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LIST OF THE PRODUCTS

Series		Applications	Temperature Range (°C)	Endurance (Hours)	Rated Voltage Range (V)	Capacitance Range (μF)	Page
Chip Type Aluminum Electrolytic Capacitors	RV	Large Capacitance Range	-40 to +85	2000	6.3 ~ 100	10 ~ 1000	16
	RV2	5.3 mmL Standard	-40 to +85	2000	4 ~ 50	0.22 ~ 220	17
	RV3	5.3mm / 7.7 mmL High C/V	-40 to +85	2000	6.3 ~ 50	4.7 ~ 330	18
	RV5	High C/V	-40 to +85	2000	6.3 ~ 100	1 ~ 2200	19
	RVT	105°C 5.4 mmL Standard	-55 to +105	1000~2000	6.3 ~ 100	1 ~ 1500	21
	RVZ	105°C, Low Impedance	-55 to +105	1000~2000	6.3 ~ 35	4.7 ~ 1500	23
	RVD	105°C, Low Impedance, Long Life	-55 to +105	2000 ~5000	6.3 ~ 100	4.7 ~ 1500	25
	RZD	105°C, Low Impedance, Miniaturized	-55 to +105	2000	6.3 ~ 50	47 ~ 2200	27
	VZH	105°C, Low Impedance, High C/V	-55 to +105	2000 ~5000	6.3 ~ 100	1 ~ 4700	29
Conductive Polymer	GPT	105°C Radial Lead Standard	-55 to +105	5000	2.5 ~ 25	10 ~ 2200	34
	GPV	105°C Radial Lead High C/V Miniaturized	-55 to +105	2000	25 ~ 35	47 ~ 1000	36
	GPL	125°C Radial Lead Standard	-55 to +125	2000	16 ~ 160	6.8 ~ 2500	38
Electric Double Layer Capacitors	DB	5.5V Standard Type	-25 to +70	1000	5.5	0.047 ~ 1.5	44
	DX	5.5V Miniaturized Standard Type	-25 to +70	1000	5.5	0.047 ~ 1.5	45
	DSK	Reflow Soldering Coin Cell Type	-10 to +60	500 ~1000	3.3	0.2 / 0.33	46
	PL	Radial Type SuperCap	-40 to +85 -40 to +65	1000	2.3 2.7	0.5 ~ 100	47
	NL	Snap in Type SuperCap	-40 to +85 -40 to +65	1000	2.3 3.0	100 ~ 400	49
	PV	Radial Type, High Voltage	-40 to +85 -40 to +65	1000	2.7 3.0	0.5 ~ 100	50
	NV	Snap in Type, High Voltage	-40 to +85 -40 to +65	1000	2.7 3.0	150 ~ 400	52

PART NUMBER SYSTEM

■ Chip type Aluminum Electrolytic Capacitors

□□□—□□□□ □ □□□ V □□□□ □ —U

Series code | Rated Capacitance symbol | Capacitance tolerance symbol | Rated voltage symbol | Dimension (Diameter x Length) | Additional symbol

Capacitance (uF)	Symbol
1	1
10	10
2.2	2.2
33	33
100	100
1000	1000

Rated voltage (V)	Symbol
16	16
25	25
50	50
100	100

Tolerance on Capacitance	Symbol
±10%	K
±20%	M

φD×L	Symbol
4×5.3	0453
6.3×7.7	6377
10×10.5	1010

■ Radial type Conductive Polymer Aluminum Solid Capacitors

□□□—□□□□ □ □□□ V □□□□ □

Series code | Rated Capacitance symbol | Capacitance tolerance symbol | Rated voltage symbol | Dimension (Diameter x Length) | Additional symbol

Capacitance (uF)	Symbol
6.8	6.8
10	10
22	22
150	150
470	470
1000	1000

Rated voltage (V)	Symbol
16	16
25	25
50	50
100	100

Tolerance on Capacitance	Symbol
±10%	K
±20%	M

φD×L	Symbol
6.3×8	6308
8×8	0808
10×12	1012

PART NUMBER SYSTEM

■ Electric Double Layer Capacitor for "DYNACAP"

□□□—□□□ □ □□□ □ — □□□

Series code | Rated voltage symbol | Terminal code | Rated capacitance symbol | Additional symbol | Taping, Lead-forming

D Type	D
H Type	H
V Type	V
E Type	E

Voltage (V)	Symbol
3.3	3R3
5.5	5R5

Capacitance (F)	Symbol
0.047	473
0.1	104
0.2	204
0.22	224
0.33	334
1	105

■ Electric Double Layer Capacitor for "SUPERCAP"

□□□—□□□ F □□□ V □□□□

Series code | Rated capacitance symbol | Rated voltage symbol | Dimension (Diameter x Length)

Voltage (V)	Symbol
2.7	2.7
5.4	5.4

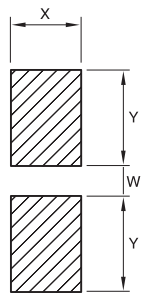
Capacitance (F)	Symbol
0.5	0.5
1	1
3.3	3.3
10	10
100	100

φD×L	Symbol
8×12	0812
10×30	1030
12.5x31.5	1332
16x31.5	1632
25×50	2550

SOLDERING CONDITIONS FOR CHIP TYPE

■ Recommended land pattern and size

● Standard type



Unit : mm

Case Size ø D × L	Land Size			Thickness of Solder paste
	X	Y	W	
4×5.3, 5.8	1.6	2.6	1.0	0.15
5×5.3, 5.8	1.6	3.0	1.4	0.15
6.3×5.3, 5.8	1.6	3.6	1.9	0.15
6.3×7.7	1.6	3.6	1.9	0.15
8×6.5	1.6	4.0	2.1	0.15
8×10, 10.5	2.5	3.5	3.0	0.15
10×10, 10.5	2.5	4.0	4.0	0.15
12.5×13.5	3.2	6.0	4.0	0.15

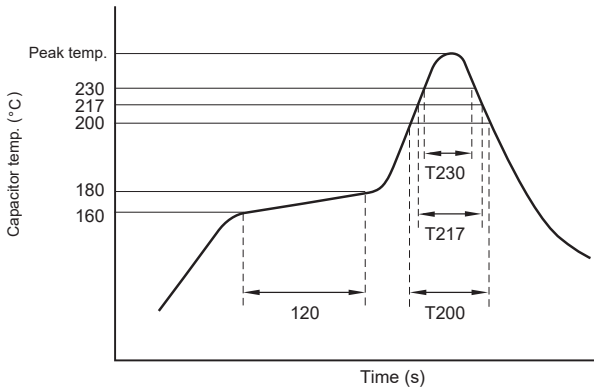
■ Recommended soldering conditions

● Standard type (Lead free)

(1) Soldering iron conditions
Iron tip temperature shall be 400°C ± 5°C within the duration of 3+1 0 seconds.

(2) Reflow soldering conditions

Profile



1. Preheating shall be under 180°C within 120 seconds.
2. Peak temperature shall be within the following table.
3. For conditions exceeding the tolerances, consult with us.

T200 : Duration while capacitor head temperature exceeds 200°C (s)
T217 : Duration while capacitor head temperature exceeds 217°C (s)
T230 : Duration while capacitor head temperature exceeds 230°C (s)
The measurement temperature point is the case top.

● Chip type Aluminum Electrolytic Capacitors

Series	Size	Peak temp. (5sec or less)	T230	T217	T200	Reflow cycle
RV2, RV3, RV5, RV, RVZ, RVD, RZD, RVT, VZH	ø4 to ø6.3	250°C Max.	40 sec. max.	50 sec. max.	60 sec. max.	2 times or less
	ø8 to ø10	240°C Max.	40 sec. max.	50 sec. max.	60 sec. max.	2 times or less
	ø12.5	240°C Max.	20 sec. max.	30 sec. max.	50 sec. max.	2 times or less

* Please ensure that the capacitor became cold enough to the room temperature (5 to 35°C) before the second reflow.

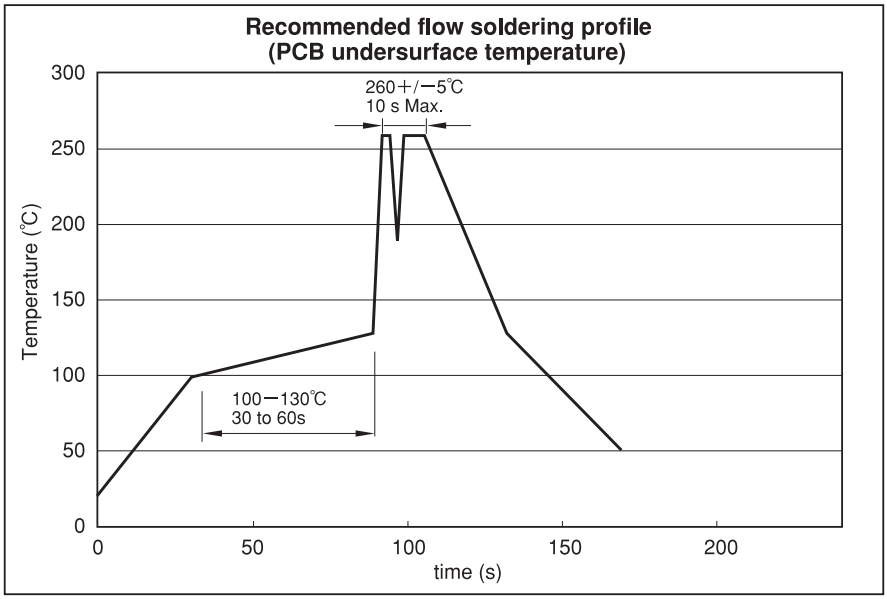
SOLDERING CONDITIONS FOR CONDUCTIVE POLYMER

■ Recommended soldering conditions (Lead free)

● Conductive Polymer Aluminum Solid Capacitors (Lead terminal type)

(1) Soldering iron conditions
Iron tip temperature shall be 400°C ± 5°C within the duration of 3[*1] seconds.

(2) Flow soldering conditions
The recommendation soldering conditions of the product in which flow soldering is possible are as graph.



Caution for Using Aluminum Electrolytic Capacitors

(1) Do not dip the capacitor into melted solder.
(2) Do not flux other part than the terminals.
(3) If there is a direct contact between the sleeve of the capacitor and the printed circuit pattern or a metal part of another component such as a lead wire, it may cause shrinkage of crack.
(4) If the application is for extended use, understand and manage the soldering characteristics to avoid abnormal current caused by a contact failure between the capacitor and the PCB.
(5) Please refer to cautions for using on page and product specifications about other notes.

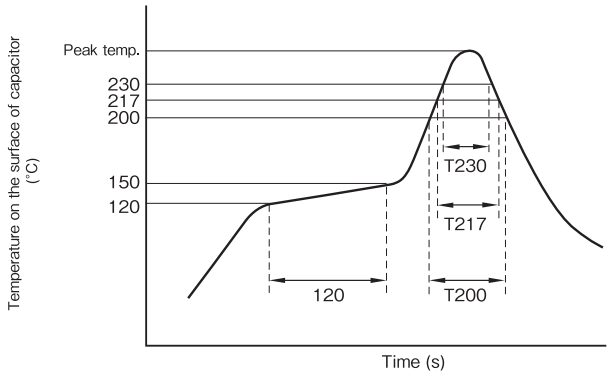
SOLDERING CONDITIONS FOR EDLC BY DYNACAP

■ Recommended soldering conditions (Lead free)

● DSK Series

Reflow soldering conditions.

Profile



1. Preheating shall be under 150°C within 120 seconds.
2. Peak temperature shall be within the following table.
3. For conditions exceeding the tolerances, consult with us.

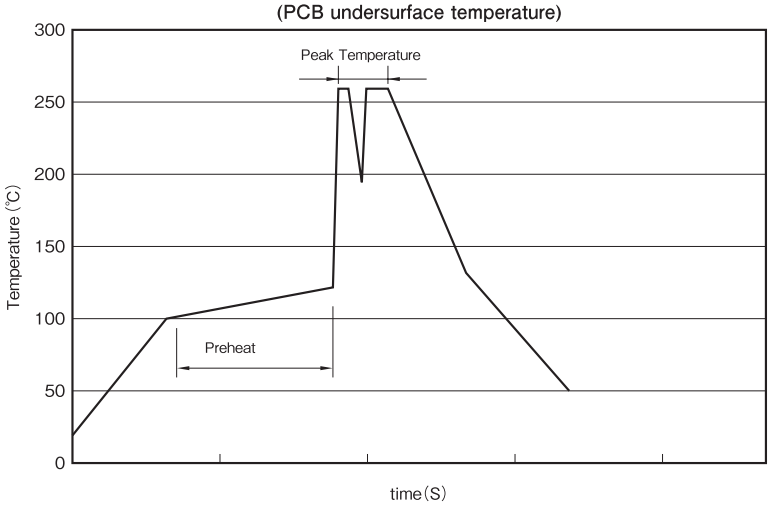
T200 : Duration while capacitor head temperature exceeds 200°C (s)
T217 : Duration while capacitor head temperature exceeds 217°C (s)
T230 : Duration while capacitor head temperature exceeds 230°C (s)
The measurement temperature point is the case top.

Series	Size	Peak temp. (5sec or less)	T230	T217	T200	Reflow cycle
DSK	ø6.8	250°C Max.	20 sec. max.	30 sec. max.	40 sec. max.	2 times or less

● DB, DX Series

(1) Soldering iron conditions
Iron tip temperature should be 400°C ± 5°C within the duration of 4 seconds.
(2) Flow soldering conditions
The recommendation soldering conditions of the product in which flow soldering is possible are as graph.

Recommended flow soldering profile
(PCB undersurface temperature)



Series	Size	Preheat		Peak	
		Temperature	Time	Temperature	Time
DB, DX	ø11.5 to ø21.5	100 to 110 °C	30 sec. max.	260 °C max	5 sec. max.

Caution for Using Aluminum Electrolytic Capacitors

(1) Do not dip the capacitor into melted solder.
(2) Do not flux other part than the terminals.
(3) If there is a direct contact between the sleeve of the capacitor and the printed circuit pattern or a metal part of another component such as a lead wire, it may cause shrinkage of crack.
(4) If it is a coin type, please manage so that main part temperature including preheating does not exceed 90°C.
(5) Please refer to cautions for using and the specification about other notes.

SOLDERING CONDITIONS FOR EDLC BY SUPERCAP

■ Recommended soldering conditions (Lead free)

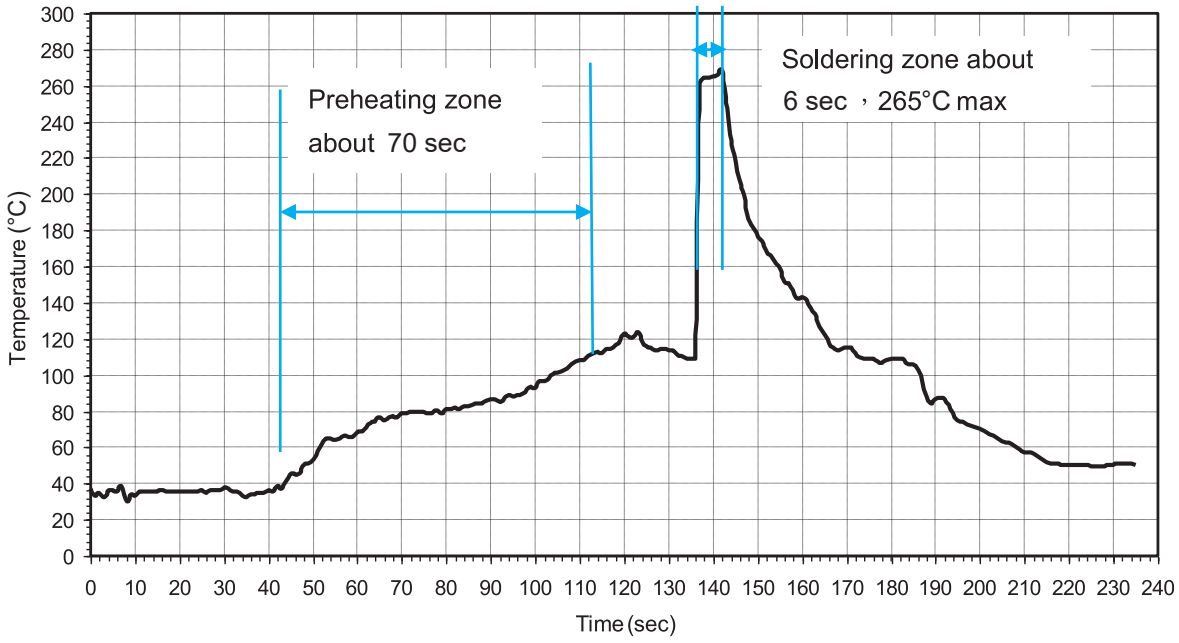
● Super Capacitors (Lead terminal type)

(1) Soldering iron conditions

Do not overheat when soldering. Limit the soldering time for 5 seconds or less and under 350°C. Solder the capacitor 3 times or less at intervals of 15 seconds or more.

(2) Flow soldering conditions

The recommendation soldering conditions of the product in which flow soldering is possible are as graph.



Series	Size	Preheat		Peak	
		Temperature	Time	Temperature	Time
PL, NL, PV, NV	ø6.3 to ø35	42°C to 112°C	about 70 sec.	265°C	6 sec. max.

Caution when soldering

(1) Never perform reflow soldering on EDLC using infrared heating or atmospheric heating methods.

(2) Do not apply excessive force to lead terminals. Do not pull or twist terminals. If deforming of lead terminals is necessary, please use a plier to bend the terminals while support the base of the terminals.

(3) Do not drop EDLC on hard surface and avoid tearing of sleeve label.

(4) Do not deform or compress EDLC.

(5) Please request supplemental information related to mounting instructions if necessary.

(6) Please do not use reflow soldering method on super capacitor.

(7) EDLC may be wave soldered. Base on actual situation from customer, the condition and equipment used for wave soldering may be different. The following was done base on our test method and condition and is for reference only. If customer uses different test condition, the result can not guarantee to be the same. In case of EDLC in and out of soldering stove many times during the process, being in the stove for too long due to malfunction of the machine or temperature of the stove is being set too high and out of spec, the explosion proof hold might bulge or burst.

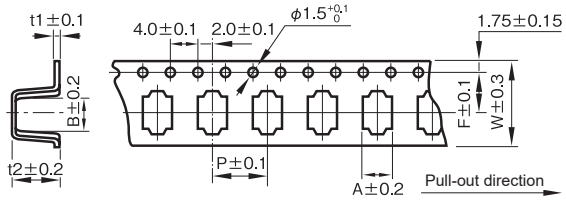
TAPING SPECIFICATIONS FOR CHIP TYPE

■ Taping

● Carrier tape dimension (taping polarity R)

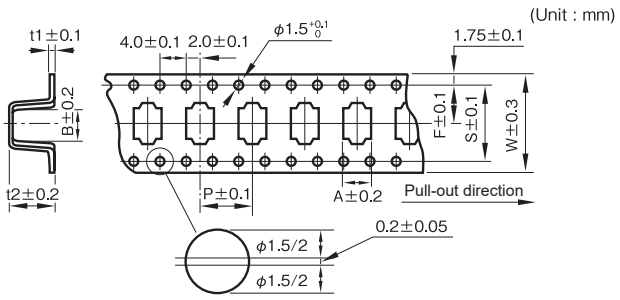
● ø4 to ø10

(Unit : mm)



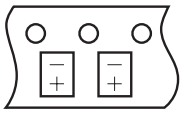
● ø12.5 to ø18

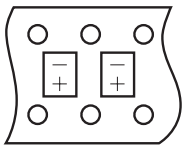
(Unit : mm)



● Taping polarity

(The all series except bipolar type)



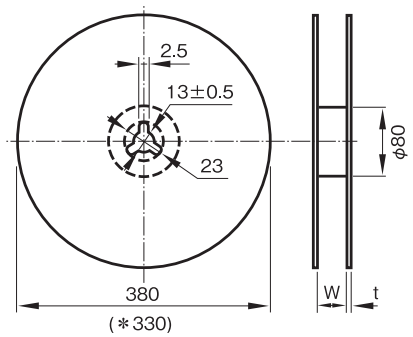


(Unit : mm)

Outside size ø D × L	W	A	B	P	t2	F	t1	S
4×5.3	12	4.7	4.7	8.0	5.8	5.5	0.4	—
4×5.7, 5.8	12	4.7	4.7	8.0	6.2	5.5	0.4	—
5×5.3	12	5.7	5.7	12	5.8	5.5	0.4	—
5×5.7, 5.8	12	5.7	5.7	12	6.2	5.5	0.4	—
6.3×5.3	16	7.0	7.0	12	5.8	7.5	0.4	—
6.3×5.7, 5.8	16	7.0	7.0	12	6.2	7.5	0.4	—
6.3×7.7	16	7.0	7.0	12	8.3	7.5	0.4	—
8×6.5	16	8.7	8.7	12	6.8	7.5	0.4	—
8×10	24	8.7	8.7	16	11	11.5	0.4	—
8×10.5	24	8.7	8.7	16	11.5	11.5	0.4	—
10×7.7	24	10.7	10.7	16	8.7	11.5	0.4	—
10×10	24	10.7	10.7	16	11	11.5	0.4	—
10×10.5	24	10.7	10.7	16	11.5	11.5	0.4	—
12.5×13.5	32	13.4	13.4	24	15	14.2	0.5	28.4
12.5×16	32	13.4	13.4	24	17	14.2	0.5	28.4
16×16.5	44	17.5	17.5	28	17.5	20.2	0.5	40.4
16×21.5	44	17.5	17.5	28	23	20.2	0.5	40.4
18×16.5	44	19.5	19.5	32	17.5	20.2	0.5	40.4
18×21.5	44	19.5	19.5	32	23	20.2	0.5	40.4

● Reel dimensions

(Unit : mm)



(Unit : mm)

Outside size ø D × L	Reel dimension	
	W	t
4	14	3
5	14	3
6.3	18	3
8×6.5	18	3
8, 10	26	3
12.5	34	3
16	46	3
18	46	3

● Packing quantity (Reel)

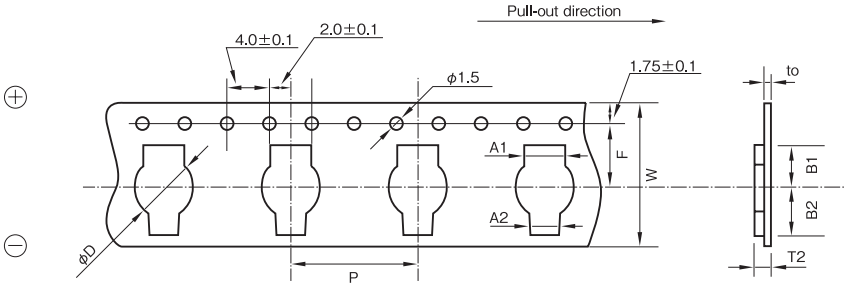
(Unit : mm)

Outside size ø D × L	Quantity (PCS)
4	2000
5, 6.3	1000
8×6.5	1000
8, 10	500
12.5×13.5	200
16×16.5	200
16×21.5	100
18×16.5	150
18×21.5	100

TAPING SPECIFICATIONS FOR EDLC BY DYACAP

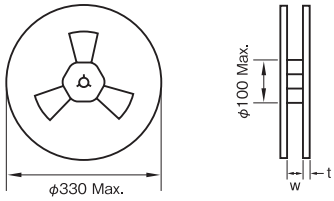
■ Taping & packing

● Carrier tape dimension (Series DSK) polarity L



Outside size	W	P	F	A1	A2	B1	B2	T2	to	øD
ø6.8×1.4 to 2.1L	24±0.2	12.0	11.5	4.4	3.4	5.9	6.5	3.2	0.3	6.9

● Reel dimensions



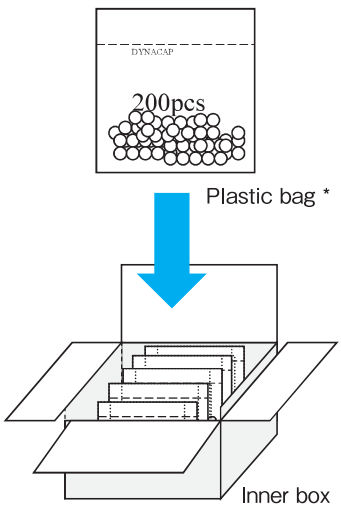
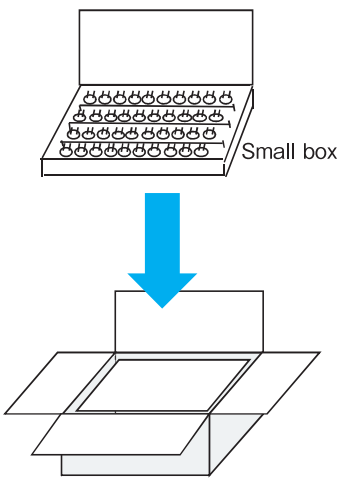
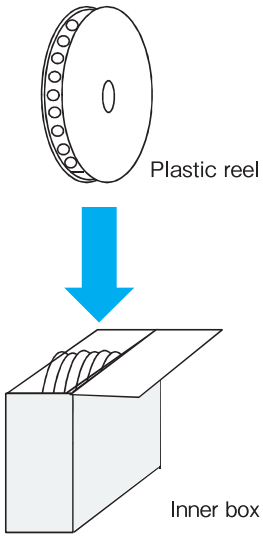
(Unit : mm)

Outside size	W	t
ø6.8×1.4 to 2.1L	26	3

● Packing quantity

Outside size	Quantity
ø6.8×2.1L	1500PCS.
ø6.8×1.4L	1500PCS. to 2000PCS.

● Standard packing specification of Coin Cell type

Series	DX (ø11.5) DB (ø13.5)	DB (ø21.5)	DSK (614, 621)
Packing style			

Chip Type Aluminum Electrolytic Capacitors

■ Cautions for Using Aluminum Electrolytic Capacitors

Please read the specification before using products.

The following cautions should be observed when using our aluminum electrolytic capacitors to assure their maximum stability and performance. When your application design conditions or operating conditions exceed the limit of the product specification, please contact us. If used under conditions beyond the limit of our specifications, it may cause defects such as short circuit, open circuit, leakage, explosion or combustion.

●Cautions for usage

1. DC electrolytic capacitors are polarized.

- If used with a wrong polarity, it creates an abnormal current resulting in a short circuit or damage to itself. Use DC bipolar electrolytic capacitors for use with uncertain or unknown polarity. DC capacitors cannot be used in AC circuits.

2. Use within the rated voltage.

- If a voltage exceeding the rated voltage is applied, it may cause characteristic deterioration or damage due to the increased leakage current.
- When ripple current is loaded, make sure that the peak value of the ripple voltage does not exceed the rated voltage.

3. Using for power supply circuit.

- While aluminum electrolytic capacitors are operated electrolyte liquid inside dries up and E.S.R. (Equivalent Series Resistance) of the capacitor increases. In case operated longer than rated life time, the capacitance much decreases, tangent of loss angle and E.S.R. much increases. Therefore, for some cases the sum of bias direct voltage and the peak of ripple voltage is over the rated voltage of the capacitor.
- For any type of circuit, in case the sum of bias direct voltage and the peak of ripple voltage is over the rated voltage of the capacitors or in case the minimum voltage is lower than 0 (zero) volt, the voltage control for the capacitors shall be provided.

4. Do not use in a circuit which requires rapid charging or discharging.

- If used in a circuit requiring rapid charging or discharging, it may cause characteristic deterioration or damage to itself due to the heat generated inside the capacitor. In such cases, contact us for our rapid charging/discharging capacitors.

5. Use within the rated ripple current.

- If applied ripple current exceeds rated ripple current, the life of the capacitor may be shortened, or in an extreme case it gets destroyed due to its internal heat. Use high-ripple type capacitors for such circuits.

6. Changes in characteristics due to operating temperature.

- The characteristics of an electrolytic capacitor will change with a change in the temperature. Such changes are temporary and the original characteristics will be restored at the original temperature (if the characteristics are not deteriorated by remaining at a high temperature for a long time). If used at a temperature exceeding the guaranteed temperature range, the capacitor may be damaged due to the increased leakage current. Pay attention to the capacitor temperature being affected by the ambient temperature of the unit, the temperature inside the appliance, the heat radiated by another hot component in the unit and the heat inside the capacitor itself due to the ripple current.
  (1) The electrostatic capacitance is normally shown as the value at 20°C-120Hz. It increases as the temperature raises and decreases as it lowers.
  (2) The tangent of loss angle (tanδ) is normally shown as the value at 20°C-120Hz. It decreases as the ambient temperature gets high and increases as it gets low.
  (3) The leakage current increases as the temperature gets high and decreases as it gets low.

7. Changes in the characteristics due to frequency.

- The characteristics of an electrolytic capacitor will change according to the change in the operating frequency.
  (1) The electrostatic capacity is normally shown as the value at 20°C-120Hz. It decreases as the frequency increases.
  (2) The tangent of loss angle (tanδ) is normally shown as the value at 20°C-120Hz. It increases as the frequency gets high.
  (3) The impedance is normally shown as the value at 100kHz 20°C. It increases as the frequency lowers.

8. Aluminum electrolytic capacitor life.

- The life of an aluminum electrolytic capacitor terminates when it fails due to the deterioration in its electronic characteristics. Temperature and the ripple current since they especially affect the life. See chart on endurance of each series.

9. Changes in aluminum electrolytic capacitors during storage.

- After storage for a long period, whether unused of

mounted on the appliance, the leakage current of an aluminum electrolytic capacitor will increase. This tendency is more prominent when the ambient temperature is high. If a capacitor has been stored for more than 2 years under normal temperature (shorter if high temperature) and it shows increased leakage current, a treatment by voltage application is recommended. Addition of a protective circuit in the design of the appliance is also recommended, considering the effect of the initial increased current.

10. Insulation between the capacitor case and the cathode terminal.

- The capacitor case and the cathode terminal are connected through the electrolyte which has uncertain resistance. If a complete insulation of the case is necessary, add an insulator at assembly.

11. External sleeve

- During a preheating or a hardening of mounting adhesive may cause a sleeve cracked.
  The capacitors are usually sleeved with poly vinyl chloride or poly ethylene terephthalate for the indication purpose only. Please do not consider it as an insulation.

12. Fumigation Process

- When exporting electronic equipment abroad, fumigation process may be performed on wooden packaging material with a halogen (compound) gas such as methyl bromide. Exercise care as this halogen gas may corrode capacitors. Also, use caution to epidemic preventive agent as corrosive component such as halogen may be contained.

13. Specific Operating Environments

- Capacitors may corrode when stored or used in a place filled with acidic toxic gases (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, bromine, methyl bromide, etc.) If capacitors are used or stored in such environments, please let us know.

14. Use at a high altitude

- The use of capacitors at high altitudes such as on an airplane causes a large difference between the internal pressure of the capacitors and the atmospheric pressure. However, there is no problem in use under atmospheric pressure up to about an altitude of 10,000 meters. Please check the operation of electronic equipment at the operating environmental temperature because the temperature lowers with increased altitude.
  If the condition is severe like space, please contact us.

15. Hole pitch adjustment of the PCB to the capacitors.

- Set the hole pitch of the PCB to the lead pitch (the “F” distance in the catalog) of the capacitor. Be careful since a short circuit, a cut or an increase in the leakage current etc. may be caused by the stress given to the lead wire terminals due to the difference between the hole pitch and the lead pitch.

16. Capacitors with pressure valves.

- A part of the capacitor case is made thin to have the function as the pressure valve in order to prevent explosion due to the rise of inside pressure when a reverse or excessive voltage is applied to the capacitor. Once it has worked as a valve, the whole capacitor needs to be replaced since the valve will not restore.
- When you use a capacitor with pressure valve, provide certain space above the pressure valve as below to prevent an interference when it works as a valve.

Diameter of the capacitor (mm)	18 or less
Required space above the valve (mm)	2.0 or more

17. Double-sided PCB’s

- When you use electrolytic capacitors on a double sided PCB, be careful not to have the circuit pattern run under where the capacitor is mounted. Otherwise it may cause a short circuit on the PCB depending on the condition of mounting.

18. Regarding to connection of capacitors

- Aluminum electrolytic capacitor has electrolyte liquid so that the most portion of electric loss characteristics came from E.S.R (Equivalent Series Resistance) of electrolyte liquid. Therefore the capacitor is an electronic device which can flow high ripple current in case the temperature increases and it decreases E.S.R.
  In case connecting two capacitors or more, E.S.R. of the capacitors is close to the resistance of the circuit. Therefore in case current is unbalanced and some capacitors have high ripple current, temperature increase, it makes more high current and finally it is over the rated ripple current.
  For parallel connection of capacitors the proper design of electric circuit such as balancing of each capacitors resistance or control of total ripple current shall be provided to avoid excess ripple current and voltage.
- When two or more capacitors are arranged in series, the voltage given to each capacitors shall be kept below the rated voltage level, by also giving consideration to the balance of the voltage impressed on the capacitors. Further, partial pressure resistor which considers leakage current shall be provided parallel to each condenser not to have over-voltage impressed on.

● Cautions for usage

1. Cautions for mounting.

- Check the ratings (electrostatic capacitance and rated voltage) of the capacitor before mounting.
- Transient recovery voltage may be generated in the capacitor due to dielectric absorption. If required, this voltage can be discharged with a resistor with a value of about 1 kΩ.
- Check the polarity of the capacitor to the chassis.
- Do not drop the capacitor to the floor. Do not use the dropped capacitor.
- Do not deform the capacitor for mounting.

2. Do not apply excessive pressure to the capacitor, its terminals or lead wires.

- Make sure that the contact path of the capacitor meets the hole pitch of the PCB before mounting.
- Do not set the automatic insertion machine to clinch the capacitor lead wires too strong.
- Pay attention to the impact given by the component receptacles of the automatic insertion/mounting machines and the product checker, and from the centering operation.

3. Soldering.

- Do not dip the capacitor into melted solder.
- The soldering conditions
  About detail conditions are described in the catalog or product specification.
- Do not flux other part than the terminals.
- If there is a direct contact between the sleeve of the capacitor and the printed circuit pattern or a metal part of another component such as a lead wire, it may cause shrinkage of crack.
- When you use the capacitor with its sleeve touching directly to the PCB, excessive solder temperature or excessive soldering time may cause the sleeve to shrink or crack during the heat.
- If the application is for extended use, understand and manage the soldering characteristics to avoid abnormal current caused by a contact failure between the capacitor and the PCB.

4. Handling after soldering

- After soldering, do not tilt, push down or twist the capacitor.
- After soldering, do not hold the capacitor as a handle to carry the PCB.
- After soldering, do not hit the capacitor with any obstacle. If PCB's are piled up for storage, the capacitor should not touch another PCB or component.

5. Cleaning after Soldering

- Recommended cleaning method
  (1) cleaning solutions:
    - CLEANTHROUGH 710M, 750H, 750L
    - PINEALPHA ST-100S
    - Techno Care FRW-4~17
    - Isopropyl alcohol (2-propanol)
  (2) Cleaning conditions:
    - The temperature of cleaning solution shall be less than 60°C.
    - Use immersion or ultrasonic waves within two minutes.
    - After cleaning, capacitors and PCB's shall thoroughly be rinsed and dried with hot blast for more than 10 minutes. The temperature of such breeze should be less than the upper category temperature.
    - After cleaning, do not keep capacitors in cleaning solution atmosphere or airtight containers.
- During cleaning, control the cleaning solution against contamination.

6. Fixing adhesives and coating materials.

- Do not use fixing adhesive or coating material containing halogen-based solvent.
- Before applying the fixing adhesive or the coating material, make sure that there is no remaining flux or stains between the PCB and the sealed part of the capacitor.
- Before applying the fixing adhesive or the coating material, make sure that the detergent etc. has dried up.
- Do not cover the whole surface of the sealed part (terminal side) of the capacitor with the fixing adhesive or the coating material.
- Observe the description in the catalog or the product specifications concerning the thermal stiffening conditions of the fixing adhesive or the coating material. (If there is no such description, contact us.) When both discrete and SMT components are on the same PCB, the fixing material for the SMT components may cause crack, tear or shrinkage on the external sleeve depending on the thermal stiffening condition.
- Recommended fixing adhesives and coating materials
  Fixing adhesives : Cemedine 1500, Diabond DN83K, Bond G103
  Coating materials : Taffy TF1159, HumiSeal 1B66NS, 1 A27NS

● Other Cautions

1. Do not touch capacitor terminals with bare hands.

You may get electric shock or your hand may be burnt. Discharge it with a 1 KΩ resistance before use if necessary.

2. Do not short the capacitor terminals with a conductor.

Do not spill conductive solution including acid or alkaline solution on the capacitor.

3. Periodical Inspections should be established for the capacitors in industrial appliances.

- The following items should be checked:
  (1) Appearance : Check if there is any open valve or leakage.
  (2) Electronic performance : Check the leakage current, the electrostatic capacitance, the tangent of loss angle and other items described in the catalog or the product specifications.

4. Take the following measures in case of emergency.

- If you see gas coming out of the capacitor valve when the set is in operation, turn off the power switch of the unit or unplug the power cord from the outlet.
- Keep your face away from the capacitor pressure valve, since the high temperature gas at over 100°C bursts out when the valve works. If the gas gets into your eyes or your mouth, wash your eyes or your mouth. Do not ingest the capacitor electrolyte. If the electrolyte gets on your skin, wash it out with soap.

5. Storing conditions.

- Avoid high temperature or high humidity when storing capacitors. Keep the storing temperature at 5°C to 35°C and the relative humidity not more than 75%.
- The leakage current of an aluminum electrolytic capacitor tends to increase when stored for a long time. This tendency becomes more prominent if the ambient temperature is high. The leakage current will be decreased by voltage application. If necessary, treatment by voltage application should be made on the capacitors which have been stored for a long period (more than 2 years after production).
- Do not store capacitors at a place where there is a possibility that they may get water, salt or oil spill.
- Do not store capacitors at a place where the air contains dense hazardous gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
- Fumigation treatment with toxic gas covering the whole wooden container frames as moth proofing during shipment may leave residual toxic gas.
- Do not store capacitors at a place where it gets ultraviolet or radioactive rays.

6. Disposing of capacitors.

- Punch a hole or crush the capacitors (to prevent explosion) before incineration at approved facility.
- If they are not to be incinerated, bring them to a professional industrial waste disposal company.

7. Other notes.

- Please refer to the following literature for anything not described in the specification or the catalog.

Chip Type Large Capacitance Capacitors

- Compatible with surface mounting.
- Supplied with carrier taping.
- Guarantees 2000 hours at 85℃ .

Marking color : Black print (Ø8×6.5L)
White print on a brown sleeve (Ø8×10L・Ø10×10L)

■ SPECIFICATIONS

Item	Performance
Category Temperature Range	−40℃ ~+85℃
Capacitance Tolerance	±20% (20℃ , 120Hz)
Leakage Current (μA)	I = 0.01CV or 3 whichever is larger (after 2 minutes) C : Rated capacitance (μF) ; V : Rated voltage (V) (20℃)

Dissipation Factor (Tanδ at 120Hz, 20℃)

Rated voltage (V)	6.3	10	16	25	35	50	63	100
tan δ (max.)	0.28	0.24	0.20	0.14	0.12	0.10	0.10	0.10

Low Temperature Characteristics (at 120Hz)

Rated voltage (V)		6.3	10	16	25	35	50	63	100
Impedance ratio (max.)	Z–25℃ / Z+20℃	4	3	2	2	2	2	2	2
	Z–40℃ / Z+20℃	8	8	7	3	3	3	3	3

Endurance (85℃) (Applied ripple current)

Test time	2000 hours
Capacitance Change	Within ±20% of initial value
Dissipation Factor	200% or less of the initial specified value
Leakage Current	The initial specified value or less

Shelf life (85℃): Test time : 1000 hours; other items are the same as those for the endurance. Voltage application treatment : According to JIS C5101 - 4 4.1

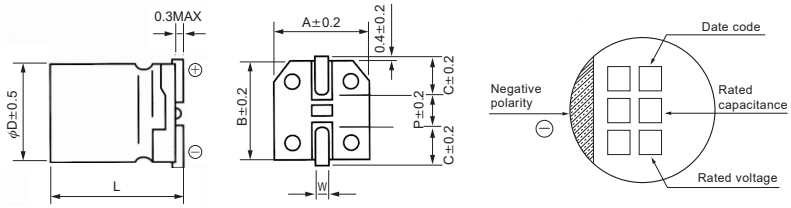
Coefficient of Frequency for Rated Ripple Current

Rated voltage (V) \ Frequency (Hz)	50	120	1k	10k・100k
6.3 to 16	0.80	1	1.15	1.25
25 to 35	0.80	1	1.25	1.40
50 to 63	0.80	1	1.35	1.50
100	0.70	1	1.35	1.50

Applicable standards: JIS C5101-1, -18 1999 (IEC 60384-1, -18)

■ OUTLINE DRAWING

Unit : mm



φD	L	A	B	C	W	P	Casing symbol
8	6.5 ± 0.3	8.4	8.4	3.4	0.5 to 0.8	2.3	G68
8	10 ± 0.5	8.4	8.4	3.0	0.7 to 1.1	3.1	G10
10	10 ± 0.5	10.4	10.4	3.3	0.7 to 1.1	4.7	H10

■ STANDARD RATINGS

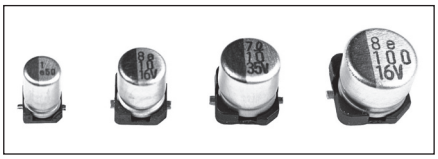
Rated voltage (V)	6.3			10			16			25			35			50			63			100		
Item / Rated capacitance (μF)	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms
10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8×10	16.6	94
22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10×10	7.5	189
33	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8×6.5	5.0	83	8×10	5.0	139	10×10	5.0	189
47	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8×10	3.5	252	10×10	3.5	226	—	—	—
100	—	—	—	—	—	—	—	—	—	8×6.5	2.3	118	8×10	2.0	252	10×10	1.7	458	10×10	1.7	226	—	—	—
220	—	—	—	8×6.5	1.8	175	8×10	1.5	220	8×10	1.1	252	10×10	0.91	458	—	—	—	—	—	—	—	—	—
330	8×6.5	1.4	155	8×10	1.2	230	8×10	1.0	260	10×10	0.70	458	—	—	—	—	—	—	—	—	—	—	—	—
470	8×10	0.99	262	8×10	0.85	310	8×10	0.71	307	10×10	0.49	458	—	—	—	—	—	—	—	—	—	—	—	—
							10×10	0.71	458															
1000	10×10	0.46	458	10×10	0.34	454	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

(Note) Rated ripple current : 85℃ , 120Hz ; ESR : 20℃ , 120Hz

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

Chip Type Standard Capacitors

- Compatible with surface mounting for 5.3mm height capacitors.
- Supplied with carrier taping.
- Guarantees 2000 hours at 85℃ .



Marking color : Black print

■ SPECIFICATIONS

Item	Performance
Category Temperature Range	−40℃ ~+85℃
Capacitance Tolerance	±20% (20℃ , 120Hz)
Leakage Current (μA)	I = 0.01CV or 3 whichever is larger (after 2 minutes) C : Rated capacitance (μF) ; V : Rated voltage (V) (20℃)

Dissipation Factor (Tanδ at 120Hz, 20℃)

Rated voltage (V)	4	6.3	10	16	25	35	50
tan δ (max.)	0.42	0.28	0.24	0.20	0.14	0.12	0.10

Low Temperature Characteristics (at 120Hz)

Rated voltage (V)		4	6.3	10	16	25	35	50
Impedance ratio (max.)	Z−25℃ / Z+20℃	7	3	3	2	2	2	2
	Z−40℃ / Z+20℃	15	8	5	4	3	3	3

Endurance (85℃) (Applied ripple current)

Test time	2000 hours
Capacitance Change	Within ±20% of initial value (4WV : ±30%)
Dissipation Factor	200% or less of the initial specified value (4WV : 300%)
Leakage Current	The initial specified value or less

Shelf life (85℃)

Test time : 1000 hours; other items are the same as those for the endurance. Voltage application treatment : According to JIS C5101 - 4 4.1

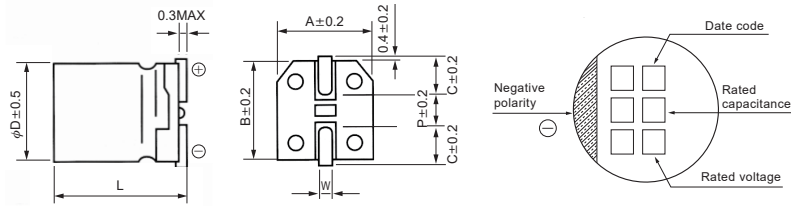
Coefficient of Frequency for Rated Ripple Current

Rated voltage (V) \ Frequency (Hz)	50 · 60	120	1k	10k · 100k
4 to 16	0.80	1	1.15	1.25
25 to 35	0.80	1	1.25	1.40
50	0.80	1	1.35	1.50

Applicable standards	JIS C5101-1 1998, -18 1999 (IEC 60384-1 1992, -18 1993)

■ OUTLINE DRAWING

Unit : mm



φD	L	A	B	C	W	P	Casing symbol
4	5.3 ± 0.2	4.3	4.3	2.0	0.5 to 0.8	1.0	—
5	5.3 ± 0.2	5.3	5.3	2.3	0.5 to 0.8	1.5	—
6.3	5.3 ± 0.2	6.6	6.6	2.7	0.5 to 0.8	2.0	—

■ STANDARD RATINGS

Rated voltage (V)	4			6.3			10			16			25			35			50		
Item / Rated capacitance (μF)	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms
0.22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.3	754	5
0.33	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.3	503	6
0.47	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.3	353	7
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.3	166	10
2.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.3	75	15
3.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.3	50	19
4.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.3	42	20	5×5.3	35	26
10	—	—	—	—	—	—	—	—	—	4×5.3	33	26	—	—	—	5×5.3	20	34	6.3×5.3	17	44
22	—	—	—	4×5.3	21	31	5×5.3	18	39	5×5.3	15	44	6.3×5.3	11	55	6.3×5.3	9.1	59	—	—	—
33	—	—	—	—	—	—	5×5.3	12	48	—	—	—	6.3×5.3	7.0	67	—	—	—	—	—	—
47	—	—	—	5×5.3	10	52	—	—	—	—	—	—	6.3×5.3	6.4	75	—	—	—	—	—	—
100	5×5.3	7.0	63	—	—	—	—	—	—	6.3×5.3	3.3	103	—	—	—	—	—	—	—	—	—
220	6.3×5.3	3.2	110	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

(Note) Rated ripple current : 85℃ , 120Hz ; ESR : 20℃ , 120Hz

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

Chip Type 85ºC Capacitors

- Compatible with surface mounting for 5.3mm, 7.7mm height.
- Supplied with carrier taping.
- Guarantees 2000 hours at 85˚C .

Marking color : Black print

■ SPECIFICATIONS

Item	Performance
Category Temperature Range	−40˚C ~+85˚C
Capacitance Tolerance	±20% (20˚C , 120Hz)
Leakage Current (μA)	I = 0.01CV or 3 whichever is larger (after 2 minutes) C : Rated capacitance (μF) ; V : Rated voltage (V) (20˚C)

Dissipation Factor (Tanδ at 120Hz, 20˚C)

Rated voltage (V)	6.3	10	16	25	35	50
tan δ (max.)	0.42	0.32	0.26	0.18	0.14	0.12

Low Temperature Characteristics (at 120Hz)

Rated voltage (V)		6.3	10	16	25	35	50
Impedance ratio (max.)	Z−25˚C / Z+20˚C	4	3	2	2	2	2
	Z−40˚C / Z+20˚C	8	8	5	5	4	4

Endurance (85˚C) (Applied ripple current)

Test time	2000 hours
Capacitance Change	Within ±30% of initial value
Dissipation Factor	300% or less of the initial specified value
Leakage Current	The initial specified value or less

Shelf life (85˚C): Test time : 1000 hours; other items are the same as those for the endurance. Voltage application treatment : According to JIS C5101-4 4.1

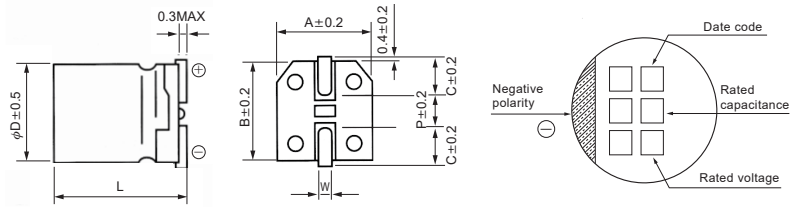
Coefficient of Frequency for Rated Ripple Current

Rated voltage (V) \ Frequency (Hz)	50	120	1k	10k · 100k
6.3 to 16	0.80	1	1.15	1.25
25 to 35	0.80	1	1.25	1.40
50	0.70	1	1.35	1.50

Applicable standards: JIS C5101-1, -18 (IEC 60384-1, -18)

■ OUTLINE DRAWING

Unit : mm



φD	L	A	B	C	W	P	Casing symbol
4	5.3 ± 0.2	4.3	4.3	2.0	0.5 to 0.8	1.0	D55
5	5.3 ± 0.2	5.3	5.3	2.3	0.5 to 0.8	1.5	E55
6.3	5.3 ± 0.2	6.6	6.6	2.7	0.5 to 0.8	2.0	F55
6.3	7.7 ± 0.2	6.6	6.6	2.7	0.5 to 0.8	2.5	F80

■ STANDARD RATINGS

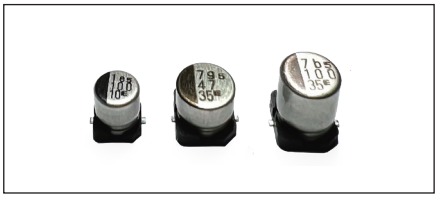
Rated voltage (V)	6.3			10			16			25			35			50		
Item / Rated capacitance (μF)	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms
4.7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.3	42	20
10	—	—	—	—	—	—	—	—	—	—	—	—	4×5.3	23	27	5×5.3	20	34
22	—	—	—	—	—	—	4×5.3	20	30	—	—	—	5×5.3	11	47	6.3×5.3	9.0	59
33	—	—	—	4×5.3	16	33	—	—	—	5×5.3	9.0	54	6.3×5.3	7.0	67	6.3×7.7	6.0	82
47	4×5.3	15	34	—	—	—	5×5.3	9.2	50	—	—	—	—	—	—	6.3×7.7	4.2	98
68	5×5.3	10	47	5×5.3	7.8	54	6.3×5.3	6.3	74	6.3×5.3	4.4	90	6.3×7.7	3.4	109	—	—	—
100	5×5.3	7.0	58	—	—	—	—	—	—	6.3×7.7	3.0	124	—	—	—	—	—	—
150	6.3×5.3	4.6	83	6.3×7.7	3.5	98	6.3×7.7	2.9	109	—	—	—	—	—	—	—	—	—
220	6.3×5.3	3.2	113	—	—	—	6.3×7.7	2.0	144	—	—	—	—	—	—	—	—	—
330	6.3×7.7	2.1	139	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

(Note) Rated ripple current : 85˚C , 120Hz ; ESR : 20˚C , 120Hz

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

Chip Type High CV Capacitors

- Compatible with surface mounting.
- Supplied with carrier taping.
- Guarantees 2000 hours at 85˚C .



Marking color : Black print

■ SPECIFICATIONS

Item	Performance
Category Temperature Range	−40˚C ~ +85˚C
Capacitance Tolerance	±20% (20˚C , 120Hz)
Leakage Current (μA)	I = 0.01CV or 3 whichever is larger (after 2 minutes) C : Rated capacitance (μF) ; V : Rated voltage (V) (20˚C)

Dissipation Factor (Tanδ at 120Hz, 20˚C)

Rated voltage (V)	6.3	10	16	25	35	50	63	100
tan δ (max.)	Refer to following page.							

Low Temperature Characteristics (at 120Hz)

Rated voltage (V)		6.3	10	16	25	35	50	63	100
Impedance ratio (max.)	Z–25˚C / Z+20˚C	4	3	2	2	2	2	2	2
	Z–40˚C / Z+20˚C	10	8	6	4	3	3	3	3

Endurance (85˚C) (Applied ripple current)

Test time	2000 hours
Capacitance Change	Within ±30% of initial value
Dissipation Factor	200% or less of the initial specified value
Leakage Current	The initial specified value or less

Shelf life (85˚C)

Test time : 1000 hours; other items are the same as those for the endurance. Voltage application treatment : According to JIS C5101-4 4.1

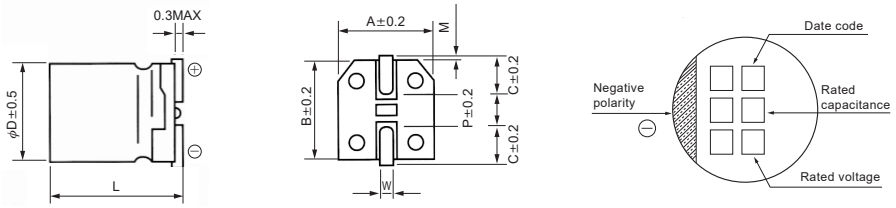
Coefficient of Frequency for Rated Ripple Current

Rated voltage (V) \ Frequency (Hz)	50 · 60	120	1k	10k · 100k
6.3 to 16	0.8	1	1.15	1.25
25 to 35	0.8	1	1.25	1.40
50 to 63	0.8	1	1.35	1.50
100	0.7	1	1.35	1.50

Applicable standards	JIS C5101-1, -18 (IEC 60384-1, -18)

■ OUTLINE DRAWING

Unit : mm



φD	L	A	B	C	M	W	P	Casing symbol
4	5.3 ± 0.2	4.3	4.3	2.0	0.4 ± 0.2	0.5 to 0.8	1.0	D55
5	5.3 ± 0.2	5.3	5.3	2.3	0.4 ± 0.2	0.5 to 0.8	1.5	E55
6.3	5.3 ± 0.2	6.3	6.3	2.7	0.4 ± 0.2	0.5 to 0.8	2.0	F55
6.3	7.7 ± 0.3	6.6	6.6	2.7	0.4 ± 0.2	0.5 to 0.8	2.0	F80
8	6.5 ± 0.3	8.4	8.4	3.4	0.4 ± 0.2	0.5 to 0.8	2.3	G68
8	10 ± 0.5	8.4	8.4	3.0	0.4 ± 0.2	0.7 to 1.1	3.1	G10
10	10 ± 0.5	10.4	10.4	3.3	0.4 ± 0.2	0.7 to 1.1	4.7	H10
12.5	13.5 ± 0.5	13.0	13.0	4.9	0.7 ± 0.3	1.0 to 1.4	4.6	IE

■ STANDARD RATINGS

Rated voltage (V)	6.3			10			16			25		
Item / Rated capacitance (μF)	Case φD×L (mm)	tanδ	Rated ripple current mArms	Case φD×L (mm)	tanδ	Rated ripple current mArms	Case φD×L (mm)	tanδ	Rated ripple current mArms	Case φD×L (mm)	tanδ	Rated ripple current mArms
10	—	—	—	4×5.3	0.24	23	4×5.3	0.20	26	4×5.3	0.18	23
22	4×5.3	0.28	31	4×5.3	0.24	26	4×5.3	0.28	30	4×5.3	0.18	24
							5×5.3	0.20	44	5×5.3	0.18	43
33	4×5.3	0.35	28	4×5.3	0.32	32	4×5.3	0.28	32	5×5.3	0.18	54
	5×5.3	0.28	44	5×5.3	0.24	48	5×5.3	0.28	44	6.3×5.3	0.14	67
47	4×5.3	0.35	34	4×5.3	0.32	33	5×5.3	0.28	52	6.3×5.3	0.18	75
	5×5.3	0.28	52	5×5.3	0.32	54	6.3×5.3	0.20	75			
100	5×5.3	0.35	58	5×5.3	0.32	54	6.3×5.3	0.20	70	6.3×7.7	0.18	124
	6.3×5.3	0.28	89	6.3×5.3	0.24	98				8×6.5	0.18	118
150	6.3×5.3	0.35	83	6.3×5.3	0.32	79	6.3×7.7	0.28	109	—	—	—
				6.3×7.7	0.32	98						
220	6.3×5.3	0.35	88	6.3×7.7	0.32	173	6.3×7.7	0.28	162	8×10	0.14	252
	6.3×7.7	0.35	113	8×6.5	0.32	175	8×10	0.20	220			
330	6.3×7.7	0.35	188	8×10	0.24	230	8×10	0.20	260	8×10	0.18	300
	8×6.5	0.35	190							10×10	0.14	458
470	8×10	0.28	262	8×10	0.32	310	8×10	0.28	307	10×10	0.14	458
							10×10	0.20	458			
680	—	—	—	—	—	—	10×10	0.28	380	—	—	—
820	8×10	0.35	320	—	—	—	—	—	—	12.5×13.5	0.14	552
1000	10×10	0.28	458	10×10	0.24	454	12.5×13.5	0.20	521	—	—	—
1500	10×10	0.35	489	12.5×13.5	0.24	560	—	—	—	—	—	—
2200	12.5×13.5	0.30	651	—	—	—	—	—	—	—	—	—

Rated voltage (V)	35			50			63			100		
Item / Rated capacitance (μF)	Case φD×L (mm)	tanδ	Rated ripple current mArms	Case φD×L (mm)	tanδ	Rated ripple current mArms	Case φD×L (mm)	tanδ	Rated ripple current mArms	Case φD×L (mm)	tanδ	Rated ripple current mArms
1	—	—	—	4×5.3	0.10	10	—	—	—	—	—	—
2.2	—	—	—	4×5.3	0.10	15	—	—	—	—	—	—
3.3	—	—	—	4×5.3	0.10	19	4×5.3	0.12	12	—	—	—
4.7	4×5.3	0.12	20	4×5.3	0.12	20	5×5.3	0.12	20	—	—	—
				5×5.3	0.10	26						
10	4×5.3	0.14	27	5×5.3	0.12	34	6.3×5.3	0.12	32	8×10	0.10	94
	5×5.3	0.12	34	6.3×5.3	0.10	44						
22	5×5.3	0.14	47	6.3×5.3	0.12	47	6.3×7.7	0.12	60	8×10	0.12	94
	6.3×5.3	0.12	59				8×6.5	0.12	62			
33	6.3×5.3	0.14	67	6.3×7.7	0.12	82	8×10	0.10	139	8×10	0.12	94
				8×6.5	0.12	83				10×10	0.10	189
47	6.3×5.3	0.14	54	6.3×7.7	0.12	85	8×10	0.10	139	10×10	0.12	189
	6.3×7.7	0.14	90	8×10	0.10	252	10×10	0.12	226			
100	6.3×7.7	0.14	120	8×10	0.12	252	10×10	0.10	226	12.5×13.5	0.10	242
				10×10	0.10	458						
220	8×10	0.14	260	—	—	—	12.5×13.5	0.10	343	—	—	—
	10×10	0.12	458									
330	10×10	0.14	360	12.5×13.5	0.10	451	—	—	—	—	—	—
470	12.5×13.5	0.12	451	—	—	—	—	—	—	—	—	—

(Note) Rated ripple current：85˚C , 120Hz

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

Chip Type 105ºC Standard Capacitors

- 4ϕ ~ 10ϕ, 1000 ~ 2000 hours at 105˚C .
- Vertical chip type miniaturized for 5.4mm height capacitors.
- Available for high density surface mounting.

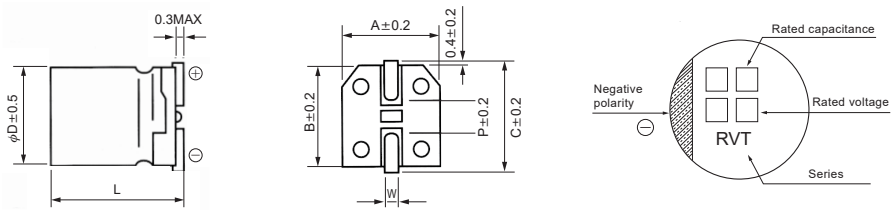
Marking color : Black

■ SPECIFICATIONS

Item	Performance
Category Temperature Range	−55˚C ~+105˚C
Capacitance Tolerance	±20% (20˚C , 120Hz)
Leakage Current (μA)	I = 0.01CV or 3 whichever is larger (after 2 minutes) C : Rated capacitance (μF) ; V = Rated voltage (V) (20˚C)
Dissipation Factor (Tanδ at 120Hz, 20˚C)	Rated voltage (V): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 100 tan δ (max.): 0.30 / 0.24 / 0.20 / 0.18 / 0.16 / 0.14 / 0.14 / 0.14 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase.
Low Temperature Characteristics (at 120Hz)	Impedance ratio shall not exceed the values given in the table below. Rated voltage (V): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 100 Impedance ratio (max.) Z–25˚C / Z+20˚C: 6 / 4 / 4 / 3 / 3 / 3 / 3 / 3 Impedance ratio (max.) Z–55˚C / Z+20˚C: 10 / 8 / 6 / 5 / 3 / 3 / 3 / 3
Endurance (105˚C) (Applied ripple current)	Test time: 1,000 ~ 2,000 hours Capacitance Change: Within ±30% of initial value Dissipation Factor: 300% or less of the initial specified value Leakage Current: The initial specified value
Shelf life (105˚C)	* Test time: 1000 hours; other items are the same as those for the endurance. Voltage application treatment: According to JIS C5101-4 4.1
Coefficient of Frequency for Rated Ripple Current	Frequency (Hz) / Rated capacitance (μF): 50 · 60 / 120 / 1k / 10k up 1 to 22: 0.60 / 1.0 / 1.25 / 1.40 33 to 1500: 0.75 / 1.0 / 1.15 / 1.35

■ OUTLINE DRAWING

Unit : mm



φD	L	A	B	C	W	P
4	5.4 ± 0.5	4.3	4.3	5.0	0.5 to 0.8	1.0
5	5.4 ± 0.5	5.3	5.3	6.0	0.5 to 0.8	1.5
6.3	5.4 ± 0.5	6.6	6.6	7.2	0.5 to 0.8	2.1
6.3	7.7 ± 0.5	6.6	6.6	7.2	0.5 to 0.8	2.1
8	10.2 ± 0.5	8.3	8.3	9.1	0.7 to 1.1	3.1
10	10.2 ± 0.5	10.3	10.3	11.1	0.7 to 1.1	4.5

■ STANDARD RATINGS

W. V.	6.3		10		16		25	
Item / Rated capacitance (μF)	Case φD×L (mm)	Rated ripple current mArms	Case φD×L (mm)	Rated ripple current mArms	Case φD×L (mm)	Rated ripple current mArms	Case φD×L (mm)	Rated ripple current mArms
1	—	—	—	—	—	—	—	—
2.2	—	—	—	—	—	—	—	—
3.3	—	—	—	—	—	—	—	—
4.7	—	—	—	—	—	—	—	—
10	—	—	—	—	4×5.4	17	4×5.4	15
22	—	—	—	—	4×5.4 5×5.4	21 28	—	—
33	—	—	—	—	—	—	5×5.4	30
47	4×5.4	26	4×5.4	26	5×5.4	33	5×5.4* 6.3×5.4	35 49
68	—	—	—	—	—	—	6×5.4	55
100	5×5.4	40	5×5.4	40	6.3×5.4	63	6.3×7.7	93
150	—	—	6.3×5.4	65	—	—	6.3×7.7	100
220	6.3×5.4	69	6.3×5.4	69	6.3×7.7	110	6.3×7.7* 8×10.2	110 183
330	6.3×7.7	108	6.3×7.7	108	8×10.2	201	8×10.2	228
470	6.3×7.7	125	6.3×7.7*	120	8×10.2	240	8×10.2* 10×10.2	220 286
680	—	—	—	—	10×10.2	320	—	—
1000	8×10.2	230	8×10.2*	230	10×10.2	347	—	—
1500	10×10.2	320	—	—	—	—	—	—

W. V.	35		50		63		100	
Item / Rated capacitance (μF)	Case φD×L (mm)	Rated ripple current mArms	Case φD×L (mm)	Rated ripple current mArms	Case φD×L (mm)	Rated ripple current mArms	Case φD×L (mm)	Rated ripple current mArms
1	—	—	4×5.4	8	—	—	—	—
2.2	—	—	4×5.4	12	—	—	6.3×5.4	15
3.3	—	—	4×5.4	14	—	—	6.3×5.4	22
4.7	—	—	4×5.4 5×5.4	14 17	5×5.4	17	6.3×5.4	23
10	4×5.4 5×5.4	15 22	5×5.4 6.3×5.4	17 25	6.3×5.4	26	6.3×7.7	38
22	5×5.4 6.3×5.4	28 40	6.3×5.4	43	6.3×7.7	53	8×10.2	90
33	6.3×5.4	45	6.3×7.7	63	—	—	10×10.2	125
47	6.3×5.4	54	6.3×7.7	66	—	—	10×10.2	140
68	6.3×7.7	80	—	—	—	—	—	—
100	6.3×7.7 8×10.2	87 125	8×10.2 10×10.2	125 178	10×10.2	200	—	—
150	—	—	—	—	—	—	—	—
220	8×10.2 10×10.2	195 230	10×10.2	220	—	—	—	—
330	10×10.2	247	10×10.2*	200	—	—	—	—
470	10×10.2	286	—	—	—	—	—	—
680	—	—	—	—	—	—	—	—
1000	—	—	—	—	—	—	—	—
1500	—	—	—	—	—	—	—	—

(Note) Rated ripple current: 105ºC, 120Hz ، * mark: Life is 1000 hours.

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

Chip Type, 105ºC, Low Impedance Capacitors

- Compatible with surface mounting.
- Supplied with carrier taping.
- Guarantees 2000 hours at 105˚C .
  (ϕ8 × 6.5L or less: 1000 hours)

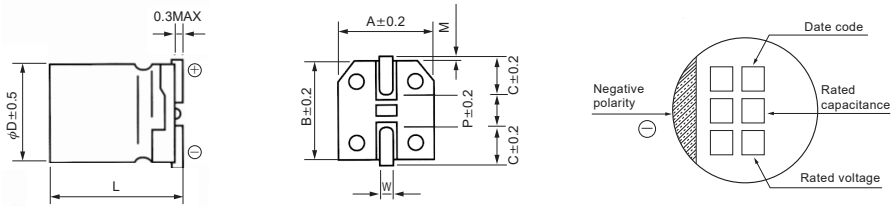
Marking color : Black print (ϕ4×5.3L–ϕ8×6.5L)
White print on a brown sleeve (ϕ8×10L・ϕ10×10L)

■ SPECIFICATIONS

Item	Performance
Category Temperature Range	−55˚C ~+105˚C
Capacitance Tolerance	±20% (20˚C , 120Hz)
Leakage Current (μA)	I = 0.01CV or 3 whichever is larger (after 2 minutes) C : Rated capacitance (μF) ; V : Rated voltage (V) (20˚C)
Dissipation Factor (Tanδ at 120Hz, 20˚C)	Rated voltage (V): 6.3 / 10 / 16 / 25 / 35 tan δ (max.): 0.28 / 0.24 / 0.20 / 0.16 / 0.14
Low Temperature Characteristics (at 120Hz)	Rated voltage (V): 6.3 / 10 / 16 / 25 / 35 Impedance ratio (max.) Z–25˚C / Z+20˚C: 4 / 3 / 2 / 2 / 2 Impedance ratio (max.) Z–55˚C / Z+20˚C: 8 / 5 / 4 / 3 / 3
Endurance (105˚C) (Applied ripple current)	Test time: 2000 hours (8×6.5 or less: 1000 hours) Capacitance Change: Within ± 25% of initial value Dissipation Factor: 200% or less of the initial specified value Leakage Current: The initial specified value or less
Shelf life (105˚C)	Test time : 1000 hours; other items are the same as those for the endurance. Voltage application treatment : According to JIS C5101-4 4.1
Coefficient of Frequency for Rated Ripple Current	Frequency (Hz) / Rated voltage (V): 120 / 1k / 10k / 100k 6.3 to 35: 0.5 / 0.75 / 0.9 / 1.0
Applicable standards	JIS C5101-1, -18 (IEC 60384-1, -18)

■ OUTLINE DRAWING

Unit : mm



φD	L	A	B	C	W	P	Casing symbol
4	5.3 ± 0.2	4.3	4.3	2.0	0.5 to 0.8	1.0	D55
4	5.8 ± 0.3	4.3	4.3	2.0	0.5 to 0.8	1.0	D61
5	5.3 ± 0.2	5.3	5.3	2.3	0.5 to 0.8	1.5	E55
5	5.8 ± 0.3	5.3	5.3	2.3	0.5 to 0.8	1.5	E61
6.3	5.3 ± 0.2	6.6	6.6	2.7	0.5 to 0.8	2.0	F55
6.3	5.8 ± 0.3	6.6	6.6	2.7	0.5 to 0.8	2.0	F61
6.3	7.7 ± 0.3	6.6	6.6	2.7	0.5 to 0.8	2.0	F80
8	6.5 ± 0.3	8.4	8.4	3.4	0.5 to 0.8	2.3	G68
8	10 ± 0.5	8.4	8.4	3.0	0.7 to 1.1	3.1	G10
8	10.5 ± 0.5	8.4	8.4	3.0	0.7 to 1.1	3.1	GA5
10	10 ± 0.5	10.4	10.4	3.3	0.7 to 1.1	4.7	H10
10	10.5 ± 0.5	10.4	10.4	3.3	0.7 to 1.1	4.7	HA5

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

■ STANDARD RATINGS

Rated voltage (V)	6.3			10			16			25			35		
Item / Rated capacitance (μF)	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms
4.7	—	—	—	—	—	—	—	—	—	—	—	—	4×5.3	3.20	65
10	—	—	—	—	—	—	4×5.3	3.20	65	4×5.8	1.80	80	5×5.3	1.50	110
										5×5.3	1.50	110	5×5.8	0.76	150
15	—	—	—	—	—	—	4×5.8	1.80	80	5×5.8	0.76	150	5×5.8	0.76	150
22	4×5.3	3.20	65	4×5.8	1.80	80	5×5.3	1.50	110	5×5.8	0.76	150	5×5.8	0.76	150
	4×5.8	1.80	80	5×5.3	1.50	110	5×5.8	0.76	150	6.3×5.3	0.85	170	6.3×5.3	0.85	170
33	5×5.3	1.50	110	5×5.3	1.50	110	6.3×5.3	0.85	170	6.3×5.3	0.85	170	6.3×5.3	0.85	170
	5×5.8	0.76	150	5×5.8	0.76	150	6.3×5.8	0.44	230	6.3×5.8	0.44	230	6.3×5.8	0.44	230
47	5×5.3	1.50	110	6.3×5.3	0.85	170	6.3×5.3	0.85	170	6.3×5.3	0.85	170	6.3×5.8	0.44	230
	5×5.8	0.76	150	6.3×5.8	0.44	230	6.3×5.8	0.44	230	6.3×5.8	0.44	230	6.3×7.7	0.34	280
68	6.3×5.8	0.44	230	6.3×5.8	0.44	230	6.3×5.8	0.44	230	6.3×5.8	0.44	230	6.3×7.7	0.34	280
100	6.3×5.3	0.85	170	6.3×5.3	0.85	170	6.3×5.3	0.85	170	6.3×7.7	0.34	280	8×10	0.20	450
	6.3×5.8	0.44	230	6.3×5.8	0.44	230	6.3×5.8	0.44	230	8×6.5	0.34	280	8×10.5	0.17	450
150	6.3×5.8	0.44	230	6.3×5.8	0.44	230	6.3×7.7	0.34	280	8×10	0.20	450	8×10.5	0.17	450
							8×6.5	0.34	280	8×10.5	0.17	450	10×10	0.10	670
220	6.3×5.8	0.44	230	6.3×7.7	0.34	280	6.3×7.7	0.34	280	8×10.5	0.17	450	8×10.5	0.17	450
	6.3×7.7	0.34	280	8×6.5	0.34	280	8×10	0.20	450	10×10	0.10	670	10×10	0.10	670
330	6.3×7.7	0.34	280	8×10.5	0.17	450	8×10.5	0.17	450	8×10.5	0.17	450	10×10.5	0.09	670
	8×6.5	0.34	200	10×10	0.10	670	10×10	0.10	670	10×10	0.10	670			
470	8×10.5	0.17	450	8×10.5	0.17	450	8×10.5	0.17	450	10×10.5	0.09	670	—	—	—
	10×10	0.10	670	10×10	0.10	670	10×10	0.10	670						
680	8×10.5	0.17	450	10×10.5	0.09	670	10×10.5	0.09	670	—	—	—	—	—	—
1000	8×10.5	0.17	450	10×10.5	0.09	670	—	—	—	—	—	—	—	—	—
	10×10	0.10	670												
1500	10×10.5	0.09	670	—	—	—	—	—	—	—	—	—	—	—	—

(Note) Rated ripple current : 105ºC, 100kHz ; ESR : 20ºC, 100kHz

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

Chip Type, 105ºC, Low Impedance Long Life Capacitors

- Compatible with surface mounting.
- Large Capacitance with ultra low impedance capacitors.
- Guarantees 2000 hours at 105˚C .
  (10.0L, 10.5L:5000 hours)

Marking color : Black print

■ SPECIFICATIONS

Item	Performance
Category Temperature Range	−55˚C ~+105˚C
Capacitance Tolerance	±20% (20˚C , 120Hz)
Leakage Current (μA)	I = 0.01CV or 3 whichever is larger (after 2 minutes) C : Rated capacitance (μF) ; V : Rated voltage (V) (20˚C)

Dissipation Factor (Tanδ at 120Hz, 20˚C)

Rated voltage (V)	6.3	10	16	25	35	50	63	80	100
tan δ (max.)	0.26	0.19	0.16	0.14	0.12	0.10	0.08	0.08	0.07

Low Temperature Characteristics (at 120Hz)

Rated voltage (V)		6.3	10	16	25	35	50	63	80	100
Impedance ratio (max.)	Z−25˚C / Z+20˚C	2	2	2	2	2	2	2	2	2
	Z−40˚C / Z+20˚C	3	3	3	3	3	3	3	3	3
	Z−55˚C / Z+20˚C	8	4	4	3	3	3	3	3	3

Endurance (105˚C) (Applied ripple current)

Test time	2000 hours (10.0L, 10.5L: 5000 hours)
Capacitance Change	Within ±30% of initial value
Dissipation Factor	200% or less of the initial specified value (10.0L, 10, 5L: 300% or less)
Leakage Current	The initial specified value or less

Shelf life (105˚C)

Test time : 1000 hours; other items are the same as those for the endurance. Voltage application treatment : According to JIS C5101-4 4.1

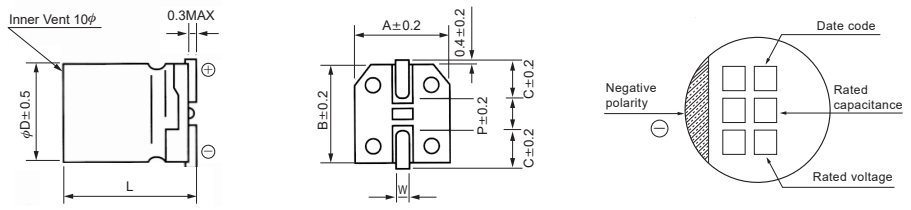
Coefficient of Frequency for Rated Ripple Current

Frequency (Hz) / Rated voltage (V)	50	120	1k	10k · 100k
6.3 to 50	0.5	0.5	0.75	1.0

Applicable standards: JIS C5101-1, -18 (IEC 60384-1, -18)

■ OUTLINE DRAWING

Unit : mm



φD	L	A	B	C	W	P	Casing symbol
4	5.8 ± 0.3	4.3	4.3	2.0	0.5 to 0.8	1.0	D61
5	5.8 ± 0.3	5.3	5.3	2.3	0.5 to 0.8	1.5	E61
6.3	5.8 ± 0.3	6.6	6.6	2.7	0.5 to 0.8	2.0	F61
6.3	7.7 ± 0.3	6.6	6.6	2.7	0.5 to 0.8	2.0	F80
8	6.5 ± 0.3	8.4	8.4	3.4	0.5 to 0.8	2.3	G68
8	10 ± 0.5	8.4	8.4	3.0	0.7 to 1.1	3.1	G10
8	10.5 ± 0.5	8.4	8.4	3.0	0.7 to 1.1	3.1	GA5
10	10 ± 0.5	10.4	10.4	3.3	0.7 to 1.1	4.7	H10
10	10.5 ± 0.5	10.4	10.4	3.3	0.7 to 1.1	4.7	HA5

■ STANDARD RATINGS

Rated voltage (V)	6.3			10			16			25			35			50		
Item / Rated capacitance (μF)	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms
4.7	—	—	—	—	—	—	—	—	—	—	—	—	4×5.8	1.35	90	4×5.8	2.70	60
10	—	—	—	—	—	—	4×5.8	1.35	90	4×5.8	1.35	90	4×5.8	1.35	90	5×5.8	1.50	90
													5×5.8	0.70	170	6.3×5.8	0.86	170
22	4×5.8	1.35	90	4×5.8	1.35	90	4×5.8	1.35	90	5×5.8	0.70	170	5×5.8	0.70	170	6.3×5.8	0.86	170
							5×5.8	0.70	170									
33	—	—	—	4×5.8	1.35	90	—	—	—	5×5.8	0.70	170	6.3×5.8	0.36	250	6.3×7.7	0.66	195
				5×5.8	0.70	170				6.3×5.8	0.36	250				8×6.5	0.63	200
47	4×5.8	1.35	90	—	—	—	5×5.8	0.70	170	6.3×5.8	0.36	250	6.3×5.8	0.36	250	6.3×7.7	0.66	195
	5×5.8	0.70	170				6.3×5.8	0.36	250							8×6.5	0.63	200
100	5×5.8	0.70	170	—	—	—	6.3×5.8	0.36	250	6.3×7.7	0.30	300	6.3×7.7	0.30	300	8×10.5	0.32	350
	6.3×5.8	0.36	250							8×6.5	0.30	300	8×10.5	0.16	600			
220	6.3×5.8	0.36	250	6.3×7.7	0.30	300	6.3×7.7	0.30	300	8×10	0.16	600	8×10.5	0.16	600	10×10	0.20	700
				8×6.5	0.30	300	8×6.5	0.30	300							10×10.5	0.18	700
330	6.3×7.7	0.30	300	8×10.5	0.16	600	8×10	0.16	600	8×10.5	0.16	600	10×10	0.09	850	—	—	—
	8×6.5	0.30	300										10×10.5	0.08	850			
470	8×10	0.16	600	8×10	0.16	600	8×10.5	0.16	600	10×10	0.09	850	—	—	—	—	—	—
										10×10.5	0.08	850						
680	—	—	—	8×10	0.16	600	10×10	0.09	850	—	—	—	—	—	—	—	—	—
							10×10.5	0.08	850									
1000	8×10	0.16	600	10×10	0.09	850	—	—	—	—	—	—	—	—	—	—	—	—
				10×10.5	0.08	850												
1500	10×10	0.09	850	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	10×10.5	0.08	850															

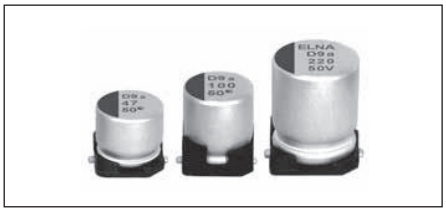
Rated voltage (V)	63			80			100		
Item / Rated capacitance (μF)	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms
4.7	5×5.8	3.0	50	—	—	—	—	—	—
10	6.3×5.8	1.5	80	6.3×7.7	2.4	60	—	—	—
22	6.3×7.7	1.2	120	8×10	0.9	130	8×10.5	1.30	130
33	8×10	0.65	250	8×10	0.9	130	10×10	0.70	200
47	8×10.5	0.65	250	10×10	0.5	200	—	—	—
68	8×10	0.65	250	—	—	—	—	—	—
100	10×10	0.35	400	—	—	—	—	—	—

(Note) Rated ripple current : 105ºC, 100kHz ; ESR : 20ºC, 100kHz

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

Chip Type, 105ºC, Low Impedance, High CV Capacitors

- Compatible with surface mounting.
- Vertical chip type miniaturized.
- Guarantees 2000 hours at 105˚C .



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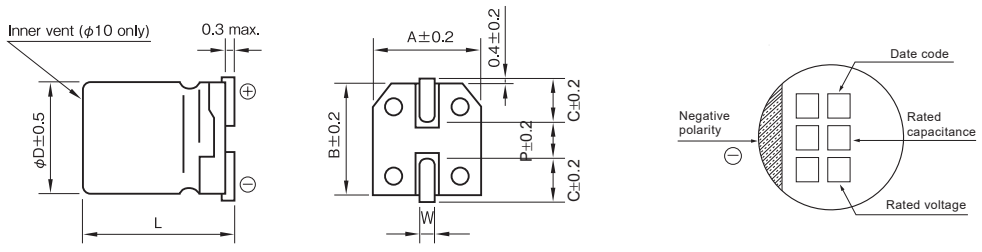
■ SPECIFICATIONS

Item	Performance
Category Temperature Range	−55˚C ~+105˚C
Capacitance Tolerance	±20% (20˚C , 120Hz)
Leakage Current (μA)	I = 0.01CV or 3 whichever is larger (after 2 minutes) C : Rated capacitance (μF) ; V : Rated voltage (V) (20˚C)
Dissipation Factor (Tanδ at 120Hz, 20˚C)	Rated voltage (V): 6.3 / 10 / 16 / 25 / 35 / 50 tan δ (max.): 0.26 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 0.02 is added to every 1000μF increase over 1000μF.
Low Temperature Characteristics (at 120Hz)	Rated voltage (V): 6.3 / 10 / 16 / 25 / 35 / 50 Impedance ratio (max.) Z−25˚C / Z+20˚C: 2 / 2 / 2 / 2 / 2 / 2 Z−40˚C / Z+20˚C: 3 / 3 / 3 / 3 / 3 / 3 Z−55˚C / Z+20˚C: 4 / 4 / 4 / 3 / 3 / 3
Endurance (105˚C) (Applied ripple current)	Test time: 2000 hours Capacitance Change: Within ±30% of initial value Dissipation Factor: 200% or less of the initial specified value Leakage Current: The initial specified value or less
Shelf life (105˚C)	Test time : 1000 hours; other items are the same as the endurance. Voltage application treatment : According to JIS C5101-4 4.1
Coefficient of Frequency for Rated Ripple Current	Frequency (Hz) / Rated voltage (V): 50 · 60 / 120 / 1k / 10k · 100k 6.3 to 50: 0.50 / 0.50 / 0.75 / 1
Applicable standards	JIS C5101-1, -18 (IEC 60384-1, -18)

■ OUTLINE DRAWING

Unit : mm



( ): Reference size

ϕD	L	A	B	C	W	P	Casing symbol
6.3	5.8 ± 0.3	6.6	6.6	2.7	0.5 to 0.8	2.0	F61
6.3	7.7 ± 0.3	6.6	6.6	2.7	0.5 to 0.8	2.0	F80
8	10 ± 0.5	8.4	8.4	3.0	0.7 to 1.1	3.1	G10
10	10 ± 0.5	10.4	10.4	3.0	0.7 to 1.1	4.7	H10

■ STANDARD RATINGS

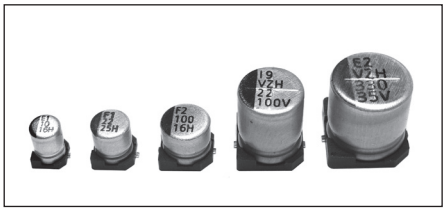
Rated voltage (V)	6.3			10			16		
Item / Rated capacitance (μF)	Case	ESR	Rated ripple current	Case	ESR	Rated ripple current	Case	ESR	Rated ripple current
	φD×L (mm)	Ω	mArms	φD×L (mm)	Ω	mArms	φD×L (mm)	Ω	mArms
150	—	—	—	—	—	—	6.3×5.8	0.26	300
220	—	—	—	6.3×5.8	0.26	300	6.3×5.8	0.26	300
330	6.3×5.8	0.26	300	6.3×7.7	0.16	600	6.3×7.7	0.16	600
470	6.3×7.7	0.16	600	6.3×7.7	0.16	600	—	—	—
680	6.3×7.7	0.16	600	—	—	—	8×10	0.08	850
1000	—	—	—	8×10	0.08	850	10×10	0.06	1190
1500	8×10	0.08	850	10×10	0.06	1190	—	—	—
2200	10×10	0.06	1190	—	—	—	—	—	—

Rated voltage (V)	25			35			50		
Item / Rated capacitance (μF)	Case	ESR	Rated ripple current	Case	ESR	Rated ripple current	Case	ESR	Rated ripple current
	φD×L (mm)	Ω	mArms	φD×L (mm)	Ω	mArms	φD×L (mm)	Ω	mArms
47	—	—	—	—	—	—	6.3×5.8	0.68	195
100	—	—	—	6.3×5.8	0.26	300	6.3×7.7	0.34	350
150	6.3×5.8	0.26	300	6.3×7.7	0.16	600	—	—	—
220	6.3×7.7	0.16	600	—	—	—	8×10	0.18	670
330	—	—	—	8×10	0.08	850	10×10	0.12	900
470	8×10	0.08	850	—	—	—	—	—	—
560	—	—	—	10×10	0.06	1190	—	—	—
820	10×10	0.06	1190	—	—	—	—	—	—

(Note) Rated ripple current：105ºC, 100kHz；ESR：20ºC, 100kHz

Chip Type, 105ºC Low Impedance, Large Capacitance Capacitors

- 4ϕ ~ 18ϕ, 105˚C , 2,000 ~ 5,000 hours assured.
- Large capacitance with low impedance capacitors.
- Designed for surface mounting on high density PC board.



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■ SPECIFICATIONS

Item	Performance
Category Temperature Range	−55˚C ~+105˚C
Capacitance Tolerance	±20% (20˚C , 120Hz)
Leakage Current (μA)	I = 0.01CV or 3 (μA) whichever is larger (after 2 minutes) C: Rated capacitance (μF) ; V: Rated voltage (V) (20˚C)
Dissipation Factor (Tanδ at 120Hz, 20˚C)	Rated Voltage: 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 80 / 100 Tanδ (max): 0.30 / 0.26 / 0.22 / 0.16 / 0.13 / 0.10 / 0.08 / 0.08 / 0.07 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase.
Low Temperature Characteristics (at 120Hz)	Impedance ratio shall not exceed the values given in the table below. Rated voltage (V): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 80 / 100 Impedance Ratio (max) Z (–25˚C) / Z (+20˚C): 4 / 3 / 2 / 2 / 2 / 2 / 2 / 2 / 2 Impedance Ratio (max) Z (–55˚C) / Z (+20˚C): 8 / 5 / 4 / 3 / 3 / 3 / 3 / 3 / 3
Endurance (105˚C) (Applied ripple current)	Test time: 2,000 Hrs for ϕD≤6.3mm & 10ϕ×7.7L; 5,000 Hrs for ϕD≥8mm Capacitance Change: Within ±30% of initial value Dissipation Factor: Less than 300% of specified value Leakage Current: Within specified value * The above Specifications shall be satisfied when the capacitors are restored to 20˚C after the rated voltage applied for 2,000 ~ 5,000 hours at 105˚C .
Shelf life (105˚C)	Test time: 1,000 Hrs Capacitance Change: Within ±30% of initial value Dissipation Factor: Less than 300% of specified value Leakage Current: Within specified value * The above Specifications shall be satisfied when the capacitors are restored to 20˚C after exposing them for 1,000 hours at 105˚C without voltage applied.
Ripple Current & Frequency Multipliers	Frequency (Hz): 50, 60 / 120 / 1k / 10k up Multiplier: 0.60 / 0.70 / 0.85 / 1.0

■ OUTLINE DRAWING

Unit : mm

Fig. 1

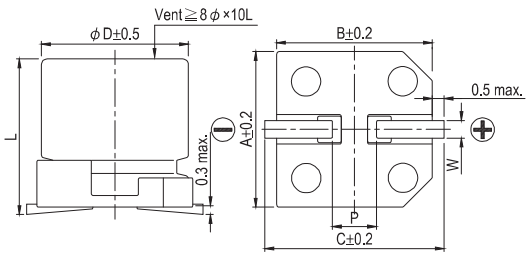
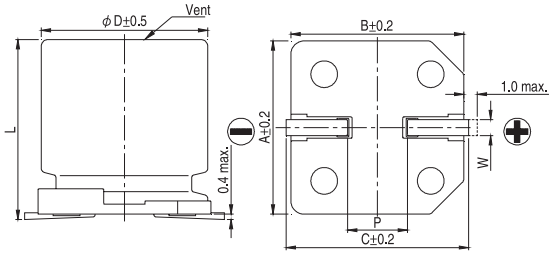


Fig. 2



φD	L	A	B	C	W	P±0.2	Fig. No.
4	5.7 ± 0.3	4.3	4.3	5.1	0.5 to 0.8	1.0	1
5	5.7 ± 0.3	5.3	5.3	5.9	0.5 to 0.8	1.5	1
6.3	5.7 ± 0.3	6.6	6.6	7.2	0.5 to 0.8	2.0	1
6.3	7.7 ± 0.3	6.6	6.6	7.2	0.5 to 0.8	2.0	1
8	6.5 ± 0.3	8.3	8.3	9.0	0.5 to 0.8	2.3	1
8	10 ± 0.5	8.3	8.3	9.0	0.7 to 1.1	3.1	1
10	7.7 ± 0.3	10.3	10.3	11.0	0.7 to 1.3	4.7	1
10	10 ± 0.5	10.3	10.3	11.0	0.7 to 1.3	4.7	1
12.5	13.5 ± 0.5	13.0	13.0	13.7	1.1 to 1.4	4.4	2
12.5	16 ± 0.5	13.0	13.0	13.7	1.1 to 1.4	4.4	2
16	16.5 ± 0.5	17.0	17.0	18.0	1.1 to 1.4	6.4	2
16	21.5 ± 0.5	17.0	17.0	18.0	1.1 to 1.4	6.4	2
18	16.5 ± 0.5	19.0	19.0	20.0	1.1 to 1.4	6.4	2
18	21.5 ± 0.5	19.0	19.0	20.0	1.1 to 1.4	6.4	2

■ STANDARD RATINGS

Rated voltage (V)	6.3			10			16			25			35			50		
Item / Rated capacitance (μF)	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms
1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.7	2.9	60
2.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.7	2.9	60
3.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4×5.7	2.9	60
4.7	—	—	—	—	—	—	—	—	—	—	—	—	4×5.7	1.35	80	5×5.7	1.52	85
10	—	—	—	—	—	—	4×5.7	1.35	80	4×5.7	1.35	80	5×5.7	0.80	150	6.3×5.7	0.88	165
22	4×5.7	1.35	80	4×5.7	1.35	80	5×5.7	0.80	150	5×5.7	0.80	150	6.5×5.7	0.44	230	6.3×5.7	0.88	165
33	4×5.7	1.35	80	5×5.7	0.80	150	6.3×5.7	0.44	230	6.3×5.7	0.44	230	6.3×5.7	0.44	230	6.3×7.7	0.68	185
47	5×5.7	0.80	150	6.3×5.7	0.44	230	6.3×5.7	0.44	230	6.3×5.7	0.44	230	6.3×5.7	0.44	230	6.3×7.7	0.68	185
68	—	—	—	—	—	—	—	—	—	6.3×5.7	0.44	230	8×6.5	0.36	280	8×10	0.34	369
100	6.3×5.7	0.44	230	6.3×5.7	0.44	230	6.3×5.7	0.44	230	6.3×7.7	0.36	280	8×10	0.17	450	8×10	0.34	369
										8×6.5	0.36	280				10×10	0.18	553
150	6.3×5.7	0.44	230	6.3×5.7	0.44	230	6.3×7.7	0.36	280	8×10	0.17	450	8×10	0.17	450	10×10	0.18	553
													10×7.7	0.17	450			
220	6.3×5.7	0.36	280	6.3×7.7	0.36	280	6.3×7.7	0.36	280	8×10	0.17	450	8×10	0.17	450	12.5×13.5	0.12	650
				8×6.5	0.36	280				10×7.7	0.17	450	10×10	0.09	670			
330	8×6.5	0.36	280	8×10	0.17	450	8×10	0.17	450	8×10	0.17	450	10×10	0.09	670	12.5×13.5	0.12	650
	8×10	0.17	450	10×7.7	0.17	450	10×7.7	0.17	450				12.5×13.5	0.07	820			
470	8×10	0.17	450	8×10	0.17	450	8×10	0.17	450	10×10	0.09	670	12.5×16	0.060	950	16×16.5	0.073	1000
	10×7.7	0.17	450	10×7.7	0.17	450	10×10	0.09	670									
680	8×10	0.17	450	10×10	0.09	670	10×10	0.09	670	12.5×13.5	0.070	820	12.5×16	0.060	950	16×16.5	0.073	1000
	10×7.7	0.17	450															
1000	8×10	0.17	450	10×10	0.09	670	12.5×13.5	0.070	820	12.5×16	0.060	950	16×16.5	0.054	1260	16×16.5	0.073	1000
																18×16.5	0.066	1500
1500	10×10	0.09	670	12.5×13.5	0.070	820	12.5×16	0.060	950	16×16.5	0.054	1260	18×16.5	0.048	1500	18×21.5	0.05	1620
													16×21.5	0.038	1630			
2200	12.5×13.5	0.070	820	12.5×16	0.060	950	16×16.5	0.054	1260	16×16.5	0.054	1260	18×21.5	0.038	1750	—	—	—
3300	12.5×16	0.060	950	16×16.5	0.054	1260	16×16.5	0.054	1260	18×16.5	0.048	1500	—	—	—	—	—	—
							16×21.5	0.038	1630	16×21.5	0.038	1630						
										18×21.5	0.038	1750	—	—	—	—	—	—
4700	16×16.5	0.054	1260	16×16.5	0.054	1260	18×16.5	0.048	1500	—	—	—	—	—	—	—	—	—
							16×21.5	0.038	1630									

Rated voltage (V)	63			80			100		
Item / Rated capacitance (μF)	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms	Case φD×L (mm)	ESR Ω	Rated ripple current mArms
4.7	5×5.7	1.90	70	—	—	—	—	—	—
10	6.3×5.7	1.20	130	—	—	—	—	—	—
22	6.3×7.7	0.90	150	8×10	1.3	130	8×10	1.3	130
33	8×10	0.50	280	8×10	1.3	130	10×10	0.7	200
47	8×10	0.50	280	10×10	0.7	200	10×10	0.7	200
100	10×10	0.25	450	10×10	0.7	200	12.5×13.5	0.32	450
150	12.5×13.5	0.15	700	12.5×13.5	0.32	450	16×16.5	0.17	650
220	12.5×13.5	0.15	700	16×16.5	0.17	650	16×16.5	0.17	650
							18×21.5	0.15	950
330	16×16.5	0.082	900	16×16.5	0.17	650	18×16.5	0.15	850
							16×21.5	0.15	900
470	16×16.5	0.082	900	16×21.5	0.15	900	18×21.5	0.15	950
680	18×16.5	0.080	1150	18×21.5	0.15	950	—	—	—
	16×21.5	0.080	1150						
1000	18×21.5	0.060	1250	—	—	—	—	—	—

(Note) Rated ripple current : 105ºC, 100kHz, ESR : 20ºC, 100kHz

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

Conductive Polymer Aluminum Solid Capacitors

■ Cautions for Using Conductive Polymer Solid Aluminum Electrolytic Capacitors

Please be sure to read this specification before using this product.

Before placing an order, please inquire about the Specification to check details

● Cautions for usage

This capacitor is the aluminum solid capacitors with Conductive Polymer electrolyte.
Please note the following points in order to take full advantage of products performance, with most stable quality.

1. Polarity

● Solid aluminum electrolytic capacitor is a polarized capacitor including positive and negative electrodes. Do not reverse the polarity when using. If it is used with the polarities reversed, increased leakage current or decreased life span may result.

2. Prohibited circuits

● Since problems can be expected due to leakage current increasing during soldering and other processes, the capacitor cannot be used in the following circuits.

(1) High impedance circuits
(2) Coupling circuits
(3) Time constant circuits.
(a) In addition to the leakage current fluctuation above, the operational conditions such as characteristics at high and low temperature, damp heat and endurance stipulated in the specifications will affect the capacitance. The fluctuation of the capacitance may cause problem if it is used as a time constant capacitor, which is extremely sensitive to the fluctuation of the capacitance. Do not use it as a time constant capacitor.
(3) Circuits to get bad influence by big leakage current
Additionally, please contact usage of two or more capacitors in series for voltage proof.

3. Overvoltage prohibited during design

● Overvoltage exceeding the rated voltage may not be applied even for an instant as it may cause a short circuit.

4. Sudden charge and discharge restricted

● Sudden charge and discharge restricted (for maintenance of high-proof reliability).
A protection circuit is recommended for when a sudden charge or discharge causes excessive rush current because this is a main cause of short circuits and large leakage current.
Use protection circuits under the following both cases;
(1) The rush current exceeds 10A.
(2) The rush current exceeds 10x the maximum allowable ripple current of capacitor.
Be sure to insert a protection resistor of about 1KΩ for charge and discharge when measuring the leakage current.

5. Operating environmental restrictions

● Do not use the capacitor in the following environments.

(1) Places where water, salt water or oil can directly fall on it, and places where condensation may form.
(2) Places filled with noxious gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonia, etc.).
(3) Places susceptible to ozone, ultraviolet rays and radiation.

6. Mounting precautions

(1) Considerations when soldering
The soldering conditions are to be within the range prescribed in specifications.
If the specifications are not followed, there is a possibility of the cosmetic defection, the intensive increase of leakage current, and the capacitance reduction.
(2) Things to be noted before mounting
(a) Do not reuse capacitors that have been assembled in a set and energized. Excluding capacitors that have been removed for measuring electrical characteristics during a periodic inspection, this capacitor cannot be reused.
(b) Leakage current may increase when capacitors are stored for a long period of time.

In this case, apply rated voltage for 2 hours at 105°C with load of 1 KΩ resistor.

(3) Flow soldering
Do not use flow soldering for SMD type.

(4) Reflow soldering
Do not use flow soldering for SMD type.

(a) Set the soldering conditions (soldering temperature, terminal submersion time) so that they fall within the stipulated range in the specifications. The leakage current value after soldering may increase a little (from a few μA to several mA) depending on the soldering conditions (preheating and solder temperature and time, PCB material and thickness, etc.). The leakage current can be reduced through self-repair by applying voltage.

(b) Reflow soldering may reduce the capacitance of products after soldering even when the soldering conditions are within the required value.

(5) Handling after soldering
Do not tilt, bend or twist the capacitor after it.

7. Disposal

● Conducting polymer capacitor comprises solid organic compounds, various metals, rubber, etc.
Treat it as industrial waste when disposing of it. In case of disposing a large amount of capacitors, the company can dispose on behalf.

8. Consideration when using in industrial equipment

● To ensure reliability when the capacitor is used in industrial equipment, design must allow for its capacitance, impedance, and other characteristics.

9. Using in equipment regarding human life

● In case of using in equipment regarding human life (e.g. Space equipment, aeronautic equipment and atomic equipment etc.), be sure to talk over the matter with supplier.
Don't use without recognition document of our company.

10. Hazardous substances for environmental care

(1) Substances destroying ozone layer
Substances (class one and two) destroying the ozone layer are not contained in this kind of capacitor. It is not used in manufacturing process of the capacitor.

(2) Bromine materials for flame-retardant
Conducting polymer capacitor does not contain bromine materials of PBBOs or PBBs as the flame-retardant

11. Others

● Design circuits after checking the following items

(1) Electric characteristics are affected by temperature and frequency fluctuations. Design circuits after checking the following items.

(2) When mounting an capacitor on a double-sided PC board, extra PC board holes and the through holes for connecting the front and back of the PCB must not exist underneath the capacitor.

● Precautions with completed board

(1) Do not touch the lead terminals of capacitor directly.

(2) Do not use electric conductors to cause short circuits between the capacitor lead terminals. Do not subject the capacitor to conductive solutions such as acids and alkaline water solutions.

(3) Check the installation environment of the board the capacitor is installed in.

(4) Age the board at conditions that fall below the capacitors ratings.

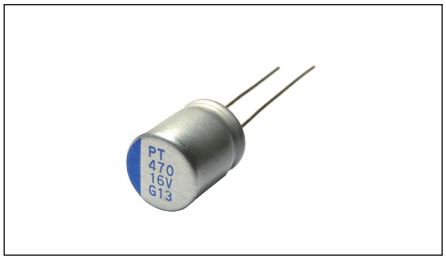
(5) It is recommended that the board be used at room temperature and in ordinary humidity.

● Note:

In case of some problems concerning industrial possessive rights of third party by using this product, we don't take responsibility except for what to be directly conceded with structure processes capacitor.
Please design with safety measures taking into consideration any social damage, such as personal or fire accident when using this product.

Radial Lead Type, 105ºC Standard

- Low ESR & high ripple current capability
- Endurance: 5,000 hours at 105°C
- Compliant to the RoHS directive
- Suitable for DC-DC converter & variety of power unit applications.



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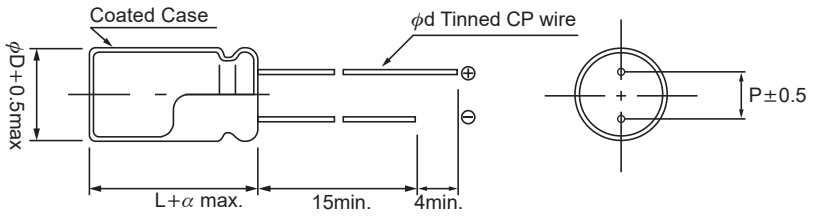
■ SPECIFICATIONS

Item	Performance	
Operating Temperature Range	−55˚C ~ +105˚C	
Rated Voltage Range	2.5V ~ 25V	
Capacitance Tolerance	±20%	(20˚C , 120Hz)
Surge Voltage	Rated Voltage x 1.15	
Leakage Current	Within the specified value as in standard rating	
Dissipation Factor (tan δ)	Less than or equal to the specified value at 20°C, 120 Hz	
Temperature Characteristics (Impedance ratio at 100 KHz)	Z (–25˚C) / Z (+20˚C)	≤ 1.15
	Z (–55˚C) / Z (+20˚C)	≤ 1.25
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 5,000 hours at 105°C.	
	Capacitance change	≤ ± 20% of the initial value
	D. F. (Tan δ)	≤ 150% of initial specified value
	ESR	≤ 150% of initial specified value
	Leakage current	Initial specified value or less
Bias Humidity Test	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjecting them at 60°C, 90 to 95% RH for 1,000 hours.	
	Capacitance change	≤ ± 20% of the initial value
	D. F. (Tan δ)	≤ 150% of initial specified value
	ESR	≤ 150% of initial specified value
	Leakage current	Initial specified value or less
Surge Voltage Test	The capacitors shall be subjected to 1,000 cycles each consisting of charge with the surge voltage specified at 105°C for 30 seconds through a protective resistor (R=1 KΩ) and discharge for 5 minutes 30 seconds.	
	Capacitance change	≤ ± 20% of the initial value
	D. F. (Tan δ)	≤ 150% of initial specified value
	ESR	≤ 150% of initial specified value
	Leakage current	Initial specified value or less

* In case of any doubt arises, measure the leakage current after voltage applied for 120 minutes at 105°C.

■ OUTLINE DRAWING

Unit : mm



Unit : mm

ϕD +0.5max	6.3		8	10
	L ≤ 7	L > 7		
ϕd ± 0.1	0.5	0.6	0.6	0.6
P	2.5	2.5	3.5	5.0
α (max)	1.5	1.5	1.5	1.5

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

■ STANDARD RATINGS

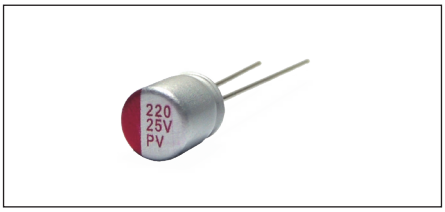
Rated voltage (V. DC)	Rated Capacitance (μF)	Case Size ϕD × L (mm)	tan δ	Leakage Current (μA)	ESR mΩ max / 20℃ 100 KHz to 300 KHz	Rated ripple current mA rms / 105℃ at 100 KHz	Part Number
2.5	560	6.3×6	0.10	500	10	3,870	GPT-560M2.5V6306
	820	6.3×8	0.10	500	7	3,500	GPT-820M2.5V6308
6.3V	220	6.3×6	0.10	300	15	3,160	GPT-220M6.3V6306
	330	6.3×6	0.10	592	17	3,160	GPT-330M6.3V6306
	470	6.3×8	0.10	592	8	4,700	GPT-470M6.3V6308
	560	6.3×8	0.10	706	8	4,700	GPT-560M6.3V6308
	560	8×8	0.10	706	7	5,700	GPT-560M6.3V0808
	820	6.3×8	0.10	1,033	8	4,700	GPT-820M6.3V6308
	820	8×8	0.10	1,033	7	5,700	GPT-820M6.3V0808
	1,000	8×8	0.10	1,260	7	5,700	GPT-1000M6.3V0808
	1,500	8×12	0.10	1,890	9	6,100	GPT-1500M6.3V0812
16V	100	6.3×6	0.10	320	25	2,490	GPT-100M16V6306
	180	8×8	0.10	576	13	5,000	GPT-180M16V0808
	270	6.3×8	0.10	864	15	3,200	GPT-270M16V6308
	270	8×8	0.10	864	11	4,520	GPT-270M16V0808
	330	8×8	0.10	1,056	11	4,520	GPT-330M16V0808
	470	8×12	0.10	1,504	11	5,400	GPT-470M16V0812
	470	10×12	0.10	1,504	10	6,100	GPT-470M16V1012
	820	8×12	0.10	2,624	11	5,400	GPT-820M16V0812
	820	10×12	0.10	2,624	11	6,100	GPT-820M16V1012
	1,000	10×12	0.10	3,200	11	6,100	GPT-1000M16V1012
	1,500	10×12	0.10	4,800	11	6,100	GPT-1500M16V1012
	2,200	10×17	0.10	7,040	11	8,100	GPT-2200M16V1017
25V	10	6.3×6	0.10	125	60	1,450	GPT-10M25V6306
	22	6.3×6	0.10	275	50	1,600	GPT-22M25V6306
	47	6.3×6	0.10	300	40	2,600	GPT-47M25V6306

- Frequency coefficient of allowable ripple current

Frequency	120 Hz ≤ f < 1 KHz	1 KHz ≤ f < 10 KHz	10 KHz ≤ f < 100 KHz	100 KHz ≤ f ≤ 300 KHz
Coefficient	0.05	0.30	0.70	1.00

Radial Lead Type, 105ºC High C/V Miniaturized

- Low ESR & high ripple current capability
- Endurance: 2,000 hours at 105°C
- Rated Voltage: 25V ~ 35V
- Rated capacitance: 47 ~ 1,000 µF



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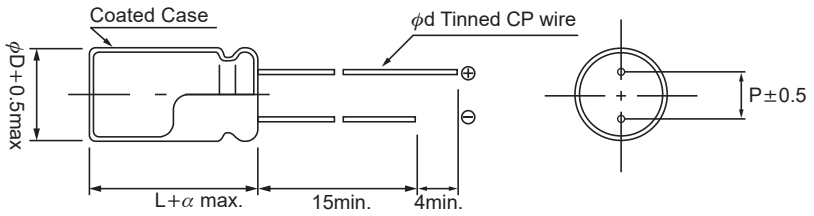
■ SPECIFICATIONS

Item	Performance	
Operating Temperature Range	−55˚C ~ +105˚C	
Rated Voltage Range	25V ~ 35V	
Capacitance Tolerance	±20%	(20˚C , 120Hz)
Surge Voltage	Rated Voltage x 1.15	
Leakage Current	Within the specified value as in standard rating	
Dissipation Factor (tan δ)	0.12, Less than or equal to the specified value at 20°C, 120 Hz	
Temperature Characteristics (Impedance ratio at 100 KHz)	Z (−25˚C) / Z (+20˚C)	≤ 1.15
	Z (−55˚C) / Z (+20˚C)	≤ 1.25
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 2,000 hours at 105°C.	
	Capacitance change	≤ ± 20% of the initial value
	D. F. (Tan δ)	≤ 150% of initial specified value
	ESR	≤ 150% of initial specified value
	Leakage current	Initial specified value or less
Bias Humidity Test	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjecting them at 60°C, 90 to 95% RH for 1,000 hours.	
	Capacitance change	≤ ± 20% of the initial value
	D. F. (Tan δ)	≤ 150% of initial specified value
	ESR	≤ 150% of initial specified value
	Leakage current	Initial specified value or less
Surge Voltage Test	The capacitors shall be subjected to 1,000 cycles each consisting of charge with the surge voltage specified at 105°C for 30 seconds through a protective resistor (R=1 KΩ) and discharge for 5 minutes 30 seconds.	
	Capacitance change	≤ ± 20% of the initial value
	D. F. (Tan δ)	≤ 150% of initial specified value
	ESR	≤ 150% of initial specified value
	Leakage current	Initial specified value or less

* In case of any doubt arises, measure the leakage current after voltage applied for 120 minutes at 105°C.

■ OUTLINE DRAWING

Unit : mm



Unit : mm

ϕD +0.5max	5	6.3		8	10
		L ≤ 7	L > 7		
ϕd ± 0.1	0.5	0.5	0.6	0.6	0.6
P	2.0	2.5	2.5	3.5	5.0
α (max)	1.5	1.5	1.5	1.5	1.5

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

■ STANDARD RATINGS

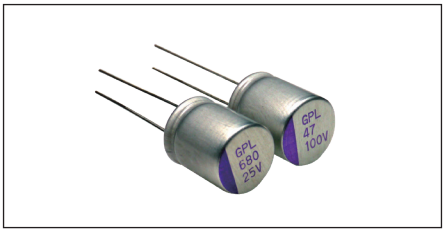
Rated voltage (V. DC)	Rated Capacitance (μF)	Case Size ϕD × L (mm)	tan δ	Leakage Current (μA)	ESR mΩ max / 20℃ 100 KHz to 300 KHz	Rated ripple current mA rms / 105℃ at 100 KHz	Part Number
25V	100	5×8	0.12	500	35	1,450	GPV-100M25V0508
	100	6.3×6	0.12	500	35	1,450	GPV-100M25V6306
	100	6.3×8	0.12	500	25	2,300	GPV-100M25V6308
	100	8×8	0.12	500	22	2,500	GPV-100M25V0808
	150	6.3×8	0.12	750	25	2,300	GPV-150M25V6308
	220	8×8	0.12	1,100	18	3,700	GPV-220M25V0808
	220	8×12	0.12	1,100	18	4,250	GPV-220M25V0812
	330	6.3×12	0.12	1,650	24	3,500	GPV-330M25V6312
	470	6.3×14	0.12	2,350	22	3,800	GPV-470M25V6314
	560	6.3×14	0.12	2,800	22	3,800	GPV-560M25V6314
	680	8×12	0.12	3,400	18	4,250	GPV-680M25V0812
	680	8×16	0.12	3,400	18	4,500	GPV-680M25V0816
	820	8×16	0.12	4,100	18	4,500	GPV-820M25V0816
	1000	10×16	0.12	5,000	16	5,000	GPV-1000M25V1016
35V	47	5×8	0.12	329	55	1,000	GPV-47M35V0508
	47	6.3×6	0.12	329	35	1,500	GPV-47M35V6306
	100	6.3×8	0.12	700	28	1,800	GPV-100M35V6308
	220	8×12	0.12	1,540	26	2,600	GPV-220M35V0812
	220	10×12	0.12	1,540	16	3,400	GPV-220M35V1012
	470	8×16	0.12	3,290	16	3,600	GPV-470M35V0816
	470	10×12	0.12	3,290	16	3,400	GPV-470M35V1012

- Frequency coefficient of allowable ripple current

Frequency	120 Hz ≤ f < 1 KHz	1 KHz ≤ f < 10 KHz	10 KHz ≤ f < 100 KHz	100 KHz ≤ f ≤ 300 KHz
Coefficient	0.05	0.30	0.70	1.00

Radial Lead Type, 125ºC Standard

- Low ESR & high ripple current capability
- Compliant to the RoHS directive
- Suitable for LED lighting, telecommunication & power unit applications.



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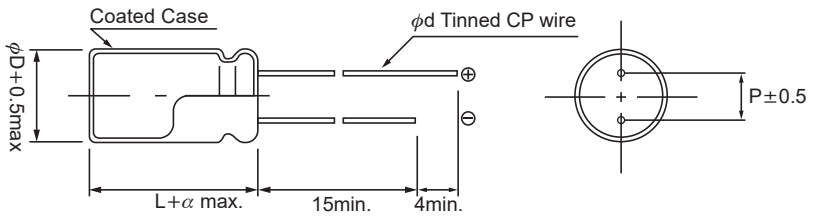
■ SPECIFICATIONS

Item	Performance	
Operating Temperature Range	−55℃ ~ +125℃	
Rated Voltage Range	16V ~ 160V	
Capacitance Tolerance	±20%	(20℃ , 120Hz)
Surge Voltage	Rated Voltage x 1.15	
Leakage Current	Within the specified value as in standard rating	
Dissipation Factor (tan δ)	Less than or equal to the specified value at 20°C, 120 Hz	
Temperature Characteristics (Impedance ratio at 100 KHz)	Z (−25℃) / Z (+20℃)	≤ 1.15
	Z (−55℃) / Z (+20℃)	≤ 1.25
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20°C after the rated voltage is applied for 2,000 hours at 125°C.	
	Capacitance change	≤ ± 30% of the initial value
	D. F. (Tan δ)	≤ 300% of initial specified value
	ESR	≤ 300% of initial specified value
	Leakage current	Initial specified value or less
Bias Humidity Test	The following specifications shall be satisfied when the capacitors are restored to 20°C after subjecting them at 60°C, 90 to 95% RH for 1,000 hours.	
	Capacitance change	≤ ± 20% of the initial value
	D. F. (Tan δ)	≤ 150% of initial specified value
	ESR	≤ 150% of initial specified value
	Leakage current	Initial specified value or less
Surge Voltage Test	The capacitors shall be subjected to 1,000 cycles each consisting of charge with the surge voltage specified at 125°C for 30 seconds through a protective resistor (R=1 KΩ) and discharge for 5 minutes 30 seconds.	
	Capacitance change	≤ ± 20% of the initial value
	D. F. (Tan δ)	≤ 150% of initial specified value
	ESR	≤ 150% of initial specified value
	Leakage current	Initial specified value or less

* In case of any doubt arises, measure the leakage current after voltage applied for 120 minutes at 125°C.

■ OUTLINE DRAWING

Unit : mm



Unit : mm

φD +0.5max	8	10	
		L ≤ 16	L > 17
φd ± 0.05	0.6	0.6	0.6
P	3.5	5.0	5.0
α (max)	1.5	1.5	2.0

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

■ STANDARD RATINGS

Rated voltage (V. DC)	Rated Capacitance (μF)	Case Size ϕD × L (mm)	tan δ	Leakage Current (μA)	ESR mΩ max / 20℃ 100 KHz to 300 KHz	Rated ripple current mArms, 100 KHz		Part Number
						Tx ≤ 105℃	105℃ < Tx ≤ 125℃	
16V	470	8×8	0.12	1,504	15	4,300	1,720	GPL-470M16V0808
	2,500	10×21	0.12	8,000	12	10,000	4,000	GPL-2500M16V1021
25V	100	8×8	0.12	500	24	2,900	1,160	GPL-100M25V0808
	150	8×8	0.12	750	24	2,900	1,160	GPL-150M25V0808
	220	8×12	0.12	1,100	18	4,250	1,700	GPL-220M25V0812
	330	8×12	0.12	1,650	18	4,250	1,700	GPL-330M25V0812
	470	8×12	0.12	2,350	18	4,250	1,700	GPL-470M25V0812
	470	10×12	0.12	2,350	16	4,700	1,880	GPL-470M25V1012
	680	10×12	0.12	3,400	16	4,700	1,880	GPL-680M25V1012
	1,000	10×17	0.12	6,000	14	5,000	2,000	GPL-1000M25V1017
35V	47	8×8	0.12	329	30	2,600	1,040	GPL-47M35V0808
	100	8×8	0.12	476	30	2,600	1,040	GPL-100M35V0808
	220	8×12	0.12	1.540	26	2,950	1,180	GPL-220M35V0812
	220	10×12	0.12	1.540	24	3,400	1,360	GPL-220M35V1012
	330	10×12	0.12	2,310	24	3,400	1,360	GPL-330M35V1012
	470	10×12	0.12	3,290	24	3,400	1,360	GPL-470M35V1012
	1,000	10×21	0.12	7,000	24	4,580	1,830	GPL-1000M35V1021
50V	47	8×12	0.12	470	32	2,250	900	GPL-47M50V0812
	120	8×12	0.12	1,200	32	2,250	900	GPL-120M50V0812
	220	10×12	0.12	2,200	28	2,620	1,040	GPL-220M50V1012
	470	10×21	0.12	4,700	28	4,250	1,700	GPL-470M50V1021
63V	22	8×12	0.12	277	32	2,100	840	GPL-22M63V0812
	33	8×12	0.12	416	32	2,100	840	GPL-33M63V0812
	47	8×12	0.12	592	32	2,100	840	GPL-47M63V0812
	100	8×12	0.12	1,260	32	2,100	840	GPL-100M63V0812
	180	10×12	0.12	2,268	28	2,550	1,020	GPL-180M63V1012
	330	10×21	0.12	4,158	28	3,570	1,420	GPL-330M63V1021
80V	47	8×12	0.12	752	40	1,950	780	GPL-47M80V0812
	82	10×12	0.12	1,312	35	2,300	900	GPL-82M80V1012
100V	22	8×12	0.12	440	40	1,850	740	GPL-22M100V0812
	47	10×12	0.12	940	38	2,100	840	GPL-47M100V1012
	100	10×21	0.12	2,000	36	2,940	1,176	GPL-100M100V1021
160V	6.8	8×12	0.12	217	130	720	280	GPL-6.8M160V0812
	12	10×12	0.12	384	130	960	380	GPL-12M160V1012

- Frequency coefficient of allowable ripple current

Frequency	120 Hz ≤ f < 1 KHz	1 KHz ≤ f < 10 KHz	10 KHz ≤ f < 100 KHz	100 KHz ≤ f ≤ 300 KHz
Coefficient	0.05	0.30	0.70	1.00

Electric Double Layer Capacitors
“DYNACAP” & “SUPERCAP”

■ Cautions for Using Electric Double Layer Capacitors (EDLC & SuperCap)

● Usage

1. Electric double layer capacitors (EDLC) use a conductive organic electrolyte.

The use at excessive mounting temperature or exceeding the upper category temperature can cause the electrolyte to leak. Especially,coin and multilayer coin types for the memory backup excluding the PL, NL, PV, NV series use a low elastic plastic as the sealant in the cell construction like coin batteries; therefore, avoid using such capacitors in the Vicinity of automotive equipment with steep temperature change, and heating element such as motor, relay, transformer, power IC, etc. because of the risk of leakage of electrolyte.

2. Since EDLC is polarized, do not apply a reversed voltage.

EDLC is polarized. If a reversed voltage is applied for a long time, the leakage current will increase abruptly, which may cause a decrease in the capacity, an increase in the internal resistance, and causing leakage or damage to the product in some cases.

3. Do not apply any voltage higher than the Max. operating voltage (this means the surge voltage in the case of short-time charge).

If an overvoltage is applied to the product, the leakage current will increase abruptly and the product will become overheated, which may cause a decrease in the capacity, an increase in the internal resistance, and causing leakage or damage to the product in some cases.

4. Do not use smoothing a power supply (for absorbing its ripple).

Since the internal resistance of EDLC is high, the product will be overheated if it is used for smoothing a power supply (for absorbing its ripple), which may cause a decrease in the capacity. an increase in the internal resistance, and causing leakage or damage to the product in some cases.

5. Do not use in a circuit where quick charge and discharge are repeated very often.

In a circuit where quick charge and discharge are repeated very often, the product will become overheated, which may cause a decrease in the capacity, an increase in the internal resistance, and causing leakage or damage to the product in some cases.

Reduce the charge and discharge currents while selecting a product with low internal resistance, and make sure that the product surface temperature does not rise.

6. EDLC life depends heavily on the ambient temperature.

(1) The lifetime of EDLC is seriously affected by change in ambient temperature. If the temperature is lowered by 10°C, the lifetime will be approximately doubled. Therefore, the product should be used at a temperature lower than the guaranteed maximum value for maximum life.

(2) If the capacitor is used at a temperature exceeding its maximum guaranteed temperature, not only is its life shortened, but increased vapor pressure of electrolyte or electrochemical reactions may increase the internal pressure, and causing leakage or damage to the product in some cases.

7. Do not use the product in an ambient atmosphere containing waterdrops (condensation) or toxic gases.

Although EDLC is sealed, water droplets or toxic gases may do degradation characteristics, a leakage and corrode the lead wires and the case, which may cause a breaking of the wires.

Avoid abrupt temperature changes, which may cause water droplets, resulting in product deterioration and electrolyte leakage.

8. Contact us before connecting the products in series.

A series connection will cause imbalance in the voltage, charged to the capacitors and an overvoltage may be charged to one or more them. This may cause a decrease in the capacity, an increase in the internal resistance and causing leakage or damage to the product in some cases. When using series connection for several capacitors, please derate the applied voltage from the Max. operating voltage or use balancing circuits (bleeder resistor, etc.) to compensate for the imbalance in the applied voltage for each capacitor. Moreover, please ensure the arrangement does not cause temperature fluctuation between capacitors.

9. About vibration.

A terminal blank, a terminal bend, and a crease may occur by adding too much vibration to a capacitor.

Moreover, depending on the case, an EDLC may do degradation of the characteristic, breakage, and a leakage.

10. When used on a double sided printed circuit board, do not overlap the wiring patterns on the mounted part.

A short circuit may be created by certain wiring conditions. Should the electrolyte leaks, the circuit pattern may cause a short circuit, resulting in tracking or migration.

11. Do not keep in high temperature and high humidity atmospheres.

(1) Avoid high temperature or high humidity or direct rays when storing capacitors.

(2) Keep the product in a place where the temperature is 5°C to 30°C and the humidity is lower than 60%. Avoid an abrupt temperature change, which may cause condensation or deterioration of the product or liquid leakage. (Recommended storage term: 1 year or less after delivery)

(3) Do not store EDLC at a place where there is a possibility that they may get water, salt or oil spill.

(4) Do not store EDLC at place where the air contains dense hazardous gas (hydrogen sulfide, sulfurous acid, nitrous acid, chlorine ammonia, etc.).

(5) Fumigation treatment with toxic gas covering the whole wooden container frames as moth proofing during shipment may leave residual toxic gas.

(6) Do not store EDLC at a place where it gets ultraviolet ray or radioactive ray.

12. Capacitors fitted with a relief valve

(1) The relief valve is provided with a valve function with part of the case made thin to avoid explosion by increased internal pressure when the capacitor is under abnormal load such as overvoltage or reverse voltage. After activation of the relief valve, the capacitor must be replaced as it does not restore.

(2) For the capacitors with a case relief valve (series PL, NL, PV, NV), provide a void on the top of the relief valve so as not to hamper its activation. Make a void of 2 mm or more for the product of Ø18 or less in diameter, and a void of 3 mm or more for the product of Ø20 to Ø35 mm in diameter on the top.

13. Use at a high altitude

The use of capacitors at high altitudes such as on an airplane causes a large difference between the internal pressure of the capacitors and the atmospheric pressure.

However, there is no problem in use under atmospheric pressure up to about an altitude of 10,000 meters.

If the condition is severe like space, please contact us.

● Mounting

1. Do not overheat when soldered.

Depending on the type and size of the board, the product may be subjected to overheat, leading to loss of airtightness. This may greatly shorten the product life or cause liquid leakage.

In case of a 1.6mm-thick and single side printed board. for example, keep the following soldering conditions: temperature lower than 260°C, time within 5 seconds (coin type), 10 seconds (Cylindrical type).

When a board thinner than 1.6 mm or multi-layer printed board is used, contact us.

In the case of hand soldering, the iron tip temperature is lower than 350°C, time is shorter than 4 seconds.

The coin types and multilayer coin types use polypropylene as the packing material for sealing and therefore susceptible to excessive heat. Note that the component body temperature shall be controlled so as not to exceed 90°C including preheating.

2. When soldering the capacitor to the wiring board, do not attach the body of the capacitor to the circuit board.

If the body of the capacitor is attached directly to the circuit board, the flux or solder can blow through the holes in the circuit board, negatively impacting the capacitor.

Moreover, the heat influence at the time of soldering can be reduced by floating the body.

3. Contact us when cleaning is necessary after soldering.

Certain types of solvents are not compatible and may cause damage.

4. Contact us when the product is attached by adhesive bonding.

Certain types of adhesives are not compatible.

Paste bond partially between the product and the board so that the product will not adhere completely to the board.

Do not raise the temperature over the guaranteed value while the bond is hardening.

5. Heating conditions of adhesive curing oven

During heating of the adhesive curing oven, application of excessive heat may significantly shorten the product life or cause liquid leakage. Control the body temperature so as not to exceed 90°C during work while setting the allowable atmospheric temperature below 110°C, and allowable heating time within 30 seconds.

For the heating conditions deviating from the above, consult with us providing your temperature profile conditions.

6. Be careful not to apply an excessive force to the capacitor body, terminals or lead wires.

(1) Mount the capacitor while making sure that the terminal spacing of the capacitor and the spacing of the holes in the printed wiring board are aligned.

(2) If the capacitor body is subjected to stress such as grabbing, falling, bending, pushing or twisting after mounted, its terminals may come off, leading to open, short or liquid leakage.

● Other cautions

1. Emergency procedures

If the EDLC overheats or starts to smell, immediately switch off the units main power supply to stop operation.

Keep your face and hands away from the EDLC, since the temperature may be high enough to cause the EDLC to ignite and burn.

2. Periodical inspections should be established for the EDLC used in industrial appliances.

The following items should be checked:

(1) Appearance: Check if there is leakage.

(2) Electronic performance: Check the leakage current, the electrostatic, the internal resistance and other items described in the catalog or the product specifications.

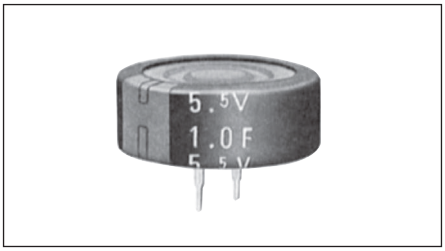
3. Disposing of EDLC

(1) Punch a hole or crush the EDLC (to prevent explosion) before incineration at approved facility.

(2) If they are not to be incinerated, bring them to a professional industrial waste disposal company.

5.5V Standard Capacitors

- Small-sized, large capacity, excellent voltage holding.
- For all ratings, uniform 5mm pitch of terminal spacing.
- Wider temperature range (–25 to +70°C) than battery.
- ϕ21.5 × 8 Lmm size can encase up to 1.5F.



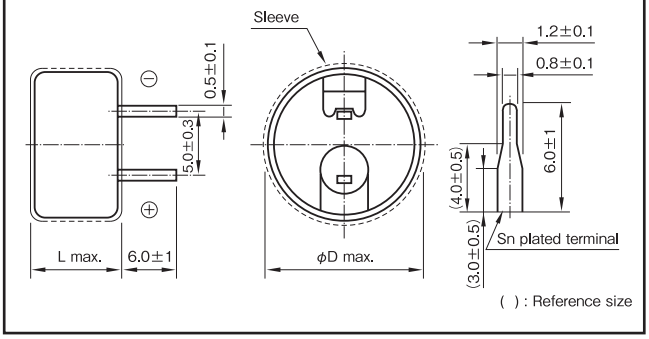
Marking color : White print on an indigo sleeve

■ SPECIFICATIONS

Item	Performance
Category temperature range	–25˚C ~ +70˚C
Tolerance at rated capacitance	–20% ~ +80%
Internal resistance at 1 kHz	Rated capacitance (F): 0.047 / 0.1 / 0.22 / 0.33 / 0.47 / 0.47 / 1.0 / 1.0 Internal resistance (Ω): 120 / 75 / 75 / 75 / 75 (ϕ13.5) / 30 (ϕ21.5) / 30 / 30
Characteristics at high and low temperature	Percentage of capacitance change: Within ±30% of the value at 20°C Internal resistance: Five times or less of the value at 20°C
Endurance (70°C)	Test time: 1000 hours Percentage of capacitance change: Within ±30% of the initial measured value Internal resistance: Four times or less of the initial specified value
Shelf life (70°C)	Test time: 1000 hours; Same as endurance.
Applicable standards	Conforms to JIS C5160-1 (IEC 62391-1)

■ OUTLINE DRAWING

Unit : mm



Part numbering system (example: 5.5V0.1F)

DB	—	5R5	D	104	□	T
Series code		Rated voltage symbol	Terminal code	Rated capacitance symbol	Additional symbol	

■ STANDARD RATINGS

Max. operating voltage (V)	Rated capacitance (F)	Parts No.	ϕD × L (mm)
5.5	0.047	DB-5R5D473T	13.5×7.5
5.5	0.1	DB-5R5D104T	13.5×7.5
5.5	0.22	DB-5R5D224T	13.5×7.5
5.5	0.33	DB-5R5D334T	13.5×7.5
5.5	0.47	DB-5R5D474ST	13.5×7.5
5.5	0.47	DB-5R5D474T	21.5×8.0
5.5	1.0	DB-5R5D105T	21.5×8.0
5.5	1.5	DB-5R5D155T	21.5×8.0

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

5.5V Miniaturized Standard Capacitors

- Smaller and lighter than Series DB.
- 5mm tall. Max. thin profile (H-shaped).
- Miniaturized but can encase up to 0.47F in 11.5×5mm case, and 1.5F in 19×20.5mm case.

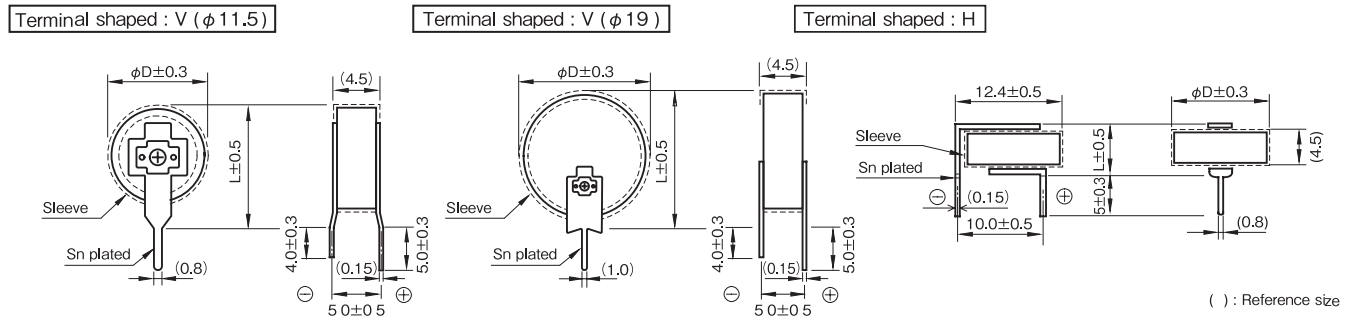
Marking color : White print on an indigo sleeve

■ SPECIFICATIONS

Item	Performance
Category temperature range	−25℃ ~ +70℃
Tolerance at rated capacitance	−20% ~ +80%
Internal resistance at 1 kHz	Rated capacitance (F): 0.047 / 0.1 / 0.22 / 0.33 / 0.47 / 0.47 / 1.0 / 1.0 Internal resistance (Ω): 120 / 75 / 75 / 75 / 75 (φ13.5) / 30 (φ21.5) / 30 / 30
Characteristics at high and low temperature	Percentage of capacitance change: Within ±30% of the value at 20°C Internal resistance: Five times or less of the value at 20°C
Endurance (70°C)	Test time: 1000 hours Percentage of capacitance change: Within ±30% of the initial measured value Internal resistance: four times or less of the initial specified value
Shelf life (70°C)	Test time: 1000 hours; Same as endurance.
Applicable standards	Conforms to JIS C5160-1 (IEC 62391-1)

■ OUTLINE DRAWING

Unit : mm



Part numbering system (example: 5.5V0.1F)						
DX	—	5R5	□	104	□	U
Series code		Rated voltage symbol	Terminal code	Rated capacitance symbol	Additional symbol	

Note

Do not apply external force to products or terminals as stress such as twisting, bending, pushing, or falling of such products or terminals may remove the terminals, resulting in an open/short circuit or liquid leakage.
Avoid applying excessive heat to capacitors during heating of an adhesive curing oven. For details, refer to the precautions in use of DYNACAP.

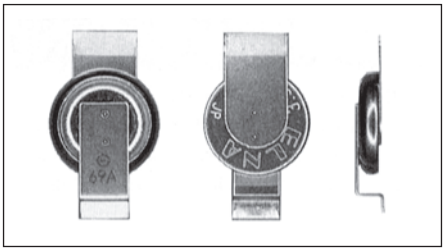
■ STANDARD RATINGS

Max. operating voltage (V)	Rated capacitance (F)	Parts No.	φD × L (mm)
5.5	0.047	DX-5R5V473U	11.5×13.0
		DX-5R5H473U	11.5×5.0
5.5	0.1	DX-5R5V104U	11.5×13.0
		DX-5R5H104U	11.5×5.0
5.5	0.22	DX-5R5V224U	11.5×13.0
		DX-5R5H224U	11.5×5.0
5.5	0.33	DX-5R5V334U	11.5×13.0
		DX-5R5H334U	11.5×5.0
5.5	0.47	DX-5R5V474SU	11.5×13.0
		DX-5R5H474SU	11.5×5.0
		DX-5R5V474U	19.0×20.5
5.5	1.0	DX-5R5V105U	19.0×20.5
5.5	1.5	DX-5R5V155U	19.0×20.5

ELECTRIC DOUBLE LAYER CAPACITORS "DYNACAP" DSK

Coin Cell Capacitors

- Reflow soldering method available.
- High reliability, safe and unlike secondarybatteries, environmentally friendly devices.
- Unlike batteries, excellent charge and discharge characteristics with no chemical reactions.
- 1.8Lmm height type 614 made lineup in the DSK series.
- Ideal for backing up of portable device etc.



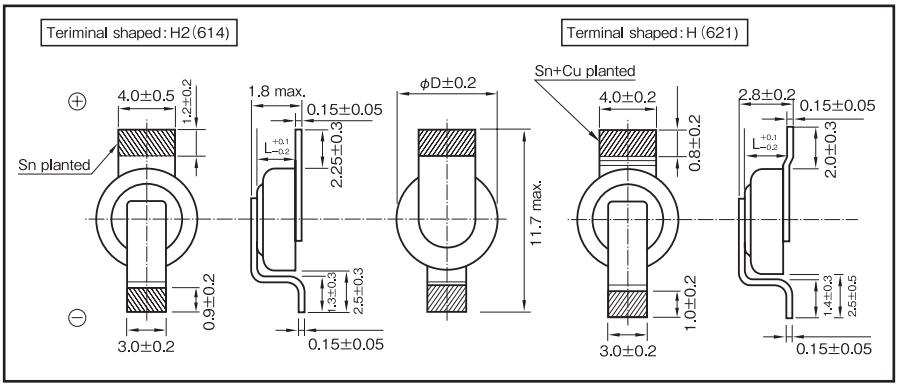
Marking color：White print on an indigo sleeve

■ SPECIFICATIONS

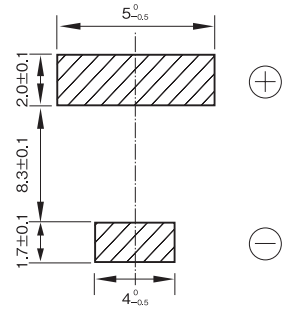
Item	Performance
Max.operating voltage	3.3 V
Category temperature range	−10˚C ~ +60˚C
Tolerance at rated capacitance	−20% ~ +80%
Internal resistance at 1 kHz	Size code: 614 / 621 — Rated capacitance (F): 0.2 / 0.22 / 0.33 — Internal resistance (Ω): 200 / 200 / 200
Characteristics at high and low temperature	Size code: 614 / 621 — Rated capacitance (F): Within ±50% of the value at 20°C — Internal resistance (Ω): Less than five times of the value at 20°C
Endurance	Size code: 614 / 621 — Test time and temp: 60˚C 1000 hours / 60˚C 500 hours — Percentage of capacitance (F): Within ±30% of the initial measured value — Internal resistance (Ω): 2kΩ Max. / 800Ω Max.
Shelf life	Test time: 1000 hours; Same as endurance.
Applicable standards	Conforms to JIS C5160-1 (IEC 62391-1)

■ OUTLINE DRAWING

Unit：mm



Recommended land pattern size



Thickness of solder paste: 0.15mm

* Please consult with us about other terminal form.

Part numbering system (example: 614, 3.3V0.2F, terminal shaped: H2)

DSK	—	3R3	H	204	T614	—	H2	L
Series code		Max. operating voltage symbol		Rated capacitance symbol	Additional symbol		Terminal shaped	Taping

Part numbering system (example: 621, 3.3V0.33F, terminal shaped: H)

DSK	—	3R3	H	334	T	—	H	L
Series code		Max. operating voltage symbol		Rated capacitance symbol	Additional symbol		Terminal shaped	Taping

■ STANDARD RATINGS

Max. operating voltage (V)	Rated capacitance (F)	Parts No.	φD × L (mm)
3.3	0.20	DSK-3R3H204T614-H2L	6.8×1.4
3.3	0.22	DSK-3R3H224U-HL	6.8×2.1
3.3	0.33	DSK-3R3H334T-HL	6.8×2.1

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

ELECTRIC DOUBLE LAYER CAPACITORS "SUPERCAP" PL

Features

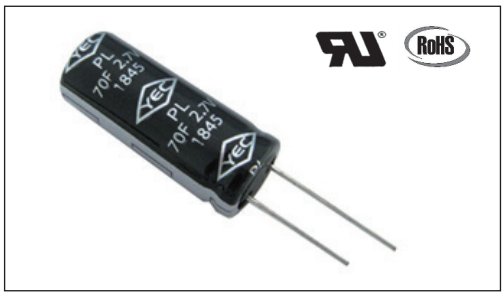
- Small size and low-resistance
- Quick charge & discharge.
- Environmentally friendly products
- Extended temperature to 85°C
- Humidity resistance at RH90%

Certification

- RoHS & REACH compliant
- UL recognized(File No. MH10260)

Recommended Applications

- Pulse power demand
- Hybrid battery pack
- Power tools

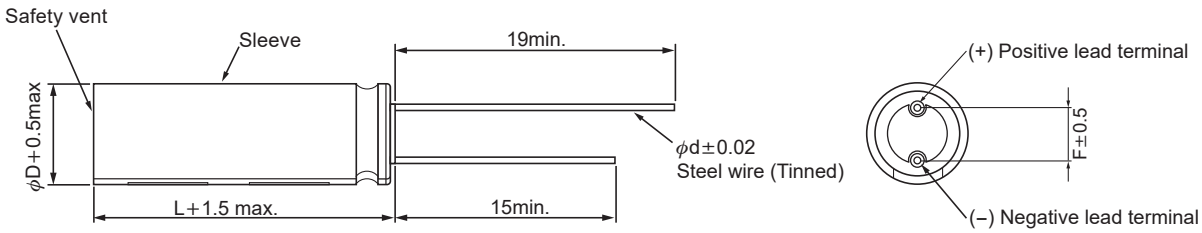


■ SPECIFICATIONS

Item	Performance	
Rated Voltage	2.3V	2.7V
Operating Temp. (Charge)	−40˚C ~ +85˚C	−40˚C ~ +65˚C
Surge Voltage	2.85V	
Capacitance Tolerance	−20% ~ +30% of Rated Capacitance	
Storage Temp.	−40˚C ~ +85˚C	−40˚C ~ +70˚C
Test	**Endurance**	**Standards**
High Temp. Life	1000hrs at Rated Voltage & Max. Operating Temp.	Must meet standards as below after test: CAP decline< 30% of Initial measurement. ESR < 2 times specification value.
Shelf Life (Non-Charge)	1000hrs at Max. Operating Temp.	
Life time	10 Years at Rated Voltage & 25°C	
Cycle Life	500,000 Cycles at 25°C (Operating Between 50% ~ 100% Of Rated Voltage)	

■ OUTLINE DRAWING

Unit：mm



Size	D	L	d	F
6.3×15	6.3	15	0.5	2.5
8×12	8	12	0.6	3.5
8×14	8	14	0.6	3.5
8×16	8	16	0.6	3.5
8×20	8	20	0.6	3.5
8×28	8	28	0.6	3.5
10×20	10	20	0.6	5.0
10×25	10	25	0.6	5.0
10×30	10	30	0.6	5.0

Size	D	L	d	F
12.5×31.5	12.5	31.5	0.8	5.3
12.5×35.5	12.5	35.5	0.8	5.3
12.5×40	12.5	40	0.8	5.3
12.5×46	12.5	46	0.8	5.3
16×26	16	26	0.8	7.5
16×31.5	16	31.5	0.8	7.5
18×40	18	40	0.8	7.5
18×45	18	45	0.8	7.5
18×60	18	60	1	7.5
22×45	22	45	1	9.5

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

■ STANDARD RATINGS

Rated Cap (F)	Size (mm)	Max. Internal Resistance (mΩ)		Max. LC (mA)	Stored Energy	Specific Energy		Specific Power		Max.Peak Current	Max. continuous current	Isc	Max. Weight (g)	Part Number
measure at 25℃	φD×L	AC (1kHz, 1V)	DC	72hrs, 25℃	(Wh)	(Wh/kg)	(Wh/l)	Pd (Wh/kg)	Pmax (Wh/kg)	1s to 1/2V (A)	(A)	(A)		
0.5	8×12	700	1800	0.002	0.0005	0.5063	0.8393	486	1013	0.36	0.05	1.50	1	WPL-0.5F2.7V0812
1	8×12	315	700	0.006	0.0010	0.9205	1.6786	1136	2367	0.80	0.1	3.86	1.1	WPL-1F2.7V0812
1.5	8×14	190	410	0.008	0.0015	1.2656	2.1582	1778	3704	1.25	0.15	6.59	1.2	WPL-1.5F2.7V0814
2	8×16	180	350	0.01	0.0020	1.5577	2.5179	1923	4005	1.59	0.2	7.71	1.3	WPL-2F2.7V0816
3.3	8×20	190	300	0.012	0.0033	2.0250	3.3236	1767	3682	2.24	0.33	9.00	1.65	WPL-3.3F2.7V0820
3.3	10×20	150	290	0.012	0.0033	1.6706	2.1271	1508	3142	2.28	0.33	9.31	2	WPL-3.3F2.7V1020
4	10×20	150	250	0.014	0.0041	1.8409	2.5783	1591	3314	2.70	0.4	10.8	2.2	WPL-4F2.7V1020
5	10×20	90	160	0.015	0.0051	2.2011	3.2229	2377	4952	3.75	0.5	16.88	2.3	WPL-5F2.7V1020
6	8×28	80	140	0.015	0.0061	2.6413	4.3164	2717	5660	4.40	0.6	19.29	2.3	WPL-6F2.7V0828
6	10×20	70	130	0.015	0.0061	2.4300	3.8675	2692	5608	4.55	0.6	20.77	2.5	WPL-6F2.7V1020
8	10×25	60	100	0.02	0.0081	2.7000	4.1253	2916	6075	6.00	0.8	27.00	3	WPL-8F2.7V1025
10	10×30	60	85	0.03	0.0101	2.8929	4.2972	2941	6126	7.30	1	31.76	3.5	WPL-10F2.7V1030
15	12.5×31.5	35	60	0.035	0.0152	2.8656	3.9289	2751	5731	10.66	1.5	45.00	5.3	WPL-15F2.7V1332
22	12.5×35.5	30	45	0.055	0.0223	3.4269	5.1130	2991	6231	14.93	2.2	60.00	6.5	WPL-22F2.7V1336
25	16×26	28	42	0.06	0.0253	3.3750	4.8421	2777	5786	16.46	2.5	64.29	7.5	WPL-25F2.7V1626
30	16×31.5	25	35	0.08	0.0304	3.4517	4.7960	2840	5917	19.76	3	77.14	8.8	WPL-30F2.7V1632
60	18×40	14	20	0.13	0.0608	4.0500	5.9683	2916	6075	36.82	6	135.00	15	WPL-60F2.7V1840
100	18×60	10	16	0.26	0.1013	4.6023	6.6315	2485	5178	51.92	10	168.75	22	WPL-100F2.7V1860
100	22×45	10	15	0.26	0.1013	4.4022	5.9190	2536	5283	54.00	10	180.00	23	WPL-100F2.7V2245

NOTE
Design, Specifications are subject to change without notice.
Ask factory for technical specifications before purchase and/or use.

ELECTRIC DOUBLE LAYER CAPACITORS "SUPERCAP" NL

Features

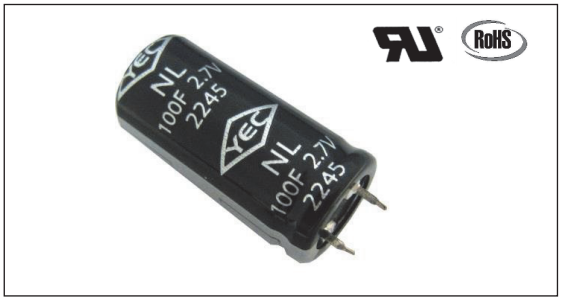
- High Capacitance and Low ESR
- Quick charge & discharge
- Environmentally friendly products
- Extended temperature to 85°C
- Humidity resistance at RH90%

Certification

- RoHS & REACH compliant
- UL recognized(File No. MH10260)

Recommended Applications

- Pulse power demand
- Hybrid battery pack
- Power tools

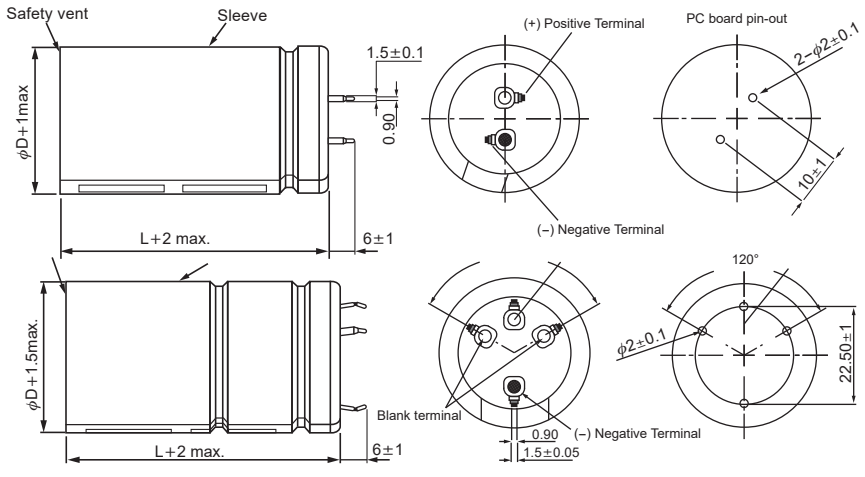


■ SPECIFICATIONS

Item	Performance	
Rated Voltage	2.3V	2.7V
Operating Temp. (Charge)	−40˚C ~ +85˚C	−40˚C ~ +65˚C
Surge Voltage	2.85V	
Capacitance Tolerance	−20% ~ +20% of Rated Capacitance	
Storage Temp.	−40˚C ~ +85˚C	−40˚C ~ +70˚C
Test	**Endurance**	**Standards**
High Temp. Life	1000hrs at Rated Voltage & Max. Operating Temp.	Must meet standards as below after test: CAP decline< 30% of Initial measurement. ESR < 2 times specification value.
Shelf Life (Non-Charge)	1000hrs at Max. Operating Temp.	
Life time	10 Years at Rated Voltage & 25°C	
Cycle Life	500,000 Cycles at 25°C (Operating Between 50% ~ 100% Of Rated Voltage)	

■ OUTLINE DRAWING

Unit：mm



Size	D	L
22×45	22	45
25×50	25	50
30×50	30	50
35×50	35	50
35×60	35	50

■ STANDARD RATINGS

Rated Cap (F)	Size (mm)	Max. Internal Resistance (mΩ)		Max. LC (mA)	Stored Energy	Specific Energy		Specific Power		Max.Peak Current	Max. continuous current	Isc	Max. Weight (g)	Part Number
measure at 25˚C	φD×L	AC (1kHz, 1V)	DC	72hrs, 25˚C	(Wh)	(Wh/kg)	(Wh/l)	Pd (Wh/kg)	Pmax (Wh/kg)	1s to 1/2V (A)	(A)	(A)		
100	22×45	9	15	0.26	0.1013	4.4022	5.9190	2536	5283	54.00	10	180.00	23	SNL-100F2.7V2245
150	25×50	7	14	0.5	0.1519	4.7641	6.1879	1953	4068	65.32	15	192.86	32	SNL-150F2.7V2550
200	30×50	7	13	0.6	0.2025	4.8214	5.7296	1602	3338	75.00	20	207.69	42	SNL-200F2.7V3050
300	35×50	7	13	0.8	0.3038	5.3287	6.3142	1181	2460	82.65	30	207.69	57	SNL-300F2.7V3550
400	35×60	5	12	1.2	0.4050	5.4000	7.0158	972	2025	93.10	40	225.00	75	SNL-400F2.7V3560

NOTE
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Ask factory for technical specifications before purchase and/or use.

ELECTRIC DOUBLE LAYER CAPACITORS "SUPERCAP" PV

Features

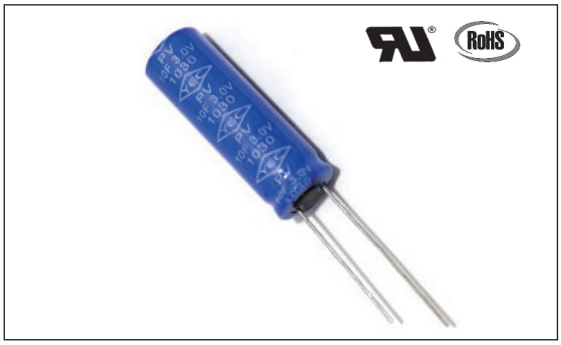
- 3.0V operating voltage
- Small size and low-resistance
- Quick charge & discharge
- Environmentally friendly products
- Extended temperature to 85°C
- Humidity resistance at RH90%

Certification

- RoHS & REACH compliant
- UL recognized(File No. MH10260)

Recommended Applications

- Pulse power demand
- Hybrid battery pack
- Power tools

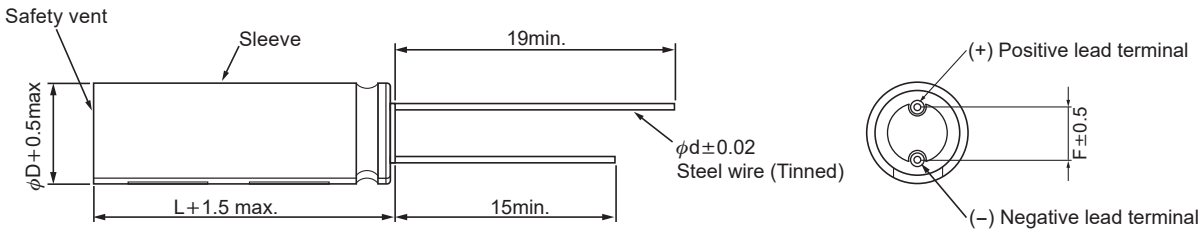


■ SPECIFICATIONS

Item	Performance	
Rated Voltage	2.7V	3V
Operating Temp. (Charge)	−40℃ ~ +85℃	−40℃ ~ +65℃
Surge Voltage	3.15V	
Capacitance Tolerance	−20% ~ +30% of Rated Capacitance	
Storage Temp.	−40℃ ~ +85℃	−40℃ ~ +70℃
Test	**Endurance**	**Standards**
High Temp. Life	1000hrs at Rated Voltage & Max. Operating Temp.	Must meet standards as below after test: CAP decline< 30% of Initial measurement. ESR < 2 times specification value.
Shelf Life (Non-Charge)	1000hrs at Max. Operating Temp.	
Life time	10 Years at Rated Voltage & 25°C	
Cycle Life	500,000 Cycles at 25°C (Operating Between 50% ~ 100% Of Rated Voltage)	

■ OUTLINE DRAWING

Unit：mm



Size	D	L	d	F
6.3×15	6.3	15	0.5	2.5
8×12	8	12	0.6	3.5
8×16	8	16	0.6	3.5
8×20	8	20	0.6	3.5
8×25	8	25	0.6	3.5
8×28	8	28	0.6	3.5

Size	D	L	d	F
10×30	10	30	0.6	5.0
12.5×31.5	12.5	31.5	0.8	5.3
12.5×46	12.5	46	0.8	5.3
16×26	16	26	0.8	7.5
16×31.5	16	31.5	0.8	7.5
18×40	18	40	0.8	7.5
18×60	18	60	1.0	7.5

NOTE
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■ STANDARD RATINGS

Rated Cap (F)	Size (mm)	Max. Internal Resistance (mΩ)		Max. LC (mA)	Stored Energy	Specific Energy		Specific Power		Max.Peak Current	Max. continuous current	Isc	Max. Weight (g)	Part Number
measure at 25°C	φD×L	AC (1kHz, 1V)	DC	72hrs, 25°C	(Wh)	(Wh/kg)	(Wh/l)	Pd (Wh/kg)	Pmax (Wh/kg)	1s to 1/2V (A)	(A)	(A)		
0.5	8×12	400	1600	0.0036	0.0006	0.6250	1.0362	675	1406	0.42	0.05	1.88	1	WPV-0.5F3V0812
1.2	6.3×15	240	600	0.008	0.0015	1.5000	3.2080	1800	3750	1.05	0.12	5.00	1	WPV-1.2F3V6315
2	8×16	180	350	0.01	0.0025	1.9231	3.1085	2374	4945	1.77	0.2	8.57	1.3	WPV-2F3V0816
3.3	8×20	160	300	0.012	0.0041	2.5781	4.3192	2250	4688	2.49	0.33	10.00	1.6	WPV-3.3F3V0820
5	8×25	80	150	0.015	0.0063	2.8409	4.9736	3273	6818	4.29	0.5	20.00	2.2	WPV-5F3V0825
6	8×28	70	130	0.015	0.0075	3.2609	5.3288	3612	7525	5.06	0.6	23.08	2.3	WPV-6F3V0828
10	10×30	40	80	0.03	0.0125	3.6765	5.3052	3971	8272	8.33	1	37.50	3.4	WPV-10F3V1030
15	12.5×31.5	30	50	0.06	0.0188	3.9894	4.8504	4596	9574	12.86	1.5	60.00	4.7	WPV-15F3V1332
25	16×26	25	33	0.075	0.0313	4.1667	5.9779	4364	9091	20.55	2.5	90.91	7.5	WPV-25F3V1626
34	12.5×46	16	26	0.08	0.0425	5.0000	7.5287	4887	10181	27.07	3.4	115.38	8.5	WPV-34F3V1346
35	16×31.5	20	30	0.09	0.0438	5.1471	6.9078	4235	8824	25.61	3.5	100.00	8.5	WPV-35F3V1632
60	18×40	12	20	0.18	0.0750	4.6875	7.3683	3375	7031	40.91	6	150.00	16	WPV-60F3V1840
100	18×60	10	16	0.225	0.1250	5.6818	8.1870	3068	6392	57.69	10	187.50	22	WPV-100F3V1860

NOTE
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ELECTRIC DOUBLE LAYER CAPACITORS "SUPERCAP" NV

Features

- 3.0V operating voltage
- High Capacitance and Low ESR
- Quick charge & discharge
- Environmentally friendly products
- Extended temperature to 85°C
- Humidity resistance at RH90%

Certification

- RoHS & REACH compliant
- UL recognized(File No. MH10260)

Recommended Applications

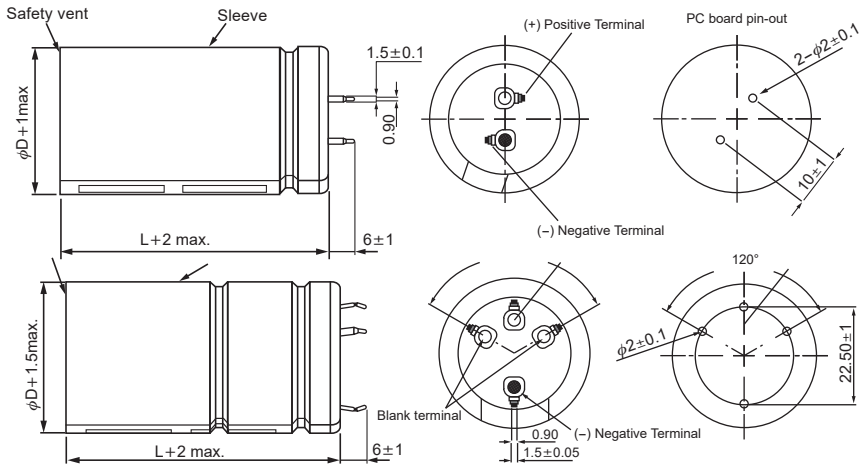
- Pulse power demand
- Hybrid battery pack
- Power tools

■ SPECIFICATIONS

Item	Performance	
Rated Voltage	2.7V	3.0V
Operating Temp. (Charge)	−40˚C ~ +85˚C	−40˚C ~ +65˚C
Surge Voltage	3.15V	
Capacitance Tolerance	−20% ~ +20% of Rated Capacitance	
Storage Temp.	−40˚C ~ +85˚C	−40˚C ~ +70˚C
Test	**Endurance**	**Standards**
High Temp. Life	1000hrs at Rated Voltage & Max. Operating Temp.	Must meet standards as below after test: CAP decline< 30% of Initial measurement. ESR < 2 times specification value.
Shelf Life (Non-Charge)	1000hrs at Max. Operating Temp.	
Life time	10 Years at Rated Voltage & 25°C	
Cycle Life	500,000 Cycles at 25°C (Operating Between 50% ~ 100% Of Rated Voltage)	

■ OUTLINE DRAWING

Unit：mm



Size	D	L
25×50	25	50
35×60	35	60

■ STANDARD RATINGS

Rated Cap (F)	Size (mm)	Max. Internal Resistance (mΩ)		Max. LC (mA)	Stored Energy	Specific Energy		Specific Power		Max.Peak Current	Max. continuous current	Isc	Max. Weight (g)	Part Number
measure at 25˚C	φD×L	AC (1kHz, 1V)	DC	72hrs, 25˚C	(Wh)	(Wh/kg)	(Wh/l)	Pd (Wh/kg)	Pmax (Wh/kg)	1s to 1/2V (A)	(A)	(A)		
150	25×50	8	12	0.3	0.1875	5.8594	7.6394	2813	5859	80.36	15	250.00	32	SNV-150F3V2550
400	35×60	5	7	1.2	0.5000	6.7568	8.6615	2085	4344	157.90	40	428.57	74	SNV-400F3V3560

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