

HoCSRV Thin Film Precision Chip Resistor

■ Features

- ① Thin film technology
- ② SMD enabled structure
- ③ AEC-Q200 Compliance
- ④ Excellent overall stability
- ⑤ Lead-free and RoHS compliant
- ⑥ Tight tolerance down to $\pm 0.1\%$
- ⑦ High power rating up to 1 Watts
- ⑧ Sn termination on Ni barrier layer
- ⑨ Extremely low TCR down to $\pm 5 \text{ ppm}/^\circ\text{C}$



■ Applications

- ① Industrial
- ② Medical Equipment
- ③ Telecommunication
- ④ Automotive(non-safety parts)
- ⑤ Measurement/Testing Equipment

■ Standard Electrical Specifications

TECHNICAL SPECIFICATIONS							
DESCRIPTION	CSR0102			CSR0204		CSR0207	
Resistance range	1Ω-1MΩ; 0Ω			0.1Ω-10MΩ; 0Ω		0.1Ω-10MΩ; 0Ω	
Resistance tolerance	±5%;±1%;±0.5%;±0.25%;±0.1%						
Temperature coefficient	±100ppm/°C;±50ppm/°C; ±25ppm/°C;±15ppm/°C			±100ppm/°C; ±50ppm/°C; ±25ppm/°C; ±15ppm/°C; ±10ppm/°C; ±5ppm/°C			
Operation mode	Standard	High power		Standard	High power	Standard	High power
Power rating P70	1/8W	1/5W	0.3W	1/4W	2/5W	1/2W	1W
Operating voltage Umax.	150V	200V	200V	200V	200V	300V	350V
Operating temperature range	-55°C~155°C						
Max. resistance change at P70 for resistance range, ΔR/R max., after 1000 h	≦0.5%			≦0.5%		≦0.5%	



■ Special Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operatin g 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-82KΩ		49.9Ω- 200KΩ	49.9Ω- 390KΩ	-	±25
					-		1Ω-1MΩ			±50
					-			1Ω-1MΩ		±100
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-3.4MΩ		±25
					10Ω-1MΩ		1Ω-3.4MΩ	0.2Ω-10MΩ		±50
					-			0.1Ω-10MΩ		±100
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-3.4MΩ		±25
					10Ω-1MΩ		1Ω-3.4MΩ	0.2Ω-10MΩ		±50
					-			0.1Ω-10MΩ		±100

■ High Power Rating Electrical Specifications

Item Type	Power Rating at 70℃	Operating Temp. Range	Max. Operatin g Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/ ℃)
					±0.1%	±0.25%	±0.5%	±1%	±5%	
0102	1/5W	-55 ~+155℃	200V	400V	100Ω-56KΩ				-	±15
	100Ω-82KΩ				49.9Ω-200KΩ	49.9Ω-390KΩ	-	±25		
	-				1Ω-1MΩ			±50		
	-				1Ω-1MΩ	±100				
0204	2/5W	-55 ~+125℃	200V	400V	10Ω-332KΩ					±5
		-55 ~+155℃	200V	400V	10Ω-20KΩ				-	±10
					10Ω-300KΩ				-	±15
					10Ω-1MΩ	10Ω-3.4MΩ	1Ω-3.4MΩ		±25	
					10Ω-1MΩ	1Ω-3.4MΩ	0.2Ω-10MΩ		±50	
					-			0.1Ω-10MΩ		±100
0207	1W	-55 ~+125℃	350V	700V	10Ω-332KΩ	-				±5
		-55 ~+155℃	350V	700V	10Ω-20KΩ				-	±10
					10Ω-300KΩ				-	±15
					10Ω-1MΩ	10Ω-3.4MΩ	1Ω-3.4MΩ		±25	
					10Ω-1MΩ	1Ω-3.4MΩ	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.

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

■ Jumper Specifications

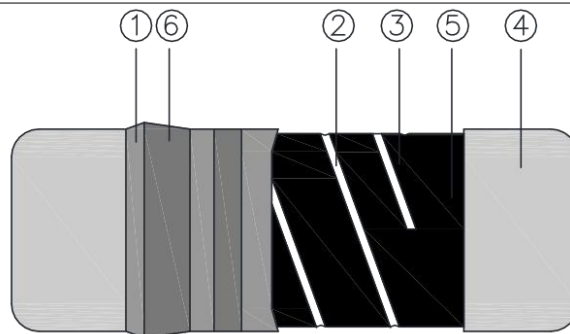
Item Type	Power Rating	Operating Temp. Range	Resistance	Rated Current
0102	1/8W	-55 ~ +155°C	0Ω(<15mΩ)	2A
	1/5W			
	0.3W			
0204	1/4W			3A
	2/5W			
0207	1/2W			5A
	1W			

■ Part Numbering

Selection Example: HoCSRVO204-1/4W-1KR-1%-50ppm

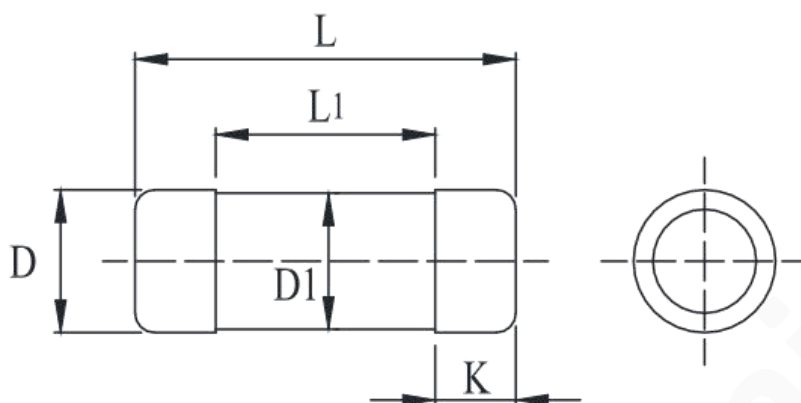
H o	C S R V	0 2 0 4	1 / 4 W	1 0 R	1 %	50ppm
↓	↓	↓	↓	↓	↓	↓
makers	Product Type	Dimensions (LxD)	Power Rating	Resistance	Resistance Tolerance	TCR (ppm/°C)
Ho	CSR V	0102:2.2x1.1 0204:3.5x1.4 0207:5.9x2.2	1W 1/2W 1/4W 2/5W 1/5W 1/8W 0.3W	1R=0010 10R=0100 1KR=1001 1MR=1004 50mR=R050 22.1R=22R1	±0.1% ±0.25% ±0.5% ±1% ±5% or Jumper	±5 ±15 ±25 ±50 ±100 -: Jumper

■ Construction



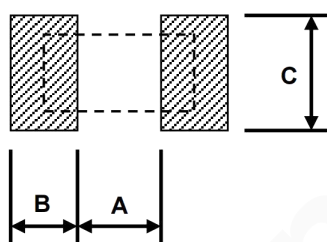
1	2	3	4	5
Insulation Coating	Trimming Line	Ceramic Rod	Electrode Cap	Resistor Layer
6				
Marking				

■ Dimensions



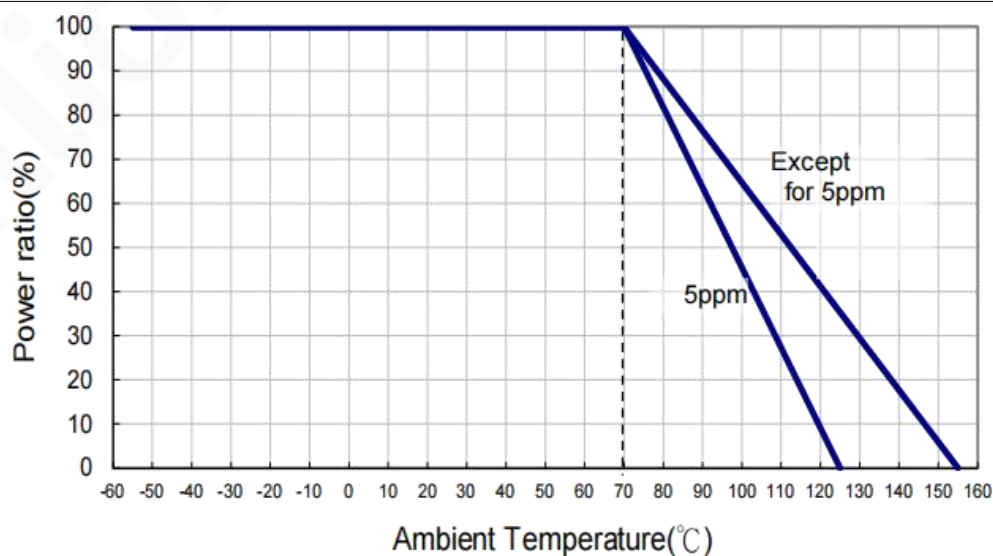
Type	L (mm)	L ₁ min. (mm)	ΦD (mm)	ΦD ₁ (mm)	K (mm)	Weight 1,000EA(g)
0102	2.2±0.1	1.1	1.1±0.10	D +0/-0.15	0.45±0.05	7.7
0204	3.5±0.2	1.7	1.4±0.15	D +0/-0.2	0.8±0.1	18.7
0207	5.9±0.2	2.9	2.2±0.20	D +0/-0.2	1.3±0.1	80.9

■ Recommend Land Pattern

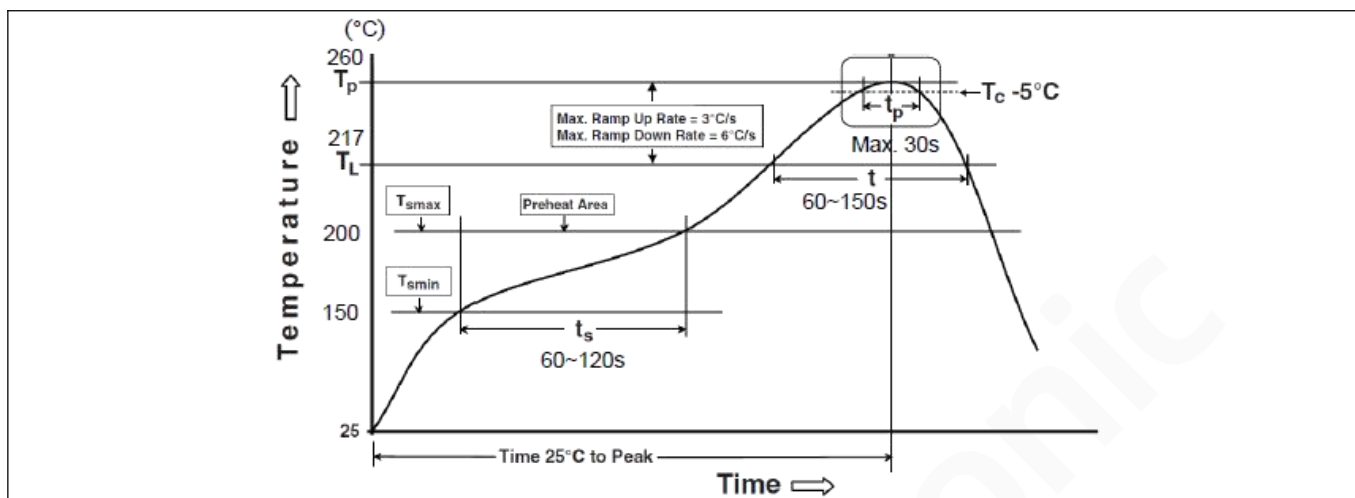


Type	A(mm)	B(mm)	C(mm)
0102	1.0	0.8	1.5
0204	1.6	1.2	1.6
0207	3.0	1.7	2.4

■ Derating Curve



■ 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.	

■ 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	10Ω-270KΩ: $\pm(0.1\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(0.15\%+0.01\Omega)$ 0102: $\pm(0.15\%+0.01\Omega)$ 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	$\geq 10G$		JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute

Operational Life	10Ω-270KΩ: $\pm(0.25\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(0.5\%+0.01\Omega)$ 0102: $\pm(0.5\%+0.01\Omega)$	<15mΩ	MIL-STD-202 Method 108 Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion. 5ppm: 70±2. °C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	<10Ω: $\pm(1\%+0.01\Omega)$ 10Ω-270KΩ: $\pm(0.5\%+0.01\Omega)$ >270KΩ-3.4MΩ: $\pm(1\%+0.01\Omega)$ >3.4MΩ: $\pm(2\%+0.01\Omega)$ 0102: $\pm(2\%+0.01\Omega)$	<15mΩ	MIL-STD-202 Method 103 1000 hrs 85. °C/85%RH 10% of operating power. (≤100 V)
High Temperature Exposure	10Ω-270KΩ: $\pm(0.25\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(1\%+0.01\Omega)$ 0102: $\pm(1\%+0.01\Omega)$	<15mΩ	MIL-STD-202 Method 108 at +125. °C/+155. °C for 1000 hrs
Board Flex	10Ω-270KΩ: $\pm(0.1\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(0.5\%+0.01\Omega)$ 0102: $\pm(0.5\%+0.01\Omega)$	<15mΩ	AEC-Q200-005 Bending once for 60 seconds with 2mm
Solderability	95% min. coverage		JIS-C-5201-1 4.17 IEC-60115-1 4.17 J-STD-002 245±5. °C for 3 seconds
Resistance to Soldering Heat	10Ω-270KΩ: $\pm(0.1\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(0.25\%+0.01\Omega)$ 0102: $\pm(0.25\%+0.01\Omega)$ 5ppm: $\pm(0.05\%+0.01\Omega)$	<15mΩ	MIL-STD-202 Method 210 260±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	10Ω-270KΩ: $\pm(0.25\%+0.01\Omega)$ <10Ω & >270KΩ: $\pm(0.5\%+0.01\Omega)$ 0102: $\pm(1\%+0.01\Omega)$	<15mΩ	JESD22 Method JA-104 -55. °C to +125. °C, 1000 cycles
Mechanical Shock	$\pm(0.25\%+0.01\Omega)$	<15mΩ	MIL-STD-202 Method 213 Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(0.5\%+0.01\Omega)$	<15mΩ	MIL-STD-202 Method 204 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
Vibration	$\pm(0.5\%+0.01\Omega)$	<15mΩ	MIL-STD-202 Method 204 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(0.5\%+0.01\Omega)$	<15mΩ	AEC-Q200-002 Human body, 0102/0204:2KV; 0207:4KV
Resistance to Solvents	No visible damage on appearance and marking.		MIL-STD-202 Method 215 Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.

Terminal Strength	No broken	AEC-Q200-00 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.

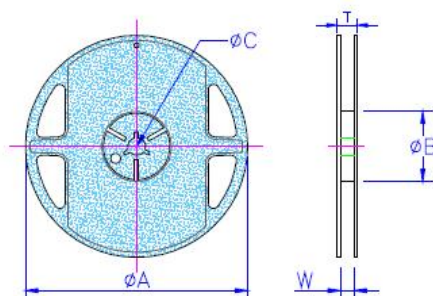
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

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

■ **Shelf Life: 2 years from production date.**

■ **Packaging**

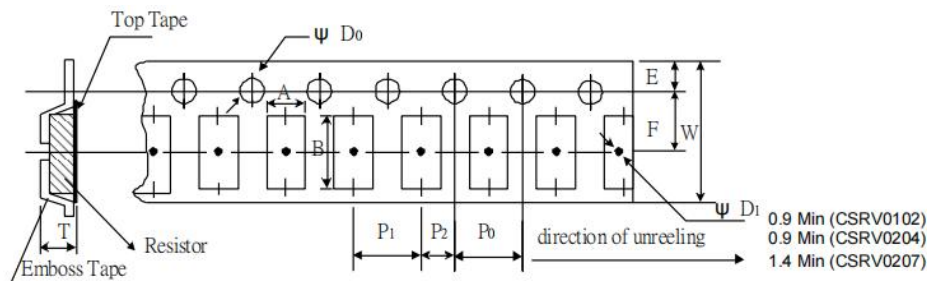
Packaging Quantity & Reel Specifications



Type	Reel Diameter	ØA	ØB	ØC	W	T	Emboss Plastic Tape (EA)
0102	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
0204	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
0207	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

■ **Packaging**

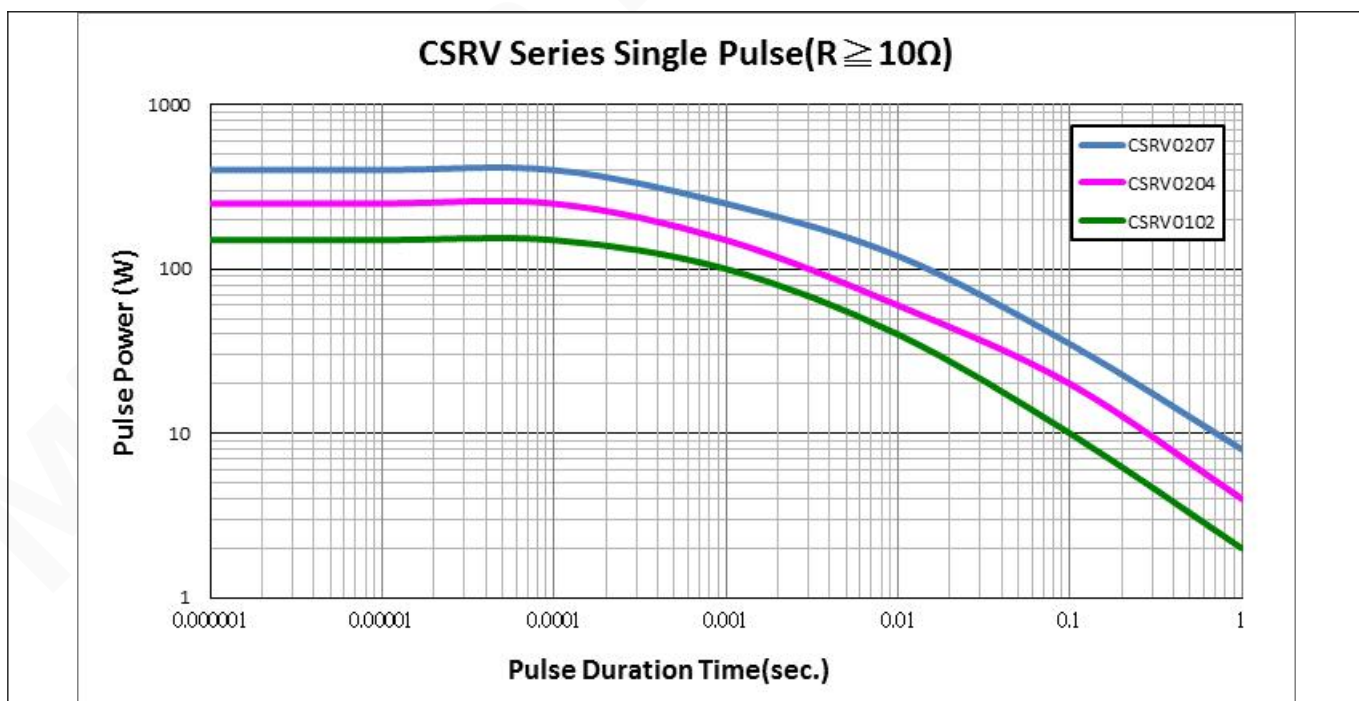
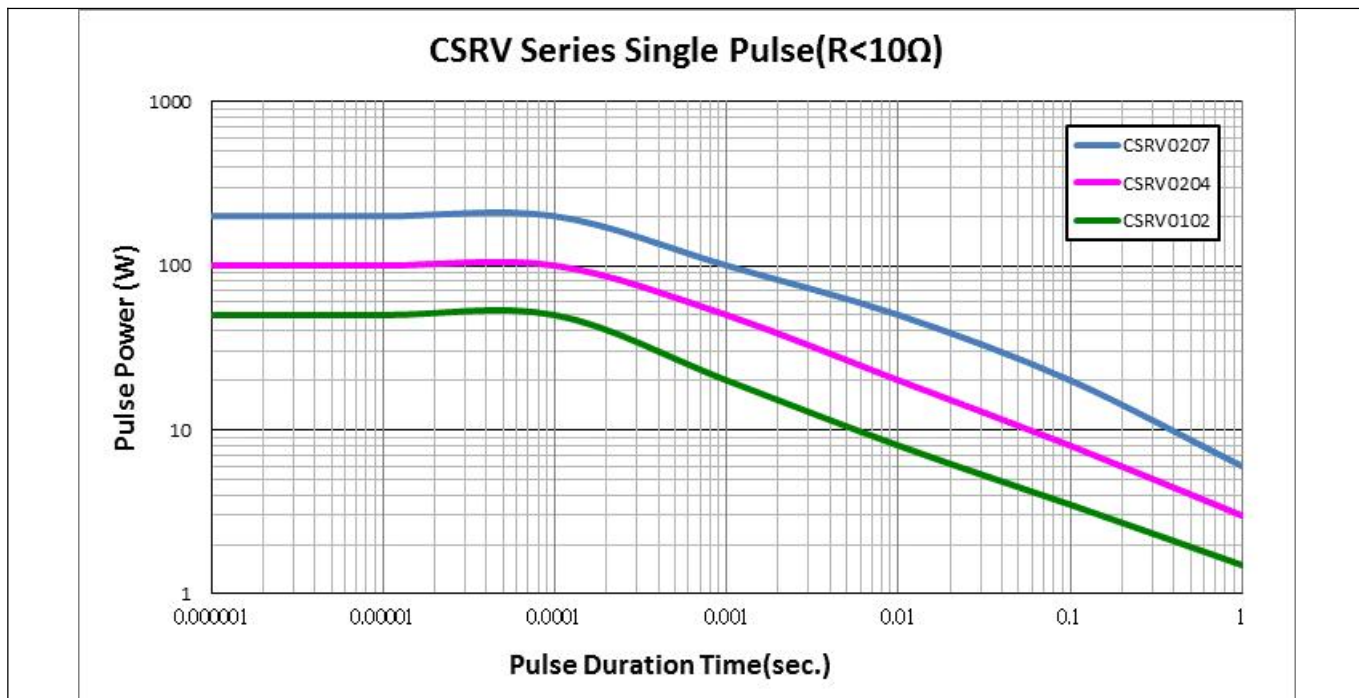
Emboss Plastic Tape Specifications



Type	A	B	W	E	F	P0	P1	P2	ØD0	T
0102	1.3±0.2	2.40±0.2	8.0±0.1	1.75±0.1	3.5±0.05	4±0.1	4±0.10	2±0.05	1.5+0.1	1.5±0.1
0204	1.55±0.2	3.65±0.2	8.0±0.1	1.75±0.1	3.5±0.05	4±0.1	4±0.10	2±0.05	1.5+0.1	1.8±0.1
0207	2.40±0.1	6.15±0.1	12.0±0.1	1.75±0.1	5.5±0.05	4±0.1	4±0.10	2±0.05	1.5+0.1	2.7±0.1

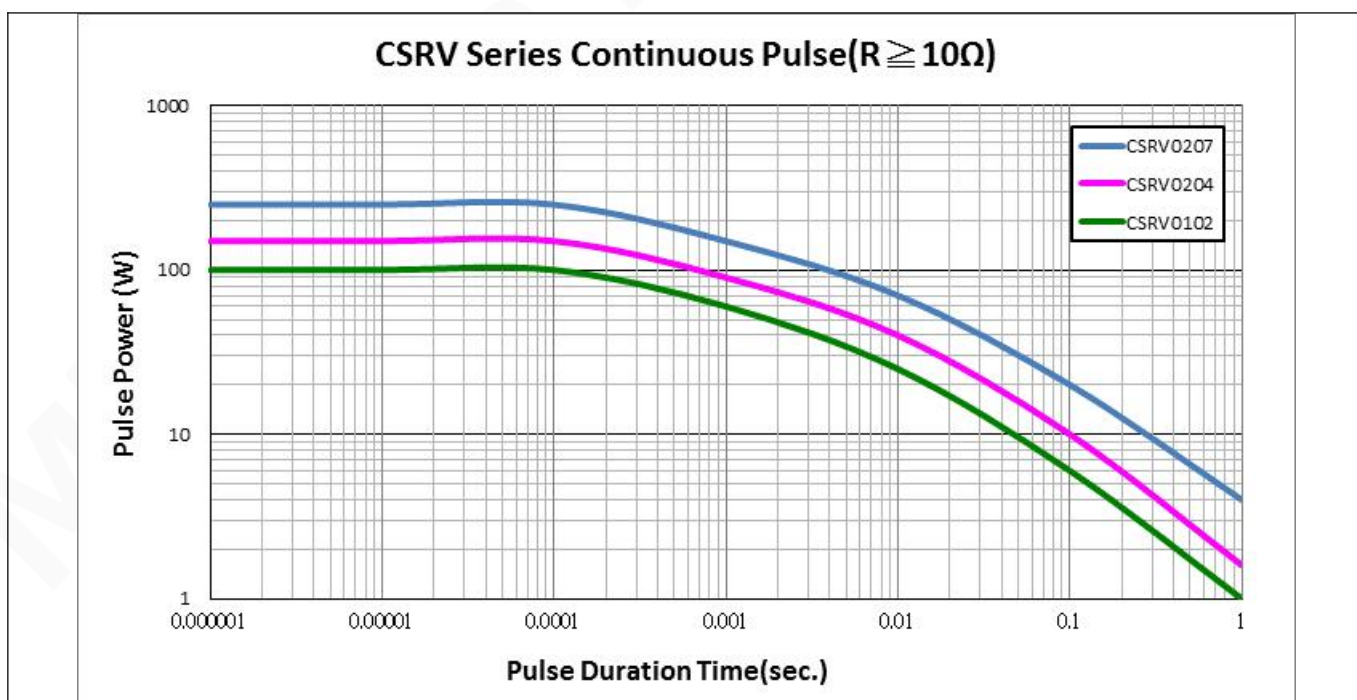
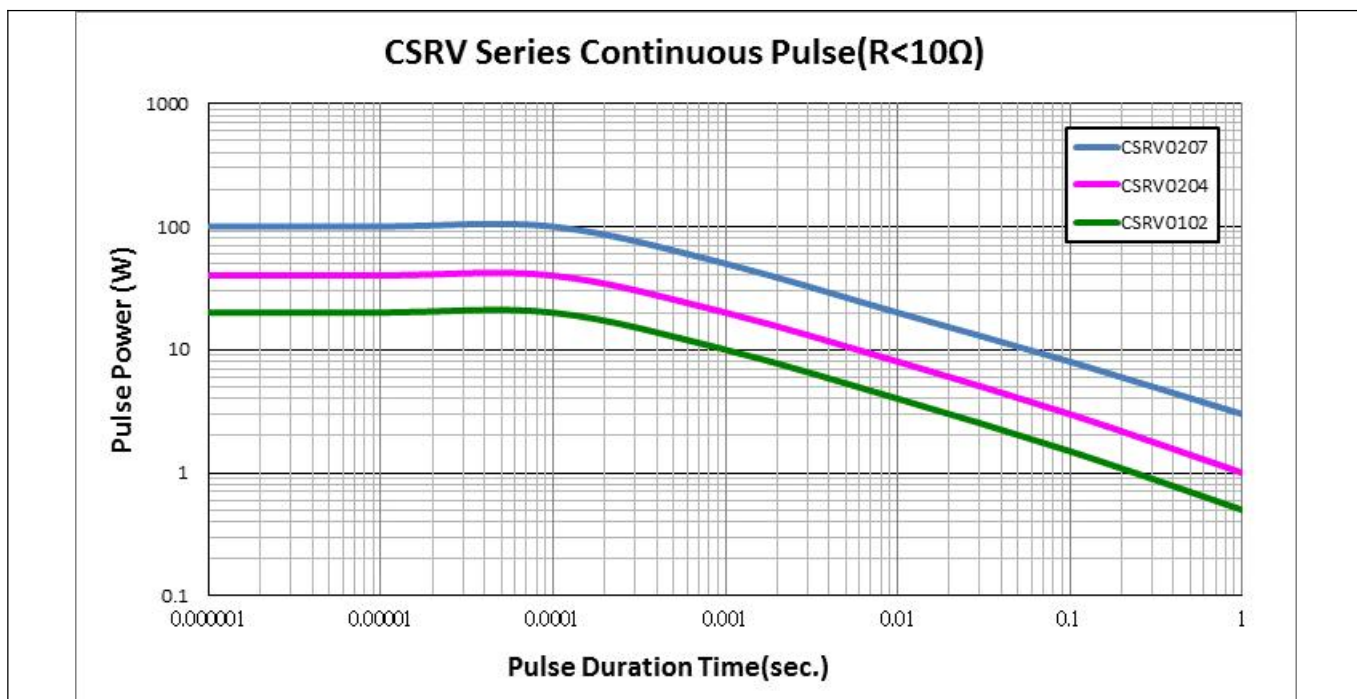
■ Pulse withstanding capacity

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

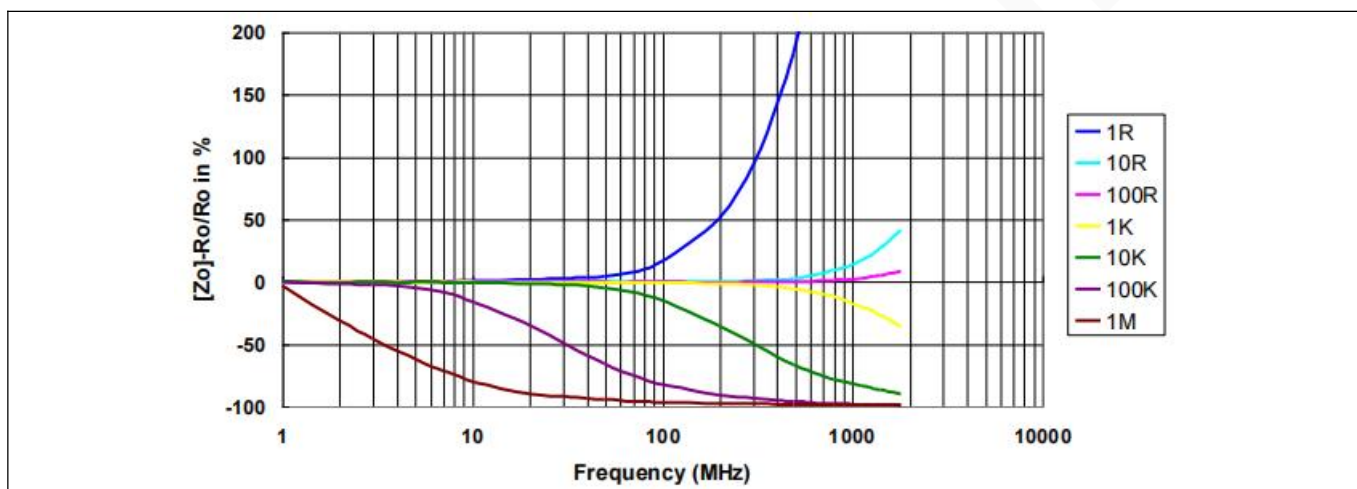
Resistors are designed to function according to ohmic laws. This is basically true of resistors for frequencies up to 100kHz. At higher frequencies, there is an additional contribution to the impedance by an ideal resistor switched in series with a coil and both switched parallel to a capacitor. The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

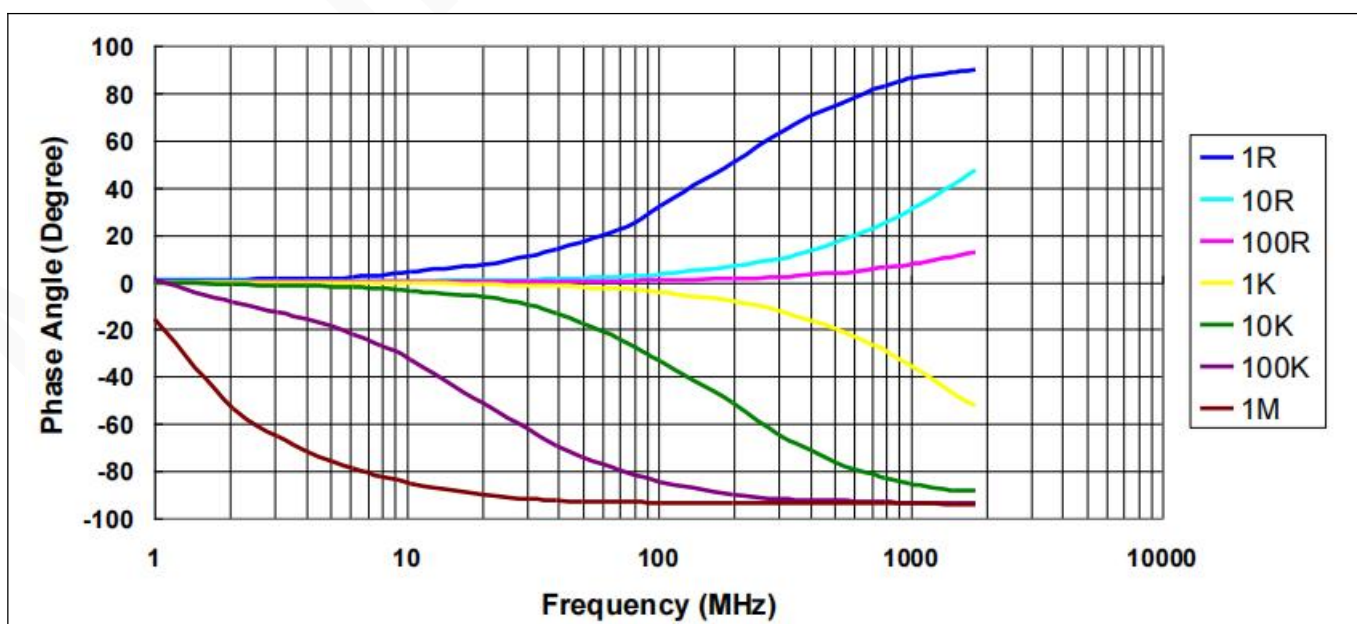
Frequency vs. Impedance

CSRV Series (CSRV0204)



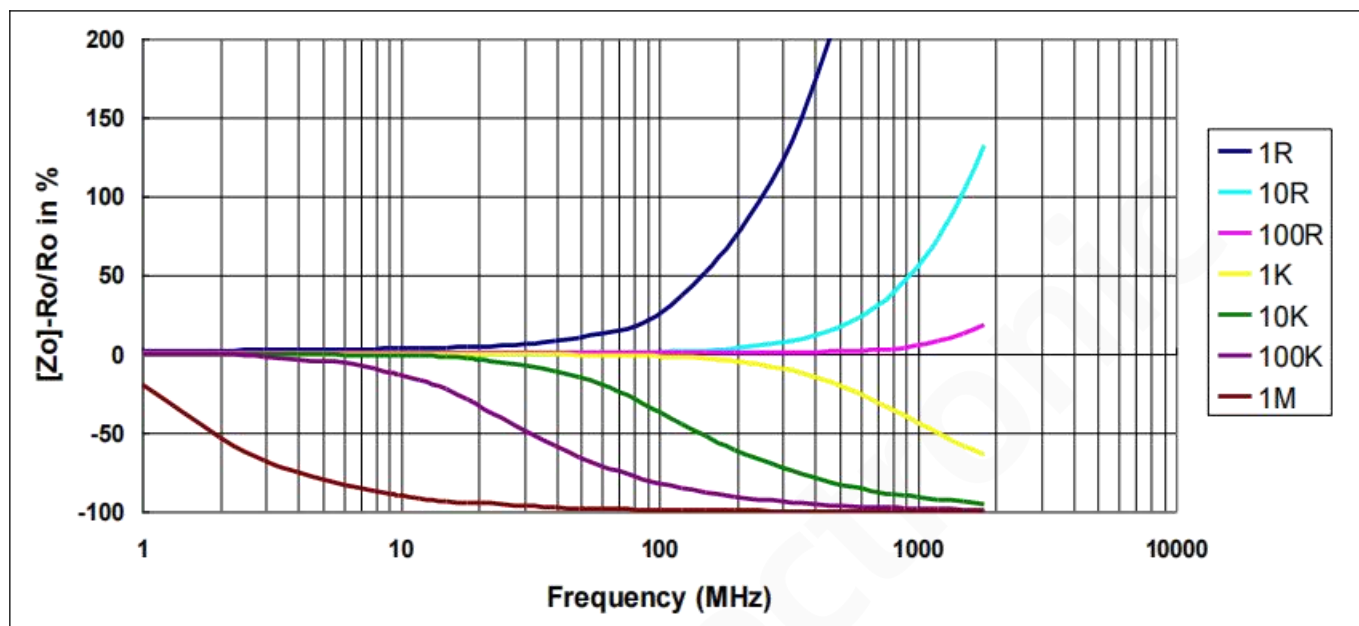
Frequency vs. Phase Angle

CSRV Series (CSRV0204)



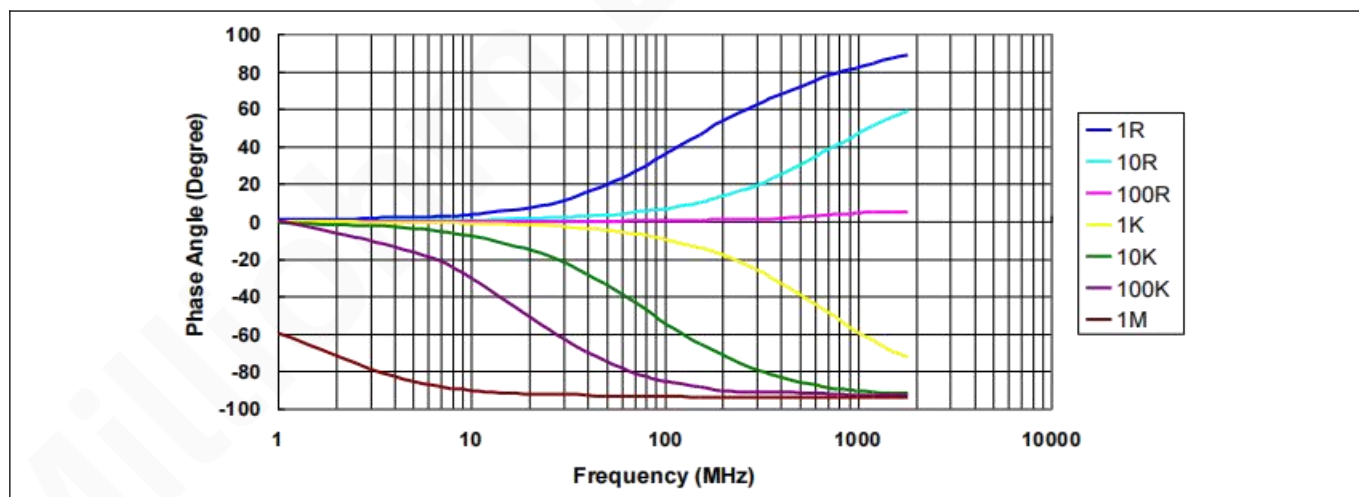
Frequency vs. Impedance

CSRV Series (CSRV0207)



Frequency vs. Phase Angle

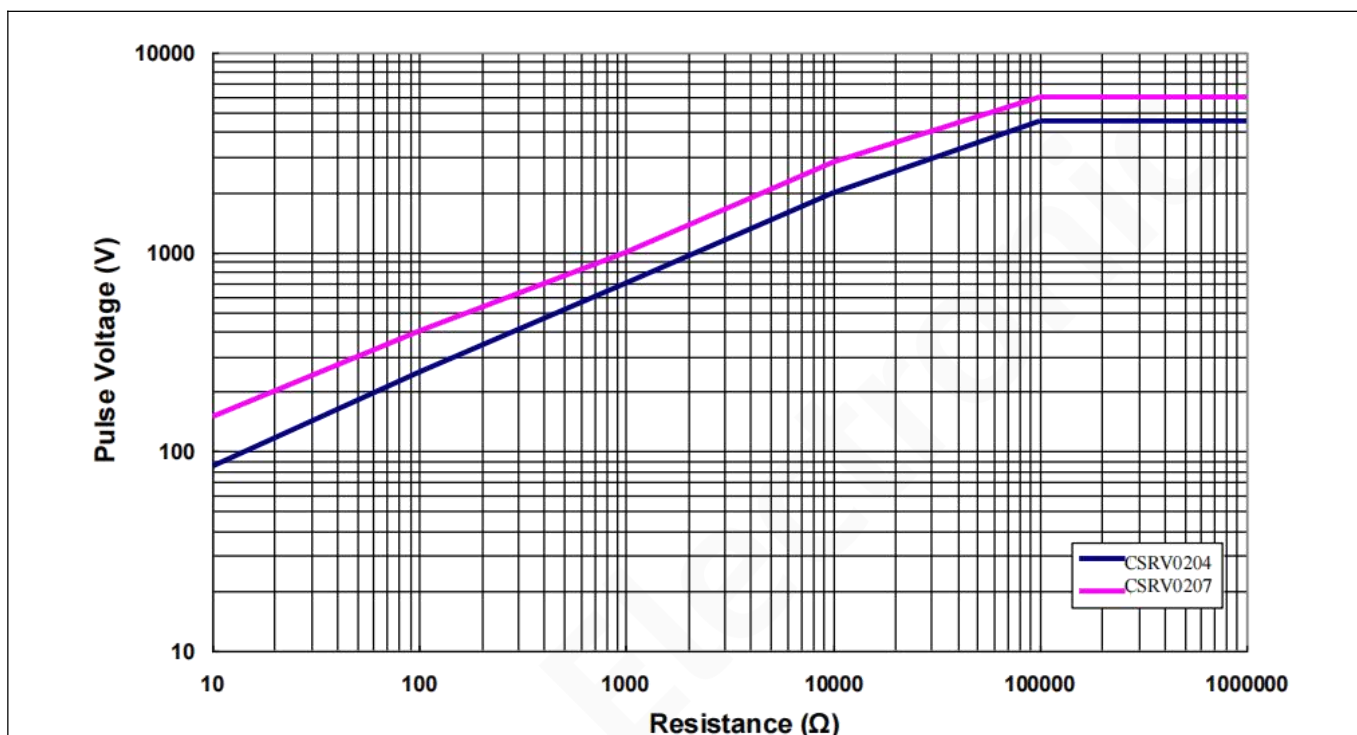
CSRV Series (CSRV0207)



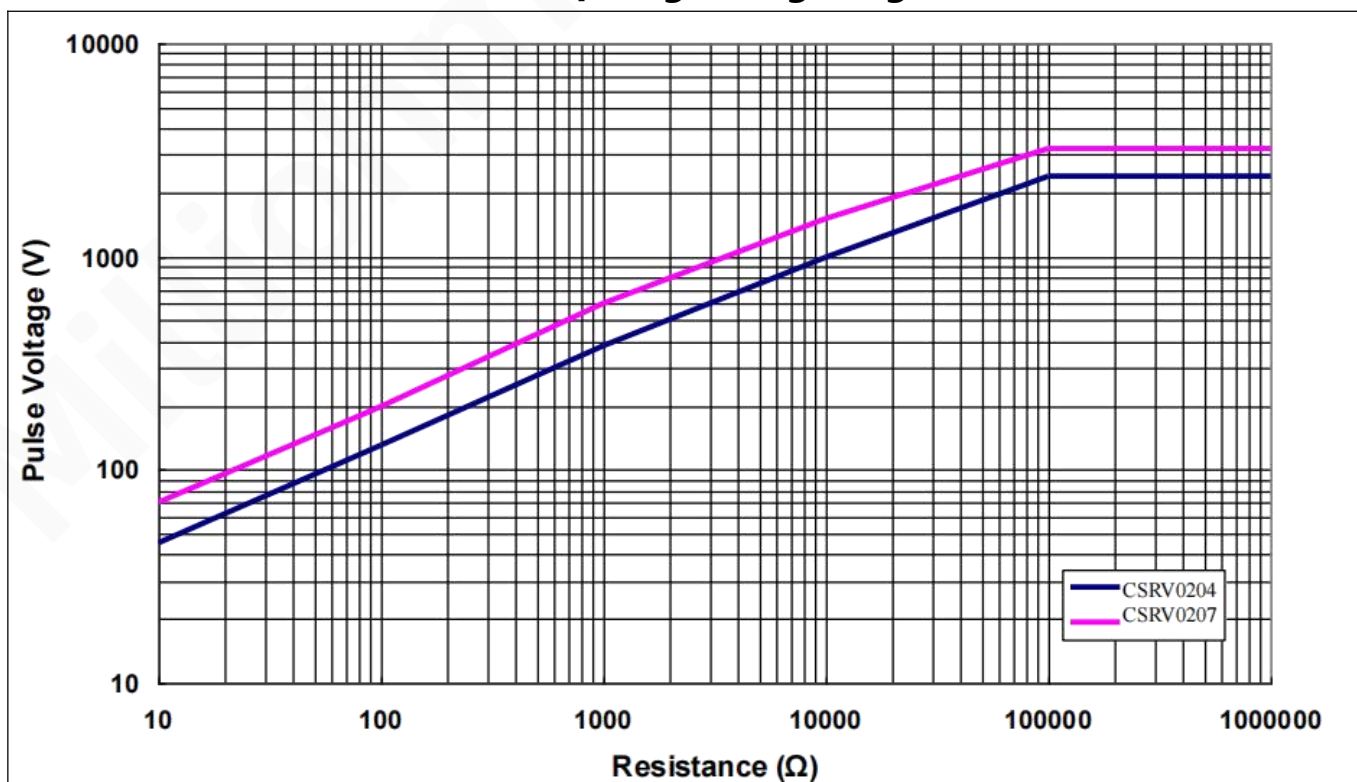
■ Lightning Surge

Resistors are tested in accordance with IEC 60115-1 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.

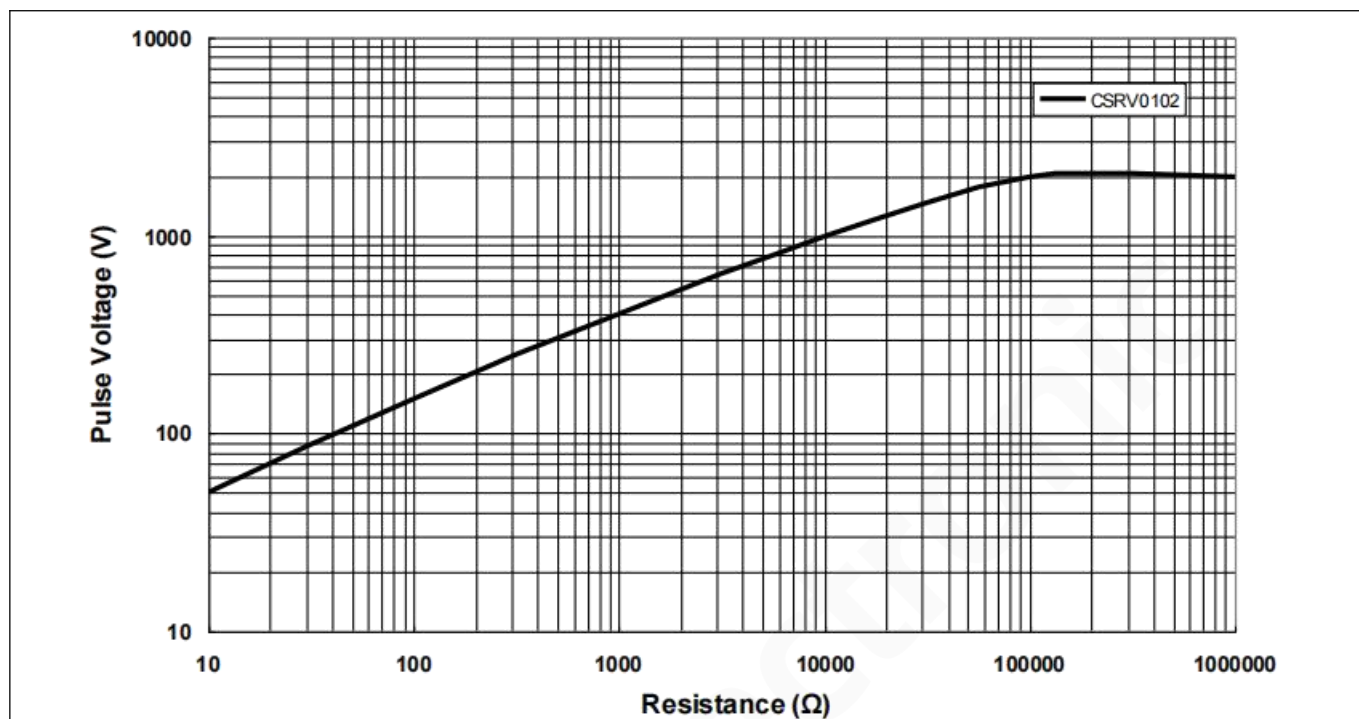
1.2/50μs Lightning Surge



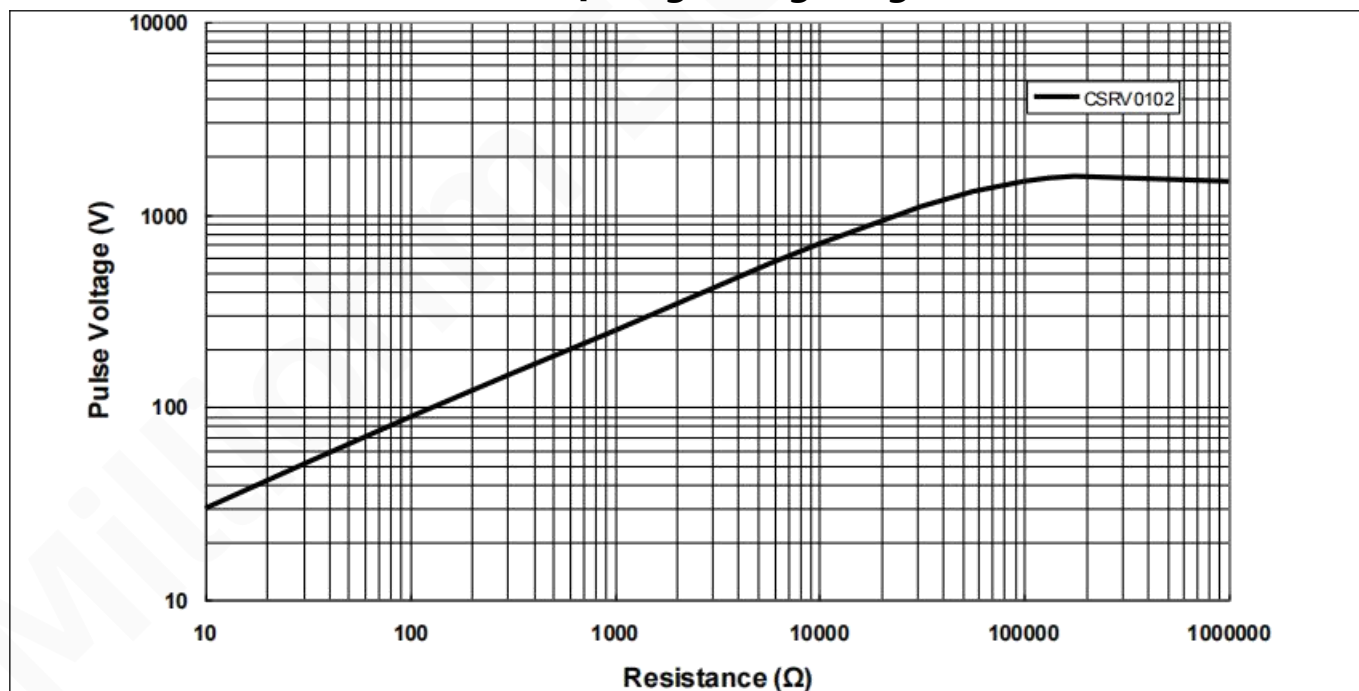
10/700μs Lightning Surge



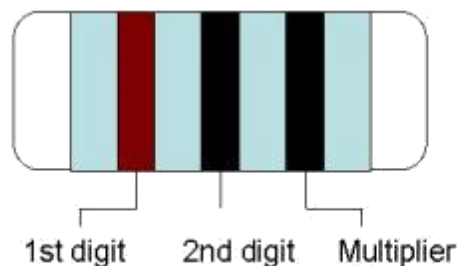
1.2/50 μ s Lightning Surge



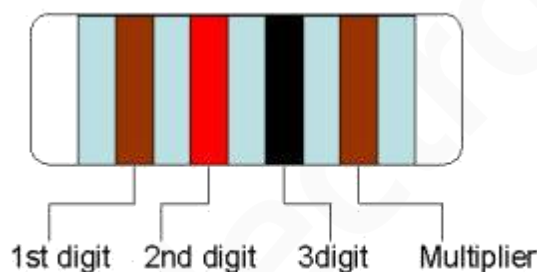
10/700 μ s Lightning Surge



■ 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
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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% ±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

■ Revision of curriculum vitae:

serial number	Contents of the modification	Modification Date	Reason for modification	releases	reviewer	auditor
1	Update resistance range	2024-04-16	Product upgrades	A0 to A1	YongKangHuang	YiWenLeng
2	Updated specification content layout	2025-06-15	standardised format	A1 to A2	YongKangHuang	YiWenLeng