MTCH1010 Evaluation Kit

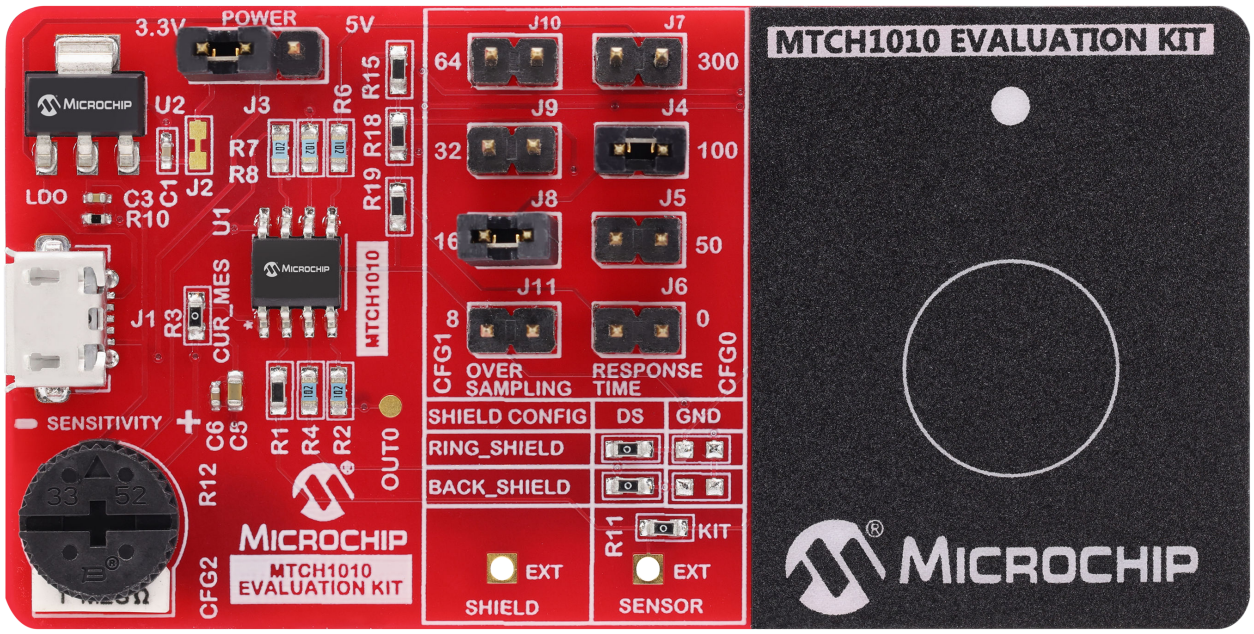
MTCH1010 Evaluation Kit User Guide

Preface

The MTCH1010 is an easy-to-use single button touch turnkey solution. The MTCH1010 Evaluation Kit (EV24Z38A) enables out-of-the-box and target usage evaluation of the MTCH1010 touch turnkey Integrated Circuit (IC). The MTCH1010 Development Kit (DevKit) offers access to the complete versatility of the MTCH1010, providing easy access to the following three key touch parameters:

- Sensitivity
- Response time
- Oversampling

Figure 1. MTCH1010 Evaluation Kit



Introduction

The MTCH1010 Evaluation Kit offers a complete out-of-the-box experience to evaluate the MTCH1010 single channel touch controller. In addition, the MTCH1010 Evaluation Kit offers options to connect an external electrode and/or the Microchip power debugger (atpowerdebugger) to prototype with the MTCH1010.

Features and Overview

- On-board touch electrode with overlay
- On-board assignable driven shield
- Ability to connect user electrode and driven shield for evaluation/prototyping
- Touch status LED
- Option to select 3.3V or 5V power rail
- Jumper array to select oversampling and response time
- Potentiometer to select sensitivity
- USB power input

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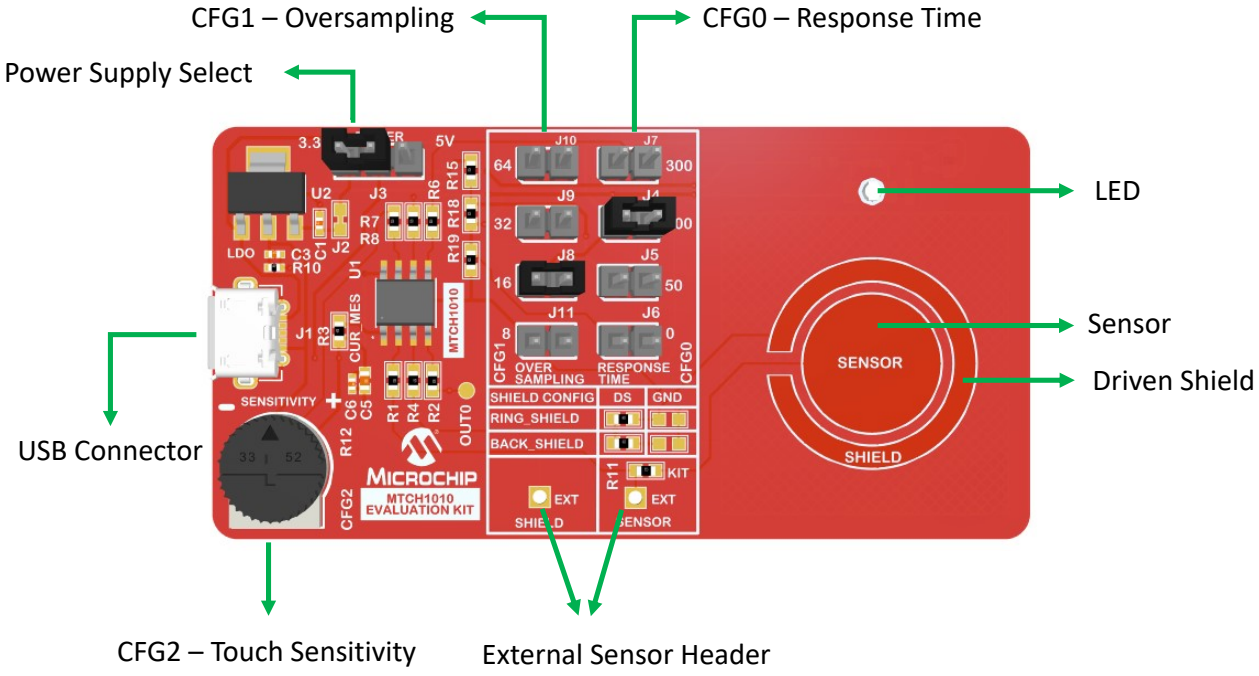
1. Getting Started

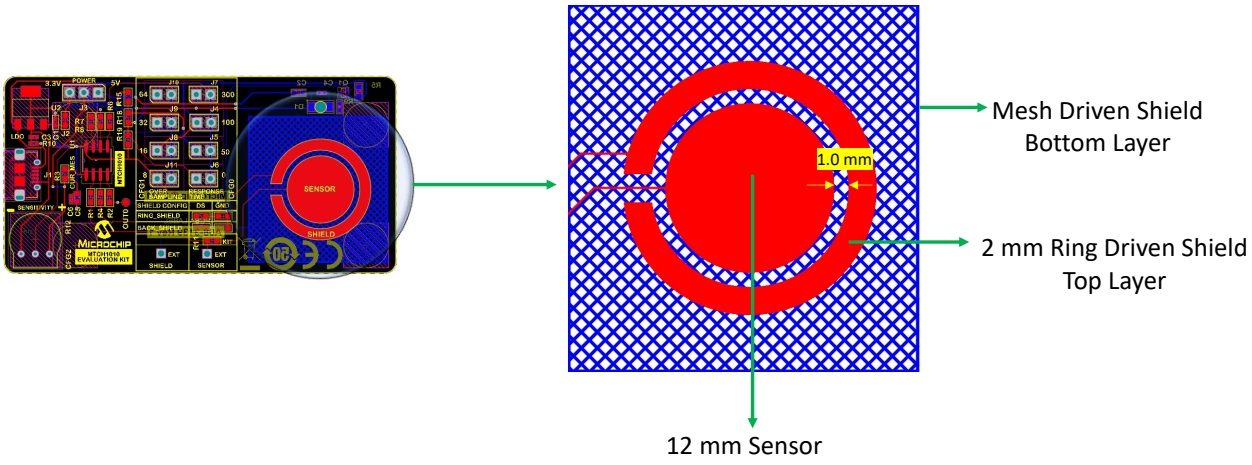
1.1 Quick Start

Figure 1-1. MTCH1010 Evaluation Kit



1.2 Electrode Design

Figure 1-2. Electrode Design



1.3 Touch Sensor

The sensor electrode is connected to MTCH1010 CH0 pin via a series resistor to reduce Electromagnetic interference (EMI) and Electromagnetic Compatibility (EMC) following the guidelines of the Microchip Touch Design guide. The series resistor used in this evaluation kit is 100 KΩ, but it can be from 10 kΩ to 200 kΩ, depending on the sensor capacitance and desired level of EMC performance.

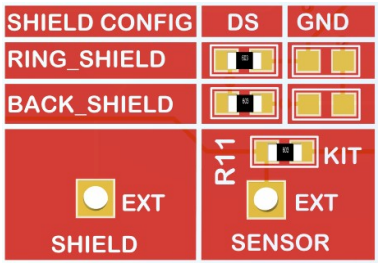
Refer to Capacitive Touch Design Guide – AN2934 for further details.

The MTCH1010 is tested against conducted immunity according to the IEC 61000-4-6 standard and passes the test level 3 (10 V_{RMS} CI noise). Applied settings:

- CFG0 'Response Time' = 100 ms
- CFG1 'Oversampling' = 64
- CFG2 'Sensitivity' = Gain 1

1.4 SHIELD – Driven Shield

The MTCH1010 Evaluation kit features an active shield (driven shield) ring on the top layer and a meshed shield on the bottom layer of the Printed Circuit Board (PCB). The shield configuration is flexible on the kit and it enables tests with other overlays.



The driven shield enhances touch sensitivity and robustness. The other driven shield benefits are the following:

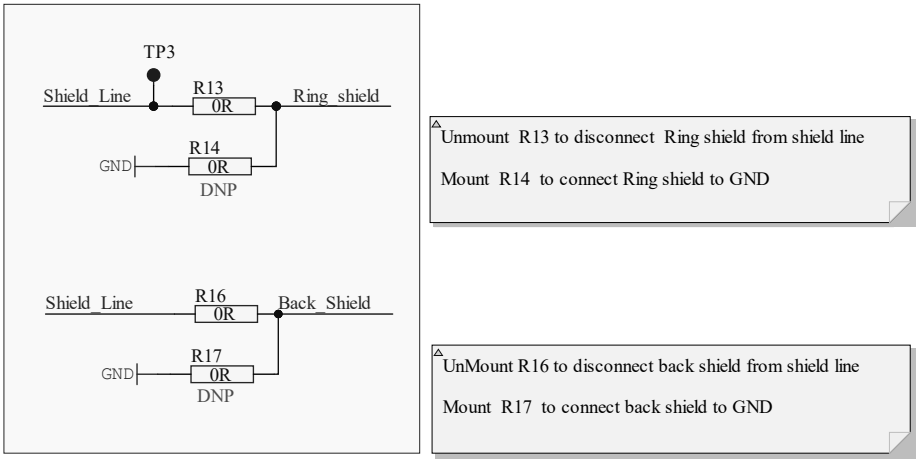
- Reduces capacitive sensor load
- Prevents touch detection in the back (rear shield)
- Provides water tolerant touch
- Increases sensitivity
- Shields against electrical noise

Refer to the Microchip Capacitive Touch Design Guide – AN2934 for further details and especially for layout considerations for the driven shield usage. The MTCH1010 uses a coplanar ring and hatched back shield.

1.5 SHIELD – Ground

The MTCH1010 Evaluation kit offers the option to use passive shielding (Ground shielding) for the coplanar ring, as well as for the back shield.

Figure 1-3. Shield Selection



2. Configuration

The MTCH1010 Devkit provides convenient options to control all three touch parameters of the MTCH1010:

- Response time
- Sensitivity
- Oversampling

The configuration inputs are read by the MTCH1010 at power-up and recurring during run time and touch sensing parameters are set accordingly. During run time, the inputs are measured once every two seconds and the configuration changes are applied at subsequent sensor measurements. Each input must be in the range of 0V to V_{DD}. CFG0 and CFG1 are split into four bands that provide four options for each parameter. CFG2 provides a continuous adjustment of sensitivity between 0V and V_{DD}.

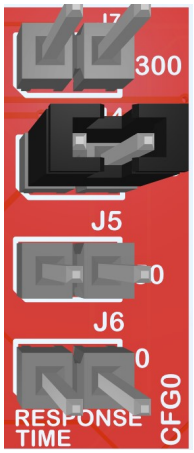
Find more details in the MTCH1010 Data Sheet.

2.1 CFG0 – Response Time

CFG0 selects a response time between free run (0), 50 ms, 100 ms and 300 ms for the target application. Measurement and sleep cycles are adjusted on chip, depending on the oversampling configuration to achieve the selected response time. This control allows the application designer to balance touch responsiveness against power consumption.

Increasing the target response time reduces power consumption, as the device spends a higher proportion of time in Sleep mode. Reducing the response time provides a faster indication of the touch event.

The response time settings are worst-case targets – meaning that actual response time of the MTCH1010 will be faster than selected.

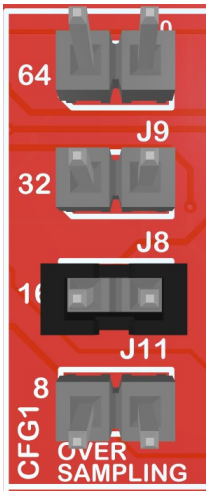


Find all details on response time settings, the on-chip calculation of measurement times and sleep times (to reach the desired response time), impact of response time on power consumption, as well as guidance on how to create the desired input voltage levels in the MTCH1010 Data Sheet.

2.2 CFG1 – Oversampling per Touch Scan Cycle

CFG1 selects the number of samples to take per scan cycle for the MTCH1010 button. Increased sampling provides more stable sensor operation and better tolerance for electrical noise, thus increasing power consumption. Oversampling values of 8x, 16x, 32x and 64x are available.

The oversampling has close to no impact on the response time of the MTCH1010, as scan and sleep time get adjusted automatically to achieve the desired response time settings. That automation takes oversampling settings into account.



2.3 CFG2 – Touch Sensitivity

CFG2 determines the sensitivity of the touch sensor. A thicker overlay, smaller electrodes, usage of passive or active shielding, and nearby ground will require adjusted sensitivity settings.

Sensitivity does not affect power consumption or measurement time, except in the case when a high setting may consume extra power by triggering unnecessary wake-up events under noise.

Note: The sensitivity input CFG2 is implemented as a full-scale linear input from GND to V_{DD}

Input Range	Sensitivity
0V to V_{DD}	Lowest at 0V Increases with increased voltage at CFG2 Highest at V_{DD}

It is recommended to match higher sensitivity settings with higher oversampling for robust touch sensing.

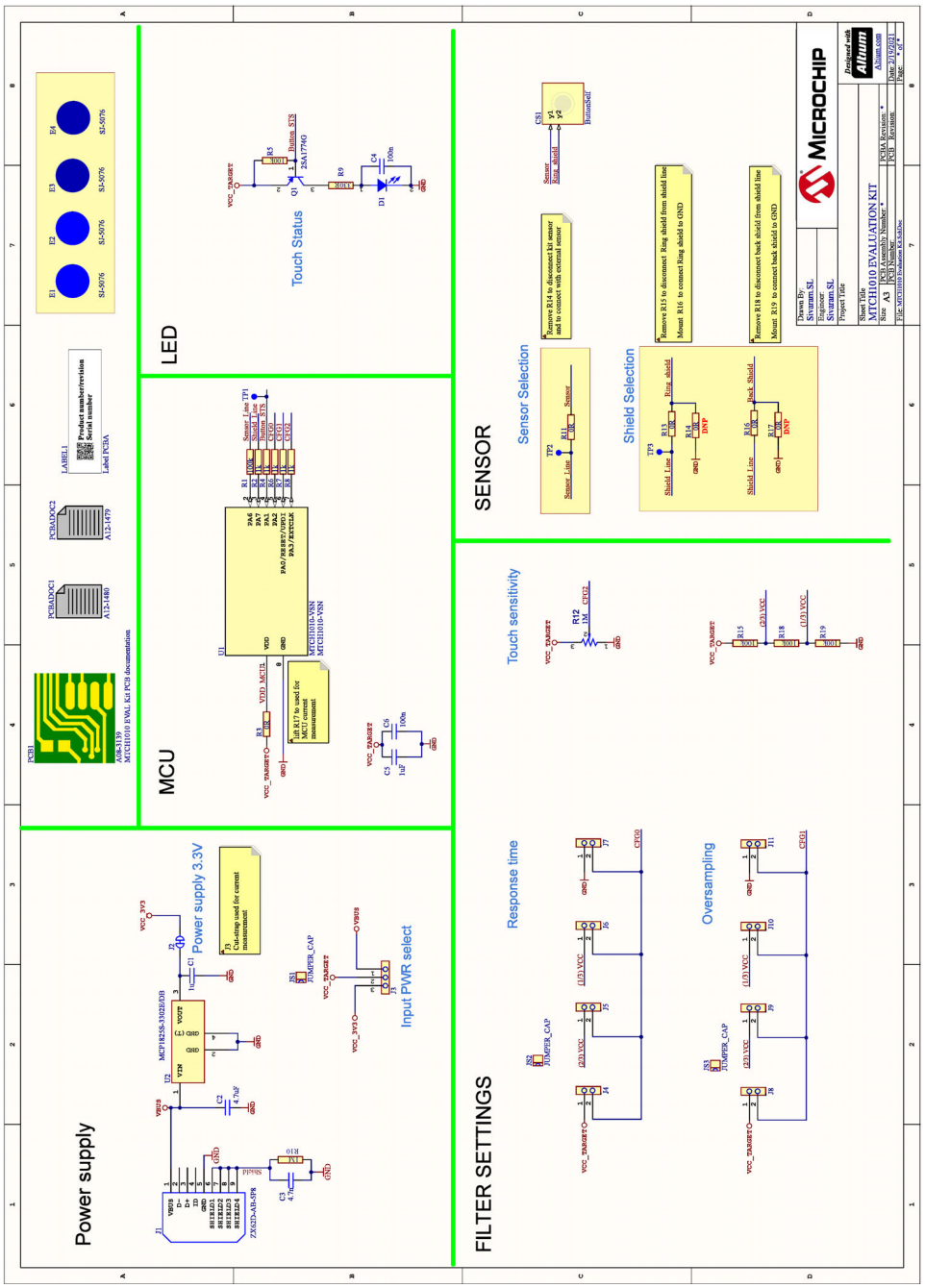
More details on sensitivity settings can be found in the MTCH1010 Data Sheet.

3. Documentation and Relevant Links

Software / IDE

- **MPLAB® X Integrated Development Environment (IDE)** – is a software program that runs on a PC (Windows®, Mac OS®, Linux®) to develop applications for Microchip microcontrollers and digital signal controllers. It is called an Integrated Development Environment because it provides a single integrated 'environment' to develop code for embedded microcontrollers.
- **MPLAB® Code Configurator (MCC)** – is a free, graphical programming environment that generates seamless, easy-to-understand C code to be inserted into the project. Using an intuitive interface, it enables and configures a rich set of peripherals and functions specific to the application.
- **MPLAB® Harmony v3** – is a fully integrated embedded software development framework that provides flexible and interoperable software modules that allow the user to dedicate their resources to creating applications for 32-bit PIC® and SAM devices, rather than dealing with device details, complex protocols, and library integration challenges. It works seamlessly with MPLAB X IDE and the MPLAB XC32 Compiler to enable a smooth transition and maximum code reuse between PIC32 MCUs and SAM MCUs and MPUs.
  MPLAB® Harmony v3 has drivers, demo code, and Data Visualizer that supports data streaming and advanced debugging.
- **Atmel Start** – is an online tool that helps the user to select and configure software components and tailor the embedded application in a usable and optimized manner.
- **Microchip Studio** – Free IDE for the development of C/C++ and assembler code for microcontrollers.
- **Data Visualizer** – is a program used for processing and visualizing data. The Data Visualizer can receive data from various sources such as the EDBG Data Gateway Interface found on Curiosity Nano and Xplained Pro boards and COM Ports.
- **Design Documentation** – Package containing CAD source, schematics, BOM, assembly drawings, 3D plots, layer plots, etc.
- **Hardware User's Guide** – PDF version of this user's guide.
- **MTCH1010 Evaluation Kit** – On Microchip's website.

4. Schematics



5. Hardware Revision History and Known Issues

5.1 Identifying Product ID and Revision

When an Evaluation board is connected to a computer with MPLAB running, an information window with the serial number is shown. The first six digits of the serial number contain the product identifier and revision. Information about connected evaluation boards is also shown in the window.

The same information can be found on the sticker on the bottom side of the PCB. Most kits have stickers that have the identifier and revision printed in plain text as A09-nnnn/rr, where *nnnn* is the identifier and *rr* is the revision. Boards with limited space have a sticker with only a data matrix code, which contains a serial number string.

The serial number string has the following format:

"nnnnrrssssssssss"

n = product identifier

r = revision

s = serial number

The product identifier for the MTCH1010 Evaluation Kit is A08-3139.

6. Revision One Evaluation Kit

Revision one of the MTCH1010 Evaluation Kit (A08-3139/01) is the initial released version. There are no known issues.

7. Revision History

Table 7-1.

Revision	Date	Comments
A	05/2021	Initial document release

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