Green-Cap(EDLC)
Characteristic measurements

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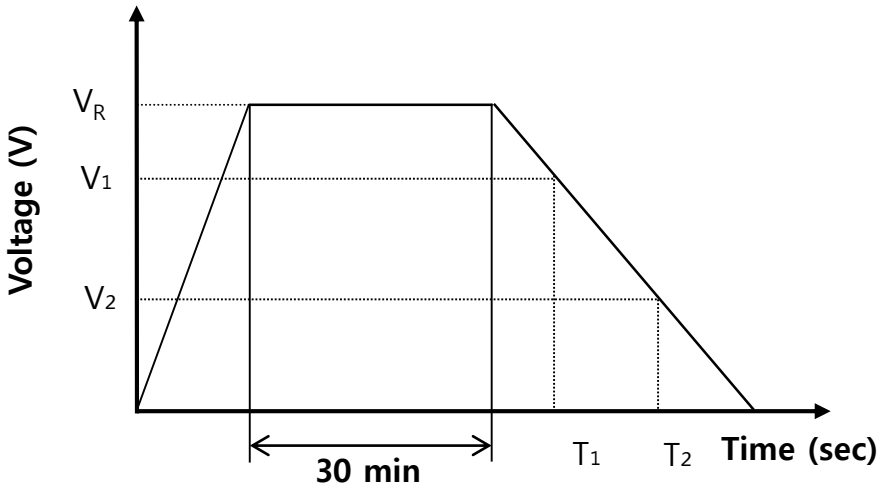
Green-Cap(EDLC) Characteristic measurements

1. Capacitance



▶ Calculation Formula

$$\text{Capacitance(F)} = \frac{I \times (T_2 - T_1)}{V_1 - V_2}$$

- I : Discharge Current(A)
- V_R : Rated Voltage(V)
- V_1 : Rated Voltage x 0.8
- V_2 : Rated Voltage x 0.4
- T_1 : The time from discharge start to reach V1 (s)
- T_2 : The time from discharge start to reach V2 (s)

Measuring method (IEC 62391-1)

1) Charging is performed by constant current followed by constant voltage charging.
2) Charging is performed for duration of 30 minutes at rated voltage.
3) Discharge use a constant current load device and measure the time for the terminal voltage to drop from V1 to V2 upon discharge at 10mA/F.
4) The capacitance can be obtained by the following equation.

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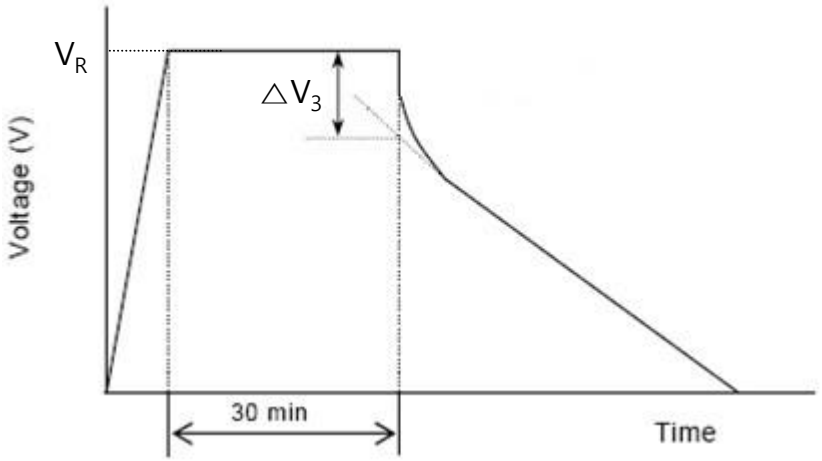
2. ESR, DC(DC resistance)



▶ Calculation Formula

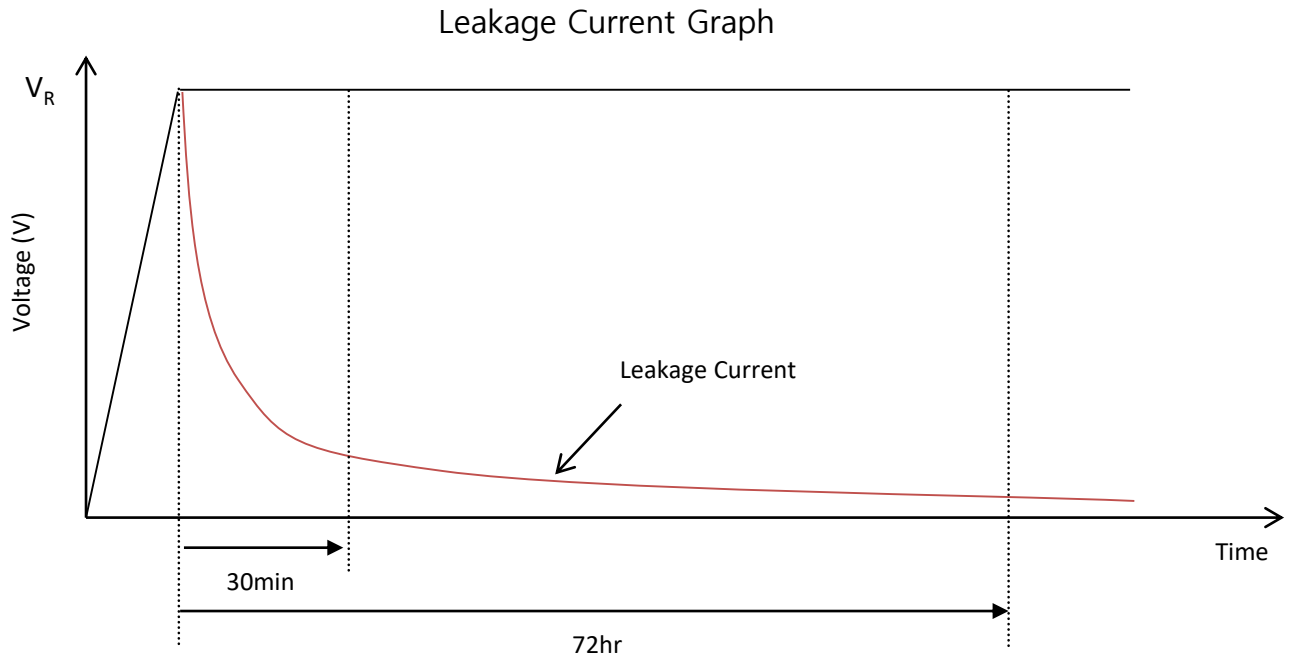
$$\text{Resistance(R)} = \frac{\triangle V_3}{I}$$

- R : Resistance(Ω)
- $\triangle V_3$: Drop Voltage(V)
- I : Discharge Current(A)

Measuring method (IEC 62391-1)

1) Constant current charge with 10mA/F to V_R
2) Constant voltage charge at V_R for 30min
3) Constant current discharge with 10mA/F to 0.1V
4) ΔV3 is measured by measurement equipment.

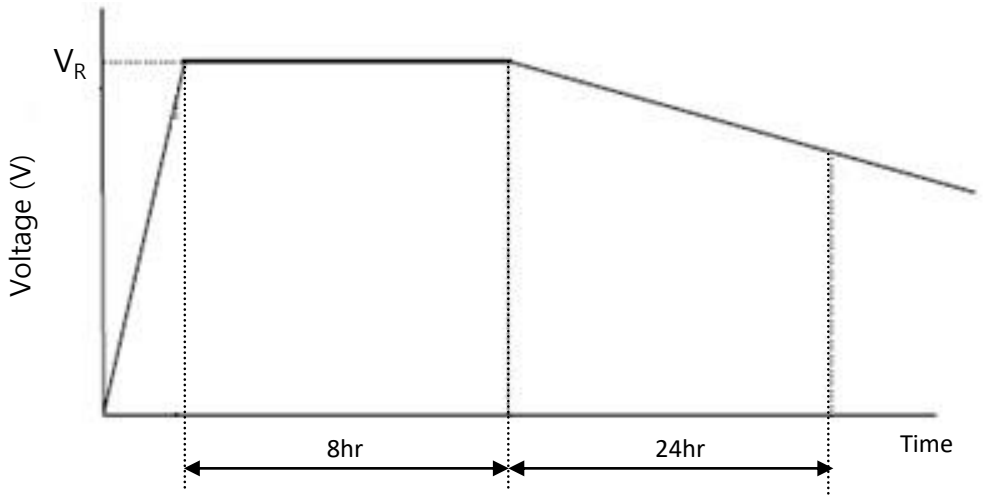
3. Leakage Current



Measuring method (IEC 62391-1)

1) Charging is performed by constant current followed by constant voltage charging.
2) Charging is performed for duration of 72 hours at rated voltage.
3) Then, Leakage current is measured by current measurement equipment.

4. Self Discharge



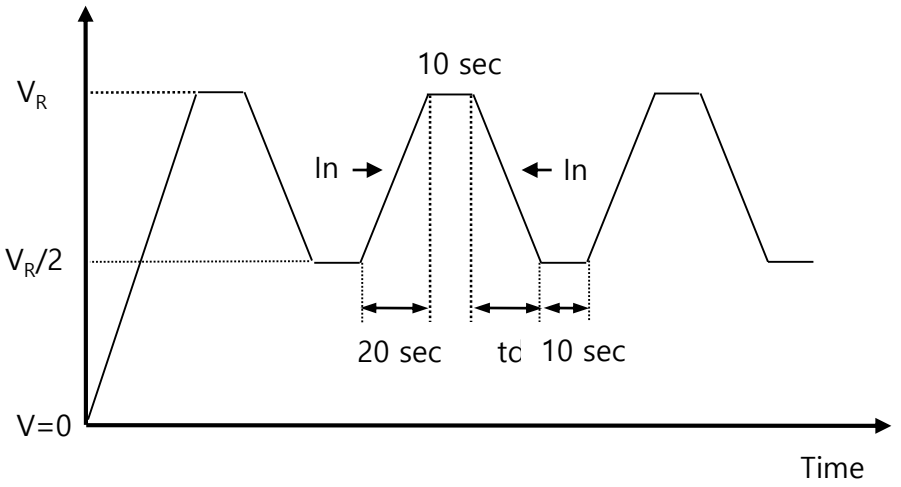
Measuring method (Samwha Standard)

1) Before this measurement is made, the capacitors shall be fully discharged. Discharge procedure shall take 1 h to 24 h and shall be specified in the relevant specification.

2) Apply the rated voltage *U*R directly to the capacitor terminals, without using a protective resistor. Unless otherwise specified by the relevant specifications, charging time shall be 8 h, including maximum 30 min charge-up time to reach 95 % of the applied voltage.

3) Disconnect the capacitor terminals from the voltage source. Unless otherwise specified in the detail specification, the capacitor shall be kept under standard conditions for 24 h.

5. Cycle Life



EDLC Cycle Life TEST Profile

Measuring method (DOE/ID-10491)

1) Condition the capacitor at 25 ± 3°C until thermal equilibrium is reached. Initialize the voltage on the capacitor at $V_R/2$.
2) charge the capacitor at a current In = ($V_R/40$) to VW or at the value of In determined experimentally so that the voltage reaches V_R in 20 (± 1) s.
3) Maintain voltage V_R on the capacitor for 10 ± 0.50 s.
4) discharge the capacitor to $V_R/2$ at current In. Hold at V_R for 10 ± 0.50 s.
5) This defines a cycle (see Figure). Repeat this cycle throughout the testing, adjusting In as needed in order to maintain the initial charge/discharge times.