

# 承认书

## APPROVAL SHEET

产品名称：多层片式陶瓷电容器

**PART NAME:** MULTILAYER CERAMIC CAPACITORS

系 列：通用系列

**Type of MLCC :** General Purpose Series (6.3V to 63V)

规 格：0201 to 1210 Sizes

**SPECIFICATION:** 0201 to 1210 Sizes

符合 RoHS 要求

**RoHS Compliance**

供应商 (SUPPLIER) : \_\_\_\_\_

发布日期 (ISSUE DATE) : \_\_\_\_\_

批准 (APPROVED BY) : \_\_\_\_\_

客户许可 (CUSTOMER APPROVAL) :

\_\_\_\_\_

**1. 概述(DESCRIPTION):**

适合厂家高密度、高效表面贴装的陶瓷电容器。To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used.

产品采用 NP0 (C0G、C0H), X7R、X7S 和 X6S 材质制作, 具有电气性能优越、精度高、稳定性高、可靠性高的特点

MLCC is made by NP0 (C0G、C0H), X7R、X7S and X6S dielectric material and which provides product with high electrical, precision, stability and reliability.

**2. 产品特点 (FEATURES):**

- a、可选尺寸范围广, 0201 至 1210 规格。A wide selection of sizes is available (0201 to 1210)
- b、给定尺寸容量高。High capacitance in given case size.

**3. 应用领域 (APPLICATIONS):**

- a、一般数字电路。For general digital circuit.
- b、电源旁路。For power supply bypass capacitors.
- c、消费电子。For consumer electronics.
- d、通讯。For telecommunication

**4. 型号规格表示方法: HOW TO ORDER**

Type of MLCC	0805	R7	104	K	500	N	T	H	J
普通型 (General): HGC	Size Inch(mm): 1005(0402),	<b>Dielectric 材质</b> R5=X5R R6=X6R S6=X6S R7=X7R S7=X7S T7=X7T R8=X8R G0=C0G H0=C0H	<b>Capacitance 电容量</b> R75=0.75pF 0R5=0.5pF 1R0=1pF 100=10pF 101=100pF 102=1000pF 103=10nF 104=100nF 105=1uF 106=10uF 107=100uF	<b>Tolerance 精度级别</b> A=±0.05pF B= ±0.1pF C=±0.25pF D= ±0.5pF F= ±1% G= ±2% J= ±5% K= ±10% L= ±15% M= ±20% S=-20%~+50%	<b>Rated voltage 额定电压</b> 4R0=4 Vdc 6R3=6.3 Vdc 100=10 Vdc 160=16 Vdc 250=25 Vdc 500=50 Vdc 101=100 Vdc 201=200 Vdc 251=250 Vdc 501=500 Vdc 631=630 Vdc 102=1k Vdc 152=1.5k Vdc 202=2k Vdc 252=2.5k Vdc 302=3k Vdc 402=4k Vdc 502=5k Vdc 602=6k Vdc	<b>Termination 端电极类型</b> N=Cu/Ni/Sn C=Cu/树脂 /Ni/Sn	<b>Packagin g 包装方式</b> T=纸带 B=散包装 S=塑胶带	<b>Symbol /Thickness (mm)</b> 高度代号 A=0.1mm B=0.2mm C=0.3mm D=0.4mm E=0.5mm F=0.6mm G=0.7mm H=0.8mm J=1.0mm L=1.2mm P=1.6mm S=1.8mm U=2.0mm V=2.5mm W=3.0mm	<b>Reel Size 卷盘尺寸</b> J=7Inch 普通宽度 D=13Inch K= 7Inch12 mm 宽度

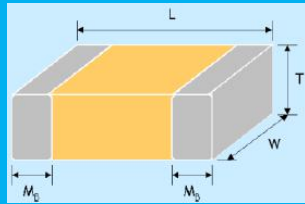
## 5. 温度系数/特性 Temperature Coefficient /Characteristics

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
COG	20°C	0±30 ppm/°C	-55°C ~ 125°C
COH	20°C	0±60 ppm/°C	-55°C ~ 125°C
X7R	20°C	±15%	-55°C ~ 125°C
X5R	20°C	±15%	-55°C ~ 85°C
X7S	20°C	±22%	-55°C ~ 125°C
X6S	20°C	±22%	-55°C ~ 105°C

备注：I 类电容器标称温度系数和允许偏差是采用温度在 20°C 和 85°C 之间的电容量变化来确定的，而 II 类电容器标称温度系数是按照工作范围之间的电容量相对 20°C 的电容量变化来确定的。

Note: Nominal temperature coefficient and allowed tolerance of class I are decided by the changing of the capacitance between 20°C and 85°C. Nominal temperature coefficient of class II are decided by the temperature of 20°C.

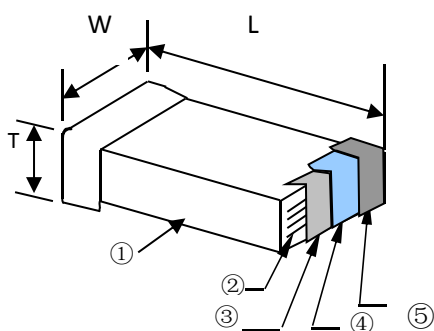
## 6. 产品外围尺寸及内部结构 EXTERNAL DIMENSIONS AND STRUCTURE

外观 Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Soldering Method*	MB(mm)
	0201 (0603)	0.60±0.05	0.30±0.05	0.30±0.05 C	R	0.15 ±0.05
	0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05 E	R	0.25 +0.05/-0.10
		1.00±0.20	0.50±0.20	0.50±0.20 E	R	
	0603 (1608)	1.60±0.20	0.80±0.20	0.80±0.20 H	R / W	0.40±0.15
	0805 (2012)	2.00±0.20	1.25±0.20	0.70±0.10 G	R / W	0.50±0.20
				0.80±0.10 H		
				1.20±0.20 L	R	
	1206 (3216)	3.20±0.20	1.60±0.20	0.70±0.10 G	R / W	0.60±0.20
				0.80±0.10 H		
				1.0±0.10 J	R	
1.20±0.2 L						
1210 (3225)	3.20±0.30	2.50±0.20	1.60±0.20 P	R	0.75±0.25	
			1.20±0.10 L			
			2.00±0.20 U			
			2.50±0.30 V			

说明：R=Reflow Soldering 回流焊

W=Wave Soldering 波峰焊

**结构 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

**7、包装标准数量 PACKAGING STANDARD QUANTITY**

Size 尺寸	Thickness (mm)/Symbol 厚度/符号		Paper tape 纸带	Plastic Tape 胶带
			7"reel	7"reel
0201 (0603)	0.30±0.03	C	15,000	
0402 (1005)	0.50±0.05	E	10,000	
	0.50±0.20	E	10,000	
0603 (1608)	0.80±0.1	H	4000	
	0.70±0.10	G	4000	
0805 (2012)	0.80±0.10	H	4000	
	1.20±0.20	L	4000	3000
	0.70±0.10	H	4000	
1206 (3216)	0.80±0.10	H	4000	
	1.0±0.10	J		3000
	1.20±0.10	L		3000
	1.60±0.20	P		2000
1210 (3225)	1.20±0.10	L		3000
	1.60±0.20	P		2000
	2.00±0.20	U		1000
	2.50±0.30	V		1000



## 8、容量范围及其电压 Capacitance Range and rating Voltage

### 8-1 C0G、C0H Dielectric

Dielectric (尺寸)Size 额定电压 Rated Voltage (VDC)	C0G、C0H								
	0201	0402	0603	0805		1206		1210	
	10 16 25 50	10 16 25 50	10 16 25 50	10 16	25 50	10 16	25 50	10 16	25 50
0.3pF (0R3)	C	E	H						
0.4pF (0R4)	C	E	H						
0.5pF (0R5)	C	E	H	G	G				
0.6pF (0R6)	C	E	H	G	G				
0.7pF (0R7)	C	E	H	G	G				
0.8pF (0R8)	C	E	H	G	G				
0.9pF (0R9)	C	E	H	G	G				
1.0pF (1R0)	C	E	H	G	G				
1.2pF (1R2)	C	E	H	G	G	G	G		
1.5pF (1R5)	C	E	H	G	G	G	G		
1.8pF (1R8)	C	E	H	G	G	G	G		
2.0pF (2R0)	C	E	H	G	G	G	G		
2.2pF (2R2)	C	E	H	G	G	G	G		
2.7pF (2R7)	C	E	H	G	G	G	G		
3.0pF (3R0)	C	E	H	G	G	G	G		
3.3pF (3R3)	C	E	H	G	G	G	G		
3.9pF (3R9)	C	E	H	G	G	G	G		
4.0pF (4R0)	C	E	H	G	G	G	G		
4.7pF (4R7)	C	E	H	G	G	G	G		
5.0pF (5R0)	C	E	H	G	G	G	G		
5.6pF (5R6)	C	E	H	G	G	G	G		
6.0pF (6R0)	C	E	H	G	G	G	G		
6.8pF (6R8)	C	E	H	G	G	G	G		
7.0pF (7R0)	C	E	H	G	G	G	G		
8.0pF (8R0)	C	E	H	G	G	G	G		
8.2pF (8R2)	C	E	H	G	G	G	G		
9.0pF (9R0)	C	E	H	G	G	G	G		
10pF (100)	C	E	H	G	G	G	G	J	J
12pF (120)	C	E	H	G	G	G	G	J	J
15pF (150)	C	E	H	G	G	G	G	J	J
18pF (180)	C	E	H	G	G	G	G	J	J
22pF (220)	C	E	H	G	G	G	G	J	J
27pF (270)	C	E	H	G	G	G	G	J	J
33pF (330)	C	E	H	G	G	G	G	J	J
39pF (390)	C	E	H	G	G	G	G	J	J
47pF (470)	C	E	H	G	G	G	G	J	J
56pF (560)	C	E	H	G	G	G	G	J	J
68pF (680)	C	E	H	G	G	G	G	J	J
82pF (820)	C	E	H	G	G	G	G	J	J
100pF (101)	C	E	H	G	G	G	G	J	J
120pF (121)		E	H	G	G	G	G	J	J
150pF (151)		E	H	G	G	G	G	J	J
180pF (181)		E	H	G	G	G	G	J	J
220pF (221)		E	H	G	G	G	G	J	J
270pF (271)		E	H	G	G	G	G	J	J
330pF (331)		E	H	G	G	G	G	J	J
390pF (391)		E	H	G	G	G	G	J	J
470pF (471)		E	H	G	G	G	G	J	J
560pF (561)		E	H	G	G	G	G	J	J
680pF (681)		E	H	G	G	G	G	J	J
820pF (821)		E	H	G	G	G	G	J	J
1,000pF (102)		E	H	G	G	G	G	J	J
1,200pF (122)			H	G	G	G	G	J	J
1,500pF (152)			H	G	G	G	G	J	J
1,800pF (182)			H	G	G	G	G	J	J
2,200pF (222)			H	G	G	G	G	J	J
2,700pF (272)				H	H	G	G	J	J
3,300pF (332)				H	H	G	G	J	J
3,900pF (392)				H	H	G	G	J	J
4,700pF (472)				H	H	G	G	J	J
5,600pF (562)				L	L	L	L	J	J
6,800pF (682)				L	L	L	L	J	J
8,200pF (822)				L	L	L	L	J	J
0.010uF (103)				L	L	L	L	J	J
0.012uF (123)						P	P	L	L
0.015uF (153)						P	P	L	L
0.018uF (183)						P	P	U	U
0.022uF (223)						P	P	U	U
0.027uF (273)						P	P	U	U
0.033uF (333)						P	P	U	U
0.039uF (393)						P	P	U	U
0.047uF (473)						P	P	U	U
0.056uF (563)						P	P	U	U
0.068uF (683)						P	P	U	U
0.082uF (823)						P	P	U	U
0.10uF (104)						P	P	U	U



8-2 X7R Dielectric

Dielectric		X7R																	
Size	0201			0402			0603			0805			1206			1210			
Rated Voltage (VLC)	6.3 10	16 25	50	6.3 10	16 25	50	6.3 10 16	25	50	6.3 10 16	25	50	6.3 10 16	25	50	10	16	25	50
capacitance	100pF(101)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	120pF(121)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	150pF(151)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	180pF(181)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	220pF(221)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	270pF(271)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	330pF(331)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	390pF(391)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	470pF(471)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	560pF(561)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	680pF(681)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	820pF(821)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	1,000pF(102)	C	C	C	E	E	E	H	H	H	H	H	H	H	H				
	1,200pF(122)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	1,500pF(152)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	1,800pF(182)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	2,200pF(222)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	2,700pF(272)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	3,300pF(332)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	3,900pF(392)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	4,700pF(472)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	5,600pF(562)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	6,800pF(682)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	8,200pF(822)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	0.010uF(103)	C	C		E	E	E	H	H	H	H	H	H	H	H				
	0.012uF(123)				E	E	E	H	H	H	H	H	H	H	H				
	0.015uF(153)				E	E	E	H	H	H	H	H	H	H	H				
	0.018uF(183)				E	E	E	H	H	H	H	H	H	H	H				
	0.022uF(223)				E	E	E	H	H	H	H	H	H	H	H				
	0.027uF(273)				E	E		H	H	H	H	H	H	H	H				
	0.033uF(333)				E	E		H	H	H	H	H	H	H	H				
	0.039uF(393)				E	E		H	H	H	H	H	H	H	H				
	0.047uF(473)				E	E		H	H	H	H	H	H	H	H				
	0.056uF(563)				E	E		H	H	H	H	H	H	H	H				
	0.068uF(683)				E	E		H	H	H	H	H	H	H	H				
	0.082uF(823)				E	E		H	H	H	H	H	H	H	H	J	J	J	J
	0.10uF(104)				E	E		H	H	H	H	H	H	H	H	J	J	J	J
	0.12uF(124)							H	H	H	H	H	H	H	H	J	J	J	J
	0.15uF(154)							H	H	H	H	H	H	H	J	J	J	J	J
	0.18uF(184)							H	H	H	H	H	H	H	J	J	J	J	J
	0.22uF(224)				E			H	H	H	H	H	H	H	J	J	J	J	J
	0.27uF(274)							H	H	H	H	H	H	H	J	L	J	J	J
	0.33uF(334)							H	H	H	H	H	H	H	J	L	J	J	L
	0.39uF(394)							H	H	H	H	H	H	H	L	P	J	J	L
	0.47uF(474)							H	H	H	L	L	L	H	L	P	J	J	L
	0.56uF(564)							H	H	H	L	L	L	H	L	P	L	L	L
	0.68uF(684)							H	H	H	L	L	L	H	L	P	L	L	L
0.82uF(824)							H	H	H	L	L	L	H	L	P	L	L	L	
1.0uF(105)							H	H	H	L	L	L	L	L	P	L	L	L	
1.5uF(155)										L	L	L	L	P			P	V	
2.2uF(225)							H			L	L	L	L	P	P		P	V	
3.3uF(335)										L	L		P	P			P	V	
4.7uF(475)										L	L	L	P	P	P	U	U	V	
6.8uF(685)										L			P						
10uF(106)										L			P	P		U	U	V	
22uF(226)																V	V	V	
47uF(476)																V			



8-3 X7S Dielectric

Dielectric		X7S																						
Size		0402				0603				0805					1206					1210				
Rated Voltage (VDC)		6.3	10	16	25	6.3	10	16	25	10	16	25	50	100	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	1.0uF (105)		E											L										
	1.5uF (155)																							
	2.2uF (225)	E	E			H		H	H															
	3.3uF (335)																							
	4.7uF (475)					H	H	H					L											
	6.8uF (685)																							
	10uF (106)										L	L												
	22uF (226)														P		P							
	47uF (476)														P						V		V	
	100uF (107)																			V				

8-4 X5R Dielectric

Dielectric		X5R																																				
Size		0201					0402					0603					0805					1206					1210											
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	4	6.3	10	16	25	50	
Capacitance	100pF(101)	C	C	C	C	C																																
	220pF(221)	C	C	C	C	C																																
	470pF(471)	C	C	C	C	C																																
	1,000pF(102)	C	C	C	C	C																																
	2,200pF(222)	C	C	C	C	C																																
	4,700pF(472)	C	C	C	C	C																																
	0.010uF(103)	C	C	C	C	C																																
	0.027uF(273)	C	C	C	C					E																												
	0.033uF(333)	C	C	C	C					E																												
	0.039uF(393)	C	C	C	C					E																												
	0.047uF(473)	C	C	C	C					E																												
	0.056uF(563)	C	C	C	C				E	E																												
	0.068uF(683)	C	C	C	C				E	E																												
	0.082uF(823)	C	C	C	C				E	E																												
	0.10uF(104)	C	C	C	C		E	E	E	E	E																											
	0.15uF(154)	C	C	C			E	E	E	E																												
	0.22uF(224)	C	C	C			E	E	E	E	E				H	H	H																					
	0.27uF(274)	C	C	C											H	H																						
	0.33uF(334)	C	C	C			E	E							H	H																						
	0.39uF(394)	C	C												H	H																						
	0.47uF(474)	C	C				E	E	E	E	E	H	H	H	H	H																						
	0.68uF(684)	C					E	E				H	H	H	H																							
	0.82uF(824)	C										H	H	H	H																							
	1.0uF(105)	C					E	E	E	E		H	H	H	H	H					L	L																
	1.5uF(155)																			L	L															U		
	2.2uF(225)											H	H	H	H	H	L	L	L	L	L				L	P	P									U		
	3.3uF(335)											H	H	H	H		L	L	L	L					P	P	P											
	4.7uF(475)						E	E	E			H	H	H	H		L	L	L	L	L				P	P	P									U	U	V
	6.8uF(685)																								P	P												
	10uF(106)						E					H	H	H			L	L	L	L					P	P	P									U	U	V
22uF(226)											H	H				L	L	L						P	P	P									V	V	V	
47uF(476)																L								P	P	P									V	V	V	
100uF(107)																								P											V	V		
220uF(227)																																			V	V		



**8-5 X6S Dielectric**

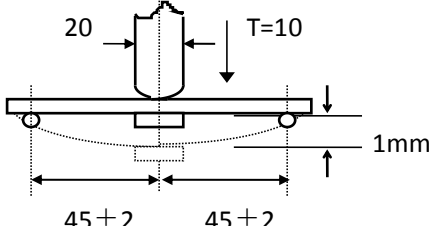
Dielectric		X6S																								
Size		0402				0603					0805					1206					1210					
Rated Voltage (VDC)		6.3	10	16	25	4	6.3	10	16	25	4	6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
Capacitance	0.10uF(104)																									
	0.15uF(154)																									
	0.22uF(224)																									
	0.33uF(334)																									
	0.39uF(394)																									
	0.47uF(474)	E																								
	0.68uF(684)																									
	1.0uF(105)	E	E	E	E																					
	1.5uF(155)																									
	2.2uF(225)	E	E	E					H	H																
	3.3uF(335)																									
	4.7uF(475)	E					H	H	H	H					L	L										
	6.8uF(685)																									
	10uF(106)	E					H	H	H		L	L	L	L	L					P	P	V			V	V
	22uF(226)					H	H					L	L	L	L			P	P	P					V	V
47uF(476)										L	L					P	P				V	V	V			
100uF(107)																P					V	V				



**9、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	I类 Class I	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
			$\leq 1000\text{pF}$	$1\text{MHz} \pm 10\%$	$1.0 \pm 0.2\text{Vrms}$
			$> 1000\text{pF}$	$1\text{KHz} \pm 10\%$	
	II类 Class II	应符合指定的误差级别 Should be within the specified tolerance.	测试温度: $25^\circ\text{C} \pm 3^\circ\text{C}$ Test Temperature: $25^\circ\text{C} \pm 3^\circ\text{C}$ $C \leq 10\mu\text{F}$ : 测试频率: $1\text{KHz} \pm 10\%$ 测试电压: $1.0 \pm 0.2\text{Vrms}$ Test Frequency: $1\text{KHz} \pm 10\%$ Test Voltage: $1.0 \pm 0.2\text{Vrms}$ $C > 10\mu\text{F}$ X7R、X5R、X7S、X6S 测试频率: $120 \pm 24\text{Hz}$ 测试电压: $0.5 \pm 0.1\text{Vrms}$ Test Frequency: $120 \pm 24\text{Hz}$ Test Voltage: $0.5 \pm 0.1\text{Vrms}$		
损耗角正切 (DF, $\tan \delta$ ) Dissipation Factor	I类 Class I	DF	标称容量 Capacitance	测试频率 Measuring Frequency	测试电压 Measuring Voltage
		$\leq 0.56\%$	$C_r < 5\text{pF}$	$1\text{MHz} \pm 10\%$	$1.0 \pm 0.2\text{Vrms}$
		$1.5[(150/C_r)+7] \times 10^{-4}$	$5\text{pF} \leq C_r < 50\text{pF}$	$1\text{MHz} \pm 10\%$	
		$\leq 0.15\%$	$50\text{pF} \leq C_r \leq 1000\text{pF}$	$1\text{MHz} \pm 10\%$	
		$\leq 0.15\%$	$> 1000\text{pF}$	$1\text{KHz} \pm 10\%$	

项目 Item	技术规格 Technical Specification				测试方法 Test Method and Remarks				
			≥50V	25V	16V	10V	6.3V		
损耗角正切 (DF, tan δ) Dissipation Factor	II类 Class II	X7R/X5R X7S/X6S (≥ 0402)	≤ 2.5% (C < 1.0μF)	≤ 3.5% (C < 0.47μF)	≤ 3.5% (C < 0.47μF)	≤ 5.0% (C < 0.15μF)	≤ 5.0% (C < 0.15μF)	C ≤ 10μF 测试频率: 1KHz ± 10% 测试电压: 1.0 ± 0.2Vrms Test Frequency: 1KHz ± 10% Test Voltage: 1.0 ± 0.2Vrms	
		X7R/X5R X7S/X6S (< 0402)	≤ 3.5%	≤ 5.0%	≤ 5.0% (C < 0.047μF)	≤ 7.5% (C < 0.047μF)	≤ 7.5% (C < 0.047μF)	C > 10μF X7R、X5R、X7S、 X6S、测试频率: 120 ± 24 Hz 测试电压: 0.5 ± 0.1Vrms Test Frequency: 120 ± 24 Hz Test Voltage: 0.5 ± 0.1Vrms	
绝缘电阻 (IR) Insulation Resistance	I类 Class I	C ≤ 10 nF, Ri ≥ 50000M Ω C > 10 nF, Ri • Cr ≥ 500S				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°C ± 3°C 测试充放电电流: ≤ 50mA Measuring Voltage: Rated Voltage Duration: 60 ± 5s Test Humidity: ≤ 75% Test Temperature: 25°C ± 3°C Test Current: ≤ 50mA			
	II类 Class II	X7R/X5R/X7S/X6S	C ≤ 25 nF, Ri ≥ 10000M Ω C > 25 nF, Ri • Cr > 100S						
介质耐电强度 (DWM) 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 II类: 250% 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 Class II :250% Rated voltage Duration: 1~5s Charge/ Discharge Current: 50mA max.		

项目 Item	技术规格 Technical Specification		测试方法 Test Method and Remarks
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°C 的温度下预热 10~30 秒。 Preheating conditions: 80 to 120°C; 10~30s.
			有铅焊料: (Sn/Pb: 63/37) 无铅焊料: 浸锡温度: 235 ± 5°C 浸锡温度: 245 ± 5°C 浸锡时间: 2 ± 0.5s 浸锡时间: 2 ± 0.5s Solder Temperature: 235 ± 5°C Solder Temperature: 245 ± 5°C Duration: 2 ± 0.5s Duration: 2 ± 0.5s
耐焊接热 Resistance to Soldering Heat	项目 Item	NPO(COG、COH) X7R/X5R/X7S/X6S	将电容在 100~200°C 的温度下预热 10 ± 1 分钟。 浸锡温度: 265 ± 5°C 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°C; 10 ± 1min. Solder Temperature: 265 ± 5°C Duration: 10 ± 1s Clean the capacitor with solvent and examine it with a 10X(min.) microscope. Recovery Time: 24 ± 2h Recovery condition: Room temperature
	ΔC/C	≤ ± 0.5% -5%~+10%	
	DF	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)	Δ C/C	≤ ± 10%	外观: 无可见损伤。 Appearance: No visible damage.
			试验基板: Al <sub>2</sub> O <sub>3</sub> 或 PCB 弯曲深度: 1mm 施压速度: 0.5mm/sec. 单位: mm 应在弯曲状态下进行测量。  Test Board: Al <sub>2</sub> O <sub>3</sub> or PCB Warp: 1mm Speed: 0.5mm/sec. Unit: mm The measurement should be made with the board in the bending position.
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	<p><math>\Delta C/C</math>:</p> <p>I类: <math>\leq \pm 1\%</math>或<math>\pm 1pF</math>, 取两者中最大者</p> <p>II类: X7R,X5R,X7S,X6S: <math>\leq \pm 10\%</math></p> <p>Class I: <math>\leq \pm 1\%</math> or <math>\pm 1pF</math>, whichever is larger.</p> <p>Class II: X7R,X5R,X7S,X6S: <math>\leq \pm 10\%</math></p>	<p>预处理* (2类): 上限类别温度, 1小时 恢复: <math>24 \pm 1h</math></p> <p>初始测量</p> <p>循环次数: 5次, 一个循环分以下4步:</p> <table border="1" data-bbox="852 501 1402 835"> <thead> <tr> <th>阶段</th> <th>温度 (°C)</th> <th>时间(分钟)</th> </tr> </thead> <tbody> <tr> <td>第1步</td> <td>下限温度(-55)</td> <td>30</td> </tr> <tr> <td>第2步</td> <td>常温 (+20)</td> <td>2~3</td> </tr> <tr> <td>第3步</td> <td>上限温度 (X7R、X7S: +125) (X5R: +85) (X6S: +105)</td> <td>30</td> </tr> <tr> <td>第4步</td> <td>常温 (+20)</td> <td>2~3</td> </tr> </tbody> </table> <p>试验后放置(恢复)时间: <math>24 \pm 2h</math></p> <p>Preheating conditions: up-category temperature, 1h Recovery time: <math>24 \pm 1h</math></p> <p>Initial Measurement</p> <p>Cycling Times: 5 times, 1 cycle, 4 steps:</p> <table border="1" data-bbox="852 1025 1426 1227"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Time(min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Low-category temp. (-55)</td> <td>30</td> </tr> <tr> <td>2</td> <td>Normal temp. (+20)</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Up-category temp. (+125)</td> <td>30</td> </tr> <tr> <td>4</td> <td>Normal temp. (+20)</td> <td>2~3</td> </tr> </tbody> </table> <p>Recovery time after test: <math>24 \pm 2h</math></p>	阶段	温度 (°C)	时间(分钟)	第1步	下限温度(-55)	30	第2步	常温 (+20)	2~3	第3步	上限温度 (X7R、X7S: +125) (X5R: +85) (X6S: +105)	30	第4步	常温 (+20)	2~3	Step	Temperature (°C)	Time(min.)	1	Low-category temp. (-55)	30	2	Normal temp. (+20)	2~3	3	Up-category temp. (+125)	30	4	Normal temp. (+20)	2~3
阶段	温度 (°C)	时间(分钟)																														
第1步	下限温度(-55)	30																														
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2	Normal temp. (+20)	2~3																														
3	Up-category temp. (+125)	30																														
4	Normal temp. (+20)	2~3																														
潮湿试验 Moisture Resistance	<p><math>\Delta C/C</math></p> <p>I类: <math>\leq \pm 2\%</math>或<math>\pm 1pF</math>, 取两者之中较大者</p> <p>II类: X7R,X5R,X7S,X6S: <math>\leq \pm 10\%</math></p> <p>Class I: <math>\leq \pm 2\%</math> or <math>\pm 1pF</math>, whichever is larger.</p> <p>Class II: X7R,X5R,X7S,X6S: <math>\leq \pm 10\%</math></p> <p>DF</p> <p><math>\leq 2</math> 倍初始标准 Not more than twice of initial value.</p> <p>IR</p> <p>I类: <math>R_i \geq 2500M \Omega</math> 或 <math>R_i \cdot C_r \geq 25S</math> 取两者之中较小者.</p> <p>Class I: <math>R_i \geq 2500M \Omega</math> 或 <math>R_i \cdot C_r \geq 25S</math> whichever is smaller.</p> <p>II类: <math>R_i \geq 1000M \Omega</math> 或 <math>R_i \cdot C_r \geq 25S</math> 取两者之中较小者.</p> <p>Class II: <math>R_i \geq 1000M \Omega</math> 或 <math>R_i \cdot C_r \geq 25S</math> whichever is smaller.</p> <p>外观: 无损伤 Appearance: No visible damage.</p>	<p>温度: <math>40 \pm 2^\circ C</math></p> <p>湿度: 90~95%RH</p> <p>时间: 500小时</p> <p>放置条件: 室温</p> <p>放置时间: 24小时(I类); 48小时(II类)</p> <p>Temperature: <math>40 \pm 2^\circ C</math></p> <p>Humidity: 90~95%RH</p> <p>Duration: 500h</p> <p>Recovery conditions: Room temperature</p> <p>Recovery Time: 24h (Class1) or 48h (Class2)</p>																														

项目 Item	技术规格 Technical Specification		测试方法 Test Method and Remarks
寿命试验 Life Test	$\Delta C/C$	I类: $\leq \pm 2\%$ 或 $\pm 1pF$ 取两者之中较大者 II类: X7R,X5R,X7S,X6S: $\leq \pm 20\%$ Class I : $\leq \pm 2\%$ or $\pm 1pF$ , whichever is larger. Class II : X7R,X5R,X7S,X6S: $\leq \pm 20\%$	低压产品 ( $<100V$ ) 电压: 1.5 倍额定工作电压 时间: 1000 小时 温度: $125^{\circ}C$ (NPO(COG、COH)、X7R、X7S) $85^{\circ}C$ (X5R) $105^{\circ}C$ (X6S) 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: $1.5 \times$ Rated Voltage Duration: 1000h Temperature: $125^{\circ}C$ (NPO(COG、COH)、X7R、X7S) $85^{\circ}C$ (X5R) $105^{\circ}C$ (X6S) Charge/ Discharge Current: 50mA max. Recovery Conditions: Room Temperature Recovery Time: 24h (Class 1), or 48h (Class2)
	DF	$\leq 2$ 倍初始标准 Not more than twice of initial value.	
	IR	I类: $R_i \geq 4000M \Omega$ 或 $R_i \cdot C_R \geq 40S$ 取两者之中较小者. Class I : $R_i \geq 4000M \Omega$ 或 $R_i \cdot C_R \geq 40S$ whichever is smaller.	
		II类: $R_i \geq 2000M \Omega$ 或 $R_i \cdot C_R \geq 50S$ 取两者之中较小者. Class II : $R_i \geq 2000M \Omega$ 或 $R_i \cdot C_R \geq 50S$ whichever is smaller.	
外观: 无损伤 Visual Appearance: No visible damage.			

**备注(Remark):**

1、预处理\* (仅对 2 类电容器):

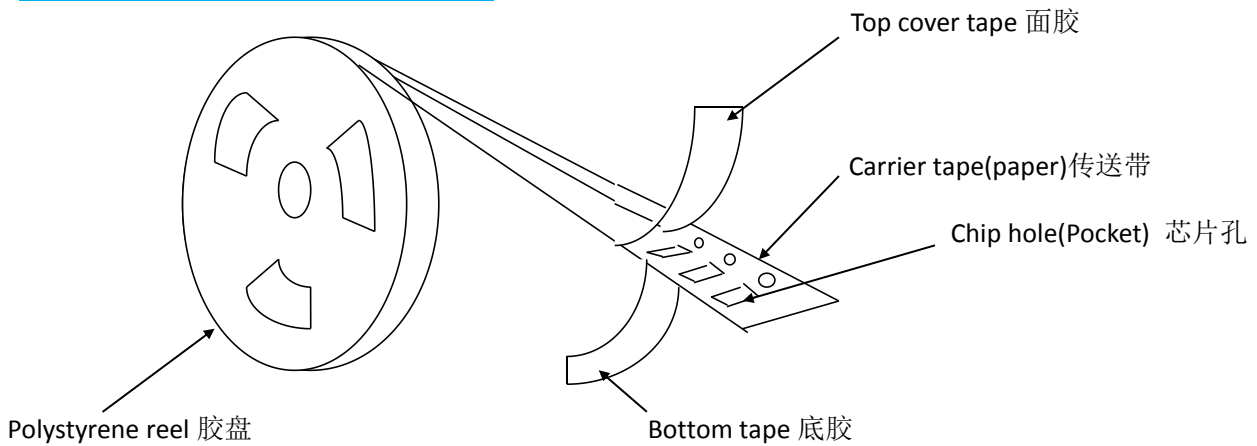
将电容器放在上限类别温度或按详细规范中可能规定的更高温度 ( $150^{\circ}C$ ) 下经 1h 后, 接着在试验的标准大气条件下恢复  $24 \pm 1h$ 。

Note: Pretreatment (only for class2 capacitor)

Pretreatment (only for class2 capacitor) is a method to treat the capacitor before measurement. First, place the capacitor in the up-category temperature or other specified higher temperature environment ( $150^{\circ}C$ ) for 1hour. Then recovery the capacitor at standard pressure conditions for  $24 \pm 1$ hours。

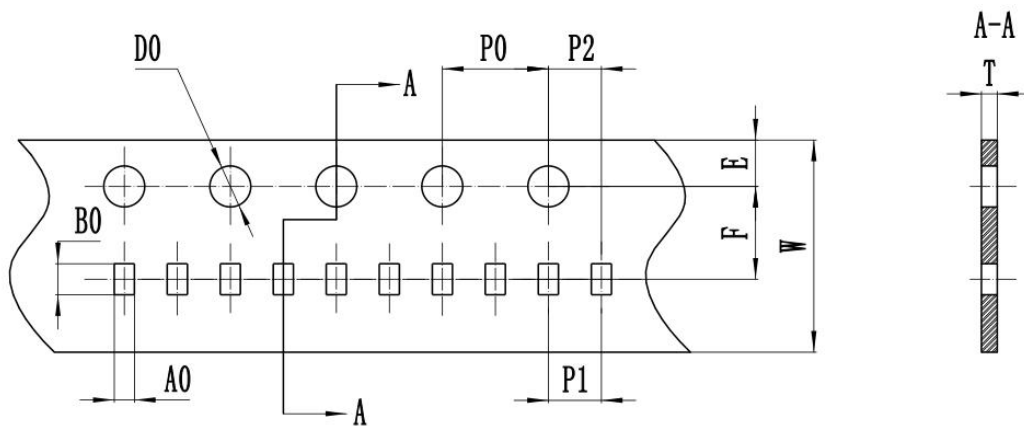
## 10、包装 PACKAGE

### 10-1 纸带卷盘结构 PAPER TAPING



#### 0201、0402 纸带编带尺寸大小

Dimensions of paper taping for 0201、0402 type



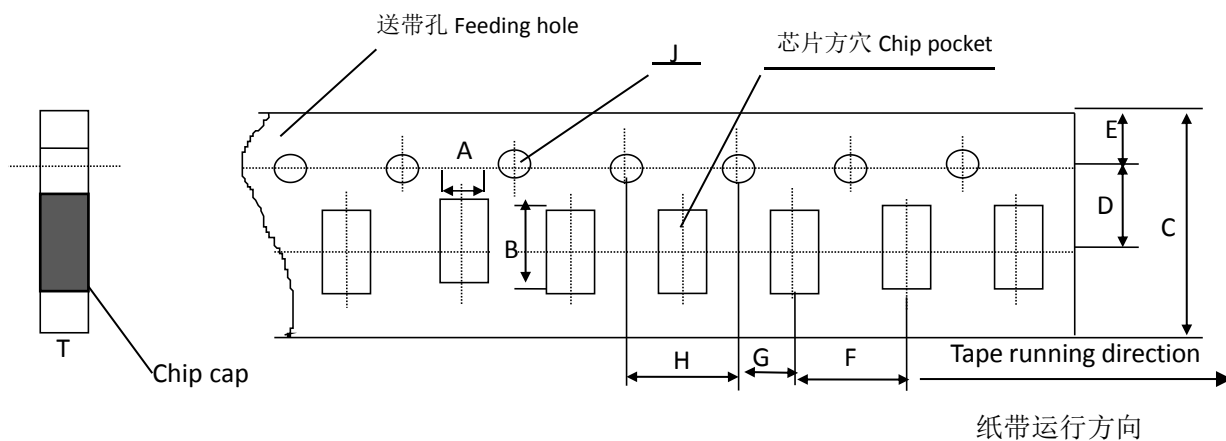
代号 Code	A0	B0	W	F*	E	P1	P2*	P0	D0	T
0201	0.37±	0.67±	8.00±	3.50±	1.75±	2.00±	2.00±	4.00±	1.50	0.80
	0.10	0.10	0.10	0.05	0.10	0.05	0.05	0.10	-0/+0.10	Below
0402	0.65±	1.15±	8.00±	3.50±	1.75±	2.00±	2.00±	4.00±	1.50	0.80
	0.10	0.10	0.10	0.05	0.10	0.05	0.05	0.10	-0/+0.10	Below

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.

**0603, 0805, 1206' 常规尺寸产品的纸带尺寸**

Dimensions of paper taping for 0603, 0805, 1206 types.



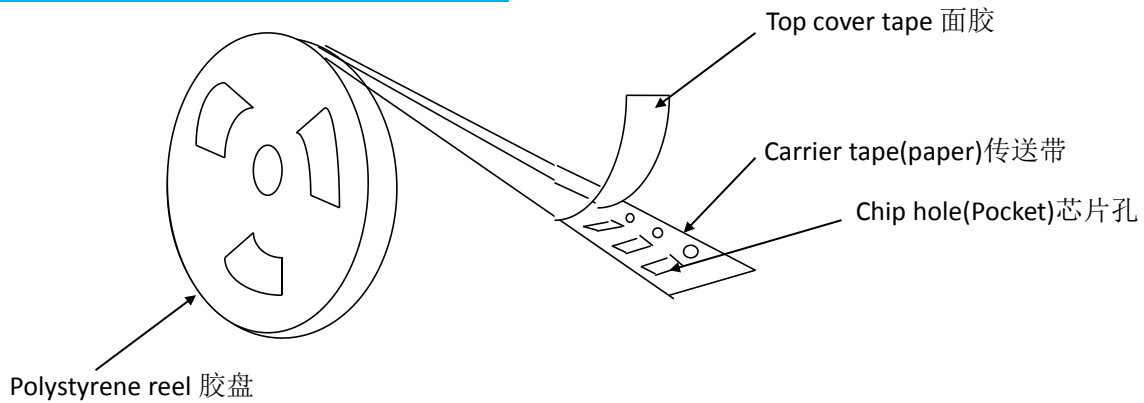
Unit: mm

代号 Code 纸带规格 papersize	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
1206	1.80 ±0.20	3.40 ±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	1.10 Max

注意: \*表示此处对尺寸的要求非常精确。

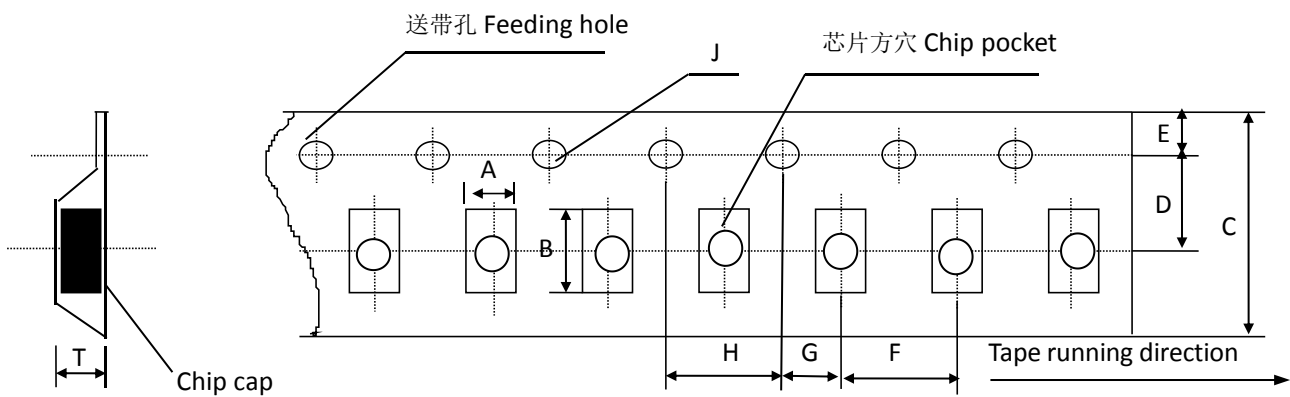
Note: The place with "\*" means where needs exactly dimensions.

**10-2 塑胶卷盘结构 EMBOSSED TAPING**



**塑胶带尺寸结构(适合‘0805~1812’型产品)**

Dimensions of embossed taping for 0805~1812 type



塑胶带传送方向

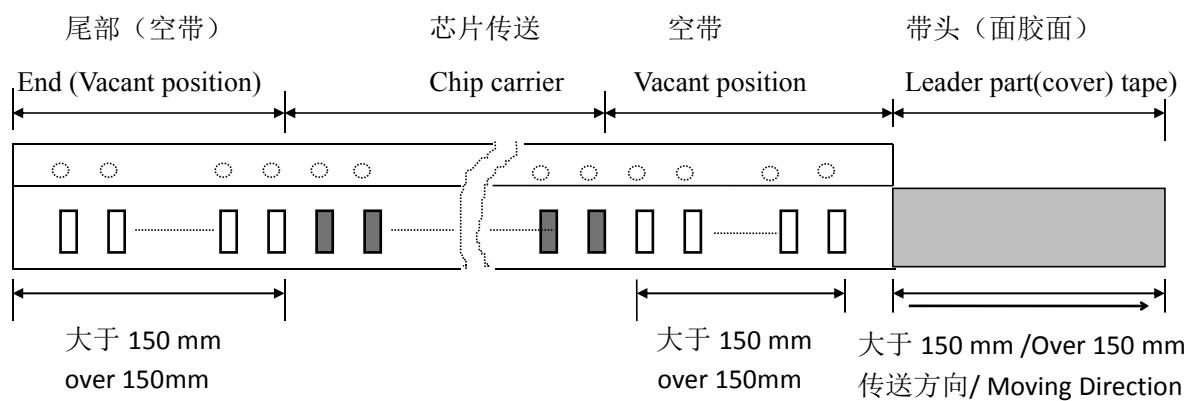
代号 Code 规格 Tapesize	A	B	C	D*	E	F	G*	H	J	T
0805	1.55 ± 0.20	2.35 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.10	1.50 -0/+0.10	1.50 Max
1206	1.95 ± 0.20	3.60 ± 0.20	8.00 ± 0.20	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10	2.00 ± 0.10	4.00 ± 0.1	1.50 -0/+0.10	1.85 Max
1210	2.70 ± 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。

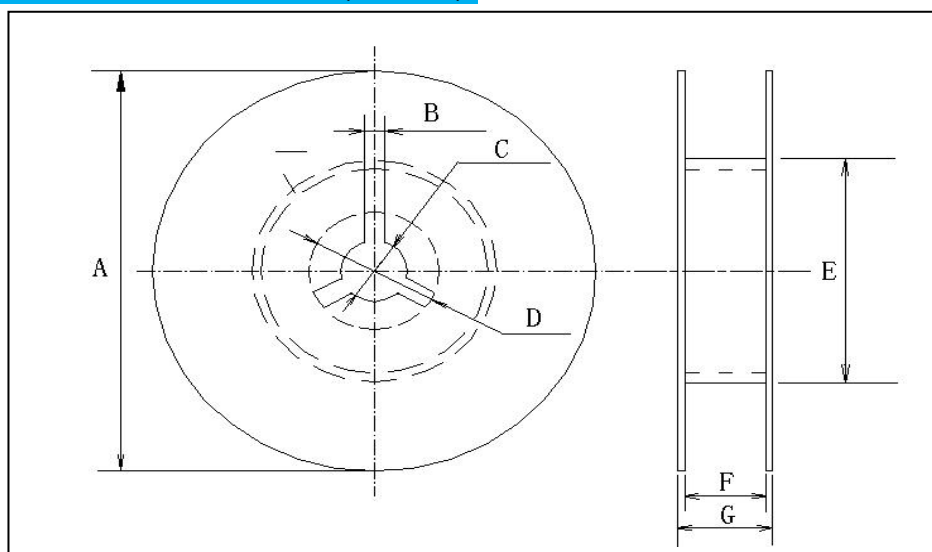
Note: The place with "\*" means where needs exactly dimensions.



**10-3 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)**



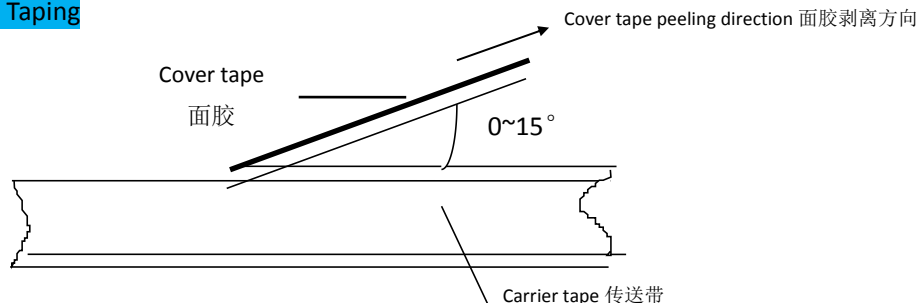
**尺寸代码 (CODE)**

卷盘型号	A	B	C	D	E	F	G
7 REEL	$\phi 178 \pm 2.0$	3.0	$\phi 13 \pm 0.5$	$\phi 21 \pm 0.8$	$\phi 50$ 或更大 $\phi 50$ or more	$100 \pm 1.5$	12max
13' REEL	$\phi 330 \pm 2.0$	3.0	$\phi 13 \pm 0.5$	$\phi 21 \pm 0.8$	$\phi 50$ 或更大 $\phi 50$ or more	$100 \pm 1.5$	12max

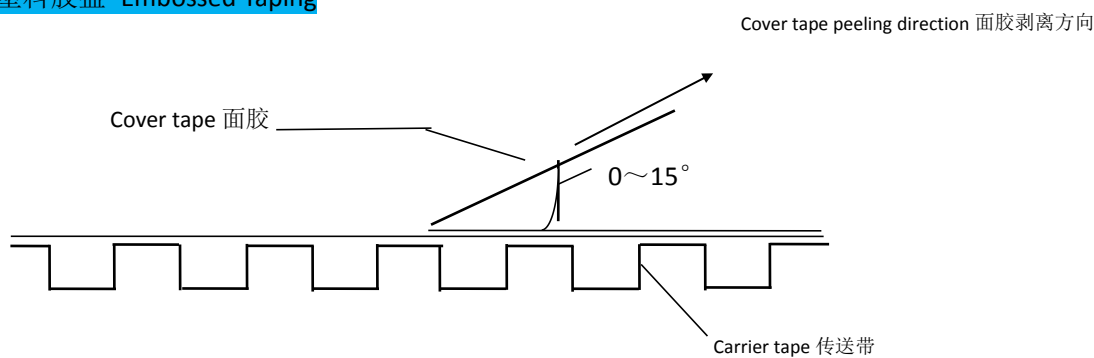
### 10-4 卷带的说明 Taping specification

面胶剥离强度 Top tape peeling strength

#### (a) 纸带 Paper Taping



#### (b) 塑料胶盘 Embossed Taping



标准:  $0.1N < \text{剥离强度} < 0.7N$

Standard:  $0.1N < \text{peeling strength} < 0.7N$

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.

### 11、储存方法 Storage Methods

确保芯片可焊性良好的贮存期限为 6 个月(在包装好已交付的情况下)。

The guaranteed period for solderability is 6 months (Under deliver package condition).

储存条件/Storage conditions:

储存温度/Temperature  $5^{\circ}\text{C} \sim 40^{\circ}\text{C}$

储存相对湿度/Relative Humidity 20%~70%

### 12、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,所以在使用的時候,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.

### 12-1. 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).

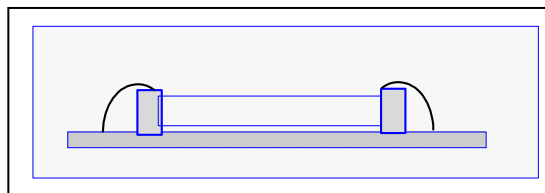
### 12-2. 手工焊接 Manual Soldering

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.

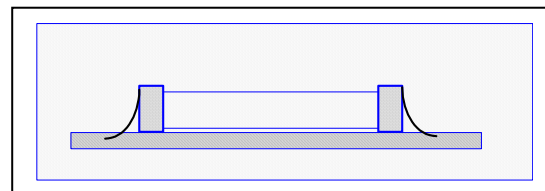
### 12-3. 适量的焊料 Optimum Solder Amount for Reflow Soldering

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

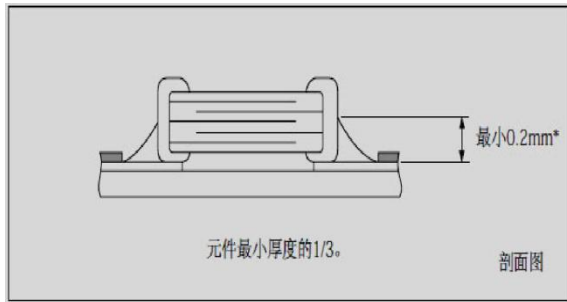


固定力量不足,可能会引起电容芯片与线路接触不良  
Weak holding force may cause bad connection between the capacitor and PCB.

## 12-4. 推荐焊料用量 Recommended Soldering amounts

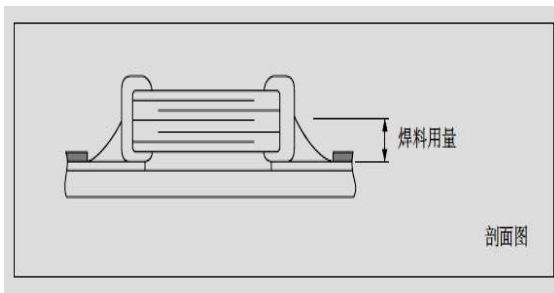
### 12-4.1 回流焊接的最佳焊料用量

The optimal solder fillet amounts for re-flow soldering



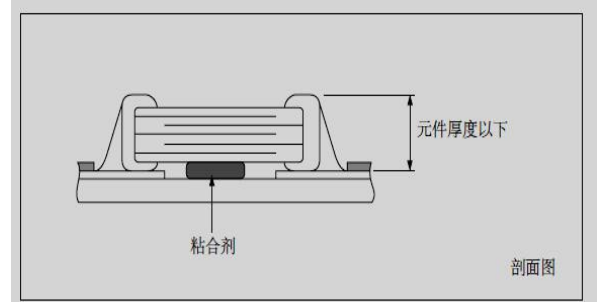
### 12-4.3 使用烙铁返修时的最佳焊料量

The optimal solder fillet amounts for rework



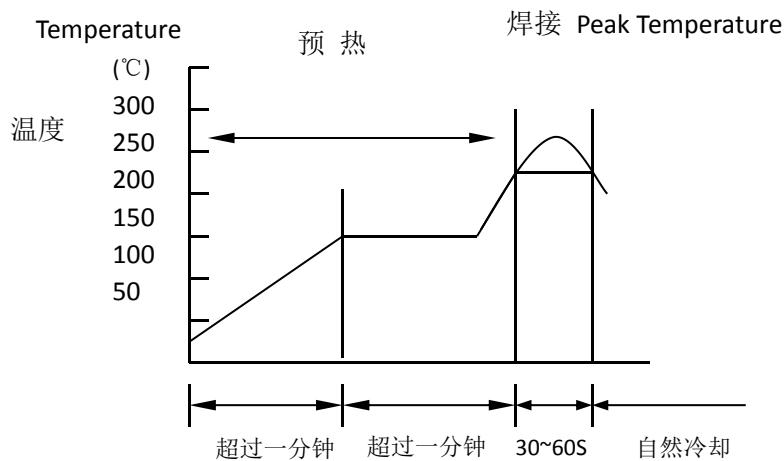
### 12-4.2 波峰焊接的最佳焊料用量

The optimal solder fillet amounts for wave soldering



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

### 回流焊接 (Re-flow soldering)

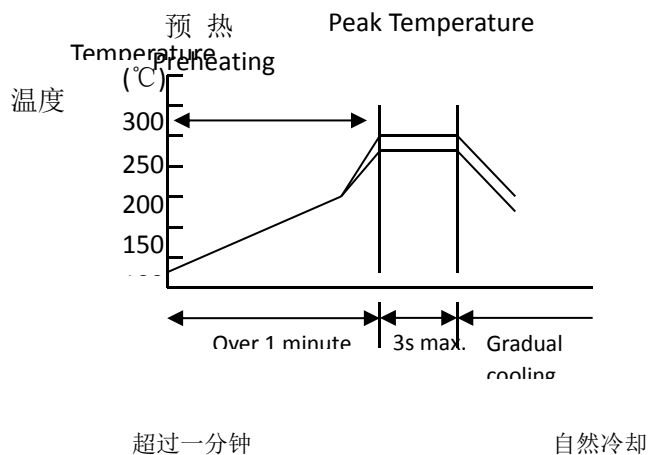


	Pb-Sn 焊接 Pb-Sn soldering	无铅焊接 Lead-free soldering
尖峰温度 Peak temperature	230°C ~ 250°C	240°C ~ 260°C

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)

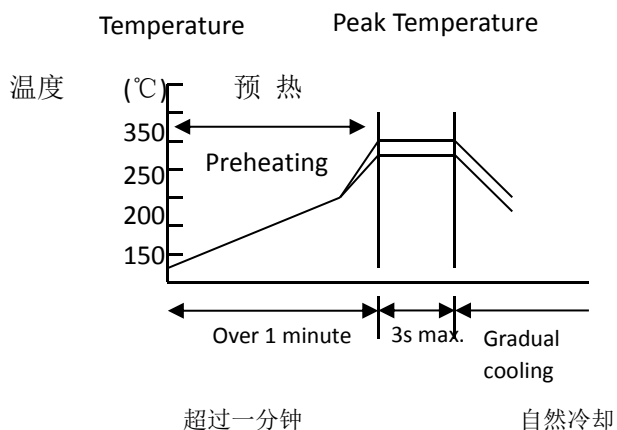


	Pb-Sn 焊接 Pb-Sn soldering	无铅焊接 Lead-free soldering
尖峰温度 Peak temperature	230°C ~ 260°C	240°C ~ 270°C

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



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