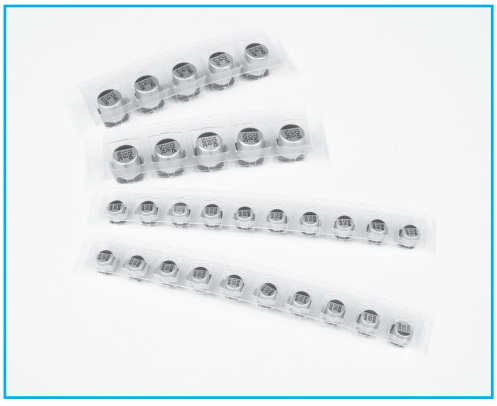
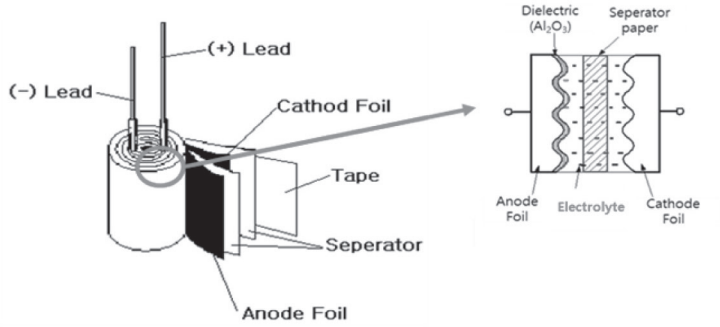
2 CONDUCTIVE POLYMER HYBRID ALUMINUM ELECTROLYTIC CAPACITORS



CONDUCTIVE POLYMER HYBRID ALUMINUM ELECTROLYTIC CAPACITORS

1. Conductive Polymer Hybrid Aluminum Electrolytic Capacitor?

Conductive Polymer Hybrid Capacitor consist of Conductive Polymer Electric materials and Liquid Electrolyte as Electrolyte



Section	Electrolytic Cap.	Solid Cap.	Hybrid Cap.
Electrolyte	Liquid Electrolyte	Conductive Polymer	Conductive Polymer + Liquid Electrolyte

2. Merits of Conductive Polymer Hybrid Aluminum Electrolytic Capacitor

By using conductive polymer as electrolyte, low ESR characteristics and high ripple characteristics can be realized. Low leakage current and short defect of capacitor can be prevented by electrolytic solution.

3. Characteristic

Section	Electrolyte Cap.	Solid Cap.	Hybrid cap.
SIZE	O	△	◎
ESR	X	O	◎
TEMPERATURE	X	O	◎
DISSIPATION FACTOR	X	O	◎
RIPPLE CURRENT	X	O	◎
RELIABILITY	X	O	◎
LEAKAGE CURRENT	O	X	◎

◎ Excellent O Good △ Average X Weak

PRECAUTIONS AND GUIDELINES (Conductive Polymer Hybrid)

Conductive Polymer Hybrid Aluminum Electrolytic Capacitors uses highly conductive polymer electrolytic and electrolyte. Please read the following in order to get the most out of your capacitor.

Device circuits design considerations

1) Confirm installation and operating requirements for the capacitors, then use them within the performance limits prescribed in this catalog or product specifications.

2) Polarity

Capacitors are polarized.

Never apply a reverse voltage or AC voltage. Connecting with wrong polarity will short-circuit or damage the capacitor with the pressure relief vent opening early on. To identify the polarity of a capacitor. See the revalant diagram in the catalogs on the body of the capacitors.

3) Operating Voltage

Do not apply an over-voltage that exceeds a rated voltage specified for the capacitors.

The total peak value of the ripple voltage plus the DC voltage must not exceed the rated voltage of the capacitors.

Capacitors do not require voltage derating within the category temperature. Although capacitors specify a surge voltage that exceeds

4) Ripple current

Do not apply an over current that exceeds the rated ripple current specified for the capacitors. Excessive ripple current will increase heat production within the capacitors, causing the capacitors to be damaged as follows:

- Shorten lifetime
- Open pressure relief vent
- Short circuit

At the time of low DC bias voltage, reverse voltage may be applied if uses with less than rated ripple current.

Please use it as far as the reverse voltage is not applied. The rated ripple current is specified along with a specific ripple frequency. calculate the allowable ripple current by multiplying the rated ripple current by frequency compensation factor (Frequency Coefficient) specified for each product series.

5) Operating temperature (Category temperature)

Do not apply high temperatures that exceed the upper limit of the category temperature range specified for the capacitors. Using the capacitors at temperatures higher than the upper limit will considerably shorten the lifetime of the capacitors and make the pressure relief vent open. The temperature, please confirm the temperature of the capacitors which included the ambient temperature of the device, not only the temperature in the device but also radiant heat of the heating elem Additionally, please do not place heating element on the back side of the capacitors. In addition, please use the capacitors within category temperature range because the life of the capacitors are affected by the operating temperature. In other words, lowering ambient temperatures will extend the expected lifetime of the capacitors.

6) Lifetime

Select the capacitors to meet the service life requirements of device.

7) Charging and discharging

Do not use capacitors in circuits intended for rapid charge and discharge cycle operations.

If capacitors are used in the circuits that repeat a charge and discharge with a large voltage drop or a rapid charge and discharge at short interval cycle, capacitance will decrease and/or the capacitors will be damaged by internal heat generation. Please consult us the capacitors to use for the circuit where rapid charge and discharge is repeated. Please be careful about rush currents. Recommend to install protective circuit.

8) Failure mode of capacitors

Non-solid aluminum electrolytic capacitors have a limited lifetime which ends in an open circuit failure mode, in general. Depending on the product type and operating conditions, the failure mode may involve in opening of the pressure relief vent.

But it may lead to shot circuit mode failure when capacitor is used in the overload more than the guarantee ranges including over voltage and the over current.

9) Capacitor insulation

The can case of capacitor does not assure electrical insulation.

The outer coating on can case is aimed for indication and does not assure function of the electrical insulation.

Electrically isolate the outer can case of a capacitor from the negative terminal, the positive terminal and circuit patterns.

10) Operating Condition

Do not use/expose capacitors to the following conditions:

① Direct contact with water, salt water or oil, or high condensation environment.
② Direct sunlight
③ Toxic gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine and its compounds, bromine and its compounds and ammonium.
④ Ozone, ultraviolet rays or radiation.
⑤ Extreme vibration or mechanical shock that exceeds limits in the catalogs or product specifications.

11) Mounting

Capacitors contain paper separators and electric-conductive electrolyte that contains organic solvent as main solvent material, both of which are flammable. If the electrolyte leaks onto a printed circuit board, it can erode the device circuit pattern, may short-circuit the copper traces, smoke and burn. Make sure of designing a PC board as follows

① Provide clearance space (2mm minimum) over the pressure relief vent of a capacitor to avoid blocking the correct opening of the pressure relief vent for 10mm case diameter of capacitor.
② Do not locate any wire or circuit pattern over the pressure relief vent of a capacitor.
③ Avoid locating any heat source components near capacitors or on the opposite side of the PC board under capacitors.
④ Design the solder land on the PC board in accordance with the catalog or the product specification.
⑤ For radial capacitors, design the terminal holes on the PC board to fit the terminal dimension of the capacitor
⑥ Do not print any copper trace under the seal (terminal) side of a capacitor. When the electrolyte leaks out, it may occur circuit pattern short-circuit, and tracking or migration. Copper traces should be 1mm (preferably 2mm or more) spaced apart.
⑦ In designing a double-sided PC board, do not locate any through-hole via or unnecessary hole underneath a capacitor.
⑧ In designing a double-sided PC board, do not print any circuit pattern underneath a capacitor.

12) Others

Design device circuits taking into consideration the following conditions:

① Electrical characteristics of a capacitor depend on the temperature and frequency. In designing the device circuits, consider the change in the characteristics.
② If using more than one capacitor connected in parallel, design the device circuits to balance the current flow in individual capacitors.
③ If using more than one capacitor connected in series, connect shunting resistors in parallel with the individual capacitors to balance the voltage.

PART NUMBER SYSTEM

Part Number System

❶	❷	❸	❹	❺	❻	❼	❽
Series Name	Rated Voltage	Capacitance	Cap. Tol.	Case Diameter	Case Height	Taping Code	Internal Control Code

❶ Series Name
See page 6.

❷ Rated Working Voltage

WV	4	6.3	10	16	25	35	50
Code	0G	0J	1A	1C	1E	1V	1H

WV	63	100	160	200	250	400	450
Code	1J	2A	2C	2D	2E	2G	2W

❸ Capacitance
ex) 0.47μF 474
4.7μF 475
47μF 476
470μF 477
4700μF 478

❹ Capacitance Tolerance

Tolerance (%)	±20
Code	M

❺ Case Diameter
ex) Ø6.3 6L
Ø8 08
Ø10 10

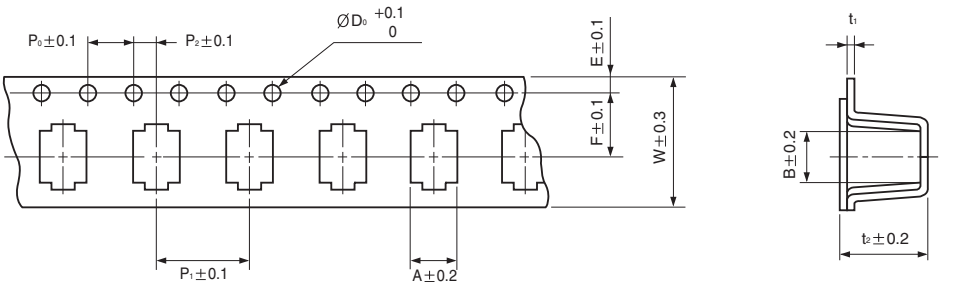
❻ Case Height
ex) 7.7mm 07K
10mm 010

❼ Taping Code
VR (Reel Type)

Taping Specifications for Chip Type Capacitors

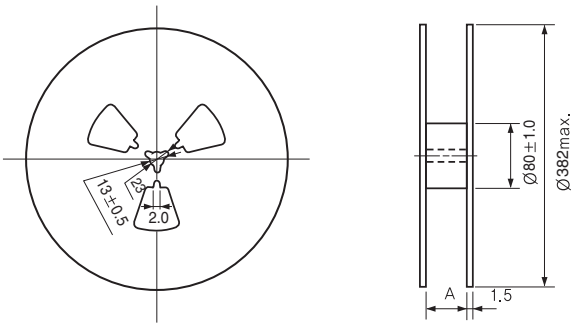
Carrier Tape

· Fig.1



ØD×L	A	B	ØD₀	E	F	P₀	P₁	P₂	t₁	t₂	W
6.3 × 7.7	7.0	7.0	1.5	1.75	7.5	4.0	12.0	2.0	0.4	8.2	16.0
8 × 10	8.7	8.7	1.5	1.75	11.5	4.0	16.0	2.0	0.4	11.0	24.0
10 × 10	10.7	10.7	1.5	1.75	11.5	4.0	16.0	2.0	0.4	11.0	24.0

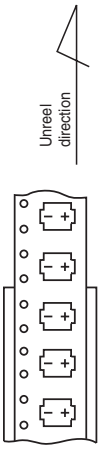
Reel (Taping code : VR)



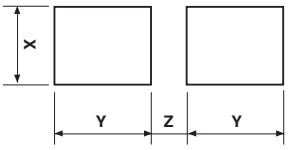
ØD×L	A
6.3 × 7.7	18
8 × 10	26
10 × 10	26

ØD×L	Q'ty/Reel(pcs.)	Q'ty/Box(pcs.)
6.3 × 7.7	900	9000
8 × 10	500	3000
10 × 10	500	3000

Polarity



Recommended Land Size



ØD×L	X	Y	Z
6.3 × 7.7	1.6	3.5	2.0
8 × 10	2.5	3.5	3.0
10 × 10	2.5	4.0	4.0

New

YC

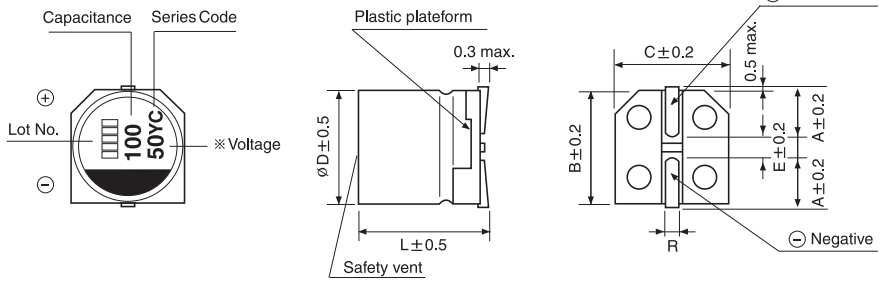
Chip type, Standard Series

- Endurance with ripple current: 5000 hours at 105˚C
- Complied to the RoHS directive

Item	Characteristics
Operating temperature range	-55 ~ +105˚C
Leakage current max.	I = 0.01CV or 3μA whichever is greater (after 2 minutes)
Capacitance tolerance	±20% at 120Hz, 20˚C
Dissipation factor max. (at 120Hz, 20˚C)	WV: 16 / 25 / 35 / 50 / 63 / 80 tanδ: 0.16 / 0.14 / 0.12 / 0.10 / 0.08 / 0.08
Low temperature characteristics (Impedance ratio at 100Hz)	Z (-25˚C) / Z (+20˚C) ≦ 1.5 Z (-55˚C) / Z (+20˚C) ≦ 2.0
Load life	After an application of DC bias voltage plus the rated AC ripple current for 5000 hours at 105˚C. The measurement shall meet the following limits. The DC voltage plus the peak AC voltage combined must not exceed the rated voltage. Capacitance change: Within ±30% of initial value tanδ: Less than 200% of the specified value ESR: Less than 200% of the specified value Leakage current: Less than specified value
Shelf life (at 105˚C)	After 1000 hours no load test, leakage current, capacitance and tanδ are same as load life value. The measurement shall be performed at 20˚C by the KS C IEC 60384 - 4
Resistance to soldering heat	The following specifications shall be satisfied when the capacitors are restored to 20˚C after exposing them at 250˚C for 10 seconds. Leakage current: Less than specified value Capacitance change: Within ±10% of initial value tanδ: Less than specified value

DRAWING

Unit : mm



ØD×L	A	B	C	E	R
6.3×7.7	2.4	6.6	6.6	2.2	0.5~0.8
8×10	2.9	8.3	8.3	3.1	0.8~1.1
10×10	3.2	10.3	10.3	4.5	0.8~1.1

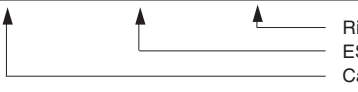
CONDUCTIVE POLYMER HYBRID ALUMINUM ELECTROLYTIC CAPACITORS

YC series

● DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT

μF \ WV	16			25			35		
47							6.3×7.7	35	2000
68				6.3×7.7	30	2000	6.3×7.7	35	2000
100				6.3×7.7	30	2000	8×10	27	2300
150	6.3×7.7	27	2200	8×10	27	2300	8×10	27	2300
							10×10	20	2500
220				8×10	27	2300			
270	8×10	22	2500	10×10	20	2500	10×10	20	2500
330				10×10	20	2500			
470	10×10	18	2600						

μF \ WV	50			63			80		
10				6.3×7.7	80	1500			
15	6.3×7.7	40	1600						
22				6.3×7.7	80	1500	8×10	45	1600
				8×10	40	1600			
33	6.3×7.7	40	1600	8×10	40	1600			
	8×10	30	1800	10×10	30	1800			
39							10×10	35	1700
47	8×10	30	1800						
56	10×10	25	2000	10×10	30	1800			
68	10×10	25	2000						
100	10×10	25	2000						



● FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz	1kHz	10kHz	100kHz
Coefficient	0.05	0.30	0.70	1.00

New

YH

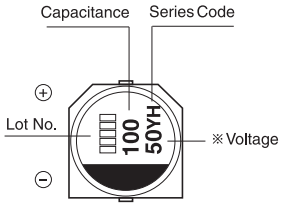
Chip type, High Temperature.
Series

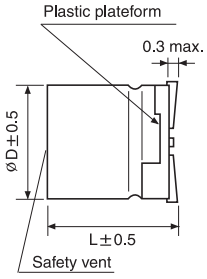
- High temperature range, for 125˚C use
- Complied to the RoHS directive

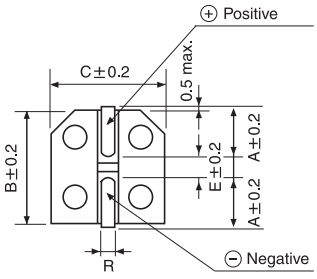
Item	Characteristics
Operating temperature range	-55 ~ +125˚C
Leakage current max.	I = 0.01CV or 3μA whichever is greater (after 2 minutes)
Capacitance tolerance	±20% at 120Hz, 20˚C
Dissipation factor max. (at 120Hz, 20˚C)	WV: 16 / 25 / 35 / 50 / 63 / 80 tanδ: 0.16 / 0.14 / 0.12 / 0.10 / 0.08 / 0.08
Low temperature characteristics (Impedance ratio at 100Hz)	Z (-25˚C) / Z (+20˚C) ≦ 1.5 Z (-55˚C) / Z (+20˚C) ≦ 2.0
Load life	After an application of DC bias voltage plus the rated AC ripple current for 4000 hours at 125˚C. The measurement shall meet the following limits. The DC voltage plus the peak AC voltage combined must not exceed the rated voltage. Capacitance change: Within ±30% of initial value tanδ: Less than 200% of the specified value ESR: Less than 200% of the specified value Leakage current: Less than specified value
Shelf life (at 125˚C)	After 1000 hours no load test, leakage current, capacitance and tanδ are same as load life value. The measurement shall be performed at 20˚C by the KS C IEC 60384 - 4
Resistance to soldering heat	The following specifications shall be satisfied when the capacitors are restored to 20˚C after exposing them at 250˚C for 10 seconds. Leakage current: Less than specified value Capacitance change: Within ±10% of initial value tanδ: Less than specified value

DRAWING

Unit : mm







ØD×L	A	B	C	E	R
6.3×7.7	2.4	6.6	6.6	2.2	0.5~0.8
8×10	2.9	8.3	8.3	3.1	0.8~1.1
10×10	3.2	10.3	10.3	4.5	0.8~1.1

YH series

● DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT

μF \ WV	16			25			35		
47							6.3×7.7	35	1400
68				6.3×7.7	30	1400	6.3×7.7	35	1400
100				6.3×7.7	30	1400	8×10	27	1600
150	6.3×7.7	27	1450	8×10	27	1600	8×10	27	1600
							10×10	20	2000
220				8×10	27	1600			
270	8×10	22	1700	10×10	20	2000	10×10	20	2000
330				10×10	20	2000			
470	10×10	18	2100						

μF \ WV	50			63			80		
10				6.3×7.7	80	900			
15	6.3×7.7	40	1100						
22				6.3×7.7	80	900	8×10	45	1100
				8×10	40	1100			
33	6.3×7.7	40	1100	8×10	40	1100			
	8×10	30	1250	10×10	30	1400			
39							10×10	35	1200
47	8×10	30	1250						
56	10×10	25	1600	10×10	30	1400			
68	10×10	25	1600						
100	10×10	25	1600						

Ripple current (mA rms) at 125°C, 100kHz
ESR (mΩ) at 20°C, 100kHz
Case size ØD×L (mm)

● FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz	1kHz	10kHz	100kHz
Coefficient	0.05	0.30	0.70	1.00