RoHS

| MESSRS: 苏州路之遥科技有限公司 | APPROVAL NO | 030 - 004 |
|---|---|---|
| | DATE | 2008.05.16 |

ALUMINUM ELECTROLYTIC

# CAPACITOR

# APPROVAL SHEET

| | |
|---|---|
| CATALOG TYPE | SHL SERIES |
| USER PART NO. | |
| 适 用 机 种 | |
| 特 记 事 项 | Pb-FREE |

**QINGDAO SAMYOUNG ELECTRONICS CO.,LTD**

**MANAGER OF DEVELOPMENT DEPARTMENT**

***GONG JANG SUG*** 长孔硕

**USER APPROVAL:**

**APPROVAL NO.:** _____

**SamYoung(Korea) : 146-1,SANGDAEWON-DONG,JOONGWON-GU,SUNGNAM-CITY,KYUNGKI-DO,KOREA**

**SamYoung(China) : No.5 CHANGJIANG ROAD,PINGDU-CITY,SHANDONG-PROVINCE,CHINA**

| APPROVAL NO. 030 - 004 | ALUMINUM ELECTROLYTIC CAPACITOR | PAGE: 1 OF 7<br>DATE: 2008.05.16 |
|---|---|---|

# Specifications of SHL Series

| Item | Characteristics | |
|---|---|---|
| Rated Voltage Range | 100 VDC or less | 160 ~ 500VDC |
| Operating Temperature Range | - 40 ~ + 85 ℃ | - 25 ~ + 85 ℃ |
| Capacitance Tolerance | ± 20% (M) | (AT 120Hz,20℃) |
| Leakage Current ( at 20 ℃ ) | After 2 minutes : 0.01CRVR ( μA ) or 3 μA, whichever is greater<br>Where,CR =Nominal capacitance（μF ）<br>VR =Rated Voltage（VDC） | |

| After 1 minute | | After 5 minutes | |
|---|---|---|---|
| CRVR≤1000 | CRVR>1000 | CRVR≤1000 | CRVR>1000 |
| 0.1CRVR+40 | 0.04CRVR+100 | 0.03CRVR+15 | 0.02CRVR+25 |

**Dissipation Factor ( Max. TANδ) (at 120Hz)**

| Rated voltage(VDC) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 160~250 | 350 ~ 500 |
|---|---|---|---|---|---|---|---|---|---|---|
| TANδ | 0.34 | 0.24 | 0.20 | 0.16 | 0.14 | 0.12 | 0.10 | 0.09 | 0.20 | 0.24 |

When the capacitance exceeds 1000μF,0.02 shall be added every 1000μF increase.

**Temperature Characteristic (Max. Impedance ratio) (at 120Hz)**

| Rated voltage(VDC) | 6.3 | 10 | 16 | 25 | 35 | 50 | 63~100 | 160 | 200~250 | 350 ~ 500 |
|---|---|---|---|---|---|---|---|---|---|---|
| Z-25℃/Z+20℃ | 5 | 4 | 3 | 2 | 2 | 2 | 3 | 4 | 8 | 16 |
| Z-40℃/Z+20℃ | 12 | 10 | 8 | 5 | 4 | 3 | 4 | - | - | - |

**Load Life**

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage applied for 2,000 hours at 85℃.

Capacitance change :≤± 20% of initial value

TANδ :≤200% of initial specified value

Leakage current :≤The initial specified value

**Shelf Life**

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 85℃ for a half assurance load life time without voltage applied.

The rated voltage shall be appled to the capacitors for a minimum of 30 minutes,at least 24 hours and not more than 48 hours before the measurements.

Capacitance change :≤± 20% of initial value

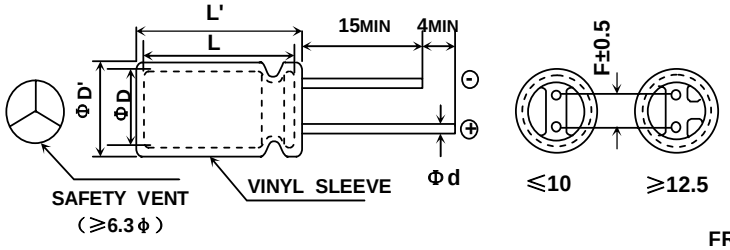
TANδ :≤200% of initial specified value

Leakage current :≤The initial specified value（where,200% for ≥WV 160VDC)

**Others**

Satisfies characteristic **W of KS C 6421**

**A.DIAGRAM OF DIMENSION**

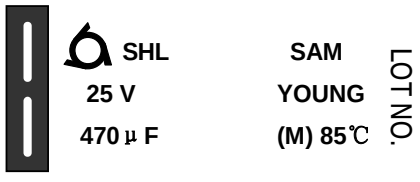



When ΦD≤8,ΦD'≤ΦD+0.5,and L'≤L+1.5

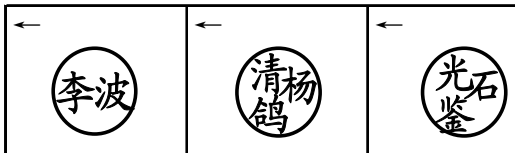
When ΦD>8,ΦD'≤ΦD+0.5,and L'≤L+2.0

| ΦD | 5 | 6.3 | 8 | 10 | 12.5 | 16 | 18 |
|---|---|---|---|---|---|---|---|
| Φd | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.8 | 0.8 |
| F | 2 | 2.5 | 3.5 | 5 | 5 | 7.5 | 7.5 |

**B.MARKING:WITH BLACK SLEEVE, WHITE INK**




FRONT VIEW OF CAPACITOR BACK VIEW OF CAPACITOR



# ALUMINUM ELECTROLYTIC CAPACITORS

**APPROVAL NO.**

**030 - 004**

## RATINGS OF SHL Series

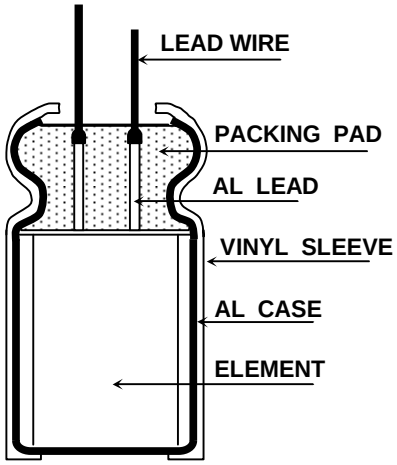
ØDXL(mm)

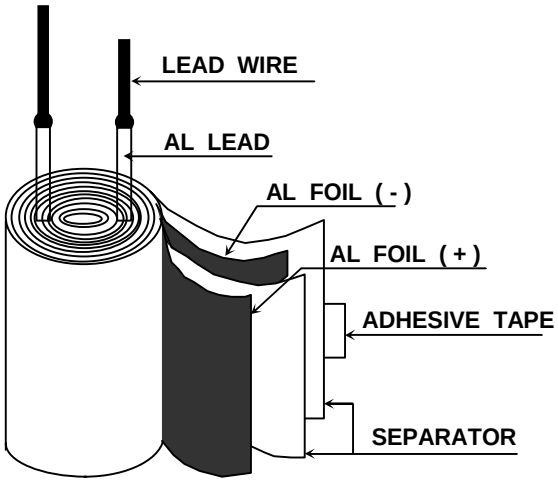
| CAP \ WV | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 100 | 160 | 200 | 250 | 350 | 400 | 450 | 500 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.1 | | | | | | 5X11 5.5 | 5X11 6.2 | 5X11 6.5 | | | | | | | |
| 0.22 | | | | | | 5X11 8 | 5X11 9 | 5X11 11 | | | | | | | |
| 0.33 | | | | | | 5X11 10 | 5X11 11 | 5X11 13 | | | | | | | |
| 0.47 | | | | | | 5X11 15 | 5X11 16 | 5X11 17 | 6.3X11 18 | 6.3X11 18 | 6.3X11 19 | 6.3X11 20 | 6.3X11 20 | | |
| 0.68 | | | | | | 5X11 18 | 5X11 19 | 5X11 19 | 6.3X11 21 | 6.3X11 21 | 6.3X11 22 | 6.3X11 23 | 6.3X11 23 | | |
| 1 | | | | | | 5X11 22 | 5X11 24 | 5X11 24 | 6.3X11 25 | 6.3X11 26 | 6.3X11 27 | 6.3X11 28 | 6.3X11 29 | 8x11.5 26 | 6.3x11 20 |
| 2.2 | | | | | | 5X11 34 | 5X11 35 | 5X11 37 | 6.3X11 38 | 6.3X11 39 | 6.3X11 41 | 8X11.5 46 | 8X11.5 47 | 8x11.5 40 | 8x11.5 34 |
| 3.3 | | | | | | 5X11 41 | 5X11 43 | 5X11 44 | 6.3X11 46 | 6.3X11 47 | 8X11.5 54 | 8X11.5 56 | 10X12.5 64 | 10X16 58 | 10x12.5 50 |
| 4.7 | | | | | 5X11 35 | 5X11 48 | 5X11 53 | 5X11 55 | 6.3X11 56 | 8X11.5 64 | 8X11.5 66 | 10X12.5 77 | 10X16 77 | 10X20 76 | 10x16 68 |
| 6.8 | | | | | 5X11 46 | 5X11 59 | 5X11 63 | 5X11 64 | 8X11.5 78 | 8X11.5 80 | 8X11.5 82 | 10X12.5 92 | 10X16 100 | 10X20 90 | 10x20 85 |
| 10 | | | 5X11 39 | 5X11 49 | 5X11 53 | 5X11 71 | 5X11 76 | 6.3X11 87 | 10X12.5 110 | 10X12.5 112 | 10X16 114 | 10X20 123 | 10X20 134 | 12.5X20 120 | 12.5x20 110 |
| 15 | | | | | | | | | | | | | | | 12.5x20 110 |
| 22 | | 5X11 52 | 5X11 68 | 5X11 73 | 5X11 80 | 5X11 106 | 5X11 113 | 6.3X11 130 | 10X20 181 | 10X20 183 | 10X20 198 | 12.5X20 233 | 12.5X25 254 | 16X25 228 | 12.5x25 127 |
| 33 | 5X11 41 | 5X11 70 | 5X11 76 | 5X11 83 | 5X11 100 | 5X11 129 | 6.3X11 159 | 8X11.5 187 | 10X20 243 | 10X20 245 | 12.5X20 286 | 16X25 312 | 16X25 345 | 16X25 291 | 16x31.5 220 |
| 47 | 5X11 59 | 5X11 88 | 5X11 98 | 5X11 126 | 5X11 138 | 6.3X11 177 | 6.3X11 190 | 10X12.5 259 | 12.5X20 341 | 12.5X20 343 | 12.5X25 371 | 16X25 413 | 16X25 413 | 16X35.5 403 | 18x31.5 247 |
| 68 | 5X11 90 | 5X11 110 | 5X11 130 | 5X11 151 | 6.3X11 191 | 6.3X11 213 | 8X11.5 269 | 10X16 342 | 12.5X20 410 | 12.5X20 447 | 16X25 495 | 16X31.5 542 | 16X35.5 569 | 18X40 573 | 18x35.5 278 |
| 100 | 5X11 135 | 5X11 150 | 5X11 170 | 6.3X11 211 | 6.3X11 231 | 8X11.5 306 | 8X11.5 321 | 10X20 453 | 12.5X25 541 | 16X25 601 | 16X31.5 658 | 18X31.5 691 | 18X40 778 | | |
| 220 | 5X11 211 | 5X11 229 | 6.3X11 290 | 8X11.5 370 | 8X11.5 405 | 10X12.5 506 | 10X16 615 | 12.5X25 860 | 16X31.5 976 | 18X35.5 1099 | 18X40 1152 | | | | |
| 330 | 6.3X11 297 | 6.3X11 322 | 8X11.5 419 | 8X11.5 453 | 10X12.5 576 | 10X16 706 | 10X20 823 | 16X25 1169 | 18X35.5 1346 | | | | | | |
| 470 | 6.3X11 355 | 6.3X11 384 | 8X11.5 499 | 10X12.5 628 | 10X16 753 | 10X20 918 | 12.5X20 1153 | 16X25 1394 | | | | | | | |
| 680 | 8X11.5 503 | 8X11.5 546 | 10X12.5 690 | 10X16 826 | 10X20 988 | 12.5X20 1296 | 12.5X25 1512 | 16X35.5 1620 | | | | | | | |
| 1000 | 8X11.5 610 | 10X12.5 791 | 10X16 928 | 10X20 1094 | 12.5X25 1407 | 12.5X25 1715 | 16X25 2037 | 18X40 2130 | | | | | | | |
| 2200 | 10X20 1147 | 10X20 1226 | 12.5X20 1555 | 12.5X25 1800 | 16X25 2134 | 16X35.5 2645 | 18X35.5 2823 | ← Case Size ØD X L (mm)<br>← Permissible Ripple Current (mArms) at 85℃,120Hz | | | | | | | |
| 3300 | 10X20 1350 | 12.5X20 1685 | 12.5X25 1970 | 16X25 2304 | 16X35.5 2806 | 18X35.5 3218 | | | | | | | | | |
| 4700 | 12.5X20 1822 | 12.5X25 2103 | 16X25 2487 | 16X31.5 2854 | 18X35.5 3386 | | | | | | | | | | |
| 6800 | 12.5X25 2235 | 16X25 2606 | 16X31.5 3010 | 18X35.5 3528 | | | | | | | | | | | |
| 10000 | 16X25 2760 | 16X35.5 3302 | 18X35.5 3705 | | | | | | | | | | | | |
| 15000 | 16X35.5 3453 | 18X35.5 3826 | | | | | | | | | | | | | |
| 22000 | 18X40 4143 | | | | | | | | | | | | | | |

# ALUMINUM ELECTROLYTIC CAPACITORS

**APPROVAL NO.**
**030 - 004**

## STRUCTURE AND MATERIALS




CE04 TYPE

*MINIATURE SIZED TYPE CAPACITORS COMPONENT

| PART NAME | MATERIALS | VENDER |
|---|---|---|
| LEAD WIRE | TINNED COPPER - PLY WIRE(Pb-FREE) | SAMATRON (KOREA/CHINA)<br>IL KWANG |
| AL LEAD | ALUMINUM 99.92 % OVER | IL KWANG (KOREA/CHINA)<br>SAM ATRON |
| PACKING PAD | SYNTHETIC RUBBER OR BAKE PAD(Pb-FREE) | SUNG NAM (KOREA/CHINA)<br>TIAN TAI (CHINA) |
| SLEEVE | P.V.C （POLY VINYL CHLORIDE） | SUNG NAM (KOREA/CHINA)<br>MOO DEUNG |
| AL CASE | ALUMINUM 99.0 % OVER | D.N TECH (KOREA/CHINA)<br>HA NAM (KOREA/CHINA)<br>AO XING (CHINA) |
| AL FOIL ⊕ | FORMED ALUMINUM 99.9 % OVER | K.D.K / JCC / MATSUSHITA (JAPAN)<br>BECROMAL (ITALY)<br>ALUKO / SAM YOUNG (KOREA)<br>ECHO / INTERTEC<br>SATMA (FRANCE)<br>HUAFENG / HISTAR (CHINA)<br>YINGKELAI / HUAFENG / HEC<br>LUXON / LITON (TAIWAN) |
| AL FOIL ⊖ | ETCHED ALUMINUM 98.0 % OVER | K.D.K (JAPAN)<br>ALUKO / K-JCC (KOREA)<br>AFT / YINGKELAI / SHENGHONG (CHINA) |
| SEPARATOR | INSULATION PAPER | N.K.K / M.F.G / DAIFUKU (JAPAN)<br>SPO (GERMANY)<br>MHD (AMERICA)<br>KAN (CHINA) |
| ADHESIVE TAPE | POLY PROPYLENE FILM | DAI IL (KOREA)<br>NITTO (JAPAN) |

# ALUMINNUM ELECTROLYTIC CAPACITOR

**APPROVAL NO.**

**030 - 004**

## Taping Dimensions：

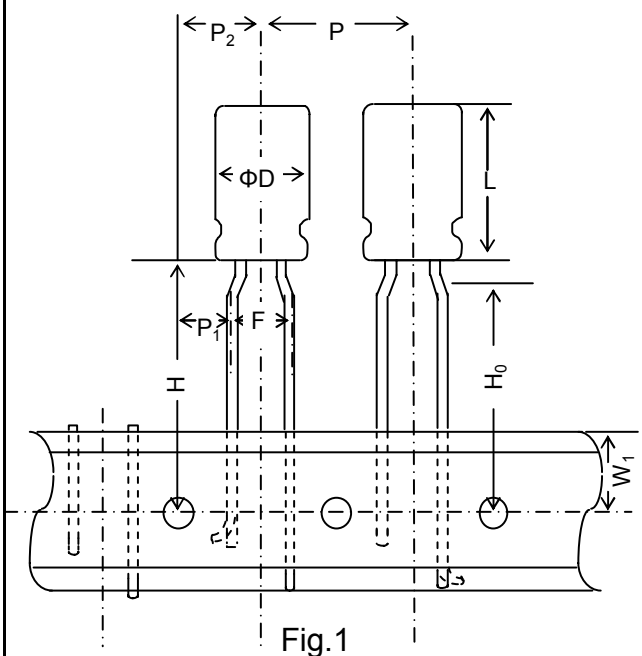



Fig.1

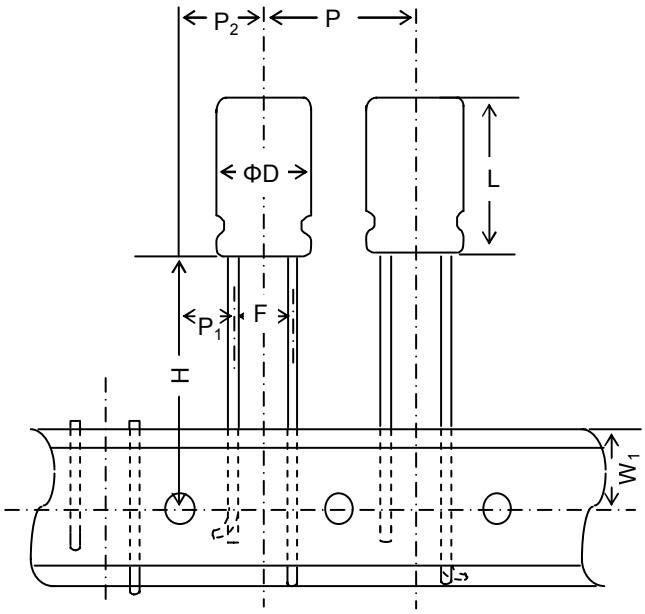



Fig.2

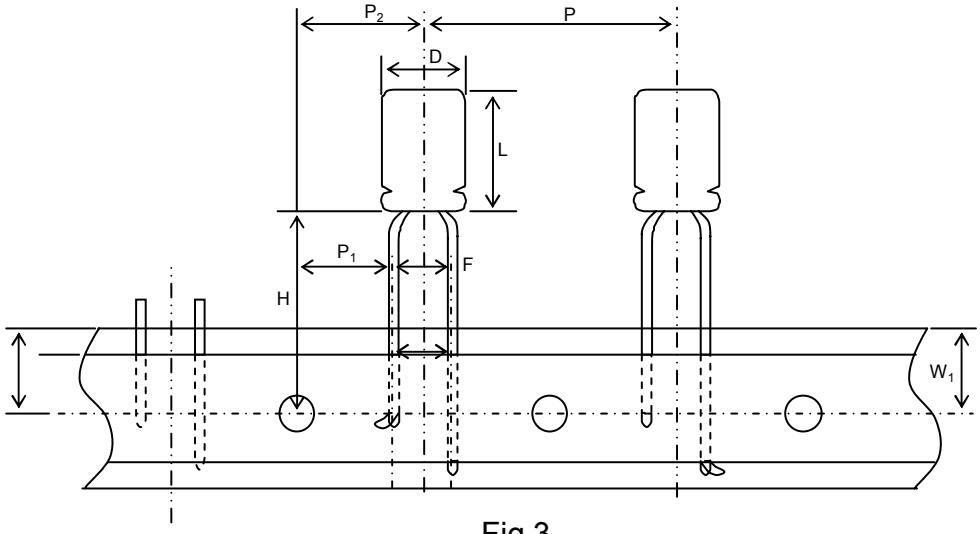



Fig.3

| Code | Case Size | | F | P | $P_1$ | $P_2$ | $W_1$ | H | $H_0$ | Fig |
|---|---|---|---|---|---|---|---|---|---|---|
| | ΦD | L | | | | | | | | |
| Tol. | +0.5 | +1.5 | ±0.2 | ±0.7 | ±0.4 | ±0.4 | +0.3 -0.5 | ±0.75 | ±0.2 | |
| Nominal | 5 | 11 | 2.5 | 12.7 | 5.1 | 6.35 | 9.0 | 18.5 | 17.2 | 3 |
| | | | 5.1 | | 3.85 | | | | 15.7 | 1 |
| | 6.3 | 11 | 2.5 | 12.7 | 5.1 | 6.35 | 9.0 | 18.5 | 17.2 | 2 |
| | | | 5.1 | | 3.85 | | | | 15.7 | 1 |
| | 8 | 11.5 | 3.5 | 12.7 | 4.6 | 6.35 | 9.0 | 20.0 | 17.2 | 2 |
| | | | 5.1 | | 3.85 | | | | 15.7 | 1 |

# ALUMINNUM ELECTROLYTIC CAPACITOR

**APPROVAL NO.**

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## Taping Dimensions：

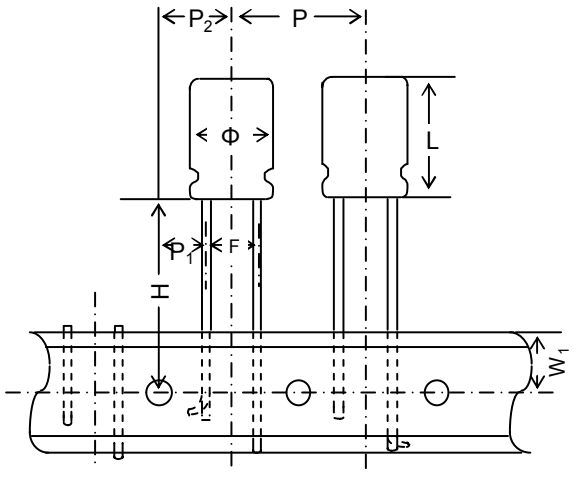


Fig.1

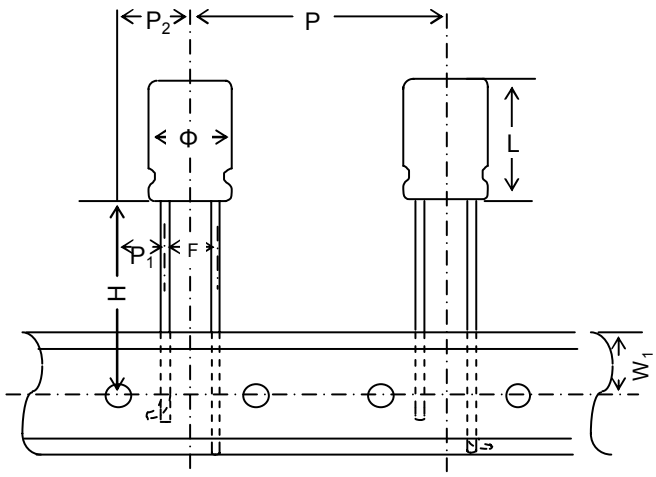


Fig.2

| Code | Case Size | | F | P | $P_1$ | $P_2$ | $W_1$ | H | Fig |
|---|---|---|---|---|---|---|---|---|---|
| | ΦD | L | | | | | | | |
| Tol. | ±0.5 | +2.0 | +0.5<br>-0.2 | ±1.0 | ±0.5 | ±1.0 | +0.3<br>-0.5 | ±0.5 | |
| Nominal | 10 | - | 5 | 12.7 | 3.85 | 6.35 | 9.0 | - | 1 |
| | 12.5 | - | 5 | ■ 15 | 5.0 | 7.5 | 9.0 | - | 1 |
| | | - | 5 | 25.4 | 3.85 | 6.35 | 9.0 | 18.5 | 2 |

■P=15 taping is not standard.Use P=25.4 taping.

## When using aluminum electrolytic capacitors,pay strict attention to the following:

**1. Electrolytic capacitors for DC application require polarization.**

Confirm the polarity.If used in reversed polarity,the circuit life may be shortened or the capacitor may be damaged.For use on circuits whose polarity is occasionally reversed,or whose polarity is unknown,use bi-polarized capacitors (BP-series).Also,note that the electrolytic capacitor cannot be used for AC application.

**2. Do not apply a voltage exceeding the capacitor`s voltage rating.**

If a voltage exeeceding the capacitor`s voltage rating is applied,the capacitor may be damaged as leakage current increases. When using the capacitor with AC voltage superimposed on DC voltage,care must be exercised that the peak value of AC voltage does not exceed the rated voltage.

**3. Do not allow excessive ripple current to pass.**

Use the electrolytic capacitor at current values within the permissible ripple range.If the ripple current exceeds the specified value,request capacitors for high ripple current applications.

**4. Ascertain the operating temperature range.**

Use the electrolytic capacitors according to the specified operating temperature range.Usage at room temperature will ensure longer life.

**5. The electrolytic capacitor is not suitable for circuits in which charge and discharge are frequently repeated.**

If used in circuits in which charge and discharge are frequently repeated,the capacitance value may drop,or the capacitor may be damaged.Please consult our engineering department for assistance in these applications.

**6. Apply voltage treatment to the electrolytic capacitor which has been allowed to stand for a long time.**

If the electrolytic capacitor is allowed to stand for a long time,its withstand voltage is liable to drop,resulting in increased leakage current.If the rated voltage is applied to such a product,a large leakage current occurs and this generates internal heat,which damaged the capacitor.If the electrolytic capacitor is allowed to stand for a long time,therefore,use it after giving voltage treatment (Note 1).(However,no voltage treatment is required if the electrolytic capacitor is allowed to stand for less than 2 or 3 years at normal temperature.)

**7. Be careful of temperature and time when soldering.**

When soldering a printed circuit board with various,components,care must be taken that the soldering temperature is not too high and that the dipping time is not too long.Otherwise,there will be adverse effects on the electrical characteristics and insulation sleeve of electrolytic capacitors in the case of small-sized electrolytic capacitors,nothing abnormal will occur if dipping is performed at less than 260℃ for less than 10 seconds.

**8. Do not place a soldering iron on the body of the capacitor.**

The electrolytic capacitor is covered with a vinyl sleeve.If the soldering iron comes in contact with the electrolytic capacitor body during wiring,damage to the vinyl sleeve and/or case may result in defective insulation,or improper protection of the capacitor element.

**9. Cleaning circuit boards after soldering.**

Some solvents have adverse effects on capacitors.

Please refer to the next page.

**10.Do not apply excessive force to the lead wires or terminals.**

If excessive force is applied to the lead wires and terminals,they may be broken or their connections with the internal elements may be affectde.(For strength of terminals,refer to KS C6035 KS C6421(JIS C5102,JIS C5141)

**11.Care should be used in selecting a storage area.**

If electrolytic capacitors are exposed to high temperatures caused by such things as direct sunlight,the life of the capacitor may be adversely affected.Storage in a high humidity atmosphere may affect the solderability of lead wires and terminals.

**12.Surge voltage.**

The surge voltage rating is the maximum DC over-voltage to which the capacitor may be subjected for short periods not exceeding approximately 30 seconds at infrequent intervals of not more than six minutes.According to KS C6421,the test shall be conducted 1000 cycles at room temperature for the capacitors of characteristic W of KS C6421 or at the maximum operating temperature for the capacitors of characteristics B and C of KS C6421 with voltage applied through a series resistance of 1000 ohms without discharge.The electrical characteristics of the capacitor after the test are specified in KS C6421.Unless otherwise specified,the rated surge voltage are as follows:

| Rated Voltage(V) | 2 | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 | 63 | 80 | 100 | 160 | 200 | 250 | 315 | 350 | 400 | 450 | 500 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated Surge Voltage(V) | 2.5 | 5 | 8 | 13 | 20 | 32 | 44 | 63 | 79 | 100 | 125 | 200 | 250 | 300 | 365 | 400 | 450 | 500 | 550 |

**Note 1 Voltage treatment** … Voltage treatment shall be performed by increasing voltage up to the capacitor`s voltage rating gradually while lowering the leakage current.In this case,the impressed voltage shall be in the range where the leakage current of the electrolytic capacitor is less than specified value.Meanwhile,the voltage treatment time may be effectively shortened if the ambient temperature is increased (within the operating temperature range).

**Note 2 For methods of testing,** refer to KS C 6035, KS C 6421， (JIS C 5102，JIS C 5141)

## CLEANING CONDITIONS

Aluminum electrolytic capacitors that have been exposed to halogenated hydrocarbon cleaning and defluxing solvents are susceptible to attack by these solvents.This exposure can result in solvent penetration into the capacitors, leading to internal corrosion and potential failure. Therefore, for ordinary capacitors, the cleaning materials of alcohol system had to be used. However, the solvent proof type capacitors of Samyoung Elec. Can withstand cleaning by some halogenated solvents shown:

(rated voltage≤100 VDC only)

*** FREON TE® OR TES®**

Cleaning method: One of immersion, ultrasonic or vap or cleaning.
Maximum cleaning time: 5 minutes(where, KRE,SRM is 2 minutes)

*** 1,1,1-Trichlorethane**

Cleaning method: immersion cleaning at the normal temperature
Maximum cleaning time: 5 minutes(where, KRE,SRM is not assured)

— Caution —

* When the lead space of the capacitor is different from the hole space of the PC board to be mounted , use the lead forming type capacitor to prevent stress on seal.
* Consult for flux to be used and other cleaning conditions.
(Freon TE and TES are registered trademarks of Dupont,Inc.)

*** Influence of cleaning solvent for aluminum electrolytic capacitor.**

Aluminum electrolytic capacitors are easily affeceted by halogen ions,particularly by chloride ions. Excessive amounts of halogen ions,if happened to enter the inside of the capacitors, will give corrosion accidents-rapid capacitance drop and vent open. The extent of corrosion accidents varies with kinds of electrolytes and seal-materials. Therefore, the prevention of halogen ion contamination is the most improtant check point for quality control in our procuction lines. At present, halogenated hydrocarbon-contained organic solvents such as Trichloroethylene, 1,1,1-Trichloroethane, and Freon are used to remove flux from circuit boards. However, if general types of aluminum electroytic capacitors,whose seal constructions are not solvent-proof, are cleaned with such solvents, the solvents may gradually penetrate the seal portion and erode. The inside of the capacitors.

The mechanism of corrosion of aluminum electrolytic capacitors by halogen ions can be explained as follows:

Halides(RX) are absorbed and diffused into the seal portion. The halides then enter the inside of the capacitors and contact with the electrolyte of the capacitors. Where by halogen ions are made free by a hydrolysis with water in the electrolyte:

$$RX + H_2O \rightarrow ROH + H^+ + X^-$$

The halogen ions ($X^-$) react with the dielectric substance($Al_2O_3$) of aluminum electrolytic capacitors:

$$Al_2O_3 + 6H^+ + 6X^- \rightarrow 2ALX_3 + 3H_2O$$

$AIX_3$ is dissociated with water:

$$ALX_3 + 3H_2O \rightarrow AL(OH)_3 + 3H^+ + 3X^-$$