

## ■ 高分子固態電容使用注意事項



### 一、回路設計上的注意事項

1. 極性  
高分子固態電容是有正極和負極。  
使用時，切勿錯置極性。若極性錯置，使用時將會增加漏電流或減少使用壽命。
2. 禁止使用的回路  
高分子固態電容的漏電流在以下條件有可能會增大。  
(a) 鍍焊錫時  
(b) 經過無外加電壓的高溫無負荷、高溫高濕無負荷、冷熱沖擊試驗等，漏電流也有增大的可能。  
以下回路有可能出現故障，請禁止使用  
(a) 高阻抗回路  
(b) 藕合回路  
(c) 時間恆定回路  
(d) 有關漏電流變而影響回路工作的情況  
▲為提高耐壓性而將兩個以上的高分子固態電容串聯連接使用時，請與我們聯絡。
3. 電路設計  
請在確認以下內容的基礎上進行電路設計。  
(1) 隨著溫度及頻率的變化，電容器的電氣特性會隨之變化。請在確認這些變化之後進行電路的設計。  
(2) 當並聯2個以上的電容器時，請在設計電路時考慮電流的平衡  
(3) 當串聯2個以上的電容器時，因載入電壓存在差異，有可能加載過電壓，請使用的時候另行諮詢我們。

### 4. 確認使用環境溫度、電壓和紋波電流

- (a) 使用溫度應控制在出廠規格書規定的使用溫度範圍內。
- (b) 超過額定電壓的過電壓將會發生短路，因此，即使是瞬間也不得外加過電壓。
- (c) 不得接通超過額定的紋波電流若接通過大的紋波電流，將會增高內部發熱，減少使用壽命。

## ■ Precautions In Using



### 一、Precautions for circuit designing

1. Polarity  
Conductive Polymer Aluminum Solid Capacitors have the positive and negative electrodes.  
Using reversed polarity may cause leakage current increased or life span decreased.
2. Prohibited circuits  
Conductive Polymer Aluminum Solid Capacitors leakage current may become larger as the following conditions.  
(a) Soldering  
(b) High temperature no-load test, high temperature and high humidity no-load test, rapidly changing temperature test, etc.  
Avoid the use of Conductive Polymer Aluminum Solid Capacitors in the following type of circuits because leakage current may increase.  
(a) High-impedance circuits  
(b) Coupling circuits  
(c) Time constant circuits  
(d) Other circuits that are significantly affected by leakage current  
▲ If you plan to use 2 or more Conductive Polymer Aluminum Solid Capacitors in a series connection, please contact us before use.

### 3. Circuit Design

- (1) The electrical characteristics of the capacitor will vary depending on differences in temperature and frequency. Only design your after verifying the scope of these factors.
- (2) When connecting two or more capacitors in parallel ensure that the design takes current balancing into account.
- (3) When two or more capacitors are connected in series, variability in applied voltage may cause over-voltage conditions. Contact Su'scon before using capacitors connected in series.

### 4. Operating temperature 、voltages and ripple current

- (a) Operating temperature must be under the category temperature range of specification.
- (b) Do not apply voltages exceeding the full rated voltage.
- (c) Do not apply currents that excess the rated ripple current. When excessive ripple current is applied ,the Conductive Polymer Aluminum Solid Capacitors may result in shorter life due to the internal heat increase.

## 5. 快速充放電的限制

急速充放電所導致過大的衝擊電流將會造成短路或增加漏電流。以下條件時，應使用保護回路。

(1) 衝擊電流超過10A

(2) 超過所用高分子固態電容額定紋波電流值10倍

▲測試漏電流時，務必插入 1kΩ的保護電阻，進行充電和放電。

## 6. 故障和使用壽命

最高使用溫度範圍、外加電壓範圍時，基於JIS C 5003標準(可信度水準60%) 0.5% / 1000小時。以下為高分子固態電容的主要故障模式。

## 6-1.故障模式

1.產品溫度上升引起的靜電電容減少及ESR的上升引起的開放模式磨損是主要的故障模式。有時候也會偶發因過大電壓和超大電流導致的短路模式

2.通過降低周圍溫度、紋波電流、加載電壓可以減少故障率。

3.由於加載超過額定電壓的電壓引起短路和通電電流過大的時候、會因內壓的上升而使得膠蓋膨脹或剝落，發出臭氣。

4.構成產品的材質中含有可燃物質，短路部位有可能因為電火花等而起火。產品的安裝方法、位置、圖形設計等請考慮以下設計方面的注意點，以確認絕對的安全

A.設置保護電路、保護裝置，確保絕對的安全

B.設置冗長電路等，以便設備不會因為單個的故障而不穩定。

## 6-2.使用中的電氣特性變動及磨耗故障(使用壽命)

高分子固態電容即使在出廠規格書記載的額定，電性能和機械性能的範圍內使用，也會在各自性能規定的範圍內發生靜電容量減少，等效串聯電阻增大等電氣特性的變動，設計時應予以注意。至於磨耗故障，主要是超過信賴性和高溫高濕保障時間後，這類電氣特性的變動進而增大，最終形成電解質的絕緣化(劣化)，成為開放模式。 Sudden charge and discharge

## 5.

An excessive surge current by sudden charge or discharge may result in a short circuit or a large leakage current. Protection circuits are recommended to retain high reliability in case of the following conditions.

(a) The surge current value exceeds 10A

(b) The value exceeds 10 times of the rated ripple current

▲ When you measure leakage current, a protection resistor of approximately 1k Ω must be inserted to the circuit before charge and discharge.

## 6. Failure and life-span

The failure rate is 0.5% / 1000h(with a 60% reliability standard) based on JIS C 5003.

The mainly failure modes are as follows.

## 6-1. Failure mode

1.The product of electrostatic capacitance decrease caused by temperature rise and the rise of the ESR open mode caused by the wear .that is the main failure mode.Sometimes accidental short-circuit caused by excessive voltage and large current mode

2. Decrease the failure rate we can reduce ambient temperature, ripple current and use voltage.

3.When the load voltage exceeds the rated voltage will cause a short circuit or ripple current is too large, internal pressure increased and the rubber expansion or peeling, smelliness

4. The installation method of products, Position, Graphic design please consider the following points to ensure the safety

A. Set the protection circuit and Protector to ensure the safety.

B. Setting a redundant circuit, so that the equipment will not be unstable because of a single fault.

## 6-2. Wear-out failure (life-span)

When life span exceeded the specified guarantee time of Endurance and Damp heat, electrolyte might insulate and cause electric characteristic changed. This is called an open circuit. The electric characteristics of capacitance and ESR may possibly change within the specified range in specifications when it is used under the condition of the rated voltage, electric and mechanical performance. Please note it when design.

## 6-3.壽命推算公式

$$L_x = L_o \times 10^{\frac{T_x - T_o}{20}}$$

Lx:推算實際使用壽命

Lo:額定壽命

Tx:設計時最大溫度

To:使用環境溫度

由于固態具有良好的自發熱性能，所以在壽命計算的過程可以不用考慮受到外界所施加的紋波電流而產生的內部溫升

## 固態電容壽命推算表

額定溫度	使用溫度	推算使用壽命
105°C	105°C	2,000 Hrs
105°C	95°C	6,325 Hrs
105°C	85°C	20,000Hrs
105°C	75°C	63,246Hrs
105°C	65°C	131,400Hrs

備注：

- 1.電容最大使用壽命為15年
- 2.施加紋波電流時，需依目錄額定電流或低于額定紋波電流下使用

## 6-3.Reliability Presumption of Life

$$L_x = L_o \times 10^{\frac{T_x - T_o}{20}}$$

Lx:Life expectance in actual use(Tx)

Lo:Guaranteed at maximum temperature (To)

Tx:Maximum operating temperature(°C)

To:Temperature in actual use (Ambient temperature of polymer) (°C)

Owing to the excellent heat-proof characteristics of conductive polymer, the estimated life expectancy can be calculated without consideration of self-heating under application of the ripple current.

## Polymer Capacitors Estimation of Life time

Rated Temp.	Used Temp.	Estimation Life
105°C	105°C	2,000 Hrs
105°C	95°C	6,325 Hrs
105°C	85°C	20,000Hrs
105°C	75°C	63,246Hrs
105°C	65°C	131,400Hrs

Please note that:

1. The Capacitors Life maximum life is 15 years
2. Ripple current in application should be less than or equal to ripple current specified in catalogue

## 二、安裝的注意事項

### 1. 漏電流

漏電流因焊接的熱應力及輸送等機械性應力的影響而有增大的可能在這種情況下，若在高分子固態電容的最高使用溫度範圍以下外加電壓，則漏電流將會逐漸變小。在接近最高使用溫度範圍的狀態下，越是外加額定電壓以下的高電壓，越會加快漏電流的修復速度。

漏電流回升的原因

- a. 焊接
- b. 高溫無負荷、高溫高濕、溫度急劇變化等試驗。

### 2. 電容器的絕緣

- (a) 外殼和負極端子之間有不穩定的電阻，未經絕緣處理，應予以注意
- (b) 外殼，負極電極端子，正極電極端子及線路結構之間的電路應完全隔離

### 3. 使用環境的限制

不得在以下環境下使用

- (a) 直接澆水，澆鹽水，澆油或結露狀態下的環境
- (b) 充滿有害氣體(硫化氫，亞硫酸，亞硝酸，氯，氨等)的環境
- (c) 受臭氧，紫外線，放射線照射的環境

### 4. 印刷電路板的設計

- (a) 避免在高分子固態電容周圍及印刷電路板背面安裝發熱元件
- (b) 貼裝型應按照技術手冊或出廠規格書記載的建議條件，設計印刷電路板接合區結構的電路
- (c) 插裝型應顧及技術手冊或出廠規格書記載的產品尺寸公差，設計安裝的基板孔及孔徑

### 5. 並聯連接

高分子固態電容與其他電容器並聯連接使用時，流入高分子固態電容的紋波電流將會增多，選購時應予以注意。

### 6. 其他

確認以下內容後，再設計電路

- (a) 電氣特性隨著溫度和頻率的變動而變化。設計前，應先掌握這一變化部份
- (b) 在雙面基板上安裝高分子固態電容時，多餘的基板孔和基板正反面連接用通孔不要位於高分子固態電容的下方

## 二、Caution For Assembling Capacitors

### 1. Leakage Current

Mechanical stress may cause Conductive Polymer Aluminum Solid Capacitors leakage current increased. In such a case, leakage current will gradually decrease by applying voltage within the category voltage and the upper category temperature. Then, self-healing speed of leakage current is faster when it is near to the upper category temperature and the category voltage.

The cause of Leakage current rise again

- a. soldering
- b. High Temp shelf、High Temp High Humidity and Temp rapid change etc.

### 2. Capacitor insulation

- (a) The space between the case and the negative electrode terminal is insulated and has some resistance.
- (b) Be sure to completely separate the case, negative lead terminal, positive lead terminal and PC board patternst.

### 3. Operating environmental restrictions

Do not use the Conductive Polymer Aluminum Solid Capacitors in the following environments.

- (a) Places where water, salt water or oil can directly fall on it, and places where condensation may form.
- (b) Places filled with noxious gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.)
- (c) Places susceptible to ozone, ultraviolet rays and radiation.

### 4. PCB design

- (a) Avoid locating heat-generating components around the Conductive Polymer Aluminum Solid Capacitors and on the underside of the PC board.
- (b) For the surface mount capacitor, design the copper pads on the PC board in according with the recommended land pattern or dimensions in the series specifications.
- (c) For radial capacitor, design the terminal pitch and hole size after conforming the dimensional tolerance in the series specifications.

### 5. Parallel connection

A large amount of ripple current may be applied to the Conductive Polymer Aluminum Solid Capacitors when it is used in parallel with another capacitor. Carefully select the type of capacitor.

### 6. Others

Design circuits after checking the following items.

- (a) Electric characteristics are affected by temperature or frequency fluctuations. Design circuits after checking the changes.
- (b) When mounting an Conductive Polymer Aluminum Solid Capacitors on a double-sided PC board, extra PC board holes or the through holes for connecting the front and back of the PCB must not exist underneath the Conductive Polymer Aluminum Solid Capacitors.

## 三、實際安裝時的注意事項

## 1. 焊接時的注意事項

焊接條件應控制在出廠規格書規定的範圍內。若採用規定以外的嚴格焊接條件，因電氣特性的劣化或在最壞的情況下，可導致外觀不良、漏電流增加及容量減少。

## 2. 安裝前的預備知識

- (a) 高分子固態電容安裝在設備上開通電後，不得重新使用。除了定期檢修時為測試電氣性能而卸下的高分子固態電容以外，不得重新使用。
- (b) 長期保存的高分子固態電容有時會增加漏電流。遇這種情況，應通過約1kΩ的電阻進行施加電壓處理。此時的電壓處理，推薦在約60~70℃下外加1小時額定電壓。

## 3. 安裝-1

- (a) 先確認額定靜電容量和額定電壓後，再進行安裝。
- (b) 小心操作，不要摔落。摔落的高分子固態電容不得使用。
- (c) 安裝時不要使其變形。
- (d) 安裝時不要破壞鋁殼表面皮膜。

## 4. 安裝-2

- (a) 避免在高分子固態電容周圍及印刷電路板背面安裝發熱元件。
- (b) 貼裝型應按照技術手冊或出廠規格書記載的建議條件，設計印刷電路板接合區結構的電路。
- (c) 插裝型應用及技術手冊或出廠規格書記載的產品尺寸公差，設計安裝的基板孔及孔徑。

## 5. 使用電烙鐵時的焊接條件

- (a) 請在以下焊接條件(溫度、時間)範圍內使用。

條件	電烙鐵溫度	時間
焊接條件	400± 10℃	within 5s.

- (b) 焊接插裝型時，若電極端子間距和印刷電路板孔間距不符而需要修整電極端子(引線端子)時，應在焊接前避免對高分子固態電容體施加應力的情況下修整。
- (c) 使用電烙鐵焊接時，注意不要對高分子固態電容主體施加過度應力。
- (d) 焊接後需要卸下高分子固態電容，用電烙鐵修正焊接狀態時，應先充分熔化焊料，防止對高分子固態電容的電極端子施加應力。
- (e) 電烙鐵頭不得接觸高分子固態電容主體。

## 三、Precautions for mounting on-board

## 1. Considerations when soldering

The soldering conditions as soldering iron, flow soldering, reflow soldering should be under the range prescribed in specifications. If the specifications are not followed, there is a possibility of the cosmetic deflection, the intensive increase of leakage current or the capacitance reduction.

## 2. Capacitor insulation

- (a) Do not reuse Conductive Polymer Aluminum Solid Capacitors that have been assembled in a set and energized. Excluding Conductive Polymer Aluminum Solid Capacitors that have been removed for measuring electrical characteristics during a periodic inspection, Conductive Polymer Aluminum Solid Capacitors cannot be reused.
- (b) Leakage current may increase when Conductive Polymer Aluminum Solid Capacitors are stored for long term. In this case, we recommend that you apply the rated voltage for 1 hour at 60℃~70℃ with a resistor load of 1kΩ.

## 3. Mounting-1

- (a) Mount after checking the capacitance and the rated voltage.
- (b) Do not drop Conductive Polymer Aluminum Solid Capacitors on the floor and do not use it that is dropped.
- (c) Do not mount Conductive Polymer Aluminum Solid Capacitors that is deformed.
- (d) Do not break aluminum case surface coating in mounting

## 4. Mounting-2

- (a) Avoid locating heat-generating components around the Conductive Polymer Aluminum Solid Capacitors and on the underside of the PC board.
- (b) For the surface mount capacitor, design the copper pads on the PC board in according with the recommended land pattern or dimensions in the series specifications.
- (c) For radial capacitor, design the terminal pitch and hole size after conforming the dimensional tolerance in the series specifications.

## 5. Soldering with a soldering iron

- (a) Soldering condition should be under the following ranges.

Conditions	Soldering iron temperature	Time
Soldering condition	400±10℃	within 5s.

- (b) When the lead terminal for radial lead type must be processed because the lead pitch and the PCB holes in spacing do not match, process it without any stresses to Conductive Polymer Aluminum Solid Capacitors.
- (c) Solder without any excessive stresses to Conductive Polymer Aluminum Solid Capacitors itself.
- (d) When an Conductive Polymer Aluminum Solid Capacitors has been soldered once and needs to be removed, remove it after the solder has been completely melted.
- (e) Do not let the tip of the soldering iron touch the Conductive Polymer Aluminum Solid Capacitors itself.

## 6. 正流焊接條件

- (a) 請在以下焊接條件(溫度、時間)範圍內使用。  
正流焊推薦條件

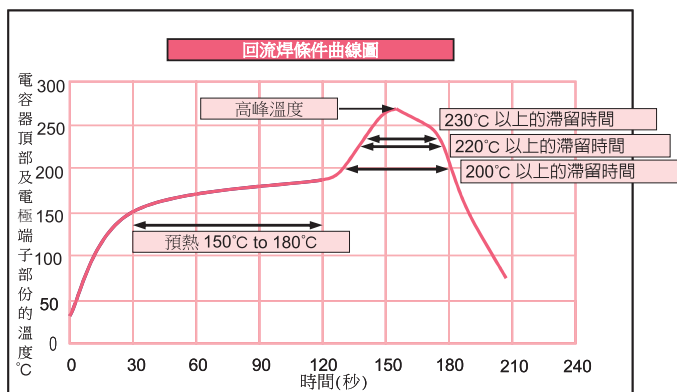
條 件	溫 度	時 間	次 數
預 熱	120°C以下(環境)	120秒以下	1次
焊接條件	260±5°C以下	10 + 1秒以下	2次以下 ※1

※1. 進行2次時，焊料的浸漬時間合計為10+1秒以下。

- (b) 貼裝型高分子固態電容不適用於波峰焊。
- (c) 不要將高分子固態電容主體浸漬在溶解焊料中。焊接部位只限於印刷電路板上與高分子固態電容相反的一側。
- (d) 松脂不要貼附在電極端子以外的部位。
- (e) 焊接時，注意不要碰倒其他元件，以免碰觸高分子固態電容。

## 7. 回流焊接條件

- (a) 請在以下焊接條件(溫度、時間)範圍內使用。  
回流焊推薦條件



項目	Polymer系列	
溫度	250°C以下	260°C以下
預熱溫度	150°C~180°C 90±3秒	
200°C以上滯留時間	60秒以內	60秒以內
200°C以上滯留時間	50秒以內	50秒以內
200°C以上滯留時間	40秒以內	40秒以內
回流次數	2次以下	1次

- (b) 插裝(DIP)型高分子固態電容不適用於回流焊。

## 6. Flow soldering

- (a) Soldering condition should be under the following ranges.  
Recommended flow soldering condition

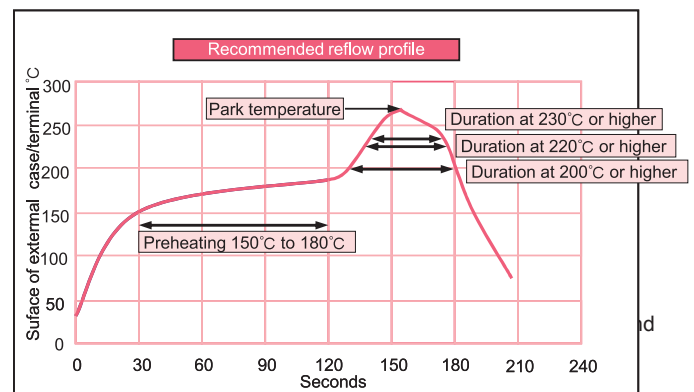
Conditions	Temperature	Time	Flow number
Preheating	120°C or less(ambient temperature)	120 sec. or less	1 time
Soldering conditions	260 + 5°C or less	10 + 1 sec. or less	2 times or less ※1

※1. When soldering 2 times, immersion time should be 10 + 1 sec. or less.

- (b) Do not apply flow soldering to SMD type.
- (c) Do not solder Conductive Polymer Aluminum Solid Capacitors itself by submerging it in melted solder. Solder the opposite side that the Conductive Polymer Aluminum Solid Capacitors is mounted on.
- (d) Note that flux does not adhere to anywhere except the lead terminal.
- (e) Note that other components do not fall over and touch the Conductive Polymer Aluminum Solid Capacitors when soldering.

## 7. Reflow soldering

- (a) Soldering condition should be under the following ranges.  
Recommended reflow soldering condition



Item	Polymer系列	
Tem	250°C or less	260°C or less
Peak Temperature	150°C~180°C 90±3秒	
Duration at 200°C or higher	60 sec. max.	60 sec. max.
Duration at 220°C or higher	50 sec. max.	50 sec. max.
Duration at 230°C or higher	40 sec. max.	40 sec. max.
Reflow number	twice or less	only 1 time

- (b) Do not apply reflow soldering to Radial Lead type.



## 8. 焊接後注意事項

- (a) 焊接在線路板上後，不得傾斜，扳倒，扭曲高分子固態電容主體。
- (b) 焊接在線路板上後，不得用高分子固態電容代替把手移動基板。
- (c) 焊接在線路板上後，注意不要碰撞高分子固態電容。堆放基板時，注意不要使高分子固態電容接觸基板或其他元件。
- (d) 焊接在線路板上後，不得對高分子固態電容施加過度應力。

## 9. 清洗基板

可使用Pine-α ST-00S、Clean thru750H、750L、710M、750K、Techno CareFRW14~17等高級乙醇類清洗劑或AK-225ES等氟里昂代替品，IPA等清洗劑清洗，清洗時，應確認以下內容。

- (a) 採用浸漬，超聲波等清洗方式時，清洗時間合計應控制在2分以內。
- (b) 清洗液溫度請控制在60°C以下。
- (c) 要進行清洗液的防污染管理(導電度、Ph值、比重、含水量等)。
- (d) 清洗後，不要在清洗液環境中或密封容器中保管。
- (e) 用熱風(請在使用溫度範圍以下進行)烘乾基板和高分子固態電容時，些許的清洗劑其液附在電容器表面上，若擦拭可抹去電容器上的標記，應予以注意。
- (f) 關於清洗劑和清洗方法等詳細情況以及使用其他種類的清洗劑時，請事先與本公司洽詢。

## 10. 固定劑和塗層劑

- (a) 選擇適合於高分子固態電容外裝材質和封裝材質的材料。特別是固定劑和塗層劑或稀釋劑中不得含有丙酮。
- (b) 使用固定劑和塗層劑前，清除基板和高分子固態電容封裝部之間的焊劑殘渣和污垢。
- (c) 使用固定劑和塗層劑前，烘乾清洗劑等。
- (d) 請洽詢固定劑和塗層劑的熱固化條件。

## 8. Handling after soldering

- (a) Do not tilt, bend or twist Conductive Polymer Aluminum Solid Capacitors.
- (b) Do not move the PCB with catching Conductive Polymer Aluminum Solid Capacitors itself.
- (c) When stacking PCBs, make sure that the Conductive Polymer Aluminum Solid Capacitors does not touch other PCBs or components.
- (d) Do not dump the Conductive Polymer Aluminum Solid Capacitors with objects.

## 9. Cleaning PCB

Check the following items before washing PC board with these detergents: high quality alcohol-based cleaning fluid such as Pine-α ST-100S, clean thru 750H, 750L, 710M, 750K or Techno Care FRW 14 through 17 or detergents including substitute Freon as AK-225AES or IPA.

- (a) Use immersion or ultrasonic waves to clean within 2 minutes on polymer conductive type.
- (b) The temperature of the cleaning fluid should be less than 60°C.
- (c) Watch the contamination of the detergent as conductivity, ph, specific gravity, water content, etc.
- (d) Do not store the Conductive Polymer Aluminum Solid Capacitors in a location subject to gases from the cleaning fluid or in an airtight container after cleaning.
- (e) Dry the PCB or Conductive Polymer Aluminum Solid Capacitors with hot air that should be less than the maximum operating temperature. Please note that Indication may disappear when rubbing print side after washing as a cleaner.
- (f) Please contact us for details about detergents, cleaning methods and about detergents other than those listed above.

## 10. Fixatives and coating materials

- (a) Select the appropriate covering and sealant materials for conductive Conductive Polymer Aluminum Solid Capacitors. In particular, make sure the fixative, coating and thinner do not contain acetone.
- (b) Before applying a fixative or coating, completely remove any flux residue and foreign matter from the area where the board and Conductive Polymer Aluminum Solid Capacitors will be joined together.
- (c) Allow any detergent to dry before applying the fixative or coating.
- (d) Please contact us for fixative and coating heat curing conditions.

## ■ 環境物質對應

對應 RoHS 法規

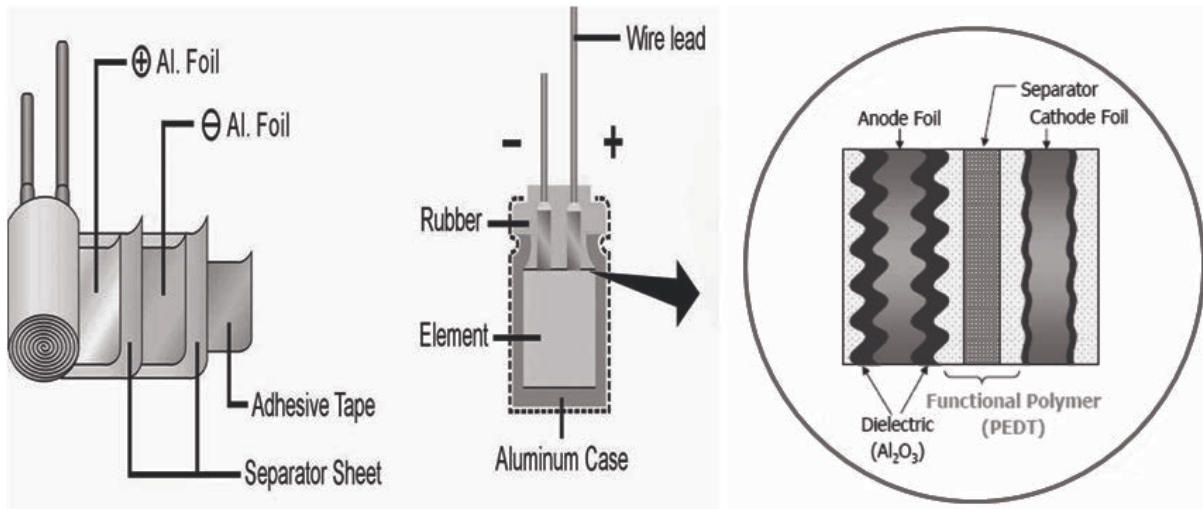
環境管理物質名	化學物質記號	環境對應 ( ppm )
鎘以及鎘化合物	Cd	100
鉛以及鉛化合物	Pb	1000
汞以及汞化合物	Hg	1000
六價鉻化合物	Cr6+	1000
聚溴聯苯	PBBs	1000
聚溴二苯醚	PBDEs	1000

## ■ Environmental Consideration

Compliance with RoHS Directive

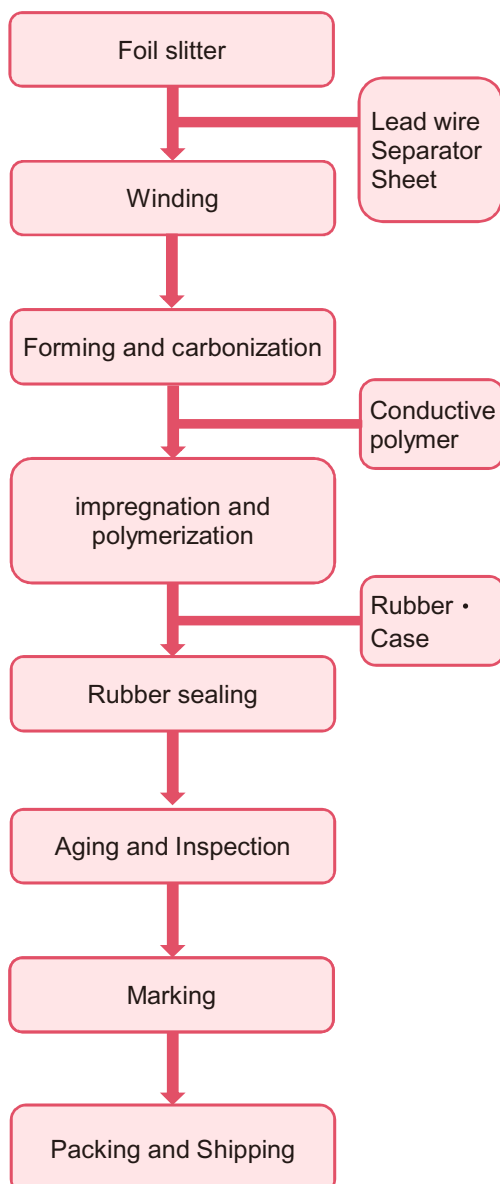
Substance	Symbol	Maximum Limit (ppm)
Cadmium and Cadmium Compounds	Cd	100
Lead and Lead Compounds	Pb	1000
Mercury and Mercury Compounds	Hg	1000
Hexavalent Chromium Compounds	Cr6+	1000
Polybrominated Biphenyls	PBBs	1000
Polybrominated Diphenyl Ethers	PBDEs	1000

## Basic structure



## Manufacturing Method

### Radial lead type



### V-CHIP type

