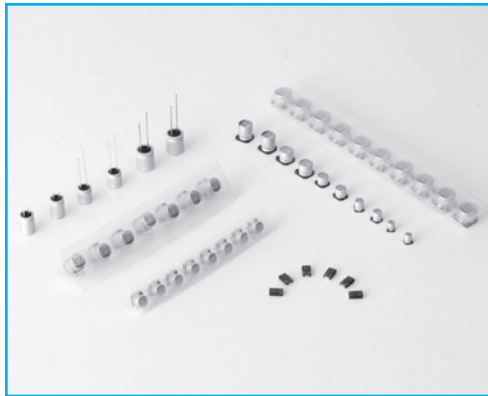


2 CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS



Hi-CAP (Conductive Polymer Aluminum Electrolytic Capacitor)

Hi-CAP is an electrolytic capacitor that uses a highly electric conductive polymer as its electrolyte. **Hi-CAP** has excellent temperature and load life characteristics due to adoption of stable polymer in high temperature. Compared to other electrolytic capacitors, the **Hi-CAP** is a low impedance capacitor suitable for high frequency making it ideal for digital circuit.

1. Circuit design

- (1) The conducting polymer capacitor cannot be used in circuits that undergo frequent charging and discharging because the resulting internal heat buildup can cause capacitor failure.
- (2) Do not use the capacitor in time-constant or coupling circuits. In these type of circuit, electrical characteristics such as capacitance can change under certain environmental conditions.

2. Capacitor handling techniques

(1) Capacitor insertion

Incorrect land size may cause problems with capacitor placement and mountability. Refer to the land size table for appropriate design dimensions.

(2) Soldering

When using a soldering iron, set the tip temperature to no more than 300°C, and work in as short a time as possible under 10 seconds. While soldering, do not apply strong force to the capacitor.

Reflow soldering

The conducting polymer capacitor is designed specifically for reflow soldering. Maintain soldering conditions (pre-heating, reflow temperature, time) within the range indicated in the product specifications. If soldering time is lengthened or temperature is higher, the heat can damage the capacitor element and / or the molded case. Do not perform reflow soldering more than twice.

(3) Circuit board cleaning

Capacitors can withstand immersion in solvent at 60°C or under for up to 5 minutes. Be sure to sufficiently wash (about 3 min. with water) and dry (20 min. at 100°C) the board afterward.

3. Electrical characteristics comparison of Capacitors

Species	High Frequency	Temperature	Allowable ripple	Miniaturized
Al Electrolytic capacitor	○	○	⊙	●
MLCC	●	○	—	⊙
Film Capacitor	●	●	—	○
Tantal Capacitor	⊙	⊙	○	⊙
Hi-CAP	●	●	●	⊙

※ ● Superior ⊙ Ordinary ○ Inferior

PRECAUTIONS AND GUIDELINES (Conductive Polymer)

The **Hi-CAP** is a Conductive Polymer Solid Aluminum Capacitor that uses highly conductive polymer electrolytic material.

Please read the following in order to get the most out of your **Hi-CAP** capacitor. For aluminum electrolytic capacitors, please refer to PRECAUTIONS AND GUIDELINES

1. Designing Device Circuits

1) Types of Circuits Where Hi-CAP Capacitors are Not to be Used

The leakage current in conductive polymer solid aluminum capacitors (hereafter called Hi-CAP) may vary depending on thermal stresses during soldering. Avoid the use of capacitors in the following types of circuits:

- ① High-impedance circuits that are to sustain voltages.
- ② Coupling circuits
- ③ Time constant circuits

Because the capacitance varies depending on the environment the capacitors are used in, there is a possibility that the capacitor can affect a time constant circuit where sensitivity to variation in capacitance is required.

- ④ Other circuits that are significantly affected by leakage current

2) Circuit Design

Verify the following before designing the circuit:

- ① The electrical characteristics of the capacitor will vary depending on differences in temperature and frequency. You had better design after verifying the scope of these factors.
- ② When connecting two or more capacitors in parallel, ensure that the design takes current balancing into account.
- ③ When two or more capacitors are connected in series, variability in applied voltage may cause over-voltage conditions. Contact Samwha before using capacitors connected in series.
- ④ Avoid putting heat generating parts either around the capacitor or on the reverse of the circuit board

3) Use in High Reliable and Critical Applications

Consult with Samwha before using these capacitors in applications involving human life: Aviation/space equipment, Nuclear power equipment, Medical equipment and Automotive equipment, or in applications where capacitor failure could have a major impact

4) Polarity

The Hi-CAP is a polarized solid aluminum electrolytic capacitor. Do not apply either reverse voltages or AC voltages to the polarized capacitors, using reversed polarity may cause a short circuit. Refer to the catalog product specifications or capacitor body to confirm the polarity prior to use

5) Operating Voltage

Do not apply a greater than rated voltage, if a voltage greater than the rated voltage is suddenly applied the leakage current increases causing shorting. The peak voltage of superimposed AC voltages (ripple voltages) on DC voltages must not exceed the full rated voltage. While there are specifications for surge voltages exceeding the rated voltage, usage conditions apply, and continued operation for extended periods of time under such conditions cannot be guaranteed.

6) Ripple current

Do not apply currents in excess of the rated ripple current. The superimposition of a large ripple current increases the rate of heating within the capacitor. When excessive ripple current is imposed the internal temperature increases which can shorten life and shorting may occur.

CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

7) Operating temperature

Use within the stated category temperature range, if used outside this range, characteristics can deteriorate potentially leading to problems.

8) Charging and Discharging in Capacitor

Do not use the Hi-CAP in circuits where the capacitor is repetitively charged and discharged rapidly. Repetitively charging and discharging the capacitor rapidly may reduce the capacitance or may cause damage due to internal heating. Use of a protective circuit to ensure reliability is recommended when rush currents exceed 20A.

9) Leakage current

The leakage current may increase when the capacitors are subjected to the conditions below. After that, however, the leakage current will gradually decrease by self-healing action of the dielectric oxide layer when the capacitors are applied with a voltage less than the rated voltage within the Category Temperature range. As the voltage is closer to the rated voltage and the temperature is closer to the upper limit of Category Temperature range, the leakage current decreases faster.

The leakage current will increase by the following factors,

- ① Soldering
- ② Testing of high temperature exposure with no voltage applied, high temperature/humidity storage, temperature cycles, etc.

10) Failures and Service Life

Based on the KS C 6032 Standard, the failure rate for Hi-CAP(with a 60% reliability standard) is as follows: 0.5%/1,000 hours(applied the rate voltage at the upper limit of Category Temperature range)

(1) Failure Modes

- ① The principal failure mode is wear-out failure, that is, capacitance decreases and ESR increases, and eventually the capacitors become open circuit failure. In addition, short circuit failure may happen with over-voltage and excessive current applied to the capacitors.
- ② The failure rate would be reduced by reducing ambient temperatures, ripple current and applying voltage.
- ③ If the short-circuited capacitor, which may be caused by over-voltages higher than the rated voltage or other conditions, has a large amount of current passed through, the aluminum can of the capacitor bulges and might be expelled with odor gas emitted.
- ④ The product contains flammable materials. If the short causes a spark it may ignite. Please be careful when installing the product, its position and the layout design.
 - ▶ Increase safety by using in conjunction with a protective circuit or protective equipment.
 - ▶ Install measures such as redundant circuits so that the failure of a part of the equipment will not cause unstable operation.

(2) Service Life

Hi-CAP uses rubber as the sealing material, so the service life depends on the thermal integrity of this rubber. Consequently, it is recommended to use the capacitor at a lower temperature than the maximum temperature for the capacitor category.

11) Capacitor Insulation

Insulation of the capacitor's case is not guaranteed. Ensure electrical insulation between the capacitor case, negative electrode, positive electrode and circuit pattern.

12) Capacitor Usage Environment

Do not use/expose capacitors to the following conditions.

- ① Oil, water, salty water, take care to avoid storage in damp locations.
- ② Direct sunlight
- ③ Toxic gases such as hydrogen, sulfide, sulfurous acids, nitrous acids, chlorine and chlorine compounds, bromine and bromine compounds, ammonia, etc.
- ④ Ozone, ultraviolet rays and radiation.

13) Storage

(1) SMD Type

- ① Do not store the Hi-CAP at high temperatures and high humidity. Avoid direct sunlight.
(Recommendable conditions 5 to 35°C, 45 to 75% RH)
- ② To keep good solderability, store the Hi-CAP not more than 6 months after delivery and 30 days after unseal.

	Before unseal	After unseal
A period of storage (SMD)	Within 6 months after delivery (Sealed conditions)	Within 30 days of unseal (Packaged condition with carrier tape)

- ③ The Hi-CAP should not be direct contact with water, salt spray, oil spray or high humidity.
- ④ The Hi-CAP must not be exposed to toxic gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.

(2) LEAD Type

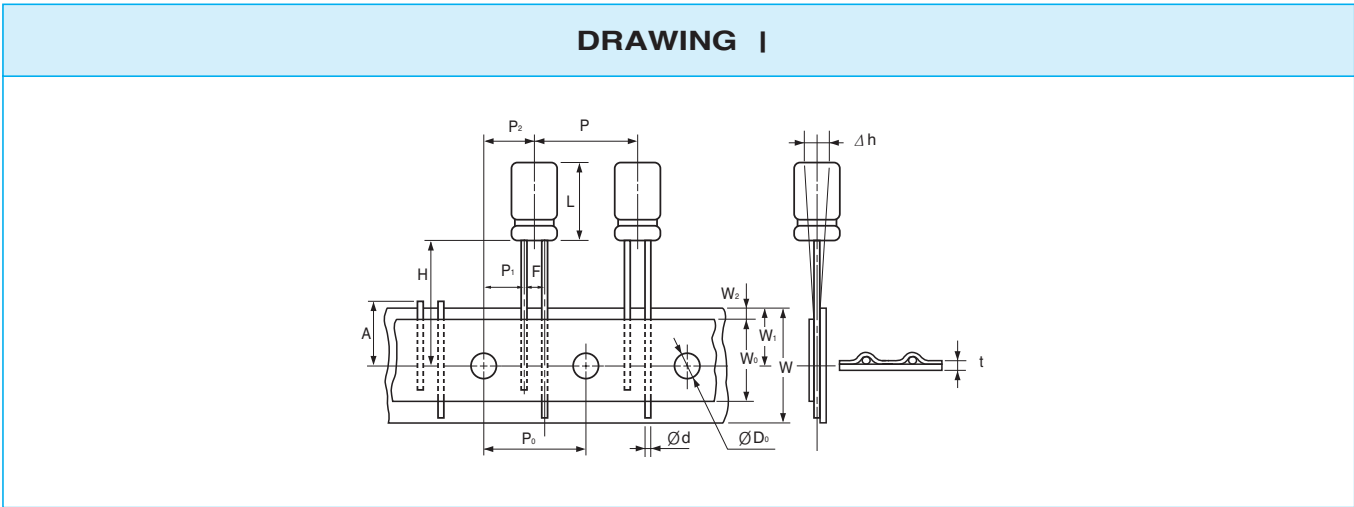
- ① Do not store the Hi-CAP at high temperatures and high humidity. Avoid direct sunlight.
(Recommendable conditions 5 to 35°C, 45 to 75% RH)
- ② To keep good solderability, store the Hi-CAP not more than 1 year after delivery and 7 days after unseal.

	Before unseal	After unseal
A period of storage (LEAD)	Within 1 year after delivery (Sealed conditions)	Within 7 days of unseal

- ③ The Hi-CAP should not be direct contact with water, salt spray, oil spray or high humidity.
- ④ The Hi-CAP must not be exposed to toxic gases such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.

CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

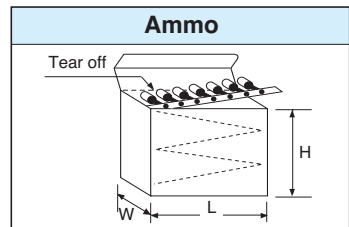
● Taping Specifications for Lead Type Polymer Capacitors



Applicable Drawing No.			I			
Description	Symbol	Tolerance	Ø6.3	Ø8		Ø10
Body Height	L	+1	6, 8	9	12	13
Lead Dia.	Ød	±0.05	0.45	0.60	0.60	0.6
Body Pitch	P	±1.0	12.7			
Feeding Hole Pitch	P ₀	±0.2	12.7			
Feeding Hole Alignment	P ₁	±0.7	5.1			3.85
Feeding Hole Alignment	P ₂	±1.0	6.35			
Lead Center Spacing	F	+0.6/-0.2	2.5	3.5		5.0
Body Inclination	Δh	±2.0	0			
Tape Width	W	±0.5	18.0			
Adhesive Tape Width	W ₀	min.	9.5	12.5		
Feeding Hole Alignment	W ₁	±0.5	9.0			
Adhesive Tape Margin	W ₂	max.	2.0			
Length from Seating Plane	H	±0.5	17.5	20.0		18.5
Feeding Hole Dia.	ØD ₀	±0.2	4.0			
Total Tape Thickness	t	±0.2	0.7			
Cut Lead Height	A	max.	11.0			
Taping Code	Ammo	⊕ leader	PC	PF		PA

● PACKAGING Q'ty(pcs.) / BOX

Size		Ammo			
ØD	Case Height	L	H	W	Q'ty
6.3	6	332	230	42	1500
	8	332	230	49	1500
8	9	332	230	49	1000
	12	332	230	49	1000
10	13	332	190	51	500



● BULK PACKING QUANTITY(PCS) / BOX

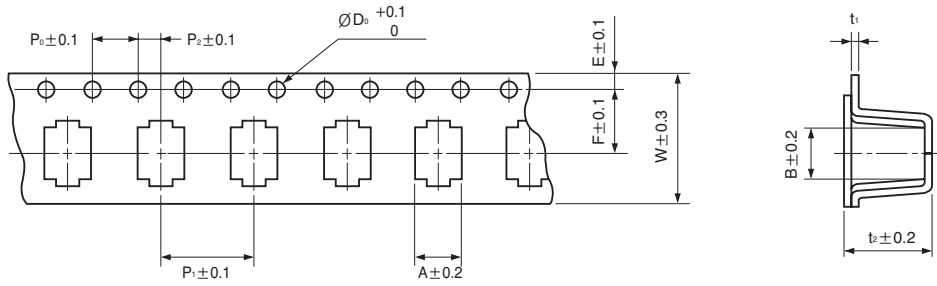
Size		V-BAG	INNER BOX	MIDDLE BOX
D	L			
6.3	6	750	6000	24000
	8	750	6000	24000
8	9	400	2800	11200
	12	400	2800	11200
10	13	250	1500	6000

● CUTTING PACKING QUANTITY(PCS) / BOX

Size		V-BAG	INNER BOX	MIDDLE BOX
D	L			
6.3	6	750	6000	24000
	8	750	6000	24000
8	9	500	4000	16000
	12	400	3200	12800
10	13	250	1500	6000

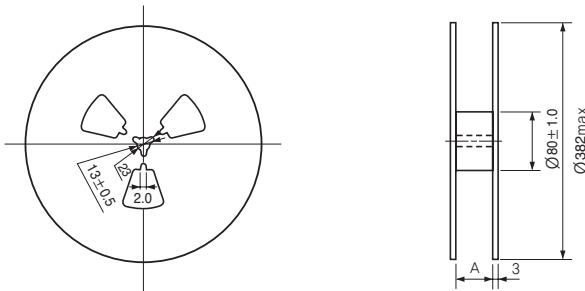
● Taping Specifications for SMD Type Polymer Capacitors (Vertical type)

● Carrier Tape



ØD×L	A	B	ØD ₀	E	F	P ₀	P ₁	P ₂	t ₁	t ₂	W
4×5.4	4.7	4.7	1.5	1.75	5.5	4	8	2	0.4	5.7	12
5×5.9	5.7	5.7	1.5	1.75	7.5	4	8	2	0.4	6.3	16
6.3×4.5	6.9	6.9	1.5	1.75	7.5	4	12	2	0.4	4.7	16
6.3×5.9	7.0	7.0	1.5	1.75	7.5	4	12	2	0.4	6.3	16
8×6.9	8.7	8.7	1.5	1.75	11.5	4	12	2	0.4	7.2	24
8×11.9	8.7	8.7	1.5	1.75	11.5	4	16	2	0.4	12.3	24
10×7.9	10.7	10.7	1.5	1.75	11.5	4	16	2	0.4	8.2	24
10×12.6	10.7	10.7	1.5	1.75	11.5	4	16	2	0.5	13	24

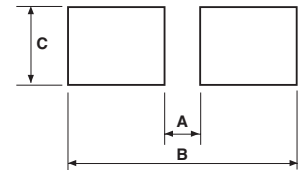
● Reel(Taping Code : VR)



ØD×L	A
4×5.4	13
5×5.9	17
6.3×4.5	17
6.3×5.9	17
8×6.9	25
8×11.9	25
10×7.9	25
10×12.6	25

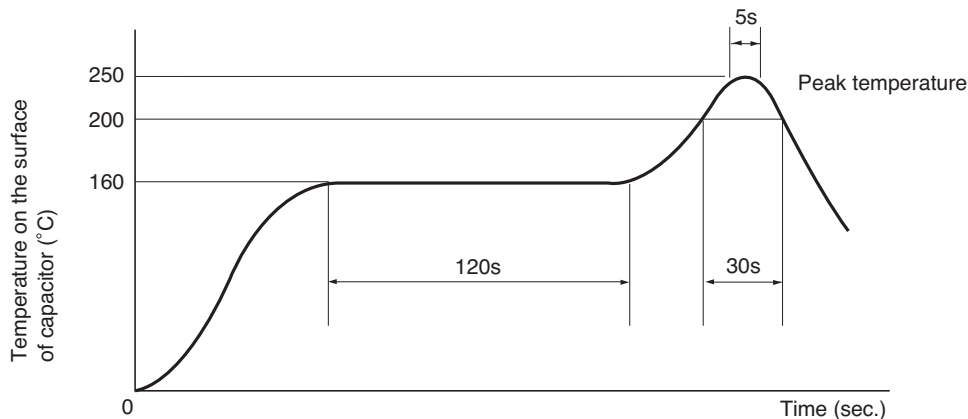
ØD×L	Q'ty/Reel(pcs)	Q'ty/Box(pcs)
4×5.4	2000	20000
5×5.9	1500	15000
6.3×4.5	1000	10000
6.3×5.9	1000	10000
8×6.9	1000	10000
8×11.9	400	4000
10×7.9	500	5000
10×12.6	400	4000

● Recommended Land Size



ØD×L	A	B	C
4×5.4	1.0	6.2	1.6
5×5.9	1.4	7.4	1.6
6.3×4.5	2.1	9.1	1.6
6.3×5.9	2.1	9.1	1.6
8×6.9	2.8	11.1	1.9
8×11.9	2.8	11.1	1.9
10×7.9	4.3	13.1	1.9
10×12.6	4.3	13.1	1.9

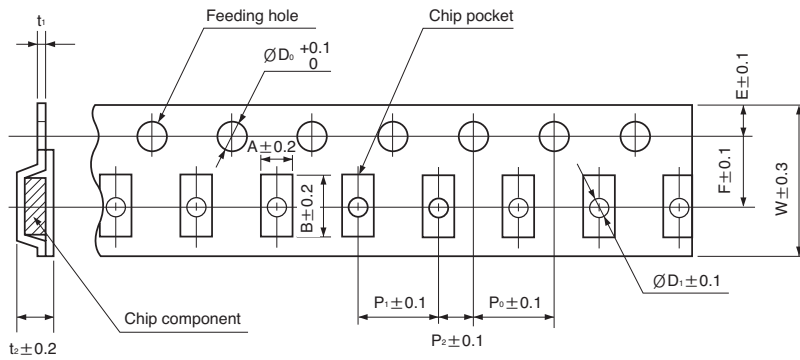
● Recommendable reflow soldering temperature



CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

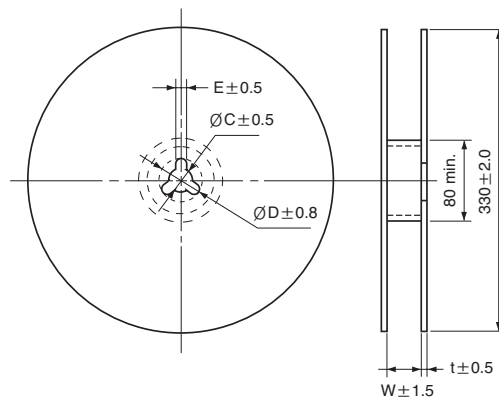
● Taping Specifications for SMD type Polymer Capacitors (Horizontal type)

● Carrier Tape



Size code	A	B	ØD ₀	ØD ₁	E	F	P ₀	P ₁	P ₂	t ₁	t ₂	W
A	4.7	7.7	1.5	1.6	1.75	5.5	4.0	8.0	2.0	0.3	2.2	12.0
C	4.7	7.7	1.5	1.6	1.75	5.5	4.0	8.0	2.0	0.3	3.4	12.0
D	4.7	7.7	1.5	1.6	1.75	5.5	4.0	8.0	2.0	0.3	4.5	12.0

● Packaging Specifications



Size code	Q'ty / Reel
A	3000 pcs.
C	2000 pcs.
D	2000 pcs.

ØC	ØD	E	W	t
13.0	21.0	2.0	14.0	2.0

FA Chip type, With Conductive Polymer Series

Hi-CAP



- Low ESR, high ripple current
- Designed for surface mounting on high density PC board
- Load life for 2000 hours at 105°C
- Complied to the RoHS directive



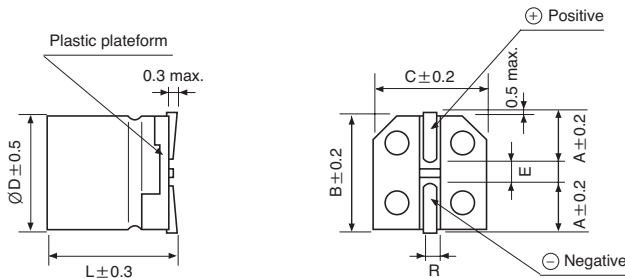
Item	Characteristics	
Operating temperature range	-55 ~ +105°C	
Leakage current max.*	Less than or equal to the value of Table1	
Capacitance tolerance	±20% at 120Hz, 20°C	
Dissipation factor max.	Less than or equal to the value of Table1	
ESR	Less than or equal to the value of Table1	
Temperature characteristics (Impedance ratio at 100kHz)	Z-55°C / Z+20°C	Z+105°C / Z+20°C
	0.75 ~ 1.25	0.75 ~ 1.25
Load life (after application of the rated voltage for 2000 hours at 105°C, In case of 25WV is applied 20V)	Leakage current	Less than specified value
	Capacitance change	Within ±20% of initial value
	tanδ	Less than 150% of specified value
Resistance to soldering heat (Refer to Page 35 for soldering recommendation)	Leakage current	Less than specified value
	Capacitance change	Within ±10% of initial value
	tanδ	Less than 130% of specified value

* In case of some problems for measured values, measure after applying rated voltage for 2.5 to 20V products or 20V derating voltage for 25V products for 120 minutes at 105°C.

DRAWING

Unit : mm

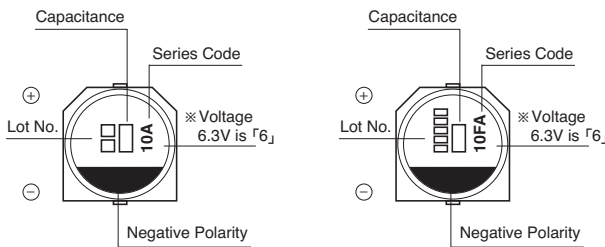
< Dimensions >



PART NUMBER SYSTEM (See Page 52)

Size	ØD	L	B	C	E	A	R
4×5.4	4	5.4	4.3	4.3	1.0	1.9	0.5~0.8
5×5.9	5	5.9	5.3	5.3	1.4	2.2	0.5~0.8
6.3×5.9	6.3	5.9	6.6	6.6	2.2	2.45	0.5~0.8
8×6.9	8	6.9	8.3	8.3	3.2	2.9	0.5~0.8
8×11.9	8	11.9	8.3	8.3	3.2	2.9	0.8~1.1
10×7.9	10	7.9	10.3	10.3	4.6	3.2	0.8~1.1
10×12.6	10	12.6	10.3	10.3	4.6	3.2	0.8~1.1

< Marking >



(Ø4, Ø5)

(Ø6.3, Ø8, Ø10)

Series Code "A"

SOLID TYPES

CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

FA Series

● Table 1. FA(SMD type) Series Characteristics List

WV	μF	ØD(mm)	L(mm)	ESR(mΩ)max. 100~300kHz	Ripple current (mA rms)at 105°C 100kHz	Dissipation factor 120Hz	Leakage Current (μA)(max.) after 2 minutes
2.5	220	6.3	5.9	23	2390	0.12	110
2.5	680	8	11.9	13	4520	0.15	340
2.5	1500	10	12.6	12	5440	0.18	750
4	33	4	5.4	200	740	0.15	66
4	39	5	5.9	70	1100	0.12	78
4	68	5	5.9	60	1400	0.12	136
4	150	6.3	5.9	40	1810	0.12	120
4	150	8	6.9	35	2560	0.12	120
4	330	8	6.9	35	2560	0.12	264
4	560	8	11.9	13	4520	0.15	448
4	680	10	7.9	25	3700	0.12	544
4	1200	10	12.6	12	5440	0.18	960
6.3	22	4	5.4	200	740	0.12	69.3
6.3	47	5	5.9	70	1100	0.12	148
6.3	82	6.3	5.9	45	1700	0.12	103
6.3	100	6.3	5.9	40	1810	0.12	126
6.3	120	6.3	5.9	17	2780	0.12	151
6.3	220	8	6.9	35	2560	0.12	277
6.3	220	10	7.9	25	3700	0.12	277
6.3	330	10	7.9	25	3700	0.12	416
6.3	470	10	7.9	25	3700	0.12	592
6.3	470	8	11.9	15	4210	0.12	592
6.3	820	10	12.6	12	5440	0.15	775
10	4.7	4	5.4	240	670	0.08	23.5
10	6.8	4	5.4	240	670	0.08	34
10	10	4	5.4	220	700	0.09	50
10	15	4	5.4	200	740	0.10	75
10	33	5	5.9	70	1100	0.10	165
10	47	6.3	5.9	50	1620	0.12	94
10	56	6.3	5.9	45	1700	0.12	112
10	120	8	6.9	35	2560	0.12	240
10	150	8	6.9	35	2560	0.12	300
10	150	10	7.9	30	3020	0.12	300
10	270	10	7.9	25	3700	0.12	540
10	330	10	7.9	25	3700	0.12	660
10	330	8	11.9	17	3950	0.15	660
10	560	10	12.6	13	5230	0.15	840
16	3.3	4	5.4	260	660	0.07	26.4
16	15	5	5.9	120	1020	0.10	120
16	22	5	5.9	90	1060	0.10	176
16	39	6.3	5.9	50	1620	0.10	125
16	56	8	6.9	45	1890	0.12	179
16	82	8	6.9	40	2120	0.12	262
16	100	10	7.9	35	2670	0.12	320
16	150	10	7.9	30	3020	0.12	480
16	180	10	7.9	30	3020	0.12	576
16	180	8	11.9	20	3640	0.15	576
16	330	10	12.6	16	4720	0.15	792
20	10	5	5.9	120	1020	0.10	100
20	22	6.3	5.9	60	1450	0.10	88
20	27	6.3	5.9	60	1450	0.10	108
20	33	8	6.9	45	1890	0.12	132
20	47	8	6.9	45	1890	0.12	188
20	56	10	7.9	40	2400	0.12	224
20	68	10	7.9	40	2400	0.12	272
20	100	8	11.9	24	3320	0.15	400
20	150	10	12.6	20	4320	0.15	600
25	6.8	6.3	5.9	80	1200	0.10	85
25	10	8	6.9	60	1500	0.10	125
25	22	10	7.9	50	2000	0.10	275
25	33	8	11.9	30	2980	0.12	413
25	56	10	12.6	28	3800	0.12	700

● FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz	1kHz	10kHz	100 ~ 500kHz
Coefficient	0.05	0.3	0.7	1

FH Chip type, Large Capacitance, Low ESR Series

- Large capacitance, Low ESR than FA Series
- Complied to the RoHS directive

Hi-CAP



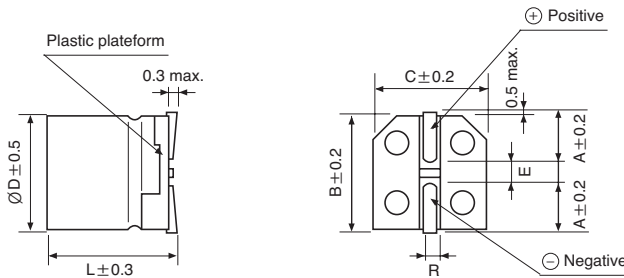
Item	Characteristics	
Operating temperature range	-55 ~ +105°C	
Leakage current max.*	Less than or equal to the value of Table1	
Capacitance tolerance	±20% at 120Hz, 20°C	
Dissipation factor max.	Less than or equal to the value of Table1	
ESR	Less than or equal to the value of Table1	
Temperature characteristics (Impedance ratio at 100kHz)	Z-55°C / Z+20°C	Z+105°C / Z+20°C
	0.75 ~ 1.25	0.75 ~ 1.25
Load life (after application of the rated voltage for 2000 hours at 105°C)	Leakage current	Less than specified value
	Capacitance change	Within ±20% of initial value
	ESR	Less than 150% of specified value
	tanδ	Less than 150% of specified value
Resistance to soldering heat (Refer to Page 35 for soldering recommendation)	Leakage current	Less than specified value
	Capacitance change	Within ±10% of initial value
	tanδ	Less than 130% of specified value

* In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 105°C.

● DRAWING

Unit : mm

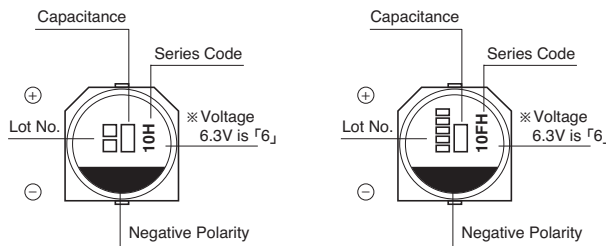
< Dimensions >



● PART NUMBER SYSTEM (See Page 52)

Size	ØD	L	B	C	E	A	R
5×5.9	5	5.9	5.3	5.3	1.4	2.2	0.5~0.8
6.3×5.9	6.3	5.9	6.6	6.6	2.2	2.45	0.5~0.8
8×6.9	8	6.9	8.3	8.3	3.2	2.9	0.5~0.8
8×11.9	8	11.9	8.3	8.3	3.2	2.9	0.8~1.1
10×12.6	10	12.6	10.3	10.3	4.6	3.2	0.8~1.1

< Marking >



(Ø5)

(Ø6.3, Ø8, Ø10)

Series Code "H"

CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

FH Series

● Table 1. FH(SMD type) Series Characteristics List

WV	μF	Size		ESR(mΩ)max. 100kHz~300kHz	Ripple current (mA rms) at 105°C, 100kHz	Dissipation factor at 120Hz (max.)	Leakage Current (μA)
		∅D(mm)	L(mm)				
2.5	180	5	5.9	24	2200	0.12	300
2.5	330	6.3	5.9	15	3160	0.12	500
2.5	390	6.3	5.9	25	2410	0.12	300
2.5	680	8	6.9	20	3370	0.12	500
2.5	820	8	11.9	9	5380	0.15	500
2.5	1500	8	11.9	10	5150	0.15	750
2.5	2700	10	12.6	12	5080	0.15	1350
4	150	5	5.9	23	2240	0.12	300
4	330	6.3	5.9	21	2630	0.12	300
4	560	8	6.9	22	3220	0.12	500
4	560	8	11.9	9	5380	0.15	500
4	1200	8	11.9	12	4700	0.15	960
4	1500	8	11.9	12	4700	0.15	1200
6.3	100	5	5.9	25	2150	0.12	300
6.3	220	6.3	5.9	15	3110	0.12	300
6.3	330	6.3	5.9	17	3390	0.12	416
6.3	390	8	6.9	22	3220	0.12	491
6.3	820	8	11.9	12	4700	0.15	1033
10	68	5	5.9	30	1970	0.12	300
10	120	6.3	5.9	27	2320	0.12	300
10	270	8	6.9	22	3220	0.12	500
16	39	5	5.9	35	1820	0.12	300
16	68	6.3	5.9	30	2200	0.12	300
16	120	8	6.9	27	2900	0.12	500

● FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz	1kHz	10kHz	100~500kHz
Coefficient	0.05	0.3	0.7	1

FT Chip type, Guaranteed at 125°C Series

- The FT Series is very reliable, guaranteeing performance
- Suitable for use in smoothing circuits of vehicle-mounted equipment, industrial equipment, etc
- Complied to the RoHS directive

Hi-CAP

FA → FT
High Temp.

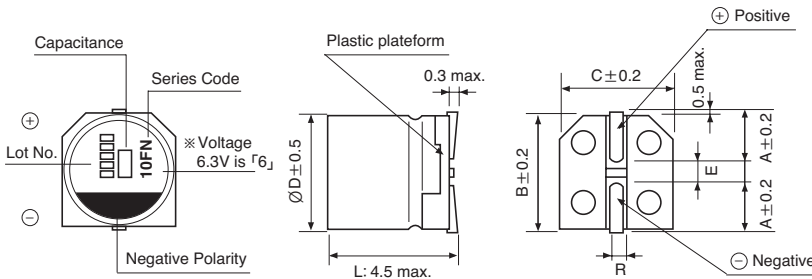


Item	Characteristics	
Operating temperature range	-55 ~ +125°C	
Leakage current max.*	Less than or equal to the value of Table1	
Capacitance tolerance	±20% at 120Hz, 20°C	
Dissipation factor max.	Less than or equal to the value of Table1	
ESR	Less than or equal to the value of Table1	
Temperature characteristics (Impedance ratio at 100kHz)	Z-55°C / Z+20°C	Z+125°C / Z+20°C
	0.75 ~ 1.25	0.75 ~ 1.25
Load life (after application of the rated voltage for 2000 hours at 125°C)	Leakage current	Less than specified value
	Capacitance change	Within ±20% of initial value
	ESR	Less than 200% of specified value
	tanδ	Less than 200% of specified value
Resistance to soldering heat (Refer to Page 35 for soldering recommendation)	Leakage current	Less than specified value
	Capacitance change	Within ±10% of initial value
	tanδ	Less than 130% of specified value

* In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 125°C.

DRAWING

Unit : mm



PART NUMBER SYSTEM (See Page 52)

Size	∅D	L	B	C	E	A	R
6.3×5.9	6.3	5.9	6.6	6.6	2.2	2.45	0.5~0.8
8×6.9	8	6.9	8.3	8.3	3.2	2.9	0.5~0.8
8×11.9	8	11.9	8.3	8.3	3.2	2.9	0.8~1.1
10×7.9	10	7.9	10.3	10.3	4.6	3.2	0.8~1.1
10×12.6	10	12.6	10.3	10.3	4.6	3.2	0.8~1.1

Table 1. FT(SMD type) Series Characteristics List

WV	μF	∅D (mm)	L(mm)	ESR(mΩ)max. 100~300kHz	Rated ripple current (100kHz)(mArms) 105°C < Tx ≤ 125°C	Allowable ripple current (100kHz)(mArms) Tx ≤ 105°C	Dissipation factor 120Hz	Leakage Current (μA)(max.) after 2 minutes
10	56	6.3	5.9	45	538	1700	0.12	112
16	82	8	6.9	40	670	2120	0.12	262
25	10	6.3	5.9	65	474	1500	0.10	50
25	22	8	6.9	48	580	1835	0.10	110
25	39	10	7.9	45	664	2100	0.10	195
25	47	8	11.9	30	943	2980	0.12	235
25	82	10	12.6	28	1202	3800	0.12	410
35	8.2	8	6.9	70	400	1300	0.10	57
35	18	10	7.9	60	550	1800	0.10	126
35	22	8	11.9	50	700	2300	0.12	154
35	47	10	12.6	30	1150	3650	0.12	329

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz	1kHz	10kHz	100~500kHz
Coefficient	0.05	0.3	0.7	1

CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

FZ Chip type, Guaranteed at 105°C 5000 hours Series

Hi-CAP

- Series has long life time than the FA Series
- Suitable for use in flat panel TV set and the others industrial equipments, etc
- Complied to the RoHS directive

FA \rightleftarrows FZ
Long life



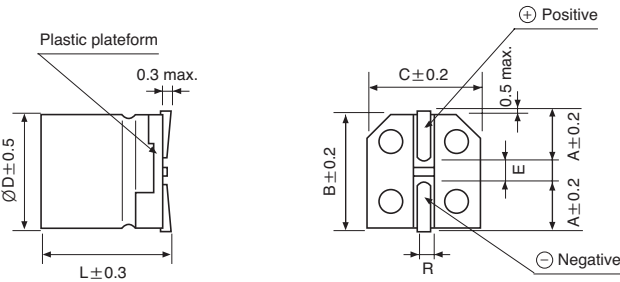
Item	Characteristics	
Operating temperature range	-55 ~ +105°C	
Leakage current max.*	Less than or equal to the value of Table1	
Capacitance tolerance	±20% at 120Hz, 20°C	
Dissipation factor max.	Less than or equal to the value of Table1	
ESR	Less than or equal to the value of Table1	
Temperature characteristics (Impedance ratio at 100kHz)	Z-55°C / Z+20°C	Z+105°C / Z+20°C
	0.75 ~ 1.25	0.75 ~ 1.25
Load life (after application of the rated voltage for 5000 hours at 105°C)	Leakage current	Less than specified value
	Capacitance change	Within ±20% of initial value
	ESR	Less than 200% of specified value
	tanδ	Less than 200% of specified value
Resistance to soldering heat (Refer to page 35 for soldering recommendation)	Leakage current	Less than specified value
	Capacitance change	Within ±10% of initial value
	tanδ	Less than 130% of specified value

* In case of some problems for measured values, measure after applying rated voltage for 4 to 20V products or 20V derating voltage for 25V products for 120 minutes at 105°C.

DRAWING

Unit : mm

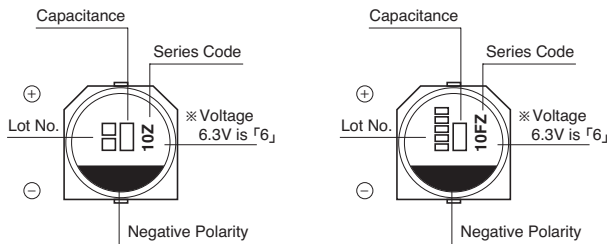
< Dimensions >



PART NUMBER SYSTEM (See Page 52)

Size	ØD	L	B	C	E	A	R
4×5.4	4	5.4	4.3	4.3	1.0	1.9	0.5~0.8
5×5.9	5	5.9	5.3	5.3	1.4	2.2	0.5~0.8
6.3×5.9	6.3	5.9	6.6	6.6	2.2	2.45	0.5~0.8
8×6.9	8	6.9	8.3	8.3	3.2	2.9	0.5~0.8
10×7.9	10	7.9	10.3	10.3	4.6	3.2	0.8~1.1

< Marking >



(Ø4, Ø5)

(Ø6.3, Ø8, Ø10)

Series Code "Z"

FZ Series

● Table 1. FZ(SMD type) Series Characteristics List

WV	μF	∅D(mm)	L(mm)	ESR(mΩ)max. 100~300kHz	Ripple current (mA rms)at 105°C 100kHz	Dissipation factor 120Hz	Leakage Current (μA)(max.) after 2 minutes
4	33	4	5.4	200	740	0.15	66
4	68	5	5.9	30	1970	0.12	300
4	150	6.3	5.9	22	2570	0.12	300
4	270	8	6.9	22	3220	0.12	500
4	680	10	7.9	20	4130	0.12	544
6.3	22	4	5.4	200	740	0.12	69.3
6.3	47	5	5.9	30	1970	0.12	300
6.3	120	6.3	5.9	22	2570	0.12	300
6.3	220	8	6.9	22	3220	0.12	500
6.3	470	10	7.9	20	4130	0.12	592
10	10	4	5.4	220	700	0.1	50
10	15	4	5.4	200	740	0.1	75
10	33	5	5.9	70	1100	0.12	165
10	68	6.3	5.9	30	2200	0.12	300
10	150	8	6.9	30	2760	0.12	500
10	150	10	7.9	30	3020	0.12	300
10	330	10	7.9	24	3770	0.12	660
16	22	5	5.9	90	1060	0.1	176
16	39	6.3	5.9	24	2460	0.12	300
16	82	8	6.9	30	2760	0.12	262
16	100	10	7.9	35	2670	0.12	320
16	180	10	7.9	29	3430	0.12	576
20	22	6.3	5.9	60	1450	0.1	88
20	47	8	6.9	45	1890	0.12	188
25	10	8	6.9	60	1500	0.1	125

SOLID TYPES

● FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz	1kHz	10kHz	100~500kHz
Coefficient	0.05	0.3	0.7	1

CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

FN Chip type, Height 4.5mmL Series

Hi-CAP



- Low ESR, high ripple current
- Designed for surface mounting on Notebook PC
- Complied to the RoHS directive

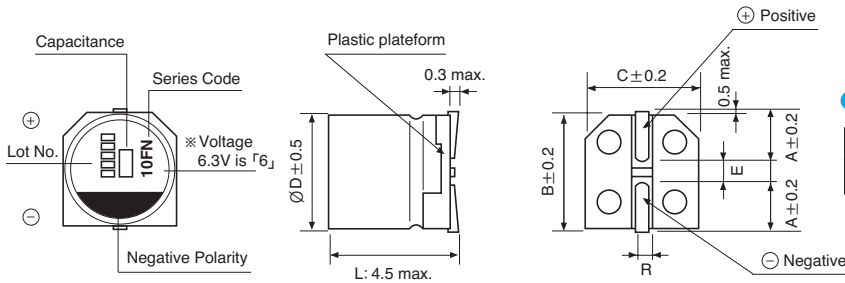


Item	Characteristics	
Operating temperature range	-55 ~ +105°C	
Leakage current max.*	Less than or equal to the value of Table1	
Capacitance tolerance	±20% at 120Hz, 20°C	
Dissipation factor max.	Less than or equal to the value of Table1	
ESR	Less than or equal to the value of Table1	
Temperature characteristics (Impedance ratio at 100kHz)	Z-55°C / Z+20°C	Z+105°C / Z+20°C
	0.75 ~ 1.25	0.75 ~ 1.25
Load life (after application of the rated voltage for 1000 hours at 105°C. In case 25WV is applied 20V)	Leakage current	Less than specified value
	Capacitance change	Within ±20% of initial value
	ESR	Less than 150% of specified value
	tanδ	Less than 150% of specified value
Resistance to soldering heat (Refer to Page 35 for soldering recommendation)	Leakage current	Less than specified value
	Capacitance change	Within ±10% of initial value
	tanδ	Less than 130% of specified value

* In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 105°C.

DRAWING

Unit : mm



PART NUMBER SYSTEM (See Page 52)

Size	ØD	L	B	C	E	A	R
6.3×4.5	6.3	4.5	6.6	6.6	2.2	2.45	0.5~0.8

Table 1. FN(SMD type) Series Characteristics List

WV	µF	ØD (mm)	L (mm)	ESR(mΩ)max. 100~300kHz	Ripple current (mA rms) at 105°C 100kHz	Dissipation factor 120Hz	Leakage Current (µA)(max.) after 2 minutes
2.5	150	6.3	4.5	38	1710	0.12	188
4	120	6.3	4.5	38	1710	0.12	240
6.3	100	6.3	4.5	40	1670	0.12	315
10	47	6.3	4.5	41	1560	0.12	235
16	22	6.3	4.5	45	1490	0.12	176
20	15	6.3	4.5	55	1650	0.12	150
25	15	6.3	4.5	55	1650	0.12	188

FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

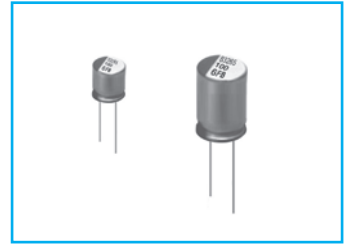
Frequency	120Hz	1kHz	10kHz	100~500kHz
Coefficient	0.05	0.3	0.7	1

FB Lead type, With Conductive Polymer Series

- Low ESR, high ripple current
- Load life for 2000 hours at 105°C
- Complied to the RoHS directive

Hi-CAP

FB \Rightarrow **FJ**
Low ESR
High Cap.

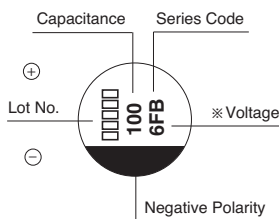
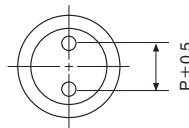
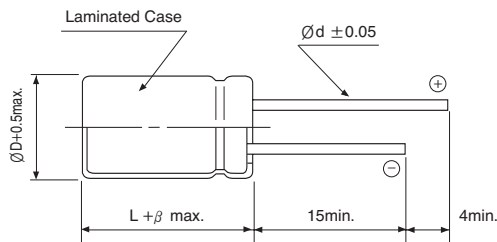


Item	Characteristics	
Operating temperature range	-55 ~ +105°C	
Leakage current max.*	Less than or equal to the value of Table1	
Capacitance tolerance	±20% at 120Hz, 20°C	
Dissipation factor max.	Less than or equal to the value of Table1	
ESR	Less than or equal to the value of Table1	
Temperature characteristics (Impedance ratio at 100kHz)	Z-55°C / Z+20°C	Z+105°C / Z+20°C
	0.75 ~ 1.25	0.75 ~ 1.25
Load life (after application of the rated voltage for 2000 hours at 105°C, In case of 25WV is applied 20V)	Leakage current	Less than specified value
	Capacitance change	Within ±20% of initial value
	tanδ	Less than 150% of specified value

* In case of some problems for measured values, measure the after applying rated voltage for 2.5 to 20V products or 20V derating voltage for 25V products for 120 minutes at 105°C.

DRAWING

Unit : mm



PART NUMBER SYSTEM (See Page 52)

Size	ØD	L	P	Ød	β
6.3×6	6.3	6.0	2.5	0.45	0.5
6.3×8	6.3	8.0	2.5	0.45	0.5
8×9	8.0	9.0	3.5	0.60	0.5
8×12	8.0	12.0	3.5	0.60	0.5
10×13	10.0	13.0	5.0	0.60	0.5

CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

FB Series

● Table 1. FB(Lead type) Series Characteristics List

WV	μF	∅D(mm)	L(mm)	ESR(mΩ)max. 100~300kHz	Ripple current (mA rms)at 105°C 100kHz	Dissipation factor 120Hz	Leakage Current (μA)(max.) after 2 minutes
2.5	390	6.3	8	20	3160	0.10	195
2.5	560	8	9	7	6100	0.10	280
2.5	680	8	9	7	6100	0.10	340
2.5	820	8	9	7	6100	0.10	410
2.5	1000	8	9	7	6100	0.10	500
2.5	1500	8	12	8	5500	0.10	750
2.5	2700	10	13	8	5560	0.10	1350
2.5	3300	10	13	8	6650	0.10	1650
4	100	6.3	6	40	1810	0.10	80
4	150	6.3	6	40	1810	0.10	120
4	220	6.3	8	35	2560	0.10	176
4	270	6.3	8	20	3160	0.10	216
4	330	6.3	8	24	3300	0.10	264
4	390	6.3	8	24	3300	0.10	312
4	470	8	9	8	5700	0.10	376
4	560	8	9	7	6100	0.10	448
4	680	8	9	7	6100	0.10	544
4	1200	8	12	8	5700	0.10	960
6.3	82	6.3	6	45	1700	0.10	103
6.3	150	6.3	8	35	2560	0.10	189
6.3	220	6.3	8	20	3160	0.10	277
6.3	330	8	9	28	3190	0.10	416
6.3	470	8	9	8	5700	0.10	592
6.3	680	8	9	7	6640	0.10	857
6.3	820	8	12	7	6640	0.10	1033
6.3	1000	8	12	8	6100	0.10	1260
6.3	1200	10	13	10	5560	0.10	1520
6.3	1500	10	13	10	5560	0.10	1890
10	47	6.3	6	25	2820	0.10	94
10	56	6.3	6	25	2820	0.10	112
10	68	6.3	6	25	2820	0.10	136
10	100	6.3	8	25	2820	0.10	200
10	120	6.3	8	35	2560	0.10	240
10	150	6.3	8	25	2820	0.10	300
10	270	8	12	9	4710	0.10	540
10	330	8	12	9	4710	0.10	660
10	390	8	12	9	5650	0.10	780
10	470	8	12	8	5650	0.10	940
10	560	10	13	8	5650	0.10	1120
10	680	10	13	7	6100	0.10	1360
16	39	6.3	6	50	1620	0.10	124
16	82	6.3	8	25	2120	0.10	262
16	100	6.3	8	25	2820	0.10	320
16	180	8	12	16	4360	0.10	576
16	270	8	12	11	5000	0.10	864
16	330	10	13	10	6100	0.10	1056
16	470	10	13	10	6100	0.10	1504
20	22	6.3	6	60	1450	0.12	88
20	47	6.3	8	25	2820	0.12	188
20	56	6.3	8	25	2820	0.12	224
20	68	6.3	8	25	2820	0.12	272
20	100	8	12	24	3320	0.12	400
20	150	10	13	20	4320	0.12	600
25	6.8	6.3	6	80	1200	0.12	85
25	10	6.3	8	60	1500	0.12	125
25	18	6.3	8	40	2230	0.12	225
25	22	8	12	40	2230	0.12	275
25	33	8	12	30	2980	0.12	413
25	56	8	12	30	3800	0.12	700
25	68	8	12	25	3320	0.12	850
25	100	8	12	20	4320	0.12	1250

● FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT (See Page 48)

CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

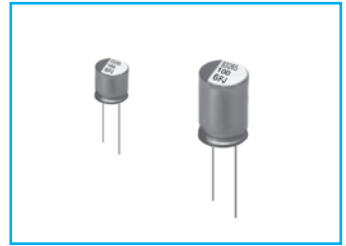


Upgrade

FJ

Lead type, With Conductive Polymer Series

Hi-CAP



- Low ESR, high ripple current
- Load life for 2000 hours at 105°C
- Complied to the RoHS directive

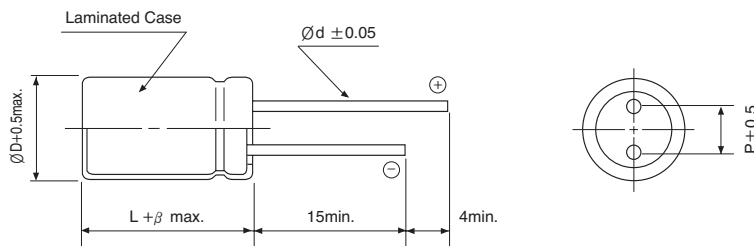
FB → **FJ**
Low ESR
High Cap.

Item	Characteristics	
Operating temperature range	-55 ~ +105°C	
Leakage current max.*	Less than or equal to the value of Table 1	
Capacitance tolerance	±20% at 120Hz, 20°C	
Dissipation factor max.	Less than or equal to the value of Table 1	
ESR	Less than or equal to the value of Table 1	
Temperature characteristics (Impedance ratio at 100kHz)	Z-55°C / Z+20°C	Z+105°C / Z+20°C
	0.75 ~ 1.25	0.75 ~ 1.25
Load life (after application of the rated voltage for 2000 hours at 105°C)	Leakage current	Less than specified value
	Capacitance change	Within ±20% of initial value
	ESR	Less than 150% of specified value
	tanδ	Less than 150% of specified value

* In case of some problems for measured values, measure after applying rated voltage for 120 minutes at 105°C.

● DRAWING

Unit : mm



● PART NUMBER SYSTEM (See Page 52)

Size	ØD	L	P	Ød	β
5×8	5.0	8.0	2.0	0.45	0.7
6.3×8	6.3	8.0	2.5	0.45	0.5
8×9	8.0	9.0	3.5	0.60	0.5
8×12	8.0	12.0	3.5	0.60	0.5
10×13	10.0	13.0	5.0	0.60	0.5



(Ø6.3, Ø8, Ø10)

(Ø5)

Series Code "J"

SOLID TYPES

CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

FJ Series

● Table 1. FJ(Lead type) Series Characteristics List

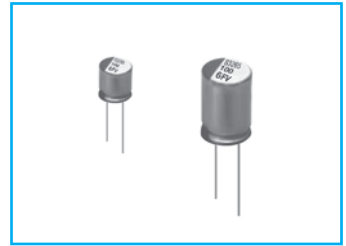
WV	μF	∅D(mm)	L(mm)	ESR(mΩ)max. 100~300kHz	Ripple current (mA rms) at 105°C 100kHz	Dissipation factor 120Hz	Leakage Current (μA)(max.) after 2 minutes
2.5	330	6.3	8	7	5600	0.10	500
2.5	560	6.3	8	7	5600	0.10	500
2.5	560	8	9	8	4700	0.10	280
2.5	820	6.3	8	7	5600	0.10	513
2.5	820	8	9	5	7200	0.10	500
2.5	820	8	12	5	7200	0.10	500
2.5	1000	8	9	7	6100	0.10	500
2.5	2700	10	13	10	5560	0.10	1350
4	560	6.3	8	7	5600	0.10	560
4	560	8	9	5	7200	0.10	500
4	560	8	12	5	7200	0.10	500
4	680	8	12	5	7200	0.10	544
4	820	10	13	7	6640	0.10	656
6.3	270	5	8	7	3700	0.10	500
6.3	330	5	8	7	3700	0.10	416
6.3	390	5	8	11	3100	0.10	130
6.3	470	8	9	8	5700	0.10	592
6.3	470	8	12	8	5700	0.10	592
6.3	560	8	9	7	6100	0.10	706
6.3	680	10	13	7	6640	0.10	857
6.3	1500	10	13	10	5560	0.10	1890
16	100	6.3	8	10	4680	0.10	500
16	180	8	12	16	4360	0.10	576
16	270	8	12	11	5000	0.10	864
16	470	10	13	10	6100	0.10	1504

● FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz	1kHz	10kHz	100~500kHz
Coefficient	0.05	0.3	0.7	1

Upgrade
FV Lead type, With Conductive Polymer Series

Hi-CAP



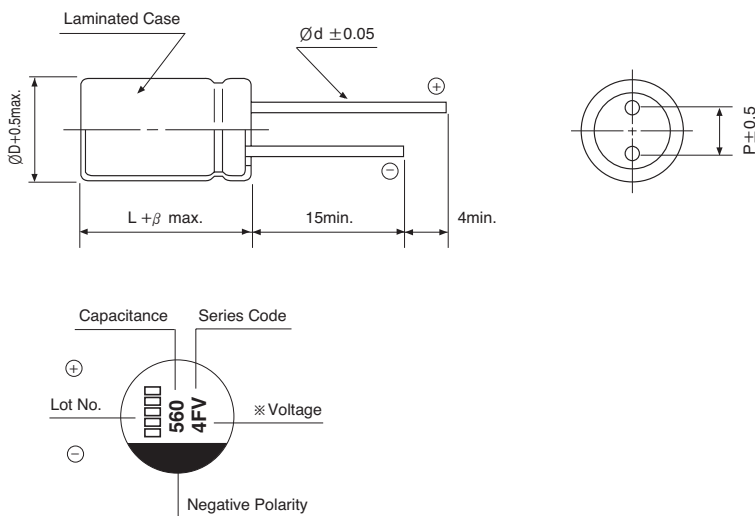
- Load life for 5000 hours at 105°C
- Mother board and VGA card for computer

FB → **FV**
 Long life

Item	Characteristics	
Operating temperature range	-55 ~ +105°C	
Leakage current max.*	Less than or equal to the value of Table1	
Capacitance tolerance	±20% at 120Hz, 20°C	
Dissipation factor max.	Less than or equal to the value of Table1	
ESR	Less than or equal to the value of Table1	
Temperature characteristics (Impedance ratio at 100kHz)	Z-55°C / Z+20°C	Z+105°C / Z+20°C
	0.75 ~ 1.25	0.75 ~ 1.25
Load life (after application of the rated voltage for 5000 hours at 105°C)	Leakage current	Less than specified value
	Capacitance change	Within ±20% of initial value
	ESR	Less than 150% of specified value
	tanδ	Less than 150% of specified value

● DRAWING

Unit : mm



● PART NUMBER SYSTEM (See Page 52)

Size	ØD	L	P	Ød	β
6.3×8	6.3	8.0	2.5	0.45	0.5
8×9	8.0	9.0	3.5	0.60	0.5
8×12	8.0	12.0	3.5	0.60	0.5

● Table 1. FV(Lead type) Series Characteristics List

WV	μF	ØD(mm)	L(mm)	ESR(mΩ)max. 100~300kHz	Ripple current (mA rms) at 105°C 100kHz	Dissipation factor 120Hz	Leakage Current (μA) (max.) after 2 minutes
2.5	820	6.3	8	7	5000	0.10	500
		8	9	7	6100	0.10	410
4	560	6.3	8	7	5000	0.10	500
		6.3	8	8	4700	0.10	592
6.3	560	6.3	8	8	4700	0.10	706
		8	9	8	6100	0.10	706
16	100	6.3	8	25	2820	0.10	320
	270	8	12	11	5000	0.10	864

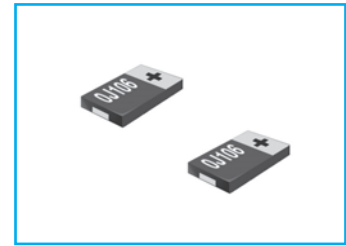
● FREQUENCY COEFFICIENT OF PERMISSIBLE RIPPLE CURRENT

Frequency	120Hz	1kHz	10kHz	100~500kHz
Coefficient	0.05	0.3	0.7	1

CONDUCTIVE POLYMER ALUMINUM ELECTROLYTIC CAPACITORS

FC Chip type, With Conductive Polymer Series

Hi-CAP

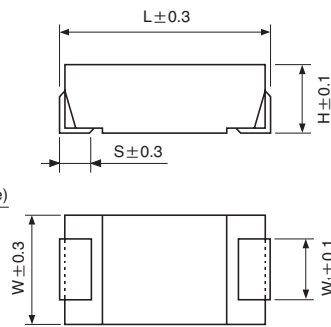
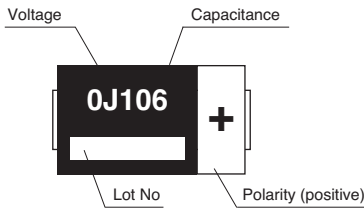


- Low ESR, high ripple current
- Excellent noise-absorbent characteristics
- Very stable capacitance, impedance and ESR against temperature
- Designed for use smoothing circuit of power supplies and noise limiter
- Complied to the RoHS directive

Item	Characteristics			
Operating temperature range	-40 ~ +105°C			
Leakage current max.	I = 0.04CV or 3μA whichever is greater (after 2 minutes)			
Capacitance tolerance	±20% at 120Hz, 20°C			
Dissipation factor max.	0.06 max. at 120Hz, 20°C			
ESR	ESR at 20°C 100kHz, as per table below			
Load life (after application of the rated voltage for 1000 hours at 105°C)	Leakage current	Less than specified value		
	Capacitance change	Within ±20% of initial value		
	tanδ	Less than 150% of specified value		
Moisture resistance (after leaving capacitors under no load at 60°C for 500 hours 90% R.H.)	Leakage current	Less than 300% of specified value		
	Capacitance change of Initial value	2, 2.5V.DC +70, -20%	4V.DC +60, -20%	6.3V.DC +50, -20%
	tanδ	Less than 150% of specified value		

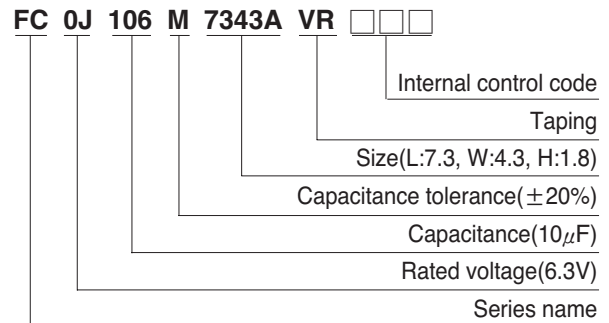
DRAWING

Unit : mm



Size Code	L	W	W ₁	H	S
A	7.3	4.3	2.4	1.8	1.3
C	7.3	4.3	2.4	2.8	1.3
D	7.3	4.3	2.4	4.2	1.3

PART NUMBER SYSTEM (See page 52)
(Example : 6.3V 10μF)



DIMENSIONS & MAXIMUM PERMISSIBLE RIPPLE CURRENT

μF \ WV	2			2.5			4			6.3			8			12.5			16			
	WV	Cap	ESR	WV	Cap	ESR	WV	Cap	ESR	WV	Cap	ESR	WV	Cap	ESR	WV	Cap	ESR	WV	Cap	ESR	
2.2																						
4.7																	80	1000	A	80	1000	A
6.8																				70	1000	A
8.2																				45	1300	A
10										55	1400	A					60	1000	A			
15										55	1400	A					50	1300	A			
22					55	1400	A			40	1600	A	28	2000	A	30	1600	A				
33		55	1400	A				40	1600	A	28	2000	A	18	2500	A						
47					40	1600	A			28	2000	A	18	2500	A							
56		40	1600	A																		
68					28	2000	A	18	2500	A												
82		28	2000	A	18	2500	A															
100		18	2500	A						10	3500	C	18	2500	D							
120																						
150								10	3500	C	10	3500	D	15	3000	D						
180								7	3700	D	7	3700	D									
220		10	3500	C	10	3500	C	7	3700	D												
330		10	3500	C	7	3700	D															
390		7	3700	D	7	3700	D															
470		7	3700	D																		

↑ Size code
 ↑ Ripple current (mA rms) at 105°C, 100kHz
 ↑ ESR (mΩ) max. at 20°C, 100kHz