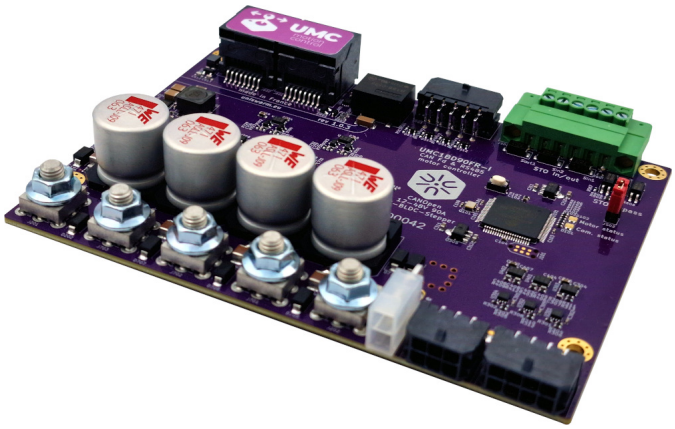
UMC1BD90

HARDWARE DATASHEET

Motor controller with CAN Fd and RS485

Description

UMC1BD90 product line is an industrial motor controller with RS485 and/or CAN Fd communication. Compatibles motors are DC brushed and brushless.



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...
- 500V isolation between power-side and interface-side

Motor

- DC brushed and brushless
- 12 - 48V input range
- 60A continuous, 90A 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
- 4 digital inputs and 4 digital outputs for global usage

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
UMC1BD90F-I	3	-	1	500 V
UMC1BD90R-I		1	-	
UMC1BD90FR-I		1	1	

Contents

Chapter 1

Specifications

1 Technical data

Electrical	
Nominal power supply voltage	12 - 48 VDC
Absolute maximum power supply	11 - 60 VDC
Output current I_{cont} / I_{max}	60 A continuous 90 A peak
Interfaces	
CAN Fd (CAN)	max 8 Mbds (1 Mbds)
RS-485 / RS422	max 16 Mbds
Isolation	Capacitive coupling, 500 V
Sensors	
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
Internal measurement	
Input voltage	0 - 60V 15 mV resolution
Back EFM voltage	3 ch., 0 - 60 V 15 mV resolution
Current	3 ch., 0 - 90 A, low side 45 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	120 x 90 x 21 mm 4 mounting holes for M3 screws
Dimensions (L x W x H), with heat sink Mounting, with heat sink	160 x 90 x 27 mm 4 mounting holes for M4 screws

2 Connectors

UMC1BD90 have 13 connectors.

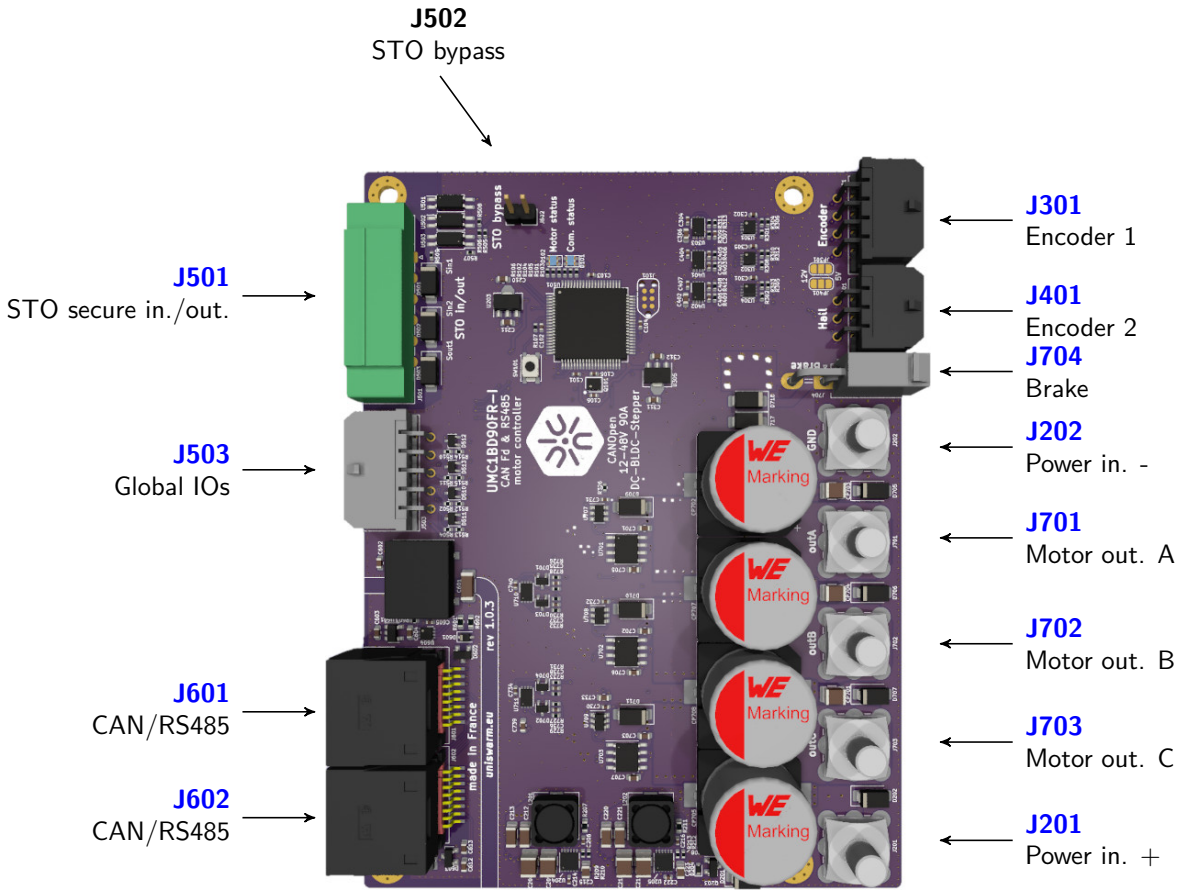


Figure 1.1: UMC1BD90 connectors

2.1 Power supply

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

2.1.1 Connectors J201 - J202 : Power supply

Pins	Name	Description
J201	GND	Ground, power input -
J202	+V	Power input + (12V - 48V)

Figure 1.2: J201 pins

The logic power supply is derived from this power input.

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

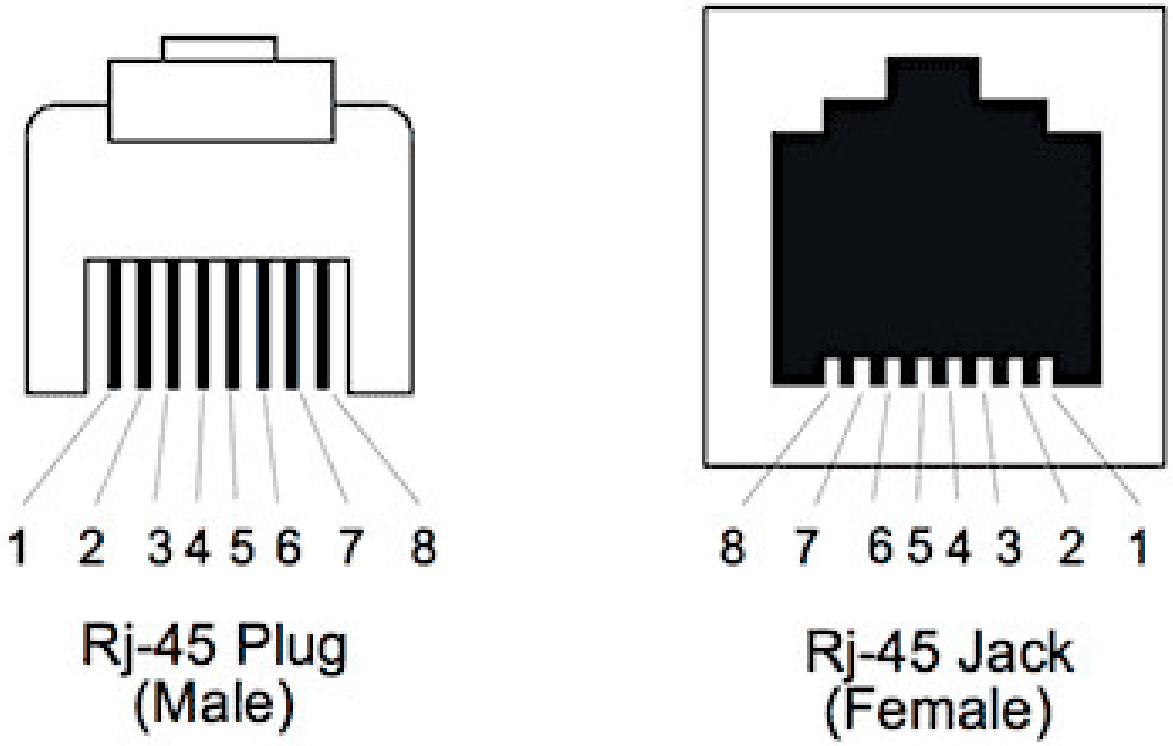


Figure 1.3: RJ45 pins

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 1.4: J601/J602 pins

2.2.2 Recommended connector references

Standard straight RJ45 cable.

2.3 Motor outputs

There are 3 motor outputs, each one corresponding to an half bridge named from A to C.

- DC motors use 2 outputs, so it's possible to drive one DC motors. (Motor 1: A,B / C unconnected)
- BLDC motors use 3 outputs (A,B,C)

Pins	Name	Description
J701	phase A	phase A output
J702	phase B	phase B output
J703	phase C	phase C output

Figure 1.5: J701/J702/J703 pins

2.3.1 Connectors J701, J702, J703, motor outputs

2.4 Brake output

An external power resistor can be connected to limit voltage overshoot or a mechanical brake.

2.4.1 Connectors J704, brake output

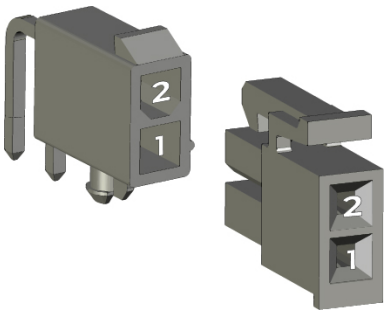


Figure 1.6: J704 pins, 2 pins, brake output

Pins	Name	Description
1	Power	Power output (connected to power in)
2	Out	Open drain output

Figure 1.7: J704 pins

2.5 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.

2.5.1 Connector J301, main sensor

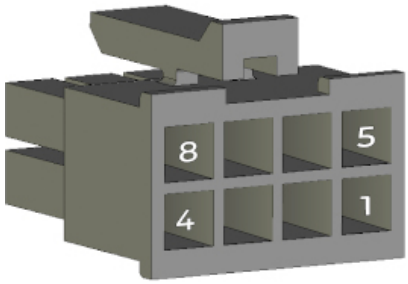
To selected the voltage on pin VDD (pin 5), please choose with the solder selector close to the connector.

For non differential signal, let - unconnected.

2.5.2 Recommended connector references

Micro-Fit 3.0 Molex® Connector

- 43025-0800



8	7	6	5
I+	B+	A+	Vcc
I-	B-	A-	GND
4	3	2	1

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

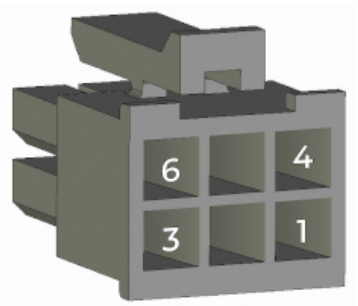
Micro-Fit 3.0 Molex® Insert

- 43030-0007

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

2.5.3 Connector J401, auxiliary sensor

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



6	5	4
AI2	Vcc	GND
I	B	A
3	2	1

Figure 1.10: J401 pins, 2 x 3 pins, auxiliary sensor input

2.5.4 Recommended connector references

Micro-Fit 3.0 Molex® Connector

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

- 43025-0600

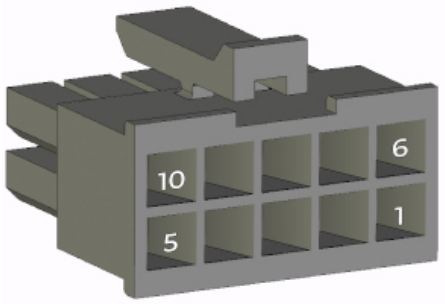
Micro-Fit 3.0 Molex® Insert

- 43030-0007

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

2.5.5 Connector J503, global IOs

A 10 positions connector with 4 digital inputs and 4 digital outputs.



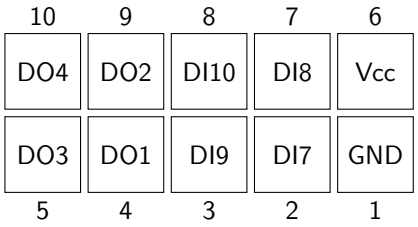


Figure 1.12: J401 pins, 2 x 3 pins, auxiliary sensor input

Pins	Name	Description
1	GND	A signal for QEI2
2	DI7	Digital input 7
3	DI9	Digital input 9
4	DO1	Open drain digital output 1
5	DO3	Open drain digital output 3
6	Vcc	5V power outputs
7	DI8	Digital input 8
8	DI10	Digital input 10
9	DO2	Open drain digital output 2
10	DO4	Open drain digital output 4

Figure 1.13: J503 pins, 2 x 5 pins, global IOs

2.5.6 Recommended connector references

Micro-Fit 3.0 Molex® Connector

- 43025-0600

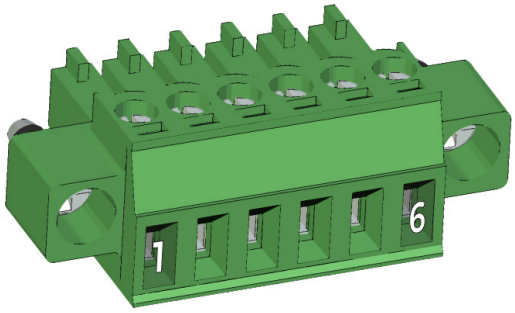
Micro-Fit 3.0 Molex® Insert

- 43030-0007

2.6 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.

2.6.1 Connector J501, security



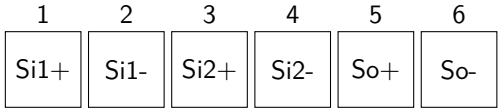


Figure 1.14: J501 pins, 6 pins, security

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 1.15: J501 pins

2.6.2 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.

3 Leds

2 RGB LEDs are present:

- D101: CAN bus status
- D102: Motor status

D101: Communication status D102: Motor status

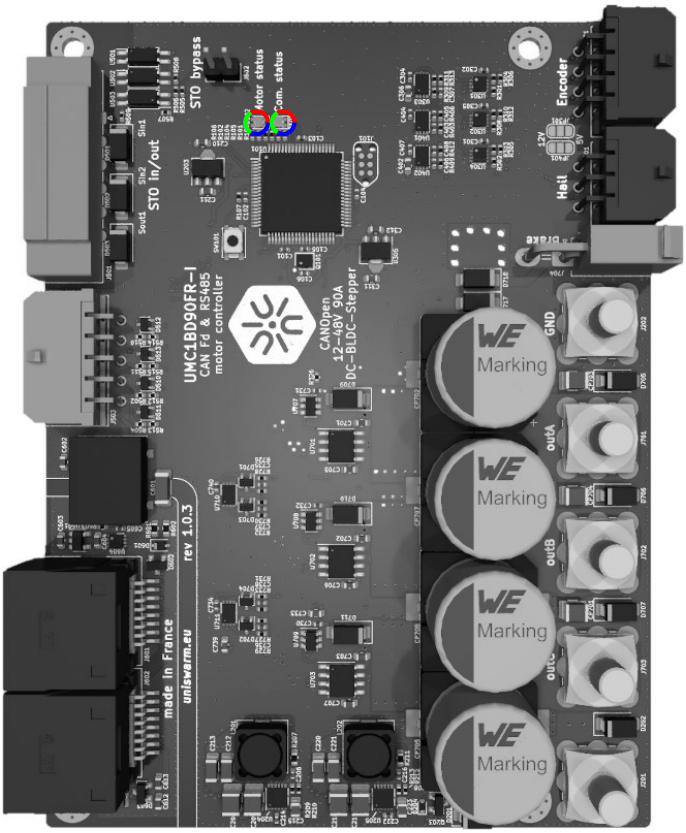
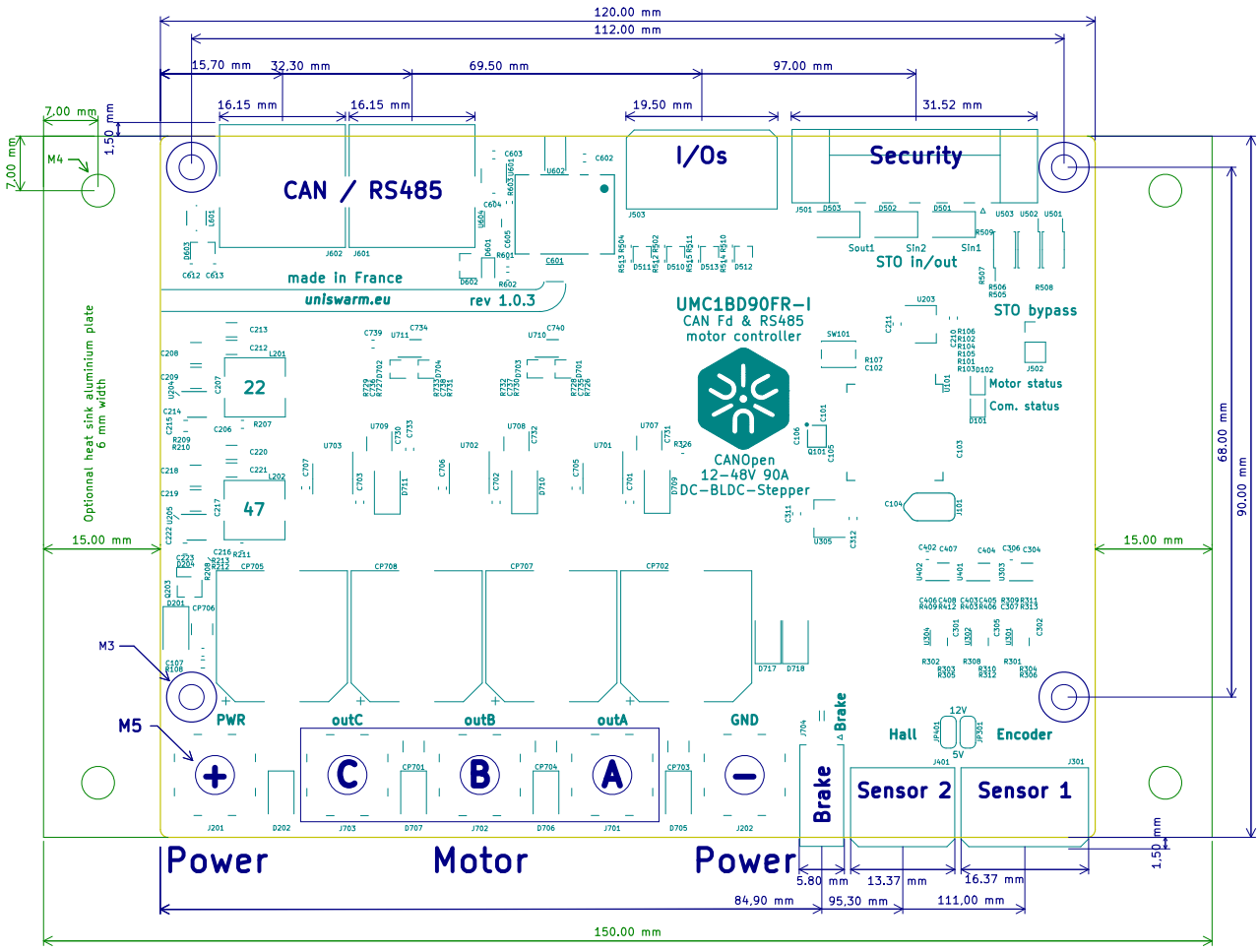


Figure 1.16: UMC1BD90 leds

4 Drawings



Overall height (without heat-sink plate): 21.00 mm
Overall height (**with** 6 mm heat-sink plate): 27.00 mm

Appendix A

Hardware version history

Version	Date	Change
v1.0.1	2021/07/03	Internal private version
v1.0.2	2021/08/24	Initial public version
v1.0.3	2023/08/02	Reduced idle power consummation Improved maximum current by reducing dead time Improved manufacturability Changed PCB color to purple to respect range theme Moved voltage selector on top for sensors connectors Added earth connection to heat sink plate Reduced EMI

Appendix B

Datasheet revision history

Revision	Date	Change
A	2021/08/25	Initial public revision
B	2021/10/21	Fixed parameters mistakes Added mapping 3D of connectors
C	2023/08/03	Added board revision v1.0.3 Reviewed spec and connectors, added digital inputs