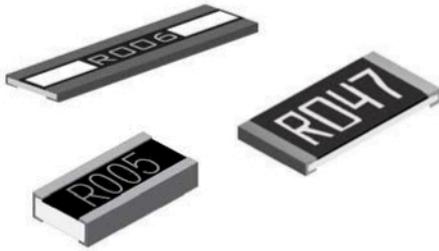
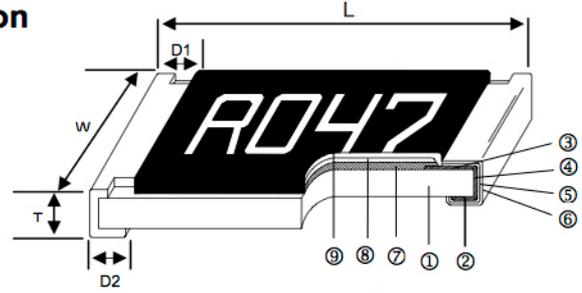


Automotive Grade Current Sensing Chip Resistor – CRS Series



Construction



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

Features

- 3 Watts power rating in 1 Watt size, 1225 package
- Low TCR of ± 100 PPM/ $^{\circ}$ 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
- Portable Devices (PDA, Cell Phone)

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CRS02	0201	0.58 \pm 0.05	0.29 \pm 0.05	0.23 \pm 0.05	0.12 \pm 0.05	0.15 \pm 0.05	0.18
CRS04	0402	1.00 \pm 0.05	0.50 \pm 0.05	0.32 \pm 0.10	0.25 \pm 0.10	0.20 \pm 0.10	0.7
CRS06	0603	1.60 \pm 0.10	0.80 \pm 0.10	0.45 \pm 0.10	0.30 \pm 0.20	0.30 \pm 0.20	1.99
CRS10	0805	2.00 \pm 0.15	1.25 \pm 0.15	0.55 \pm 0.10	0.30 \pm 0.20	0.40 \pm 0.25	5.3
CRS12	1206	3.05 \pm 0.15	1.55 \pm 0.15	0.55 \pm 0.10	0.50 \pm 0.30	0.40 \pm 0.25	8.82
CRS14	1210	3.00 \pm 0.15	2.50 \pm 0.15	0.55 \pm 0.10	0.50 \pm 0.30	0.50 \pm 0.25	15.5
CRS20	2010	5.00 \pm 0.20	2.45 \pm 0.15	0.60 \pm 0.15	0.60 \pm 0.30	0.50 \pm 0.25	27.03
CRS25	2512	6.35 \pm 0.20	3.15 \pm 0.15	0.60 \pm 0.10	0.60 \pm 0.30	0.55 \pm 0.25	43.08
CRS25 (2W)	2512 10 - 99m Ω	6.35 \pm 0.20	3.15 \pm 0.15	0.74 \pm 0.10	0.60 \pm 0.30	0.55 \pm 0.25	53.08
CRS25 (2W)	2512 100 - 1000m Ω	6.35 \pm 0.20	3.15 \pm 0.15	0.74 \pm 0.10	0.60 \pm 0.30	2.10 \pm 0.10	53.08
CRS21	1225	3.10 \pm 0.15	6.30 \pm 0.15	0.90 \pm 0.15	0.60 \pm 0.30	0.55 \pm 0.25	64.88
CRS37	3720	2.00 \pm 0.20	3.75 \pm 0.20	0.60 \pm 0.10	0.40 \pm 0.20	0.40 \pm 0.20	19.96
CRS75	7520	2.00 \pm 0.20	7.50 \pm 0.30	0.60 \pm 0.10	0.40 \pm 0.20	0.40 \pm 0.20	35.71

Part Numbering

CRS	06	F	R100	CT	G	U	A
Product Type	Dimensions	Resistance Tolerance	Resistance	Packaging Code	TCR (PPM/ $^{\circ}$ C)	Power Rating	Automotive Grade
	02: 0201 04: 0402 06: 0603 10: 0805 12: 1206 14: 1210 20: 2010 25: 2512 21: 1225 37: 3720 75: 7520	F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$	R010: 0.01 Ω R100: 0.1 Ω 1R00: 1 Ω	CT = Tape & Reel	: Standard E: ± 100 F: ± 200 G: ± 300 H: ± 400 J: ± 600 K: ± 150 R: ± 1000	: Standard A: 1.5W Q: 3/4W S: 2W T: 1W U: 1/2W V: 1/4W W: 1/8W	

Derating Curve



Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
			±1%	±2%	±5%	
CRS02 (0201)	1/20W	-55 ~ +155°C	100 - 149 150 - 500 501 - 1000			±1000 ±600 ±300
CRS04 (0402)	1/16W		50 - 100 101 - 500 501 - 1000			±400 ±300 ±200
CRS06 (0603)	1/10W		20 - 50 51 - 100 101 - 500 501 - 1000			±600 ±400 ±300 ±200
CRS10 (0805)	1/8W		20 - 50 51 - 100 101 - 500 501 - 1000			±600 ±400 ±300 ±200
CRS12 (1206)	1/4W		10 - 20 21 - 50 51 - 99 100 - 1000			±600 ±400 ±300 ±200
CRS14 (1210)	1/2W					
CRS20 (2010)	3/4W					
CRS25 (2512)	1W					
CRS21 (1225)	3W		3 - 5 6 - 20 21 - 30 31 - 250 251 - 8000			±300 ±200 ±150 ±100 ±200
CRS37 (3720)	1W		10 - 19 20 - 500			±300 ±150
CRS75 (7520)	2W		— 1 - 4			±300
			5 - 10 11 - 350			±200 ±150

High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
			±1%	±2%	±5%	
CRS06 (0603)	1/8W	-55 ~ +155°C	51 - 100 101 - 500 501 - 1000			±400 ±300 ±200
CRS10 (0805)	1/4W					
CRS12 (1206)	1/2W					
CRS14 (1210)	3/4W	-55 ~ +155°C	10 - 20 21 - 50 51 - 99 100 - 1000			±600 ±400 ±300 ±200
CRS20 (2010)	1W					
CRS25 (2512)	1.5W					
CRS25 (2512)	2W					

Low TCR Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
			±1%	±2%	±5%	
CRS12 (1206)	1/4W	-55 ~ +155°C	100 - 1000			±100
CRS14 (1210)	1/2W		100 - 1000			±100
CRS20 (2010)	3/4W		100 - 1000			±100
CRS25 (2512)	1W		20 - 1000			±100
CRS37 (3720)	1W		100 - 500			±100
CRS75 (7520)	2W		50 - 350			±100

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

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

Marking for 0603

Codes	Type
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
<u>101</u>	0.101Ω
<u>035</u>	0.035Ω

■ Environmental Characteristics

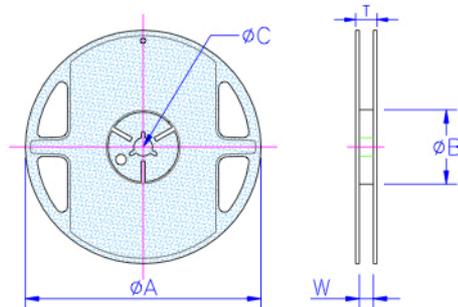
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+25/+125/+25°C
Short Time Overload	±0.5%	RCWV*2.5 or Max. overload voltage for 5 seconds
	ΔR±1% for high power rating	
Insulation Resistance	>1000MΩ	Apply 100V _{DC} for 1 minute
Endurance	±1%	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±0.5%	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%	at +155°C for 1000 hrs
Bending Strength	As Spec.	Bending amplitude 3mm for 10 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±0.5%	260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type	Apply Max. Overload Voltage for 1 minute
Thermal Shock	±0.5%	-55°C ~150°C, 100 cycles
Low Temperature Operation	±0.5%	1 hour, -65°C followed by 45 minutes of RCWV

■ Reference Standards: MIL-STD-202, JIS-C 5201-1

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

■ Packaging

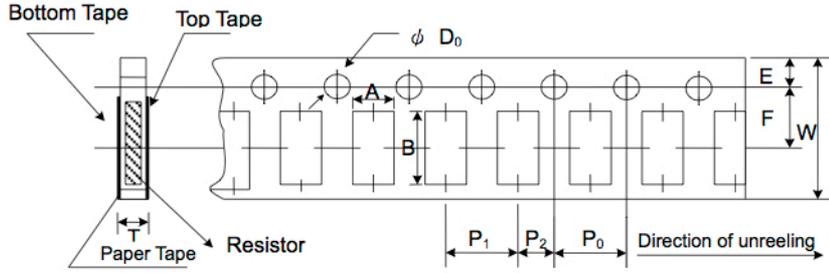
Packaging Quantity & Reel Specifications



Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
CRS02	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	10,000	-
CRS04	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	10,000	-
CRS06	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
CRS10	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
CRS12	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
CRS14	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
CRS20	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
CRS25	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
CRS25 (2W)	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CRS21	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CRS37	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CRS75	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	17.5 ± 1.0	19.5 ± 1.0	-	2,000

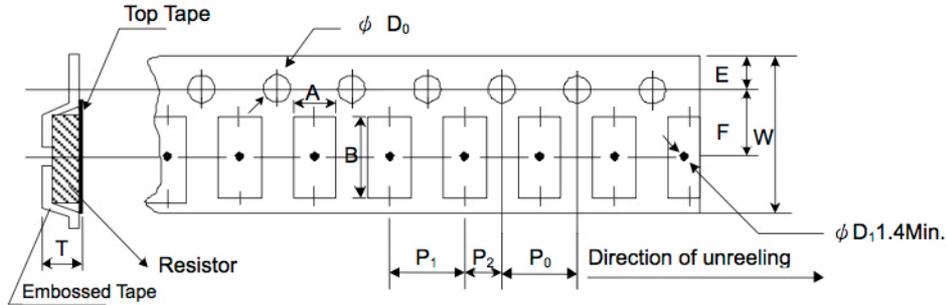
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRS02	0.38±0.05	0.68±0.05	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
CRS04	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CRS06	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
CRS10	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
CRS12	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
CRS14	2.80±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

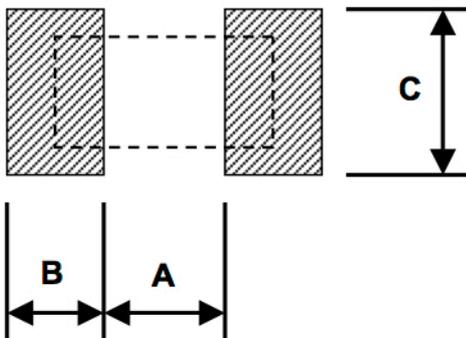
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRS14	2.85±0.10	5.45±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
CRS25	3.40±0.10	6.65±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
CRS25 (2W)	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.45±0.20
CRS21	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.45±0.20
CRS37	2.50±0.20	4.45±0.20	12.0±0.30	1.75±0.10	5.5±0.05	4.00 ±0.05	4.00±0.10	2.00±0.05	1.50+0.20	1.20±0.20
CRS75	2.50±0.20	8.30±0.20	16.0±0.30	1.75±0.10	7.8±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.20	1.20±0.20

Recommend Land Pattern



Pad Layout (Except For CRS25: High Power Rating Series)

Unit: mm

Type	A	B	C
CRS02	0.25	0.30	0.40±0.2
CRS04	0.50	0.50	0.60±0.2
CRS06	0.80	1.00	0.90±0.2
CRS10	1.00	1.00	1.35±0.2
CRS12	2.00	1.15	1.70±0.2
CRS14	2.00	1.15	2.50±0.2
CRS20	3.60	1.40	2.50±0.2
CRS25	4.90	1.60	3.10±0.2
CRS21	2.00	2.00	6.40±0.2
CRS37	1.00	1.80	3.90±0.2
CRS75	1.00	1.80	7.60±0.2

Pad Layout (For CRS25: High Power Rating Series)

Unit: mm

Type	Resistance Range	A	B	C
CRS25	10 - 99mΩ	4.9	1.6	3.1±0.2
CRS25	100 - 1000mΩ	1.0	3.55	3.1±0.2