

Document No.	VJDD01LC12-014
Date	2021.02.18

PRODUCT SPECIFICATION

Product :	3.8V 250F (1335 size)
Part No. :	VEL13353R8257G

Customer :	
Approval date :	
Confirmation signature :	

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1. Purpose

This document states the specification, the measurement method of performance, and other notes about our product.

2. Product composition and recommendation of Ambient Condition

2-1. Product composition

This product is composed of as followed.

- ① Electrode : The appearance of electrode is electrode material (activated carbon or metal oxide) adhered to the AL or Cu foil. Electrodes consist of positive and negative polarity.
- ② Separator : It is uses to separate between the positive and negative electrodes.
- ③ Electrolyte : It is organic liquid that salt dissolved in . Electrode and separator are soaked in electrolyte.
- ④ Aluminum case: It contains an electrode, a separator, and an electrolyte.
- ⑤ Rubber stopper : It is used for sealing cells. Positive and negative terminals come out through it.

2-2. Recommendation of Ambient Condition

This product can be used in the range of $-25^{\circ}\text{C} \sim 85^{\circ}\text{C}$ temperature condition.

We recommended temperature range is $5^{\circ}\text{C} \sim 35^{\circ}\text{C}$ at 1 atm.

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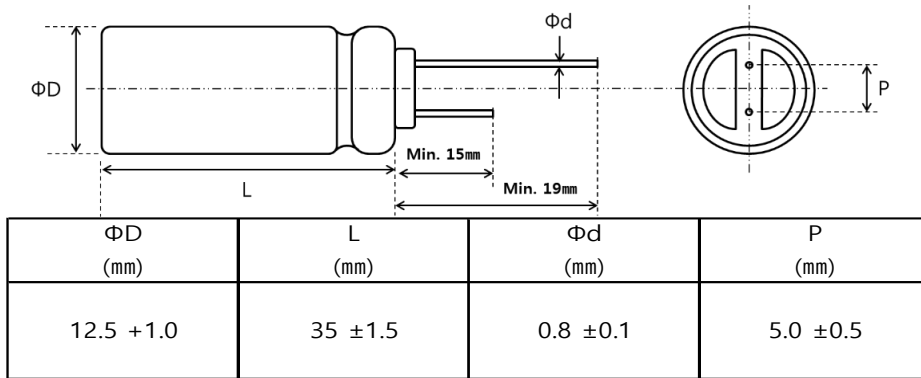
3. General Specification

Item		Specification / Condition	
Part number		VEL13353R8257G	
Rated voltage (V)		3.8	
Discharge capacitance ($\Delta V = 3.8V - 2.5V, 3mA/F$)	Rated capacitance (F)	250	
	Rated capacity (mAh)	90	
	Tolerance (%)	-10 ~ +30	
Internal resistance	AC ESR (m Ω , 1kHz)	Max. 50	
Max. current (A)		5.0	
Environmental condition	Operating	Temperature (°C) (-40 ~ +85 @ in Li/SOCL2 battery system)	-25 ~ +85
		Humidity (%RH)	Max. 85
		Atmosphere (atm)	0.85 ~ 1.15
	Storage	Temperature (°C)	-5 ~ +35
		Humidity (%RH)	Max. 85
		Atmosphere (atm)	0.8 ~ 1.2
Low temperature characteristics (-25°C)		Capacitance change : ≤ 50% of initial value, ESR : Less than 20 times of initial spec.	
High Temperature Loaded (temp. : 70°C, Electrical Charge : 3.8V DC, test time : 1000h)		Capacitance change : ≤ 30% of initial value, ESR : Less than 200% of initial spec. Appearance : No abnormality	
Shelf life (temp. : blow 70°C, No Electrical Charge, test time : 2 years) *VPC recommends charging at rated voltage every six months		Capacitance change : ≤ 10% of initial value, ESR : ≤ 100% of specified value	

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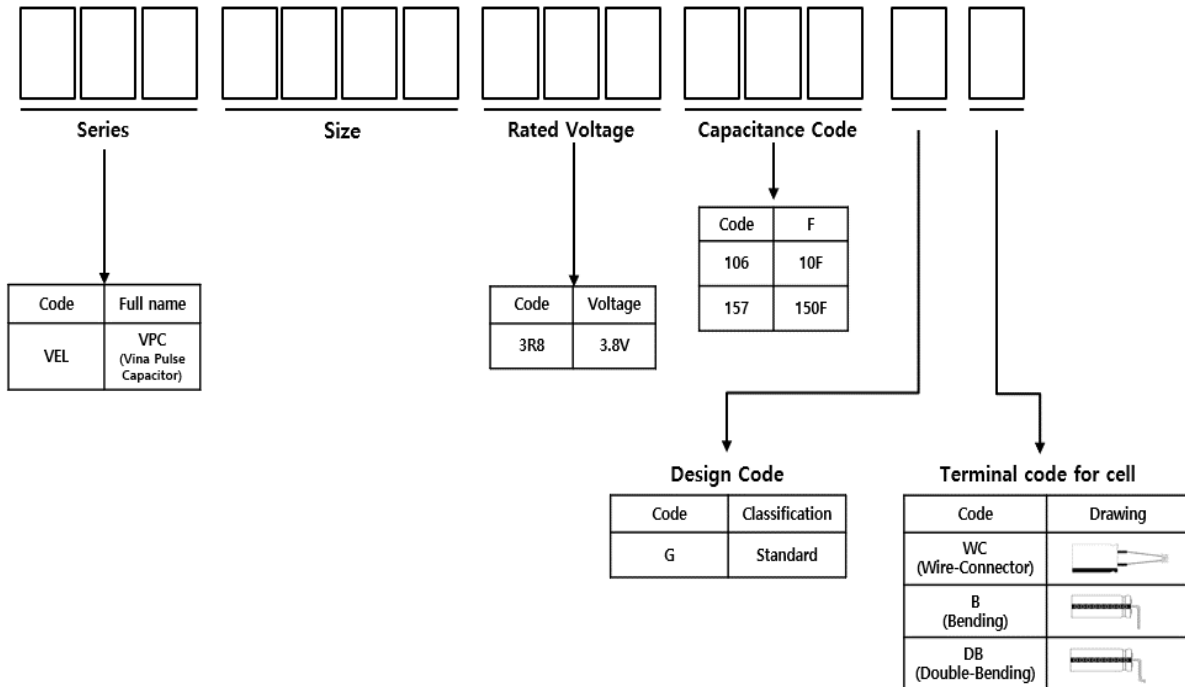
4. Drawing and size, part number, code number, sleeve

4-1. Drawing and size



4-2. Part number

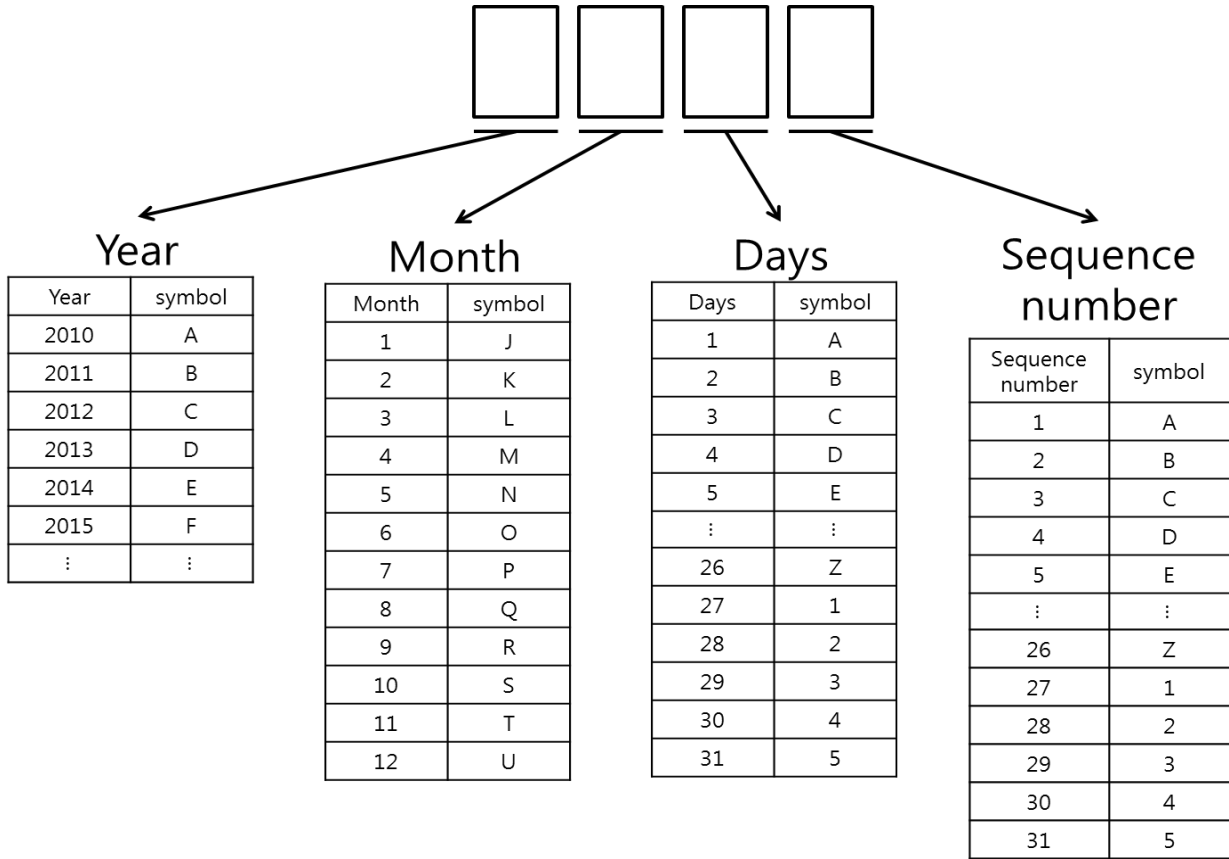
The part number consists of 15 digit-numbers. Specific meaning of each digit is stated as follows.



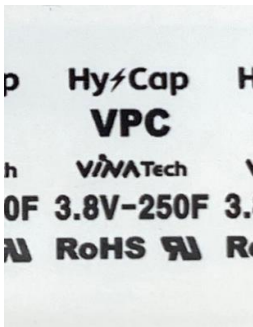
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4-3. Code number

The code number, which marked in the sleeve, consists of 4-digit number. Specific meaning of each digit is stated as follows.



4-4. Sleeve



rated voltage & rated capacitance



code number

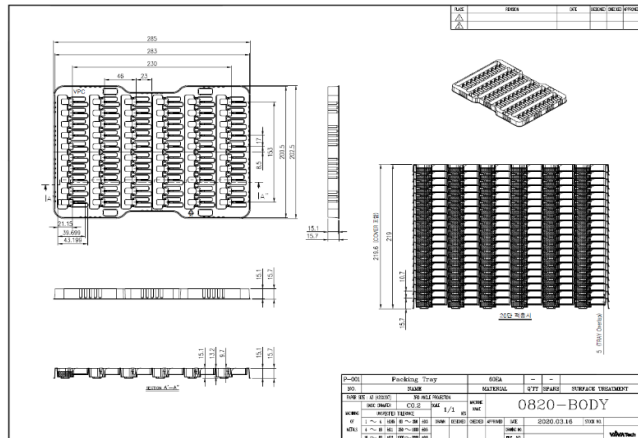
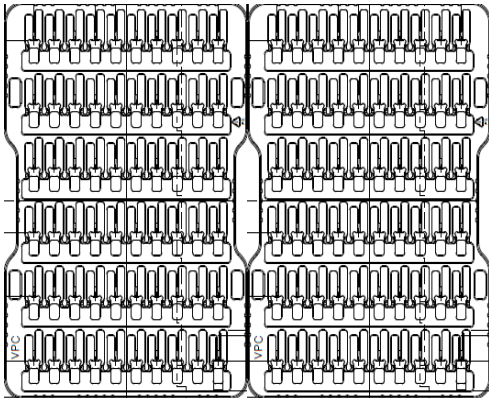
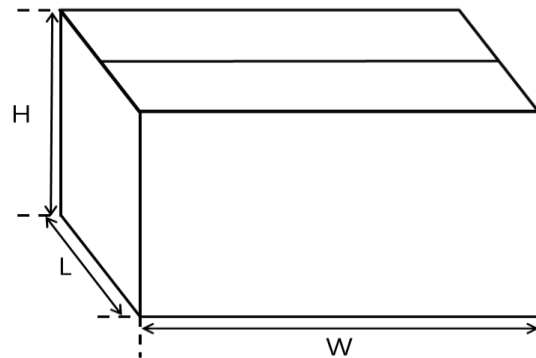
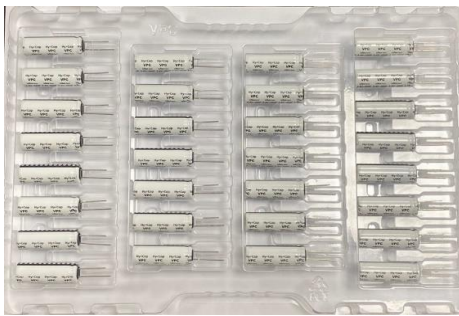
polarity (-)

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5. Packaging

Packing method and quantity of the product are as follows.

Division	Quantity (pcs)	Box size (W X L X H, mm)	Weight (kg)
Tray	30	202 X 285 X 21.6	Max. 0.3
Outer Box	600	420 X 300 X 240	Max. 11



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6. Measurement of the product

6-1. Measurement condition

Except temperature characteristic test, the ordinary conditions of temperature and pressure are 25°C and 1 atm (or 101.3kPa).

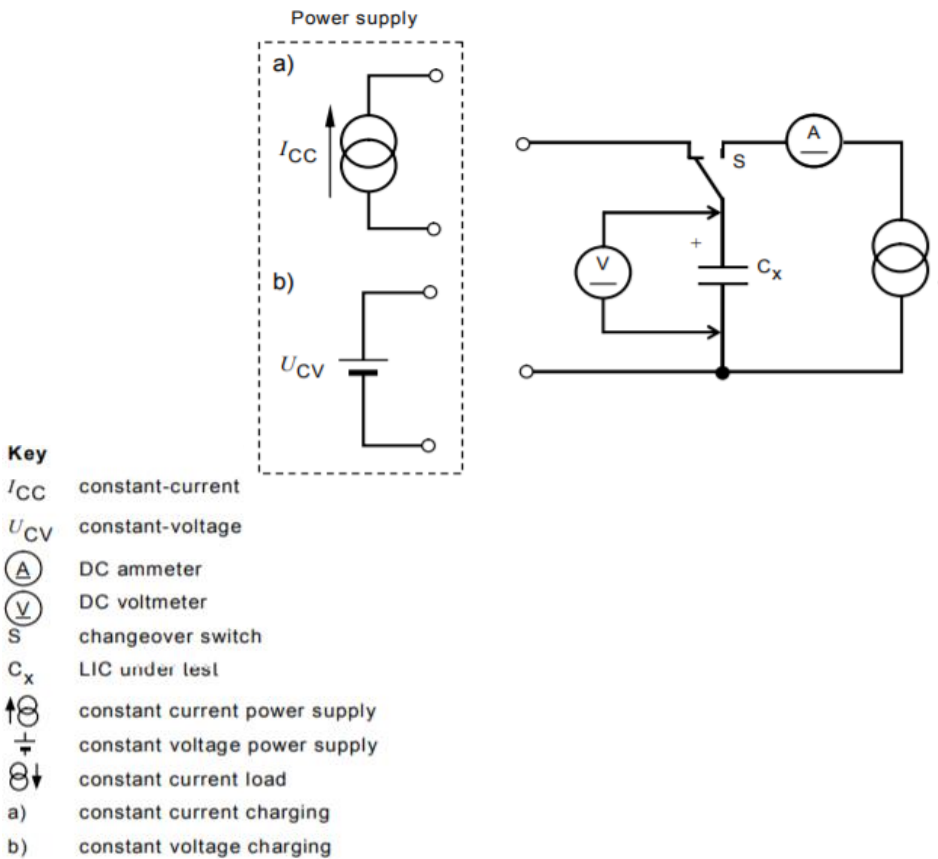
6-2. Reference of measurement methods

The measurement method refers to IEC 62813 Ed.1(Capacitors and resistors for electronic equipment)

6-3. Discharge capacitance

Discharge capacitance can be calculated by using the constant current discharge method. Circuit diagram is as below.

(1) Circuit diagram





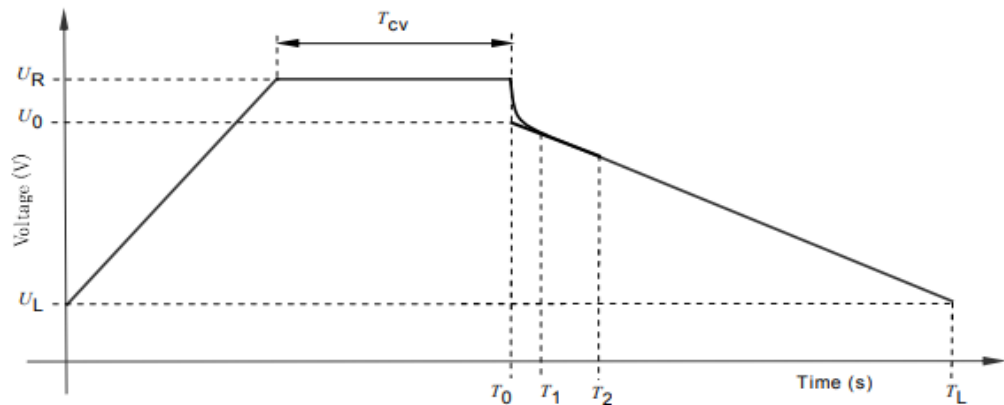
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(2) Method

- 1) Set the value of current and voltage of the power supply to perform the procedure with constant current and constant voltage accurately.
The value of charge voltage is rated voltage and the value of charge current is calculated as follows: (IEC 62813 4.2)
- 2) Set the value of discharge current of constant current discharger. Discharge current is calculated as follows: (IEC 62813 4.2)
- 3) Make close circuit with the power supply and start constant current/constant voltage charging procedure.
- 4) After constant voltage charge for 30min has finished, change over the switch to the constant current discharger.
- 5) After the test, charge-discharge curve draws below, and discharge capacitance is calculated with the following equation.



Key

- T_0 discharge start time (s)
- T_1 calculation start time, which is set to $C_N R_N$ (s)
- T_2 calculation end time, which is set to $2 C_N R_N$ (s)
- T_L time to reach rated lower limit voltage (s)
- T_{CV} the duration of constant voltage charging (s)
- U_R rated voltage (V)
- U_L rated lower limit voltage (V)
- U_0 instant drop voltage at discharge (V)

$$C_x = \frac{I(T_L - T_0)}{10(U_0 - U_L)}$$

$$W = \frac{C_x(U_0^2 - U_L^2)}{2}$$

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(3) IEC 62813 4.2

$$I = \frac{1}{30R_N} \sqrt{1 + \frac{27}{5C_N R_N + 1} - \frac{26}{10C_N R_N + 1}}$$

where

- I is the charging or discharging current (A);
- R_N is the nominal internal resistance of LIC under test (Ω);
- C_N is the nominal capacitance of LIC under test (F).

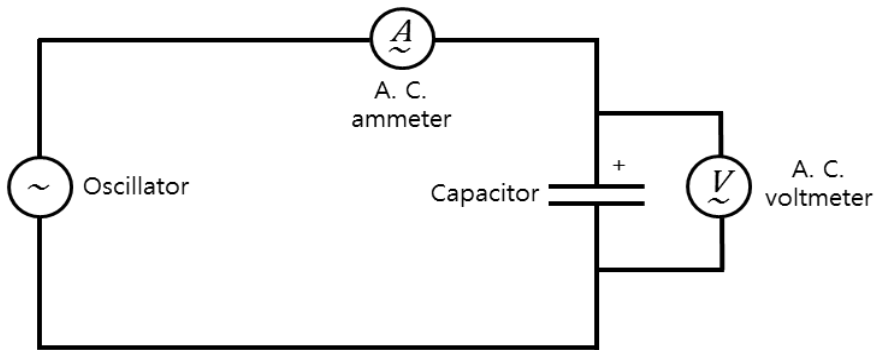
6-4. Internal resistance

6-4-1. AC ESR

AC ESR can be measured by using a four probe impedance analyzer. The value of AC frequency is 1 kHz.

Circuit diagram is as below.

(1) Circuit diagram



(2) AC ESR calculation

$$R_a = \frac{U}{I}$$

where,

- R_a : A. C. internal resistance (Ω)
- U : Effective value of A. C. voltage (V. r. m. s.)
- I : Effective value of A. C. current (A. r. m. s.)

Note

- The frequency of the measuring voltage shall be 1kHz.
- The A. C. current shall be from 1mA to 10mA.

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6-4-2. DC Resistance

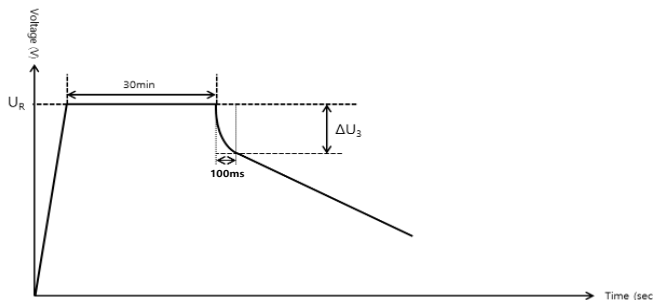
DC Resistance can be calculated through constant current discharge. Refer to circuit diagram 6-3.

(1) Method

- 1) Set the value of current and voltage of the power supply to perform the procedure with constant current and constant voltage accurately.
The value of charge specified voltage is rated voltage and the value of charge current is calculated as follows: (IEC 62813 4.2)
- 2) Set the value of discharge current of constant current discharger. Discharge current is calculated as follows:
0.1 / the maximum value of DC ESR suggested in this specification
- 3) Make close circuit with the power supply and start constant current/constant voltage charging procedure.
- 4) After constant voltage charge for 30min has finished, change over the switch to the constant current discharger.
When the switch changes over, it is necessary that interval time of switch (or rest time) is 1 sec.
- 5) After the test, charge-discharge curve draws below, and ΔU is calculated with the following equation.
 ΔU_3 = voltage when beginning to discharge - voltage 100 ms after starting to discharge.

Do not discharge the product to voltages less than the lower limit voltage (U_L is 2.5 V).

- 6) The value of DC ESR is calculated with the following equation.



$$R_d = \frac{\Delta U_3}{I}$$

where,

R_d : D. C. internal resistance (Ω)

ΔU_3 : drop voltage (V)

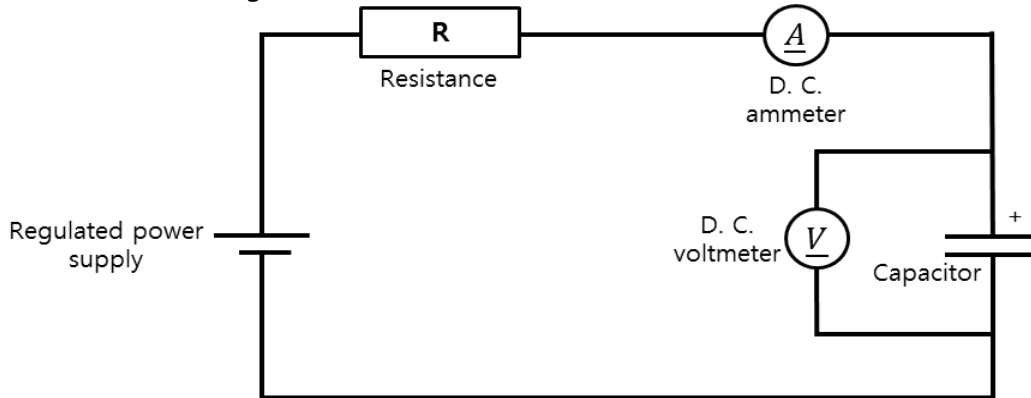
I : discharge current (A)

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6-5. Leakage current

Leakage current can be measured as the following circuit diagram.

(1) Circuit diagram



(2) Method

- 1) Before testing, the product must be discharged to the lower limit voltage(3.0V).
Duration time of discharge is until the lower limit voltage(2.5V).
- 2) Set the value of charge voltage of a power supply which is rated voltage.
- 3) Connect the protective resistor of 100Ω or less in the circuit, this resistor can be selected depending on the condition in order to charge-up to reach 95% of rated voltage within 30 min.
- 4) Charge the product with power supply.
- 5) After 72h of the voltage reaching 95% of rated voltage, measure the value of the current.



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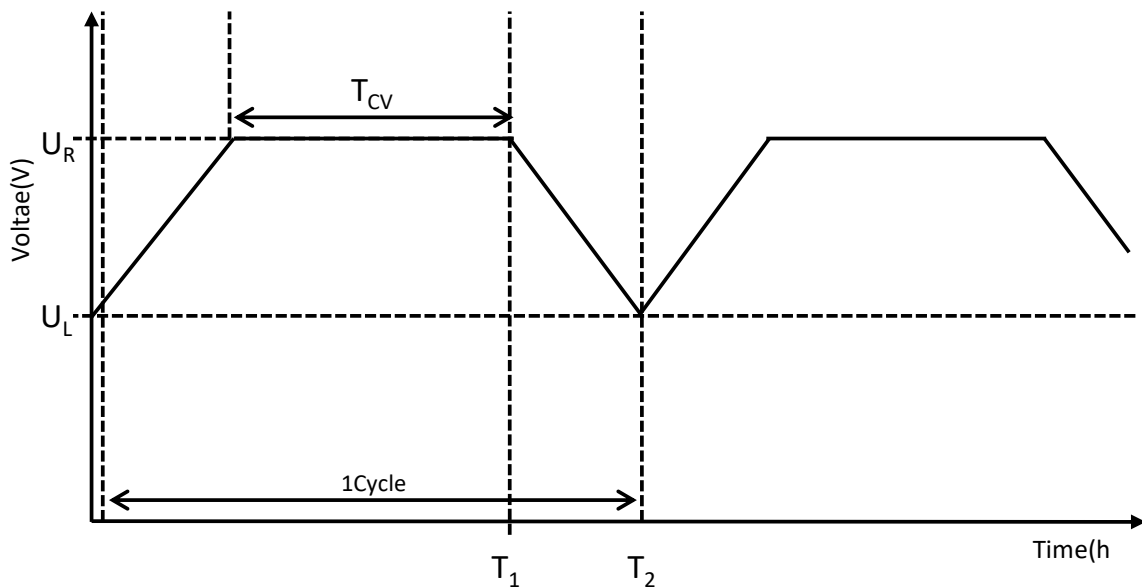
6-6. Cycle characteristic

Cycle characteristic of the product can be observed by using the constant current charge and discharge method.

Refer to circuit diagram 6-3.

(1) Measurement

The measurement process is as follows.



- 1) At the first start, the cycle test starts charging at a current of 20C-rate from a voltage of U_L to a voltage of U_R
follows: the value of charge current is calculated as
Charge current is 20 C-rate
- 2) Charge the product at constant voltage (Rated voltage) until the 0.1C-rate current
- 3) Discharge the product at constant current. The value of discharge voltage is the lower limit voltage and the value of discharge current is calculated as follows: Discharge current is 20 C-rate
- 4) Repeat the process 1) ~ 3).



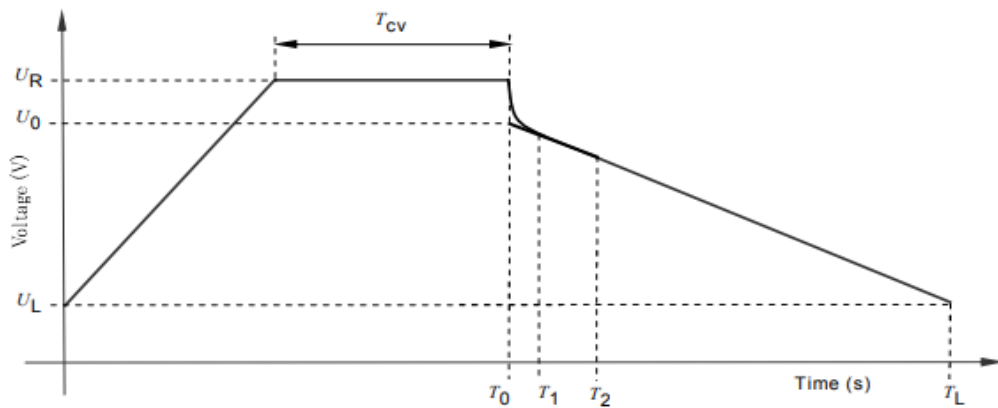
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5) During the measurement of cycle characteristic, discharge capacitance of nth time is calculated as follows.

where,



$$C_x = \frac{I(T_L - T_0)}{10(U_0 - U_L)}$$

Key

- T_0 discharge start time (s)
- T_1 calculation start time, which is set to $C_N R_N$ (s)
- T_2 calculation end time, which is set to $2 C_N R_N$ (s)
- T_L time to reach rated lower limit voltage (s)
- T_{CV} the duration of constant voltage charging (s)
- U_R rated voltage (V)
- U_L rated lower limit voltage (V)
- U_0 instant drop voltage at discharge (V)

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7. Note when using

- 1) This specification guarantees the quality and features of our product as stated in its suggested conditions.
- 2) Do not take the product apart or damage at random.
In this case, we do not compensate for the product either materially or monetarily.
- 3) Polarity
 - This product has polarity (positive and negative poles) so it can be used accordingly. The negative pole is marked on the sleeve of the product.
- 4) Overvoltage and overcurrent
 - It is recommended that the product should be used at below the rated voltage. When used at over the rated voltage, it can burst or its life span can be shortened.
 - In case of connecting more than 2 units for modules, we recommend to lower the operating voltage per unit by Min. 10% from the rated voltage for the sake of safer voltage balancing (e.g. 3.4V per unit in case of 3.8V series).
 - It is recommended that the product should be applied and used at below the maximum current. When used at over the maximum current, it can be burst or its lifespan can be shortened.
- 5) Danger
 - Do not throw the product into the fire or heat it to temperatures exceeding the upper limit temperature specified in the specifications.
Do not use the product near flames.
 - Do not throw the product into water.
It may start to smoke, explode, or burst into flames.
 - Do not disassemble or alter the product or damage it with a sharp object such as a knife or nail. It may cause an electric shock or personal injury. Damage to the main body may cause it to heat up, and it may start to smoke, explode, or burst into flames.
 - Do not place the product on an electromagnetic cooker or in a microwave oven, a high-pressure vessel, or a vacuum vessel.
It may start to leak, smoke, explode, or burst into flames. Do not store or install the product in places exposed to high temperatures, such as a vehicle cab under the direct sunlight.

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→ Wear personal protective equipment such as insulating gloves when touching conductive parts such as terminals.

Failure to wear personal protective equipment may result in an electric shock, burns, or personal injury. Before storing the product, insulate the positive and negative electrode terminals.

6) Warning

→ Do not use the product at voltages outside the operating range.

Improper use at voltages outside the operating range not only will shorten the product's life, but may also cause it to leak, heat up, smoke, explode, or burst into flames.

→ Do not use the product at temperatures outside the operating range.

Improper use at temperatures outside the operating range not only will shorten the life, but may also cause it to leak, heat up, smoke, explode, or burst into flames.

→ Keep the voltages balanced when multiple products are used in series or parallel connection. It may cause an internal short circuit, leakage, or a fault.

→ Do not hold the terminals when carrying the product.

It may cause an electric shock, an internal short circuit, leakage, or a fault.

→ Do not install or store the product in hot and humid places or places exposed to direct sunlight for a long period of time.

It may cause leakage, heat generation, or a fault.

→ VINATech assumes no responsibility for problems resulting from failure to seek prior advice.

→ In the event of abnormal conditions, such as leaks, emission of a strange smell, smoke, or heat, stop using the product and contact us or the distributor immediately.

Failure to balance voltages may cause leakage or a fault.

7) Precautions in Handling

→ Do not short-circuit the positive and negative electrode terminals.

This product is designed to have a certain voltage at the time of shipment.

More specifically, energy corresponding to the voltage has been prestored in the product. Therefore, never short-circuit the positive electrode terminal with the

negative electrode terminal. It may cause an electric shock, burns, or personal injury,

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resulting in a fault causing it to leak, heat up, smoke, explode, or burst into flames. Especially when using a metal tool, use it taking care not to short-circuit the terminals.

(Examples of dangerous operations: cutting two lead terminals at the same time with nippers; measuring the pitch of the lead terminals with metal vernier calipers)

Do not discharge the product to voltages less than the lower limit voltage (2.5 V).

- Products whose voltage falls below the lower limit voltage cannot return to the initial normal state even when they are recharged one more time. Please take special care with storage and handling, and design circuits so that the voltage never falls below the lower limit voltage.
- Do not charge the product to voltages greater than the upper limit voltage (3.8 V). Charging the product to voltages greater than the upper limit voltage will drastically shorten the life, which may result in a deterioration of the electrical characteristics, a short circuit, or an explosion caused by leaking electrolyte or generation of gas.

8) If you have any other inquiries, please e-mail us at the following address.

E-mail: hycap@vina.co.kr

※ When received the approval sheet for the specific part from VINATech to confirm the final product specification, please send back with the confirmation signature.

If the approval sheet with the confirmation signature is not arrived within 30days after the request of the confirmation, it is considered that all the specification on the approval sheet is agreed.

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1 VINAtch warrants to Buyer that the Products (1) shall be free of defects in materials and workmanship for the warranty period (“Warranty Period of two (2) years”) from date of shipment to Buyer; and (2) shall be free of liens and encumbrances when shipped to Buyer. If VINAtch agrees in writing to provide and does provide system design, drawings, technical advice, or any other services to Buyer in connection with Products, then VINAtch further warrants to Buyer during the applicable Warranty Period that such services shall be undertaken in accordance with VINAtch’s reasonable technical judgment based on VINAtch’s understanding of pertinent technical data as of the date of performance of such services.

Notice of 4M changes to improve performance can be subjected to be replaced by reliability data submission in advance.

VINAtch’s warranties will not apply to any Product with respect to which there has been

- (i) improper installation or testing,
- (ii) failure to provide a suitable operating environment,
- (iii) use of the Product for purposes other than that for which it was designed,
- (iv) failure to monitor or operate the Product in accordance with applicable VINAtch specifications and good industry practice,
- (v) unauthorized attachment or removal or alteration of any part of the Product,
- (vi) unusual mechanical, physical or electrical stress,
- (vii) modifications or repairs done by other than VINAtch,
- (viii) mishandling during shipment of the Product; or
- (ix) any other abuse, misuse, neglect or accident.

In no circumstance shall VINAtch have any liability or obligation with respect to expenses, liabilities or losses associated with the installation or removal of any Product or the installation or removal of any components for inspection, testing or redesign occasioned by any defect or by repair or replacement of a Product.

2. Buyer shall notify VINAtch in writing promptly (and in no case later than thirty (30) calendar days after discovery) of the failure of any Product to conform to the warranty set forth above, shall describe in commercially reasonable detail in such notice the symptoms associated with such failure, and shall provide to VINAtch the opportunity to inspect such Products as installed, if possible.

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The notice must be received by VINAtch during the Warranty, Period for such Product. Unless otherwise directed in writing by VINAtch, within thirty (30) calendar days after submitting such notice, Buyer shall package the allegedly defective Product in its original shipping carton(s) or a functional equivalent and shall ship it to VINAtch.


3. Within a reasonable time after receipt of the allegedly defective Products and verification by VINAtch that the Products fail to meet the warranty set forth above, VINAtch shall correct such failure by, at VINAtch's option, either
- (i) modifying or repairing the Products or
 - (ii) replacing the Products.

Such modification, repair or replacement and the return shipment of the Products with minimum insurance to Buyer shall be at VINAtch's expense. Buyer shall bear the risk of loss or damage in transit, and may insure the Products.

Buyer shall reimburse VINAtch for transportation costs incurred for Products returned but found by VINAtch not to be defective. Modification or repair of Products may, at VINAtch's option, take place either at VINAtch's facilities or at Buyer's premises. If VINAtch is unable to modify, repair or replace Products to conform to the warranty set forth above, then VINAtch shall, at VINAtch's option, either refund to Buyer or credit to Buyer's account the purchase price of the Products less depreciation calculated on a straight-line basis over VINAtch's stated Warranty Period. These remedies shall be buyer's exclusive remedies for breach of warranty.

4. Except for the express warranty set forth above, VINAtch makes no other representations, warranties or conditions, express or implied, statutory or otherwise, regarding the products, their fitness for any purpose, their quality, their merchantability, their noninfringement, or otherwise.

No employee of VINAtch or any other party is authorizes to make any other representations, warranties or conditions for the goods other than the warranty set forth herein. VINAtch's liability under the warranty shall be limited to a refund of the purchase price of the product. In no event shall VINAtch be liable for the cost of procurement or installation of substitute goods by buyer or for any special, consequential, indirect or incidental damages.

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5. Buyer assumes the risk and agrees to indemnify VINAtch against and hold VINAtch harmless from all liability relating to
- (i) assessing the suitability for Buyer's intended use of the Products and of any system design or drawing and
 - (ii) determining the compliance of Buyer's use of the Products with applicable laws, regulations, codes and standards.

Buyer retains and accepts full responsibility for all warranty and other claims relating to, or arising from, Buyer's products which include or incorporate Products or components manufactured or supplied by VINAtch. Buyer is solely responsible for any and all representations and warranties regarding the products made or authorized by Buyer. Buyer will indemnify VINAtch and hold VINAtch harmless from any liability, claims, loss, cost or expenses (including legal fees) attributable to Buyer's products or representations or warranties concerning same.