Capacitive mTouch™ Sensing Solutions

Overview

Touch sensing is fast becoming an alternative to traditional push button switch user interfaces, because it requires no mechanical movement, and it enables a completely sealed and modern-looking design. Expanding beyond the consumer market, touch sensing is beginning to take hold in medical, industrial and automotive applications for reasons such as improved aesthetics, reduced maintenance and lower cost.

Microchip's Capacitive mTouch™ Solution is a free and easy method to optimize your touch sensing application using a wide variety of hardware and software resource options.

How it Works

A capacitive touch sensor is a copper pad area created on the surface of a printed circuit board. It creates a parasitic capacitance to ground. When a person touches the sensor, or its covering (plastic, glass, etc.), the person's finger introduces an additional glass-finger-ground capacitance. That capacitance is in parallel to the parasitic one. As capacitors in parallel are added, a finger approaching the pad will increase the total capacitance. This change is the criteria needed to detect a touch.

Microcontrollers provide the ability to perform capacitive sensing, decision making, responsive actions and other duties pertinent to the system as well.

Capacitive Touch Implementation

The illustration below shows a simple implementation of a single capacitive touch key. One key capacitive touch can:

- Be used as a on/off, open/close button or other single action user interface
- Act as a proximity sensor – detecting a hand coming close to the sensor
  - Enable lower standby power consumption
  - Trigger an action, like lighting up a display, without a touch

The schematic is very simple and uses a PIC10F204/6 MCU, a diode, a capacitor and a resistor (see the white sensing square on the PCB).

USB Power Connector · Jumper J2 · Jumper J4 · Sense Pad · PICkit™ 2 or MPLAB® ICD 2 Connector
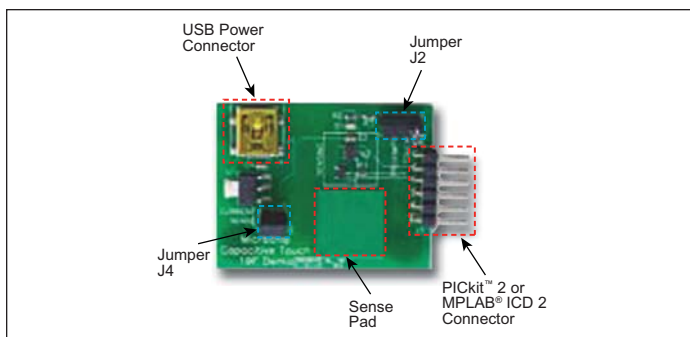
Being a microcontroller based solution, capacitive touch can also be used to drive an LED, a buzzer or to communicate with the main processor or the rest of the system. The necessary schematic software is provided in AN1202: Capacitive Sensing with PIC10F.

How to Use the Board

- Connect the USB cable to power the board
- The LED will light up to show a touch or finger detection
- The Jumper J2 enables two Sensitivity levels:
  - On the left: Higher sensitivity as a proximity sensor
  - On the right: Lower sensitivity as a key

  The scanning rate does not change, therefore the power consumption remains the same in both modes.
- The current can easily be measured using the jumper J4 connections
- If a user leaves his finger on the sensor for a couple of seconds, the MCU will re-calibrate the sensitivity of the key. That auto-calibration feature takes care of temperature or humidity changes as well as a "stuck" button.

Flexibility of the Solution

The MCU can be reprogrammed using the PICkit™ 2/MPLAB® ICD 2 connector. By having access to the source code, it is very easy to change some values or parameters to meet your applications' specific needs.

- The sensitivity can easily be adjusted to the sense pad size and cover material
- The power consumption can be lowered by reducing the scan rate, leaving the MCU in Sleep mode as much as possible
- The autocalibration feature can be disabled, or the software can make it faster or slower depending on the application needs

Additional Information

AN1101: Introduction to Capacitive Sensing:

AN1102: Layout and Physical Design Guidelines for Capacitive Sensing

AN1103: Software Handling for Capacitive Sensing

AN1104: Capacitive Multi-Button Configurations

AN1202: Capacitive Sensing with PIC10F

AN1171: Using the Capacitive Sensing Module on the PIC16F72X

DS41328: mTouch™ Users Guide

DS39724: Charge Time Measurement Unit (CTMU) Reference Manual

Web Seminars

Introduction to mTouch™ Capacitive Touch Sensing

Capacitive mTouch™ Sensing Solutions: Design Guidelines

Additional Resources

Microchip offers a number of hardware solutions to suit the demands of any application from the most basic single button design using the incredibly small and cost effective PIC10F to the peripheral rich Mid-Range and PIC24FJ MCU Families. Solutions are available for up to 64 keys using 8- or 16-bit microcontrollers.

For more information on Microchip Capacitive Touch solutions, please consult our design center at **www.microchip.com/mtouch**

	Development Tools from Microchip	
Part Number	**Development Tool**	**Description**
DM164125	PICDEM™ Touch Sense 1 Development Kit	Introduces users to Microchip's 8-bit capacitive mTouch™ sensing solutions. This kit includes keys and slides, the 8-bit PIC16F microcontroller with S/R latch module and the PICkit™ Serial Analyzer.
DM164128	PICDEM™ Touch Sense 2 Development Kit	Introduces users to Microchip's Charge Time Measurement Unit (CTMU) Capacitive mTouch™ Sensing Solutions. Demonstrates touch sensing technology using the 16-bit PIC24F family with CTMU.
DM240011	PIC24F Starter Kit	Includes everything needed to start designing a touch sensing application. This kit features a number of demos including capacitive touch sensing with CTMU and includes an integrated in-circuit debugger and programmer, USB device and host connectors, tri-color LED, capacitive touch pad and an OLED display.

MICROCHIP

www.microchip.com/mtouch

Visit our web site for additional product information and to locate your local sales office.

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