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UK Series-Electric Double-Layer Capacitor (EDLC)



Recently, there has been a growing market for the use of Electric Double-Layer Capacitors in large products such as cars, cranes, forklifts, and elevators using regenerative energy. Nichicon's UK Series was developed to meet these market needs and those of smart meter manufacturers who require capacitors with lower resistance and the ability to operate in a lower temperature range. The UK Series is guaranteed to -40°C!

There are many advantages to the EDLC:

Advantage #1: Longer Life

Rechargeable batteries typically have 500 - 1000 life cycles. After being charged and discharged a few hundred times, the capacity of the batteries starts to decrease. Eventually, they will lose most of their storage capacity. An EDLC can be charged and discharged over a million times without any reduction in its storage capacity. If an EDLC can be used in conjunction with the battery, it can increase the battery's life.

Advantage #2: Faster Charging Times

Since a rechargeable battery stores energy by chemical reactions, it generally takes much longer to recharge, usually about an hour. Whereas the EDLC stores energy by the movement of ions, it usually takes from 0.1 to 30 seconds. Therefore, if equipment needs rapid energy, the EDLC is a much better choice.

Advantage #3: Lighter and Safer

Rechargeable batteries usually contain heavy and harmful metals like lead and cadmium. As the size increases, they could weigh more than twice that of an EDLC of the same volume. EDLCs do not contain harmful metals and are environmentally friendly.

Advantage #4: No Limitation for the Charging Current

When using a rechargeable battery, a current limiting circuit is sometimes needed to prevent any rush charging current from damaging the battery. The EDLC has no limitation for the charging circuit, provided the charging voltage does not exceed the rated voltage of the EDLC. Please note that if high ripple current, high pulse current, and/or high charge and discharge currents are applied to the capacitor the internal temperature rise, generated by self-heating of the capacitor, may cause deterioration greater than one might expect.

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Electric Double Layer Capacitors

Quick Facts

- EDLCs have short-charge and discharge times
- Maintenance-Free: Fit and Forget Device
- No special Charge-Control needed
- With its short charging and discharging times, EDLCs are well suited for intermittent loads
- Environmentally Friendly: The method of energy storage is done naturally between the double-layers which is safer vs. through chemical reactions with rechargeable batteries
- Long Life
- Less Weight
- Damage Proof against Short Circuit
- Completely Dischargeable
- High Power Density compared to standard capacitors
- Lowest Temperature Range

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Advantage # 5: Maintenance Free

EDLC is a "Fit and Forget" device. There's no maintenance required or special handling like a rechargeable battery.

Nichicon's Newest EDLC: UK Series EVerCAP



Nichicon's newest EDLC is the UK series. It's rated at 2.5V with capacitance ranges of 6.8-27 Farads (*Data sheet attached*). Nichicon has five additional series in the EVerCAP family: UM, UW, JC, JD and JL. These come in leaded, snap-in and screw terminal types. They are available in 2.5 & 2.7 Volt and capacitance ranges from 0.47 to 6000 Farads. They can all be found at: www.nichicon.com.

Markets

Consumer

Cell phones, Digital Cameras, Video Games, Radio Control Cars, Video Projectors, Garden Lights, Computers, Video Recorders

Equipment

Smart Meters, Power Supply, Traffic Control, Solar and Wind Power, Construction Equipment, Welding, Electric Power Tools, Copiers, Satellite Receivers, Street Lights

Transportation

Electric Motorcycle, Golf Cart, Electric Assist Bicycle, Railroad, Automobile

Applications



There is a wide variety of applications for EDLCs and in this Tech Topic we have merely scratched the surface. We encourage you to contact your Nichicon Account Representative to assist you if you have any additional questions.

Backup Power

Power and memory backup can be provided by the EDLC while the battery is disconnected, when a temporary power outage occurs, or during the replacement of batteries.

Main Power

Main power can be provided to motor drive by a quick charge or through the combination of a power generator and charging circuit.

Alternating Power

This is accomplished through the use of solar cells. During the day the electric load is supplied by solar cells, which also recharge the EDLC.

ELECTRIC DOUBLE LAYER CAPACITORS "EVerCAP®"

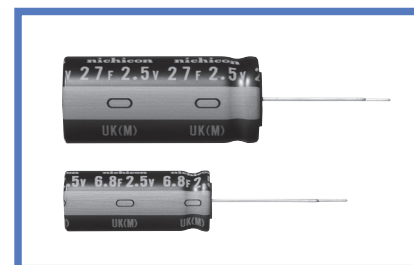
UK series

Radial Lead Type, Lower Resistance

- Lower resistance type of UM series.
- Suited for Smart Meters.
- Lower temperature range (– 40 to +70°C).
- Adapted to the RoHS directive (2002/95/EC).



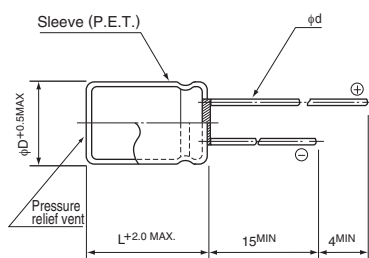
NEW



Specifications

Item	Performance Characteristics		
Category Temperature Range	－ 40 to +70℃		
Rated Voltage	2.5V		
Rated Capacitance Range	6.8 to 27F See Note		
Capacitance Tolerance	± 20% , 20℃		
Leakage Current	0.5C (mA) [C : Rated Capacitance(F)] (After 30 minutes' application of rated voltage, 2.5V)		
Stability at Low Temperature	Capacitance (－ 40℃) / Capacitance (+20℃) ×100 ≥ 70%		
ESR, DCR*	Refer to the list below (20℃). *DC internal resistance		
Endurance	The specifications listed at right shall be met when the capacitors are restored to 20℃ after the rated voltage is applied for 1000 hours at 70℃.	Capacitance change	Within ±30% of the initial capacitance value
		ESR	300% or less than the initial specified value
		Leakage current	Less than or equal to the initial specified value
Shelf Life	The specifications listed at right shall be met when the capacitors are restored to 20℃ after storing the capacitors under no load for 1000 hours at 70℃.	Capacitance change	Within ±30% of the initial capacitance value
		ESR	300% or less than the initial specified value
		Leakage current	Less than or equal to the initial specified value
Marking	Printed with white color letter on black sleeve.		

Drawing



	(mm)		
φD	12.5	16	18
P	5.0	7.5	7.5
φd	0.8	0.8	0.8

Type numbering system (Example : 2.5V 6.8F)

1 2 3 4 5 6 7 8 9 10 11
J U K 0 E 6 8 5 M H D

Configuration ※
Capacitance tolerance (±20%)
Rated capacitance (6.8F)
Rated voltage (2.5V)
Series name
Type

※ Configuration	
φ D	Pb-free lead finishing Pb-free PET sleeve
12.5 to 18	HD

Dimensions

Rated Voltage (Code)	Rated Capacitance (F)	Code	ESR (Ω) (at 1kHz)	DCR※ Typical (Ω)	Case size φ D × L (mm)
2.5V (0E)	6.8	685	0.075	0.085	12.5 × 31.5
	12	126	0.060	0.065	16 × 31.5
	18	186	0.055	0.055	18 × 31.5
	27	276	0.040	0.035	18 × 40

※ The listed DCR value is typical and therefore not a guaranteed value.

Note :

The capacitance calculated from discharge time (ΔT) with constant current (i) after 30minute charge with rated voltage (2.5V).

The discharge current (i) is 0.01 × rated capacitance (F).

The discharge time (ΔT) measured between 2V and 1V with constant current.

The capacitance calculated below.

$$\text{Capacitance (F)} = i \times \Delta T$$

Design, Specifications are subject to change without notice.