

# Pulse Withstanding Thick Film Chip Resistor



CPR Series

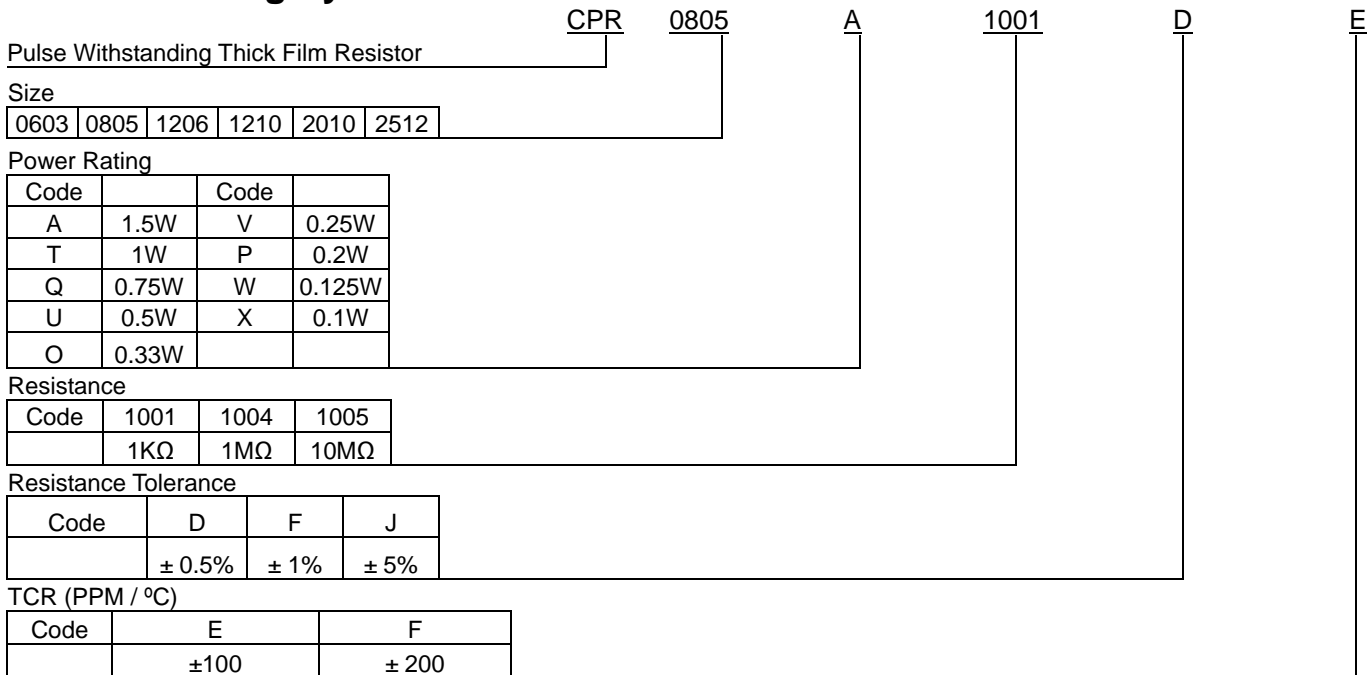
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## Feature

- Tolerance from  $\pm 0.5\%$  ~ 5%
- High Power Rating
- Excellent pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0805 ~ 2512



## Part Numbering System



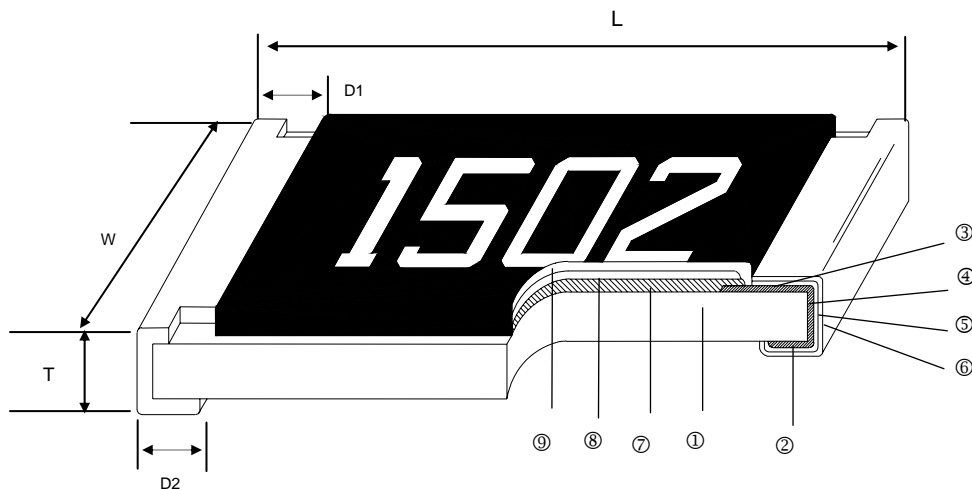
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## Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO <sub>2</sub> /Ag)
②	Bottom Electrode (Ag)	⑤	Barrier Layer (Ni)	⑧	Primary Overcoat (Glass)
③	Top Electrode (Ag-Pd)	⑥	External Electrode (Sn)	⑨	Secondary Overcoat (Epoxy)

## Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CPR0603	0603	1.60 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20	2.042
CPR0805	0805	2.00 ± 0.10	1.25 ± 0.10	0.50 ± 0.10	0.35 ± 0.20	0.40 ± 0.20	4.368
CPR1206	1206	3.10 ± 0.10	1.55 ± 0.10	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.20	8.947
CPR1210	1210	3.10 ± 0.10	2.60 ± 0.15	0.55 ± 0.10	0.50 ± 0.25	0.50 ± 0.20	15.959
CPR2010	2010	5.00 ± 0.10	2.50 ± 0.15	0.55 ± 0.10	0.60 ± 0.25	0.50 ± 0.20	24.241
CPR2512	2512	6.35 ± 0.10	3.10 ± 0.15	0.55 ± 0.10	0.60 ± 0.25	0.50 ± 0.20	39.448

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**Standard Electrical Specifications**

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Resistance Range			TCR (PPM/°C)
				±0.5%	±1%	±5%	
CPR0603	1/10W	-55 ~ +155°C	50V	10Ω - 299Ω	1Ω - 299Ω		±200
					300Ω - 1MΩ		±100
CPR0805	1/8W	-55 ~ +155°C	150V	10Ω - 299Ω	1Ω - 299Ω		±200
					300Ω - 20MΩ		±100
CPR1206	1/3W	-55 ~ +155°C	200V	10Ω - 20Ω	1Ω - 20Ω		±200
					20.1Ω - 20MΩ		±100
CPR1210	1/2W	-55 ~ +155°C	200V	10Ω - 20Ω	1Ω - 20Ω		±200
					20.1Ω - 20MΩ		±100
CPR2010	3/4W	-55 ~ +155°C	400V	10Ω - 20Ω	1Ω - 20Ω		±200
					20.1Ω - 20MΩ		±100
CPR2512	1.5W	-55 ~ +155°C	500V	10Ω - 20Ω	1Ω - 20Ω		±200
					20.1Ω - 20MΩ		±100

**High Power Rating Electrical Specifications**

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Resistance Range			TCR (PPM/°C)
				±0.5%	±1%	±5%	
CPR0603	1/8W	-55 ~ +155°C	50V	10Ω - 299Ω	1Ω - 299Ω		±200
	1/5W				300Ω - 1MΩ		±100
CPR0805	1/4W	-55 ~ +155°C	150V	10Ω - 299Ω	1Ω - 299Ω		±200
					300Ω - 20MΩ		±100
CPR1206	1/2W	-55 ~ +155°C	200V	10Ω - 20Ω	1Ω - 20Ω		±200
					20.1Ω - 20MΩ		±100
CPR2010	1W	-55 ~ +155°C	400V	10Ω - 20Ω	1Ω - 20Ω		±200
					20.1Ω - 20MΩ		±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.

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## Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	<b>JIS-C-5201-1 4.8</b> <b>IEC-60115-1 4.8</b> -55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	<b>JIS-C-5201-1 4.13</b> <b>IEC-60115-1 4.13</b> RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G	<b>JIS-C-5201-1 4.6</b> <b>IEC-60115-1 4.6</b> Max. overload voltage for 1 minute
Endurance	±(1.0%+0.05Ω)	<b>JIS-C-5201-1 4.25</b> <b>IEC-60115-1 4.25.1</b> 70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(0.5%+0.05Ω)	<b>JIS-C-5201-1 4.24</b> 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	±(0.5%+0.05Ω)	<b>JIS-C-5201-1 4.23</b> <b>IEC-60115-1 2.23.2</b> at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	<b>JIS-C-5201-1 4.33</b> <b>IEC-60115-1 4.33</b> Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	<b>JIS-C-5201-1 4.17</b> <b>IEC-60115-1 4.17</b> 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	<b>JIS-C-5201-1 4.18</b> <b>IEC-60115-1 4.18</b> 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	<b>JIS-C-5201-1 4.7</b> <b>IEC-60115-1 4.7</b> 1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%	<b>JIS-C-5201-1 4.18</b> <b>IEC-60068-2-58 8.2.1</b> 260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	<b>JIS-C-5201-1 4.18</b> <b>IEC-60115-1 4.18</b> -55°C to +155°C, 5 cycles

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

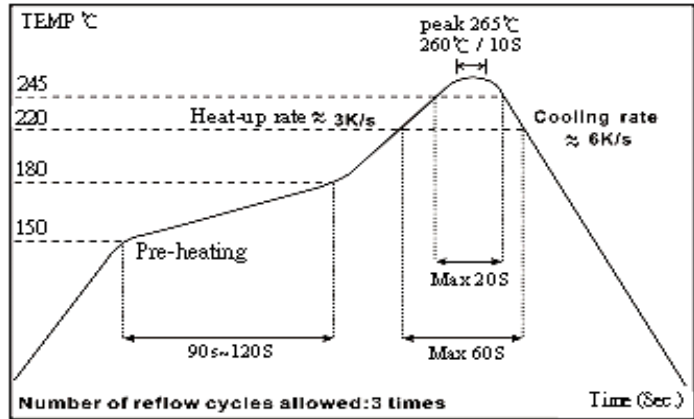
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## CPR Series

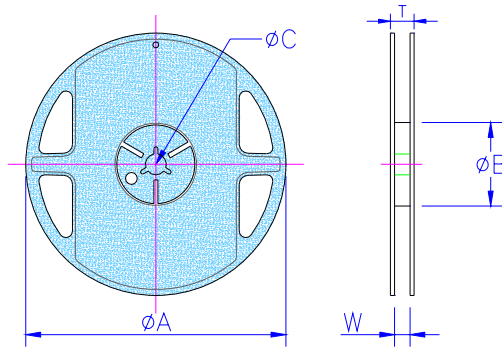


### Reflow



### Packaging

#### Reel Specification & Packaging Quantity



Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	$\Phi A$	$\Phi B$	$\Phi C$	W	T
CPR0603 CPR0805 CPR1206 CPR1210	Paper	5K	7 inch	$178.5 \pm 1.5$	$60 + 1/-0$	$13.0 \pm 0.2$	$9.0 \pm 0.5$	$12.5 \pm 0.5$
		10K	10 inch	$254 \pm 1.0$	$100 \pm 0.5$	$13.0 \pm 0.2$	$9.5 \pm 0.5$	$13.5 \pm 0.5$
		20K	13 inch	$330 \pm 1.0$	$100 \pm 0.5$	$13.0 \pm 0.2$	$9.5 \pm 0.5$	$13.5 \pm 0.5$
CPR2010 CPR2512	Embossed	4K	7 inch	$178.5 \pm 1.5$	$60 + 1/-0$	$13.0 \pm 0.5$	$13.0 \pm 0.5$	$15.5 \pm 0.5$
		8K	10 inch	$250 \pm 1.0$	$62 \pm 0.5$	$13.0 \pm 0.5$	$12.5 \pm 0.5$	$16.5 \pm 0.5$

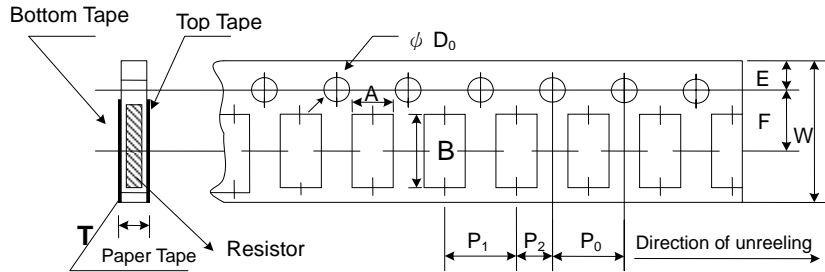
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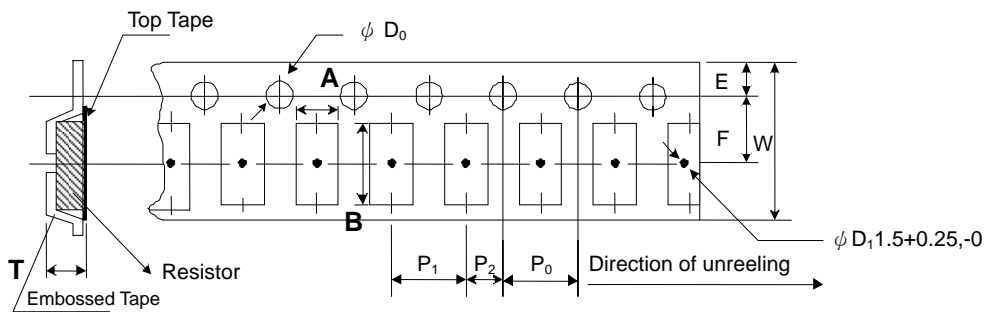
## Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ΦD <sub>0</sub>	T
CPR0603	1.10 ± 0.1	1.90 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.50 ± 0.05	4.00 ± 0.1	4.00 ± 0.05	2.00 ± 0.05	1.50 + 0.1, -0	0.70 ± 0.1
CPR0805	1.60 ± 0.1	2.40 ± 0.2	8.0 ± 0.2	1.75 ± 0.1	3.50 ± 0.05	4.00 ± 0.1	4.00 ± 0.05	2.00 ± 0.05	1.50 + 0.1, -0	0.85 ± 0.1
CPR1206	1.90 ± 0.1	3.50 ± 0.2	8.0 ± 0.2	1.75 ± 0.1	3.50 ± 0.05	4.00 ± 0.1	4.00 ± 0.05	2.00 ± 0.05	1.50 + 0.1, -0	0.85 ± 0.1
CPR1210	2.90 ± 0.1	3.50 ± 0.2	8.0 ± 0.2	1.75 ± 0.1	3.50 ± 0.05	4.00 ± 0.1	4.00 ± 0.05	2.00 ± 0.05	1.50 + 0.1, -0	0.85 ± 0.1

## Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	ΦD <sub>0</sub>	T
CPR2010	2.8 ± 0.10	5.5 ± 0.10	12.0 ± 0.3	1.75 ± 0.1	5.5 ± 0.05	4.00 ± 0.10	4.00 ± 0.1	2.00 ± 0.05	1.50 + 0.1, -0	1.2 <sup>+0</sup>
CPR2512	3.5 ± 0.10	6.7 ± 0.10	12.0 ± 0.3	1.75 ± 0.1	5.5 ± 0.05	4.00 ± 0.10	4.00 ± 0.1	2.00 ± 0.05	1.50 + 0.1, -0	1.2 <sup>+0</sup>

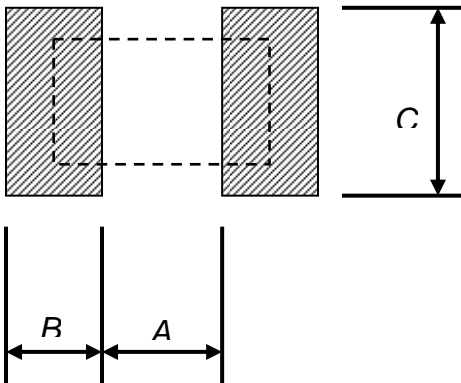
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## Recommend Land Pattern

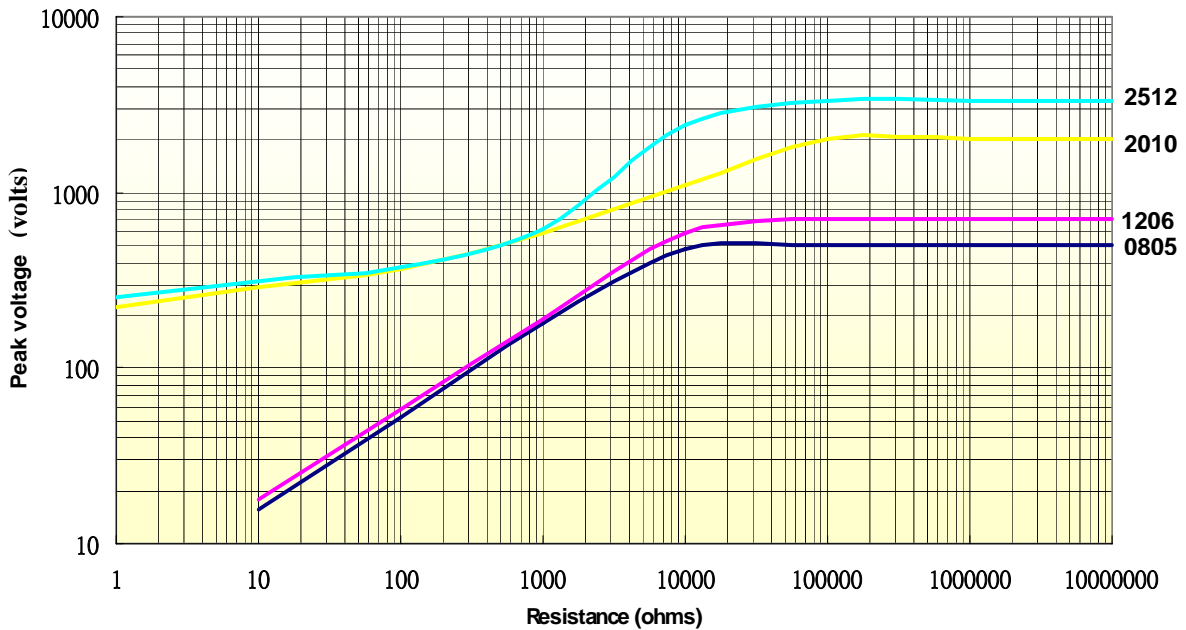


Type	A	B	C
CPR0603	0.90	0.60	0.90
CPR0805	1.20	0.70	1.30
CPR1206	2.00	0.90	1.60
CPR1210	2.00	0.90	2.80
CPR2010	3.80	0.90	2.80
CPR2512	3.80	1.60	3.50

## Lightning Surge

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

### 10/700us Lightning Surge



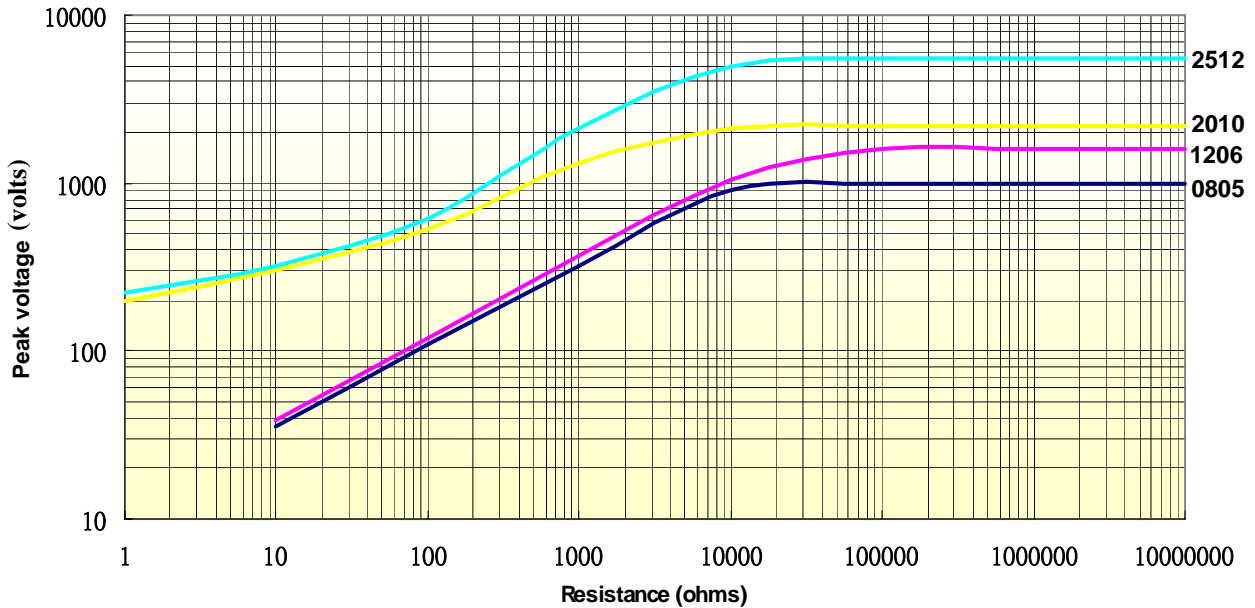
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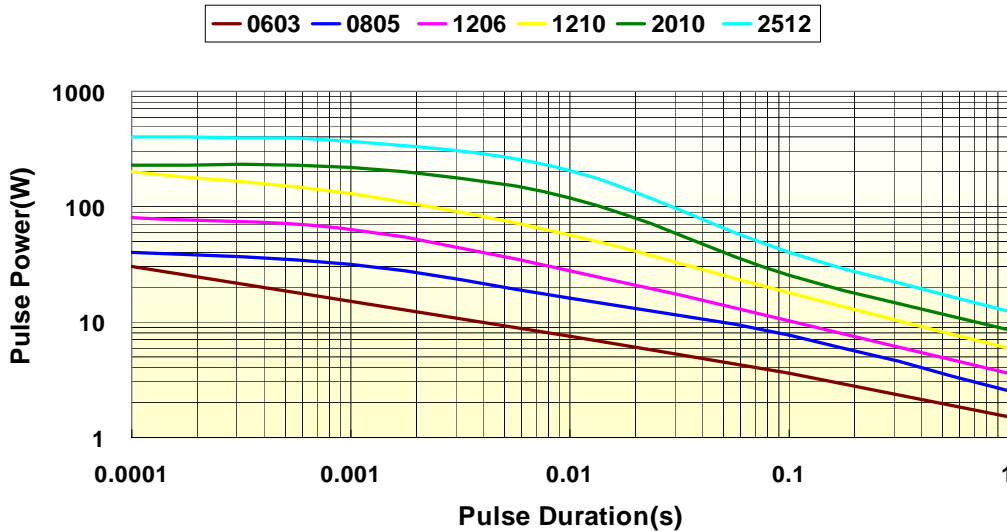
## 1.2/50 us Lightning Surge



## Pulse withstand 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.

## Single Pulse (100 Ohm)





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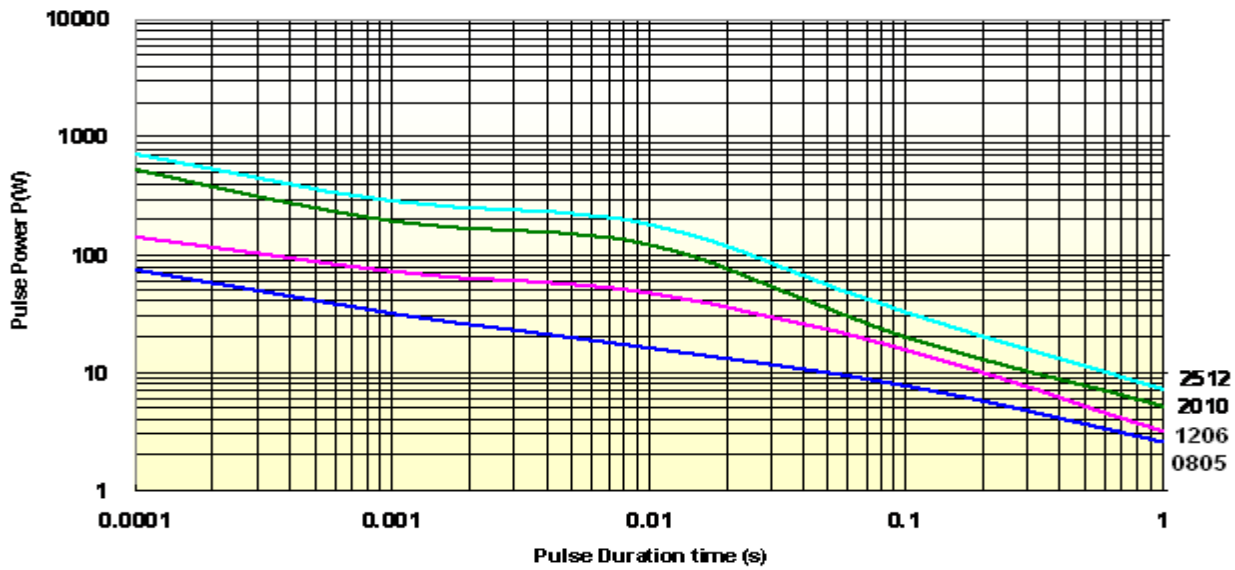
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## Continuous Pulse

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.

### Continuous Pulse (100 Ohm)



### Pulse Voltage(100 ohm)

