

# 2DM542

4.2A 50V<sub>DC</sub> Digital Stepper Drive

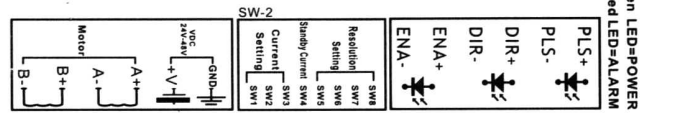
2DM542 is a two phase digital stepper driver based on ARM STM32. Its Micro step resolutions and output current are programmable. And it has advanced control algorithm, which can brings a unique level of system smoothness, provides optimum torque and mid-range instability. The control algorithm of Multi-Stepping can make stepper motor has smooth system performance. The control algorithm of torque compensation can improve the torque of motor in the high speed. The control algorithm of motor self-test and parameter auto-setup technology offers optimum responses with different motors and easy-to-use. The control algorithm of smoothness can enhance the acceleration and deceleration of motor (*S - Curve*). Its unique features make the 2DM542 to be an ideal solution for applications.



SW-2 Microstep Setting					SW-2 Current Setting				SW-1 Smoothness		
Steps per Revolution	5	6	7	8	Current Table	1	2	3	Smoothness	Sw4	Sw5
400	off	on	on	on	1.00A	on	on	on	0	off	off
800	on	off	on	on	1.46A	off	on	on	1	off	on
1600	off	off	on	on	1.91A	on	off	on	2	on	off
3200	on	on	off	on	2.37A	off	off	on	3	on	on
6400	off	on	off	on	2.84A	on	on	off			
12800	on	off	off	on	3.31A	off	on	off			
25600	off	off	off	on	3.76A	on	off	off			
1000	on	on	on	off	4.2A	off	off	off			
2000	off	on	on	off							
4000	on	off	on	off							
5000	off	off	on	off							
8000	on	on	off	off							
10000	off	on	off	off							
20000	on	off	off	off							
25000	off	off	off	off							

Peak Current=RMS\*1.4

Sw1: Off=Run; On=Self Test  
Sw2: Off=Pul&Dir; On=Cw/Ccw  
Sw3: Off=Up edge; On=Down edge

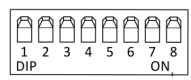


- Parameter auto-setup and motor self-test
- Multi-Stepping inside, small noise, low heating, smooth movement
- Torque compensation in high speed
- Variable current control technology, high current efficiency
- *S - Curve* dynamic acceleration and deceleration filtering provides a smooth *Start/Stop* motion, reducing mechanical wear and tear
- Support *PUL/DIR* and *CW/CCW* modes
- Storage the position of motor
- Optically isolated input and compatible with 5V to 24V
- User-defined micro steps
- Micro-step resolutions and Output current programmable
- Over current and over voltage protection
- Automatic detection, flexible selection of pulse edge count mode
- Green light means running while red light means protection or off line

## SPECIFICATION

Parameter	Min	Typical	Max	Unit
Input Voltage(DC)	24	48	50	VDC
Output Current	1	-	4.2	A
Pulse Signal Frequency	0	-	200	kHz
Pulse width	2.5			μs

## SW2



### CURRENT SETTING

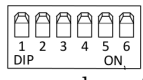
peek	rms	SW2-1	SW2-2	SW2-3
1.00A	0.71A	on	on	on
1.46A	1.04A	off	on	on
1.91A	1.35A	on	off	on
2.37A	1.68A	off	off	on
2.84A	2.01A	on	on	off
3.31A	2.35A	off	on	off
3.76A	2.67A	on	off	off
4.20A	2.98A	off	off	off

SW2-4 is used for setting the standstill current, "off" means the standstill current is set to be half of the selected dynamic current or other current, which can be set by the *HISU* (via rs232).  
SW2-4 = off Half Current = on Full Current

### MICROSTEP SETTING

step/rev	SW2-5	SW2-6	SW2-7	SW2-8
400	off	on	on	on
800	on	off	on	on
1600	off	off	on	on
3200	on	on	off	on
6400	off	on	off	on
12800	on	off	off	on
25600	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
5000	off	off	on	off
8000	on	on	off	off
10000	off	on	off	off
20000	on	off	off	off
25000	off	off	off	off

## SW1



The SW1 switch is mainly a number of auxiliary functions, the auxiliary functions of the first three switch are respectively motor self detection, pulse counting mode and single pulse selection; fourth and fifth are set for the smoothing coefficient, and the last one is reserved.

- SW1-1 : Off=Run (normal) On=Self Test
- SW1-2 : Off=Pul&Dir (normal) On=Cw/Ccw
- SW1-3 : Off=Up edge (normal) On=Down edge
- SW1-6 : RESERVED

### SMOOTH COEFFICIENT

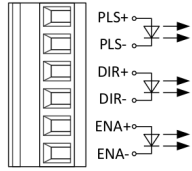
Smoothness	SW1-4	SW1-5
0	off	off
1	off	on
2	on	off
3	on	on

The Smoothness must be set to the same value for each driver in multi-axis applications

## Control Signal Input Connector

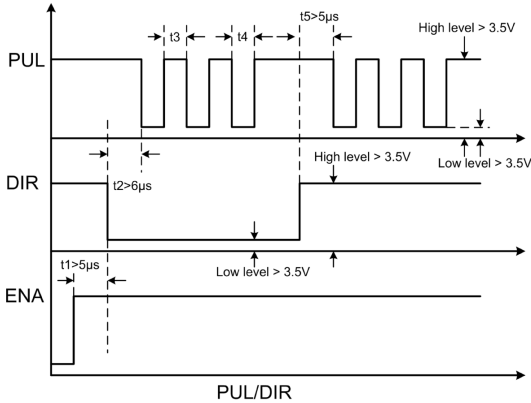
PLS+	Puls signal+
PLS-	Puls signal-
DIR+	Direction signal+
DIR-	Direction signal-
ENA+	Enable signal+
ENA-	Enable signal-

Compatible with 5V to 24V



## Control Signal

In order to avoid some fault operations and deviations, PUL, DIR and ENA should abide by some rules, shown as following diagram:

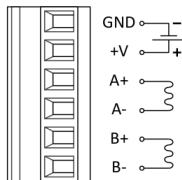


- t1: ENA must be ahead of DIR by at least  $5\mu s$ . Usually, ENA+ and ENA- are NC (not connected).
- t2: DIR must be ahead of PUL active edge by  $6\mu s$  to ensure correct
- t3: Pulse width not less than  $2.5\mu s$
- t4: Low level width not less than  $2.5\mu s$

## Power and Motor Connector

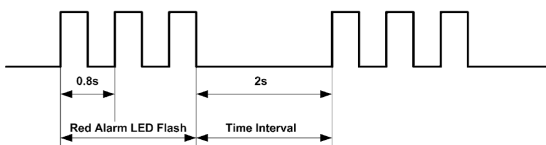
GND	Power Input Negative
+V	Power Input Positive
A+	Motor Phase A+
A-	Motor Phase A-
B+	Motor Phase B+
B-	Motor Phase B-

+V DC 24V - 50V



## Output Alarm Signal

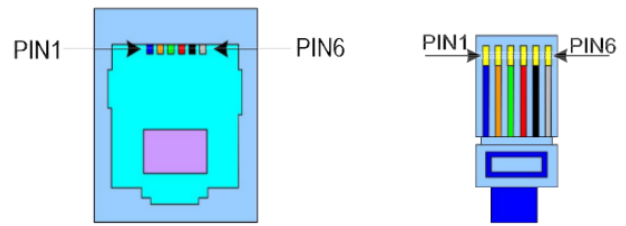
Faults alarm and LED flicker frequency



flash(s)	description to the Faults
1	Error occurs when the motor coil current exceeds the drive's current limit.
2	Voltage reference error in the drive
3	Parameters upload error in the drive
4	Error occurs when the input voltage exceeds the drive's voltage limit.

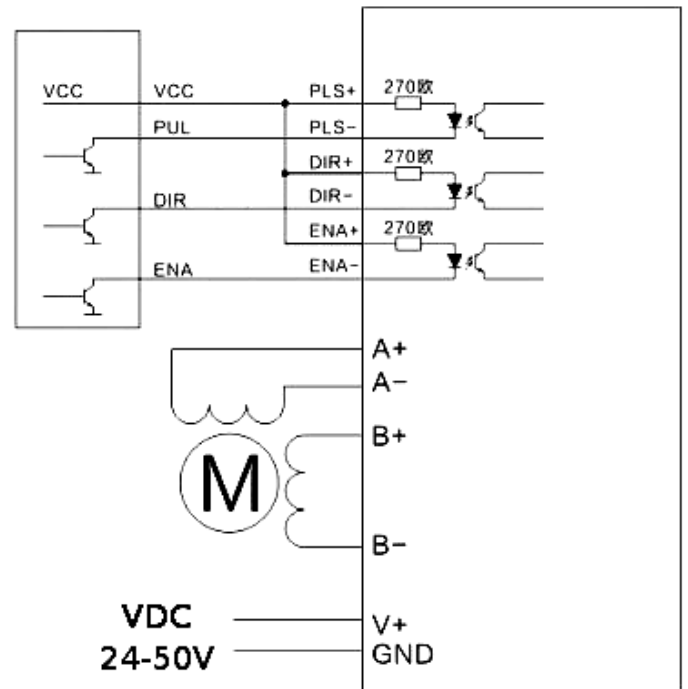
The drive will halt when there is fault. The user need to disconnect power source and reconnect the power source to eliminate the fault.

## Connections to RS232 Serial Interface

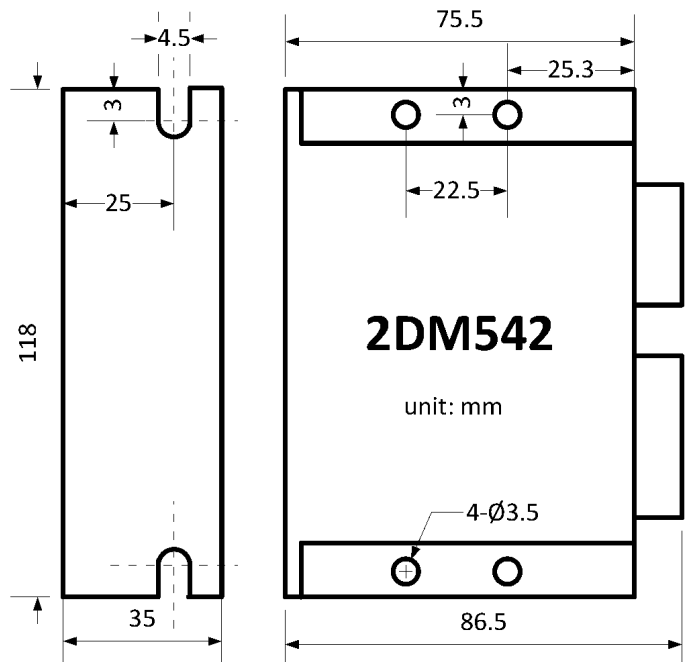


PIN1	TXD	Transmit Data
PIN2	RXD	Receive Data
PIN4	+5V	Power Supply to HISU
PIN6	GND	Power Ground

## Typical Connection



## Mechanical Specifications



## Parameter Setting

The parameter setting method of 2DM542 drive is to use a *HISU* adjuster through the RS232 serial communication ports, only in this way we can set the parameters we want. There are a set of best default parameters to the corresponding motor which are carefully adjusted by our engineers, users only need refer to the following table, specific condition and set the correct parameters.

Mode	Definition	Range	Dimension	Drive Restart	Default Value
<b>P1</b>	Current loop $K_p$	0 – 4000	1	<i>N</i>	1000
<b>P2</b>	Current loop $K_i$	0 – 1000	1	<i>Y</i>	50
<b>P3</b>	Damping coefficient	0 – 500	1	<i>N</i>	200
<b>P4</b>	Amplitude of 1– resonance point	0 – 100	1	<i>N</i>	0
<b>P5</b>	Phase of 1– resonance point	0 – 100	1	<i>N</i>	0
<b>P6</b>	Amplitude of 2– resonance point	0 – 100	1	<i>N</i>	0
<b>P7</b>	Phase of 2– resonance point	0 – 100	1	<i>N</i>	0
<b>P8</b>	Anti-resonance coefficient	0 – 1000	1	<i>N</i>	0
<b>P9</b>	Reserved				
<b>P10</b>	Enable signal level	0 – 1	1	<i>N</i>	0
<b>P11</b>	Initial direction selection	0 – 1	1	<i>N</i>	0
<b>P12</b>	Reserved				
<b>P13</b>	Command Type	0 – 1	1	<i>Y</i>	0
<b>P14</b>	User-defined micro steps	4 – 1000	50	<i>Y</i>	0
<b>P15</b>	Time of standstill current	0 – 4000	<i>1ms</i>	<i>N</i>	1000
<b>P16</b>	Percentage of standstill current	0 – 100	1	<i>Y</i>	50
<b>P17</b>	Speed smoothness	0 – 10	1	<i>Y</i>	50
<b>P18</b>	Enable of position memory	0 – 1	1	<i>Y</i>	0
<b>P19</b>	User-defined resistance of motor	0 – 100	<i>mh</i>	<i>Y</i>	0
<b>P20</b>	User-defined inductance of motor	0 – 100	<i>0.1Ohm</i>	<i>Y</i>	0
<b>P21</b>	Result of position memory	0-128	1		0
<b>P22</b>	Reserved				

There are total 22 parameter configurations, use the *HISU* to download the configured parameters to the drive, the detail descriptions to every parameter configuration are as follows:

### Current loop $K_p$ (P1) & Current loop $K_i$ (P2)

The **P1** and **P2** is used to set  $K_p$  and  $K_i$  of Current loop at the moment of power-on. When the motor is turning, the  $K_p$  and  $K_i$  is got by the Self-tuning algorithm.

#### Current loop $K_p$

Increase  $K_p$  to make current rise fast. Proportional Gain determines the response of the drive to setting command. Low Proportional Gain provides a stable system (doesn't oscillate), has low stiffness, and the current error, causing poor performances in tracking current setting command in each step. Too large proportional gain values will cause oscillations and unstable system.

#### Current loop $K_i$

Adjust  $K_i$  to reduce the steady error. Integral Gain helps the drive to overcome static current errors. A low or zero value for Integral Gain may have current errors at rest. Increasing the integral gain can reduce the error. If the Integral Gain is too large, the system may "hunt" (oscillate) around the desired position.

### Damping coefficient (P3)

This parameter is used to change the damping coefficient in case of the desired operating state is under resonance frequency. This parameter is useful in high speed.

### Amp 1 – 2 & Phase 1 – 2 (P4,P5,P6,P7)

2DM542Driver provides robust anti-resonance control to stop the vibrations and maintain equilibrium.

**Amp1** and **Phase1** is Phase adjustment for 1st and Amplitude adjustment for 1st resonance area respectively. Usually between 0.6rps and 1.2rps.

**Amp2** and **Phase2** is Phase adjustment for 2nd and Amplitude adjustment for 2nd resonance area respectively. Usually between 1.2rps and 2.4rps.

### Anti-resonance coefficient (P8)

This parameter is used for reducing resonance. Usually between 3rps and 4rps.

### Enable signal level (P10)

This parameter is set to control the Enable Input signal level. 0 means high, while 1 means low.

### Initial direction selection (P11)

For the initial direction selection, 1 indicates that the initial direction is the counter clockwise, and the 0 indicates the initial direction is clockwise.

### User-defined micro steps (P14)

This parameter is set of user-defined micro steps. The actual micro steps = the set value  $\times$  50. For example, if the parameter is 4, the micro steps is  $4 \times 50 = 800$ . But If this parameter is 0, which means micro steps is set by the outer DIP switches.

### Time of standstill current (P15)

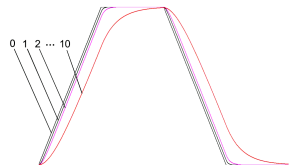
This parameter is set the time when the standstill current is set to be half of the selected dynamic current or other current.

### Percentage of standstill current (P16)

This parameter is set the percentage of standstill current.

## Speed smoothness (P17)

This parameter is set to control the smoothness of the speed of the motor while acceleration or deceleration, the larger the value, the smoother the speed in acceleration or deceleration.



## Enable of position memory (P18)

This parameter is set to enable the function of position memory. 0 means disable, while 1 means enable. If set 1, the 2DM542 can remember the position of motor in the next time of power on.

## User-defined inductance of motor (P19)

This parameter is set the inductance of motor. 0 means 2DM542 gets the inductance by control algorithm of Parameter auto-setup, while 1 means 2DM542 gets the inductance through user sets.

## User-defined resistance of motor (P20)

This parameter is set the resistance of motor. 0 means 2DM542 gets the resistance by control algorithm of Parameter auto-setup, while 1 mean 2DM542 gets the resistance through user sets.

## Result of position memory (P21)

This parameter is set to control the smoothness of Display the result of position memory

# Processing Methods to Common Problems and Faults

## Power on power light off

No power input, please check the power supply circuit. The voltage is too low.

## Power on red alarm light on

- Please check the motor is connected with the drive.
- The stepper digital drive is over voltage or under voltage. Please lower or increase the input voltage.

## After input pulse signal but the motor not running

- Please check the input pulse signal wires are connected in reliable way.
- Please make sure the input pulse mode is corresponding with the real input mode.
- The Driver is disabled.