

Stepper Motor Driver

AD1131

User's Manual

NPM

Nippon Pulse Motor Co., Ltd

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1. Product Warranty

1-1. In the case of purchase from a supplier other than NPM

Regarding the product warranty in the case of purchase from a supplier other than NPM, please contact to the supplier

1-2. Warranty period

The warranty period is one year from the date of the delivery to an assigned place.

1-3. Warranty scope

If defects are found in the product during the warranty period under normal use following this document, NPM will repair the product without charge. However, the following cases are not covered by the warranty and free repair does not apply to the product even during the warranty period.

- The products are modified or repaired by anyone other than NPM or an authorized person by NPM.
- The defect results from falling of the product after delivery or mishandling in transit.
- -Wearing of components, natural deterioration or fatigue (motor axle bearing, gear, grease, cables, etc.)
- The defect results from any use other than original use.
- The product has been subjected to natural disaster or force majeure such as fire, earthquake, lightning strike, wind and flood, salt, and electrical surges.
- The defects or damage results from the cause other than the fault of NPM.

Note 1) Only if the product with defects is carried to the specific place to repair, NPM will repair the product. NPM will not provide on-site repair.

Note 2) The warranty period of the repaired product is not extended beyond the warranty period of the product before the failure. It is the same as the warranty product of the product before the repair.

Note 3) This warranty covers the product. It does not cover the detriments caused by the product's defects, etc.

Note 4) A replacement may be provided instead of a repair at the direction of NPM.

1-4.

This documents aims to describe the detail of the function of the product and it does not warrant fitness for a particular purpose of the customers.

The examples of application and circuit diagram in this manual are described for your reference. Please confirm the feature and the safety of device or equipment before use.

1-5.

Please do not use this product for the following use in principle.

If you use the product for the following use, please contact our sales department.

- Any equipment that may require high reliability or safety, such as nuclear facility, electricity or gas supply system, transportation facilities, vehicle, various safety system, medical equipment, etc.
- Any equipment that may directly affect human survival or property
- Usage under conditions or circumstances that are not specified in the brochure, manual, etc.

1-6.

When this product is used in any equipment where faults or malfunctions may directly affect human survival or property, please secure high reliability and security with redundancy design, etc.

2. Features

AD1131 is a constant voltage stepper motor driver of 2 phase unipolar type.

- It drives a unipolar motor.
- Motor voltage can be set from 5V to 30V.
- Excitation method can be selected from 2-phase (full step) and 1-2 phase (half step).
- Motor excitation ON/OFF, one pulse method/two pulse method, full step/half step can be switched with a single touch of a button.
- It fits for an experiment or evaluation as well as for being embedded in devices.

3. Specifications

Product Name : Stepper Motor Driver		Model : AD1131	
Electrical specifications	Motor voltage [VM]	DC+5V to +30V (*Note 1)	
	Logic voltage [VCC]	DC+5V±5%	
	Control method	Unipolar constant voltage	
	Excitation method	FULL step : (2-2 phase), HALF step : (1-2 phase)	
	Maximum output current	1.1A/phase (continuous)	
	Applicable motor	(1) Our products PF, PFC, PFCL PFCU series (2) Commercially available 2-phase stepper motor Note. Driving voltage and current of both the above are within specifications.	
Input/Output signal	Input signal	TTL input L : 0 to 0.5V, H : 1.9 to control power voltage (VCC)	
	Driving signal input	CW/CCW pulse input (Default)	CW / CCW Command pulse input (*Note 2, 3) Operate at the rising of positive logic pulse signal.
		STEP&DIR signal input (changed by SW1)	STEP&DIR command input (*Note 2, 3) STEP pulse : operate at the rising of positive logic pulse signal. DIR signal logic : CW at the level L, CCW at the level H (Setting can be changed by SW1)
	FULL/HALF signal	Full step at the level H (2-2 phase) Half step at the level LI (1-2 phase) The setting of half step at the level H and full step at the level L can be set by SW2 setting. (*Note 2)	
	MOT/OFF signal	H level : Excitation ON (Shaft locked) L level : Excitation OFF (Shaft free) The setting H=excitation OFF and L=excitation ON can be set by SW3. (*Note 2)	
Environmental Condition	Operating temperature range	-10 to 50 °C (No condensation)	
	Storage temperature range	-10 to 60 °C (No condensation)	
Others	External dimensions	70(W) x 49(D) x 15(H) [mm] (Typical)	
	Weight	20g	
	Cooling system	Natural cooling	
	Production circuit	3.15A fuse with motor voltage	
	Accessories	Connector (Housing and contact pin) [IL-G series made by Japan Aviation Electronics Industry, Ltd] For CN1 : IL-G-4S-S3C2-SA (Rated current 3A) For CN2 : IL-G-8S-S3C2-SA contact pin For CN3 : IL-G-6S-S3C2-SA IL-G-C2-10000 (18 piece)	
	Installation	Under surface	
	RoHS	RoHS compatible	

*1 When power on, you can turn on either of motor voltage VM or logic voltage VCC first.
 When power off, we recommend you to turn off motor voltage VM first and then turn off logic voltage VCC one second later.
 If logic voltage VCC is turned ON or OFF with turning on motor voltage VM, the large amount of current can be flowed to the power source.

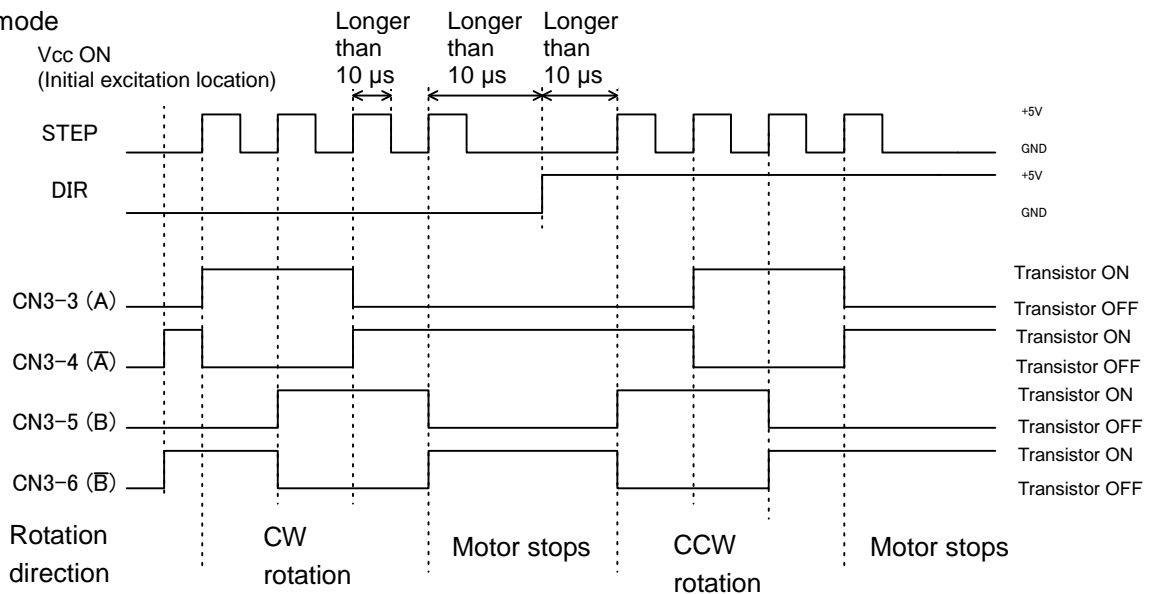
*2 Please make the width of pulse signals more than 10µs.
 FULL/HALF signal and the DIR signal in the one pulse input mode should be confirmed more than 10µs before STEP signal input.

*3 One pulse mode and two pulse mode
 One pulse mode

It is a method that the rotation direction CW/CCW is decided by whether the DIR photocoupler is ON or OFF when pulses are input to the STEP.

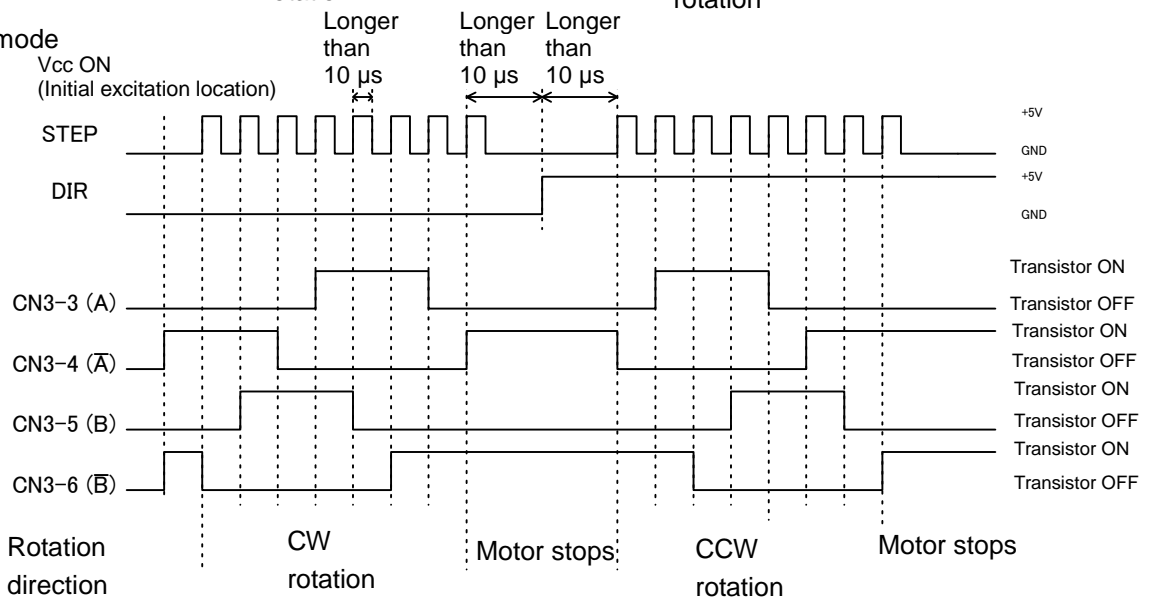
One pulse mode

Full step



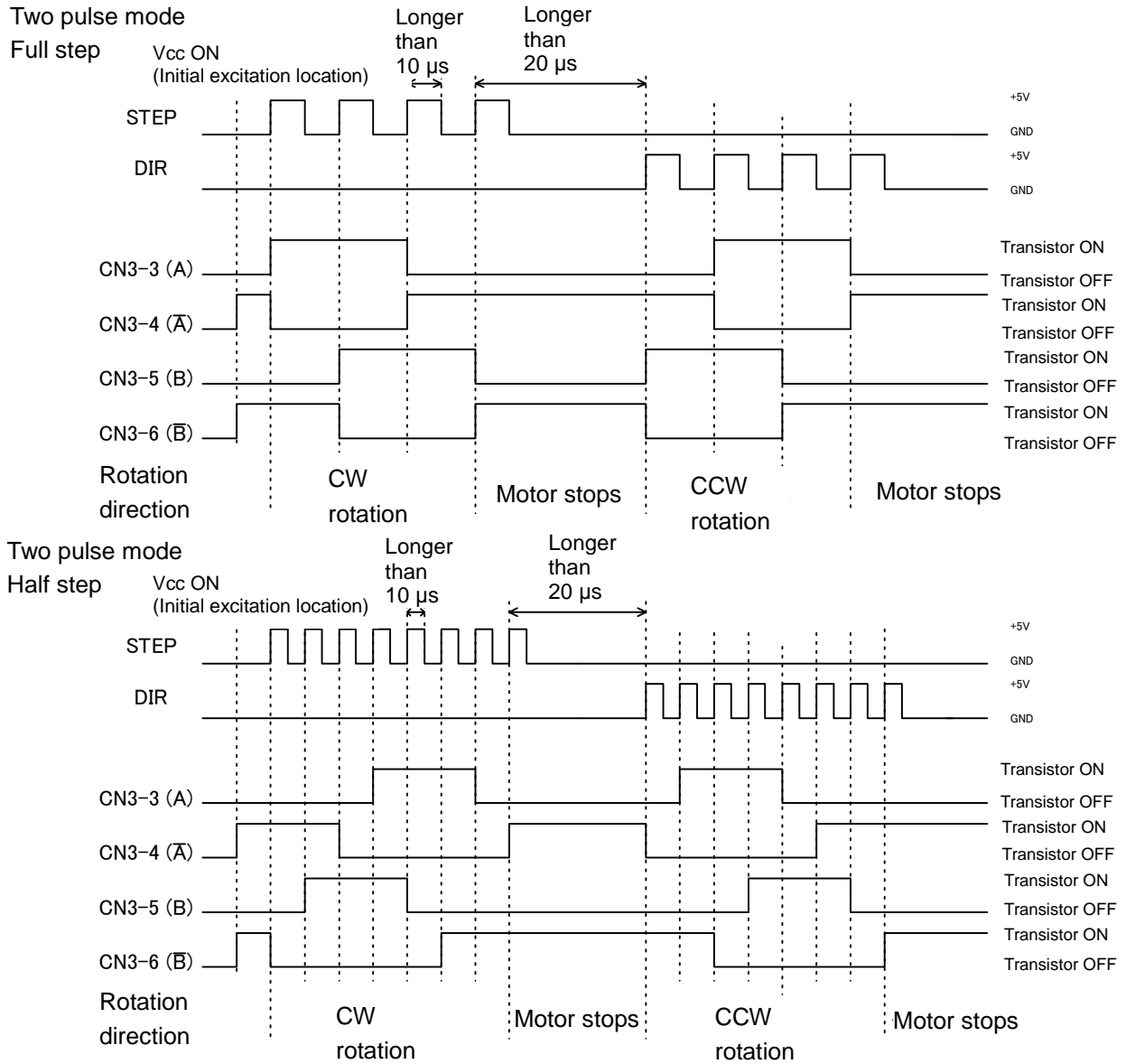
One pulse mode

Half step



Two pulse mode

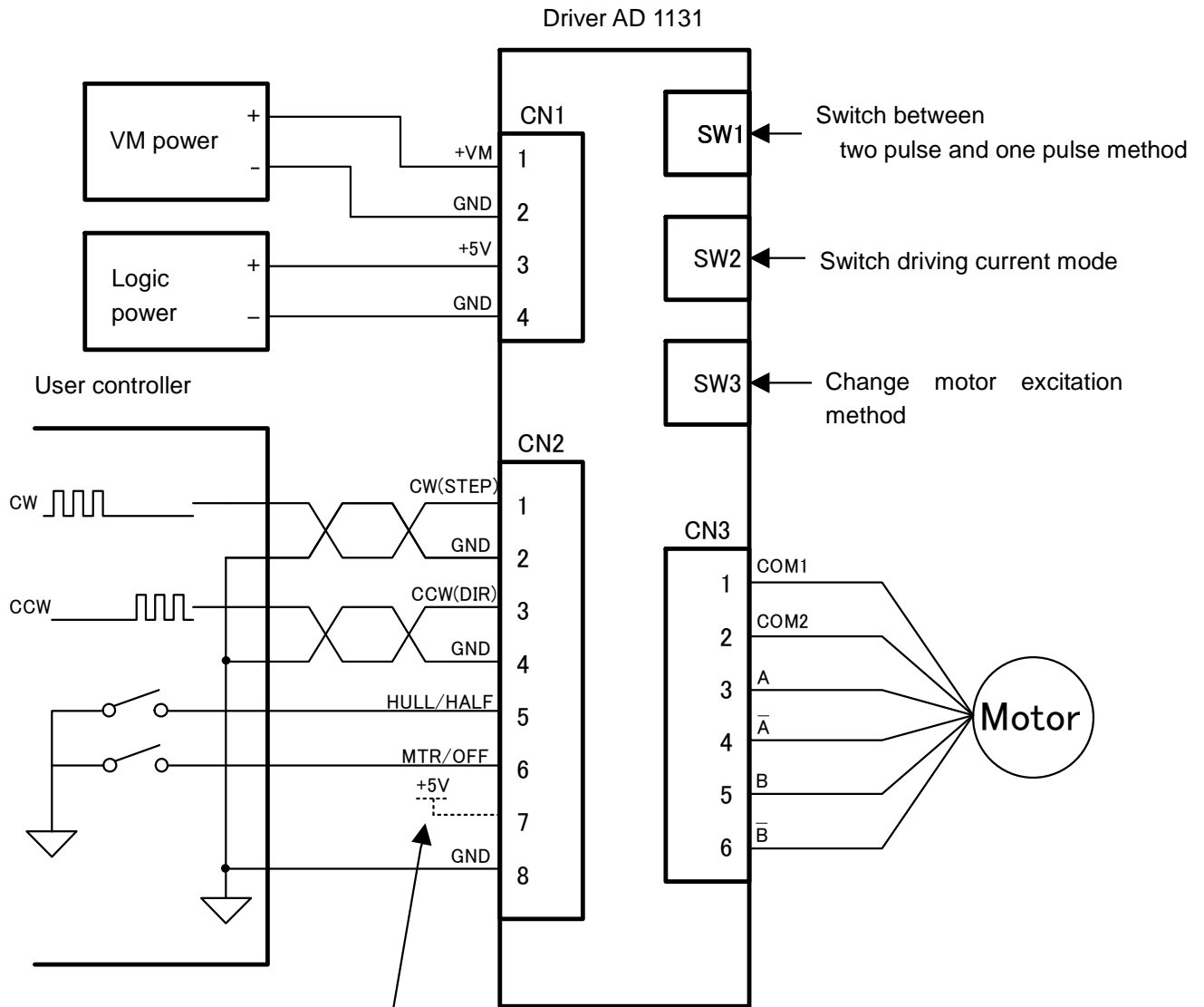
It is a method that the rotation direction CW/CCW is decided by whether the pulse is input to the CW terminal or that CCW terminal.



4. Connection

Connector No.	Pin No.	Signal name	Remarks
CN1 (Power supply)	1	VM	Motor driving power input terminal
	2	GND	GND
	3	+5V-	Power input terminal VCC for driver circuit.
	4	GND	GND
CN2 (I/O)	1	CW(STEP)	CW signal in the two pulse method STEP signal in the one pulse method
	2	GND	GND
	3	CCW(DIR)	CCW signal in the two pulse method DIR signal in the one pulse method
	4	GND	GND
	5	FULL/HALF	Full step (2-2 phase excitation) / Half step (1-2 phase excitation)
	6	MTR/OFF-	Motor excitation ON/OFF signals
	7	+5V	5V terminal for I/O control (This pin is connected to 3 pin of CN1 internally.)
	8	GND	GND
CN3 (Motor)	1	COM1	Motor A (or B) phase common connection (These are connected to VM terminals internally.)
	2	COM2	
	3	A ($\Phi 1$)	Motor A phase lead line connection
	4	\bar{A} ($\Phi 3$)	Motor \bar{A} phase lead line connection
	5	B ($\Phi 2$)	Motor B phase lead line connection
	6	\bar{B} ($\Phi 4$)	Motor \bar{B} phase lead line connection

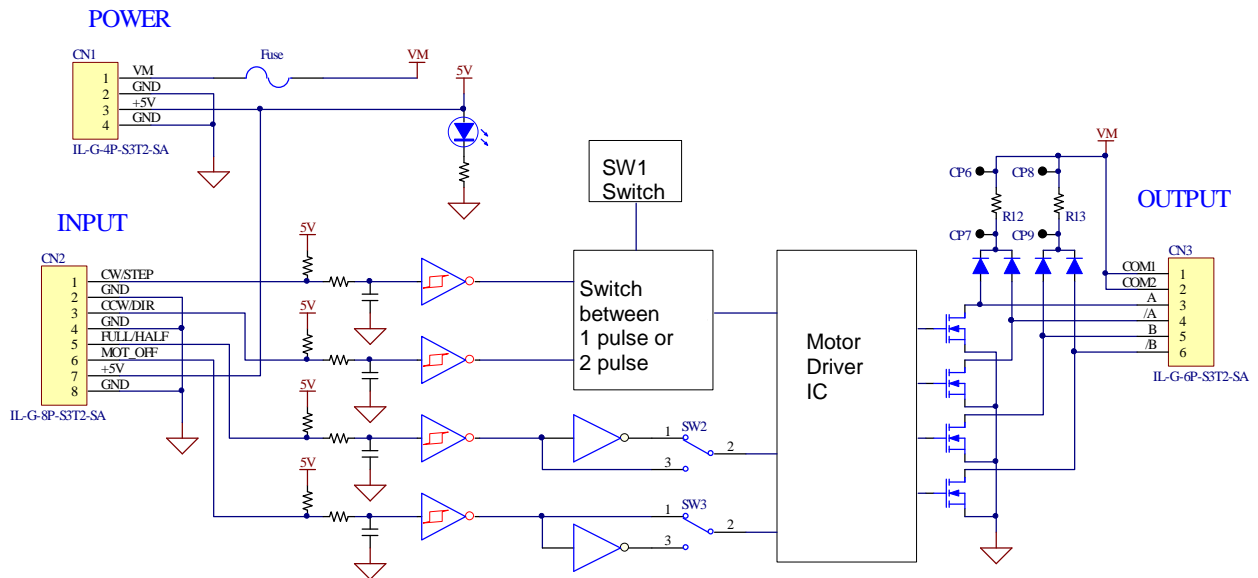
Typical example of connection with driver



* This is an output terminal to supply +5V for I/O. (This terminal is connected with No.3 pin of CN1 internally.)

5. System features

5-1. Block diagram



5-2. Setting of Two pulse method (CW, CCW) and One pulse (STEP, DIR) by SW1

SW 1 setting (See 5-7 Layout)	Function
STEP/DIR direction	One pulse method
CW/CCW direction	Two pulse method (Default)

5-3. Setting of full step and half step by FULL/HALF signal or SW2

FULL/HALF signal	SW2 setting (See 5-7 Layout)	Function
H level or open	FULL (H) direction	Full step
	HALF (L) direction	Half step
L level	FULL (H) direction	Full step
	HALF (L) direction	Half step

5-4. Setting of motor excitation ON/OFF by MOT/OFF signal or SW3

MOT/OFF signal	SW3 setting (See 5-7 Layout)	Function
H level or open	ON (L) direction	Excitation ON
	OFF (H) direction	Excitation OFF
L level	ON (L) direction	Excitation ON
	OFF (H) direction	Excitation OFF

5-5. LED display

The LEDs (LED1 and LED2) lights under the following conditions.

LED1 : It lights green when the logic power VCC is ON.

LED2 : It lights orange reacting with pulses for motor rotation. When LED 2 is turned on, motor sequence changes.

5-6. Default setting

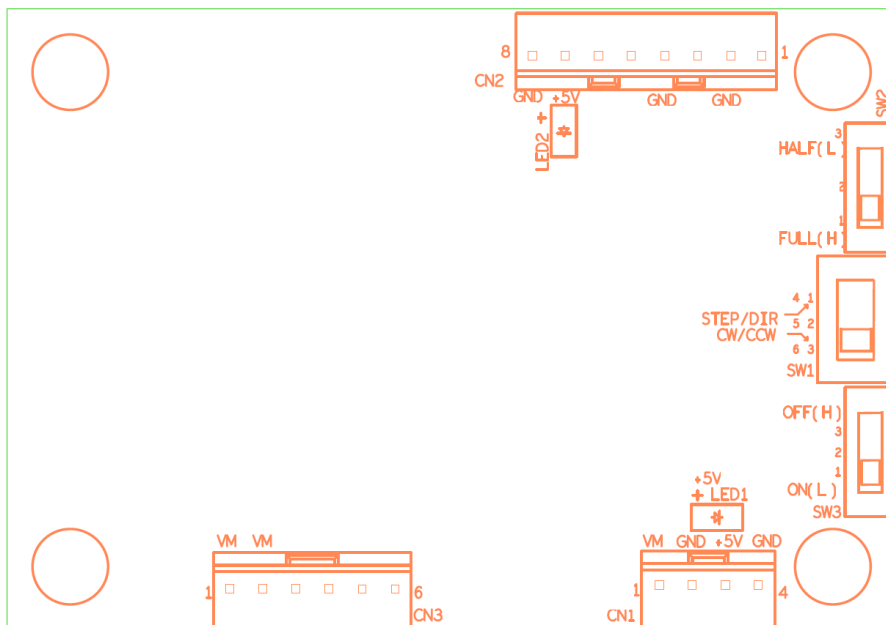
SW1: CW/CCW direction

SW2: FULL (H) direction

SW3: ON (L) direction

5-7. Layout

Layout of CN1 to CN3, SW1 to SW3, LED1 and LED2 is as follows.



6. Handling precautions

- 6-1. This driver is a natural cooling type. Put this product in well-ventilated place as possible and space more than 10mm out around this driver.
- 6-2. Do not use in place with dust, oil mist, corrosive gas, etc. Additionally, remove dust periodically.
- 6-3. Do not put this driver in place with excessive vibration and shock directly
- 6-4. Make sure to keep the signal line (CN2), the power line (CN1) and the motor line (CN3) away from one another to prevent noises.
- 6-5. If there are noise sources such as relays, high-pressure switching equipments or inverters, these may cause induced and radiation noises mix in the signal lines or power lines and may cause malfunctions. Make sure to keep the wires and driver from such noise source as possible.
- 6-6. Be careful to touch metal parts. It may result in injury on your finger by an angle of the metal.
- 6-7. Do not touch the board of this product while the power is supplied. When you move, wire, maintain and inspect this product, power it off.
- 6-8. Be careful to touch the product while the power is supplied and just after the power turns off. The product may be hot.
- 6-9. Keep this driver out of reach of children.
- 6-10. Store this driver in place within the predetermined range of temperature and humidity. Do not leave it in place subject to direct sunlight.
- 6-11. Plug in the connectors closely. Do not insert and remove connectors with wet hands.
- 6-12. If smoking, abnormal smell or noise occur, shut down the power immediately.

7. Accessories

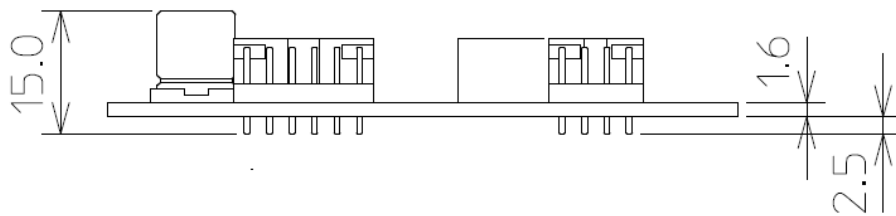
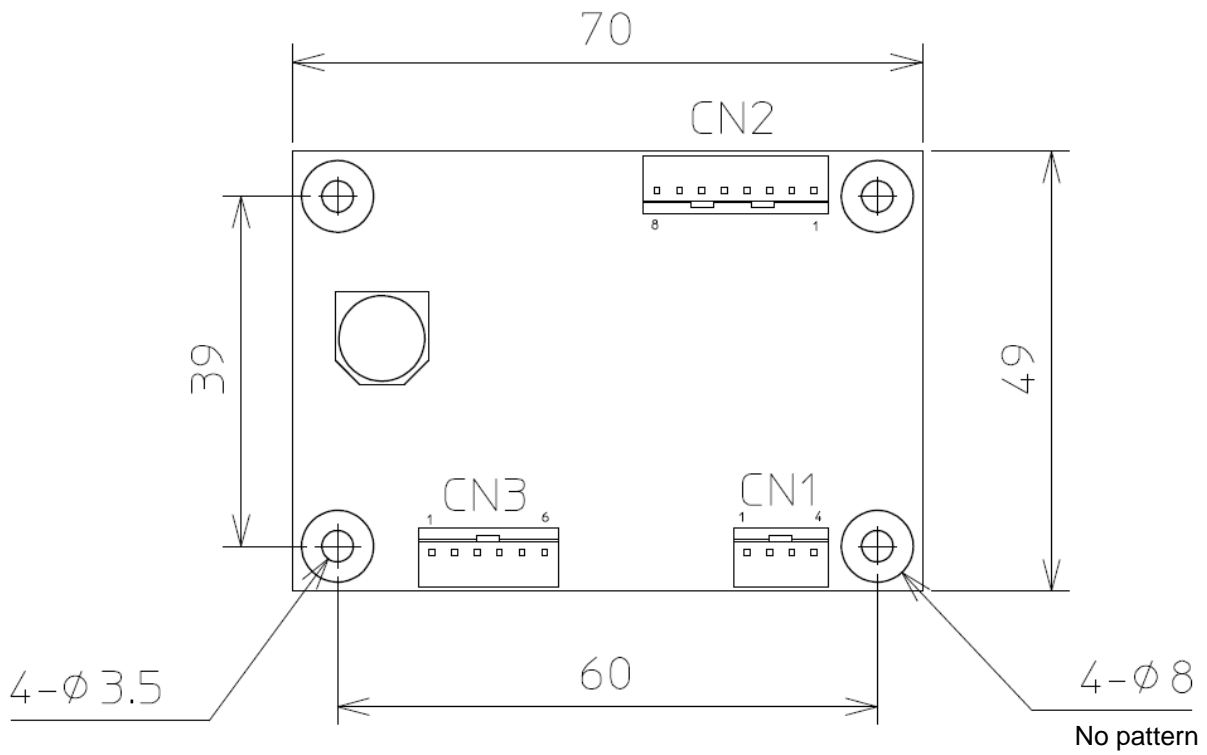
Connector for CN1	IL-G-4S-S3C2-SA (Japan Aviation Electronics Industry, Ltd) 1 pc
Connector for CN2	IL-G-8S-S3C2-SA (Japan Aviation Electronics Industry, Ltd) 1 pc
Connector for CN3	IL-G-6S-S3C2-SA (Japan Aviation Electronics Industry, Ltd) 1 pc
Contact for connectors	IL-G-C2-SC-10000 (Japan Aviation Electronics Industry, Ltd) 18 pcs
	Applicable wire : AWG22 to28

The above components are attached.

Use the following crimp tool for clamping contact.

CT150-1-ILG (Japan Aviation Electronics Industry, Ltd)	Applicable wire : AWG26 to 28
CT150-1B-ILG (Japan Aviation Electronics Industry, Ltd)	Applicable wire : AWG24 to 26
CT150-1C-ILG (Japan Aviation Electronics Industry, Ltd)	Applicable wire : AWG22 to 24

8. External dimensions



Unit : mm (typical)

CAUTION	The descriptions in this manual may be changed without prior notice to improve performance or quality.
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***NPM* Nippon Pulse Motor Co., Ltd.**

Head Office: No.16-13, 2-chome, Hongo, Bunkyo-ku, Tokyo, 113-0033, Japan
TEL: 81-3-3813-8841 FAX: 81-3-3813-8665
Web: <http://www.pulsemotor.com> E-mail: int-l@npm.co.jp

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