INDEX

◆ Resistors

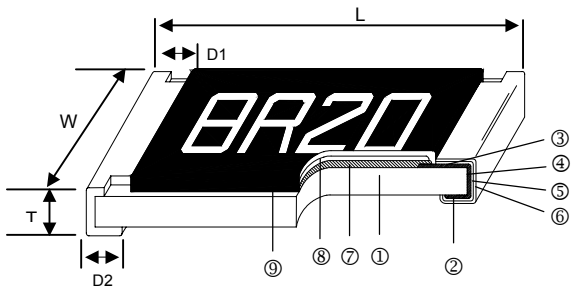
◆ Automotive Grade

◆ Power Resistors

◆ Chip Capacitors

Thin Film Precision Chip Resistor－AR Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (NiCr)
②	Bottom Electrode (Ag)	⑤	Barrier Layer (Ni)	⑧	Overcoat (Epoxy)
③	Top Electrode (Ag-Pd)	⑥	External Electrode (Sn)	⑨	Marking

■Features

－Advanced thin film technology
－Very tight tolerance down to ±0.01%
－Extremely low TCR down to ±5PPM/°C
－Wide resistance range 1ohm ~ 3Mega ohm
－Miniature size 0201 available

■Applications

－Medical Equipment
－Testing / Measurement Equipment
－Printer Equipment
－Automatic Equipment Controller
－Converters
－Communication Device, Smart Phone, Navigation system

■Dimensions

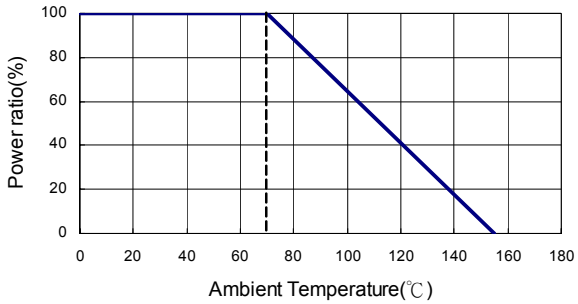
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
AR01	0201	0.58±0.05	0.29±0.05	0.23±0.05	0.12±0.05	0.15±0.05	0.14
AR02	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.20±0.10	0.54
AR03	0603	1.55±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.83
AR05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.25	4.71
AR06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.42±0.20	0.35±0.25	9.02
AR13	1210	3.10±0.15	2.40±0.15	0.55±0.10	0.40±0.20	0.55±0.25	10
AR10	2010	4.90±0.15	2.40±0.15	0.55±0.10	0.60±0.30	0.50±0.25	23.61
AR12	2512	6.30±0.15	3.10±0.15	0.55±0.10	0.60±0.30	0.50±0.25	38.06

■Part Numbering

AR	03	T	T	B	Y	1001	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	T: ±0.01% A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	S: ±5 B: ±10 N: ±15 C: ±25 D: ±50	: Standard Y: 1/16W X: 1/10W W: 1/8W M: 1/6W P: 1/5W V: 1/4W O: 1/3W U: 1/2W Q: 3/4W T: 1W	0010: 1Ω 4R70: 4.7Ω 1001: 1KΩ 1004: 1MΩ	: Standard Marking for E96 / E24 N: No Marking

■Derating Curve



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■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/°C)
					±0.05%	±0.1%	±0.25%	±0.5%	±1%	
AR01 (0201)	1/32W	-55 ~ +155°C	15V	30V	—			49.9Ω - 5KΩ		±25
								49.9Ω - 33KΩ		±50
AR02 (0402)	1/16W	-55 ~ +155°C	25V	50V	—	10Ω –205KΩ				±25
						10Ω –205KΩ		1Ω –205KΩ		±50
AR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	4.7Ω -332KΩ	4.7Ω - 1MΩ	2Ω - 1MΩ			±25
							1Ω - 1MΩ			±50
AR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	4.7Ω -511KΩ	4.7Ω - 2MΩ	1Ω - 2MΩ			±25 ±50
AR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	4.7Ω - 1MΩ	4.7Ω - 2.5MΩ	1Ω - 2.5MΩ			±25 ±50
AR13 (1210)	1/5W									
AR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	4.7Ω - 1MΩ	4.7Ω - 3MΩ	1Ω - 3MΩ			±25 ±50
AR12 (2512)	1/2W									

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.
Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

- Viking is capable of manufacturing the optional spec based on customer's requirement.
- Lower Resistance: 1~10Ω

■Special Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.01%	±0.05%	±0.1%	
AR02 (0402)	1/16W	-55 ~ +155°C	25V	50V	49.9Ω - 5KΩ			±5
					49.9Ω - 12KΩ			±10
					49.9Ω - 12KΩ		49.9Ω - 70KΩ	±15
AR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	24.9Ω - 15KΩ			±5
					24.9Ω - 100KΩ	4.7Ω - 332KΩ		±10 ±15
AR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	24.9Ω - 30KΩ			±5
					24.9Ω - 200KΩ	4.7Ω - 511KΩ		±10 ±15
AR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 50KΩ			±5
					24.9Ω - 500KΩ	4.7Ω - 1MΩ		±10 ±15
AR13 (1210)	1/5W	-55 ~ +155°C	150V	300V	24.9Ω - 50KΩ			±5
					24.9Ω - 500KΩ	4.7Ω - 1MΩ		±10 ±15
AR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	24.9Ω - 100KΩ			±5
					24.9Ω - 500KΩ	4.7Ω - 1MΩ		±10 ±15
AR12 (2512)	1/2W	-55 ~ +155°C	150V	300V	24.9Ω - 100KΩ			±5
					24.9Ω - 500KΩ	4.7Ω - 1MΩ		±10 ±15

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■High Power Rating Electrical Specifications

<table>
<tr><th rowspan="2">Item / Type</th><th rowspan="2">Power Rating at 70°C</th><th rowspan="2">Operating Temp. Range</th><th rowspan="2">Max. Operating Voltage</th><th rowspan="2">Max. Overload Voltage</th><th colspan="5">Resistance Range</th><th rowspan="2">TCR (PPM/°C)</th></tr>
<tr><th>±0.01%</th><th>±0.05%</th><th>±0.1%</th><th>±0.25%</th><th>±0.5%</th></tr>
<tr><td rowspan="3">AR03 (0603)</td><td rowspan="2">1/10W</td><td rowspan="2">-55 ~ +155°C</td><td rowspan="2">75V</td><td rowspan="2">150V</td><td colspan="5">24.9Ω - 15KΩ</td><td>±5</td></tr>
<tr><td rowspan="2">24.9Ω
- 100KΩ</td><td rowspan="2">4.7Ω -
332KΩ</td><td colspan="3">4.7Ω - 332KΩ</td><td>±10
±15</td></tr>
<tr><td>1/6W</td><td>-55 ~ +155°C</td><td>100V</td><td>150V</td><td>—</td><td colspan="3">4.7Ω – 1MΩ</td><td>±25
±50</td></tr>
<tr><td rowspan="4">AR05 (0805)</td><td rowspan="3">1/8W</td><td rowspan="3">-55 ~ +155°C</td><td rowspan="3">150V</td><td rowspan="3">300V</td><td colspan="5">10Ω - 332KΩ</td><td>±25
±50</td></tr>
<tr><td colspan="5">24.9Ω - 30KΩ</td><td>±5</td></tr>
<tr><td rowspan="3">24.9Ω
- 200KΩ</td><td rowspan="3">4.7Ω -
511KΩ</td><td colspan="3">4.7Ω - 511KΩ</td><td>±10</td></tr>
<tr><td>1/4W</td><td>-55 ~ +155°C</td><td>150V</td><td>300V</td><td>—</td><td colspan="3">4.7Ω - 1MΩ</td><td>±15</td></tr>
<tr><td rowspan="2">AR06 (1206)</td><td rowspan="2">1/4W</td><td rowspan="2">-55 ~ +155°C</td><td rowspan="2">200V</td><td rowspan="2">400V</td><td>4.7Ω -
1MΩ</td><td colspan="2">1Ω – 1MΩ</td><td>±25
±50</td></tr>
<tr><td colspan="5">10Ω – 500KΩ</td><td>±25
±50</td></tr>
<tr><td rowspan="2">AR13 (1210)</td><td rowspan="2">1/3W</td><td rowspan="2">-55 ~ +155°C</td><td rowspan="2">200V</td><td rowspan="2">400V</td><td colspan="5">24.9Ω – 50KΩ</td><td>±5</td></tr>
<tr><td>24.9Ω
- 500KΩ</td><td colspan="4">4.7Ω – 1MΩ</td><td>±10
±15
±25
±50</td></tr>
<tr><td rowspan="2">AR10 (2010)</td><td rowspan="2">1/3W</td><td rowspan="2">-55 ~ +155°C</td><td rowspan="2">200V</td><td rowspan="2">400V</td><td colspan="5">24.9Ω – 50KΩ</td><td>±5</td></tr>
<tr><td>24.9Ω –
500KΩ</td><td colspan="4">4.7Ω – 1MΩ</td><td>±10
±15
±25
±50</td></tr>
<tr><td rowspan="2">AR12 (2512)</td><td>3/4W</td><td>-55 ~ +155°C</td><td>200V</td><td>400V</td><td>24.9Ω –
2KΩ</td><td colspan="2">4.7Ω – 2KΩ</td><td colspan="2">1Ω – 2KΩ</td><td>±10
±15
±25
±50</td></tr>
<tr><td>1W</td><td>-55 ~ +155°C</td><td>200V</td><td>400V</td><td colspan="2">-</td><td>4.7Ω –
100Ω</td><td colspan="2">1Ω – 100Ω</td><td>±25
±50</td></tr>
</table>

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■ Lower Resistance: 1~10Ω ; High Power Rating

■Environmental Characteristics

Item	Requirement		Test Method
	Tol. ≦ 0.05%	Tol. > 0.05%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		+25/-55/+25/+125/+25°C
Short Time Overload	ΔR±0.05%	ΔR±0.2%	RCWV*2.5 or Max. overload voltage for 5 seconds
	ΔR±0.2% for high power rating		
Insulation Resistance	>1000 MΩ		Apply 100V_{DC} for 1 minute
Endurance	ΔR±0.05%	ΔR±0.2%	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
	>7kΩ ΔR±0.5%		
	ΔR±0.5% for high power rating		
Damp Heat with Load	ΔR±0.05%	ΔR±0.3%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
	ΔR±0.5% for high power rating		
Bending Strength	ΔR±0.05%	ΔR±0.2%	Bending amplitude 3 mm for 10 seconds
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±0.05%	ΔR±0.2%	260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type		Max. overload voltage for 1 minute
Thermal Shock	ΔR±0.05%	ΔR±0.25%	-55°C~150°C, 100 cycles
Low Temperature Operation	ΔR±0.05%	ΔR±0.2%	1 hour, -65°C, followed by 45 minutes of RCWV
	ΔR±0.5% for high power rating		

■ **Reference Standards: MIL-STD-202, JIS-C 5201-1**

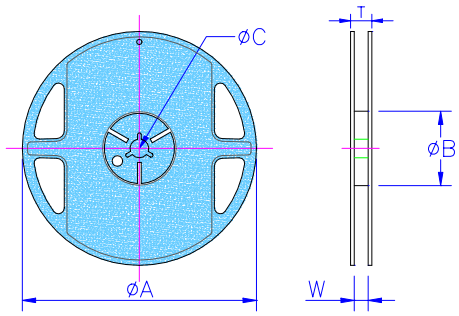
■ **Storage Temperature: 25±3°C; Humidity < 80%RH**

■Packaging

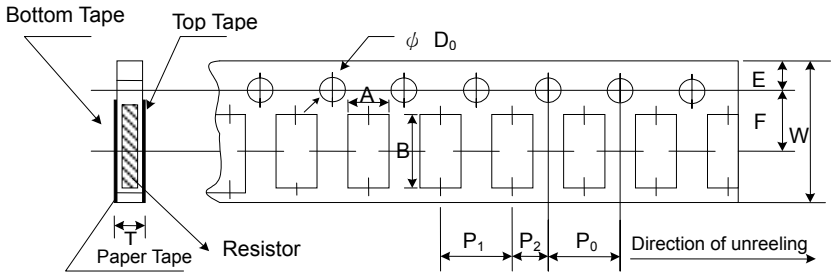
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
AR01	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	10,000	-
AR02	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	10,000	-
AR03	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
AR05	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
AR06	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
AR13	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
AR10	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
AR12	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000



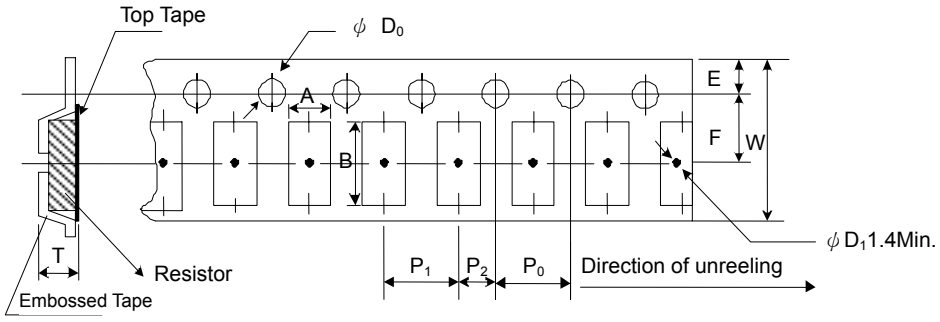
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
AR01	0.40±0.05	0.70±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.03	0.42±0.02
AR02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
AR03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
AR05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
AR06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
AR13	2.75±0.05	3.40±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.60±0.10	0.75±0.05

Embossed Plastic Tape Specifications

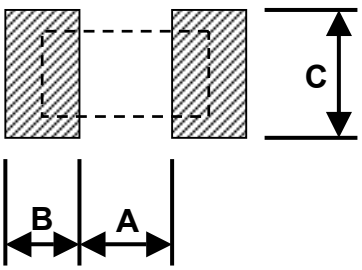


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
AR10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
AR12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

■Recommend Land Pattern

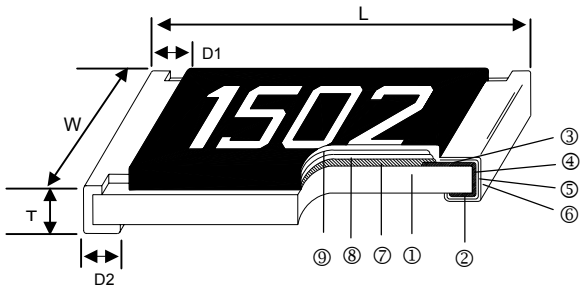
Unit: mm



Type	A	B	C
AR01	0.25	0.30	0.40±0.2
AR02	0.50	0.50	0.60±0.2
AR03	0.80	1.00	0.90±0.2
AR05	1.00	1.00	1.35±0.2
AR06	2.00	1.15	1.70±0.2
AR13	2.00	1.15	2.50±0.2
AR10	3.60	1.40	2.50±0.2
AR12	4.90	1.60	3.10±0.2

Anti-Corrosive Thin Film Precision Chip Resistor－PR Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (NiCr)
②	Bottom Electrode (Ag)	⑤	Barrier Layer (Ni)	⑧	Passivation
③	Top Electrode (Ag-Pd)	⑥	External Electrode (Sn)	⑨	Overcoat

■Features

- Long term life stability and demonstrated the Anti–Corrosion claims characterized by Ta_2N
- Special passivated NiCr film for Anti-Acid and Anti-Damp
- Tight tolerance down to ±0.1%
- Extremely low TCR down to ±15 PPM/°C
- Wide resistance range 10ohm ~ 1Mega ohm

■Applications

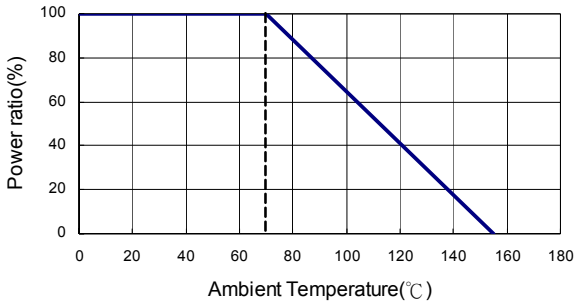
- Automotive
- High-end Computer
- Industrial Equipment
- Automatic Equipment Controller
- Medical Equipment
- Telecommunication Device
- High-end Multimedia Electronics
- Outdoor Electronic Applications

■Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
PR02	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.20±0.10	0.55
PR03	0603	1.55±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.85
PR05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.25	4.76
PR06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.42±0.20	0.35±0.25	9.11
PR10	2010	4.90±0.15	2.40±0.15	0.55±0.10	0.60±0.30	0.50±0.25	23.82
PR12	2512	6.30±0.15	3.10±0.15	0.55±0.10	0.60±0.30	0.50±0.25	38.46

■Derating Curve



■Part Numbering

PR	03	D	T	D	X	1000	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	B: ±0.1% C: ±0.25% D: ±0.5%	T: Taping Reel B: Bulk	N: ±15 C: ±25 D: ±50	: Standard Y: 1/16W X: 1/10W W: 1/8W V: 1/4W U: 1/2W	1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ	: Standard Marking for E96 / E24 N: No Marking

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±0.1%	Resistance Range ±0.25%	Resistance Range ±0.5%	TCR (PPM/°C)
PR02 (0402)	1/16W	-55 ~ +155°C	25V	50V	49.9Ω - 12KΩ			±15
					25Ω - 25KΩ			±25 ±50
PR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	25Ω - 332KΩ			±15 ±25 ±50
PR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	10Ω – 1MΩ			±15 ±25 ±50
PR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	10Ω - 1MΩ			±15 ±25 ±50
PR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	25Ω – 1MΩ			±15
					10Ω – 1.5MΩ			±25 ±50
PR12 (2512)	1/2W	-55 ~ +155°C	150V	300V	25Ω – 1MΩ			±15
					10Ω – 1.5MΩ			±25 ±50

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±0.1%	Resistance Range ±0.25%	Resistance Range ±0.5%	TCR (PPM/°C)
PR03 (0603)	1/10W	-55 ~ +155°C	75V	150V	25Ω -220KΩ			±15 ±25 ±50
PR05 (0805)	1/8W	-55 ~ +155°C	150V	300V	25Ω – 680KΩ			±15 ±25 ±50
PR06 (1206)	1/4W	-55 ~ +155°C	200V	400V	25Ω - 1MΩ			±15 ±25 ±50

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■Environmental Characteristics

Item	Requirement: Size 0603 / 0805 / 1206 2010 / 2512	Requirement: Size 0402	Test Method
Short Time Overload	≦±0.02%	≦±0.1%	RCWV*2.5 or Max. overload voltage for 2 seconds
	≦±0.2% for high power rating		
Endurance	≦±0.05%	≦±0.25%	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
	≦±0.25% for high power rating		
Damp Heat with Load	≦±0.05%	≦±0.5%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
	≦±0.25% for high power rating		
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	≦±0.02%	≦±0.1%	260±5°C for 10 seconds
Thermal Shock	≦±0.02%	≦±0.1%	-55°C~150°C, 100 cycles

■ **Reference Standards: MIL-STD-202, JIS-C 5201-1**

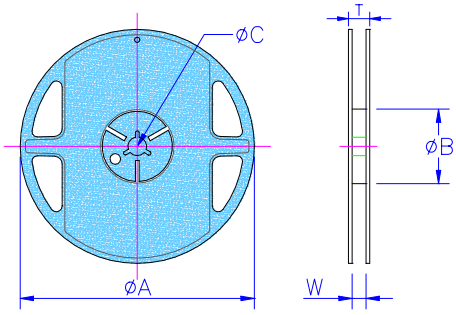
■ **Storage Temperature: 25±3°C; Humidity < 80%RH**

■Packaging

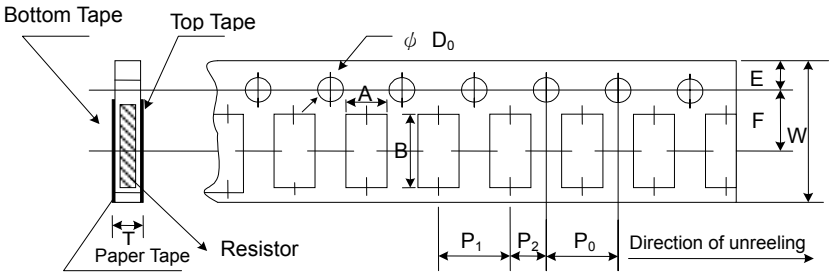
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
PR02	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	10,000	-
PR03	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
PR05	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
PR06	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
PR10	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
PR12	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000



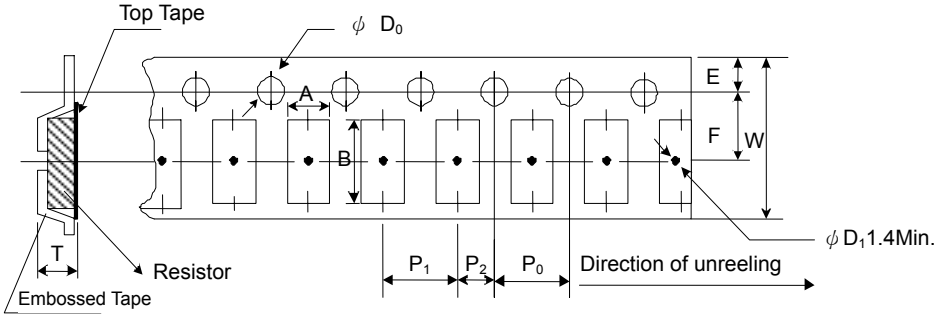
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
PR02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
PR03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
PR05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
PR06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

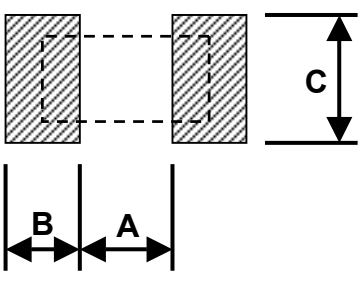
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
PR10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
PR12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

■Recommend Land Pattern

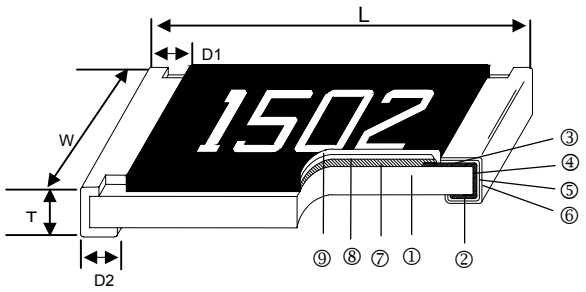


Unit: mm

Type	A	B	C
PR02	0.50	0.50	0.60±0.2
PR03	0.80	1.00	0.90±0.2
PR05	1.00	1.00	1.35±0.2
PR06	2.00	1.15	1.70±0.2
PR10	3.60	1.40	2.50±0.2
PR12	4.90	1.60	3.10±0.2

Thick Film Chip Resistor－CR Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/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)

■Features

－Small size and light weight
－Highly reliable multilayer electrode construction
－Compatible with all soldering process

■Applications

－Telecommunication Equipments
－Radio and Tape Recorders, TV Tuners
－Digital Cameras, Watches, Pocket Calculators
－Automotive Industry
－Computers, Instruments
－Medical and Military Equipment

■Dimensions

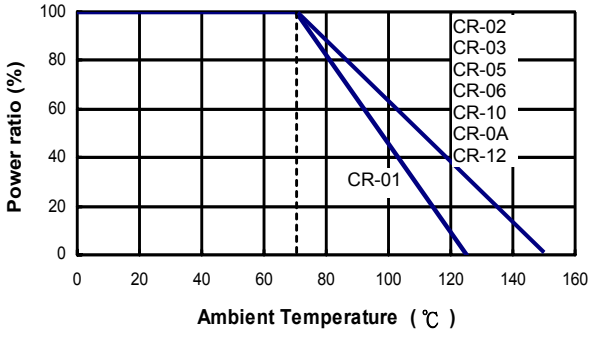
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CR-01	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05	0.150
CR-02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
CR-03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
CR-05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
CR-06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
CR-10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
CR-0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
CR-12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

■Part Numbering

CR-	03	F	L	7	- - -10R
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% J: ±5%	L: Standard & High Precision E: TC50 P: High Power H: Ultra High Power	0: 7” Reel 15Kpcs 4: 7” Reel 4Kpcs 6: 7” Reel 10Kpcs 7: 7” Reel 5Kpcs 9: 10” Reel 8Kpcs A: 10” Reel 10Kpcs B: 10” Reel 20Kpcs C: 13” Reel 40Kpcs D: 13” Reel 20Kpcs F: Bulk	- - - 1R2: 1.2Ω - - - 3K3: 3.3KΩ - - - 10K: 10KΩ - - 100K: 100KΩ “-“ to fill up 6 spaces

■Derating Curve



■Standard Electrical Specifications

Item / Type	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±1%	Resistance Range ±5%	TCR (PPM/°C)
CR-01 (0201)	1/20W	-55 ~ +125°C	25V	50V	1Ω - 10MΩ		±200
Jumper	1A				0Ω (<50mΩ)		-
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
Jumper	1A				0Ω (<50mΩ)		-
CR-03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
Jumper	1A				0Ω (<50mΩ)		-
CR-05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
CR-06 (1206)	1/4W		200V	400V			
Jumper	2A				0Ω (<50mΩ)		-
CR-10 (1210)	1/3W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 39MΩ		±200 ±100 ±200 ±400
Jumper	2.5A				0Ω (<50mΩ)		-
CR-0A (2010)	3/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
Jumper	3.5A				0Ω (<50mΩ)		-
CR-12 (2512)	1W	-55 ~ +155°C	250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±100 ±200 ±400
Jumper	4A				0Ω (<50mΩ)		-

■High Precision Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±0.1%	Resistance Range ±0.25%	Resistance Range ±0.5%	TCR (PPM/°C)
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	-		10Ω - 1MΩ	±100
					-		1.02M - 10MΩ	±200
CR-03 (0603)	1/10W		75V	150V	10Ω - 1MΩ			±100
					-	1.02M - 10MΩ		±200
CR-05 (0805)	1/8W		150V	300V	10Ω - 1MΩ			±100
					-	1.02M - 10MΩ		±200
CR-06 (1206)	1/4W		200V	400V	10Ω - 1MΩ			±100
					-	1.02M - 10MΩ		±200
CR-10 (1210)	1/3W		200V	400V	10Ω - 1MΩ			±100
					-	1.02M - 10MΩ		±200
CR-0A (2010)	3/4W		200V	400V	10Ω - 1MΩ			±100
					-	1.02M - 10MΩ		±200
CR-12 (2512)	1W		250V	500V	10Ω - 1MΩ			±100
					-	1.02M - 10MΩ		±200

■TC50 Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±0.1%	Resistance Range ±0.25%	Resistance Range ±0.5%	Resistance Range ±1%	TCR (PPM/°C)
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	-		100Ω - 1MΩ		±50
CR-03 (0603)	1/10W		75V	150V	10Ω - 1MΩ	10Ω - 10MΩ			
CR-05 (0805)	1/8W		150V	300V					
CR-06 (1206)	1/4W		200V	400V					
CR-10 (1210)	1/3W		200V	400V					
CR-0A (2010)	3/4W		200V	400V					
CR-12 (2512)	1W		250V	500V					

■High Power & Ultra 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)
					±1%	±5%	
CR-02 (0402)	1/10W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
CR-03 (0603)	1/8W		50V	100V			
CR-05 (0805)	1/3W		150V	300V			
CR-06 (1206)	1/3 *1/2W		200V	400V			
CR-10 (1210)	1/2 *3/4W		200V	400V			
CR-0A (2010)	1W		200V	400V			
CR-12 (2512)	2W		250V	500V			

*: Ultra High Power

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. overload voltage for 5 seconds, 2 seconds for high power series
Insulation Resistance	≥10G			Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	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)	±(1.5%+0.10Ω)	<50mΩ	at +125/+155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%			260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55°C to +125/+155°C, 5 cycles

■ **Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1**

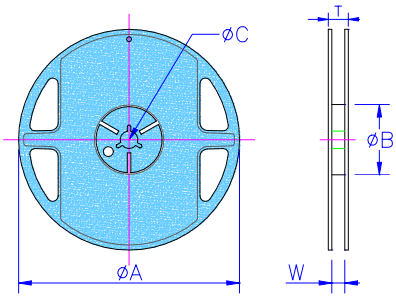
■ **Storage Temperature: 25±3°C; Humidity < 80%RH**

■Packaging

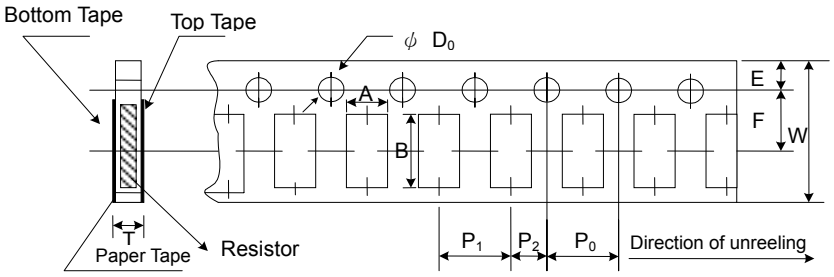
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CR-01	Paper	15K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
CR-01 CR-02	Paper	10K 20K 40K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
				10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-03 CR-05 CR-06 CR-10	Paper	5K 10K 20K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CR-0A CR-12	Embossed	4K 8K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5
				10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



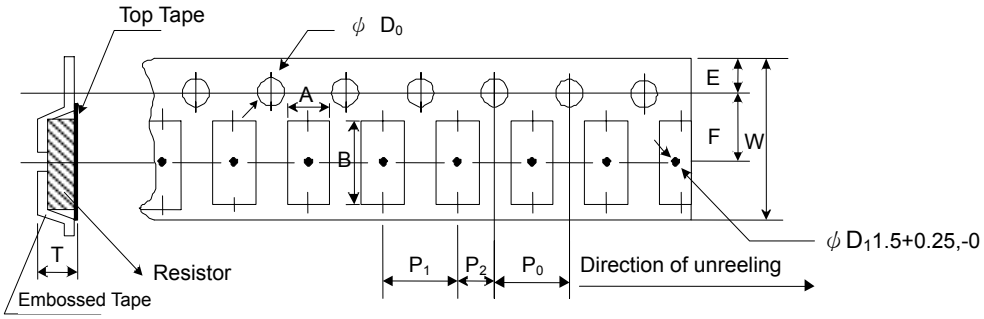
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	$ΦD_0$	T
CR-01	0.38±0.05	0.68±0.05	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
CR-02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CR-03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
CR-05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CR-06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CR-10	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

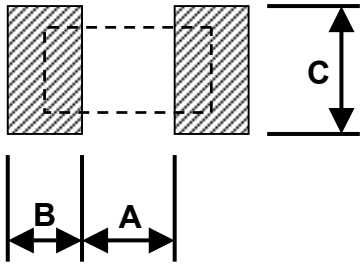


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	$ΦD_0$	T
CR-0A	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
CR-12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Recommend Land Pattern

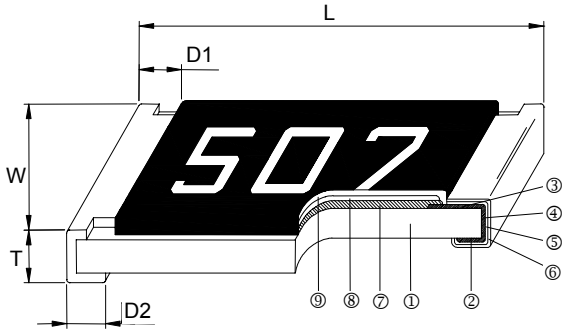
Unit: mm



Type	A	B	C
CR-01	0.30	0.25	0.30
CR-02	0.50	0.45	0.60
CR-03	0.90	0.60	0.90
CR-05	1.20	0.70	1.30
CR-06	2.00	0.90	1.60
CR-10	2.00	0.90	2.80
CR-0A	3.80	0.90	2.80
CR-12	3.80	1.60	3.50

High Ohmic Chip Resistor－HMR Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/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)

■Features

－Extended resistance range(110MΩ~ 1GΩ)
－Surface mount package
－Highly reliable multilayer electrode construction

■Applications

－Voltage dividers and hybrids
－X-Ray equipment
－Low signal detection or amplification circuits
－High input impedance quartz amplifiers
－Testing devices

■Dimensions

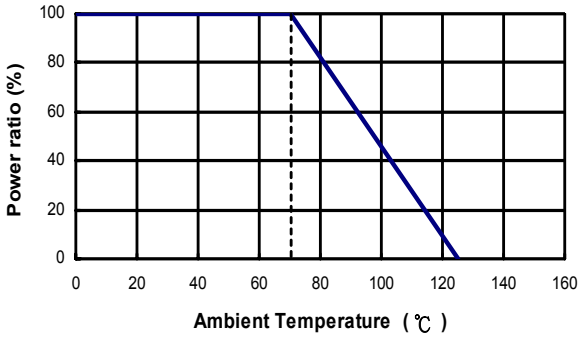
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
HMR05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
HMR06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947

■Part Numbering

HMR	05	J	L	7	- - 200M
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	05: 0805 06: 1206	J: ±5%	L: Standard	7: 7” Reel 5Kpcs A: 10” Reel 10Kpcs D: 13” Reel 20Kpcs F: Bulk	- - 200M: 200MΩ - - - -1G: 1GΩ “-“ to fill up 6 spaces

■Derating Curve



■Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±5%	TCR (PPM/°C)
HMR05 (0805)	1/8W	-55 ~ +125°C	150V	300V	110MΩ ~ 500MΩ	±500
					510MΩ ~ 1GΩ	±1000
HMR06 (1206)	1/4W		200V	400V	110MΩ ~ 500MΩ	±500
					510MΩ ~ 1GΩ	±1000

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

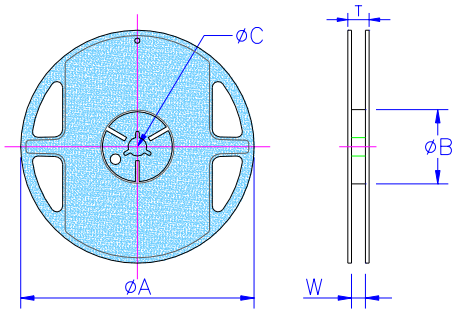
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(2.0%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G	Max. overload voltage for 1 minute
Endurance	±(3.0%+0.10Ω)	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(3.0%+0.10Ω)	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	±(1.5%+0.10Ω)	at +125°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	Bending once for 5 seconds 0805, 1206 sizes: 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±(1.0%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%	260±5°C for 30 seconds
Rapid Change of Temperature	±(1.0%+0.05Ω)	-55°C to +125°C, 5 cycles

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

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

■Packaging

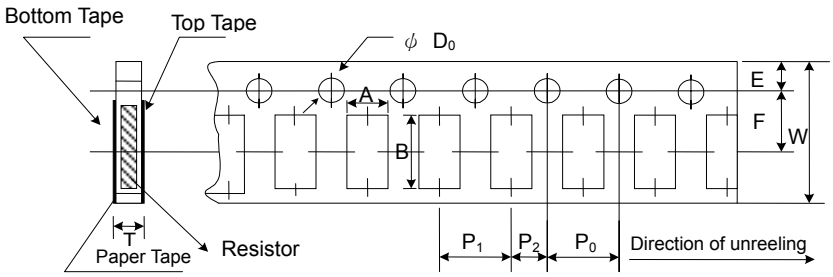
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
HMR05 HMR06	Paper	5K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
		10K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5

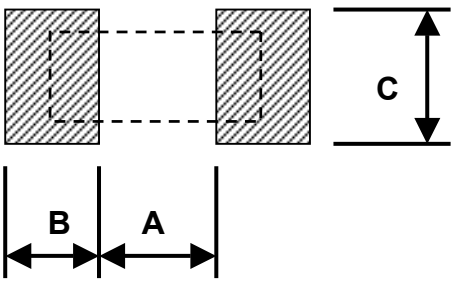
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	$ΦD_0$	T
HMR05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
HMR06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

■Recommend Land Pattern

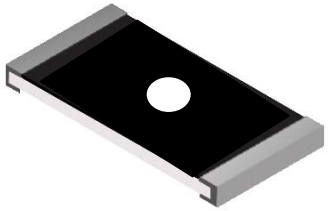


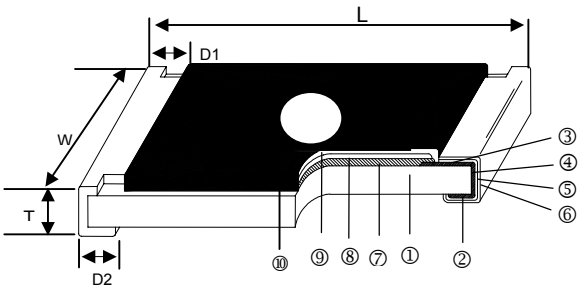
Unit: mm

Type	A	B	C
HMR05	1.20	0.70	1.30
HMR06	2.00	0.90	1.60

Non-magnetic Thick Film Chip Resistor－NMP Series

■Construction





①	Alumina Substrate	④	Edge Electrode (Ag)	⑦	Resistor Layer (RuO_2/Ag)
②	Bottom Electrode (Ag)	⑤	Barrier Layer (Cu)	⑧	Primary Overcoat (Glass)
③	Top Electrode (Ag-Pd)	⑥	External Electrode (Sn)	⑨	Secondary Overcoat (Epoxy)
⑩	Marking (Epoxy)				

■Features

－Cu/Sn Terminations
－Suitable for Soldering
－Non-magnetic

■Applications

－Medical and military equipment
－MRI coil industries
－Computer tomography (CT)

■Dimensions

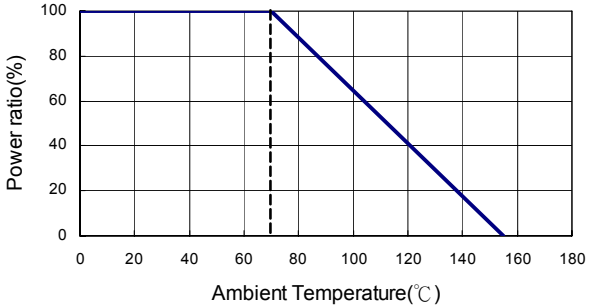
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
NMP02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
NMP03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
NMP05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
NMP06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
NMP10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
NMP0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
NMP12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

■Part Numbering

NMP	03	J	L	7	- - -10K
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	F: ±1% J: ±5%	L: Standard	4: 7” Reel 4Kpcs 6: 7” Reel 10Kpcs 7: 7” Reel 5Kpcs 9: 10” Reel 8Kpcs A: 10” Reel 10Kpcs B: 10” Reel 20Kpcs C: 13” Reel 40Kpcs D: 13” Reel 20Kpcs	- - - 1R2: 1.2Ω - - - 3K3: 3.3KΩ - - - 10K: 10KΩ - - 100K: 100KΩ “-“ to fill up 6 spaces

■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)
					±1%	±5%	
NMP02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
Jumper	1A				0Ω (<50mΩ)		-
NMP03 (0603)	1/10W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
Jumper	1A				0Ω (<50mΩ)		-
NMP05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
NMP06 (1206)	1/4W		200V	400V			
Jumper	2A				0Ω (<50mΩ)		-
NMP10 (1210)	1/3W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
Jumper	2.5A				0Ω (<50mΩ)		-
NMP0A (2010)	3/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
Jumper	3.5A				0Ω (<50mΩ)		-
NMP12 (2512)	1W	-55 ~ +155°C	250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
Jumper	4A				0Ω (<50mΩ)		-

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	2.5 times RCWV or Max. overload voltage for 5 seconds
Insulation Resistance	≧10G			Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	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)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%			260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55°C to +155°C, 5 cycles

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

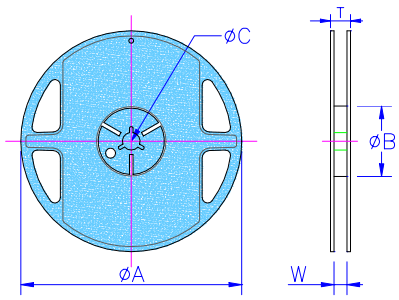
■ **Storage Temperature: 25±3°C; Humidity < 80%RH**

■Packaging

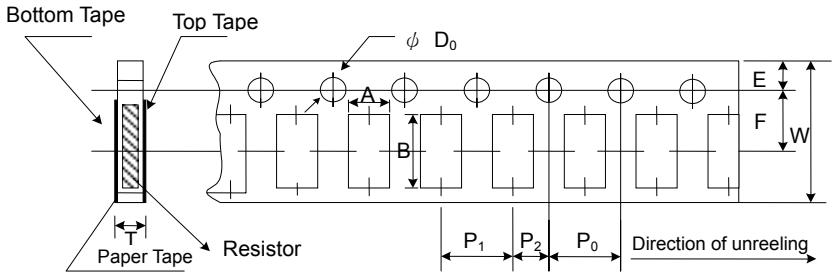
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
NMP02	Paper	10K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
		20K							
		40K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
NMP03 NMP05 NMP06 NMP10	Paper	5K							
		10K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K							
NMP0A NMP12	Embossed	4K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5
		8K		10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



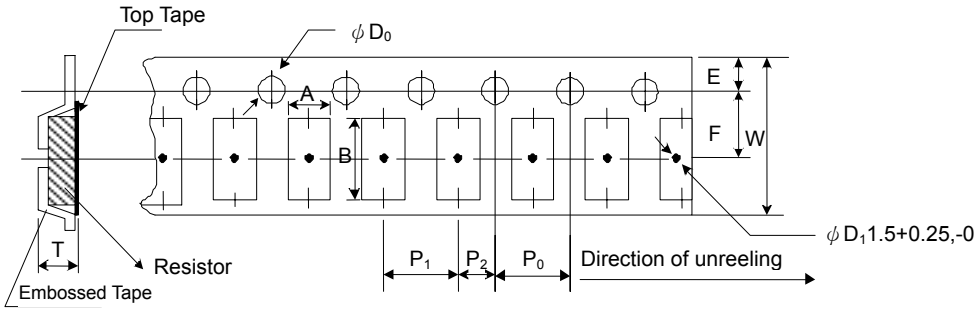
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
NMP02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
NMP03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
NMP05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
NMP06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
NMP10	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

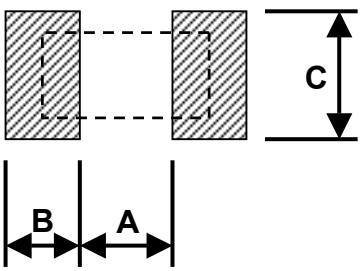


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
NMP0A	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
NMP12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Recommend Land Pattern

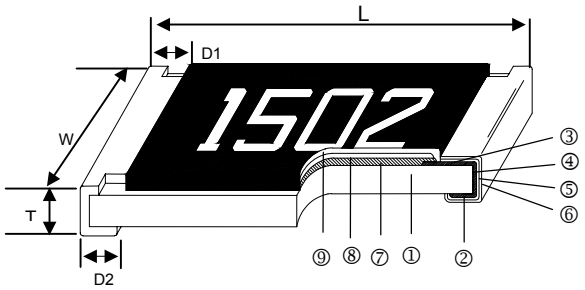
Unit: mm



Type	A	B	C
NMP02	0.50	0.45	0.60
NMP03	0.90	0.60	0.90
NMP05	1.20	0.70	1.30
NMP06	2.00	0.90	1.60
NMP10	2.00	0.90	2.80
NMP0A	3.80	0.90	2.80
NMP12	3.80	1.60	3.50

Pulse Withstanding Chip Resistor－PWR Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/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)

■Features

－Tolerance from ±0.5%~5%
－High power rating
－Excellent pulse withstanding performance
－Improved working voltage ratings
－Standard package sizes of 0603~2512

■Applications

－Metering (Testing/Measurement)
－Diagnostic Equipment
－Medical Devices
－Industrial Controls
－Plasma
－LCD Video Monitors

■Dimensions

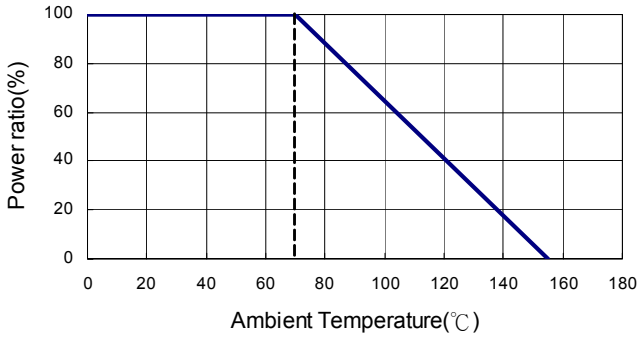
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
PWR03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
PWR05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
PWR06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
PWR13	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
PWR10	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
PWR12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

■Part Numbering

PWR	12	J	T	E	A	1001	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/℃)	Power Rating	Resistance	Marking
	03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	D: ±0.5% F: ±1% J: ±5%	T: Taping Reel B: Bulk	E: ±100 F: ±200	A: 1.5W T: 1W Q: 3/4W U: 1/2W O: 1/3W V: 1/4W P: 1/5W W: 1/8W X: 1/10W	1001: 1KΩ 1004: 1MΩ 1005: 10MΩ	: Standard Marking N: No Marking

■Derating Curve



■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%	
PWR03 (0603)	1/10W	-55 ~ +155°C	50V	10Ω - 299Ω	1Ω - 299Ω		±200
				300Ω - 1MΩ			±100
PWR05 (0805)	1/8W	-55 ~ +155°C	150V	10Ω - 299Ω	1Ω - 299Ω		±200
				300Ω - 20MΩ			±100
PWR06 (1206)	1/3W	-55 ~ +155°C	200V	10Ω - 20Ω	1Ω - 20Ω		±200
				20.1Ω - 20MΩ			±100
PWR13 (1210)	1/2W	-55 ~ +155°C	200V	10Ω - 20Ω	1Ω - 20Ω		±200
				20.1Ω - 20MΩ			±100
PWR10 (2010)	3/4W	-55 ~ +155°C	400V	10Ω - 20Ω	1Ω - 20Ω		±200
				20.1Ω - 20MΩ			±100
PWR12 (2512)	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%	
PWR03 (0603)	1/8W	-55 ~ +155°C	50V	10Ω - 299Ω	1Ω - 299Ω		±200
	1/5W			300Ω - 1MΩ			±100
PWR05 (0805)	1/4W	-55 ~ +155°C	150V	10Ω - 299Ω	1Ω - 299Ω		±200
				300Ω - 20MΩ			±100
PWR06 (1206)	1/2W	-55 ~ +155°C	200V	10Ω - 20Ω	1Ω - 20Ω		±200
				20.1Ω - 20MΩ			±100
PWR10 (2010)	1W	-55 ~ +155°C	400V	10Ω - 20Ω	1Ω - 20Ω		±200
				20.1Ω - 20MΩ			±100

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■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	±(1.0%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G	Max. overload voltage for 1 minute
Endurance	±(1.0%+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	±(0.5%+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	±(0.5%+0.05Ω)	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%	260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	-55°C to +155°C, 5 cycles

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

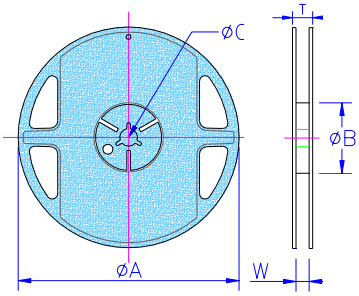
■ Storage Temperature: 25±3°C; Humidity < 80%RH

■Packaging

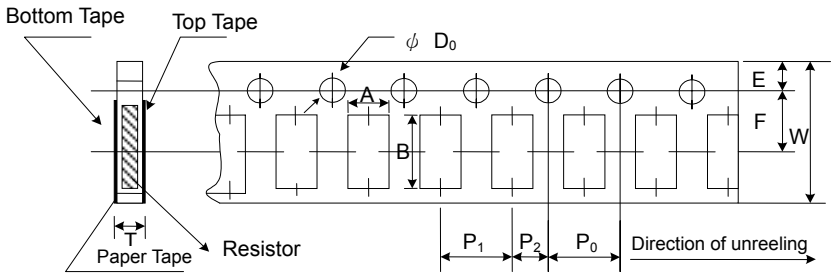
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
PWR03 PWR05 PWR06 PWR13	Paper	5K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
		10K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
PWR10 PWR12	Embossed	4K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5
		8K		10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



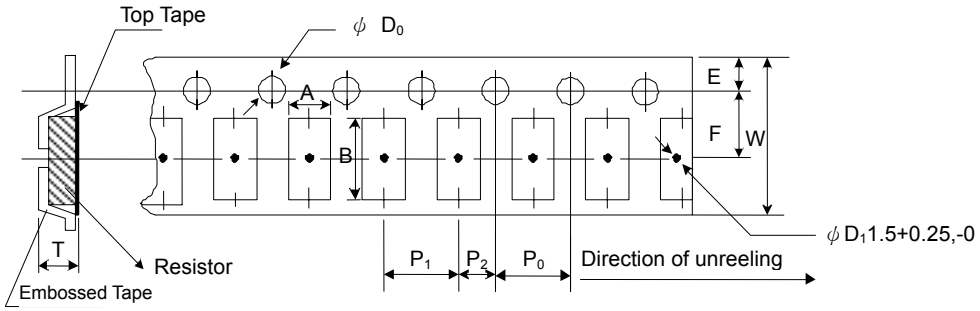
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
PWR03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
PWR05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
PWR06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
PWR13	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

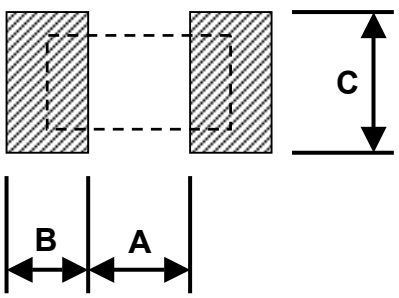
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
PWR10	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
PWR12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Recommend Land Pattern

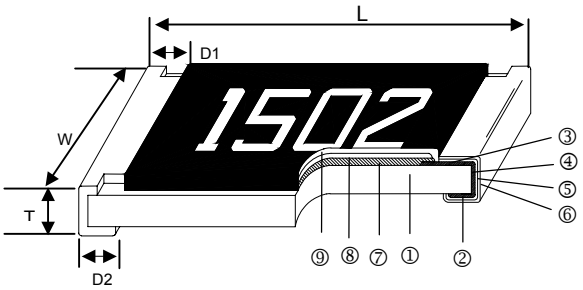


Unit: mm

Type	A	B	C
PWR03	0.90	0.60	0.90
PWR05	1.20	0.70	1.30
PWR06	2.00	0.90	1.60
PWR13	2.00	0.90	2.80
PWR10	3.80	0.90	2.80
PWR12	3.80	1.60	3.50

Surge Withstanding Chip Resistor－SWR Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/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)

■Features

- High power rating
- Excellent surge withstanding & pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0603~2512

■Applications

- Metering (Testing/Measurement)
- Medical Devices
- Automotive
- Power supply
- Charger
- Inverter
- LCD Video Monitors

■Dimensions

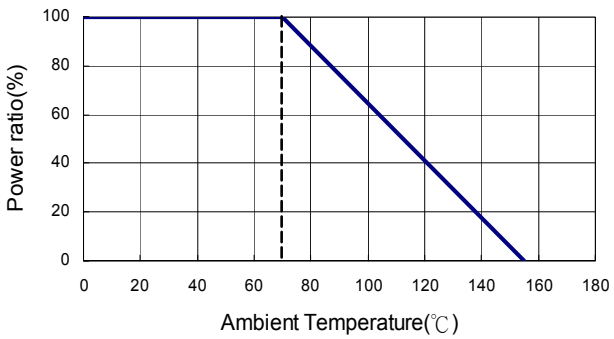
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
SWR03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
SWR05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
SWR06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
SWR13	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
SWR10	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
SWR12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

■Part Numbering

SWR	12	J	T	E	A	1001	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/℃)	Power Rating	Resistance	Marking
	03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	J: ±5% K: ±10% M: ±20%	T: Taping Reel B: Bulk	E: ±100 F: ±200	A: 1.5W Q: 3/4W U: 1/2W O: 1/3W V: 1/4W W: 1/8W	1001: 1KΩ 1004: 1MΩ 1005: 10MΩ	: Standard Marking N: No Marking

■Derating Curve



■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Resistance Range			TCR (PPM/°C)
				±5%	±10%	±20%	
SWR03 (0603)	1/8W	-55 ~ +155°C	50V	10Ω - 299Ω			±200
				300Ω - 1MΩ			±100
SWR05 (0805)	1/4W	-55 ~ +155°C	150V	1Ω - 299Ω			±200
				300Ω - 20MΩ			±100
SWR06 (1206)	1/3W	-55 ~ +155°C	200V	1Ω - 20Ω			±200
				20.1Ω - 20MΩ			±100
SWR13 (1210)	1/2W	-55 ~ +155°C	200V	1Ω - 20Ω			±200
				20.1Ω - 20MΩ			±100
SWR10 (2010)	3/4W	-55 ~ +155°C	400V	1Ω - 20Ω			±200
				20.1Ω - 20MΩ			±100
SWR12 (2512)	1.5W	-55 ~ +155°C	500V	1Ω - 20Ω			±200
				20.1Ω - 20MΩ			±100

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■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	±(1.0%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G	Max. overload voltage for 1 minute
Endurance	±(3.0%+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	±(3.0%+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	±(3.0%+0.05Ω)	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±(1.0%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%	260±5°C for 30 seconds
Rapid Change of Temperature	±(1.0%+0.05Ω)	-55°C to +155°C, 5 cycles

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

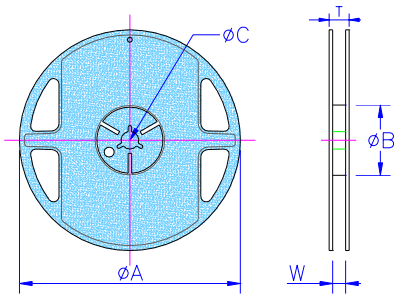
■ Storage Temperature: 25±3°C; Humidity < 80%RH

■Packaging

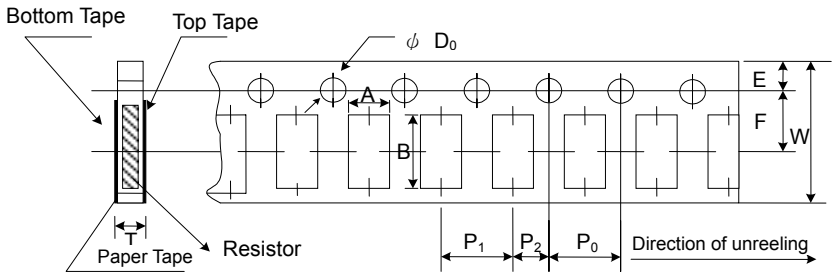
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
SWR03 SWR05 SWR06 SWR13	Paper	5K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
		10K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
SWR10 SWR12	Embossed	4K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5
		8K		10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



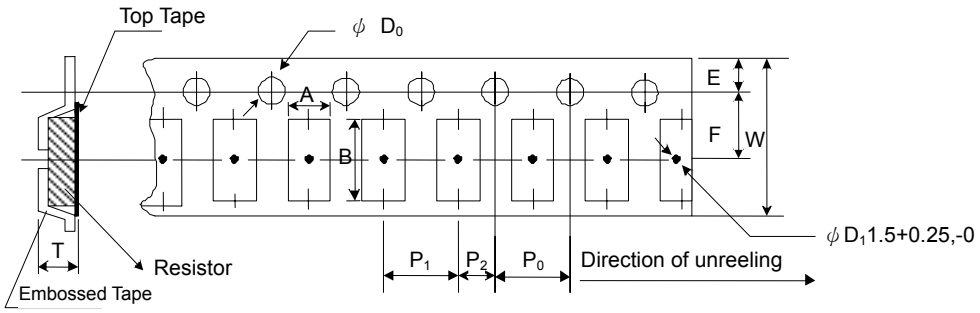
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
SWR03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
SWR05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
SWR06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
SWR13	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

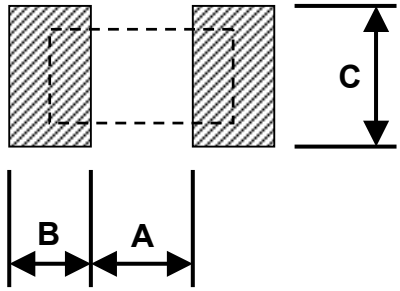
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
SWR10	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
SWR12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Recommend Land Pattern

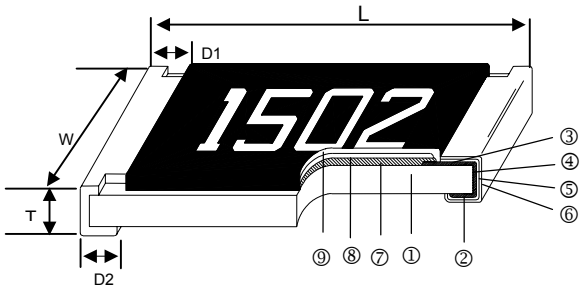


Unit: mm

Type	A	B	C
SWR03	0.90	0.60	0.90
SWR05	1.20	0.70	1.30
SWR06	2.00	0.90	1.60
SWR13	2.00	0.90	2.80
SWR10	3.80	0.90	2.80
SWR12	3.80	1.60	3.50

High Voltage Thick Film Chip Resistor－HVR Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/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)

■Features

－Highly reliable multilayer electrode construction
－Higher component and equipment reliability
－Excellent performance at high voltage
－Reduced size of final equipment

■Applications

－Inverter
－Outdoor Equipments
－Converter
－Automotive Industry
－High Pulse Equipment

■Dimensions

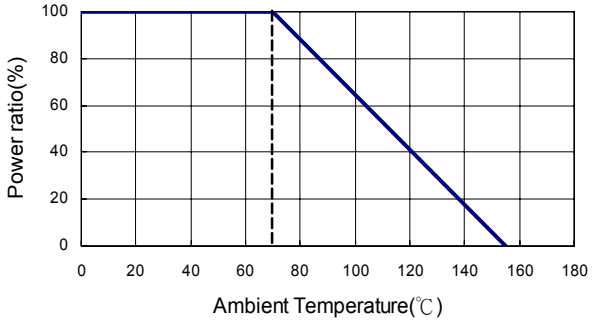
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
HVR02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
HVR03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
HVR05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
HVR06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
HVR0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
HVR12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

■Part Numbering

HVR	03	F	T	E	X	1001
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 0A: 2010 12: 2512	F: ±1% J: ±5%	B: Bulk T: Taping Reel	E: ±100 F: ±200 H: ±400	Y: 1/16W X: 1/10W W: 1/8W V: 1/4W U: 1/2W T: 1W	1001: 1KΩ 1004: 1MΩ 1005: 10MΩ

■Derating Curve



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■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
HVR02 (0402)	1/16W	-55 ~ +155°C	100V	200V	10Ω - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR03 (0603)	1/10W		200V	400V	10Ω - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR05 (0805)	1/8W		400V	800V	10Ω - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR06 (1206)	1/4W		500V	1000V	10Ω - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR0A (2010)	1/2W		2000V	3000V	10Ω - 1MΩ		±100
					1.02MΩ - 20MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR12 (2512)	1W		3000V	4000V	10Ω - 1MΩ		±100
					1.02MΩ - 20MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

Item	Requirement		Test Method
	±1%	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G		Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	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)	±(1.5%+0.10Ω)	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%		260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	-55°C to +155°C, 5 cycles

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

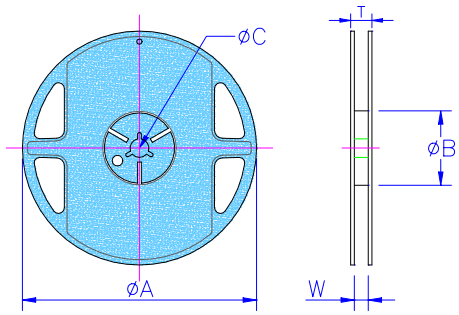
■ Storage Temperature: 25±3°C; Humidity < 80%RH

■Packaging

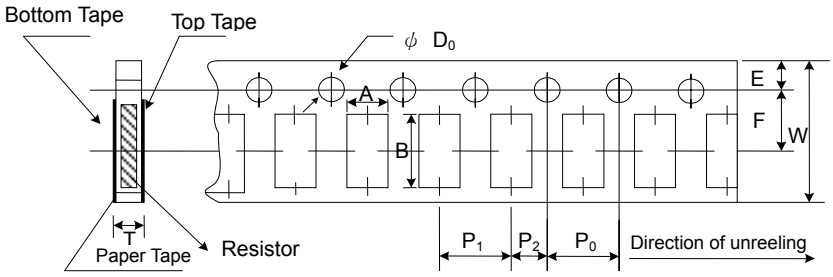
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
HVR02	Paper	10K 20K 40K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
				10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
HVR03 HVR05 HVR06	Paper	5K 10K 20K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
HVR0A HVR12	Embossed	4K 8K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5
				10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



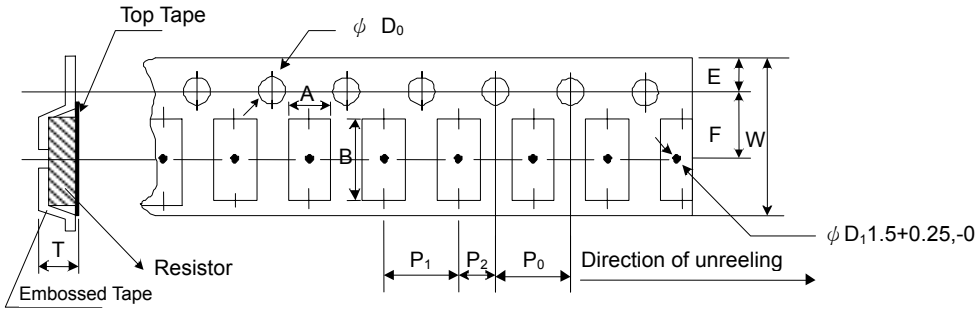
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
HVR02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
HVR03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
HVR05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
HVR06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

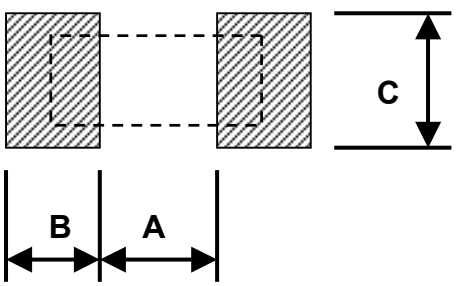


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
HVR0A	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
HVR12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Recommend Land Pattern

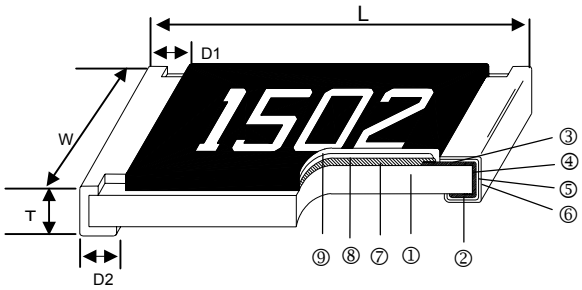
Unit: mm



Type	A	B	C
HVR02	0.50	0.45	0.60
HVR03	0.90	0.60	0.90
HVR05	1.20	0.70	1.30
HVR06	2.00	0.90	1.60
HVR0A	3.80	0.90	2.80
HVR12	3.80	1.60	3.50

Anti-Sulfurated Thick Film Chip Resistor－AS Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/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)

■Features

－Special construction to prevent sulfuration in a sulfur containing environment

■Applications

－Automotive
－High-end Computer
－Industrial Equipment
－Automatic Equipment Controller
－Medical Equipment
－High-end Multimedia Electronics
－Outdoor Electronic Applications

■Dimensions

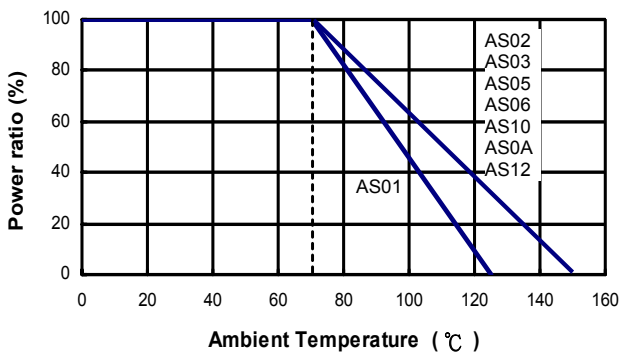
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
AS01	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05	0.150
AS02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
AS03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
AS05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
AS06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
AS10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
AS0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
AS12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

■Part Numbering

AS	03	F	T	E	1002
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	D: ±0.5% F: ±1% J: ±5%	B: Bulk T: Taping Reel	E: ±100 F: ±200	R0R0: 0Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ

■Derating Curve



■Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
AS01 (0201)	1/20W	-55 ~ +125°C	25V	50V	—	1Ω - 10MΩ		±200
	Jumper: 1A				—	0Ω(<50mΩ)		—
AS02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				0Ω(<50mΩ)			—
AS03 (0603)	1/10W		50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				0Ω(<50mΩ)			—
AS05 (0805)	1/8W		150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				0Ω(<50mΩ)			—
AS06 (1206)	1/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				0Ω(<50mΩ)			—
AS10 (1210)	1/3W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2.5A				0Ω(<50mΩ)			—
AS0A (2010)	3/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 3.5A				0Ω(<50mΩ)			—
AS12 (2512)	1W		250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 4A				0Ω(<50mΩ)			—

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.
Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G			Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	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)	±(1.5%+0.10Ω)	<50mΩ	at +125/+155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%			260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55°C to +125/+155°C, 5 cycles
Sulfur Test	±(0.5%+0.05Ω)	±(0.5%+0.05Ω)	<50mΩ	3~5ppm H2S, 50±2°C, 91~93% R.H., no power rating for 1000 hrs

■ **Reference Standards: IEC60115-1, 60068-2-58; JIS-C 5201-1; ASTM-B-809**

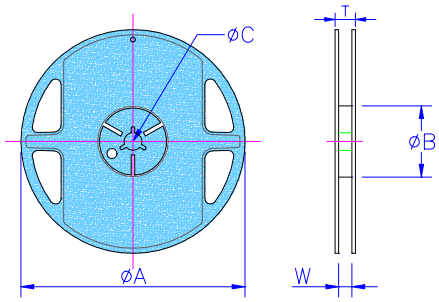
■ **Storage Temperature: 25±3°C; Humidity < 80%RH**

■Packaging

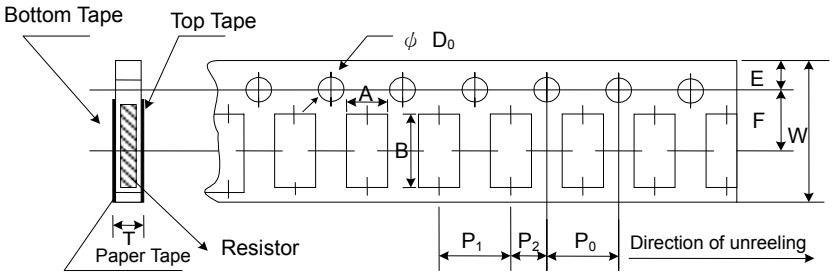
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
AS01	Paper	15K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
AS01 AS02	Paper	10K 20K 40K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
				10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
AS03 AS05 AS06 AS10	Paper	5K 10K 20K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
AS0A AS12	Embossed	4K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5
		8K		10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



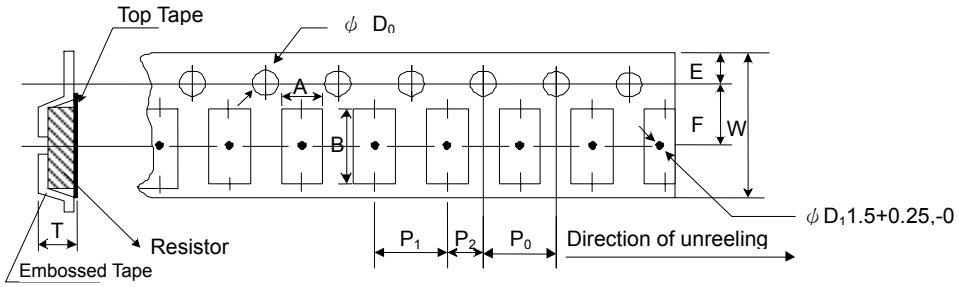
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
AS01	0.38±0.05	0.68±0.05	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
AS02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
AS03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
AS05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
AS06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
AS10	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

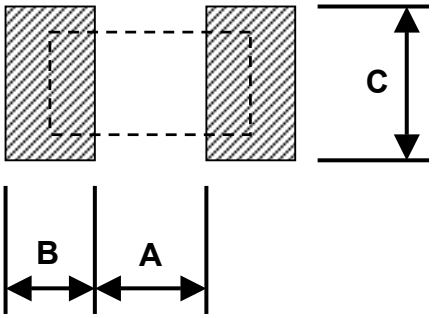


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
AS0A	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
AS12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Recommend Land Pattern

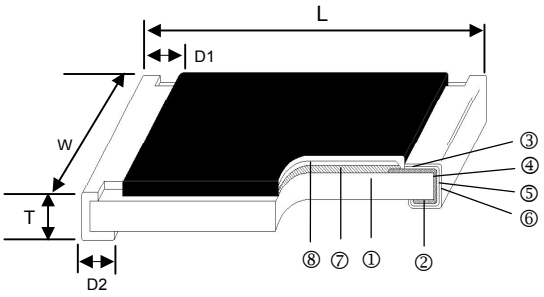
Unit: mm



Type	A	B	C
AS01	0.30	0.25	0.30
AS02	0.50	0.45	0.60
AS03	0.90	0.60	0.90
AS05	1.20	0.70	1.30
AS06	2.00	0.90	1.60
AS10	2.00	0.90	2.80
AS0A	3.80	0.90	2.80
AS12	3.80	1.60	3.50

Trimmable Thick Film Chip Resistor－RT Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/Ag)
②	Bottom Electrode (Ag)	⑤	Barrier Layer (Ni)	⑧	Primary Overcoat (Glass)
③	Top Electrode (Ag-Pd)	⑥	External Electrode (Sn)		

■Features

- Suitable for laser fine tune
- Small size and light weight
- Highly reliable multilayer electrode construction
- Compatible with all soldering process

■Applications

- Tuner
- Sensor Control Circuit
- Camcorder
- Portable Audio
- Photo Sensor
- Portable Measuring Equipment

■Dimensions

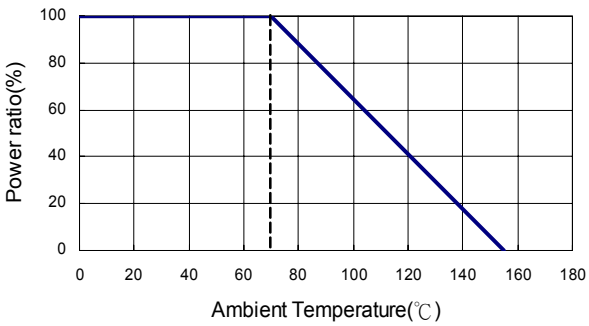
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
RT-02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
RT-03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
RT-05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
RT-06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
RT-10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
RT-0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
RT-12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

■Part Numbering

RT-	03	F	L	7	- - -1R2
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	N: 0~-10% P: 0~-20% Q: 0~-30%	L: Standard	4: 7" Reel 4Kpcs 6: 7" Reel 10Kpcs 7: 7" Reel 5Kpcs 9: 10" Reel 8Kpcs A: 10" Reel 10Kpcs B: 10" Reel 20Kpcs C: 13" Reel 40Kpcs D: 13" Reel 20Kpcs F: Bulk	- - - 1R2: 1.2Ω - - - 3K3: 3.3KΩ - - - 10K: 10KΩ - - 100K: 100KΩ "-" to fill up 6 spaces

■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~ -10%	0~ -20%	0~ -30%	
RT-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 10MΩ			±200
RT-03 (0603)	1/10W		50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
RT-05 (0805)	1/8W		150V	300V				
RT-06 (1206)	1/4W		200V	400V				
RT-10 (1210)	1/3W		200V	400V				
RT-0A (2010)	3/4W		200V	400V				
RT-12 (2512)	1W		250V	500V				

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■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	±(1.0%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G	Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	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
Bending Strength	±(1.0%+0.05Ω)	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%	260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	-55°C to +155°C, 5 cycles

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

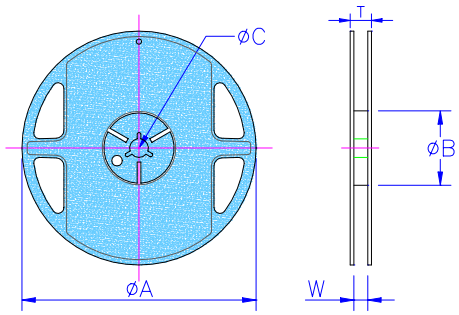
■ Storage Temperature: 25±3°C; Humidity < 80%RH

■Packaging

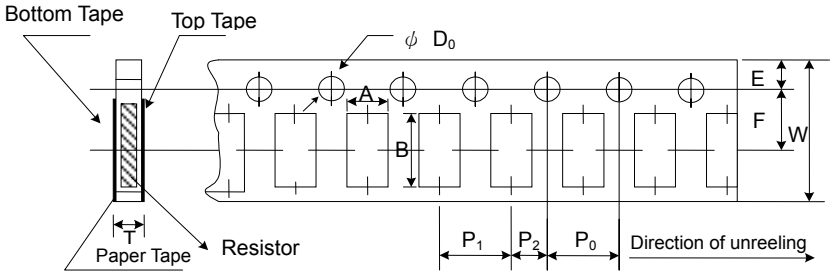
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
RT-02	Paper	10K 20K 40K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
				10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
RT-03 RT-05 RT-06 RT-10	Paper	5K 10K 20K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
RT-0A RT-12	Embossed	4K 8K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5
				10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



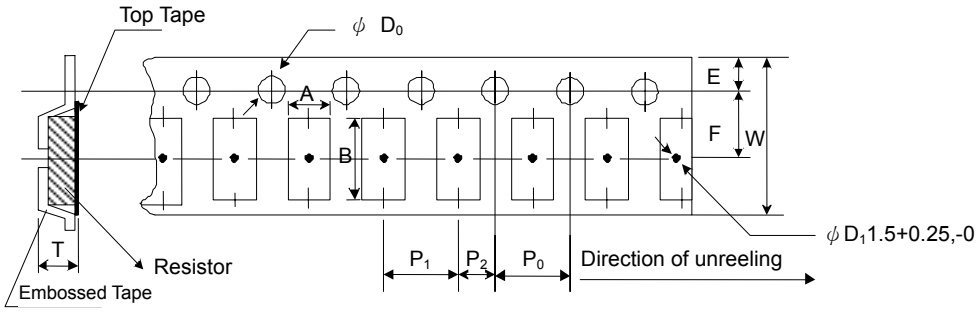
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
RT-02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
RT-03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
RT-05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
RT-06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
RT-10	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

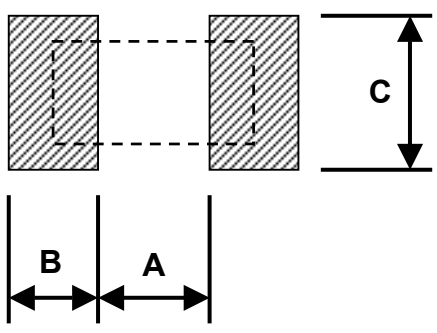
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
RT-0A	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
RT-12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■ Recommend Land Pattern

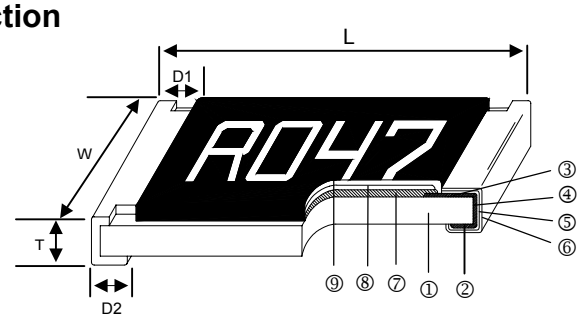


Unit: mm

Type	A	B	C
RT-02	0.50	0.45	0.60
RT-03	0.90	0.60	0.90
RT-05	1.20	0.70	1.30
RT-06	2.00	0.90	1.60
RT-10	2.00	0.90	2.80
RT-0A	3.80	0.90	2.80
RT-12	3.80	1.60	3.50

Thin Film Current Sensing Chip Resistor－TCS Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (NiCr)
②	Bottom Electrode (Ag)	⑤	Barrier Layer (Ni)	⑧	Overcoat (Epoxy)
③	Top Electrode (Ag-Pd)	⑥	External Electrode (Sn)	⑨	Marking

■Features

－Thin film process
－High power rating up to 3 Watts in 2512 size
－Tight tolerance down to ±0.5%
－Extremely low TCR down to ±50 PPM/°C
－Resistance values from 50m to 1ohm
－High purity alumina substrate for high power dissipation

■Applications

－Power Management Applications
－Switching Power Supply
－Over Current Protection in Audio Applications
－Voltage Regulation Module (VRM)
－DC-DC Converter, Battery Pack, Charger, Adaptor
－Automotive Engine Control
－Disk Driver

■Dimensions

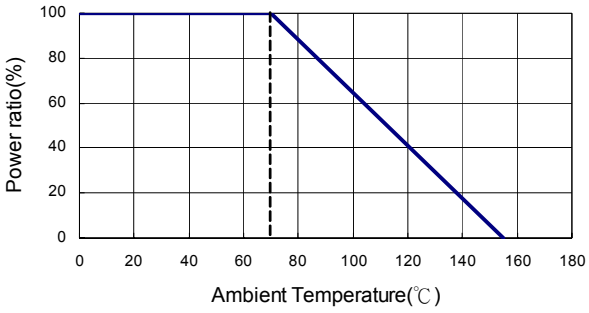
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
TCS02	0402	1.00±0.05	0.50±0.05	0.32±0.10	0.25±0.10	0.20±0.10	0.56
TCS03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	3.1
TCS05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.25	5.6
TCS06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.50±0.30	0.40±0.25	12.3
TCS10	2010	5.00±0.20	2.45±0.15	0.60±0.15	0.60±0.30	0.50±0.25	26.7
TCS12	2512	6.35±0.20	3.15±0.15	0.60±0.10	0.60±0.30	0.55±0.25	49.6

■Part Numbering

TCS	12	F	T	E		R010	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	D: ±50 E: ±100 F: ±200	: Standard R: 3W	R010: 0.01Ω R100: 0.1Ω 1R00: 1Ω	: Standard N: No Marking

■Derating Curve



Tel:886-3-5972931 Fax: 886-3-5973494 E-mail: sales@viking.com.tw http://www.viking.com.tw

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)		TCR (PPM/°C)
			±0.5%	±1%	
TCS02 (0402)	1/16W	-55~+155°C	500 - 1000		±100 ±50
TCS03 (0603)	1/10W	-55~+155°C	200 - 300 301 - 1000		±100 ±50
TCS05 (0805)	1/8W		200 - 300 301 - 1000		±100 ±50
TCS06 (1206)	1/4W	-55~+155°C	—	50 - 100	±200 ±100 ±50
			101 - 300 301 - 1000		
TCS10 (2010)	3/4W	-55~+155°C	50 - 100 101 - 300 301 - 1000		±200 ±100 ±50
TCS12 (2512)	1W	-55~+155°C	50 - 100 101 - 300 301 - 1000		±200 ±100 ±50

■High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)	TCR (PPM/°C)
			±1%	
TCS12 (2512)	3W	-55~+155°C	100 - 1000	±100

Operating Voltage=$\sqrt{(P*R)}$

Overload Voltage=2.5*$\sqrt{(P*R)}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+25/+125/+25°C
Short Time Overload	±1%	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	>1000MΩ	Apply 100V_{DC} for 1 minute
Endurance	±1%	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%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Bending Strength	As Spec.	Bending amplitude 3mm for 10 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±0.5%	260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type	Apply Max. Overload Voltage for I minute
Thermal Shock	±0.5%	-55°C ~150°C, 100 cycles
Low Temperature Operation	±0.5%	1 hour, -65°C followed by 45 minutes of RCWV

■ **Reference Standards: MIL-STD-202, JIS-C 5201-1**

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

■Marking for 0603

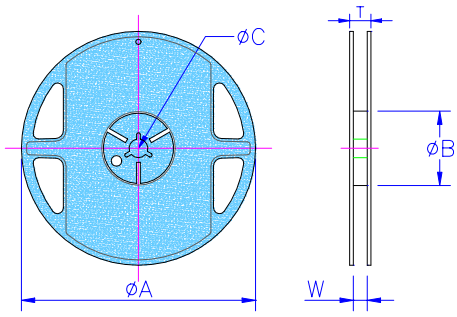
Codes	Type
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
101	0.101Ω
035	0.035Ω

■Packaging

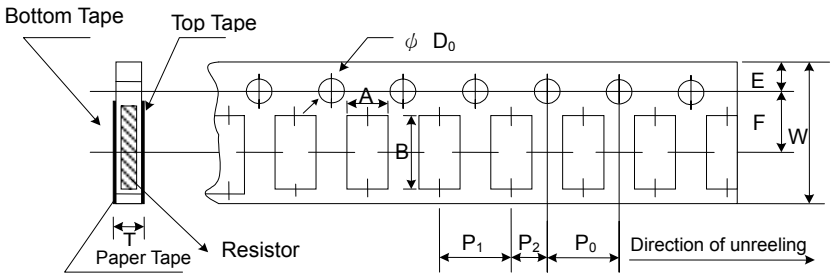
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
TCS02	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	10,000	-
TCS03	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
TCS05	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
TCS06	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
TCS10	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
TCS12	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000



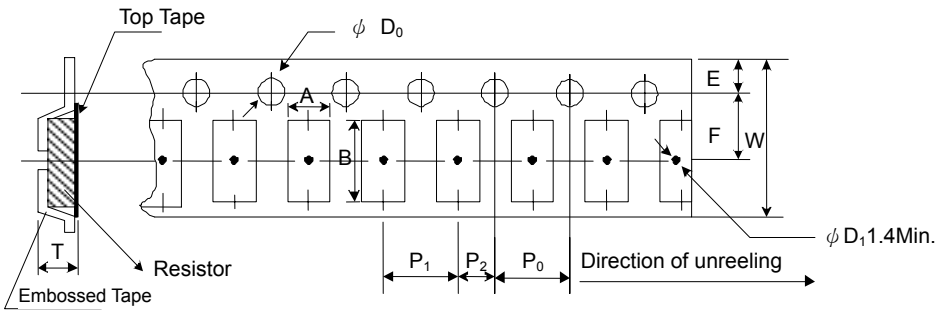
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	$ΦD_0$	T
TCS02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.40±0.03
TCS03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.60±0.03
TCS05	1.60±0.05	2.37±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05
TCS06	2.00±0.05	3.55±0.05	8.00±0.10	1.75±0.05	3.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	0.75±0.05

Embossed Plastic Tape Specifications

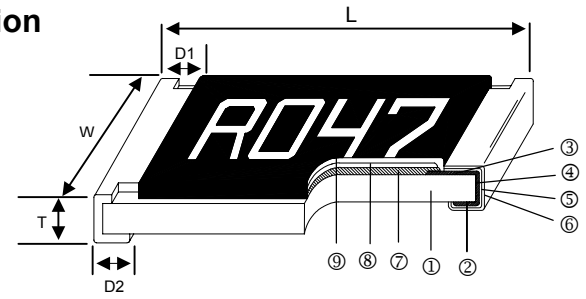


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	$ΦD_0$	T
TCS10	2.85±0.10	5.45±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
TCS12	3.40±0.10	6.65±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

Current Sensing Chip Resistor－CS Series

■Construction



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

■Features

- －3 Watts power rating in 1 Watt size, 1225 package
- －Low TCR of ±100 PPM/°C
- －Resistance values from 1m to 8 ohm
- －High purity alumina substrate for high power dissipation
- －Long side terminations with higher power rating

■Applications

- －Power Management Applications
- －Switching Power Supply
- －Over Current Protection in Audio Applications
- －Voltage Regulation Module (VRM)
- －DC-DC Converter, Battery Pack, Charger, Adaptor
- －Automotive Engine Control
- －Disk Driver

■Dimensions

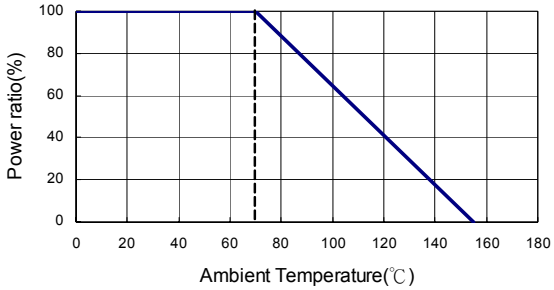
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CS01	0201	0.60±0.03	0.30±0.03	0.23±0.05	0.12±0.05	0.15±0.05	0.18
CS02	0402	1.00±0.05	0.50±0.05	0.32±0.10	0.25±0.10	0.20±0.10	0.7
CS03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.99
CS05	0805	2.00±0.10	1.25±0.10	0.55±0.10	0.30±0.20	0.40±0.25	5.3
CS06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.30	0.40±0.25	8.82
CS13	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.30	0.50±0.25	15.5
CS10	2010	5.00±0.10	2.50±0.15	0.60±0.15	0.60±0.30	0.50±0.25	27.03
CS12	2512	6.35±0.10	3.10±0.15	0.60±0.10	0.60±0.30	0.55±0.25	43.08
CS12 (2W)	2512 10 - 99mΩ	6.35±0.20	3.15±0.15	0.74±0.10	0.60±0.30	0.55±0.25	53.08
CS12 (2W)	2512 100 - 1000mΩ	6.35±0.20	3.15±0.15	0.74±0.10	0.60±0.30	2.10±0.10	53.08
CS25	1225	3.10±0.15	6.30±0.15	0.90±0.15	0.60±0.30	0.55±0.25	64.88
CS37	3720	2.00±0.20	3.75±0.20	0.60±0.10	0.40±0.20	0.40±0.20	19.96
CS75	7520	2.00±0.20	7.50±0.30	0.60±0.10	0.40±0.20	0.40±0.20	35.71

■Part Numbering

CS	06	F	T	G	U	R100	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512 25: 1225 37: 3720 75: 7520	F: ±1% G: ±2% J: ±5%	T: Taping Reel B: Bulk	E: ±100 F: ±200 G: ±300 H: ±400 J: ±600 K: ±150 R: ±1000	: Standard A: 1.5W Q: 3/4W S: 2W T: 1W U: 1/2W V: 1/4W W: 1/8W	R010: 0.01Ω R100: 0.1Ω 1R00: 1Ω	: Standard N: No Marking W: Wide

■Derating Curve



■Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ) ±1%	±2%	±5%	TCR (PPM/°C)
CS01 (0201)	1/20W	-55 ~ +155°C	100 - 149 150 - 500 501 - 1000			±1000 ±600 ±300
CS02 (0402)	1/16W		50 - 100 101 - 500 501 - 1000			±400 ±300 ±200
CS03 (0603)	1/10W		20 - 50 51 - 100 101 - 500 501 - 1000			±600 ±400 ±300 ±200
CS05 (0805)	1/8W		20 - 50 51 - 100 101 - 500 501 - 1000			±600 ±400 ±300 ±200
CS06 (1206)	1/4W		10 - 20 21 - 50 51 - 99 100 - 1000			±600 ±400 ±300 ±200
CS13 (1210)	1/2W					
CS10 (2010)	3/4W					
CS12 (2512)	1W					
CS25 (1225)	3W		3 - 5 6 - 20 21 - 30 31 - 250 251 - 8000			±300 ±200 ±150 ±100 ±200
CS37 (3720)	1W		10 - 19 20 - 500			±300 ±150
CS75 (7520)	2W		—	1 - 4		±300
			5 - 10 11 - 350			±200 ±150

■High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ) ±1%	±2%	±5%	TCR (PPM/°C)
CS02 (0402)	1/8W	-55 ~ +155°C	51 - 100 101 - 500 501 - 1000			±400 ±300 ±200
CS03 (0603)	1/8W					
CS05 (0805)	1/4W					
CS06 (1206)	1/2W	-55 ~ +155°C	10 - 20 21 - 50 51 - 99 100 - 1000			±600 ±400 ±300 ±200
CS13 (1210)	3/4W					
CS10 (2010)	1W					
CS12 (2512)	1.5W					
CS12 (2512)	2W					

■Low TCR Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ) ±1%	±2%	±5%	TCR (PPM/°C)
CS05 (0805)	1/8W	-55 ~ +155°C	100 - 1000			±100
CS06 (1206)	1/4W		100 - 1000			±100
CS13 (1210)	1/2W		75 - 1000			±100
CS10 (2010)	3/4W		50 - 1000			±100
CS12 (2512)	1W		20 - 1000			±100
CS12 (2512)	2W		50 - 1000			±100
CS37 (3720)	1W		100 - 500			±100
CS75 (7520)	2W		50 - 350			±100

Operating Voltage=$\sqrt{}$(P*R) ; Overload Voltage=2.5*$\sqrt{}$(P*R) ; Operating Current=$\sqrt{}$(P/R)

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Marking for 0603

Codes	Type
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
101	0.101Ω
035	0.035Ω

■Environmental Characteristics

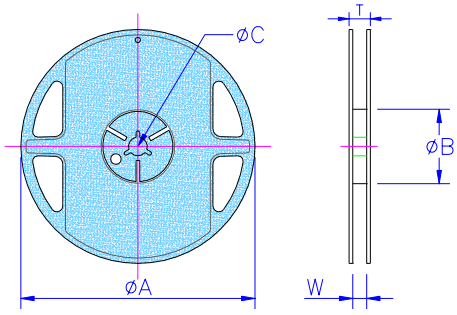
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(0.5%+0.05Ω) ±(1.0%+0.05Ω) for high power rating	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≧10G	Max. overload voltage for 1 minute
Endurance	±(1.0%+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	±(0.5%+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	±(0.5%+0.05Ω)	at +155°C for 1000 hrs
Bending Strength	As Spec.	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦10%	260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	-55°C to +155°C, 5 cycles

■ **Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1**

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

■Packaging

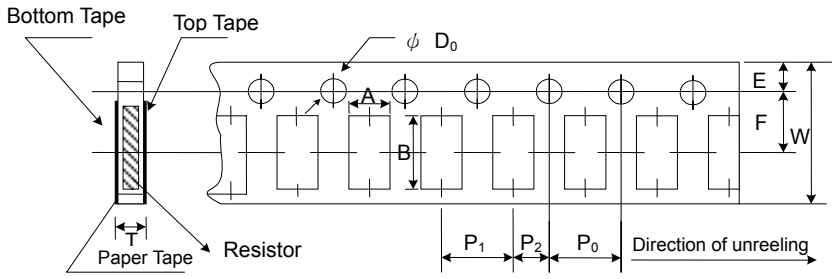
Packaging Quantity & Reel Specifications



Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
CS01	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	10,000	-
CS02	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	10,000	-
CS03	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
CS05	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
CS06	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
CS13	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
CS10	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
CS12	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
CS12 (2W)	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CS25	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CS37	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CS75	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	17.5 ± 1.0	19.5 ± 1.0	-	2,000

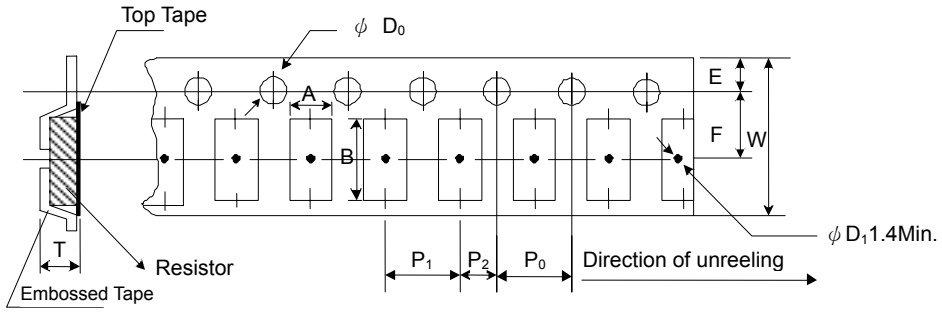
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CS01	0.38±0.05	0.68±0.05	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.42±0.20
CS02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CS03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
CS05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CS06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CS13	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

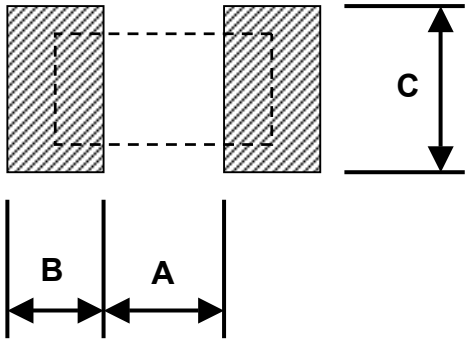
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CS10	2.80±0.10	5.50±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CS12	3.50±0.10	6.70±0.10	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CS12 (2W)	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.45±0.20
CS25	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.55+0.05	1.45±0.20
CS37	2.50±0.20	4.45±0.20	12.0±0.30	1.75±0.10	5.5±0.05	4.00 ±0.05	4.00±0.10	2.00±0.05	1.50+0.20	1.20±0.20
CS75	2.50±0.20	8.30±0.20	16.0±0.30	1.75±0.10	7.8±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.20	1.20±0.20

■Recommend Land Pattern



Pad Layout (Except For CS12: High Power Rating Series) Unit: mm

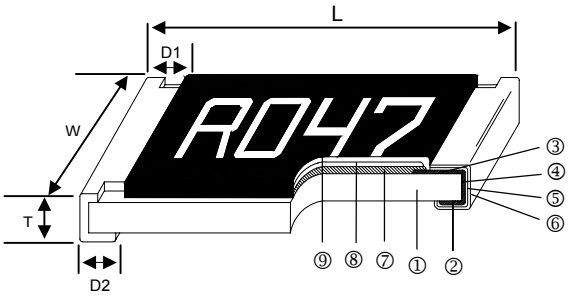
Type	A	B	C
CS01	0.25	0.30	0.40±0.2
CS02	0.50	0.50	0.60±0.2
CS03	0.80	1.00	0.90±0.2
CS05	1.00	1.00	1.35±0.2
CS06	2.00	1.15	1.70±0.2
CS13	2.00	1.15	2.50±0.2
CS10	3.60	1.40	2.50±0.2
CS12	4.90	1.60	3.10±0.2
CS25	2.00	2.00	6.40±0.2
CS37	1.00	1.80	3.90±0.2
CS75	1.00	1.80	7.60±0.2

Pad Layout (For CS12: High Power Rating Series) Unit: mm

Type	Resistance Range	A	B	C
CS12	10 - 99mΩ	4.9	1.6	3.1±0.2
CS12	100 - 1000mΩ	1.0	3.55	3.1±0.2

Current Sensing Thick Film Chip Resistor－RS Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/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)

■Features

- Low inductance
- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Reduced size of final equipment reliability

■Applications

- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Application
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor
- Automotive Engine Control
- Disk Driver

■Dimensions

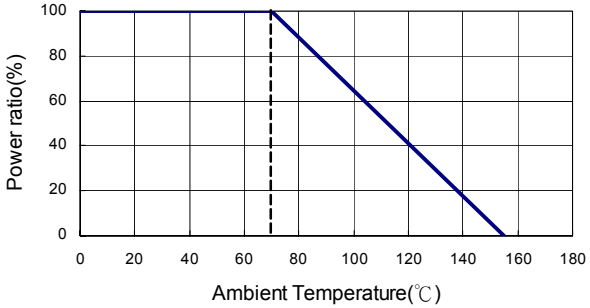
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
RS-02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
RS-03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
RS-05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
RS-06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
RS-10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
RS-0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
RS-12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

■Part Numbering

RS-	03	F	L	7	- 0R047
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	F: ±1% J: ±5%	L: Standard P: High Power	4: 7” Reel 4Kpcs 6: 7” Reel 10Kpcs 7: 7” Reel 5Kpcs 9: 10” Reel 8Kpcs A: 10” Reel 10Kpcs B: 10” Reel 20Kpcs C: 13” Reel 40Kpcs D: 13” Reel 20Kpcs F: Bulk	- 0R047: 0.047Ω - - - 0R1: 0.1Ω “-“ to fill up 6 spaces

■Derating Curve



■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)		TCR (PPM/°C)
			±1%	±5%	
RS-02 (0402)	1/16W	-55～+155°C	50 - 99 100 - 499 500 - 976		±800 ±500 ±200
RS-03 (0603)	1/10W	-55～+155°C	20 - 47 50 - 99 100 - 499 500 - 976		±1200 ±800 ±500 ±200
RS-05 (0805)	1/8W	-55～+155°C	10 - 18 20 - 47 50 - 99 100 - 499 500 - 976		±1500 ±1200 ±800 ±500 ±200
RS-06 (1206)	1/4W				
RS-10 (1210)	1/3W	-55～+155°C	10 - 18 20 - 47 50 - 99 100 - 499 500 - 976		±1500 ±800 ±800 ±200 ±200
RS-0A (2010)	3/4W				
RS-12 (2512)	1W				

Operating Voltage=$\sqrt{(P*R)}$

Overload Voltage=2.5*$\sqrt{(P*R)}$

■High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Resistance Range (mΩ)		TCR (PPM/°C)
			±1%	±5%	
RS-02 (0402)	1/10W	-55～+155°C	50 - 99 100 - 499 500 - 976		±800 ±500 ±200
RS-03 (0603)	1/8W	-55～+155°C	20 - 47 50 - 99 100 - 499 500 - 976		±1200 ±800 ±500 ±200
RS-05 (0805)	1/4W	-55～+155°C	10 - 18 20 - 47 50 - 99 100 - 499 500 - 976		±1500 ±1200 ±800 ±500 ±200
RS-06 (1206)	1/3W				
RS-10 (1210)	1/2W	-55～+155°C	10 - 18 20 - 47 50 - 99 100 - 499 500 - 976		±1500 ±800 ±800 ±200 ±200
RS-0A (2010)	1W				
RS-12 (2512)	2W				

Operating Voltage=$\sqrt{(P*R)}$

Overload Voltage=2.5*$\sqrt{(P*R)}$

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

Item	Requirement		Test Method
	±1%	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds, 2 seconds for high power series
Insulation Resistance	≥10G		Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	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)	±(1.5%+0.10Ω)	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%		260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	-55°C to +155°C, 5 cycles

■ **Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1**

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

■Marking for 0603

Codes	Type
1R0	1.000Ω
R10	0.100Ω
R01	0.010Ω
101	0.101Ω
035	0.035Ω

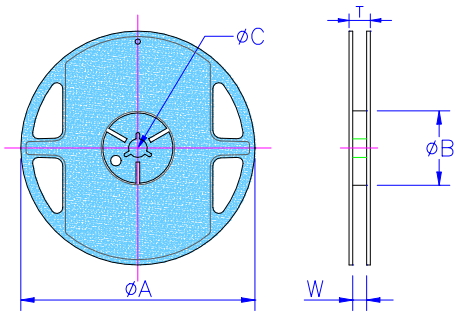
non-E24 / E96 series product is with no marking

■Packaging

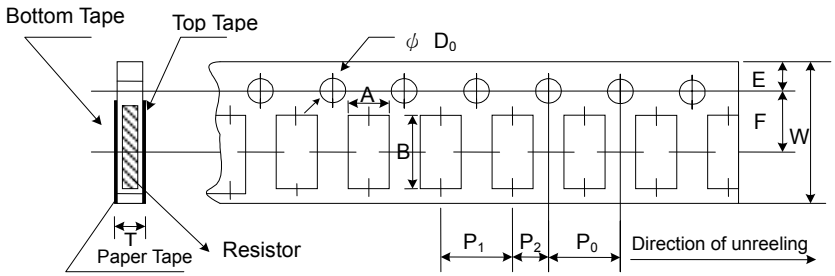
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
RS-02	Paper	10K 20K 40K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
				10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
RS-03 RS-05 RS-06 RS-10	Paper	5K 10K 20K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
RS-0A RS-12	Embossed	4K 8K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5
				10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



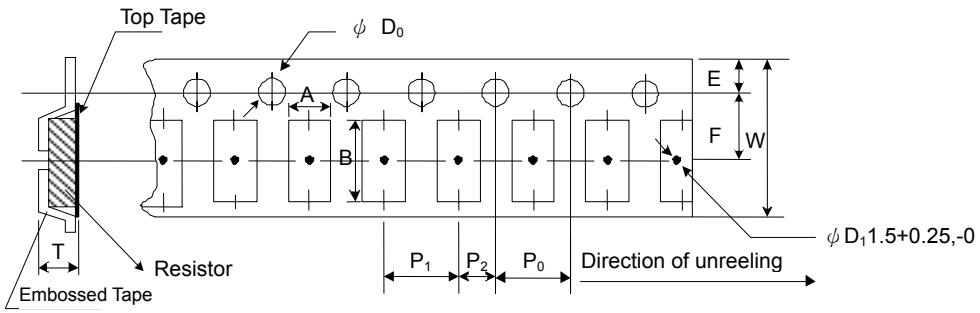
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	$ΦD_0$	T
RS-02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
RS-03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
RS-05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
RS-06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
RS-10	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

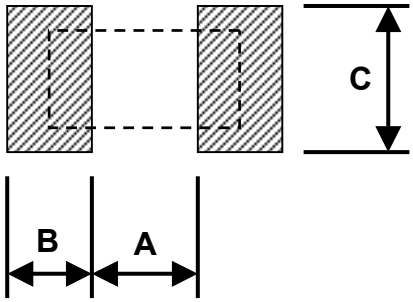


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	$ΦD_0$	T
RS-0A	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
RS-12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Recommend Land Pattern

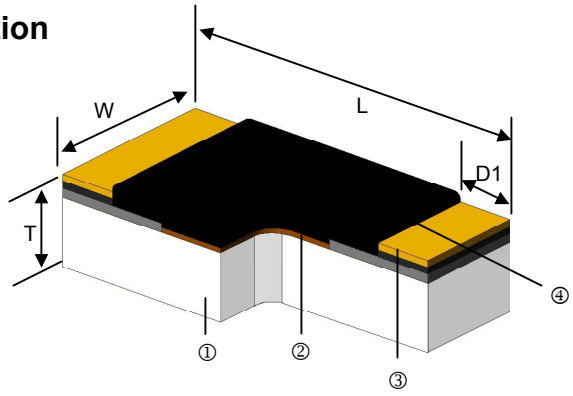
Unit: mm



Type	A	B	C
RS-02	0.50	0.45	0.60
RS-03	0.90	0.60	0.90
RS-05	1.20	0.70	1.30
RS-06	2.00	0.90	1.60
RS-10	2.00	0.90	2.80
RS-0A	3.80	0.90	2.80
RS-12	3.80	1.60	3.50

Wire Bondable Chip Resistor－WB Series

■Construction



①	Alumina Substrate	③	Ni/Au Plating (Bonding Pad)
②	Passivated NiCr Resistive Element	④	Overcoat

■Features

- Thin film passivated NiCr resistive element
- Tolerance of ±0.1%
- Extremely low TCR down to ±25PPM/°C
- Wide resistance range
- Customized bonding pattern design

■Applications

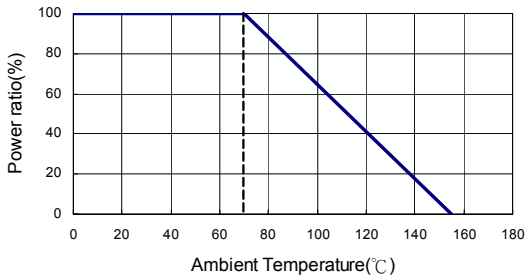
- LED Constant Current Application
- Medical Equipment
- Testing / Measurement Equipment
- Hybrid Chip on Board Circuits
- Multi Chip Module(MCM) Package
- Integrated MMIC

■Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	Weight (g) (1000pcs)
WB01	0201	0.58±0.05	0.29±0.05	0.23±0.05	0.12±0.05	0.12
WB02	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.52
WB03	0603	1.55±0.10	0.80±0.10	0.45±0.10	0.30±0.20	2.36

■Derating Curve



■Part Numbering

WB	02	D	T	E	1000	A	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance	Construction	Electrode
	01: 0201 02: 0402 03: 0603	B: ±0.1% D: ±0.5% F: ±1% J: ±5% K: ±10%	T: Taping Reel B: Bulk	C: ±25 D: ±50 E: ±100	0100: 10Ω 1000: 100Ω 2201: 2200Ω 1002: 10000Ω	A: Two Bonding Pads	N: Ni / Au

■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%	±0.5%	±1%	±5%	±10%	
WB01 (0201)	1/32W	-55 ~ +155°C	15V	30V	—	50Ω - 33KΩ				±50 ±100
WB02 (0402)	1/16W		25V	50V	10Ω - 100KΩ					±25 ±50 ±100
WB03 (0603)	1/16W		50V	100V	10Ω - 332KΩ					±25 ±50 ±100

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+25/-55/+25/+125/+25°C
Short Time Overload	ΔR±0.5%	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	>1000MΩ	Apply 100V_{DC} for 1 minute
Endurance	ΔR±0.2% >7kΩ ΔR±0.5%	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	ΔR±0.3%	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	ΔR±0.2%	at +155°C for 1000 hrs
Bending Strength	ΔR±0.2%	Bending amplitude 3 mm for 10 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±0.2%	260±5°C for 10 seconds
Dielectric Withstand Voltage	By Type	Apply Max. overload voltage for 1 minute
Thermal Shock	ΔR±0.25%	-55°C ~150°C, 100 cycles
Low Temperature Operation	ΔR±0.2%	1 hour, -65°C, followed by 45 minutes of RCWV

■ **Reference Standards: MIL-STD-202, JIS-C 5201-1**

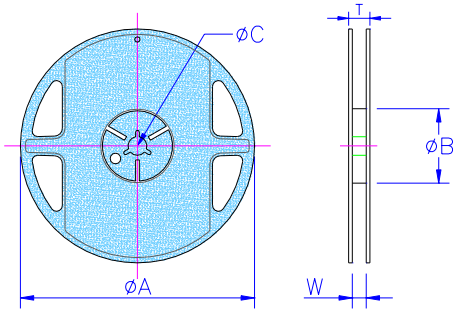
■ **Storage Temperature: 25±3°C; Humidity < 80%RH**

■Packaging

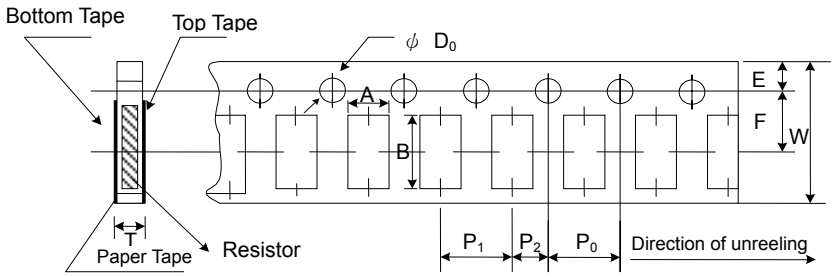
Reel Specifications & Packaging Quantity

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)
WB01	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000
WB02	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000
WB03	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000



Paper Tape Specifications

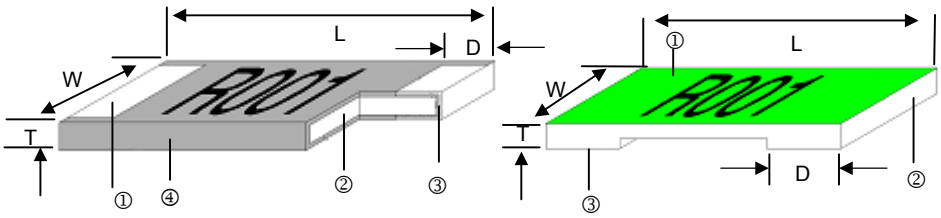


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	$ΦD_0$	T
WB01	0.40±0.05	0.70±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.05	0.265±0.05
WB02	0.70±0.05	1.16±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.55±0.03	0.40±0.03
WB03	1.10±0.05	1.90±0.05	8.00±0.10	1.75±0.05	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.03	0.40±0.03

Ultra Low Ohm (Metal Strip) Chip Resistor－LR Series

■Construction



Black－Wave or IR reflow soldering

①	Solder Plating (Sn)	③	Barrier Layer (Ni)
②	Alloy Plate	④	Overcoat

Green－IR reflow soldering only

①	Overcoat	③	Solder Plating
②	Alloy Plate		

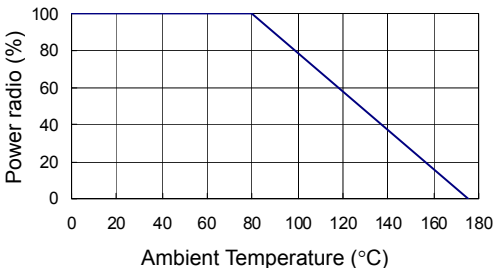
■Features

- －High power rating up to 3 Watts
- －Low TCR down to ±50 PPM/°C
- －Resistance values from 0.5 to 15m ohm
- －Customized resistance available
- －Wide range package sizes 1206 / 2010 / 2512

■Applications

- －NB (for Power Management)
- －MB (for Power Management)
- －SWPS (DC-DC Converter, Charger, Adaptor)
- －Monitor (for Power Management)

■Derating Curve



■Dimensions

Unit: mm

Part No.	Resistance (mΩ)	L	W	T	D	Weight (g) (1000pcs)
LR06□T□□□□□	1.0, 4.0, 5.0, 6.0	3.20±0.25	1.60±0.10	0.60±0.20	1.10±0.25	22.6
LR06□T□□□□□	2.0, 3.0, 10	3.20±0.25	1.60±0.10	0.60±0.20	0.60±0.25	22.6
LR06□T□□□□□	7.0, 8.0, 9.0	3.20±0.25	1.60±0.10	0.60±0.20	0.90±0.25	22.6
LR10□TDAR001	1.0	5.08±0.25	2.54±0.15	0.60±0.20	1.84±0.25	42.3
LR10□TDA□□□□	2.0, 6.0, 7.0, 8.0	5.08±0.25	2.54±0.15	0.60±0.20	1.54±0.25	42.3
LR10□TDAR003	3.0	5.08±0.25	2.54±0.15	0.60±0.20	1.04±0.25	42.3
LR10□TDA□□□□	4.0, 5.0	5.08±0.25	2.54±0.15	0.60±0.20	1.84±0.25	42.3
LR10□T□□□□□	1.0 – 10	5.08±0.254	2.54±0.15	0.60±0.20	1.665±0.625	42.3
LR12□T□0M50G	0.5	6.35±0.25	3.00±0.20	0.60±0.20	2.68±0.25	59.13
LR12□T□0M75G	0.75	6.35±0.25	3.00±0.20	0.60±0.20	2.48±0.25	59.13
LR12□T□□□□□G	1.0, 6.0	6.35±0.25	3.00±0.20	0.60±0.20	1.93±0.25	59.13
LR12□T□□□□□G	1.5, 6.5, 7.0	6.35±0.25	3.00±0.20	0.60±0.20	1.43±0.25	59.13
LR12□T□□□□□G	2.0, 3.0	6.35±0.25	3.00±0.20	0.60±0.20	1.18±0.25	59.13
LR12□T□□□□□G	4.0, 4.5	6.35±0.25	3.00±0.20	0.60±0.20	2.18±0.25	59.13
LR12□T□□□□□G	5.0, 6.0	6.35±0.25	3.00±0.20	0.60±0.20	1.93±0.25	59.13
LR12□T□□□□□G	8.0 - 15	6.35±0.25	3.00±0.20	0.60±0.20	1.18±0.25	59.13
LR12□T□0M50	0.5	6.35±0.254	3.18±0.254	1.25±0.20	1.30±0.38	61.03
LR12□T□0M75	0.75	6.35±0.254	3.18±0.254	0.75±0.20	1.30±0.38	61.03
LR12□T□R001	1.0	6.35±0.254	3.18±0.254	0.65±0.20	1.30±0.38	61.03
LR12□T□1M50	1.5	6.35±0.254	3.18±0.254	0.45±0.20	1.30±0.38	61.03
LR12□T□R002	2.0	6.35±0.254	3.18±0.254	0.35±0.20	1.30±0.38	61.03
LR12□T□2M50	2.5	6.35±0.254	3.18±0.254	0.65±0.20	1.30±0.38	61.03
LR12□T□R003	3.0	6.35±0.254	3.18±0.254	0.55±0.20	1.30±0.38	61.03
LR12□T□R004	4.0	6.35±0.254	3.18±0.254	0.45±0.20	1.30±0.38	61.03
LR12□T□R005	5.0	6.35±0.254	3.18±0.254	0.35±0.20	1.30±0.38	61.03
LR12□T□R006	6.0	6.35±0.254	3.18±0.254	0.32±0.20	1.30±0.38	61.03
LR12□T□6M50	6.5	6.35±0.254	3.18±0.254	0.30±0.20	1.30±0.38	61.03
LR12□T□R007	7.0	6.35±0.254	3.18±0.254	0.27±0.20	1.30±0.38	61.03
LR12□T□R010	10	6.35±0.254	3.18±0.254	0.25±0.20	1.30±0.38	61.03

■Part Numbering

LR	12	J	T	E	S	R002	G
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	06: 1206 10: 2010 12: 2512	F: ±1% H: ±3% J: ±5%	T: Taping Reel	D: ±50 W: ±75 E: ±100 K: ±150	: Standard A: 1.5W S: 2W B: 2.5W R: 3W	R002: 0.002Ω R020: 0.02Ω 0M50: 0.0005Ω 1M50: 0.0015Ω	: Black Coating G: Green Coating **2010/1206 No coating / marking

■Standard Electrical Specifications

Item / Part No.	Power Rating at 80°C	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
			±1%	±3%	±5%	
LR06□TD□□□□	1W	-55°C ~ +170°C	1 – 10			±50
LR12□TD□□□□	1W		0.5 , 0.75 , 1 , 1.5 , 2			±50
LR12□TK□□□□	1W		2.5 , 3 , 10			±150
LR12□TE□□□□	1W		4 , 5			±100
LR12□TW□□□□	1W		6 , 6.5 , 7			±75
LR12□TD□□□□G	1W		11 , 12 , 13 , 14 , 15			±50

Operating Current=√(P/R), Operating Voltage=√(P*R)

■High Power Rating Electrical Specifications

Item / Part No.	Power Rating at 80°C	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
			±1%	±3%	±5%	
LR10□TDA□□□□	1.5W	-55°C ~ +170°C	1 - 10			±50
LR12□TDS□□□□	2W		0.5 , 0.75 , 1 , 1.5 , 2			±50
LR12□TKS□□□□	2W		10			±150
LR12□TDS□□□□G	2W		6.5 , 7 , 8 , 9 ,10			±50
LR12□TDB□□□□G	2.5W		4 , 4.5 , 5 , 6			±50
LR12□TDR□□□□G	3W		1 , 1.5 , 2 , 3			±50
LR12□TER□□□□G	3W		0.5 , 0.75			±100

Operating Current =√(P/R), Operating Voltage=√(P*R)

■ Viking has the ability of manufacture following options based on customer's requirement.

■Environmental Characteristics

Item	Requirement		Test Method
	Black coating	Green coating	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		+25/-55/+25/+125/+25°C
Short Time Overload	±0.5%	±1%	5*rated power for 5 seconds
Endurance	±1%	±1%	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Dry Heat	±1%	±1%	at +170°C for 1000 hrs
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	±0.5%	±1%	260±5°C for 10 seconds
Thermal Shock	±0.5%	±1%	-55°C ~ 150°C, 100 cycles

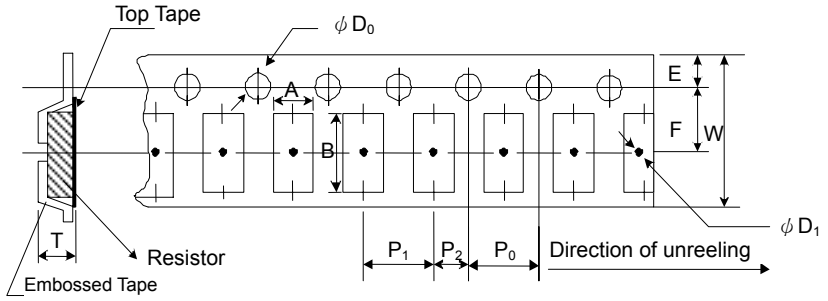
**Green coating can't be work with wave soldering bath.

■ **Reference Standards: MIL-STD-202, JIS-C 5201-1**

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

■Packaging

Embossed Plastic Tape Specifications

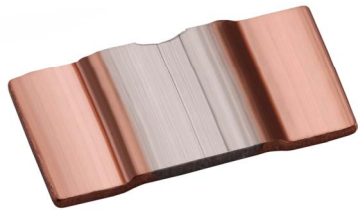


Unit: mm

Type	Resistance (mΩ)	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	ΦD_1	T	Quantity (EA)
LR06	1 - 10	1.90±0.1	3.60±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	4.00±0.1	2.0±0.05	1.55±0.05	1.0min.	0.87±0.1	2000
LR10	1 - 10	2.85±0.1	5.55±0.1	12.0±0.2	1.75±0.1	5.5±0.05	4.0±0.1	4.00±0.1	2.0±0.05	1.55±0.05	1.4min.	0.85±0.1	2000
LR12	0.50	3.40±0.1	6.73±0.1	12.0±0.1	1.75±0.1	5.5±0.05	4.0±0.1	4.00±0.1	2.0±0.05	1.55+0.05	1.4min.	1.45±0.2	2000
	0.50 - 15	3.40±0.1	6.75±0.1	12.0±0.1	1.75±0.1	5.5±0.05	4.0±0.1	4.00±0.1	2.0±0.05	1.55±0.05	1.4min.	0.80±0.1	2000

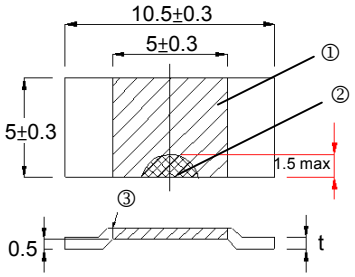
1. The cumulative tolerance of 10 sprockets hole pitch is ± 0.2mm.
2. Carrier camber shall be not more than 1mm per 100mm through a length of 250mm.
3. A & B measured 0.3mm from the bottom of the packet
4. T measured at a point on the inside bottom of the packet to the top surface of the carrier.
5. Pocket position relative to sprocket hole is measured as the true position of the pocket and not the pocket hole.

Chip Shunt Resistor－LRS Series

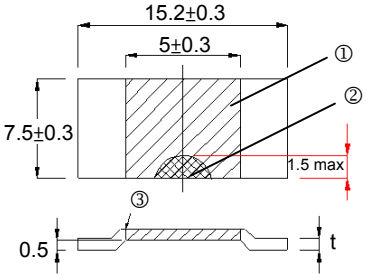


■Construction

LRS1050



LRS1575



①	Resistance Material	②	Trimming Area	③	Electron Beam Welding

■Features

－LRS1050 3W up to 77A at 0.5mΩ
－LRS1575 5W up to 100A at 0.5mΩ
－Maximum soldering temperatures of up to 350°C / 30 sec. or 250°C /10 min
－Heavy copper connectors
－Excellent long-term stability and low inductance
－Mounting using re-flow soldering or welding on copper

■Applications

－Current Sensors for Hybrid Power Sources
－Frequency Converters
－High Current Automotive

■Dimensions

Unit: mm

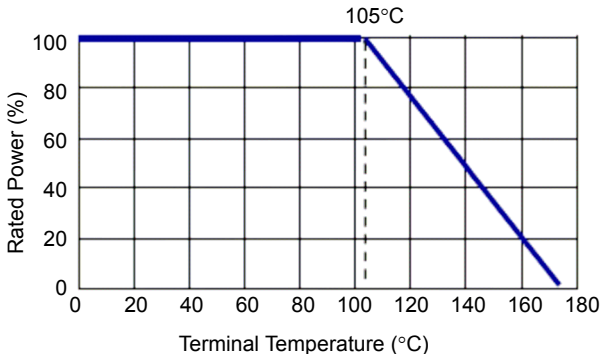
Type	Size (Inch)	Value	Material	Thickness (t)	Weight (g) (1000pcs)
LRS1050	1050	0.5mΩ	Manganin	0.88 mm±0.05	420
LRS1050	1050	1mΩ	Manganin	0.43 mm±0.05	220
LRS1050	1050	2mΩ	NiCr alloy	0.64 mm±0.05	310
LRS1050	1050	3mΩ	NiCr alloy	0.43 mm±0.05	210
LRS1050	1050	4mΩ	NiCr alloy	0.32 mm±0.05	160
LRS1575	1575	0.5mΩ	Manganin	0.56 mm±0.05	590
LRS1575	1575	1mΩ	NiCr alloy	0.90 mm±0.05	940
LRS1575	1575	2mΩ	NiCr alloy	0.45 mm±0.05	470
LRS1575	1575	3mΩ	NiCr alloy	0.30 mm±0.05	320

■Part Numbering

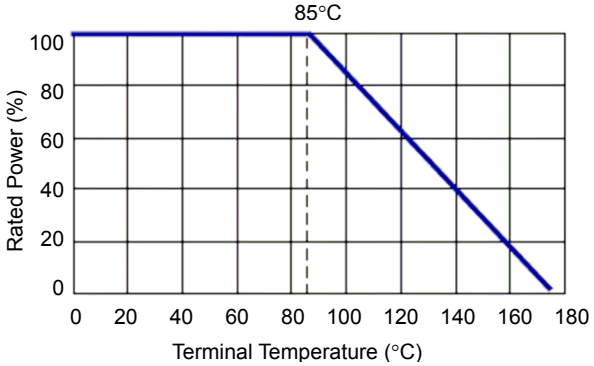
LRS	1050	F	T	D	R	0M50	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	1050: 10.5x5.0 1575: 15.2x7.5	F: ±1% G: ±2% J: ±5%	T: Taping Reel B: Bulk	D: ±50 E: ±100	R: 3W D: 5W	0M50: 0.5mΩ	M: Manganin N: NiCr alloy

■Derating Curve

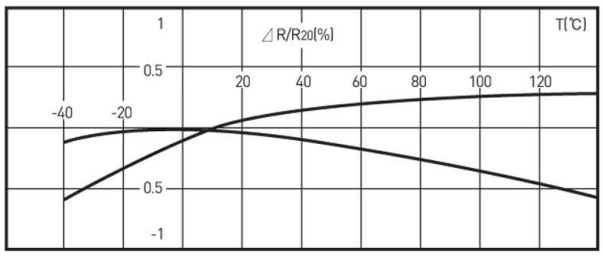
LRS1050



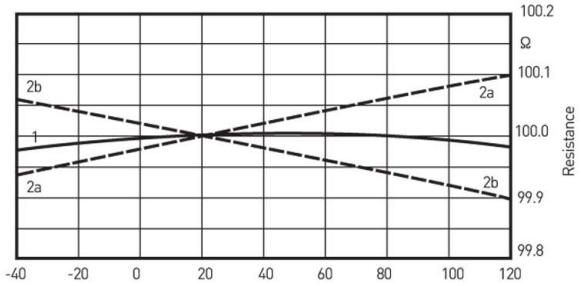
LRS1575



■Resistance Change VS Temperature



Resistance Change Versus Temp.(Managnin)



Resistance Change Versus Temp.(Ni-Dr alloy)

■Standard Electrical Specifications

Type	Power Rating	Operating Temp. Range	Resistance Range			TCR (PPM/°C)	Internal Heat Resistance
			±1%	±2%	±5%		
LRS1050	3W	-55°C ~ 170°C	0.5mΩ, 1mΩ, 2mΩ, 3mΩ, 4mΩ			±50 (20°C to 60°C)	Rthi < 10k/W
LRS1575	5W		0.5mΩ, 1mΩ, 2mΩ, 3mΩ			±100 Max.	

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

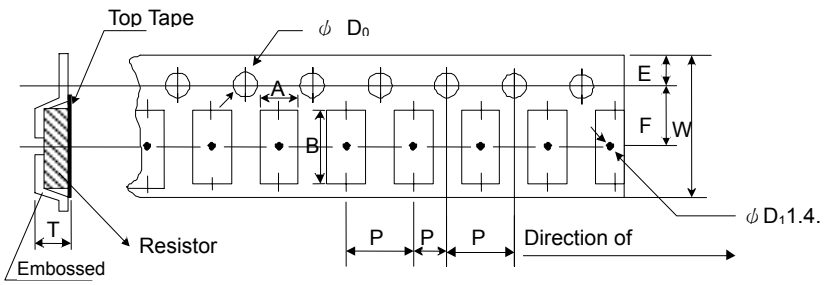
■Environmental Characteristics

Item	Requirement	Test Method
Short time overload	±0.2%	Rated Power × 5 for 5 seconds
Load Life [Terminal temp. max. 105°C]	±1.0%	Power rating 90 min. "ON", 30 min. "OFF" for 2000 hours
Resistance to Soldering Heat	±0.2%	350°C for 30 seconds or 250°C for 10 min.
Thermal Shock	±0.1%	-65°C, 25°C, 125°C, 25°C, 25 cycles
Moisture Resistance	±0.2%	90 ~ 98%RH, +25°C, +65°C, -10°C, 10 cycles
High Temperature Exposure	±0.2%	140°C for 250 hours
Vibration, High Frequency	±0.2%	15g 10~2000Hz, 36 cycles
Inductance	<3nH	—
Thermal EMF [μV/°C]	2μV/°C max.	0~100°C
Current Noise	±0.01%	MIL-STD-202 Method 308
Voltage Coefficient	Linearity error less than 120 dB	MIL-STD-202 Method 309
Shock	±0.2%	50g's 11ms

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

■Packaging

Embossed Plastic Tape Specifications

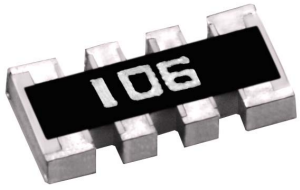


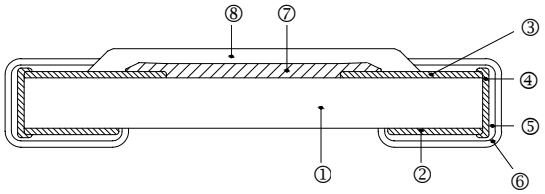
Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T	Quantity (EA)
LRS1050	5.5	10.8	16	1.75	7.5	4	12	6	1.50	1.2	3,000
LRS1575	8.4	15.7	24	1.75	11.5	4	12	6	1.50	1.9	2,000

Thin Film Array Chip Resistor－TFAN Series

■Construction





①	Alumina Substrate	⑤	Barrier Layer (Ni)
②	Bottom Electrode (Ag)	⑥	External Electrode (Sn)
③	Top Electrode (Ag-Pd)	⑦	Resistor Layer (NiCr)
④	Edge Electrode (Ag)	⑧	Overcoat (Epoxy)

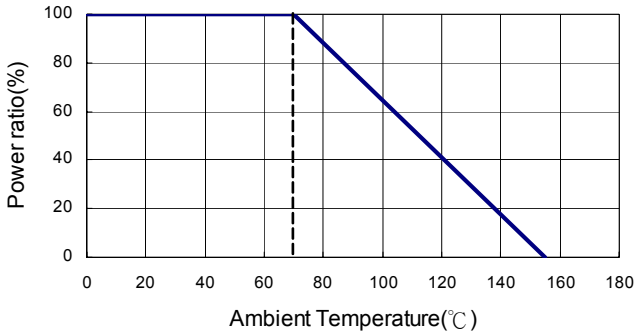
■Features

－Advanced thin film technology
－Very tight tolerance down to ±0.1%
－Extremely low TCR down to ±25PPM/°C
－RoHS compliant component, compatible with lead (Pb)-free

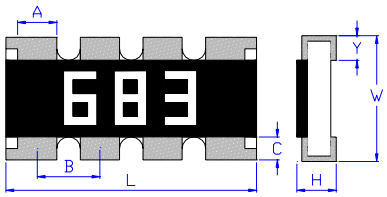
■Applications

－Voltage divider
－Feedback circuits
－Signal conditioning

■Derating Curve



■Dimensions



Unit: mm

Type	Number of Resistors	L	W	H	A	B	C	Y	Weight (g) (1000pcs)
TFAN43	4	3.20±0.15	1.60±0.15	0.55±0.10	0.50±0.15	0.80±0.05	0.30±0.15	0.30±0.15	8.22

■Part Numbering

TFAN	43	B	T	C	Y	1001	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	43: 0603X4	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	B: ±10 N: ±15 C: ±25 D: ±50	: Standard Y: 1/16W	0010: 1Ω 4R70: 4.7Ω 1001: 1KΩ 1004: 1MΩ	: Standard Marking for E96 N: No Marking

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number Of Resistors	Resistance Range				TCR (PPM/°C)
						±0.1%	±0.25%	±0.5%	±1%	
TFAN 43	1/16W	-55 ~ +155°C	50V	100V	4	100Ω~20KΩ				±25 ±50

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■Special Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number Of Resistors	Resistance Range				TCR (PPM/°C)
						±0.1%	±0.25%	±0.5%	±1%	
TFAN 43	1/16W	-55 ~ +155°C	50V	100V	4	100Ω~2KΩ				±10 ±15

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

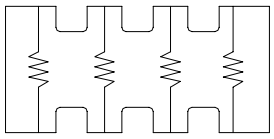
Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Environmental Characteristics

Item	Requirement		Test Method
	Tol. ≦ 0.25%	Tol. > 0.25%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		**MIL-STD-202F Method 304** +25/-55/+25/+125/+25°C
Short Time Overload	ΔR±0.25%	ΔR±0.5%	**JIS-C-5201-1 5.5** RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	>1000 MΩ		**MIL-STD-202F Method 302** Apply 100V_{DC} for 1 minute
Endurance	ΔR±0.25%	ΔR±0.5%	**MIL-STD-202F Method 108A** 70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	ΔR±0.25%	ΔR±0.5%	**MIL-STD-202F Method 103B** 40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Bending Strength	ΔR±0.25%	ΔR±0.5%	**JIS-C-5201-1 6.1.4** Bending amplitude 3 mm for 10 seconds
Solderability	95% min. coverage		**MIL-STD-202F Method 208H** 245±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±0.25%	ΔR±0.5%	**MIL-STD-202F Method 210E** 260±5°C for 10 seconds
Dielectric Withstand Voltage	100V		**MIL-STD-202F Method 301** Max. overload voltage for 1 minute
Thermal Shock	ΔR±0.25%	ΔR±0.5%	**MIL-STD-202F Method 107G** -55°C ~150°C, 100 cycles
Low Temperature Operation	ΔR±0.25%	ΔR±0.5%	**JIS-C-5201-1 7.1** 1 hour, -65°C, followed by 45 minutes of RCWV

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

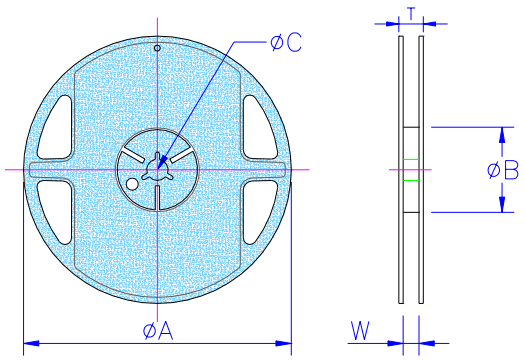
■Equivalent Circuit Diagram



TFAN

■Packaging

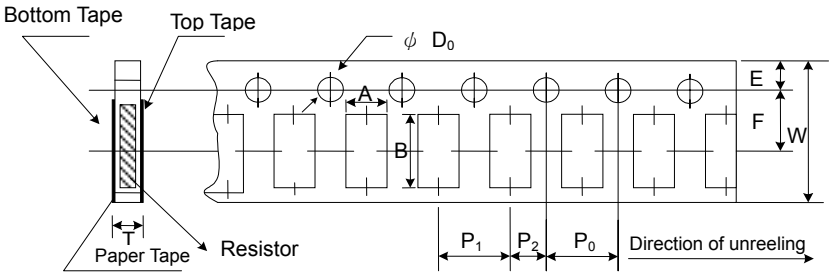
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
TFAN 43	Paper	5K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5

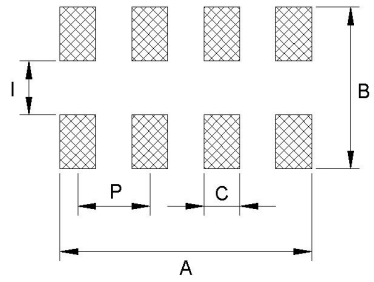
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
TFAN 43	1.95±0.10	3.50±0.10	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	4.0±0.05	2.0±0.05	$1.5^{+0.1}_{-0}$	0.85±0.10

■Recommend Land Pattern

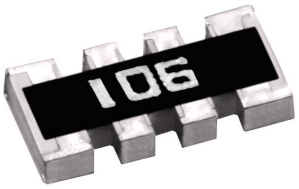


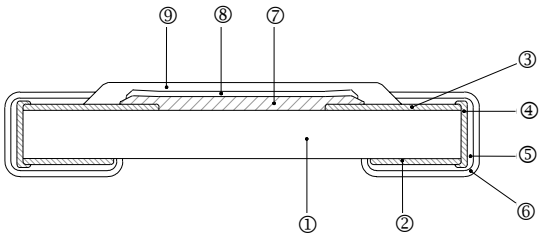
Unit: mm

Type	A	B	C	C1	I	I1	P	P1
TFAN 43	2.85	3.10	0.45	--	0.80	--	0.80	--

Thick Film Array Chip Resistor－CN Series

■Construction





①	Alumina Substrate	④	Edge Electrode (Ag)	⑦	Resistor Layer (RuO_2/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)

■Features

－Small size and light weight
－Reduction of assembly costs and matching with placement machines
－Reliability, high quality
－Suitable for both IR reflow soldering and wave soldering

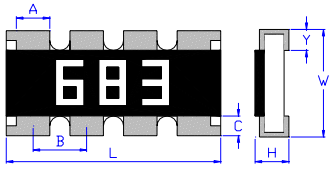
■Part Numbering

CN-	42	F	L	6	----1K
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
CN- (Convex) CNA (Concave)	42: 0402x4 43: 0603x4	F: ±1% J: ±5%	L: 4P2R/8P4R	6: 7" Reel 10Kpcs 7: 7" Reel 5Kpcs A: 10" Reel 10Kpcs B: 10" Reel 20Kpcs C: 13" Reel 40Kpcs D: 13" Reel 20Kpcs F: Bulk	----1K: 1KΩ ---3K3: 3.3KΩ ---10K: 10KΩ "-" to fill up 6 spaces

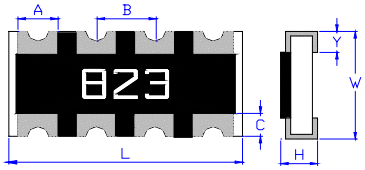
■Applications

－Entertainment
－Computer & Related Products
－Communication Equipment
－Power Equipment
－Measuring Instrument

■Dimensions



CN-42/CN-43

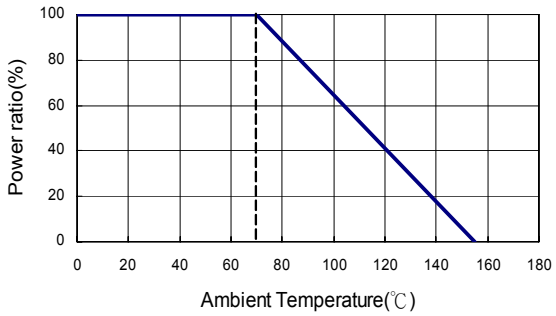


CNA42/43

Unit: mm

Type	Number of Resistors	L	W	H	A	B	C	Y	Weight (g) (1000pcs)
CN-42	4	2.00±0.10	1.00±0.10	0.45±0.10	0.30±0.10	0.50±0.05	0.22±0.15	0.22±0.15	2.817
CN-43	4	3.20±0.15	1.60±0.15	0.55±0.10	0.50±0.15	0.80±0.05	0.30±0.15	0.30±0.15	8.288
CNA42	4	2.00±0.10	1.00±0.10	0.40±0.10	0.30±0.10	0.50±0.05	0.20±0.10	0.25±0.10	3.003
CNA43	4	3.20±0.15	1.60±0.15	0.55±0.10	0.50±0.15	0.80±0.05	0.30±0.15	0.40±0.15	10.115

■Derating Curve



■Standard Electrical Specifications

Item / Type	Power Rating / Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range		TCR (PPM/°C)
						±1%	±5%	
CN-42	1/16W	-55 ~ +155°C	25V	50V	4	10Ω - 1MΩ	1Ω - 1MΩ	±200
Jumper	1A					0Ω (<50mΩ)		
CN-43	1/10W	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 1MΩ	±200
Jumper	1A					0Ω (<50mΩ)		
CNA42	1/16W	-55 ~ +155°C	25V	50V	4	10Ω - 1MΩ		±200
Jumper	1A					0Ω (<50mΩ)		
CNA43	1/16W	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ		±200
Jumper	1A					0Ω (<50mΩ)		

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.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G			Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<50mΩ	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<50mΩ	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)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 5 seconds with 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%			260±5°C for 30 seconds
Rapid Change of Temperature	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55°C to +155°C, 5 cycles

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

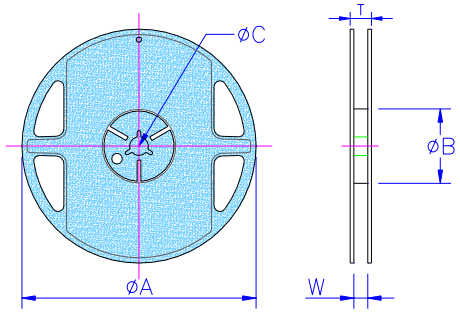
■ Storage Temperature: 25±3°C; Humidity < 80%RH

■Packaging

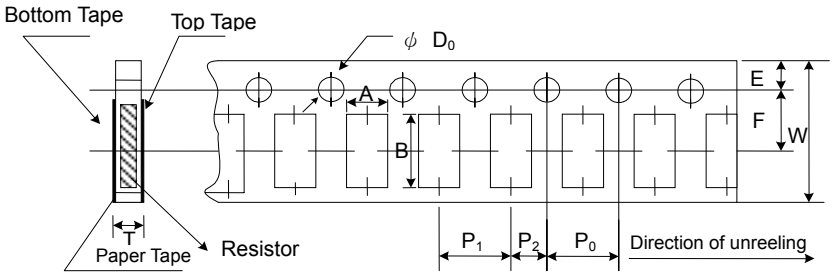
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CN-42 CNA42	Paper	10K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
		20K							
		40K		10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CN-43 CNA43	Paper	5K							
		10K		13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K							



Paper Tape Specifications

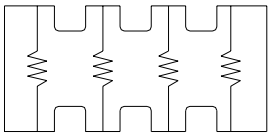


Unit: mm

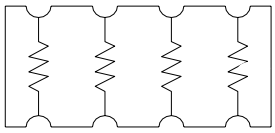
Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CN-42	1.20±0.10	2.20±0.10	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	2.0±0.05	2.0±0.05	$1.5^{+0.1}_{-0}$	0.70±0.10
CN-43	1.95±0.10	3.50±0.10	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	4.0±0.05	2.0±0.05	$1.5^{+0.1}_{-0}$	0.85±0.10
CNA42	1.20±0.10	2.20±0.10	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	2.0±0.05	2.0±0.05	$1.5^{+0.1}_{-0}$	0.70±0.10
CNA43	1.95±0.10	3.50±0.10	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	4.0±0.05	2.0±0.05	$1.5^{+0.1}_{-0}$	0.85±0.10

■Equivalent Circuit Diagram

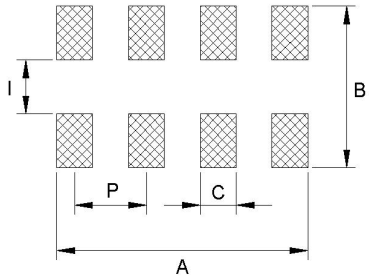
CN-42 / 43



CNA42 / 43



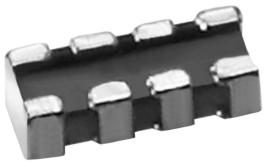
■Recommend Land Pattern



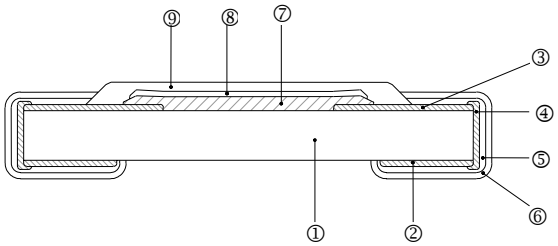
Unit: mm

Type	A	B	C	C1	I	I1	P	P1
CN-42	1.80	2.10	0.30	--	0.50	--	0.50	--
CN-43	2.85	3.10	0.45	--	0.80	--	0.80	--
CNA42	1.80	2.10	0.30	--	0.50	--	0.50	--
CNA43	2.85	3.10	0.45	--	0.80	--	0.80	--

Thick Film Flat Array Chip Resistor－CN-21 & CN-41



■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/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)

■Features

－Contribute to higher-density mounting and reduction in size of devices by remarkably PCB
－Contribute to the size reduction of small electronic equipment such as Mobile phone, HDD
－Reduced the mounting time by decreasing the number of components
－Suitable for IR reflow soldering

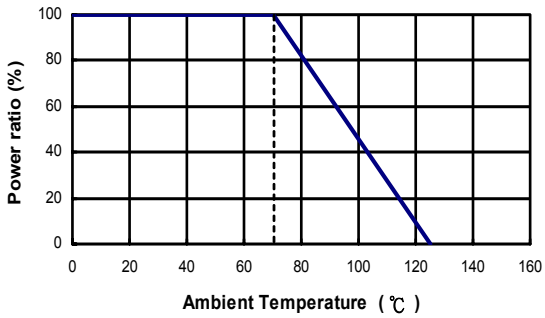
■Part Numbering

CN-	41	J	L	6	----1K
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	21: 0201x2 41: 0201x4	J: ±5%	L: 8P4R / 4P2R	6: 7” Reel 10Kpcs F: Bulk	----1K: 1KΩ ---3K3: 3.3KΩ ---10K: 10KΩ “-” to fill up 6 spaces

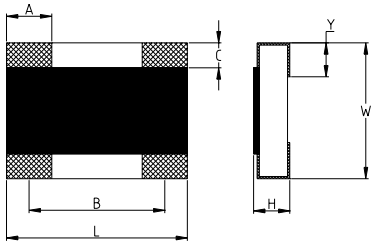
■Applications

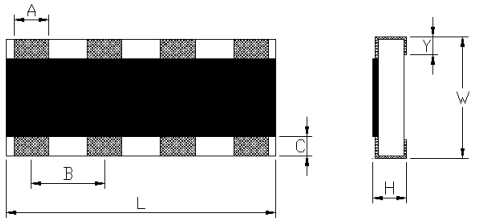
－Pull-up/pull-down resistors for digital circuits
－Used in interface circuits of LCD displays, memory modules, etc.
－Communication Equipments

■Derating Curve



■Dimensions





Unit: mm

Type	Number of Resistors	L	W	H	A	B	C	Y	Weight (g) (1000pcs)
CN-21	2	0.80±0.10	0.60±0.10	0.35±0.10	0.30±0.10	0.50±0.10	0.15±0.10	0.15±0.10	0.500
CN-41	4	1.40±0.10	0.60±0.10	0.35±0.10	0.20±0.10	0.40±0.1	0.10±0.07	0.15±0.05	0.833

■Standard Electrical Specifications

Item / Type	Power Rating / Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range ±5%	TCR (PPM/°C)
CN-21	1/32W	-55 ~ +125°C	12.5V	25V	2	10Ω - 1MΩ	±200
Jumper	0.5A					0Ω (<50mΩ)	
CN-41	1/32W	-55 ~ +125°C	12.5V	25V	4	10Ω - 1MΩ	±200
Jumper	0.5A					0Ω (<50mΩ)	

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage Listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage Listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

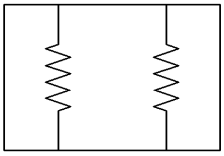
■Environmental Characteristics

Item	Requirement ±5%	Requirement Jumper	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(2.0%+0.1Ω)	<50mΩ	2.5 times RCWV or Max. overload voltage for 5 seconds
Insulation Resistance	≧10G		Max. overload voltage for 1 minute
Endurance	±(3.0%+0.1Ω)	<100mΩ	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(3.0%+0.1Ω)	<50mΩ	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	±(3.0%+0.1Ω)	<100mΩ	at +125°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	<50mΩ	Bending once for 5 seconds with 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times RCWV (RMS) for 1 minute
Rapid Change of Temperature	±(1.0%+0.05Ω)	<50mΩ	-55°C to +125°C, 5 cycles

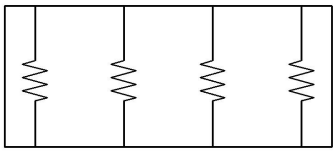
■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1

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

■Equivalent Circuit Diagram



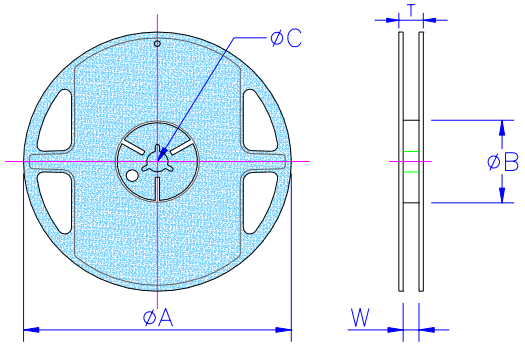
CN-21



CN-41

■Packaging

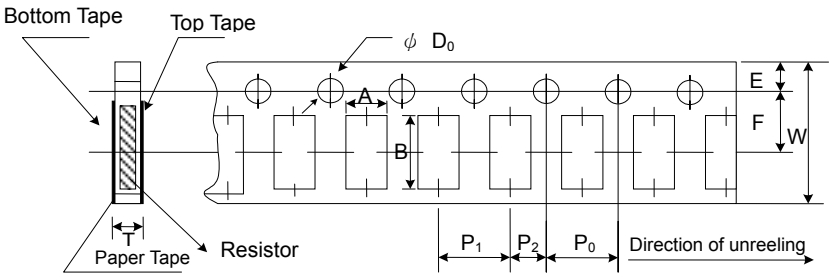
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CN-21	Paper	10K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
CN-41	Paper	10K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5

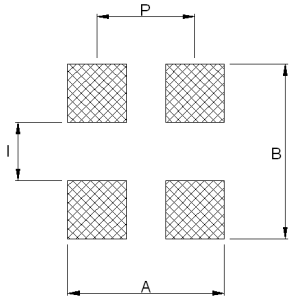
Paper Tape Specifications



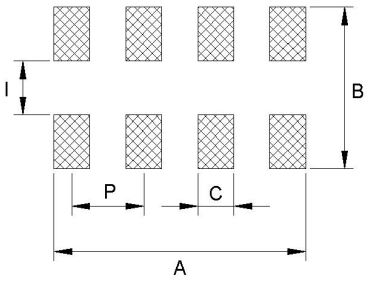
Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CN-21	0.77±0.05	0.97±0.05	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	$1.5^{+0.1}_{-0}$	0.50±0.10
CN-41	0.77±0.05	1.57±0.05	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	$1.5^{+0.1}_{-0}$	0.50±0.10

■Recommend Land Pattern



CN-21



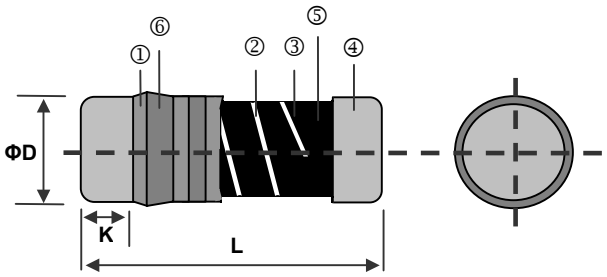
CN-41

Unit：mm

Type	A	B	C	I	P
CN-21	0.80	0.90	--	0.30	0.50
CN-41	1.40	0.90	0.20	0.30	0.40

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 ±0.1%
－Extremely low TCR down to ±10 PPM/°C
－High power rating up to 1 Watts

■Dimensions

Unit: mm

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

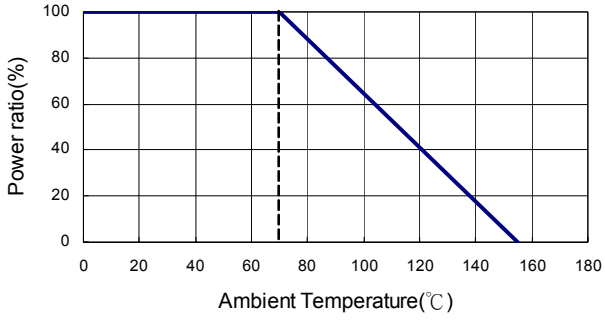
■Applications

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

■Part Numbering

CSR	0204	D	T	D	V	1000
Product Type	Dimensions (L×ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0204: 3.5x1.4 0207: 5.9x2.2	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% J: ±5%	T: Taping Reel B: Bulk	B: ±10 N: ±15 C: ±25 D: ±50 E: ±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	-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
	Jumper: 2A				0Ω(<15mΩ)					-
0207	1/2W	-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
	Jumper: 4A				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		±100

■Environmental Characteristics

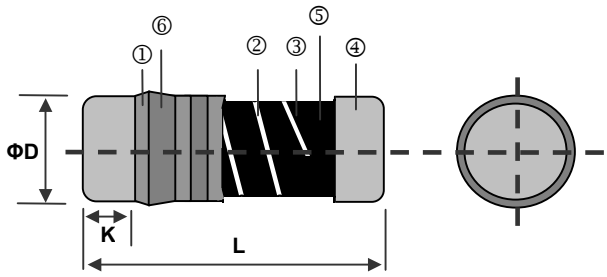
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(0.15%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	≥10G	Max. overload voltage for 1 minute
Endurance	±(0.5%+0.05Ω)	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Damp Heat with Load	±(1%+0.05Ω)	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%+0.05Ω)	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**

Carbon Film Resistor—CFS Series

■Construction



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

■Features

- SMD style carbon resistor
- Free direction for mounting due to cylindrical design
- High solder ability due to specially plated electrodes
- Electrodes strength is higher than flat chip resistors
- Lower current noise than thick film flat chip resistors
- Suitable for reflow, flow and iron soldering

■Dimensions

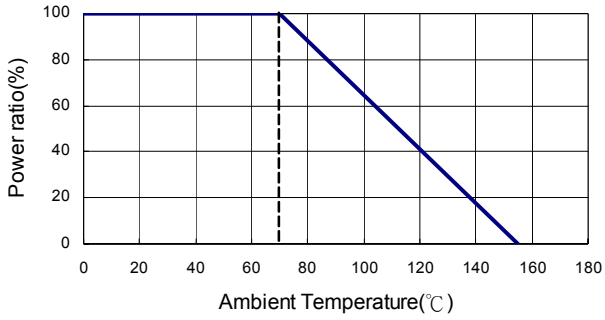
Unit: mm

Type	L	ΦD	K min.	Wight (g) (1000pcs)	Packaging	
					180mm/7″	330mm/13″
CFS0204	3.50±0.20	1.40±0.15	0.5	19	3,000EA	—
CFS0207	5.90±0.20	2.20±0.20	0.5	81	2,000EA	—
CFS0309	8.50±0.20	3.20±0.20	0.5	95	—	2,500EA

■Applications

- Automotive
- Telecommunication
- Medical Equipment
- Consumer Product

■Derating Curve



■Part Numbering

CFS	0204	G	T	-	V	1000
Product Type	Dimensions (L×ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0204: 3.5x1.4 0207: 5.9x2.2 0309: 8.5x3.2	G: ±2% J: ±5%	T: Taping Reel B: Bulk	-: No specified	S: 2W T: 1W U: 1/2W V: 1/4W	0010: 1Ω 1R20: 1.2Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range	
					±2%	±5%
0204	1/4W	-55 ~ +155°C	250V	500V	1Ω - 1MΩ	
0207	1/2W		300V	600V	1Ω - 1MΩ	
0309	1W		350V	700V	1Ω - 1MΩ	

■High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range	
					±2%	±5%
0207	1W	-55 ~ +155°C	350V	700V	1Ω - 1MΩ	
0309	2W		350V	700V	1Ω - 1MΩ	

■Environmental Characteristics

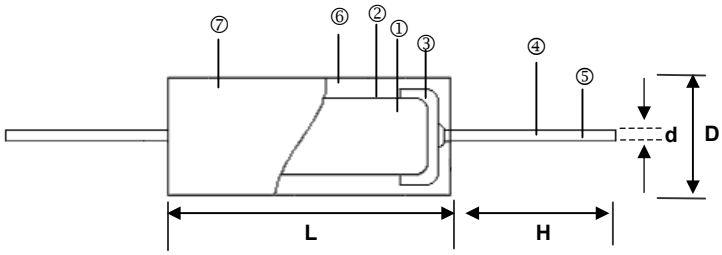
Item	Requirement	Test Method
Short Time Overload	△R±1%	RCWV*2.5 or Max. overload voltage for 5 seconds
Endurance	△R±3%	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Damp Heat with Load	△R±5%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Dry Heat	△R±2%	at +155°C for 1000 hrs
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	△R±1%	260±5°C for 10 seconds

■ **Reference Standards: JIS-C 5201-1**

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

High Precision Metal Film Leaded Resistor－MFD Series

■Construction



①	Ceramic Core (Alumina ceramic)	⑤	Lead Wire (Tinned annealed copper wire)
②	Resistor Element (Nickel alloy)	⑥	Molding (Expose)
③	Terminal (Tinned iron cap)	⑦	Marking (Expose based ink)
④	Connection		

■Features

－Very tight tolerance down to ±0.02%
－Extremely low TCR down to ±5PPM/°C
－High precision
－Excellent stability

■Applications

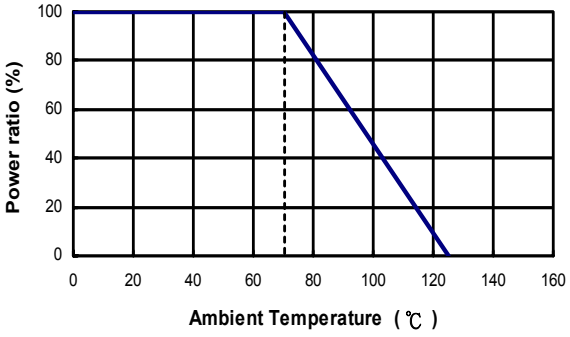
－Precision Equipment
－Measurement Equipment

■Dimensions

Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)	Packaging
						Ammo
MFD0727	7.0±0.3	2.7±0.4	26±3	0.6±0.05	230	2,000
MFD1040	10.2±0.3	4.0±0.4	25±3	0.6±0.05	430	1,000

■Derating Curve



■Part Numbering

MFD	0727	B	A	C	V	1001
Product Type	Dimensions (L×D)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0727: 7.0x2.7 1040: 10.2x4.0	Q: ±0.02% A: ±0.05% B: ±0.1%	A: Ammo B: Bulk	S: ±5 B: ±10 N: ±15 C: ±25	U: 1/2W V: 1/4W	0100: 10Ω 2201: 2200Ω 1002: 10000Ω 1001: 1KΩ 1004: 1MΩ

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.02%	±0.05%	±0.1%	
0727	1/4W	-55 ~ +125°C	250V	500V	10Ω - 500KΩ			±5
					10Ω - 1MΩ			±10 ±15 ±25
1040	1/2W		300V	600V	10Ω – 500KΩ			±5
					10Ω - 1MΩ			±10 ±15 ±25

Operating Voltage =$\sqrt{}$(P*R)

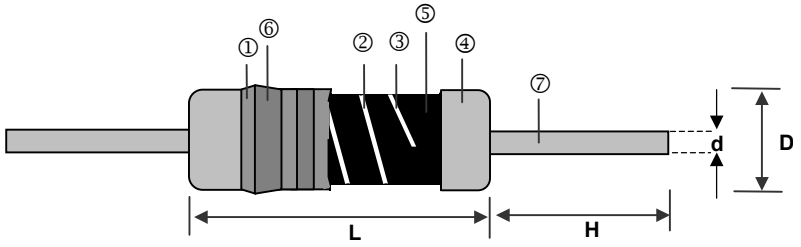
■Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Resistance value at room temperature and room temperature+60°C
Short Time Overload	±(0.05%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	> 1,000MΩ	Apply 500V_{DC} for 1 minute
Endurance	±(0.2%+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	±(0.2%+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”
Solderability	95% min. coverage	245±5°C for 5 seconds
Resistance to Soldering Heat	±(0.05%+0.01Ω)	350±10°C for 3 seconds or 260±5°C for 10 seconds
Terminal Strength	Tensile: ≧2.5kg	Tensile strength: for 10 sec. Torsional strength: Rotated through 360˚, 5 rotations
Pulse Overload	±(0.1%+0.01Ω)	4 times RCWV for 10000 cycles with 1second “ON” and 25 seconds “OFF”
Temperature Cycle	±(0.05%+0.05Ω)	-25℃(30min.)/+85℃(30min.), 5 cycles
Resistance to Solvent	No deterioration of coatings and markings	Trichroethane for 3 min. with ultrasonic

■ **Reference Standards: MIL-STD-202, JIS-C 5201-1**
■ **Storage Temperature: 25±3°C; Humidity < 80%RH**

Metal Film Leaded Precision Resistor－MFR Series

■Construction



①	Insulation Coating (Expose resin)	⑤	Resistor Layer (Nickel alloy)
②	Trimming Line	⑥	Marking (Expose)
③	Ceramic Rod (Alumina ceramic)	⑦	Lead Wire (Tinned annealed copper wire)
④	Electrode Cap (Tinned iron cap)		

■Features

－Excellent overall stability
－Very tight tolerance down to ±0.05%
－Extremely low TCR down to ±5 PPM/°C
－High power rating up to 3 Watts
－Excellent ohmic contact

■Applications

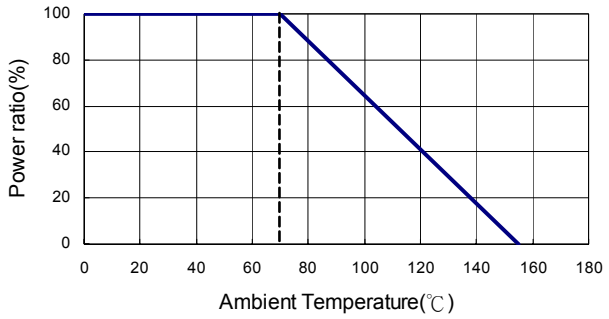
－Automotive
－Telecommunication
－Medical Equipment

■Dimensions

Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)
MFR0318	3.3+0.7/-0.2	1.8±0.30	29±2.0	0.45±0.03	90
MFR0623	6.3±0.5	2.3±0.30	28±2.0	0.55±0.03	150
MFR0932	9.0±0.5	3.2±0.50	26±2.0	0.65±0.03	350
MFR1145	11.5±1.0	4.5±0.50	35±2.0	0.78±0.03	770
MFR1550	15.5±1.0	5.0±0.50	32±2.0	0.78±0.03	1040

■Derating Curve



■Part Numbering

MFR	0318	B	T	N		1001	MA
Product Type	Dimensions (L×D)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Special
	0318: 3.3x1.8 0623: 6.3x2.3 0932: 9.0x3.2 1145: 11.5x4.5 1550: 15.5x5.0	A: ±0.05% B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	A: Ammo B: Bulk T: Taping Reel	S: ±5 B: ±10 N: ±15 C: ±25 D: ±50 E: ±100	: Standard R: 3W S: 2W T: 1W U: 1/2W V: 1/4W F: 3/5W G: 2/5W W: 1/8W	R100: 0.1Ω 0010: 1Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ	: Standard MA: MA-type MB: MB-type MC: MC-type FA: FA-type FB: FB-type FC: FC-type

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±0.05%	±0.1%	±0.25%	±0.5%	±1%	TCR (PPM/°C)
0318	1/8W	-55 ~ +155°C	200V	400V	-	10Ω-1MΩ		10Ω-4.99MΩ		±15
						10Ω-1MΩ		10Ω-10MΩ		±25 ±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
0623	1/4W	-55 ~ +155°C	250V	500V	10Ω-1MΩ					±5 ±10
					10Ω-1MΩ			10Ω10MΩ		±15 ±25
					-	10Ω-1MΩ		10Ω-10MΩ		±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
0932	1/2W	-55 ~ +155°C	350V	700V	10Ω-1MΩ					±5 ±10
					10Ω-1MΩ			10Ω-10MΩ		±15 ±25
					-	10Ω-1MΩ		10Ω-10MΩ		±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
1145	1W	-55 ~ +155°C	450V	1000V	-	10Ω-1MΩ		10Ω-4.99MΩ		±15
						10Ω-1MΩ		10Ω-10MΩ		±25 ±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
1550	2W	-55 ~ +155°C	500V	1000V	-	10Ω-1MΩ		10Ω-4.99MΩ		±15
						10Ω-1MΩ		10Ω-10MΩ		±25 ±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100

■High Power & Ultra High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±0.05%	±0.1%	±0.25%	±0.5%	±1%	TCR (PPM/°C)
0318	1/4W	-55 ~ +155°C	200V	400V	-	10Ω-1MΩ		10Ω-4.99MΩ		±15
						10Ω-1MΩ		10Ω-10MΩ		±25 ±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
	2/5W		250V	500V	-	10Ω-1MΩ		10Ω-4.99MΩ		±15
						10Ω-1MΩ		10Ω-10MΩ		±25 ±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
0623	1/2W	-55 ~ +155°C	300V	600V	10Ω-1MΩ					±5 ±10
					10Ω-1MΩ			10Ω-10MΩ		±15 ±25
					-	10Ω-1MΩ		10Ω-10MΩ		±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
	3/5W		350V	700V	-	10Ω-1MΩ		10Ω-4.99MΩ		±15
						10Ω-1MΩ		10Ω-10MΩ		±25
						10Ω-1MΩ		10Ω-10MΩ	1Ω-10MΩ	±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100

■High Power & Ultra High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/°C)
					±0.05%	±0.1%	±0.25%	±0.5%	±1%	
0932	1W	-55 ~ +155°C	400V	800V	10Ω-1MΩ					±5 ±10
					10Ω-1MΩ			10Ω-10MΩ		±15 ±25
					-	10Ω-1MΩ		10Ω-10MΩ		±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
1145	2W	-55 ~ +155°C	500V	1000V	-	10Ω-1MΩ		10Ω-4.99MΩ		±15
					-	10Ω-1MΩ		10Ω-10MΩ		±25 ±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100
1550	3W	-55 ~ +155°C	500V	1000V	-	10Ω-1MΩ		10Ω-4.99MΩ		±15
					-	10Ω-1MΩ		10Ω-10MΩ		±25 ±50
					-		1Ω-1MΩ	1Ω-10MΩ	0.1Ω-10MΩ	±100

■Environmental Characteristics

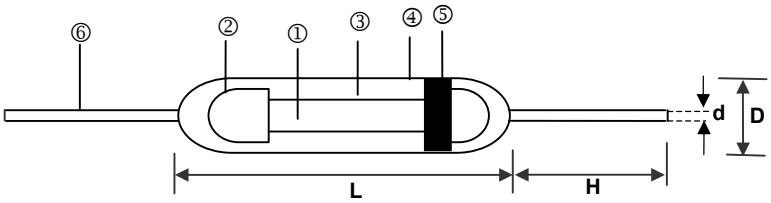
Item	Requirement	Test Method
Short Time Overload	±0.25%	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	＞1000MΩ	Apply 100V_{DC} for 1 minute
Endurance	±0.2%	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Damp Heat with Load	±0.3%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Solderability	90% min. Coverage	245±5°C for 3 seconds
Temperature Coefficient	By Type	Resistance value at room temperature and room temperature+100°C
Pulse Overload	±0.75%	4 times RCWV for 10000 cycles with 1 second “ON” and 25 seconds “OFF”
Resistance To Solvent	No deterioration of coatings and markings	Trichroethane for 1 min. with ultrasonic
Terminal Strength	Tensile: ≧ 2.5kg	Direct Load for 10 sec. In the direction off the terminal leads
Shelf life	△R=±0.1%	12 months at room temperature 25±3°C, 80%RH Max.

■ **Reference Standards: MIL-STD-202, JIS-C 5201-1**

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

Metal Oxide Film Leaded Resistor－MOF Series

■Construction



①	Ceramic Rod	④	Non-flame Paint With Sol Vent-proof
②	Tinned Iron Caps	⑤	Color Code
③	Metal Outside	⑥	Lead Wire

■Features

－Excellent Long-Time stability
－High surge / overload capability
－Wide resistance range: 0.1Ω~10MΩ
－Controlled temperature coefficient
－Resistance standard tolerance: ±5% (consult factory for ±2% ±1%)
－Electrical and mechanical stability and high reliability

■Dimensions

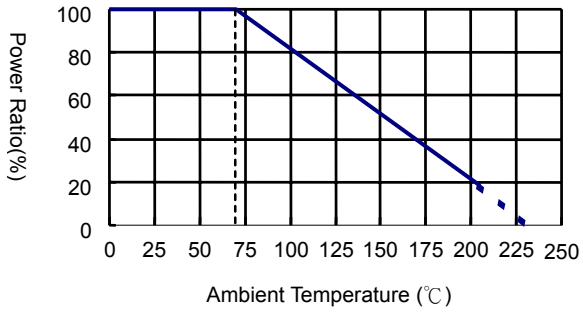
Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)
MOF0623	6.3±0.5	2.3±0.3	28±2.0	0.55±0.03	156
MOF0932	9.0±0.5	3.2±0.5	26±2.0	0.65±0.03	355
MOF1145	11.5±1.0	4.5±0.5	35±2.0	0.78±0.03	760
MOF1550	15.5±1.0	5.0±0.5	32±2.0	0.78±0.03	1040

■Applications

－Automotive
－Telecommunication
－Medical Equipment

■Derating Curve



■Part Numbering

MOF	0623	F	A	F	U	1001	MA
Product Type	Dimensions (L×D)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Special
	0623: 6.3x2.3 0932: 9.0x3.2 1145: 11.5x4.5 1550: 15.5x5.0	F: ±1% G: ±2% J: ±5%	A: Ammo B: Bulk T: Taping Reel	F: ±200	: Standard R: 3W S: 2W T: 1W U: 1/2W	R500: 0.5Ω 0010: 1Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ	: Standard MA: MA-type MB: MB-type MC: MC-type FA: FA-type FB: FB-type FC: FC-type

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range			TCR (PPM/°C)
						±1%	±2%	±5%	
0623	1/4W	-55 ~ +155°C	200V	350V	350V	0.1Ω - 10MΩ		0.1Ω-22MΩ	±200
0932	1/2W		250V	400V	350V	0.1Ω - 1MΩ	0.1Ω - 10MΩ		
1145	1W		500V	600V	500V	0.1Ω - 1MΩ	0.1Ω - 10MΩ		
1550	2W		550V	600V	500V	0.1Ω - 1MΩ	0.1Ω - 10MΩ		

■High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range			TCR (PPM/°C)
						±1%	±2%	±5%	
0623	1/2W	-55 ~ +155°C	250V	400V	350V	0.1Ω - 10MΩ			±200
0932	1W		300V	500V	400V	0.1Ω - 1MΩ	0.1Ω - 10MΩ		
1145	2W		500V	600V	500V	0.1Ω - 1MΩ	0.1Ω - 10MΩ		
1550	3W		750V	700V	600V	0.1Ω - 1MΩ	0.1Ω - 10MΩ		

■ Resistor body color: Standard Power Rating: Grey High Power Rating: Pink

■Environmental Characteristics

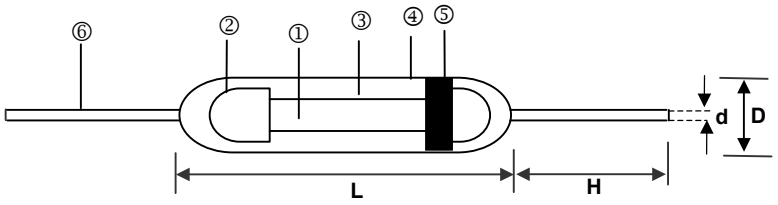
Item	Requirement	Test Method
Short Time Overload	±(0.25%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	＞1000MΩ	Apply 100V_{DC} for 1 minute
Endurance	±(1.5%+0.05Ω)	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Damp Heat with Load	±(1.5%+0.05Ω)	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Solderability	90% min. Coverage	245±5°C for 3 seconds
Dielectric Withstanding Voltage	By Type	Apply Max. Overload Voltage for 1 minute
Temperature Coefficient	By Type	Resistance value at room temperature and room temperature+100°C
Pulse Overload	±(1%+0.05Ω)	4 times RCWV for 10000 cycles with 1second “ON” and 25 seconds “OFF”
Resistance To Solvent	No deterioration of coatings and markings	Trichroethane for 1 min. with ultrasonic
Terminal Strength	Tensile: ≧2.5kg	Direct Load for 10 seconds In the direction off the terminal leads

■ **Reference Standards: JIS-C 5201-1**

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

Carbon Film Leaded Resistor－CFR Series

■Construction



①	Ceramic Rod	④	Non-flame Paint With Sol Vent-proof
②	Tinned Iron Caps	⑤	Color Code
③	Carbon Film	⑥	Lead Wire

■Features

－The most economic industrial investment
－Standard tolerance: ±5% (available ±2%)
－Excellent long term stability
－Termination: Standard solder-plated copper lead

■Applications

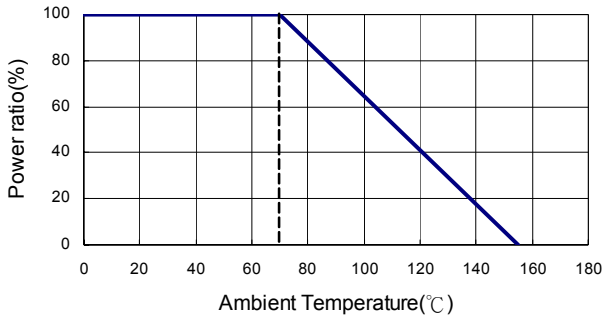
－Automotive
－Telecommunication
－Medical Equipment

■Dimensions

Unit: mm

Type	L	D	H	d	Weight (g) (1000pcs)
CFR0318	3.3+0.4/-0.2	1.8±0.3	29±2.0	0.41~0.48	92
CFR0623	6.3±0.5	2.3±0.3	28±2.0	0.43~0.58	155
CFR0932	9.0±0.5	3.2±0.5	26±2.0	0.58~0.68	352
CFR1145	11.5±1.0	4.5±0.5	35±2.0	0.68~0.81	775
CFR1550	15.5±1.0	5.0±0.5	32±2.0	0.75~0.81	1042

■Derating Curve



■Part Numbering

CFR	0318	J	T	-	W	1001	MA
Product Type	Dimensions (L×D)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Special
	0318: 3.3x1.8 0623: 6.3x2.3 0932: 9.0x3.2 1145: 11.5x4.5 1550: 15.5x5.0	G: ±2% J: ±5%	A: Ammo B: Bulk T: Taping Reel	-:No specified	: Standard R: 3W S: 2W T: 1W U: 1/2W V: 1/4W W: 1/8W	R500: 0.5Ω 0010: 1Ω 1000: 100Ω 2201: 2200Ω 1001: 1KΩ 1004: 1MΩ	: Standard MA: MA-type MB: MB-type MC: MC-type FA: FA-type FB: FB-type FC: FC-type

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	
						±2%	±5%
0318	1/8W	-55 ~ +155°C	150V	300V	300V	—	0.1Ω - 22MΩ
0623	1/4W		250V	500V	500V	1Ω - 10MΩ	
0932	1/2W		350V	700V	700V	1Ω - 10MΩ	
1145	1W		450V	1000V	1000V	—	0.1Ω - 10MΩ
1550	2W		500V	1000V	1000V	1Ω - 10MΩ	

■High Power Rating Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Resistance Range	
						±2%	±5%
0318	1/4W	-55 ~ +155°C	200V	400V	400V	—	1Ω - 10MΩ
0623	1/2W		300V	500V	500V	—	0.1Ω - 22MΩ
0932	1W		400V	800V	800V	1Ω - 10MΩ	
1145	2W		500V	1000V	1000V	—	0.1Ω - 10MΩ
1550	3W		500V	1000V	1000V	1Ω - 10MΩ	

■ Resistor body color:

Standard power rating: Light Brown

High power rating 0318 size: Light Brown is available only other sizes: Light Brown or Pink are available.

Please specify which color is acceptable else the light brown is a top priority.

■Environmental Characteristics

Item	Requirement	Test Method
Short Time Overload	±(0.75%+0.05Ω)	RCWV*2.5 or Max. overload voltage for 5 seconds
Insulation Resistance	＞1000MΩ	Apply 100V_{DC} for 1 minute
Endurance	±(3%+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	≦100KΩ±3% ≧100KΩ±5%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Solderability	90% min. coverage	245±5°C for 3 seconds
Dielectric Withstanding Voltage	By Type	Apply Max. overload voltage for 1 minute
Temperature Coefficient	< 100KΩ +350ppm~-500ppm 100KΩ~1MΩ -0ppm~-700ppm > 1 MΩ -0ppm~-1500ppm	Resistance value at room temperature and room temperature+100°C
Pulse Overload	±(1%+0.05Ω)	4 times RCWV for 10000 cycles with 1 second “ON” and 25 seconds “OFF”
Resistance To Solvent	No deterioration of coatings and markings	Trichroethane for 1 min. with ultrasonic
Terminal Strength	Tensile: ≧2.5 kg	Direct Load for 10 seconds In the direction off the terminal leads

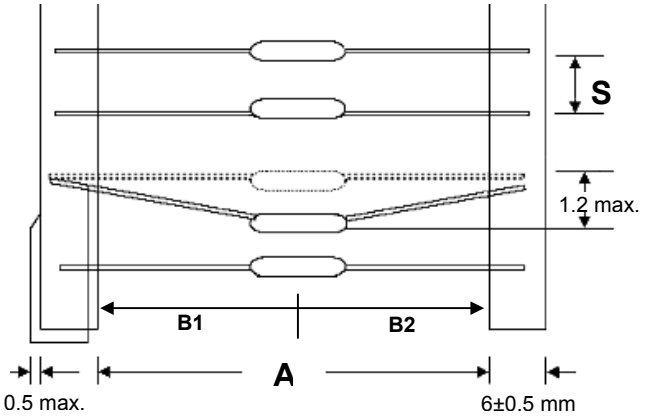
■ Reference Standards: MIL-STD-202, JIS-C 5201-1

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

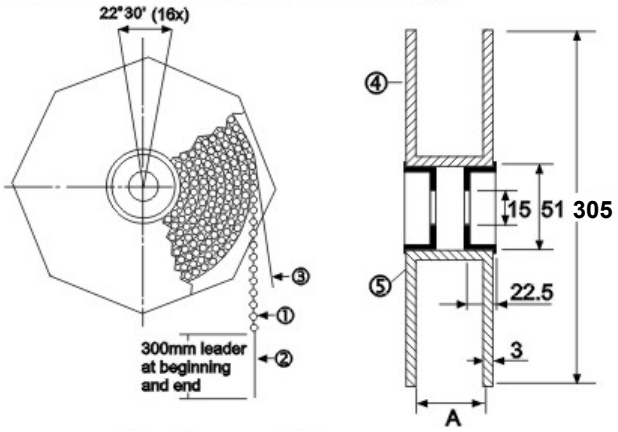
■Taping/Packing Specifications (For MFR / MOF / CFR)

1.Standard Type (Reel & Ammo)

Packing Methods



Reel Packing

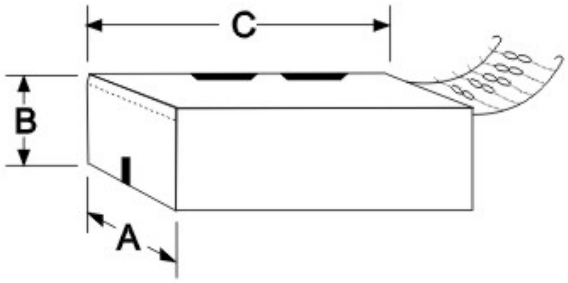


(1) Resistor (4) Flange
(2) Bandolier (5) Cylinder
(3) Paper

Unit: mm

Type	Packing Methods			Reel Packing			
	A	B1-B2	S	Across Flange (A)	MFR Qty	CFR Qty	MOF Qty
0318	52+1/-0	1.2	5	72	5,000	5,000	-
0623	52+1/-0	1.2	5	72	5,000	5,000	5,000
0932	52+1/-0	1.2	5	72	2,500	2,500	2,500
1145	52+1/-0	1.5	5	95	2,000	2,000	2,000
1550	52+1/-0	1.5	10	95	1,000	1,000	1,000

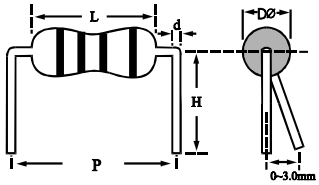
Ammo Packing



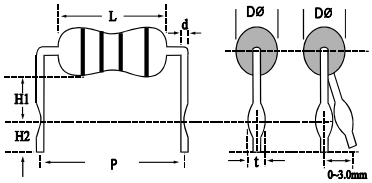
Unit: mm

Type	Packing Methods			Ammo Packing					
	A	B1-B2	S	A	B	C	MFR Qty	CFR Qty	MOF Qty
0318	26+1/-0	1.0	5	80	75	264	5,000	5,000	-
0623	26+1/-0	1.0	5	80	105	264	5,000	5,000	5,000
0932	52+1/-0	1.2	5	80	46	264	1,000	1,000	1,000
1145	73+1/-0	1.5	5	103	82	265	1,000	1,000	1,000
1550	73+1/-0	1.5	10	103	96	265	1,000	1,000	1,000

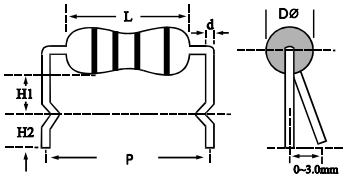
2. Special Type (Bulk)



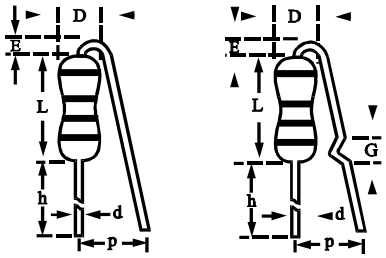
MA Type



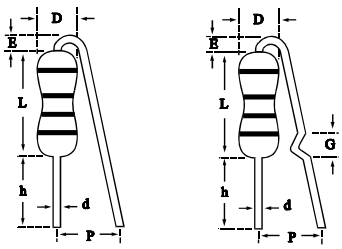
MB Type



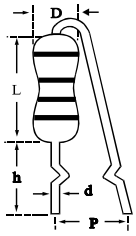
MC Type



FA Type



FB Type



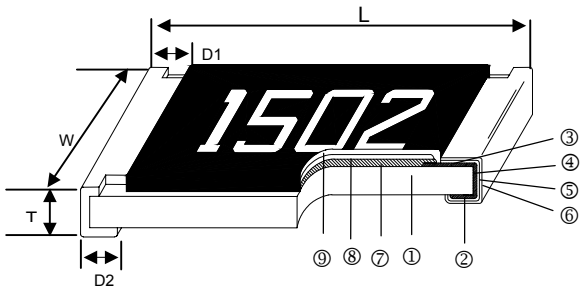
FC Type

Unit: mm

Product Type	Type	P	H /H1/h	H2/G	t	D	L	d	E
0318	MA	5.00±1	5.00±1	-	-	1.8±0.3	3.30±0.4	0.45±0.03	-
0623	MA	10.0±1	10.0±1	-	-	2.3±0.3	6.30±0.5	0.55±0.03	-
	FA	10.0±1	28.0±2	2.00±0.5	-	2.3±0.3	6.30±0.5	0.55±0.03	2.00±0.5
	FB	10.0±1	8.00±1	2.00±0.5	-	2.3±0.3	6.30±0.5	0.55±0.03	2.00±0.5
0932	MA	12.5±1	10.0±1	-	-	3.2±0.5	9.00±0.5	0.65±0.03	-
	FC	6.00±1	10.0±1	-	-	3.2±0.5	9.00±0.5	0.65±0.03	-
1145	MA	15.0±1	12.5±1	-	-	4.5±0.5	11.5±1.0	0.78±0.03	-
	MB	15.0±1	6.00±1	5.00±1.0	1.4±0.2	4.5±0.5	11.5±1.0	0.78±0.03	-
	MC	15.0±1	6.00±1	5.00±1.0	-	4.5±0.5	11.5±1.0	0.78±0.03	-
	FC	6.00±1	10.0±1	-	-	4.5±0.5	11.5±1.0	0.78±0.03	-
1550	MA	20.0±1	15.0±1	-	-	5.0±0.5	15.5±1.0	0.78±0.03	-
	MB	20.0±1	10.0±1	5.00±1.0	1.4±0.2	5.0±0.5	15.5±1.0	0.78±0.03	-
	MC	20.0±1	10.0±1	5.00±1.0	-	5.0±0.5	15.5±1.0	0.78±0.03	-
	FC	6.00±1	10.0±1	-	-	5.0±0.5	15.5±1.0	0.78±0.03	-

Automotive Grade Chip Resistor－CR..A Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/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)

■Features

－AEC-Q200 Compliance
－Highly reliable multilayer electrode construction
－Compatible with all soldering process

■Applications

－Automotive Industry
－Telecommunication Equipments
－Radio and Tape Recorders, TV Tuners
－Video Cameras, Watches, Pocket Calculators
－Computers, Instruments

■Dimensions

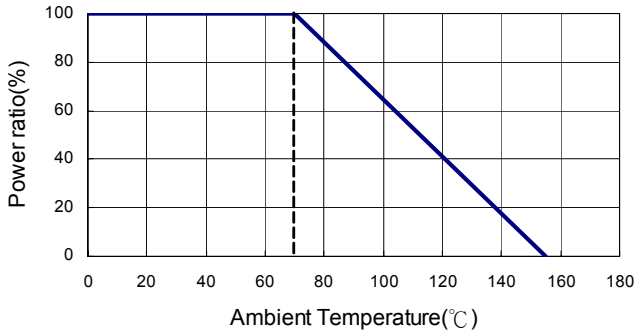
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CR-02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
CR-03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
CR-05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
CR-06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
CR-10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
CR-0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
CR-12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

■Part Numbering

CR-	03	F	A	7	- - -10R
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1% J: ±5%	A: Automotive Grade	4: 7" Reel 4Kpcs 6: 7" Reel 10Kpcs 7: 7" Reel 5Kpcs	- - - 1R2: 1.2Ω - - - 3K3: 3.3KΩ - - - 10K: 10KΩ - - 100K: 100KΩ "-" to fill up 6 spaces

■Derating Curve



■Standard Electrical Specifications

Item / Type	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/°C)
					±0.1%	±0.25%	±0.5%	±1%	±5%	
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	-			1Ω - 9.76Ω		±200
					-		10Ω - 1MΩ 1.02MΩ - 10MΩ			±100 ±200
					-			10.2MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±400
Jumper	1A				0Ω (<50mΩ)					-
CR-03 (0603)	1/10W	-55 ~ +155°C	75V	150V	-			1Ω - 9.76Ω		±200
					10Ω - 1MΩ					±100
					-	1.02MΩ - 10MΩ				±200
					-			10.2MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±400
Jumper	1A				0Ω (<50mΩ)					-
CR-05 (0805)	1/8W	-55 ~ +155°C	150V	300V	-			1Ω - 9.76Ω		±200
					10Ω - 1MΩ					±100
					-	1.02MΩ - 10MΩ				±200
CR-06 (1206)	1/4W		200V	400V	-			10.2MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±400
Jumper	2A				0Ω (<50mΩ)					-
CR-10 (1210)	1/3W	-55 ~ +155°C	200V	400V	-			1Ω - 9.76Ω		±200
					10Ω - 1MΩ					±100
					-	1.02MΩ - 10MΩ				±200
					-			10.2MΩ - 20MΩ 20.5MΩ - 39MΩ		±200 ±400
Jumper	2.5A				0Ω (<50mΩ)					-
CR-0A (2010)	3/4W	-55 ~ +155°C	200V	400V	-			1Ω - 9.76Ω		±200
					10Ω - 1MΩ					±100
					-	1.02MΩ - 10MΩ				±200
					-			10.2MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±400
Jumper	3.5A				0Ω (<50mΩ)					-
CR-12 (2512)	1W	-55 ~ +155°C	250V	500V	-			1Ω - 9.76Ω		±200
					10Ω - 1MΩ					±100
					-	1.02MΩ - 10MΩ				±200
					-			10.2MΩ - 20MΩ 20.5MΩ - 100MΩ		±200 ±400
Jumper	4A				0Ω (<50mΩ)					-

Operating Voltage=$\sqrt{}$(P*R) or Max. operating voltage listed above, whichever is lower.

Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

Item	Requirement			Test Method
	±1% and Below	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	RCWV*2.5 or Max. overload voltage for 5 seconds, 2 seconds for high power series
Insulation Resistance	≥10G			Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Biased Humidity	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 5 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Thermal Shock	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55C/+155°C. Note: Number of cycles required-300, Maximum transfer time-20 seconds, Dwell time-15minutes. Air-Air.
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%			260±5°C for 30 seconds
Temperature Cycling	±(0.5%+0.05Ω)	±(1.5%+0.05Ω)	<50mΩ	-55°C to +125°C, 1000 cycles
Moisture Resistance	±(2.0%+0.05Ω)	±(3.0%+0.05Ω)	<50mΩ	24 hrs/cycle
Mechanical Shock	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(1%+0.05Ω)			Human body, 2KV
Flame Retardance	Not flame			Temperature sensing at 500℃, voltage power subjected to 32VDC current clamped up to 500ADC and decreased in 1.0VDC/hour.
Resistance to solvents	Marking Unsmeared			Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal strength	No broken			Force of 1.8kg for 60 seconds.

■ **Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1, 6429; AEC-Q200; MIL-STD-202**

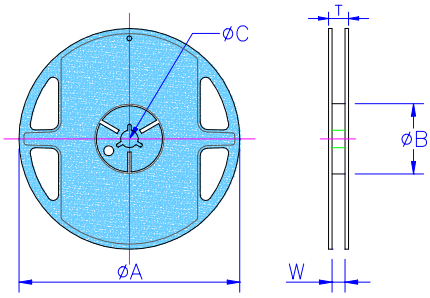
■ **Storage Temperature: 25±3°C; Humidity < 80%RH**

■Packaging

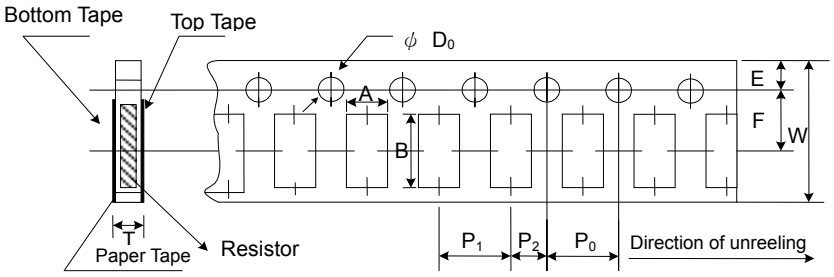
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CR-02	Paper	10K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
CR-03 CR-05 CR-06 CR-10		5K							
CR-0A CR-12	Embossed	4K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5



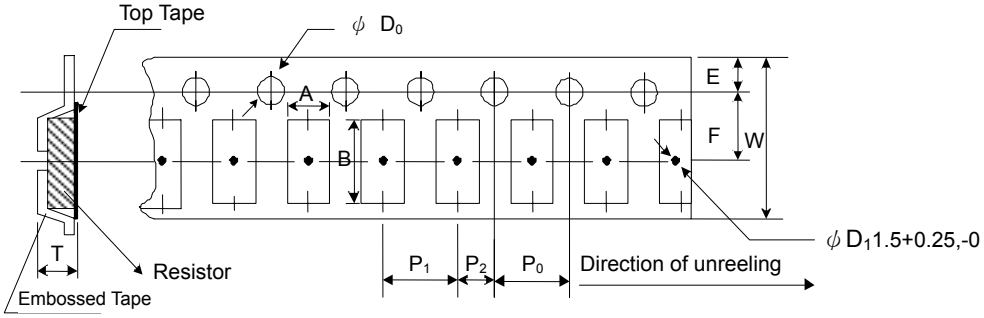
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CR-02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CR-03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
CR-05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CR-06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
CR-10	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

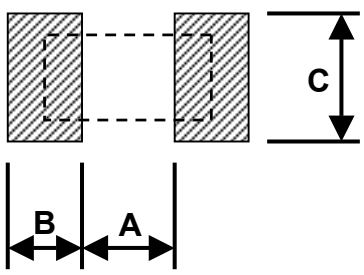


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CR-0A	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
CR-12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Recommend Land Pattern

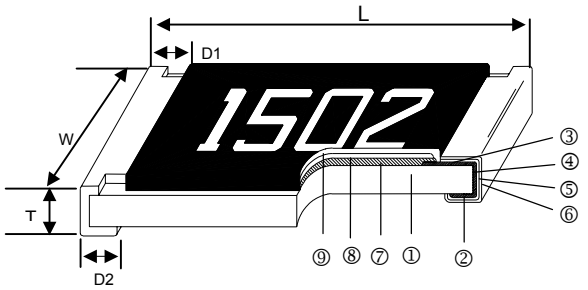
Unit: mm



Type	A	B	C
CR-02	0.50	0.45	0.60
CR-03	0.90	0.60	0.90
CR-05	1.20	0.70	1.30
CR-06	2.00	0.90	1.60
CR-10	2.00	0.90	2.80
CR-0A	3.80	0.90	2.80
CR-12	3.80	1.60	3.50

Automotive Grade Anti-Sulfurated Chip Resistor－AS..A Series

■Construction



①	Alumina Substrate	④	Edge Electrode (NiCr)	⑦	Resistor Layer (RuO_2/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)

■Features

－Special construction to prevent sulfuration in a sulfur containing environment
－AEC-Q200 Compliance

■Applications

－Automotive
－High-end Computer
－Industrial Equipment
－Automatic Equipment Controller
－Medical Equipment
－High-end Multimedia Electronics
－Outdoor Electronic Applications

■Dimensions

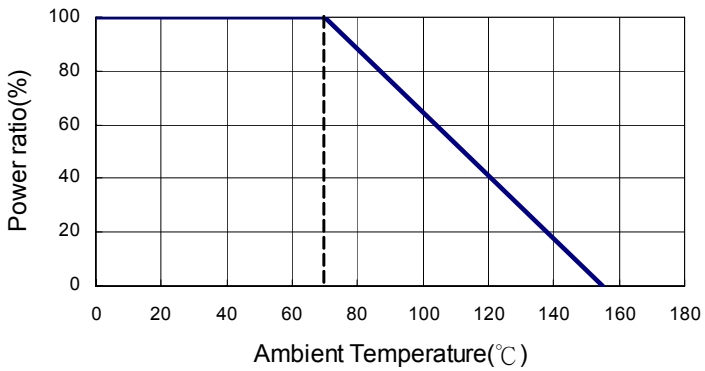
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
AS02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.20±0.10	0.620
AS03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.042
AS05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.368
AS06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.947
AS10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.959
AS0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.241
AS12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.448

■Part Numbering

AS	03	F	T	E	1002	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/℃)	Resistance	Making
	02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	D: ±0.5% F: ±1% J: ±5%	B: Bulk T: Taping Reel	E: ±100 F: ±200	1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ	: Standard A: Auto Grade

■Derating Curve



■Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±0.5%	Resistance Range ±1%	Resistance Range ±5%	TCR (PPM/°C)
AS02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				0Ω(<50mΩ)			-
AS03 (0603)	1/10W		50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				0Ω(<50mΩ)			-
AS05 (0805)	1/8W		150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				0Ω(<50mΩ)			-
AS06 (1206)	1/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				0Ω(<50mΩ)			-
AS10 (1210)	1/3W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2.5A				0Ω(<50mΩ)			-
AS0A (2010)	3/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 3.5A				0Ω(<50mΩ)			-
AS12 (2512)	1W		250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 4A				0Ω(<50mΩ)			-

Operating Voltage=$\sqrt{(P*R)}$ or Max. operating voltage listed above, whichever is lower.
Overload Voltage=2.5*$\sqrt{(P*R)}$ or Max. overload voltage listed above, whichever is lower.

■ Viking is capable of manufacturing the optional spec based on customer's requirement.

■Environmental Characteristics

Item	Requirement ±1% and Below	Requirement ±5%	Requirement Jumper	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	±(2.0%+0.05Ω)	<50mΩ	2.5 times RCWV or Max. overload voltage for 5 seconds
Insulation Resistance	≧10G			Max. overload voltage for 1 minute
Endurance	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	70±2°C, Max. working voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Biased Humidity	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Bending Strength	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 5 seconds 2010, 2512 sizes: 2 mm Other sizes: 3mm

■Environmental Characteristics

Item	Requirement			Test Method
	1% and Below	5%	Jumper	
Thermal Shock	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	-55C/+155°C. Note: Number of cycles required-300, Maximum transfer time-20 seconds, Dwell time-15minutes. Air-Air.
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times RCWV (RMS) for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦10%			260±5°C for 30 seconds
Temperature Cycling	±(0.5%+0.05Ω)	±(1.5%+0.05Ω)	<50mΩ	-55°C to +125°C, 1000 cycles
Moisture Resistance	±(2.0%+0.05Ω)	±(3.0%+0.05Ω)	<50mΩ	24 hrs/cycle
Mechanical Shock	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(1%+0.05Ω)			Human body, 2KV
Flame Retardance	Not flame			Temperature sensing at 500℃, voltage power subjected to 32VDC current clamped up to 500ADC and decreased in 1.0VDC/hour.
Resistance to solvents	Marking Unsmeared			Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal strength	No broken			Force of 1.8kg for 60 seconds.
Sulfur Test	△R±0.5%		<50mΩ	3~5ppm H2S, 50±2°C, 91~93% R.H., no power rating for 1000 hrs

■ **Reference Standards: IEC60115-1, 60068-2-58; JIS-C 5201-1; ASTM-B-809; AEC-Q200 AEC-Q200; JIS-C-6429; MIL-STD-202; JESD22**

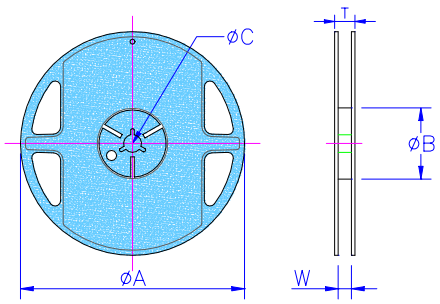
■ **Storage Temperature: 25±3°C; Humidity < 80%RH**

■Packaging

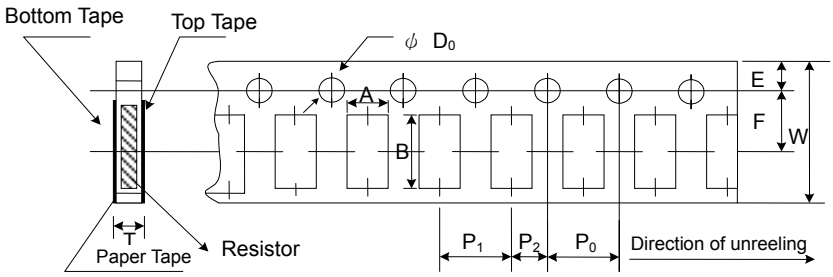
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
AS02	Paper	10K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
AS03 AS05 AS06 AS10		5K							
AS0A AS12	Embossed	4K	12mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.5	13.0±0.5	15.5±0.5



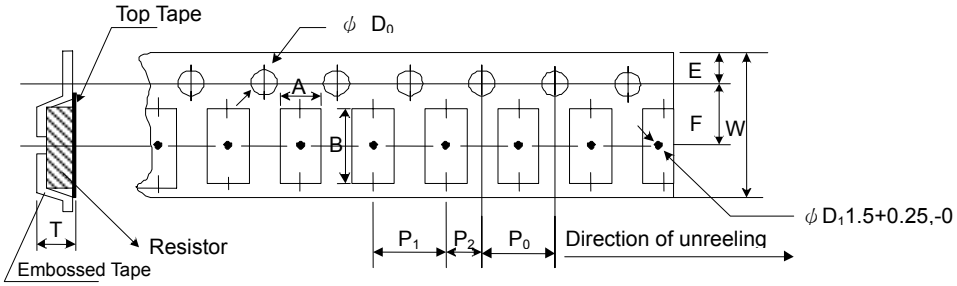
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	$ΦD_0$	T
AS02	0.65±0.10	1.15±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
AS03	1.10±0.10	1.90±0.10	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10
AS05	1.60±0.10	2.40±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
AS06	1.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10
AS10	2.90±0.10	3.50±0.20	8.0±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications

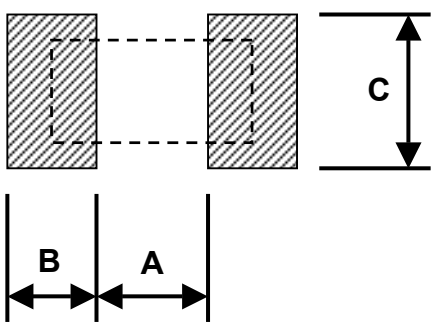


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	$ΦD_0$	T
AS0A	2.8±0.10	5.5±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}
AS12	3.5±0.10	6.7±0.10	12.0±0.30	1.75±0.10	5.5±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2^{+0}

■Recommend Land Pattern

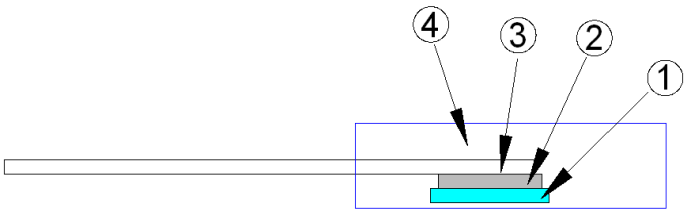
Unit: mm



Type	A	B	C
AS02	0.50	0.45	0.60
AS03	0.90	0.60	0.90
AS05	1.20	0.70	1.30
AS06	2.00	0.90	1.60
AS10	2.00	0.90	2.80
AS0A	3.80	0.90	2.80
AS12	3.80	1.60	3.50

TO-220 Power Resistor－TR20

■Construction



①	Alumina Substrate	③	Lead
②	Resistor Layer	④	Molding

■Features

－20 Watts at 25°C case temperature heat sink mounted
－TO-220 style power package
－Molded case for protection and easy to mount
－Electrically isolated case
－Non-Inductive design

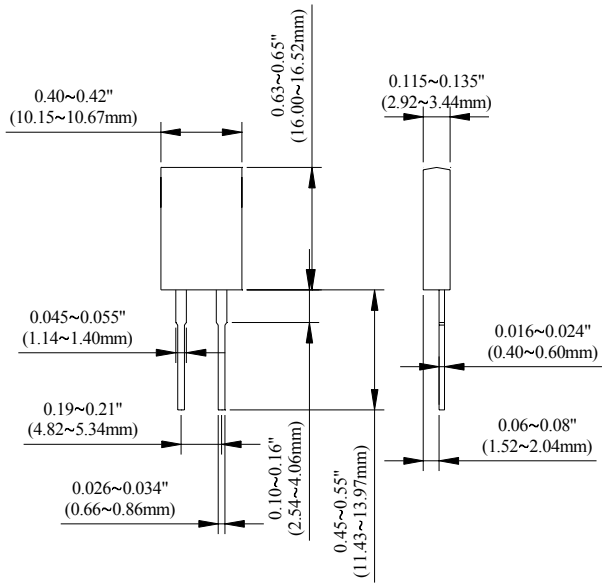
■Dimensions

Unit: mm

Type	Weight (g) (1000pcs)
TR20	1290

■Applications

－High Speed Switching Power Supplies
－Snubber Circuits
－Load Resistor for Pulse Generators
－Voltage Regulation
－VHF Amplifiers

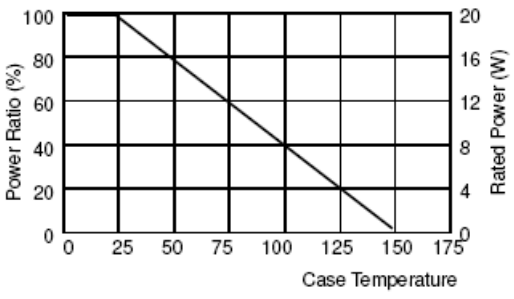


■Electrical Characteristics Specifications

Item / Type	Resistance Range ±0.5%	±1%	±5%	±10%	TCR (PPM/°C)
TR20	-	-	0.05Ω -1Ω		No Specified
	-	>1Ω -3Ω			±300
	-	>3Ω -10Ω			±100 ±200
	>10Ω –10KΩ				±50 ±100 ±200

- Operating Voltage: 350V max.
- Dielectric Strength: 1800VAC
- Insulation Resistance: 10GΩ min.
- Working Temperature Range: -65°C to +150°C
- Resistance Value <1Ω is available

■Derating Curve



■Part Numbering

TR	20	J	B	D	1001
Product Type	Power	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance
	20: 20 Watts	D: ±0.5% F: ±1% J: ±5% K: ±10%	B: Bulk	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1000Ω 1002: 10000Ω

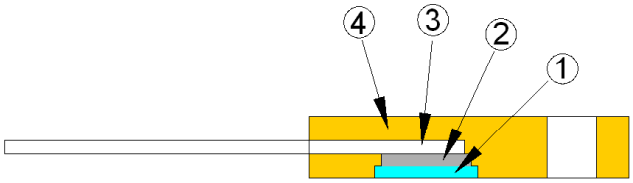
■Environmental Characteristics

Test Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Short Time Overload	ΔR±0.3%	2 times rated power with applied voltage not to exceed 1.5 times Maximum continuous operating voltage for 5 seconds
Load Life	ΔR±1.0%	2,000 hours at rated power
Damp Heat with Load	ΔR±0.5%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Solderability	90% min. coverage	245±5°C for 3 seconds
Thermal Shock	ΔR±0.3%	-65°C~150°C, 100 cycles
Terminal Strength	ΔR±0.2%	(Pull Test) 2.4N
Vibration, High Frequency	ΔR±0.2%	20g peak

- Lead Material: Tinned Copper
- Without a Heat Sink
- When in Free Air at 25°C, the TR20 is Rated for 3W
- The Case Temperature is to be used for the Definition of the Applied Power Limit
- The Case Temperature Measurement must be made with a Thermocouple Contacting the Center of the Component mounted on the Designed Heat Sink.
- Thermal Grease should be Applied Properly

TO-220 Power Resistor－TR30

■Construction



①	Alumina Substrate	③	Lead
②	Resistor Layer	④	Molding

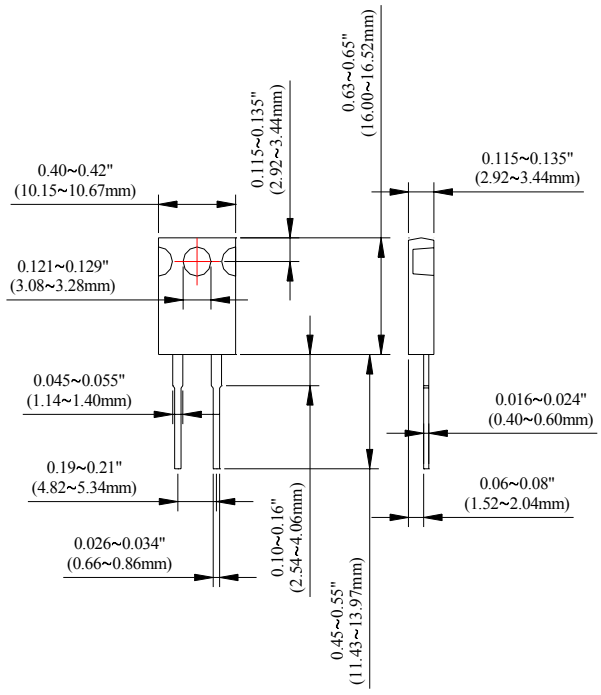
■Features

- 30 Watts at 25°C case temperature heat sink mounted
- TO-220 style power package
- Single screw mounting to heat sink
- Molded case for protection and easy to mount
- Electrically isolated case
- Non–Inductive design

■Dimensions

Unit: mm

Type	Weight (g) (1000pcs)
TR30	1155



■Applications

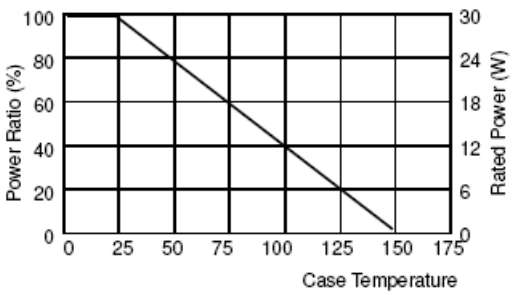
- Gate Resistors in Power Supplies
- Snubbers
- Load and Dumping Resistors in CRT Monitors
- Terminal Resistance in RF Power Amplifiers
- Voltage Regulation
- Low Energy Pulse Loading
- UPS

■Electrical Characteristics Specifications

Item / Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR30	-	-	0.05Ω -1Ω		No Specified
	-	>1Ω -3Ω			±300
	-	>3Ω -10Ω			±100 ±200
	>10Ω –10KΩ				±50 ±100 ±200

- Operating Voltage: 420V max.
- Dielectric Strength: 1800VAC
- Insulation Resistance: 10GΩ min.
- Working Temperature Range: -65°C to +150°C
- Resistance Value <1Ω is available

■Derating Curve



■Part Numbering

TR	30	J	B	D	1001
Product Type	Power	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance
	30: 30 Watts	D: ±0.5% F: ±1% J: ±5% K: ±10%	B: Bulk	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1000Ω 1002: 10000Ω

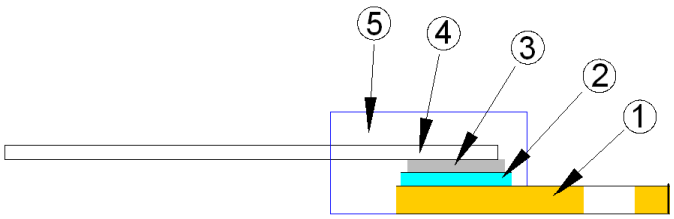
■Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Short Time Overload	ΔR±0.3%	2 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds
Load Life	ΔR±1.0%	2,000 hours at rated power
Damp Heat with Load	ΔR±0.5%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Solderability	90% min. coverage	245±5°C for 3 seconds
Thermal Shock	ΔR±0.3%	-65°C~150°C, 100 cycles
Terminal Strength	ΔR±0.2%	(Pull Test) 2.4N
Vibration, High Frequency	ΔR±0.2%	20g peak

- Lead Material: Tinned Copper
- Maximum Torque: 0.9 N-m
- When in Free Air at 25°C, the TR30 is Rated for 2.25W
- The Case Temperature is to be used for the Definition of the Applied Power Limit
- The Case Temperature Measurement must be made with a Thermocouple Contacting the Center of the Component mounted on the Designed Heat Sink.
- Thermal Grease should be Applied Properly

TO-220 Power Resistor－TR35

■Construction



①	Flange	④	Lead
②	Alumina Substrate	⑤	Molding
③	Resistor Layer		

■Features

- 35 Watts at 25°C case temperature heat sink mounted
- TO-220 style power package
- Single screw mounting to heat sink
- Molded case for protection and easy to mount
- Electrically isolated case
- Non-Inductive design

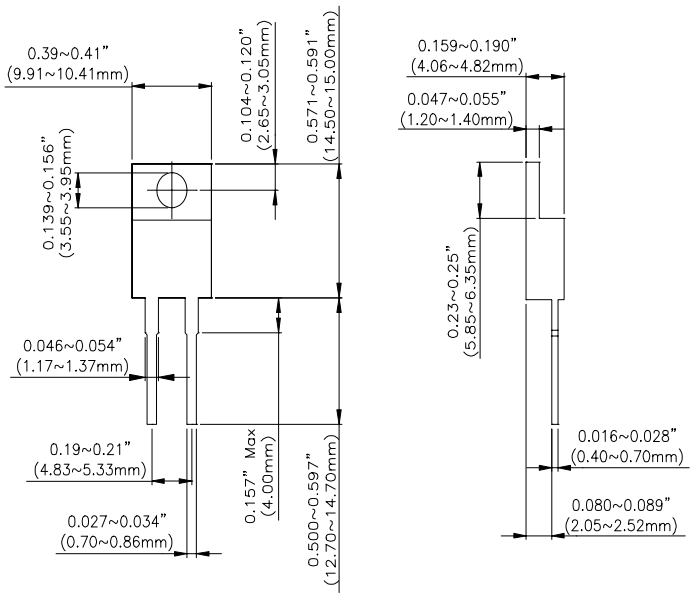
■Dimensions

Unit: mm

Type	Weight (g) (1000pcs)
TR35	1902

■Applications

- Switching Power Supplies
- Snubbers Circuits
- Automated Machine Controller
- RF Power Amplifiers
- Low Energy Pulse Loading
- UPS
- Voltage Regulation

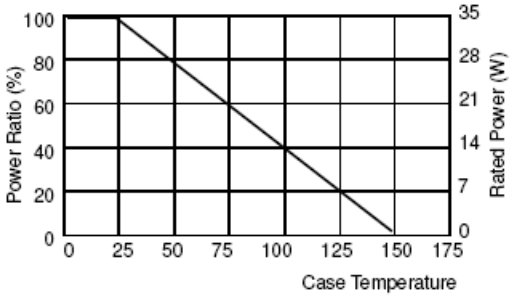


■Electrical Characteristics Specifications

Item / Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR35	-	-	0.05Ω -1Ω		No Specified
	-	>1Ω -3Ω			±300
	-	>3Ω -10Ω			±100 ±200
	>10Ω –10KΩ				±50 ±100 ±200

- Operating Voltage: 350V Max.
- Dielectric Strength: 1800VAC
- Insulation Resistance: 10GΩ min.
- Working Temperature Range: -65°C to +150°C
- Resistance Value <1Ω is available

■Derating Curve



■Part Numbering

TR	35	J	B	D	1001
Product Type	Power	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance
	35: 35 Watts	D: ±0.5% F: ±1% J: ±5% K: ±10%	B: Bulk	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1000Ω 1002: 10000Ω

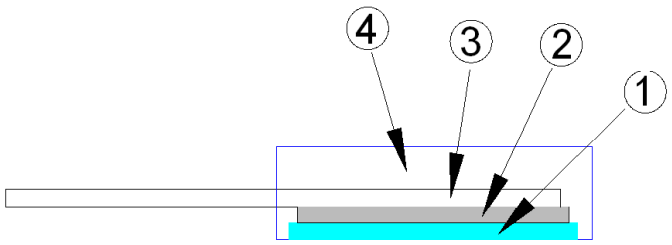
■Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Short Time Overload	ΔR±0.3%	2 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds
Load Life	ΔR±1.0%	2,000 hours at rated power
Damp Heat with Load	ΔR±0.5%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Solderability	90% min. coverage	245±5°C for 3 seconds
Thermal Shock	ΔR±0.3%	-65°C~150°C, 100 cycles
Terminal Strength	ΔR±0.2%	(Pull Test) 2.4N
Vibration, High Frequency	ΔR±0.2%	20g peak

- Lead Material: Tinned Copper
- Maximum Torque: 0.9 N-m
- Without a Heat Sink, When in Free Air at 25°C, the TR35 is Rated for 2.50W
- The Case Temperature is to be used for the Definition of the Applied Power Limit
- The Case Temperature Measurement must be made with a Thermocouple Contacting the Center of the Component mounted on the Designed Heat Sink.
- Thermal Grease should be Applied Properly.

TO-220 Power Resistor－TR50

■Construction



①	Alumina Substrate	③	Lead
②	Resistor Layer	④	Molding

■Features

－50 Watts at 25°C case temperature heat sink mounted
－TO-220 style power package
－Molded case for protection and easy to mount
－Electrically isolated case
－Non-Inductive design

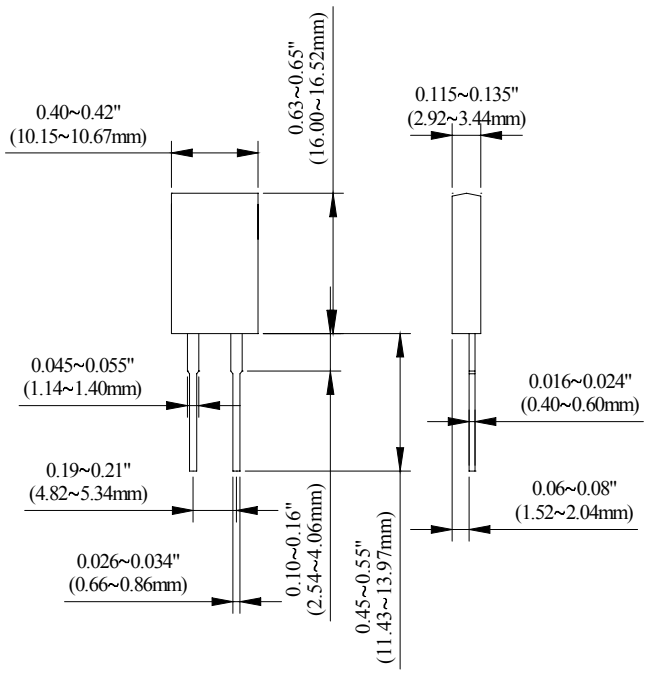
■Dimensions

Unit: mm

Type	Weight (g) (1000pcs)
TR50	1290

■Applications

－Switching Power Supplies
－Non-inductive Design for High Frequency
－Pulsing Applications
－UPS
－Voltage Regulation

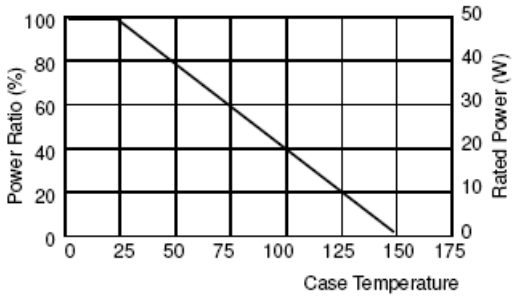


■Electrical Characteristics Specifications

Item / Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR50	-	-	0.1Ω -1Ω		No Specified
	-	>1Ω -3Ω			±300
	-	>3Ω -10Ω			±100 ±200
	>10Ω –10KΩ				±50 ±100 ±200

- Operating Voltage: 350V Max.
- Dielectric Strength: 1800VAC
- Insulation Resistance: 10GΩ min.
- Working Temperature Range: -65°C to +150°C
- Resistance Value <1Ω is available

■Derating Curve



■Part Numbering

TR	50	J	B	D	1001
Product Type	Power	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance
	50: 50 Watts	D: ±0.5% F: ±1% J: ±5% K: ±10%	B: Bulk	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1000Ω 1002: 10000Ω

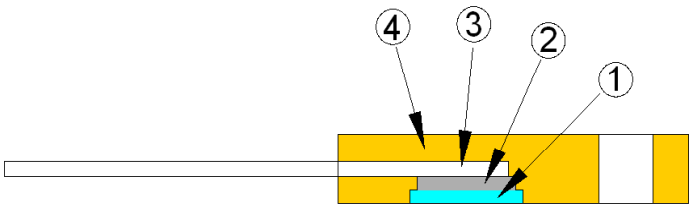
■Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Short Time Overload	ΔR±0.3%	2 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds
Load Life	ΔR±1.0%	2,000 hours at rated power
Damp Heat with Load	ΔR±0.5%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Solderability	90% min. coverage	245±5°C for 3 seconds
Thermal Shock	ΔR±0.3%	-65°C~150°C, 100 cycles
Terminal Strength	ΔR±0.2%	(Pull Test) 2.4N
Vibration, High Frequency	ΔR±0.2%	20g peak

- Lead Material: Tinned Copper
- Without a Heat Sink, When in Free Air at 25°C, the TR50 is Rated for 3W.
- The Case Temperature is to be used for the Definition of the Applied Power Limit.
- The Case Temperature Measurement must be made with a Thermocouple Contacting the Center of the Component mounted on the Designed Heat Sink.
- Thermal Grease should be Applied Properly.

TO-220 Power Resistor－TR50-H

■Construction



①	Alumina Substrate	③	Lead
②	Resistor Layer	④	Molding

■Features

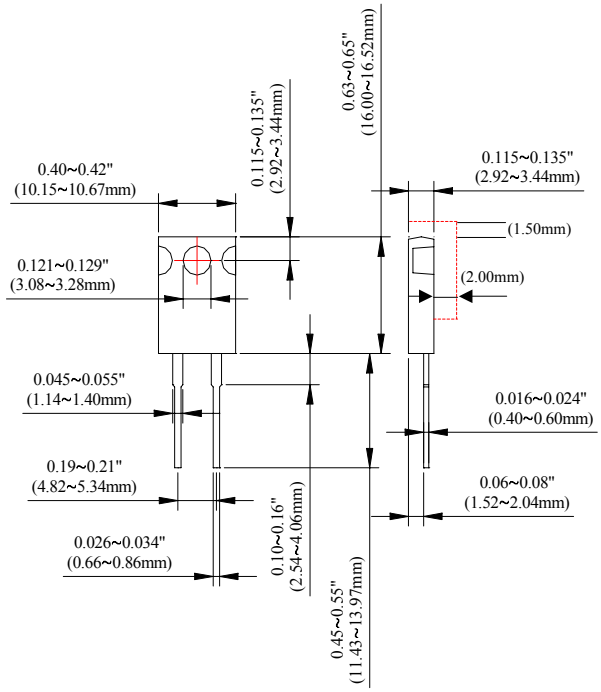
－50 watts at ≦25°C case temperature heat sink mounted
－TO-220 style power package
－Fixed with a M3 screw on system heat sink.
－Improve the heat dissipation by ceramic exposure design with external fix jig to mount the chip on heat sink

■Dimensions

Unit: mm

Type	Weight (g) (1000pcs)
TR50-H	2770

Unit: mm



■Applications

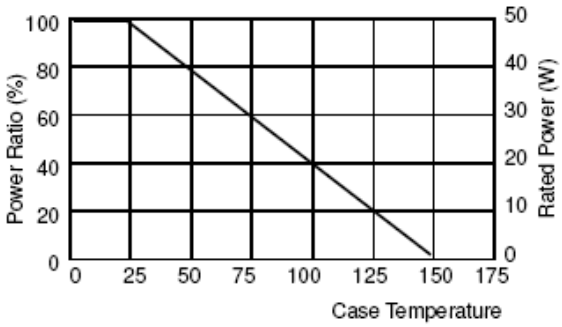
－Power Supplies
－Non-inductive Design for High Frequency
－Pulsing Applications

■Electrical Characteristics Specifications

Item / Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR50-H	-	-	0.1Ω -1Ω		No Specified
	-	>1Ω -3Ω			±300
	-	>3Ω -10Ω			±100 ±200
	>10Ω –10KΩ				±50 ±100 ±200

- Operating Voltage: 420V Max.
- Dielectric Strength: 1800VAC
- Insulation Resistance: 10GΩ min.

■ Derating Curve



■Part Numbering

TR	50	J	B	D	1001	-H
Product Type	Power	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance	Code
	50: 50 Watts	D: ±0.5% F: ±1% J: ±5% K: ±10%	B: Bulk	D: ±50 E: ±100 F: ±200 G: ±300 -:No Specified	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1000Ω 1002: 10000Ω	H: Hole

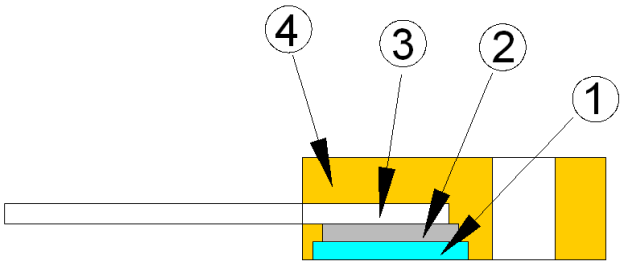
■Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Short Time Overload	ΔR±0.3%	2 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds
Load Life	ΔR±1.0%	2,000 hours at rated power
Damp Heat with Load	ΔR±0.5%	40±2°C, 90~95% R.H. Max. working voltage for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
Solderability	90% min. coverage	245±5°C for 3 seconds
Thermal Shock	ΔR±0.3%	-65°C ~150°C, 100 cycles
Terminal Strength	ΔR±0.2%	(Pull Test) 2.4N
Vibration, High Frequency	ΔR±0.2%	20g peak

- Lead Material: Tinned Copper
- Maximum Torque: 0.9 N-m
- Without a Heat Sink, When in Free Air at 25°C, the TR50-H is Rated for 2.25W.
- The Case Temperature is to be used for the Definition of the Applied Power Limit.
- The Case Temperature Measurement must be made with a Thermocouple Contacting the Center of the Component mounted on the Designed Heat Sink.
- Thermal Grease should be Applied Properly.

TO-247 Power Resistor－TR100

■Construction



①	Alumina Substrate	③	Lead
②	Resistor Layer	④	Molding

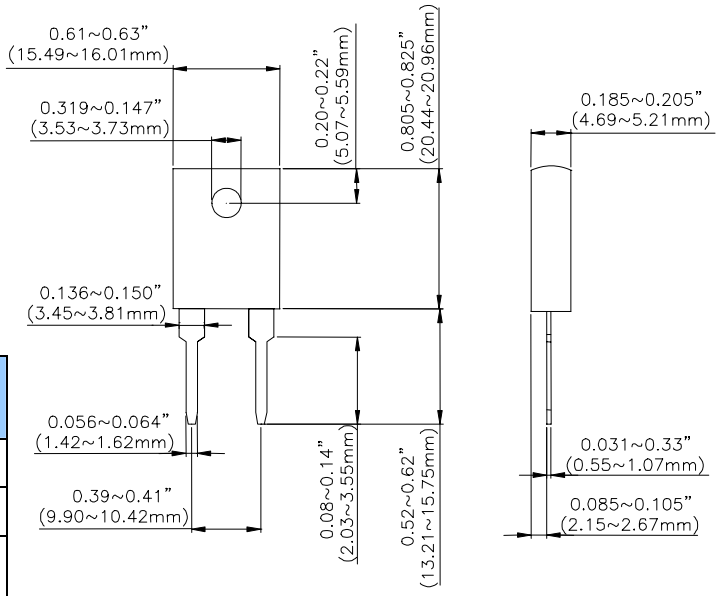
■Features

－100 Watts at 25°C case temperature heat sink mounted
－TO-247 style power package
－Single M3 screw mounting to heat sink
－Molded case for protection and easy to mount
－Electrically isolated case
－Non-Inductive design

■Dimensions

Unit: mm

Type	Weight (g) (1000pcs)
TR100	3381



■Applications

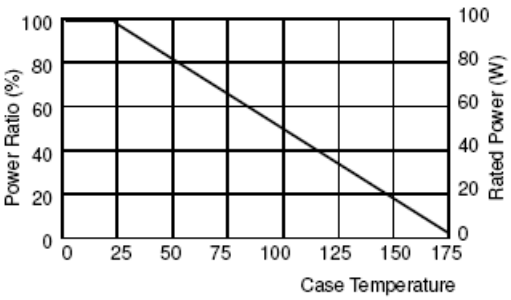
－Gate Resistors in Power Supplies
－Snubbers
－Load and Dumping Resistors in CRT Monitors
－Terminal Resistance in RF Power Amplifier
－Voltage Regulation
－Low Energy Pulse Loading
－UPS

■Electrical Characteristics Specifications

Item / Type	Resistance Range			TCR (PPM/°C)
	±1%	±5%	±10%	
TR100	-	0.05Ω -1Ω		No Specified
	>1Ω -3Ω			±300
	>3Ω -10Ω			±100 ±200
	>10Ω –10KΩ			±50 ±100 ±200

- Operating Voltage: 700V Max.
- Dielectric Strength: 1800V AC
- Insulation Resistance: 10GΩ min.
- Working Temperature Range: -65°C to +175°C

■Derating Curve



■Part Numbering

TR	100	J	B	D	1001
Product Type	Power	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance
	100: 100 Watts	F: ±1% J: ±5% K: ±10%	B: Bulk	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1000Ω 1002: 10000Ω

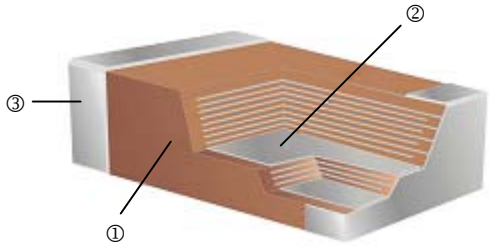
■Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Load Life	ΔR±1.0%	Rated power, 2,000 hours
Solderability	90% min. coverage	245±5°C for 3 seconds
Momentary Overload	ΔR±0.5%	1.5 times rated power and V (dc) ≦ 1.5V Max. for 5 seconds
Dielectric strength	ΔR±0.15%	1800v AC, 60 seconds
Moisture resistance	ΔR±0.5%	-10°C~+65°C, RH>90%, cycle 240 hours
Thermal Shock	ΔR±0.5%	-65°C~150°C, 100 cycles
Terminal Strength	ΔR±0.2%	(Pull Test) 2.4N
Vibration, High Frequency	ΔR±0.4%	20g peak

- Lead Material: Tinned Copper
- Maximum Torque:0.9 Nm
- When in Free Air at 25°C, the TR100 is Rated for 3.5W
- The Case Temperature is to be used for the Definition of the Applied Power Limit
- The Case Temperature Measurement must be made with a Thermocouple Contacting the Center of the Component mounted on the Designed Heat Sink
- Thermal Grease should be Applied Properly.

Multilayer Ceramic Capacitor－MC Series

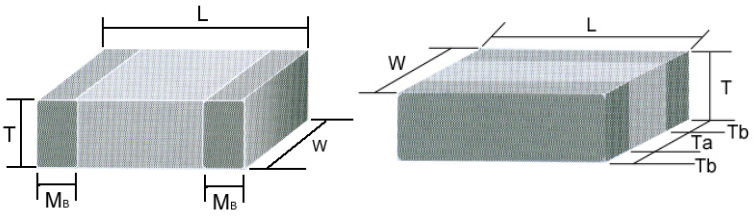
■Construction



①	Ceramic Material	③	Termination: NPO: Ag/Ni/Sn dielectric X7R, Y5V, X5R: Cu/Ni/Sn dielectric
②	Inner Electrodes		

■Features

－Wide capacitance range, extremely compost size
－Low inductance of capacitor for high frequency application
－Excellent solderability and resistance to soldering heat, suitable for flow and reflow soldering
－Adaptable to high-speed surface mount assembly
－Conform to EIAJ-RC3402, and also compatible with EIA-RS198 and IEC PUB. 384-10



■Dimensions

MC / MCHL / MCRF Type

Unit: mm

Type	Size (Inch)	L	W	T / Symbol		M_B	Packaging (7" Reel)	
							Paper tape	Plastic tape
01	0201	0.6±0.03	0.3±0.03	0.3±0.03	L	0.15±0.05	15K	-
02	0402	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05 / -0.10	10K	-
03	0603	1.60±0.10	0.80±0.10	0.80±0.07	S	0.40±0.15	4K	-
		1.60 +0.15 / -0.10	0.80 +0.15 / -0.10	0.80 +0.05 / -0.10	X		4K	
05	0805	2.00±0.15	1.25±0.10	0.60±0.10	A	0.50±0.20	4K	-
				0.80±0.10	B		4K	-
				1.25±0.10	D		-	3K
		2.00±0.20	1.25±0.20	0.85±0.10	T		4K	-
				1.25±0.20	I		-	3K
06	1206	3.20±0.15	1.60±0.15	0.80±0.10	B	0.60±0.20	4K	-
				0.95±0.10	C		-	3K
				1.25±0.10	D		-	3K
		3.20±0.20		1.15±0.15	J		-	3K
			1.60±0.20	1.60±0.20	G		-	2K
		3.20+0.3 / -0.1	1.60+0.3 / -0.1	1.60+0.3 / -0.1	P		-	2K
10	1210	3.20±0.30	2.50±0.20	0.95±0.10	C	0.75±0.25	-	3K
				1.25±0.10	D		-	3K
		3.20±0.40	2.50±0.30	1.60±0.20	G		-	2K
				2.00±0.20	K		-	1K
				2.50±0.30	M		-	1K
08	1808	4.50±0.40	2.03±0.25	1.25±0.10	D	0.75±0.25	-	2K
				2.00±0.20	K		-	1K
12	1812	4.50±0.40	3.20±0.30	1.25±0.10	D	0.75±0.25	-	1K
				2.00±0.20	K		-	1K
			3.20±0.40	2.50±0.30	M		-	0.5K

Low Inductance Capacitors for MCLI Type

Unit: mm

Type	Size (Inch)	L	W	T / Symbol		Ta min.	Tb min.	Packaging (7" Reel)	
								Paper tape	Plastic tape
MCLI43	0612	3.20±0.15	1.60±0.15	0.80±0.10	B	0.5	0.13	4K	-

■Part Numbering

MC	03	J	T	N	250	3R9
Product Type	Dimensions (L×W)	Capacitance Tolerance	Packaging	Dielectric	Voltage (VDCW)	Capacitance
MC : General; Ultra-small Middle and High Voltage MCHL: High Q and Low ESR MCRF: Ultra High Q and Low ESR (RF) MCLI: Low Inductance	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 08: 1808 12: 1812 43: 0612	B: ±0.1pF (Cap≦5pF) C: ±0.25pF (Cap≦5pF) D: ±0.5pF (5pF<Cap<10pF) F: ±1% G: ±2% J: ±5% K: ±10% M: ±20% Z: +80/-20%	T: Taping Reel	N: NPO (COG) B: X7R F: Y5V X: X5R	6V3: 6.3V 250: 25V 500: 50V 101: 100V 102: 1000V 202: 2000V 302: 3000V	3R9: 3.9pF 150: 15pF 181: 180pF 225: 2.2μF 476: 47μF 107: 100μF

■General Capacitance & Voltage

Capacitance & Voltage (NPO)

Dielectric		NPO														
EIA	Size	0402					0603					0805				
Code	VDCW	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V
0R5	0.5pF	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
0R6	0.6	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
0R7	0.7	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
0R8	0.8	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
0R9	0.9	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
1R0	1.0	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
1R2	1.2	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
1R5	1.5	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
1R8	1.8	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
2R2	2.2	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
2R7	2.7	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
3R3	3.3	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
3R9	3.9	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
4R7	4.7	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
5R6	5.6	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
6R8	6.8	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
8R2	8.2	N^	N^	N^	N^	N^	S	S	S	S	S	A	A	A	A	A
100	10pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
120	12	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
150	15	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
180	18	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
220	22	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
270	27	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
330	33	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
390	39	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
470	47	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
560	56	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
680	68	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
820	82	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
101	100pF	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
121	120	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
151	150	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
181	180	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
221	220	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
271	270	N	N	N	N		S	S	S	S	S	A	A	A	A	A
331	330	N	N	N	N		S	S	S	S	S	A	A	A	A	A
391	390	N	N	N	N		S	S	S	S	S	B	B	B	B	B
471	470	N	N	N	N		S	S	S	S	S	B	B	B	B	B
561	560	N	N	N	N		S	S	S	S	S	B	B	B	B	B
681	680	N	N	N	N		S	S	S	S	S	B	B	B	B	B
821	820						S	S	S	S	S	B	B	B	B	B
102	1000pF						S	S	S	S	S	B	B	B	B	B
122	1200						X	X	X	X		B	B	B	B	B
152	1500						X	X	X	X		B	B	B	B	B
182	1800						X	X	X	X		B	B	B	B	B
222	2200						X	X	X	X		B	B	B	B	B
272	2700						X	X	X	X		D	D	D	D	D
332	3300						X	X	X	X		D	D	D	D	D
392	3900											D	D	D	D	D
472	4700											D	D	D	D	
562	5600											D^	D^			
682	6800											D^	D^			
822	8200											D^	D^			
103	0.01uF											D^	D^			
123	0.012											D^	D^			

■The letter in cell is expressed the symbol of product thickness

■The "^" mark is expressed product with Ag/Ni/Sn

Capacitance & Voltage (NPO)

Dielectric		NPO												
EIA	Size	1206					1210					1812		
Code	VDCW	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	16V	50V	100V
1R8	1.8pF	B	B	B	B	B								
2R2	2.2	B	B	B	B	B								
2R7	2.7	B	B	B	B	B								
3R3	3.3	B	B	B	B	B					C^			
3R9	3.9	B	B	B	B	B					C^			
4R7	4.7	B	B	B	B	B					C^			
5R6	5.6	B	B	B	B	B					C^			
6R8	6.8	B	B	B	B	B					C^			
8R2	8.2	B	B	B	B	B					C^			
100	10pF	B	B	B	B	B					C^			D^
120	12	B	B	B	B	B					C^			D^
150	15	B	B	B	B	B					C^			D^
180	18	B	B	B	B	B					C^			D^
220	22	B	B	B	B	B	C^	C^	C^	C^	C^			D^
270	27	B	B	B	B	B	C^	C^	C^	C^	C^			D^
330	33	B	B	B	B	B	C^	C^	C^	C^	C^			D^
390	39	B	B	B	B	B	C^	C^	C^	C^	C^			D^
470	47	B	B	B	B	B	C^	C^	C^	C^	C^			D^
560	56	B	B	B	B	B	C^	C^	C^	C^	C^			D^
680	68	B	B	B	B	B	C^	C^	C^	C^	C^			D^
820	82	B	B	B	B	B	C^	C^	C^	C^	C^			D^
101	100pF	B	B	B	B	B	C^	C^	C^	C^	C^			D^
121	120	B	B	B	B	B	C^	C^	C^	C^	C^			D^
151	150	B	B	B	B	B	C^	C^	C^	C^	C^			D^
181	180	B	B	B	B	B	C^	C^	C^	C^	C^			D^
221	220	B	B	B	B	B	C^	C^	C^	C^	C^			D^
271	270	B	B	B	B	B	C^	C^	C^	C^	C^			D^
331	330	B	B	B	B	B	C^	C^	C^	C^	C^			D^
391	390	B	B	B	B	B	C^	C^	C^	C^	C^			D^
471	470	B	B	B	B	B	C^	C^	C^	C^	C^			D^
561	560	B	B	B	B	B	C^	C^	C^	C^	C^			D^
681	680	B	B	B	B	B	C^	C^	C^	C^	C^			D^
821	820	B	B	B	B	B	C^	C^	C^	C^	C^			D^
102	1000pF	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
122	1200	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
152	1500	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
182	1800	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
222	2200	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
272	2700	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
332	3300	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
392	3900	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
472	4700	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
562	5600	B	B	B	B	B	C^	C^	C^	C^	C^	D^	D^	D^
682	6800	C	C	C	C	C	C^	C^	C^	C^	C^	D^	D^	D^
822	8200	D	D	D	D	D	C^	C^	C^	C^	C^	D^	D^	D^
103	0.01uF	D	D	D	D		C^	C^	C^	C^	C^	D^	D^	D^
123	0.012	D^	D^				C^	C^	D^	D^	D^	D^	D^	D^
153	0.015	D^	D^				C^	C^	D^	D^	D^	D^	D^	D^
183	0.018	D^	D^									D^	D^	D^
223	0.022	D^	D^									D^	D^	D^
273	0.027	D^	D^									D^	D^	D^
333	0.033	D^	D^									D^	D^	D^
393	0.039	G^	G^											

■The letter in cell is expressed the symbol of product thickness

■The “^” mark is expressed product with Ag/Ni/Sn

Capacitance & Voltage (X7R)

Dielectric		X7R															
EIA	Size	0402				0603						0805					
Code	VDCW	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V
101	100pF	N	N	N	N		S	S	S	S	S		B	B	B	B	B
121	120	N	N	N	N		S	S	S	S	S		B	B	B	B	B
151	150	N	N	N	N		S	S	S	S	S		B	B	B	B	B
181	180	N	N	N	N		S	S	S	S	S		B	B	B	B	B
221	220	N	N	N	N		S	S	S	S	S		B	B	B	B	B
271	270	N	N	N	N		S	S	S	S	S		B	B	B	B	B
331	330	N	N	N	N		S	S	S	S	S		B	B	B	B	B
391	390	N	N	N	N		S	S	S	S	S		B	B	B	B	B
471	470	N	N	N	N		S	S	S	S	S		B	B	B	B	B
561	560	N	N	N	N		S	S	S	S	S		B	B	B	B	B
681	680	N	N	N	N		S	S	S	S	S		B	B	B	B	B
821	820	N	N	N	N		S	S	S	S	S		B	B	B	B	B
102	1000pF	N	N	N	N		S	S	S	S	S		B	B	B	B	B
122	1200	N	N	N	N		S	S	S	S	S		B	B	B	B	B
152	1500	N	N	N	N		S	S	S	S	S		B	B	B	B	B
182	1800	N	N	N	N		S	S	S	S	S		B	B	B	B	B
222	2200	N	N	N	N		S	S	S	S	S		B	B	B	B	B
272	2700	N	N	N	N		S	S	S	S	S		B	B	B	B	B
332	3300	N	N	N	N		S	S	S	S	S		B	B	B	B	B
392	3900	N	N	N	N		S	S	S	S	S		B	B	B	B	B
472	4700	N	N	N	N		S	S	S	S	S		B	B	B	B	B
562	5600	N	N	N	N		S	S	S	S	S		B	B	B	B	B
682	6800	N	N	N	N		S	S	S	S	S		B	B	B	B	B
822	8200	N	N	N	N		S	S	S	S	S		B	B	B	B	B
103	0.01μF	N	N	N	N		S	S	S	S	S		B	B	B	B	B
123	0.012	N	N	N			S	S	S	S			B	B	B	B	B
153	0.015	N	N	N			S	S	S	S			B	B	B	B	B
183	0.018	N	N	N			S	S	S	S			B	B	B	B	B
223	0.022	N	N	N			S	S	S	S			B	B	B	B	B
273	0.027	N	N	N			S	S	S	S			B	B	B	B	D
333	0.033	N	N	N			S	S	S	X			B	B	B	B	D
393	0.039	N	N	N			S	S	S	X			B	B	B	B	D
473	0.047	N	N	N			S	S	S	X			B	B	B	B	D
563	0.056	N	N				S	S	S	X			B	B	B	B	D
683	0.068	N	N				S	S	S	X			B	B	B	B	D
823	0.082	N	N				S	S	S	X			B	B	B	B	D
104	0.10μF	N	N				S	S	S	X			B	B	B	B	D
124	0.12						S	X	X				D	D	D	D	
154	0.15						S	X	X				D	D	D	D	
184	0.18						S	X	X				D	D	D	D	
224	0.22					X	S	X	X				D	D	D	D	
274	0.27					X	X	X	X				D	D	D	I	
334	0.33					X	X	X	X				D	D	D	I	
394	0.39					X	X	X	X				D	D	D	I	
474	0.47					X	X	X	X				D	D	D	I	
564	0.56					X	X						D	D	D		
684	0.68					X	X						D	D	D		
824	0.82					X	X						D	D	D		
105	1.0μF					X	X						D	D	D		
155	1.5												I	I			
225	2.2											I	I	I	I		
335	3.3																
475	4.7																

■The letter in cell is expressed the symbol of product thickness

Capacitance & Voltage (X7R)

Dielectric		X7R															
EIA	Size	1206						1210					1812				
Code	VDCW	6.3V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V
101	100pF																
121	120																
151	150		B	B	B	B	B										
181	180		B	B	B	B	B										
221	220		B	B	B	B	B										
271	270		B	B	B	B	B										
331	330		B	B	B	B	B										
391	390		B	B	B	B	B										
471	470		B	B	B	B	B										
561	560		B	B	B	B	B										
681	680		B	B	B	B	B										
821	820		B	B	B	B	B										
102	1000pF		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
122	1200		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
152	1500		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
182	1800		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
222	2200		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
272	2700		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
332	3300		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
392	3900		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
472	4700		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
562	5600		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
682	6800		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
822	8200		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
103	0.01μF		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
123	0.012		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
153	0.015		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
183	0.018		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
223	0.022		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
273	0.027		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
333	0.033		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
393	0.039		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
473	0.047		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
563	0.056		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
683	0.068		B	B	B	B	B	C	C	C	C	C	D	D	D	D	D
823	0.082		B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
104	0.10μF		B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
124	0.12		B	B	B	B	D	C	C	C	C	C	D	D	D	D	D
154	0.15		C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
184	0.18		C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
224	0.22		C	C	C	C	G	C	C	C	C	D	D	D	D	D	D
274	0.27		C	C	C	D		C	C	C	C	G	D	D	D	D	D
334	0.33		C	C	C	D		C	C	C	D	G	D	D	D	D	D
394	0.39		C	C	J	P		C	C	C	D	M	D	D	D	D	D
474	0.47		J	J	J	P		C	C	C	D	M	D	D	D	D	K
564	0.56		J	J	J	P		D	D	D	D	M	D	D	D	D	K
684	0.68		J	J	J	P		D	D	D	D	K	D	D	D	K	K
824	0.82		J	J	J	P		D	D	D	D	K	D	D	D	K	K
105	1.0μF		J	J	J	P		D	D	D	D	K	D	D	D	K	K
155	1.5	J	J	J													K
225	2.2	J	J	J	P				K	G						M	M
335	3.3	P	P	P	P												
475	4.7	P	P	P	P			K	K								
106	10	P	P					K	K								

■The letter in cell is expressed the symbol of product thickness

Capacitance & Voltage (X5R)

Dielectric		X5R																		
EIA	Size	0402				0603				0805				1206				12010		
Code	VDCW	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	6.3V	10V	16V
273	0.027μF			N																
333	0.033			N																
393	0.039			N																
473	0.047			N																
563	0.056		N	N																
683	0.068		N	N																
823	0.082	N	N	N																
104	0.10μF	N	N	N	N															
224	0.22	N	N					X	X											
274	0.27						X	X												
334	0.33	N				X	X	X	X											
394	0.39						X	X												
474	0.47	N					X	X	X											
684	0.68	N					X	X	X											
824	0.82					X	X	X												
105	1.0μF	N	N			X	X	X	X											
155	1.5					X				I	I				J	J			K	K
225	2.2	N				X	X			I	I	I	I		J	J	P		K	K
335	3.3									I	I	I	I		P	P	P			
475	4.7					X				I	I	I	I	P	P	P	P		K	K
685	6.8													P	P					
106	10μF									I	I			P	P	P	P	K	K	K
226	22													P	P					

Capacitance & Voltage (Y5V)

Dielectric		Y5V																																				
EIA	Size	0402					0603					0805						1206						1210							1812				
Code	VDCW	6.3	10V	16V	25V	50V	6.3	10V	16V	25V	50V	6.3	10V	16V	25V	50V	100	10V	16V	25V	35V	50V	100	6.3	10V	16V	25V	35V	50V	100	10V	16V	25V	50V	100
103	0.010μF		N	N	N	N		S	S	S	S		A	A	A	A	B	B	B	B		B	B							C					D
153	0.015		N	N	N	N		S	S	S	S		A	A	A	A	B	B	B	B		B	B							C					D
223	0.022		N	N	N	N		S	S	S	S		A	A	A	A	B	B	B	B		B	B							C					D
333	0.033		N	N	N	N		S	S	S	S		A	A	A	A	B	B	B	B		B	B							C					D
473	0.047		N	N	N			S	S	S	S		A	A	A	A	B	B	B	B		B	B							C					D
683	0.068		N	N	N			S	S	S	S		A	A	A	A	B	B	B	B		B	B							C					D
104	0.10μF		N	N	N			S	S	S	S		A	A	A	A	B	B	B	B		B	B		C	C	C		C	C	D	D	D	D	D
154	0.15		N					S	S	S	S		A	A	A	A		B	B	B		B	C		C	C	C		C	C	D	D	D	D	D
224	0.22	N	N				S	S	S	S	S		A	A	A	A		B	B	B		B	C		C	C	C		C	C	D	D	D	D	D
334	0.33	N	N					S	S	S			B	B	B	B		B	B	B		B			C	C	C		C	C	D	D	D	D	D
474	0.47	N	N					S	S	X			B	B	B	B/D		B	B	B		B			C	C	C		C		D	D	D	D	D
684	0.68	N						S	X				B	B	D	D		B	B	B		B			C	C	C		C		D	D	D	D	D
105	1.0μF	N	N					S	X	X			B	B	D	D		C	C	C		C/D			C	C	C		C		D	D	D	D	D
155	1.5							S					D	D	I			C	C	C					C	C	C				D	D	D	D	
225	2.2						S	S	X				D	D	D			C	C	C		J			C	C	C		G		D	D	D	D	
335	3.3												D	D	I			J	J	J					C	C	C				D	D	D	D	
475	4.7						X						D	D	D			J	J	J	J				C	C	D		G		D	D	D	D	
685	6.8												I					J	J						C	C	D				D	D	D	D	
106	10μF											I	I					J	J	P					D	D	G	K			D	D	D		
226	22μF																	P							K	K									
476	47μF																							K	K						M				
107	100μF																							M											

■Environmental Characteristics

Size	0402, 0603, 0805, 1206, 1210, 1812			
Dielectric	**NP0**	**X7R**	**X5R**	**Y5V**
Capacitance*	0.5pF~0.039μF	100pF~10μF	27nF~22μF	10nF~100μF
Capacitance tolerance	Cap≦5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.50pF) Cap≧10pF: J (±5%)	J (± 5%) K (±10%)		M (±20%) Z (-20 / +80%)
Rated voltage (VDCW)	10V, 16V, 25V, 50V, 100V	6.3V, 10V, 16V, 25V, 50V, 100V		
Q*	Cap<30pF: Q≧400 +20C Cap≧30pF: Q≧1000	Note 1		
Insulation resistance at Ur**	≧10GΩ or R×C≧500Ω×F Whichever is less			
Operating temperature	-55 to +125°C		-55 to 85°C	-25 to +85°C
Capacitance change	±30 ppm	±15%		+30/-80%
Termination	Ni/Sn (lead-free termination)			

■ '*'Measured at the condition of 30~70% related humidity
■ NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≦1000pF and 1.0±0.2Vrms, 1.0 KHz±10% for Cap>1000pF, 25°C ambient temperature
■ X7R: Apply 1.0±0.2Vrms, 1.0KHz±10% at the condition of 25°C ambient temperature
■ Y5V: Apply 1.0±0.2Vrms, 1.0 KHz±10% at the condition of 20°C ambient temperature

Note 1:

X7R / X5R

Rated vol.	D.F.	Exception of D.F.	
≧50V	≦2.5%	≦3%	0603≧0.047μF 0805≧0.18μF 1206≧0.47μF
25V	≦3.5%	≦5%	0805≧1μF 1210≧10μF
		≦7%	0603≧0.33μF 1206≧4.7μF
		≦10%	0402≧0.10μF 0603≧0.47μF 0805≧2.2μF 1206≧6.8μF
16V	≦3.5%	≦5%	0402≧0.033μF 0603≧0.15μF 0805≧0.68μF 1206≧2.2μF 1210≧4.7μF
		≦10%	0603≧0.68μF 0805≧0.68μF 1206≧4.7μF 1210≧22μF
10V	≦5.0%	≦10%	0402≧0.33μF 0603≧0.33μF 0805≧2.2μF 1206≧2.2μF 1210≧22μF
		≦15%	0402≧1μF
6.3V	≦10%	≦15%	0603≧10μF 0805≧4.7μF 1210≧100μF
		≦20%	0402≧2.2μF

Y5V

Rated vol.	D.F.	Exception of D.F.	
≧50V	≦5.0%	≦7%	0603≧0.1μF 0805≧0.47μF 1206≧4.7μF
35V	7%	—	—
25V	≦5.0%	≦7%	0402≧0.047μF 0603≧0.1μF 0805≧0.33μF 1206≧1μF 1210≧4.7μF
		≦9%	0402≧0.068μF 0603≧0.47μF 1206≧4.7μF 1210≧22μF
16V (C<1.0μF)	≦7.0%	≦9%	0402≧0.068μF 0603≧0.68μF
		≦12.5%	0402≧0.22μF
16V (C≧1.0μF)	≦9.0%	≦12.5%	0603≧2.2μF 0805≧3.3μF 1206≧10μF 1210≧22μF 1812≧47μF
10V	≦12.5%	≦20%	0402≧0.47μF
6.3V	≦20%	—	—

■Middle and High Voltage

Capacitance & Voltage (NPO 200V~3KV)

Dielectric		NPO																												
EIA	Size	0603		0805				1206						1210						1808			1812							
Code	VDCW	200	250	200	250	500	630	200	250	500	630	1000	2000	200	250	500	630	1000	2000	1000	2000	3000	200	250	500	630	1000	2000	3000
0R5	0.5pF	S	S	A	A	A	A																						
1R0	1	S	S	A	A	A	A																						
1R2	1.2	S	S	A	A	A	A																						
1R5	1.5	S	S	A	A	A	A	B	B	B	B	B	B																
1R8	1.8	S	S	A	A	A	A	B	B	B	B	B	B																
2R2	2.2	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D							
2R7	2.7	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D							
3R3	3.3	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D							
3R9	3.9	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D							
4R7	4.7	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D							
5R6	5.6	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D							
6R8	6.8	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D							
8R2	8.2	S	S	A	A	A	A	B	B	B	B	B	B							D	D	D							
100	10pF	S	S	A	A	A	A	B	B	B	B	B	B	C^	C^	C^	C^	C	C	D	D	D	D^	D^	D^	D^	D	D	D
120	12	S	S	A	A	A	A	B	B	B	B	B	B	C^	C^	C^	C^	C	C	D	D	D	D^	D^	D^	D^	D	D	D
150	15	S	S	A	A	A	A	B	B	B	B	B	B	C^	C^	C^	C^	C	C	D	D	D	D^	D^	D^	D^	D	D	D
180	18	S	S	A	A	A	A	B	B	B	B	B	B	C^	C^	C^	C^	C	C	D	D	D	D^	D^	D^	D^	D	D	D
220	22	S	S	A	A	A	A	B	B	B	B	B	B	C^	C^	C^	C^	C	C	D	D	D	D^	D^	D^	D^	D	D	D
270	27	S	S	A	A	A	A	B	B	B	B	B	B	C^	C^	C^	C^	C	C	D	D	D	D^	D^	D^	D^	D	D	D
330	33	S	S	A	A	A	A	B	B	B	B	B	C	C^	C^	C^	C^	C	C	D	D	D	D^	D^	D^	D^	D	D	D
390	39	S	S	A	A	A	A	B	B	B	B	B	C	C^	C^	C^	C^	C	C	D	D	D	D^	D^	D^	D^	D	D	D
470	47	S	S	A	A	A	A	B	B	B	B	C	C	C^	C^	C^	C^	C	C	D	D	D	D^	D^	D^	D^	D	D	D
560	56	S	S	A	A	A	A	B	B	B	B	C	D	C^	C^	C^	C^	C	D	D	D	D	D^	D^	D^	D^	D	D	D
680	68	S	S	A	A	A	A	B	B	B	B	C	D	C^	C^	C^	C^	C	D	D	D	D	D^	D^	D^	D^	D	D	D
820	82	S	S	A	A	B	B	B	B	B	B	D	D	C^	C^	C^	C^	C	D	D	D	D	D^	D^	D^	D^	D	D	D
101	100pF	S	S	A	B	B	B	B	B	B	B	D	D	C^	C^	C^	C^	D	D	D	D	K	D^	D^	D^	D^	D	D	D
121	120	S	S	A	B	D	D	B	B	B	B	D	G	C^	C^	C^	C^	D	D	D	D	K	D^	D^	D^	D^	D	D	D
151	150	S	S	B	D	D	D	B	B	B	B	D	G	C^	C^	C^	C^	D	G	D	K	K	D^	D^	D^	D^	D	D	D
181	180	S	S	B	D	D	D	B	B	B	B	G	G	C^	C^	C^	C^	D	G	D	K	K	D^	D^	D^	D^	D	D	K
221	220	S	S	D	D	D	D	B	B	B	B	G	G	C^	C^	C^	C^	G	G	D	K	K	D^	D^	D^	D^	D	D	K
271	270			D	D	D	D	B	C	C	C	G		C^	C^	C^	C^	G		K	K	K	D^	D^	D^	D^	D	K	K
331	330			D	D	D	D	B	C	C	C	G		C^	C^	C^	C^	G		K	K	K	D^	D^	D^	D^	D	K	K
391	390			D	D	D	D	B	C	C	C	G		C^	C^	C^	C^	G		K	K		D^	D^	D^	D^	D	K	K
471	470			D				C	C	C	C	G		C^	C^	C^	C^	G		K	K		D^	D^	D^	D^	K	K	K
561	560			D				C	D	D	D			C^	C^	C^	C^			K	K		D^	D^	D^	D^	K	K	
681	680			D				C	D	D	D			C^	C^	C^	C^			K	K		D^	D^	D^	D^	K	K	
821	820			D				C	G	G	G			C^	C^	C^	C^			K			D^	D^	D^	D^	K	K	
102	1000pF			D				C	G	G	G			D^	D^	D^	D^			K			D^	D^	D^	D^	K	K	
122	1200							C	G	G	G			D^	D^	D^	D^						D^	D^	D^	D^	K		
152	1500							D	G	G	G			D^	D^	D^	D^						D^	D^	D^	D^	K		
182	1800							D	G	G	G			D^	D^	D^	D^						D^	D^	D^	D^			
222	2200							D	G	G	G			D^	D^								D^	D^	D^	D^			
272	2700													D^	D^								D^	D^	D^	D^			
332	3300													D^									D^	D^	D^	D^			
392	3900													D^									D^						
472	4700																						D^						
562	5600																						D^						
682	6800																						D^						

■ The letter in cell is expressed the symbol of product thickness
■ The "^" mark is expressed product with Ag/Ni/Sn termination

Capacitance & Voltage (X7R 200V~3KV)

Dielectric		X7R																								
EIA	Size	0805				1206						1210					1808			1812						
Code	VDCW	200V	250V	500V	630V	200V	250V	500V	630V	1000V	2000V	200V	250V	500V	630V	1000V	1000V	2000V	3000V	200V	250V	500V	630V	1000V	2000V	3000V
101	100pF	B	B	B	B																					
121	120	B	B	B	B																					
151	150	B	B	B	B	D	D	D	D	D	D						D	D	D							
181	180	B	B	B	B	D	D	D	D	D	D						D	D	D							
221	220	B	B	B	B	D	D	D	D	D	D						D	D	D							
271	270	B	B	B	B	D	D	D	D	D	D						D	D	D					D	D	
331	330	B	B	B	B	D	D	D	D	D	D						D	D	K					D	D	
391	390	B	B	B	B	D	D	D	D	D	D						D	D	K					D	D	
471	470	B	B	B	B	D	D	D	D	D	D						D	D	K					D	D	
561	560	B	B	B	B	D	D	D	D	D	D						D	D	K					D	D	
681	680	B	B	B	B	D	D	D	D	D	D						D	D	K					D	D	K
821	820	B	B	B	B	D	D	D	D	D	G						D	D	K					D	D	K
102	1000pF	B	B	B	B	D	D	D	D	D	G	C	C	D	D	D	D	K	K	D	D	D	D	D	D	K
122	1200	B	B	B	B	D	D	D	D	D	G^	C	C	D	D	D	D	K		D	D	D	D	D	D	
152	1500	B	B	B	B	D	D	D	D	D	G^	C	C	D	D	D	D	K		D	D	D	D	D	D	
182	1800	B	B	B	B	D	D	D	D	D		C	C	D	D	D	D	K		D	D	D	D	D	D	
222	2200	B	B	B	B	D	D	D	D	D		C	C	D	D	D	D	K^		D	D	D	D	D	D	
272	2700	B	B	B	B	D	D	D	D	D		C	C	D	D	D	D			D	D	D	D	D	D	
332	3300	B	B	B	B	D	D	D	D	D		C	C	D	D	D	D			D	D	D	D	D	K	
392	3900	B	B	B	B	D	D	D	D	D		C	C	D	D	G	D			D	D	D	D	D	K	
472	4700	B	D			D	D	D	D	D		C	C	D	D	G	D			D	D	D	D	D	K	
562	5600	D	D			D	D	D	D	D		C	C	D	D	G	K			D	D	D	D	D		
682	6800	D	D			D	D	D	D	D		C	C	D	D	G	K			D	D	D	D	D		
822	8200	D	D			D	D	D	D	D		C	C	D	D	G	K			D	D	D	D	D		
103	0.010μF	D	D			D	D	D	D	D		C	C	D	D	G	K			D	D	D	D	D		
123	0.012	D				D	D	D	D			C	C	D	D					D	D	D	D	K		
153	0.015	D				D	D	D	D			C	C	D	D					D	D	D	D	K		
183	0.018	D				D	D	D	D			C	C	D	D					D	D	D	D			
223	0.022	D				D	D	G	G			C	C	D	D					D	D	D	D			
273	0.027					D	D	G	G			C	C	G	G					D	D	D	D			
333	0.033					G	G	G	G			C	C	G	G					D	D	D	D			
393	0.039					G	G					C	C	G	G					D	D	D	D			
473	0.047					G	G					D	D	G	G					D	D	D	D			
563	0.056					G	G					D	D	G	G					D	D	K	K			
683	0.068					G	G					G	G							D	D	K	K			
823	0.082					G	G					G	G							D	D	K	K			
104	0.10μF					G	G					G	G							D	D	K	K			
124	0.12											G	G							D	D					
154	0.15											M	M							K	K					
184	0.18											M	M							K	K					
224	0.22											M	M							K	K					
274	0.27											M	M							K	K					
334	0.33											M	M							K	K					
394	0.39											M	M							K	K					
474	0.47											M	M							K	K					

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Capacitance & Voltage (Y5V 200V~250V)

Dielectric		Y5V							
EIA	Size	0805		1206		1210		1812	
Code	VDCW	200V	250V	200V	250V	200V	250V	200V	250V
103	0.010μF	B	B	B	B	C	C	D	D
153	0.015	B	B	B	B	C	C	D	D
223	0.022	B	B	B	B	C	C	D	D
333	0.033	B	B	B	B	C	C	D	D
473	0.047	B	B	B	B	C	C	D	D
683	0.068	B	B	B	B	C	C	D	D
104	0.10μF			B	B	C	C	D	D
154	0.15			C	C	C	C	D	D
224	0.22							D	D
334	0.33							D	D
474	0.47							D	D
684	0.68							D	D

■ The letter in cell is expressed the symbol of product thickness

Electrical data

Dielectric	NP0	X7R	Y5V
Size	0603,0805,1206,1210,1808,1812	0805,1206,1210,1808,1812	0805,1206,1210,1812
Capacitance*	0.5pF~6800pF	100pF~0.47μF	0.01uF~0.68μF
Capacitance tolerance	Cap≦5pF: C (±0.25pF) 5pF<Cap<10pF: D (±0.50pF) Cap≧10pF: J (±5%), K (±10%)	K (±10%) M (±20%)	Z (-20 / +80%)
Rated voltage (VDCW)	200V to 3KV		200V, 250V
Q*	Cap<30pF: Q≧400 +20C Cap≧30pF: Q≧1000	≦2.5%	≦5%
Insulation resistance at Ur**	Ur=200~630V:≧10GΩ or R×C≧100Ω-F Whichever is smaller Ur=1000~3000V: ≧10GΩ		
Dielectric Strength	200~300V: ≧2×VDCW 500~999V: ≧1.5×VDCW 1000~3000V: ≧1.2×VDCW		
Operating temperature	-55 to +125°C		-25 to +85°C
Capacitance change	±30 ppm	±15%	+30/-80%
Termination	Ni/Sn (lead-free termination)		

■ '*'Measured at the condition of 30~70% related humidity
■ NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≦1000pF and 1.0±0.2Vrms, 1.0KHz±10% for Cap>1000pF, 25°C ambient temperature
■ X7R, X5R: Apply 1.0±0.2Vrms, 1.0KHz±10% at the condition of 20°C ambient temperature
■ '**'Measured at 500V_{DC} for 60 sec. for Ur > 500V_{DC}

■Ultra-small 0201 Capacitors

Capacitance & Voltage

EIA	Size	0201		
Dielectric		NPO		
Code	VDCW	16V	25V	50V
0R3	0.3pF		L^	L^
0R4	0.4		L^	L^
0R5	0.5		L^	L^
1R0	1.0		L^	L^
1R2	1.2		L^	L^
1R5	1.5		L^	L^
1R8	1.8		L^	L^
2R2	2.2		L^	L^
2R7	2.7		L^	L^
3R3	3.3		L^	L^
3R9	3.9		L^	L^
4R0	4.0		L^	L^
4R7	4.7		L^	L^
5R6	5.6		L^	L^
6R8	6.8		L^	L^
8R2	8.2		L^	L^
100	10		L^	L^
120	12		L^	L^
150	15		L^	L^
180	18		L^	L^
220	22		L^	L^
270	27		L^	L^
330	33		L^	L^
390	39		L^	L^
470	47		L^	L^
560	56	L^	L^	
680	68	L^	L^	
820	82	L^	L^	
101	100	L^	L^	

EIA	Size	0201									
Dielectric		X7R					X5R				
Code	VDCW	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
101	100pF			L	L	L			L	L	L
121	120			L	L	L			L	L	L
151	150			L	L	L			L	L	L
181	180			L	L	L			L	L	L
221	220			L	L	L			L	L	L
271	270			L	L	L			L	L	L
331	330			L	L	L			L	L	L
391	390			L	L	L			L	L	L
471	470			L	L	L			L	L	L
561	560			L	L	L			L	L	L
681	680			L	L	L			L	L	L
821	820			L	L	L			L	L	L
102	1000	L	L	L	L	L			L	L	L
152	1500	L	L	L				L	L		
222	2200	L	L	L				L	L		
272	2700	L	L	L				L	L		
332	3300	L	L	L				L	L		
472	4700	L	L	L				L	L		
682	6800	L	L					L			
103	0.010μF	L	L				L	L			
153	0.015						L				
223	0.022						L				
333	0.033						L				
473	0.047						L				
683	0.068						L				
104	0.100						L				

■ The letter in cell is expressed the symbol of product thickness
■ The “^” mark is expressed product with Ag/Ni/Sn terminations

Electrical Data

Size	0201		
Dielectric	NPO	X7R	X5R
Capacitance*	0.3pF~100pF	100pF~10nF	100pF~0.1μF
Capacitance tolerance	Cap≦5pF: C (±0.25pF) 5pF<Cap<10pF: D (±0.50pF) Cap≧10pF: J (±5%)	J (±5%) K (±10%)	K (±10%) M (±20%)
Rated voltage (VDCW)	16V, 25V, 50V	6.3V, 10V, 16V, 25V, 50V	6.3V, 10V, 16V, 25V, 50V
Tan δ/Q*	Cap<30pF: Q≧400 +20C Cap≧30pF: Q≧1000	Ur=50V: ≦3.0% Ur=16V, 25V: ≦3.5% Ur=10V: ≦5.0% Ur=6.3V: ≦10%	Ur=50V: ≦3.0% Ur=16V, 25V: ≦3.5% Ur=10V: ≦5.0% Ur=6.3V: ≦10%
Insulation resistance at Ur	≧10GΩ	≧10GΩ or R×C≧500Ω×F Whichever is less	
Operating temperature	-55 to +125°C		-55 to +85°C
Capacitance change	±30 ppm	±15%	
Termination	Ni/Sn (lead-free termination)		

■ ‘*’Measured at 30~70% related humidity
■ NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% at the condition of 25°C ambient temperature
■ X7R, X5R: Apply 1.0±0.2Vrms, 1.0KHz±10% at the condition of 25°C ambient temperature

■High Q and Low ESR Capacitors for MCHL Series

Capacitance & Voltage

Dielectric		NPO								
EIA	Size	0402			0603				0805	
Code	VDCW	16V	25V	50V	16V	25V	50V	100V	50V	100V
0R5	0.5pF	N^	N^	N^	S^	S^	S^	S^	A^	A^
0R6	0.6pF	N^	N^	N^	S^	S^	S^	S^	A^	A^
0R7	0.7	N^	N^	N^	S^	S^	S^	S^	A^	A^
0R8	0.8	N^	N^	N^	S^	S^	S^	S^	A^	A^
0R9	0.9	N^	N^	N^	S^	S^	S^	S^	A^	A^
1R0	1.0	N^	N^	N^	S^	S^	S^	S^	A^	A^
1R2	1.2	N^	N^	N^	S^	S^	S^	S^	A^	A^
1R5	1.5	N^	N^	N^	S^	S^	S^	S^	A^	A^
1R8	1.8	N^	N^	N^	S^	S^	S^	S^	A^	A^
2R2	2.2	N^	N^	N^	S^	S^	S^	S^	A^	A^
2R7	2.7	N^	N^	N^	S^	S^	S^	S^	A^	A^
3R3	3.3	N^	N^	N^	S^	S^	S^	S^	A^	A^
3R9	3.9	N^	N^	N^	S^	S^	S^	S^	A^	A^
4R7	4.7	N^	N^	N^	S^	S^	S^	S^	A^	A^
5R6	5.6	N^	N^	N^	S^	S^	S^	S^	A^	A^
6R8	6.8	N^	N^	N^	S^	S^	S^	S^	A^	A^
8R2	8.2	N^	N^	N^	S^	S^	S^	S^	A^	A^
100	10	N	N	N	S	S	S	S	A^	A^
120	12	N	N	N	S	S	S	S	A^	A^
150	15	N	N	N	S	S	S	S	A^	A^
180	18	N	N	N	S	S	S	S	A^	A^
220	22	N	N	N	S	S	S	S	A^	A^
270	27	N	N	N	S	S	S	S	A^	A^
330	33	N	N	N	S	S	S	S	A^	A^
390	39	N	N	N	S	S	S	S	A^	A^
470	47	N	N	N	S	S	S	S	A^	A^
560	56	N	N	N	S	S	S	S	A^	A^
680	68	N	N	N	S	S	S	S	A^	A^
820	82	N	N	N	S	S	S	S	A^	A^
101	100	N	N	N	S	S	S	S	A^	A^
121	120	N	N	N	S	S	S	S	A^	A^
151	150	N	N	N	S	S	S	S	A^	A^
181	180	N	N	N	S	S	S	S		
221	220	N	N	N	S	S	S	S		
271	270	N	N	N	S	S	S	S		
331	330	N	N	N	S	S	S	S		
391	390	N	N	N	S	S	S	S		
471	470	N	N	N	S	S	S	S		
561	560				S	S	S			
681	680				S	S	S			
821	820				S	S	S			
102	1000				S	S	S			
122	1200				X	X	X			
152	1500				X	X	X			
182	1800				X	X	X			
222	2200				X	X	X			
272	2700				X	X	X			
332	3300				X	X	X			

■ The letter in cell is expressed the symbol of product thickness
■ The "^" mark is expressed product with Ag/Ni/Sn terminations
■ 0402,Capacitance<0.5pF:On request

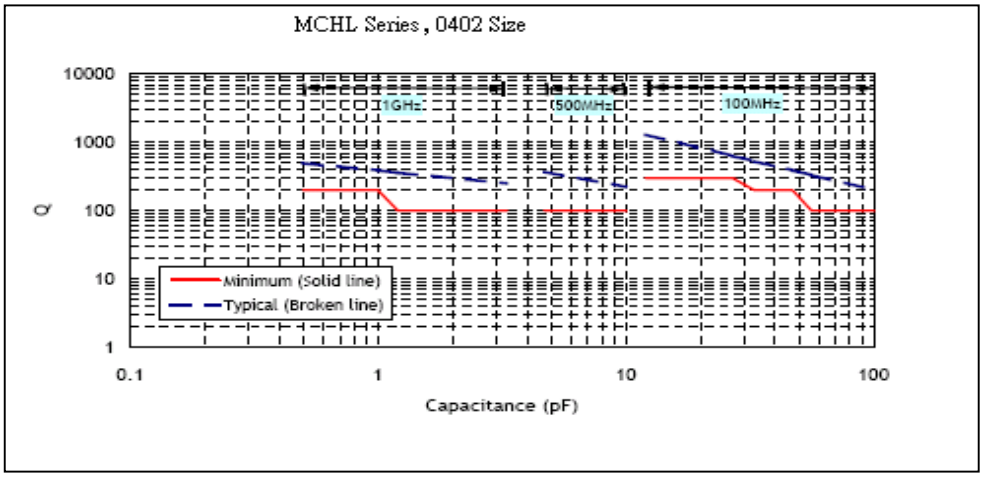
Electrical Data

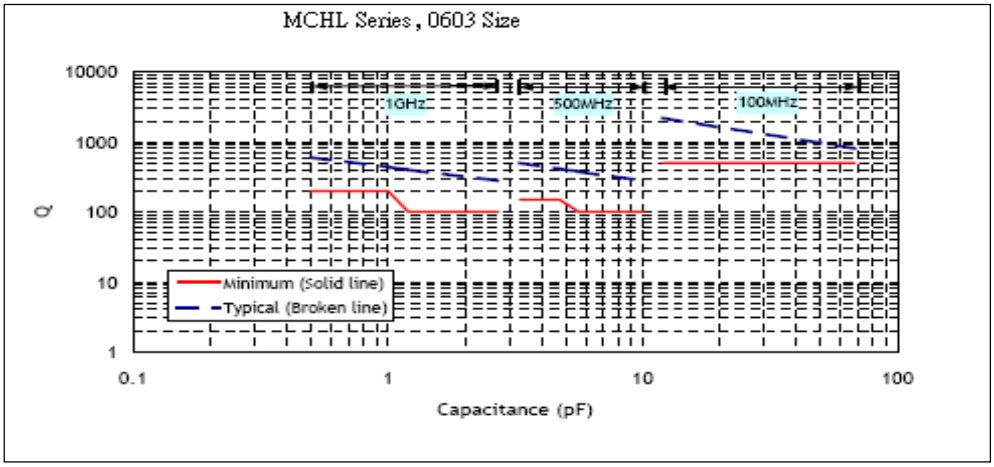
Dielectric	NPO
Size	**0402, 0603, 0805**
Capacitance*	0402: 0.5pF ~ 470pF (<0.5pF:on requested) 0603: 0.5pF ~ 3300pF 0805: 0.5pF ~ 150pF
Capacitance tolerance	Cap≦5pF: B(±0.1pF), C(±0.25pF) 5pF<Cap<10pF: C(±0.25pF), D(±0.50pF) Cap≧10pF: J(±5%)
Rated voltage (VDCW)	16V, 25, 50V, 100V
Q *	Cap<30pF: Q≧400 +20C Cap≧30pF: Q≧1000
Insulation resistance at Ur	≧10GΩ
Operating temperature	-55 to +125°C
Capacitance change	±30 ppm
ESR	Cap<2.2pF: ≦1000mΩ @900±100MHz 2.2pF≦Cap≦470pF: ≦500mΩ @900±100MHz Cap>470pF: ≦500mΩ @60±10MHz
Termination	Ni/Sn (lead-free termination)

■ '*'Measured at the conditions of 25°C ambient temperature and 30~70% related humidity

■ Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≦1000pF; 1.0KHz±10% for Cap>1000pF

Electrical characteristics





■Ultra High Q & Low ESR Capacitors for MCRF Series

Capacitance & Voltage

Dielectric		NPO										
EIA	Size	0201			0402		0603			0805		
Code	VDCW	6.3V	10V	25V	50V	100V	50V	100V	250V	50V	100V	250V
0R1	0.1pF	L	L	L	N	N						
0R2	0.2	L	L	L	N	N						
0R3	0.3	L	L	L	N	N	S	S	S	T	T	T
0R4	0.4	L	L	L	N	N	S	S	S	T	T	T
0R5	0.5	L	L	L	N	N	S	S	S	T	T	T
0R6	0.6	L	L	L	N	N	S	S	S	T	T	T
0R7	0.7	L	L	L	N	N	S	S	S	T	T	T
0R8	0.8	L	L	L	N	N	S	S	S	T	T	T
0R9	0.9	L	L	L	N	N	S	S	S	T	T	T
1R0	1.0	L	L	L	N	N	S	S	S	T	T	T
1R2	1.2	L	L	L	N	N	S	S	S	T	T	T
1R5	1.5	L	L	L	N	N	S	S	S	T	T	T
1R8	1.8	L	L	L	N	N	S	S	S	T	T	T
2R2	2.2	L	L	L	N	N	S	S	S	T	T	T
2R7	2.7	L	L	L	N	N	S	S	S	T	T	T
3R3	3.3	L	L	L	N	N	S	S	S	T	T	T
3R9	3.9	L	L	L	N	N	S	S	S	T	T	T
4R7	4.7	L	L	L	N	N	S	S	S	T	T	T
5R6	5.6	L	L	L	N	N	S	S	S	T	T	T
6R8	6.8	L	L	L	N	N	S	S	S	T	T	T
8R2	8.2	L	L	L	N	N	S	S	S	T	T	T
100	10	L	L	L	N	N	S	S	S	T	T	T
120	12	L	L	L	N		S	S	S	T	T	T
150	15	L	L	L	N		S	S	S	T	T	T
180	18	L	L	L	N		S	S	S	T	T	T
220	22				N		S	S	S	T	T	T
330	33						S	S		T	T	T
390	39						S	S		T	T	T
470	47						S	S		T	T	T
560	56									T	T	T
680	68									T	T	T
820	82									T	T	T
101	100									T	T	T

■ The letter in cell is expressed the symbol of product thickness

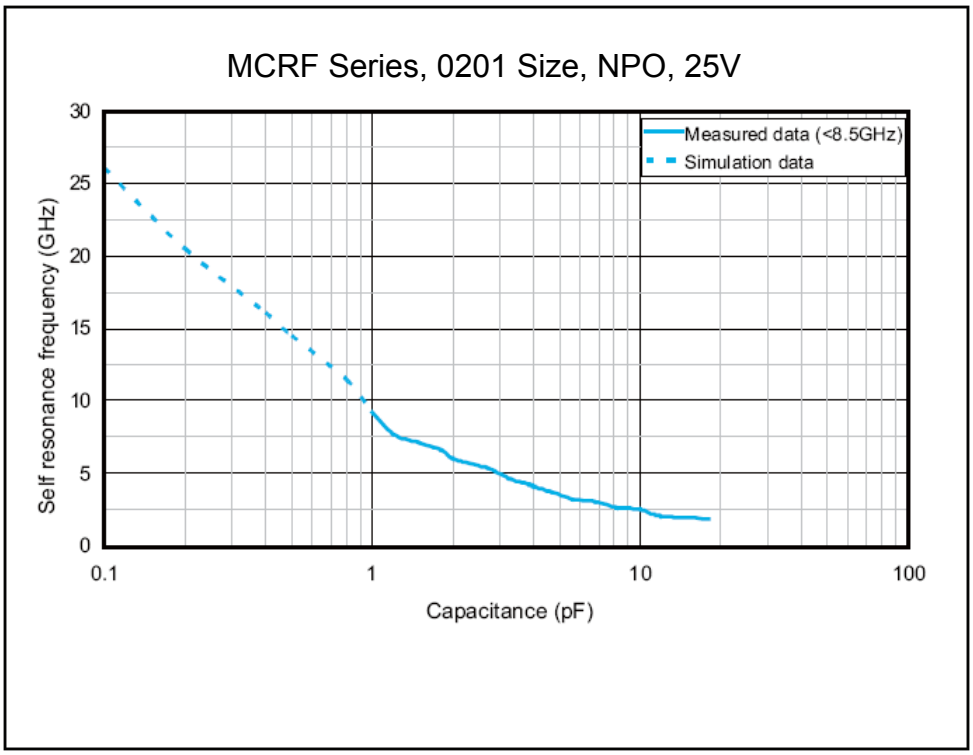
Electrical Data

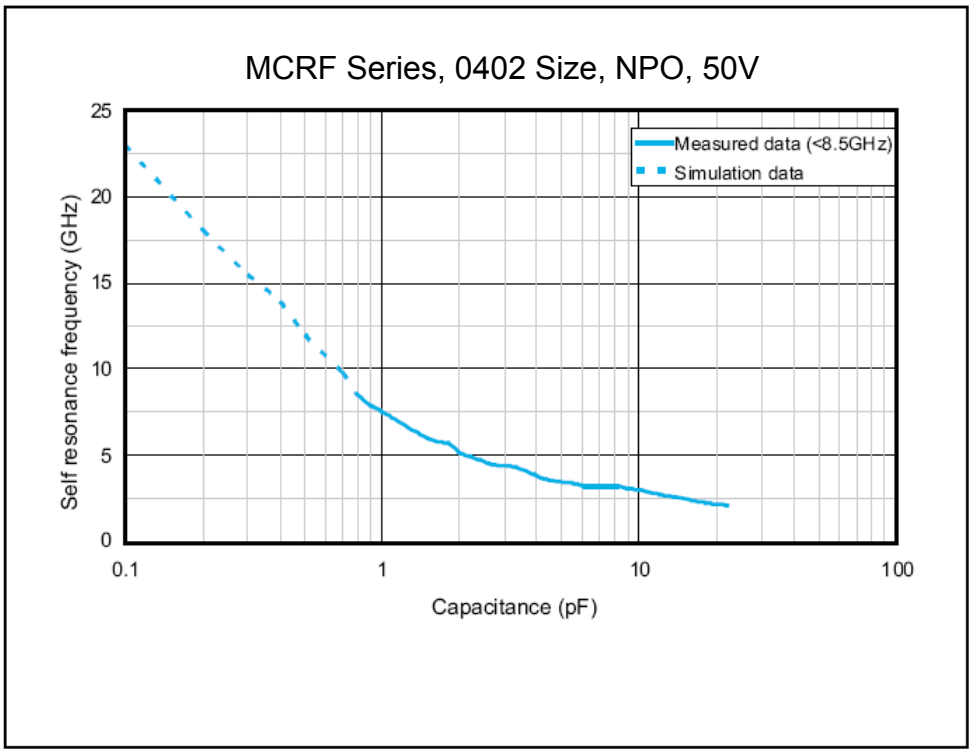
Dielectric	NPO
Size	0201, 0402, 0603, 0805
Capacitance*	0201: 0.1pF ~ 18pF　0402: 0.1pF ~ 22pF 0603: 0.3pF ~ 47pF　0805: 0.3pF ~ 100pF
Capacitance tolerance**	Cap≦5pF: A(±0.05pF), B(±0.1pF), C(±0.25pF) 5pF<Cap<10pF: B(±0.1pF), C(±0.25pF) , D(±0.5pF) Cap≧10pF: F(±1%), G(±2%), J(±5%)
Rated voltage (VDCW)	6.3V, 10V, 25V, 50V, 100V, 250V
Q *	Cap≧30pF: Q≧1000 , Cap<30pF: Q≧400+20C;
Insulation resistance at Ur	≧10GΩ
Operating temperature	-55 to +125°C
Capacitance	±30 ppm
Termination	Ni/Sn (lead-free termination)

■ '*'Measured at the conditions of 25°C ambient temperature and 30~70% related humidity

■ Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≦1000pF; 1.0KHz±10% for Cap>1000pF

Electrical characteristics





■Low Inductance Capacitors for MCLI Series

Capacitance & Voltage

Dielectric		X7R
EIA	Size	0612
Code	VDCW	50V
103	10nF	B
123	12	B
153	15	B
183	18	B
223	22	B
273	27	B
333	33	B
393	39	B
473	47	B
563	56	B
683	68	B
823	82	B
104	100	B
124	120	B
154	150	B

■ The letter in cell is expressed the symbol of product thickness

General Electrical data

Dielectric	X7R
Size	0612
Capacitance*	10nF~150nF
Capacitance tolerance	K (±10%) M (±20%)
Rated voltage (WVDC)	50V
Tan δ*	≦2.5%
Insulation resistance at Ur	≧10GΩ or R×C≧500Ω×F Whichever is less
Operating temperature	-55 to +125°C
Capacitance change	±15%
Termination	Ni/Sn (lead-free termination)
ESL	500pH

■ '*'Measured at 1.0±0.2Vrms, 1.0KHz±10%, 30~70% related humidity, 25°C ambient temperature

■Environmental Characteristics

<table>
<tr><th>Item</th><th>Requirement</th><th>Test Method</th></tr>
<tr><td>External Appearance</td><td>No defects which may affect performance</td><td>Visual inspection & Dimension measurement</td></tr>
<tr><td>Capacitance(Cap.)</td><td>Within the specified tolerance that refers on page2</td><td rowspan="2">NPO: (Class I)
Cap≤1000pF 1.0±0.2Vrms, 1MHz±10%
Cap≤1000pF 1.0±0.2Vrms, 1KHz±10%

X7R, X5R, Y5V: (Class II)
Cap≤10uF 1.0±0.2Vrms, 1KHz±10%
Cap>10uF 0.5±0.2Vrms, 120Hz±10%</td></tr>
<tr><td>Dissipation Factor (D.F.) or Quality factor (Q=1/D.F.)</td><td>NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C

X7R, X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td>≧50V</td><td>2.5%</td><td>3%</td><td>0201(50V); 0603≧0.047μF
0805≧0.18μF; 1206≧0.47μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">3.5%</td><td>5%</td><td>0805≧1μF; 1210≧10μF</td></tr>
<tr><td>7%</td><td>0603≧0.33μF; 1206≧4.7μF</td></tr>
<tr><td>10%</td><td>0402≧0.10μF; 0603≧0.47μF
0805≧2.2μF; 1206≧6.8μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">3.5%</td><td>5%</td><td>0402≧0.033μF; 0603≧0.15μF
0805≧0.68μF; 1206≧2.2μF
1210≧4.7μF</td></tr>
<tr><td>10%</td><td>0603≧0.68μF; 0805≧2.2μF
1206≧4.7μF; 1210≧22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">5%</td><td>10%</td><td>0402≧0.33μF; 0603≧0.33μF
0805≧2.2μF; 1206≧2.2μF
1210≧22μF</td></tr>
<tr><td>15%</td><td>0201≧0.1μF; 0402≧1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">10%</td><td>15%</td><td>0603≧10μF; 0805≧4.7μF
1210≧100μF</td></tr>
<tr><td>20%</td><td>0402≧2.2μF</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td>≧50V</td><td>5%</td><td>7%</td><td>0603≧0.1μF; 0805≧0.47μF
1206≧4.7uF</td></tr>
<tr><td>35V</td><td>7%</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">5%</td><td>7%</td><td>0402≧0.047μF; 0603≧0.1μF
0805≧0.33μF; 1206≧1μF
1210≧0.47μF</td></tr>
<tr><td>9%</td><td>0402≧0.068μF; 0603≧0.47μF
1206≧4.7μF; 1210≧22μF</td></tr>
<tr><td rowspan="2">16V
(C＜1.0μF)</td><td rowspan="2">7%</td><td>9%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr>
<tr><td>12.5%</td><td>0402≧0.22μF</td></tr>
<tr><td>16V
(C≧1.0μF)</td><td>9%</td><td>12.5%</td><td>0603≧2.2μF; 0805≧3.3μF
1206≧10μF; 1210≧22μF
1812≧47μF</td></tr>
<tr><td>10V</td><td>12.5%</td><td>20%</td><td>0402≧0.47μF</td></tr>
<tr><td>6.3V</td><td>20%</td><td>-</td><td>-</td></tr>
</table></td></tr>
<tr><td>Dielectric Strength</td><td>No evidence of damage or flash over during test</td><td>To apply voltage(≤100V) 250%
Duration: 1 to 5sec
Charge and discharge current less than 50mA

To apply voltage:
200V~300V ≧2 time VDC
500V~999V ≧1.5 time VDC
1000V~3000V ≧1.2 time VDC
Cut-off, set at 10mA
TEST=15 sec. RAMP=0</td></tr>
</table>

<table>
<tr><th>Item</th><th>Requirement</th><th>Test Method</th></tr>
<tr><td rowspan="3">Insulation Resistance</td><td>10GΩ or R×C≧500Ω-F Whichever is smaller
X7R, X5R, Y5V:
<table>
<tr><td>Rated Voltage</td><td>Insulation Resistance</td></tr>
<tr><td>100V: X7R</td><td rowspan="5">RxC≧100Ω-F</td></tr>
<tr><td>16V: 0402≧0.22uF</td></tr>
<tr><td>10V: 0201≧47nF;0402≧0.47uF;0603≧0.47uF
0805≧2.2uF;1206≧4.7uF;1210≧47uF</td></tr>
<tr><td>6.3V</td></tr>
</table></td><td>To apply rated voltage for max. 120sec</td></tr>
<tr><td>≧10GΩ or 100Ω-F whichever is smaller
Rated voltage: 200V~630V</td><td>To apply rated voltage(500V max.) for 60sec.</td></tr>
<tr><td>≧10GΩ
Rated voltage: >630V</td><td>To apply 500V for 60sec.</td></tr>
<tr><td>Temperature Characteristic of Capacitance</td><td>
<table>
<tr><td>T.C.</td><td>Capacitance Change</td></tr>
<tr><td>NPO</td><td>±30 (ppm/°C)</td></tr>
<tr><td>X7R</td><td>±15%</td></tr>
<tr><td>X5R</td><td>±15%</td></tr>
<tr><td>Y5V</td><td>+30%～-80%</td></tr>
</table></td><td>With no electrical load.
<table>
<tr><td>T.C.</td><td>Operating Temp</td></tr>
<tr><td>NPO</td><td>-55 ~ 125℃ at 25℃</td></tr>
<tr><td>X7R</td><td>-55 ~ 125℃ at 25℃</td></tr>
<tr><td>X5R</td><td>-55 ~ 85℃ at 25℃</td></tr>
<tr><td>Y5V</td><td>-25 ~ 85℃ at 20℃</td></tr>
</table></td></tr>
<tr><td>Adhesive Strength of Termination</td><td>No remarkable damage or removal of the terminations</td><td>Pressurizing force:
0201:2N
0402&0603:5N
>0603:10N
Test time: 10±1 sec</td></tr>
<tr><td>Vibration Resistance</td><td>No remarkable damage
Cap change and Q/D.F.: To meet initial spec</td><td>Vibration frequency: 10~55Hz/min
Total amplitude: 1.5mm
Test time: 6hrs.(tow hrs each in three mutually Perpendicular directions.)</td></tr>
<tr><td>Solderability</td><td>95% min. coverage of all metalized area.</td><td>Solder temperature: 235±5℃
Dipping time: 2±0.5 sec.</td></tr>
<tr><td>Bending Test</td><td>No remarkable damage
Cap change:
NPO: within±5% or 0.5pF whichever is larger
X7R, X5R: within±12.5%
Y5V: within±30%
(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</td><td>The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1mm per second until the deflection becomes 1mm and then the pressure shall be maintained for 5±1sec.
Measurement to be made after keeping at room temp. for 24±2hrs(Class I) or 48±4hrs(Class II)
(Thickness>1.0mm, Thickness≦1.0mm)</td></tr>
<tr><td>Resistance to Soldering Heat</td><td>No remarkable damage
Cap change:
NPO: within±2.5% or 0.25pF whichever is larger
X7R, X5R: within±7.5%
Y5V: within±20%
Q/D.F., I.R. and dielectric strength: To meet initial requirements.
25%max. leaching on each edge.</td><td>Solder temperature: 270±5℃
Dipping time: 10±1sec
Preheating: 120 to 150℃ for 1minute before immerse the capacitor in a eutectic solder.
Before initial measurement(Class II only): Perform 150+0/-10℃ for 1hr and then set for 48±4hrs at room temp.
Measurement to be made after keep at room temp. for 24±2 hrs.(Class I) or 48±4 hrs.(Class II).</td></tr>
<tr><td>Temperature Cycle</td><td>No remarkable damage.
Cap change:
NPO: within±2.5% or 0.25pF whichever is larger
X7R, X5R: within±7.5%
Y5V: within±20%
Q/D.F., I.R. and dielectric strength: To meet initial requirements.</td><td>Conduct the five cycles according to the temperature and time.
<table>
<tr><td>Step</td><td>Temp.(℃)</td><td>Time(min)</td></tr>
<tr><td>1</td><td>Min. operating temp.+0/-3</td><td>30±3</td></tr>
<tr><td>2</td><td>Room temp</td><td>2-3</td></tr>
<tr><td>3</td><td>Max. operating temp.+3/-0</td><td>30±3</td></tr>
<tr><td>4</td><td>Room temp.</td><td>2-3</td></tr>
</table>
Before initial measurement(Cass II only): Perform 150+0/-10℃ for 1hr and then set for 48±4 hrs at room temp.
Measurement to be made after keeping at room temp. for 24±2 hrs.(Class I) or 48±4 hrs.(Class II).</td></tr>
</table>

<table>
<tr><th>Item</th><th>Requirement</th><th>Test Method</th></tr>
<tr><td>Humidity
(steady state)</td><td>No remarkable damage.
Cap change:
NPO: within±5% or 0.5pF whichever is large
X7R, X5R:≥10V, within±12.5%;6.3V, within±25%
Y5V:≥10V, within±30%;6.3V, within+30/-40%
Q/D.F. value:
NPO: More than 30pF Q≥350,
10pF≤C≤30pF, Q≥275+2.5C
Less than 10pF Q≥200+10C
X7R, X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50V</td><td>3.0%</td><td>6%</td><td>0201(50V); 0603≧0.047μF
0805≧0.18μF ; 1206≧0.47μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">5.0%</td><td>10%</td><td>0805≧1μF;1210≧10μF</td></tr>
<tr><td>14%</td><td>0603≧0.33μF;1206≧4.7μF</td></tr>
<tr><td>15%</td><td>0402≧0.1μF;0603≧0.47μF
0805≧2.2μF;1206≧6.8μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">5%</td><td>10%</td><td>0603≧0.15μF;0603≧0.68μF
1206≧2.2μF;1210≧4.7μF</td></tr>
<tr><td>15%</td><td>0402≧0.033μF;0603≧0.68μF
0805≧2.2μF;1206≧4.7μF
1210≧22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">7.5%</td><td>15%</td><td>0402≧0.33μF;0603≧0.33μF
0805≧2.2μF;1206≧2.2μF
1210≧22μF</td></tr>
<tr><td>20%</td><td>0201≧0.1μF;0402≧1μF</td></tr>
<tr><td>6.3V</td><td>15%</td><td>30%</td><td>0402≧2.2μF;0603≧10μF
0805≧4.7μF;1210≧100μF</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50 V</td><td>7.5%</td><td>10%</td><td>0603≧0.1μF;0805≧0.47μF
1206≧4.7μF</td></tr>
<tr><td>35V</td><td>10%</td><td>—</td><td>—</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">7.5%</td><td>10%</td><td>0402≧0.047μF;0603≧0.1μF
0805≧0.33μF;1206≧1μF
1210≧4.7μF</td></tr>
<tr><td>15%</td><td>0402≧0.068μF;0603≧0.47μF
1206≧4.7μF;1210≧22μF</td></tr>
<tr><td rowspan="2">16V
(C<1.0μF)</td><td rowspan="2">10%</td><td>12.5%</td><td>0402≧0.068μF;0603≧0.68μF</td></tr>
<tr><td>20%</td><td>0402≧0.22μF</td></tr>
<tr><td>16V
(C≧.0μF)</td><td>12.5%</td><td>20%</td><td>0603≧2.2μF;0805≧3.3μF
1206≧10μF;1210≧22μF
1812≧47μF</td></tr>
<tr><td>10V</td><td>20%</td><td>30%</td><td>0402≧0.47μF</td></tr>
<tr><td>6.3V</td><td>30%</td><td>-</td><td>-</td></tr>
</table>
I.R.: ≥10V 1GΩ or 50Ω-F whichever is smaller.
Class II (X7R, X5R, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V:X7R</td><td rowspan="4">RxC≧10Ω-F</td></tr>
<tr><td>16V:0402≥0.22uF</td></tr>
<tr><td>10V: 0201≥47nF; 0402≥0.47uF
0603≥0.47uF;0805≥2.2uF
1206≥0.47uF;1210≥47uF</td></tr>
<tr><td>6.3V</td></tr>
</table></td><td>Test temp: 40±2℃
Humidity: 90~95% RH
Test time: 500+24/-0hrs
Measurement to be made after keeping at room temp. for 24±2hrs.(Class I) or 48±4 hrs. (Class II).</td></tr>
</table>

<table>
<tr><th>Item</th><th>Requirement</th><th>Test Method</th></tr>
<tr><td>Humidity load</td><td>
No remarkable damage.
Cap change:
NPO:±7.5% or 0.75pF whichever is larger
X5R, X5R:≧10V, within±12.5%; 6.3V, within±25%
Y5V:≧10V, within±30%; 6.3V, within+30/-40%
Q/D.F. value:
NPO: C≧30pF,Q≧200; C＜30pF,Q≧100+10/3C

X7R, X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50V</td><td>3.0%</td><td>6%</td><td>0201(50V);0603≧0.047μF
0805≧0.18μF; 1206≧0.47μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">5.0%</td><td>10%</td><td>0805≧1μF;1210≧10μF</td></tr>
<tr><td>14%</td><td>0603≧0.33μF;1206≧4.7μF</td></tr>
<tr><td>15%</td><td>0402≧0.10μF;0603≧0.47μF
0805≧2.2μF;1206≧6.8μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">5%</td><td>10%</td><td>0603≧0.15μF;0805≧0.68μF
1206≧2.2μF;1210≧4.7μF</td></tr>
<tr><td>15%</td><td>0402≧0.033μF;0603≧0.68μF
0805≧2.2μF;1206≧4.7μF
1210≧22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">7.5%</td><td>15%</td><td>0402≧0.22μF;0603≧0.33μF
0805≧2.2μF;1206≧2.2μF
1210≧22μF</td></tr>
<tr><td>20%</td><td>0201≧0.1μF;0402≧1μF</td></tr>
<tr><td>6.3V</td><td>15%</td><td>30%</td><td>0402≧2.2μF;0603≧10μF
0805≧4.7μF;1210≧100μF</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50 V</td><td>7.5%</td><td>10%</td><td>0603≧0.1μF;0805≧0.47μF
1206≧4.7μF</td></tr>
<tr><td>35V</td><td>10%</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">7.5%</td><td>10%</td><td>0402≧0.047μF;0603≧0.1μF
0805≧0.033μF; 1206≧1μF
1210≧4.7μF</td></tr>
<tr><td>15%</td><td>0402≧0.068μF; 0603≧0.1μF
1206≧4.7μF; 1210≧22μF</td></tr>
<tr><td rowspan="2">16V
(C＜1.0μF)</td><td rowspan="2">10%</td><td>12.5%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr>
<tr><td>20%</td><td>0402≧0.22μF</td></tr>
<tr><td>16V
(C≧1.0μF)</td><td>12.5%</td><td>20%</td><td>0603≧2.2μF;0805≧3.3μF
1206≧10μF; 1210≧22μF
1812≧47μF</td></tr>
<tr><td>10V</td><td>20%</td><td>30%</td><td>0402≧0.47μF</td></tr>
<tr><td>6.3V</td><td>30%</td><td>-</td><td>-</td></tr>
</table>
I.R.: ≧10V 500MΩ or 25Ω-F (Whichever is smaller)
Class II (X7R, X5R, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="4">RxC≧5Ω-F</td></tr>
<tr><td>16V:0402≧0.22uF</td></tr>
<tr><td>10V: 0201≧47nF;0402≧0.47uF
0603≧0.47uF;0805≧2.2uF
1206≧4.7uF;1210≧47uF</td></tr>
<tr><td>6.3V</td></tr>
</table>
</td><td>
Test temp: 40±2℃
Humidity: 90~95%RH
Test time: 500+24/-0 hrs
To apply voltage: Rated voltage (Max. 500V)
Measurement to be made after keeping at room temp for 24±2hrs.(Class I) or 48±4hrs.(Class II)
</td></tr>
</table>

<table>
<tr><th>Item</th><th>Requirement</th><th>Test Method</th></tr>
<tr>
<td>High Temperature Load (Endurance)</td>
<td>
No remarkable damage
Cap change:
NPO: ±3% or ±0.3F whichever is larger
X7R, X5R: ≧10V, within±12.5%; 6.3V, within+30/-40%
Q/D.F. value:
NPO: more than 30pF, Q≧350
10pF≦C<30pF, Q≧275+2.5C
Less than 10pF, Q≧200+10C
X7R, X5R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50V</td><td>3.0%</td><td>6%</td><td>0201(50V) ;0603≧0.047μF
0805≧0.18μF; 1206≧0.47μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">5.0%</td><td>10%</td><td>0805≧1μF;1210≧10μF</td></tr>
<tr><td>14%</td><td>0603≧0.33μF; 1206≧4.7μF</td></tr>
<tr><td>15%</td><td>0402≧0.10μF;0603≧0.47μF
0805≧2.2μF;1206≧6.8μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">5%</td><td>10%</td><td>0603≧0.15μF;0805≧0.68μF
1206≧2.2μF;1210≧4.7μF</td></tr>
<tr><td>15%</td><td>0402≧0.033μF;0603≧0.68μF
0805≧2.2μF;1206≧4.7μF
1210≧22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">7.5%</td><td>15%</td><td>0402≧0.33μF;0603≧0.33μF
0805≧2.2μF;1206≧2.2μF
1210≧22μF</td></tr>
<tr><td>20%</td><td>0201≧0.1μF;0402≧1μF</td></tr>
<tr><td>6.3V</td><td>15%</td><td>30%</td><td>0402≧2.2μF;0603≧10μF
0805≧4.7μF;1210≧100μF</td></tr>
</table>
Y5V:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F.≦</th></tr>
<tr><td>≧50 V</td><td>7.5%</td><td>10%</td><td>0603≧0.1μF;0805≧0.47μF
1206≧4.7μF</td></tr>
<tr><td>35V</td><td>10%</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">25V</td><td rowspan="2">7.5%</td><td>10%</td><td>0402≧0.047μF;0603≧0.1μF
0805≧0.33μF; 1206≧1μF
1210≧4.7μF</td></tr>
<tr><td>15%</td><td>0402≧0.068μF;0603≧0.47μF
1206≧4.7μF; 1210≧22μF</td></tr>
<tr><td rowspan="2">16V
(C＜1.0μF)</td><td rowspan="2">10%</td><td>12.5%</td><td>0402≧0.068μF; 0603≧0.68μF</td></tr>
<tr><td>20%</td><td>0402≧0.22μF</td></tr>
<tr><td>16V
(C≧1.0μF)</td><td>12.5%</td><td>20%</td><td>0603≧2.2μF;0805≧3.3μF
1206≧10μF; 1210≧22μF
1812≧47μF</td></tr>
<tr><td>10V</td><td>20%</td><td>30%</td><td>0402≧0.47μF</td></tr>
<tr><td>6.3V</td><td>30%</td><td>-</td><td>-</td></tr>
</table>
I.R.: ≧10V 1GΩ or 50Ω-F whichever is smaller
Class II (X7R, X5R, Y5V)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="4">RxC≧10Ω-F</td></tr>
<tr><td>16V:0402≧0.22uF</td></tr>
<tr><td>10V:0201≧47nF;0402≧0.47uF
0603≧0.47uF;0805≧2.2uF
1206≧4.7uF;1210≧47uF</td></tr>
<tr><td>6.3V</td></tr>
</table>
</td>
<td>
Test temp:
NPO, X7R: 125±3℃
X5R, Y5V: 85±3℃
To apply voltage:
(1.1) 100% of rated voltage for below range
<table>
<tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr>
<tr><td>0201</td><td>X5R</td><td>6.3V,10V</td><td>C≧0.1uF</td></tr>
<tr><td>0402</td><td>X5R,Y5V</td><td>6.3V,10V</td><td>C≧1.0uF</td></tr>
<tr><td>0603</td><td>X5R</td><td>6.3V,10V</td><td>C≧4.7uF</td></tr>
<tr><td>0805</td><td>X5R</td><td>6.3V</td><td>C≧22uF</td></tr>
</table>
(1.2) 6.3V or C≧10uF: 150% of rated voltage
(2) 10V≦Ur<500V: 200% of rated voltage
150% of rated voltage for below range
<table>
<tr><th>Size</th><th>Dielectric</th><th>Rated voltage</th><th>Capacitance range</th></tr>
<tr><td>0603</td><td>X5R</td><td>10V,16V</td><td>C≧1.0uF</td></tr>
<tr><td rowspan="2">0805</td><td rowspan="2">X5R</td><td rowspan="2">10V</td><td>C≧4.7uF</td></tr>
<tr><td>C≧2.2uF & T=0.85±0.1mm</td></tr>
<tr><td>1206</td><td>X5R</td><td>10V</td><td>C≧4.7uF & T=0.85±0.1mm</td></tr>
</table>
(3) 500V: 150% of rated voltage
(4) Ur≧630V: 120% of rated voltage

Test time: 1000+24/-0hrs
Measurement to be made after keeping at room temp. for 24±2hrs.(Class I) or 48±4hrs.(Class II).
</td>
</tr>
</table>

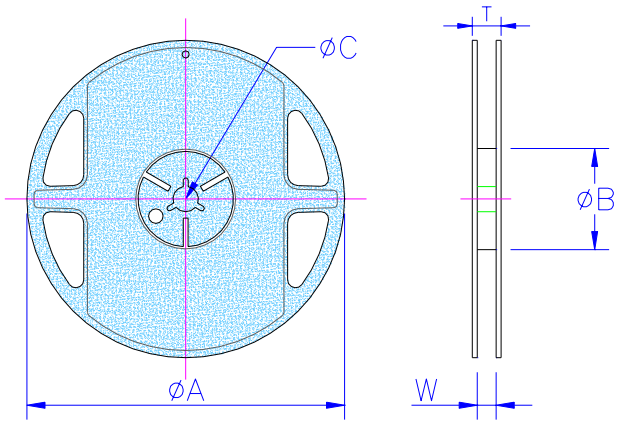
■Packaging

Packaging Quantity

Unit: mm

Type	Thickness / Symbol		Packaging (7" Reel)	
			Paper tape	Plastic tape
0201	0.30±0.03	L	15K	-
0402	0.50±0.05	N	10K	-
0603	0.80±0.07	S	4K	-
	0.80 +0.15 / -0.10	X	4K	-
0805	0.60±0.10	A	4K	-
	0.80±0.10	B	4K	-
	0.85±0.10	T	4K	-
	1.25±0.10	D	-	3K
	1.25±0.20	I	-	3K
1206	0.80±0.10	B	4K	-
	0.95±0.10	C	-	3K
	1.15±0.15	J	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	1.60 +0.30 / -0.10	P	-	2K
1210	0.95±0.10	C	-	3K
	1.25±0.10	D	-	3K
	1.60±0.20	G	-	2K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	1K
1808	1.25±0.10	D	-	2K
	2.00±0.20	K	-	1K
1812	1.25±0.10	D	-	1K
	2.00±0.20	K	-	1K
	2.50±0.30	M	-	0.5K
0612	0.80±0.10	B	4K	-

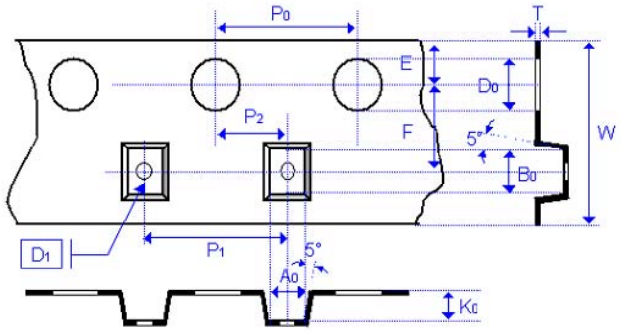
Tape and Reel



Unit: mm

Type	Chip Size							
	0201	0402	0603	0805	1206/0612	1210	1808	1812
ΦC	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0	13.0±1.0
W	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	9.0±1.0	13.5±1.0	13.5±1.0
ΦA	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")	178±1.0(7")
ΦB	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	60.5±1.0(7")	80.0±1.0(7")	80.0±1.0(7")

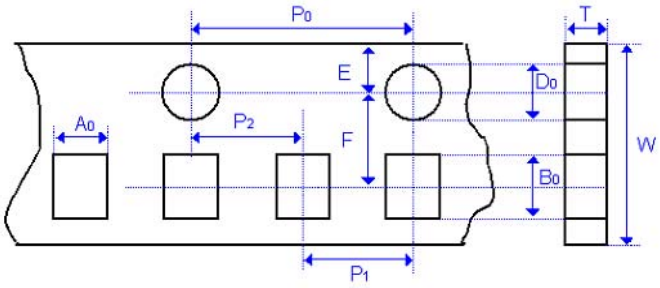
Plastic Tape Size Specification



Unit: mm

Type	0805		1206					1210					1808		1812		
Thickness	D	I	C	J	D	G	P	C	D	G	K	M	D	K	D	K	M
A_0	<1.57		<1.85			<1.95		<2.97				<2.97	<2.35		<3.81		
B_0	<2.40		<3.46			<3.67		<3.73				<3.73	<4.98	<5.00	<5.30		
T	0.23±0.05		0.23±0.05			0.23±0.05		0.23±0.05				0.23±0.05	0.25±0.05		0.25±0.05		
K_0	<2.50		<2.50			<2.50		<2.50				<3.00	<2.50		<2.50		<3.00
W	8.00±0.10		8.00±0.10			8.00±0.10		8.00±0.10				8.00±0.10	12.0±0.20		12.0±0.20		
P_0	4.00±0.10		4.00±0.10			4.00±0.10		4.00±0.10				4.00±0.10	4.00±0.10		4.00±0.10		
P_1	4.00±0.10		4.00±0.10			4.00±0.10		4.00±0.10				4.00±0.10	4.00±0.10		8.00±0.10		
P_2	2.00±0.05		2.00±0.05			2.00±0.05		2.00±0.05				2.00±0.05	2.00±0.05		2.00±0.05		
D_0	1.50±0.05		1.50±0.05			1.50±0.05		1.50±0.05				1.50±0.05	1.50±0.05		1.50±0.05		
D_1	1.00±0.10		1.00±0.10			1.00±0.10		1.00±0.10				1.00±0.10	1.00±0.10		1.00±0.10		
E	1.75±0.10		1.75±0.10			1.75±0.10		1.75±0.10				1.75±0.10	1.75±0.10		1.75±0.10		
F	3.50±0.05		3.50±0.05			3.50±0.05		3.50±0.05				3.50±0.05	3.50±0.05		5.50±0.05		

Paper Tape Size Specification



Unit: mm

Type	0201	0402	0603		0805		1206/0612
Thickness	L	N	S	X	A	B	B
A_0	0.45±0.05	0.62±0.05	1.02±0.05		1.50±0.10	1.50±0.10	2.00±0.10
B_0	0.75±0.05	1.12±0.05	1.82±0.05		2.30±0.10	2.30±0.10	3.50±0.10
T	0.60±0.05	0.60±0.05	0.95±0.05		0.75±0.05	0.95±0.05	0.95±0.05
W	8.00±0.10	8.00±0.10	8.00±0.10		8.00±0.10	8.00±0.10	8.00±0.10
P_0	4.00±0.10	4.00±0.10	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P_1	2.00±0.05	2.00±0.05	4.00±0.10		4.00±0.10	4.00±0.10	4.00±0.10
P_2	2.00±0.05	2.00±0.05	2.00±0.05		2.00±0.05	2.00±0.05	2.00±0.05
D_0	1.55±0.05	1.55±0.05	1.55±0.05		1.55±0.05	1.55±0.05	1.50±0.05
E	1.75±0.05	1.75±0.05	1.75±0.05		1.75±0.05	1.75±0.05	1.75±0.10
F	3.50±0.05	3.50±0.05	3.50±0.05		3.50±0.05	3.50±0.05	3.50±0.05