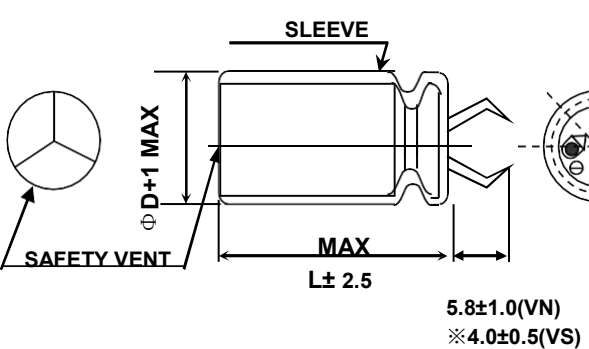


Specifications of TLS Series

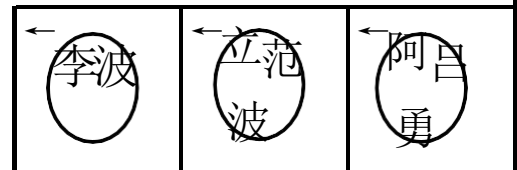
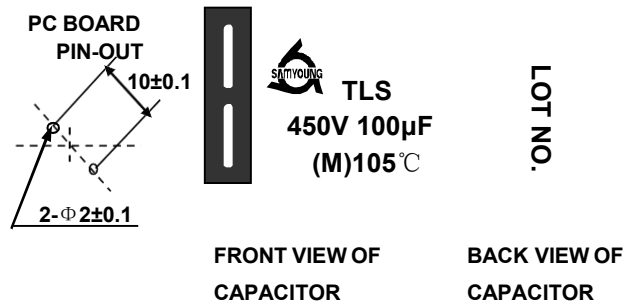
Item	Characteristics							
Rated Voltage Range	160 ~ 500V _{DC}							
Operating Temperature Range	-25 ~ +105°C							
Capacitance Tolerance	±20 % (M) (at 20°C, 120Hz)							
Leakage Current (at 20°C)	After 5 minutes, I = 0.02CV or 3mA, whichever is smaller Where, I : Leakage current(µA) C: Nominal capacitance(µF) V : Rated voltage(V _{DC})							
Dissipation Factor(TANδ) (20°C, 120Hz)	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:20%;">Rated voltage(V_{DC})</td> <td style="width:20%;">160~400</td> <td style="width:20%;">450~500</td> <td rowspan="2" style="width:40%;"></td> </tr> <tr> <td>Tanδ(Max)</td> <td>0.15</td> <td>0.20</td> </tr> </table>	Rated voltage(V _{DC})	160~400	450~500		Tanδ(Max)	0.15	0.20
	Rated voltage(V _{DC})	160~400	450~500					
Tanδ(Max)	0.15	0.20						
Temperature Characteristics (Max.Impedance radio)	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:20%;">Rated voltage(V_{DC})</td> <td style="width:20%;">160~400</td> <td style="width:20%;">450~500</td> <td rowspan="2" style="width:40%;"></td> </tr> <tr> <td>Z-25°C/Z+20°C</td> <td>4</td> <td>8</td> </tr> </table>	Rated voltage(V _{DC})	160~400	450~500		Z-25°C/Z+20°C	4	8
	Rated voltage(V _{DC})	160~400	450~500					
Z-25°C/Z+20°C	4	8						
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 3,000 hours at 105°C. Capacitance change: ≤±20% of the initial value Tanδ ≤200% of the initial specified value Leakage current ≤The initial specified value							
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20°C after exposing them at 105°C for 1,000 hours without voltage applied. The rated voltage shall be applied 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 the initial value Tanδ ≤200% of the initial specified value Leakage current ≤The initial specified value							
Others	Satisfied characteristics KS C IEC 60384-4							

※For capacitors with CV products > 100,000, higher Tanδ value may apply.
When the capacitance exceeds 1,000µF, 0.01 shall be added every 1,000µF increase.

DIMENSIONS OF TLS Series



MARKING: BROWN SLEEVE, SILVER INK



ALUMINUM ELECTROLYTIC CAPACITOR

APPROVAL NO.

300-042

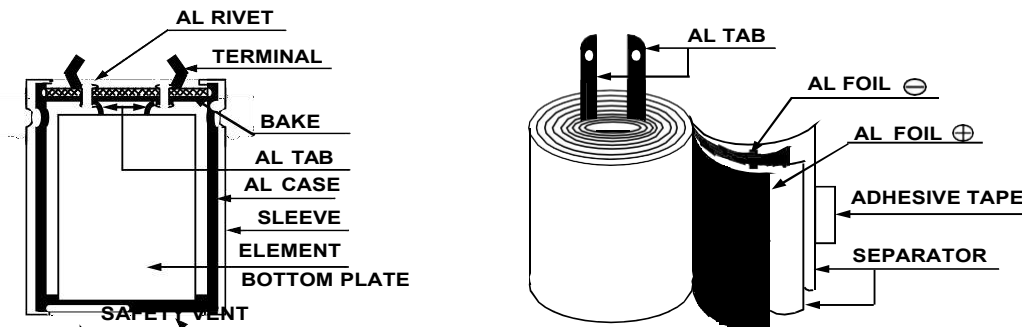
RATINGS OF TLS Series

WV (V _{DC})	CAP (μF)	Case Size (mm) Φ×L	Ripple Current (Arms 105 °C /120Hz)	WV (V _{DC})	CAP (μF)	Case Size (mm) Φ×L	Ripple Current (Arms 105 °C /120Hz)	WV (V _{DC})	CAP (μF)	Case Size (mm) Φ×L	Ripple Current (Arms 105 °C /120Hz)				
160	470	22×25	1.47	250	820	25.4×45	2.26	450	150	25.4×25	0.90				
	560	22×30	1.68			30×35	2.34		180	22×40	1.02				
	680	22×35	1.86			35×30	2.44		180	25.4×30	0.95				
		25.4×25	1.84			25.4×50	2.53			25.4×35	1.05				
	820	22×40	2.12			30×40	2.66		220	30×25	1.06				
		25.4×30	2.08			35×30	2.70			22×45	1.17				
	1000	22×45	2.40			1200	30×45		2.99	220	25.4×35	1.16			
			25.4×35				2.40		35×25		1.10				
			30×25				2.50		30×30		1.18				
	1200	22×50	2.69			1500	35×40		3.48	270	25.4×40	1.32			
			2.68				1800		35×50		3.98	30×30	1.30		
			25.4×40				2.68		150		25.4×25	0.90	35×25	1.37	
	1500	30×35	3.17			220	22×30		1.10	330	25.4×45	1.48			
			3.30				22×35		1.24		25.4×50	1.48			
			3.40				25.4×25		1.21		30×35	1.51			
			1800				30×40		3.57		270	22×40	1.40	30×40	1.51
									3.62			25.4×30	1.38	35×30	1.54
			2200				30×45		4.05		330	30×25	1.43	390	25.4×50
	3300	35×50				5.40			22×45	1.56		30×45	1.67		
			2700			35×40	4.67		390	25.4×35	1.57	30×50	1.86		
	4.56	30×30					1.57			35×35	1.87				
	3300	35×50	5.40			470	22×50		1.70	470	35×40	1.87			
			5.40				25.4×40		1.76		560	35×40	2.05		
	200	220	22×25			0.85	315		470	30×30	1.73	500	56	22×35	0.41
330		22×25	1.23	35×25	1.82	68		22×40		0.48					
390		22×30	1.40	25.4×45	1.96	82		25.4×30		0.46					
470		22×30	1.54	30×35	1.93			22×50		0.54					
560		25.4×25	1.67	680	35×30	2.02		100		25.4×35	0.54				
			1.94		30×40	2.19				22×50	0.64				
680		25.4×30	1.89	820	35×30	2.20		120		25.4×40	0.56				
			2.05		30×45	2.47				25.4×45	0.63				
820		22×45	2.17	1000	35×35	2.48		150		30×30	0.61				
			2.17		30×50	2.48				30×45	0.73				
1000		30×30	2.52	1200	35×40	2.83		180		30×25	0.56				
			2.45		35×45	3.18				30×35	0.72				
1200		25.4×45	2.78	150	22×40	0.80		220		25.4×50	0.78				
			2.83		22×25	0.77				30×40	0.85				
1500		30×40	3.26	180	22×30	0.90		270		35×30	0.83				
			3.36		22×35	1.02				30×45	0.98				
1800		35×35	3.36	220	25.4×25	0.99		330		35×35	0.96				
			3.72		22×40	1.15				30×50	1.03				
2200		35×40	3.81	270	25.4×30	1.13		390		30×60	1.24				
			4.32		22×45	1.29				35×45	1.31				
2700		35×50	4.88	330	25.4×35	1.30		470		35×50	1.38				
			4.88		30×25	1.29				35×60	1.63				
250		270	22×25	1.11	400	390		22×50		1.47	420		220	25.4×35	0.95
		330	22×30	1.29				25.4×40		1.47			100	22×25	0.70
	390	25.4×25	1.40	470			30×30	1.45	120	22×30		0.81			
			1.44				25.4×45	1.63		150		22×35	0.92		
	470	22×40	1.61	560			30×35	1.61	180	35×25		1.65			
			1.57				35×25	1.65		25.4×50		1.82			
	560	25.4×30	1.79	680			30×40	1.82	220	30×40		1.82			
			1.87				35×30	1.85		35×30		1.85			
	680	30×25	1.87	820			30×45	2.04	270	30×45		2.04			
			2.02				35×40	2.05		35×45		2.05			
	820	25.4×40	2.02	1000			30×50	2.30	330	30×50		2.30			
			2.08				35×40	2.34		35×40		2.34			
	1000	35×25	2.19	1200			35×45	2.63	390	35×45		2.63			
			2.19				35×50	2.96		35×50		2.96			

ALUMINUM ELECTROLYTIC CAPACITORS

APPROVAL NO.
300-042

STRUCTURE and MATERIALS



※ LARGE SIZED TYPE CAPACITORS COMPONENT

PART NAME	MATERIALS	VENDER
AL RIVET	ALUMINUM 99.9 %	KYUNG-WON (KOREA) MECTRON/TNS (KOREA/CHINA) NAN TONG CHUANG JIA (CHINA)
TERMINAL	SPCC (Pb-FREE)	KYUNG-WON (KOREA) MECTRON/TNS (KOREA/CHINA) NAN TONG CHUANG JIA (CHINA) JIANGYIN JINMA LVYE
BAKE	RUBBER + PAPER LAMINATE	ISOVOLTA (AUSTRIA) FINE POLYMER (KOREA) NAN TONG CHUANG JIA (CHINA) TNS
AL TAB	ALUMINUM 99.9 % OVER	KISTRON (KOREA) SAMYOUNG (KOREA) NANTONG HUIFENG (JAPAN) DONG YANG
SLEEVE	P.E.T(Poly Ethylene Terephthalate Resin)	MOODEUNG (KOREA) YUNLIN PLASTIC (CHINA) SHUN PENG PLASTIC SUZHOU QILIAN
BOTTOM PLATE	P.P(Polypropylene)	SUNG NAM (KOREA)
AL CASE	ALUMINUM 99.5 %	D.N TECH/DONG NAM (KOREA) LINAN AOXING (CHINA) NANTONG XINLIAN/HAI BANG CHUANGJIA ELETROMECHANICAL NANTONG CHUANGJIA PONTIGGIA (ITALIA)
AL FOIL +	FORMED ALUMINUM 99.9 % OVER	SAMYOUNG (KOREA) K.D.K/JCC/MATSUSHITA (JAPAN) BECROMAL (ITALY) SATMA (FRANCE) HUAFENG/NANTONG /RAOIO HEC (CHINA) XINJIANG JOINWORLD LUXON/LITON (TAIWAN)
AL FOIL ⊖	ETCHED ALUMINUM 99.8 % OVER	K.D.K (JAPAN) K-JCC (KOREA) AFT/INCULCU/SHENGHONG (CHINA) ELECON/WU JIANG FEILO
SEPARATOR	INSULATION PAPER	N.K.K (JAPAN) SPO (GERMANY) LUNAN PAPER/KAN (CHINA)
ADHESIVE TAPE	POLY PROPYLENE OR POLY IMIDE FILM	DAEIL/SWECO (KOREA) NICHIBAN (JAPAN)



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 exceeding 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°C 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 affected. (For strength of terminals, refer to KS C IEC 60384-4 (JIS C5101-1, JIS C5101-4))

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 C IEC 60384-4, the test shall be conducted 1000 cycles at room temperature for the capacitors of characteristic KS C IEC 60384-4 or at the maximum operating temperature for the capacitors of characteristics B and C of KS C IEC 60384-4 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 C IEC 60384-4. 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 IEC 60384-4, (JIS C 5101-1, JIS C 5101-4)



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.

Common type of halogenated cleaning agents are listed below.

Chemical Name	Structural Formula	Representative Brand Name
Trichlorotrifluoroethane	C ₂ Cl ₃ F ₃	Freon TF, Daiflon S-3
Fluorotrichloromethane	CCl ₃ F	Freon-11, Daiflon S-1
1,1,1-Trichloroethane	F ₂ H ₃ Cl ₃	Chloroethane
Trichloroethylene	C ₂ HCl ₃	Trichlene
Methyl Chloride	CH ₃ Cl	MC

We would like to recommend you the below cleaning materials for your stable cleaning condition taking the place of previous materials.

◎ Isopropyl Alcohol (IPA) or Water

Cleaning method: One of immersion, ultrasonic or vapor cleaning.

Maximum cleaning time: 5 minutes (Chip type: 2 minutes)

※ Do not use AK225AES

Aluminum electrolytic capacitors are easily affected 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 important check point for quality control in our production 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.

If electrolytic capacitors are cleaned with such solvents, they may gradually penetrate the seal portion and cause the corrosion. When using latex-based adhesive on the capacitors rubber end seal for adhesion to a PCB, corrosion may occur depending on the kind of solvent in the adhesive. Select an adhesive as an organic solvent with dissolved polymer that is not halogenated hydrocarbon. Hot air drying is required for eliminating the solvent between the product and the PCB at 50°C~80°C after coating.

Followings are the penetration path of the halogenated solvent.

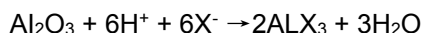
- ① Penetration between the rubber and the aluminum case
- ② Penetration between the rubber and the lead wire
- ③ Penetration through the rubber

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:



The halogen ions (X⁻) react with the dielectric substance (Al₂O₃) of aluminum electrolytic capacitors:



ALX₃ is dissociated with water:



※ **MANUFACTURING SITE**

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