

超高壓陶瓷電容器產品承認書

APPROVAL SPECIFICATIONS

FOR ULTRA-HIGH VOLTAGE TYPE CERAMIC CAPACITORS

客戶 CUSTOMER	立創商城		
客戶料號 CUSTOMER P/N			
產品編碼 PART NUMBER	CC4A471KE1IEB47E7100		
規格描述 DESCRIPTION	10KV/471/K/F10/直腳/L24/環氧(藍)/Y5P/7E/ZNR		
日期 DATE	2021-03-18	文件編號 DOC. NO.	DEC-SA-WI002

德爾創承認欄 APPROVED BY DERSONIC			客戶承認欄 APPROVED BY CUSTOMER	
批 準 APPROVED BY	審 核 CHECK BY	制 訂 FORMULATE BY	批 準 APPROVED BY	審 核 CHECK BY
彭少雄	吳成愛 承認專用章	麥瓊方		

東莞市德爾創電子有限公司

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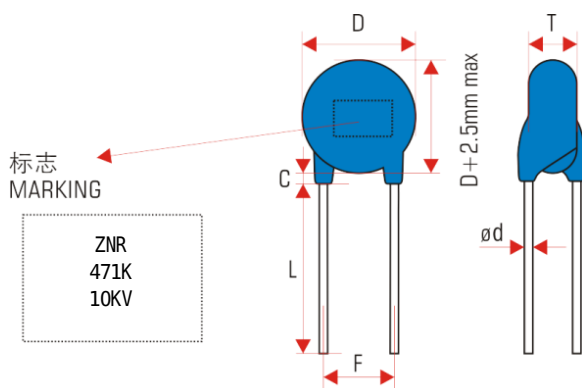
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1. 规格表 DATA SHEET



本体颜色: Body color:	蓝色 Blue
包封层: Coating:	环氧树脂 (UL94 V-0) Epoxy resin (UL94 V-0)
导线: Lead wire:	CP 线 CP wire
脚型: Lead style:	直脚 Straight leads

產品編碼 PART NUMBER		CC4A471KE1IEB47E7100
客戶料號 CUSTOMER P/N		
產品類別 PRODUCT SUBCLASS		Hi-k type
額定電壓 RATED VOLTAGE		10kVdc Remark: Rated ac voltage (50/60Hz) ≈ 280% rated dc voltage, e.g.: Rated dc voltage 10 000V ≈ rated ac voltage 3 600V Rated dc voltage 12 000V ≈ rated ac voltage 4 200V Rated dc voltage 15 000V ≈ rated ac voltage 5 400V
電容量 CAPACITANCE		470pF±10% @ 1kHz 1.0V _{RMS} 25.0°C
損耗角正切 TANGENT OF LOSS ANGLE		0.025 max @ 1kHz 1.0V _{RMS} 25.0°C
耐電壓 TESTING VOLTAGE		NO FAILURE @ DC15kVdc 60s 50mA
絕緣電阻 INSULATION RESISTANCE		10 000MΩ min @ 1000VDC 60s
溫度特性 TEMPERATURE CHARACTERISTIC		Y5P (ΔC/C: ±10% @ -25°C~105°C)
工作溫度範圍 OPERATING TEMPERATURE RANGE		-25°C ~+105°C
尺寸 DIMENSIONS	D (DIAMETER)	12.0mm max
	T (THICKNESS)	7.0mm max
	F (LEAD SPACING)	10.0mm±1.0mm
	L (LEAD LENGTH)	24.0mm±4.0mm
	ød (LEAD DIAMETER)	0.60mm±0.10mm
	C (COATING RUNDOWN ON LEADS)	3.0mm max

2. 應用

APPLICATION

本規格書適用於額定電壓超過6.3kVdc電子設備用超高压陶瓷電容器。

This specification is applied to ultra-high voltage type ceramic capacitors used for electric equipment with a rated voltage exceeding DC 6.3kV.

3. 額定值

RATING

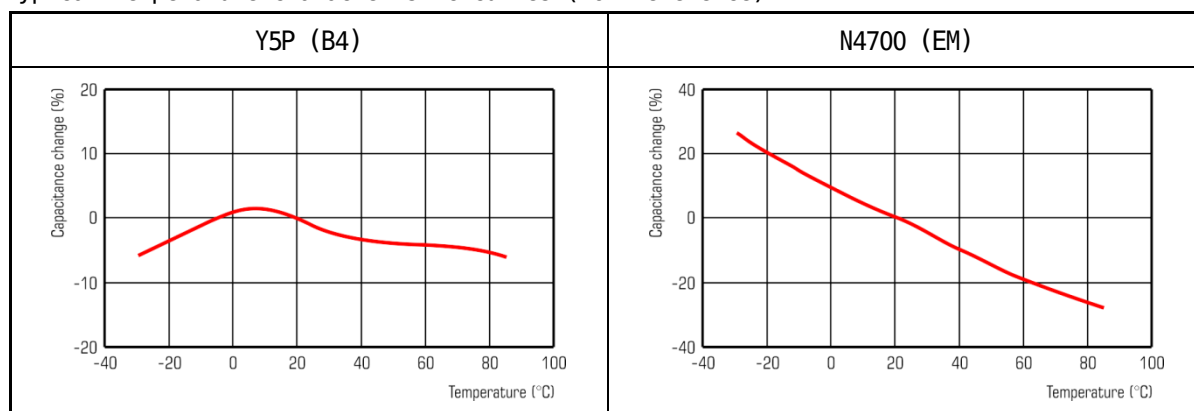
3.1. 工作溫度

Operating temperature

-25°C to +105°C

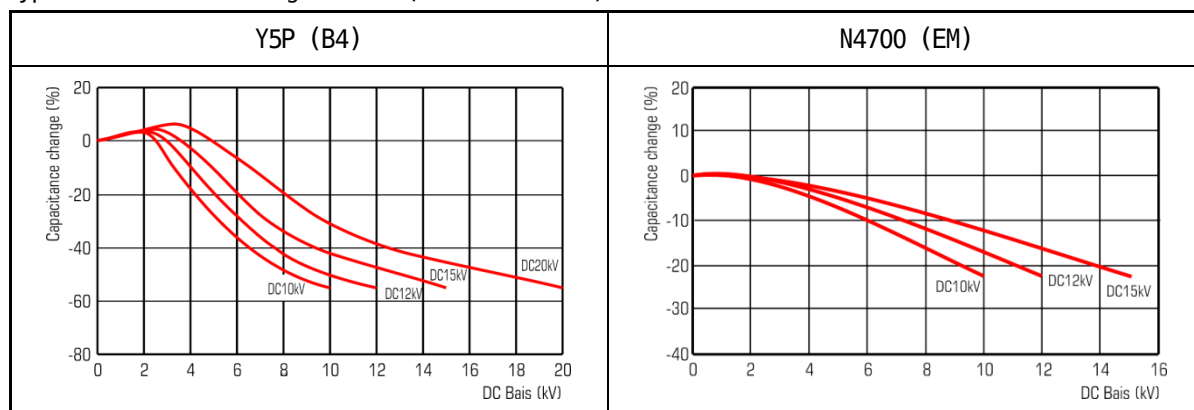
3.2. 典型溫度特性曲線（供參考）

Typical temperature characteristic curves (for reference)



3.3. 典型直流偏置電壓曲線（供參考）

Typical DC bias voltage curve (for reference)



3.4. 符合RoHS 2.0標準，無鹵。

Comply with RoHS 2.0, halogen-free available

4. 品號組成

PART NUMBER CONFIGURATION

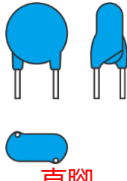
<u>CC</u>	<u>4A</u>	<u>471</u>	<u>K</u>	<u>E1I</u>	<u>E</u>	<u>B4</u>	<u>7E7</u>	<u>100</u>
系列 Serie	額定電壓 Rated voltage	標稱容量 Nominal capacitance	容量偏差 Capacitance tolerance	引線 成型方式 Leads format	包封材質 Coating material	溫度特性 Temperature characteristic	生產識別碼 Production identification code	標誌 Marking

■ 額定電壓 Rated voltage	3J: 6.3kVdc 3K: 8kVdc	4A: 10kVdc 4B: 12kVdc 4N: 15kVdc 4D: 20kVdc
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■ 標稱容量 Nominal capacitance	三位數表示, 單位pF。如: Three-digit representation, in pF. Ex. 471 = 470pF 102 = 1 000pF 103 =10 000pF (0.01 μF)
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■ 容量偏差 Capacitance tolerance	K: ±10% M: ±20%
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■ 引線成型方式 Leads format

代碼 Code	腳型 Lead style	腳距 Lead spacing	腳長 Lead length
E1I	 直腳 Straight leads	10.0mm ± 1.0mm	24.0mm ± 4.0mm

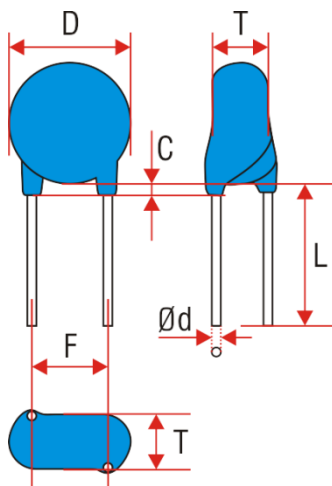
■ 包封材質 Coating material	E: 環氧樹脂包封 (藍色) Epoxy coating (blue)
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■ 溫度特性 Temperature characteristic	B4: Y5P EM: N4700
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■ 生產識別碼 Production identification code	本規格書不作說明。 This specification does not explain.
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■ 標誌 Marking	100: 印 “ZNR” 商標 Printing “ZNR” logo
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5. 規格表 SPECIFICATIONS LIST



溫度特性 Temperature Characteristic		Y5P (B4)			N4700 (EM)		
額定電壓 Rated voltage		10kV/12kV (4A/4B)	15kV (4N)	20kV (4D)	10kV/12kV (4A/4B)	15kV (4N)	20kV (4D)
標稱容量 Nominal Capacitance	100pF	9.0	9.0	9.5	9.0	10.0	
	150pF	9.0	9.5	11.0	9.0	15.5	
	220pF	10.0	10.5	12.5	10.0	13.0	
	330pF	11.0	12.0	14.0	11.0	15.0	
	470pF	12.0	14.0	15.0	12.0	17.0	
	680pF	13.0	16.0	16.5	16.0	20.0	
	1000pF	17.0	18.0	22.0	21.0	23.0	D, max
尺寸 Dimensions (mm)	T, max	7.0	8.0	10.0	6.0	7.0	---
	F	10.0±1.0	10.0±1.0 12.5±2.0	12.5±2.0	10.0±1.0	10.0±1.0 12.5±2.0	---
	L	24.0±4.0 32.0±4.0	24.0±4.0 32.0±4.0	24.0±4.0 32.0±4.0	24.0±4.0 32.0±4.0	24.0±4.0 32.0±4.0	---
	Φd	0.60±0.10	0.60±0.10 0.80±0.10	0.80±0.10	0.60±0.10	0.60±0.10 0.80±0.10	---
包封層 Coating		環氧樹脂 (UL94 V-0) Epoxy resin (UL94 V-0)					

6. 標準和測試方法 SPECIFICATION AND TEST METHODS

試驗與測試必須在標準條件（溫度15~30℃，相對濕度45~75%）下進行。

Test and measurement shall be made at the standard condition (Temperature 15~35℃, relative humidity 45~75%).

除非另有說明，如果對測量結果有疑問和被特別要求的情況下，電容必須在基準條件（溫度25±2℃，相對濕度60~70%）下進行測試。

Unless otherwise specified herein. If doubt occurred on the value of measurement, and measurement was requested by customer capacitors shall be measured at the reference condition (Temperature 25±2℃, relative humidity 60~70%).

No.	項目 Item		標準 Specification	測試方法 Test method												
1	外觀和尺寸 Appearance (APP) & dimensions		外觀和尺寸沒有明顯的缺陷 No marked defect on appearance form and dimensions. 尺寸請參考“規格表” Please refer to “DATA SHEET” .	用目視檢查電容器表面明顯的缺陷 The capacitor should be inspected by naked eyes for visible evidence of defect. 尺寸用遊標卡尺測量。 Dimensions should be measured with slide calipers.												
2	標誌 Marking		清晰易於識別 To be easily legible.	目視檢查。 The capacitor should be inspected by naked eyes.												
3	介質 強度 Dielectric Strength	引線之間 Between Lead wires (TV)	無失效 No failure	在絕緣油或氣體中，兩引線間施加150%額定直流電壓60秒鐘，電容器不應損壞（充放電流小於50mA）。 The capacitors shall not be damage when DC voltage of 150% of the rated voltage is applied between the lead wires for 60 s in insulate liquid or gas. (Charge/discharge current: 50mA max.)												
		本體絕緣 Body insulation	無失效 No failure	將電容器放入填充滿直徑為1mm金屬球的容器中，然後將兩根引線短路，並且使電容器根部離金屬球2mm，在金屬與兩根引線之間施加3kV的直流電壓10s（充放電流小於50mA）。 The capacitors is placed in the container with metal balls of diameter 1mm so that each lead wires, Short-circuited, is kept approximately 2mm off the balls, and DC voltage of 3kV is applied for 10 s between capacitor lead wires and small metals. (Charge/discharge current: 50mA max.)												
4	絕緣電阻 Insulation Resistance(IR)		Y5P: 10,000MΩ min. N4700: 30,000MΩ min.	在電容器兩引線間施加1 000V的直流電壓，時間60±5。 The insulation resistance shall be measured with DC 1 000V within 60±5 s of charging.												
5	電容量 Capacitance		在允許誤差範圍內 Within the specified tolerance.	電容量、損耗應在25°C的環境下，使用1±0.1kHz、1.0Vrms的條件進行測試。 The capacitance and DF shall be measured at 25°C with 1±0.1kHz and 1.0V (r.m.s.).												
6	損耗因素 Dissipation Factor (DF)		Y5P: 0.025 max. N4700: 0.004 max.													
7	溫度特性 Temperature Characteristic		Y5P: ±10% N4700: -4,700±1,000ppm/°C	電容量應在表中規定的每個步驟進行測量。 The capacitance measurement shall be made at each step specified in table. <table><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>Temperature(°C)</td><td>20</td><td>-25</td><td>20</td><td>105</td><td>20</td></tr></table> 針對第3步驟的容量變化率不能超過指定值。 Capacitance change from the value of step 3 shall not exceed the limit specified.		1	2	3	4	5	Temperature(°C)	20	-25	20	105	20
	1	2	3	4	5											
Temperature(°C)	20	-25	20	105	20											
8	充放 電試驗 Charge Discharge Test	APP	無可見損傷 No marked defect.	充放電試驗應在下列試驗電路和循環中測量。 Charge discharge test shall be measured in the following test circuit and cycle. <div><p>E: Direct-current voltage source Co: Supplied energy for Cx (Co≠Cx) Cx: Specimen R1: Current protective resistor (300kΩ) R2: Current limiting resistor (E/10Ω)</p></div>												
		ΔC/C	±10%													
		DF	Y5P: 4.0% max. N4700: 1.5% max.													
		IR	Y5P: 2,500MΩ min. N4700: 10,000MΩ min.													
		TV	無失效 No failure													
9	導線抗張強度 Terminal Tensile Strength		導線無折斷，電容無破損。 Lead wire should not be cut off. Capacitor should not be broken.	固定電容器的本體，使電容器每支導線均承受10N垂直力，保持10±1秒鐘 Fix the body of capacitor, apply a tensile weight gradually to each lead wire in the radial direction of capacitor up to 10N, and keep it for 10±1 s.												

No.	項目 Item	標準 Specification	測試方法 Test method									
10	導線抗折強度 Terminal Bending Strength	導線無折斷。 Lead wire should not be cut off.	電容器導線應承受5N重量，然後彎外彎折成90°，然後回復到原來位置；接着往反方彎折90°，再復原；彎折一次2-3秒鐘。 Each lead wire shall be subjected to 5N weight and then a 90° to bend, at the point of egress, in one direction, return to original position, and then a 90° bend in the opposite direction at the rate of one bend in 2 to 3 s.									
11	可焊性 Solderability of Leads	導線必須有3/4以上的面積均勻附着焊錫。 Lead wire shall be soldered with uniformly coated on the axial direction over 3/4 of the circumferential direction.	將引線應浸入濃度為25%的乙醇溶液中，然後浸泡在熔融焊料中2±0.5秒鐘，浸泡深度為距引線根部約1.5至2.0mm處。 The lead wire shall be dipped into a 25% ethanol solution of rosin and then into molten solder of below temperature for 2±0.5 s. In both cases the depth of dipping is up to about 1.5 to 2.0mm from the root of lead wires. 焊錫溫度 Temp. of solder : 無鉛焊錫(Sn-3Ag-0.5Cu)245±5°C Lead Free Solder (Sn-3Ag-0.5Cu) 245±5°C									
12	焊錫耐熱性 Soldering effect	APP	將引線浸泡在260±5°C的焊料中10±0.5秒鐘，其深度為距端子根部1.5至2.0mm處。 The lead wires shall be immersed into the melted solder of 260±5°C up to about 1.5 to 2.0mm from the main body for 10.0±0.5 s. 試驗後處理：電容器應在室溫下儲存1到2小時。 Post-treatment: Capacitor shall be stored for 1 to 2 h at room condition									
		Δ C/C		±10%								
13	穩態濕熱 Humidity (under steady state)	APP	將電容器儲存溫度40±2°C、相對溫度為90~95%的環境中500±8小時。 Set the capacitor for 500±8 h at 40±2°C in 90 to 95% humidity. 試驗後處理：電容器應在室溫下儲存1到2小時。 Post-treatment: Capacitor shall be stored for 1 to 2 h at room condition.									
		Δ C/C		Y5P: ±10% N4700: ±3%								
		DF		Y5P: 4.0% max. N4700: 1.5% max.								
		IR		Y5P: 1,000MΩ min. N4700: 5,000MΩ min.								
14	壽命 Life (高溫負荷) (high temperature load)	APP	電容器浸入105±2°C的絕緣油中，施加額定電壓1000+48/-0小時。 Apply a DC voltage of rated voltage for 1000+48/-0 h in insulating oil at 105±2°C. 試驗後處理：電容器應在室溫下儲存24±2小時。 Post-treatment: Capacitor shall be stored for 24±2 h at room condition.									
		Δ C/C		Y5P: ±10% N4700: ±3%								
		DF		Y5P: 4.0% max. N4700: 1.5% max.								
		IR		Y5P: 2,500MΩ min. N4700: 10,000MΩ min.								
		TV		無失效 No failure								
15	溫度循環 Temperature Cycling	APP	溫度循環試驗按以下條件進行試驗和測量 Temperature cycling shall be measured in the following test. <table><tr><td>Step</td><td>Temperature(°C)</td><td>Time</td></tr><tr><td>1</td><td>-30</td><td>30 min</td></tr><tr><td>2</td><td>+105</td><td>30 min</td></tr></table> 循環次數：5次 Cycle numbers: 5 cycles 試驗後處理：電容器應在室溫下儲存4小時。 Post-treatment: Capacitor shall be stored for 4h at room condition.	Step	Temperature(°C)	Time	1	-30	30 min	2	+105	30 min
		Step		Temperature(°C)	Time							
		1		-30	30 min							
		2		+105	30 min							
		Δ C/C		Y5P: ±10% N4700: ±3%								
DF	Y5P: 4.0% max. N4700: 1.5% max.											
IR	Y5P: 2,500MΩ min. N4700: 10,000MΩ min.											
TV	無失效 No failure											



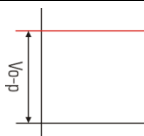
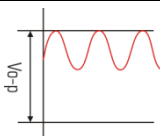
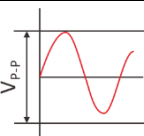
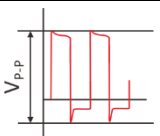
警告 CAUTION

A. 工作電壓

OPERATING VOLTAGE

在交流电路或纹波电路中使用直流额定电压电容器时，请务必将外加电压的 V_{p-p} 值或包含直流偏置电压的 V_{o-p} 值维持在额定电压范围内。若将电路施加电压，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 DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the V_{p-p} value of the applied voltage or the V_{o-p} which contains DC bias within the rated voltage range. When the voltage is started to apply to the circuit or it is stopped applying, the irregular voltage may be generated for a transit period because of resonance or switching. Be sure to use a capacitor within rated voltage containing these irregular voltages.

電壓 Voltage	直流電壓 DC Voltage	直流+交流電壓 DC+AC Voltage	交流電壓 AC Voltage	脈沖電壓 Pulse Voltage
測量位置 Positional Measurement				

B. 工作溫度與自生熱

OPERATING TEMPERATURE AND SELF-GENERATED HEAT

電容器的表面溫度應保持在其額定工作溫度範圍的上限以下。務必考慮到電容器的自生熱。

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself.

電容器在高頻電流、脈沖電流等中使用時可能會因介電損耗發出自生熱。外加電壓應使自生熱等負荷在25°C周圍溫度條件下不超過20°C範圍。測量時應使用 $\phi 0.1\text{mm}$ 小熱容量(K)的熱電偶，而且電容器不應受到其它元件的散熱或環境溫度波動影響。

When the capacitor is used in a high-frequency current, pulse current or the like, it may have the self-generated heat due to dielectric-loss. Applied voltage should be the load such as self-generated heat is within 20°C on the condition of atmosphere temperature 25°C. When measuring, use a thermocouple of small thermal capacity-K of $\phi 0.1\text{mm}$ and be in the condition where capacitor is not affected by radiant heat of other components and wind of surroundings.

過熱可能會導致電容器特性及可靠性下降。(切勿在冷卻風扇運轉時進行測量。否則無法確保測量數據的精確性。)

Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. (Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

C. 貯存與使用條件

OPERATING AND STORAGE ENVIRONMENT

電容器絕緣包封層不是完美的密封形式，因此，請勿將電容器存放在腐蝕性氣體中，尤其是存在氯氣、硫氣、酸、堿、鹽等場所，同時應防潮。

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.

在對本產品進行清洗、焊接或成型前，請先在指定設備上測試經清洗、焊接或成型的產品的性能，以確定上述過程不會影響產品質量。

In case of cleaning, bonding, or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment.

電容器應存放在溫度及相對濕度分別不超出-10~40°C及15~85%範圍的場所。請在6個月內使用電容器。

Store the capacitors where the temperature and relative humidity do not exceed -10 to 40°C and 15% to 85%. Use capacitors within 6 months after delivered.

D. 壓焊、樹脂塗層與包封

BONDING, RESIN MOLDING AND COATING, BOARD TO AVOID

在壓焊、樹脂塗層和封膜之前，請先使用指定設備確認對產品沒有影響，然後再進行使用。

In case of bonding, molding or coating this product, verify that these processes do not affect the quality of capacitor by testing the performance of the bonded, molded or coated product in the intended equipment.

在粘合、樹脂塗層、封膜的乾燥、硬化條件使用到有機溶劑(乙酸乙酯、甲基乙酮、甲苯等)，可能會破壞電容器的包封樹

脂，而造成短路不良。

In case of the amount of applications, dryness / hardening conditions of adhesives and molding resins containing organic solvents (ethyl acetate, methyl ethyl ketone, toluene, etc.) are unsuitable, the outer coating resin of a capacitor is damaged by the organic solvents and it may result, worst case, in a short circuit.

粘合、樹脂塗層、封膜厚度的偏差可能會在冷卻與加熱過程中使電容器的包封樹脂和/或陶瓷介質破裂。

The variation in thickness of adhesive, molding resin or coating may cause a outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.

樹脂材料在熱條件下（超過100℃）的強度較弱。因此，在這種情況下，為了避免機械應力，請小心處理。

Resin material to hot conditions (over 100℃) was weaker to intensity. So such with board to avoid mechanical stress in this state, please handle it with care.

E. 振動與碰撞

VIBRATION AND IMPACT

使用時請勿使電容器受到過度沖擊或振動。

Do not expose a capacitor or its leads to excessive shock or vibration during use.

F. 焊錫

SOLDERING

當在PCB/PWB焊錫這個產品時，不要超過電容器的焊錫耐熱性標準。過度的熱量會使電容器內部焊錫熔化，可能導致熱衝擊而使陶瓷介質出現暗裂。

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification 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.

右圖是推薦的波峰焊曲線，請參考！

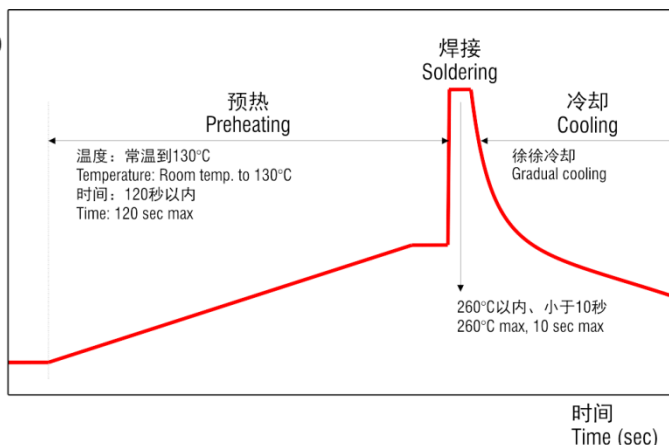
On the right is the recommended wave-soldering curve, please refer to!

當使用烙鐵進行手工焊錫時，應該遵照下列條件：

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

- 焊錫溫度：350℃最大
Temperature of iron-tip: 350 °C max.
- 烙鐵頭：不超過40W
Soldering iron wattage: 40W max.
- 焊錫時間：不超過5.0秒
Soldering time: 5.0s max.

溫度
Temperature (°C)



使用本產品時如忽略上述警告事項，則在嚴重情況下可能導致短路，並引起冒煙或局部破裂。

Failure to follow the above cautions may result, worst case, in a short circuit and cause fuming or partial dispersion when the product is used.

注意事項

NOTICE

G. 清洗

CLEANING

要進行超聲波清洗，應遵守下列條件。

To perform ultrasonic cleaning, observe the following conditions.

- 清洗槽容量：每升輸出功率小於20W。
Rinse bath capacity : Output of 20 watts per liter or less.
- 清洗時間：最多5分鐘。
Rinsing time: 5min maximum
- 不得直接振動 PCB/PWB。

Do not vibrate the PCB/PWB directly.

- 過度的超聲波清洗會導致導線的過載損壞。

Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires.

H. 電容器容量變化

CAPACITANCE CHANGE OF CAPACITOR

- 1類瓷電容器

Class 1 capacitors

電容量可能會因環境溫度或外加電壓而發生輕微變化。若要將本產品用於嚴格的時間常數電路，請與我公司聯系。

Capacitance might change a little depending on a surrounding temperature or an applied voltage. Please contact us if you use for the strict time constant circuit.

- 2類瓷電容器

Class 2 capacitors

2類瓷像Y5P、Y5U和Y5V等溫度特性具有老化特性，因此，電容器若長時間不使用，其電容量會逐漸降低。而且，電容量還可能會因周圍溫度或外加電壓而發生巨大變化。所以不適合用於時間常數電路。若需詳情，請與我公司聯系。

Class 2 capacitors like temperature characteristic Y5P, Y5U and Y5V have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor leaves for a long time. Moreover, capacitance might change greatly depending on a surrounding temperature or an applied voltage. So, it is not likely to be able to use for the time constant circuit. Please contact us if you need a detail information.

請確保我們的產品已安裝到您的產品上前已根據您的規格進行了評估。

Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.

請您使用我們的產品時，不要偏離此標準。

You are requested not to use our product deviating from this specification.

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