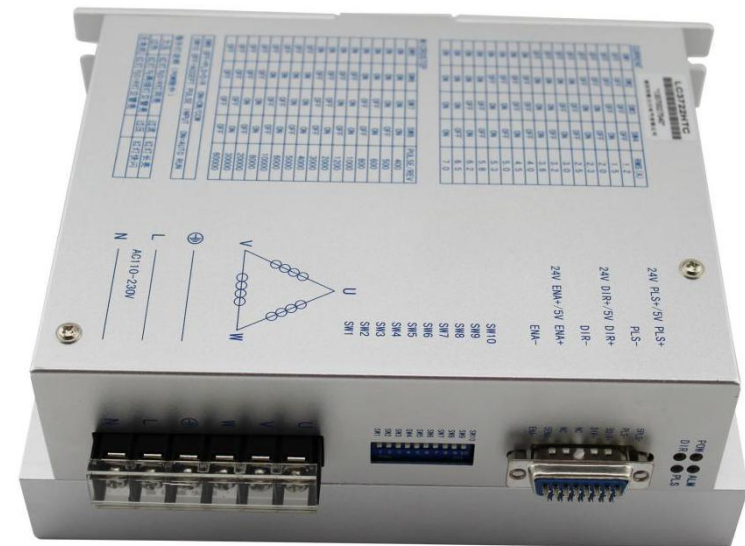




# Instruction Book Of LC372HTC



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High Performance Microstepping Driver

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## 1. Introduction

### ◆ Introduction

LC3722HTC is a kind of three-phase hybrid stepping motor drive based on DSP control , it is a new generation of digital stepper motor drive made up of the advanced DSP control chip and three-phase inverter driver module combine together. The drive voltage is AC180V - 250 v, adaptive current is below 7.0 A,57-130 mm external diameter of the various types of three-phase hybrid stepping motor. The inner of drive adopts a circuit similar with servo control principle. the circuit can make the motor run smoothly, little vibration and noise. When motor is in high speed, the torque is much higher than the two and five phase hybrid stepping motors. Step positioning accuracy up to 60000 / rolls.

### ◆ Features

- Single power input, the voltage range: AC180V - 250 V;
  - Output current programmable, from 1.3A to 7A;
  - Pulse input frequency up to 200kHz;
  - Equipped with 16 files of uniform angle constant torque subdivided ,the max resolution is 60000 steps/roll;
  - TTL compatible and optically isolated input;
  - Pure-sinusoidal current control technology;
  - Self-adjustment technology;
  - Support PUL/DIR and CW/CCW modes;
  - Short-voltage, over-voltage, over-current protections;
  - Automatic idle-current reduction.
- Phase memory function (note: when stop inputting for more than 3 seconds, drive will bear motor phase in mind automatically at the time, back to

electricity or WF signals from low level to high , drive will recovery motor phase automatically)

◆ Applications

Suitable for a wide range of stepper motors, from NEMA size 34 to 51. It can be used in various applications such as laser cutters, laser markers, high precision X-Y tables, labeling machines, CNC router, etc. Its unique features make the 3722HTC an ideal choice for applications that require both low-speed smoothness and high speed performances

2. Specifications

◆ Electrical Specifications (Tj = 25°C/77°F)

Parameters	Min	Typical	Max
Output current	1.5A		5.7 A
Supply voltage	+24VDC		+50VDC
Logic signal current	7mA	10 mA	16 mA
Pulse input frequency	0		200 kHz
Isolation resistance	500 M Ω		

◆ Operating Environment

Environment	Avoid dust, oil fog and corrosive gases
Ambient Temperature	0°C — 50°C
Humidity	40%RH — 90%RH
Operating Temperature	70°C Max
Vibration	5.9m/s2 Max
Storage Temperature	-20°C — 65°C

◆ Installation specifications (unit: mm [inch])

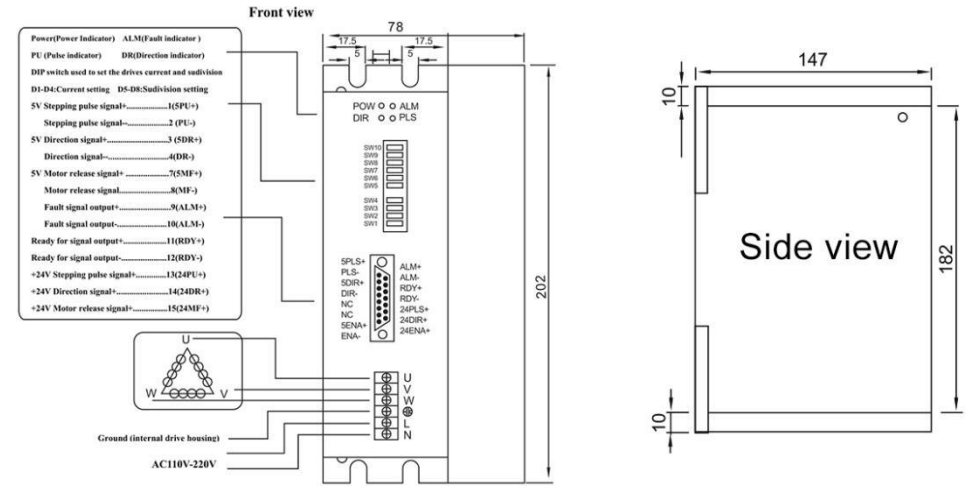


Figure 1: Installation specifications

◆ Elimination of Heat

- Driver’s reliable working temperature should be <70°C(158°F), and motor working temperature should be <80°C(176°F);
- It is recommended to use automatic idle-current mode, namely current automatically reduce to 60% when motor stops, so as to reduce driver heating and motor heating;
- It is recommended to mount the driver vertically to maximize heat sink area. Use forced cooling method to cool the system if necessary.

3. External terminal instructions


◆ Control Signal Connector

Port definition	Connector	mark symbol	Function	Annotation

s	pins no.			
DB 15	1	5PUS+	input signal photoelectric isolation plus port	connect + 5 v power supply, + 5 v to + 24 v can all be driven, higher than + 5 v, current limiting resistor is required
	2	PLS-	DP9=OFF, Is stepping pulse signal	Falling edge effective, when the pulse change from high to low, the motor takes a step. input resistance 220 Ω, requirement: low level 0-0.5 V, high level 4-5 V, pulse width > 2.5 μs
			DP9=ON, Is plus direction stepping pulse signal	
	3	5DIR+	input signal photoelectric isolation plus port	connect + 5 v power supply, + 5 v to + 24 v can all be driven, higher than + 5 v, current limiting resistor is required
	4	DIR-	DP9=OFF, Is direction control signal	Used to change the motor turning. input resistance 220 Ω, requirements: low level 0-0.5 V, high level 4-5 V, pulse width > 2.5 μs
			DP9=ON, Is reverse direction stepping pulse signal	
	7	5ENA+	input signal photoelectric isolation plus port	connect + 5 v power supply, + 5 v to + 24 v can all be driven, higher than + 5 v, current limiting resistor is required
	8	ENA-	motor release signal	Shut off the motor terminal current when effective (low level), drive stop working, the motor in the free state.
	9	ALM+	Drive failure output signal photoelectric isolation plus	when over-current, overheating fault appear, drive

			port	output the trouble signal, it is effective (high level)
	10	ALM-	Drive failure output signal photoelectric isolation minus port	
	11	RDY+	drive ready to output signal of photoelectric isolation plus port	Driver's status is normal, when ready to accept the signal of Controller, it is effective (low level)
	12	RDY-	drive ready to output signal of photoelectric isolation minus port	
	13	24PLS+	input signal photoelectric isolation plus port	+24Vdrivable
	14	24DIR+	input signal photoelectric isolation plus port	+24Vdrivable
	15	24ENA+	input signal photoelectric isolation plus port	+24Vdrivable

◆ Main Circuit Connector

Pin Function	Details	
L、N	power supply	power supply: AC180-250V
PE	base line	ground (Inscribe shell of drive)
U	Motor Phase U	

V	Motor Phase V	
W	Motor Phase W	

### 4. Control Signal Connector Interface

The LC3722HTC can accept differential and single-ended inputs (including open-collector and PNP output). The LC3722HTC has 3 optically isolated logic inputs which are located on connector P1 to accept line driver control signals. These inputs are isolated to minimize or eliminate electrical noises coupled onto the drive control signals. Recommend use line driver control signals to increase noise immunity of the driver in interference environments. In the following figures, connections to open-collector and PNP signals are illustrated.

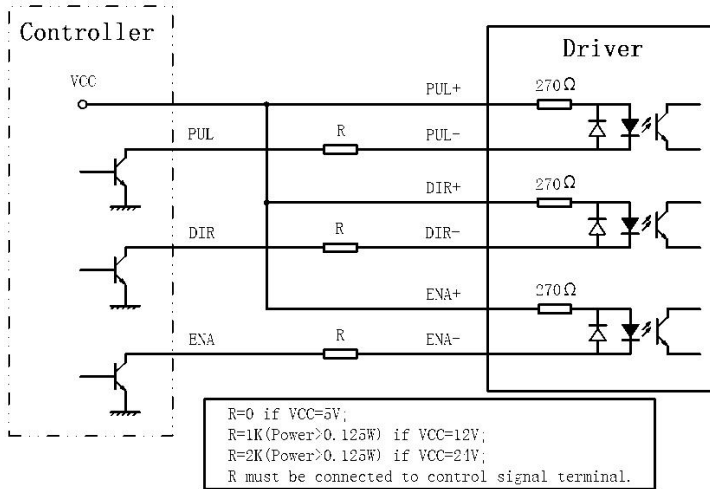


Figure 2: Connections to open-collector signal (common-anode)

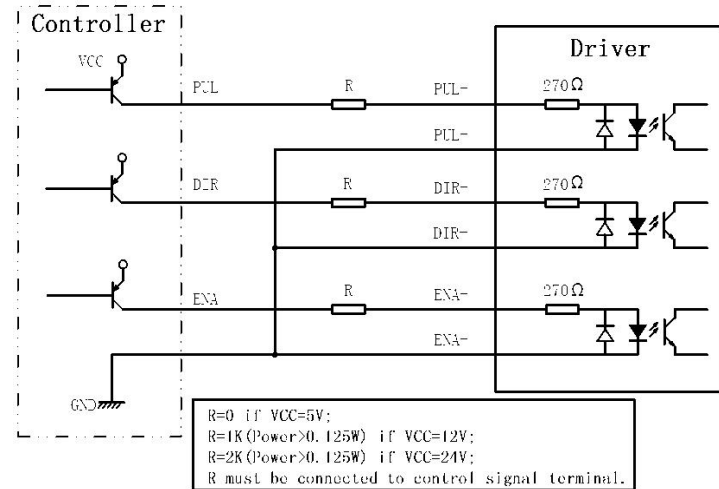


Figure 3: Connection to PNP signal (common-cathode)

### ◆ Typical Connection

A complete stepping system should include stepping motor, stepping driver, power supply and controller (pulse generator). A typical connection is shown as figure 4.

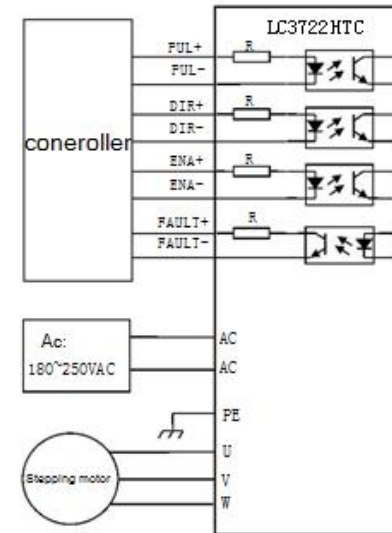


Figure 4: Typical connection

### ◆ Sequence Chart of Control Signals

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

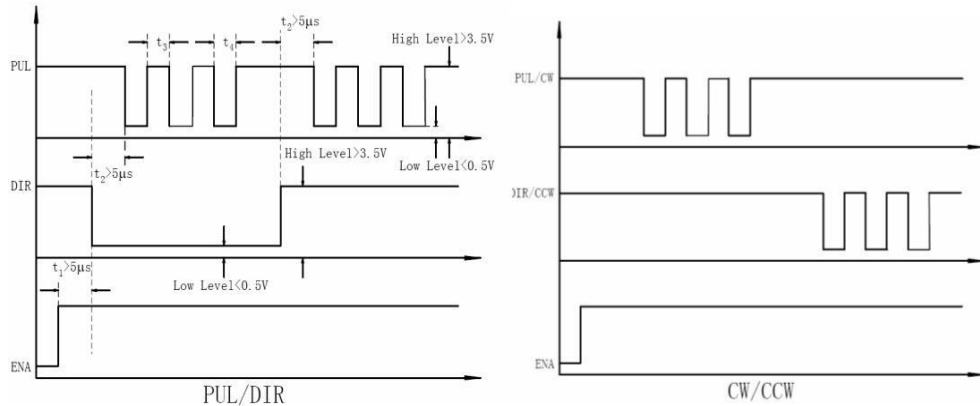


Figure 5: Sequence chart of control signals

#### Remark:

- t1: ENA must be ahead of DIR by at least 5 s. Usually, ENA+ and ENA- are NC (not connected). See “Connector P1 Configurations” for more information.
- t2: DIR must be ahead of PUL effective edge by 5 s to ensure correct direction;
- t3: Pulse width not less than 1.5 s;
- t4: Low level width not less than 1.5 s.

## 4. Connecting the Motor

The LC3722HTC can drive any three phase hybrid stepping motors. Using delta-connection, the performances of the motor under high speed condition are better,

but the driver current is higher too (about 1.73 times the motor coil current); A typical connection is shown as figure 6

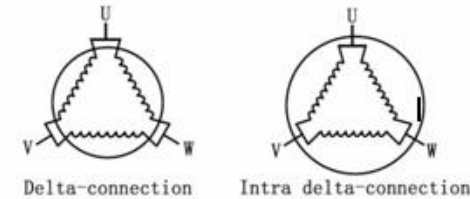


Figure 6: 4-lead Motor Connections

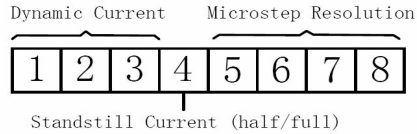
## 5. Power Supply Selection

The LC3722HTC can match medium and small size stepping motors (from NEMA frame size 34 to 51) made by Li chuan or other motor manufactures around the world. To achieve good driving performances, it is important to select supply voltage and output current properly. Generally speaking, supply voltage determines the high speed performance of the motor, while output current determines the output torque of the driven motor (particularly at lower speed). Higher supply voltage will allow higher motor speed to be achieved, at the price of more noise and heating. If the motion speed requirement is low, it's better to use lower supply voltage to decrease noise, heating and improve reliability.

## 6. Selecting Microstep Resolution and Output Current

Microstep resolutions and output current are programmable, the former can be set from 400 to 60000 steps/rev and the latter can be set from 1.3A to 7.0A. See more information about

.This driver uses an 10-bit DIP switch to set microstep resolution, and motor operating current, as shown below:



◆ **Microstep Resolution Selection**

Microstep resolution is set by SW6,7,8 of the DIP switch as shown in the following table:

Steps/rev.(for 1.2° motor)	SW5	SW6	SW7	SW8
400	ON	ON	ON	ON
500	ON	ON	ON	OFF
600	ON	ON	OFF	ON
800	ON	ON	OFF	OFF
1000	ON	OFF	ON	ON
1200	ON	OFF	ON	OFF
2000	ON	OFF	OFF	ON
3000	ON	OFF	OFF	OFF
4000	OFF	ON	ON	ON
5000	OFF	ON	ON	OFF
6000	OFF	ON	OFF	ON
10000	OFF	ON	OFF	OFF
8000	OFF	OFF	ON	ON
20000	OFF	OFF	ON	OFF
30000	OFF	OFF	OFF	ON
60000	OFF	OFF	OFF	OFF

◆ **Current Settings**

For a given motor, higher driver current will make the motor to output more torque, but at the same time causes more heating in the motor and driver. Therefore, output current is generally set to be such that the motor will not overheat for long time operation. Since parallel and serial connections of motor coils will significantly change resulting inductance and resistance, it is therefore important to set driver output current depending on motor phase current, motor leads and connection methods. Phase current

rating supplied by motor manufacturer is important in selecting driver current, however the selection also depends on leads and connections.

The first 3 bits (SW1, 2, 3.4) of the DIP switch are used to set the dynamic current. Select a setting closest to your motor's required current.

RMS Current	SW1	SW2	SW3	SW3
1.3A	OFF	OFF	OFF	OFF
1.6A	OFF	OFF	OFF	ON
2.1A	OFF	OFF	ON	OFF
2.3A	OFF	OFF	ON	ON
2.5A	OFF	ON	OFF	OFF
3.0A	OFF	ON	OFF	ON
3.2A	OFF	ON	ON	OFF
3.5A	OFF	ON	ON	ON
4.0A	ON	OFF	OFF	OFF
4.5A	ON	OFF	OFF	ON
5.0A	ON	OFF	ON	OFF
5.3A	ON	OFF	ON	ON
5.8A	ON	ON	OFF	OFF
6.2A	ON	ON	OFF	ON
6.5A	ON	ON	ON	OFF
7.0A	ON	ON	ON	ON

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

◆Function code definition

D9	Double pulse: PU is forward direction step pulse signal, DR is reverse direction step pulse signal
	Single pulse: PU is step pulse signal, DR is direction control signals
D10	Automatic detection switch (when OFF receiving external pulse, when ON runs at a speed of 30 r/min in internal drive)

**The selection of input voltage and current**

**The voltage setting**

In general, the higher the voltage, the motor is high The greater the speed when the moment. The step out to avoid high speed. But on the other hand, the voltage is too high will cause over voltage protection, Electric heating is more, even can damage the drive. Work under high voltage, the motor at low speed vibration of movement The move will be larger.

**Output current value**

For the same motor, current value, the greater the When the motor output torque is larger, but the current is large and motor Drives are more severe fever. The specific heat Size is not only related to the current Settings, also with the shipment Dynamic type and duration of stay. The following set Using step motor rated current value as reference, But the best value in practical application should be based on the increase The whole. In principle, such as the temperature is very low (< 40 °C) is visible Need to appropriately increase the current value to increase the motor lose The power (torque and high speed response).

**Protection function**

**Under voltage protection:** when the drive power supply voltage is lower than 170 v, drive to stop working and ALM and DIR display alarm, need to check the power supply voltage or replace power supply, driving voltage returned to normal; Power drives at this time must be reset, will lift the alarm.

**Over voltage protection:** when the input voltage is higher than 280 v, drive the ALM will flash alarm; At this time must be electric reset again, to discharge failure.

**Over current protection:** when the in terphase short circuit or device internal flow occurs, the drive will normally on ALM. At this time must be electric reset again, to discharge failure.

**Overheating protection:** when the temperature higher than 80 ° drive electric opportunity to stop working, and drives the ALM, DIR, PUL will shine alternately; At this time until the temperature dropped to a 50 °, the drive must be electric reset again, can discharge failure.

**No motor protection:** when the motor open or not, drive the ALM DIR lights flashing lights turn. At this time must be electric reset again, to discharge failure.