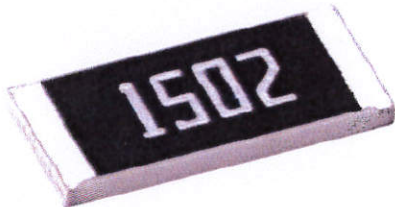




Resistor Technology

Thick Film Chip Resistor [CR Series]

Thick Film Chip Resistor



Scope

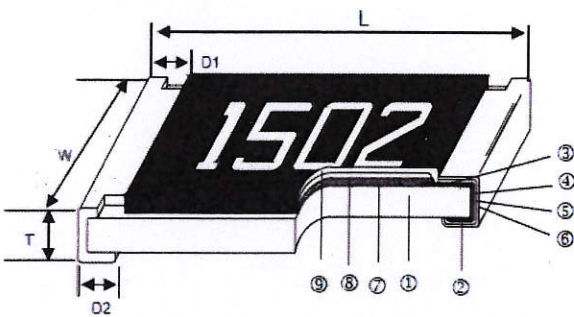
- This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.

Features

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

Construction

Applications



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

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

Dimensions

Type	Size (Inch)	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	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
CR-25	1225	3.10±0.15	6.30±0.15	0.90±0.15	0.60±0.30	0.80±0.25	64.88



Resistor Technology

[CR Series]

Thick Film Chip Resistor

Part Numbering

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

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

CR-	03	F	L	7	- - - 1 0 R
CR-	03	J	L	7	- - - - 0 R
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
CR-	E5: 01005 01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512 25: 1225	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$	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 F: Bulk	--- 1R2: 1.2 Ω --- 3K3: 3.3K Ω --- 10K: 10K Ω -- 100K: 100K Ω "-" to fill up 6 spaces

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 Ω - 1M Ω		± 300
	Jumper: 0.5A				0 Ω (<50m Ω)		-
CR-01 (0201)	1/20W	-55 ~ +125°C	25V	50V	1 Ω - 10M Ω		± 200
	Jumper: 1A				0 Ω (<50m Ω)		-
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1 Ω - 9.76 Ω 10 Ω - 1M Ω 1.02M Ω - 20M Ω 20.5M Ω - 100M Ω	± 200 ± 100 ± 200 ± 400	
	Jumper: 1A				0 Ω (<50m Ω)		-
CR-03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1 Ω - 9.76 Ω 10 Ω - 1M Ω 1.02M Ω - 20M Ω 20.5M Ω - 100M Ω	± 200 ± 100 ± 200 ± 400	
	Jumper: 1A				0 Ω (<50m Ω)		-
CR-05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1 Ω - 9.76 Ω 10 Ω - 1M Ω 1.02M Ω - 20M Ω 20.5M Ω - 100M Ω	± 200 ± 100 ± 200 ± 400	
	Jumper: 2A				0 Ω (<50m Ω)		-
CR-06 (1206)	1/4W	-55 ~ +155°C	200V	400V	1 Ω - 9.76 Ω 10 Ω - 1M Ω 1.02M Ω - 20M Ω 20.5M Ω - 100M Ω	± 200 ± 100 ± 200 ± 400	
	Jumper: 2A				0 Ω (<50m Ω)		-
CR-10 (1210)	1/3W	-55 ~ +155°C	200V	400V	1 Ω - 9.76 Ω 10 Ω - 1M Ω 1.02M Ω - 20M Ω 20.5M Ω - 39M Ω	± 200 ± 100 ± 200 ± 400	
	Jumper: 2.5A				0 Ω (<50m Ω)		-



Resistor Technology

【CR Series】

Thick Film Chip Resistor

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	Jumper: 3.5A	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
	0Ω (<50mΩ)					-		
CR-12 (2512)	1W	Jumper: 4A	-55 ~ +155°C	250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
	0Ω (<50mΩ)					-		
CR-25 (1225)	2W	Jumper: 10A	-55 ~ +155°C	200V	400V	10Ω - 20KΩ		±100
	0Ω (<20mΩ)					-		

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			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		-55 ~ +155°C	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			50V	100V	-		100Ω - 1MΩ		±50
CR-03 (0603)	1/10W			75V	150V					
CR-05 (0805)	1/8W			150V	300V					
CR-06 (1206)	1/4W		-55 ~ +155°C	200V	400V	10Ω - 1MΩ	10Ω - 10MΩ			
CR-10 (1210)	1/3W			200V	400V					
CR-0A (2010)	3/4W			200V	400V					
CR-12 (2512)	1W			250V	500V					



Resistor Technology

[CR Series]

Thick Film Chip Resistor

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)	1/8W Jumper: 1.5A	-55 ~ +155°C		50V	100V	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			

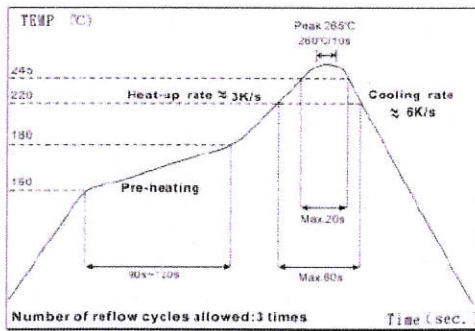
*: Ultra High Power

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

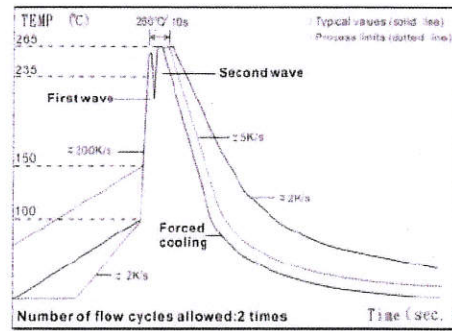
Overload Voltage = $2.5 \cdot \sqrt{P \cdot R}$ or Max. overload voltage listed above, whichever is lower.

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

Soldering Condition



IR Reflow Soldering



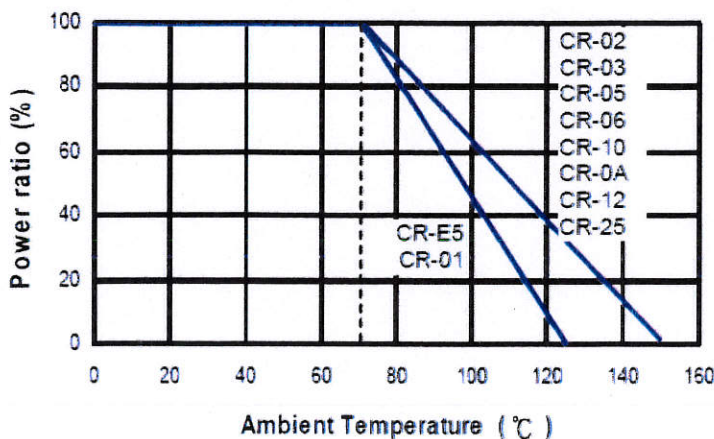
Wave Soldering (Flow Soldering)

(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

Derating Curve





Resistor Technology

【CR Series】

Thick Film Chip Resistor

■ 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 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 hrs "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 hrs "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 +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 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 +125/+155°C, 5 cycles

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

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



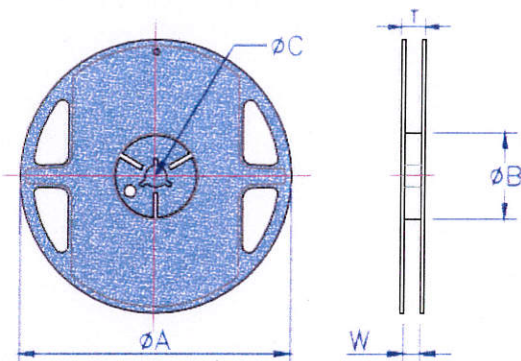
Resistor Technology

【CR Series】

Thick Film Chip Resistor

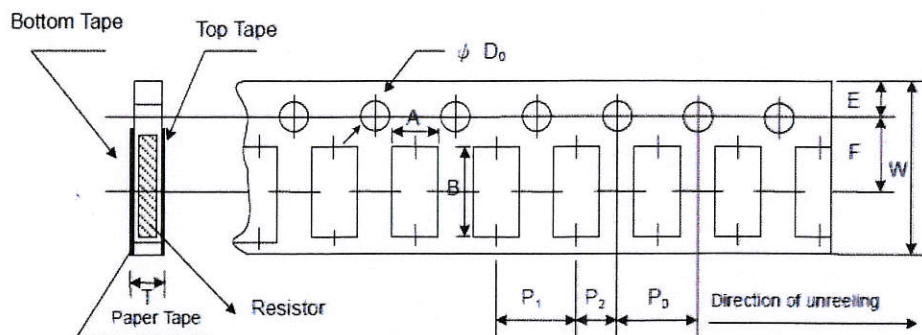
■ Packaging

Reel Specifications & Packaging Quantity



Type	Packaging Quantity	Tape Width	Reel Diameter	ϕA (mm)	ϕB (mm)	ϕC (mm)	W (mm)	T (mm)	
CR-E5	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	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
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
CR-25	Embossed	2K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±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-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

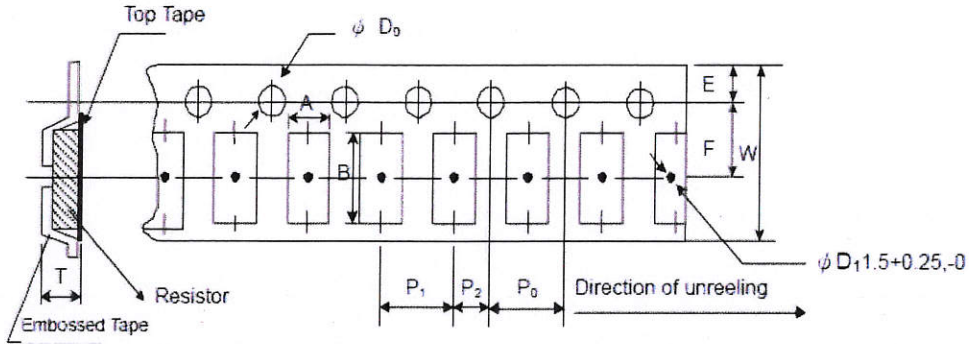


Resistor Technology

【CR Series】

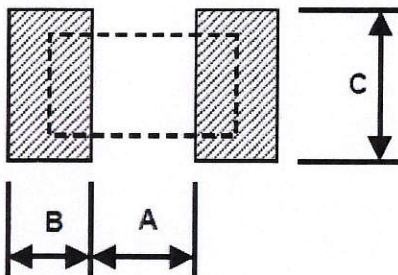
Thick Film Chip Resistor

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	5.5±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 ⁺⁰
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 ⁺⁰
CR-25	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

Recommend Land Pattern



Type	A (mm)	B (mm)	C (mm)
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
CR-25	1.20	2.00	7.00



Resistor Technology

【CR Series】

Thick Film Chip Resistor

■ Marking

No Marking for 01005, 0201 and 0402

Jumper for all: Letter "0"

1% for 0805/1206/1210/2010/2512/1225: 4 digits marking

Example:

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

5% for 0603/0805/1206/1210/2010/2512/1225: 3 digits marking in E24

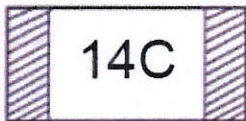
Example: 101=100Ω 102=1KΩ (1st and 2nd are E24 code and 3rd code is multiplier)

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