

规格书**SPECIFICATION****丽智电子（南通）有限公司**

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VS 高壓耐硫厚膜貼片電阻規格書-VS 系列

Approval Specification for High Voltage Anti-Sulfur Thick Film Chip Resistors - Type VS

1. 範圍 (scope) :

1.1 適用於本公司所生產的無鉛、無鹵之高壓耐硫厚膜貼片電阻 VS 系列

This specification applies to High Voltage Anti-Sulfur thick film chip resistors which meet requirements of Pb free and halogen free.

1.2 本公司的無鉛產品指的貼片電阻端電極無鉛，而存在於電阻層的玻璃中的符合 RoHS 豁免條款。

There no lead exists in terminal of resistor, and lead which exist in glass of resistor layer meets RoHS exemption.

2. 產品料號 (part number) :

2512 1W 1% 510K

VS2512F15103G

VS	2512	F	1	5103	G	
↓	↓	↓	↓	↓	↓	↓
類型(Type)	尺寸(Size)	公差	額定功率	阻值	包裝代碼	區別碼
VS: 高壓耐	0805	Tolerance	Rated Power	Resistance value	Packing Code	Distinction Code
硫厚膜貼片	1206	F=±1%	1= 1W	±1% :	G=成品, 7 inch reel	空碼 = 無指定
電阻	1210	G=±2%	2= 3/4W	5103=510KΩ	常規包裝量	- “X “= 特別指
(High	2010	J=±5%	3= 1/2W	±2%, ±5% :	H=成品, 10 inch reel	定, 不同字母代表
Voltage	2512		4= 1/4W	0334=330KΩ	兩倍包裝量	不同指定
Anti-Sulfur				0104=100KΩ	Z=成品, 15K包裝量	
thick film					S=成品, 20K包裝量	
chip					U=成品, 50K包裝	
					V=bulk (散料)	

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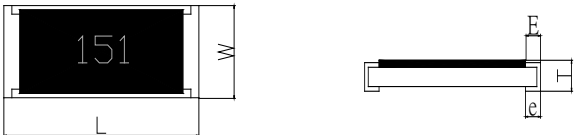
3. 電阻本體字碼標示(Marking on the Resistor's Body):

※ 公差±5%的產品，以三字碼標示，前兩位表示阻值的有效數字，最後一位表示 10 的乘幂 $\pm 5\%$ tolerance product: the marking is 3 digits, the first 2 digits are significant figures of resistance value and the 3rd one denotes the power number of 10, (10^x) ※ 公差±0.1%±0.5%及±1%的產品，以四字碼標示，前三位表示阻值的有效數字，最後一位表示 10 的乘幂 $\pm 0.1\%$、$\pm 0.5\%$ and $\pm 1\%$ tolerance product: the marking is 4 digits, the first 3 digits are significant figures of resistance value and the 4th one denotes the power number of 10, (10^x) ※ 0 歐姆產品，採用 000 三位元代碼標示。 0Ω Products, use 000 3digits code to indicate the resistance value.		$472=47 \times 10^2=4.7K\Omega$
		10 Ω 以下標示：5R6=5.6 Ω Below 10 Ω : 5R6=5.6 Ω
		$4992=499 \times 10^2=49.9K\Omega$
		100 Ω 以下標示：6R81=6.81 Ω Below 100 Ω : 6R81=6.81 Ω
		$000=0\Omega$

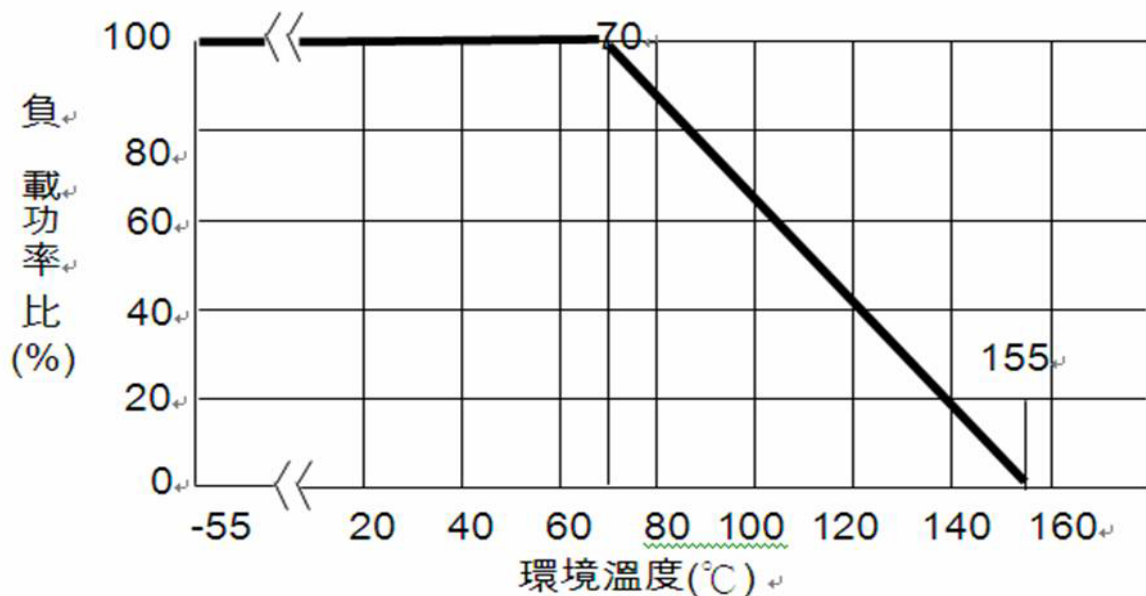
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4. 尺寸 (dimension) :

尺寸 dimension						單位 (unit) : mm
型別(Type)	L	W	T	E	e	
VS0805	2.00±0.15	1.25±0.15	0.50±0.10	0.35±0.20	0.40±0.20	
VS1206	3.10±0.15	1.60±0.15	0.55±0.10	0.45±0.25	0.40±0.25	
VS1210	3.10±0.15	2.50±0.15	0.55±0.15	0.35±0.25	0.50±0.25	
VS2010	5.00±0.20	2.50±0.20	0.55±0.15	0.65±0.25	0.50±0.25	
VS2512	6.25±0.20	3.10±0.20	0.55±0.15	0.85±0.25	0.95±0.25	

5. 功率衰減曲線 (Derating Curve) :



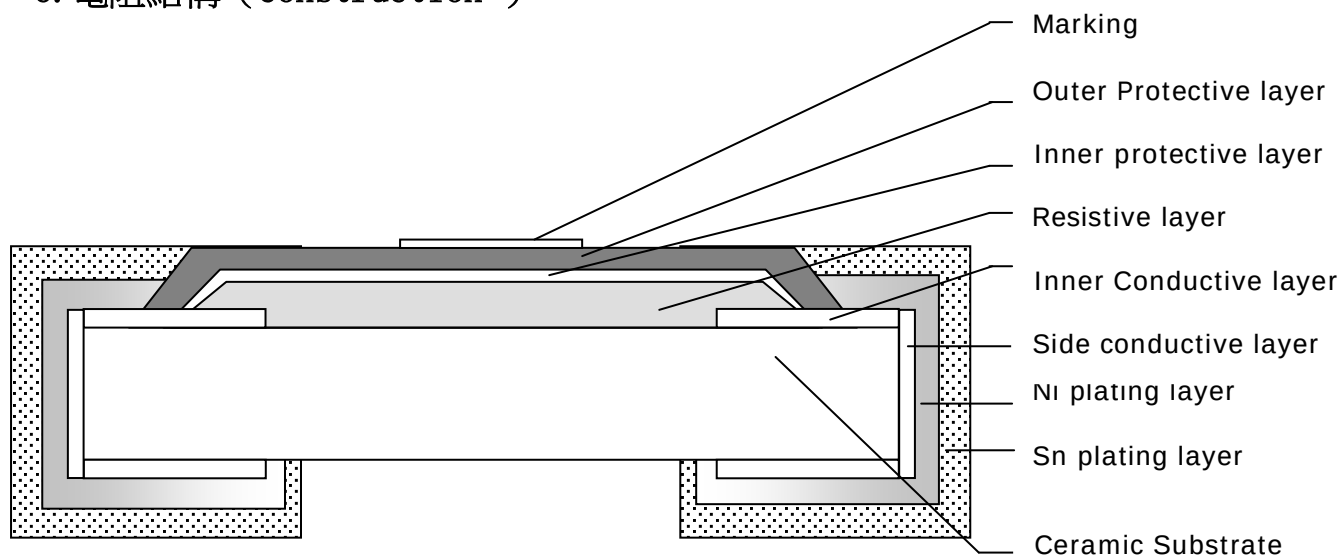
工作溫度範圍 (Operating Temperature Range) : -55°C ~ +155°C

儲存條件 (storage condition) : 5~30°C, 30~75%RH.

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6. 電阻結構 (Construction) :



No.	結構 construction	主要材料 Major material
1	陶瓷基板 Ceramic substrate	三氧化二鋁 Al ₂ O ₃
2	內電極 Inner Conductive layer	銀 Ag
3	側電極 Side conductive layer	鎳鉻合金 Ni-Cr
4	阻體層 Resistive layer	氧化鈦+玻璃 RuO ₂ + glass
5	內保護層 Inner protective layer	玻璃 Glass
6	外保護層 Outer Protective layer	環氧樹脂 Epoxy
7	文字 Marking	環氧樹脂 Epoxy
8	鎳電極 Ni plating layer	鎳 Ni
9	錫電極 Sn plating layer	霧錫 Matte Tin

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7. 阻值範圍 (resistance range) :

型別 Type	阻值範圍 Resistance Range		
	1%	2%	5%
VS0805	1Ω ~10MΩ	1Ω ~10MΩ	1Ω ~10MΩ
VS1206	1Ω ~10MΩ	1Ω ~10MΩ	1Ω ~10MΩ
VS1210	1Ω ~10MΩ	1Ω ~10MΩ	1Ω ~10MΩ
VS2010	1Ω ~10MΩ	1Ω ~10MΩ	1Ω ~10MΩ
VS2512	1Ω ~10MΩ	1Ω ~10MΩ	1Ω ~10MΩ

8. 電氣特性 (electrical characteristics) :

備註 (remark) :

型別 Type	VS0805	VS1206	VS1210	VS2010	VS2512
額定功率 Rated power	1/4W	1/2W	1/2W	3/4W	1W
最大工作電壓 Max Working Voltage	300V	400V	400V	400V	1600V
最大過負荷電壓 Max Overload Voltage	500V	800V	800V	800V	2500V
絕緣耐壓 Dielectric Withstanding Voltage	430V	570V	710V	710V	710V

※ 額定電壓計算公式 (The rated voltage is calculated by the following formula) :

$$E = \sqrt{RP}$$

E : 額定電壓 (Rated Voltage) (V)

P : 額定功率 (Rated Power) (W)

R : 電阻阻值 (Resistance) (ohm)

※ 如果計算出的電壓超過此型別的最大工作電壓,則此型別的最大工作電壓為此電阻的額定電壓。
 In case the value calculated by the formula exceed the maximum working voltage as above table 8, the maximum working voltage shall be regarded as rated voltage.

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9.性能信賴性測試 (Performance Reliability Test Methods)

內容 Item	測試方法 Test Methods	測試條件 Test Conditions	規格 Specification
溫度係數 Temperature Coefficient	JIS C 5201 4.8	$TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 \text{ (ppm)}$ R_0 電阻在室溫下的阻值(resistance at room temperature) R 電阻在 125°C 或 -55°C 下的阻值(resistance at 125°C or -55°C) t_0 室溫(room temperature) t 測試溫度 (test temperature 125°C or -55°C)	$1 \Omega \leq R \leq 10 \Omega$: $\pm 100 \text{ PPM/}^\circ\text{C}$ $10 \Omega < R \leq 10 \text{ M}\Omega$: $\pm 50 \text{ PPM/}^\circ\text{C}$
焊錫性 Solderability	JIS C 5201 4.17	沾助焊劑後浸入錫爐，錫爐溫度 245±5°C，時間 3±0.5 秒 Dip the terminal in a flux and then dip into a soldering bath at 245±5°C for 3±0.5sec.	最少 95%面積上錫 (Min 95% coverage)
絕緣電阻 Insulation resistance	JIS C 5201 4.6	電阻本體上載入絕緣耐壓 60±5 秒後，測量絕緣阻抗 Applied the dielectric withstanding voltage on the center of body for 60±5seconds. Then measure insulation resistance	>10GΩ
絕緣耐壓 Dielectric withstanding voltage	JIS C 5201 4.7	電阻本體上載入絕緣耐壓 60±5 秒。 Applied the dielectric withstanding voltage on the center of body for 60±5seconds.	無擊穿、飛弧及可見機械性損傷 No evidence of flashover, mechanical damage arcing or insulation breakdown

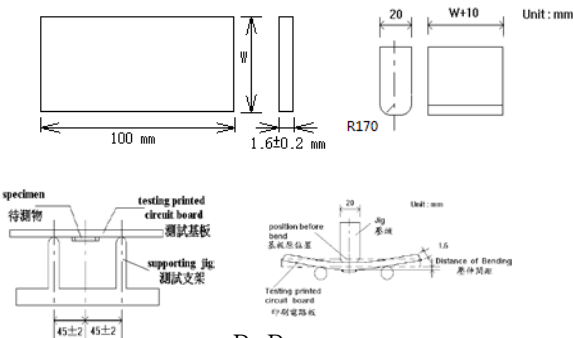
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內容 Item	測試方法 Test Methods	測試條件 Test Conditions	規格 Specification
短時間過負荷 Short-time overload	JIS C 5201 4.13	載入 2.5 倍的額定電壓，時間 5 秒後測量試驗前後的阻值變化率。 Applied 2.5 times of rated voltage for 5 second. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 試驗前阻值(resistance before test) R2 = 試驗後阻值(resistance after test)	±(1.0%+0.05Ω) Max
抗焊錫熱 Resist to soldering heat	JIS C 5201 4.18	沾助焊劑後浸入錫爐，錫爐溫度 260±5℃，時間 10±0.5 秒，測量試驗前後的阻值變化率。 Dip the terminal in a flux and then dip into a soldering bath at 260±5℃ for 10±0.5sec. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 試驗前阻值(resistance before test) R2 = 試驗後阻值(resistance after test)	±(1.0%+0.05Ω) Max

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內容 Item	測試方法 Test Methods	測試條件 Test Conditions	規格 Specification
端子彎曲 Terminal bending	JIS C 5201 4.33	電阻焊接在測試板上進行彎折,彎折保持時間 20±1 秒,1206(含) 以下的尺寸彎曲 $5^{+0.2}/\%$mm; 1206 以上的尺寸彎曲 $2^{+0.2}/\%$mm; 量測試驗前後阻值變化率 Specimen shall be mounted on test board, then bend the board and maintained for 20±1s. the distance of bending is $5^{+0.2}/\%$mm for resistors which size no larger than 1206 or $2^{+0.2}/\%$mm which size larger than 1206. Measure the variation of resistance. 測試板 (test board) 壓頭 (jig)  $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 試驗前阻值(resistance before test) R2 = 試驗後阻值(resistance after test)	±(1.0%+0.05Ω) Max

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內容 Item	測試方法 Test Methods	測試條件 Test Conditions	規格 Specification
溫度循環 Temperature Cycling	JIS C 5201 4.19	電阻放入溫度循環機中，溫度 155±2℃ 至 -55±3℃，共 5 個循環。 量測試驗前後阻值變化率。 Put specimen in a chamber which temperature can be changed to 155±2℃ or -55±3℃, repeated 5 times. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 試驗前阻值(resistance before test) R2 = 試驗後阻值(resistance after test)	±(2.0%+0.05Ω) Max
耐濕特性 Biased Humidity	MIL-STD-202 METHOD 103	加載 10%額定功率 85℃/85%RH,持續通電 1000H,試驗結束 24±4 小時後進行測試。 1000 hours 85℃/85%RH. Note: Specified conditions: 10% of operating power. Measurement at 24±4 hours after test conclusion. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 試驗前阻值(resistance before test) R2 = 試驗後阻值(resistance after test)	±(2.0%+0.05Ω) Max
負荷壽命 Load life	JIS C 5201 4.25.1	電阻放入恒溫箱中，溫度 70±2℃，ON TIME:1.5H，OFF TIME:0.5H，通電額定電壓 1000⁺²⁴/0 小時，量測試驗前後阻值變化率。 Put the specimen in a chamber at 70±2℃ temperature, ON TIME:1.5H，OFF TIME:0.5H， and applied rated voltage for 1000⁺²⁴/0H. Measure the variation of resistance. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{-----} (\%)$ R1 = 試驗前阻值(resistance before test) R2 = 試驗後阻值(resistance after test)	±(2.0%+0.05Ω) Max

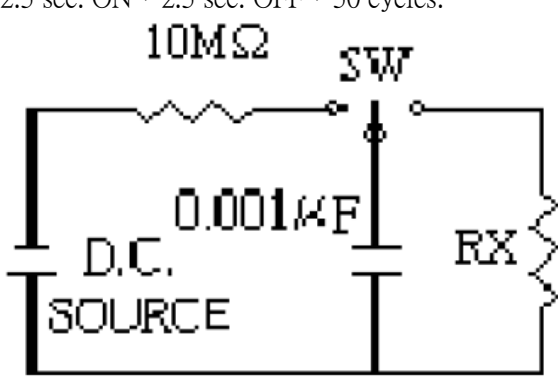
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內容 Item	測試方法 Test Methods	測試條件 Test Conditions	規格 Specification
溫濕循環 Moisture resistance	MIL-STD-202 METHOD 106	25 ° C~65 ° C,90~100%RH, 2.5 小時 ; 65 ° C 90~100%RH, 3 小時 ; 65 ° C~25 ° C,80~100%RH,2.5小時,10個循環,試驗結束 24±4小時後進行測試. 25 ° C~65 ° C,90~100%RH, 2.5H; 65 ° C 90~100%RH, 3H; 65°C~25°C 80~100%RH, 2.5H, 10 cycles, Measurement at 24±4 hours after test conclusion. $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- (\%)}$ R1 = 試驗前阻值(resistance before test) R2 = 試驗後阻值(resistance after test)	±(2.0% +0.05 Ω) Max
高溫儲存 High Temperature Exposure(Storage)	MIL-STD-202 METHOD 108	155°C 下放置 1000h,不載入功率, 試驗結束 24±4 小時後進行測試. 1000 hrs. @ T=155 °C . Unpowered. Measurement at 24±4 hours after test conclusion $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- (\%)}$ R1 = 試驗前阻值(resistance before test) R2 = 試驗後阻值(resistance after test)	±(1.00%+0.05 Ω) Max
ESD 試驗 ESD test	AEC-Q200-002	載入規定靜電電壓2次/間隔1秒 , 0805~2512規格2KV: 0805~2512:2KV, 2times/1s $\Delta R\% = \frac{R_2 - R_1}{R_1} * 100 \text{----- (\%)}$ R1 = 試驗前阻值(resistance before test) R2 = 試驗後阻值(resistance after test)	±(3.0%+0.05 Ω) Max

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內容 Item	測試方法 Test Methods	測試條件 Test Conditions	規格 Specification
抗硫化試驗 Sulfur test	EIA-977*B	方法一：在玻璃容器底部的培养皿上铺满10mm厚的硫粉，温度105℃，750hrs 方法二：切削油:硫粉=96.5:3.5，温度105℃，100H 预处理：前后先经历3次回流焊+100次温冲 Method 1: cover the tray or base of the chamber with a bed of sulfur to 10 mm depth minimum, temperature 105℃, 750hrs Method 2: cutting oil: sulfur powder =96.5:3.5, temperature 105℃, 100H; Pretreatment: before and after three reflow soldering +100 thermal shock $\Delta R\% = \frac{R2-R1}{R1} * 100 \quad (\%)$ R1 = 試驗前阻值(resistance before test) R2 = 試驗後阻值(resistance after test)	±(3.0%+0.05Ω) Max
脈衝 Pulse withstanding voltage		在下圖的電路中重複放電循環50次， 2.5 sec. ON，2.5 sec. OFF，50 cycles. 	±(20%+0.05Ω) Max

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10. 包裝規格 (Tapping Specification)

10.1 卷盤尺寸 (reel dimension)

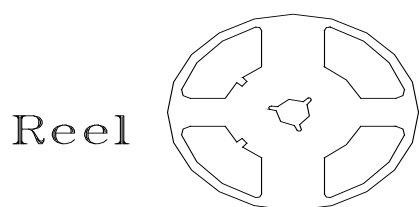
尺寸 Dimensions		A	B	C	F	W
VS0805 VS1206 VS1210	mm	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
	Inch	7.008±0.079	2.362±0.039	0.531±0.020	0.449±0.039	0.354±0.012
VS2010 VS2512	mm	178±2.0	60.0±1.0	13.5±0.5	15.4±1.0	13.0±0.3
	Inch	7.008±0.079	2.362±0.039	0.531±0.020	0.606±0.039	0.512±0.012

※ 備註 (Remark) : (1) 0805/1206/1210 每卷 5,000pcs

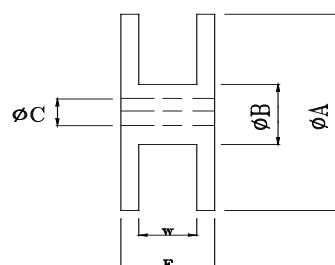
0805/1206/1210 Quantity per Reel 5,000 pcs/Reel

(2) 2010/2512 每卷 4,000 pcs

2010/2512 Quantity per Reel 4,000 pcs/Reel



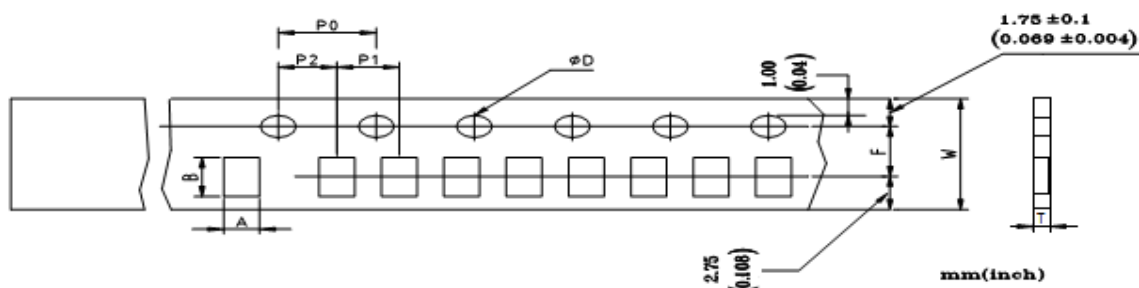
Standard Quantity per Reel
5,000 pcs/Reel



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10.2 包裝尺寸 (packing dimension)



Unit: mm

Dimensions	A	B	D	F	P0	P1	P2	W	T
VS0805	1.65 ± 0.20	2.40 ± 0.20	$1.50 \pm \begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	8.00 ± 0.20	0.75 ± 0.07
VS1206	2.00 ± 0.20	3.60 ± 0.20	$1.50 \pm \begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	8.00 ± 0.20	0.75 ± 0.07
VS1210	2.80 ± 0.20	3.50 ± 0.20	$1.50 \pm \begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	8.00 ± 0.20	0.75 ± 0.07
VS2010	2.90 ± 0.10	5.30 ± 0.10	$1.50 \pm \begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	5.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	12.0 ± 0.10	1.0 ± 0.07
VS2512	3.40 ± 0.10	6.60 ± 0.10	$1.50 \pm \begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	5.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	12.0 ± 0.10	1.0 ± 0.07

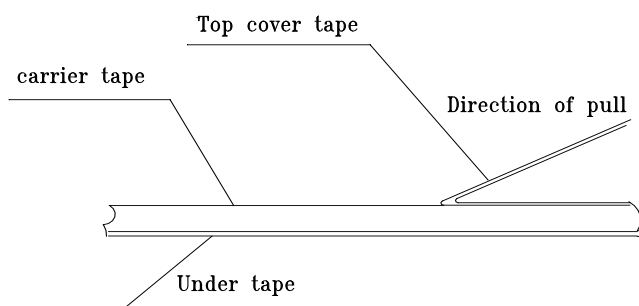
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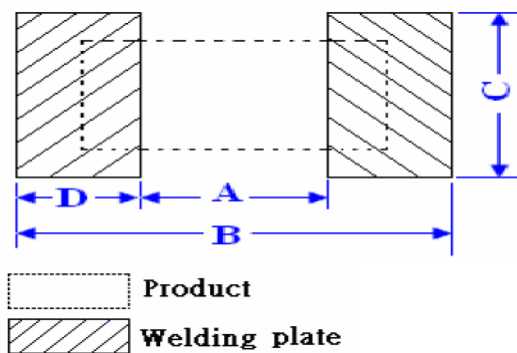
11. 上膠帶剝離力測試 (Peel force of top cover tape)

上膠帶以 300mm/分鐘的速度，沿 165~180 度角的方向進行剝離，如下圖所示。紙帶的剝離力範圍為 10g~70g；載帶的剝離力範圍為 15~80g。

The top cover tape is pulled at a speed of 300mm/min with the angle between the tape during peel and the direction of unreeling maintained at 165 to 180 degree as following picture. The peel force of paper carrier tape shall be 0.1N to 0.7N(10 to 70 g), the peel force of plastic carrier tape shall be 0.15N to 0.80N (15 to 80 g)



12. 焊盤尺寸 (Recommended land patterns):



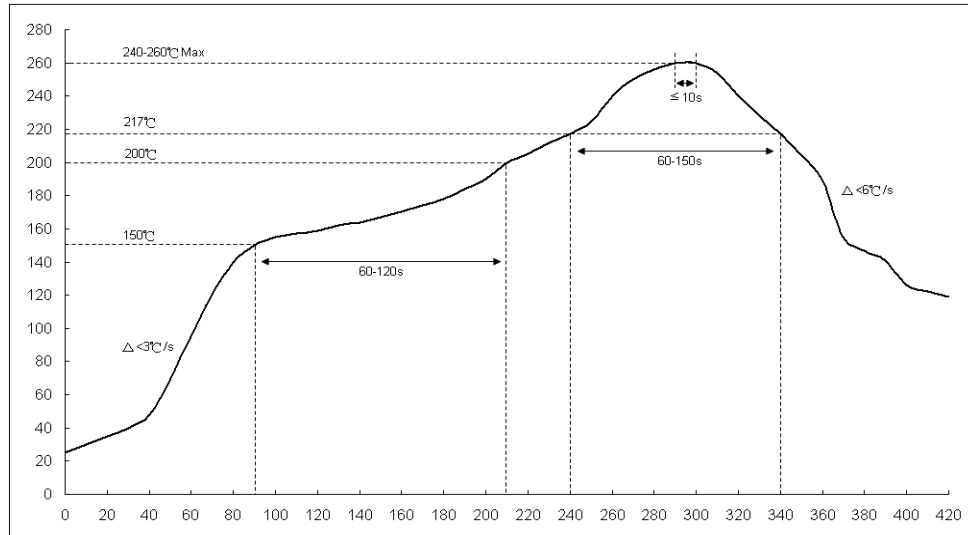
Type	Land pattern	Dimensions (mm)			
		A	B	C	D
VS0805		1.00~1.40	3.20~3.80	0.90~1.40	1.10~1.20
VS1206		2.00~2.40	4.40~5.00	1.20~1.80	1.15~1.35
VS1210		2.00~2.40	4.40~5.00	2.30~3.50	1.15~1.35
VS2010		3.30~3.70	5.70~6.50	2.30~3.50	1.20~1.40
VS2512		3.60~4.00	7.60~8.60	2.30~3.50	2.05~2.25

VS 高壓耐硫厚膜貼片電阻規格書-VS 系列

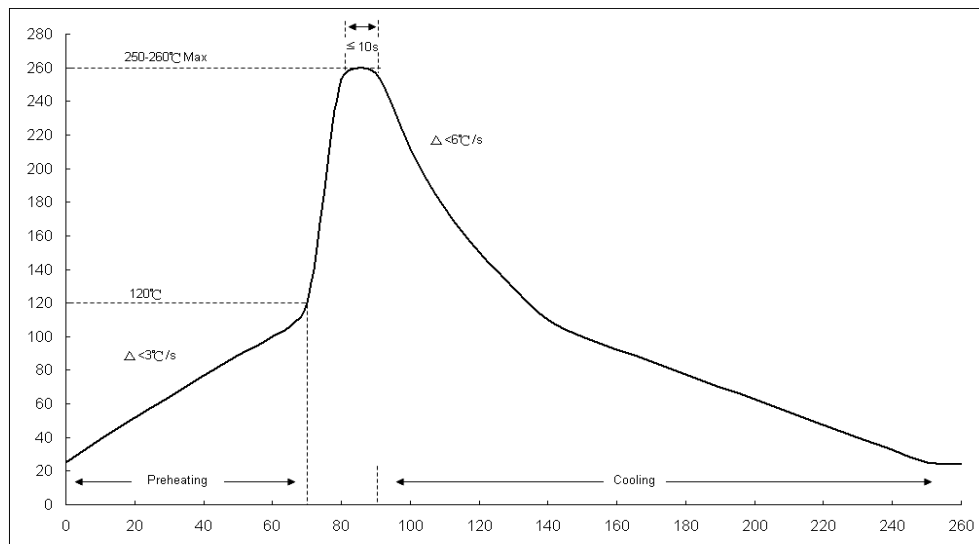
Approval Specification for High Voltage Anti-Sulfur Thick Film Chip Resistors - Type VS

13. 焊接 (soldering)

13.1 建議回流焊曲線 (Recommend reflow soldering profile)



13.2 建議波峰焊曲線 (Recommend wave soldering profile)



13.3 手工焊溫度 (hand soldering temperature)

烙鐵溫度 350±10°C 3 秒之內，避免烙鐵接觸電阻本體

The iron temperature is 350±10°C, hand soldering time less than 3S. Avoid solder iron tip direct touch the components body.

产品规格及资料如有更改，恕不另行通知。

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