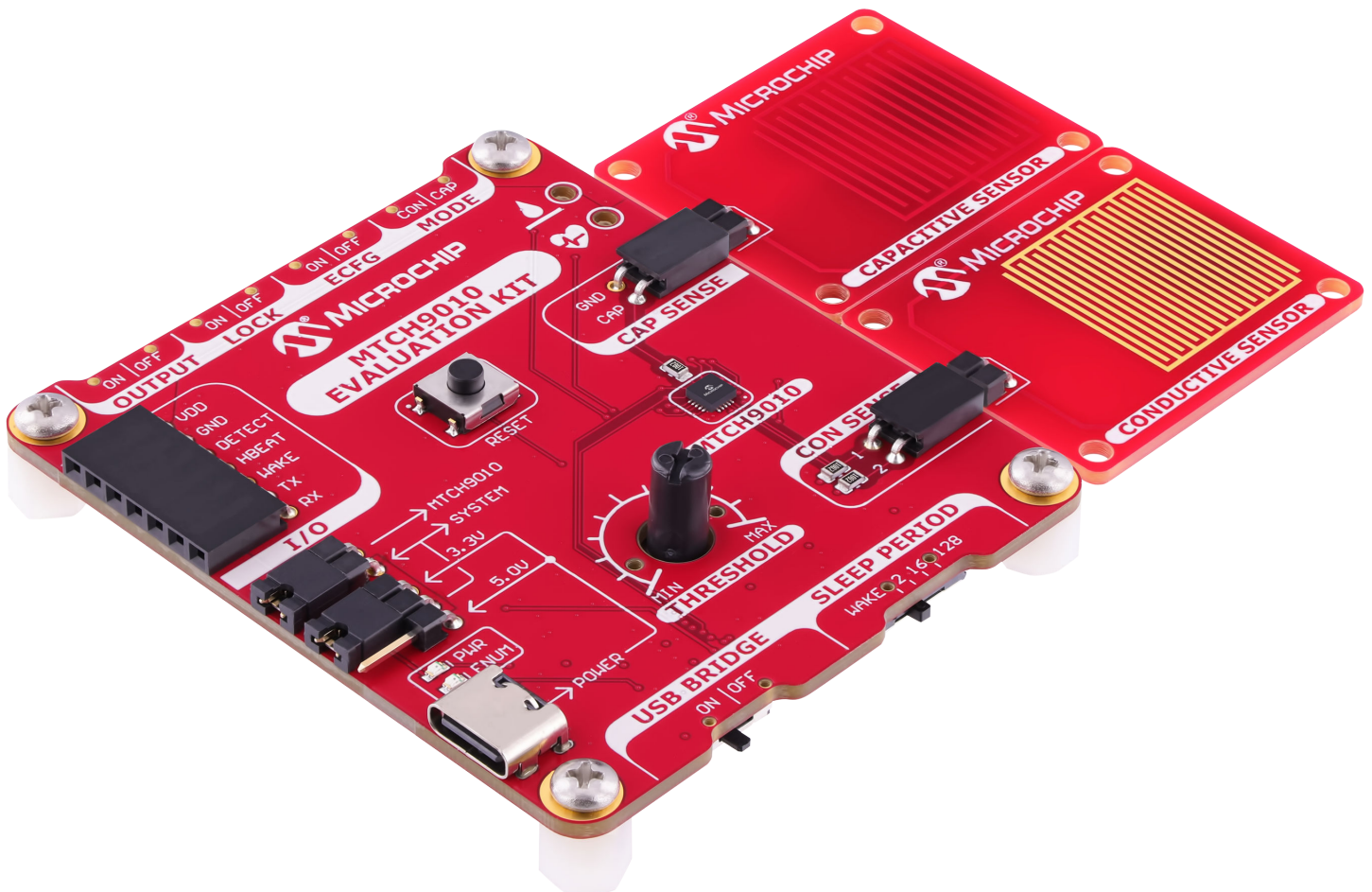


Preface



- [MTCH9010](#) Device website - Find data sheets, samples, and purchase devices
- [MTCH9010 Evaluation Kit website](#) - Purchase this product, kit information, latest user guide, and design documentation
- [Schematics](#) - Board schematics and history
- [Altium Project](#) - Altium Design files for the latest board revision
- [Design Documentation](#) - Production files for every revision

Table of Contents

Preface.....	1
1. Introduction.....	3
1.1. MTCH9010 Evaluation Kit.....	3
1.2. Kit Features.....	3
1.3. Overview.....	4
2. Power Supply.....	5
2.1. MTCH9010 Power Measurement.....	6
3. USB Bridge.....	8
4. Board Configuration.....	10
4.1. Configuration Slide Switches.....	10
4.1.1. Sleep Period.....	11
4.1.2. USB Bridge	11
4.2. Reset Button.....	12
4.3. Liquid Detection Threshold.....	12
5. Status LEDs.....	13
6. External Control Interface.....	14
7. Sensor Input.....	15
8. Hardware Revision History.....	17
8.1. Hardware Revision History and Known Issues.....	17
8.1.1. Identifying Product ID and Revision.....	17
8.1.2. Revision 5.....	17
9. Document Revision History.....	18
10. Appendix.....	19
10.1. Assembly Drawings.....	19
10.2. Schematics.....	22
Microchip Information.....	25
Trademarks.....	25
Legal Notice.....	25
Microchip Devices Code Protection Feature.....	25
Product Page Links.....	26

1. Introduction

Kit introduction, features, overview.

1.1. MTCH9010 Evaluation Kit

The MTCH9010 Evaluation Kit is a complete system designed to help users quickly familiarize themselves with the MTCH9010's capabilities. It includes two sensor boards: One capacitive and one conductive. The evaluation kit uses the MCP2221A USB to UART bridge for communication, allowing sensor data streaming and device configuration through the MTCH9010's Enhanced Configuration mode.

The evaluation kit is designed to allow users to easily interface and test their custom sensors with the MTCH9010, providing a versatile platform for rapid development and experimentation.

1.2. Kit Features

Liquid Detection and Indication

- Includes two sensor boards: one capacitive and one conductive
- Detect LED indicates liquid detection
- Heartbeat LED provides system status updates

Configure the [MTCH9010](#) using Slide Switches or UART

- **Easy Configuration Using the Slide Switches:**
 - Select between capacitive or conductive sensing modes
 - Adjustable liquid detection threshold via an on-board potentiometer
 - Selectable sleep periods (four options) to optimize power consumption
 - Enable sensor data streaming via UART
 - Enable Enhanced configuration mode
- **Advanced Configuration Using UART Interface:**
 - Access enhanced settings for more precise control and customization

USB to UART Communication

- [MCP2221A](#) USB to UART bridge for easy data logging and communication
- On-board status LED indicating successful enumeration with host computer

Multiple Power Options

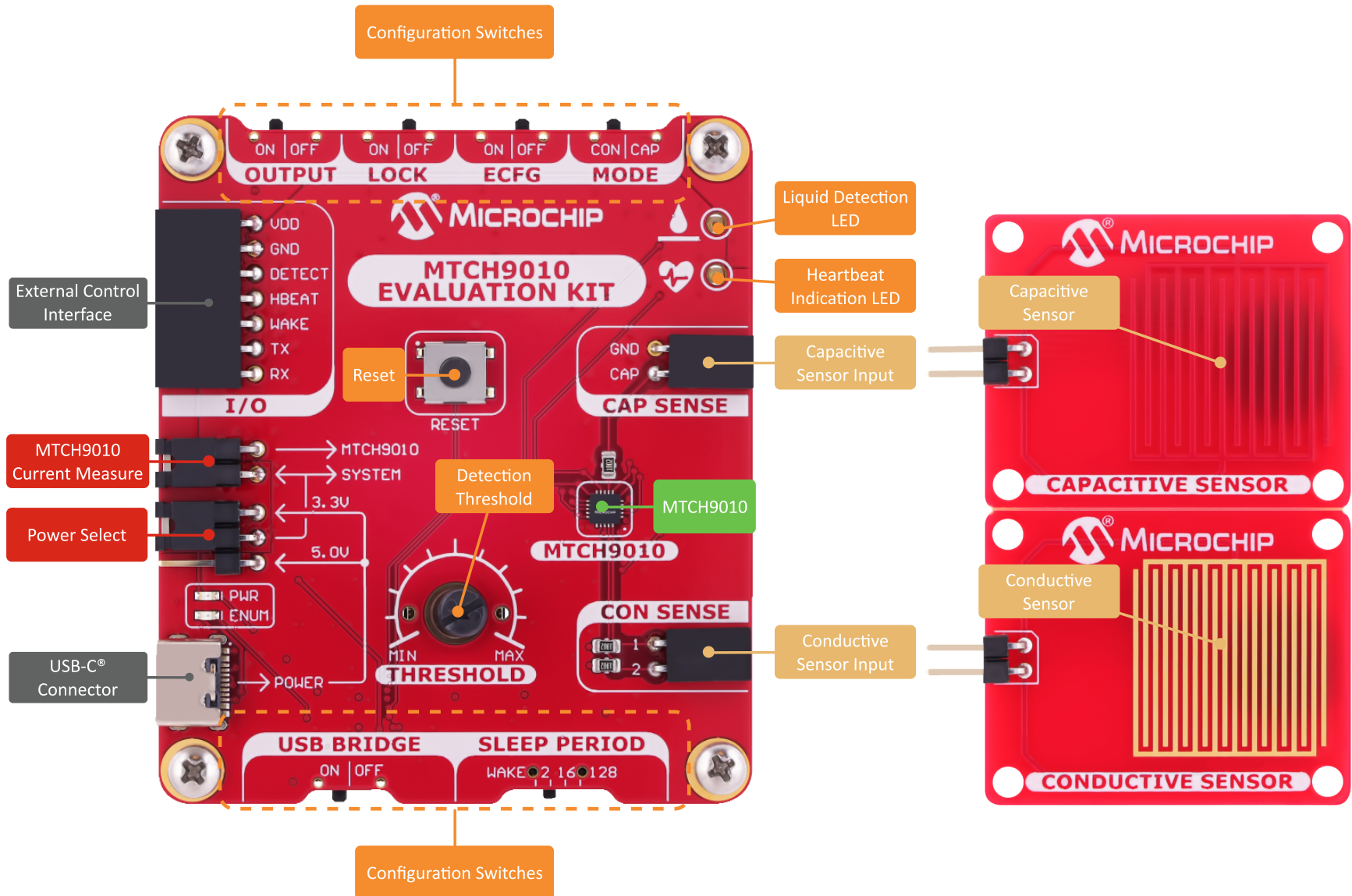
- Directly power the board via USB for easy use
- On-board LDO ensures stable 3.3V operation for low-power applications
- Allows integration with external power sources for system evaluation

Reliable On-Board Power Management

- [MCP1754](#) (3.3V, 150 mA LDO) powers the board and USB bridge
- [MIC2008](#) High-side power switch provides controlled power delivery with controlled slew rate and over-current protection
- On-board status LED indicating power status

1.3. Overview

Figure 1-1. MTCH9010 Evaluation Kit Overview




2. Power Supply

Power Supply, Power Measurement.

The MTCH9010 Evaluation Kit's power supply features:

- USB input power via USB-C connector
- A current limiting switch with a soft start to protect the board, the current limit set at 500 mA
- Dedicated 3.3V regulator for stable output
- Powered by USB or external power

 **Tip:** Select between 3.3V or 5.0V by changing position of the jumper on header J201.

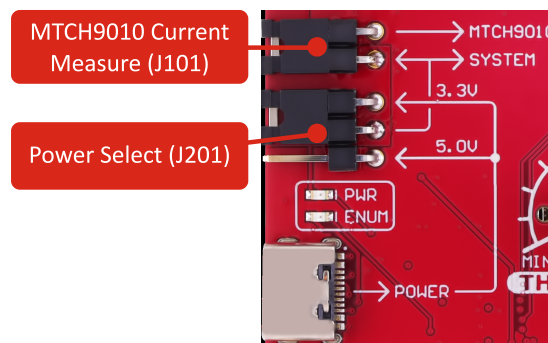
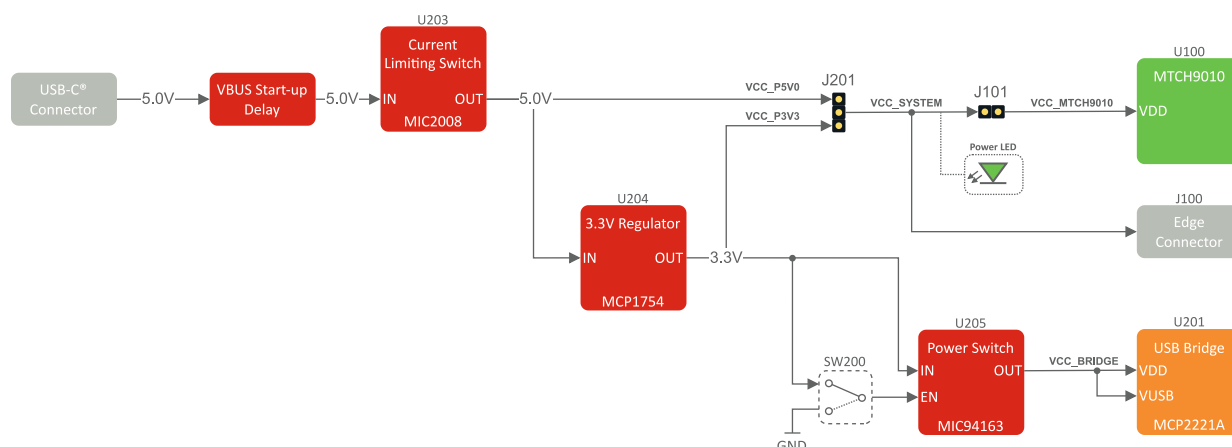



Figure 2-1. Power Supply Overview



There are two main power domains available on the MTCH9010 Evaluation Kit.

Table 2-1. Power Domain Specifications

Power Domain	V _{nom} [V]	V _{min} - V _{max} [V]	I _{max} [mA]
VCC_P5V0	5.0	4.4-5.5	500
VCC_P3V3	3.30	3.23-3.37	150

 **Info:** VCC_P3V3 is connected to VCC_BRIDGE via a reverse blocking power switch and is subject to the same limitations.

Current Limiting Switch

A MIC2008 current limiting switch with an adjustable slew rate is mounted on the board to manage power start-up and prevent large inrush currents. The switch has been configured with the following limits using external components on the board:

- Slew rate: 2 V/ms
- Current limit: 500 mA

Info: MIC2008 current limit range: 0.2–2.0A.

The current limit and slew rate are set using external components on the board:

- Slew rate: C205
- Current limit: R205

The user may alter the current limit and/or slew rate by changing the mounted resistor/capacitor. See the MIC2008 data sheet for more information on calculating the current limit and slew rate.

Power Sources

The MTCH9010 Evaluation Kit supports multiple power sources, select the desired power source by moving the provided jumper cap on the 1x3-100mil header J201 to the desired source as indicated on the silkscreen:

1. USB-C® Power: The board can be powered directly from the USB-C connector. Power passes through the slow-start and current-limiting circuit, and the supply voltage depends on the USB input, which is typically 5.0V.
2. 3.3V Regulator [MCP1754/3.3V](#): The MCP1754 provides a stable 3.3V output to the board. It features robust input capabilities, protecting the board from short circuits and transient voltage events.

Tip: The characteristics of VCC_SYSTEM depend on the power source to which it is connected, either VCC_P5V0 or VCC_P3V3.

Edge Connector

System power is available for user peripherals via the 1x7-100 mil header (J100). This header can also be used to power the board externally or provide power to connected devices.

Important: When powering the board externally through header J100, the user must remove the jumper cap on header J201 to prevent potential damage to the board.

DANGER There is no polarity protection on header J100. Ensure correct polarity when connecting power to avoid potential damage to the board.

2.1. MTCH9010 Power Measurement

The power consumption of the MTCH9010 can be measured using header J101. To do so, remove the jumper cap and connect your measuring instrument, as seen below.

The evaluation kit is designed to ensure that the current through header J101 reflects only the actual current consumption of the MTCH9010.

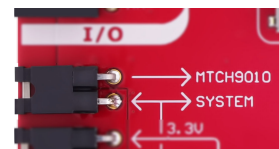
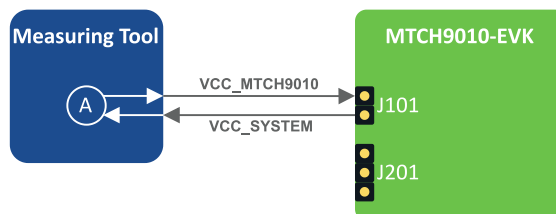


Figure 2-2. Connecting Measurement Tool



Tip: See the [MTCH9010 data sheet](#) for detailed electrical characteristics.



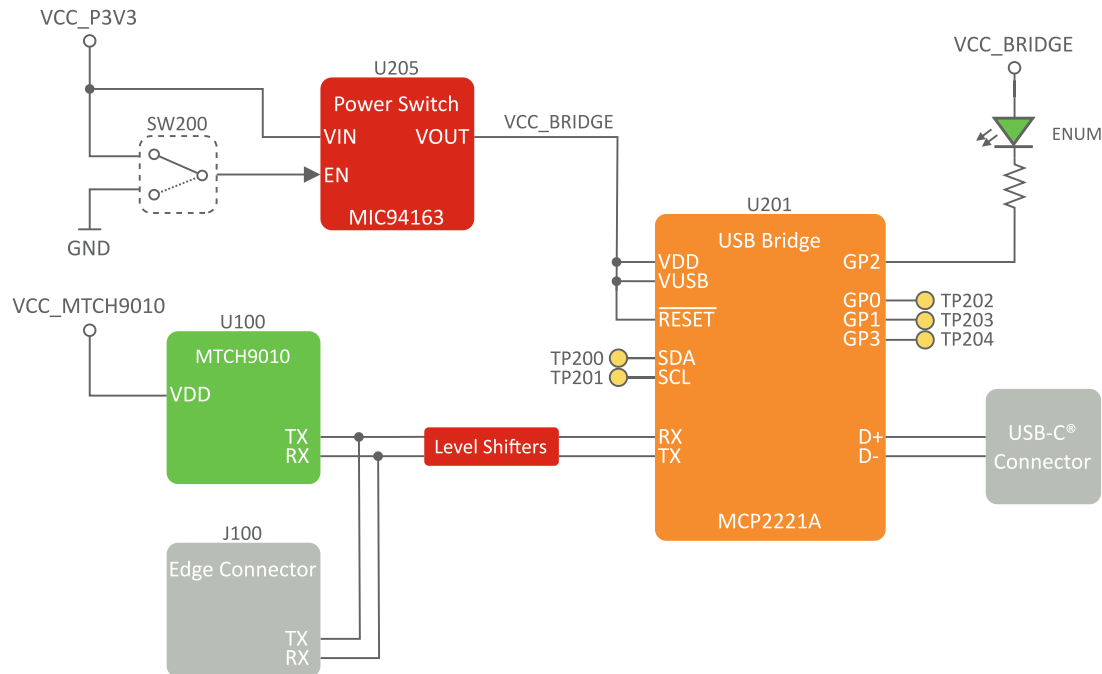
Ensure the board is powered off when removing the jumper from header J101. Removing the jumper while the board is powered may cause the MTCH9010 to be powered through its input pins, potentially damaging the device.

3. USB Bridge

USB Bridge, shared connections, level shifters.

The [MCP2221A](#) is a USB-to-UART/I²C serial converter. It bridges the gap between a computer's USB port and the UART interface on the MTCH9010 Evaluation Kit. A green LED labeled “ENUM” in the silkscreen indicates successful enumeration with the host computer. The MTCH9010 UART connection is shared between the USB bridge and the edge connector. A fixed 3.3V supplied by the onboard regulator (U204) powers the USB bridge for optimal USB performance.

Figure 3-1. USB Bridge Overview

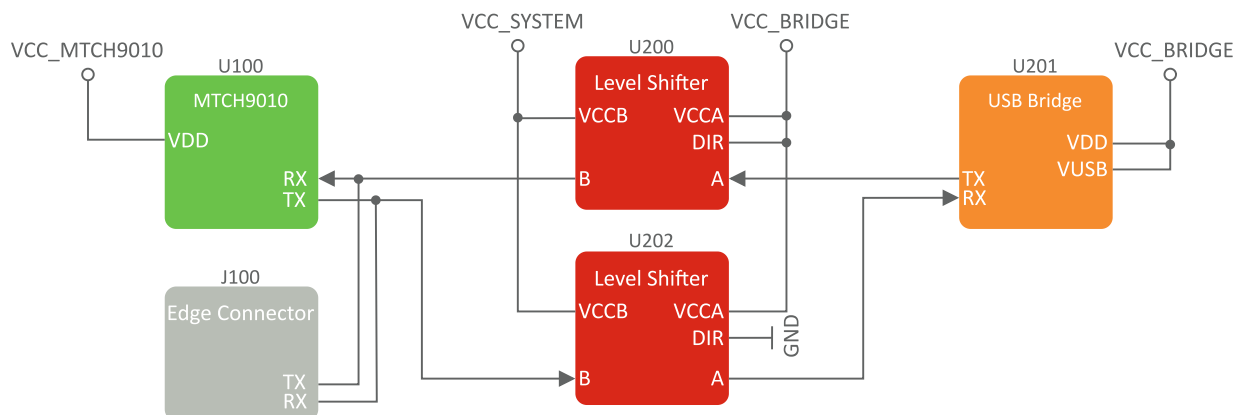


Tip: Drivers, CLI tools and apps are available to interface with the [MCP2221A](#) on its web page.

Power Considerations

Level shifters are used in the UART connection between the USB bridge and the MTCH9010 to accommodate the operating voltage range of the MTCH9010. These level shifters are powered by two separate supplies: **VCC_BRIDGE**, corresponding to the USB bridge, and **VCC_SYSTEM**, corresponding to the MTCH9010. If either power supply voltage drops to zero, the level shifters enter their tri-state mode, placing their outputs in a high-impedance state. This mode electrically isolates the RX and TX UART lines, preventing interference or backflow currents between the USB bridge and the MTCH9010.

Figure 3-2. Level Shifters



Disabling USB Bridge

When SW200 is in the 'OFF' position, the [MIC94163](#) (U205) power switch is disabled, pulling the USB bridge $\overline{\text{RESET}}$ pin low and cutting power to the VDD and VUSB power pins. With the $\overline{\text{RESET}}$ pin pulled low, the USB bridge remains in reset, preventing unwanted transmissions on the UART or USB interfaces. With the power switch disabled, the level shifters will also enter their tri-state mode.

Figure 3-3. USB Bridge Slide Switch



4. Board Configuration

Operation Mode, Detection Threshold, Enhanced Configuration, System Lock, Extended Output, Sleep Period.

4.1. Configuration Slide Switches

The MTCH9010 can be configured using onboard slide switches for the following settings:

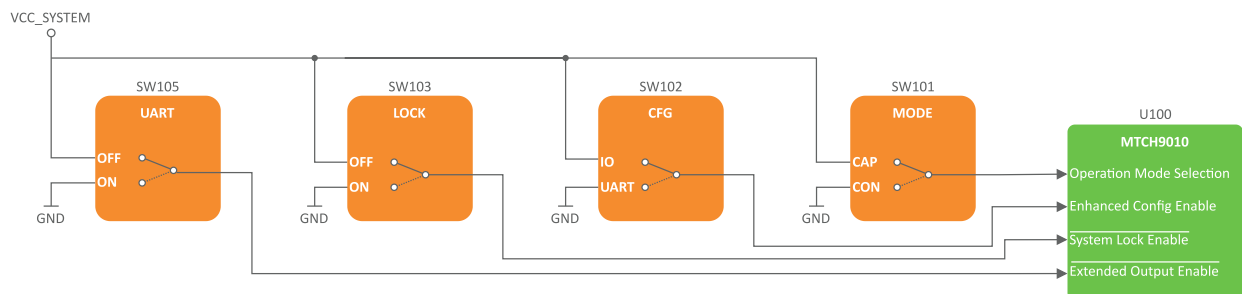
- Extended Output Enable (SW105)
- System Lock Enable (SW103)
- Enhanced Configuration Enable (SW102)
- Operation Mode Selection (SW101)
- Sleep Period Selection (SW104)

Figure 4-1. Configuration Slide Switches



Tip: Reset the MTCH9010 using the onboard reset button to latch new settings.

Figure 4-2. Slide Switches



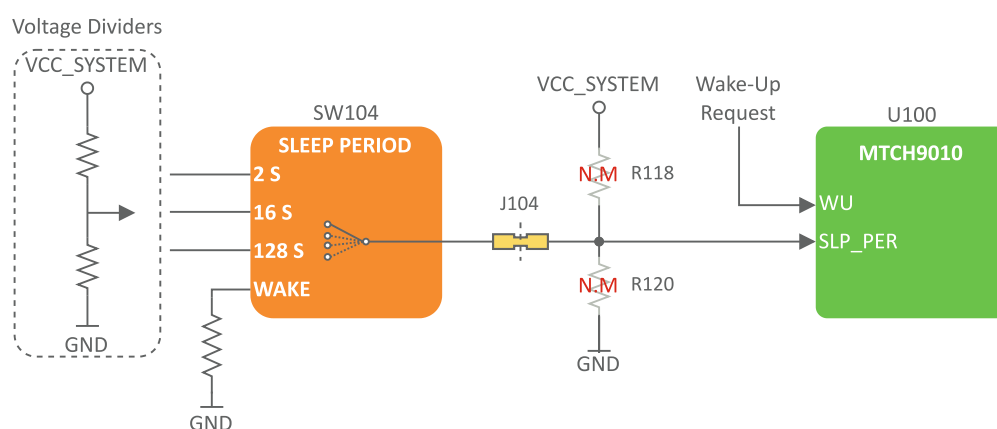
4.1.1. Sleep Period

The sleep period configuration switch may configure the sleep period for the MTCH9010. The MTCH9010 sleep period can be set to 2, 16, or 128 seconds or configured to use the on-demand wake-up through the WUP_REQ pin when using this switch. The MTCH9010 Evaluation Kit also includes two unpopulated footprints for resistors (R118 and R120) and a cut-strap, enabling any other sleep period defined in the device's data sheet.

Figure 4-3. Sleep Period Slide Switch

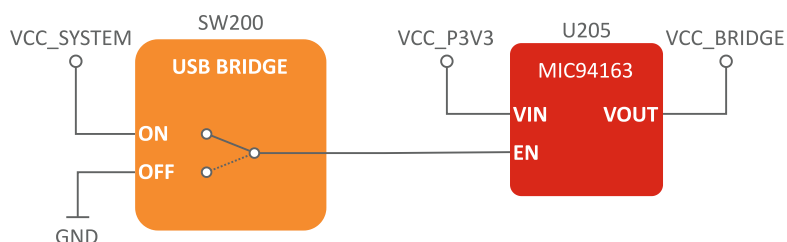


Figure 4-4. Sleep Period Configuration Switch



4.1.2. USB Bridge

Figure 4-5. USB Bridge Slide Switch



Info: A slide switch is used to control the power to the USB bridge, see [Disabling USB Bridge](#) for more information.

4.2. Reset Button

The MTCH9010 Evaluation Kit features a reset button connected to the MTCH9010's RESET pin. Pressing the button pulls the reset line low and holds the device in reset. When released, the line is pulled high through a pull-up resistor.

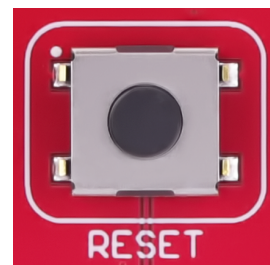
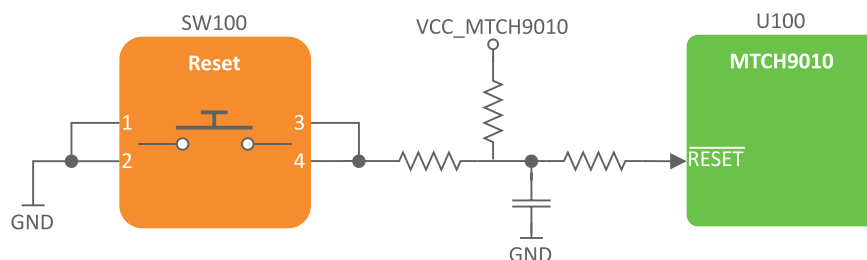


Figure 4-6. Reset Button

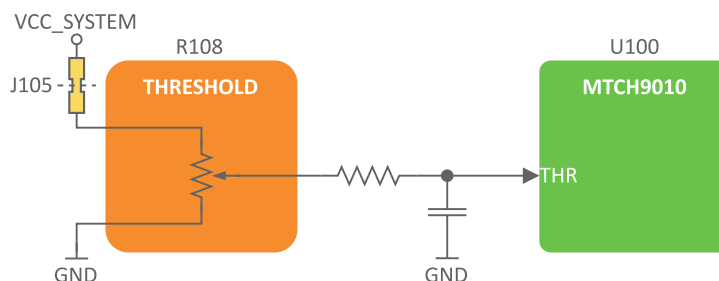


4.3. Liquid Detection Threshold

The MTCH9010 Evaluation Kit features a 100 k Ω \pm 20% linear rotary potentiometer to set the threshold for detecting liquid on the connected sensor. The output from the potentiometer is passed through a low-pass filter to remove high-frequency noise.



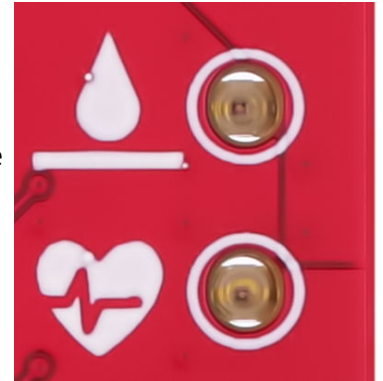
Figure 4-7. Liquid Detection Threshold Potentiometer



5. Status LEDs

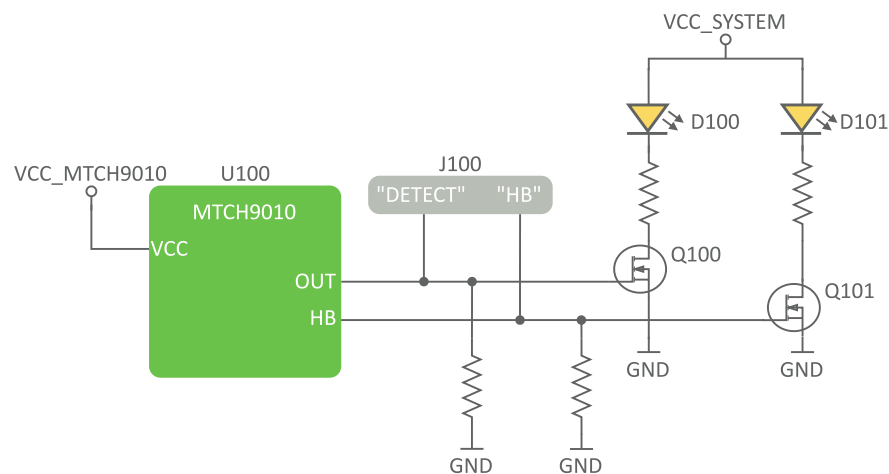
The MTCH9010 Evaluation Kit uses two LEDs to indicate liquid detection and the heartbeat. Both statuses are digital signals with an active high logic. The liquid-detected LED will shine when the MTCH9010 detects liquid exceeding the configured threshold.

The heartbeat output indicates that the device is functioning correctly. The heartbeat signal depends on the configured Sleep period, the output level toggling every time the device enters the Sleep state. See the [MTCH9010 data sheet](#) for more information on the heartbeat feature.



➔ Important: The MTCH9010 will indicate an error state using the output and heartbeat signals, causing the liquid detect and heartbeat LEDs to blink. See the [MTCH9010 data sheet](#) for more information on error codes.

Figure 5-1. Status LEDs Overview

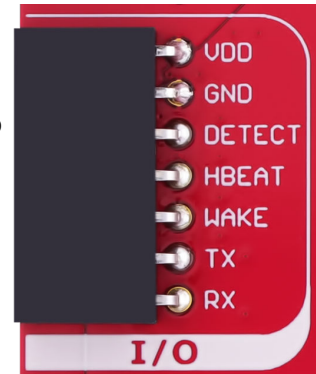


MOSFET switches are used to separate the current draw of the LEDs from the MTCH9010. The pull-down resistors for the MOSFET gates are selected to have a minimal effect on the total current drawn by the MTCH9010.

6. External Control Interface

A 1x7 (100-mil) female right-angle header (J100) provides access to key signals and power of the evaluation kit. The header includes the following pin functions:

- VDD (External power in-/output): This pin may supply external power to the evaluation kit or supply an external system.
- GND (Ground): Common ground reference for signals and power.
- Detect (Digital Output): Indicates the presence of liquid based on sensor input.
- Hbeat (Digital Output): Periodic heartbeat signal confirming the MTCH9010 is active and operating normally.
- Wake (Digital Input): External signal used to wake the system from sleep. It requires configuring the MTCH9010 sleep period for external wake-up.
- UART Interface: TX and RX pins for serial communication with an external host controller.



Header J100 has no polarity protection. Ensure correct polarity when connecting power to avoid potential damage to the board.



Important: When powering the board externally through header J100, the user must remove the jumper cap on header J201 to prevent potential damage to the board.

7. Sensor Input

Capacitive and Conductive Sensor Input.

The MTCH9010 Evaluation Kit includes two sensor PCBs intended to give the user a quick introduction to the MTCH9010 and its capabilities. The goal is to have a rapid prototyping platform for users to evaluate their own sensor designs.

The MTCH9010 detects liquids by measuring the capacitive or conductive levels of the corresponding connected sensors. Only one sensing mode can be active at a time.



Tip: For detailed sensor design considerations and guidelines, see the [MTCH9010 data sheet](#).

Capacitive Sensor Input

The MTCH9010 Evaluation Kit includes a 1x2 (100-mil) female capacitive sensor input header, J103, enabling users to connect the provided sensor PCB or their custom sensor designs. A 10 k Ω (0805 size) series resistor (R113) is placed in line with the capacitive sense line to filter out high-frequency noise. The series resistor, in combination with the capacitive sensor, forms an RC circuit. For optimal performance, users must adjust the series resistor value according to the capacitance of their sensor design.

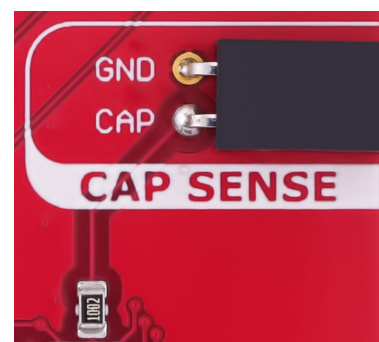
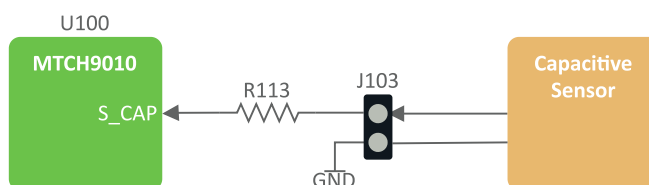


Figure 7-1. Capacitive Sensor Connection



Conductive Sensor Input

The MTCH9010 Evaluation Kit includes a 1x2 (100-mil) female conductive sensor input header, J102, enabling users to connect the provided sensor PCB or their custom sensor designs. To improve performance and reliability of the conductive sense signals, two 10 k Ω (0805 size) pull-up resistors (R111 and R112) are used. These resistors help maintain stable signal levels and minimize noise. For optimal performance, users must adjust the pull-up resistor values according to their sensor design.

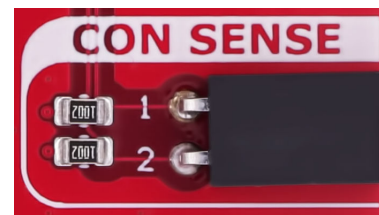
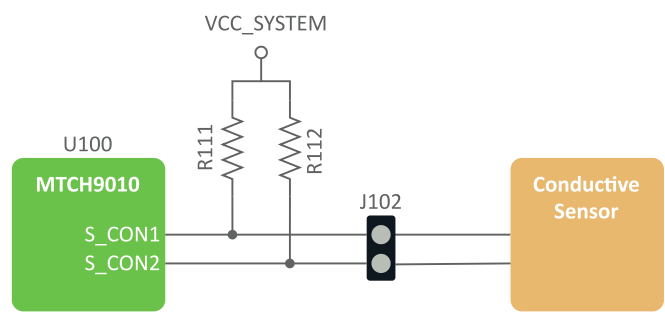


Figure 7-2. Conductive Sensor Connection



8. Hardware Revision History

8.1. Hardware Revision History and Known Issues

This user guide provides information about the latest available revision of the board. The following sections contain information about known issues, a revision history of older revisions, and how older revisions differ from the latest revision.

8.1.1. Identifying Product ID and Revision

There are two ways to find the revision and product identifier of the MTCH9010 Evaluation Kit:

1. Check the sticker on the bottom of the PCB.
2. Read the information from the on-board USB bridge. This method requires familiarity with USB devices or a dedicated application to read USB device information.

The accompanying sensor boards' revision and product identifier can be found on the sticker labels on the bottom of the sensor PCBs.

The first nine digits of the serial number contain the product identifier and revision. The data matrix code on the sticker contains a string with the product identifier, revision and serial number.

The product identifier and revision are printed in plain text on the MTCH9010 Evaluation Kit as 02-01228/rr and on the sensor boards as 02-01348/rr, where "rr" represents the revision. The serial number is printed on the following line.

The string in the data matrix code has the following format:

```
"nnnnnnnnrrssssssss"
```

n = product identifier

r = revision

s = serial number

8.1.2. Revision 5

Revision 5 is the initially released board revision.

Known issue: The slew rate limiting for the U208 - MIC2008 is implemented incorrectly. The capacitor on the CSLEW pin is currently connected to GND, which causes the slew rate for VCC_P5V0 to be approximately 50 V/ms. For the correct implementation, the capacitor is instead connected between the VIN and CSLEW pins to achieve the intended slew rate limiting.

9. Document Revision History

Doc. Rev.	Date	Comments
A	5/2025	Initial document release

10. Appendix

Schematics and Assembly Drawings.

10.1. Assembly Drawings

Figure 10-1. MTCH9010 Evaluation Kit Top Assembly

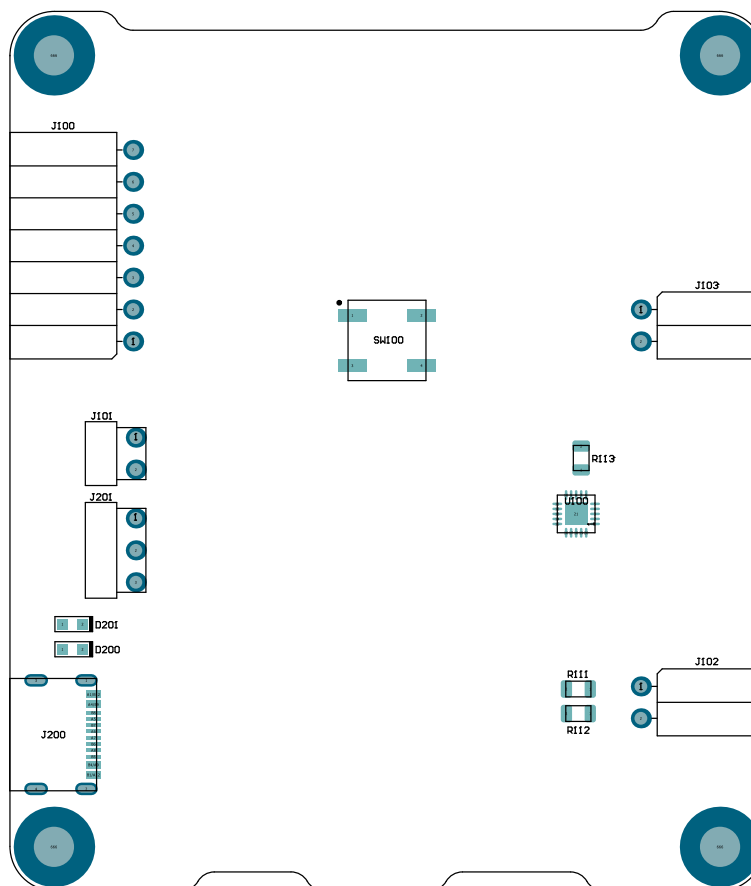


Figure 10-2. MTCH9010 Evaluation Kit Bottom Assembly

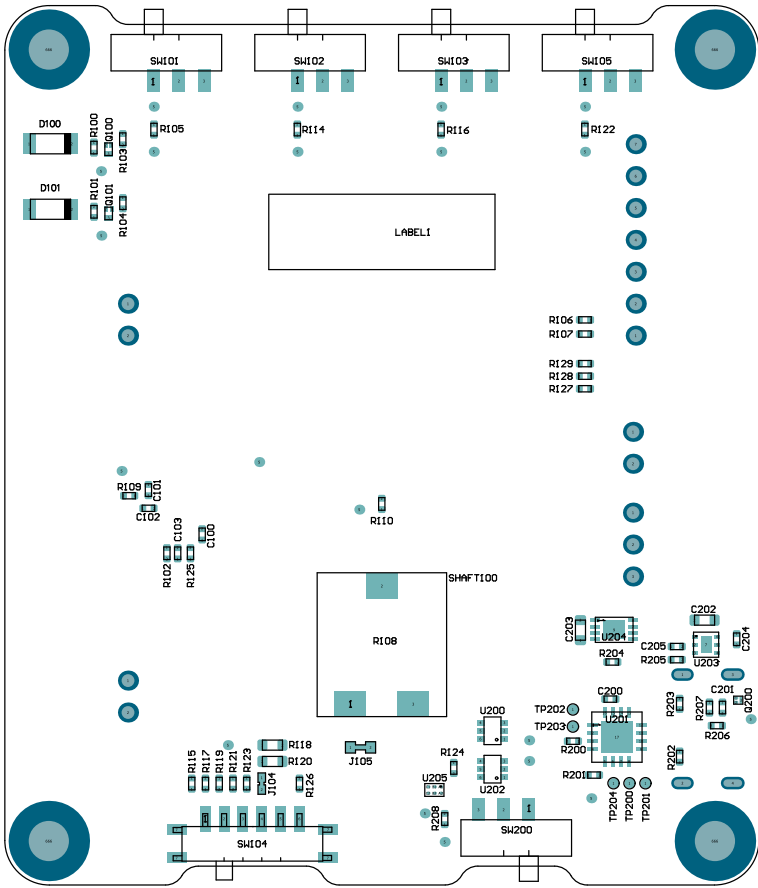


Figure 10-3. MTCH9010 Evaluation Kit Sensors Top Assembly

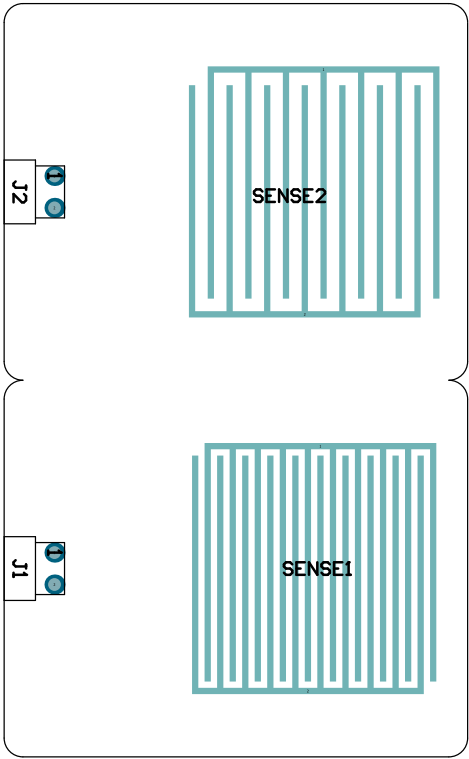
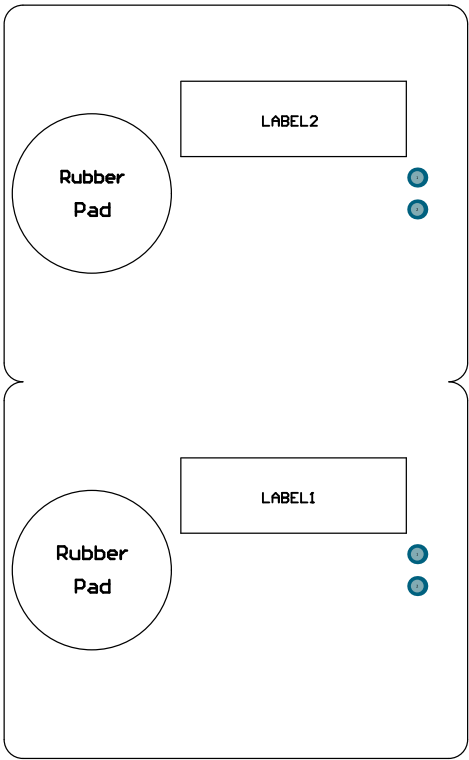
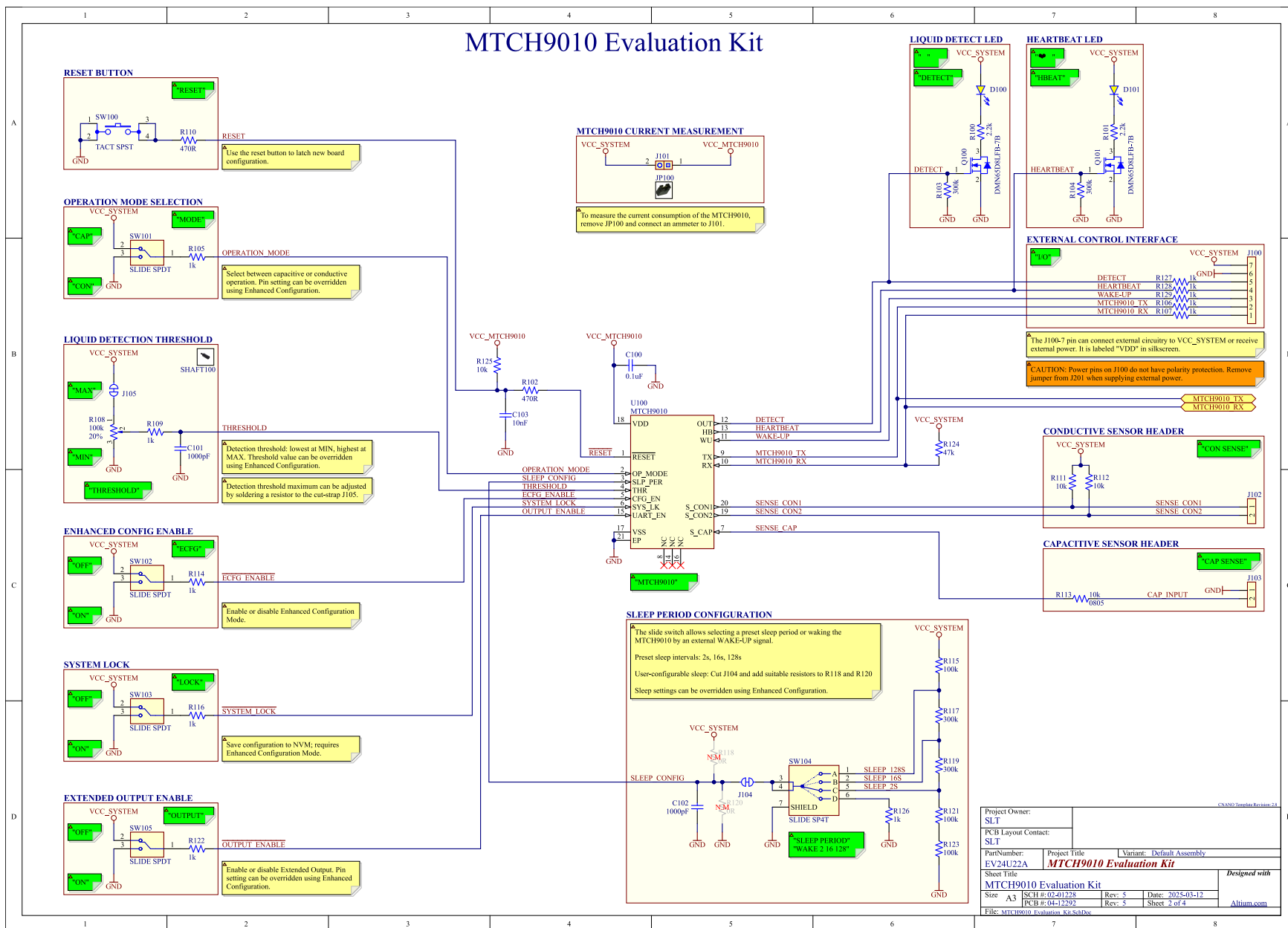


Figure 10-4. MTCH9010 Evaluation Kit Sensors Bottom Assembly



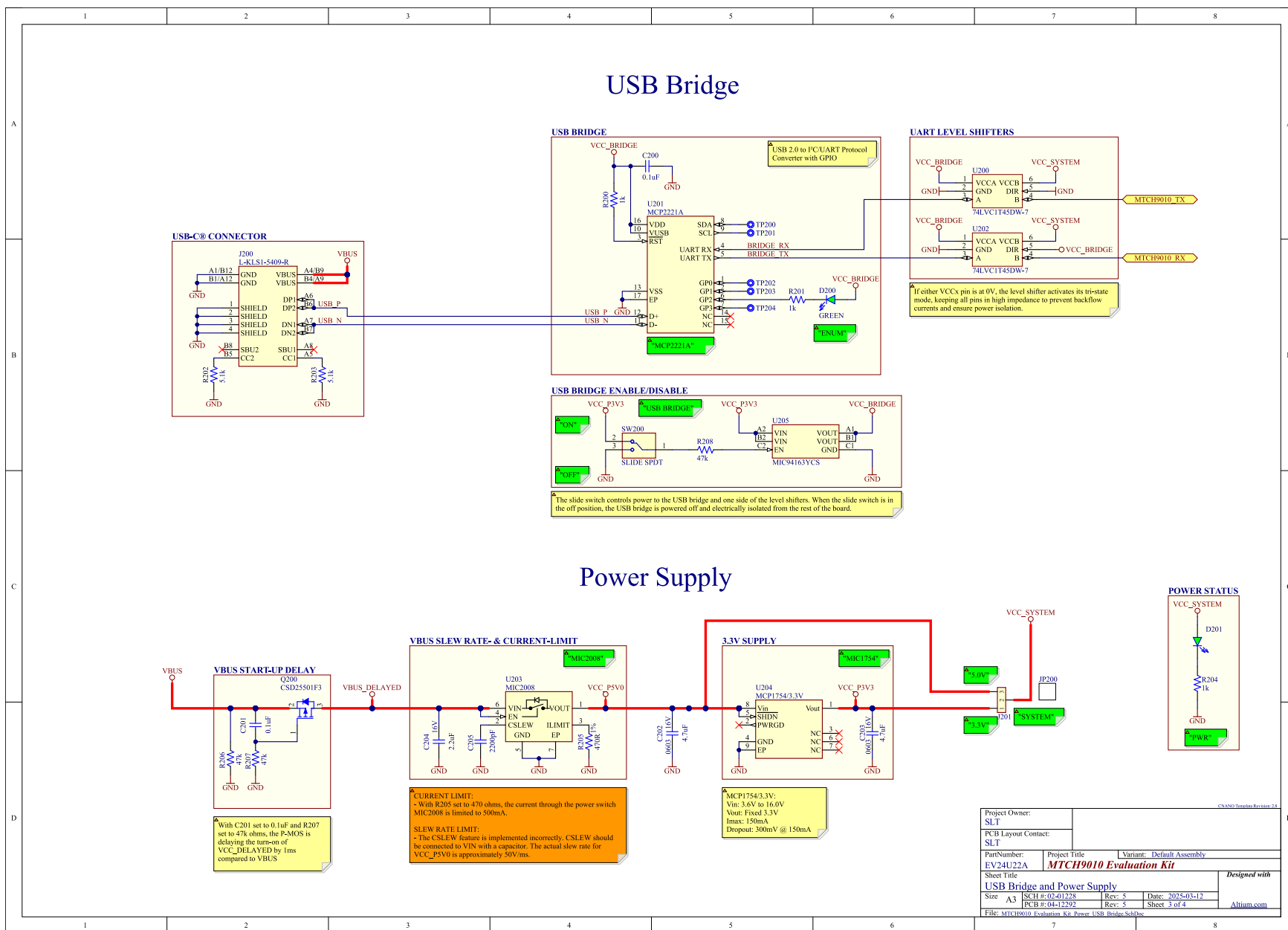
10.2. Schematics

Figure 10-5. MTCH9010 Evaluation Kit



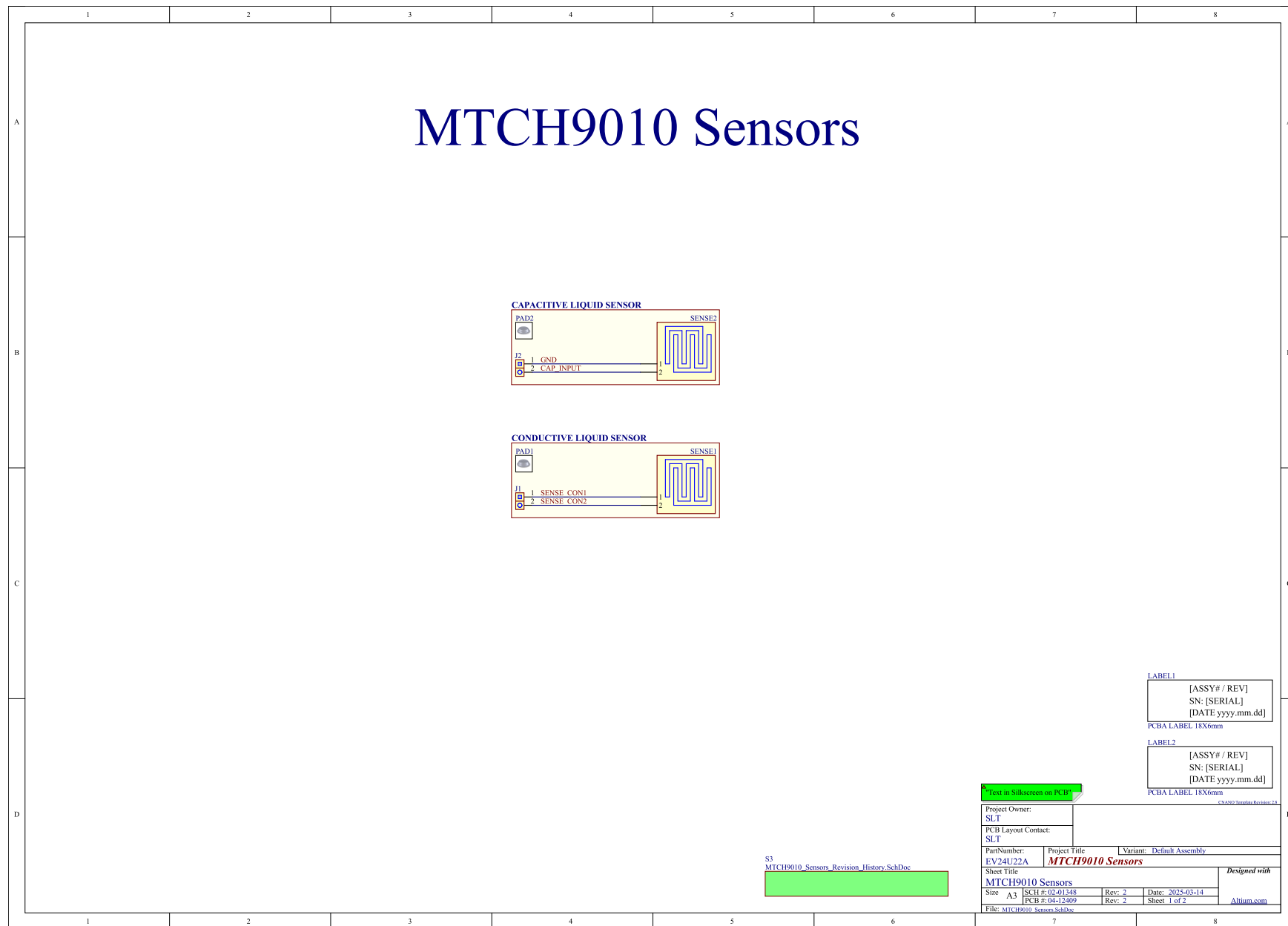
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PCB Layout Contact:	SLT		
PartNumber:	EV24U22A	Project Title:	MTCH9010 Evaluation Kit
Sheet Title:	MTCH9010 Evaluation Kit	Designed with:	Altium.com
Size:	A3	SCH #:	02401228
PCB #:	04-12292	Rev:	5
File:	MTCH9010_Evaluation_Kit_SchDoc	Date:	2025-03-12
		Rev:	5
		Sheet:	2 of 4

Figure 10-6. USB Bridge and Power Supply



Project Owner: SLT		Project Title: MTC19010 Evaluation Kit	
PCB Layout Contact: SLT		Variant: Default Assembly	
Part Number: EV24U22A	Sheet Title: USB Bridge and Power Supply	Designed with: Altium.com	
Size: A3	SCH B: 03-01228 Rev: 5	Date: 2025-03-12	Rev: 5
PCB B: 04-12292 Rev: 5	Sheet: 3 of 4		
File: MTC19010_Evaluation_Kit_Power_USB_Bridge_SchDoc			

Figure 10-7. MTCH9010 Evaluation Kit Sensors



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ISBN: 979-8-3371-1101-8

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