

ALUMINUM ELECTROLYTIC CAPACITORS

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產品一覽表 Series Table

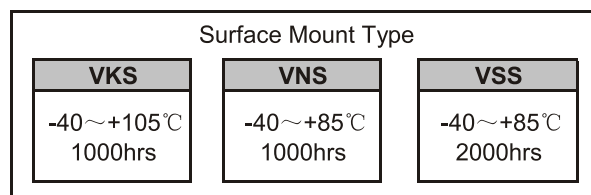
Series	Series	Featuress	temp (°C)	voltage (VDC)	cap (μF)	load life	Page
貼片品 Surface Mount Type							
	VSS	Surface Mount Type General Purpose (貼片標準品)	-40 ~ +85	4 ~ 100	0.1 ~ 1500	2000Hrs	18
	VNS	Bi-polar Surface Mount Type (無極性貼片品)	-40 ~ +85	6.3 ~ 50	0.1 ~ 100	1000Hrs	21
	VKS	Surface Mount Type General Purpose (貼片標準品)	-40 ~ +105	4 ~ 100	0.1 ~ 1500	1000Hrs	24
小型鋁電解電容 Miniatrure Aluminum Electrolytic Capacitors							
小型品 Miniature Type							
CD11W	SSM	5mmL (高) , +85°C	-40 ~ +85	4 ~ 50	0.1 ~ 470	1000Hrs	27
CD26K	SKF	5mmL (高) , +105°C	-40 ~ +105	4 ~ 50	0.1 ~ 470	1000Hrs	29
CD11C	SSS	7 (9)mmL(高) , High (高) C/V(化)	-40 ~ +85	6.3 ~ 50	0.1 ~ 470	1000Hrs	31
CD26C	SKS	7mmL (高) , -40°C ~ +105°C	-40 ~ +105	6.3 ~ 50	0.1 ~ 470	1000Hrs	33
標準品 General Purpose							
CD110X	SGS	Standard (標準品)	-40 ~ +85	6.3 ~ 450	0.1-22000	2000Hrs	35
CD268	SKM	+105°C, Standard (標準品)	-40 ~ +105	6.3 ~ 450	0.1-33000	1000 ~ 2000Hrs	38
	SKG	-55°C ~ +105°C, Standard (標準品)	-55 ~ +105	6.3 ~ 450	0.1-22000	1000 ~ 2000Hrs	41
低阻抗品 Low Impedance Type							
	SZM	5mmL (高) , +105°C, Low Impedance (低阻抗)	-40 ~ +105	6.3 ~ 35	1 ~ 470	1000Hrs	44
	SZS	7mmL (高) , +106°C, Low Impedance (低阻抗)	-40 ~ +105	6.3 ~ 35	4.7 ~ 470	1000Hrs	46
CD288H	SGF	+105°C, High Ripple Current (高紋波) Low Impedance (低阻抗)	-40 ~ +105	6.3 ~ 450	1 ~ 18000	2000 ~ 4000Hrs	48
CD263L	SRS	+105°C, High Ripple Current (高紋波) Low Impedance (極低阻抗)	-40 ~ +105	6.3 ~ 450	1 ~ 18000	3000 ~ 7000Hrs	53
長壽命品 High Reliability Type							
	SRL	Long Life Assurance (長壽命) High Ripple Current (高紋波)	-40 ~ +105	6.3 ~ 450	1-22000	3000 ~ 8000Hrs	58
	SRD	Long Life Assurance (長壽命) High Ripple Current (高紋波)	-25 ~ +105	160 ~ 450	10-330	8000-10000Hrs	63
無極性品 Non-polarized Type							
CD11N	SNM	5mmL (高) , Nonpolar (無極性)	-40 ~ +85	6.3 ~ 50	0.1 ~ 47	1000Hrs	65
CD71C	SNS	7mmL (高) , Nonpolar (無極性)	-40 ~ +85	6.3 ~ 50	0.1 ~ 220	1000Hrs	67
CD71	SNP	Nonpolar (無極性)	-40 ~ +85	6.3 ~ 100	0.47 ~ 6800	1000Hrs	69
CD71H	SNH	+105°C, Nonpolar (無極性)	-40 ~ +105	6.3 ~ 100	0.47 ~ 1000	1000Hrs	71
低漏電品 Low Leakage Type							
	SLF	5mmL(高), Low Leakage Current (低漏電)	-40 ~ +105	4 ~ 50	0.1 ~ 100	1000Hrs	73
	SLZ	7mmL(高), Low Leakage Current (低漏電)	-40 ~ +105	6.3 ~ 50	0.1 ~ 220	1000Hrs	75
CD113H	SLL	Low Leakage Current (低漏電)	-40 ~ +105	6.3 ~ 100	1 ~ 3300	1000Hrs	77
	SLT	Time Circuit Use (計時回路用)	-40 ~ +85	10 ~ 50	1 ~ 470	2000Hrs	79
	SLN	Low Noise Purpose (低噪音)	-40 ~ +85	6.3 ~ 100	0.47 ~ 47	1000Hrs	80

產品一覽表 Series Table

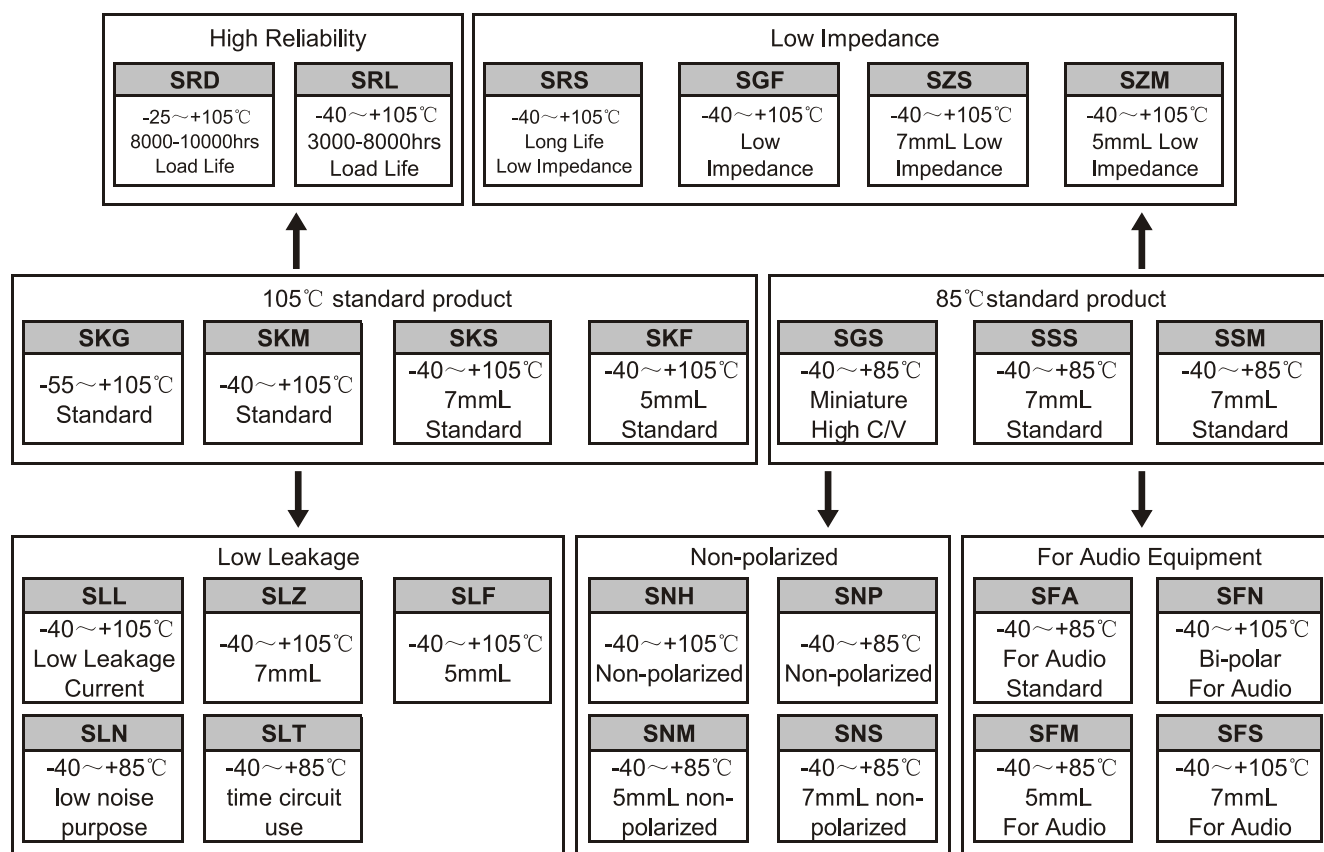
Series	Series	Featuress	temp (°C)	voltage (VDc)	cap (μF)	load life	Page
音響用品 For Audio Type							
	SFM	5mmL (高) , For Audio (音響)	-40 ~ +85	4 ~ 50	0.1 ~ 470	1000Hrs	81
	SFS	7mmL (高) , For Audio (音響)	-40 ~ +85	6.3 ~ 50	0.1 ~ 220	1000Hrs	83
CD72	SFA	Standard (標準品) , For Audio (音響)	-40 ~ +85	6.3 ~ 100	0.1 ~ 10000	1000Hrs	85
	SFN	Bi-polar (無極性) , For Audio (音響)	-40 ~ +85	50	1 ~ 68	---	87
閃光燈用品 For Photo Flash Type							
CD17S	SPF	Photo Flash Use (閃光燈用品)	-25 ~ +55	330	36 ~ 300	5000times	88
CD17	SPS	Recharging And Discharging in Flash (閃光燈充電用)	-25 ~ +55	330,360	150 ~ 1500	5000times	89
大型鋁電解電容器 Large Can Aluminum Electrolytic Capacitors							
標準品 Standard Type							
CD293	SLP	Lug/Snap-in Terminal Type Standard (插入/自立型, 標準品)	-40 (25) ~ +85	10 ~ 450	56 ~ 82000	2000Hrs	92
	SAP	Lug/Snap-in Terminal Type for Audio (插入/自立型, 音響電容)	-40 ~ +85	16 ~ 100	680 ~ 10000	1000Hrs	98
CD293H	SHP	Lug/Snap-in Terminal Type,Wide Temperature (插入/自立型)	-40 (25) ~ +105	10 ~ 450	47 ~ 56000	2000Hrs	100
高可靠品 High Reliability Type							
CD294	SKP	Lug/Snap-in Terminal Type, Long Life (插入直立型, 長壽命)	-40 (25) ~ +105	10 ~ 450	47 ~ 56000	3000Hrs	106
CD296	SSP	Lug/Snap-in Terminal Type, Long Life (插入直立型, 長壽命)	-40 (25) ~ +105	160 ~ 450	56 ~ 1500	7000Hrs	112
特殊品 Special Type							
CD137	SWF	Screw Terminal Type, Long Life Assurance (螺釘型, 長壽命保證)	-40 (25) ~ +105	10 ~ 450	330 ~ 390000	5000Hrs	115

产品体系图 Series Chart

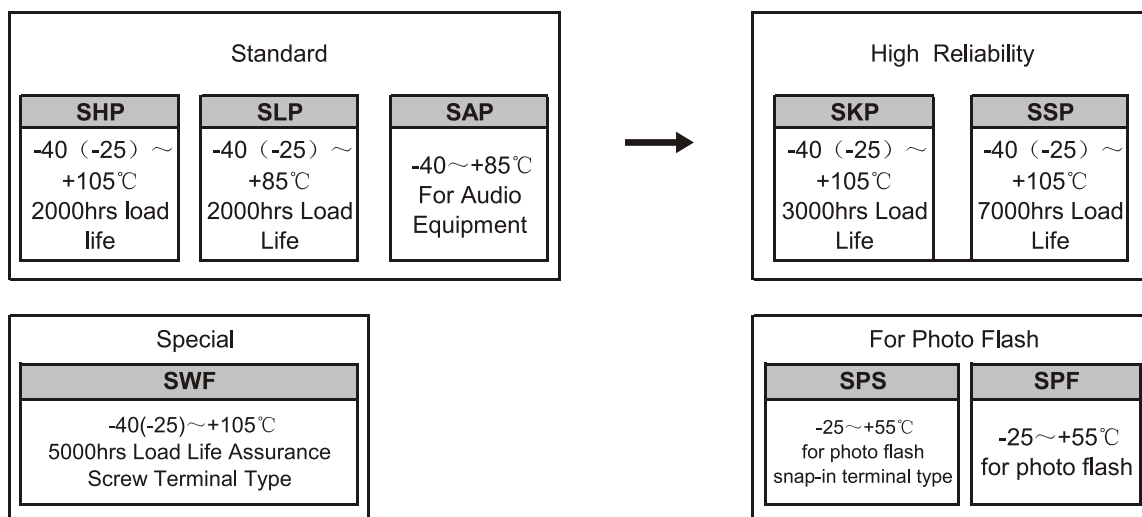
Surface Mount Type



Radial Lead Type



Snap-in Terminal Type



鋁電解電容器應用指南

Application Guidelines For Aluminum Electrolytic Capacitors

1. 電路設計 Circuit Design

- 1.1 請明確鋁電解電容器所處的環境和安裝條件應符合本說明書中規定的情況。 Please make sure the environmental and mounting conditions to which the capacitor will be exposed to are within the conditions specified in this catalog (or alternate specifications, such as series drawings).
- 1.2 工作溫度和紋波電流應小於本說明書中的規定。 Operating temperature and applied ripple current must be within the specification.
 - 電容器不能用於超過規定的環境溫度。 The capacitor must not be used in an ambient temperature which exceeds the operating temperature specified in this catalog.
 - 電容器不能用於超過規定的紋波電流。 Do not apply excessive current which exceeds the allowable ripple current.
- 1.3 設計電路時請選擇滿足產品壽命的電容器。 Appropriate capacitors which comply with the life requirement of the products should be selected when designing the circuit.
- 1.4 鋁電解電容器是有極性的。 不要施加反向電壓或交流電。在可能出現電壓極性相反的電路中，請使用無極性電容器。 注意：即使無極性電容器也不能在交流電情況下使用。 Aluminum electrolytic capacitors are polarized. Do not apply reverse voltage or AC voltage. Please use non-polarized capacitors for a circuit that can possibly see reversed polarity. Note; Even non-polarized capacitors can not be used for AC voltage application.
- 1.5 在需要快速和頻繁充/放電的電路中，請不要使用鋁電解電容器。它需要使用具有長壽命特徵的特別設計的電容器。 Do not use aluminum electrolytic capacitors in a circuit that requires rapid and very frequent charge/discharge. In this type of circuit, it is necessary to use a special design capacitor with extended life characteristics.
- 1.6 不要施加過高的電壓。 Do not apply excess voltage.
 - 請注意直流電壓上疊加紋波電流時的峰值電壓不要超過額定電壓。 Please pay attention so that the peak voltage, which is DC voltage overlapped by ripple current, will not exceed the rated voltage.
 - 在使用2個以上的鋁電解電容器串聯時，請注意施加的電壓應低於額定電壓。應在每只電容器並聯一只平衡電阻，使每只電容器承受的電壓相等。 In the case where more than 2 aluminum electrolytic capacitors are used in series, please make sure that applied voltage will be lower than rated voltage and the voltage will be applied to each capacitor equally using a balancing resistor in parallel with the capacitor.
- 1.7
 - 電容器外面的套管不能保證是一個電的絕緣體，不要使用標準套管的電容器在需要電絕緣的場合。當需要特別的絕緣時，請與我們的業務部聯系。 Outer sleeve of the capacitor is not guaranteed as an electrical insulator. Do not use a standard sleeve on a capacitor in applications that require the electrical insulation. When the application requires special insulation, please contact our sales office for details.
 - 不要將具有多端子（三或四端子）的自立式產品的空端子（加固端子）連接到其他電路，這樣可能引起短路。 Do not connect the blank terminal (reinforcing terminal) of a multi-terminal (three- or four-terminal) product of the snap-in type to another circuit it may cause a short circuit.
- 1.8 電容器避免用在下面的情況: capacitors must not be used under the following conditions:
 - (a) 暴露於水(包括露水)、鹽水或油。 Capacitors must not be exposed to water (including condensation), brine or oil.
 - (b) 在環境含有害氣體，象氫硫化物、亞硫酸、亞硝酸、氯、銨等等。 Ambient conditions that include toxic gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonium etc.
 - (c) 使電容器暴露在臭氧、紫外綫和放射綫環境中。 Ambient conditions that expose the capacitor to ozone, ultraviolet ray and radiation.
 - 超過本說明書的劇烈振動和物理衝擊。 Severe vibration and physical shock conditions that exceed the specifications.

鋁電解電容器應用指南

Application Guidelines For Aluminum Electrolytic Capacitors

1.9 當設計電路板時，請注意以下：When designing a circuit board, please pay attention to following;

- 綫路板上的孔，要與電容器的引綫相應。Make the hole spacing on the PC. Board match the lead space of the capacitor.
- 在電容器安全孔的上面不應當有器件或電綫。There should not be any circuit pattern or circuit wire above the capacitor safety vent.
- 除非另有規定的，壓力釋放口上面的間隙應大於下表； Unless otherwise specified, following clearance should be made above the pressure relief vent.

鋁殼直徑 Case Diameter	需要的間隙 Gap Required
Φ 6.3 ~ 16	2mm or more
Φ 18 ~ 35	3mm or more
Φ 40 or more	5mm or more

- 假如壓力釋放口面向綫路板（例如端面密封型），在綫路板上的相應位置打一個孔以釋放氣體。In case the vent side is placed toward PC. board (such as end seal vented parts). make a corresponding hole on the PC board to release the gas when vent is operated. The hole should be made to match the capacitor vent position.
- 不要將具有螺絲端的電容器的密封端面向下安裝。當水平安裝時，正極端一定要在較上的位置。Do not install screw terminal capacitor with end seal down. When you install a screw terminal capacitor in a horizontal mount, the positive terminal must be in the upper position.

1.10 用於電容器的主要化學成分電解液和隔離紙是易燃的。電解液是導電的，當它與綫路板接觸時，可能造成腐蝕或短路甚至會燃燒和起火。因此不要在電容器密封端的下面布置任何綫條。The main chemical solution of the electrolyte and the separator paper used in the capacitors are combustible. The electrolyte is conductive, When it comes in contact with the PC. board, there is a possibility of pattern corrosion or short circuit between the circuit pattern which could result in smoking or catching fire. Do not locate any circuit pattern beneath the capacitor end seal.

1.11 設計電路板時，不要在電容器的旁邊或下面（PCB板的另一面）放置發熱量較大的元器件，如電阻、變壓器等。Do not design a circuit board so that heat generating components such as resistor and transistors are placed near an aluminum capacitor or reverse side of PC. board (under the capacitor)。

1.12 鋁電容器的電特性隨溫度和頻率而變化。設計電路時請考慮這些變化。Electrical characteristics may vary depending on changes in temperature and frequency. Please consider this variation when you design circuits.

1.13 當設計雙面PCB板時，避免在電容器下面布置綫條或通孔。When you are designing capacitors for use on double-sided PC. Boards avoid circuit patterns or through holes (such as to connect both sides), that are placed under the capacitor.

1.14 螺絲安裝型的鋁電解電容器接綫柱螺絲或支架螺絲的力矩必須在規定的範圍。The torque for terminal screw or brackets screws must be within the specified value on ACON'S drawings.

1.15 當用2個以上電容器並聯時，請考慮電容器電流的平衡。When you install more than 2 capacitors in parallel, consider the balance of current flowing into the capacitors.

鋁電解電容器應用指南

Application Guidelines For Aluminum Electrolytic Capacitors

2. 安裝 Mounting

- 2.1 一旦一個電容器已用在設備中並加上電壓，不要嘗試再將它使用在別的電路。 Once a capacitor has been assembled in the set and power applied, do not attempt to reuse the capacitor in other circuits or application.
- 2.2 在正負極之間可能存在電動勢，請使用一祇1kΩ電阻放電。 Electric potential between positive and negative terminal may exist as a result of returned electromotive force, so please discharge the capacitor using a 1kΩ resistor.
- 2.3 貯藏6個月以上，漏電流可能增加。當漏電流已增加時，請使用1kΩ電阻做一次電壓修補。 Leakage current of the parts that have been stored for more than 6 months may increase. When leakage current has increased, please perform a voltage treatment using 1kΩ resistor.
- 2.4 在將電容器安裝到PCB板之前注意核實其額定值。 Please confirm ratings before installing capacitors on the PC board.
- 2.5 在將電容器安裝到PCB板之前注意核實其極性。 Please confirm polarity before installing capacitors on the PC board.
- 2.6 不要將電容器掉到地板上，也不要使用已掉于地板上的電容器。 Do not drop capacitors on the floor, nor use a capacitor that was dropped.
- 2.7 安裝時注意不要再改變已成型的電容器的引線。 Be careful not to deform the capacitor during installation.
- 2.8 請核實電容器的腳距符合PCB板的孔距。 Please confirm that the lead spacing of the capacitor matches the hole spacing of the PC board prior to installation.
- 2.9 自立式電容器(外形如JIS 692, 693, 694和695)安裝時，要緊貼PCB板(在PCB板與電容器底部間不允許有間隙。) Snap-in can type capacitor such as JIS configuration 692; 693; 694 and 695 type should be installed tightly to the PC board (Silo no gap between the PC board and bottom of the capacitor).
- 2.10 注意自動插件機的夾力不要太強($\leq 2.5\text{kg}$)。 Please pay attention that the clinch force is not too strong when capacitors are placed and fixed by an automatic insertion machine($\leq 2.5\text{kg}$).
- 2.11 請注意自動插件機等機械設備不要對電容器產生機械衝擊。 Please pay attention to that the mechanical shock to the capacitor by suction nozzle of the automatic insertion machine or automatic mounter, or by product checker, or by centering mechanism.
- 2.12 焊接條件要滿足本說明書的有關規定。 Soldering condition must be confirmed to be within The specification.
- 2.13 將電容器焊接到PCB板後，請不要扳倒或轉動電容器。 Do not tilt lay down or twist the capacitor body after the capacitor are soldered to the P.C. board.
- 2.14 請不要靠拿住焊好的電容器移動PCB板。 Do not carry the PC Board by grasping the soldered capacitor.
- 2.15 請不要允許任何東西接觸焊好的電容器。如果PCB板存放在貨架，請保證PCB板或其他器件不要接觸電容器。 Please do not allow anything to touch the capacitor after soldering. If P.C. board are stored in stack, please make sure P.C. board or the other components do not touch the capacitor.
電容器不能受剛焊接好的PCB板或其他器件的熱輻射的影響。 The capacitors shall not be effected by any radiated heat from the soldered P.C. board or other components after soldering.
- 2.16 不要用鹵化物清潔電容器。 Do not clean capacitors with halogenated cleaning agent.
- 2.17 固定材料和塗復材料。 Fixing materials and coating materials
 - 不要使用任何含有鹵素成分的材料。 Do not use any ingredients which contain halogen.
 - 請在塗復前，清除電容器密封端面與PCB板空隙中的焊劑和雜物。 Please pay attention to remove flux and any contamination which remains in the gap between the end seal and PC board and dry that portion well before coating.
 - 祇能部分地而不是全部包住電容器。 Please do not apply any material all around the capacitor body but apply it partially.
 - 了解有關塗復材料造成的不良影響，請與我們的業務部聯繫。 Please contact our sales office to make sure whether the curing condition of coating material would cause any problems.

鋁電解電容器應用指南

Application Guidelines For Aluminum Electrolytic Capacitors

3. 貯存 Storage

當鋁電解電容器經過長期靜態貯存時，其性能會降低。變化的比率依溫度、濕度而變化。The characteristics of aluminum electrolytic capacitors degrade when stored in a static condition for long periods of time. The rate of deterioration depends upon temperature and humidity.

電容器應當在溫度5℃~35℃濕度小於75%，無直接日光照射的環境貯存。Capacitors should be stored at the temperature of 5℃ to 35℃, the humidity of less than 75% RH and out of direct sunlight.

電容器經貯存一年以上在使用前應進行“電壓老化”，以再形成和修補氧化膜。Capacitors that have been stored for long periods normally over one year should be subjected to a “voltage aging” treatment before use, This will reform and repair the oxide dielectric.

建議老化過程是在監視漏電流不要超過規定值的情況下，逐漸地給電容器加壓直到電容器的額定電壓。當到達額定電壓後保持30–60分鐘。Suggested aging procedure is gradually apply the rated voltage to the capacitors while monitoring the leakage current. Do not exceed the specified leakage current value. when rated voltage has been reached, maintain for 30 to 60 minutes.

4. 印制板的清潔 Printed Circuit Board Cleaning

4.1 前言 foreword

現在家普遍都認為鹵類溶劑對鋁電解電容器是有危害的。這是因為溶液能滲透電容器密封。然後，溶解和釋放氯離子(Cl⁻離子).可腐蝕鋁電極。It had been generally accepted that halogen type organic solvents were hazardous to aluminum electrolytic capacitors, This is because an organic solvent can permeate the capacitor through the end seal. Then, the solvent dissolves and free chlorine ions(Cl⁻ ion), which can corrode the aluminum electrodes. 下面的方法是唯一可以預先避免這個現象的途徑。The following measures were previously the only way to avoid this phenomenon.

- 使用對電容器無害的清潔劑，如水或酒精。Use of cleaning agents, not hazardous to capacitors such as water or alcohol.
- 將電容器安裝在已事先經過鹵類溶劑清洗過的印制板上。Mount capacitors on PC boards cleaned with a halogen type solvent before hand.
- 端口使用環氧密封。Use of epoxy end seals.

這些方法在工作效率、清潔能力、成本等方面有缺點。因此，耐鹵類清洗劑的鋁電解電容器是大家所希望的。These measures have disadvantages with respect to working efficiency, cleaning capability, cost etc. Therefore, aluminum electrolytic capacitors which can withstand halogen type cleaning agents are desirable.

鋁電解電容器應用指南

Application Guidelines For Aluminum Electrolytic Capacitors

4.2 清洗劑的類型 Types of Cleanig Agents

一般地有三種類型清洗劑。 Gtenerally there are three types of cleaning agents.

- 水類 Water type
- 酒精類 Alcohol type
- 滷素類 Halogen type

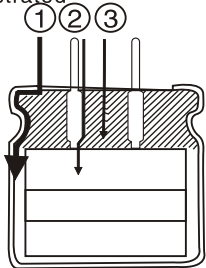
三類中，水和酒精即使滲進鋁電解電容器也僅有很微弱的影響。然而，滷素能引起鋁箔和引線的腐蝕。普通滷素類清洗劑列在下表： of these, water and alcohol will have little effect even if they permeate the capacitor. However, halogens can cause corrosion of aluminum foil and tab, Common types Of halogen cleaning agents are olsted in table below:

化學名稱	結構式代	表性商標名
三氯三氟代乙烷 Trichlorotrifluoroethane	$C_2Cl_3F_3$	Freon TF, Daiflon S-3
氟代三氯甲烷 Fluorotrichloromethane	CCl_3F	Freon-11, Daiflon S-1
三氯甲烷 (氯仿) Trichloroethane	$C_2H_3Cl_3$	Chloroethane
三氯乙烯 Trichloroethylene	C_2HCl_3	Trichlene
甲基氯化物 Methyl Chloride	CH_3Cl	MC

上表所列後四個溶劑可顯著地腐蝕鋁，不推薦使用這些清洗劑。 The last four solvents listed above are particularly corrosive to aluminum and are not recommended to use as cleaning solvents.

4.3 溶劑滲透通道和腐蝕機制 Penetration channel of Solvent and Corrosion Mechanism

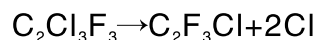
下圖畫出溶劑滲入電容器的三條通道。 The three channels by which solvents can penetrate into the capacitor are illustrated



- ① 通過密封膠粒和鋁殼 (曲綫部分) 之間的空隙滲入。 Penetration through a clearance between the rubber and the aluminum case (curled section)
- ② 通過密封膠粒和導針之間的空隙滲入。 Penetration through a clearance between the rubber and the lead wires.
- ③ 通過密封膠粒滲入。 Permeation through the rubber end seal.

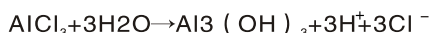
為減少溶劑進入電空器的可能性，加強密封以減少膠粒和鋁殼/導針間的空隙。需要使用抗溶劑滲透的密封膠粒。 To reduce the possiblilty of solvents entering a capacitor, tight seaiong is required to eliminate clearances between the tubber and the aluminum case/lead wires. A solvent resistant rubber material is also a necessity.

當一溶劑,例如三氯三氟代乙烷，滲入不抗溶劑滲透的電容器，其氯離子是自由的，如下面的反應公式。 when a solvent, for example, trichlorotrifluoroethane gets inside a non antisolvent capacitor, the chlorine ion is free as shown by the following reaction formula.



氯離子與鋁起反應如下： This chlorine ion reacts with aluminum as follows: $Al + 3Cl^- \rightarrow AlCl_3 + 3e^-$

AlCl₃溶液在水裏反應為： Then AlCl₃ resolves in water, and it becones:



如此，氯離子再一次自由并重復腐蝕鋁。這個反應的度，依溶液的量，使用時電容的周圍溫度，施加的電壓和時間等等。 thus, the Cl^- ion is free again and repeats the corrosion of aluminum. The degree of this reaction depends on the volume of solvent, the ambient temperature of the capacitor in service, he applied voltage and time etc.

鋁電解電容器應用指南

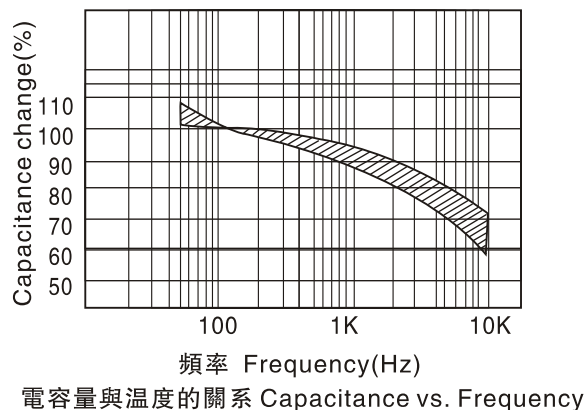
Application Guidelines For Aluminum Electrolytic Capacitors

5.基本電氣的特性 Basic Electrical Characteristics

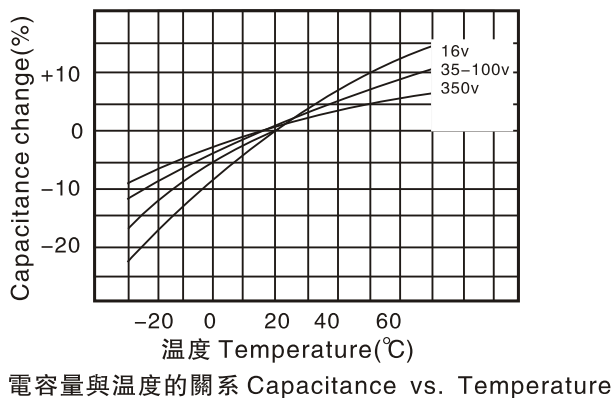
電容量 Capacitance:

電容器的電容量可通過測量它的阻抗來確定其交流電容量。其交流電容量依賴于頻率、電壓和測量方法。JIS C 5102規定一個串聯等效電路 ($\bigcirc - \text{||} - \text{---} - \bigcirc$) 的串聯電容分量，是在頻率120HZ，交流電壓0.5Vrms加直流偏置電壓1.5–2.0V條件下測量出電容量。The capacitance of capacitor is determined as AC capacitance by measuring its impedance. As the AC capacitance depends on frequency, voltage and other measuring methods, JIS C 5102 prescribes that the series capacitive component of an equivalent series circuit ($\bigcirc - \text{||} - \text{---} - \bigcirc$) shall be considered as the capacitance by measuring it at a frequency of 120Hz and a maximum AC voltage of 0.5vrms with a DC bias voltage of 1.5 to 2.0V applied for aluminum electrolytic capacitors.

鋁電解電容器的電容量在測量頻率增加時變小。如下圖所示: The capacitance of an aluminum electrolytic capacitor shows smaller values as a measuring frequency increases. See the typical behavior shown below:



測量的溫度和頻率一樣同樣影響電容量。當溫度降低時電容量變小。如下圖所示: Measuring temperature as well as frequency effects the capacitance. As the measuring temperature decreases, the capacitance shows smaller values. see the typical behavior shown below:



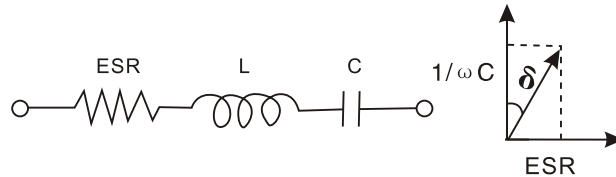
另一方面，直流電容量可以在施加一直流電壓時測量改變來確定，在正常溫度下它比交流電容量稍大，而超過這溫度範圍有較平的特性。On one hand, DC capacitance, which can be determined by measuring the change when a DC voltage is applied, shows a slightly larger value than the AC capacitance at a normal temperature and has the flatter characteristic over the temperature range.

鋁電解電容器應用指南

Application Guidelines For Aluminum Electrolytic Capacitors

Tan δ (損失角的正切或損失因子) :

Tan δ 是串聯等效電路的電阻分量 (ESR) 與容抗分量 ($1/\omega C$) 之比, 它的測量條件與電容量測量相同。The tan δ is the ratio of the resistive component (ESR) to the capacitive reactance ($1/\omega C$) in the equivalent series circuit, and its measuring conditions are the same as the capacitance.



$$\tan \delta = \text{ESR} / (1/\omega C) = \omega C \cdot \text{ESR}$$

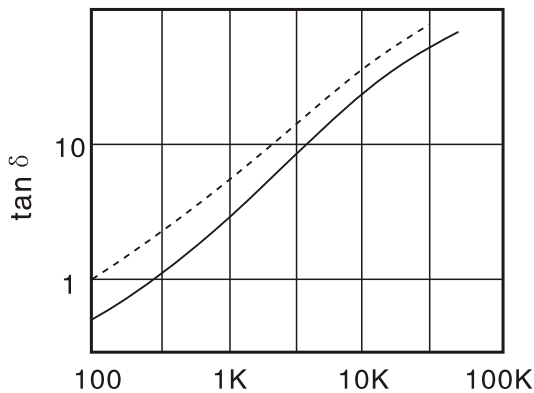
這裏: ESR=串聯等效電路在120Hz時的電阻

Where: ESR= Equivalent series resistor at 120Hz

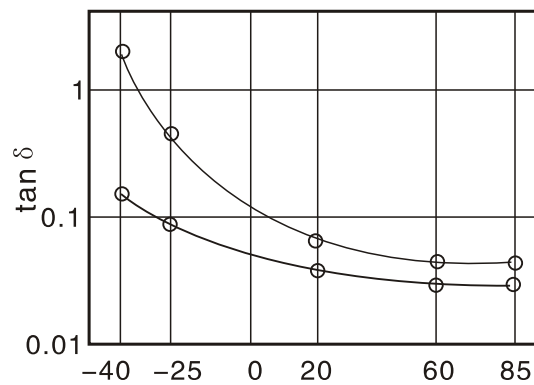
$$\omega = 2\pi f$$

$$f = 120\text{Hz}$$

Tan δ 隨測量頻率的增加和測量溫度的減少而變大, 如下圖所示: The tan δ show higher values as a measuring frequency increases and a measuring temperature decreases, as follows:



頻率 Frequency(Hz)
tan δ 與頻率之間的關係 tan δ vs. Frequency



溫度 Temperature(°C)
tan δ 的溫度特性 Temperature Characteristics of Tan δ

等效串聯電阻 Equivalent series resistance (ESR)

ESR由鋁氧化膜、電解液、電解紙及其它受鋁箔長度、面積等影響產生的電阻。 ESR值依赖于溫度。 減小溫度使電解液的電阻率增加, 結果使ESR增加。當測量頻率增加, ESR減少并到達一個幾乎恒定的值, 主要是由于電解液、電解紙獨立于頻率的電阻。The ESR is comprised of the resistance due to aluminum oxide layer and electrolyte/separator combination and other resistance effected with foillength, foil surface area, etc。The ESR value depends on the temperature。Decreasing the temperature makes the resistivity of the electrolyte increase with the result of the ESR increasing。As the measuring frequency increases, the ESR decreases and reaches an almost constant value that is mainly the frequency-independent resistance due to electrolyte/separator combination.

鋁電解電容器應用指南

Application Guidelines For Aluminum Electrolytic Capacitors

阻抗 Impedance (Z) :

阻抗是在一指定的頻率下阻礙交變電流流動的阻力。The impedance is the resistance which oppose the flow of alternating current at a specific frequency.

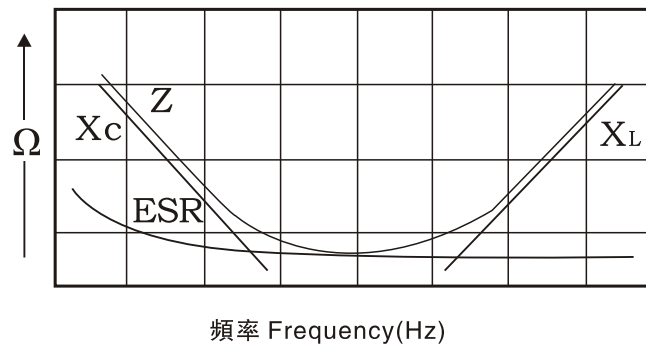
它與電容 (C) 的容抗和電感 (L) 的感抗, 也和ESR有關。表達式如下: It is related to capacitance (C) and inductance (L) in terms of capacitive and inductive reactance, and also related to the ESR. it is expressed as follows:

$$Z = \sqrt{ESR^2 + (X_L - X_C)^2}$$

$$\text{這裏: } X_C = 1 / \omega C = 1 / 2 \pi f C$$

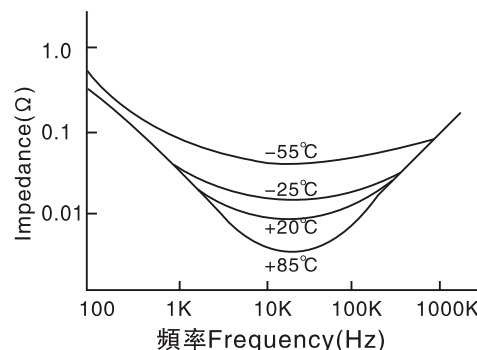
$$X_L = \omega L = 2 \pi f L$$

如下所示, 容抗 (Xc) 統治低頻率範圍, 阻抗隨頻率增加而減少, 直到達到中間的頻率範圍的ESR。在更高的頻率的範圍, 感抗成為統治者, 阻抗隨頻率增加而增加。As shown below, the capacitive reactance (Xc) predominates at the range of low frequencies, and the impedance decreases with increasing frequency until it reaches the ESR in the middle frequency range. At the range of the higher frequencies the inductive reactance (XL) comes to predominate, so that the impedance increases with increasing the measuring frequency.



阻抗與頻率之間的關係 Impedance vs. Frequency

如下所示, 因為電解液的電導隨溫度而變化, 阻抗也隨溫度而變化。As shown below, the impedance value varies with temperature, because the resistance of the electrolyte strongly changes with temperature.



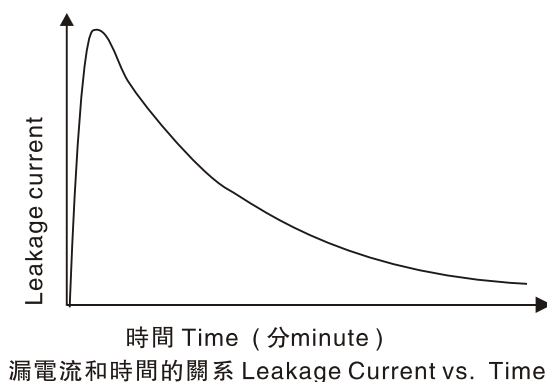
典型的阻抗溫度特性 Temperature Characteristics of impedance

鋁電解電容器應用指南

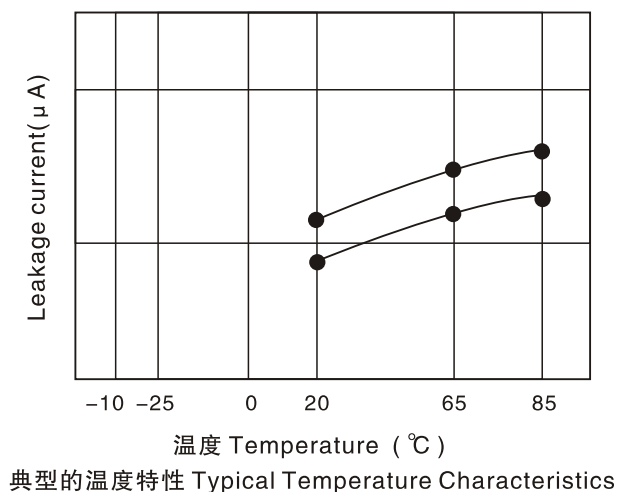
Application Guidelines For Aluminum Electrolytic Capacitors

漏電流 Leakage current

電容器的絕緣有很高的電阻，阻止直流電流的流動。然而，由于鋁氧化膜作為與電解液接觸的絕緣物，有一個小的電流叫做漏電流。當施加電壓時電流修補和再化成氧化膜。如下圖所示，當施加給電容器電壓前幾分鐘，有較高的漏電流，然後漏電流隨時間減小，並到達一個幾乎穩當的值。The dielectric of a capacitor has a very high resistance which prevents the flow of DC current, However, due to the characteristics of the aluminum oxide layer that functions as a dielectric in contact with electrolyte, a small amount of current, called leakage current, will flow to reform and repair the oxide layer while a voltage is being applied. As shown below, a high leakage current flows in the first minutes as a voltage is applied to the capacitor, and then the leakage current will decrease and reach an almost steady-state value with time.



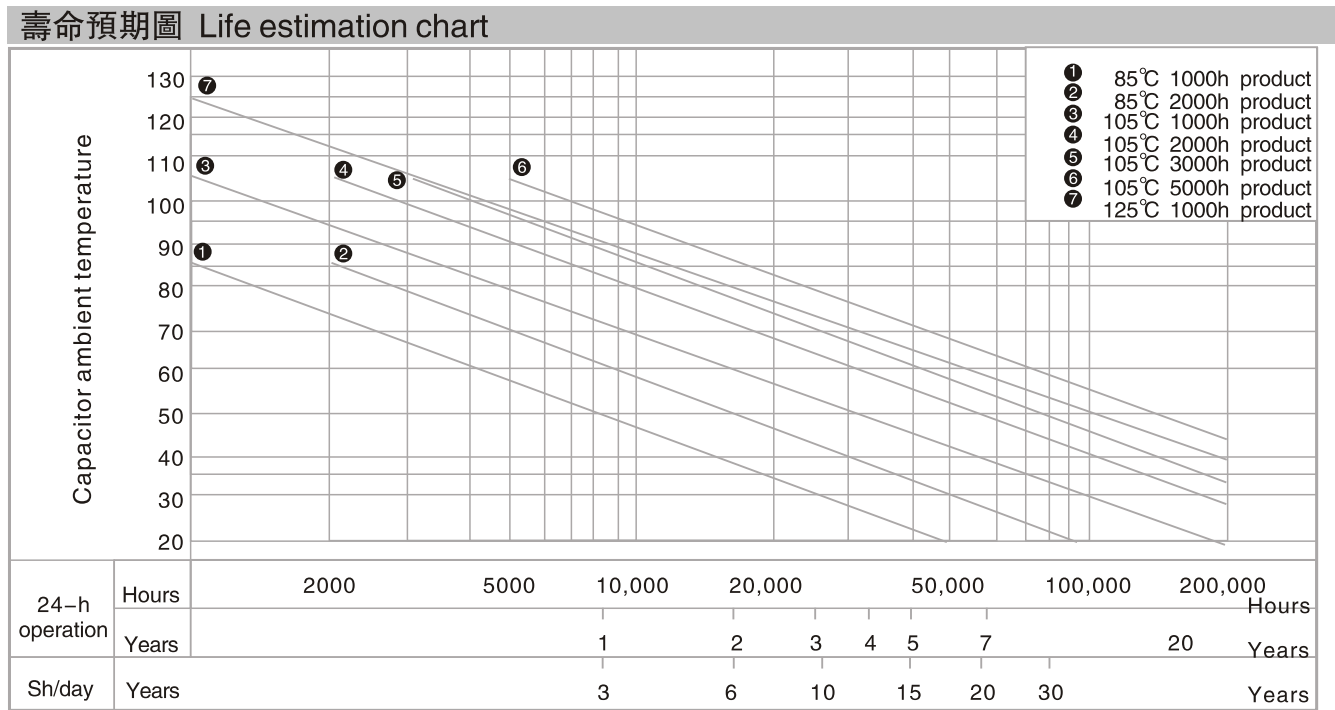
測量時的溫度和電壓影響漏電流。漏電流當溫度和電壓增加時變大。 Measuring temperature and voltage effect the leakage current, The leakage current shows higher values as the temperature and voltage increase.



鋁電解電容器應用指南

Application Guidelines For Aluminum Electrolytic Capacitors

一般地，漏電流的測量是在20℃施加標稱電壓，與電容器串連一個1000Ω的電阻，當電容器的電壓到達額定電壓幾分鐘後進行測量。 本目錄描述了測量溫度和時間。 In general, the leakage current is measured at 20℃by applying the rated voltage , which is applied through a resistor of 1,000 connected in series with the capacitor , and several minutes after the capacitor reached tie rated voltage. The catalog prescribes the measuring temperature and time。

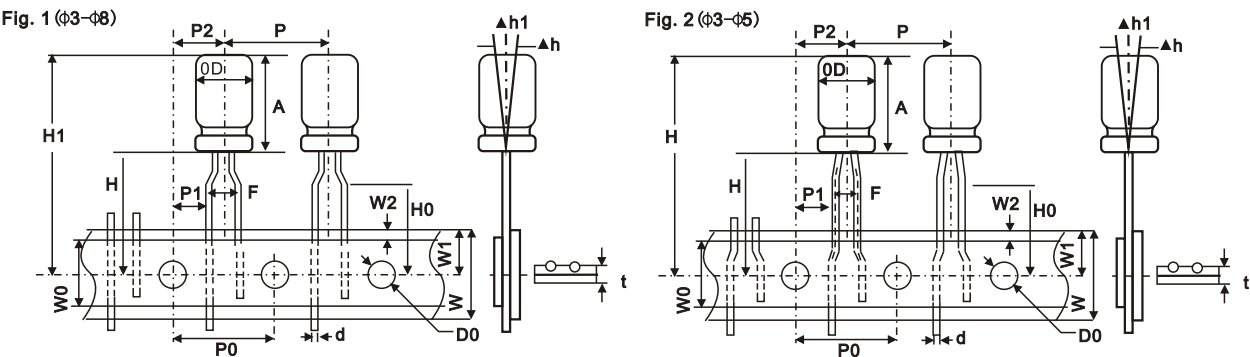


產品編碼 Part Number System

1	2	3	4	5	6	7	8	9	10	11	12	13	14
SKS			227			M	C	E	07		A5		一般品
SKS			220 μ F			± 20%	10V	6.3	7		5mm切脚		

Series		Cap(MFD) Code		Tolerance (%) Code		Voltage(w.v.)Code		Diameter Code				Feature Code		Sleeve Material Code	
VSS		0.1	104	± 5	J	4	A	4	C	5	05	Radial bulk	RR	PET	P
VNS						6.3	B	5	D	7	07	Axial	AR	PVC	Blank
VKS		0.22	224	± 10	K	10	C	6.3	E			Taping			
SSM		0.47	474			16	D	8	F	9	09	2.5mm	TU		
SKF		1	105	+10 -20	C	25	E	10	G	11	11	3.5mm	TV		
SSS		2.2	225			35	F	12	H			5mm	TC		
SGS		3.3	335	± 15	L	50	G	12.5	I	12	12	Lead Cut&From			
SKM		4.7	475	± 20	M	63	H	13	J	14	14	A-Type	A		
SKG		6.8	685			80	I	16	K	16	16	B-Type	B		
SZM		10	106	± 30	N	100	J	18	L	20	20	C-Type	C		
SGF		22	226			125	K	20	M	25	25	D-Type	D		
SRS		33	336	+30 -10	Q	150	L	22	N	30	30	E-Type	E		
SRL		47	476			160	M	25	O	35	35	F-Type	F		
SRD		68	686	+20 -10	V	180	N	30	P	40	40	PCB Terminal			
SNM		100	107			200	O	35	Q	45	45	Snap-in	SW		
SNS		220	227	+20 0	R	220	P	40	R	50	50		SZ		
SNP		330	337			250	Q	50	S			Lug	SG		
SNH		470	477			315	R	63	T			Screw	SO		
SLF		680	687			330	S	76	U						
SLZ		1000	108			350	T	90	V						
SLL		2200	228			400	U								
SLT		3300	338			420	V								
SLN		4700	478			450	W								
SFM		47000	479												
SFS		470000	47T												
SFA															
SFN															
SPF															
SPS															
SLP															
SAP															
SHP															
SKP															
SSP															
SWF															

編帶產品規格 taping specifications



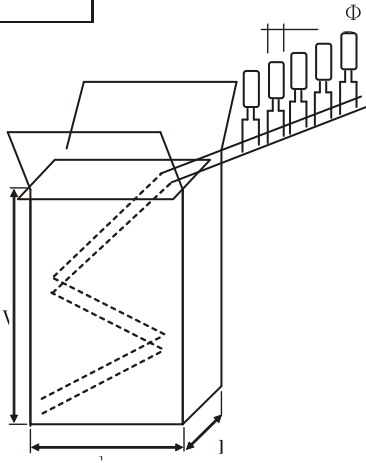
Specifications

code	D	A	D	P	P0	P1	F	P2	W	W0	W1	W2	H	H0	D0	L	T	H
tol.	±0.5	±0.15	±0.05	±1.0	±0.2	±0.7	±1.3	±0.8 -0.2	±0.5	min (m m)	±0.5	max	±7.5	±0.5	±0.2	max	±0.2	max
item	4	7	0.45	12.7	12.7	3.85	6.35	2.5or5.0	18	10	9	0.2-0.6	18.5	17.5	4.1	1	0.7	1
	5	12.5	0.5	12.7	12.7	3.85	6.35	2.5or5.0	18	10	9	0.2-0.6	18.5	17.5	4.1	1	0.7	1
	6.3	12.5	0.5	12.7	12.7	5.1	6.35	2.5or5.0	18	10	9	0.2-0.6	18.5	~	4.1	1	0.7	1
	8	12.5	0.5	12.7	12.7	4.6	6.35	3.5	18	12	9	0.2-0.6	18.5	~	4.1	1	0.7	1
	10	21	0.6	12.7	12.7	3.85	6.35	5	18	12	9	0.2-0.6	18.5	~	4.1	1	0.7	1
	13	26	0.6	15	15	5	7.5	5	18	12	9	0.2-0.6	18.5	~	4.1	1	0.7	1
	16	31.5	0.8	25.4	25.4	8.95	12.7	7.5	18	12	9	0.2-0.6	18.5	~	4.1	1	0.7	1

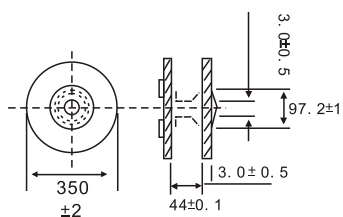
package information

Case Diameter D φ (mm)	Ammo Package		
	A	W	Q'ty pcs
4	190	53	2000
5	235	53	2000
6.3	300	53	2000
8	235	53	1000
10	300	55	300
13	300	61	300

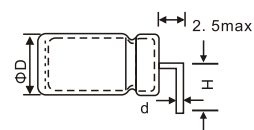
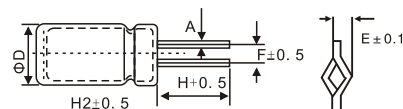
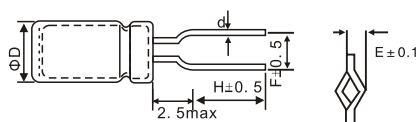
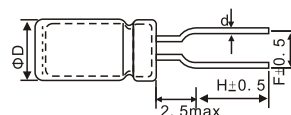
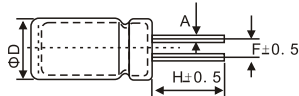
ammo package



成型產品規格 Lead Forming Specification



D ϕ	4		5	6	8	10		13	16	18	22	25
F	1.5		2	2.5	3.5		5		7.5	7.5(10)	10	12.5
D ϕ	0.45			0.5			0.6			0.8		



specifications

shape no	cutting & forming methods	D ϕ	4		5	6	8	10		13	16	18	22	25
A	lead cutting only	F	1.5		2	2.5	3.5	5		5	7.5	7.5(10)	10	12.5
		H	4		4	4	4	5		5	5	5	5	5
		D	0.45		0.5	0.5	0.5	0.6		0.6	0.6	0.8	0.8	0.8
B	lead cutting forming	F	5		5	5	5	-		-	-	-	-	-
		H	4		4	4	4	-		-	-	-	-	-
		D	0.45		0.5	0.5	0.5	-		-	-	-	-	-
C	lead cutting, crimping and forming	F	5		5	5	5	-		-	-	-	-	-
		H1	4		4	4	4	-		-	-	-	-	-
		H2	1.8		1.8	1.8	1.8	-		-	-	-	-	-
		D	0.45		0.5	0.5	0.5	-		-	-	-	-	-
D	lead cutting and forming	F	-		-	-	-	5		5	7.5	7.5(10)	10	12.5
		H1	-		-	-	-	4.5		4.5	4.5	4.5	4.5	4.5
		H2	-		-	-	-	1.8		1.8	1.8	1.8	1.8	1.8
		D	-		-	-	-	0.6		0.6	0.8	0.8	0.8	0.8
E	lead cutting and bending	F	5		5	5	5	-		-	-	-	-	-
		F1	1.2		1.2	1.2	1.2	-		-	-	-	-	-
		H1	4		4	4	4	-		-	-	-	-	-
		H2	1.8		1.8	1.8	1.8	-		-	-	-	-	-
		D	0.45		0.5	0.5	0.5	-		-	-	-	-	-
F	lead cutting and bending	F	1.5		2	2.5	2.5	-		-	-	-	-	-
		H	6		7	9	9	-		-	-	-	-	-
		D	0.45		0.5	0.5	0.5	-		-	-	-	-	-

VSS SERIES CHIP TYPE +85°C(標準品)

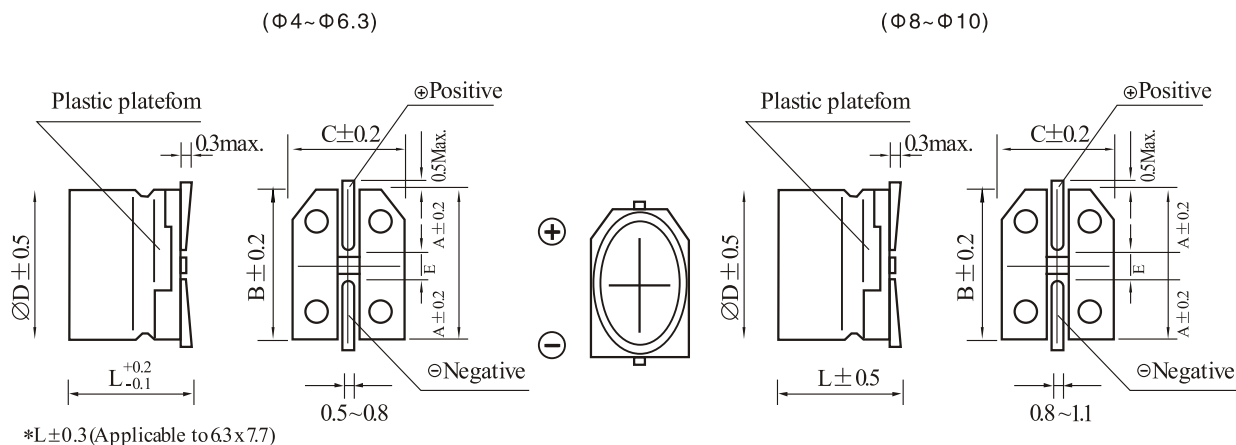
- For general purpose, -40°C to +85°C.
- Case diameter: $\Phi 4\text{mm} \sim \Phi 10\text{mm}$
- Reflow soldering is available
- Available for high density surface mounting

◆ SPECIFICATIONS

Item	Performance Characteristics																																																														
Operating temperature range	-40 to +85℃																																																														
Rated Working Voltage Range	4V to 100V																																																														
Nominal Capacitance Range	0.1 to 1500μF																																																														
Capacitance Tolerance	±20(120Hz,+20℃)																																																														
Leakage Current	I≤ 0.01CV or 3(μA)after 2minutes whichever is greater measured with rated working voltage applied at +20 ℃																																																														
Dissipation Factor	<table><tr><td>Working Voltage(V)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>tan δ(max)</td><td></td><td>0.35</td><td>0.28</td><td>0.24</td><td>0.18</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.12</td><td>0.1</td></tr></table>										Working Voltage(V)	4	6.3	10	16	25	35	50	63	100	tan δ(max)		0.35	0.28	0.24	0.18	0.16	0.14	0.12	0.12	0.1																																
Working Voltage(V)	4	6.3	10	16	25	35	50	63	100																																																						
tan δ(max)		0.35	0.28	0.24	0.18	0.16	0.14	0.12	0.12	0.1																																																					
Low Temperature Characteristics	Impedance ratio max at 120Hz <table><tr><td colspan="2">Working Voltage(V)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td rowspan="2">Z-25℃/Z+20℃</td><td>< Φ8</td><td>7</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>≥ Φ8</td><td>7</td><td>5</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td rowspan="2">Z-40℃/Z+20℃</td><td>< Φ8</td><td>15</td><td>8</td><td>8</td><td>4</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td></tr><tr><td>≥ Φ8</td><td>15</td><td>10</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table>										Working Voltage(V)		4	6.3	10	16	25	35	50	63	100	Z-25℃/Z+20℃	< Φ8	7	4	3	2	2	2	2	2	2	≥ Φ8	7	5	4	3	2	2	2	2	2	Z-40℃/Z+20℃	< Φ8	15	8	8	4	4	3	3	3	3	≥ Φ8	15	10	8	6	4	3	3	3	3
Working Voltage(V)		4	6.3	10	16	25	35	50	63	100																																																					
Z-25℃/Z+20℃	< Φ8	7	4	3	2	2	2	2	2	2																																																					
	≥ Φ8	7	5	4	3	2	2	2	2	2																																																					
Z-40℃/Z+20℃	< Φ8	15	8	8	4	4	3	3	3	3																																																					
	≥ Φ8	15	10	8	6	4	3	3	3	3																																																					
High Temperature Loading	Test conditions Duration : 2000 hours Ambient temp : +85℃ Applied vlotage:Rated DC working voltage with max,ripple current. Post test requirements at +20℃ Leakage current : ≤Initial specified value Cap . Change : ≤ ±20%of Initial measured value tan δ : ≤ 200% of Initial specified value																																																														
Shelf Life	Test conditions Duration : 1000 hours Ambient temp : +85℃ Applied vlotage:(None) Post test requirements at +20℃ Leakage current : ≤ 200% of Initial specified value Cap . Change : ≤ ±30%of Initial measured value tan δ : ≤ 300% of Initial specified value																																																														

VSS SERIES CHIP TYPE +85℃(標準品)

◆Dimensions



ØD×L	4×5.4	5×5.4	6.3×5.4	6.3×7.7	8×10.5	10×10.5
A	1.8	2.1	2.4	2.4	2.9	3.2
B	4.3	5.3	6.6	6.6	8.3	10.3
C	4.3	5.3	6.6	6.6	8.3	10.3
E	1	1.3	2.1	2.1	3.1	4.2
L	5.4	5.4	5.4	7.7	10.5	10.5

Nominal capacitance, rated voltage, rated ripple current and case size table

Voltage	4V		6.3V		10V		16V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10							4*5.4	23
22			4*5.4	28	4*5.4	30	4*5.4	30
					5*5.4	33	5*5.4	37
33	4*5.4	28	4*5.4	34	4*5.4	34	5*5.4	44
			5*5.4	37	5*5.4	41	6.3*5.4	49
47	4*5.4	33	4*5.4	40	5*5.4	47	5*5.4	52
			5*5.4	45	6.3*5.4	52	6.3*5.4	58
56	5*5.4	42	5*5.4	46	5*5.4	50	5*5.4	57
			6.3*5.4	52	6.3*5.4	57	6.3*5.4	63
100	5*5.4	56	5*5.4	47	5*5.4	54	6.3*5.4	86
			6.3*5.4	70	6.3*5.4	76		
150	6.3*5.4	79	6.3*5.4	74	6.3*7.7	85	6.3*7.7	135
220	6.3*5.4	96	6.3*5.4	75	6.3*7.7	150	6.3*7.7	150
			6.3*7.7	95			8*10.2	210
330	6.3*7.7	152	6.3*7.7	150	8*10.2	240	8*10.2	270
			8*10.2	195				
470	6.3*7.7	200	8*10.2	265	8*10.2	290	8*10.2	307
							10*10.2	330
680	8*10.2	284	10*10.2	374	10*10.2	374	10*10.2	390
1000	8*10.2	344	10*10.2	450	10*10.2	450		
1500	10*10.2	347						

Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ØD X L (mm)

VSS SERIES CHIP TYPE +85℃(標準品)

Nominal capacitance, rated voltage, rated ripple current and case size table

Voltage	25V		35V		50V		63V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1					4*5.4	1	4*5.4	1
0.22					4*5.4	2	4*5.4	2
0.33					4*5.4	3	4*5.4	3
0.47					4*5.4	5	4*5.4	5
1					4*5.4	7	4*5.4	8
2.2					4*5.4	13	4*5.4	12
3.3			4*5.4	16	4*5.4	15	4*5.4	15
4.7	4*5.4	16	4*5.4	18	4*5.4	18	5*5.4	20
					5*5.4	20		
10	4*5.4	24	4*5.4	24	5*5.4	30	6.3*5.4	32
	5*5.4	27	5*5.4	29	6.3*5.4	33		
22	5*5.4	38	5*5.4	39	6.3*5.4	45	6.3*7.7	60
	6.3*5.4	42	6.3*5.4	46				
33	5*5.4	46	6.3*5.4	53	6.3*7.7	75	8*10.2	100
	6.3*5.4	52						
47	6.3*5.4	60	6.3*5.4	65	6*7.7	85	6*7.7	100
			6.3*7.7	70	8*10.2	120	8*10.2	130
56	6.3*7.7	65	6.3*7.7	80	8*10.2	150	8*10.2	180
100	6.3*7.7	120	6.3*7.7	120	8*10.2	180	10*10.2	275
			8*10.2	175	10*10.2	195		
150	8*10.2	192	8*10.2	214	10*10.2	238		
220	8*10.2	230	8*10.2	240	10*10.2	289		
	10*10.2	250	10*10.2	265				
330	8*10.2	305	10*10.2	350	10*10.2	390		
	10*10.2	250						
470	10*10.2	390						

Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ΦD X L (mm)

Voltage	100V	
Cap(μF)	Size	Ripple
3.3	6.3*7.7	25
4.7	6.3*7.7	32
10	6.3*7.7	50
22	8*10.2	120
33	10*10.2	190

Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ΦD X L (mm)

VNS SERIES CHIP TYPE +85℃(標準品)

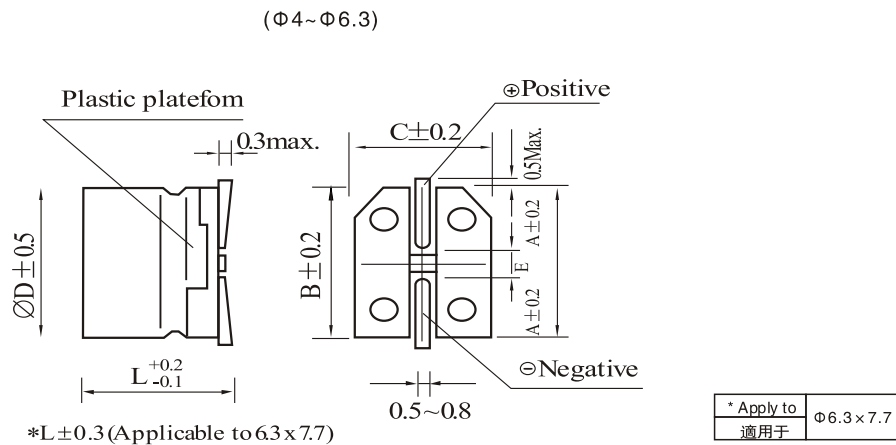
- For general purpose, -40℃ to +85℃.
- Bi-polariz
- Reflow soldering is available
- Available for high density surface mounting

◆ SPECIFICATIONS

Item	Performance Characteristics																																																														
Operating temperature range	-40 to +85℃																																																														
Rated Working Voltage Range	6.3V to 50V																																																														
Nominal Capacitance Range	0.1 to 1500μF																																																														
Capacitance Tolerance	±20(120Hz, +20℃)																																																														
Leakage Current	I ≤0.05CRVR or 10 (μ A) whichever is greater after (After 2 minutes'application of rated voltage) CR: nominal capacitance (μ F) is greater measured with rated working voltage applied at +20 ℃																																																														
Dissipation Factor	<table><tr><td>Working Voltage(V)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>tan δ(max)</td><td>0.28</td><td>0.24</td><td>0.2</td><td>0.17</td><td>0.15</td><td>0.15</td></tr></table>										Working Voltage(V)	6.3	10	16	25	35	50	tan δ(max)	0.28	0.24	0.2	0.17	0.15	0.15																																							
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Low Temperature Characteristics	Impedance ratio max at 120Hz <table><tr><td colspan="2">Working Voltage(V)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td rowspan="2">Z-25℃/Z+20℃</td><td>< Φ 8</td><td>7</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>≥ Φ 8</td><td>7</td><td>5</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td rowspan="2">Z-40℃/Z+20℃</td><td>< Φ 8</td><td>15</td><td>8</td><td>8</td><td>4</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td></tr><tr><td>≥ Φ 8</td><td>15</td><td>10</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table>										Working Voltage(V)		4	6.3	10	16	25	35	50	63	100	Z-25℃/Z+20℃	< Φ 8	7	4	3	2	2	2	2	2	2	≥ Φ 8	7	5	4	3	2	2	2	2	2	Z-40℃/Z+20℃	< Φ 8	15	8	8	4	4	3	3	3	3	≥ Φ 8	15	10	8	6	4	3	3	3	3
Working Voltage(V)		4	6.3	10	16	25	35	50	63	100																																																					
Z-25℃/Z+20℃	< Φ 8	7	4	3	2	2	2	2	2	2																																																					
	≥ Φ 8	7	5	4	3	2	2	2	2	2																																																					
Z-40℃/Z+20℃	< Φ 8	15	8	8	4	4	3	3	3	3																																																					
	≥ Φ 8	15	10	8	6	4	3	3	3	3																																																					
High Temperature Loading	<table><tr><td>Test conditions</td><td>Post test requirements at +20℃</td></tr><tr><td>Duration : 1000 hours</td><td>Leakage current : ≤Initial specified value</td></tr><tr><td>Ambient temp : +85℃</td><td>Cap . Change : ≤ ±20%of Initial measured value</td></tr><tr><td>Applied vlotage:Rated DC working voltage with max,ripple current.</td><td>tan δ : ≤ 200% of Initial specified value</td></tr></table>										Test conditions	Post test requirements at +20℃	Duration : 1000 hours	Leakage current : ≤Initial specified value	Ambient temp : +85℃	Cap . Change : ≤ ±20%of Initial measured value	Applied vlotage:Rated DC working voltage with max,ripple current.	tan δ : ≤ 200% of Initial specified value																																													
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Shelf Life	<table><tr><td>Test conditions</td><td>Post test requirements at +20℃</td></tr><tr><td>Duration : 1000 hours</td><td>Leakage current : ≤200% of Initial specified value</td></tr><tr><td>Ambient temp : +85℃</td><td>Cap . Change : ≤ ±30%of Initial measured value</td></tr><tr><td>Applied vlotage:(None)</td><td>tan δ : ≤ 300% of Initial specified value</td></tr></table>										Test conditions	Post test requirements at +20℃	Duration : 1000 hours	Leakage current : ≤200% of Initial specified value	Ambient temp : +85℃	Cap . Change : ≤ ±30%of Initial measured value	Applied vlotage:(None)	tan δ : ≤ 300% of Initial specified value																																													
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Ambient temp : +85℃	Cap . Change : ≤ ±30%of Initial measured value																																																														
Applied vlotage:(None)	tan δ : ≤ 300% of Initial specified value																																																														

VNS SERIES CHIP TYPE +85℃(標準品)

◆Dimensions



∅D×L	4×5.4	5×5.4	6.3×5.4	6.3×7.7
A	1.8	2.1	2.4	2.4
B	4.3	5.3	6.6	6.6
C	4.3	5.3	6.6	6.6
E	1	1.3	2.1	2.1
L	5.4	5.4	5.4	7.7

Nominal capacitance, rated voltage, rated ripple current and case size table

Voltage	6.3V		10V		16V		25	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1								
0.22								
0.33								
0.47								
1								
2.2								
3.3							4*5.4	12
4.7					4*5.4	20	5*5.4	21
10			4*5.4	25	5*5.4	23	6.3*5.4	27
22	5*5.4	28	6.3*5.4	33	6.3*5.4	39	6.3*7.7	50
33	6.3*5.4	37	6.3*5.4	43	6.3*5.4	49	6.3*7.7	61
47	6.3*5.4	45	6.3*7.7	64	6.3*7.7	75		
100	6.3*5.4	82						

Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ΦD X L (mm)

VNS SERIES CHIP TYPE +85℃(標準品)

Nominal capacitance, rated voltage, rated ripple current and case size table

Voltage	35		50	
Cap(μF)	size	ripple	size	ripple
0.1			4*5.4	1
0.22			4*5.4	2
0.33			4*5.4	2.8
0.47			4*5.4	5
1			4*5.4	10
2.2	4*5.4	12	5*5.4	16
3.3	5*5.4	16	5*5.4	21
4.7	5*5.4	22	6.3*5.4	31
10	6.3*5.4	29	6.3*7.7	36
22	6.3*7.7	54		

Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ΦD X L (mm)

VKS SERIES CHIP TYPE +105℃(標準品)

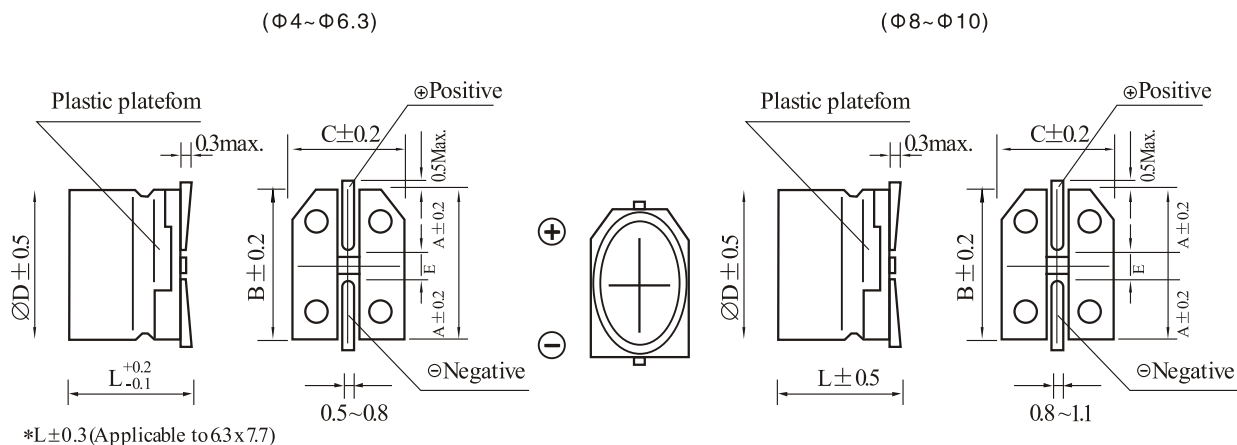
- Case diameter: ϕ 4mm- ϕ 10mm
- Reflow soldering is available
- Available for high density surface mounting
- operating over wide temperature range

◆ SPECIFICATIONS

Item	Performance Characteristics																																																														
Operating temperature range	-40 to +105℃																																																														
Rated Working Voltage Range	4V to 100V																																																														
Nominal Capacitance Range	0.1 to 1500μF																																																														
Capacitance Tolerance	±20(120Hz, +20℃)																																																														
Leakage Current	I ≤0.01CRVR or 3 (μ A) whichever is greater after (After 2 minutes'application of rated voltage) CR: nominal capacitance (μ F) is greater measured with rated working voltage applied at +20 ℃																																																														
Dissipation Factor	<table><tr><td colspan="2">Working Voltage(V)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>tan δ(max)</td><td></td><td>0.35</td><td>0.28</td><td>0.24</td><td>0.18</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.12</td><td>0.1</td></tr></table>										Working Voltage(V)		4	6.3	10	16	25	35	50	63	100	tan δ(max)		0.35	0.28	0.24	0.18	0.16	0.14	0.12	0.12	0.1																															
Working Voltage(V)		4	6.3	10	16	25	35	50	63	100																																																					
tan δ(max)		0.35	0.28	0.24	0.18	0.16	0.14	0.12	0.12	0.1																																																					
Low Temperature Characteristics	Impedance ratio max at 120Hz <table><tr><td colspan="2">Working Voltage(V)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td rowspan="2">Z-25℃/Z+20℃</td><td>< Φ 8</td><td>7</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>≥ Φ 8</td><td>7</td><td>5</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td rowspan="2">Z-40℃/Z+20℃</td><td>< Φ 8</td><td>15</td><td>8</td><td>8</td><td>4</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td></tr><tr><td>≥ Φ 8</td><td>15</td><td>10</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table>										Working Voltage(V)		4	6.3	10	16	25	35	50	63	100	Z-25℃/Z+20℃	< Φ 8	7	4	3	2	2	2	2	2	2	≥ Φ 8	7	5	4	3	2	2	2	2	2	Z-40℃/Z+20℃	< Φ 8	15	8	8	4	4	3	3	3	3	≥ Φ 8	15	10	8	6	4	3	3	3	3
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Z-25℃/Z+20℃	< Φ 8	7	4	3	2	2	2	2	2	2																																																					
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Z-40℃/Z+20℃	< Φ 8	15	8	8	4	4	3	3	3	3																																																					
	≥ Φ 8	15	10	8	6	4	3	3	3	3																																																					
High Temperature Loading	<table><tr><td>Test conditions</td><td>Post test requirements at +20℃</td></tr><tr><td>Duration : 1000 hours</td><td>Leakage current : ≤ Initial specified value</td></tr><tr><td></td><td>Cap . Change : ≤ ±20%of Initial measured value</td></tr><tr><td>Ambient temp : +105℃</td><td>tan δ : ≤ 200% of Initial specified value</td></tr><tr><td colspan="2">Applied vlotage:Rated DC working voltage with max,ripple current.</td></tr></table>										Test conditions	Post test requirements at +20℃	Duration : 1000 hours	Leakage current : ≤ Initial specified value		Cap . Change : ≤ ±20%of Initial measured value	Ambient temp : +105℃	tan δ : ≤ 200% of Initial specified value	Applied vlotage:Rated DC working voltage with max,ripple current.																																												
Test conditions	Post test requirements at +20℃																																																														
Duration : 1000 hours	Leakage current : ≤ Initial specified value																																																														
	Cap . Change : ≤ ±20%of Initial measured value																																																														
Ambient temp : +105℃	tan δ : ≤ 200% of Initial specified value																																																														
Applied vlotage:Rated DC working voltage with max,ripple current.																																																															
Shelf Life	<table><tr><td>Test conditions</td><td>Post test requirements at +20℃</td></tr><tr><td>Duration : 1000 hours</td><td>Leakage current : ≤ 200% of Initial specified value</td></tr><tr><td>Ambient temp : +105℃</td><td>Cap . Change : ≤ ±30%of Initial measured value</td></tr><tr><td>Applied vlotage:(None)</td><td>tan δ : ≤ 300% of Initial specified value</td></tr></table>										Test conditions	Post test requirements at +20℃	Duration : 1000 hours	Leakage current : ≤ 200% of Initial specified value	Ambient temp : +105℃	Cap . Change : ≤ ±30%of Initial measured value	Applied vlotage:(None)	tan δ : ≤ 300% of Initial specified value																																													
Test conditions	Post test requirements at +20℃																																																														
Duration : 1000 hours	Leakage current : ≤ 200% of Initial specified value																																																														
Ambient temp : +105℃	Cap . Change : ≤ ±30%of Initial measured value																																																														
Applied vlotage:(None)	tan δ : ≤ 300% of Initial specified value																																																														

VKS SERIES CHIP TYPE +105°C(標準品)

◆Dimensions



$\Phi D \times L$	4x5.4	5x5.4	6.3x5.4	6.3x7.7	8x10.5	10x10.5
A	1.8	2.1	2.4	2.4	2.9	3.2
B	4.3	5.3	6.6	6.6	8.3	10.3
C	4.3	5.3	6.6	6.6	8.3	10.3
E	1	1.3	2.1	2.1	3.1	4.2
L	5.4	5.4	5.4	7.7	10.5	10.5

Nominal capacitance, rated voltage, rated ripple current and case size table

Voltage	4V		6.3V		10V		16	
Cap(μ F)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10					4*5.4	15	5*5.4	18
22	4*5.4	18	4*5.4	23	4*5.4	20	4*5.4	25
					5*5.4	27	5*5.4	31
33	4*5.4	23	4*5.4	25	5*5.4	34	5*5.4	35
			5*5.4	30			6.3*5.4	41
47	5*5.4	42	4*5.4	28	5*5.4	36	5*5.4	39
			5*5.4	37	6.3*5.4	41	6.3*5.4	47
100	6.3*5.4	61	5*5.4	47	6.3*5.4	55	6.3*5.4	70
			6.3*5.4	57				
220	6.3*5.4	68	6.3*5.4	74	6.3*7.7	105	6.3*7.7	105
			6.3*7.7	105	8*10.2	150	8*10.2	150
330	6.3*7.7	73	6.3*7.7	105	8*10.2	196	8*10.2	170
			8*10.2	198				
470	6.3*7.7	105	8*10.2	210	8*10.2	200	8*10.2	230
					10*10.2	270	8*10.2	295
1000	8*10.2	210	8*10.2	230	10*10.2	315		
			10*10.2	300				
1500	8*10.2	260	10*10.2	315				

Maximum Allowable Ripple Current (mA rms) at 105°C 120Hz

Case Size $\Phi D \times L$ (mm)

VKS SERIES CHIP TYPE +105°C(標準品)

Nominal capacitance, rated voltage, rated ripple current and case size table

Voltage	25		35		50		63	
Cap(μF)	size	ripple	size	ripple	size	ripple	size	ripple
0.1					4*5.4	1		
0.22					4*5.4	2		
0.33					4*5.4	3		
0.47					4*5.4	5		
1					4*5.4	7		
2.2					4*5.4	10		
3.3			4*5.4	13	4*5.4	12		
4.7	4*5.4	13	4*5.4	16	5*5.4	17		
10	4*5.4 5*5.4	15 20	5*5.4	24	6.3*5.4	26	6.3*7.7	39
22	5*5.4	27	6.3*5.4	38	6.3*7.7	51	6.3*7.7	49
	6.3*5.4	25					8*10.2	98
33	6.3*5.4	45	6.3*5.4	42	6.3*7.7	60	6.3*7.7	112
					8*10.2	91		
47	6.3*7.7	60	6.3*7.7	70	6.3*7.7	63	8*10.2	119
					8*10.2	95	10*10.2	160
100	6.3*7.7	91	6.3*7.7	84	8*10.2	110	10*10.2	196
				120	10*10.2	120		
220	8*10.2	180	8*10.2	170	10*10.2	175		
			10*10.2	210				
330	8*10.2	220	10*10.2	250				
	10*10.2	240						
470	10*10.2	280	10*10.2	275				

Maximum Allowable Ripple Current (mA rms) at 105°C 120Hz

Case Size ΦD X L (mm)

Nominal capacitance, rated voltage, rated ripple current and case size table

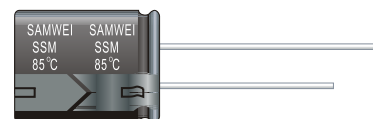
Voltage	100	
Cap(μF)	size	ripple
4.7	6.3*7.7	32
10	6.3*7.7	35
	8*10.2	77
22	8*10.2	85
	10*10.2	125
33	10*10.2	133
47	10*10.2	140

Maximum Allowable Ripple Current (mA rms) at 105°C 120Hz

Case Size ΦD X L (mm)

SSM SERIES(5mmL 高 +85℃ Standard標準品)

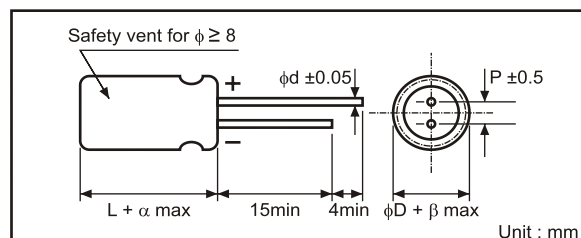
- Designed for space-saving and high density insertion.
- Low price compared to tantalum capacitors.



◆ SPECIFICATIONS

Item	Performance Characteristics																																							
Operating temperature range	-40 to + 85℃																																							
Rated Working Voltage Range	4 to 50V																																							
Nominal Capacitance Range	0.1to 470μF																																							
Capacitance Tolerance	±20(120Hz,+20℃)																																							
Leakage Current	I ≤ 0.01CV or 3(μA) after 5 minutes application of rated working voltage at +20℃																																							
Dissipation Factor tan δ(120Hz,+20℃)	<table><tr><td>Working Voltage(V)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>tan δ(max)</td><td>0.37</td><td>0.28</td><td>0.24</td><td>0.2</td><td>0.16</td><td>0.13</td><td>0.12</td></tr></table>								Working Voltage(V)	4	6.3	10	16	25	35	50	tan δ(max)	0.37	0.28	0.24	0.2	0.16	0.13	0.12																
Working Voltage(V)	4	6.3	10	16	25	35	50																																	
tan δ(max)	0.37	0.28	0.24	0.2	0.16	0.13	0.12																																	
Low Temperature Characteristics	Impedance ratio max at 120Hz <table><tr><td>Working Voltage(V)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25℃/Z+20℃</td><td>6</td><td>3</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃/Z+20℃</td><td>12</td><td>8</td><td>5</td><td>4</td><td>3</td><td>3</td><td>3</td></tr></table>								Working Voltage(V)	4	6.3	10	16	25	35	50	Z-25℃/Z+20℃	6	3	3	2	2	2	2	Z-40℃/Z+20℃	12	8	5	4	3	3	3								
Working Voltage(V)	4	6.3	10	16	25	35	50																																	
Z-25℃/Z+20℃	6	3	3	2	2	2	2																																	
Z-40℃/Z+20℃	12	8	5	4	3	3	3																																	
High Temperature Loading	<table><tr><td>Test conditions</td><td colspan="7">Post test requirements at +20℃</td></tr><tr><td>Duration : 1000 hours</td><td colspan="7">Leakage current : ≤ Initial specified value</td></tr><tr><td>Ambient temp : + 85℃</td><td colspan="7">Cap . Change : ≤ ±20%of Initial measured value</td></tr><tr><td>Applied voltage : Rated DC working voltage</td><td colspan="7">tan δ : ≤ 200% of Initial specified value</td></tr></table>								Test conditions	Post test requirements at +20℃							Duration : 1000 hours	Leakage current : ≤ Initial specified value							Ambient temp : + 85℃	Cap . Change : ≤ ±20%of Initial measured value							Applied voltage : Rated DC working voltage	tan δ : ≤ 200% of Initial specified value						
Test conditions	Post test requirements at +20℃																																							
Duration : 1000 hours	Leakage current : ≤ Initial specified value																																							
Ambient temp : + 85℃	Cap . Change : ≤ ±20%of Initial measured value																																							
Applied voltage : Rated DC working voltage	tan δ : ≤ 200% of Initial specified value																																							
Shelf Life	<table><tr><td>Test conditions</td><td colspan="7">Post test requirements at +20℃</td></tr><tr><td>Duration : 500 hours</td><td colspan="7">Leakage current : ≤ Initial specified value</td></tr><tr><td>Ambient temp : + 85℃</td><td colspan="7">Cap . Change : ≤ ±20%of Initial measured value</td></tr><tr><td>Applied vlotage:(None)</td><td colspan="7">tan δ : ≤ 200% of Initial specified value</td></tr></table>								Test conditions	Post test requirements at +20℃							Duration : 500 hours	Leakage current : ≤ Initial specified value							Ambient temp : + 85℃	Cap . Change : ≤ ±20%of Initial measured value							Applied vlotage:(None)	tan δ : ≤ 200% of Initial specified value						
Test conditions	Post test requirements at +20℃																																							
Duration : 500 hours	Leakage current : ≤ Initial specified value																																							
Ambient temp : + 85℃	Cap . Change : ≤ ±20%of Initial measured value																																							
Applied vlotage:(None)	tan δ : ≤ 200% of Initial specified value																																							

◆ CASE SIZE TABLE



φD	4	5	6.3	8
P	1.5	2.0	2.5	3.5
φd	0.45	0.45	0.45	0.45
α	1.5			
β	0.5			

◆ RIPPLE CURRENT MULTIPLIER

(1) Frequency Coefficient

cap(μf) \ freq. (Hz)	50	120	300	1k	10k~
≤ 47	0.75	1.00	1.35	1.57	2.00
56~470	0.80	1.00	1.23	1.34	1.50

(2) Temperature Coefficient

Temperatu	~55	65	70	85
FACTOR	1.65	1.50	1.30	1.00

SSM SERIES(5mmL 高 +85℃ Standard標準品)

◆ DIMENSIONS

Voltage	4V		6.3V		10V		16V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10							4*5	22
22	4*5	20	4*5	21	4*5	24	4*5	28
							5*5	35
33	4*5	24	4*5	25	4*5	32	4*5	33
							5*5	40
47	4*5	32	4*5	33	4*5	45	5*5	48
	5*5	40	5*5	41	5*5	51	6.3*5	56
100	5*5	53	5*5	53	5*5	62	6.3*5	81
	6.3*5	64	6.3*5	66	6.3*5	74	8*5	95
220	6.3*5	80	6.3*5	87	6.3*5	95	8*5	119
					8*5	111		
330	8*5	86	8*5	96	8*5	140		
470	8*5	97	8*5	107				

Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ΦD X L (mm)

Voltage	25V		35V		50V			
Cap(μF)	Size	Ripple	Size	Ripple				
0.1					4*5	1.8		
0.22					4*5	3.9		
0.33					4*5	4.2		
0.47					4*5	4.9		
1					4*5	8.1		
2.2			4*5	11	4*5	15		
3.3			4*5	15	4*5	18		
4.7	4*5	17	4*5	20	5*5	24		
	5*5	24	5*5	22				
10	4*5	21	5*5	29	5*5	31		
	5*5	27			6.3*5	36		
22	5*5	33	5*5	41	6.3*5	59		
	6.3*5	43	6.3*5	54				
33	6.3*5	53	8*5	69	8*5	75		
47	5*5	57	8*5	95				
	6.3*5	65						
100	8*5	107						

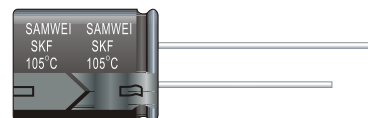
Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ΦD X L (mm)

SKF SERIES(5mmL高, +105℃)

● Super miniature, 5mmL, high temperature, suit for use in electronic circuit of

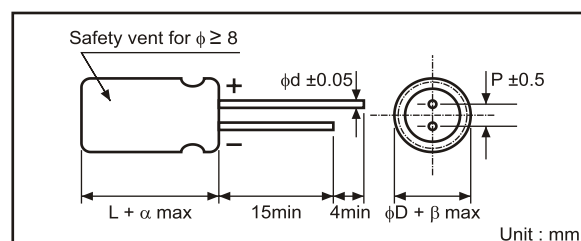
high density assembly for videoorder, remote controller, VCD etc.



◆ SPECIFICATIONS

Item	Performance Characteristics																																								
Operating temperature range	-40 to + 105℃																																								
Rated Working Voltage Range	4 to 50V																																								
Nominal Capacitance Range	0.1to 470μF																																								
Capacitance Tolerance	±20(120Hz,+20℃)																																								
Leakage Current	I≤ 0.01CV or 3(μA) after 5 minutes application of rated working voltage at +20℃																																								
Dissipation Factor tan δ(120Hz,+20℃)	<table><tr><td>Working Voltage(V)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>tan δ(max)</td><td>0.37</td><td>0.28</td><td>0.24</td><td>0.2</td><td>0.16</td><td>0.13</td><td>0.12</td></tr></table>								Working Voltage(V)	4	6.3	10	16	25	35	50	tan δ(max)	0.37	0.28	0.24	0.2	0.16	0.13	0.12																	
Working Voltage(V)	4	6.3	10	16	25	35	50																																		
tan δ(max)	0.37	0.28	0.24	0.2	0.16	0.13	0.12																																		
Low Temperature Characteristics	<table><tr><td colspan="9">Impedance ratio max at 120Hz</td></tr><tr><td>Working Voltage(V)</td><td>4</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25℃/Z+20℃</td><td>6</td><td>3</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃/Z+20℃</td><td>12</td><td>8</td><td>5</td><td>4</td><td>3</td><td>3</td><td>3</td></tr></table>								Impedance ratio max at 120Hz									Working Voltage(V)	4	6.3	10	16	25	35	50	Z-25℃/Z+20℃	6	3	3	2	2	2	2	Z-40℃/Z+20℃	12	8	5	4	3	3	3
Impedance ratio max at 120Hz																																									
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Z-25℃/Z+20℃	6	3	3	2	2	2	2																																		
Z-40℃/Z+20℃	12	8	5	4	3	3	3																																		
High Temperature Loading	<table><tr><td colspan="4">Test conditions</td><td colspan="4">Post test requirements at +20℃</td></tr><tr><td colspan="4">Duration : 1000 hours</td><td colspan="4">Leakage current : ≤Initial specified value</td></tr><tr><td colspan="4">Ambient temp : + 105℃</td><td colspan="4">Cap . Change : ≤ ±20%of Initial measured value</td></tr><tr><td colspan="4">Applied voltage : Rated DC working voltage</td><td colspan="4">tan δ : ≤ 200% of Initial specified value</td></tr></table>								Test conditions				Post test requirements at +20℃				Duration : 1000 hours				Leakage current : ≤Initial specified value				Ambient temp : + 105℃				Cap . Change : ≤ ±20%of Initial measured value				Applied voltage : Rated DC working voltage				tan δ : ≤ 200% of Initial specified value				
Test conditions				Post test requirements at +20℃																																					
Duration : 1000 hours				Leakage current : ≤Initial specified value																																					
Ambient temp : + 105℃				Cap . Change : ≤ ±20%of Initial measured value																																					
Applied voltage : Rated DC working voltage				tan δ : ≤ 200% of Initial specified value																																					
Shelf Life	<table><tr><td colspan="4">Test conditions</td><td colspan="4">Post test requirements at +20℃</td></tr><tr><td colspan="4">Duration : 500 hours</td><td colspan="4">Leakage current : ≤Initial specified value</td></tr><tr><td colspan="4">Ambient temp : + 105℃</td><td colspan="4">Cap . Change : ≤ ±20%of Initial measured value</td></tr><tr><td colspan="4">Applied vlotage:(None)</td><td colspan="4">tan δ : ≤ 200% of Initial specified value</td></tr></table>								Test conditions				Post test requirements at +20℃				Duration : 500 hours				Leakage current : ≤Initial specified value				Ambient temp : + 105℃				Cap . Change : ≤ ±20%of Initial measured value				Applied vlotage:(None)				tan δ : ≤ 200% of Initial specified value				
Test conditions				Post test requirements at +20℃																																					
Duration : 500 hours				Leakage current : ≤Initial specified value																																					
Ambient temp : + 105℃				Cap . Change : ≤ ±20%of Initial measured value																																					
Applied vlotage:(None)				tan δ : ≤ 200% of Initial specified value																																					

◆ CASE SIZE TABLE



ΦD	4	5	6.3	8
P	1.5	2.0	2.5	3.5
φd	0.45	0.45	0.45	0.45
α	1.5			
β	0.5			

◆ RIPPLE CURRENT MULTIPLIER

(1) Frequency Coefficient

freq. (Hz) cap(μf)	50	120	300	1k	10k~
≤47	0.75	1.00	1.35	1.57	2.00
56~470	0.80	1.00	1.23	1.34	1.50

(2) Temperature Coefficient

Temperatu	~55	60	70	85	105
FACTOR	2.23	2.17	2.00	1.75	1.00

SKF

SERIES(5mmL高, +105℃)

◆ DIMENSIONS

Voltage	4V		6.3V		10V		16V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10							4*5	18
22	4*5	16	4*5	17	4*5	20	4*5	24
							5*5	30
33	4*5	20	4*5	21	4*5	28	4*5	29
							5*5	35
47	4*5	28	4*5	29	4*5	40	5*5	43
	5*5	36	5*5	36	5*5	46	6.3*5	50
100	5*5	48	5*5	48	5*5	57	6.3*5	75
	6.3*5	60	6.3*5	60	6.3*5	69	8*5	88
220	6.3*5	75	6.3*5	82	6.3*5	88	8*5	112
					8*5	105		
330	8*5	80	8*5	90	8*5	132		
470	8*5	88	8*5	100				

Maximum Allowable Ripple Current (mA rms) at 105℃ 120Hz

Case Size ΦD X L (mm)

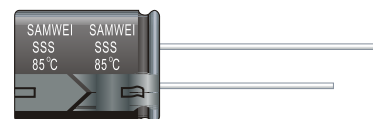
Voltage	25V		35V		50V			
Cap(μF)	Size	Ripple	Size	Ripple				
0.1					4*5	1.0		
0.22					4*5	2.6		
0.33					4*5	3.2		
0.47					4*5	3.8		
1					4*5	6.2		
2.2			4*5	7	4*5	11		
3.3			4*5	11	4*5	14		
4.7	4*5	13	4*5	15	5*5	19		
	5*5	20	5*5	17				
10	4*5	17	5*5	22	5*5	24		
	5*5	23			6.3*5	30		
22	5*5	28	5*5	35	6.3*5	52		
	6.3*5	38	6.3*5	48				
33	6.3*5	48	8*5	62	8*5	68		
47	5*5	52	8*5	88				
	6.3*5	68						
100	8*5	100						

Maximum Allowable Ripple Current (mA rms) at 105℃ 120Hz

Case Size ΦD X L (mm)

SSS SERIES 7(9)mmL高, -40℃~+85℃)

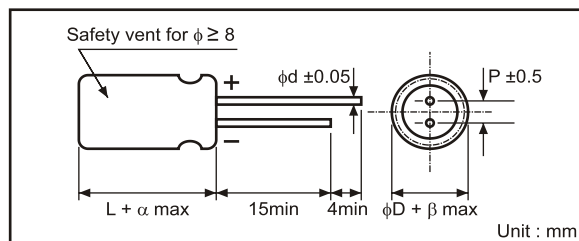
- This series is for communication equipments, switching power supply, industrial measuring instruments, automotive electric products, etc.



◆ SPECIFICATIONS

Item	Performance Characteristics						
Operating temperature range	-40 to + 85℃						
Rated Working Voltage Range	6.3 to 50V						
Nominal Capacitance Range	0.1to 470μF						
Capacitance Tolerance	±20(120Hz,+20℃)						
Leakage Current	I ≤ 0.01CV or 3(μA) after 5 minutes application of rated working voltage at +20℃						
Dissipation Factor tan δ(120Hz,+20℃)	Working Voltage(V)	6.3	10	16	25	35	50
	tan δ(max)	0.24	0.20	0.16	0.14	0.12	0.10
Low Temperature Characteristics	Impedance ratio max at 120Hz						
	Working Voltage(V)	6.3	10	16	25	35	50
	Z-25℃/Z+20℃	4	3	2	2	2	2
	Z-40℃/Z+20℃	8	6	4	4	3	3
High Temperature Loading	Test conditions			Post test requirements at +20℃			
	Duration : 1000 hours			Leakage current : ≤Initial specified value			
	Ambient temp : + 85℃			Cap . Change : ≤ ±20%of Initial measured value			
	Applied voltage : Rated DC working voltage			tan δ : ≤ 200% of Initial specified value			
Shelf Life	Test conditions			Post test requirements at +20℃			
	Duration : 500 hours			Leakage current : ≤Initial specified value			
	Ambient temp : + 85℃			Cap . Change : ≤ ±20%of Initial measured value			
	Applied vlotage:(None)			tan δ : ≤ 200% of Initial specified value			

◆ CASE SIZE TABLE



ΦD	4	5	6.3	8
P	1.5	2.0	2.5	3.5
Φd	0.45	0.45	0.45	0.45
α	1.5			
β	0.5			

◆ RIPPLE CURRENT MULTIPLIER

(1) Frequency Coefficient

freq. (Hz) cap(μf)	50	120	300	1k	10k~
≤ 47	0.75	1.00	1.35	1.57	2.00
56~470	0.80	1.00	1.23	1.34	1.50

(2) Temperature Coefficient

Temperature	~55	65	70	85
FACTOR	1.65	1.50	1.30	1.00

SSS SERIES 7(9)mmL高, -40℃~+85℃)

◆ DIMENSIONS

Voltage	6.3V		10V		16V		25V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10					4*7	28	4*7	28
22	4*7	34	4*7	35	4*7	39	4*7	39
							5*7	48
33	4*7	40	4*7	43	(4)5*7	(45)59	5*7	58
47	4*7	48	(4)5*7	45(59)	4*7	58	5*7	67
					5*7	65	6.3*7	71
68			5*7	65	5*7	76	6.3*7	78
100	4*7	65	(5)6.3*7	(74)87	5*7	84	6.3*7	100
	5*7	78			6.3*7	98	8*7(9)	115(130)
					8*7	110		
220	5*7	96	6.3*7	138	6.3*7	132	8*9	150
	6.3*7	120	8*7	145	8*7(9)	172(200)		
330	6.3*7	108	8*7(9)	201(230)				
	8*7(9)	180(204)						
470	8*7(9)	215(243)						

Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ΦD X L (mm)

Voltage	35V		50V					
Cap(μF)	Size	Ripple	Size	Ripple				
0.1			4*7	1.0				
0.22			4*7	2.3				
0.33			4*7	3.5				
0.47			4*7	5.0				
1			4*7	10				
2.2			4*7	19				
3.3			4*7	24				
4.7	4*7	24	4*7	29				
10	4*7	30	4*7	34				
	5*7	38	5*7	38				
22	5*7	52	6.3*7	58				
	6.3*7	61						
33	6.3*7	65	6.3*7	70				
	8*7	74	8*7	75				
47	6.3*7	76	8*7(9)	101(107)				
	8*7(9)	85(96)						
100	8*9	115						

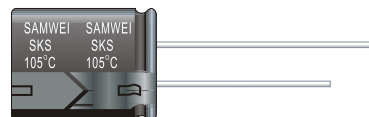
Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ΦD X L (mm)

SKS

SERIES 7(9)mmL高, -40℃~+105℃)

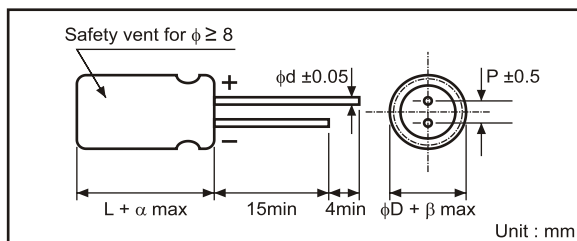
- This series is for communication equipments, switching power supply, industrial measuring instruments, automotive electric products, etc.



◆ SPECIFICATIONS

Item	Performance Characteristics																																			
Operating temperature range	-40 to + 105℃																																			
Rated Working Voltage Range	6.3 to 50V																																			
Nominal Capacitance Range	0.1to 470μF																																			
Capacitance Tolerance	±20(120Hz,+20℃)																																			
Leakage Current	I ≤ 0.01CV or 3(μA) after 5 minutes application of rated working voltage at +20℃																																			
Dissipation Factor tan δ(120Hz,+20℃)	<table><tr><td>Working Voltage(V)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>tan δ(max)</td><td>0.24</td><td>0.21</td><td>0.18</td><td>0.15</td><td>0.13</td><td>0.12</td></tr></table>							Working Voltage(V)	6.3	10	16	25	35	50	tan δ(max)	0.24	0.21	0.18	0.15	0.13	0.12															
Working Voltage(V)	6.3	10	16	25	35	50																														
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Low Temperature Characteristics	<table><tr><td colspan="8">Impedance ratio max at 120Hz</td></tr><tr><td>Working Voltage(V)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td></tr><tr><td>Z-25℃/Z+20℃</td><td>4</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃/Z+20℃</td><td>8</td><td>5</td><td>4</td><td>3</td><td>3</td><td>3</td></tr></table>							Impedance ratio max at 120Hz								Working Voltage(V)	6.3	10	16	25	35	50	Z-25℃/Z+20℃	4	2	2	2	2	2	Z-40℃/Z+20℃	8	5	4	3	3	3
Impedance ratio max at 120Hz																																				
Working Voltage(V)	6.3	10	16	25	35	50																														
Z-25℃/Z+20℃	4	2	2	2	2	2																														
Z-40℃/Z+20℃	8	5	4	3	3	3																														
High Temperature Loading	<table><tr><td>Test conditions</td><td colspan="6">Post test requirements at +20℃</td></tr><tr><td>Duration : 1000 hours</td><td colspan="6">Leakage current : ≤ Initial specified value</td></tr><tr><td>Ambient temp : + 105℃</td><td colspan="6">Cap . Change : ≤ ±20%of Initial measured value</td></tr><tr><td>Applied voltage : Rated DC working voltage</td><td colspan="6">tan δ : ≤ 200% of Initial specified value</td></tr></table>							Test conditions	Post test requirements at +20℃						Duration : 1000 hours	Leakage current : ≤ Initial specified value						Ambient temp : + 105℃	Cap . Change : ≤ ±20%of Initial measured value						Applied voltage : Rated DC working voltage	tan δ : ≤ 200% of Initial specified value						
Test conditions	Post test requirements at +20℃																																			
Duration : 1000 hours	Leakage current : ≤ Initial specified value																																			
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Applied voltage : Rated DC working voltage	tan δ : ≤ 200% of Initial specified value																																			
Shelf Life	<table><tr><td>Test conditions</td><td colspan="6">Post test requirements at +20℃</td></tr><tr><td>Duration : 500 hours</td><td colspan="6">Leakage current : ≤ Initial specified value</td></tr><tr><td>Ambient temp : + 105℃</td><td colspan="6">Cap . Change : ≤ ±20%of Initial measured value</td></tr><tr><td>Applied vlotage:(None)</td><td colspan="6">tan δ : ≤ 200% of Initial specified value</td></tr></table>							Test conditions	Post test requirements at +20℃						Duration : 500 hours	Leakage current : ≤ Initial specified value						Ambient temp : + 105℃	Cap . Change : ≤ ±20%of Initial measured value						Applied vlotage:(None)	tan δ : ≤ 200% of Initial specified value						
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Duration : 500 hours	Leakage current : ≤ Initial specified value																																			
Ambient temp : + 105℃	Cap . Change : ≤ ±20%of Initial measured value																																			
Applied vlotage:(None)	tan δ : ≤ 200% of Initial specified value																																			

◆ CASE SIZE TABLE



φD	4	5	6.3	8
P	1.5	2.0	2.5	3.5
φd	0.45	0.45	0.45	0.45
α	1.5			
β	0.5			

◆ RIPPLE CURRENT MULTIPLIER

(1) Frequency Coefficient

freq. (Hz) cap(μf)	50	120	300	1k	10k~
≤47	0.75	1.00	1.35	1.57	2.00
56~470	0.80	1.00	1.23	1.34	1.50

(2) Tmperature Coefficient

Tmperatu	~55	65	70	85	105
FACTOR	2.23	2.17	2.00	1.75	1.00

SKS

SERIES 7(9)mmL高, -40℃~+105℃)

◆ DIMENSIONS

Voltage	6.3V		10V		16V		25V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10					4*7	25	4*7	28
22	4*7	29	4*7	31	4*7	34	4*7	37
							5*7	42
33	4*7	35	4*7	38	4*7	46	5*7	53
47	4*7	42	4*7	48	4*7	55	5*7	65
					5*7	62	6.3*7	72
68			5*7	56	5*7	70	6.3*7	78
100	4*7	58	(5)6.3*7	(69)75	5*7	80	6.3*7	96
	5*7	69			6.3*7	90	8*7(9)	118(130)
					8*7	107		
220	5*7	79	6.3*7	110	6.3*7	128		
	6.3*7	95	8*7	140	8*7	165		
330	6.3*7	108	8*7(9)	158(176)				
	8*7(9)	120(145)						
470	8*7(9)	160(182)						

Maximum Allowable Ripple Current (mA rms) at 105℃ 120Hz

Case Size ΦD X L (mm)

Voltage	35V		50V					
Cap(μF)	Size	Ripple	Size	Ripple				
0.1			4*7	1.0				
0.22			4*7	2.3				
0.33			4*7	3.5				
0.47			4*7	5.0				
1			4*7	10				
2.2			4*7	19				
3.3			4*7	24				
4.7	4*7	24	4*7	29				
10	4*7	28	4*7	32				
	5*7	36	5*7	39				
22	5*7	45	6.3*7	60				
	6.3*7	57						
33	6.3*7	66	6.3*7	73				
	8*7	72	8*7	80				
47	6.3*7	75	8*7(9)	96(103)				
	8*7	88						
100	8*9	96						

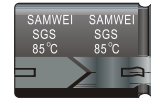
Maximum Allowable Ripple Current (mA rms) at 105℃ 120Hz

Case Size ΦD X L (mm)

SGS

SERIES +85°C(標準品)

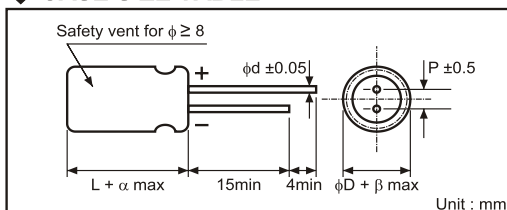
- High CV value, guarantee 2000 hrs load life at 85°C.
- Suit for use in electronic circuits in colour TV receiver, videocoder etc.



◆ SPECIFICATIONS

Item	Performance Characteristics																																			
Operating temperature range	-40 to +85℃						-25 to +85℃																													
Rated Working Voltage Range	6.3 to 100V						160 to 450V																													
Nominal Capacitance Range	0.1 to 22000μF																																			
Capacitance Tolerance	±20(120Hz,+20℃)																																			
Leakage Current	I≤ 0.01CV or 3(μA)after 2minutes whichever is greater measured with rated working voltage applied at +20 ℃						I≤ 0.03CV + 40(μA)after 2minutes application of rated working vlotage at +20 ℃																													
Dissipation Factor tan δ(120Hz,+20℃)	<table><tr><td>Working Voltage(V)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>tan δ(max)</td><td>0.28</td><td>0.24</td><td>0.2</td><td>0.14</td><td>0.14</td><td>0.12</td><td>0.1</td><td>0.08</td></tr></table>									Working Voltage(V)	6.3	10	16	25	35	50	63	100	tan δ(max)	0.28	0.24	0.2	0.14	0.14	0.12	0.1	0.08									
	Working Voltage(V)	6.3	10	16	25	35	50	63	100																											
	tan δ(max)	0.28	0.24	0.2	0.14	0.14	0.12	0.1	0.08																											
	<table><tr><td>Working Voltage(V)</td><td>160</td><td>200</td><td>250</td><td>350</td><td>400</td><td>450</td></tr><tr><td>tan δ(max)</td><td>0.2</td><td>0.2</td><td>0.2</td><td>0.25</td><td>0.25</td><td>0.25</td></tr></table>									Working Voltage(V)	160	200	250	350	400	450	tan δ(max)	0.2	0.2	0.2	0.25	0.25	0.25													
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Low Temperature Characteristics	Impedance ratio max at 120Hz																																			
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	Working Voltage(V)	6.3	10	16	25	35	50	63	100																											
	Z-25℃/Z+20℃	5	4	3	2	2	2	2	2																											
	Z-40℃/Z+20℃	12	10	8	5	4	3	3	3																											
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Working Voltage(V)	160	200	250	350	400	450																														
Z-25℃/Z+20℃	3	3	4	4	6	15																														
For capacitance value > 1000μF,Add 0.5per another 1000μF for Z-25℃/Z+20℃ Add 1.0per another 1000μF for Z-40℃/Z+20℃																																				
High Temperature Loading	Test conditions						Post test requirements at +20℃																													
	Duration : 2000 hours						Leakage current : ≤ Initial specified value																													
	Ambient temp : +85℃						Cap . Change : ≤ ±20%of Initial measured value																													
	Applied vlotage:Rated DC working voltage						tan δ : ≤ 200% of Initial specified value																													
Shelf Life	Test conditions						Post test requirements at +20℃																													
	Duration :1000 hours						Leakage current : ≤ Initial specified value																													
	Ambient temp : +85℃						Cap . Change : ≤ ±20%of Initial measured value																													
	Applied vlotage:(None)						tan δ : ≤ 200% of Initial specified value																													

◆ CASE SIZE TABLE



ΦD	5	6.3	8	10	13	16	18	22	25
P	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0	12.5
Φd	0.5	0.5	0.5	0.6	0.6	0.8	0.8	0.8	1.0
α	(L < 20) 1.5				(L ≥ 20) 2.0				
β	(D < 20) 0.5				(D ≥ 20) 1.0				

◆ RIPPLE CURRENT MULTIPLIER

(1) Frequency Coefficient

Rated Voltage(V)	freq. (Hz)	50	120	300	1k	10k~
6.3~100	cap(μf) ≤ 47	0.75	1	1.35	1.57	2
	56 ~ 470	0.8	1	1.23	1.34	1.5
	≥ 560	0.85	1	1.1	1.13	1.15
160~450	0.47~220	0.8	1	1.25	1.4	1.6
	> 220	0.9	1	1.1	1.13	1.15

(2) Temperature Coefficient

Temperature	-55	60	70	85
FACTOR	1.65	1.5	1.3	1

SGS

SERIES +85°C(標準品)

◆ DIMENSIONS

Voltage	6.3V		10V		16V		25V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
10							5*11	54
22							5*11	73
33							5*11	98
47					5*11	115	5*11	126
100	5*11	135	5*11	140	5*11	175	6.3*11	211
220	5*11	220	5*11	230	6.3*11	290	8*12	370
330	6.3*11	297	6.3*11	322	6.3*11	350	8*12	453
470	6.3*11	360	6.3*11	384	8*12	499	10*12.5	628
680	8*12	503	8*12	546	10*12.5	690	10*16	826
1000	8*12	610	10*12.5	791	10*16	928	10*20	1094
1500	10*12.5	780	10*16	875	10*20	1025	12.5*20	1210
2200	10*16	890	10*20	1226	12.5*20	1555	12.5*25	1800
3300	10*20	1350	12.5*20	1685	12.5*25	1990	16*25	2304
4700	12.5*20	1822	12.5*25	2103	16*25	2487	16*30	2854
6800	12.5*25	1930	16*25	2606	16*30	3010	16*40	3528
10000	16*25	2760	16*30	2960	16*35	3490	18*45	3982
15000	16*35	2860	16*40	3100	18*40	4025		
22000	18*40	3400	18*40	3435	22*40	4686		

Maximum Allowable Ripple Current (mA rms) at 85°C 120Hz

Case Size ΦD X L (mm)

Voltage	35V		50V		63V		100V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1			5*11	1.3				
0.15			5*11	1.5				
0.22			5*11	2.9				
0.33			5*11	4.3				
0.47			5*11	6.2			5*11	10
1			5*11	17			5*11	24
2.2			5*11	28			5*11	37
3.3			5*11	35			5*11	45
4.7	5*11	35	5*11	48			5*11	55
10	5*11	53	5*11	71	5*11	76	5*11	76
22	5*11	90	5*11	106	5*11	113	6.3*11	135
33	5*11	110	5*11	130	6.3*11	159	8*12	187
47	5*11	138	6.3*11	177	6.3*11	190	10*12.5	259
100	6.3*11	231	8*12	306	8*12	321	10*20	453
220	8*12	405	10*12.5	506	10*16	615	12.5*20	742
330	10*12.5	576	10*16	706	10*20	823	12.5*25	987
470	10*16	753	10*20	811	12.5*20	1153	16*25	1394
680	10*20	988	12.5*20	988	12.5*25	1512	16*30	1400
1000	12.5*20	1407	12.5*25	1715	16*25	2037	18*35	1995
2200	16*25	2134	16*30	2320	18*35	2300	22*45	2786
3300	18*30	2498	18*35	3218	18*40	2500		
4700	16*40	3386	18*40	3336	22*45	3562		
5600	18*40	3411						
6800	18*40	3500						

Maximum Allowable Ripple Current (mA rms) at 85°C 120Hz

Case Size ΦD X L (mm)

SGS

SERIES +85℃(標準品)

◆ DIMENSIONS

Voltage	160V		200V		250V		350V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.47					6.3*11	8	6.3*11	8
1					6.3*11	16	6.3*11	16
2.2					6.3*11	30	6.3*11	27
3.3			6.3*11	47	6.3*11	45	8*12	56
4.7	6.3*11	56	6.3*11	55	6.3*11	73	10*12.5	77
10	8*12	82	8*12	90	10*12.5	113	10*20	123
22	10*16	150	10*16	168	10*20	198	12.5*20	233
33	10*20	243	10*20	245	10*20	185	16*25	312
47	10*20	307	12.5*20	343	12.5*20	235	16*25	413
100	12.5*25	541	16*25	601	16*25	572	18*35	518
220	16*30	976	16*35	1138	18*35	1061	22*40	1100
330	18*35	1346	18*35	1324	22*40	1366		
470	22*35	1457	22*40	1494				
680	22*40	1680						

Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ΦD X L (mm)

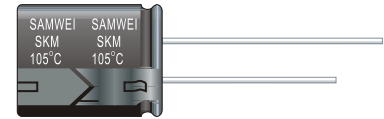
Voltage	400V		450V					
Cap(μF)	Size	Ripple	Size	Ripple				
0.47	6.3*11	8	6.3*11	8				
1	6.3*11	16	6.3*11	16				
2.2	8*12	47	8*12	40				
3.3	10*12.5	64	10*12.5	54				
4.7	10*12.5	73	10*16	72				
10	10*20	134	10*20	98				
22	12.5*25	254	12.5*25	220				
33	16*25	345	16*25	271				
47	16*25	437	16*30	355				
100	18*32	700	18*36	600				
150	22*35	885	22*45	750				
220	22*45	1150						

Maximum Allowable Ripple Current (mA rms) at 85℃ 120Hz

Case Size ΦD X L (mm)

SKM SERIES +105°C(標準品)

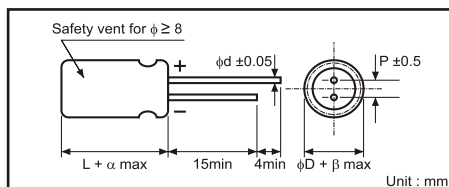
- For general purpose, -40°C to +105°C.
- This series is for communication equipments, switching power supply, industrial measuring instruments, etc.



◆ SPECIFICATIONS

Item	Performance Characteristics																																																					
Operating temperature range	-40 to +105℃					-25 to +105℃																																																
Rated Working Voltage Range	6.3 to 100V					160 to 450V																																																
Nominal Capacitance Range	0.1 to 33000μF					1.0 to 330μF																																																
Capacitance Tolerance	±20(120Hz,+20℃)																																																					
Leakage Current	I≤ 0.01CV or 3(μA)after 2minutes whichever is greater measured with rated working voltage applied at +20 ℃					I≤ 0.03CV + 40(μA)after 2minutes application of rated working vlotage at +20 ℃																																																
Dissipation Factor tan δ(120Hz,+20℃)	<table><tr><td>Working Voltage(V)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>tan δ(max)</td><td>0.26</td><td>0.22</td><td>0.18</td><td>0.16</td><td>0.14</td><td>0.12</td><td>0.1</td><td>0.08</td></tr></table> <table><tr><td>Working Voltage(V)</td><td>160</td><td>200</td><td>220</td><td>250</td><td>350</td><td>400</td><td>420</td><td>450</td></tr><tr><td>tan δ(max)</td><td>0.2</td><td>0.2</td><td>0.2</td><td>0.2</td><td>0.24</td><td>0.24</td><td>0.24</td><td>0.24</td></tr></table> For capacitance value > 1000μF,add 0.02per another 1000μF									Working Voltage(V)	6.3	10	16	25	35	50	63	100	tan δ(max)	0.26	0.22	0.18	0.16	0.14	0.12	0.1	0.08	Working Voltage(V)	160	200	220	250	350	400	420	450	tan δ(max)	0.2	0.2	0.2	0.2	0.24	0.24	0.24	0.24									
Working Voltage(V)	6.3	10	16	25	35	50	63	100																																														
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Working Voltage(V)	160	200	220	250	350	400	420	450																																														
tan δ(max)	0.2	0.2	0.2	0.2	0.24	0.24	0.24	0.24																																														
Low Temperature Characteristics	Impedance ratio max at 120Hz <table><tr><td>Working Voltage(V)</td><td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td></tr><tr><td>Z-25℃/Z+20℃</td><td>5</td><td>4</td><td>3</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></tr><tr><td>Z-40℃/Z+20℃</td><td>10</td><td>8</td><td>6</td><td>4</td><td>3</td><td>3</td><td>3</td><td>3</td></tr></table> <table><tr><td>Working Voltage(V)</td><td>160</td><td>200</td><td>220</td><td>250</td><td>350</td><td>400</td><td>420</td><td>450</td></tr><tr><td>Z-25℃/Z+20℃</td><td>3</td><td>3</td><td>3</td><td>4</td><td>4</td><td>6</td><td>6</td><td>15</td></tr></table> For capacitance value > 1000μF,Add 0.5per another 1000μF for Z-25℃/Z+20℃ Add 1.0per another 1000μF for Z-40℃/Z+20℃									Working Voltage(V)	6.3	10	16	25	35	50	63	100	Z-25℃/Z+20℃	5	4	3	2	2	2	2	2	Z-40℃/Z+20℃	10	8	6	4	3	3	3	3	Working Voltage(V)	160	200	220	250	350	400	420	450	Z-25℃/Z+20℃	3	3	3	4	4	6	6	15
Working Voltage(V)	6.3	10	16	25	35	50	63	100																																														
Z-25℃/Z+20℃	5	4	3	2	2	2	2	2																																														
Z-40℃/Z+20℃	10	8	6	4	3	3	3	3																																														
Working Voltage(V)	160	200	220	250	350	400	420	450																																														
Z-25℃/Z+20℃	3	3	3	4	4	6	6	15																																														
High Temperature Loading	Test conditions Duration : <table><tr><td>ΦD</td><td>≤8</td><td>≥10</td></tr><tr><td>Life</td><td>1000</td><td>2000</td></tr></table> Ambient temp : +105℃ Applied vlotage:Rated DC working voltage with max,ripple current.					ΦD	≤8	≥10	Life	1000	2000	Post test requirements at +20℃ Leakage current : ≤Initial specified value Cap . Change : ≤ ±20%of Initial measured value tan δ : ≤ 200% of Initial specified value																																										
ΦD	≤8	≥10																																																				
Life	1000	2000																																																				
Shelf Life	Test conditions Duration : 1000 hours Ambient temp : +105℃ Applied vlotage:(None)					Post test requirements at +20℃ Leakage current : ≤Initial specified value Cap . Change : ≤ ±20%of Initial measured value tan δ : ≤ 200% of Initial specified value																																																

◆ CASE SIZE TABLE



ΦD	5	6.3	8	10	12.5	16	18	22	25
P	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0	12.5
Φd	0.5	0.5	0.5	0.6	0.6	0.8	0.8	0.8	1.0
α	(L < 20) 1.5 (L ≥ 20) 2.0								
β	(D < 20) 0.5 (D ≥ 20) 1.0								

◆ RIPPLE CURRENT MULTIPLIER

(1) Frequency Coefficient

Rated Voltage(V)	cap(μf)	freq. (Hz)	50	120	300	1k	10k~
6.3~100	≤47		0.75	1	1.35	1.57	2
	56	~470	0.8	1	1.23	1.34	1.5
	≥560		0.85	1	1.1	1.13	1.15
160~450	0.47~220		0.8	1	1.25	1.4	1.6
	>220		0.9	1	1.1	1.13	1.15

(2) Temperature Coefficient

Temperature	-55	60	70	85	105
FACTOR	2.23	2.17	2	1.75	1

SKM SERIES +105℃(標準品)

◆ DIMENSIONS

Voltage	6.3V		10V		16V		25V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
4.7							5*11	25
10					5*11	35	5*11	37
22			5*11	48	5*11	53	5*11	56
33	5*11	52	5*11	56	5*11	60	5*11	75
47	5*11	61	5*11	66	5*11	80	5*11	84
68	5*11	70	5*11	75	5*11	90	5*11	92
100	5*11	94	5*11	105	5*11	125	6.3*11	159
220	5*11	153	6.3*11	193	6.3*11	213	8*12	285
330	6.3*11	216	6.3*11	239	8*12	315	8*12	340
470	6.3*11	258	6.3*11	285	8*12	366	10*12.5	471
680	8*12	365	10*12.5	472	10*12.5	480	10*16	620
1000	8*12	443	8*14	560	8*16	680	10*17	720
			10*12.5	571	10*16	680	10*20	821
2200	10*16	720	10*20	886	10*20	940	12.5*20	1090
	10*20	817			12.5*20	1108	12.5*25	1297
3300	10*20	1032	10*25	1190	12.5*20	1268	16*25	1646
			12.5*20	1205	12.5*25	1389		
4700	12.5*20	1280	12.5*25	1492	16*25	1740	16*30	2012
6800	12.5*25	1554	16*25	1824	16*30	2080	16*40	2452
10000	16*25	1897	16*30	1980	16*40	2527	18*35	2500
15000	16*35	2344	16*40	2180	18*35	2600		
22000	18*35	2500	18*35	2264				
33000	18*40	2555						

Maximum Allowable Ripple Current (mA rms) at 105℃ 120Hz

Case Size ΦD X L (mm)

Voltage	35V		50V		63V		100V	
Cap(μF)	Size	Ripple	Size	Ripple	Size	Ripple	Size	Ripple
0.1			5*11	1				
0.22			5*11	2.5				
0.33			5*11	4				
0.47			5*11	7			5*11	8
1			5*11	13			5*11	16
2.2			5*11	20			5*11	21
3.3			5*11	30			5*11	34
4.7	5*11	27	5*11	37			5*11	40
10	5*11	40	5*11	54	5*11	59	6.3*11	61
22	5*11	67	5*11	79	6.3*11	87	8*12	110
33	5*11	80	6.3*11	115	6.3*11	122	8*12	144
47	5*11	101	6.3*11	155	6.3*11	146	10*12.5	199
100	6.3*11	168	8*12	229	8*12	251	10*20	349
220	8*12	294	10*16	509	10*12.5	504	12.5*25	662
330	10*12.5	419	10*20	650	10*20	688	12.5*25	800
470	10*16	547	12.5*20	801	12.5*20	897	16*30	1072
1000	12.5*20	1023	12.5*25	1287	12.5*25	1568	18*40	1020
2200	16*25	1497	16*35	1884	16*30	1890		
3300	16*30	1808	18*40	2300	18*40	2352		
4700	18*35	2335						
6800	18*40	2400						

Maximum Allowable Ripple Current (mA rms) at 105℃ 120Hz

Case Size ΦD X L (mm)