This product is completed the lead-free and RoHS.

Date. 2018. 02. 23.

Messrs. YOTA

Drawing No. SC-ARF559

Approval Sheet

Aluminum electrolytic capacitors

I t e m

HE 450V 470㎌ 30*50

Approved by *k. c. Eom* k. c. Eom

Technical team manager

● SALES OFFICE	10, NONHYEON-RO 152 GIL, GANGNAM-GU, SEOUL, KOREA TEL : (02) 544-9111 FAX : (02) 546-0440, (02) 540-6605 OVERSEAS SALES DEPT. TEL : 82-2-2056-1640 FAX : 82-2-542-8554, 82-2-542-8890 seexport@samwha.com
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SAMWHA ELECTRIC CO., LTD.

1. Scope

This specification is for aluminum electrolytic capacitors.

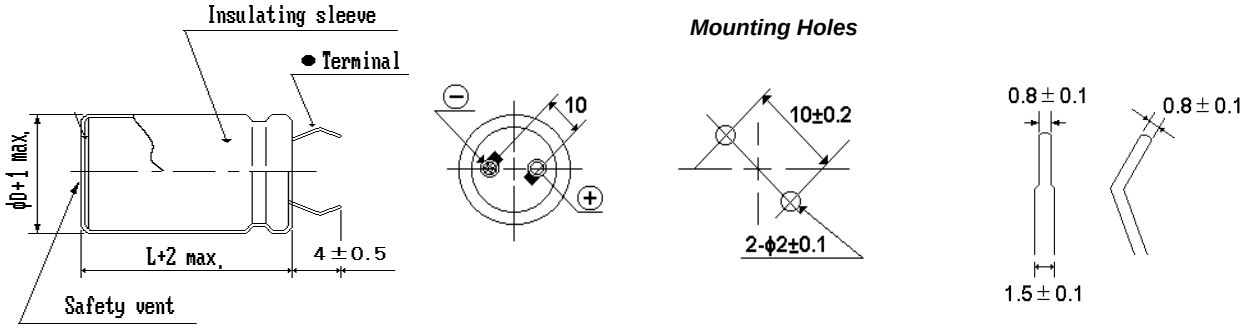
2. Applicable standards

KS C IEC 60384-4, except as specified in this specification

3. Operating temperature range

Rated voltage (VDC)	WV<350	WV ≥ 350
Temperature range (℃)	-40～+105	-25～+105

4. Dimensions



For dimensions of ΦD & L, refer to the table 1.

5. Marking

. SAMWHA trade mark

. Series identification

. Rated voltage

. Maximum operating Temperature

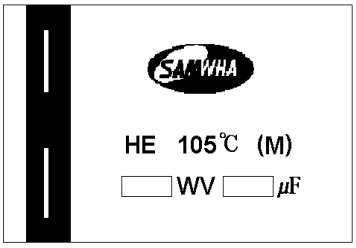
. Capacitance tolerance

. Polarity

. Sleeve color : Dark Brown

. Print color : Silver

(Marking)



(Marking BACK)

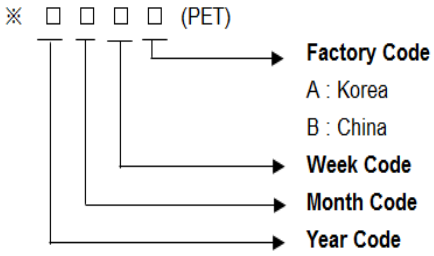


Table 1.

6.1 Rated Voltage (VDC)	6.2 Cap. (μF)	4. Dimensions ΦD (mm)	4. Dimensions L (mm)	6.3 tanδ	6.4 ESR (Ω)	6.5 Leakage Current (μA)	6.6 Ripple Current (A rms)	6.7 Surge Voltage (VDC)	SAMWHA PART No.
450	470	30	50	0.20	0.56	1380	1.76	500	HE 2W 477 M 30050 HC

6. Performance

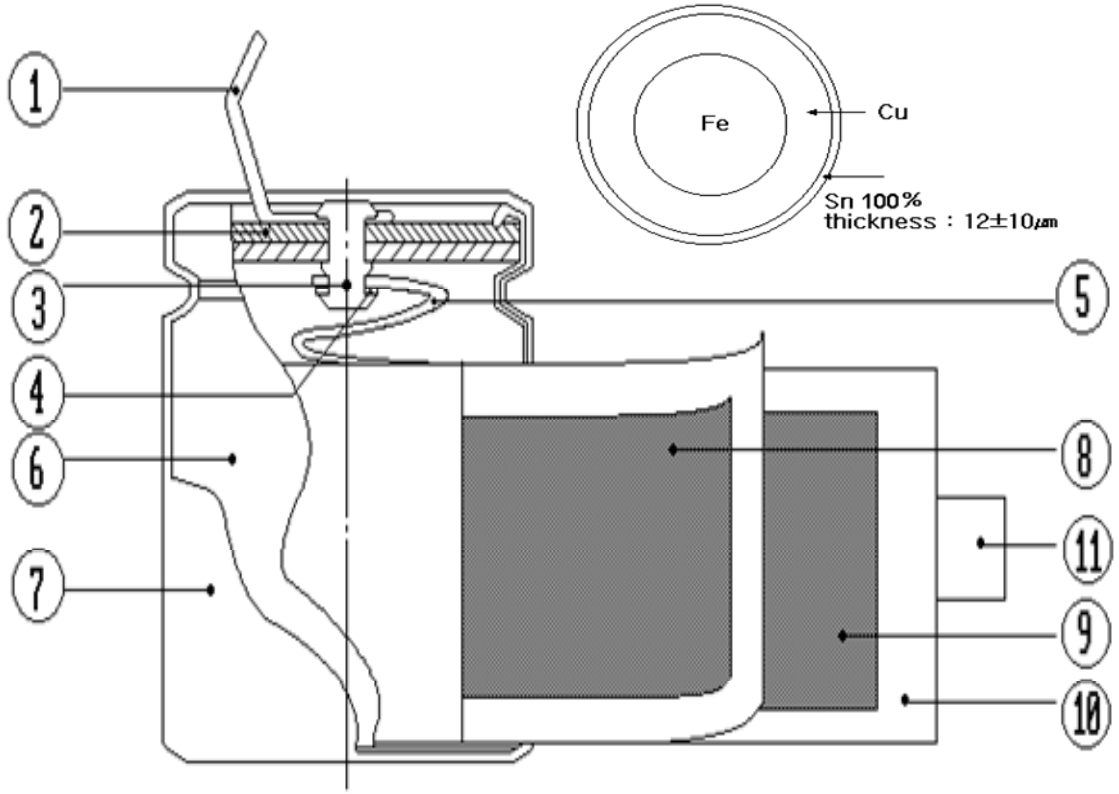
Test environmental conditions

- Ambient temperature : 25±2℃ / Relative humidity : 60～70% / Air pressure : 86～106kPa

No.	Item	Test condition	Specification
6.1	Rated voltage		**See table 1**
6.2	Capacitance ***(Tolerance)***	. Measuring frequency : 120Hz±20% . Measuring voltage : 0.5Vrms or less . DC bias voltage : +1.5～2.0VDC . Measurement circuit : Equivalent series circuit	**See table 1** ***(M : ±20%)***
6.3	tanδ	. Measurement shall be made under the same conditions as those given for the measurement of capacitance.	**See table 1**
6.4	ESR	. ESR can be obtained from the following formula. $ESR = \frac{\tan\delta}{2\pi fC}$ f : 120Hz, C: capacitance (F)	**See table 1**
6.5	Leakage Current	The rated voltage shall be applied across the capacitor through a 1000±10Ω protective resistor. The leakage current shall be measured after an electrification period of 5 minutes.	**See table 1**
6.6	Maximum Permissible Ripple current	. Temperature : 105℃ . Ripple : rms value of 120Hz sine wave AC (The sum of DC voltage and peak voltage shall not exceed the rated voltage.)	**See table 1**
6.7	Surge voltage	. Applied voltage : **See table 1** . Temperature : 15～35℃ . Duration of charge : 30±5 seconds . Duration of discharge : 5 minutes 30 seconds . Cycles : 1000 times	. No visible damage . Leakage current ≤ initial specified value . Capacitance change within ±15% of initial value . tanδ≤ initial specified value
6.8	Solderability	. Solder : HSE-02 SR-34 . Flux : 25% by weight of rosin in ethanol . Solder temperature : 250±5℃ . Immersion depth : 2.0mm . Immersion time : 10±0.5 sec. . Immersion speed : 25±2.5 mm/sec.	. 3/4 of the circumference of the surface up to the immersed shall be covered with new solder.

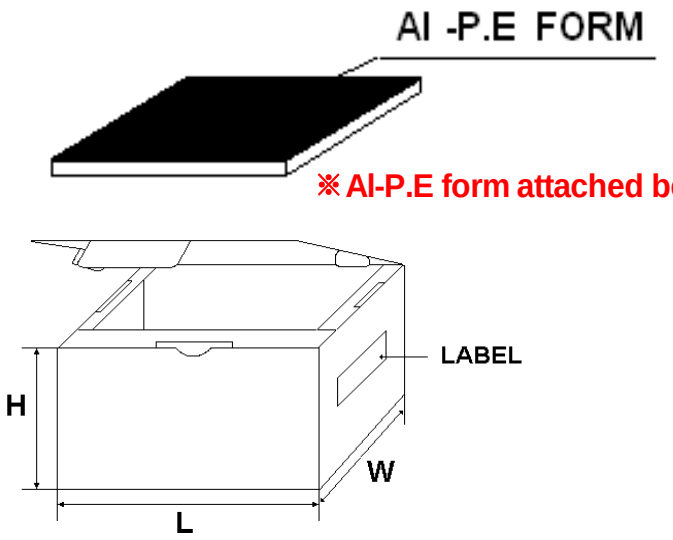
No.	Item	Test condition	Specification
6.9	Resistance to soldering heat	. Solder : HSE-02 SR-34 . Flux : 25% by weight of rosin in ethanol . Solder temperature : 260±5℃ . Immersion depth : 2.0 mm . Immersion time : 10±1 sec. . Immersion speed : 25±2.5 mm/sec.	. No visible damage . Leakage current ≤ initial specified value . Capacitance change within ±10% of initial value . tanδ≤ initial specified value
6.10	Damp (steady state)	. Temperature : 40±2℃ . Relative humidity : 90%～95% . Duration : 240±8 hours	. No visible damage . Leakage current ≤ initial specified value . Capacitance change within ±10% of initial value . tanδ ≤ initial specified value×1.2
6.11	Load life	. Temperature : 105℃±2℃ . Applied voltage : rated voltage . Duration : 2000 +72/-0 hours ※ The capacitors which is stored under standard atmospheric conditions for 16 hours, shall be measured.	. No visible damage . Capacitance change within ±20% of initial value . tanδ≤ 200% of initial specified value . Leakage current ≤ initial specified value
6.12	Shelf life	. Temperature : 105℃±2℃ . Duration : 1000 +48/-0 hours ※ Prior to the measurement of leakage current, following conditioning may be made. The DC rated voltage shall be applied across the capacitor and its protective resistor (1kΩ) for 1 hour. And then The capacitor shall be stored under standard atmospheric conditions for 16 hours.	. No visible damage . Capacitance change within ±20% of initial value . tanδ≤ 200% of initial specified value . Leakage current ≤ initial specified value

TERMINAL

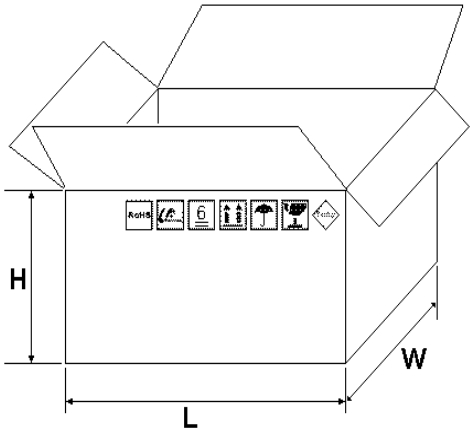


No.	Component	Materials
1	Terminal	SPCC
2	Sealing rubber-bake	Rubber : EPDM Bakelite : Phenolic resin
3	Connector(Al-rivet)	Aluminum 99.91%
4	Connect ring(Al-washer)	Aluminum 99.7%
5	Lead plate (+) (-)	Aluminum 99.99% Aluminum 99.3%
6	Case	Aluminum 99.5%
7	Sleeve	PET (Polyester)
8	Anode foil	Formed aluminum 99.99% or 99.98%
9	Cathode foil	Etched aluminum 99.7%, 99.4%, 98.0%
10	Separator	Manila pulp or Kraft pulp
11	Adhesive tape	Poly propylene film

1. INNER BOX



2. MIDDLE BOX



Case size		INNER BOX		MIDDLE BOX	
φD	L	Size(L×W×H)	Quantity(pcs.)	Size(L×W×H)	Quantity(pcs.)
22	20~40	460×232×52	200	504x254x181	600
	45~50	460×232×67		504×254×226	
25.4	20~40	400x267x52	150	444x294x190	450
	45~50	400x267x67		444x294x226	
	60	400x267x97		444x294x226	300
30	20~40	313x313x52	100	354x334x190	300
	45~55	313x313x67		354x334x226	
	60~80	313x313x97		354x334x226	200
35	20~40	357x181x52	50	415x210x275	200
	42~55	357x181x67		404x204x316	
	58~80	357x181x97		404x204x316	150
	100~120	357x181x137		404x204x436	
40	30~40	408x206x52	50	504x254x181	150
	50	408x206x67		464x234x226	
	60~80	408x206x97		454x234x316	
	90~110	408x206x137		454x234x436	100

Packaging specification	Snap-in & Lug parts

WARNING !

Correct application and strict adherence to the important information listed below, will ensure optimum performance of the capacitors over their entire specified useful life.
Please note, that ignoring these rules may reduce the equipment life or even destroy the capacitor, together with parts of the equipment or property involved.

PARAMETER	IMPORTANT INFORMATION - PRODUCT SAFETY
'POLARITY, REVERSE VOLTAGE	**Electrolytic capacitors for DC applications require polarization** - Check the polarity of each capacitor : both in circuit design and in mounting - It is advisable to use non-polar capacitors for a DC circuit where the polarity is to be reversed.
VOLTAGE	**Do not apply a voltage exceeding the capacitor's voltage rating.** - Check the maximum voltage across the capacitor which can occur over the whole equipment life. - In normal operation the rated voltage of the capacitor shall not exceeded; if so early failures may occur.
RIPPLE LOAD	**Do not allow excessive ripple current to pass** - The rated ripple current given for certain conditions (temperature, frequency, and useful life) shall not be exceeded. If so, early failure may result. **Keep ripple voltage within ratings.** - The sum of DC-bias and maximum amplitude of ripple voltage shall be within rated voltage. Electrolytic capacitors are not normally designed for AC application.
TEMPERATURE RANGE	**Use capacitors within specified temperature** - A general principle is that lower ambient temperature means longer life; therefore, electrolytic capacitors should be placed at the coolest positions on the board, wherever possible. - Exceeding the permitted temperature range may cause early failure.
CHARGE - DISCHARGE	**Observe charge - discharge limitations.** - Frequent charge - discharge load via low resistance may cause capacitance drop or destroy the capacitor.
STORAGE	**A aluminum electrolytic capacitor which has been stored for a long period tends to give increased leakage current.** - Whenever you use a capacitor that has been long stored, make sure to gradually increase the voltage to the rated value. - The leakage current tends to be higher with higher storage atmosphere temperature, store the units at a location with storage temperature of 5℃ to 35℃,75% or below RH which is not exposed to direct sunlight. - Capacitors should be stored sealed in bag until they are actually used. Once the sealed bag is cut open, all the parts should be used al one time. If not, then the remaining parts should be places in a bag and sealed with tape. In order to maintain a good solderability of the parts, shelf life of parts should not exceed 1 year.

<table>
<tr><th>PARAMETER</th><th>IMPORTANT INFORMATION - PRODUCT SAFETY</th></tr>
<tr><td>HIGH AIR PRESSURE</td><td>Do not expose capacitors to overpressure.
Maximum operating pressure is 150kPa. High pressure may cause a short circuit.</td></tr>
<tr><td>LOW AIR PRESSURE</td><td>The capacitors may be used at an altitude of ≤12,000 m.
Minimum air pressure : 8.5kPa for short periods.</td></tr>
<tr><td>MOUNTING</td><td>Avoid excessive stress to the lead wires or terminals.
- The distance between the terminal holes on the circuit board should be the same as that between the lead wires or terminals of the capacitor. Excessive force in mounting on circuit boards should be avoided.
- Improper insertion of the lead wires in circuit boards may cause electrolyte leakage or break the lead wires or impair their connection with the internal elements. When the distance between the two terminal holes on the circuit board cannot be reduced to that between the lead wires, lead formed capacitors are recommended.
- In order to prevent possible damage by vibration on the circuit board, kindly bond our capacitors on the circuit board or use any fastening devices.
<table>
<tr><td>RADIAL TYPE</td><td>over Φ18 or 25㎜L</td></tr>
<tr><td>SNAP-IN TYPE</td><td>over Φ22 or 40㎜L</td></tr>
</table></td></tr>
<tr><td>INSULATION MATERIAL</td><td>SLEEVE
- The standard sleeve material is polyester, if exposed to xylene, toluene, etc. and then subjected to high heat, the sleeve may crack.
Case and cathode terminal
- The case of capacitor is not insulated from the cathode terminal.
Dummy terminals for snap-in type
- Dummy terminals are not insulated from the element.</td></tr>
<tr><td>BOARD CLEANING</td><td>Aluminum electrolytic capacitors may be damaged when used with certain types of flux cleaning solvents commonly used to clean printed circuit board.
- When you clean a PCB, halogen cleaning agents can cause corrosion of aluminum foil and lead tab. If you need to clean, please replace Isopropyl Alcohol(IPA), Water as halogenated cleaning atents.
- 5minutes either by ultrasonic, vapor or immersion cleaning method. (chip type:2minutes)
Be careful not to apply mechanical stress to the terminals or lead wires
- Common type of halogenated cleaning agents are listed below
<table>
<tr><th>Chemical Name</th><th>Structural Formula</th><th>Representatice Brand Name</th></tr>
<tr><td>Trichlorotrifluoroethane</td><td>$C_2Cl_3F_3$</td><td>Freon TF, Daiflon S-3</td></tr>
<tr><td>Fluorotrichloromethane</td><td>CCl_3F</td><td>Freon-11, Daiflon S-1</td></tr>
<tr><td>1,1,1-Trichloroethane</td><td>$C_2H_3Cl_3$</td><td>Cholroethene</td></tr>
<tr><td>Trichloroethylene</td><td>C_2HCl_3</td><td>Trichlene</td></tr>
<tr><td>Methyl Chloride</td><td>CH_3Cl</td><td>MC</td></tr>
</table>
Don't use the solvents listed above as clearning solvent agents even for solvents proof capacitors, because it has strong chemical reaction.
- When using a latex-based adhesive on the capacitor's rubber end seal for adhesion to a PCB,corrosion may occurdepending on the king of solvent in the adhesive. Select an adhesive as an organic solvent with dissolved polymer that is not halogenated hydrocarbon.</td></tr>
</table>