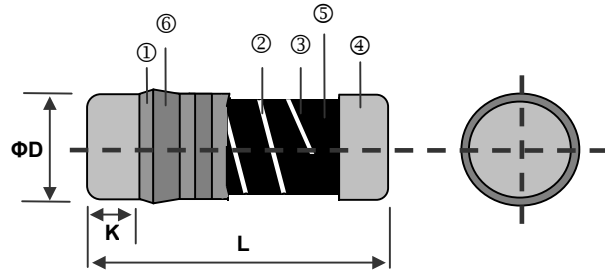


# Metal Film Precision Resistor—CSR Series

## Construction



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

## Features

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

## Applications

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

## Dimensions

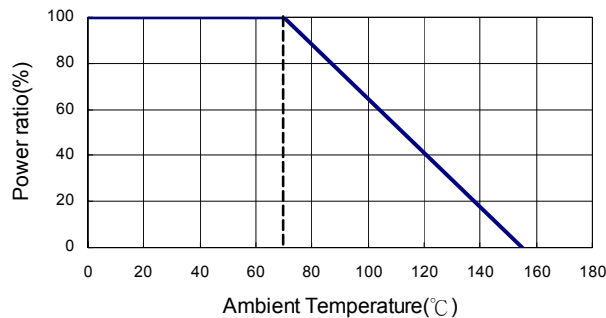
Unit: mm

Type	L	ΦD	K min.	Weight (g) (1000pcs)	Packaging
					180mm (7")
CSR0204	3.50 $\pm$ 0.20	1.40 $\pm$ 0.15	0.5	18.7	3,000EA
CSR0207	5.90 $\pm$ 0.20	2.20 $\pm$ 0.20	0.5	80.9	2,000EA

## Part Numbering

CSR	0204	D	T	D	V	1000
Product Type	Dimensions (L $\times$ ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}\text{C}$ )	Power Rating	Resistance
	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: $\pm 10$ N: $\pm 15$ C: $\pm 25$ D: $\pm 50$ E: $\pm 100$	T: 1W U: 1/2W V: 1/4W	0100: 10Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ

## Derating Curve



## 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	100Ω-20KΩ	10Ω-20KΩ				±10	
					100Ω-100KΩ	10Ω-100KΩ				±15	
					100Ω-270KΩ	10Ω-330KΩ	4.7Ω-560KΩ	4.7Ω-1MΩ		±25	
					100Ω-270KΩ	1Ω-330KΩ	1Ω-1MΩ	1Ω-10MΩ		±50	
					-				0.1Ω-10MΩ		±100
					0Ω(<15mΩ)					-	
0207	1/2W Jumper: 4A	-55 ~ +155°C	300V	500V	100Ω-20KΩ	10Ω-20KΩ				±10	
					100Ω-100KΩ	10Ω-100KΩ				±15	
					100Ω-400KΩ	10Ω-400KΩ	10Ω-560KΩ	10Ω-1MΩ		±25	
					100Ω-400KΩ	1Ω-330KΩ	1Ω-1MΩ	1Ω-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%	
0207	1W	-55 ~ +155°C	350V	700V	100Ω-100KΩ	10Ω-100KΩ				±15
					100Ω-100KΩ	4.7Ω - 1MΩ				±25
					100Ω-100KΩ	10Ω - 1MΩ	1Ω - 1MΩ	1Ω - 2.2MΩ		±50
					-				0.1Ω - 0.91Ω	

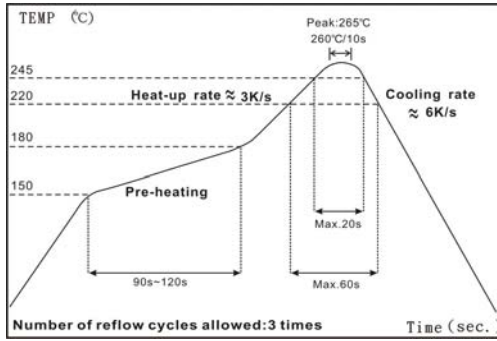
## Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(0.15%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G	Max. overload voltage for 1 minute
Endurance	±(0.5%+0.05Ω)	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(1.0%+0.05Ω)	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	±(1.0%+0.05Ω)	at +155°C for 1000 hrs
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	260±5°C for 10 seconds

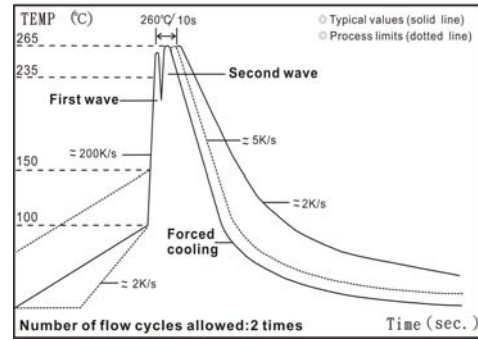
Reference Standards: IEC 60115-1 ; JIS-C 5201-1

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

## ■ Soldering Condition



IR Reflow Soldering



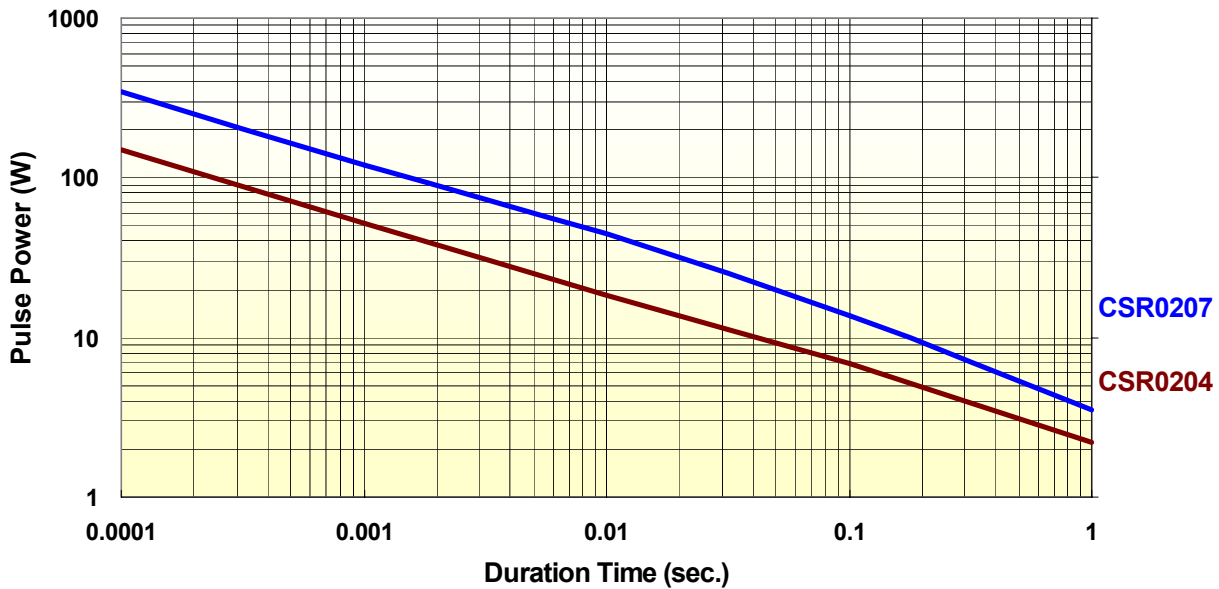
Wave Soldering (Flow Soldering)

- (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

## ■ 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.

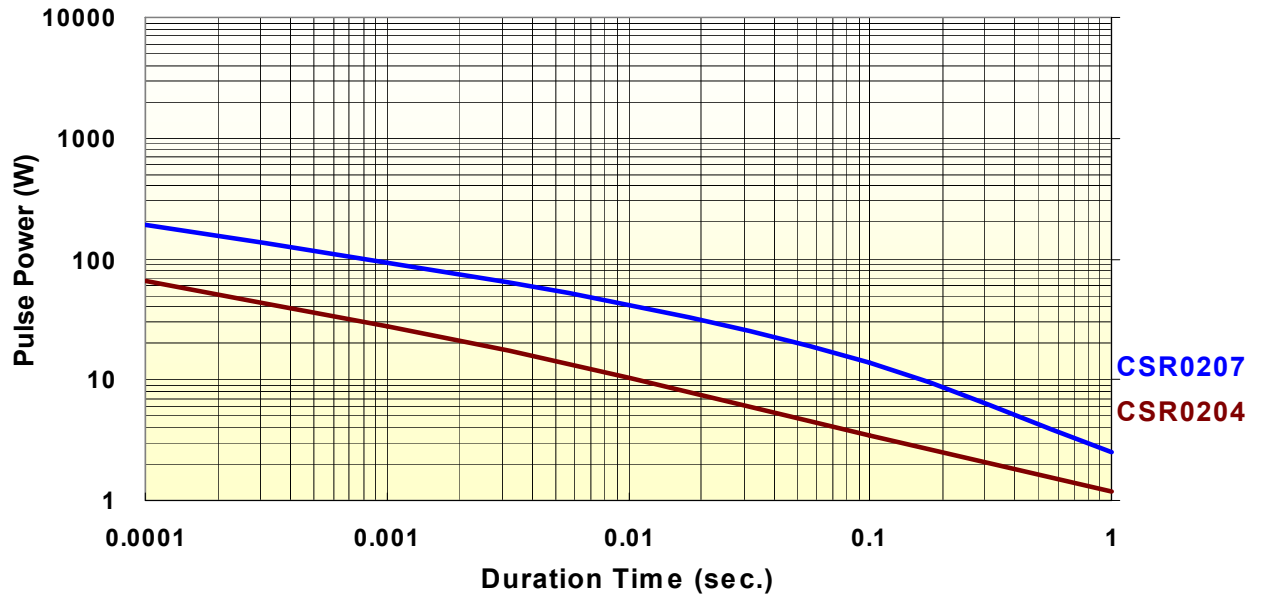
### CSR Series Single Pulse(100 Ohm)



## ■ 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)

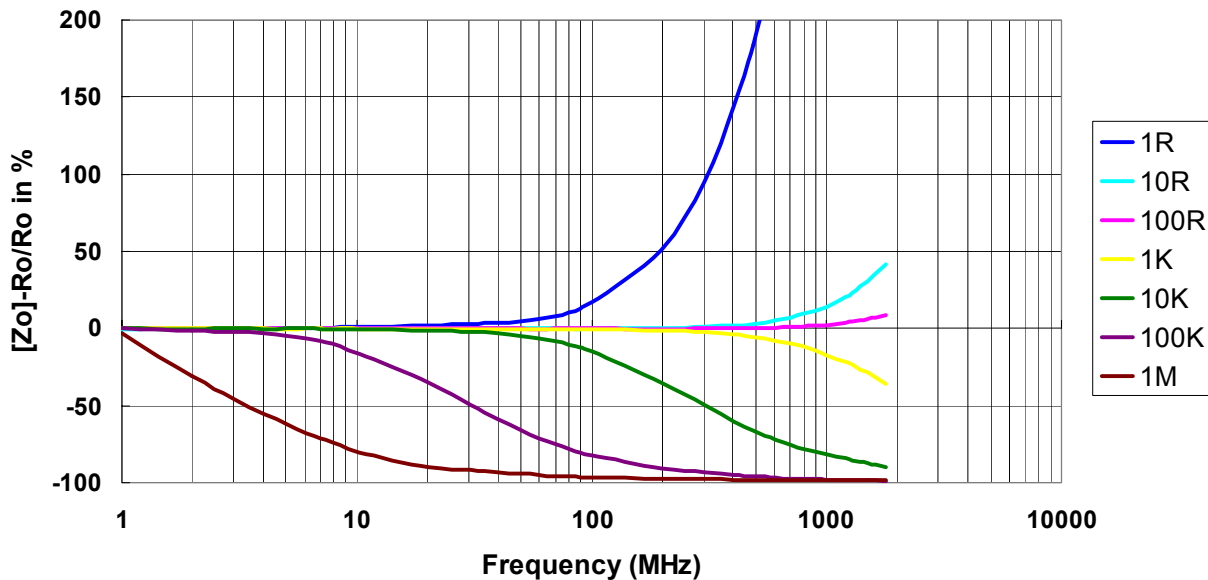


## Frequency Behavior

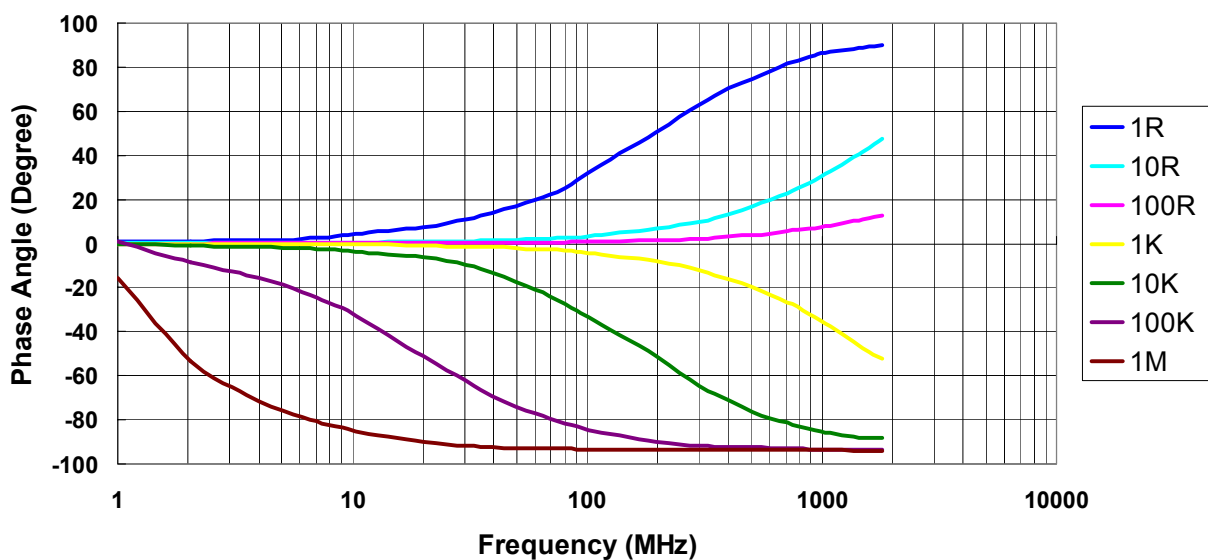
Resistors are designed to function according to ohmic laws. This is basically true of resistors for frequencies up to 100kHz. At higher frequencies, there is an additional contribution to the impedance by an ideal resistor switched in series with a coil and both switched parallel to a capacitor. The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

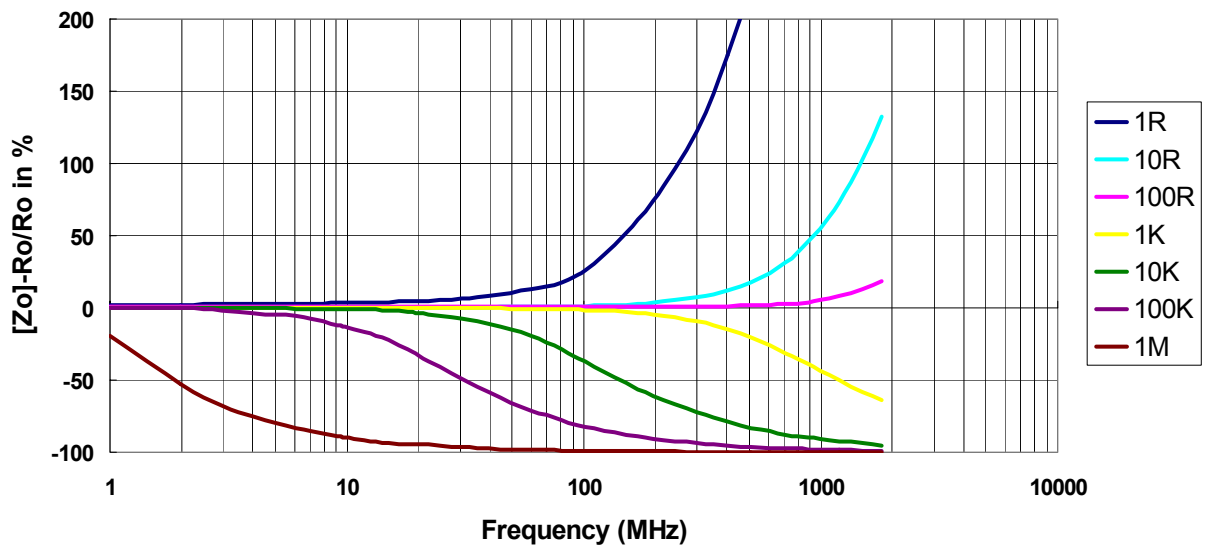
### Frequency vs. Impedance CSR Series(CSR0204)



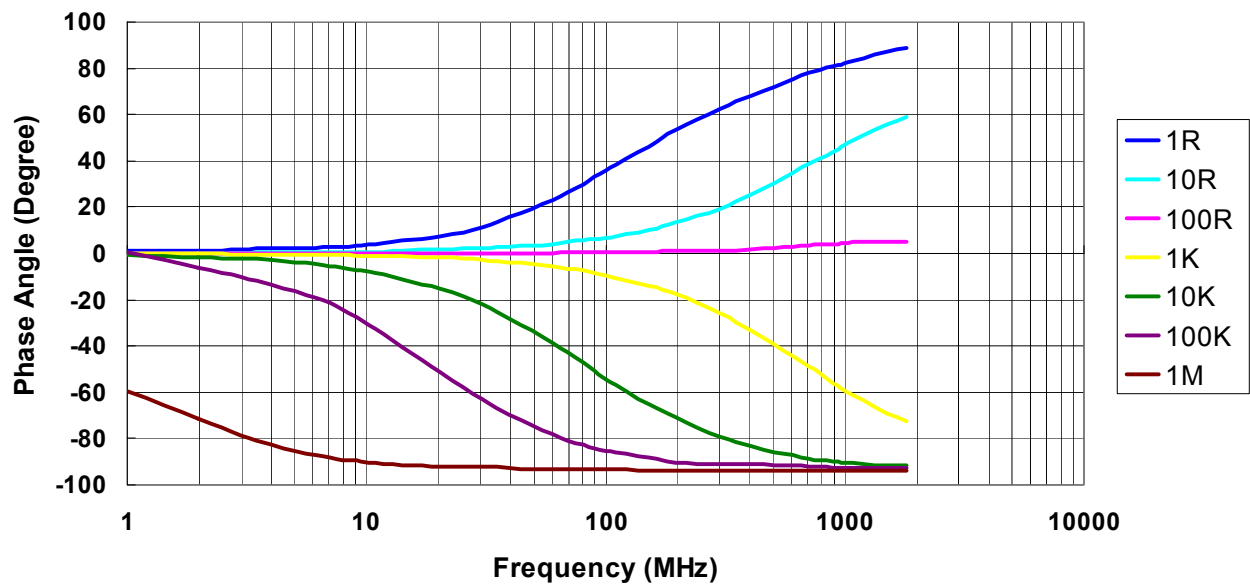
### Frequency vs. Phase Angle CSR Series(CSR0204)



## Frequency vs. Impedance CSR Series(CSR0207)



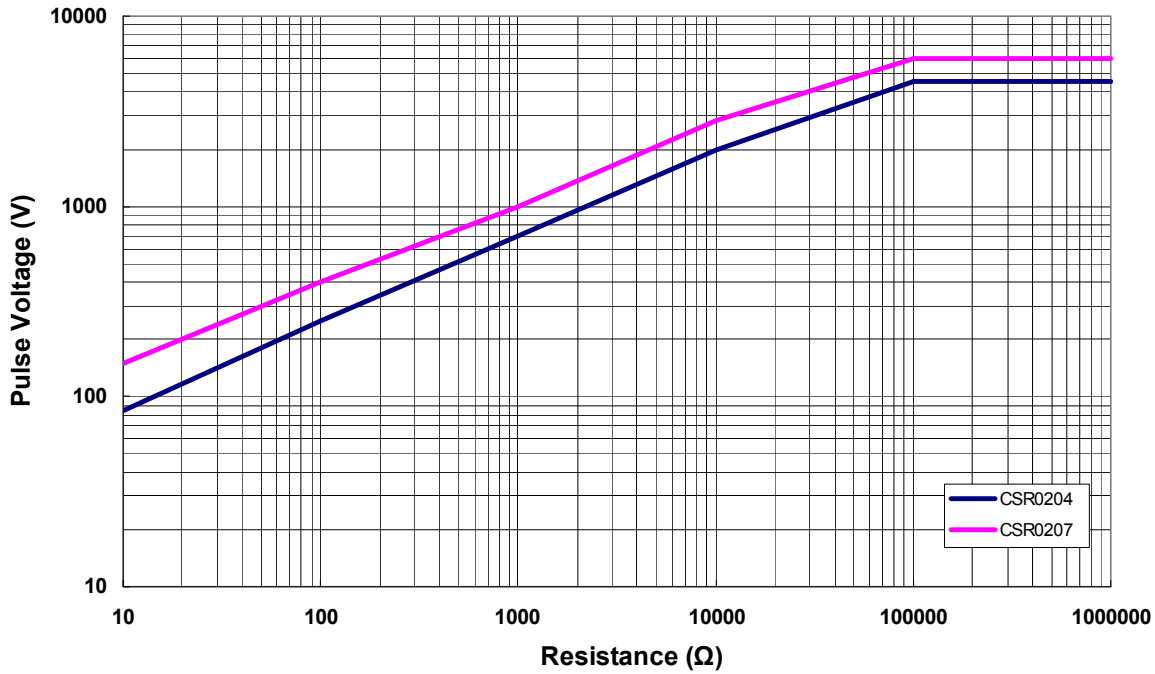
## Frequency vs. Phase Angle CSR Series(CSR0207)



## ■ Lightning Surge

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

### 1.2/50 $\mu$ s Lightning Surge



### 10/700 $\mu$ s Lightning Surge

