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SINCE 1970
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ADD:Sanhuan Industrial District,Fengtang Chaozhou,Guangdong,China

# 承认书
# SPECIFICATION FOR APPROVAL

| | |
|---|---|
| 客户名称：<br>CUSTOMER： | |
| 产品名称：<br>PARTNAME： | 多层片式瓷介电容器<br>Multi-Layer Ceramic Capacitors |
| 产品规格：<br>SPECIFICATION： | TCC1206M3L333J101HT<br>TCC1206M3L333J101HT |
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| 批准<br>APPROVED | 审核<br>CHECKED | 经办<br>PREPARED |
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MLCC事业部
品管课

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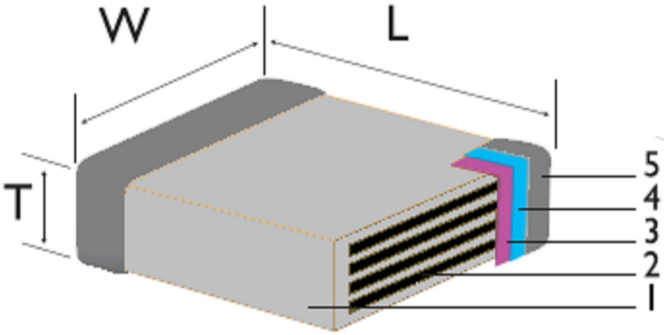
## 1. 电容器及介质分类 Types of Capacitor and Dielectric Material

※M3L：此类型的电容器为低失真型电容器，此类产品电性能较稳定，几乎不随电压和时间变化，容量随温度变化率为-500ppm/℃~ -1500ppm/℃,适用于损耗低、要求较高的电路中。

※M3L: The capacitor of this kind dielectric material is considered as low distorted capacitor.The electrical properties of M3L capacitor are stably and have little change with voltage and time. The coeficience of temperature is -500ppm/℃~ -1500ppm/℃, They are suited for applications where low-losses and high-stability are required.

## 2．产品结构 Product Frame

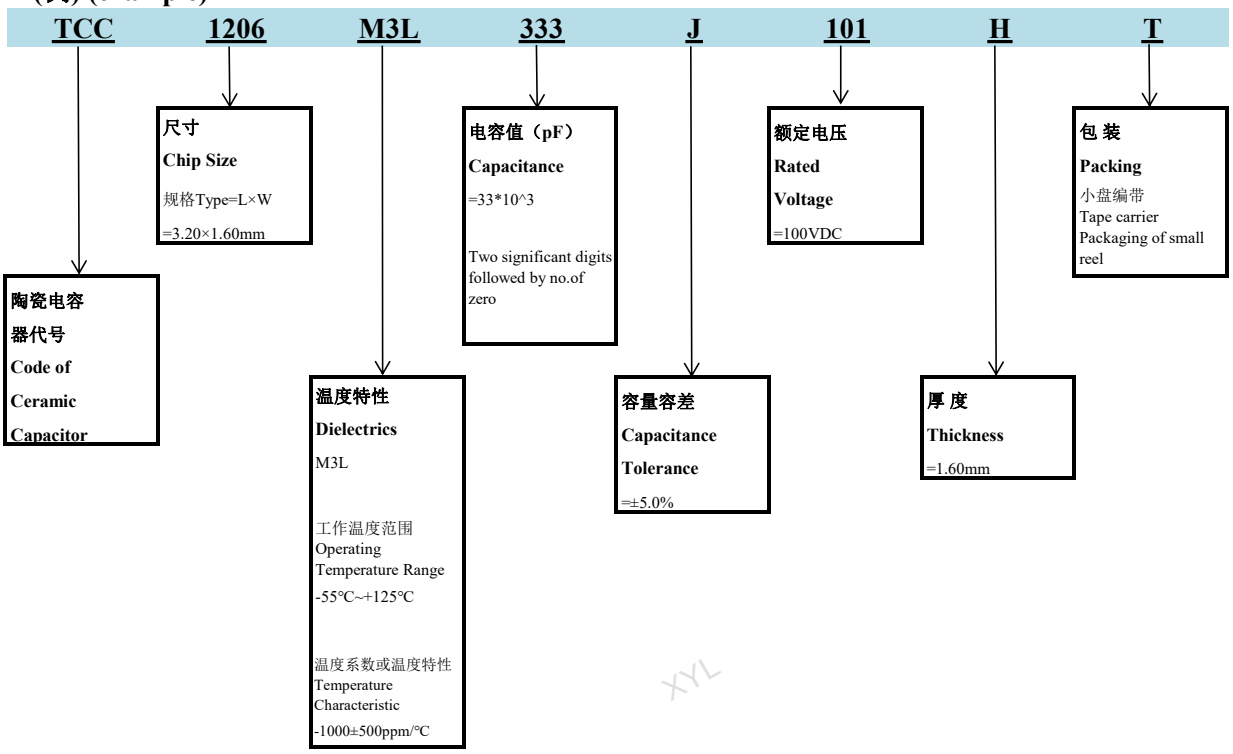



| 序号 No. | 名称 Name |
|---|---|
| 1 | 陶瓷介质<br>Ceramic dielectric |
| 2 | 内电极<br>Inner electrode |
| 3 | 外电极<br>Outer electrode |
| 4 | 镍层<br>Nickel |
| 5 | 锡层<br>Tin |

## 3．产品规格型号命名规则

**General Product Parts Numbering System**

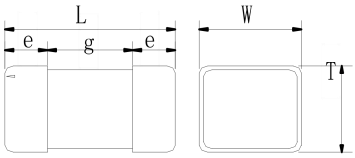
**(例) (example)**




注意：选型时建议使用温度降额 20℃以上，使用电压降额 30%以上；具体可使用的应用场景，请联系原厂FAE或授权代理工程师交流。
Attention: It is recommended to decrease the operating temperature by 20℃ or more and decrease the operating voltage by 30% or more; For specific application scenarios, please contact the original factory FAE or authorized agent engineer for discussion.

## 4. 产品尺寸 Dimensions

规格： 1206
Chip Size： 1206




| 规格 | L | W | e | g min | T |
|---|---|---|---|---|---|
| Type | (mm) | (mm) | (mm) | (mm) | (mm) |
| 1206 | 3.20±0.20 | 1.60±0.20 | 0.3~0.8 | 1.60 | 1.60±0.20 |

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

### 5.1 容量 Capacitance

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | 在要求的容值容差范围内<br>Within the specified tolerance<br>31.35~34.65nF | 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48小时后进行测量。<br>参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.5.1<br>II类 Class II GB-T 21042-2007 4.5.1 | | |

### 5.2 损耗 Dissipation Factor

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | DF≤0.1% | 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48小时后进行测量。<br>参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.5.2<br>II类 Class II GB-T 21042-2007 4.5.2 | | |

### 5.3 绝缘电阻 Insulation Resistance

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | ≥3.03GΩ | 测试电压：100V；<br>充电时间：60±5秒；<br>充放电电流：≤50mA；<br><br>Test voltage: 100V;<br>Charge Time: 60±5sec;<br>Charge/discharge current: 50mA max |
| 备注：测试温度：25℃±3℃，测试湿度：＜70%RH.<br>参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.5.3<br>II类 Class II GB-T 21042-2007 4.5.3 | | |

### 5.4 尺寸 Dimensions

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | 在要求的范围内<br>Within the specified dimensions | 用千分尺<br>Using calipers on micrometer |
| 参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.4<br>II类 Class II GB-T 21042-2007 4.4 | | |

### 5.5 耐电压 Voltage Proof

| 类型<br>Dielectrics | 额定电压范围<br>Rated voltage range | 耐电压性能测试方法<br>Measuring Method |
|---|---|---|
| M3L | Ur=100V | 施加电压200VDC,5秒,最大电流不超过50mA；<br>Force 200VDC for 5second. Max.current should not exceed 50 mA. |
| 备注：测试温度：25℃±3℃，测试湿度：＜70%RH.<br>参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.5.4<br>II类 Class II GB-T 21042-2007 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<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | l≤1/8L,w≤1/8W,t≤1/8T<br>（任意一项不符合，均判定不合格）<br>(If any one is unacceptable, all judged unqualified) | 目视检查<br>Visual inspection. |
| 参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.4<br>II类 Class II GB-T 21042-2007 4.4 | | |

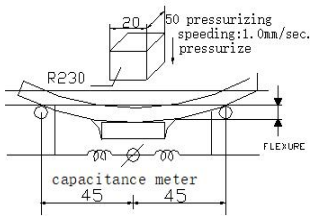
### 5.7 可焊性 Solderability

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | 端电极挂锡面积不小于95%，针孔或粗糙面积小于5%。<br><br>95% min-coverage of both terminal electrodes and less than 5% have pin holes or rough spots. | 锡炉温度：245±5℃<br>浸入时间：2±1秒<br>两侧端电极完全浸入焊锡炉<br><br>Solder temperature: 245±5℃<br>Dipping time:2±1 seconds.<br>Completely soak both terminal electrodes in solder. |
| 参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.10<br>II类 Class II GB-T 21042-2007 4.10 | | |

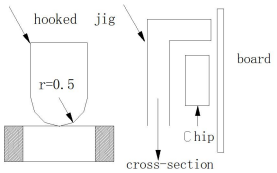
### 5.8 耐焊性 Resistance to leaching

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | 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。<br><br>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<br>锡炉温度：270±5℃<br>浸入时间： 10±1秒<br>两侧端电极完全浸入焊锡炉<br><br>Preheating: 120℃~150℃/60sec<br>Solder temperature: 270±5℃<br>Dipping time: 10±1 seconds.<br>Completely soak both terminal electrodes in solder. |
| 参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.9<br>II类 Class II GB-T 21042-2007 4.9 | | |

**5.9 端电极结合强度 Board Flex**

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | 无可见损伤；<br>容量变化小于等于±5%<br><br>No remarkable visual damage;<br>Cp change ≤ ±5%. | 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。<br><br>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.<br>  |
| 备注：1206规格的测试板厚度为1.6mm | | |
| | | 参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.8<br>II类 Class II GB-T 21042-2007 4.8 |

**5.10 附着力 Terminal Strength**

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | 端电极无松动，也无其它不良现象。<br>No removal of the terminations or other defect shall occur. | 施加6N的压力,并保持10±1秒<br><br>The pressurizing force shall be 6N and the duration of application shall be 10±1sec.<br>  |
| | | 参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.7<br>II类 Class II GB-T 21042-2007 4.7 |

### 5.11 耐焊接热 Resistance to Soldering Heat

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | 无明显可见损伤,<br>容量变化在±2.5%以内,<br>DF满足产品初始值的要求,<br>IR满足产品初始值的要求<br><br>No remarkable visual damage,<br>Cp change within ±2.5%<br>DF and IR meets initial standard value. | 焊接温度: 270±5°C<br>预热: 120~150°C ,60秒<br>浸入时间: 10±1秒<br>在室温下放置24±2 小时以后测量<br>试验后在标准条件下恢复<br><br>*高介电常数电容器的初始值测量<br>在140~150°C进行1小时的热处理后在室温下放置48±4小时，测量初始值<br><br>Soldering temperature: 270±5°C<br>Preheating: 120~150°C ,60sec.<br>Dipping time: 10±1 seconds.<br><br>Measurement to be made after being kept at room temperature for 24±2hours.Recovery for the following period under the standard condition after test.<br>*Initial measurement for high dielectric constant type Perform a heat treatment at 140~150°C for 1hr and let sit for 48±4hrs at room temperature. Perform the initial measurement. |
| | | 参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.9<br>II类 Class II GB-T 21042-2007 4.9 |

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

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | 容量变化在-500ppm/°C~ -1500ppm/°C以内<br>Temperature coefficient within -500ppm/°C~ -1500ppm/°C | 按M3L系列温度顺序测试电容容量：<br>Measure capacitance under follow table list temperature(°C):<br>在140~150°C预处理1小时，放置24小时后进行测量，测试电压≤1Vrms。<br>Heat at 140~150°C for 1 hour，Leave at room temperature for 24 hours and then measure,The text voltage is 1Vrms max. |
| | | 步骤 Step / 温度 Temp.(°C)<br>1 / 25±2<br>2 / -55±3<br>3 / 25±2<br>4 / 125±3<br>5 / 25±2 |
| | | M3L 温漂计算方法为:温度系数的计算以第3步骤测量电容容量为参考。The capacitance drift is calculate：The temperature coefficient is determined using the Capacitance measured in step 3 as a reference. |
| | | 参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.6<br>II类 Class II GB-T 21042-2007 4.6 |

**5.13 温度快速循环 Temperature Cycling**

<table>
<tr><th>类型<br>Dielectrics</th><th>技术要求<br>Specification</th><th>测试条件<br>Testing Condition</th></tr>
<tr><td rowspan="2">M3L</td><td rowspan="2">无明显可见损伤，<br>容量变化在±2.5%以内。<br><br>No remarkable visual damage.<br>Cp change within ±2.5%.</td><td>按下列步骤进行5次循环：<br>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°C<br>Min.operating<br>Temp.+0/-3°C</td><td>30min</td></tr>
<tr><td>2</td><td>25°C</td><td>1 min</td></tr>
<tr><td>3</td><td>上限类别温度+3/-0°C<br>Max.operating<br>Temp.+3/-0°C</td><td>30 min</td></tr>
<tr><td>4</td><td>25°C</td><td>1min</td></tr>
</table></td></tr>
<tr><td>在室温下放置24±2小时以后测量。<br><br>*高介电常数电容器的初始值测量<br>在140~150°C进行1小时的热处理后在室温下放置48±4小时，测量初始值<br><br>Measurement to be made after being kept at room temperature for 24±2hrs at room temperature, then measure.<br>*Initial measurement for high dielectric constant type<br>Perform a heat treatment at 140~150°C for 1hr and let sit for 48±4hrs at room temperature. Perform the initial measurement.</td></tr>
<tr><td colspan="3">参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.11<br>II类 Class II GB-T 21042-2007 4.11</td></tr>
</table>

**5.14 稳态湿热 Moisture Resistance**

<table>
<tr><th>类型<br>Dielectrics</th><th>技术要求<br>Specification</th><th>测试条件<br>Testing Condition</th></tr>
<tr><td>M3L</td><td>外观无明显可见损伤，<br>容量变化在±5%以内<br>DF≤0.29%<br>IR: 大于等于303.03MΩ<br><br>No remarkable visual damage,<br>Cp change within ±5%.<br>DF≤0.29%<br>IR≥303.03MΩ</td><td>测试温度: 40±2°C<br>湿度: 90~95% RH<br>测试时间: 500±12小时<br>在室温下放置24±2小时以后测量<br><br>*高介电常数电容器的初始值测量<br>在140~150°C进行1小时的热处理后在室温下放置48±4小时，测量初始值<br><br>Test temperature: 40±2°C<br>Humidity: 90~95% RH<br>Testing time: 500 ±12hrs<br>Measurement to be made after being kept at room temperature for 24±2hrs.<br>*Initial measurement for high dielectric constant type<br>Perform a heat treatment at 140~150°C for 1hr and let sit for 48±4hrs at room temperature. Perform the initial measurement.</td></tr>
<tr><td colspan="3">参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.13<br>II类 Class II GB-T 21042-2007 4.13</td></tr>
</table>

**5.15 耐湿负荷 Biased Humidity**

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | 外观无明显可见损伤,<br>容量变化在±7.5%以内；<br>DF≤0.50%<br>IR: 大于等于151.52MΩ<br><br>No remarkable visual damage,<br>Cp change≤±7.5%<br>DF≤0.50%<br>IR≥151.52MΩ | 测试温度: 40±2℃<br>湿度: 90~95% RH<br>电压: 额定电压<br>测试时间: 500±12小时<br>充放电电流：≤50mA<br><br>实验前：焊接后，测量初始值；<br>实验后：在室温下放置 24±2小时，然后测量。<br><br>Test temperature: 40±2℃<br>Humidity: 90~95% RH<br>Voltage: Rated voltage<br>Testing time: 500 ±12hrs<br>Charge/discharge current: 50mA max<br><br>Before experiment, measure the initial value after soldering;<br>Post-experimental treatment, left at room temperature for 24±2hrs, then measure. |

备注：该项可靠性试验由于机台施加电压极限为600V，仅适用于中低压产品（＜630V），不适用于高压产品（≥630V）。

Remarks: This reliability test is limited by the maximum voltage that can be applied by the test equipment, which is 600V. Therefore, this test is only applicable to medium and low voltage products (＜630V) and is not suitable for high voltage products (≥630V).

参考标准 Reference standard:I类 Class I GB-T 21041-2007 4.18
II类 Class II GB-T 21042-2007 4.18

**5.16 耐久性 Durability**

| 类型<br>Dielectrics | 技术要求<br>Specification | 测试条件<br>Testing Condition |
|---|---|---|
| M3L | 外观无明显可见损伤<br>容量变化在±12.5%以内<br>DF: ≤0.2%<br>IR: 大于等于151.52MΩ<br><br>No remarkable visual damage.<br>Cp change ≤±12.5%.<br>DF: ≤0.2%.<br>IR: ≥151.52MΩ | 测试温度：上限类别温度±3℃<br>电压：1倍额定电压<br>充放电电流：≤50mA<br>测试时间: 1000小时<br><br>实验前：焊接后，测量初始值；<br>实验后：在室温下放置 24±2小时，然后测量。<br><br>Test temperature:<br>Max. Operating Temp. ±3℃<br>Voltage:<br>100% of the rated voltage<br><br>Charge/discharge current:50mA max<br>Testing time: 1000 hrs<br><br>Before experiment, measure the initial value after soldering;<br>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 4.14<br>II类 Class II GB-T 21042-2007 4.14 |

## 6. 产品包装 Packing

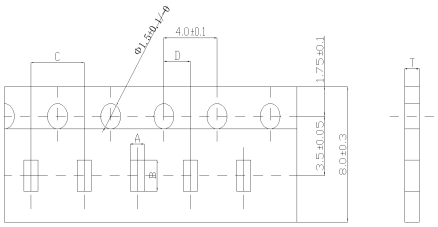
### 6.1 袋式散装 Bulk Packing

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 |
| 1206 | 3.20 | 1.60 | 1.60 | N/A | 2000 |

#### 6.2.1 纸带尺寸 Dimensions of Packing Paper

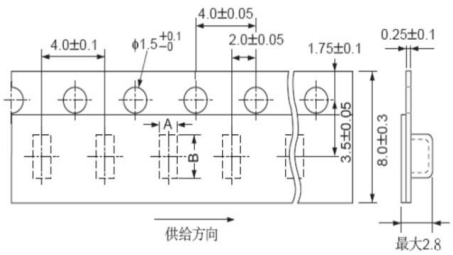



| Type | A | B | C | D | T |
|---|---|---|---|---|---|
| 0105 | 0.23±0.03 | 0.43±0.03 | 2.00±0.10 | 2.00±0.05 | 0.50max |
| 0201 | 0.40±0.09 | 0.70±0.09 | 2.00±0.10 | 2.00±0.05 | 0.60max |
| 0402 | 0.65±0.15 | 1.20±0.15 | 2.00±0.10 | 2.00±0.05 | 0.80max |
| 0603 | 1.05±0.15 | 1.90±0.15 | 4.00±0.10 | 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 |

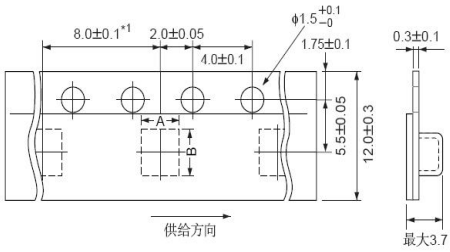
(单位unit:毫米mm)

#### 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

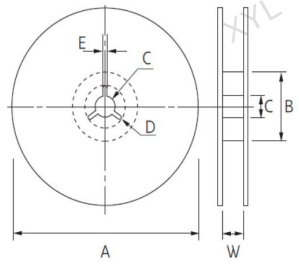



A：1.40±0.20 B：2.25±0.20（0805）
A：1.90±0.20 B：3.50±0.20（1206）
A：2.90±0.30 B：3.60±0.30（1210）

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)

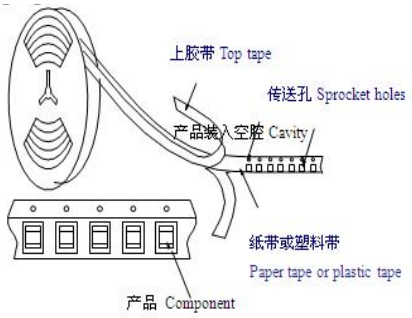
**6.2.3 编带盘尺寸 Dimensions of Reel**

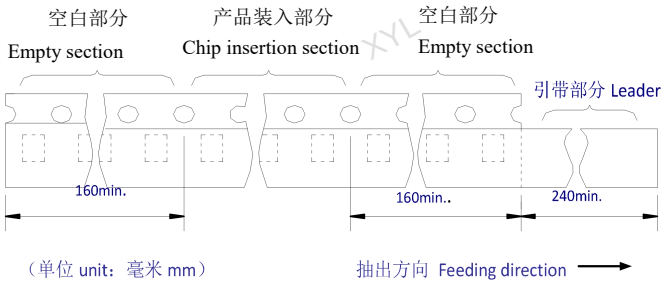



[unit:mm]

| 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 |

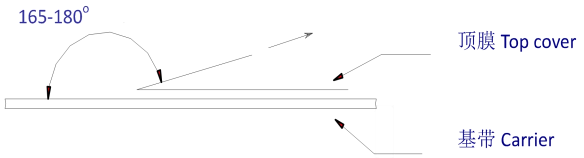
**6.2.4 编带方式 Taping Figure**



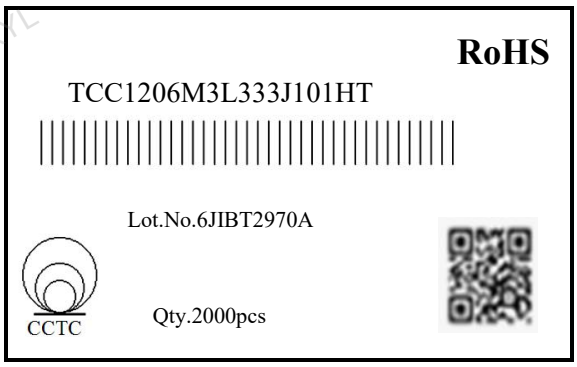




**6.2.5 编带方法 Taping Method**

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 | 1206 | M3L | 333 | J | 101 | H | T |
|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ |

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

(2) 产品批号Lot. No.: 6JIBT2970A
(3) 数量Qty: 2000pcs
(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

120Kpcs /箱 The Quantity:120Kpcs /one carton
1 内包装盒=20000PCS 1 INNER BOX=20000PCS
1 包装箱 =20000PCS × 6包装盒=120KPCS
1 CARTON=20000PCS × 6BOX=120KPCS
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 | 18.5±1cm | 11.8±1cm |

6.2.7.2.2 数量 Quantity

20000pcs /盒
1盘=2000PCS 1 REEL=2000PCS
1包装盒=2000PCS × 10盘 =20000PCS
1 INNER BOX=2000PCS × 10REEL =20000PCS

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

### 7.1 电路板设计 PCB Design

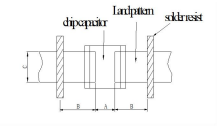
7.1.1电路板图案设计 Design of Land-patterns

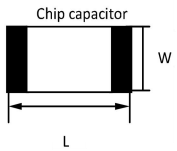
下面图和表格给出了部分推荐的设计图案，可以防止安装时焊锡量过多；同时也给出了不正确的图案。
The following diagrams and tables show some examples recommended patterns to prevent excessive solder amounts; Examples of improper pattern designs are also shown.

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 | | 0.8~1.0 | 1.0~1.4 | 1.8~2.5 |
| B | | 0.5~0.8 | 0.8~1.5 | 0.8~1.7 |
| C | | 0.6~0.8 | 0.9~1.2 | 1.2~1.6 |



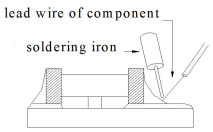
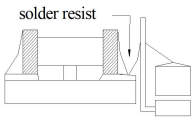
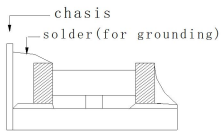
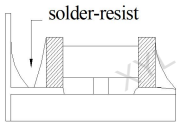
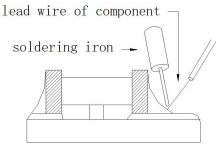
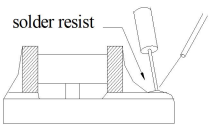




再流焊接时推荐设计的尺寸 (单位: mm)
Recommended land dimensions for reflow-soldering (unit: mm)

| 规格 SIZE | | 1206 |
|---|---|---|
| 尺寸（mm） | L | 3.2 |
| | W | 1.6 |
| A | | 1.8~2.5 |
| B | | 1.0~1.5 |
| C | | 1.2~2.0 |

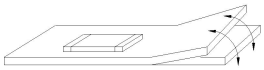
过量的焊锡会影响产品抵抗机械应力的能力，因此在设计图案时应引起注意。
Excess solder can affect the ability of chips to withstand mechanical stresses. Therefore, please take proper precautions when designing land-patterns.

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<br>Mixed mounting of SMD and leaded component |  |  |
| 靠近底座的焊接<br>Component placement close to the chassis |  |  |
| 在片状元件附近带引线元件的焊接<br>Hand-soldering of leaded components near mounted components |  |  |

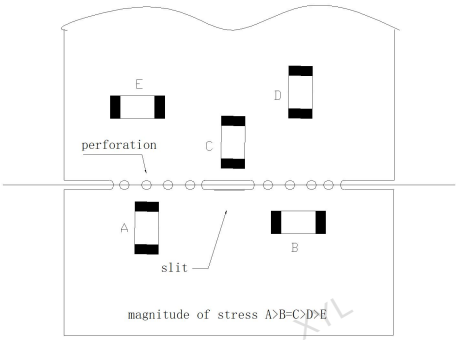
7.1.2 图案结构 Pattern configurations

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.




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。分折电路板时片状元件受到的疲劳按照如下顺序增大：分折、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

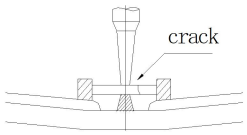
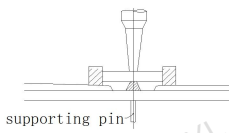
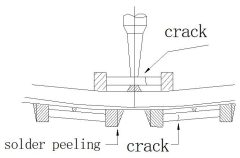
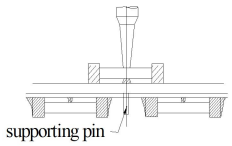
贴装机的调整 Adjustment of mounting machine

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。

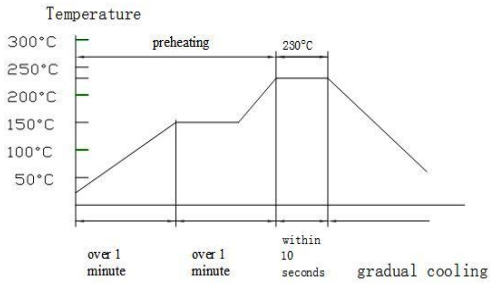
Re：

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

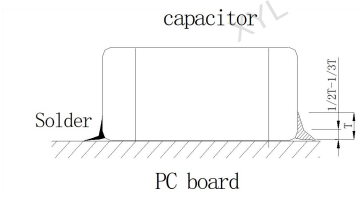
**回流焊接 Reflow soldering**




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：

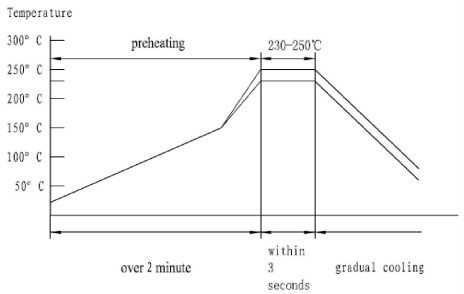
①The ideal condition is to have solder mass (fillet) controlled to 1/2 to 1/3of the thickness of the capacitor, as shown below:




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 solder profile**




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:

| 预热 | 烙铁头温度 | 烙铁功率 | 烙铁头直径 | 焊接时间 | 锡膏量 | 限制条件 |
|---|---|---|---|---|---|---|
| △≤130℃ | 最高350℃ | 最大20W | 建议1mm | 最长5s | ≤1/2芯片厚度 | 请勿使用烙铁头直接接触陶瓷原件 |

注意 Caution

①.用尖端最大直径1.0mm功率20W的焊接烙铁。

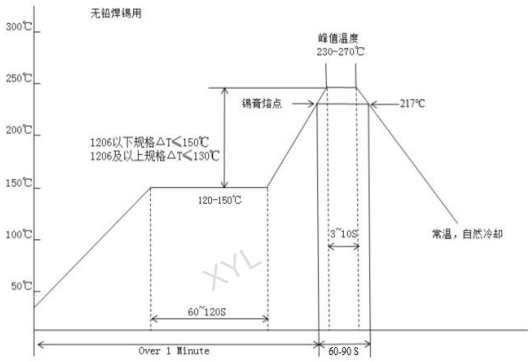
②.焊接烙铁不要直接接触产品。

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

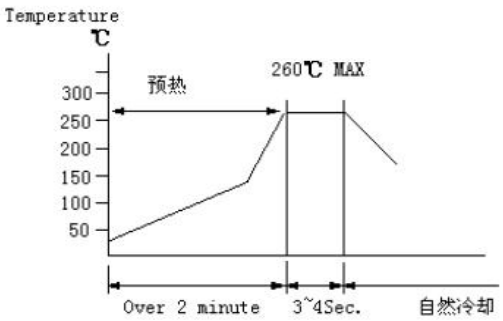
②.The soldering iron should not directly touch the capacitor.

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 solder profile**




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

| 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 solder profile | / | 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 solder | 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)

⑴.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。
⑵.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.
⑵.Board separation should not be done manually, but by using the appropriate fixture.

### 7.5保存 Storage

⑴.在下列环境中保存产品：温度 5~40℃；湿度 ≤70% RH
⑵.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。
⑶.编带拆开后，产品应在三个月内使用。
⑷.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。
⑴. Keep the storage environment conditions as following: Temperature: 5~40℃；Humidity: ≤70% RH
⑵. 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.
⑶. Use the chips within 3 months after the tape is opened.
⑷. 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

⑴.我司所有MLCC产品均符合RoHS 2.0标准；
⑵.我司所有MLCC产品均符合最新的REACH法规要求；
⑶.我司所有MLCC产品均符合HF要求。
⑴.All MLCC products of our comply with RoHS 2.0;
⑵.All MLCC products of our comply with the latest REACH regulations;
⑶.All MLCC products of our comply meet HF requirements.