



# SMD356C

## User Manual

### OVERVIEW

The SMD356C is a three-phase motor driver for hybrid stepper motors, supports 16 grades setting for both drive current and stepping subdivision, resolution up to 12000S/R. It is widely used in CNC equipment, sculpturing machine, cutting machine, etc.

### FEATURES

- Wide range voltage input (DC 24V~60V)
- 16 grades stepping subdivision setting, resolution up to 12000S/R
- 16 grades drive current setting, adjustable between 1.2A/Phase and 6.0A/Phase
- Supports three control modes: common cathode, common anode, and differential
- Supports alerts for undervoltage, overvoltage, overheat, overcurrent
- Supports phase memory when power down
- Optical isolation for both I/O signal and input signal
- When the stepping pulse stops over 100ms, coil current will be halved automatically
- Comes with development resources and manual (examples for Raspberry Pi, STM32, Arduino)

## SPECIFICATIONS

- Operating voltage: DC 24V ~ 80V
- Signal voltage: 4.2V ~ 24V
- Drive current: 0.5A ~ 5A
- Signal frequency:  $\leq 150\text{KHz}$
- Control mode: common cathode, common anode, and differential

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## HARDWARE



## PINOUT

There are two sets of sockets and DIP switches.

PIN	Description
PU+	Optical isolation positive port of pulse signals
PU-	Optical isolation negative port of pulse signals
DR+	Optical isolation positive port of direction signals
DR-	Optical isolation negative port of direction signals
MF+	Optical isolation positive port of motor-enable signals
MF-	Optical isolation negative port of motor-enable signals
U	U port of three-phase stepper motor
V	V port of three-phase stepper motor
W	W port of three-phase stepper motor

NC	Not connect
DC+	24~80V Power input
DC-	Ground

PU+/PU-: Pulse signals. The width of signal should larger than 2.5us. Motor move one step for one signal

DR+/DR-: Direction signal

MF+/MF-: Motor enable signal

#### Connection ways:

Common Cathode: Connect PU-, DR- and MF- to GND, connect PU+, DR+ and MF+ to GPIO, high active;

Common Anode: Connect PU+, DR+ and MF+ to 5~24V, connect PU-, DR- and MF- to GPIO, low active;

Differential: Combine Command Cathode and Common Anode.

**【Note】** Recommend Common Cathode connection

## SUBDIVISION

Support microstepping subdivision and current subdivision.

### MICROSTEPPING SUBDIVISION

User DIP switches to control microstepping.

REV/PULSE	D1	D2	D3	D4
300	ON	ON	ON	ON
500	ON	ON	ON	OFF

<b>600</b>	ON	ON	OFF	ON
<b>800</b>	ON	ON	OFF	OFF
<b>1000</b>	ON	OFF	ON	ON
<b>1200</b>	ON	OFF	ON	OFF
<b>2000</b>	ON	OFF	OFF	ON
<b>3000</b>	ON	OFF	OFF	OFF
<b>4000</b>	OFF	ON	ON	ON
<b>5000</b>	OFF	ON	ON	OFF
<b>6000</b>	OFF	ON	OFF	ON
<b>10000</b>	OFF	ON	OFF	OFF
<b>12000</b>	OFF	OFF	ON	ON
<b>1600</b>	OFF	OFF	ON	OFF
<b>3200</b>	OFF	OFF	OFF	ON
<b>6400</b>	OFF	OFF	OFF	OFF

D1/D2/D3/D4 are DIP switches used to control microstepping, support 16 level subdividing, default 200 pulse/circle.

Generally, step angle of two-phase stepper motor is 1.8 degree, so if it is set to 200, it requires 200 pulse signals for every circle.  $200 \times 1.8 = 360$

**【Note】** You should re-power on module to take effect.

## CURRENT SUBDIVISION

User DIP switches to control driving current.

RSM(A)	Peak(A)	D1	D2	D3	D4
1.2	1.7	OFF	OFF	OFF	OFF
1.5	2.1	OFF	OFF	OFF	ON
2.0	2.8	OFF	OFF	ON	OFF
2.3	3.2	OFF	OFF	ON	ON
2.5	2.5	OFF	ON	OFF	OFF
3.0	4.2	OFF	ON	OFF	ON
3.2	4.5	OFF	ON	ON	OFF
3.6	5.0	OFF	ON	ON	ON
4.0	5.6	ON	OFF	OFF	OFF
4.5	6.3	ON	OFF	OFF	ON
5.0	7.0	ON	OFF	ON	OFF
5.3	7.4	ON	OFF	ON	ON
5.5	7.7	ON	ON	OFF	OFF
5.8	8.1	ON	ON	OFF	ON
6.0	8.4	ON	ON	ON	OFF
6.0	8.4	ON	ON	ON	ON

D1\D2\D3\D4 are DIP switches used to control driving current, support 16 level

controlling. Larger the current, larger the torque.

**【Note】** You should re-power to take effect.

## USE GUIDES

### DOWNLOAD DEMO CODES

Please visit Waveshare Wiki, search with key words "SMD356C. Download the demo code from [wiki](#),

### Resources [\[edit\]](#)

- [User Manual](#)
- [Demo code](#)

Extract it and you can get these folders:

 Arduino	2018/11/26 19:18	文件夹
 RaspberryPi	2018/11/24 17:27	文件夹
 STM32	2018/11/26 19:18	文件夹

Arduino<sup>1</sup>: Demo code for Arduino UNO;

RaspberryPi: Demo codes for Raspberry Pi. (BCM2835, wiringPi and python)

STM32: Demo code for STM32, control board is STM32F103RBT6

### CONNECT STEPPER MOTORS

SMD258C is three-phase stepper motor driver, can drive three-phase stepper motors.

Standard three-phase stepper motor has three lines, their colors are red, yellow and blue.

U- red line

V- yellow line

W-blue line

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<sup>1</sup> If you use other Arduino board, you should check if it is compatible with Arduino Uno, or modification is required.

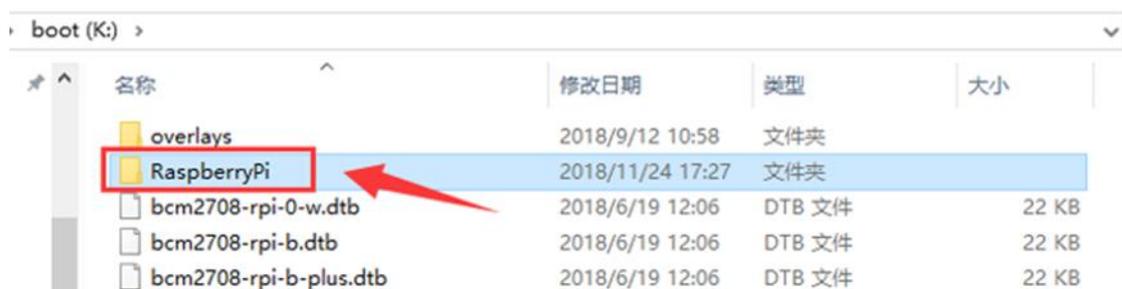
## RASPBERRYPI EXAMPLES

### COPY EXAMPLES TO RASPBERRY PI

1. Insert SD card which has Raspbian installed to your PC



2. Copy RaspberryPi extracted to root directory (BOOT) of SD card



3. Power on your Raspberry Pi and open Terminal, you can find that the examples is listed in boot directory

```
pi@raspberrypi:~$ ls /boot/
bcm2708-rpi-0-w.dtb  bcm2710-rpi-3-b.dtb  config.txt  fixup_x.dat  kernel.img  start_cd.elf
bcm2708-rpi-b.dtb  bcm2710-rpi-3-b-plus.dtb  COPYING.Linux  FSCK0000.REC  LICENCE.broadcom  start_db.elf
bcm2708-rpi-b-plus.dtb  bcm2710-rpi-cm3.dtb  fixup_cd.dat  FSCK0001.REC  LICENSE.oracle  start.elf
bcm2708-rpi-cm.dtb  bootcode.bin  fixup.dat  issue.txt  overlays  start_x.elf
bcm2709-rpi-2-b.dtb  cmdline.txt  fixup_db.dat  kernel7.img  RaspberryPi  System Volume Information
```

4. Copy the RaspberryPi folder to /home/pi and change its execute permission.

```
sudo cp -r /boot/RaspberryPi/ ./
```

```
sudo chmod 777 -R RaspberryPi/
```

```
pi@raspberrypi:~$ sudo cp -r /boot/RaspberryPi/ ./
pi@raspberrypi:~$ ls
code  libcode  RaspberryPi  RPiLib  ubuntu  usbdisk
pi@raspberrypi:~$ sudo chmod 777 -R RaspberryPi/
pi@raspberrypi:~$ ls
code  libcode  RaspberryPi  RPiLib  ubuntu  usbdisk
```

---

## LIBRARIES INSTALLATION

To use demo codes, libraries should be installed first.

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### BCM2835 LIBRARY

Download link of the bcm2835 library: <http://www.airspayce.com/mikem/bcm2835/>

Download the library and copy it to raspberry pi without extracting. Open terminal of raspberry pi and install:

```
sudo tar zxvf bcm2835-1.xx.tar.gz

cd bcm2835-1.xx

sudo ./configure

make

sudo make check

sudo make install
```

Note: xx is version of the library you download. For example, if the version is bcm2835-1.52, you should complete the command to: sudo tar zxvf bcm2835-1.52.tar.gz

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### WIRINGPI LIBRARY

Open Terminal and install wiringPi with commands below:

```
sudo apt-get install git

sudo git clone git://git.drogon.net/wiringPi

cd wiringPi
```

```
sudo ./build
```

---

## PYTHON LIBRARY

Open Terminal and execute commands to install:

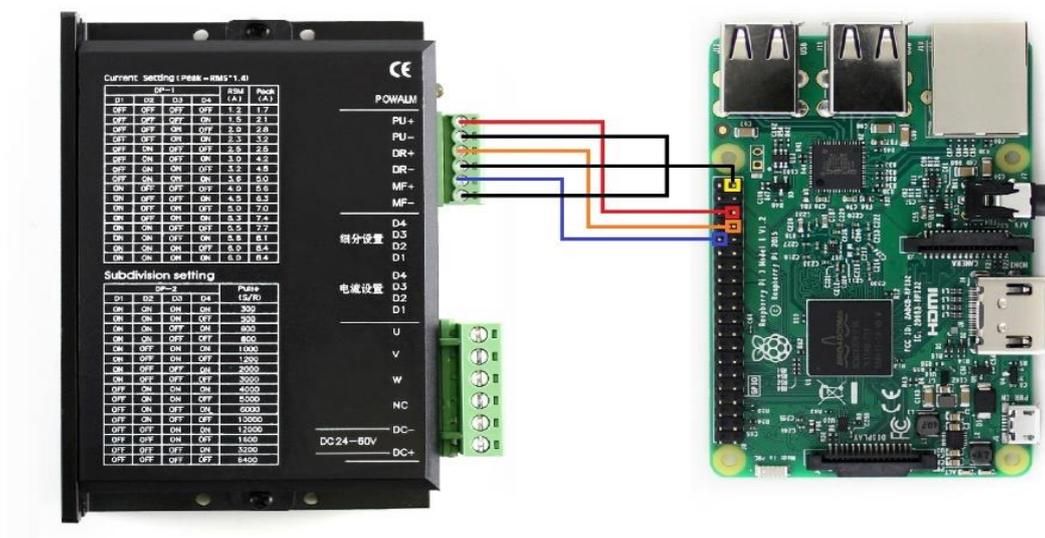
```
sudo apt-get install python-pip
sudo pip install RPi.GPIO
sudo pip install spidev
```

---

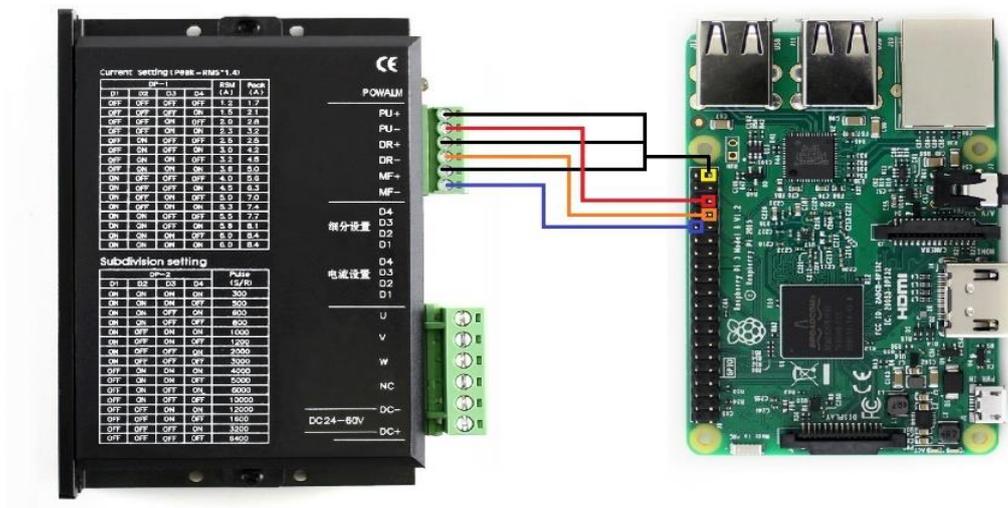
## HARDWARE CONNECTION

Driver	RaspberryPi(BCM2835)	
	Common Cathode	Common Anode
PU+	19	5V
PU-	GND	19
DR+	13	5V
DR-	GND	13
MF+	12	5V
MF-	GND	12

## Common Cathode



## Common Anode



**【Note】** Common Cathode: High active; Common Anode: Low active

## RUNNING DEMO CODE

- BCM2835:  
  
cd bcm2835  
  
sudo ./motor

- wiringpi:

```
cd wiringpi
```

```
sudo ./motor
```

- python:

```
cd python
```

```
sudo python main.py
```

- Expected result:

Motor will rotate a circle clockwise and then rotate two circles anticlockwise

### STM32 EXAMPLE

The development board used is XNUCLEO-F103RB. Project is based on HAL library

### HARDWARE CONNECTION

Driver	XNUCLEO-F103RB	
	Common Cathode	Common Anode
PU+	PB4	5V
PU-	GND	PB4
DR+	PB10	5V
DR-	GND	PB10
MF+	PB8	5V
MF-	GND	PB8

**【Note】** Common Cathode: High active; Common Anode: Low active

## ARDUINO

The development board used herein is Arduino UNO

Driver	Arduino UNO	
	Common Cathode	Common Anode
PU+	5	5V
PU-	GND	5
DR+	6	5V
DR-	GND	6
MF+	7	5V
MF-	GND	7

【Note】 Common cathode: High active; Common anode: Low active

## FAQ

### 1. Why motor and driver board get very hot?

Energy efficiency of stepper motor is very low, has only 20%~30% useful work, others become heat. So, stepper motor will get very hot after running for long time. Do not touch!!!

### 2. Why doesn' t motor work and only be shaking?

Motor shake when lack-phase, try to connect motor with Dupont lines if both interfaces of module cannot work properly

### 3. Why do motor desynchronize?

The phase current is based on torsion of stepper motor. You can adjust the blue potentiometer if motor desynchronize.

### 4. Why do motor sound "si, si" when stopping?

It is normal phenomenon.

### 5. How to use RS232 interface on board.

The RS232 interface is used to factory configure driver board, which is unavailable for users.