Innovative Service Around the Globe YAGEO

# DATA SHEET

## HIGH VOLTAGE THIN FILM CHIP RESISTORS

VT series

0.1% TO 1%, TC10 TO TC50

**sizes 0805/1206/1210**

**RoHS compliant**


YAGEO

Product specification – April 18, 2025 V.2

## SCOPE

This specification describes VT0805, VT1206 and VT1210 high precision-high stability chip resistors made by thin film process.

## APPLICATIONS

- Automotive electronics
- Industrial and medical equipment
- Test and measuring equipment
- Telecommunications

## FEATURES

- AEC-Q200 qualified
- Total lead free without RoHS exemption
- Halogen free epoxy
- Superior resistance against sulfur containing atmosphere
- Moisture sensitivity level: MSL 1
- Reducing environmentally hazardous wastes
- High component and equipment reliability
- Non-forbidden materials used in products/production

## ORDERING INFORMATION - GLOBAL PART NUMBER

Part number is identified by the series name, size, tolerance, packaging type, temperature coefficient, taping reel and resistance value.

### GLOBAL PART NUMBER

| VT | XXXX | X | X | X | XX | XXXXX | L |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |

**(1) SIZE**

0805/1206/1210

**(2) TOLERANCE**

B = ± 0.1%
C = ± 0.25%
D = ± 0.5%
F = ± 1%

**(3) PACKAGING TYPE**

R = Paper taping reel

**(4) TEMPERATURE COEFFICIENT OF RESISTANCE**

B = ± 10 ppm/°C
C = ± 15 ppm/°C
D = ± 25 ppm/°C
E = ± 50 ppm/°C

**(5) TAPING REEL**

07 = 7 inch dia. Reel

**(6) RESISTANCE VALUE**

There are 2~4 digits indicated the resistor value.
Letter K/M is decimal point
Example: 499K=499,000Ω
1M=1,000,000Ω

**(7) DEFAULT CODE**

Letter L is the system default code for ordering only. (NOTE)

### ORDERING EXAMPLE

The ordering code of a VT1206 chip resistor, TCR 25 value 560KΩ with ±0.5% tolerance, supplied in 7-inch tape reel is: VT1206DRD07560KL.

### NOTE

1. All our Rchip products meet RoHS compliant and Halogen Free. "LFP" of the internal 2D reel label mentions "Lead Free Process".
2. On customized label, "LFP" or specific symbol can be printed.

## MARKING

VT0805/VT1206/VT1210


Fig. 1 Value = 162 KΩ

Both E-24 and E-96 series: 4 digits
First three digits for significant figure and 4th digit for number of zeros

**NOTE**

For further marking information, please see special data sheet "Chip resistors marking".

## CONSTRUCTION

The resistors are constructed out of a high grade ceramic body. Internal metal electrodes are added at each end connected by a resistive layer.
This resistive layer is trimmed to its nominal value and on both ends a contact is made which will guarantee optimum solderability. This is achieved by applying several layers and for ease of soldering the outer layer consists of Ni/matte tin.
Adding a special protective layer, passivation coating, on this series to enhance moisture resistance of the environment.

## OUTLINES

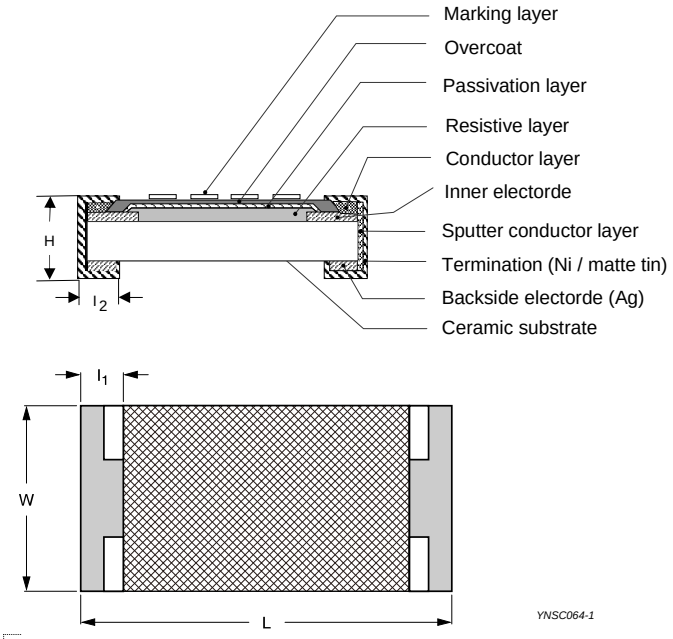


Fig. 2 Chip resistor outlines

## DIMENSIONS

Table 1

| TYPE | L (mm) | W (mm) | H (mm) | $I_1$ (mm) | $I_2$ (mm) |
|---|---|---|---|---|---|
| VT0805 | 2.00 ± 0.10 | 1.25 ± 0.10 | 0.50 ± 0.10 | 0.35 ± 0.20 | 0.35 ± 0.20 |
| VT1206 | 3.10 ± 0.10 | 1.60 ± 0.10 | 0.55 ± 0.10 | 0.45 ± 0.20 | 0.40 ± 0.20 |
| VT1210 | 3.10 ± 0.10 | 2.60 ± 0.15 | 0.55 ± 0.10 | 0.50 ± 0.20 | 0.50 ± 0.20 |

## ELECTRICAL CHARACTERISTICS

Table 2

| TYPE | Operating Temperature Range | Power Rating | Max. Working Voltage | Resistance Range (E-24/E-96 series)( Ω) & Tolerance[1] | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | T.C.R. (ppm/°C)[2] | ±0.1% (B) | ±0.25% (C) | ±0.5% (D) | ±1% (F) |
| VT0805 | –55 °C to +155 °C | 200mW | 448 V | ±50 (E) | | 150K ≤ R ≤1M | | |
| | | | | ±25 (D) | | | | |
| VT1206 | | 250mW | 613 V | ±50 (E) | | 162K ≤ R ≤1M5 | | |
| | | | | ±25 (D) | | | | |
| | | | | ±15 (C) | | | | |
| | | | | ±10 (B) | | | | |
| VT1210 | | 333mW | 578 V | ±50 (E) | | 120K ≤ R ≤1M | | |
| | | | | ±25 (D) | | | | |

**NOTE** : 1. Global part number (code 7)

2. Global part number (code 9)

3. Rated voltage follow maximum voltage formula.

$V = \sqrt{(P \times R)}$

V: Rated Voltage (V), P: Rated Power(W), R: Resistance Value(Ω)

## FOOTPRINT AND SOLDERING PROFILES

For recommended footprint and soldering profiles, please see the special data sheet "Chip resistors mounting".

## PACKING STYLE AND PACKAGING QUANTITY

Table 3 Packing style and packaging quantity

| PRODUCT TYPE | PATKING STYLE | REEL DIMENSION | QUANTITY PER REEL |
|---|---|---|---|
| VT0805 | Paper taping reel | 7" (178 mm) | 5,000 Units |
| VT1206 | Paper taping reel | 7" (178 mm) | 5,000 Units |
| VT1210 | Paper taping reel | 7" (178 mm) | 5,000 Units |

**NOTE:** for paper tape and reel specification/dimensions, please see the special data sheet "packing" document.

## FUNCTIONAL DESCRIPTION

### OPERATING TEMPERATURE RANGE

Range: –55 °C to +155 °C

### POWER RATING

Each type rated power at 70 °C:
VT0805=1/5 W
VT1206=1/4 W
VT1210=1/3 W

### RATED VOLTAGE

The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

$$V = \sqrt{(P \times R)}$$

Or max. working voltage whichever is less

Where

V=Continuous rated DC or AC (rms) working voltage (v)

P=Rated power

R=Resistance value (Ω)

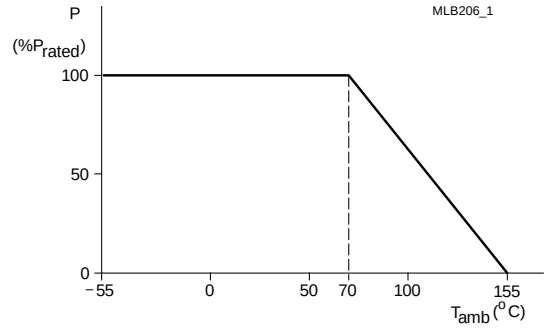


Fig. 3 Maximum dissipation ($P_{max}$) in percentage of rated power as a function of the operating ambient temperature ($T_{amb}$)

## TESTS AND REQUIREMENTS

Table 4 Test condition, procedure and requirements

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|---|---|---|---|
| Short Time Overload | IEC60115-1 4.13 | 2.5 times of rated voltage or maximum overload voltage, the less of the above, for 5 sec at room temperature | ±(0.05%+0.05Ω) |
| High Temperature Exposure | AEC-Q200 Test 3<br>MIL-STD-202 Method 108 | 1,000 hours at Tamb = 155 °C, unpowered | ±(0.3%+0.05Ω) |
| Biased Humidity | AEC-Q200 Test 7<br>MIL-STD-202 Method 103 | 1,000 hours; 85 °C / 85% RH<br>10% of operating power<br>Measurement at 24±4 hours after test conclusion | 0805/1206: ±(0.1%+0.05Ω)<br>1210 : ±(0.25%+0.05Ω) |
| Life | AEC-Q200 Test 8<br>MIL-STD-202 Method 108 | 1,000 hours at 70±2 °C, RCWV applied for 1.5 hours on, 0.5 hour off, still air required | ±(0.1%+0.05Ω) |
| Resistance to Soldering Heat | AEC-Q200 Test 15<br>MIL-STD-202 Method 210 | Specimen passed 3 times reflow temperature at 260°C, with solder | ±(0.05%+0.05Ω)<br>No visible damage |
| Temperature Cycling | AEC-Q200 Test 4<br>JESD22-A104 | 1,000 cycles, -55/+155°C for 1 cycle per 30 minutes | ± (0.3%+0.05Ω)<br>No visible damage |
| Solderability - Wetting | AEC-Q200 Test 18<br>J-STD-002 | (1) Baking 4 hours at 155°C dry heat, dipping at 245±3°C for 5±0.5 seconds.<br>(2) Baking 4 hours at 155°C dry heat, dipping at 260±3°C for 30±0.5 seconds. | Well tinned<br>(>95% covered)<br>No visible damage |
| Board Flex / Bending | AEC-Q200 Test 21<br>AEC-Q200-005 | Chips mounted on a glass epoxy resin PCB (FR4)<br>Bending for 1206/1210 : 2mm<br>0805 : 3mm<br>Holding time: minimum 60 second | ±(0.1%+0.05Ω) |
| Temperature Coefficient of Resistance (T.C.R.) | IEC 60115-1 4.8 | At +25/–55 °C and +25/+125°C Formula:<br>$T.C.R = \frac{R2 - R1}{R1(t2 - t1)} \times 10^6 (ppm/°C)$<br>Where<br>t1=+25 °C or specified room temperature<br>t2=–55 °C or +125 °C test temperature<br>R1=resistance at reference temperature in ohms<br>R2=resistance at test temperature in ohms | Refer to table 2 |
| Flower of Sulfur | ASTM-B-809-95*<br>* Modified | Sulfur 750 hours, 105°C, unpowered. | ±(2.0%+0.05Ω) |

## REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|---|---|---|---|
| Version 2 | Apr. 18, 2025 | - | - Add VT0805, VT1210 |
| Version 1 | Dec. 6, 2024 | - | - Update TCR range. |
| Version 0 | Feb. 24, 2023 | - | - First issue of this specification |

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