

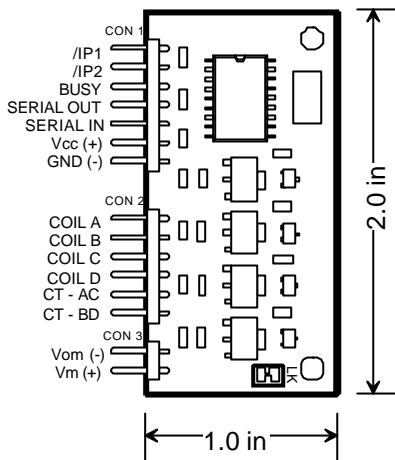
Description

The **Little Step-U** is a complete, serially controlled, drive system for unipolar stepper motors. Using an intelligent module allows the host system to concentrate on the task at hand while the **Little Step-U** performs all calculations and operation of the motor.

The desired operating speed, ramp time and drive mode can be configured once and then a single command used as required, to move to fixed or relative positions. While the motor is in motion, a BUSY output is active and the movement can be optionally interrupted by one of the two external inputs. The position of the motor is maintained in a readable register which can be set to zero (Home) by a command or when an input is activated. A similar register is available to save a second position (Mark) either by command or from an input. These points can then be referenced directly with a 'Move to home' or 'Move to mark' command.

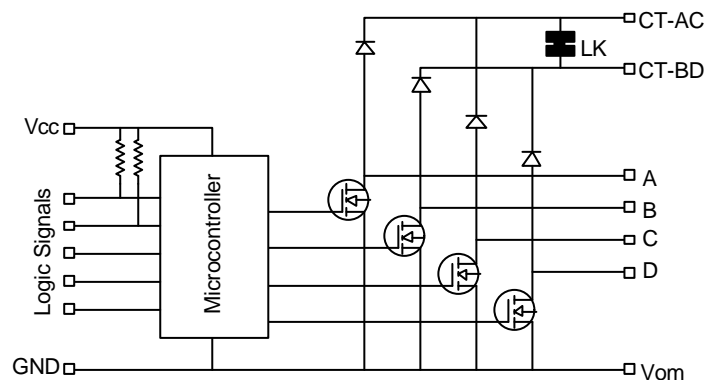
A built-in ramping function accelerates the motor from a standstill to the desired speed over a specified time period, allowing faster final speeds to be achieved, and also to decelerate the motor to give maximum load braking. When the motor is stopped, a command specifies whether the windings are left energized (for maximum holding torque) or turned off (for lower power consumption / dissipation).

A remote function is included for use in more complex systems. Once activated, the two external inputs become STEP and DIR, with the motor stepping in the indicated direction with every pulse applied to the step input.



Features

- Unipolar motors to 35V, 3.0A
- Full step, half step and wave drive modes
- 1-5,000 steps per second
- Inbuilt speed ramp (0.1-20.0 seconds)
- Simple serial commands (TTL interface)
- Separate power input for motor and logic
- Suitable for direct and L/R operation in all modes
- On board clamping diodes
- Current position register (+/-100,000,000)
- Zero position and user marker registers
- Absolute & Relative movement commands
- Busy output
- Two inputs suitable for optical stops
- Slave mode using inputs for STEP & DIR
- Stop with motor coils on or off



DC Characteristics

Characteristic	Symbol	Min	Typ	Max	Unit	Notes
Logic Supply Voltage	V _{CC}	4.5	5.0	5.5	V	
Vcc risetime	t _{VCC}	0.05			V/ms	1
Logic supply current	I _{CC}		1.5	3.0	mA	
Input Low Voltage	V _{IL}	0.0		1.0	V	
Input High Voltage	V _{IH}	4.3		V _{CC}	V	
Output Low Voltage	V _{OL}			0.6	V	
Output High Voltage	V _{OH}	4.3			V	
IP1/2 Source Current	I _{OL}		1.0		mA	
Motor Voltage	V _M			50	V	
Motor current	I _M			3.0	A	
Motor resistance	R _M	2.8			Ω	
Clamp diode current	I _{CL}			250	mA	
Step rate	F _{STEP}	1		5000	steps/sec	
Speed Error	F _{ERR}			+/- 0.5	%	2
Comms bit rate	F _{BIT}		2400		bps	
BUSY rise/fall time	T _{RF}		10	25	ns	
Response time to IP1/2	T _{INP}			1	ms	3
DIR hold time	T _{DIR}	8			us	
Max Slave step rate	F _{EXT}			10000	steps/sec	4
Operating temp	t _{OP}	0		70	°C	5
Storage temp	t _{ST}	-40		100	°C	

- [1] Required to ensure reliable startup.
 [2] As a percentage of requested speed
 [3] Response to IP is lesser of 1ms or 1 step
 [4] If no comms while stepping. Max = 6000 steps/sec with comms
 [5] Refer loading derating graph

Pin functions

Connector 1

Pin	Function
/IP1	Optional input 1. Set home. Emergency stop.
/IP2	Optional input 2. Set mark. Emergency stop.
BUSY	Output - High when motor moving
SERIAL OUT	Data from Little step-U to controller. TTL
SERIAL IN	Data from controller to Little Step-U . TTL
Vcc	Supply to logic circuits
GND	Supply ground. Common with motor circuits.

Connector 2

Pin	Function
A	Winding A output
B	Winding B output
C	Winding C output
D	Winding D output
CT-AC	Common for windings A & C
CT-BD	Common for windings B & D

Connector 3

Pin	Function
V _{OM}	Motor supply ground. Common with logic circuits
V _M	Motor Supply +

Hardware Connection

Power Supply

The **Little Step-U** divides the circuitry into two distinct sections with separate power supplies required for the motor drive and the logic. The logic/control section must be powered by a regulated 5V supply applied to the VCC and GND pins. The motor power supply voltage is dictated by the motor characteristics and is connected to the VM(+) and VOM(-) pins. The GND and VOM pins are connected on the circuit board as a common reference. The motor power supply must have sufficient capacity for the motor and if the power supply is not physically close to the motor/controller, a capacitor (eg. 4700uF) may be required at the controller to ensure smooth operation of the motor.

Motor Connection

The motor connector has 4 connections (A, B, C & D) that are switched to ground in the sequence required to cause the motor to step. Note that stepper motor manufacturers have several methods of labelling the connections to the motor. The **Little Step-U** labels the pins in the sequence they are switched when operating the motor with one coil on at a time and driving in a clockwise direction. ie. A, then B, then C, then D and back to A. The centre taps of the two coils are connected to CT-AC and CT-BD, corresponding to the common connection of coils A & C and coils B & D respectively. These two connections provide the freewheel diodes for each of the motor coils and are connected on the circuit board.

IMPORTANT: A poor or intermittent connection to any of the stepper motor terminals can result in destructive voltages being generated and causing permanent damage to the Little Step-U. Similarly, do not connect or disconnect any stepper motor connections while power is applied.

The connection point between CT-AC and CT-BD is indicated on the circuit board by the designator "LK". This track can be cut and rejoined by soldering a wire between two pads if needed. In most cases this isn't required but is provided for applications using and L/xR configuration in half step mode.

Interface connections

The Little Step-U acts on commands received serially from a host controller via the SERIAL IN pin. This is an asynchronous interface operating at 2400 bits per second, 8 data bits (LSB first), 1 stop bit and no parity. The signal levels are TTL. Some commands illicit a response and these are sent via the SERIAL OUT pin using the same protocol and signal levels as the SERIAL IN pin.

When a command has been sent to the Little Step-U that causes the motor to move, the BUSY pin will be high while the motor is in motion.

Two input pins are provided for use with stepper operation in the form of limit or home switches or can be used as general inputs which can be read by software. These pins accept logic level inputs and will source 1mA when pulled low, making them suitable for direct connection to the output of opto-couplers.