à la mods

ISOIOZ19112

Isolated I/O Module

User Guide

Revision History

REV	DATE	DESCRIPTION
0	May, 2020	Initial release

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Introduction

The à la mods ISOIOZ19112 isolated I/O module is designed to provide galvanic electrical isolation between the connecting devices and the host computer (i.e. Raspberry Pi ®). This is accomplished through the use of a signal relay for the two outputs and an opto-isolator for the two inputs.

The relays are controlled via GPIO outputs from the host computer 40 pin GPIO header while the opto-isolators are also connected to the 40 pin GPIO header, but as inputs so they can be read by the host computer.

Status LEDs are connected to each of the relay coils and the outputs of the opto-isolators to provide feedback to the software developer. These LEDs are illuminated when each I/O are in the active state (relay coil is energized / opto-isolator input is at logic high voltage).

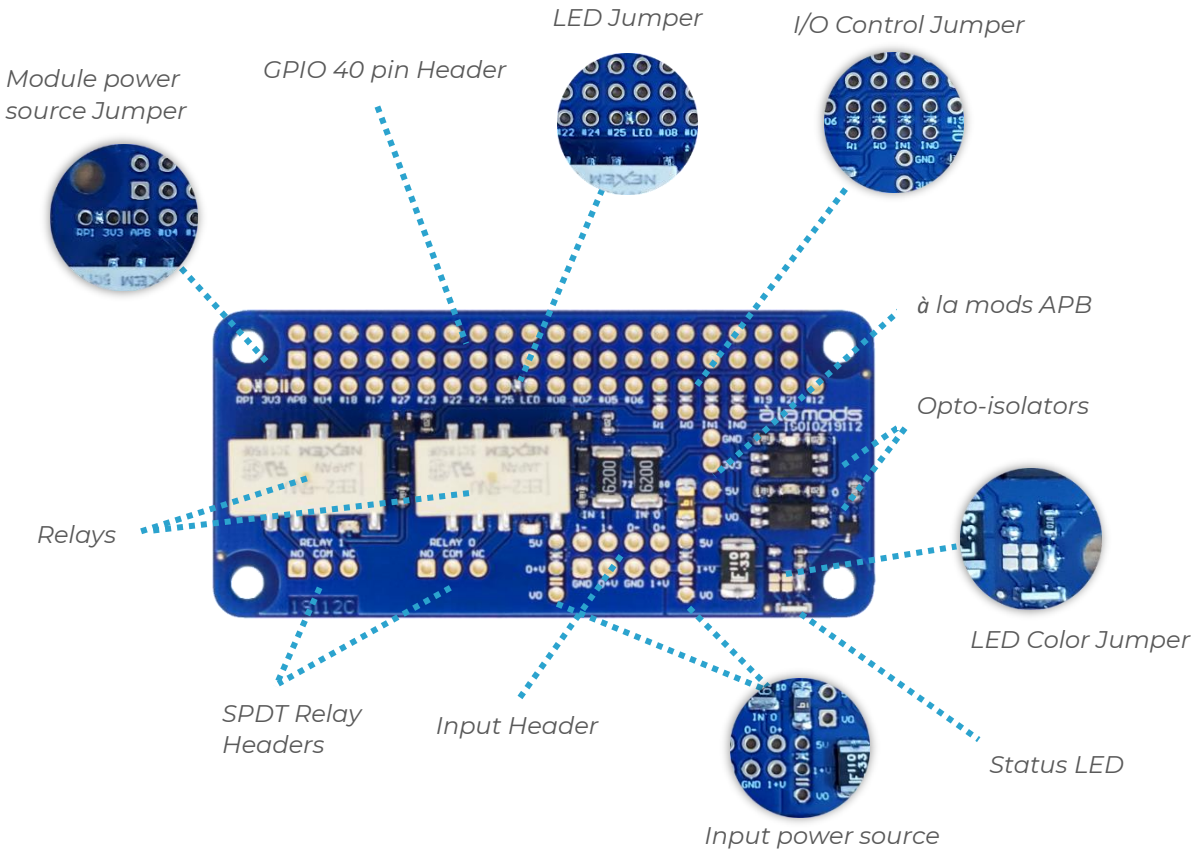

Figure 1 ISOIOZ19112 Overview

Mechanical Specifications

The à la mods “Z” series modules are all compatible with the Raspberry Pi® Zero form factor and are designed to be stacked onto the Raspberry Pi® or EMBDZ19121 Embedded Host Microcontroller.

NOTE: *GPIO 40 pin and Auxiliary Power Bus (APB) 4 pin headers are double stacking.*

Use 17 mm M2.5 standoff with double stacking headers

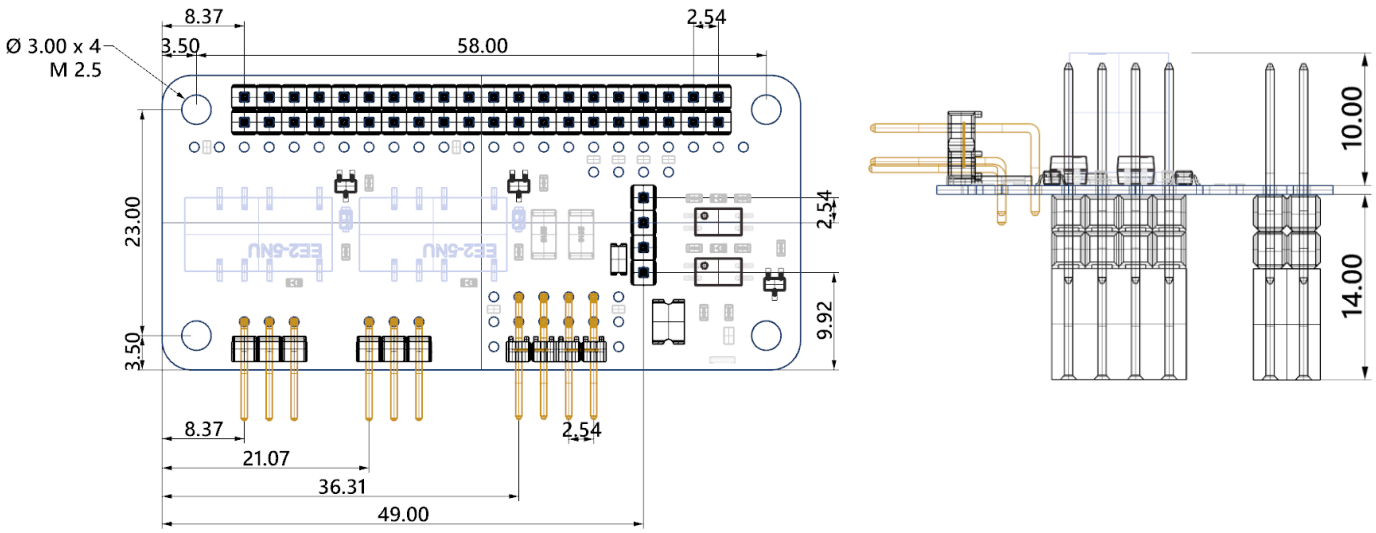

Figure 2 Mechanical Dimensions (mm)

Electrical Specifications

The à la mods ISOIOZ19112 module is designed to be electrically compatible with the Raspberry Pi® 3.3 Volt GPIO logic.

Table 1 Electrical Operating Characteristics

PARAMETER	PERFORMANCE			UNIT
	Min	*Typ*	*Max*	
Input Voltage 3V3	3.14	3.3	3.46	V
Input Current 3V3		5		mA
Input Voltage 5V0	4.75	5.0	5.25	V
Input Current 5V0 *			65	mA
GPIO V_{IH} (relay control)	2.0			V
GPIO V_{IL} (relay Control)			0.5	V
GPIO V_{OH} (opto-isolator output)	3.0			V
GPIO V_{OL} (opto-isolator output)			0.3	V
Relay Contact Voltage DC			60	Vdc
Relay Contact Voltage AC			60	Vac
Relay Contact Current			2	A
Relay Operating time **		2		mSec
Relay Release time **		1		mSec
Opto input Voltage	9		24	V
Operating Temperature	-40		+85	°C

* All I/O active

** Does NOT include bounce time

Hardware Configuration Options

The ISOIOZ19112 module has jumper options to adapt the module to specific logic environments. These are special solder bridge and 0.1" header hybrid combination jumpers for added convenience. A simple solder bridge or the addition of a header can be used.

Input Power Source

This option allows this modules 3V3 power to be sourced by the host computer from the GPIO 40 pin header or the à la mods Auxiliary Power Bus (if an à la mods power supply is used)

Default: GPIO 40 pin header 3V3 source

WARNING ! Do not bridge both power sources to the modules 3V3

Opto-Isolator Input Source

This option allows the ISOIOZ19112 to provide a power source such as an external switch (i.e. reed switch) to energize the internal LED.

NOTE: The power sources are fused (resettable).

Default: No power source (open)

WARNING ! Do not bridge both power sources to the power output

I/O Control

These are jumpers used to connect the control lines of the relays and outputs of the opto-isolators to the GPIO of the 40 pin header.

Default: bridged

System LED

The system status LED has two configuration jumpers. One to connect it to the GPIO 40 pin header and the other to set the color.

The LED control line can be moved to another GPIO pin by removing the LED solder bridge and moving the connection to another GPIO pin.

Default: GPIO pin 22 (GPIO25).

Select one or multiple color jumpers to set the RGB LED color.

Default: Color Blue.

I/O Pinouts

Specific I/O pins of the 40 pin header are used by default for the I/O to control the relays and provide status of the input signals.

These pin assignments can be easily modified without cutting PCB traces by simply removing the solder bridges of the individual default control signals and providing a jumper from the control signal to a different GPIO line. Many of the unused GPIO lines are brought out to solderable holes for this purpose.

GPIO Header – 40 Pin

Table 2 40 Pin GPIO Header Pin Assignments

PIN	DIRECTION	NAME	DESCRIPTION
1	Power	3V3	3.3 Volt power input [1]
2	Power	5V0	5.0 Volt power source
3	-	-	unused
4	Power	5V0	5.0 Volt power input/output
5	-	-	unused
6	Power	GND	GND
7	I/O	#04	alternate I/O
8	-	-	unused
9	Power	GND	GND
10	-	-	unused
11	I/O	#17	alternate I/O
12	I/O	#18	alternate I/O
13	I/O	#27	alternate I/O
14	Power	GND	GND
15	I/O	#22	alternate I/O
16	I/O	#23	alternate I/O
17	Power	3V3	3.3 Volt power input [1]
18	I/O	#24	alternate I/O

19	-	-	unused
20	Power	GND	GND
21	-	E32_GPIO12 / MISO	GPIO or SPI MISO (HSPI Q) [2]
22	I/O	Status LED	GPIO25
23	-	-	unused
24	I/O	#08	alternate I/O
25	Power	GND	GND
26	I/O	#07	alternate I/O
27	-	-	unused
28	-	-	unused
29	I/O	#05	alternate I/O
30	Power	GND	GND
31	I/O	#06	alternate I/O
32	I/O	#12	alternate I/O
33	I	**Input 1**	**Jumpered Opto-isolator 1 input**
34	Power	GND	GND
35	I/O	#19	alternate I/O
36	I	**Input 0**	**Jumpered Opto-isolator 0 input**
37	O	**Relay 1**	**Jumpered Relay 1 Control**
38	O	**Relay 0**	**Jumpered Relay 0 Control**
39	Power	GND	GND
40	I/O	#21	alternate I/O

1 dependent upon 3V3 power source jumper configuration.

Isolated I/O

Table 3 Relay 0 & 1 Header Pin Assignments

PIN	DIRECTION	NAME	DESCRIPTION
1	I/O	N.O.	Normally open contact
2	I/O	COM	Common
3	I/O	N.C.	Normally closed contact

Table 4 Opto-Isolator Input Header Pin Assignments

PIN	DIRECTION	NAME	DESCRIPTION
1	Power	GND	GND
2	Output	IN1-	Input 1 – negative contact [2]
3	Power	IN1 V+	Input 1 – Power source
4	Input	IN1+	Input 1 – positive contact [1]
5	Power	GND	GND
6	Output	IN0-	Input 0 – negative contact [2]
7	Power	IN0 V+	Input 0 – Power source
8	Input	IN0+	Input 0 – positive contact [1]

1 The input positive contact terminates into a 620 Ω 1W resistor then into the opto-isolator anode side of the internal LED.

2 The input negative contact terminates directly into the opto-isolator cathode of the internal LED.

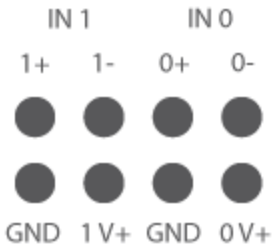

Table 5 Auxiliary Power Bus (APB)

PIN	DIRECTION	NAME	DESCRIPTION
1	PWR	Vo	Connected directly to Vin
2	PWR	5V0	5.0 Vdc
3	PWR	3V3	3.3 Vdc
4	PWR	GND	Common Ground

Module Operation

Setup

By default, the ISOIOZ19112 is configured to use the 3V3 source from the GPIO Header (host computer) and the control I/O connected as shown in Table 2 above.

Using the default setup, the host computer must setup the I/O pins as follows:

- Pin 22 Output
- Pin 33 Input
- Pin 36 Input
- Pin 37 Output
- Pin 38 Output

Operation

Setting pin 37 and/or 38 to a logic high level will energize relays 1 & 0 respectively.

Reading a logic low (0) on input 33 or 36 indicates the lack of a current through opto-isolator inputs 1 & 0 respectively.

Setting pin 22 to a logic high level will illuminate the system status LED .