



Hercules 16V, 30A, Motor Driver

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Introduction

Hercules 16V, 30Amp Motor Driver is virtually indestructible DC motor controller capable of driving loads up to 30Ampere at 16V. It can take up to 15Amp current continuously and 30Amp current for few seconds at 25 degree C ambient temperature. It also give current sensing output. It is made from high grade double sided PTH PCB. Motor controller is encapsulated in powder coated aluminum shell for better protection and easy mounting. Motor controller is thermally bonded with board for proper heat dissipation. This motor controller is very commonly used in robotics and automotive applications such as Steer By Wire (SBW) assembly in automobile, or robots used in Robocon, robot wars etc. This motor controller is used to drive Steer by Wire system (SBW) of Mahindra Scorpio and NEX Robotics' Intelligent Autonomous Transport Vehicle (IATV).

Specifications

- Operating voltage: 6V to 16V
- Output current 30A peak (15Amp nominal, additional air flow needed for more than 15Amp load)
- PWM operations up to 20 KHz
- Over voltage and under voltage shutdown
- Thermal shutdown
- Protection against loss of GND and Vcc.
- MOSFET based reverse polarity protection
- Motor fault diagnostics outputs for smart motion control system
- Motor controller is encapsulated in powder coated aluminum shell for better protection and easy mounting.

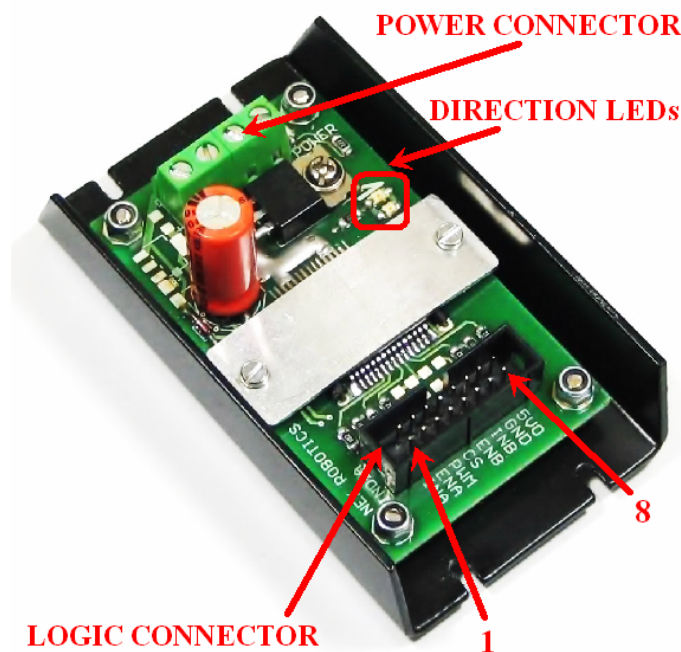
Thermal and short circuit protection:

Hercules Motor Driver has built in overheating and short circuit protection. If motor controller is shut down because of over temperature or short circuit then it needs to be restarted to resume operations.

Parameters:

Parameter	Range
Vcc (Supply voltage)	6V to 16V DC
Supply current	15A. continuous at 25 ⁰ C, 30A. additional air flow needed for more than 10A. load
PWM frequency	0 to 20KHz
VIL (Low level logic input)	>0.8V
VIH (High level logic input)	3.5V to 5V
Output at DIAGNA/ENA and DIAGNB/ENB	Open collector

Table 1: Parameters



Motor Connector Pin Functionality:

Pin	Functionality
Vcc	Motor supply 16V DC maximum
Ground	Ground pin to be connected to the supply
Motor A	Output A for the motor
Motor B	Output B for the motor

Table 2: Motor Connector Pin Functionality

Logic input Connector Pin Functionality:

Pin No.	Pin	Functionality
1	IN A	Logic input for the motor direction. These two pins control the state of the bridge in normal operation according to the truth table (brake to VCC, Brake to GND, clockwise and counterclockwise).
6	IN B	
3	PWM	Gates of Low-Side FETS get modulated by the PWM signal during their ON phase allowing speed control of the motor
2	ENA/DIAGNA	In case of fault detection (thermal shutdown of a High-Side FET or excessive ON state voltage drop across a Low-Side FET), these pins are pulled low by the device (refer Table 4)
5	ENB/DIAGNB	
4	CS	No connection
7	GND	Ground

Table 3: Logic Input Connector Pin Functionality
Current Sensing:

Motor controller can give voltage output proportional to the current. Current Sensing output should be connected to high impedance input such as ADC input of the microcontroller (while microcontroller's internal pull-ups disabled) or unity gain buffer OP Amp.

Note:

- **Ground of the Motor Connector and Logic input Connector are internally shorted.**
- **If you want to drive motor without using PWM then connect PWM pin to 5V logic level.**

Truth Table in Normal Operating Conditions:

INA	INB	DIAGA/ENA	DIAGB/ENB	OUTA	OUTB	CS	Mode of Operation
1	1	1	1	H	H	N.A..	Break to VCC
1	0	1	1	H	L	N.A..	Clockwise(CW)
0	1	1	1	L	H	N.A..	Counterclockwise (CCW)
0	0	1	1	L	L	N.A..	Break to GND

Table 4: Truth Table in Normal Operating Conditions
Truth Table in Fault Conditions (Detected On OUTA):

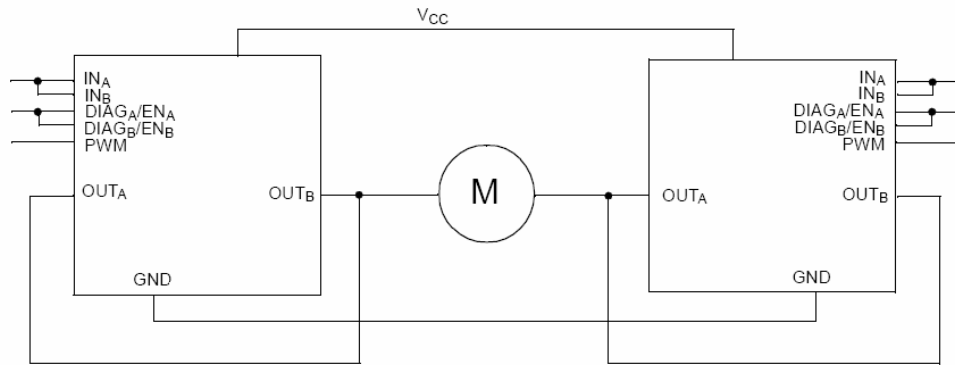
INA	INB	DIAGNA/ENA	DIAGNB/ENB	OUTA	OUTB	CS
1	1	0	1	Open	H	High Imp.
1	0	0	1	Open	L	High Imp.
0	1	0	1	Open	H	CS Out
0	0	0	1	Open	L	High Imp.
X	X	0	0	Open	Open	High Imp.
X	1	0	1	Open	H	CS Out
X	0	0	1	Open	L	High Imp.

Table 5: Truth Table in Fault Conditions

Bridge Configurations:

1. Half-Bridge Configuration:

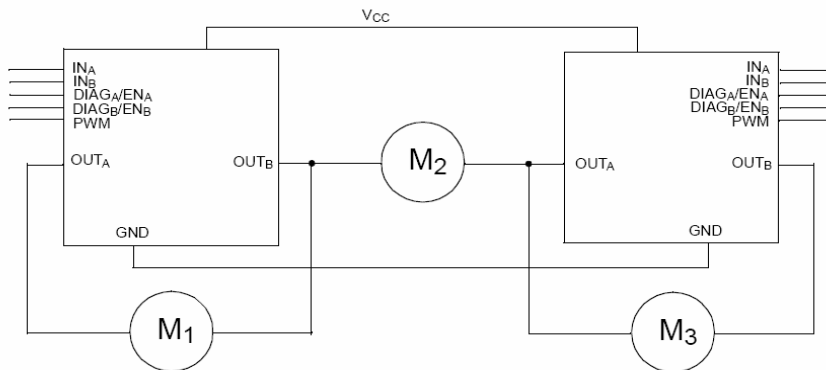
Hercules Motor Driver can be used as high power half-bridge driver to increase the current driving capacity. Suggested configuration is shown below:



Half-Bridge Configuration

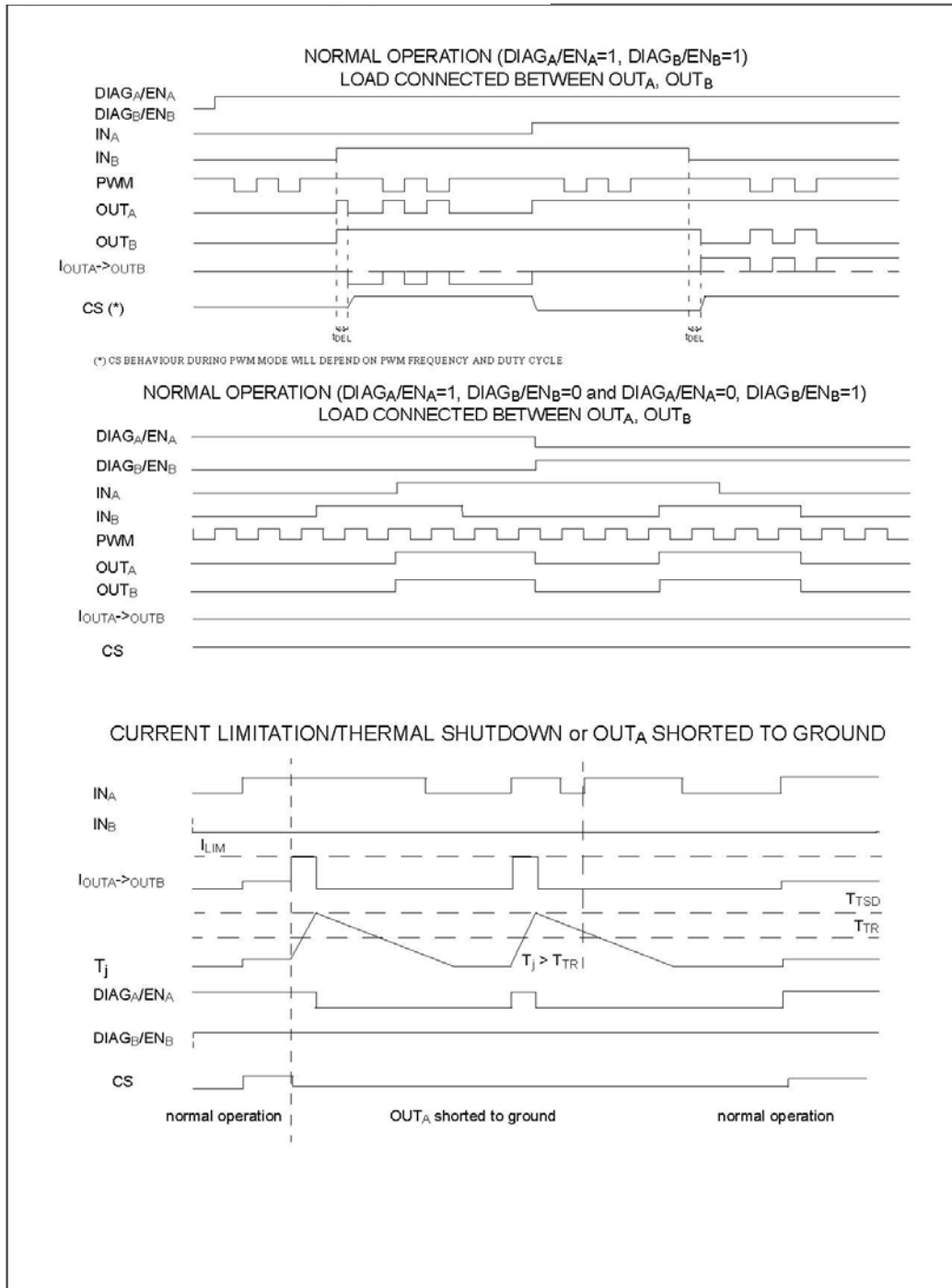
2. Multi-motors Configuration:

Hercules Motor Driver can easily be used in multi-motor systems such as seat positioning systems where, only a single motor must be driven at a time. DIAGX/ENX pins allow putting unused half-bridges in high impedance. Suggested configuration is as follows:

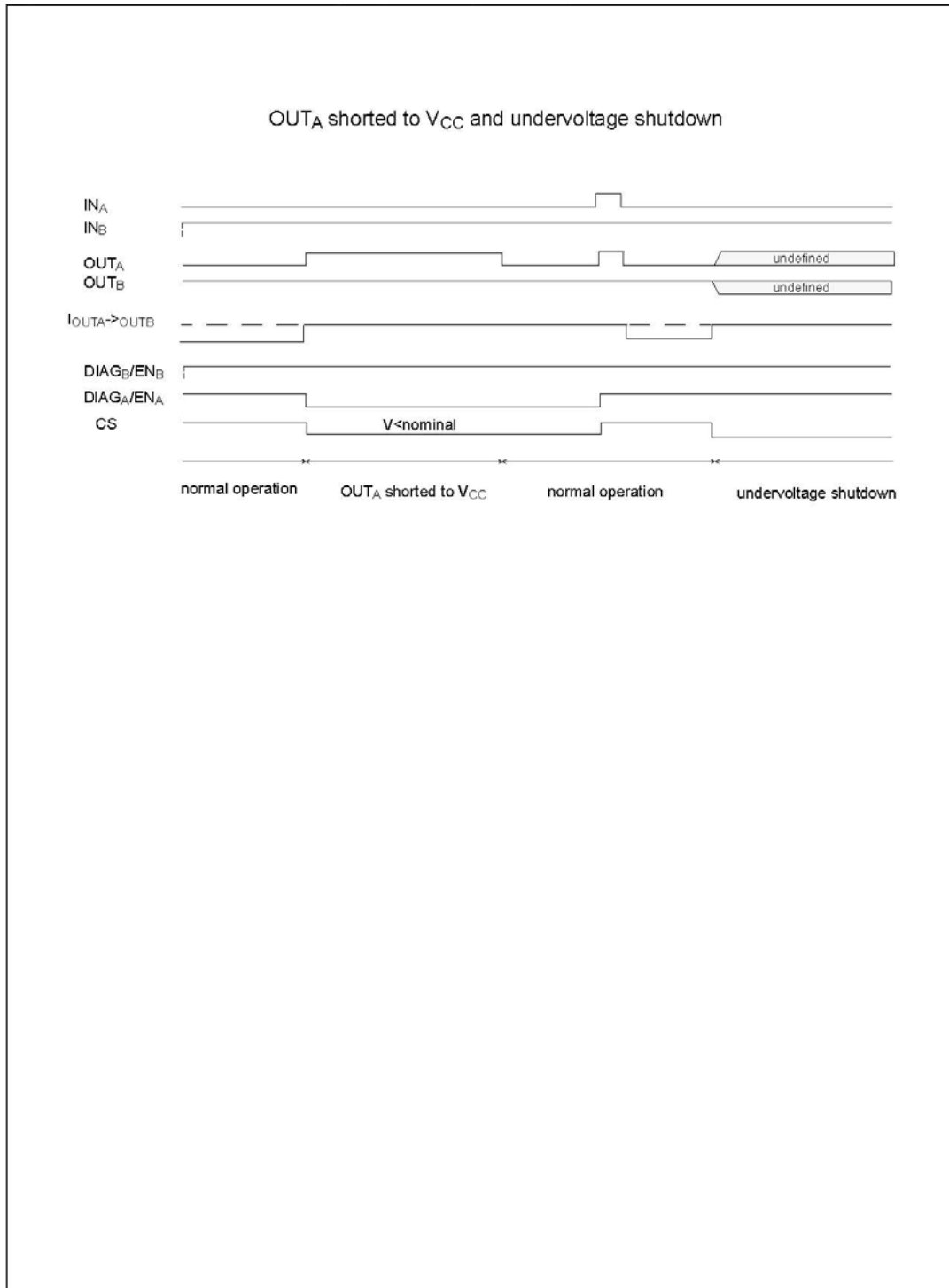


Multi-motor Configuration

Waveforms in full bridge operation



Waveforms in full bridge operation (continued)



Notice

The contents of this manual are subject to change without notice. All efforts have been made to ensure the accuracy of contents in this manual. However, should any errors be detected, NEX Robotics welcomes your corrections. You can send us your queries / suggestions at info@nex-robotics.com



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- ⚠ **Product's electronics is static sensitive. Use the product in static free environment.**
- ⚠ **Read the user manuals completely before start using this product**



Recycling:

Almost all the part of this product are recyclable. Please send this product to the recycling plant after its operational life. By recycling we can contribute to cleaner and healthier environment for the future generations.