FrelTec GmbH

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Surge Withstanding Chip Resistor SMD

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Part Number

0A5	05*	1001*	J*	T05*	D	D
Type	Size	Value	Tolerance	Packing	TCR	Power Rating
0A5 : Surge With-standing Chip Resistor	02 : 0402	R=Decimal	J : ±5%	T10: Tape and reel for 10k pc (7"reel for 0402),	F : ±100ppm/°C	D: 1/8W
	03 : 0603	The last digit is the multiplier	K: ±10%	T05: Tape and reel for 5k pc (7"reel for 0603 to 1210),	G : ±200ppm/°C	S: 1/5W E: 1/4W
	05 : 0805	which denotes the number of zero following	M: ±20%	E04: Embossed reel for 4k pc 7"reel for 2010 and 2512	H : ±300ppm/°C	G: 1/3W
	06 : 1206	0000=0Ohm			L : ±350ppm/°C	F: 2/5W
	10 : 1210	Example:				H: 1/2W
	20 : 2010	97R6= 97,6 Ohm				I: 3/4W
	25 : 2512	9760 = 976Ohm				J: 1W
		1001 = 1kOhm				2: 1,25W
		E24-Series is first digit "0"				K: 1,5W
						L: 2W
						* not all combination is possible

^

All products according to RoHS (2011/65/EU)

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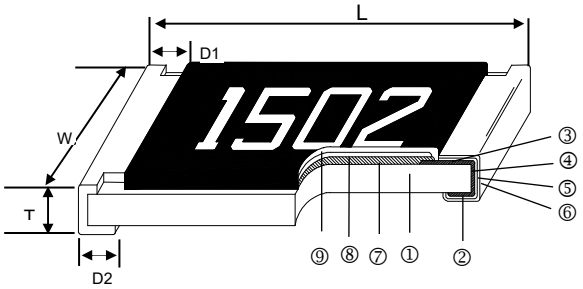
THICK FILM CHIP RESISTORS



①	Alumina Substrate	④	Edge Electrode	⑦	Resistor Layer
②	Bottom Electrode	⑤	Barrier Layer	⑧	Primary Overcoat
③	Top Electrode	⑥	External Electrode	⑨	Secondary Overcoat

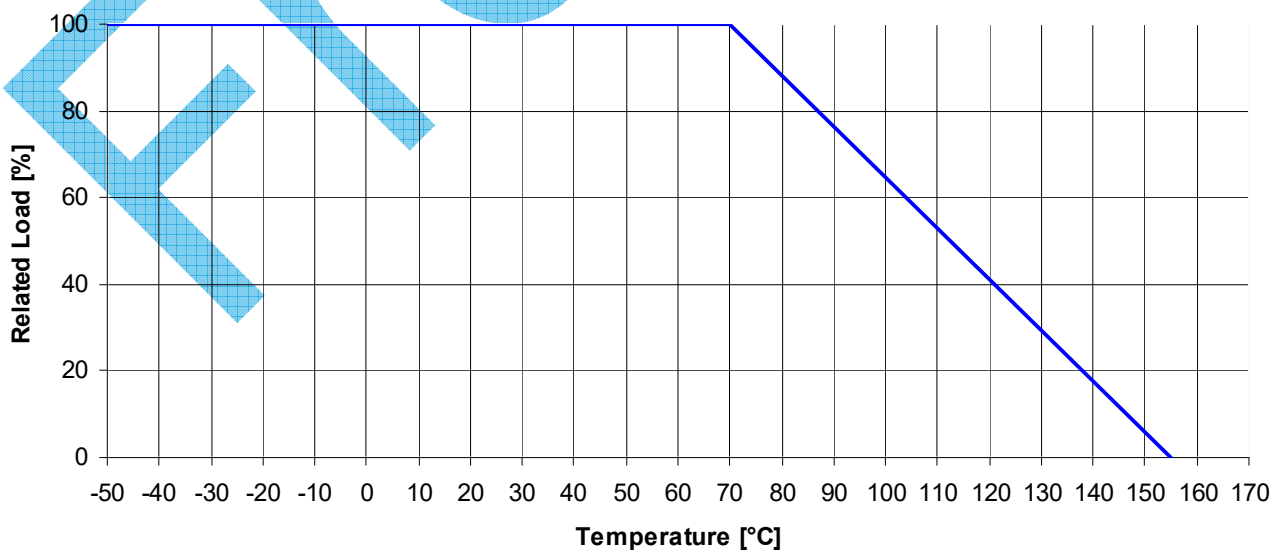
Dimensions

SIZE	L	W	T	D_1	D_2
0402	1,00±0,05	0,50±0,05	0,35±0,05	0,20±0,10	0,20±0,10
0603	1,60±0,10	0,80±0,10	0,45±0,10	0,30±0,20	0,30±0,20
0805	2,00±0,10	1,25±0,10	0,50±0,10	0,35±0,20	0,40±0,20
1206	3,10±0,10	1,55±0,10	0,55±0,10	0,50±0,25	0,50±0,20
1210	3,10±0,10	2,60±0,15	0,55±0,10	0,50±0,25	0,50±0,20
2010	5,00±0,10	2,50±0,15	0,55±0,10	0,60±0,25	0,50±0,20
2512	6,35±0,10	3,10±0,15	0,55±0,10	0,60±0,25	0,50±0,20
2512 (2W)	6,35±0,20	3,15±0,15	0,60±0,10	0,60±0,25	0,60±0,20

(unit: mm)

Power Derating Curve:

For resistors operated in ambient temperatures above 70℃, power rating must be derated in accordance with the curve below. Operating temperature -55°C to +155°C



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CHIP RESISTORS

0A5 Series

Standard Electrical Specification

Item / Size	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	TCR (ppm/°C)	Resistance Range ±5%	Resistance Range ±10%	Resistance Range ±20%
0603	1/5W	-55 ~ +155°C	50V	100V	±100	22Ω – 1MΩ		
					±300	1Ω - 20Ω		
0603	1/8W		50V	100V	±100	300Ω - 1MΩ		
					±200	10Ω - 270Ω		
0805	1/4W		150V	300V	±100	300Ω - 20MΩ		
					±200	1Ω - 270Ω		
1206	1/3W		200V	400V	±100	22Ω - 20MΩ		
					±200	1Ω - 20Ω		
1210	1/2W		200V	400V	±100	22Ω - 20MΩ		
					±200	1Ω - 20Ω		
2010	3/4W		400V	800V	±100	22Ω - 20MΩ		
					±200	1Ω - 20Ω		
2512	1,5W		500V	1000V	±100	22Ω - 20MΩ		
					±200	1Ω - 20Ω		

High Power Rating Electrical Specification

Item / Size	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	TCR (ppm/°C)	Resistance Range ±5%	Resistance Range ±10%	Resistance Range ±20%
0603	1/4W 1/3W	-55 ~ +155°C	75V	150V	±100	300Ω - 1MΩ		
					±200	10Ω - 270Ω		
0805	2/5W		150V	300V	±100	300Ω - 1MΩ		
					±200	1Ω - 270Ω		
	1/2W		400V	600V	±100	300Ω – 1MΩ		
					±200	1Ω - 270Ω		
1206	1/2W		200V	400V	±100	22Ω - 1MΩ		
					±200	1Ω - 20Ω		
	3/4W		500V	1000V	±100	22Ω – 1MΩ		
					±200	1Ω - 20Ω		
1210	3/4W 1W		200V	400V	±100	22Ω - 1MΩ		
					±200	1Ω - 20Ω		
2010	1W 1,25W		400V	800V	±100	22Ω - 1MΩ		
					±200	1Ω - 20Ω		
2512	2W		500V	1000V	±100	11Ω – 200kΩ		
					±350	1Ω - 10Ω		

Operating Voltage=√(P*R) or Max. operating voltage listed above, whichever is lower.
Overload Voltage=2,5*√(P*R) or Max. overload voltage listed above, whichever is lower.

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The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power ratingin application only applies if the temperature of the resistive element is not exceed 155 ° C.

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SMD Resistor

SPECIFICATION

E24 0603

3 digit marking, first two digits marking are significant figures; third digit is multiplier (10^X).
examples: 512 = 51×10^2 = 5,1kOhm

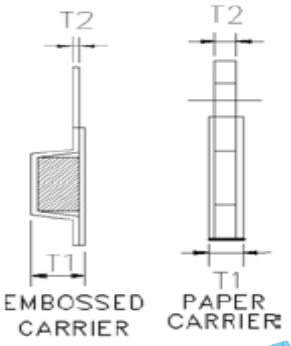
0805 to 2512

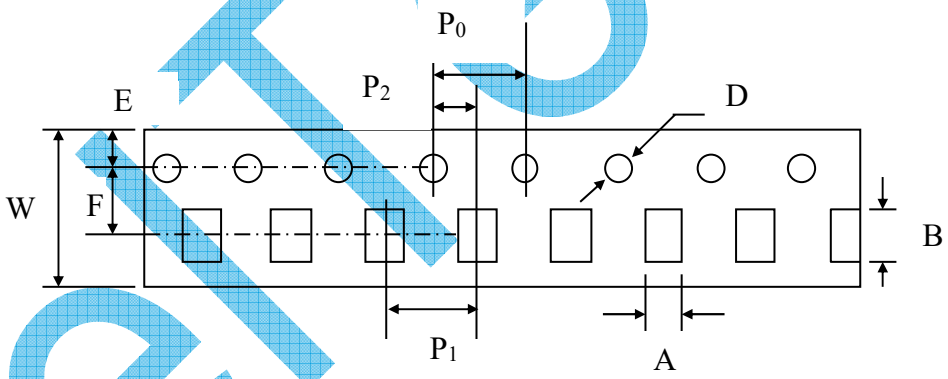
4 digit marking, first three digits marking are significant figures; forth digit is multiplier (10^X).
examples: 1542 = 154×10^2=15.400 Ohm=15,4kOhm

E24	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91

SPECIFICATION

Tape And Reel Package





Packing	Size	A	B	W	F	E	P_1	P_2	P_0	D	T_1
Paper Tape	0402	0,65±0,10	1,15±0,1	8,0±0,2	3,50±0,05	1,75±0,1	2,00±0,05	2,00±0,05	4,00±0,10	1,50+0,1,-0	0,45±0,1
	0603	1,10±0,10	1,90±0,1	8,0±0,2	3,50±0,05	1,75±0,1	4,00±0,05	2,00±0,05	4,00±0,10	1,50+0,1,-0	0,70±0,1
	0805	1,60±0,10	2,40±0,2	8,0±0,2	3,50±0,05	1,75±0,1	4,00±0,05	2,00±0,05	4,00±0,10	1,50+0,1,-0	0,85±0,1
	1206	1,90±0,10	3,50±0,2	8,0±0,2	3,50±0,05	1,75±0,1	4,00±0,05	2,00±0,05	4,00±0,10	1,50+0,1,-0	0,85±0,1
	1210	2,90±0,10	3,50±0,2	8,0±0,2	3,50±0,05	1,75±0,1	4,00±0,05	2,00±0,05	4,00±0,10	1,50+0,1,-0	0,85±0,1
Embossed Plastic Tape	2010	2,8±0,10	5,4±0,20	12,0±0,3	5,5±0,05	1,75±0,1	4,00±0,1	2,00±0,05	4,00±0,10	1,50+0,1, -0	$1,2^{+0}$
	2025	3,5±0,10	6,7±0,10	12,0±0,3	5,5±0,05	1,75±0,1	4,00±0,1	2,00±0,05	4,00±0,10	1,50+0,1, -0	$1,2^{+0}$

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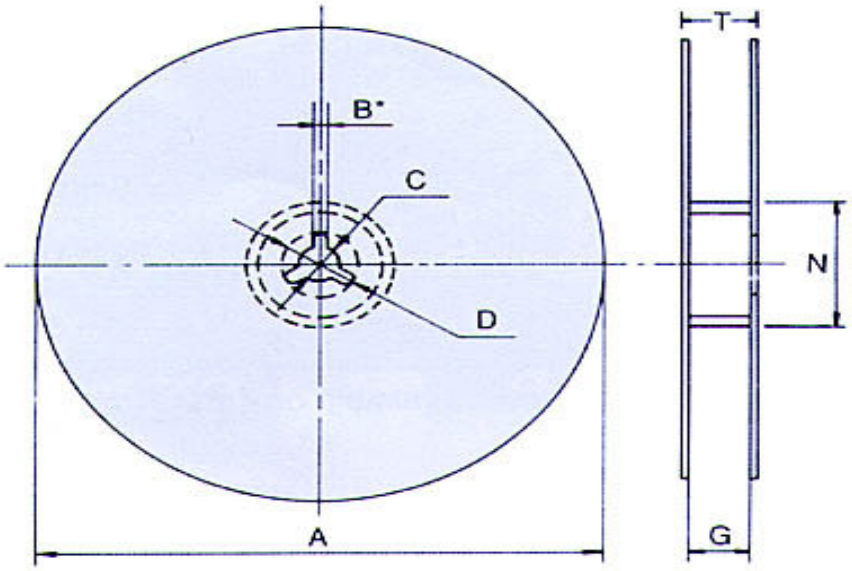
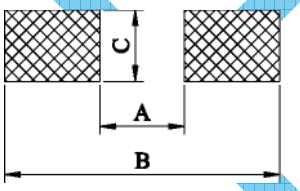


Symbol	Type	A	N	C	T	G
Dimension	0402~1210	178,5±1,5	60,0+1-0	13,0±0,2	12,5±0,5	9,0±0,5
	2010, 2512				15,5±0,5	13,0±0,5

in mm

Stock period
The performance of these products, including the solderability, is guaranteed for 24 months after production date code, provided that they remain packed as they were when delivered and stored at a temperature of 25°C ± 3°C and a relative humidity less than 80%RH

Recommended Land Pattern Design (For Reflow Soldering):



Size	A	B	C
0402	0,50	1,40	0,60
0603	0,90	2,10	0,90
0805	1,20	2,60	1,30
1206	2,00	3,80	1,60
1210	2,00	3,80	2,80
2010	3,80	5,60	2,80
2512	4,90	6,90	3,40

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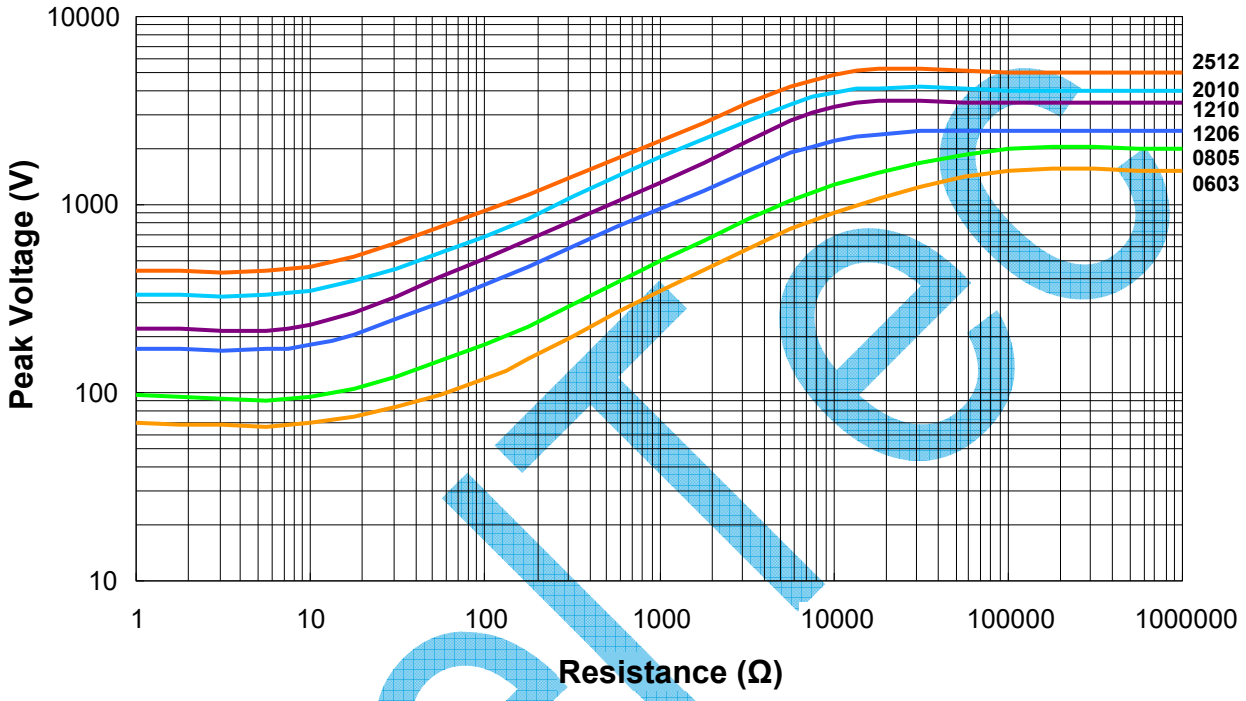
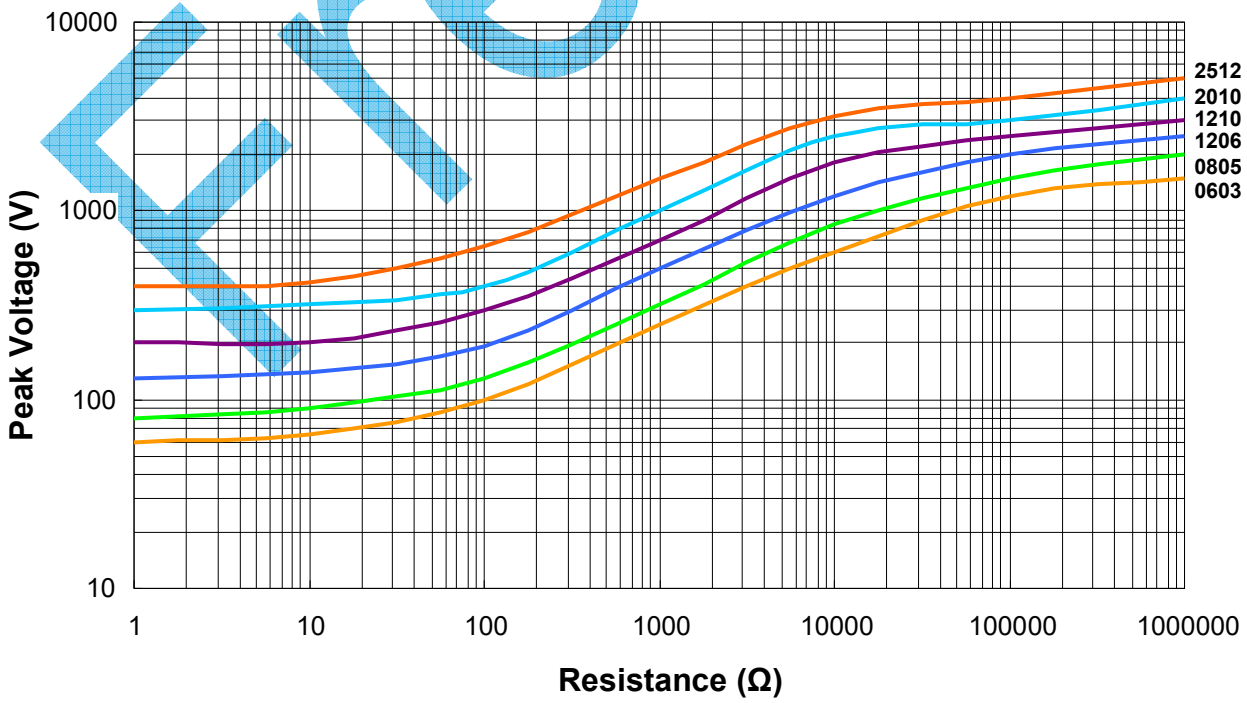
Lightning Surge

Resistors are tested in accordance with IEC 60115-1 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.

1,2/50us Lightning Surge



10/700us Lightning Surge



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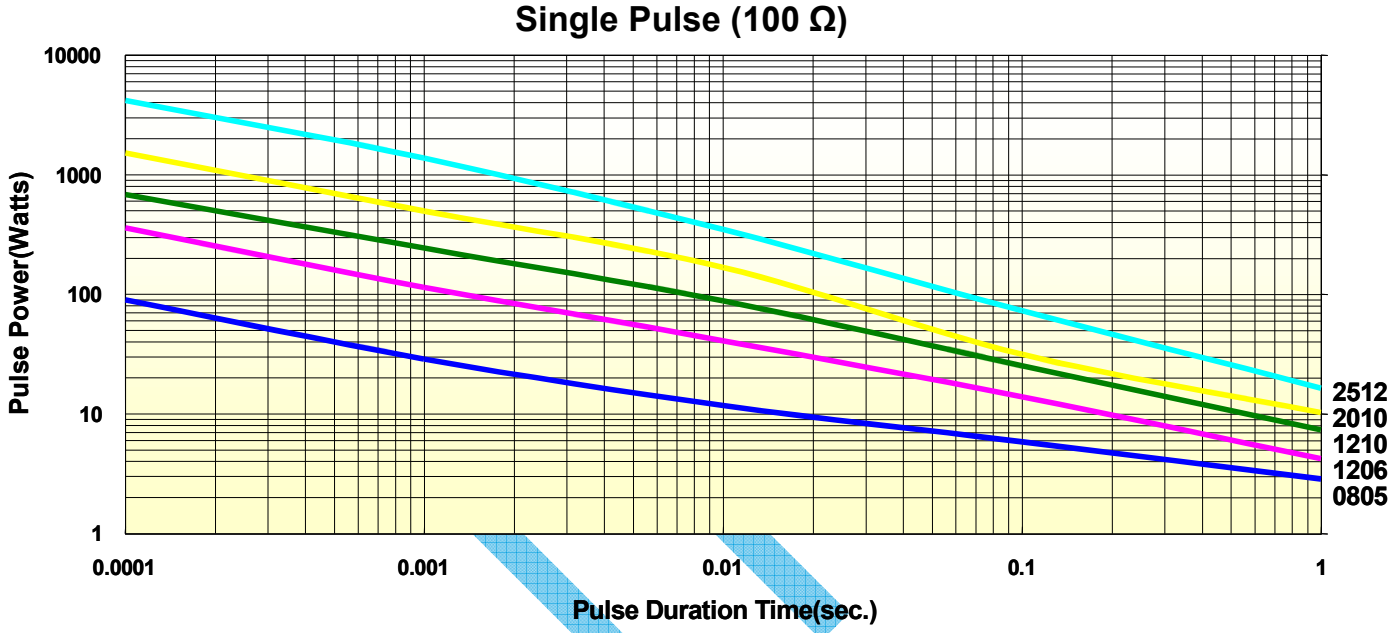
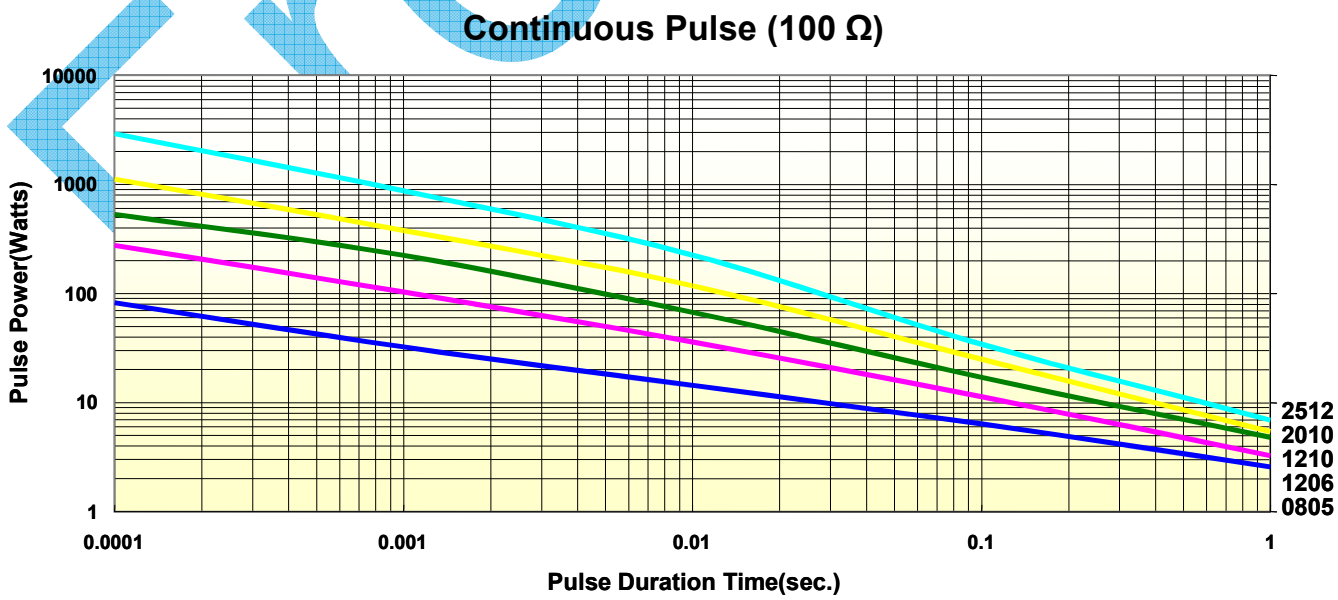
Pulse withstanding capacity

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.



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.



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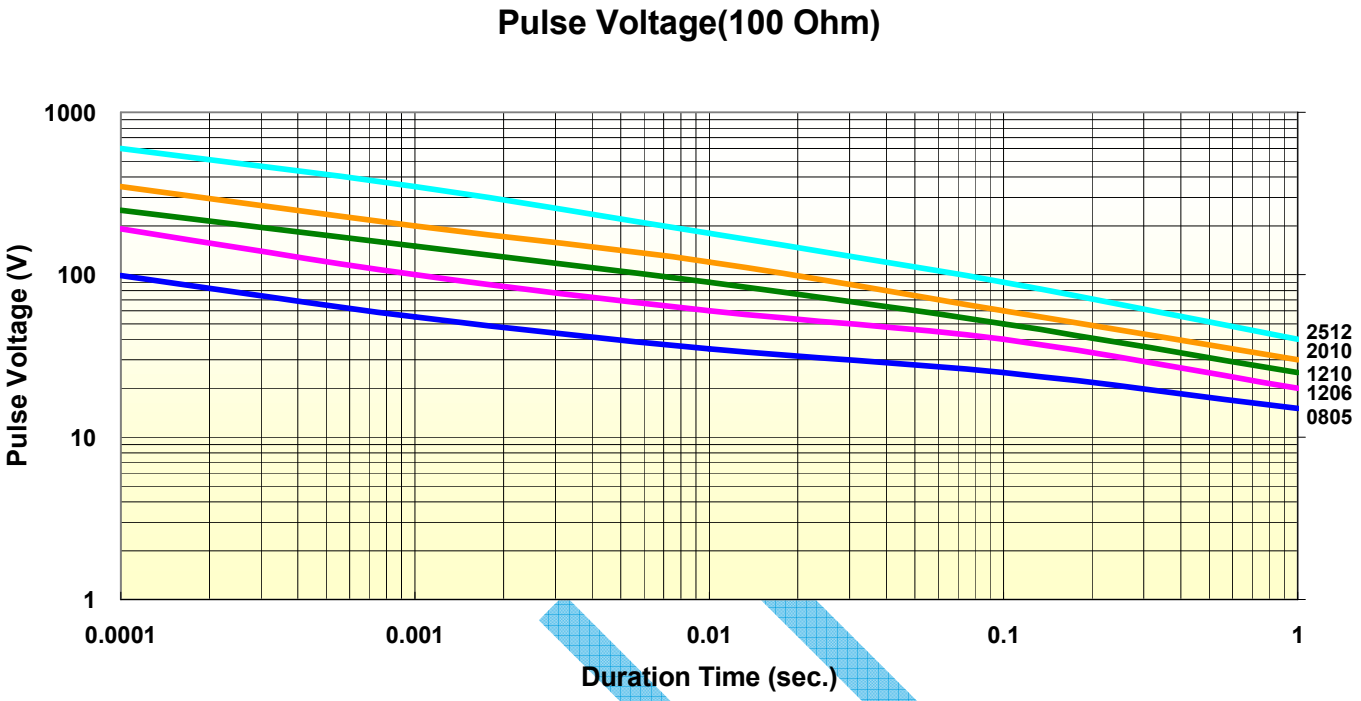

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Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	**JIS C 5201-1 4.8** **IEC 60115-1 4.8** At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1,0%+0,05Ω)	**JIS C 5201-1 4.13** **IEC 60115-1 4.13** 2,5 times RCWV or Max. overload voltage whichever is lower for 5 sec
Insulation Resistance	≧10G	**JIS C 5201-1 4,6** **IEC 60115-1 4,6** Max, overload voltage for 1 minute
Endurance	±(3,0%+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"
Damp Heat with Load	±(3,0%+0,05Ω)	**JIS C 5201-1 4.24** **IEC 60115-1 4.24** 40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1,5 hrs "ON" and 0,5 hrs "OFF"
Dry Heat	±(3,0%+0,05Ω)	**JIS C 5201-1 4.23** **IEC 60115-1 2.23.2** at +155°C for 1000 hrs
Bending Strength	±(1,0%+0,05Ω)	**JIS C 5201-1 4.33** **IEC 60115-1 4.33** Bending once for 60 seconds 2010 2512 sizes: 2 mm other size : 3mm
Solderability	>95% coverage	**JIS C 5201-1 4.17** **IEC 60115-1 4.17** 245±5°C for 3 seconds
Resistance to Soldering Heat	±(1,0%+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
Rapid Change of Temperature	±(1,0%+0,05Ω)	**JIS C 5201-1 4.19** **IEC 60115-1 4.19** -55°C to +155°C, 5 cycles

RCWV(Rated Continuous Working Voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

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