

English



DLCAPTM

Electric Double Layer Capacitor

2016/2017

CAT.NO.E1009D



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◆ Regarding compliance for EU REACH Regulation

a) According to the content of REACH handbook (Guidance on requirements for substances in articles which is published on May 2008), our electronic components are "articles without any intended release". Therefore they are not applicable for "Registration" for EU REACH Regulation Article 7(1).
Reference: Electrolytic Condenser Investigation Society
"Study of REACH Regulation in EU about Electrolytic Capacitor" (publicized on 13 March 2008)

b) Nippon Chemi-Con develops the products without substance of very high concern(SVHC).
DEHP(CASNo.117-81-7) was contained as some covering material, Nippon Chemi-Con has abolished use of DEHP in June, 2011.

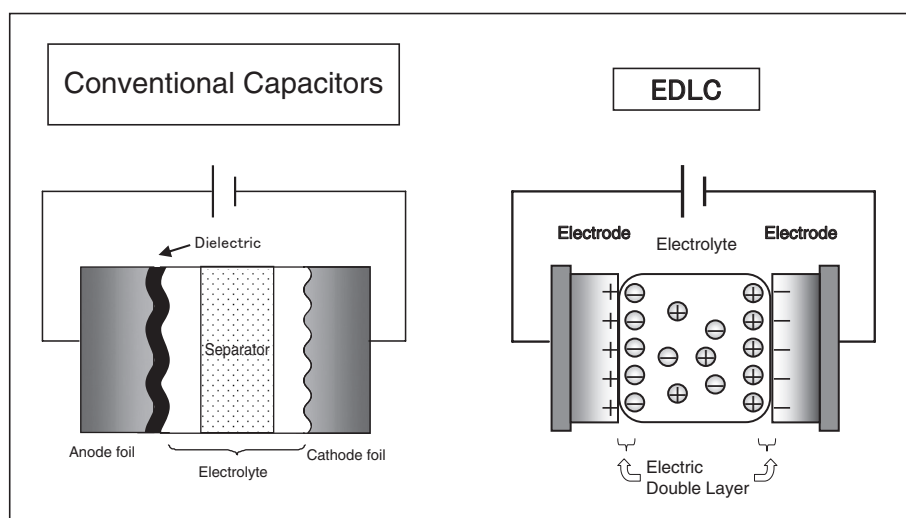
Introduction of Electric Double Layer Capacitor

1. Introduction

Compared to the commonly used rechargeable batteries, Electric Double Layer Capacitor (EDLC), 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 EDLC on more and more new applications is considered. Installation of EDLC 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. EDLC represents those environmental-friendly products. We have a wide range of products to meet customers' needs, starting from a several hundred Farads, to large capacitance of 2300F.

2. Basic Mechanism of EDLC

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, EDLC does not use chemical reactions and it stores energy solely by physical movement of ion to the surface of activated carbon. That gives EDLC 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

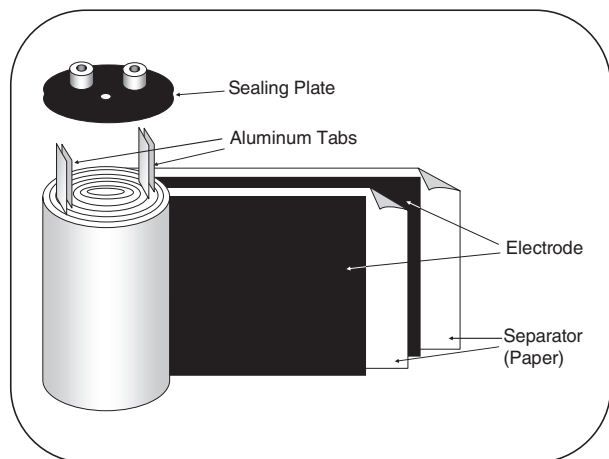
Nippon Chemi-Con produces cylindrical type DLCAP™ (Photo1).

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™



(Figure2) DLCAP™Structure

DLCAP™ DLE series



- Achieved high energy density with our unique electrode process technology.
- Higher charge/discharge efficiency than batteries.
- Environment-friendly
- Suitable for electricity storage, battery assistance, short-term backups, etc.

◆ SPECIFICATIONS

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

◆ STANDARD RATINGS

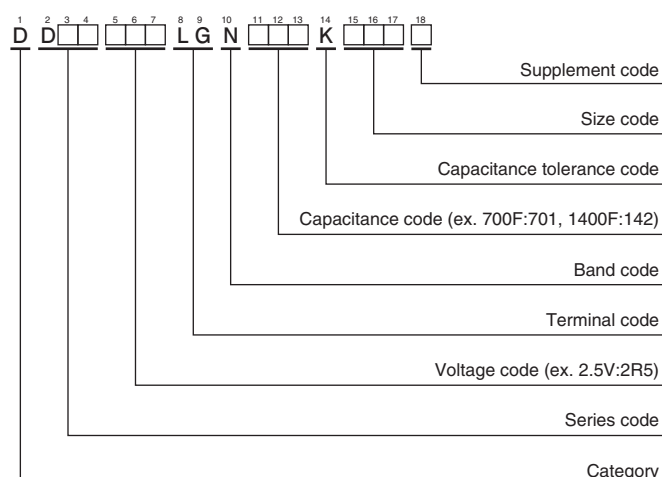
● DLE series

Rated Voltage [V]	Capacitance [F] (Min.)	Nominal Case Size		Internal Resistance		Weight* ¹ [g]	Energy Storage* ² [Wh]	Part No.
		φ D [mm]	L [mm]	Typical [mΩ]	Max. [mΩ]			
2.5	350 (315)	35	65	6.5	8.0	90	0.4	DDLE2R5LGN351KA65S
	700 (630)	35	105	4.0	4.8	150	0.7	DDLE2R5LGN701KAA5S
	1400 (1260)	40	150	2.4	2.9	280	1.3	DDLE2R5LGN142KBF0S
	2300 (2070)	50	172	1.2	1.44	470	2.0	DDLE2R5LGN232KCH2S

* 1 Reference data

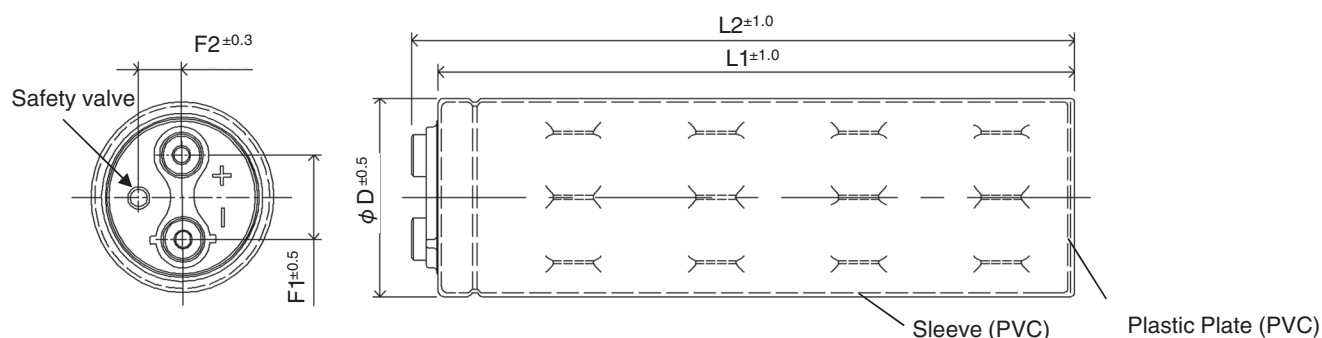
* 2 Energy storage capacity(Wh) in EDLC is indicated higher than the actual value because it is calculated based on "Guidelines for transportation of Electric double layer capacitors used in electronic and electric equipments (JEITA)".

◆ PART NUMBERING SYSTEM



DLCAP™ DLE series

◆ DIMENSIONS (CE331) [mm]



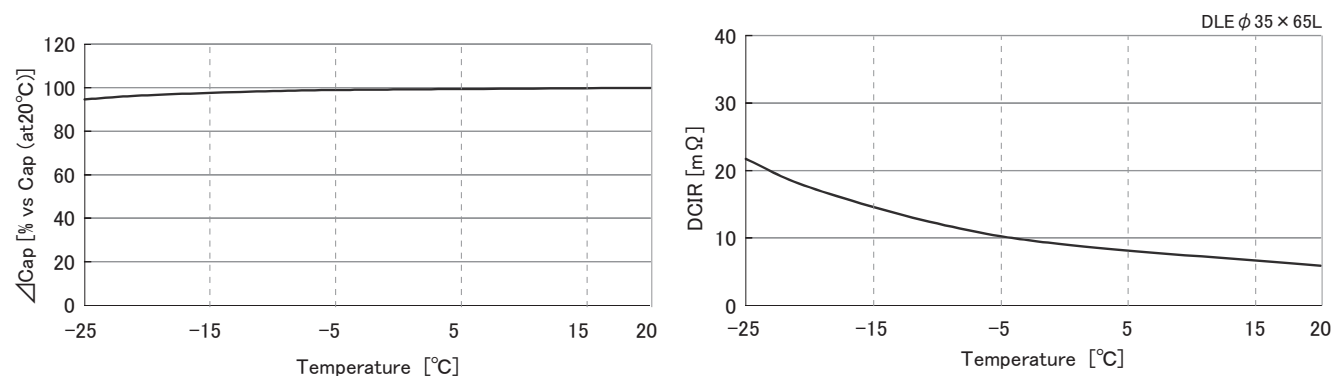
<Screw specification>

Plus hexagon-headed screw : M5×0.8×10

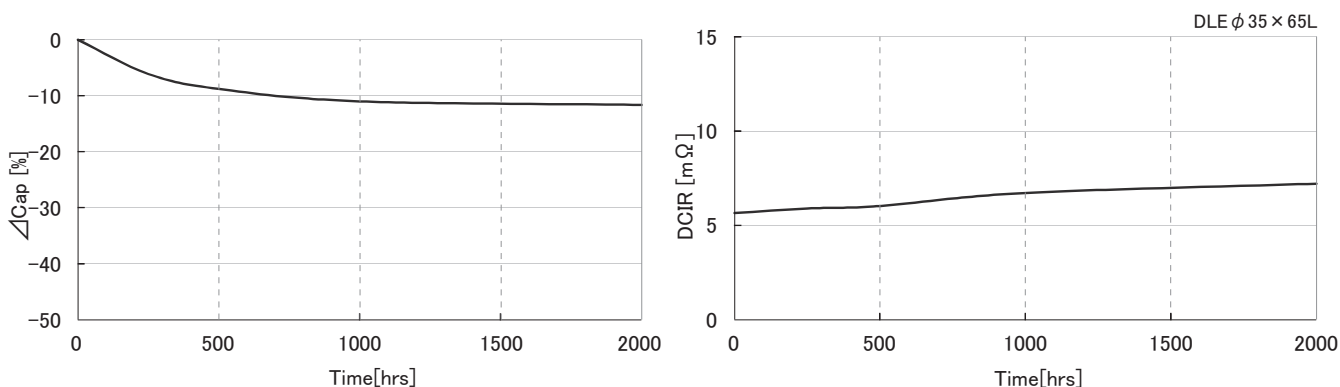
Maximum screw tightening torque : 3.23Nm

Part No.	ϕD [mm]	L 1 [mm]	L 2 [mm]	F 1 [mm]	F 2 [mm]
DDLE2R5LGN351KA65S	35.4	66	72.5	12.7	8.7
DDLE2R5LGN701KAA5S		106	112.5		
DDLE2R5LGN142KBF0S	40.4	151	157.5	17.0	10.2
DDLE2R5LGN232KCH2S	50.4	173	181.5	22.1	11.9

◆ Temperature Characteristics of Capacitance & DCIR



◆ 60°C Load Life Test



DLCAP™ DXE series



- Achieved low resistance and high energy density with our unique electrode process technology.
- Higher charge/discharge efficiency than batteries.
- Environment-friendly
- Suitable for electricity storage, battery assistance, short-term backups, etc.
- Also suitable for kinetic energy recapturing, start/stop application for automobile.



◆ SPECIFICATIONS

Items	Specifications		
Operating Temperature	-40℃ ~ +70℃		
Capacitance Tolerance	± 10% (K) (20℃)		
Temperature Characteristics	Capacitance Change	≤ ± 30% of the initial measured value at 20℃	(-40℃)
	Internal Resistance Change	≤ 1200% of the internal resistance actual value given in the ratings tables	
Load Life Test	After the capacitors are subjected to the rated DC voltage at 70℃ for 2000 hours, the following specifications shall be satisfied when they are restored to 20℃ .		
	Capacitance Change	≤ ± 30% of the initial measured value at 20℃	
	Internal Resistance Change	≤ +200% of the internal resistance actual value given in the ratings tables	
Bias Humidity Test	After the capacitors are left at 40℃ and 90 to 95%RH for 500 hours without voltage applied, the following specifications shall be satisfied when they are restored to 20℃ .		
	Capacitance Change	≤ ± 30% of the initial measured value at 20℃	
	Internal Resistance Change	≤ +200% of the internal resistance actual value given in the ratings tables	

◆ STANDARD RATINGS

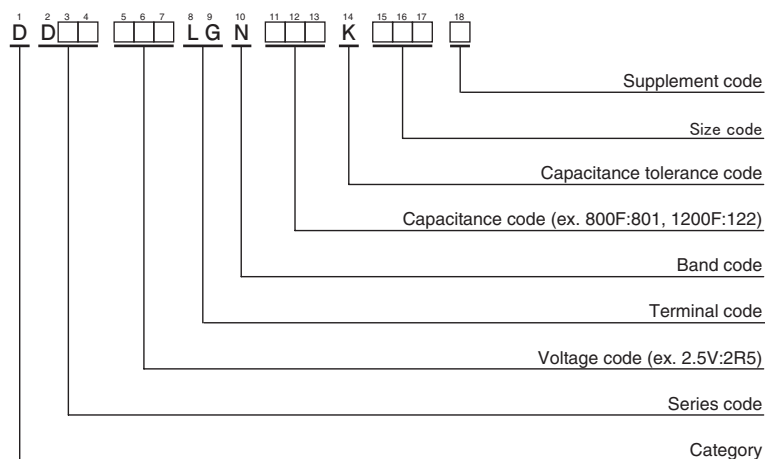
● DXE series

Rated Voltage [V]	Capacitance [F] (Min.)	Nominal Case Size		Internal Resistance		Weight* ¹ [g]	Energy Storage* ² [Wh]	Part No.
		φ D [mm]	L [mm]	Typical [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

* 1 Reference data

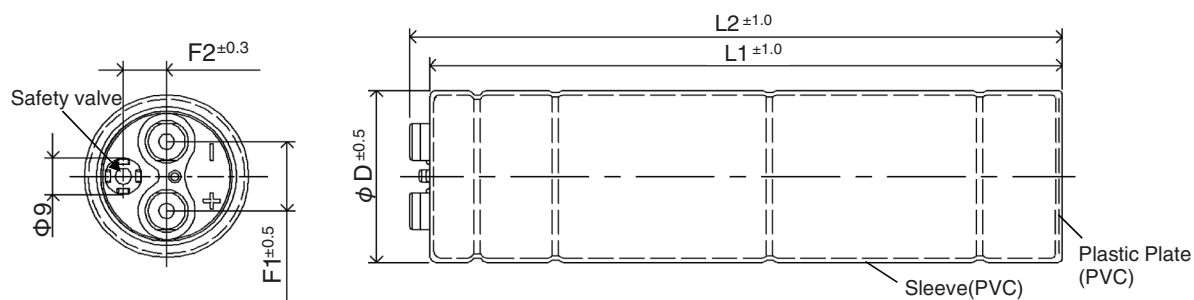
* 2 Energy storage capacity(Wh) in EDLC is indicated higher than the actual value because it is calculated based on "Guidelines for transportation of Electric double layer capacitors used in electronic and electric equipments (JEITA)".

◆ PART NUMBERING SYSTEM



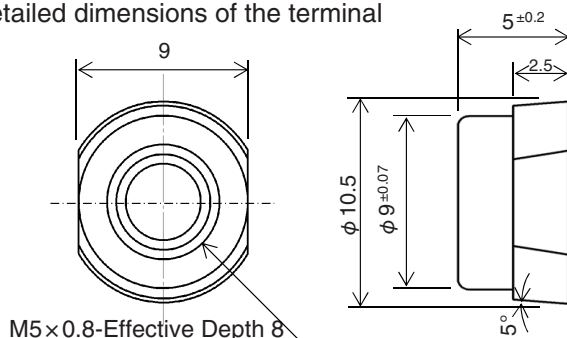
DLCAP™ DXE series

◆ DIMENSIONS (CE331) [mm]



Part No.	φ D [mm]	L 1 [mm]	L 2 [mm]	F1 [mm]	F2 [mm]
DDXE2R5LGN401KB65S	40.4	66	71	17.0	10.5
DDXE2R5LGN801KBA5S		106	111		
DDXE2R5LGN122KBF0S		151	156		
DDXE2R5LGN142KBF0S					

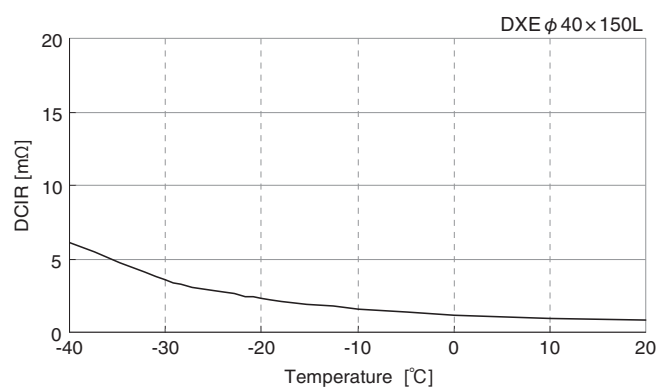
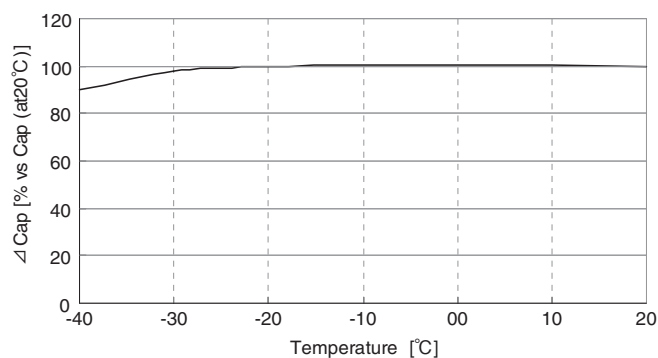
Detailed dimensions of the terminal



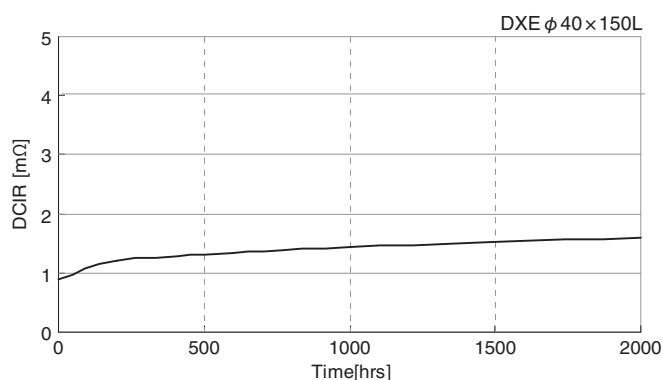
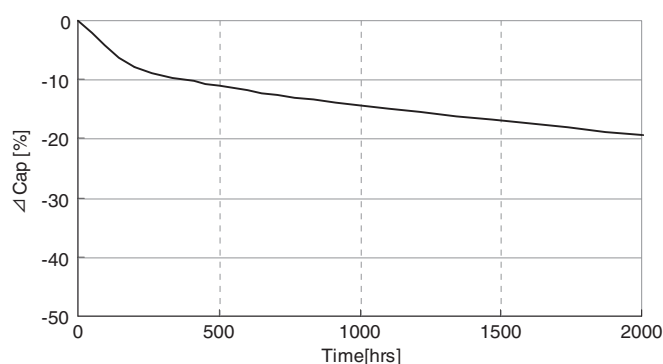
< Screw specification >

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

◆ Temperature Characteristics of Capacitance & DCIR



◆ 70°C Load Life Test



DLCAP™ Module



For an easy usage of Electric Double Layer Capacitor DLCAP™, we have prepared modules.
By connecting multiple modules, modules with higher voltage and larger capacitance can be made.

● Application Examples

◆ Energy Saving

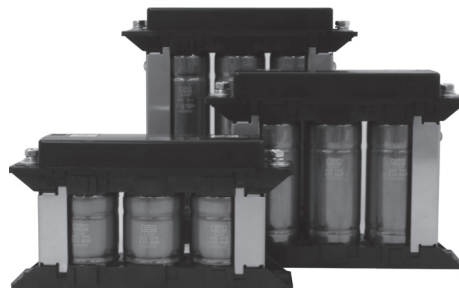
- Peak power assistance
- Effective recapture of kinetic energy

◆ 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

- Built-in voltage balance circuit.
- Built-in failure detection circuit.
- Built-in thermistor for temperature monitor.

◆ SPECIFICATIONS

Items	Specifications			
Operating Temperature	-30℃ ~ +70℃			
Capacitance Tolerance	+10%/-15% (20℃)			
Temperature Characteristics	Capacitance Change	≤ ± 30% of the initial measured value at 20℃		(-30℃)
	Internal Resistance Change	≤ 1200% of the internal resistance actual value given in the ratings tables		
Load Life Test	After the capacitors are subjected to the rated DC voltage at 70℃ for 2000 hours, the following specifications shall be satisfied when they are restored to 20℃ .			
	Capacitance Change	≤ ± 30% of the initial measured value at 20℃		
	Internal Resistance Change	≤ +200% of the internal resistance actual value given in the ratings tables		
Bias Humidity Test	After the capacitors are left at 40℃ and 90 to 95%RH for 500 hours without voltage applied, the following specifications shall be satisfied when they are restored to 20℃ .			
	Capacitance Change	≤ ± 30% of the initial measured value at 20℃		
	Internal Resistance Change	≤ +200% of the internal resistance actual 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 [F] (Min.)	Case Size			Internal Resistance		Weight*1 [kg]	Energy Storage*2 [Wh]	Part No.
		W [mm]	D [mm]	H [mm]	Typical [mΩ]	Max. [mΩ]			
7.5	133 (113)	54	180	97	6.6	7.8	0.7	1.0	MDXE07R5V133FB0
	266 (226)	54	180	137	3.6	4.2	1.0	2.1	MDXE07R5V266FB0
	400 (340)	54	180	182	2.7	3.3	1.3	3.1	MDXE07R5V400FB0
	466 (396)	54	180	182	3.6	4.2	1.3	3.6	MDXE07R5V466FB0

* 1 Reference data

Connecting parts are attached.

* 2 Energy storage capacity(Wh) in EDLC is indicated higher than the actual value because it is calculated based on "Guidelines for transportation of Electric double layer capacitors used in electronic and electric equipments (JEITA)".

● DLCAP™ Custom Module Acceptable

Custom designs are available on requests.

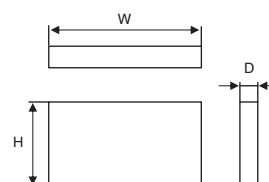
◆ Custom design examples;

- 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 if custom specification is required.

- Please consult us if these items are needed to be connected more than 6 in series.

◆ DIMENSIONS



◆ Screw Specification (Suggested)

Part No.	Screw	Tightning torque
MDXE07R5V133FB0	M6x10	5.2Nm±10%
MDXE07R5V266FB0	M6x10	5.2Nm±10%
MDXE07R5V400FB0	M6x10	5.2Nm±10%
MDXE07R5V466FB0	M6x10	5.2Nm±10%

Precaution Statement

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 EDLC does not assure electrical insulation.
- ③ EDLC has finite and regulated life.
- ④ Please do not use or store EDLC 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) Please assemble the module with cell terminals upward.
Do not mount EDLC with terminals facing downward or sideways as the electrolyte inside the EDLC may block pressure release vent and cause it to open, electrolyte to leak, and shorten lifetime.
 - b) Please keep the sealing plate facing upward whenever handling EDLC.
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 EDLC.
 - e) Please avoid locating any heat source components near EDLC.
 - f) To assure insulation voltage, please provide adequate space among EDLC case, cathode terminal, anode terminal, circuit pattern and chassis.
 - g) Please note that electrical properties of EDLC may change according to the changes in temperature and frequency of EDLC.
 - h) When the temperature between EDLC 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 EDLC, please conduct a load test to confirm there is no abnormal heat rise, and the temperature stays within the EDLC's specified temperature range.
 - j) Please assure appropriate current balance when connecting two or more EDLC in parallel.
 - k) Please assure appropriate voltage balance when connecting two or more EDLC 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 be 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 EDLC 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.



ELECTRIC DOUBLE LAYER CAPACITOR

- 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 EDLC. Do not use it once it is dropped.
- ⑧ Please make sure of the polarity when assembling EDLC into a module.
- ⑨ Please follow the specification of the screw tightening torque.
- ⑩ Please do not deform EDLC when assembling it into a module.
- ⑪ Voltage of EDLC changes in proportion to the stored energy.
If stable output voltage is required, circuit system such as converter needs to be added.
- ⑫ When using EDLC for industrial application, following periodical check is recommended.
Please disconnect power from the device and fully discharge EDLC 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.
- ⑬ Please stop the whole system when EDLC generates excessive heat or a foul smell.
In case of excessive heat, do not get close to the part in order to avoid injury.
- ⑭ Please stop the system immediately and ventilate the area sufficiently when the safety vent on EDLC 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 EDLC. Wash away the electrolyte from the skin with soap and water.
- ⑮ EDLC may have been spontaneously recharged with time by a recovery voltage phenomenon.
Discharge EDLC as necessary especially before connecting multiple EDLCs in series.
- ⑯ Please discharge EDLC 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 EDLC may be self-charged while being left open-circuit even after fully discharged.
- ⑰ Do not wash EDLC.
- ⑱ Do not use any adhesive or coating materials containing halogenated solvents.

2. Precautions in transportation

- ① When exporting EDLC, 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 EDLC 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 EDLC. Please make sure to place its terminal upward to avoid electrolyte leakage.
- ④ Transport operations of EDLC 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 EDLC 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 If EDLC have been stored for long periods of time, it may appear to have high leakage current.

Voltage treatment is recommended when EDLC is stored for more than one year.

For voltage treatment, please charge at 5A up to the rated voltage, and then keep applying rated voltage for about 20 hours.

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 crash the part before incineration.

Please refer to the following report before using EDLC.

Japan Electronics and Information Technology Industries Association, JEITA RCR-2370C

"Safety Application Guide for electric double layer capacitors (Guideline of notabilia 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"

This image shows a full page of primary-ruled notebook paper. At the very top, there is a solid light blue horizontal band. Below this band, the rest of the page is white and filled with evenly spaced horizontal dashed lines, providing a guide for handwriting practice. The lines extend across the entire width of the page from left to right.

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● Huntsville Office: South Park Office Center, 7501 Memorial Parkway SW, Suite 209, Huntsville, Alabama, 35801, U.S.A.		1(256)489-9385	1(256)489-9387
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● Beijing Office: Rm 905, Towercrest Plaza, No.3 Maizidian West Road, Chaoyang District, Beijing, China 100016		86(10)51087377	86(10)51087378
■ CHEMI-CON TRADING (SHENZHEN) CO., LTD.			
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ASEAN			
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■ CHEMI-CON (MALAYSIA) SDN,BHD.			
● Main Office: FIZ Telok Panglima Garang, Km15, Jalan Klang- Banting, 42507 Kuala Langat, Selangor, Darul Ehsan, Malaysia		60(3)31226239	60(3)31226292
● Kuala Lumpur Office: Suite 2115, Level 21, Plaza Pengkalan Batu 3, Jalan Ipoh, 51100 Kuala Lumpur, Malaysia		60(3)40442437	60(3)40442445
● Penang Office: Unit 3A-3A, 4th Floor, Wisma LEADER No.8, Jalan Larut, 10050 Penang, Malaysia		60(4)2297631	60(4)2291779
■ P.T. INDONESIA CHEMI-CON	EJIP Industrial Park Plot 4C Cikarang Selatan, Bekasi 17550, Indonesia	62(21)8970070	62(21)8970071

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

ELECTRONIC COMPONENTS & DEVICES

PRODUCTS

	CAT.No.
Aluminum Electrolytic Capacitors	1001
Multilayer Ceramic Capacitors	1002
Film Capacitors	1003
Metal Oxide Varistors TNR™	1006
Amorphous / Dust Choke Coils	1008
Electric Double Layer Capacitors	1009
Electro-Mechanical Products	

Notes on Safety



- Always read "Notes on Use" before using the product in order to enable you to use the product correctly and prevent any faults and accidents from occurring.
- Request the Product Specification on the product of NIPPON CHEMI-CON CORPORATION to refer to it as well as this brochure prior to the order of the products. Some specific notes on use of the ordered product may be described in the specifications.

The electronic components described in this catalogue were designed and developed for use in general electronic equipment, such as ; general household appliances, office and AV equipment, information and communication equipment, etc.

We ask you, therefore, to appraise, examine and judge the suitability of these electronic components very carefully, or contact us, for designs that require higher levels of safety and reliability, such as ; medical or aerospace equipment, equipment related to nuclear power, safety devices for automotive products, or disaster prevention equipment.

When using these components for circuits in general electronic equipment that also require higher levels of safety and reliability, we recommend that you carry out a thorough appraisal of the component's intended use in the application and add any necessary protection networks during the design phase.

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