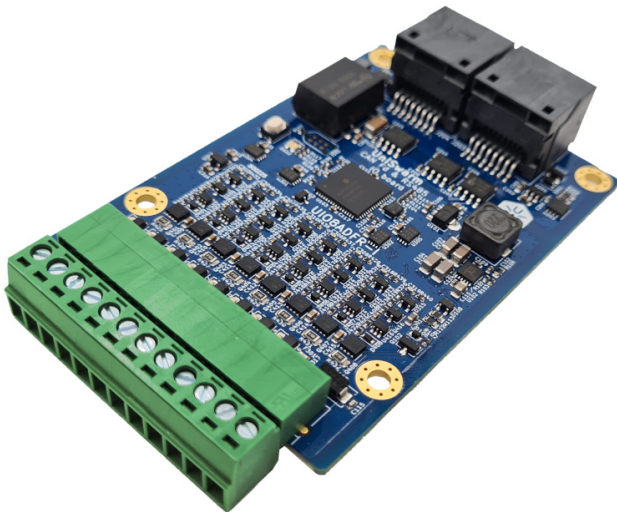# UIO8AD

uniswarm
electronics for robots

Analog inputs / outputs with CAN Fd and RS485

Description

UIO8AD product line is an industrial inputs/outputs module with RS485 and/or CAN Fd communication. It contains 8 inputs that can be reconfigured as outputs.

Features

- Analog inputs and digital outputs
- Fast communication to read and write IOs
- Full compatibility with CAN Open protocol, DS401

Interfaces

- CAN Fd bus up to 8 Mbds

- RS485 / RS422 interface (up to 50 Mbds) for protocols like Modbus, Profibus or DMX512...
- 1 kV isolation between power-side and interface-side

Inputs / outputs

- Each channel can be configured as output or input
- analog inputs, 0 - 12 V, 12 bits ADC resolution ($\approx$3 mV sensibility)
- outputs configurable as open drain (NPN), (PNP) or push-pull
- outputs can drive up to 55V / 0.5A, relay directly driven, PWM control

Application examples

- Small DC motor
- RGB LED
- Addressable LED
- Relay
- Pneumatic solenoid valve
- Ultrasonic sensors
- Analogic sensors
- etc...

Reference	Inputs	Outputs	RJ45	RS485	CAN Fd	Isolated
UIO8ADF	up to 8	up to 8	1	-	1	-
UIO8ADF-I						1000V
UIO8ADR				1	-	-
UIO8ADR-I						1000V
UIO8ADFR				1	1	-
UIO8ADFR-I						1000V

Contents

Chapter 1

Specifications

1.1   Technical data

Electrical	
Nominal power supply voltage (Vin)	6.5 - 55 V
ESD protection	30 kV
Analog Inputs	
Voltage	0 - 12 V
Resolution	3 mV (12 bits)
Maximum Frequency	500 kHz
Digital Inputs	
Voltage	0 - 12 V
Logic low voltage	configurable
Logic high voltage	configurable
Maximum Frequency	500 kHz
Digital Output	
Voltage	5 V or Vin
Output current	max 400 mA
Logic low voltage	0 V
Logic high voltage	5 V or Vin
Interfaces	
CAN Fd	max 8 Mbit/s
RS-485	max 50 Mbit/s
Isolation	1 kV
Physical	
Operating temperature	0°C...+85°C
Dimensions (L x W)	80 mm x 55 mm
Mounting	4 mounting holes for M3 screws

1.2   Connectors

UIO8AD have 3 connectors.

J203
CAN Fd/RS485

J204
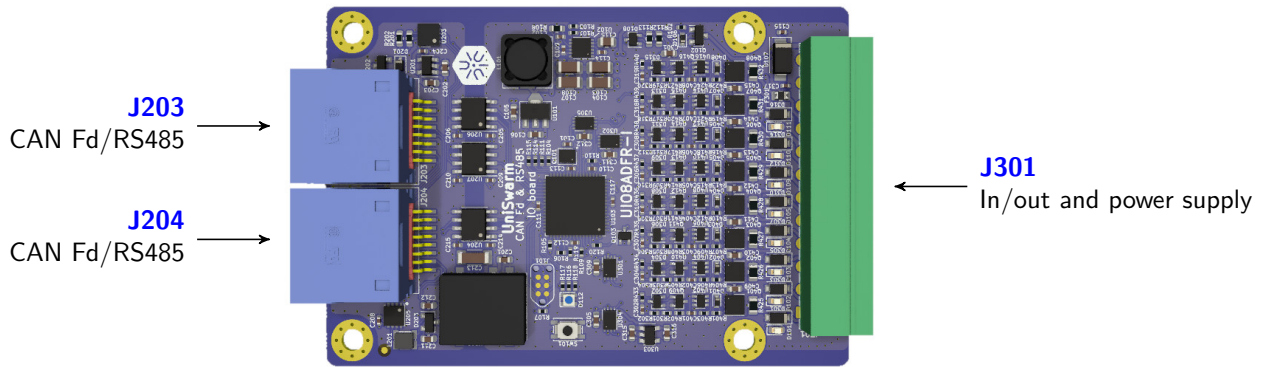CAN Fd/RS485

J301
In/out and power supply

Figure 1.1: UIO8AD connectors

1.3   Electrical

1.3.1   Buses

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

A full 1kV isolation is present between BUS-side and power-side to prevent damage and avoid noise to propagate through the bus.

Dual RJ45 socket (J203 / J204), 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. The board does not include a bus terminator, you need to add one to each side of the bus.

Connectors J203-J204, CAN Fd / RS485

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

Figure 1.2: J203/J204 pins

1.3.2   Inputs, outputs and power supply

The inputs and output uses the same connector.
Each way can be programmed by software as an input or as an output.
The inputs are protected of overvoltage and negative voltage.

Inputs

- The input can be used in analog mode :

  Then the UIO can measure analog tension up to 12V with a 3mV resolution with a maximal frequency of 500 kHz.

Analog inputs	
Voltage	0 - 12 V
Resolution	3 mV (12 bits)
Maximum Frequency	500 kHz

- Or digital mode :

Then the UIO can be used to determine the logic level of the input. The low and high logic level can be set by software depending of the application.

Digital inputs	
Voltage range	0 - 12 V
Resolution	3 mV (12 bits)

Outputs

- the output can be used in digital mode:

There is different function with the digital mode:

- Push pull with 5V or Vcc voltage with a maximal current of 400 mA.
- Or as open drain with a maximal current of 400 mA and voltage of 100V.

Push Pull	
Voltage	5 V or VCC
Current	400 mA
Maximum Frequency	1 MHz
Open drain	
Voltage	0 - 100 V
Current	max 400 mA

Connector J301, inputs / outputs - power supply

12 ways connector (J301). 8 inputs/outputs, a 5V power output and a ground + power supply.
UIO requires a single 6.5 V to 55 V power supply with reverse polarity protection.

Pins	Name	Description
1	io0	Input / output 0
2	io1	Input / output 1
3	io2	Input / output 2
4	io3	Input / output 3
5	io4	Input / output 4
6	io5	Input / output 5
7	io6	Input / output 6
8	io7	Input / output 7
9	+5V out	+5V output (500mA max.)
10	GND	Ground
11	GND	Ground, power in -
12	+V	Power in +

Figure 1.3: J301 pins

Recommended connector references

Screw connection :
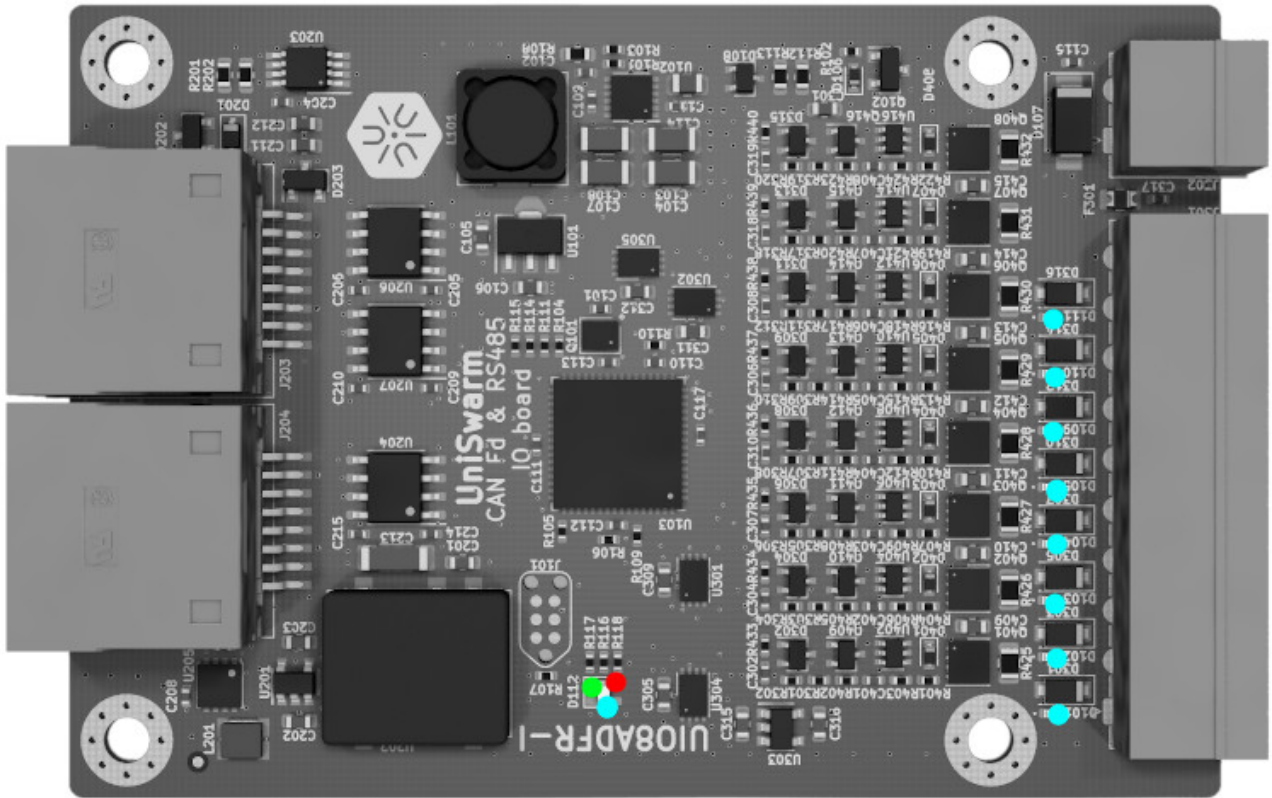
- Phoenix : MC 1,5/12-ST-3,5

Push-in spring connection :

- Phoenix : FK-MCP 1,5/12-ST-3,5

1.3.3 Leds

There are 9 leds on the board :
- The first one is a RGB leds that give the status of the board.
- The 8 others leds are blue and each one correspond to a channel. If the led is turned on, it means that the channel is active.

1.4   Application examples

The board can be used to drive different elements if they **didn't exceed 500 mA**.
The following list shows the most common examples but is not exhaustive and specific applications can also be adapted.
Please refer to datasheet of the element before using it.

1.4.1   DC motors

The board can be used to drive DC motors up to 48 V and 500 mA, there is two ways to drive a DC motor (speed can be modulated using PWM) :

- If one-way operation is used a single output can be used with the ground.

- If both directions is used 2 outputs needs to be used.

Mode	Motor	UIO
One way	+	Output 1
	-	GND
Two ways	+	Output 1
	-	Output 2

Figure 1.4: DC motor connection example

1.4.2   RGB LED

The board can be used to drive RGB LEDs, each color needs to be linked to an output so 3 outputs are used to drive a single RGB LED (brightness can be modulated using PWM).

LED	UIO
R	Output 1
G	Output 2
B	Output 3
GND	GND

Figure 1.5: RGB LED connection example

1.4.3   Addressable LED

The board can be used to drive addessable LEDs, one output needs to be linked to the LED data.
If the total current of the LEDs don't exceed 500 mA the board can also be used as power source with the 5V out.

LED	UIO
Vcc	5V out (if the current is less 500 mA)
Din	Output 2
GND	GND

Figure 1.6: Addressable LED connection example

1.4.4 Relay

The board can be used to drive external relay coils up to 48 V and 500 mA.
The relay coil needs to be connected to an output and the ground.

Relay	UIO
+	Output 1
-	GND

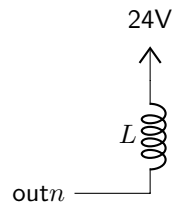Figure 1.7: Relay connection example

Figure 1.8: Relay schematics example

1.4.5 Pneumatic solenoid valve

The board can drive solenoid valve up to 48 V and 500 mA.
The solenoid valve needs to be connected to an output and the ground.

Solenoid valve	UIO
+	Output 1
-	GND

Figure 1.9: Solenoid valve connection example

1.4.6 Ultrasonic sensor

The board can use ultrasonic sensor.

Ultrasonic module	UIO
Vcc	Output 1
Trig	Output 2
Echo	Input 3
GND	GND

Figure 1.10: Ultrasonic module connection example

1.5 Drawings

Maximum height : 18.00 mm

Appendix A

Hardware revision history

Version	Date	Change
1.0.1	2020/09/01	Initial public version
1.0.2	2021/05/05	Changed connectors 10 + 2 to 12 pins Improved outputs power dissipation Improved EMC on switching supply Added a restore button

Appendix B

Datasheet revision history

Revision	Date	Change
A	2020/09/07	Initial public revision
B	2021/05/18	Added board revision 1.0.2