

IoTextra Octal2

Digital I/O Module



The **IoTextra Octal2** (Rev. 3.02) is an eight-channel digital I/O module, containing four digital input and four digital output channels.

The maximum digital input signal level is 36VDC.

Digital output signals are generated by NPN transistors. Transistor parameters include: collector current 8A (peak up to 16A), voltage up to 100VDC, and power dissipation 20W. The module can be used in extreme conditions only with appropriate cooling, including radiators. If SMAJ48A TVS diodes are installed to protect against transient processes, the maximum voltage is up to 48VDC.

All channels have individual galvanic isolation with a dielectric strength of 3750 Vrms.

The module provides indication of the digital input and output channel status.

There are two modes for using the **IoTextra Octal2** module:

- **GPIO Mode.** In this mode, reading the state of the input signals and controlling the output signals are performed using the AP0-AP7 signals on the HOST-P connector.
- **I²C Mode.** In this mode, reading the state of input signals and controlling output signals are performed via the I²C bus using the I/O expander installed on the module ([TCA9534](#) or a compatible chip). Up to 16 modules can be connected to one I²C bus.

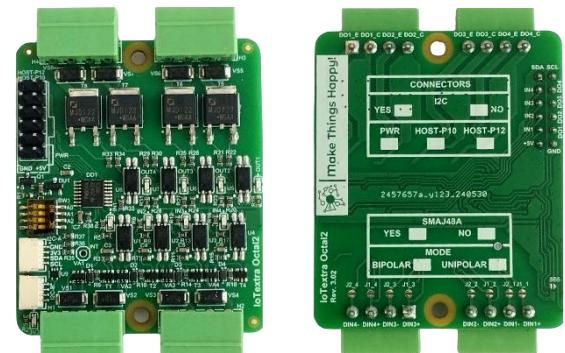
Combined Use: It is also possible to use the AP0-AP7 signals for some channels through the HOST-P connector and the I/O expander for the remaining channels.

Main Applications of the **IoTextra Octal2** module:

- PLCs (Programmable Logic Controllers)
- Field Devices and Data Acquisition Systems (DAS)
- Robotics
- Consumer Electronics and Devices
- Industry
- Scientific Equipment
- Smart Home
- Education

FEATURES:

- Compatibility with major microcontrollers
- Module power supply is 5VDC, which feeds a 3V3 regulator for powering the logic section
- Includes a 3V3 Indicator LED
- Protection against reverse power supply polarity
- 4 independent, optically isolated digital input signals with TVS protection on the inputs
- Insulation strength for input signals (opto-coupler characteristic) from the module's logic section is 3750Vrms
- Digital input voltage is up to 36VDC:
 - 0 to 2 V – opto-coupler closed, logical “1” on opto-coupler output
 - 4 to 36V – opto-coupler open, logical “0” on opto-coupler output
- 4 optically isolated digital outputs



- Insulation strength (opto-coupler characteristic) for output signals from the logical section of the module is 3750Vrms
 - Maximum current I_C for digital output channels is 8A (16A peak), with a voltage up to 100VDC, and dissipated power of 20W. The module can be used in extreme conditions only with appropriate cooling, including radiators
 - If SMAJ48A TVS diodes are installed to protect against transient processes, the maximum voltage is up to 48VDC
 - When working with digital output channels: logical “1” (2.5 to 5V) means the transistor is closed; logical “0” (0 to 0.5V) means the transistor is open
 - Low-side and high-side load connection schemes can be used
 - The module features LED indicators for the status of digital input and output channels (the LED lights up when the opto-coupler on the input/output is open)
 - Reading the input signal states and controlling the output signals are done using **AP0-AP7** (signals **IN1-IN4** and **DO1-DO4**) through the **HOST-P** connector and/or via the **I²C** bus through the I/O expander
 - The I/O expander used in the module is the [**TCA9534**](#) or a compatible chip
 - The expander's **I²C** address (**A2-A0**) is set using DIP microswitch:

TCA9534	0	1	0	0	A2	A1	A0	x
TCA9534A	0	1	1	1	A2	A1	A0	x

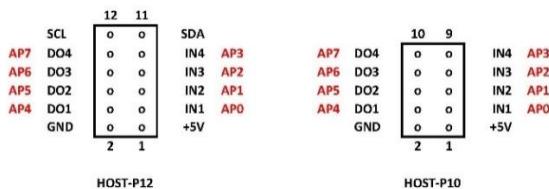
- Connection to the module via the I²C bus is done through **Qwiic®** connectors or through pins 11 (SDA) and 12 (SCL) of the **HOST-P12** connector
 - Transient suppression and electrostatic discharge protection of signals on **Qwiic®** connectors is done using a TVS diode assembly (ESD protection)
 - Module size is 47x56 mm. The module has mounting holes allowing it to be installed in the base module or in a Raspberry Pi

HOST-P CONNECTOR:

Depending on the version of the **IoTextra Octal2** module can have either a 12-pin (**HOST-P12**) or a 10-pin (**HOST-P10**) **HOST-P** connector.



The pinouts for these connectors are shown in the image below:



The **HOST-P** connector is used differently depending on how the microcontroller interacts with the **IoTextra Octal2** module:

- 1) **Standalone Use:** In this mode, the input signal states and control of the output signals are available via the **HOST-P10 (HOST-P12)** connector or via the **I²C** bus using the I/O expander.

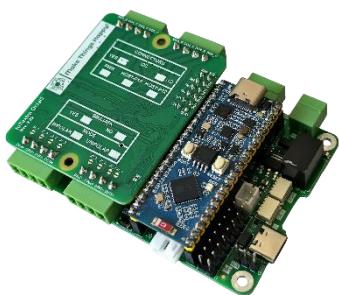
- 2) **Smart Use:** In this mode, an **IoTsmart** microcontroller module is vertically inserted into the **HOST-P12** connector. Reading the input signal states, control of the output signals and the 5V module power supply are done through the **HOST-P12** connector. Power is supplied from the **IoTsmart** module. Below is a photo of the **IoTextra Octal2** module with the **IoTsmart** module:



**IoTextra Octal2 with a vertically mounted
IoTsmart RP2040 module**

**IoTextra Octal2 with a horizontally
mounted IoTsmart ESP32-S3 module**

- 3) **Mezzanine Use:** In this mode, the **IoTextra Octal2** module is installed in the base module, the state of the input signals and the output signal control are available through the **HOST-P12** connector. Photo of the **IoTextra Octal2** module installed in **IoTbase** modules below.



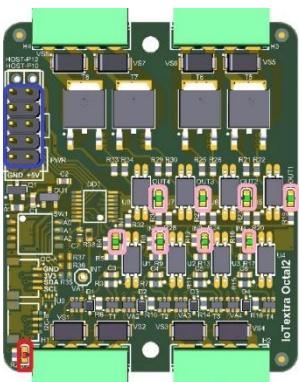
**IoTbase PICO with the IoTextra Octal2 module
installed**



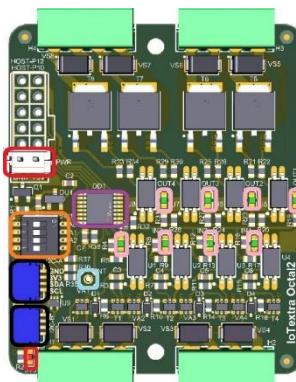
**IoTbase Nano with the IoTextra Octal2 module
installed**

COMPONENT LAYOUT:

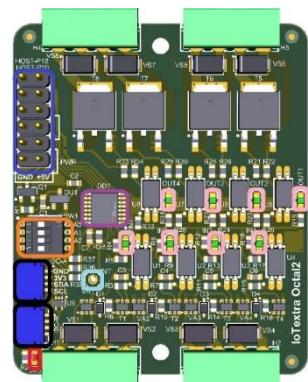
There are three versions of the **IoTextra Octal2** module, and accordingly, each with a different **top-side** component layout:



HOST-P10



PWR and Qwiic[®]



HOST-P12 and Qwiic[®]

It is possible to obtain input signal status and control output signals via the **HOST-P** connector (highlighted in blue).

The **Qwiic[®]** connectors are highlighted in black.

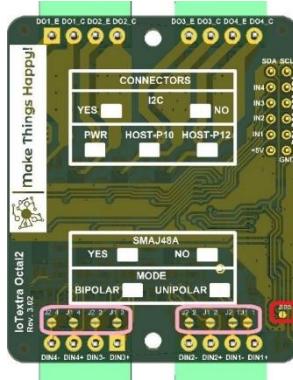
The I/O expander is highlighted in purple.

The DIP microswitch for setting the I/O expander's address on the **I²C** bus is highlighted in orange. The “ON” position of the microswitch corresponds to a “0” value in the respective address bit (A0, A1, and A2) for the I/O expander. The “OFF” position corresponds to a “1” value.

It is possible to get an interrupt signal from the I/O expander (corresponding hole highlighted in light blue). If the module does not have a **HOST-P** connector, the 5VDC power for the module is supplied via the **PWR** connector. There is a 3V3 power indicator. The **PWR** connector and power indicator are highlighted in red in the **top-side** image.

JUMPERS:

The image below shows the component and marking layout on the **bottom-side** of the **IoTextra Octal2** module:



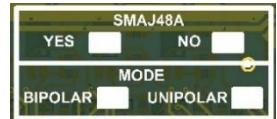
The **bottom-side** of the **IoTextra Octal2** module has **jumpers for setting unipolar mode**. Setting these jumpers allows the use of unipolar signals; their absence means that the module can input bipolar signals. By default, the jumpers are absent. For each input channel, there are two jumpers – **J1_i** and **J2_i**, where **i** is the digital input channel. In the image of the **bottom-side** of the module, these jumpers are highlighted in pink.

The **bottom-side** of the **IoTextra Octal2** module has a **jumper that allows powering devices connected through the Qwiic® connector**. It is highlighted in red. By default, the jumper is absent.

CONFIGURATION TABLES:

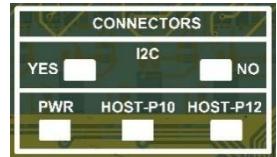
The **bottom-side** of the module provides information about the digital signal input mode and the use of TVS diodes in the output circuits of the digital output channels:

- **bipolar or unipolar** input mode
- TVS diodes **SMAJ48A** installed or not (typical Voltage-Reverse Standoff value is 48V, peak power is 400W)



It also provides information on whether the following connectors are installed:

- **Qwiic®** connectors for **I²C**
- **PWR** power connector
- **HOST-P10** or **HOST-P12** connector for reading the state of digital input signals and for digital output control



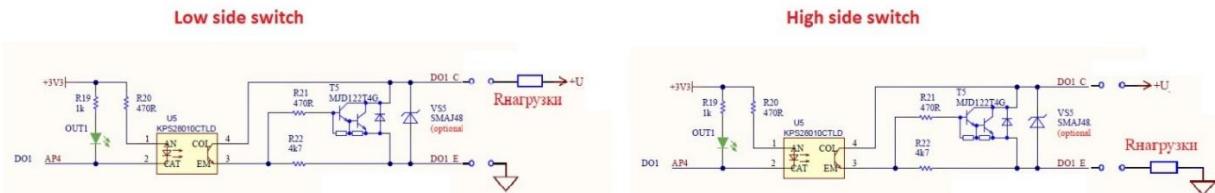
EXTERNAL SIGNAL CONNECTION:

Removable terminal blocks with a 3.5mm pitch are recommended for connecting external input signals to the **H1-H2** connectors on the module. The pin layout is marked on the **bottom-side** of the module.

Attention! When using **unipolar** mode, it's important to observe polarity when connecting external input signals.

To connect external output signals, the **H3** and **H4** connectors on the module are used, into which it is recommended to insert removable pads with a pitch of 3.5 mm for terminal blocks. The location of the contacts is marked on the **bottom-side** of the module.

The digital output channels are implemented using Darlington Transistors, and the load can be connected using both the **Low Side Switch** and the **High Side Switch** schemes. For more details, see the following figure (for the DO1 channel):



ACCESSORIES:

The following accessories may be required for using the module:

- A set of four removable terminal blocks with a 3.5mm pitch for terminal blocks **H1-H4**
- A set of two standoffs and four screws for mounting the module into the **IoTbase** series base module.
- Cable for the **HOST-P10** connector
- Cable for the **Qwiic[®]** connector
- Cable for the **PWR** connector