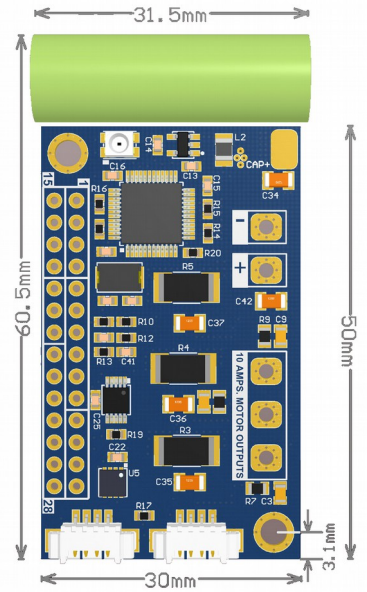
CAN_Drv module

3-phase BLDC motor driver to be used as a part of the SimpleBGC32 stabilizer system

https://www.basecamelectronics.com Version: 1.01 Edit: 10. Mar. 2020



Introduction

CAN_Drv is a DC brushless motor driver with the CAN-bus interface, intended to be used with the CAN-enabled SimpleBGC32 controller in a camera stabilization system, replacing the on-board motor drivers. System supports up to 3 CAN_Drv modules for the main stabilization axes, and up to 4 additional modules for the other tasks. Such modular scheme benefits by the optimized wiring between modules that is perfectly immune to EMI noise. It provides a better motor control algorithm compared to conventional SimpleBGC32 controllers with the integrated drivers.

This document provides a specifications and pin configuration of the CAN_Drv module designed by the Basecamelectronics company. Modules, developed by the partners of Basecamelectronics, may differ in specifications and pin-out – please refer to their manuals for details.

The information regarding a configuration and possible applications of this module can be found in the reference manuals for the CAN_Drv module and SimpleBGC32 main controller. The most actual version is published at the product's page: https://www.basecamelectronics.com/can_driver/ and in the "Manuals" section of our web site.

Features

- High-current and high-voltage output MOSFETs allows energy-efficient motor driving working with wide range of applications
- Fully-featured field-oriented control (FOC) of the brushless motor with various modes of operation (speed, torque, position and gyro-based feedbacks are supported)
- Built-in over-current, short-circuit, under-voltage, over-temperature protections make device immune to the most harmful working conditions
- Optional current limiting function and virtual temperature model saves battery lifetime and protect motors
- GUI provides easy tuning and calibrations (including fully automatic motor parameters estimation); a big number of adjustable parameters for maximum flexibility and efficiency

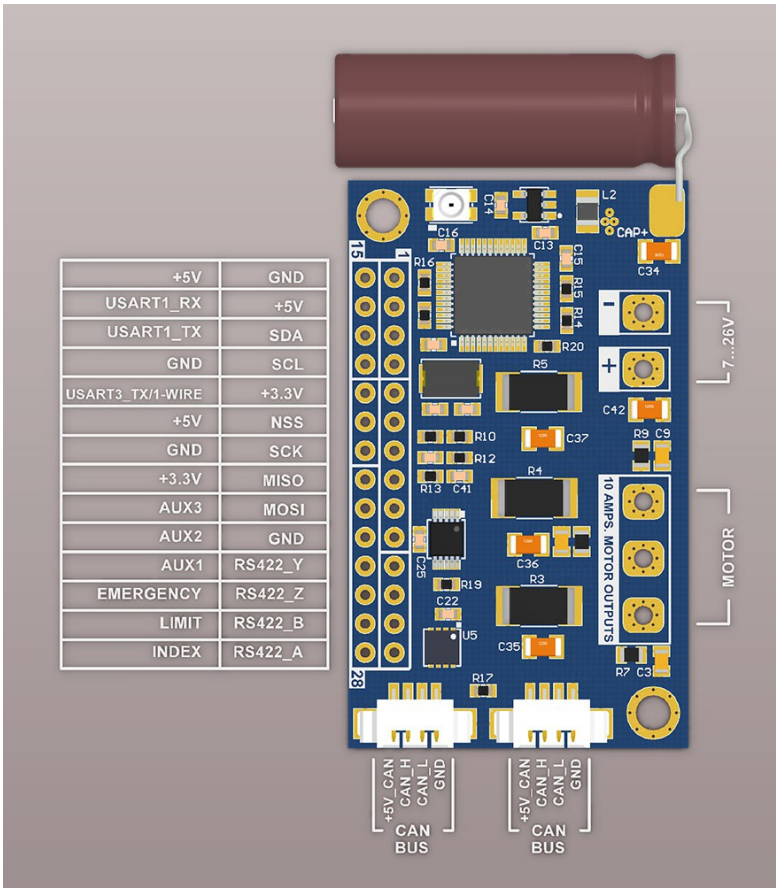
- Firmware upgradeable over CAN-bus interface simplifies a support of a system
- Build-in 5V and 3.3V switching regulators allow to connect an external load
- 2x can ports allows daisy-chain connection of modules
- Support of a big range of encoder interfaces and a big number of encoder models (new models could be add in firmware later)

Specifications

- Input voltage: 6-26V (2S – 6S Li-ion battery equivalent)
- Current: 10A continuous (15A with the heatsink installed)[(1)]; max. 40A impulse
- +5V line max. load: 800mA
- +3.3V line max. load: 100ma (150 mA for a short time)
- Working temperature[(1)]: -40 ... +85 °C
- Dimensions: 30mm x 50mm (31.5 x 61.5mm with capacitor)
- Weight: 11g (17g with pin headers and power terminal)
- Built-in protection systems:
  - Over-current protection with the configurable thresholds for an impulse and average current
  - Under-voltage protection with two thresholds: recoverable and critical
  - Output short-circuit protection [(2)]
  - Over-temperature protection with the on-board and external (motor) sensors or software-computed motor thermal model
- Control interface: 2x CAN-bus with proprietary protocol (specification can be provided upon request)
- Encoder interfaces:
  - SPI
  - PWM
  - I2C
  - A,B,Z
  - SSI, BiSS
- Other interfaces:
  - Limit switch
  - Z-Index switch
  - Emergency switch
  - 2x digital I/O pins
  - 1-wire for thermal sensor connection

(1) MOSFETs and shunt resistor may need proper thermal dissipation when working in a hard temperature environment

(2) Protected from short circuit phase-to-phase and battery-to-phase. **WARNING**: phase-to-GND is not protected and can damage MOSFET!



Pin configuration

Name	No.	Type[1]	Description	+5V tolerant
HEADER ROW #1				
+5V	15	P		
UART_RX*	16	I	Use only for firmware upgrade when motor is NOT CONNECTED!	•
UART_TX*	17	O		•
GND	18	P		
AUX3 / 1-Wire	19	OD	Pulled to +5V by the 4.7k resistor. Supported temperature sensor model: DS18B20 or compatible	•
+5V	20	P		
GND	21	P		
+3.3V	22	P		
AUX3 / 1-Wire	23	OD	connected to pin 19 internally	•
AUX2	24	I/O	depending on configuration	
AUX1	25	I/O	depending on configuration	•

EMERGENCY	26	I	Pulled HIGH internally, active 0	
LIMIT	27	I	Pulled LOW internally, active 1	
INDEX	28	I[(2)]	Pulled HIGH or LOW internally depending on a model of encoder	
HEADER ROW #2				
GND	1	P		
+5V	2	P		
I2C SDA	3	OD	Pulled HIGH by the 3.3k resistor	•
SPI CS / PWM IN / I2C SCL	4	I2C: OD PWM: I SPI: O	Pin mode depend on configuration. I2C: Pulled HIGH by the 3.3k resistor	•
+3.3V	5			
SPI CS / PWM IN / I2C SCL	6		connected to pin 4 internally	•
SPI SCK	7	O		•
SPI MISO	8	I		•
SPI MOSI	9	O		•
GND	10			
RS422_Y	11	O		•
RS422_Z	12	O		•
RS422_B	13	I	Terminated by the 100 Ohm resistor internally	•
RS422_A	14	I		•
CAN PORT (top view)				
GND		P		
CAN_L		O	Can be terminated by the internal 120 Ohm resistor[(3)]	
CAN_H		O		
+5V		P	Is not connected to the +5V power line of the module. Used as pass-through only.	

(1) I = input, O = output, OD = open-drain output, P = power
(2) In the firmware 1.0 pin is configured as output, be careful on connection!
(3) Solder a jumper SW4, located on the back side of the board, to terminate the line by the 120 Ohm resistor. Should be done for the last device on a CAN bus in case of a "serial" connection. For a "star" connection, leave each device unterminated (but the length of unterminated line may affect the noise immunity in this case).

Logic level: HIGH = +3.3V, LOW = GND

Device address selection by jumpers

By soldering address selection jumpers, you can assign hardware address that the main controller will use to refer for a particular CAN_Drv module. Leave all jumpers open to assign address in the GUI - in this case, it will be stored in the EEPROM of main controller.

SW3	**SW2**	**SW1**	**Address**
0	0	0	software-assigned
0	0	1	drv#1
0	1	0	drv#2
0	1	1	drv#3
1	0	0	drv#4
1	0	1	drv#5
1	1	0	drv#6
1	1	1	drv#7