■Scope

—This specification applies to all sizes of rectangular-type fixed chip resistors with Ruthenium-base as material.

■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

■Applications

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

■IEC 62368-1:2018

	HVRC1206	HVRC2010	HVRC2512
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

■Standard Electrical Specifications

Item / Type	Power Rating at 70°C	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range ±0.5% (E24、E96)	Resistance Range ±1% (E24、E96)	Resistance Range ±5% (E24)	TCR (PPM/°C)	VCR (PPM/V)
HVRC1206	1/3W	-55 ~ +155°C	1000V	1500V	100KΩ - 1MΩ	100KΩ - 10MΩ	100KΩ-500MΩ	±100	<25
HVRC2010	1/2W		2000V	3000V	51KΩ- 1MΩ	51KΩ- 20MΩ	51KΩ - 500MΩ	±100	
HVRC2512	1W		3000V	4000V	30KΩ - 1MΩ	30KΩ - 20MΩ	30KΩ - 500MΩ	±100	

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

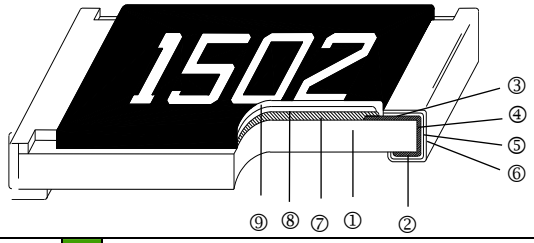
Overload Voltage=2.5*$\sqrt{}$(P*R) or Max. Overload Voltage listed above, whichever is lower.

■Part Numbering

Ho	HVRC	1206	1/3W	1MR	1%
manufacturer	Product Type	Dimensions (L×W)	power	Resistance	Resistance Tolerance
Ho	HVRC	1206	1/3W	1MΩ=1004	±0.5%
		2010	1/2W	10MΩ=1005	±1%
		2512	1W	100MΩ=1006	±5%

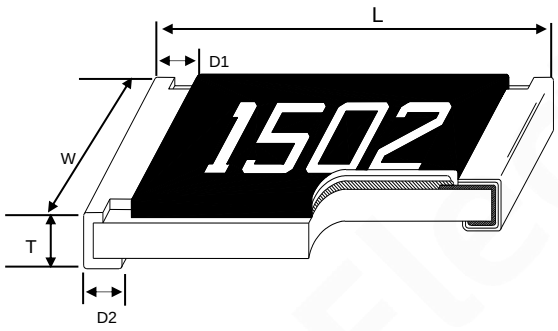
High-tech enterprises IATF16949 ISO9001 RoHS REACH AEC-Q200

■Construction



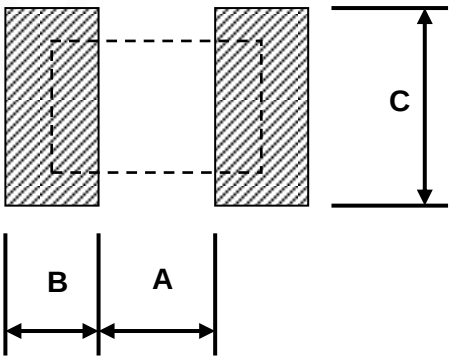
①	Alumina Substrate	④	Edge Electrode	⑦	Resistor Layer
②	Bottom Electrode	⑤	Barrier Layer	⑧	Primary Overcoat
③	Top Electrode	⑥	External Electrode	⑨	Secondary Overcoat

■Dimensions



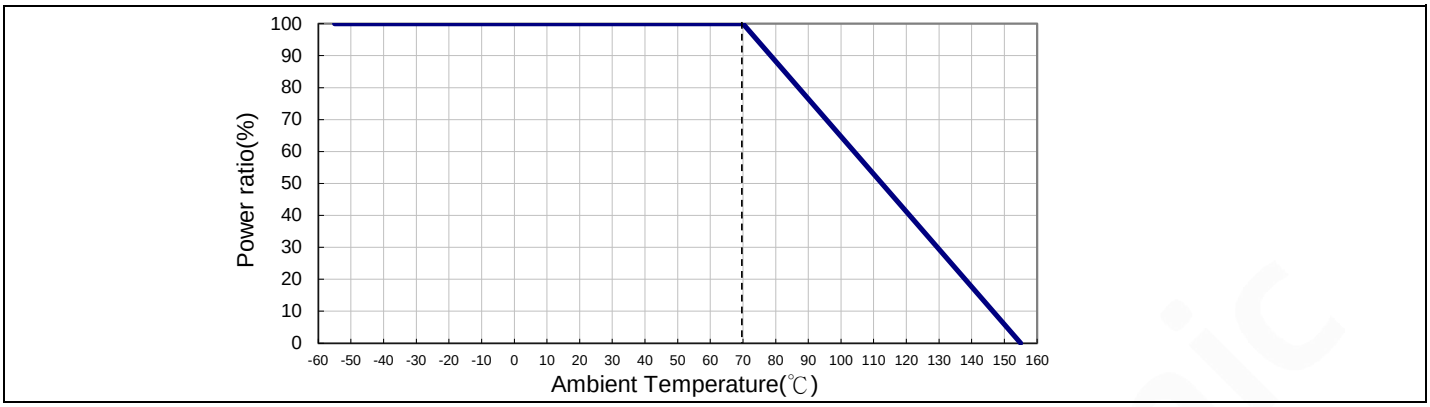
Type	Size (Inch)	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	Weight (g) (1000pcs)
HVRC	1206	3.10±0.10	1.55±0.10	0.55±0.10	0.50±0.25	0.50±0.20	8.9
HVRC	2010	5.00±0.10	2.50±0.15	0.55±0.10	0.60±0.25	0.50±0.20	24.7
HVRC	2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.25	0.50±0.20	39.8

■Recommend Land Pattern

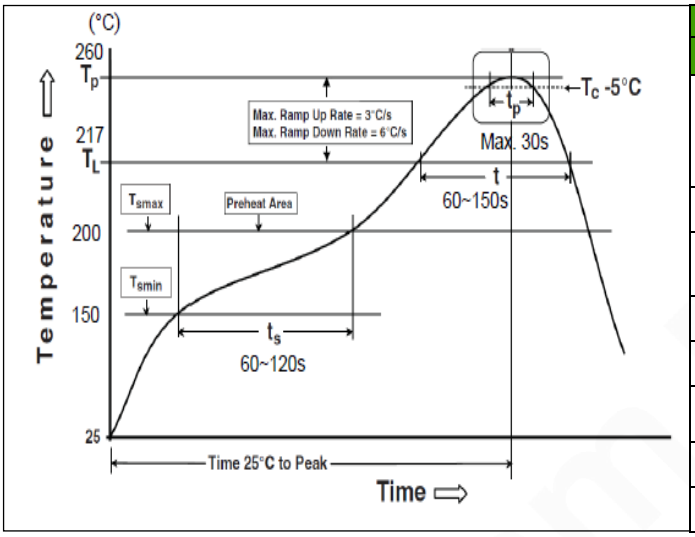


Type	A (mm)	B (mm)	C (mm)					
HVRC1206	2.00	0.90	1.60					
HVRC2010	3.80	0.90	2.80					
HVRC2512	4.90	1.60	3.50					

■Derating Curve



■Soldering Condition (Ref. IPC/JEDEC J-STD-020 & J-STD-002)



Reflow Profiles	
Profile Feature	**Pb-Free Assembly**
Preheat Min. Temperature (Tsmin) Max Temperature (Tsmax) Preheating time (ts) from (Tsmin to Tsmax)	 150 °C 200 °C 60-120 seconds
Ramp-up rate (T_L to Tp)	3 °C/second max.
Liquidous temperature (T_L) Time (t_L) maintained above T_L	217 °C 60-150 seconds
Min. Peak temperature (Tp min)	235°C
Max. Peak temperature (Tp max)	260°C
Time (tp) within 5 °C of the specified classification temperature (Tc)	30 seconds max.
Ramp-down rate (Tp to T_L)	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

■Environmental Characteristics

Item	Requirement		Test Method
	±1% and Below	±5%	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		**JIS-C-5201-1 4.8** **IEC-60115-1 4.8** At 25°C/-55°C and 25°C/+125°C, 25°C is the reference temperature
Voltage Coefficient (VCR)	As Spec.		**IEC-60115-1 4.11** 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)	**JIS-C-5201-1 4.13** **IEC-60115-1 4.13** RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds
Insulation Resistance	≥10G		**JIS-C-5201-1 4.6** **IEC-60115-1 4.6** Max. Overload Voltage for 1 minute
Endurance	±(1.0%+0.10Ω)	±(2.0%+0.10Ω)	**JIS-C-5201-1 4.25** **IEC-60115-1 4.25.1** 70±2°C, RCWV for 1000 hrs with 1.5 hrs “ON” and 0.5 hr “OFF”

Biased Humidity	±(1.0%+0.10Ω)	±(3.0%+0.10Ω)	**MIL-STD-202 Method 103** 1000 hrs 85°C/85%RH 10% of operating power (≦100 V)
High Temperature Exposure	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	**MIL-STD-202 Method 108** at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	±(1.0%+0.05Ω)	**AEC-Q200-005** Bending once for 60 seconds 1206 size: 3mm 2010, 2512 sizes: 2mm
Solderability	95% min. coverage		**JIS-C-5201-1 4.17** **IEC-60115-1 4.17** 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	±(1.0%+0.05Ω)	**JIS-C-5201-1 4.18** **IEC-60115-1 4.18** 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		**JIS-C-5201-1 4.7** **IEC-60115-1 4.7** HVRC06/HVRC0A/HVRC12: 500V for 1 minute
Leaching	Individual leaching area ≦5% Total leaching area ≦ 10%		**JIS-C-5201-1 4.18** **IEC-60068-2-58 8.2.1** 260±5°C for 30 seconds
Temperature Cycling	±(1.0%+0.05Ω)		**JESD22 Method JA-104** -55°C to +125°C, 1000 cycles
Mechanical Shock	±(1.0%+0.05Ω)		**MIL-STD-202 Method 213** Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.
Vibration	±(1.0%+0.05Ω)		**MIL-STD-202 Method 204** 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(3%+0.05Ω)		**AEC-Q200-002** Human body model 2KV
Resistance to Solvents	No visible damage on appearance and marking.		**MIL-STD-202 Method 215** Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken		**AEC-Q200-006** Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		**UL-94** V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	△R±1%		**EIA-977 (Condition A)** 60±2°C, no power rating for 500 hrs.

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

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

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

■Marking

1% for 1206/2010/2512: 4 digits marking

Example:

Resistance	1MΩ	4.99MΩ	10MΩ
Marking	1004	4994	1005

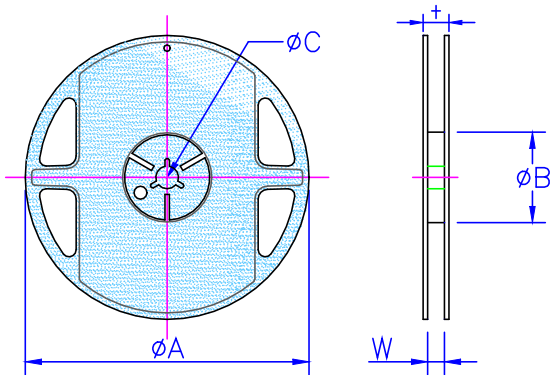
5% for 1206/2010/2512: 3 digits marking in E24

Example: 124=120KΩ 106=10MΩ (1st and 2nd are E24 code and 3rd code is multiplier)

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

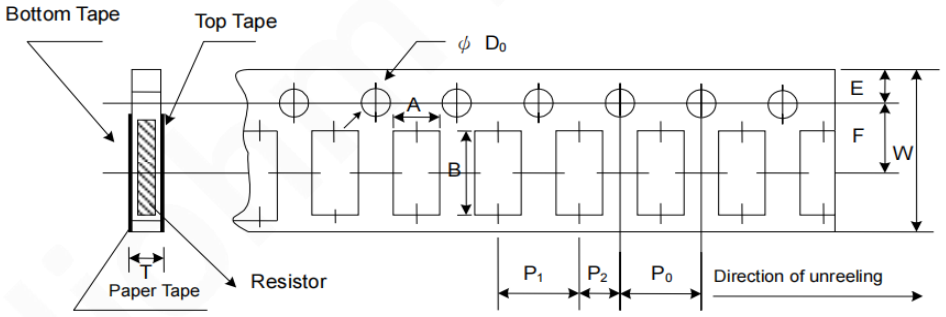
■Packaging

Reel Specifications & Packaging Quantity



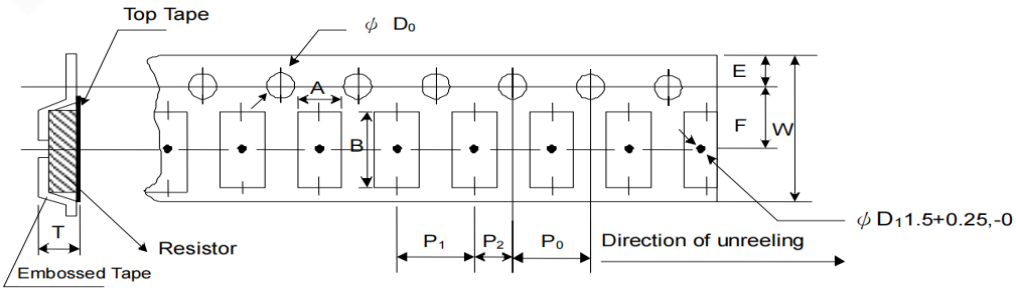
Type	Packaging Quantity		Tape Width	Reel Diameter	ΦA (mm)	ΦB (mm)	ΦC (mm)	W (mm)	T (mm)
1206	Paper	5K	8mm	7 inch	178.5±1.5	$60^{+1/-0}$	13.0±0.2	9.0±0.5	12.5±0.5
		10K	8mm	10 inch	254±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
		20K	8mm	13 inch	330±1.0	100±0.5	13.0±0.2	9.5±0.5	13.5±0.5
2010 2512	Embossed	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

Paper Tape Specifications



Type	A (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P_0 (mm)	P_1 (mm)	P_2 (mm)	ΦD_0 (mm)	T (mm)
1206	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 (mm)	B (mm)	W (mm)	E (mm)	F (mm)	P_0 (mm)	P_1 (mm)	P_2 (mm)	ΦD_0 (mm)	T (mm)
2010	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}
2512	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}