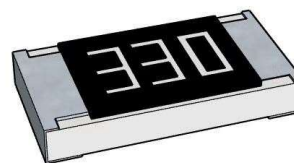


FRS-Series
Anti-Surge Thick Film Chip Resistor
FRS 系列抗浪涌厚膜晶片电阻器规格说明书



■ 抗浪涌厚膜晶片电阻 (Anti-Surge Thick Film Chip Resistor)



■应用(Application)

- Telecommunications
- Power supplies
- Car electronics
- 电信
- 电源供应器
- 汽车电力

■特性(Features)

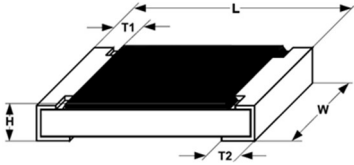
- Small size and light weight
- Reliability, high quality
- Special material and design for high working voltage require
- 体积小, 重量轻
- 可靠性, 高质量
- 对高工作电压要求的特殊材质和设计

■料号说明(Parts Number Explanation):

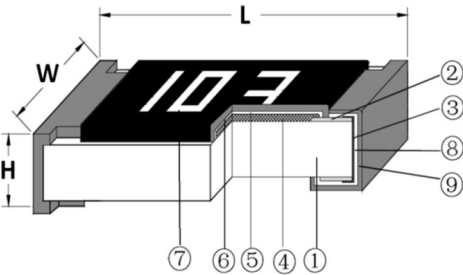
示例 Example: FRS1206J103TS

F 公司名	R 产品别	S 功能别	1206 型别	J 公差	103 字码	I 包装别	S 端电极	特殊型
FOJAN	R: Resistor C: Capacitor L: Inductor D: Diode A: Audion	C: Normal P: Hi-Power L: Low ohmic A: Array S: Surge H: Hi-Precision V: Hi-Voltage Q: Auto-motive R: Anti-sulfur M: Metal D: (LED)	0201 0402 0603 0805 1206 1210 2010 2512	B: $\pm 0.1\%$ C: $\pm 0.25\%$ D: $\pm 0.5\%$ F: $\pm 1\%$ J: $\pm 5\%$ P: Jumper	$\pm 5\%$: E24 3-digits+blank 102=1K Ω 1R0=1 Ω $\pm 1\%$ &Below: E24+E96: 4-digits 1001=1K Ω 1R00=1 Ω	T: 7 inch reel Q: 10 inch reel R: 13 inch reel B: Bulk	S: Sn C: Cu A: Au	N: Normal D: LED
Company code	Type code	Functional code	Size code	Tolerance code	Resistance code	Packaging code	Termination code	Special code

尺寸 (Dimension)

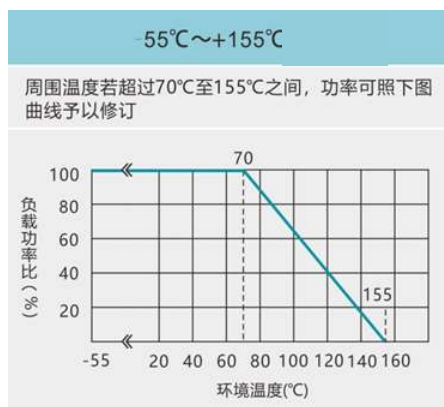
尺寸 dimension	 单位 (unit) : mm				
型别 (Type)	L	W	H	T1	T2
0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
1210	3.10±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.50±0.20
2010	5.00±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.50±0.20
2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.90±0.20

电阻结构 (Construction)



NO.	结构 construction	主要材料 Major material
1	陶瓷基板 Ceramic substrate	氧化铝 Al_2O_3
2	银电极 Conductive layer	银 Ag
3	侧电极 Side conductive layer	镍铬合金 NiCr
4	阻体层 Resistive layer	氧化钌+玻璃 $\text{RuO}_2 + \text{glass}$
5	内保护层 Inner protective layer	玻璃 Glass
6	外保护层 Outer Protective layer	环氧树脂 Epoxy
7	文字 Marking	环氧树脂 Epoxy
8	镍电极 Ni plating layer	镍 Ni
9	锡电极 Sn plating layer	锡 Matte Tin

■功率衰减曲线 (Derating Curve)



■阻值范围 (Resistance range) :

型别 Type	阻值范围 Resistance Range				
	D (±0.5%)	F (±1%)	J (±5%)	K (±10%)	M (±20%)
0603	1Ω~1MΩ	1Ω~1MΩ	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
0805	1Ω~1MΩ	1Ω~1MΩ	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
1206	1Ω~1MΩ	1Ω~1MΩ	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
1210	1Ω~1MΩ	1Ω~1MΩ	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
2010	1Ω~1MΩ	1Ω~1MΩ	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ
2512	1Ω~1MΩ	1Ω~1MΩ	1Ω~10MΩ	1Ω~10MΩ	1Ω~10MΩ

如有非标准品的需求,请联系我们的业务部门 For non-standard parts, please contact our sales dept.

■电气特性 (Electrical characteristics)

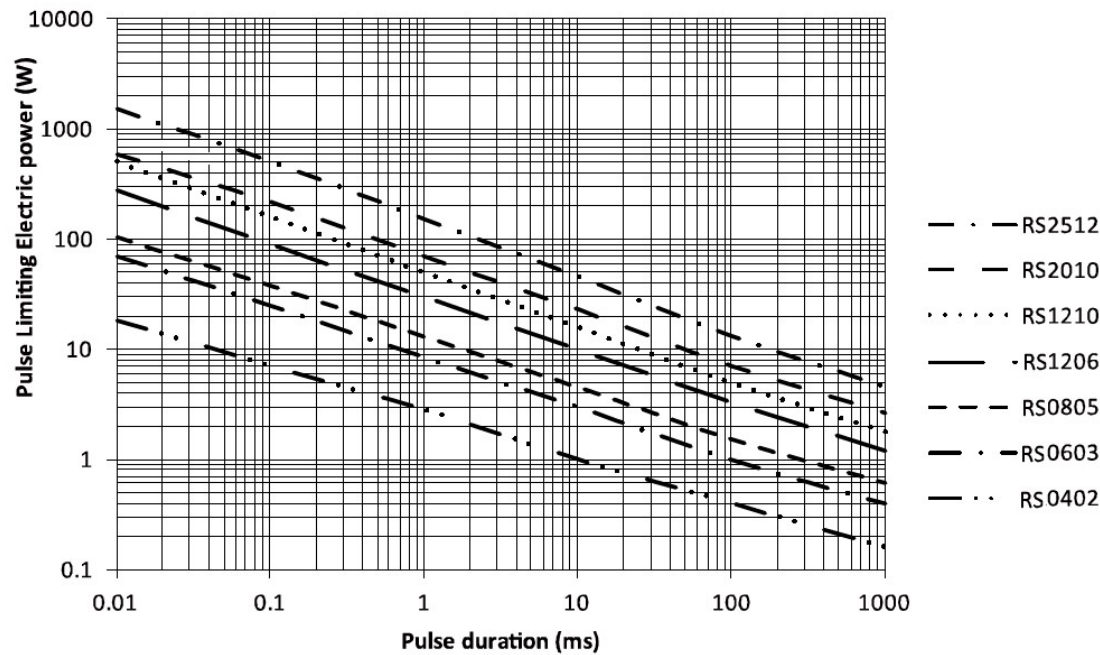
型别 Type	0603	0805	1206	1210	2010	2512
绝缘耐压 Dielectric Withstanding Voltage	150V	300V	500V	500V	500V	500V

电性规格 (Standard Electrical Specifications)

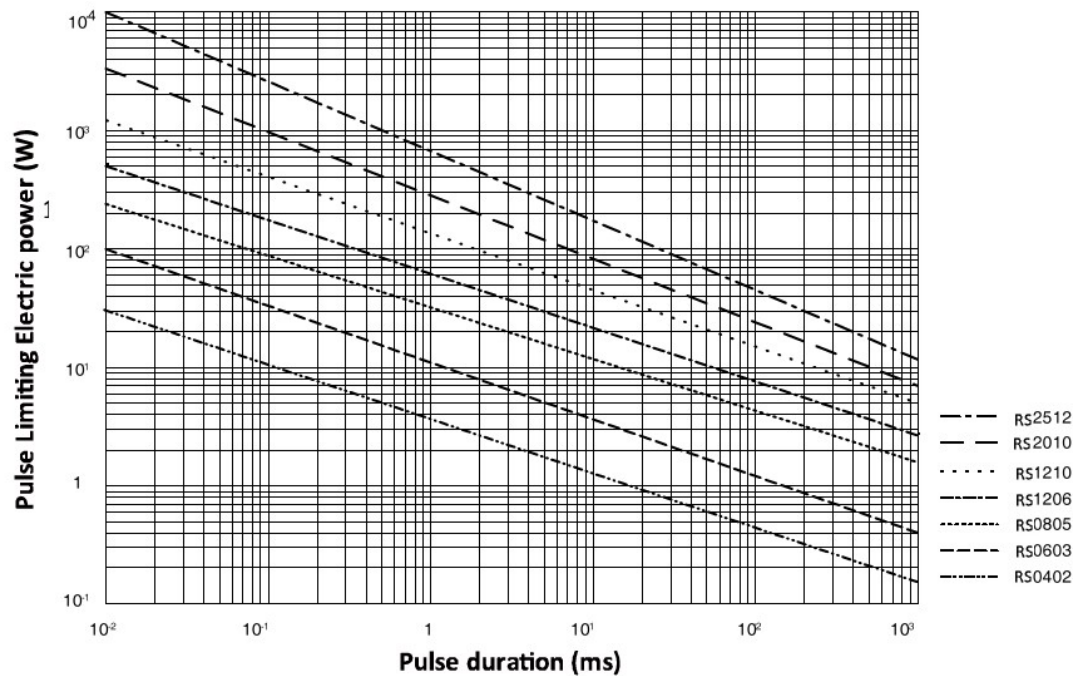
型别 Type	额定功率 (Power Rating at 70°C)	最高工作电压 Max. RCWV	最大过负荷电压 Max. Overload Voltage	T.C.R. (PPM/°C)	阻值范围 Resistance Range
0603	1/10W	75V	150V	±200PPM/°C ±100PPM/°C	1Ω~10Ω 10Ω~10MΩ
0805	1/8W	150V	300V		
1206	1/4W	200V	400V		
1210	1/2W	200V	400V		
2010	3/4W	200V	400V		
2512	1W	200V	400V		

脉冲曲线 (Pulse Load Behavior)

公差 Tolerance: ±0.50%、±1.00%如下:



公差 Tolerance: ±5.00%、±10.00%、±20.00%如下:



性能 (Performance Specifications)

内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
温度系数 Temperature Coefficient	JIS C 5201 4.8	$TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 \text{ (ppm)}$ R0 电阻在室温下的阻值(resistance at room temperature) R 电阻在 125℃或-55℃下的阻值 (resistance at 125℃ or -55℃) t0 室温(room temperature) t 测试温度 (test temperature 125℃ or -55℃)	1Ω<R≤10Ω: ±200 PPM/℃ 10Ω<R≤10MΩ: ±100 PPM/℃

内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
短时间过负荷 Short-time overload	JIS C 5201 4.13	加载 2.5 倍的额定电压, 时间 5 秒后测量试验前后的阻值变化率。 Applied 2.5 times of rated voltage for 5 second. Measure the variation of resistance.	$\pm(1.00\% + 0.05\Omega)$
焊锡性 Solderability	JIS C 5201 4.17	沾助焊剂后浸入锡炉, 锡炉温度 $245\pm 5^{\circ}\text{C}$, 时间 3 ± 0.5 秒。 Dip the terminal in a flux and then dip into a soldering bath at $245\pm 5^{\circ}\text{C}$ for $3\pm 0.5\text{sec}$.	$> 95\%$ 面积上锡 ($> 95\%$ coverage)
抗焊锡热 Resist to soldering heat	JIS C 5201 4.18	沾助焊剂后浸入锡炉, 锡炉温度 $260\pm 5^{\circ}\text{C}$, 时间 10 ± 0.5 秒, 测量试验前后的阻值变化率。 Dip the terminal in a flux and then dip into a soldering bath at $260\pm 5^{\circ}\text{C}$ for $10\pm 0.5\text{sec}$. Measure the variation of resistance.	$\pm(1.00\% + 0.05\Omega)$
绝缘电阻 Insulation resistance	JIS C 5201 4.6	电阻本体上加载绝缘耐压 60 ± 5 秒后, 测量绝缘阻抗。 Applied the dielectric withstanding voltage on the center of body for $60\pm 5\text{seconds}$. Then measure insulation resistance.	$> 10\text{G}\Omega$
绝缘耐压 Dielectric withstanding voltage	JIS C 5201 4.7	电阻本体上加载绝缘耐压 60 ± 5 秒。 Applied the dielectric withstanding voltage on the center of body for $60\pm 5\text{seconds}$.	无击穿、飞弧及可见机械性损伤 No evidence of flashover, mechanical damage arcing or insulation breakdown

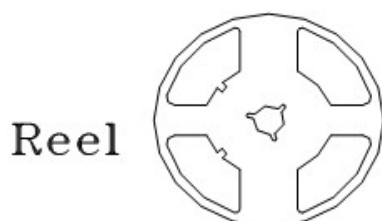
内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
端子弯曲 Terminal bending	JIS C 5201 4.33	电阻焊接在测试板上进行弯折,弯折保持时间 20 ± 1 秒, 1206(含) 以下的尺寸弯曲 $5+0.2/0$ mm; 1206 以上的尺寸弯曲 $2+0.2/0$ mm; 量测试验前后阻值变化率 Specimen shall be mounted on test board, then bend the board and maintained for 20 ± 1s. the distance of bending is $5+0.2/0$ mm for resistors which size no larger than 1206 or $2+0.2/0$ mm which size larger than 1206. Measure the variation of resistance.	$\pm(1.00\% +0.05\Omega)$
温度循环 Temperature Cycling	JIS C 5201 4.19	电阻放入温度循环机中, 温度 $155\pm 2^{\circ}\text{C}$ 至 $-55\pm 3^{\circ}\text{C}$, 共 5 个循环。量测试验前后阻值变化率。 Put specimen in a chamber which temperature can be changed to $155\pm 2^{\circ}\text{C}$ or $-55\pm 3^{\circ}\text{C}$, repeated 5 times. Measure the variation of resistance.	$\pm(2.00\% +0.05\Omega)$
耐湿特性 Humidity	JIS C 5201 4.24	电阻放入恒温恒湿箱, 温度 $40\pm 2^{\circ}\text{C}$, 湿度 90~95 %RH;通电额定电压 1.5 小时, 断电 0.5 小时; 重复通断电至试验时间 $1000^{+48}/_{-0}$ 小时。量测试验前后阻值变化率。 Put the specimen in a chamber at $40\pm 2^{\circ}\text{C}$ temperature and 90~95% relative humidity, then applied rated voltage for 1.5H and rested for 0.5H repeatedly till total test time is $1000^{+48}/_{-0}$ H. Measure the variation of resistance.	$\pm(2.00\% +0.05\Omega)$

内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
负荷寿命 Load life	JIS C 5201 4.25.1	电阻放入恒温箱中, 温度 $70\pm 2^{\circ}\text{C}$, ON TIME:1.5H, OFF TIME:0.5H, 通电额定电压 1000 $^{+24}/_{-0}$ 小时, 量测试验前后阻值变化率. Put the specimen in a chamber at $70\pm 2^{\circ}\text{C}$ temperature, ON TIME:1.5H, OFF TIME:0.5H, and applied rated voltage for 1000 $^{+24}/_{-0}$ H. Measure the variation of resistance.	$\pm(2.00\% + 0.05\Omega)$
温湿循环 Moisture resistance	MIL-STD-202 METHOD 106	25 $^{\circ}\text{C}$ ~65 $^{\circ}\text{C}$, 90~100%RH, 2.5 小时; 65 $^{\circ}\text{C}$ 90~100%RH, 3 小时; 65 $^{\circ}\text{C}$ ~25 $^{\circ}\text{C}$, 80~100%RH, 2.5 小时, 10 个循环, 试验结束 24 $\pm$ 4 小时后进行测试. 25 $^{\circ}\text{C}$ ~65 $^{\circ}\text{C}$, 90~100%RH, 2.5H; 65 $^{\circ}\text{C}$ 90~100%RH, 3H; 65 $^{\circ}\text{C}$ ~25 $^{\circ}\text{C}$ 80~100%RH, 2.5H, 10 cycles, Measurement at 24 $\pm$ 4 hours after test conclusion.	$\pm(2.00\% + 0.05\Omega)$

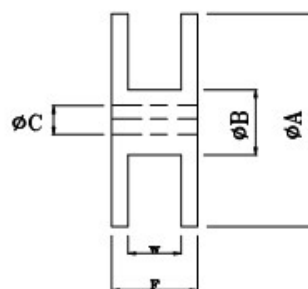
包装规格 (Tapping Specification)

-卷盘尺寸 (Reel dimension)

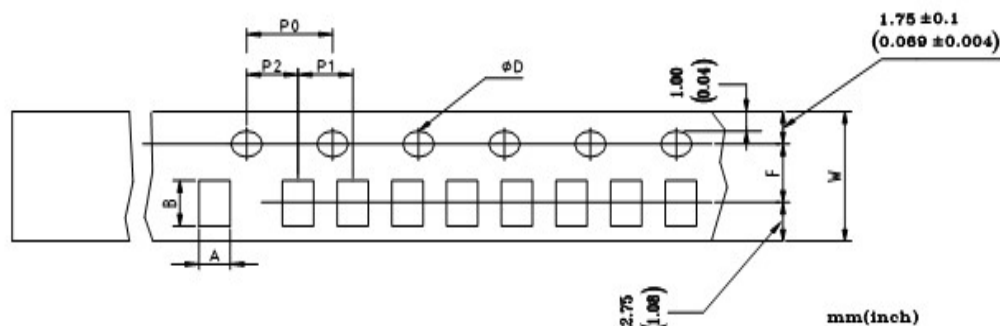
Type	Size		Unit	A	B	C	F	W
0603/0805/1206/1210	7"	5K/Reel	mm	178 $\pm$ 2.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.5	11.4 $\pm$ 0.1	9.00 $\pm$ 0.3
0603/0805/1206	10"	10K/Reel	mm	254 $\pm$ 2.0	100.0 $\pm$ 1.0	13.5 $\pm$ 0.5	11.4 $\pm$ 0.1	9.00 $\pm$ 0.3
0603/0805/1206	13"	20K/Reel	mm	330 $\pm$ 2.0	100.0 $\pm$ 1.0	13.5 $\pm$ 0.5	11.4 $\pm$ 0.1	9.00 $\pm$ 0.3
2010/2512	7"	4K/Reel	mm	178 $\pm$ 2.0	60.0 $\pm$ 1.0	13.5 $\pm$ 0.5	15.4 $\pm$ 1.0	13.0 $\pm$ 0.3



Standard Quantity per Reel
5,000 pcs/Reel



-包装尺寸 (packing dimension)



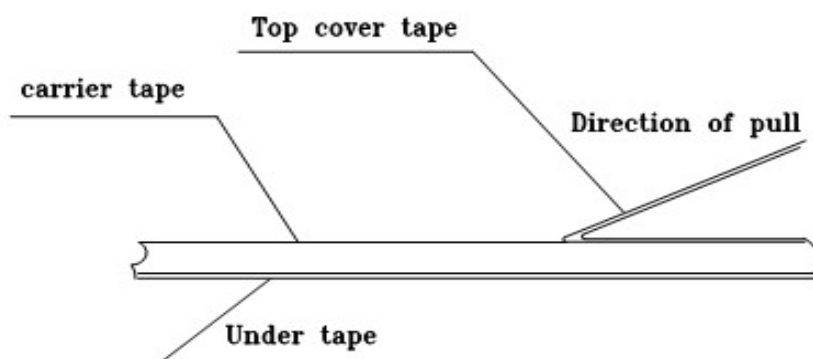
Unit: mm

Dimensions	A	B	D	F	P0	P1	P2	W
0603	1.10±0.10	1.90±0.10	1.50± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
0805	1.65±0.20	2.40±0.20	1.50± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1206	1.90±0.20	3.50±0.20	1.50± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1210	2.80±0.20	3.50±0.20	1.50± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
2010	2.90±0.10	5.30±0.10	1.50± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10
2512	3.40±0.10	6.60±0.10	1.50± $\begin{smallmatrix} 0.1 \\ 0.0 \end{smallmatrix}$	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10

■ 上胶带剥离力测试 (Peel force of top cover tape)

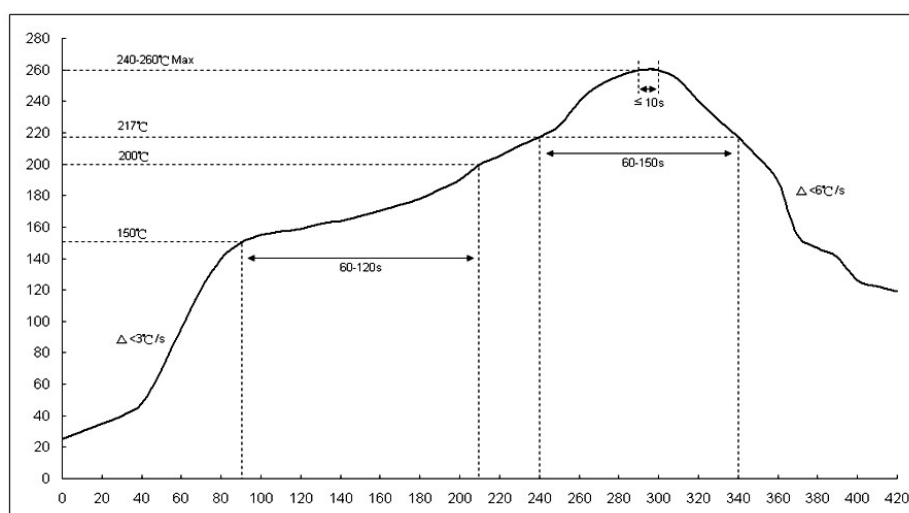
上胶带以 200mm/分钟的速度，沿 165~180 度角的方向进行剥离，如下图所示。纸带的剥离力范围为 10g~70g；载带的剥离力范围为 30~100g。

The top cover tape is pulled at a speed of 200 mm/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 0.3N to 1N (30 to 100 g)

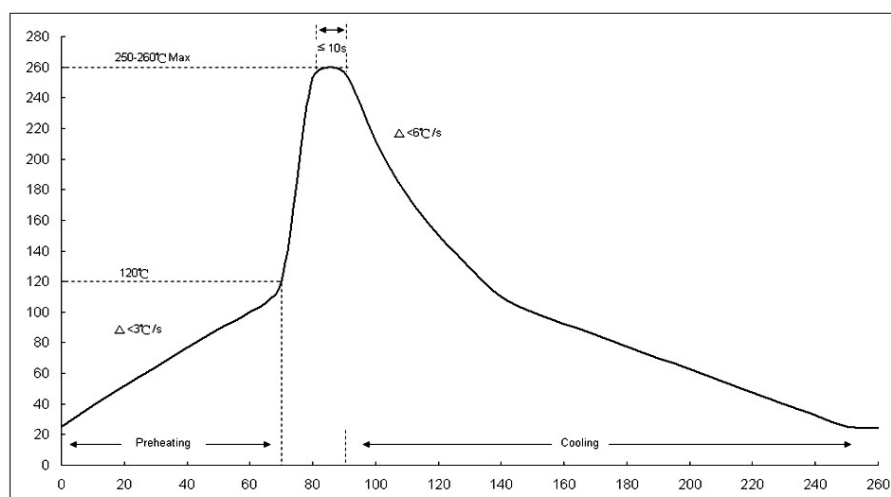


■ 焊接 (soldering)

-建议回流焊曲线 (Recommend reflow soldering profile)



-建议波峰焊曲线 (Recommend wave soldering profile)



FRS-Series

Anti-Surge Thick Film Chip Resistor

FRS 系列抗浪涌厚膜晶片电阻器规格说明书



-手工焊温度 (hand soldering temperature)

烙鐵溫度 $350\pm 10^{\circ}\text{C}$ 3 秒之內，避免烙鐵接觸電阻本體

The iron temperature is $350\pm 10^{\circ}\text{C}$, hand soldering time less than 3S. Avoid solder iron tip direct touch the components body

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[MCR01MZPJ121](#) [MCR01MZPJ751](#) [MCR03EZPFX2004](#) [MCR10EZPF1102](#) [RC1005F2052CS](#) [RC1005F471CS](#) [RC1005J122CS](#)
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[RCWP72251K47FKWB](#) [RMCF0201FT49R9](#) [RMCF0603FT300K](#) [RMCF0805FT221K](#) [RMCF1210JT20R0](#) [RMCF1210JT68K0](#)
[RMCF1210ZT0R00](#) [RMCF2512FT1R00](#) [RMCF2512JT20R0](#) [RMCF2512JT7K50](#) [RMCF2512JT910R](#) [NRC04F1000TRF](#) [NRC04F1004TRF](#)
[NRC04F10R0TRF](#) [NRC04F1132TRF](#) [NRC04F2001TRF](#) [NRC04F2002TRF](#) [NRC04F2203TRF](#) [NRC04F3011TRF](#) [NRC04F33R0TRF](#)
[NRC04F51R1TRF](#) [NRC04J103TRF](#) [NRC04J204TRF](#)