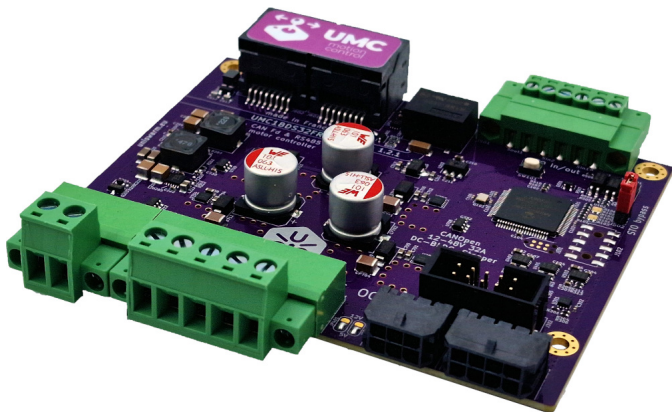


HARDWARE DATASHEET

Motor controller with CAN Fd and RS485

Description

UMC1BDS32 product line is an industrial motor controller with RS485 and/or CAN Fd communication. Compatibles motors are DC brushed, brushless and stepper.



Features

- 3 types of motors supported
- Upgradable firmware to keep up to date functionalities
- CANOpen protocol with CiA DS402 profile
- Safe Torque Off (STO) two inputs and one security output

Interfaces

- CAN Fd bus up to 8 Mbds compatible with CANOpen and CANOpen Fd

- RS485 / RS422 interface (up to 16 Mbds) for protocols like Modbus, Profibus or DMX512...
- 500 V isolation between power-side and interface-side

Motor

- DC brushed, brushless and stepper
- 12 - 48V input range
- 15A continuous, 32A peak

Sensors

- Current on each phases and Back EMF measurements
- Temperature sensors with over-temperature protection
- High speed incremental encoders
- 3 digital differential, single-ended or analog inputs
- Hall sensors or end stops inputs

MCU

- High performance dual core safety MCU
- Dedicated real-time motion control processing
- For firmware manual, please refer to UFM1001 document : https://uniswarm.eu/uboards/umc/doc/umc_firmware_ufm1001B.pdf

Reference	Motor phases	RS485	CAN Fd	Isolated
UMC1BDS32F-I	4	-	1	500 V
UMC1BDS32R-I		1	-	
UMC1BDS32FR-I		1	1	

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Chapter 1

Specifications

1 Technical data

Electrical	
Nominal power supply voltage	12 - 48 V _{DC}
Absolute maximum power supply	11 - 60 V _{DC}
Output current I _{cont} / I _{max}	15 A continuous 32 A peak
Communication interfaces	
CAN Fd (CAN)	max 8 Mbds (1 Mbds)
RS-485 / RS422	max 16 Mbds
Galvanic isolation	Capacitive coupling, 500 V
External sensors	
Quadrature Encoder Interface	2/3 channels, RS485/RS422, max 16 Mbds
Digital Hall sensor signals	5 V _{DC} (Internal pull up)
SSI absolute encoder	configurable RS485/RS422, max 16 Mbit/s
Internal measurement	
Input voltage	0 - 60V 15 mV resolution
Back EFM voltage	3 ch., 0 - 60 V 15 mV resolution
Current	4 ch., 0 - 33 A, low side 16 mA resolution
Temperature	3 ch., CPU + 2 on bridges 0.2°C resolution
Security Inputs / Outputs STO	
Security input voltage	5 - 24 V
Security output voltage	5 - 24 V
Security output current	max 10 mA
Isolation	Optocoupler, 3.75 kV
Physical	
Operating temperature	0 to +85°C
Storage temperature	-40 to +125°C
Dimensions (L x W x H), without heat sink Mounting, without heat sink	100 x 80 x 17 mm 4 mounting holes for M3 screws
Dimensions (L x W x H), with heat sink Mounting, with heat sink	130 x 80 x 23 mm 4 mounting holes for M4 screws

2 Connectors

UMC1BDS32 have 10 connectors.

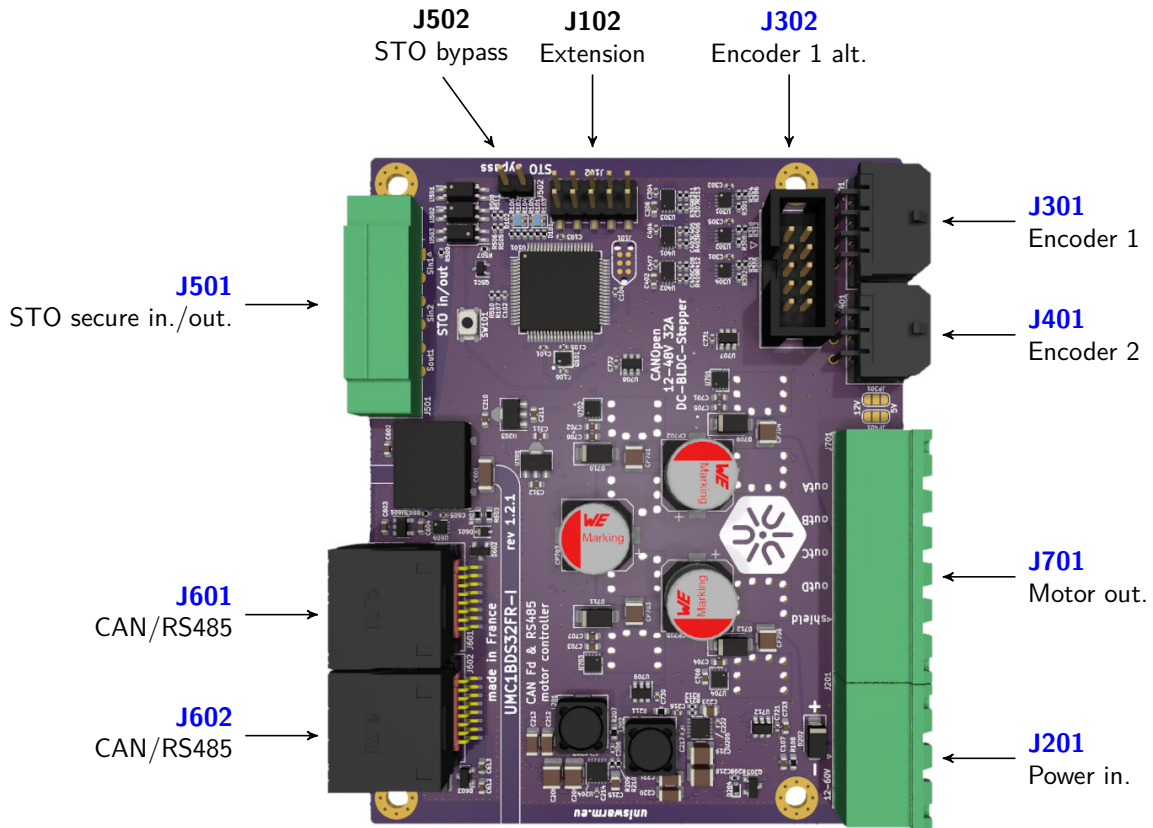


Figure 1.1: UMC1BDS32 connectors

2.1 Power supply

12 - 48V range, protected against polarity reverse when use an external fuse.

2.1.1 Connectors J201 : power supply

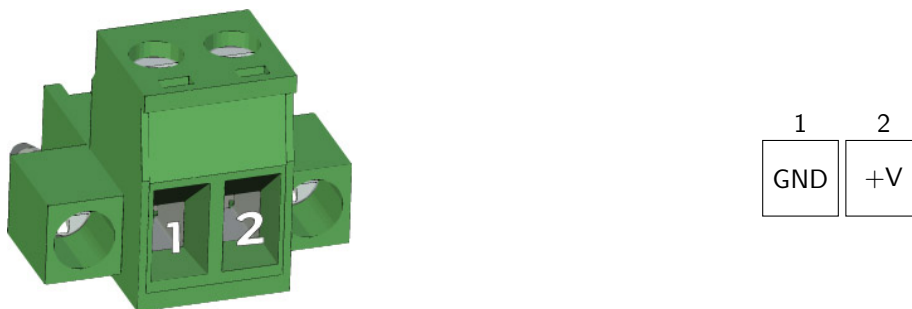


Figure 1.2: J201 pins, 2 pins, power supply

Pins	Name	Description
1	GND	Ground, power input -
2	+V	Power input + (12V - 48V)

Figure 1.3: J201 pins

The logic power supply is derived from this power input. Power bridge is not directly connected to this power supply but a power switch driven by software.

Recommended connector references, screw connection :

- Phoenix® : MSTB 2,5/ 2-STF

Recommended connector references, Push-in spring connection :

- Phoenix® : FKCN 2,5/ 2-STF

2.2 Buses

Both buses (RS485 and CAN Fd) have 30 kV Electrostatic Discharge (ESD) protection and high quality filters for noisy environment.

A full 500 V isolation is present between BUS-side and power-side to prevent damage and avoid noise to propagate through the bus.

Dual RJ45 socket (J601/J602). Both ports are connected together, to daisy chain the bus without external Y cable or adapter.

The speed of both buses can be set by software.

2.2.1 Connectors J601/J602 : CAN Fd / RS485

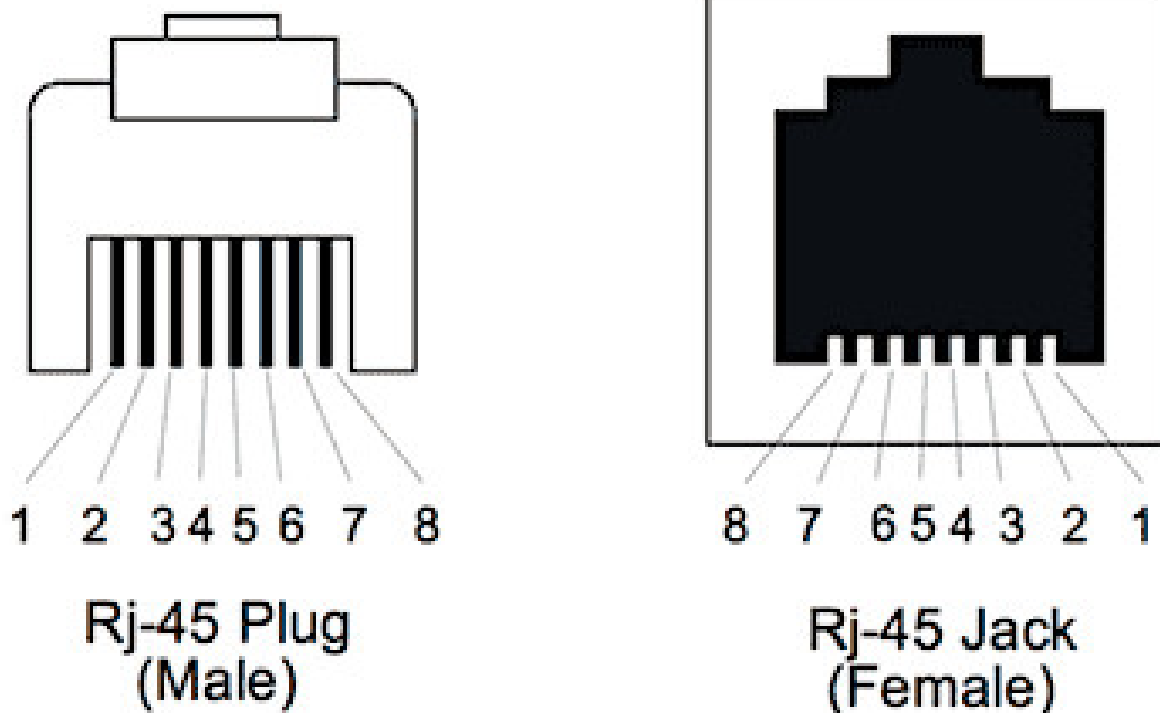


Figure 1.4: RJ45 pins

2.2.2 Recommended connector references

Standard straight RJ45 cable.

Pins	Name	Description
1	CAN H	CAN Fd dominant
2	CAN L	CAN Fd recessive
3	GND	Ground, connected to 8
4	RS485 B	RS485 B side
5	RS485 A	RS485 A side
6	-	Unused, but both 6 pins are connected together
7	GND	Ground, connected to 3
8	-	Unused, but both 8 pins are connected together

Figure 1.5: J601/J602 pins

2.3 Motor outputs

There are 4 motor outputs, each one corresponding to an half bridge named from A to D.

- DC motors use 2 outputs, so it's possible to drive two DC motors with only one UMC board. (Motor 1: A,B and Motor 2: C,D)
- BLDC motors use 3 outputs (A,B,C) There is one unused outputs.
- Steppers motors use two outputs for each phase. (Phase 1: A,B and Phase 2: C,D)

2.3.1 Connector J701, motor outputs

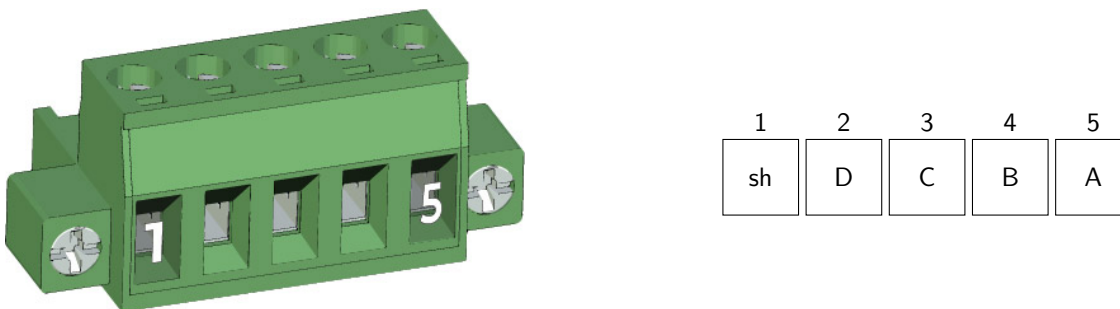


Figure 1.6: J701 pins, 5 pins, motor outputs

Pins	Name	Description
1	shield	motor shield (optional, connected to power ground)
2	D	phase D output
3	C	phase C output
4	B	phase B output
5	A	phase A output

Figure 1.7: J701 pins

2.3.2 Recommended connector references

Screw connection :

- Phoenix® : MSTB 2,5/ 5-STF-5,08

Push-in spring connection :

- Phoenix® : FKCN 2,5/ 5-STF-5,08



2.4 Sensors inputs

Several types of sensors can be used :

- Differential Quadrature Encoder Interface (QEI) (A+, A-, B+, B-, I+, I-)
- Single Ended Quadrature Encoder Interface (QEI) (A+, B+, I+)
- SSI absolute encoder (Tx, Rx) (32 bits maximum frame)
- Digital Hall sensors (H1, H2, H3)

There are 2 different connectors for sensors. A main 8 positions connector with QEI differential or single ended with 2 or 3 signals it can also use an SSI encoder using RS422 or RS485 communication up to 16 Mbit/s.

2.4.1 Connector J301, main sensor

To selected the voltage on pin VDD (pin 5), please choose with the solder selector close to the connector.



Figure 1.8: J301 pins, 2 x 4 pins, main sensor input

Pins	Name	Description
1	GND	Ground
2	A- Tx/Rx A	A- signal (differential) Inverting RS-485/RS-422 Receiver Input and Driver Output A
3	B- Tx/Rx B	B- signal (differential) Inverting RS-485/RS-422 Receiver Input and Driver Output B
4	I- Rx I	I- index/home signal (differential) Inverting RS-485/RS-422 Receiver Input I
5	VCC	Sensor power (5V or 12V)
6	A+ Tx/Rx A DI0	A+ signal (differential) Non-inverting RS-485 Receiver Input and Driver Output A Digital input 0
7	B+ Tx/Rx B DI1	B+ signal (differential) Non-inverting RS-485 Receiver Input and Driver Output B Digital input 1
8	I+ Rx I DI2 AI1	I+ index/home signal (differential) Non-inverting RS-485 Receiver Input I Digital input 2 Analog input 1

Figure 1.9: J301 pins, 2 x 4 pins, main sensor input

For non differential signal, let - unconnected.

2.4.2 Recommended connector references

Micro-Fit 3.0 Molex® Connector

- 43025-0800

Micro-Fit 3.0 Molex® Insert

- 43030-0007

A second connector can also be used instead of the first one:

2.4.3 Connector J302, second main sensor

Pins	Name	Description
1	NC	
2	VCC	Sensor power (5V or 12V)
3	GND	Ground
4	NC	
5	A- / Tx/Rx B	A- signal (differential) / Inverting RS-485/RS-422 Receiver Input and Driver Output
6	A+ / Tx/Rx A	A+ signal (differential)/ Non-inverting RS-485 Receiver Input and Driver Output
7	B- / Tx/Rx B	B- signal (differential) / Inverting RS-485/RS-422 Receiver Input and Driver Output
8	B+ / Tx/Rx A	B+ signal (differential)/ Non-inverting RS-485 Receiver Input and Driver Output
9	I- / Rx B	I- index/home signal (differential) / Inverting RS-485/RS-422 Receiver Input
10	I+ / ANI / Rx A	I+ index/home signal (differential) / analog I in / Non-inverting RS-485 Receiver Input

Figure 1.10: J302 pins

2.4.4 Connector J401, auxiliary sensor

A 6 positions auxiliary connector can be connected to a Hall sensors or with a single ended QEI encoder.



Figure 1.11: J401 pins, 2 x 3 pins, auxiliary sensor input

Pins	Name	Description
1	A H1 DI3	A signal for QEI2 H1 Hall signal Digital input 3
2	B H2 DI4	B signal for QEI2 B+ signal, analog B or H2 Hall signal Digital input 4
3	I H3 DI5	I index/home signal for QEI2 H3 Hall signal Digital input 5
4	GND	Ground
5	VCC	Sensor power (5V or 12V)
6	AI2 DI6	Analog input 2 Digital input 6

Figure 1.12: J401 pins, 2 x 3 pins, auxiliary sensor input

2.4.5 Recommended connector references

Micro-Fit 3.0 Molex® Connector

- 43025-0600

Micro-Fit 3.0 Molex® Insert

- 43030-0007

To selected the voltage on pin 5, please choose with the solder selector behind the connector.

2.5 Secure inputs / output (STO)

2 secure inputs and 1 secure output to connect to a secure automate for security usage. All signals are opto-electrically isolated with 3.75 kV barrier. Inputs supports voltage between 5 - 24V.

2.5.1 Connector J501, security

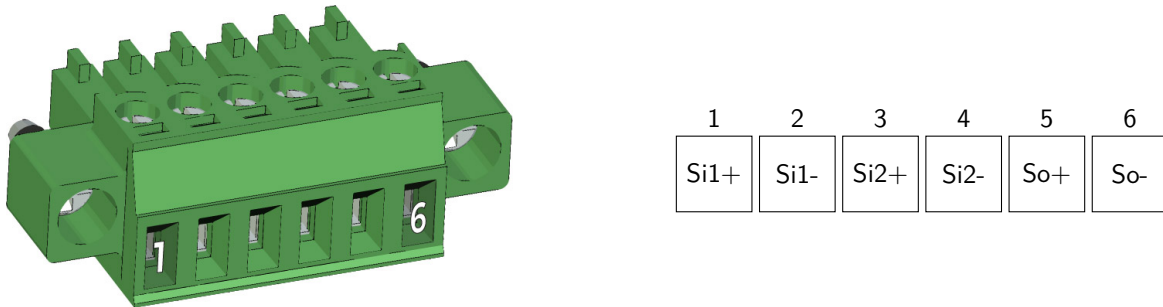


Figure 1.13: J501 pins, 6 pins, security

Pins	Name	Description
1	Si1+	Isolated secure input 1
2	Si1-	Isolated secure input 1 ground (Do not connect to board Ground !)
3	Si2+	Isolated secure input 2
4	Si2-	Isolated secure input 2 ground (Do not connect to board Ground !)
5	So+	Isolated secure output 1
6	So-	Isolated secure output 1 ground (Do not connect to board Ground !)

Figure 1.14: J501 pins

2.5.2 Recommended connector references

Screw connection :

- Phoenix® : MC 1,5/ 6-STF-3,5

Push-in spring connection :

- Phoenix® : FK-MCP 1,5/ 6-STF-3,5

A second connector (J502) allows to bypass the STO system.

2.6 External connector

An external connector is also present on the board, it will be used for future applications.

3 Leds

2 RGB LEDs are present:

- D101: CAN bus status
- D102: Motor status

D101: Communication status D102: Motor status

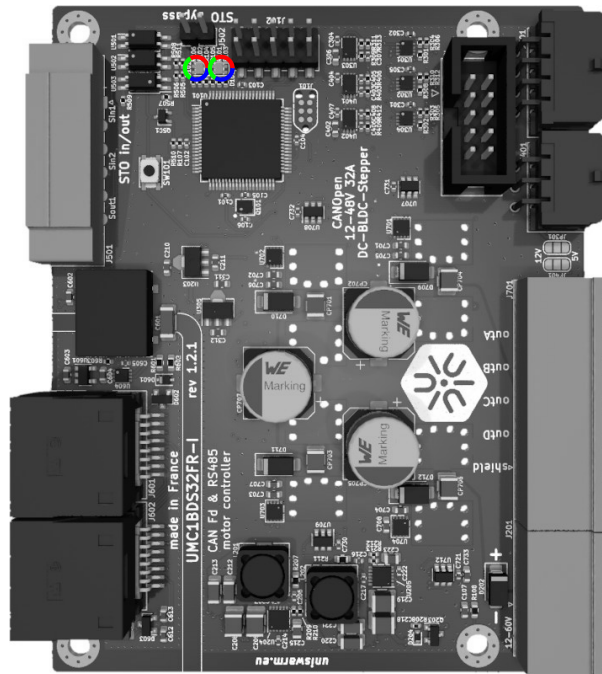
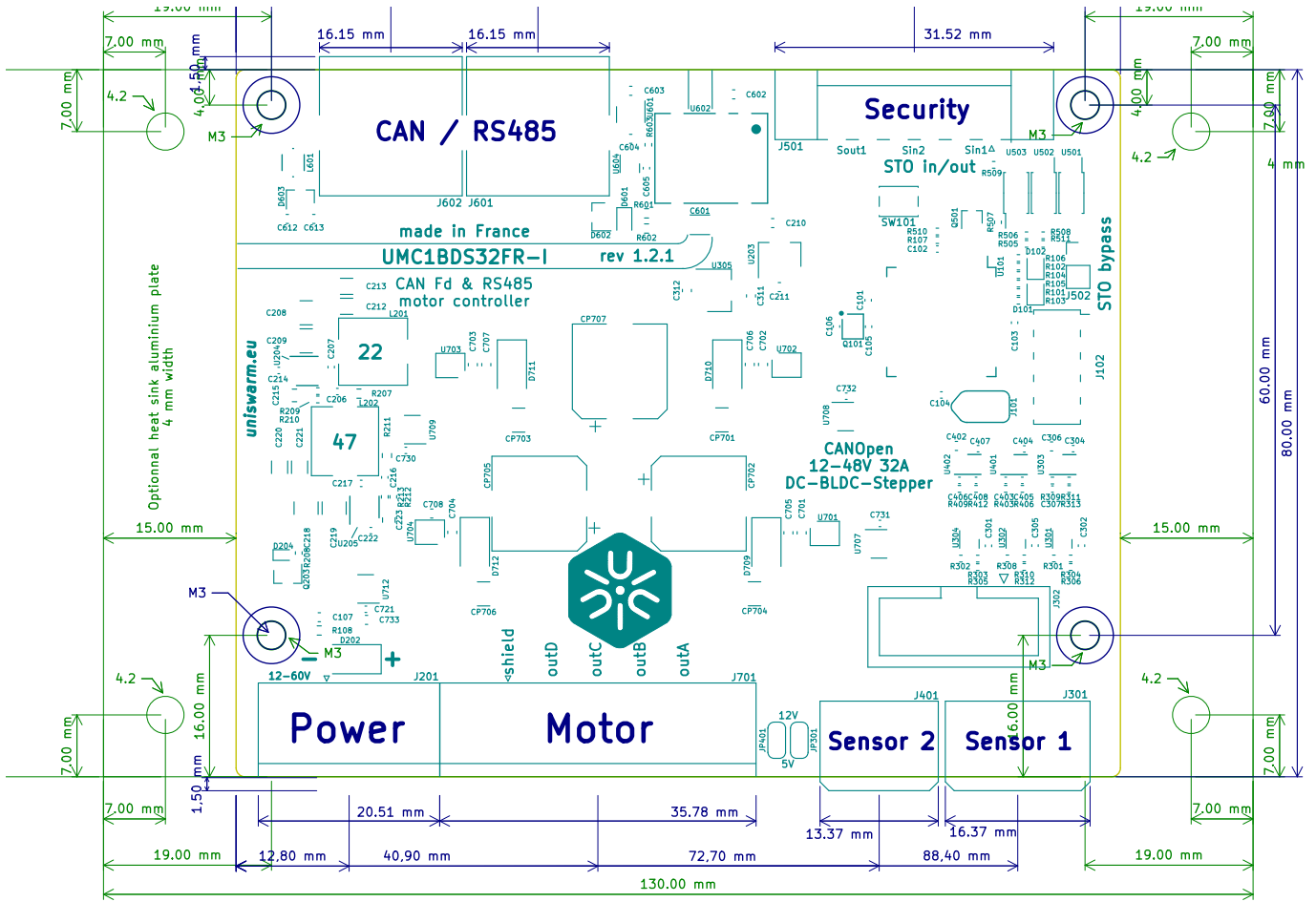


Figure 1.15: UMC1BDS32 leds

4 Mechanical drawings



Overall height (without heat-sink plate): 19.00 mm
 Overall height (**with** 4 mm heat-sink plate): 23.00 mm

Appendix A

Hardware version history

Version	Date	Change
v1.0.1	2019-03-06	Initial public version
v1.0.2	2019-05-28	Analog input bug fix Improved Back EMF performances
v1.1.0	2020-10-15	Complete redesign Improved maximum current and reduced power loss Added dual side current measurement Added a second sensor connector Reduced power consumption Upgrade STO secure input to obtain a real PID secure input
v1.1.1	2021-01-25	Robustified power bridges with negative diodes protections
v1.2.0	2021-12-01	Added a fourth bridge current measurement Fixed issue with temperature measurement that cause bad over temp detection Improved current measurement precision
v1.2.1	2023/07/31	Reduced idle power consumption Improved manufacturability Changed PCB color to purple to respect range theme Moved voltage selector on top for sensors connectors Reduced EMI

Appendix B

Datasheet revision history

Revision	Date	Change
A	2019/05/28	Initial public revision
B	2020/09/23	Added board revision v1.1.0 Added recommended connectors
C	2021/12/15	Added board revision v1.2.0 Added mapping 3D of connectors
D	2023/08/03	Added board revision v1.2.1 Reviewed spec and connectors, added digital inputs