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 ±0.1%
- Extremely low TCR down to ±10 PPM/℃
- High power rating up to 1 Watts
- SMD enabled structure
- Lead-free and RoHS compliant

■Applications

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

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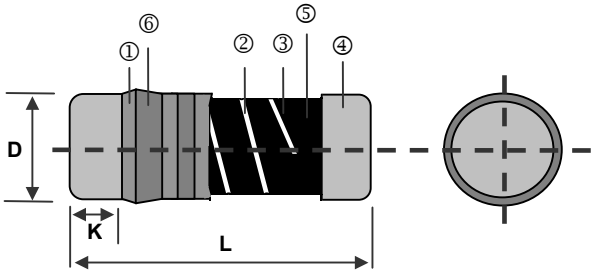
TECHNICAL SPECIFICATIONS				
DESCRIPTION	**CSRV0204**		**CSRV0207**	
Resistance range	0.1Ω-1MΩ;0Ω		0.1Ω-1MΩ;0Ω	
Resistance tolerance	±5%;±1%;±0.5%;±0.25%;±0.1%		±5%;±1%;±0.5%;±0.25%;±0.1%	
Temperature coefficient	±100ppm/℃; ±50ppm/℃; ±25ppm/℃; ±15ppm/℃; ±10ppm/℃			
Operation mode	Standard	High power	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℃~155℃			
Max. resistance change at P70 for resistance range, △R/R max., after 1000 h	≦0.5%		≦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

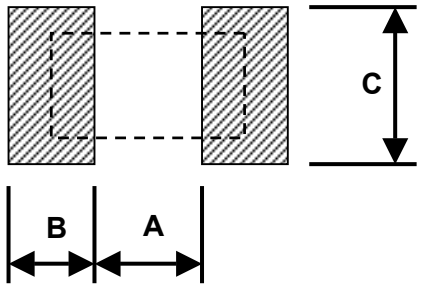
■Part Numbering

Part Number：CSRV0204DTDV1001
Part Number：CSRV0204JT-VR0R0

C	S	R	V	0	2	0	4	D	T	D	V	1	0	0	1
C	S	R	V	0	2	0	4	J	T	–	V	R	0	R	0

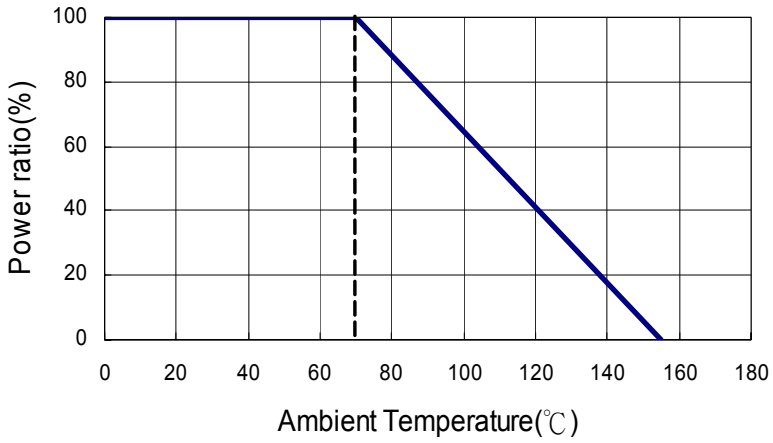
Product Type	Dimensions (L×ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/℃)	Power Rating	Resistance
CSRV	0204: 3.5x1.4 0207: 5.9x2.2	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% J: ±5%	T: Taping Reel B: Bulk	B: ±10 N: ±15 C: ±25 D: ±50 E: ±100 -: Jumper	T: 1W U: 1/2W V: 1/4W G: 2/5W	0010: 1Ω 0100: 10Ω 2201: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

■Recommend Land Pattern

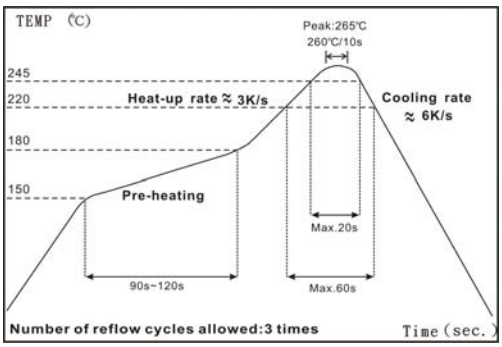


Type	A (mm)	B (mm)	C (mm)
CSRV0204	1.6	1.2	1.6
CSRV0207	3.0	1.7	2.4

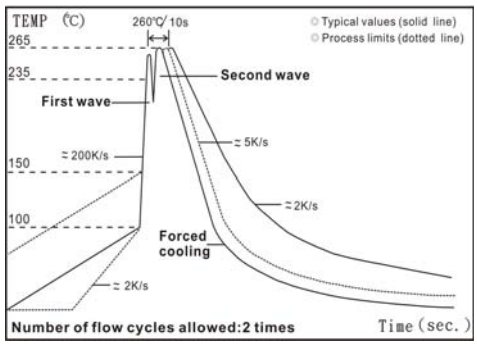
■Derating Curve



■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	-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
	Jumper:2A				0Ω(<15mΩ)					-
0207	1/2W	-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
	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%	
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=$\sqrt{(P*R)}$ or Max. operating voltage listed above, whichever is lower.
Overload Voltage=2.5*$\sqrt{(P*R)}$ or Max. overload voltage listed above, whichever is lower.
RCWV(Rated continuous working voltage)=$\sqrt{(P*R)}$ 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%+0.05Ω)	**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

Metal Film Precision MELF Resistor

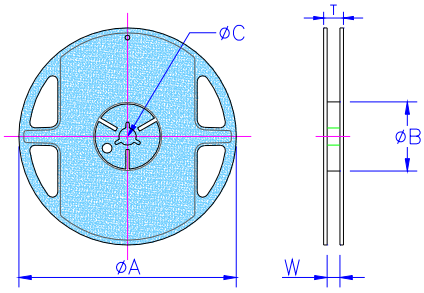
Item	Requirement	Test Method
Endurance	±(0.5%+0.05Ω)	**JIS-C-5201-1 4.25** **IEC-60115-1 4.25.1** 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Biased Humidity	±(1.0%+0.05Ω)	**MIL-STD-202 Method 103** 1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	±(1.0%+0.05Ω)	**MIL-STD-202 Method 108** at +155°C for 1000 hrs
Bending Strength	±(0.5%+0.05Ω)	**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	±(0.5%+0.05Ω)	**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
Temperature Cycling	±(0.5%+0.05Ω)	**JESD22 Method JA-104** -55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	**MIL-STD-202 Method 213** Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.05Ω)	**MIL-STD-202 Method 204** 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(1%+0.05Ω)	**AEC-Q200-002** Human body, 2KV
Flame Retardance	Not flame	**AEC-Q200-001** Temperature sensing at 500℃, 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 or the pinewood board	**UL-94** V-0 or V-1 are acceptable. Electrical test not required.

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

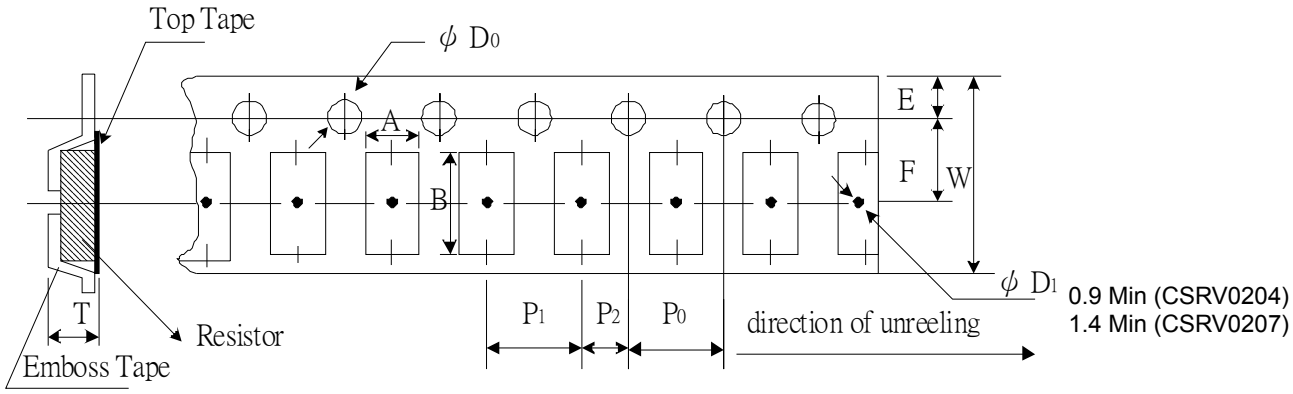
■Packaging

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

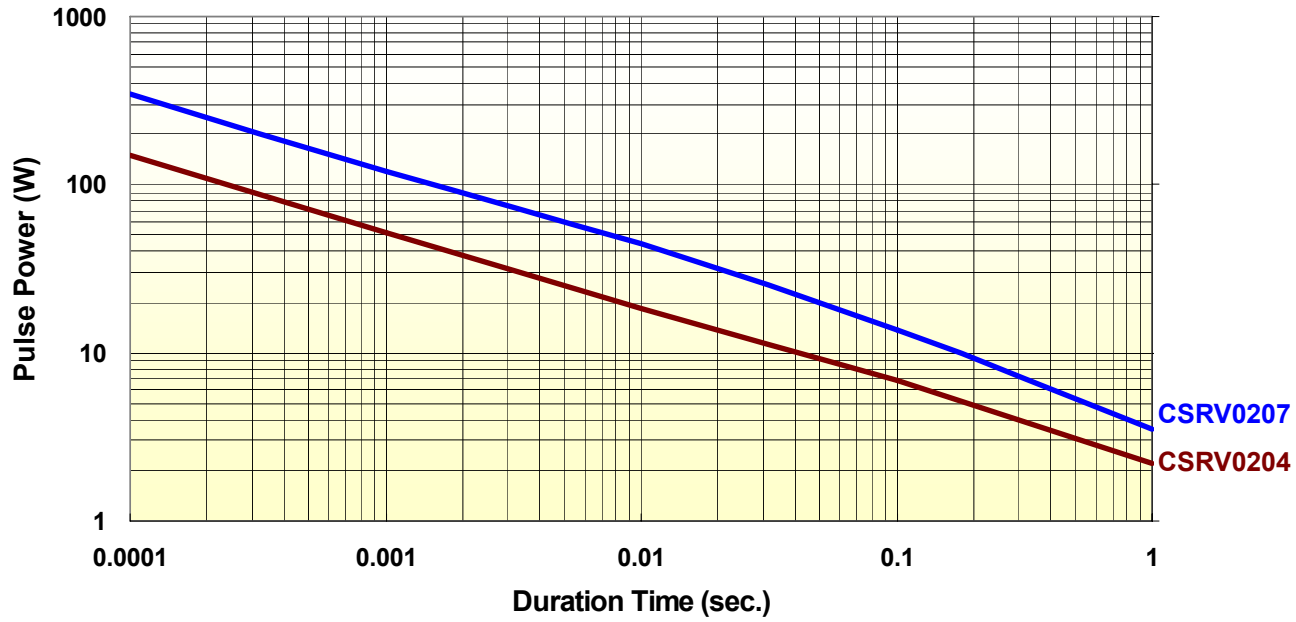


Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P_0 (mm)	P_1 (mm)	P_2 (mm)	$ΦD_0$ (mm)	T (mm)
CSRV0204	1.55±0.10	3.65±0.10	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.80±0.10
CSRV0207	2.40±0.10	6.15±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	2.70±0.10

■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.

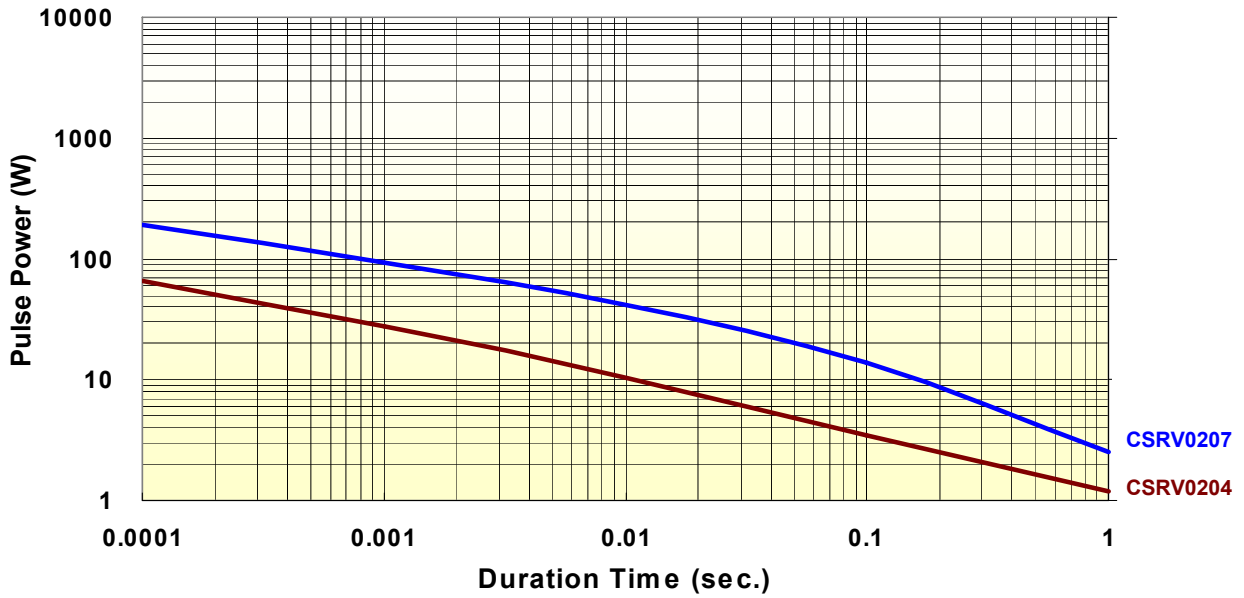
CSRV Series Single Pulse(100 Ohm)



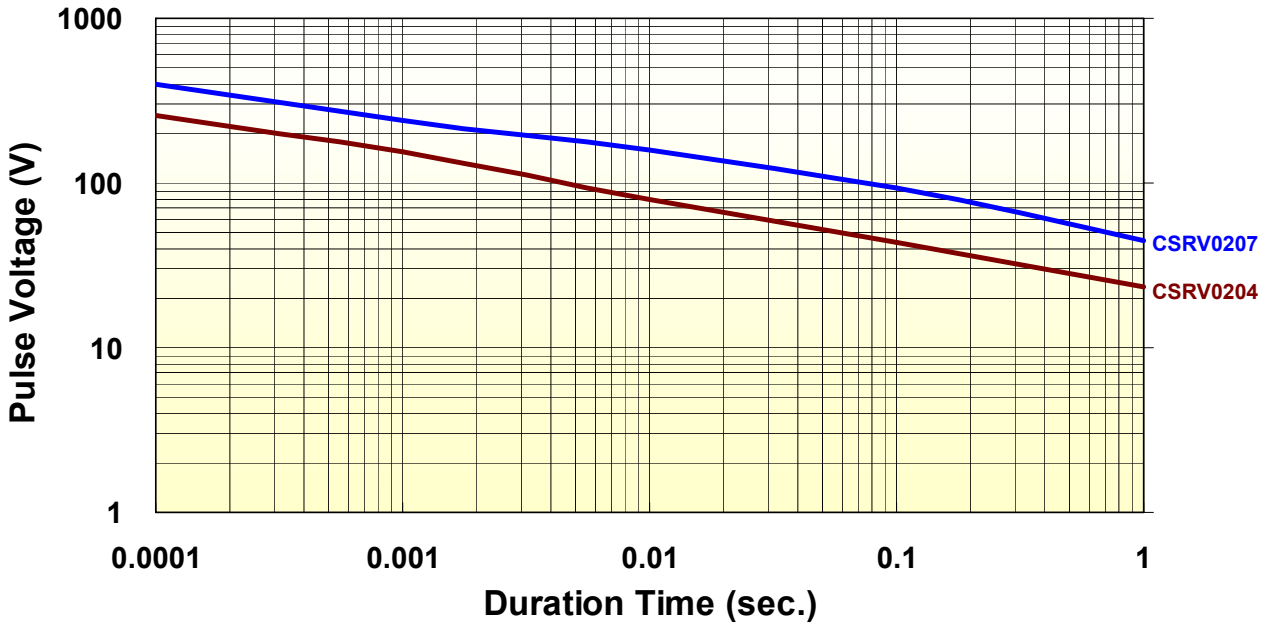
■Continuous Pulse

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)



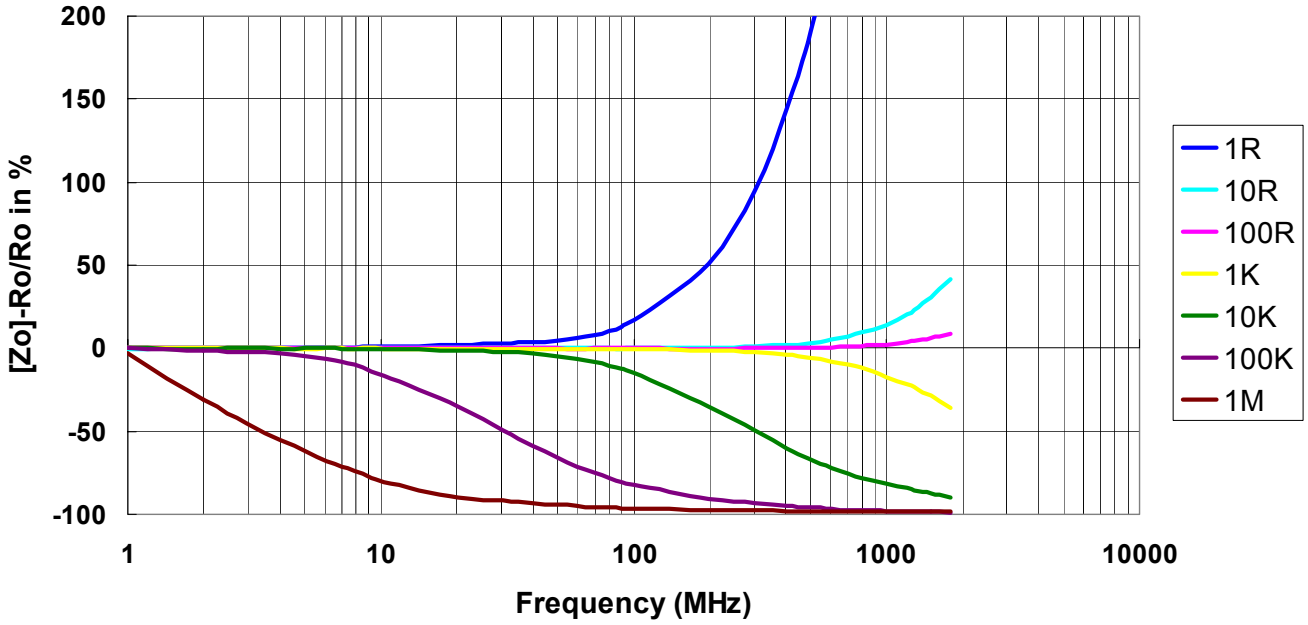
■Frequency behavior

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.

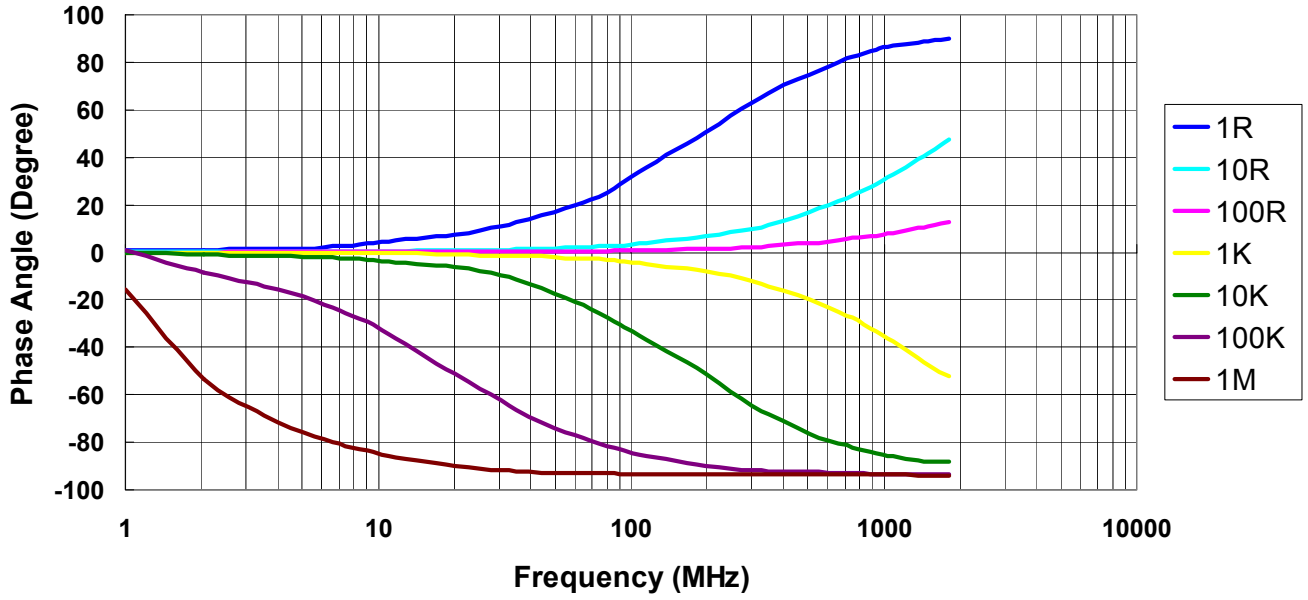
Frequency vs. Impedance

CSRV Series (CSRV0204)

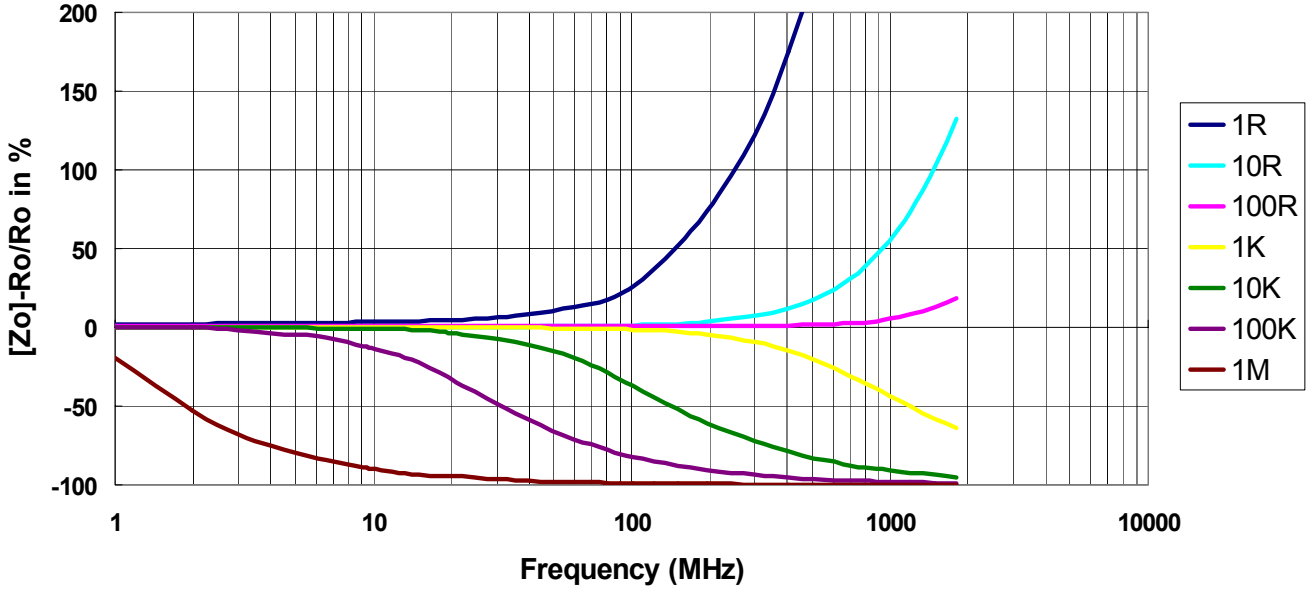


Frequency vs. Phase Angle

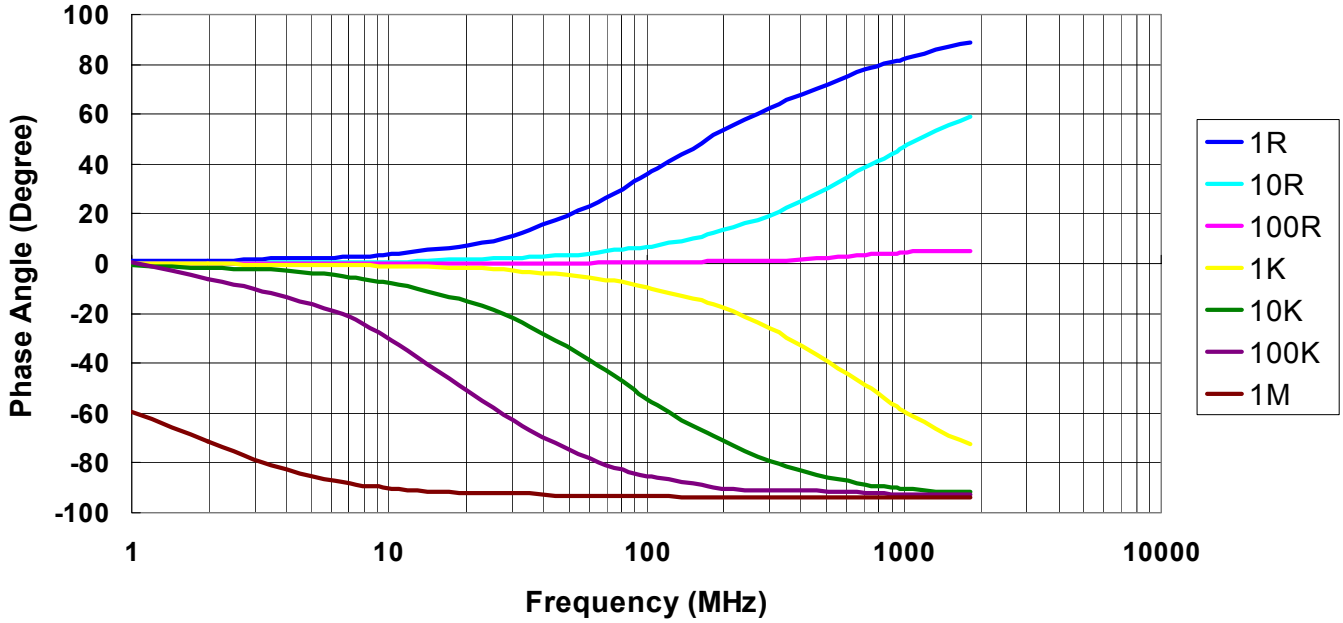
CSRV Series (CSRV0204)



Frequency vs. Impedance
CSRV Series (CSRV0207)



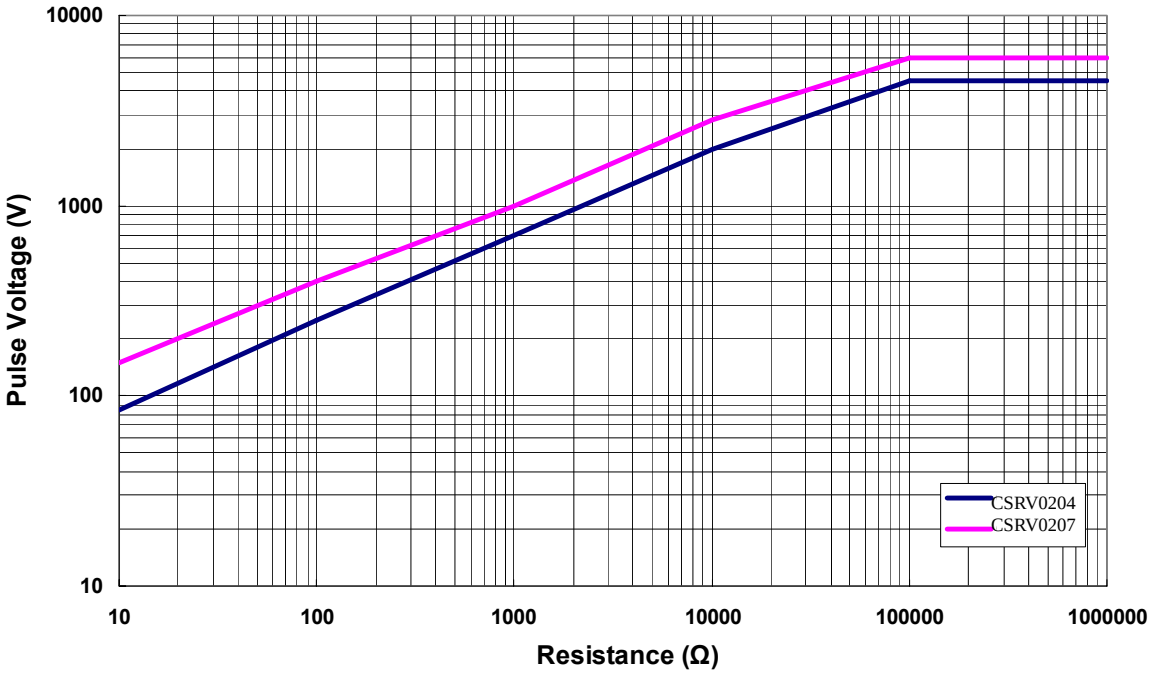
Frequency vs. Phase Angle
CSRV Series (CSRV0207)



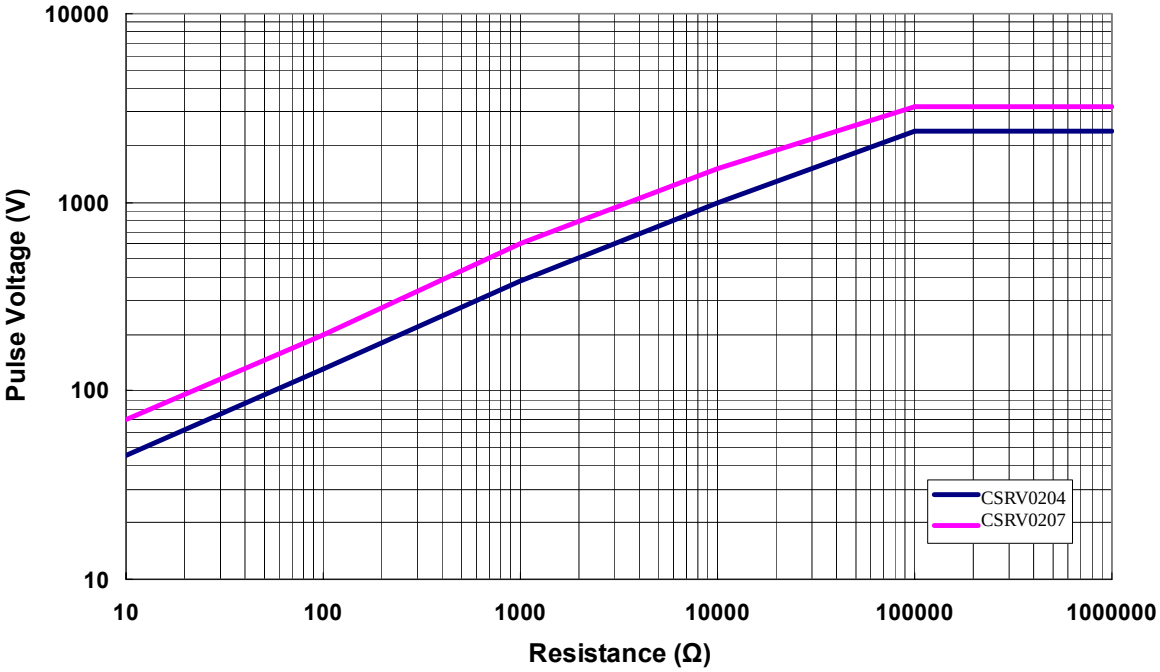
■Lightning Surge

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

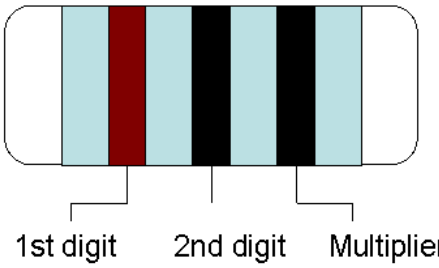
1.2/50μs Lightning Surge



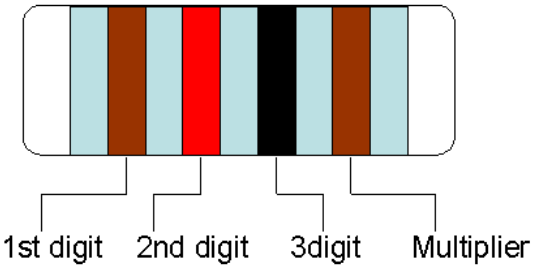
10/700μs Lightning Surge



■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



±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}