

Viking Tech Corporation

Carbon Film Resistor



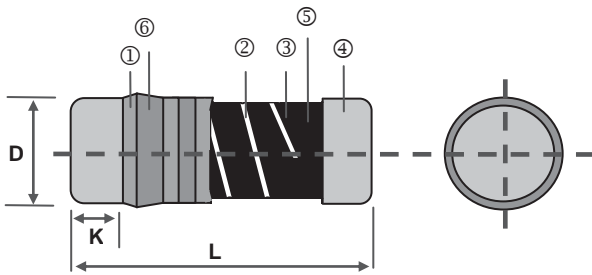
■ Features

- SMD style carbon resistor
- Free direction for mounting due to cylindrical design
- High solder ability due to specially plated electrodes
- Electrodes strength is higher than flat chip resistors
- Lower current noise than thick film flat chip resistors
- Suitable for reflow, flow and iron soldering

■ Applications

- Automotive
- Telecommunication
- Medical Equipment
- Consumer Product

■ Construction



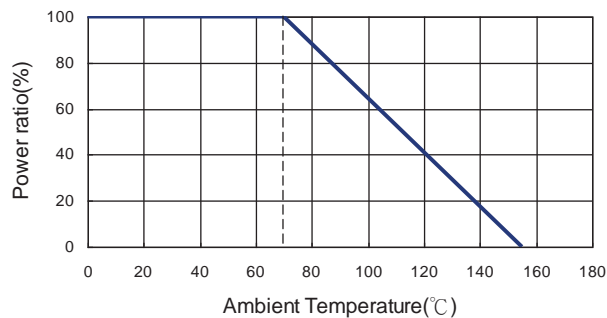
① Insulation Coating	④ Electrode Cap
② Trimming Line	⑤ Resistor Layer
③ Ceramic Rod	⑥ Marking

■ Dimensions

Unit: mm

Type	L	ΦD	K min.	Wight (g) (1000pcs)	Packaging	
					180mm/7"	330mm/13"
CFS0204	3.50±0.2	1.40±0.15	0.5	19	3000EA	—
CFS0207	5.90±0.2	2.20±0.20	0.5	81	2000EA	—
CFS0309	8.50±0.2	3.20±0.20	0.5	95	—	2500EA

■ Derating Curve



Metal Film Precision MELF Resistor

Features

- AEC-Q200 Compliance
- Thin film technology
- Excellent overall stability
- Sn termination on Ni barrier layer
- Tight tolerance down to $\pm 0.1\%$
- Extremely low TCR down to $\pm 10 \text{ PPM}/^\circ\text{C}$
- High power rating up to 1 Watts
- SMD enabled structure
- Lead-free and RoHS compliant



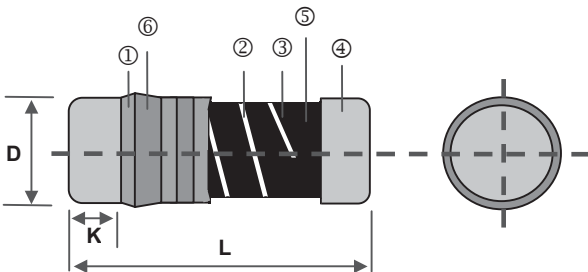
Applications

- Automotive
- Industrial
- Telecommunication
- Medical Equipment
- Measurement/Testing Equipment

TECHNICAL SPECIFICATIONS

DESCRIPTION	CSRV0204		CSRV0207	
Resistance range	0.1 Ω -1M Ω ;0 Ω		0.1 Ω -1M Ω ;0 Ω	
Resistance tolerance	$\pm 5\%$; $\pm 1\%$; $\pm 0.5\%$; $\pm 0.25\%$; $\pm 0.1\%$		$\pm 5\%$; $\pm 1\%$; $\pm 0.5\%$; $\pm 0.25\%$; $\pm 0.1\%$	
Temperature coefficient	$\pm 100 \text{ ppm}/^\circ\text{C}$; $\pm 50 \text{ ppm}/^\circ\text{C}$; $\pm 25 \text{ ppm}/^\circ\text{C}$; $\pm 15 \text{ ppm}/^\circ\text{C}$; $\pm 10 \text{ ppm}/^\circ\text{C}$			
Operation mode	Standard	High power	Standard	High power
Power rating P_{70}	1/4W	2/5W	1/2W	1W
Operating voltage U_{max}	200V	200V	300V	350V
Operating temperature range	$-55^\circ\text{C} \sim 155^\circ\text{C}$			
Max. resistance change at P70 for resistance range, $\Delta R/R$ max., after 1000 h	$\leq 0.5\%$		$\leq 0.5\%$	

Construction & Dimension

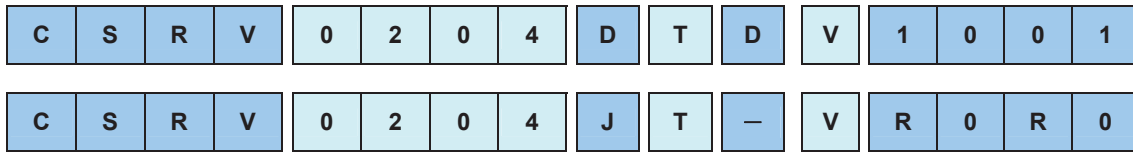


Type	L (mm)	ΦD (mm)	K min (mm)	Weight 1,000EA (g)
CSRV0204	3.50 ± 0.2	1.40 ± 0.15	0.5	18.7
CSRV0207	5.90 ± 0.2	2.20 ± 0.20	0.5	80.9

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

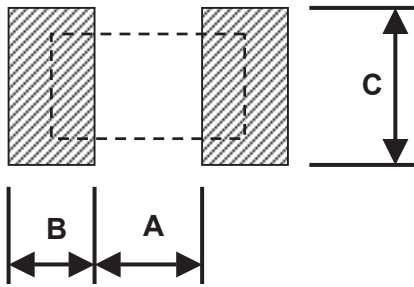
Part Numbering

Part Number : CSRV0204DTDV1001
 Part Number : CSRV0204JT-VR0R0



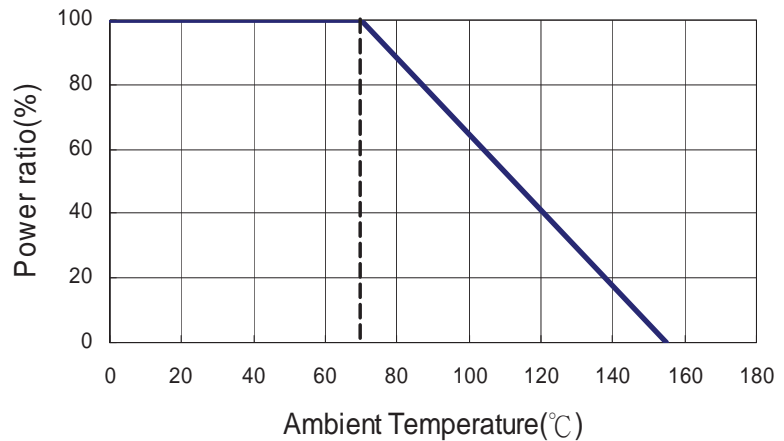
Product Type	Dimensions (LxΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
CSRV	0204: 3.5x1.4 0207: 5.9x2.2	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% J: ±5%	T: Taping Reel B: Bulk	B: ±10 N: ±15 C: ±25 D: ±50 E: ±100 -: Jumper	T: 1W U: 1/2W V: 1/4W G: 2/5W	0010: 1Ω 0100: 10Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ R050: 0.05Ω 22R1: 22.1Ω R0R0: 0Ω

Recommend Land Pattern

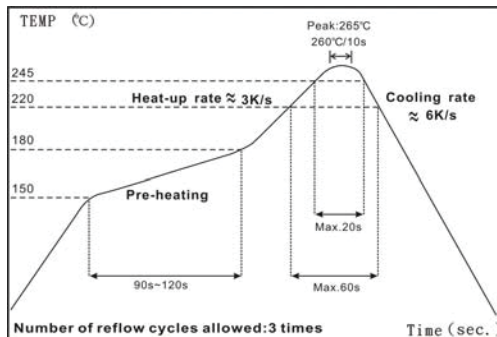


Type	A (mm)	B (mm)	C (mm)
CSRV0204	1.6	1.2	1.6
CSRV0207	3.0	1.7	2.4

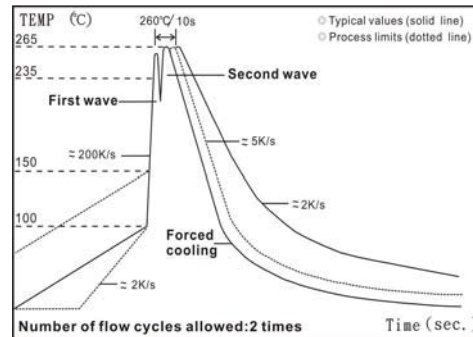
Derating Curve



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

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 Jumper:2A	-55 ~ +155°C	200V	400V	49.9Ω-20KΩ					±10
					49.9Ω-300KΩ					±15
					10Ω-1MΩ			10Ω-1MΩ		±25
					10Ω-1MΩ	1Ω-1MΩ		0.2Ω-1MΩ		±50
					-			0.1Ω-1MΩ		±100
0Ω(<15mΩ)					-					
0207	1/2W Jumper:4A	-55 ~ +155°C	300V	500V	49.9Ω-20KΩ					±10
					49.9Ω-300KΩ					±15
					10Ω-1MΩ			10Ω-1MΩ		±25
					10Ω-1MΩ	1Ω-1MΩ		0.2Ω-1MΩ		±50
					-			0.1Ω-1MΩ		±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 ~ +155°C	200V	400V	49.9Ω-100KΩ					±15
					49.9Ω-1MΩ					±25
					10Ω-1MΩ	1Ω - 1MΩ		0.2Ω-1MΩ		±50
					-			0.1Ω-1MΩ		±100
0207	1W	-55 ~ +155°C	350V	700V	10Ω-100KΩ					±15
					10Ω-1MΩ					±25
					10Ω-1MΩ	1Ω-1MΩ		0.2Ω-1MΩ		±50
					-			0.1Ω-1MΩ		±100

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.

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

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

Environmental Characteristics

Item	Requirement	Test Method
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	±(0.15%+0.05%)	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

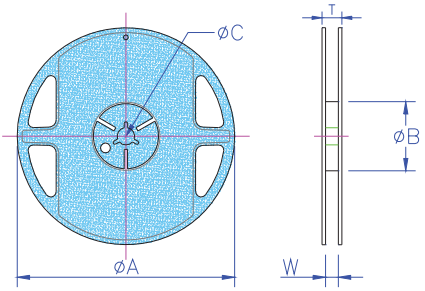
Item	Requirement	Test Method
Endurance	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70 \pm 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Biased Humidity	$\pm(1.0\%+0.05\Omega)$	MIL-STD-202 Method 103 1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	$\pm(1.0\%+0.05\Omega)$	MIL-STD-202 Method 108 at +155°C for 1000 hrs
Bending Strength	$\pm(0.5\%+0.05\Omega)$	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 \pm 5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260 \pm 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 \leq 5% Total leaching area \leq 10%	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260 \pm 5°C for 30 seconds
Temperature Cycling	$\pm(0.5\%+0.05\Omega)$	JESD22 Method JA-104 -55°C to +125°C, 1000 cycles
Mechanical Shock	$\pm(0.25\%+0.05\Omega)$	MIL-STD-202 Method 213 Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(0.5\%+0.05\Omega)$	MIL-STD-202 Method 204 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(1\%+0.05\Omega)$	AEC-Q200-002 Human body, 2KV
Flame Retardance	Not flame	AEC-Q200-001 Temperature sensing at 500°C, voltage power subjected to 32VDC current clamped up to 500ADC and decreased in 1.0VDC/hour.
Resistance to solvents	Marking legible	MIL-STD-202 Method 215 Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal strength	No broken	AEC-Q200-006 Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching of the pinewood board	UL-94 V-0 or V-1 are acceptable. Electrical test not required.

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

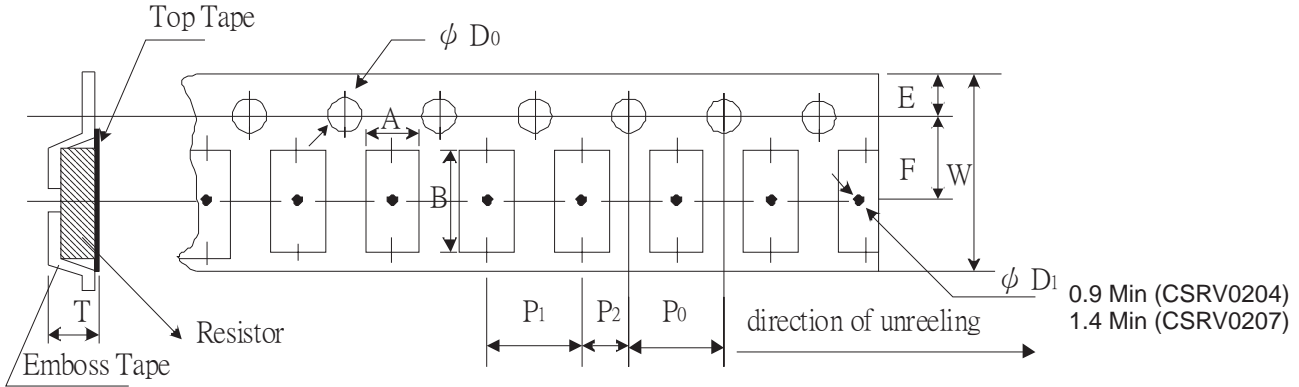
■ Packaging

Packaging Quantity & Reel Specifications

Type	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)	Emboss Plastic Tape (EA)
CSRV0204	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
CSRV0207	7 inch	178.5±1.5	60.0+1.0	13.0±0.5	13.0±0.5	15.5±0.5	2,000



Emboss Plastic Tape Specifications

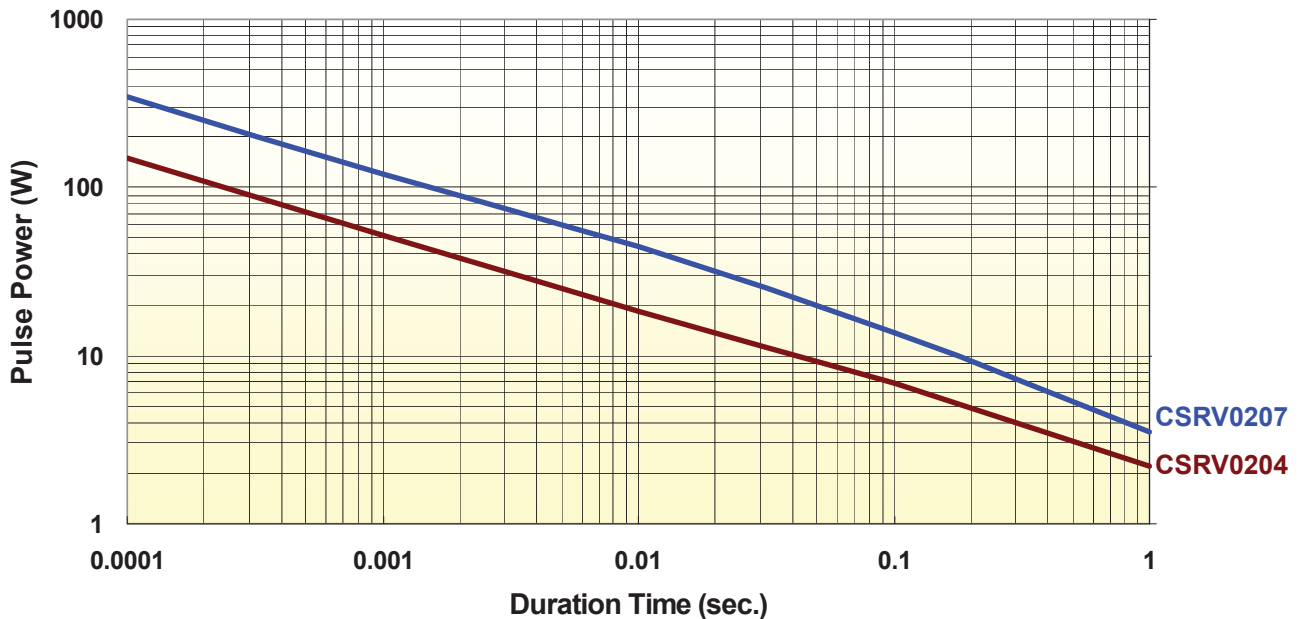


Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P ₀ (mm)	P ₁ (mm)	P ₂ (mm)	ΦD ₀ (mm)	T (mm)
CSRV0204	1.55±0.10	3.65±0.10	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.80±0.10
CSRV0207	2.40±0.10	6.15±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	2.70±0.10

■ Pulse withstanding capacity

The single impulse graph is the result of 50 impulses of rectangular shape applied at one-minute intervals. 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.

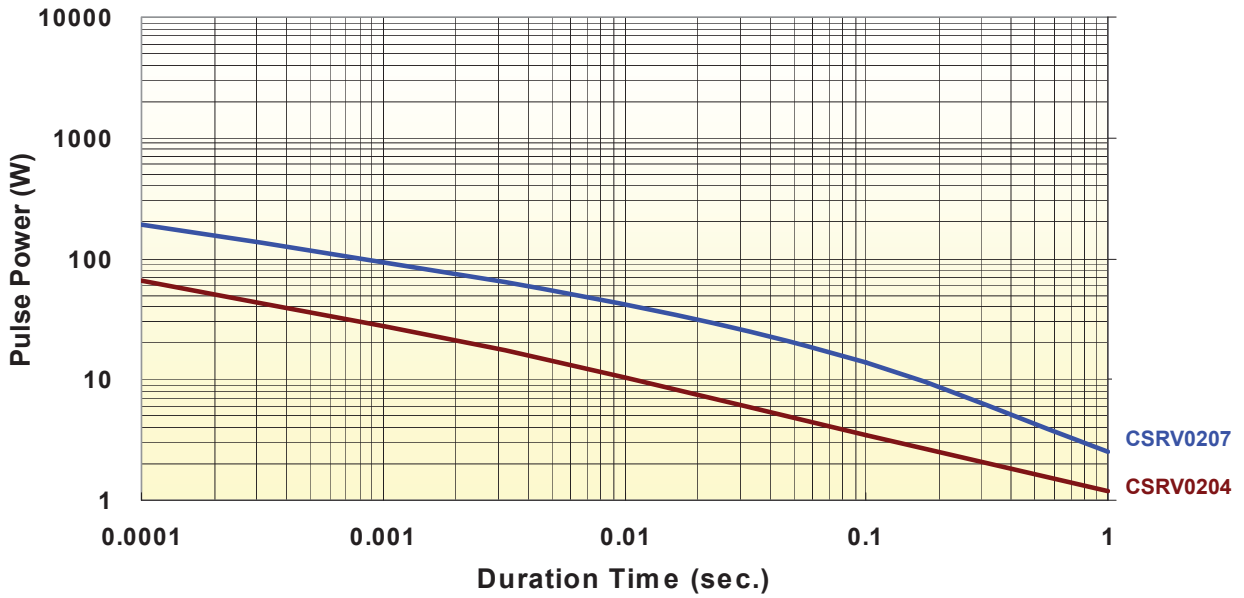
CSRV Series Single Pulse(100 Ohm)



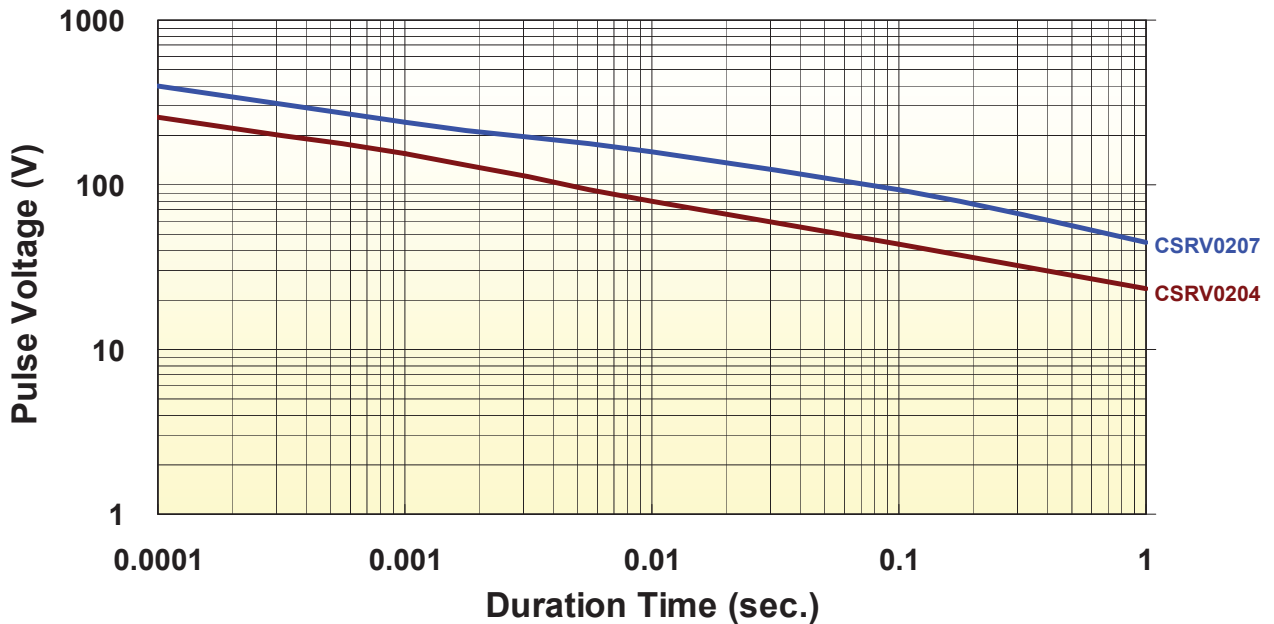
Continuous Pulse

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.

CSRV Series Continuous Pulse(100 Ohm)



CSRV Series Pulse Voltage(100 Ohm)

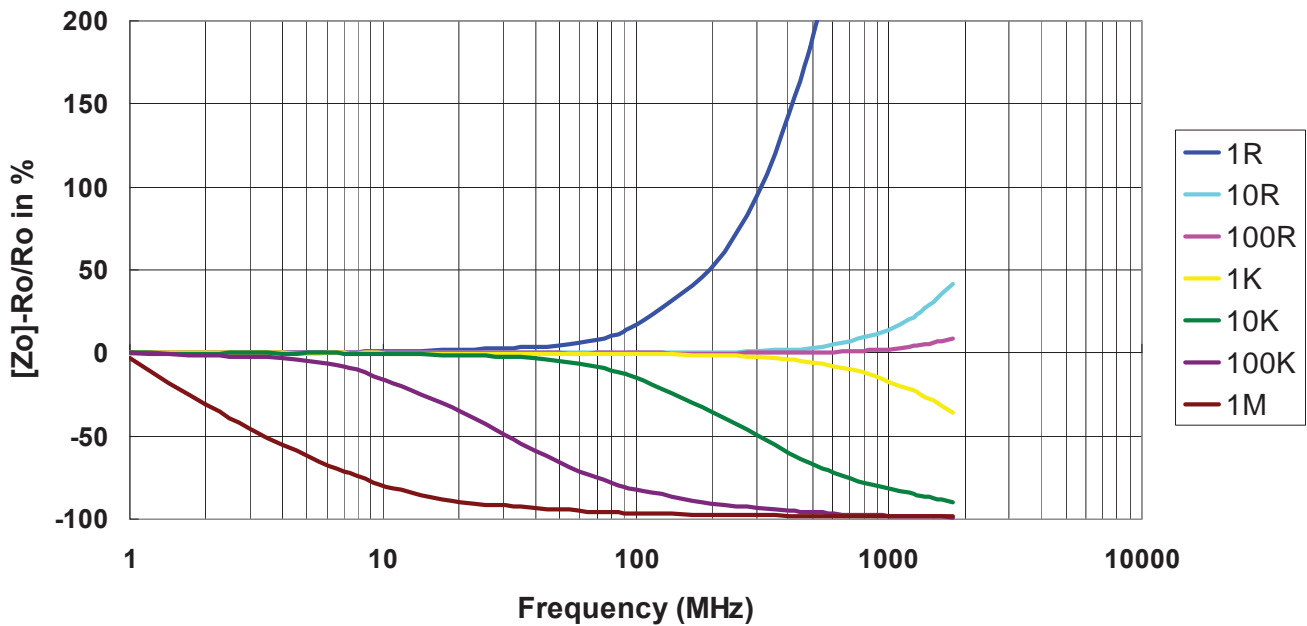


Frequency behavior

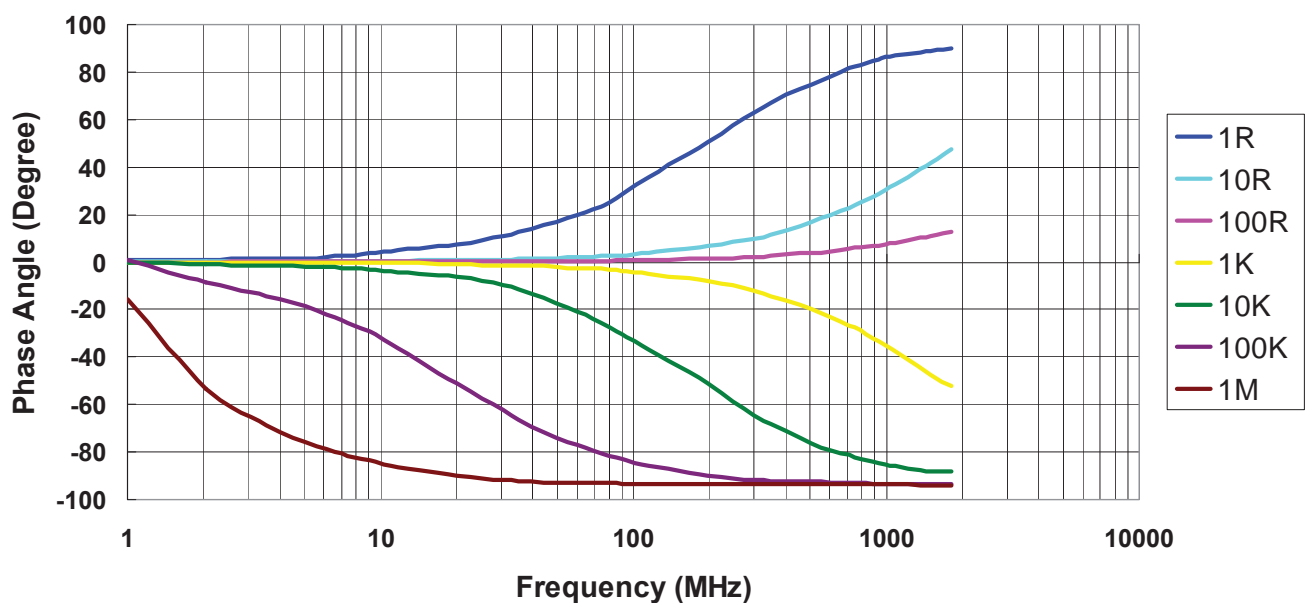
Resistors are designed to function according to ohmic laws. This is basically true of resistors for frequencies up to 100kHz. At higher frequencies, there is an additional contribution to the impedance by an ideal resistor switched in series with a coil and both switched parallel to a capacitor. The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

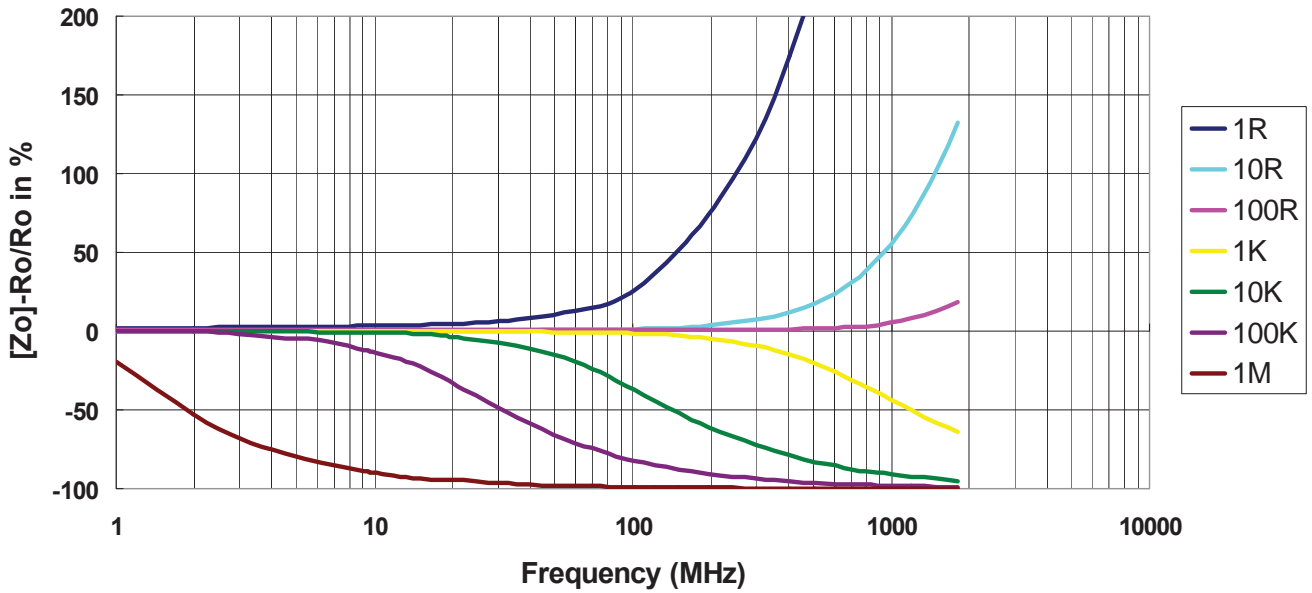
Frequency vs. Impedance CSRV Series (CSRV0204)



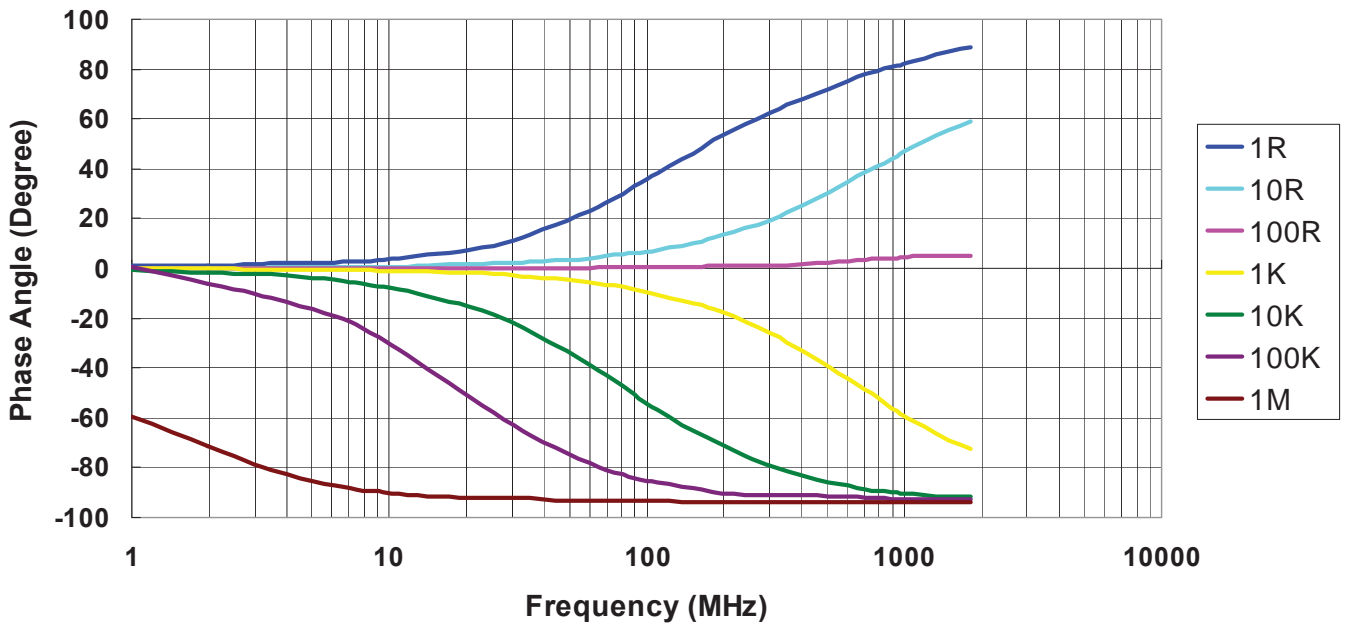
Frequency vs. Phase Angle CSRV Series (CSRV0204)



Frequency vs. Impedance CSRV Series (CSRV0207)



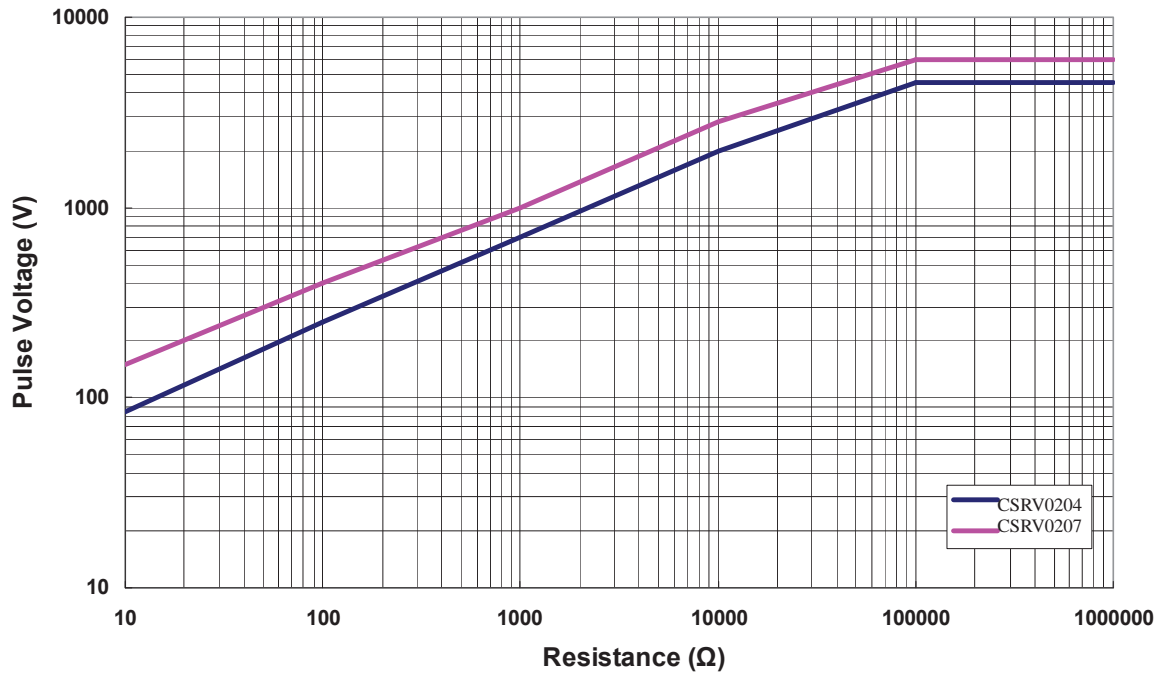
Frequency vs. Phase Angle CSRV Series (CSRV0207)



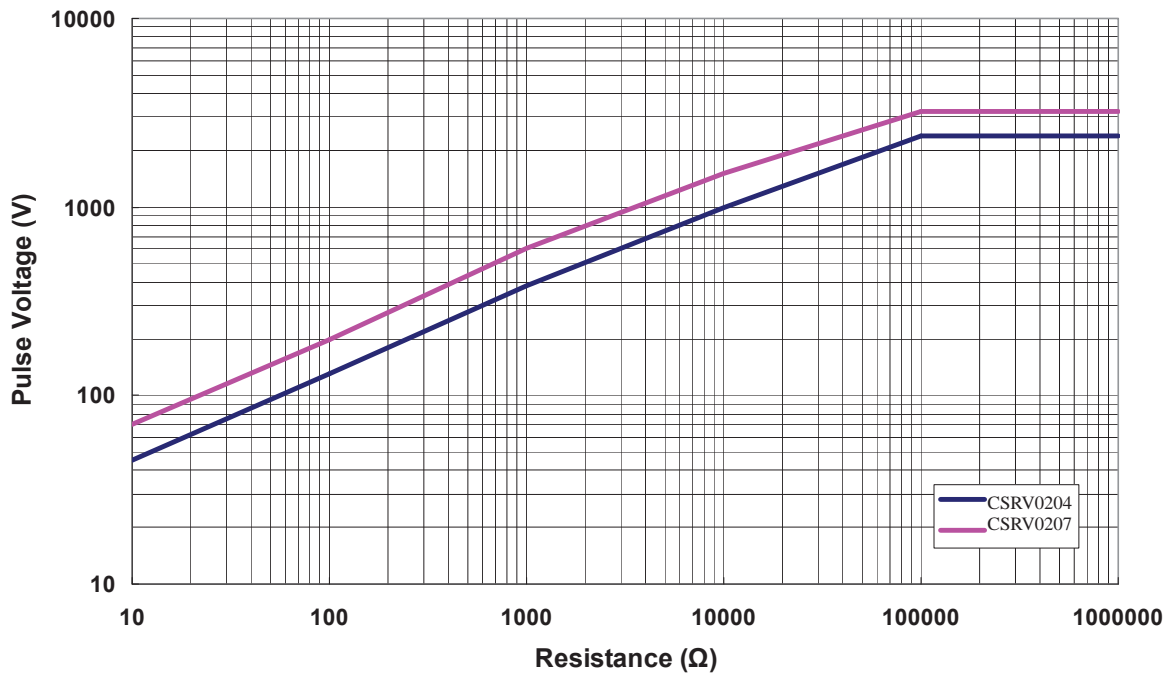
Lightning Surge

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

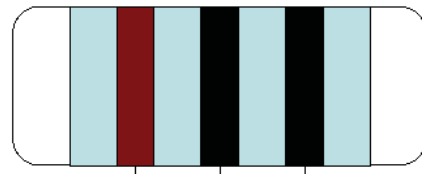
1.2/50 μ s Lightning Surge



10/700 μ s Lightning Surge

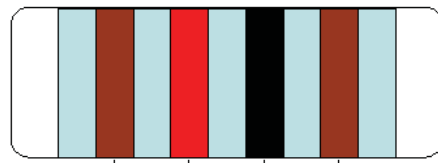


■ Marking & Resistance Tolerance



1st digit 2nd digit Multiplier

±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
-----	------	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----



1st digit 2nd digit 3rd digit Multiplier

±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% ±0.25% ±0.1%	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

Metal Film Precision Resistor



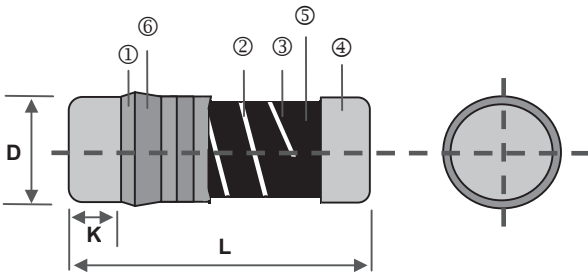
■ Features

- Excellent overall stability
- Tight tolerance down to $\pm 0.1\%$
- Extremely low TCR down to $\pm 10 \text{ PPM}/^\circ\text{C}$
- High power rating up to 1 Watts

■ Applications

- Telecommunication
- Medical Equipment
- Measurement/Testing Equipment

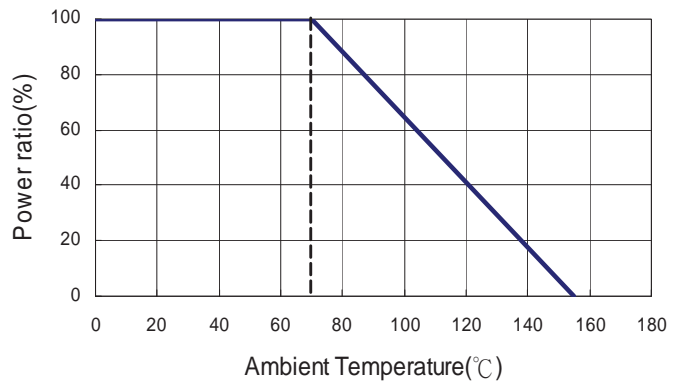
■ Construction & Dimension



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

Type	L (mm)	ΦD (mm)	K min (mm)	Weight 1,000EA (g)
CSR0102	2.00 \pm 0.10	1.30 \pm 0.05	0.5	7.2
CSR0204	3.50 \pm 0.20	1.40 \pm 0.15	0.5	18.7
CSR0207	5.90 \pm 0.20	2.20 \pm 0.20	0.5	80.9

■ Derating Curve

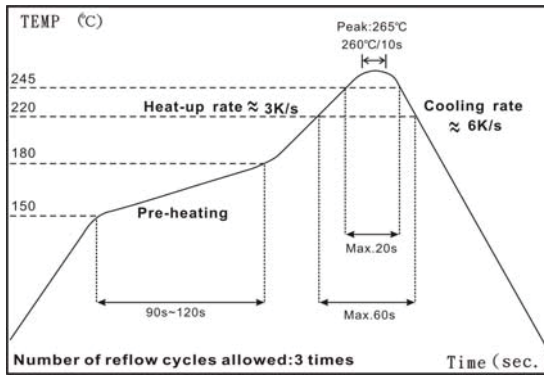


■ Part Numbering

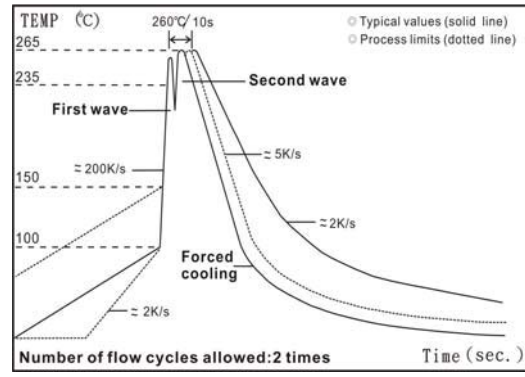
CSR	0204	D	T	D	V	1000
Product Type	Dimensions (Lx Φ D)	Resistance Tolerance	Packaging Code	TCR (PPM/ $^\circ$ C)	Power Rating	Resistance
	0102: 2.0x1.3 0204: 3.5x1.4 0207: 5.9x2.2	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$	T: Taping Reel B: Bulk	B: ± 10 N: ± 15 C: ± 25 D: ± 50 E: ± 100 - : No Specified	T: 1W U: 1/2W V: 1/4W W: 1/8W P: 1/5W G: 2/5W	0010: 1 Ω 0100: 10 Ω 1000: 100 Ω 2201: 2200 Ω 1001: 1K Ω 1004: 1M Ω R0R0: 0 Ω R050: 0.05 Ω R100: 0.1 Ω 22R1: 22.1 Ω

** Letter "R" is a decimal point.

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

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%	
0102	1/8W	-55 ~ +155°C	150V	300V	100Ω-56KΩ					±15
					100Ω-100KΩ					±25
					-	1Ω-1MΩ				±50
					-	0.22Ω-2MΩ				±100
0204	1/4W	-55 ~ +155°C	200V	400V	10Ω-20KΩ					±10
					10Ω-300KΩ					±15
					10Ω-1MΩ			10Ω-4.7MΩ		±25
					10Ω-1MΩ	1Ω-1MΩ		0.2Ω-10MΩ		±50
					-			0.1Ω-10MΩ		±100
	Jumper:2A	0Ω(<15mΩ)					-			
0207	1/2W	-55 ~ +155°C	300V	500V	10Ω-20KΩ					±10
					10Ω-300KΩ					±15
					10Ω-1MΩ			10Ω-4.7MΩ		±25
					10Ω-1MΩ	1Ω-1MΩ		0.2Ω-10MΩ		±50
					-			0.1Ω-10MΩ		±100
	Jumper:4A	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%	
0102	1/5W	-55 ~ +155°C	200V	400V	100Ω-56KΩ					±15
					100Ω-100KΩ					±25
					-	1Ω-1MΩ				±50
					-				0.5Ω-2MΩ	±100
0204	2/5W	-55 ~ +155°C	200V	400V	10Ω-100KΩ					±15
					10Ω-1MΩ					±25
					10Ω-1MΩ	1Ω - 1MΩ		0.2Ω-1MΩ		±50
					-			0.1Ω-1MΩ		±100
0207	1W	-55 ~ +155°C	350V	700V	10Ω-100KΩ					±15
					10Ω-1MΩ					±25
					10Ω-1MΩ	1Ω-1MΩ		0.2Ω-10MΩ		±50
					-			0.1Ω-10MΩ		±100

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.

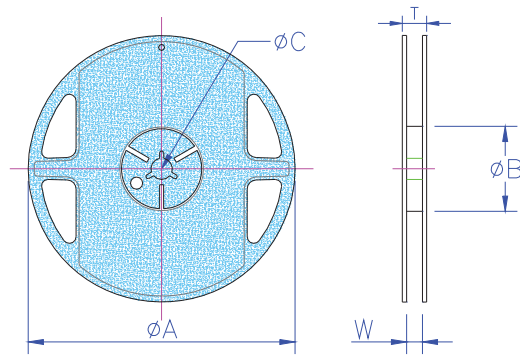
■ Environmental Characteristics

Item	Requirement	Test Method
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	0204/0207: $\pm(0.15\%+0.05\Omega)$ 0102: $\pm(0.5\%+0.05\Omega)$	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	$\geq 10G$	JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload voltage for 1 minute
Endurance	0204/0207: $\pm(0.5\%+0.05\Omega)$ 0102: $\pm(1.5\%+0.05\Omega)$	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70 \pm 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	0204/0207: $\pm(1.0\%+0.05\Omega)$ 0102: $\pm(1.5\%+0.05\Omega)$	JIS-C-5201-1 4.24 40 \pm 2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	0204/0207: $\pm(1.0\%+0.05\Omega)$ 0102: $\pm(1.5\%+0.05\Omega)$	JIS-C-5201-1 4.23 IEC-60115-1 2.23.2 at +155°C for 1000 hrs
Bending Strength	$\pm(0.5\%+0.05\Omega)$	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 \pm 5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260 \pm 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 $\leq 5\%$ Total leaching area $\leq 10\%$	JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260 \pm 5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.18 IEC-60115-1 4.18 -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: 25 \pm 3°C; Humidity < 80%RH

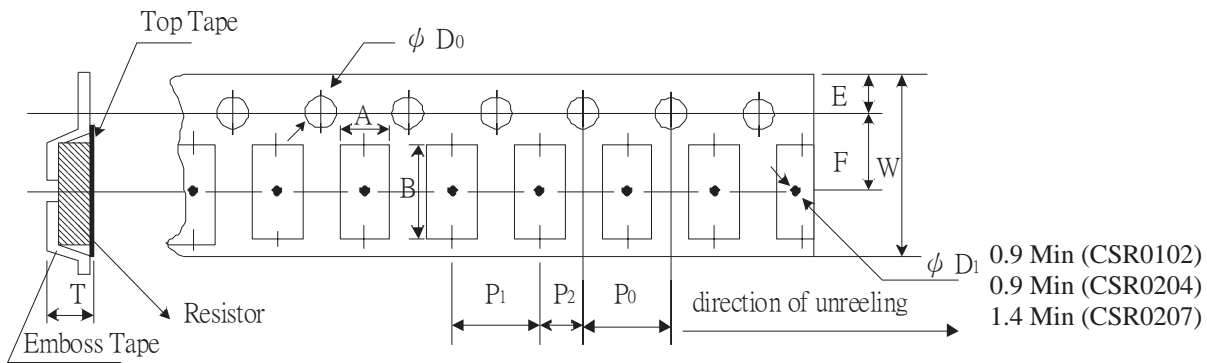
■ Packaging



Packaging Quantity & Reel Specifications

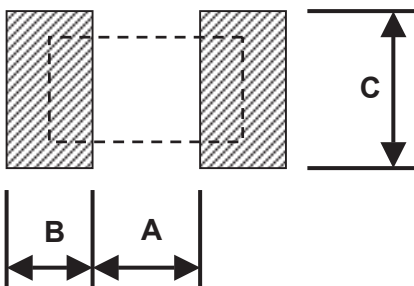
Type	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)	Emboss Plastic Tape (EA)
CSR0102	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
CSR0204	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
CSR0207	7 inch	178.5±1.5	60.0+1.0	13.0±0.5	13.0±0.5	15.5±0.5	2,000

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)
CSR0102	1.50±0.10	2.30±0.10	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	1.70±0.10
CSR0204	1.55±0.10	3.65±0.10	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

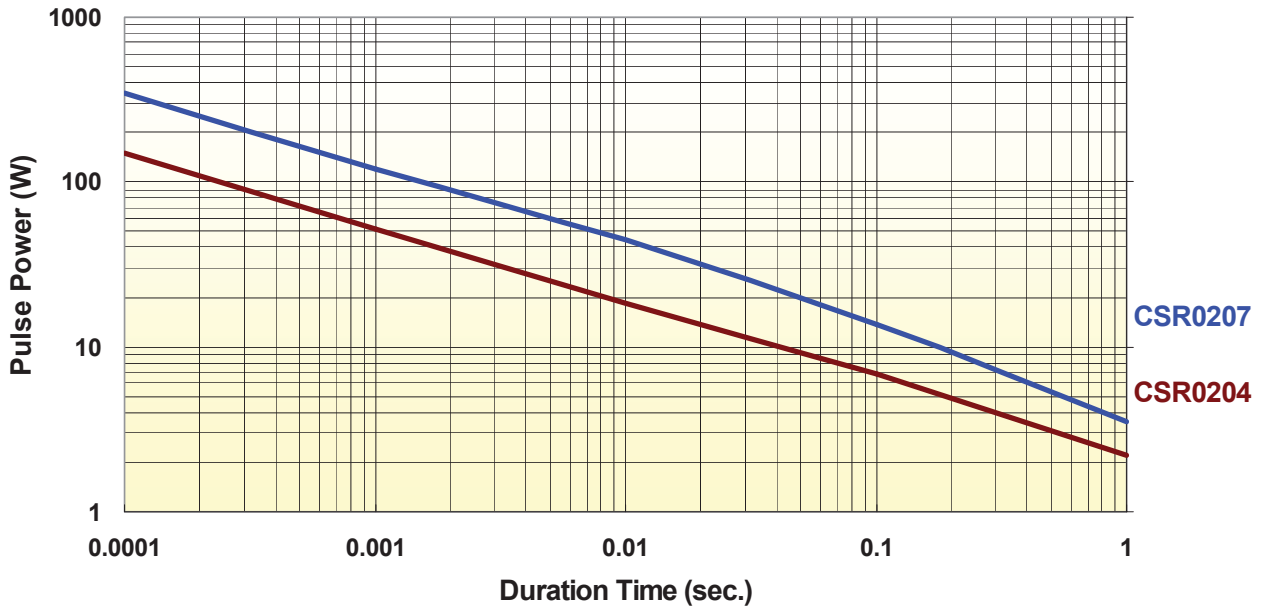


Type	A (mm)	B (mm)	C (mm)
CSR0102	1.0	0.8	1.5
CSR0204	1.6	1.2	1.6
CSR0207	3.0	1.7	2.4

■ Pulse withstanding capacity

The single impulse graph is the result of 50 impulses of rectangular shape applied at one-minute intervals. 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.

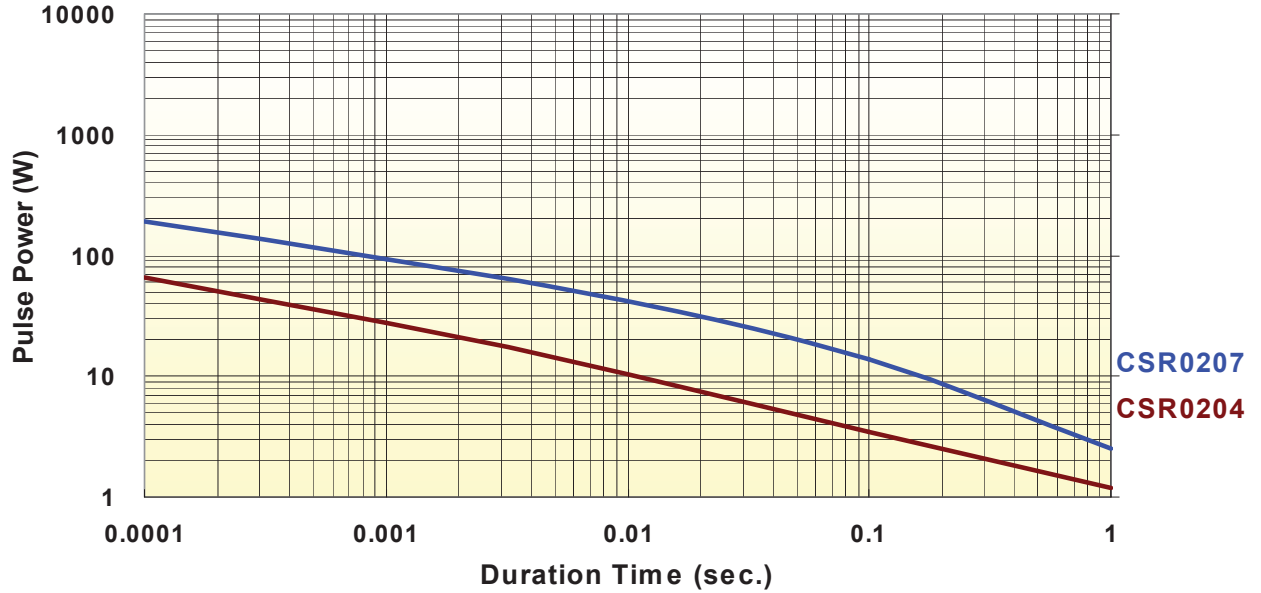
CSR Series Single Pulse(100 Ohm)



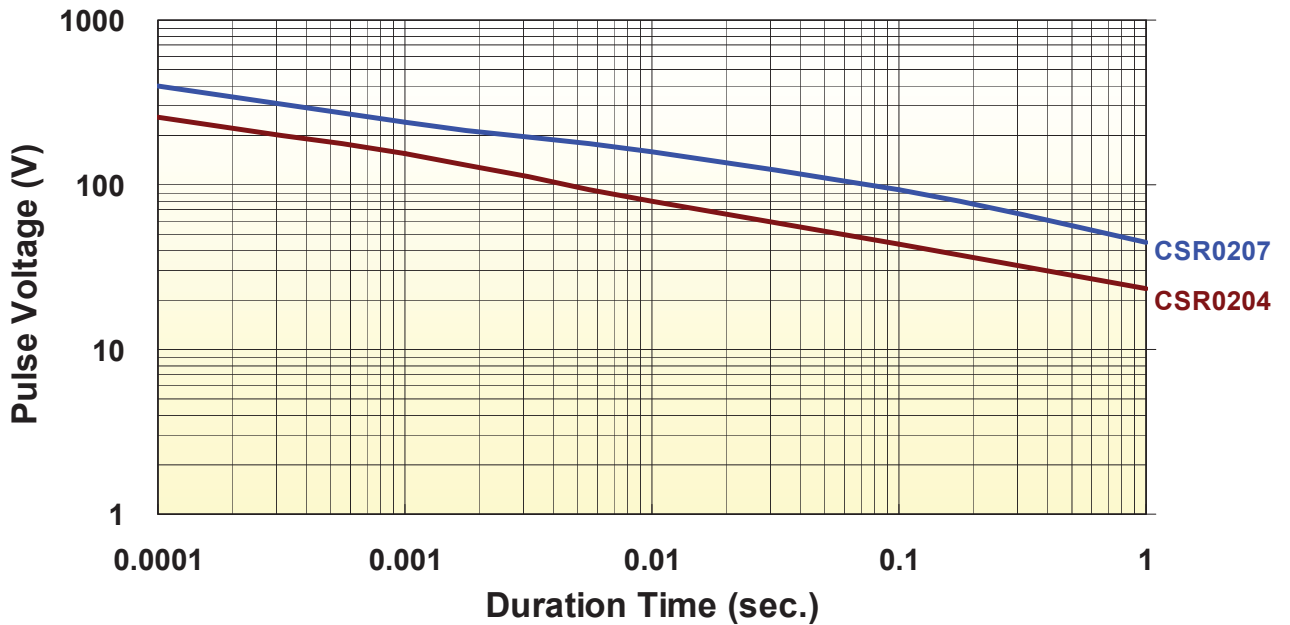
Continuous Pulse

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.

CSR Series Continuous Pulse(100 Ohm)



CSR Series Pulse Voltage(100 Ohm)

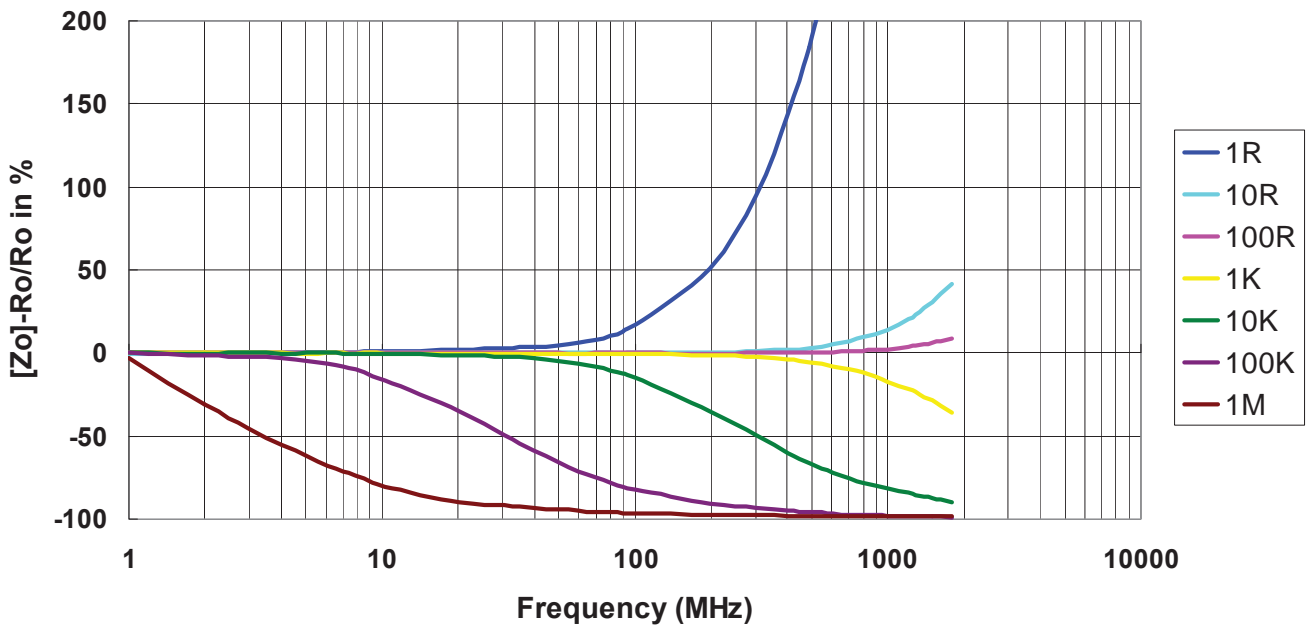


Frequency behavior

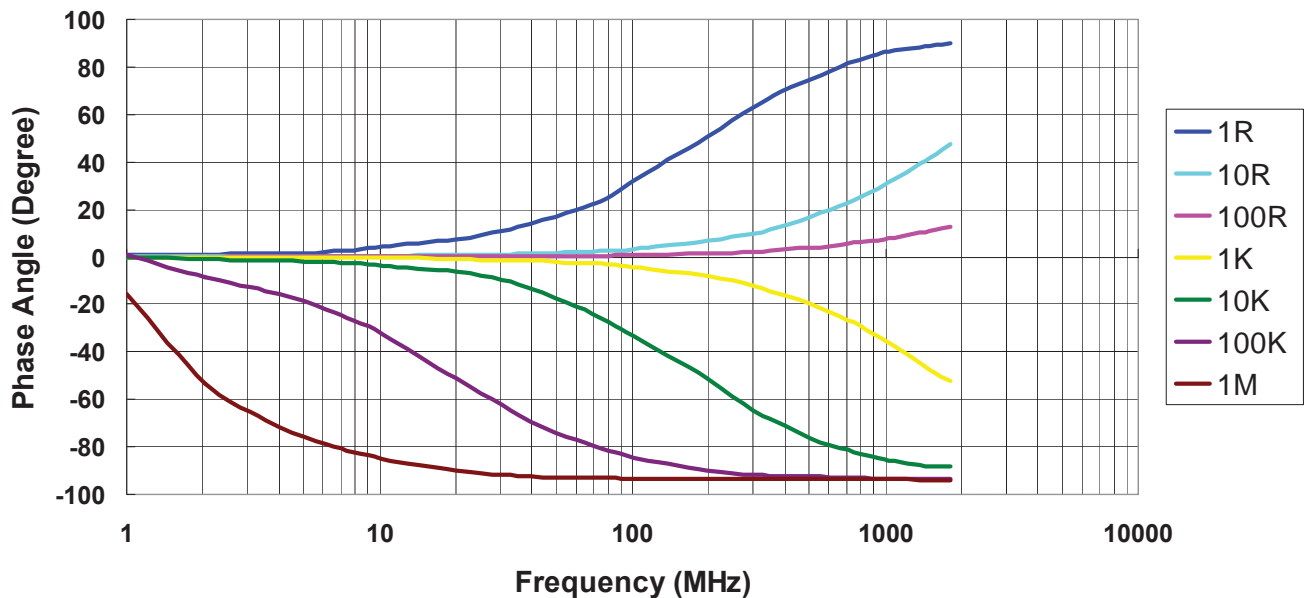
Resistors are designed to function according to ohmic laws. This is basically true of resistors for frequencies up to 100kHz. At higher frequencies, there is an additional contribution to the impedance by an ideal resistor switched in series with a coil and both switched parallel to a capacitor. The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

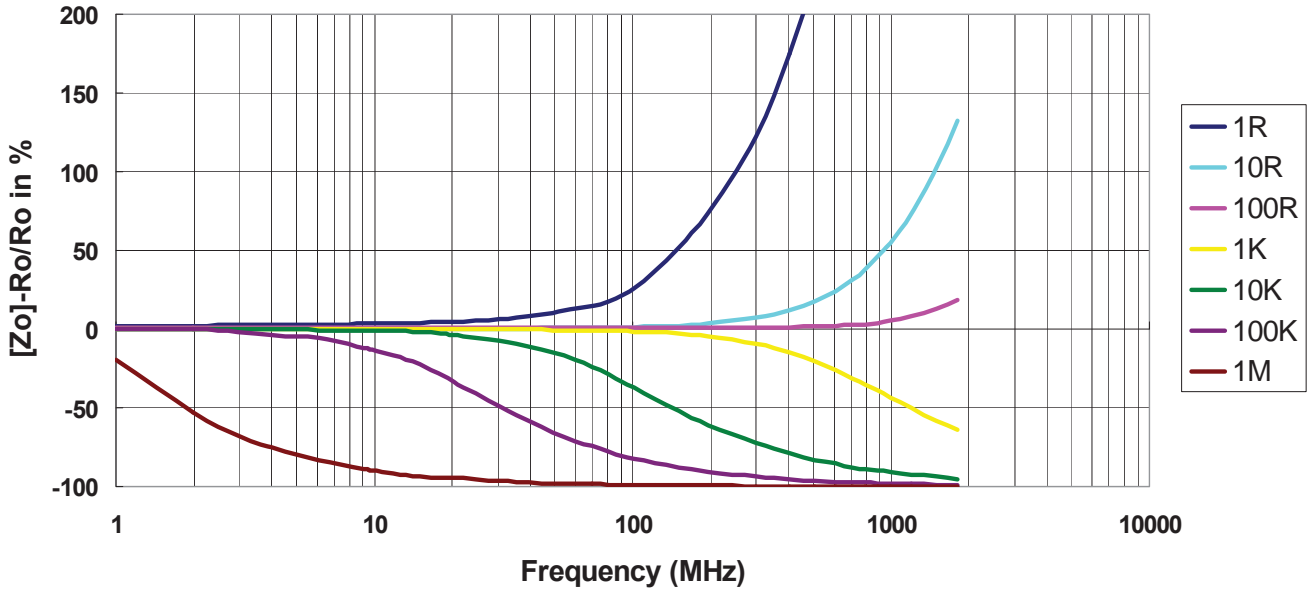
Frequency vs. Impedance CSR Series(CSR0204)



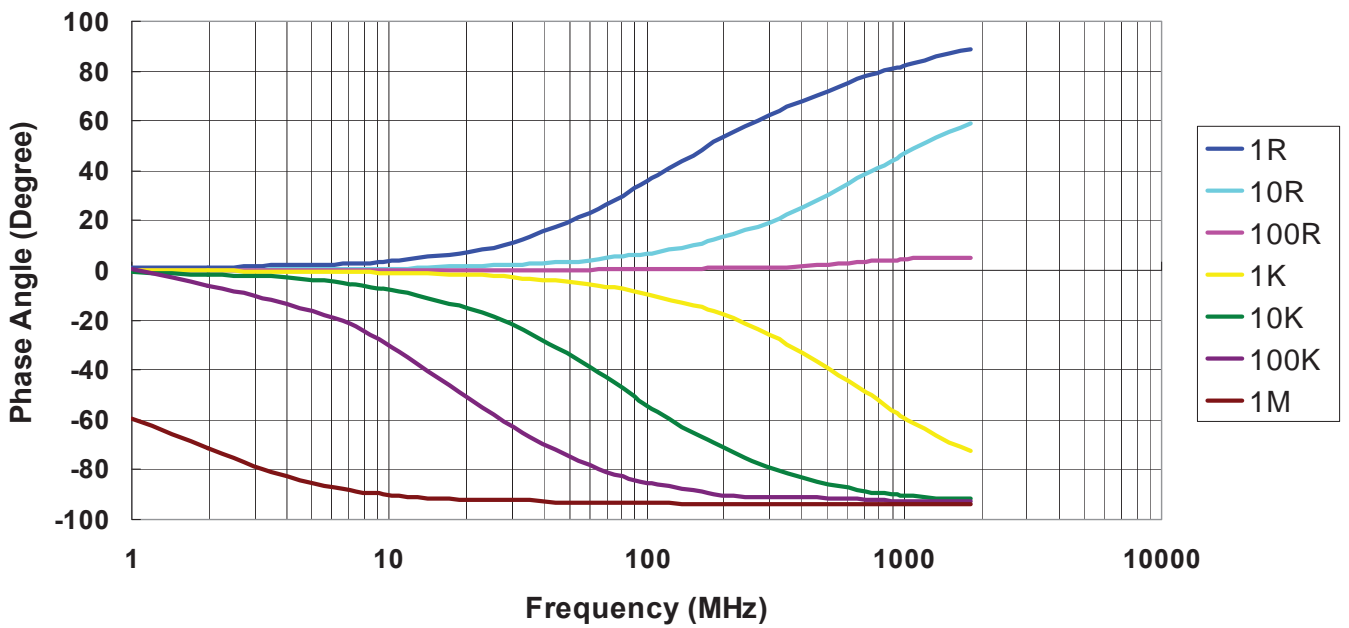
Frequency vs. Phase Angle CSR Series(CSR0204)



Frequency vs. Impedance CSR Series(CSR0207)



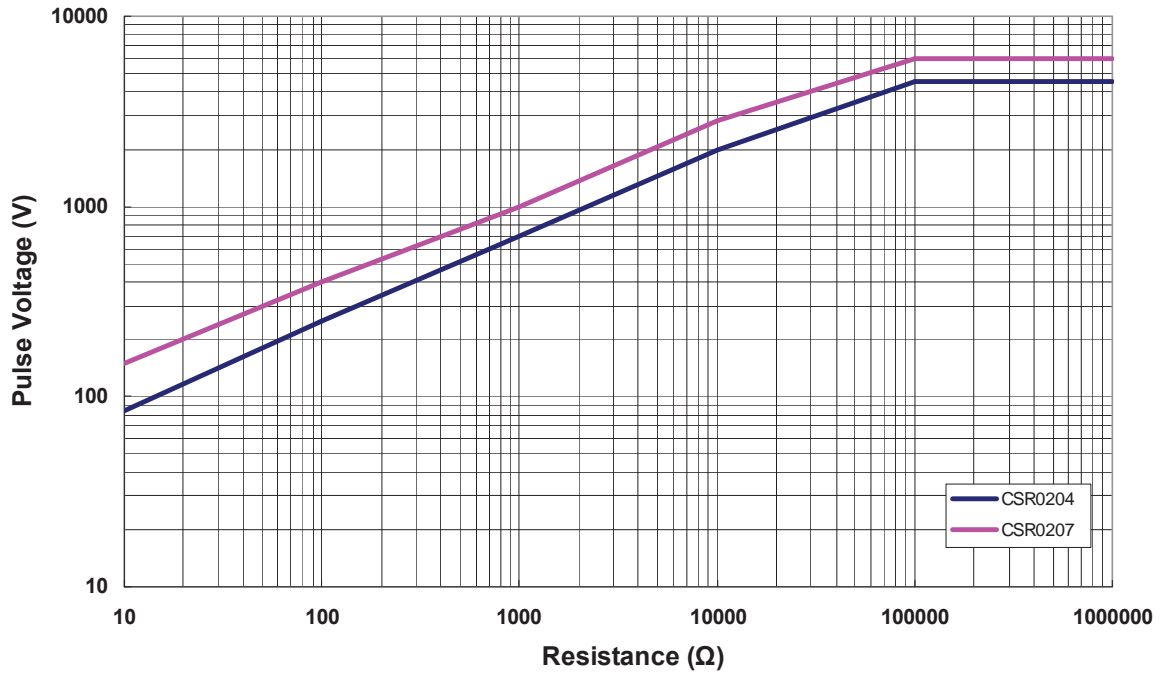
Frequency vs. Phase Angle CSR Series(CSR0207)



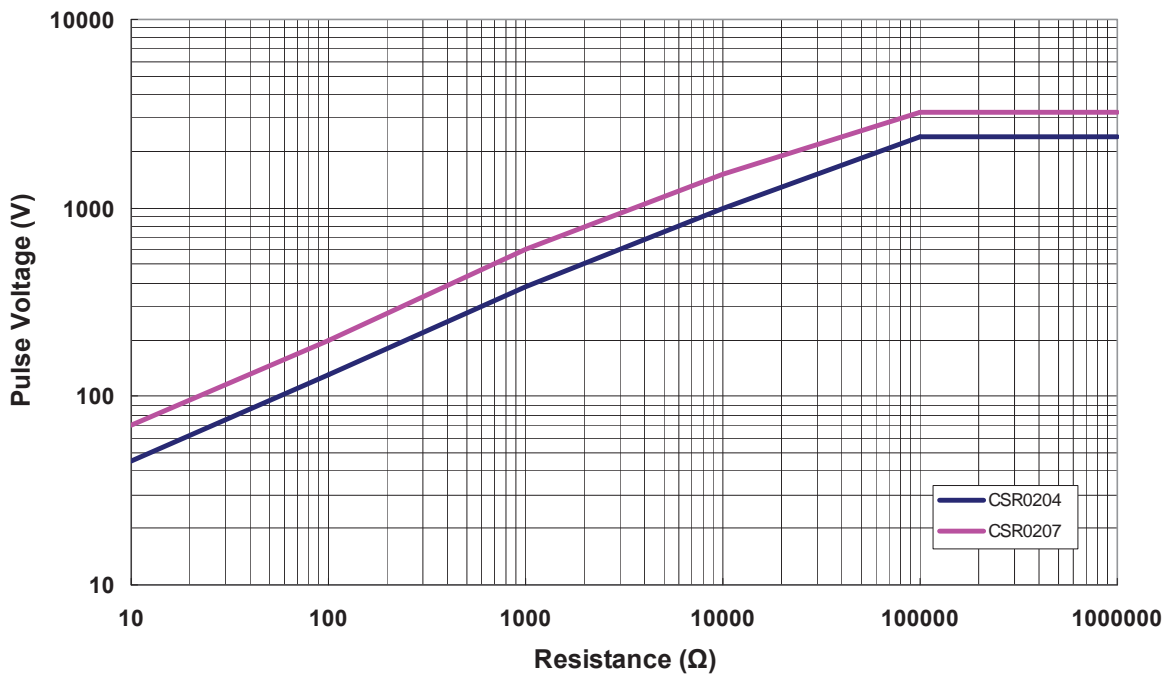
■ Lightning Surge

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

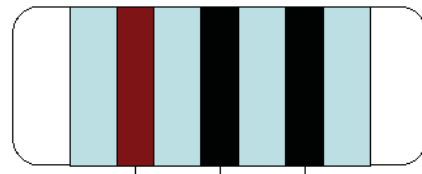
1.2/50 μ s Lightning Surge



10/700 μ s Lightning Surge

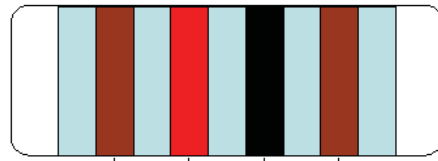


■ Marking & Resistance Tolerance



1st digit 2nd digit Multiplier

±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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1st digit 2nd digit 3rd digit Multiplier

±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% ±0.25% ±0.1%	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

Part Numbering

CFS	0204	G	T	-	V	1000
Product Type	Dimensions (LxΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0204: 3.5x1.4 0207: 5.9x2.2 0309: 8.5x3.2	G: ±2% J: ±5%	T: Taping Reel B: Bulk	∴ No specified	S: 2W T: 1W U: 1/2W V: 1/4W	0010: 1Ω 1R20: 1.2Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range	
					±2%	±5%
0204	1/4W	-55 ~ +155°C	250V	500V	1Ω - 1MΩ	
0207	1/2W		300V	600V	1Ω - 1MΩ	
0309	1W		350V	700V	1Ω - 1MΩ	

High Power Rating Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range	
					±2%	±5%
0207	1W	-55 ~ +155°C	350V	700V	1Ω - 1MΩ	
0309	2W		350V	700V	1Ω - 1MΩ	

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.

Environmental Characteristics

Item	Requirement	Test Method
Short Time Overload	$\Delta R \pm 1\%$	JIS-C-5201-1 5.5 RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
Endurance	$\Delta R \pm 3\%$	JIS-C-5201-1 7.10 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	$\Delta R \pm 5\%$	JIS-C-5201-1 7.9 40±2 C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	$\Delta R \pm 2\%$	JIS-C-5201-1 7.2 at +155°C for 1000 hrs
Solderability	95% min. coverage	JIS-C-5201-1 6.5 245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R \pm 1\%$	JIS-C-5201-1 6.4 260±5°C for 10 seconds

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

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