Stepper motor driver circuit

AD1111

User's Manual

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

AD1111 is a circuit to drive 2-phase constant voltage unipolar stepper motor.
This can drive unipolar stepper motors, such as our PF series, whose input current is up to 350mA per phase.

3. Specifications

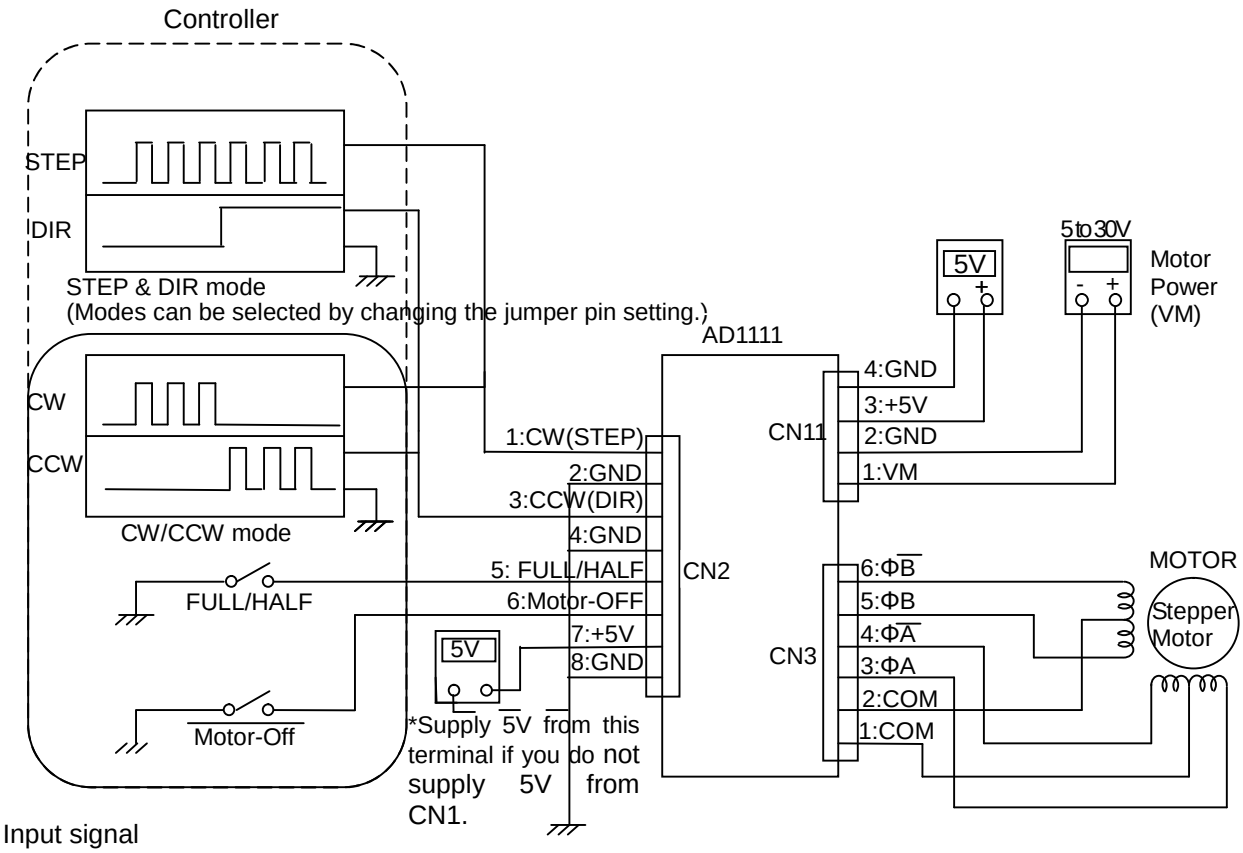
<table>
<tr><td colspan="4">Product Name : Board-type circuit to drive unipolar constant-voltage motor Model : AD1111</td></tr>
<tr><td rowspan="5">Electrical specifications</td><td colspan="2">Input voltage</td><td>Control power (VCC): DC5V ±5%, Capacity: more than 100[mA]
Motor power (VM): DC5V to 30V (Voltage and current are varied according to a motor in use)</td></tr>
<tr><td colspan="2">Control method</td><td>Unipolar constant voltage</td></tr>
<tr><td colspan="2">Excitation method</td><td>Full step : (2-2 phase), HALF step : (1-2 phase)</td></tr>
<tr><td colspan="2">Output current</td><td>350mA / phase (MAX) (500mA / phase - instantaneous MAX)</td></tr>
<tr><td colspan="2">Applicable motor</td><td>(1) Our products PF, PFC, PFCL, PFCU series
(2) Commercially available 2-phase unipolar (6 leads) stepper motor
Note: Driving voltage and current of both the above are within specifications.</td></tr>
<tr><td rowspan="5">Input signal</td><td colspan="2">Input signal</td><td>TTL input L: 0 to 0.5V, H : 1.9V to control power voltage (VCC)</td></tr>
<tr><td rowspan="2">Driving signal input</td><td>CW/CCW pulse input (Default)</td><td>CW / CCW command input
Pulse width : 10µsec or longer
Rising and falling time is 2µsec or shorter
Operate at the rising of positive logic pulse signal.</td></tr>
<tr><td>STEP&DIR signal input

(When setting is changed by JP1 and 2)</td><td>STEP&DIR Command input
STEP Pulse width : 10µsec or longer
Rising and falling time is 2µsec or shorter
Operate at the rising of positive logic pulsesignal.
DIR signal logic : CW at the level, CCW at the level H
DIR signal should be determined over 10µsec before STEP signal input.</td></tr>
<tr><td colspan="2">Input to switch STEP angle</td><td>Full step at the level H (2-2 phase)
Half step at the level L (1-2 phase)
The setting of half step at the level H and full step at the level L can be set by JP3 setting.</td></tr>
<tr><td colspan="2">Excitation control input (ON/OFF)</td><td>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 JP4.</td></tr>
<tr><td rowspan="2">Environmental Condition</td><td colspan="2">Operating temperature range</td><td>0 to 55 °C (No condensation)</td></tr>
<tr><td colspan="2">Storage temperature range</td><td>-10 to 70 °C</td></tr>
</table>

Others	External dimensions	70(W) x 49(D) x 170(H) [mm]
	Weight	15g (including heatsink)
	Cooling system	Natural cooling

Specifications may be changed without prior notice to improve performance or quality.

4. Connection diagram



Input signal

CW and CCW Driving pulses are input in these terminals. When pulses are input to CW terminal, the axis rotates in a clockwise direction. When pulses are input to CCW terminal, the axis rotates in a counterclockwise direction. The motor operates at the rising edge of pulse signals. Note 1.

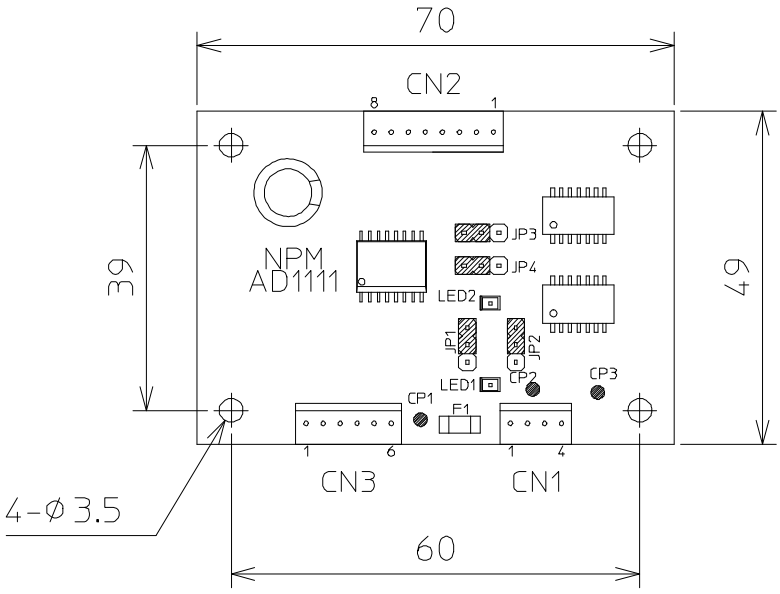
FULL/HALF This terminal is used to switch between full-step (2-2 phase excitation) and half-step (1-2 phase excitation). H level: Full-step, L level: half-step Note 2.

MOTOR-OFF This terminal is used to control motor excitation. When L level signal is input, excitation is OFF. When H level signal is input, excitation is ON.

Note 1: If JP1 and JP2 connections on the board are changed to connect with STEP and DIR, you can use the STEP&DIR mode. In this case, please input STEP signal to CW terminal and DIR signal to CCW terminal. L level DIR signal is input, the axis rotates in a clockwise direction.

Note 2: If needed, you can reverse operation logic. JP3 (FULL/HALF) and JP4 (Motor-OFF) connections are changed from short 1 to 2 to short 2 to 3, operation of each terminal reverses.

5. External dimensions



6. Precautions

1. The driver is a naturally-cooled type one. Please put this in a well-ventilated place and space more than 10mm around the driver.
2. Please do not put the driver in a hostile environment (such as one with dust, oil mist, corrosive gas, etc.)
3. Please do not put the driver in a place affected by excessive vibration and shock directly.
4. To ensure anti-noise, a signal line (CN2), a power supply line (CN1) and a motor line (CN3) of the driver should be wired so as to keep away each line from one another separately.
5. If there are noise sources such as relays, high pressure switching equipments and inverters near the driver, inductive and radiation noise may come to be mixed in signal lines or power-supply lines and that may cause malfunction. Please make sure to keep lines and driver away from these noise sources, as possible.
6. CW/CCW and STEP signals should be input in positive logic (L level when no signal is input). Input in negative logic (H level when no signal is input) may cause incorrect steps or malfunction.
7. If you want to change operating direction in the CW/CCW signal input mode, please input pulses in more than 10 micro seconds.
8. If you want to change operating direction in the STEP&DIR signal input mode, please input STEP signals in more than 10 micro seconds after DIR signal is changed. If you input DIR signal and STEP signal simultaneously, it may cause incorrect steps.
9. To power on, please power on +5V power supply first and then power on VM power supply. To power off, please power off VM power supply first and then power off +5V power supply.

7. Accessories

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

The above components are attached.

CAUTION	The descriptions in this manual may be changed without prior notice to improve performance or quality.

NPM Nippon Pulse Motor Co., Ltd.

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