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■铜端子片式陶瓷电容器

Copper terminal MLCC

◆特征

Feature

*叠层独石结构，具有高可靠性能

The laminated monolithic structure makes it have high reliability.

*具有较高的容量且容量性能稳定

It includes high and stable capacitance.

*X7R、X7S、X7T、X6S、X5R、：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，具有较稳定的温度特性，适用于容量范围广，具有一定稳定性要求的电路中，如隔直、耦合、旁路、鉴频等电路中。

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.

* 更宽、更大的端头面积，表面铜层致密性、一致性更好，便于内埋后的端子稳定接触。

It has a wider and larger terminal area, and the copper layer on the surface has better compactness and consistency, which is convenient for the stable contact of the embedded terminals.

* 执行标准：GB/T 21042-2007

Executive Standard: GB/T 21042-2007

◆应用范围

Application

*应用于各种滤波、耦合、谐振、旁路、高频电子线路

It is suitable for all kinds of filter, coupled, harmonic vibration, bypassing and high frequency circuits.

*适用于 IC 封装、嵌入式封装应用、PCB 板内埋应用，通过激光钻孔、镀铜连线，实现垂直接入，可大大减少电路布线，降低电路损耗、提升电源转换效率。

It is suitable for IC package, embedded package application and PCB board embedded application. Vertical connection can be realized by laser drilling and copper plating, which can greatly reduce circuit wiring, reduce circuit loss and improve power conversion efficiency.

◆型号表示法

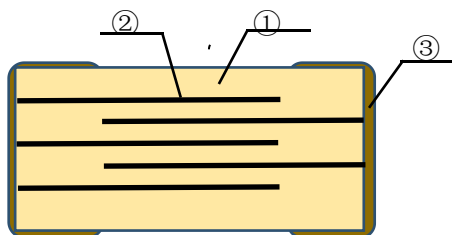
How To Order

0402			B		103		K		160		C		T	
尺寸规格 Size Code			标称容量 Nominal Capacitance 单位(unit): pF			额定电压 Rated Voltage 单位(unit): V			包装方式 Package Styles					
尺寸规格 Size Code	长×宽 inch	长×宽 mm	表示方式 Express Method	实际值 Actual Value		表示方式 Express Method	实际值 Actual Value		表示方式	包装方式				
0201	0.02×0.01	0.60×0.30	0R5	0.5		6R3	6.3							
0402	0.04×0.02	1.00×0.50	1R0	1.0		500	50×10 ⁰							
			102	10×10 ²		201	20×10 ¹		T	编带包装 Braided packing				
介质种类 Dielectric Code			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.			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.			端头材料 Terminal Material Styles					
									端头类别 Termination Styles		表示方式 Express Method			
									铜电镀端头 Copper Barrier Termination		C			
			容量误差 Capacitance Tolerance											
			代码 Code	A	B	C	D	F	G	J	K	M		
			误差 Tolerance	±0.05 pF	±0.10 pF	±0.25 pF	±0.50 pF	±1%	±2%	±5%	±10 %	±20%		
			注：A、B、C、D级误差适用于容量≤10pF的产品。 These Capacitance tolerance A, B, C, D are just applicable the capacitance that equals to or less than 10pF。											

◆产品结构

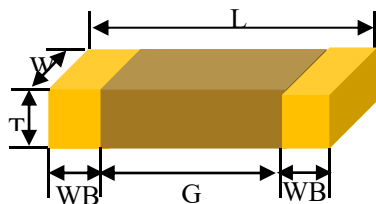
Product Structure

序号 NO	名称 Name
①	陶瓷介质 Ceramic dielectric
②	内电极 (Ni 金属) Inner electrode(Ni metal)
③	外电极 (Cu) Substrate electrode(Cu)



◆产品尺寸

Product Dimensions



型号 Type		尺寸 (mm) Dimensions					厚度代码 Size code
英制表示 Imperial	公制表示 Metric	L	W	T	WB	G	
0201	0603	0.6±0.03	0.3±0.03	0.3±0.03	0.20~0.26	>0.08mm	BA
			0.3±0.09	0.3±0.09			BB
0402	1005	1.00±0.05	0.50±0.05	0.30±0.03	0.30~0.40	>0.2mm	CD
注：可根据客户的要求设计符合客户尺寸需求的产品。 We can design according to customer special requirements							

◆容量范围及其电压
Capacitance Range and Voltage

*II 类电容器具体电压对应容量及厚度情况列表

List of capacity and thickness corresponding to specific Voltage of Class II capacitor

尺寸 Size	0201 (0.6mm*0.3mm)																							
材料 Dielectric	X7R					X7S					X7T					X6S/X6T					X5R			
容量/电压 Capacity/ Voltage	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V
120pF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
180pF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
220pF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
330pF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
470pF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
560pF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
680pF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
1nF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
2.2nF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
3.9nF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
4.7nF	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA				
5.6nF	BA	BA	BA	BA		BA	BA	BA	BA		BA	BA	BA	BA		BA	BA	BA	BA					
6.8nF	BA	BA	BA	BA		BA	BA	BA	BA		BA	BA	BA	BA		BA	BA	BA	BA					
10nF	BA	BA	BA	BA		BA	BA	BA	BA		BA	BA	BA	BA		BA	BA	BA	BA					
15nF																					BA	BA	BA	BA
18nF																					BA	BA	BA	BA
22nF																					BA	BA	BA	BA
33nF																					BA	BA	BA	BA
47nF																					BA	BA	BA	BA
56nF																					BA	BA	BA	BA
68nF																					BA	BA	BA	BA
100nF																					BB	BB	BB	BB

代码 Code	BA	BB
T	0.30±0.03	0.3±0.09

尺寸 Size	0402 (1.0mm*0.5mm)																								
材料 Dielectric	X7R					X7S					X7T					X6S/X6T					X5R				
容量/电压 Capacity/ Voltage	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
330pF	CD	CD	CD	CD	CD																				
470pF	CD	CD	CD	CD	CD																				
560pF	CD	CD	CD	CD	CD																				
680pF	CD	CD	CD	CD	CD																				
1nF	CD	CD	CD	CD	CD																				
2.2nF	CD	CD	CD	CD																					
3.9nF	CD	CD	CD	CD																					
4.7nF	CD	CD	CD	CD																					
5.6nF	CD	CD	CD	CD																					
6.8nF	CD	CD	CD	CD																					
10nF	CD	CD	CD	CD																					
15nF						CD	CD	CD			CD	CD	CD			CD	CD	CD			CD	CD	CD		
18nF						CD	CD	CD			CD	CD	CD			CD	CD	CD			CD	CD	CD		
22nF						CD	CD	CD			CD	CD	CD			CD	CD	CD			CD	CD	CD		
33nF						CD	CD	CD			CD	CD	CD			CD	CD	CD			CD	CD	CD		
47nF						CD	CD	CD			CD	CD	CD			CD	CD	CD			CD	CD	CD		
56nF						CD	CD	CD			CD	CD	CD			CD	CD	CD			CD	CD	CD		
68nF						CD	CD	CD			CD	CD	CD			CD	CD	CD			CD	CD	CD		
100nF						CD	CD	CD			CD	CD	CD			CD	CD	CD			CD	CD	CD		
220nF																					CD				

代码 Code	CD
T	0.30±0.03

◆可靠性测试方法

Reliability Test Methods

二类介质规格测容量前需去老化处理：测试温度：25℃±3℃，测试湿度：<70%RH. 电容器 150℃热处理 1h±10min，放置 24±2h 后测量。

The second type of medium specification needs to be aged before measuring the capacity: test temperature: 25℃±3℃, test humidity: <70%RH. The capacitors were heat treated at 150℃ for 1 hour ±10minutes and measured after 24±2 hours of placement.

项目 Item	技术规格 Technical Specification	测试方法 Test Method and Remarks											
容量 Capacitance	应符合指定的误差级别 Should be within the specified tolerance.	测试温度：25℃±3℃ 测试频率：1KHz±10% 测试电压：1.0±0.2Vrms Test temperature: 25℃±3℃ Test frequency: 1kHz±10% Test Voltage: 1.0±0.2Vrms											
损耗角正切 (DF, tanδ) Dissipation Factor	II 类 Class II : <table border="1"> <tr> <th>规格 specifications</th><th>容量 Capacitance</th><th>损耗 wastage</th></tr> <tr> <td rowspan="2">0201</td><td>C≤10nF</td><td>≤5%</td></tr> <tr> <td>10nF<C≤100nF</td><td>≤10%</td></tr> <tr> <td>0402</td><td>C≤100nF</td><td>≤5%</td></tr> </table>	规格 specifications	容量 Capacitance	损耗 wastage	0201	C≤10nF	≤5%	10nF<C≤100nF	≤10%	0402	C≤100nF	≤5%	测试温度：25℃±3℃ 测试频率：1KHz±10% 测试电压：1.0±0.2Vrms Test temperature: 25℃±3℃ Test frequency: 1kHz±10% Test Voltage: 1.0±0.2Vrms
规格 specifications	容量 Capacitance	损耗 wastage											
0201	C≤10nF	≤5%											
	10nF<C≤100nF	≤10%											
0402	C≤100nF	≤5%											
绝缘电阻 Insulation Resistance	C≤25 nF, Ri≥10000MΩ C>25 nF, Ri•CR>100S 注：S=Ω·F	测试电压:额定电压 测试时间: 60±5 秒 测试湿度: ≤75% 测试温度: 25℃±3℃ 测试充放电电流: ≤50mA Measuring Voltage: Rated Voltage Duration: 60±5s Test Humidity: ≤75% Test Temperature: 25℃±3℃ Test Current: ≤50mA											

项目 Item	技术规格 Technical Specification		测试方法 Test Method and Remarks															
介质耐电强度 Dielectric Withstanding Voltage	不应有介质被击穿或损伤 No breakdown or damage.		测量电压: 250%额定电压 时间: 1~5 秒 充放电电流: 不应超过 50mA Measuring Voltage: 250% rated Voltage. Time: 1 ~ 5 seconds. Charge and discharge current: no more than 50mA.															
温度冲击 Temperature concussion	项目 subje ct	II 类 Class II	过三次回流焊炉焊接, 初始测量 循环次数: 5 次,一个循环分以下 4 步: (Category 2) Pretreatment: Preheating at 140℃~150℃ for 1h±10min, and then placing at room temperature for 24±2h. After three times of reflow soldering, initial measurement Cycle times: 5 times, and a cycle is divided into the following 4 steps: <table><tr><td>阶段 phase</td><td>温度 (℃) temperature (℃)</td><td>时间 (分钟) Time(min)</td></tr><tr><td>第 1 步 Step 1</td><td>-55</td><td>30</td></tr><tr><td>第 2 步 Step 2</td><td>常温 (+20) normal atmospheric temperature</td><td>2~3</td></tr><tr><td>第 3 步 Step 3</td><td>上限温度 Upper limit temperature</td><td>30</td></tr><tr><td>第 4 步 Step 4</td><td>常温 (+20) normal atmospheric temperature</td><td>2~3</td></tr></table> 试验后放置 (恢复) 时间: 24±2h Posttest storage (recovery) time: 24±2h.	阶段 phase	温度 (℃) temperature (℃)	时间 (分钟) Time(min)	第 1 步 Step 1	-55	30	第 2 步 Step 2	常温 (+20) normal atmospheric temperature	2~3	第 3 步 Step 3	上限温度 Upper limit temperature	30	第 4 步 Step 4	常温 (+20) normal atmospheric temperature	2~3
	阶段 phase	温度 (℃) temperature (℃)		时间 (分钟) Time(min)														
	第 1 步 Step 1	-55		30														
	第 2 步 Step 2	常温 (+20) normal atmospheric temperature		2~3														
	第 3 步 Step 3	上限温度 Upper limit temperature		30														
	第 4 步 Step 4	常温 (+20) normal atmospheric temperature		2~3														
ΔC/C	-15% ~+15%																	
DF	≤初始规格上限 ≤ Upper limit of initial value																	
IR	≥初始规格下限 ≥ lower limit of initial value																	
外观 appe aranc e	无可见损伤(10 倍放大镜) No visible damage (10x magnifying glass)																	
耐湿负荷 Humidity load	项目 Item	II 类 Class II	温度: 85℃; 湿度: 85%RH; 电压: 额定电压; 时间: 168 小时 Pretreatment (only for Class II capacitors): Preheating at 140℃~150℃ for 1h±10min, and then placing at room temperature for 24±2h. Temperature: 85℃; Humidity: 85% RH; Voltage: rated Voltage; Time: 168 hours															
	ΔC/C	-15% ~+15%																
	DF	≤5 倍初始规格上限 ≤5 times the upper limit of the initial value																
	IR	≥0.2 倍初始规格下限 ≥ 0.2 times the lower limit of the initial value																
	外观 appe aranc e	无可见损伤(10 倍放大镜) No visible damage (10x magnifying glass)																
耐久性 Durability	外观无可见损伤(10 倍放大镜); 电容量: ΔC/C≤15% ; 损耗因数:≤5 倍初始规格上限 绝缘电阻:≥0.2 倍初始规格下限 No visible damage in appearance (10 times magnifying glass); Capacitance: ΔC/C≤15%; Loss factor: ≤5 times the upper limit of the initial value. Insulation resistance: ≥0.2 times the lower limit of initial value.		电压: 2 倍额定工作电压 (0201≥10nF、0402≥47nF 按 1.5 倍额定工作电压) 时间: 1000 小时 温度: 125℃ (X7R、X7S) 85℃ (X5R) 105℃ (X6S、X6T) 充电电流: 不应超过 50mA. 放置时间: 24±2h 小时; II 类: 0201≥47nF、0402≥33nF 产品试验后需在 150℃温度下保持 1h , 再放置 24±2h 后测试电性能. Voltage: twice the rated working Voltage (0201 ≥ 10nF, 0402 ≥ 47nF is 1.5 times the rated working Voltage). Time: 1000 hours Temperature: 125℃(X7R, X7S) 85℃(X5R)105℃(X6S, X6T) Charging current: should not exceed 50mA. Placement time: 24±2h; Class II: 0201≥47nF and 0402≥33nF product need to keep in 150℃、1h after the test, and measurement to be made after being kept at room temperature for 24±2h.															

备注: 特殊试验要求可联系我司进行确认。

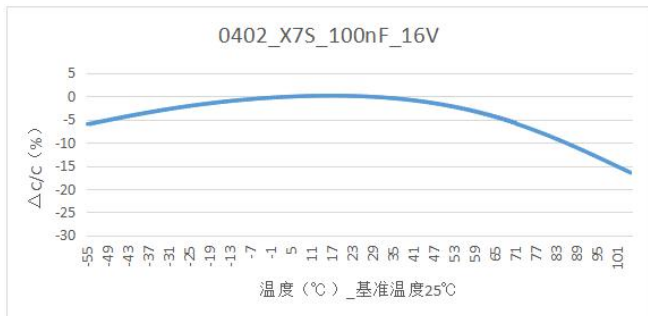
Note: Special test requirements can be confirmed by contacting our company.

◆产品特性曲线图

Product feature curve graph

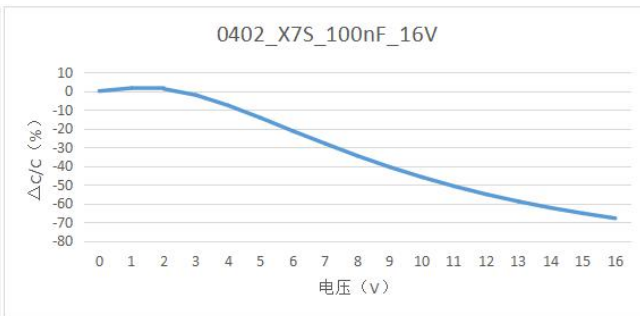
* 材料 TC 曲线

TC curve of material

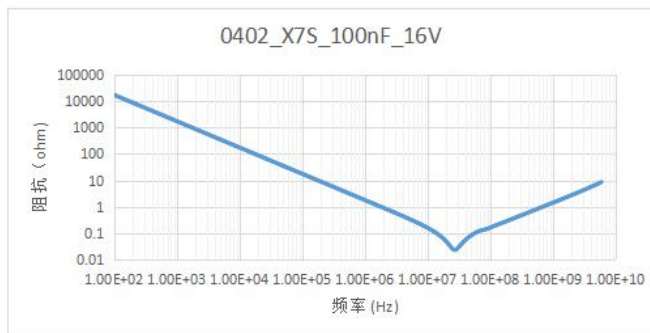


* 直流偏压曲线

DC bias curve

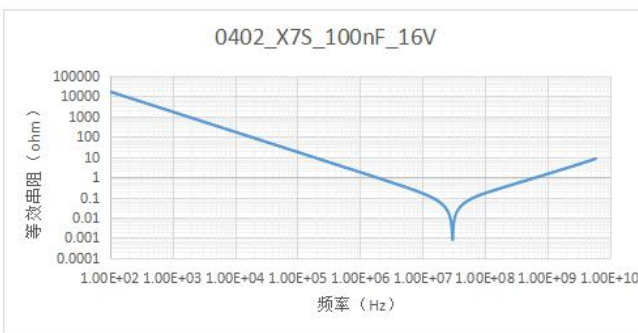


* 阻抗特性曲线



Impedance characteristic curve

* 等效串阻(ESR)特性曲线



Equivalent series resistance (ESR) characteristic curve

注：以上典型曲线仅供参考，具体规格的特性需求请咨询我司。

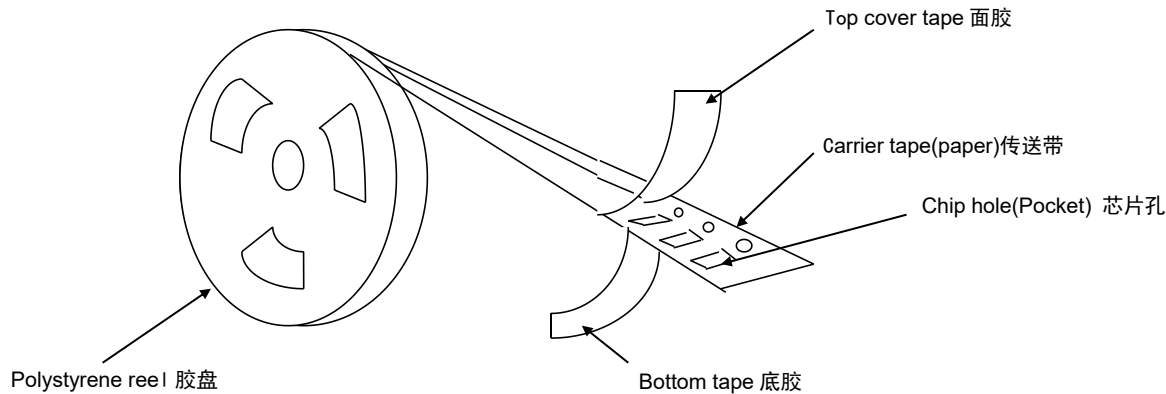
Note: The above typical curves are for reference only. Please consult our company for specific specifications

◆包装

Package

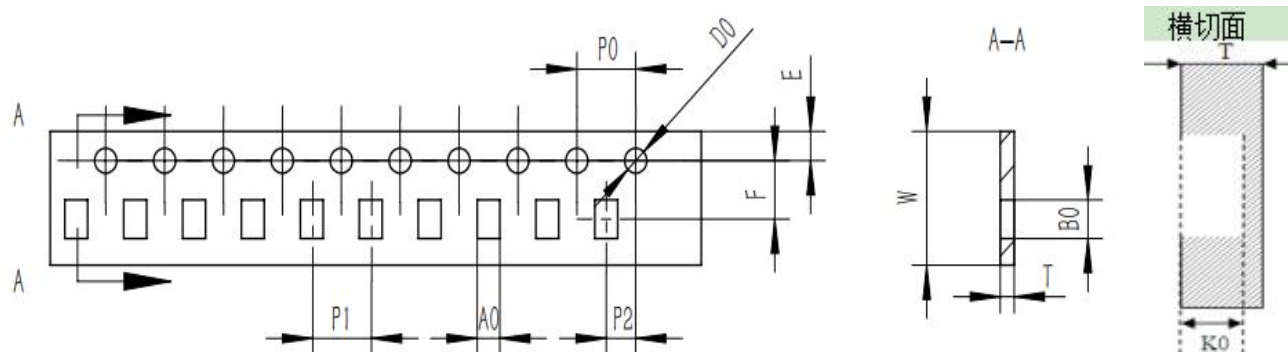
* 纸带卷盘结构

Paper Taping



*0201 纸带编带尺寸大小

Dimensions of paper taping for 0201type

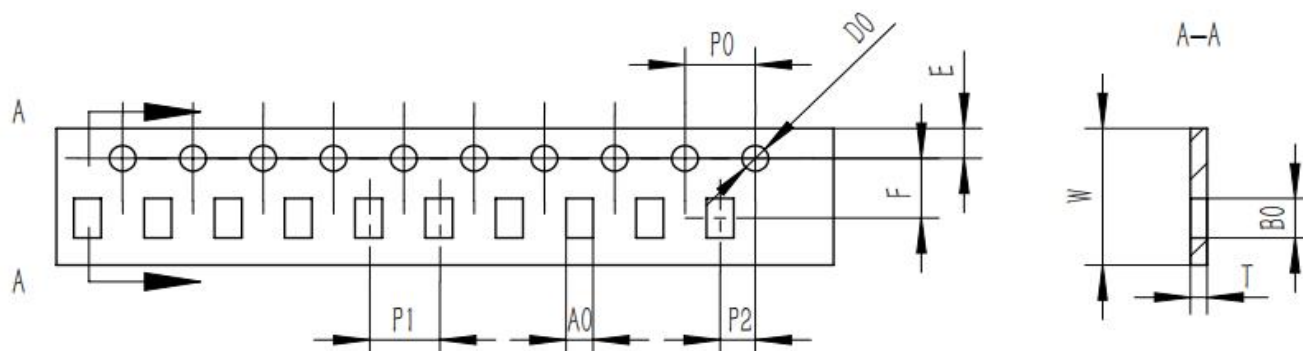


单位 Unit: mm

代号 Code	A0	B0	W	F	E	P1	P2	P0	D0	T	K0
0201	0.37 ±0.10	0.67 ±0.10	8.00 ±0.10	3.50 ±0.05	1.75 ±0.10	2.00 ±0.05	2.00 ±0.05	4.00 ±0.10	1.50 -0/+0.10	0.80 Below	0.24± 0.02
0402	0.68± 0.03	1.17± 0.03	8.00± 0.10	3.50± 0.05	1.75± 0.10	2.00± 0.05	2.00± 0.05	4.00±0 .10	1.55 ±0.05	0.43± 0.03	

*0402 纸带编带尺寸大小

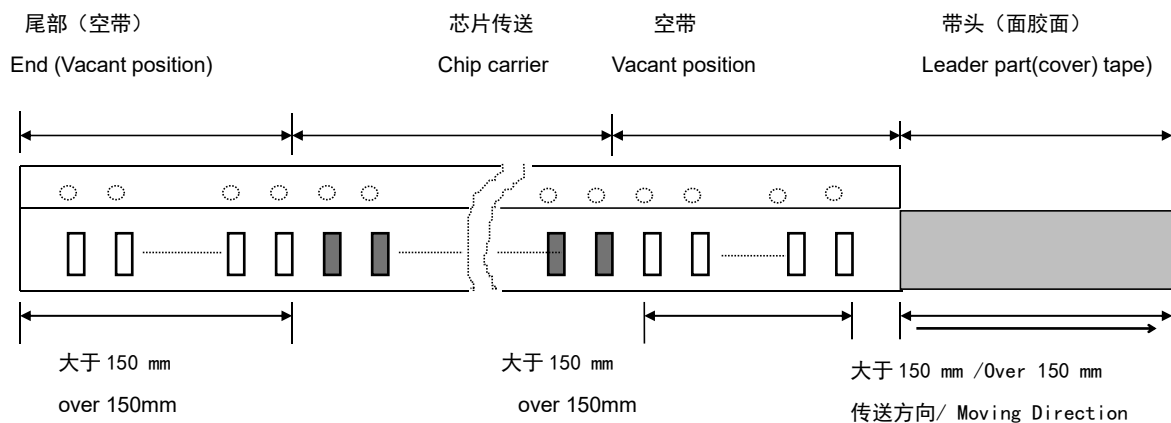
Dimensions of paper taping for 0402type



代号 Code	A0	B0	W	F	E	P1	P2	P0	D0	T
0402	0.68± 0.03	1.17± 0.03	8.00± 0.10	3.50± 0.05	1.75± 0.10	2.00± 0.05	2.00± 0.05	4.00±0. 10	1.55 ±0.05	0.43± 0.03

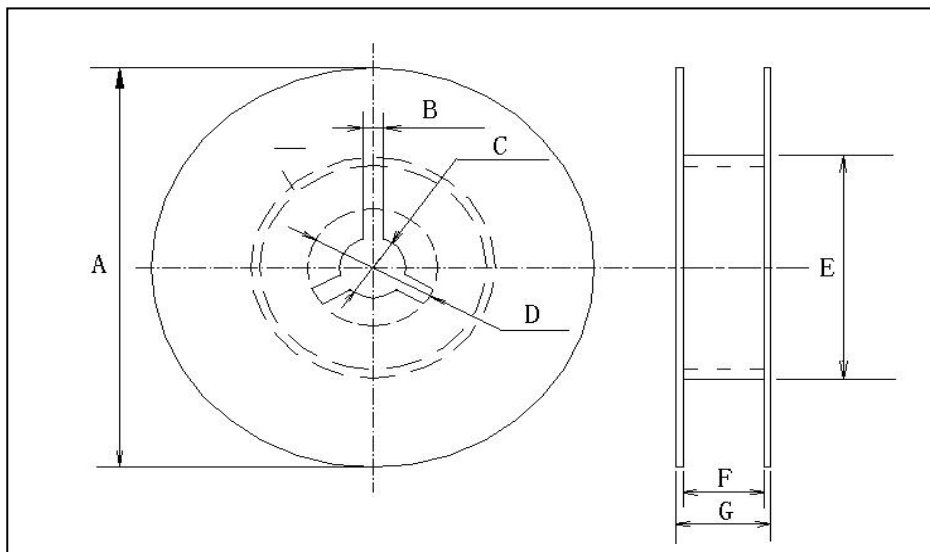
* 传送带的前后结构

Structure of leader part and end part of the carrier paper



* 卷盘尺寸

Reel Dimensions (unit: mm)

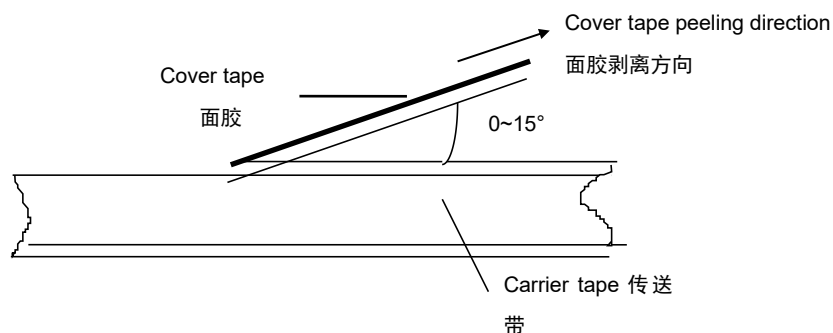


单位: mm

卷盘型号 Reel Code	A	B	C	D	E	F	G
7" REEL	$\phi 178 \pm 2.0$	3.0	$\phi 13 \pm 0.5$	$\phi 21 \pm 0.8$	$\phi 50$ 或更大 $\phi 50$ or more	10.0 ± 1.5	12max

* 关于卷带的说明: 面胶剥离强度

Taping specification: Top tape peeling strength



标准: $0.1N < \text{剥离强度} < 0.7N$; 在剥离时, 纸带不能有纸碎, 也不能粘在底、面胶上。

Standard: $0.1N < \text{peeling strength} < 0.7N$; No paper dirty remains on the scotch when peeling and sticks to top and bottom tape.

* 包装数量 Packing Quantity

尺寸代码 SizeCode	厚度 (T) Thickness	7 寸纸带卷盘 (7' PT)	7 寸胶带卷盘 (7' ET)	13 寸纸带卷盘 (13' PT)	13 寸胶带卷盘 (13' ET)
0201	0.3 ± 0.03	15000	—	—	—
	0.3 ± 0.09		—	—	—
0402	0.30 ± 0.03	10000	—	—	—

注意: 包装的形式和数量可根据客户的要求来定。

Note: We can choose packing style and quantity can be according to the customer's requirement.

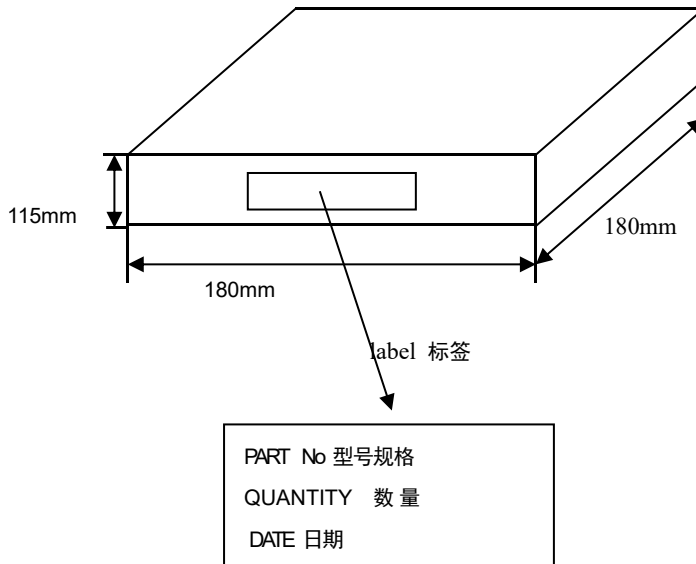
*** 外包装**

Outer packing

小包装 The first package

Quantity: 10 reels

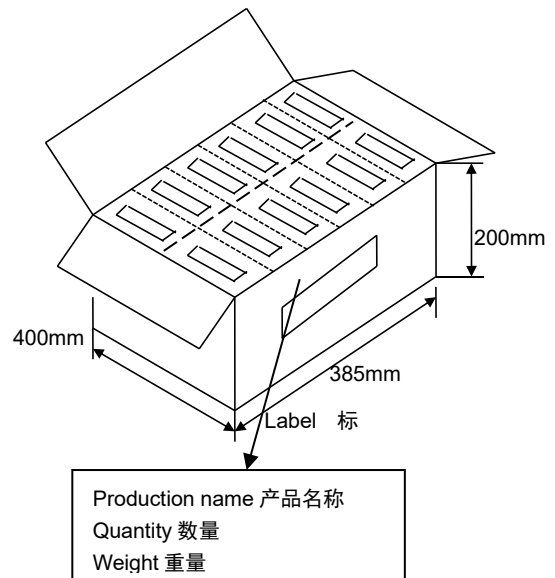
数量: 10 卷



大包装 The second package

Quantity: 6 cases

数量: 6 盒



◆储存注意事项

*MLCC 的储存条件: 相对湿度为 20~70%, 储存温度为 5~40℃, 建议温度低于 30℃。

*MLCC 的性能可能会受到储存条件的影响, 交货后请立即使用。高温高湿条件、长期储存可能会导致包装材料变质、产品端头电极氧化。如自交付后已超过六个月, 使用前检查包装、外观等。如果交付后超过一年, 在使用前要检查可焊性。

* 不要将电容器存放在含有腐蚀性气体(例如硫化氢、二氧化硫、氯气、氨气等)的环境中。

* 不要在阳光直射下或高湿度条件下储存电容器。

◆ Storage Precautions

* Storage Conditions for MLCC: Relative humidity: 20~70%, storage temperature: 5~40℃, recommended temperature is below 30℃.

* The performance of MLCCs may be affected by storage conditions. Please use immediately after delivery. High temperature and high humidity conditions, or long-term storage, may lead to packaging material deterioration and oxidation of the product's end electrodes. If it has been over six months since delivery, check the packaging and appearance before use. If it has been over a year, check the solderability before use.

* Do not store capacitors in environments containing corrosive gases (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia, etc.).

* Do not store capacitors under direct sunlight or in high humidity conditions.

◆使用前注意事项

*安装前的信息

- 1、不要重复使用从设备上拆下的电容器。
- 2、确认额定容量、额定电压等电气特性。
- 3、确认施加电压下的电容特性。
- 4、确认使用下的机械应力。
- 5、确认长期存放的电容器的可焊性。
- 6、在测量电容之前, 对长期存放的电容器进行热处理。

◆ Precautions Before Use

Pre-installation Information

- 1、Do not reuse capacitors removed from equipment.
- 2、Confirm electrical characteristics such as rated capacitance and rated Voltage.
- 3、Confirm the capacitor characteristics under applied Voltage.
- 4、Confirm the mechanical stress under use conditions.

5、Confirm the solderability of capacitors stored for long periods.

6、Perform heat treatment on capacitors that have been stored for a long time before measuring capacitance.

◆应用限制 Application Restrictions

1、我们的产品旨在用于一般消费电子设备(例如家用电器、办公设备、信息和通信设备, AV 设备、OA 设备、包括但不限于手机和 PC 等), 产品的设计基于正常操作和使用条件下的通用应用和标准用途。

2、不推荐用于下列高可靠性应用场景, 包括但不限于: 航天设备、医疗设备、航空设备、原子能设备、灾难预防设备、犯罪预防设备、电加热设备、燃烧设备、公共信息网络设备、数据处理设备、军事设备、发电控制设备、安全设备、车载设备、交通信号设备、运输设备和海底设备。

3、除非您事先获得风华的书面同意, 否则风华不对您或第三方因将我们的产品用于第 2 点设备而产生的任何损害承担任何责任。

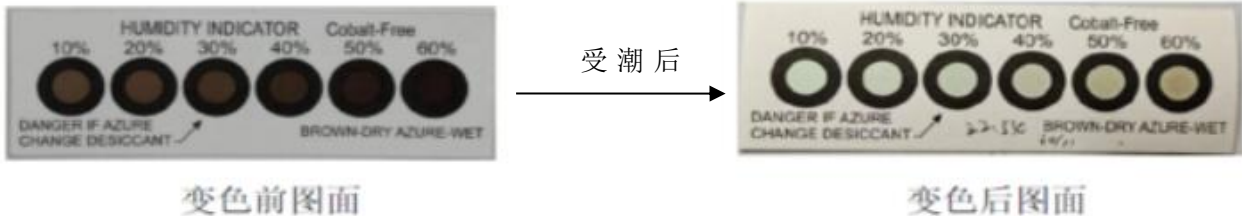
1、Our products are intended for use in general consumer electronic devices (such as household appliances, office equipment, information and communication devices, AV equipment, OA equipment, including but not limited to mobile phones and PCs), based on general applications and standard uses under normal operating and usage conditions.

2、Our products are not recommended for the following high-reliability application scenarios, including but not limited to: aerospace equipment, medical devices, aviation equipment, atomic energy equipment, disaster prevention equipment, crime prevention equipment, electric heating equipment, combustion equipment, public information network devices, data processing equipment, military equipment, power generation control equipment, safety equipment, vehicle-mounted devices, traffic signal equipment, transportation equipment, and underwater equipment.

3、Unless you have prior written consent from Fenghua, Fenghua is not liable for any damages caused to you or third parties by using our products in the devices mentioned in point 2.

* 每卷产品单独使用铝箔袋进行充氮气封口, 袋中同时附有防潮珠以及三级潮敏等级卡; 在拆袋后使用前注意检查潮敏等级卡是否已变色, 如已变色可能存在受潮氧化情况会影响产品使用, 请及时沟通我们。

Each roll of products is sealed by filling nitrogen in an aluminum foil bag, and moisture-proof beads and a three-level moisture-sensitive grade card are attached to the bag; Pay attention to check whether the moisture-sensitive grade card has changed color after unpacking and before use. If it has changed color, there may be moisture oxidation, which will affect the use of the product. Please contact us in time.



* 拆袋使用后的剩余产品, 建议使用氮气进行密封保存并尽快使用完。

It is recommended to use nitrogen to seal the remaining products after unpacking and use them as soon as possible.

* 备注: 产品规格书仅供设计选型参考用, 不作为交货依据。

Note: The product specification is for reference only in design and selection, and not as the basis for delivery.

2. In the product specification, deliverable high-Voltage models with the same specifications, capacity, and temperature characteristics can fully cover the low-Voltage models. For products with the same specifications, capacity, and Voltage, X7R temperature characteristic products can cover X7S, X7T, X6S, and X5R (e.g., OP02B104K250NT can cover OP02BS104K250NT, OP02BT104K250NT, OP02DS104K250NT, OP02X104K250NT). Therefore, detailed model specifications will not be listed separately in the specification.