



广东风华高新科技股份有限公司
GUANGDONG FENGHUA ADVANCED TECHNOLOGY HOLDING CO., LTD.

承认书

APPROVAL SHEET

客户名称: 深圳市天河星供应链有限公司
CUSTOMER (闻泰通信股份有限公司)

产品名称: 多层片式陶瓷电容器
PARTNAME

产品规格: 0201 TYPE
SPECIFICATION

客户料号:
CUSTOMER P/N

版本号: FH-2017-001
VERSION

日期: 2018-01-22
DATE

制造			客户		
APPROVAL			APPROVAL		
拟制	审核	确认	检验	审核	批准
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一、概述

● 电容器及介质种类:

※ 高频类: 此类介质材料的电容器为 I 类电容器, 包括通用型高频 COG、COH 电容器和温度补偿型高频 HG、LG、PH、RH、SH、TH、UJ、SL 电容器。其中 COG、COH 电容器电性能最稳定, 几乎不随温度、电压和时间的变化而变化, 适用于低损耗, 稳定性要求高的高频电路, HG、LG、PH、RH、SH、TH、UJ、SL 电容器容量随温度变化而相应变化, 适用于低损耗、温度补偿型电路中。

※ X7R、X5R、X7S、X6S: 此类介质材料的电容器为 II 类电容器, 具有较高的介电常数, 容量比 I 类电容器高, 具有较稳定的温度特性, 适用于容量范围广, 稳定性要求不高的电路中, 如隔直、耦合、旁路、鉴频等电路中。

※ Y5V: 此类介质材料的电容器为 II 类电容器, 是所有电容器中介电常数最大的电容器, 但其容量稳定性较差, 对温度、电压等条件较敏感, 适用于要求大容量, 温度变化不大的电路中。

※ Z5U: 此类介质材料的电容器为 II 类电容器, 其温度特性介于 X7R 和 Y5V 之间, 容量稳定性较差, 对温度、电压等条件较敏感, 适用于要求大容量, 使用温度范围接近于室温的旁路, 耦合等, 低直流偏压的电路中。

SUMMARY

● Types of Dielectric Material and Capacitor

※ HIGH FREQUENCY TYPE: The capacitor of this kind dielectric material is considered as Class I capacitor, including high frequency COG、COH capacitor and temperature compensating capacitor such as HG, LG, PH, RH, SH, TH, UJ, SL. The electrical properties of COG、COH capacitor are the most stable one and change invariably with temperature, voltage and time. They are suited for applications where low-losses and high-stability are required, HG, LG, PH, RH, SH, TH, UJ, SL capacitor's capacitance changes with temperature. They are suited for applications where low-losses and temperature compensating circuits.

※ X7R、X5R、X7S、X6S: X7R、X5R、X7S、X6S material is a kind of material has high dielectric constant. The capacitor made of this kind material is considered as Class II capacitor whose capacitance is higher than that of class I. These capacitors are classified as having a semi-stable temperature characteristic and used over a wide temperature range, such in these kinds of circuits, DC-blocking, decoupling, bypassing, frequency discriminating etc.

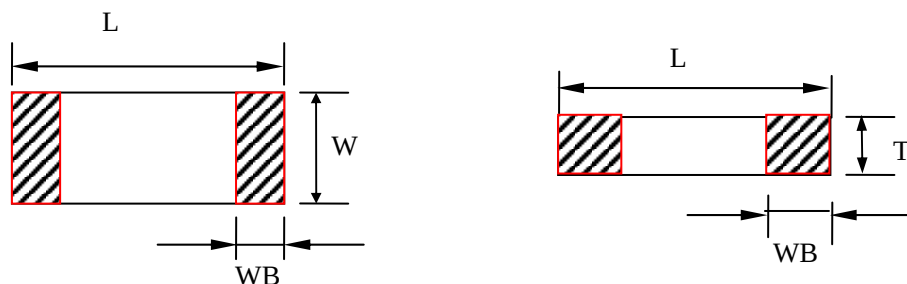
※ Y5V: The capacitor made of this kind of material is the highest dielectric constant of all ceramic capacitors. They are used over a moderate temperature range in application where high capacitance is required because of its unstable temperature coefficient, but where moderate losses and capacitance changes can be tolerated. Its capacitance and dissipation factors are sensible to measuring conditions, such as temperature and voltage, etc.

※ Z5U: The capacitor made of this kind of material is considered as Class II capacitor, whose temperature characteristic is between that of X7R and Y5V. The capacitance of this kind of capacitor is unstable and sensible to temperature and voltage. Ideally suited for bypassing and decoupling application circuits operating with low DC bias in the environment approaches to room temperature.



二、尺寸及结构 DIMENSIONS AND STRUCTURE

※ 尺寸 DIMENSIONS

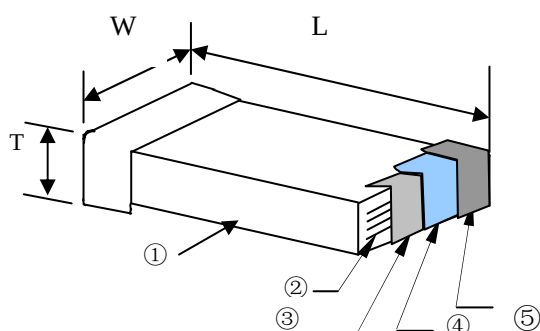


型号 Type		介质种类 Dielectric	尺寸 Dimensions (mm)				特别说明 Special Instructions
英制表示 British expression	公制表示 Metric expression		L	W	T	WB	
0201	0603	所有介质 All Dielectric	0.6 ± 0.03	0.3 ± 0.03	0.3 ± 0.03	0.15 ± 0.10	$C < 220\text{nF}$
			0.6 ± 0.05	0.3 ± 0.05	0.3 ± 0.05	0.15 ± 0.10	$C \geq 220\text{nF}$

备注：可根据客户的特殊要求设计符合客户需求的产品。

Note: We can design according to customer special requirements.

※ 结构 STRUCTURE



序号 NO	名称 Name
①	陶瓷介质 Ceramic dielectric
②	内电极 Inner electrode
③	外电极 Substrate electrode
④	镍层 Nickel Layer
⑤	锡层 Tin Layer



三、型号规格表示方法 HOW TO ORDER

0201	CG	680	J	500	N	T
①	②	③	④	⑤	⑥	⑦

※说明 NOTES:

①尺寸 DIMENSIONS

单位 (unit): inch/ mm

型号 (type)	长×宽 (L×W) Inch	长×宽 (L×W) mm
0201	0.02×0.01	0.60×0.30

② 介质种类 DIELECTRIC STYLE

介质种类 (Dielectric Code)	CG	CH	HG	LG	PH	RH	SH	TH	UJ	SL	B	X	BS	DS	E	F
介质材料 (Dielectric)	COG	COH	HG	LG	PH	RH	SH	TH	UJ	SL	X7R	X5R	X7S	X6S	Z5U	Y5V

③ 标称容量 NOMINAL CAPACITANCE

单位(unit): pF

表示方式 (Express Method)	实际值 (Actual Value)	注：头两位数字为有效数字，第三位数字为 0 的个数；R 为小数点。 Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.
0R5	0.5	
1R0	1.0	
102	10×10^2	
224	22×10^4	
...	...	

④ 容量误差 CAPACITANCE TOLERANCE

代码 (Code)	A	B	C	D	F	G	J	K	M	S	Z
误差 (Tolerance)	± 0.05pF	± 0.10pF	± 0.25pF	± 0.5pF	± 1.0%	± 2.0%	± 5.0%	±10%	±20%	+50% -20%	+80% -20%

备注：A、B、C、D 级误差适用于容量≤10pF 的产品。

Note: These capacitance tolerance A, B, C, D are just applicable the capacitance that equals to or less than 10pF.



⑤ 额定电压 RATED VOLTAGE

单位(unit): V

表示方式 (Express Method)	实际值 (Actual Value)	注: 头两位数字为有效数字, 第三位数字为 0 的个数; R 为小数点。 Note: the first two digits are significant; third digit denotes number of zeros; R=decimal point.
6R3	6.3	
500	50×10^0	
201	20×10^1	
102	10×10^2	
...	...	

⑥ 端头材料 TERMINAL MATERIAL STYLES

端头类别 (Termination Styles)	表示方式 (Express Method)
纯银端头 (Silver Solderable Termination)	S
纯铜端头 (Copper Solderable Termination)	C
三层电镀端头 (Nickel Barrier Termination)	N

⑦ 包装方式 PACKAGE STYLES

B	T
散包装 (Bulk Bag)	编带包装 (Taping Package)

四、温度系数/特性 Temperature Coefficient /Characteristics

介质种类 Dielectric	参考温度点 Reference Temperature Point	标称温度系数 Temperature Coefficient	工作温度范围 Operation Temperature Range
COG	20°C	0±30 ppm/°C	-55°C ~ 125°C
COH	20°C	0±60 ppm/°C	-55°C ~ 125°C
HG	20°C	-33±30 ppm/°C	-25°C ~ 85°C
LG	20°C	-75±30 ppm/°C	-25°C ~ 85°C
PH	20°C	-150±60 ppm/°C	-25°C ~ 85°C
RH	20°C	-220±60 ppm/°C	-25°C ~ 85°C
SH	20°C	-330±60 ppm/°C	-25°C ~ 85°C
TH	20°C	-470±60 ppm/°C	-25°C ~ 85°C
UJ	20°C	-750±120 ppm/°C	-25°C ~ 85°C
SL	20°C	-1000~+140 ppm/°C	-25°C ~ 85°C
X7R	20°C	±15%	-55°C ~ 125°C
X5R	20°C	±15%	-55°C ~ 85°C
X7S	20°C	±22%	-55°C ~ 125°C
X6S	20°C	±22%	-55°C ~ 105°C
Z5U	20°C	-56%~+22%	10°C ~ 85°C
Y5V	20°	-80%~+30%	-25°C ~ 85°C

备注: I 类电容器标称温度系数和允许偏差是采用温度在 20°C 和 85°C 之间的电容量变化来确定的, 而 II 类电容器标称温度系数是按照工作范围之间的电容量相对 20°C 的电容量变化来确定的。

Note: Nominal temperature coefficient and allowed tolerance of class I are decided by the changing of the capacitance between 20°C and 85°C. Nominal temperature coefficient of class II are decided by the temperature of 20°C.



五、容量范围及其电压 Capacitance Range and Operating Voltage

单位/unit: pF

尺寸规格 Size Code	额定电压 Rated Voltage	容量范围 Capacitance	
		COG(NPO)(PF)	Y5V (Z5U)(PF)
0201	4V	—	—
	6.3V	—	10,000~100,000
	10V	—	—
	16V	—	10,000
	25V	0.1~1,000	—
	50V	0.1~220	—

尺寸规格 Size Code	额定电压 Rated Voltage	容量范围 Capacitance			
		X7R (PF)	X7S(PF)	X5R(uF)	X6S(uF)
0 01	4V	—	10,000~1,000,000	0.015uF~1uF	0.015uF~1uF
	6.3V	—	10,000~220,000	0.015uF~1uF	0.015uF~1uF
	10V	100~22,000	10,000~220,000	0.015uF~1uF	0.015uF~0.22uF
	16V	100~22,000	—	0.015uF~0.22uF	0.015uF~0.1uF
	25V	100~10,000	—	0.015uF~0.1uF	0.015uF~0.1uF
	50V	100~1,000	—	0.0047uF~0.01uF	—

备注：可根据客户的特殊要求设计符合客户需求的产品。

Note: We can design according to customer special requirements



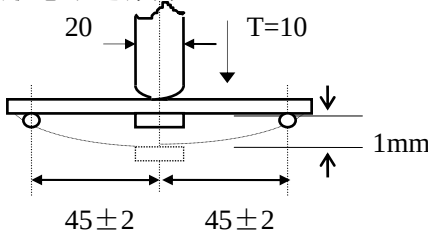
六、可靠性测试 Reliability Test

项目 Item	技术规格 Technical Specification		测 试 方 法 Test Method and Remarks		
容量 Capacitance	I类 Class I	应符合指定的误差级别 Should be within the specified tolerance.	标称容量 Capacitance	测试频率 Measuring Frequency	测试电压 Measuring Voltage
			≤1000pF	1MHz±10%	1.0±0.2Vrms
			>1000 pF	1KHz±10%	
	II类 Class II	应符合指定的误差级别 Should be within the specified tolerance.	测试温度： 25℃±3℃ Test Temprature: 25℃±3℃ C≤10μF： 测试频率: 1KHz±10% 测试电压: 1.0±0.2Vrms Test Frequency: 1KHz±10% Test Voltage: 1.0±0.2Vrms C>10μF X7R、X5R、X7S、X6S、Y5V 测试频率: 120±24 Hz 测试电压:0.5±0.1Vrms Test Frequency: 120±24 Hz Test Voltage: 0.5±0.1Vrms Z5U： 测试频率:1±0.1KHz 测试电压:0.5±0.05Vrms Test Frequency: 1±0.1KHz Test Voltage: 0.5±0.05Vrms		
损耗角正切 (DF, tan δ) Dissipation Factor	I类 Class I	DF	标称容量 Capacitance	测试频率 Measuring Frequency	测试电压 Measuring Voltage
		≤0.56%	Cr<5 pF	1MHz±10%	1.0±0.2Vrms
		1.5[(150/Cr)+7]×10 ⁻⁴	5pF≤Cr<50 pF	1MHz±10%	
		≤0.15%	50pF≤Cr≤1000 pF	1MHz±10%	
		≤0.15%	>1000 pF	1KHz±10%	



项目 Item	技术规格 Technical Specification					测 试 方 法 Test Method and Remarks				
损耗角正切 (DF, tan δ) Dissipation Factor	II类 Class II	X7R/ X5R X7S/ X6S (≥ 0402)	≥50V	25V	16V	10V	6.3V	C≤10μF		
			≤2.5%	≤3.5% (C < 0.47μF) ≤10.0% (C ≥ 0.47μF)	≤3.5% (C < 0.47μF) ≤10.0% (C ≥ 0.47μF)	≤5.0% (C < 0.15μF) ≤10.0% (C ≥ 0.15μF)	≤5.0% (C < 0.15μF) ≤10.0% (C ≥ 0.15μF)	测试频率: 1KHz±10% 测试电压: 1.0±0.2Vrms Test Frequency: 1KHz ± 10% Test Voltage: 1.0±0.2Vrms		
				X7R/ X5R X7S/ X6S (< 0402)	≤3.5%	≤5.0%	≤5.0% (C < 0.047μF) ≤ 10% (C ≥ 0.047μF)	≤7.5% (C < 0.047μF) ≤ 10% (C ≥ 0.047μF)	≤7.5% (C < 0.047μF) ≤ 10% (C ≥ 0.047μF)	C>10μF X7R、X5R、X7S、X6S、Y5V 测试频率: 120±24 Hz 测试电压:0.5±0.1Vrms Test Frequency: 120±24 Hz Test Voltage: 0.5±0.1Vrms Z5U:测试频率:1±0.1KHz 测试电压:0.5±0.05Vrms Test Frequency: 1±0.1KHz Test Voltage: 0.5±0.05Vrms
		Y5V Z5U	≥25V		16V	10V	6.3V	测试电压:0.5±0.05Vrms Test Frequency: 1±0.1KHz Test Voltage: 0.5±0.05Vrms		
			≤7.0% (C<1.0μF) ≤9.0% (C≥1.0μF)		≤15%	≤15%	≤15%			
		绝缘电阻 (IR) Insulation Resistance	I类 Class I	C≤10 nF, Ri≥50000M Ω C>10 nF, Ri• CR≥500S					测试电压:额定电压 测试时间: 60±5 秒 测试湿度: ≤75%	
X7R/X5R/ X7S/X6S	C≤25 nF, Ri≥10000M Ω C>25 nF, Ri• CR>100S					测试温度: 25℃±3℃ 测试充放电电流: ≤50mA Measuring Voltage: Rated Voltage Duration: 60±5s				
	Y5V Z5U			C≤25 nF, Ri≥4000M Ω C>25 nF, Ri• CR>100S					Test Humidity: ≤75% Test Temperature: 25℃±3℃ Test Current: ≤50mA	
介质耐电强度 (DWV) Dielectric Withstanding Voltage	不应有介质被击穿或损伤 No breakdown or damage.						测量电压: I类: 300%额定电压 II类: 250% 额定电压 时间: 1~5 秒 充/放电电流: 不应 超过 50mA (这部分说明不包括中高压 MLCC) Measuring Voltage: Class I :300% Rated voltage Class II :250% Rated voltage Duration: 1~5s Charge/ Discharge Current: 50mA max. (This method excludes high-voltage MLCC)			



项目 Item	技术规格 Technical Specification					测试方法 Test Method and Remarks	
可焊性 Solderability	上锡率应大于 95% 外观：无可见损伤。 At least 95% of the terminal electrode is covered by new solder. Visual Appearance: No visible damage.					将电容在 80~120℃ 的温度下预热 10~30 秒。 Preheating conditions:80 to 120℃; 10~30s.	
						有铅焊料：(Sn/Pb: 63/37) 浸锡温度：235±5℃ 浸锡时间：2±0.5s Solder Temperature: 235±5℃ Duration: 2±0.5s	无铅焊料： 浸锡温度：245±5℃ 浸锡时间：2±0.5s Solder Temperature: 245±5℃ Duration: 2±0.5s
耐焊接热 Resistance to Soldering Heat	项目 Item	NPO 至 SL NPO to SL	X7R/X5R /X7S/X6S	Y5V	Z5U	将电容在 100~200℃ 的温度下预热 10±2 分钟。 浸锡温度：265±5℃ 浸锡时间：10±1s 然后取出溶剂清洗干净,在10 倍以上的显微镜底下观察。 放置时间：24±2 小时 放置条件：室温 Preheating conditions: 100 to 200℃; 10±2min. Solder Temperature: 265±5℃ Duration: 10±1s Clean the capacitor with solvent and examine it with a 10X(min.) microscope. Recovery Time: 24±2h Recovery condition: Room temperature	
	ΔC/C	≤±0.5%	-5~+10%	-10~+20%			
	DF	同初始标准 Same to initial value.					
	IR	同初始标准 Same to initial value.					
	外观：无可见损伤 上锡率：≥95% Appearance: No visible damage.At least 95% of the terminal electrode is covered by new solder.						
抗弯曲强度 Resistance to Flexure of Substrate (Bending Strength)	外观：无可见损伤。 Appearance: No visible damage.					试验基板：Al₂O₃ 或 PCB 弯曲深度：1mm 施压速度：0.5mm/sec. 单位：mm 应在弯曲状态下进行测量。  Test Board: Al₂O₃ or PCB Warp: 1mm Speed: 0.5mm/sec. Unit: mm The measurement should be made with the board in the bending position.	
	Δ C/C	≤±10%					
端头结合强度 Termination Adhesion	外观无可见损伤 No visible damage.					施加的力：5N 时间：10±1S Applied Force: 5N Duration: 10±1S	



项目 Item	技术规格 Technical Specification		测 试 方 法 Test Method and Remarks															
温度循环 Temperature Cycle	$\Delta C/C$: I 类: $\leq \pm 1\%$ 或 $\pm 1\text{pF}$, 取两者中最大者 II 类: B,X,BS,DS: $\leq \pm 10\%$ E,F: $\leq \pm 20\%$ Class I : $\leq \pm 1\%$ or $\pm 1\text{pF}$, whichever is larger. Class II : B,X,BS,DS: $\leq \pm 10\%$ E,F: $\leq \pm 20\%$		预处理 [*] (2 类): 上限类别温度, 1 小时 恢复: $24 \pm 1\text{h}$ 初始测量 循环次数: 5 次,一个循环分以下 4 步: <table><tr><td>阶段</td><td>温度 (℃)</td><td>时间(分钟)</td></tr><tr><td>第 1 步</td><td>下限温度 (NPO/X7R/X7S/X6S/X5R:-55 Y5V:-25 Z5U:+10)</td><td>30</td></tr><tr><td>第 2 步</td><td>常温 (+20)</td><td>2~3</td></tr><tr><td>第 3 步</td><td>上限温度 (NPO/X7R/X7S: +125 Y5V/Z5U/X5R:+85 X6S:+105)</td><td>30</td></tr><tr><td>第 4 步</td><td>常温 (+20)</td><td>2~3</td></tr></table>	阶段	温度 (℃)	时间(分钟)	第 1 步	下限温度 (NPO/X7R/X7S/X6S/X5R:-55 Y5V:-25 Z5U:+10)	30	第 2 步	常温 (+20)	2~3	第 3 步	上限温度 (NPO/X7R/X7S: +125 Y5V/Z5U/X5R:+85 X6S:+105)	30	第 4 步	常温 (+20)	2~3
			阶段	温度 (℃)	时间(分钟)													
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第 4 步	常温 (+20)	2~3																
试验后放置 (恢复) 时间: $24 \pm 2\text{h}$ Preheating conditions: up-category temperature, 1h Recovery time: $24 \pm 1\text{h}$ Initial Measurement Cycling Times: 5 times, 1 cycle, 4 steps: <table><tr><td>Step</td><td>Temperature (℃)</td><td>Time(min.)</td></tr><tr><td>1</td><td>Low- category temp. (NPO/X7R/X7S/X6S/X5R:-55 Y5V:-25 Z5U:+10)</td><td>30</td></tr><tr><td>2</td><td>Normal temp. (+20)</td><td>2~3</td></tr><tr><td>3</td><td>Up- category temp. (NPO/X7R/X7S: +125 Y5V/Z5U/X5R:+85 X6S:+105)</td><td>30</td></tr><tr><td>4</td><td>Normal temp. (+20)</td><td>2~3</td></tr></table>			Step	Temperature (℃)	Time(min.)	1	Low- category temp. (NPO/X7R/X7S/X6S/X5R:-55 Y5V:-25 Z5U:+10)	30	2	Normal temp. (+20)	2~3	3	Up- category temp. (NPO/X7R/X7S: +125 Y5V/Z5U/X5R:+85 X6S:+105)	30	4	Normal temp. (+20)	2~3	
Step	Temperature (℃)	Time(min.)																
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3	Up- category temp. (NPO/X7R/X7S: +125 Y5V/Z5U/X5R:+85 X6S:+105)	30																
4	Normal temp. (+20)	2~3																
Recovery time after test: $24 \pm 2\text{h}$																		
潮湿试验 Moisture Resistance	$\Delta C/C$	I 类: $\leq \pm 2\%$ 或 $\pm 1\text{pF}$, 取两者之中较大者 II 类: B,X,BS,DS: $\leq \pm 10\%$ E,F: $\leq \pm 30\%$ Class I : $\leq \pm 2\%$ or $\pm 1\text{pF}$, whichever is larger. Class II : B,X,BS,DS: $\leq \pm 10\%$ E,F: $\leq \pm 30\%$	温度: $40 \pm 2^\circ\text{C}$ 湿度: 90~95%RH 时间: 500 小时 放置条件: 室温 放置时间: 24 小时(I 类); 48 小时(II 类) Temperature: $40 \pm 2^\circ\text{C}$ Humidity: 90~95%RH Duration: 500h Recovery conditions: Room temperature Recovery Time: 24h (Class1) or 48h (Class2)															
	DF	≤ 2 倍初始标准 Not more than twice of initial value.																
	IR	I 类: $R_i \geq 2500\text{M}\Omega$ 或 $R_i \bullet C_R \geq 25\text{S}$ 取两者之中较小者. Class I : $R_i \geq 2500\text{M}\Omega$ 或 $R_i \bullet C_R \geq 25\text{S}$ whichever is smaller.																
		II 类: $R_i \geq 1000\text{M}\Omega$ 或 $R_i \bullet C_R \geq 25\text{S}$ 取两者之中较小者. Class II : $R_i \geq 1000\text{M}\Omega$ 或 $R_i \bullet C_R \geq 25\text{S}$ whichever is smaller.																
	外观: 无损伤 Appearance: No visible damage.																	



项目 Item	技术规格 Technical Specification		测试方法 Test Method and Remarks
寿命试验 Life Test	$\Delta C/C$	I 类: $\leq \pm 2\%$ 或 $\pm 1\text{pF}$ 取两者之中较大者 II 类: B,X,BS,DS: $\leq \pm 20\%$ E,F: $\leq \pm 30\%$ Class I : $\leq \pm 2\%$ or $\pm 1\text{pF}$, whichever is larger. Class II: B,X,BS,DS: $\leq \pm 20\%$ E,F: $\leq \pm 30\%$	低压产品 ($<100\text{V}$) 电压: 1.5 倍额定工作电压 时间: 1000 小时 温度: 125°C (NPO、X7R、X7S) 85°C (Y5V、X5R) 105°C (X6S) 充电电流: 不应超过 50mA 放置条件: 室温 放置时间: 24 小时 (I 类), 或 48 小时 (II 类), Low-voltage ($<100\text{V}$) Applied Voltage: $1.5 \times \text{Rated Voltage}$ Duration: 1000h Temperature: 125°C (NPO、X7R、X7S) 85°C (Y5V、X5R) 105°C (X6S) Charge/ Discharge Current: 50mA max. Recovery Conditions: Room Temperature Recovery Time: 24h (Class 1), or 48h (Class2)
	DF	≤ 2 倍初始标准 Not more than twice of initial value.	
	IR	I 类: $R_i \geq 4000\text{M}\Omega$ 或 $R_i \cdot C_R \geq 40\text{S}$ 取两者之中较小者. Class I : $R_i \geq 4000\text{M}\Omega$ 或 $R_i \cdot C_R \geq 40\text{S}$ whichever is smaller.	
		II 类: $R_i \geq 2000\text{M}\Omega$ 或 $R_i \cdot C_R \geq 50\text{S}$ 取两者之中较小者. Class II: $R_i \geq 2000\text{M}\Omega$ 或 $R_i \cdot C_R \geq 50\text{S}$ whichever is smaller.	
	外观: 无损伤 Visual Appearance: No visible damage.		

注解:

专门预处理^{*} (仅对 2 类电容器):

将电容器放在上限类别温度或按详细规范中可能规定的更高温度下经 1h 后, 接着在试验的标准大气条件下恢复 $24 \pm 1\text{h}$ 。

Note: Pretreatment (only for class2 capacitor)

Pretreatment (only for class2 capacitor) is a method to treat the capacitor before measurement. First, place the capacitor in the up-category temperature or other specified higher temperature environment for 1hour. Then recovery the capacitor at standard pressure conditions for $24 \pm 1\text{hours}$ 。

※以最新版本的内容为准