

English

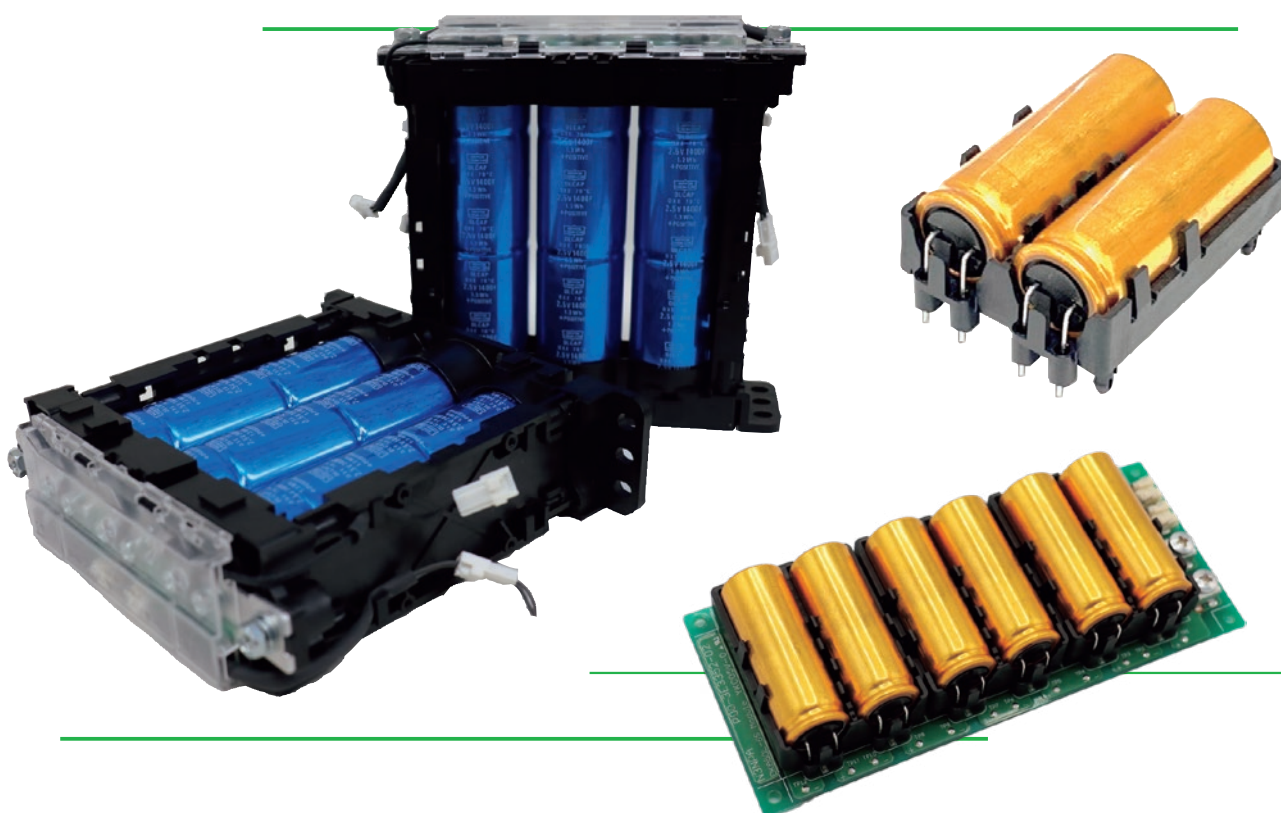


DLCAP™

Supercapacitor

2022

CAT.NO.E1009J



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◆ Environment-friendly products

Nippon Chemi-Con has been taking proactive approaches toward developing and marketing less environmentally-load products in response to the international efforts for reducing hazardous substances and to the regulations. Nippon Chemi-Con had already abolished 4 additional substances, which will be prohibited from July 2017 in accordance with revised RoHS directive (2011/68/EU), by innovating alternative materials of the outer tube.

RoHS2 Compliant : Compliant to the 2011/65/EU and the revisions (2015/863/EU)

ELV Compliant : Compliant to the 2000/53/EC and the revisions (2016/774/EU)

Please contact us for more information about "Halogen-free specification".

Introduction of Supercapacitor

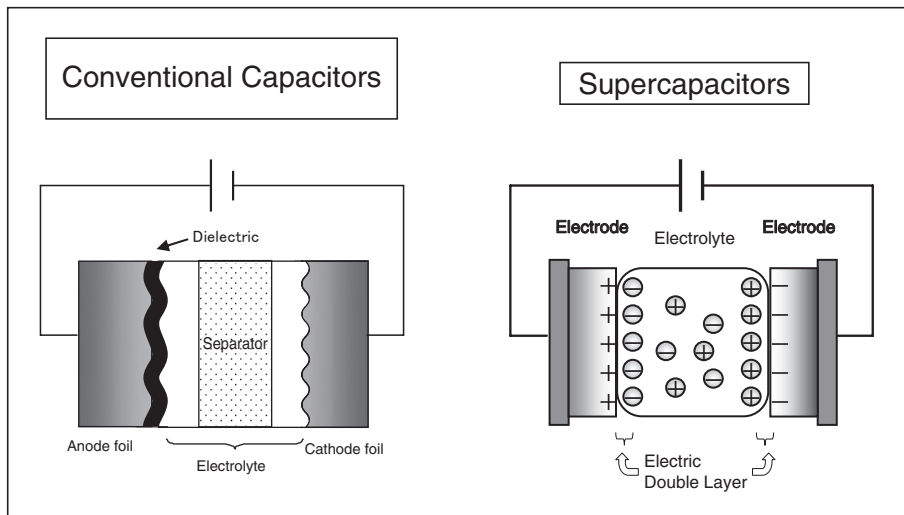
1. Introduction

Compared to the commonly used rechargeable batteries, Supercapacitor(Electric Double Layer Capacitor), which is capable to be charged-discharged with high current, is an energy storage device which has excellent charge-discharge cycle life. In the recent years, with energy issues (reduction of oil consumption, consumer electric power, CO₂ emission, and effective use of new energy) being focused, using Supercapacitor on more and more new applications is considered. Electrification of mobilities and installation of Supercapacitor in hybrid or fuel-cell vehicle is also considered.

Nippon Chemi-Con has been strongly pursuing products that serve for energy conservation, low environmental load. Supercapacitor represents those environmental-friendly products. We have a wide range of products to meet customers' needs, from dozens to thousands of farads.

2. Basic Mechanism of Supercapacitor

Conventional capacitors have a dielectric sandwiched between two electrodes. When voltage is applied, dipoles are oriented, and thus electric charge is stored. Electric double layer capacitors have electric charges oriented at the boundary of electrolyte and electrodes which is called the "electric double layer."



(Figure1) Mechanism

3. Characteristics

Unlike rechargeable batteries, Supercapacitor does not use chemical reactions and it stores energy solely by physical movement of ion to the surface of activated carbon. That gives Supercapacitor features as following;

- With low degradation, it withstands multimillion charge-discharge cycles.
- With the high power density, rapid (high current) charge-discharge is possible.
- With a high charge-discharge efficiency, the output efficiency of over 95% with a power density 1kW/kg is achieved.
- Environment-friendly without containing heavy metals.
- High in safety at irregular occasions, and will be not destroyed even by short circuiting.

4. Structure

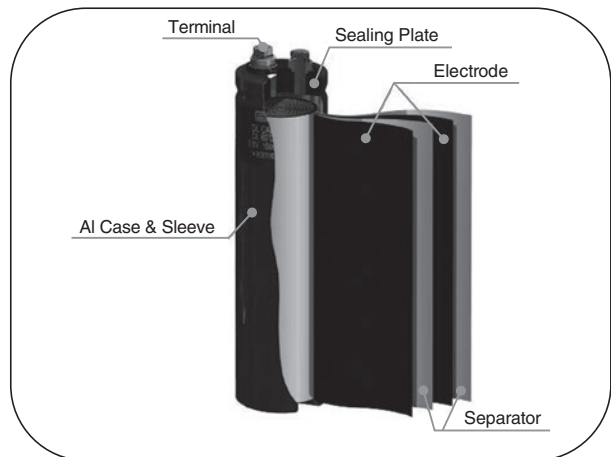
Nippon Chemi-Con produces Lead type and cylindrical type DLCAP™ (Photo 1).

Basic structure is, as shown in figure 2, aluminum foils with electrode pasted on the surface wound into a roll.

Using activated carbon for the electrode utilizing its very large surface area, and with our original high-density electrode manufacturing technology, we achieved both high capacitance and low resistance.



(Photo1) DLCAP™ Appearance



(Figure2) DLCAP™ Structure



SUPERCAPACITOR

Lead type

New!

DLCAP™ DKG series

High Voltage

Long Life

-40°C

+65°C

RoHS2 Compliant

- Improved rated Voltage 2.5V ⇒ 2.7V
- Long life products 2.7V 65°C 2000h warranty / 2.5V 70°C 2000h warranty
- Space saving with smaller volume when moduled
- Suitable for electricity backups



Sleeveless type

◆ SPECIFICATIONS

Items	Specifications	
Operating Temperature	-40°C ~ +70°C	
Capacitance Tolerance	±10% (K) (25°C)	
Temperature Characteristics	Capacitance Change	≤ ±30% of the measured value at 20°C
	Internal Resistance Change	≤ 600% of the internal resistance maximum value given in the ratings tables (-40°C)
Load Life Test	After the capacitors are subjected to the rated DC voltage 2.7V at 65°C for 2,000 hours, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the initial measured value at 20°C
	Internal Resistance Change	≤ 200% of the internal resistance maximum value given in the ratings tables
	After the capacitors are subjected to the DC 2.5V at 70°C for 2,000 hours, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the initial measured value at 20°C
	Internal Resistance Change	≤ 200% of the internal resistance maximum value given in the ratings tables
Bias Humidity Test	After the capacitors are left at 60°C and 90 to 95%RH for 500 hours without voltage applied, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the initial measured value at 20°C
	Internal Resistance Change	≤ 200% of the internal resistance maximum value given in the ratings tables

◆ STANDARD RATINGS

● DKG series

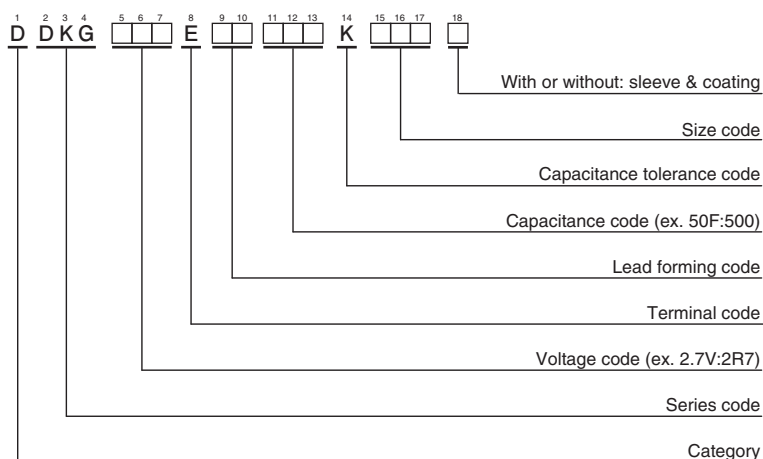
Rated Voltage [V]	Capacitance	Nominal Case Size		Internal Resistance		Weight*1 [g]	Energy Storage*2 [Wh]	Part No.	Note*3
	Typ. (rated) [F]	φ D [mm]	L [mm]	Typ. [mΩ]	Max. [mΩ]				
2.7	50	18	40	16.0	19.2	14	0.04	DDKG2R7ELL500KM40T	no sleeve, no coating

* 1 Reference data

* 2 Energy Storage (Wh) is calculated based on 「電気及び電子機器用電気二重層キャパシタの輸送に関する手引書」 (Japanese only) by JEITA (It shows up to the second decimal place).

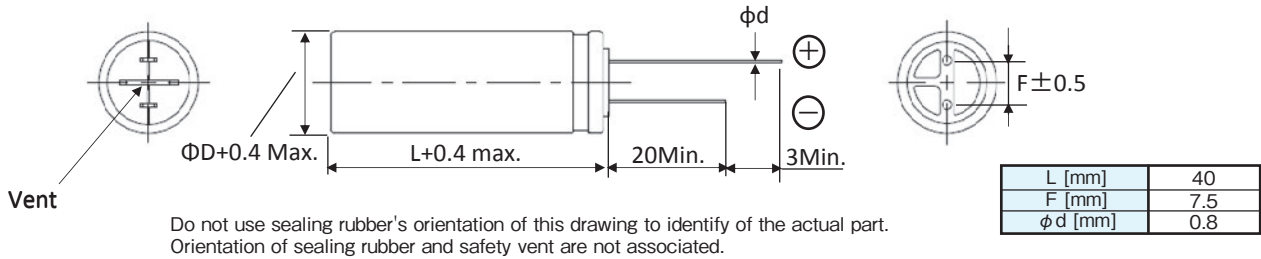
* 3 No sleeve no coating is the basic specification. Consult separately about products with a sleeve.

◆ PART NUMBERING SYSTEM



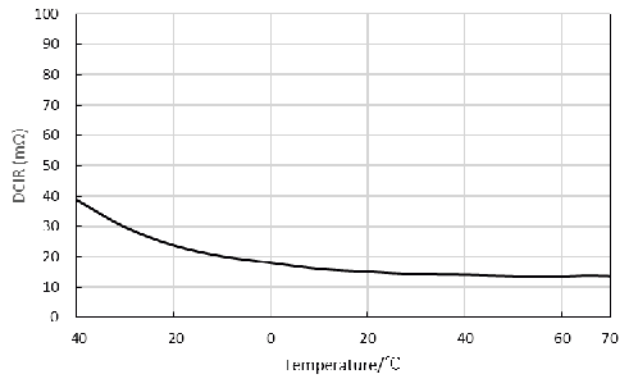
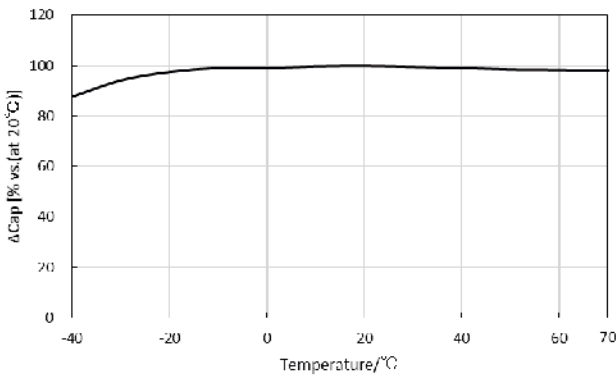
DLCAP™ DKG series

◆ DIMENSIONS [mm]

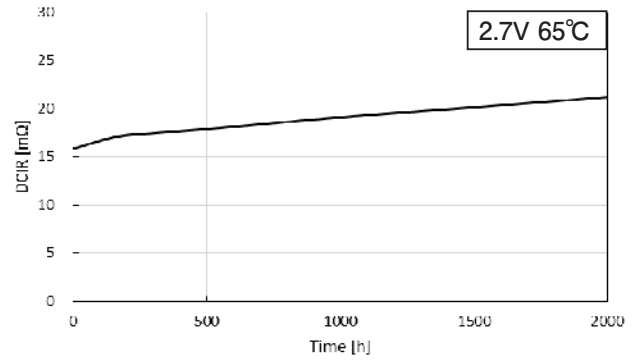
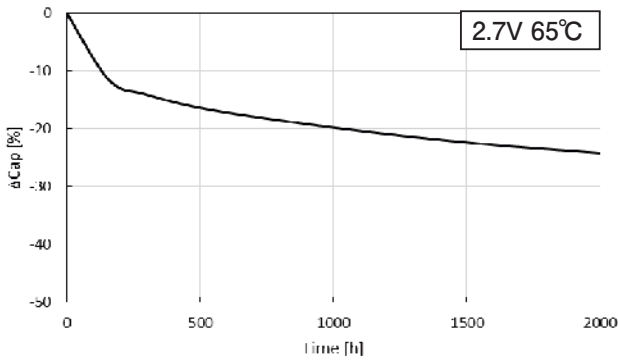


◆ Temperature Dependence of Capacitance & DCIR

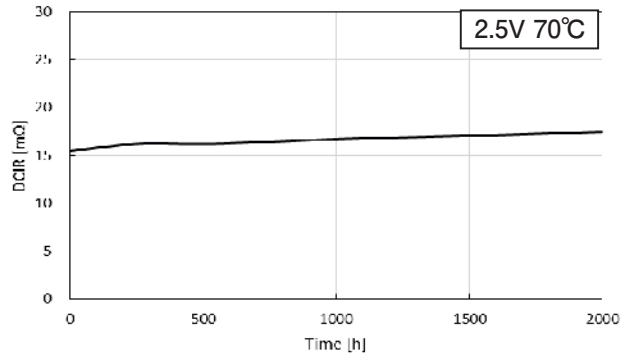
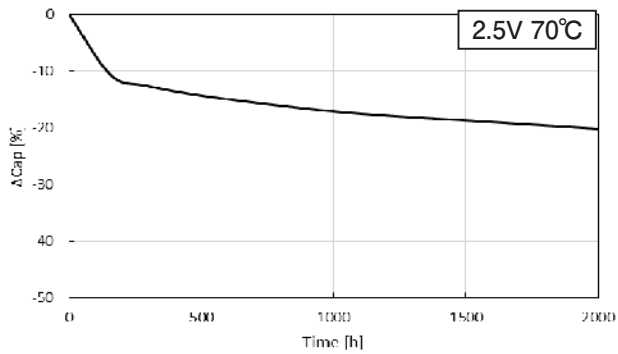
Φ18×40L



Φ18×40L



Φ18×40L





SUPERCAPACITOR

Lead type

DLCAP™ DKA series



Sleeveless type

- Very low DCIR even at low and high temperature.
- Uses highly safe electrolyte.
- Ideal as a backup power supply for automotive electrical components.

◆ SPECIFICATIONS

Items	Specifications	
Operating Temperature	-40°C ~ +70°C	
Capacitance Tolerance	±10% (K) (25°C)	
Temperature Characteristics	Capacitance Change	≤ ±30% of the measured value at 20°C
	Internal Resistance Change	≤ 600% of the internal resistance maximum value given in the ratings tables (-40°C)
Load Life Test	After the capacitors are subjected to the rated DC voltage at 70°C for 1000 hours, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the initial measured value at 20°C
	Internal Resistance Change	≤ 200% of the internal resistance maximum value given in the ratings tables
	After the capacitors are subjected to the rated DC voltage at 60°C for 2000 hours, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the initial measured value at 20°C
	Internal Resistance Change	≤ 200% of the internal resistance maximum value given in the ratings tables
Bias Humidity Test	After the capacitors are left at 60°C and 90 to 95%RH for 500 hours without voltage applied, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the initial measured value at 20°C
	Internal Resistance Change	≤ 200% of the internal resistance maximum value given in the ratings tables

◆ STANDARD RATINGS

● DKA series

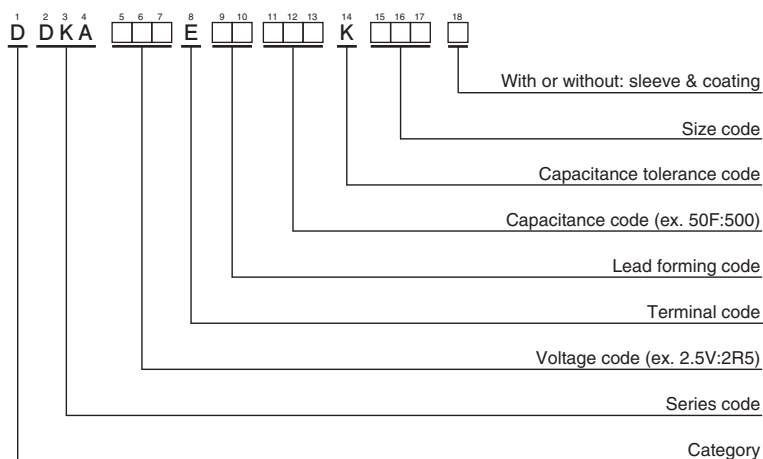
Rated Voltage [V]	Capacitance	Nominal Case Size		Internal Resistance		Weight* ¹ [g]	Energy Storage* ² [Wh]	Part No.	Note* ³
	Typ. (rated) [F]	φ D [mm]	L [mm]	Typ. [mΩ]	Max. [mΩ]				
2.5	50	18	50	11.0	13.2	18	0.04	DDKA2R5ELL500KM50S	with sleeve (PET)
2.5	50	18	50	11.0	13.2	18	0.04	DDKA2R5ELL500KM50T	no sleeve, no coating

* 1 Reference data

* 2 Energy Storage (Wh) is calculated based on 「電気及び電子機器用電気二重層キャパシタの輸送に関する手引書」 (Japanese only) by JEITA (It shows up to the second decimal place).

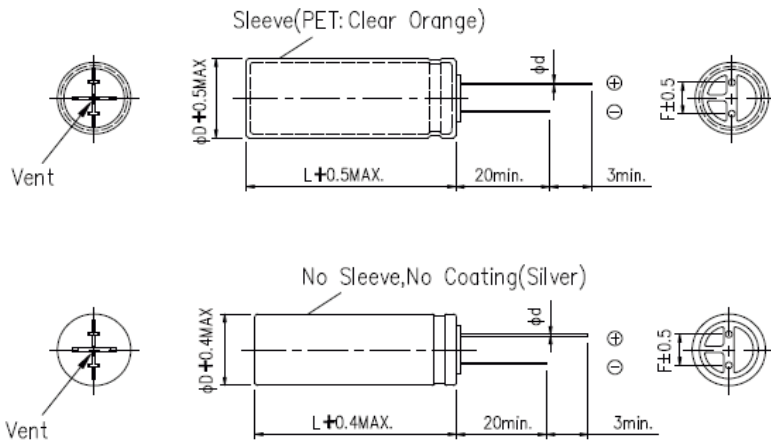
* 3 No sleeve no coating type and sleeve type are the basic specification.

◆ PART NUMBERING SYSTEM



DLCAP™ DKA series

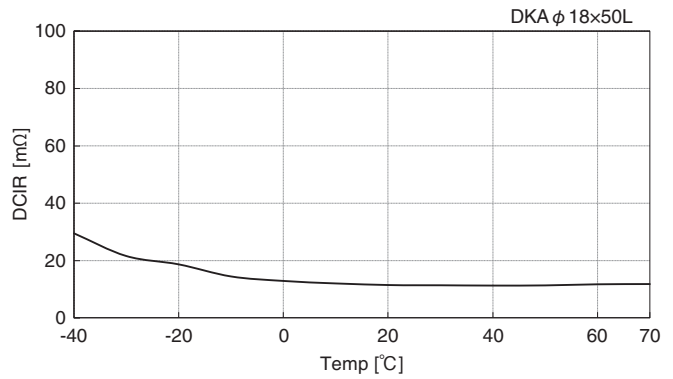
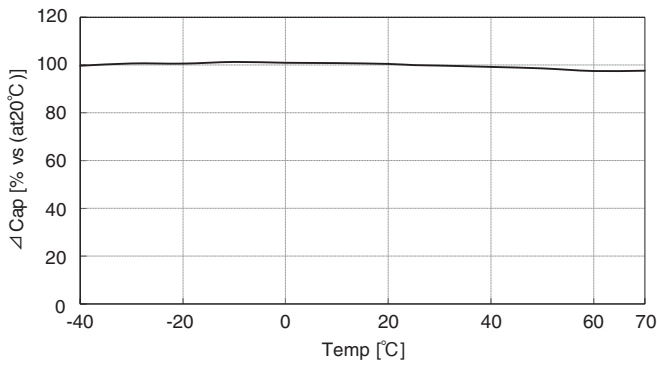
◆ DIMENSIONS [mm]



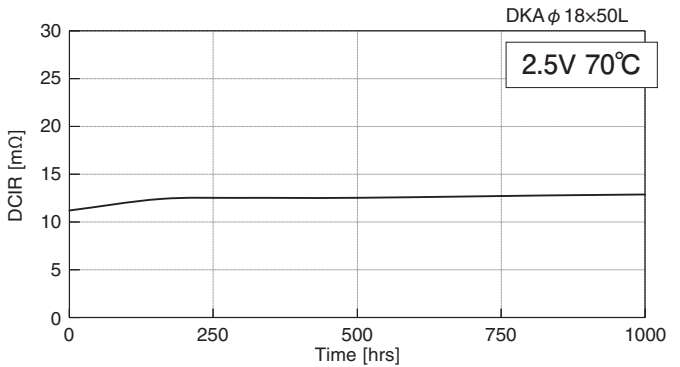
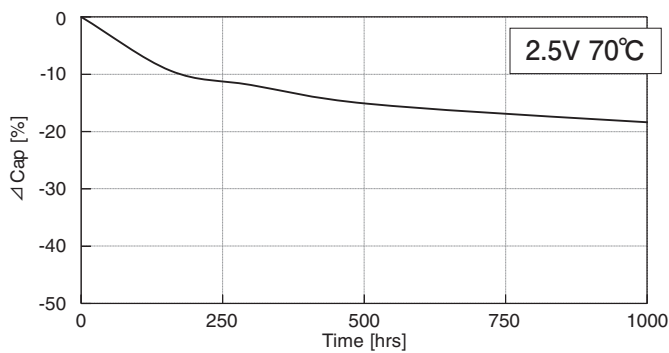
L [mm]	50
F [mm]	7.5
φd [mm]	0.8

Do not use sealing rubber's orientation of this drawing to identify polarity of the actual part.
Orientation of sealing rubber and safety vent are not associated.

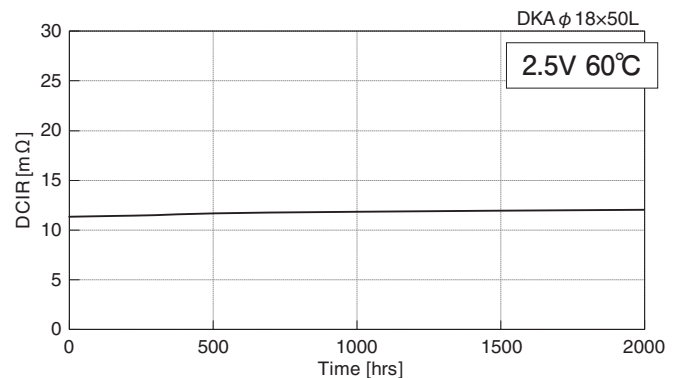
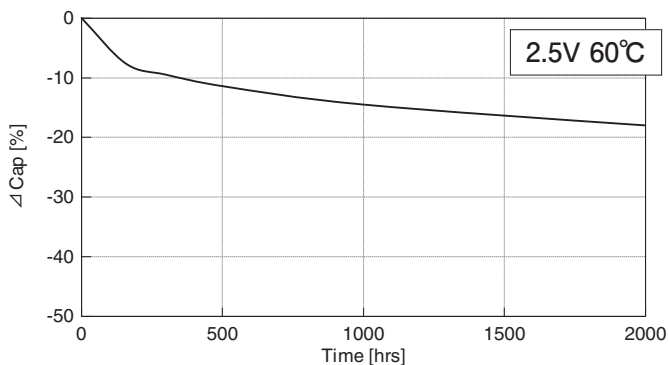
◆ Temperature Dependence of Capacitance & DCIR



◆ 70°C Load Life Test



◆ 60°C Load Life Test





SUPERCAPACITOR

Cylindrical type

DLCAP™ DXF series



- High withstand voltage 2.8 V achieved.
- Suitable for electricity storage, battery assistance, short-term backups, etc.
- It can be used at 3.0 V (-40°C~+50°C) by temperature delay.

◆ SPECIFICATIONS

Items	Specifications	
Operating Temperature	-40°C ~ +60°C	
Capacitance Tolerance	-0%, +20% (E) (20°C)	
Temperature Characteristics	Capacitance Change	≤ ±30% of the measured value at 20°C
	Internal Resistance Change	≤ 1000% of the internal resistance maximum value given in the ratings tables (-40°C)
Load Life Test	After the capacitors are subjected to the rated DC voltage at 60°C for 1500 hours, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the capacitance rated value given in the ratings tables
	Internal Resistance Change	≤ 300% of the internal resistance maximum value given in the ratings tables
Bias Humidity Test	After the capacitors are left at 60°C and 90 to 95%RH for 500 hours, without voltage applied, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the capacitance rated value given in the ratings tables
	Internal Resistance Change	≤ 300% of the internal resistance maximum value given in the ratings tables

◆ STANDARD RATINGS

● DXF series *3

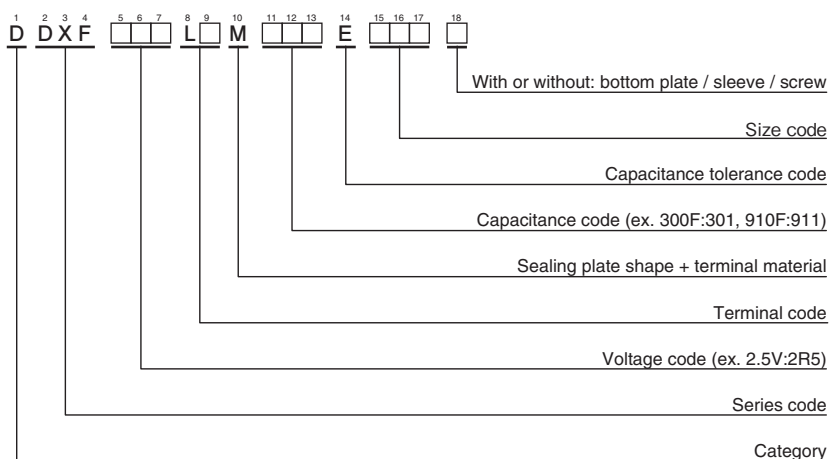
Rated Voltage [V]	Capacitance		Nominal Case Size		Internal Resistance		Weight*1 [g]	Energy Storage*2 [Wh]	Part No.
	Min. (rated) [F]	Typ. [F]	φ D [mm]	L [mm]	Typ. [mΩ]	Max. [mΩ]			
2.8	3150	3500	63.5	172	0.3	0.4	810	3.5	DDXF2R8LGM3B2EDH2S

* 1 Reference data

* 2 The energy storage capacity (Wh) described in this product is calculated based on 「電気及び電子機器用電気二重層キャパシタの輸送に関する手引書」 (Japanese only) by JEITA.

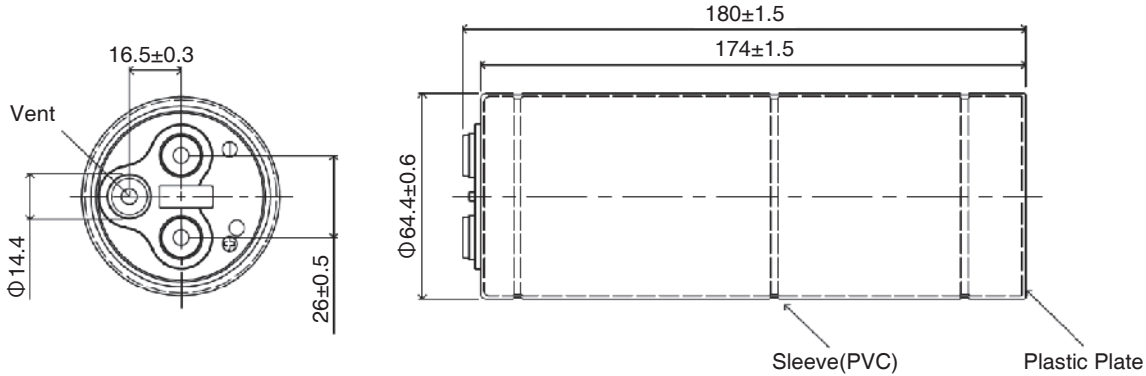
* 3 In the DXF series, the capacity specification are set to the minimum values.

◆ PART NUMBERING SYSTEM

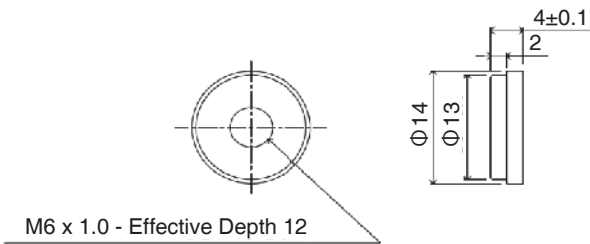


DLCAP™ DXF series

◆ DIMENSIONS [mm]



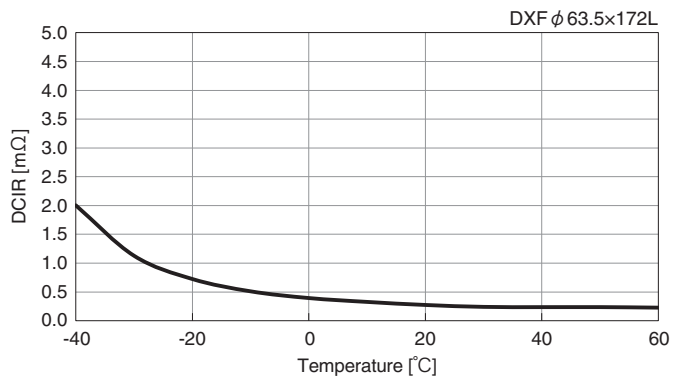
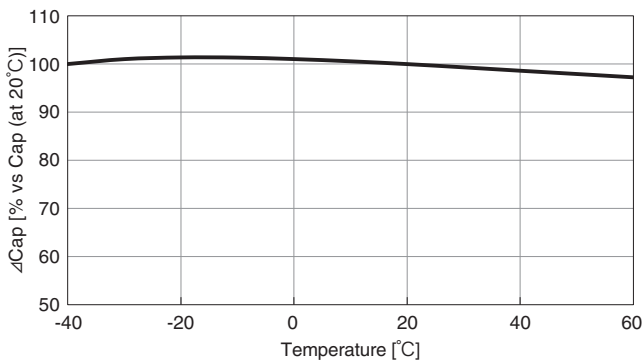
Detailed dimensions of the terminal



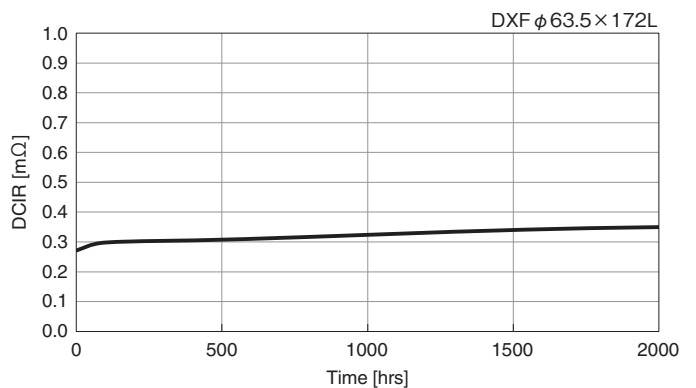
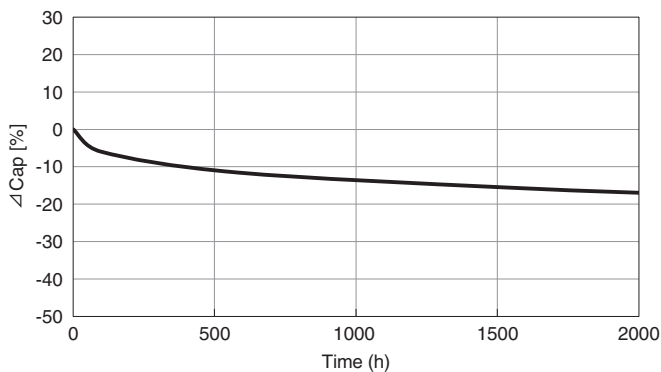
Plus hexagon-headed screw : M6×1.0×12

Maximum screw tightening torque : 5.5Nm

◆ Temperature Characteristics of Capacitance & DCIR



◆ 60°C Load Life Test



Cylindrical type

DLCAP™ DXG series



- It realizes further higher power density.
- DXG series improves the excellent low temperature characteristics, and it also supports high temperature environment (85°C).
- Suitable for electricity storage, battery assistance, short-term backups, etc.
- Also suitable for kinetic energy recapturing, start/stop, low temperature engine cranking application for automobile.

◆ **SPECIFICATIONS**

Items	Specifications	
Operating Temperature	-40°C ~ +85°C	
Capacitance Tolerance	-0%, +20% (E) (20°C)	
Temperature Characteristics	Capacitance Change	≤ ±30% of the measured value at 20°C
	Internal Resistance Change	≤ 500% of the internal resistance maximum value given in the ratings tables (-40°C)
Load Life Test	After the capacitors are subjected to the rated DC voltage at 85°C for 1500 hours, the following specifications shall be satisfied when they are restored to 20°C.	
	Capacitance Change	≤ ±30% of the capacitance rated value given in the ratings tables
	Internal Resistance Change	≤ 200% of the internal resistance maximum value given in the ratings tables
	After the capacitors are subjected to the rated DC voltage at 70°C for 3000 hours, the following specifications shall be satisfied when they are restored to 20°C.	
	Capacitance Change	≤ ±30% of the capacitance rated value given in the ratings tables
	Internal Resistance Change	≤ 150% of the internal resistance maximum value given in the ratings tables
Bias Humidity Test	After the capacitors are left at 60°C and 90 to 95%RH for 500 hours without voltage applied, the following specifications shall be satisfied when they are restored to 20°C.	
	Capacitance Change	≤ ±30% of the capacitance rated value given in the ratings tables
	Internal Resistance Change	≤ 200% of the internal resistance maximum value given in the ratings tables

◆ **STANDARD RATINGS**

● **DXG series***3

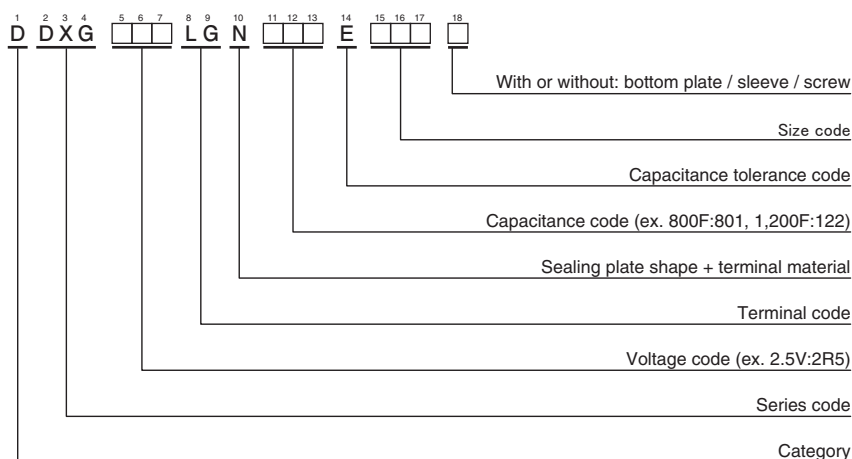
Rated Voltage [V]	Capacitance		Nominal Case Size		Internal Resistance		Weight*1 [g]	Energy Storage*2 [Wh]	Part No.
	Min. (rated) [F]	Typ. [F]	φ D [mm]	L [mm]	Typ. [mΩ]	Max. [mΩ]			
2.5	300	330	40	65	1.2	1.6	120	0.3	DDXG2R5LGN301EB65S
	590	650		105	0.7	1.0	200	0.6	DDXG2R5LGN591EBA5S
	910	1000		150	0.5	0.7	280	0.8	DDXG2R5LGN911EBF0S

* 1 Reference data

* 2 The energy storage capacity (Wh) described in this product is calculated based on 「電気及び電子機器用電気二重層キャパシタの輸送に関する手引書」(Japanese only) by JEITA.

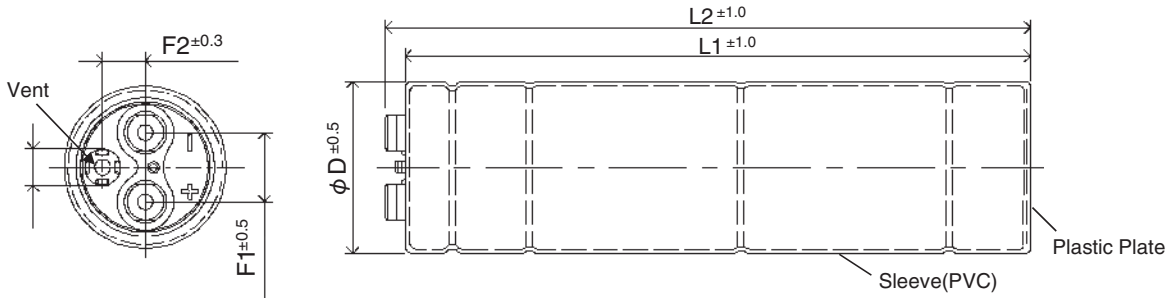
* 3 In the DXG series, the capacity specification are set to the minimum values.

◆ **PART NUMBERING SYSTEM**



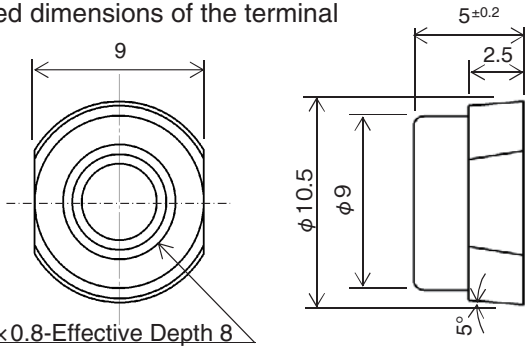
DLCAP™ DXG series

◆ DIMENSIONS [mm]



Part No.	φ D [mm]	L 1 [mm]	L 2 [mm]	F1 [mm]	F2 [mm]
DDXG2R5LGN301EB65S	40.4	66	71	17.0	10.5
DDXG2R5LGN591EBA5S		106	111		
DDXG2R5LGN911EBF0S		151	156		

Detailed dimensions of the terminal

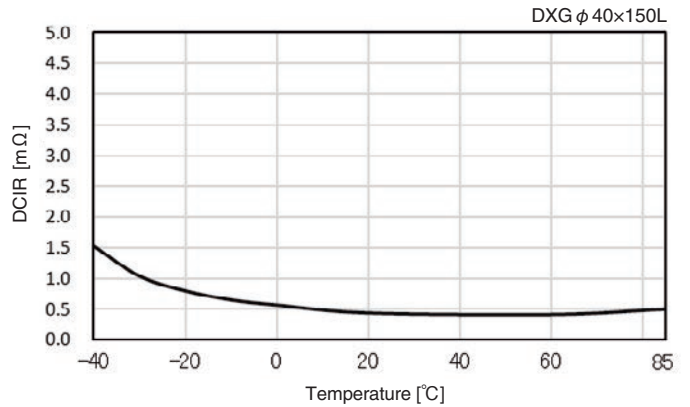
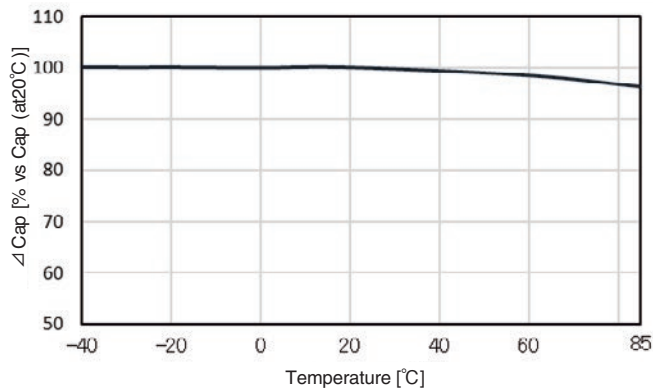


M5×0.8-Effective Depth 8

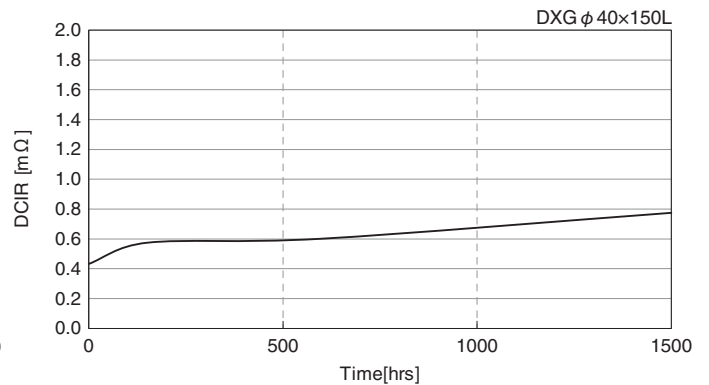
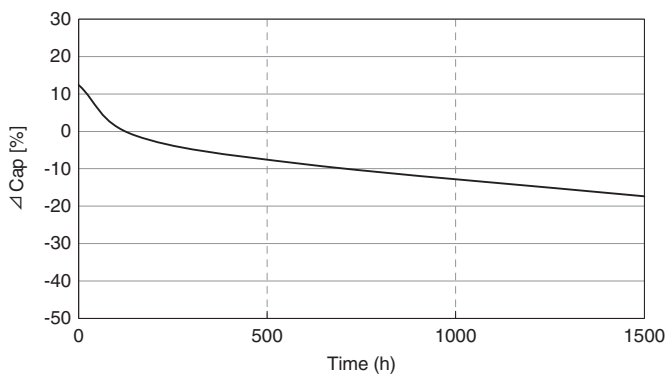
< Screw specification >

Plus hexagon-headed screw : M5×0.8×10
Maximum screw tightening torque : 3.23Nm

◆ Temperature Characteristics of Capacitance & DCIR



◆ 85°C Load Life Test





SUPERCAPACITOR

Cylindrical type

DLCAP™ DXE series



- Suitable for electricity storage, battery assistance, short-term backups, etc.
- Also suitable for kinetic energy recapturing, start/stop application for automobile.
- Can be installed horizontally.

◆ SPECIFICATIONS

Items	Specifications	
Operating Temperature	-40°C ~ +70°C	
Capacitance Tolerance	±10% (K) (20°C)	
Temperature Characteristics	Capacitance Change	≤ ±30% of the measured value at 20°C
	Internal Resistance Change	≤ 1200% of the internal resistance maximum value given in the ratings tables (-40°C)
Load Life Test	After the capacitors are subjected to the rated DC voltage at 70°C for 2000 hours, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the initial measured value at 20°C
	Internal Resistance Change	≤ 300% of the internal resistance maximum value given in the ratings tables
Bias Humidity Test	After the capacitors are left at 60°C and 90 to 95%RH for 500 hours, without voltage applied, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the initial measured value at 20°C
	Internal Resistance Change	≤ 300% of the internal resistance maximum value given in the ratings tables

◆ STANDARD RATINGS

● DXE series

Rated Voltage [V]	Capacitance		Nominal Case Size		Internal Resistance		Weight*1 [g]	Energy Storage*2 [Wh]	Part No.
	Typ. (rated) [F]	Min. [F]	φ D[mm]	L[mm]	Typ. [mΩ]	Max. [mΩ]			
2.5	400	360	40	65	2.1	2.5	120	0.4	DDXE2R5LGN401KB65S
	800	720		105	1.1	1.3	200	0.7	DDXE2R5LGN801KBA5S
	1200	1080		150	0.8	1.0	280	1.1	DDXE2R5LGN122KBF0S
	1400	1260		150	1.1	1.3	280	1.3	DDXE2R5LGN142KBF0S
Rated Voltage [V]	Capacitance		Nominal Case Size		Internal Resistance		Weight*1 [g]	Energy Storage*2 [Wh]	Part No.
	Typ. (rated) [F]	Min. [F]	φ D[mm]	L[mm]	Typ. [mΩ]	Max. [mΩ]			
2.5	400	360	40	65	2.1	2.5	120	0.4	DDXE2R5LGL401KB65S*3
	1400	1260		150	1.1	1.3	280	1.3	DDXE2R5LGL142KBF0S*3

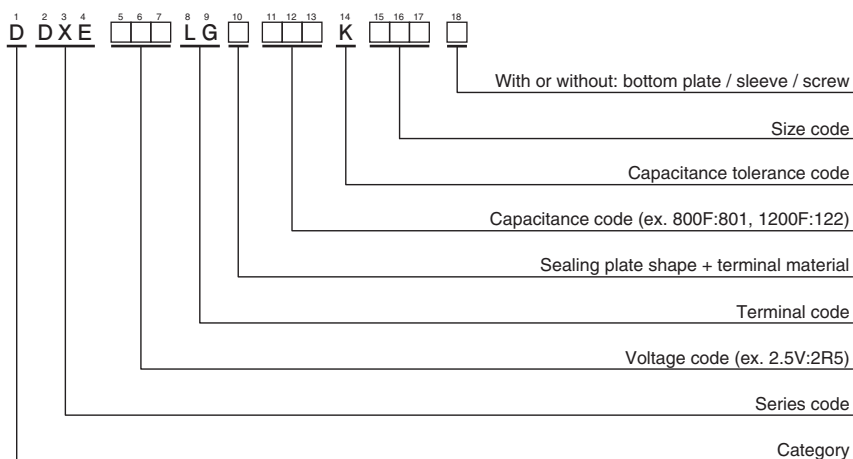
Possible to used horizontally

* 1 Reference data

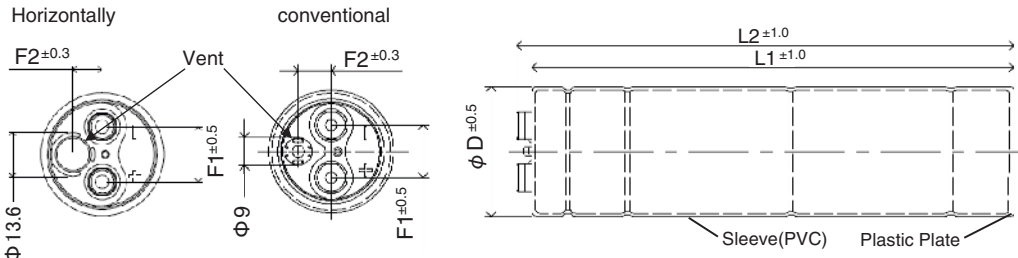
* 2 The energy storage capacity (Wh) described in this product is calculated based on 「電気及び電子機器用電気二重層キャパシタの輸送に関する手引書」(Japanese only) by JEITA.

* 3 For transverse installment

◆ PART NUMBERING SYSTEM



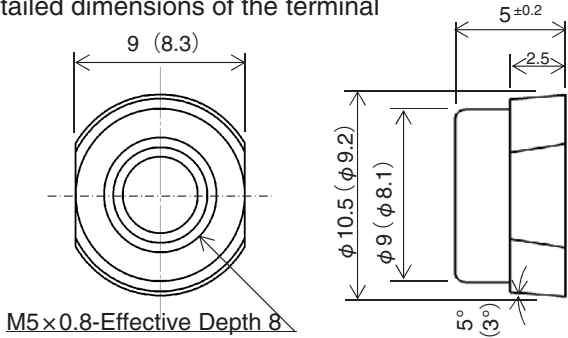
◆ DIMENSIONS [mm]



Part No.	ϕD [mm]	L 1 [mm]	L 2 [mm]	F 1 [mm]	F 2 [mm]
DDXE2R5LGN401KB65S	40.4	66	71	17.0	10.5
DDXE2R5LGN801KBA5S		106	111		
DDXE2R5LGN122KBF0S		151	156		
DDXE2R5LGN142KBF0S		151	156		
Part No.	ϕD [mm]	L 1 [mm]	L 2 [mm]	F 1 [mm]	F 2 [mm]
DDXE2R5LGL401KB65S	40.4	66	71	17.0	9.0
DDXE2R5LGL142KBF0S		151	156		

Possible to used horizontally

Detailed dimensions of the terminal

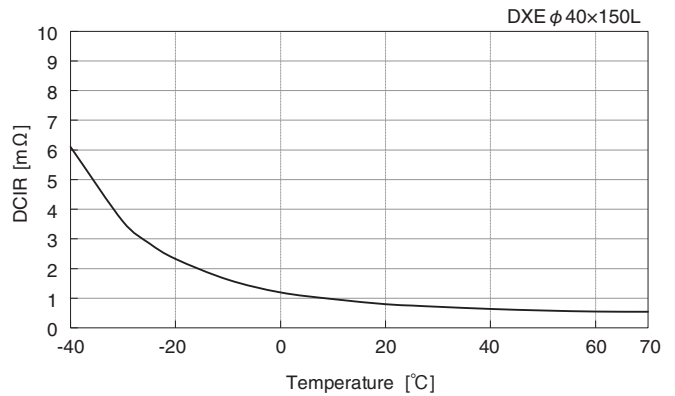
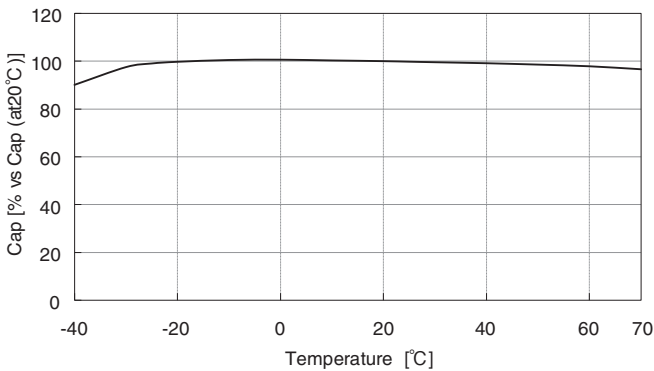


() is the size of the corresponding product placed horizontally.

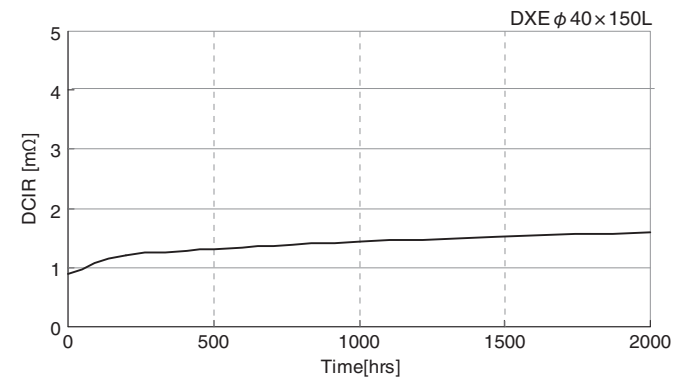
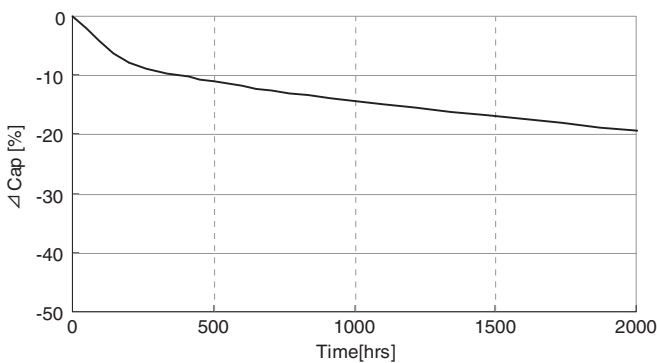
< Screw specification >

Plus hexagon-headed screw : M5×0.8×10
Maximum screw tightening torque : 3.23Nm

◆ Temperature Characteristics of Capacitance & DCIR



◆ 70°C Load Life Test



New!

DLCAP™ 2 Cells Module (Lead type)

Low Resistance +70°C RoHS2 Compliant

For an easy usage of Electric Double Layer Capacitor DLCAPT™, we have prepared modules (lead type).

● Application Examples

- Electricity assist for battery
- Momentary power supply at power failure
- Back up for power source failure



● DLCAP™ Module

◆ FEATURES

- Equipped with two $\Phi 18 \times 50L$ (50F) DKA series cells with sleeve
- Board mounting of products by snap-fit

◆ SPECIFICATIONS

Items	Specifications
Operating Temperature	-40°C ~ +70°C
Capacitance Tolerance	±10%, -15% (20°C)
Temperature Characteristics	Capacitance Change $\leq \pm 30\%$ of the measured value at 20°C
	Internal Resistance Change $\leq 600\%$ of the internal resistance maximum value given in the ratings tables (-40°C)
Load Life Test	After the capacitors are subjected to the rated DC voltage at 70°C for 1000 hours, the following specifications shall be satisfied when they are restored to 20°C .
	Capacitance Change $\leq \pm 30\%$ of the initial measured value at 20°C
	Internal Resistance Change $\leq 200\%$ of the internal resistance maximum value given in the ratings tables
	After the capacitors are subjected to the rated DC voltage at 60°C for 2000 hours, the following specifications shall be satisfied when they are restored to 20°C .
Bias Humidity Test	After the capacitors are left at 60°C and 90 to 95%RH for 500 hours without voltage applied, the following specifications shall be satisfied when they are restored to 20°C .
	Capacitance Change $\leq \pm 30\%$ of the initial measured value at 20°C
	Internal Resistance Change $\leq 200\%$ of the internal resistance maximum value given in the ratings tables
	Internal Resistance Change $\leq 200\%$ of the internal resistance maximum value given in the ratings tables

◆ STANDARD RATINGS

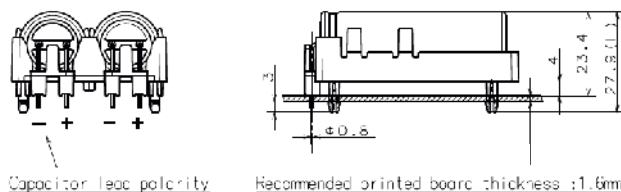
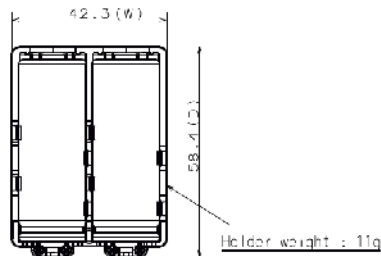
Rated Voltage [V]*1	Capacitance*1	Product Size			Internal Resistance*1		Weight*2 [kg]	Energy Storage*1*3 [Wh]	Part No.
	Typ. [F]	W [mm]	D [mm]	H [mm]	Typ. [mΩ]	Max. [mΩ]			
2.5	50	42.3	58.4	27.9	11	13.2	0.047	0.05	MDKA2R5T500PN1111A

* 1 Per single cell

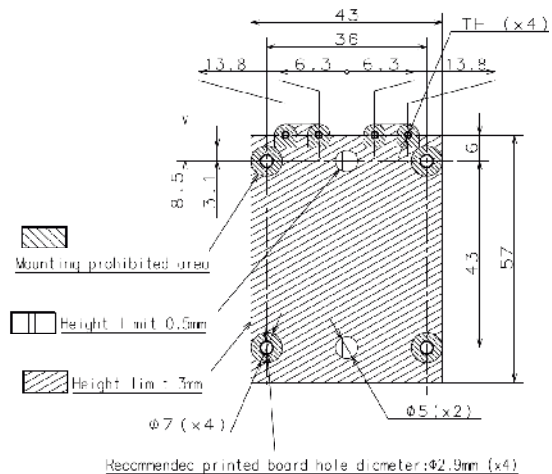
* 2 Reference data

* 3 Energy Storage (Wh) is calculated based on 「電気及び電子機器用電気二重層キャパシタの輸送に関する手引書」 (Japanese only) by JEITA.

◆ DIMENSIONS



◆ Mounting dimensions, mounting prohibited area, mounting limit height.



● Series and or parallels connection of DLCAP™ Module

This module can be connected and used in series and parallel if necessary. If you need to connect more than 12 pieces in series please consult us.

● DLCAP™ Custom Module Acceptable

Customized designs for system integration are available upon request.

Please consult us for other special specifications.

New!

DLCAP™ Module (Lead type)



For an easy usage of Electric Double Layer Capacitor DLCAPTTM, we have prepared modules (lead type).

● Application Examples

- Electricity assist for battery
- Momentary power supply at power failure
- Back up for power source failure



● DLCAP™ Module

◆ FEATURES

- Voltage equalization circuit installed
- Over voltage detection circuit installed
- Equipped with six Φ 18x50L (50F) DKA series cells with sleeve

◆ SPECIFICATIONS

Items	Specifications	
Operating Temperature	-40°C ~ +70°C	
Capacitance Tolerance	±10%, -15% (20°C)	
Temperature Characteristics	Capacitance Change	≤ ±30% of the measured value at 20°C
	Internal Resistance Change	≤ 600% of the internal resistance maximum value given in the ratings tables (-40°C)
Load Life Test	After the capacitors are subjected to the rated DC voltage at 70°C for 1000 hours, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the initial measured value at 20°C
	Internal Resistance Change	≤ 200% of the internal resistance maximum value given in the ratings tables
	After the capacitors are subjected to the rated DC voltage at 60°C for 2000 hours, the following specifications shall be satisfied when they are restored to 20°C .	
Bias Humidity Test	After the capacitors are left at 60°C and 90 to 95%RH for 500 hours without voltage applied, the following specifications shall be satisfied when they are restored to 20°C .	
	Capacitance Change	≤ ±30% of the initial measured value at 20°C
	Internal Resistance Change	≤ 200% of the internal resistance maximum value given in the ratings tables

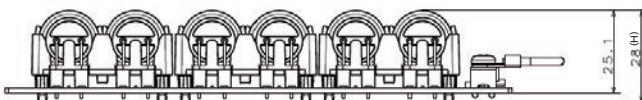
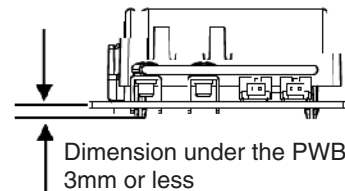
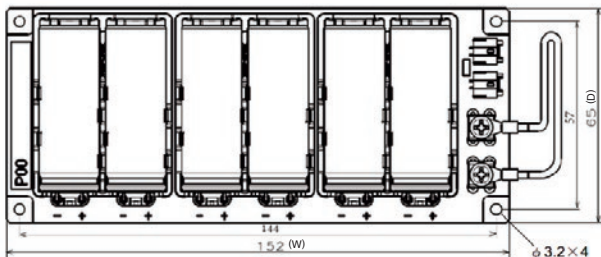
◆ STANDARD RATINGS

Rated Voltage [V]	Capacitance		Product Size			Internal Resistance		Weight* ¹ [kg]	Energy Storage* ² [Wh]	Part No.
	Typ. [F]	Min. [F]	W [mm]	D [mm]	H [mm]	Typ. [mΩ]	Max. [mΩ]			
15	8.3	7.1	152	65	28	74.2	87.4	0.2	0.26	MDKA150S8R3PE6111A

* 1 Reference data

* 2 Energy Storage (Wh) is calculated based on 「電気及び電子機器用電気二重層キャパシタの輸送に関する手引書」 (Japanese only) by JEITA.

◆ DIMENSIONS



◆ Screw Specification

Screw : M4

Tightning torque : 1.5Nm±10%

● Series and or parallels connection of DLCAP™ Module

This module can be connected and used in series and parallel if necessary. If you need to connect more than 5 pieces in series please consult us.

● DLCAP™ Custom Module Acceptable

Customized designs for system integration are available upon request.

Please consult us for other special specifications.

New!

DLCAP™ Module (Horizontal installation compatible)

Horizontal
installation
compatible

Low
Resistance

+70°C

RoHS2
Compliant

For an easy usage of Electric Double Layer Capacitor DLCAP™, we have prepared modules (horizontal installation compatible). Compared to conventional products, it is smaller when connected. (please refer 'Custom Module support example')

● Application Examples

◆ Energy Saving

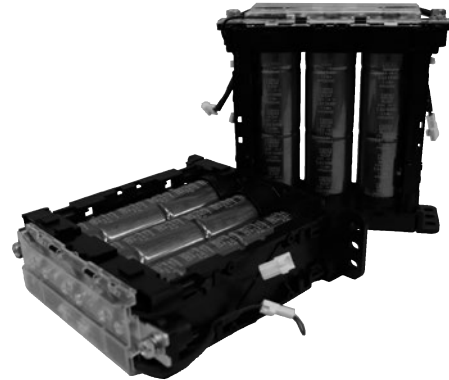
- Peak power assistance
- Effective recapture of kinetic energy

◆ Renewable Energy

- Stabilization of windmill power
- High efficient charge of solar energy
- Electricity assist for fuel cell

◆ Safety & Emergency Applications

- Momentary large power supply at power failure
- Back up for power source failure



● DLCAP™ Module

◆ FEATURES

- Voltage equalization circuit installed
- Over voltage detection circuit installed
- Thermistor for temperature monitor installed

◆ SPECIFICATIONS

Items	Specifications
Operating Temperature	-40°C ~ +70°C
Capacitance Tolerance	+10%/-15% (20°C)
Temperature Characteristics	Capacitance Change $\leq \pm 30\%$ of the measured value at 20°C
	Internal Resistance Change $\leq 1200\%$ of the internal resistance maximum value given in the ratings tables (-40°C)
Load Life Test	After the capacitors are subjected to the rated DC voltage at 70°C for 2000 hours, the following specifications shall be satisfied when they are restored to 20°C .
	Capacitance Change $\leq \pm 30\%$ of the initial measured value at 20°C
	Internal Resistance Change $\leq 300\%$ of the internal resistance maximum value given in the ratings tables
Bias Humidity Test	After the capacitors are left at 60°C and 90 to 95%RH for 500 hours without voltage applied, the following specifications shall be satisfied when they are restored to 20°C .
	Capacitance Change $\leq \pm 30\%$ of the initial measured value at 20°C
	Internal Resistance Change $\leq 300\%$ of the internal resistance maximum value given in the ratings tables
Insulation Resistance	The measured value between the lumped terminal and the case using 500Vdc insulation resistance meter shall be more than 100MΩ.
Insulation Withstand Voltage	No abnormality after the AC 2500V is applied between lumped terminal and package for 1 minute. package for 1 minute.

◆ STANDARD RATINGS

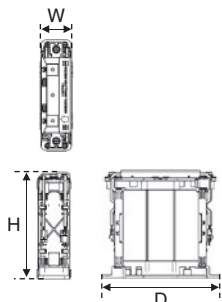
Rated Voltage [V]	Capacitance		Product Size*2			Internal Resistance		Weight*1 [kg]	Energy Storage [Wh]	Part No.
	Typ. [F]	Min. [F]	W [mm]	D [mm]	H [mm]	Typ. [mΩ]	Max. [mΩ]			
7.5	133	113	54	186	88	6.6	7.8	0.7	1.1	MDXE7R5S131PB3111B*3
	466	396			172.6	3.6	4.2			1.2

* 1 Reference data

* 2 Energy Storage (Wh) is calculated based on 「電気及び電子機器用電気二重層キャパシタの輸送に関する手引書」 (Japanese only) by JEITA.

* 3 This module uses only DXE series cells.

◆ DIMENSIONS



◆ Screw Specification
Screw : M6
Tightening torque : 5.2Nm±10%

● DLCAP™ Custom Module Acceptable

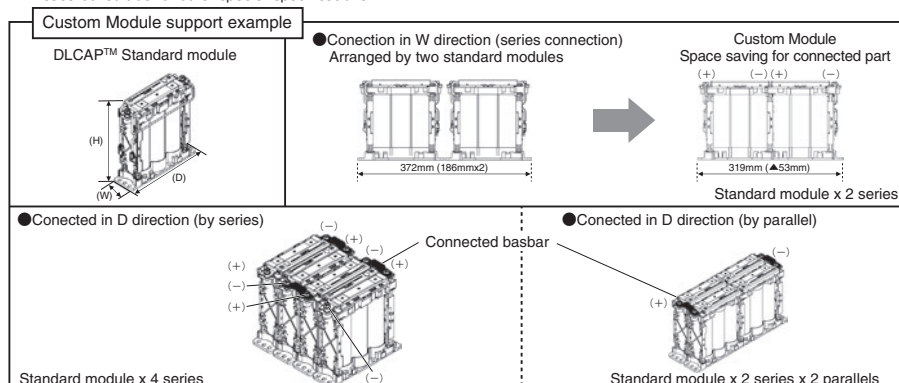
Customized specifications can be designed upon request.

◆ Custom design examples;

- High voltage application
- Large capacitance application
- High current application

- Proper balance circuit suggestion
- Usage under vibration or physical shocks.
- Optional circuits for charge/discharge control

Please consult us for other special specifications.



Precaution Statement

The circuits described as examples in this catalog and the "delivery specifications" are featured in order to show the operations and usage of our products, however, this fact does not guarantee that the circuits are available to function in your equipment systems.

We are not in any case responsible for any failures or damage caused by the use of information contained herein.

You should examine our products, of which the characteristics are described in the "delivery specifications" and other documents, and determine whether or not our products suit your requirements according to the specifications of your equipment systems. Therefore, you bear final responsibility regarding the use of our products.

Please make sure that you take appropriate safety measures such as use of redundant design and malfunction prevention measures in order to prevent fatal accidents and/or fires in the event any of our products malfunction.

1. Precautions in use

① Please do not use the capacitor under the environment, which exceeds the rated performance range.

- a) High temperature (over operating temperature)
- b) Over voltage (over rated voltage)
- c) Application of reverse or alternate voltage

② The outer sleeve and resin plate of the Supercapacitor does not assure electrical insulation.

③ Supercapacitor has finite and regulated life.

④ Please do not use or store Supercapacitor under the following environment;

- a) Environment where the capacitor could be exposed to water, salt water or oil, or the environment which is filled with gaseous oil or salt.
- b) Environment which is filled with toxic gases such as hydrogen sulfide, sulfurous acid, chlorine, ammonia, bromine, or methyl bromide.
- c) Environment where the capacitor could be exposed to acidic or alkaline solvent.
- d) Environment where the capacitor could be exposed to direct sunlight, ozone, ultraviolet rays or radiation.
- e) Environment under extreme vibration or mechanical impact.

⑤ Please note the followings when designing;

a) Supercapacitor screw terminal When using cells and modules, be sure to install the terminal with the terminal facing upward except for horizontal products/horizontal product.

Do not mount Supercapacitor with terminals facing downward or sideways as the electrolyte inside the Supercapacitor may block pressure relief vent and cause it to open, electrolyte to leak, and shorten lifetime.

Please set the valve is on the upper side when used horizontally.



Figure. Installation of horizontal products

b) Please keep the sealing plate facing upward whenever handling Supercapacitor.

Facing it downward even for a brief time may shorten lifetime.

c) Please provide enough clearance space over the pressure relief vent.

d) Please do not locate any wire or circuit pattern over the pressure relief vent or between the anode and cathode terminal of Supercapacitor.

e) Please avoid locating any heat source components near Supercapacitor.

f) To assure insulation voltage, please provide adequate space among Supercapacitor case, cathode terminal, anode terminal, circuit pattern and chassis.

g) Please note that electrical properties of Supercapacitor may change according to the changes in temperature and frequency of Supercapacitor.

h) When the temperature between Supercapacitor cells in a same system differs largely, it may amplify the slight characteristic difference of each cell, and may cause the system to malfunction in the end.

Please make sure to design the system with an adequate heat radiation to avoid variation in temperature among the cells.

i) When heat increase is expected due to charging and discharging of Supercapacitor, please conduct a load test to confirm there is no abnormal heat rise, and the temperature stays within the Supercapacitor's specified temperature range.

- j) Please assure appropriate current balance when connecting two or more Supercapacitor in parallel.
 - k) Please assure appropriate voltage balance when connecting two or more Supercapacitor in series.
 - l) In case of use outside of specification, such as overvoltage and/or above specified temperature range, the electrolyte fume from inside may expelled through releasing valve. Please take that in consideration at the time of system design.
 - m) Please establish safety design such as stopping charge/discharge in case of abnormal temperature and voltage. Applying voltage that exceeds rated voltage frequently may cause the devices to smoke or burn.
Please design the system with fail-safe functions.
 - n) As Supercapacitor has internal resistance, the internal heat generated by charge-discharge affects its life.
Please choose the products with low resistance and make sure to avoid overheat of the capacitor.
 - o) Due to capacitor's internal resistance, there is a voltage drop (also referred to as "IR drop") at the beginning of charge-discharge. Please consider this voltage drop in your circuit design.
- ⑥ When a capacitor is fully charged, short-circuiting the output terminals could cause the electric current to flow as high as a few hundred amperes. Please do not install or uninstall a module when it is charged.
- ⑦ Please do not drop Supercapacitor. Do not use it once it is dropped.
- ⑧ Please make sure of the polarity when assembling Supercapacitor into a module.
- ⑨ When assembling Supercapacitor into a circuit, position it so that the case and the circuit electronic components do not come in contact with each other.
- ⑩ Please follow the specification of the screw tightening torque.
- ⑪ Please do not deform Supercapacitor when assembling it into a module.
- ⑫ Voltage of Supercapacitor changes in proportion to the stored energy.
If stable output voltage is required, circuit system such as converter needs to be added.
- ⑬ When using Supercapacitor for industrial application, following periodical check is recommended.
Please disconnect power from the device and fully discharge Supercapacitor before conducting periodical check.
- a) Appearance: Significant damage in appearance including deformation, liquid leakage, discolor, dust between the terminals and stain
 - b) Electrical characteristics: Characteristics prescribed in the catalog or product specifications.
- ⑭ Please stop the whole system when Supercapacitor generates excessive heat or a foul smell.
In case of excessive heat, do not get close to the part in order to avoid injury.
- ⑮ Please stop the system immediately and ventilate the area sufficiently when the pressure relief vent on Supercapacitor operates and releases a gas from inside.
Never expose your face or your hand as hot gas may expel.
If the gas is inhaled or hits eyes, please wash your eyes, gargle, and consult with a doctor immediately.
Do not lick the electrolyte of Supercapacitor. Wash away the electrolyte from the skin with soap and water.
- ⑯ Supercapacitor may have been spontaneously recharged with time by a recovery voltage phenomenon.
Discharge Supercapacitor as necessary especially before connecting multiple Supercapacitors in series.
- ⑰ Please discharge Supercapacitor before assembling or removing. There is a risk of large current flow and electrical shock when short circuiting the terminal with residual voltage.
Note that Supercapacitor may be self-charged while being left open-circuit even after fully discharged.
- ⑱ Do not wash Supercapacitor.
- ⑲ Do not use any adhesive or coating materials containing halogenated solvents.
Additional notes about products with lead terminals
- a) Align the distance between the capacitor terminals with the distance between the printed wiring board holes. (If the distances differ, use a lead forming processed product.)
 - b) Provide clearance space specified below at the section over the capacitor pressure relief vent.
 - φ 8 (6.3) to φ 16 2 mm or more
 - φ 18 to φ 22: 2.5 mm or more
 - c) Ensure that no wire or circuit patterns are placed over the capacitor pressure relief vent.
If the capacitor pressure valve is attached to the printed wiring board side, create an air release hole for the pressure relief vent taking the location of the pressure valve into consideration.

- d) Provide clearance space specified below at the section over the rubber on the capacitor lead terminal side.
(Do not attach the capacitor directly to the board. Provide space in between them.)
 - φ 8 (6.3) to φ 18 2 mm or more
 - φ 20 to φ 22: 3 mm or more
- e) Do not wire a circuit pattern below the sealing section of the capacitor. If a circuit pattern needs to be wired near the capacitor, reserve 1 mm or more (ideally 2 mm) between them.
- f) Avoid attaching any heat source components near the capacitor or on the back (under the capacitor) of the printed wiring board.
- g) When attaching a capacitor on a tow-sided printed wiring board, design it so that any unnecessary board holes or through holes for interfacial connection do not come under the capacitor.
- h) When attaching a capacitor on a tow-sided printed wiring board, design it so that wire or circuit patterns do not come in contact with the assembled sections of the capacitor.
- i) To assure insulation voltage, provide adequate space between the capacitor case, cathode terminal, anode terminal, circuit pattern, and chassis when designing.

2. Precautions in transportation

- ① When exporting Supercapacitor, fumigation process may be required for export in some countries.
Please note that some types of fumigation process which uses halogenated ions may cause corrosion on Supercapacitor materials.
- ② Due to the Export Trade Control Ordinance, the documents obtained to the exporter concerning that export trade, with information that the product is being used for developing mass destruction weapons, the exporter will have to apply and hand in the export permission from the Ministry of Industrial Trade and Industry.
- ③ During transportation of Supercapacitor. Please make sure to place its terminal upward to avoid electrolyte leakage both vertical and horizontal products.
- ④ Transport operations of Supercapacitor has been changed in line with the revision of "The Recommendations on the Transport of Dangerous Goods" adopted by the United Nations in December 2010.
Please confirm the latest information of the followings as well as laws of each country.
 - United Nations (UN) Recommendations on the Transport of Dangerous Goods-Model Regulations.
 - International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air.
 - International Air Transport Association (IATA) Dangerous Goods Regulations.
 - International Maritime Organization (IMO) IMDG (International Maritime Dangerous Goods) -code.

3. Precautions in storage

- ① Please store Supercapacitor at temperature between 5°C~35°C and humidity less than 75% .
Please avoid an environment with drastic temperature change which could damage the product.
- ② Long term storage may cause an increase of leakage current, decrease of capacitance, increase of internal resistance, etc..
Before using the part after a long term storage over 6 months, please charge it with a current of 5mA per Farad, up to the rated voltage, then keep the voltage for around 20 hours.
Please then measure the electric characteristics to ensure the part still has the desired performance.

4. Precautions in disposal

Please discharge the electricity to safety voltage before disposal.
Please follow the laws or regulations at the place of disposal.
Please drill or crush the part before incineration.

Please refer to the following report before using Supercapacitor.

Japan Electronics and Information Technology Industries Association, JEITA RCR-2370B
"Safety Application Guide for electric double layer capacitors (Guideline of notes for electric double layer capacitors)"

Japan Electronics and Information Technology Industries Association
"Guidelines of the transport of fixed electric double-layer capacitors for use in electric and electronic equipment" (Japanese only)

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- Kuala Lumpur Office: Suite 2115, Level 21, Plaza Pengkalan Batu 3, Jalan Ipoh, 51100 Kuala Lumpur, Malaysia
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62(21)8970071

* Specifications in this catalog are subject to change without notice.

DLCAP™ Module Specifications Check Sheet

Customer contact information	①	Customer name : _____
		Post name : _____
		Name : _____
		Contact : TEL _____ E-mail _____

Schedule and planned number of units

Prototype	②	Delivery date : _____	: Number of prototype units _____ (Units)
Mass production		Start of mass production time : _____	: Planned number of units _____ (Units/month or year)

Intended use and conditions

Application and purpose	③	Select from the following or write down the application and purpose of using the DLCAP within the permissible scope. [Equipment Classification] • Passenger vehicles • Buses • Trucks • Railways • Ships • Aircraft • Construction machines • Military • Medical devices • Office automation equipment • Factory automation equipment • Measuring instruments • Household equipment • Others : _____ [Purpose] • Power regeneration • Power backup • Power peak assist • Environment load reduction • Instantaneous drop compensation • Others : _____
-------------------------	---	--

Environmental conditions	④	Enter the temperature environment conditions of the location where the module is installed. In addition, enter any special conditions such as high humidity, presence of salt water, oil and chemicals. Location [Outdoor/Indoor] • Accommodated in the panel • Incorporated in the equipment • Others (_____) Operating Temperature Operating temperature range (_____)° C to (_____)° C Average usage temperature (_____)° C Storage temperature Storage temperature range (_____)° C to (_____)° C Average storage temperature (_____)° C Other special environmental conditions _____
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Expected service life	⑤	(_____) years
-----------------------	---	-----------------

Required specifications

Electrical specification	⑥	Enter the charge/discharge specifications, cycle pattern including pause, and operating rate (charge/discharge frequency). If doing so is complicated, ideally attach graphs and other documents. Item ⑨ operating rate is used to check the heating state.
	⑦	Voltage specifications Max. charge voltage (_____) V * Rated voltage of module Voltage range at normal use (_____) V to (_____) V Standby voltage * Starting voltage of charge/discharge (_____) V
	⑧	Charge/discharge power or current Charge power (_____) W or Charge current (_____) A Discharge power (_____) W or Discharge current (_____) A
	⑨	Charge/discharge time (charge/discharge cycle) Charge time (_____) sec. Discharge time (_____) sec. Pause (_____) sec. One cycle time (_____) sec.
	⑩	Operating rate (charge/discharge frequency) Charge/discharge operation time (_____) hours/day or year Or Charge/discharge cycle count (_____) time/second, hour, day, or year

Mechanical specifications	⑪	Enter the requirements of the mechanical specifications. If doing so is complicated, ideally attach diagrams and other documents.
	⑫	Restrictions on outside dimensions Orientation and length requiring restrictions (_____) D × (_____) W × (_____) H mm Weight restrictions Weight (_____) kg or less
	⑬	Vibration/impact resistance performance Required specifications • Standards Waterproof/anti-dust performance Required specifications • Standards (IPxx)
	⑭	Package and terminal specifications Add any specification requirements on the exterior package (chassis), or shape and position of the terminal (+)(-), if any.

Additional function	⑮	Enter any necessary functions other than the basic module configuration. Basic configuration: Cell and bus-bar connection, voltage balance circuit, overvoltage detection circuit [Presence/absence] Temperature sensor, relay, fuse, cooling fan, others (_____)
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Others Remarks

Attached document

[Presence/absence] Document name: _____

Field used by Nippon chemi-con

