■ 片式多层陶瓷电容器微波系列（RF）
Microwave MLCC (RF Series)

◆ 特征
Feature

* 叠层独石结构，具有高可靠性能
  There is high reliability on monolithic structure of laminated layers.
* 具有优良的焊接与耐焊性能，适用于回流焊接与波峰焊接
  And its character of excellent soldering ability and
  soldering resistance ability is suitable for reflow soldering and peak soldering.
* 具有较高的容量且容量性能稳定
  It includes high and stable capacitance.
* 高 Q 值
  High Q
* 低等效串联电阻
  Low equivalent series resistance
* 高自谐振频率
  High self-resonant frequency
* 执行标准：GB/T 21041-2007
  Executive Standard: GB/T 21041-2007

◆ 应用
Application

* 移动通信基站
  Mobile communication base station
* 无线通信产品
  Wireless communication products
* 射频功率放大器
  RF power amplifier
* 阻抗匹配网络
  Impedance matching network
* 滤波网络
  Filter network
* VCO

◆型号表示法
How To Order

1111	RF	5R0	B	500	N	T

尺寸规格 Size Code

尺寸规格 Size Code	长×宽 (L×W) inch	长×宽 (L×W) mm
0603	0.06×0.03	1.60×0.80
0805	0.08×0.05	2.00×1.25
0505	0.055×0.055	1.40×1.40
1111	0.11×0.11	2.79×2.79

标称容量 Nominl Capacitance

表示方式 Express Method	实际值 Actual Value
0R5	0.5
1R0	1.0
102	10×10^2

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.

额定电压 Rated Voltage 单位(unit)：V

表示方式 Express Method	实际值 Actual Value
6R3	6.3
500	50×10^0
201	20×10^1

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 digitsare significant; third digit denotes number of zeros; R=decimal point.

包装方式 Package Styles

表示方式 Express Method	包装方式 Package Styles
B	散包装 Bulk Bag
T	编带包装 Taping Package

介质种类 Dielectric Code

介质种类 Dielectric Code	介质材料 Dielectric
RF	C0G

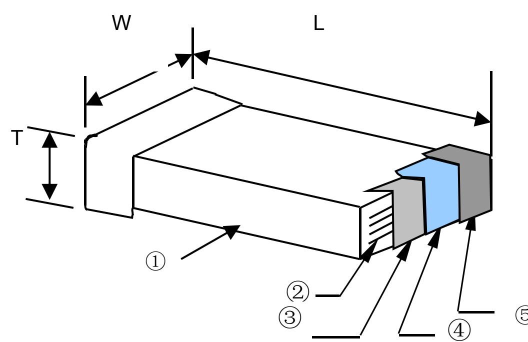
容量误差 Capacitance Tolerance

代码 Code	误差 Tolerance	备注 Note
A	±0.05pF	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。
B	±0.10pF	
C	±0.25pF	
D	±0.50pF	
F	±1%	
G	±2%	
J	±5%	

端头材料 Terminal Material Styles

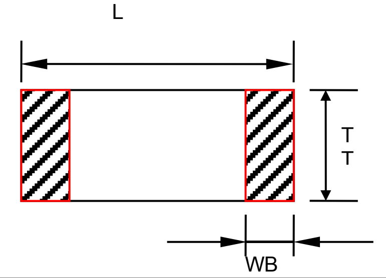
端头类别 Termination Styles	表示方式 Express Method
三层电镀端头 Nickel Barrier Termination	N

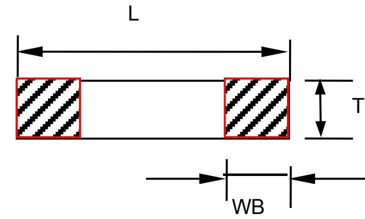
◆产品结构
Product Structure



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

◆ 产品尺寸 Product Dimensions





型号 Type		尺寸 Dimensions (mm)			
英制表示 British expression	公制表示 Metric expression	L	W	T	WB
0603	1608	1.60±0.10	0.80±0.10	0.80±0.10	0.35±0.20
0805	2012	2.00±0.20	1.25±0.20	0.80±0.20 1.25±0.20	0.50±0.20
0505	1414	1.40±0.38	1.40±0.38	≤1.45	0.30±0.10
1111	2828	2.79±0.50	2.79±0.50	≤2.59	0.80±0.30

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

◆ 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
C0G	20°C	0±30ppm/℃	-55℃～125℃

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

介质种类 Dielectric	C0G						
尺寸 Dimensions	0603	0805	0505	1111			
电压 Voltage	25V~250V	25V~250V	25V~250V	≤50V	100V	200/250V	500V
电容量 Capacitance							
0.3pF							
0.4pF							
0.5pF							
0.6 pF							
0.7pF							
1.0pF							
1.2pF							
1.5pF							
1.8pF							
2.0pF							
2.2pF							
3.3pF							
3.9pF							
4.7pF							
5.6pF							
6.8pF							
8.2pF							

备注：1、▭ 正常产品　　2、可根据客户的特殊要求设计符合客户需求的产品
Note: 1、▭ Normal production　　2、We can design according to the customer requirements.

介质种类 Dielectric	C0G						
尺寸 Dimensions	0603	0805	0505	1111			
电压 Voltage	25V~250V	25V~250V	25V~250V	≤50V	100V	200/250V	500V
电容量 Capacitance							
10pF	■	■	■	■	■	■	■
12pF	■	■	■	■	■	■	■
15pF	■	■	■	■	■	■	■
18pF	■	■	■	■	■	■	■
22pF	■	■	■	■	■	■	■
27pF	■	■	■	■	■	■	■
33pF	■	■	■	■	■	■	■
39pF	■	■	■	■	■	■	■
47pF	■	■	■	■	■	■	■
56pF		■	■	■	■	■	■
68pF		■	■	■	■	■	■
82pF		■	■	■	■	■	■
100pF		■	■	■	■	■	■
120pF				■	■	■	
150pF				■	■	■	
180pF				■	■	■	
220pF				■	■	■	
270pF				■	■	■	
330pF				■	■	■	
390pF				■	■	■	
470pF				■	■	■	
560pF				■	■		
680pF				■			
820pF				■			
1000pF				■			

备注：1、■ 正常产品　　2、可根据客户的特殊要求设计符合客户需求的产品

Note: 1、■ Normal production　　2、We can design according to the customer requirements.

◆ 可靠性测试 Reliability Test

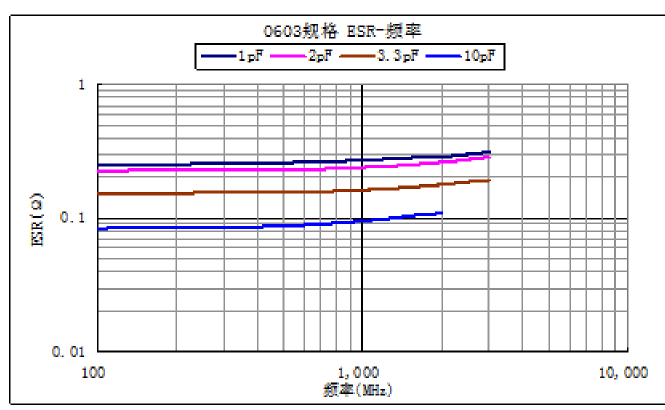
项目 Item	技术规格 Technical Specification	测 试 方 法 Test Method and Remarks		
容量 Capacitance	应符合指定的误差级别 Should be within the specified tolerance.	标称容量 Capacitance	测试频率 Measuring Frequency	测试电压 Measuring Voltage
		≤1000pF	1MHz±10%	1.0±0.2Vrms
		＞1000 pF	1KHz±10%	
Q	C≥30pF, Q≥1400 C≤30pF, Q≥800+20C	测试频率：1MHz±10% 测试电压： 1.0±0.2Vrms Test Frequency: 1MHz±10% Test Voltage: 1.0±0.2Vrms		

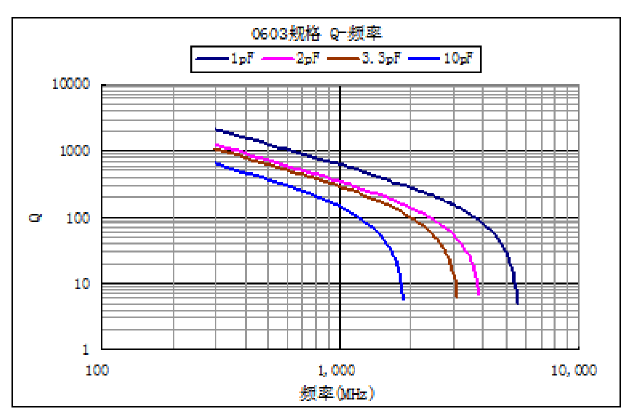
<table>
<tr><th>项目
Item</th><th colspan="2">技术规格
Technical Specification</th><th colspan="2">测 试 方 法
Test Method and Remarks</th></tr>
<tr><td>绝缘电阻
（IR）
Insulation Resistance</td><td colspan="2">≥10,000MΩ</td><td colspan="2">测试电压：额定电压
测试时间：60±5 秒
测试湿度：≤75%
测试温度： 25℃±3℃
测试充放电电流：≤50mA
Measuring Voltage: Rated Voltage（Max 500V）
Duration: 60±5s
Test Humidity: ≤75%
Test Temperature: 25℃±3℃
Test Current: ≤50mA</td></tr>
<tr><td>介质耐电强度(DWV)
Dielectric Withstanding Voltage</td><td colspan="2">不应有介质被击穿或损伤
No breakdown or damage.</td><td colspan="2">测量电压： Ⅰ类：300%额定电压
时间： 1~5 秒 充/放电电流：不应超过 50mA
Measuring Voltage:
ClassⅠ:300% Rated voltage
Duration: 1~5s Charge/ Discharge Current: 50mA max.</td></tr>
<tr><td rowspan="2">可焊性
Solderability</td><td colspan="2" rowspan="2">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.</td><td colspan="2">将电容在 80~120℃的温度下预热 10~30 秒.
Preheating conditions:80 to 120℃; 10~30s.</td></tr>
<tr><td>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</td><td>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</td></tr>
<tr><td rowspan="4">耐焊接热
Resistance to Soldering Heat</td><td>ΔC/C</td><td>在±0.5%或±0.5pF 范围内，取较大值
Within ±0.5% or ±0.5pF，whichever is larger</td><td colspan="2" rowspan="4">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</td></tr>
<tr><td>Q</td><td>同初始标准
Same to initial value.</td></tr>
<tr><td>IR</td><td>同初始标准
Same to initial value.</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td rowspan="2">抗弯曲强度
Resistance to Flexure of Substrate (Bending Strength)</td><td colspan="2">外观：无可见损伤.
Appearance: No visible damage.</td><td colspan="2" rowspan="2">试验基板：Al_2O_3或 PCB 弯曲深度：1mm
施压速度：1mm/sec. 单位：mm
应在弯曲状态下进行测量。

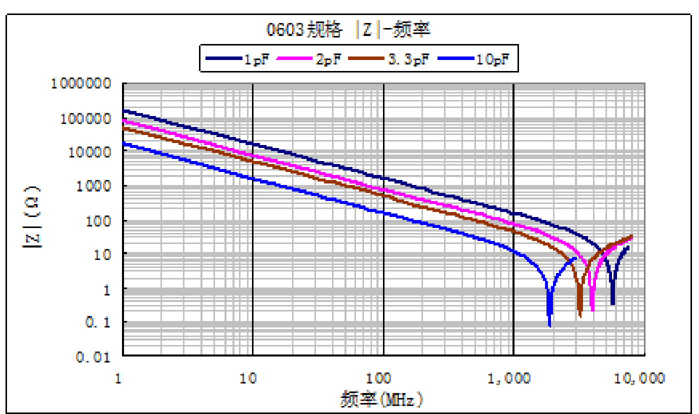
Test Board: Al_2O_3 or PCB Warp: 1mm
Speed: 1mm/sec. Unit: mm
The measurement should be made with the board in the bending position.
20 T=10s 1mm 45±2 45±2</td></tr>
<tr><td>ΔC/C</td><td>在±0.5%或±0.5pF 范围内，取较大值
Within ±0.5% or ±0.5pF， whichever is larger</td></tr>
<tr><td>端头结合强度
Termination Adhesion</td><td colspan="2">外观无可见损伤
No visible damage.</td><td colspan="2">施加的力：5N 时间：10±1S
Applied Force: 5N Duration: 10±1S</td></tr>
</table>

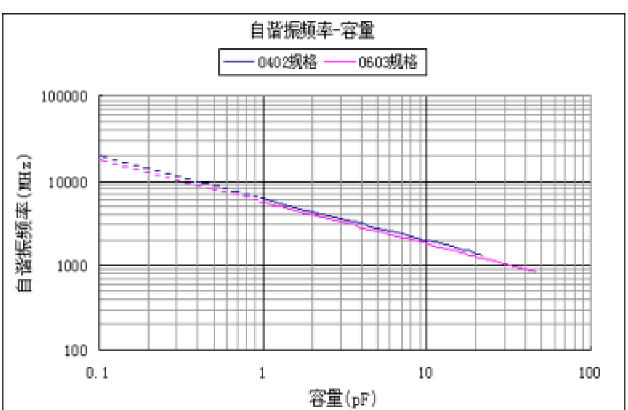
项目 Item	技术规格 Technical Specification	测 试 方 法 Test Method and Remarks
温度循环 Temperature Cycle	项目 Item / C0G ΔC/C: ≤±1%或±1PF，取较大值 ≤±1% or ±1pF，whichever is larger Q: 同初始标准 Same to initial value. IR: 同初始标准 Same to initial value.	初始测量 Initial Measurement 循环次数：5 次，一个循环分以下 4 步： Cycling Times: 5 times, 1 cycle, 4 steps: 阶段 Step / 温度（Temperature）（℃） / 时间 (Time) 1 / 下限温度(Low- category temp.): (NPO:-55) / 30min 2 / 常温(Normal temp.)：+20℃ / 2～3min 3 / 上限温度(Up- category temp.) (NPO: +125) / 30min 4 / 常温(Normal temp.)：+20℃ / 2～3min 试验后放置（恢复）时间：24±2h Recovery time after test: 24±2h
耐湿负荷 Humidity load	ΔC/C: Ⅰ类: ±7.5%或±0.75pF,取两者之中较大者 ClassⅠ: ±7.5% or ±0.75pF, whichever is larger. Q: ≤2 倍初始标准 Not more than twice of initial value. IR: Ri≥1000MΩ 外观：无损伤 Appearance: No visible damage.	温度：40±2℃ 湿度：90~95%RH 电压：额定电压 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±2℃ Humidity: 90~95%RH Voltage: Rated Voltage Duration: 500h Recovery conditions: Room temperature Recovery Time: 24h (Class1) or 48h (Class2)
寿命试验 Life Test	ΔC/C: C0G ±2%或±1pF, 取两者之中较大者 ±2% or ±1pF, whichever is larger. Q: ≤2 倍初始标准 Not more than twice of initial value. IR: Ri≥4000MΩ或 Ri•C_R≥40S 取两者之中较小者 Ri≥4000MΩ或 Ri•C_R≥40S whichever is smaller. 外观：无损伤 Appearance: No visible damage.	低压产品（<100V） 电压：2 倍额定工作电压， 时间：1000 小时 温度：125℃ 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（<100V） Applied Voltage: 2*Ur Duration: 1000h Temperature：125℃ Charge/ Discharge Current: 50mA max. Recovery Conditions: Room Temperature Recovery Time: 24h (Class 1), or 48h (Class2)

◆ 典型特性曲线
Typical characteristic curve



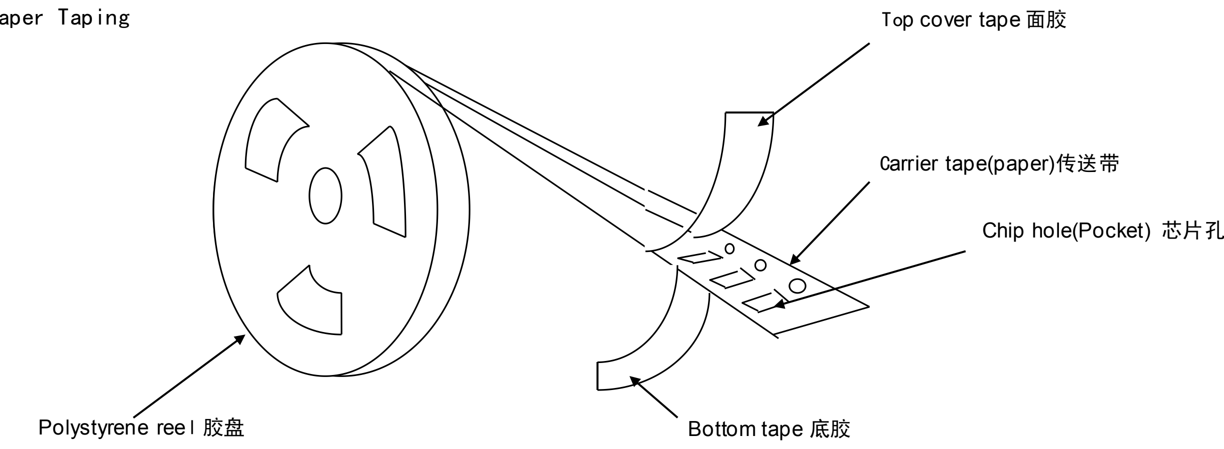




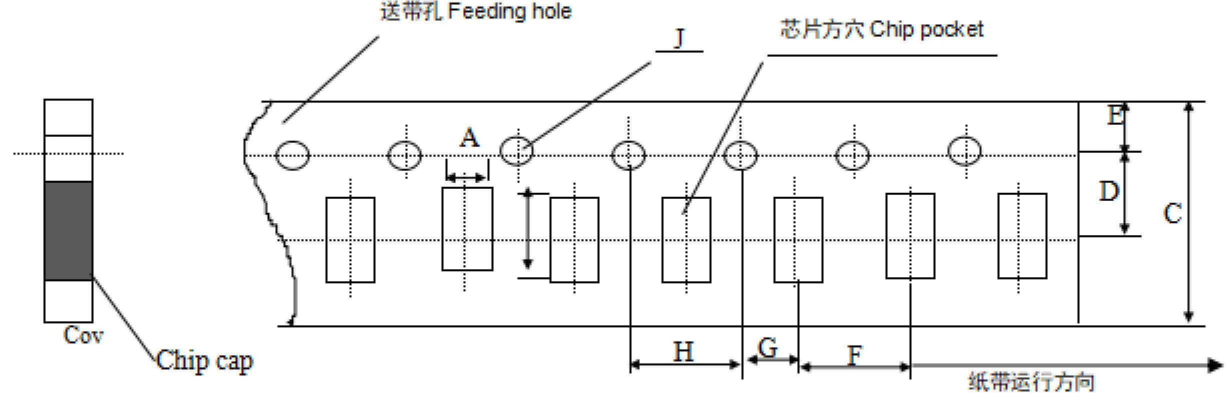


◆ 包装
Package

* 纸带卷盘结构
Paper Taping



* 适合'0603，0805'常规尺寸产品的纸带尺寸
Dimensions of paper taping for 0603，0805 types.

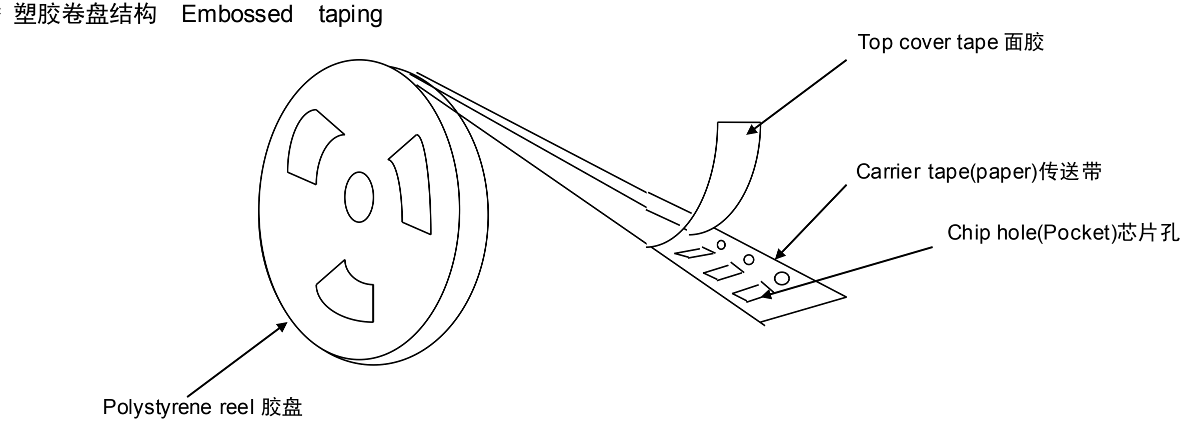


Unit：mm

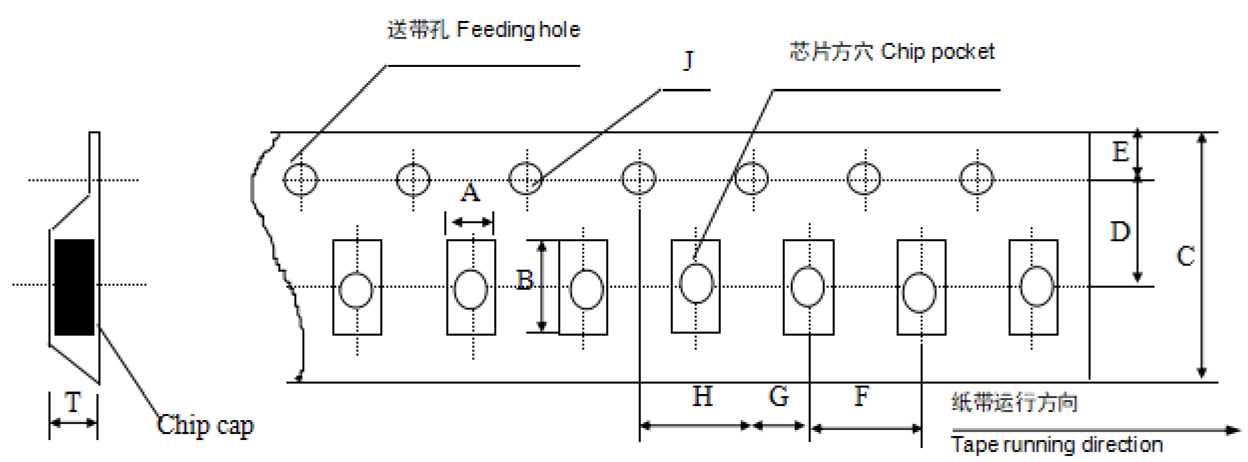
代号Code / 纸带规格 paper size	A	B	C	D*	E	F	G*	H	J	T
0603	1.10 ±0.10	1.90 ±0.10	8.00 ±0.10	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.10	4.00 ±0.10	1.50 -0/+0.10	1.10 Max
0805	1.45 ±0.15	2.30 ±0.15	8.0 ±0.15	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.10	4.00 ±0.10	1.50 -0/+0.10	1.10 Max

注意：*表示此处对尺寸的要求非常精确。
Note: The place with "*" means where needs exactly dimensions.

＊ 塑胶卷盘结构 Embossed taping



＊ 塑胶带尺寸结构(适合 ‘0505、1111’ 型产品)
Dimensions of embossed taping for 0505、1111 type

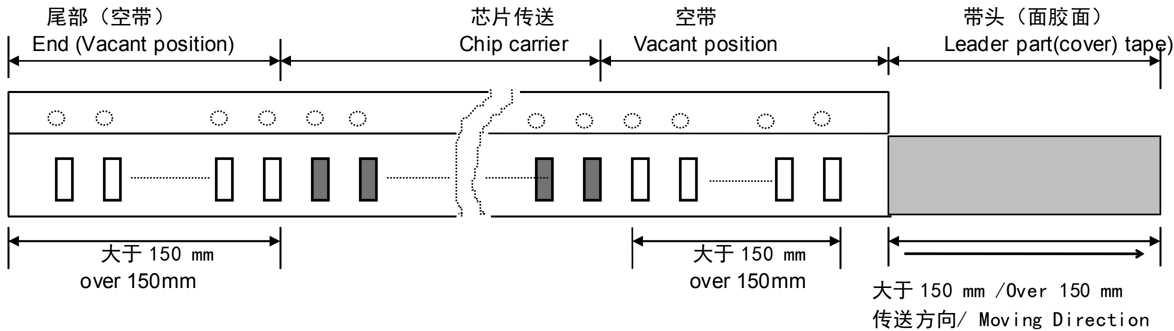


Unit：mm

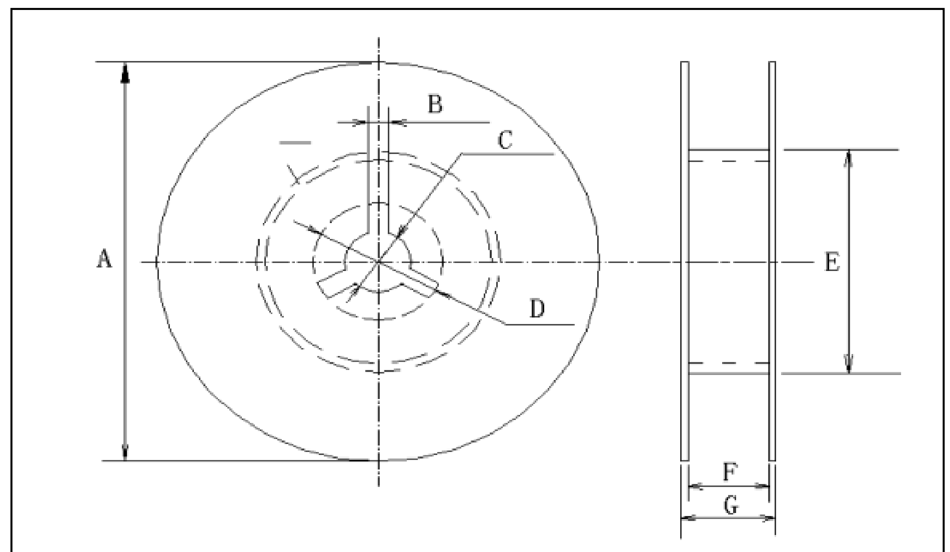
代号Code / 纸带规格 paper size	A	B	C	D*	E	F	G*	H	J	T
0505	1.55 ± 0.20	2.35 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.50 -0/+0.10	1.50 Max
1111	2.70 ± 0.10	3.42 ± 0.10	8.00 ± 0.10	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	4.00 ± 0.10	1.55 -0/+0.10	3.2 Max

备注：*表示此处对尺寸的要求非常精确。
Note：The place with “*” means where needs exactly dimensions.

＊ 传送带的前后结构
Structure of leader part and end part of the carrier paper

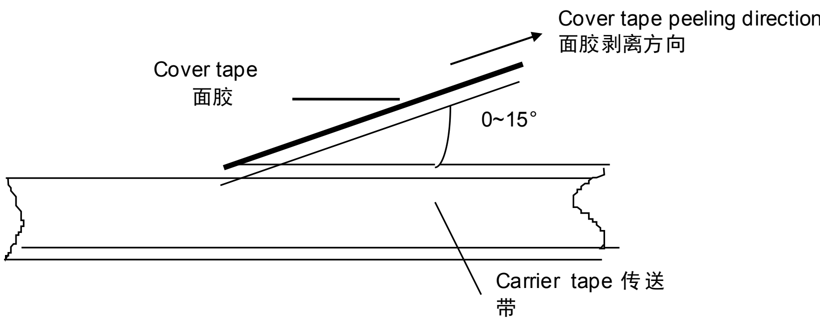


* 卷盘尺寸
Reel dimensions (unit: mm)

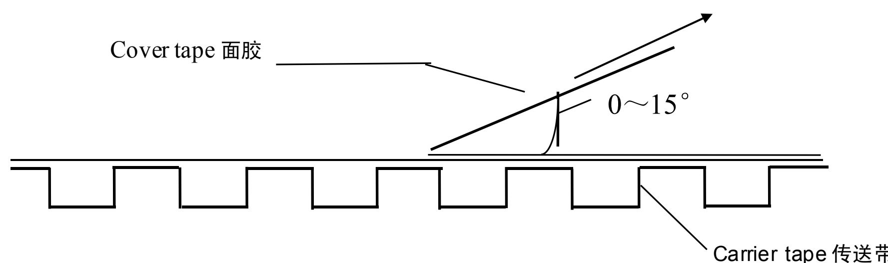


卷盘型号	A	B	C	D	E	F	G
7′REEL	φ178±2.0	3.0	φ13±0.5	φ21±0.8	φ50 或更大 φ50 or more	10.0±1.5	12max
13′REEL	φ330±2.0	3.0	φ13±0.5	φ21±0.8	φ50 或更大 φ50 or more	10.0±1.5	12max

* 关于卷带的说明：面胶剥离强度
Taping specification：top tape peeling strength
纸带 Paper Tapin



* 塑料胶盘 Embossed Taping



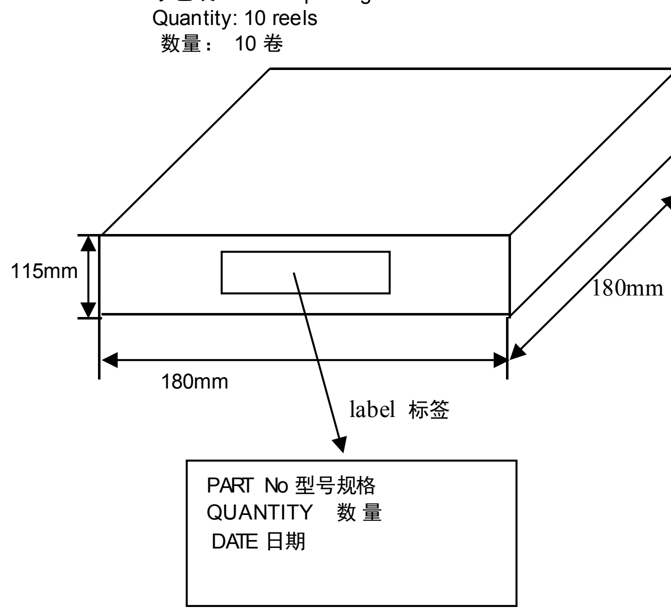
标准：0.1N<剥离强度<0.7N
Standard: 0.1N < peeling strength < 0.7N
在剥离时，纸带不能有纸碎，也不能粘在底、面胶上。
No paper dirty remains on the scotch when peeling, and sticks to top and bottom tape.

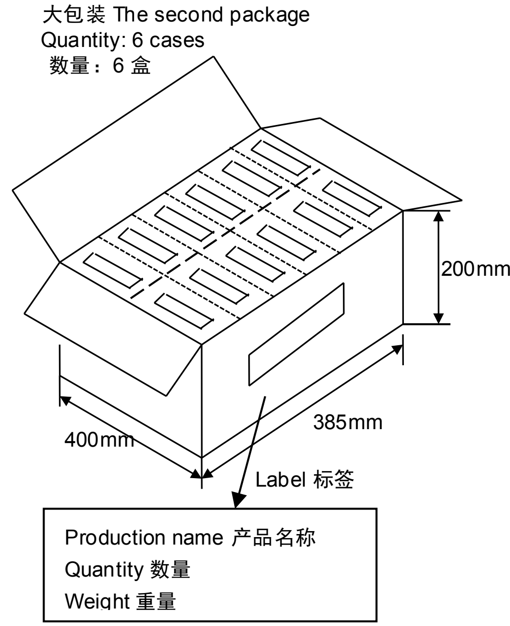
* 包装数量
  Packing Quantity

尺寸 (SIZE)	包装形式和数量（Package Style & Quantity） unit: pcs				
	塑料压纹带卷盘（EPT）	纸带卷盘（PT）	胶带卷盘（ET）	塑料盒散装（BC）	一般散装（BP）
0603	------	4000	------	15000	5000
0805	------	4000	3000	10000	5000
0505	------	------	500	------	------
1111	------	------	500	------	------

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





◆储存方法
Storage Methods

* 确保芯片可焊性良好的贮存期限为 12 个月(在包装好已交付的情况下)。
  The guaranteed period for solderability is 12 months (Under deliver package condition).
* 储存条件 Storage conditions：
  储存温度/Temperature 5~40℃ 储存相对湿度/Relative Humidity 20~70%

◆使用前的注意事项
Precautions For Use

多层片式瓷介电容器(MLCC)在短路或开路的电路中都有可能失效，在超出本承认书或相关说明书中所述使用频率的恶劣工作环境，或外界机械力超压作用下，电容芯片都有可能着火、燃烧甚至爆炸，所以在使用的时候，首先应考虑按本承认书的有关说明来进行，如有不明之处，请联系我们技术部、品管部或生产部.

The Multi-layer Ceramic Capacitors (MLCC) may fail in a short circuit modern in an open circuit mode when subjected to severe conditions of electrical environment and / or mechanical stress beyond the specified "rating" and specified "conditions" in the specification, which will result in burn out, flaming or glowing in the worst case. Following "precautions for "safety" and Application Notes shall be taken in your major consideration. If you have a question about the precautions for handling, please contact our engineering section or factory.

* 焊接的条件与相关图表
  Soldering Profile

为避免因温度的突然变化而引起的芯片开裂或局部爆炸的现象发生，请按有关温度曲线图表来进行. (请参考附页中的图表)

To avoid the crack problem by sudden temperature change, follow the temperature profile in the adjacent graph (refer to the graph in the enclosure page).

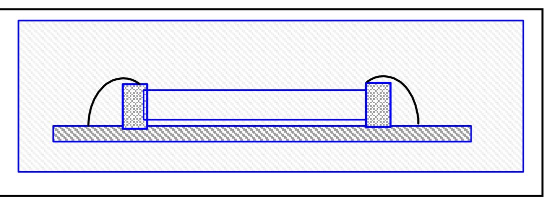
* 手工焊接
Manual Soldering

手工焊接很容易因为芯片局部受热不均而引起瓷体微裂或局部爆炸的现象，在焊接时，如果操作者不小心，会使烙铁头直接同电容芯片的瓷体部分接触，这样很容易使电容芯片因热冲击而受损或出现其他意外．因此，使用电烙铁手工焊接时应仔细操作，并对电烙铁的尖端的选择和尖端温度控制应多加小心．

Manual soldering can pose a great risk of creating thermal cracks in capacitors. The hot soldering iron tip comes into direct contact with the end terminations, and operator's careless may cause the tip of the soldering iron to come into direct contact with the ceramic body of the capacitor. Therefore the soldering iron must be handled carefully, and pay much attention to the selection of the soldering iron tip and temperature contact of the tip.

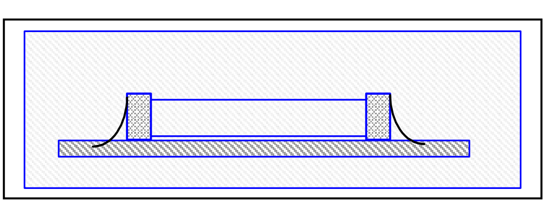
*适量的焊料
Optimum Solder Amount for Reflow Soldering

焊料过多
Too much solder



这样会因端头压力过大而
可能引起芯片受损
Cracks tend to occur due to large stress.

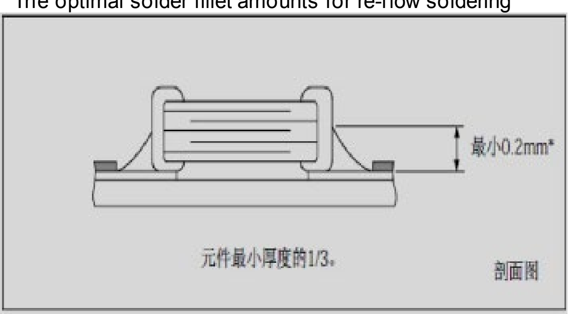
焊料太少
Not enough solder



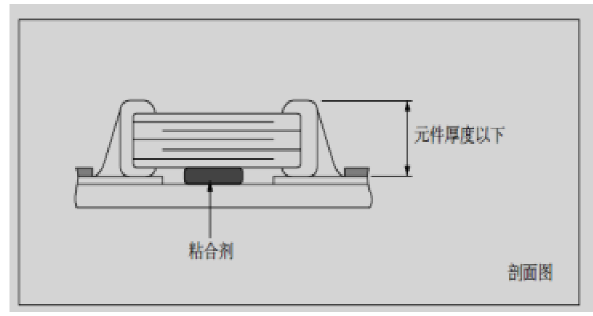
固定力量不足，可能会引起
电容芯片与线路接触不良
Weak holding force may cause badconnection between the capacitor and PCB.

* 推荐焊料用量
Recommended Soldering amounts

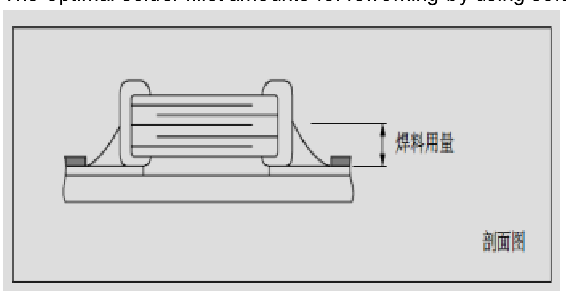
回流焊接的最佳焊料用量
The optimal solder fillet amounts for re-flow soldering



波峰焊接的最佳焊料用量
The optimal solder fillet amounts for wave soldering



使用烙铁返修时的最佳焊料量
The optimal solder fillet amounts for reworking by using soldering iron



* 推荐焊接方式
Recommended Soldering Method

规格尺寸 Size	温度特性 Temperature Characteristics	额定电压 RatedVoltage	容量范围 Capacitance	焊接方式 Soldering Method
0603	NPO	/	/	R
0805	NPO	/	/	R
0505	NPO	/	/	R
1111	NPO	/	/	R

焊接方式 Soldering method： R—回流焊 Reflow Solering W—波峰焊 Wave Soldering

◆ 推荐焊接温度曲线图
The temperature profile for soldering

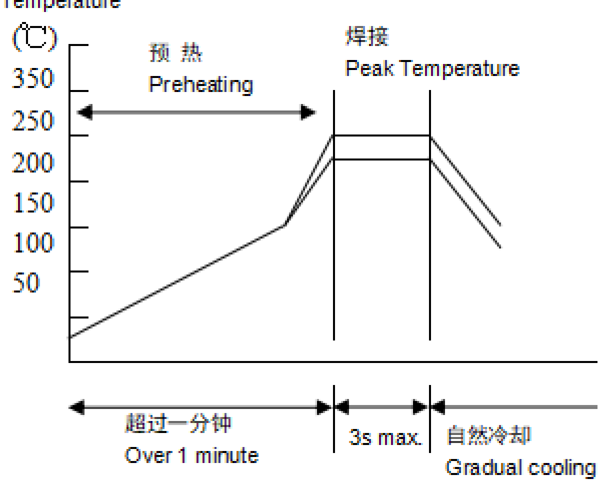
＊ 回流焊接 (Re-flow soldering)

	Pb-Sn 焊接 Pb-Sn soldering	无铅焊接 Lead-free soldering
尖峰温度 Peak temperature	230℃~250℃	240℃~260℃

在预热时，请将焊接温度与芯片表面温度之间的温差维持在 T≤150℃。
While in preheating,please keep the temperature difference between soldering temperature and surface temperature of chips as: T≤150℃.

温度 Temperature
(℃)
300
250
200
150
100
50
预 热
焊接 Peak Temperature
超过一分钟
超过一分钟
30~60 S
自然冷却

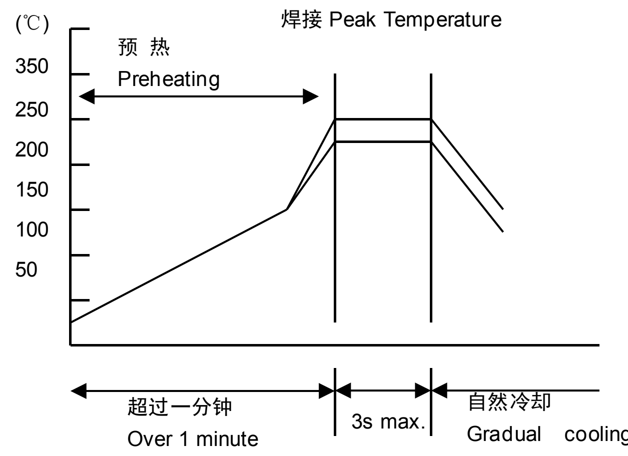
＊ 波峰焊接 (Wave soldering)



	Pb-Sn 焊接 Pb-Sn soldering	无铅焊接 Lead-free soldering
尖峰温度 Peak temperature	230℃~260℃	240℃~270℃

在预热时，请将焊接温度与芯片表面温度之间的温差维持在 T≤150℃。
While in preheating,please keep the temperature difference between soldering temperature and surface temperature of chips as: T≤150℃.

＊ 手工焊接 (Hand soldering)



条件 Conditions：

预热 Preheating	烙铁头温度 Temperature of soldering iron head	烙铁功率 Power of soldering iron	烙铁头直径 Diameter of soldering iron head	焊接时间 Soldering time	锡膏量 Solder paste amount	限制条件 Restricted conditions
△≤130℃	最高 350℃ Highest temperature:350℃	最大 20W 20W at the highest	建议 1mm 1mm recommended	最长 3s 3s at the longest	≤1/2 芯片厚度 ≤1/2 chip thickness	请勿使用烙铁头直接接触陶瓷元件 Please avoid the derect contact between soldering iron head and ceramic components

*以最新版本的内容为准