

Data Sheet

Customer:

Product: Thick Film Chip Resistor – CR..AC Series

Size: 0201/0402/0603/0805/1206/1210/2010/2512

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Thick Film Chip Resistor

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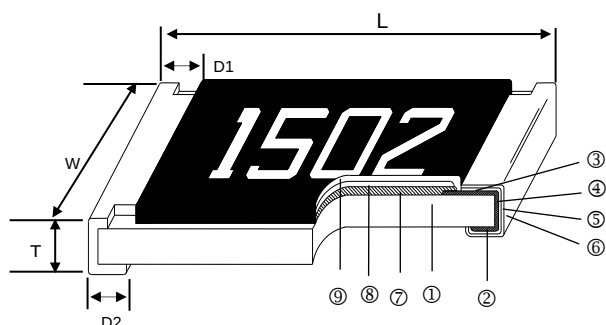
Scope

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

Features

- AEC-Q200 Compliance
- Small size and light weight
- Highly reliable multilayer electrode construction
- Compatible with all soldering process
- 100% CCD inspection

Construction



Applications

- Telecommunication Equipment
- Car Media
- Digital Cameras, Watches, Pocket Calculators
- Computers, Instruments
- Medical Equipment

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)
CR-01	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05	0.150
CR-02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
CR-03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
CR-05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
CR-06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
CR-10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
CR-0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
CR-12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

Part Numbering

Part Number : CR-03FL7---10RAC

Part Number : CR-03JL7----0RAC

CR-	03	F	L	7	-	-	-	1	0	R	AC
CR-	03	J	L	7	-	-	-	-	0	R	AC
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance					Special Code	
CR-	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% J: ±5%	L: Standard & High Precision E: TC50 P: High Power H: Ultra High Power	0: 7" Reel 15Kpcs 2: 7" Reel 2Kpcs 4: 7" Reel 4Kpcs 5: 7" Reel 20Kpcs 6: 7" Reel 10Kpcs 7: 7" Reel 5Kpcs 9: 10" Reel 8Kpcs A: 10" Reel 10Kpcs B: 10" Reel 20Kpcs C: 13" Reel 40Kpcs D: 13" Reel 20Kpcs	--- 1R2: 1.2Ω --- 3K3: 3.3KΩ --- 10K: 10KΩ -- 100K: 100KΩ “-“ to fill up 6 spaces					AC:100% CCD inspection	

Standard Electrical Specifications

Item Type	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%(E24 · E96)	±5%(E24)	
CR-01 (0201)	1/20W	-55 ~ +155°C	25V	50V	1Ω - 10MΩ		±200
	Jumper: 1A				-	0Ω (<50mΩ)	-
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
	Jumper: 1A				-	0Ω (<50mΩ)	-
CR-03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
	Jumper: 1A				-	0Ω (<50mΩ)	-
CR-05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
	Jumper: 2A				-	0Ω (<50mΩ)	-
CR-06 (1206)	1/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
	Jumper: 2A				-	0Ω (<50mΩ)	-
CR-10 (1210)	1/3W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 39MΩ		±200 ±100 ±200 ±400
	Jumper: 2.5A				-	0Ω (<50mΩ)	-

Item Type	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%(E24、E96)	±5%(E24)	
CR-0A (2010)	3/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
	Jumper: 3.5A				-	0Ω (<50mΩ)	-
CR-12 (2512)	1W	-55 ~ +155°C	250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
	Jumper: 4A				-	0Ω (<50mΩ)	-

High Precision Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range (E24、E96)			TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	-	10Ω - 1MΩ		±100
CR-03 (0603)	1/10W		75V	150V	-	1.02M - 10MΩ		±200
CR-05 (0805)	1/8W		150V	300V	-	10Ω - 1MΩ		±100
CR-06 (1206)	1/4W		200V	400V	-	1.02M - 10MΩ		±200
CR-10 (1210)	1/3W		200V	400V	-	10Ω - 1MΩ		±100
CR-0A (2010)	3/4W		200V	400V	-	1.02M - 10MΩ		±200
CR-12 (2512)	1W		250V	500V	-	10Ω - 1MΩ		±100
					-	1.02M - 10MΩ		±200

TC50 Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range (E24、E96)				TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	-		100Ω - 1MΩ		±50
CR-03 (0603)	1/10W		75V	150V	10Ω - 1MΩ	10Ω - 10MΩ			
CR-05 (0805)	1/8W		150V	300V					
CR-06 (1206)	1/4W		200V	400V					
CR-10 (1210)	1/3W		200V	400V					
CR-0A (2010)	3/4W		200V	400V					
CR-12 (2512)	1W		250V	500V					

■ High Power & Ultra High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5% (E24、E96)	±1% (E24、E96)	±5% (E24)	
CR-02 (0402)	1/8W Jumper: 1.5A	-55 ~ +155°C	50V	100V	- 10Ω - 1MΩ -	1Ω - 9.76Ω 10Ω - 1MΩ -	1Ω - 9.76Ω 10Ω - 1MΩ 0Ω (<20mΩ)	±200 ±100 -
CR-03 (0603)	1/4W Jumper: 2A		75V	150V				
CR-05 (0805)	1/3W Jumper: 2.5A		150V	300V				
CR-06 (1206)	1/3 *1/2W Jumper: 3.5A		200V	400V				
CR-10 (1210)	1/2 *3/4W Jumper: 5A		200V	400V				
CR-0A (2010)	1W Jumper: 6A		200V	400V				
CR-12 (2512)	2W Jumper: 7A		250V	500V				

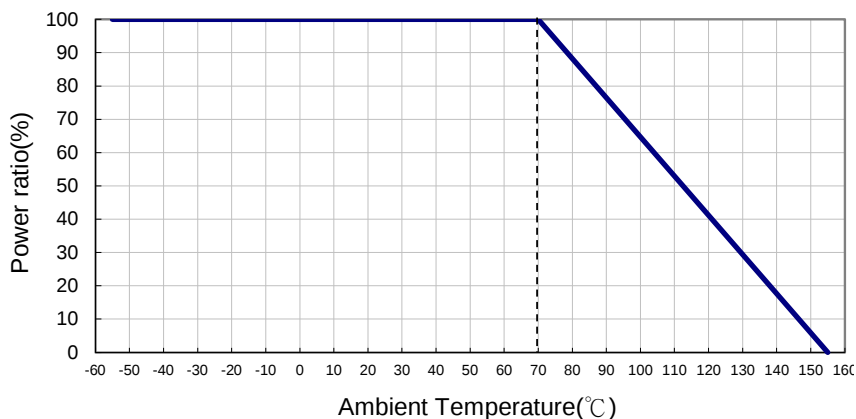
*: Ultra High Power

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

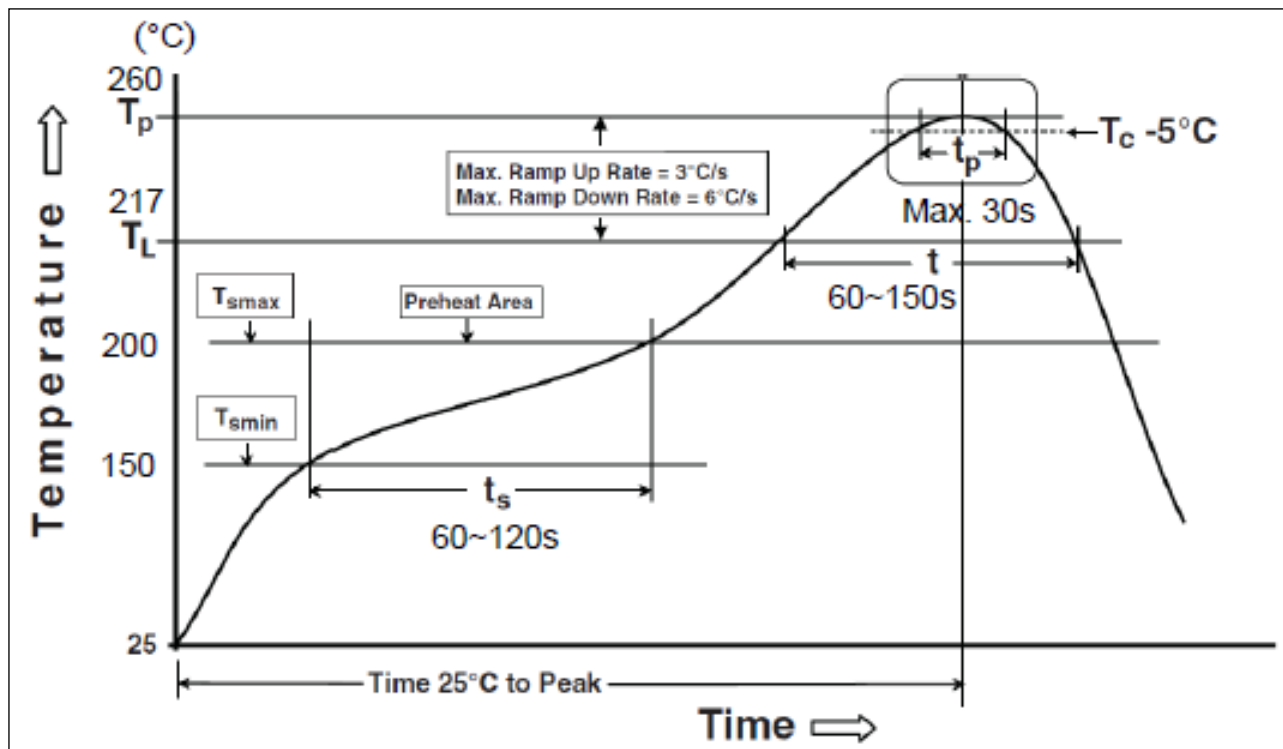
Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

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

■ Derating Curve



■ 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.

Environmental Characteristics

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
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	±(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, 2 seconds for high power series
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)	<100mΩ	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	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	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"
Dry Heat	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 At +155°C 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 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			JIS-C-5201-1 4.17 IEC-60115-1 4.17 245±5°C 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°C 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
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%			JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C to +155°C, 5 cycles

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

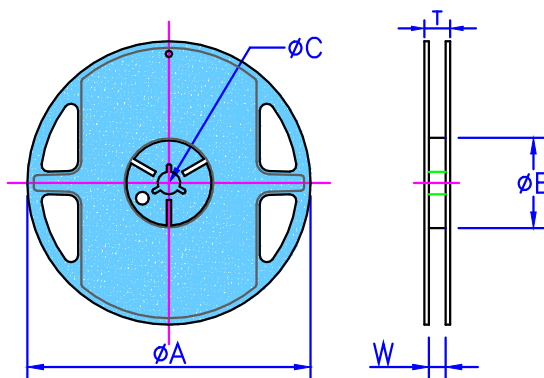
■Storage Temperature: 15~28°C; Humidity < 80%RH

■Shelf Life: 2 years from production date.

Thick Film Chip Resistor

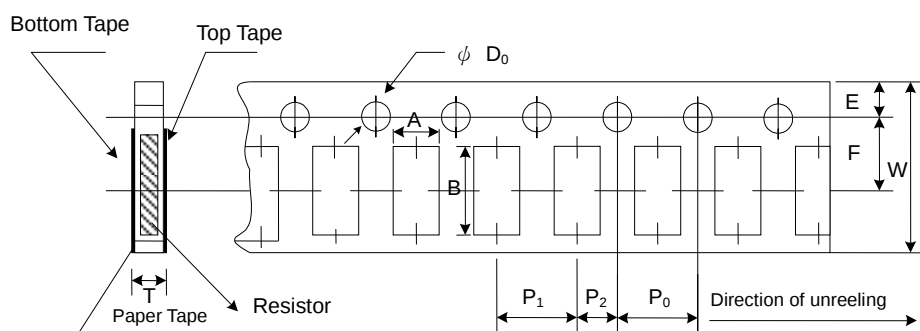
■ Packaging

Reel Specifications & Packaging Quantity



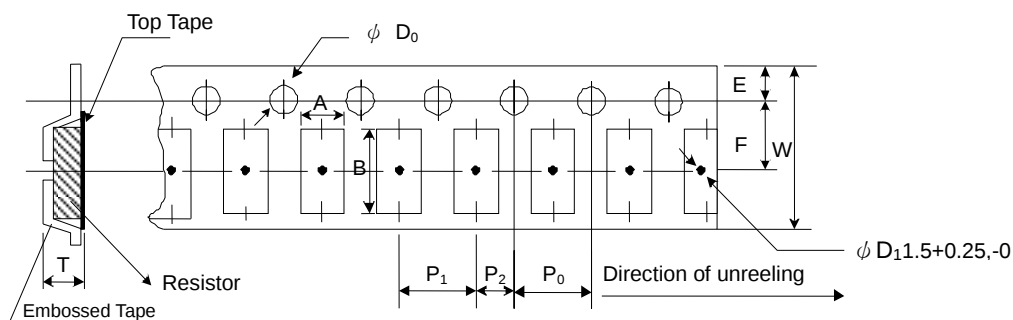
Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)
CR-01	Paper	15K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CR-01 CR-02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-03 CR-05 CR-06 CR-10	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		10K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-0A CR-12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
		8K	12mm	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5

Paper Tape Specifications



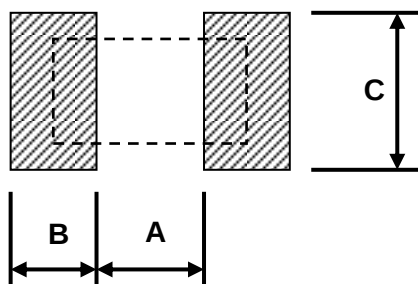
Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P ₀ (mm)	P ₁ (mm)	P ₂ (mm)	ΦD ₀ (mm)	T (mm)
CR-01	0.38±0.05	0.68±0.05	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
CR-02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CR-03	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
CR-05	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
CR-06	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
CR-10	2.90±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

Embossed Plastic Tape Specifications



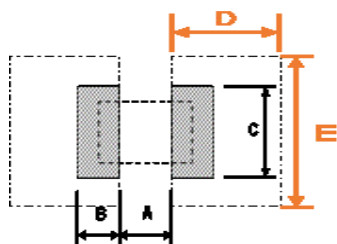
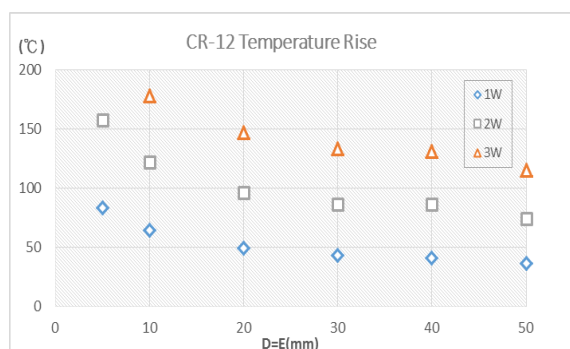
Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P ₀ (mm)	P ₁ (mm)	P ₂ (mm)	ΦD ₀ (mm)	T (mm)
CR-0A	2.8±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
CR-12	3.5±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰

Recommend Land Pattern



Type	A (mm)	B (mm)	C (mm)
CR-01	0.30	0.25	0.30
CR-02	0.50	0.45	0.60
CR-03	0.90	0.60	0.90
CR-05	1.20	0.70	1.30
CR-06	2.00	0.90	1.60
CR-10	2.00	0.90	2.80
CR-0A	3.80	0.90	2.80
CR-12	4.90	1.60	3.50

Temperature Rise



*FR4 copper board, 35μm of copper pad thickness

■ Marking

No Marking for 0201 and 0402

Jumper for all: Letter "0"

1% for 0805/1206/1210/2010/2512: 4 digits marking

Example:

Resistance	5.6Ω	97.6Ω	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
Marking	5R60	97R6	1000	2201	1002	4992	1003

5% for 0603/0805/1206/1210/2010/2512: 3 digits marking in E24

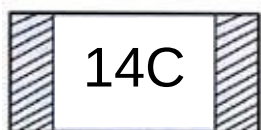
Example: 101=100Ω 102=1KΩ (1st and 2nd are E24 code and 3rd code is multiplier)

E24 code	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91
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1% for 0603(E24): 3 digits marking in E24, When the E24 and E96 are the same resistance, this marking in E96

Example: 01A= 100Ω 05C=11KΩ 123=12KΩ 273=27KΩ

1% for 0603: 3 digits marking in E96



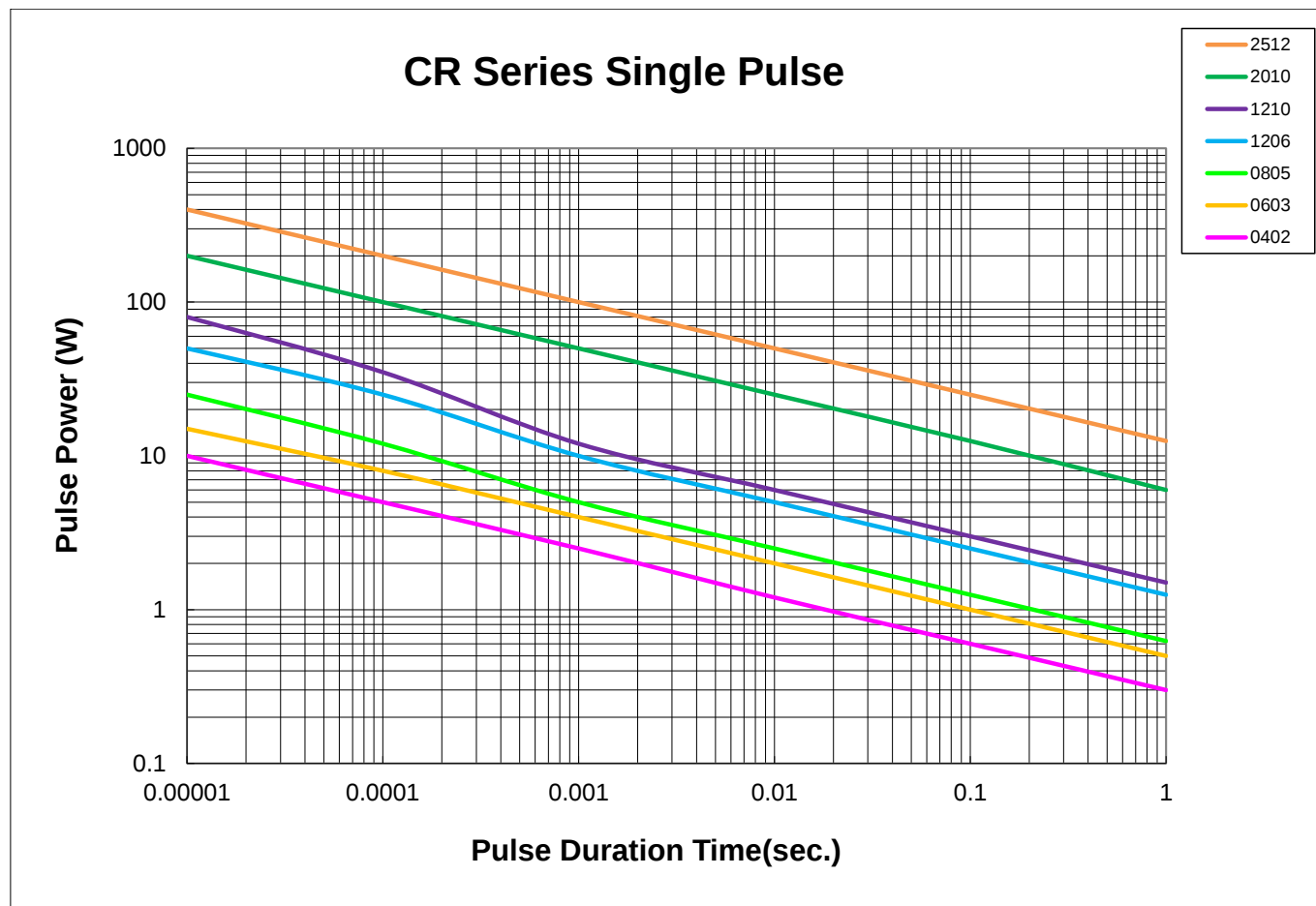
3 digits marking for Example: 14C=13K7Ω 13C=13K3Ω
68B=4K99Ω 68X=49.9Ω

Marking Table

Code	E96		Code	E96		Code	E96		Code	E96	
01	100		25	178		49	316		73	562	
02	102		26	182		50	324		74	576	
03	105		27	187		51	332		75	590	
04	107		28	191		52	340		76	604	
05	110		29	196		53	348		77	619	
06	113		30	200		54	357		78	634	
07	115		31	205		55	365		79	649	
08	118		32	210		56	374		80	665	
09	121		33	215		57	383		81	681	
10	124		34	221		58	392		82	698	
11	127		35	226		59	402		83	715	
12	130		36	232		60	412		84	732	
13	133		37	237		61	422		85	750	
14	137		38	243		62	432		86	768	
15	140		39	249		63	442		87	787	
16	143		40	255		64	453		88	806	
17	147		41	261		65	464		89	825	
18	150		42	267		66	475		90	845	
19	154		43	274		67	487		91	866	
20	158		44	280		68	499		92	887	
21	162		45	287		69	511		93	909	
22	165		46	294		70	523		94	931	
23	169		47	301		71	536		95	953	
24	174		48	309		72	549		96	976	
Code	A	B	C	D	E	F	G	X	Y		
Multiplier	10 ⁰	10 ¹	10 ²	10 ³	10 ⁴	10 ⁵	10 ⁶	10 ⁻¹	10 ⁻²		

Pulse withstanding capacity

The limit of acceptance was a shift in resistance of less than 1% from the initial value. The power applied was subject to the restrictions of the maximum permissible impulse voltage.



Note: The limit of the applicable voltage is the max. overload voltage. Please consult us about the resistance characteristic when pulse is applied continuously. This data is a reference value, please be sure to test the products on the actual circuit before you use them.

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version A	Apr 23, 2021	-	- New product release
Version A1	Nov 15, 2021	-	- Increase the shelf life description
Version A2	Jan 26, 2022	-	- 0201 Operating temperature rises to 155°C
Version A3	Feb 15, 2022	-	- Derating Curve changes the temperature range
Version A4	Jun 15, 2022	-	- Modify Soldering Condition