

I2Connect: EEPROM

Function: Non-volatile data storage, 2 Mbit (256 KB)

1 DESCRIPTION

The PTSolns *I2Connect: EEPROM* is a compact non volatile memory module based on the M24M02 DR serial EEPROM. Designed as part of the I2Connect Series, the module provides a simple and reliable way to add persistent data storage to embedded systems. The device communicates over the industry standard I2C interface and provides 2 Mbit (256 KB) of EEPROM memory, allowing user data to be retained even when power is removed.

Like all I2Connect modules, the *I2Connect: EEPROM* is fully assembled and ready to use out of the box. Dual Qwiic[®] compatible connectors allow the module to be easily integrated into existing I2C systems without soldering, while the preinstalled right-angle header provides direct access to the I2C bus for breadboard-based prototyping. The module is compatible with both 3.3 V and 5 V systems, making it suitable for use with a wide range of popular microcontroller platforms.

The *I2Connect: EEPROM* is intended for applications requiring reliable long term data storage. Typical uses include configuration settings, calibration constants, device identifiers, user preferences, data logging, and other information that must be preserved across power cycles. The device supports byte and page write operations, provides up to 4 million write cycles, and offers data retention of up to 200 years. Comprehensive documentation, example programs, and dedicated software libraries are provided to help users quickly integrate the module into their projects.

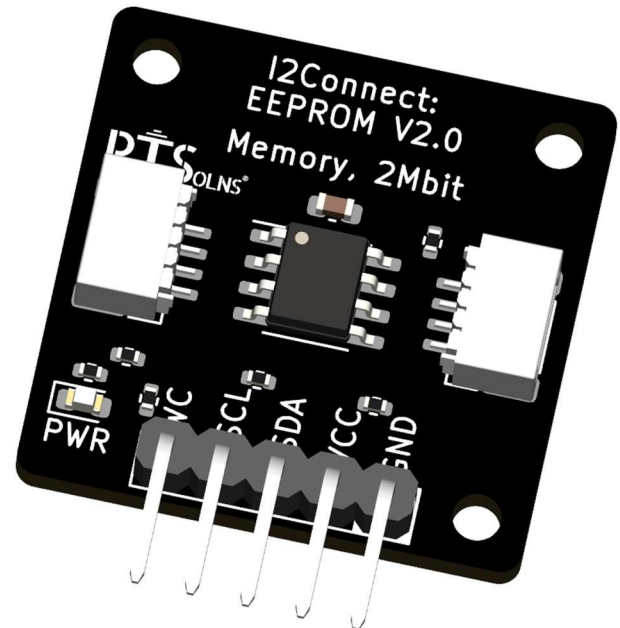


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2 DOCUMENT REVISION HISTORY

Current document revision is Rev 0.

3 PRODUCT FEATURES

This section highlights notable features of the *I2Connect: EEPROM*.

3.1 I2Connect Series

The PTSolns *I2Connect* Series is a family of plug and play expansion modules designed to simplify the integration of sensors, displays, user interfaces, and other peripherals into embedded systems. Built around the industry standard I2C communication protocol and featuring convenient Qwiic[®] compatible connectors (4 pin, 1 mm JST SH), *I2Connect* modules can be quickly connected without soldering or complex wiring.

Each module is fully assembled and includes a preinstalled male header that is compatible with standard solderless breadboards, enabling immediate use and rapid prototyping. Designed to work seamlessly with a wide range of microcontroller platforms, *I2Connect* modules combine compact hardware, comprehensive documentation, and easy to use software libraries. The *I2Connect* Series enables makers, students, educators, and professionals to rapidly prototype, evaluate, and develop reliable electronic systems.

The following modules are part of the *I2Connect* Series:

- AHT20: Temperature & Humidity
- VEML7700: Light & Lux
- EEPROM: 2Mbit Memory
- Buttons: User Input via 4x4 Matrix of Buttons
- Digit Display: 2x 7-Segment Displays
- ICO-20100: Pressure & Temperature
- KXTJ3-1057: 3-Axis Accelerometer
- MUX: 4-Channel I2C Multiplexer
- OLED: 0.96" 128x64 OLED Display
- I2C Doctor: Improve I2C Bus
- ... and more!

3.2 What is I2C?

Inter Integrated Circuit, commonly abbreviated as I2C (or I²C, IIC), is a synchronous serial communication protocol widely used throughout the electronics industry for interfacing microcontrollers with peripheral devices such as sensors, displays, memory devices, real time clocks, and input/output expanders. The protocol utilizes two communication signals, Serial Data (SDA) and Serial Clock (SCL), in addition to power and ground, enabling multiple devices to communicate over a common bus architecture while minimizing wiring complexity.

Each device connected to an I2C bus is assigned a unique address, typically a 7 bit address. This addressing scheme allows a single bus master, generally a microcontroller, to selectively communicate with individual devices on the shared bus. Standard 7 bit I2C addressing provides up to 112 usable device addresses, permitting a large number of peripherals to coexist on a single communication interface. In applications requiring additional devices, bus multiplexers can be employed to further expand system capacity.

The I2C specification defines several operating speeds, including Standard Mode (100 kHz), Fast Mode (400 kHz), and Fast Mode Plus (1 MHz). Support for these modes varies by device and application. While I2C was originally intended for communication between devices located on the same printed circuit board, it is commonly used for short cable connections between modules and development boards. Practical cable lengths depend on bus speed, pull up resistor values, wiring quality, and overall bus capacitance. In most embedded applications, cable lengths ranging from a few centimeters to approximately one meter can be achieved reliably, with shorter cable lengths generally permitting higher communication speeds.

The combination of a simple two wire interface, multi device capability, and widespread industry adoption has established I2C as one of the most commonly implemented communication protocols in embedded systems. As a result, I2C is natively supported by the vast majority of modern microcontrollers, development platforms, and peripheral devices.

The oscilloscope capture in Figure 1 shows a typical I2C communication transaction operating at a clock frequency of 100 kHz. The upper trace (purple) represents the SDA (Serial Data) signal, while the lower trace (yellow) represents the SCL (Serial Clock) signal. During communication, the bus master generates the clock pulses on the SCL line, and data is transferred on the SDA line one bit at a time. In accordance with the I2C specification, the state of the SDA signal remains stable while SCL is high and is permitted to change only when SCL is low. Each clock pulse corresponds to the transfer of a single data bit, allowing addresses, commands, and measurement data to be exchanged between the microcontroller and peripheral device. This two wire communication method enables reliable data transfer while maintaining a simple and efficient electrical interface.

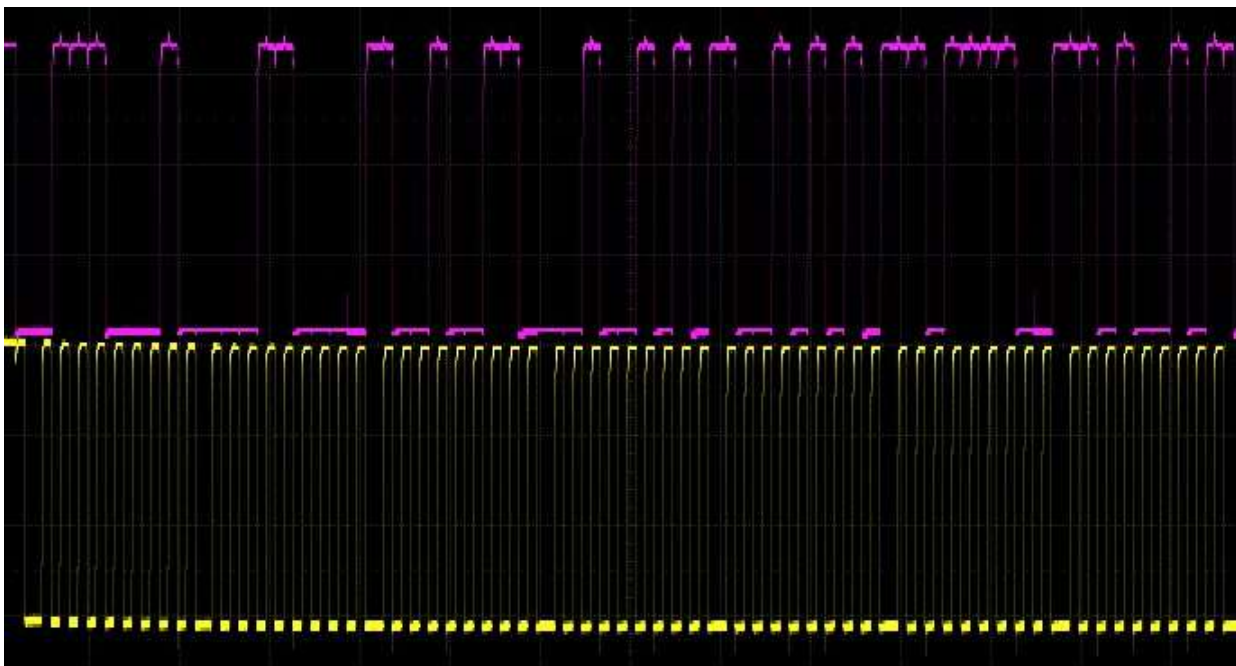


Figure 1: Oscilloscope capture of a typical SDA (top) and SCL (bottom) signal.

3.3 Technical Features Diagram

The I2Connect: EEPROM has several technical features depicted in Figure 2.

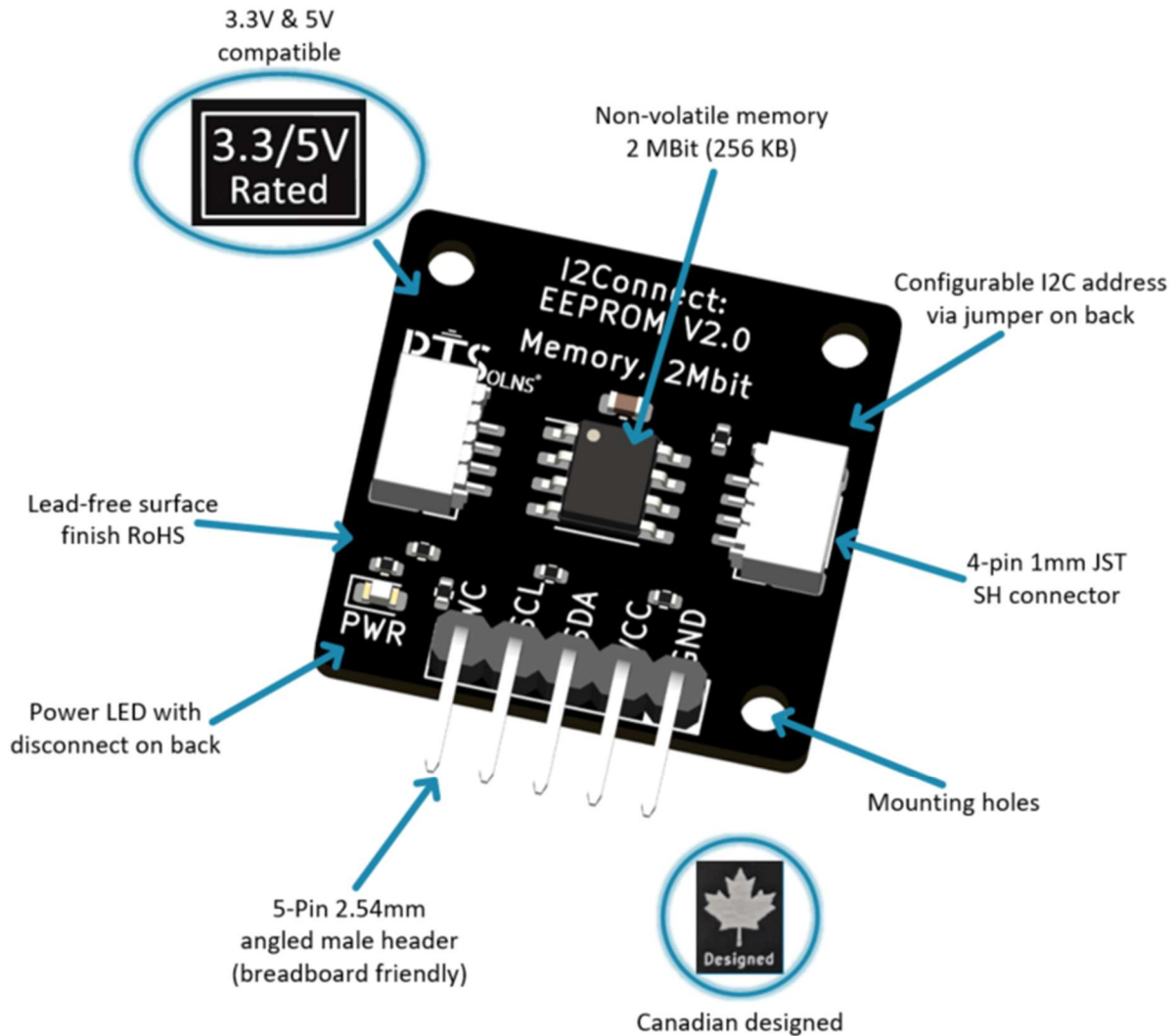


Figure 2: Technical Features Diagram for the I2Connect: EEPROM.

3.4 I2C Address

The *I2Connect: EEPROM* module uses a configurable I2C address range via a jumper on the back of the board. By default, the module occupies the following addresses:

0x50, 0x51, 0x52, 0x53

An onboard address selection jumper allows the address range to be changed to:

0x54, 0x55, 0x56, 0x57

These address ranges are required to access the full 256 KB memory space provided by the EEPROM. The supplied software library (See Section 3.7) automatically manages the underlying addressing scheme and presents the device as a single continuous memory array.

Up to two *I2Connect: EEPROM* modules can therefore coexist on the same I2C bus. If additional EEPROM modules are required, an I2C multiplexer must be used. The PTSolns *I2Connect: MUX* module provides four independent I2C channels, allowing multiple EEPROM modules with identical address configurations to be connected to a single microcontroller.

3.5 Write Control (WC)

The *I2Connect: EEPROM* module provides access to the EEPROM's WC (Write Control) pin through the preassembled right-angle header. By default, the WC pin is pulled low on the module, enabling normal read and write operation. If desired, the user may drive the WC pin high from an external circuit or microcontroller GPIO to temporarily disable all write operations while continuing to allow read access to the stored data.

For applications requiring permanent write protection, an onboard configuration jumper is provided on the back of the module. Cutting this jumper permanently pulls the WC pin high, placing the EEPROM into a hardware write protected mode. In this configuration, all write operations are disabled and the device functions as a read only memory.

When the write protection jumper has been cut, the state of the WC pin exposed on the right-angle header is ignored. The EEPROM will remain permanently write protected regardless of any external signals applied to the WC pin. This feature is useful for protecting calibration data, configuration settings, serial numbers, or other critical information from accidental modification.

3.6 Wired Connection

The most common method of connecting the *I2Connect: EEPROM* to a microcontroller is through the two onboard Qwiic[®] compatible connectors (4 pin, 1 mm JST SH). These connectors provide access to the I2C bus and allow modules to be easily connected without soldering. Both connectors are electrically identical, enabling multiple *I2Connect* modules to be daisy chained together using standard Qwiic[®] compatible cables. An example of three different *I2Connect* modules daisy-chained together is shown in Figure 3.

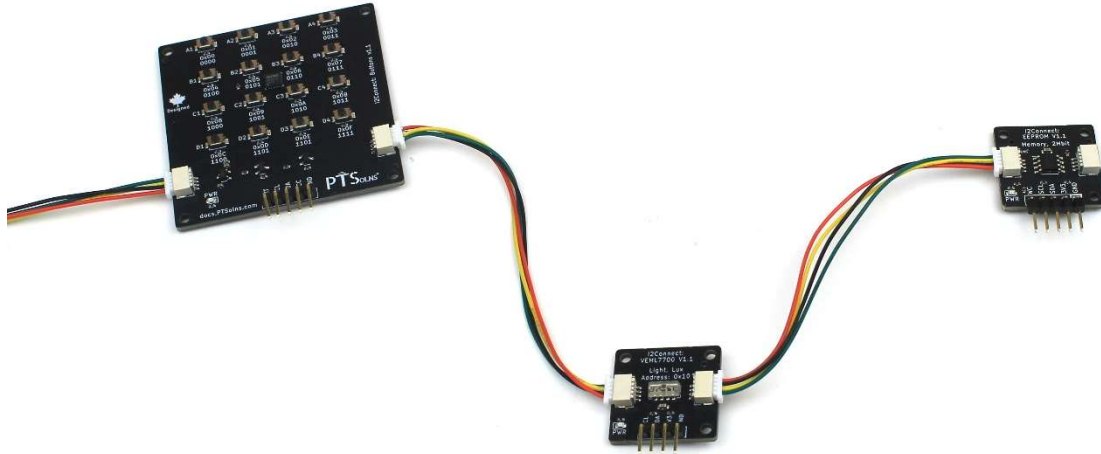


Figure 3: Daisy-Chain of different I2Connect modules.

3.7 Breadboard Connection

All I2Connect modules are designed to be breadboard friendly and include a preinstalled right angle male header. At a minimum, the I2C interface pins are made available through this header, allowing the module to be easily connected to a microcontroller or prototype circuit using a standard solderless breadboard. Where applicable, additional pins are also exposed to provide access to device specific features and functionality. Right angle headers are intentionally used so that modules stand upright when inserted into a breadboard, improving visibility, accessibility, and user interaction during development, testing, and demonstration.

Figure 4 shows two different I2Connect modules connected to a standard solderless breadboard. The modules are daisy chained together through the exposed I2C pins on the preassembled right angle male headers, allowing both devices to share the same I2C bus.

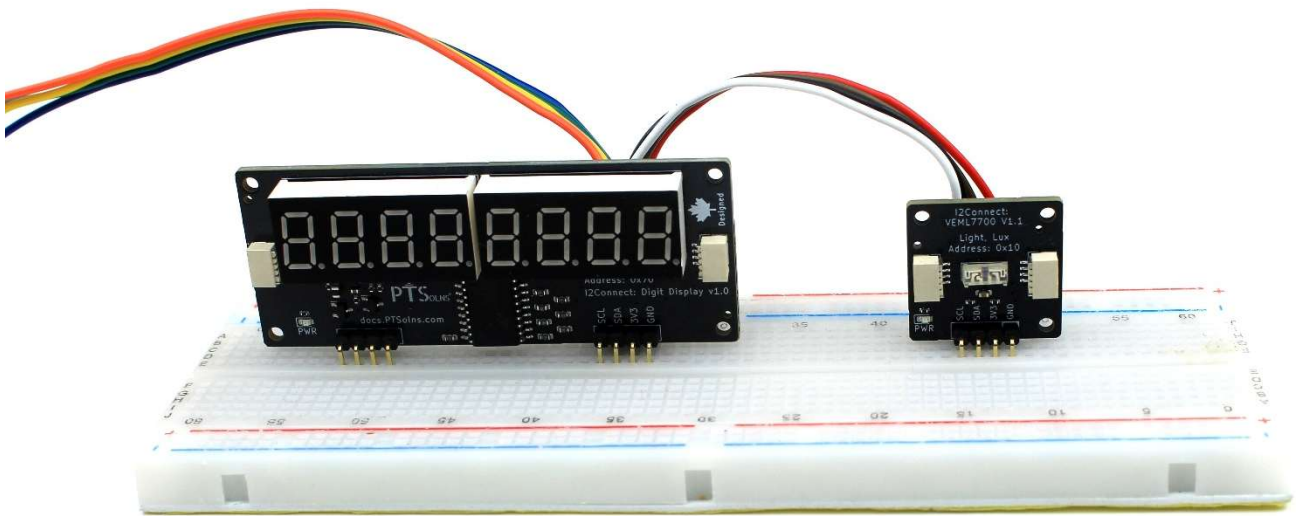


Figure 4: I2Connect modules plugged into standard breadboard.

3.8 Compatibility

All I2Connect modules are designed to operate with both 3.3V and 5V microcontroller systems. This flexibility allows the modules to be used with a wide range of popular development platforms without requiring additional level shifting hardware. Modules that support both operating voltages are identified by the “3.3/5V Rated” marking shown in Figure 5.



Figure 5: The “3.3/5V Rated” compatibility marking found on all I2Connect modules.

The *I2Connect* Series utilizes a 4 pin JST SH connector with a 1.0 mm pitch, following the industry standard Qwiic[®] pinout. The four connections consist of GND, VCC, SDA, and SCL, providing power and I2C communication through a single compact connector. By adhering to the Qwiic[®] standard connector and pin ordering, *I2Connect* modules are electrically compatible with a wide range of Qwiic[®] and STEMMA QT based devices. Additionally, each module includes a preinstalled angled male header that exposes the same signals, allowing the module to be connected directly to virtually any 3.3V or 5V microcontroller system that supports I2C communication, even if a Qwiic[®] compatible connector is not available.

3.9 Programming & Custom Library

The *I2Connect* Series is designed to integrate seamlessly with all PTSolns microcontroller development boards. Depending on the specific microcontroller, modules can be connected either through onboard Qwiic[®] compatible connectors or directly through the exposed I2C pins. Since I2C is a widely supported communication standard, *I2Connect* modules can also be used with many third-party development platforms and microcontrollers.

The choice of development environment is entirely up to the user. PTSolns microcontrollers can be programmed using the *PTSolns IDE*, the *Arduino IDE*, and many other compatible development tools. As long as the selected environment supports the target microcontroller and provides access to the I2C peripheral, it can generally be used with *I2Connect* modules.

To simplify development, the *I2Connect: EEPROM* module is supported by a dedicated software library. This library provides an easy-to-use interface for initializing the EEPROM and performing read and write operations to the full 256 KB memory array. The library can be downloaded directly from GitHub (https://github.com/PTSolns/I2Connect_EEPROM) or installed through the Library Manager available in both the *PTSolns IDE* and *Arduino IDE* by searching for:

I2Connect_EEPROM

Internally, the EEPROM device distributes its memory across four consecutive I2C addresses. While this addressing scheme is necessary to access the entire 256 KB memory space, it is handled automatically by the library. Users can therefore treat the module as a single continuous memory device without needing to manage individual I2C addresses, memory banks, or page boundaries. The library automatically selects the appropriate address range and performs the required transactions in the background.

Example programs are included with the library and demonstrate common tasks such as device initialization, writing data, reading data, and verifying stored information. Users are encouraged to review these examples as a starting point for integrating the *I2Connect: EEPROM* module into their own applications.

3.10 Mark of Authenticity

Authentic PTSolns PCBs have a black solder mask color and are marked with the “PTSolns” logo in white silkscreen printing. The “Canadian Designed” symbol, consisting of the Canadian Maple Leaf with the word “Designed” underneath, can also be found on the PCB in white silkscreen printing. The “PTSolns” trademark and the “Canadian Designed” symbols are shown in Figure 6.



Figure 6: The "Canadian Designed" symbol and "PTSolns" trademark found on authentic PTSolns PCBs.

4 PHYSICAL PROPERTIES

The physical properties of the *I2Connect: EEPROM* are outlined in Table 1.

Table 1: Physical Properties.

	Quantity	Value	Reference
PCB	Length	23.2 mm	Figure 7
	Width	22.9 mm	Figure 7
	Thickness	1.6 mm	--
	Weight (with header, without wire)	3 g	--
	Color	Black	--
	Silkscreen	White	--
Material	Lead free HASL-RoHS surface finish		--
	FR-4 base		--
Mounting Holes	3x each with 2.2 mm diameter		Figure 7

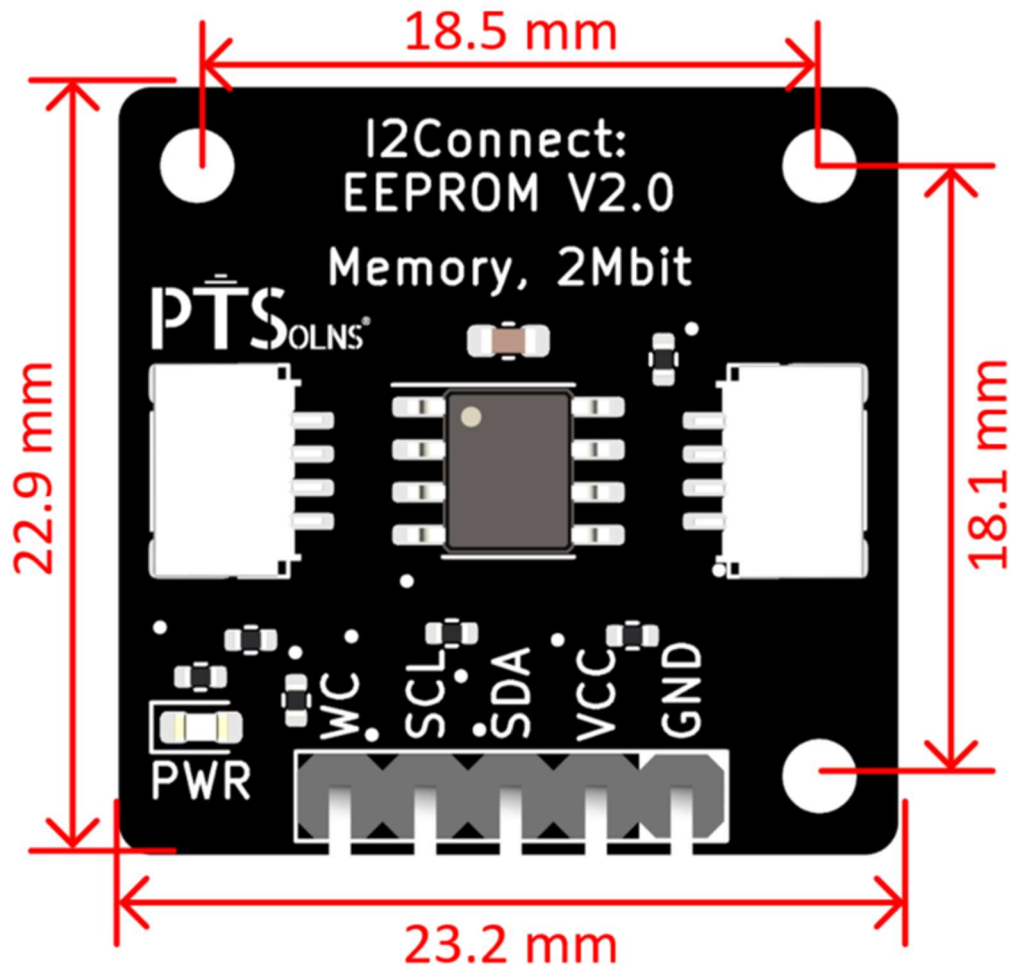


Figure 7: Dimensions of the *I2Connect: EEPROM*.

5 REFERENCES

This section lists relevant references.

- *I2Connect: EEPROM* Library:
[https://github.com/PTSolns/I2Connect EEPROM](https://github.com/PTSolns/I2Connect_EEPROM)

Or download directly from within *PTSolns IDE* & Arduino IDE using the Library Manager and search:

I2Connect_EEPROM

- PTSolns website:
<https://PTSolns.com>
- PTSolns Documentation Repository:
<https://docs.PTSolns.com>
- *PTSolns IDE* software:
<https://PTSolns.com/IDE>
- PTSolns support:
<https://PTSolns.com/contact-us>