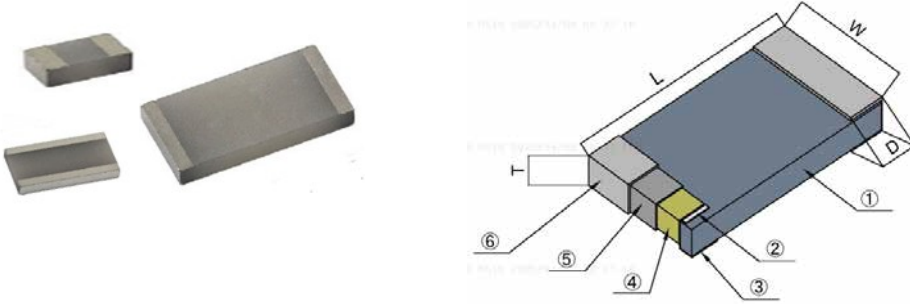


Thermal Jumper Surface Mount Chip—THJ Series

Construction



Features

- Electrically isolated thermal conductor
- High thermal conductivity ALN substrate (170W/mK)
- Electrically Isolated terminations (>999MΩ)
- Low capacitance
- Available with SnPb or lead (Pb)-free wrap terminations
- MSL: Level 1

Applications

- Power Supplies and Converters
- RF Amplifiers
- Switch Mode Power Supplies
- Filters

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D	Weight (g) (1000pcs)
THJ03	0603	1.55±0.15	0.80±0.15	0.635±0.20	0.40±0.20	2.97
THJ62	0612	1.55±0.15	3.00±0.15	0.635±0.20	0.40±0.20	12.43
THJ06	1206	3.05±0.20	1.55±0.20	0.635±0.20	0.50±0.25	11.10
THJ12	2512	6.30±0.20	3.10±0.20	0.635±0.20	0.50±0.25	45.87

Part Numbering

THJ	62	-	T	G		RXR
Product Type	Dimensions	Resistance Tolerance	Packaging Code	Substrate Thickness	Power Rating	Resistance
	03: 0603 62: 0612 06: 1206 12: 2512	—: No Specified	T: Taping Reel	G: 0.635mm	: Standard* (See Remark)	RXR: Jumper

*Remark: Standard parts don't need for power rating code.

Typical Characteristics

Case Size	0603	0612	1206	2512
Thermal resistance (°C/W), T _R	17.9	4.8	18.2	18.8
Thermal conductance (mW/°C), T _C	55.7	208.9	54.7	53.1
Operating temperature range	-55°C to +155°C			
Storage temperature range	-55°C to +155°C			
Dielectric withstanding voltage kVAC, RMS (60 Hz)	>1.5	>1.5	>1.5	>1.5

Note:

$$T_R = \frac{L}{k \cdot (T \cdot W)}$$

where k is the thermal conductivity of ALN, 170 W/mK

$$T_C = \frac{1}{T_R}$$

Environmental Characteristics

Item	Requirement	Test Method
Solderability	95% min. coverage	245±5°C for 3 seconds
Terminal Strength	No broken	Force of 1.8kg for 60 seconds
Bending Strength (Board Flex)	No visual damage	Bending once for 60 seconds Bending displacement: 2512 sizes: 2 mm ; Other sizes: 3 mm

■ Reference Standards: MIL-STD-202; JIS-C 5201-1; AEC-Q200

■ Storage Temperature: 15~28°C; Humidity < 80%RH

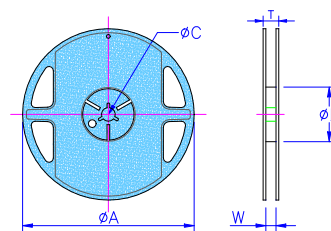
■ Shelf Life: 2 years from production date

Packaging

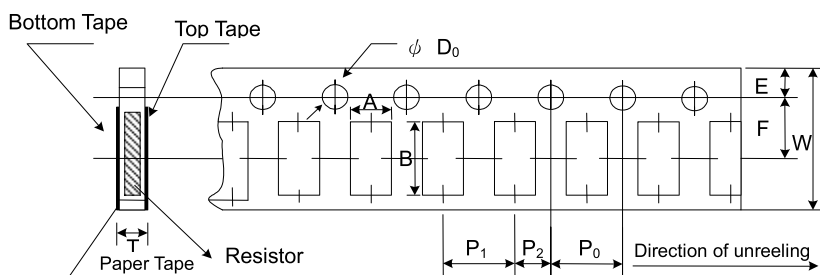
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
THJ03	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	
THJ62	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
THJ06	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000	-
THJ12	178.0±1.0	60.0±1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000



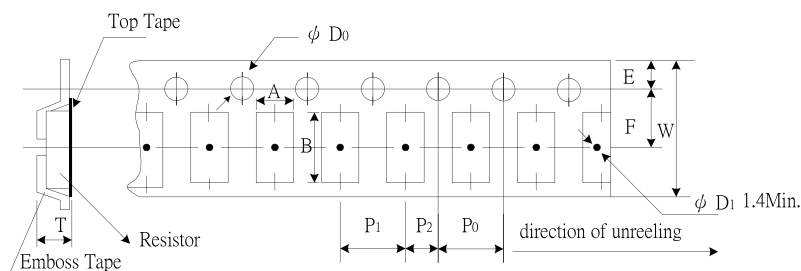
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
THJ03	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	0.75±0.03
THJ62	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
THJ06	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

Emboss Plastic Tape Specifications

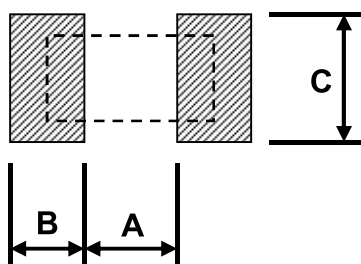


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
THJ12	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

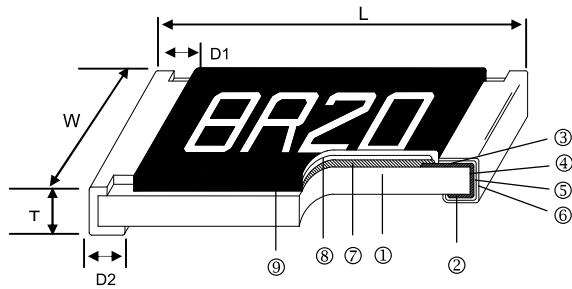
Unit: mm



Type	A	B	C
THJ03	0.76	0.80	0.86±0.2
THJ62	0.79	0.76	3.70±0.2
THJ06	2.15	0.92	1.70±0.2
THJ12	5.13	1.25	3.18±0.2

Automotive Grade Thin Film Precision Chip Resistor—AR..A Series

Construction



Features

- AEC-Q200 Qualified
- Advanced thin film technology
- RoHS compliant
- Special materials, design, and processing for high sulfur applications
- Test proven immunity to humidity, moisture, and sulfur
- MSL: Level 1

Applications

- Automotive
- Medical Equipment
- Testing / Measurement Equipment
- Printer Equipment
- Automatic Equipment Controller
- Converters
- Communication Device, Cell Phone, GPS, PDA

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

Dimensions

Unit: mm

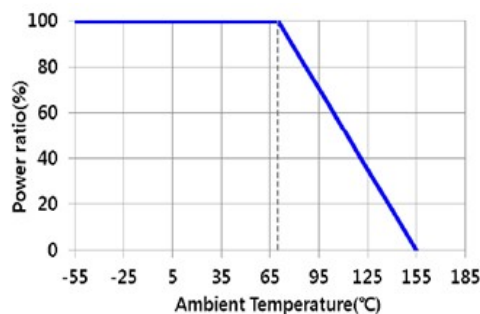
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
AR02	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.20±0.10	0.54
AR03	0603	1.55±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.83
AR05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.20	4.71
AR06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.42±0.20	0.35±0.25	9.02
AR13	1210	3.10±0.15	2.40±0.15	0.55±0.10	0.40±0.20	0.55±0.25	10.00
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	A	T	C		1001	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	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* (See Remark) X: 1/10W W: 1/8W V: 1/4W G: 2/5W O: 1/3W V: 1/2W	0100: 10Ω 10R2: 10.2Ω 1000: 100Ω 1001: 1KΩ 1004: 1MΩ	A: Automotive Grade

*Remark: Standard parts don't need for power rating code.

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)
					±0.05%	±0.1%	±0.25%	±0.5%	±1%	
AR02 (0402)	1/16W	-55 ~ +155°C	50V	100V	10Ω - 12KΩ	10Ω - 221KΩ				±25 ±50
AR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	10Ω - 49.9KΩ	4.7Ω - 680KΩ				±25 ±50
AR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	10Ω - 100KΩ	4.7Ω - 1MΩ				±25 ±50
AR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	10Ω - 200KΩ	4.7Ω - 1.5MΩ				±25 ±50
AR13 (1210)	1/4W	-55 ~ +155°C	150V	300V	10Ω - 499KΩ	10Ω - 1MΩ				±25 ±50
AR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	10Ω - 499KΩ	10Ω - 1MΩ				±25 ±50
AR12 (2512)	1/2W	-55 ~ +155°C	150V	300V	10Ω - 499KΩ	10Ω - 1MΩ				±25 ±50

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%	±0.25%	±0.5%	±1%	
AR02 (0402)	1/16W	-55 ~ +155°C	50V	100V	49.9Ω - 12KΩ				-		±5
					49.9Ω - 12KΩ		49.9Ω – 69.8KΩ				±10 ±15
AR03 (0603)	1/16W	-55 ~ +155°C	50V	100V	24.9Ω - 15KΩ				-		±5
					24.9Ω - 15KΩ	10Ω – 49.9KΩ	10Ω – 332KΩ				±10 ±15
AR05 (0805)	1/10W	-55 ~ +155°C	100V	200V	24.9Ω - 30KΩ				-		±5
					24.9Ω - 30KΩ	10Ω – 100KΩ	10Ω – 1MΩ				±10 ±15
AR06 (1206)	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 50KΩ				-		±5
					24.9Ω - 50KΩ	10Ω – 200KΩ	10Ω – 1MΩ				±10 ±15
AR13 (1210)	1/ 4W	-55 ~ +155°C	150V	300V	-	10Ω – 499KΩ	10Ω – 1MΩ				±10 ±15
AR10 (2010)	1/4W	-55 ~ +155°C	150V	300V	-	10Ω – 499KΩ	10Ω – 1MΩ				±10 ±15
AR12 (2512)	1/2W	-55 ~ +155°C	150V	300V	-	10Ω – 499KΩ	10Ω – 1MΩ				±10 ±15

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

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

■ 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)
					±0.01%	±0.05%	±0.1%	±0.25%	±0.5%	±1%	
AR02 (0402)	1/10W	-55 ~ +155°C	50V	100V	-		10Ω - 221KΩ				±25 ±50
AR03 (0603)	1/10W	-55 ~ +155°C	75V	150V	24.9Ω - 15KΩ				-		±5
					24.9Ω - 15KΩ	10Ω - 49.9KΩ	10Ω - 332KΩ				±10 ±15
					-		4.7Ω - 680KΩ				±25 ±50
	1/8W				-		10Ω - 680KΩ				±25 ±50
AR05 (0805)	1/8W	-55 ~ +155°C	150V	300V	24.9Ω - 30KΩ						±5
					24.9Ω - 30KΩ	10Ω - 100KΩ	10Ω - 1MΩ				±10 ±15
					-		4.7Ω - 1MΩ				±25 ±50
	1/5W				-		10Ω - 1MΩ				±25 ±50
AR06 (1206)	1/4W	-55 ~ +155°C	200V	400V	24.9Ω - 50KΩ				-		±5
					24.9Ω - 50KΩ	10Ω - 200KΩ	10Ω - 1MΩ				±10 ±15
					-		4.7Ω - 1.5MΩ				±25 ±50
	2/5W				-		10Ω - 1.5MΩ				±25 ±50
AR13 (1210)	1/3W	-55 ~ +155°C	200V	400V	-	10Ω - 499KΩ	10Ω - 1MΩ				±10 ±15 ±25 ±50
	1/2W				-		10Ω - 1MΩ				±25 ±50
AR10 (2010)	1/3W	-55 ~ +155°C	200V	400V	-	10Ω - 499KΩ	10Ω - 1MΩ				±10 ±15 ±25 ±50

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

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

Environmental Characteristics

Item	Requirement		Test Method
	Tol. ≤ 0.05%	Tol. > 0.05%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	ΔR±0.05% ΔR±0.1% (0402 1/10W, 0603 1/8W, 0805 1/5W, 1206 2/5W, 1210 1/2W)		RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	>1000 MΩ		Apply 100VDC for 1 minute
Operational Life	ΔR±0.05%	ΔR±0.2%	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
	>7kΩ ΔR±0.2%		
	ΔR±0.2% for high power rating		
Biased Humidity	ΔR±0.1%		1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	ΔR±0.2%		at +155°C for 1000 hrs
Temperature Cycling	ΔR±0.1%		-55°C to +125°C, 1000 cycles
Bending Strength (Board Flex)	ΔR±0.1%		Bending once for 60 seconds Bending displacement: 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±0.05%		260±5°C for 10 seconds
Terminal strength	No broken		Force of 1.8kg for 60 seconds.
Mechanical Shock	ΔR±0.05%	ΔR±0.1%	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	ΔR±0.05%	ΔR±0.1%	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	ΔR±0.5%		Human body model AR02: 0.4KV AR03: 1KV AR05: 1.5KV AR06, AR10, AR12, AR13: 2KV
Resistance to solvents	Marking Unsmear		Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Sulfur Test	ΔR±1% (0201 product is excluded)		105±2°C, no power rating for 1000 hrs
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94; ASTM-B-809-95

■ Storage Temperature: 15~28°C; Humidity < 80%RH

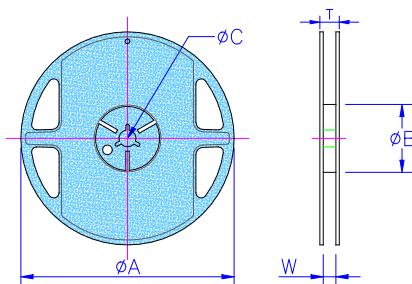
■ Shelf Life: 2 years from production date

Packaging

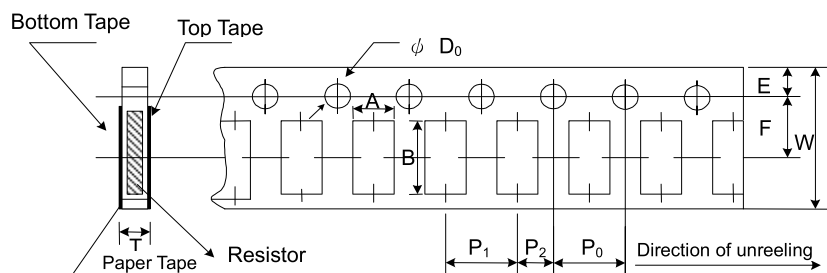
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
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



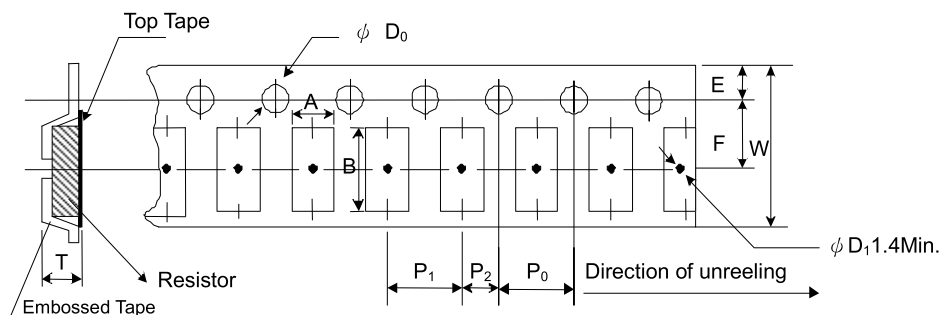
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
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

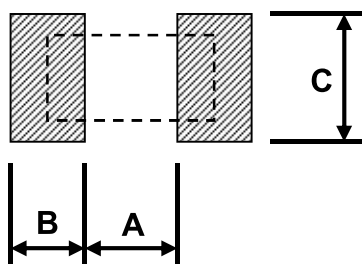


Unit: mm

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

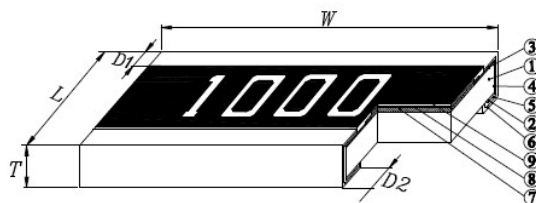
Unit: mm



Type	A	B	C
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

Automotive Grade Thin Film Precision Chip Resistor (Wide Thrminal)—ARW..A Series

Construction



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

Features

- AEC-Q200 Qualified
- Advanced thin film technology
- RoHS compliant
- Special materials, design, and processing for high sulfur applications
- Test proven immunity to humidity, moisture, and sulfur
- MSL: Level 1

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARW08	0508	1.25±0.15	2.00±0.15	0.43±0.10	0.21±0.15	0.25±0.15	3.39
ARW62	0612	1.55±0.15	3.00±0.15	0.43±0.10	0.25±0.15	0.32±0.15	7.69
ARW20	1020	2.45±0.20	4.90±0.20	0.43±0.10	0.40±0.20	0.52±0.20	20.95
ARW25	1225	3.15±0.20	6.30±0.20	0.45±0.10	0.52±0.20	0.52±0.20	33.24

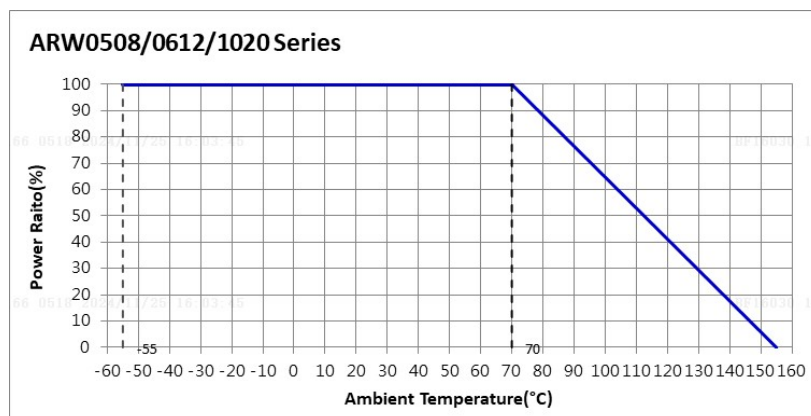
Applications

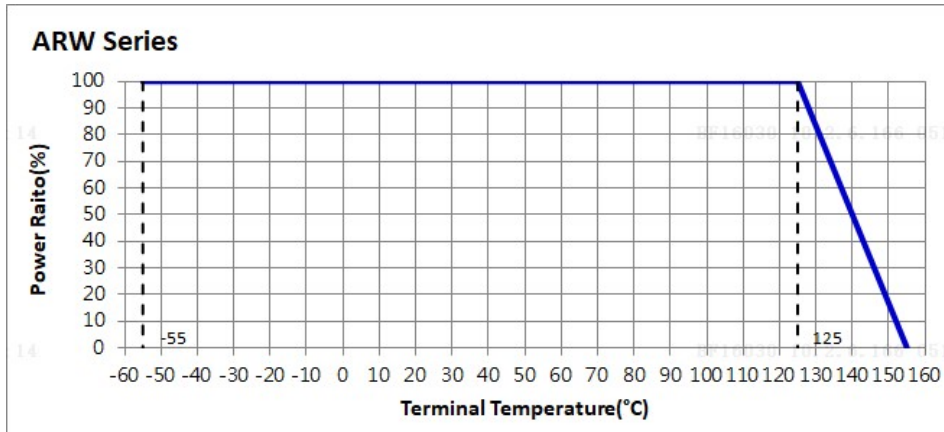
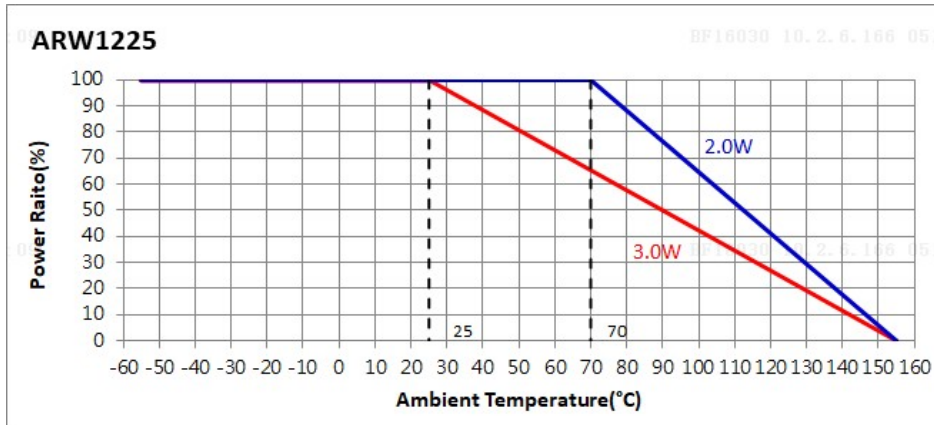
- Automotive
- DC Motor, Inverters
- Testing / Measurement Equipment
- Robotics, Industrial Control System

Part Numbering

ARW	62	B	T	C	T	1001	A
Product Type	Dimensions (LxW)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	08: 0508 62: 0612 20: 1020 25: 1225	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	C: ±25 D: ±50	U: 0.5W T: 1W A: 1.5W S: 2W R: 3W	0100: 10Ω 10R2: 10.2Ω 1000: 100Ω 1001: 1KΩ 1003: 100KΩ	A: Automotive Grade NA: No Marking Automotive Grade

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%	
ARW08 (0508)	0.5W	-55 ~ +155°C	50V	100V	12.5Ω – 25KΩ				±25
									±50
ARW62 (0612)	1W	-55 ~ +155°C	75V	150V	2.5Ω – 80KΩ				±25
									±50
ARW20 (1020)	1.5W	-55 ~ +155°C	100V	200V	2.5Ω – 200KΩ				±25
									±50
ARW25 (1225)	2W	-55 ~ +155°C	200V	400V	2.5Ω – 250KΩ				±25
									±50

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%	
ARW20 (1020)	2W	-55 ~ +155°C	100V	200V	2.5Ω – 200KΩ				±25
									±50
ARW25 (1225)	3W	-55 ~ +155°C	200V	400V	2.5Ω – 250KΩ				±25
									±50

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

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

■ 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⁾	$\Delta R \pm 0.1\%$ for Standard power rating	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
	$\Delta R \pm 0.2\%$ for High power rating	
Insulation Resistance	>1000 M Ω	Apply 100VDC for 1 minute
Endurance	$\Delta R \pm 0.2\%$	70 $\pm 2^\circ\text{C}$, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Operational Life	$\Delta R \pm 0.2\%$	Condition D Steady State TA=125°C at derated power. Measurement at 24 ± 4 hours after test conclusion.
Biased Humidity	$\Delta R \pm 0.1\%$	1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	$\Delta R \pm 0.2\%$	at +155°C for 1000 hrs
Temperature Cycling	$\Delta R \pm 0.1\%$	-55°C to +125°C, 1000 cycles
Bending Strength (Board Flex)	$\Delta R \pm 0.1\%$	Bending once for 60 seconds Bending displacement: 1020, 1225 sizes: 2mm 0508, 0612 sizes: 3mm
Solderability	95% min. coverage	245 $\pm 5^\circ\text{C}$ for 3 seconds
Resistance to Soldering Heat	$\Delta R \pm 0.05\%$	260 $\pm 5^\circ\text{C}$ for 10 seconds
Terminal strength	No broken	Force of 1.8kg for 60 seconds.
Mechanical Shock	$\Delta R \pm 0.1\%$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\Delta R \pm 0.1\%$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\Delta R \pm 0.5\%$	Human body model 0508, 0612, 1020, 1225: 2KV
Resistance to solvents	Marking Unsmeared	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Sulfur Test	$\Delta R \pm 1\%$	105 $\pm 2^\circ\text{C}$, no power rating for 1000 hrs
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

(1) High power resistor surface temperature measured using FLIR ETS-320 thermal imaging system must be less than 200°C

■ Reference Standards: IEC 60115-1, JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94;

ASTM-B-809-95

■ Storage Temperature: 15~28°C; Humidity < 80%RH

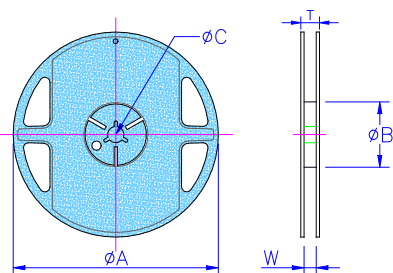
■ Shelf Life: 2 years from production date

Packaging

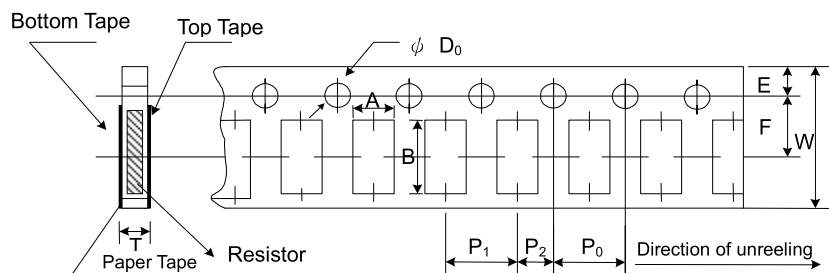
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Embossed Plastic Tape (EA)
ARW08	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
ARW62	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	9.5 ± 1.0	11.5 ± 1.0	5,000	-
ARW20	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
ARW25	178.0 ± 1.0	60.0 + 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000



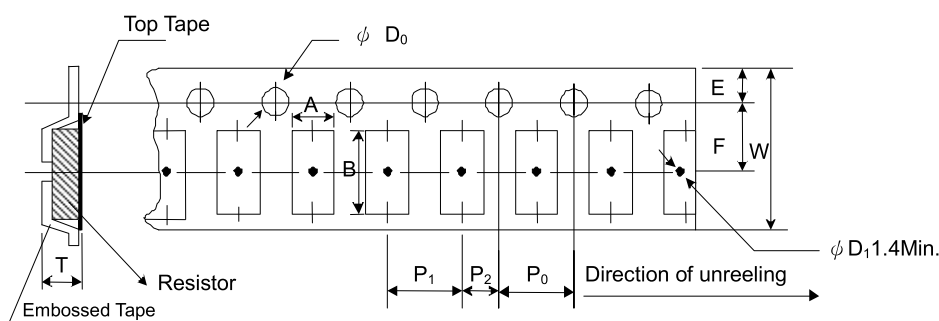
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARW08	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
ARW62	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

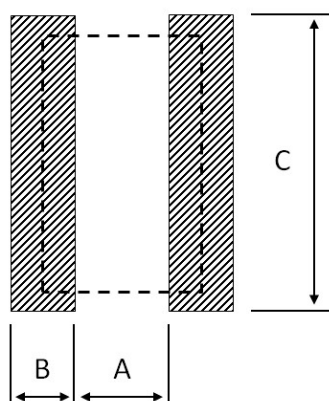
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARW20	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
ARW25	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

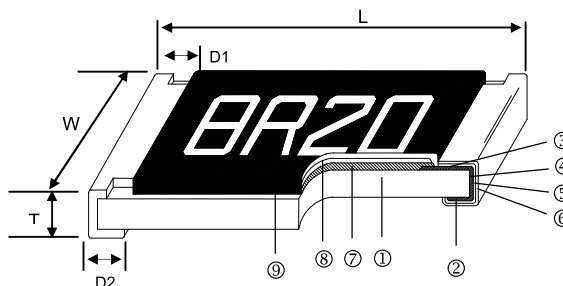


Unit: mm

Type	A	B	C
ARW08	0.55	0.65	2.35±0.20
ARW62	0.70	1.00	3.20±0.20
ARW20	1.00	1.20	5.00±0.20
ARW25	1.80	2.00	6.50±0.20

Automotive Grade Metal Thin Film Chip Resistors — ARM..A Series

Construction



Features

- AEC-Q200 Qualified
- High precision resistance tolerance: $\pm 0.02\%$
- Low TCR down to $\pm 5\text{ppm}/^\circ\text{C}$
- Advanced sulfur resistance verified according to ASTM B 809
- MSL: Level 1

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

Applications

- Automotive
 - Telecommunication
 - Medical equipment
 - Industrial equipment
- Industrial measurement instrumentation, industrial machines, Various sensors, medical electronics

Dimensions

Unit: mm

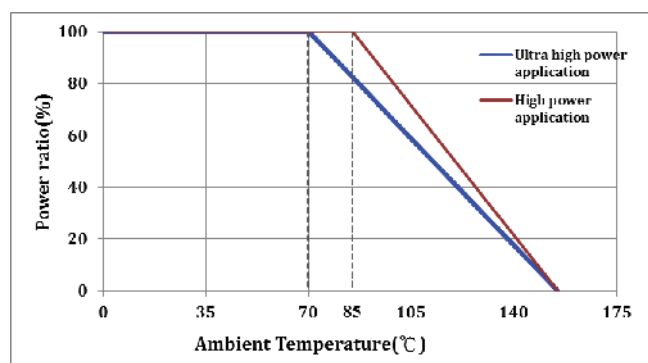
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARM02	0402	1.00 $\pm$ 0.05	0.50 $\pm$ 0.05	0.30 $\pm$ 0.05	0.20 $\pm$ 0.10	0.20 $\pm$ 0.10	0.54
ARM03	0603	1.55 $\pm$ 0.10	0.80 $\pm$ 0.10	0.45 $\pm$ 0.10	0.30 $\pm$ 0.20	0.30 $\pm$ 0.20	1.83
ARM05	0805	2.00 $\pm$ 0.15	1.25 $\pm$ 0.15	0.55 $\pm$ 0.10	0.30 $\pm$ 0.20	0.40 $\pm$ 0.20	4.71
ARM06	1206	3.05 $\pm$ 0.15	1.55 $\pm$ 0.15	0.55 $\pm$ 0.10	0.42 $\pm$ 0.20	0.35 $\pm$ 0.25	9.02

Part Numbering

ARM	06	F	T	C		1001	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805 06: 1206	Q: $\pm 0.02\%$ A: $\pm 0.05\%$ B: $\pm 0.1\%$ D: $\pm 0.5\%$	T: Taping Reel B: Bulk	S: ± 5 B: ± 10 C: ± 25 D: ± 50 E: ± 100	: Standard* (See Remark) Y: 1/16W X: 1/10W M: 1/6W W: 1/8W V: 1/4W	0100: 10Ω 10R2: 10.2Ω 1000: 100Ω 1001: 1KΩ 1004: 1MΩ	A: Automotive Grade NA: No Marking Automotive Grade

*Remark: Standard parts don't need for power rating code.

Derating Curve



■ Electrical Specifications

Item Type	Power Rating			Max. Operating Voltage	Max. Overload Voltage	Resistance Range				TCR (PPM/°C)
	Standard	High	Ultra high			±0.02%	±0.05%	±0.1%	±0.5%	
ARM02 (0402)	1/32W	1/16W	1/8W	75V	100V	100Ω – 3KΩ				±5
						100Ω – 3KΩ	47Ω – 100KΩ			±10
						100Ω – 3KΩ	47Ω – 100KΩ		47Ω – 150KΩ	±25
						–	–	47Ω – 100KΩ	10Ω – 150KΩ	±100
ARM03 (0603)	1/16W	1/10W	1/6W	100V	200V	100Ω – 5.1KΩ				±5
						100Ω – 5.1KΩ	47Ω – 270KΩ			±10
						100Ω – 5.1KΩ	47Ω – 270KΩ	47Ω – 332KΩ	47Ω – 1MΩ	±25
						–	–	47Ω – 332KΩ	10Ω – 1MΩ	±50
ARM05 (0805)	1/10W	1/8W	1/4W	150V	300V	100Ω – 10.2KΩ				±5
						100Ω – 10.2KΩ	47Ω – 475KΩ			±10
						100Ω – 10.2KΩ	47Ω – 475KΩ	47Ω – 2.7MΩ		±25
						–	–	47Ω – 2.7MΩ	10Ω – 2.7MΩ	±50
ARM06 (1206)	1/8W	1/4W	–	200V	400V	100Ω – 33.2KΩ				±5
						100Ω – 33.2KΩ	47Ω – 1MΩ			±10
						100Ω – 33.2KΩ	47Ω – 1MΩ	47Ω – 5.1MΩ		±25
						–	–	47Ω – 5.1MΩ	10Ω – 5.1MΩ	±50

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

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

Operating Temperature Range: -55 ~ +155°C

■ 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	$\leq 47\Omega\Delta R\pm 0.1\%$ $\geq 47\Omega\Delta R\pm 0.05\%$ for Standard and High power rating		RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
	$\Delta R\pm 0.1\%$ for Ultra high power rating		
Endurance	Standard power rating at 85°C	$\Delta R\pm 0.1\%$	RCWV for 1000 hrs with 1.5 hrs “ON” and 0.5 hrs “OFF”
	High power rating at 85°C	$\Delta R\pm 0.25\%$	
	Ultra high power rating at 70°C	$\Delta R\pm 0.5\%$	
Biased Humidity	$\Delta R\pm 0.1\%$ for Standard power rating		1000 hrs 85°C /85%RH 10% of operating power.
	$\Delta R\pm 0.25\%$ for high power rating		
	$\Delta R\pm 0.5\%$ for Ultra high power rating		
High Temperature Exposure	$\leq 47\Omega\Delta R\pm 0.25\%$ $\geq 47\Omega\Delta R\pm 0.1\%$ for 0603/0805/1206 size		at +155°C for 1000 hrs
	$\leq 47\Omega\Delta R\pm 0.25\%$ $\geq 47\Omega\Delta R\pm 0.2\%$ for 0402 size		
Temperature Cycling	$\leq 47\Omega\Delta R\pm 0.25\%$ $\geq 47\Omega\Delta R\pm 0.1\%$		-55°C to +125°C, 1000 cycles
Resistance to soldering heat	$\Delta R\pm 0.1\%$		260±5°C for 10 seconds
Insulation Resistance	>1000 MΩ		Apply 100V _{DC} for 1 minute
Bending Strength (Board Flex)	$\Delta R\pm 0.1\%$		Bending once for 60 seconds Bending displacement: 1206 sizes: 3 mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Terminal strength	No broken		Force of 1.8kg for 60 seconds.
Mechanical Shock	$\Delta R\pm 0.1\%$		Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\Delta R\pm 0.1\%$		5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\Delta R\pm 0.5\%$		Human body model ARM02、ARM03 0.2KV ARM05、ARM06 1KV
Resistance to solvents	Marking Unsmearred		Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Sulfur Test	$\Delta R\pm 1\%$		105±2°C no power rating for 1000 hrs.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.

RCWV(Rated continuous working voltage)= $\sqrt{P \cdot R}$ or Max. Operating voltage whichever is lower

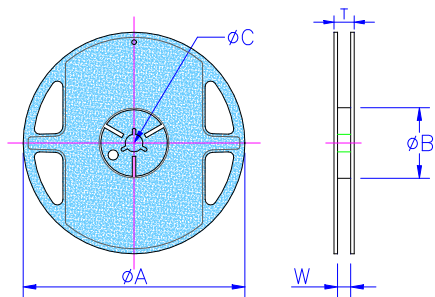
■Reference Standards: JIS-C-5201-1, IEC-60115-1, MIL-STD-202, JESD22, AEC-Q200, ASTM-B-809-95, UL-94

■Storage Temperature: 15~28°C; Humidity < 80%RH

■Shelf Life: 2 years from production date

■Packaging

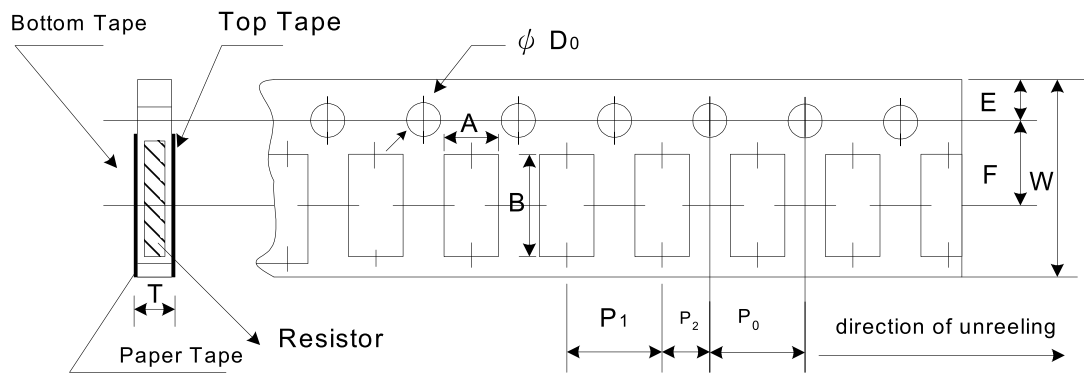
Packing Quantity & Reel Specifications



Unit :mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)
ARM02	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000
ARM03	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000
ARM05	178.0±1.0	60.0+1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000
ARM06	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

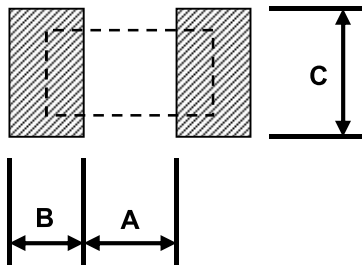


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARM02	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
ARM03	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
ARM05	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
ARM06	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

■ Recommend Land Pattern

Unit: mm

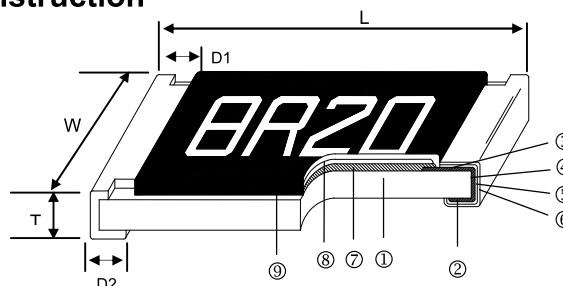


Type	A	B	C
ARM02	0.50	0.50	0.60±0.2
ARM03	1.00	1.00	1.20±0.2
ARM05	1.20	1.40	1.65±0.2
ARM06	2.20	1.40	2.00±0.2

Automotive Grade Professional Thin Film Chip Resistor – ART..A Series



Construction



Features

- Operating temperature up to 175°C for 1000 hrs
- Rated dissipation P_{85} up to 0.4W for size 1206
- AEC-Q200 Qualified(<10Ω is excluded)
- Superior temperature cycling robustness
- Advanced sulfur resistance verified according to ASTM B 809
- MSL: Level 1

Applications

- Automotive
- Telecommunications
- Medical equipment
- Industrial equipment

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

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ART02	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.20±0.10	0.54
ART03	0603	1.55±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.83
ART05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.20	4.71
ART06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.42±0.20	0.35±0.25	9.02

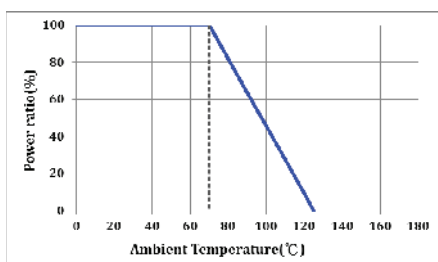
Part Numbering

ART	03	F	T	C		1001	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805 06: 1206	B: ±0.1% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	C: ±25 D: ±50	: Standard* (See Remark)	0100: 10Ω 10R2: 10.2Ω 1000: 100Ω 1001: 1KΩ 1002: 10KΩ 1003: 100KΩ 1004: 1MΩ	A: Automotive Grade NA: No Marking Automotive Grade

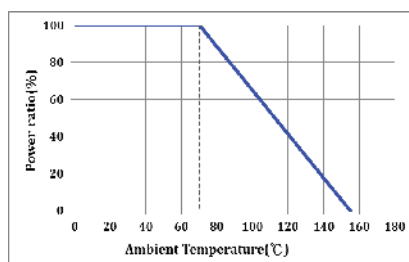
*Remark: Standard parts don't need for power rating code.

Functional Performance

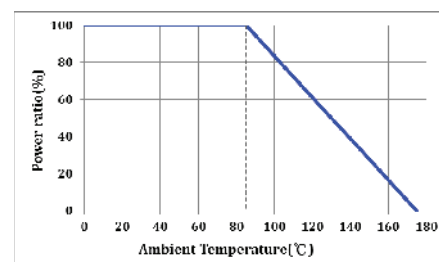
Derating-Standard Operation



Derating- Power Operation



Derating- Advanced Power Operation



■ Standard Electrical Specifications

Type \ Item	Power Rating at 85°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.1%	±0.5%	±1%	
ART02 (0402)	0.13W	-55 ~ +175°C	50V	100V	10Ω – 221KΩ			±25 ±50
ART03 (0603)	0.21W	-55 ~ +175°C	75V	150V	4.7Ω – 511KΩ			±25 ±50
ART05 (0805)	0.26W	-55 ~ +175°C	150V	300V	4.7Ω – 1MΩ			±25 ±50
ART06 (1206)	0.52W	-55 ~ +175°C	200V	400V	4.7Ω – 1MΩ			±25 ±50

■ Maximum Resistance Change at Rated Dissipation

Operation Mode		Standard P ₇₀	Power P ₇₀	Advanced Temperature P ₈₅
Rated dissipation	ART02	0.070W	0.105W	0.130W
	ART03	0.110W	0.170W	0.210W
	ART05	0.140W	0.220W	0.260W
	ART06	0.270W	0.420W	0.520W
Operating temperature range		-55 ~ 125°C	-55 ~ 155°C	-55 ~ 175°C
Permissible film temperature		125°C	155°C	175°C
Max. resistance change at rated dissipation for resistance range, ΔR/R after:	ART02	10Ω – 221KΩ	10Ω – 221KΩ	10Ω – 221KΩ
	ART03	4.7Ω – 511KΩ	4.7Ω – 511KΩ	4.7Ω – 511KΩ
	ART05	4.7Ω – 1MΩ	4.7Ω – 1MΩ	4.7Ω – 1MΩ
	ART06	4.7Ω – 1MΩ	4.7Ω – 1MΩ	4.7Ω – 1MΩ
	1000hr	≤ 0.15%	≤ 0.3%	≤ 0.5%
	8000hr	≤ 0.25%	≤ 0.5%	—

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
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			+25/-55/+25/+125/+25°C
Short Time Overload (Standard operation mode)	ΔR±0.10 %			RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
Short Time Overload (Power operation mode)	ΔR±0.25%			
Insulation Resistance	>1000 MΩ			Apply 100V _{DC} for 1 minute
Endurance	Standard at 70°C	1000hrs	ΔR±0.15%	RCWV with 1.5 hrs “ON” and 0.5 hrs “OFF”
		8000hrs	ΔR±0.25%	
	Power at 70°C	1000hrs	ΔR±0.3%	
		8000hrs	ΔR±0.5%	
	Advanced temperature at 85°C	1000hrs	ΔR±0.5%	
High Temperature Exposure	125°C	ΔR±0.15%		1000 hrs
	155°C	ΔR±0.3%		
	175°C	ΔR±0.5%		
Temperature Cycling	<10Ω	ΔR±0.1%		30 min at -55°C and 30min at 125°C, 1000 cycles
	>10Ω	ΔR±0.25%		30 min at -55°C and 30min at 155°C, 1000 cycles
Biased Humidity	Standard operation mode ΔR±0.5%			1000hrs 85°C /85%RH 10% of operating power (≤ 100 V)
Bending Strength (Board Flex)	ΔR±0.1%			Bending once for 60 seconds Bending displacement: 0402 0603 0805 1206 sizes: 3 mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±0.1%			260±5°C for 10 seconds
Terminal strength	No broken			0402 0603: Force of 1kg for 60 seconds. Others: Force of 1.8kg for 60 seconds.
Mechanical Shock	ΔR±0.1%			Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	ΔR±0.1%			5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	ΔR±0.5%			Human body model ART02 0.4 KV ; ART03 1 KV ; ART05 1.5 KV ; ART06 2 KV
Resistance to solvents	Marking Unsmearred			Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Flammability	No ignition of the tissue paper or scorching or the pinewood board			V-0 or V-1 are acceptable. Electrical test not required.
External Visual	No visible damage.			Electrical test not required. Inspect device construction, marking and workmanship.
Physical Dimension	As Spec.			Verify physical dimensions to the applicable device detail specification. Note: User(s) and Suppliers Specification. Electrical test not required.
Sulfur Test	ΔR±1%			105±2 °C no power rating for 1000 hrs

RCWV(Rated continuous working voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating voltage whichever is lower

■ Reference Standards: MIL-STD-202, JIS-C-5201-1, EN 60115-1, JESD22, IEC-60115-1, AEC-Q200, UL-94, MIL-STD-883, astm-b-809-95

■ Storage Temperature: 15~28°C; Humidity < 80%RH

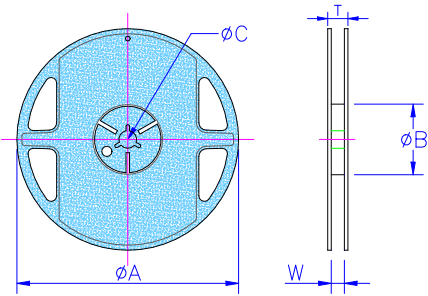
■ Shelf Life: 2 years from production date

■Packaging

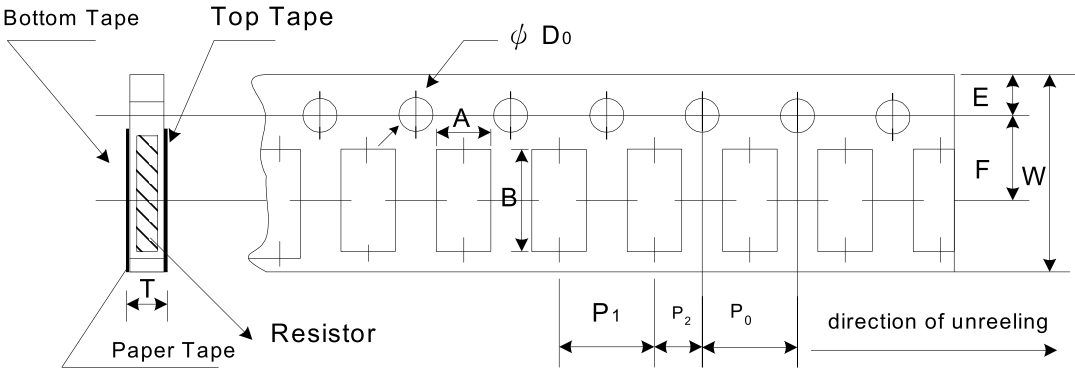
Packing Quantity & Reel Specifications

Unit :mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)
ART02	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	10,000
ART03	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000
ART05	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000
ART06	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

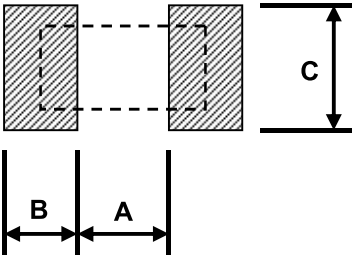


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ART02	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
ART03	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
ART05	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
ART06	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±0.10	1.55±0.05	0.75±0.05

■Recommend Land Pattern

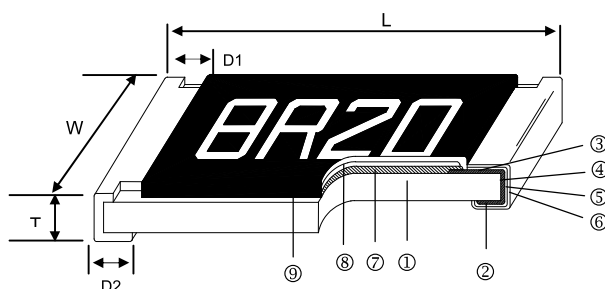
Unit: mm



Type	A	B	C
ART02	0.50	0.50	0.60±0.20
ART03	0.80	1.00	0.90±0.20
ART05	1.00	1.00	1.35±0.20
ART06	2.00	1.15	1.70±0.20

Automotive Grade High Power Thin Film Chip Resistors — ARTP..A Series

Construction



Features

- Operating temperature up to 175°C for 1000hr
- Rated dissipation up to 0.4W for size 0805
- AEC-Q200 Qualified
- Superior temperature cycling robustness
- Advanced sulfur resistance verified according to ASTM B 809
- MSL: Level 1

Applications

- Automotive
- Industrial
- High power and high temperature applications
- Replacement for larger case sizes

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

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARTP02	0402	1.00±0.05	0.50±0.05	0.30±0.05	0.20±0.10	0.20±0.10	0.54
ARTP03	0603	1.55±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	1.83
ARTP05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.20	4.71

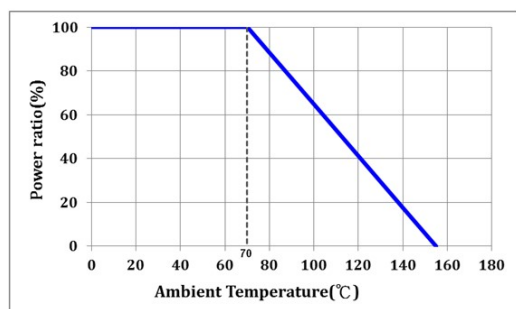
Part Numbering

ARTP	05	F	T	C		1001	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805	B: ±0.1% D: ±0.5% F: ±1%	T: Taping Reel B: Bulk	C: ±25 D: ±50	: Standard* (See Remark)	0100: 10Ω 10R2: 10.2Ω 1000: 100Ω 1001: 1KΩ 1002: 10 KΩ 1003: 100KΩ	A: Automotive Grade

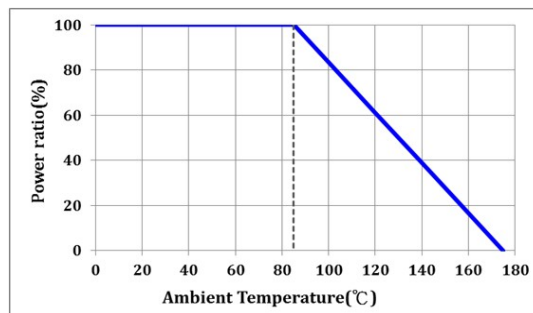
*Remark: Standard parts don't need for power rating code.

Functional Performance

Derating- Power Operation 70



Derating- Advanced Power Operation



■ Standard Electrical Specifications

Item Type	Power Rating at 85°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.1%	±0.5%	±1%	
ARTP02 (0402)	1/5W	-55 ~ +175°C	50V	100V	47Ω –100KΩ			±25 ±50
ARTP03 (0603)	1/4W		75V	150V	47Ω –100KΩ	10Ω –100KΩ		±25
					—	10Ω – 100KΩ		±50
ARTP05 (0805)	2/5W		150V	300V	47Ω –100KΩ	10Ω –100KΩ		±25
					—	10Ω – 100KΩ		±50

■ Maximum Resistance Change at Rated Dissipation

Operation Mode		Power P ₇₀	Advanced Temperature P ₈₅
Rated dissipation	ARTP02	0.200W	0.200W
	ARTP03	0.250W	0.250W
	ARTP05	0.400W	0.400W
Operating temperature range		-55 ~ 155°C	-55 ~ 175°C
Permissible film temperature		155°C	175°C
Max. resistance change at rated dissipation for resistance range, ΔR/R after:	ARTP02	47Ω – 100KΩ	47Ω – 100KΩ
	ARTP03	10Ω – 100KΩ	10Ω – 100KΩ
	ARTP05	10Ω – 100KΩ	10Ω – 100KΩ
	1000hr	≤ 0.2%	≤ 0.3%
	8000hr	≤ 0.4%	—

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
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			+25/-55/+25/+125/+25°C
Short Time Overload (Power operation mode)	ΔR±0.25%			RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
Insulation Resistance	>1000 MΩ			Apply 100V _{DC} for 1 minute
Endurance	Power at 70°C	1000hrs	ΔR±0.20%	RCWV with 1.5 hrs “ON” and 0.5 hrs “OFF” 1000 hrs
		8000hrs	ΔR±0.40%	
	Advanced temperature at 85°C	1000hrs	ΔR±0.30%	
High Temperature Exposure	ΔR±0.20%	+155°C		1000 hrs
	ΔR±0.30%	+175°C		
Temperature Cycling	ΔR±0.25%			-55°C to +155°C, 1000 cycles
Biased Humidity	Power operation mode ΔR±0.5%			1000 hrs 85°C/85%TH 10% of operating power (≤100V)
Bending Strength (Board Flex)	ΔR±0.1%			Bending once for 60 seconds Bending displacement: 0402 0603 0805 sizes: 3 mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±0.1%			260±5°C for 10 seconds
Terminal strength	No broken			Force of 1.8kg for 60 seconds.
Mechanical Shock	ΔR±0.1%			Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.

Item	Requirement	Test Method
Vibration	$\Delta R \pm 0.1\%$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\Delta R \pm 0.5\%$	Human body model 0402: 0.4KV ; 0603: 0.5KV ; 0805: 1.5KV
Resistance to solvents	Marking Unsmear	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	$\Delta R \pm 1\%$	105 $\pm$ 2 °C no power rating for 1000 hrs

RCWV(Rated continuous working voltage)= $\sqrt{P \cdot R}$ or Max. Operating voltage whichever is lower

■Reference Standards: MIL-STD-202, JIS-C-5201-1, IEC-60115-1, AEC-Q200, UL-94, ASTM-B-809-95

■Storage Temperature: 15~28°C; Humidity < 80%RH

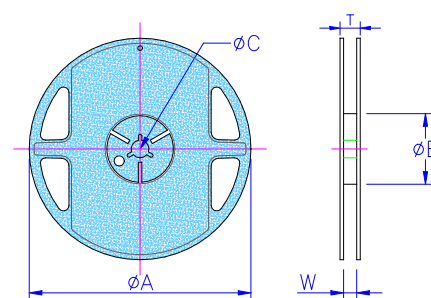
■Shelf Life: 2 years from production date

Packaging

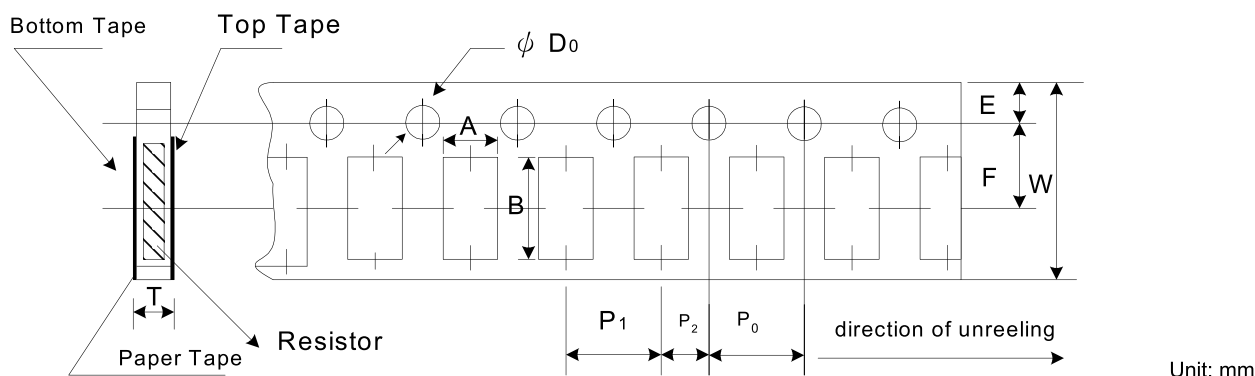
Packing Quantity & Reel Specifications

Unit :mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)
ARTP02	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	10,000
ARTP03	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	5,000
ARTP05	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	5,000



Paper Tape Specifications

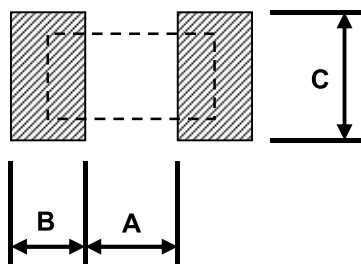


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARTP02	0.70 $\pm$ 0.05	1.16 $\pm$ 0.05	8.00 $\pm$ 0.10	1.75 $\pm$ 0.05	3.5 $\pm$ 0.05	4.00 $\pm$ 0.10	2.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.55 $\pm$ 0.05	0.40 $\pm$ 0.03
ARTP03	1.10 $\pm$ 0.05	1.90 $\pm$ 0.05	8.00 $\pm$ 0.10	1.75 $\pm$ 0.05	3.5 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.55 $\pm$ 0.05	0.60 $\pm$ 0.03
ARTP05	1.60 $\pm$ 0.05	2.37 $\pm$ 0.05	8.00 $\pm$ 0.10	1.75 $\pm$ 0.05	3.5 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.55 $\pm$ 0.05	0.75 $\pm$ 0.05

Recommend Land Pattern

Unit: mm

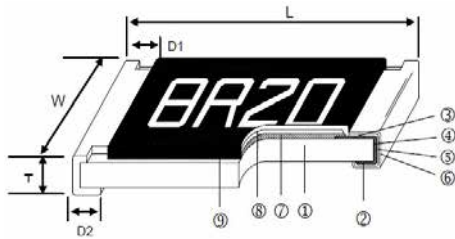


Type	A	B	C
ARTP02	0.50	0.50	0.60 $\pm$ 0.2
ARTP03	0.80	1.00	0.90 $\pm$ 0.2
ARTP05	1.00	1.00	1.35 $\pm$ 0.2

Automotive Grade High Voltage Thin Film Flat Chip Resistor—ARHV..A Series



Construction



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

Features

- High operating voltage Umax. Up to 1000V
- Low voltage coefficient < 1.5ppm/V
- Superior moisture resistivity (85°C; 85%RH)
- AEC-Q200 Qualified
- Test proven immunity to humidity, moisture, and sulfur
- MSL: Level 1

Dimensions

Unit:mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ARHV05	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.30±0.20	0.40±0.25	5.3
ARHV06	1206	3.05±0.15	1.55±0.15	0.55±0.10	0.42±0.20	0.35±0.25	10.8
ARHV13	1210	3.10±0.15	2.40±0.15	0.55±0.10	0.40±0.20	0.55±0.25	15.7

Applications

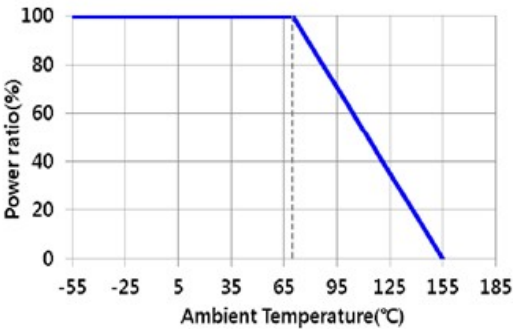
- Industrial and automotive inverters
- Battery management system
- Testing / Measurement Equipment
- Automatic Equipment Controller

Part Numbering

ARHV	13	B	T	C		1213	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	05:0805 06:1206 13:1210	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* (See Remark)	1213: 121KΩ 1004: 1MΩ 2004: 2MΩ	A: Automotive Grade NA: No Making Automotive Grade

*Remark: Standard parts don't need for power rating code.

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)	VCR (PPM/V)
					±0.1%	±0.25%	±0.5%	±1%		
ARHV05 (0805)	1/5W	-55 ~ +155°C	450V	900V	180KΩ~1MΩ				±10 ±15 ±25 ±50	<1.5
ARHV06 (1206)	1/4W	-55 ~ +155°C	700V	1400V	160KΩ~2MΩ				±10 ±15 ±25 ±50	<1.5
ARHV13 (1210)	1/3W	-55 ~ +155°C	1000V	2000V	121KΩ~3.01MΩ				±10 ±15 ±25 ±50	<1.5

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

Overload Voltage= $2 \cdot \sqrt{(P \cdot R)}$ or Max. overload voltage listed above, whichever is lower.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	-55°C~+125°C, 25°C is the reference temperature
Short Time Overload	$\Delta R \pm 0.05\%$	$U = 2 \cdot \sqrt{(P \cdot R)}$ or Max. overload voltage whichever is lower for 5 seconds
Endurance	$\Delta R \pm 0.1\%$	$U = \sqrt{(P \cdot R)}$ 1.5 h on; 0.5 h off; 70 °C; 1000 hrs
Damp Heat with Load	$\Delta R \pm 0.1\%$	$U = 0.1 \cdot \sqrt{(P \cdot R)}$ 40±2°C, 90~95% R.H. 1000 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Biased Humidity	$\Delta R \pm 0.25\%$	$U = 0.3 \cdot \sqrt{(P \cdot R)}$ 1000 hrs 85°C/85%RH Voltage isn't exceeding 100V
Temperature Cycling	$\Delta R \pm 0.1\%$	-55°C to +125°C, 1000 cycles
High Temperature Exposure	$\Delta R \pm 0.2\%$	at +155°C for 1000 hrs
Single pulse high voltage overload	$\Delta R \pm 0.1\%$	$U = 2 \times \sqrt{(P \cdot R)}$ 10pulses 10us / 700us
Periodic electric overload	$\Delta R \pm 0.1\%$	$U = 2 \times \sqrt{(P \cdot R)}$ 0.1 s on; 2.5 s off; 1000 cycles
Bending Strength (Board Flex)	$\Delta R \pm 0.05\%$	Bending amplitude 3mm for 60 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R \pm 0.02\%$	260±5°C for 10 seconds
Terminal strength	No broken	Force of 1.8 kg for 60 seconds.
Vibration	$\Delta R \pm 0.05\%$	5g's for 20min, 12 cycles each of 3 orientations, 10-2000Hz
ESD	$\Delta R \pm 0.5\%$	Human body model 0805: 2KV 1206, 1210: 6KV
Dielectric Withstand Voltage	By Typ	Max. Operating voltage for 1 minute
Resistance to solvents	Marking Unsmearred	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	$\Delta R \pm 1\%$	105±2 °C no power rating for 1000 hrs.

RCWV(Rated continuous working voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating voltage whichever is lower

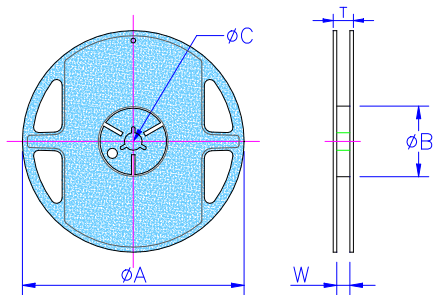
Reference Standards: MIL-STD-202, JIS-C-5201-1, IEC-60115-1, AEC-Q200, UL-94, JESD22, IEC61000-4, ASTM-B-809-95

Storage Temperature: 15~28°C; Humidity < 80%RH

Shelf Life: 2 years from production date

■Packaging

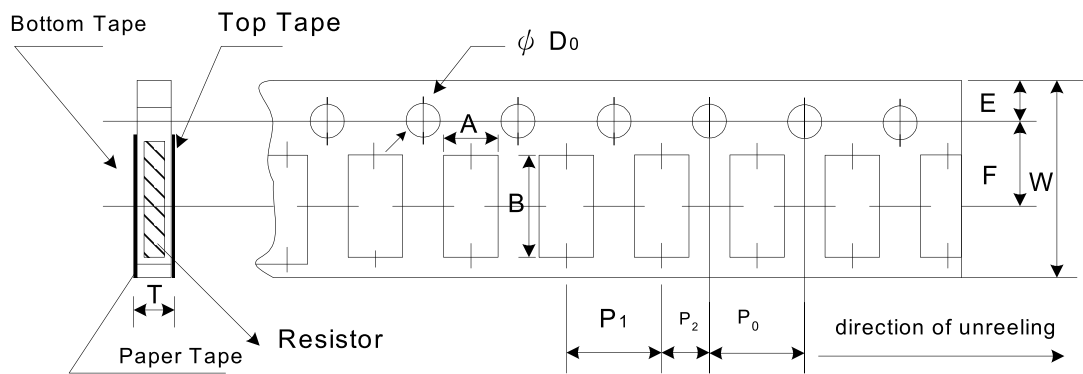
Packing Quantity & Reel Specifications



Unit :mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)
ARHV05	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000
ARHV06	178.0±1.0	60.0±1.0	13.5±0.7	9.5±1.0	11.5±1.0	5,000
ARHV13	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

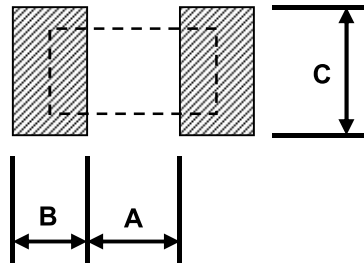


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ARHV05	1.60±0.05	2.37±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	1.55±0.05	0.75±0.05
ARHV06	2.00±0.05	3.55±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	1.55±0.05	0.75±0.05
ARHV13	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

■Recommend Land Pattern

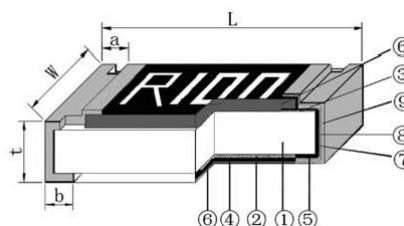
Unit: mm



Type	A	B	C
ARHV05	1.00	1.00	1.35±0.2
ARHV06	2.00	1.15	1.70±0.2
ARHV13	2.00	1.15	2.50±0.2

Automotive Grade Metal Foil Chip Fixed Resistor—MF..A Series

Construction



① Ceramic Substrate	④ Primary Overcoat	⑦ Edge Electrode
② Alloy Plate	⑤ Cu Plating	⑧ Barrier Layer
③ Top Electrode	⑥ Secondary Overcoat	⑨ External Electrode

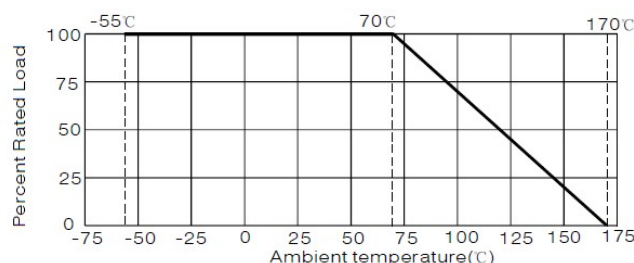
Features

- AEC-Q200 Compliance
- High power rating up to 2 Watts
- Low TCR down to ± 50 PPM/ $^{\circ}$ C
- Current detecting resistors for power supply, Motor circuits, etc
- Superior mechanical and frequency characteristics
- Compliant with RoHS directive
- Halogen free requirement

Applications

- Switching Power Supply, Over Current Protection
- Voltage Regulation Module (VRM)
- DC-DC Converter, Charger
- Automotive Engine Control, Portable Devices etc.

Derating Curve



Dimensions

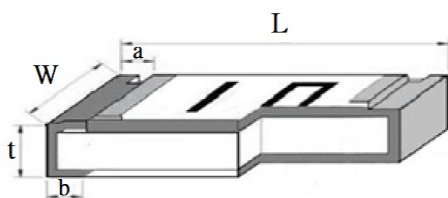


Figure1

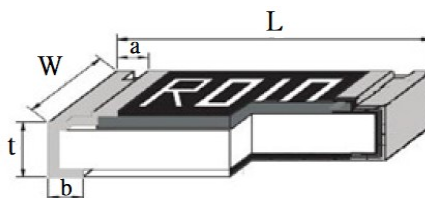


Figure2

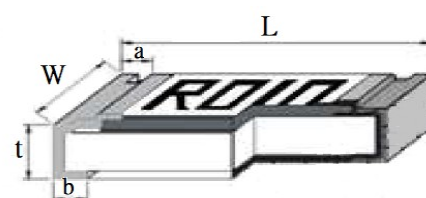


Figure3

Unit: mm

Type	Size (Inch)	Resistance (mΩ)	L	W	t	a	b
MF03	0603	5-20	1.60 $\pm$ 0.20	0.80 $\pm$ 0.20	0.70 $\pm$ 0.15	0.35 $\pm$ 0.25	0.35 $\pm$ 0.20
MF05	0805	3-4	2.00 $\pm$ 0.20	1.25 $\pm$ 0.20	0.70 $\pm$ 0.15	0.40 $\pm$ 0.25	0.70 $\pm$ 0.30
		5-47					0.40 $\pm$ 0.30
MF06	1206	3-4	3.20 $\pm$ 0.20	1.60 $\pm$ 0.20	0.75 $\pm$ 0.15	0.50 $\pm$ 0.30	0.90 $\pm$ 0.30
		5-56					0.50 $\pm$ 0.30
MF10	2010	3	5.00 $\pm$ 0.20	2.50 $\pm$ 0.20	0.75 $\pm$ 0.20	0.60 $\pm$ 0.30	1.60 $\pm$ 0.30
		4-5					1.30 $\pm$ 0.30
		6-100					0.80 $\pm$ 0.30
MF12	2512	2	6.40 $\pm$ 0.20	3.20 $\pm$ 0.20	0.75 $\pm$ 0.20	0.90 $\pm$ 0.30	2.30 $\pm$ 0.30
		3					1.90 $\pm$ 0.30
		4					1.70 $\pm$ 0.30
		5-6					1.20 $\pm$ 0.30
		7					1.10 $\pm$ 0.30
		8-200					0.90 $\pm$ 0.30

Figure 1 for MF03 type ; Figure 2 for MF05 $\geq$ 10mΩ / MF06 type / MF12 type ; Figure 3 for MF05 < 10mΩ / MF10 type

Part Numbering

MF	06	J	T	E	U	R005	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Function Code
	03: 0603 05: 0805 06: 1206 10: 2010 12: 2512	F: ±1% G: ±2% J: ±5%	T: Taping Reel	D: ±50 E: ±100 F: ±200	V: 1/4W O: 1/3W U: 1/2W T: 1W S: 2W	R005: 0.005Ω R010: 0.01Ω R100: 0.1Ω	A: Automotive Grade

Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Limiting Element Current	Max. Overload Current	Resistance Range(mΩ)			TCR (PPM/°C)
					±1%	±2%	±5%	
MF03	1/4W	-55 ~ +170°C	5.0A	11.2A	11 - 20			±100
	1/3W, 1/2W		10.0A	22.4A	5 - 9		±200	
					10		±100	
MF05	1/4W	-55 ~ +170°C	3.5A	7.9A	21 - 47			±50
	1/3W, 1/2W		12.9A	28.9A	3 - 9		±100	
					10 -20		±50	
MF06	1/2W	-55 ~ +170°C	5.0A	11.2A	21 - 56			±50
	1/2W, 1W		18.3A	40.8A	3 - 9		±100	
					10 -20		±50	
MF10	1W	-55 ~ +170°C	18.3A	40.8A	3 - 9		±100	
					10 - 100		±50	
MF12	1W	-55 ~ +170°C	3.2A	7.1A	101 - 200			±50
	1W, 2W		31.6A	63.3A	2		±200	
					3 - 9		±100	
					10 - 100		±50	

Current of DC or AC RMS value.

Rated current= $\sqrt{(P/R)}$ or Limiting element voltage whichever is lower.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	+20/+125/+20°C
Short Time Overload	No mechanical damage $\Delta R \leq \pm 1\%$	1/4W&1/3W&1/2W&1W: 5x rated power for 5s; 2W: 4x rated power for 5s
High Temperature Exposure	No mechanical damage $\Delta R \leq \pm 1\%$	1000 hrs.@T=170±2°C .Unpowered.
Temperature Cycling	No mechanical damage $\Delta R \leq \pm 1\%$	-55°C(30min)~ normal temperature(≤ 1min)~ 155°C (30min), 1000 cycles.
Biased Humidity	No mechanical damage $\Delta R \leq \pm 1\%$	85°C /85%RH. 1000 hours, Apply 10% of operating power or limiting element current whichever is lower
Component Solvent Resistance	Clearly marked No mechanical damage	Immersed in three solvents after 3min immersion, brush wipe 10 times, a total of 3 times, washing with washing and cleaning agent, room temperature on the surface of the ventilation drying
Solderability	95% min. coverage	245±5°C for 3±0.3 seconds
Resistance to Soldering Heat	No mechanical damage $\Delta R \leq \pm 1\%$	270±5°C for 10±1 seconds
Mechanical shock	No mechanical damage $\Delta R \leq \pm 1\%$	Positive half wave, peak acceleration:100g's, pulse duration:6ms, three axis six to each 3 times, a total of 18 times

Item	Requirement	Test Method
Insulation Resistance	$>1000M\Omega$	Apply DC 100V $\pm$ 15V between substrate and terminations for 1min, then check insulation resistance
Voltage Proof	No breakdown or flashover	Apply max. overload voltage of AC RMS at a rate of approximately 100V/s between substrate and terminations for 60 $\pm$ 5 seconds
Vibration	No mechanical damage $\Delta R \leq \pm 1\%$	Frequency: 10Hz~2000Hz, acceleration: 5g S, a loop 20 min, X,Y,Z three directions, each direction 12 cycles, 36 cycles
Thermal Shock	No mechanical damage $\Delta R \leq \pm 1\%$	-55°C(15min)~ normal temperature(≤ 20 sec)~ 155°C (30min), 300 cycles
Operational Life	No mechanical damage $\Delta R \leq \pm 1\%$	70 $\pm$ 2°C, 1000hrs, rated current or limiting element current whichever is lower for 1.5 hrs "ON" and 0.5hrs "OFF"
		125 $\pm$ 2°C, 1000hrs, de-rated current for 1.5 hrs "ON" and 0.5hrs "OFF"
Operation at Low Temperature	No mechanical damage $\Delta R \leq \pm 1\%$	-55 $\pm$ 5°C , 1h without load rated voltage or limiting element voltage whichever is lower for 45min, 15min without load.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.
Substrate Bending Test	No mechanical damage $\Delta R \leq \pm 1\%$	Bending distance: 2mm Duration: 60 $\pm$ 5s.
Terminal Strength	No mechanical damage $\Delta R \leq \pm 1\%$	Applying force 17.7N for 60 $\pm$ 1s

■ Reference Standards: IEC 60115-1; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ Storage Temperature: 5~30°C; Humidity 30~70%RH

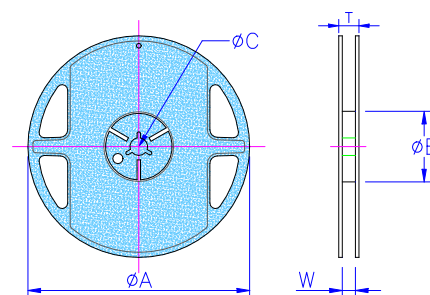
■ Shelf Life: 1 year from production date

Packaging

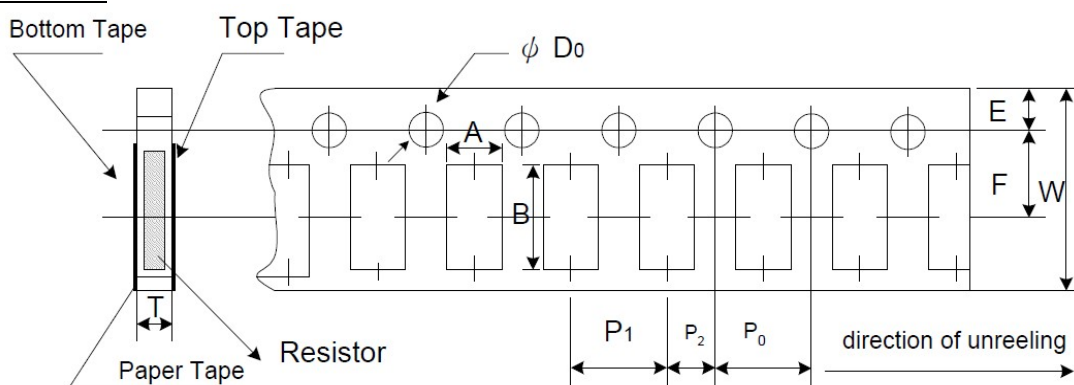
Packing Quantity & Reel Specifications

Unit :mm

Type	ØA	ØB	ØC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
MF03	178.0 $\pm$ 2.0	58.0 $\pm$ 2.0	13.0 $\pm$ 0.5	9.5 $\pm$ 1.0	12.5 $\pm$ 1.5	5,000	-
MF05	178.0 $\pm$ 2.0	58.0 $\pm$ 2.0	13.0 $\pm$ 0.5	9.5 $\pm$ 1.0	12.5 $\pm$ 1.5	5,000	-
MF06	178.0 $\pm$ 2.0	58.0 $\pm$ 2.0	13.0 $\pm$ 0.5	9.5 $\pm$ 1.0	12.5 $\pm$ 1.5	5,000	-
MF10	178.0 $\pm$ 2.0	57.0 $\pm$ 2.0	13.0 $\pm$ 0.5	13.0 $\pm$ 0.5	15.5 $\pm$ 1.5	-	4,000
MF12	178.0 $\pm$ 2.0	57.0 $\pm$ 2.0	13.0 $\pm$ 0.5	13.0 $\pm$ 0.5	15.5 $\pm$ 1.5	-	4,000



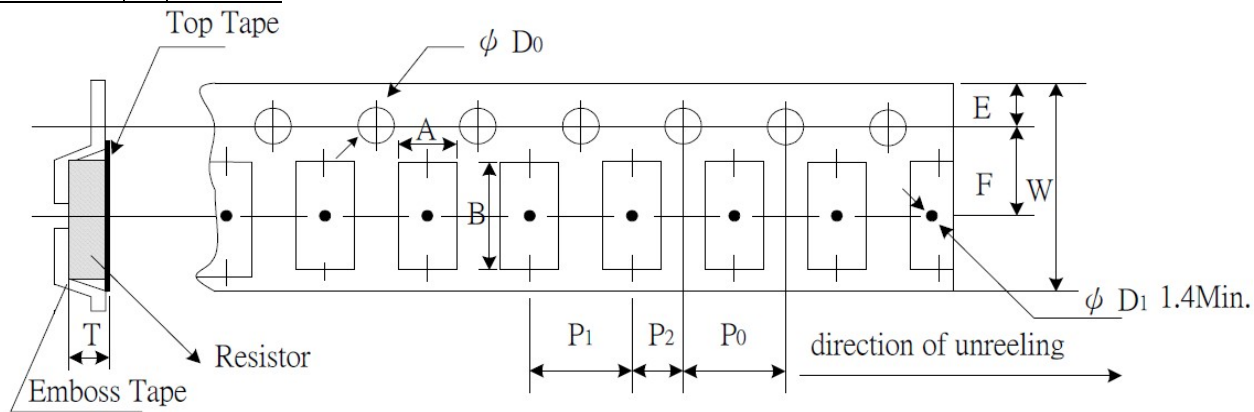
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ØD ₀	T
MF03	1.10 $\pm$ 0.10	1.85 $\pm$ 0.10	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.5 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.50 $\pm$ 0.10	0.75 $\pm$ 0.10
MF05	1.65 $\pm$ 0.10	2.35 $\pm$ 0.10	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.5 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.50 $\pm$ 0.10	0.95 $\pm$ 0.10
MF06	1.90 $\pm$ 0.20	3.50 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.5 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.50 $\pm$ 0.10	0.95 $\pm$ 0.10

Emboss Plastic Tape Specifications

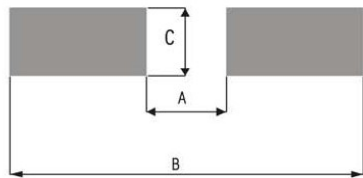


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ØD ₀	T
MF10	2.82±0.15	5.50±0.15	12.0±0.10	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	0.84±0.10
MF12	3.45±0.15	6.78±0.15	12.0±0.10	1.75±0.10	5.5±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	1.00±0.10

Recommend Land Pattern

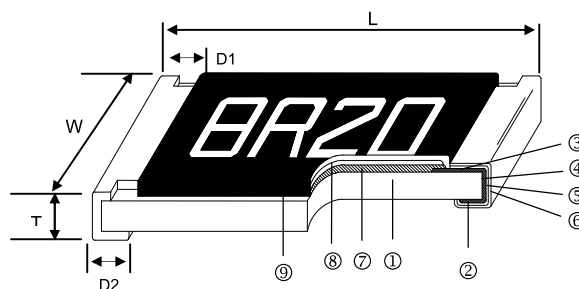
Unit: mm



Type	Resistance	A	B	C
MF03	5mΩ - 20mΩ	0.6	2.8	1.0
MF05	3mΩ - 4mΩ	0.5	3.2	1.4
	5mΩ - 47mΩ	0.8		
MF06	3mΩ - 4mΩ	0.8	4.4	1.8
	5mΩ - 56mΩ	1.8		
MF10	3mΩ - 9mΩ	1.6	6.3	2.9
	10mΩ - 100mΩ	2.7		
MF12	2mΩ - 4mΩ	1.0	8.0	3.4
	5mΩ - 200mΩ	3.8		

Automotive Grade Tantalum Nitride Thin Film Precision Chip Resistor – TAR Series

Construction



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

Features

- Tantalum nitride thin film resistor
- High stability in humid environments
- AEC-Q200 Qualified
- Tight tolerance down to $\pm 0.05\%$
- Extremely low TCR down to $\pm 10\text{PPM}/^\circ\text{C}$
- Resistance values from 10 ohm to 1M ohm
- Special materials, design, and processing for high sulfur applications
- Test proven immunity to humidity, moisture, and sulfur
- MSL: Level 1

Dimensions

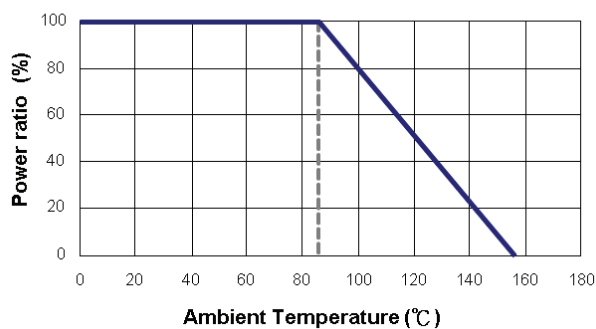
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
TAR02	0402	1.00 ± 0.05	0.50 ± 0.05	0.30 ± 0.05	0.20 ± 0.10	0.20 ± 0.10	0.54
TAR03	0603	1.55 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.30 ± 0.20	0.30 ± 0.20	1.83
TAR05	0805	2.00 ± 0.15	1.25 ± 0.15	0.55 ± 0.10	0.30 ± 0.20	0.40 ± 0.20	4.71
TAR06	1206	3.05 ± 0.15	1.55 ± 0.15	0.55 ± 0.10	0.42 ± 0.20	0.35 ± 0.25	9.02

Applications

- Automotive
- Medical Equipment
- Testing / Measurement Equipment
- Automatic Equipment Controller
- Converters
- Communication Device

Derating Curve



Part Numbering

TAR	03	A	T	C	M	1001	N
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking Code
	02: 0402 03: 0603 05: 0805 06: 1206	A: $\pm 0.05\%$ B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$	T: Taping Reel B: Bulk	B: ± 10 N: ± 15 C: ± 25 D: ± 50	Y: 1/16W M: 1/6W P: 1/5W U: 1/2W	0100: 10 Ω 1001: 1K Ω 1004: 1M Ω	: Standard Marking for E96 / E24 N: No Marking

Standard Electrical Specifications

Type \ Item	Power Rating at 85°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range					TCR (PPM/°C)
					±0.05 %	±0.1 %	±0.25 %	±0.5%	±1%	
TAR02 (0402)	1/16W	-55 ~ +155°C	50V	100V	40Ω - 35KΩ					±10 ±15 ±25 ±50
TAR03 (0603)	1/6W	-55 ~ +155°C	75V	150V	40Ω - 130KΩ					±10 ±15 ±25 ±50
TAR05 (0805)	1/5W	-55 ~ +155°C	100V	200V	10Ω - 350KΩ					±10 ±15 ±25 ±50
TAR06 (1206)	1/2W	-55 ~ +155°C	200V	400V	10Ω - 1MΩ					±10 ±15 ±25 ±50

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

■ 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	$\Delta R \pm 0.1\%$	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	>1000 MΩ	Apply 100V _{DC} for 1 minute
Operational Life	$\Delta R \pm 0.1\%$	Condition D Steady State T _A =125°C at derated power. Measurement at 24±4 hours after test conclusion
Biased Humidity	$\Delta R \pm 0.1\%$	1000 hrs 85°C/85%RH 10% of operating power.
High Temperature Exposure	$\Delta R \pm 0.15\%$	at +155°C for 1000 hrs
Temperature Cycling	$\Delta R \pm 0.1\%$ for 125°C $\Delta R \pm 0.2\%$ for 155°C	-55°C to +125°C, 1000 cycles -55°C to +155°C, 1000 cycles
Bending Strength (Board Flex)	$\Delta R \pm 0.1\%$	Bending 2mm for 60 seconds
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\Delta R \pm 0.1\%$	260±5°C for 10 seconds
Terminal strength	No broken	Force of 1kg for 60 seconds
Mechanical Shock	$\Delta R \pm 0.1\%$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\Delta R \pm 0.1\%$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\Delta R \pm 0.1\%$	Human body model TAR02、TAR03 0.2KV TAR05、TAR06 1KV
Resistance to solvents	Marking Unsmearred	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents

Item	Requirement	Test Method
Sulfur Test	$\Delta R \pm 1\%$	105 $\pm$ 2 °C no power rating for 750 hrs
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required
Endurance	$\Delta R \pm 0.1\%$	1000 +48/-0 hours, loaded with RCWV or Vmax in chamber controller 85 $\pm$ 2°C, 1.5 hours on and 0.5 hours off
Moisture Resistance	$\Delta R \pm 0.1\%$	65 $\pm$ 2°C, 80~100% RH, 10 cycles, 24 hours/cycle

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94; EIA-977

■ Storage Temperature: 15~28°C; Humidity < 80%RH

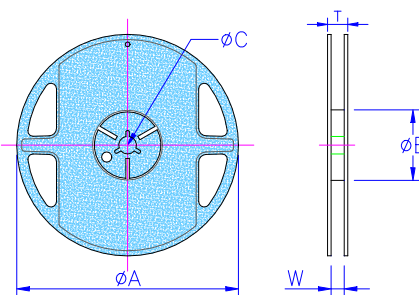
■ Shelf Life: 2 years from production date

Packaging

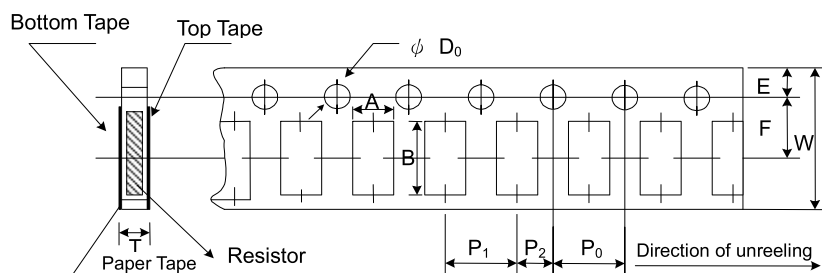
Packaging Quantity & Reel Specifications

Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)
TAR02	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	10,000
TAR03	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	5,000
TAR05	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	5,000
TAR06	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 1.0	11.5 $\pm$ 1.0	5,000



Paper Tape Specifications

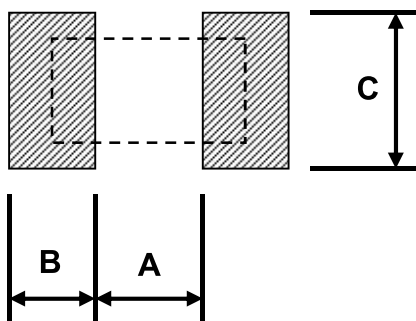


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
TAR02	0.70 $\pm$ 0.05	1.16 $\pm$ 0.05	8.00 $\pm$ 0.10	1.75 $\pm$ 0.05	3.5 $\pm$ 0.05	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.55 $\pm$ 0.05	0.40 $\pm$ 0.03
TAR03	1.10 $\pm$ 0.05	1.90 $\pm$ 0.05	8.00 $\pm$ 0.10	1.75 $\pm$ 0.05	3.5 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.55 $\pm$ 0.05	0.60 $\pm$ 0.03
TAR05	1.60 $\pm$ 0.05	2.37 $\pm$ 0.05	8.00 $\pm$ 0.10	1.75 $\pm$ 0.05	3.5 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.55 $\pm$ 0.05	0.75 $\pm$ 0.05
TAR06	2.00 $\pm$ 0.05	3.55 $\pm$ 0.05	8.00 $\pm$ 0.10	1.75 $\pm$ 0.05	3.5 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.10	2.00 $\pm$ 0.05	1.55 $\pm$ 0.05	0.75 $\pm$ 0.05

Recommend Land Pattern

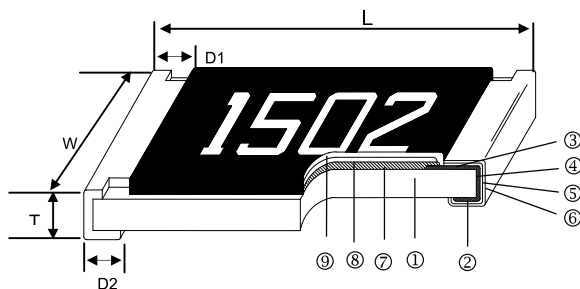
Unit: mm



Type	A	B	C
TAR02	0.50	0.50	0.60 $\pm$ 0.2
TAR03	0.80	1.00	0.90 $\pm$ 0.2
TAR05	1.00	1.00	1.35 $\pm$ 0.2
TAR06	2.00	1.15	1.70 $\pm$ 0.2

Automotive Grade Chip Resistor—CR..A Series

Construction



Features

- AEC-Q200 Qualified
- Highly reliable multilayer electrode construction
- Special construction to prevent sulfuration in a sulfur containing environment
- Compatible with all soldering process
- 100% CCD inspection
- MSL: Level 1

Applications

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

Dimensions

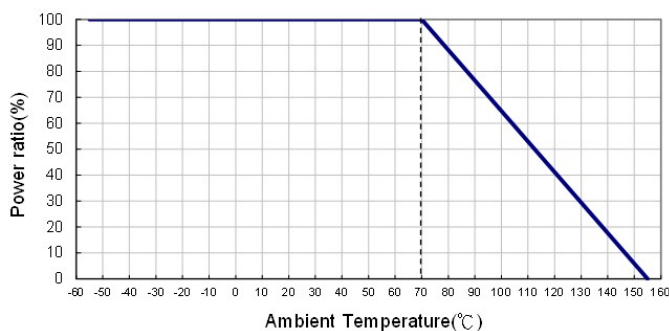
Unit: mm

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	0.2
CR-02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
CR-03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
CR-05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
CR-06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
CR-10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
CR-0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
CR-0A (2W)	2010	5.00±0.10	2.50±0.15	0.74±0.10	0.60±0.30	1.70±0.20	36.9
CR-12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4
CR-12 (3W)	2512	6.35±0.20	3.15±0.15	0.74±0.10	0.60±0.30	2.10±0.20	53.0

Part Numbering

CR-	03	F	A	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	D: ±0.5% F: ±1% J: ±5%	A: Automotive Grade C: High Power & Automotive Grade D: High Power 1 & Automotive Grade U: Ultra High Power & Automotive Grade Q: Ultra High Power 1 & Automotive Grade	2: 7" Reel 2Kpcs 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 --- 0R: 0Ω " " 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)
					±1%	±5%	
CR-01 (0201)	1/20W	-55 ~ +155°C	25V	50V	1Ω - 10MΩ		±200
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
CR-03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
CR-05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
CR-06 (1206)	1/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
CR-10 (1210)	1/2W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
CR-0A (2010)	3/4W	-55 ~ +155°C	400V	800V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
CR-12 (2512)	1W	-55 ~ +155°C	500V	1000V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200

High Precision Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range	TCR (PPM/°C)
					±0.5%	
CR-02 (0402)	1/16W	-55 ~ +155°C	50V	100V	10Ω - 1MΩ	±100
CR-03 (0603)	1/10W		75V	150V	10Ω - 1MΩ	±100
CR-05 (0805)	1/8W		150V	300V	10Ω - 1MΩ	±100
CR-06 (1206)	1/4W		200V	400V	10Ω - 1MΩ	±100
CR-10 (1210)	1/2W		200V	400V	10Ω - 1MΩ	±100
CR-0A (2010)	3/4W		400V	800V	10Ω - 1MΩ	±100
CR-12 (2512)	1W		500V	1000V	10Ω - 1MΩ	±100

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

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

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

■ High Power & Ultra High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Function Code	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
						±0.5%	±1%	±5%	
CR-02 (0402)	1/10W	D	-55 ~ +155°C	50V	100V	-	1Ω - 9.76Ω		±200
	1/8W	C				10Ω - 1MΩ		±100	
CR-03 (0603)	1/4W	C		75V	150V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100	
CR-05 (0805)	1/3W	C		150V	300V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100	
CR-06 (1206)	1/2W	C		200V	400V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100	
CR-10 (1210)	1W	C		200V	400V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100	
CR-0A (2010)	1W	C		400V	800V	-	1Ω - 9.76Ω		±200
	*1.25W	U				10Ω - 1MΩ		±100	
	*2W	Q				10Ω - 1MΩ		±100	
CR-12 (2512)	2W	C		500V	1000V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100	
	*3W	U		250V	500V	-	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100	

*: Ultra High Power

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

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

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

■ Jumper(0Ω)

Type \ Item	Rated Current	Function Code	Resistance	Operating Temp. Range
			0Ω 5%	
CR-01 (0201)	1A	A	<50mΩ	-55 ~ +155°C
CR-02 (0402)	1A			
CR-03 (0603)	1A			
CR-05 (0805)	2A			
CR-06 (1206)	2A			
CR-10 (1210)	2.5A			
CR-0A (2010)	3.5A			
CR-12 (2512)	4A			

■ High Current Jumper(0Ω)

Type \ Item	Rated Current	Function Code	Resistance	Operating Temp. Range
			0Ω 5%	
CR-02 (0402)	1.5A	C	<20mΩ	-55 ~ +155°C
CR-03 (0603)	2A			
CR-05 (0805)	2.5A			
CR-06 (1206)	3.5A			
CR-10 (1210)	5A			
CR-0A (2010)	6A			
CR-12 (2512)	7A			

Environmental Characteristics

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			At 25°C/-55°C and 25°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 whichever is lower for 5 seconds, 2 seconds for high power series Ultra High Power: RCWV*2 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G			Max. Overload Voltage for 1 minute
Operational Life	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	<100mΩ	1000 hrs. 85°C/85%RH 10% of operating power (≤100V).
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs.
Board Flex	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage			245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover			1.42 times Max. Operating Voltage 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
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	±(3%+0.05Ω)			Human body model 0201: 0.5KV 0402/0603: 1KV 0805 and above: 2KV
	±(1%+0.05Ω)			3 positive + 3 negative discharges ESD voltage acc. to size
Resistance to Solvents	No visible damage on appearance and marking.			Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken			Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board			V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±1%		<50mΩ	60±2°C, no power rating for 500 hrs.

RCWV(Rated continuous working voltage)=√(P*R) or Max. Operating Voltage whichever is lower.

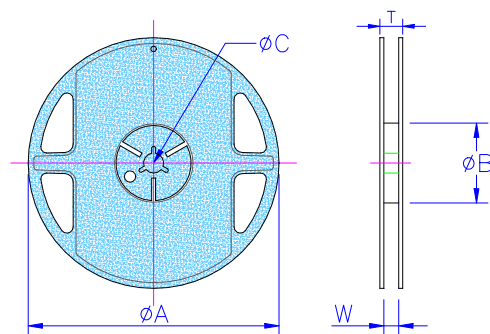
■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94 ; EIA-977

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

Packaging

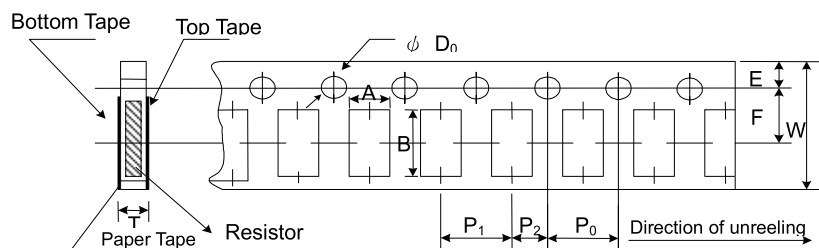
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T	
CR-01 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
		20K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±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	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		10K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	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	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
		8K	12mm	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5
CR-0A(2W) CR-12(3W)	Embossed	2K	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

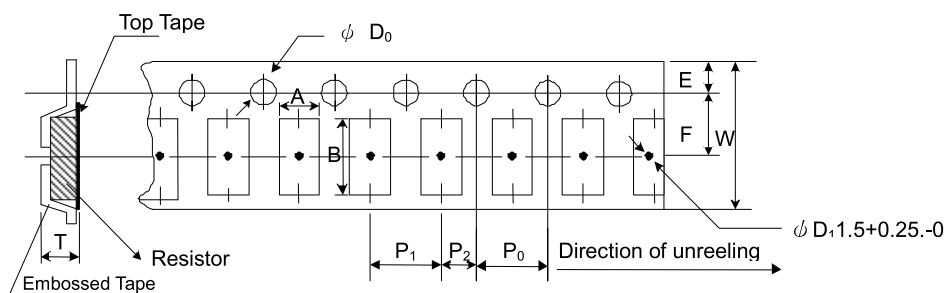


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CR-01	0.38±0.05	0.68±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	1.50+0.1,-0	0.42±0.20
CR-02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CR-03	1.10±0.10	1.90±0.10	8.00±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	8.00±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	8.00±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	8.00±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

Packaging

Embossed Plastic Tape Specifications

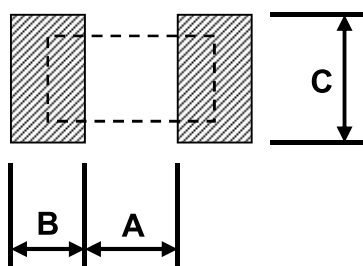


Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CR-0A	2.80 ± 0.10	5.40 ± 0.20	12.0 ± 0.30	1.75 ± 0.10	5.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	$1.50 + 0.1, -0$	1.2^{+0}
CR-0A (2W)	2.85 ± 0.10	5.55 ± 0.10	12.0 ± 0.30	1.75 ± 0.10	5.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	$1.50 + 0.1, -0$	1.45 ± 0.20
CR-12	3.50 ± 0.10	6.70 ± 0.10	12.0 ± 0.30	1.75 ± 0.10	5.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	$1.50 + 0.1, -0$	1.2^{+0}
CR-12 (3W)	3.40 ± 0.10	6.70 ± 0.10	12.0 ± 0.30	1.75 ± 0.10	5.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	1.55 ± 0.05	1.45 ± 0.20

Recommend Land Pattern

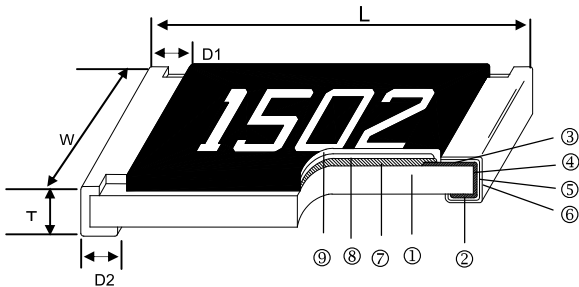
Unit: mm



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-0A(2W)	1.20	2.70	2.80
CR-12	4.90	1.60	3.50
CR-12(3W)	1.00	3.55	3.50

Automotive Grade Thick Film High Precision Low TCR Chip Resistor—CRTC..A Series

Construction



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

Features

- AEC-Q200 Qualified
- Small size and light weight
- Highly reliable multilayer electrode construction
- Compatible with all soldering process
- 100% CCD inspection
- MSL: Level 1

Applications

- Industrial
- Car Media
- Digital Cameras, Watches, Pocket Calculators
- Computers, Instruments
- Medical Equipment

Dimensions

Unit: mm

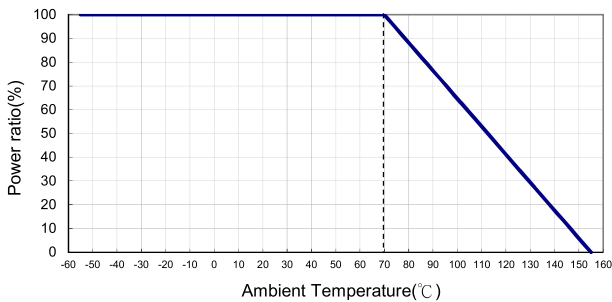
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CRTC02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.18±0.10	0.25±0.10	0.6
CRTC03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
CRTC05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
CRTC06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9

Part Numbering

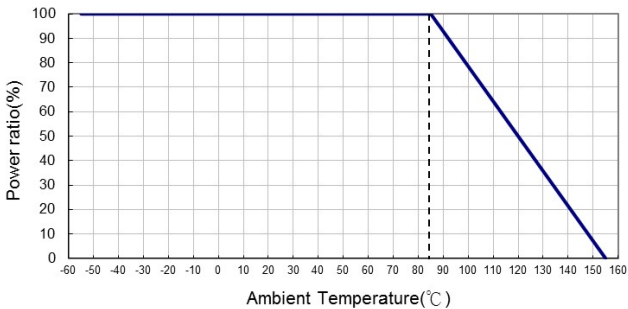
CRTC	06	F	T	C	V	1002	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206	B: ±0.1% C: ±0.25% D: ±0.5% F: ±1%	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel	C: ±25 D: ±50	Y: 1/16W X: 1/10W W: 1/8W P: 1/5W V: 1/4W O: 1/3W	1000: 100Ω 2201: 2.2KΩ 1002: 10KΩ 1004: 1MΩ	A: Automotive Grade

Derating Curve

For Standard power rating



For High power rating



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%	
CRTC02 (0402)	1/16W	-55 ~ +155°C	50V	100V	300Ω~1MΩ				*±25 ±50
CRTC03 (0603)	1/10W		75V	150V	10Ω~1MΩ				
CRTC05 (0805)	1/8W		150V	300V	10Ω~3MΩ	10Ω~6.8MΩ	10Ω~10MΩ		
CRTC06 (1206)	1/4W		200V	400V	10Ω~5.1MΩ		10Ω~10MΩ		

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%	
CRTC02 (0402)	1/8W	-55 ~ +155°C	75V	100V	300Ω~1MΩ				*±25 ±50
CRTC03 (0603)	1/5W		100V	150V	10Ω~1MΩ				
CRTC05 (0805)	1/4W		150V	300V	10Ω~3MΩ	10Ω~6.8MΩ	10Ω~10MΩ		
CRTC06 (1206)	1/3W		200V	400V	10Ω~5.1MΩ		10Ω~10MΩ		

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

*TCR(25°C/-55°C): -50~+25PPM/°C

■ 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.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(0.2%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G	Max. Overload Voltage for 1 minute
Endurance	For Standard power rating: 02 (R ≤ 30KΩ) : ±(0.2%+0.05Ω) 02 (R > 30KΩ) : ±(0.4%+0.05Ω) 03,05,06 : ±(0.2%+0.05Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
	For High power rating: 02 (R ≤ 30KΩ) : ±(0.2%+0.05Ω) 02 (R > 30KΩ) : ±(0.4%+0.05Ω) 03,05,06 : ±(0.2%+0.05Ω)	85±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	±(1.0%+0.10Ω)	1000hrs 85°C/85%RH 10% of operating power (≤100V).
High Temperature Exposure	02 (R ≤ 30KΩ) / 03 (R ≤ 200KΩ) : ±(0.2%+0.05Ω) 02 (R > 30KΩ) / 03 (R > 200KΩ) : ±(0.5%+0.05Ω) 05,06 : ±(0.2%+0.05Ω)	At +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	Bending once for 60 seconds 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds

Item	Requirement	Test Method
Resistance to Soldering Heat	$\pm(0.2\%+0.05\Omega)$	260 $\pm$ 5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260 $\pm$ 5°C for 30 seconds
Temperature Cycling	02 ($R \leq 30K\Omega$) : $\pm(0.2\%+0.05\Omega)$ 02 ($R > 30K\Omega$) : $\pm(0.5\%+0.05\Omega)$ 03,05,06 : $\pm(0.2\%+0.05\Omega)$	-55°C to +125°C, 1000 cycles
Mechanical Shock	$\pm(0.25\%+0.05\Omega)$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(0.5\%+0.05\Omega)$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(3\%+0.05\Omega)$	Human body model 0402/0603: 1KV 0805 and above: 2KV
Resistance to Solvents	No visible damage on appearance and marking.	Add aqueous wash chemical – OKEM Clean or equivalent. DO not use banned solvents.
Terminal Strength	No broken	Force of 1.8kg for 60 seconds
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required
Sulfur Test	$\triangle R \pm 1\%$	105 $\pm$ 2°C, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

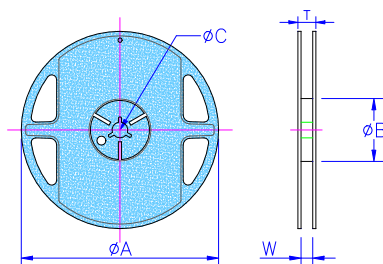
■ **Reference Standards:** IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94 ; EIA-977

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

Packaging

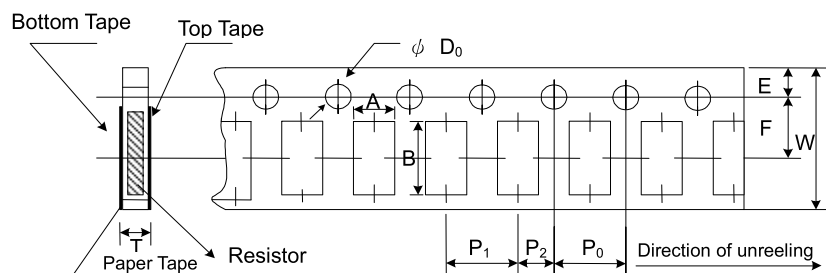
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CRTC02	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	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CRTC03 CRTC05 CRTC06	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		8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	
20K		8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	

Paper Tape Specifications

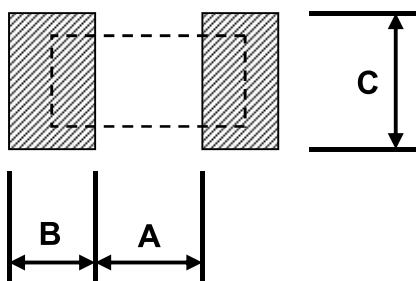


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRTC02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CRTC03	1.10±0.10	1.90±0.10	8.00±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
CRTC05	1.60±0.10	2.40±0.20	8.00±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
CRTC06	1.90±0.10	3.50±0.20	8.00±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

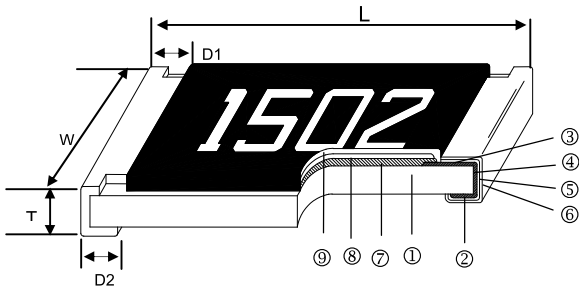
Unit: mm



Type	A	B	C
CRTC02	0.50	0.45	0.60
CRTC03	0.90	0.60	0.90
CRTC05	1.20	0.70	1.30
CRTC06	2.00	0.90	1.60

Automotive Grade Thick Film High Temperature Chip Resistor—CRHT..A Series

Construction



Features

- AEC-Q200 Qualified
- Small size and light weight
- Highly reliable multilayer electrode construction
- Compatible with all soldering process
- 100% CCD inspection
- MSL: Level 1

Applications

- Industrial
- Car Media
- Digital Cameras, Watches, Pocket Calculators
- Computers, Instruments
- Medical Equipment

Dimensions

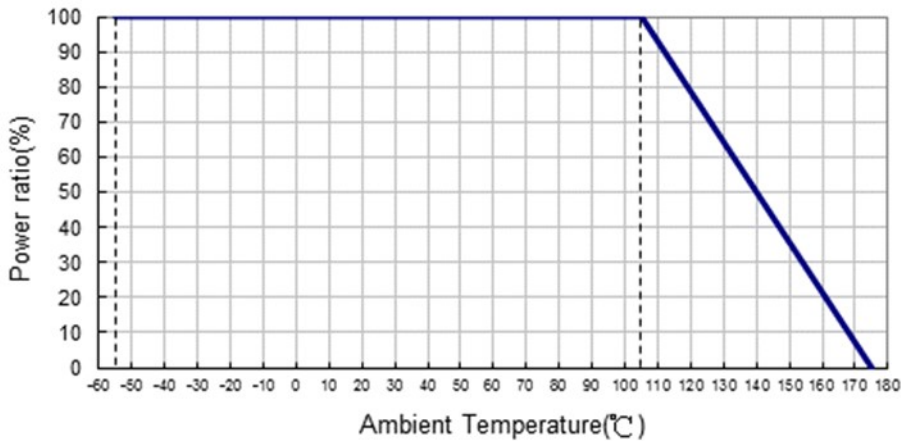
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CRHT02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.18±0.10	0.25±0.10	0.6
CRHT03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
CRHT05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4

Part Numbering

CRHT	03	F	T	E	V	1002	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805	D: ±0.5% F: ±1% J: ±5% -: No specified (for Jumper)	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel	E: ±100 F: ±200 -: No specified (for Jumper)	X: 1/10W W: 1/8W V: 1/4W U: 1/2W	1000: 100Ω 2201: 2.2KΩ 1002: 10KΩ 1003: 100KΩ	A: Automotive Grade

Derating Curve



Electrical Specifications

Type \ Item	Power Rating at 105°C Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
CRHT02	1/10W	-55 ~ +175°C	50V	100V	-	1Ω~9.76Ω	1Ω~9.1Ω	±200
					10Ω~300KΩ			±100
CRHT03	1/8W	-55 ~ +175°C	75V	150V	-	1Ω~9.76Ω	1Ω~9.1Ω	±200
					10Ω~300KΩ			±100
	1/4W	-55 ~ +175°C	75V	150V	1Ω~9.76Ω		1Ω~9.1Ω	±200
CRHT05	1/2W	-55 ~ +175°C	400V	600V	-	1Ω~9.76Ω	1Ω~9.1Ω	±200
					10Ω~300KΩ			±100

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

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

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

Jumper(0Ω)

Type\Item	Power Rating	Rated Current	Overload Current	Resistance	Operating Temp. Range
CRHT02	1/10W	1A	2A	0Ω (≤50mΩ)	-55 ~ +175°C
CRHT03	1/8W	1A	2A		
CRHT05	1/2W	2A	4A		

Environmental Characteristics

Item	Requirement		Test Method
	5% and Below	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		At 25°C/+175°C, 25°C is the reference temperature
Short Time Overload	±(2%+0.05Ω)	<50mΩ	0402/0603 : RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds. 0805 : RCWV*1.77 or Max. Overload Voltage whichever is lower for 5 seconds.
Endurance	±(3%+0.10Ω)	<50mΩ	105±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Operational Life	±(1.0%+0.10Ω)	<100mΩ	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(3%+0.10Ω)	<50mΩ	1000hrs 85°C/85%RH 10% of operating power (≤100V).
High Temperature Exposure	±(1.0%+0.05Ω)	<50mΩ	At +175°C for 1000 hrs
Resistance to Soldering Heat	±(1.0%+0.05Ω)	<50mΩ	270±5°C for 10 seconds
Temperature Cycling	±(1.0%+0.05Ω)	<50mΩ	-55°C to +175°C, 1000 cycles
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute

Item	Requirement		Test Method
	5% and Below	Jumper	
Board Flex	$\pm(1.0\%+0.10\Omega)$	$<50m\Omega$	Bending once for 60 seconds 3mm
Solderability	95% min. coverage		$245\pm5^{\circ}\text{C}$ for 3 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$		$260\pm5^{\circ}\text{C}$ for 30 seconds
Mechanical Shock	$\pm(0.25\%+0.05\Omega)$	$<50m\Omega$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(0.5\%+0.05\Omega)$	$<50m\Omega$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(3\%+0.05\Omega)$		Human body model 0402/0603: 1KV 0805 : 2KV
Resistance to Solvents	No visible damage on appearance and marking.		Add aqueous wash chemical – OKEM Clean or equivalent. DO not use banned solvents.
Terminal Strength	No broken		Force of 1.8kg for 60 seconds
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required
Sulfur Test	$\triangle R\pm 1\%$	$<50m\Omega$	$105\pm2^{\circ}\text{C}$, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

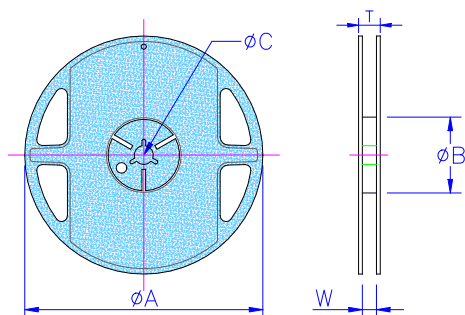
■ **Reference Standards:** IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94 ; EIA-977

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

Packaging

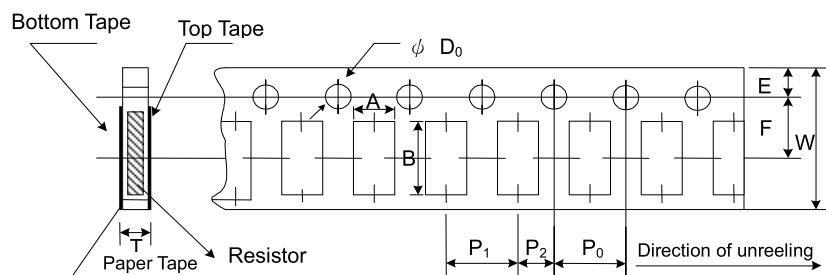
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CRHT02	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	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
CRHT03 CRHT05	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	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5

Paper Tape Specifications

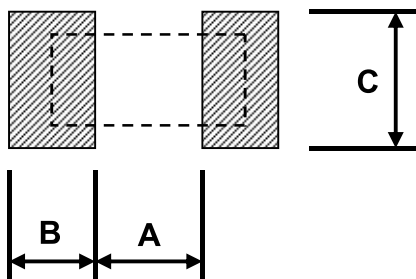


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRHT02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CRHT03	1.10±0.10	1.90±0.10	8.00±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
CRHT05	1.60±0.10	2.40±0.20	8.00±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

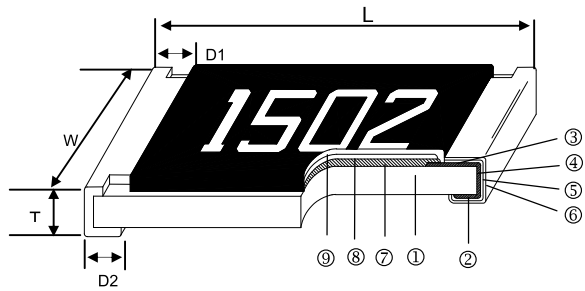
Unit: mm



Type	A	B	C
CRHT02	0.50	0.45	0.60
CRHT03	0.90	0.60	0.90
CRHT05	1.20	0.70	1.30

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

Construction



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

Features

- Special construction to prevent sulfuration in a sulfur containing environment
- AEC-Q200 Qualified
- 100% CCD inspection
- MSL: Level 1

Applications

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

Dimensions

Unit: mm

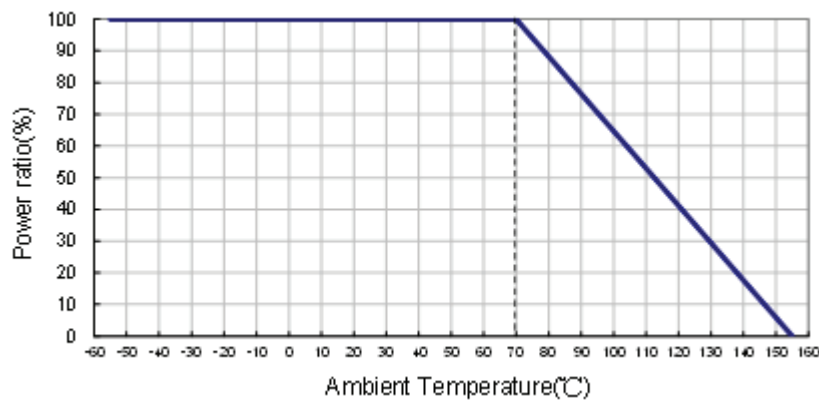
Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
AS01	0201	0.60±0.03	0.30±0.03	0.23±0.03	0.15±0.05	0.15±0.05	0.2
AS02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
AS03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
AS05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
AS06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
AS10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
AS0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
AS12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

Part Numbering

AS	06	F	T	E	U	1002	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	01: 0201 02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	D: ±0.5% F: ±1% J: ±5% or Jumper	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel	E: ±100 F: ±200 -: No specified (for Jumper)	: Standard* (See Remark) W: 1/8W V: 1/4W O: 1/3W U: 1/2W T: 3/4W Q: 1W	1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ R0R0: 0Ω	A: Automotive Grade

*Remark: Standard parts don't need power rating code.

Derating Curve



Electrical Specifications

Item Type	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 ~ +155°C	25V	50V	-	1Ω - 10MΩ		±200
	Jumper: 1A				-	0Ω(<50mΩ)	-	
AS02 (0402)	1/16W		50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				-	0Ω(<50mΩ)	-	
AS03 (0603)	1/10W		75V	150V	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)	-	

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%	
AS02 (0402)	1/8W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100
AS03 (0603)	1/4W		75V	150V	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100
AS05 (0805)	1/3W		150V	300V	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100
AS06 (1206)	1/2W		200V	400V	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100
AS10 (1210)	3/4W		200V	400V	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100
AS0A (2010)	1W		200V	400V	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 125°C.

■ 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.			At 25°C/-55°C and 25°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 whichever is lower for 5 seconds High Power: 2 times RCWV or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥ 10G			Max. Overload Voltage for 1 minute
Operational Life	±(1.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(1.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	1000 hrs 85°C/85%RH 10% of operating power(≤100V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 seconds 2010, 2512 sizes: 2 mm 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 Max. Operating Voltage 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
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	±(3%+0.05Ω)			Human body model 0201: 0.5KV 0402/0603: 1KV 0805 and above: 2KV
Resistance to Solvents	No visible damage on appearance and marking.			Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken			Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board			V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±1%		<50mΩ	105±2°C, no power rating for 750 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ **Reference Standards:** IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

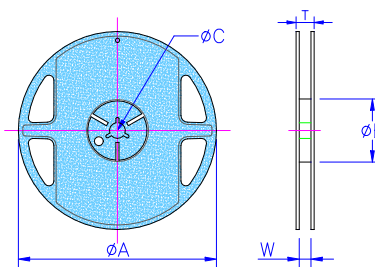
■ **Shelf Life:** 2 years from production date

Packaging

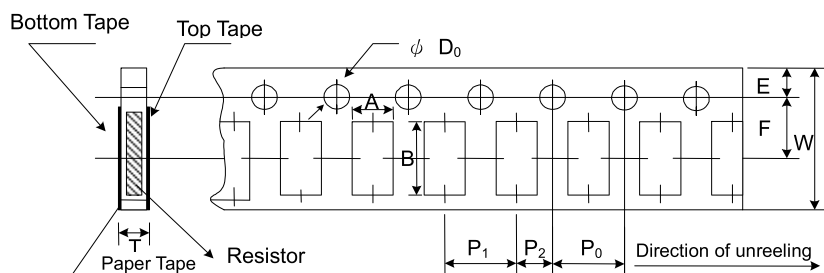
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
AS01 AS02	Paper	10K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
AS03 AS05 AS06 AS10	Paper	5K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		10K	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
AS0A AS12	Embossed	4K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
		8K	10 inch	250.0±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



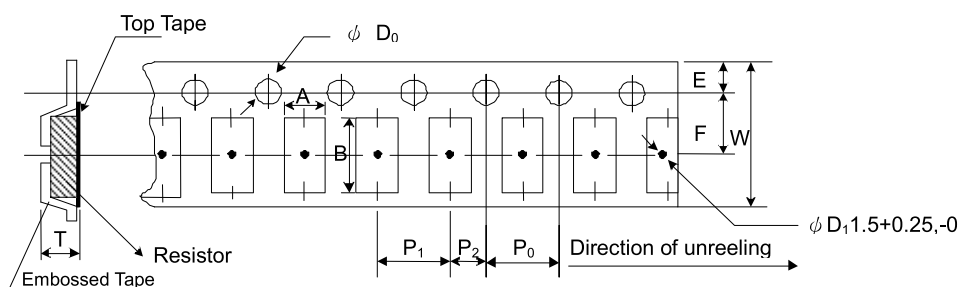
Paper Tape Specifications



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

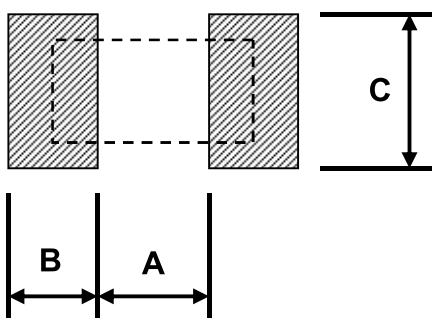


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
AS0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
AS12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±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

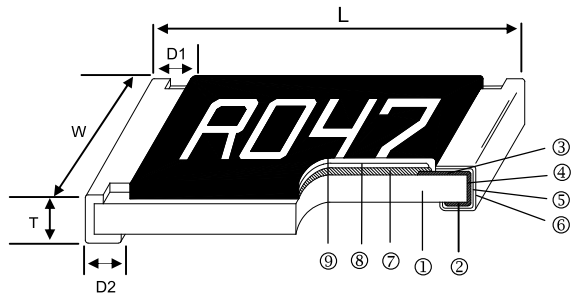
Unit: mm



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	4.90	1.60	3.50

Automotive Grade Current Sensing Chip Resistor—CS..A Series

Construction



Features

- AEC-Q200 Qualified
- Highly reliable multilayer electrode construction
- Reduced size of final PCB design
- 3 Watts power rating in 1 Watt size, 1225 package
- Low TCR of ± 100 PPM/ $^{\circ}$ C
- Resistance values from 1m to 1 ohm
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating
- Special construction to prevent sulfuration in a sulfur containing environment
- RoHS Compliance
- 100% CCD inspection
- MSL: Level 1

Applications

- Automotive Industry
- 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

Part Numbering

CS	06	F	T	F	U	R100	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}$ C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512 25: 1225 37: 3720 75: 7520 08: 0508 62: 0612 20: 1020	F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$	T: Taping Reel V: 10" Taping Reel W: 13" Taping Reel	E: ± 100 F: ± 200 G: ± 300 H: ± 400 J: ± 600 K: ± 150	: Standard* (See Remark) S: 2W A: 1.5W T: 1W Q: 3/4W U: 1/2W V: 1/4W P: 1/5W W: 1/8W	R010: 0.01 Ω R100: 0.1 Ω 1R00: 1 Ω	NA: No Marking A: Automotive Grade

*Remark: Standard parts don't need for power rating code.

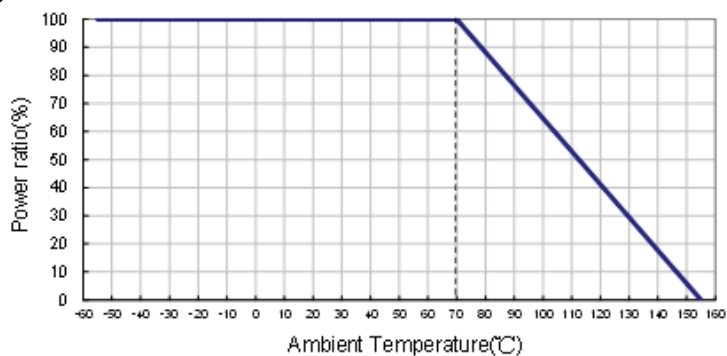
① Alumina Substrate	④ Edge Electrode	⑦ Resistor Layer
② Bottom Electrode	⑤ Barrier Layer	⑧ Primary Overcoat
③ Top Electrode	⑥ External Electrode	⑨ Secondary Overcoat

Dimensions

Unit: mm

Type	Size	L	W	T	D1	D2	Weight (g) (1000pcs)
CS02	0402	1.00 $\pm$ 0.05	0.50 $\pm$ 0.05	0.32 $\pm$ 0.10	0.25 $\pm$ 0.10	0.25 $\pm$ 0.10	0.7
CS03	0603	1.60 $\pm$ 0.10	0.80 $\pm$ 0.10	0.45 $\pm$ 0.10	0.30 $\pm$ 0.20	0.30 $\pm$ 0.20	2.0
CS05	0805	2.00 $\pm$ 0.10	1.25 $\pm$ 0.10	0.55 $\pm$ 0.10	0.30 $\pm$ 0.20	0.40 $\pm$ 0.25	5.3
CS06	1206	3.10 $\pm$ 0.10	1.55 $\pm$ 0.10	0.55 $\pm$ 0.10	0.50 $\pm$ 0.30	0.40 $\pm$ 0.25	8.8
CS13	1210	3.10 $\pm$ 0.10	2.60 $\pm$ 0.15	0.55 $\pm$ 0.10	0.50 $\pm$ 0.30	0.50 $\pm$ 0.25	15.5
CS10	2010	5.00 $\pm$ 0.10	2.50 $\pm$ 0.15	0.60 $\pm$ 0.15	0.60 $\pm$ 0.30	0.50 $\pm$ 0.25	27.0
CS12	2512	6.35 $\pm$ 0.10	3.10 $\pm$ 0.15	0.60 $\pm$ 0.10	0.60 $\pm$ 0.30	0.55 $\pm$ 0.25	43.0
CS12 (2W)	2512 (10 - 99m Ω)	6.35 $\pm$ 0.20	3.15 $\pm$ 0.15	0.74 $\pm$ 0.10	0.60 $\pm$ 0.30	0.55 $\pm$ 0.25	53.1
CS12 (2W)	2512 (100 - 1000m Ω)	6.35 $\pm$ 0.20	3.15 $\pm$ 0.15	0.74 $\pm$ 0.10	0.60 $\pm$ 0.30	2.10 $\pm$ 0.10	53.1
CS25	1225	3.20 $\pm$ 0.15	6.45 $\pm$ 0.15	0.90 $\pm$ 0.15	0.60 $\pm$ 0.30	0.80 $\pm$ 0.25	64.9
CS37	3720	2.00 $\pm$ 0.20	3.75 $\pm$ 0.20	0.60 $\pm$ 0.10	0.40 $\pm$ 0.20	0.40 $\pm$ 0.20	20.0
CS75	7520	2.00 $\pm$ 0.20	7.50 $\pm$ 0.30	0.60 $\pm$ 0.10	0.40 $\pm$ 0.20	0.40 $\pm$ 0.20	35.7
CS08	0508	1.25 $\pm$ 0.10	2.00 $\pm$ 0.10	0.55 $\pm$ 0.10	0.30 $\pm$ 0.15	0.30 $\pm$ 0.15	5.7
CS62	0612	1.55 $\pm$ 0.10	3.10 $\pm$ 0.15	0.55 $\pm$ 0.10	0.30 $\pm$ 0.15	0.45 $\pm$ 0.15	10.2
CS20	1020	2.45 $\pm$ 0.15	5.00 $\pm$ 0.10	0.60 $\pm$ 0.15	0.35 $\pm$ 0.20	0.70 $\pm$ 0.20	28.4

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS02 (0402)	1/16W	-55 ~ +155°C	1.11A	50 - 100 102 - 500 510 - 1000			±400 ±300 ±200
CS03 (0603)	1/10W		2.23A	20 - 50 51 - 100 102 - 300 301 - 1000			±600 ±400 ±300 ±200
CS05 (0805)	1/8W		2.50A	20 - 50 51 - 100 102 - 196 200 - 1000			±600 ±400 ±300 ±200
CS06 (1206)	1/4W		5.00A	10 - 20 21 - 50 51 - 91 100 - 1000			±600 ±400 ±300 ±200
CS13 (1210)	1/2W		7.07A				
CS10 (2010)	3/4W		8.66A				
CS12 (2512)	1W		10.0A				
CS25 (1225)	3W		31.6A	3 - 5 6 - 20 21 - 30 33- 8000			±300 ±200 ±150 ±100
CS37 (3720)	1W		10.0A	10 - 18 20 - 500			±300 ±150
CS75 (7520)	2W		44.7A	—	1 - 4		±300
				5 - 10 11 - 350			±200 ±150
CS62 (0612)	1W		10.0A	10 - 27 30 - 91 100 - 499 500 - 1000			±600 ±300 ±200 ±100

Low TCR Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS05 (0805)	1/8W	-55 ~ +155°C	1.11A	100 - 1000			±100
CS06 (1206)	1/4W		1.58A	100 - 1000			±100
CS13 (1210)	1/2W		2.58A	75 - 1000			±100
CS10 (2010)	3/4W		3.87A	50 - 1000			±100
CS12 (2512)	1W		4.47A	50 - 1000			±100
CS12 (2512)	*2W		6.32A	50 - 1000			±100
CS37 (3720)	1W		3.16A	100 - 500			±100
CS75 (7520)	2W		6.32A	50 - 350			±100

*: Ultra High Power

■ High Power & Ultra High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)			TCR (PPM/°C)
				±1%	±2%	±5%	
CS02 (0402)	1/8W	-55 ~ +155°C	1.58A	50 - 100 102 - 500 510 - 1000			±400 ±300 ±200
CS03 (0603)	1/8W		1.58A				
CS05 (0805)	1/4W 1/2W		2.23A				
CS06 (1206)	1/2W		3.16A	50 - 91 100 - 1000			±300 ±200
CS13 (1210)	3/4W		3.87A				
CS10 (2010)	1W		4.47A				
CS12 (2512)	1.5W		5.47A				
CS12 (2512)	*2W		6.32A				
CS08(0508)	1W		7.07A	20 - 30 33 - 100 102 - 499 500 - 1000			±600 ±400 ±200 ±100
CS20(1020)	2W		14.14A				
				10 - 30 33 - 100 102 - 499 500 - 1000			±600 ±400 ±200 ±100

*: Ultra High Power

Operating Voltage= $\sqrt{P \cdot R}$; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$; Operating Current= $\sqrt{P/R}$

■ 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.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(0.5%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
	±(1.0%+0.05Ω) For High power rating	
Insulation Resistance	≥ 10G	Max. Overload Voltage for 1 minute
Operational Life	±(1.0%+0.05Ω)	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(1.0%+0.05Ω)	1000 hrs 85°C/85%RH 10% of operating power. (≤ 100V).
High Temperature Exposure	±(0.5%+0.05Ω)	at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	Bending once for 60 seconds 2010, 2512 sizes: 2 mm 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

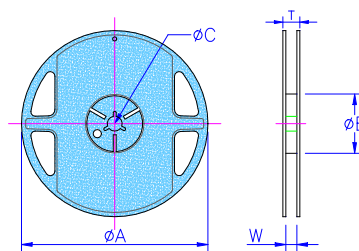
Item	Requirement	Test Method
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute CS02:100V; CS03:150V; CS05/08:300V CS06/13/10/25/37/75/62/20:400V; CS12:500V
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260 $\pm 5^{\circ}\text{C}$ for 30 seconds
Temperature Cycling	$\pm(0.5\%+0.05\Omega)$	-55 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$, 1000 cycles
Mechanical Shock	$\pm(0.25\%+0.05\Omega)$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(0.5\%+0.05\Omega)$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(1\%+0.05\Omega)$	Human body, 2KV
Resistance to Solvents	No visible damage on appearance and marking.	Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken	Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	$\pm(2.0\%+0.05\Omega)$	105 $\pm 2^{\circ}\text{C}$, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ **Reference Standards:** IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22;
UL-94; EIA-977

■ **Storage Temperature:** 15~28 $^{\circ}\text{C}$; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date



■ Packaging

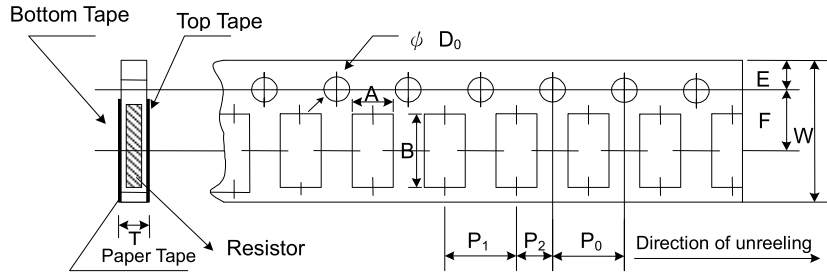
Packaging Quantity & Reel Specifications

Unit: mm

Type	Reel Diameter	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
CS02	7 inch	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	10,000	-
	10 inch	254.0 ± 1.0	100.0 ± 0.5	13.0 ± 0.2	9.5 ± 0.5	13.5 ± 0.5	20,000	-
	13 inch	330.0 ± 1.0	100.0 ± 0.5	13.0 ± 0.2	9.5 ± 0.5	13.5 ± 0.5	40,000	-
CS03 CS05 CS06 CS13	7 inch	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
	10 inch	254.0 ± 1.0	100.0 ± 0.5	13.0 ± 0.2	9.5 ± 0.5	13.5 ± 0.5	10,000	-
	13 inch	330.0 ± 1.0	100.0 ± 0.5	13.0 ± 0.2	9.5 ± 0.5	13.5 ± 0.5	20,000	-
CS10 CS12	7 inch	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	4,000
	10 inch	250.0 ± 1.0	62.0 ± 0.5	13.0 ± 0.5	12.5 ± 0.5	16.5 ± 0.5	-	8,000
CS12 (2W)	7 inch	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CS25	7 inch	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CS37	7 inch	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	13.5 ± 1.0	15.5 ± 1.0	-	2,000
CS75	7 inch	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	17.5 ± 1.0	19.5 ± 1.0	-	2,000
CS08	7 inch	178.5 ± 1.5	60.0 ± 1.0	13.0 ± 0.2	9.0 ± 0.5	12.5 ± 0.5	5,000	-
CS62	7 inch	178.0 ± 1.0	60.0 ± 1.0	13.5 ± 0.7	9.5 ± 0.1	11.5 ± 1.0	5,000	-
CS20	7 inch	178.5 ± 1.5	60.0 ± 1.0	13.0 ± 0.5	13.0 ± 0.5	15.5 ± 0.5	-	4,000

Packaging

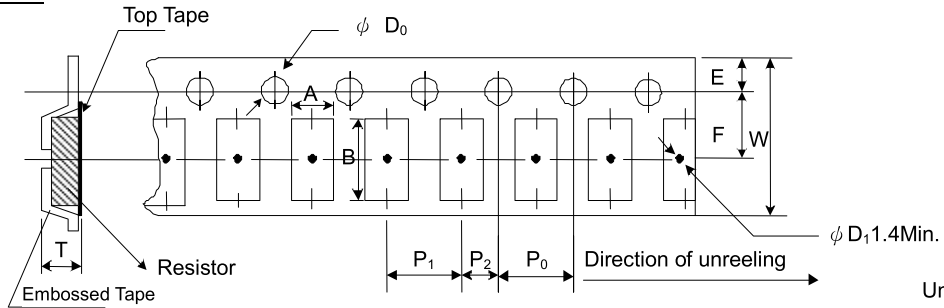
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CS02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CS03	1.10±0.10	1.90±0.10	8.00±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	8.00±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	8.00±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	8.00±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
CS08	1.60±0.10	2.40±0.20	8.00±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
CS62	1.90±0.10	3.50±0.20	8.00±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

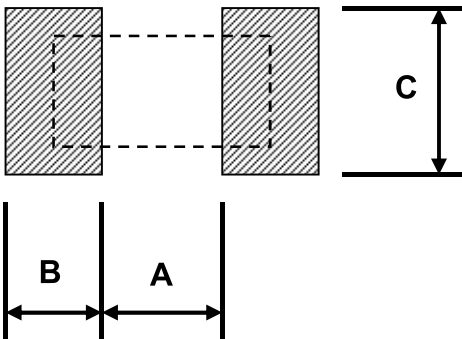
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CS10	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±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±0.30	1.75±0.10	5.50±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	5.50±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	5.50±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	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.20±0.20
CS75	2.50±0.20	8.30±0.20	16.0±0.30	1.75±0.10	7.80±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.20±0.20
CS20	2.80±0.15	5.40±0.20	12.0±0.10	1.75±0.10	5.5±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.55+0.10	1.00±0.20

Recommend Land Pattern



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

Unit: mm

Type	A	B	C
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	3.20±0.2
CS25	1.20	2.00	7.00±0.2
CS37	1.00	1.80	3.90±0.2
CS75	1.00	1.80	7.60±0.2
CS08	0.55	0.90	2.00±0.2
CS62	0.60	1.00	3.20±0.2
CS20	1.00	1.20	5.00±0.2

Pad Layout (For CS12: Ultra High Power Rating Series)

Unit: mm

Type	Resistance Range	A	B	C
CS12	10 - 99mΩ	4.9	1.6	3.2±0.2
CS12	100 - 1000mΩ	1.0	3.55	3.2±0.2

■ Marking

No Marking for 0402/1206(1W)

1%, 5% for 0805/1206/1210/2010/2512/1225/3720/7520/0612 : 4 digits marking

Example:

Resistance	47mΩ	75mΩ	15mΩ	750mΩ	820mΩ
Marking	R047	R075	R015	R750	R820

Marking for 0603

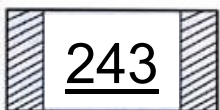
E24 Series (<100mΩ): 3 digits marking with under-line

E24 Series ($\geq 100\text{m}\Omega$): 3 digits marking for E24 or R value suffix is zero in E96: R10=100mΩ; R28=280mΩ

E96 Series ($\geq 100\text{m}\Omega$): 3 digits marking with under-line in E96 (non-including E24 series)



3 digits marking for E24 or R value suffix is zero in E96: R10=100mΩ; R28=280mΩ



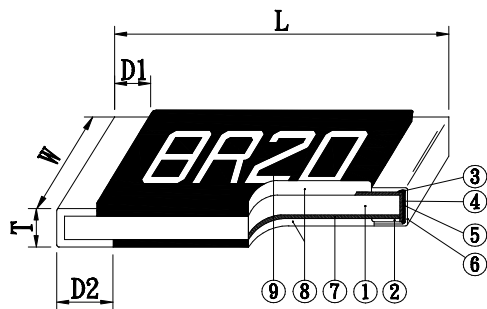
3 digits marking for E96: 243=243mΩ; 511=511mΩ

Example:

Resistance	1.000Ω	0.100Ω	0.010Ω	0.102Ω	0.024Ω
Marking	1R0	R10	R01	<u>102</u>	<u>024</u>

Automotive Grade Current Sensing Thin Film Chip Resistor—CSTF..A Series

Construction



Features

- AEC-Q200 Qualified
- Highly reliable multilayer electrode construction
- Reduced size of final equipment reliability
- Low TCR of ± 50 PPM/ $^{\circ}$ C
- Resistance values from 1 to 10 ohm
- High purity alumina substrate for high power dissipation
- RoHS Compliance
- 100% CCD inspection
- MSL: Level 1

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

Dimensions

Unit: mm

Type	Size	L	W	T	D1	D2	Weight (g) (1000pcs)
CSTF06	1206	3.10 $\pm$ 0.10	1.55 $\pm$ 0.10	0.55 $\pm$ 0.10	0.40 $\pm$ 0.25	0.40 $\pm$ 0.25	9.2

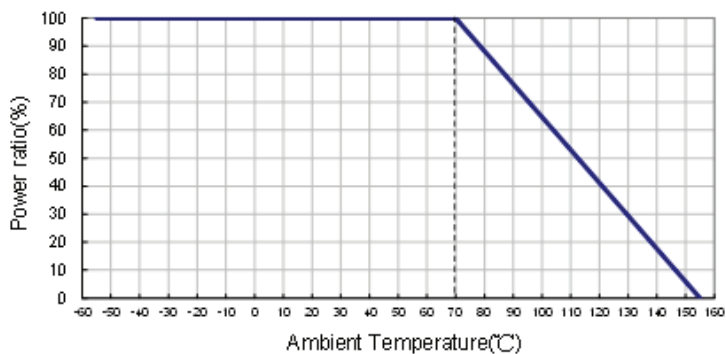
Applications

- Automotive Industry
- 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

Part Numbering

CSTF	06	F	T	D	U	0010	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}$ C)	Power Rating	Resistance	Marking
	06: 1206	F: $\pm 1\%$ G: $\pm 2\%$ J: $\pm 5\%$	T: Taping Reel	D: ± 50 E: ± 100	T: 1W U: 1/2W	0010: 1 Ω 4R70: 4.7 Ω 0100: 10 Ω	A: Automotive Grade

Derating Curve



Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range			TCR (PPM/°C)
				±1%	±2%	±5%	
CSTF06 (1206)	1/2W	-55 ~ +155°C	0.707A	1Ω - 10Ω			±50 ±100
	1W		1A				

Operating Voltage= $\sqrt{P \cdot R}$; Operating Current= $\sqrt{P/R}$

■ 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.	At 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥ 10G	Max. Overload Voltage for 1 minute
Operational Life (Endurance)	±(1.0%+0.05Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	±(0.5%+0.05Ω)	1000 hrs 85°C/85%RH 10% of operating power. (≤ 100V).
High Temperature Exposure	±(1.0%+0.05Ω)	at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	Bending once for 60 seconds with 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 Max. Operating Voltage for 1 minute CSTF06:400V
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%	260±5°C for 30 seconds
Temperature Cycling	±(1.0%+0.05Ω)	-55°C to +155°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.05Ω)	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(1%+0.05Ω)	Human body, 2KV

Item	Requirement	Test Method
Resistance to Solvents	No visible damage on appearance and marking.	Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken	Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	$\Delta R \pm 1\%$	105 $\pm$ 2°C, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

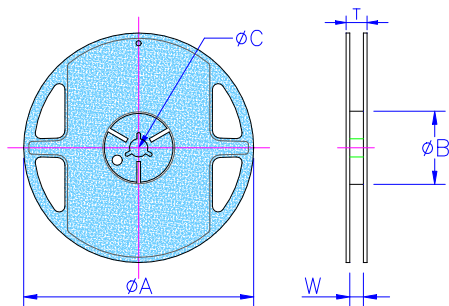
■ **Reference Standards:** IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94; EIA-977

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

■ Packaging

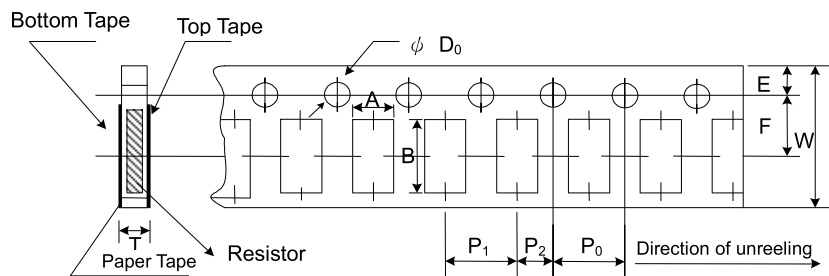
Packaging Quantity & Reel Specifications



Unit: mm

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)
CSTF06	178.0 $\pm$ 1.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.7	9.5 $\pm$ 0.1	11.5 $\pm$ 1.0	5,000

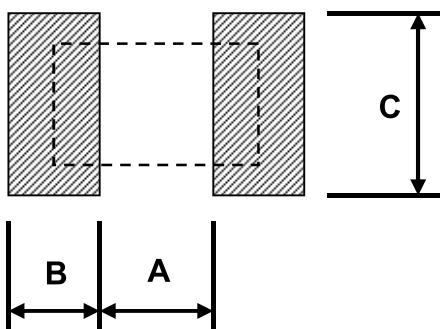
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSTF06	1.90 $\pm$ 0.10	3.50 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1, -0	0.85 $\pm$ 0.10

■ Recommend Land Pattern

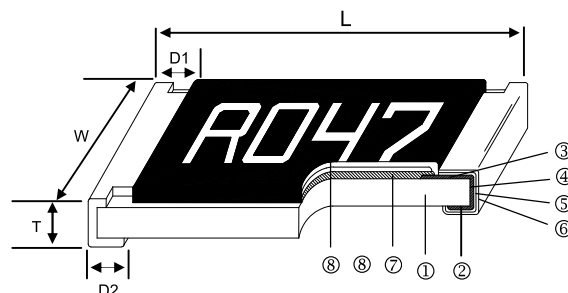


Unit: mm

Type	A	B	C
CSTF06	2.00	1.15	1.70 $\pm$ 0.2

Automotive Grade Current Sensing Chip Resistor—CSN..A Series

Construction



Features

- Resistance values from 10mΩ to 1Ω
- Low TCR
- High purity alumina substrate for high power dissipation
- RoHS Compliance
- AEC-Q200 Qualified
- 100% CCD inspection
- MSL: Level 1

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

Applications

- Automotive(non-safety parts)
- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor

Dimensions

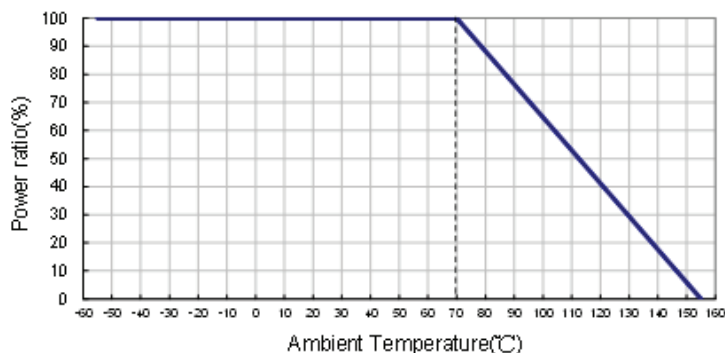
Unit: mm

Type	Size	L	W	T	D1	D2	Weight (g) (1000pcs)
CSN05	0805	2.00±0.10	1.25±0.10	0.55±0.15	0.30±0.20	0.40±0.25	4.6
CSN06	1206	3.10±0.10	1.55±0.10	0.55±0.15	0.50±0.30	0.40±0.25	8.7
CSN13	1210	3.10±0.10	2.60±0.15	0.55±0.15	0.50±0.30	0.50±0.25	16.0
CSN10	2010	5.00±0.10	2.50±0.15	0.60±0.15	0.60±0.30	0.50±0.25	23.7
CSN12	2512	6.35±0.10	3.10±0.15	0.60±0.15	0.60±0.30	0.55±0.25	40.0

Part Numbering

CSN	06	F	T	F	V	R100	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	F: ±1% G: ±2% J: ±5%	T: Taping Reel	F: ±200 G: ±300 H: ±400 J: ±600	T: 1W Q: 3/4W U: 1/2W V: 1/4W W: 1/8W	R051: 0.051Ω R100: 0.1Ω 1R00: 1Ω	A: Automotive Grade

Derating Curve



Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range			TCR (PPM/°C)
				±1%*	±2%	±5%	
CSN05 (0805)	1/8W	-55 ~ +155°C	2.5A	20 - 50 51 - 100 102 - 196 200 - 1000	20 - 50 51 - 100 110 - 180 200 - 1000		±600 ±400 ±300 ±200
CSN06 (1206)	1/4W	-55 ~ +155°C	5.0A	10 - 20 22 - 50 51 - 91 100 - 1000	10 - 20 22 - 50 51 - 91 100 - 1000		±600 ±400 ±300 ±200
CSN13 (1210)	1/2W		7.07A				
CSN10 (2010)	3/4W		8.66A				
CSN12 (2512)	1W		10.0A				

*: The nominal resistance value for less than 100mΩ is in E-24 series, other requirement of resistance value please contact our sales office.

Operating Voltage= $\sqrt{P \cdot R}$; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$; Operating Current= $\sqrt{P/R}$

■ 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.	At 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(0.5%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥ 10G	Max. Overload Voltage for 1 minute
Operational Life	±(3.0%+0.05Ω)	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(1.0%+0.05Ω)	1000 hrs 85°C/85%RH 10% of operating power. (≤ 100V).
High Temperature Exposure	±(3.0%+0.05Ω)	at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	Bending once for 60 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 Max. Operating Voltage for 1 minute CSTF06:400V
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%	260±5°C for 30 seconds
Temperature Cycling	±(3.0%+0.05Ω)	-55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.

Item	Requirement	Test Method
Vibration	$\pm(0.5\%+0.05\Omega)$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(1\%+0.05\Omega)$	Human body, 2KV
Resistance to Solvents	No visible damage on appearance and marking.	Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken	Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	$\pm(2.0\%+0.05\Omega)$	105 $\pm$ 2°C, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22;

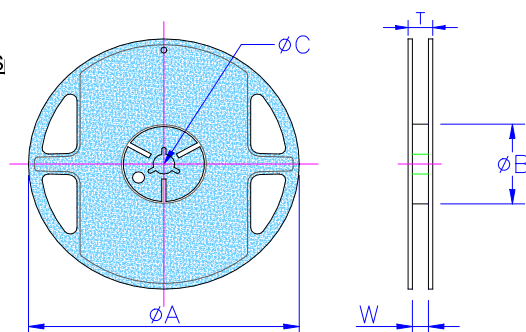
UL-94; EIA-977

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

■ Packaging

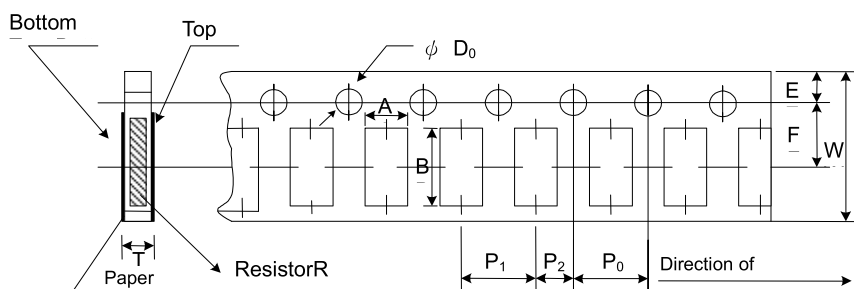
Packaging Quantity & Reel S



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CSN05 CSN06 CSN13	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CSN10 CSN12	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

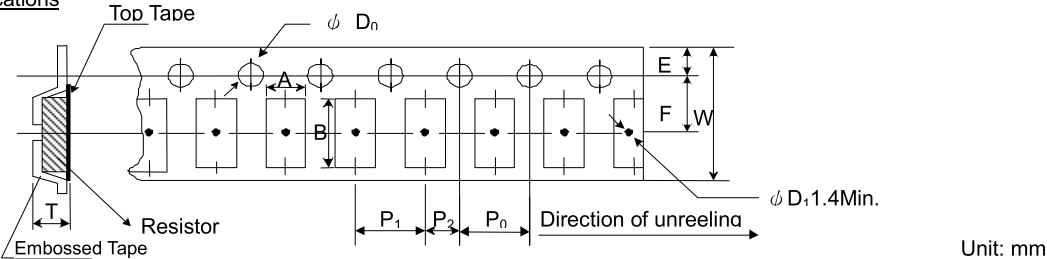


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSN05	1.60 $\pm$ 0.10	2.40 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1,-0	0.85 $\pm$ 0.10
CSN06	1.90 $\pm$ 0.10	3.50 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1,-0	0.85 $\pm$ 0.10
CSN13	2.90 $\pm$ 0.10	3.50 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1,-0	0.85 $\pm$ 0.10

■Packaging

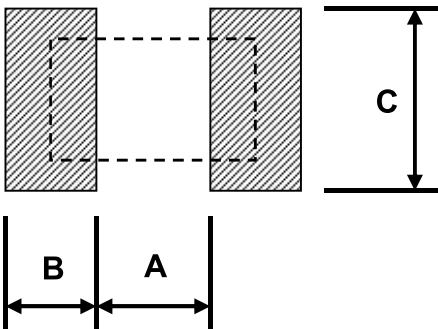
Embossed Plastic Tape Specifications



Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSN10	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CSN12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±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
CSN05	1.00	1.00	1.35±0.2
CSN06	2.00	1.15	1.70±0.2
CSN13	2.00	1.15	2.50±0.2
CSN10	3.60	1.40	2.50±0.2
CSN12	4.90	1.60	3.20±0.2

■Marking

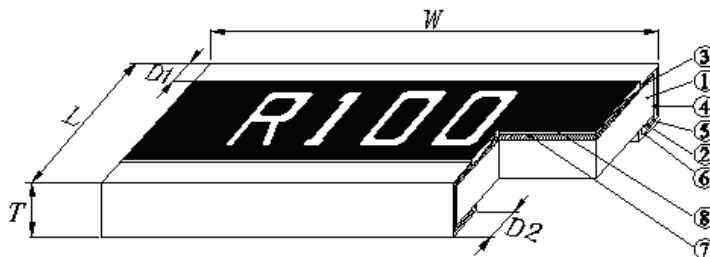
1%, 5% for 0805/1206/1210/2010/2512 : 4 digits marking

Example:

Resistance	10mΩ	51mΩ	75mΩ	100mΩ	549mΩ
Marking	R010	R051	R075	R100	R549

Automotive Grade Current Sensing Chip Resistor (Wide Terminal)—CSW..A Series

Construction



Features

- AEC-Q200 Qualified
- Highly reliable multilayer electrode construction
- Reduced size of final equipment reliability
- 3 Watts power rating in 1 Watt size, 1225 package
- Resistance values from 10m to 750mΩ
- High purity alumina substrate for high power dissipation
- Long side terminations with higher power rating
- RoHS Compliance
- 100% CCD inspection
- MSL: Level 1

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

Dimensions

Unit: mm

Type	Size	L	W	T	D1	D2	Weight (g) (1000pcs)
CSW08	0508	1.25±0.15	2.00±0.15	0.60±0.10	0.30±0.20	0.35±0.15	6
CSW62	0612	1.60±0.15	3.20±0.15	0.60±0.10	0.30±0.20	0.45±0.15	12
CSW20	1020	2.50±0.15	5.00±0.15	0.60±0.10	0.40±0.20	0.75±0.15	35
CSW25	1225	3.10±0.15	6.30±0.15	0.60±0.10	0.45±0.20	0.75±0.15	48

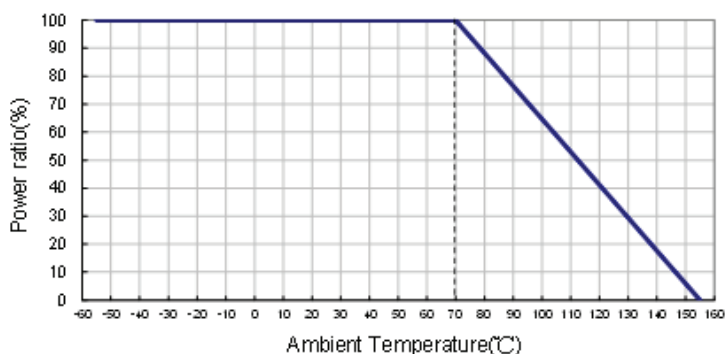
Applications

- Automotive(non-safety parts)
- Power Management Applications
- Switching Power Supply
- Over Current Protection in Audio Applications
- Voltage Regulation Module (VRM)
- DC-DC Converter, Battery Pack, Charger, Adaptor

Part Numbering

CSW	25	F	T	F	R	R100	A
Product Type	Dimensions (L×W)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	08: 0508 62: 0612 20: 1020 25: 1225	F: ±1% J: ±5%	T: Taping Reel	E: ±100 F: ±200 J: ±600	U: 1/2W Q: 3/4W T: 1W A: 1.5W S: 2W R: 3W	R010: 0.01Ω R100: 0.1Ω	A: Automotive Grade

Derating Curve



■ Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)		TCR (PPM/°C)
				±1%*	±5%	
CSW08 (0508)	1/2W	-55 ~ +155°C	7.07A	10-27		±600
				30-510		±200
CSW62 (0612)	3/4W		8.66A	10-27		±600
				30-510		±200
CSW20 (1020)	1W		10A	10-27		±600
				30-750		±200
CSW25 (1225)	1.5W		12.24A	10-27		±600
				30-750		±200

■ High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)		TCR (PPM/°C)
				±1%*	±5%	
CSW08 (0508)	1W	-55~+155°C	10.0A	10 - 27		±600
				30 - 510		±200
CSW62 (0612)	1.5W		12.2A	10 - 27		±600
				30 - 510		±200
CSW20 (1020)	2W		14.1A	10 - 27		±600
				30 - 750		±200
CSW25 (1225)	3W		17.3A	10 - 27		±600
				30 - 750		±200

■ High Power Rating & Low TCR Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)		TCR (PPM/°C)
				±1%*	±5%	
CSW08 (0508)	1W	-55~+155°C	3.16A	100 - 510		±100
CSW62 (0612)	1.5W		7.07A	30 - 510		±100
CSW20 (1020)	2W		8.16A	30 - 750		±100
CSW25 (1225)	3W		10.0A	30 - 750		±100

*: The nominal resistance value for less than 100mΩ is in E-24 series, other requirement of resistance value please contact our sales office.

Operating Voltage= $\sqrt{P \cdot R}$; Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$; Operating Current= $\sqrt{P/R}$

■ 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.	At 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(2.0\%+0.05\Omega)$	RCWV*2 for 5 seconds
Insulation Resistance	$\geq 10G$	Max. Overload Voltage for 1 minute
Operational Life	$\pm(3.0\%+0.05\Omega)$	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	$\pm(3.0\%+0.05\Omega)$	1000 hrs 85°C/85%RH 10% of operating power. ($\leq 100V$).
High Temperature Exposure	$\pm(3.0\%+0.05\Omega)$	at +155°C for 1000 hrs
Board Flex	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds with 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(1.0\%+0.05\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute CSW08:300V;CSW62/20/25:400V
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260±5°C for 30 seconds
Temperature Cycling	$\pm(3.0\%+0.05\Omega)$	-55°C to +125°C, 1000 cycles
Mechanical Shock	$\pm(3.0\%+0.05\Omega)$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(3.0\%+0.05\Omega)$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(1.0\%+0.05\Omega)$	Human body, 2KV
Resistance to Solvents	No visible damage on appearance and marking.	Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken	Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching of the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	$\pm(2.0\%+0.05\Omega)$	105±2°C, no power rating for 1000 hrs.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94; EIA-977

■ Storage Temperature: 15~28°C; Humidity < 80%RH

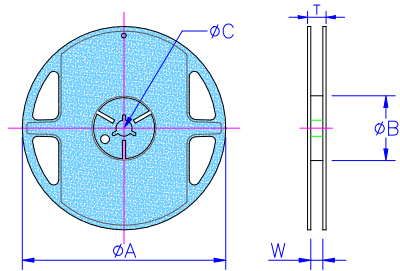
■ Shelf Life: 2 years from production date

Packaging

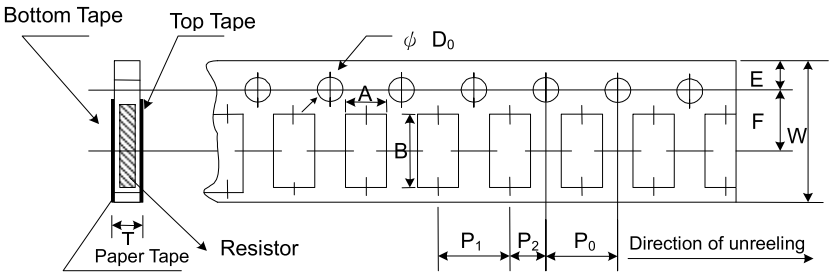
Packaging Quantity & Reel Specifications

Type	ΦA	ΦB	ΦC	W	T	Paper Tape (EA)	Emboss Plastic Tape (EA)
CSW08	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CSW62	178.0±1.0	60.0+1.0	13.5±0.7	9.5±0.1	11.5±1.0	5,000	-
CSW20	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000
CSW25	178.0±1.0	60.0+1.0	13.5±0.7	13.5±1.0	15.5±1.0	-	4,000

Unit: mm



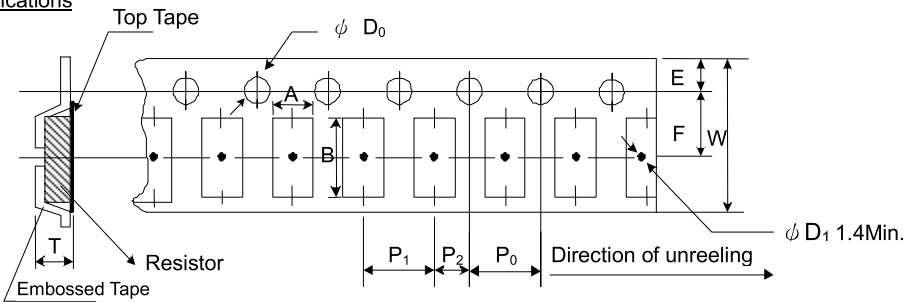
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSW08	1.60±0.10	2.40±0.20	8.00±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
CSW62	1.90±0.10	3.50±0.20	8.00±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

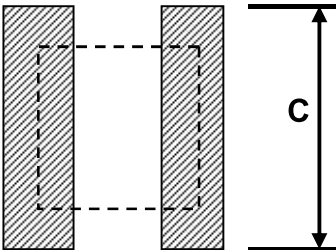
Embossed Plastic Tape Specifications



Unit: mm

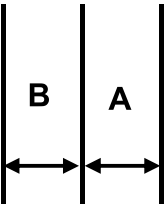
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSW20	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20
CSW25	3.38±0.10	6.68±0.10	12.0±0.30	1.75±0.10	5.50±0.10	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.00±0.20

Recommend Land Pattern



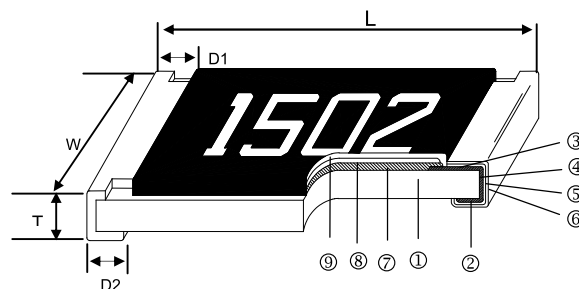
Unit: mm

Type	A	B	C
CSW08	0.55	0.90	2.00
CSW62	0.70	0.80	3.20
CSW20	1.00	1.30	5.00
CSW25	1.60	1.20	6.40



Automotive Grade Pulse Withstanding Chip Resistor—PWR..A Series

Construction



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

Features

- Tolerance from $\pm 0.5\%$ ~5%
- High power rating
- Excellent pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0402~2512
- Special construction to prevent sulfuration in a sulfur containing environment
- AEC-Q200 Qualified
- 100% CCD inspection
- MSL: Level 1

Applications

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

Dimensions

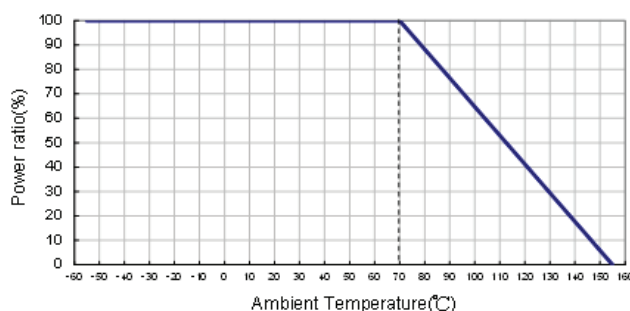
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
PWR02	0402	1.00 $\pm$ 0.05	0.50 $\pm$ 0.05	0.35 $\pm$ 0.05	0.20 $\pm$ 0.10	0.25 $\pm$ 0.10	0.6
PWR03	0603	1.60 $\pm$ 0.10	0.80 $\pm$ 0.10	0.45 $\pm$ 0.10	0.30 $\pm$ 0.20	0.30 $\pm$ 0.20	2.0
PWR05	0805	2.00 $\pm$ 0.10	1.25 $\pm$ 0.10	0.50 $\pm$ 0.10	0.35 $\pm$ 0.20	0.40 $\pm$ 0.20	4.4
PWR05 (1/2W)	0805	2.00 $\pm$ 0.10	1.25 $\pm$ 0.10	0.55 $\pm$ 0.10	0.35 $\pm$ 0.20	0.40 $\pm$ 0.20	5.0
PWR06	1206	3.10 $\pm$ 0.10	1.55 $\pm$ 0.10	0.55 $\pm$ 0.10	0.50 $\pm$ 0.25	0.50 $\pm$ 0.20	8.9
PWR06 (3/4W)	1206	3.10 $\pm$ 0.10	1.55 $\pm$ 0.10	0.55 $\pm$ 0.10	0.60 $\pm$ 0.25	0.55 $\pm$ 0.25	9.5
PWR13	1210	3.10 $\pm$ 0.10	2.60 $\pm$ 0.15	0.55 $\pm$ 0.10	0.50 $\pm$ 0.25	0.50 $\pm$ 0.20	16.0
PWR10	2010	5.00 $\pm$ 0.10	2.50 $\pm$ 0.15	0.55 $\pm$ 0.10	0.60 $\pm$ 0.25	0.50 $\pm$ 0.20	24.2
PWR12	2512	6.35 $\pm$ 0.10	3.10 $\pm$ 0.15	0.55 $\pm$ 0.10	0.60 $\pm$ 0.25	0.50 $\pm$ 0.20	39.4
PWR12 (2W)	2512	6.35 $\pm$ 0.20	3.15 $\pm$ 0.15	0.60 $\pm$ 0.10	0.80 $\pm$ 0.25	0.60 $\pm$ 0.30	42.0

Part Numbering

PWR	12	J	T	E	A	1001	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$ -: No specified (for Jumper)	T: 7" Taping Reel V: 10" Taping Reel W: 13" Taping Reel	E: ± 100 F: ± 200 G: ± 300 4: ± 350 -: No specified (for Jumper)	S: 2W A: 1.5W K: 1.25W T: 1W Q: 3/4W U: 1/2W G: 2/5W O: 1/3W V: 1/4W P: 1/5W W: 1/8W X: 1/10W	1001: 1K Ω 1004: 1M Ω R100: 0.1 Ω R0R0: 0 Ω	A: Automotive Grade NA: Automotive Grade & No Marking

Derating Curve



Standard Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overlaod Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
PWR02 (0402)	1/5W	-55 ~ +155°C	50V	100V	-	1Ω-20Ω		±300
					100Ω-1MΩ	10Ω-1MΩ		±100
PWR03 (0603)	1/10W	-55 ~ +155°C	50V	100V	10Ω - 294Ω	1Ω - 294Ω		±200
					7.15Ω - 1MΩ			±100
PWR05 (0805)	1/8W	-55 ~ +155°C	150V	300V	10Ω - 294Ω	1Ω - 294Ω		±200
					3Ω - 20MΩ			±100
PWR06 (1206)	1/3W	-55 ~ +155°C	200V	400V	10Ω - 20Ω	1Ω - 20Ω		±200
					5.1Ω - 20MΩ			±100
PWR13 (1210)	1/2W	-55 ~ +155°C	200V	400V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 20MΩ			±100
PWR10 (2010)	3/4W	-55 ~ +155°C	400V	800V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 20MΩ			±100
PWR12 (2512)	1.5W	-55 ~ +155°C	500V	1000V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 20MΩ			±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			TCR (PPM/°C)
					±0.5%	±1%	±5%	
PWR03 (0603)	1/4W 1/3W	-55 ~ +155°C	75V	150V	10Ω - 294Ω	1Ω - 294Ω		±200
					7.15Ω - 1MΩ		±100	
PWR05 (0805)	2/5W	-55 ~ +155°C	150V	300V	10Ω - 294Ω	1Ω - 294Ω		±200
					3Ω - 1MΩ		±100	
PWR05 (0805)	*1/2W	-55 ~ +155°C	400V	600V	10Ω - 294Ω	1Ω - 294Ω		±200
					10Ω - 1MΩ		±100	
PWR06 (1206)	1/2W	-55 ~ +155°C	200V	400V	10Ω - 20Ω	1Ω - 20Ω		±200
					5.1Ω - 1MΩ		±100	
PWR06 (1206)	*3/4W	-55 ~ +155°C	500V	1000V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 1MΩ		±100	
PWR13 (1210)	3/4W 1W	-55 ~ +155°C	200V	400V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 1MΩ		±100	
PWR10 (2010)	1W 1.25W	-55 ~ +155°C	400V	800V	10Ω - 20Ω	1Ω - 20Ω		±200
					10Ω - 1MΩ		±100	
PWR12 (2512)	*2W	-55 ~ +155°C	500V	1000V	10Ω	1Ω – 10Ω		±350
					10Ω-200K		±100	

Low Resistance Electrical Specifications

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Current	Resistance Range (mΩ)		TCR (PPM/°C)
				±1%	±5%	
PWR06 (1206)	1/2W	-55 ~ +155°C	2.23A	100~976		±200
PWR13 (1210)	3/4W	-55 ~ +155°C	2.73A	100~976		±200
PWR10 (2010)	1.25W	-55 ~ +155°C	3.53A	100~976		±200
PWR12 (2512)	2W	-55 ~ +155°C	4.47A	100~976		±200

■ Jumper(0Ω)

Type	Item	Power Rating	Rated Current	Overload Current	Resistance	Operating Temp. Range
PWR02 (0402)		1/5W	3A	6A	0Ω ($\leq 10m\Omega$)	-55 ~ +155°C
PWR03 (0603)		1/3W	5A	10A	0Ω ($\leq 8m\Omega$)	
PWR05 (0805) *		1/2W	6A	12A	0Ω ($\leq 5m\Omega$)	
PWR06 (1206) *		3/4W	10A	20A	0Ω ($\leq 5m\Omega$)	
PWR13 (1210)		1W	12A	24A	0Ω ($\leq 4m\Omega$)	
PWR10 (2010)		1.25W	12A	24A	0Ω ($\leq 5m\Omega$)	
PWR12 (2512)		2W	16A	32A	0Ω ($\leq 5m\Omega$)	

*: Ultra High Power: double side printed resistor element

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

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

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

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

■ Environmental Characteristics

Item	Requirement		Test Method
	$\pm 5\%$ and Below	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(1.0\%+0.05\Omega)$	As Spec.	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds Jumper: $2 \cdot I_{max}$ for 5 seconds
Insulation Resistance	$\geq 10G$		Max. Overload Voltage for 1 minute
Operational Life	$\pm(1.0\%+0.05\Omega)$	As Spec.	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	$\pm(1.0\%+0.05\Omega)$	As Spec.	1000 hrs 85°C/85%RH 10% of operating power ($\leq 100V$)
High Temperature Exposure	$\pm(1.0\%+0.05\Omega)$	As Spec.	at +155°C for 1000 hrs
Board Flex	$\pm(1.0\%+0.05\Omega)$	As Spec.	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	As Spec.	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$		260±5°C for 30 seconds
Temperature Cycling	$\pm(0.5\%+0.05\Omega)$	As Spec.	-55°C to +125°C, 1000 cycles
Mechanical Shock	$\pm(0.25\%+0.05\Omega)$	As Spec.	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(0.5\%+0.05\Omega)$	As Spec.	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(3\%+0.05\Omega)$		Human body model 0402/0603: 1KV 0805 and above: 2KV

Item	Requirement		Test Method
	±5% and Below	Jumper	
Resistance to Solvents	No visible damage on appearance and marking.		Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken		Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	$\Delta R \pm 5\%$	As Spec.	105±2°C, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

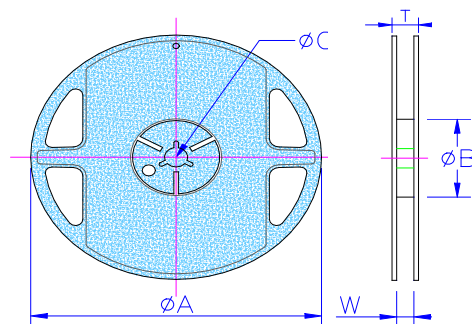
■ **Reference Standards:** IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

■ Packaging

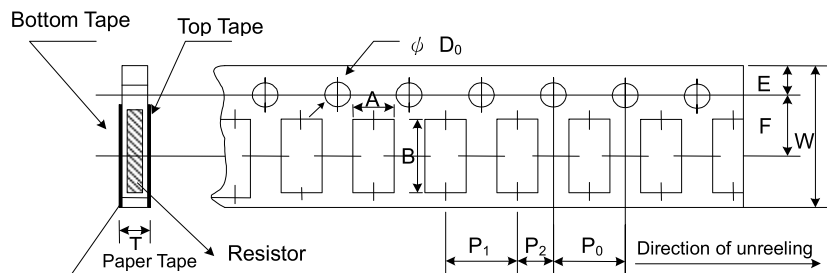
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
PWR02	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	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
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		8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	
20K		8mm	13 inch	330.0±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		12mm	10 inch	254.0±1.0	62±0.5	13.0±0.2	12.5±0.5	16.5±0.5	

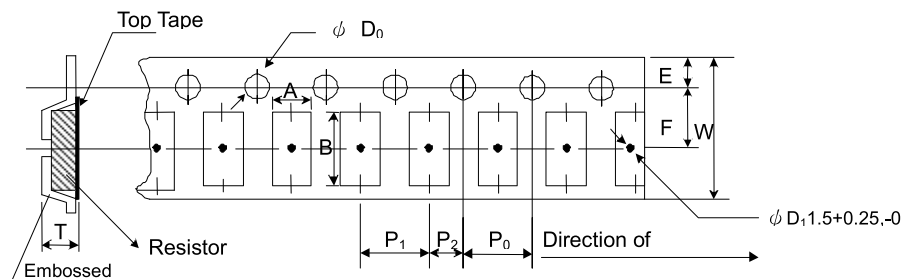
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
PWR02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
PWR03	1.10±0.10	1.90±0.10	8.00±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	8.00±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	8.00±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	8.00±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

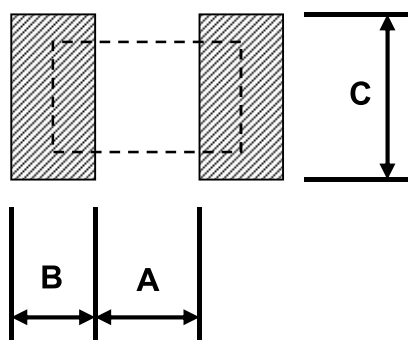


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ϕD_0	T
PWR10	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
PWR12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±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

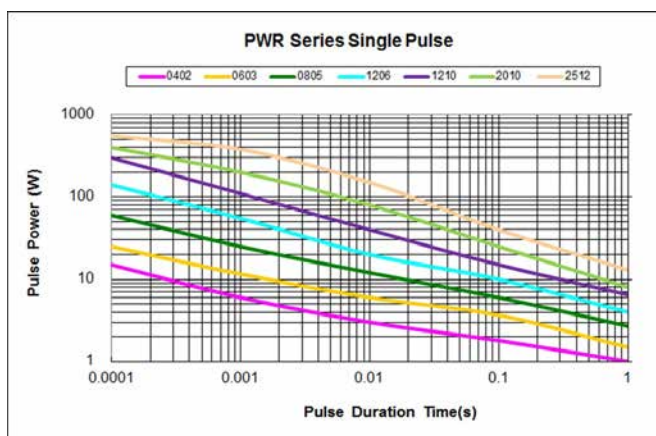
Unit: mm



Type	A	B	C
PWR02	0.50	0.45	0.60
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	4.90	1.00	3.40

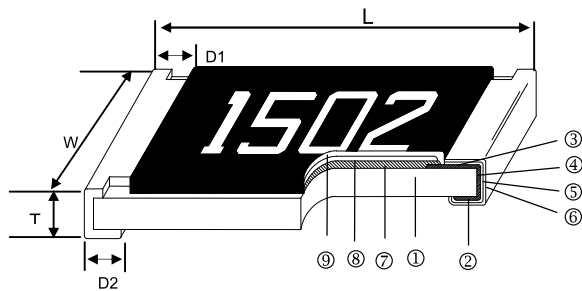
Pulse withstanding capacity

The limit of acceptance was a shift in resistance of less than 1% from the initial value. The power applied was subject to the restrictions of the maximum permissible impulse voltage graph shown.



Automotive Grade Surge Withstanding Chip Resistor—SWR..A Series

Construction



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

Features

- High power rating
- Excellent surge withstanding & pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0402~2512
- Special construction to prevent sulfuration in a sulfur containing environment
- AEC-Q200 Qualified
- 100% CCD inspection
- MSL: Level 1

Applications

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

Dimensions

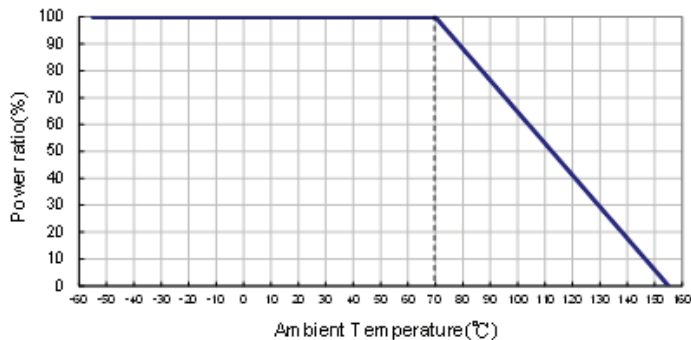
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
SWR02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
SWR03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
SWR05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
SWR05 (1/2W)	0805	2.00±0.10	1.25±0.10	0.55±0.10	0.35±0.20	0.40±0.20	5.0
SWR06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
SWR06 (3/4W)	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.60±0.25	0.55±0.25	9.2
SWR13	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	15.9
SWR10	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
SWR12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4
SWR12 (2W)	2512	6.35±0.20	3.15±0.15	0.60±0.10	0.80±0.25	0.60±0.30	42.0

Part Numbering

SWR	12	J	T	E	A	1001	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	J: ±5% K: ±10% M: ±20%	T: Taping Reel V: 10" Taping Reel W: 13" Taping Reel	E: ±100 F: ±200 G: ±300 4: ±350	S: 2W A: 1.5W K: 1.25W T: 1W Q: 3/4W U: 1/2W G: 2/5W O: 1/3W V: 1/4W P: 1/5W W: 1/8W	1001: 1KΩ 1004: 1MΩ 1005: 10MΩ	A: Automotive Grade NA: Automotive Grade & No Marking

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)
					±5%	±10%	±20%	
SWR02 (0402)	1/5W	-55 ~ +155°C	50V	100V	1Ω - 20Ω			±300
					22Ω - 1MΩ			±100
SWR03 (0603)	1/8W	-55 ~ +155°C	50V	100V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
SWR05 (0805)	1/4W	-55 ~ +155°C	150V	300V	1Ω - 270Ω			±200
					300Ω - 20MΩ			±100
SWR06 (1206)	1/3W	-55 ~ +155°C	200V	400V	1Ω - 20Ω			±200
					22Ω - 20MΩ			±100
SWR13 (1210)	1/2W	-55 ~ +155°C	200V	400V	1Ω - 20Ω			±200
					22Ω - 20MΩ			±100
SWR10 (2010)	3/4W	-55 ~ +155°C	400V	800V	1Ω - 20Ω			±200
					22Ω - 20MΩ			±100
SWR12 (2512)	1.5W	-55 ~ +155°C	500V	1000V	1Ω - 20Ω			±200
					22Ω - 20MΩ			±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			TCR (PPM/°C)
					±5%	±10%	±20%	
SWR03 (0603)	1/4W 1/3W	-55 ~ +155°C	75V	150V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
SWR05 (0805)	2/5W	-55 ~ +155°C	150V	300V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
SWR05 (0805)	*1/2W	-55 ~ +155°C	400V	600V	1Ω - 270Ω			±200
					300Ω - 1MΩ			±100
SWR06 (1206)	1/2W	-55 ~ +155°C	200V	400V	1Ω - 20Ω			±200
					22Ω - 1MΩ			±100
SWR06 (1206)	*3/4W	-55 ~ +155°C	500V	1000V	1Ω - 20Ω			±200
					22Ω - 1MΩ			±100
SWR13 (1210)	3/4W 1W	-55 ~ +155°C	200V	400V	1Ω - 20Ω			±200
					22Ω - 1MΩ			±100
SWR10 (2010)	1W 1.25W	-55 ~ +155°C	400V	800V	1Ω - 20Ω			±200
					22Ω - 1MΩ			±100
SWR12 (2512)	*2W	-55 ~ +155°C	500V	1000V	1Ω - 10Ω			±350
					11Ω - 200KΩ			±100

*: Ultra High Power: double side printed resistor element

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

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

■ 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.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(1.0\%+0.05\Omega)$	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$	Max. Overload Voltage for 1 minute
Operational Life	$\pm(3.0\%+0.05\Omega)$	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	$\pm(3.0\%+0.05\Omega)$	1000 hrs 85°C/85%RH 10% of operating power ($\leq 100V$)
High Temperature Exposure	$\pm(1.0\%+0.05\Omega)$	at +155°C for 1000 hrs
Board Flex	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(1.0\%+0.05\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260±5°C for 30 seconds
Temperature Cycling	$\pm(1\%+0.05\Omega)$	-55°C to +125°C, 1000 cycles
Mechanical Shock	$\pm(1\%+0.05\Omega)$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(1\%+0.05\Omega)$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(3\%+0.05\Omega)$	Human body model 0402/0603: 1KV 0805 and above: 2KV
Resistance to Solvents	No visible damage on appearance and marking.	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken	Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	$\triangle R \pm 5\%$	105±2°C, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

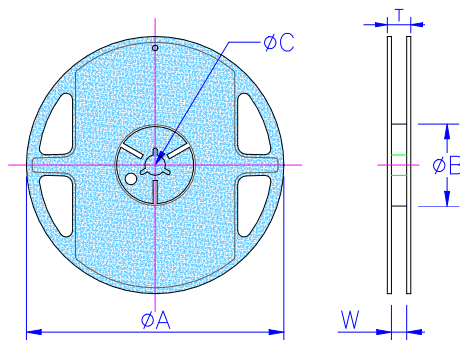
■ **Reference Standards:** IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

Packaging

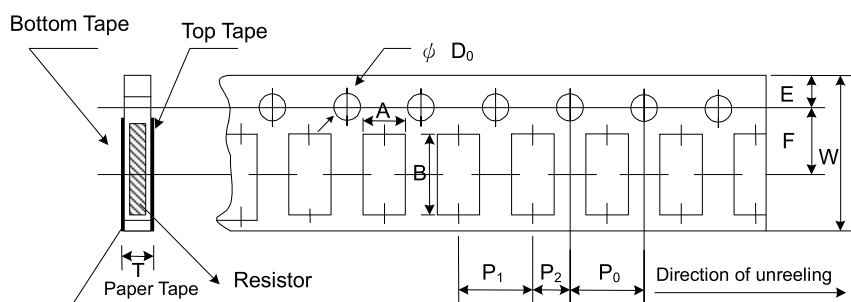
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
SWR02	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	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
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		8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	
20K		8mm	13 inch	330.0±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		12mm	10 inch	250.0±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5	

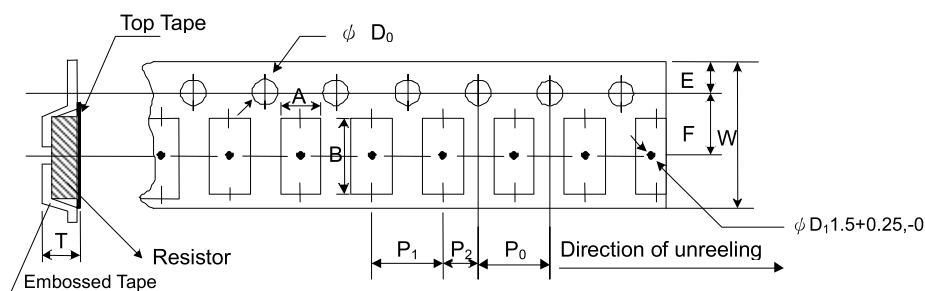
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
SWR02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
SWR03	1.10±0.10	1.90±0.10	8.00±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	8.00±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	8.00±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	8.00±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

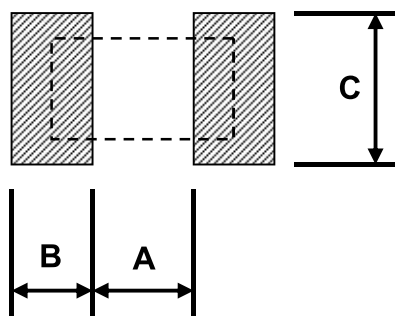


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
SWR10	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
SWR12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±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

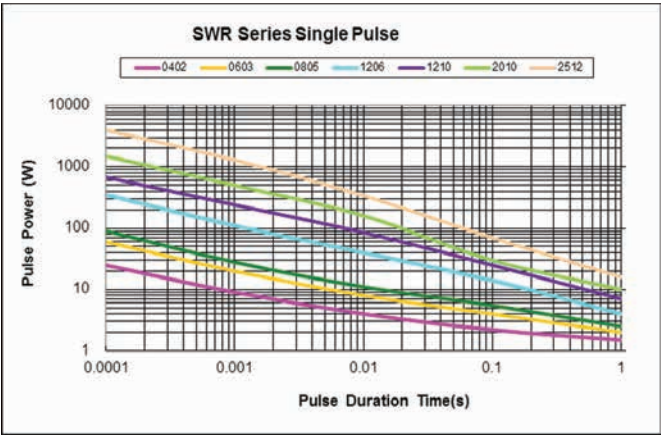
Unit: mm



Type	A	B	C
SWR02	0.50	0.45	0.60
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	4.90	1.00	3.40

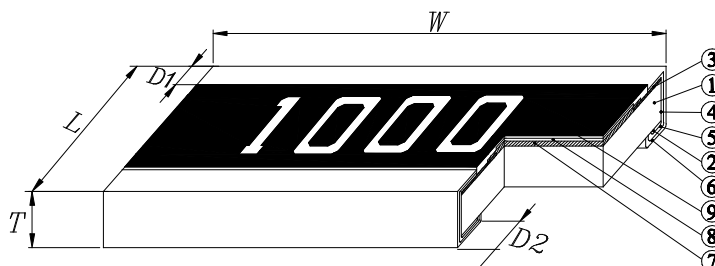
Pulse withstanding capacity

The limit of acceptance was a shift in resistance of less than 1% from the initial value. The power applied was subject to the restrictions of the maximum permissible impulse voltage graph shown.



Automotive Grade Thick Film Chip Resistor (Wide Terminal)—CRW..A Series

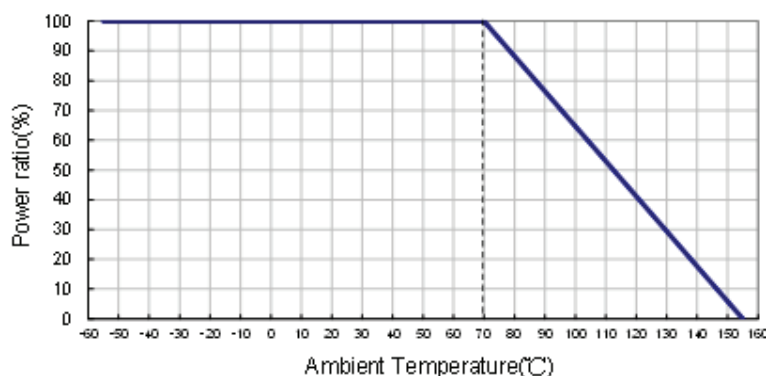
Construction



Features

- AEC-Q200 Qualified
- Highly reliable multilayer electrode construction
- Compatible with all soldering process
- 100% CCD inspection
- MSL: Level 1

Derating Curve



Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2
CRW08	0508	1.25±0.10	2.00±0.10	0.55±0.10	0.30±0.15	0.30±0.15
CRW08-Jumper					0.20±0.15	
CRW62	0612	1.55±0.10	3.00±0.15	0.55±0.10	0.25±0.15	0.40±0.15
CRW62-Jumper					0.25±0.15	
CRW20	1020	2.45±0.15	5.00±0.10	0.60±0.15	0.35±0.20	0.70±0.20
CRW20-Jumper					0.45±0.20	
CRW25	1225	3.20±0.20	6.40±0.15	0.65±0.15	0.40±0.20	1.10±0.20
CRW25-Jumper					0.50±0.20	

Part Numbering

CRW	25	F	C	7	---10R
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	08: 0508 62: 0612 20: 1020 25: 1225	D: ±0.5% F: ±1% J: ±5%	A: Automotive Grade C: High Power & Automotive Grade	4: 7" Reel 4Kpcs 7: 7" Reel 5Kpcs	-- -20R: 20Ω -- --0R: Jumper "-" to fill up 6 spaces

Standard Electrical Specifications

Type \ Item	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
CRW08 (0508)	0.75W	-55 ~ +155°C	200V	400V	1Ω – 9.76Ω			±150
					10Ω – 1MΩ			±100
CRW62 (0612)	1W	-55 ~ +155°C	200V	400V	1Ω – 1MΩ			±100
CRW20 (1020)	1.5W	-55 ~ +155°C	200V	400V	1Ω – 9.76Ω			±150
					10Ω – 1MΩ			±100
CRW25 (1225)	2W	-55 ~ +155°C	200V	400V	1Ω – 29.4Ω			±200
					30Ω – 1MΩ			±100

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)
					±0.5%	±1%	±5%	
CRW08 (0508)	1W	-55 ~ +155°C	200V	400V	1Ω~9.76Ω			±150
					10Ω~1MΩ			±100
	Jumper:5A				-		0Ω(<10mΩ)	-
CRW62 (0612)	1.5W	-55 ~ +155°C	200V	400V	1Ω~1MΩ			±100
					-			-
	Jumper:6A				-		0Ω(<10mΩ)	-
CRW20 (1020)	2W	-55 ~ +155°C	200V	400V	1Ω~9.76Ω			±150
					10Ω~1MΩ			±100
	Jumper:10A				-		0Ω(<10mΩ)	-
CRW25 (1225)	3W	-55 ~ +155°C	200V	400V	1Ω~29.4Ω			±200
					30Ω~1MΩ			±100
	Jumper:12A				-		0Ω(<10mΩ)	-

Ultra High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5%	±1%	±5%	
CRW62 (0612)	2W	-55 ~ +155°C	200V	400V	1Ω – 1MΩ			±100

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

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

■ 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.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	6.25*rated power or Max. Overload Voltage whichever is lower for 5 seconds Ultra High Power:5*rated power for 5 seconds
Insulation Resistance	≥10G	Max. Overload Voltage for 1 minute
Operational Life	±(1.0%+0.10Ω)	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.

Item	Requirement*	Test Method
Biased Humidity	$\pm(1.0\%+0.10\Omega)$	1000 hrs 85°C/85%RH 10% of operating power. (≤ 100 V)
High Temperature Exposure	$\pm(1.0\%+0.05\Omega)$	at +155°C for 1000 hrs
Board Flex	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds with 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260±5°C for 30 seconds
Temperature Cycling	$\pm(0.5\%+0.05\Omega)$	-55°C to +125°C, 1000 cycles
Mechanical Shock	$\pm(0.25\%+0.05\Omega)$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(0.5\%+0.05\Omega)$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(3.0\%+0.05\Omega)$	Human body model: 2KV
Resistance to Solvents	No visible damage on appearance and marking.	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken	Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	$\Delta R \pm 1\%$	105±2°C, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

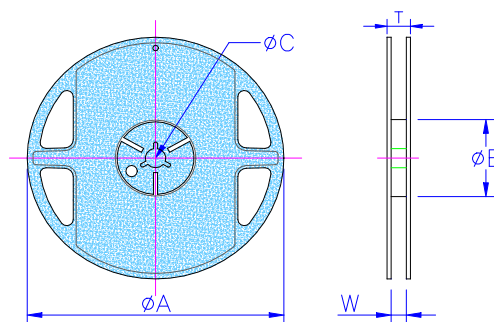
* Not include 0Ω Jumper

■ **Reference Standards:** IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

■ Packaging



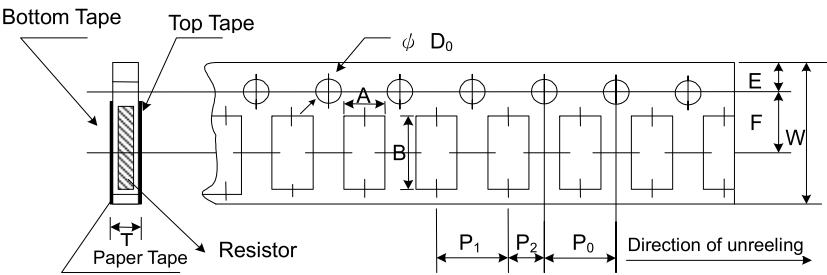
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CRW08 CRW62	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CRW20 CRW25	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5

■Packaging

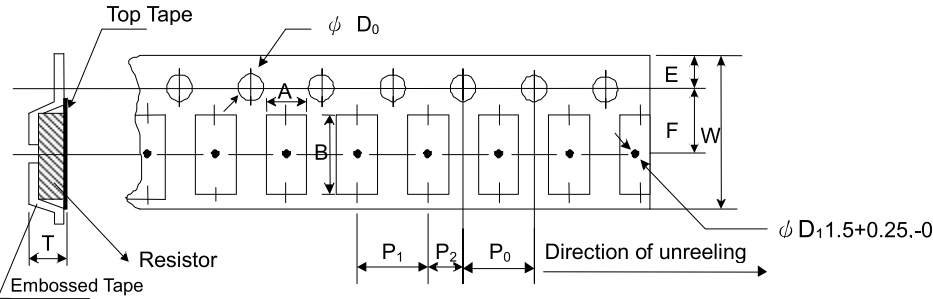
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRW08	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
CRW62	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

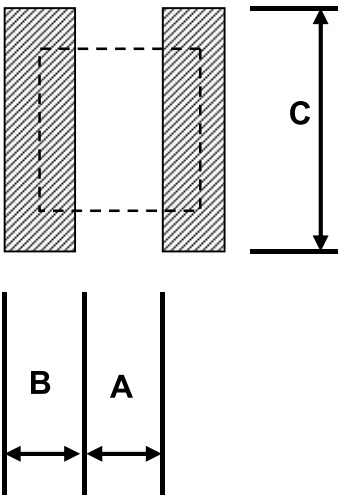


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRW20	2.80±0.15	5.40±0.20	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.55+0.10	1.00±0.20
CRW25	3.50±0.10	6.70±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.05	4.00±0.10	2.00±0.05	1.55+0.10	1.00±0.20

■Recommend Land Pattern

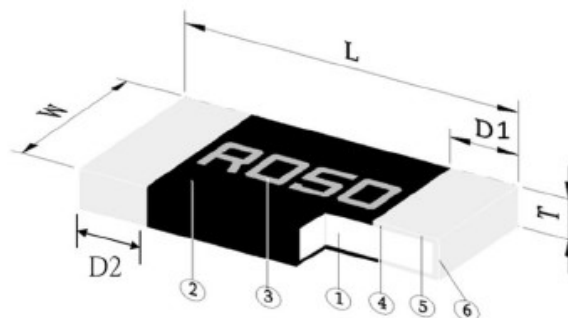
Unit: mm



Type	A	B	C
CRW08	0.55	0.90	2.00
CRW62	0.70	0.80	3.20
CRW20	1.00	1.20	5.00
CRW25	1.00	2.00	7.00

Automotive Grade Low Ohm (Metal Strip) Chip Resistor—LRP..A Series

Construction



Features

- Low TCR down to ± 25 PPM/ $^{\circ}$ C
- Customized resistance available
- Low inductance < 5nH
- AEC-Q200 Qualified
- Sulfur resistance unaffected by sulfur environments
- Lead-free and RoHS compliant
- 100% CCD inspection
- MSL: Level 1

Applications

- NB (for Power Management)
- MB (for Power Management)
- SWPS (DC-DC Converter, Charger, Adaptor)
- Monitor (for Power Management)
- Industrial / Power supply
- Automotive

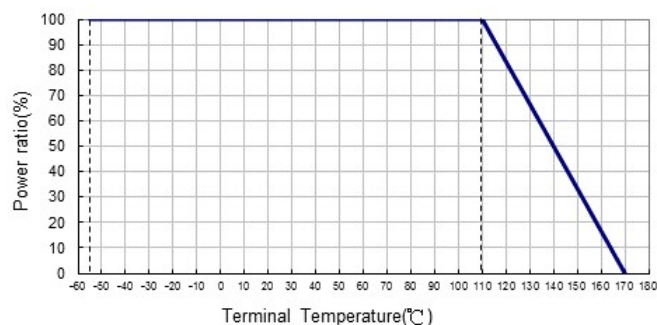
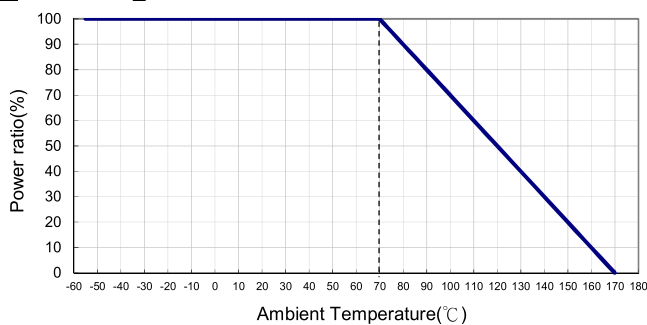
① Alloy Plate	④ Internal Electrode
② Overcoat	⑤ Barrier Layer
③ Marking	⑥ Solder Plating

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
LRP05 2mΩ	0805	2.05 $\pm$ 0.10	1.25 $\pm$ 0.10	0.50 $\pm$ 0.15	0.65 $\pm$ 0.15	0.65 $\pm$ 0.15	6.5
LRP05 5~20mΩ	0805	2.05 $\pm$ 0.10	1.25 $\pm$ 0.10	0.43 $\pm$ 0.15	0.45 $\pm$ 0.15	0.45 $\pm$ 0.15	4.5
LRP06	1206	3.15 $\pm$ 0.10	1.45 $\pm$ 0.10	0.55 $\pm$ 0.10	0.55 $\pm$ 0.15	0.55 $\pm$ 0.15	10.5
LRP10	2010	5.00 $\pm$ 0.15	2.40 $\pm$ 0.15	0.55 $\pm$ 0.15	0.80 $\pm$ 0.20	0.80 $\pm$ 0.20	40.0
LRP12 2~200mΩ	2512	6.40 $\pm$ 0.25	3.20 $\pm$ 0.25	0.70 $\pm$ 0.20	0.90 $\pm$ 0.30	0.90 $\pm$ 0.30	52.6
LRP12 1.5mΩ	2512	6.40 $\pm$ 0.25	3.20 $\pm$ 0.25	0.70 $\pm$ 0.20	0.90 $\pm$ 0.30	1.45 $\pm$ 0.30	52.6
LRP12 1mΩ	2512	6.40 $\pm$ 0.25	3.20 $\pm$ 0.25	0.70 $\pm$ 0.20	0.90 $\pm$ 0.30	1.85 $\pm$ 0.30	52.6

Derating Curve



Part Numbering

LRP	12	F	T	D	S	R015	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}$ C)	Power Rating	Resistance	Marking
	05: 0805 06: 1206 10: 2010 12: 2512	D: $\pm$ 0.5% F: $\pm$ 1% J: $\pm$ 5%	T: Taping Reel	C: $\pm$ 25 D: $\pm$ 50 W: $\pm$ 75 E: $\pm$ 100	R: 3W S: 2W T: 1W Q: 3/4W	R015: 0.015Ω R050: 0.05Ω	A: Automotive Grade

■ Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Rated Terminal Temperature	Operating Temp. Range	Resistance Range (mΩ)			TCR (PPM/°C)
				±0.5%	±1%	±5%	
LRP05 (0805)	3/4W	110°C	-55 ~ +170°C	10、15、20			±50 ±75
				5			±75
				2			±100
	1W	110°C	-55 ~ +170°C	10			±50 ±75
				5			±75
				2			±100
LRP06 (1206)	1W	110°C	-55 ~ +170°C	8, 10, 12, 15, 20, 25, 30, 33, 40			±50
				3, 4, 5, 7, 8, 10, 12, 15, 20, 25, 30, 33, 40			±75 ±100
LRP10 (2010)	1W	110°C	-55 ~ +170°C	4, 5, 10, 15, 20, 30, 50, 68, 75, 100			±75
	2W	110°C	-55 ~ +170°C	4, 5, 10, 15, 20, 30, 50, 68, 75			
LRP12 (2512)	2W, 3W	110°C	-55 ~ +170°C	3, 4, 5, 6, 7, 18, 20, 22, 25, 30, 33, 35, 39, 40, 47, 50, 60, 68, 70, 75, 80, 82, 90, 91, 100, 120, 150, 180, 200			±25
				1, 1.5, 2, 2.5, 3, 4, 5, 6, 7, 8, 8.5, 9, 10, 12, 15, 18, 20, 22, 25, 30, 33, 35, 39, 40, 47, 50, 60, 68, 70, 75, 80, 82, 90, 91, 100, 120, 150, 180, 200			±50 ±75

Operating Current = $\sqrt{P/R}$, Operating Voltage = $\sqrt{P \cdot R}$

■ 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°C ~ 125°C, 25°C is the reference temperature
Short Time Overload	±1.0%	5*rated power for 5 seconds
Insulation Resistance	≥10G	100V DC for 1 minute
Endurance	±1.0%	70±2°C, rated power for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	±1.0%	1000 hrs 85°C/85%RH 10% of operating power (≤100 V)
High Temperature Exposure	±1.0%	at +170°C for 1000 hrs
Board Flex	±1.0%	Bending once for 60 seconds with 3mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	±0.5%	260±5°C for 10 seconds
Temperature Cycling	±1.0%	-55°C to +125°C, 1000 cycles
Low Temperature Storage	±1.0%	at -55°C for 2 hrs
Mechanical Shock	±(0.25%+0.05Ω)	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.05Ω)	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(3%+0.05Ω)	Human body model: 2KV

Item	Requirement	Test Method
Resistance to Solvents	No visible damage on appearance and marking.	Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken	Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower. Operating Current = $\sqrt{(P/R)}$.

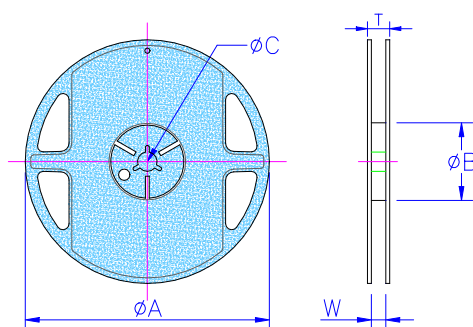
■ **Reference Standards:** IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

■ Packaging

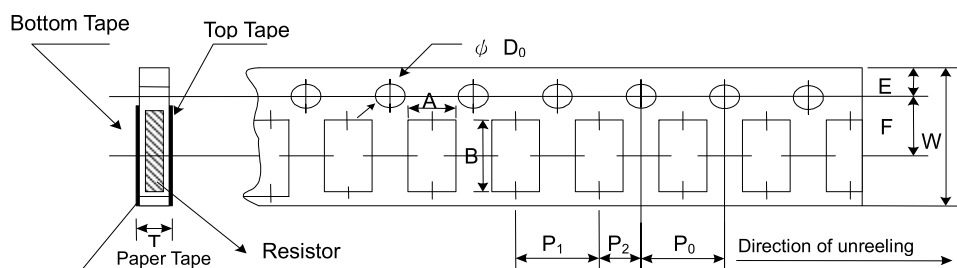
Reel Specifications & Packaging Quantity



Unit: mm

Type	Resistance (mΩ)	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
LRP05	2~20	Paper	5K	8mm	7 inch	178.5±1.5	60+1/-0	13.0±0.2	9.0±0.5	12.5±0.5
LRP06	3~40	Paper	5K	8mm	7 inch	178.5±1.5	60+1/-0	13.0±0.2	9.0±0.5	12.5±0.5
LRP10	4~100	Embossed	4K	12mm	7 inch	178.5±1.5	60±1.0	13.0±0.5	13.0±1.0	15.5±0.5
LRP12	1~200	Embossed	4K	12mm	7 inch	178.5±1.5	60±1.0	13.0±0.5	13.0±1.0	15.5±0.5

Paper Tape Specifications

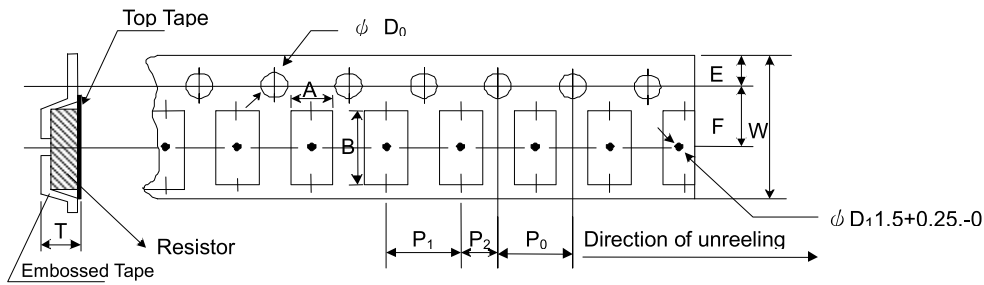


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
LRP05	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
LRP06	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

■Packaging

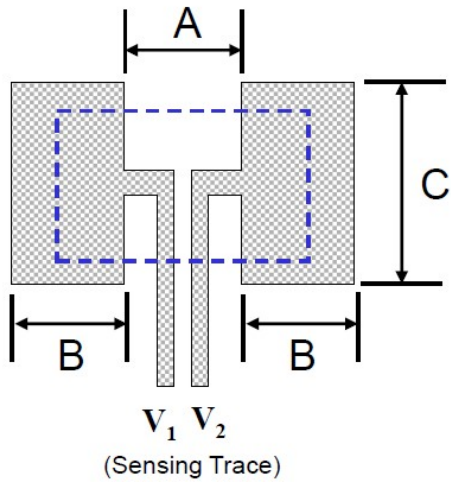
Embossed Plastic Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ϕD_0	T
LRP10	2.80±0.10	5.40±0.20	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	1.20+0
LRP12	3.50±0.10	6.70±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	1.20+0

■Recommend Land Pattern



Unit: mm

Type	A	B	C
LRP05	0.65	1.10	1.40
LRP06	1.50	1.40	1.70
LRP10	3.60	1.40	2.50
LRP12 (2~200mΩ)	4.00	2.00	3.50
LRP12 (1~1.5mΩ)	2.30	2.65	3.50

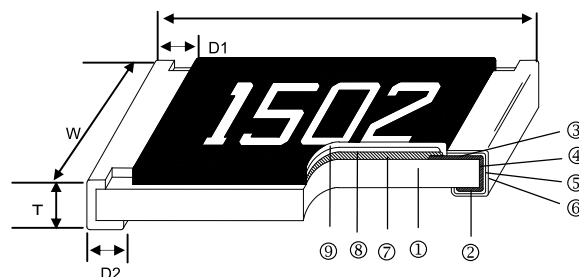
*FR4 copper board, 100μm of copper pad thickness

Note: The land pattern is designed based on the Kelvin resistance measurement (also known as the 4-wire resistance measurement), with the sensing trace positioned on the inner side. This approach ensures that the resistance impedance meets the specified design standards.

However, factors such as the solder pad area and the amount of solder applied can influence the resistance after soldering. Therefore, these variables should also be carefully considered during the circuit design process.

Automotive Grade High Voltage Thick Film Chip Resistor – HVR..A Series

Construction



Features

- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Excellent performance at high voltage
- Reduced size of final equipment
- Special construction to prevent sulfuration in a sulfur containing environment
- AEC-Q200 Qualified
- 100% CCD inspection
- MSL: Level 1

Applications

- Inverter
- Outdoor Equipments
- Converter
- High Pulse Equipment

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

Dimensions

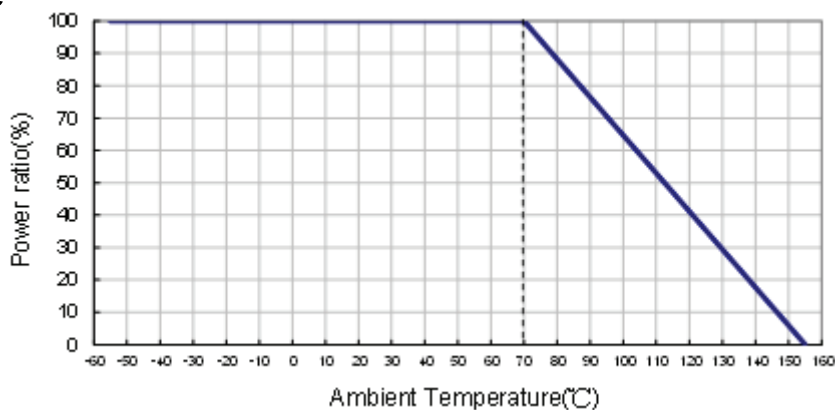
unit: mm

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	0.25±0.10	0.6
HVR03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
HVR05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
HVR06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
HVR0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
HVR12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

Part Numbering

HVR	03	F	T	E	X	1003	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 0A: 2010 12: 2512	F: ±1% J: ±5%	T: 7" Taping Reel V: 10" Taping Reel W: 13" 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	1003: 100KΩ 1004: 1MΩ 1005: 10MΩ	A: Automotive Grade NA: Automotive Grade & No Marking

Derating Curve



Standard Electrical Specifications

Type \ Item	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	39KΩ - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR03 (0603)	1/10W		200V	400V	56KΩ - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR05 (0805)	1/8W		400V	800V	100KΩ - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR06 (1206)	1/4W		500V	1000V	100KΩ - 1MΩ		±100
					1.02MΩ - 10MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR0A (2010)	1/2W		2000V	3000V	51KΩ - 1MΩ		±100
					1.02MΩ - 20MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400
HVR12 (2512)	1W		3000V	4000V	30KΩ - 1MΩ		±100
					1.02MΩ - 20MΩ	1.1MΩ - 20MΩ	±200
					-	22MΩ - 100MΩ	±400

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

■ 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.		At 25°C/-55°C and 25°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 whichever is lower for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Operational Life	±(2.0%+0.05Ω)	±(3.0%+0.10Ω)	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(2.0%+0.05Ω)	±(3.0%+0.10Ω)	1000 hrs 85°C/85%RH 10% of operating power(≤ 100V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds

Item	Requirement		Test Method
	±1%	±5%	
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		HVR02: 150V for 1 minute HVR03: 300V for 1 minute HVR05/HVR06/HVR0A/HVR12: 500V for 1 minute
Leaching	Individual leaching area ≤ 5% Total leaching area ≤ 10%		260±5°C for 30 seconds
Temperature Cycling	±(1.0%+0.05Ω)		-55°C to +125°C, 1000 cycles
Mechanical Shock	±(1.0%+0.05Ω)		Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(1.0%+0.05Ω)		5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(3%+0.05Ω)		Human body model 0402/0603: 1KV 0805 and above: 2KV
Resistance to Solvents	No visible damage on appearance and marking.		Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken		Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±5%	△R±5%	105±2°C, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

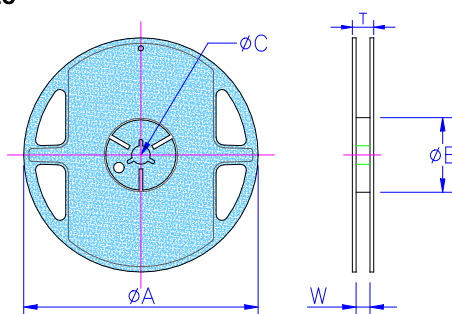
■ Reference Standards: IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

■ Packaging

Reel Specifications & Packaging Quantity

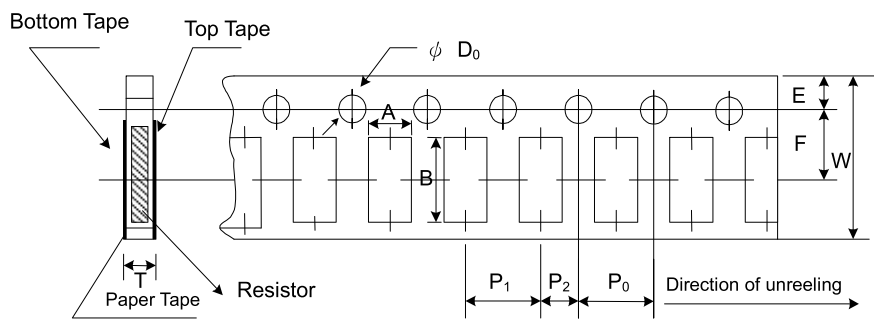


Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
HVR02	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	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
HVR03 HVR05 HVR06	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	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
HVR0A HVR12	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	12mm	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5

■Packaging

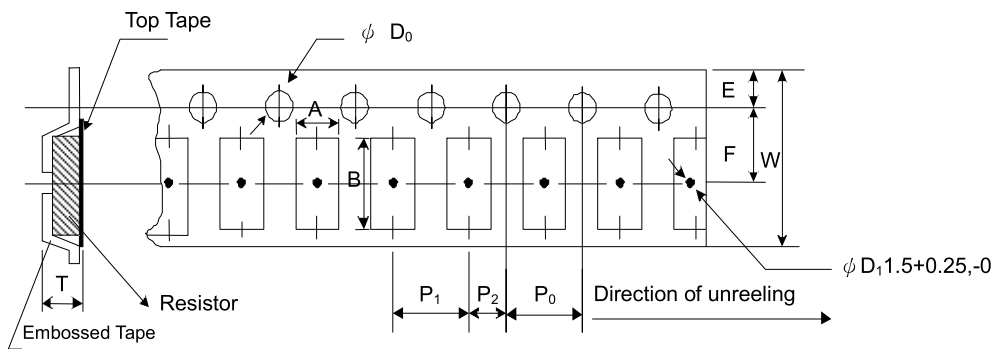
Paper Tape Specifications



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	8.00±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	8.00±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	8.00±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	8.00±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

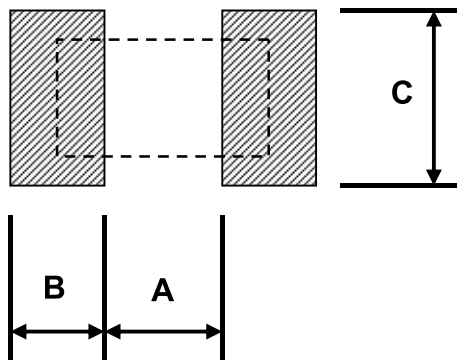


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
HVR0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
HVR12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±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

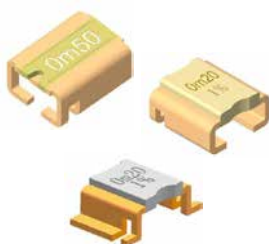


Type	A	B	C
HVR02	0.50	0.45	0.60
HVR03	0.90	0.60	0.90
HVR05	1.20	0.70	1.30
HVR06	2.00	0.90	1.60
HVR0A	3.80	0.90	2.80
HVR12	4.90	1.60	3.50

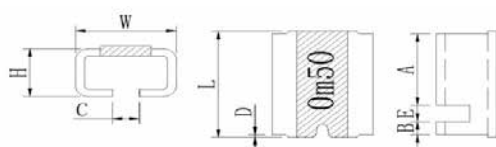
Automotive Grade Alloy Chip Shunt Resistor – LRA..A Series

■ Features

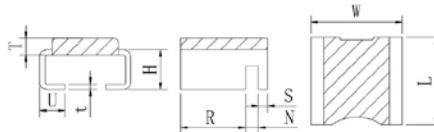
- Nudity E-beam welded metal strip resistors with 4-terminal, Pure copper electrodes are the ideal solution for current sensing applications
- Excellent reliability, stability, Anti-pulse capability, support $\pm 0.5\%$ tolerance of R value
- Special welding process, all-metal construction, supports low Resistance (down to $0.2\text{m}\Omega$), surface pickling passivation Treatment, vulcanization resistance, strong weather resistance
- Very low EMF ($<1\ \mu\text{V}/^\circ\text{C}$)
- Ultra-low parasitic inductance, Fast response, Can be used for high frequency AC current detection
- AEC-Q200 Compliance
- RoHS compliant



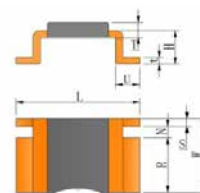
■ Dimensions



LRA0340



LRA0766



LRA1066

Unit: mm

Type	Size (Inch)	Resistance (mΩ)	Material	L	W	H	A	B	C	D	E	R	N	S	U	T	t
LRA0340	1216	0.3	Manganin	4.1 +0/-0.3	3.1 +0/-0.35	1.9 +0/-0.35	2.7 ±0.1	0.5 ±0.1	0.8 +0.35/-0	0.1	0.6 +0.15/-0	-	-	-	-	-	-
		0.5	Manganin														
		1	Manganin														
		2	Kamar														
		2.5	Kamar														
LRA0766	2726	0.2	Manganin	6.6 +0.35/-0.2	6.9 ±0.3	3.0 ±0.3	-	-	-	-	-	4.9 ±0.2	1.0 ±0.15	0.7 ±0.1	1.9 ±0.1	1.3±0.1	0.6±0.1
		0.3	Manganin													1.2±0.1	0.6±0.1
		0.5	Manganin													0.68±0.1	0.68±0.1
		0.7	Manganin													0.48±0.1	0.48±0.1
		1	Manganin													0.35±0.1	0.4±0.1
		2	FeCrAl													0.55±0.1	0.55±0.1
		3	FeCrAl													0.36±0.1	0.4±0.1
		4	FeCrAl													0.28±0.1	0.4±0.1
		5	FeCrAl													0.28±0.1	0.4±0.1
		2	Kamar													0.52±0.1	0.52±0.1
		3	Kamar													0.35±0.1	0.4±0.1
		4	Kamar													0.26±0.1	0.4±0.1
LRA1066	4026	0.2	Manganin	10.1±0.3	6.6 +0.35/-0.2	3.0 ±0.3	-	-	-	-	-	4.9 ±0.2	1.0 ±0.15	0.7 ±0.1	2.0 ±0.1	1.3±0.1	0.6±0.1
		0.3	Manganin													1.2±0.1	0.6±0.1
		0.5	Manganin													0.68±0.1	0.68±0.1
		0.7	Manganin													0.48±0.1	0.48±0.1
		1	Manganin													0.35±0.1	0.4±0.1
		2	FeCrAl													0.55±0.1	0.55±0.1
		3	FeCrAl													0.36±0.1	0.4±0.1
		4	FeCrAl													0.28±0.1	0.4±0.1
		5	FeCrAl													0.28±0.1	0.4±0.1
		2	Kamar													0.52±0.1	0.52±0.1
		3	Kamar													0.35±0.1	0.4±0.1
		4	Kamar													0.26±0.1	0.4±0.1

■ Note: FeCrAl material is magnetic and affects the inverter current, so please be careful in product selection.

■Part Numbering

LRA	0340	F	T	E	D	R001	MI	A
Product Type	Dimensions (WxL)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Material & Shape Code	Function Code
	0340: 3.1x4.1 0766: 6.9x6.6 1066: 10.1x6.6	D: ±0.5% F: ±1% J: ±5%	T: Taping Reel	C : ±25 D : ±50 W : ±75 E: ±100	R: 3W H: 4W D: 5W I: 6W E: 7W 9: 9W J:10W 11: 11W 12: 12W	0M20: 0.2mΩ 0M30: 0.3mΩ 0M50: 0.5mΩ 0M70: 0.7mΩ R001: 1mΩ R002: 2mΩ R003: 3mΩ R004: 4mΩ R005: 5mΩ	FI: FeCrAl & Inward Fold KI: Kamar & Inward Fold MI: Manganin & Inward Fold FO: FeCrAl & Outward Fold KO: Karma & Outward Fold MO: Manganese & Outward Fold	A: Automotive Grade

■Standard Electrical Specifications

Type	Power Rating P _{70°C}	Material	Resistance Range(mΩ)			TCR (PPM/°C)
			±0.5%	±1%	±5%	
LRA0340	10W	Manganin	0.3			±100
	9W	Manganin	0.5			±100
	7W	Manganin	1			±100
	5W	Kamar	2, 2.5			±100
LRA0766	12W	Manganin	0.2			±75
	11W	Manganin	0.3			±75
	9W	Manganin	0.5			±75
	7W	Manganin	0.7			±75
	6W	Manganin	1			±50
	6W	FeCrAl	2			±25
	5W	FeCrAl	3			±25
	4W	FeCrAl	4			±25
	3W	FeCrAl	5			±25
	6W	Kamar	2			±50
	5W	Kamar	3			±50
	4W	Kamar	4			±50
LRA1066	12W	Manganin	0.2			±75
	11W	Manganin	0.3			±75
	9W	Manganin	0.5			±75
	7W	Manganin	0.7			±75
	6W	Manganin	1			±50
	6W	FeCrAl	2			±25
	5W	FeCrAl	3			±25
	4W	FeCrAl	4			±25
	3W	FeCrAl	5			±25
	6W	Kamar	2			±50
	5W	Kamar	3			±50
	4W	Kamar	4			±50

■Operating Temperature: -55 ~ +175°C

Environmental Characteristics

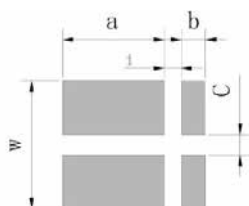
Item	Requirement	Test Method
Thermal shock	Within the specified value	0340 size: Measured value -55°C and +125°C, reference value +20°C 0766 / 1066 size: Measured value -55°C and +130°C, reference value +20°C
Solderability	No visible damage, weldable area 95% minimum	245°C Tin slot, hold for 3 sec
Short time overload	No visible damage, 0340: $\Delta R \pm 0.5\%$ maximum 0766/1066: $\Delta R \pm 1.0\%$ maximum	2.5 times rated voltage, 5 sec
Resistance to solder heat	No visible damage, 0340: $\Delta R \pm 0.5\%$ maximum 0766/1066: $\Delta R \pm 1.0\%$ maximum	270°C Tin bath, hold for 10 sec
High temperature and humidity	No visible damage, $\Delta R \pm 1.0\%$ maximum	Temperature 85°C, humidity 85% of the conditions applied 10% of the rated power (current) or component limit current (whichever is less), for 1000 hours
High temperature storage	No visible damage, 0340: $\Delta R \pm 0.5\%$ maximum 0766/1066: $\Delta R \pm 1.0\%$ maximum	1000 hrs @ 170°C, without load
Low temperature load	No visible damage, 0340: $\Delta R \pm 0.5\%$ maximum 0766/1066: $\Delta R \pm 1.0\%$ maximum	-55°C, No load for one hour, rated voltage load for 45 min, no load for 15 min
Temperature cycling	No visible damage, 0340: $\Delta R \pm 0.5\%$ maximum 0766/1066: $\Delta R \pm 1.0\%$ maximum	-55°C @ 30 min ~ room temperature @ <5 min ~ +155°C @ 30 min, 500 cycles
Load life	No visible damage, $\Delta R \pm 1.0\%$ maximum	1000 h @ 70±2°C, rated voltage, 90 min on, 30 min off

Reference Standards: IEC 60115-1, MIL-STD-202

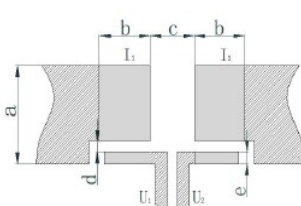
Storage Temperature: 5~35°C; Humidity: 40~75%RH

Shelf Life: 1 year from production date

Recommend Land Pattern



LRA0340

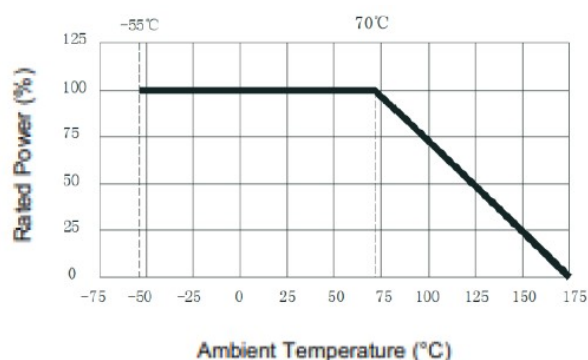


LRA0766 / 1066

Unit: mm

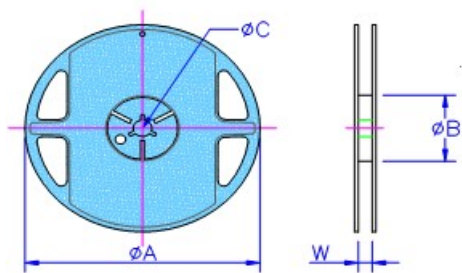
Type	a	b	c	d	e	i	w
LRA0340	2.95	0.70	0.60	-	-	0.50	3.60
LRA0766	7.30	2.90	2.00	0.80	0.90	-	-
LRA1066	7.30	2.45	5.50	0.80	0.90	-	-

Derating Curve



■Packaging

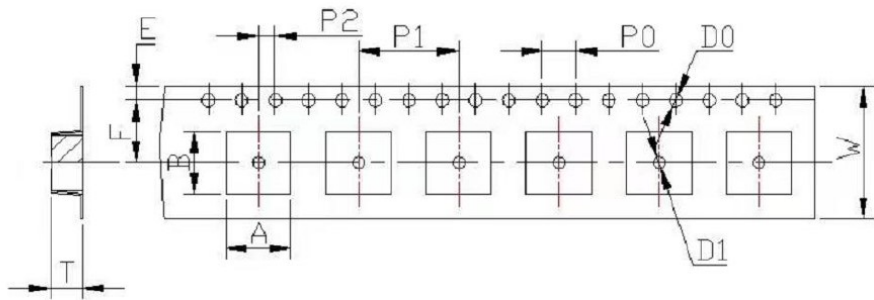
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W
LRA0340	Embossed	1K	12mm	7 inch	178.0±2.0	60.0±1.0	13.5±0.5	12.3±1.0
LRA0766	Embossed	1K	16mm	13 inch	33.0±2.0	60.0±1.0	13.5±0.5	17.0±0.5
LRA1066	Embossed	1K	24mm	13 inch	33.0±2.0	60.0±1.0	13.5±0.5	25.0±1.0

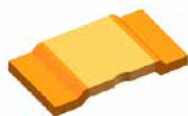
Tape Specifications



Unit: mm

Type	A	B	W	E	F	P0	P1	P2	$\Phi D0$	T
LRA0340	3.4	4.2	12	1.75	5.5	4	8	2	1.5	2.3
LRA0766	7.8	7.5	16	1.75	7.5	4	12	2	1.5	3.8
LRA1066	7.3	12.1	24	1.75	12.2	6	12	2	1.5	3.8

Automotive Grade Chip Shunt Resistor— LRSW..A Series



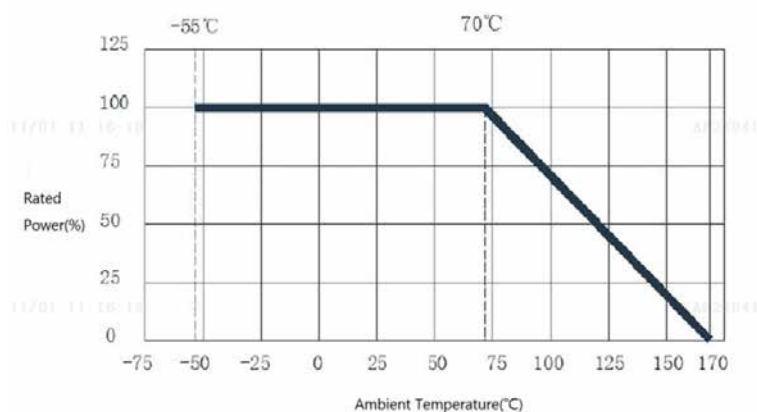
Features

- Nudity E-beam welded metal strip resistors, pure copper Electrodes are the ideal solution for current sensing applications
- Excellent reliability, stability, Anti-pulse capability
- Special welding process, all-metal construction, Supports low resistance, The surface is pickled and passivated for strong weather resistance
- High temperature silicon molded for sever working Environment
- Very low EMF ($<1 \mu V/^{\circ}C$)
- Ultra-low parasitic inductance($< 2nH$), Fast response, Can be used for high frequency AC current detection
- AEC-Q200 Compliance

Part Numbering

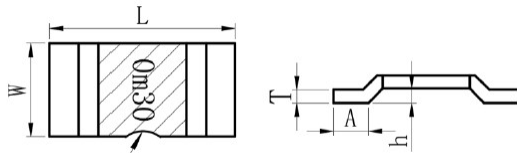
LRSW	1050	F	T	W	R	R005	K	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}C$)	Power Rating	Resistance	Material Code	Function Code
	0630: 6.4x3.2 1050: 10.0x5.2 1575: 15.0x7.5	F: $\pm 1\%$ J: $\pm 5\%$	T: Taping Reel	D: ± 50 W: ± 75 E: ± 100 K: ± 150	B: 2.5W R: 3W H: 4W D: 5W I: 6W E: 7W 8: 8W 9: 9W J: 10W 12: 12W 15: 15W	0M20: 0.2m Ω 0M30: 0.3m Ω 0M40: 0.4m Ω 0M50: 0.5m Ω 0M70: 0.7m Ω R001: 1m Ω R002: 2m Ω R003: 3m Ω R004: 4m Ω R005: 5m Ω	M: Manganin F: FeCrAl K: Kamar	A: Automotive Grade

Derating Curve



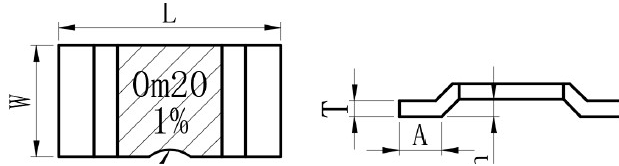
■ Dimensions

LRSW0630



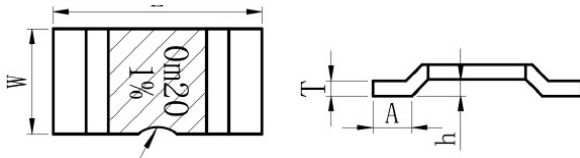
The side arc is a notch for the resistance process

LRSW1050



The side arc is a notch for the resistance process

LRSW1575



The side arc is a notch for the resistance process

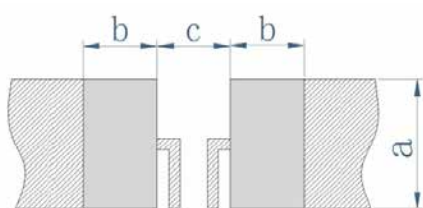
Type	Size (Inch)	Resistance (mΩ)	Material	L (mm)	W (mm)	T (mm)	A (mm)	h (mm)
LRSW0630	2512	0.3	Manganin	6.40±0.30	3.20±0.25	0.95±0.10	1.20±0.20	0.50±0.10
		0.35	Manganin	6.40±0.30	3.20±0.25	0.80±0.10	1.20±0.20	0.50±0.10
		0.4	Manganin	6.40±0.30	3.20±0.25	0.88±0.10	1.20±0.20	0.50±0.10
		0.5	Manganin	6.40±0.30	3.20±0.25	0.85±0.10	1.20±0.20	0.50±0.10
		0.7	Manganin	6.40±0.30	3.20±0.25	0.60±0.10	1.20±0.20	0.50±0.10
		0.75	Manganin	6.40±0.30	3.20±0.25	0.56±0.10	1.20±0.20	0.50±0.10
		1	Manganin	6.40±0.30	3.20±0.25	0.42±0.10	1.20±0.20	0.50±0.10
		2	FeCrAl	6.40±0.30	3.20±0.25	0.67±0.10	1.20±0.20	0.50±0.10
		3	FeCrAl	6.40±0.30	3.20±0.25	0.45±0.10	1.20±0.20	0.50±0.10
		4, 5	FeCrAl	6.40±0.30	3.20±0.25	0.32±0.10	1.20±0.20	0.50±0.10
		2	Kamar	6.40±0.30	3.20±0.25	0.65±0.10	1.20±0.20	0.50±0.10
		2.5	Kamar	6.40±0.30	3.20±0.25	0.50±0.10	1.20±0.20	0.50±0.10
		3	Kamar	6.40±0.30	3.20±0.25	0.43±0.10	1.20±0.20	0.50±0.10
		4	Kamar	6.40±0.30	3.20±0.25	0.32±0.10	1.20±0.20	0.50±0.10
LRSW1050	3920	0.2	Manganin	10.00±0.20	5.20±0.25	1.70±0.10	2.00±0.20	0.50±0.10
		0.3	Manganin	10.00±0.20	5.20±0.25	1.28±0.10	2.00±0.20	0.50±0.10
		0.4	Manganin	10.00±0.20	5.20±0.25	1.00±0.10	2.00±0.20	0.50±0.10
		0.5	Manganin	10.00±0.20	5.20±0.25	0.80±0.10	2.00±0.20	0.50±0.10
		0.7	Manganin	10.00±0.20	5.20±0.25	0.55±0.10	2.00±0.20	0.50±0.10
		0.8	Manganin	10.00±0.20	5.20±0.25	0.48±0.10	2.00±0.20	0.50±0.10
		1	Manganin	10.00±0.20	5.20±0.25	0.40±0.10	2.00±0.20	0.50±0.10
		1	FeCrAl	10.00±0.20	5.20±0.25	1.25±0.10	2.00±0.20	0.50±0.10
		1.5	FeCrAl	10.00±0.20	5.20±0.25	0.94±0.10	2.00±0.20	0.50±0.10
		2	FeCrAl	10.00±0.20	5.20±0.25	0.62±0.10	2.00±0.20	0.50±0.10
		3	FeCrAl	10.00±0.20	5.20±0.25	0.42±0.10	2.00±0.20	0.50±0.10
		4	FeCrAl	10.00±0.20	5.20±0.25	0.35±0.10	2.00±0.20	0.50±0.10
		5	FeCrAl	10.00±0.20	5.20±0.25	0.28±0.10	2.00±0.20	0.50±0.10
		1	Kamar	10.00±0.20	5.20±0.25	1.16±0.10	2.00±0.20	0.50±0.10
		2	Kamar	10.00±0.20	5.20±0.25	0.65±0.10	2.00±0.20	0.50±0.10
		3	Kamar	10.00±0.20	5.20±0.25	0.43±0.10	2.00±0.20	0.50±0.10
		4	Kamar	10.00±0.20	5.20±0.25	0.32±0.10	2.00±0.20	0.50±0.10
LRSW1575	5930	0.2	Manganin	15.00±0.20	7.70±0.30	1.50±0.10	4.20±0.20	0.50±0.15
		0.3	Manganin	15.00±0.20	7.70±0.30	0.96±0.10	4.20±0.20	0.50±0.15
		0.4	Manganin	15.00±0.20	7.70±0.30	0.72±0.10	4.20±0.20	0.50±0.15
		0.5	Manganin	15.00±0.20	7.70±0.30	0.58±0.10	4.20±0.20	0.50±0.15
		0.7	Manganin	15.00±0.20	7.70±0.30	0.42±0.10	4.20±0.20	0.50±0.15
		0.75	Manganin	15.00±0.20	7.70±0.30	0.39±0.10	4.20±0.20	0.50±0.15
		0.8	Manganin	15.00±0.20	7.70±0.30	0.36±0.10	4.20±0.20	0.50±0.15
		1	FeCrAl	15.00±0.20	7.70±0.30	0.94±0.10	4.20±0.20	0.50±0.15
		1.5	FeCrAl	15.00±0.20	7.70±0.30	0.62±0.10	4.20±0.20	0.50±0.15
		2	FeCrAl	15.00±0.20	7.70±0.30	0.48±0.10	4.20±0.20	0.50±0.15
		3	FeCrAl	15.00±0.20	7.70±0.30	0.31±0.10	4.20±0.20	0.50±0.15
		1	Kamar	15.00±0.20	7.70±0.30	0.88±0.10	4.20±0.20	0.50±0.15
		2	Kamar	15.00±0.20	7.70±0.30	0.43±0.10	4.20±0.20	0.50±0.15
		3	Kamar	15.00±0.20	7.70±0.30	0.30±0.10	4.20±0.20	0.50±0.15

Standard Electrical Specifications

Type	Power (P _{70°C})	Material	Resistance Range(mΩ)		TCR (PPM/°C)
			±1%	±5%	
LRSW0630	6W	Manganin	0.3, 0.35, 0.4, 0.5		±150
			0.7, 0.75, 1		±100
	5W	FeCrAl	2		±50
	4W	FeCrAl	3		±50
	3W	FeCrAl	4		±50
	2.5W	FeCrAl	5		±50
	5W	Kamar	2		±75
	4W	Kamar	2.5, 3		±75
	3W	Kamar	4		±75
	2.5W	Kamar	5		±75
LRSW1050	12W	Manganin	0.2		±100
	10W	Manganin	0.3		±100
	9W	Manganin	0.4, 0.5		±100
	8W	Manganin	0.7, 0.8		±100
	7W	Manganin	1		±100
	8W	FeCrAl	1		±50
	7W	FeCrAl	1.5		±50
	6W	FeCrAl	2		±50
	5W	FeCrAl	3		±50
	4W	FeCrAl	4		±50
	3W	FeCrAl	5		±50
	8W	Kamar	1		±75
	6W	Kamar	2		±75
	5W	Kamar	3, 4, 5		±75
LRSW1575	15W	Manganin	0.2,		±150
	10W	Manganin	0.3		±150
	9W	Manganin	0.4		±150
	8W	Manganin	0.5		±100
	7W	Manganin	0.7, 0.75, 0.8		±100
	9W	FeCrAl	1		±50
	8W	FeCrAl	1.5		±50
	7W	FeCrAl	2, 3		±50
	9W	Kamar	1		±75
	7W	Kamar	2, 3		±75

Note: Iron-chromium aluminum material is magnetic and affects the inverter current, so please be careful in product selection.

Recommend Land Pattern



Unit: mm

Type	a	b	c
LRSW0630	3.60	1.80	3.80
LRSW1050	6.20	2.70	5.60
LRSW1575	8.75	5.20	5.60

■ Environmental Characteristics

Item	Requirement	Test Method
Thermal shock	Within the specified value	Measured value -20°C and +120°C, reference value +20°C
Solderability	No visible damage, weldable area 95% minimum	245°C Tin slot, hold for 3 sec
Short time overload	No visible damage, $\Delta R \pm 1.0\%$ maximum	5 times rated voltage, 5 sec
Resistance to solder heat	No visible damage, $\Delta R \pm 0.5\%$ maximum	260°C Tin bath, hold for 10 sec
High temperature and humidity	No visible damage, $\Delta R \pm 1.0\%$ maximum	Temperature 85°C, humidity 85% of the conditions applied 10% of the rated power (current) or component limit current (whichever is less), for 1000 hours
High temperature storage	No visible damage, $\Delta R \pm 1.0\%$ maximum	1000 hrs @ 170°C, without load
Low temperature load	No visible damage, $\Delta R \pm 0.5\%$ maximum	-55°C, No load for 1.5 hour, rated voltage load for 45 min, no load for 15 min
Temperature cycling	No visible damage, $\Delta R \pm 1.0\%$ maximum	-55°C @ 30 min ~ room temperature @ <5 min ~ +155°C @ 30 min, 1000 cycles
Load life	No visible damage, $\Delta R \pm 1.0\%$ maximum	1000 h @ 70±2°C, rated voltage, 90 min on, 30 min off

■ Reference Standards: IEC 60115-1; MIL-STD-202;

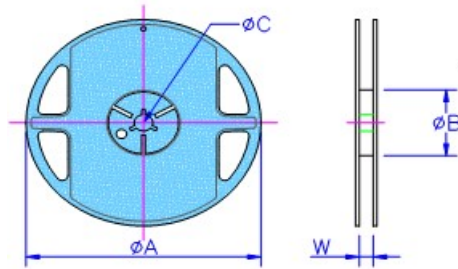
■ Operating Temperature Range: -55~170°C

■ Storage Temperature: 25±5°C; Humidity 40%~70%RH

■ Shelf Life: 1 year from production date

■ Packaging

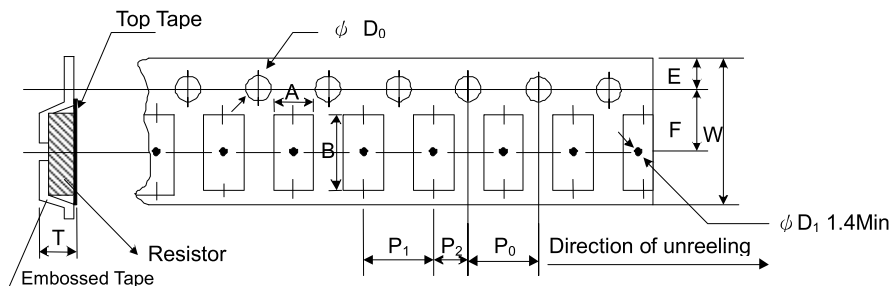
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W
LRSW0630	Embossed	4K	16mm	13 inch	330.0±2.0	60.0±1.0	13.5±0.5	17.5±0.5
LRSW1050	Embossed	2K	24mm	13 inch	330.0±2.0	60.0±1.0	13.5±0.5	25.5±0.5
LRSW1575	Embossed	2K	32mm	13 inch	330.0±2.0	60.0±1.0	13.5±0.5	33.0±0.5

Embossed Plastic Tape Specifications



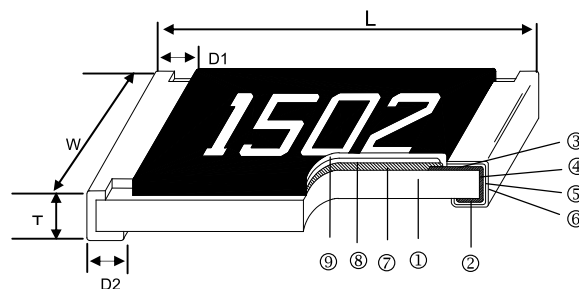
Unit: mm

Type	A	B	W	E	F	P0	P1	P2	ΦD0	T
LRSW0630	3.5	6.8	16	1.75	7.5	4	8	2	1.5	1.8
LRSW1050	5.7	11.2	24	1.75	7.5	4	12	6	1.5	2.5
LRSW1575	8.2	16.1	32	1.75	11.5	4	12	6	1.5	2.5

Automotive Grade High Voltage Low VCR Thick Film Chip Resistor—HVRC Series



Construction



Features

- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Excellent performance at high voltage
- Reduced size of final equipment
- Low VCR
- AEC-Q200 Qualified
- IEC 62368-1:2018 Safety Certificate issued by UL Demko
- Excellent sulfur resistance against sulfur containing atmosphere
- MSL: Level 1

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

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
HVRC06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
HVRC0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.7
HVRC12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.8

Applications

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

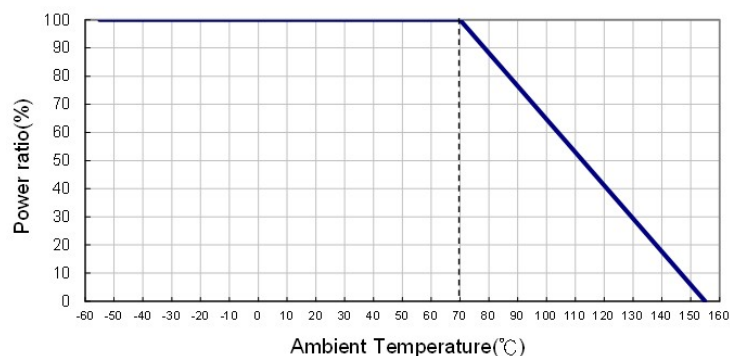
Part Numbering

HVRC	06	F	T	E	O	1004
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	06: 1206 0A: 2010 12: 2512	D: ±0.5% F: ±1% J: ±5%	T: 7" Taping Reel V: 10" Taping Reel W: 13" Taping Reel	E: ±100	O: 1/3W U: 1/2W Q: 3/4W T: 1W	1004: 1MΩ 1005: 10MΩ 1006: 100MΩ

IEC 62368-1:2018

	HVRC06	HVRC0A	HVRC12
G.10.3 (2.5KV impulse test)	100K~470M	51K~470M	30K~470M
G.10.4 (10KV Voltage surge test)			
G.10.5 (5KV Impulse test)			
G.10.6 (396Vac Overload test)	100K~470M	100K~470M	100K~470M

Derating Curve



Standard Electrical Specifications

Type \ Item	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)	VCR (PPM/V)
					±0.5%	±1%	±5%		
HVRC06 (1206)	1/3W	-55 ~ +155°C	1000V	1500V	100KΩ - 1MΩ	100KΩ - 10MΩ	100KΩ-500MΩ	±100	<25
HVRC0A (2010)	1/2W		2000V	3000V	51KΩ- 1MΩ	51KΩ- 20MΩ	51KΩ - 500MΩ	±100	
	3/4W								
HVRC12 (2512)	1W		3000V	4000V	30KΩ - 1MΩ	30KΩ - 20MΩ	30KΩ - 500MΩ	±100	

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

■ 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.		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Voltage Coefficient (VCR)	As Spec.		measured at 10 % and at 100 % of either the rated voltage or the limiting element voltage, whichever is the smaller
Short Time Overload	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	±(1.0%+0.10Ω)	±(3.0%+0.10Ω)	1000 hrs 85°C/85%RH 10% of operating power (≤ 100 V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	Bending once for 60 seconds 1206 size: 3mm 2010, 2512 sizes: 2mm
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		HVRC06/HVRC0A/HVRC12: 500V for 1 minute

Item	Requirement		Test Method
	±1%	±5%	
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$		260±5°C for 30 seconds
Temperature Cycling	±(1.0%+0.05Ω)		-55°C to +125°C, 1000 cycles
Mechanical Shock	±(1.0%+0.05Ω)		Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(1.0%+0.05Ω)		5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(3.0%+0.05Ω)		Human body model 2KV
Resistance to Solvents	No visible damage on appearance and marking.		Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken		Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±1%		60±2°C, no power rating for 500 hrs.

RCVV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

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

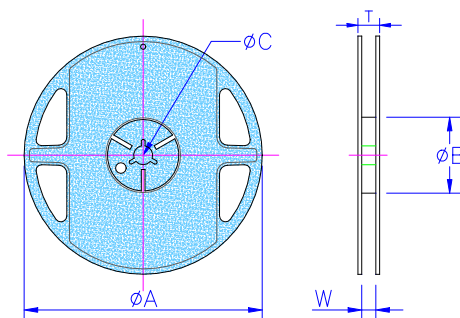
JESD22; UL-94

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

■ Packaging

Reel Specifications & Packaging Quantity

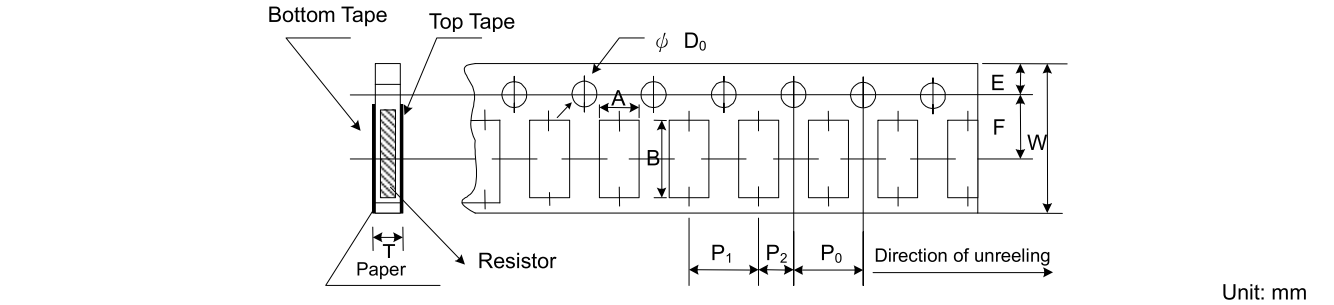


Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
HVRC06	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	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
HVRC0A HVRC12	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	12mm	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5

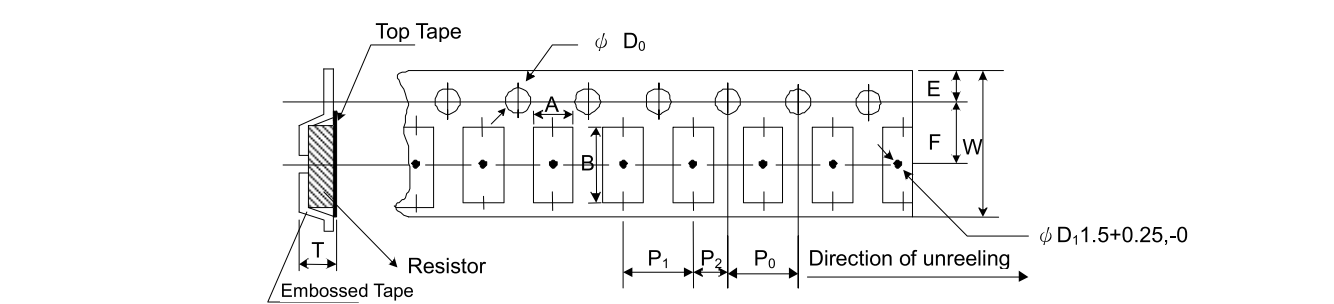
■Packaging

Paper Tape Specifications



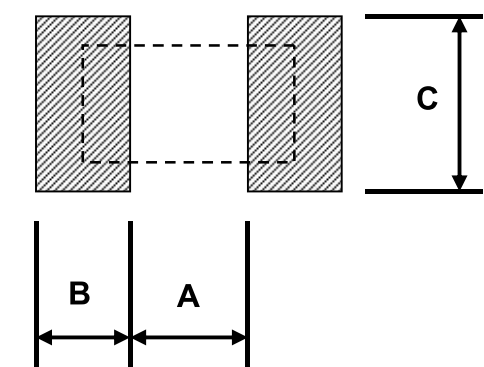
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
HVRC06	1.90±0.10	3.50±0.20	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.05	2.00±0.05	1.50+0.1,-0	0.85±0.10

Embossed Plastic Tape Specifications



Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
HVRC0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1,-0	1.2 ⁺⁰
HVRC12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±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

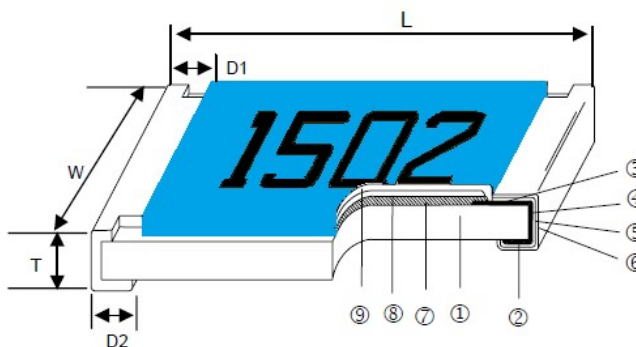


Unit: mm

Type	A	B	C
HVRC06	2.00	0.90	1.60
HVRC0A	3.80	0.90	2.80
HVRC12	4.90	1.60	3.50

Automotive Grade Green Chip Resistor—CRG.A Series

Construction



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

Features

- AEC-Q200 Qualified
- Total Lead(Pb)-free without RoHS exemptions
- Highly reliable multilayer electrode construction
- Compatible with all soldering process
- 100% CCD inspection
- MSL: Level 1

Applications

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

Dimensions

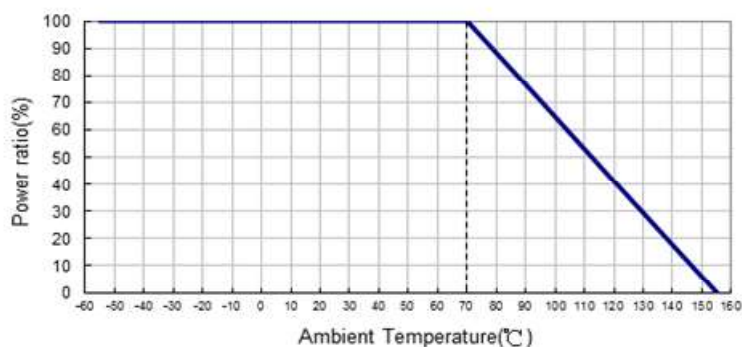
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
CRG02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
CRG03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
CRG05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.3
CRG06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
CRG10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
CRG0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
CRG0A (2W)	2010	5.00±0.10	2.50±0.15	0.74±0.10	0.60±0.30	1.70±0.20	37.0
CRG12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4
CRG12 (3W)	2512	6.35±0.20	3.15±0.15	0.74±0.10	0.60±0.30	2.10±0.20	53.0

Part Numbering

CRG	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	F: ±1% J: ±5%	A: Automotive Grade C: High Power & Automotive Grade U: Ultra High Power & 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

Type \ Item	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
CRG02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 1A				-	0Ω (<50mΩ)	-
CRG03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 1A				-	0Ω (<50mΩ)	-
CRG05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 2A				-	0Ω (<50mΩ)	-
CRG06 (1206)	1/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 2A				-	0Ω (<50mΩ)	-
CRG10 (1210)	1/3W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 2.5A				-	0Ω (<50mΩ)	-
CRG0A (2010)	3/4W	-55 ~ +155°C	200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 3.5A				-	0Ω (<50mΩ)	-
CRG12 (2512)	1W	-55 ~ +155°C	250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ		±200 ±100 ±200
	Jumper: 4A				-	0Ω (<50mΩ)	-

High Power & Ultra High Power Rating Electrical Specifications

Type \ Item	Power Rating at 70°C	Function Code	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
						±1%	±5%	
CRG05 (0805)	1/3W	C	-55 ~ +155°C	150V	300V	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
CRG06 (1206)	1/2W	C		200V	400V	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
CRG10 (1210)	1W	C		200V	400V	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
CRG0A (2010)	1W	C		400V	800V	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
	*2W	U		200V	500V	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
CRG12 (2512)	2W	C		500V	1000V	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100
	*3W	U		500V	1000V	1Ω - 9.76Ω		±200
						10Ω - 1MΩ		±100

*: Ultra High Power

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

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

■ 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.		At 25°C/-55°C and 25°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 whichever is lower for 5 seconds Ultra High Power: RCWV*2 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Operational Life	±(2.0%+0.05Ω)	±(3.0%+0.10Ω)	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(2.0%+0.05Ω)	±(3.0%+0.10Ω)	1000 hrs 85°C/85%RH 10% of operating power(≤100V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	Bending once for 60 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 Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%		260±5°C for 30 seconds
Temperature Cycling	±(1.0%+0.05Ω)		-55°C to +125°C, 1000 cycles
Mechanical Shock	±(1.0%+0.05Ω)		Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(1.0%+0.05Ω)		5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(3.0%+0.05Ω)		Human body model 0402/0603: 0.5KV 0805 and above: 2KV
Resistance to Solvents	No visible damage on appearance and marking.		Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken		Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±1%	△R±5%	60±2°C, no power rating for 500 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

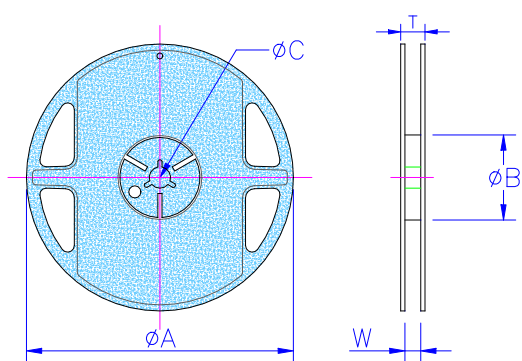
■ Reference Standards: IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

■ Packaging

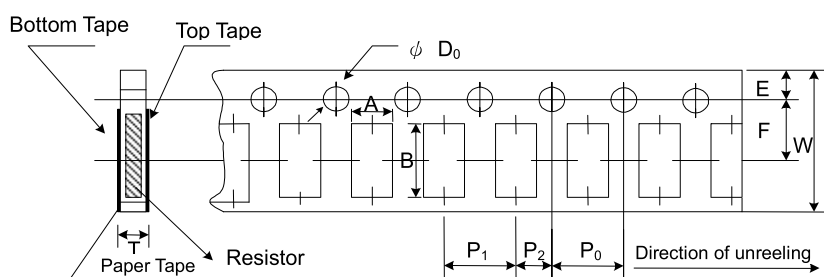
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CRG02	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CRG03 CRG05 CRG06 CRG10	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
CRG0A CRG12	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
CRG0A(2W) CRG12(3W)	Embossed	2K	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

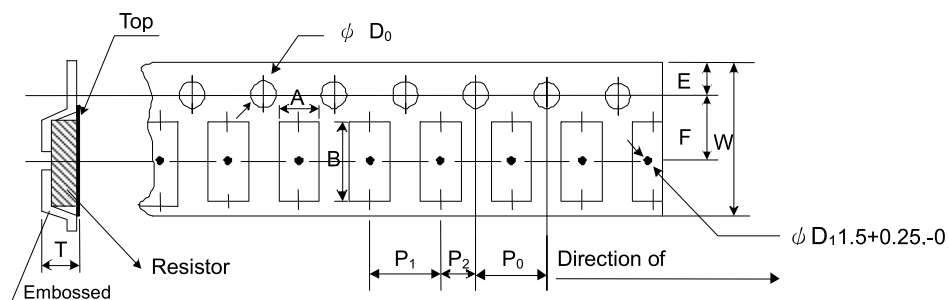


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRG02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
CRG03	1.10±0.10	1.90±0.10	8.00±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
CRG05	1.60±0.10	2.40±0.20	8.00±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
CRG06	1.90±0.10	3.50±0.20	8.00±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
CRG10	2.90±0.10	3.50±0.20	8.00±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

Packaging

Embossed Plastic Tape Specifications

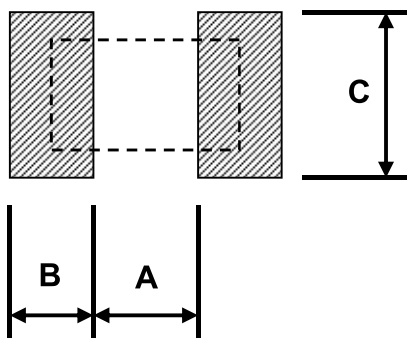


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CRG0A	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
CRG0A(2W)	2.85±0.10	5.55±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.45±0.20
CRG12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
CRG12(3W)	3.40±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.55±0.05	1.45±0.20

Recommend Land Pattern

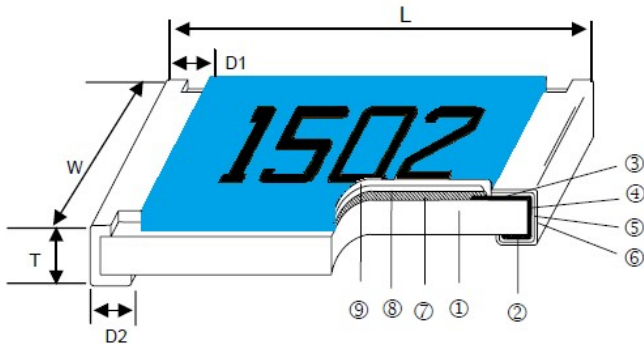
Unit: mm



Type	A	B	C
CRG02	0.50	0.45	0.60
CRG03	0.90	0.60	0.90
CRG05	1.20	0.70	1.30
CRG06	2.00	0.90	1.60
CRG10	2.00	0.90	2.80
CRG0A	3.80	0.90	2.80
CRG0A(2W)	1.20	2.70	2.80
CRG12	4.90	1.60	3.50
CRG12(3W)	1.00	3.55	3.50

Automotive Grade Green Anti-Sulfurated Chip Resistor—ASG..A Series

Construction



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

Features

- Special construction to prevent sulfuration in a sulfur containing environment
- Total Lead(Pb)-free without RoHS exemptions
- AEC-Q200 Qualified
- 100% CCD inspection
- MSL: Level 1

Applications

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

Dimensions

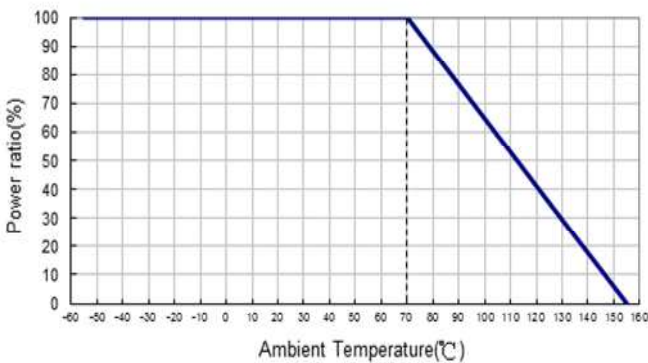
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
ASG02	0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	0.6
ASG03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
ASG05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
ASG06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
ASG10	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
ASG0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
ASG12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

Part Numbering

ASG	06	F	T	E	X	1002	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	02: 0402 03: 0603 05: 0805 06: 1206 10: 1210 0A: 2010 12: 2512	D: ±0.5% F: ±1% J: ±5%	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel	E: ±100 F: ±200 -: No specified (For Jumper)	Y: 1/16W X: 1/10W W: 1/8W V: 1/4W O: 1/3W U: 1/2W Q: 3/4W T: 1W A: 1.5W	R0R0: 0Ω 0010: 1Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ	A: Automotive Grade

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)
					±0.5%	±1%	±5%	
ASG02 (0402)	1/16W	-55 ~ +155°C	50V	100V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				— 0Ω(<50mΩ)			—
ASG03 (0603)	1/10W		75V	150V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 1A				— 0Ω(<50mΩ)			—
ASG05 (0805)	1/8W		150V	300V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				— 0Ω(<50mΩ)			—
ASG06 (1206)	1/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2A				— 0Ω(<50mΩ)			—
ASG10 (1210)	1/3W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 2.5A				— 0Ω(<50mΩ)			—
ASG0A (2010)	3/4W		200V	400V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 3.5A				— 0Ω(<50mΩ)			—
ASG12 (2512)	1W		250V	500V	1Ω - 9.76Ω 10Ω - 1MΩ 1.02MΩ - 10MΩ			±200 ±100 ±200
	Jumper: 4A				— 0Ω(<50mΩ)			—

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)
					±0.5%	±1%	±5%	
ASG02 (0402)	1/10W	-55 ~ +155°C	50V	100V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	
ASG03 (0603)	1/4W		75V	150V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	
ASG05 (0805)	1/3W		150V	300V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	
ASG06 (1206)	1/2W		200V	400V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	
ASG10 (1210)	3/4W		200V	400V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	
ASG0A (2010)	1W		200V	400V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	
ASG12 (2010)	1.5W		250V	500V	-	1Ω - 9.76Ω		±200
					10Ω - 1MΩ		±100	

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

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

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 125 °C.

■ 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.			At 25°C/-55°C and 25°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 whichever is lower for 5 seconds
Insulation Resistance	≥ 10G			Max. Overload Voltage for 1 minute
Operational Life	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	1000 hrs 85°C/85%RH 10% of operating power (≤ 100V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 seconds 2010, 2512 sizes: 2 mm 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 Max. Operating Voltage 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
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	±(3.0%+0.05Ω)			Human body model 0402/0603: 0.5KV 0805 and above: 2KV
Resistance to Solvents	No visible damage on appearance and marking.			Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken			Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board			V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	ΔR±1%		<50mΩ	105±2°C, no power rating for 750 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

■ **Reference Standards:** IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

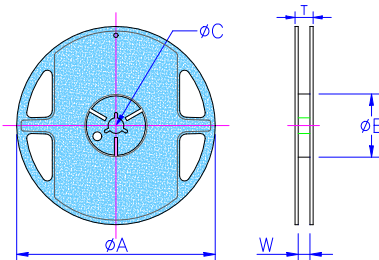
■ **Shelf Life:** 2 years from production date

Packaging

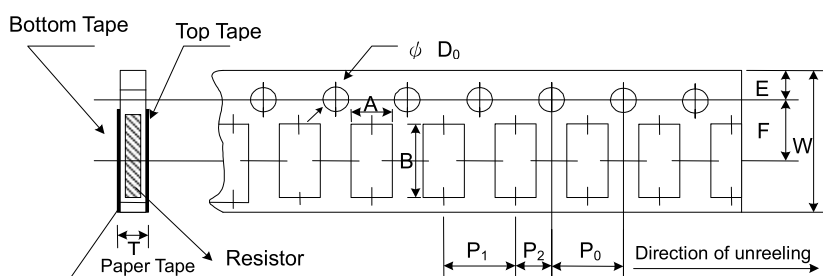
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
ASG02	Paper	10K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
		20K	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
ASG03	Paper	5K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
ASG05		10K	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
ASG06		20K	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
ASG10	Paper	5K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
ASG03		10K	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
ASG06		20K	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
ASG0A	Embossed	4K	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
ASG12		8K	10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



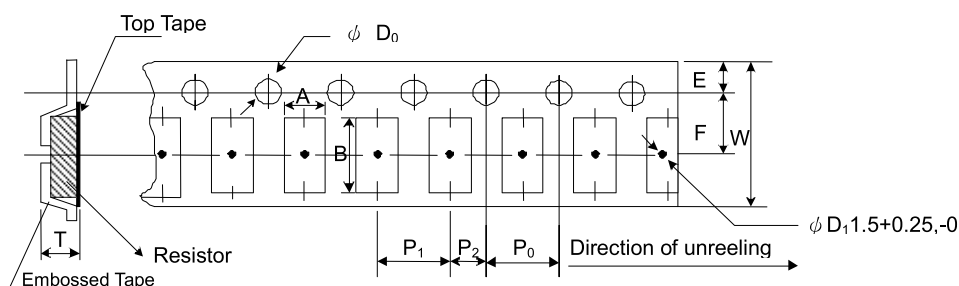
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ASG02	0.65±0.10	1.15±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.45±0.10
ASG03	1.10±0.10	1.90±0.10	8.00±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
ASG05	1.60±0.10	2.40±0.20	8.00±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
ASG06	1.90±0.10	3.50±0.20	8.00±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
ASG10	2.90±0.10	3.50±0.20	8.00±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

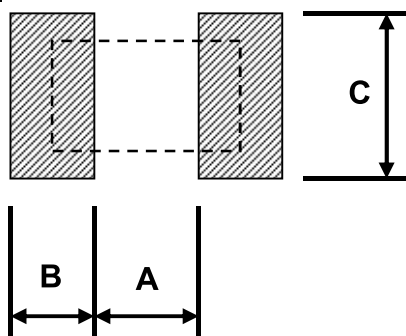


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ASG0A	2.80±0.10	5.40±0.20	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
ASG12	3.50±0.10	6.70±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

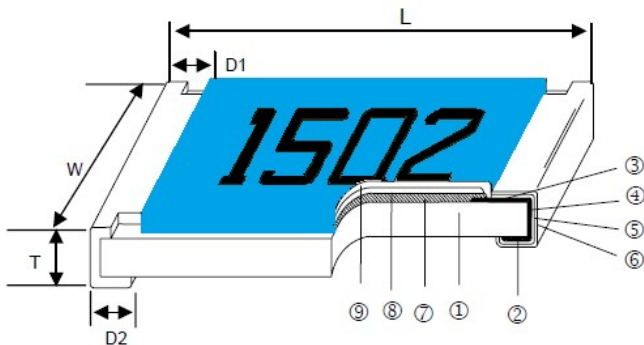
Unit: mm



Type	A	B	C
ASG02	0.50	0.45	0.60
ASG03	0.90	0.60	0.90
ASG05	1.20	0.70	1.30
ASG06	2.00	0.90	1.60
ASG10	2.00	0.90	2.80
ASG0A	3.80	0.90	2.80
ASG12	4.90	1.60	3.50

Automotive Grade Total Lead-free High Voltage Thick Film Chip Resistor—HVRG..A Series

Construction



Features

- AEC-Q200 Qualified
- Total Lead(Pb)-free without RoHS exemptions
- Highly reliable multilayer electrode construction
- Higher component and equipment reliability
- Excellent performance at high voltage
- Reduced size of final equipment
- Special construction to prevent sulfuration in a sulfur containing environment
- 100% CCD inspection
- MSL: Level 1

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

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
HVRG06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
HVRG0A	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
HVRG12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4

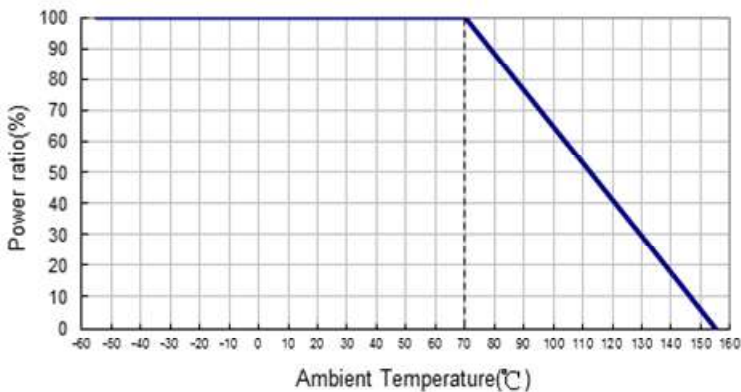
Applications

- Inverter
- Outdoor Equipments
- Converter
- High Pulse Equipment

Part Numbering

HVRG	06	F	T	E	V	1003	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	06: 1206 0A: 2010 12: 2512	F: ±1% J: ±5%	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel	E: ±100	V: 1/4W U: 1/2W T: 1W	1003: 100KΩ 1004: 1MΩ 1005: 10MΩ	A: Automotive Grade

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%	
HVRG06 (1206)	1/4W	-55 ~ +155°C	500V	1000V	100KΩ - 10MΩ	100KΩ - 100MΩ	±100
HVRG0A (2010)	1/2W		2000V	3000V	51KΩ - 20MΩ	51KΩ - 100MΩ	±100
HVRG12 (2512)	1W		3000V	4000V	30KΩ - 20MΩ	30KΩ - 100MΩ	±100

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

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

■ 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.		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(1.0\%+0.05\Omega)$	$\pm(2.0\%+0.05\Omega)$	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$		Max. Overload Voltage for 1 minute
Operational Life	$\pm(2.0\%+0.05\Omega)$	$\pm(3.0\%+0.10\Omega)$	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	$\pm(2.0\%+0.05\Omega)$	$\pm(3.0\%+0.10\Omega)$	1000 hrs 85°C/85%RH 10% of operating power ($\leq 100V$)
High Temperature Exposure	$\pm(1.0\%+0.05\Omega)$	$\pm(1.5\%+0.10\Omega)$	at +155°C for 1000 hrs
Board Flex	$\pm(1.0\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds 2010, 2512 sizes: 2 mm Other sizes: 3mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.5\%+0.05\Omega)$	$\pm(1.0\%+0.05\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		500V for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$		260±5°C for 30 seconds
Temperature Cycling	$\pm(1.0\%+0.05\Omega)$		-55°C to +125°C, 1000 cycles
Mechanical Shock	$\pm(1.0\%+0.05\Omega)$		Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(1.0\%+0.05\Omega)$		5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(3.0\%+0.05\Omega)$		Human body mode: 2KV
Resistance to Solvents	No visible damage on appearance and marking.		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	$\Delta R \pm 1\%$	$\Delta R \pm 5\%$	60±2°C, no power rating for 500 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ Storage Temperature: 15~28°C; Humidity < 80%RH

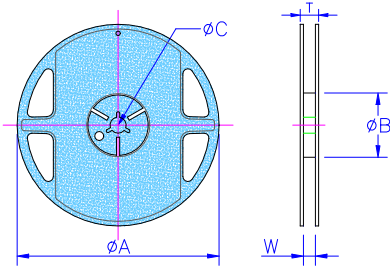
■ Shelf Life: 2 years from production date

■Packaging

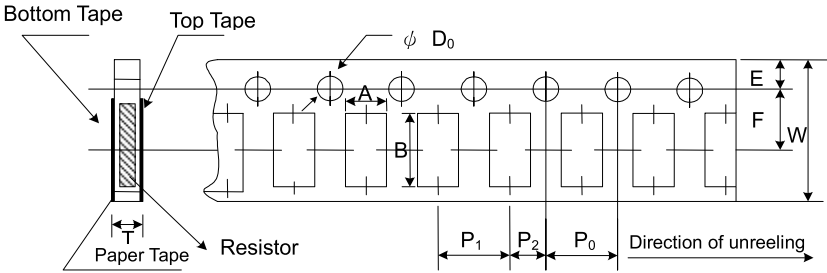
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
HVRG06	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
HVRG0A	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
HVRG12		8K		10 inch	250±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



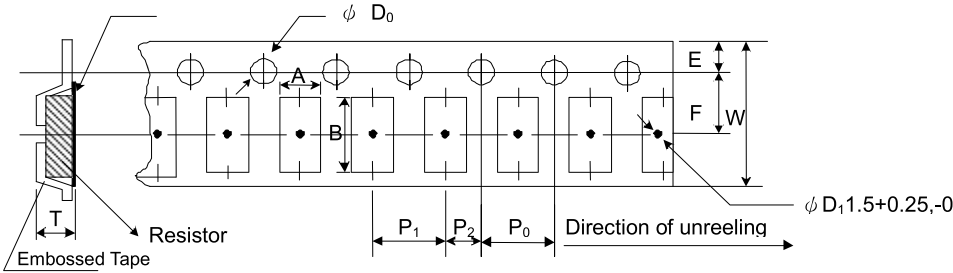
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
HVRG06	1.90±0.10	3.50±0.20	8.00±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

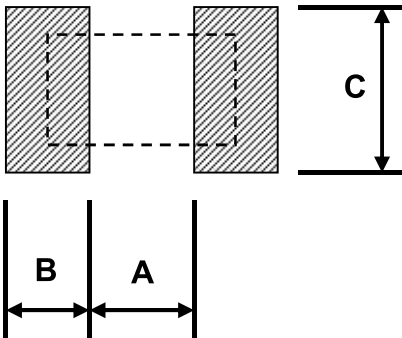


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
HVRG0A	2.80±0.10	5.40±0.20	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
HVRG12	3.50±0.10	6.70±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

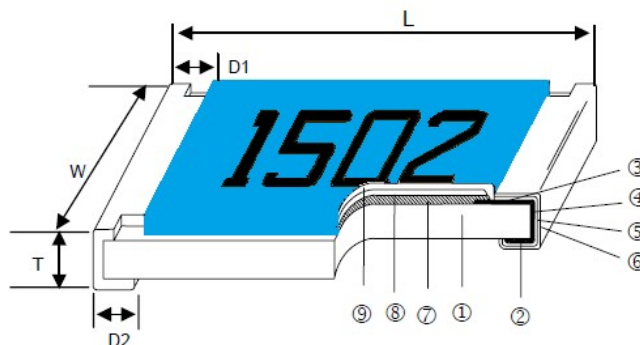
Unit: mm



Type	A	B	C
HVRG06	2.00	0.90	1.60
HVRG0A	3.80	0.90	2.80
HVRG12	4.90	1.60	3.50

Automotive Grade & Total Lead-free Pulse Withstanding Chip Resistor—PWRG.A Series

Construction



Features

- Total Lead(Pb)-free without RoHS exemptions
- Tolerance from $\pm 0.5\%$ ~ 5%
- High power rating
- Excellent pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0603~2512
- AEC-Q200 Qualified
- MSL: Level 1

Applications

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

Dimensions

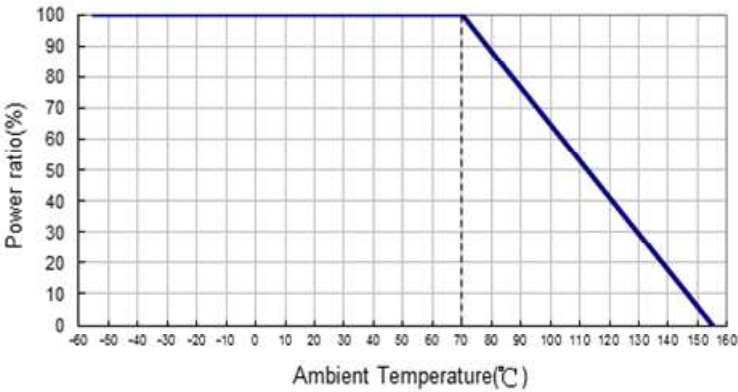
Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
PWRG03	0603	1.60 $\pm$ 0.10	0.80 $\pm$ 0.10	0.45 $\pm$ 0.10	0.30 $\pm$ 0.20	0.30 $\pm$ 0.20	2.0
PWRG05	0805	2.00 $\pm$ 0.10	1.25 $\pm$ 0.10	0.50 $\pm$ 0.10	0.35 $\pm$ 0.20	0.40 $\pm$ 0.20	4.4
PWRG05 (1/2W)	0805	2.00 $\pm$ 0.10	1.25 $\pm$ 0.10	0.55 $\pm$ 0.10	0.35 $\pm$ 0.20	0.40 $\pm$ 0.20	5.0
PWRG06	1206	3.10 $\pm$ 0.10	1.55 $\pm$ 0.10	0.55 $\pm$ 0.10	0.50 $\pm$ 0.25	0.50 $\pm$ 0.20	8.9
PWRG06 (3/4W)	1206	3.10 $\pm$ 0.10	1.55 $\pm$ 0.10	0.55 $\pm$ 0.10	0.60 $\pm$ 0.25	0.50 $\pm$ 0.20	9.5
PWRG13	1210	3.10 $\pm$ 0.10	2.60 $\pm$ 0.15	0.55 $\pm$ 0.10	0.50 $\pm$ 0.25	0.50 $\pm$ 0.20	16.0
PWRG10	2010	5.00 $\pm$ 0.10	2.50 $\pm$ 0.15	0.55 $\pm$ 0.10	0.60 $\pm$ 0.25	0.50 $\pm$ 0.20	24.2
PWRG12	2512	6.35 $\pm$ 0.10	3.10 $\pm$ 0.15	0.55 $\pm$ 0.10	0.60 $\pm$ 0.25	0.50 $\pm$ 0.20	39.4
PWRG12 (2W)	2512	6.35 $\pm$ 0.20	3.15 $\pm$ 0.15	0.60 $\pm$ 0.10	0.60 $\pm$ 0.25	0.60 $\pm$ 0.20	42.0

Part Numbering

Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
PWRG	12	J	T	E	A	1001	A
	03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$ -: No specified (for Jumper)	T: 7" Taping Reel V: 10" Taping Reel W: 13" Taping Reel	E: ± 100 F: ± 200 L: ± 250 -: No specified (for Jumper)	S: 2W A: 1.5W K: 1.25W T: 1W Q: 3/4W U: 1/2W G: 2/5W O: 1/3W V: 1/4W P: 1/5W W: 1/8W X: 1/10W	1001: 1K Ω 1004: 1M Ω R0R0: 0 Ω	A: Automotive Grade

Derating Curve



Standard Electric

Item Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range		TCR (PPM/°C)
					±1%	±5%	
PWRG03 (0603)	1/10W	-55 ~ +155°C	75V	150V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG05 (0805)	1/8W	-55 ~ +155°C	150V	300V	1Ω-9.76Ω		±200
					10Ω-10MΩ		±100
PWRG06 (1206)	1/3W	-55 ~ +155°C	200V	400V	1Ω-9.76Ω		±200
					10Ω-20MΩ		±100
PWRG13 (1210)	1/2W	-55 ~ +155°C	200V	400V	1Ω-9.76Ω		±200
					10Ω-20MΩ		±100
PWRG10 (2010)	3/4W	-55 ~ +155°C	400V	800V	1Ω-9.76Ω		±200
					10Ω-20MΩ		±100
PWRG12 (2512)	1.5W	-55 ~ +155°C	500V	1000V	1Ω-9.76Ω		±200
					10Ω-20MΩ		±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		TCR (PPM/°C)
					±1%	±5%	
PWRG03 (0603)	1/3W	-55 ~ +155°C	75V	150V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG05 (0805)	2/5W	-55 ~ +155°C	150V	300V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG05 (0805)	*1/2W	-55 ~ +155°C	400V	600V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG06 (1206)	1/2W	-55 ~ +155°C	200V	400V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG06 (1206)	*3/4W	-55 ~ +155°C	500V	1000V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG13 (1210)	1W	-55 ~ +155°C	200V	400V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG10 (2010)	1.25W	-55 ~ +155°C	400V	800V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100
PWRG12 (2512)	*2W	-55 ~ +155°C	500V	1000V	1Ω-9.76Ω		±200
					10Ω-1MΩ		±100

■ Jumper(0Ω)

Type	Item	Power Rating	Rated Current	Overload Current	Resistance	Operating Temp. Range
PWRG03 (0603)		1/3W	5A	10A	0Ω (≤8mΩ)	-55 ~ +155°C
PWRG05 (0805) *		1/2W	6A	12A	0Ω (≤5mΩ)	
PWRG06 (1206) *		3/4W	10A	20A	0Ω (≤5mΩ)	
PWRG13 (1210)		1W	12A	24A	0Ω (≤4mΩ)	
PWRG10 (2010)		1.25W	12A	24A	0Ω (≤5mΩ)	
PWRG12 (2512)		2W	16A	32A	0Ω (≤5mΩ)	

*: Ultra High Power: double side printed resistor element

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.

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

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

■ Environmental Characteristics

Item	Requirement	Test Method
High Temperature Exposure (Storage)	±(1.0%+0.05Ω)	at +155°C for 1000 hrs
Temperature Cycling	±(1.0%+0.05Ω)	-55°C to +155°C, 1000 cycles
Humidity Bias	±(3.0%+0.05Ω)	1000 hrs 85°C/85%RH 10% of operating power (≤100V)
High Temperature Operating Life	±(2.0%+0.05Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Resistance to Solvents	No visible damage on appearance and marking.	Add an aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	±(1.0%+0.05Ω)	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(1.0%+0.05Ω)	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
Resistance to Soldering Heat	±(1.0%+0.05Ω)	260±5°C for 10 seconds
ESD	±(3.0%+0.05Ω)	Human body model: 0603: 1KV 0805 and above: 2KV
Solderability	95% min. coverage	245±5°C for 3 seconds
Board Flex	±(1.0%+0.05Ω)	Bending once for 60 seconds 2010, 2512 sizes: 2 mm Other sizes: 3mm
Terminal Strength (SMD)	No broken	Force of 1.8kg for 60 seconds.
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(2.0%+0.05Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥ 10G	Max. Overload Voltage for 1 minute

Item	Requirement	Test Method
Voltage Proof	No breakdown or flashover	500V for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260 $\pm$ 5°C for 30 seconds
Sulfur Test	$\Delta R \pm 1\%$	105 $\pm$ 2°C, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

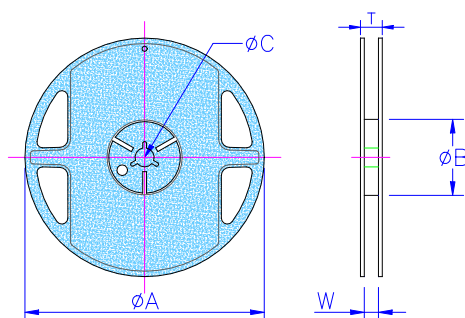
■ **Reference Standards:** IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

■ Packaging

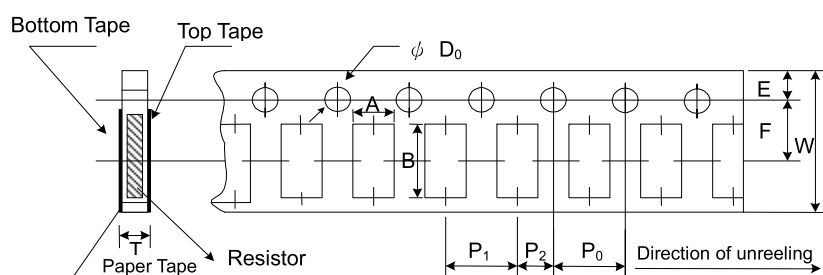
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
PWRG03	Paper	5K	8mm	7 inch	178.5 $\pm$ 1.5	60 ^{+1/-0}	13.0 $\pm$ 0.2	9.0 $\pm$ 0.5
PWRG05		10K	8mm	10 inch	254.0 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5
PWRG06		20K	8mm	13 inch	330.0 $\pm$ 1.0	100 $\pm$ 0.5	13.0 $\pm$ 0.2	9.5 $\pm$ 0.5
PWRG13	Embossed	4K	12mm	7 inch	178.5 $\pm$ 1.5	60 ^{+1/-0}	13.0 $\pm$ 0.5	15.5 $\pm$ 0.5
PWRG10		8K	12mm	10 inch	254.0 $\pm$ 1.0	62 $\pm$ 0.5	13.0 $\pm$ 0.5	16.5 $\pm$ 0.5
PWRG12								

Paper Tape Specifications

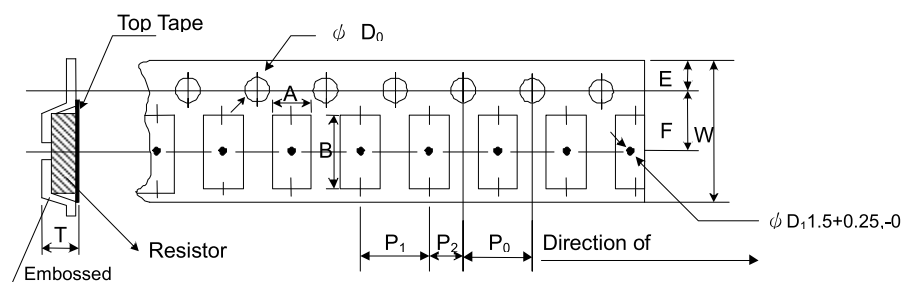


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
PWRG03	1.10 $\pm$ 0.10	1.90 $\pm$ 0.10	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1,-0	0.70 $\pm$ 0.10
PWRG05	1.60 $\pm$ 0.10	2.40 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1,-0	0.85 $\pm$ 0.10
PWRG06	1.90 $\pm$ 0.10	3.50 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1,-0	0.85 $\pm$ 0.10
PWRG13	2.90 $\pm$ 0.10	3.50 $\pm$ 0.20	8.00 $\pm$ 0.20	1.75 $\pm$ 0.10	3.50 $\pm$ 0.05	4.00 $\pm$ 0.10	4.00 $\pm$ 0.05	2.00 $\pm$ 0.05	1.50 $\pm$ 0.1,-0	0.85 $\pm$ 0.10

Packaging

Embossed Plastic Tape Specifications

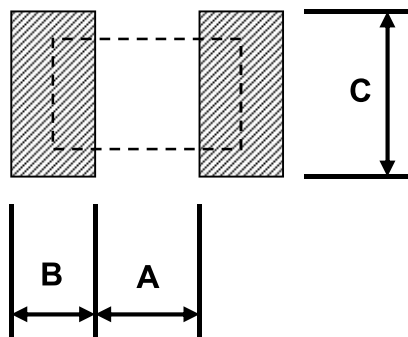


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
PWRG10	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
PWRG12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±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

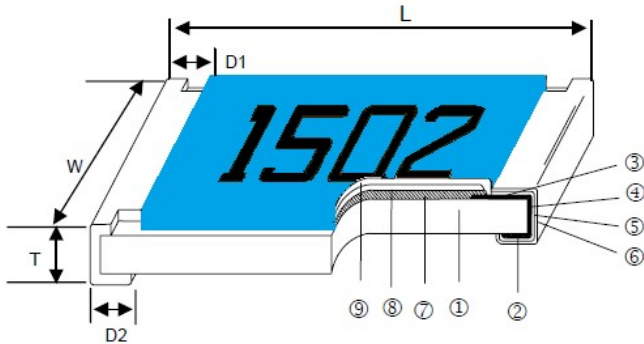
Unit: mm



Type	A	B	C
PWRG03	0.90	0.60	0.90
PWRG05	1.20	0.70	1.30
PWRG06	2.00	0.90	1.60
PWRG13	2.00	0.90	2.80
PWRG10	3.80	0.90	2.80
PWRG12	4.90	1.00	3.40

Automotive Grade & Total Lead-free Surge Withstanding Chip Resistor—SWRG..A Series

Construction



Features

- Total Lead(Pb)-free without RoHS exemptions
- High power rating
- Excellent surge withstanding & pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0603~2512
- AEC-Q200 Qualified
- MSL: Level 1

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

Dimensions

Unit: mm

Type	Size (Inch)	L	W	T	D1	D2	Weight (g) (1000pcs)
SWRG03	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20	2.0
SWRG05	0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.40±0.20	4.4
SWRG05 (1/2W)	0805	2.00±0.10	1.25±0.10	0.55±0.10	0.35±0.20	0.40±0.20	5.0
SWRG06	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
SWRG06 (3/4W)	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.60±0.25	0.50±0.20	9.5
SWRG13	1210	3.10±0.10	2.60±0.15	0.55±0.10	0.50±0.25	0.50±0.20	16.0
SWRG10	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.2
SWRG12	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.4
SWRG12 (2W)	2512	6.35±0.20	3.15±0.15	0.60±0.10	0.60±0.25	0.60±0.20	42.0

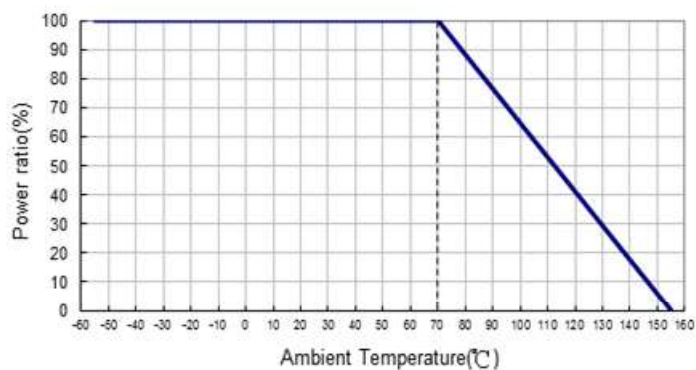
Applications

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

Part Numbering

SWRG	05	J	T	E	V	1001	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	03: 0603 05: 0805 06: 1206 13: 1210 10: 2010 12: 2512	J: ±5% K: ±10% M: ±20%	T: 7"Taping Reel V: 10"Taping Reel W: 13"Taping Reel	E: ±100 F: ±200 L: ±250	S: 2W A: 1.5W K: 1.25W T: 1W Q: 3/4W U: 1/2W G: 2/5W O: 1/3W V: 1/4W P: 1/5W W: 1/8W	1001: 1KΩ 1004: 1MΩ R0R0: 0Ω	A: Automotive Grade

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)
					±5%	±10%	±20%	
SWRG03 (0603)	1/8W	-55 ~ +155°C	75V	150V	1Ω-9.1Ω			±200
					10Ω-1MΩ			±100
SWRG05 (0805)	1/4W	-55 ~ +155°C	150V	300V	1Ω-9.1Ω			±200
					10Ω-10MΩ			±100
SWRG06 (1206)	1/3W	-55 ~ +155°C	200V	400V	1Ω-9.1Ω			±200
					10Ω-20MΩ			±100
SWRG13 (1210)	1/2W	-55 ~ +155°C	200V	400V	1Ω-9.1Ω			±200
					10Ω-20MΩ			±100
SWRG10 (2010)	3/4W	-55 ~ +155°C	400V	800V	1Ω-9.1Ω			±200
					10Ω-20MΩ			±100
SWRG12 (2512)	1.5W	-55 ~ +155°C	500V	1000V	1Ω-9.1Ω			±200
					10Ω-20MΩ			±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			TCR (PPM/°C)
					±5%	±10%	±20%	
SWRG03 (0603)	1/3W	-55 ~ +155°C	75V	150V	1Ω-9.1Ω			±200
					10Ω-1MΩ			±100
SWRG05 (0805)	2/5W	-55 ~ +155°C	150V	300V	1Ω-9.1Ω			±200
					10Ω-1MΩ			±100
SWRG05 (0805)	*1/2W	-55 ~ +155°C	400V	600V	1Ω-9.1Ω			±200
					10Ω-1MΩ			±100
SWRG06 (1206)	1/2W	-55 ~ +155°C	200V	400V	1Ω-9.1Ω			±200
					10Ω-1MΩ			±100
SWRG06 (1206)	*3/4W	-55 ~ +155°C	500V	1000V	1Ω-9.1Ω			±200
					10Ω-1MΩ			±100
SWRG13 (1210)	1W	-55 ~ +155°C	200V	400V	1Ω-9.1Ω			±200
					10Ω-1MΩ			±100
SWRG10 (2010)	1.25W	-55 ~ +155°C	400V	800V	1Ω-9.1Ω			±200
					10Ω-1MΩ			±100
SWRG12 (2512)	*2W	-55 ~ +155°C	500V	1000V	1Ω-9.1Ω			±200
					10Ω-1MΩ			±100

*: Ultra High Power: double side printed resistor element

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage listed above, whichever is lower.

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

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

■ Environmental Characteristics

Item	Requirement	Test Method
High Temperature Exposure (Storage)	$\pm(1.0\%+0.05\Omega)$	at +155°C for 1000 hrs
Temperature Cycling	$\pm(1.0\%+0.05\Omega)$	-55°C to +155°C, 1000 cycles
Humidity Bias	$\pm(3.0\%+0.05\Omega)$	1000 hrs 85°C/85%RH 10% of operating power ($\leq 100V$)
High Temperature Operating Life	$\pm(2.0\%+0.05\Omega)$	70 $\pm$ 2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Resistance to Solvents	No visible damage on appearance and marking.	Add an aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	$\pm(1.0\%+0.05\Omega)$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(1.0\%+0.05\Omega)$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
Resistance to Soldering Heat	$\pm(1.0\%+0.05\Omega)$	260 $\pm$ 5°C for 10 seconds
ESD	$\pm(3.0\%+0.05\Omega)$	Human body mode: 0603: 1KV 0805 and above: 2KV
Solderability	95% min. coverage	245 $\pm$ 5°C for 3 seconds
Board Flex	$\pm(1.0\%+0.05\Omega)$	Bending once for 60 seconds 2010, 2512 sizes: 2 mm Other sizes: 3mm
Terminal Strength (SMD)	No broken	Force of 1.8kg for 60 seconds.
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(2.0\%+0.05\Omega)$	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$	Max. Overload Voltage for 1 minute
Voltage Proof	No breakdown or flashover	500V for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260 $\pm$ 5°C for 30 seconds
Sulfur Test	$\triangle R \pm 1\%$	105 $\pm$ 2°C, no power rating for 1000 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ Storage Temperature: 15~28°C; Humidity < 80%RH

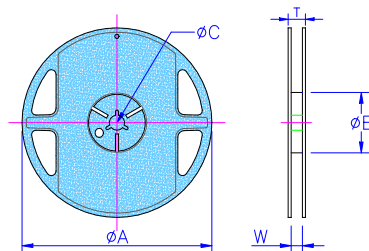
■ Shelf Life: 2 years from production date

Packaging

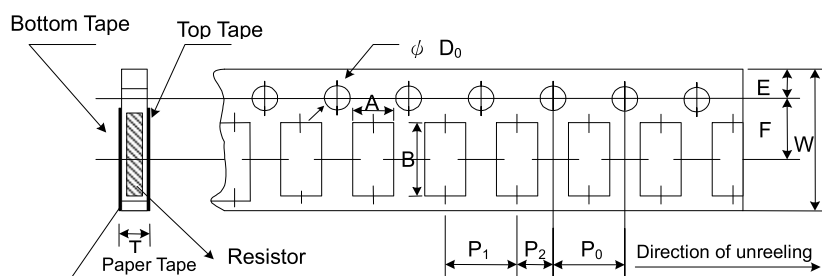
Reel Specifications & Packaging Quantity

Unit: mm

Type	Packaging Quantity	Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T	
SWRG03	Paper	5K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
SWRG05		10K	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
SWRG06		20K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
SWRG13									
SWRG10	Embossed	4K	12mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.5	13.0±0.5	15.5±0.5
SWRG12		8K	12mm	10 inch	254.0±1.0	62±0.5	13.0±0.5	12.5±0.5	16.5±0.5



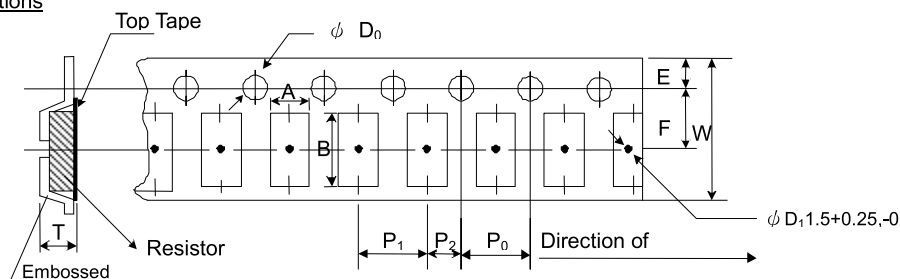
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
SWRG03	1.10±0.10	1.90±0.10	8.00±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
SWRG05	1.60±0.10	2.40±0.20	8.00±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
SWRG06	1.90±0.10	3.50±0.20	8.00±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
SWRG13	2.90±0.10	3.50±0.20	8.00±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

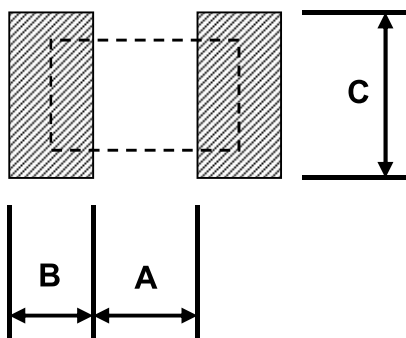


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
SWRG10	2.80±0.10	5.40±0.20	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰
SWRG12	3.50±0.10	6.70±0.10	12.0±0.30	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.1, -0	1.2 ⁺⁰

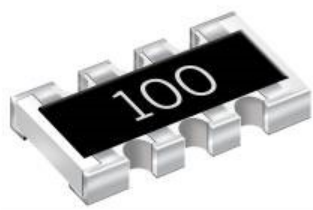
Recommend Land Pattern

Unit: mm

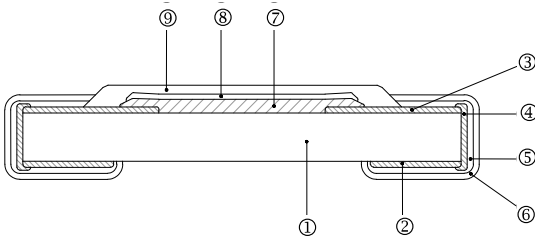


Type	A	B	C
SWRG03	0.90	0.60	0.90
SWRG05	1.20	0.70	1.30
SWRG06	2.00	0.90	1.60
SWRG13	2.00	0.90	2.80
SWRG10	3.80	0.90	2.80
SWRG12	4.90	1.00	3.40

Automotive Grade Thick Film Array Chip Resistor—CN..A Series



Construction



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

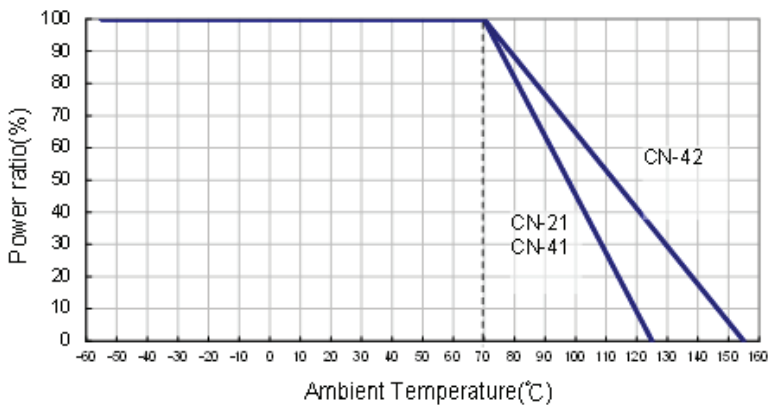
Features

- AEC-Q200 Qualified
- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality
- Special construction to prevent sulfuration in a sulfur containing environment
- Suitable for IR reflow soldering
- 100% CCD inspection
- MSL: Level 1

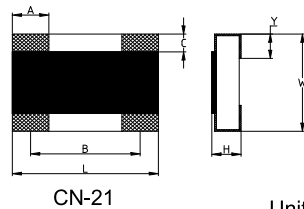
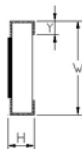
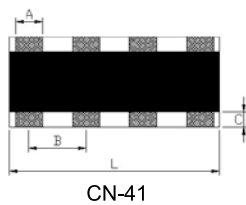
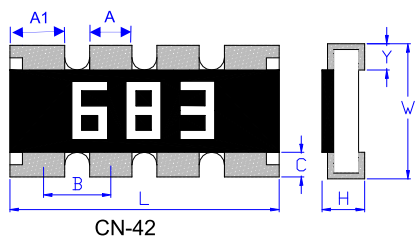
Applications

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

Derating Curve



Dimensions



Unit: mm

Type	Number of Resistors	L	W	H	A	A1	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	0.5
CN-41	4	1.40±0.10	0.60±0.10	0.35±0.10	0.20±0.10	-	0.40±0.10	0.10±0.07	0.15±0.05	0.8
CN-42	4	2.00±0.10	1.00±0.10	0.45±0.10	0.30±0.10	0.40±0.10	0.50±0.05	0.22±0.15	0.22±0.15	2.8

Part Numbering

CN-	42	J	A	6	-- -10R
Product Type	Dimensions	Resistance Tolerance	Function Code	Packaging Code	Resistance
	21: 0201x2 41: 0201x4 42: 0402x4	F: ±1% J: ±5%	A: Automotive Grade	6: 7" Reel 10Kpcs B: 10" Reel 20Kpcs C: 13" Reel 40Kpcs	--- 1R2: 1.2Ω --- 3K3: 3.3KΩ --- 10K: 10KΩ -- 100K: 100KΩ "-" to fill up 6 spaces

Standard Electrical Specifications

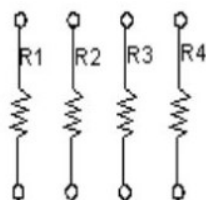
Type	Item	Power Rating / Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range		TCR (PPM/°C)
							±1%	±5%	
CN-21	1/32W	-55 ~ +125°C	12.5V	25V	2	-	3Ω - 9.1Ω		±300
							10Ω - 1MΩ		±200
	Jumper: 0.5A						-	0Ω (<50mΩ)	-
CN-41	1/32W	-55 ~ +125°C	12.5V	25V	4	-	10Ω - 1MΩ		±200
	Jumper: 0.5A						-	0Ω (<50mΩ)	-
CN-42	1/16W	-55 ~ +155°C	25V	50V	4	-	10Ω - 1MΩ	1Ω - 1MΩ	±200
	Jumper: 1A						-	0Ω (<50mΩ)	-

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

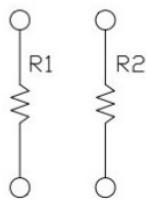
Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage Listed above, whichever is lower.

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

Equivalent Circuit Diagram

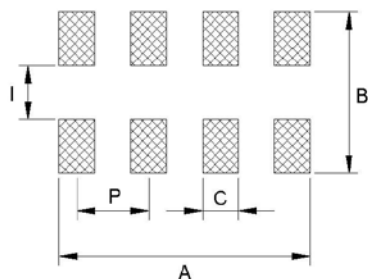


CN-41/CN-42

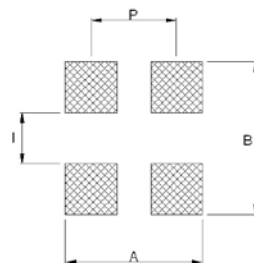


CN-21

Recommend Land Pattern



CN-41/CN-42



CN-21

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
CN-42	2.10	1.80	0.30	0.50	0.50

■ Environmental Characteristics

Item	Requirement			Test Method
	±1%	±5%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.			At 25°C/-55°C and 25°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 whichever is lower for 5 seconds
Insulation Resistance	≥10G			Max. Overload Voltage for 1 minute
Operational Life	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	1000 hrs 85°C/85%RH 10% of operating power. (≤ 100 V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω) CN-21/41: ±(3.0%+0.10Ω)	<50mΩ CN-21/41: <100mΩ	at +125/+155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 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 Max. Operating Voltage 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
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%+0.05Ω)			Human body, 2KV
Resistance to Solvents	No visible damage on appearance and marking.			Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken			Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board			V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±1%	△R±5%	<100mΩ	60±2°C, no power rating for 500 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

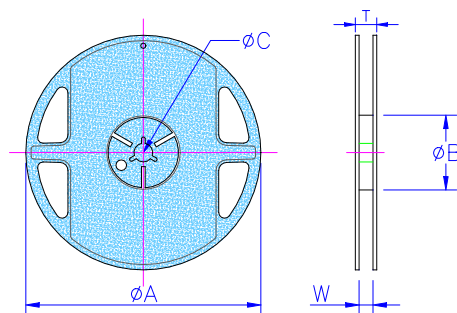
■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22;
UL-94; EIA-977

■ Storage Temperature: 15~28°C; Humidity < 80%RH

■ Shelf Life: 2 years from production date

Packaging

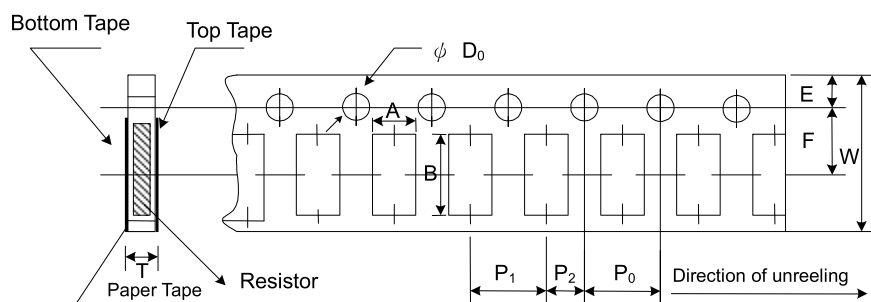
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CN-21 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
CN-42	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	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5

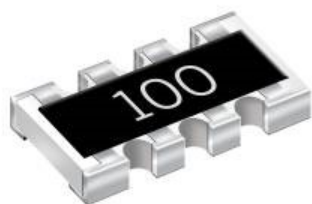
Paper Tape Specifications



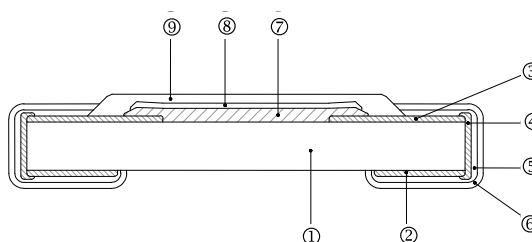
Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
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	1.50+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	1.50+0.1,-0	0.50±0.10
CN-42	1.20±0.10	2.20±0.10	8.00±0.20	1.75±0.10	3.50±0.05	4.00±0.10	2.00±0.05	2.00±0.05	1.50+0.1,-0	0.70±0.10

Automotive Grade Anti-Sulfurated Thick Film Array Chip Resistor—AS..A Series



Construction



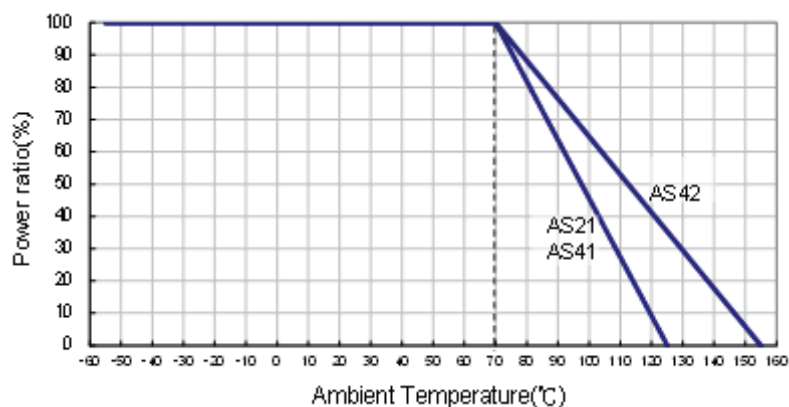
Features

- AEC-Q200 Qualified
- Special construction to prevent sulfuration in a sulfur containing environment
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality
- Suitable for IR reflow soldering
- 100% CCD inspection
- MSL: Level 1

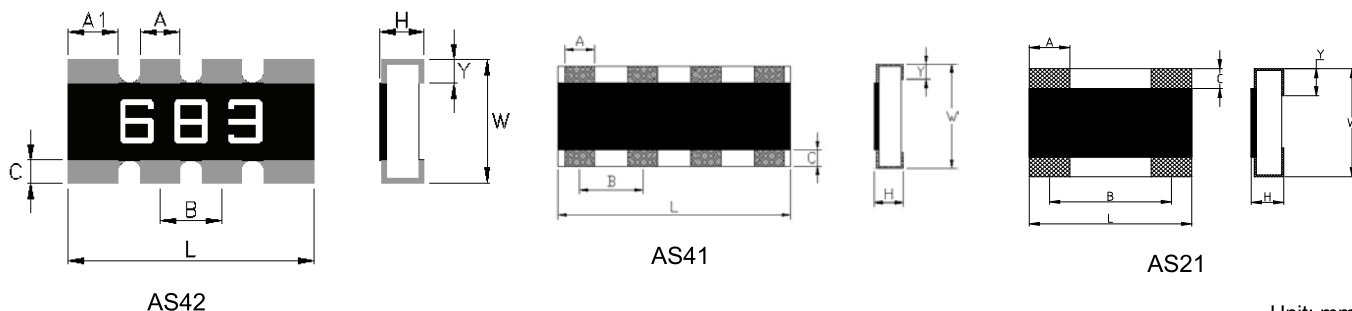
Applications

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

Derating Curve



Dimensions



Type	Number of Resistors	L	W	H	A1	A	B	C	Y	Weight (g) (1000pcs)
AS21	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	0.5
AS41	4	1.40±0.10	0.60±0.10	0.35±0.10	0.20±0.10	-	0.40±0.10	0.10±0.07	0.15±0.05	0.8
AS42	4	2.00±0.10	1.00±0.10	0.45±0.10	0.40±0.10	0.30±0.10	0.50±0.05	0.22±0.15	0.22±0.15	3.1

Part Numbering

AS	42	J	T	F	1000	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance	Marking
	21: 0201x2 41: 0201x4 42: 0402x4	F: ±1% J: ±5%	T: 7" Taping Reel V: 10" Taping Reel W: 13" Taping Reel	F: ±200	1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ	A: Automotive Grade

Standard Electrical Specifications

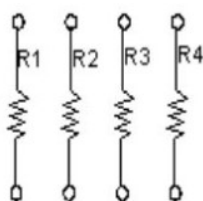
Type	Item	Power Rating / Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range		TCR (PPM/°C)
							±1%	±5%	
AS21		1/32W	-55 ~ +125°C	12.5V	25V	2	-	3Ω - 9.1Ω	±300
							10Ω - 1MΩ		±200
AS41		1/32W	-55 ~ +125°C	12.5V	25V	4	10Ω - 1MΩ		±200
AS42		1/16W	-55 ~ +155°C	25V	50V	4	10Ω - 1MΩ	1Ω - 1MΩ	±200

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

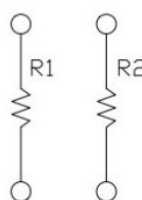
Overload Voltage= $2.5 \cdot \sqrt{(P \cdot R)}$ or Max. Overload Voltage Listed above, whichever is lower.

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

Equivalent Circuit Diagram

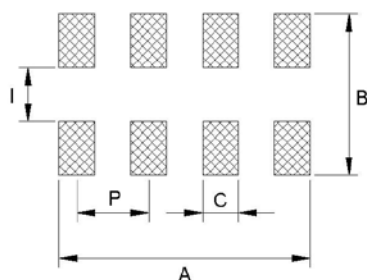


AS41/AS42

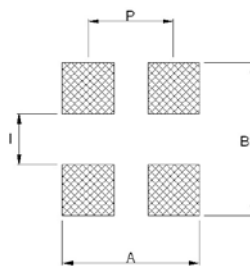


AS21

Recommend Land Pattern



AS41/AS42



AS21

Unit:mm

Type	A	B	C	I	P
AS21	0.80	0.90	--	0.30	0.50
AS41	1.40	0.90	0.20	0.30	0.40
AS42	2.10	1.80	0.30	0.50	0.50

■ Environmental Characteristics

Item	Requirement		Test Method
	±1%	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		At 25°C/-55°C and 25°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 whichever is lower for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Operational Life	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	1000 hrs 85°C/85%RH 10% of operating power (≤ 100 V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	at +125°C /+155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	Bending once for 60 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)	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage 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)	-55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	±(1.0%+0.05Ω)	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)	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(1.0%+0.05Ω)		Human body, 0.5KV
Resistance to Solvents	No visible damage on appearance and marking.		Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken		Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±1%	△R±5%	105±2°C, no power rating for 750 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

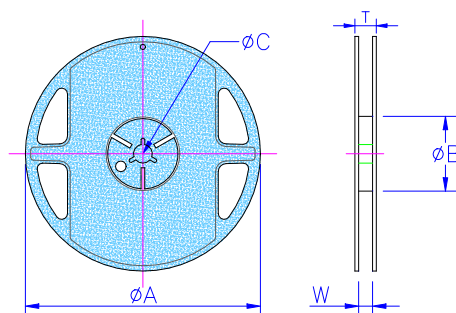
■ **Reference Standards:** IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22;
UL-94; EIA-977

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

Packaging

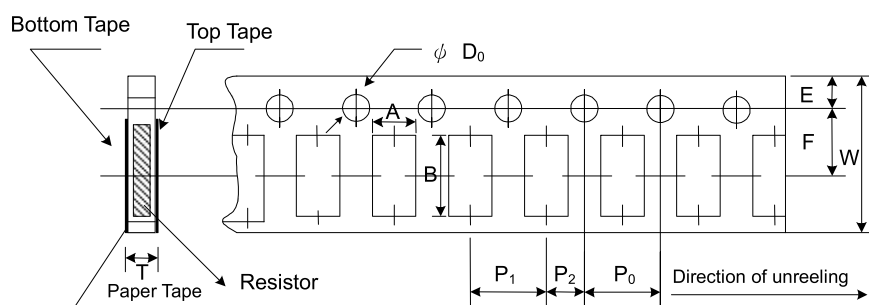
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
AS21	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
AS41	Paper	10K	8mm	7 inch	178.5±1.5	60 ^{+1/-0}	13.0±0.2	9.0±0.5	12.5±0.5
AS42	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	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		40K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5

Paper Tape Specifications

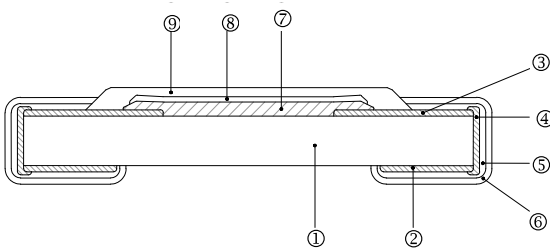
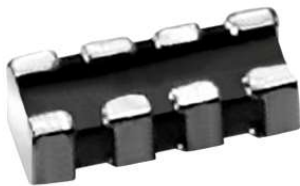


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
AS21	0.77±0.05	0.97±0.05	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.50±0.10
AS41	0.77±0.05	1.57±0.05	8.0±0.20	1.75±0.10	3.5±0.05	4.0±0.10	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.50±0.10
AS42	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	1.50+0.1,-0	0.70±0.10

Automotive Grade Anti-Sulfurated Thick Film Flat Array Chip Resistor—ASF..A Series

Construction



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

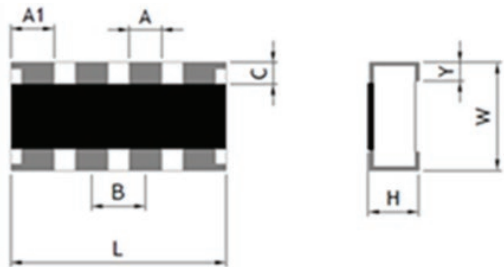
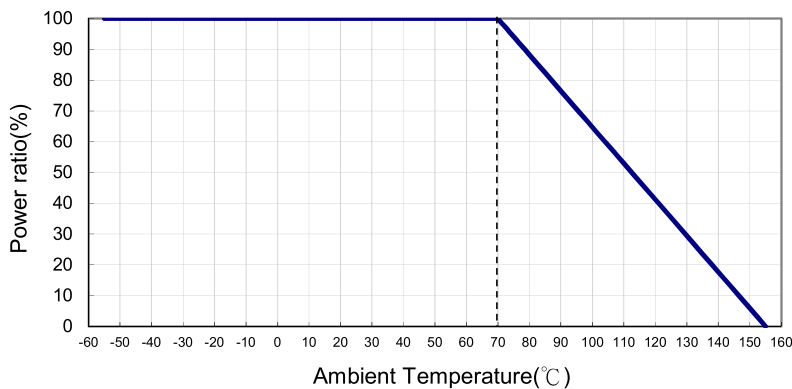
Features

- AEC-Q200 Qualified
- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality
- Suitable for IR reflow soldering
- 100% CCD inspection
- MSL: Level 1

Applications

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

Derating Curve



Unit: mm

Type	Number of Resistors	L	W	H	A	A1	B	C	Y	Weight (g) (1000pcs)
ASF42	4	2.00±0.10	1.00±0.10	0.45±0.10	0.30±0.10	0.40±0.10	0.50±0.10	0.20±0.10	0.30±0.10	3.3
ASF43	4	3.20±0.10	1.60±0.10	0.55±0.10	0.50±0.15	0.65±0.10	0.80±0.05	0.23±0.15	0.47±0.15	9.0

Part Numbering

ASF	43	F	T	F	X	1000	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	42: 0402x4 43: 0603x4	F: ±1% J: ±5% or Jumper	T: Taping Reel V: 10" Taping Reel W: 13" Taping Reel	F: ±200 -: No specified (For Jumper)	Y: 1/16W X: 1/10W	0030: 3Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ R0R0: 0Ω	A: Automotive Grade

Standard Electrical Specifications

Type	Item	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range		TCR (PPM/°C)
							±1%	±5%	
ASF42		1/16W	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 10MΩ	±200
							-	0Ω (<50mΩ)	-
ASF43		1/10W	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 10MΩ	±200
							-	0Ω (<50mΩ)	-

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

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

■ 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.			At 25°C/-55°C and 25°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 whichever is lower for 5 seconds
Insulation Resistance	≥ 10G			Max. Overload Voltage for 1 minute
Operational Life	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	1000 hrs 85°C/85%RH 10% of operating power (≤ 100V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 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 Max. Operating Voltage 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
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	±(3.0%+0.05Ω)			Human body model ASF42: 0.5KV ASF43: 1KV
Resistance to Solvents	No visible damage on appearance and marking.			Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.

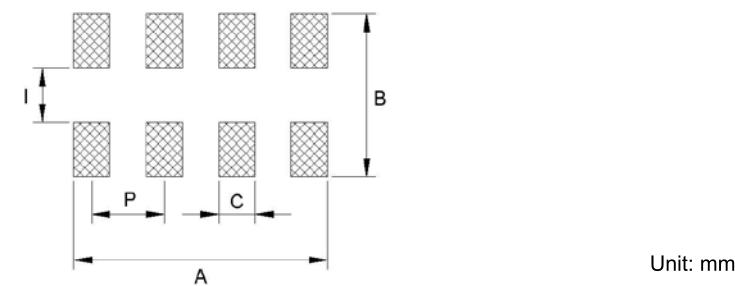
Item	Requirement			Test Method
	±1%	±5%	Jumper	
Terminal Strength	No broken			Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board			V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	$\Delta R \pm 1\%$	$\Delta R \pm 5\%$	$< 50m\Omega$	$105 \pm 2^{\circ}\text{C}$, no power rating for 750 hrs.

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \times R)}$ or Max. Operating Voltage whichever is lower.

■ **Reference Standards:** IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

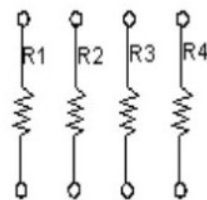
■ **Storage Temperature:** 15~28°C; **Humidity** < 80%RH
 ■ **Shelf Life:** 2 years from production date

■Recommend Land Pattern



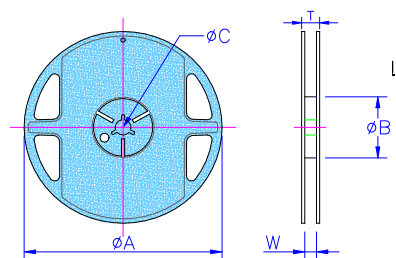
Type	A	B	C	I	P
ASF42	2.10	1.80	0.30	0.50	0.50
ASF43	3.10	2.85	0.45	0.80	0.80

■Equivalent Circuit Diagram

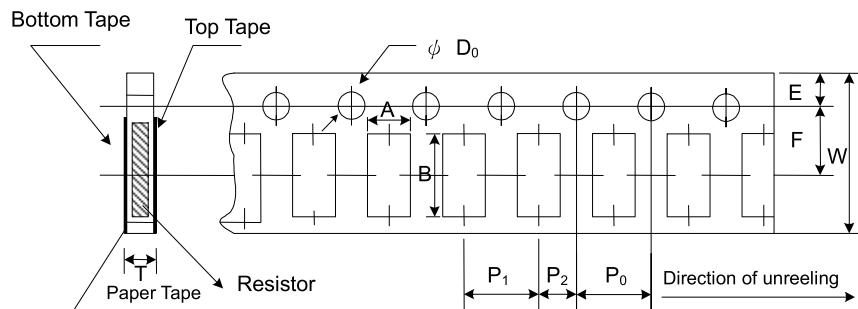


■Packaging

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
ASF42 ASF43	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	10K	8mm	10 inch	254.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
	Paper	20K	8mm	13 inch	330.0±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5



Paper Tape Specifications

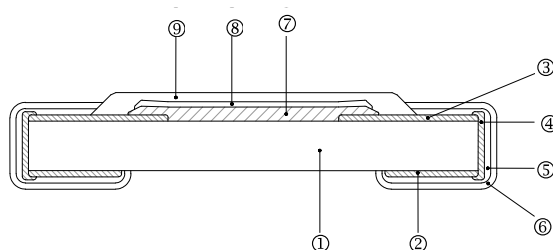
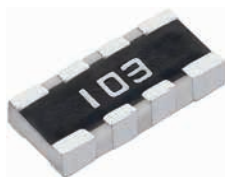


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
ASF42	1.20±0.1	2.20±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	2.0±0.05	2.0±0.05	1.50+0.1,-0	0.70±0.1
ASF43	1.95±0.1	3.50±0.1	8.0±0.2	1.75±0.1	3.5±0.05	4.0±0.1	4.0±0.05	2.0±0.05	1.50+0.1,-0	0.85±0.1

Automotive Grade Thick Film Flat Array Chip Resistor – CNF..A Series

Construction



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

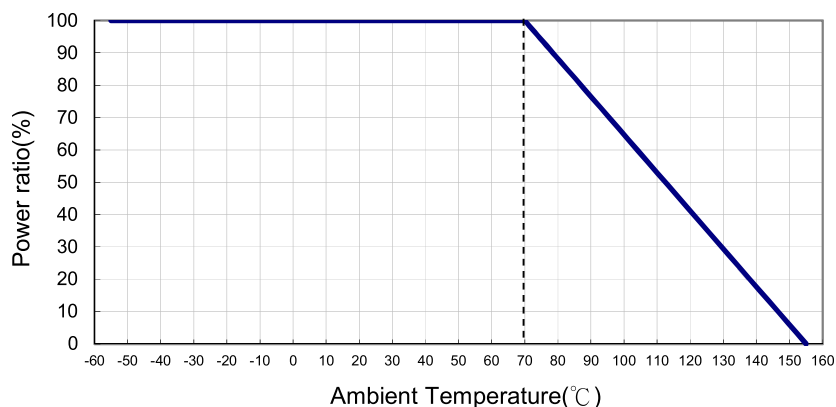
Features

- AEC-Q200 Qualified
- Small size and light weight
- Reduction of assembly costs and matching with placement machines
- Reliability, high quality
- Suitable for IR reflow soldering
- 100% CCD inspection
- MSL: Level 1

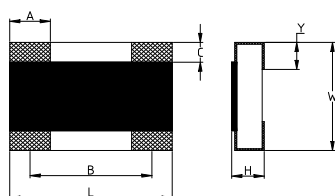
Applications

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

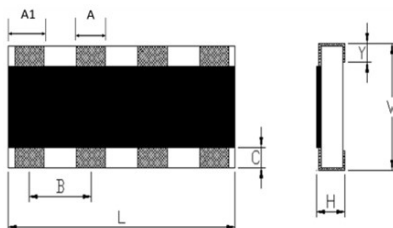
Derating Curve



Dimensions



CNF22



CNF42/43

Unit: mm

Type	Number of Resistors	L	W	H	A	A1	B	C	Y	Weight (g) (1000pcs)
CNF22	2	1.25±0.10	1.00±0.10	0.35±0.10	0.43±0.10	-	0.82±0.05	0.18±0.15	0.30±0.10	1.6
CNF42	4	2.00±0.10	1.00±0.10	0.45±0.10	0.30±0.10	0.40±0.10	0.50±0.10	0.20±0.10	0.30±0.10	3.3
CNF43	4	3.20±0.10	1.60±0.15	0.55±0.10	0.50±0.15	0.65±0.10	0.80±0.05	0.23±0.15	0.40±0.10	9.0

Part Numbering

CNF	22	F	T	F	Y	1000	A
Product Type	Dimensions	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance	Marking
	22: 0402x2 42: 0402x4 43: 0603x4	F: ±1% J: ±5% or Jumper	T: Taping Reel	F: ±200 -: No specified (For Jumper)	Y: 1/16W X: 1/10W W: 1/8W	0030: 3Ω 1000: 100Ω 1002: 10KΩ 2201: 2.2KΩ 1003: 100KΩ 1004: 1MΩ R0R0: 0Ω	A: Automotive Grade

Standard Electrical Specifications

Type	Item	Power Rating at 70°C Jumper Rated Current	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Number of Resistors	Resistance Range		TCR (PPM/°C)
							±1%	±5%	
CNF22	1/16W	Jumper: 1A	-55 ~ +155°C	25V	50V	2	1Ω - 1MΩ		±200
	Jumper: 1A						-	0Ω (<50mΩ)	-
CNF42	1/16W	Jumper: 1A	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 10MΩ	±200
	Jumper: 1A						-	0Ω (<50mΩ)	-
CNF43	1/10W 1/8W	Jumper: 1A	-55 ~ +155°C	50V	100V	4	10Ω - 1MΩ	1Ω - 10MΩ	±200
	Jumper: 1A						-	0Ω (<50mΩ)	-

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

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

■ 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.			At 25°C/-55°C and 25°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 whichever is lower for 5 seconds
Insulation Resistance	≥ 10G			Max. Overload Voltage for 1 minute
Operational Life	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(2.0%+0.10Ω)	±(3.0%+0.10Ω)	<100mΩ	1000 hrs 85°C/85%RH 10% of operating power(≤ 100V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.5%+0.10Ω)	<50mΩ	at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	<50mΩ	Bending once for 60 seconds with 3mm

Item	Requirement			Test Method
	±1%	±5%	Jumper	
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 Max. Operating Voltage 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
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	±(3.0%+0.05Ω)			Human body model CNF22/CNF42: 0.5KV CNF43: 1KV
Resistance to Solvents	No visible damage on appearance and marking.			Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken			Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board			V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±1%	△R±5%	<100mΩ	60±2°C, no power rating for 500 hrs.

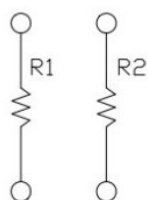
RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ **Reference Standards:** IEC60115-1, 60068-2-58; JIS-C 5201-1; EIA-977; AEC-Q200; MIL-STD-202; JESD22; UL-94

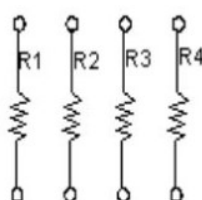
■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

■ **Shelf Life:** 2 years from production date

■ Equivalent Circuit Diagram



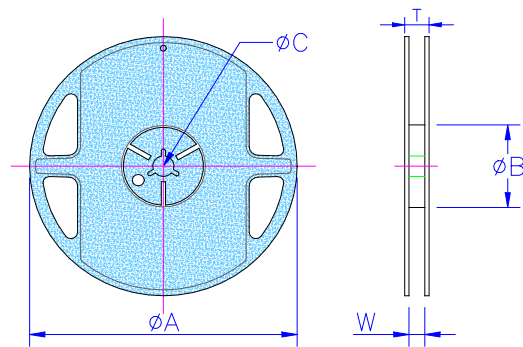
CNF22



CNF42/43

■ Packaging

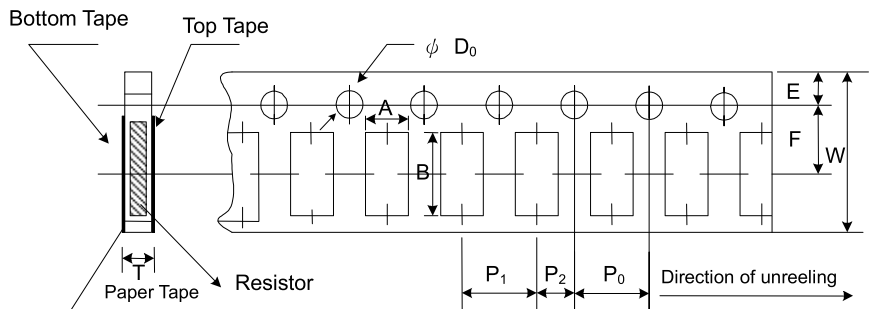
Reel Specifications & Packaging Quantity



Unit: mm

Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA	ΦB	ΦC	W	T
CNF22	Paper	10K	8mm	7 inch	178.5 ± 1.5	$60^{+1/-0}$	13.0 ± 0.2	9.0 ± 0.5	12.5 ± 0.5
CNF42	Paper	10K	8mm	7 inch	178.5 ± 1.5	$60^{+1/-0}$	13.0 ± 0.2	9.0 ± 0.5	12.5 ± 0.5
CNF43	Paper	5K	8mm	7 inch	178.5 ± 1.5	$60^{+1/-0}$	13.0 ± 0.2	9.0 ± 0.5	12.5 ± 0.5

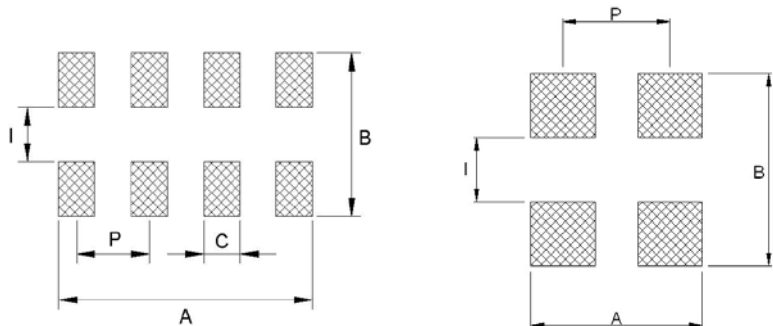
Paper Tape Specifications



Unit: mm

Type	A	B	W	E	F	P_0	P_1	P_2	ΦD_0	T
CNF22	1.20 ± 0.1	1.45 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	2.0 ± 0.05	$1.50 \pm 0.1, -0$	0.43 ± 0.1
CNF42	1.20 ± 0.1	2.20 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	2.0 ± 0.05	$1.50 \pm 0.1, -0$	0.70 ± 0.1
CNF43	1.95 ± 0.1	3.50 ± 0.1	8.0 ± 0.2	1.75 ± 0.1	3.5 ± 0.05	4.0 ± 0.1	4.0 ± 0.05	2.0 ± 0.05	$1.50 \pm 0.1, -0$	0.85 ± 0.1

■ Recommend Land Pattern



CNF42/CNF43

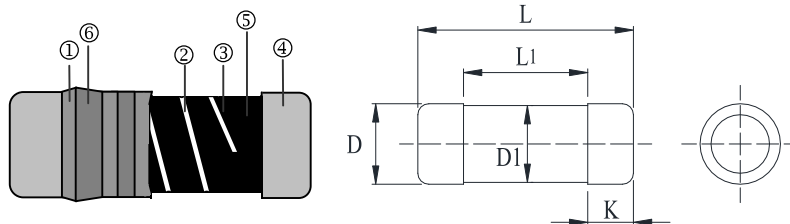
CNF22

Unit: mm

Type	A	B	C	I	P
CNF22	1.50	1.25	-	0.35	0.80
CNF42	2.10	1.80	0.30	0.50	0.50
CNF43	3.10	2.85	0.45	0.80	0.80

Automotive Grade Metal Film Precision MELF Resistor—CSRA Series

Construction



Features

- AEC-Q200 Qualified
- Thin film technology
- Excellent overall stability
- Sn termination on Ni barrier layer
- Tight tolerance down to $\pm 0.1\%$
- Extremely low TCR down to $\pm 5 \text{ PPM}/^\circ\text{C}$
- High power rating up to 1 Watts
- SMD enabled structure
- Lead-free and RoHS compliant
- Sulfur resistance unaffected by sulfur environments
- MSL: Level 1

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

Dimensions

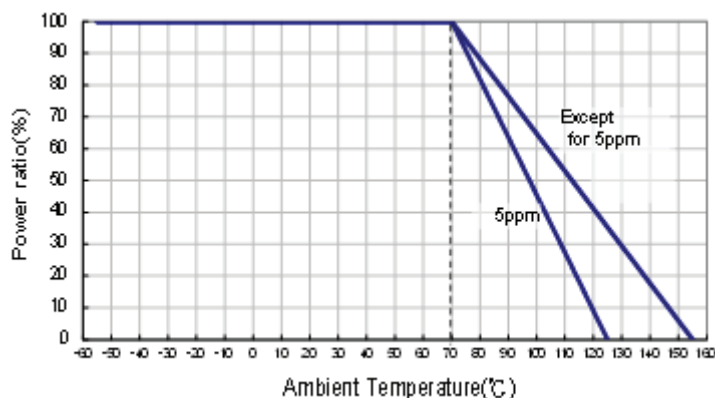
Unit: mm

Type	L	L ₁ min.	ΦD	ΦD ₁	K	Weight (g) (1000pcs)
CSRA0102	2.20±0.10	1.1	1.10±0.10	D +0/-0.15	0.45±0.05	7.7
CSRA0204	3.50±0.20	1.7	1.40±0.15	D +0/-0.2	0.8±0.1	18.7
CSRA0207	5.90±0.20	2.9	2.20±0.20	D +0/-0.2	1.3±0.1	80.9

Applications

- Automotive (non-safety parts)
- Industrial
- Telecommunication

Derating Curve



Part Numbering

CSRA	0204	D	T	D	V	1000
Product Type	Dimensions (L×ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0102: 2.2x1.1 0204: 3.5x1.4 0207: 5.9x2.2	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$ or Jumper	T: 7" Taping Reel S: 7" Taping Reel, Antistatic Tape W: 13" Taping Reel M: 13" Taping Reel, Antistatic Tape	S: ± 5 B: ± 10 N: ± 15 C: ± 25 D: ± 50 E: ± 100 - : Jumper	T: 1W U: 1/2W V: 1/4W G: 2/5W P: 1/5W L: 3/10W	0100: 10Ω 1000: 100Ω 2201: 2.2KΩ 1001: 1KΩ 1004: 1MΩ R0R0: 0Ω R050: 0.05Ω 22R1: 22.1Ω

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%	
0102	1/5W	-55 ~ +155°C	200V	400V	49.9Ω-56KΩ				-	±15
					100Ω-82KΩ		4.02Ω- 200KΩ	4.02Ω- 390KΩ	-	±25
					-		1Ω-1MΩ	0.22Ω-1MΩ		±50
					-			0.22Ω-1MΩ		±100
0204	1/4W	-55 ~ +125°C	200V	400V	10Ω-332KΩ		-			±5
		-55 ~ +155°C	200V	400V	10Ω-332KΩ				-	±10
					10Ω-332KΩ		4.02Ω-332KΩ		-	±15
					10Ω-1MΩ		4.02Ω-3.4MΩ	1Ω-3.4MΩ		±25
					10Ω-1MΩ		1Ω-3.4MΩ	0.2Ω-10MΩ		±50
					-			0.1Ω-10MΩ		±100
0207	1/2W	-55 ~ +125°C	300V	600V	10Ω-332KΩ		-			±5
		-55 ~ +155°C	300V	600V	10Ω-332KΩ				-	±10
					10Ω-332KΩ		4.02Ω-332KΩ		-	±15
					10Ω-1MΩ		4.02Ω-3.4MΩ	1Ω-3.4MΩ		±25
					10Ω-1MΩ		1Ω-3.4MΩ	0.2Ω-10MΩ		±50
					-			0.1Ω-10MΩ		±100

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%	
0102	3/10W	-55 ~ +155°C	200V	400V	49.9Ω-56KΩ				-	±15
					100Ω-82KΩ		4.02Ω- 200KΩ	4.02Ω- 390KΩ	-	±25
					-		1Ω-1MΩ	0.22Ω-1MΩ		±50
					-			0.22Ω-1MΩ	±100	
0204	2/5W	-55 ~ +125°C	200V	400V	10Ω-332KΩ		-			±5
		-55 ~ +155°C	200V	400V	10Ω-332KΩ				-	±10
					10Ω-332KΩ		4.02Ω-332KΩ		-	±15
					10Ω-1MΩ		4.02Ω-3.4MΩ	1Ω-3.4MΩ		±25
					10Ω-1MΩ		1Ω-3.4MΩ	0.2Ω-10MΩ		±50
					-			0.1Ω-10MΩ	±100	
0207	1W	-55 ~ +125°C	350V	700V	10Ω-332KΩ		-			±5
		-55 ~ +155°C	350V	700V	10Ω-332KΩ				-	±10
					10Ω-332KΩ		4.02Ω-332KΩ		-	±15
					10Ω-1MΩ		4.02Ω-3.4MΩ	1Ω-3.4MΩ		±25
					10Ω-1MΩ		1Ω-3.4MΩ	0.2Ω-10MΩ		±50
					-			0.1Ω-10MΩ	±100	

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

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

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

Jumper Specifications

Item Type	Power Rating	Operating Temp.Range	Resistance	Rated Current
CSRA0102	1/5W	-55 ~ +155°C	0Ω(<15mΩ)	2A
	3/10W			
CSRA0204	1/4W	-55 ~ +155°C		3A
	2/5W			
CSRA0207	1/2W	-55 ~ +155°C		5A
	1W			

Environmental Characteristics(Tol. >0.1%)

Item	Requirement		Test Method
	Tol. >0.1%	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature 5ppm: At 25°C/-10°C and 25°C/+85°C, 25°C is the reference temperature
Short Time Overload	10Ω-332KΩ: ±(0.1%+0.01Ω) <10Ω & >332KΩ: ±(0.15%+0.01Ω) 0102: ±(0.15%+0.01Ω) 5ppm: ±(0.05%+0.01Ω)	<15mΩ	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Operational Life (Endurance)	10Ω-332KΩ: ±(0.25%+0.01Ω) <10Ω & >332KΩ: ±(0.5%+0.01Ω) 0102: ±(0.5%+0.01Ω)	<15mΩ	Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion. 5ppm: 70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	≤332KΩ: ±(0.25%+0.01Ω) >332KΩ: ±(1%+0.01Ω) 0102: ±(1%+0.01Ω)	<15mΩ	1344 hrs 85°C/85%RH 10% of operating power. (≤100V)
High Temperature Exposure	≤332KΩ: ±(0.25%+0.01Ω) >332KΩ: ±(0.5%+0.01Ω) 0102: ±(1%+0.01Ω)	<15mΩ	at +125°C/+155°C for 1000 hrs
Board Flex	10Ω-332KΩ: ±(0.1%+0.01Ω) <10Ω & >332KΩ: ±(0.2%+0.01Ω) 0102: ±(0.5%+0.01Ω)	<15mΩ	Bending once for 60 seconds with 2mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	10Ω-332KΩ: ±(0.1%+0.01Ω) <10Ω & >332KΩ: ±(0.25%+0.01Ω) 0102(≥1Ω): ±(0.25%+0.01Ω) 0102(<1Ω): ±(0.50%+0.01Ω) 5ppm: ±(0.05%+0.01Ω)	<15mΩ	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤10%		260±5°C for 30 seconds
Temperature Cycling	≤332KΩ: ±(0.15%+0.01Ω) >332KΩ: ±(0.25%+0.01Ω) 0102: ±(1%+0.01Ω)	<15mΩ	-55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.01Ω)	<15mΩ	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.01Ω)	<15mΩ	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(0.5%+0.01Ω)	<15mΩ	Human body, 0102/0204:2KV; 0207:4KV
Resistance to solvents	No visible damage on appearance and marking.		Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal strength	No broken		Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.

■ Environmental Characteristics(Tol. ≤0.1%)

Item	Requirement		Test Method
	Tol. ≤0.1%		
	Standard	High Power	
Temperature Coefficient of Resistance (T.C.R.)	As Spec		At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature 5ppm: At 25°C/-10°C and 25°C/+85°C, 25°C is the reference temperature
Short Time Overload	10Ω-332KΩ: ±(0.05%+0.01Ω) >332KΩ-1MΩ: ±(0.1%+0.01Ω) 0102: ±(0.15%+0.01Ω)	10Ω-332KΩ: ±(0.1%+0.01Ω) >332KΩ: ±(0.15%+0.01Ω) 0102: ±(0.15%+0.01Ω)	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G		Max. Overload Voltage for 1 minute
Endurance	10Ω-332KΩ: ±(0.1%+0.01Ω) >332KΩ-1MΩ: ±(0.25%+0.01Ω) 0102: ±(0.15%+0.01Ω)	10Ω-332KΩ: ±(0.25%+0.01Ω) >332KΩ: ±(0.5%+0.01Ω) 0102: ±(0.5%+0.01Ω)	70±2°C, RCWV for 1000 hrs with 1.5 hrs “ON” and 0.5 hr “OFF”
Biased Humidity	10Ω-332KΩ: ±(0.2%+0.01Ω) >332KΩ-1MΩ: ±(0.5%+0.01Ω) 0102: ±(1%+0.01Ω)	10Ω-332KΩ: ±(0.25%+0.01Ω) >332KΩ: ±(1%+0.01Ω) 0102: ±(1%+0.01Ω)	1000 hrs 85°C/85%RH 10% of operating power. (≤100V)
High Temperature Exposure	10Ω-332KΩ: ±(0.25%+0.01Ω) >332KΩ-1MΩ: ±(0.3%+0.01Ω) 0102: ±(1%+0.01Ω)	10Ω-332KΩ: ±(0.25%+0.01Ω) >332KΩ: ±(0.5%+0.01Ω) 0102: ±(1%+0.01Ω)	at +125°C/+155°C for 1000 hrs
Board Flex	10Ω-332KΩ: ±(0.1%+0.01Ω) <10Ω & >332KΩ: ±(0.2%+0.01Ω) 0102: ±(0.5%+0.01Ω)		Bending once for 60 seconds with 2mm
Solderability	95% min. coverage		245±5°C for 3 seconds
Resistance to Soldering Heat	10Ω-332KΩ: ±(0.1%+0.01Ω) <10Ω & >332KΩ: ±(0.25%+0.01Ω) 0102: ±(0.25%+0.01Ω)		260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤ 10%		260±5°C for 30 seconds
Temperature Cycling	≤332KΩ: ±(0.15%+0.01Ω) >332KΩ: ±(0.25%+0.01Ω) 0102: ±(1%+0.01Ω)		-55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.01Ω)		Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(0.5%+0.01Ω)		5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(0.5%+0.01Ω)		Human body, 0102/0204:2KV; 0207:4KV
Resistance to solvents	No visible damage on appearance and marking.		Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal strength	No broken		Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		V-0 or V-1 are acceptable. Electrical test not required.

RCWV(Rated Continuous Working voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL94

■ Storage Temperature: 15~28°C; Humidity < 80%RH

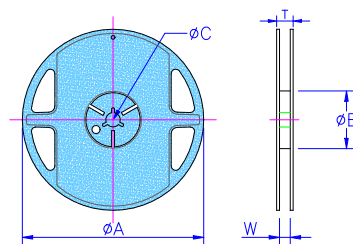
■ Shelf Life: 2 years from production date

Packaging

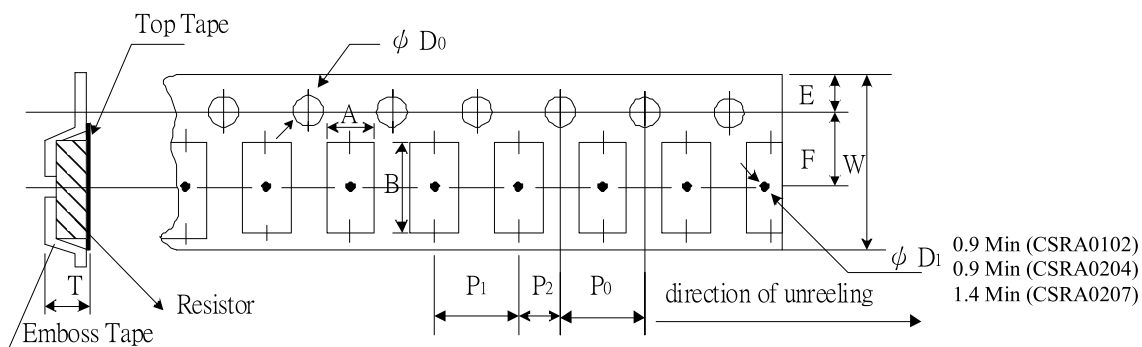
Packaging Quantity & Reel Specifications

Unit : mm

Type	Reel Diameter	ΦA	ΦB	ΦC	W	T	Emboss Plastic Tape (EA)
CSRA0102	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	10,000
CSRA0204	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	10,000
CSRA0207	7 inch	178.5±1.5	60.0+1.0	13.0±0.5	13.0±0.5	15.5±0.5	2,000
	13 inch	330±1.0	99±0.5	13.0±0.5	13.4±1.0	17.8±1.0	6,000



Emboss Plastic Tape Specifications

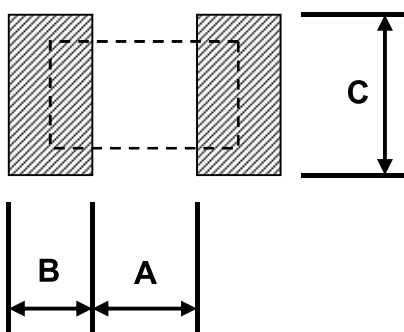


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD_0	T
CSRA0102	1.30±0.20	2.40±0.20	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.50±0.10
CSRA0204	1.55±0.20	3.65±0.20	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.80±0.10
CSRA0207	2.40±0.10	6.15±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	2.70±0.10

Recommend Land Pattern

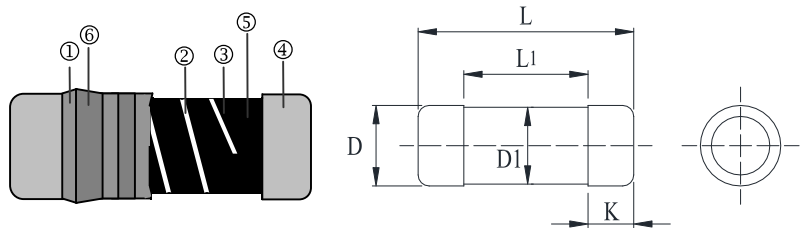
Unit: mm



Type	A	B	C
CSRA0102	1.0	0.8	1.5
CSRA0204	1.6	1.2	1.6
CSRA0207	3.0	1.7	2.4

Automotive Grade Metal Film Precision High Voltage MELF Resistor—CSRP Series

Construction



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

Features

- AEC-Q200 Qualified
- Thin film technology
- High voltage application
- Sn termination on Ni barrier layer
- Tight tolerance down to $\pm 0.1\%$
- High power rating up to 1 Watts
- SMD enabled structure
- Lead-free and RoHS compliant
- Sulfur resistance unaffected by sulfur environments
- MSL: Level 1

Dimensions

Unit: mm

Type	L	L ₁ min.	ΦD	ΦD ₁	K	Weight (g) (1000pcs)
CSRP0204	3.50±0.20	1.7	1.40±0.15	D +0/-0.2	0.80±0.10	18.7
CSRP0207	5.90±0.20	2.9	2.20±0.20	D +0/-0.2	1.30±0.10	80.9

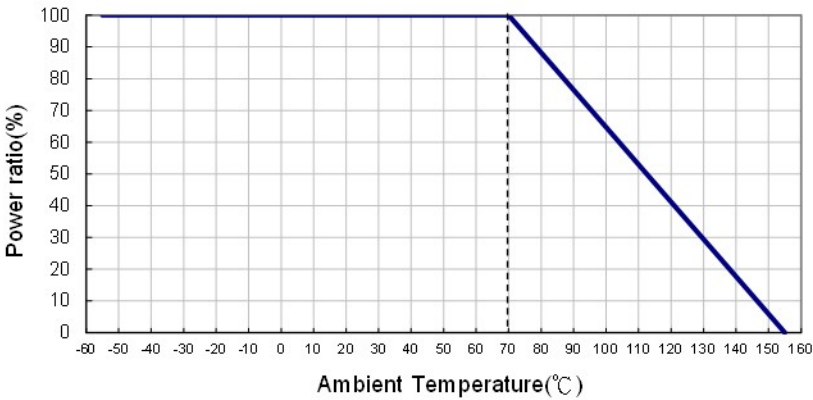
Applications

- Industrial
- Telecommunication
- Medical Equipment

Part Numbering

CSRP	0204	D	T	D	V	1004
Product Type	Dimensions (L×ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0204: 3.5×1.4 0207: 5.9×2.2	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$	T: Taping Reel S: 7" Taping Reel, Antistatic Tape W: 13" Taping Reel M: 13" Taping Reel, Antistatic Tape	C: ± 25 D: ± 50	T: 1W G: 2/5W	3403: 340KΩ 1004: 1MΩ Letter "R" is a decimal point

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%	
0204	2/5W	-55 ~ +155°C	700V	1400V	100KΩ-1MΩ		100KΩ-3.4MΩ		±25
					100KΩ-1MΩ		100KΩ-3.4MΩ	100KΩ-10MΩ	±50
0207	1W	-55 ~ +155°C	1200V	2400V	100KΩ-1MΩ		100KΩ-3.4MΩ		±25
					100KΩ-1MΩ		100KΩ-3.4MΩ	100KΩ-10MΩ	±50

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

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

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.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(0.15\%+0.01\Omega)$	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$	Max. Overload Voltage for 1 minute
Endurance	$\leq 332K\Omega$: $\pm(0.25\%+0.01\Omega)$ $> 332K\Omega$: $\pm(0.5\%+0.01\Omega)$	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	$\leq 332K\Omega$: $\pm(0.25\%+0.01\Omega)$ $> 332K\Omega$: $\pm(1\%+0.01\Omega)$	1344 hrs 85°C/85%RH 10% of operating power. ($\leq 100V$)
High Temperature Exposure	$\leq 332K\Omega$: $\pm(0.25\%+0.01\Omega)$ $> 332K\Omega$: $\pm(0.5\%+0.01\Omega)$	at +155°C for 1000 hrs
Board Flex	$\pm(0.2\%+0.01\Omega)$	Bending once for 60 seconds with 2mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(0.25\%+0.01\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260±5°C for 30 seconds
Temperature Cycling	$\leq 332K\Omega$: $\pm(0.15\%+0.01\Omega)$ $> 332K\Omega$: $\pm(0.25\%+0.01\Omega)$	-55°C to +125°C, 1000 cycles
Resistance to Solvents	No visible damage on appearance and marking.	Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Mechanical Shock	$\pm(0.25\%+0.01\Omega)$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.

Item	Requirement	Test Method
Vibration	$\pm(0.5\%+0.01\Omega)$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(0.5\%+0.01\Omega)$	Human body, 0204:2KV; 0207:4KV
Terminal Strength	No broken	Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.

RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.

■ **Reference Standards:** IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ **Storage Temperature:** 15~28°C; Humidity < 80%RH

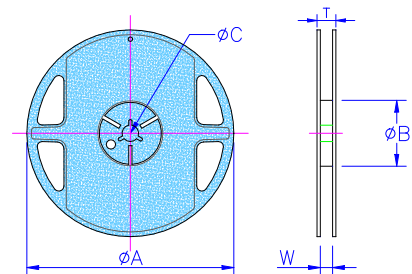
■ **Shelf Life:** 2 years from production date

■ Packaging

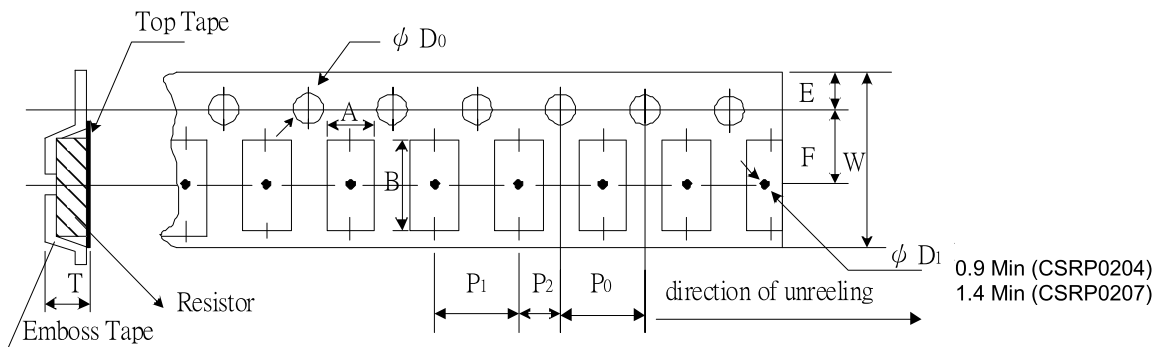
Packaging Quantity & Reel Specifications

Unit: mm

Type	Reel Diameter	ΦA	ΦB	ΦC	W	T	Emboss Plastic Tape (EA)
CSRP0204	7 inch	178.5±1.5	60.0+1.0	13.0±0.2	9.0±0.5	12.5±0.5	3,000
	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5	10,000
CSRP0207	7 inch	178.5±1.5	60.0+1.0	13.0±0.5	13.0±0.5	15.5±0.5	2,000
	13 inch	330±1.0	99±0.5	13.5±0.5	13.4±1.0	17.8±1.0	6,000



Emboss Plastic Tape Specifications

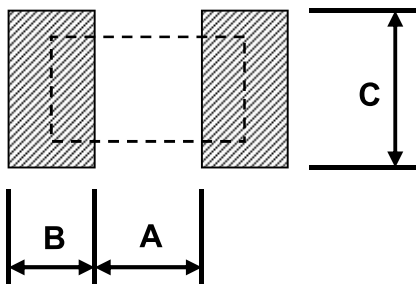


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSRP0204	1.55±0.10	3.65±0.20	8.0±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	1.80±0.10
CSRP0207	2.40±0.10	6.15±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50+0.10	2.70±0.10

■ Recommend Land Pattern

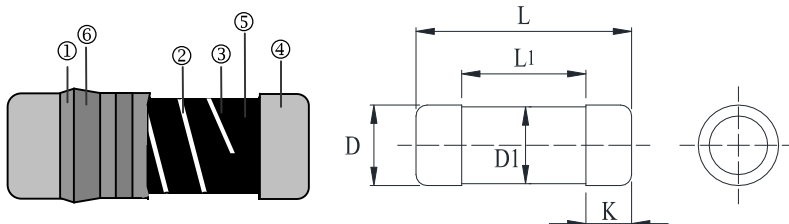
Unit: mm



Type	A	B	C
CSRP0204	1.6	1.2	1.6
CSRP0207	3.0	1.7	2.4

Automotive Grade Surge Withstanding Carbon Film MELF Resistor – CSRC Series

Construction



Features

- AEC-Q200 Qualified
- Carbon film technology
- High Surge voltage
- High power rating
- Excellent surge withstanding performance
- SMD enabled structure
- Lead-free and RoHS compliant
- MSL: Level 1

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

Dimensions

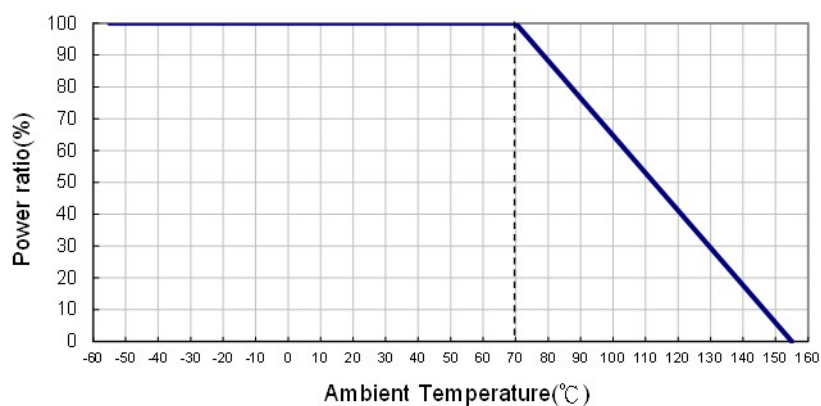
Unit: mm

Type	L	L ₁ min.	ΦD	ΦD ₁	K	Weight (g) (1000pcs)
CSRC0207	5.90±0.20	2.9	2.20±0.20	D +0/-0.2	1.30±0.10	80.9
CSRC0411	10.5±0.50	6	4.00±0.50	D+0.05/-0.45	1.90±0.30	529

Part Numbering

CSRC	0207	J	T	G	T	4R70
Product Type	Dimensions (L×ΦD)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	0207: 5.9x2.2 0411: 10.5x4.0	F: ±1% G: ±2% J: ±5%	T: Taping Reel S: 7" Taping Reel, Antistatic Tape W: 13" Taping Reel M: 13" Taping Reel, Antistatic Tape	G: ±300 J: ±600	T: 1W R: 3W	4R70: 4.7Ω 0100: 10Ω 1200: 120Ω 1001: 1KΩ 1004: 1MΩ Letter "R" is a decimal point

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%	±2%	±5%	
0207	1W	-55 ~ +155°C	600V	1200V	2.7Ω-100KΩ			±300
					>100KΩ-1.5MΩ			±600
0411	3W	-55 ~ +155°C	800V	1600V	3Ω~4.3KΩ	-	2Ω~4.3KΩ	±300
					>4.3KΩ~10MΩ	-	>4.3KΩ~10MΩ	±600

Operating Voltage= $\sqrt{P \cdot R}$ or Max. Operating Voltage Listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$ or Max. Overload Voltage Listed above, whichever is lower.

■ 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.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	$\pm(2\%+0.1\Omega)$	RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	$\geq 10G$	Max. Overload Voltage for 1 minute
Endurance	$\pm(5\%+0.05\Omega)$	70±2°C, RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Biased Humidity	$\pm(5\%+0.10\Omega)$	1000hrs 85°C/85%RH 10% of operating power. ($\leq 100V$)
Damp Heat with Load	$\pm(5\%+0.10\Omega)$	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
High Temperature Exposure	$\pm(2.5\%+0.05\Omega)$	at +155°C for 1000 hrs
Board Flex	$\pm(0.5\%+0.1\Omega)$	Bending once for 60 seconds with 2mm
Solderability	95% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	$\pm(1\%+0.1\Omega)$	260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover	1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area $\leq 5\%$ Total leaching area $\leq 10\%$	260±5°C for 30 seconds
Temperature Cycling	$\pm(2\%+0.1\Omega)$	-55°C to +125°C, 1000 cycles
Resistance to Solvents	No visible damage on appearance and marking.	Add aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.

Item	Requirement	Test Method
Mechanical Shock	$\pm(0.5\%+0.1\Omega)$	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	$\pm(0.5\%+0.1\Omega)$	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	$\pm(0.5\%+0.1\Omega)$	Human body model: 2KV
Terminal Strength	No broken	Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching of the pinewood board	V-0 or V-1 are acceptable. Electrical test not required.

RCWV(Rated Continuous Working Voltage)= $\sqrt{(P \cdot R)}$ or Max. Operating Voltage whichever is lower.

■ Reference Standards: IEC 60115-1, 60068-2-58; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94

■ Storage Temperature: 15~28°C; Humidity < 80%RH

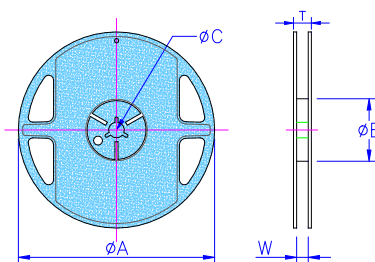
■ Shelf Life: 2 years from production date

■ Packaging

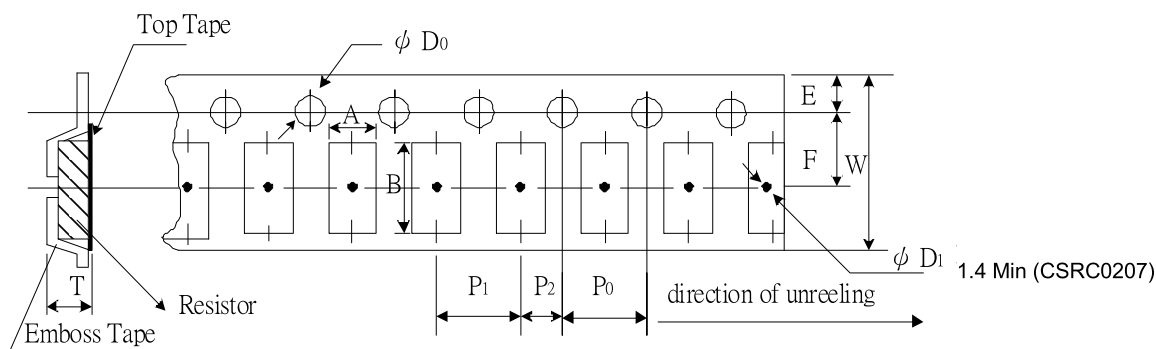
Packaging Quantity & Reel Specifications

Unit: mm

Type	Reel Diameter	ΦA	ΦB	ΦC	W	T	Emboss Plastic Tape (EA)
CSRC0207	7 inch	178.5±1.5	60.0±1.0	13.0±0.5	13.0±0.5	15.5±0.5	2,000
CSRC0411	13 inch	330.0±2.0	100±1.0	13.0±0.5	25.4±1.0	29.4±1.0	1,500



Emboss Plastic Tape Specifications

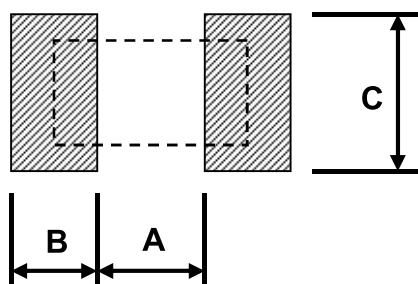


Unit: mm

Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
CSRC0207	2.40±0.10	6.15±0.10	12.0±0.10	1.75±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	1.50±0.10	2.70±0.10
CSRC0411	4.45±0.10	11.0±0.10	24.0±0.30	1.75±0.10	11.50±0.10	4.00±0.10	8.00±0.10	2.00±0.05	1.50±0.10	5.50 max.

■ Recommend Land Pattern

Unit: mm

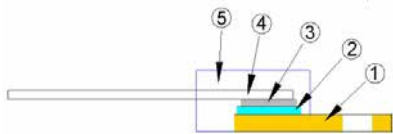


Type	A	B	C
CSRC0207	3.0	1.7	2.4
CSRC0411	5.8	4.0	5.0

Automotive Grade TO-220 Power Resistor—TR50-RF..A Series



Construction



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

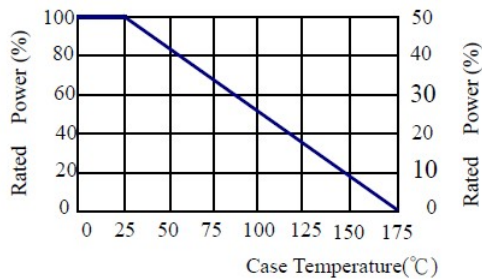
Features

- 50 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
- AEC-Q200 compliant

Applications

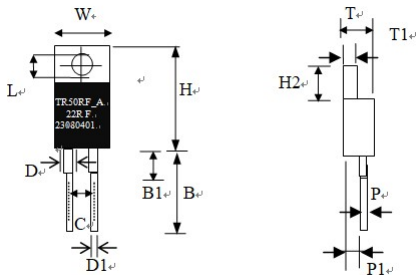
- Switching Power Supplies
- Snubbers Circuits
- Automated Machine Controller
- RF Power Amplifiers
- Low Energy Pulse Loading
- UPS
- Voltage Regulation

Derating Curve



Derating Curve Slope: 0.333W/°K
(thermal resistance) : 3.00°K/W

Dimensions



Unit:mm

Type	W	H	H1	B	B1	D	D1	L	C	T	T1	H2	P	P1	Packaging
															Tube
TR50-RF	10.16 ±0.30	15.00 ±0.30	2.90 ±0.25	13.50 ±0.80	4 max	1.27 ±0.10	0.78 ±0.08	3.85 ±0.30	5.08 ±0.25	4.60 ±0.20	1.20 ±0.10	6.25 ±0.35	0.60 ±0.15	2.30 ±0.25	50 pcs

Part Numbering

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

Electrical Characteristics Specifications

Item Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR50-RF	-	-	0.05Ω - 0.1Ω		No Specified
	-	≧ 0.1Ω - 1Ω			No Specified
	-	≧ 1Ω - 5Ω			±100 ±200 ±300
	≧ 5Ω - 10Ω			±100 ±200 ±300	
	≧ 10Ω - 100KΩ			±50 ±100 ±200	

■ Operating Voltage: 350V Max.

■ Dielectric Strength: 1800VAC

■ Insulation Resistance: 10GΩ min.

■ Operating Temperature Range: -55°C to +175°C

Environmental Characteristics

Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
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
Operational Life	ΔR±1.0%	Condition D Steady State TA=125°C at rated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	ΔR±0.5%	1000 hrs 85°C/85% RH of operating power
High Temperature Exposure	ΔR±0.3%	at 125°C for 1000 hrs
Solderability	90% min. coverage	245±5°C for 3 seconds
Resistance to Soldering Heat	ΔR±0.5%	260±5°C for 10 seconds (Delta R)
Temperature Cycling	ΔR±0.5%	-55°C~+125°C, 1000 cycles
Mechanical Shock	ΔR±0.25%	Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	ΔR±0.25%	5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	ΔR±3.0%	Human body model : 2KV
Flammability	No ignition of the tissue paper or scorching or the pinewood board	V-0 are acceptable. Electrical test not required.

■ Lead Material: Tinned Copper

■ Maximum Torque: 0.9 N-m

■ Without a Heat Sink, When in Free Air at 25°C, the TR50-RF..A 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.

■ Storage Temperature: 25°C; Humidity: 25~75%RH

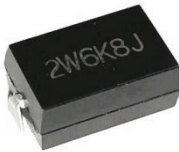
■ Shelf life: 1 year from production date

■ Reference Standards: IEC 60115-1; JIS-C 5201-1; AEC-Q200; MIL-STD-202; JESD22; UL-94

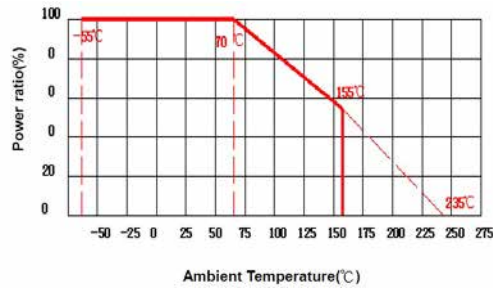
SMD Wire Wound Chip Power Resistor—WR

Features

- Resistance range:0.1 to 1.2KΩ
- High loading power , can bear high power load
- Nonflammable epoxy resin hot-pressing encapsulated, firm in structure
- Low noise, perfect stability and high reliability
- Good moisture-proof and environmental suitability
- Suitable for surface mounted (SMT) operating for automation
- Many kinds of size series for selection
- Non-inductive wire wound resistors is available that customized by customers



Derating Curve



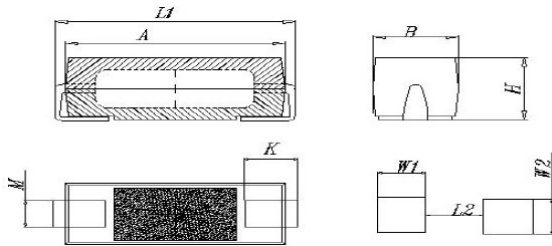
Applications

- Power Supply Models of Communication
- High Power Supply
- Protection Circuits of Signal
- Power Supply of STB or Other Terminal Devices

Part Numbering

WR	27	J	T	E	R	1001
Product Type	Dimensions (L1×B)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	15: 2615 16: 3816 25: 4525 27: 6327	D: ±0.5% F: ±1% G: ±2% J: ±5%	T: Taping Reel B: Bulk	E: ±100 K: ±150 F: ±200 G: ±300	U: 1/2W T: 1W S: 2W R: 3W D: 5W	0010: 1Ω 4R70: 4.7Ω 1001: 1KΩ

Dimensions



Unit: mm

Type	Size (Inch)	L1	A	B max.	H	K min.	M	W1	W2	L2	Packaging
											330mm/13"
15	2615	6.6±0.5	5.6±0.5	4.0	3.2±0.25	1.2	1.0±0.4	2.0	2.0	4.0	2000pcs
16	3816	9.6±0.5	8.6±0.5	4.2	3.5±0.25	1.8	1.2±0.4	3.0	2.2	5.2	2000pcs
25	4525	11.4±0.5	10.2±0.5	6.5	4.6±0.25	2.2	2.0±0.4	3.2	2.5	7.0	1000pcs
27	6327	15.9±0.5	14.7±0.5	7.0	6.4±0.25	3.0	2.0±0.4	4.5	3.0	8.8	800pcs

Standard Electrical Specifications

Item Type	Power Rating	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Dielectric Withstand Voltage	Resistance Range				TCR (PPM/°C)
						±0.5%	±1%	±2%	±5%	
15 (2615)	1/2W 1W	-55 ~ +155°C	200V	350V	500V	—			0.22Ω – 0.49Ω	±300
						—			0.5Ω – 0.99Ω	±200
						—	1Ω – 9.9Ω			±150
						10Ω – 50Ω				±100
16 (3816)	1W 2W	-55 ~ +155°C	250V	500V	500V	—			0.1Ω – 0.49Ω	±300
						—			0.5Ω – 0.99Ω	±200
						—	1Ω – 9.9Ω			±150
						10Ω – 200Ω				±100
25 (4525)	2W 3W	-55 ~ +155°C	350V	700V	500V	—			0.1Ω – 0.49Ω	±300
						—			0.5Ω – 0.99Ω	±200
						—	1Ω – 9.9Ω			±150
						10Ω – 1KΩ				±100
27 (6327)	3W 5W	-55 ~ +155°C	500V	800V	500V	—			0.1Ω – 0.49Ω	±300
						—			0.5Ω – 0.99Ω	±200
						—	1Ω – 9.9Ω			±150
						10Ω – 1.2KΩ				±100

For special TCR which is not shown in the above table, please check us.

Environmental Characteristics

Item	Requirement	Test Method
Temperature Shock Test	±(5% +0.05Ω)	-25°C for 30min, 25°C for 10min and 70°C for 30min as a cycle, 5cycles
Short Time Overload	±(2% +0.05Ω)	RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
Endurance	±(5% +0.05Ω)	70±3°C, RCWV for 1000±48 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(5% +0.05Ω)	40±2°C, 90~95% R.H. RCWV for 1000±48 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Solderability	95% min. coverage	245±5°C for 3 seconds
Dielectric Withstand Voltage	1000MΩ	Apply 500V~1000V for 1 minute

Storage Temperature: 30±5°C; Humidity < 65%RH

Shelf Life: 2 years from production date

Metal Film Chip Power Resistor—WRM

Features

- Metal film cutting, excellent long-term stability
- Low thermal electromotive force (EMF) design
- MSL: Level 3



Applications

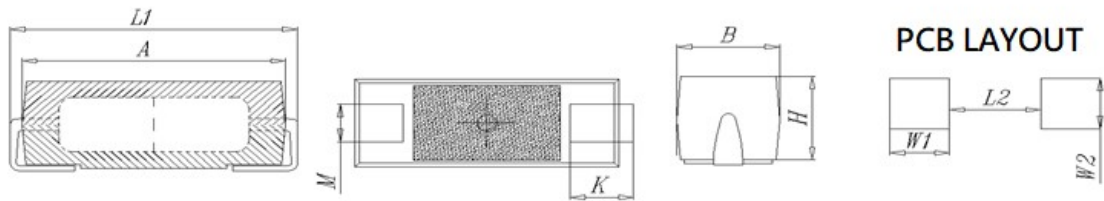
- Instruments
- Meter
- Communication Equipment
- Special Power Supplies and Various Electronic Equipment



Part Numbering

WRM	25	J	T	E	R	1001
Product Type	Dimensions (L1×B)	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Power Rating	Resistance
	15: 2615 16: 3816 25: 4525 27: 6327	D: ±0.5% F: ±1% G: ±2% J: ±5%	T: Taping Reel B: Bulk	C: ±25 3: ±30 D: ±50 E: ±100 F: ±200	U: 1/2W T: 1W S: 2W R: 3W D: 5W	0010: 1Ω 1001: 1KΩ 1002: 10KΩ 1004: 1MΩ

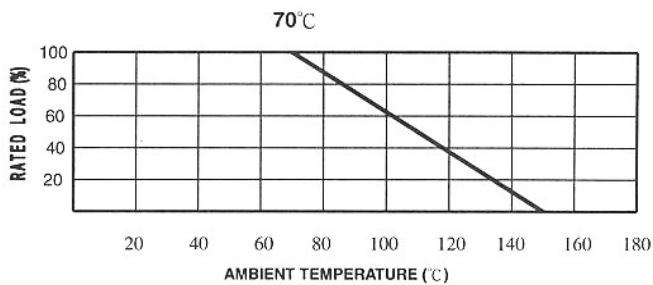
Dimensions



Unit: mm

Type	Size (Inch)	L1	A	B max.	H	K min.	M	W1	W2	L2	Packaging
											330mm/13"
15	2615	6.6±0.5	5.6±0.5	4.0	3.2±0.25	1.2	1.0±0.4	2.0	2.0	4.0	2000pcs
16	3816	9.6±0.5	8.6±0.5	4.2	3.5±0.25	1.8	1.2±0.4	2.2	2.2	5.5	2000pcs
25	4525	11.4±0.5	10.2±0.5	6.5	4.6±0.25	2.2	2.0±0.4	3.2	2.5	7.0	1000pcs
27	6327	15.9±0.5	14.7±0.5	7.0	6.4±0.25	3.0	2.0±0.4	4.5	3.0	8.8	800pcs

Derating Curve



Standard Electrical Specifications

Type	Item	Power Rating	Operating Temp. Range	Resistance Range				TCR (PPM/°C)
				±0.5%	±1%	±2%	±5%	
WRM15 (2615)	1/2W 1W	-55 ~ +155°C		10Ω – 100KΩ				±25 ±30 ±50 ±100
				100KΩ – 1MΩ				±100 ±200
WRM16 (3816)	1W 2W	-55 ~ +155°C		10Ω – 100KΩ				±25 ±50 ±100
				100KΩ – 10MΩ				±100 ±200
WRM25 (4525)	2W 3W	-55 ~ +155°C		10Ω – 100KΩ				±25 ±30 ±50 ±100
				100KΩ – 10MΩ				±100 ±200
WRM27 (6327)	3W 5W	-55 ~ +155°C		10Ω – 100KΩ				±25 ±50 ±100
				100KΩ – 10MΩ				±100 ±200

Environmental Characteristics

Item	Requirement	Test Method
Short Time Overload	±(2% +0.05Ω)	RCWV*2.5 or Max. overload voltage whichever is lower for 5 seconds
Endurance	±(5% +0.05Ω)	70±3°C, RCWV for 1000±48 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Damp Heat with Load	±(5% +0.05Ω)	40±2°C, 90~95% R.H. RCWV for 1000±48 hrs with 1.5 hrs "ON" and 0.5 hrs "OFF"
Solderability	95% min. coverage	245±5°C for 3 seconds
Dielectric Withstand Voltage	1000MΩ	Apply 500V~1000V for 1 minute

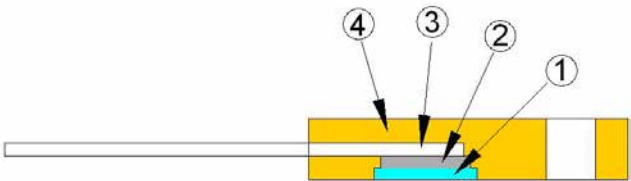
■ Storage Temperature: Room temperature < 25°C ; Humidity: < 65%

■ Shelf life: 5 years from production date

TO-220 Power Resistor—TR30



Construction



①	Alumina Substrate	③	Lead
②	Resistor Layer	④	Molding

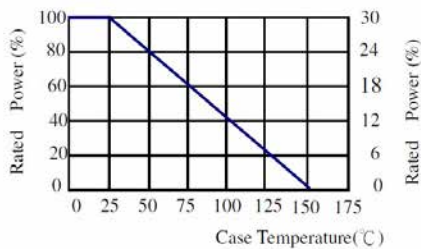
Features

- 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

Applications

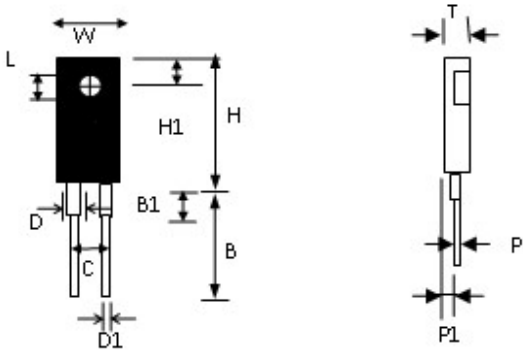
- Gate Resistors in Power Supplies
- Snubbers
- Load and Dumping Resistors in CRT Monitors
- Automated Machine Controller
- Terminal Resistance in RF Power Amplifiers
- Voltage Regulation
- Low Energy Pulse Loading
- UPS

Derating Curve



Derating Curve Slope : 0.24W/°K ;
Thermal resistance : 4.17°K/W

Dimensions



Unit: mm

Type	W	H	B	B1	C	D	D1	T	P	P1	Weight (g) (1000pcs)	Packaging
												Tube
TR30	10.44 ±0.24	16.25 ±0.25	12.70 ±1.3	3.3 ±0.76	5.08 ±0.26	1.27 ±0.13	0.76 ±0.1	3.18 ±0.26	0.55 ±0.1	1.78 ±0.26	1155	50pcs

Part Numbering

TR	30	J	D	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%	D: Tube	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified (±300~±700)	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1000Ω 1002: 10000Ω

Electrical Characteristics Specifications

Item Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR30	-	-	0.05Ω - 0.1Ω		No Specified (±300~±700)
	-	≥ 0.1Ω - 1Ω			±300
	-	≥ 1Ω - 5Ω			±100 ±200 ±300
	≥ 5Ω - 10Ω			±100 ±200 ±300	
	≥ 10Ω - 100KΩ			±50 ±100 ±200	

- Operating Voltage: 420V max.
- Dielectric Strength: 1800VAC
- Insulation Resistance: 10GΩ min.
- Operating Temperature Range: -65°C to +150°C

Environmental Characteristics

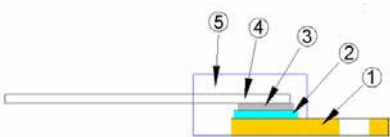
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Short Time Overload	ΔR±0.3%	2 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds
Load Life	ΔR±1.0%	2,000 hours at rated power
Damp Heat with Load	ΔR±0.5%	40±2°C, 90~95% R.H., RCWV 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.
- Storage Temperature: 25±5°C; Humidity < 75%RH
- Shelf Life: **1 year from production date**

TO-220 Power Resistor—TR35



Construction



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

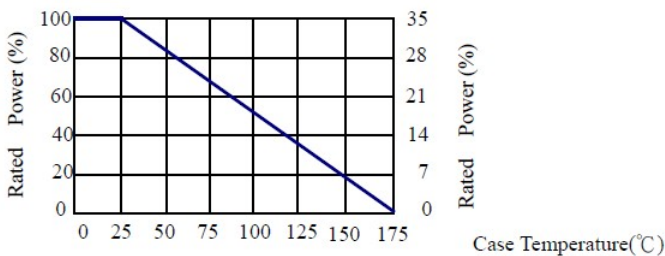
Features

- 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

Applications

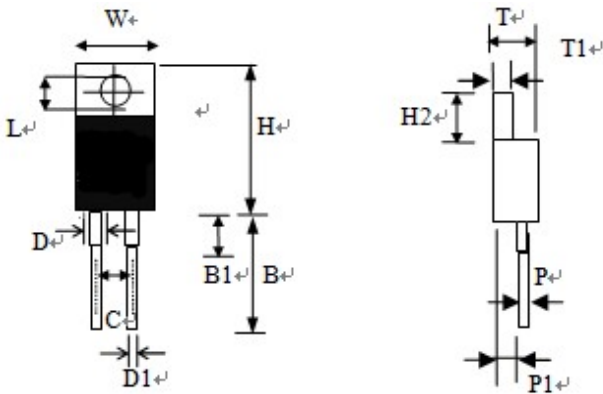
- Switching Power Supplies
- Snubbers Circuits
- Automated Machine Controller
- RF Power Amplifiers
- Low Energy Pulse Loading
- UPS
- Voltage Regulation

Derating Curve



Derating Curve Slope: 0.23W/ °K
Thermal Resistance: 4.28 °K/W

Dimensions



Unit:mm

Type	W	H	H1	B	B1	D	D1	L	C	T	T1	H2	P	P1	Packaging
															Tube
TR35	10.16 ±0.30	15.00 ±0.30	2.90 ±0.25	13.50 ±0.80	4 max	1.27 ±0.10	0.78 ±0.08	3.65 ±0.30	5.08 ±0.25	4.60 ±0.20	1.20 ±0.10	6.25 ±0.35	0.60 ±0.15	2.30 ±0.25	50 pcs

Part Numbering

TR	35	J	D	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%	D: Tube	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified (±300~±700)	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1KΩ 1002: 10KΩ

Electrical Characteristics Specifications

Item Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR35	-	-	0.05Ω - 0.1Ω		No Specified (±300~±700)
			≥ 0.1Ω - 1Ω		±300
	-		≥ 1Ω - 5Ω		±100 ±200 ±300
			≥ 5Ω - 10Ω		±100 ±200 ±300
			≥ 10Ω - 100KΩ		±50 ±100 ±200

- Operating Voltage: 350V Max.
- Dielectric Strength: 1800VAC
- Insulation Resistance: 10GΩ min.
- Operating Temperature Range: -55°C to +175°C

Environmental Characteristics

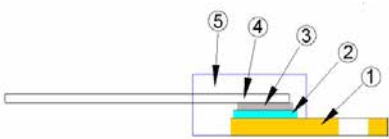
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Short Time Overload	ΔR±0.3%	2 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds
Load Life	ΔR±1.0%	2,000 hours at rated power
Damp Heat with Load	ΔR±0.5%	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "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.
- Storage Temperature: 25±5°C; Humidity <75%RH
- Shelf Life: **1 year from production date**

TO-220 Power Resistor—TR35-T



Construction



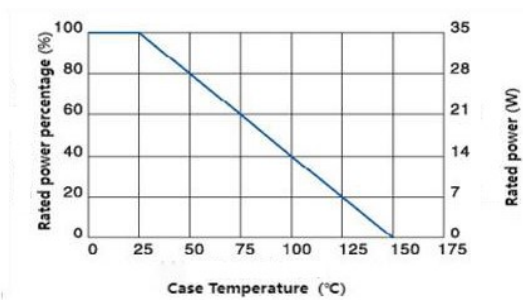
Features

- Installed on the radiator, with a rated power of 35 watts at 25°C ; the rated power is 2.5 watts at room temperature of 25°C without using heat sinks.
- TO-220 style power package
- With just one screw, it can be installed on the radiator
- The conductive part is insulated from the metal substrate, with high insulation level.
- Highly protective molded plastic outer box, and easy to install.
- Sensorless design

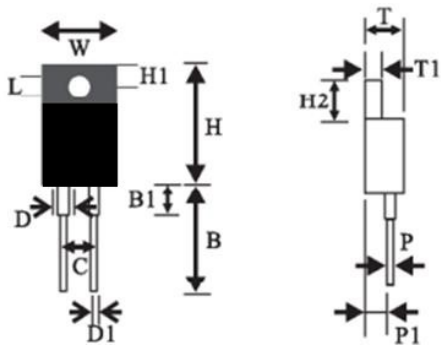
Applications

- RF Power Amplifier
- Buffer Circuit
- Switched Power Supply
- Automation Controller
- Uninterruptible Power Supply
- UPS
- Voltage Regulation
- Low Energy Pulse Loading

Derating Curve



Dimensions



Unit:mm

Type	W	H	H1	B	B1	D	D1	L	C	T	T1	H2	P	P1	Packaging Tube
TR35-T	10.1 ±0.3	15.0 ±0.5	3.0 ±0.1	6.35 ±0.3	14.0 ±0.5	3.25 ±0.1	1.35 ±0.1	0.8 ±0.1	3.6 ±0.1	4.3 ±0.3	4.5 ±0.3	1.15 ±0.1	0.6 ±0.1	2.08 ±0.1	10 pcs

Part Numbering

TR	35	J	D	D	1001	-T
Product Type	Power	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance	Special
	35: 35 Watts	D: ±0.5% F: ±1% J: ±5% K: ±10%	D: Tube	D: ±50 E: ±100 F: ±200 G: ±300	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1KΩ 1002: 10KΩ	

■ Electrical Characteristics Specifications

Item Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR35-T	-	≧ 0.1Ω - 1Ω			±300
	-	≧ 1Ω - 5Ω			±100 ±200 ±300
	≧ 5Ω - 10Ω			±100 ±200 ±300	
	≧ 10Ω - 100KΩ			±50 ±100 ±200	

■ Operating Voltage: 350V

■ Dielectric Strength: 1800VAC

■ Insulation Resistance: 10GΩ min.

■ Operating Temperature Range: -55°C to +155°C

■ Environmental Characteristics

Item	Requirement	Test Method
Short Time Overload	$\Delta R \pm 0.3\%$	2 times the rated power, but not exceeding 1.5 times the maximum withstand voltage, for 5 consecutive seconds
Load Life	$\Delta R \pm 1.0\%$	2,000 hours at rated power
Humidity Test	$\Delta R \pm 0.5\%$	40±2°C, 90~95% R.H., maximum operating voltage for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Solderability	90% min. coverage	245±5°C for 3 seconds
Thermal Shock	$\Delta R \pm 0.3\%$	-65°C ~150°C, 100 cycles
Terminal Strength	$\Delta R \pm 0.2\%$	(Pull Test) 2.4N
Vibration, High Frequency	$\Delta R \pm 0.2\%$	20g peak
Dielectric Strength	$\Delta R \pm 0.15\%$	1800V AC, 60 seconds
Temperature Cycling	$\Delta R \pm 0.3\%$	-65°C~+150°C, 1000 cycles

■ Storage Temperature: 25°C; Humidity: 25~85%RH

■ Shelf Life: **1 year from production date**

TO-263 Power Resistor—STR35

Construction



Features

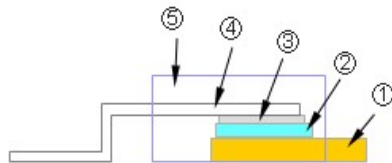
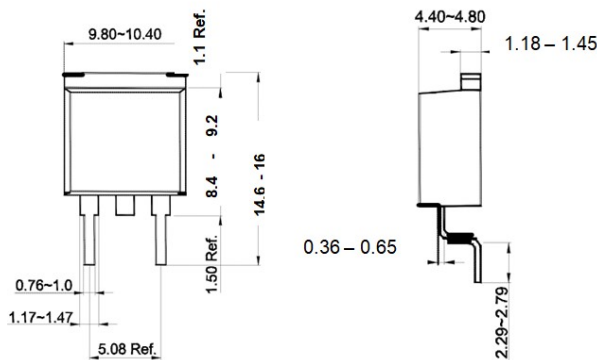
- 35 watts at 25°C case temperature heat sink mounted
- Molded case for protection and easy to mount
- Resistor is electrically isolated from metal tab

Applications

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

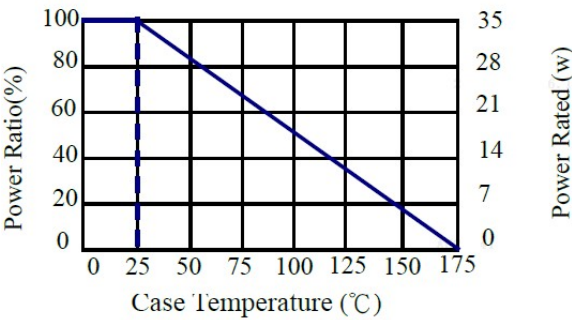
Dimensions

Unit: mm



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

Derating Curve



Derating Curve Slope : 0.23W/°K
Thermal resistance : 4.28°K/W

Part Numbering

STR		J	D	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%	T: Taping Reel D: Tube	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified (±300~±700)	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1KΩ 1002: 10KΩ

Electrical Characteristics Specifications

Item Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
STR35	-	-	0.05Ω - 0.1Ω		No Specified (±300~±700)
	-	≥ 0.1Ω - 1Ω			±300
	-	≥ 1Ω - 5Ω			±100 ±200 ±300
	≥ 5Ω - 10Ω			±100 ±200 ±300	
	≥ 10Ω - 100KΩ			±50 ±100 ±200	

- Operating Voltage: 350V Max.
- Dielectric Strength: 1800VAC
- Insulation Resistance: 10GΩ min.
- Operating Temperature Range: -55°C to +175°C

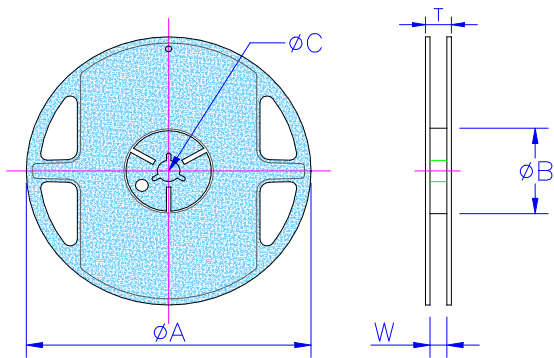
Environmental Characteristics

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., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Solderability	90% min. Coverage	245±5°C for 3 seconds
Temperature Cycling	ΔR±0.3%	-65°C~+150°C, 1000 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 Nm
- Without a Heat Sink, When in Free Air at 25°C, the STR35 is Rated for 2.5W
- 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.
- Storage Temperature: 25°C; Humidity: 25~80%RH
- Shelf Life: 1 year from production date

■Packaging

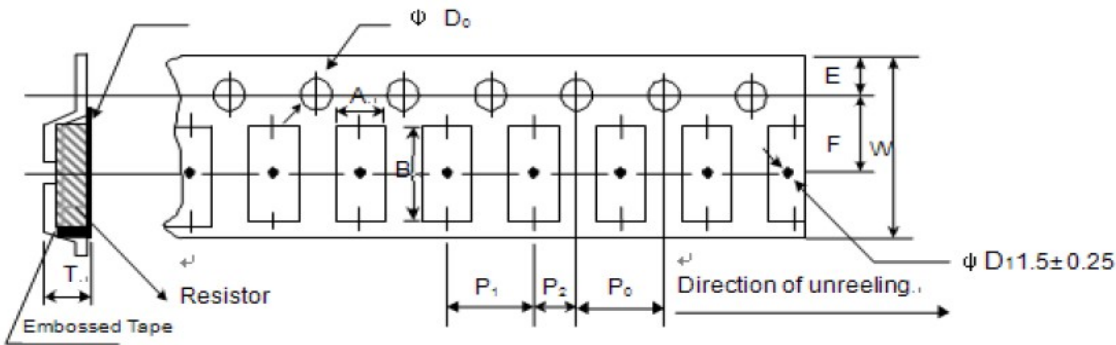
Reel Specifications & Packaging Quantity



Unit:mm

Type	Packaging Quantity	Reel Diameter	ΦA	ΦB	ΦC	W	T
STR35	500 pcs	13 inch	330±1.0	100±0.5	13.5±0.3	25.4±0.5	30.0±0.5

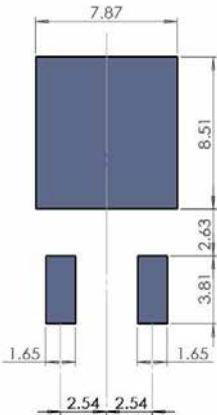
Embossed Plastic Tape Specifications



Unit:mm

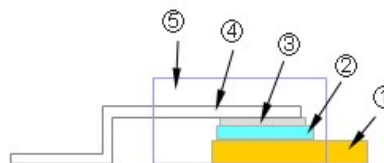
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
STR35	10.80±0.10	16.13±0.10	24.0±0.30	1.75±0.1	11.5±0.1	4.0±0.1	16.0±0.1	2.0±0.1	1.55±0.05	5.25±0.20

■Recommended Pad Layout



TO-263 Power Resistor—STR35-T

Construction



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

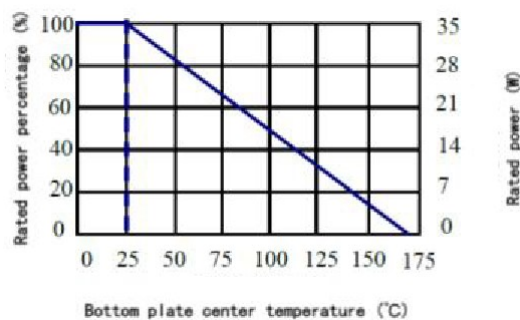
Features

- Installed on the radiator, the center temperature of the bottom plate is $\leq 25^{\circ}\text{C}$, and the rated power is 35W ; the rated power is 2.5 watts at room temperature of 25°C without using heat sinks.
- Surface mount (SMD) TO-263 molded package
- After adding heat sinks, the thermal resistance R_{th} is less than 4.28°C/W
- Can withstand reflow soldering temperature of $270^{\circ}\text{C} / 10\text{S}$
- Conductive parts and metal substrate insulation

Applications

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

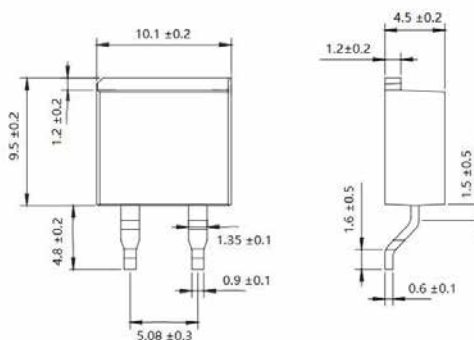
Derating Curve



Dimensions

Unit: mm

Type	Packaging
	Tube
STR35-T	50pcs



Part Numbering

STR	35	J	D	D	1001	-T
Product Type	Power	Resistance Tolerance	Packaging Code	TCR (PPM/ $^{\circ}\text{C}$)	Resistance	Special
	35: 35 Watts	D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$ K: $\pm 10\%$	D: Tube	D: ± 50 E: ± 100 F: ± 200 G: ± 300	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: $1\text{K}\Omega$ 1002: $10\text{K}\Omega$	

Electrical Characteristics Specifications

Type	Item	Resistance Range				TCR (PPM/°C)
		±0.5%	±1%	±5%	±10%	
STR35-T	-	≥ 0.1Ω - 1Ω				±300
	-	≥ 1Ω - 5Ω				±100 ±200 ±300
		≥ 5Ω - 10Ω				±100 ±200 ±300
		≥ 10Ω - 100KΩ				±50 ±100 ±200

■ Operating Voltage: 350V Max.

■ Dielectric Strength: 1800VAC

■ Insulation Resistance: 10GΩ min.

■ Operating Temperature Range: -55°C to +155°C

Environmental Characteristics

Item	Requirement	Test Method
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
Humidity Test	ΔR±0.5%	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Solderability	90% min. Coverage	245±5°C for 3 seconds
Temperature Cycling	ΔR±0.3%	-65°C~+150°C, 1000 cycles
Terminal Strength	ΔR±0.2%	(Pull Test)2.4N
Vibration, High Frequency	ΔR±0.2%	20g peak
Dielectric Strength	ΔR±0.15%	1800V AC, 60 seconds
Temperature Cycling	ΔR±0.3%	-65°C~+150°C, 1000 cycles

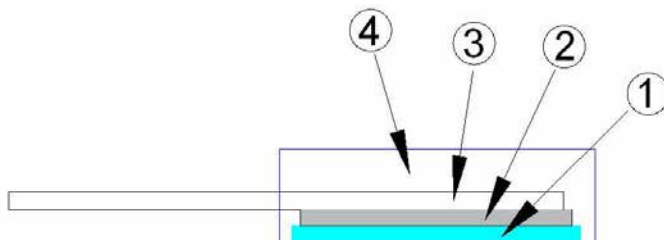
■ Storage Temperature: 25°C; Humidity: 25~80%RH

■ Shelf Life: 1 year from production date

TO-220 Power Resistor—TR50



Construction



① Alumina Substrate	③ Lead
② Resistor Layer	④ Molding

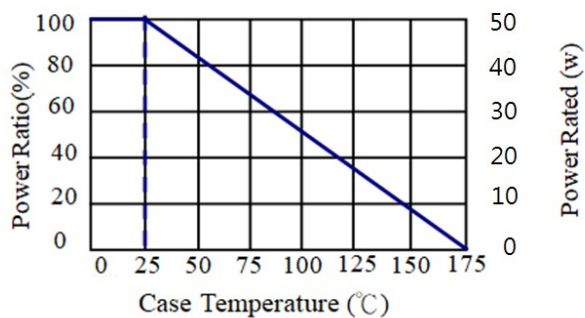
Features

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

Applications

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

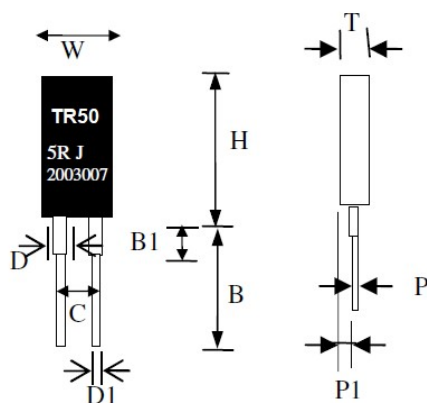
Derating Curve



Derating Curve Slope : 0.333W/°K

Thermal resistance : 3.00°K/W

Dimensions



Unit: mm

Type	W	H	B	B1	C	D	D1	T	P	P1	Weight (g) (1000pcs)	Packaging Tube
TR50	10.41 ±0.26	16.26 ±0.26	12.70 ±1.27	3.3 ±0.76	5.08 ±0.26	1.27 ±0.13	0.8 ±0.15	3.18 ±0.26	0.50 ±0.10	1.78 ±0.26	1290	50pcs

Part Numbering

TR	50	J	D	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%	D: Tube	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified (±300~±700)	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1KΩ 1002: 10KΩ

Electrical Characteristics Specifications

Item Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR50	-	-	0.05Ω - 0.1Ω		No Specified (±300~±700)
	-	≧ 0.1Ω - 1Ω			±300
	-	≧ 1Ω - 5Ω			±100 ±200 ±300
	≧ 5Ω - 10Ω			±100 ±200 ±300	
	≧ 10Ω - 100KΩ			±50 ±100 ±200	

- Operating Voltage: 350V Max.
- Dielectric Strength: 1800VAC
- Insulation Resistance: 10GΩ min.
- Operating Temperature Range: -65°C to +175°C

Environmental Characteristics

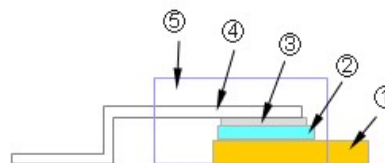
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Short Time Overload	ΔR±0.3%	2 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds
Load Life	ΔR±1.0%	2,000 hours at rated power
Damp Heat with Load	ΔR±0.5%	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "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.
- RCWV(Rated Continuous Working Voltage)= $\sqrt{P \cdot R}$ or Max. Operating Voltage whichever is lower.
- Storage Temperature: 25±5°C; Humidity <75%RH
- Shelf Life: 1 year from production date

TO-263 Power Resistor—STR50



Construction



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

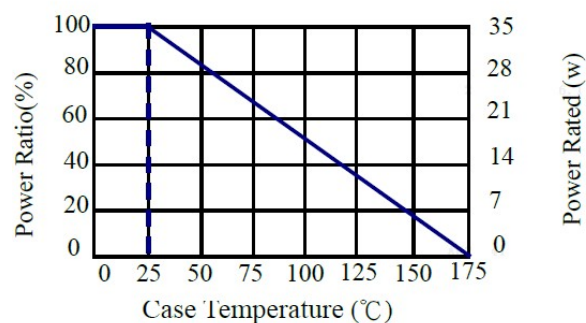
Features

- 50 watts at 25°C case temperature heat sink mounted
- Molded case for protection and easy to mount
- Resistor is electrically isolated from metal tab

Applications

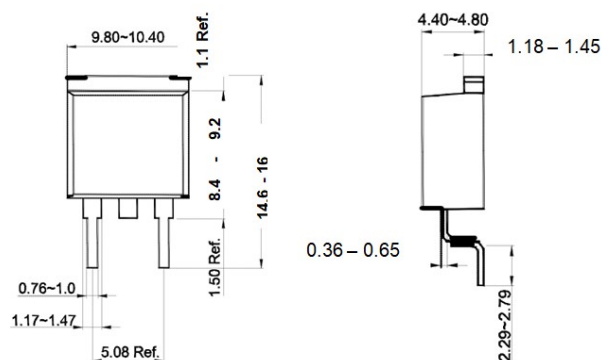
- Switching Power Supplies
- Snubbers Circuits
- Automated Machine Controller
- RF Power Amplifiers
- Low Energy Pulse Loading
- UPS
- Voltage Regulation

Derating Curve



Dimensions

Unit: mm



Derating Curve Slope : 0.333W/°K
Thermal resistance : 3.00°K/W

Part Numbering

STR	50	J	D	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%	T: Taping Reel D: Tube	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified (±300~±700)	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1KΩ 1002: 10KΩ

Electrical Characteristics Specifications

Item Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
STR50	-	-	0.05Ω - 0.1Ω		No Specified (±300~±700)
	-	≥ 0.1Ω - 1Ω			±300
	-	≥ 1Ω - 5Ω			±100 ±200 ±300
	≥ 5Ω - 10Ω			±100 ±200 ±300	
	≥ 10Ω - 100KΩ			±50 ±100 ±200	

■ Operating Voltage: 350V Max.

■ Dielectric Strength: 1800VAC

■ Insulation Resistance: 10GΩ min.

■ Operating Temperature Range: -65°C to +175°C

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., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "OFF"
Solderability	90% min. Coverage	245±5°C for 3 seconds
Temperature Cycling	ΔR±0.3%	-65°C~+150°C, 1000 cycles
Terminal Strength	ΔR±0.2%	(Pull Test)2.4N
Vibration, High Frequency	ΔR±0.2%	20g peak

■ Without a Heat Sink, When in Free Air at 25°C, the STR50 is Rated for 2.5W

■ 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.

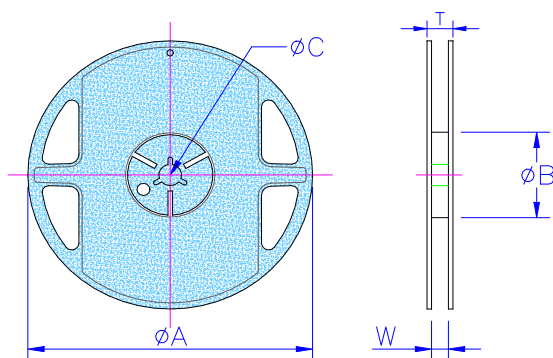
■ Thermal Grease should be Applied Properly.

■ Storage Temperature: 25±5°C; Humidity: <75%RH

■ Shelf Life: 1 year from production date

Packaging

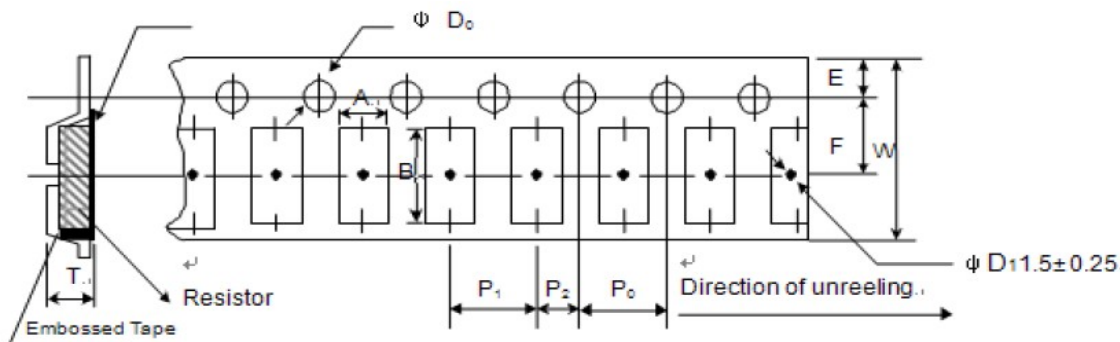
Reel Specifications & Packaging Quantity



Unit:mm

Type	Packaging Quantity	Reel Diameter	ΦA	ΦB	ΦC	W	T
STR50	500 pcs	13 inch	330±1.0	99±0.5	13.5±0.3	25.4±0.5	29.8±1.0

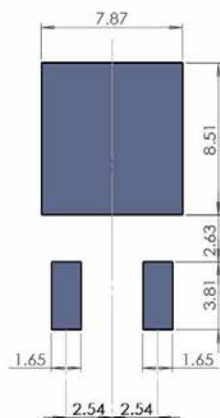
Embossed Plastic Tape Specifications



Unit:mm

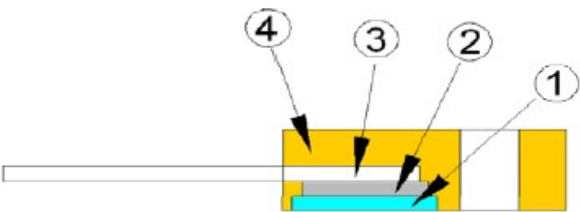
Type	A	B	W	E	F	P ₀	P ₁	P ₂	ΦD ₀	T
STR50	10.80±0.10	16.13±0.10	24.0±0.30	1.75±0.1	11.5±0.1	4.0±0.1	16.0±0.1	2.0±0.1	1.55±0.05	5.25±0.20

Recommended Pad Layout



TO-220 Power Resistor—TR50-H

Construction



① Alumina Substrate	③ Lead
② Resistor Layer	④ Molding

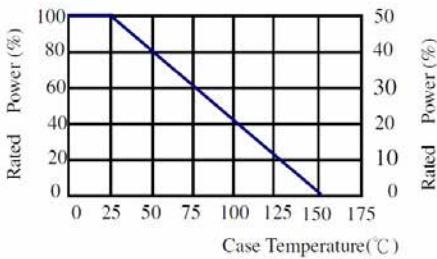
Features

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

Applications

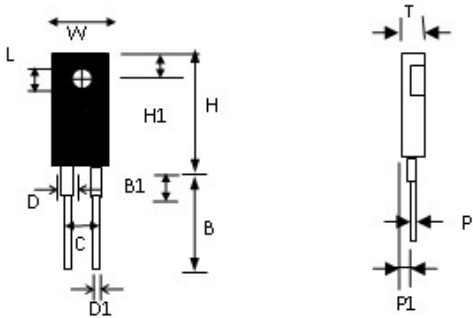
- Gate Resistors in Power Supplies
- Snubbers
- Load and Dumping in Resistors in CRT Monitors
- Automated Machine Controller
- Terminal Resistance in RF Power Amplifiers
- Low Energy Pulse Loading
- UPS
- Voltage Regulation

Derating Curve



Derating Curve Slope : 0.4W/°K
Thermal resistance : 3.7°K/W

Dimensions



Unit: mm

Type	W	H	B	B1	C	D	D1	T	P	P1	Weight (g) (1000pcs)	Packaging
												Tube
TR50-H	10.44 ±0.24	16.25 ±0.25	12.70 ±1.3	3.3 ±0.76	5.08 ±0.26	1.27 ±0.13	0.76 ±0.1	3.18 ±0.26	0.55 ±0.1	1.78 ±0.26	1290	50pcs

Part Numbering

TR	50	J	D	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%	D: Tube	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified (±300~±700)	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1000Ω 1002: 10000Ω	H: Hole

Electrical Characteristics Specifications

Type	Item	Resistance Range				TCR (PPM/°C)
		±0.5%	±1%	±5%	±10%	
TR50-H	-	-	0.05Ω - 0.1Ω		No Specified (±300~±700)	
	-	≧ 0.1Ω - 1Ω			±300	
	-	≧ 1Ω - 5Ω			±50 ±100 ±200 ±300	
	≧ 5Ω - 10Ω			±50 ±100 ±200 ±300		
	≧ 10Ω - 100KΩ			±50 ±100 ±200		

- Operating Voltage: 350V Max.
- Dielectric Strength: 2000VAC
- Insulation Resistance: 10GΩ min.
- Operating Temperature Range: -55°C to +150°C

Environmental Characteristics

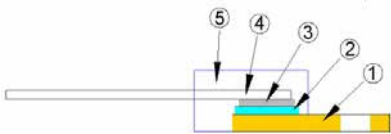
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Short Time Overload	ΔR±0.3%	2 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds
Load Life	ΔR±1.0%	2,000 hours at rated power
Damp Heat with Load	ΔR±0.5%	40±2°C, 90~95% R.H., RCWV 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: 0.9N-m
- 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.
- Storage Temperature: 25±5°C; Humidity <75%RH
- Shelf Life: 1 year from production date

TO-220 Power Resistor—TR50-RF



Construction



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

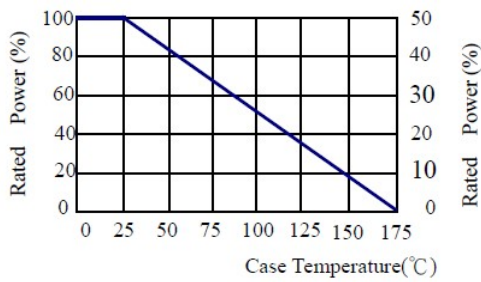
Features

- 50 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

Applications

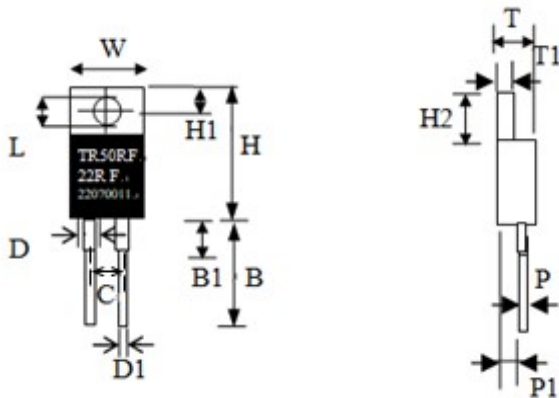
- Switching Power Supplies
- Snubbers Circuits
- Automated Machine Controller
- RF Power Amplifiers
- Low Energy Pulse Loading
- UPS
- Voltage Regulation

Derating Curve



Derating Curve Slope: 0.333W/°K
(thermal resistance) : 3.00°K/W

Dimensions



Unit:mm

Type	W	H	H1	B	B1	D	D1	L	C	T	T1	H2	P	P1	Packaging
															Tube
TR50-RF	10.16 ±0.30	15.00 ±0.30	2.90 ±0.25	13.50 ±0.80	4 max	1.27 ±0.10	0.78 ±0.08	3.65 ±0.30	5.08 ±0.25	4.60 ±0.20	1.20 ±0.10	6.25 ±0.35	0.60 ±0.15	2.30 ±0.25	50 pcs

Part Numbering

TR	50	J	D	D	1001	-RF
Product Type	Power	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance	Code
	50: 50 Watts	D: ±0.5% F: ±1% J: ±5%	D: Tube	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified (±300~±700)	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1000Ω 1002: 10000Ω	RF: Radiator Fin

Electrical Characteristics Specifications

Item Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR50-RF	-	-	0.05Ω - 0.1Ω		No Specified (±300~±700)
	-	≧ 0.1Ω - 1Ω			±300
	-	≧ 1Ω - 5Ω			±100 ±200 ±300
	≧ 5Ω - 10Ω			±100 ±200 ±300	
	≧ 10Ω - 100KΩ			±50 ±100 ±200	

- Operating Voltage: 350V Max.
- Dielectric Strength: 1800VAC
- Insulation Resistance: 10GΩ min.
- Operating Temperature Range: -55°C to +175°C

Environmental Characteristics

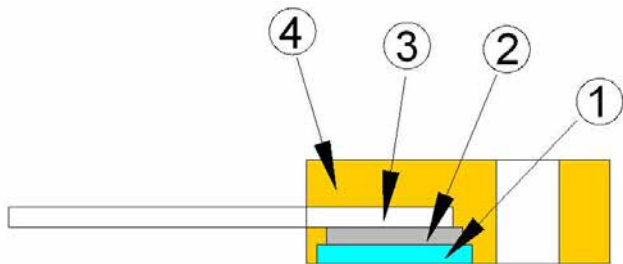
Item	Requirement	Test Method
Temperature Coefficient of Resistance (T.C.R.)	As Spec.	Referenced to 25°C, ΔR taken at +105°C
Short Time Overload	ΔR±0.3%	2 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds
Load Life	ΔR±1.0%	2,000 hours at rated power
Damp Heat with Load	ΔR±0.5%	40±2°C, 90~95% R.H., RCWV for 1000 hrs with 1.5 hrs "ON" and 0.5 hr "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-RF 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.
- Storage Temperature: 25°C; Humidity: 25~ 80%RH
- Shelf Life: 1 year from production date

TO-247 Power Resistor—TR100



Construction



① Alumina Substrate	③ Lead
② Resistor Layer	④ Molding

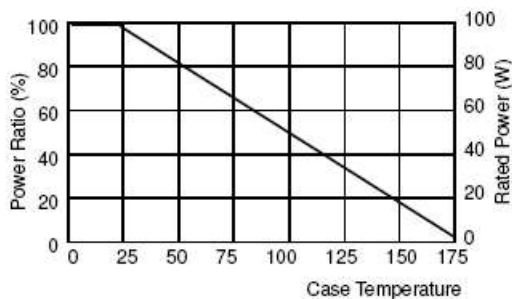
Features

- 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

Applications

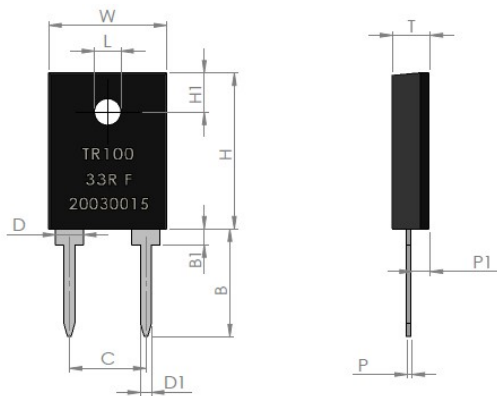
- Gate Resistors in Power Supplies
- Snubbers
- Load and Dumping Resistors in CRT Monitors
- Terminal Resistance in RF Power Amplifier
- Voltage Regulation
- Low Energy Pulse Loading
- UPS

Derating Curve



Derating Curve Slope : 0.6667W/°K
Thermal resistance : 1.5°K /W

Dimensions



Unit: mm

Type	W	H	H1	B	B1	D	D1	L	C	T	P	P1	Weight (g) (1000pcs)	Packaging
														Tube
TR100	15.75 ±0.26	20.7 ±0.26	5.33 ±0.26	14.48 ±1.27	2.79 ±0.76	3.63 ±0.18	1.52 ±0.1	3.63 ±0.1	10.16 ±0.26	4.95 ±0.26	0.81 ±0.26	2.41 ±0.26	3381	35pcs

Part Numbering

TR	10035	J	D	D	1001
Product Type	Power	Resistance Tolerance	Packaging Code	TCR (PPM/°C)	Resistance
	100: 100 Watts	D: ±0.5% F: ±1% J: ±5% K: ±10%	T:Taping Reel D:Tube	D: ±50 E: ±100 F: ±200 G: ±300 - : No Specified (±300~±700)	R100: 0.1Ω 0100: 10Ω 4700: 470Ω 1001: 1KΩ 1002: 10KΩ

Electrical Characteristics Specifications

Item Type	Resistance Range				TCR (PPM/°C)
	±0.5%	±1%	±5%	±10%	
TR100	-	-	0.05Ω - 0.1Ω		No Specified (±300~±700)
	-	≧ 0.1Ω - 1Ω			±300
	-	≧ 1Ω - 5Ω			±100 ±200 ±300
	≧ 5Ω - 10Ω			±100 ±200 ±300	
	≧ 10Ω - 100KΩ			±50 ±100 ±200	

- Operating Voltage: 700V Max.
- Dielectric Strength: 2500V AC
- Insulation Resistance: 10GΩ min.
- Operating Temperature Range: -65°C to +175°C

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±0.3%	1.5 times rated power and V (dc) ≤ 1.5V Max. for 5 seconds
Dielectric strength	ΔR±0.15%	2500V AC, 60 seconds
Moisture resistance	ΔR±0.5%	-10°C~+65°C, RH>90%, cycle 240 hours
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 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.
- Storage Temperature: 25±5°C; Humidity <75%RH
- Shelf Life: 1 year from production date

Wire Wound Power Resistor—QR



Features

- Power 75W~20000W
- Tolerance $\pm 5\%$
- High temperature resistant cerami
- High heat dissipation
- High stability
- Customization for special specification and requirement is available

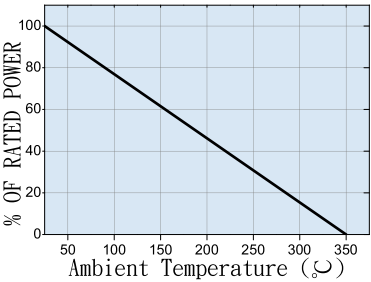
Applications

- Load For Power Burn- in
- Brake Load Of Elevator
- Brake Load Of The Motor
- Load Of Injection Molding Machine
- Current Limit
- Buck
- Current Divide
- Fitness Equipment
- Navigation System

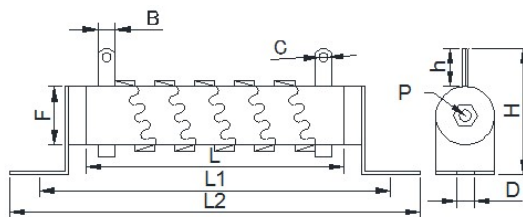
Part Numbering

QR	300W	R500	J	B
Product Type	Power Rating	Resistance	Resistance Tolerance	Mounting
QR: Q Type	75W: 75W 90W: 90W 100W: 100W 120W: 120W 150W: 150W 180W: 180W 200W: 200W 225W: 225W 240W: 240W 300W: 300W 350W: 350W 375W: 375W 450W: 450W 600W: 600W 750W: 750W 900W: 900W 1000W: 1000W 1200W: 1200W 1500W: 1500W 2000W: 2000W	R500: 0.5 Ω 0010: 1 Ω 0100: 10 Ω 1000: 100 Ω	J: $\pm 5\%$	B: With Bracket

Derating



Dimensions



Unit: mm

Power Rating	Dimensions										Resistance Range
	L	F	B	L1	C	h	D	L2	H	P	±5%
75W	90±5	25±1	8±1	120±5	5±1	18±2	6±1	144±5	58±3	Single M5x115	0.5Ω - 10Ω
95W	110±5	25±1	8±1	125±5	5±1	18±2	6±1	164±5	60±3	Single M5x135	0.5Ω - 11Ω
100W	90±5	28±1	8±1	120±5	5±1	18±2	6±1	144±5	60±3	Single M5x115	0.5Ω - 12Ω
120W	110±5	28±1	8±1	145±5	5±1	18±2	6±1	164±5	60±3	Single M5x135	0.5Ω - 13Ω
150W	140±5	28±1	8±1	175±5	5±1	18±2	6±1	195±5	60±3	Single M5x165	0.5Ω - 15Ω
180W	160±5	28±1	8±1	190±5	5±1	18±2	6±1	215±5	60±3	Single M5x185	0.5Ω - 18Ω
200W	185±5	28±1	8±1	215±5	5±1	18±2	6±1	239±5	60±3	Dual M5x215	0.25Ω - 20Ω
225W	195±5	28±1	8±1	225±5	5±1	18±2	6±1	249±5	60±3	Dual M5x220	0.5Ω - 22Ω
240W	185±5	35±1	8±1	221±5	5±1	18±2	9±1	250±5	75±3	Dual M5x210	0.5Ω - 24Ω
300W	210±5	35±1	8±1	245±5	5±1	18±2	9±1	268±5	75±3	Dual M5x245	0.5Ω - 27Ω
350W	300±5	28±1	8±1	330±5	5±1	18±2	5±1	355±5	60±3	Dual M5x325	0.5Ω - 27Ω
375W	210±5	40±1	10±1	250±5	5±1	22±2	9±1	277±5	77±3	Dual M5x245	0.5Ω - 30Ω
450W	260±5	40±1	10±1	300±5	5±1	22±2	9±1	327±5	77±3	Dual M5x295	0.5Ω - 35Ω
600W	330±5	40±1	10±1	370±5	5±1	22±2	9±1	400±5	77±3	Dual M5x365	0.5Ω - 40Ω
750W	330±5	50±1	12±1	370±5	6±1	24±2	10±1	400±5	105±3	Dual M5x365	0.5Ω - 100Ω
900W	400±5	50±1	12±1	444±5	6±1	24±2	10±1	469±5	105±3	Dual M5x435	0.5Ω - 100Ω
1000W	460±5	50±1	12±1	505±5	6±1	24±2	10±1	532±5	105±3	Dual M5x495	0.5Ω - 120Ω
1200W	460±5	60±1	15±1	508±5	6±1	30±2	10±1	535±5	112±3	Dual M5x495	0.5Ω - 120Ω
1500W	540±5	60±1	15±1	587±5	6±1	30±2	10±1	615±5	112±3	Dual M5x600	1Ω - 160Ω
2000W	650±5	65±1	15±1	690±5	6±1	30±2	10±1	720±5	115±3	Dual M5x695	1Ω - 160Ω

Resistor Body Color: Green

Electrical Characteristics

Characteristics	Limits
Resistance and Resistance Tolerance	Range Resistance tolerance ±5%(J)
Temperature Coefficient	FCHR-2 0.14X1.2m/m 1000~1200ppm/°C max (according to the material)
Power Rating Load	$\Delta R/R \leq \pm(1\% + 0.05\Omega)$ temperature 350°C max
Short-time Overload	$\Delta R/R \leq \pm(2\% + 0.05\Omega)$
Insulation Resistance	DC500V 100MQ min
Dielectric Withstanding Voltage	AC2500V 1.5MA 1 minute

- These resistors are made by winding resistance ribbon around a ceramic tube in wave shape, externally coated with non flame paint.
- They are extremely good in dissipation of heat, small in size, able to take large load.
- Fit for use on heavy electric machines and production machines.

Nominal Resistance / Capacitance

E1	E3	E6	E12	E24	E96			E192					
100	100	100	100	100	100	215	464	100	147	215	316	464	681
	220	150	120	110	102	221	475	101	149	218	320	470	690
	470	220	150	120	105	226	487	102	150	221	324	475	698
		330	180	130	107	232	499	104	152	223	328	481	706
		470	220	150	110	237	511	105	154	226	332	487	715
		680	270	160	113	243	523	106	156	229	336	493	723
			330	180	115	249	536	107	158	232	340	499	732
			390	200	118	255	549	109	160	234	344	505	741
			470	220	121	261	562	110	162	237	348	511	750
			560	240	124	267	576	111	164	240	352	517	759
			680	270	127	274	590	113	165	243	357	523	768
			820	300	130	280	604	114	167	246	361	530	777
				330	133	287	619	115	169	249	365	536	787
				360	137	294	634	117	172	252	370	542	796
				390	140	301	649	118	174	255	374	549	806
				430	143	309	665	120	176	258	379	556	816
				470	147	316	681	121	178	261	383	562	825
				510	150	324	698	123	180	264	388	569	835
				560	154	332	715	124	182	267	392	576	845
				620	158	340	732	126	184	271	397	583	856
				680	162	348	750	127	187	274	402	590	866
				750	165	357	768	129	189	277	407	597	876
				820	169	365	787	130	191	280	412	604	887
				910	174	374	806	132	193	284	417	612	898
					178	383	825	133	196	287	422	619	909
					182	392	845	135	198	291	427	626	920
					187	402	866	137	200	294	432	634	931
					191	412	887	138	203	298	437	642	942
					196	422	909	140	205	301	442	649	953
					200	432	931	142	208	305	448	657	965
					205	442	953	143	210	309	453	665	976
					210	453	976	145	213	312	459	673	988

TAIWAN

▪ Viking Tech Corporation (Headquarter)

TEL : 886-3-5972931
FAX : 886-3-5972935
E-mail : sales@viking.com.tw
Website: www.viking.com.tw

▪ Hsin Chu Factory II

TEL : 886-3-5973431
FAX : 886-3-5973640
E-mail : sales@viking.com.tw

▪ Kaohsiung Branch

TEL : 886-7-8217999
FAX : 886-7-8228229

USA

▪ Viking Tech America Corporation

TEL : 1-949-398-5228
FAX : 1-949-259-4510
Toll Free : 1-888-359-3714
Email : sales@vikingamerica.com
Website: www.vikingamerica.com

EUROPE

▪ Viking Tech Europe S.R.L.

TEL : 39-334-382-5550
Mobile 1 : 39-333-571-9105
Mobile 2 : 39-334-382-5597
E-mail : sales@vikingeuro.com

CHINA

▪ Viking Electronics (WUXI) CO.LTD.

TEL : 86-510-85203339 #166
FAX : 86-510-85203667 / 86-510-85203977
Email : china@viking.com.tw

▪ Dong Guan Office

TEL : 86-769-82026115
Mobile : 86-137-13035560
Email : dongguan@viking.com.tw

▪ Shanghai Office

TEL : 86-21-52731113
Mobile : 86-135-85892326
Email : shanghai@viking.com.tw

▪ Beijing Office

TEL : 86-21-52731113
Mobile : 86-135-85892326
Email : beijing@viking.com.tw

▪ Cheng Du, China Office

Mobile : 86-137-95302908
Email : chengdu@viking.com.tw

INDIA

▪ Bengaluru, India Office

Email: India@viking.com.tw





www.viking.com.tw