香 港 電 阻 製 造 廠

香港柴灣安業街十二號長益工業大廈 **10** 字樓 **A** 座

HONG KONG RESISTORS MANUFACTORY

(wholly owned by Hong Kong Resistors Manufactory International Ltd.)

AN ISO 9001:2015 CERTIFIED MANUFACTURER

AN ISO 45001 : 2018 MANUFACTURER

AN ISO 14001 : 2015 MANUFACTURER

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國內工廠一: 東莞溢輝電子有限公司

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國內工廠二: 恆輝電阻(益陽)有限公司

地址：湖南省益陽市資陽區長春工業園五福路

Tel.: (86 737) 3800 399 Fax.: (86 737) 3800 199

DATA SHEET

Name of Product : Current Sensing Metal Chip Resistors - CSM Series

Sales Executive :_____ Date: _____

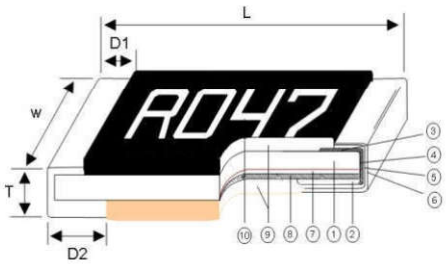
製造 Prepared by	檢驗 Inspected by	審核 Audited by	核准 Authorized by
客戶 customer approval	客戶 customer approval	客戶 customer approval	客戶 customer approval

Current Sensing Metal Chip Resistors
(CSM Series)

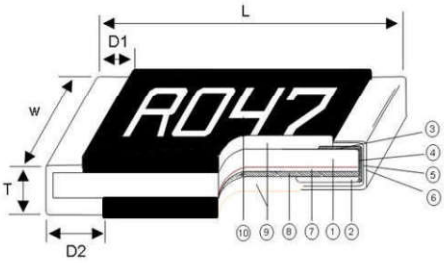


■ Construction

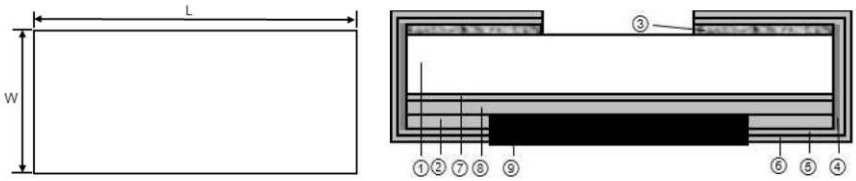
For Standard Power



For High Power (0603-1206)



For High Power (0402)



①	Alumina Substrate	⑤	Barrier Layer	⑨	Primary Overcoat
②	Bottom Electrode	⑥	External Electrode	⑩	Marking
③	Top Electrode	⑦	Adhesive		
④	Edge Electrode	⑧	Resistor Layer		

■ Features

- SMD Type designed for automatic insertion (CSM02：The soldering side has a black mark on the product surface .)
- High power rating in small size
- Low resistance resistor for current detection
- Metal foil construction ensures high reliability and performance with very low and stable TCR
- Designed for current sense circuits in power electronic systems
- Pb-Free to meet RoHS requirements

■ Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor

■ Dimensions

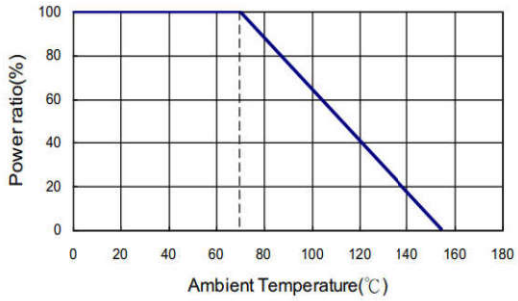
Type	Size (Inch)	Resistance Range (mΩ)	L	W	T	D1	D2
CSM02	0402	10 - 50	1.05±0.10	0.55±0.10	0.45±0.10	-	0.27±0.10
CSM03	0603	10 - 29	1.55±0.10	0.85±0.10	0.40±0.10	0.30±0.15	0.45±0.15
		30 - 100	1.55±0.10	0.85±0.10	0.40±0.10	0.30±0.15	0.35±0.15
		10 – 100 (1/2W)	1.70±0.15	1.00±0.15	0.62±0.15	0.35±0.25	0.35±0.25
CSM05	0805	10 - 29	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.50±0.20
		30 - 100	2.00±0.15	1.25±0.15	0.52±0.10	0.30±0.20	0.35±0.20
		10 – 100 (3/4W)	2.15±0.15	1.40±0.15	0.75±0.15	0.40±0.25	0.40±0.25
CSM06	1206	10 - 29	3.05±0.15	1.55±0.15	0.58±0.15	0.50±0.25	0.90±0.25
		30 - 100	3.05±0.15	1.55±0.15	0.55±0.15	0.50±0.25	0.60±0.25
		10 – 100 (1W)	3.20±0.15	1.70±0.15	0.75±0.15	0.50±0.25	0.50±0.25
CSM20	2010	10 - 29	5.00±0.20	2.50±0.20	0.58±0.15	0.60±0.30	1.50±0.30
		30 - 100	5.00±0.20	2.50±0.20	0.55±0.15	0.60±0.30	0.90±0.30
CSM25	2512	10 - 29	6.30±0.20	3.15±0.20	0.58±0.15	0.60±0.30	1.80±0.30
		30 - 100	6.30±0.20	3.15±0.20	0.55±0.15	0.60±0.30	1.20±0.30

Part Numbering

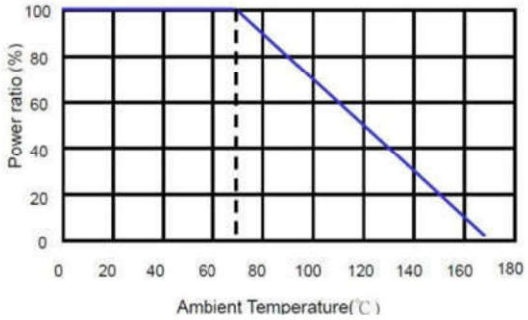
CSM	06	0R01	F	C1	1/2W
Type	Size	Value	Tolerance	TCR	Power
	02 : 0402		D : ±0.5%	C2:±50ppm	1/8W
	03 : 0603		F : ±1%	C1:±100ppm	1/4W
	05 : 0805		G : ±2%		1/2W
	06 :1206		J : ±5%		3/4W
	20 : 2010				1W
	25 : 2512				

Derating Curve

For Standard Power



For High Power



Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)				TCR (PPM/°C)
			±0.5%	±1%	±2%	±5%	
CSM03 (0603)	1/8W	-55 ~ +155°C	-	10 - 19			±100
				20 - 100			±50 ±100
CSM05 (0805)	1/4W		-	10 - 19			±100
			30 - 100	20 - 100			±50 ±100
CSM06 (1206)	1/2W		-	10 - 19			±100
			30 - 100	20 - 100			±50 ±100
CSM20 (2010)	3/4W		-	10 - 19			±100
			30 - 100	20 - 100			±50 ±100
CSM25 (2512)	1W		-	10 - 19			±100
			30 - 100	20 - 100			±50 ±100

High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Overload Current	Resistance Range (mΩ)				TCR (PPM/°C)
				±0.5%	±1%	±2%	±5%	
CSM02 (0402)	1/4W	-55 ~ +170°C	11.2A	30 - 50	10 - 50			±100
CSM03 (0603)	1/2W		15.8A	30 - 100	10 - 100			±100
CSM05 (0805)	3/4W		19.4A	30 - 100	10 - 100			±50
CSM06 (1206)	1W		22.4A	30 - 100	10 - 100			±50

Operating Voltage=$\sqrt{}$(P*R) ; Overload Voltage=2.5*$\sqrt{}$(P*R) ; Operating Current=$\sqrt{}$(P/R)

■HKR is capable of manufacturing the optional spec based on customer's requirement.

■ Environmental Characteristics

For Standard Series

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	**JIS-C-5201-1 4.8** **IEC-60115-1 4.8** -55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(0.5%+0.05Ω)	**JIS-C-5201-1 4.13** **IEC-60115-1 4.13** 5 X Rated Power for 5 seconds
Insulation Resistance	≧10G	**JIS-C-5201-1 4.6** **IEC-60115-1 4.6** Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.05Ω)	**MIL-STD-202 Method 108A** 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 Hrs "OFF"
Damp Heat with Load	±(1.0%+0.05Ω)	**JIS-C-5201-1 4.24** **IEC-60115-1 4.24** 40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Dry Heat	±(0.5%+0.05Ω)	**JIS-C-5201-1 4.23** **IEC-60115-1 4.23.2** at +155 C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	**JIS-C-5201-1 4.33** Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	**JIS-C-5201-1 4.17** **IEC-60115-1 4.17** 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	**JIS-C-5201-1 4.18** **IEC-60115-1 4.18** 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	**JIS-C-5201-1 4.7** **IEC-60115-1 4.7** 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦10%	**JIS-C-5201-1 4.18** **IEC-60068-2-58 8.2.1** 260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	**JIS-C-5201-1 4.19** **IEC-60115-1 4.19** -55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

■Storage Temperature: 15~28°C; Humidity <80%RH

■ Environmental Characteristics

For High Power Rating Series

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	**JIS-C-5201-1 4.8** **IEC-60115-1 4.8** -55°C~+125°C, 25°C is the reference temperature
Short Time Overload	△ R≤±1%R	**JIS-C-5201-1 4.13** **IEC-60115-1 4.13** 5 X Rated Power for 5 seconds
Insulation Resistance	≧1000MΩ	**JIS-C-5201-1 4.6** **IEC-60115-1 4.6** Max. Overload Voltage for 1 minute
Operational Life	△ R≤±1%R	**MIL-STD-202 Method 108** Condition D Steady State T_A=125°C at derated power. Measurement at 24±4 hours after test conclusion
Biased Humidity	△ R≤±1%R	**MIL-STD-202 Method 103** 85°C/85RH., 1000 hrs, apply 10% of operating power (current) or limiting element current whichever is lower
High Temperature Exposure	△ R≤±1%R	**MIL-STD-202 Method 108** at +155°C for 1000 hrs
Temperature Cycling	△ R≤±1%R	**JESD22 Method JA-104** -55°C to +125°C, 1000 cycles
Bending Strength (Board Flex)	△ R≤±1%R	**JIS-C-5201-1 4.33** Bending once for 60 seconds 0402-1206 sizes: 3mm
Solderability	95% min. coverage	**JIS-C-5201-1 4.17** **IEC-60115-1 4.17** 245±5°C for 3 seconds
Resistance to Soldering Heat	△ R≤±1%R	**JIS-C-5201-1 4.18** **IEC-60115-1 4.18** 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	**JIS-C-5201-1 4.7** **IEC-60115-1 4.7** 1.42 times Max. Operating Voltage for 1 minute
Resistance to solvents	Marking Unsmeared	**MIL-STD-202 Method 215** Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	△ R≤±1%R	**MIL-STD-202 Method 213** Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration(D) is 6.
Vibration	△ R≤±1%R	**MIL-STD-202 Method 204** 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	△ R≤±1%R	**AEC-Q200-002** **Human body model** 0402 sizes: 1KV Other sizes: 2KV
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.
Terminal strength	No broken	**AEC-Q200-006** Force of 1.8kg for 60 seconds

RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

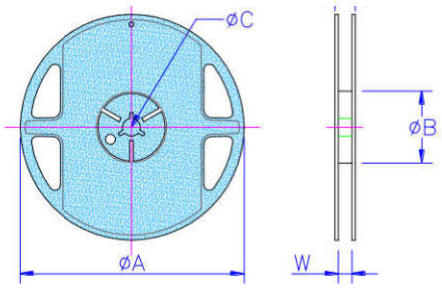
■ Storage Temperature: 15~28°C; Humidity <80%RH

Packaging

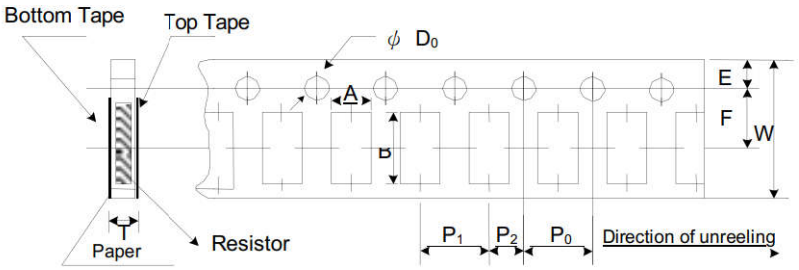
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
CSM02	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	10,000	-
CSM03	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CSM05	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CSM06	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CSM20	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000
CSM25	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000



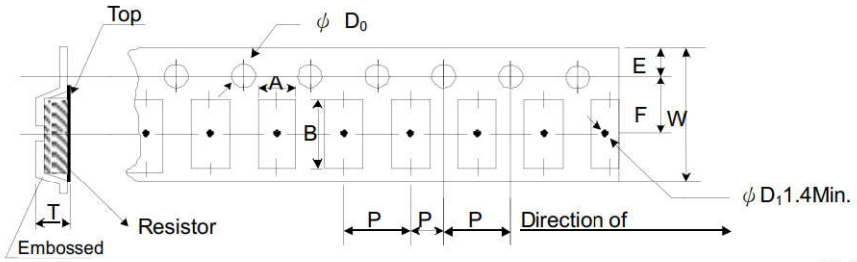
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CSM02 (1/4W)	0.66±0.06	1.18±0.06	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.60±0.06
CSM03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
CSM03 (1/2W)	1.10±0.10	1.85±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.60±0.05
CSM05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CSM05 (3/4W)	1.60±0.10	2.35±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.95±0.05
CSM06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CSM06 (1W)	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.95±0.05

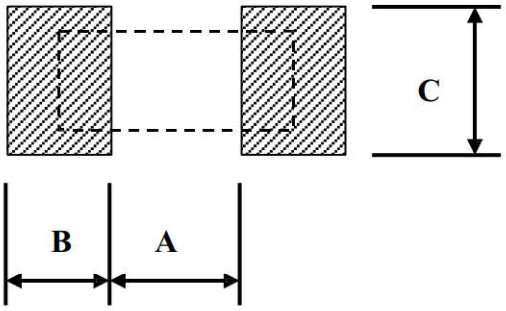
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CSM20	2.80±0.10	5.50±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CSM25	3.50±0.10	6.70±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

■ Recommend Land Pattern



Pad Layout

Type	Resistance Range	A (mm)	B (mm)	C (mm)	t (μm)
CSM02	10-50mΩ	0.50	0.50	0.60	35
CSM03	10-29mΩ	0.40	1.20	0.90	-
	30-100mΩ	0.70	1.05	0.90	-
CSM03(1/2W)	10-100mΩ	0.50	1.00	0.90	35
CSM05	10-29mΩ	0.80	1.10	1.35	-
	30-100mΩ	1.00	1.00	1.35	-
CSM05(3/4W)	10-100mΩ	0.80	1.30	1.30	70
CSM06	10-29mΩ	0.9	1.70	1.70	-
	30-100mΩ	1.50	1.40	1.70	-
CSM06(1W)	10-100mΩ	1.50	1.40	1.70	105
CSM20	10-29mΩ	1.70	2.35	2.50	-
	30-100mΩ	2.80	1.80	2.50	-
CSM25	10-29mΩ	2.30	2.90	3.20	-
	30-100mΩ	3.60	2.25	3.20	-

t：copper toil minimum thickness of PCB

■Marking

No Marking for 0402

For 0603

Type	Code
R10	0.100Ω
R01	0.010Ω
035	0.035Ω

For 0805-2512

Type	Code
R100	0.100Ω
R050	0.050Ω
R010	0.010Ω