M325 Micro Microstepping Driver

1. Introduction

The M325 is a very small size high performance microstepping driver based on one of the most advanced technologies in the world today. It's suitable for driving any 2-phase and 4-phase hybrid stepping motors. By using advanced bipolar constant-current chopping technique, it can output more speed and power from the same motor, compared with traditional drivers such as L/R drivers. Its 3-state current control technology allows coil currents to be well controlled with relatively smaller current ripple, therefore less motor heating is achieved.

2. Features

- High performance
- Low cost
- Supply voltage up to +24VDC
- Output current up to 2.5A
- Pulse frequency up to 100 KHz
- Input signals TTL compatible and optically isolated
- Automatic idle-current reduction
- 3-state current control technology for less motor heating
- 4 selectable microstep resolutions: 1, 2, 4, 8
- PUL/DIR & CW/CCW mode optional
- Suitable for 2-phase and 4-phase motors
- DIP switch current setting with 7 different values
- Small size: 86*55*20mm

3. Applications

Suitable for a wide range of stepping motors from NEMA size 14 to 23, which used in various kinds of machines, such as X-Y tables, labeling machines, laser cutters, engraving machines, pick-place devices, and etc. It's specially adapted to the applications desired with low vibration, high speed and high precision.

4. Specifications

Electrical Specifications (T_j = 25℃)

Parameters	M325			
	Min.	Typical	Max.	Unit
Peak output current	0.39	-	2.5	Amps
Supply voltage	+12	-	+24	VDC
Logic signal current	7	10	16	mA
Pulse input frequency	0	-	100	KHz
Isolation resistance	500	-	-	MΩ

Operating Environment and Other Specifications

Cooling	Natural Cooling or forced cooling	
Operating Environment	Environment	Avoid dust, oil fog and corrosive gases
	Ambient Temperature	0℃ — 50℃
	Humidity	40%RH — 90%RH
	Operating Temperature	70℃ Max
	Vibration	5.9m/s^2 Max
Storage Temperature	-20℃ — 65℃	
Weight	Approx. 150 gram (5.3 oz)	

Mechanical Specifications (unit=mm, 1 inch=25.4 mm)

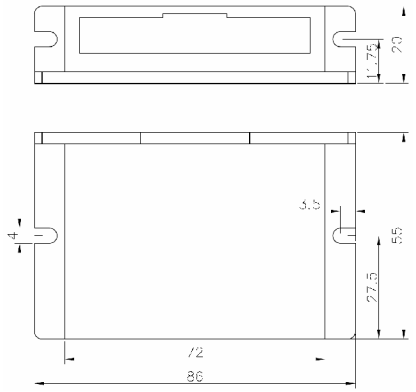


Figure 1: Mechanical dimensions

*Recommend use side mounting for better heat dissipation

5. Pin Assignment and Description

The M325 has two connectors, connector P1 for control signals connections, and connector P2 for power and motor connections. The following tables are brief descriptions of the two connectors of the M325.

Connector P1 Configurations

Pin Function	Details
PUL	Pulse signal: In single pulse (pulse/direction) mode, this input represents pulse signal, active at each rising or falling edge (set by inside jumper J1); 4-5V when PUL-HIGH, 0-0.5V when PUL-LOW. In double pulse mode (pulse/pulse) , this input represents clockwise (CW) pulse，active at high level or low level (set by inside jumper J1). For reliable response, pulse width should be longer than 3.0μs. Series connect resistors for current-limiting when +12V or +24V used.
DIR	Direction signal: In single-pulse mode, this signal has low/high voltage levels, representing two directions of motor rotation; in double-pulse mode (set by inside jumper J2), this signal is counter-clock (CCW) pulse，active at high level or low level (set by inside jumper J1). For reliable motion response, DIR signal should be ahead of PUL signal by 5μs at least. 4-5V when DIR-HIGH, 0-0.5V when DIR-LOW. Please note that motion direction is also related to motor-driver wiring match. Exchanging the connection of two wires for a coil to the driver will reverse motion direction.
OPTO	Opto-coupler power supply, and the typical voltage is +5V.
ENA	Enable signal: This signal is used for enabling/disabling driver. High level for enabling driver and low level for disabling driver. Usually left unconnected (enabled).

Select Active Edge or Active Level and Control Signal Mode

There are two jumpers J1 and J2 inside the M325 specifically for selecting active edge or active level and control signal mode, as shown in figure 2. Default setting is PUL/DIR mode and upward-rising edge active.

(a) J1, J2 open circuit
PUL/DIR mode and active at upward-rising edge

(b) J1 short circuit, J2 open circuit
PUL/DIR mode and active at downward-falling edge

(c)J1 open circuit, J2 short circuit
CW/CCW mode and active
at high level (The fixed level)

(d) J1, J2short circuit
CW/CCW mode and active
at low level (The fixed level)

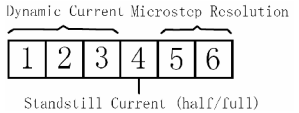
Figure 2: J1 and J2 jumpers

Connector P2 Configurations

Pin Function	Details
Gnd	DC power ground
+V	DC power supply, 12~24VDC, Including voltage fluctuation and EMF voltage.
A+, A-	Motor Phase A
B+, B-	Motor Phase B

6. Selecting Microstep Resolution and Driver Output Current

This driver uses a 6-bit DIP switch to set microstep resolution, and motor operating current, as shown below:



Microstep Resolution Selection

Microstep resolution is set by SW 5, SW 6 of the DIP switch as shown in the following table:

Microstep	Steps/rev.(for 1.8°motor)	SW5	SW6
1	200	ON	ON
2	400	OFF	ON
4	800	ON	OFF
8	1600	OFF	OFF

Current Settings

The first three bits (SW1, 2, 3) of the DIP switch are used to set the dynamic current. Select a setting closest to your motor's required current.

Dynamic Current Setting

Peak current (A)	SW1	SW2	SW3
0.39A	OFF	ON	ON
0.71A	ON	OFF	ON
1.10A	OFF	OFF	ON
1.42A	ON	ON	OFF
1.81A	OFF	ON	OFF
2.13A	ON	OFF	OFF
2.52A	OFF	OFF	OFF

Notes: Due to motor inductance, the actual current in the coil may be smaller than the dynamic current setting, particularly under high speed condition.

Standstill Current

SW4 is used for this purpose. OFF meaning that the standstill current is set to be half of the selected dynamic current, and ON meaning that standstill current is set to be the same as the selected dynamic current.

The current automatically reduced to 60% of the selected dynamic current 0.2 second after the last pulse. Theoretically, this will reduce motor heating to 36% (due to $P=I^2*R$) of the original value. If the application needs a different standstill current, please contact Leadshine.

7. Typical Connections

A complete stepping system should include stepping motor, stepping driver, power supply and controller (pulse generator). The following figures are two typical connections of the M325.

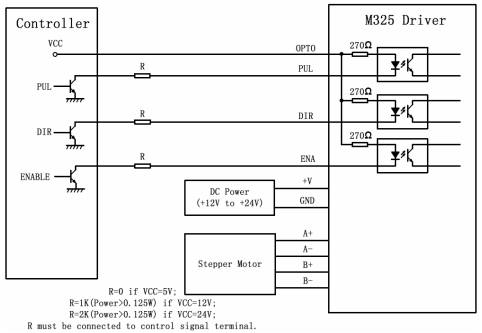


Figure 3: Typical connection with open-collector controller

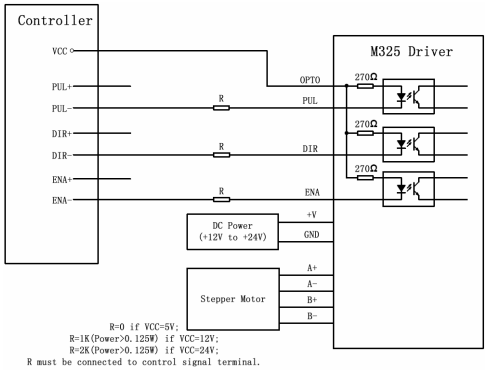


Figure 4: Typical connection with difference controller