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SPECIFICATION FOR APPROVAL

DATE：

CUSTOMER：

PART NAME： UL Safety Certified Anti-Sulfur Thick Film High Voltage Chip Resistor

CUSTOMER'S DWG. NO.：

CUSTOMER'S PART NO.：

PDC PART NO.： **AVS/AVF SERIES APPROVED**

DESCRIPTION.：

ACTION / RESULT	" V "	CUSTOMER'S SIGNATURE	NOTE
FULL APPROVED			
CONDITIONAL APPROVED			
REJECTED			

OUR ACTION	SIGNATURE
PREPARED By	Jenny Tseng
CHECKED By	Tony Chou
APPROVED By	Byron Tsai

CUSTOMER SIGNATURE FOR ACCEPTANCE

Contents.

AVS / AVF series. (AEC-Q200)

Safety Certified / General Purpose

High Voltage Anti-Sulfur Thick-film Chip Resistors

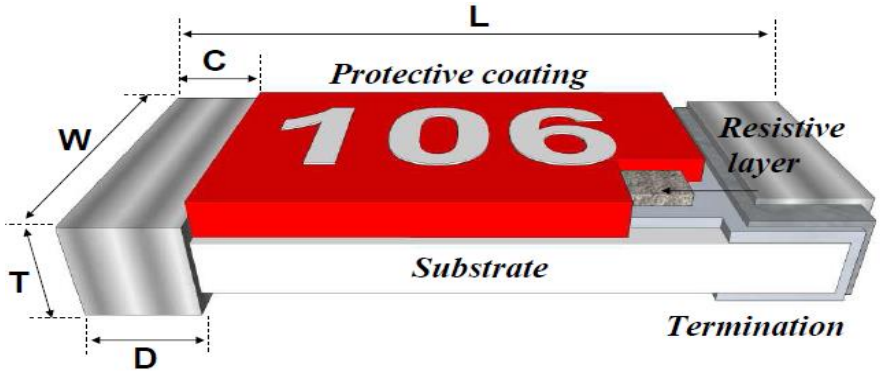
1. Features

- Special materials and design for higher working voltage required.
- Compatible with lead free flow and reflow soldering.
- Meet AEC-Q200, RoHS compliant & Halogen Free.
- Anti-Sulfur evaluated by EIA-977 105'C 750H.
- Safety certificated, UL/IEC 62368_ed3 certification available.

2. Applications

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

3. Dimension and Construction

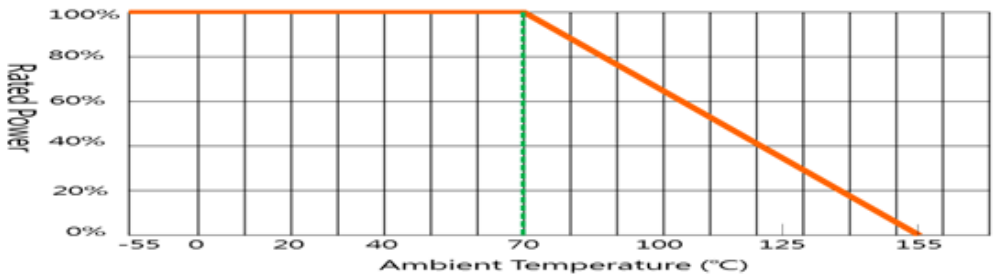


Unit：mm

Chip Size	L	W	C	D	T
1206	3.10±0.10	1.60±0.10	0.41±0.20	0.39±0.20	0.55±0.10
2010	5.00±0.20	2.50±0.20	0.50±0.25	0.63±0.25	0.60±0.10
2512	6.40±0.20	3.20±0.20	0.57±0.25	0.78±0.25	0.60±0.15

4. Power Derating Curve

Operating Temperature Range: -55 to +155℃



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5. Rating

5.1 Safety Certified

Type	Size	Rated Power at 70℃	Max. Working (V)	Max. Overload (V)	Tolerance (%)	T.C.R (ppm/℃)	Resistance (Ω)		Standard Resistance Values
							Min.	Max	
AVS06	1206	1/4W	800V	1600V	±1%(F)	±100	100K	10M	E96/E24
					±1%(F)	±200	11M	22M	E24
					±5%(J)	±200	100K	100M	E24
AVS20	2010	1/2W	2000V	3000V	±1%(F)	±100	100K	10M	E96/E24
					±1%(F)	±200	11M	22M	E24
					±5%(J)	±200	100K	100M	E24
AVS25	2512	1W	3000V	4000V	±1%(F)	±100	100K	10M	E96/E24
					±1%(F)	±200	11M	22M	E24
					±5%(J)	±200	100K	100M	E24

5.2 General Purpose

Type	Size	Rated Power at 70℃	Max. Working (V)	Max. Overload (V)	Tolerance (%)	T.C.R (ppm/℃)	Resistance (Ω)		Standard Resistance Values
							Min.	Max	
AVF06	1206	1/4W	800V	1600V	±1%(F)	±100	100K	10M	E96/E24
					±1%(F)	±200	11M	22M	E24
					±5%(J)	±200	100K	100M	E24
AVF20	2010	1/2W	2000V	3000V	±1%(F)	±100	100K	10M	E96/E24
					±1%(F)	±200	11M	22M	E24
					±5%(J)	±200	100K	100M	E24
AVF25	2512	1W	3000V	4000V	±1%(F)	±100	100K	10M	E96/E24
					±1%(F)	±200	11M	22M	E24
					±5%(J)	±200	100K	100M	E24

Notes:

1. Rated Working Voltage V= $\sqrt{P * R}$ or Max. Working Voltage whichever is lower.
2. V: Working Voltage(V), P: Rated Power(W), R: Resistance Value(Ω).
3. Please consider the resistance variance may from soldering pad/trace/amount influence, and recommend keep the surface temperature do not exceed 105℃ when operating.

6. Part Number

Type	Size	Tolerance	Packing	Watt	R Code	TCR	Grade
AVS Safety Certified **AVF** General Purpose	**06** 1206 **20** 2010 **25** 2512	**F** ±1% **J** ±5%	Paper Tape: 1206 **T** 5Kpcs **V** 10Kpcs **W** 20Kpcs Plastic Tape: 2010.2512 **P** 4Kpcs **X** 8Kpcs **Y** 16Kpcs	**-** As Rating Info	**XXXX** **XXX** **±1%** 4 digits **±5%** 3 digits	**-** As Rating Info	**M** Meet AEC-Q200

Example：

AVS25FP-1004-M

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

AVF06JT-104 -M

➔General, 1206 size, tolerance 5%, paper tape, 1/4W, 100 KΩ, Aec-Q200.

7. Marking/Soldering

Resistance value identify introduction: 4 digits or 3 digits.

How to use the marking transfer to R-value:

ABCD=ABC x 10^{D}, ABC=AB x 10^{C}, R means decimal(Ω) as example showing.

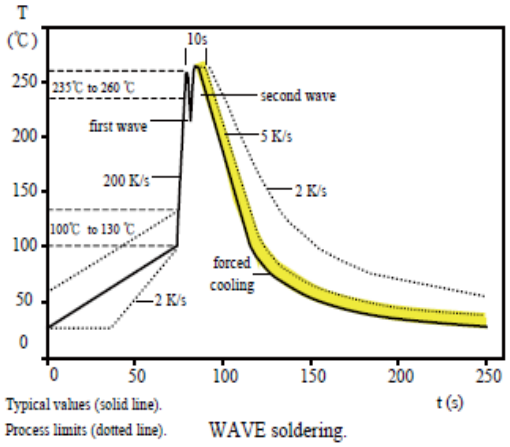
⊙ Tolerance >1% &. Size≧0805, **3** digits marking to identify the resistance value.

E24: ex. 1R0➔1Ω, 6R2➔6.2Ω, 101➔10 x 10^{1} =100Ω, 333➔33 x 10^{3} =33KΩ

⊙ Tolerance ≦1% &. Size≧0805, **4** digits marking to identify the resistance value.

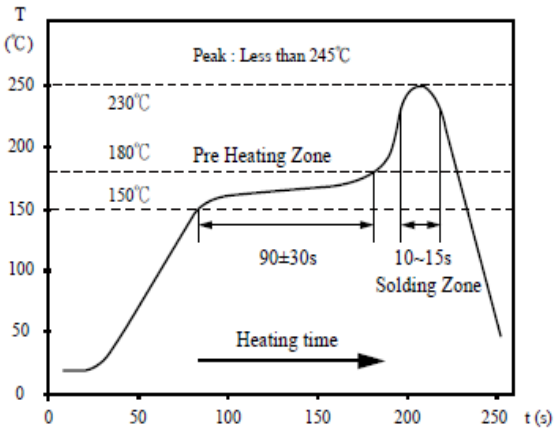
E96: ex. 3R32➔3.32Ω, 1001➔100 x 10^{1} =1KΩ, 4643➔464 x 10^{3} =464KΩ

Soldering Reference：Compatible for most industrial soldering request.



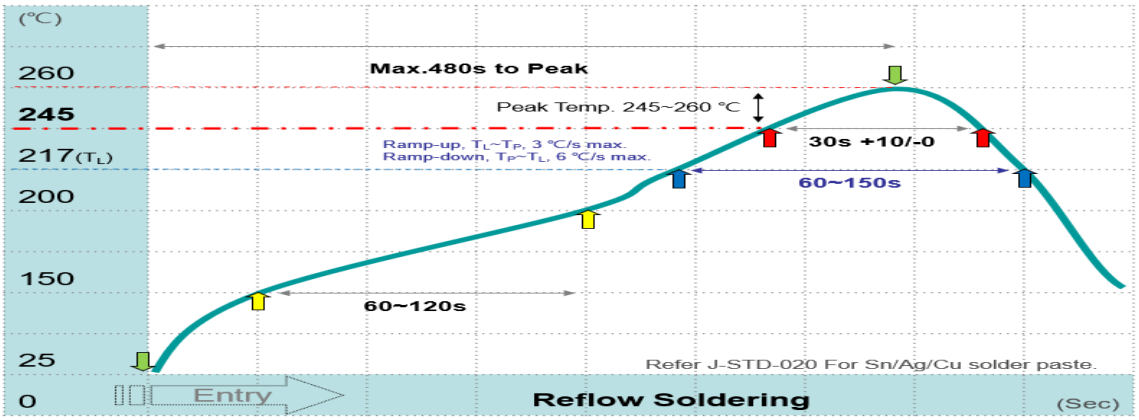
Typical values (solid line).
Process limits (dotted line).

WAVE soldering.



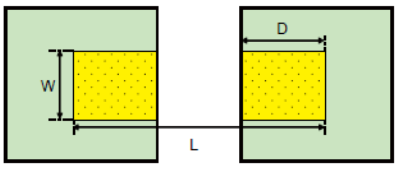
IR Reflow soldering.

J-STD-020



Recommend Solder Pad Dimensions：

Size	W(mm)	D(mm)	L(mm)
1206	1.80	1.30	4.70
2010	3.00	1.50	6.80
2512	3.70	1.60	7.60



8. Reliability Performance

AEC-Q200 [1]	Specification [2]	Refer Methods
Initial Limits (D.C. Resistance)	J：±5% F：±1%	**AEC-Q200 TABLE 7.1 / IEC 60115-1, Clause 4.5** Measure the resistance within specified tolerance.
High Temperature Exposure (storage)	J：△R≦±(3%+0.1Ω) F：△R≦±(1%+0.1Ω)	**AEC-Q200 TABLE 7.3** Max. operating temperature, 1000 hours, Unpowered. Measure at 24±4 hours after test end.
Temperature Cycling	ΔR≦±(1%+0.1Ω) No mechanical damage.	**AEC-Q200 TABLE 7.4** Unpowered. -55°C to Max. operating temperature but shall not exceed 155°C. 1000 Cycles. Min. dwell time 15 mins, transition time: Max. 1 min. Measure at least 24 hours after test end.
Humidity Bias	J：△R≦±(5%+0.1Ω) F：△R≦±(3%+0.1Ω)	**AEC-Q200 TABLE 7.7** 1000 hours 85°C /85%RH, 10% of operating power. Measure at 24 ±2 hours after test end. (for components with specified operating voltages higher or equal to 500V, 10% of operating voltage)
High Temperature Operating Life	J：△R≦±(5%+0.1Ω) F：△R≦±(3%+0.1Ω)	**AEC-Q200 TABLE 7.8** 1000 hours. Power shall be applied 90 mins ON and 30 mins OFF intermittently. Max. specified operating temperature at 100% rated power without derating. Measurement at 24±2 hours after test end.
External Visual	No visual damage and refer PDC marking code.	**AEC-Q200 TABLE 7.9** Inspect construction, marking and workmanship.
Physical Dimension	Within the spec.	**AEC-Q200 TABLE 7.10** Verify physical dimensions to the applicable component specification.
Resistance to Solvents	Marking must remain legible	**AEC-Q200 TABLE 7.12** In addition to the Method 215 solvents, add an Aqueous wash chemical.
Mechanical Shock	ΔR≦±(1%+0.1Ω) No mechanical damage.	**AEC-Q200 TABLE 7.13** Condition C, Peak value: 100g's, Wave: Half-sine, Duration: 6ms, Velocity change: 12.3ft/sec. Three shocks in each direction, total 18 shocks.

AEC-Q200 [1]	Specification [2]	Refer Methods
Vibration	ΔR≦±(1%+0.1Ω) No mechanical damage.	**AEC-Q200 TABLE 7.14** 5 g's for 20 min., 12 cycles each of 3 orientations. Test from 10 Hz-2000 Hz.
Resistance to Solder Heat	ΔR≦±(1%+0.1Ω) No mechanical damage.	**AEC-Q200 TABLE 7.15** SMD: Condition K. Infared/convection reflow soldering and time above 217℃, 60~150 sec.
ESD	△R≦±(1%+0.1Ω) No mechanical damage.	**AEC-Q200 TABLE 7.17** AEC-Q200-002, Direct contact, min.1KV.
Solderability	95% coverage min. good tinning, no visible damage.	**AEC-Q200 TABLE 7.18** SMD, J-STD-002, Coating durability category 2. B1: Baking 155℃ 4H, dipping 245±5℃ 5+0/-0.5s D: Baking 155℃ 4H, dipping 260±5℃ 30+0/-0.5s
Flammability	Refer UL-94.	**AEC-Q200 TABLE 7.20** UL-94 V-0 or V-1 are acceptable.
Board Flex (SMD)	J：ΔR≦±(1%+0.1Ω) F：ΔR≦±(0.5%+0.1Ω) No mechanical damage.	**AEC-Q200 TABLE 7.21** AEC-Q200-005, 1.6±0.2 mm FR4 PCB board. Bending min. 2mm, 60+5/-0 sec.
Terminal Strength (SMD)	No mechanical damage.	**AEC-Q200 TABLE 7.22** AEC-Q200-006, component mounted on a PCB. Force 17.7N(1.8Kg) for 60 seconds.

Electrical	Specification [2]	Refer Methods
Short Time Overload	J：ΔR≦±(2%+0.1Ω) F：ΔR≦±(1%+0.1Ω)	**IEC 60115-1, Clause 4.13** 5 × Rated power for 5 seconds
Temperature Coefficient of Resistance	Within the spec.	**IEC 60115-1, Clause 4.8** Test temperature：(T_1) 25℃~ (T_2) -55℃/+155℃ TCR(ppm/℃) = $(R_2-R_1)/R_1 \times 1 / (T_2-T_1) \times 10^6$
VCR (Voltage Coefficient Of Resistance)	≦1MΩ ：±100ppm ＞1MΩ ：±200ppm ≧10MΩ ：±300ppm	**IEC 60115-1, Clause 4.11** V_L：15V, V_H：100%, RCWV or Max. RCWV Max. test voltage: 500V
Environmental	**Specification**	**Refer Methods**
Anti-Sulfur	ΔR≦±(2%+0.1Ω)	**EIA-977(Test B)** Sulfur 750 hours, 105±2°C

Remarks 1: Refer AEC - Q200 - Rev E March 20, 2023

Remarks 2: Specifications with +xΩ is not applicable when the resistance below 1KΩ.

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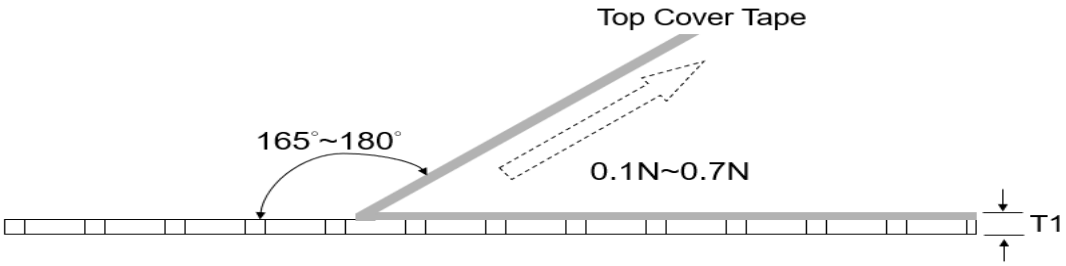
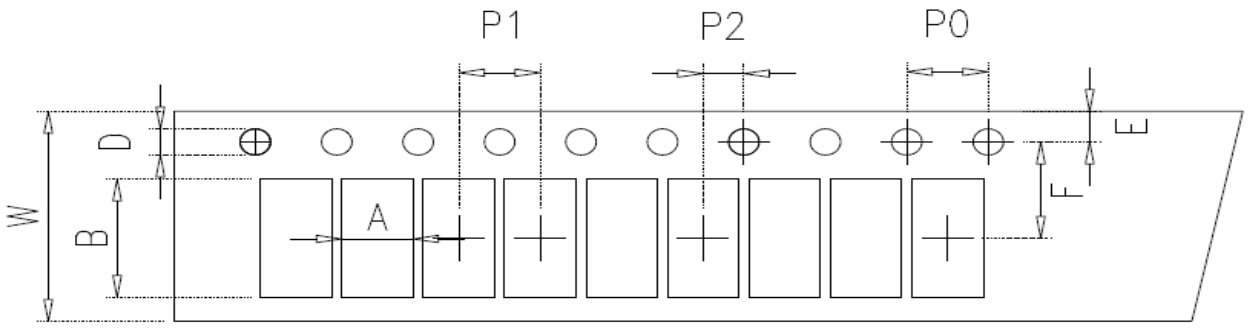
9. PACKAGING

9.1 Peel Strength of Top Cover Tape

The peel speed shall be about 300 mm/min and peel force of top cover tape shall between 0.1 to 0.7N.

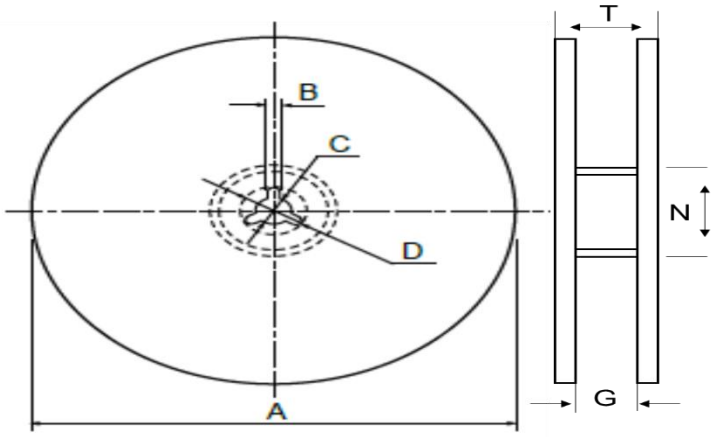


9.2 Tape Packaging Dimensions (unit.mm)



Size	A	B	W	F	E	P1	P2	P0	D	T1
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	0.80±0.10
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	1.00±0.10
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	1.05±0.10

9.3 Reel Dimensions (unit.mm)



Size	Packaging pcs/Reel	A	N	C	D	B	G	T
1206	5 k	178.0±2.0	60.0±0.5	13.0±0.5	20(Min.)	2.0±0.5	10.0±1.5	14.9max.
	10 k	254.0±2.0	100.0±1.0	13.5±0.5	20(Min.)	2.0±0.5	10.0±1.5	14.9max.
	20 k	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	4 k	178.0±2.0	60.0±0.5	13.0±0.5	20(Min.)	2.0±0.5	13.8±1.5	16.7max.
	8 k	254.0±2.0	100.0±0.5	13.5±0.5	20(Min.)	2.0±0.5	13.8±1.5	20.0max.
	16 k	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℃；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.

※ All product specification and data are subject to change without notice.

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