

昆山厚聲電子工業有限公司

UNIROYAL ELECTRONICS INDUSTRY (KUNSHAN) CO., LTD.



ISO14001



ISO/TS16949



244546



245468



REG.-Nr.A759



CQC04001010658



## Specification for Approval

**Customer** : 深圳市嘉立创科技发展有限公司

**Product Name:** CURRENT SENSING CHIP RESISTORS

**Part Name** : CS SERIES ±1%、±5%

88 LongTeng Road, Economic & Technical Development Zone, Kunshan City, Jiangsu, CHINA

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File Name: <b>CS SERIES ±1%、±5%</b>			Date <b>2015.11.26</b>	Edition No. <b>1</b>	
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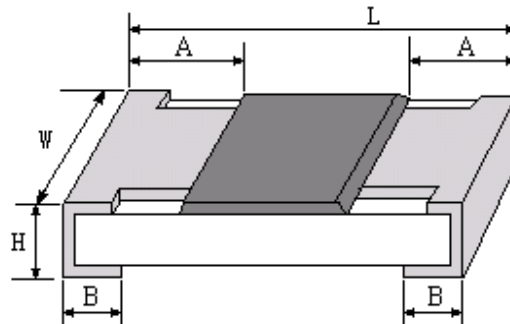


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### 1.0 Scope:

This file is specification for approve the Current Sensing Chip Resistor made by UNIOHM.

### 2.0 Ratings & Dimension:



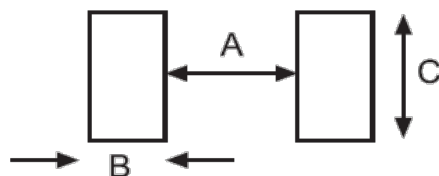
Dimension (mm)

Type		CS02 (0402)	CS03 (0603)	CS05 (0805)	CS06 (1206)	CS07 (1210)	CS10 (2010)	CS11 (1812)	CS12 (2512)
Power Rating at 70°C		1/10W (1/8WS)	1/10W (1/5WS)	1/8W (1/4WS)	1/4W (1/3WS)	1/3W (1/2WS)	1/2W (3/4WS)	1/2W (3/4WS)	1W
Dimension (mm)	L	1.00±0.10	1.60±0.10	2.00±0.15	3.10±0.15	3.10±0.10	5.00±0.10	4.50±0.20	6.35±0.10
	W	0.50±0.05	0.80±0.10	1.25 <sup>+0.15</sup> <sub>-0.10</sub>	1.55 <sup>+0.15</sup> <sub>-0.10</sub>	2.60±0.20	2.50±0.20	3.20±0.20	3.20±0.20
	H	0.35±0.05	0.45±0.10	0.55±0.10	0.55±0.10	0.55±0.10	0.55±0.10	0.55±0.20	0.55±0.10
	A	0.20±0.10	0.30±0.20	0.40±0.20	0.45±0.20	0.50±0.25	0.60±0.25	0.50±0.20	0.60±0.25
	B	0.25±0.20	0.30±0.20	0.40±0.20	0.45±0.20	0.50±0.20	0.50±0.20	0.80±0.30	0.80±0.30
Resistance range	±1% ±5%	50mΩ~1Ω	20mΩ~1Ω	10mΩ~1Ω	10mΩ~1Ω	10mΩ~1Ω	10mΩ~1Ω	10mΩ~1Ω	10mΩ~1Ω
Dielectric Withstanding Voltage		100v	300V	500V	500V	500V	500V	500V	500V
Operating Temperature		-55 ~ +155°C							

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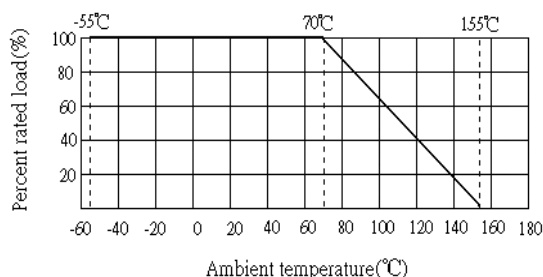
2.1 Recommend the size of welding plate by uniohm



規格	A	B	C
CS02 (0402)	0.40	0.60	0.50
CS03 (0603)	0.80	1.00	0.90
CS05 (0805)	1.00	1.00	1.40
CS06 (1206)	2.00	1.20	2.00
CS07 (1210)	2.00	1.20	2.70
CS10 (2010)	3.60	1.40	3.00
CS11 (1812)	3.50	2.10	3.60
CS12 (2512)	3.80	2.10	3.60

3.0 Power rating:

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



4.0 Voltage rating:

Resistors should have a direct-current (DC) continuous voltage rating and an alternating-current (AC) continuous voltage rating relates to Power Rating, formula shown as below:

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

RCWV: Rated dc or RMS ac continuous working voltage at commercial-line frequency and waveform (Volt.)

P: Power Rating (Watt.)

R: Nominal Resistance (Ohm)

Resistors will be burned out if it overload, such as higher than the maximum value of series' RCWV. And we named 2.5 times RCWV is OVERLOAD Voltage.

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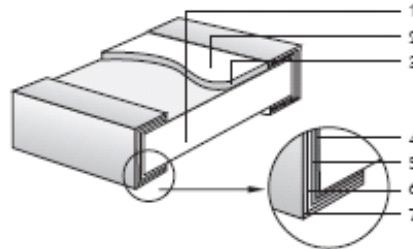
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### 5.0 Structure:

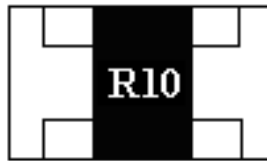
1. High purity alumina substrate
2. Protective covering
3. Resistive covering
4. Termination (inner) Ni/Cr
5. Termination (between) Cu
6. Termination (between) Ni
7. Termination (outer) Sn



### 6.0 Marking:

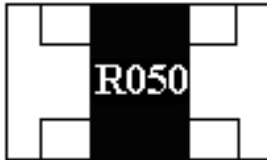
6.1 For CS03 size: product Less than 100mΩ, there is no marking on the body.

6.2 Above (contain) 100mΩ product: 3 digits, the first digit is "R", which as decimal point, the 2<sup>nd</sup> & 3<sup>rd</sup> digits are significant.

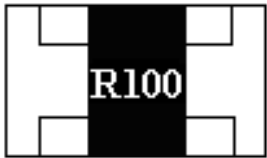


R10 → 100mΩ

6.3 ±1%,±5%Tolerance: product below 1Ω show as following, the first digit is "R", which as decimal.

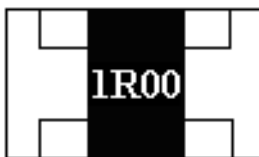


R050 → 50mΩ



R100 → 100mΩ

6.4 ±1%,±5%Tolerance: product of 1Ω show as following, the first digit is "1", "R" as decimal.



1R00 → 1Ω

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7.0 Performance Specification:

Characteristic	Limits		Test Method (JIS-C-5201 & JIS-C-5202)
Temperature Coefficient	CS02 (0402)	50mΩ~0.1Ω: ≤±700 PPM/°C 0.11Ω~1Ω: ≤±200PPM/°C	4.8 Natural resistance changes per temp. Degree centigrade  $\frac{R_2 - R_1}{R_1(T_2 - T_1)} * 10^6(\text{PPM}/^\circ\text{C})$ R <sub>1</sub> : resistance value at room temp. (T <sub>1</sub> ) R <sub>2</sub> : resistance value at room temp. +100°C (T <sub>2</sub> ) Test pattern: room temp. (T <sub>1</sub> ), room temp. +100°C(T <sub>2</sub> )
	CS03 (0603)	20mΩ~29.9mΩ: ≤±800PPM/°C 30mΩ~32.9mΩ: ≤±600PPM/°C 33mΩ~50mΩ: ≤±400PPM/°C 50.1mΩ~0.1Ω: ≤±300PPM/°C 0.11Ω~1Ω: ≤±200 PPM/°C	
	CS05 (0805)	10mΩ~15mΩ: ≤±800PPM/°C 15.1mΩ~25mΩ: ≤±600PPM/°C 25.1mΩ~50mΩ: ≤±400PPM/°C 50.1mΩ~0.2Ω: ≤±200 PPM/°C 0.21Ω~1Ω: ≤±100PPM/°C	
	CS06 (1206)	10mΩ~14.9mΩ: ≤±700PPM/°C 15mΩ~30mΩ: ≤±400PPM/°C 30.1mΩ~50mΩ: ≤±300 PPM/°C 50.1mΩ~0.1Ω: ≤±200 PPM/°C 0.11Ω~1Ω: ≤±150PPM/°C	
	CS07 (1210)	10mΩ~14.9mΩ: ≤±500PPM/°C 15mΩ~19.9mΩ: ≤±400PPM/°C 20mΩ~50mΩ: ≤±300PPM/°C 50.1mΩ~1Ω: ≤±100PPM/°C	
	CS10 (2010)	10mΩ~14.9mΩ: ≤±600PPM/°C 15mΩ~19.9mΩ: ≤±500PPM/°C 20mΩ~30mΩ: ≤±300PPM/°C 30.1mΩ~50mΩ: ≤±200PPM/°C 50.1mΩ~0.1Ω: ≤±150PPM/°C 0.11mΩ~1Ω: ≤±100PPM/°C	
	CS11 (1812)	10mΩ~19.9mΩ: ≤±500PPM/°C 20mΩ~49.9mΩ: ≤±400PPM/°C 50mΩ~0.1Ω: ≤±200 PPM/°C 0.11Ω~1Ω: ≤±100PPM/°C	
	CS12 (2512)	10mΩ~14.9mΩ: ≤±600PPM/°C 15mΩ~19.9mΩ: ≤±400PPM/°C 20mΩ~30mΩ: ≤±300PPM/°C 30.1mΩ~50mΩ: ≤±200PPM/°C 50.1mΩ~0.1Ω: ≤±150PPM/°C 0.11Ω~1Ω: ≤±100PPM/°C	
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	

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Terminal bending	$\pm(1\%+0.005\Omega)$ Max		4.33 Twist of test board: $Y/X = 3/90$ mm for 60Seconds															
Solderability	95% coverage Min.		Wave solder: Test temperature of solder: $245^{\circ}\text{C}\pm 3^{\circ}\text{C}$ 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 $90^{\circ}$ metallic v-block and shall be tested at ac potential respectively specified in the given list of each product type for 60-70 seconds.															
Temperature cycling	$\pm(1.0\%+0.005\Omega)$ Max		4.19 Resistance change after continuous five cycles for duty cycle specified below: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>STEP</th> <th>TEMPERATURE</th> <th>TIME</th> </tr> </thead> <tbody> <tr> <td>1</td> <td><math>-55^{\circ}\text{C}\pm 3^{\circ}\text{C}</math></td> <td>30 MINS</td> </tr> <tr> <td>2</td> <td>ROOM TEMP.</td> <td>10 --- 15 MIN</td> </tr> <tr> <td>3</td> <td><math>+155^{\circ}\text{C}\pm 2^{\circ}\text{C}</math></td> <td>30 MINS</td> </tr> <tr> <td>4</td> <td>ROO TEMP.</td> <td>10 --- 15 MIN</td> </tr> </tbody> </table>	STEP	TEMPERATURE	TIME	1	$-55^{\circ}\text{C}\pm 3^{\circ}\text{C}$	30 MINS	2	ROOM TEMP.	10 --- 15 MIN	3	$+155^{\circ}\text{C}\pm 2^{\circ}\text{C}$	30 MINS	4	ROO TEMP.	10 --- 15 MIN
STEP	TEMPERATURE	TIME																
1	$-55^{\circ}\text{C}\pm 3^{\circ}\text{C}$	30 MINS																
2	ROOM TEMP.	10 --- 15 MIN																
3	$+155^{\circ}\text{C}\pm 2^{\circ}\text{C}$	30 MINS																
4	ROO TEMP.	10 --- 15 MIN																
Soldering heat	Resistance change rate is: $\pm(1\%+0.005\Omega)$ Max		4.18 Dip the resistor into a solder bath having a temperature of $260^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and hold it for $10\pm 1$ seconds.															
Load life in humidity	$\pm 1\%$	$\pm(1.0\%+0.005\Omega)$ 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 $40^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and 90 to 95% relative humidity.															
	$\pm 5\%$	$\pm(3.0\%+0.005\Omega)$ Max.																
Load life	$\pm 1\%$	$\pm(1.0\%+0.005\Omega)$ 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 $70^{\circ}\text{C}\pm 2^{\circ}\text{C}$ ambient.															
	$\pm 5\%$	$\pm(3.0\%+0.005\Omega)$ Max.																

### 8.0 Explanation of Part No. System:

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

**8.1** 1<sup>st</sup> ~4<sup>th</sup> : Product series name

Example: CS02、CS03、CS05、CS06、CS07、CS10、CS11、CS12

**8.2** 5<sup>th</sup>~6<sup>th</sup>:

**8.2.01** Power rating.

W=Normal Size; S=Small Size; U=Extra Small Size;

"1"~"G" to denotes "1"~"16" as Hexadecimal: 1/16W~ 1W:

Wattage	1/2	1/3	1/4	1/5	1/6	3/4	1/8	1/10	1/16	1
Normal Size	W2	W3	W4	W5	W6	/	W8	WA	WG	1W
Small Size	S2	S3	S4	S5	S6	07	S8	SA	SG	1S

**8.2.02** For power rating less than 1 watt (contain), the 5<sup>th</sup> digit will be the letters "W" or "S" to represent the size required & the 6<sup>th</sup> digit will be a number or a letter code.

Example: WA=1/10W; S4=1/4W-S

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### 8.3 7<sup>th</sup>: Resistance Tolerance.

F=±1%      G=±2%      J=±5%      K= ±10%

### 8.4 8<sup>th</sup>~11<sup>th</sup>: Resistance Value.

**8.4.01** For the standard resistance values of E-24 series, the 8<sup>th</sup> 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; For the standard resistance values of E-96 series, the 8<sup>th</sup> digit to the 10<sup>th</sup> digits is to denote the significant figures of the resistance and the 11<sup>th</sup> digit is the zeros following.

### 8.4.02 Power of ten in the 11<sup>th</sup> digit:

J=10<sup>-1</sup>      K=10<sup>-2</sup>      L=10<sup>-3</sup>      M=10<sup>-4</sup>

### 8.5 12<sup>th</sup>~14<sup>th</sup> digits.

#### 8.5.01 12<sup>th</sup>: Packaging Type

C=Bulk in (Chip Product)      T=Tape/Reel

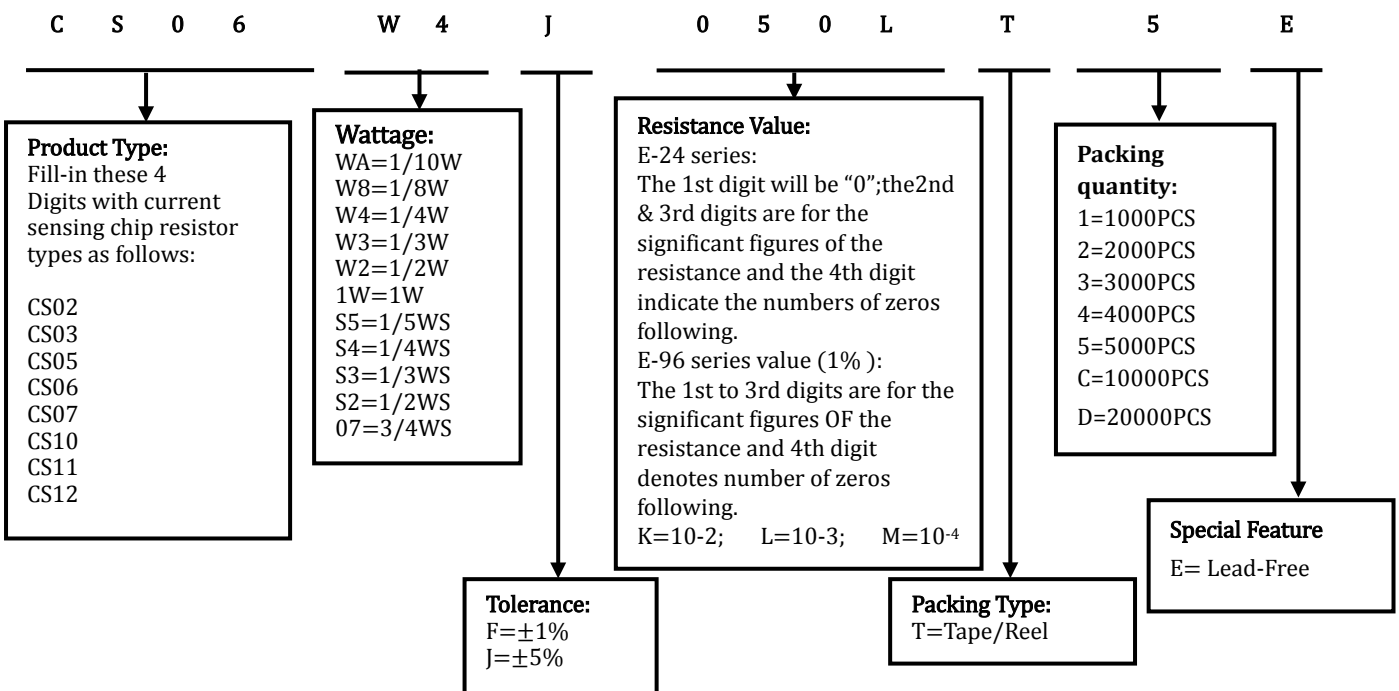
#### 8.5.02 13<sup>th</sup>: Packing Quantity

Packing quantities code:  
 5=5000pcs C=10000pcs D=20000pcs  
 Chip Product: BD=B/B-20000pcs TC=T/R-10000pcs

#### 8.5.03 14<sup>th</sup>: Special features of additional information with the following codes:

E: Environmental Protection, Lead Free type.

## 9.0 Ordering Procedure: ( Example: CS06 1/4W ±5% 50mΩ T/R-5000 )



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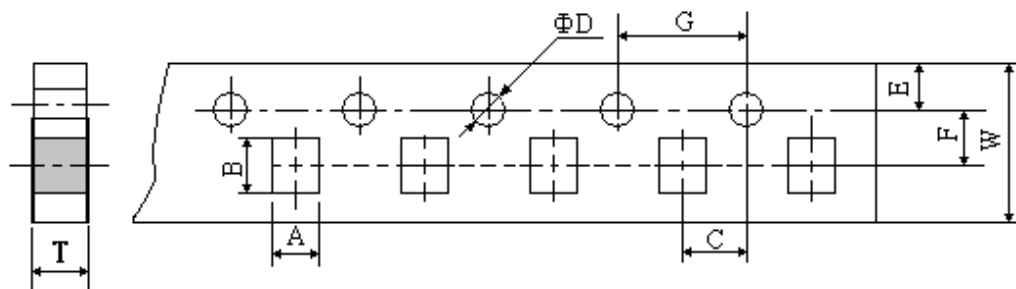
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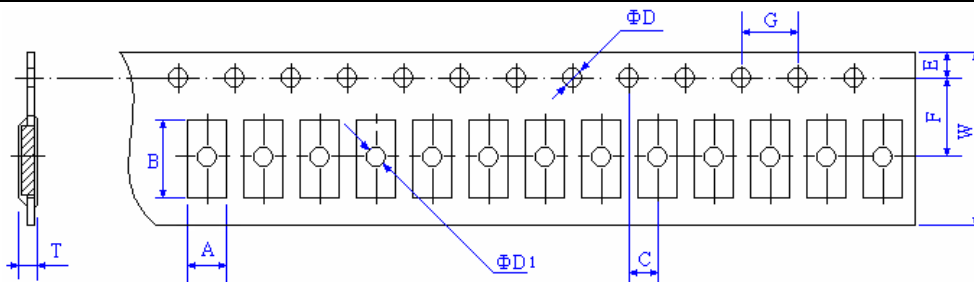
10.0 Packaging:

10.1 Tapping Dimension:



UNIT: mm

TYPE	A±0.2	B±0.2	C±0.05	φD+0.1	E±0.1	F±0.05	G±0.1	W±0.2	T±0.10
CS02 (0402)	0.65	1.15	2.00	1.50	1.75	3.50	4.00	8.00	0.45
CS03 (0603)	1.10	1.90	2.00	1.50	1.75	3.5	4.00	8.0	0.67
CS05 (0805)	1.65	2.40	2.00	1.50	1.75	3.5	4.00	8.0	0.81
CS06 (1206)	2.00	3.60	2.00	1.50	1.75	3.5	4.00	8.0	0.81
CS07 (1210)	2.80	3.50	2.00	1.50	1.75	3.5	4.00	8.0	0.75
CS10 (2010)	2.80	5.40	2.00	1.50	1.75	5.5	4.00	12.0	0.75



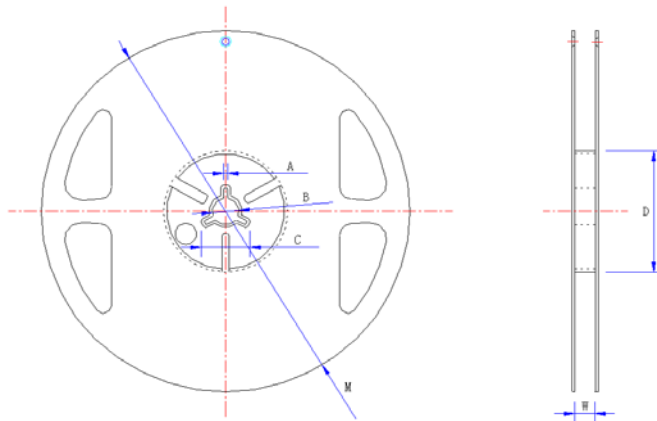
UNIT: mm

TYPE	A±0.2	B±0.2	C±0.05	φD+ 0.1	φD1+0.25	E±0.1	F±0.05	G±0.1	W±0.2	T±0.10
CS11 (1812)	3.50	4.80	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
CS12 (2512)	3.50	6.70	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00

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10.2 Dimension:



Unit: mm

TYPE	TAPING	SIZE	A±0.5	B±0.5	C±0.5	D±1	M±2	W±1
CS02 (0402)	Paper	10000pcs reel	2.0	13.0	21.0	60.0	178.0	10.0
CS03 (0603)	Paper	5000pcs reel	2.0	13.0	21.0	60.0	178.0	10.0
CS05 (0805)	Paper	5000pcs reel	2.0	13.0	21.0	60.0	178.0	10.0
CS06 (1206)	Paper	5000pcs reel	2.0	13.0	21.0	60.0	178.0	10.0
CS07 (1210)	Paper	5000pcs reel	2.0	13.0	21.0	60.0	178.0	10.0
CS10 (2010)	Paper or Embossed	4,000pcs reel	2.0	13.0	21.0	60.0	178	13.8
CS11 (1812)	Embossed	4,000pcs reel	2.0	13.0	21.0	60.0	178.0	13.8
CS12 (2512)	Embossed	4,000pcs reel	2.0	13.0	21.0	60.0	178	13.8

11.0 Precaution for storage/Transportation:

11.1 UNIOHM recommend the storage condition temperature: 15°C~35°C, humidity :25%~75%.

(Put condition for individual product)

Even under UNIOHM 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:

11.3.01 In high electrostatic;

11.3.02 In direct sunshine, rain, snow or condensation;

11.3.03 Exposed to sea winds or corrosive gases, including Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>.

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