



## Features

- Wide Input range of 24 – 60Vdc
- Up to 240W output
- High temperature – 177degC
- High efficiency design
- CNC Machined aluminum housing
- CANbus Interface
- Bootloader
- Open protocol

## Product Photo



## Description

The NSE HT 60V BLDC Motor Controller is designed for use in harsh environment with extreme temperatures. It is developed for running motors with input voltage up to 60Vdc, typically powered from batteries. An alternative is to use a NSE DCDC converter to provide the low voltage. The controller can interface hall encoders or run in sensorless mode. It is also possible to connect an external resolver board if required. Closed loop speed control is integrated in firmware. CANbus interface for control and monitoring. Protocol is open and examples for integration is provided.

## Revision History

REV	DATE	DESCRIPTION	PREP	APPR
1.0	16.08.2012	System Spec Aug. 2012	RFY	GLK
1.1	24.10.2012	Updated parameters and formatting	RFY	GLK
1.2	18.12.2012	Updated length and product photo	RFY	GLK
02	03.06.2013	Updated document name to 48&60V BLDC	GLK	BCM
03	21.08.2013	Minor changes	BCM	RFY
D	28.10.2014	Updated; Closed loop reg. Is standard.	BCM	GLK
E	20.01.2017	Updated; Temperature definition and lifetime	GLK	RFY

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## 1 System Specifications

Parameter	Conditions / Comments	Min	Typ	Max	Unit
<b>SUPPLY VOLTAGE</b> <i>Input Voltage</i> <i>Internal Vcc</i>		24	3.5	60	Vdc Vdc
<b>DRIVE SECTION</b> <i>Commutation Mode</i> <i>Speed Range</i>			Trapezoid		
	<i>4 pole motor</i>	0		12.000	RPM
	<i>Hall Encoder Feedback</i>	500		10.000	RPM
	<i>Sensorless</i>				
	<i>Motor Current</i>	0		4	Arms
	<i>Motor Current</i>			T.B.D	A
	<i>Hall Excitation Voltage</i>	4.5	5.0	5.5	V
	<i>Hall Excitation Current</i>			20	mA
	<i>PWM frequency</i>	16	32	80	kHz
	<i>Depending on motor</i>				
<b>CAN PORT</b> <i>Baud rate</i>			125	250	Kbits/s
<b>ENVIRONMENT</b> <i>Op. Temperature Range*</i> <i>Op. Pressure Range</i>		-20		177	DegC Atm.
				1	
<b>PHYSICAL PCB DIMENSION</b> <i>Height</i> <i>Width</i> <i>Length</i> <i>Mount holes</i>			10 35 175 6 x M3		mm mm mm
	<i>Excluding Connector</i>				
<b>PHYSICAL HOUSING DIMENSION</b> <i>Height</i> <i>Width</i> <i>Length</i> <i>Mount holes</i>			17 38 228 6 x M4		mm mm mm
<b>THERMAL</b> <i>Ambient temperature</i>	<i>Max Temperature on the surface of outer housing given that thermal resistance is within the specification</i>			177	°C
	<i>Thermal Resistance</i>			0.5	°C/W
	<i>Surface of OUTER HOUSING to NSE UNIT</i>				
<b>OPERATIONAL LIFETIME</b> <i>Expected Lifetime</i>	<i>&lt; 125°C Ambient Temperature</i>		2000		Hours
	<i>125 - 150°C (4 x acc. factor)</i>		500		Hours
	<i>150- 177°C (8 x acc. factor)</i>		250		Hours

\* Consult NSE for mounting guidance.

\*\* Consult NSE for pressure ratings on this board.

## 1.1 Sensors, Connectors and Communication Interface

On board sensor:	2 temperature sensor (ambient and driver stage) 1 off – Supply current measurement 1 off – Supply voltage measurement
Communication interface:	CAN bus, NSE Protocol
Input Connector:	Glenair MIL-DTL-83513/13-B01NW (Max 2A /120W) Flying leads for currents above 2A/120W
Output Connector:	Glenair MIL-DTL-83513/10-A01NW (Max 2A/120W) Flying leads for currents above 2A/120W

## 2 Functional Description

### 2.1 Block Diagram

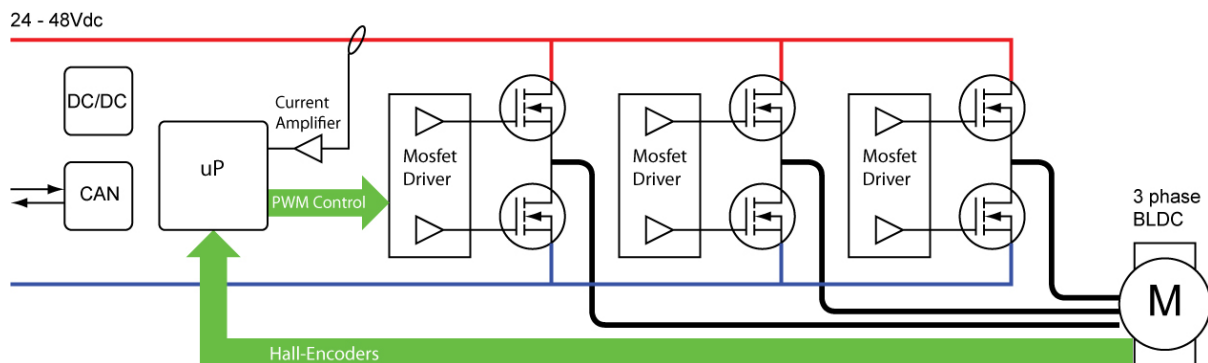


Figure 1 Block Diagram

### 2.2 BLDC Driver Stage

The BLDC Motor Driver Stage uses a Trapezoidal commutation scheme for controlling a 3-phase BLDC motor. The motor can be run with hall encoder feedback or using sensorless feedback.

Both the hall encoder feedback and the sensorless feedback are processed in the motor controller microprocessor, so that filtering and proper algorithms can be applied.

The HT 60V BLDC Motor Controller board is specifically made for lower voltage BLDC motors, such as the Maxon EC series, including the EC22 HD. The high temperature rating is possible through careful selection of components, and high quality control in assembly of the boards.

### 3 Firmware Control and Feedback Parameters

The motor controller has a CAN bus Interface for setting control parameters and reading back motor controller status parameters. The BLDC Driver Stage can be set up to run PWM (Open loop, 0-100%), Current or RPM (Closed loop) control modes. PWM and closed loop regulation is standard.

The parameters mentioned in 7.1 and 7.2 are the main control and feedback parameters. For the complete set of commands, refer to the communication protocol document.

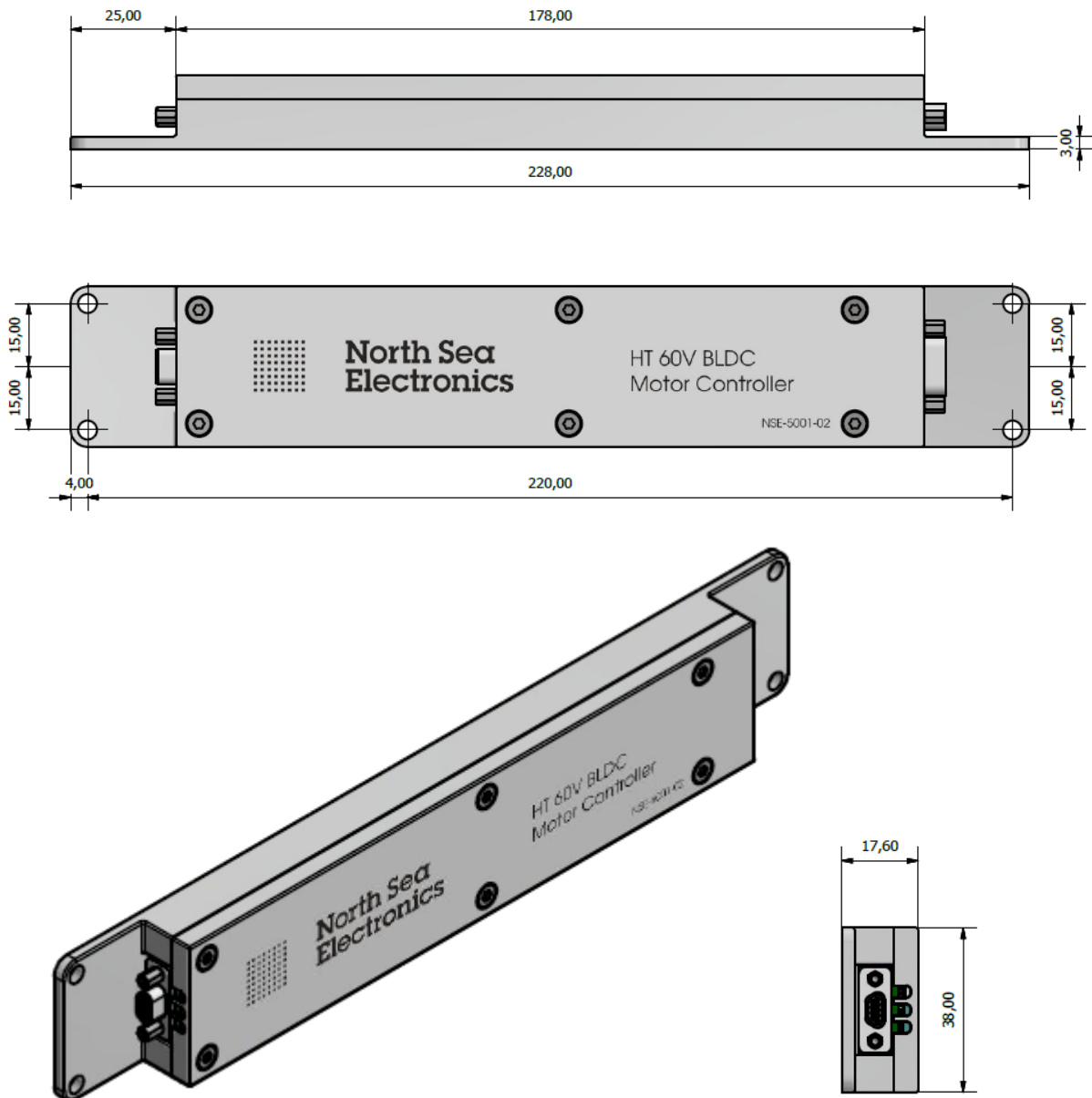
#### 3.1 BLDC Motor Control Parameters

Motor Control Parameters	Range
Motor PWM	0 – 100%
Motor Current Protection	0 – 6A
Motor Current (in Current Control Mode)	0 – 5A
Motor RPM (in RPM Control Mode)	100 – 15.000RPM
Motor Start / Stop	Boolean operation
Motor Control Mode	PWM / Current / RPM
Fault condition levels	<i>Defined fault conditions</i>
Motor Parameters	<i>T.B.D – Tuning parameters for different types of BLDC Motors</i>

#### 3.2 BLDC Motor Feedback Parameters

Motor Feedback Parameters	Range
Motor Voltage	0 – 60V
Motor Current	0 – 5A
Motor Driver Temperature	0 – 200degC (board and transistor temperature)
Motor RPM	0 – 15.000RPM
Mode Status:	Idle / Hall-Run / Sensorless-Run
Alarm Status:	Current Alarm Low RPM Alarm Temperature Alarm

## 4 Mechanical



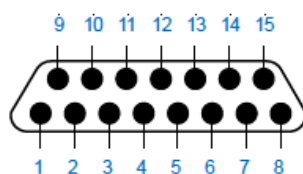
## 5 Connector Pinouts

BLDC Driver			
Input Connector		Motor Connector	
*M83513/13-B01N		**M83513/10-A01CP	
Pin no	Signal	Pin no	Signal
1	GND	1	Hall A
2	CANL	2	3.3V Hall
3	GND	3	Motor Phase B
4	CANL	4	Hall C
5	CANH	5	GND Hall
6	VMOTOR (max.60V)	6	Motor Phase A
7	CANH	7	Hall B
8	VMOTOR (max.60V)	8	GND Hall
9	GND	9	Motor Phase C
10	GND		
11	GND		
12	-		
13	-		
14	VMOTOR (max.60V)		
15	VMOTOR (max.60V)		

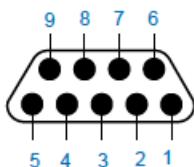
\*Vmotor and GND input are also available on flying leads.

\*\*Output to motor is also available on flying leads. This is recommended for more than 2A continuous load.

M83513/13-Bxx front view:



M83513/10-Axx front view:





## 5.1 Thermal properties

The device is designed to operate in a maximum ambient temperature of 177°C.

In a typical assembly, the **NSE UNIT** is mounted to a **MOUNTING PROFILE** that is located inside an **OUTER HOUSING**.

The **OUTER HOUSING** surface temperature should not rise above the specified maximum ambient temperature, and the mechanical design and interface between the **OUTER HOUSING, MOUNTING PROFILE** and the **NSE UNIT** should be such that the thermal resistance specification is achieved.

