承认书
SPECIFICATION FOR APPROVAL

客户名称： CUSTOMER：	
产品名称： PARTNAME：	多层片式瓷介电容器 Multi-Layer Ceramic Capacitors
产品规格： SPECIFICATION：	TCC0402X5R106N6R3ATR TCC0402X5R106N6R3ATR
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客户 CUSTOMER		
批准 APPROVED	审核 CHECKED	经办 PREPARED

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MLCC事业部
品管课

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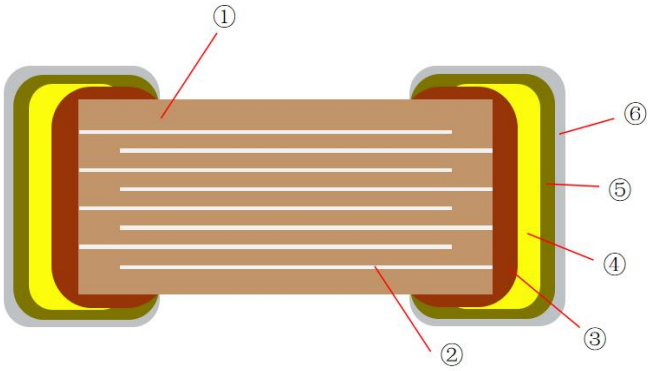
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1. 电容器及介质分类 Types of Capacitor and Dielectric Material

※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，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。

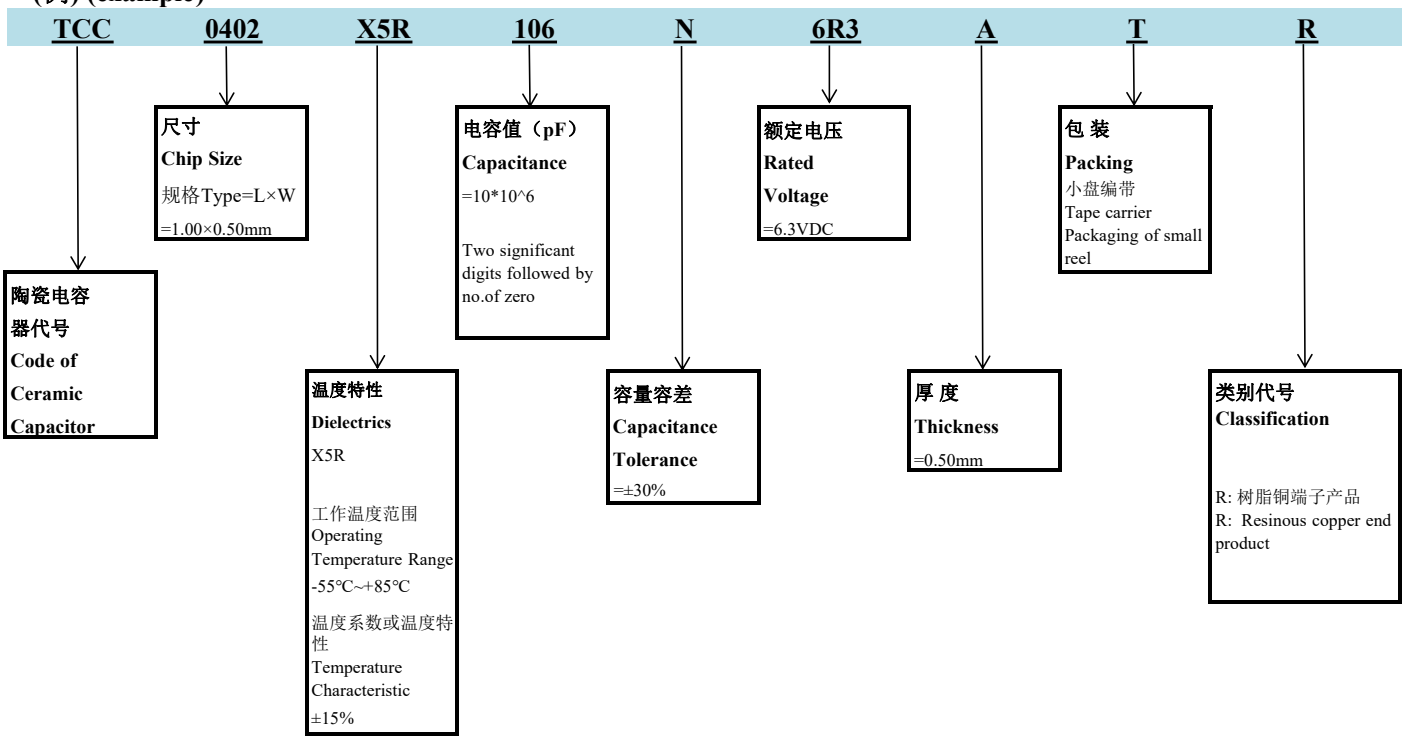
※X5R：The material is a kind of material has high dielectric constant. The capacitor made of this kind material is considered as Class II capacitor whose capacitance is higher than that of class I. These capacitors are classified as having a semi-stable temperature characteristic and used over a wide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

2．产品结构 Product Frame



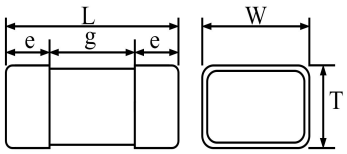
序号 No.	名称 Name
1	陶瓷介质 Ceramic dielectric
2	内电极 Inner electrode
3	外电极 Outer electrode
4	树脂铜浆 Resinous copper paste
5	镍层 Nickel
6	锡层 Tin

3．产品规格型号命名规则
General Product Parts Numbering System
(例) (example)



4. 产品尺寸 Dimensions

规格： 0402
Chip Size： 0402



规格	L	W	e	g min	T
Type	(mm)	(mm)	(mm)	(mm)	(mm)
0402	1.00-0.05/+0.25	0.50-0.05/+0.25	0.15~0.3	0.40	0.50-0.05/+0.25

5. 技术要求和测试条件 Specification and Testing Conditions

5.1 容量 Capacitance

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	在要求的容值容差范围内 Within the specified tolerance 7~13uF	1.0±0.2Vrms, 1KHz±10%
备注：测试温度：25℃±3℃，测试湿度：＜70%RH。针对二类介质规格需去老化处理，条件：电容器在150℃热处理1小时，放置24小时后进行测量。 参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.5.1 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.5.1		

5.2 损耗 Dissipation Factor

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	DF≤10%	1.0±0.2Vrms, 1KHz±10%
备注：测试温度：25℃±3℃，测试湿度：＜70%RH。针对二类介质规格需去老化处理，条件：电容器在150℃热处理1小时，放置24小时后进行测量。 参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.5.2 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.5.2		

5.3 绝缘电阻 Insulation Resistance

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	≥10MΩ	测试电压：6.3V 充电时间：60±5秒 充放电电流：≤50mA Test voltage: 6.3V Charge Time: 60±5sec Charge/discharge current: 50mA max.
备注：测试温度：25℃±3℃，测试湿度：＜70%RH。 参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.5.3 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.5.3		

5.4 尺寸 Dimensions

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	在要求的范围内 Within the specified dimensions	用千分尺 Using calipers on micrometer
参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.4 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.4		

5.5 耐电压 Voltage Proof

类型 Dielectrics	额定电压范围 Rated voltage range	耐电压性能测试方法 Measuring Method
X5R	Ur=6.3V	施加电压15.75VDC, 5秒, 最大电流不超过50mA Force 15.75VDC for 5second. Max.current should not exceed 50 mA
备注：测试温度：25℃±3℃，测试湿度：＜70%RH。 参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.5.4 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.5.4		

注意：耐电压测试的电压为瞬间电压 。
Attention: The Voltage Proof test uses transient voltage.

5.6 外观 Appearance

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	l≤1/8L, w≤1/8W, t≤1/8T （任意一项不符合，均判定不合格） (If any one is unacceptable, all judged unqualified)	目视检查 Visual inspection.
参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.4 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.4		

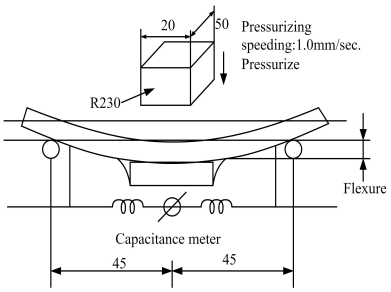
5.7 可焊性 Solderability

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	端电极挂锡面积不小于95%，针孔或粗糙面积小于5% 95% min-coverage of both terminal electrodes and less than 5% have pin holes or rough spots	锡炉温度：245±5℃ 浸入时间：2±1秒 两侧端电极完全浸入焊锡炉 Solder temperature: 245±5℃ Dipping time: 2±1 seconds Completely soak both terminal electrodes in solder
参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.10 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.10		

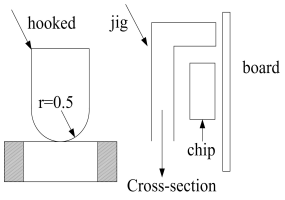
5.8 耐焊性 Resistance to leaching

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	端电极挂锡面积不小于95%，针孔或粗糙面积小于5%,外观无开裂 95% min. coverage of both terminal electrodes and less than 5% have pin holes or rough spots.No remarkable visual damage	预热：120℃~150℃/60秒 锡炉温度：270±5℃ 浸入时间： 10±1秒 两侧端电极完全浸入焊锡炉 Preheating: 120℃~150℃/60sec Solder temperature: 270±5℃ Dipping time: 10±1 seconds Completely soak both terminal electrodes in solder
参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.9 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.9		

5.9 端电极结合强度 Board Flex

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	外观无明显可见损伤 容量变化小于等于±10% No obvious damage on appearance Cp change within ±10%	将片状电容器安装在测试夹具上，按图所示方向以1.0mm/s的速率施加压力，弯曲1.0mm，保持5±1s。 Solder the capacitor on testing substrate and put it on testing stand.The middle part of substrate shall successively be pressurized by pressuring rod at a rate of about 1.0mm/sec. Until the deflection become means of the 1.0mm, and hold for 5±1s. 
备注：0402规格的测试板厚度为1.0mm 参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.8 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.8		

5.10 附着力 Terminal Strength

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	端电极无松动，也无其它不良现象 No removal of the terminations or other defect shall occur	施加6N的压力,并保持10±1秒 The pressurizing force shall be 6N and the duration of application shall be 10±1sec. 
参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.7 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.7		

5.11 耐焊接热 Resistance to Soldering Heat

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	外观无明显可见损伤 容量变化在±7.5%以内 DF满足产品初始值的要求 IR满足产品初始值的要求 No obvious damage on appearance Cp change within ±7.5% DF and IR meets initial standard value	焊接温度: 270±5℃ 预热: 120~150℃ ,60秒 浸入时间: 10±1秒 *高介电常数电容器（II类介质）： 实验前预处理，在150℃条件下热处理1小时，在室温下放置24±2hrs，然后测量； 实验后在室温下放置24±2hrs，然后测量。 Soldering temperature: 270±5℃ Preheating: 120~150℃ , 60sec Dipping time: 10±1 seconds *High dielectric constant capacitor (Class II): Pretreatment before experiment, heat treatment at 150℃ for 1hour, left at room temperature for 24±2hrs, then measure; Post-experimental treatment, left at room temperature for 24±2hrs, then measure.
参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.9 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.9		

5.12 静电容量温度特性 Temperature Characteristics of Capacitance

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	容量变化在±15%以内 Cp change within ±15%	按X5R系列温度顺序测试电容容量： Measure capacitance under follow table list temperature(℃): 在140~150℃预处理1小时，放置24小时后进行测量，测试电压≤1Vrms。 Heat at 140~150℃ for 1 hour ， Leave at room temperature for 24 hours and then measure,The test voltage is 1Vrms max.

步骤 Step	温度 Temp.(℃)
1	25±2
2	-55±3
3	25±2
4	85±3
5	25±2

X5R 与25℃（步骤3）时的电容容量相比较，电容容量在温度范围内的变化在要求的范围之内 。Compared with the capacitance capacity at 25 ℃(Step 3) ,the capacitance capacity changes within the temperature range within the required range.

参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.6
II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.6

5.13 温度快速循环 Temperature Cycling

<table>
<tr><th>类型
Dielectrics</th><th>技术要求
Specification</th><th>测试条件
Testing Condition</th></tr>
<tr><td rowspan="2">X5R</td><td rowspan="2">外观无明显可见损伤
容量变化在±7.5%以内

No obvious damage on appearance
Cp change within ±7.5%</td><td>按下列步骤进行5次循环：
To perform 5 cycles of the stated environment:
<table>
<tr><th>步骤 Step</th><th>温度 Temperature</th><th>时间 Time</th></tr>
<tr><td>1</td><td>下限类别温度+0/-3℃
Min.operating Temp.+0/-3℃</td><td>30min</td></tr>
<tr><td>2</td><td>25℃</td><td>1 min</td></tr>
<tr><td>3</td><td>上限类别温度+3/-0℃
Max.operating Temp.+3/-0℃</td><td>30 min</td></tr>
<tr><td>4</td><td>25℃</td><td>1min</td></tr>
</table></td></tr>
<tr><td>*高介电常数电容器（II类介质）：
实验前预处理，在150℃条件下热处理1小时，在室温下放置24±2小时，然后测量；
实验后处理，在150℃条件下热处理1小时，在室温下放置24±2小时，然后测量。

*High dielectric constant capacitor (Class II):
Pretreatment before experiment,heat treatment at 150℃ for 1hour, left at room temperature for 24±2hrs, then measure;
Post-experimental treatment,heat treatment at 150℃ for 1hour, left at room temperature for 24±2hrs, then measure.</td></tr>
<tr><td colspan="3">参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.11
II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.11</td></tr>
</table>

5.14 稳态湿热 Moisture Resistance

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	外观无明显可见损伤 容量变化在±12.5%以内 DF为初始标准的2倍以下 IR大于等于1MΩ No obvious damage on appearance Cp change within ±12.5% DF Not more than 2 times of initial standard IR ≥1MΩ	测试温度: 40±2℃ 湿度: 90~95% RH 测试时间: 500±12小时 *高介电常数电容器（II类介质）： 实验前预处理，在150℃条件下热处理1小时，在室温下放置24±2小时，然后测量； 实验后处理，在150℃条件下热处理1小时，在室温下放置24±2小时，然后测量。 Test temperature: 40±2℃ Humidity: 90~95% RH Testing time: 500 ±12hrs *High dielectric constant capacitor (Class II): Pretreatment before experiment,heat treatment at 150℃ for 1hour, left at room temperature for 24±2hrs, then measure; Post-experimental treatment,heat treatment at 150℃ for 1hour, left at room temperature for 24±2hrs, then measure.
参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.13 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.13		

5.15 耐湿负荷 Biased Humidity

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	外观无明显可见损伤 容量变化在±12.5%以内 DF为初始标准的2倍以下 IR大于等于0.5MΩ No obvious damage on appearance Cp change within ±12.5% DF Not more than 2 times of initial standard IR ≥0.5MΩ	测试温度: 40±2℃ 湿度: 90~95% RH 电压: 额定电压 测试时间: 500±12小时 充放电电流：≤50mA *高介电常数电容器（II类介质）： 实验前预处理，在150℃条件下热处理1小时，在室温下放置24±2小时，然后测量； 实验后处理，在150℃条件下热处理1小时，在室温下放置24±2小时，然后测量。 Test temperature: 40±2℃ Humidity: 90~95% RH Voltage: Rated voltage Testing time: 500 ±12hrs Charge/discharge current: 50mA max. *High dielectric constant capacitor (Class II): Pretreatment before experiment,heat treatment at 150℃ for 1hour, left at room temperature for 24±2hrs, then measure; Post-experimental treatment,heat treatment at 150℃ for 1hour, left at room temperature for 24±2hrs, then measure.
参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.18 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.18		

5.16 耐久性 Durability

类型 Dielectrics	技术要求 Specification	测试条件 Testing Condition
X5R	外观无明显可见损伤 容量变化在±12.5%以内 DF为初始标准的2倍以下 IR 大于等于0.5MΩ No obvious damage on appearance Cp change within ±12.5%. DF Not more than 2 times of initial standard. IR ≥0.5MΩ	测试温度：上限类别温度±3℃ 电压：1倍额定电压 测试时间: 1000小时 充放电电流：≤50mA *高介电常数电容器（II类介质）： 实验前预处理，在150℃条件下热处理1小时，在室温下放置24±2小时，然后测量； 实验后处理，在150℃条件下热处理1小时，在室温下放置24±2小时，然后测量。 Test temperature: Max. Operating Temp. ±3℃ Voltage: 100% of the rated voltage Testing time: 1000 hrs Charge/discharge current:50mA max. *High dielectric constant capacitor (Class II): Pretreatment before experiment,heat treatment at 150℃ for 1hour, left at room temperature for 24±2hrs, then measure; Post-experimental treatment,heat treatment at 150℃ for 1hour, left at room temperature for 24±2hrs, then measure.
参考标准 Reference standard: I类 Class I GB/T 21041-2007/IEC 60384-21: 2004 4.14 II类 Class II GB/T 21042-2007/IEC 60384-22: 2004 4.14		

6. 产品包装 Packing

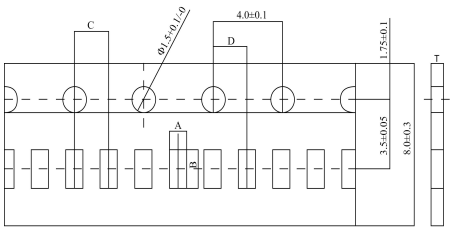
6.1 袋式散装 Bulk Packing

10000个/袋或按客户要求。Standard packing 10Kpcs/bag; others are according to customer request.

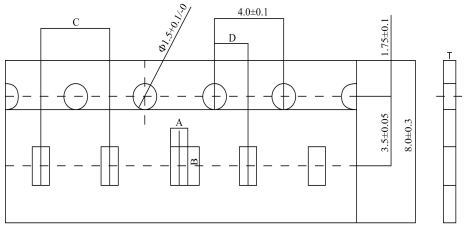
6.2 编带式包装 Tape Packing

规格	尺寸 Size (mm)			编带数量(个/盘 pcs/reel)	
Type	长度L	宽度W	厚度T	小盘纸带Small Paper Tape	小盘塑料带Small Plastic Tape
0402	1.00	0.50	0.50	10000	N/A

6.2.1 纸带尺寸 Dimensions of Packing Paper



C: 2.0±0.05mm间距



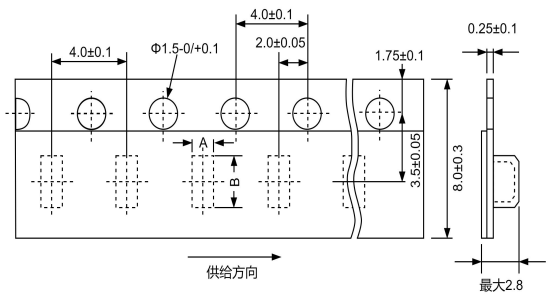
C: 4.0±0.10mm间距

Type	A	B	C	D	T
0105	0.23±0.03	0.43±0.03	2.00±0.05	2.00±0.05	0.50max
0201	0.40±0.09	0.70±0.09	2.00±0.05	2.00±0.05	0.60max
0402	0.65±0.15	1.20±0.15	2.00±0.05	2.00±0.05	0.80max
0603	1.05±0.15	1.90±0.15	4.00±0.10	2.00±0.10	1.10max
0805	1.55±0.15	2.30±0.15	4.00±0.10	2.00±0.10	1.10max
1206	2.00±0.04	3.50±0.04	4.00±0.10	2.00±0.10	1.10max

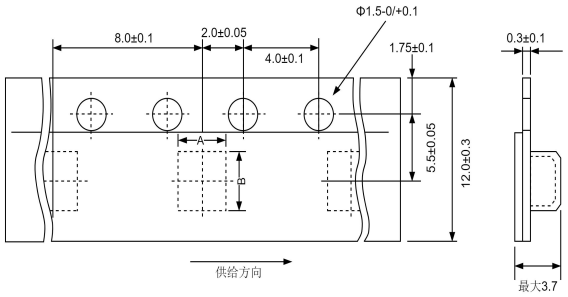
(单位unit:毫米mm)

6.2.2 塑料带尺寸 Dimensions of Embossed Packing

8mm宽，4mm间距编带



12mm宽，8mm间距编带

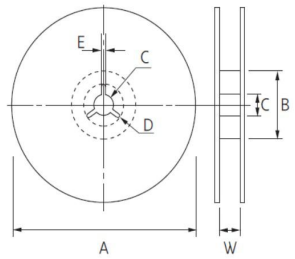


A：1.40±0.20 B：2.25±0.20 （0805）
A：1.90±0.20 B：3.50±0.20 （1206）
A：2.90±0.30 B：3.60±0.30 （1210）

A：3.60±0.20 B：5.00±0.20 （1812）
A：5.60±0.20 B：6.10±0.20 （2220）

(单位unit:毫米mm)

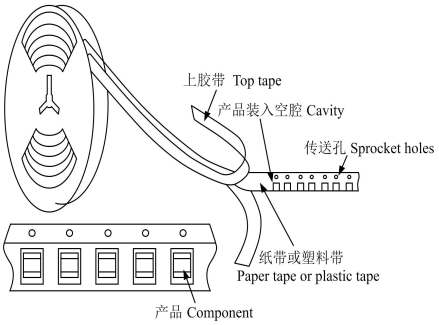
6.2.3 编带盘尺寸 Dimensions of Reel

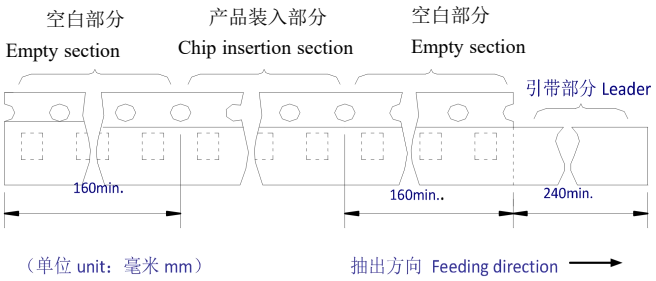


[unit:mm]

类型	载带宽度	A	B	C	D	E	W
7″盘	8mm	φ178±2.0	MINφ50	φ13±0.5	21±0.8	2.0±0.5	10±1.5
	12mm	φ178±2.0	MINφ50	φ13±0.5	21±0.8	2.0±0.5	13±0.5
13″盘	8mm	φ330±2.0	MINφ70	φ13±0.5	21±0.8	2.0±0.5	10±1.5
	12mm	φ330±2.0	MINφ70	φ13±0.5	21±0.8	2.0±0.5	13±0.5

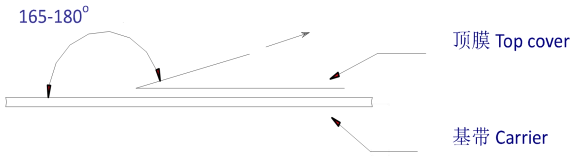
6.2.4 编带方式 Taping Figure



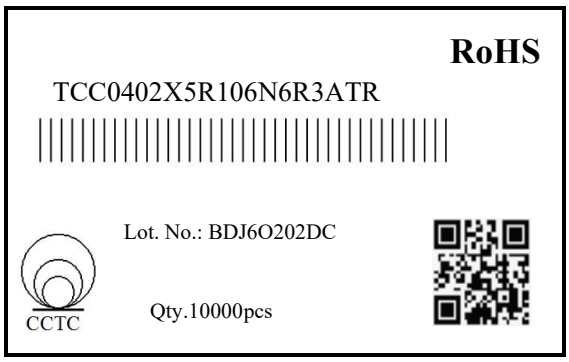


6.2.5 编带方法 Taping Method

① 包装电容器的编带是顺时针卷绕的，由上往下的方向拉出编带时，传送孔处于编带的右侧。
② 在编带的前端，至少留出5个间距的引出带。
③ 在编带时，必须按下图留出引带部分或空白部分。
④ 上胶带和下胶带不应超出编带的边缘，不能挡住传送孔。
⑤ 传送孔的累计误差为10个间距：±0.3毫米以内。
⑥ 上胶带的剥离力矩应在0.1至0.6牛顿以内，其方向如下图所示。
① Tapes for capacitors are wound clockwise. The sprocket holes are to the right as the tape is pulled toward the user.
② The top tape and base tape are not attached at the end of the tape for a minimum of 5 pitches.
③ Part of the leader and part of the empty tape shall be attached to the end of the tape as follows.
④ The top tape and bottom tape shall not protrude beyond the edges of the tape and shall not cover sprocket holes.
⑤ Cumulative tolerance of sprocket holes, 10 pitches: ±0.3mm.
⑥ Peeling off force: 0.1 to 0.6N in the direction shown down.



6.2.6 产品标签 Reel Label



(1) 标签内容 The Contents of Label

TCC	0402	X5R	106	N	6R3	A	T	R
①	②	③	④	⑤	⑥	⑦	⑧	⑨

①陶瓷电容器代号Code of Ceramic Capacitor, ②尺寸chip size, ③温度特性dielectrics, ④容量capacitance, ⑤容量容差tolerance, ⑥额定电压rated voltage, ⑦厚度thickness, ⑧包装packing,
⑨树脂铜端子产品 Resinous copper end product

(2) 产品批号Lot. No.: BDJ6O202DC
(3) 数量Qty: 3000pcs
(4) RoHS: GREEN PARTS 绿色物料
(5) CCTC: 潮州三环的简称（Simplified vendor name of ChaoZhou Three-circle）

6.2.7.外包装 Package

6.2.7.1 包装箱 Carton
6.2.7.1.1 包装箱尺寸 Carton Size

L	W	H
41.0±3cm	38.5±3cm	20.2±3cm

6.2.7.1.2 数量 Quantity

600Kpcs /箱 The Quantity:600Kpcs /one carton
1 内包装盒=100000PCS 1 INNER BOX=100000PCS
1 包装箱 =100000PCS × 6 内包装盒=600KPCS
1 CARTON=100000PCS × 6 INNER BOX=600KPCS
RoHS标识(根据客户要求张贴) according to customer request

6.2.7.2 内包装盒 Inner Box
6.2.7.2.1 包装盒尺寸 Size

L	W	H
18.0±1cm	11.8±1cm	18.5±1cm

6.2.7.2.2 数量 Quantity

100000pcs /盒
1盘=10000PCS 1 REEL=10000PCS
1内包装盒=10000PCS × 10盘 =100000PCS
1 INNER BOX=10000PCS × 10 REEL =100000PCS

7.MLCC使用注意事项 Precautions on the use of MLCC

7.1 电路板设计 PCB Design

7.1.1电路板图案设计 Design of Land-patterns

下面图和表格给出了部分推荐的设计图案，可以防止安装时焊锡量过多；同时也给出了不正确的图案。

The following diagrams and tables show some examples recommended patterns to prevent excessive solder amounts; Examples of improper pattern designs are also shown.

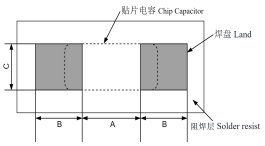
电路板设计推荐图案尺寸：

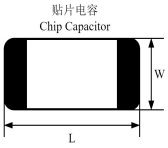
Recommended land dimensions for a typical chip capacitor land patterns for PCBs:

波峰焊接时推荐设计的尺寸 (单位: mm)：

Recommended land dimensions for Wave soldering (unit: mm):

规格 SIZE		0603	0805	1206
尺寸	L	1.6	2	3.2
	W	0.8	1.25	1.6
A		0.6 ~ 1.0	1.0~1.4	2.2 ~ 2.6
B		1.0 ~ 1.2	0.9 ~ 1.0	1.0 ~ 1.1
C		0.6 ~ 0.8	0.8 ~ 1.1	1.0 ~ 1.4





回流焊接时推荐设计的尺寸 (单位: mm)

Recommended land dimensions for Reflow soldering (unit: mm)

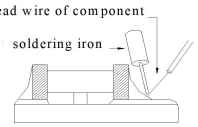
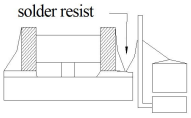
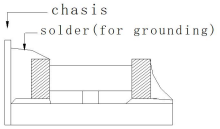
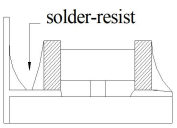
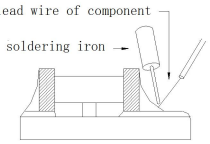
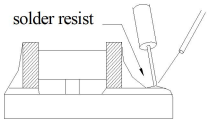
规格 SIZE		0402
尺寸（mm）	L	1
	W	0.5
A		0.4 ~ 0.6
B		0.4 ~ 0.5
C		0.5 ~ 0.7

过量的焊锡会影响产品抵抗机械应力的能力，因此在设计图案时应引起注意。

Excess solder can affect the ability of chips to withstand mechanical stresses. Therefore, please take proper precautions when designing land patterns.

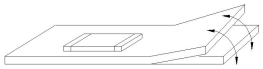
在应用中一些焊接好与坏的情况：

Examples of good and bad solder application.

项目 Item	不推荐结构 Not recommended	推荐结构 Recommended
片状元件和带引线的元件的混合焊接 Mixed mounting of SMD and leaded component		
靠近底座的焊接 Component placement close to the chassis		
在片状元件附近带引线元件的焊接 Hand-soldering of leaded components near mounted components		

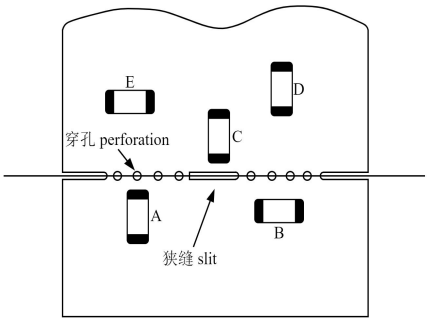
7.1.2 图案结构 Pattern configurations

下面是电容器安装好与坏的例子。选择贴装位置，应尽可能减小电路板在弯曲时受到的机械应力。
The following are examples of good and bad capacitor layout, SMD capacitors should be located to minimize any possible mechanical stresses from board warp or deflection.

项目 Item	不推荐结构 Not recommended	推荐结构 Recommended
电路板弯曲 Deflection of the board		

对于电路板分拨的电容器，在分拨时受到的机械应力大小与电容器的安装有关。下面推荐了一些好的设计。

To layout the capacitors for the breakaway PC board, it should be noted that the amount of mechanical stresses imposed depending on capacitor layout. The example below shows recommendations for better design.



应力大小顺序为：A > B = C > D > E
magnitude of stress: A > B=C > D > E

在沿着分拨线分拨电路板时，对产品施加的机械应力与使用的方法关系很大。分拨电路板时片状元件受到的疲劳按照如下顺序增大：分拨、剪切、V型槽、穿孔。因此，贴装时应该考虑电路板的分拨过程。

When breaking PC boards along their perforations, the amount of mechanical stress on the capacitors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: splitting, shearing, V-groove, and perforating. Thus, any ideal SMD capacitor layout must also consider the PCB splitting procedure.

7.2 自动贴装注意事项 Considerations for automatic placement

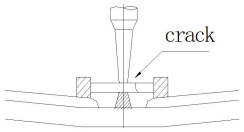
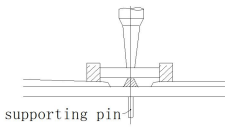
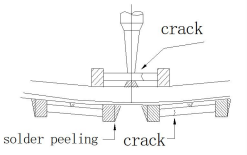
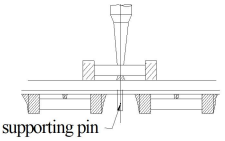
贴装机的调整 Adjustment of mounting machine

①.产品在电路板贴装时，不应该受到过大的冲击。

②.必须定期对吸头和定位爪进行检查、维修和更换。

①. Excessive impact load should not be imposed on the capacitors when mounting the PC boards.

②. The maintenance and inspection of the mounters should be conducted periodically.

项目 Item	不推荐结构 Not recommended	推荐结构 Recommended
单面贴装 Single-sided mounting		
双面贴装 Double-sided mounting		

7.3推荐焊接曲线 Recommended soldering profile

7.3.1 说明：

① 产品推荐使用回流焊接工艺；

② 大尺寸产品适用于回流焊接工艺。

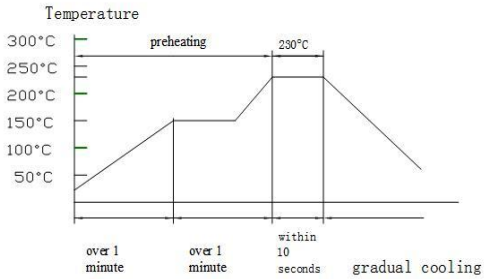
Re：

① Reflow soldering is recommended；

② Reflow soldering is suitable for bigger size MLCCs.

7.3.2 锡铅焊接曲线 Recommended Sn&Pb soldering profile

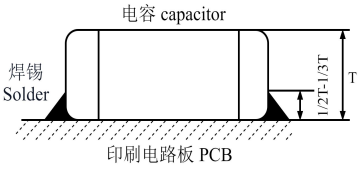
回流焊接 Reflow soldering



注意 Caution

①理想状况的焊锡高度为电容器厚度的 1/3 ~1/2，如下图所示：

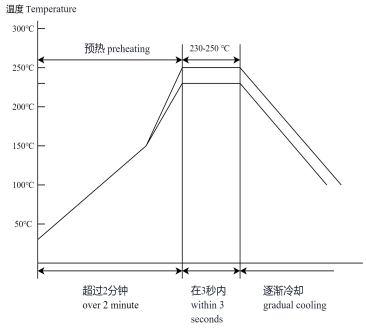
①The ideal condition is to have solder mass (fillet) controlled to 1/2 to 1/3of the thickness of the capacitor, as shown below:



②过长的焊接时间会影响端头的可焊性，焊接时间尽可能保持与推荐时间一致。

②Because excessive dwell times can detrimentally affect solderability, soldering duration should be kept as close to recommended times as possible.

波峰焊接 Wave soldering



注意Caution

①.确保电容器充分预热。

②.产品预热和焊接温度差不超过 150℃。

③.焊接后尽可能慢速冷却。

①.Make sure the capacitors are preheated sufficiently.

②.The temperature difference between product preheating and welding shall not exceed 150℃.

③.Cooling after soldering should be gradual as possible.

手工焊接 Hand soldering

条件 Condition：

预热 Preheat	烙铁头温度 Soldering tip temperature	烙铁功率 Soldering power	烙铁头直径 Diameter of soldering iron head	焊接时间 Welding time	锡膏量 Solder paste content	限制条件 Restriction condition
Δ≤130℃	最高350℃ Up to 350℃	最大20W Max. 20W	建议1mm Recommended 1mm	最长5s Up to 5s	≤1/2 芯片厚度 ≤1/2 chip thickness	请勿使用烙铁头直接接触陶瓷原件 Do not use the soldering tip to touch the ceramic element directly

注意 Caution

①.用尖端最大直径1.0mm功率20W的焊接烙铁。

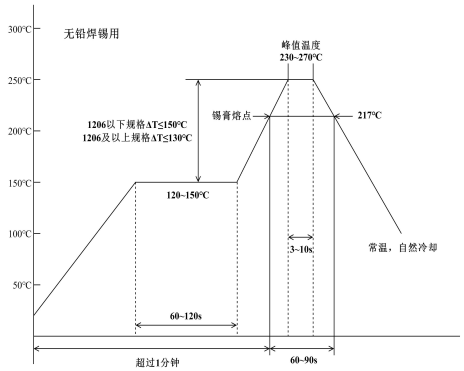
②.焊接烙铁不要直接接触产品 。

①.Use a 20w soldering iron with a maximum tip diameter of 1.0mm.

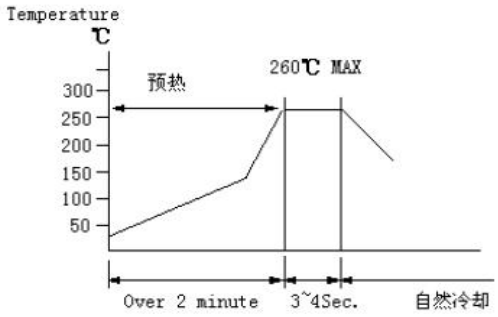
②.The soldering iron should not directly touch the capacitor.

7.3.3无铅焊接曲线 Recommended Pb-Free soldering profile

回流焊接 Reflow soldering



波峰焊接 Wave soldering



波峰焊/回流焊的容值范围 Capacitance range of Wave soldering and Reflow soldering：

焊接模式 Welding mode	0402及以下 0402 and below	0603	0805	1206	1210及以上 1210 and above
波峰焊 Wave soldering	/	105及以下容值 Capacitance of 105 and below	225及以下容值 Capacitance of 225 and below	475及以下容值 Capacitance of 475 and below	/
回流焊 Reflow soldering	所有规格 All Specifications	所有规格 All Specifications	所有规格 All Specifications	所有规格 All Specifications	所有规格 All Specifications

7.4 分拨电路板 Handling breakaway PC boards (splitting along perforations)

①.在电容器或其它贴装后，必须注意因电路板弯曲或变形带来的应力 。
②.分拨电路板时必须使用专用的夹具，不可以用手拨断。
①.When splitting the PC board after mounting capacitors and other components, care is required so as not to Subject the board to excessive bending or torsional stress.
②.Board separation should not be done manually, but by using the appropriate fixture.

7.5保存 Storage

①.在下列环境中保存产品：温度 5~40℃；湿度 ≤70% RH；
②.产品自生产之日保存期为一年，产品使用之前请勿拆开编带；
③.编带拆开后，产品应在三个月内使用；
④.高介电常数电容器 (X7R/X7S/X7T/X6S/X5R) 的容值随时间会逐渐减小，所以在电路设计时应充分考虑这一现象 。容值减小的电容器在150℃热处理1小时后容值会恢复到初试值 。
①. Keep the storage environment conditions as following: Temperature: 5~40℃； Humidity: ≤70% RH;
②. Don’t open the tape until the parts are to be used, and store them within one year since the date printed on the reel;
③. Use the chips within 3 months after the tape is opened;
④. The capacitance value of high dielectric constant capacitors (X7R/X7S/X7T/X6S/X5R) will gradually decrease with the passage of time, so this should be taken into consideration in the circuit design. If such a capacitance reduction occurs, a heat treatment of 150℃ for 1 hour will return the capacitance to its initial level.

7.6 环保申明 Environmental Declaration

①.我司所有MLCC产品均符合RoHS 2.0标准；
②.我司所有MLCC产品均符合最新的REACH法规要求；
③.我司所有MLCC产品均符合HF要求。
①.All MLCC products of our comply with RoHS 2.0;
②.All MLCC products of our comply with the latest REACH regulations;
③.All MLCC products of our comply meet HF requirements.

7.7 使用建议 Usage Recommendation

选型时建议使用温度降额 20℃ 以上，使用电压降额 30% 以上。
It is recommended to decrease the operating temperature by 20℃ or more and decrease the operating voltage by 30% or more.