

## Current Sensing Chip Resistor (CS Series)

### ■ Features

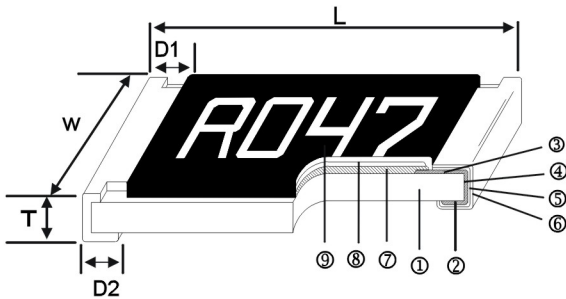
- 3 Watts power rating in 1 Watt size, 1225 package
- Low TCR of  $\pm 100$  PPM/°C
- Resistance values from 1m to 1 ohm
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating

### ■ Applications

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



### ■ Construction



① Alumina Substrate	④ Edge Electrode (NiCr)	⑦ Resistor Layer (Ag/Pd)
② Bottom Electrode (Ag)	⑤ Barrier Layer (Ni)	⑧ Primary Overcoat (Glass)
③ Top Electrode (Ag-Pd)	⑥ External Electrode (Sn)	⑨ Secondary Overcoat (Epoxy)

### ■ Dimensions

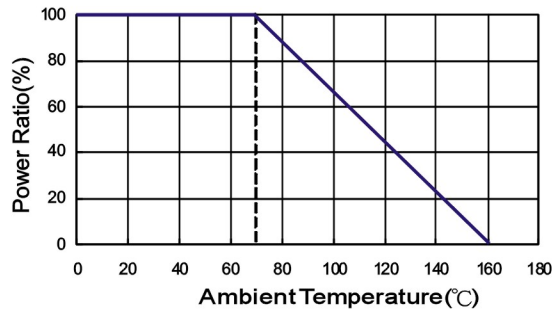
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CS01	0201	0.60±0.03	0.30±0.03	0.23±0.05	0.12±0.05	0.15±0.05	0.18
CS02	0402	1.00±0.05	0.50±0.05	0.32±0.10	0.25±0.10	0.20±0.10	0.7
CS03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.99
CS05	0805	2.00±0.10	1.25±0.10	0.55±0.10	0.30±0.20	0.40±0.25	5.3
CS06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.30	0.40±0.25	8.82
CS13	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.30	0.50±0.25	15.5
CS10	2010	5.00±0.10	2.50±0.15	0.60±0.15	0.60±0.30	0.50±0.25	27.03
CS12	2512	6.35±0.10	3.10±0.15	0.60±0.10	0.60±0.30	0.55±0.25	43.08
CS12 (2W)	2512 (10 - 99mΩ)	6.35±0.20	3.15±0.15	0.74±0.10	0.60±0.30	0.55±0.25	53.08
CS12 (2W)	2512 (100 - 1000mΩ)	6.35±0.20	3.15±0.15	0.74±0.10	0.60±0.30	2.10±0.10	53.08
CS25	1225	3.10±0.15	6.30±0.15	0.90±0.15	0.60±0.30	0.80±0.25	64.88
CS37	3720	2.00±0.20	3.75±0.20	0.60±0.10	0.40±0.20	0.40±0.20	19.96
CS75	7520	2.00±0.20	7.50±0.30	0.60±0.10	0.40±0.20	0.40±0.20	35.71
CS62	0612	1.55±0.10	3.10±0.15	0.55±0.10	0.30±0.15	0.40±0.15	10.19

## Part Numbering

CS	06	F	T	G	U	R100	N
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
CS CSM	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512 25: 1225 37: 3720 75: 7520	F: ±1% G: ±2% J: ±5%	T: Taping Reel B: Bulk	E: ±100 F: ±200 G: ±300 H: ±400 J: ±600 K: ±150 R: ±1000	: Standard S: 2W A: 1.5W T: 1W Q: 3/4W U: 1/2W V: 1/4W W: 1/8W P: 1/5W	R010: 0.01Ω R100: 0.1Ω 1R00: 1Ω	: Standard N: No Marking W: Wide

## Derating Curve



## Standard Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS01 (0201)		1/20W	-55 ~ +155°C	100 - 149			±1000
				150 - 500			±600
				501 - 1000			±300
CS02 (0402)		1/16W		50 - 100			±400
				101 - 500			±300
				501 - 1000			±200
CS03 (0603)		1/10W		20 - 50			±600
				51 - 100			±400
				101 - 500			±300
				501 - 1000			±200
CS05 (0805)		1/8W		20 - 50			±600
				51 - 100			±400
				101 - 196			±300
			200 - 1000			±200	
CS06 (1206)		1/4W	10 - 20			±600	
CS13 (1210)		1/2W	21 - 50			±400	
CS10 (2010)		3/4W	51 - 91			±300	
CS12 (2512)		1W	100 - 1000			±200	
CS25 (1225)		3W	3 - 5			±300	
			6 - 20			±200	
			21 - 30			±150	
			33 - 8000			±100	
CS37 (3720)		1W	10 - 19			±300	
			20 - 500			±150	
CS75 (7520)		2W	—	1 - 4		±300	
			5 - 10			±200	
CS62(0612)		1W	11 - 350			±150	
			10 - 27			±600	
			30 - 91			±300	
100 - 1000			±200				



## High Power & Ultra High Power Rating Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS02 (0402)		1/8W	-55 ~ +155°C	51 - 100			±400 ±300 ±200
CS03 (0603)		1/8W, 1/5W		101 - 500			
CS05 (0805)		1/4W		501 - 1000			
CS06 (1206)		1/2W		10 - 20			±600 ±400 ±300 ±200
CS13 (1210)		3/4W		21 - 50			
CS10 (2010)		1W		51 - 91			
CS12 (2512)		1.5W		100 - 1000			
CS12 (2512)		* 2W					

\* : Ultra High Power

## Low TCR Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS05 (0805)		1/8W	-55 ~ +155°C	100 - 1000			±100
CS06 (1206)		1/4W		100 - 1000			
CS13 (1210)		1/2W		75 - 1000			±100
CS10 (2010)		3/4W		50 - 1000			
CS12 (2512)		1W		20 - 1000			±100
CS12 (2512)		* 2W		50 - 1000			
CS37 (3720)		1W		100 - 500			±100
CS75 (7520)		2W		50 - 350			

\* : UltraHighPower

Operating Voltage= $\sqrt{P \cdot R}$  ; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$  ; Operating Current= $\sqrt{P/R}$

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

## Ultra Low Ohm&TCR

Type	Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (m )			TCR (PPM/°C)
				± 1%	± 2%	± 5%	
CSM03(0603)		1/8W	-55 ~ +155°C	10 - 19			± 100
				20 - 100			± 50 ± 100
				10 - 19			± 100
CSM05(0805)	1/4W	20 - 100			± 50 ± 100		
		10 - 19			± 100		
		20 - 100			± 50 ± 100		
CSM06(1206)	1/2W	10 - 19			± 100		
		20 - 100			± 50 ± 100		
		10 - 19			± 100		
CSM10(2010)	3/4W	20 - 100			± 50 ± 100		
		10 - 19			± 100		
		20 - 100			± 50 ± 100		
CSM12(2512)	1W	10 - 19			± 100		
		20 - 100			± 50 ± 100		

## ■ Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	<b>JIS-C-5201-1 4.8</b> <b>IEC-60115-1 4.8</b> -55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(0.5%+0.05Ω)	<b>JIS-C-5201-1 4.13</b> <b>IEC-60115-1 4.13</b> RCWV*2.5 or Max. overload voltage for 5 seconds
	±(1.0%+0.05Ω) for high power rating	
Insulation Resistance	≥10G	<b>JIS-C-5201-1 4.6</b> <b>IEC-60115-1 4.6</b> Max. overload voltage for 1 minute
Endurance	±(1.0%+0.05Ω)	<b>JIS-C-5201-1 4.25</b> <b>IEC-60115-1 4.25.1</b> 70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(0.5%+0.05Ω)	<b>JIS-C-5201-1 4.24</b> 40±2°C, 90~95% R.H., Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	±(0.5%+0.05Ω)	<b>JIS-C-5201-1 4.23.2</b> <b>IEC-60115-1 2.23.2</b> at +155°C for 1000 hrs
Bending Strength	As Spec.	<b>JIS-C-5201-1 4.33</b> <b>IEC-60115-1 4.33</b> Bending once for 5 seconds with 3mm 2010, 2512 sizes: 2 mm
Solderability	95% min. coverage	<b>JIS-C-5201-1 4.17</b> <b>IEC-60115-1 4.17</b> 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	<b>JIS-C-5201-1 4.18</b> <b>IEC-60115-1 4.18</b> 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	<b>JIS-C-5201-1 4.7</b> <b>IEC-60115-1 4.7</b> 1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤10%	<b>JIS-C-5201-1 4.18</b> <b>IEC-60068-2-58 8.2.1</b> 260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	<b>JIS-C-5201-1 4.19</b> <b>IEC-60115-1 4.19</b> -55°C to +155°C, 5 cycles

■ Storage Temperature: 25±3°C; Humidity < 80%RH