

TPSensor[®] Designer User Guide



Version: A0

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Chapter 1 Introduction

The TPSensor[®] Designer is a development tool that simplifies and accelerates capacitive touch design using 3PEAK MCU devices. The tool provides a graphical user interface for touch configuration and parameter tuning.

1.1 Key Features

- Simple graphical user interface for creating, configuring and defining microcontroller connections for sensors.
- Support for button, slider, and wheel sensors.
- Support for self-capacitive and mutual-capacitive sensor types.
- Real-time plotting of sensor data.
- Real-time tuning of sensor parameters.
- Data logging for further analysis and processing.
- Automated code generation for efficient programming.
- Signal-to-noise ratio (SNR) measurements.

1.2 Software Requirements

Operating Systems	Windows [®] 10 and 11
Screen Resolution	Minimum supported resolution is 1200 x 800 pixels.

1.3 Licensing

The TPSensor[®] Designer is released under the 3PEAK software license. See the license manifest in the installation directory for details.

1.4 Documentation Conventions

Convention	Usage
Bold	Displays commands, menu paths, and icon names in procedures. For example: Click the File icon and then click Open .
File > New	Represents menu path. For instance:

Convention	Usage
	File > New > New Project
Courier New	Displays file locations, user entered text, and source code. For example: <code><your_sdk_path>/example/tpsensors/ tpsensors_exp/source</code>

Chapter 2 Main Window

The TPSensor[®] Designer main window includes three main parts: [Menu Bar](#), [Tool Bar](#) and [Design Area](#).

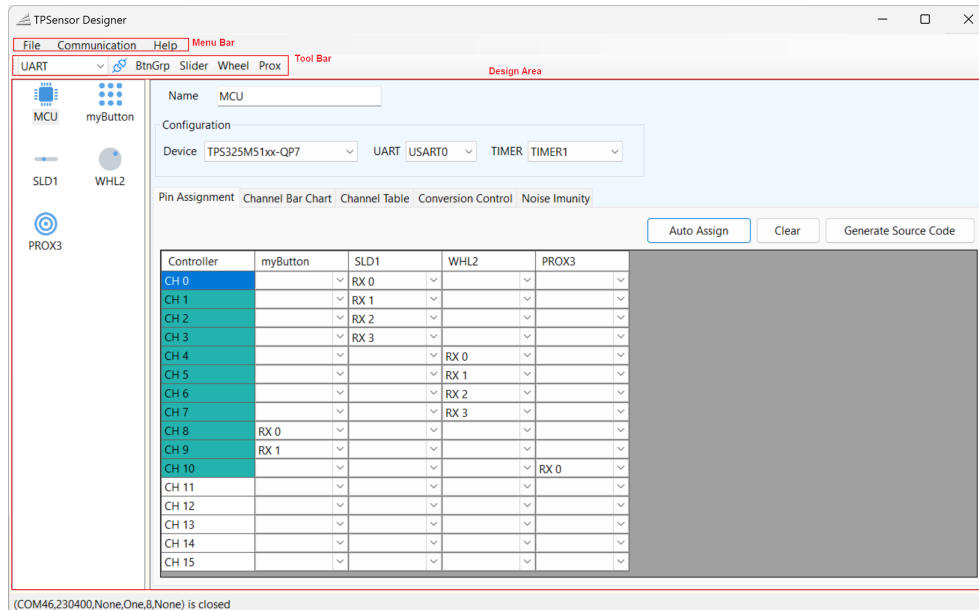


Figure 2-1 Main Window

2.1 Main Menu

The main menu bar provides access to the fundamental features and controls of TPSensor[®] Designer.

2.1.1 File

The **File** menu provides the options to create, open, save, and save as project options, detailed in the table below. Project files are saved in the .tps format.

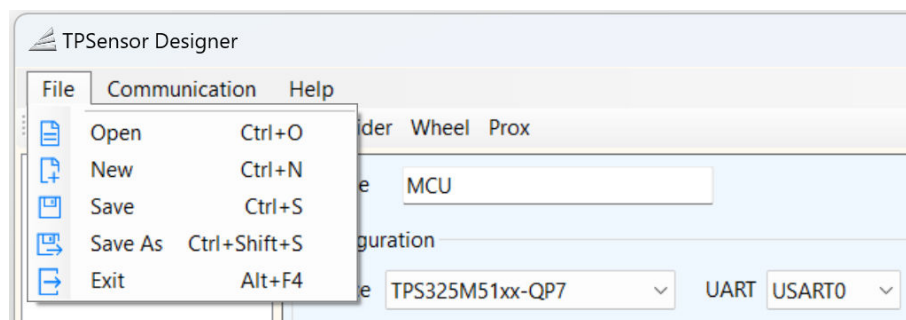
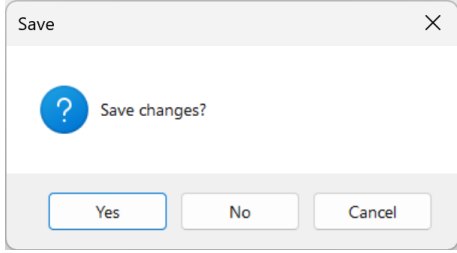


Figure 2-2 File Menu

Action Name	Shortcuts	Description
Open	Ctrl+O	Click Open and choose a .tps file to access an existing project.
New	Ctrl+N	Click New to create a new project. If the current project is unsaved, the system will prompt you to save it.
Save	Ctrl+S	Save the current project, including the device type and related parameters.
Save As	Ctrl+Shift+S	Save the current project as a copy.
Exit	Alt+F4	Click Exit to close current project and quit the application. The software displays a pop-up prompt to save the project. 

2.1.2 Communication

The **Communication** menu includes communication interface settings and connection controls.

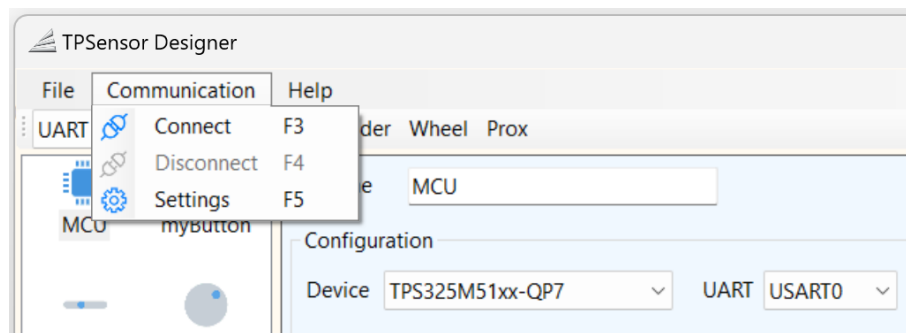


Figure 2-3 Communication Menu

The **Communication** menu contains three submenus:

- **Connect:** Used to establish a connection with the target board. The option grays out when already connected.
- **Disconnect:** Disconnect with the target board. The option grays out when already disconnected.
- **Settings:** Allow configuration of communication interface settings. Currently, the interface only supports serial port connections.

[Figure 2-4](#) shows the **Communication Settings** window.

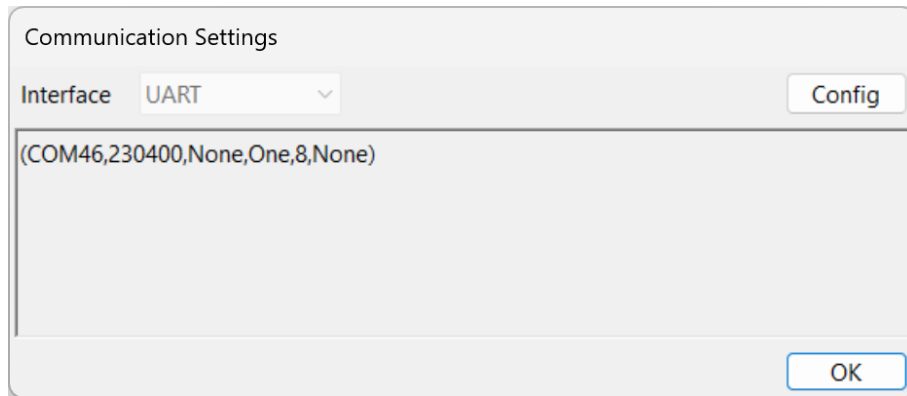


Figure 2-4 Configuration Window for UART

Figure 2-5 shows the configuration Items for UART.

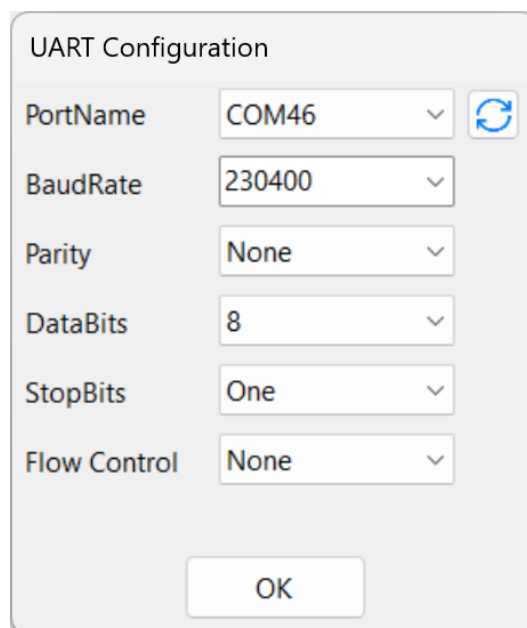


Figure 2-5 UART Configuration Window

2.1.3 Help

Figure 2-6 shows the **Help** menu.

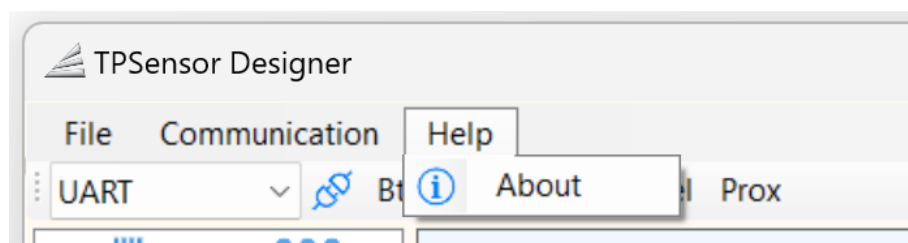


Figure 2-6 Help Menu

Figure 2-7 displays software copyright and version information.



Figure 2-7 About Pop-Up

2.2 Tool Bar

The toolbar provides:

- Communication interface options
- Connect/disconnect button
- Button group widget button
- Slider widget button
- Wheel widget button
- Proximity widget button

2.3 Design Area

An application utilizing TPSensor[®] capacitive touch requires an MCU and at least one touch sensor. Users can add various touch sensors to the design area by clicking the widget button on the toolbar.

Each widget has detail properties and configurable parameters. User click the widget on the left side of design area, the detailed properties and configurable parameters of the widget are displayed on the right side.

2.3.1 MCU Properties

The MCU properties panel provides the following features:

- Device configuration
- MCU pins to sensor elements mapping

2.3.1.1 Properties Page

Figure 2-8 shows the properties page, detailed in the table below.

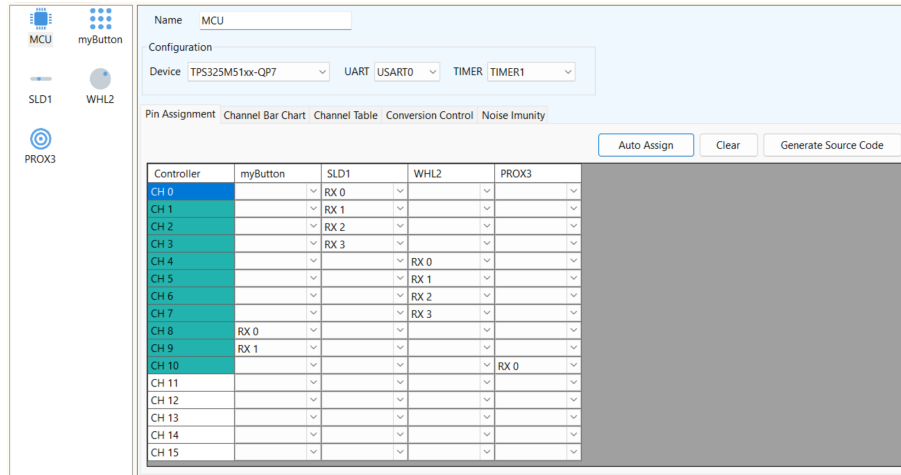

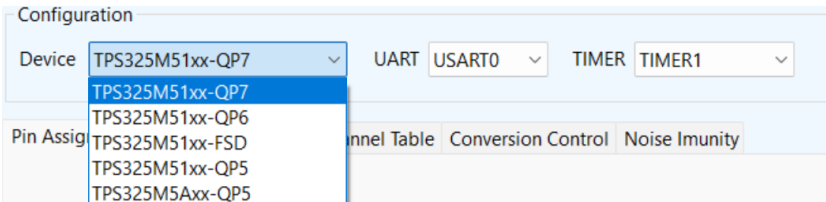
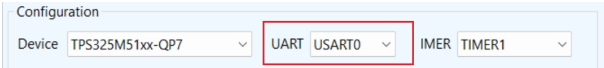
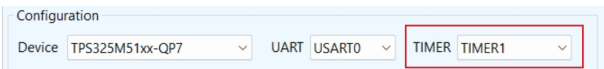
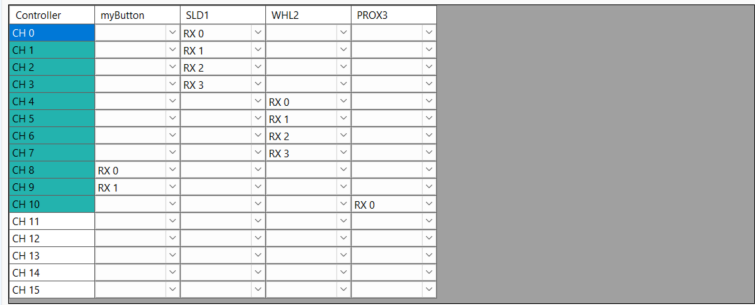
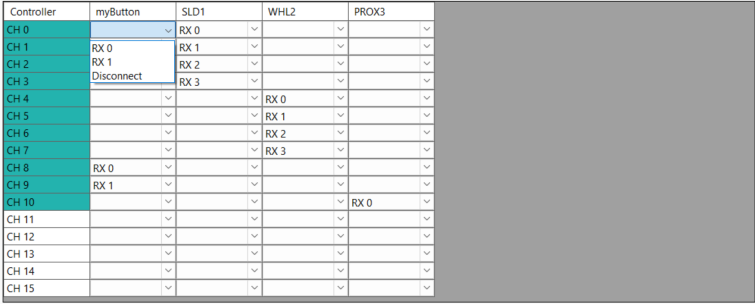
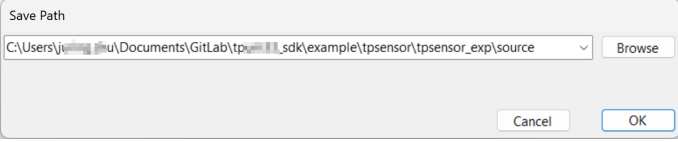
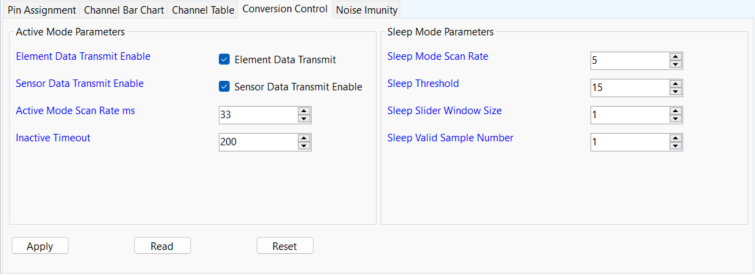
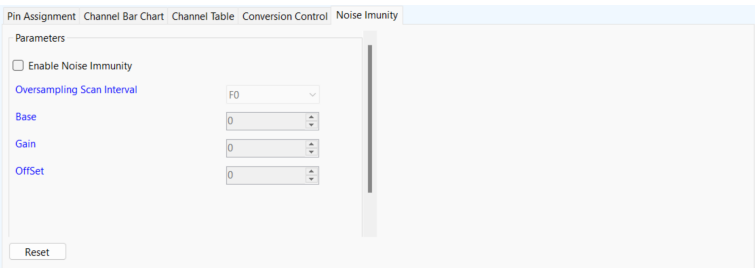


Figure 2-8 MCU Properties Panel

Property Configuration	Description
Name	The MCU name can be defined in the Name text box. 
Device	Select a MCU device from the drop-down box. 
UART	TPSensor [®] application library requires a UART. Select one from the drop-down box. 
TIMER	TPSensor [®] application library requires a Timer. Select one from the drop-down box. 
TPSensor [®] Channel Assignment	In Pin Assignment tab, users can manually assign the sensor pins to appropriate pins on the MCU, or click Auto Assign button to automatically do the assignment.

Property Configuration	Description										
	<p data-bbox="576 286 1334 315">Pin Assignment Channel Bar Chart Channel Table Conversion Control Noise Immunity</p> <p data-bbox="1043 320 1315 338">Auto Assign Clear Generate Source Code</p>  <p data-bbox="703 667 1299 701">Figure 2-9 Auto Assign Channel Connections</p>  <p data-bbox="683 1066 1319 1099">Figure 2-10 Manual Assign Channel Connections</p> <p data-bbox="576 1133 1026 1160">Click Clear button to clear all connections.</p>										
<p data-bbox="256 1350 448 1413">Configuration File Generation</p>	<p data-bbox="576 1182 1390 1245">Click Generate Source Code button, then click Browse to select a folder to save the generated files, and then click OK.</p>  <p data-bbox="576 1413 1430 1514">The generated file can be found in the specified path. These two files include all hardware connections and sensor parameter configuration information. These files are used in software project.</p> <table border="1" data-bbox="592 1525 1294 1574"> <tr> <td><input type="checkbox"/></td> <td>tp_tpsensor_userConfig.c</td> <td>7/31/2023 3:00 PM</td> <td>C Source file</td> <td>8 KB</td> </tr> <tr> <td><input type="checkbox"/></td> <td>tp_tpsensor_userConfig.h</td> <td>7/31/2023 3:00 PM</td> <td>C++ Header file</td> <td>3 KB</td> </tr> </table>	<input type="checkbox"/>	tp_tpsensor_userConfig.c	7/31/2023 3:00 PM	C Source file	8 KB	<input type="checkbox"/>	tp_tpsensor_userConfig.h	7/31/2023 3:00 PM	C++ Header file	3 KB
<input type="checkbox"/>	tp_tpsensor_userConfig.c	7/31/2023 3:00 PM	C Source file	8 KB							
<input type="checkbox"/>	tp_tpsensor_userConfig.h	7/31/2023 3:00 PM	C++ Header file	3 KB							
<p data-bbox="256 1783 464 1809">Conversion Control</p>	<p data-bbox="576 1597 1398 1704">The Conversion Control tab contains the parameter settings for TPSensor[®] active mode and sleep mode. Keep the default value if user is unfamiliar with the setting.</p> 										
<p data-bbox="256 2033 424 2060">Noise Immunity</p>	<p data-bbox="576 2018 1406 2080">The Noise Immunity tab includes the parameter settings for conducted noise immunity.</p>										

Property Configuration	Description
	

2.3.2 Sensor Properties

TPSensor[®] Designer support Button Group, Slider, and Wheel sensors. Different sensors have similar properties. This chapter takes button group as an example and introduce the sensor properties. A button group represents a sensor with multiple buttons, such as keypad.

2.3.2.1 Properties Page

The Button Group sensor properties panel provides below functions:

- Sensor configuration
- Sensor tuning
- Sensor data view

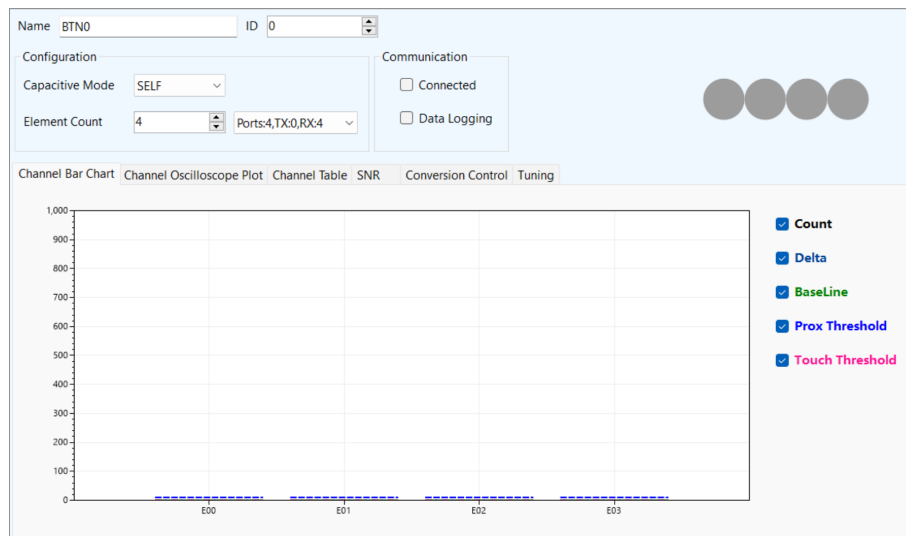



Figure 2-11 Button Group Properties

Property Configuration	Description	
Name	The sensor name can be customized in the Name text box. This name is used for code generation. 	
ID	The ID is generated according to the order the sensor be added. User can edit the ID value manually. But make sure every sensor has a unique ID number.	
Configuration	Capacitive Mode	Capacitive Mode specify the sensor type:

Property Configuration		Description
		<ul style="list-style-type: none"> Self <div data-bbox="687 338 1369 539" style="border: 1px solid #ccc; padding: 5px; margin: 5px 0;"> Configuration Capacitive Mode SELF ▼ Element Count 4 ▲▼ Ports:4,TX:0,RX:4 ▼ </div> <p style="text-align: center;">Figure 2-12 Self-Capacitive Mode</p> Mutual <div data-bbox="687 685 1369 887" style="border: 1px solid #ccc; padding: 5px; margin: 5px 0;"> Configuration Capacitive Mode MUTUAL ▼ Element Count 4 ▲▼ Ports:4,TX:2,RX:2 ▼ </div> <p style="text-align: center;">Figure 2-13 Mutual-Capacitive Mode</p>
Element Count		Specify the number of elements for the sensor.
Connection Topology		Specify TX and RX configuration for the sensor. <div data-bbox="687 1111 1369 1406" style="border: 1px solid #ccc; padding: 5px; margin: 5px 0;"> Configuration Capacitive Mode MUTUAL ▼ Element Count 4 ▲▼ Ports:4,TX:2,RX:2 ▼ <div style="border: 1px solid #ccc; padding: 2px; margin-top: 2px;"> Ports:5,TX:4,RX:1 Ports:4,TX:2,RX:2 Ports:5,TX:2,RX:3 Ports:5,TX:1,RX:4 </div> </div> <p style="text-align: center;">Figure 2-14 Connection Topology</p>

2.3.3 Communication

Figure 2-15 shows the communication configuration.

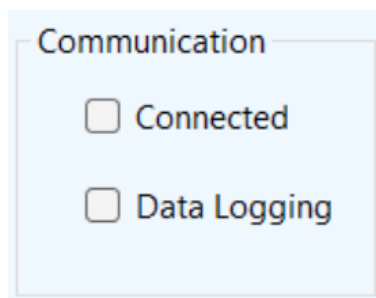





Figure 2-15 Communication Configuration


The configuration section provides two configuration options:

- **Connected:** Used to enable or disable the connection with the target board and reflect the connection status.
- **Data Logging:** Used to log element and sensor data in .csv format.

 sensor-230801085626 097.csv

 sensor-230801085625 329.csv

 sensor-230801085624 517.csv

 sensor-230801085624 933.csv

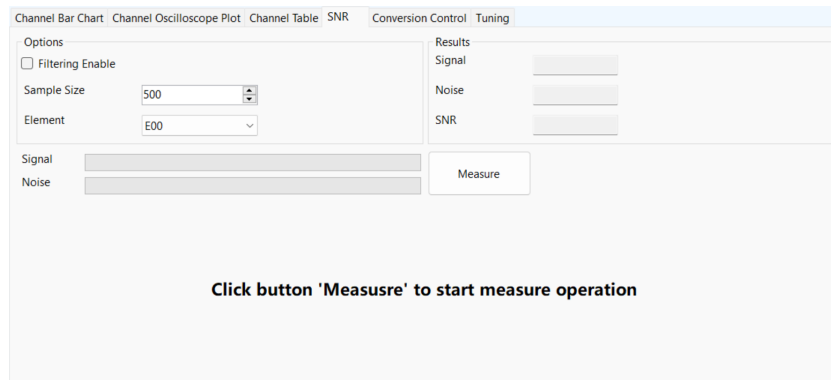
2.3.4 Data View

View Type	GUI Example	Description
Image View		<p>Display the touch status of the sensor.</p>
Bar View		<p>Display the element data stream in bar view mode. The Y-axis range can be scaled by the mouse wheel, and the check box on the right can choose which items to display.</p>
Oscillograph		<p>Display the element data stream in oscilloscope view mode. The Y-axis range can be scaled by the mouse wheel, and the check box on the right can choose which items to display.</p>

View Type	GUI Example	Description																																																							
Data Table	<p>Channel Bar Chart Channel Oscilloscope Plot Channel Table SNR Conversion Control Tuning</p> <table border="1"> <thead> <tr> <th>Element</th> <th>TX</th> <th>RX</th> <th>Channel</th> <th>BaseLine</th> <th>Count</th> <th>Delta</th> <th>Prox Threshold</th> <th>Touch Threshold</th> <th>Prox State</th> <th>Touch State</th> </tr> </thead> <tbody> <tr> <td>E0</td> <td></td> <td>RX0</td> <td></td> <td>513</td> <td>546</td> <td>33</td> <td>523</td> <td>533</td> <td>Y</td> <td>Y</td> </tr> <tr> <td>E1</td> <td></td> <td>RX1</td> <td></td> <td>512</td> <td>530</td> <td>19</td> <td>522</td> <td>532</td> <td>Y</td> <td></td> </tr> <tr> <td>E2</td> <td></td> <td>RX2</td> <td></td> <td>515</td> <td>516</td> <td>1</td> <td>525</td> <td>535</td> <td></td> <td></td> </tr> <tr> <td>E3</td> <td></td> <td>RX3</td> <td></td> <td>511</td> <td>512</td> <td>1</td> <td>521</td> <td>530</td> <td></td> <td></td> </tr> </tbody> </table>	Element	TX	RX	Channel	BaseLine	Count	Delta	Prox Threshold	Touch Threshold	Prox State	Touch State	E0		RX0		513	546	33	523	533	Y	Y	E1		RX1		512	530	19	522	532	Y		E2		RX2		515	516	1	525	535			E3		RX3		511	512	1	521	530			
Element	TX	RX	Channel	BaseLine	Count	Delta	Prox Threshold	Touch Threshold	Prox State	Touch State																																															
E0		RX0		513	546	33	523	533	Y	Y																																															
E1		RX1		512	530	19	522	532	Y																																																
E2		RX2		515	516	1	525	535																																																	
E3		RX3		511	512	1	521	530																																																	

2.3.5 SNR

TPSensor[®] Designer provides a built-in SNR measurement tool which makes it easy to perform an SNR evaluation of touch design.



2.3.6 Conversion Control

Figure 2-16 shows the Conversion Control configuration page.

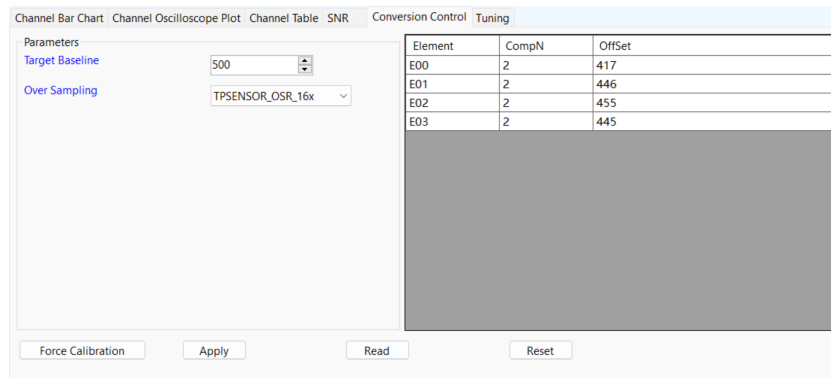


Figure 2-16 Conversion Control Tab

2.3.7 Tunning

Figure 2-17 shows the Tunning configuration page.

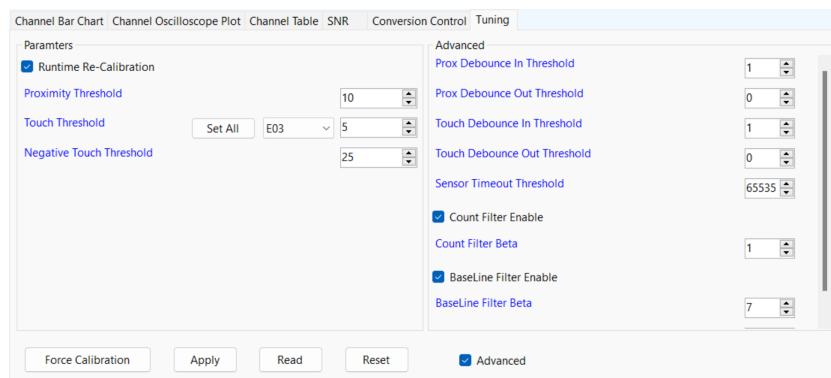





Figure 2-17 Tunning Panel

Check **Advanced** to show other parameters.

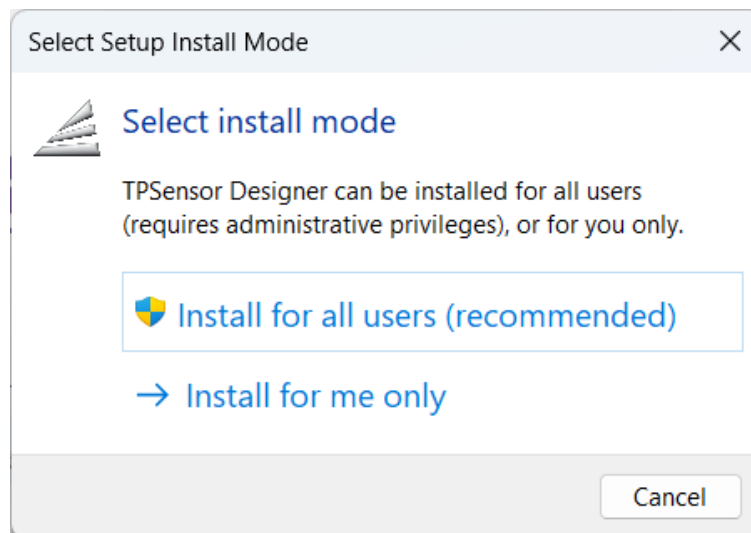
Chapter 3 Software Installation

3.1 Installation Procedures

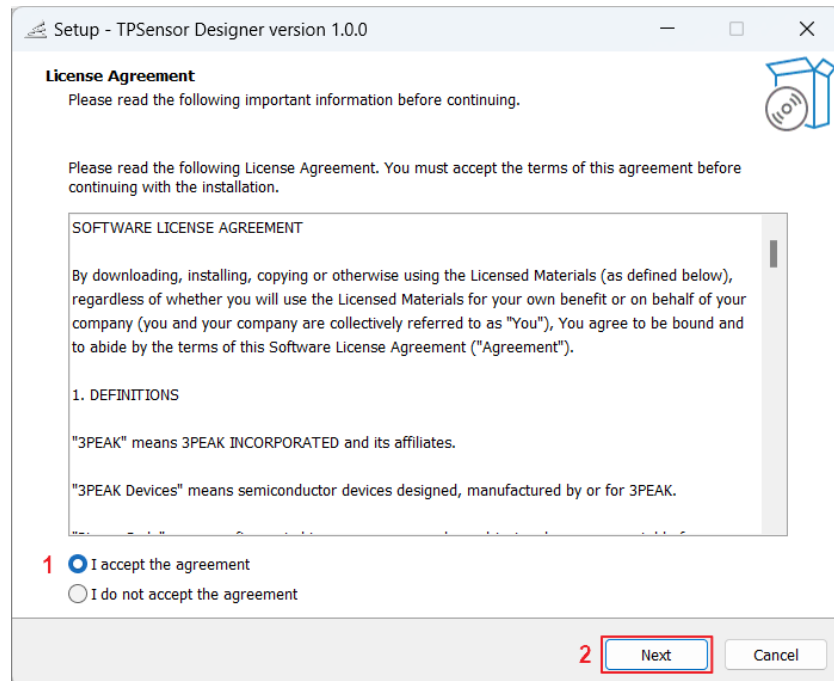
1. Double click the installation file appropriate for your operating system.

 TPSensor Designer win-x64.exe		2023/11/1 15:11	Application	58,172 KB
 TPSensor Designer win-x86.exe	File description: TPSensor Designer Setup Company: 3PEAK INCORPORATED File version: 1.0.0.0 Date created: 2023/10/30 14:54 Size: 56.8 MB Availability status: Available on this device		Application	53,306 KB

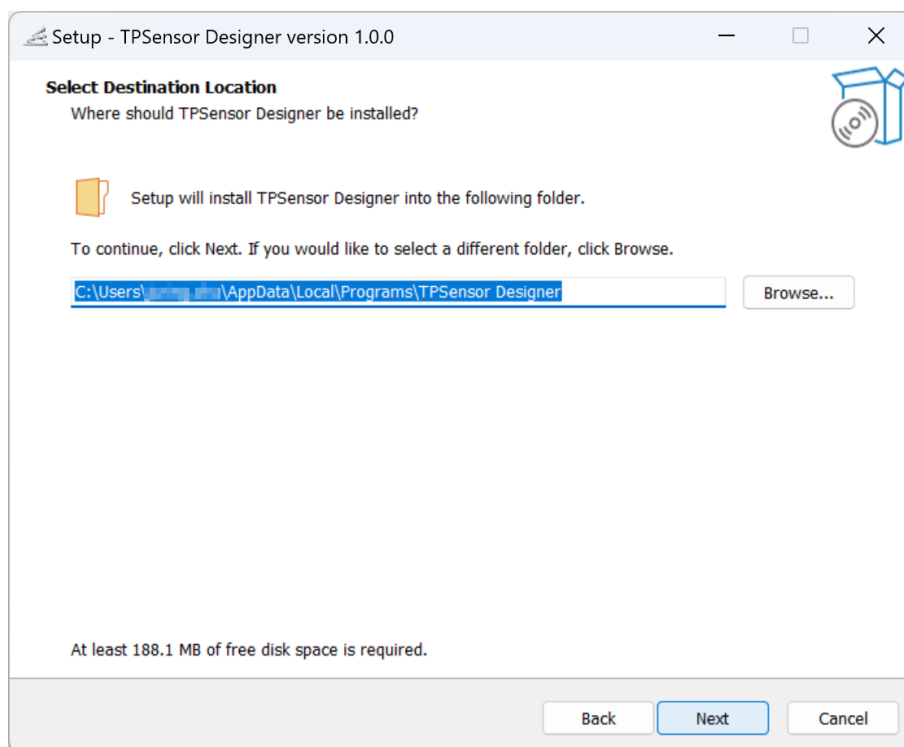
2. Select an install mode.



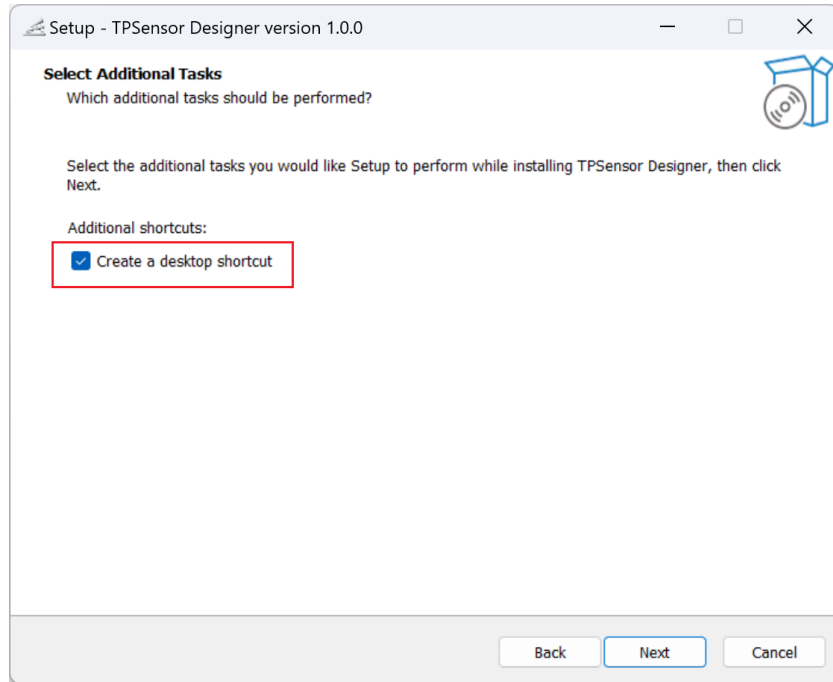
3. Read and accept the license agreement, then click **Next** to continue.



4. Select an installation folder; the default folder is recommended, and click **Next**.

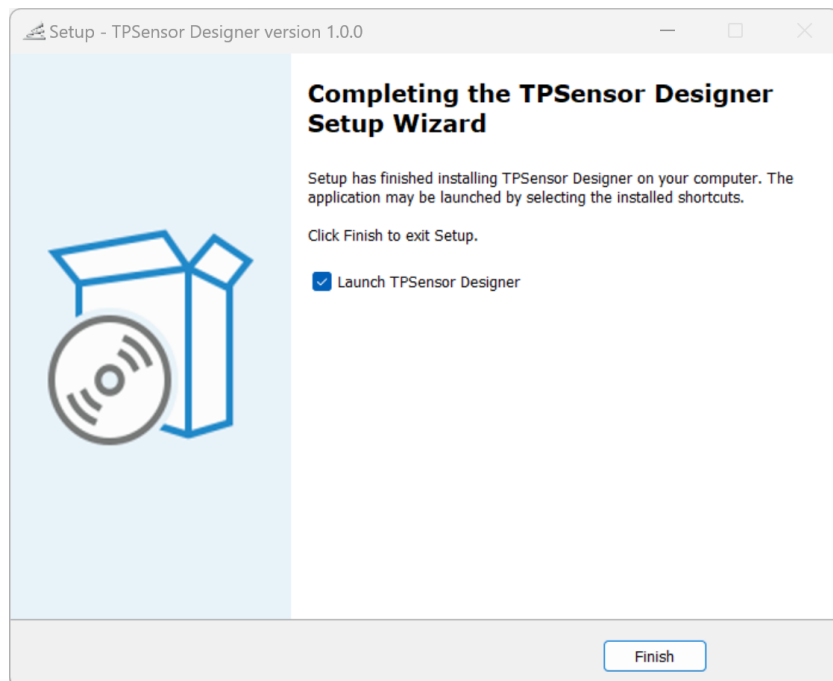


5. Create a desktop shortcut if desired.



6. Complete the installation process.

You can choose to launch TPSensor[®] Designer immediately after installation, or launch it later by double-clicking the shortcut on the Desktop.

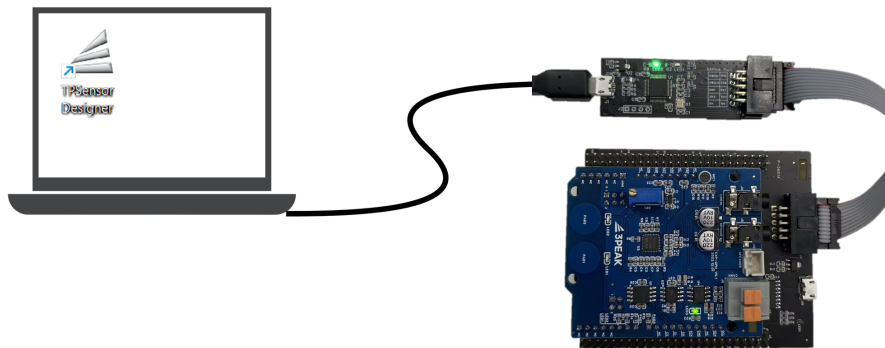


Chapter 4 Start the TPSensor® Designer

This chapter demonstrates using TPSensor® Designer in capacitive touch application development with EVB and expansion board.

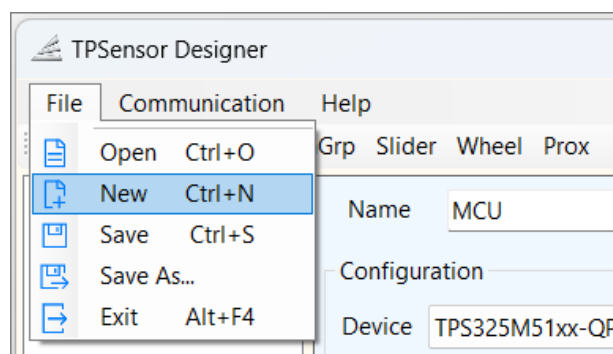
The expansion board has two capacitive touch buttons connected to TPSensor® channels CH8 and CH9.

Before getting started, connect the expansion board and EVB to your PC with a DAPLink.

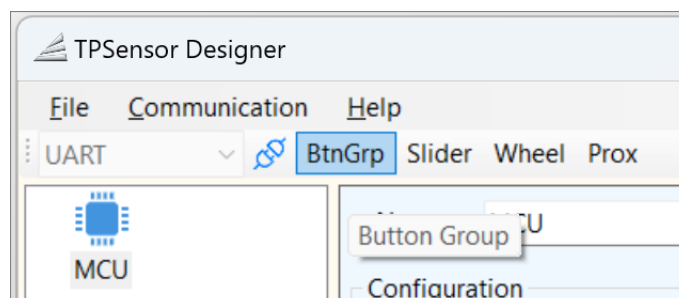


4.1 Startup Procedures

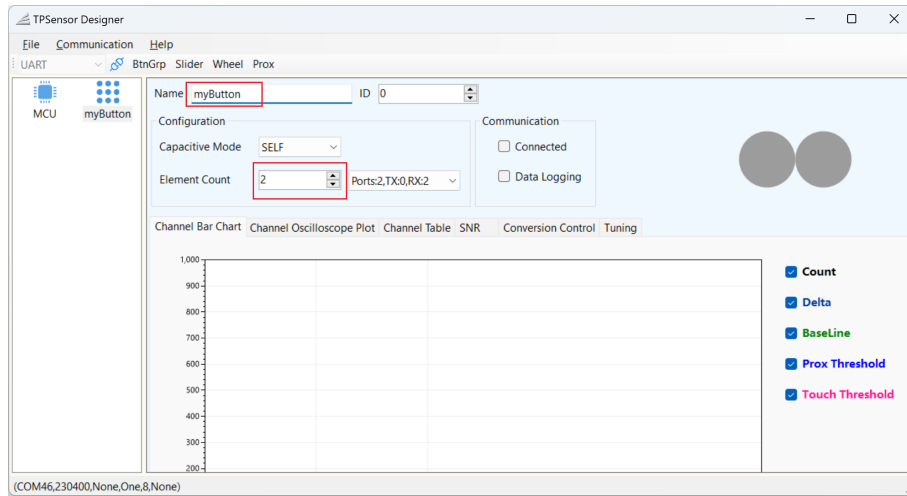
1. Double click on the TPSensor® Designer shortcut on the desktop to start the tool.
2. Click **File > New** to create a new project.



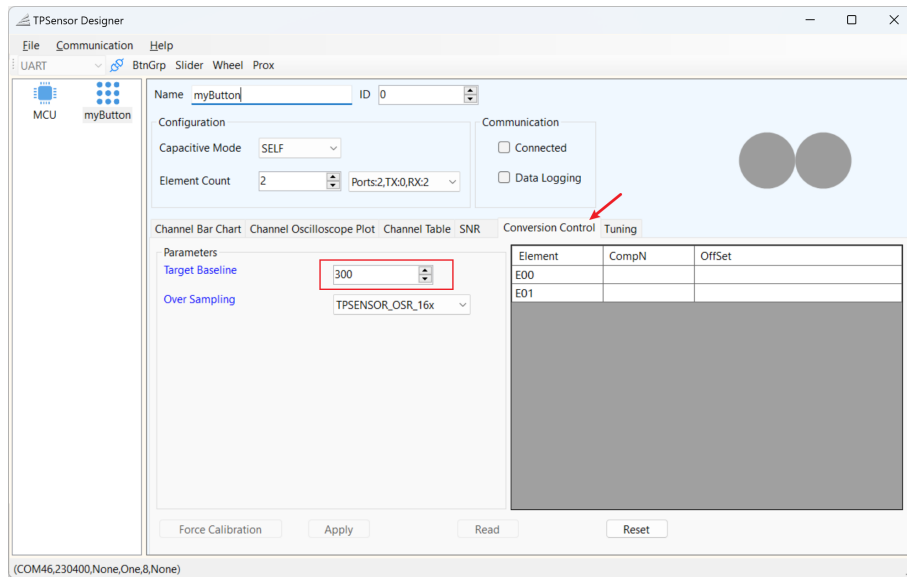
3. Click **BtnGrp** on tool bar to add a button group sensor to the design area.



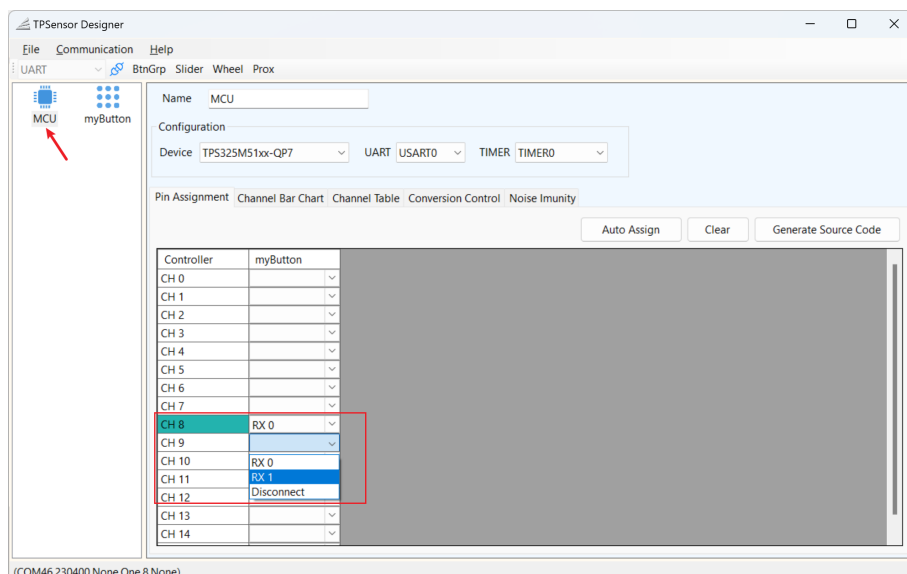
4. Rename button group to **myButton** and Set **Element Count** to **2**.



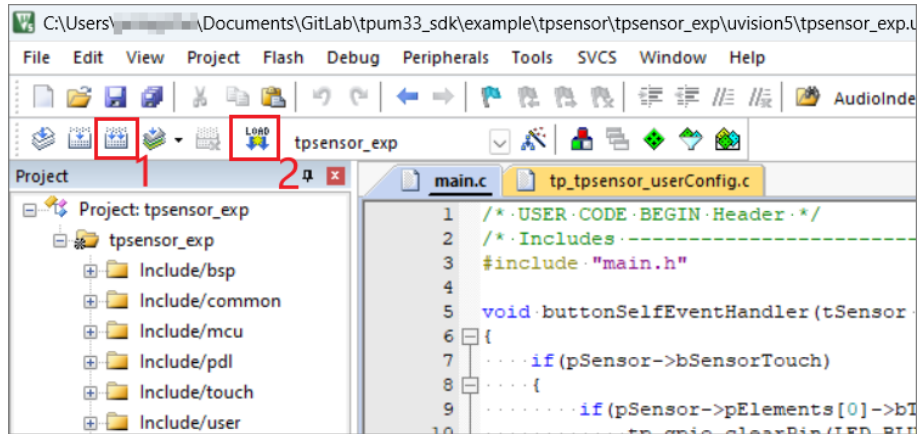
5. Click **Conversion Control** tab and set **Target Baseline** to **300**.



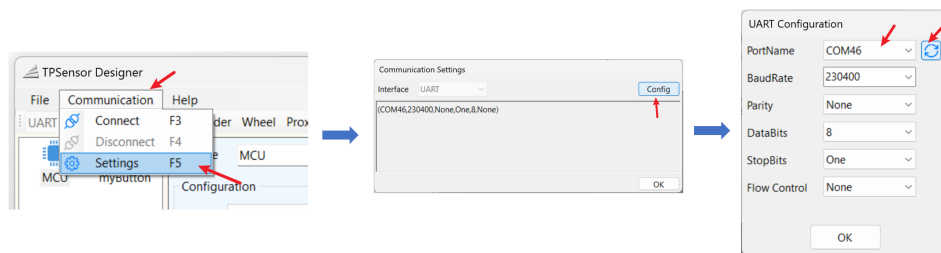
6. Go back to MCU properties setting window. Assign myButton RX 0 to CH 8 and RX 1 to CH 9.



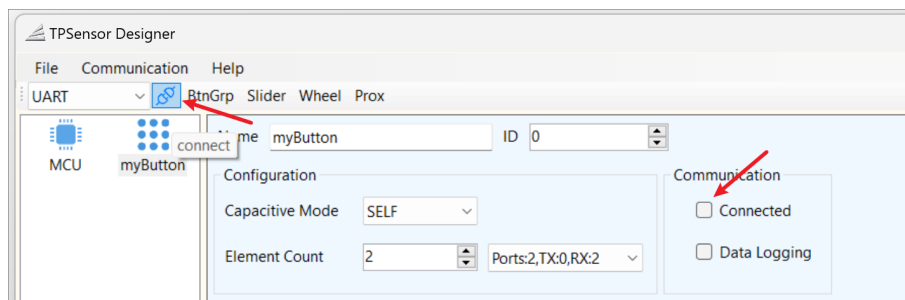
7. Select **UART** to **USART0** and **TIMER** to **TIMER1**.



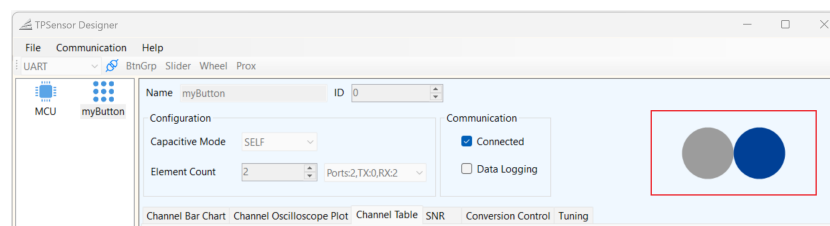
11. In TPSensor® Designer, configure the connection parameters.



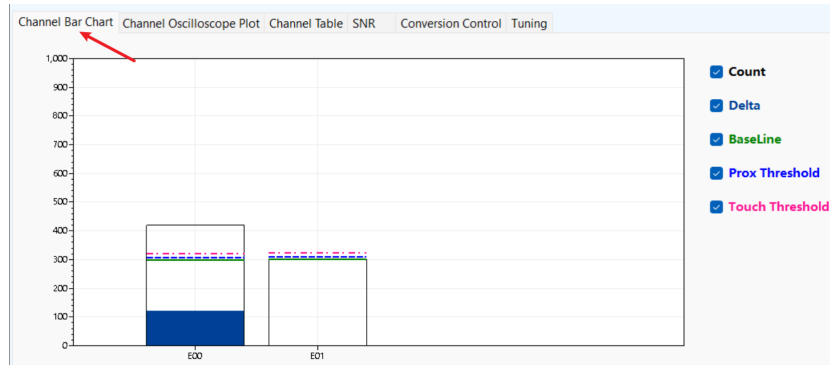
12. Click the connection icon on the toolbar or check the **Connected** checkbox of the **myButton** properties.



13. Touch the buttons and check the button status.



14. Touch the buttons and check the touch data in bar chart view.



15. Touch the buttons and check the touch data in oscilloscope view



16. Touch the buttons and check the raw data.

The Channel Table displays raw data for elements E0 and E1. A red arrow points to the 'Channel Table' tab. The table has columns for Element, TX, RX, Channel, BaseLine, Count, Delta, Prox Threshold, Touch Threshold, Prox State, and Touch State.

Element	TX	RX	Channel	BaseLine	Count	Delta	Prox Threshold	Touch Threshold	Prox State	Touch State
E0		RX0	CH 8	298	298	0	308	321		
E1		RX1	CH 9	300	570	270	310	323	Y	Y

17. Tune the touch parameters as needed.

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