

Pulse Withstanding Thick Film Resistors(PWCR Series)



Features:

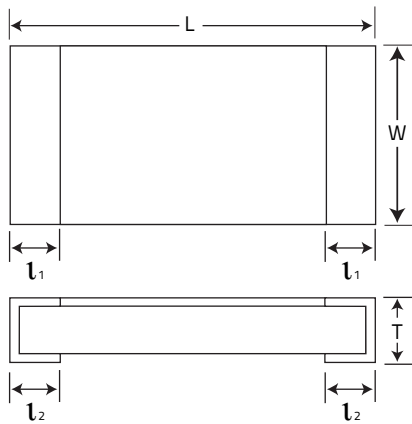
- Excellent pulse withstanding performance
- Higher power ratings than General Purpose Thick Film Resistors
- Improved working voltage ratings
- Offered in 0603 to 2512 package sizes
- RoHS and REACH compliant
- Halogen Free

Part Number Structure

PWCR Series	1206 Size	- V Power Rating	K TCR	- 1001 Resistance Value	D Resistance Tolerance	T Packaging
0603	0805	T = 1/4W	K = ±100ppm/°C	1001 = 1KΩ	D = ±0.50%	T = Tape & Reel
1206	1210	V = 1/2W	L = ±200ppm/°C	2493 = 249KΩ	F = ±1%	
2010	2512	W = 3/4W		4R7 = 4.7Ω	J = ±5%	
		X = 1W		102 = 1KΩ		
		Z = 1.5W				

Example P/N: PWCR1206-VK-1001DT Standard termination finish is 100% matte Tin (Sn) over Nickel.

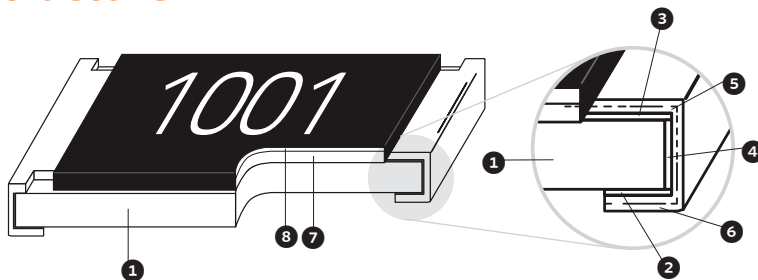
Dimensions



Unit: inches (mm)

Size	L	W	T	l1	l2
0603	0.062 ± 0.004 (1.60 ± 0.10)	0.031 ± 0.004 (0.80 ± 0.1)	0.018 ± 0.004 (0.45 ± 0.10)	0.012 ± 0.008 (0.30 ± 0.20)	0.012 ± 0.008 (0.30 ± 0.20)
0805	0.079 ± 0.004 (2.0 ± 0.10)	0.049 ± 0.006 (1.25 ± 0.15)	0.019 ± 0.004 (0.50 ± 0.10)	0.013 ± 0.008 (0.35 ± 0.20)	0.016 ± 0.008 (0.40 ± 0.20)
1206	0.122 ± 0.004 (3.10 ± 0.10)	0.061 ± 0.004 (1.55 ± 0.10)	0.022 ± 0.004 (0.55 ± 0.10)	0.019 ± 0.009 (0.50 ± 0.25)	0.019 ± 0.008 (0.50 ± 0.20)
1210	0.122 ± 0.004 (3.10 ± 0.10)	0.102 ± 0.006 (2.60 ± 0.15)	0.022 ± 0.004 (0.55 ± 0.10)	0.019 ± 0.009 (0.50 ± 0.25)	0.019 ± 0.008 (0.50 ± 0.20)
2010	0.196 ± 0.004 (5.0 ± 0.10)	0.098 ± 0.006 (2.50 ± 0.15)	0.022 ± 0.004 (0.55 ± 0.10)	0.024 ± 0.009 (0.60 ± 0.25)	0.020 ± 0.008 (0.50 ± 0.20)
2512	0.25 ± 0.004 (6.35 ± 0.10)	0.122 ± 0.006 (3.10 ± 0.15)	0.022 ± 0.004 (0.55 ± 0.10)	0.024 ± 0.009 (0.60 ± 0.25)	0.020 ± 0.008 (0.50 ± 0.20)

Structure



1	Alumina Substrate	5	Nickel Plating
2	Backside Electrode	6	Tin Plating
3	Top Electrode	7	Resistive layer
4	Edge Electrode	8	Overcoat

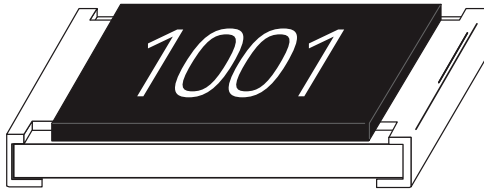
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Electrical Specifications and Range

Size	0603	0805	1206	1210		2010	2512
Power Rating at 70°C (W)	0.25W (1/4W)	0.25W (1/4W)	0.50W (1/2W)	0.50W (1/2W)	0.75W (3/4W)	1W (1W)	1.5W (1.5W)
Max. Working Voltage	50V	150V	200V	200V	200V	400V	500V
*Max. Overload Voltage	100V	300V	400V	400V	400V	800V	1000V
Operating Temp. Range	-55°C to +155°C	-55°C to +155°C	-55°C to +155°C	-55°C to +155°C	-55°C to +155°C	-55°C to +155°C	-55°C to +155°C
Tolerance	TCR	Resistance Range	Resistance Range	Resistance Range	Resistance Range	Resistance Range	Resistance Range
±0.5%(D)	±100ppm	300Ω - 1MΩ	300Ω - 20MΩ	20.5Ω - 20MΩ	20.5Ω - 20MΩ	20.5Ω - 20MΩ	20.5Ω - 20MΩ
	±200ppm	1Ω - 294Ω	1Ω - 294Ω	1Ω - 20Ω	1Ω - 20Ω	1Ω - 20Ω	1Ω - 20Ω
±1%(F)	±100ppm	300Ω - 1MΩ	300Ω - 20MΩ	20.5Ω - 20MΩ	20.5Ω - 20MΩ	20.5Ω - 20MΩ	20.5Ω - 20MΩ
	±200ppm	1Ω - 294Ω	1Ω - 294Ω	1Ω - 20Ω	1Ω - 20Ω	1Ω - 20Ω	1Ω - 20Ω
±5%(J)	±100ppm	300Ω - 1MΩ	300Ω - 20MΩ	20.5Ω - 20MΩ	20.5Ω - 20MΩ	20.5Ω - 20MΩ	20.5Ω - 20MΩ
	±200ppm	1Ω - 294Ω	1Ω - 294Ω	1Ω - 20Ω	1Ω - 20Ω	1Ω - 20Ω	1Ω - 20Ω

NOTE: * Overload Voltage=2.5*√(P*R). or Max. overload voltage listed above, whichever is lower.

Marking Code



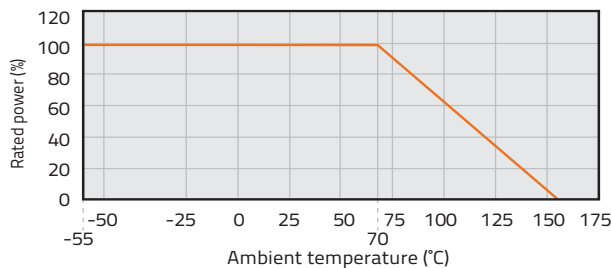
E-96 values for 0805 size and larger, will be marked with standard 4 digit marking code.

E-24 values for 0603 size and larger, will be marked with standard 3 digit marking code.

0603 - E-96 values will be marked with a standard 3 digit alpha numeric code

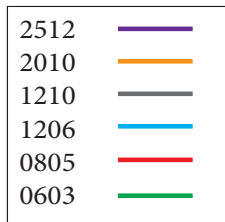
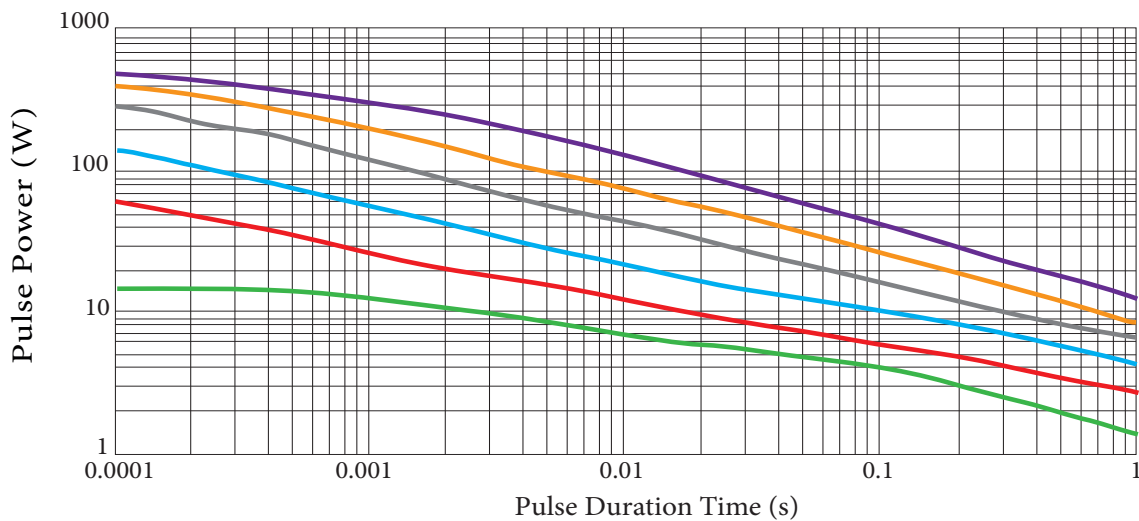
(Please see alpha numeric codes).

Derating Curve



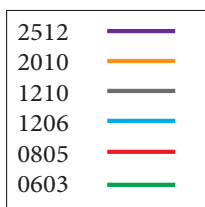
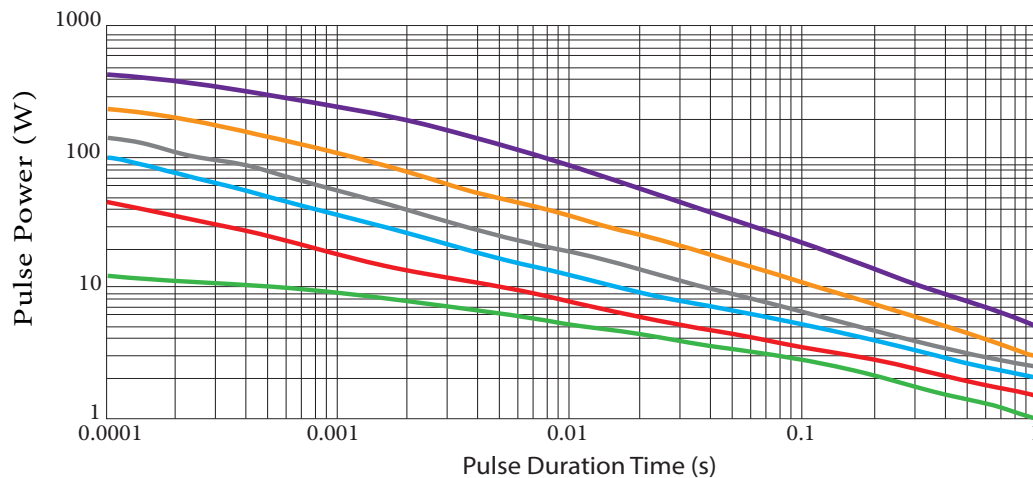
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Single Pulse Graph



Note: The Single pulse graph is the result of 50 rectangular shape pulses that are 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 subjected to the restrictions of the maximum permissible pulse voltage.

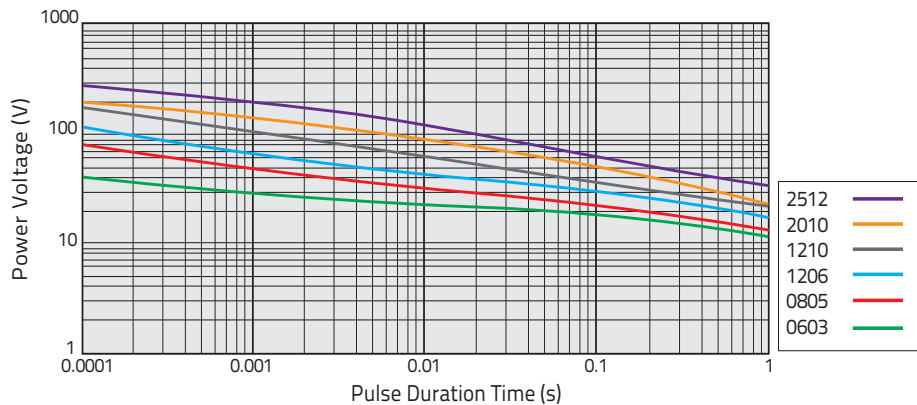
Multi Pulse Graph



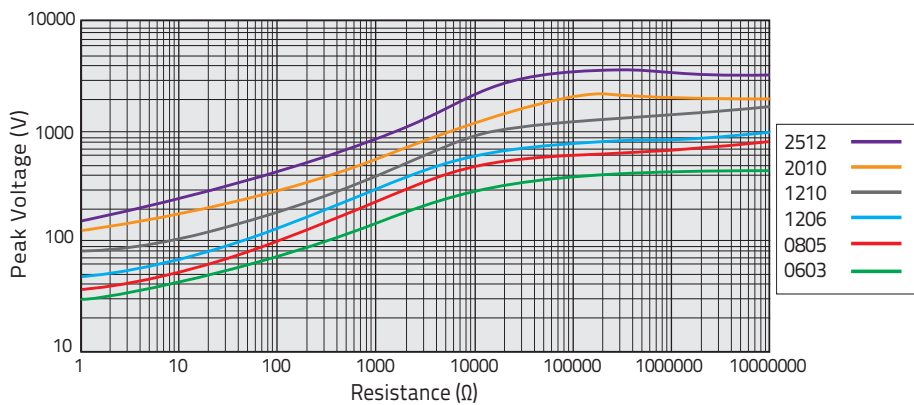
Note: The continuous load graph was obtained by applying repetitive rectangular pulses where the pulse period was adjusted so that the average power dissipated in the resistor was equal to its rated power at 70°C. Again the limit of acceptance was a shift in resistance of less than 1% from the initial value.

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Pulse Voltage

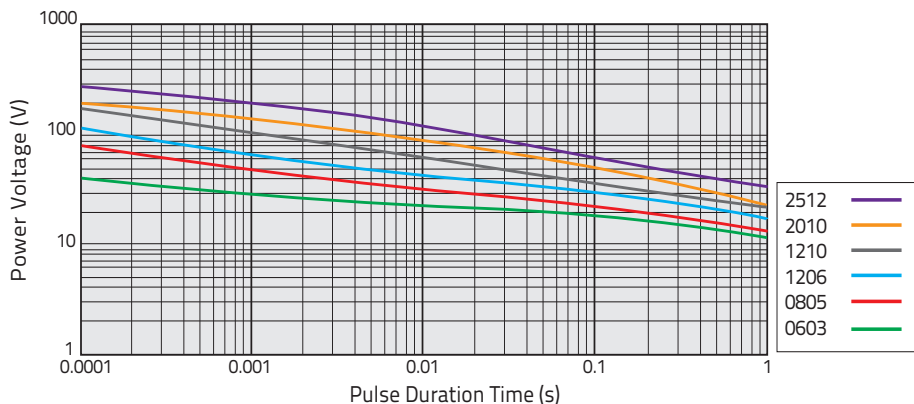


10/700 μ S Lightning Surge



Note: Resistors are tested in accordance with IEC 60 115-1 using 10/700 μ S pulse shapes. The limit of acceptance is a shift in resistance of less than 1% from the initial value.

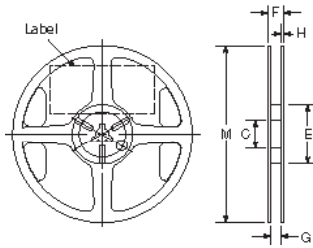
1.2/50 μ S Lightning Surge



Note: Resistors are tested in accordance with IEC 60 115-1 using 1.2/50 μ S pulse shapes. The limit of acceptance is a shift in resistance of less than 1% from the initial value.

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Reel Specifications

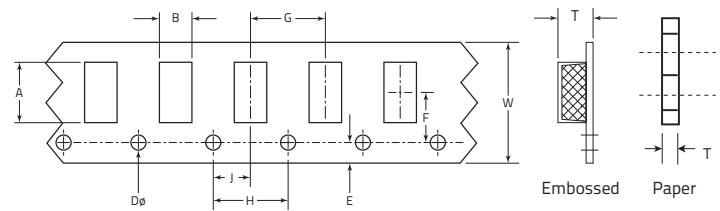


Unit: mm (inch)

C	E	F	G	H	M
13.0 ± 0.2 (0.51 ± 0.008)	60.0 ± 1.0 (2.36 ± 0.03)	11.4 ± 1.0 (0.45 ± 0.04)	9.0 ± .3 (0.35 ± 0.012)	1.5 ± .3 (0.06 ± 0.012)	180 ± 2.0 (7.09 ± 0.08)

Minimum of 30 empty pockets at the beginning of reel, 65 minimum empty pockets at the end.

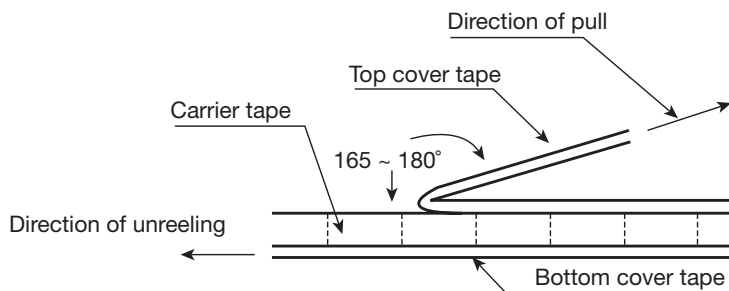
Tape Specifications



All dimensions in mm.

Tape	Size (inches)	A	B	W	E	F	T	G	H	J	Dø
Paper	0603	1.90±0.10	1.10±0.05	8.0±0.10	1.75±0.05	3.50±0.05	0.60±0.03	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05
	0805	2.37±0.20	1.60±0.05	8.0±0.10	1.75±0.05	3.50±0.05	0.75±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05
	1206	3.55±0.05	2.00±0.05	8.0±0.10	1.75±0.05	3.50±0.05	0.75±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05
	1210	3.40±0.05	2.75±0.05	8.0±0.10	1.75±0.05	3.50±0.05	0.75±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.60±0.10
Embossed	2010	5.45±0.10	2.85±0.10	12.00±0.10	1.75±0.10	5.50±0.05	1.00 +0.2, 0	4.00±0.10	4.00±0.05	2.00±0.05	1.50 +0.1, -0
	2512	6.65±0.10	3.40±0.10	12.00±0.10	1.75±0.10	5.50±0.05	1.00 +0.2, 0	4.00±0.10	4.00±0.05	2.00±0.05	1.50 +0.1, -0

Peel Back Force and Direction Diagram



Peel back force and direction of peel back angle should follow EIA481-1-A. Peel back force should be between 0.1N – 1.3N and peel back angle of 165° – 180°.

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Environmental Characteristics

Type of Test	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R)	As per Spec.	JIS-C-5201-1 4.8 IEC-60115-1 4.8 -55°C to +125°C, 25°C is the reference temperature
Short Time Overload	$\pm(1.0\%+0.05\Omega)$	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	$\pm(1.0\%+0.05\Omega)$	JIS-C-5201-1 4.25 IEC-60115-1 4.25.1 70 \pm 2°C, RCWV for 1000 hrs with with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.24 IEC-60115-1 4.24 40 \pm 2°C, 90~95% R.H., RCWV for 1000 hrs with with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2 at +155°C for 100 hrs
Bending Strength	$\pm(1.0\%+0.05\Omega)$	JIS-C-5201-1 4.33 IEC-60115-1 4.33 2010,2515 sizes: 2mm Other sizes: 3mm
Solderability	95% min coverage	JIS-C-5201-1 4.17 IEC-60115-1 4.17 245 \pm 5°C for 3 seconds
Resisatance 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-600068-2-1 8.2.1 260 \pm 5°C for 30 seconds
Rapid Change of Temperature	$\pm(0.5\%+0.05\Omega)$	JIS-C-5201-1 4.19 IEC-60115-1 4.19 -55°C to +155°C, 5 cycles