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## Data Sheet

Customer:

Product: Thick Film Chip Resistor - CR Series

Size: 01005/0201/0402/0603/0805/1206/1210/2010/  
2512

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# Thick Film Chip Resistor (CR Series)

## Scope

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

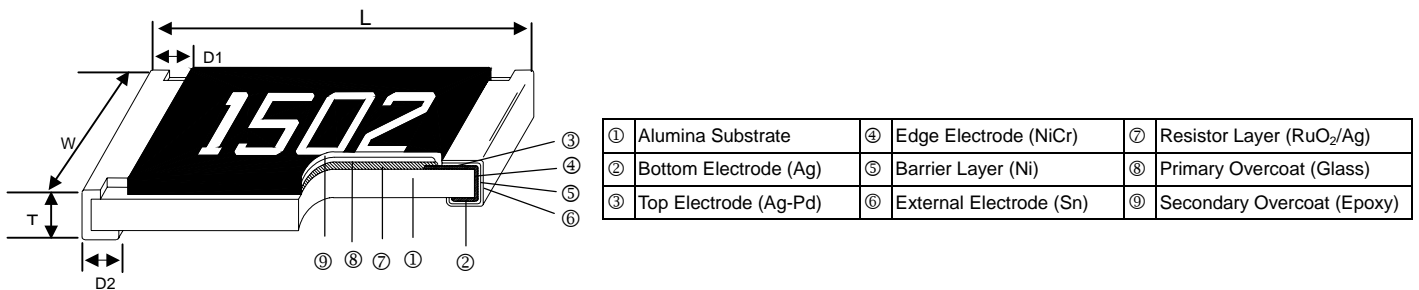
## Features

- Small size and light weight
- Highly reliable multilayer electrode construction
- Compatible with all soldering process

## Applications

- Telecommunication Equipments
- Radio and Tape Recorders, TV Tuners
- Digital Cameras, Watches, Pocket Calculators
- Automotive Industry
- Computers, Instruments
- Medical and Military Equipment

## Construction

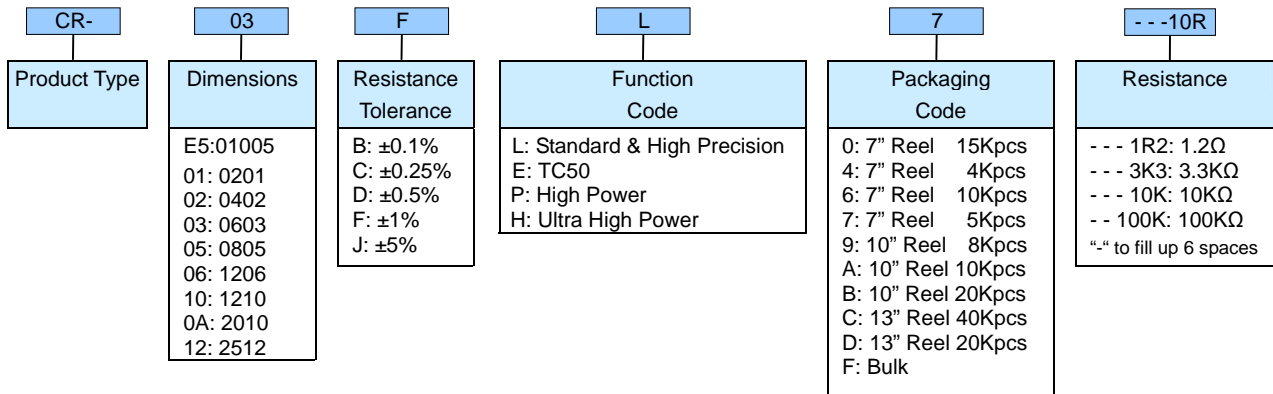


## Dimensions

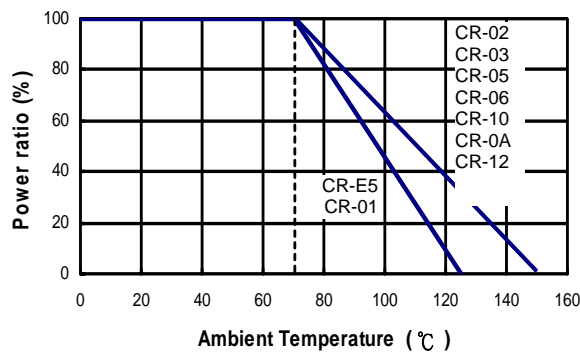
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CR-E5	01005	0.40±0.02	0.20±0.02	0.13±0.02	0.10±0.03	0.10±0.03	0.037
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



## Derating Curve



## 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)
					$\pm 1\%$	$\pm 5\%$	
CR-E5 (01005)	1/32W	-55 ~ +125°C	15V	30V	-	10 $\Omega$ - 1M $\Omega$	$\pm 300$
<b>Jumper</b>	0.5A				0 $\Omega$ (<50m $\Omega$ )	-	
CR-01 (0201)	1/20W	-55 ~ +125°C	25V	50V	1 $\Omega$ - 10M $\Omega$		$\pm 200$
<b>Jumper</b>	1A				0 $\Omega$ (<50m $\Omega$ )	-	
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1 $\Omega$ - 9.76 $\Omega$ 10 $\Omega$ - 1M $\Omega$ 1.02M $\Omega$ - 20M $\Omega$ 20.5M $\Omega$ - 100M $\Omega$		$\pm 200$ $\pm 100$ $\pm 200$ $\pm 400$
<b>Jumper</b>	1A				0 $\Omega$ (<50m $\Omega$ )	-	
CR-03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1 $\Omega$ - 9.76 $\Omega$ 10 $\Omega$ - 1M $\Omega$ 1.02M $\Omega$ - 20M $\Omega$ 20.5M $\Omega$ - 100M $\Omega$		$\pm 200$ $\pm 100$ $\pm 200$ $\pm 400$
<b>Jumper</b>	1A				0 $\Omega$ (<50m $\Omega$ )	-	
CR-05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1 $\Omega$ - 9.76 $\Omega$ 10 $\Omega$ - 1M $\Omega$ 1.02M $\Omega$ - 20M $\Omega$ 20.5M $\Omega$ - 100M $\Omega$		$\pm 200$ $\pm 100$ $\pm 200$ $\pm 400$
CR-06 (1206)	1/4W		200V		400V	0 $\Omega$ (<50m $\Omega$ )	-
CR-10 (1210)	1/3W	-55 ~ +155°C	200V	400V	1 $\Omega$ - 9.76 $\Omega$ 10 $\Omega$ - 1M $\Omega$ 1.02M $\Omega$ - 20M $\Omega$ 20.5M $\Omega$ - 39M $\Omega$		$\pm 200$ $\pm 100$ $\pm 200$ $\pm 400$
<b>Jumper</b>	2.5A				0 $\Omega$ (<50m $\Omega$ )	-	

## Standard Electrical Specifications

Type	Item	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
						±1%	±5%	
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

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

## TC50 Electrical Specifications

Type	Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range				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)
						±1%	±5%	
CR-02 (0402)		1/10W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ		±200 ±100
CR-03 (0603)		1/8W		50V	100V			
CR-05 (0805)		1/3W		150V	300V			
CR-06 (1206)		1/3 *1/2W		200V	400V			
CR-10 (1210)		1/2 *3/4W		200V	400V			
CR-0A (2010)		1W		200V	400V			
CR-12 (2512)		2W		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.

## ■ Soldering Condition

IR Reflow Soldering

Wave Soldering (Flow Soldering)

(1) Time of IR reflow soldering at maximum temperature point 260°C : 10s

(2) Time of wave soldering at maximum temperature point 260°C : 10s

(3) Time of soldering iron at maximum temperature point 410°C : 5s

## ■ 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 -55°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 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, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	JIS-C-5201-1 4.24 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	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	JIS-C-5201-1 4.23 IEC-60115-1 2.23.2 at +125/+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 5 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 RCWV (RMS) 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 4.18 IEC-60115-1 4.18 -55°C to +125/+155°C, 5 cycles

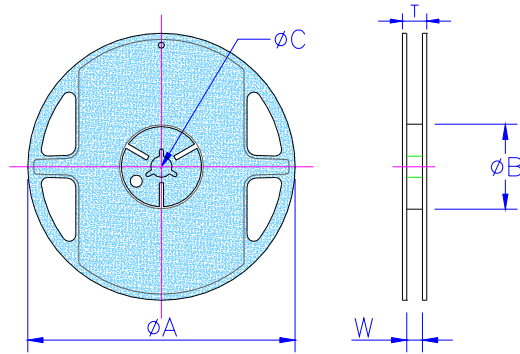
■ Storage Temperature: 25±3°C; Humidity < 80%RH

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## ■ Packaging

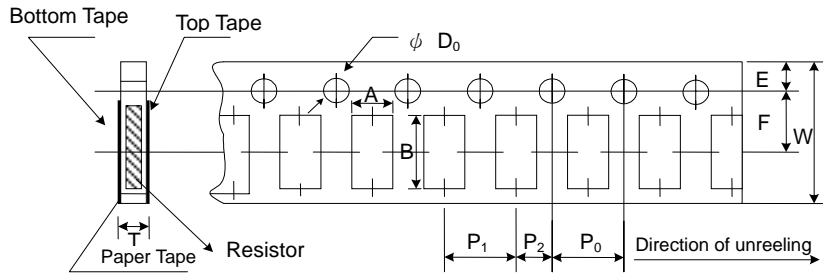
### Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CR-01	Paper	15K	8mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
CR-E5	Paper	10K	8mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
CR-01		20K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-02		40K							
CR-03	Paper	5K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-05		10K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-06		20K							
CR-10		20K							
CR-0A	Embossed	4K	12mm	7 inch	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.5	13.0±0.5	15.5±0.5
CR-12		8K		10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5

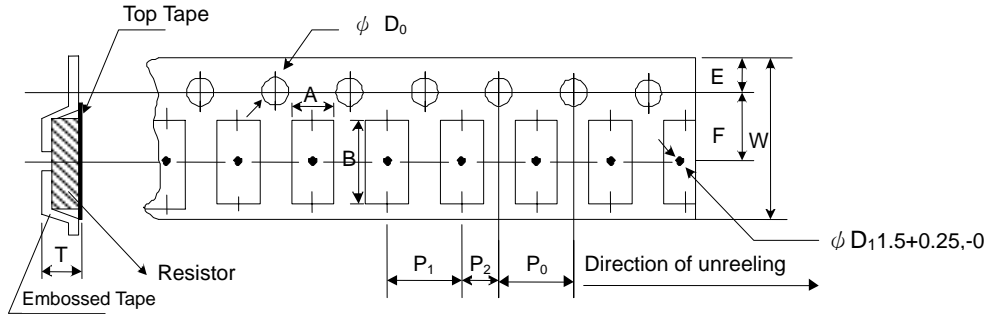
### Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ΦD <sub>0</sub>	T
CR-E5	0.24±0.05	0.45±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	0.40±0.10
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**



Unit: mm

Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ΦD <sub>0</sub>	T
CR-0A	2.8±0.10	5.5±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 <sup>+0</sup>
CR-12	3.5±0.10	6.7±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 <sup>+0</sup>

**Marking**

No Marking for 01005, 0201 and 0402

Jumper for all: Letter "0"

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

Example:

Resistance	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ
Marking	1000	2201	1002	4992	1003

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

Example: 101=100Ω 102=1KΩ (1<sup>st</sup> and 2<sup>nd</sup> are E24 code and 3<sup>rd</sup> 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: 3 digits marking in E96

**14C**

3 digits marking for Example: 14C=13K7Ω 13C=13K3Ω

68B=4K99Ω 68X=49.9Ω

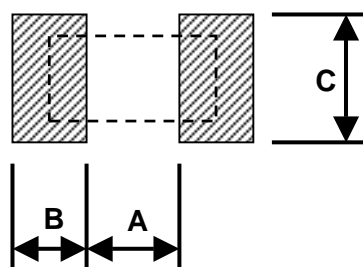


## Marking Table

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 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>-1</sup>	10 <sup>-2</sup>		

## Recommend Land Pattern

Unit: mm



Type	A	B	C
CR-E5	0.14	0.18	0.25
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	3.80	1.60	3.50