

# Stepper Motor Driver

AD1111

**NPM**

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# 1 Product Warranty

## 1.1 In the case of purchase from a supplier other than NPM

If your device was purchased from a supplier other than NPM, please contact that supplier.

## 1.2 Warranty period

The warranty period is one year from the date of delivery

## 1.3 Warranty scope

If defects are found in the product during the warranty period under normal use as described in 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 repair facility.
- The defect results from abuse or mishandling of the product.
- 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.

1. NPM will not provide on-site repair. All products to be repaired must be sent to NPM or an authorized repair location.
2. The warranty period of the repaired product does not extended beyond the warranty period of the product before the failure. It is the same as the warranty period of the product before the repair.
3. This warranty covers the product. It does not cover damages caused by the product's defects, etc.
4. A replacement may be provided instead of a repair at the sole direction of NPM.

This documents aims to describe the function of the product and it does not warrant fitness for a particular purpose. The application examples and circuit diagrams in this manual are described for your reference. Please confirm the feature and the safety of device or equipment before use.

Please do not use this product for the following types of applications. If you plan to use the product as described below, please contact our sales department.

- Any equipment that may require high reliability or safety, such as nuclear facilities, electricity or gas supply systems, transportation facilities, vehicle, various safety system, patient critical 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.

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 General

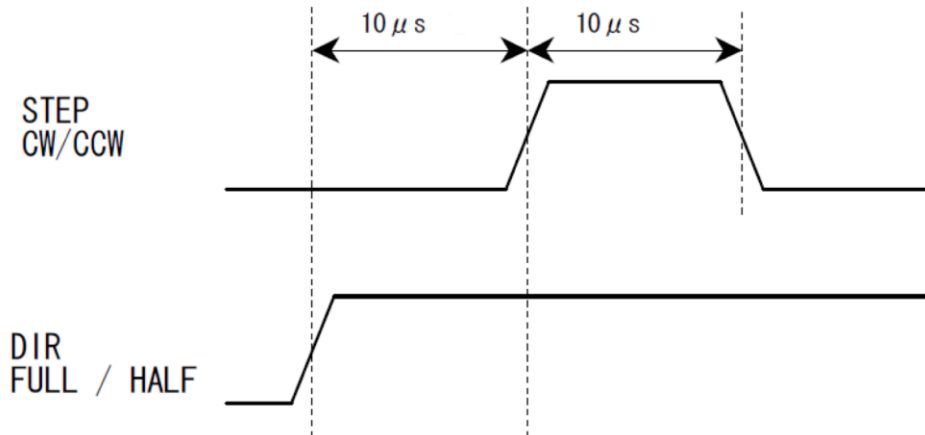
The AD1111 is a constant voltage stepper motor driver for 2 phase unipolar stepping motors. The maximum output current is 0.35 Amps per phase.

## 3 Specifications

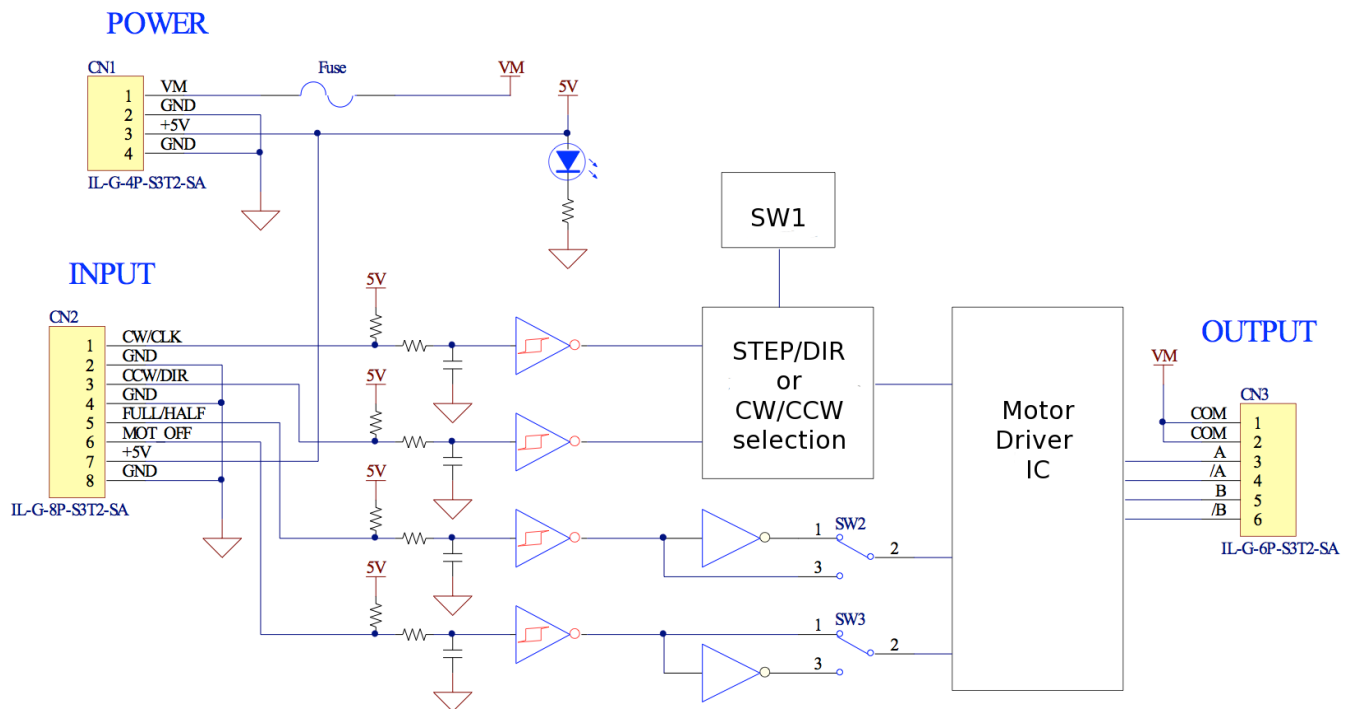
|                           |                       |   |   |         |
|---------------------------|-----------------------|---|---|---------|
| Product Name:             | Stepper Motor Driver  |   |   |         |
| Model:                    | AD1111                |   |   |         |
| Electrical Specifications | Motor Voltage [VM]    | DC +5V ~ +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)   |   |         |
|                           | Output Current        | 0.35 A/phase continuous   |   |         |
|                           | Applicable Motors     | 1) Our PF, PFC, PFCL, and PFCU series<br>2) Commercially available two-phase unipolar stepper motors that are within the current and voltage specifications of the drive. |   |         |
| Output Signal             | Input interface       | TTL Input Low: 0~0.5V High: 1.9V ~ VCC (5V) (Note 2)  |   |         |
|                           | Input signal modes    | CW/CCW (Factory Setting)  | Operation with input of positive logic (Note 2)   |         |
|                           |                       | Step & Direction (Changed by SW1)   | Operation with input of positive logic for STEP commands and selection of High or Low logic for selection of CW/CCW movement. (Set in conjunction with SW2.) (Note 2) |         |
|                           | Full/Half signal      | Logic High = Full Step (2-2 phase), Logic Low = Half Step (1-2 phase) (Set in conjunction with switch SW2)  |   |         |
|                           | MOT/OFF signal        | Logic High = Motor Energized (Shaft Locked) Logic Low = Motor Off (Shaft motion uninhibited) (Set in Conjunction with switch SW3) (Note2)                                 |   |         |
| Environmental Conditions  | Operating temperature | 0°C ~ +50°C (No condensation)   |   |         |
|                           | Storage temperature   | -10°C ~ +60°C (No condensation)   |   |         |
|                           | RoHS                  | RoHS Compliant  |   |         |
| Other                     | External Dimensions   | 70(W) X 49(D) 17(H) [mm]  |   |         |
|                           | Weight                | 20g   |   |         |
|                           | Cooling method        | Natural cooling   |   |         |
|                           | Protection circuit    | 3.15A fuse for motor power  |   |         |
|                           | Accessories           | Connector (housing and pin contacts) [IL-G series JAE]  |   |         |
|                           |                       | CN1   | IL-G-4S-S3C2-SA   | 1 piece |
|                           |                       | CN2   | IL-G-8S-S3C2-SA   | 1 piece |
| CN3                       |                       | IL-G-6S-S3C2-SA   | 1 piece   |         |
| Contact pins              |                       | IL-G-C2-SC-10000  | 18 pieces   |         |

### 3.1 Notes

1. It is recommended that the motor input voltage (VM) be connected after turning on the logic (VCC.) When powering the unit off, it is recommended that you disconnect VM first, followed by VCC. When disconnecting VCC, large currents may be allowed to flow that could otherwise damage the motor.
2. All input pulse signals must last 10 microseconds or more. After commanding a change in Direction, or Full/Half step mode, 10 microseconds must elapse before sending step commands.



### 4 Block Diagram



## 5 System Features

### 5.1 Pulse Input Selection

SW1: Selection of pulse input method.

| SW1 setting | Function                 |
|-------------|--------------------------|
| STEP/DIR    | 1 pulse method           |
| CW/CCW      | 2 pulse method (default) |

### 5.2 Excitation Selection

SW2: Selection for Full and Half step.

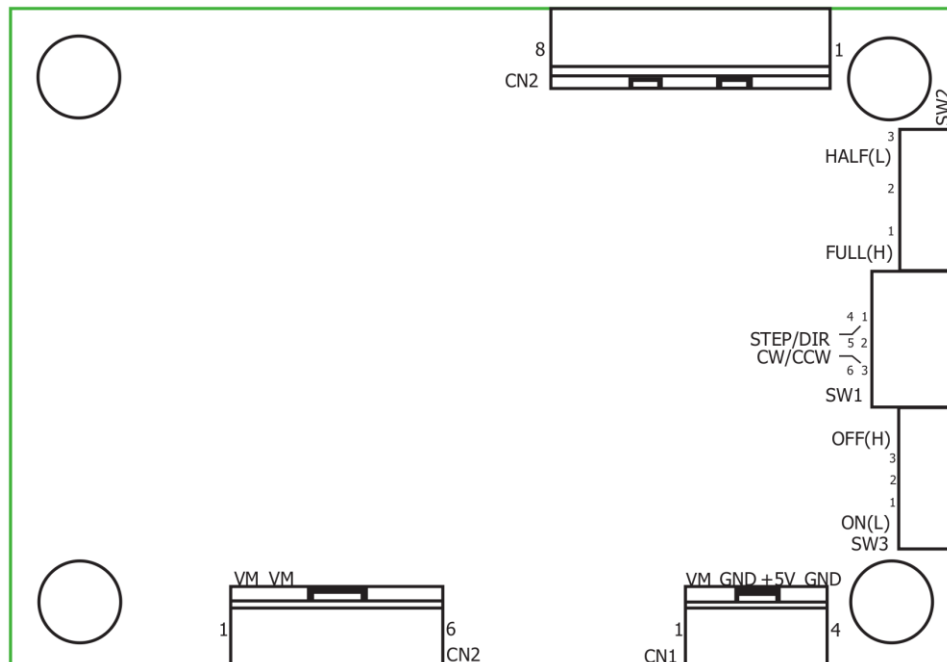
| FULL/HALF Signal     | SW2 setting | Function  |
|----------------------|-------------|-----------|
| Logic High (or open) | FULL(H)     | Full Step |
|                      | HALF(L)     | Half-Step |
| Logic Low            | FULL(H)     | Half-Step |
|                      | HALF(L)     | Full Step |

### 5.3 Motor Enable/ Disable Selection

SW3: Selection for motor enable or disable.

| MOT/OFF Signal       | SW 3 setting | Function       |
|----------------------|--------------|----------------|
| Logic High (or open) | ON(L)        | Excitation ON  |
|                      | OFF(H)       | Excitation OFF |
| Logic Low            | ON(L)        | Excitation OFF |
|                      | OFF(H)       | Excitation ON  |

### 5.4 Switch and Connector Location



## 5.5 LED Function

LED1 and LED2 are lit under the following conditions:

- LED1 is green with logic power (VCC) is supplied.
- LED2: When the motor is rotating, LED2 will flash.

## 6 Connections

### 6.1 Power Supply Connection CN1

Power supply connector (compatible connector type: IL-G-4P-S3T2-SA)

| Pin | Pin Name | Pin Description                           |
|-----|----------|---|
| 1   | VM       | Power supply input for motor (VM)         |
| 2   | GND      | Ground                                    |
| 3   | +5V      | Power supply input for driver logic (VCC) |
| 4   | GND      | Ground                                    |

### 6.2 I/O Connection CN2

I/O connector (compatible connector type: IL-G-8P-S3T2-SA)

| Pin | Pin Name  | Pin Description  |
|-----|-----------|--|
| 1   | CW/CLK    | CW signal input in 2 pulse mode, CLK input in 1 pulse mode           |
| 2   | GND       | Ground   |
| 3   | CCW/DIR   | CCW signal input in 2 pulse mode, DIR input in 1 pulse mode          |
| 4   | GND       | Ground   |
| 5   | FULL/HALF | Full Step (2-2 phase excitation) or Half Step (1-2 phase excitation) |
| 6   | MTR OFF   | Input to enable/disable the motor                                    |
| 7   | +5V       | Driver logic power input (Internally connected to CN1 pin 3)         |
| 8   | GND       | Ground   |

### 6.3 Motor Connection CN3

Motor connector (compatible connector type: IL-G-6P-S3T2-SA)

| Pin | Pin Name     | Pin Description   |
|-----|--------------|---|
| 1   | COM          | Common wire connection for phase A and B (Internally connected to VM) |
| 2   | COM          |   |
| 3   | A (phase 1)  | Motor A phase connection  |
| 4   | /A (phase 3) | Motor /A phase connection   |
| 5   | B (phase 2)  | Motor B phase connection  |
| 6   | /B (phase 4) | Motor /B phase connection   |

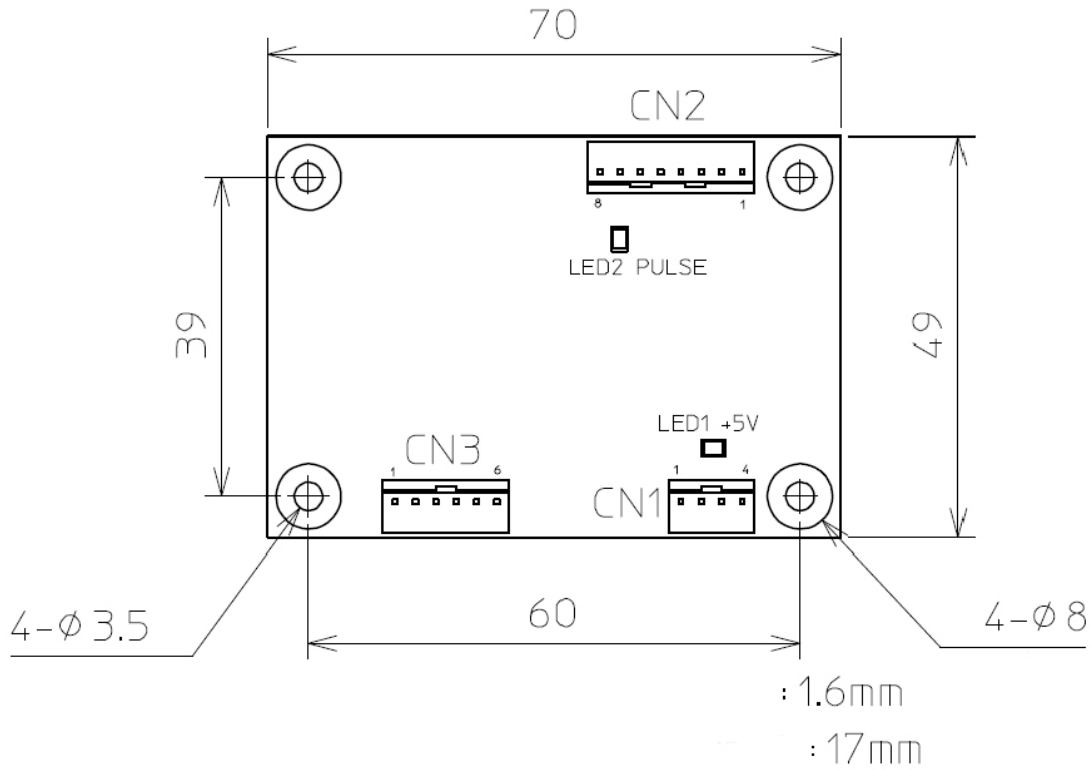
## 7 Handling Precautions

1. This driver is a natural cooling type. Put this product in a well-ventilated place and provide at least 10mm clearance around this driver.
2. Do not use in a place with dust, oil mist, corrosive gas, etc. Additionally, remove dust periodically.
3. Do not put this driver in a place with excessive vibration and direct physical shock.
4. Make sure to keep the signal line (CN2), the power line (CN1) and the motor line (CN3) away from one another to prevent electrical noise.
5. If there are noise sources such as relays, high-pressure switching equipment or inverters, these may cause induced and radiation noises in the signal lines or power lines and may cause malfunctions. Make sure to keep the wires and driver as far away from such noise source as possible.
6. Ensure that STEP input signals are Logic High (Logic low when not signal is being sent.) Reversal of logic polarity may cause malfunctions and cause the motor to misstep.
7. Be careful when touching metal parts. The metal parts may have sharp edges.
8. Do not touch the board of this product while the power is supplied. When moving, wiring, or performing maintenance, power this product off.
9. Be careful if you touch the product while the power is supplied and just after the power turns off. The product may be hot.
10. Keep this driver out of reach of children.
11. Store this driver in a place with the predetermined range of temperature and humidity. Do not leave it in a place subject to direct sunlight.
12. Plug in the connectors carefully. Do not insert and remove connectors with wet hands.
13. If smoking, abnormal odor or noise occur, shut down the power immediately.



## 8 Board Dimensions

This board is built using a 2 layer substrate



## 9 Accessories

CN1 Mating Connector: 1 piece IL-G-4S-S3C2-SA (JAE)

CN2 Mating Connector: 1 piece IL-G-8S-S3C2-SA (JAE)

CN3 Mating Connector: 1 piece IL-G-6S-S3C2-SA (JAE)

Contact pins for all connectors: 18 pieces IL-C-C2-SC-10000 (JAE) For wire gauges AWG22-28.