

Low Voltage H-Bridge

S17-3A-LV-HBRIDGE

Functional Specification

Revision 1.1



Acroname
easier robotics

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Revision History

Revision	Date	Description
0.0	April 9, 2003	Initial Creation
0.1	May 20, 2003	Major revision based on actual design
1.0	August 8, 2003	Design Verification revisions
1.1	August 12, 2003	Revision B PCB modifications

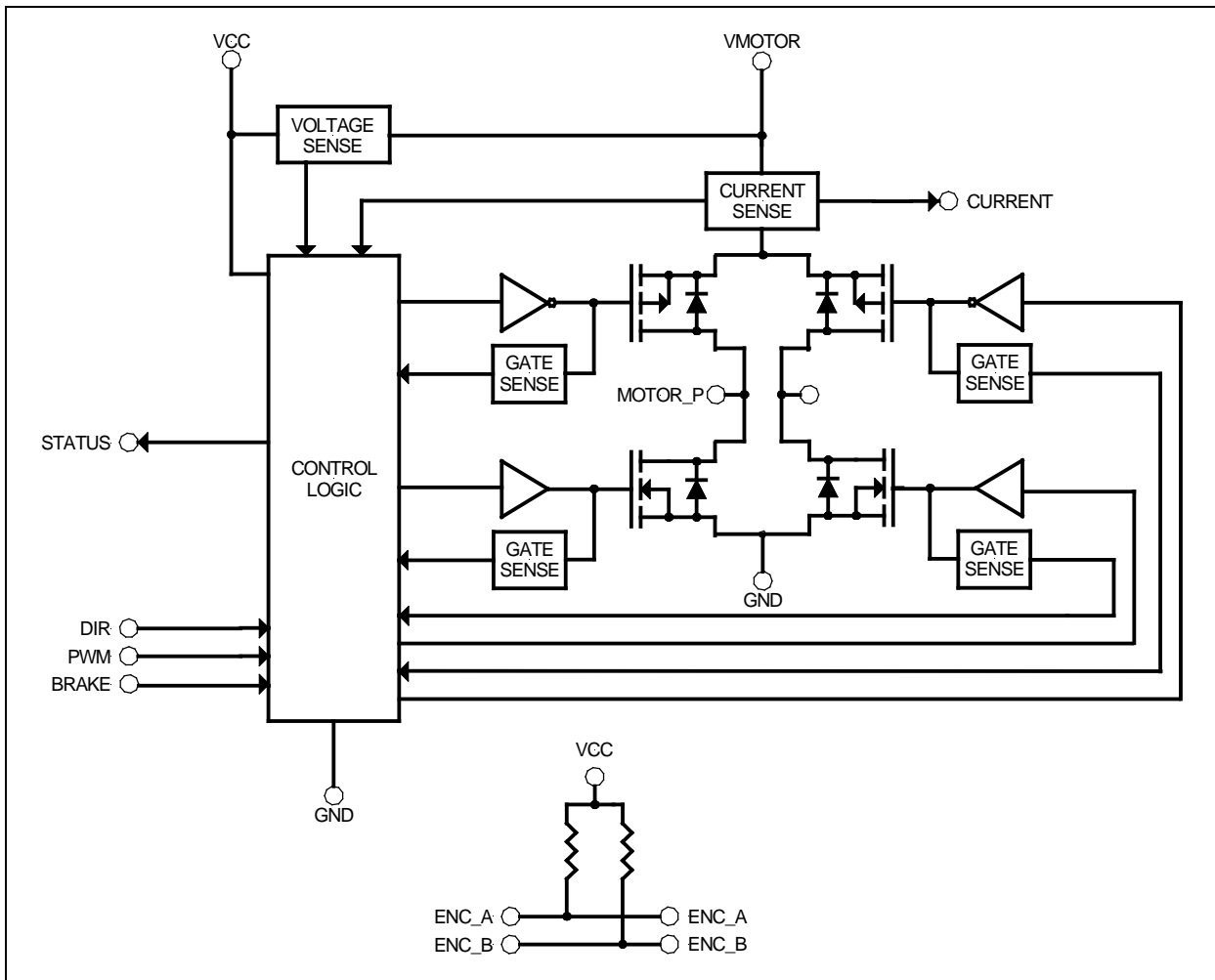
Features

- Designed for battery operation from 4 to 8 (1.5V) or 10 (1.2V) cells (3.6V to 12.0V)
- Alternate assembly option for operation from 1 or 2 cells (0V to 3.5V)
- Delivers up to 3.5A continuous output current
- Less than 250m Ω “on” resistance
- TTL and CMOS compatible inputs
- No “shoot-through” current
- Analog current monitor output
- Digital status output
- Digital brake input
- Over current and under voltage shutdown
- Separate logic and motor power supply connections
- Quadrature encoder pass through with pull-up resistors
- Integrated connector for combined motor/encoder
- PWM operation up to 50KHz
- Conforms to the Acroname H-Bridge standard

General Description

The Low Voltage H-Bridge motor driver is designed specifically for battery operation using 4 to 10 NiCad/NiMH cells, or 4 to 8 Alkaline cells, with a continuous current handling capability of 3.5A. An assembly option allows operation from 1 or 2 cells also with a continuous current handling capability of 3A. Conforming to the Acroname H-Bridge standard, the Low Voltage H-Bridge motor driver easily connects to the Acroname BrainStem® Moto 1.0 Module, providing the ideal solution for complete low voltage motion control. Using the integrated motor/encoder connector, combined motor and encoder devices connect with ease.

Functional Block Diagram



Absolute Maximum Ratings

Operation beyond these limits may damage the device. Proper device operation is not guaranteed between Recommended Operating Conditions and Absolute Maximum Ratings.

Motor Voltage (4 to 8 or 10 cell option, V_{MOTOR})	0V to 15V
Motor Voltage (1 or 2 cell option, V_{MOTOR})	0V to 4.5V
Continuous Output Current (I_{MOTOR})	3.5A
Logic Supply Voltage (V_{CC})	-0.5V to 5.5V
Logic Supply Current (I_{CC})	50mA
Logic Input Voltage (V_{IN})	-0.5V to 5.5V
Logic Output Current (I_{OUT})	± 4 mA
Combined MOSFET Power Dissipation	3W
MOSFET Junction Temperature	-25°C to 100°C
Storage Temperature	-50°C to 125°C

Recommended Operating Conditions

Proper device operation is guaranteed when operating within the limits below.

Motor Voltage (4 to 8 or 10 cell option, V_{MOTOR})	3.6V to 12V
Motor Voltage (1 or 2 cell option, V_{MOTOR})	0V to 3.5V
Logic Voltage (V_{CC})	4.5V to 5.5V
Logic Input Voltage (V_{IN})	0V to V_{CC}
Ambient Operating Temperature	0°C to 50°C

Pin Descriptions

Moto 1.0 Interface Connectors			
Pin	Signal Name	Type	Description
J1-1	STATUS	Digital Output	STATUS is active (logic high) when the driver is functioning properly. It will become inactive (logic low) due to an over current or under voltage condition. When STATUS is inactive (logic low), the driver will be placed in a floating (free spin) state.
J1-2	CURRENT	Analog Output	CURRENT is an analog voltage signal corresponding to the amount of current flowing through the driver. The units are 1 Volt/Amp.
J1-3	VCC	Logic Power Input	VCC is logic power input and is nominally 5V.
J1-4	GND	Logic Ground	GND is the logic ground reference.
J2-1	BRAKE	Digital Input	The BRAKE input will cause one of three actions to occur depending on the state of DIR and PWM (see Table 1). When BRAKE is active (logic high), it will: turn on both low side MOSFETs shunting both motor terminals to GND; turn on both high side MOSFETs shunting both motor terminals to VMOTOR; or float the motor terminals.
J2-2	DIR	Digital Input	The DIR input controls the direction of the motor (see Table 1).
J2-3	PWM	Digital Input	The PWM input controls when a voltage is applied to the motor (see Table 1).
J2-4	ENC_B	Digital Output	ENC_B is a passthrough of the quadrature encoder channel B from the Motor Connector. There is a 4.75K pull-up resistor between this signal and VCC.
J2-5	ENC_A	Digital Output	ENC_A is a passthrough of the quadrature encoder channel A from the Motor Connector. There is a 4.75K pull-up resistor between this signal and VCC.

Motor Connector			
Pin	Signal Name	Type	Description
J3-1	MOTOR_P	Analog Output	MOTOR_P should connect to the motor terminal such that when a positive voltage is applied with respect to MOTOR_N, the motor spins forward.
J3-2	VCC	Logic Power Output	VCC is connected to logic power (passed from the Interface Connector) and is intended to be used by the encoder.
J3-3	ENC_A	Digital Input	ENC_A is channel A of the quadrature encoder. When the motor spins forward, channel A should lead channel B. There is a 4.75K pull-up resistor between this signal and VCC.
J3-4	ENC_B	Digital Input	ENC_B is channel B of the quadrature encoder. When the motor spins in reverse, channel B should lead channel A. There is a 4.75K pull-up resistor between this signal and VCC.
J3-5	GND	Logic Ground	GND is connected to logic ground (passed from the Interface Connector) and is intended to be used by the encoder.
J3-6	MOTOR_N	Analog Output	MOTOR_N should connect to the motor terminal such that when a positive voltage is applied with respect to MOTOR_P, the motor spins in reverse.

Power Connector			
Pin	Signal Name	Type	Description
J4-1	VMOTOR	Motor Power Input	VMOTOR is the motor voltage.
J4-2	GND	Motor Ground	GND is the motor voltage ground. This is connected to logic ground in the driver.

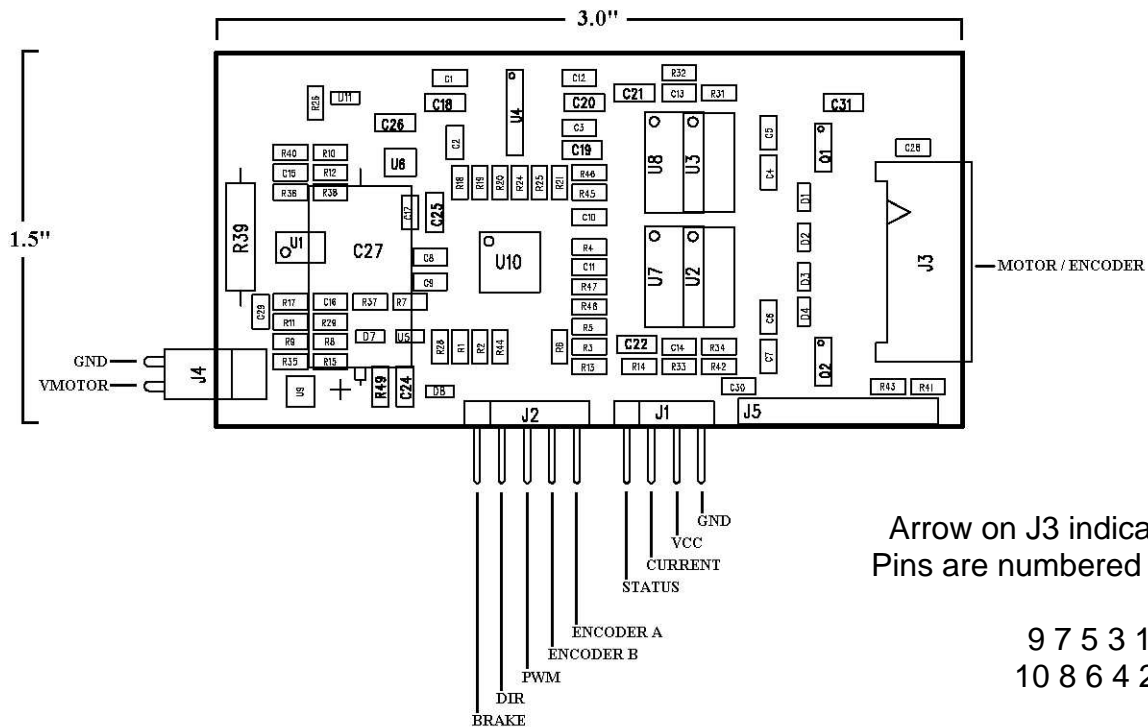
Control Logic

Inputs			Outputs		Function
BRAKE	DIR	PWM	MOTOR_P	MOTOR_N	
0	0	0	VMOTOR	VMOTOR	Brake High
0	0	1	GND	VMOTOR	Reverse
0	1	0	VMOTOR	VMOTOR	Brake High
0	1	1	VMOTOR	GND	Forward
1	0	0	FLOAT	FLOAT	Free Spin
1	0	1	GND	GND	Brake Low
1	1	0	FLOAT	FLOAT	Free Spin
1	1	1	VMOTOR	VMOTOR	Brake High
X	X	X	FLOAT	FLOAT	STATUS = 0

Table 1 : Control Logic

Physical Dimensions

Designed to conform to the Acroname H-Bridge standard.



Arrow on J3 indicates pin 1.
Pins are numbered as follows:

9 7 5 3 1
10 8 6 4 2

(looking into connector with arrow up)