



HITANO ENTERPRISE CORP.

7F-7, No. 3, Wu Chuan 1st Road, New Taipei Industrial Park,
New Taipei City, TAIWAN, R.O.C.
Tel: +886 2 2299 1331 Fax: +886 2 2298 2466

Data Sheet

Customer: _____

Product: Thick Film High Voltage Chip Resistor _____

Resistors Size : 0603/0805/1206/2010/2512 _____

Issued Date: 30-March-2023 _____

Edition: Ver. 1 _____

Record of change

| Date | Ver. | Description | Page |
|------|------|-------------|------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| | |
|--|--|
| VENDOR : <input type="checkbox"/> HITANO ENTERPRISE CORP. 7F-7,NO.3,WUCHUAN1ST ROAD, NEW TAIPEI INDUSTRIAL PARK, NEW TAIPEI CITY, TAIWAN, R.O.C. TEL:+886222991331(REP.) FAX:+886222982466 | |
| MAKER : <input type="checkbox"/> Prosperity Dielectric Co., Ltd. No.220-1, Sec. 2, Nanshan Rd., Lujhu, Taoyuan 33860, Taiwan, R.O.C | |

HFVF series. (AEC-Q200) High Voltage Series Thick-film Lead Free Chip Resistors

1. Features

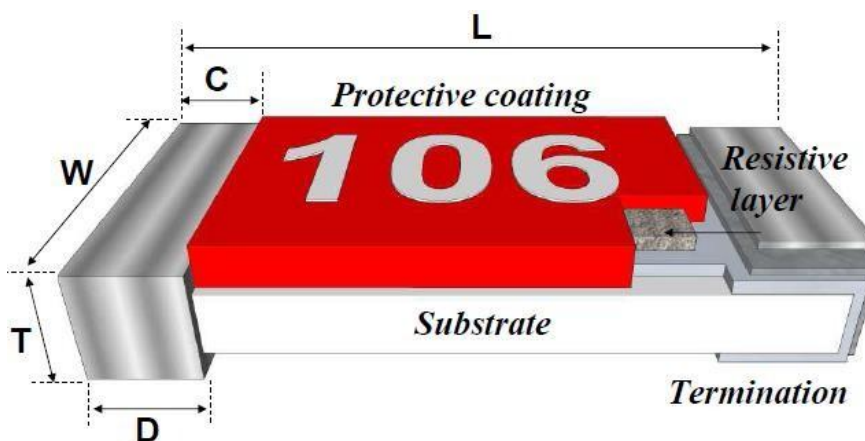
- Special materials and design for higher working voltage required.
- Superior surge ability than general purpose series.
- Compatible with flow and reflow soldering.
- Suitable for lead free soldering.
- Max. Voltage coefficient resistance below 300ppm.
- Meet AEC-Q200, RoHS compliant & Halogen Free.

2. Applications

- Power supply.
- Automotive industry.
- Measurement instrument.
- Medical equipment.

3. Dimension and Construction

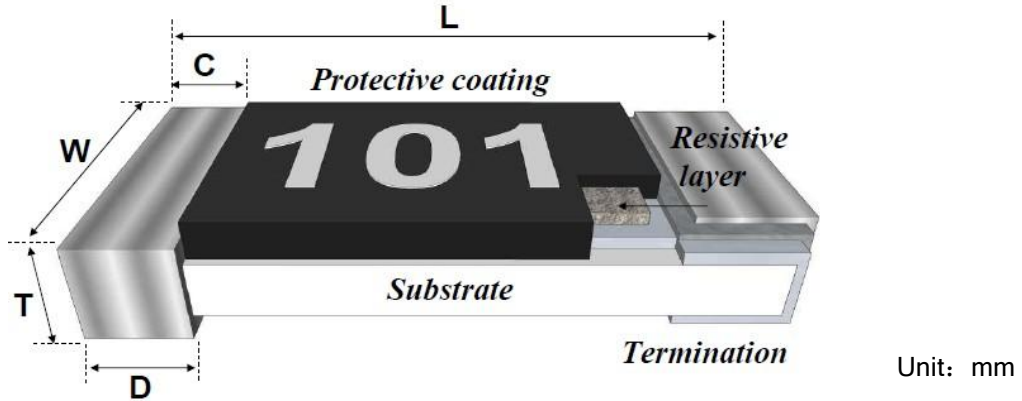
3.1 R value $\geq 100K\Omega$



Unit: mm

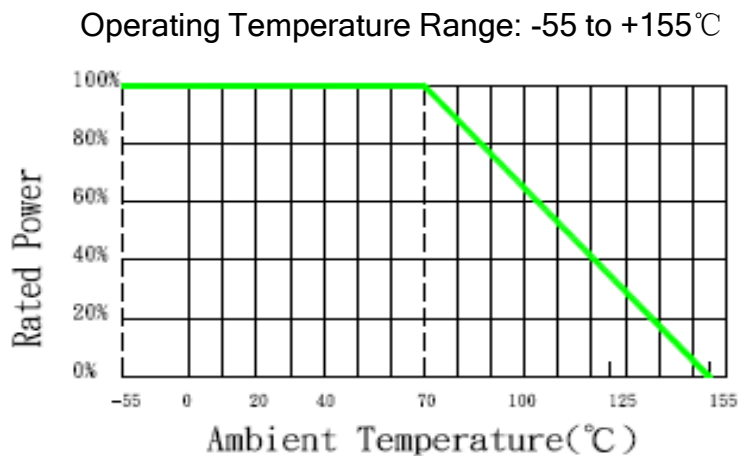
| Type | L | W | C | D | T |
|--------|-----------|-----------|-----------|-----------|-----------|
| HFVF03 | 1.60±0.10 | 0.80±0.10 | 0.30±0.20 | 0.30±0.20 | 0.45±0.10 |
| HFVF05 | 2.00±0.10 | 1.25±0.10 | 0.40±0.20 | 0.40±0.20 | 0.50±0.10 |
| HFVF06 | 3.10±0.10 | 1.60±0.10 | 0.50±0.20 | 0.50±0.20 | 0.55±0.10 |
| HFVF20 | 5.00±0.20 | 2.50±0.20 | 0.65±0.25 | 0.60±0.25 | 0.60±0.10 |
| HFVF25 | 6.40±0.20 | 3.20±0.20 | 0.65±0.25 | 0.90±0.25 | 0.60±0.15 |

3.2 R value <100KΩ



| Type | L | W | C | D | T |
|--------|-----------|-----------|-----------|-----------|-----------|
| HFVF03 | 1.60±0.10 | 0.80±0.10 | 0.30±0.20 | 0.30±0.20 | 0.45±0.10 |
| HFVF05 | 2.00±0.10 | 1.25±0.10 | 0.40±0.20 | 0.40±0.20 | 0.50±0.10 |
| HFVF06 | 3.10±0.10 | 1.60±0.10 | 0.50±0.25 | 0.50±0.25 | 0.55±0.10 |
| HFVF20 | 5.00±0.20 | 2.50±0.20 | 0.65±0.25 | 0.60±0.25 | 0.60±0.10 |
| HFVF25 | 6.40±0.20 | 3.10±0.20 | 0.60±0.25 | 1.80±0.25 | 0.60±0.15 |

4. Power Derating Curve



HFVF series. (AEC-Q200)

High Voltage Series

Thick-film Lead Free Chip Resistors

5. Rating

| Type | Size | Power Rating at 70°C | Max. RCWV | Max. Overload Voltage | Resistance Tolerance | Temperature Coefficient (ppm/°C) | Resistance Range | | Standard Resistance Values |
|--------|------|----------------------|-----------|-----------------------|----------------------|----------------------------------|------------------|-------|----------------------------|
| | | | | | | | Min. | Max. | |
| HFVF03 | 0603 | 1/10W | 200V | 400V | ±1%(F) | ±100 | 47Ω | 10MΩ | E96/E24 |
| | | | | | ±5%(J) | ±200 | 100KΩ | 22MΩ | E24 |
| HFVF05 | 0805 | 1/8W | 400V | 800V | ±1%(F) | ±100 | 47Ω | 10MΩ | E96/E24 |
| | | | | | ±5%(J) | ±200 | 100KΩ | 22MΩ | E24 |
| HFVF06 | 1206 | 1/4W | 800V | 1600V | ±1%(F) | ±100 | 47Ω | 10MΩ | E96/E24 |
| | | | | | ±1%(F) | ±200 | 11MΩ | 22MΩ | E24 |
| | | | | | ±5%(J) | ±200 | 47Ω | 100MΩ | E24 |
| HFVF20 | 2010 | 1/2W | 2000V | 3000V | ±1%(F) | ±100 | 47Ω | 10MΩ | E96/E24 |
| | | | | | ±1%(F) | ±200 | 11MΩ | 22MΩ | E24 |
| | | | | | ±5%(J) | ±200 | 47Ω | 100MΩ | E24 |
| HFVF25 | 2512 | 1W | 3000V | 4000V | ±1%(F) | ±100 | 47Ω | 10MΩ | E96/E24 |
| | | | | | ±1%(F) | ±200 | 11MΩ | 22MΩ | E24 |
| | | | | | ±5%(J) | ±200 | 47Ω | 100MΩ | E24 |

Note: RCWV=(P×R)^{1/2} or Max. RCWV listed above, whichever is lower. RCWV:

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

6. Part Number

| Type | Size | Tolerance | Packing | Watt | R Value (GM) | TCR | Special Code |
|-------------|---|--------------------------------|--|------------------------------------|---|------------------------------------|--------------------------------|
| HFVE | 03 :0603 05 :0805 06 :1206 20 :2010 25 :2512 | E :±1% J :±5% | Paper Tape : 0603.0805.1206 I : 5Kpcs V : 10Kpcs W : 20Kpcs Plastic Tape : 2010.2512 P : 4Kpcs X : 8Kpcs Y : 16Kpcs | ∅ : As Rating Info | XXXX XXX ±5%: 3 digits ±1%: 4 digits | ∅ : As Rating Info | M : Meet AEC-Q200 |

HFVF series. (AEC-Q200) High Voltage Series Thick-film Lead Free Chip Resistors

Example:

HFVF25FP-1004-M

→ 2512 size, tolerance 1%, plastic tape, 1W, 1 MΩ, Aec-Q200.

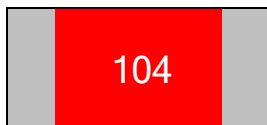
7. Marking/Soldering

R value $\geq 100\text{K}\Omega$, Overcoating Color is "Red".

R value $< 100\text{K}\Omega$, Overcoating Color is "Black".

E24 $\pm 5\%$: 3 Digits marking to identify the resistance value

0603/0805/1206/2010/2512



$$104 \rightarrow 10 \times 10^4 = 100 \text{ K}\Omega$$

E24/E96 $\pm 1\%$: 4 Digits marking to identify the resistance value

0805/1206/2010/2512



$$1001 \rightarrow 100 \times 10^1 = 1 \text{ K}\Omega$$

E24 $\pm 1\%$: 3 Digits marking to identify the resistance value

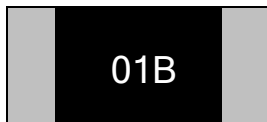
0603



$$106 \rightarrow 10 \times 10^6 = 10 \text{ M}\Omega$$

E96 $\pm 1\%$: 3 Digits marking to identify the resistance value

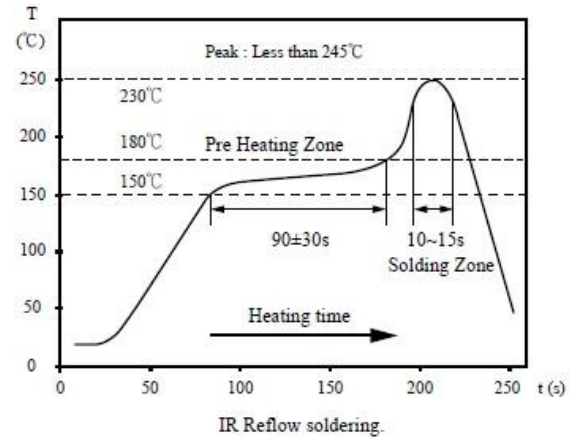
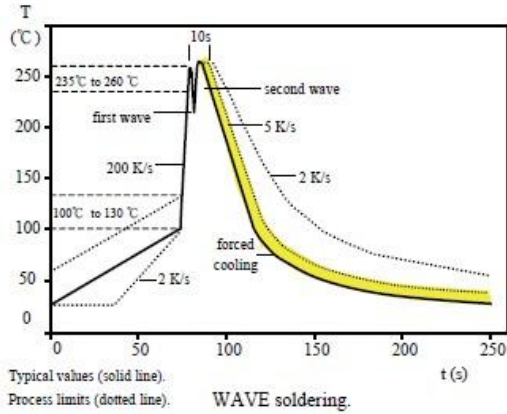
0603



$$01B \rightarrow \text{Refer 0603 marking table} = 1 \text{ K}\Omega$$

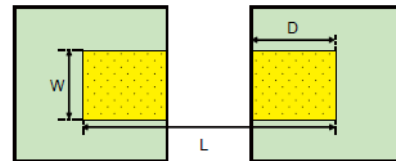
HFVF series. (AEC-Q200) High Voltage Series Thick-film Lead Free Chip Resistors

Soldering Reference :



Recommend Solder Pad Dimensions :

| Type | W | D | L |
|-----------------------------|------|------|------|
| HFVF03 | 0.90 | 1.00 | 3.00 |
| HFVF05 | 1.30 | 1.15 | 3.50 |
| HFVF06 | 1.80 | 1.30 | 4.70 |
| HFVF20 | 3.00 | 1.50 | 6.80 |
| HFVF25 | 3.70 | 1.60 | 7.60 |
| HFVF25 <100KΩ | 3.70 | 2.45 | 7.60 |



HFVF series. (AEC-Q200)

High Voltage Series

Thick-film Lead Free Chip Resistors

8. Reliability Performance (AEC-Q200)

| Test Item | Specification | Test Method (AEC-Q200. IEC 60115) |
|--|---|--|
| DC Resistance | F: $\pm 1\%$; J: $\pm 5\%$ | AEC-Q200 TABLE 7.1 IEC 60115-1 / JIS C 5201-1 , Clause 4.5 Measure the resistance Value. |
| High Temperature Exposure (Storage) | J: $\circ R \cong \pm(3\%+0.1\Omega)$ F: $\circ R \cong \pm(1\%+0.05\Omega)$ | AEC-Q200 TABLE 7.3 1000 hrs. @ T=125°C. Unpowered. Measurement at 24 \pm 2 hours after test conclusion. |
| Temperature Cycling | $\Delta R \cong \pm(1\%+0.1\Omega)$ No mechanical damage. | AEC-Q200 TABLE 7.4 1000 Cycles (-55°C to +125°C). Measurement at 24 \pm 4 hours after test conclusion. |
| Moisture Resistance | $\Delta R \cong \pm(1\%+0.1\Omega)$ | AEC-Q200 TABLE 7.6 Test 65°C/80~100%RH/10Cycles. Measurement at 24 \pm 2 hours after test conclusion. (t=24hrs/cycle). |
| Biased Humidity | J: $\circ R \cong \pm(5\%+0.1\Omega)$ F: $\circ R \cong \pm(3\%+0.05\Omega)$ VCR within the spec. | AEC-Q200 TABLE 7.7 1000 hours 85°C/85%RH. 10% of operating power. Measurement at 24 \pm 2 hours after test conclusion. |
| Operational Life | J: $\circ R \cong \pm(5\%+0.1\Omega)$ F: $\circ R \cong \pm(3\%+0.05\Omega)$ VCR within the spec. | AEC-Q200 TABLE 7.8 Test 1000hr @ TA=125°C at specified rated power. Measurement at 24 \pm 2 hours after test conclusion. |
| External Visual | No visual damage and refer PDC marking code. | AEC-Q200 TABLE 7.9 Inspect device construction, marking and workmanship. |
| Physical Dimension | Within the spec. | AEC-Q200 TABLE 7.10 Verify physical dimensions to the applicable device detail specification. |

HFVF series. (AEC-Q200)

High Voltage Series

Thick-film Lead Free Chip Resistors

| | | |
|----------------------------------|--|--|
| Mechanical Shock | Within product specification tolerance and no visible damage. | AEC-Q200 TABLE 7.13 Test Peak value:100g's,Wave:Hail-sine, Duration:6ms,Velocity:12.3ft/sec. |
| Vibration | No mechanical damage. | AEC-Q200 TABLE 7.14 5 g's for 20 min., 12 cycles each of 3 orientations. Test from 10-2000 Hz. |
| Resistance to Solder Heat | $\Delta R \cong \pm(1\% + 0.1\Omega)$ No mechanical damage. | AEC-Q200 TABLE 7.15 Solder dipping @ 270°C±5°C for 10sec.±1sec. |
| Thermal Shock | J: $\Delta R \cong \pm(1\% + 0.1\Omega)$ F: $\Delta R \cong \pm(0.5\% + 0.05\Omega)$ No mechanical damage. | AEC-Q200 TABLE 7.16 -55 to 155°C/ dwell time 15min/ Max transfer time 20sec/ 300cycles. |
| ESD | $\Delta R \cong \pm(1\% + 0.1\Omega)$ No mechanical damage. | AEC-Q200-002 Test contact min. 1KV. |
| Solder Ability | Over 95% of termination must be covered with solder. | AEC-Q200 TABLE 7.18 a) Baking 155°C 4H, dipping 235°C 5s b) Steam 1H, dipping 215°C 5s c) Steam 1H, dipping 260°C 7s |
| Flammability | Refer UL-94. | AEC-Q200 TABLE 7.20 UL-94 V-0 or V-1 are acceptable |
| Board Flex | J: $\Delta R \cong \pm(1\% + 0.1\Omega)$ F: $\Delta R \cong \pm(0.5\% + 0.05\Omega)$ No mechanical damage. | AEC-Q200 TABLE 7.21 Bending 2mm 2512.2010.1210.1206, 3mm 0805.0603. |
| Terminal Strength | No mechanical damage | AEC-Q200 TABLE 7.22 Force 1 Kg for 60 seconds. |
| Short Time Overload | J: $\Delta R \cong \pm(2\% + 0.1\Omega)$ F: $\Delta R \cong \pm(1\% + 0.1\Omega)$ | IEC 60115-1, Clause 4.13 5 × Rated power for 5 seconds |
| Load Life Humidity | J: $\Delta R \cong \pm(3\% + 0.1\Omega)$ F: $\Delta R \cong \pm(1\% + 0.1\Omega)$ | IEC 60115-1, Clause 4.24 40±2°C with relative humidity 90% ~ 95% D.C. rated voltage for 1.5 hours ON 30 minutes OFF. Cycle repeated 1000 hours. |

HFVF series. (AEC-Q200)

High Voltage Series

Thick-film Lead Free Chip Resistors

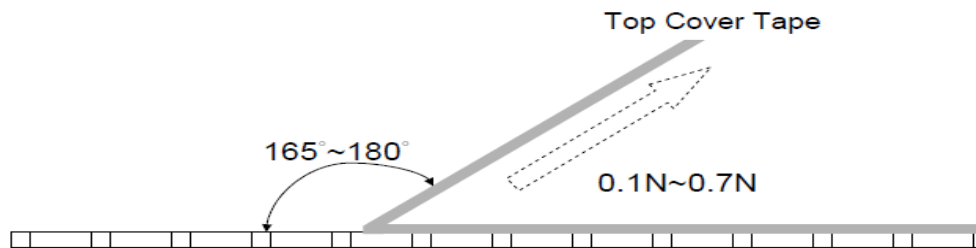
| | | |
|--|--|---|
| Temperature Coefficient of Resistance (TCR) | Within the spec. | IEC 60115-1, Clause 4.8 $TCR(ppm/^{\circ}C) = \frac{(R_2 - R_1) / R_1 \times 1}{(T_2 - T_1)} \times 10^6$ Test temperature: 25°C ~ -55°C 25°C ~ +155°C |
| Load Life | J: $\sigma R \cong \pm(3\% + 0.1\Omega)$ F: $\sigma R \cong \pm(1\% + 0.1\Omega)$ | IEC 60115-1, Clause 4.25 Rated voltage for 1.5 hours for followed by a pause 0.5 hour at 70±2°C. Cycle repeated 1000 hours. |
| Insulation Resistance | Between termination and coating must over 1000MΩ | IEC 60115-1, Clause 4.6 Test voltage: 100±15V |
| Voltage Coefficient of Resistance (VCR) | $\cong 1M \Omega$: ±100ppm $> 1M \Omega$: ±200ppm $\cong 10M \Omega$: ±300ppm | IEC 60115-1, Clause 4.11 Max. test voltage: 500V V _L : 10% RCWV or Max.RCWV V _H : 100% RCWV or Max.RCWV |

9. PACKAGING

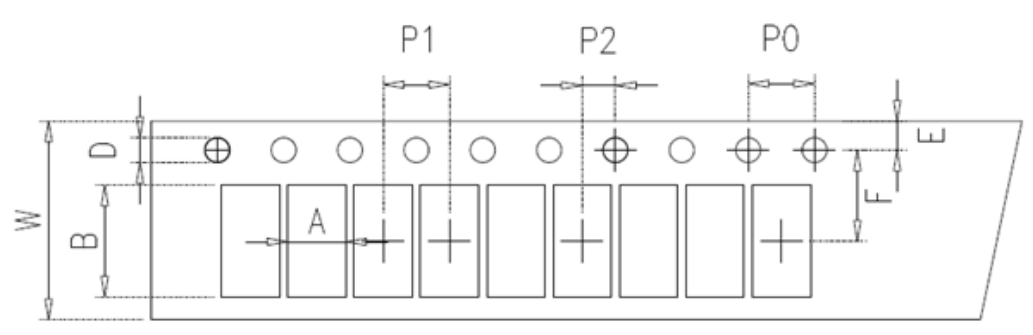
9.1 Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min

The peel force of top cover tape shall be between 0.1 to 0.7N



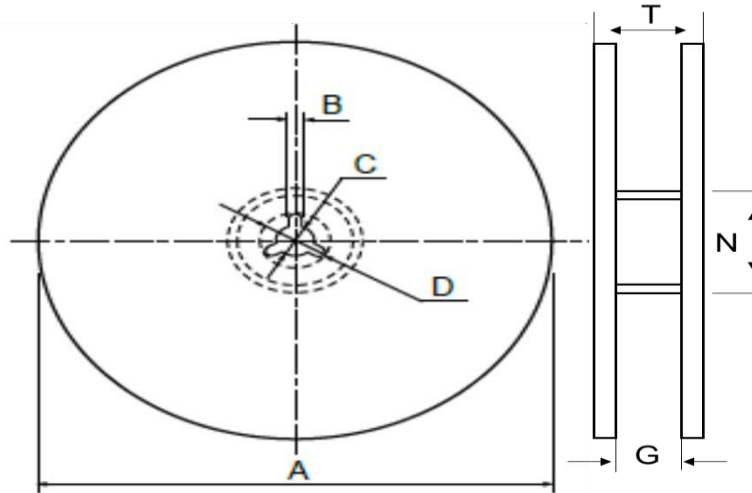
9.2 Tape Packaging Dimensions



| Size | A | B | W | F | E | P1 | P2 | P0 | D |
|------|-----------|-----------|------------|-----------|-----------|-----------|-----------|-----------|--------------|
| 0603 | 1.10±0.20 | 1.90±0.20 | 8.00±0.30 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.05 | 4.00±0.10 | 1.50+0.10/-0 |
| 0805 | 1.65±0.20 | 2.40±0.20 | 8.00±0.30 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.05 | 4.00±0.10 | 1.50+0.10/-0 |
| 1206 | 2.00±0.20 | 3.60±0.20 | 8.00±0.30 | 3.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.05 | 4.00±0.10 | 1.50+0.10/-0 |
| 2010 | 2.80±0.20 | 5.50±0.20 | 12.00±0.30 | 5.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.05 | 4.00±0.10 | 1.50+0.10/-0 |
| 2512 | 3.50±0.20 | 6.70±0.20 | 12.00±0.30 | 5.50±0.05 | 1.75±0.10 | 4.00±0.10 | 2.00±0.05 | 4.00±0.10 | 1.50+0.10/-0 |

unit: mm

9.3 Reel Dimensions



unit:mm

| Size | Packaging Q'ty | A | N | C | D | B | G | T |
|----------------------|----------------|-----------|-----------|----------|----------|---------|----------|----------|
| 0603 0805 1206 | 5kpcs/Reel | 178.0±2.0 | 60.0±0.5 | 13.0±0.5 | 20(Min.) | 2.0±0.5 | 10.0±1.5 | 14.9max. |
| | 10kpcs/Reel | 254.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 10.0±1.5 | 14.9max. |
| | 20kpcs/Reel | 330.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 10.0±1.5 | 14.9max. |
| 2010 2512 | 4kpcs/Reel | 178.0±2.0 | 60.0±0.5 | 13.0±0.5 | 20(Min.) | 2.0±0.5 | 13.8±1.5 | 16.7max. |
| | 8kpcs/Reel | 254.0±2.0 | 100.0±0.5 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 13.8±1.5 | 20.0max. |
| | 16kpcs/Reel | 330.0±2.0 | 100.0±1.0 | 13.5±0.5 | 20(Min.) | 2.0±0.5 | 13.8±1.5 | 20.0max. |

10. Storage & Handling

... Products are recommended to be used up within one year as ensured shelf life.

Check solder ability in case shelf life extension is needed.

... To store products with following condition:

Temperature: 5 to 40°C; Humidity: 20 to 70% relative humidity.

Precaution for use :

The AEC-Q200 series resistors is mainly used on general automotive equipment without safety considerations.

Please contact our company in advanced if you intend to use resistor for designing the equipment which may damage itself and the safety of third party. If necessary, please consider to add the protect circuit in devising process and obtaining fully safety evaluation. The contents of the acknowledgment is only used for our parent company, marketing subsidiaries and official marketing agents who purchase our products. Not applicable for the other nonofficial channels.

HFVF series. (AEC-Q200)
High Voltage Series
Thick-film Lead Free Chip Resistors

Appendix

■ 0603 1% Marking Table (Table 1)

| Code | E48 | E96 | Code | E48 | E96 | Code | E48 | E96 | Code | E48 | E96 |
|------|-----|-----|------|-----|-----|------|-----|-----|------|-----|-----|
| 01 | 100 | 100 | 25 | 178 | 178 | 49 | 316 | 316 | 73 | 562 | 562 |
| 02 | | 102 | 26 | | 182 | 50 | | 324 | 74 | | 576 |
| 03 | 105 | 105 | 27 | 187 | 187 | 51 | 332 | 332 | 75 | 590 | 590 |
| 04 | | 107 | 28 | | 191 | 52 | | 340 | 76 | | 604 |
| 05 | 110 | 110 | 29 | 196 | 196 | 53 | 348 | 348 | 77 | 619 | 619 |
| 06 | | 113 | 30 | | 200 | 54 | | 357 | 78 | | 634 |
| 07 | 115 | 115 | 31 | 205 | 205 | 55 | 365 | 365 | 79 | 649 | 649 |
| 08 | | 118 | 32 | | 210 | 56 | | 374 | 80 | | 665 |
| 09 | 121 | 121 | 33 | 215 | 215 | 57 | 383 | 383 | 81 | 681 | 681 |
| 10 | | 124 | 34 | | 221 | 58 | | 392 | 82 | | 698 |
| 11 | 127 | 127 | 35 | 226 | 226 | 59 | 402 | 402 | 83 | 715 | 715 |
| 12 | | 130 | 36 | | 232 | 60 | | 412 | 84 | | 732 |
| 13 | 133 | 133 | 37 | 237 | 237 | 61 | 422 | 422 | 85 | 750 | 750 |
| 14 | | 137 | 38 | | 243 | 62 | | 432 | 86 | | 768 |
| 15 | 140 | 140 | 39 | 249 | 249 | 63 | 442 | 442 | 87 | 787 | 787 |
| 16 | | 143 | 40 | | 255 | 64 | | 453 | 88 | | 806 |
| 17 | 147 | 147 | 41 | 261 | 261 | 65 | 464 | 464 | 89 | 825 | 825 |
| 18 | | 150 | 42 | | 267 | 66 | | 475 | 90 | | 845 |
| 19 | 154 | 154 | 43 | 274 | 274 | 67 | 487 | 487 | 91 | 866 | 866 |
| 20 | | 158 | 44 | | 280 | 68 | | 499 | 92 | | 887 |
| 21 | 162 | 162 | 45 | 287 | 287 | 69 | 511 | 511 | 93 | 909 | 909 |
| 22 | | 165 | 46 | | 294 | 70 | | 523 | 94 | | 931 |
| 23 | 169 | 169 | 47 | 301 | 301 | 71 | 536 | 536 | 95 | 953 | 953 |
| 24 | | 174 | 48 | | 309 | 72 | | 549 | 96 | | 976 |

| Code | A | B | C | D | E | F | G | H | X | Y | Z |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|------------------|
| Multiplier | 10 ⁰ | 10 ¹ | 10 ² | 10 ³ | 10 ⁴ | 10 ⁵ | 10 ⁶ | 10 ⁷ | 10 ⁻¹ | 10 ⁻² | 10 ⁻³ |

**** If you have any request not find from above datas, please contact our sales for further information, we may do our best to meet your request.**