

■ **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



◆ **应用范围**
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

[illegible]

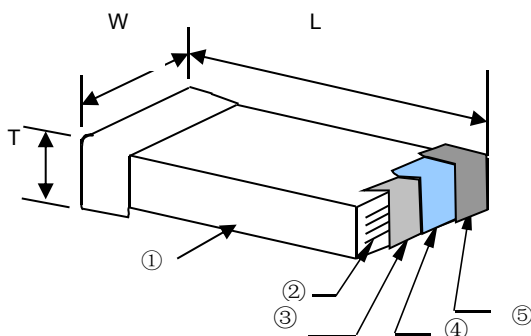
2. In the product specification, deliverable high-Voltage models with the same specifications, capacity, and temperature characteristics can fully cover the low-Voltage models.

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◆型号表示法
How To Order

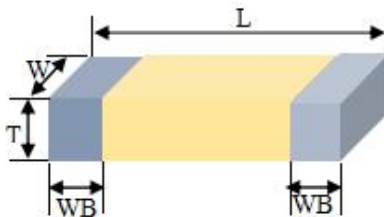
1111	RF	5R0	B	500	N	T
尺寸规格 Size Code		标称容量 Nominal Capacitance		额定电压 Rated Voltage 单位(unit): V		包装方式 Package Styles
尺寸规格 Size Code	EIA	长×宽 (L×W) mm	表示方式 Express Method	实际值 Actual Value	表示方式 Express Method	实际值 Actual Value
0603	0603	1.60×0.80	0R5	0.5	6R3	6.3
0805	0805	2.00×1.25	1R0	1.0	500	50×10 ⁰
1111	1111	2.79×2.79	102	10×10 ²	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 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.		
介质种类 Dielectric Code		容量误差 Capacitance Tolerance		端头材料 Terminal Material Styles		
介质种类 Dielectric Code	介质材料 Dielectric	代码 Code	误差 Tolerance	备注 Note		端头类别 Termination Styles
RF	C0G	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.		表示方式 Express Method
		B	±0.10pF			
		C	±0.25pF			
		D	±0.50pF			
		F	±1%			
		G	±2%			
		J	±5%			三层电镀端头 Nickel Barrier Termination
						N
						编带7寸盘包装 Braided 7 inch disc packing
						编带13寸盘包装 Braided 13 inch disc packing

◆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)				尺寸代码 Size code
尺寸规格 Size Code	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	DA
0805	2012	2.00±0.20	1.25±0.20	0.80±0.20	0.50±0.20	EA
1111	2828	2.79±0.50	2.79±0.50	1.25±0.25	0.80±0.30	ZA

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/°C	-55°C ~ 125°C

◆ 容量范围及电压 Capacitance Range and Voltage

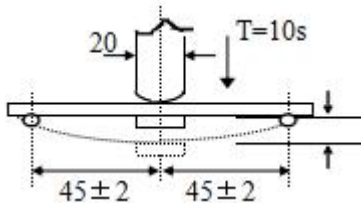
材料 Dielectric	C0G				
尺寸 Dimension	0603	0805	1111		
容量/电压 Capacity/Voltage	25V~250V	25V~250V	≤50V	100V	200V/ 250V
0.3pF	DA	EA	ZA	ZA	ZA
0.4pF	DA	EA	ZA	ZA	ZA
0.5pF	DA	EA	ZA	ZA	ZA
0.6 pF	DA	EA	ZA	ZA	ZA
0.7pF	DA	EA	ZA	ZA	ZA
1.0pF	DA	EA	ZA	ZA	ZA
1.2pF	DA	EA	ZA	ZA	ZA
1.5pF	DA	EA	ZA	ZA	ZA
1.8pF	DA	EA	ZA	ZA	ZA
2.0pF	DA	EA	ZA	ZA	ZA
2.2pF	DA	EA	ZA	ZA	ZA
3.3pF	DA	EA	ZA	ZA	ZA
3.9pF	DA	EA	ZA	ZA	ZA
4.7pF	DA	EA	ZA	ZA	ZA
5.6pF	DA	EA	ZA	ZA	ZA
6.8pF	DA	EA	ZA	ZA	ZA
8.2pF	DA	EA	ZA	ZA	ZA
10pF	DA	EA	ZA	ZA	ZA
12pF	DA	EA	ZA	ZA	ZA
15pF	DA	EA	ZA	ZA	ZA
代码 Code	DA		EA		ZA
T	0.80±0.10		0.80±0.20		1.25±0.25

材料 Dielectric	C0G				
尺寸 Dimension	0603	0805	1111		
容量/电压 Capacity/Voltage	25V~250V	25V~250V	≤50V	100V	200V/ 250V
18pF	DA	EA	ZA	ZA	ZA
22pF	DA	EA	ZA	ZA	ZA
27pF	DA	EA	ZA	ZA	ZA
33pF	DA	EA	ZA	ZA	ZA
39pF	DA	EA	ZA	ZA	ZA
47pF	DA	EA	ZA	ZA	ZA
56pF		EA	ZA	ZA	ZA
68pF		EA	ZA	ZA	ZA
82pF		EA	ZA	ZA	ZA
100pF		EA	ZA	ZA	ZA
120pF			ZA	ZA	ZA
150pF			ZA	ZA	ZA
180pF			ZA	ZA	ZA
220pF			ZA	ZA	ZA
270pF			ZA	ZA	ZA
330pF			ZA	ZA	ZA
390pF			ZA	ZA	ZA
470pF			ZA	ZA	ZA
560pF			ZA	ZA	
680pF			ZA		
820pF			ZA		
1000pF			ZA		

代码 Code	DA	EA	FA
T	0.80±0.10	0.80±0.20	1.25±0.25

◆ **可靠性测试**
Reliability Test

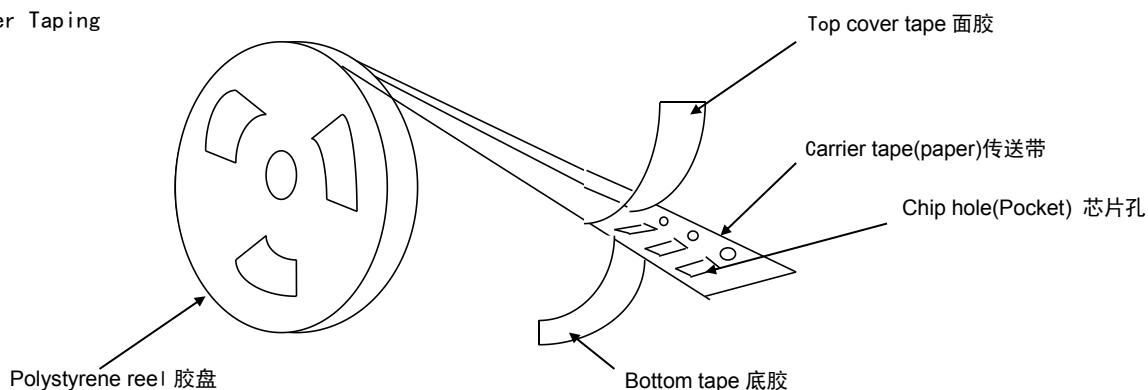
项目 Item	技术规格 Technical Specification	测试方法 Test Method and Remarks		
容量 Capacitance	应符合指定的误差级别 Should be within the specified tolerance.	标称容量 Capacitance	测试频率 Measuring Frequency	测试电压 Measuring Voltage
		≤1000pF	1MHz±10%	1.0±0.2Vrms
		> 1000 pF	1KHz±10%	
Q	C≥30pF, Q≥1000 C<30pF, Q≥400+20C	测试频率: 1MHz±10% 测试电压: 1.0±0.2Vrms Test Frequency: 1MHz±10% Test Voltage: 1.0±0.2Vrms		

项目 Item	技术规格 Technical Specification		测试方法 Test Method and Remarks
绝缘电阻 (IR) Insulation Resistance	≥10,000MΩ		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
介质电强度 (DW) Dielectric Withstanding Voltage	不应有介质被击穿或损伤。 No breakdown or damage.		测量电压: I 类: 300%额定电压 时间: 1~5 秒 充/放电电流: 不应超过 50mA Measuring Voltage: Class I :300% Rated Voltage Duration: 1~5s Charge/ Discharge Current: 50mA max.
可焊性 Solderability	上锡率应大于 95% 外观: 无可见损伤。 At least 95% of the terminal electrode is covered by new solder. Visual Appearance: No visible damage.		将电容在 80~120℃的温度下预热 10~30 秒。 Preheating conditions:80 to 120℃; 10~30s. 无铅焊料: 浸锡温度: 245±5℃ 浸锡时间: 2±0. 5s Solder Temperature: 245±5℃ Duration: 2±0.5s
耐焊接热 Resistance to Soldering Heat	ΔCC	≤±2.5%或±0.25pF, 取较大值 ≤±2.5% or ±0.25PF, whichever is larger	将电容在 100~200℃的温度下预热 60~120 秒。 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℃; 60~120s. 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
	Q	同初始标准 Same to initial value.	
	IR	同初始标准 Same to initial value.	
	外观: 无可见损伤 上锡率: ≥95% Appearance: No visible damage.At least 95% of the terminal electrode is covered by new solder.		
抗弯曲强度 Resistance to Flexure of Substrate (Bending Strength)	外观: 无可见损伤。 Appearance: No visible damage.		试验基板: 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: PCB Warp: 1mm Speed: 1mm/sec. Unit: mm The measurement should be made with the board in the bending position. 
	ΔC/C	在±5%或±0. 5pF 范围内, 取较大值 Within ±5% or ±0.5pF , whichever is larger	
端头结合强度 Termination Adhesion	外观无可见损伤 No visible damage.		施加的力: 5N 时间: 10±1S Applied Force: 5N Duration: 10±1S

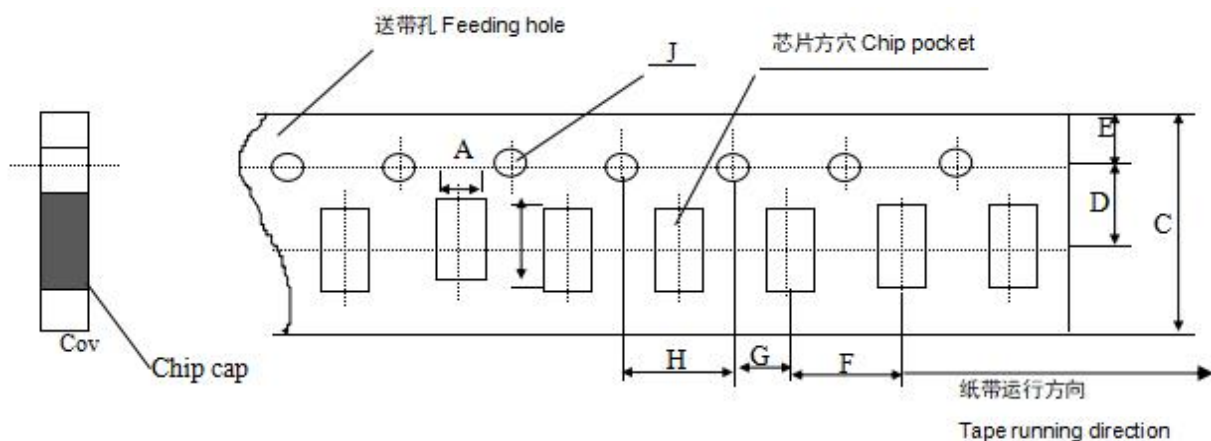
项目 Item	技术规格 Technical Specification		测试方法 Test Method and Remarks		
温度循环 Temperature Cycle	项目 Item	C0G	初始测量 Initial Measurement 循环次数: 5 次, 一个循环分以下 4 步: Cycling Times: 5 times, 1 cycle, 4 steps:		
	$\Delta C/C$	$\leq \pm 1\%$ 或 $\pm 1pF$, 取较大值 $\leq \pm 1\%$ or $\pm 1pF$, whichever is larger	阶段 Step	温度 (Temperature) ($^{\circ}C$)	时间 (Time)
	Q	同初始标准 Same to initial value.	1	下限温度 (Low- category temp.): (C0G: -55)	30min
	IR	同初始标准 Same to initial value.	2	常温 (Normal temp.): $+20^{\circ}C$	2~3min
	外观无可见损伤 No visible damage.		3	上限温度 (Up- category temp.): (C0G: $+125^{\circ}C$)	30min
耐湿负荷 Humidity load	$\Delta C/C$	I 类: $\pm 7.5\%$ 或 $\pm 0.75pF$, 取两者之中较大者 Class I: $\pm 7.5\%$ or $\pm 0.75pF$, whichever is larger.	4	常温 (Normal temp.): $+20^{\circ}C$	2~3min
	Q	$> 50\%$ 初始标准 Not more than twice of initial value.	试验后放置 (恢复) 时间: $24 \pm 2h$ Recovery time after test: $24 \pm 2h$		
	IR	$R_i \geq 1000M\Omega$	温度: $40 \pm 2^{\circ}C$ 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 Temperature: $40 \pm 2^{\circ}C$ Humidity: 90~95%RH Voltage: Rated Voltage Duration: 500h Recovery conditions: Room temperature Recovery Time: 24h		
	外观: 无损伤 Appearance: No visible damage.				
寿命试验 Life Test	$\Delta C/C$	C0G $\pm 2\%$ 或 $\pm 1pF$, 取两者之中较大者 $\pm 2\%$ or $\pm 1pF$, whichever is larger.	电压: 额定电压 $< 100V$: 2 倍额定工作电压, $100V \leq$ 额定电压 $\leq 200V$: 1.5 倍额定工作电压 $200V <$ 额定电压 $\leq 500V$: 1.3 倍额定工作电压 时间: 1000 小时 温度: $125^{\circ}C$ 充电电流: 不应超过 50mA 放置条件: 室温 放置时间: 24 小时		
	Q	$> 50\%$ 初始标准 Not more than twice of initial value.	Applied Voltage: Rated Voltage $< 100V$: $2U_r$ $100V \leq$ Rated Voltage $\leq 200V$: $1.5 U_r$ $200V <$ Rated Voltage $\leq 500V$: $1.3 U_r$ Duration: 1000h Temperature: $125^{\circ}C$ Charge/ Discharge Current: 50mA max. Recovery Conditions: Room Temperature Recovery Time: 24h		
	IR	$R_i \geq 4000M\Omega$ 或 $R_i \cdot C_R \geq 40S$ 取两者之中较小者 $R_i \geq 4000M\Omega$ 或 $R_i \cdot C_R \geq 40S$ whichever is smaller.			
	外观: 无损伤 Appearance: No visible damage.				

◆ 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.

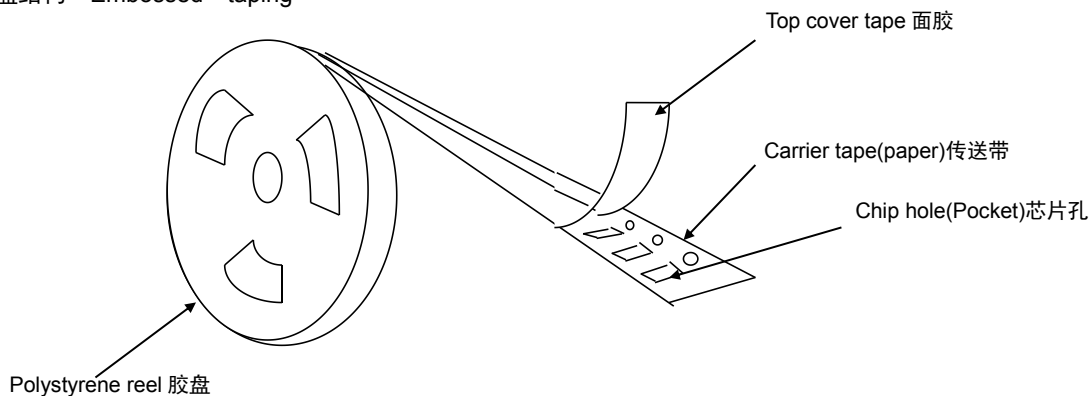


代号Code 纸带规格 paper size	A	B	C	D*	E	F	G*	H	J	T
0603	1.10 ±0.10	1.90 ±0.10	8.00 ±0.10	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.10	4.00 ±0.10	1.55 -0/+0.05	1.10 Max
0805	1.45 ±0.15	2.30 ±0.15	8.0 ±0.15	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.10	4.00 ±0.10	1.55 -0/+0.05	1.10 Max

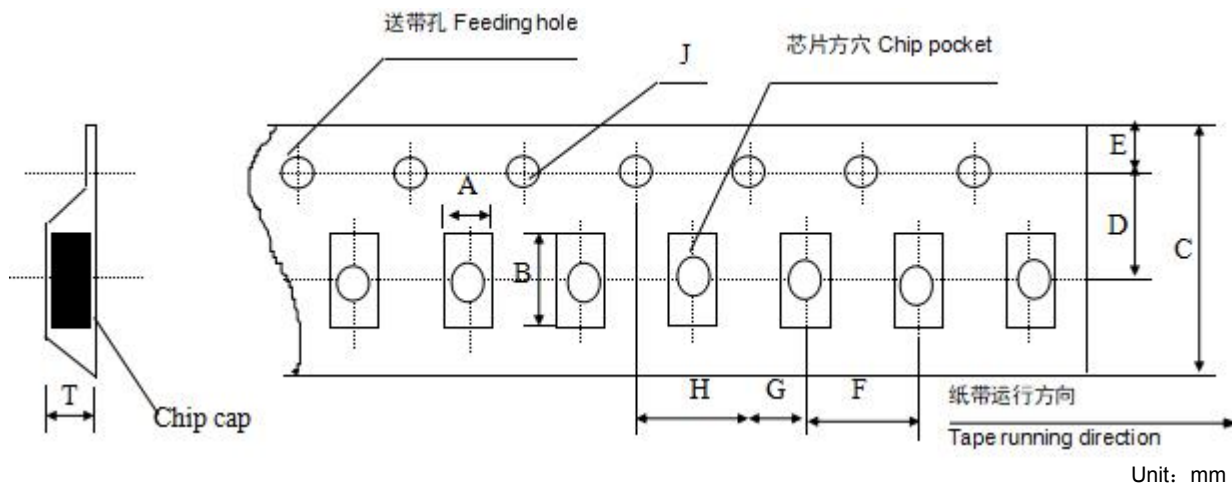
注意: *表示此处对尺寸的要求非常精确。

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 '1111' 型产品)
Dimensions of embossed taping for 0505、1111 type



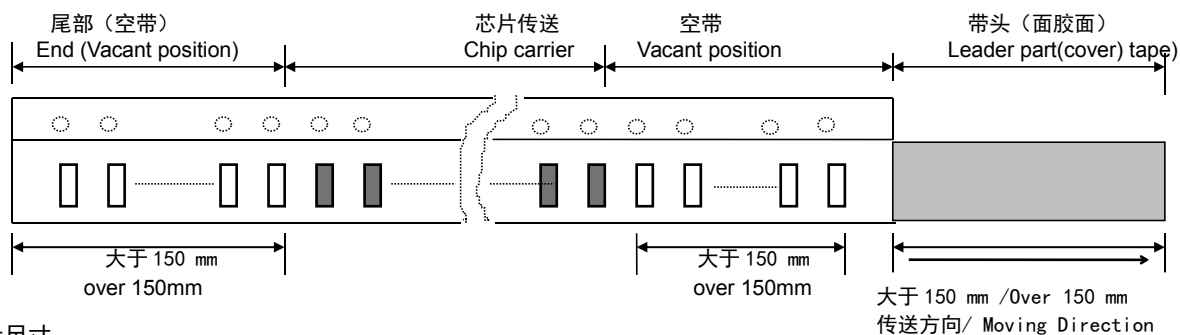
代号Code 纸带规格 paper size	A	B	C	D*	E	F	G*	H	J	T
1111	2.70 ±0.10	3.42 ±0.10	8.00 ±0.10	3.50 ±0.05	1.75 ±0.10	4.00 ±0.10	2.00 ±0.05	4.00 ±0.10	1.55 -0/+0.05	3.2 Max

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.

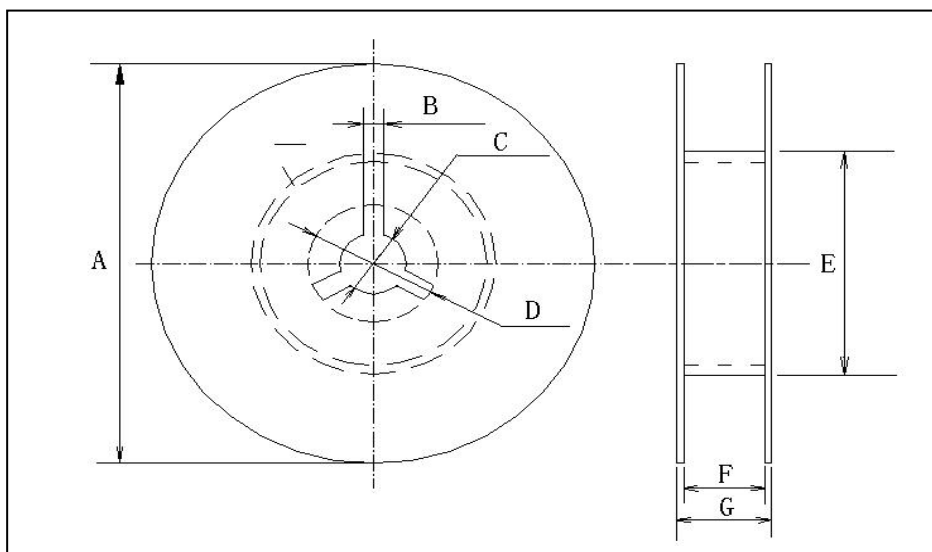
* 传送带的前后结构

Structure of leader part and end part of the carrier paper



卷盘尺寸

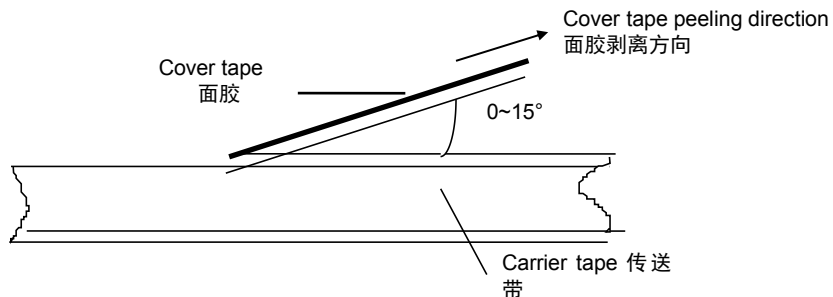
Reel dimensions (unit: mm)



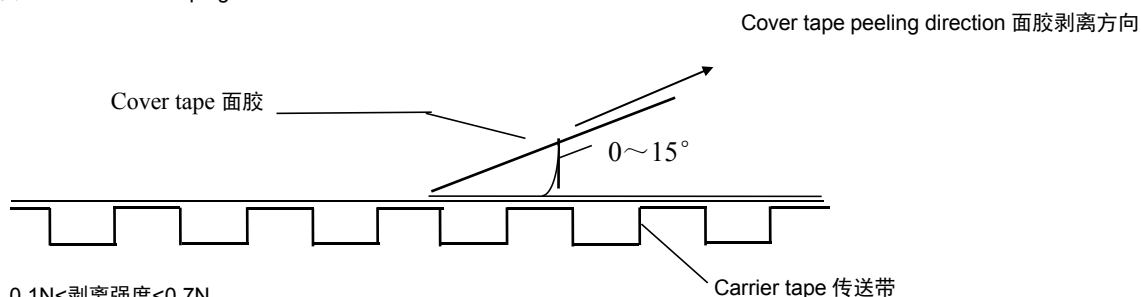
卷盘型号 Reel Code	A	B	C	D	E	F	G
7'REEL	φ178±2.0	3.0	φ13±0.5	φ21±0.8	φ50 或更大 φ50 or more	10.0±1.5	12max

* 关于卷带的说明：面胶剥离强度

Taping specification: top tape peeling strength
纸带 Paper Taping



* 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

尺寸代码 SizeCode	厚度 Thickness	纸带卷盘 (PT)	胶带卷盘 (ET)
0603	0.80±0.10	4000	-----
0805	0.80±0.20	4000	3000
1111	1.25±0.20	-----	500

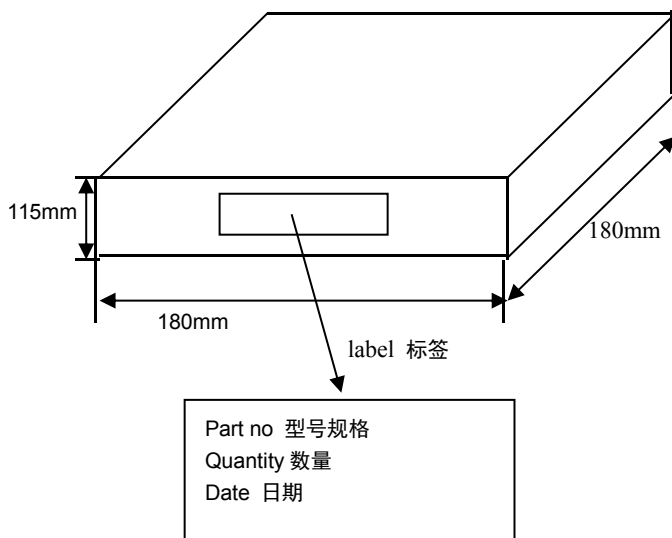
* 外包装

Outer packing

小包装 The first package

Quantity: 10 reels

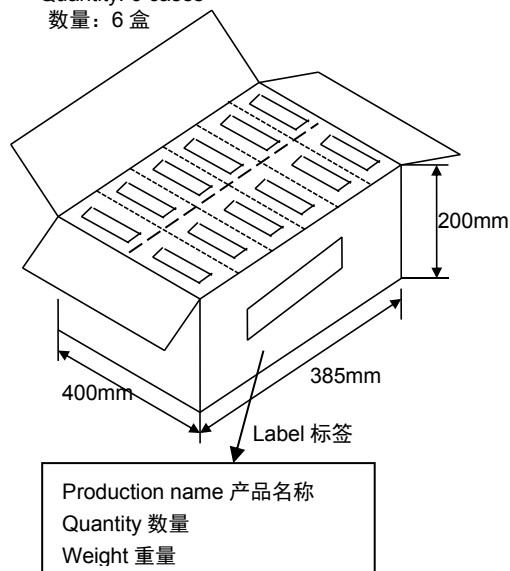
数量：10 卷



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.

* 焊接的条件与相关图表

Soldering Condition and 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.

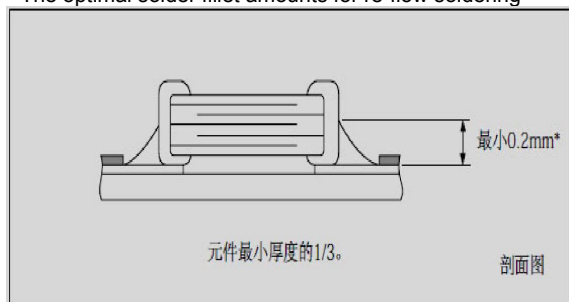
Manual soldering can pose a great risk of creating thermal cracks in capacitors. The hot soldering iron tip comes into direct contact with the end terminations, and operator's careless may cause the tip of the soldering iron to come into direct contact with the ceramic body of the capacitor. Therefore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

* 推荐焊料用量

Recommended Soldering amounts

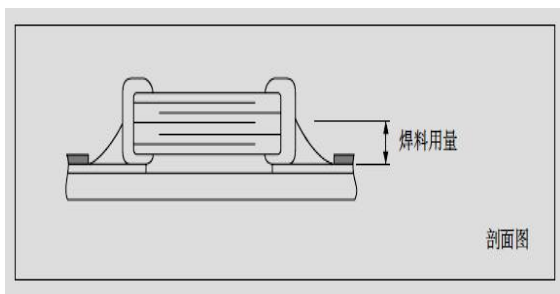
回流焊接的最佳焊料用量

The optimal solder fillet amounts for re-flow soldering



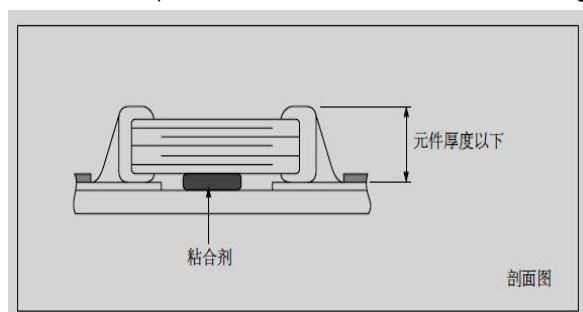
使用烙铁返修时的最佳焊料量

The optimal solder fillet amounts for reworking by using soldering iron



波峰焊接的最佳焊料用量

The optimal solder fillet amounts for wave soldering



* 推荐焊接方式

Recommended Soldering Method

规格尺寸 Size	温度特性 Temperature Characteristics	容量范围 Capacitance	焊接方式 Soldering Method
0603	C0G	/	R
0805	C0G	/	R
1111	C0G	/	R

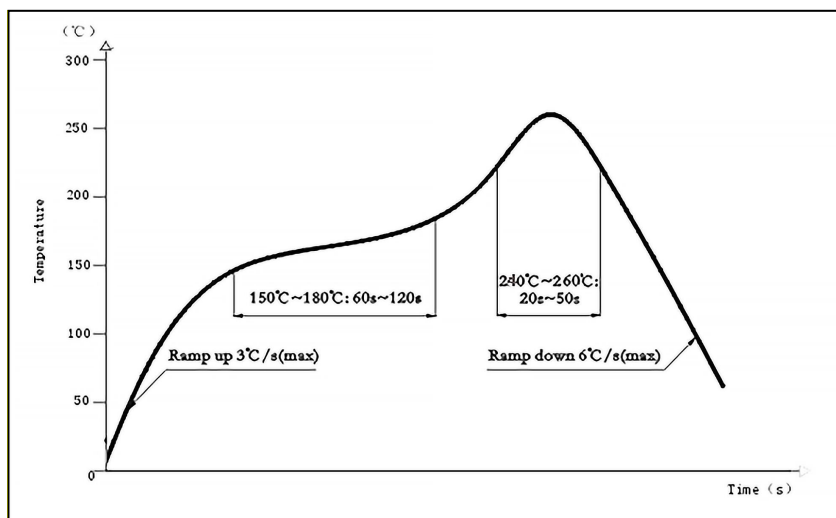
焊接方式 Soldering method: R—回流焊 Reflow soldering

W—波峰焊 Wave Soldering

◆ 推荐焊接温度曲线图

The temperature profile for soldering

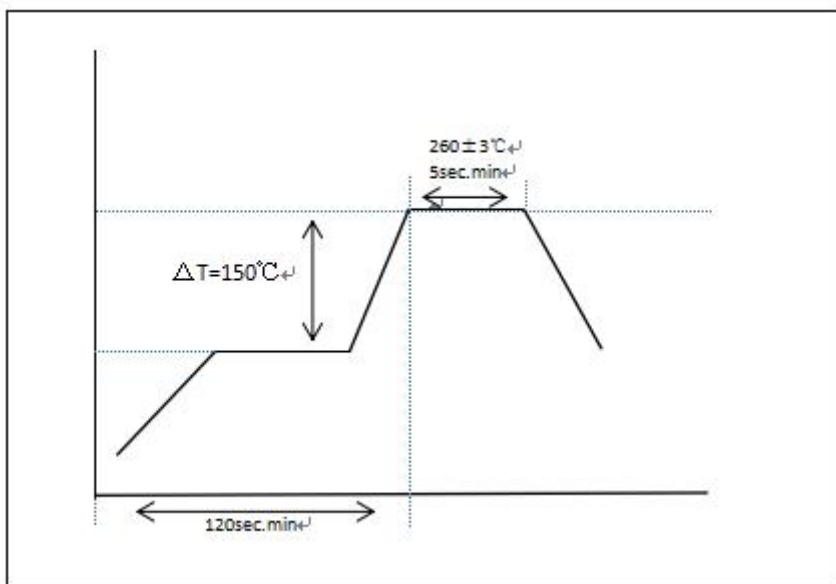
* 回流焊接 (Re-flow soldering)



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 $T \leq 150^{\circ}\text{C}$ 。

While in preheating, please keep the temperature difference between soldering temperature and surface temperature of chips as: $T \leq 150^{\circ}\text{C}$.

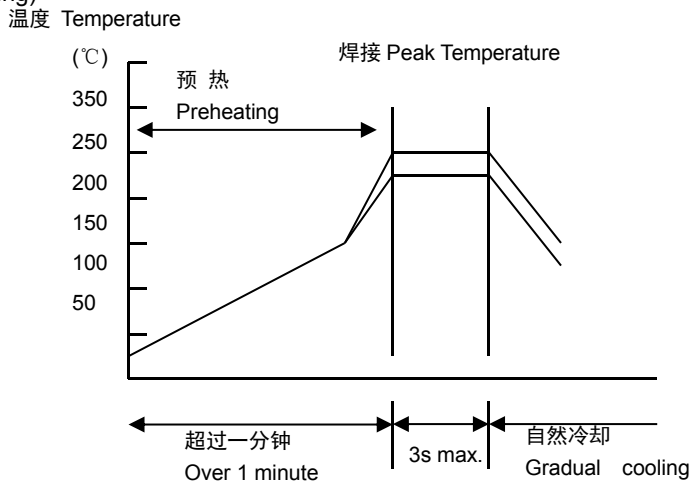
* 波峰焊接 (Wave soldering)



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 $T \leq 150^{\circ}\text{C}$ 。

While in preheating, please keep the temperature difference between soldering temperature and surface temperature of chips as: $T \leq 150^{\circ}\text{C}$.

* 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
$\Delta \leq 130^{\circ}\text{C}$	最高 350°C Highest temperature: 350°C	最大 20W 20W at the highest	建议 1mm 1mm recommended	最长 3s 3s at the longest	$\leq 1/2$ 芯片厚度 $\leq 1/2$ chip thickness	请勿使用烙铁头直接接触陶瓷元件 Please avoid the direct contact between soldering iron head and ceramic components

* 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 design and selection reference only and shall not serve as a basis for delivery.