

车用厚膜晶片电阻
Automotive Thick Chip Resistor
FRQ Series



■应用 (Application)

- Automotive electronics
- Navigation equipment, TPMS
- Heating, Ventilating and Air conditioning
- Indoor lighting, Central door locking, Wiper module

- 汽车电子
- 导航设备、胎压监测
- 暖气系统、通风系统、空调
- 室内照明、中央门锁、雨刮器模块

■特性 (Features)

- Small size and lightweight
- Reliability, high quality
- CCD visual quality inspection
- Comply with AEC-Q200 standard

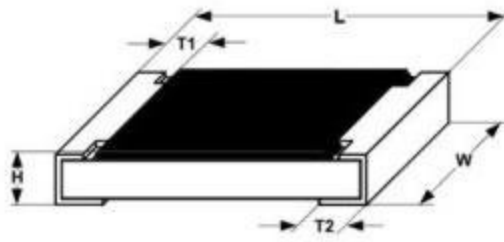
- 体积小、重量轻
- 可靠性、高质量
- 通过 CCD 外观品质检测
- 符合 AEC-Q200 标准

■料号说明 (Parts Number Explanation)

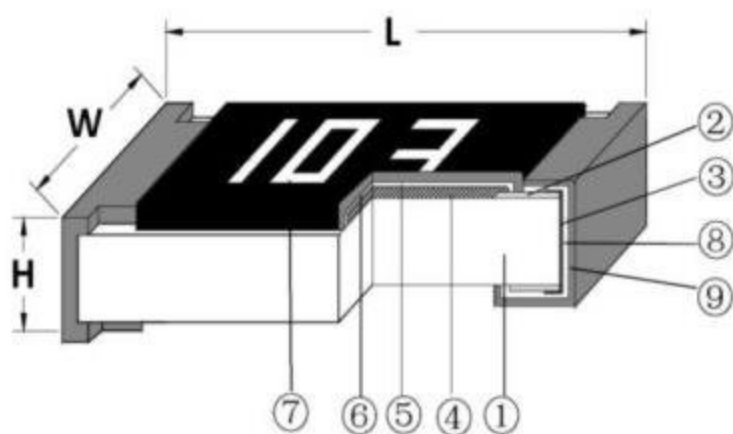
示例 : Example: FRQ0805J102 TS

F 公司名	R 产品别	Q 功能别	0805 型别	J 公差	102 字码	I 包装别	S 端电极	特殊型
FOJAN	R:Resistor	Q:Auto-motive	0201 0402 0603 0805 1206 1210 2010 1812 2512	B:±0.1% C:±0.25% D:±0.5% F:±1% J:±5% P : Jumper	±5%:E24 3-digits+blank 102=1KΩ 1R0=1Ω ±1%&Below : E24+E96 : 4-digits 1001=1KΩ 1R00=1Ω	T: 7 inch reel Q:10 inch reel R:13 inch reel B:Bulk	S : Sn C : Cu A : Au	N:Normal
Company code	Type code	Functional code	Size code	Tolerance code	Resistance code	Packaging code	Termination code	Special code

尺寸 (Dimension)

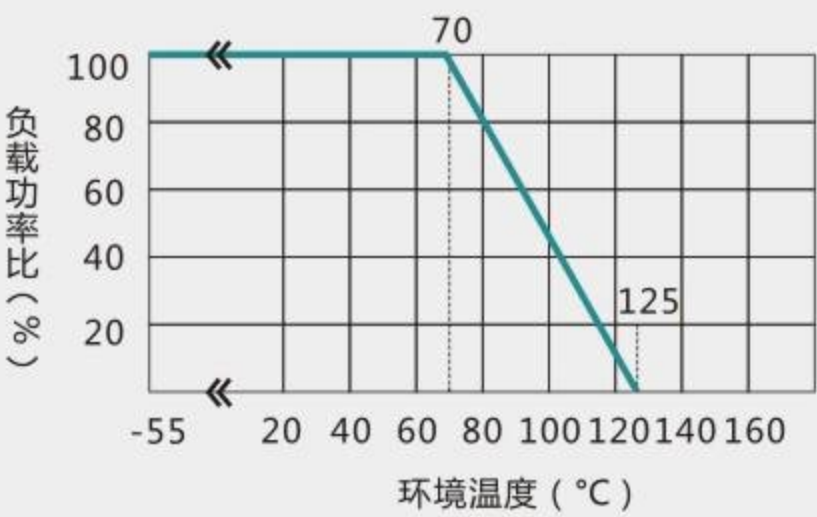
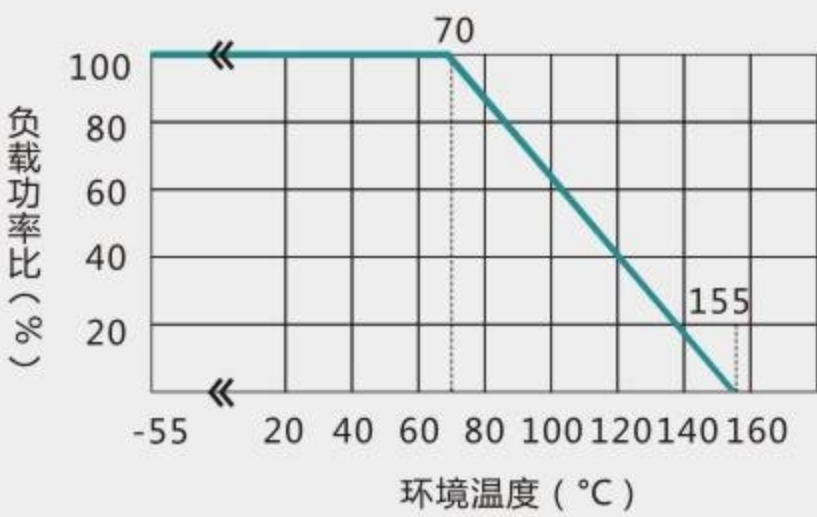
尺寸 dimension						单位 (unit) : mm
型别 (Type)	L	W	H	T1	T2	
0201	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05	
0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10	
0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15	
0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20	
1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20	
1210	3.10±0.10	2.60±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	
1812	4.50±0.20	3.10±0.20	0.55±0.10	0.55±0.20	0.70±0.20	
2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.50±0.20	

电阻结构 (Construction)



NO.	结构 construction	主要材料 Major material
1	陶瓷基板 Ceramic substrate	三氧化二铝 Al ₂ O 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 RuO ₂ + 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)

使用温度范围	-55℃~+125℃(0201)	-55℃~+155℃
说明	周围温度若超过70℃至125℃之间,功率可照下图曲线予以修订	周围温度若超过70℃至155℃之间,功率可照下图曲线予以修订
功率衰减曲线图		

■电气特性 (Electrical characteristics)

型别 Type	0201	0402	0603	0805	1206	1210	2010	2512
绝缘耐压 Dielectric Withstanding Voltage	75V	100V	100V	300V	500V	500V	500V	500V
零欧姆阻值 ±5% Resistance Value of Jumper ±5%	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ
零欧姆额定电流 Rated Current of Jumper	0.5A	1A	1A	2A	2A	2A	2A	2A
零欧姆电阻最大电流 Max Current of Jumper	1A	2A	2A	5A	10A	10A	10A	10A

■电性规格 (Standard Electrical Specifications)

型别 Type	额定功率 (Power Rating at 70℃)	最高工作电压 Max. RCWV	最大过负荷电压 Max. Overload Voltage	T.C.R. (PPM/℃)	阻值范围 Resistance Range
0201	1/20W	25V	50V	-100~+300	1Ω~10Ω
					10 MΩ~22 MΩ
				± 200	10Ω~10MΩ
0402	1/16W	50V	100V	±200	1Ω~10Ω
					10 MΩ~22MΩ
				± 100	10Ω~10MΩ
0603	1/10W	75V	150V	± 200	1Ω~10Ω
					10 MΩ~22MΩ
				± 100	10Ω~10MΩ
0805	1/8W	150V	300V	± 200	1Ω~10Ω
					10 MΩ~22MΩ
				± 100	10Ω~10MΩ
1206	1/4W	200V	400V	± 200	1Ω~10Ω
					10 MΩ~22 MΩ
				± 100	10Ω~10MΩ
1210	1/3W	200V	500V	± 200	1Ω~10Ω
					10 MΩ~22MΩ
				± 100	10Ω~10MΩ
2010	3/4W	200V	500V	± 200	1Ω~10Ω
					10 MΩ~22MΩ
				± 100	10Ω~10MΩ
2512	1W	200V	500V	± 200	1Ω~10Ω
					10 MΩ~22MΩ
				± 100	10Ω~10MΩ

■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	$TCR = (R - R_0) / (t - t_0) R_0 \times 10^6 \text{ (ppm)}$ R_0 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℃) t_0 室温(room temperature) t 测试温度 (test temperature 125℃ or -55℃)	0201 规格 : $1\Omega \leq R \leq 10\Omega$: $-100 \sim +300 \text{ PPM}/^\circ\text{C}$ $10\Omega < R \leq 10\text{M}\Omega$: $\pm 200 \text{ PPM}/^\circ\text{C}$ 0402~2512 规格 : $1\Omega \leq R \leq 10\Omega$: $\pm 200 \text{ PPM}/^\circ\text{C}$ $10\Omega < R \leq 10\text{M}\Omega$: $\pm 100 \text{ PPM}/^\circ\text{C}$ $10\text{M}\Omega < R \leq 22\text{M}\Omega$: $\pm 200 \text{ PPM}/^\circ\text{C}$
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 $(> 95\% \text{ coverage})$
抗焊锡热 Resist to soldering heat	MIL-STD-202 METHOD 210	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
温度循环 Temperature Cycling	JESD22 METHOD JA-104	-55℃~+ 155℃, 循环 1000 次,在每一个极限温度持续时间不超过 30 分钟,且温度转换时间不超过 1 分钟,试验结束 24±4 小时后进行测试. 1000 Cycles (-55℃ to +155℃) Measurement at 24±4 hours after test conclusion. 30min maximum dwell time at each temperature extreme. 1min. maximum transition time.	±(2.00% +0.05Ω)
耐湿特性 Humidity	MIL-STD-202 METHOD 103	加载 10%额定功率, 85℃/85%RH, 持续通电 1000H,试验结束 24±4 小时后进行测试 1000 hours 85℃/85%RH. Note: Specified conditions: 10% of operating power. Measurement at 24±4 hours after test conclusion.	±(2.00% +0.05Ω)
负荷寿命 Load life	MIL-STD-202 METHOD 108	电阻放入恒温箱中, 温度 125±2℃, 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 125±2℃ temperature, ON TIME:1.5H, OFF TIME:0.5H, and applied rated voltage for 1000 ⁺²⁴ / ₋₀ H. Measure the variation of resistance.	±(2.00% +0.05Ω)
温湿循环 Moisture resistance	MIL-STD-202 METHOD 106	25℃~65℃,90~100%RH, 2.5 小时; 65℃ 90~100%RH, 3 小时; 65℃~25℃,80~100%RH,2.5 小时,10 个循环,试验结束 24±4 小时后进行测试. 25℃~65℃,90~100%RH, 2.5H; 65℃ 90~100%RH, 3H; 65℃~25℃ 80~100%RH, 2.5H, 10 cycles, Measurement at 24±4 hours after test conclusion.	±(2.00% +0.05Ω)
高温储存 High Temperature Exposure(Storag)	MIL-STD-202 METHOD 108	155℃下放置 1000h,不加载功率, 试验结束 24±4 小时后进行测试. 1000 hrs. @ T=155℃. Unpowered. Measurement at 24±4 hours after test conclusion	±(1.00%+0.05Ω)

内容 Item	测试方法 Test Methods	测试条件 Test Conditions	规格 Specification
端子弯曲 Terminal bending	AEC-Q200-005	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; 1210 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.	±(1.00% +0.05Ω)
ESD 试验 ESD test	AEC-Q200-002	加载规定静电电压2次/间隔1秒, 0201/0402规格:0.5KV, 0603规格:1KV, 其它规格2KV. 0201/0402: 0.5KV, 0603: 1.0KV, Other:2KV, 2times/1s	±(3.0%+0.05Ω)
抗硫化试验 Sulfuration test	ASTM-B-809-95	方法一: 温度60℃, 湿热蒸硫粉试验(加饱和硝酸钾) 750hrs 方法二: 切削油:硫粉=96.5:3.5, 温度60℃, 100 hrs; 预处理: 前后先经历3次回流焊+100次温冲 Method 1: steam sulfur powder test (with saturated potassium nitrate) at 60℃ with humidity and heat (750hrs) Method 2: cutting oil: sulfur powder =96.5:3.5, temperature 60℃, 100 hrs; Pretreatment: before and after three reflow soldering +100 thermal shock	±(1.0% +0.05Ω)