



### 1. 適用範圍 (Scope):

此承認書適用於所有系列積層式陶瓷電容(The specifications are applicable to all series of chip type multi-layer ceramic capacitor.)。

- 包括(Include) 介質材料(Dielectrics): NPO(C0G), X7R, X5R and Y5V
- 電容尺寸(Chip Size): 0402, 0603, 0805, 1206, 1210, and 1812.
- 容值範圍(Capacitance): 0.5 pF~22.0uF

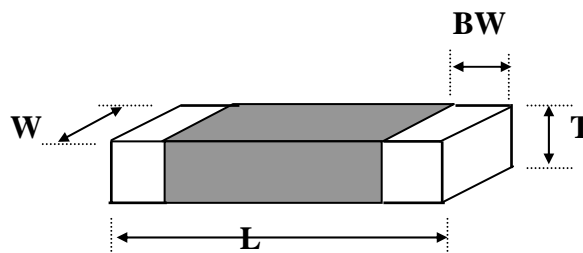
本司所有電容均不含 SS-00259 規定的八大禁用物質(見環保相關資料第 26 頁)All the parts do not contain the eight prohibited substances, which conform to SS-00259 (Ref. Environment related materials, see page 26.)。

### 2. 規格描述 (Part Numbering System):

範例(Example)

<u>0805</u>	<u>Y</u>	<u>104</u>	<u>M</u>	<u>500</u>	<u>A</u>	<u>D</u>
↓	↓	↓	↓	↓	↓	↓
<p><b>晶片尺寸</b> <b>Chip Size</b> Type = L × W 0201=0.6×0.3 0402=1.00×0.50 0603=1.60×0.80 0805=2.00×1.25 1206=3.20×1.60 1210=3.20×2.50 1812=4.50×3.20 (mm)</p>	<p><b>電介質</b> <b>Dielectrics</b> N=NPO(C0G) B=X7R (=B) W=X5R Y=Y5V (=F)</p>	<p><b>容值公差</b> <b>Capacitance Tolerance</b> B=±0.1pF C=±0.25pF D=±0.50pF F=±1.0% G=±2.0% H=±3.0% J=±5.0% K=±10% M=±20% Z=-20, +80% P=-0, +100% (EIA code)</p>	<p><b>額定電壓</b> <b>Rated Voltage</b> Two significant digits followed by no of zeros. 250=25×10<sup>0</sup> =25V<sub>DC</sub> 500= 50V<sub>DC</sub> 101= 100 V<sub>DC</sub> 251= 250 V<sub>DC</sub> 501= 500 V<sub>DC</sub> 102=1000 V<sub>DC</sub> 202=2000 V<sub>DC</sub> 302=3000 V<sub>DC</sub></p>	<p><b>晶片厚度</b> <b>Thickness</b> A: 0.60±0.10mm B: 0.82±0.12mm △ 0.85±0.15mm (For 0805/1206) C: 1.25±0.15mm D: 1.60±0.15mm N:1.90±0.20mm E: 2.50±0.20mm F: 3.20±0.25mm H: 0.50±0.05mm G:0.30±0.03mm</p>	<p><b>卷裝數量</b> <b>Packing Q'TY</b> A: 1KPS/Reel B: 2KPS/Reel C: 3KPS/Reel D: 4KPS/Reel E: 15KPS/Reel I: 10KPS/Reel J: 2.5KPS/Reel F: others G: 15KPS/Cartridge (0603) H: 10KPS/Cartridge K: 50KPS/Cartridge(0402) L: 5KPS/Cartridge(0805) (special)</p>	

### 3. 尺寸描述 (Dimensions): △



Type	長 L (mm)	寬 W (mm)	帶寬 BW (mm)	厚 T (mm)								
				(A)	(B)	(C)	(D)	(E)	(F)	(H)	(G)	
0201	0.60±0.03	0.30±0.03	0.15±0.05	—	—	—	—	—	—	—	0.50±0.05	0.30±0.03
0402	1.00±0.05 1.00±0.20	0.50±0.05 0.50±0.20	0.25±0.10	—	—	—	—	—	—	—	0.50±0.05 0.50±0.20	—
0603	1.60±0.10 1.60±0.20	0.82±0.12	0.40±0.15	—	0.82±0.12	—	—	—	—	—	—	—
0805	2.00±0.10 2.00±0.20	1.25±0.10 1.25±0.20	0.50±0.20	0.60±0.10	0.85±0.15	1.25±0.15	—	—	—	—	—	—
1206	3.20±0.15 3.20±0.20	1.60±0.10 1.60±0.20	0.60±0.20	—	0.85±0.15	1.25±0.15	1.60±0.15	—	—	—	—	—
1210	3.20±0.20	2.50±0.20	0.50±0.25	—	—	1.25±0.15	1.60±0.15	1.90±0.20	2.50±0.20	—	—	—
1812	4.50±0.50	3.20±0.25	0.60±0.35	—	—	1.25±0.15	1.60±0.15	—	2.50±0.20	3.20±0.25	—	—

4. 容值範圍 (Capacitance Range):

Y5V																												
Cp V <sub>DC</sub>	0402					0603					0805					1206					1210			1812				
	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	10	6.3	50	25	16	50	25	16		
103	H	H				B					B					B												
153	H	H				B					B					B												
223		H	H			B					B					B												
333		H	H			B					B					B												
473		H	H			B					B					B												
683		H	H	H		B					B					B												
104		H	H	H		B	B				B	B				B							C	C	C	D	D	D
154		H	H	H	H	B	B				B	B				B							C	C	C	D	D	D
224		H	H	H	H	B	B	B			B	B				B							C	C	C	D	D	D
334				H		B	B	B			B	B				B	B						C	C	C	D	D	D
474				H	H	B	B	B			C	B	B			B	B						C	C	C	D	D	D
684					H		B	B	B		C	B	B			B	B						C	C	C	D	D	D
105					H		B	B	B	B	C	B	B			C	B	B					C	C	C	D	D	D
155							B	B			C	B	B			C	B	B					D	C	C	D	D	D
225							B	B			C	B	C	B	B	C	C	B	B				D	C	C	D	D	D
335										B		B	C	C	C	C	C	B	B				D	C	C	D	D	D
475										B		B	C	C	C	C	C	C	B	B			D	D	C	D	D	D
106										B			C	C	C		C	D	C	C	C	C	G	D	D	D	D	D
226																		D	D	D			G	D		D	D	D
336																							D		D		D	D
476																							D		D		D	D
107																												

Y5V 公差(Tolerance): M ( $\pm 20\%$ ), Z ( $-20, +80\%$ ), 厚度(Thickness): A:  $0.60\pm 0.10\text{mm}$  B:  $0.82\pm 0.10\text{mm}$   $0.85\pm 0.10\text{mm}$ (for 0805/1206) C:  $1.25\pm 0.15\text{mm}$  D:  $1.60\pm 0.15\text{mm}$  N:  $1.90\pm 0.20\text{mm}$  E:  $2.50\pm 0.20\text{mm}$  F:  $3.20\pm 0.25\text{mm}$  H:  $0.50\pm 0.05\text{mm}$   
 以上涉及到的電容必須以產品標準規格為準(Above capacitance for reference only, actual cap range depends on the standard products.)。

X7R( $\geq 16\text{V}$ )/X5R( $\leq 10\text{V}$ )																												
Cp V <sub>DC</sub>	0402					0603					0805					1206												
	50	25	16	10	6.3	250	100	50	25	16	10	6.3	250	100	50	25	16	10	6.3	630	250	100	50	25	16	10	6.3	
221	H	H				B	B	B	B				B	B	B	B							B	B	B	B		
271	H	H				B	B	B	B				B	B	B	B							B	B	B	B		
331	H	H					B	B	B				B	B	B	B							B	B	B	B		
391	H	H					B	B	B				B	B	B	B							B	B	B	B		
471	H	H					B	B	B				B	B	B	B							B	B	B	B		
561	H	H					B	B	B				B	B	B	B							B	B	B	B		
681	H	H					B	B	B				B	B	B	B							B	B	B	B		
821	H	H					B	B	B				B	B	B	B							B	B	B	B		
102	H	H					B	B	B				B	B	B	B							C	B	B	B	B	
122	H	H					B	B	B				B	B	B	B							C		B	B	B	
152	H	H					B	B	B				B	B	B	B							C		B	B	B	
182	H	H					B	B	B				B	B	B	B							C		B	B	B	
222	H	H					B	B	B				B	B	B	B							C		B	B	B	
272	H	H					B	B	B				B	B	B	B							C		B	B	B	
332	H	H					B	B	B				B	B	B	B							C		B	B	B	

392	H	H					B	B	B				B	B	B	B			C		B	B	B				
<b>X7R(<math>\geq 16V</math>)/X5R(<math>\leq 10V</math>)</b>																											
<b>X5R</b>	<b>0201</b>																										
<b>Cp - V<sub>DC</sub></b>	6.3																										
104	G																										
	<b>0402</b>					<b>0603</b>					<b>0805</b>					<b>1206</b>											
<b>Cp - V<sub>DC</sub></b>	50	25	16	10	6.3	250	100	50	25	16	10	6.3	250	100	50	25	16	10	6.3	630	250	100	50	25	16	10	6.3
472	H	H					B	B	B				B	B	B	B				C		B	B	B			
562	H	H					B	B	B				B	B	B	B				C		B	B	B			
682	H	H					B	B	B				B	B	B	B				C		B	B	B			
822		H	H				B	B	B				B	B	B	B				C		B	B	B			
103		H	H				B	B	B				B	B	B	B				C	C	B	B	B			
123		H	H				B	B	B				B	B	B	B				C	C	B	B	B			
153		H	H				B	B	B				B	B	B	B				C	C	B	B	B			
183		H	H				B	B	B				B	B	B	B				C	C	B	B	B			
223		H	H				B	B	B				B	B	B	B				C	C	B	B	B			
273		H	H	H				B	B	B				B	B	B				C	C	B	B	B			
333		H	H	H				B	B	B				B	B	B				C	C	B	B	B			
393		H	H	H				B	B	B				B	B	B					C	B	B	B			
473		H	H	H				B	B	B				B	B	B					C	B	B	B			
563		H	H	H				B	B	B				B	B	B					C	B	B	B			
683		H	H	H				B	B	B				B	B	B					C	B	B	B			
823		H	H	H				B	B	B				B	B	B					C	B	B	B			
104		H	H	H				B	B	B				B	B	B					C	B	B	B			
124			H	H					B	B	B				C	C						C	B	B			
154			H	H					B	B	B				C	B	B					C	B	B			
184			H	H					B	B	B				C	B	B					C	B	B			
224			H	H					B	B	B				C	B	B					C	B	B			
274				H					B	B					C	B	B					C	B	B			
334				H					B	B					C	B	B					C	C	B	B		
394				H					B	B					C	B	B					C	C	B	B		
474				H					B	B					C	C	C					C	C	B	B		
564				H					B	B					C	C						C	C	C	C		
684				H					B	B					C	C						C	C	C	C		
824				H					B	B					C	C						C	C	C	C		
105				H					B	B	B				C	C						C	C	C	C		
125									B	B	B				C	C	C							C	C		
155									B	B	B				C	C	C							C	C		
225									B	B	B				C	C	C							C	C		
335										B	B											C	C	C	C		
475										B	B											C	C	C	C		
565											B											C	C				
685											B											C	C				
825											B											C	C				
106											B											C	C				
226																						C					
336																											
476																											

X7R/X5R 公差(Tolerance): (16V, 10V):J(±5%),K(±10%),M(±20%) · 厚度 Thickness: A: 0.60±0.10mm B: 0.82±0.10mm 0.85±0.10mm(for 0805/1206) C: 1.25±0.15mm D: 1.60±0.15mm N: 1.90±0.20mm E: 2.50±0.20mm F: 3.20±0.25mm H: 0.50±0.05mm  
 以上涉及到的電容必須以產品標準規格為準(Above capacitance for reference only, actual cap range depends on the standard products.) °

NPO (C0G)																			
Cp Vdc	0402				0603				0805				1206						
	100	50	25	10	250	100	50	25	250	100	50	25	630	250	100	50	25		
OR5 ~OR9	H	H				B	B												
1R0 ~ 9R9	H	H				B	B			A	A	A			B	B			
100	H	H				B	B			A	A	A			B	B			
120	H	H				B	B			A	A	A			B	B			
150	H	H				B	B			A	A	A			B	B			
180	H	H				B	B			A	A	A			B	B			
200	H	H				B	B			A	A	A			B	B			
220	H	H				B	B			A	A	A			B	B			
270	H	H				B	B			A	A	A			B	B			
300	H	H				B	B			A	A	A			B	B			
330	H	H				B	B			A	A	A			B	B			
390	H	H				B	B			A	A	A			B	B			
470	H	H				B	B			A	A	A			B	B			
560	H	H				B	B			A	A	A			B	B			
680	H	H				B	B			A	A	A			B	B			
820	H	H				B	B			A	A	A			B	B			
101	H	H			B	B	B			A	A	A	C		B	B			
121	H	H			B	B	B			A	A	A	C		B	B			
151	H	H			B	B	B			A	A	A	C		B	B			
181	H	H			B	B	B			A	A	A	C		B	B			
201	H	H			B	B	B			A	A	A	C		B	B			
221	H	H			B	B	B			A	A	A	C		B	B			
271	H	H			B	B	B			A	A	A	C		B	B			
301	H	H			B	B	B			A	A	A	C		B	B			
331	H	H			B	B	B			A	A	A	C		B	B			
391		H			B	B	B			B	B	B	C		B	B			
471		H			B	B	B			B	B	B	C		B	B			
561			H		B	B	B			B	B	B	C		B	B			
681			H		B	B	B			B	B	B	C		B	B			
821			H		B	B	B	B	B	B	B	B	C		B	B			
102			H		B	B	B	B	B	B	B	B	C		B	B			
122				H	B	B	B	B	B	B	B	B	C		B	B			
152				H	B	B	B	B	B	B	B	B	C		B	B			
182				H	B	B	B	B	B	B	B	B	C		B	B			
222				H	B	B	B	B	B	B	B	B	C		B	B			
272				H	B				C	C	C	C		B	B	B			
332				H	B				C	C	C	C		B	B	B			
392				H		B			C	C	C			B	B	B			
472						B			C	C	C			B	B	B			
562						B			C	C	C			B	B	B			
682						B			C	C	C			C	C	C			
822						B				C	C			C	C	C			



		以下情况测试条件: 電壓 0.5±0.2Vrms, 頻率 1KHz±10% X7R 0603≥225 (10V); 0805=106 (6.3, 10V) X5R 0402≥475 (6.3V); 0402≥225 (10V); 0603=106 (6.3V) ; 0603≥475 (10V)
Y5V	公差在以下範圍內 (Within the specified tolerance) M: ±20%; Z: -20%, +80%	Cp ≤ 10uF 電壓 1.0±0.2Vrms, 頻率 1KHz±10% Cp >10uF 電壓 1.0±0.2Vrms, 頻率 120Hz±20% 烘烤靜置 24 小時後, 在環境溫度 25 度下測試 (at 25°C, 24 hrs after annealing)

7.2 散逸因素(Dissipation Factor (DF)):

電介質 (Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
NPO(C0G)	Cp<30pF, Q≥400+20Cp; Cp≥30pF, Q≥1000 (Q=1/DF)	電壓 1.0±0.2Vrms, 頻率 1MHz±10% at 25°C (Cp>1000pF, 1KHz±10%)
X7R	額定電壓(Rated voltage)≥50V, DF≤2.5%(Tan δ ≤0.025) 0603≥1UF; 0805≥1UF; 1206≥4.7UF; DF≤10%(Tan δ ≤0.1) 額定電壓(Rated voltage) = 25V, 16V, DF≤3.5%(Tan δ ≤0.035) 0201≥0.01UF; 0402≥0.033UF; 0805≥0.68UF; 1206≥2.2UF; DF≤5%(Tan δ ≤0.05) 0603≥0.33UF; 1206≥4.7UF ;DF≤7%(Tan δ ≤0.07) 0402≥0.47UF; 0603≥0.68UF; 0805≥2.2UF; 1206≥4.7UF; DF≤10%(Tan δ ≤0.1) 額定電壓(Rated voltage)= 10V, 6.3V, DF≤5.0%(Tan δ ≤0.05) 0402≥0.33UF; 0603≥0.33UF; 0805≥2.2UF; 1206≥4.7UF; DF≤10%(Tan δ ≤0.1) 0201≥0.1UF; 0402≥1.0UF; 0603≥4.7UF; 0805≥10UF; 1206≥22UF; DF≤15%(Tan δ ≤0.15)	電壓 1.0±0.2Vrms, 頻率 1KHz±10%,at 25°C
X5R	額定電壓(Rated voltage)≥50V, DF≤2.5%(Tan δ ≤0.025) 0603≥1UF; 0805≥1UF; 1206≥4.7UF; DF≤10%(Tan δ ≤0.1) 額定電壓(Rated voltage) = 25V, 16V, DF≤3.5%(Tan δ ≤0.035) 0201≥0.01UF; 0402≥0.033UF; 0805≥0.68UF; 1206≥2.2UF; DF≤5%(Tan δ ≤0.05) 0402≥0.47UF; 0603≥0.68UF; 0805≥2.2UF; 1206≥4.7UF; DF≤10%(Tan δ ≤0.1) 額定電壓(Rated voltage)= 10V, DF≤5.0%(Tan δ ≤0.05) 0402≥0.33UF; 0603≥0.33UF; 0805≥2.2UF; 1206≥4.7UF; DF≤10%(Tan δ ≤0.1) 0201≥0.1UF; 0402≥1.0UF; 0603≥4.7UF; 0805≥10UF; 1206≥22UF; DF≤15%(Tan δ ≤0.15) 額定電壓(Rated voltage)= 6.3V, 0402 C<0.22uF ; DF≤5.0%(Tan δ ≤0.05) ; C≥0.22uF DF≤8.0%(Tan δ ≤0.08) 0603 C<2.2uF ; DF≤5.0%(Tan δ ≤0.05) ; C≥2.2uF DF≤8.0%(Tan δ ≤0.08) 0805 C<4.7uF ; DF≤5.0%(Tan δ ≤0.05) ; C≥4.7uF DF≤8.0%(Tan δ ≤0.08) 1206 C<10uF ; DF≤5.0%(Tan δ ≤0.05) ; C≥10uF DF≤8.0%(Tan δ ≤0.08) 0402≥0.33UF; 0603≥0.33UF; 0805≥2.2UF; 1206≥4.7UF; DF≤10%(Tan δ ≤0.1) 0201≥0.1UF; 0402≥1.0UF; 0603≥4.7UF; 0805≥10UF; 1206≥22UF;	電壓 1.0±0.2Vrms, 頻率 1KHz±10%,at 25°C

	DF ≤ 15% (Tan δ ≤ 0.15)	
Y5V	額定電壓(Rated voltage) ≥ 50V, DF ≤ 5.0% (Tan δ ≤ 0.05) 0603 ≥ 0.1UF; 0805 ≥ 0.47UF; 1206 ≥ 4.7UF; DF ≤ 7.0% (Tan δ ≤ 0.07) 額定電壓(Rated voltage) = 25V, DF ≤ 7.0% (Tan δ ≤ 0.07) 0402 ≥ 0.068UF; 0603 ≥ 0.47UF; 0805 ≥ 0.33UF; 1206 ≥ 4.7UF; DF ≤ 9.0% (Tan δ ≤ 0.09) 額定電壓(Rated voltage) = 16V, DF ≤ 9.0% (Tan δ ≤ 0.09) 0402 ≥ 0.22UF; 0603 ≥ 2.2UF; 0805 ≥ 3.3UF; 1206 ≥ 10UF; DF ≤ 12.5% (Tan δ ≤ 0.125) 額定電壓(Rated voltage) = 10V, DF ≤ 12.5% (Tan δ ≤ 0.125) 0402 ≥ 0.47UF; DF ≤ 20% (Tan δ ≤ 0.2) 額定電壓(Rated voltage) = 6.3V, DF ≤ 20% (Tan δ ≤ 0.2)	電壓 1.0±0.2Vrms, 頻率 1KHz±10%, at 25°C

7.3 絕緣阻抗(Insulation Resistance (IR)):

電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
NPO(C0G)	IR ≥ 10GΩ or R x C ≥ 500MΩ-u F 以較小者為標準(Whichever is smaller)	在 25°C 下，使用額定電壓測試 60±5 秒。 (Rated voltage for 60±5secs, at 25°C)
X7R/X5R Y5V	IR ≥ 10GΩ or R x C ≥ 100MΩ-u F 以較小者為標準(Whichever is smaller)	

7.4 耐電壓(Dielectric Strength (Flash)):

電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
NPO(C0G) X7R/X5R Y5V	外觀無明顯破損或能通過高壓測試(No remarkable visual damage or flash over during test)	Class1 電容用 3 倍額定電壓，Class2 和 3 用 2.5 倍，持續 1 到 5 秒，充放電流小於 50 毫安，此條件只適用於額定電壓小於 200 伏之電容(300% of rated voltage for class1 capacitors, and 250% of rated voltage for class2 & 3 capacitors. Duration of application: 1 to 5 seconds. Charging and discharging current less than 50mA. This condition is suitable to rated voltages no greater than 200V.)
NPO(C0G) X7R	外觀無明顯破損或能通過高壓測試(No remarkable visual damage or flash over during test)	額定電壓為 500V，用 2 倍的額定電壓持續 1 到 5 秒。 (500V – 200% of rated voltage for 1 to 5 Seconds.) 額定電壓為 1000V，用 1.5 倍的額定電壓持續 1 到 5 秒。 (1000V - 150% of rated voltage for 1 to 5 Seconds.) 額定電壓大於 2000V，用 1.2 倍的額定電壓持續 1 到 5 秒。 (2000V or above – 120% of rated voltage for 1 to 5 Seconds.)
額定電壓為 500V 到 5000V 之料品必須在絕緣油中測試。 (1/2-KV to 5-KV parts are to be tested in a non-corrosive dielectric fluid or potted.)		

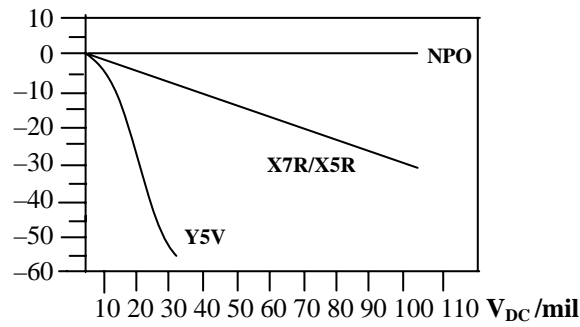
7.5 容值與直流電的關係(DC Voltage Coefficients):

X7R/X5R, Y5V 材質電容 (NPO(C0G)除外)對直流電敏感，此類電容於直流加壓下使用時會產生介電常數降低現象，電壓越大現樣越明顯，進而導致有電容值降低的結果發生，此為俗稱 DC bias 效應，特別是介電常數越大，容值降低的越嚴重。產生原因為直流電壓阻礙介電陶瓷磁體偏極化效應，而造成介電常數降低的現象。

The materials X7R/X5R, Y5V (except NPO) are sensitive to DC voltage. In all cases an eventual decrease in dielectric constant occurs with DC bias, which is more severe with dielectrics of higher dielectric constant. This behavior is attributed to a constraint of the DC voltage on the response of the polarizing mechanisms, which give rise to the dielectric constant of the material.

$$\Delta C_p (\%)$$

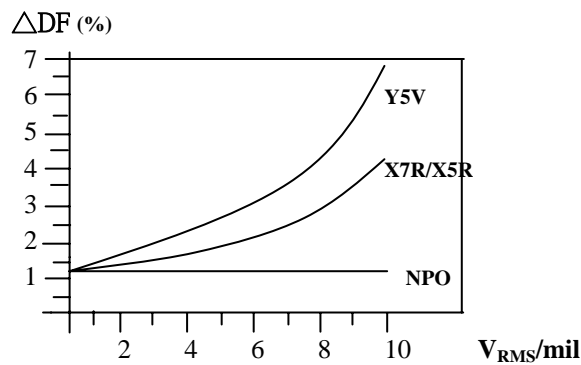




7.6 容值與交流電的關係(AC Voltage Coefficient):

X7R/X5R 或 Y5V 材質電容(NPO(C0G)除外)於交流電下使用時，其散逸因素會增加，且介電常數越大越明顯，如下圖所示。電容的層疊結構是由極薄的電極組成，要防止在高壓和高流的電路中使用，因為電壓大於 5 Vrms /mil 之後散逸因素增加很大，即能量耗損增加介電陶瓷體偏極化效應降低。

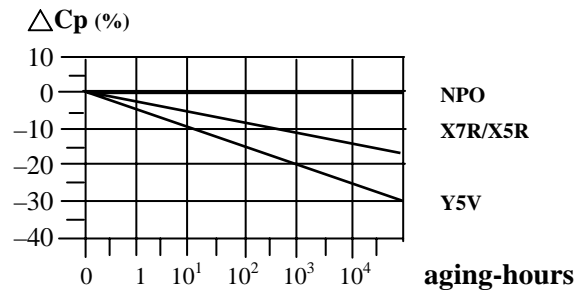
The increase of dielectric constant with AC test voltage is accompanied by a marked increase in the dissipation factor (X7R/X5R and Y5V, except NPO), as illustrated below. The multi-layer construction of chip capacitors, with thin dielectric layers, precludes application in circuitry with large AC voltage and high current, as dielectric losses become quite significant from 5 Vrms /mil voltage stress.



7.7 容值與時間的關係(Aging Rate):

電極(X7R/X5R 和 Y5V, 除 NPO(C0G))都存在固有的老化特性，也就是說 X7R/X5R 和 Y5V 的容值會隨時間的增加而降低，容值與時間的關係如下圖。

There are capacitance-aging rate of dielectrics (X7R/X5R and Y5V, except NPO). It means the capacitance of X7R and Y5V will decrease after lots of hours, as following charts:



範例(Example): (1) X7R at 10<sup>3</sup> hours  
 ΔCp = -10%, Decades=3

Aging Rate =  $-10 \div 3 = -3.33$  (%/decade-hours)  
 (2) Y5V at  $10^3$  hours  
 $\Delta C_p = -20\%$ , Decades = 3  
 Aging Rate =  $-20 \div 3 = -6.67$  (%/decade-hours)

電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
NPO(C0G)	無容值變化(No capacitance change)	在沒有通電及環境溫度 25°C 下 (Without electric load and keeping at 25°C)。
X7R/X5R	容值變化小於 3.5%/10 小時(Capacitance change less than 3.5%/decade-hours)	
Y5V	容值變化小於 7%/10 小時(Capacitance change less than 7%/decade-hours)	

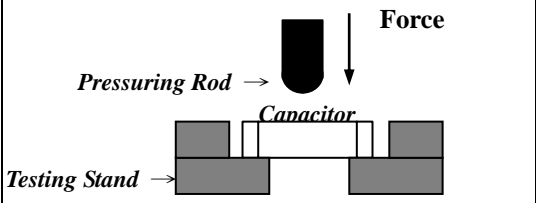
## 8. 信賴性測試 Environment Test:

### 8.1 耐電壓 (Breakdown Voltage (BDV)):

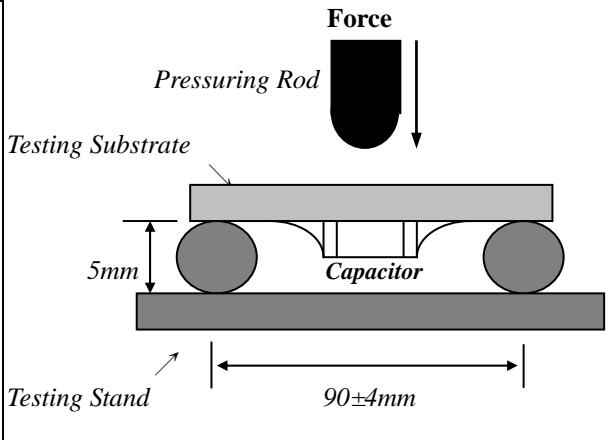
電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing condition)
NPO(C0G) X7R/X5R Y5V	額定電壓低於 200 伏之電容，其耐電壓高於 8 倍額定電壓(More than 8 times of rated voltage. This spec is suitable to the rated voltages no greater than 100V.)。	以 300 伏每秒的增加速率直至電容被擊穿時最大瞬間電壓 ( By increment rate 300 V <sub>DC</sub> /sec. Until chip breakdown )。
NPO(C0G) X7R	200 伏：5 倍額定電壓(200V: 5 times of rated voltage) 500 伏：2.5 倍額定電壓 500V: 2.5 times of rated voltage 1000 伏：2 倍額定電壓(1000V: 2 times of rated voltage) 2000 伏：1.5 倍額定電壓(2000V: 1.5 times of rated voltage) >2000 伏：1.2 倍額定電壓 (>2000V: 1.2 times of rated voltage)	以 300 伏每秒的增加速率直至電容被擊穿時最大瞬間電壓(By increment rate 300 V <sub>DC</sub> /sec.Until chip breakdown)
額定電壓為 500 到 5000 之料品必須在絕緣油中測試 1/2-KV to 5-KV parts are to be tested in a non-corrosive dielectric fluid or potted.		

### 8.2 應力測試(Break Strength):

電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
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<p>NPO(C0G) X7R/X5R Y5V</p>	<p>各種厚度能承受的力 (Thickness Force Value (AVE - 3σ))</p> <p><b>A</b>    <math>\geq 0.5\text{Kg}</math>  <b>B</b>    <math>\geq 1.0\text{Kg}</math>  <b>C</b>    <math>\geq 2.0\text{Kg}</math>  <b>D</b>    <math>\geq 3.5\text{Kg}</math>  <b>E</b>    <math>\geq 3.5\text{Kg}</math>  <b>F</b>    <math>\geq 3.5\text{Kg}</math>  <b>H</b>    <math>\geq 0.4\text{Kg}</math></p>	<p>如下圖加壓並記錄至破裂時所需力量 (Apply force as shown and record the force figure while the capacitor breaks.) °</p>  <p>The diagram shows a capacitor mounted on a testing stand. A pressing rod is positioned above the capacitor, with a downward arrow labeled 'Force' indicating the direction of pressure. The stand is labeled 'Testing Stand'.</p>
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**8.3 抗曲繞測試(Bending):**

電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
<p>NPO(C0G)</p>	<p>外觀無明顯破損，容值 <math>\leq 10\text{pF}</math> 時，容值變化 <math>\leq 0.5\text{pF}</math>，容值 <math>&gt; 10\text{pF}</math> 時，容值變化在 <math>\pm 5\%</math> 之內                      No remarkable visual damage                      Cp change <math>\leq 0.5\text{pF}</math> (Cp <math>\leq 10\text{pF}</math>)                      Cp change within <math>\pm 5\%</math> (Cp <math>&gt; 10\text{pF}</math>)</p>	<p>將晶片焊接於測試板並將其置於測試機上，以 <math>0.2 \pm 0.1\text{mm/sec}</math> 的速度下壓測試板中央位置至測試深度 <math>1.0 \pm 0.1\text{mm}</math>，並停留 <math>5 \pm 1\text{sec}</math>，才可進行測試容值 Solder the capacitor on testing substrate and put it on testing stand. The middle part of substrate shall successively be pressurized by pressurizing rod at a rated of about <math>0.2 \pm 0.1\text{mm/sec}</math>. until the deflection become means of the <math>1.0 \pm 0.1\text{mm}</math> and lease the pressurizing rod after <math>5 \pm 1\text{sec}</math>. To measure the capacitance.</p>
<p>X7R/X5R</p>	<p>外觀無明顯破損，容值變化在 <math>\pm 12.5\%</math> 之內                      No remarkable visual damage                      Cp change within <math>\pm 12.5\%</math></p>	<p>(相關標準(Related STD.): JIS C 5101-10-1999 / JIS C 6429)</p>
<p>Y5V</p>	<p>外觀無明顯破損，容值變化在 <math>\pm 30\%</math> 之內                      No remarkable visual damage                      Cp change within <math>\pm 30\%</math></p>	 <p>The diagram shows a capacitor mounted on a testing substrate, which is supported by a testing stand. A pressing rod is positioned above the capacitor, with a downward arrow labeled 'Force' indicating the direction of pressure. The stand is labeled 'Testing Stand'. Dimensions are shown: a 5mm gap between the stand and the substrate, and a 90 ± 4mm length for the testing area.</p>

**8.4 焊錫性測試(Solder-Ability):**

電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
<p>NPO(C0G) X7R/X5R Y5V</p>	<p>爬錫面積 <math>\geq 95\%</math> 和孔洞 <math>&lt; 5\%</math> (95% min. coverage of both terminal electrodes and less than 5% have pin holes or rough spots) °</p>	<p>焊錫溫度(Solder temperature): <math>230 \pm 5^\circ\text{C}</math>; <math>240 \pm 5^\circ\text{C}</math>                      浸泡時間(Dipping time): <math>2 \pm 1</math> seconds.                      焊接劑成份(Solder): Sn / Pb = 63 / 37; Sn ~ 100                      預熱(Preheating): <math>80 \sim 120^\circ\text{C}</math> 10~30sec                      將晶片兩端電極完全浸泡於錫爐中(Completely soak both terminal electrodes in solder)                      (相關標準(Related STD.): JIS C 5101-1998 / JIS C 5102 clause 8.4)</p>

**8.5 抗焊熱震(Resistance to Soldering Heat):**

電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
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NPO(C0G) (Class1)	外觀無明顯破損，容值變化在 $\pm 2.5\%$ 或 $\pm 0.25\text{pF}$ 之內，以較大者為準， $C_p < 30\text{pF}$ , $Q \geq 400 + 20C_p$ ; $C_p \geq 30\text{pF}$ , $Q \geq 1000$ ，電阻測試標準與測試前標準相同 (No remarkable visual damage $C_p$ change within $\pm 2.5\%$ or $\pm 0.25\text{pF}$ whichever is larger: $C_p < 30\text{pF}$ , $Q \geq 400 + 20C_p$ ; $C_p \geq 30\text{pF}$ , $Q \geq 1000$ IR meet initial standard value)	焊錫溫度： $270 \pm 5^\circ\text{C}$ Solder temperature: $270 \pm 5^\circ\text{C}$ 浸泡時間： $10 \pm 1$ 秒 Dipping time: $10 \pm 1$ seconds 焊接劑成份：純錫 Solder: S n= ~100 在室溫中 Class1 需靜置 $24 \pm 2$ Hrs, Class 2,3 需靜置 $48 \pm 4$ Hrs，待電性回覆之后再在標準條件下測電性 Measurement to be made after being kept at room temperature for $24 \pm 2$ (Class1) or $48 \pm 4$ (Class 2,3) hours. Recovery for the following period under the standard condition after test.
X7R/X5R (Class2)	外觀無明顯破損，容值變化在 $\pm 7.5\%$ 之內，散逸因素和電阻測試標準與測試前標準相同 (No remarkable visual damage $C_p$ change within $\pm 7.5\%$ DF (Tan $\delta$ ) meet initial standard value IR meet initial standard value)	(相關標準(Related STD.): JIS C 5101-10-1999 / JIS C 6429)
Y5V (Class3)	外觀無明顯破損，容值變化在 $\pm 20\%$ 之內，散逸因素和電阻測試標準與測試前標準相同 (No remarkable visual damage $C_p$ change within $\pm 20\%$ DF (Tan $\delta$ ) meet initial standard value IR meet initial standard value)	

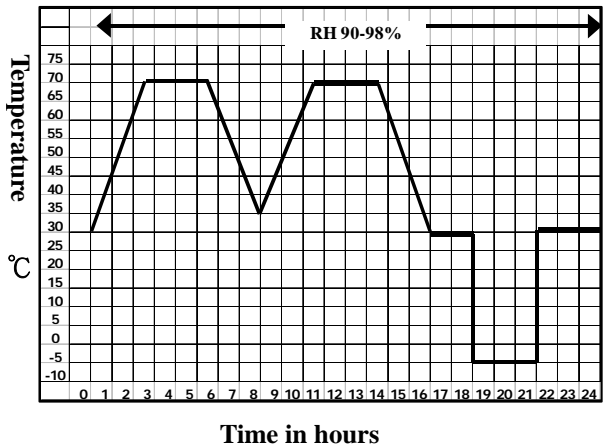
### 8.6 溫度循環測試(Temperature Cycle):

電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
NPO(C0G)	外觀無明顯破損，容值變化在±2.5%或±0.25pF之內，以較大者為準，Cp<30pF, Q≥400+20Cp; Cp≥30pF, Q≥1000，電阻測試標準與測試前標準相同(No remarkable visual damage Cp change within ±2.5% or ±0.25pF whichever is larger Cp<30pF, Q≥400+20Cp ; Cp≥30pF, Q≥1000;(Q=1/DF) IR meet initial standard value	在下列標準的環境下做 1000 次循環 (To perform 1000 cycles of the stated Environment) <b>Step temperature timing</b> <b>1 -55±3°C 30±3min.</b> <b>2 25°C 2~5min.</b> <b>3 125°C±2 30±2min</b> (85°C for X5R) <b>4 25°C 2~5min.</b>
X7R/X5R	外觀無明顯破損，容值變化在±7.5%之內，>25V，DF≤2.5%；16V，DF≤3.5%電阻測試標準與測試前標準相同 (No remarkable visual damage Cp change within ±7.5% DF≤2.5% for 25V Above & ≤3.5% for 16V (Tan δ ≤0.025 for 25V Above & ≤0.035 for 16V) IR meet initial standard value	在室溫中靜置 24±2Hrs 之后再測電性 (Measurement to be made after being kept at room temperature for 24± 2 hours)。 (相關標準(Related STD.): JIS C 5101-1998 / JIS C 5102 clause 9.3)
Y5V	外觀無明顯破損，容值變化在±20%之內，≥25V，DF≤5%；16V，DF≤7%電阻測試標準與測試前標準相同 No remarkable visual damage Cp change within ±20% DF≤5% for 25V Above & ≤7% for 16V (Tan δ ≤0.05 for 25V Above & ≤0.07 for 16V) IR meet initial standard value	在下列標準的環境下做 1000 次循環 (To perform 1000 cycles of the stated Environment)。 <b>Step temperature timing</b> <b>1 -30±3°C 30±3min.</b> <b>2 25°C 2~5min.</b> <b>3 85±2°C 30±2min.</b> <b>4 25°C 2~5min.</b> 在室溫中靜置 24±2Hrs 之后再測電性 (Measurement to be made after being kept at room temperature for 24± 2 hours.)。 (相關標準(Related STD.): JIS C 5101-1998 / JIS C 5102 clause 9.3)

8.7 溫度循環耐濕性測試(Damp heat cyclic (temp. cyclic)):

電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
NPO(C0G) (Class1)	外觀無明顯破損，容值變化在±5%或±0.5pF之內，以較大者為準，Cp<30pF, Q≥200+10Cp ; Cp≥30pF, Q≥200; (Q=1/DF)，IR≥1000MΩ或R*C≥50MΩ-u F，以阻值較小者為準(No remarkable visual damage, Cp change within ±5% or ±0.5pF whichever is larger, Cp<30pF, Q≥200+10Cp ; Cp≥30pF, Q≥200; (Q=1/DF) IR≥1000MΩ or R*C≥50MΩ-u F whichever is smaller.)。	測試溫度：25°C --> 2.5hrs. --> 65°C (3hrs.) --> 2.5hrs. --> 25°C --> 2.5hrs. --> 65°C (3hrs.) --> 2.5hrs. --> 25°C (2hrs.) --> -10°C (3hrs.) --> 25°C (3hrs.) Testing temperature : 25°C --> 2.5hrs. --> 65°C (3hrs.) --> 2.5hrs. --> 25°C --> 2.5hrs. --> 65°C (3hrs.) --> 2.5hrs. --> 25°C (2hrs.) --> -10°C (3hrs.) --> 25°C (3hrs.)
X7R/X5R (Class2)	外觀無明顯破損，容值變化在±12.5%之內，DF≤5.0%，IR≥1000MΩ或R*C≥50MΩ-u F，以阻值較小者為準(No remarkable visual damage Cp change within ±12.5% DF≤5.0% (Tan δ ≤0.05) IR≥1000MΩ or R*C≥50MΩ-u F whichever is smaller.)。	濕度：90~98% RH Humidity: 90~98% RH 測試週期：連續 10 次 Test cycle: 10 continuous cycles 週期時間：24 小時

<p>Y5V (Class3)</p>	<p>外觀無明顯破損，容值變化在±30%之內，10V 或 6.3V，DF≤12.5%；16V，DF≤10%；≥25V，DF≤7.5%。IR≥1000MΩ 或 R*C≥50MΩ-u F 以阻值較小者為準(No remarkable visual damage Cp change within ±30% DF≤12.5%for10V or 6.3V(Tan δ ≤0.125) 10%for16V (Tan δ ≤0.10) 7.5%for25V Above (Tan δ ≤0.075) IR≥1000MΩ or R*C≥50MΩ-u F whichever is smaller</p>	<p>Time of 1 cycle: 24hrs. 在室溫中 Class1 需靜置 24±2Hrs, Class 2,3 需靜置 48±4Hrs 再測試電性 Measurement to be made after being kept at room temperature for 24±2 (Class1) or 48±4(Class 2,3) hours. (相關標準(Related STD.): JIS C 5101-1998)</p>
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項次 Stage	時間 Time (h)	溫度 Temp.	濕度 Humidity
a	2.5	-	90~95%RH
b	3.0	65°C	90~95%RH
c	2.5	-	90~95%RH
d	2.5	-	90~95%RH
e	3.0	65°C	90~95%RH
f	2.5	-	90~95%RH
g	1~4	25°C	90~95%RH
h	3.0	-10°C	Optional
i	1~4	25°C	90~95%RH

8.8 壽命測試(Life Test):

電介質(Dielectrics)	判定標準(Specification)	測試條件(Testing Condition)
<p>NPO(C0G)</p>	<p>外觀無明顯破損，容值變化在±3%或±0.3pF 之內，以較大者為準，(Cp&lt;10pF), Q≥200+(10*Cp) ; (10pF ≤ Cp&lt;30pF), Q≥275+(2.5*Cp) ; (Cp≥30pF), Q≥350 ; (Q=1/DF), IR≥1000MΩ 或 R*C≥50 MΩ-u F 以阻值較小者為準 (No remarkable visual damage Cp change within ±3% or ±0.3pF whichever is larger (Cp&lt;10pF) Q≥200+(10*Cp) ; (10pF ≤ Cp&lt;30pF) Q≥275+(2.5*Cp) ; (Cp≥30pF) Q≥350 ; (Q=1/DF) IR≥1000MΩ or R*C≥50 MΩ-u F whichever is smaller)</p>	<p>測試溫度：125±3°C Testing temperature:125±3°C 電壓：兩倍額定電壓 200% of the rated voltage 測試時間：1000~1048 小時 Testing time: 1000+48/-0hrs 在室溫中靜置 24±2Hrs 後再測試電性(Measurement to be made after being kept at room temperature for 24±2 hours.)。</p>
<p>X7R/X5R</p>	<p>外觀無明顯破損，容值變化在±12.5%之內，≥25V,DF≤4%;16V 或 10V，DF≤5%。 IR≥1000MΩ 或 R*C≥50MΩ-u F，以阻值較小者為準(No remarkable visual damage Cp change within ±12.5% DF≤4% for 25V Above &amp; ≤5% for 16V,10V (Tan δ ≤0.04 for 25V Above &amp; ≤0.05 for 16V,10V) IR≥1000MΩ or R*C≥50 MΩ-u F whichever is smaller)</p>	<p>測試溫度：125±3°C Testing temperature:125±3°C 電壓：兩倍額定電壓 200% of the rated voltage 測試時間：1000~1048 小時 Testing time: 1000+48/-0hrs 在室溫中靜置 48±4Hrs 後再測試電性(Measurement to be made after being kept at room temperature for 48±4 hours)</p>

Y5V	外觀無明顯破損，容值變化在±30%之內， 16V，DF≤10%；≥25V，DF≤7.5%。IR≥1000MΩ或R*C≥50MΩ-u F以阻值較小者為準(No remarkable visual damage Cp change within ±30% DF≤7.5% for 25V Above & ≤10% for 16V (Tan δ ≤0.075 for 25V Above & ≤0.10 for 16V) IR≥1000MΩ or R*C≥50 MΩ-u F whichever is smaller.)。	測試溫度：85±3℃ Testing temperature:85±3℃ 電壓：兩倍額定電壓 200% of the rated voltage 測試時間：1000~1048 小時 Testing time: 1000+48/-0hrs 在室溫中靜置 48±4Hrs 後再測試電性(Measurement to be made after being kept at room temperature for 48±4 hours.)。
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理論: (依 Prokopowicz & Vaskas 經驗公式模式)

Theory : (based upon empirical formula modelled dy Prokopowicz & Vaskas)

$$t_1/t_2=(V_2/V_1)^n \cdot \exp Es/k(1/T_1-1/T_2)$$

Es= Pseudo 活化能 Pseudo activation energy

K = Boltzman's 常數 Boltzman's Constant

Subscripts 1 and 2 refer to test conditions.(simplified to  $t_1/t_2=(V_2/V_1)^3 \cdot 10 \cdot \exp((T_1-T_2)/20)$ )

設備測試時間 The equivalent device-hrs:

$$T=F a \cdot n \cdot t$$

T=等效元件測試時間 Equivalent device hours

N=測試數量 No. of devices under test

t=測試時間 Test duration in hrs

F a=加速因子 Acceleration factor= $(V_{test}/V_{op})^3 \cdot 10 \cdot \exp((T_{test}-T_{op})/20)$

T<sub>test</sub>=測試溫度 Test temperature

T<sub>op</sub>=使用溫度 Operating temperature

不良率計算公式 The formula for the failure rate is:

$$F = n/T \cdot k \cdot 10^9 \text{ FITS}$$

n =測試累計不良數 Total number of cumulative failures in the test

T =累計元件時間 Accumulated device-hours

K =信心度係數 Coefficient of confidence level (n\*K=0.917 if n=0)

信心度係數為 60%時 K 值對照表,如表 1

The coefficient K at 60% confidence level can be found from Table1.

不良數 No. of Failure	信心度 係數 K	不良數 No. of Failure	信心度係 數 K
1	2.02	6	1.22
2	1.56	7	1.19
3	1.39	8	1.18
4	1.31	9	1.175
5	1.26	10	1.17

表 1 Table1

例 EX.

於壽命測試 1 千小時測試下預估 15V,25℃ 下使用失效不良率(1/百萬小時)

The predicted failure rates in failures per billion device-hrs at 15V,25℃ operation ,based on total number of cumulative failures at the end of normal life testing(1000hr).

介電材質 Dielectrics	額訂電壓 Rate Voltage	不良數 No. of Failure	壽命 FIT LIFE
NPO(C0G), X7R	25V	0	0.167FIT
	50V	0	0.021FIT

**9. 積層式陶瓷電容使用注意事項 (Precautions on the use of MLCC):**

**9.1 有效的焊錫表面(Suggested soldering profile):**

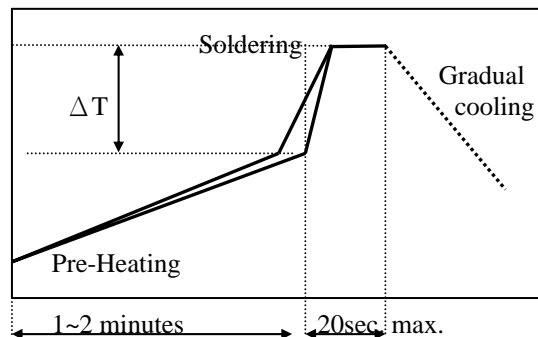
**9.1.1 手工焊(Hand soldering):**

當用烙鐵焊接時，只要符合以下條件，不需要預熱即可焊接(When correcting chips with a soldering iron, no preheating is required if the following conditions are met.)。

項目(Item)	條件(Conditions)	
尺寸(Chip size)	2.0 × 1.25mm max.	3.2 × 1.6mm over
烙鐵溫度(Temperature of iron-tip)	300°C max.	270°C max.
烙鐵功率(Soldering iron wattage)	20W max.	
注意(Caution)	不要讓烙鐵頭直接接觸陶瓷體(Do not allow the iron-tip to directly touch the ceramic element.)。	

Temperature (°C)

Hand Soldering Condition



(For 1206 and under  $\Delta T \leq 190^\circ\text{C}$  ; For 1210 and over  $\Delta T \leq 130^\circ\text{C}$  )

**9.1.2 焊錫(Soldering):**

焊錫步驟( solder Buildup )

- (1) 浸泡與焊接(Dip and iron soldering)

保證焊接良好，同時用最少的焊接劑。

Use as little solder as possible, and confirm that the solder is securely placed.

- (2) 回流焊(Re-flow soldering)

確保端電極表面爬錫高度在 0.2mm 到 0.3mm 之間。

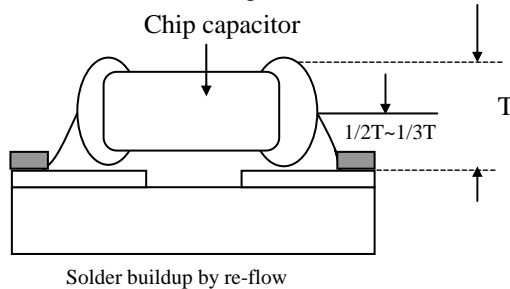
When soldering confirms that the solder is placed over 0.2 to 0.3mm of the surface of the terminations.

- (3) 焊錫良好與不良應用舉例(Examples of good and bad solder application.)。

- (4) 電容器在 270°C 時受熱 20 秒或在 230°C 時 60 秒下焊錫，不會影響電容器電性，不會導致電容器外觀機械損傷(Capacitors/Components can be heat to the max temperature of 270°C for 20 seconds(Min.) or 230°C for 60 seconds. And no electrical failures and mechanical damages of the capacitors/components.)。

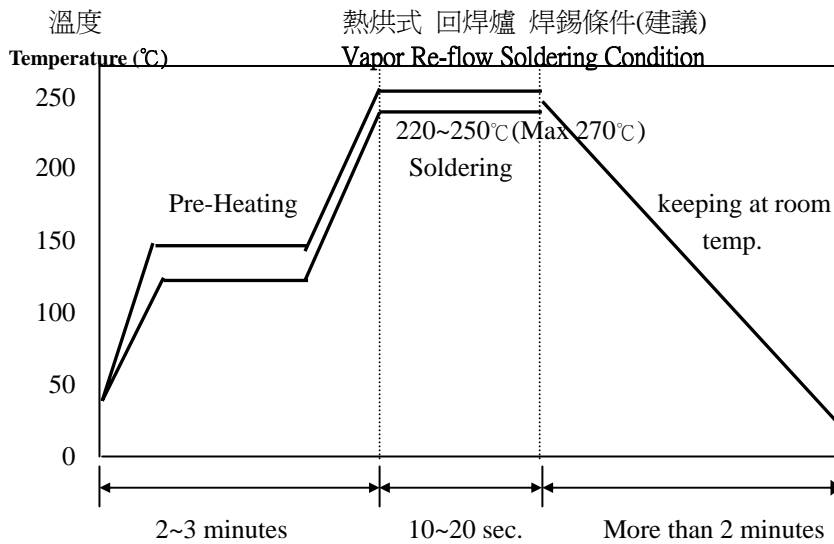
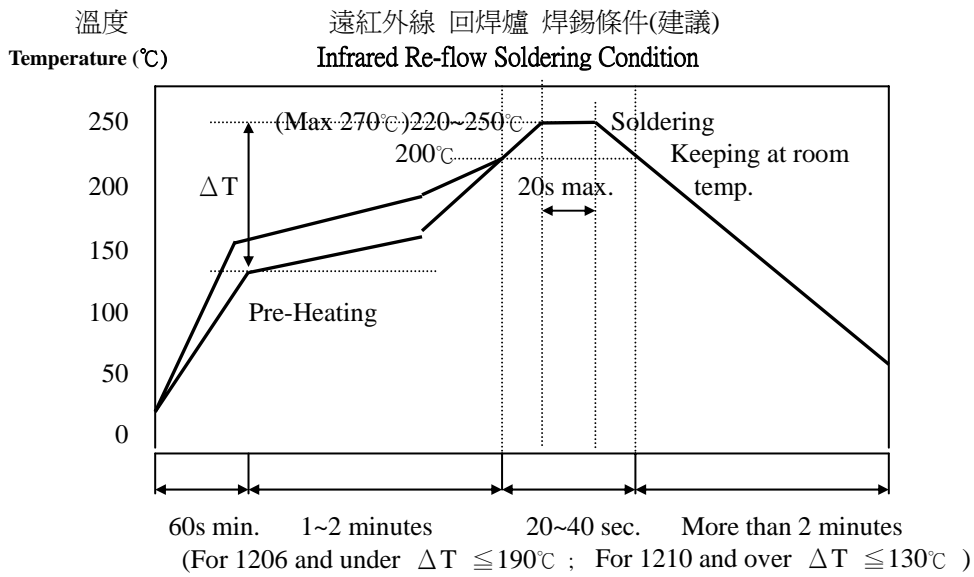
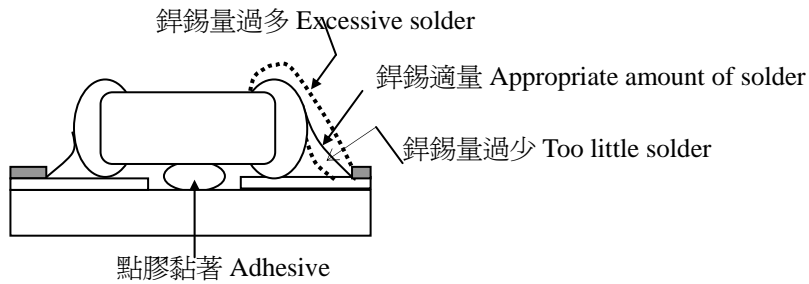
- (5) 冷卻：建議在自然條件下冷卻(Cooling: We recommend natural cooling in the air.)。

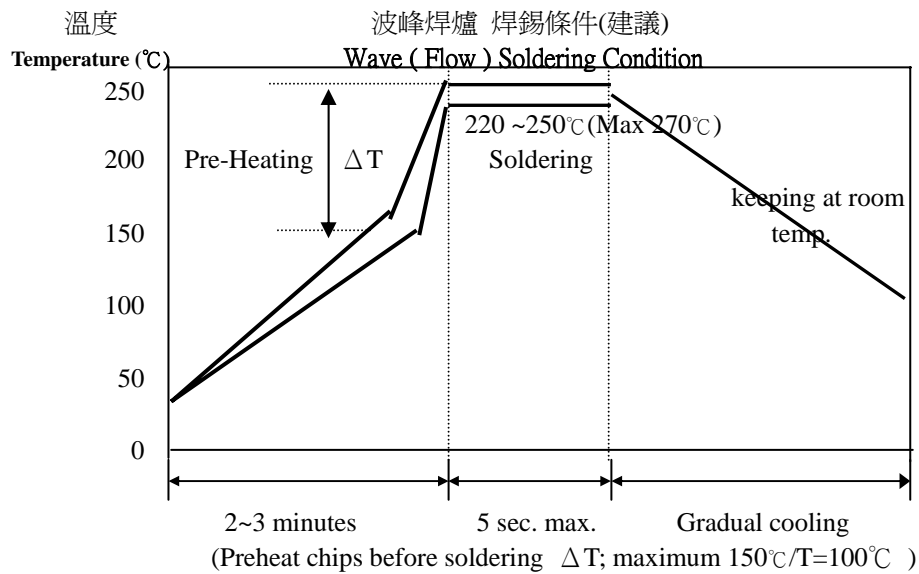
- (6) 電鍍材料：純錫(Cladding material of outer-electrode: Sn (~100%).)。



理想狀態為爬錫高度達電容厚度的 1/3 到 1/2(The ideal condition is to have soldered mass controlled to 1/2 to 1/3 of the thick-ness of the capacitor.)







9.2 自動貼片注意事項(Consideration for automatic placement):

機器上板子貼片調整(Adjustment of mounting machine)

1. 當電容上 PC 板時不能施加過大的外力於電容上

Excessive impact load should not be imposed on the capacitors when mounting onto the PC boards.

2. 爬錫過程中，支撐物必須恰當並定期檢查確認

The maintenance and inspection of the mountings should be conducted periodically.

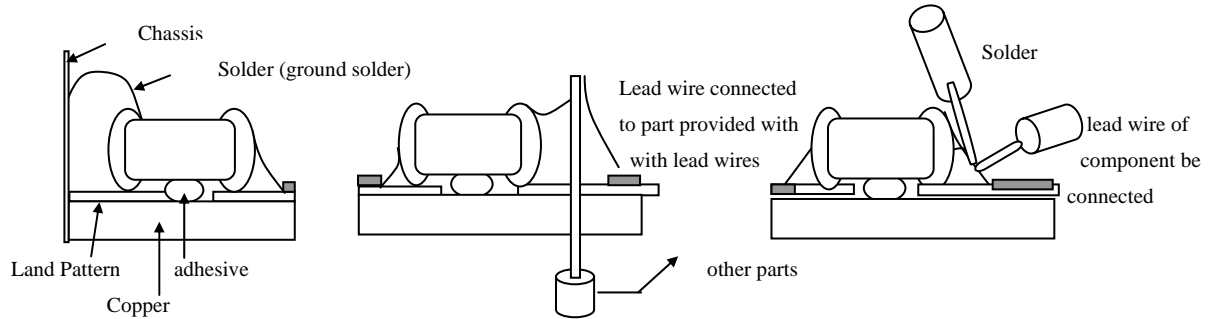
	不正確的(Not recommended)	正確的(Recommended)
單面板爬錫 (Single-sided Mounting)	Cracks	Supporting pin
雙面板爬錫 Double-sided Mounting	Crack Solder peeling	Supporting pin

9.3 印刷電路板設計(PCB design):

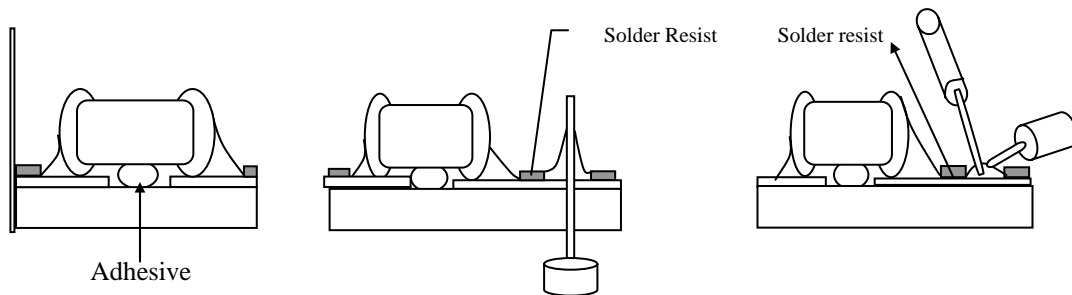
9.3.1 印刷電路板設計(PCB design):

回流焊及手工焊方法(Solder buildup by flow method and soldering methods)

錯誤方法舉例(Example of soldering to be avoided)

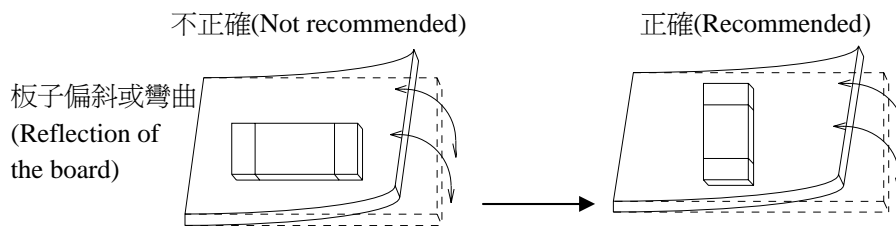


正確方法舉例(Example of correct soldering)

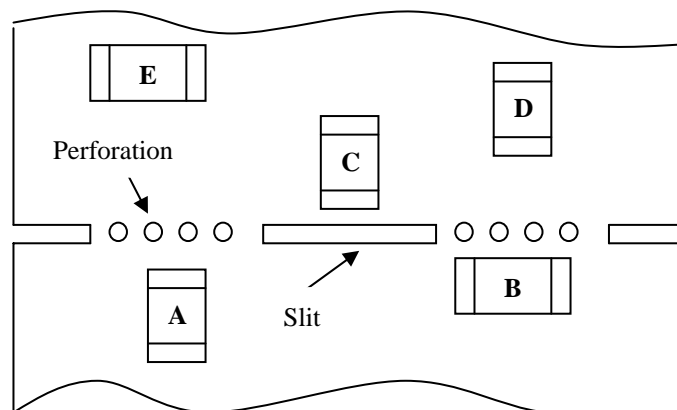


9.3.2 板面排列設計(Pattern Configurations):

以下圖片為電容正確和錯誤放置方法示意圖，SMD 電容貼片放置位置設計應將電容位置置於較不受任何機械外應力位置使板子彎曲降影響降到最低(The following are examples of good and bad capacitor layout; SMD capacitors should be located to minimize. Any possible mechanical stress from board warp or deflection.)。



以下示意圖為一個較好的設計範例(The example below shows recommendations for better design.)

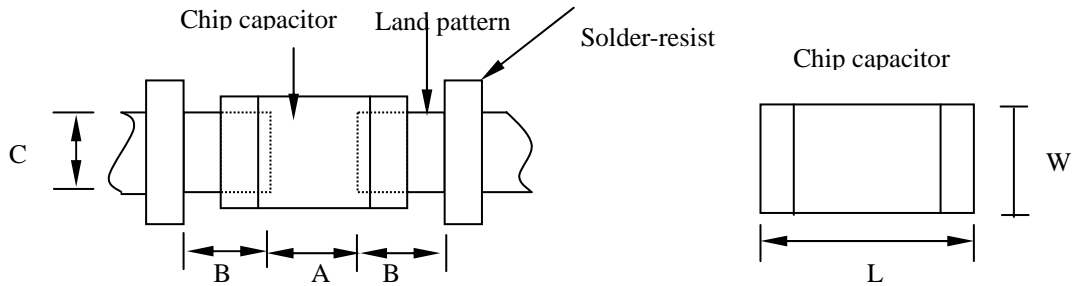


應力大小比較 Magnitude of stress  $A > B = C > D > E$

9.3.3. 焊錫點設計(Design of Land-patterns):

恰當的焊錫點設計可防止過多的焊料(過多的焊料會延展整個零件端頭)，如下圖和下表所示(The following diagrams and tables show some examples of recommended patterns to prevent excessive solder amounts. (Larger fillets, which extend above the component end terminations))。

一般的電容焊錫點設計如以下表格尺寸(Recommended land dimensions for a typical chip capacitor land patterns for PCBs)。



波峰焊正確尺寸(單位：mm)Recommended land dimensions for wave soldering (unit: mm)

Type	0603	0805	1206	1210	
Size	L	1.6	2.0	3.2	3.2
	W	0.8	1.25	1.6	2.5
A	0.8~1.0	1.0~1.4	1.8~2.5	1.8~2.5	
B	0.5~0.8	0.8~1.5	0.8~1.7	0.8~1.7	
C	0.6~0.8	0.9~1.2	1.2~1.6	1.8~2.5	

回流焊正確尺寸(單位：mm)Recommend land dimensions for reflow-soldering (unit: mm)

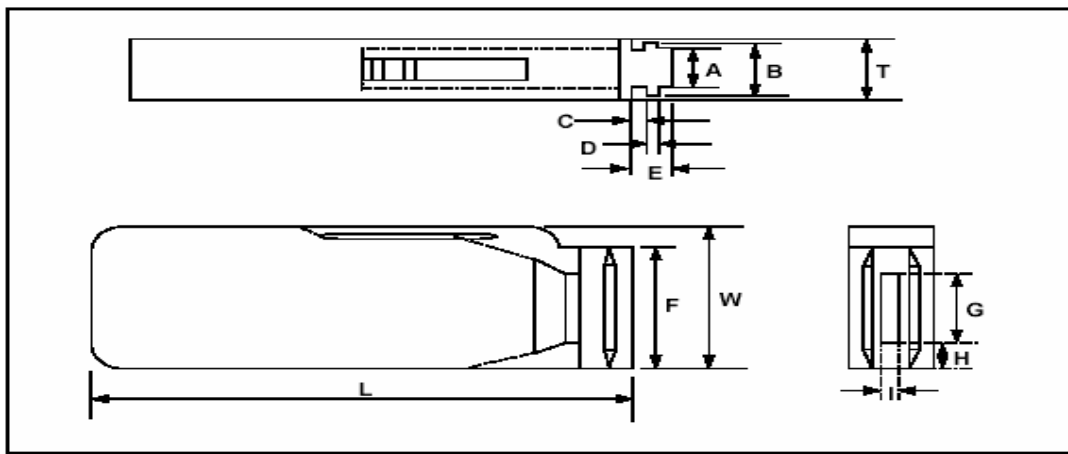
Type	0402	0603	0805	1206	1210	1812	(2220)	
Size	L	1.0	1.6	2.0	3.2	3.2	4.5	5.5
	W	0.5	0.8	1.25	1.6	2.5	3.2	5.0
A	0.45~0.55	0.6~0.8	0.8~1.2	1.8~2.5	1.8~2.5	2.5~3.5	3.7~4.7	
B	0.40~0.50	0.6~0.8	0.8~1.2	1.0~1.5	1.0~1.5	1.5~1.8	1.5~2.3	
C	0.45~0.55	0.6~0.8	0.9~1.6	1.2~2.0	1.2~2.0	2.3~3.5	3.5~5.5	

過多的焊料會降低電容承受機械應力的能力，因此，當刷焊料時，請注意焊墊設計來採取預防措施 (Excess solder can affect the ability of chips to withstand mechanical stresses. Therefore, please take proper precautions when land-patterns.)。

10. 包裝 Packing:

10.1 散裝數量 Bulk Case Packing:

標準為 5,10,15K 或 50Kpcs 每卷依尺寸不同，其他根據客戶要求指定(Standard packing 5,10,15K 或 50Kpcs /cartridge; others are according to customer request.)。



(unit : mm)

項次 (symbol)	A	B	T	C	D	E	L	F	W	I	H	G
尺寸 (Dimension)	6.8 ±0.1	8.8 ±0.1	12 ±0.1	1.5 +0.1/-0	2 +0/-0.1	3 +0.2/-0	110 ±0.7	31.5 +0.2/-0	36 +0/-0.2	5 ±0.35	7 ±0.35	19 ±0.35

彈夾包裝數量 (Quantity of Bulk Case Packaging):

尺寸(Size)	0402	0603	0603/0805B	0805C
代號(symbol)	K	G	H	L
晶片數量 Chip quantity	50000	15000	10000	5000

### 10.2 包裝帶 Tape Packing:

晶片尺寸(Chip Size): 0402, 0603, 0805, 1206, 1210, and 1812.

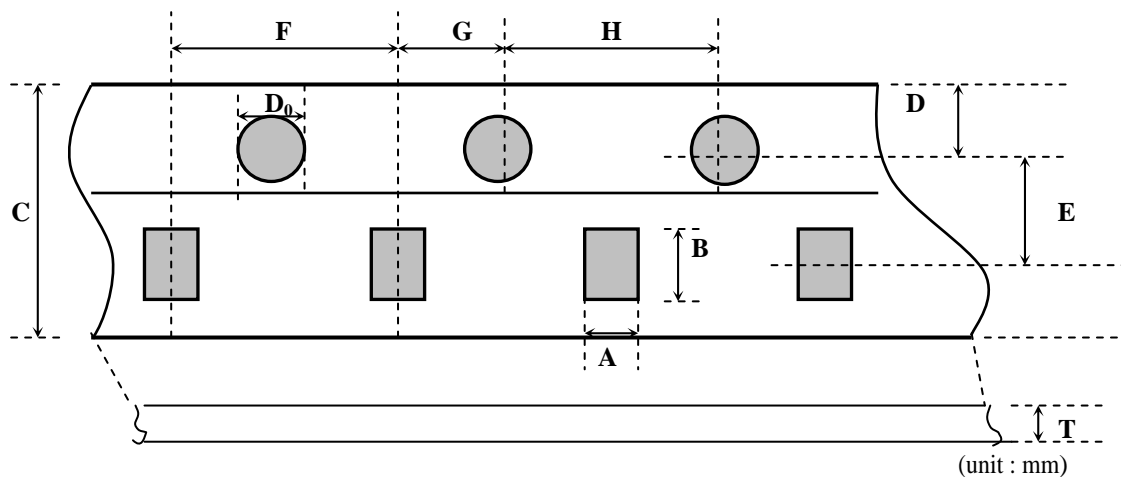
捲軸尺寸(Reel Size): 7 英寸或 13 英寸(7" diameter standard and 13" available.)

紙帶寬度(Tape width): 8mm (8mm tape width)

紙帶(Paper Tape): 對於 0603, 0805 和 1206 每卷 4Kpcs, 對於 0402 每卷 10Kpcs(Standard taping (8mm paper width) suitable to 0603,0805 and 1206, 4Kpcs/reel ;to 0402, 10Kpcs/reel.)

塑膠帶(Plastic Tape): 適合各種尺寸, 特別是厚度大於 1mm 之晶片, 4K 或 3Kpcs 每卷(Suitable all sizes, particularly for chip thickness over 1mm, 4Kpcs/reel or 3Kpcs/reel are available.)

#### 10.2.1 紙帶尺寸(Dimensions of Packing Paper (paper tape)):

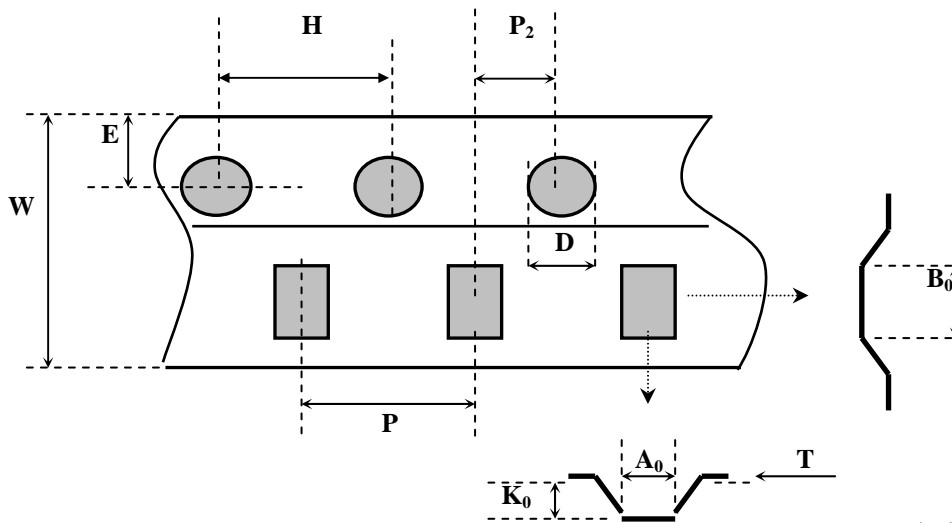


(unit : mm)

項次(Mark)	電容(Chip Size)			
	0402 H type	0603 B type	0805 B type	1206 B type
A (Width of Compartment)	0.65±0.10	1.02±0.10	1.50±0.10	2.00±0.20
B (Length of Compartment)	1.15±0.10	1.81±0.10	2.30±0.10	3.50±0.20
C (Tape width)	8.00±0.10			
D (Distance between a sprocket hole and the upper edge of the tape)	1.75±0.10			

<b>D<sub>0</sub></b> (Diameter of sprocket hole)	1.50±0.10/-0			
<b>E</b> (Distance between centers of a Sprocket hole and chip hole)	3.50±0.10			
<b>F</b> (Compartment pitch)	2.00±0.10	4.00±0.10		
<b>G</b> (Distance between centers of a Sprocket hole and chip hole)	1.00±0.10	2.00±0.10		
<b>H</b> (Sprocket hole pitch)	4.00±0.10			
<b>T</b> (Paper tape thickness H type :~0.5mm ; B type :~0.82mm)	0.60±0.05	0.95±0.05	0.95±0.05	0.95±0.05

10.2.2 塑膠帶尺寸(Dimensions of Embossed Packing (plastic tape)):

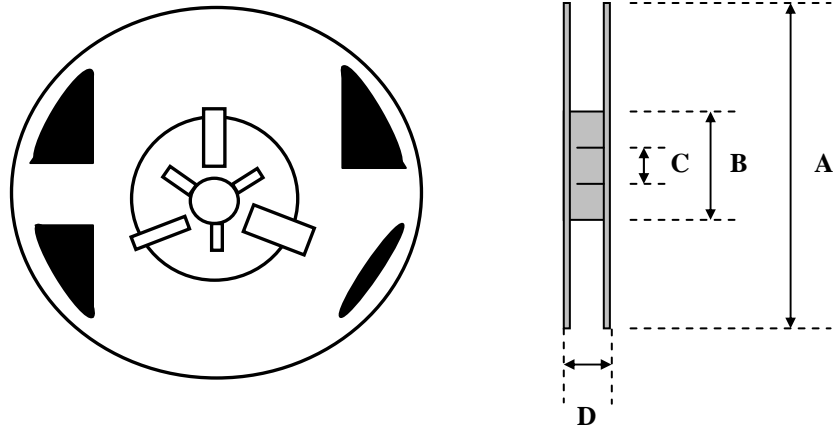


(unit : mm)

電容(Chip Size)	0805	1206	1206	1210	1210	1812	1812
項次(Mark)	C Type	C Type	D Type	C Type	D Type	C Type	D Type
<b>A<sub>0</sub></b> (Width of compartment)	1.45±0.20	1.80±0.20	1.88±0.20	2.75±0.20	2.68±0.20	3.65±0.20	3.66±0.20
<b>B<sub>0</sub></b> (Length of compartment)	2.30±0.20	3.50±0.20	3.53±0.20	3.55±0.20	3.46±0.20	4.69±0.20	4.95±0.20
<b>K<sub>0</sub></b> (Depth of compartment)	1.35±0.20	1.50±0.20	1.88±0.20	1.55±0.20	1.74±0.20	1.40±0.20	1.74±0.20
<b>D</b> (Diameter of sprocket hole)	1.50±0.10/-0						
<b>W</b> (Tape width)	8.00±0.20						
<b>P</b> (Compartment pitch)	4.00±0.10						
<b>P<sub>2</sub></b> (Distance between centers of a Sprocket hole and chip hole)	2.00±0.10						
<b>E</b> (Distance between a sprocket hole and the upper edge of the tape)	1.75±0.10						
<b>T</b> (Tape thickness)	0.23±0.10						
<b>H</b> (Sprocket hole pitch)	4.00±0.10						

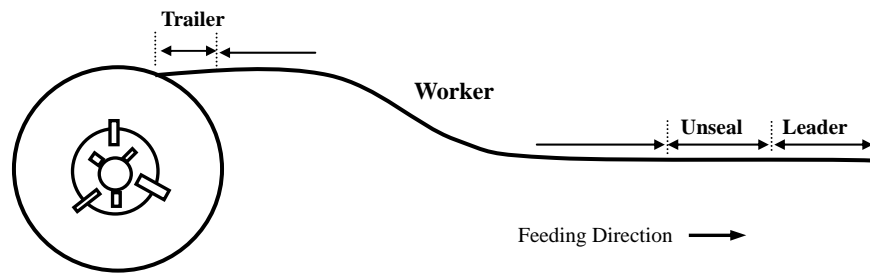
10.2.3 捲軸尺寸(Dimensions of Reel):

(相關標準(Related STD.):EIAJ ETX-7001 / JIS C 0806 / JIS K 6870)



捲軸尺寸(Reel size)	A	B	C	D
7"	178.0±2.0mm	60.0±5.0mm	13.0±0.8mm	9.0±0.8mm
13"	330.0±4.0mm	50~90mm	13.5±0.8mm	9.5±0.8mm

10.2.4 包裝描述(Taping Figure):



包裝 packing	晶片數量 Chip quantity		Minimum number of Empty compartments		
	包裝帶 Tape	Worker (PCS)	Trailer	Unseal	Leader
紙帶 Paper	D	4000	50 min.	50 min.	50 min.
	E	15000			
	I	10000			
	J	2500			
塑膠帶 Emboss (plastic)	A	1000	20 min.	20 min.	20 min.
	B	2000			
	C	3000			

10.2.5 包裝作業(Performance of Taping (JIS C 0806-3))

10.2.5.1.本位帶與上帶測試(Strength of Carrier Tape and Top Cover Tape)

10.2.5.1.1.本位帶 Carrier Tape

未使用本位帶能承受 1.02kgf 以上之力量強度(When a tensile force 1.02kgf is applied in the direction of unreeling the tape, the tape shall withstand this force.)。

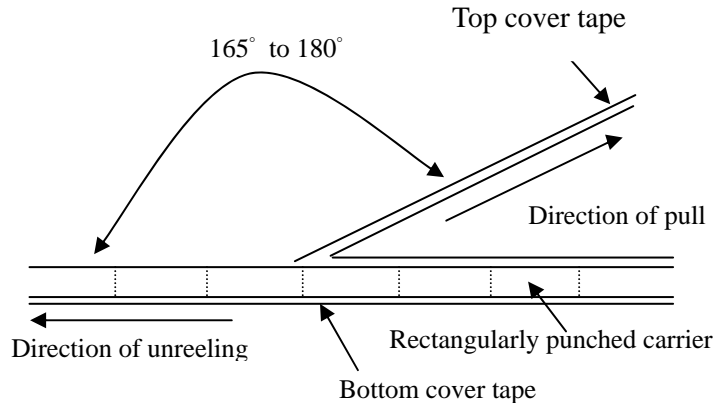
10.2.5.1.2.上帶(Top cover Tape)

上帶能承受 1.02kgf 以上之力量強度(When a tensile force 1.02kgf is applied to the tape, the tape shall

withstand this force.)

### 10.2.5.2. 上帶剝離力(Peel Force of Top Cover Tape)

除非特別說明，上帶剝離力必須在 10.2 到 71.4gf 之間，方法為以每分鐘 300mm 的速度，上帶與本位帶夾角為 165 到 180 度分離上帶與本位帶，示意圖如下(Unless otherwise specified, the peel force of top cover tape shall be 10.2 to 71.4 g f when the top cover tape is pulled at a speed of 300mm/min with the angle between the taped during peel and the direction of unreeling maintained at 165 to 180° as illustrated in Fig.)。



## 12. 證明書 (Warranty):

保證生產過程中不含有害物質

### Warranty for Non-Inclusion of Hazardous Substances in Manufacturing Processes

我司籍此證明生產過程中符合 SS-00259 (索尼管理規定標準) 分類標準(化合物與目標)，在生產過程中沒有使用以下材料和物質(Our company hereby certify that the “Targets” (combinations of substances and purposes) classified at SS-00259 (a management standard specified, issued by SONY) are not used for the following materials and substances: the materials which used in manufacturing Processes.)。

產品及零組件成分之相關證明

### Assurance relative to the composition of products and components

我司保證不含以下物質(We guarantee that the substances below will not be contained.)。

禁用物質(Banned substances)

- 重金屬(Heavy metals): 鎘及其化合物(Cadmium and cadmium compounds)  
鉛及其化合物(Lead and lead compounds)  
汞及其化合物(Mercury and mercury compounds)  
六价鉻及其化合物(Hexavalent chromium compounds)
- 氯化物(Chlorinated organic compounds): 多氯連苯(Polychlorinated biphenyl (PCB))  
多氯化鈉(Polychlorinated naphthalenes (PCN))  
氯代烷烴(Chlorinated paraffins (CP))  
污泥(過氯化物)(Mires (Perchlordecone))  
其他含氯化物(Other chlorinated organic compounds)
- 溴化物(Brominated organic compounds): 多溴連苯(Polybrominated biphenyls (PBB))  
多溴二苯醚(Polybrominated diphenylethers (PBDE))  
其他含溴化物(Other brominated organic compounds)
- 有機錫化合物(三丁基錫化合物,三苯基化合物)  
Organic tin compounds (Tributyl tin compounds, Triphenyl tin compounds)
- 石棉(Asbestos)
- 氮化物(Azo compounds)
- 甲醛(Formaldehyde)
- 聚氯乙烯及其化合物(Polyvinyl chloride (PVC) and PVC blends)

不使用含有損害臭氧層的物质材料(will not use the material, which has ozonosphere damage concerned.)



產品構成成分表(Constituent's illustration):

部位名稱 Name of the position	材料 Material	含量 the content (%)	CAS No.
電介質 (Dielectric material) (BME)	Barium Titanate Zirconate (BaTi <sub>x</sub> Zr <sub>1-x</sub> O <sub>3</sub> ), Barium titanate (BaTiO <sub>3</sub> ), Barium carbonate (BaCO <sub>3</sub> ), Yttrium oxide(Y <sub>2</sub> O <sub>3</sub> )	70~89	66402-68-4,12047- 27-7,513-77-9,1314 -63-9
電介質 (Dielectric material) (NME)	Barium carbonate (BaCO <sub>3</sub> ), Titanane oxide (TiO <sub>2</sub> ), Gadolinium oxide (Gd <sub>2</sub> O <sub>3</sub> ), Neodymium oxide (Nd <sub>2</sub> O <sub>3</sub> )	81~93	1340-28-5,13643-6 7-7
內電極 (Internal-electrode) (BME)	Ni	4~18	7440-02-0
內電極 (Internal-electrode) (NME)	Ag + Pd (9:1)	2~9	7440-22-4 / 7440-05-3
端電極 Outer-electrode (BME)	Termination-electrode Cu (cladding material Ni/Sn) ; 2nd cladding material: pure S n(fog)	6~12	7440-50-8
端電極 Outer-electrode (NME)	Termination-electrode Ag(cladding material Ni/Sn) ; 2nd cladding material: pure S n(fog)	4~10	7440-22-4

晶片單重表;

unit: mg

尺寸 厚度 / 材質	Y5V	X7R/X5R	NPO(C0G)
0402 H	0.0015±0.0003	0.0014±0.0003	0.0013±0.0003
0603 B	0.0058±0.0008	0.0057±0.0008	0.0048±0.0008
0805 B	0.0112±0.0010	0.0110±0.0010	0.0078±0.0010
0805 C	0.0163±0.0012	0.0168±0.0012	0.0082±0.0012
1206 B	0.0200±0.0015	0.0222±0.0015	0.0110±0.0015
1206 C	0.0238±0.0015	0.0283±0.0015	0.0132±0.0015
1206 D	0.0368±0.0015	0.0350±0.0025	0.0193±0.0015