SPECIFICATION

SAMWHA CAPACITOR CO.,LTD

PT SAMCON

JL. RAYA SUBANG CIKUMPAY

CAMPAKA-PURWAKARTA

JAWA BARAT – INDONESIA

To. TME

No.SWC-20251016-03

SPECIFICATION

ITEM : DISC CERAMIC CAPACITOR
(Class I : High Voltage)

PT. SAMCON		
Written	Checked	Approved
		
Irman Sudirman	Apang Djafar S.	Kim Jae Min
TME		

2025.10.16

SAMWHA CAPACITOR Co., Ltd
(Manufacturer : PT. SAMCON)
Jln Raya Subang Cikumpay – campaka
Purwakarta – West Java Indonesia

Record of Revision

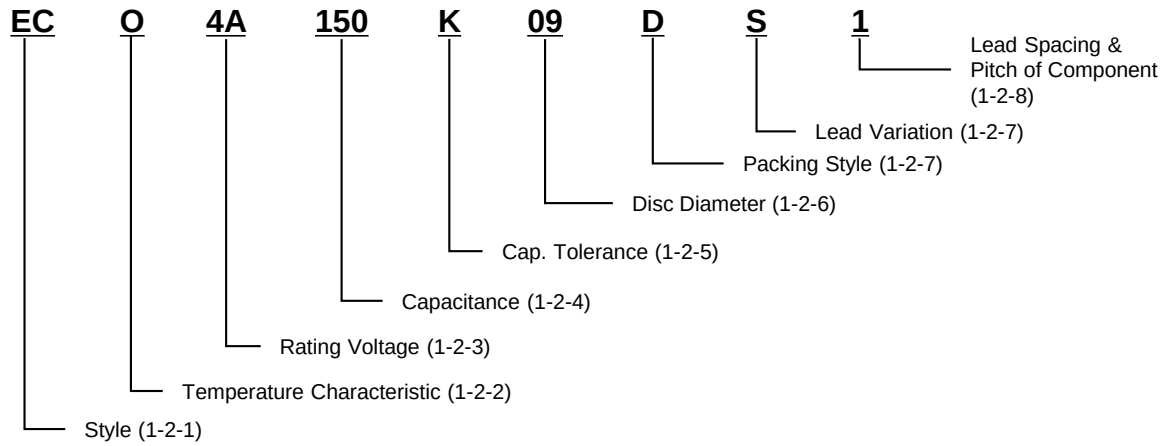
P/N	SAMWHA SPEC	P/N	SAMWHA SPEC
-	ECO4A150K09DS1		
-	ECO4A220K10DS1		
-	ECO4A470K12DS1		
-	ECO4C150K10DS2		
-	ECO4C220K10DS2		
-	ECO4C470K13DS2		
-	ECO4D150K12DS3		
-	ECO4D220K12DS3		
-	ECO4D470K13DS3		

No	Reason	Contents	Date of approval	Checked	Remark

1. Scope.

This specification relates temperature compensating, high dielectric constant disc type fixed ceramic capacitor, intended for use in equipment for telecommunication and in electronic devices.

1-1. Type Designation



1-2. Specification

1-2-1. Style

EC : Temperature compensating fixed ceramic capacitor

(Class Ⅰ) - Epoxy coated ceramic capacitor

1-2-2. Temperature coefficient and Temperature characteristics

EC (class Ⅰ)

Code	Operating Temp	Temp. Range	TCC	TC Tolerance
SL	-25°C ~ +85°C	+20°C ~ +85°C	- 1000 ~ + 350	ppm/°C

1-2-3. Rating Voltage

4A : 10kV, 4B : 12kV, 4C : 15kV, 4D : 20kV

1-2-4. Capacitance

The nominal capacitance value in pF is expressed by three digit number.

The first two digits represent significant figures and the last digit is the number of zero to follow.

Ex. 15pF – 150

Note : Pre-treatment : max operating temp ±2°C heating and maintain 1hr, and release 24±2hr at room condition, using LCR meter.

1-2-5. Cap. Tolerance

Symbol	K	M
Cap. Tol	± 10%	± 20%

1-2-6. Disc Diameter

Unit : ㎜

Code	08	09	10	11	12	13	14	15	16	17	19
Dia. (∅mm)	8.5	9..5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	19.5

1-2-7. Packing Style and Lead Variation (see page 9/11~10/11)

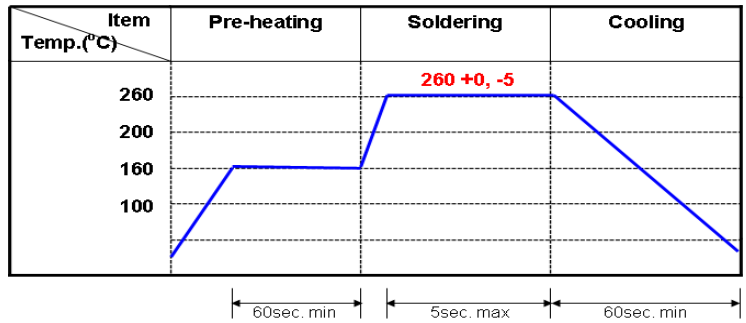
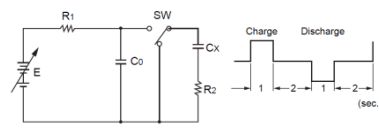
Packing Style		Lead Variation	
B	Bulk	S	Straight Long Type
		W	Kink Short Type
		N	Straight Short Type
D	Double Bulk	S	Straight Type Long

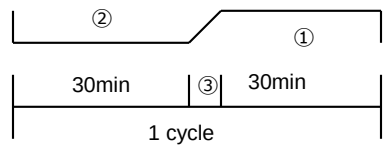
1-2-8. Lead Spacing and Pitch of Component [mm] (see page 9/11~10/11)

Bulk Type	
Code	Lead Spacing (mm)
1	10.0
2	12.5
3	15.0

2. Requirements and method of test and environmental substance

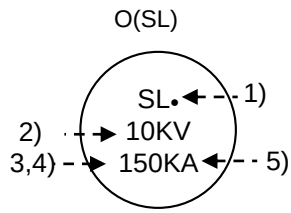
<table>
<tr><th rowspan="2">NO</th><th rowspan="2" colspan="2">ITEM</th><th>Rated value</th><th rowspan="2">Testing method / application</th></tr>
<tr><th>Class Ⅰ</th></tr>
<tr><td>1</td><td colspan="2">Operating Temperature Range</td><td>-25℃ ~ +100℃</td><td></td></tr>
<tr><td>2</td><td colspan="2">Capacitance</td><td>Within the specified range</td><td rowspan="2">- Temperature : 20℃
- Frequency: 1 ± 0.1 MHz (SL)
- Measured voltage : 1 ± 0.1Vrms</td></tr>
<tr><td>3</td><td colspan="2">Quality Factor (Q)</td><td>SL : 30pF or more ≥ 1000
less then 30pF ≥ 400+20C
(C : Cap)</td></tr>
<tr><td>4</td><td>Insulation resistance</td><td>Between terminals</td><td>More than 10000MΩ</td><td>- Applied Voltage : Charge at 500 VDC
- Charge Time : 60 ± 5 sec</td></tr>
<tr><td>5</td><td>Withstand Voltage</td><td>Between terminals</td><td>No remarkable abnormality is recognized</td><td>- 4A, 4B, 4C, 4D : Applied voltage 150% of rating voltage between the lead wire with insulate in silicon oil.
- Charge Time : 1 ~ 5 sec</td></tr>
<tr><td>6</td><td colspan="2">Capacitance Temperature Characteristics</td><td><table><tr><th>Temp Char. Code</th><th>Cap. Change Rate</th></tr><tr><td>SL</td><td>+350 ~ -1000</td></tr></table></td><td>The capacitor measurement shall be made at each step specified in table.
Capacitance change from the value of the step 3 shall not exceed the limit specified.<table><tr><th>Step / Char.</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr><tr><td>O (SL)</td><td>-</td><td>-</td><td>+20</td><td>+85</td><td>+20</td></tr></table></td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">Solder Heat Resistance</td><td>External view</td><td>No remarkable abnormality is Recognized</td><td rowspan="2">- Soldering temperature: 260 -0,+5℃
- Immersion : 5 sec</td></tr>
<tr><td>Rate change for capacitance</td><td>SL : Within the greater value of ± 2.5 and ± 0.25 pF</td></tr>
<tr><td>8</td><td colspan="2">Solder ability</td><td>The lead wire is soldered more than 3/4 of it in the circumferential direction and to the immersed part continuously in the axial direction</td><td>- Soldering temp : 230 ± 5℃ or 260 ± 5℃
- Immersion time : 2 ± 0.5 sec</td></tr>
</table>

No	ITEM		Rated Value Class I	Testing method/application (EIA-STD, RS-198-C)
9	Soldering Profile	Flow Soldering	 When soldering this product to a Pcb / Pwb, do not exceed the solder heat resistance specification of capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.	
		Iron Soldering	When soldering capacitor with a soldering capacitor iron, it should be performed in following conditions. Temperature of iron-tip : 400°C max. Soldering iron wattage : 50W max. Soldering time : 3.5 sec. max. Failure to follow the above cautions may result, worst case, in a short circuit and cause fuming or partial dispersion when the product is used	
10	Humidity Resistance Test	External view	No remarkable abnormality is recognized	- Temperature : 40 ± 2℃ - Humidity : 90 ~ 95% RH - Testing time : 240 +24,-0 hours Post treatment : Capacitor should be stored for 1 to 2 hrs. at room condition
		Rate change for capacitance	SL : Within ± 3.0%	
		Quality Factor (Q)	SL: less than 30pF: Q ≥ 275 + 5/2C 30pF or more : Q ≥ 350	
		Insulation resistance	More than 5000MΩ	
11	Charge Discharge Test	Appearance	No remarkable abnormality is recognized	Circuit discharge test should be measured in the following test circuit and cycle (in silicon oil). Applied voltage : Rated voltage Cycle time : 20000 cycle. Post-treatment : Capacitor should be stored for 4 hrs. at room condition.  Cx : Specimen R1 : Circuit protector resistor (300kΩ) C0 : Supplied energy for Cx. C0=10Cx R2 : Current limiting resistor (E/10Ω) E : direct-current voltage source
		Capacitance Change	SL : Within ± 3.0%	
		Quality Factor (Q)	SL: Less than 30pF: Q ≥ 275 + 5/2C 30pF or more : Q ≥ 350	
		I.R	More than 5000MΩ	

No	ITEM		Rated Value		Testing method/application (EIA-STD, RS-198-C)
			Class I		
12	High Temperature Load	External view	No remarkable abnormality is recognized		- Temperature : 85 ± 2℃ - Testing Time : 1000 +48,-0 hours - Applied voltage : 4A, 4B, 4C : rated voltage × 125% 4D : rated voltage × 110% - The discharge current shall be 50㎃ or less - Insulate in silicon oil Post treatment : Capacitor should be stored for 24±2hrs at room.
		Rate change for Capacitance	SL : ± 3%		
		Quality Factor (Q)	SL	Less than 30 ㎊: Q≥275+5/2C 30㎊ or more : Q ≥ 350	
		Insulation Resistance	More than 5000㏁		
13	Temperature Cycling Test	Appearance	No Visible Damage		Temperature cycle should be measured in the following test. Cycle time : 5 cycle Pre-treatment : Capacitor should be stored at max operating temp(①). for 1hr., placing at room condition for 24±2hrs. Post treatment : Capacitor should be stored for 24±2hrs at room. ※②:min. operating temperature ③:2 to 5minutes  Table II : Temperature Cycle Step / Temperature (°C) / Time (min) 1 / X ; +0/-3 / 30 2 / Room temp. / 3 3 / Y; +3/-0 / 30 4 / Room temp. / 3 **Note : X = minimum operating temp** **Y = maximum operating temp** **Based on temp characteristics**
		Cap. Change	SL : ± 3%		
		Quality Factor (Q)	SL	Less than 30 ㎊: Q≥275+5/2C 30㎊ or more : Q ≥ 350	
		Insulation Resistance	More than 5000㏁		
14	Preservation (keeping)		When Solderability is considered, capacitors are recommended to be used in 12 months		1). Temperature : 30°C ± 10°C 2). Relative Humidity : 55% ± 25
15	The Regulation of Environmental Pollution Materials		* Never use materials mentioned below based on International RoHS Standard. * Pb, Hg, Cr^{+6}, PBB, PBDE, Cd, Phthalate (DEHP, DBP, BBP & DIBP).		

3. Marking

High Voltage Dielectric Capacitor



Code No.	Marking Item	Char.
1	Temperature Characteristics	SL
2	Rated Voltage (kV)	10, 15, 20
3	Nominal capacitance	Based on SPEC
4	Tolerance of Capacitance	K
5	Last Letter	Month of Manufacture

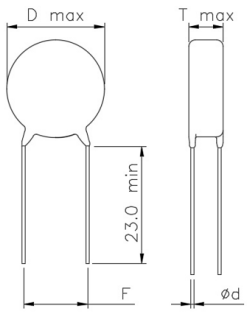
*. Month of Manufacture :

A, M : January
B, N : February
C, O : March
D, P : April
E, Q : May
F, R : June
G, S : July
H, T : August
I, U : September
J, V : October
K, W : November
L, X : December

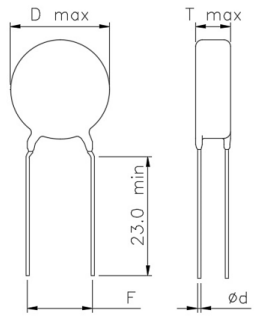
From A to L are Even year, From M to X are odd year

4. Dimension & Packing Style

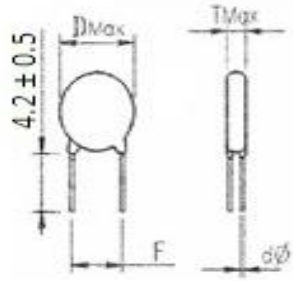
BS Type



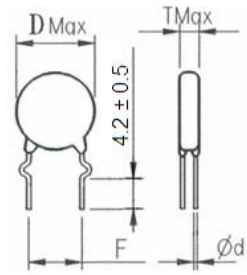
DS Type



BN Type



BW Type



4-1). 4A (10 kV)

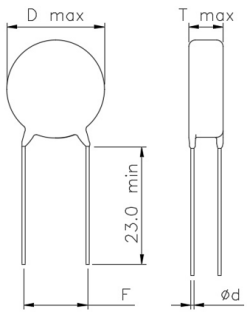
TCC	Cap.	TOL.	D	T	F	WIRE SIZE ORDERING	Size Code
	(pF)	(%)	Dmax (mm)	Tmax (mm)	mm	mm	
SL +20~85℃ +350~-1000 ppm	10	±10%	9.5	8.5	10.0±2.0	0.80±0.05	9
	15	±10%	9.5	8.5	10.0±2.0	0.80±0.05	9
	20	±10%	9.5	8.5	10.0±2.0	0.80±0.05	9
	22	±10%	10.5	8.5	10.0±2.0	0.80±0.05	10
	27	±10%	10.5	8.5	10.0±2.0	0.80±0.05	10
	33	±10%	11.5	8.5	10.0±2.0	0.80±0.05	11
	47	±10%	12.5	8.5	10.0±2.0	0.80±0.05	12
	56	±10%	13.5	8.5	10.0±2.0	0.80±0.05	13
	68	±10%	14.5	8.5	10.0±2.0	0.80±0.05	14
	82	±10%	15.5	8.5	10.0±2.0	0.80±0.05	15
	100	±10%	15.5	8.5	10.0±2.0	0.80±0.05	15

4-2). 4C (15 kV)

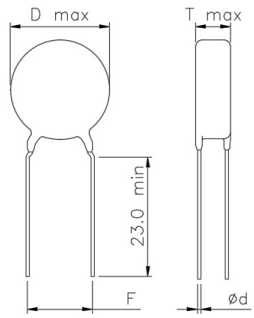
TCC	Cap.	TOL.	D	T	F	WIRE SIZE ORDERING	Size Code
	(pF)	(%)	Dmax (mm)	Tmax (mm)	mm	mm	
SL +20~85℃ +350~-1000 ppm	10	±10%	8.5	8.0	12.5±2.0	0.80±0.05	8
	12	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
	15	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
	20	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
	22	±10%	10.5	9.0	12.5±2.0	0.80±0.05	10
	27	±10%	11.5	9.0	12.5±2.0	0.80±0.05	11
	33	±10%	12.5	9.0	12.5±2.0	0.80±0.05	12
	47	±10%	13.5	9.0	12.5±2.0	0.80±0.05	13
	56	±10%	14.5	9.0	12.5±2.0	0.80±0.05	14
	68	±10%	16.5	9.0	12.5±2.0	0.80±0.05	16
	82	±10%	17.5	9.0	12.5±2.0	0.80±0.05	17
	100	±10%	17.5	9.0	12.5±2.0	0.80±0.05	17

4. Dimension & Packing Style

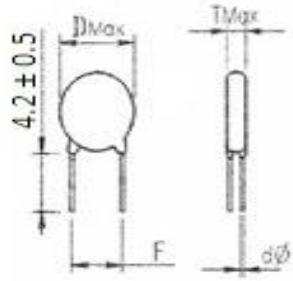
BS Type



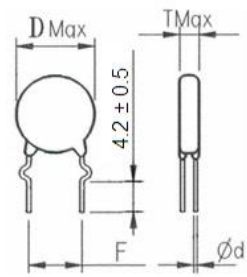
DS Type



BN Type



BW Type



4-3). 4D (20 kV)

TCC	Cap.	TOL.	D	T	F	WIRE SIZE ORDERING	Size Code
	(pF)	(%)	Dmax (mm)	Tmax (mm)	mm	mm	
SL +20~85℃ +350~-1000 ppm	15	±10%	12.5	10	15.0±2.0	0.80±0.05	12
	20	±10%	12.5	10	15.0±2.0	0.80±0.05	12
	22	±10%	12.5	10	15.0±2.0	0.80±0.05	12
	27	±10%	12.5	10	15.0±2.0	0.80±0.05	12
	33	±10%	13.5	10	15.0±2.0	0.80±0.05	13
	47	±10%	13.5	10	15.0±2.0	0.80±0.05	13
	56	±10%	15.5	10	15.0±2.0	0.80±0.05	15
	68	±10%	17.5	10	15.0±2.0	0.80±0.05	17
	82	±10%	18.5	10	15.0±2.0	0.80±0.05	18
	100	±10%	19.5	10	15.0±2.0	0.80±0.05	19

▣ PACKING SPECIFICATION

1) BULK

TYPE		PACKING QUANTITY [pcs]				
DIVISION	L/W DIVISION [mm]	DIAMETER [Φ]	INNER BOX		OUT BOX	
			VINIL PAPERBAG	IBB 140	OBB 150	OBB 300
10 ~ 20 KV	Short	All	200 +2, -0	2,000	4,000	-
	Long	10	200 +2, -0	2,000	4,000	-
		11 ~ 15	100 +2, -0	1,000	2,000	-
		16 ~ 19	50 +2, -0	800	1,600	-

2) PACKING BOX DIMENSIONS

PACKING STYLE		CATEGORY	L × W × H [mm]
BULK	IBB (Inner Box Bulk)	IBB 140	250 × 235 × 130
	OBB (Out Box Bulk)	OBB 150 (IBB 140 × 2)	485 × 265 × 145

3) STACKING BOX (Maximum)

PACKING STYLE	INBOX	OUTBOX
BULK	6	6

▣ MATERIAL LIST

NO	Material Name	Substance	Hazardous Substance Existences						Remarks
			Pb	Hg	Cr	Cr^{+6}	PBB	PBDE	
1	Dielectric powder	$SrTiO_3$	X	X	X	X	X	X	
2	Ag Paste	Ag	X	X	X	X	X	X	
3	Solder	Sn, Ag, Cu	X	X	X	X	X	X	
4	Epoxy resin	Epoxy	X	X	X	X	X	X	
5	Lead wire	Cu, Sn, Fe	X	X	X	X	X	X	Plating thickness : Min 3 μm. (material : tin)

▣ Label Type - Bulk

BULK TYPE		
PLASTIC VINYL	INBOX	OUTBOX
		

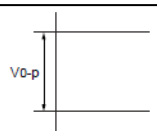
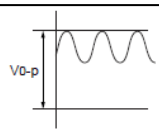
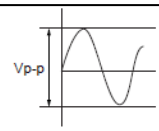
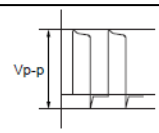
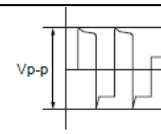
▣ ECN Series Caution and Notice

⚠Caution (Rating)

1.Operating Voltage

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the V_{p-p} value of the applied voltage or the V_{0-p} which contains DC bias within the rated voltage range.

When the voltage is applied to the circuit, starting or stopping may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

Voltage	DC Voltage	DC+AC Voltage	AC Voltage	Pulse Voltage (1)	Pulse Voltage (2)
Positional Measurement					

2. Operating Temperature and Self-generated Heat

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in high-frequency current, pulse current or similar current, it may self-generate heat due to dielectric loss. The applied voltage load should be such that the capacitor's self-generated heat is within $10^{O}C$ at an atmosphere temperature of $25^{O}C$. When measuring, use a thermocouple of small thermal capacity-K of Ø0.1mm in conditions where the capacitor is not affected by radiant heat from other components or surrounding ambient fluctuations. Excessive heat may lead to deterioration of the capacitor characteristics and reliability. (never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

Failure to follow the above cautions may result, worst case, in a short circuit and cause fuming or partial dispersion when the product is used.

⚠ Caution (Storage and Operation Condition)

Operating and storage environment.

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. And avoid exposure to moisture.

The capacitor is designed to be used in insulating media, such as epoxy resin, silicone oil, etc. there must be 3mm or more of insulating media for each direction of the capacitor.

Before cleaning, bonding or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment.

Store the capacitors where the temperature and relative humidity do not exceed 20 to 40 degrees centigrade and 30 to 80%. Use the capacitors within 12 months.

⚠ Caution (Soldering and Mounting)

1.Vibration and impact

Do not expose a capacitor or its leads to excessive shock or vibration during use.

▶ Notice (Capacitance change of capacitors)

For some of the capacitors, capacitance value may change considerably in the temperature range, or by applied DC voltage. and capacitor has aging characteristics (capacitance decreases by keeping as it is)