SICE-SP-L007	SPECIFICATION	REV. Date	2015.11.20
DAEWOO ELECTRONIC EQUIPMENT VIETNAM Co., Ltd.	ELECTROLYTIC CAPACITORS FHS SERIES	DACHS	

SUPPLIER'S DAEWOO

Maker	Checker	Approval

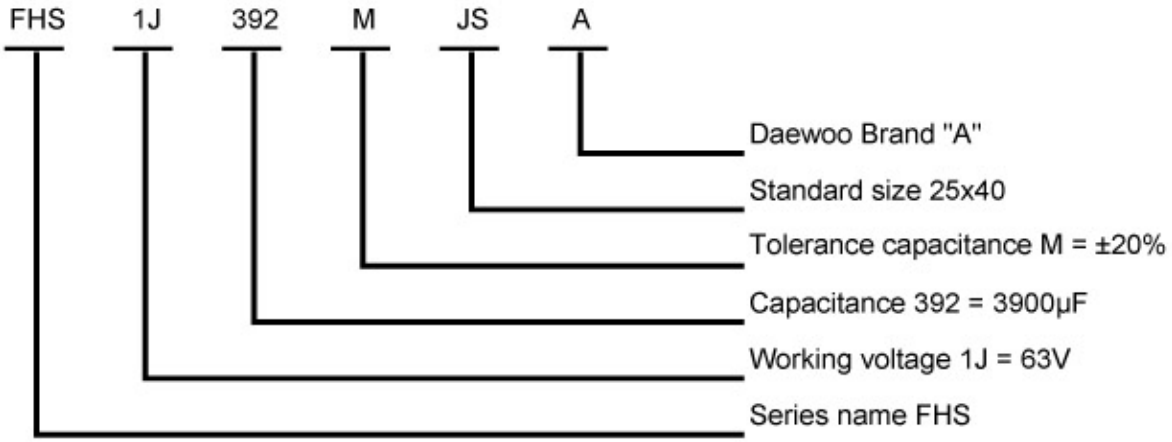
CUSTOMER'S DACHS

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 FHS series that our company is going to deliver your company.

1. Composition Type: Ex: FHS1J392MJSA "25x40"



2. Operating temperature range:

16WV ~ 250WV: -40°C to +85°C (-40°F to +185°F)

315WV ~ 450WV: -25°C to +85°C (-13°F to +185°F)

3. Electrical characteristic:

3.1 Capacitance.

The capacitance is measured at a frequency of 120Hz at a temperature of 20°C ± 2°C (68°F ± 3.6°F) with a maximum of 0.5 Vrms applied.

Capacitance tolerance	-20% ~ +20% (M)

3.2 Leakage current (L.C)

16 ~ 450V	I ≤ 0.02CV or 2mA (3Min) Whichever is less

I = DC Leakage current (μA)

C = Nominal capacitance (μF)

V = Rated Voltage (WV.DC)

3.3 Tangent of Loss Angle (Tanδ)

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

	W.V (V)	16~25	35~50	63~100	160~250	315~450
Tanδ (max., at 20°C,120Hz)	47~2200μF	-	0,20	0,15	0,10	0,20
	2700~6800μF	0,30	0,25	0,20	-	-
	8200μF	0,35	0,30	0,25	-	-
	10000~33000μF	0,50	0,40	0,30	-	-
	39000~47000μF	0,70	-	-	-	-

4. Test.

4.1 Damp heat

The capacitor shall be stored at a temperature of 40 ± 2°C and relative humidity of 90% to 95% for 240 ± 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 ± 10% of the initial value.
Tanδ	Within value specified above.
Leakage current	Within value specified above.

4.2 Load life

After applying rated working voltage for 2000hours at +85°C and then being stabilized at +20°C capacitors shall meet following limits.

Capacitance change	Within ± 20% of the initial measured value.
Tanδ	≤ 200% of initial specified value
Leakage current	≤ The initial specified value.

4.3 Shelf life

After storage for 1000 hours at +85°C with no voltage applied and then being stabilized at +20°C capacitors shall meet following limits.

Capacitance change	Within ± 20% of the initial measured value.
Tanδ	≤ 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°C ± 3°C, -25°C ± 3°C and 20°C ± 2°C respectively the ratio of impedance measured at each test temperature with the frequency of 120 Hz shall be less than value.

W.V (V)	16	25~100	160~250	315~450
Z-25°C/ +20°C	4	3	3	6
Z-40°C/ +20°C	8	6	6	-

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 ± 10% of the initial value.
Tanδ	Within values specified above
Leakage current	Within values specified above

4.6 Solderability

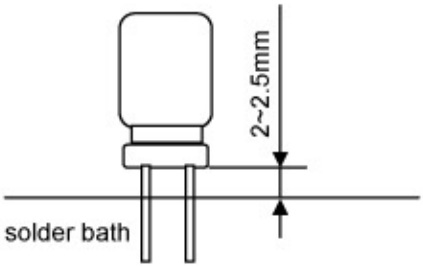
Dipping condition :

+ Temperature of solder bath : 235 ± 5 ☐

+ Dipping speed : 25 ± 2.5 mm/sec.

+ Dipping time : 3 ± 0.2 sec.

Result : 95% over covered.

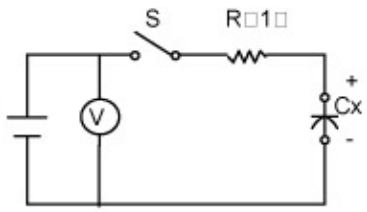


4.7 Surge test

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 30 s. 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 ± 5%
Tanδ	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 φ0.5, 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 φ0.5 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(□)	Series resistor(Ω)
C ≤ 1	1000
1 < C ≤ 10	100
10 < C ≤ 100	10
100 < C ≤ 1000	1
1000 < C ≤ 10000	0,1
10000 < C	*

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

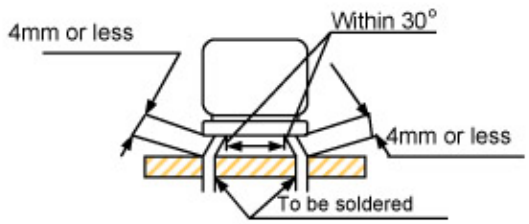
The safety vent shall open to avoid any danger of fire or explosion of capacitor elements (terminal and metal foil etc.) or cover.
When the safety vent does not open 30min. after the beginning of the test, the test shall be finished.

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 ±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,isobutanaol, ethanol, petroleum ether, propanol and or commercial detergents.

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

6. Marking

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

1). Brand:

2). Series Designation: FHS

3). Rated Voltage (DC): 63V

4). Capacitance (μF): 3900μF

5). Capacitance Tolerance(M): ±20%

6). Maximum Operating Temperature: 85°C

7). Lot No : 5L

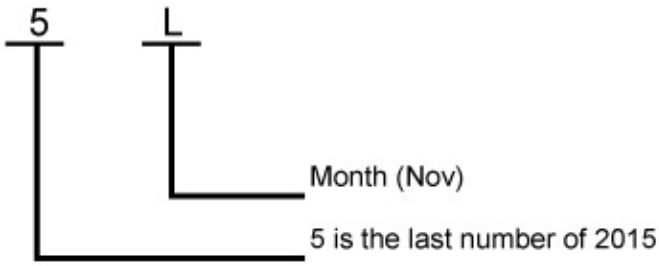
8). Polarity of the terminals

9). Sleeve Colour: BLACK

7. Lot Number

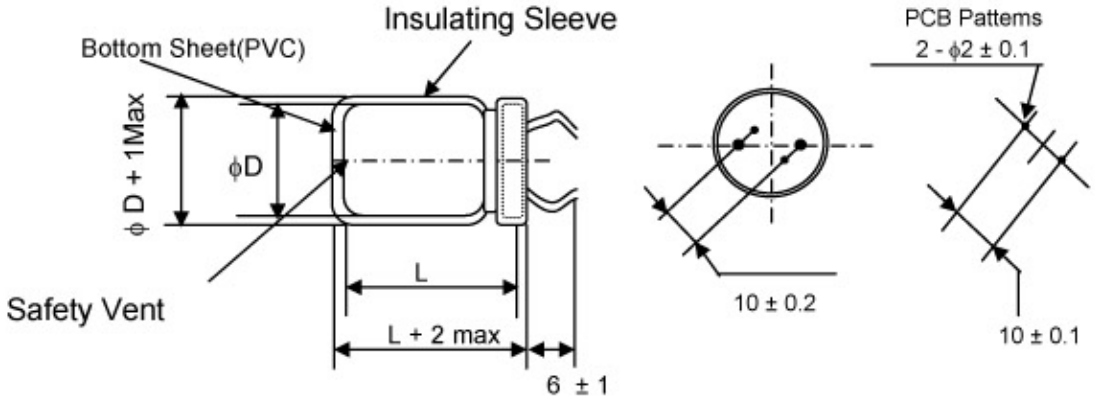
The lot number regulates the following formula. But 1, 0, I are exception

Ex: Nov 2015



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

8.CASE SIZE AND DIMENSION



D = ϕ 22~35

9.RIPPLE CURRENT COEFFICIENT

* Frequency

Freq(Hz) / W.V	50	120	500	1K	10K	100K
16~100	0,90	1,0	1,10	1,15	1,25	1,25
160~250	0,80	1,0	1,25	1,40	1,45	1,50
315~450	0,80	1,0	1,20	1,25	1,35	1,40

* Temperature

Temperature	≤ 45°C	60°C	70°C	85°C
Factor	1,48	1,30	1,15	1,0

10.FHS SERIES

W.V(V) / Cap (μF)	16(1C)				25(1E)				35(1V)				50(1H)			
	ϕ 22	ϕ 25	ϕ 30	ϕ 35	ϕ 22	ϕ 25	ϕ 30	ϕ 35	ϕ 22	ϕ 25	ϕ 30	ϕ 35	ϕ 22	ϕ 25	ϕ 30	ϕ 35
2200													22x25 1.90	25x25 2.05		
2700													22x30 2.10	25x25 2.10		
3300									22x25 2.20				22x30 2.25	25x25 2.25	30x25 2.30	
3900									22x30 2.25	25x25 2.25			22x35 2.50	25x30 2.50	30x25 2.50	
4700					22x25 2.20				22x30 2.35	25x25 2.35			22x40 2.65	25x35 2.65	30x25 2.65	
5600					22x30 2.40	25x25 2.40			22x35 2.55	25x30 2.50	30x25 2.55		22x45 2.95	25x40 3.00	30x30 3.00	
6800					22x35 2.55	25x25 2.55			22x40 2.80	25x35 2.82	30x25 2.80		22x50 3.30	25x45 3.30	30x35 3.30	35x30 3.30
8200	22x25 2.50				22x40 2.80	25x30 2.70	30x25 2.80		22x45 3.04	25x40 3.10	30x30 3.10			25x50 3.80	30x40 3.80	35x30 3.80
10000	22x30 2.65	25x25 2.65			22x40 3.10	25x35 3.10	30x25 3.10		22x50 3.65	25x40 3.65	30x30 3.65				30x45 4.20	35x35 4.20
12000	22x35 3.10	25x25 3.10			22x45 3.57	25x40 3.65	30x30 3.65			25x45 4.00	30x35 4.10	35x30 4.00			30x50 4.80	35x40 4.80
15000	22x40 3.55	25x30 3.38	30x25 3.55		22x50 3.88	25x45 4.00	30x35 4.00	35x30 4.00		25x50 4.15	30x40 4.45	35x35 4.45			30x50 4.65	35x45 5.20
18000	22x45 4.10	25x35 4.10	30x30 4.10			25x50 4.45	30x40 4.45	35x35 4.45			30x45 5.20	35x40 5.20				35x50 6.10
22000	22x50 4.50	25x40 4.35	30x30 4.35				30x45 5.20	35x40 5.20				35x45 6.10				
27000		25x45 4.70	30x35 4.60	35x30 4.70			30x50 6.10	35x40 6.10				35x50 6.40				
33000			30x40 5.25	35x35 5.25				35x50 6.45								
39000			30x45 5.60	35x35 5.60												
47000			30x50 5.85	35x40 5.85												

W.V(V) / Cap (μF)	63(1J)				80(1K)				100(2A)			
	ϕ 22	ϕ 25	ϕ 30	ϕ 35	ϕ 22	ϕ 25	ϕ 30	ϕ 35	ϕ 22	ϕ 25	ϕ 30	ϕ 35
820									22x25 150			
1000					22x25 150				22x30 170	25x25 170		
1200					22x30 165	25x25 165			22x35 185	25x25 180	30x25 185	
1500	22x25 170				22x30 180	25x25 180			22x40 2.30	25x30 2.20	30x25 2.30	
1800	22x30 190	25x25 190			22x35 2.20	25x30 2.20	30x25 2.20		22x45 2.50	25x40 2.50	30x30 2.50	
2200	22x30 2.20	25x25 2.20			22x40 2.50	25x35 2.50	30x25 2.50		22x50 2.80	25x45 2.80	30x30 2.80	
2700	22x35 2.40	25x30 2.40	30x25 2.40		22x45 2.60	25x40 2.70	30x30 2.70			25x50 3.20	30x35 3.10	35x30 3.10
3300	22x40 2.70	25x35 2.70	30x25 2.70		22x50 2.90	25x45 3.00	30x35 3.00	35x30 3.00			30x40 3.40	35x35 3.40
3900	22x45 2.90	25x40 2.90	30x30 2.90			25x50 3.20	30x40 3.20	35x30 3.20			30x50 3.80	35x40 3.80
4700	22x50 3.04	25x45 3.10	30x30 3.10				30x45 3.50	35x35 3.50				35x45 4.00
5600		25x50 3.40	30x40 3.40	35x30 3.40			30x50 3.90	35x40 3.90				35x50 4.30
6800			30x45 3.90	35x35 3.90				35x45 4.30				
8200			30x50 4.40	35x35 4.40				35x50 4.90				
10000				35x40 4.90								
12000				35x45 5.40								

I_R : Max. permissible ripple current [A(rms) at 85°C,120Hz]

Case size [ϕDxL (mm)]

W.V(V)	160(2C)				180(2S)				200(2D)				250(2E)			
Cap (μF)	ϕ 22	ϕ 25	ϕ 30	ϕ 35	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 1.00			
220									22x25 1.15	25x25 1.10			22x30 1.25	25x25 1.25		
270					22x25 1.30				22x30 1.35	25x25 1.35			22x35 1.40	25x30 1.45	30x25 1.40	
330	22x25 1.43				22x30 1.45	25x25 1.45			22x30 1.50	25x25 1.50			22x40 1.50	25x30 1.45	30x25 1.50	
390	22x30 1.55	25x25 1.55			22x35 1.60	25x25 1.60			22x35 1.70	25x30 1.75	30x25 1.70		22x45 1.80	25x35 1.80	30x30 1.80	
470	22x30 1.95	25x25 1.95			22x35 1.98	25x30 1.98	30x25 1.98		22x40 2.05	25x35 2.05	30x25 2.05		22x50 2.10	25x40 2.10	30x30 2.10	
560	22x35 2.01	25x30 2.01	30x25 2.01		22x40 2.05	25x35 2.05	30x25 2.05		22x45 2.10	25x35 2.10	30x30 2.10			25x45 2.20	30x35 2.20	35x30 2.20
680	22x40 2.22	25x35 2.22	30x30 2.22		22x50 2.30	25x40 2.30	30x30 2.30		22x45 2.35	25x40 2.40	30x30 2.40			25x50 2.50	30x40 2.50	35x30 2.50
820	22x50 2.60	25x40 2.60	30x30 2.60		22x50 2.30	25x45 2.65	30x35 2.65	35x30 2.65	22x45 2.70	25x50 2.70	30x40 2.75	35x30 2.70			30x45 2.80	35x35 2.80
1000	22x50 2.85	25x45 3.02	30x35 3.02	35x30 3.02		25x50 3.05	30x40 3.05	35x35 3.05			30x45 3.15	35x35 3.10			30x50 3.25	35x40 3.25
1200		25x50 3.29	30x40 3.29	35x35 3.29			30x45 3.35	35x35 3.30			30x50 3.40	35x40 3.40			30x50 3.40	35x50 3.50
1500			30x45 3.80	35x40 3.80			30x50 3.90	35x40 3.95				35x50 4.10				
1800			30x50 4.27	35x40 4.27				35x50 4.30				35x50 4.30				
2200				35x50 4.50												

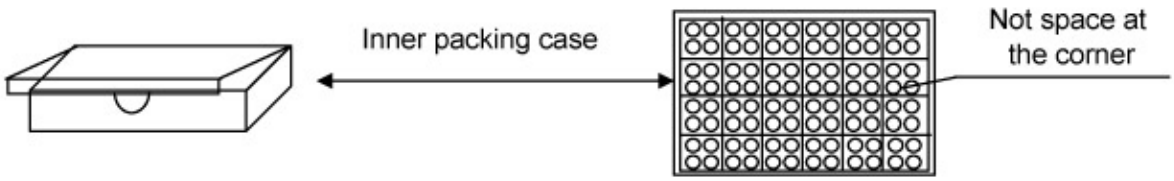
W.V(V)	315(2F)				350(2V)				400(2G)				450(2W)			
Cap (μF)	ϕ 22	ϕ 25	ϕ 30	ϕ 35	ϕ 22	ϕ 25	ϕ 30	ϕ 35	ϕ 22	ϕ 25	ϕ 30	ϕ 35	ϕ 22	ϕ 25	ϕ 30	ϕ 35
47													22x25 0.45			
56									22x25 0.50				22x25 0.50			
68									22x25 0.60				22x30 0.60	25x25 0.60		
82					22x25 0.65				22x30 0.65	25x25 0.65			22x30 0.65	25x25 0.65		
100	22x25 0.65				22x30 0.68	25x25 0.68			22x30 0.75	25x25 0.75			22x35 0.75	25x30 0.75	30x25 0.75	
120	22x30 0.75	25x25 0.75			22x30 0.85	25x25 0.85			22x35 0.92	25x30 0.92	30x25 0.92		22x40 0.92	25x35 0.92	30x25 0.92	
150	22x35 0.85	25x25 0.85			22x35 1.00	25x30 1.00	30x25 1.00		22x40 1.05	25x30 1.07	30x25 1.05		22x50 1.10	25x40 1.10	30x30 1.10	
180	22x35 1.00	25x30 1.00	30x25 1.05		22x40 1.10	25x35 1.10	30x25 1.10		22x45 1.20	25x35 1.20	30x30 1.20			25x45 1.20	30x35 1.20	35x30 1.20
220	22x40 1.20	25x35 1.15	30x25 1.15		22x45 1.30	25x40 1.30	30x30 1.30		22x50 1.35	25x40 1.35	30x35 1.35	35x30 1.35		25x50 1.40	30x40 1.40	35x30 1.40
270	22x45 1.30	25x40 1.32	30x30 1.30			25x45 1.53	30x35 1.50	35x30 1.50		25x45 1.60	30x40 1.62	35x30 1.60			30x45 1.65	35x35 1.65
330	22x50 1.50	25x45 1.55	30x35 1.55	35x30 1.55		25x50 1.70	30x40 1.70	35x30 1.70			30x45 1.85	35x35 1.85			30x50 1.90	35x40 1.90
390		25x50 1.70	30x40 1.70	35x35 1.70			30x45 1.90	35x35 1.90			30x50 2.08	35x40 2.08				35x50 2.50
470			30x45 1.90	35x35 1.90			30x50 2.20	35x40 2.20				35x45 2.38				
560			30x50 2.20	35x40 2.20				35x45 2.50				35x50 2.65				
680				35x45 2.50				35x50 2.90								
820				35x50 2.80												

I_R : Max. permissible ripple current [A(rms) at 85°C,120Hz]

Case size [ϕ DxL (mm)]

11. Packing methode

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

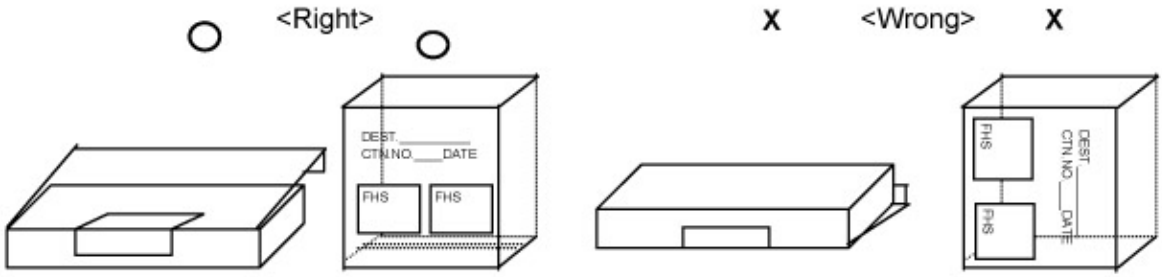


11.2 Inner carton box shall be handled as follows.

* No more than 10 inner carton boxes shall be piled.

* In case of putting the boxes lengthways, the indication of polarity shall face down.

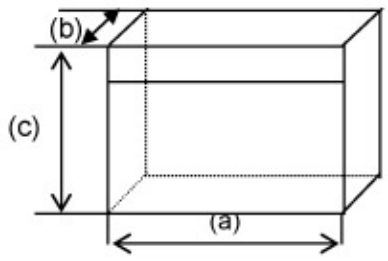
* The products shall be handled with care.



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.

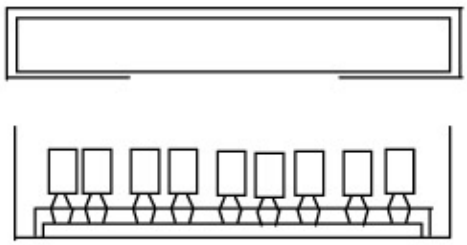


Case size		(a)	(b)	(c)
ϕD	L			
ϕ 22	25~50	360	260	340
ϕ 25	25~50	360	260	340
ϕ 30	25~50	360	260	340
ϕ 35	25~50	360	260	340

△1

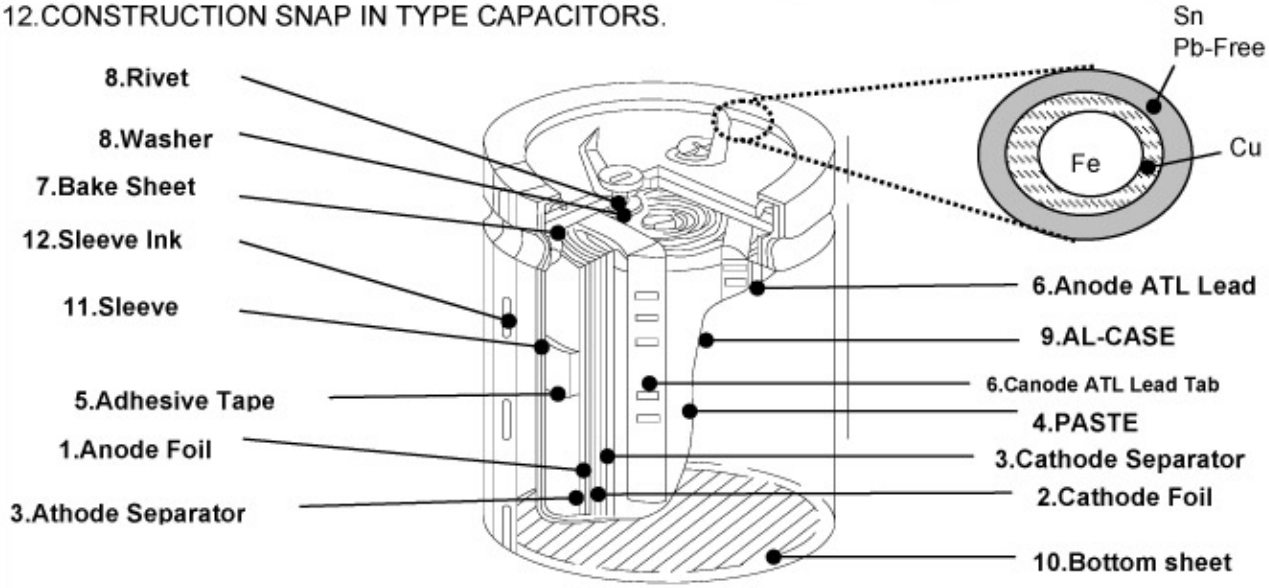
* Note: The dimensions listed above may be changed without notice. The carton shall be suitable for the auto-insert machines after change.

11.5. Packing methode



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	0	0	0	0	0	
	SAMSUNG Eco-Partner Standard				5	100	100	100	100	100	

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, 50μm)	* 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

CONFIRMATION AND ACTION PLAN TABLE

No	Banned Substances and total abbolish	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		