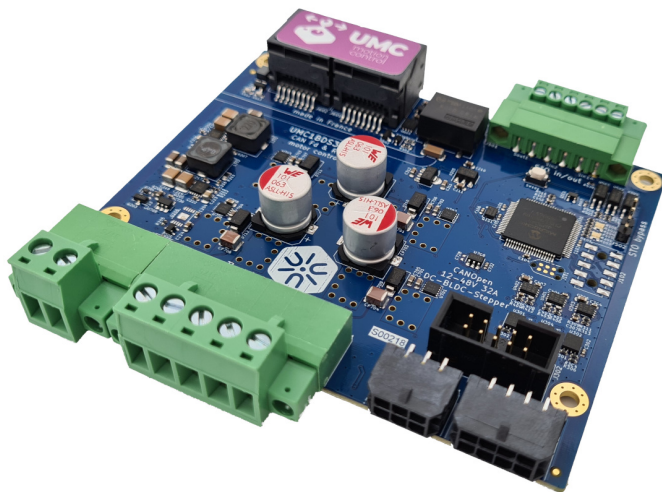


## HARDWARE DATASHEET

# 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, digital 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/boards/umc/doc/umc\\_firmware\\_ufm1001B.pdf](https://uniswarm.eu/boards/umc/doc/umc_firmware_ufm1001B.pdf)

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

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# Chapter 1

## Specifications

### 1.1 Technical data

<b>Electrical</b>	
Nominal power supply voltage	12 - 48 VDC
Absolute maximum power supply	11 - 60 VDC
Output current $I_{cont}$ / $I_{max}$	15 A continuous / 32 A peak
<b>Interfaces</b>	
CAN Fd (CAN)	max 8 Mbds (1 Mbds)
RS-485	max 16 Mbds
Isolation	500 V
<b>Sensors</b>	
Quadrature Encoder Interface	2/3 channels, RS485/RS422 max 16 Mbds
Digital Hall sensor signals	5 VDC (Internal pull up)
SSI absolute encoder	configurable RS485/RS422 max 16 Mbit/s
<b>Security Inputs / Outputs</b>	
Security input voltage	5 - 24 V
Security output voltage	5 - 24 V
Security output current	max 10 mA
Isolation	3.75 kV
<b>Physical</b>	
Operating temperature	0°C...+85°C
Dimensions (L x W)	100 mm x 80 mm
Mounting	4 mounting holes for M3 screws

## 1.2 Electrical

UMC1BDS32 have 10 connectors :

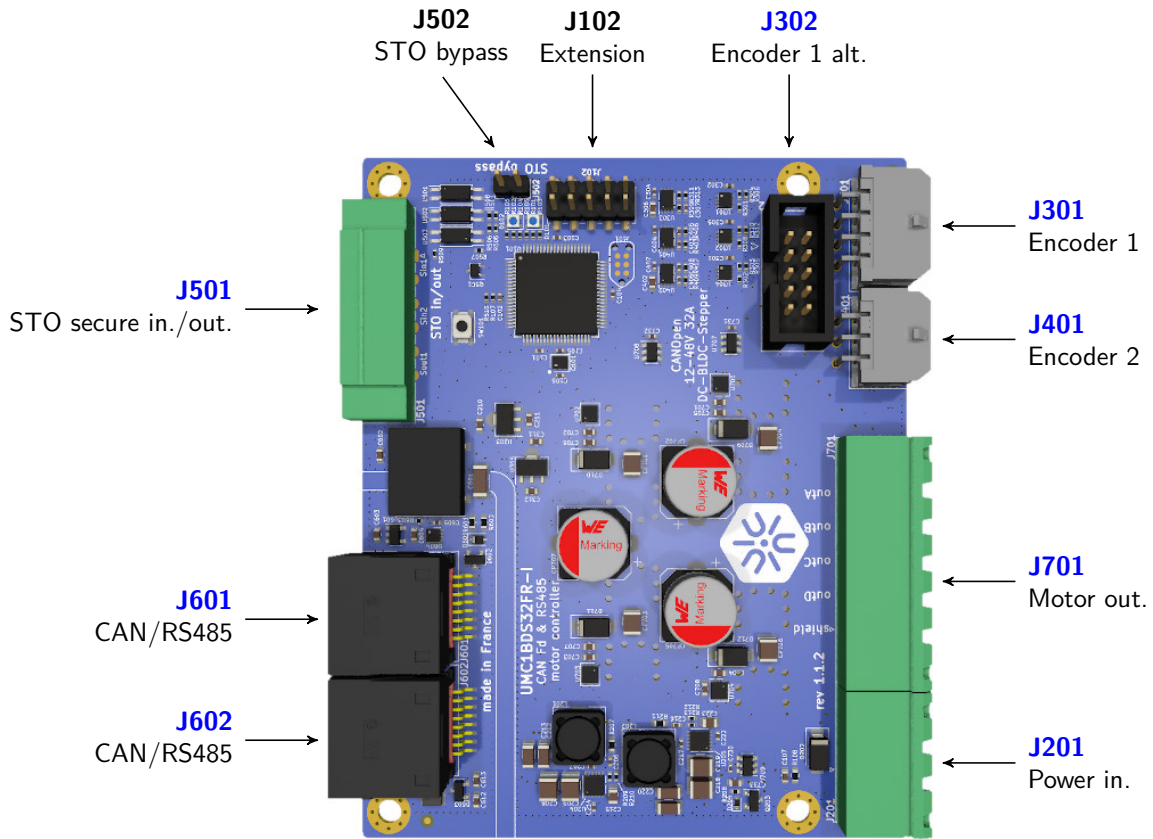


Figure 1.1: UMC1BDS32 connectors

### 1.2.1 Power supply

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

Connectors J201 : power supply

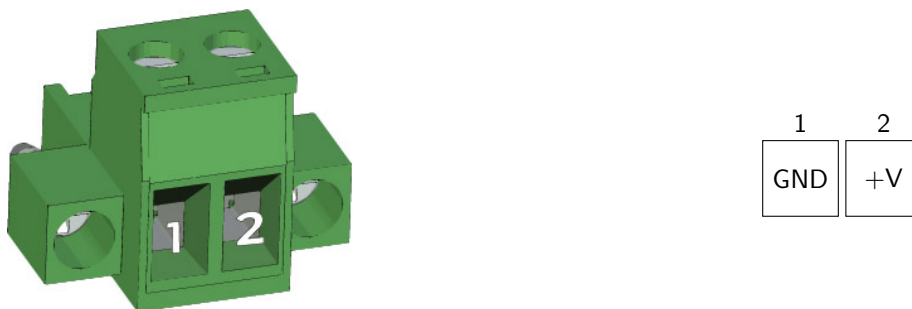


Figure 1.2: J201 pins, 2 pins, power supply

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

## 1.2.2 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.

### Connectors J601/J602 : CAN Fd / RS485

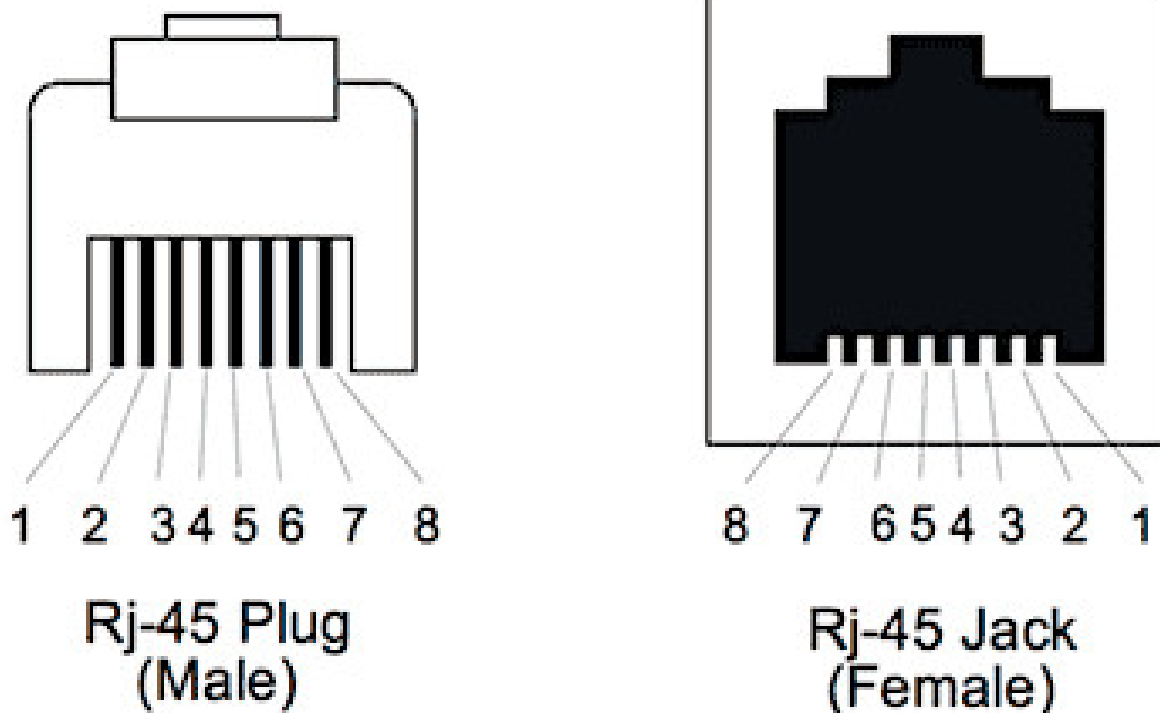


Figure 1.4: RJ45 pins

### 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

### 1.2.3 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)

#### Connector J701, motor outputs

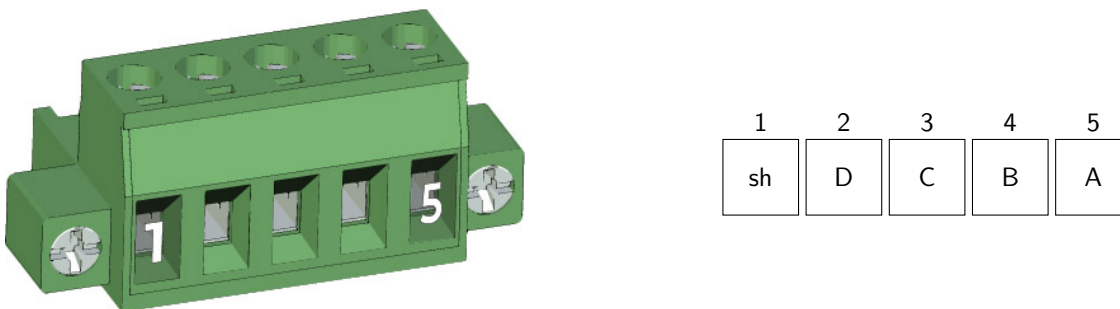


Figure 1.6: J701 pins, 5 pins, motor outputs

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

#### 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

### 1.2.4 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)
- Digital Hall sensors (H1,H2,H3)

There is 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.

#### Connector J301, main sensor



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

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

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

#### Recommended connector references

Micro-Fit 3.0 Molex® Connector

- 43025-0800

Micro-Fit 3.0 Molex® Insert

- 43030-0007

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

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

**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

**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	A+ signal, analog A or H1 Hall signal
2	B+ / H2	B+ signal, analog B or H2 Hall signal
3	I+ / H3	I+ index/home signal, analog I or H3 Hall signal
4	GND	Ground
5	VCC	Sensor power (5V or 12V)
6	AN2	Analog Input 2

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

**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.

**1.2.5 Secure inputs / output**

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.





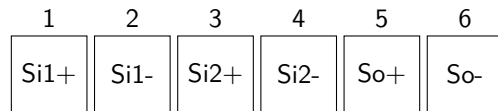
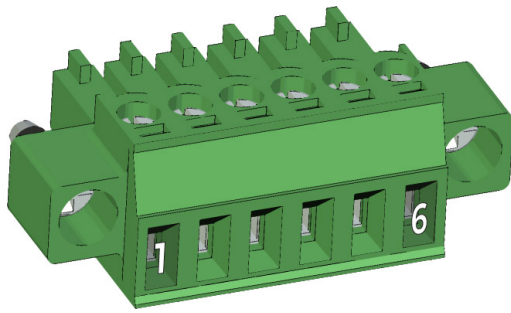


Figure 1.13: J501 pins, 6 pins, security

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

### Connector J501, security

#### 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.

### 1.2.6 External connector

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

## 1.3 Leds

2 RGB LEDs are present:

- D101: CAN bus status
- D102: Motor status

D101: Communication status

D102: Motor status

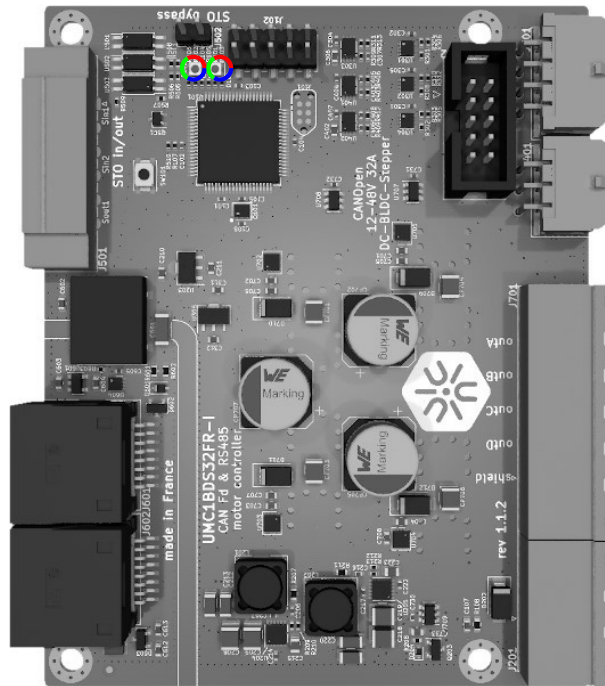
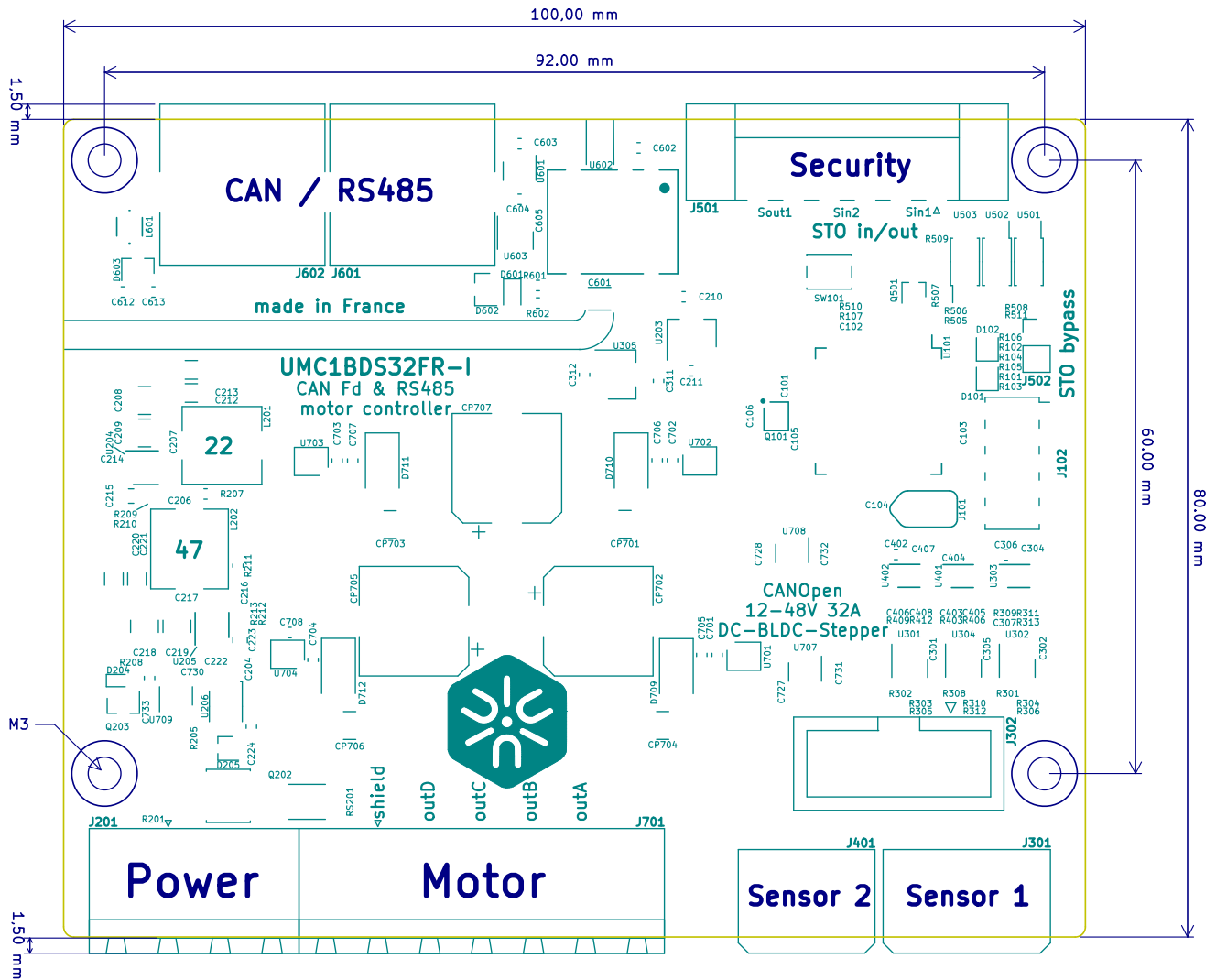


Figure 1.15: UMC1BDS32 leds

# 1.4 Drawings



Maximum height : 20.00 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 Improved current measurement precision Added a second sensor connector Reduced power consumption Upgrade STO secure input to obtain a real PID secure input
v1.1.1	2021/02/01	Robustified power bridges with negative diodes protections
v1.1.2	2021/10/21	Fixed issue with temperature measurement that cause bad over temp detection Improved current measurement precision and dual side

## 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	2021/10/21	Added board revision v1.1.2 Added mapping 3D of connectors