

# Thick Film Chip Resistor

## Surge Withstanding AEC-Q200

CRSW Series

MERITEK

### FEATURE

- Operating Temperature: -55 ~ +155°C
- Storage Temperature: 15~28°C, Humidity < 80% RH
- Superior power and working voltage rating
- Excellent surge withstanding & pulse withstanding performance
- AEC-Q200 Compliance



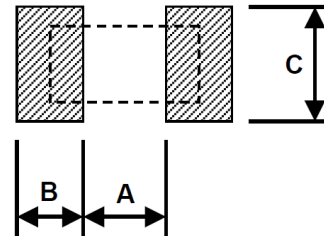
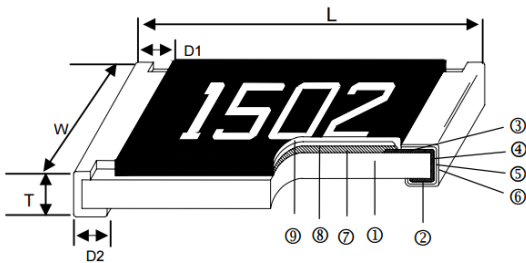
### PART NUMBERING SYSTEM

CRSW (1)   0603 (2)   A (3)   1001 (4)   J (5)   E (6)



No	Item	Code	Description	Series Reference
(1)	Meritek Series	CRSW	Thick Film Chip Resistor	Surge Withstanding Type
(2)	Size Code	0603	0603	0402, 0805, 1206, 1210, 2010, 2512
(3)	Power Rating	A	A: 1.5W	T:1W, Q: 3/4W, U: 1/2W, G:2/5W, O: 1/3W, V: 1/4W, W: 1/8W, P:1/5W, S: 2W
(4)	Resistance	1001	1001: 1KΩ	1004: 1MΩ, 1005: 10MΩ
(5)	Tolerance	J	J: ±5%	K: ±10%, M:±20%
(6)	TCR	E	E: ±100 (PPM/°C)	F: ±200, G±300 , 4±350 (PPM/°C)

### DIMENSIONS and CONSTRUCTION



Size	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	A (mm)	B (mm)	C (mm)	Weight (g/1000pcs)
0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.50	0.45	0.60	0.63
0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	0.90	0.60	0.90	2.042
0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	1.20	0.70	1.30	4.368
0805*	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	1.20	0.70	1.30	5.049
1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	2.0	0.90	1.60	8.947
1206*	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	2.0	0.90	1.60	9.541
1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	2.0	0.90	2.80	15.959
2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	3.8	0.90	2.80	24.241
2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	4.90	1.0	3.40	39.448

Item	Construction	Item	Construction	Item	Construction
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

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### ELECTRICAL CHARACTERISTIC

#### Standard Electrical Specification

Size	Power Rating at 70°C	Operating Temperature	Max Operating Voltage	Max Overload Voltage	Resistance Range (Ω)			TCR (PPM/°C)
					±5%	±10%	±20%	
0402	1/5W	-55 ~ +155°C	50V	100V	1~20			±300
					22~1M			±100
0603	1/8W	-55 ~ +155°C	50V	100V	10~270			±200
					300~1M			±100
0805	1/4W	-55 ~ +155°C	150V	300V	1~270			±200
					300~20M			±100
1206	1/3W	-55 ~ +155°C	200V	400V	1~20			±200
					22~20M			±100
1210	1/2W	-55 ~ +155°C	200V	400V	1~20			±200
					22~20M			±100
2010	3/4W	-55 ~ +155°C	400V	800V	1~20			±200
					22~20M			±100
2512	1.5W	-55 ~ +155°C	500V	1000V	1~20			±200
					22~20M			±100

### ELECTRICAL CHARACTERISTIC

#### High Power and Ultra High Power Rating Electrical Specification

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

Notes:

1. Operating Voltage =  $\sqrt{(P \cdot R)}$  or Maximum operating voltage whichever is lower
2. Overload Voltage =  $2.5 \cdot \sqrt{(P \cdot R)}$  or Maximum overload voltage whichever is lower
3. \*Ultra High Power: double side printed resistor element

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### RELIABILITY TEST CONDITION AND REQUIREMENT

Test	Standard	Condition	Requirement
Temperature Coefficient of Resistance (T.C.R.)	JIS-C5201-1 4.8 IEC-60115-1 4.8	-55°C ~ +125°C, 25°C is the reference temperature	As Specified
Short Time Overload	JIS-C-5201-1 4.13 IEC-60115-1 4.13	RCWV*2.5 or Max. overload voltage/ 5 sec.	±(1%+0.05Ω)
Insulation Resistance	JIS-C-5201-1 4.6 IEC-60115-1 4.6	Apply Max Overload Voltage for 1 minute	≥10GΩ
Endurance	JIS-C-5201-1 4.25 IEC60115-1 4.25.1	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"	±(3.0%+0.05Ω)
Damp Heat with Load	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"	±(3.0%+0.05Ω)
Dry Heat	JIS-C-5201-1 4.23 IEC-60115-1 4.23.2	at +155°C for 1000 hrs	±(3.0%+0.05Ω)
Bending Strength	JIS-C-5201-1 4.33 IEC-60115-1 4.33	Bending once for 5 seconds 2010,2512 sizes: 2mm, other sizes: 3mm	±(1.0%+0.05Ω)
Solderability	JIS-C-5201-1 4.17 IEC-60115-1 4.17	245±5°C for 3 seconds	95% min. coverage
Resistance to Soldering Heat	JIS-C-5201-1 4.18 IEC-60115-1 4.18	260±5°C for 10 seconds	±(1%+0.05Ω)
Voltage Proof	JIS-C-5201-1 4.7 IEC-60115-1 4.7	1.42 times Max. operating voltage for 1 minute	No breakdown or flashover
Leaching	JIS-C-5201-1 4.18 IEC60068-2-58 8.2.1	260±5°C for 30 seconds	Individual leaching area ≤ 5% Total leaching area ≤ 10%
Thermal Shock	JIS-C-5201-1 4.19 IEC-60115-1 4.19	-55°C ~ +155°C, 5 cycles	±(1%+0.05Ω)

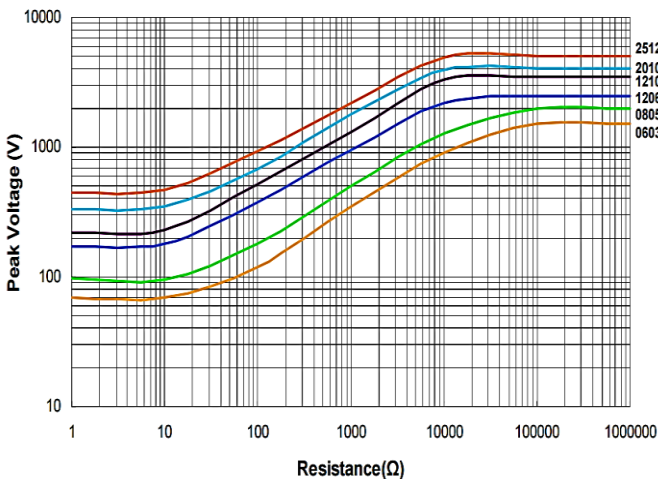
Notes:

1. RCWV(Rated Continuous Working Voltage) =  $\sqrt{(P \cdot R)}$  or Maximum operating voltage whichever is lower
2. Overload Voltage =  $2.5 \cdot \sqrt{(P \cdot R)}$  or Maximum overload voltage whichever is lower

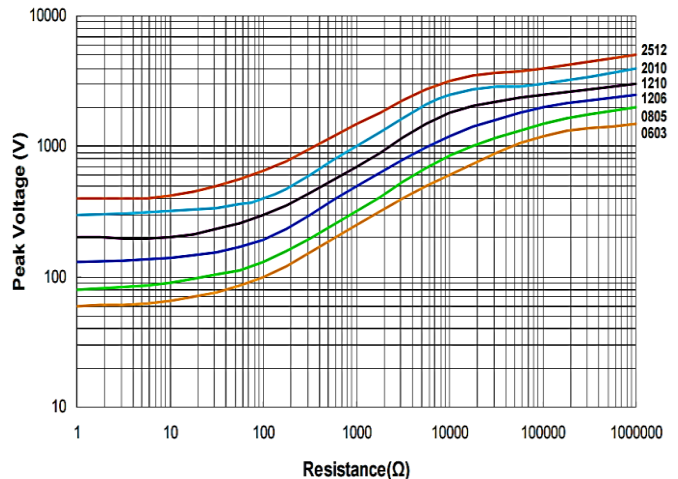
### CHARACTERISTIC CURVE

#### LIGHTNING SURGE

1.2/50μs Lighting Surge



10/700μs Lighting Surge

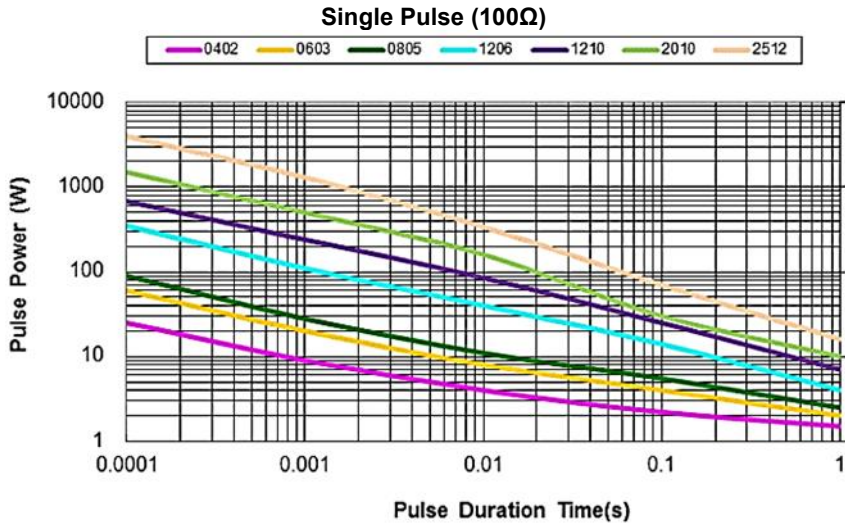


Notes:

1. Resistors are tested in accordance with IEC 60115-1 using both 1.2/50μs and 10/700μs pulse shapes. The limit of acceptance is a shift in resistance of less than 1% from the initial value.

## CHARACTERISTIC CURVE

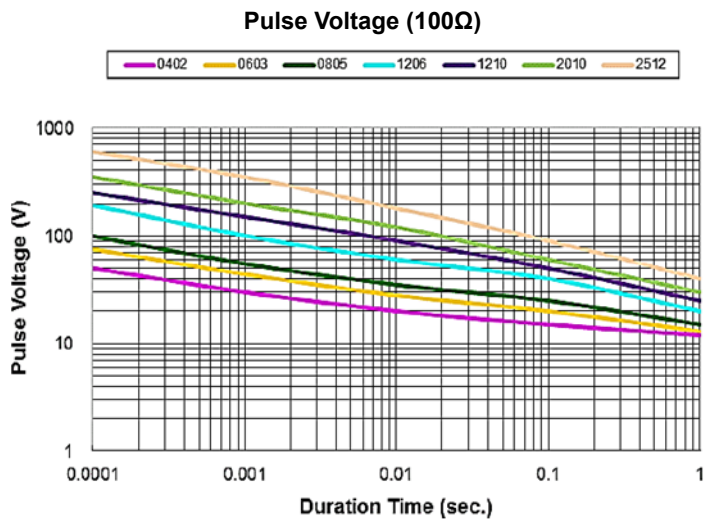
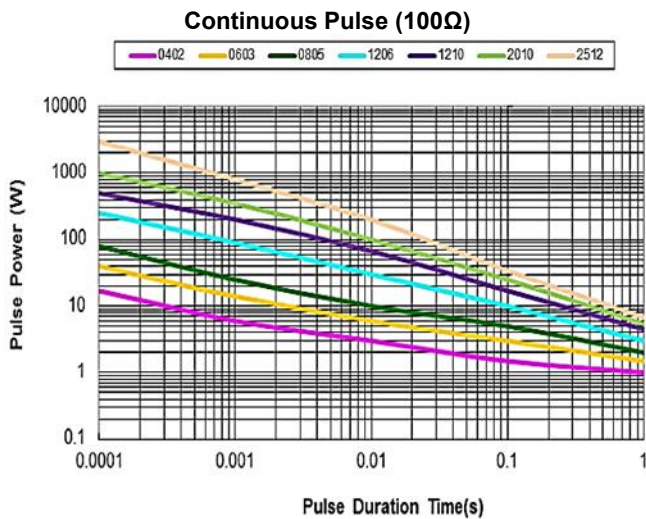
### Single PULSE WITHSTANDING CAPACITY



**Notes:**

- 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 the restrictions of the maximum permissible impulse voltage graph shown.

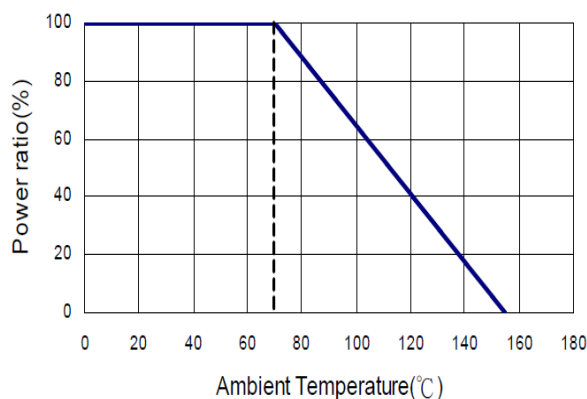
### CONTINUOUS PULSE WITHSTANDING CAPACITY



**Notes:**

- 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.

## POWER DERATING CURVE



# Thick Film Chip Resistor

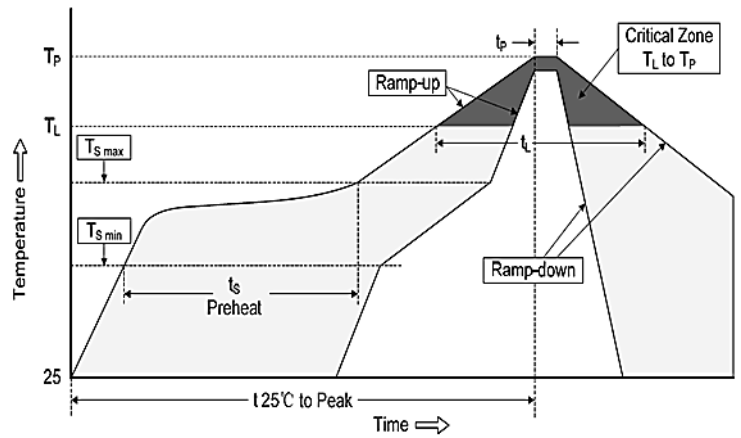
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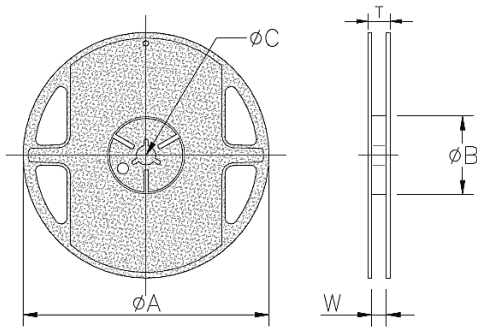
### SOLDERING CONDITION

Reflow Condition		
Average Ramp-up rate ( $T_{Smax}$ to $T_P$ )		3°C/second max
Preheat	Temperature Min ( $T_{Smin}$ )	150°C
	Temperature Max ( $T_{Smax}$ )	180°C
	Time ( $t_L$ )	90~120seconds
Ramp-up Rate $T_{S(max)}$ to $T_L$		3°C/second max
Reflow	Temperature ( $T_L$ )	220°C
	Time ( $T_L$ )	60 seconds max
Peak Temperature ( $T_P$ )		265°C
Time within 5°C of actual peak Temperature ( $t_P$ )		10 seconds max
Ramp-down rate		6°C/second max
Number of Reflow Cycles Allowed		3 times

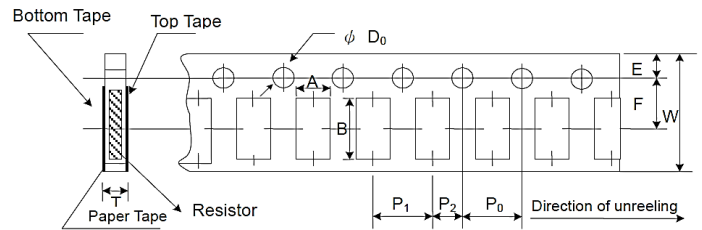


### PACKAGING SPECIFICATIONS

#### Reel Specification & Packaging Quantity



#### Paper Tape Specification



Size	Reel Dimension (mm)							
	Packaging Quantity	Tape Width	Reel Diameter	$\phi A$	$\phi B$	$\phi C$	W	T
0402	Paper 10K	8mm	7"	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
0603	Paper 5K	8mm	7"	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
0805	Paper 5K	8mm	7"	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
1206	Paper 5K	8mm	7"	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5
1210	Paper 5K	8mm	7"	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	9.0±0.5	12.5±0.5

Size	Paper Tape Dimension (mm)									
	A	B	W	E	F	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	$\Phi D_0$	T
0402	0.65±0.1	1.15±0.1	8.0±0.2	1.75±0.1	3.50±0.05	4.0±0.1	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.45±0.1
0603	1.10±0.1	1.90±0.1	8.0±0.2	1.75±0.1	3.50±0.05	4.0±0.1	4.0±0.05	2.0±0.05	1.50+0.1,-0	0.70±0.1
0805	1.60±0.1	2.40±0.2	8.0±0.2	1.75±0.1	3.50±0.05	4.0±0.1	4.0±0.05	2.0±0.05	1.50+0.1,-0	0.85±0.1
1206	1.90±0.1	3.50±0.2	8.0±0.2	1.75±0.1	3.50±0.05	4.0±0.1	4.0±0.05	2.0±0.05	1.50+0.1,-0	0.85±0.1
1210	2.90±0.1	3.50±0.2	8.0±0.2	1.75±0.1	3.50±0.05	4.0±0.1	4.0±0.05	2.0±0.05	1.50+0.1,-0	0.85±0.1

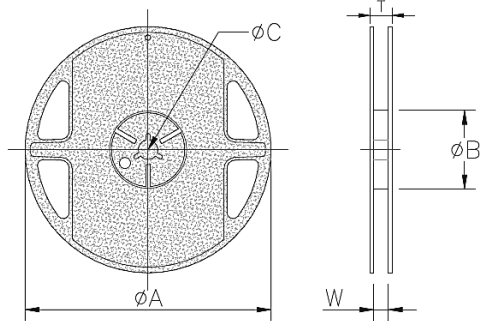
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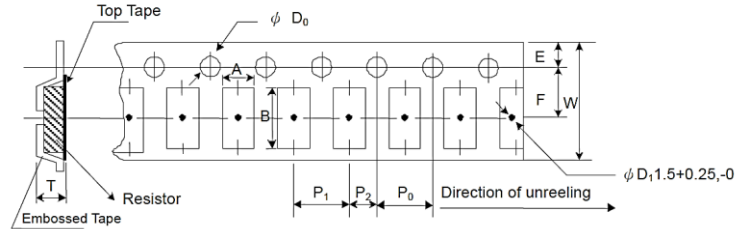
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## PACKAGING SPECIFICATIONS

### Reel Specification & Packaging Quantity



### Plastic Tape Specification



Size	Reel Dimension (mm)							
	Packaging Quantity	Tape Width	Reel Diameter	$\phi A$	$\phi B$	$\phi C$	W	T
2010	Plastic 4K	12mm	7"	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	13.0±0.5	15.5±0.5
2512	Plastic 4K	12mm	7"	178.5±1.5	60 <sup>+1/-0</sup>	13.0±0.2	13.0±0.5	15.5±0.5

Size	Plastic Tape Dimension (mm)									
	A	B	W	E	F	$P_0$	$P_1$	$P_2$	$\phi D_0$	T
2010	2.8±0.10	5.5±0.10	12.0±0.3	1.75±0.1	5.5±0.05	4.0±0.10	4.0±0.10	2.0±0.05	1.50+0.1,-0	1.2 <sup>+0</sup>
2512	3.5±0.10	6.7±0.10	12.0±0.3	1.75±0.1	5.5±0.05	4.0±0.10	4.0±0.10	2.0±0.05	1.50+0.1,-0	1.2 <sup>+0</sup>

\*Specifications subject to change without notice.