AN5949 - Getting Started with the MTCH9010 Evaluation Kit

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Introduction

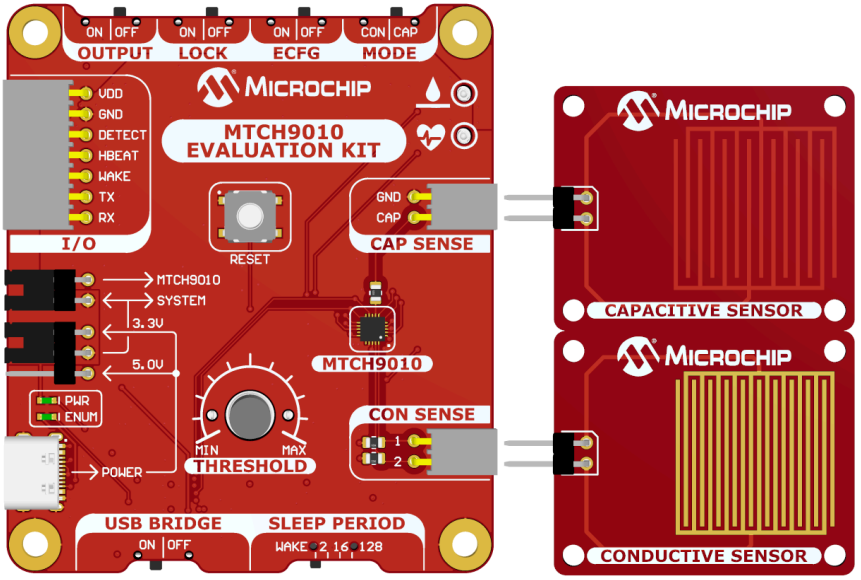
This guide provides step-by-step instructions on how to power up and configure the MTCH9010 Evaluation Kit to start the evaluation of the MTCH9010 liquid detection device, using both capacitive and conductive sensing modes.

For additional information on the MTCH9010 device, refer to the MTCH9010 data sheet.

For additional information on the MTCH9010 Evaluation Kit User Guide, refer to the user guide.

What's in the Box?

- MTCH9010 Evaluation Kit
- Capacitive sensor board
- Conducive sensor board



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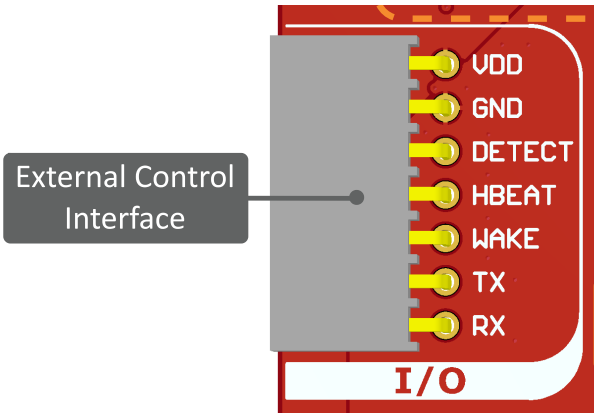
1. Step 1: Connect Power

The MTCH9010 Evaluation Kit can be powered in two ways:

- USB-C®: A USB-C cable may be connected to the bottom-left port to provide power from a computer or USB power adapter
- External Supply: Power can also be supplied through the V_{DD} Pin on the External Control Interface
  Note: When powering the board externally through the External Control Interface (J100) header, the user must remove the jumper cap on the Power Select (J201) header to prevent potential damage.

Figure 1-1. External Control Interface



When power is applied:

- The PWR LED will illuminate, indicating the board is receiving power
- The ENUM LED will illuminate when the USB Bridge slider is set to ON and the USB interface is recognized (Universal Asynchronous Receiver Transmitter (UART) mode only)

If the board is powered through USB-C, the Power Select header can be used to choose the system voltage:

- Place a jumper on 5.0V to use USB power directly
  Note: USB power can vary, typically from 4.4V to 5.5V.
- Place jumper on 3.3V to route USB power through the on-board voltage regulator

Figure 1-2. USB-C Connector

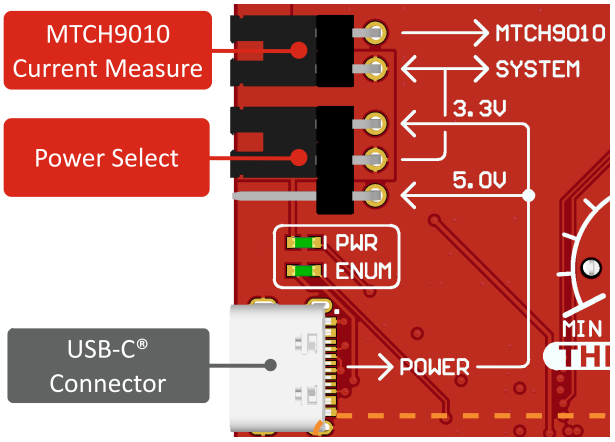
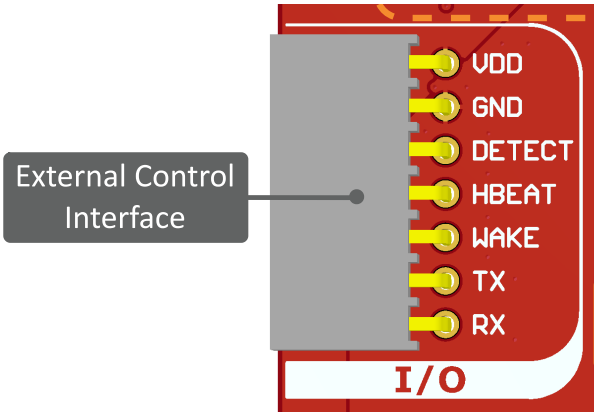


Figure 1-3. External Control Interface



Important: When powering through the External Control Interface, the jumper on the Power Select header must be removed. The applied V_{DD} becomes the system voltage. There is no polarity protection, so correct polarity must be applied to avoid damage.

2. Step 2: Connect a Sensor

The MTCH9010 Evaluation Kit supports two sensor input modes: capacitive and conductive.

Based on the selected sensing mode—only one sensor type will operate at a time. While both sensors may be connected, the device will use only the active mode (capacitive or conductive).

Note: The sensor boards are connected by a V-cut and, if needed, can be separated for individual placement.

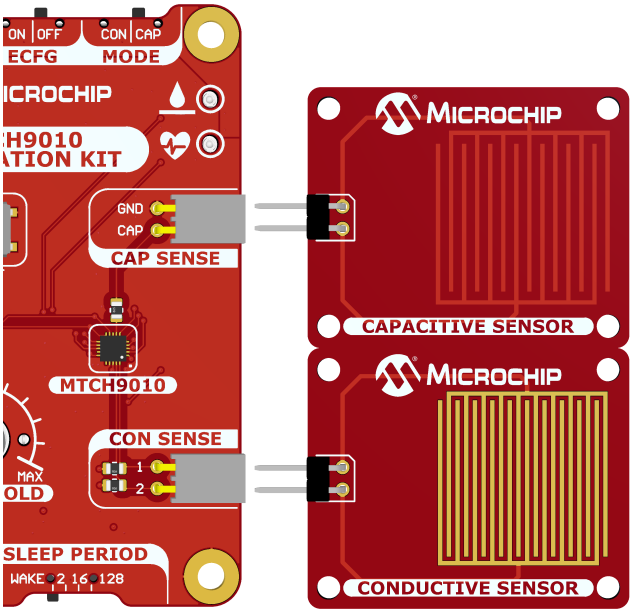
- For capacitive sensing, connect the sensor board to the CAP SENSE header
- For conductive sensing, connect the sensor board to the CON SENSE header

Ensure the sensor is fully seated and aligned with the header pins.

The sensor surface should face upward when properly installed.

If switching between sensor types, disconnect power before removing or connecting sensor boards.

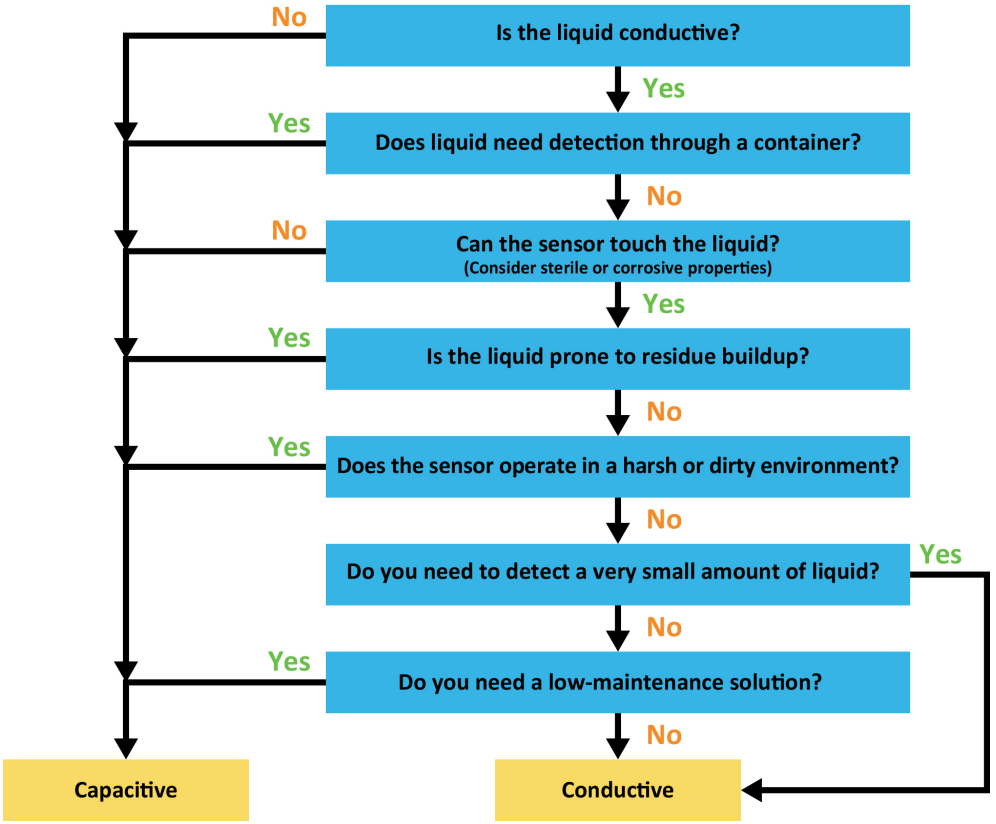
Figure 2-1. Connecting Sensor Boards to MTCH9010 Evaluation Kit



Tip: Choose and connect the appropriate sensor.
The choice between capacitive and conductive modes depends on the detected liquid type. Each mode is optimized for different properties, ensuring accurate and reliable detection.

- Capacitive mode: Ideal for detecting water, oils, fuels, and alcohol-based liquids by sensing changes in dielectric properties
- Conductive mode: Designed for water and ionic liquids, using electrical conductivity for detection

Figure 2-2. Choose Between Capacitive or Conductive



3. Step 3: Choose and Set a Configuration Mode

The MTCH9010 Evaluation Kit can be configured using one of two modes through the on-board Enhanced Configuration Mode (ECFG) switch:

Figure 3-1. ECFG Switch

- ECFG: OFF
  - Slide switches: Uses on-board switches and tuning knob for configuration
- ECFG: ON
  - UART Terminal mode: Uses a serial terminal (via USB) to send configuration values

3.1. ECFG: OFF (Slide Switches)

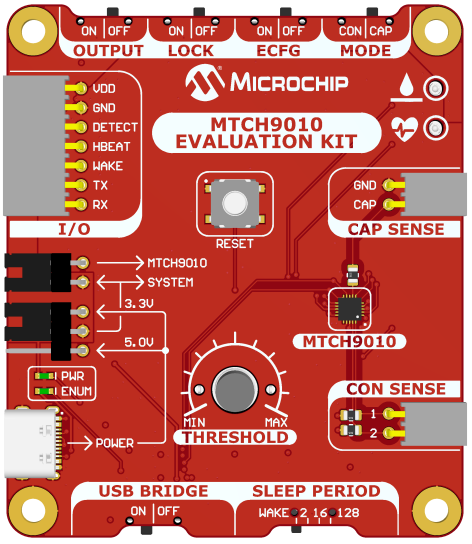
When ECFG is set to OFF, the board is configured using the on-board slider switches and the manual tuning knob. This mode provides a simple, hardware-based setup method without requiring a computer or terminal connection.

Table 3-1. Slider Switch Overview

Switch/Label	Functionality
Operation Mode Selection (MODE)	Sets sensing mode (CAP: Capacitive, CON: Conductive)
ECFG	Sets configuration method (OFF: Slide switches, ON: UART mode) to ensure the LOCK switch is set to OFF before applying configuration changes
System Lock Enable (LOCK)	When ON, the device loads any saved configuration from Non-Volatile Memory (NVM); if no valid data is present, it enters an error state. When OFF, new configuration can be applied based on the selected method (ECFG setting)
Sleep Period Selection (SLEEP PERIOD) **Note:** The available pre-configured values are 2, 16, 128 seconds, or external Wake-up (WAKE).	Sets the amount of time the MTCH9010 stays in low-power mode between sensing cycles or enables WAKE on Request mode, where the host triggers acquisitions via the WAKE pin found on the External Control Interface header
Extended Output Enable (OUTPUT)	Enables the UART output when ECFG is set to ON. When ECFG is set to OFF, the slide has no effect, as output is controlled through the serial terminal.
Threshold	Manually adjusts the detection threshold (clockwise: Less sensitive)
USB Bridge	Disable the USB bridge by placing the USB bridge slide switch in the OFF position, preventing unwanted transmissions on the UART or USB interfaces

Important: Slide switch changes that configure the MTCH9010 take effect on power-up or after pressing the RESET button.

Figure 3-2. MTCH9010 Evaluation Kit



3.2. ECFG: ON (UART Terminal Mode)

When ECFG is set to ON, the board is configured through a serial terminal connected via USB. This method allows access to extended settings that are unavailable through dual in-line package (DIP) switches.

In UART configuration mode, the device begins accepting input as soon as it is powered. Enter each configuration value in the correct order, pressing "Enter" after each one to move to the next.

Table 3-3 showcases a configuration that uses Conductive mode with a four-second sleep time, Extended Output mode enabled for delta and standard measurements, and user-defined reference and threshold values.

To enter configuration values using a serial terminal on the host PC, select the COM port assigned to the MCP2221 and apply the following UART settings:

Table 3-2. UART Serial Communication Configuration Settings

Setting	Value
Baud Rate	38400
Data Bits	8
Parity	None
Stop Bits	1

Table 3-3. Example UART Command Input and Actions

Step	Input + Enter key	Description
1	0	Set mode to Conductive
2	3	Set sleep time to four seconds
3	1	Enable extended output
4	2	Output format: Delta and standard measurement
5	2	Selecting a custom reference value
6	REFERENCE_VALUE (0 to 65,535)	Enter a custom reference value
7	THRESHOLD_VALUE (0 to 65,535)	Enter a custom detection threshold value

Other values are available for each step. For a complete list, refer to the **"Enhanced Configuration Mode Enable"** section of the MTCH9010 data sheet.

4. Step 4: Observe the Output

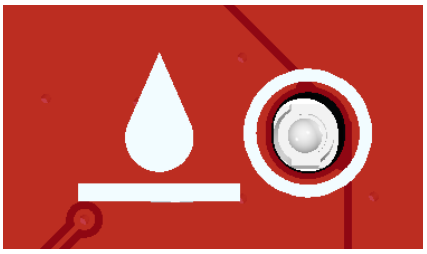
After configuration is applied, the MTCH9010 provides output through a digital signal or serial data over USB, depending on the selected mode and feature set.

4.1. Digital Output (Available in All Modes)

The MTCH9010 drives two digital output signals:

1. **Liquid Detect Output**: Figure 4-1 indicates the detection status mirrored by an on-board LED that lights up during detection.
   - LOW: No liquid present
   - HIGH: Liquid detected

Figure 4-1. Liquid Detect Indicator

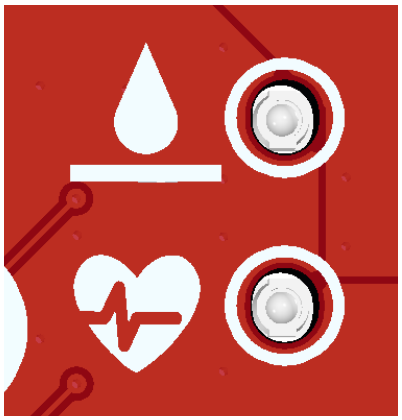


2. **Heartbeat Output**: The heartbeat output indicates that the device is functioning correctly. The heartbeat signal depends on the configured Sleep period, with the output level toggling every time the device enters Sleep state. See the MTCH9010 data sheet for more information on the heartbeat feature.

Figure 4-2. Heartbeat Indicator

Attention:
Error State: If an error is detected, the MTCH9010's on-board LED (Figure 4-3) blinks alternately between the liquid detect indicator and heartbeat indicator.

Figure 4-3. Liquid Detect and Heartbeat Indicators



4.2. Extended Output via UART (Available in Both Configuration Modes)

The extended output provides real-time sensor data through the UART interface. Basic output, including raw measurement and delta values, is available in slide switch and UART configuration modes. However, selecting which values are displayed—current, delta, or both—is only supported in Enhanced Configuration Mode (ECFG ON).

When the extended output is enabled, the MTCH9010 sends diagnostic information to the terminal window, which helps confirm the device is operating correctly and provides insight into real-time sensor performance.

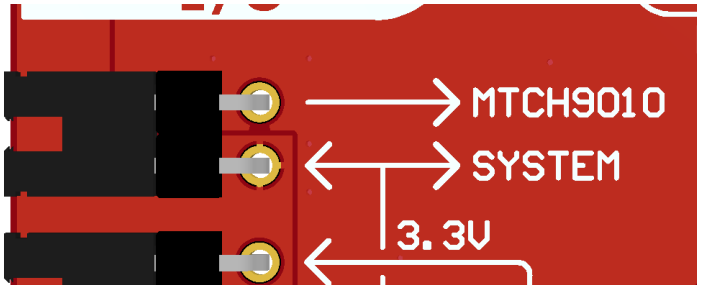
Here is what the output includes:

1. Firmware version
   The first line shows the version of the firmware currently running on the device:
   Firmware vX.Y.Z
   - X: Major version
   - Y: Minor version
   - Z: Patch version
2. Reference and threshold values
   These are shown on a single line:
   <reference_value> <liquid_detection_threshold>
   - Reference value: The baseline reading from a dry sensor
   - Threshold: The value at which the device will consider liquid to be present
3. Real-Time sensor data
   During normal operation, the device outputs two values in each sensing cycle:
   <standard_measurement> <delta_measurement>
   - Standard measurement: The latest reading from the sensor
   - Delta: The difference between the standard reading and the reference value

Depending on the configuration, the output can show both values or only the current or delta.

For power monitoring, the evaluation board includes a dedicated header that allows an external ammeter to be inserted in-line for measuring the current drawn by the MTCH9010.

Figure 4-4. MTCH9010 Power Measurement



5. Step 5: Detect Liquid

Now, the MTCH9010 is fully configured and actively reporting its detection status.

Whether using basic digital outputs or extended UART data, the board is ready for evaluation or integration into a bigger system.

Tip:

- For capacitive sensors, touch the sensor with a fingertip or make direct contact using a water-filled object to trigger detection
- For conductive sensors, apply a small drop of water to bridge the two sensing pads, completing the circuit and activating the sensor
- When liquid is detected, the output LED indicates detection. The device continues its regular sleep cycle during this time

6. What's Next

With the development board set up and running, the next step is to explore additional features or begin integration into a broader system.

No additional software or programming tools are required. A simple serial terminal window is sufficient to interact with the device.

For a more enhanced experience, consider:

MPLAB® Data Visualizer: A free Microchip tool for logging data, graphing results, and monitoring serial communication (or any standard serial terminal application).

7. Additional Resources

- MTCH9010 data sheet: MTCH9010 data sheet
- MTCH9010 Evaluation Kit User Guide: user guide
- Documentation Hub: onlinedocs.microchip.com
- Microchip Technical Support: microchipsupport.force.com/s

8. Revision History

Doc. Rev.	Date	Comments
A	05/2025	Initial document release

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