# PUSIROBOT
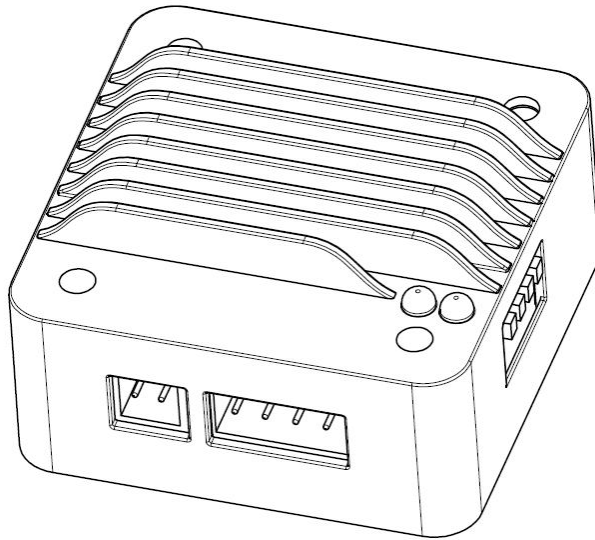
CQPUSI ROBOT CONTROL SYSTEM

# User Manual

## PMD006xx Series

### Miniature Integrated Stepper Motor Driver

## 1. **Version Control**

## 1） **Update Records**

| Date | Author | Version | Remarks |
|------|--------|---------|---------|
| 2015-7-20 | liur | V0.1.0 | Initial |
| 2015-8-6 | Jacky | V0.1.1 | Add Timing diagram |
| 2015-8-25 | liur | V0.1.2 | Add Interface description |
| 2015-12-9 | huangcheng | V0.1.3 | Add PMD006P2 |
| 2016/3/1 | liur | V0.1.4 | Add PMD006P1 & PMD006P6 |
| 2016/4/4 | liur | V0.1.5 | Modify PMD006P1 spec. |
| 2017/7/12 | yyj | V0.1.6 | Update model |
| 2018/2/10 | liur | V0.1.7 | Modify selection description |
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Catalog

# 1 Introduction

## 1.1 Statement of intellectual property right

PMD006xx series driver has been applied for the following national patent:

• Controller scheme and method have been applied for the protection of the invention patent.

• Controller circuit has been applied for the protection of utility model patent.

• Controller appearances has been applied for the protection of appearance patent protection.

Since PMD006xx series controller with embedded firmware code, it would be considered as a violation of intellectual property protection act and regulations that any behavior of trying to destroy the function of the firmware code protection. If this behavior acquires the software or other achievements of intellectual property protection without authorization of CQPUSI, CQPUSI has the right to stop such behavior by filing a lawsuit according to the act.

## 1.2 Disclaimer

The using method of the device and other content in the description of this manual is only used to provide convenience for you. To ensure the application conforms to the technical specifications is the responsibility of your own. CQPUSI does not make any form of statement or guarantee to the information, which include but not limited to usage, quality, performance, merchantability or applicability of specific purpose. CQPUSI is not responsible for these information and the consequences result caused by such information. If the CQPUSI device is used for life support and/or life safety applications, all risks are borne by the buyer. The buyer agrees to protect the CQPUSI from legal liability and compensation for any injury, claim, lawsuit or loss caused by the application.
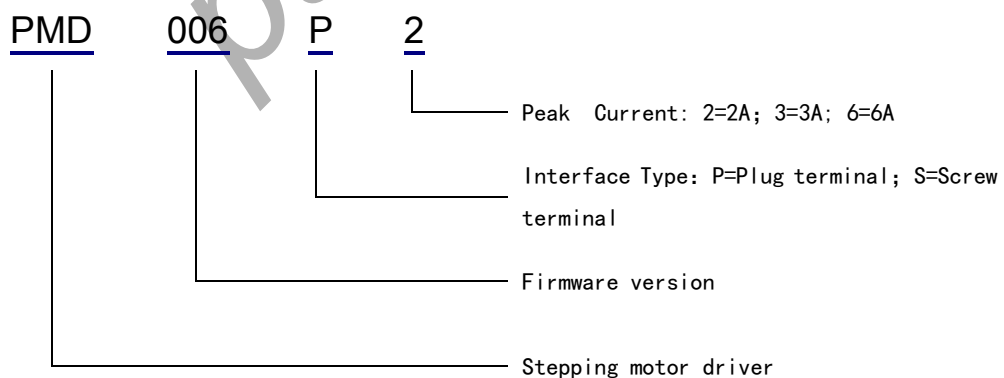
## 2 Overview

### 2.1 General Description

PMD006xx is a kind of micro integrated stepper motor microstepping driver, which can be directly installed in the rear 42/57/86 etc series stepper motor, and which has the advantages of small size, strong driving force, and low heat and so on. PMD006xx stepping motor driver can provide 0~5A continuous adjustable peak current, maximum 128 microstepping, free current which can be adjusted continuously.

### 2.2 Features

✓ Wide range of 9-48V single voltage supply. (Refer to the model specification)

✓ Output current 0.1A ~ 6A, which can be adjusted continuously.

✓ Support common anode, common cathode, differential, double pulse, pulse direction, and other input modes.

✓ Support 0/2/4/8/16/32/64/128 microstepping accuracy. (Refer to the model specification)

✓ Support 4/6/8 lines of 2 phase stepper motor.

✓ The highest frequency of input pulse can reach 250 KHz.

✓ TSD, UVLO, OCP protection.

✓ The idle current is 0- The current of full load can be adjusted continuously.

✓ Support full torque mode of torque enhancement.

### 2.3 Product selection & Ordering Information

In order to serve you quicker and better, please provide the product number in following format when ordering.

PMD    006    P    2

Peak Current: 2=2A; 3=3A; 6=6A

Interface Type: P=Plug terminal; S=Screw terminal

Firmware version

Stepping motor driver

#### 2.3.1 Selection guide

| Model | Voltage | Max current | Microstepping | Features |
|---|---|---|---|---|
| PMD006P2 | 9-32V | 2A | 0/2/4/8/16/32/64/128 | High-precision, high-medium speed |
| PMD006P3E | 12-48V | 3A | 0/2/4/16 | High torque and high speed |

| PMD006P6 | 12-48V | 6A | 0/2/4/16 | High torque and high speed |
|----------|--------|-----|----------|----------------------------|

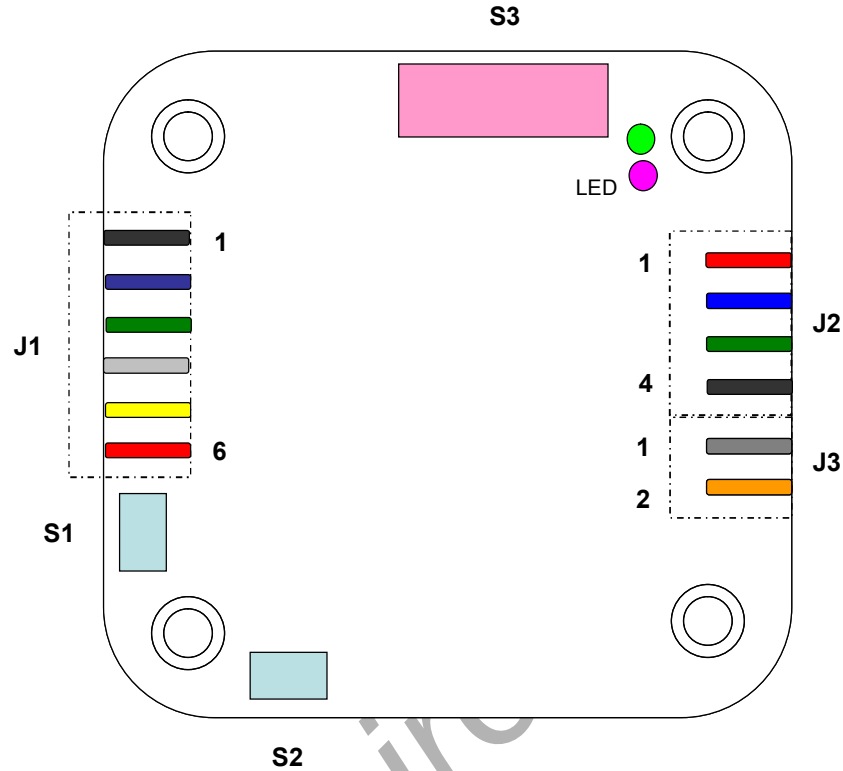## 3    Connection description

## 3.1    Terminal port location



Figure 3-1

## 3.2    Motor connection J2

| Pin no: | 1 | 2 | 3 | 4 |
|---------|-----|-----|-----|-----|
| Designator: | M10 | M11 | M20 | M21 |

Description:

M10, M11: Connect to the stepper motor phase A;

M20, M21: Connect to the stepper motor phase B.

WARNING: Incorrect connection of phase of power or motor will permanently damage the controller!

## 3.3    Power connection J3

| Pin no: | 1 | 2 |
|---------|-----|-----|
| Designator: | GND | VCC |

Description:

VCC: DC supply voltage, 9~48V;

GND: Supply voltage ground.

## 3.4 Signal connection J1

| Pin no: | 1 | 2 | 3 | 4 | 5 | 6 |
|---------|------|------|------|------|------|------|
| Designator: | ENA+ | ENA- | PUL+ | PUL- | DIR+ | DIR- |

Description:

ENA+/-: Enable signal, optocoupler input. Don't enable when conduction；

PUL+/-: The pulse signal, optocoupler input;

DIR+/-: The direction (or pulse) signal, optocoupler input;

Notice: The voltage directly added on the optocoupler inputs should not exceed 5.5V. When the value of input signal exceeds 5V, the extra divider resistance is required.

## 3.5 Operation current adjustment knob S1

It is used to adjust the operation current of driver. The 0~6A current can be adjusted continuously.

Notice：There is not linear proportion relationship between mechanical stroke of potentiometer and current value. Please refer to the scale indicator to determine the value of current.

## 3.6 Idle current adjustment knob S2

It is used to adjust the idle current of driver. The minimum value is 0, and the highest value is the value of operation current, and the current value can be adjusted continuously.

Notice:

1. There is not linear proportion relationship between mechanical stroke of potentiometer and current value. Please refer to the scale indicator to determine the value of current.

2. If PUL+/- of optocoupler is in a conduction state, the driver will be out of idle mode even if there is no pulse forming. The users can dynamically control the holding torque because of this feature. If users do not want to use this feature, just ensure PUL+/- (including DIR+/- in double pulse mode) in spare time is in a non-conducting state.

## 3.7 Microstepping and selection of pulse dial switch S3

Dial switch 1~3 is used to select the microstepping of driver. Dial switch 4 is used to select pulse/direction operation mode or dual pulse operation mode.

The following is the PMD006P2 dial switch function table:

| SW1 | SW2 | SW3 | Function | Remarks |
|------|------|------|----------------|---------|
| OFF | OFF | OFF | 0 Microstepping | |
| ON | OFF | OFF | 2 Microstepping | |
| OFF | ON | OFF | 4 Microstepping | |
| ON | ON | OFF | 8 Microstepping | |

| OFF | OFF | ON | 16 Microstepping | |
|-----|-----|-----|------------------|---|
| ON | OFF | ON | 32 Microstepping | |
| OFF | ON | ON | 64 Microstepping | |
| ON | ON | ON | 128 Microstepping | |

The following is the PMD006P6/PMD006P3E dial switch function table:

| SW1 | SW2 | SW3 | Function | Remarks |
|-----|-----|-----|----------|---------|
| OFF | OFF | -- | 0 Microstepping | ③ |
| ON | OFF | -- | 2 Microstepping | ③ |
| OFF | ON | -- | 4 Microstepping | ③ |
| ON | ON | -- | 16 Microstepping | ③ |

Dial switch SW4: ON setting double pulse input mode, OFF setting pulse / direction input mode. (except PMD006P1)

Note: ①Depending on the motor type, the middle-low speed usually is below 300RPM. ②All current adjustment knob and dial switch should be selected before power on. ③ In PMD006P6, it will be high speed optimization when dial code switch 3 is set to ON, and it will be medium-low speed optimization when dial code switch 3 is set to OFF. ④The dial code switch 3 in PMD006P1 is reserved for use and must be set to OFF. When the motor is connected with 57 and above motor, the dial switch 4 is set to ON, and when the motor is connected with the 42 and below motor, the dial switch 4 is set to OFF.

## 3.8  Indicator led

There are two lights on the top of PMD006xx driver. The green light is the normal power indicator, and the red light is error indicator. The red light is on when driver is in the state of reset, over voltage, over temperature, or over current.

## 4  Signal connection of driver

PMD006 series driver support the connection of common cathode, common anode, differential, single/double pulse, encoder following and so on.

Details are as follows.

## 4.1  Common cathode connection

Figure 4-1 provides a common cathode connection method. The current flows from the signal+ port of driver, and pours into the ground of controller from signal- port. The resistor R can be omitted when the output voltage of the controller is less than 5V.
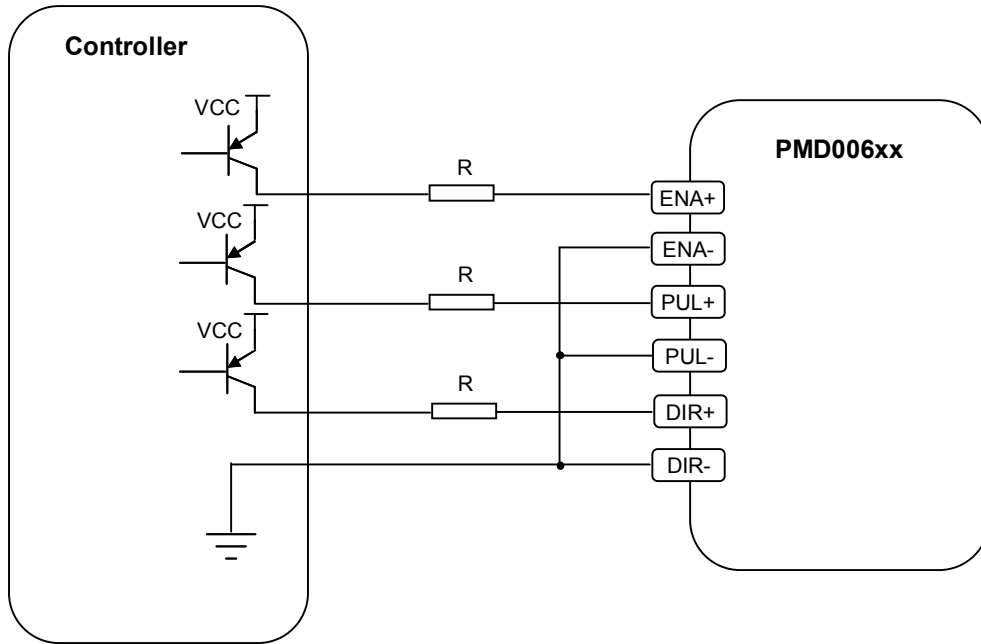
Figure 4-1

## 4.2   Common anode connection

Figure 4-2 provides a common anode connection method, which is suitable for connecting controller with the open collector type output. Such as PIO002xx. The resistor R can be omitted when the output voltage of the controller is less than 5V.
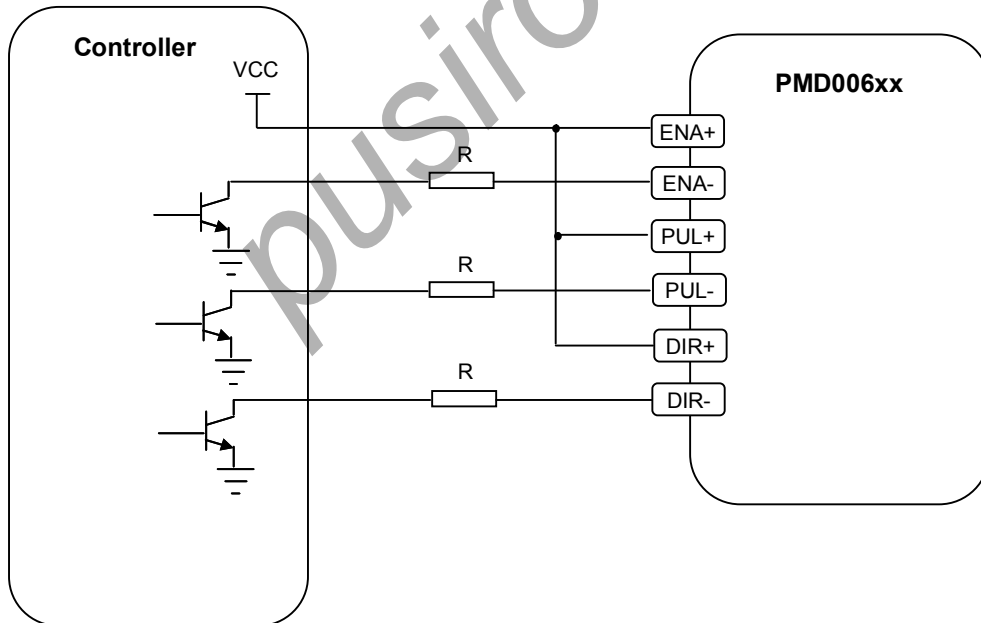


Figure 4-2

## 4.3   Differential connection

Figure 4-3 provides a differential connection method. Using long-term differential driver in the harsh environment can significantly improve the transmission distance and anti-jamming ability of the signal. The typical differential driver uses RS422 driver chip to drive.
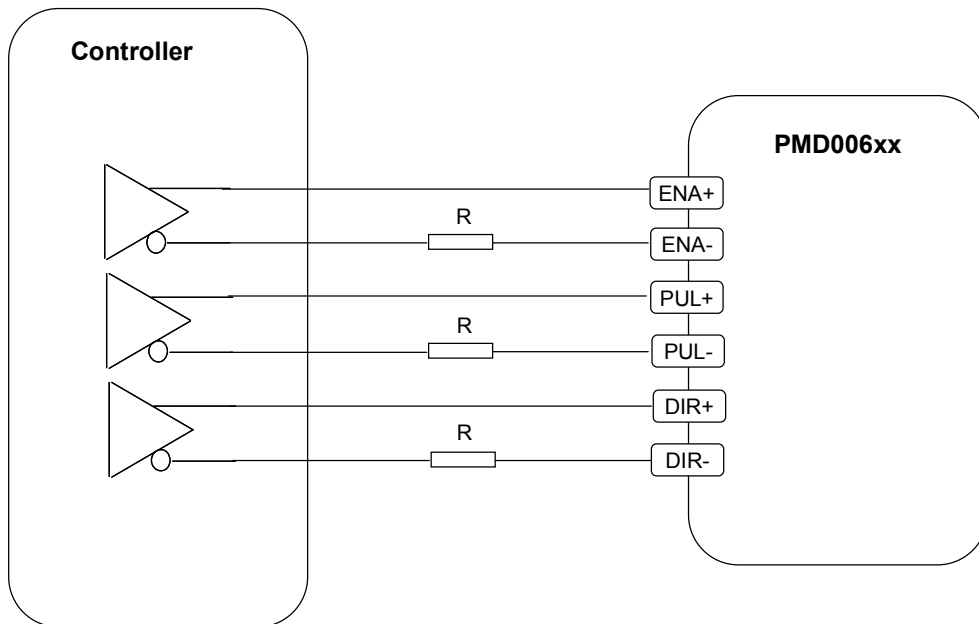
Figure 4-3

## 4.4  Encoder following

In order to achieve the following function, the PUL and DIR interface of PMD006xx can be connected to the output of encoder, graduator or hand wheel of CNC. In this application, the SW4 of select switch S3 must be set ON. If there is already the phase detector circuit on the output terminal of encoder, the encoder can be directly connected to the PUL and DIR ports. Otherwise the PEN2CCW sub module is required to connect encoder and driver, as shown below.
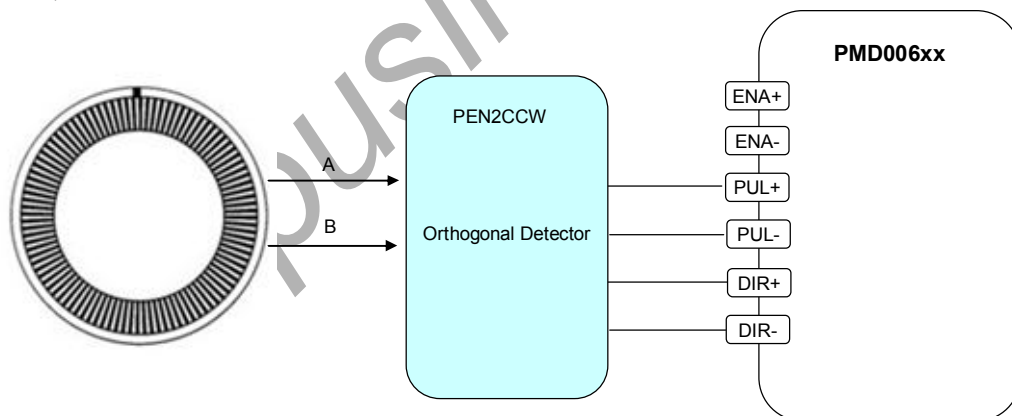


Figure 4-4

## 4.5  Selection of current limiting resistance

The maximum voltage which the signal interface of PMD006xx can directly bear is 5.5V. In most cases, the output voltage of controller may exceed this value. Such as, the output voltage of PIO002xx or PLC is generally 24V. In this case, in order to make the current flowing through the emission port of optocoupler less than 18mA, a divider resistance should be connected on the signal circuit. Normally, the 1.5Kohm 1/4W resistor is recommended to use when 12V voltage inputs. The 3.3Kohm 1/4W resistor is recommended to use when 24V voltage inputs.

## 5 Control sequence

The signal of PMD006xx interface is required to meet the following sequence. (The committed value is minimum)
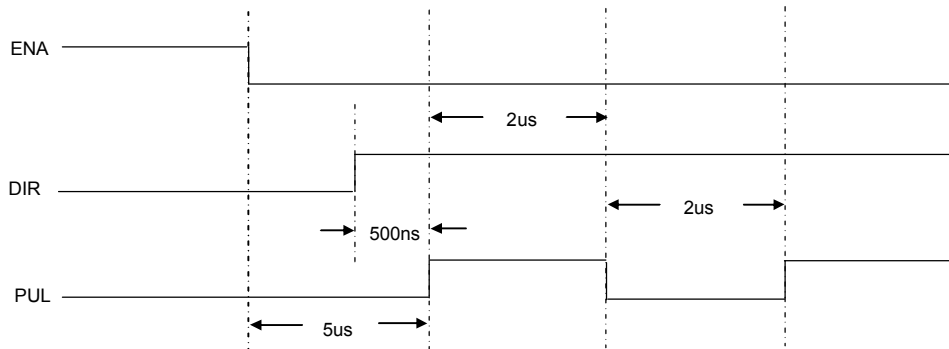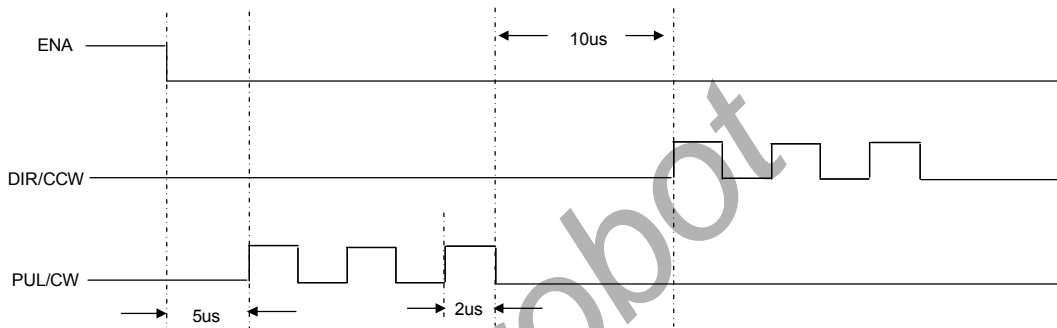


Figure 5-1



Figure 5-2

## 6 Electrical Characteristics and Technical Specifications

| Parameter | Condition | Min | Typical | Max | Unit |
|---|---|---|---|---|---|
| Power Voltage | Normal 25℃ | 9 | | 48 | V |
| Temperature | 24V DC | 0 | | 55 | ℃ |
| Maximum current of signal port | Source/sink current | 0 | | 20 | mA |
| Output current | Normal 25℃ | 0 | | 6 | A |
| Input pulse frequency | 24V DC voltage | 0 | | 250 | Khz |
| Speed range | 0 Microstepping | 0 | | 4000 | RPM |
| Idle current range | 3A operation current | 0 | Continuously adjustable | 3 | A |

## 7    Dimensions