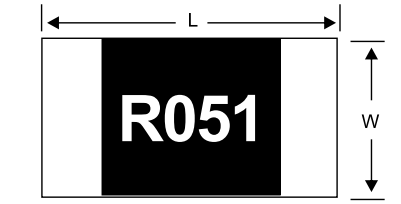
Automotive Grade Chip Resistor
(CR-A Series)

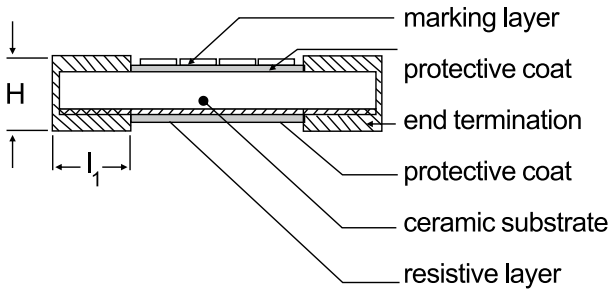
Features
- —AEC-Q200 Compliance
- —Highly reliable multilayer electrode construction
- —Compatible with all soldering process

Applications
- — Automotive Industry
- — Telecommunication Equripments
- — Radio and Tape Recorders,TV Tuners
- — Digital Cameras,Watches,Pocket Calculators.
- — Computers,Instruments

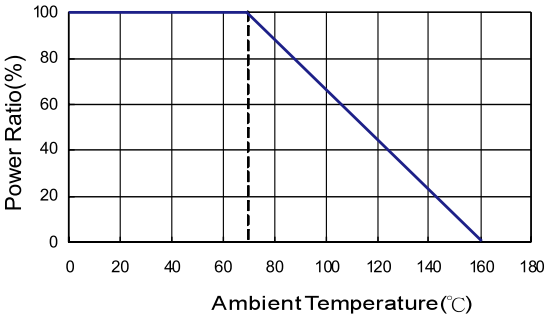
Scope
—This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.

Construction





Derating Curve



Dimensions

Type	L (mm)	W (mm)	H (mm)	l_1 (mm)
CR-02	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10
CR-03	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.15
CR-05	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20
CR-06	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.20
CR-10	3.10±0.10	2.60±0.15	0.50±0.10	0.50±0.15
CR-0A	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.15
CR-12	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20

Part Numbering

CR-	03	F	A	7	- - - 1 0 R
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
CR-	02:0402 03:0603 05:0805 06:1206 10:1210 0A:2010 12:2512	F:±1% J:±5%	A:Automotive Grade	4:7"Reel 4Kpcs 6:7"Reel 10Kpcs 7:7"Reel 5Kpcs	---1R2:1.2Ω ---3K3:3.3KΩ ---10K:10KΩ ---100K:100KΩ "-"to fill up 6 spaces

■Standard Electrical Specifications

Item / Type	Power Rating at 70℃ Jumper Rated Current	Operating Temp.Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM℃)
					±1%	±5%	
CR-02(0402)	1/16W	-55~+155℃	50V	100V	1Ω -9.76Ω 10Ω -1MΩ 1.02MΩ -10M Ω		±200 ±100 ±200
	Jumper: 1A				0Ω (<50mΩ)		-
CR-03(0603)	1/10W	-55~+155℃	75V	150V	1Ω -9.76Ω 10Ω -1MΩ 1.02MΩ -10M Ω		±200 ±100 ±200
	Jumper: 1A				0Ω (<50mΩ)		-
CR-05(0805)	1/8W	-55~+155℃	150V	300V	1Ω -9.76Ω 10Ω -1MΩ 1.02MΩ -10M Ω		±200 ±100 ±200
	Jumper: 2A				0Ω (<50mΩ)		-
CR-06(1206)	1/4W	-55~+155℃	200V	400V	1Ω -9.76Ω 10Ω -1MΩ 1.02MΩ -10M Ω		±200 ±100 ±200
	Jumper: 2A				0Ω (<50mΩ)		-
CR-10(1210)	1/2W	-55~+155℃	200V	400V	1Ω -9.76Ω 10Ω -1MΩ 1.02MΩ -10M Ω		±200 ±100 ±200
	Jumper: 2.5A				0Ω (<50mΩ)		-
CR-0A(2010)	3/4W	-55~+155℃	200V	400V	1Ω -9.76Ω 10Ω -1MΩ 1.02MΩ -10M Ω		±200 ±100 ±200
	Jumper: 2A				0Ω (<50mΩ)		-
CR-12(2512)	1W	-55~+155℃	250V	500V	1Ω -9.76Ω 10Ω -1MΩ 1.02MΩ -10M Ω		±200 ±100 ±200
	Jumper: 4A				0Ω (<50mΩ)		-

Operating Voltage=√(P*R)or Max.operating voltage listed above,whichever is lower.

Operating Voltage=2.5*√(P*R)or Max.overload voltage listed above,whichever is lower.

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

■Environmental Characteristics

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance(T.C.R.)	As Spec			**JIS-C-5201-1 4.8** **IEC-60115-1 4.8** −55℃~+125℃，25℃ is the reference temperature
Short Time Overload	± (1.0%+0.05Ω)	± (2.0%+0.05Ω)	<50mΩ	**JIS-C-5201-1 4.13** **IEC-60115-1 4.13** RCWV*2.5 or Max.Overload voltage whichever is lower 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%+0.10Ω)	± (2.0%+0.10Ω)	<100m Ω	**JIS-C-5201-1 4.25** **IEC-60115-1 4.25.1** 70±2℃，RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs"OFF"

■ Environmental Characteristics

Item	Requirement			Test Method
	± 1%	± 5%	Jumper	
Biased Humidity	± (1.0%+0.10Ω)	± (2.0%+0.10Ω)	<100mΩ	**MIL-STD-202 Method 103** 1000 hrs 85℃ /85%RH 10% of operating power.
High Temperature Exposure	± (1.0%+0.05Ω)	± (1.5%+0.10Ω)	<50mΩ	**MIL-STD-202 Method 108** at +155℃ for 1000 hrs
Bending Strength	± (1.0%+0.05Ω)	± (1.0%+0.05Ω)	<50mΩ	**JIS-C-5201-1 4.33** **IEC-60115-1 4.33** Bending once for 5 seconds 2010,2015 sizes:2mm Other sizes:3mm
Thermal Shock	± (0.5%+0.05Ω)	± (1.0%+0.05Ω)	<50mΩ	**MIL-STD-202 Method 107** -55C/+155℃ . Note: Number of cycles required-300, Maximum transfer time-20 seconds, Dwell time 15minutes Air Air
Solderability	95% min.coverage			**JIS-C-5201-1 4.17** **IEC-60115-1 4.17** 245±5℃ for 3 seconds
Resistance to Soldering Heat	± (0.5%+0.05Ω)	± (1.0%+0.05Ω)	<50mΩ	**JIS-C-5201-1 4.18** **IEC-60115-1 4.18** 260±5℃ 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
Leching	Individual leaching area ≤5% Total leaching area ≤10%			**JIS-C-5201-1 4.18** **IEC-60068-2-58 8.2.1** 260 ± 5℃ for 30 seconds
Temperature Cycling	± (0.5%+0.05Ω)	± (0.5%+0.05Ω)	<50mΩ	**JESD22 Method JA-104** -55℃ to +125℃ , 1000 cycles
Terminal strength	No broken			**AEC-Q200-006** Force of 1.8kg for 60 seconds.
Mechanical Shock	± (0.25%+0.05Ω)	± (1.0%+0.05Ω)	<50mΩ	**MIL-STD-202 Method 213** Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	± (0.5%+0.05Ω)	± (1.0%+0.05Ω)	<50mΩ	**MIL-STD-202 Method 204** 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	± (1%+0.05Ω)			**AEC-Q200-002** Human body, 2KV
Resistance to solvents	Marking Unsmeared			**MIL-STD-202 Method 215** Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
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.**

RCWV(Rated continuous working voltage)=$\sqrt{}$ (P*R)or Max. Operating Voltage whichever is lower.

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

■Reference Standards:IEC 60115-1,60068-2-58;JIS-C 5201-1;AEC-Q200;MIL-STD-202;JESD22;UL-94