

Charging Module for Supercapacitor Evaluation

Instruction Manual

Doc No. U23J010001
NIPPON CHEMI-CON CORPORATION

Part Number: N3JXI

Precautions

This product is an experimental charging module exclusively for the supercapacitor module " [MDKA150S8R3PE6111A](#) ".

Please refrain from using this product for the following applications:

Use of the module for applications other than our "MDKA150S8R3PE6111A", mass production, or installation in equipment that may cause injury or death.

Use of the product in a manner not described in the instruction manual may result in damage or ignition.

To avoid personal injury, fire, or other accidents due to malfunction of this product, design safety by the person using the product.

We assume no responsibility for any malfunction or damage that may occur while using this product.

Specifications of this product and the contents of this instruction manual are subject to change without notice.

Outline

This is an experimental charging module exclusively for MDKA150S8R3PE6111A.

The circuit configuration is a non-isolated DCDC converter.

Standard specification output voltage is 14.9V and output current is 3A.

Output voltage is 4.9V depending on mounting options, or 9.9V can be selected.

1. Dimention and Terminal Descriptions

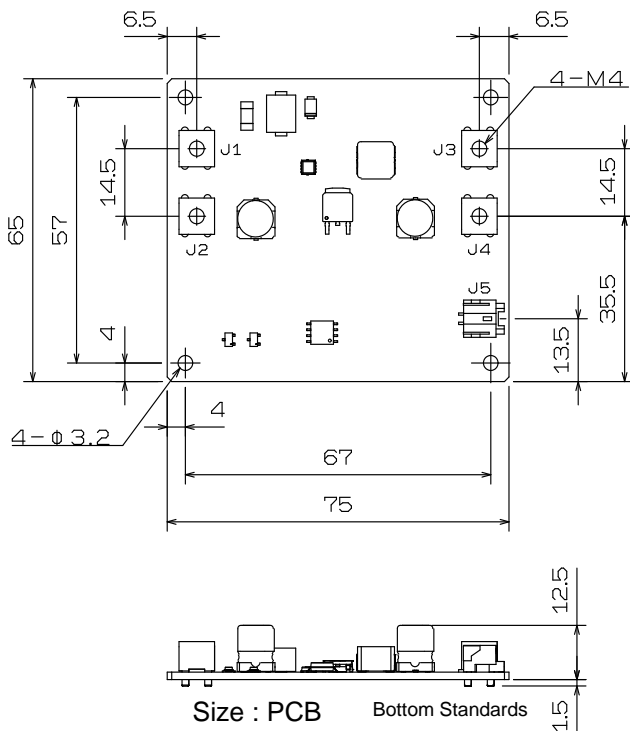


Figure 1. Dimention

Table 1. Electrical Mounting Points

Terminal Ref	Name	Specifications
J1	Vin (+)	M4 female screw (Brass - Tin plating)
J2	Vin (-)	
J3	Vout (+)	
J4	Vout (-)	
J5	On/Off	2Pin Connector

Table 2. Mechanical Mounting Points

Item	Description
Part	Holes at four corners ϕ 3.2mm
	PCB FR-4 (t=1.6mm)
	Side A: Within silk area Side B: Pattern removal area
Recommended Mounting Method	Screw fastening
Tightening Torque	Max. 0.5 Nm

* Note that the PCB surface may be distorted by the mounting of the board.

2. Specifications

Item		Mounting OP		Standard
		Type 2s	Type 4s	Type 6s
Input	Voltage Range	7 to 22V	12 to 22V	17 to 22V
	Current	3A max		
	Efficiency	89% max		
Output	Fixed output (Mounting OP)	4.9V	9.9V	14.9V
	Voltage Accuracy	± 3.5%		
	Current	CC 3A		
	Current Accuracy	± 5%		
	Ripple Voltage	p-p 50mV max		
Environment	Storage Temperature Range	-40 to 85°C		
	Operating Temperature Range	-40 to 70°C		
	Cooling Method	Natural air cooling		
Shape	Size	65 x 75 x 14mm		
	Weight	35g		

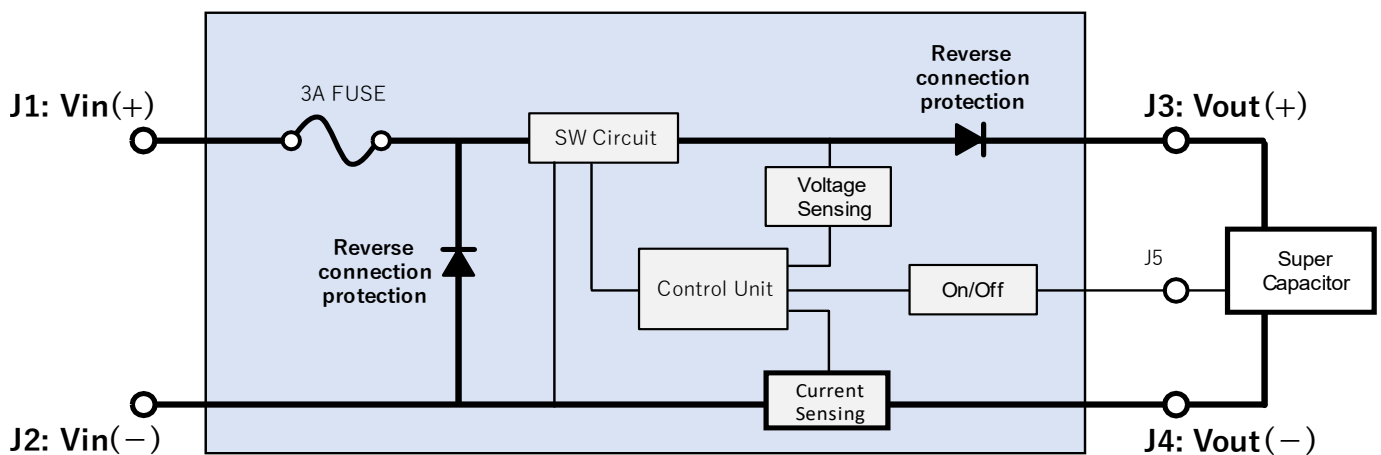
Combinable supercapacitor Number of Series

- 2 series (2s), rated voltage 5V, OP
- 4 series (4s), rated voltage 10V, OP
- 6 series (6s), rated voltage 15V, Standard

* Rated voltage of a single cell is assumed to be 2.5V.

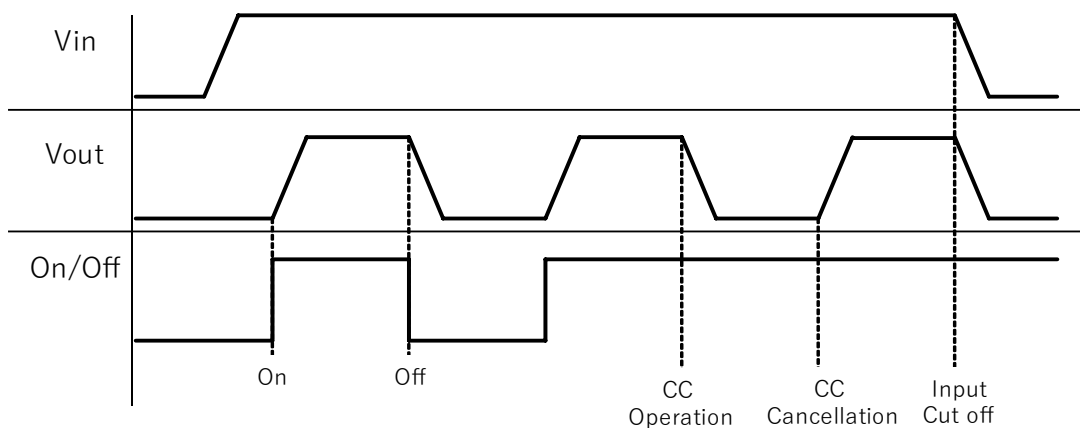
Multiple parallel connections possible

3. Control Block Diagram



* Do not connect Vin(-) and Vout(-) to the same potential because there is a current detection resistor between them.

4. Sequence Chart



5. Electrical Connection Methods

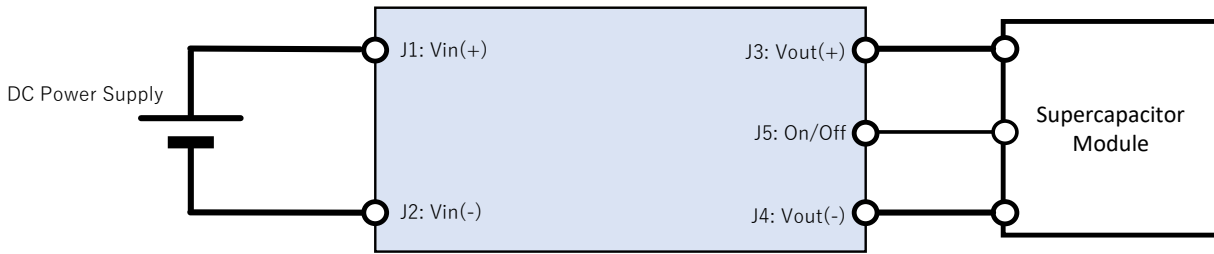


Figure 2. Connection

Input Vin

Terminal Ref: Connect DC power supply to J1&J2.

The input voltage range is 7 to 22V. Any type of DC power supply is acceptable.

A constant voltage source, AC/DC adapter, battery, or solar cell (PV) etc. for experiments can also be connected.

If the impedance of the connected power supply is low enough, an inrush current will be generated to the charging module.

Ex. In the case of a 13V-5mΩ lead-acid battery, about 10A-0.5msec

Output Vout

Terminal Ref: Connect an supercapacitor to J3 & J4.

When installing, the supercapacitor side should be 0V

and no voltage should be applied to the input section (power supply is not activated).

Charging other than the supercapacitor is the responsibility of the customer.

On/Off Connector

Terminal Ref: Connect the supplied harness to J5 and connect it to the fault detection terminal of the supercapacitor module.

* This product will not start if the harness is not connected.

* Refer to "7. Functional Description" for the startup method without the dedicated harness.

6. How to Change Output Voltage (Mounting Option)

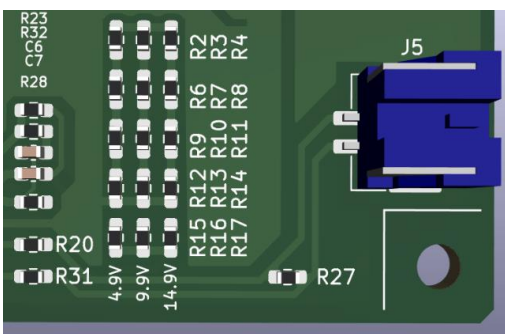


Figure 3. Output Voltage Setting Mounting Location

The output voltage can be set by jumpering any of the following mounting points R15 to 17.

Mounting should be limited to one location only.

Any changes from the default settings should be made by the customer.

Table 4. Output Settings

Ref	Output Settings	Status
R15	4.9V	Non
R16	9.9V	Non
R17	14.9V	Mounting * Initial

Mounted Parts: SMD, jumper resistor, 0Ω, 1608 (IEC 0603)

Solder bliching, etc. are also available.

7. Functional Description

Reverse voltage protection to input section

If a reverse voltage is applied to V_{in} , the fuse inside the circuit will blow to protect the device.
In this case, $V_{in}(+)$ of the input section becomes electrically open.

Surge Protection for Input Section

A varistor (surge absorber) is attached to the input section to protect against pulsed overvoltages.
The varistor operating voltage is 27V.

Reverse voltage protection to Output section

$V_{out}(+)$ has a reverse current protection diode connected between the power supply circuit and the output terminal.

This function prevents current from returning from the charged supercapacitor.

It also functions while the charging module is not running.

Overcurrent Protection

This product has built-in overcurrent protection, but does not have an automatic shut-off function.

This is because, when charging a supercapacitor, a pseudo short-circuit current appears to flow continuously.

Overvoltage Protection

The overvoltage function of this product is only the FB function of the power supply. It does not provide double protection.

Overheat Protection

This product does not have an overheat protection function. In the development and evaluation of the product, operation was verified under the following conditions:

- 1) Continuous operation at room temperature of 25° C, natural air cooling, and no airflow
- 2) Continuous operation at 70° C, inside a thermostatic chamber, with forced convection

On/Off Function

With a voltage input of 7 V or more to V_{in} , the output is enabled when there is a short between connectors Pin 1 and 2 of J5.

When the supplied harness is connected, the signal state with the supercapacitor module is normal-short.

If an abnormality is detected on the charging module side, it becomes Abnormal-Open and the output is stopped (SW stop of power supply).

To switch On/Off by another method, follow the procedure below:

- 1) Connect a jumper resistor to R27, which is unmounted at shipping.
- 2) Turn on/off the pin-to-pin connection of J5 with a switch, etc. In this case, add a chattering remover.

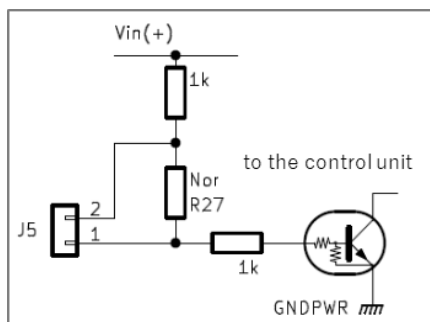
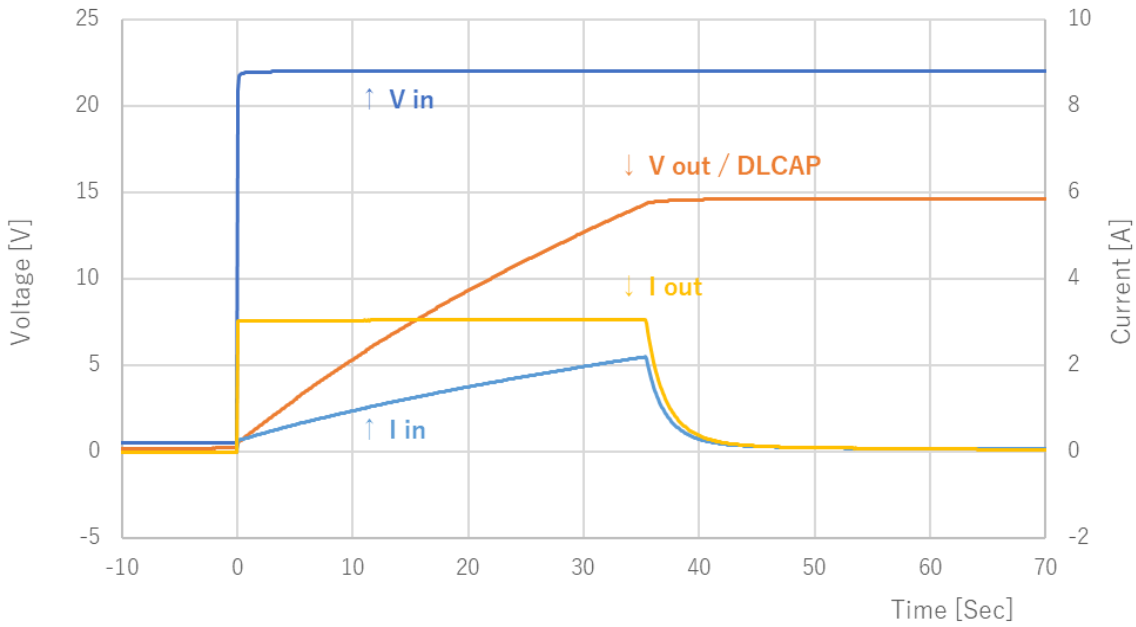
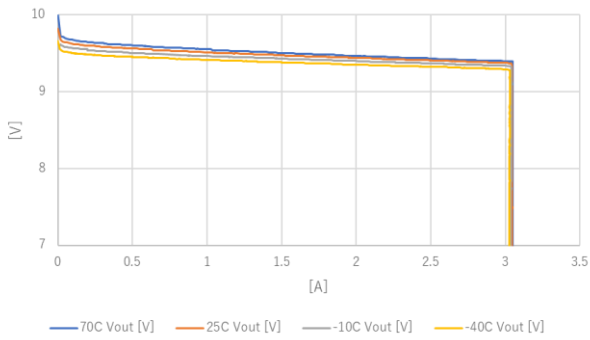


Figure 4. On/Off Circuit

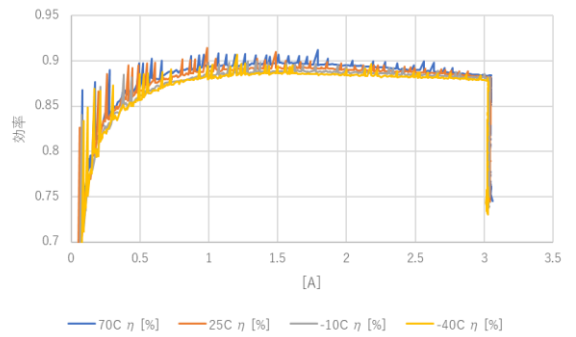
8. Operating Waveform



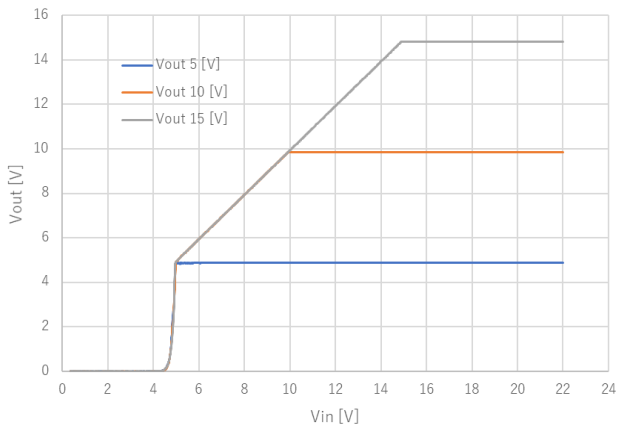
Graph 1. Charging Waveform



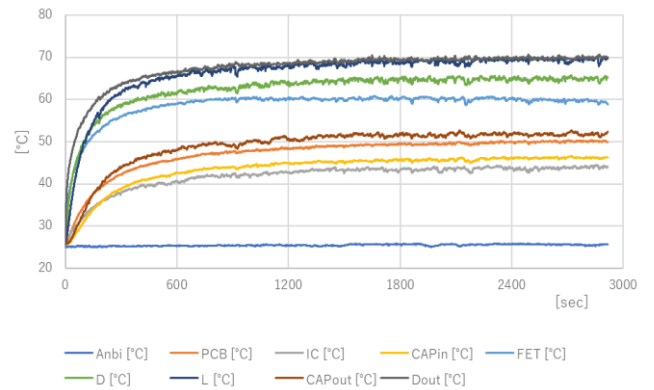
Graph 2. Droop



Graph 3. Efficiency



Graph 4. Input vs. Output



Graph 5. Heat Generation