VR Series
High Voltage Thick Film Chip Resistors
Version. I

FEATURE

- Higher Max. Working Voltage than general purpose series resistors
- High reliability and stability
- RoHS and Halogen-free compliance
- Compatible with reflow and wave soldering
- MSL class: MSL 1
- Applications:
  - Adapters
  - Back-light circuit
  - Camera
  - Industrial Equipment
  - etc.

MANUFACTURER PART NO.

For example: VR1206J100KT5G00 - VR1206 ±5% 100KΩ T/R-5000

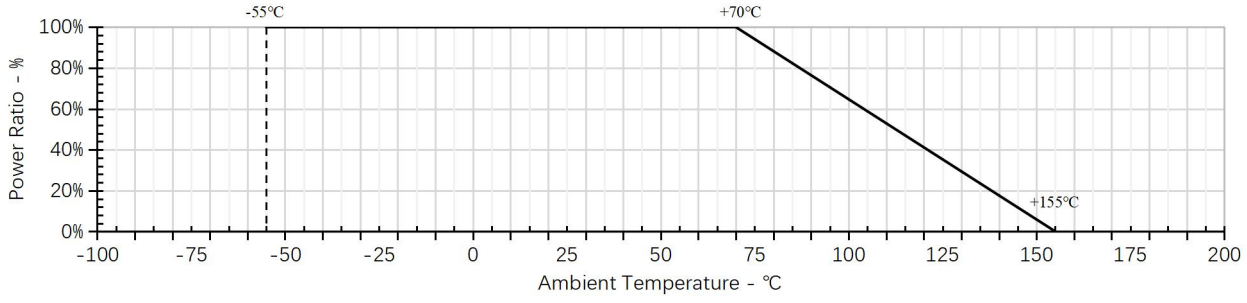
Series	Size	Tol.	Nominal Resistance Value	PKG	SPQ	Feature	TCR
2 codes	4 codes	1 code	2~5 codes	1 code	1 code	1 code	2 codes
VR	1206	J	100K	T	5	G	00
High Voltage Thick Film Chip Resistors	0603 0805 1206 1210 2010 2512	F=±1% J=±5%	36K①=36KΩ 49K9=49.9KΩ 4M7②=4.7MΩ	T=T/R③	4=4K 5=5K	G=Std. S=P.C.④	00=Refer to RELIABILITY.

Note: ① K=Kilo, 10^3, KΩ ② M=Mega, 10^6, MΩ
③ T/R=Taping in Reel package type ④ P.C.=Personal and Customized.

CHARACTERISTICS

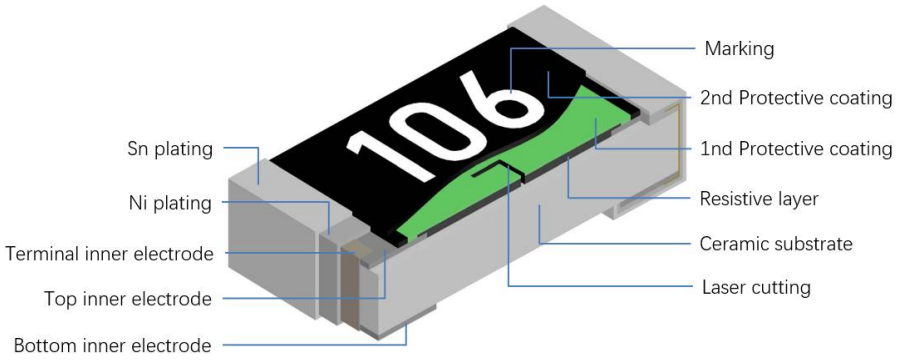
Type	Rated Power	Max. Working Voltage	Max. Overload Voltage	Dielectric Withstanding Voltage	Tolerance	Value Range	Operating Temp.
VR0603	1/10W	350V	500V	500V	±1, ±5%	36KΩ-22MΩ	-55~+155℃
VR0805	1/8W	400V	800V	800V	±1, ±5%	100KΩ-22MΩ	
VR1206	1/4W	500V	1000V	1000V	±1, ±5%	100KΩ-22MΩ	
VR1210	1/2W	800V	1500V	1000V	±1, ±5%	50KΩ-22MΩ	
VR2010	3/4W	2000V	3000V	1000V	±1, ±5%	50KΩ-22MΩ	
VR2512	1W	3000V	4000V	1000V	±1, ±5%	39KΩ-22MΩ	

POWER DERATING CURVE



This document is subject to change without notice. The products described herein, and this document are subject to specific disclaimers, set forth at GiantOhm official website, http://www.giantohm.com/download/cid/22.html

STRUCTURE GRAPH



RATED VOLTAGE

Resistors should have a Rated Voltage DC or AC corresponding to Rated Power which can be calculated by formula as below.

The Rated Voltage of certain resistance value should be the calculated result or Max. Working Voltage of product series whichever less.

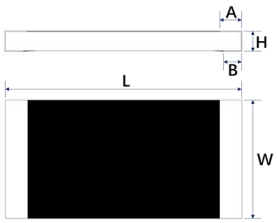
Formula:

$$E = \sqrt{P \times R}$$

E=Rated voltage(V)
P=Rated power(W)
R=Nominal resistance(Ω)

DIMENSIONS

Unit: mm

Figure	Type	L	W	H	A	B
	0603	1.60±0.10	0.80±0.10	0.45±0.10	0.30±0.20	0.30±0.20
	0805	2.00±0.15	1.25±0.15	0.55±0.10	0.40±0.20	0.40±0.20
	1206	3.10±0.15	1.55±0.15	0.55±0.10	0.45±0.20	0.45±0.20
	1210	3.10±0.10	2.60±0.20	0.55±0.10	0.50±0.25	0.50±0.20
	2010	5.00±0.10	2.50±0.20	0.55±0.10	0.50±0.25	0.50±0.20
	2512	6.35±0.10	3.20±0.20	0.55±0.10	0.60±0.25	0.50±0.20

RELIABILITY

Item	Test Method	Acceptable Criterion
Temperature Coefficient of Resistance (T.C.R.)	$TCR(PPM/℃)=\frac{(R_2-R_1)}{R_1\times(T_2-T_1)}\times10^6$ R_1=Value in room temperature R_2=Value in test temperature -55℃ or +125℃ T_1=Room temperature T_2=Test temperature -55℃ or +125℃ Reference: IEC 60115-1 6.2	R≤10M: ±100PPM/°C 10M < R≤22MΩ: ±200PPM/°C
Insulation Resistance	Using the parallel clamp method: 100±15V_{DC} voltage is applied between the electrode and the substrate within 60 seconds. Test the insulation resistance between the terminal and the back of the part. Reference: IEC 60115-1 12.1.3.5	≥ 10^9Ω
Dielectric Withstanding Voltage	Apply an alternating current between the electrode and substrate, with the effective value of the maximum overload voltage referring to the DWV characteristics and maintain the pressure for 60 ± 5 seconds. Reference: IEC 60115-1 12.2.4	Test to confirm if the presence of current or arc breakdown by ≥10uA

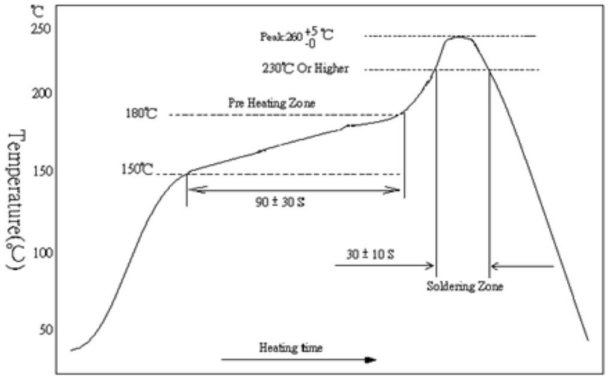
This document is subject to change without notice. The products described herein, and this document are subject to specific disclaimers, set forth at GiantOhm official website, http://www.giantohm.com/download/cid/22.html

<table>
<tr><th>Item</th><th>Test Method</th><th>Acceptable Criterion</th></tr>
<tr><td>Short Time Overload</td><td>Apply 2.5 times of rated voltage or maximum overload voltage (whichever is the smallest) for 5 seconds.
Reference: IEC 60115-1 8.1.4.2</td><td>△R/R=±(2.0%+0.05Ω)</td></tr>
<tr><td>Intermittent Overload</td><td>Put it in the thermostat, apply 2.5 times of rated voltage, 1 second ON, 25 seconds OFF, 10000^{+400}_{-0} cycles, take it out and stand for 60 minutes, then measure the change rate of resistance value.
Reference: IEC 60115-1 8.4.4</td><td>△R/R=±(5.0%+0.05Ω)</td></tr>
<tr><td>Resistance to Solvent</td><td>Immerse in isopropanol solvent at room temperature (23±5℃) for 5min, wipe 10 times with a hard toothbrush, repeat 3 times, take out and blow dry for examination
Reference: IEC 60115-1 11.3.2 method1</td><td>No obvious damage, peeling, swelling phenomenon</td></tr>
<tr><td>Solderability</td><td>Pretreatment:
dry heat 155℃, 4H, after taking out, stand at room temperature for 2 hours.
Test method B1:
Dip the resistance in a tin furnace at 245±5℃ for 5 seconds, then take it out and observe the solder area under a microscope.
Method D: 260±5℃， T=30+5/-0s.
Reference: J-STD-002 & IEC 60115-1 11.1.4.3</td><td>1. Solder coverage over 95%
2. No more than 5% of the partially exposed substrate, non-wetted plating or ceramic substrate part.</td></tr>
<tr><td>Resistance to Soldering Heat</td><td>Reflow test, time above 217 °C is 60s-150s, time above 250 ± 5°C is 30±5s.
Reference: IEC 60115-1 11.2.4.3& MIL-STD-202 Method 210</td><td>△R/R=±(1.0%+0.05Ω)</td></tr>
<tr><td>Thermal Shock</td><td>High and low temperature test is carried out according to the upper and lower limits of the application temperature of the parts, the residence time of the upper and lower limits of the temperature is 30min, and the temperature conversion time is less than 30s, lasting 500 cycles.
Reference: IEC 60115-1 10.1.4</td><td>△R/R=±(1.0%+0.05Ω)</td></tr>
<tr><td>Solder Joint Endurance Test</td><td>The SMD resistance was welded to the test board and bent with the standard pressure block. After standing for 60 sec. under the corresponding deformation condition, the change rate of resistance value of the part was tested.
<table>
<tr><th>Size</th><th>0603, 0805</th><th>1206, 1210</th><th>2010, 2512</th></tr>
<tr><td>Depth</td><td>5mm</td><td>3mm</td><td>2mm</td></tr>
</table>
Reference: IEC 60115-1 9.8.4</td><td>△R/R=±(1.0%+0.05Ω)</td></tr>
<tr><td>Resistance to Dry Heat</td><td>Put it in an oven at 155±5℃ for 1000^{+48}_{-0}hrs., take it out and let it stand for more than 1hr., then measure the change rate of resistance value.
Reference: IEC 60115-1 7.3</td><td>△R/R=±(3.0%+0.05Ω)</td></tr>
<tr><td>Loading Life in Moisture</td><td>Place it in a constant temperature and humidity box with 40±2℃ and 90~96%RH and apply the voltage (IEC 60115-1 10.4 Table 22) for 1000 hrs. Take it out and stand for 30 minutes before applying rated voltage for 1 minute, and then measure the change rate.
Reference: IEC 60115-1 10.4</td><td>△R/R=±(3.0%+0.05Ω)</td></tr>
<tr><td>Load Life</td><td>Put in an oven at 70±2℃, apply rated voltage, 90 min ON, 30 min OFF, 1000 hrs., take out and stand for more than 60 min, then measure the resistance change rate.
Reference: IEC 60115-1 7.1</td><td>△R/R=±(3.0%+0.05Ω)</td></tr>
<tr><td>Low temperature load test</td><td>-55℃, unpowered, 1 hr.: Rated voltage/current for 45 minutes, then unpowered within 15 minutes, return to room temperature, take out and stand for 24 hours, then measure the change rate of resistance value.
Reference: IEC 60115-1 10.2.4</td><td>△R/R=±(3.0%+0.05Ω)</td></tr>
<tr><td>Shear force test</td><td>Weld the part to the PCB. Apply the corresponding test stress from the side of the part with the test terminal for 10s. Check the appearance of the welded end of the part under the stress condition.
<table>
<tr><th>Size</th><th>0603, 0805, 1206, 1210, 2010, 2512</th></tr>
<tr><td>Test force</td><td>18N</td></tr>
</table>
Reference: IEC 60115-1 9.7</td><td>Without visible damage.</td></tr>
</table>

This document is subject to change without notice. The products described herein, and this document are subject to specific disclaimers, set forth at GiantOhm official website, http://www.giantohm.com/download/cid/22.html

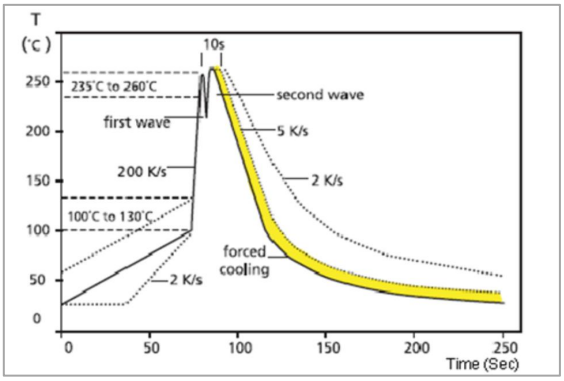
SOLDERING

Lead Free IR Reflow Soldering Profile



- Top temperature should be under 260 +5/-0 ℃ ,10Sec.
- Reference: J-STD-020D

Lead Free Double-Wave Soldering Profile



- Suitable for 0603 above size products
- 350±10℃ within 3 Sec. if soldering iron.

SOLDERING PAD

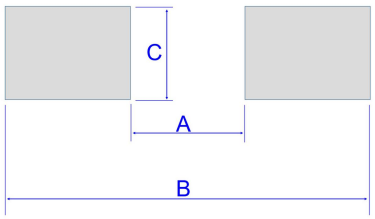


Figure	Type	A	B	C
	0603	0.8	2.1	0.9
	0805	1.2	3.0	1.3
	1206	2.2	4.2	1.6
	1210	2.2	4.2	2.8
	2010	3.5	6.1	2.8
	2512	3.8	8.0	3.5

WORKING ENVIRONMENT

If user intends to use products in special environments or states (including but not limited to the following), it is necessary to approve special characteristics and reliability for the following or other application environments.

A. High temperature.
B. Near the sea, or corrosive gas, such as Cl_2, H_2S, NH_3, SO_2 and NO_2, etc.
C. Unverified liquids, such as water, oil, chemical or organic solvent.
D. Unverified resin or paint to cover products.
E. Products should be washed with water soluble cleaner even if non cleaning flux.

STORAGE / CARRY CONDITIONS

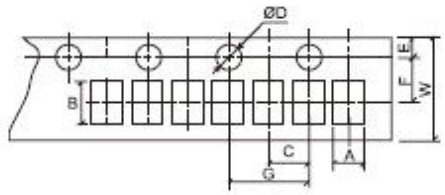
A. Temperature: 25±5℃
B. Humidity: 60±15%RH
C. Storage life: 2 years. FIFO
D. Please hold box correct orientation when storing and carrying. It is strictly prohibited to fall or squeeze the box, otherwise the product electrode or package may be damaged.

This document is subject to change without notice. The products described herein, and this document are subject to specific disclaimers, set forth at GiantOhm official website, http://www.giantohm.com/download/cid/22.html

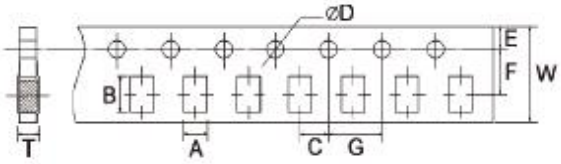
TAPING SPECIFICATIONS

A. Taping drawing

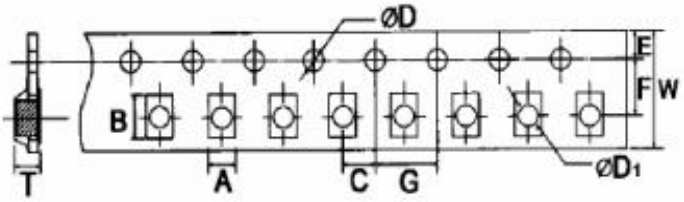
B. Carrier Taping A



Carrier Taping B



Embossed Taping



B. Taping Dimensions

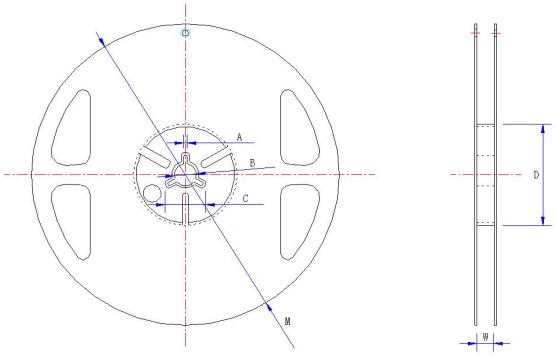
Unit: mm

Type or Size		A±0.2	B±0.2	C±0.05	$\text{ØD}^{+0.1}_{-0}$	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
Carrier Taping A	0603	1.10	1.90	2.0	1.5	1.75	3.5	4.0	8.0	0.67
Carrier Taping B	0603	1.10	1.90	2.0	1.5	1.75	3.5	4.0	8.0	0.67
	0805	1.65	2.40	2.0	1.5	1.75	3.5	4.0	8.0	0.81
	1206	1.90	3.45	2.0	1.5	1.75	3.5	4.0	8.0	0.81
	1210	2.85	3.50	2.0	1.5	1.75	3.5	4.0	8.0	0.81

Type or Size		A±0.2	B±0.2	C±0.05	$\text{ØD}^{+0.1}_{-0}$	$\text{ØD}^{+0.25}_{-0}$	E±0.1	F±0.05	G±0.1	W±0.2	T±0.1
Embossed Taping	2010	2.90	5.60	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00
	2512	3.50	6.70	2.00	1.50	1.50	1.75	5.50	4.00	12.00	1.00

REEL SPECIFICATION

A. Reel drawing



This document is subject to change without notice. The products described herein, and this document are subject to specific disclaimers, set forth at GiantOhm official website, http://www.giantohm.com/download/cid/22.html

B. Reel dimension Unit: mm

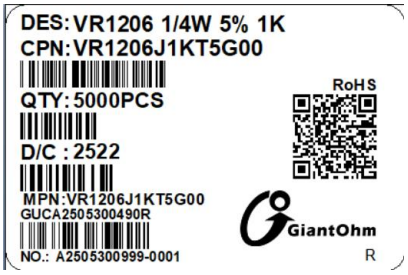
Type	SPQ PCS/Rl.	A±0.5	B±0.5	C±0.5	D±1	M±2	W±1
0603	5,000	2.0	13.0	21.0	60.0	178.0	10.0
0805	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1206	5,000	2.0	13.0	21.0	60.0	178.0	10.0
1210	5,000	2.0	13.0	21.0	60.0	178.0	10.0
2010	4,000	2.0	13.0	21.0	60.0	178.0	13.8
2512	4,000	2.0	13.0	21.0	60.0	178.0	13.8

LABEL SPECIFICATION

A. Produce Label (Ref.)



B. Customer Label (Ref.)



PACKING BOX

A. Packing Type

Taping in reel / Bulk in plastic bag.

B. Inner box

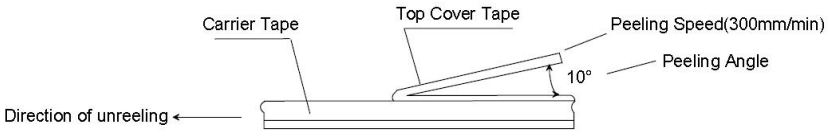
The inner box has several capacities hold 1 reel, 2 reels, 3 reels, 4 reels, 5 reels and 10 reels.

C. Out box

The out box has two capacities hold 6- or 8-pieces inner box.

NOTE OF COVER TAPE PEEL OFF

A. Figure of cover tape peel off.



B. Please keep peeling speed under 300mm per minute.

C. Please keep the angle between cover tape and direction of unreeling narrower than 10 degree.

D. There is limit of adhesive force between cover tape and carrier tape or embossed tape shown as following table.

Size of chip resistors	0603 and above
Adhesive force limit	10~70gf

This document is subject to change without notice. The products described herein, and this document are subject to specific disclaimers, set forth at GiantOhm official website, http://www.giantohm.com/download/cid/22.html

LEGAL DISCLAIMER

1. Right to Modify Information

- NingBo Giantohm Micro Electronics Technology Co., Ltd. (hereinafter referred to as Giantohm, including distributors and agents, the same applies hereinafter) retains the right to interpret, update, and revise product information (specifications, data, images, etc.).
- Product information shall be subject to the published version on GiantOhm official website (www.giantohm.com). Please note to check for updates.

2. Limitation of Liability

To the maximum extent permitted by applicable laws, GiantOhm shall not be liable for:

- **Misuse Liability**: All liabilities arising from improper use or application of the products.
- **Damages**: Any direct/indirect losses (including loss of profit, special damages, punitive damages, etc.) caused by improper use or application of the products, regardless of the legal theory (contract, tort, or otherwise).
- **Implied Warranties**: Exclusion of implied fitness warranties for a particular purpose, non-infringement, and merchantability (except as mandated by law).

3. Product Use Scope and Technical Advice Liability

- Statements regarding the suitability of products for certain types of applications are based on GiantOhm knowledge of typical requirements that are often placed on GiantOhm products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the user's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application.
- Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each user application by the user's technical experts for the application, with the user assuming full responsibility.
- Except as expressly indicated in writing, GiantOhm products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the GiantOhm product could result in personal injury or death. users using or selling GiantOhm products not expressly indicated for use in such applications do so at their own risk.

4. Combined Use Risk

- When the product is used in combination with other materials or processes, the Buyer assumes all risks and liabilities. GiantOhm does not warrant the suitability of the combination and shall not be liable for any responsibilities.

5. Disclaimer Updates

- The updated Terms shall prevail over previous versions and shall be subject to the latest version published on the official website (http://www.giantohm.com/download/cid/22.html), except for transactions concluded prior to the effective date of the amendments.
- Continued use of the products by the user after the Terms update shall constitute deemed acceptance of the new Terms.

6. Effectiveness:

- This disclaimer does not exclude liability for personal injury caused by intentional misconduct or gross negligence, or other liabilities prohibited from exclusion by law.

VERSION HISTORY

Version	Date	Change Item(s)	Description
A	2022/04/22	-	First version
B	2022/10/31	Reliability	Update test items, test method and acceptable criterion.
C	2023/02/18	Characteristics	Update VR1210,2010,2512 MWV, MOV value.
D	2024/01/13	Full	Updated test items, test methods. Add Packing Specifications.
E	2024/06/01	Full	Add Moisture sensitivity level description.
F	2025/04/08	Legal Disclaimer Taping Dimensions	Revise the entire text Updated the size of the 0603 paper tape
G	2025/04/25	Feature	RoHS
H	2025/07/08	Label Specification	Correction of reference label template
I	2026/01/05	Dimensions	Correction 2010 A Value

This document is subject to change without notice. The products described herein, and this document are subject to specific disclaimers, set forth at GiantOhm official website, http://www.giantohm.com/download/cid/22.html