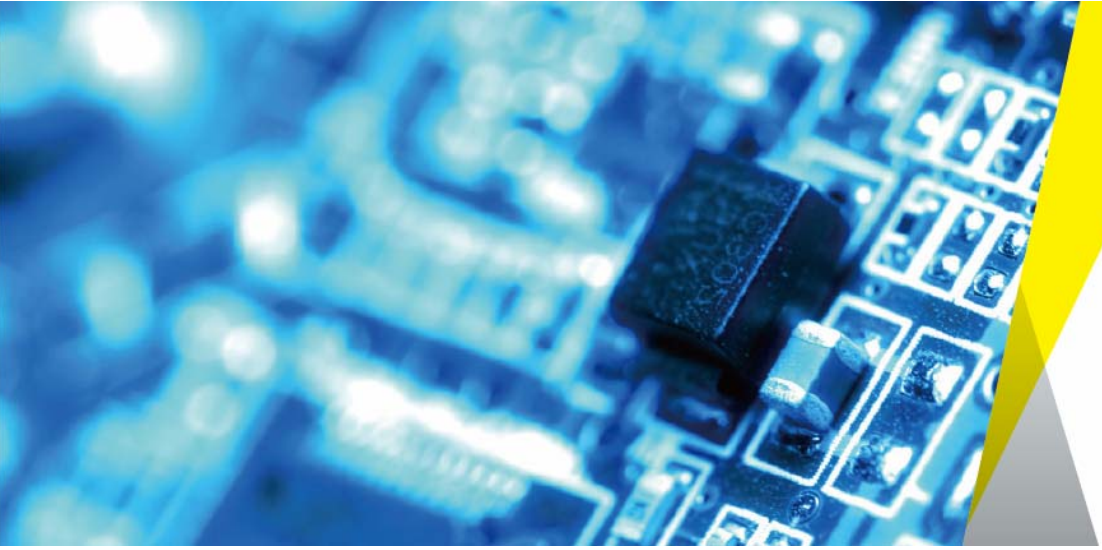


# DATA SHEET

**Product Name** **Current Sensing Chip Resistors**

**Part Name** **CS Series**


**Uniroyal Electronics Global Co., Ltd.**

88 Longteng Road, Economic & Technical Development Zone, Kunshan, Jiangsu, China

Tel +86 512 5763 1411 / 22 /33

Email marketing@uni-royal.cn

Manufacture Plant Uniroyal Electronics Industry (kunshan) co., ltd.
Uniroyal Electronics Industry Co., Ltd.
Uniroyal Electronics Global Co.,Ltd Shenzhen Branch
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 Current Sensing Chip Resistors manufactured by UNI-ROYAL.
1.2 Ultra-low Value
1.3 Low Temperature Coefficient
1.4 Suitable for reflow & wave soldering
1.5 Application：Power supply

## 2. Part No. System

Part No. includes 14 codes shown as below:
2.1 1st~4th codes: Part name. E.g.: CS02,CS03,CS05,CS06,CS07,CS10,CS11,CS12
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=$10^0$ 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=$10^{-4}$
2.5 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: CS12 1W ±1% 0.018Ω T/R-4000)**

**C S 1 2 | 1 W | F | 1 8 0 M | T | 4 | E**

**Product Type:**
Fill-in 4 digits with the chip resistor type as follows:
CS02
CS03
CS05
CS06
CS07
CS10
CS11
CS12

**Wattage:**
Normal size:
WA=1/10W
W8=1/8W
W4=1/4W
W5=1/5W
W3=1/3W
W2=1/2W
07=3/4W
1W=1W

**Tolerance:**
F=±1% ; J=±5%

**Resistance Value:**
5% series:
The 1st digit will be "0"; the 2nd & 3rd digits are for the significant figures of the resistance and the 4th digit indicate the numbers of zeros following.
1% series:
The 1st to 3rd digits are for the significant figures of the resistance and 4th digit denotes number of zeros following.
J=$10^{-1}$; K=$10^{-2}$; L=$10^{-3}$;M=$10^{-4}$

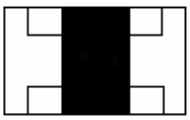
**Packing Type:**
T=Tape/Reel

**Packing quantity:**
1=1000PCS
2=2000PCS
3=3000PCS
4=4000PCS
5=5000PCS
C=10000PCS
D=20000PCS

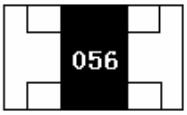
**Special Feature**
E= Lead-Free

## 4. Marking:

(1) For CS02 size. Due to the very CS02 small size of the resistor'sbody, there is no marking on the body.



(2) For CS03 size: Below 100mΩ（do not contain）product 3 digits of ±1%,±5%Tolerance , show as following：

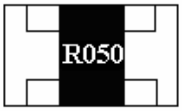



056→ 0.056Ω

(3) For CS03 size: Above( contain) 100mΩ product: 3 digits, the first digit is "R" , which as decimal point, the 2nd & 3rd digits are significant.

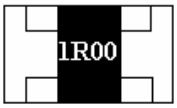

R10→ 100mΩ

(4) ±1%,±5%Tolerance: product below 1Ω show as following, the first digit is "R" , which as decimal point.



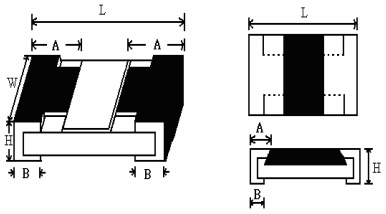

R050→50mΩ

(5) ±1%,±5%Tolerance: product of 1Ω show as following, the first digit is "1" , read alphabet "R" as decimal point.




1R00→ 1Ω

## 5. Dimension

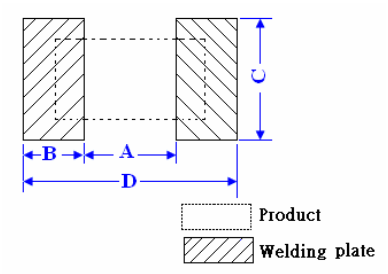



| Type | Dimension(mm) | | | | |
|---|---|---|---|---|---|
| | L | W | H | A | B |
| CS02(0402) | 1.00±0.10 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 |
| CS03(0603) | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| CS05(0805) | 2.00±0.15 | 1.25+0.15/-0.10 | 0.55±0.10 | 0.40±0.20 | 0.40±0.20 |
| CS06(1206) | 3.10±0.15 | 1.55+0.15/-0.10 | 0.55±0.10 | 0.45±0.20 | 0.45±0.20 |
| CS07(1210) | 3.10±0.10 | 2.60±0.20 | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 |
| CS10(2010) | 5.00±0.10 | 2.50±0.20 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |
| CS11(1812) | 4.50±0.20 | 3.20±0.20 | 0.55±0.20 | 0.50±0.20 | 0.80±0.30 |
| CS12(2512) | 6.35±0.10 | 3.20±0.20 | 0.55±0.10 | 0.60±0.25 | 0.80±0.30 |

## 6. Resistance Range

| Type | Power Rating at 70℃ | Dielectric withstanding Voltage | Resistance Range 1%&5% | Operating Temperature |
|---|---|---|---|---|
| CS02 | 1/8W | 100V | 50mΩ~1Ω | -55℃~155℃ |
| CS03 | 1/5W | 300V | 10mΩ~1Ω | -55℃~155℃ |
| CS05 | 1/4W | 500V | 10mΩ~1Ω | -55℃~155℃ |
| CS06 | 1/3W | 500V | 10mΩ~1Ω | -55℃~155℃ |
| CS07 | 1/2W | 500V | 10mΩ~1Ω | -55℃~155℃ |
| CS10 | 3/4W | 500V | 10mΩ~1Ω | -55℃~155℃ |
| CS11 | 3/4W | 500V | 10mΩ~1Ω | -55℃~155℃ |
| CS12 | 1W | 500V | 10mΩ~1Ω | -55℃~155℃ |

## 7. Recommend the size of welding plate

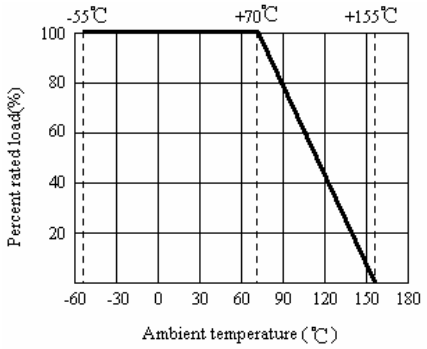



| Type | Dimension(mm) | | | |
|---|---|---|---|---|
| | A | B | C | D |
| CS02 | 0.5±0.05 | 0.5±0.05 | 0.6±0.05 | 1.5±0.05 |
| CS03 | 0.8±0.05 | 1±0.05 | 0.9±0.05 | 2.7±0.05 |
| CS05 | 1.0±0.1 | 1±0.1 | 1.4±0.1 | 3.4±0.1 |
| CS06 | 2.0±0.1 | 1.1±0.1 | 1.8±0.1 | 4.2±0.1 |
| CS07 | 2.0±0.1 | 1.1±0.1 | 2.9±0.1 | 4.2±0.1 |
| CS10 | 3.6±0.1 | 1.4±0.1 | 3±0.1 | 6.4±0.1 |
| CS11 | 2.9±0.1 | 1.5±0.1 | 3.7±0.1 | 5.9±0.1 |
| CS12 | 4.4±0.1 | 2.1±0.1 | 3.7±0.1 | 8.6±0.1 |

## 8. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55℃ to 70℃. For temperature in excess of 70℃, 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:

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

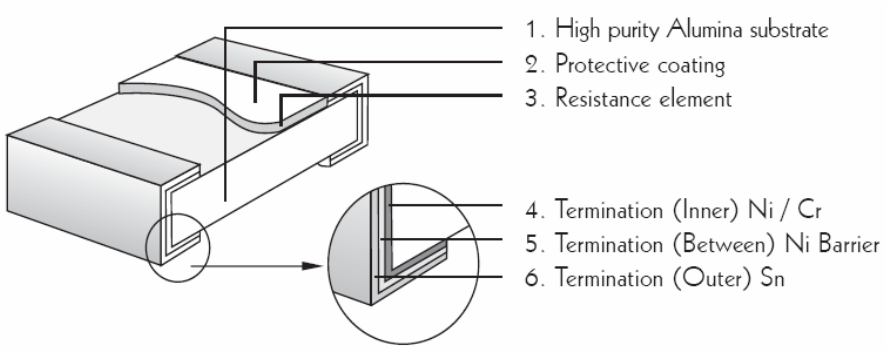
Where: RCWV commercial-line frequency and waveform (Volt.)

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

## 9. Structure



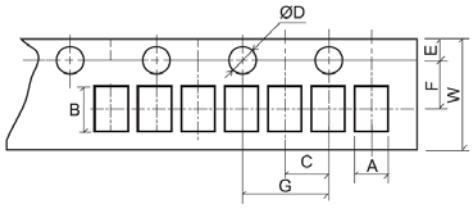
## 10. Performance Specification

| Characteristic | Limits | | Test Method (JIS-C-5201 & JIS-C-5202) |
|---|---|---|---|
| Temperature Coefficient | CS02 | 50mΩ≤R<100mΩ: ±700 ppm/ºC<br>100mΩ≤R≤1Ω: ±200 ppm/ºC | 4.8 Natural resistance changes per temp. Degree centigrade<br>$\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) $\frac{R_3-R_1}{R_1(t_3-t_1)} \times 10^6$ (PPM/℃)<br>$R_1$: Resistance Value at room temperature （$t_1$）;<br>$R_2$: Resistance Value at upper limit temperature ± 2℃（$t_2$）<br>$R_3$ : Resistance Value at lower limit temperature ± 3℃（$t_3$）<br>Test pattern： Room temperature：（$t_1$）<br>Upper limit temperature：（$t_2$）<br>Lower limit temperature ：（$t_3$） |
| | CS03 | 10mΩ≤R<15mΩ: ±1500 ppm/ºC<br>15mΩ≤R<20mΩ: ±1000 ppm/ºC<br>20mΩ≤R<30mΩ: ±800 ppm/ºC<br>30mΩ≤R<33mΩ: ±600 ppm/ºC<br>33mΩ≤R≤50mΩ: ±400 ppm/ºC<br>50mΩ<R≤0.1Ω: ±300 ppm/ºC<br>0.1Ω<R≤1Ω: ±200 ppm/ºC | |
| | CS05 | 10mΩ≤R≤15mΩ: ±800 ppm/ºC<br>15mΩ<R≤25mΩ: ±600 ppm/ºC<br>25mΩ<R≤50mΩ: ±400 ppm/ºC<br>50mΩ<R≤0.2Ω: ±200 ppm/ºC<br>0.2Ω<R≤1Ω: ±100 ppm/ºC | |
| | CS06 | 10mΩ≤R＜15mΩ: ±700ppm/℃<br>15mΩ≤R≤30mΩ: ±400ppm/℃<br>30mΩ＜R≤50mΩ: ±300ppm/℃<br>50mΩ＜R≤0.1Ω: ±200ppm/℃<br>0.1Ω＜R≤1Ω: ±150ppm/℃ | |
| | CS07 | 10mΩ≤R＜15mΩ: ±500ppm/℃<br>15mΩ≤R＜20mΩ: ±400ppm/℃<br>20mΩ≤R≤50mΩ: ±300ppm/℃<br>50mΩ＜R≤1Ω: ±100ppm/℃ | |
| | CS10 | 10mΩ≤R＜15mΩ: ±600ppm/℃<br>15mΩ≤R＜20mΩ: ±500ppm/℃<br>20mΩ≤R≤30mΩ: ±300ppm/℃<br>30mΩ＜R≤50mΩ: ±200ppm/℃<br>50mΩ＜R≤0.1Ω: ±150ppm/℃<br>0.1Ω＜R≤1Ω: ±100ppm/℃ | |
| | CS11 | 10mΩ≤R＜20mΩ: ±500ppm/℃<br>20mΩ≤R＜50mΩ: ±400ppm/℃<br>50mΩ≤R≤0.1Ω: ±200ppm/℃<br>0.1Ω＜R≤1Ω: ±100ppm/℃ | |
| | CS12 | 10mΩ≤R＜15mΩ: ±600ppm/℃<br>15mΩ≤R＜20mΩ: ±400ppm/℃<br>20mΩ≤R≤30mΩ: ±300ppm/℃<br>30mΩ＜R≤50mΩ: ±200ppm/℃<br>50mΩ＜R≤0.1Ω: ±150ppm/℃<br>0.1Ω＜R≤1Ω: ±100ppm/℃ | |
| Short-time overload | ±1% | ±(1%+0.005Ω) Max. | 4.13 Permanent resistance change after the application of 2.5 times RCWV for 5 seconds. |
| | ±5% | ±(2%+0.005Ω) Max | |
| Terminal bending | ±(1%+0.005Ω) Max | | 4.33 Twist of test board:<br>Y/X = 3/90 mm for 60Seconds |
| Solderability | 95% coverage Min. | | Wave solder:<br>Test temperature of solder: 245℃±3℃ dipping time in solder: 2-3 seconds. |
| Dielectric withstanding voltage | No evidence of flashover mechanical damage, arcing or insulation breaks down. | | 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 given list of each product type for 60-70 seconds. |
| Rapid change of temperature | ±1% | ±(1.0%+0.005Ω) Max. | 4.19 30 min at lower limit temperature and 30 min at upper limit temperature，5 cycles. |
| | ±5% | ±(3.0%+0.005Ω) Max. | |
| Soldering heat | Resistance change rate must be in ±(1%+0.005Ω) | | 4.18 Dip the resistor into a solder bath having a temperature of 260℃±5℃ and hold it for 10±1 seconds. |

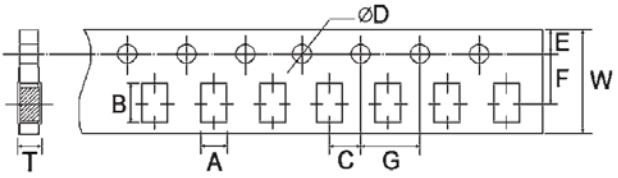
| | | | |
|---|---|---|---|
| Load life in humidity | ±1% | ±(1.0%+0.005Ω) Max. | 7.9 Resistance change after 1,000 hours (1.5 hours "ON",0.5 hour "OFF") at RCWV in a humidity chamber controlled at 40℃±2℃ and 90 to 95% relative humidity. |
| | ±5% | ±(3.0%+0.005Ω) Max. | |
| Load life | ±1% | ±(1.0%+0.005Ω) 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℃±2℃ ambient. |
| | ±5% | ±(3.0%+0.005Ω) Max. | |
| Low Temperature Storage | ±1% | ±(1.0%+0.005Ω) Max. | 4.23.4 Lower limit temperature，for 2H. |
| | ±5% | ±(3.0%+0.005Ω) Max. | |
| High Temperature Exposure | ±1% | ±(1.0%+0.005Ω) Max. | 4.23.2 Upper limit temperature ，for 16H. |
| | ±5% | ±(3.0%+0.005Ω) Max. | |
| Leaching | No visible damage | | J-STD-002 Test D<br>Samples completely immersed for 30 sec in solder bath at 260 ℃. |

## 11. Packing of Surface Mount Resistors

11.1 Dimension of Paper Taping :(Unit: mm)

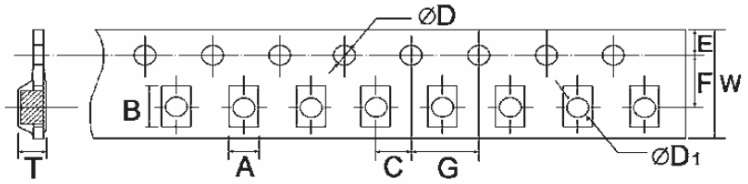



| Type | A | B | C ±0.05 | +0.1 ΦD -0 | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.05 |
|---|---|---|---|---|---|---|---|---|---|
| CS02 | 0.65±0.10 | 1.20±0.10 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.42 |



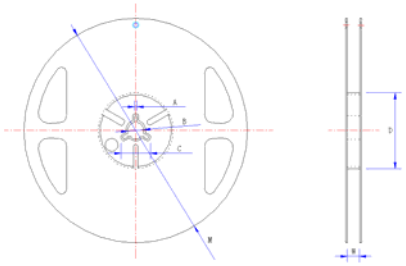

| Type | A ±0.2 | B ±0.2 | C ±0.05 | +0.1 ΦD -0 | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.1 |
|---|---|---|---|---|---|---|---|---|---|
| CS03 | 1.10 | 1.90 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.67 |
| CS05 | 1.65 | 2.40 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.81 |
| CS06 | 2.00 | 3.60 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.81 |
| CS07 | 2.80 | 3.50 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.75 |

11.2 Dimension of Embossed Taping：(Unit: mm)




| Type | A ±0.2 | B ±0.2 | C ±0.05 | + 0.1 ϕD - 0 | +0.25 ϕD1 -0 | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.1 |
|---|---|---|---|---|---|---|---|---|---|---|
| CS10 | 2.90 | 5.60 | 2.00 | 1.50 | 1.50 | 1.75 | 5.50 | 4.00 | 12.00 | 1.00 |
| CS11 | 3.50 | 4.80 | 2.00 | 1.50 | 1.50 | 1.75 | 5.50 | 4.00 | 12.00 | 1.00 |
| CS12 | 3.50 | 6.70 | 2.00 | 1.50 | 1.50 | 1.75 | 5.50 | 4.00 | 12.00 | 1.00 |

11.3 Dimension of Reel：(Unit: mm)



| Type | Taping | Qty/Reel | A ±0.5 | B ±0.5 | C ±0.5 | D ±1 | M ±2 | W ±1 |
|---|---|---|---|---|---|---|---|---|
| CS02 | Paper | 10,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| CS03 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| CS05 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| CS06 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| CS07 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| CS10 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |
| CS11 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |
| CS12 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |

## 12. Note

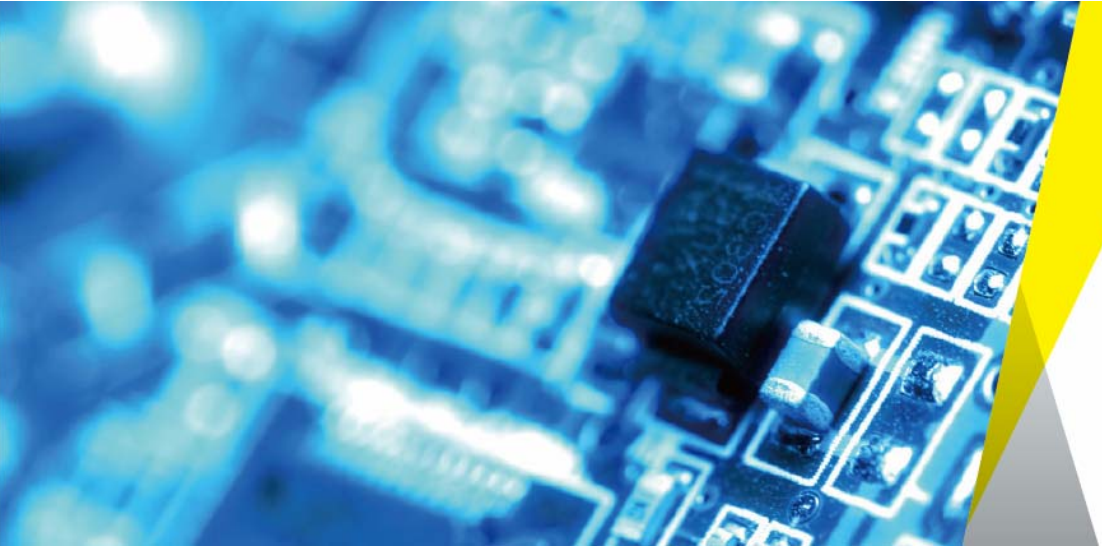
12.1. UNI-ROYAL recommend the storage condition temperature: 15℃~35℃, humidity :25%~75%.
(Put condition for individual product).Even under UNI-ROYAL recommended storage condition, solderability of products over 1 year old.
(Put condition for each product) may be degraded.

12.2. 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.

12.3. 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 $Cl_2$, $H_2S_3$ $NH_3$, $SO_2$, $NO_2$.

## 13. 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 |
| | | | | | |
| | | | | | |



# DATA SHEET

**Product Name** **Current Sensing Chip Resistors**

**Part Name** **CS Series**


**Uniroyal Electronics Global Co., Ltd.**

88 Longteng Road, Economic & Technical Development Zone, Kunshan, Jiangsu, China

Tel +86 512 5763 1411 / 22 /33

Email marketing@uni-royal.cn

Manufacture Plant Uniroyal Electronics Industry (kunshan) co., ltd.
Uniroyal Electronics Industry Co., Ltd.
Uniroyal Electronics Global Co.,Ltd Shenzhen Branch
Aeon Technology Corporation
Uniroyal Electronics Global Co.,Ltd Xiamen Branch
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Brands ***RoyalOhm*** ***UniOhm***

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1.3 Low Temperature Coefficient
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1.5 Application：Power supply

## 2. Part No. System

Part No. includes 14 codes shown as below:
2.1 1st~4th codes: Part name. E.g.: CS02,CS03,CS05,CS06,CS07,CS10,CS11,CS12
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=$10^0$ 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=$10^{-4}$
2.5 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: CS12 1W ±1% 0.018Ω T/R-4000)**

**C S 1 2 | 1 W | F | 1 8 0 M | T | 4 | E**

**Product Type:**
Fill-in 4 digits with the chip resistor type as follows:
CS02
CS03
CS05
CS06
CS07
CS10
CS11
CS12

**Wattage:**
Normal size:
WA=1/10W
W8=1/8W
W4=1/4W
W5=1/5W
W3=1/3W
W2=1/2W
07=3/4W
1W=1W

**Tolerance:**
F=±1% ; J=±5%

**Resistance Value:**
5% series:
The 1st digit will be "0"; the 2nd & 3rd digits are for the significant figures of the resistance and the 4th digit indicate the numbers of zeros following.
1% series:
The 1st to 3rd digits are for the significant figures of the resistance and 4th digit denotes number of zeros following.
J=$10^{-1}$; K=$10^{-2}$; L=$10^{-3}$;M=$10^{-4}$

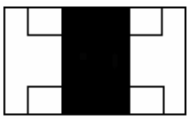
**Packing Type:**
T=Tape/Reel

**Packing quantity:**
1=1000PCS
2=2000PCS
3=3000PCS
4=4000PCS
5=5000PCS
C=10000PCS
D=20000PCS

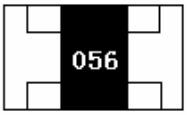
**Special Feature**
E= Lead-Free

## 4. Marking:

(1) For CS02 size. Due to the very CS02 small size of the resistor'sbody, there is no marking on the body.



(2) For CS03 size: Below 100mΩ（do not contain）product 3 digits of ±1%,±5%Tolerance , show as following：

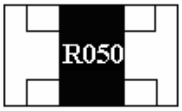



056→ 0.056Ω

(3) For CS03 size: Above( contain) 100mΩ product: 3 digits, the first digit is "R" , which as decimal point, the 2nd & 3rd digits are significant.

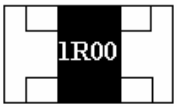

R10→ 100mΩ

(4) ±1%,±5%Tolerance: product below 1Ω show as following, the first digit is "R" , which as decimal point.



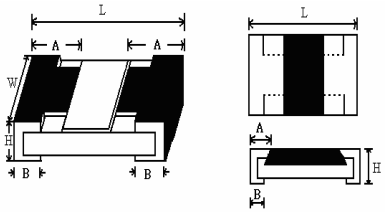

R050→50mΩ

(5) ±1%,±5%Tolerance: product of 1Ω show as following, the first digit is "1" , read alphabet "R" as decimal point.




1R00→ 1Ω

## 5. Dimension

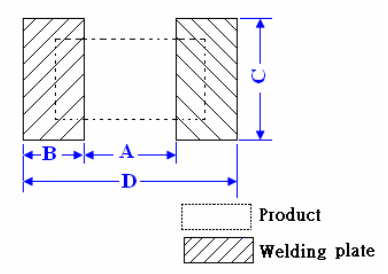



| Type | Dimension(mm) | | | | |
|---|---|---|---|---|---|
| | L | W | H | A | B |
| CS02(0402) | 1.00±0.10 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 |
| CS03(0603) | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.30±0.20 | 0.30±0.20 |
| CS05(0805) | 2.00±0.15 | 1.25+0.15/-0.10 | 0.55±0.10 | 0.40±0.20 | 0.40±0.20 |
| CS06(1206) | 3.10±0.15 | 1.55+0.15/-0.10 | 0.55±0.10 | 0.45±0.20 | 0.45±0.20 |
| CS07(1210) | 3.10±0.10 | 2.60±0.20 | 0.55±0.10 | 0.50±0.25 | 0.50±0.20 |
| CS10(2010) | 5.00±0.10 | 2.50±0.20 | 0.55±0.10 | 0.60±0.25 | 0.50±0.20 |
| CS11(1812) | 4.50±0.20 | 3.20±0.20 | 0.55±0.20 | 0.50±0.20 | 0.80±0.30 |
| CS12(2512) | 6.35±0.10 | 3.20±0.20 | 0.55±0.10 | 0.60±0.25 | 0.80±0.30 |

## 6. Resistance Range

| Type | Power Rating at 70℃ | Dielectric withstanding Voltage | Resistance Range 1%&5% | Operating Temperature |
|---|---|---|---|---|
| CS02 | 1/8W | 100V | 50mΩ~1Ω | -55℃~155℃ |
| CS03 | 1/5W | 300V | 10mΩ~1Ω | -55℃~155℃ |
| CS05 | 1/4W | 500V | 10mΩ~1Ω | -55℃~155℃ |
| CS06 | 1/3W | 500V | 10mΩ~1Ω | -55℃~155℃ |
| CS07 | 1/2W | 500V | 10mΩ~1Ω | -55℃~155℃ |
| CS10 | 3/4W | 500V | 10mΩ~1Ω | -55℃~155℃ |
| CS11 | 3/4W | 500V | 10mΩ~1Ω | -55℃~155℃ |
| CS12 | 1W | 500V | 10mΩ~1Ω | -55℃~155℃ |

## 7. Recommend the size of welding plate

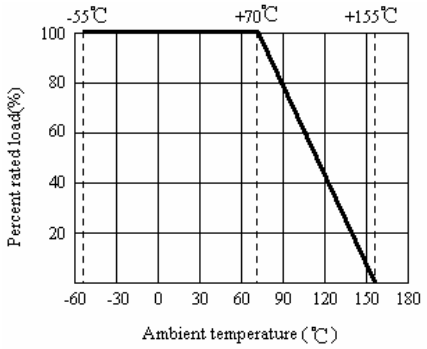



| Type | Dimension(mm) | | | |
|---|---|---|---|---|
| | A | B | C | D |
| CS02 | 0.5±0.05 | 0.5±0.05 | 0.6±0.05 | 1.5±0.05 |
| CS03 | 0.8±0.05 | 1±0.05 | 0.9±0.05 | 2.7±0.05 |
| CS05 | 1.0±0.1 | 1±0.1 | 1.4±0.1 | 3.4±0.1 |
| CS06 | 2.0±0.1 | 1.1±0.1 | 1.8±0.1 | 4.2±0.1 |
| CS07 | 2.0±0.1 | 1.1±0.1 | 2.9±0.1 | 4.2±0.1 |
| CS10 | 3.6±0.1 | 1.4±0.1 | 3±0.1 | 6.4±0.1 |
| CS11 | 2.9±0.1 | 1.5±0.1 | 3.7±0.1 | 5.9±0.1 |
| CS12 | 4.4±0.1 | 2.1±0.1 | 3.7±0.1 | 8.6±0.1 |

## 8. Derating Curve

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55℃ to 70℃. For temperature in excess of 70℃, 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:

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

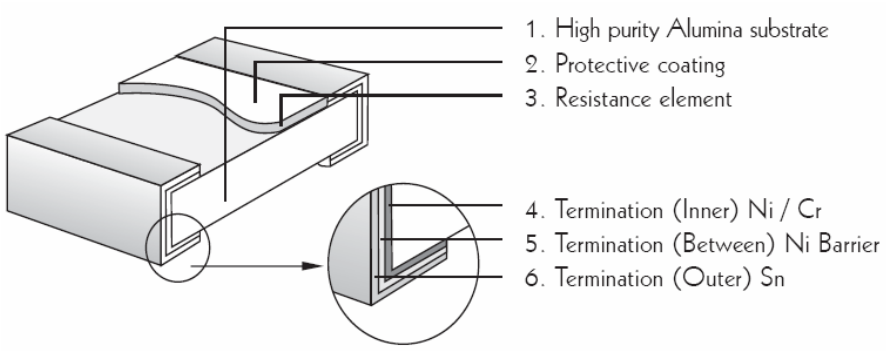
Where: RCWV commercial-line frequency and waveform (Volt.)

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

## 9. Structure



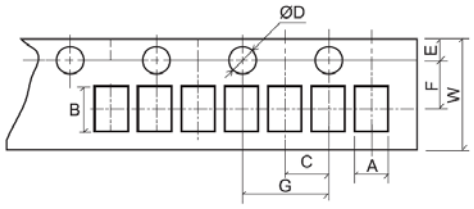
## 10. Performance Specification

| Characteristic | Limits | | Test Method (JIS-C-5201 & JIS-C-5202) |
|---|---|---|---|
| Temperature Coefficient | CS02 | 50mΩ≤R<100mΩ: ±700 ppm/ºC<br>100mΩ≤R≤1Ω: ±200 ppm/ºC | 4.8 Natural resistance changes per temp. Degree centigrade<br>$\frac{R_2-R_1}{R_1(t_2-t_1)} \times 10^6$ (PPM/℃) $\frac{R_3-R_1}{R_1(t_3-t_1)} \times 10^6$ (PPM/℃)<br>$R_1$: Resistance Value at room temperature （$t_1$）;<br>$R_2$: Resistance Value at upper limit temperature ± 2℃（$t_2$）<br>$R_3$ : Resistance Value at lower limit temperature ± 3℃（$t_3$）<br>Test pattern： Room temperature：（$t_1$）<br>Upper limit temperature：（$t_2$）<br>Lower limit temperature ：（$t_3$） |
| | CS03 | 10mΩ≤R<15mΩ: ±1500 ppm/ºC<br>15mΩ≤R<20mΩ: ±1000 ppm/ºC<br>20mΩ≤R<30mΩ: ±800 ppm/ºC<br>30mΩ≤R<33mΩ: ±600 ppm/ºC<br>33mΩ≤R≤50mΩ: ±400 ppm/ºC<br>50mΩ<R≤0.1Ω: ±300 ppm/ºC<br>0.1Ω<R≤1Ω: ±200 ppm/ºC | |
| | CS05 | 10mΩ≤R≤15mΩ: ±800 ppm/ºC<br>15mΩ<R≤25mΩ: ±600 ppm/ºC<br>25mΩ<R≤50mΩ: ±400 ppm/ºC<br>50mΩ<R≤0.2Ω: ±200 ppm/ºC<br>0.2Ω<R≤1Ω: ±100 ppm/ºC | |
| | CS06 | 10mΩ≤R＜15mΩ: ±700ppm/℃<br>15mΩ≤R≤30mΩ: ±400ppm/℃<br>30mΩ＜R≤50mΩ: ±300ppm/℃<br>50mΩ＜R≤0.1Ω: ±200ppm/℃<br>0.1Ω＜R≤1Ω: ±150ppm/℃ | |
| | CS07 | 10mΩ≤R＜15mΩ: ±500ppm/℃<br>15mΩ≤R＜20mΩ: ±400ppm/℃<br>20mΩ≤R≤50mΩ: ±300ppm/℃<br>50mΩ＜R≤1Ω: ±100ppm/℃ | |
| | CS10 | 10mΩ≤R＜15mΩ: ±600ppm/℃<br>15mΩ≤R＜20mΩ: ±500ppm/℃<br>20mΩ≤R≤30mΩ: ±300ppm/℃<br>30mΩ＜R≤50mΩ: ±200ppm/℃<br>50mΩ＜R≤0.1Ω: ±150ppm/℃<br>0.1Ω＜R≤1Ω: ±100ppm/℃ | |
| | CS11 | 10mΩ≤R＜20mΩ: ±500ppm/℃<br>20mΩ≤R＜50mΩ: ±400ppm/℃<br>50mΩ≤R≤0.1Ω: ±200ppm/℃<br>0.1Ω＜R≤1Ω: ±100ppm/℃ | |
| | CS12 | 10mΩ≤R＜15mΩ: ±600ppm/℃<br>15mΩ≤R＜20mΩ: ±400ppm/℃<br>20mΩ≤R≤30mΩ: ±300ppm/℃<br>30mΩ＜R≤50mΩ: ±200ppm/℃<br>50mΩ＜R≤0.1Ω: ±150ppm/℃<br>0.1Ω＜R≤1Ω: ±100ppm/℃ | |
| Short-time overload | ±1% | ±(1%+0.005Ω) Max. | 4.13 Permanent resistance change after the application of 2.5 times RCWV for 5 seconds. |
| | ±5% | ±(2%+0.005Ω) Max | |
| Terminal bending | ±(1%+0.005Ω) Max | | 4.33 Twist of test board:<br>Y/X = 3/90 mm for 60Seconds |
| Solderability | 95% coverage Min. | | Wave solder:<br>Test temperature of solder: 245℃±3℃ dipping time in solder: 2-3 seconds. |
| Dielectric withstanding voltage | No evidence of flashover mechanical damage, arcing or insulation breaks down. | | 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 given list of each product type for 60-70 seconds. |
| Rapid change of temperature | ±1% | ±(1.0%+0.005Ω) Max. | 4.19 30 min at lower limit temperature and 30 min at upper limit temperature，5 cycles. |
| | ±5% | ±(3.0%+0.005Ω) Max. | |
| Soldering heat | Resistance change rate must be in ±(1%+0.005Ω) | | 4.18 Dip the resistor into a solder bath having a temperature of 260℃±5℃ and hold it for 10±1 seconds. |

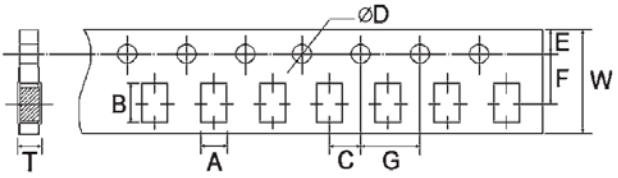
| | | | |
|---|---|---|---|
| Load life in humidity | ±1% | ±(1.0%+0.005Ω) Max. | 7.9 Resistance change after 1,000 hours (1.5 hours "ON",0.5 hour "OFF") at RCWV in a humidity chamber controlled at 40℃±2℃ and 90 to 95% relative humidity. |
| | ±5% | ±(3.0%+0.005Ω) Max. | |
| Load life | ±1% | ±(1.0%+0.005Ω) 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℃±2℃ ambient. |
| | ±5% | ±(3.0%+0.005Ω) Max. | |
| Low Temperature Storage | ±1% | ±(1.0%+0.005Ω) Max. | 4.23.4 Lower limit temperature，for 2H. |
| | ±5% | ±(3.0%+0.005Ω) Max. | |
| High Temperature Exposure | ±1% | ±(1.0%+0.005Ω) Max. | 4.23.2 Upper limit temperature ，for 16H. |
| | ±5% | ±(3.0%+0.005Ω) Max. | |
| Leaching | No visible damage | | J-STD-002 Test D<br>Samples completely immersed for 30 sec in solder bath at 260 ℃. |

## 11. Packing of Surface Mount Resistors

11.1 Dimension of Paper Taping :(Unit: mm)

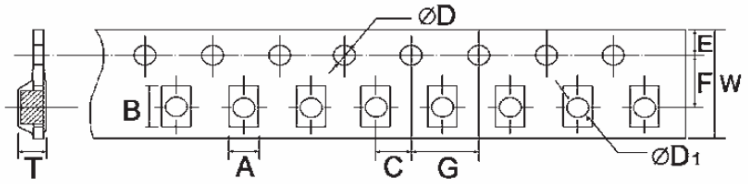



| Type | A | B | C ±0.05 | +0.1 ΦD -0 | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.05 |
|---|---|---|---|---|---|---|---|---|---|
| CS02 | 0.65±0.10 | 1.20±0.10 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.42 |



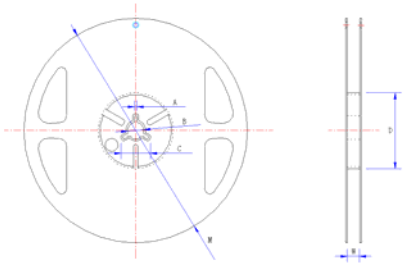

| Type | A ±0.2 | B ±0.2 | C ±0.05 | +0.1 ΦD -0 | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.1 |
|---|---|---|---|---|---|---|---|---|---|
| CS03 | 1.10 | 1.90 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.67 |
| CS05 | 1.65 | 2.40 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.81 |
| CS06 | 2.00 | 3.60 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.81 |
| CS07 | 2.80 | 3.50 | 2.00 | 1.50 | 1.75 | 3.50 | 4.00 | 8.00 | 0.75 |

11.2 Dimension of Embossed Taping：(Unit: mm)




| Type | A ±0.2 | B ±0.2 | C ±0.05 | + 0.1 ϕD - 0 | +0.25 ϕD1 -0 | E ±0.1 | F ±0.05 | G ±0.1 | W ±0.2 | T ±0.1 |
|---|---|---|---|---|---|---|---|---|---|---|
| CS10 | 2.90 | 5.60 | 2.00 | 1.50 | 1.50 | 1.75 | 5.50 | 4.00 | 12.00 | 1.00 |
| CS11 | 3.50 | 4.80 | 2.00 | 1.50 | 1.50 | 1.75 | 5.50 | 4.00 | 12.00 | 1.00 |
| CS12 | 3.50 | 6.70 | 2.00 | 1.50 | 1.50 | 1.75 | 5.50 | 4.00 | 12.00 | 1.00 |

11.3 Dimension of Reel：(Unit: mm)



| Type | Taping | Qty/Reel | A ±0.5 | B ±0.5 | C ±0.5 | D ±1 | M ±2 | W ±1 |
|---|---|---|---|---|---|---|---|---|
| CS02 | Paper | 10,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| CS03 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| CS05 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| CS06 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| CS07 | Paper | 5,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 10.0 |
| CS10 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |
| CS11 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |
| CS12 | Embossed | 4,000pcs | 2.0 | 13.0 | 21.0 | 60.0 | 178.0 | 13.8 |

## 12. Note

12.1. 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.

12.2. 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.

12.3. 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 $Cl_2$, $H_2S_3$ $NH_3$, $SO_2$, $NO_2$.

## 13. 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 |
| | | | | | |
| | | | | | |