



APPLICATION GUIDELINES FOR ELECTRIC DOUBLE LAYER CAPACITORS "EVerCAP®"

1. Circuit Design

- (1) The EDLC has a specified endurance and an end of life.
- (2) The EDLC has a maximum temperature.
- (3) Electrical characteristics of the EDLC change depending on the ambient temperature.
- (4) Electrical characteristics of the EDLC can be adversely affected by increasing temperature.
- (5) The voltage held by the EDLC drops after discharge, depending on the discharging current and the internal resistance (DCR) of the EDLC.
- (6) The voltage of the EDLC is reduced when discharged. To keep a constant voltage as the application circuit use a booster circuit, DC-DC converter etc.
- (7) Please note that if high ripple current, high pulse current and/or high charge & discharge currents are applied to a capacitor, greater deterioration than you expect to the capacitor may occur due to internal temperature rise of self-heat generation.
- (8) Outer sleeve of the EDLC is not guaranteed as an electrical insulator.
- (9) Capacitance of the EDLC is measured by the D.C. discharging method and differs from the one used for other capacitors, and is based on EIAJ RC-2377.
- (10) If EDLC is used in series connection, an overvoltage may be applied one the parts due to voltage imbalance. In this case, countermeasure actions are needed for voltage imbalance such as; increasing voltage margin, use of balance resistance, or the use of a voltage control circuit in parallel.
- (11) Do not expose the EDLC to following conditions.
 - ① Environmental (climatic) conditions
 - (a) Being exposed to water, high temperature & high humidity atmosphere, or condensation of moisture.
 - (b) Being exposed to oil or an atmosphere that is filled with particles of oil.
 - (c) Being exposed to salty water or an atmosphere that is filled with particles of salt.
 - (d) In an atmosphere filled with toxic gasses (such as hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, bromine, methyl bromide, ammonia, etc.)
 - (e) Being exposed to direct sunlight, ozone, ultraviolet ray, or radication.
 - (f) Being exposed to acidic or alkaline solutions.
 - ② Under severe conditions where vibration and / or mechanical shock exceed the applicable ranges of the specifications.
- (12) Do not use the EDLC above the voltage and temperature specified in the data sheet, otherwise the EDLC may be electrically damaged or in worst case, will fail completely.
- (13) Do not apply reverse-voltage as the EDLC is polarised.
- (14) When designing a P.C. board, please pay attention to the following:
 - ① Have the hole spacing on the P.C. board match the lead spacing of the capacitor.
 - ② There should not be any circuit pattern or circuit wire above the capacitor pressure relief vent.
 - ③ Unless otherwise specified, following clearance should be made above the pressure relief vent.

| Case Diameter | Clearance Required |
|---------------|--------------------|
| φ 6.3 to 16 | 2mm or more |
| φ 18 to 35 | 3mm or more |
| φ 40 or more | 5mm or more |
 - ④ In case the vent side is placed toward P.C. board (such as end seal vented parts), make a corresponding hole on the P.C. board to release the gas when vent is operated. The hole should be made to match the capacitor vent position.
 - ⑤ Screw terminal capacitors must be installed with their end seal side facing up. When you install a screw terminal capacitor in a horizontal position, the positive terminal must be in the upper position.
- (15) The main chemical solution of the electrolyte and the separator paper used in the capacitors are combustible. The electrolyte is conductive. When it comes in contact with the P.C. board, there is a possibility of pattern corrosion or short circuit between the circuit pattern which could result in smoking or catching fire.
Do not locate any circuit pattern beneath the capacitor end seal.
- (16) Do not design a circuit board so that heat generating components are placed near an EDLC or reverse side of P.C. board (under the capacitor).

- (17) When you mount capacitors on the double-sided P.C. boards, do not place capacitors on circuit patterns or over on unused holes.
- (18) The torque for terminal screw or brackets screws shall be within the specified value on Nichicon's drawings.

2. Mounting

- (1) Please confirm polarity before installing capacitors on the P.C. board.
- (2) Do not drop capacitors on the floor, nor use a capacitor that was dropped.
- (3) Do not damage the capacitor while installing.
- (4) Please confirm that the lead spacing of the capacitor matches the hole spacing of the P.C. board prior to installation.
- (5) Snap-in can type capacitor such as JIS style symbol 692 type should be installed tightly to the P.C. board (allow no gap between the P.C. board and bottom of the capacitor).
- (6) Hand soldering.
- ① Soldering condition shall be confirmed to be within the specification.
 - ② If it is necessary that the leads must be formed due to a mismatch of the lead space to hole space on the board, bend the lead prior to soldering without applying too much stress to the capacitor.
 - ③ If you need to remove parts which were soldered, please melt the solder enough so that stress is not applied to lead.
 - ④ Please pay attention so that solder iron does not touch any portion of capacitor body.
- (7) Do not tilt lay down or twist the capacitor body after the capacitor are soldered to the P.C. board.
- (8) Do not carry the P.C. board by grasping the soldered capacitor.
- (9) Please do not allow anything to touch the capacitor after soldering. If P.C. board are stored in a stack, please make sure P.C. board or the other components do not touch the capacitor.
The capacitors shall not be effected by any radiated heat from the soldered P.C. board or other components after soldering.
- (10) Recommended Cleaning Condition
Applicable : Any type, any ratings.
Cleaning Agents
Based Alcohol solvent cleaning agent
Isopropyl Alcohol
Based water solvent cleaning agent
Premium alcohol solvent type
Pine Alpha ST-100S
Techno Care FRW 14to17
Sanelek B-12
Surfactant type
Clean Through 750H, 750L, 710M
Alkaline saponification agent
Aqua Cleaner 210SEP
Cleaning Conditions :
Total cleaning time shall be no greater than 5 minutes by immersion, ultrasonic or other method.
(Temperature of the cleaning agent shall be 60°C maximum.)
After the board cleaning has been completed, the capacitors should be dried using hot air for a minimum of 10 minutes.
If the cleaning solution is infiltrated between the case and the sleeve, the sleeve might soften and swell when hot air temperature is too high. Therefore, hot air temperature should not exceed softening temperature(80°C) of the sleeve.
Insufficient dries after water rinse may cause appearance problems, such as sleeve shrinking, bottom-plate bulging.
In addition, a monitoring of the contamination of cleaning agents (electric conductivity, pH, specific gravity, water content, etc.) must be implemented.
After the cleaning, do not keep the capacitors in an atmosphere containing the cleaning agent or in an air tight container.
Depending on the cleaning method, the marking on a capacitor may be erased or blurred.
Consult Nichicon before using a cleaning method or a cleaning agent other than those recommended.

(11) Fixing Material and Coating Material

- 1) Do not use any affixing or coating materials, which contain halide substance.
- 2) Remove flux and any contamination, which remains in the gap between the end seal and PC board.
- 3) Please dry the cleaning agent on the PC board before using affixing or coating materials.
- 4) Please do not apply any material all around the end seal when using affixing or coating materials.

There are variations of cleaning agents, fixing and coating materials, so please contact those manufacture or our sales office to make sure that the material would not cause any problems.

(12) Others

Wooden package material may be subjected to fumigation by a halogen(e.g. methyl bromide) before they are exported in order to protect them against pests. If devices with aluminum electrolytic capacitors or capacitors themselves are directly fumigated or packed with the pallet that is fumigated, the capacitors may internally corrode due to the halogen contents of fumigation agents.

3.Storage

- (1) It is recommended to keep the EDLC under the ambient temperature of 5°C to 35°C and a relative humidity of 75% or below.
- (2) Confirm that the environment does not have any of the following conditions :
 - ① Where the EDLC is exposed to water, high temperature & high humidity atmosphere, or condensation of moisture
 - ② Where the EDLC is exposed to oil or an atmosphere that is filled with particles of oil.
 - ③ Where the EDLC is exposed to salty water, high temperature & high humidity atmosphere, or condensation of moisture
 - ④ The atmosphere is filled with toxic acid gasses
(e.g. hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, bromine, methyl bromide, etc.)
 - ⑤ The atmosphere is filled with toxic alkaline gasses. (e.g. ammonia)
 - ⑥ Where the EDLC is exposed to acidic or alkaline solutions
- (3) If 2 years or more have passed without applying voltage to the part, please contact us because before using the part as characteristics may have been affected by environmental conditions.

4.Disposal

- (1) Take the following methods in disposing of the EDLC, hand them over to a waste disposal agent.
- (2) When removing a capacitor from the circuit board or when disposing of capacitor please ensure that the capacitor is properly discharged.

The above mentioned material is according to JEITA RCR-2370C (issued in July 2008), titled "Safety Application Guide for electric double layer capacitors" Please refer to the book for details.

[Application & Development Case Study]

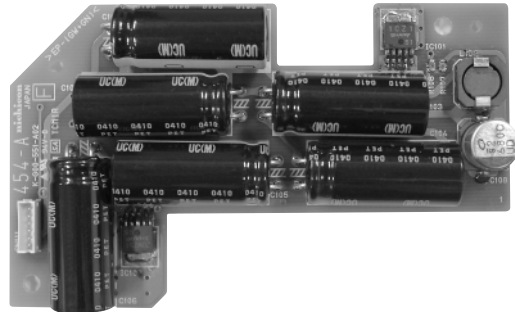
High-voltage product :

12.5V 2F (2.5V 10F × 5-series connection)



High-voltage product :

15V 1.5F (2.5V 10F × 6-series connection)



Example of recommendable applications for "EVerCAP®" :

Storage function (as an alternative to a storage battery)

1. Stand-by power source
Employing "EVerCAP®" as stand-by electric power for remote controllers such as for TV's, air conditioners and console games will allow energy saving therefore contributing to environmental countermeasures.
2. Back-up power supply
"EVerCAP®" used as a short-time back-up power supply for various regulated power supplies will reduce weight and the service life is longer than lead storage batteries
3. Self-generation
"EVerCAP®" can be used as a power source for a street lamp or a repeater indicator of road when used in combination with a compact solar cell, etc.

Recommended Use Case Study

- High input/output function (Motor-operated equipment assistant for mechanical motive power systems for vehicles, etc. and regenerative power supply systems) This function exhibits its effectiveness for assistance and regeneration HEV, etc.
- Other
"EVerCAP®" can store electricity even at negligible levels. Immense electric power is produced using a switchboard if electricity is collected from energy that has been unusable and/or discharged.
Therefore, "EVerCAP®" can be fully employed as an outdoor power source for fun as well.

Solar cell type LED illuminated approach light:

