MICROCHIP

Touch and 3D Gesture Control

www.microchip.com/touch

Touch and 3D Gesture Control

Microchip's award winning technologies cover a broad range of implementations for touch and gesture controlled applications—from touch buttons (1D) to touch screens (2D), as well as 3D gesture control.

Microchip has the solution for your user interface needs, including:

- Water-resistant touch buttons
- Heavy duty touch solutions under metal
- Lower-power touch pads
- Non-touch interaction based on hand gestures

- Cost-efficient AVR® and PIC® MCU-based touch solutions with integrated touch peripheral
- High-performance 32-bit touch solutions with integrated touch peripheral (SAMD/L series)
- IEC/UL 67030 Class-B certified touch solutions

Keys, Sliders and Proximity

User interfaces with push buttons have several moving parts, which significantly decrease their reliability. They also require complex design and assembly as well as a major investment in tooling. Microchip touch technologies, such as capacitive or Metal-over-Capacitive (MoC), allow you to create a high-impact user interface at a lower total system cost.

- Easy to use
  - Turnkey, bus or digital I/O interface
  - Microcontroller based
- Robust
  - High SNR (Signal to Noise Ratio)
  - IEC61000, EFT and BCI tested
  - IEC/UL 60730 Safety Class-B supported
- Lowest Power
  - Proximity sensing down to 1 µA
  - Capacitive Sensing down to 5 µA
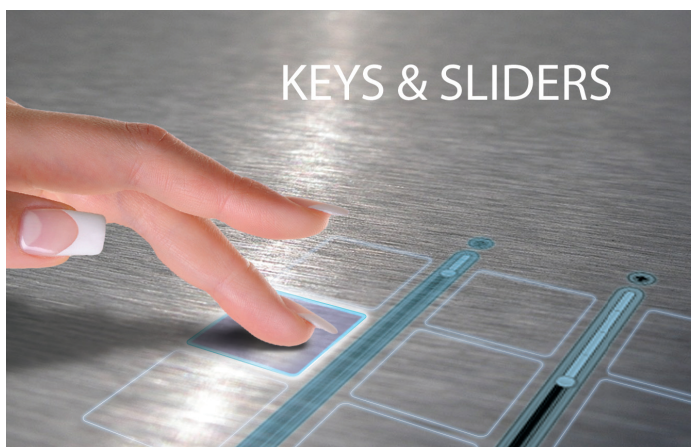
Capacitive Touch Sensing

How It Works

A capacitor is simply two electrically isolated conductors which are in close proximity to one another. The conductors can be wires, traces on a PCB or even the human body. The capacitive touch sensor is a copper pad area that is capacitively coupled to grounds located elsewhere in the system creating a parasitic capacitance. A covering plate material such as glass is used to provide the user touch surface. The introduction of the user's finger then produces an increase in capacitance which will be detected by the system.
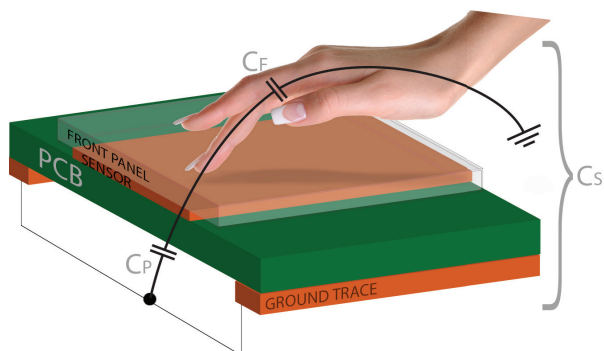
Microcontroller-Based Solution

Microchip offers a variety of standard PIC and AVR MCUs enabling you to dedicate an MCU for touch function or integrate touch sensing with other application functions onto a single MCU:

- 8-, 16- and 32-bit PIC, AVR and SAM (ARM M0) MCUs for touch sensing
- From 6-pin to 144-pin devices
- Up to 512 KB Flash memory
- On-chip integration options include USB, CAN, IrDA, wireless protocol stack, segmented LCD and graphics accelerator and LCD driver for TFT/STN displays

Low-Cost mTouch® Evaluation Kit (DM160227)

The Low-Cost mTouch Evaluation Kit provides a simple platform for developing capacitive touch sense applications using including water-resistant touch.

mTouch Capacitive Touch Software Package

The mTouch Software Package (PIC MCUs) and the QTouch® Library (AVR/SAM MCUs) enable designers to easily integrate touch technologies into their application. It allows the implementation in a small dedicated controller as well as integration of the complete application in a single MCU.

Keys, Sliders and Proximity

Turnkey Solutions

The MTCH10X capacitive touch controllers provide the fastest and simplest way to evolve from mechanical buttons to modern touch. Designed for direct button replacement, the MTCH10X family provides dedicated digital output for every input channel while implementing latest noise suppression technologies.

- From 1 to 8 sensors
- Water resistance
- Proximity
- Packaging as small as 2 × 3 mm UDFN

MTCH10X Evaluation Board (DM160229)

The MTCH10X Evaluation Board provides an out-of-the-box experience for performance and the robustness of Microchip touch solutions.

The CAP1XXX and AT42QTXXXX capacitive touch controllers provide a wide variety of slider, button and proximity functionality. A Graphical User Interface (GUI) allows the designer to analyze sensor data and easily configure the controller.

- From 1 to 64 sensors
- Up to 11 LED drivers
- Enhanced proximity option with guard ring
- I²C, SPI, UART or GPIO communication
- 1.8–5.5V
- As small as 2 × 3 mm TDFN or optimized for manufacturing as SOIC.
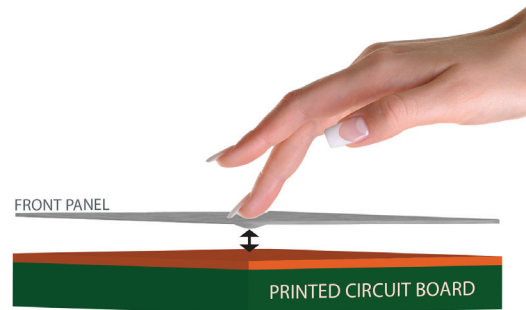
CAP1188 Evaluation Board (DM160222)

The CAP1188 evaluation kit provides an easy platform for evaluating and developing a variety of capacitive touch sense applications and LED configuration using CAP11XX family.

CAP1298 Evaluation Board (DM160223)

The CAP1298 evaluation kit provides an easy platform for evaluating and developing a variety of capacitive touch sense and proximity applications using CAP12XX family.

Metal-Over-Capacitive Technology

In addition to capacitive touch, Microchip has developed metal-over-capacitive technology enabling:

- Metal surfaces such as stainless steel or aluminum
- Sense through glove support
- Waterproof designs
- Braille-friendly interfaces

Metal-over-capacitive technology is implemented with the same Microchip hardware, PCB, electronics and firmware as capacitive touch technology and is compatible with all touch products.

How It Works

A metal-over-capacitive touch system uses a conductive target layer suspended over a capacitive touch sensor, to act as a second capacitor plate. When the user applies a downward pressure on the target, the resulting deformation moves the center of the target closer to the capacitive sensor. The change in spacing produces a change in capacitance, which is then measured by the touch controller.

FRONT PANEL

PRINTED CIRCUIT BOARD

The target can be a sheet of metal with the Fascia marking screen on the outer surface, a metal flashing on the back of a plastic fascia, or a co-molded layer composed of both metal and plastic. The spacer layer is typically an adhesive with a cut out over the capacitive sensor, and the sensors themselves can be either printed conductive pads on a plastic film or pads etched into the top surface of a PCB.

Application Notes

- *Techniques for Robust Capacitive Touch Sensing*, AN1334
- *mTouch Sensing Solution Acquisition Methods Capacitive Voltage Divider*, AN1478
- *Proximity Design Guide*, AN1492

- CAP1XXX Touch Key Controller Tuning Guide, AN2034
- *mTouch Metal-Over-Cap Technology*, AN1325
- Implementing Metal-Over-Capacitive Touch Sensors, AN1626

For datasheets, user's guides and general design information please visit www.microchip.com/touch.

Touch Pad and Touch Screen Controllers

Touch Pad and Touch Screen Controllers

Microchip offers a broad portfolio of touch solutions for touch screen and touch pad applications that make it easy for designers to integrate touch-sensing interfaces.

- High-flexibility
  - We offer both turnkey and source code touch solutions with options to integrate touch sensing with application code on a single low-cost MCU
- Sophisticated
  - Advanced touch solutions use sophisticated proprietary touch decoding algorithms to send your application fully processed and reliable touch coordinates
- Easy Integration
  - Add touch technology to your application without extensive development time, risk or cost
  - On-board surface gesture detection (multi-finger scroll, swipes, tap events, etc.) allow even GPIO-based integration
  - Lowest power

Projected Resistive and Capacitive Touch Solutions

Microchip offers both projected capacitive and resistive touch solutions to allow you to choose the best fit for your design. Each offers different advantages:

Analog Resistive

- Low-cost sensors that accept finger, glove or stylus inputs
- Ease of manufacturing and integration

Projected Capacitive

- Glass front sensor construction provides high durability, good optics and light touch
- Multi-touch capability which enables gestures

Touch Sensing Technology Comparison

	Analog Resistive	Projected Capacitive
Cost for screen < 6"	Lowest	Low
Cost for screen > 10"	Lowest	High
Optics	75%	90%
Screen Life	Good	Better
Ease of Integration	Easy	Moderate
Multi-Touch	Limited	Yes
Touch Object	Finger, Stylus/ Glove	Finger

TOUCH PADS & SCREENS

Resistive Technology Overview

How It Works

Two conductive coated polyester layers are separated by a spacer layer. When touched, the top (flex) layer moves past the spacer layer and contacts the bottom (stable) layer. The point of contact creates a voltage divider in the X and Y directions.

AR1000 Resistive Touch Advantages

- Proven plug-and-play design
- Eliminates all host processing of touch data
- Built in decoding and advanced filtering
- Low system power—wake on touch
- Universal, supports all 4-, 5-, and 8-wire sensors
- SPI, I^{2}C, UART or USB Interfaces
- Free drivers for most major platforms

Development Tools for Resistive Touch

Microchip provides fully functional hardware and feature-rich GUIs to quickly get started using AR1000 resistive touch controllers for a turnkey, cost effective solution.

mTouch AR1100 Development Kit (DV102012)

mTouch AR1000 Development Kit (DV102011)
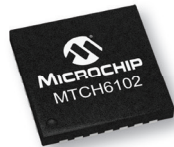
Touch Screen and Touch Pad Controllers

Projected Capacitive Technology

Microchip's projected capacitive technology is available as turnkey touch controllers (maXTouch® technology) or solutions across the portfolio of 8-, 16- and 32-bit PIC and maXTouch microcontrollers. You can use a dedicated controller for touch or integrate additional applications with touch into a single MCU. Our flexible, royalty-free source code and turnkey projected capacitive touch controllers provide you with solutions to create the innovative user interfaces that consumers desire.

Lowest Power Touch Pads: MTCH6102

Microchip offers key advantages in touch pad design with low-power and low-cost solutions to enable simple touch designs with short time-to-market. Microchip leverages eXtreme Low Power (XLP) technology to provide industry-leading low power touch solutions to maximize battery life. Example power measurements for a typical application with 11 channels using the MTCH6102 at 2V are:
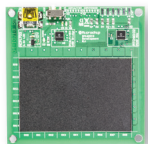
- Standby <1 µW
- Approach <30 µW
- Active <300 µW

How It Works

Projected Capacitive Touch Sensors operate by measuring the tiny change in capacitance on an electrode due to the influence of a human finger or other object.

- One or two thin conductive layers
- Screen is configured as rows and columns
- Point of contact identified by change in capacitance of row and column cells electrodes

QTouch Surface Library

For SAMD/LXXXX devices, Microchip offers the QTouch Surface Library to enable fast and reliable touch pad implementations. The use of the QTouch Surface Library is as simple as the original QTouch Library, fully supported by Studio 7.

Included Gestures

All turnkey controllers (MTCH61XX/MTCH63XX) detect (multi-)finger gestures.

- Single Tap
- Double Tap
- Tap and Hold
- Swipe Up
- Swipe Up and Hold
- Swipe Down
- Swipe Down and Hold
- Swipe Left
- Swipe Left and Hold
- Swipe Right
- Swipe Right and Hold

Development Tools for Projected Capacitive Touch

Microchip makes it easy to add gestures and multi-touch to your interface design.

MTCH6102 Low-Power Projected Capacitive Touch Pad Development Kit (DM160219)

- Supports the MTCH6102
- Surface gesture detection on board
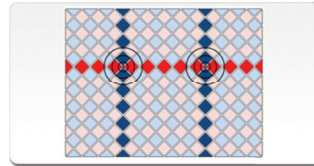- GUI with skins to accelerate UI development

MTCH6303 Multi-Touch PCAP Development Kit (DV102013)

- Supports the MTCH6303
- Ten-finger multi-touch
- Multi-finger surface gesture detection on board
- GUI provided for system integration
- Convenient direct USB interface
- 8" ITO sensor included

For datasheets, user's guides and general design information please visit www.microchip.com/touch.

3D Tracking and Gesture Sensing

MGC3030/3130/3140 3D Gesture Controllers with GestIC® Technology

The MGC3030/MGC3130 are single-chip solutions to enable 3D gesture control in almost any product, such as wireless speakers, radios, light switches and remote controls. The MGC3X30 are optimized for embedded usage, require no host intelligence or resources and come with a complete gesture portfolio. MGC3140 is designed for automotive usage.

The Benefits of GestIC Technology

Similar to capacitive touch sensing, GestIC technology uses E-field sensing to detect gestures. Electrodes remain invisible behind the device housing, allowing an aesthetically pleasing industrial design without the need for holes or other cut-outs typically required for cameras or infrared-based systems. Further benefits include:

- Full surface coverage, no blind spots
- Lighting independent
- Build in adaptive noise filtering
- Only gesture solution with built-in auto wake/sleep
  - <100 µA sleep current
- Low system complexity
- Low costs

The MGC3030/MGC31X0 output direct and immediately usable results—everything is detected on-chip including gestures, approach, touch events and x/y/z 3D positions. The MGC3X30 controllers are true single-chip solutions for the next generation of user interface, enabling gesture-based UI applications for embedded products.

3D TRACKING & GESTURE SENSING

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MICROCHIP maXTouch® Controllers

Fast, Precise and Robust

Implemented as a low-power mixed-signal System-on-Chip (SoC), the MGC3x30 controllers offer a rich set of smart-functional features including:

- 0 (touch) to 10 cm detection range
- Fast report rate up to 200 Hz (5 ms)
- Field upgradable on-board gesture suite
- Digital interface (I²C) and configurable GPIOs

Digital Interface
00100110
01011001
01101001
10001001

Gesture Port

On-Board Gesture Recognition

Gesture recognition is performed on chip to eliminate the complexity and need for additional processing, a unique feature to GestIC technology shortening your time-to-market. The gesture suite gives the MGC3030/MGC31X0 controllers the ability to recognize gestures while the rest of the system is powered down or in a power savings mode. It is field-upgradable to ensure your system can accommodate and use additional gesture algorithms as they become available.

Like speech and language, everybody's hand gestures have a unique quality that differs in timing, amplitude and a broad range of other metrics. The integrated GestIC Technology Colibri Suite makes use of a Hidden Markov Model for high recognition rates of various gestures. This detects the subtle difference between deliberate gestures and general hand movement to limit response to unintended gestures.

Gestures

Approach Wake-up is primarily used to wake up the MGC3130 (and the rest of the system) when a hand approaches the sensing area.

Flick Gestures are available as swipes or edge flicks in four directions: North, East, South and West. These are typically used for commands such as next, previous, on/off or up/down.

The **Airwheel Gesture** is an intuitive input for up/down adjustments to levels and values. The rotations are also detected on chip.
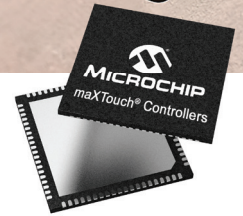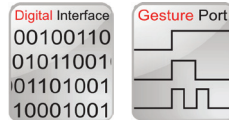
Sensor Touch detects touch, tap or double tap at any of the five receive electrodes. This is typically used for selection and confirmation commands.

The **Wave Gesture** registers small finger movements and differentiates in the x- and y-direction. Applications include shuffle play control in an audio device.

The **Hold Gesture** detects a steady hand to trigger events, best envisioned as the touchless enter key. Timing is configurable.

The **Presence Gesture** enables intelligent back lighting and in the simplest manner.

Position Tracking is available on the MGC3130.

Gesture Sensing and Multi-Touch

3DTouchPad: 2D Multi-Touch Pad with 3D Gesture Sensing

The 3DTouchPad (DM160225) converges Microchip's 2D projected capacitive maXTouch solution with Microchip's patented GestIC technology for 3D gesture recognition.

The 3DTouchPad is a PC peripheral that extends the 2D touch pad with 3D gestures. The 3DTouchPad offers multi-finger tracking and surface gestures as well as free-space 3D gestures above the surface.

The 3DTouchPad is a powerful accessory to enhance your productivity by providing gestures to interact with your PC as well as a compelling development platform.

Microchip provides and SDK/API for app/driver development as well as a Graphical User Interface (GUI).

For more information, please visit www.microchip.com/3dtouchpad.

3D Gestures for 2D Multi-Touch Displays

Gestures are a powerful way to enhance the user interface of a product. They are simple to use and simple to perform.

With Microchip, you can now go even further by adding 3D gestures to multi-touch displays. By combining 10-finger, multi-touch sensing with 3D gestures up to 20 cm from the display, the touch display we all embrace becomes sensible for the third dimension. Interaction with gloves, prevention of smudging and touchless interaction can all become a reality.

Features include:

- maXTouch technology-based 2D multi-touch sensing
- 10-finger touch sensing
- >100 Hz report rate
- Extended gesture range of up to 20 cm
- Complete 3D gesture suite available

Please contact Microchip Sales or Marketing for details and availability.

Evaluation Tools

MGC3130 Hillstar Development Kit (DM160218) and MGC3030 Woodstar Development Kit (DM160226)
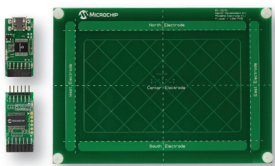
Features:
- 5" electrode and variety of electrode reference designs
- GestIC technology electrode design guide
- MGC3030/3130 unit (GestIC Technology Colibri Suite)

- I²C/USB bridge (USB powered)
- I²C interface reference code
- Microchip's AUREA GUI for Windows 7 and Windows 8
- SDK for Windows 7, Windows 8, Windows 10, Android™ and Linux® operating systems

PCAP with 3D GestIC Sensing Development Kit (DV102014)

Features:
- 8" multi-touch (ITO)
- 2D3D sensing by combining 2D multi-touch with 3D gesture sensing
- USB interface

- API and SDK
- Microchip's AUREA GUI for Windows 7 and Windows 8

For datasheets, user's guides and general design information please visit www.microchip.com/gestic.

Support

Microchip is committed to supporting its customers in developing products faster and more efficiently. We maintain a worldwide network of field applications engineers and technical support ready to provide product and system assistance. In addition, the following service areas are available at www.microchip.com:

- **Support** link provides a way to get questions answered fast: http://support.microchip.com
- **Sample** link offers evaluation samples of any Microchip device: http://sample.microchip.com
- **Forum** link provides access to knowledge base and peer help: http://forum.microchip.com
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Training

If additional training interests you, then Microchip can help. We continue to expand our technical training options, offering a growing list of courses and in-depth curriculum locally, as well as significant online resources – whenever you want to use them.

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- MASTERs Conferences: www.microchip.com/masters
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