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DMA872S digital two-phase stepper driver

一、Product Introduction

1. Overview

DMA872S is a two-phase digital stepper driver launched by Green IoT Technology Co., Ltd. It adopts a servo-like control principle, integrates vector control technology, built-in micro-segmentation technology, and adaptive filtering technology, greatly optimizing the performance of the stepper motor. It runs smoothly at low, medium and high speeds with low noise. The precise and smooth pure sinusoidal current vector control technology effectively reduces the heating of the motor. It has a very high cost-effectiveness and can meet the application needs of most occasions.

The DMA872S driver supports AC and DC power supply, and its driving voltage range is AC18~55V/DC20~80V. It is suitable for two-phase hybrid stepper motors with a peak current below 7.2A and an outer diameter of 42~86mm.

2. Features

●New 32-bit DSP technology●Easy to install

●Can drive 4, 6, 8-wire two-phase stepper motor Optically isolated differential signal input

●Built-in micro-segmentation ●Pulse response frequency up to 200KHz (higher frequency can be adjusted)

●Precise current control greatly reduces motor heating ●Low vibration and low noise

●The current automatically halves when stationary ●With overvoltage, undervoltage, overcurrent, phase loss and other protection functions

● Both AC and DC power supply

3. Application Areas

Suitable for various small and medium-sized automation equipment and instruments, such as: engraving machines, marking machines, cutting machines, plotters, CNC machine tools, automatic assembly equipment, etc. It has a particularly good application effect in equipment applications where users expect low noise and high speed.

2. Electrical, Mechanical and Environmental Indicators

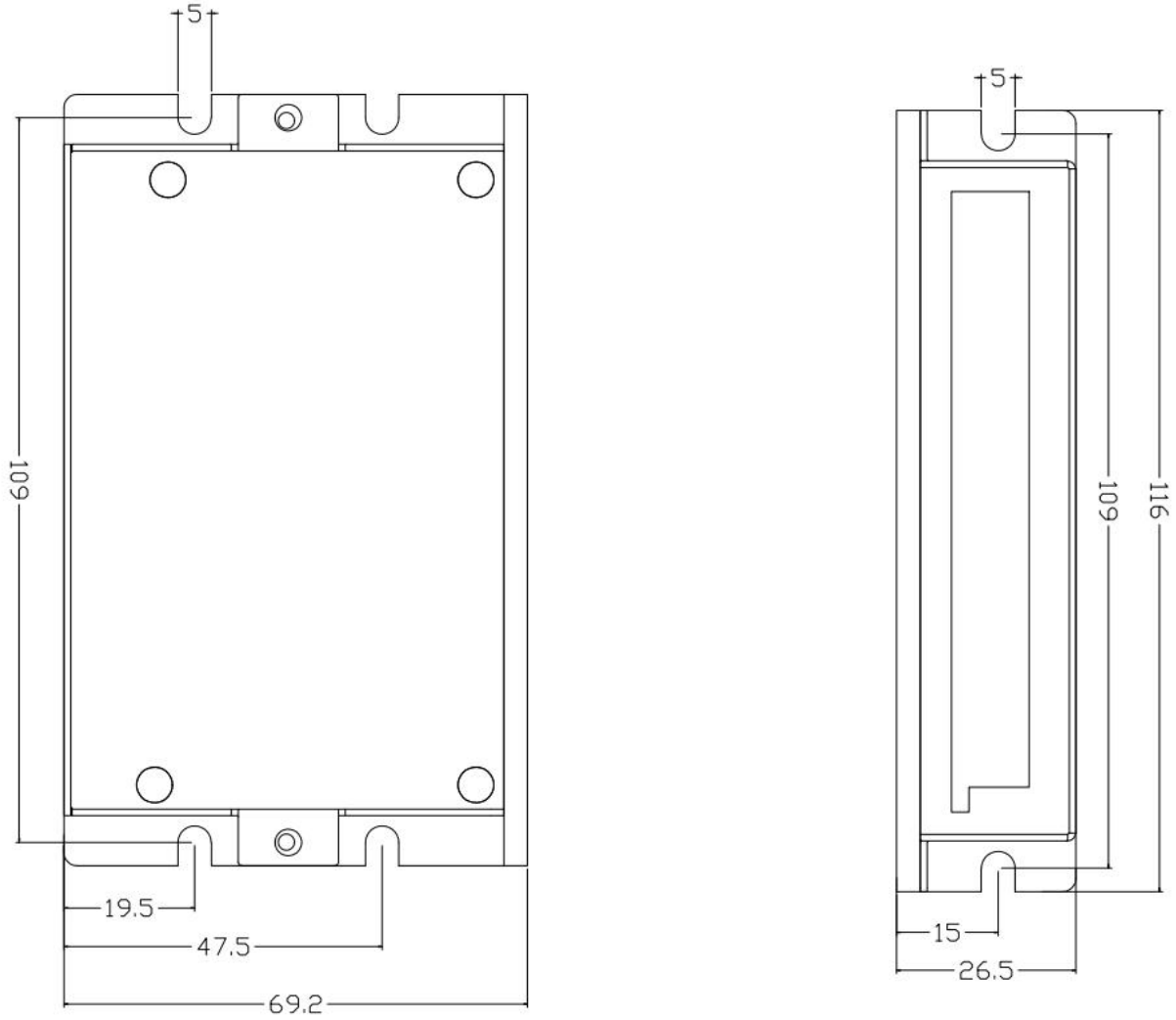
1. Electrical Specifications

illustrate	DMA872S			
	Minimum	Typical Value	Maximum	unit
Output Current	2.1	-	7.2	A
Input power voltage (DC)	20	48	80	VDC
Input power voltage (AC)	18	36	55	VAC
Control signal input current	7	10	16	mA
Step pulse frequency	0	-	200	KHz
Insulation resistance	50			MΩ

2. Use environment and parameters

Cooling method		Natural cooling, fan cooling
Usage Environment	**occasion**	Do not place it near other heating equipment. Avoid dust, oil mist, corrosive gas, high humidity and strong vibration. Flammable gas and conductive dust are prohibited.
	temperature	0——50℃
	humidity	40-90%RH
	vibration	10~55Hz/0.15mm
Storage temperature		-20℃~65℃

3. Mechanical installation drawing



Front installation diagram Side installation diagram

Figure 1 Installation dimensions (unit: mm)

※Side installation is recommended for better heat dissipation. When designing the installation dimensions, pay attention to the terminal size and wiring!

4. Enhanced heat dissipation

1）The reliable operating temperature of the driver is usually within 50℃, and the operating temperature of the motor is within 80℃;

2）It is recommended to select the automatic half-current mode when using, that is, when the motor stops, the current is automatically reduced by half to reduce the heating of the motor and driver;

3）When installing the driver, please install it sideways and allow strong air convection to form on the bottom of the driver. If necessary, install a fan near the driver inside the machine to form air convection to assist in heat dissipation and ensure that the driver operates within a reliable operating temperature range.

3. Driver interface and wiring introduction

1. Interface Description

1) Control signal interface

name	Function
PLS+	Pulse control signal: +5V-+24V can be driven, rising edge is effective, every time the pulse changes from high to low, the motor takes a microstep. In order to reliably respond to the pulse signal, the pulse width should be greater than 2μs.
PLS-	
DIR+	Direction control signal: can be driven by +5V-+24V, high/low level signal. To ensure reliable commutation of the motor, the direction signal should be established at least 5μs before the pulse signal. The initial running direction of the motor is related to the motor wiring. Interchanging any phase winding (such as A+ and A-) can change the initial running direction of the motor.
DIR-	
ENA+	Enable control signal: +5V-+24V can be driven, high/low level signal. Used to enable or disable the operation of the motor. When ENA+ is connected to +5V and ENA- is connected to a low level, the driver will cut off the current of each phase of the motor to put the motor in a free state, and the step pulse will not be responded to at this time. When this function is not needed, the enable signal terminal can be left floating.
ENA-	

2) Strong power interface

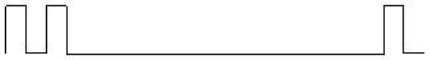
name	Function
AC2	Universal AC and DC, regardless of positive or negative, range AC18~55V/DC20~80V
AC1	
A+、A-	Motor A phase coil
B+, B-	Motor B phase coil

3) Status Indicator

The green LED is the power indicator light. When the driver is powered on, the LED is always on; when the driver is powered off, the LED is off.

The red LED is a fault indicator. When a fault occurs, the indicator flashes in a cycle of 3 seconds. When the fault is eliminated by the user, the red LED goes out. The number of times the red LED flashes in 3 seconds

represents different fault information. The specific relationship is shown in the following table:

Serial number	Number of flashes	Red LED flashing waveform	Fault Description
1	1		Overcurrent, phase short circuit or poor contact fault
2	2		Overvoltage fault (voltage>DC80V)
3	3		Undervoltage fault (voltage<DC20V)
4	5		Motor open circuit(Phase missing)

2. Control signal interface circuit

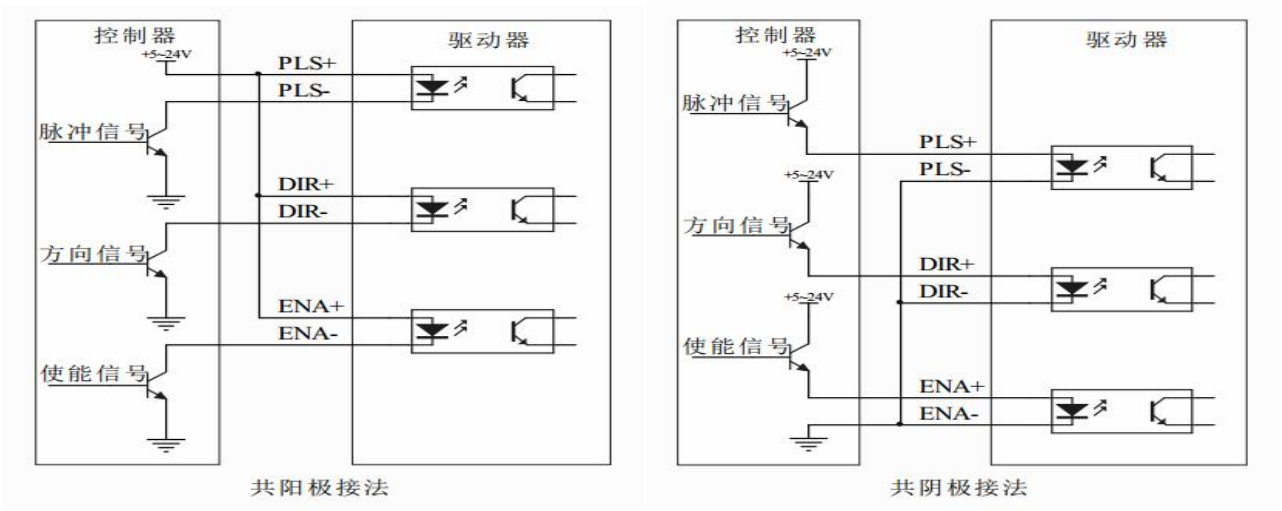


Figure 2 Input interface circuit

The DMA872S driver control signal end adopts a differential interface circuit, which can be used for differential signals, single-ended common cathode and common anode interfaces, etc. It has a built-in high-speed optocoupler and has strong anti-interference ability in harsh environments. The interface circuit diagram is shown in Figure 2.

▶Note: DMA872S is a 5V-24V universal driver, so the signal control end does not need a series resistor!

3. Control signal timing diagram

In order to avoid some false actions and deviations, PLS, DIR and ENA should meet certain requirements, as

shown in the following figure:

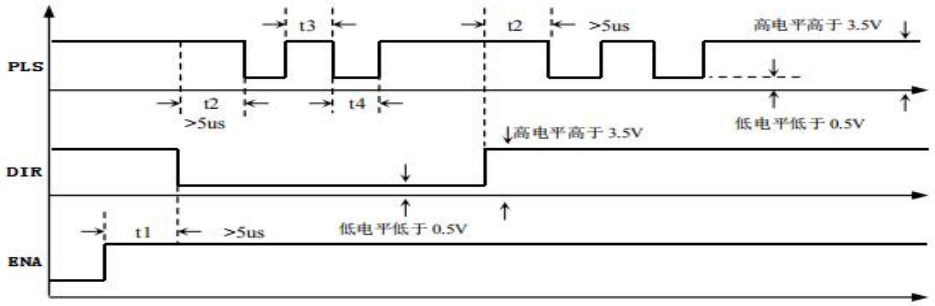


Figure 3 Control signal timing diagram

Notes:

1）t1: ENA (enable signal) should be at least 5ms ahead of DIR and determined to be high. In general, it is recommended that ENA+ and ENA- be left floating.

2）t2: DIR determines its state high or low at least 5μs in advance of the falling edge of PLS.

3）t3: The pulse width is at least 2.5μs.

4）t4: Low level width is not less than 2.5μs.

4. Wiring requirements

1）In order to prevent the driver from being interfered, it is recommended that the control signal use shielded cable, and the shield layer is short-circuited with the ground wire. Except for special requirements, the shield line of the control signal cable is grounded at one end: the host computer end of the shield line is grounded, and the driver end of the shield line is suspended. Only the same point is allowed to be grounded in the same machine. If it is not a real ground wire, there may be serious interference. In this case, the shield layer is not connected.

2）The pulse and direction signal lines are not allowed to be wrapped side by side with the motor lines. It is best to separate them by at least 10 cm. Otherwise, the motor noise will easily interfere with the pulse direction signals and cause inaccurate motor positioning, system instability and other faults.

3）If one power supply supplies multiple drives, they should be connected in parallel at the power supply. Chain connection from one drive to another is not allowed.

4）It is strictly forbidden to plug or unplug the high-voltage terminals of the driver while it is powered on. When the motor is stopped, there is still a large current flowing through the coil. Plugging or unplugging the terminals while it is powered on will cause a huge instantaneous induced electromotive force that will burn out the driver.

5) It is strictly forbidden to connect the wire end to the terminal after tinning it, otherwise the contact resistance may increase and the terminal may be damaged by overheating.

6) The wiring ends must not be exposed outside the terminals to prevent accidental short circuits and damage to the driver.

四、DIP switch function setting

The DMA872S driver uses an 8-bit dip switch, SW1-SW3 is used to set the current; SW4 selects full current or half current lock; SW5-SW8 is used for subdivision settings. The detailed description is as follows:

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Current setting			Semi-st	Segment settings			

1. Current setting

Output peak current(A)	Output effective current (A)	SW1	SW2	SW3
2.1	1.5	off	off	off
2.8	2.0	on	off	off
3.5	2.5	off	on	off
4.2	3.0	on	on	off
4.9	3.5	off	off	on
5.6	4.0	on	off	on
6.4	4.5	off	on	on
7.2	5.1	on	on	on

2. Quiescent current setting

The static current can be set with the SW4 DIP switch. Off means the static current is set to half of the dynamic current, and on means the static current is the same as the dynamic current. In general use, SW4 should be set to off to reduce the heat of the motor and driver and improve reliability. After the pulse input stops, the current is automatically reduced to half.

3. Segment settings

Steps/turn	SW5	SW6	SW7	SW8
200	on	on	on	on
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

五、Power supply selection

The power supply voltage can work normally within the specified range. The DMA872S driver can be powered by a transformer. It is recommended that the AC output voltage of the transformer does not exceed its specified maximum voltage. The DMA872S driver can also be powered by an unregulated DC power supply, but it should be noted that the peak value of the rectified voltage ripple should not exceed its specified maximum voltage. It is recommended that users use a DC voltage lower than the maximum voltage to avoid power grid fluctuations exceeding the driver's operating voltage range.

If a voltage-regulated switching power supply is used, it should be noted that the output current range of the switching power supply must be set to the maximum.

▶Notice:

1）When wiring, pay attention to the position of the power interface and do not connect it to the motor port. After connecting, it is best to confirm whether it is connected correctly;

2）It is best to use an unregulated power supply;

3）When using an unregulated power supply, the power supply current output capacity should be greater than 60% of the driver set current;

4）When using a voltage-regulated switching power supply, the output current of the power supply should be greater than or equal to the operating current of the driver;

5）To reduce costs, two or three drivers can share one power supply, but the power supply must be large enough.

六、Protection function

1. Short circuit protection

When a phase-to-phase short circuit or overcurrent occurs inside the driver, the driver red light flashes once and flashes repeatedly in a cycle of 3 seconds. At this time, the fault must be eliminated and the power must be turned on again for a reset.

2. Overvoltage protection

When the input voltage is higher than DC 80V or AC 55V, the driver red light flashes twice and flashes repeatedly in a cycle of 3 seconds. At this time, the fault must be eliminated and the power must be turned on again to reset.

3. Undervoltage protection

When the input voltage is lower than DC20V or AC18V, the driver red light flashes 3 times and flashes repeatedly in a cycle of 3 seconds. At this time, the fault must be eliminated and the power must be turned on again for reset.

4. Phase loss protection

When the power is initially turned on and the motor is out of phase, the driver red light flashes 5 times and flashes repeatedly in a 3-second cycle. At this time, the fault must be eliminated and the power must be turned on again to reset.