



1% Thick Film Chip Resistors

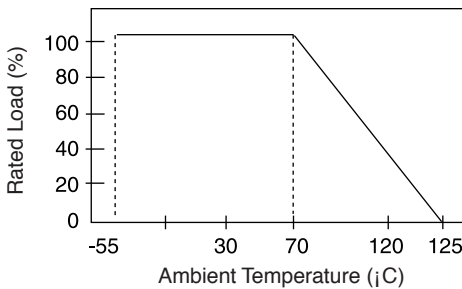
CR1 Series

FEATURES

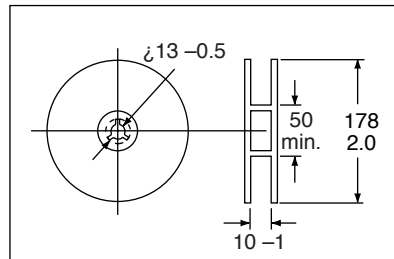
- Temperature Range: -55°C ~ +125°C
- High purity alumina substrate
- Wave or flow solderable
- Excellent high frequency characteristics
- Wrap around termination
- Inner electrode protection



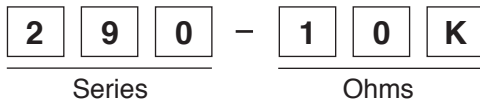
DERATING CURVE



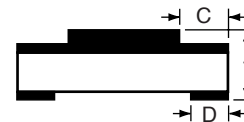
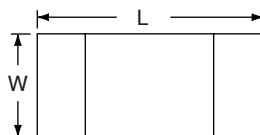
REEL DIMENSIONS (mm)



PART NUMBERING SYSTEM



SERIES, SIZE, WATTAGE, VOLTAGE, AND DIMENSIONS



Series	Case Size	Power Rating	Voltage (max.)		Dimensions (mm)				
			W.V.	O.V.	L	W	C	D	t
290	1206	1/8	200	400	3.1 ± 0.15	1.55 ± 0.15	0.45 ± 0.2	0.45 ± 0.2	0.55 ± 0.10
292	0805	1/10	150	300	2.0 ± 0.15	1.25 ± 0.15	0.40 ± 0.2	0.40 ± 0.2	0.55 ± 0.10
302	0603	1/10	50	100	1.6 ± 0.10	0.8 ± 0.15	0.30 ± 0.2	0.30 ± 0.2	0.45 ± 0.10
304	0402	1/16	25	50	1.00 ± 0.1	0.5 ± 0.05	0.2 ± 0.1	0.25 ± 0.1	0.35 ± 0.05



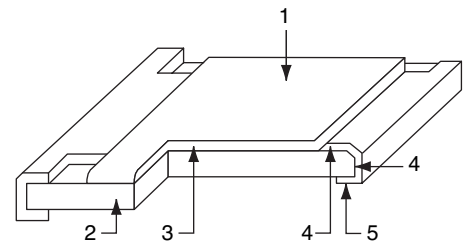
■ STANDARD STOCKED VALUES (Ω)

10	16.9	28.7	48.7	82.5	140	237	392	665	1.13K	1.91K	3.16K	5.36K	9.09K	15.4K	26.1K	43.2K	73.2K	124K	210K	348K	590K
10.2	17.4	29.4	49.9	84.5	143	243	402	681	1.15K	1.96K	3.24K	5.49K	9.31K	15.8K	26.7K	44.2K	75K	127K	215K	357K	604K
10.5	17.8	30.1	51.1	86.6	147	249	412	698	1.18K	2.0K	3.32K	5.62K	9.53K	16.2K	27.4K	45.3K	76.8K	130K	221K	365K	619K
10.7	18.2	30.9	52.3	88.7	150	255	422	715	1.21K	2.05K	3.4K	5.76K	9.76K	16.5K	28K	46.4K	78.7K	133K	226K	374K	634K
11	18.7	31.6	53.6	90.9	154	261	432	732	1.24K	2.1K	3.48K	5.9K	10K	16.9K	28.7K	47.5K	80.6K	137K	232K	383K	649K
11.3	19.1	32.4	54.9	93.1	158	267	442	750	1.27K	2.15K	3.57K	6.04K	10.2K	17.4K	29.4K	48.7K	82.5K	140K	237K	392K	665K
11.5	19.6	33.2	56.2	95.3	162	274	453	768	1.3K	2.21K	3.65K	6.19K	10.5K	17.8K	30K	49.9K	84.5K	143K	243K	402K	681K
11.8	20	34	57.6	97.6	165	280	464	787	1.33K	2.26K	3.74K	6.34K	10.7K	18.2K	30.1K	51.1K	86.6K	147K	249K	412K	698K
12.1	20.5	34.8	59	100	169	287	475	806	1.37K	2.32K	3.83K	6.49K	11.K	18.7K	30.9K	52.3K	88.7K	150K	255K	422K	715K
12.4	21	35.7	60.4	102	174	294	487	825	1.40K	2.37K	3.92K	6.65K	11.3K	19.1K	31.6K	53.6K	90.9K	154K	261K	432K	732K
12.7	21.5	36.5	61.9	105	178	300	499	845	1.43K	2.43K	4.02K	6.81K	11.5K	19.6K	32.4K	54.9K	93.1K	158K	267K	442K	750K
13	22.1	37.4	63.4	107	182	301	511	866	1.47K	2.49K	4.12K	6.98K	11.8K	20K	33.2K	56.2K	95.3K	162K	274K	453K	768K
13.3	22.6	38.3	64.9	110	187	309	523	887	1.5K	2.55K	4.22K	7.15K	12.1K	20.5K	34.K	57.6K	97.6K	165K	280K	464K	787K
13.7	23.2	39.2	66.5	113	191	316	536	909	1.54K	2.61K	4.32K	7.32K	12.4K	21.K	34.8K	59.0K	100K	169K	287K	475K	806K
14	23.7	40.2	68.1	115	196	324	549	931	1.58K	2.67K	4.42K	7.5K	12.7K	21.5K	35.7K	60.4K	102K	174K	294K	487K	825K
14.3	24.3	41.2	69.8	118	200	332	562	953	1.62K	2.74K	4.53K	7.68K	13K	22.1K	36.5K	61.9K	105K	178K	300K	499K	845K
14.7	24.9	42.2	71.5	121	205	340	576	976	1.65K	2.8K	4.64K	7.87K	13.3K	22.6K	37.4K	63.4K	107K	182K	301K	511K	866K
15	25.5	43.2	73.2	124	210	348	590	1.0K	1.69K	2.87K	4.75K	8.06K	13.7K	23.2K	38.3K	64.9K	110K	187K	309K	523K	887K
15.4	26.1	44.2	75	127	215	357	604	1.02K	1.74K	2.94K	4.87K	8.25K	14.K	23.7K	39.2K	66.5K	113K	191K	316K	536K	909K
15.8	26.7	45.3	76.8	130	221	365	619	1.05K	1.78K	3.0K	4.99K	8.45K	14.3K	24.3K	40.2K	68.1K	115K	196K	324K	549K	931K
16.2	27.4	46.4	78.7	133	226	374	634	1.07K	1.82K	3.01K	5.11K	8.66K	14.7K	24.9K	41.2K	69.8K	118K	200K	332K	562K	953K
16.5	28	47.5	80.6	137	232	383	649	1.1K	1.87K	3.09K	5.23K	8.87K	15K	25.5K	42.2K	71.5K	121K	205K	340K	576K	976K

1M

■ CONSTRUCTION

No.	Part Name
1	Protective coating: Epoxy
2	Al ₂ O ₃ high purity alumina substrate: Al 96fi
3	Resistive element: metal film
4	Termination (Inner): Ag/Pd
5	Termination (Between): Ni plating film
6	Termination (Outer): Sn plating film



■ CHARACTERISTICS

Characteristics	Limits	Test Methods (JIS C 5201-1)
Temperature coefficient	1Ω ~ 10Ω ≤ ±400 PPM / °C 11Ω ~ 10MΩ ≤ ±200 PPM / °C	5.2 Natural resistance change per temp. degree centigrade. R ₂ -R ₁ ———— x10 ⁶ (PPM/°C) R ₁ (t ₂ -t ₁) R ₁ : Resistance value at room temperature (t ₁) R ₂ : Resistance value at room temp.plus 100°C (t ₂)
Short time overload	Resistance change rate is ± (2.0 % + 0.1Ω) Max.	5.5 Permanent resistance change after the application of a potential of 2.5 times RCWV for 5 seconds.
Insulation resistance	1,000M Ω or more	5.6 Apply 500V DC between protective coating and termination for 1 minute
Dielectric withstanding voltage	No evidence of flashover mechanical damage,arcing or insulation break down.	5.7 Apply 500V AC between protective coating and termination for 1 minute
Terminal bending	±(1.0% +0.05Ω) Max.	6.1.4 Twist of Test Board: Y/X=5/90mm for 10 seconds



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CR1 Series

■ CHARACTERISTICS (Cont.)

Characteristics	Limits	Test Methods (JIS C 5201-1)															
Temperature cycling	± (1.0% + 0.05Ω) Max.	7.4 Resistance change after continuous 5 cycles for duty shown below:															
		<table><tr><th>Step</th><th>Temperature</th><th>Time</th></tr><tr><td>1</td><td>-55°C ±3°C</td><td>30 mins</td></tr><tr><td>2</td><td>Room temp.</td><td>10~15 mins</td></tr><tr><td>3</td><td>+155°C ±2°C</td><td>30 mins</td></tr><tr><td>4</td><td>Room temp.</td><td>10~15 mins</td></tr></table>	Step	Temperature	Time	1	-55°C ±3°C	30 mins	2	Room temp.	10~15 mins	3	+155°C ±2°C	30 mins	4	Room temp.	10~15 mins
		Step	Temperature	Time													
		1	-55°C ±3°C	30 mins													
		2	Room temp.	10~15 mins													
3	+155°C ±2°C	30 mins															
4	Room temp.	10~15 mins															
Load life in humidity	Resistance change rate is ± (3.0% + 0.1Ω) Max.	7.9 Resistance change after 1,000 hours (1.5 hours "on", 0.5 hour "off") at RCWV in a humidity chamber controlled at 40°C ± 2°C and 90 to 95 % relative humidity															
Load life	Resistance change rate is ± (3.0% + 0.1Ω) Max.	7.10 Permanent resistance change after 1,000 hours operating at RCWV, with duty cycle of (1.5 hours "on", 0.5 hour "off") at 70°C ± 2°C ambient															
Soldering Heat	Electrical characteristics shall be satisfied. Without distinct deformation in appearance.	<u>Solder bath method</u> Pre-Heat: 100 ro 105°C, 30 ±5 sec. Temperature: 265 ± 3°C, 5 +1/-0 sec <u>Reflow soldering method</u> Peak: 250 +5/-0°C 230°C or higher, 30 ±10Sec. <u>Solder iron method</u> Bit temperature: 350° ±10°C Application time of soldering iron: 3 +1/-0 seconds															
Solderability	95% Coverage min.	6.5 Test temperature of solder: 245° ±3°C Dipping them solder: 2~3 seconds															



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