155°C. Unpowered. Measurement at 24±2 hours after test conclusion.
	<50mΩ		Apply to rate current for 0 Ω
Temperature Cycling	$\pm(1\% \pm 0.05\Omega)$ Max.	JESD22 Method JA-104	1000 Cycles (-55°C to +155°C). Measurement at 24±2 hours after test conclusion.
	<50mΩ		Apply to rate current for 0 Ω
Moisture Resistance	$\pm(3\% \pm 0.1\Omega)$ Max.	MIL-STD-202 Method 106	
	<50mΩ		
Biased Humidity	$\pm(3\% \pm 0.1\Omega)$ Max.	MIL-STD-202 Method 103	1000 hours 85°C, 85%RH. Note: Specified conditions: 10% of operating power. Measurement at 24±2 hours after test conclusion.
	<100mΩ		Apply to rate current for 0 Ω
Mechanical Shock	$\pm(1\% \pm 0.05\Omega)$ max	MIL-STD-202 Method 213	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(1\% \pm 0.1\Omega)$ max	MIL-STD-202 Method 204	5g's for 20 min., 12cycle each of 3 orientations. Note: Use 8"×5"PCB. 031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2' from any secure point. Test from 10-2000Hz.
Thermal Shock	$\pm(1\% \pm 0.1\Omega)$ max	MIL-STD-202 Method 107	-55°C/+155°C, Note: Number of cycles required -300, Maximum transfer time -20 seconds, Dwell time -15 minutes. Air-Air.
	<100mΩ		Apply to rate current for 0 Ω

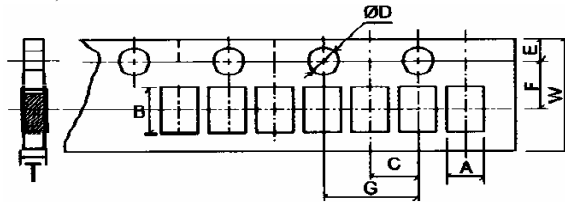
ESD	$\pm(1.0\%+0.1\Omega)\max$	AEC-Q200-002	With the electrometer in direct contact with the discharge tip, verify the voltage setting at levels of $\pm 500V, \pm 1KV, \pm 2KV, \pm 4KV, \pm 8KV$ , The electrometer reading shall be within $\pm 10\%$ for voltages from 500V to $\cong 800V$ .
Solderability	95% coverage Min.	J-STD-002	For both leaded & SMD. Electrical test not required. Magnification 50X. Conditions: a) Method B 4hrs at 155°C dry heat, the dip in bath with 245°C, 5s. b) Method B: at 215°C, 5s. c) Method D: at 260°C, 60s.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	UL-94	V-0 or V-1 are acceptable. Electrical test not required.
Board Flex	$\pm(1\% \pm 0.05\Omega)\max$	JIS-C-6429	2mm (Min)
	$<50m\Omega$		Apply to rate current for 0 $\Omega$
Flame Retardance	No flame	AEC-Q200-001	Temperature sensing at 500°C, Voltage power subjected to 32VDC current clamped up to 500ADC and decreased in 1.0VDC/hour.
Resistance to Soldering Heat	$\pm(1\% \pm 0.05\Omega)\max$ .	MIL-STD-202 Method 210	Condition B No per-heat of samples. Note: Single Wave Solder-Procedure 2 for SMD and Procedure 1 for Leaded with solder within 1.5mm of device body.
	$<50m\Omega$		Apply to rate current for 0 $\Omega$

Sulfuration test : Soaked in industrial oil with sulfur substance 3.5% contained 105°C  $\pm 3^\circ C$  500h

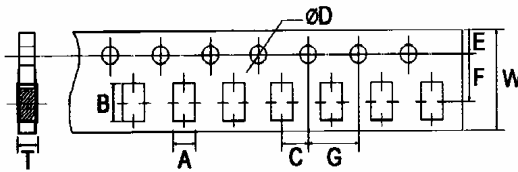
$\Delta R \leq \pm(5\%+0.1 \Omega)$

### 10. Packing of Surface Mount Resistors

#### 10.1 Dimension of Paper Taping :(Unit: mm)

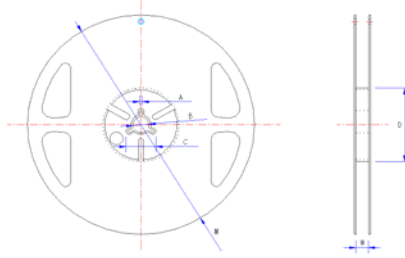


Type	A $\pm 0.2$	B $\pm 0.2$	C $\pm 0.05$	$\begin{matrix} +0.1 \\ \Phi D \\ -0 \end{matrix}$	E $\pm 0.1$	F $\pm 0.05$	G $\pm 0.1$	W $\pm 0.2$	T $\pm 0.1$
2S02	1.2	1.2	2.0	1.5	1.75	3.5	4.0	8.0	0.45
4S02	1.2	2.2	2.0	1.5	1.75	3.5	4.0	8.0	0.70



Type	A $\pm 0.2$	B $\pm 0.2$	C $\pm 0.05$	$\begin{matrix} +0.1 \\ \Phi D \\ -0 \end{matrix}$	E $\pm 0.1$	F $\pm 0.05$	G $\pm 0.1$	W $\pm 0.2$	T $\pm 0.1$
4S03	2.0	3.60	2.0	1.5	1.75	3.5	4.0	8.0	0.83

## 10.2 Dimension of Reel : (Unit: mm)



Type	Qty/Reel	A ± 0.5	B ± 0.5	C ± 0.5	D ± 1.0	M ± 2.0	W ± 1.0
2S02	10,000PCS	2.0	13.0	21.0	60.0	178.0	10.0
4S02	10,000PCS	2.0	13.0	21.0	60.0	178.0	10.0
4S03	5,000PCS	2.0	13.0	21.0	60.0	178.0	10.0

**11. Note**

11.1 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.

11.2 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.

11.3 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

**12. 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

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