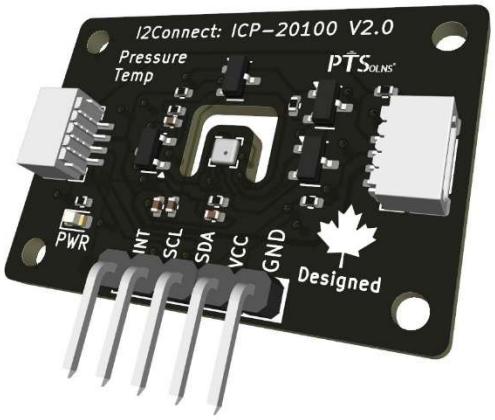
I2Connect: ICP-20100

Function: Pressure and Temperature Sensor

1 DESCRIPTION



The PTSolns *I2Connect: ICP-20100* is a compact, high-accuracy, low-power barometric pressure and temperature sensing module based on the TDK InvenSense ICP-20100 digital sensor. Designed as part of the I2Connect Series, the module provides a simple and reliable way to add environmental sensing capabilities to embedded systems. The sensor communicates over the industry-standard I2C interface and delivers precision pressure and temperature data with minimal software overhead.

The internal sense element features a capacitive pressure sensor tailored for monitoring pressure changes in the range of 30 to 110 kPa. The module integrates a DSP module for on-chip calibration with an Analog-to-Digital converter (ADC), digital filtering including FIR and IIR filters for improved noise performance and glitch filtering, and a 96-byte FIFO buffer.

The *I2Connect: ICP-20100* is intended for hobby and educational applications where environmental monitoring is required. Typical applications include smartphones and tablets, wearable sensors, home and building automation, and weather stations. Comprehensive documentation, example programs, and dedicated software libraries are provided to help users quickly integrate the module into their projects.

Like all I2Connect modules, the *I2Connect: ICP-20100* 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 3.3V and 5V systems, making it suitable for use with a wide range of popular microcontroller platforms.

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2 DOCUMENT REVISION HISTORY

Current document revision is Rev 0.

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3 PRODUCT FEATURES

This section highlights notable features of the *I2Connect: ICP-20100.*

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
- ICP-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 unique 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.

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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.

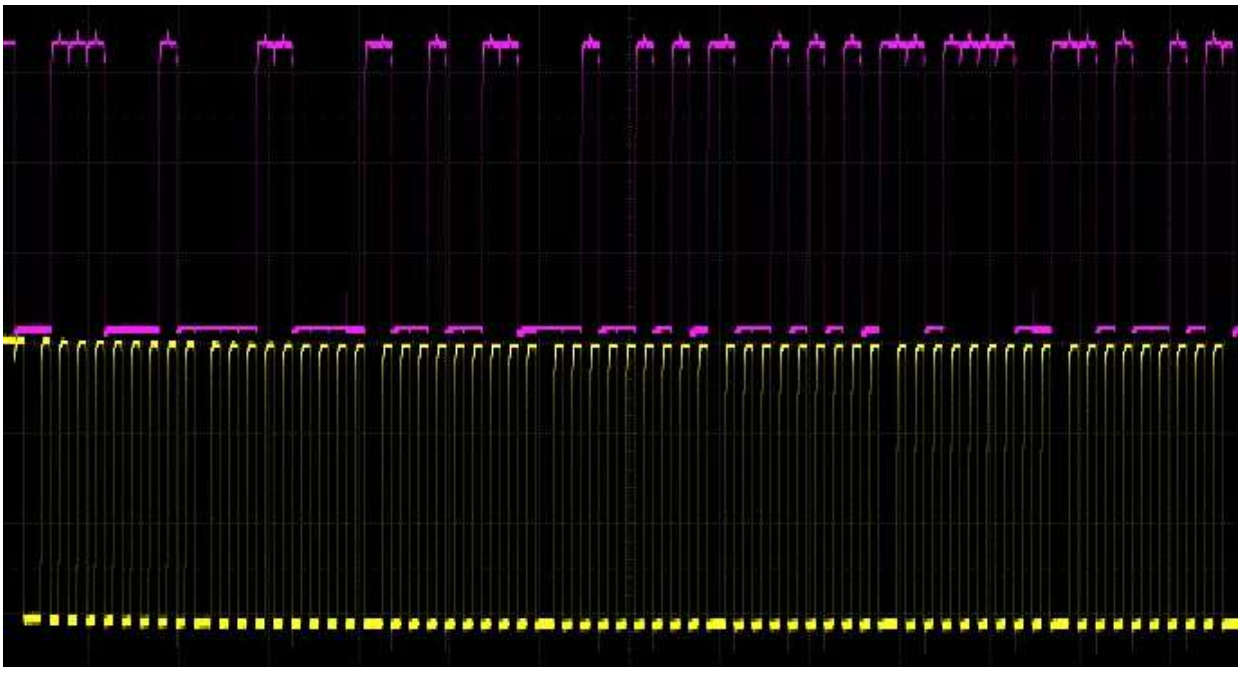


Figure 1: Oscilloscope capture of a typical SDA (top) and SCL (bottom) signal.

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3.3 Technical Features Diagram

The *I2Connect: ICP-20100* has several technical features depicted in Figure 2.

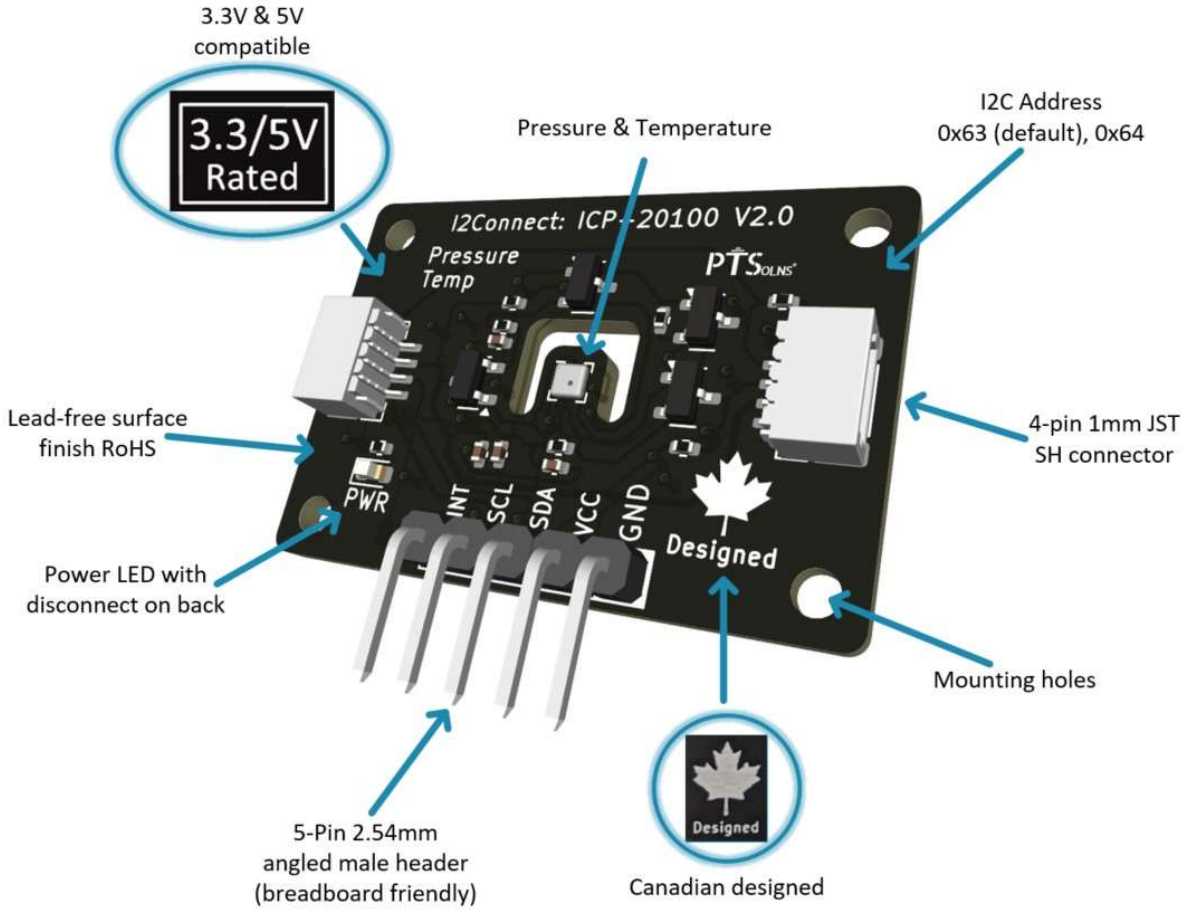


Figure 2: Technical Features Diagram for the I2Connect: ICP-20100.

3.4 I2C Address

The *I2Connect: ICP-20100* can be configured to have one of the following I2C addresses via the jumper on the back of the module:

0x63 (Default)
0x64

To change the address from the default 0x63 to 0x64, locate the address solder jumper on the back of the board. Cut the trace connecting the center pad to the "0x63 (D)" side, and create a solder bridge between the center pad and the "0x64" side.

If multiple ICP-20100 modules are required in the same system, an I2C multiplexer must be used. The PTSolns *I2Connect: MUX* module provides four independent I2C channels, allowing up to four ICP-20100 modules with the same fixed I2C address to be connected to a single microcontroller.

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3.5 Wired Connection

The most common method of connecting the *I2Connect: ICP-20100* 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.

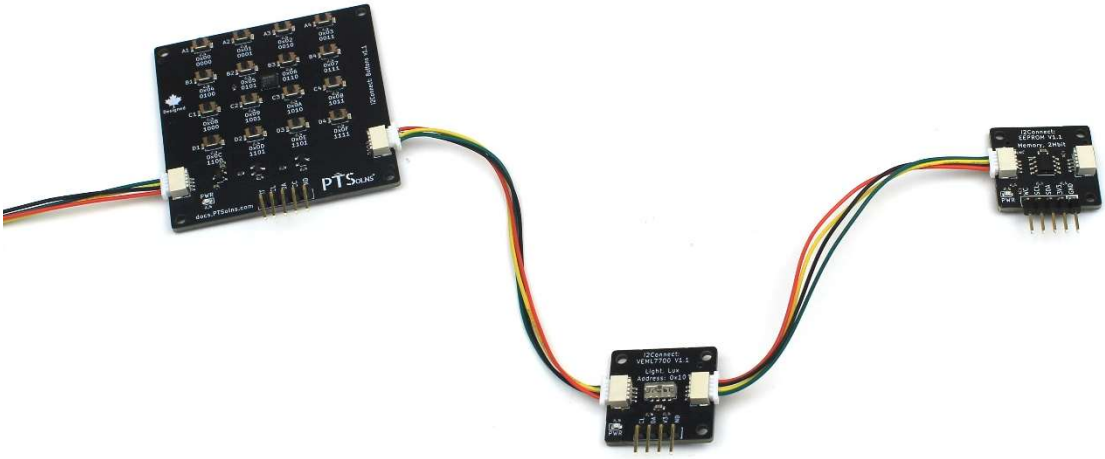


Figure 3: Daisy-Chain of different I2Connect modules.

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3.6 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 (SDA, SCL, VCC, GND) are made available through this header. On the *I2Connect: ICP-20100*, the user-programmable interrupt pin (INT) is also routed out to provide direct access to the sensor's programmable interrupts like FIFO watermark or threshold overruns. Right-angle headers are intentionally used so that modules stand upright when inserted into a breadboard, improving visibility and accessibility.

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.

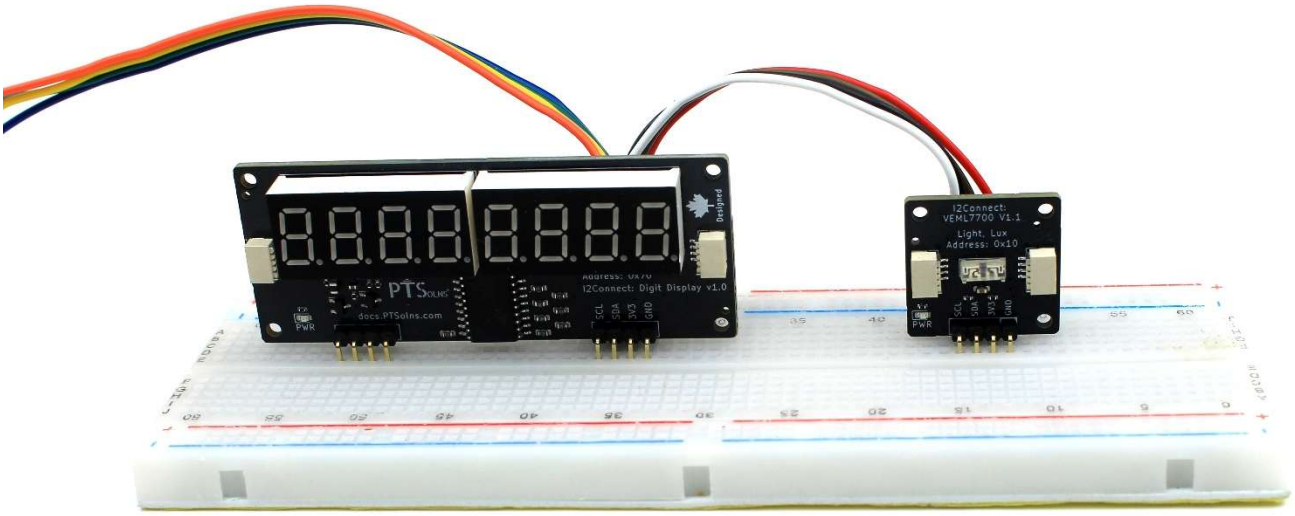


Figure 4: I2Connect modules plugged into standard breadboard.

3.7 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.

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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.

3.8 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: ICP-20100* module is supported by a dedicated software library. This library provides an easy-to-use interface for configuring the sensor and reading barometric pressure and temperature data. The library can be downloaded directly from GitHub (https://github.com/PTSolns/I2Connect_ICP-20100) or installed through the Library Manager available in both the *PTSolns IDE* and Arduino IDE by searching for:

I2Connect_ICP_20100

Example sketches are included with the library and demonstrate common tasks such as device initialization, reading orientation data, and configuring the embedded low-pass filter and wake-up functions.

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3.9 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.

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4 PHYSICAL PROPERTIES

The physical properties of the *I2Connect ICP-20100* are outlined in Table 1.

Table 1: Physical Properties.

	Quantity	Value	Reference
PCB	Length	33.2 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	4x each with 2.2 mm diameter		Figure 7

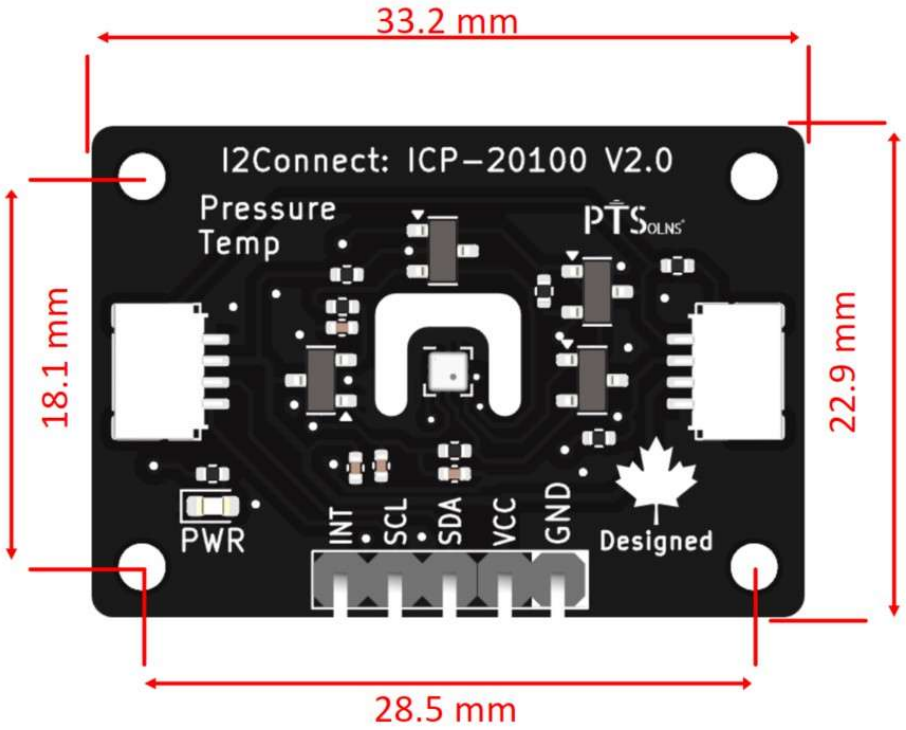


Figure 7: Dimensions of the I2Connect: ICP-20100.

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5 REFERENCES

This section lists relevant references.

- *I2Connect: ICP-20100* Library:
  https://github.com/PTSolns/I2Connect_ICP-20100

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

  I2Connect_ICP_20100

- 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

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