

Data Sheet

Customer:

Product: Metal Film Precision Resistor-CSR Series

Size: 0204/ 0207

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VIKING TECH CORPORATION
光頡科技股份有限公司
No.70 Guangfu N. Rd., Hukou
Township, Hsinchu County 303,
Taiwan

TEL:886-3-5972931
FAX:886-3-5972935•886-3-5973494
E-mail:sales@viking.com.tw

VIKING TECH CORPORATION KAOHSIUNG BRANCH
光頡科技股份有限公司高雄分公司
No.248-3, Sin-Sheng Rd., Cian-Jhen Dist., Kaohsiung,
806, Taiwan

TEL:886-7-8217999
FAX:886-7-8228229
E-mail:sales@viking.com.tw

VIKING ELECTRONICS (WUXI) CO., LTD.
光頡電子(無錫)有限公司
No.22 Xixia Road, Machinery & Industry Park,
National Hi-Tech Industrial Development Zone
of Wuxi, Wuxi, Jiangsu Province, China
Zip Code:214028
TEL:86-510-85203339
FAX:86-510-85203667•86-510-85203977
E-mail:china@viking.com.tw

Produced by (QC)	Checked (QC)	Approved by (QC)	Prepared by (Sales)	Accepted by (Customer)
05-Sep-23	05-Sep-23	05-Sep-23		
Alice Hsiao	Susan Huang	Susan Huang		

Metal Film Precision Resistor
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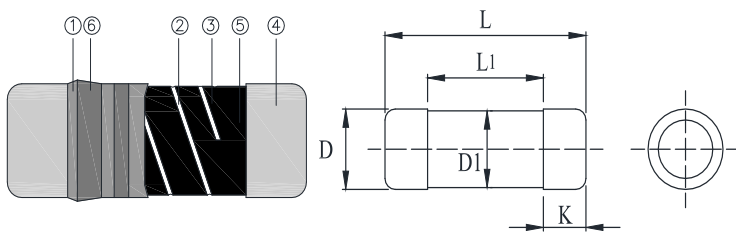
■Features

- Thin film technology
- Excellent overall stability
- Tight tolerance down to $\pm 0.1\%$
- Extremely low TCR down to $\pm 5 \text{ PPM}/^\circ\text{C}$
- High power rating up to 1 Watts

■Applications

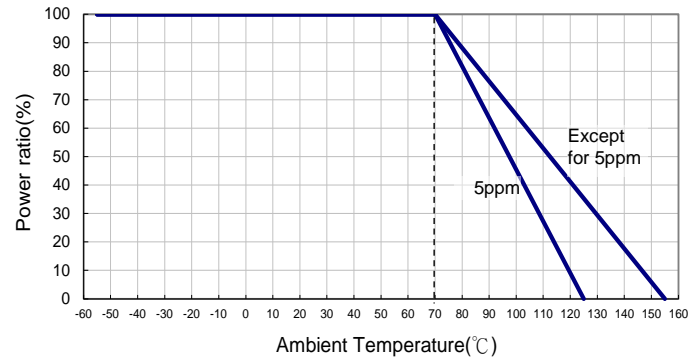
- Telecommunication
- Medical Equipment
- Measurement/Testing Equipment

■Construction & Dimension



① Insulation Coating	④ Electrode Cap
② Trimming Line	⑤ Resistor Layer
③ Ceramic Rod	⑥ Marking

■Derating Curve



Type	L (mm)	L ₁ min. (mm)	ΦD (mm)	ΦD ₁ (mm)	K (mm)	Weight 1,000EA (g)
CSR0204	3.50±0.2	1.7	1.40±0.15	D +0/-0.2	0.8±0.1	18.7
CSR0207	5.90±0.2	2.9	2.20±0.20	D +0/-0.2	1.3±0.1	80.9

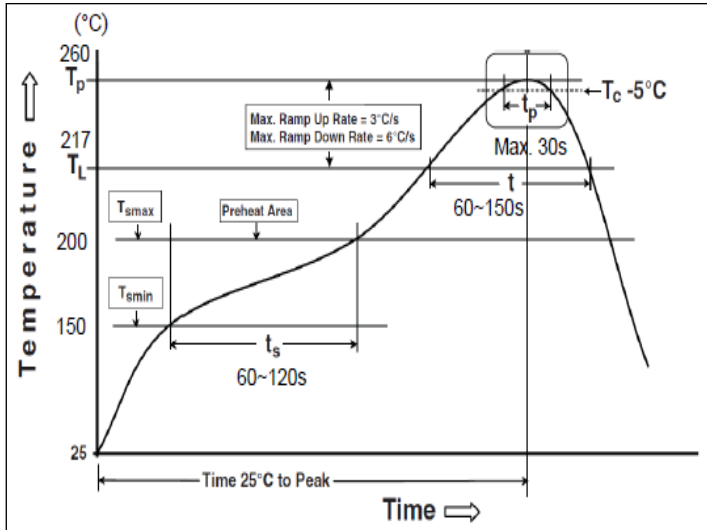
■Part Numbering

Product Type	Dimensions (L×ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
CSR	0204	D	T	D	V	1000
	0204: 3.5x1.4 0207: 5.9x2.2	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$	T: 7" Taping Reel S: 7" Taping Reel, Antistatic Tape* W: 13" Taping Reel M: 13" Taping Reel, Antistatic Tape*	S: ± 5 B: ± 10 N: ± 15 C: ± 25 D: ± 50 E: ± 100 - : No Specified	T: 1W U: 1/2W V: 1/4W G: 2/5W	0010: 1Ω 0100: 10Ω 1000: 100Ω 1001: 1KΩ 1004: 1MΩ R0R0: 0Ω R050: 0.05Ω R100: 0.1Ω 22R1: 22.1Ω

** Letter "R" is a decimal

*Packaging Code "S" & "M" only for 0204 size product, not include 0207 size product.

■ Soldering Condition (Ref. IPC/JEDEC J-STD-020 & J-STD-002)



Reflow Profiles	
Profile Feature	Pb-Free Assembly
Preheat	
Min. Temperature (T _{smin})	150 °C
Max Temperature (T _{smax})	200 °C
Preheating time (t _s) from (T _{smin} to T _{smax})	60-120 seconds
Ramp-up rate (T _L to T _p)	3 °C/second max.
Liquidous temperature (T _L)	217 °C
Time (t _L) maintained above T _L	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.

■ Standard Electrical Specifications

Item Type	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%	±5%	
0204	1/4W	-55 ~ +125°C	200V	400V	10Ω-332KΩ	-				±5
		-55 ~ +155°C	200V	400V	10Ω-20KΩ					±10
					10Ω-300KΩ					±15
	10Ω-1MΩ				10Ω-3.4MΩ	1Ω-4.7MΩ	±25			
	Jumper:2A	-55 ~ +155°C	200V	400V	10Ω-1MΩ	1Ω-3.4MΩ	0.2Ω-10MΩ	±50		
					-		0.1Ω-10MΩ	±100		
-					0Ω(<15mΩ)	-				
0207	1/2W	-55 ~ +125°C	300V	600V	10Ω-332KΩ	-				±5
		-55 ~ +155°C	300V	600V	10Ω-20KΩ					±10
					10Ω-300KΩ					±15
	10Ω-1MΩ				10Ω-3.4MΩ	1Ω-4.7MΩ	±25			
	Jumper:4A	-55 ~ +155°C	300V	600V	10Ω-1MΩ	1Ω-3.4MΩ	0.2Ω-10MΩ	±50		
					-		0.1Ω-10MΩ	±100		
-					0Ω(<15mΩ)	-				

■ High Power Rating Electrical Specifications

Item Type	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%	±5%	
0204	2/5W	-55 ~ +125°C	200V	400V	10Ω-332KΩ	-				±5
		-55 ~ +155°C	200V	400V	10Ω-20KΩ					±10
					10Ω-300KΩ					±15
	10Ω-1MΩ				10Ω-3.4MΩ	1Ω-4.7MΩ	±25			
	1W	-55 ~ +155°C	300V	600V	10Ω-1MΩ	1Ω-3.4MΩ	0.2Ω-10MΩ	±50		
					-		0.1Ω-10MΩ	±100		
-					0Ω(<15mΩ)	-				

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.

■ Environmental Characteristics

Item	Requirement		Test Method
	5% and Below	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 5ppm: At 25°C/-10°C and 25°C/+85°C, 25°C is the reference temperature
Short Time Overload	$\pm(0.15\%+0.05\Omega)$ 5ppm: $\pm(0.05\%+0.01\Omega)$	<15mΩ	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	$\pm(0.5\%+0.05\Omega)$ 5ppm: $\pm(0.25\%+0.01\Omega)$	<15mΩ	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	$\pm(1.0\%+0.05\Omega)$ 5ppm: $\pm(0.25\%+0.01\Omega)$	<15mΩ	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	$\pm(1.0\%+0.05\Omega)$ 5ppm: $\pm(0.25\%+0.01\Omega)$	<15mΩ	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 at +125°C/+155°C for 1000 hrs
Bending Strength	$\pm(0.5\%+0.05\Omega)$ 5ppm: $\pm(0.1\%+0.01\Omega)$	<15mΩ	JIS-C-5201-1 4.33 IEC-60115-1 4.33 Bending once for 5 seconds with 2mm
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	$\pm(0.5\%+0.05\Omega)$ 5ppm: $\pm(0.05\%+0.01\Omega)$	<15mΩ	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	$\pm(0.5\%+0.05\Omega)$ 5ppm: $\pm(0.2\%+0.01\Omega)$	<15mΩ	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C to +125°C/+155°C, 5 cycles

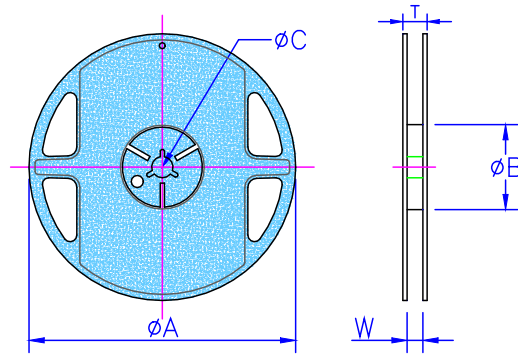
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

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

■ Shelf Life: 2 years from production date.

Metal Film Precision Resistor

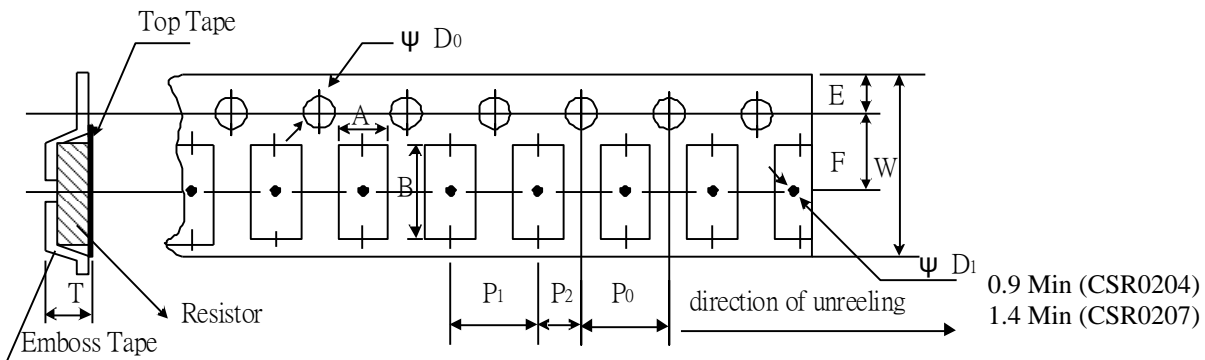
■ Packaging



Packaging Quantity & Reel Specifications

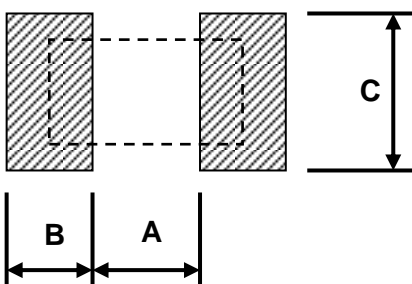
Type	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)	Emboss Plastic Tape (EA)
CSR0204	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	10,000
CSR0207	7 inch	178.5±1.5	60.0+1.0	13.0±0.5	13.0±0.5	15.5±0.5	2,000
	13 inch	330±1.0	99±0.5	13.5±0.5	13.4±1	17.8±1	6,000

Emboss 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)
CSR0204	1.55±0.20	3.65±0.20	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.80±0.10
CSR0207	2.40±0.10	6.15±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	2.70±0.10

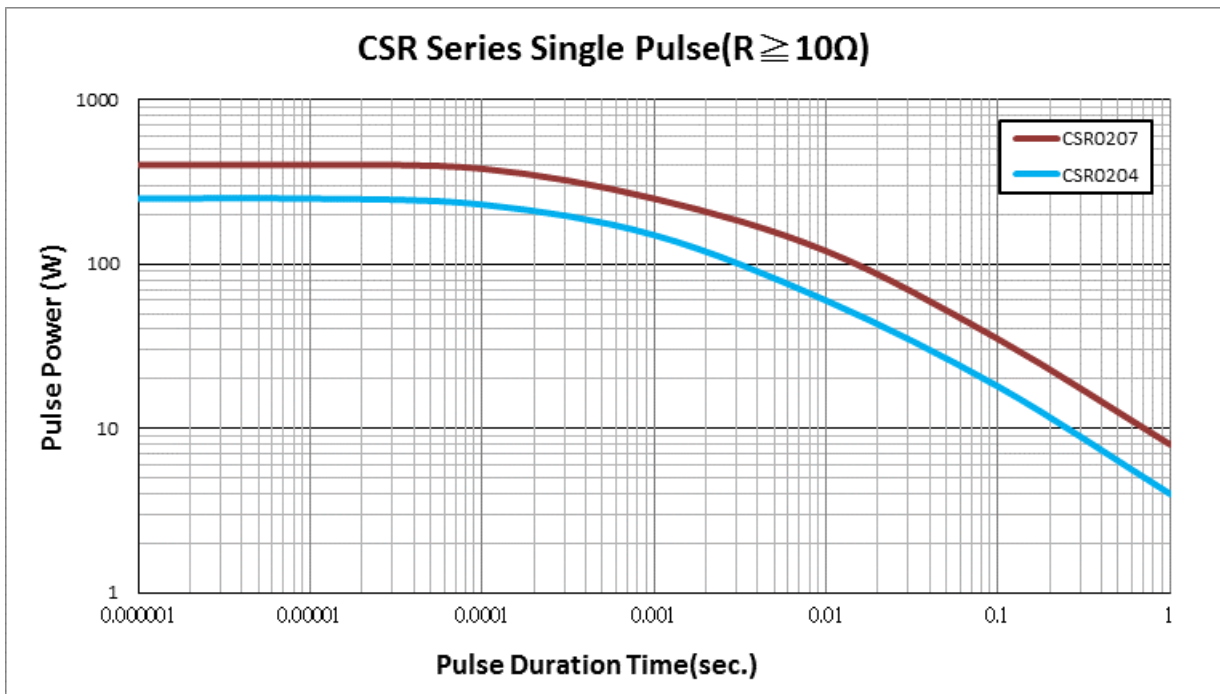
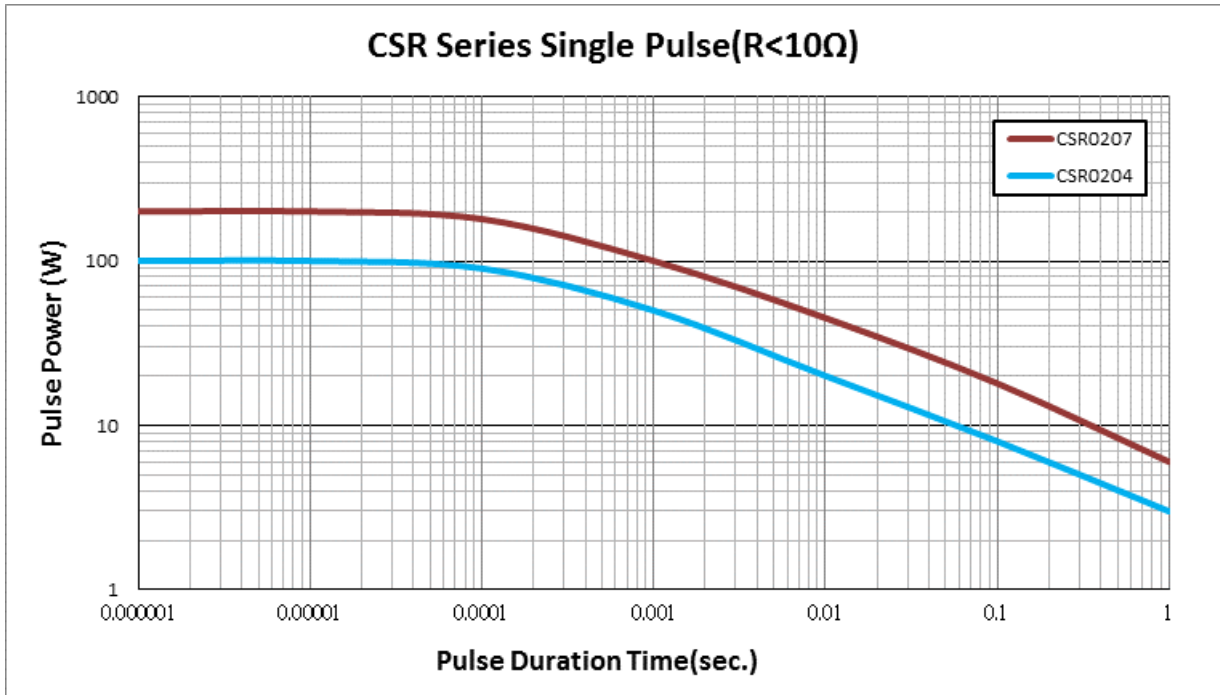
■ Recommend Land Pattern



Type	A (mm)	B (mm)	C (mm)
CSR0204	1.6	1.2	1.6
CSR0207	3.0	1.7	2.4

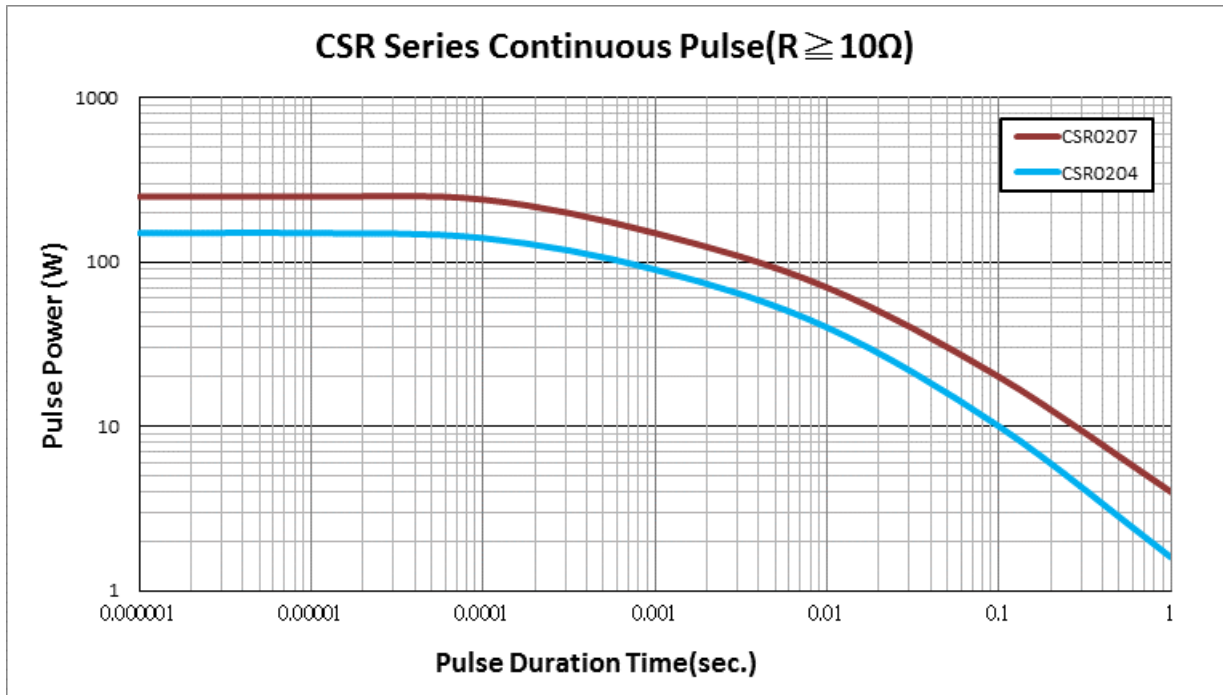
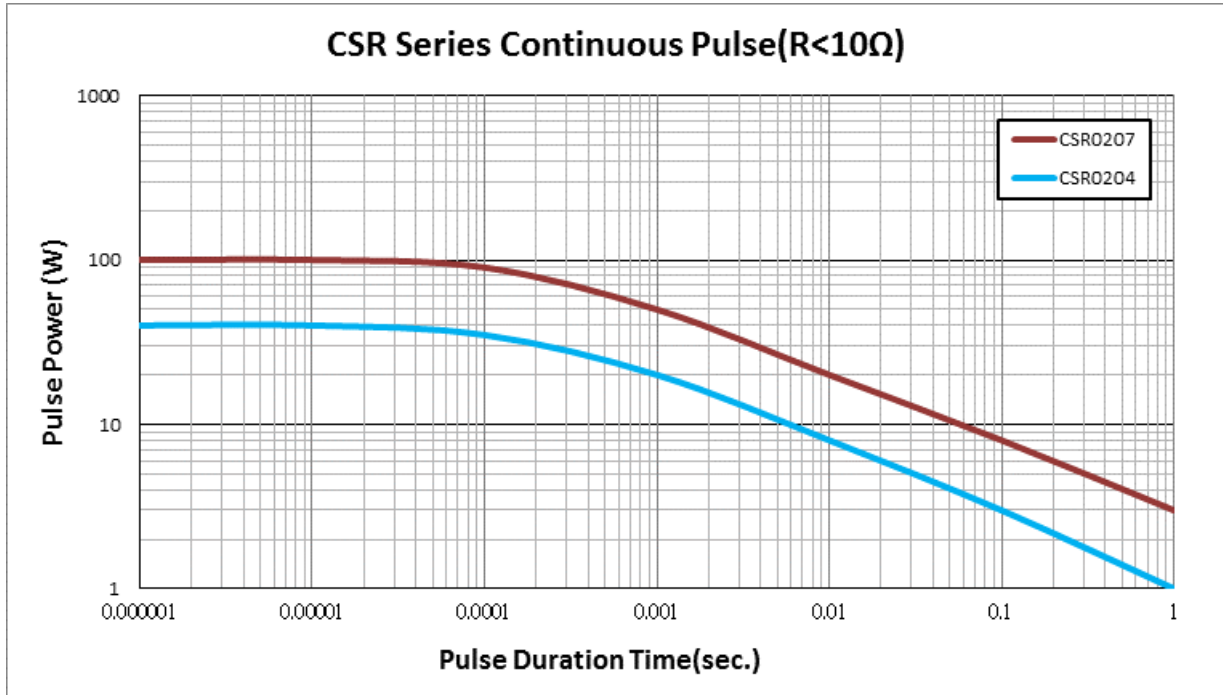
■ Pulse withstanding capacity

The single impulse graph is the result of the impulse of rectangular shape applied. 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 graph shown.



■ Continuous Pulse

The continuous load graph was obtained by applying repetitive rectangular pulses where the pulse period was adjusted so that the average power dissipated in the resistor was equal to its rated power at 70°C. Again the limit of acceptance was a shift in resistance of less than 1% from the initial value.

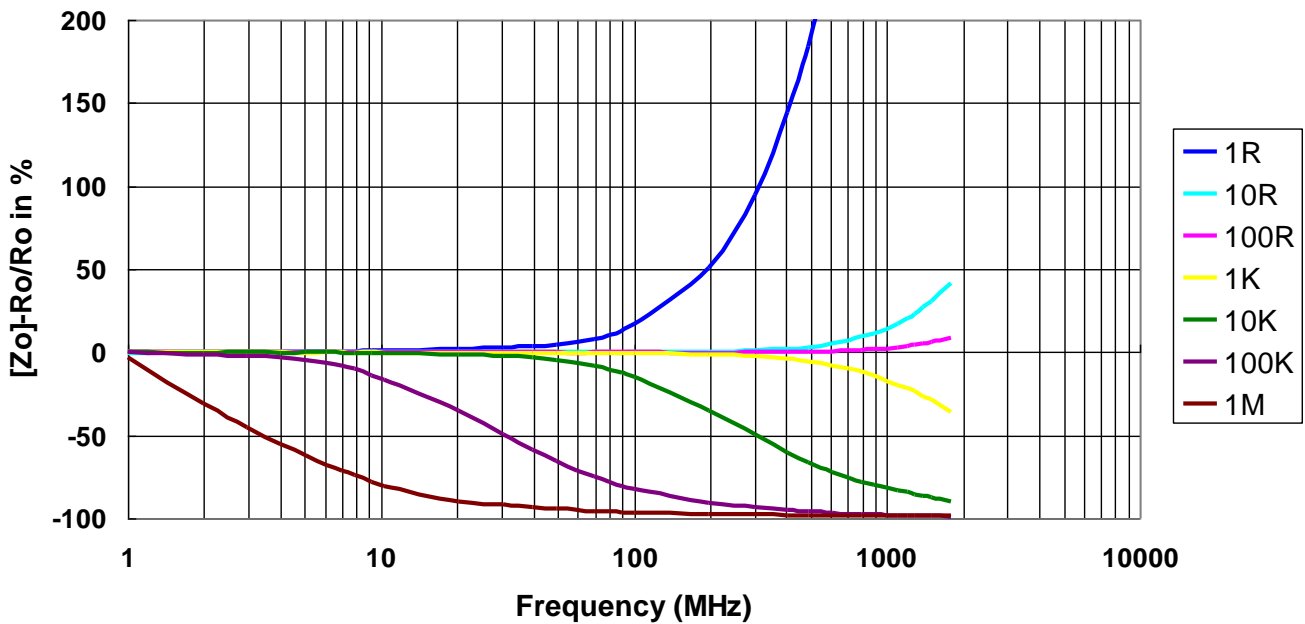


Frequency behavior

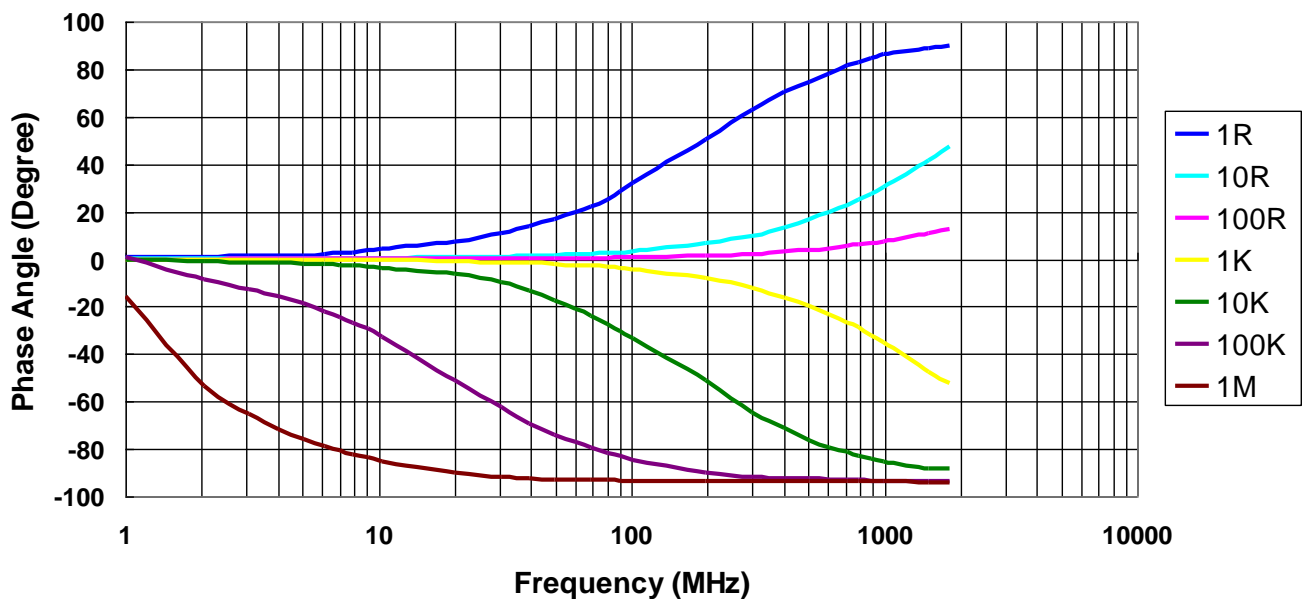
Resistors are designed to function according to ohmic laws. This is basically true of resistors for frequencies up to 100kHz. At higher frequencies, there is an additional contribution to the impedance by an ideal resistor switched in series with a coil and both switched parallel to a capacitor. The values of the capacitance and inductance are mainly determined by the dimensions of the terminations and the conductive path length.

The environment surrounding components has a large influence on the behavior of the component on the printed-circuit board.

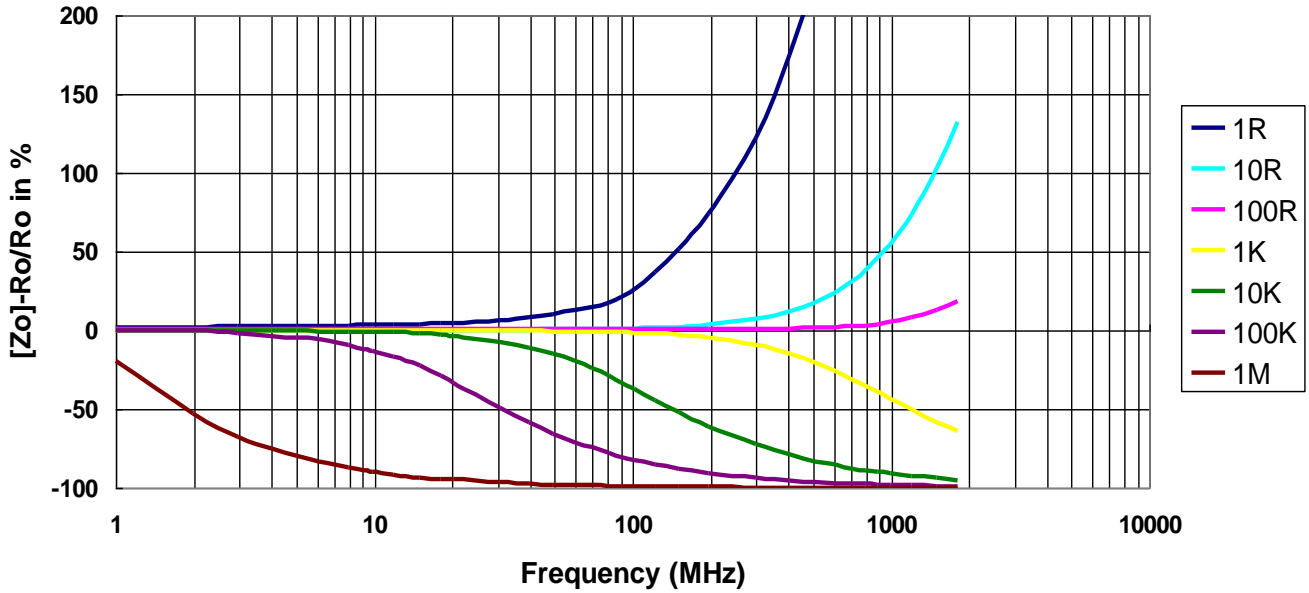
**Frequency vs. Impedance
CSR Series(CSR0204)**



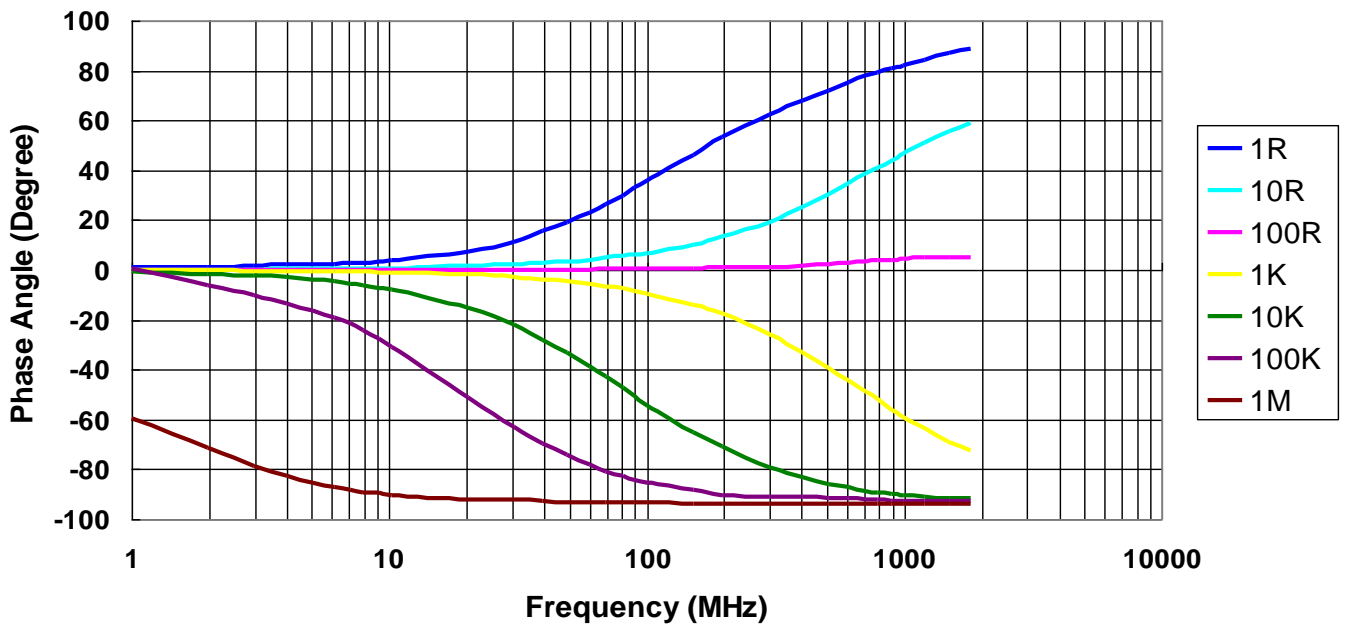
**Frequency vs. Phase Angle
CSR Series(CSR0204)**



Frequency vs. Impedance CSR Series(CSR0207)



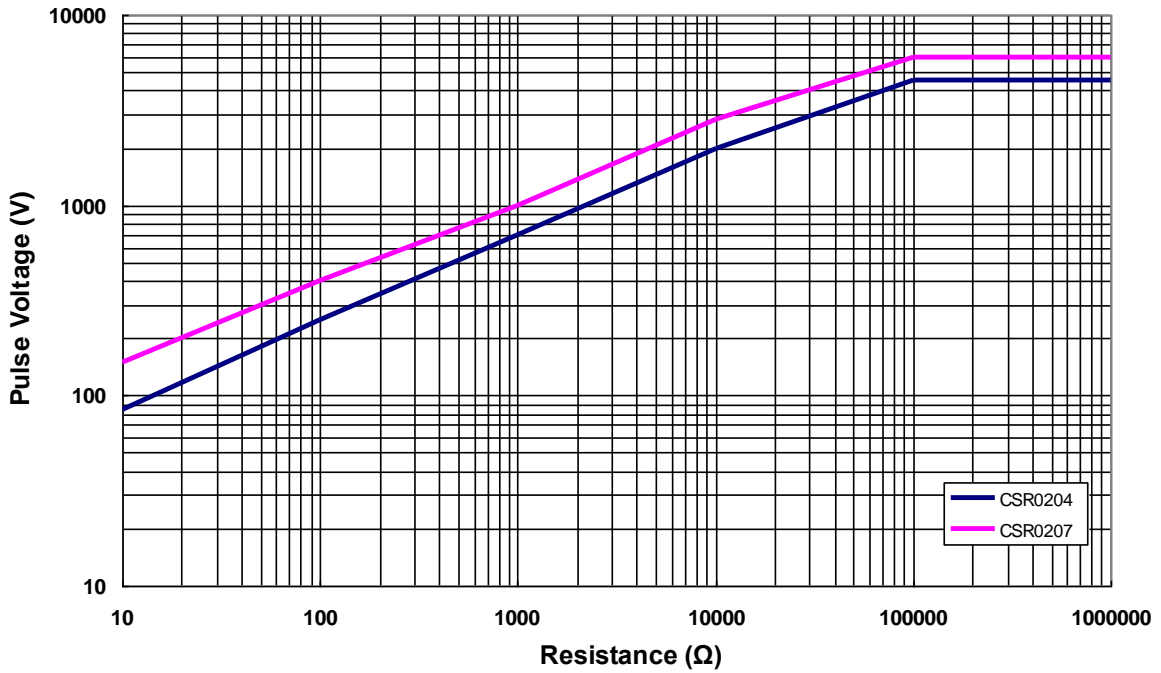
Frequency vs. Phase Angle CSR Series(CSR0207)



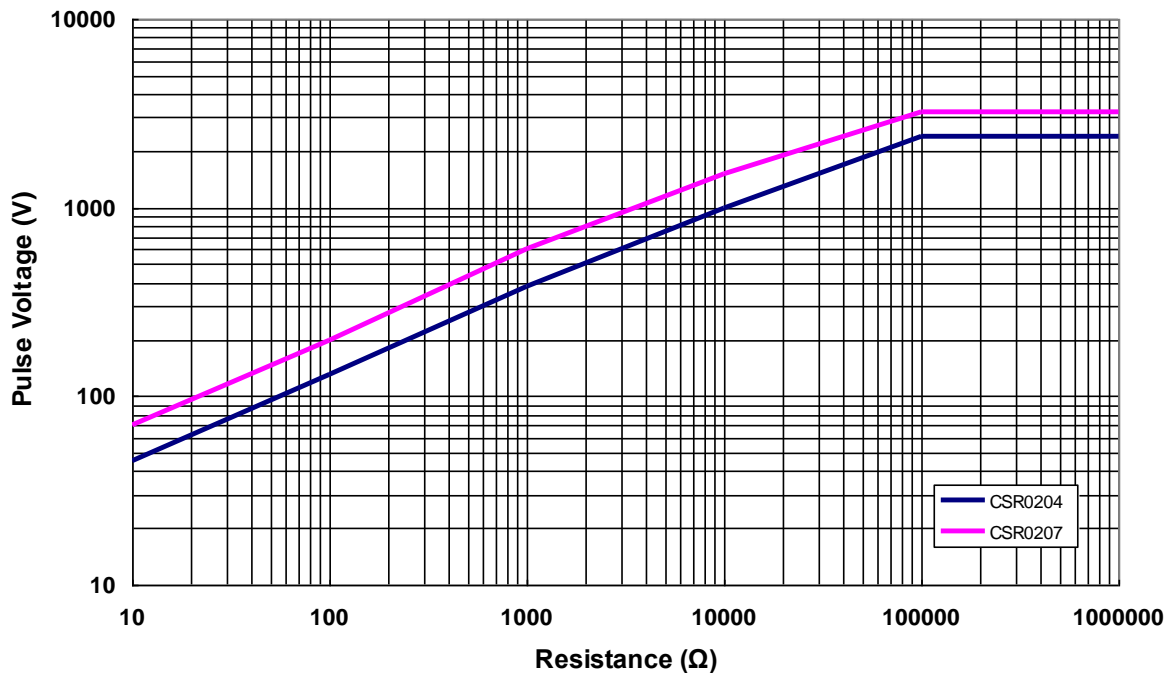
■ Lightning Surge

Resistors are tested in accordance with IEC 60 115-1 using both 1.2/50us and 10/700us pulse shapes. The limit of acceptance is a shift in resistance of less than 0.5% from the initial value.

1.2/50μs Lightning Surge

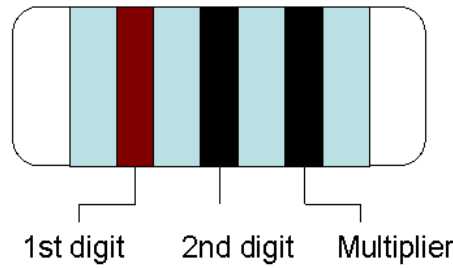


10/700μs Lightning Surge

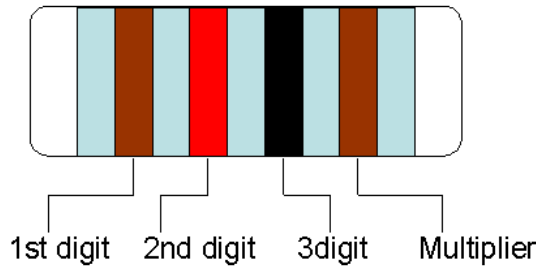


Metal Film Precision Resistor

■ Marking & Resistance Tolerance



±5%	E-24	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1
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±1%	E-96	1.00	1.02	1.05	1.07	1.10	1.13	1.15	1.18	1.21	1.24	1.27	1.30	1.33	1.37	1.40	1.43	1.47	1.50	1.54	1.58	1.62	1.65	1.69	1.74
		1.78	1.82	1.87	1.91	1.96	2.00	2.05	2.10	2.15	2.21	2.26	2.32	2.37	2.43	2.49	2.55	2.61	2.67	2.74	2.80	2.87	2.94	3.01	3.09
		3.16	3.24	3.32	3.40	3.48	3.57	3.65	3.74	3.83	3.92	4.02	4.12	4.22	4.32	4.42	4.53	4.64	4.75	4.87	4.99	5.11	5.23	5.36	5.49
		5.62	5.76	5.90	6.04	6.19	6.34	6.49	6.65	6.81	6.98	7.15	7.32	7.50	7.68	7.87	8.06	8.25	8.45	8.66	8.87	9.09	9.31	9.53	9.76
±0.5%	E-192	10.0	10.1	10.2	10.4	10.5	10.6	10.7	10.9	11.0	11.1	11.3	11.4	11.5	11.7	11.8	12.0	12.1	12.3	12.4	12.6	12.7	12.9	13.0	13.2
		13.3	13.5	13.7	13.8	14.0	14.2	14.3	14.5	14.7	14.9	15.0	15.2	15.4	15.6	15.8	16.0	16.2	16.4	16.5	16.7	16.9	17.2	17.4	17.6
		17.8	18.0	18.2	18.4	18.7	18.9	19.1	19.3	19.6	19.8	20.0	20.3	20.5	20.8	21.0	21.3	21.5	21.8	22.1	22.3	22.6	22.9	23.2	23.4
		23.7	24.0	24.3	24.6	24.9	25.2	25.5	25.8	26.1	26.4	26.7	27.1	27.4	27.7	28.0	28.4	28.7	29.1	29.4	29.8	30.1	30.5	30.9	31.2
		31.6	32.0	32.4	32.8	33.2	33.6	34.0	34.4	34.8	35.2	35.7	36.1	36.5	37.0	37.4	37.9	38.3	38.8	39.2	39.7	40.2	40.7	41.2	41.7
		42.2	42.7	43.2	43.7	44.2	44.8	45.3	45.9	46.4	47.0	47.5	48.1	48.7	49.3	49.9	50.5	51.1	51.7	52.3	53.0	53.6	54.2	54.9	55.6
		56.2	56.9	57.6	58.3	59.0	59.7	60.4	61.2	61.9	62.6	63.4	64.2	64.9	65.7	66.5	67.3	68.1	69.0	69.8	70.6	71.5	72.3	73.2	74.1
		75.0	75.9	76.8	77.7	78.7	79.6	80.6	81.6	82.5	83.5	84.5	85.6	86.6	87.6	88.7	89.8	90.9	92.0	93.1	94.2	95.3	96.5	97.6	98.8

Color	Digit	Multiplier
Silver	-	10 ⁻²
Gold	-	10 ⁻¹
Black	0	10 ⁰
Brown	1	10 ¹
Red	2	10 ²
Orange	3	10 ³
Yellow	4	10 ⁴
Green	5	10 ⁵
Blue	6	10 ⁶
Violet	7	10 ⁷
Grey	8	10 ⁸
White	9	10 ⁹

※Resistance more than two significant figures(<1R) or more than three significant figures(>1R) will not provide color code.

REVISION HISTORY

REVISION	DATE	CHANGE NOTIFICATION	DESCRIPTION
Version B9	Jun 03, 2014	-	- Electrical Specifications updated - Environmental Characteristics updated
Version C	Feb 25, 2015	-	- Max overload voltage updated - Increase the color code Description
Version C1	Apr 30, 2015	-	- Electrical Specifications updated (CSR0102) - Dimension "K" updated
Version C2	Jul 07, 2015	-	- Increase CSR0102 Characteristic Curve
Version C3	Jul 15, 2016	-	- Modify Storage Temperature - Remove CSR0102 specification
Version C4	Jun 01, 2017	-	- Electrical Specifications updated
Version C5	Jan 12, 2018	-	- Electrical Specifications updated - Increase L1 & Φ D1 Dimension - Environmental Characteristics updated
Version C6	May 20, 2019	-	- Modify TCR Test description
Version C7	Mar 31, 2020	-	- Increase 5ppm specification range
Version C8	Jun 30, 2020	-	- Increase 5ppm specification range
Version C9	Mar 10, 2021	-	- Modify Soldering Condition (IPC/JEDEC J-STD-020) - Electrical Specifications updated
Version D	Sep 3, 2021	-	- Modify Pulse Curve
Version D1	Sep 28, 2021	-	- Add in Shelf Life: 2 years from production date.
Version D2	Jan 05, 2022	-	- Newly added antistatic tape packaging for packaging methods.
Version D3	Feb 15, 2022	-	- Derating Curve changes the temperature range.
Version D4	Jun 15, 2022	-	- Modify Soldering Condition
Version D5	Sep 05, 2023	-	- Features added Thin film technology