

独石电容器规格承认书

APPROVAL SPECIFICATION FOR LEADED TYPE MLCC

客户
CUSTOMER

立创

客户料号
CUSTOMER P/N

客户规格描述
CUST. DESCRIPTION

规格描述
DESCRIPTION

50V/471/K/F5.08/小平头/L3.5/环氧(蓝)/X7R(II)/0603

产品编码
PART NUMBER

CD1H471KC94ER1D000

日期
DATE

2020/8/22

文件编号
DOC. NO.

DEC-SA-WI006

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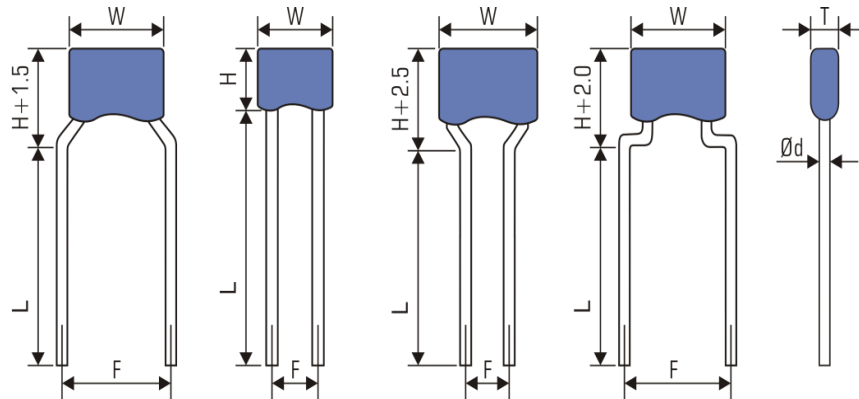
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独石电容器规格承认书
APPROVAL SPECIFICATION FOR LEADED TYPE MLCC

1. 规格表
DATA SHEET



脚型代码
Lead style code: 0 1 2 9

产品编码 Part number	CD1H471KC94ER1D000	
规格描述 Description	50V/471/K/F5.08/小平头/L3.5/环氧(蓝)/X7R(II)/0603	
客户料号 Customer P/N		
介质类别 Dielectric class	Class 2	
额定电压 Rated voltage	50Vdc	
电容量 Capacitance	470pF ±10% @ 1kHz 1.0V 25°C	
损耗角正切 Tangent of loss angle	0.035 max @ 1kHz 1.0V 25°C	
耐电压 Testing voltage	125Vdc (Charge/discharge 2mA max) 3s PASS	
绝缘电阻 Insulation resistance	10000MΩ min @ 50V 60s, RH≤70%	
温度特性 Temperature characteristics	X7R(II) ΔC/C: ±15% @ -55°C~125°C	
尺寸 DIMENSIONS	W (Weight)	5mm max
	H (Height)	3.8mm max
	T (Thickness)	3.2mm max
	F (Lead spacing)	5.08mm±0.8mm
	L (Lead length)	3.5mm±0.5mm
	ød (Lead diameter)	0.55mm max
标志 Marking	471	

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2. 总则

GENERAL

- 1) 1) 本规格书适用于电子设备用独石电容器。

This specification applies to the leaded type MLCC for the electronic equipment.

- 2) 2) 独石电容器

Leaded type MLCC

独石电容器是一种用积层陶瓷电容器焊接导线、并用环氧树脂包封后的电容器。

Leaded type MLCC is a capacitor with a multilayer ceramic capacitor soldering lead wire and coating epoxy resin.

其具有以下特点：

It has the following characteristics：

- 体积小，容量大，适合自动安装的编带包装。

Miniature size, large capacitance, tape and reel packaging suitable for auto-placement.

- 环氧树脂封装，从而具有优良的防潮性能、机械强度及耐热性。

Epoxy resin coating creates excellent performance in humidity resistance, mechanical strength and heat resistance.

- 工业生产标准尺寸及多种脚型产品。

Standard size, various lead configurations.

- 3) 符合RoHS 2.0

Complies with RoHS 2.0

3. 适用标准

APPLICABLE STANDARD

本产品符合下列标准，且本规格书的相关内容引用以下标准，当双方对此存在争议时，可依以下标准进行仲裁。

This product complies with the following standards, and the relevant content of this specification refers to the following standards, when the two sides in dispute, the following criteria for arbitration.

GB/T 2693-2001 电子设备用固定电容器 第1部分 总规范(IDT IEC 60384-1)

Fixed capacitors for use in electronic equipmen — Part 1: Generic specification (IDT IEC 60384-1)

GB/T 5966-2011 电子设备用固定电容器 第8部分 分规范 1类瓷介固定电容器(IDT IEC 60384-8)

Fixed capacitors for use in electronic equipmen — Part 8: Sectional specification: Fixed capacitors of ceramic dielectric, Class 1 (IDT IEC 60384-8)

GB/T 5968-2011 电子设备用固定电容器 第9部分 分规范 2类瓷介固定电容器(IDT IEC 60384-9)

Fixed capacitors for use in electronic equipmen — Part 9: Sectional specification: Fixed capacitors of ceramic dielectric, Class 2 (IDT IEC 60384-9)

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4. 产品编码

PART NUMBER

本公司产品编码方式，举例说明如下：

The product part number representation of the company, examples are as follows:

CD	1H	471	K	C9	4	E	R1	D	000
系列 Series	额定电压 Rated voltage	标称容量 Nominal capacitance	容量偏差 Capacitance tolerance	引线 成型方式 Leads format	编带包装或 散装脚长 Taping packing or Leads length of bulk	封装材质 Coating material	温度系数 Temperature coefficient	芯片 Chip specification	生产识别码 Production identification code

■ 系列
Series

CD: 独石电容器
Leads type MLCC

■ 额定电压
Rated voltage

1H: 50V 3A: 1kV 1E: 25V
2A: 100V 3D: 2kV 2E: 250V
2H: 500V 3F: 3kV

■ 标称容量
Nominal capacitance

用3位数表示，单位pF。如下所示：
In 3 digits, unit is pF, as shown in below:
471: 470pF

■ 容量偏差
Capacitance tolerance

C: ±0.25pF J: ±5% S: +50%/-20%
D: ±0.50pF K: ±10% Z: +80%/-20%
M: ±20% P: +100%/-0%

■ 引线成型方式
Leads format

代码 Code	脚距 Leads spacing
A	2.54mm
C	5.08mm
D	7.50mm
E	10.0mm

代码 Code	1	0	9
脚型 样式 Leads style drawing			

■ 编带包装或脚长
Taping packing or
Leads length

● Taping ● Bulk (Leads length)

T: Reel packing 4: 3.5mm 9: 6.0mm E: 16.0mm I: 24.0mm
P: Ammo packing 6: 4.0mm A: 8.0mm F: 18.0mm
8: 5.0mm B: 10.0mm G: 20.0mm

■ 封装材质
Coating material

E: 环氧 (蓝)
Epoxy (Blue)

■ 温度系数
Temperature coefficient

CH: NPO F4: Y5V
R1: X7R R2: X5R

■ 芯片规格
Chip specifications

D: 0603 G: 1210 J: 1825
E: 0805 H: 1808 K: 2220
F: 1206 I: 1812 L: 2225

■ 生产识别码
Production identification code

内部控制码，本规格书不作说明。
Inteer control code will not be described in this an approval specifications.

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5. 测量和试验

MEASUREMENT AND TEST

序 No.	项目 Item	标准 Specifications	试验方法 Testing Method
1	工作温度范围 Operating temp. range	-55°C~125°C	
2	额定电压 Rated voltage (U_R)	50V	额定电压是指在工作温度范围内, 可连续施加在电容器上的最大直流电压或最大交流电压有效值或脉冲电压的峰值。 当交流电压附加于直流电压时, V_p -p或 V_o -p (以较大者为准) 应维持在额定电压范围内。 The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor within the operating temperature range. When AC voltage is superimposed on DC voltage, V_p -p or V_o -p, whichever is larger, should be maintained within the rated voltage range.
3	外观与尺寸 Appearance (APP) and Dimension	外观形状没有明显的缺点, 尺寸在标准范围内。 No marked defect on appearance form and dimensions are within specified range.	电容必须用目视检查其明显的缺点。 The capacitor should be visually inspected for evidence of defect. 尺寸用游标卡尺测量。 Dimensions should be measured with slide calipers.
4	标志 Marking	清晰易于识别。 To be easily legible.	目视检查。 The capacitor should be visually inspected.
5	容量 (C_R) Capacitance (C_R)	470pF ± 10%	容量与 $\tan\delta$ 在 $25 \pm 1^\circ\text{C}$ 下, 使用下列条件进行测量。 The capacitance, $\tan\delta$ should be measured at $25^\circ\text{C} \pm 1^\circ\text{C}$ with the following conditions.
6	损耗角正切($\tan\delta$) Tangent of loss angle ($\tan\delta$)	0.035 max	1kHz 1.0Vrms
7	绝缘电阻 Insulation Resistance (IR)	10000MΩ min	在两导线间施加下列电压进行测量, 时间不超过1分钟。 The insulation resistance should be measured with a DC voltage not exceeding the following voltage at normal temperature and humidity and less than 1 minute of charging. 50VDC
8	耐电压 Testing Voltage (TV)	没有不合格 No failure.	在电容器两导线间施加下列测试电压1到5s后不被破坏 (充/放电流不大于2mA)。 The capacitor should not be damaged when test voltages of below are applied between the lead wires for 1 to 5 sec. (Charge/Discharge current \leq 2mA) 125VDC
9	导线抗张强度 Terminal Tensile Strength	引线不应断开, 电容器不应破裂。 Lead wire should not be cut off capacitor should not be broken.	固定住电容器, 在引线上逐步施加径向拉力直至10N, 并保持 10 ± 1 秒钟。 Fix the body of the capacitor and apply a tensile weight gradually to each lead wire in the radial direction of the capacitor up to 10N and keep it for 10 ± 1 sec.
10	导线抗折强度 Terminal Bending Strength	引线不应断开, 电容器不应破裂。 Lead wire should not be cut off capacitor should not be broken.	在引线出口处沿一个方向施加5N、90°的弯曲压力, 再恢复至初始状态。之后, 在2至3秒内再以相反方向施加一次90°的弯曲压力。 Each lead wire should be subjected to 5N of weight and bent 90° at the point of egress, in one direction, then returned to its original position and bent 90° in the opposite direction at the rate of one bent in 2 to 3 sec.
11	可焊性 Solderability of Leads	导线必须有3/4以上的面积均匀附着焊锡 Lead wire should be soldered with uniform coating on the axial direction over 3/4 of the circumferential direction.	引线必须浸入焊料中 3 ± 0.5 秒钟, 浸入深度离导线根部1.5-2.0mm。 The lead wire of a capacitor should be dipped into molten solder for 3 ± 0.5 sec. The depth of immersion is up to about 1.5 to 2.0mm from the root of lead wires. 焊锡温度: 无铅焊(Sn-3Ag-0.5Cu) $245 \pm 5^\circ\text{C}$ Temp. of solder: Lead Free Solder (Sn-3Ag-0.5Cu) $245 \pm 5^\circ\text{C}$ 易溶解的H63号锡 $235 \pm 5^\circ\text{C}$ H63 Eutectic Solder $235 \pm 5^\circ\text{C}$

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↘ 续上表

Continued on the table

序 No.	项目 Item	标准 Specifications	试验方法 Testing Method												
12	焊锡耐热性 Soldering Effect	APP 没有可见损伤 No marked defect	导线浸入离导线根部1.5-2.0mm处、锡温为 $260 \pm 10^\circ\text{C}$ 中 3.5 ± 0.5 秒。 The lead wires should be immersed in solder of $260 \pm 5^\circ\text{C}$ up to 1.5 to 2.0mm from the root of terminal for 3.5 ± 0.5 sec. 试验后处理: Post-treatment: 电容必须存放在室温下12小时。 Capacitor should be stored for 12 h at room condition.												
		$\Delta C/C$ $\pm 20\%$													
		IR 符合初始标准 Meets initial specified value.													
13	振动 Vibration Resistance	APP 没有可见损伤 No marked defect	将电容器导线焊稳和调整振动频率范围为10-55Hz、总振幅为1.5mm, 振动从10Hz到55Hz, 然后再回到10Hz, 大约一分钟。 The capacitor should be firmly soldered to the supporting lead wire and vibrated at a frequency range of 10 to 55Hz, 1.5mm in total amplitude, with about a 1 minute rate of vibration change from 10Hz to 55Hz and back to 10Hz. 总时间六个小时, 每两小时在相互垂直方向来回三次。 Apply for a total of 6 hours, 2 hours each in 3 mutually perpendicular directions.												
		C_R 如第5项进行试验, 没有不合格 Per Item 5.													
		$\tan\delta$ 如第6项进行试验, 没有不合格 Per Item 6.													
14	温度特性 Temperature characteristics	$\Delta C/C: \pm 15\%$	电容器必须按照下列每一步骤进行测量。 The capacitance measurement should be made at each step specified in below. <table style="margin-left: 20px;"> <thead> <tr> <th>Stwp</th> <th>Temperature ($\pm 1^\circ\text{C}$)</th> </tr> </thead> <tbody> <tr><td>1</td><td>+20</td></tr> <tr><td>2</td><td>-55 (Y5V: -30)</td></tr> <tr><td>3</td><td>+20</td></tr> <tr><td>4</td><td>+125 (Y5V, X5R: +85)</td></tr> <tr><td>5</td><td>+20</td></tr> </tbody> </table>	Stwp	Temperature ($\pm 1^\circ\text{C}$)	1	+20	2	-55 (Y5V: -30)	3	+20	4	+125 (Y5V, X5R: +85)	5	+20
Stwp	Temperature ($\pm 1^\circ\text{C}$)														
1	+20														
2	-55 (Y5V: -30)														
3	+20														
4	+125 (Y5V, X5R: +85)														
5	+20														
15	耐湿负荷 Humidity Loading	APP 没有可见损伤 No marked defect	施加额定电压的电容保持在温度为 $40 \pm 2^\circ\text{C}$ 、相对湿度为90-95%条件下500 ± 12 小时。 Apply the rated voltage for 500 ± 12 hours at $40 \pm 2^\circ\text{C}$ in 90 to 95% relative humidity. 试验后处理: Post-treatment: 电容必须贮存在室温条件下24小时。 Capacitor should be stored for 24 h at room condition.												
		$\Delta C/C$ $\pm 30\%$													
		$\tan\delta$ 小于初始标准的2倍 Less than 200% initial specified value.													
		IR 大于初始标准的25% More than 25% initial specified value.													
16	高温负荷 High Temperature Load	APP 没有可见损伤 No marked defect	在 $125 \pm 2^\circ\text{C}$ (X5R, Y5V: 85°C)、相对湿度不大于50%条件下施加下列额定电压1000+48/-0小时 (充/放电流小于2mA) Apply a DC voltage of 150% of the following voltage for 1000+48/-0 hours at $125 \pm 2^\circ\text{C}$ (X5R, Y5V: 85°C) with a relative humidity of 50% max. (Charge/discharge current $\leq 2\text{mA}$) 187.5VDC 试验后处理: 电容器应在室温下储存24小时。 Post-treatment: Capacitor shall be stored for 24 h at room condition.												
		$\Delta C/C$ $\pm 30\%$													
		$\tan\delta$ 小于初始标准的1.5倍 Less than 1.50% of initial specified value.													
		IR 大于初始标准的50% More than 50% initial specified value.													
17	温度循环 Temperature and Immersion Cycle	APP 没有可见损伤 No marked defect	温度循环试验按以下条件进行试验和测量 Temperature cycling shall be measured in the following test. <table style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr><td>1</td><td>$-55 \pm 2^\circ\text{C}$ (Y5V, -30°C)</td><td>30min</td></tr> <tr><td>2</td><td>$+125 \pm 2^\circ\text{C}$ (X5R, Y5V: 85°C)</td><td>30min</td></tr> </tbody> </table> 循环次数: 5次 Cycle numbers: 5 cycles 试验后处理: 电容器应在室温下储存12小时。 Post-treatment: Capacitor shall be stored for 12 h at room condition.	Step	Temperature	Time	1	$-55 \pm 2^\circ\text{C}$ (Y5V, -30°C)	30min	2	$+125 \pm 2^\circ\text{C}$ (X5R, Y5V: 85°C)	30min			
		Step		Temperature	Time										
		1		$-55 \pm 2^\circ\text{C}$ (Y5V, -30°C)	30min										
		2		$+125 \pm 2^\circ\text{C}$ (X5R, Y5V: 85°C)	30min										
$\Delta C/C$ $\pm 20\%$															
$\tan\delta$ 小于初始标准的1.5倍 Less than 150% of initial specified value.															
IR 符合初始标准 Meets initial specified value.															

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6. 包装和储存

PACKAGING AND STORAGE

6.1. 包装

PACKAGING

盒装编带品，每盒2000pcs（每箱20 000pcs）。

Taping of ammo packing, 2000 pcs/box (20 000 pcs/carton)

散包包装，每包1000pcs（视瓷片大小不等，每箱20 000~100 000pcs）。

Bulk packing, 1000 pcs/bag (Depending on the disc size, each carton is 20 000~100 000pcs)

6.2. 贮存条件

STORAGE ENVIRONMENT

电容器绝缘包封层不是完美的密封形式，因此，请勿将电容器存放在腐蚀性气体中，尤其是存在氯气、硫气、酸、碱、盐等场所，同时应防潮。电容器应存放在温度及相对湿度分别不超出5~40℃及15~70%范围的场所。

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. And avoid exposure to moisture. Store the capacitors where the temperature and relative humidity do not exceed 5 to 40 degrees centigrade and 15 to 70%.

请在6个月内使用电容器。超过6个月，在使用前确认其可焊性和电容量。

Use capacitors within 6 months after delivered. for more than 6 months, confirm the solderability and capacitance before use.

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7. 测量和使用注意事项

MEASURING AND APPLICATION NOTICE

7.1. 测量注意事项

Measurement notice

请在以下条件下测量。

Please measure under the following conditions.

7.1.1. 标准大气条件

Standard atmospheric conditions

除非另有规定，所有试验和测量应按在IEC 60068-1的5.3中规定的试验用标准大气条件下表进行。

Unless otherwise specified, all tests and measurements shall be made under standard atmospheric conditions for testing as given in 5.3 of IEC 60068-1.

温度 Temperature	相对湿度 Relative humidity	气压 Air pressure
15°C~35°C	25%~75%	86kPa~106kPa

在进行测量之前，电容器应在测量温度下存放足够时间，以使整个电容器都达到这一温度。为此目的，规定与试验后恢复时间同样的时间，通常是足够的。

Before the measurements are made, the capacitor shall be stored at the measuring temperature for a time sufficient to allow the entire capacitor to reach this temperature. The period as prescribed for recovery at the end of a test is normally sufficient for this purpose.

在标准大气条件下进行测量，其测量结果存在争议时应采用仲裁温度（见7.1.3）重复测量。

Test and measurement shall be made under standard atmospheric conditions for testing, in the event of a dispute, the measurements shall be repeated using one of the referee temperatures (as given in 7.1.3).

当按某一顺序进行试验时，一个试验的最后测量可以作为下一试验的初始测量。

When tests are conducted in a sequence, the final measurements of one test may be taken as the initial measurements for the succeeding test.

在测量期间，不应使电容器受到气流、阳光直射或可能引起误差的其他影响。

During measurements the capacitor shall not be exposed to draughts, direct sunlight or other influences likely to cause error.

7.1.2. 恢复条件

Recovery conditions

除非另有规定，恢复应在试验用标准大气条件（见7.1.1）下进行。

Unless otherwise specified recovery shall take place under the standard atmospheric conditions for testing (7.1.1).

如果恢复必须在严格控制条件下进行，应采用IEC 60068-1中5.4.1的控制条件。

If recovery under closely controlled conditions is necessary, the controlled recovery conditions of 5.4.1 of IEC 60068-1 shall be used.

除非有关规范另有规定，恢复时间应为1h~2h。

Unless otherwise specified in the relevant specification, a duration of 1 h to 2 h shall be used.

7.1.3. 仲裁条件

Referee conditions

在仲裁情况下，应选用IEC 60068-1中5.2中规定的仲裁试验用标准大气条件。

For referee purposes, one of the standard atmospheric conditions for referee tests taken from 5.2 of IEC 60068-1, as given in table 1 below, shall be selected:

温度 Temperature	相对湿度 Relative humidity	气压 Air pressure
25°C±1°C	48%~52%	86kPa~106kPa

7.2. 工作电压

Operating voltage

向电容器施加的电压切勿超过额定电压。

The voltage applied to the capacitor must not exceed the rated voltage.

电压 Voltage	直流电压 DC Voltage	直流+交流电压 DC+AC Voltage	交流电压 AC Voltage	脉冲电压 Pulse Voltage
测量位置 Positional Measurement				

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在交流电路或纹波电流电路中使用直流额定电压电容器时，请务必将外加电压的Vp-p值或包含直流偏置电压的Vo-p值维持在额定电压范围内。

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the Vp-p value of the applied voltage or the Vo-p which contains DC bias within the rated voltage range.

若向电路施加电压，开始或停止时可能会因谐振或切换产生暂时的异常电压。请务必使用额定电压范围包含这些异常电压的电容器。

When the voltage is applied to the circuit, starting or stopping may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

7.3. 过电压影响

Overvoltage effects

施加到电容器的过电压可能会导致电容器内部介质层击穿而引起电路短路。

The overvoltage applied to the capacitor may cause the dielectric layer of the capacitor to break down and cause a short circuit.

击穿前的可持续时间取决于施加电压和周围温度。

The duration before the breakdown depends on the applied voltage and the ambient temperature.

7.4. 焊锡

Soldering

当在PCB/PWB焊锡这个产品时，不要超过电容器的焊锡耐热性标准。过度的热量会使电容器内部焊锡熔化，可能导致热冲击而使陶瓷介质出现暗裂。

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specifications of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.

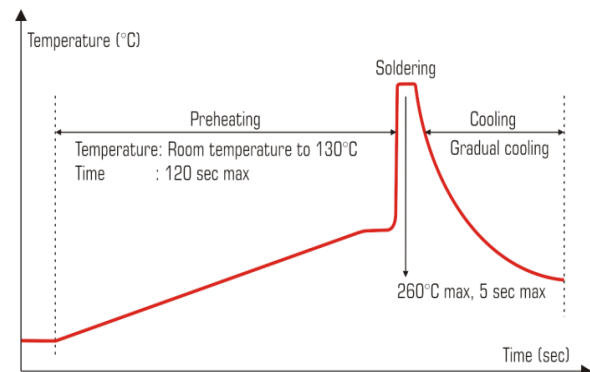


Fig.: Wave-soldering temperature-time profile to recommend

当使用烙铁进行手工焊锡时，应该遵照下列条件：

When soldering capacitor with a soldering iron, it should be performed in the following conditions.

焊锡温度：320°C最大

Temperature of iron-tip: 320 degrees C. Max.

烙铁头：不超过40W

Soldering iron wattage: 40W max.

焊锡时间：不超过3.0秒

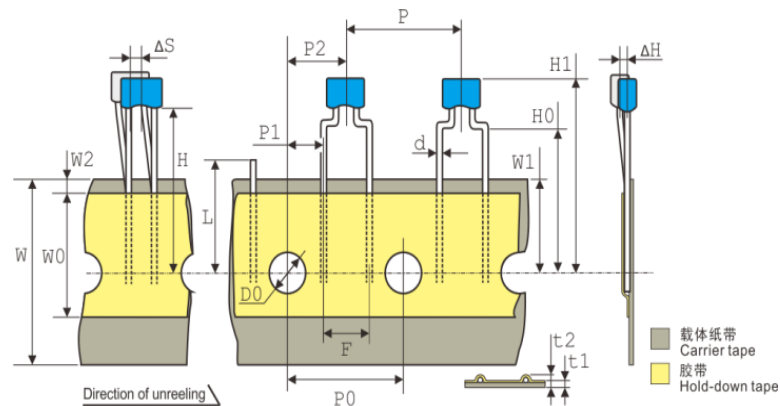
Soldering time: 3.0 sec. Max.

独石电容器规格承认书

APPROVAL SPECIFICATION FOR LEADED TYPE MLCC

8. 编带尺寸规格

TAPING SPECIFICATIONS



项目 Item	代码 Symbol	标准 (mm) Specification (mm)	备注 Remarks
导线直径 Lead-wire diameter	d	0.45±0.05	
元件间间距 Pitch of component	P	12.7±1.0	
进料孔间距 Feed hole pitch	P0	12.7±0.3	间距累积误差: 每20孔1.0mm Cumulative pitch error: 1.0mm/20 pitch
进料孔与导线垂直距离 Feed hole center to lead	P1	3.85±0.7	
进料孔与元件垂直距离 Hole center to component center	P2	6.35±1.3	
脚距 Lead-to-lead distance	F	5.0±0.8	
元件偏移 Component alignment	Δh	≤2.0	
元件沿编带偏离, 左或右 Deviation along tape, Left or right	ΔS	≤1.3	
纸带宽 Tape width	W	18.0+1.0/-0.5	
胶带宽 Hold-down tape width	W0	≥7.0	
孔位 Hole position	W1	9.0+0.75/-0.5	
胶带位置 Hole-down tape position	W2	≤3.0	
元件到纸带的高度 Height of component from tape center	直脚类型 For straight lead type	H	18.0+2/-0
	弯脚类型 For kinked lead type	H0	16.0±0.5
元件高度 Component height	H1	≤32.25	
进料孔直径 Feed hole diameter	D0	4.0±0.3	
编带厚度 Total tape thickness	t1	≤0.9	纸带厚度: 0.5±0.1mm Ground paper: 0.5±0.1mm
编带厚度 (含导线) Total thickness, tape and lead wire	t2	≤1.5	
剪切长度 Length of snipped	L	≤11.0	