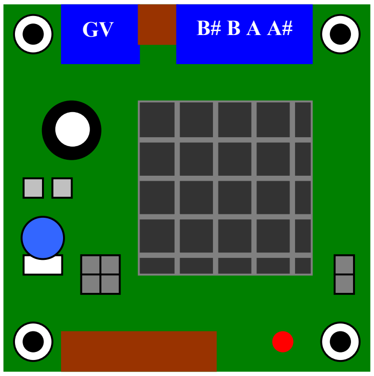
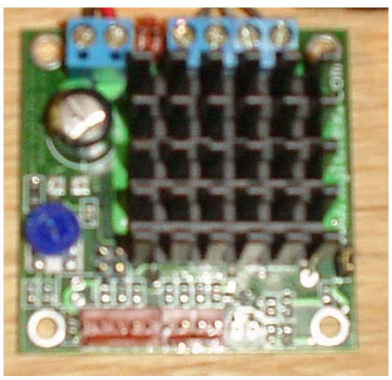
XS-3525/8S-1





Standard Pinout Information

A single 9 pin Molex header contains all of the logic signals necessary to operate the drive

1) GND	Logic Power Return (Ground)
2) SLEEP#	Shuts down entire drive
3) MS1	Sets up microstepping mode. See Table Below Left
4) MS0	Sets up microstepping mode. See Table Below Left
5) HOME#	Motor Position Indicator
6) ENA#	Disables Motor drives.
7) DIR	Motor Direction Signal
8) STEP	Motor Step signal
9) VCC	Logic Power Supply (+5V)

The MS0 & MS1 inputs may also be selected via onboard jumpers. The ENA# input may also be enabled via an onboard jumper. The minimum connections would be GND, STEP, DIR, and VCC. See schematic (last page) for actual connection assignment.

- Small Size 2.1 X 2.1 inches.
- Drives up to 35Volts @ 2.5 A/phase
- 4 different microstepping step levels from Full-Step(FS) to 1/8 step/FS
- Simple TTL interface
- 5 Volt Logic Supply
- Isolated Logic & Power Planes

Microstepping Truth Table

MS1	MS0	Output
0	0	Full Step
0	1	Half Step
1	0	Quarter Step
1	1	Eighth Step

1 means NOT shorted to GND

The XS-3525/8S-1 Stepper Driver is a Single axis pulse-width-modulated (PWM) current controlled bipolar micro-stepping controller.

The drive has a ±2.5 Amp/phase @ 35Volt maximum continuous Output Rating. The drive circuitry has thermal shutdown protection and crossover-current protection. Synchronous rectification circuitry eliminates the need for external clamp diodes in most applications.

The drive accepts Step & Direction signals, along with 2 inputs to define microsteps per full step. Home Position Output(HOME#) is provided as an indicator when the motor is being commanded to the HOME position (see below).

The board is of 4-Layer construction with Isolated Power and Logic supply planes. The drive circuitry has a heat sink attached to allow cooler operation.

Power

The drive can be setup to deliver different maximum current levels by adjusting an on-board potentiometer. The potentiometer creates a voltage which is input to the drivers Vref (Voltage Reference) pin. The Vref voltage is referenced to ground (GND) and can be monitored at the Vref(TP) pin. The reference voltage at the test point is related to the motor drive current by the following formula:

Bipolar Max Motor Current=Vref/1.44 <u>for example:</u>

2.5 Amp = Vref 3.6V
2.0 Amp = Vref 2.88V
1.5 Amp = Vref 2.16V
1.0 Amp = Vref 1.44V
0.5 Amp = Vref 0.72V

Thus if Vref is set to 3.60 volts, the resulting maximum drive current supplied to the motor will be:

2.5Amps ~= 3.60/1.44

The Vref circuitry is based on a 5 volt VCC input, although voltages as low as 4.90 volts can still be used to obtain a Vref of 3.6V. Because of this, it is possible to set the Vref input to higher than 3.60 volts when using a full 5.0 Volt logic power source. This will cause the drive circuitry to attempt to deliver more current than it is rated for, which can cause overheating of the device. Overheating the device lowers life expectancy of the circuitry as well as introducing the possibility of a thermal shutdown cycle (which can lead to motor/system position losses). You should never drive the motor at a current higher than specified by the motor manufacturer. Generally, very little extra torque will be achieved, and the motor will probably overheat.

The Vref voltage is compared to onboard Sense Resistors which have a ±5% accuracy rating. Full current can be achieved with voltages as low as 3.42V on Vref. When attempting to deliver 2.5A/phase, start with a Vref voltage of 3.42V.

The system motor drive circuitry can handle up to 35 volts **<u>which includes Back EMF</u>** (BEMF)**.** A system using 35 volts as a motor supply voltage **<u>may require an external capacitor</u>** to be used if BEMF (i.e. from rapid motor decelerations) would cause voltages to exceed 35V. Exceeding the maximum voltage (35V) will destroy the circuitry!

Because stepper motors are current driven, rather than voltage driven devices, it is generally acceptable, and most often necessary, to drive the motor at a voltage higher than the motor's rated voltage. The on-board drive circuitry limits the source/sink current to the motor without the need for external power resistors. A higher voltage allows the motor to be driven to the correct position faster, thus allowing for higher motor RPM.

12 Volt and 24 volt power supplies are the most common power sources with voltage outputs under the maximum 35V. Of the two, 24V will provide much better performance, while 12V supplies are a little more common and thus less expensive. System running with 24V generally do not require any external capacitors. Other supplies like 27V and 30V, while available are generally much more expensive, and may require the addition of external capacitors to the circuitry to keep voltage levels from exceeding the maximum 35V due to BEMF.

The minimum motor supply voltage is 8**.**0 volts. Minimum current selectable ~0**.**39A

The **2 Pin Molex** connector is tied to the system ground (**GND**) and motor power supply planes (**VBB**). In systems using 12 or 24 volts, this connector can be used to supply power to a cooling fan rated for the appropriate voltage. **<u>Use of a cooling fan is recommended for systems operating at or near the maximum current rating</u>** (see below).

The board is manufactured with 4 layers with Green Solder Mask covering the Top and Bottom Layers

ABSOLUTE MAXIMUM RATINGS

T_A=+25°C

which should not be exceeded

Load Supply Voltage(V_{BB}) (including Back EMF)	**35V**
Output Current(I_{OUT})	**±2.5A**
Logic Supply Voltage(V_{cc})	**7.0V**
Operating Temperature Range(T_A)	**–20°C to +85°C**
Junction Temperature(T_J)	**+150°C**

Logic Input Voltage (with Vcc = +5V)

Logic HIGH min. voltage 3.5V

Logic LOW max. voltage 1.5V

If you are using a parallel port to drive the board, be sure that it meets the above logic requirements. (Some motherboards with on-boards parallel port may not meet the requirements).

Restrictions

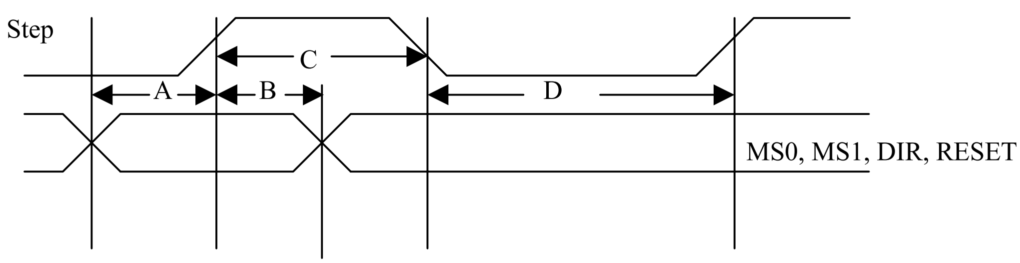
Do **NOT** adjust the Vref voltages with VBB powered

Do **NOT** adjust the Vref voltages to more than 3.60V

Never connect **or** disconnect motors, fans, etc when the drive is powered with VCC or VBB.

Do **NOT** place a fuse between the motors and the drive.

Do **NOT** allow voltages to exceed the ratings above (Be sure VBB isn't connected to VCC)



A) Minimum Command Active Time Before Step Pulse	200nS
B) Minimum Command Active Time After Step Pulse	200nS
C) Minimum STEP Pulse Width	1.0uS
D) Minimum STEP Low Time	1.0uS

Step Sequencing

Table 1.

FULL	HALF	QUARTER	EIGHTH	ANGLE	NOTE:
	1	1	1	0	
			2	11.25	
		2	3	22.50	
			4	33.75	
1	2	3	5	45	HOME#
			6	56.25	
		4	7	67.50	
			8	78.75	
	3	5	9	90	
			10	101.25	
		6	11	112.50	
			12	123.75	
2	4	7	13	135	
			14	146.25	
		8	15	157.50	
			16	168.75	
	5	9	17	180	
			18	191.25	
		10	19	202.50	
			20	213.75	
3	6	11	21	225	
			22	236.25	
		12	23	247.50	
			24	258.75	
	7	13	25	270	
			26	281.25	
		14	27	292.50	
			28	303.75	
4	8	15	29	315	
			30	326.25	
		16	31	337.50	
			32	348.75	
	9 or 1	17 or 1	33 or 1	360 or 0	restart cycle

360 is 4 FULL Steps

Setup & Operation

Before applying motor power to the drive, the Vref of the drive needs to be set up. With VCC(+5V) applied, turn the potentiometer until the proper voltage has been achieved. Under no circumstances should the voltage be allowed to go above 3.60 volts, as this represent then maximum allowable current drive of 2.5 Amps. As noted above, 3.42V on Vref is a good starting voltage for 2.5Amp/phase output.

The ENA# jumper (see appendix drawing) may be jumpered if the controlling system will not be dynamically enabling and disabling the axis drive via the 9 pin Molex connector.

If the motors run backwards, swap either the A-A#, or B-B# wire pairs (but not both)

Logic Requires < 50 mA at +5.0V on the 9 pin Molex connector

At power-up the drive sets the motor to the HOME position (see table 1).

Pulling the SLEEP# input active LOW will disable the axis outputs, and stops its' charge pumps. This helps to reduce power consumption when the drive is not in use. Wait at least 1 mS when coming out of SLEEP# mode to allow the charge pumps to stabilize before issuing a STEP command. Default operations is non-SLEEP mode, and no jumpers are required to be in non-SLEEP mode

The **Heat Sinks** are attached with thermally conductive adhesive pad. The driver board is meant to operate in a **Horizontal** position. The adhesive pad has NOT been tested for holding strength when the driver board is operated in a vertical position.

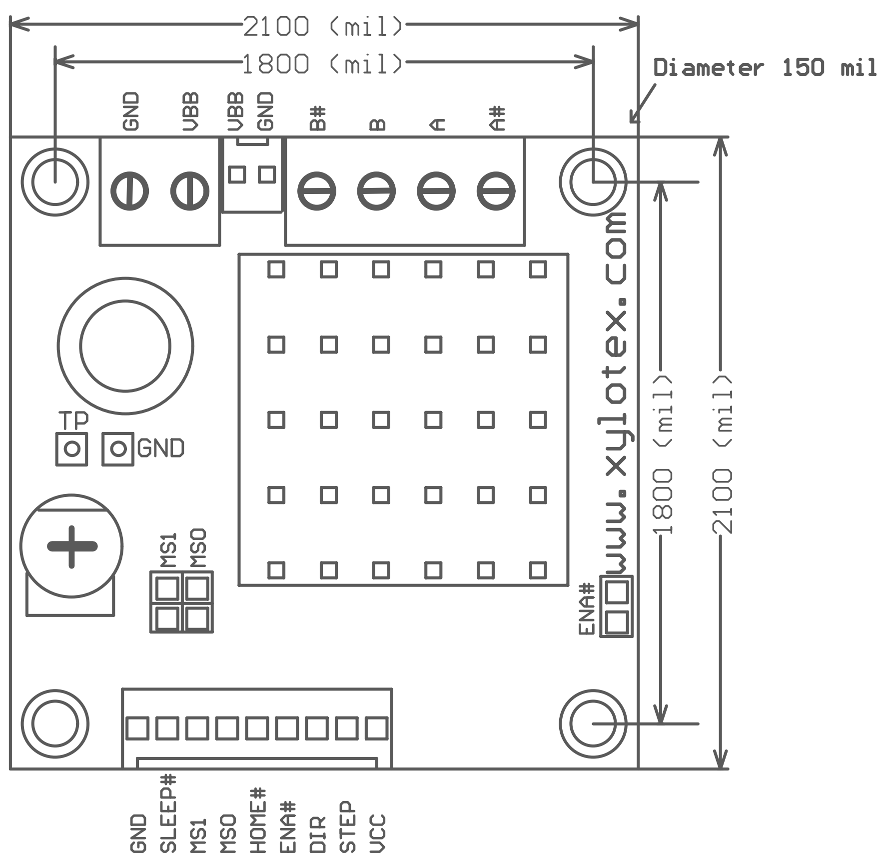
At power-up, the drive puts equal current to both coil to bring it to the HOME position. To do this it places ~**.**7 max current on each coil thus consuming ~1.4 max amps per motor. This would be the Maximum current draw at high speed running. At standstill (HOME), it will actually be much less.

Restrictions

Do **NOT** adjust the Vref voltages with VBB powered
Do **NOT** adjust the Vref voltages to more than 3.60V
Never connect **or** disconnect motors, fans, etc when the drive is powered with VCC or VBB.
Do **NOT** allow voltages to exceed the ratings above (Be sure VBB isn't connected to VCC)

Unipolar Motor Note:

When Setting Vref for a UNIPOLAR rated motor, use a current of 71.5% of the rated unipolar current, thus a UNIPOLAR motor rated at 2.5A, when wired in series mode would be setup for 1.79A, or Vref of 2.58 Volts


2100 (mil)
1800 (mil)
Diameter 150 mil
GND
VBB
VBB
GND
B#
B
A
A#
www.xylotex.com
TP
GND
MS1
MS0
ENA#
1800 (mil)
2100 (mil)
GND
SLEEP#
MS1
MS0
HOME#
ENA#
DIR
STEP
VCC