

AUTO GRADE CURRENT SENSING CHIP RESISTOR

- CRS SERIES -

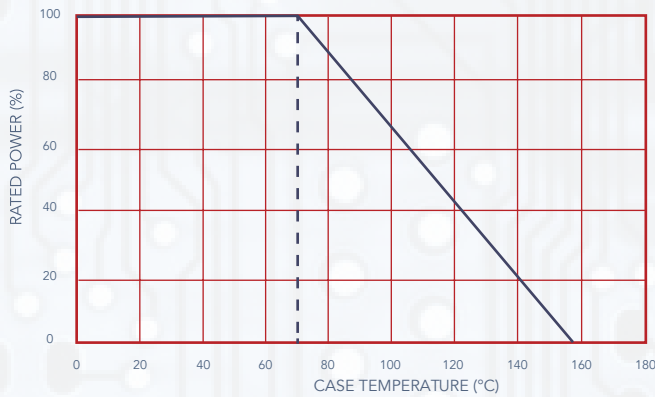
FEATURES

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

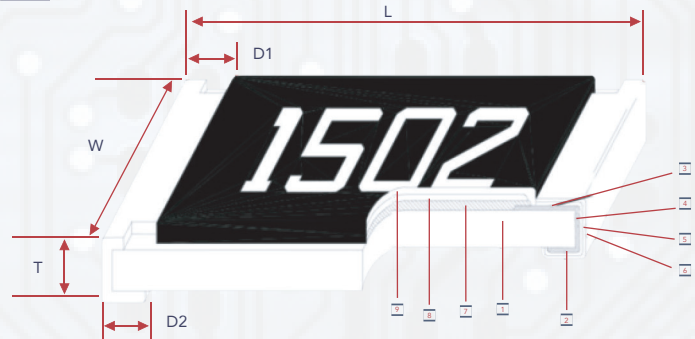
APPLICATIONS

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

DERATING CURVE



CONSTRUCTION



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

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	0.50 \pm 0.30	0.40 \pm 0.25	5.3
CRS12	1206	3.05 \pm 0.15	1.55 \pm 0.15				8.82
CRS14	1210	3.00 \pm 0.15	2.50 \pm 0.15	0.60 \pm 0.15	0.60 \pm 0.30	0.50 \pm 0.25	15.5
CRS20	2010	5.00 \pm 0.20	2.45 \pm 0.15				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			0.74 \pm 0.10			53.08
CRS25 (2W)	2512 100-1000m Ω						2.10 \pm 0.10
CRS21	1225	3.10 \pm 0.15	6.30 \pm 0.15	0.90 \pm 0.15		0.55 \pm 0.25	64.88
CRS37	3720		3.75 \pm 0.20	0.60 \pm 0.10	0.40 \pm 0.20	0.40 \pm 0.20	19.96
CRS75	7520		7.50 \pm 0.30				35.71

PART NUMBERING

CRS	12	F	R100	CT	G	U	A
TYPE	DIMENSIONS	RESISTANCE TOLERANCE	RESISTANCE	PACKAGING TYPE	TCR (PPM/ $^{\circ}$ C)	POWER RATING	AUTOMOTIVE GRADE
CRS SERIES	02: 0201 04: 0402 06: 0603 10: 0805 12: 1206 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: Taping & Reel	: STANDARD E: ± 100 F: ± 200 G: ± 300 H: ± 400 J: ± 600 K: ± 150 R: ± 1000	: STANDARD A: 1.5W Q: 3/4W R: 3W S: 2W T: 1W U: 1/2W V: 1/4W W: ± 1000	



STANDARD ELECTRICAL SPECIFICATIONS

TYPE	ITEM	POWER RATING AT 70°C	OPERATING TEMP RANGE	RESISTANCE RANGE (mΩ)			T.C.R. (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					
CRS12	1206	1/4W					
CRS14	1210	1/2W		10 - 20 21 - 50 51 - 99 100 - 1000			
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)			T.C.R. (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		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)			T.C.R. (PPM / °C)
				±1%	±2%	±5%	
CRS12	1206	1/4W	-55~+155°C		100 - 1000		±100
CRS14	1210	1/2W					
CRS20	2010	3/4W					
CRS25	2512	1W		20 - 1000			
CRS37	3720			100 - 500			
CRS75	7520	2W		50 - 350			

Operating Voltage - $\sqrt{(P \cdot R)}$; Overload Voltage - $2.5 \cdot \sqrt{(P \cdot R)}$; Operating Current - $\sqrt{(P \cdot R)}$
 Cal-Chip is capable of manufacturing the optional spec based on customer's requirement.



Cal-Chip
Electronics Inc.

MARKING FOR 0603

CODES	TYPE
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
101	0.101Ω
035	0.035Ω

ENVIRONMENTAL CHARACTERISTICS

ITEMS	REQUIREMENT	TEST METHOD
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25°C/-55/+25/+125/+25°C
Short Time Overload	±0.5	RCWW*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% coverage Min.	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 RCWW

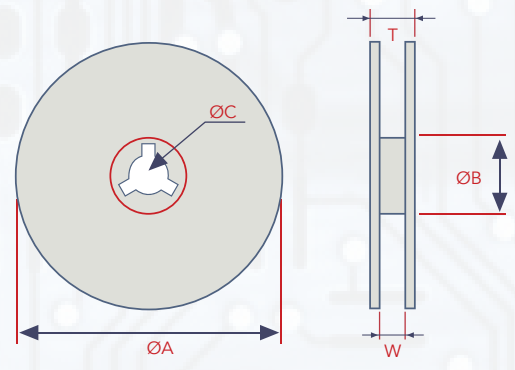
Reference Standards: MIL-STD-202, JIS-C 5201-1
 Storage Temperature: 25±3°C: Humidity <80%RH

PACKAGING

- Packaging Quantity & Reel Specifications

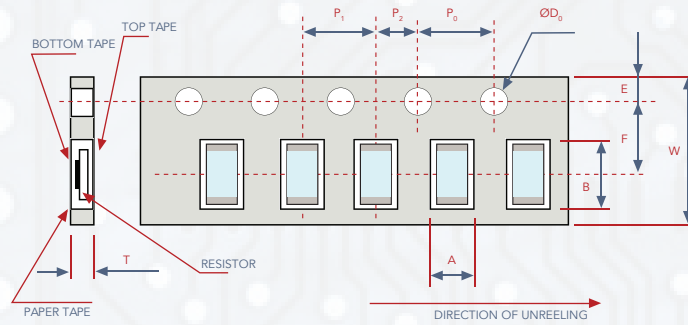
UNIT: MM

TYPE	ØA	ØB	ØC	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						-			
CRS06						-			
CRS10						-			
CRS12						-			
CRS14				5,000	-				
CRS20				-	4,000				
CRS25				-	-				
CRS25 (2W)				13.5 ± 1.0	15.5 ± 1.0	-	-	-	2,000
CRS21				-	-	-	-	-	-
CRS37	-	-	-	-	-	-			
CRS75	-	-	-	17.5 ± 1.0	19.5 ± 1.0	-	-		



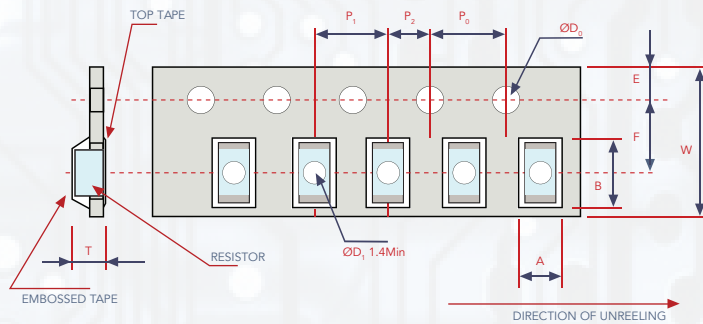
PACKAGING

- Paper Tape Specifications



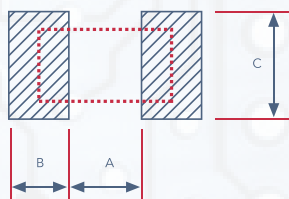
TYPE	A	B	W	E	F	P ₀	P ₁	P ₂	ØD ₀	T
CRS02	0.38 ± 0.05	0.68 ± 0.05	8.0 ± 0.20	1.75 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	2.00 ± 0.05	2.00 ± 0.05	1.50 + 0.1, -0	0.42 ± 0.20
CRS04	0.65 ± 0.10	1.15 ± 0.10								0.45 ± 0.20
CRS06	1.10 ± 0.10	1.90 ± 0.10								0.70 ± 0.10
CRS10	1.60 ± 0.10	2.40 ± 0.20					0.85 ± 0.10			
CRS12	1.90 ± 0.10	3.50 ± 0.20								
CRS14	2.80 ± 0.10									

- Embossed Plastic Tape Specifications



TYPE	A	B	W	E	F	P ₀	P ₁	P ₂	ØD 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 ± 0.30		5.5 ± 0.10	4.00 ± 0.10			1.55 ± 0.05	1.45 ± 0.20		
CRS25 (ZW)	3.38 ± 0.10	6.68 ± 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	2.50 ± 0.20	4.45 ± 0.20			5.5 ± 0.05	4.00 ± 0.05			1.50 + 0.20	1.20 ± 0.20		
CRS37		4.45 ± 0.20	5.5 ± 0.05		4.00 ± 0.05							
CRS75	2.50 ± 0.20	8.30 ± 0.20	16.0 ± 0.30		7.8 ± 0.05	4.00 ± 0.05			1.50 + 0.20	1.20 ± 0.20		

RECOMMEND LAND PATTERN



- Pad Layout (Except for CRS25: High Power Rating Series)

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)

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

