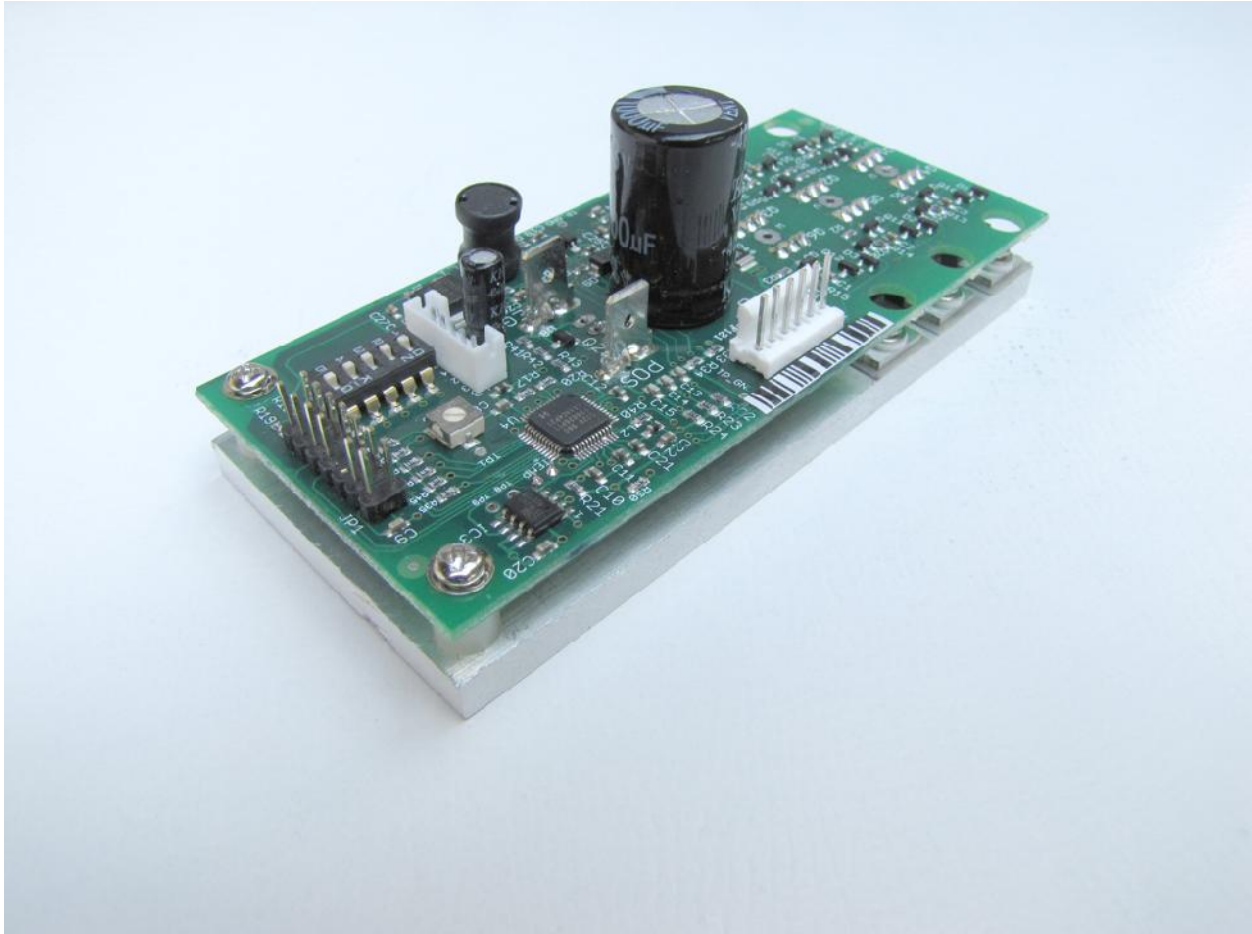


# SDP1 Low Voltage Drive with “Open Drive” Firmware

REV A, 8-16-2013

Software Defined Power

[www.softwaredefinedpower.com](http://www.softwaredefinedpower.com)



## Typical Applications;

- Standalone low voltage motion applications.
- Up to ½ HP motor drive for Raspberry Pi, Beaglebone, or other 3.3V logic systems. May be extended to Arduino and other 5V applications with optional level shifter
- Solar powered and other alternative energy motion applications
- Vehicle, bus, truck and marine motion applications
- UPS, Battery powered, portable and other low voltage motion applications

## SDP1 Low Voltage Drive Features;

- SDP1 hardware is licensed under the Creative Commons Attribution, Share Alike (CC BY-SA 3.0) license (<http://creativecommons.org/licenses/by-sa/3.0/>)
- Drives Brushless, Brush or Permanent Magnetic Synchronous Motors
- 12 to 48V Operation
- 10 amp cycle by cycle current limit
- Thermal shutdown at 95C heat sink temperature
- Reverse supply voltage protection
- Five on board dip switches
- On board potentiometer
- Complementary N-FET P-FET topology for 100% duty cycle operation
- Eight digital I/O lines (3.3V logic)
- .25 inch fastons for power input

## Hardware Description

The SDP1 drive is a versatile low voltage motor control hardware platform for driving up to ½ HP brush or brushless motors. It can be used in standalone applications or in Raspberry Pi, Beaglebone, Arduino or other processor based systems. The input voltage range of the SDP1 is compatible with most portable, automotive, marine, solar and alternative energy DC power sources. Sensing is provided for input voltage, motor current, and heatsink and processor temperature. Eight digital I/O pins running 3.3V logic are connected to the outside world through locking connectors. With the addition of an optional level shifter, the I/O range can be extended to 10 volts max. In addition, there is an on board potentiometer for manual parameter entry.

The microprocessor on the SDP1 is a Texas Instruments TMS320F28026. For users that prefer to do their own firmware development, all JTAG signals of the microprocessor are brought out to a separate header compatible with most JTAG development tools.

## SDP “Open Drive” Firmware Features;

- SDP “Open Drive” Firmware is licensed under the “BSD Simplified” license (<http://opensource.org/licenses/BSD-3-Clause>).
- Motor type jumper selectable
- Configuration via on board dip switches
  - Selection of operating mode
    - Motor Voltage, open loop
    - Motor Current/ torque, closed loop
  - Selection of command source
    - PWM input (50 to 1000Hz)
    - On board potentiometer
  - Direction (in two quadrant mode)

- Two or four quadrant operation
- Inputs
  - PWM command
  - Enable
  - 3 Hall commutation signals
- Outputs
  - Digital speed output; frequency proportional to speed (in brushless or PMSM mode)

## **Firmware Description**

The SDP1 ships pre-loaded with Software Defined Power's "Open Drive" firmware which can be configured by the on board DIP switches. The digital I/O is configured to provide five digital inputs and one digital output as an interface to processors and other controls.

## **SWITCHES**

SW1-1 Selects either open loop voltage operation or closed loop current/ torque operation. In open loop voltage operation, the command sets the voltage of the motor to a corresponding fraction of the input voltage. In closed current or torque operation, the current to the motor is a closed loop controlled linear function of the command.

SW1-2 Selects either the on board potentiometer or an external PWM signal for command. The external PWM frequency may be between 50Hz and 1000Hz.

SW1-3 Selects motor direction, when the control is operating in two quadrant mode (see SW1-4).

SW1-4 Selects two quadrant or four quadrant mode. In two quadrant mode the command, whether from PW or the on board potentiometer, spans 0 to full scale. In four quadrant mode the command spans +/- full scale and passes through zero midrange.

## **DIGITAL I/O**

JP2

Pin 1 Hall power (+11.5 to +15 VDC, 50ma max)

Pin 2 Hall 1 input (10k pull up to +3.3V)

Pin 3 Hall 2 input (10k pull up to +3.3V)

Pin 4 Hall 3 input (10k pull up to +3.3V)

Pin 5 Not used

Pin 6 Signal ground

JP3

Pin 1 Signal ground

Pin 2 PWM command input (3.3v logic)

Pin 3 +3.3VDC, 50ma max

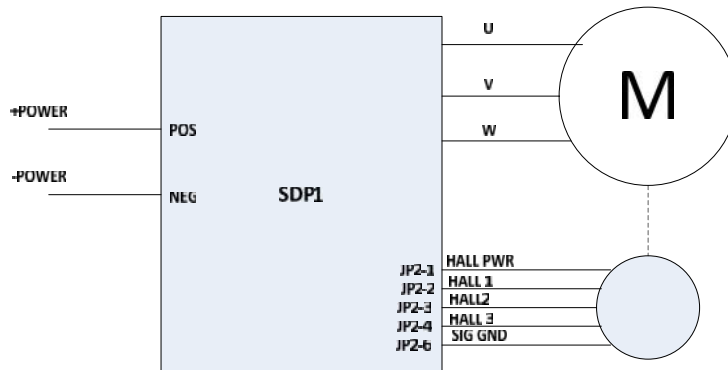
Pin 4 Speed output for brushless motors. Frequency proportional to speed (3.3v logic)

Pin 5 Not Used

Pin 6 Enable (10k pull up to +3.3v)

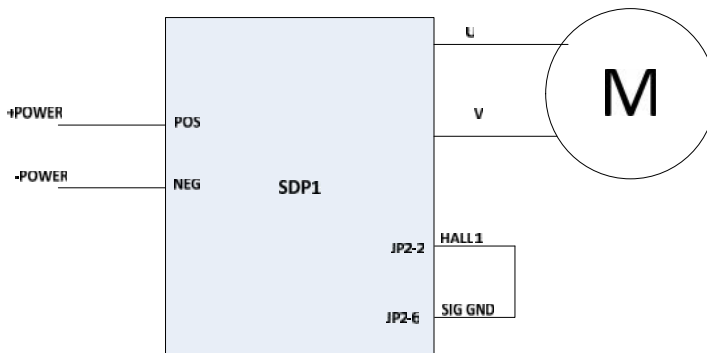
## Application Information

### Standalone Brushless Motor



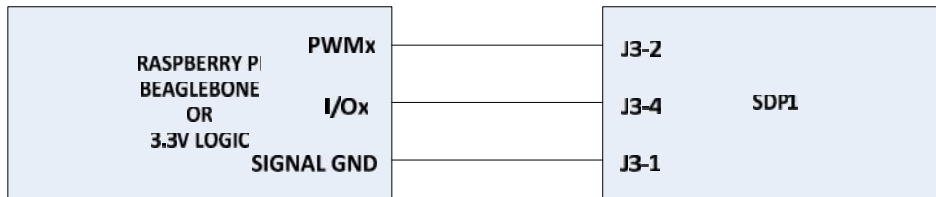
### STANDALONE CONNECTIONS, BRUSHLESS MOTOR

### Standalone Brush Motor



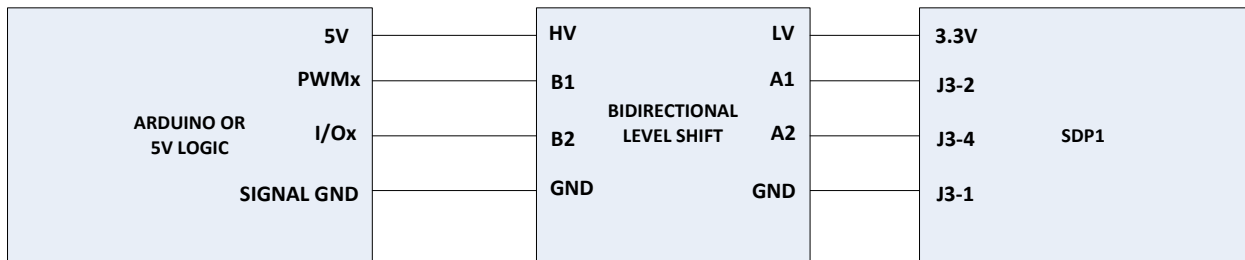
### STANDALONE CONNECTIONS, BRUSH MOTOR

### 3.3V Logic Operation



### CONTROL CONNECTIONS 3.3V LOGIC

### 5V Logic Operation



### CONTROL CONNECTIONS 5V LOGIC

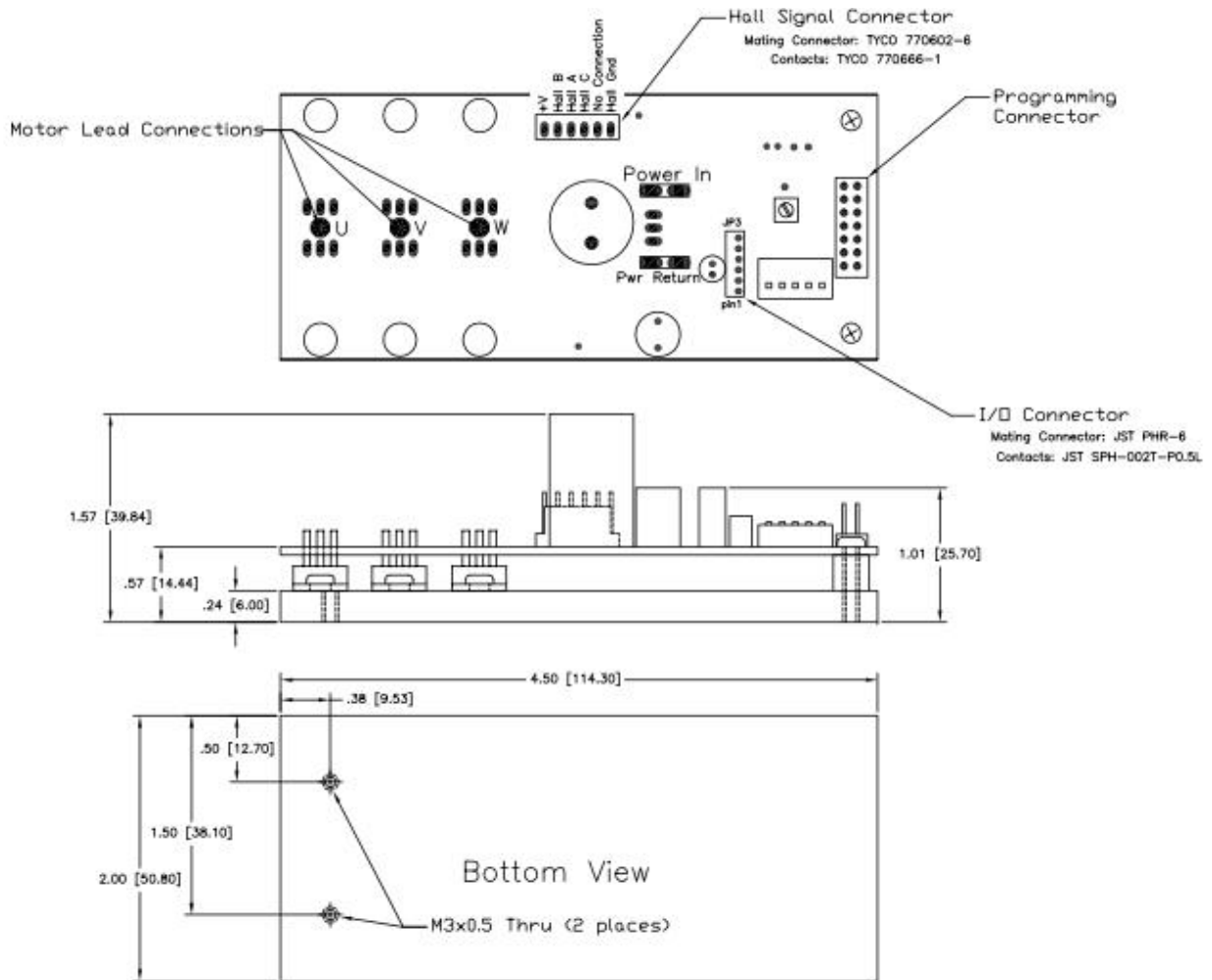
Bidirectional Level Shift: Adafruit 757 or equivalent <http://www.adafruit.com/products/757>

### Absolute Maximum Ratings

CONNECTION	VMIN	VMAX
POS to NEG	-75	60
JP1-1 to JP1-8	-0.3	4.6
JP1-3 to JP1-8	-0.3	4.6
JP1-7 to JP1-8	-0.3	4.6
JP1-9 to JP1-8	-0.3	4.6
JP1-11 to JP1-8	-0.3	4.6
JP2-2 to JP2-6	-0.3	4.6
JP2-3 to JP2-6	-0.3	4.6
JP2-4 to JP2-6	-0.3	4.6
JP2-5 to JP2-6	-0.3	4.6

JP3-2 to JP3-1	-0.3	4.6
JP3-3 to JP3-1	-0.3	4.6
JP3-4 to JP3-1	-0.3	4.6
JP3-5 to JP3-1	-0.3	4.6
JP3-6 to JP3-1	-0.3	4.6

## Mechanical Drawings



For sales, application assistance or inquiries on custom configurations contact [solutions@gboxllc.com](mailto:solutions@gboxllc.com)