厚 聲 電 子 工 業 有 限 公 司

UNIROYAL ELECTRONICS INDUSTRY CO., LTD.

ISO14001 ISO/TS16949 244546 245468 REG.-Nr.A759 CQC34001010658

UniOhm U Need it!

Specification for Approval

Customer : 深圳市碧綠天科技有限公司

Product Name: CURRENT SENSING CHIP RESISTORS

Part Name : CS SERIES

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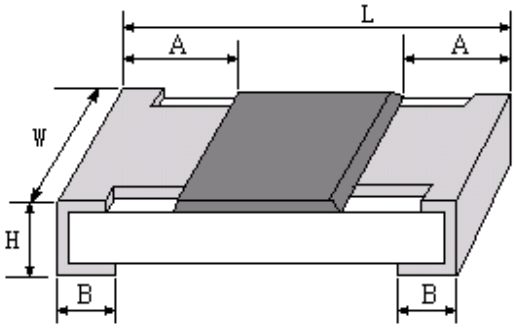
Content

File Name: CS SERIES		Date	2016/03/24	Edition No.	1
Amendment Record				Signature	
Edition	Description	Page	Date	Amended by	Checked by

1 Scope:

This file is specification for approve **Current Sensing Chip Resistors** manufactured by UNIOHM.

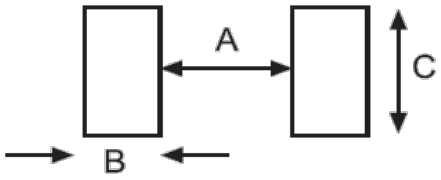
2 Ratings & dimension:



unit: mm

Type		CS02 (0402)	CS03 (0603)	CS05 (0805)	CS06 (1206)	CS07 (1210)	CS10 (2010)	CS11 (1812)	CS12 (2512)
Power Rating 70℃		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	$1.25^{+0.15}_{-0.10}$	$1.55^{+0.15}_{-0.10}$	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℃							

2.1 Welding plate size recommend

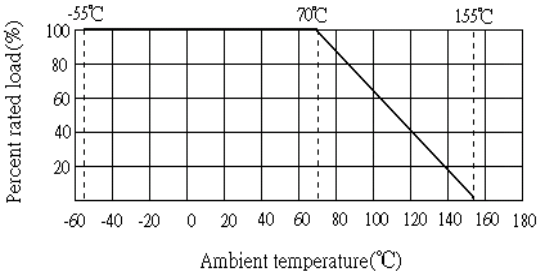


規格	A	B	C
CS02（0402）	0.40	0.60	0.50
CS03（0603）	0.80	1.00	0.90
CS05（0805）	1.00	1.00	1.40
CS06（1206）	2.00	1.20	2.00

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 Power rating

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 derate as shown in figure 1



4 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:

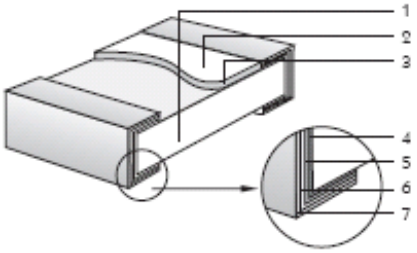
$$RCWV = \sqrt{P \times R}$$

RCWV: Rated 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.

5 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



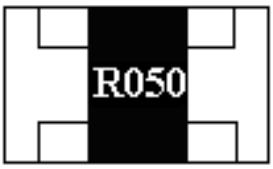
6 Marking:

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

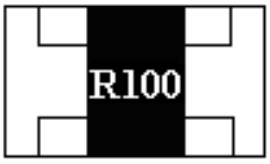
6.2 Above (contain) 100mΩ product: 3 digits, the first digit is "R", which as decimal point, the 2nd & 3rd digits are significant.

R10→ 100mΩ

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

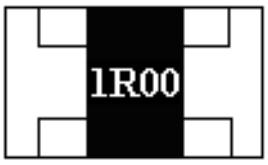


R050→50mΩ



R100→ 100mΩ

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



1R00→ 1Ω

7 Performance specification:

Characteristic	Limits		Test Method (JIS-C-5201 & JIS-C-5202)
Temperature Coefficient	CS02 (0402)	50mΩ~0.1Ω :≤±700 PPM/℃ 0.11Ω~1Ω : ≤±200PPM/℃	4.8 Natural resistance changes per temp. Degree centigrade $\frac{R_2 - R_1}{R_1(T_2 - T_1)} * 10^6 (PPM/℃)$ R_1: resistance value at room temp. (T_1) R_2: resistance value at room temp. +100℃ (Tt_2) Test pattern: room temp. (T_1), room temp. +100℃(T_2)
	CS03 (0603)	20mΩ~ 29.9mΩ : ≤±800PPM/℃ 30mΩ~32.9mΩ : ≤ ±600PPM/℃ 33mΩ~50mΩ : ≤±400PPM/℃ 50.1mΩ~0.1Ω: ≤±300PPM/℃ 0.11Ω~1Ω : ≤±200 PPM/℃	
	CS05 (0805)	10mΩ~15mΩ: ≤±800PPM/℃ 15.1mΩ~25mΩ: ≤±600PPM/℃ 25.1mΩ~50m Ω: ≤±400PPM/℃ 50.1mΩ~0.2Ω : ≤±200 PPM/℃ 0.21Ω~1Ω : ≤ ±100PPM/℃	
	CS06 (1206)	10mΩ~14.9mΩ: ≤±700PPM/℃ 15mΩ~30mΩ:≤±400PPM/℃ 30.1mΩ~50mΩ : ≤±300 PPM/℃ 50.1mΩ~0.1Ω : ≤±200 PPM/℃ 0.11Ω~1Ω : ≤ ±150PPM/℃	

	CS07 （1210）	10mΩ~14.9mΩ: ≤±500PPM/℃ 15mΩ~19.9mΩ:≤±400PPM/℃ 20mΩ~50mΩ:≤±300PPM/℃ 50.1mΩ~1Ω : ≤±100PPM/	
	CS10 （2010）	10mΩ~14.9mΩ : ≤±600PPM/℃ 15mΩ~19.9mΩ : ≤±500PPM/℃ 20mΩ~30mΩ : ≤±300PPM/℃ 30.1mΩ~50mΩ : ≤±200PPM/℃ 50.1mΩ~0.1Ω : ≤±150PPM/℃ 0.11mΩ~1Ω : ≤±100PPM/℃	
	CS11 （1812）	10mΩ~19.9mΩ: ≤±500PPM/℃ 20mΩ~49.9mΩ:≤±400PPM/℃ 50mΩ~0.1Ω : ≤±200 PPM/℃ 0.11Ω~1Ω : ≤ ±100PPM/℃	
	CS12 （2512）	10mΩ~14.9mΩ : ≤ ±600PPM/℃ 15mΩ~19.9mΩ : ≤ ±400PPM/℃ 20mΩ~30mΩ : ≤ ±300PPM/℃ 30.1mΩ~50mΩ : ≤±200PPM/℃ 50.1mΩ~0.1Ω : ≤±150PPM/℃ 0.11Ω~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: Y/X = 3/90 mm for 60Seconds
Solderability	95% coverage Min.		Wave solder: 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°Cmetallic 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	±(1.0%+0.005 Ω)Max		4.19Resistance change after continuous five cycles for duty cycle specified below:

STEP	TEMPERATURE	TIME
1	-55℃±3℃	30 MIN
2	ROOM TEMP.	10 --- 15 MIN
3	+155℃±2℃	30 MIN
4	ROO TEMP.	10 --- 15 MIN

Soldering heat	Resistance change rate is: ±(1%+0.005Ω) Max		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

	±5%	±(3.0%+0.005Ω) Max.	operating at RCWV with duty cycle 1.5 hours "ON", 0.5 hour "OFF" at 70℃±2℃ ambient.

8 Part No. System:

Part No. System has 14 codes.

8.1 1st ~4th : Product series name

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

8.2 5th~6th:

8.2.1 Power rating.

W:Normal Size; S:Small Size; U: Ultra-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

8.2.2 If power rating is lower than 1 watt (contain), 5th code would be "W", "S" or "U", and 6th code would be a number or a letter.

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

8.3 7th: Resistance Tolerance.

F:±1% G:±2% J:±5% K: ±10%

8.4 8th~11th: Resistance Value.

8.4.1 If resistance value belongs to E-24 series: 8th code must be "0", 9th~10th codes would be numbers which mean significant figures of the resistance, and 11th code is the number or letter which means power of ten;

8.4.2 If resistance value belongs to E-96 series: 8th~10th codes would be numbers which meaning mentioned above, and 11th code is the number mentioned above too.

8.4.3 We use the number or letter in the 11th digit, meaning shows as below:

J: 10^{-1} K: 10^{-2} L: 10^{-3} M: 10^{-4}

8.5 12th~14th digits.

8.5.1 12th: Packaging Type. Example: C: Bulk/Box T: Tape/Reel

8.5.2 13th: Packing Quantity

5:5000pcs C: 10000pcs D: 20000pcs

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

8.5.3 14th: Special features of additional information with the following codes:

E: Environmental Protection, Lead Free type.

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

C S 0 6 | W 4 | J | 0 5 0 L | T | 5 | E

Product Type:
Fill-in these 4 Digits with current sensing chip resistor types as follows:

CS02
CS03
CS05
CS06
CS07
CS10
CS11
CS12

Wattage:
WA: 1/10W
W8: 1/8W
W4: 1/4W
W3: 1/3W
W2: 1/2W
1W: 1W
S5: 1/5WS
S4: 1/4WS
S3: 1/3WS
S2: 1/2WS
07: 3/4WS

Tolerance:
F=±1%
J=±5%

Resistance Value:
E-24 series:
The 1st digit will be "0";the2nd & 3rd digits are for the significant figures of the resistance and the 4th digit indicate the numbers of zeros following.
E-96 series value (1%):
The 1st to 3rd digits are for the significant figures OF the resistance and 4th digit denotes number of zeros following.
K:10-2; L:10-3; M:10-4

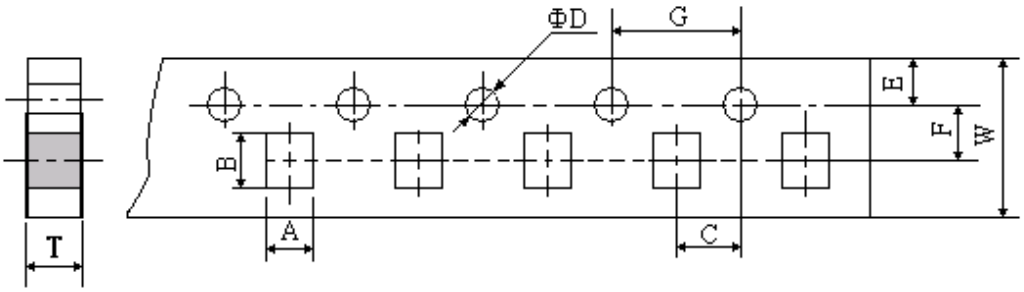
Packing Type:
T=Tape/Reel

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

Special Feature
E= Lead-Free

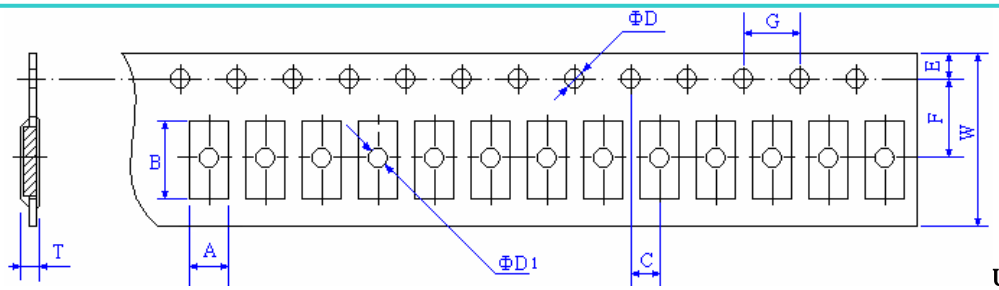
10 Packaging:

10.1 Tapping dimension:



UNIT: mm

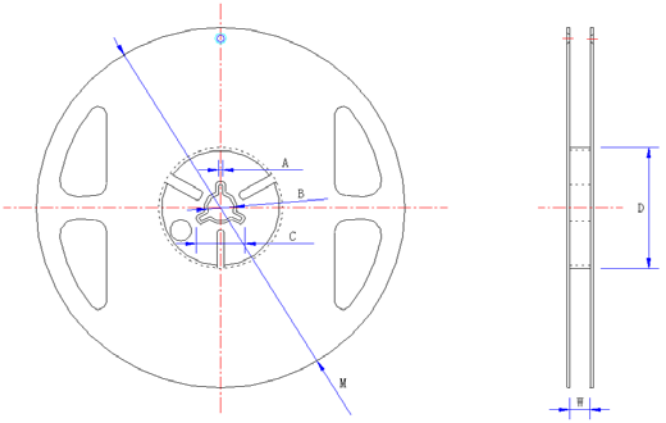
TYPE	A ± 0.2	B ± 0.2	C ± 0.05	ϕD+0.1	E ± 0.1	F ± 0.05	G ± 0.1	W ± 0.2	T±0.10
CS02（0402）	0.65	1.15	2.00	1.50	1.75	3.50	4.00	8.00	0.45
CS03（0603）	1.10	1.90	2.00	1.50	1.75	3.5	4.00	8.0	0.67
CS05（0805）	1.65	2.40	2.00	1.50	1.75	3.5	4.00	8.0	0.81
CS06（1206）	2.00	3.60	2.00	1.50	1.75	3.5	4.00	8.0	0.81
CS07（1210）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

10.2 Reel 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	178.0	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	178.0	13.8

11 Note:

11.1 UNIOHM recommend the storage condition temperature: 15℃~35℃, 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:

11.3.1 In high electrostatic;

11.3.2 In direct sunshine, rain, snow or condensation;

11.3.3 Exposed to sea winds or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, or NO_2.