

SICE-SP-L018

SPECIFICATION

REV. Date

2015.11.24



DAEWOO ELECTRONIC
EQUIPMENT VIETNAM Co., Ltd.

ELECTROLYTIC CAPACITORS FUT SERIES



DACHS



SUPPLIER'S DAEWOO

| Maker | Checker | Approval |
|-------|---------|----------|
| | | |



CUSTOMER'S DACHS

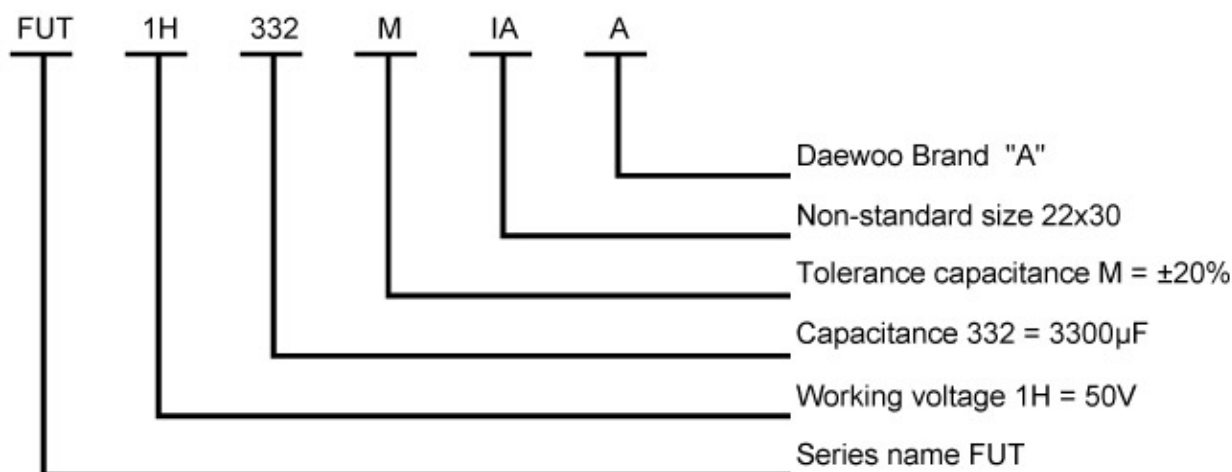
| Maker | Checker | Approval |
|-------|---------|----------|
| | | |

Please return us one copy your signed specification after you approved of it



We hand in this specification in order to be approved of electrolytic capacitor FUT Series that our company is going to deliver your company.

1. Composition Type: Ex: FUT1H332MIAA "22x30"



2. Operating temperature range:

160WV ~ 250WV: -40°C to $+105^{\circ}\text{C}$ (-40°F to $+221^{\circ}\text{F}$)

350WV ~ 450WV: -25°C to $+105^{\circ}\text{C}$ (-13°F to $+221^{\circ}\text{F}$)

3. Electrical characteristic:

3.1 Capacitance.

The capacitance is measured at a frequency of 120Hz at a temperature of $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($68^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$) with a maximum of 0.5 Vrms applied.

| | |
|-----------------------|------------------------|
| Capacitance tolerance | $-20\% \sim +20\%$ (M) |
|-----------------------|------------------------|

3.2 Leakage current (L.C)

| | |
|-------------|--|
| 160WV~450WV | $I \leq 0.02CV$ or 3mA (3Min) Whichever is less |
|-------------|--|

I = DC Leakage current (μ A)

C = Nominal capacitance (μ F)

V = Rated Voltage (WV.DC)



3.3 Tangent of Loss Angle (Tan δ)

The tangent of the loss angle when measured at a frequency of 120Hz at a temperature of (20°C \pm 2°C) (68°F \pm 3.6°F) shall be less than the values indicated below:

| | | |
|--|----------|----------|
| Tan δ (max., at 20°C, 120Hz) | 160~250V | 350~450V |
| | 0,10 | 0,20 |

4. Test.

4.1 Damp heat

The capacitor shall be stored at a temperature of 40 \pm 2°C and relative humidity of 90% to 95% for 240 \pm 8hours. And then the capacitor shall be subjected to standard atmospheric conditions for 1 to 2 hours, after which measurements shall be made.

| | |
|--------------------|--|
| Capacitance change | Within \pm 10% of the initial value. |
| Tan δ | Within value specified above. |
| Leakage current | Within value specified above. |

4.2 Load life

After applying rated working voltage for 3000hours at +105°C and then being stabilized at +20°C capacitors shall meet following limits.

| | |
|--------------------|---|
| Capacitance change | Within \pm 20% of the initial measured value. |
| Tan δ | $\leq \pm$ 200% of initial specified value |
| Leakage current | \leq The initial specified value. |

4.3 Shelf life

After storage for 1000 hours at +105°C with no voltage applied and then being stabilized at +20°C capacitors shall meet following limits.

| | |
|--------------------|---|
| Capacitance change | Within \pm 20% of the initial measured value. |
| Tan δ | \leq 150% of initial specified value |
| Leakage current | The initial specified value. |



4.4 Impedance ratio at low temperature

When capacitor are stored at the temperature of $-40^{\circ}\text{C} \pm 3^{\circ}\text{C}$, $-25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ and $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ respectively the ratio of impedance measured at each test temperature with the frequency of 120Hz shall be less than value.

| W.V (V) | 160~250 | 350~450 |
|---|---------|---------|
| Z- $25^{\circ}\text{C}/+20^{\circ}\text{C}$ | 4 | 8 |
| Z- $40^{\circ}\text{C}/+20^{\circ}\text{C}$ | 12 | - |

4.5 Resistance to soldering heat

For other procedures than those specified below soldering iron method.

+ Temperature : 260 ± 5 □

+ Application time of soldering iron : 10 sec.

| | |
|--------------------|---|
| Capacitance change | Within $\pm 10\%$ of the initial value. |
| Tan δ | Within values specified above |
| Leakage current | Within values specified above |

4.6 Solderability

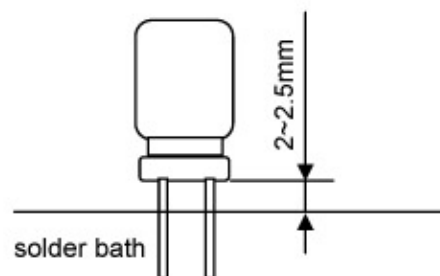
Dipping condition :



+ Temperature of solder bath : 235 ± 5 □

+ Dipping speed : 25 ± 2.5 mm/sec.

+ Dipping time : 3 ± 0.2 sec.

Result : 95% over covered.



| | | | | | |
|--|---|---|------|---|------------|
| SICE - SP - L018 | APPROVAL DATA FOR ELECTROLYTIC CAPACITOR | | | REV. Date | 2015.11.24 |
|  DAEWOO ELECTRONIC EQUIPMENT VIETNAM Co., Ltd. | REV. No | 0 | Page | 4 of 13 | |
| | | | |  | |

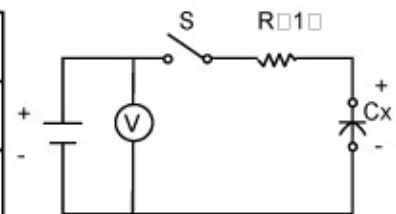
4.7 Surge test

The capacitor shall be subjected to 1000cycles at a temperature specified below, each consisting of a charge period of 30 ± 5 s. followed by a discharge period of approx. 5 min 30s.

And the capacitor shall be stored under standard atmospheric conditions to obtain thermal stability, after which measurements shall be made.

* Condition : Normal room temperature, DC32V Supply

| | |
|--------------------|---|
| Capacitance change | Referred to the value before test $\pm 5\%$ |
| Tan δ | Initial specified value |
| Leakage current | Initial specified value |



4.8 Terminal strength test

4.8.1 Tensile

> A static load of (A) N shall be applied to the terminal to the axial direction opposite to the body for (B) s. >>> (A) : 10 N { 1.0 kgf } (B) : 10 s

* However for lead terminal with a diameter of $\phi 0.5$, the load shall be 5N { 0.5kgf }

4.8.2 Bending

> The capacitor shall be held by its body in such a manner that the axis of the terminal is vertical a mass applying a force of (A) N shall be suspended from the end of the terminal.

The body of the capacitor shall then be inclined through an angle of 90° in the vertical plane and then returned to its initial position over a period of (B) sec; this operation constitutes 1 bend.

The terminal shall be subjected to 1 bend in each direction to give a total of 2 bends.

>>> (A) : 5 N { 0.5 kgf } (B) : 5 s

* However, for lead terminals with a diameter of $\phi 0.5$ the lead shall be 2.5 N { 0.25kgf }.

There shall be no such mechanical damage as terminal damage, etc.



4.9 Pressure relief test

4.9.1 AC test

> Applied voltage : AC voltage not exceeding 0.7times the direct or 250V AC, whichever is the lower.

> Frequency : 50Hz or 60 Hz

> Series resistor : Refer to the table below

| Capacitance(μ) | Series resistor(Ω) |
|-----------------------|-----------------------------|
| $C \leq 1$ | 1000 |
| $1 < C \leq 10$ | 100 |
| $10 < C \leq 100$ | 10 |
| $100 < C \leq 1000$ | 1 |
| $1000 < C \leq 10000$ | 0,1 |
| $10000 < C$ | * |

* Resistance is equivalent to a half of impedance by test frequency.

The safety vent shall open to avoid any danger of fire or explosion of capacitor elements (terminal and metal foil etc.) or cover.

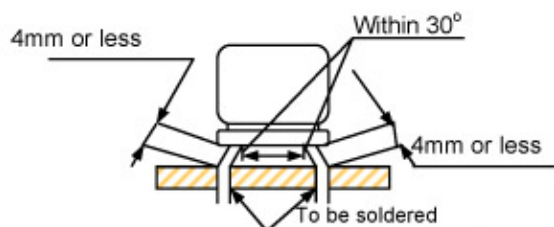
When the safety vent does not open 30min. after the beginning of the test, the test shall be finished.

4.10 Vibration test

The entire frequency range. from 10Hz to 55Hz and return 10Hz shall be trans versed in 1minute. This motion shall be applied for a period of 2hours in each 3 mutually perpendicular direction.

* Amplitude (total excursion) : 1.5mm

During the last 30min of vibration in each direction. The capacitance shall be measured 3 to 5 times.



| | |
|-------------------------|--|
| Capacitance change max. | Referred to the value before $\pm 5\%$ |
| Appearance | There shall be no such mechanical damage as terminal damage etc. Or leakage of electrolytic or swelling of the case. The marking shall be legible. |
| Inner construction | There shall be no damage of tab terminals or electrodes. |



5. Recommended cleaning solvents

Methanol, isopropanol, isobutanol, ethanol, petroleum ether, propanol and or commercial detergents.

Halogenated hydrocarbon cleaning agents such as freon (MF, TF, TMC or TC) trichloroethylene, trichloroethane, or methylchloride are not recommended as they may damage the capacitor.

6. Marking

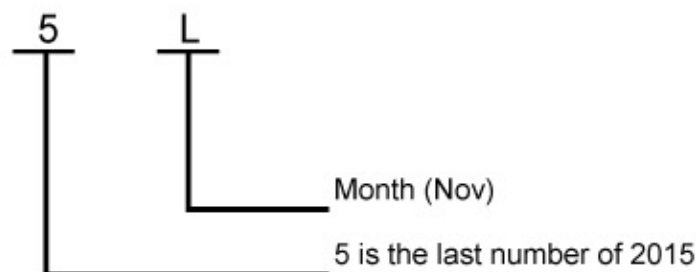
The following items shall be marked indelibly and legibly on the speci-fled location.

- 1). Brand: 
- 2). Series Designation: FUT
- 3). Rated Voltage (DC): 50V
- 4). Capacitance (μF): 3300 μF
- 5). Capacitance Tolerance: (M): $\pm 20\%$
- 6). Maximum Operating Temperature: 105 $^{\circ}\text{C}$
- 7). Lot No : 5L
- 8). Polarity of the terminals
- 9). Sleeve Colour: MAROON

7. Lot Number

The lot number regulates the following formula. But 1, 0, I are exception

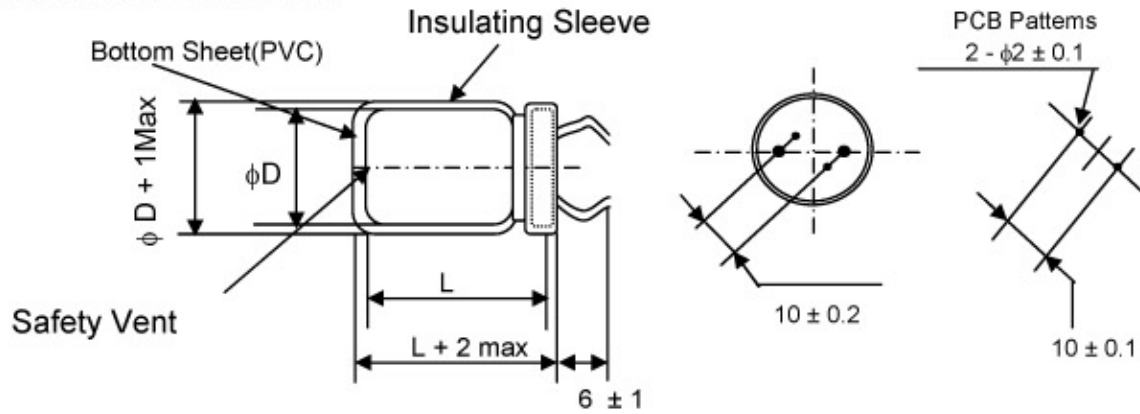
Ex: Nov 2015



| MONTH YEAR | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---------------|---|---|---|---|---|---|---|---|---|----|----|----|
| 2010 | A | B | C | D | E | F | G | H | J | K | L | M |
| 2019 | | | | | | | | | | | | |



8.CASE SIZE AND DIMENSION



$$D = \phi 22 \sim 35$$

9.RIPPLE CURRENT COEFFICIENT

* Frequency

| W.V \ Freq(Hz) | 50 | 120 | 1K | 10K | 100K |
|----------------|------|-----|------|------|------|
| 160~250 | 0,80 | 1,0 | 1,25 | 1,40 | 1,5 |
| 350~450 | 0,84 | 1,0 | 1,15 | 1,20 | 1,32 |

* Temperature

| Temperature | $\leq 45^{\circ}\text{C}$ | 60°C | 85°C | 105°C |
|-------------|---------------------------|----------------------|----------------------|-----------------------|
| Factor | 2,40 | 2,20 | 1,65 | 1,00 |



10. FUT SERIES

| W.V(V) Cap (μF) | 160(2C) | | | | 200(2D) | | | | 250(2E) | | | |
|--------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | φ 22 | φ 25 | φ 30 | φ 35 | φ 22 | φ 25 | φ 30 | φ 35 | φ 22 | φ 25 | φ 30 | φ 35 |
| 180 | | | | | | | | | 22x25 0,78 | | | |
| 220 | | | | | | | | | 22x30 1,00 | 25x25 1,00 | | |
| 270 | | | | | 22x25 1,00 | | | | 22x35 1,26 | 25x30 1,26 | | |
| 330 | 22x25 1,20 | | | | 22x30 1,25 | 25x25 1,25 | | | 22x40 1,31 | 25x30 1,31 | 30x25 1,31 | |
| 390 | 22x30 1,33 | | | | 22x35 1,44 | 25x30 1,44 | | | 22x45 1,52 | 25x35 1,52 | 30x30 1,52 | |
| 470 | 22x35 1,47 | 25x25 1,47 | | | 22x40 1,55 | 25x35 1,55 | 30x25 1,55 | | 22x50 1,63 | 25x40 1,63 | 30x30 1,63 | 35x25 1,63 |
| 560 | 22x40 1,60 | 25x30 1,60 | | | 22x45 1,65 | 25x40 1,65 | 30x30 1,68 | | | 25x45 1,90 | 30x35 1,87 | 35x30 1,90 |
| 680 | 22x45 1,80 | 25x35 1,78 | 30x30 1,78 | | 22x50 1,87 | 25x45 1,87 | 30x35 1,87 | 35x25 1,86 | | 25x50 2,15 | 30x30 2,15 | 35x35 2,18 |
| 820 | 22x50 2,15 | 25x40 2,15 | 30x30 2,10 | 35x25 2,10 | | 25x50 2,25 | 30x40 2,20 | 35x30 2,25 | | | 30x45 2,30 | 35x35 2,30 |
| 1000 | | 25x45 2,36 | 30x35 2,36 | 35x30 2,36 | | | 30x45 2,52 | 35x35 2,52 | | | 30x50 2,57 | 35x40 2,57 |
| 1200 | | 25x50 2,63 | 30x40 2,63 | 35x30 2,57 | | | 30x50 2,71 | 35x40 2,71 | | | | 35x45 2,73 |
| 1500 | | | 30x45 2,93 | 35x35 2,57 | | | | 35x45 3,20 | | | | |
| 1800 | | | 30x50 3,47 | 35x45 | | | | 35x50 3,57 | | | | |
| 2200 | | | | 35x50 3,95 | | | | | | | | |

| W.V(V) Cap (μF) | 350(2V) | | | | 400(2G) | | | | 450(2W) | | | |
|--------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | φ 22 | φ 25 | φ 30 | φ 35 | φ 22 | φ 25 | φ 30 | φ 35 | φ 22 | φ 25 | φ 30 | φ 35 |
| 56 | | | | | | | | | 22x25 0,46 | | | |
| 68 | | | | | 22x25 0,53 | | | | 22x30 0,53 | 25x25 0,53 | | |
| 82 | | | | | 22x30 0,60 | 25x25 0,60 | | | 22x35 0,60 | 25x30 0,60 | | |
| 100 | 22x25 0,72 | | | | 22x35 0,74 | 25x30 0,74 | | | 22x40 0,76 | 25x30 0,76 | 30x25 0,76 | |
| 120 | 22x30 0,78 | 22x25 0,78 | | | 22x40 0,81 | 25x35 0,88 | 30x25 0,80 | | 22x45 0,80 | 25x35 0,80 | 30x30 0,80 | |
| 150 | 22x35 0,86 | 25x30 0,86 | | | 22x45 0,88 | 25x40 0,99 | 30x30 0,88 | | 22x50 0,90 | 25x40 0,90 | 30x30 0,90 | |
| 180 | 22x45 0,99 | 25x35 0,96 | 30x25 0,96 | | 22x50 0,99 | 25x45 1,13 | 30x30 0,99 | 35x25 0,99 | | 25x45 2,00 | 30x35 0,99 | |
| 220 | 22x50 1,09 | 25x40 1,09 | 30x30 1,07 | 35x25 1,07 | | 25x50 1,28 | 30x35 1,13 | 35x30 1,13 | | 25x50 1,20 | 30x30 1,20 | 35x30 1,20 |
| 270 | | 25x45 1,20 | 30x35 1,20 | 35x30 1,20 | | | 30x40 1,28 | 35x30 1,28 | | | 30x45 1,30 | 35x35 1,30 |
| 330 | | 25x50 1,42 | 30x40 1,42 | 35x35 1,42 | | 35x50 1,45 | 30x45 1,47 | 35x35 1,47 | | | 30x50 1,50 | 35x40 1,50 |
| 390 | | | 30x45 1,58 | 35x40 1,58 | | | 30x50 1,63 | 35x40 1,63 | | | | 35x45 1,68 |
| 470 | | | | 35x45 1,80 | | | | 35x45 1,84 | | | | 35x50 1,84 |
| 560 | | | | 35x50 2,05 | | | | 35x50 2,10 | | | | |

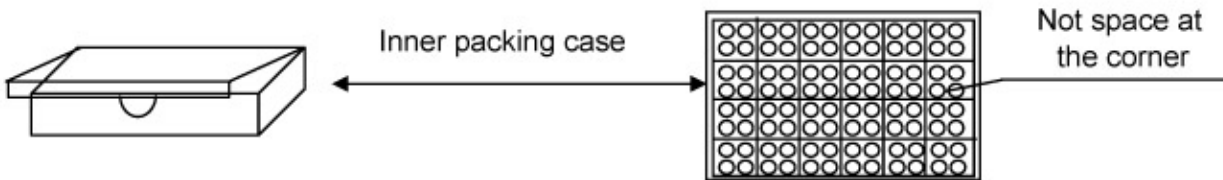
I_R : Maximum permissible ripple current [A(rms) at 105°C, 120Hz]

Case size [φ DxL (mm)]



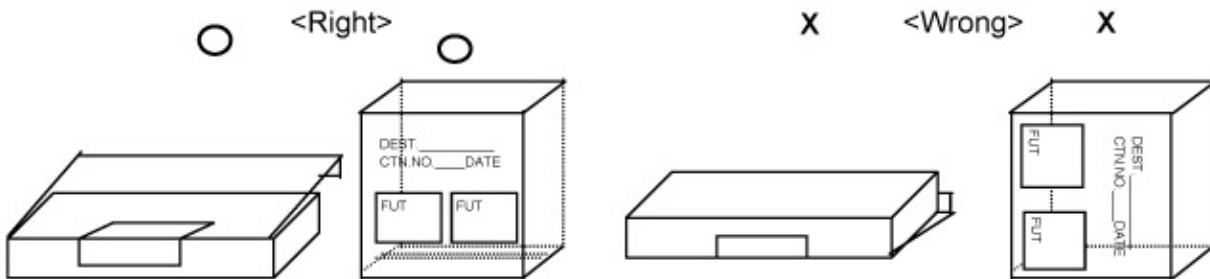
11. Packing method

11.1 There shall be a single part number in a inner carton .



11.2 Inner carton box shall be handled as follows.

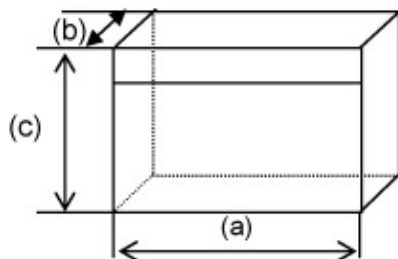
- * No more than 10 inner carton boxes shall be piled.
- * In case of putting the boxes lengthways, the indication of polarity shall face down.
- * The products shall be handled with care.



11.3 The inner cartons shall be packed in a cardboard box for transportation.

Various part number can be packed in a outer carton.

11.4 Shape & dimensions of inner carton shall be as follows.



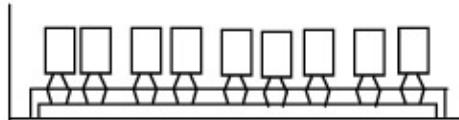
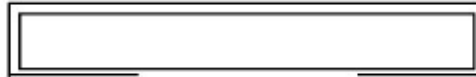
| Case size | | (a) | (b) | (c) |
|-----------|-------|-----|-----|-----|
| ϕD | L | | | |
| $\phi 22$ | 25~50 | 360 | 260 | 340 |
| $\phi 25$ | 25~50 | 360 | 260 | 340 |
| $\phi 30$ | 25~50 | 360 | 260 | 340 |
| $\phi 35$ | 25~50 | 360 | 260 | 340 |



* **Note:** The dimensions listed above may be changed without notice. The carton shall be suitable for the auto-insert machines after change.



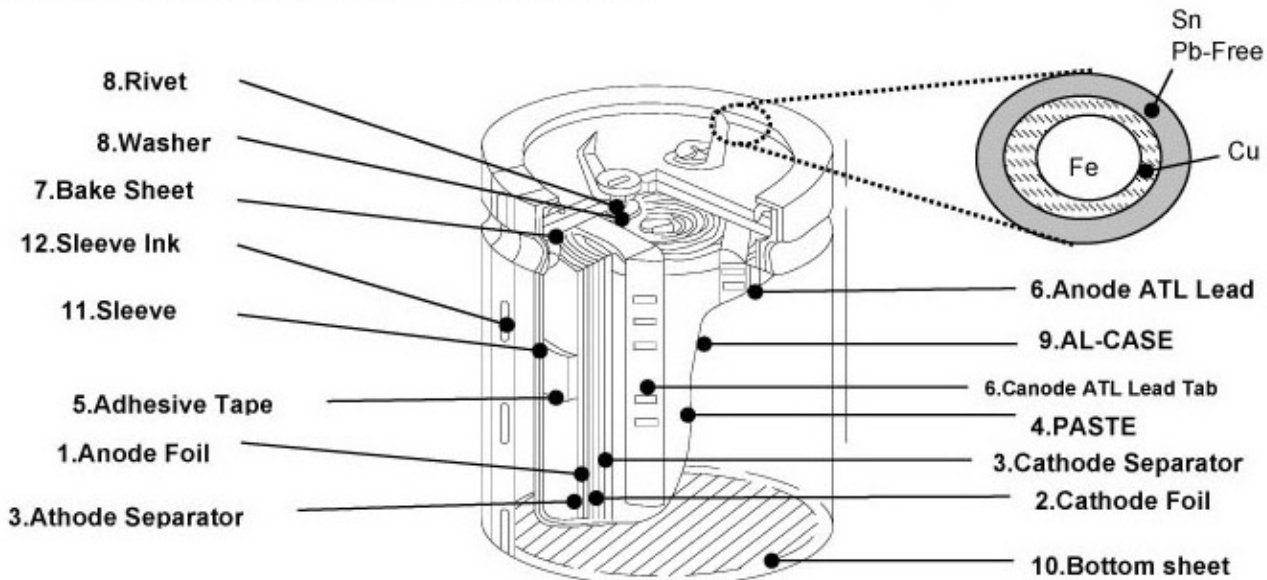
11.5. Packing method



| Product size [mm] | | Inner carton quantity min. Packing quantity [Pcs] | Outer carton quantity [Pcs] |
|-------------------|-------|--|-----------------------------|
| ϕ D | L | | |
| ϕ 22 | 25~40 | 130 | 650 |
| | 45~50 | 130 | 520 |
| ϕ 25 | 25~40 | 88 | 440 |
| | 45~50 | 88 | 352 |
| ϕ 30 | 25~40 | 63 | 315 |
| | 45~50 | 63 | 252 |
| ϕ 35 | 25~40 | 48 | 240 |
| | 45~50 | 48 | 192 |




12.CONSTRUCTION SNAP IN TYPE CAPACITORS



| Type | No | Raw Materials | | | Contents(ppm=mg/kg) | | | | | | ICP Data |
|------------------------------|----|---------------|---------------|----------------|---------------------|-----|-----|------|-----|------|----------|
| | | Part Name | Vendor | Material | cd | pb | Hg | Cr6+ | PBB | PBDE | |
| SNAP -IN | 1 | Foil(+) | HAIXING, HFCC | Aluminium | 0 | 0 | 0 | 0 | 0 | 0 | #1 |
| | 2 | Foil(-) | ELE-CON | Aluminium | 0 | 0 | 0 | 0 | 0 | 0 | #2 |
| | 3 | Con-Paper | KAN | Pulp | 0 | 0 | 0 | 0 | 0 | 0 | #3 |
| | 4 | Paste | CAPCHEM | MEG | 0 | 0 | 0 | 0 | 0 | 0 | #4 |
| | 5 | Adhesive Tape | TAPEX | Polypropylene | 0 | 0 | 0 | 0 | 0 | 0 | #5 |
| | 6 | Lead-Tab | ELE-CON | Aluminium | 0 | 0 | 0 | 0 | 0 | 0 | #6 |
| | 7 | Terminal | NINGHAI | PP | 0 | 0 | 0 | 0 | 0 | 0 | #7 |
| | 8 | Washer, Rivet | NINGHAI | Iron + Sn 100% | 0 | 0 | 0 | 0 | 0 | 0 | #8 |
| | 9 | Case | OAK-LEY | Aluminium | 0 | 0 | 0 | 0 | 0 | 0 | #9 |
| | 10 | Bottom-Sheet | NINGHAI | Polypropylene | 0 | 0 | 0 | 0 | 0 | 0 | #10 |
| | 11 | Sleeve | MOODEUNG | PVC | 0 | 0 | 0 | 0 | 0 | 0 | #11 |
| | 12 | Sleeve Ink | MOODEUNG | INK | 0 | 0 | 0 | 0 | 0 | 0 | #12 |
| Total | | | | | 0 | 11 | 0 | 0 | 0 | 0 | |
| SAMSUNG Eco-Partner Standard | | | | | 5 | 100 | 100 | 100 | 100 | 100 | |

| SICE-SP-L018 | | APPROVAL DATA FOR ELECTROLYTIC CAPACITOR | | | REV. Date | 2015.11.24 |
|--|------------------------------------|---|-------------------------------------|--------------------|----------------------------------|------------|
|  DAEWOO ELECTRONIC EQUIPMENT VIETNAM Co., Ltd. | REV. No | | | | 0 | Page |
| | RAW MATERIAL SUPPLIERS LIST | | | | | |
| Items | Company name | Country | Contents | Using of CE | Remark | |
| Anode Foil | - HFCC | - CHINA | * Low and high gain Anode Foil | * All series of CE | * Forming(+) | |
| | - HAIXING | - CHINA | * High voltage (160Fv up) Foil | | | |
| Cathode Foil | - ELE-CON | - CHINA | * Cathode Foil (20, 40, 50 μ m) | * All series of CE | * Etching(-) * PURITY : 98.4% | |
| Lead | - ELE-CON | - CHINA | * Lead-wire welding and press | * 04 type only | * Sn 100% coated | |
| Case | - OAK-LEY | - CHINA | - 18 up snap-in type press | * Snap-in type | | |
| Sleeve | - MOODEUNG | - KOREA | * PVC tube | * 04, Snap-in all | | |
| Paper | - KAN | - CHINA | * 100% from NKK | * All series CE | | |
| Paste | - CAPCHEM | - CHINA | * Adipic Acid, Boric Acid | * All series CE | | |
| Adhesive | - TAPEX | - KOREA | * Element winding film | * 04, Snap-in all | | |
| Terminal | - NINGHAI | - CHINA | * Sn 100% coated | * Snap-in type | | |
| Washer | - NINGHAI | - CHINA | * Press Washer | * Snap-in type | * Al 99.9% up | |

| | | | | | | |
|--|---------|---|--|--|-----------|------------|
| SICE-SP-L018 | | APPROVAL DATA FOR ELECTROLYTIC CAPACITOR | | | REV. Date | 2015.11.24 |
|  DAEWOO ELECTRONIC EQUIPMENT VIETNAM Co., Ltd. | REV. No | | | | 0 | Page |

CONFIRMATION AND ACTION PLAN TABLE

| No | Banned Substances and total abolish | PART OR RAW MATERIAL MANUFACTURER | | ACTION PLAN TO ELIMINATE IF STILL USING |
|----|---|-----------------------------------|-----|---|
| | | NOT USE | USE | |
| 1 | Cadmium and cadmium compounds | X | | |
| 2 | PBB and PBDE | X | | |
| 3 | Chlorinated paraffins (chlorine flame retarding materials/plasticizers) | X | | |
| 4 | Polychlorinated biphenyl (PCB) category | X | | |
| 5 | Polychlorinated naphthalene category | X | | |
| 6 | Organic tin compounds(Tributhyl tin category/Triphenyl tin category) | X | | |
| 7 | Asbestos | X | | |
| 8 | Azo compounds | X | | |
| 9 | Lead and its compounds | X | | |
| 10 | Mercury and its inorganic compounds | X | | |
| 11 | Hexavalent chromium compounds | X | | |
| 12 | Polyvinylchloride (PVC) | | X | |
| 13 | Organic bromine compound except PBB and PBDE | X | | |
| 14 | Manufacturing Process : Ozone Depleting Substances | X | | |
| 15 | Manufacturing Process : Chlorined organic solvent | X | | |