

Data Sheet

Customer:

Product: Current Sensing Chip Resistor – CS Series

Size: 0201/0402/0603/0805/1206/1210/2010/2512
1225/3720/7520/0612

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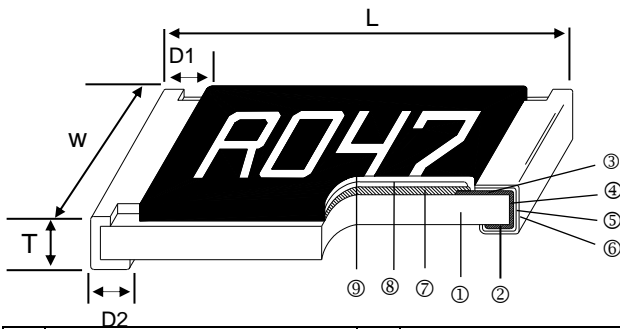
Current Sensing Chip Resistor



■ Features

- 3 Watts power rating in 1 Watt size, 1225 package
- Low TCR of ± 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
- RoHS Compliance

■ Construction



■ Applications

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

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

■ Dimensions

Type	Size (Inch)	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	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
CS06 (1W)	1206 (102 - 1000mΩ)	3.15±0.10	1.60±0.15	0.65±0.10	0.80±0.20	0.80±0.20	12.15
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	3.20±0.15	6.45±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	0.45±0.15	10.19

Part Numbering

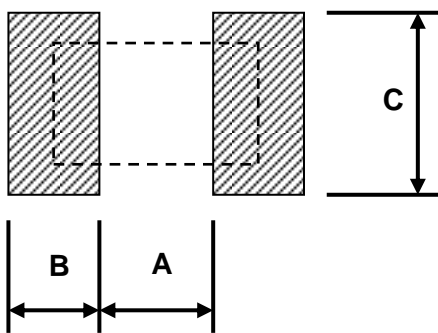
Part Number : CS06FTFR100

Part Number : CS06FTETR200N (CS06 1W No Marking)

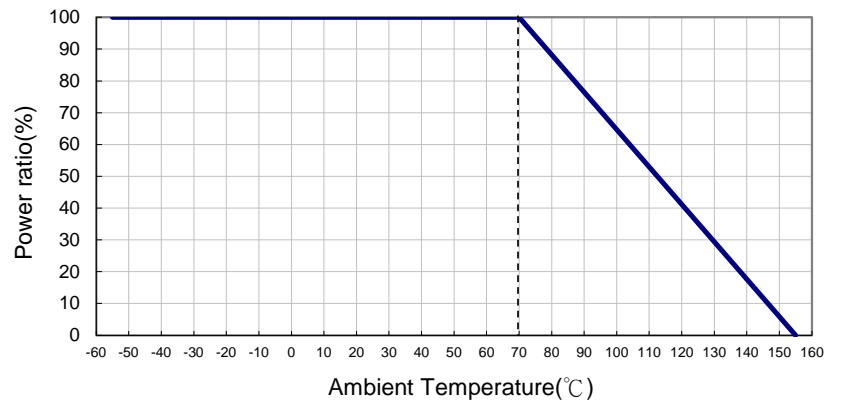
CS	06	F	T	G	U	R100	
Product Type	Dimensions (LxW)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512 25: 1225 37: 3720 75: 7520 62: 0612	F: ±1% G: ±2% J: ±5%	T: Taping Reel B: Bulk	E: ±100 F: ±200 G: ±300 H: ±400 J: ±600 K: ±150 R: ±1000	: Standard* (See Remark) S: 2W A: 1.5W T: 1W Q: 3/4W U: 1/2W V: 1/4W P: 1/5W W: 1/8W	R010: 0.01Ω R100: 0.1Ω 1R00: 1Ω	: Standard N: No Marking

*Remark: Standard part no need for power rating code.

Recommend Land Pattern



Derating Curve



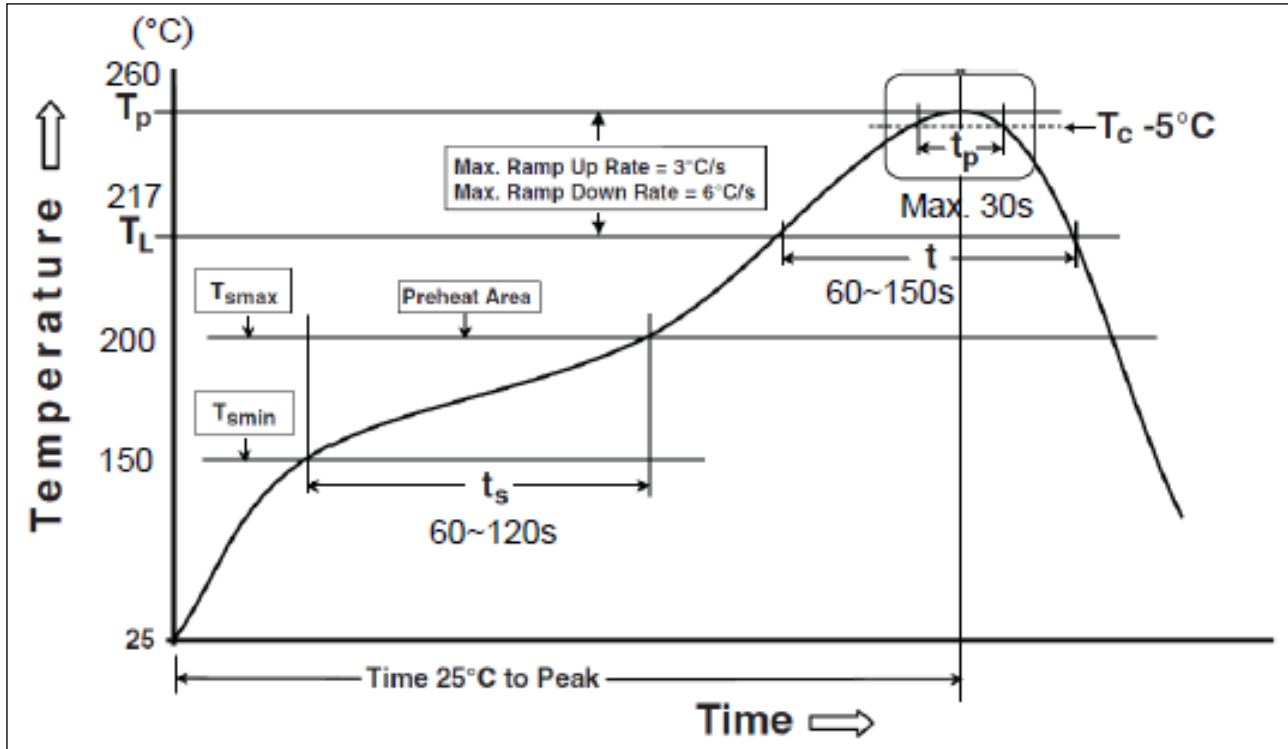
Pad Layout (Except For CS12:Ultra High Power Rating Series)

Type	A (mm)	B (mm)	C (mm)
CS01	0.25	0.30	0.40±0.2
CS02	0.50	0.50	0.60±0.2
CS03	0.80	1.00	0.90±0.2
CS05	1.00	1.00	1.35±0.2
CS06	2.00	1.15	1.70±0.2
CS06 (1W)	0.90	1.70	1.70±0.2
CS13	2.00	1.15	2.50±0.2
CS10	3.60	1.40	2.50±0.2
CS12	4.90	1.60	3.20±0.2
CS25	1.20	2.00	7.00±0.2
CS37	1.00	1.80	3.90±0.2
CS75	1.00	1.80	7.60±0.2
CS62	0.60	1.00	3.20±0.2

Pad Layout (For CS12: Ultra High Power Rating Series)

Type	Resistance Range	A (mm)	B (mm)	C (mm)
CS12	10~99 mΩ	4.9	1.6	3.2±0.2
CS12	100~1000mΩ	1.0	3.55	3.2±0.2

■ Soldering Condition (Ref. IPC/JEDEC J-STD-020 & J-STD-002)



Reflow Profiles	
Profile Feature	Pb-Free Assembly
Preheat Min. Temperature (T _{smin}) Max Temperature (T _{smax}) Preheating time (t _s) from (T _{smin} to T _{smax})	150 °C 200 °C 60-120 seconds
Ramp-up rate (T _L to T _p)	3 °C/second max.
Liquidous temperature (T _L) Time (t _L) maintained above T _L	217 °C 60-150 seconds
Min. Peak temperature (T _p min)	235°C
Max. Peak temperature (T _p max)	260°C
Time (t _p) within 5 °C of the specified classification temperature (T _c)	30 seconds max.
Ramp-down rate (T _p to T _L)	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS01 (0201)	1/20W	-55 ~ +155°C	0.70A	100 - 147 150 - 500 510 - 1000			±1000 ±600 ±300
CS02 (0402)	1/16W	-55 ~ +155°C	1.11A	50 - 100 102 - 500 510 - 1000			±400 ±300 ±200
CS03 (0603)	1/10W	-55 ~ +155°C	2.23A	20 - 50 51 - 100 102 - 300 301 - 1000			±600 ±400 ±300 ±200
CS05 (0805)	1/8W	-55 ~ +155°C	2.50A	20 - 50 51 - 100 102 - 196 200 - 1000			±600 ±400 ±300 ±200
CS06 (1206)	1/4W	-55 ~ +155°C	5.00A	10 - 20			±600 ±400 ±300 ±200
CS13 (1210)	1/2W		7.07A	21 - 50			
CS10 (2010)	3/4W		8.66A	51 - 91			
CS12 (2512)	1W		10.0A	100 - 1000			
CS25 (1225)	3W	-55 ~ +155°C	31.6A	3 - 5 6 - 20 21 - 30 33 - 8000			±300 ±200 ±150 ±100
CS37 (3720)	1W	-55 ~ +155°C	10.0A	10 - 18 20 - 500			±300 ±150
CS75 (7520)	2W	-55 ~ +155°C	44.7A	—	1 - 4		±300
				5 - 10 11 - 350			±200 ±150
CS62 (0612)	1W	-55 ~ +155°C	10.0A	10 - 27 30 - 91 100 - 499 500 - 1000			±600 ±300 ±200 ±100

High Power & Ultra High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS02 (0402)	1/8W	-55 ~ +155°C	1.56A	51 - 100 102 - 500 510 - 1000			±400 ±300 ±200
CS03 (0603)	1/8W 1/5W		1.98A				
CS05 (0805)	1/4W 1/2W		2.21A				
CS06 (1206)	1/2W	-55 ~ +155°C	7.07A	10 - 20 21 - 50 51 - 91 100 - 1000			±600 ±400 ±300 ±200
CS13 (1210)	3/4W		8.66A				
CS10 (2010)	1W		10.0A				
CS12 (2512)	1.5W		12.2A				
CS12 (2512)	*2W		14.1A				
CS06 (1206)	*1W		-55 ~ +155°C				

*: Ultra High Power

■ CS06 1W: double side printed resistor element without marking.

Low TCR Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS05 (0805)	1/8W	-55 ~ +155°C	1.11A	100 - 1000			±100
CS06 (1206)	1/4W		1.58A	100 - 1000			±100
CS13 (1210)	1/2W		2.58A	75 - 1000			±100
CS10 (2010)	3/4W		3.87A	50 - 1000			±100
CS12 (2512)	1W		7.07A	20 - 1000			±100
CS12 (2512)	*2W		6.32A	50 - 1000			±100
CS37 (3720)	1W		3.16A	100 - 500			±100
CS75 (7520)	2W		6.32A	50 - 350			±100

*: Ultra High Power

Operating Current= $\sqrt{P/R}$

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

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	JIS-C-5201-1 4.8 IEC-60115-1 4.8 At 25°C/-55°C and 25°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 RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds CS06 1W: 5*rated power for 5 seconds
	±(1.0%+0.05Ω) For High power rating	
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)	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Damp Heat with Load	±(0.5%+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"
	CS06 1W : ±(1.0%+0.05Ω)	
Dry Heat	±(0.5%+0.05Ω)	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 at +155°C for 1000 hrs
	CS06 1W : ±(1.0%+0.05Ω)	
Bending Strength	±(1.0%+0.05Ω)	JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 60 seconds with 3mm 2010, 2512 sizes: 2mm
Solderability	95% min. coverage	JIS-C-5201-1 4.17 IEC-60115-1 4.17 245±5°C for 3 seconds

Current Sensing Chip Resistor

Item	Requirement	Test Method
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260 \pm 5°C for 10 seconds
	CS06 1W : $\pm(1.0\%+0.05\Omega)$	
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 CS01:50V; CS02:100V; CS03:150V; CS05:300V CS06/13/10/25/37/75/62:400V; CS12:500V
Leaching	Individual leaching area \leq 5% Total leaching area \leq 10%	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260 \pm 5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C to +155°C, 5 cycles
	CS06 1W : $\pm(1.0\%+0.05\Omega)$	

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

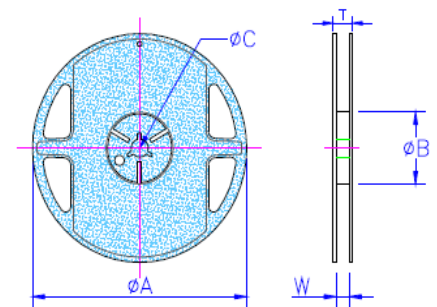
■ **Storage Temperature: 15~28°C; Humidity < 80%RH**

■ **Shelf Life: 2 years from production date.**

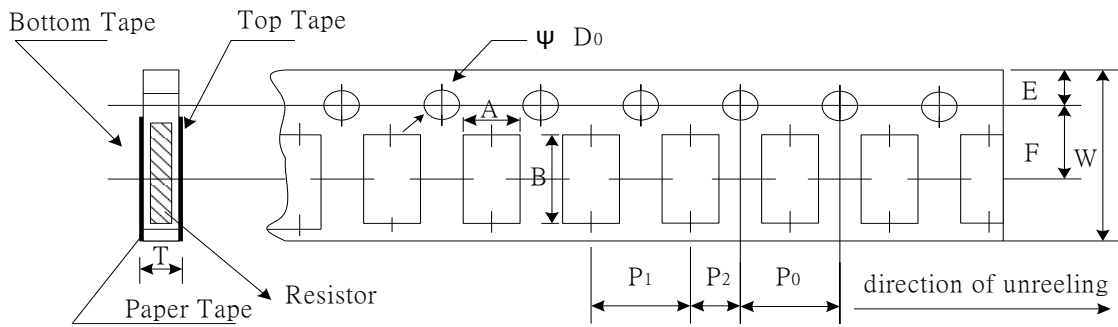
■ Packaging

Packaging Quantity & Reel Specifications

Type	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)	Paper Tape (EA)	Embossed Plastic Tape (EA)
CS01	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	9.5 \pm 0.1	11.5 \pm 1.0	10,000	
CS02	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	9.5 \pm 0.1	11.5 \pm 1.0	10,000	-
CS03	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	9.5 \pm 0.1	11.5 \pm 1.0	5,000	-
CS05	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	9.5 \pm 0.1	11.5 \pm 1.0	5,000	-
CS06	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	9.5 \pm 0.1	11.5 \pm 1.0	5,000	-
CS13	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	9.5 \pm 0.1	11.5 \pm 1.0	5,000	
CS10	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	13.5 \pm 1.0	15.5 \pm 1.0	-	4,000
CS12	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	13.5 \pm 1.0	15.5 \pm 1.0	-	4,000
CS12 (2W)	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	13.5 \pm 1.0	15.5 \pm 1.0	-	2,000
CS25	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	13.5 \pm 1.0	15.5 \pm 1.0	-	2,000
CS37	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	13.5 \pm 1.0	15.5 \pm 1.0	-	2,000
CS75	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	17.5 \pm 1.0	19.5 \pm 1.0	-	2,000
CS62	178.0 \pm 1.0	60.0 \pm 1.0	13.5 \pm 0.7	9.5 \pm 0.1	11.5 \pm 1.0	5,000	-

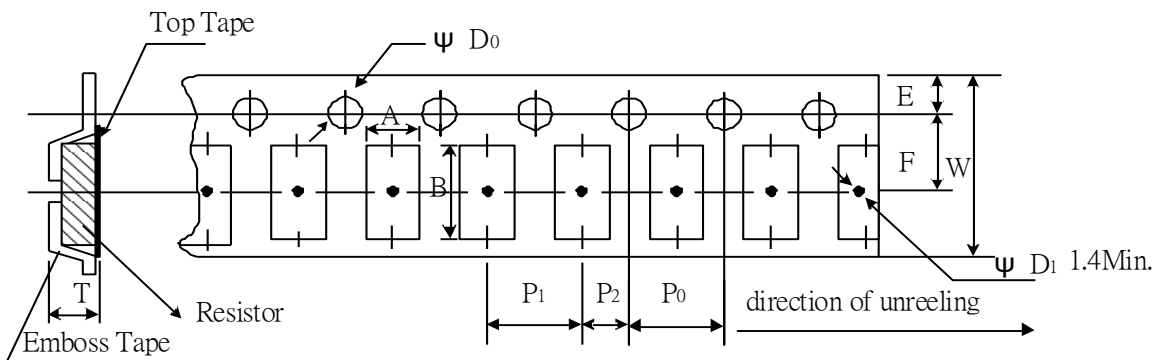


Paper Tape Specifications



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P0 (mm)	P1 (mm)	P2 (mm)	ΦD ₀ (mm)	T (mm)
CS01	0.38±0.05	0.68±0.05	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
CS02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CS03	1.10±0.10	1.90±0.10	8.00±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
CS05	1.60±0.10	2.40±0.20	8.00±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
CS06	1.90±0.10	3.50±0.20	8.00±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
CS13	2.90±0.10	3.50±0.20	8.00±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
CS62	1.90±0.10	3.50±0.20	8.00±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

Emboss Plastic Tape Specifications



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P ₀ (mm)	P ₁ (mm)	P ₂ (mm)	ΦD ₀ (mm)	T (mm)
CS10	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CS12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CS12 (2W)	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.50±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.45±0.20
CS25	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.50±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.45±0.20
CS37	2.50±0.20	4.45±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00 ±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.20 ±0.20
CS75	2.50±0.20	8.30±0.20	16.0±0.30	1.75±0.10	7.80±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.20 ±0.20

■ Marking

No Marking for 0201/0402/1206(1W).

1%, 5% for 0805/1206/1210/2010/2512/1225/3720/7520/0612 : 4 digits marking

Example:

Resistance	47mΩ	75mΩ	15mΩ	750mΩ	820mΩ
Marking	R047	R075	R015	R750	R820

5% for 0603: 3 digits marking in E24

1% for 0603: 3 digits marking with under-line in E96 (non-including E24 series)



3 digits marking for E24 or R value suffix is zero in E96: R10=100mΩ; R28=280mΩ



3 digits marking for E96: 243=243mΩ; 511=511mΩ

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version D1	Jun 03, 2014	-	- Electrical Specifications updated - CS25 Pad Layout updated - Environmental Characteristics updated
Version D2	Apr 30, 2015	-	- Increase Product Size 0612
Version D3	Jul 15, 2016	-	- Remove Material Description - Modify Storage Temperature - CS12 Pad Layout updated - CS62 Resistance Range updated
Version D4	Jan 12, 2018	-	- Modify 1225 Dimension L, W
Version D5	Jul 27, 2018	-	- Increase 1206 1W Ultra High Power Electrical Specifications
Version D6	May 20, 2019	-	- Modify TCR Test description - Electrical Specifications updated
Version D7	Mar 23, 2020	-	- Environmental Characteristics : Added test voltage for Voltage Proof
Version D8	Mar 10, 2021	-	- Modify Bending Test description - Modify 2010 Embossed Plastic Tape B Specification - Modify Soldering Condition (IPC/JEDEC J-STD-020)
Version D9	Nov 15, 2021	-	- Increase the shelf life description
Version E	Dec 21, 2021	-	- Added 0805 1/2W high power production range
Version E1	Feb 15, 2022	-	- Derating Curve changes the temperature range
Version E2	Jun 15, 2022	-	- Modify Soldering Condition