immersion

TouchSense® System 2000 Series – Haptics for Mass Market Products

The TouchSense 2000 Series solution offers the power of touch feedback effects in user experience designs for mass market, touch-enabled applications. From microwaves to cameras, and tablet PCs, the TouchSense 2000 Series provides a drop-in solution for haptic effects in button-based, touch screen-based, and mobile computing devices.

Highlights

- **Cost-effective Compelling Haptic Effects** to improve the user experience in mass market devices
- **Drop-in Haptic Processor** from leading IC manufacturers and porting available for custom processors
- **Product-specific Reference Designs** simplify implementation electromechanical design and software implementation to deliver rich haptic effects that are suited to the device – from washing machines to mobile computing devices.
- **Streamlined Haptic Effects Library** allows designers to readily select compelling haptic effects through a single command API that is tailored to a range of user interface elements
- **Custom Haptic Effects Design Tool** (TouchSense 2500 only) allows designer to create any haptic effect that they desire, including game effects, music effects, and texture simulation.
- **I/O Interfaces**
  - Mass Market Devices: I2C, SPI, GPIO
  - Mobile Computing: I2C, USB and Operation System support including Android and Windows
- **Low Power Consumption** minimizes drain on battery life
- **Proven Mass Market Suppliers** for inertial actuators and amplifiers enable a reliable solution for mass market devices

With the certainty of response that tactile feedback supplies, you can eliminate mechanical controls and expand design options.

Haptics for Mass Market Products

The TouchSense 2000 Series includes the 2000, 2100, and 2500 solutions to power touch feedback effects in user experience designs for mass market products. Product-specific reference designs simplify electromechanical design and software implementation to deliver rich haptic effects that are suited to the device – from washing machines to mobile computing devices.

Button-based Devices – The TouchSense 2000 solution provides designers with a library of 14 ready-to-load haptic effects including alert, click, buzz, transition, and pulse. The TouchSense 2000 is tailored for button-based devices found in clean, capacitive surfaces of white goods, kitchen appliances, and consumer printers.

Touch Screen-based Devices – The TouchSense 2100 solution contains a rich palette of 115 touch screen-based haptic effects including touch gestures like tap, double-tap, swipe, spread, pinch, slide/drag and long press. The TouchSense 2100 is suitable for small screen applications from personal media players to consumer medical devices.

Mobile Computing Devices – The TouchSense 2500 solution is for mobile computing devices including laptops, netbooks, tablets, slates and all-in-one PCs. Custom haptic effect design tools provide designers with an infinite palette of haptic effects for games, music, and texture simulation.

When used with low-travel mechanical or membrane buttons, the technology provides more confirming response and can be varied to help users quickly and intuitively distinguish one button from another.

TouchSense 2000 Series Overview

Feature	TouchSense 2000	TouchSense 2100	TouchSense 2500
Haptic Effects Library	14	115	Infinite
UI	Button-based	Screen-based	Screen-based
Button Effects	Simple confirmation	Rich UI support	Complex UI support
Alert Effects	Limited	Yes	Yes
Gesture Effects	No	Yes	Yes
Custom Effects	No	No	Infinite
I/O	I2C, SPI, GPIO	I2C, SPI, GPIO	USB, I2C
OS Support	No	No	Drivers for Windows and Android
Sample Products	Washers & Dryers Professional-grade Cook Tops Refrigerators Microwaves Blenders Consumer Printers	Personal Navigation Devices Personal Media Players Digital Cameras Digital Video Cameras IP Telephones Multi-functional Printers Point of Sale Devices Consumer Medical Devices	Slates Tablets Netbooks Notebooks Ultra-portables

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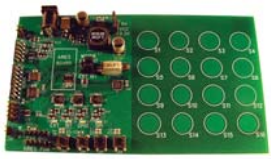
About TouchSense tactile feedback

TouchSense technology enables touch screens, buttons, and handheld devices to provide tactile cues, promoting a more intuitive, engaging, and natural experience for the user. When used with touch screens, users feel that onscreen buttons press and release similar to mechanical buttons. When used with low-travel mechanical or membrane buttons, the technology provides a confirming response and can be varied to help users quickly and intuitively distinguish one button from another. TouchSense tactile effects can be synchronized with sound and graphical images, creating a more engaging and multisensory experience.

TouchSense technology is employed in millions of commercially available electronic devices, including mobile phones, personal navigation devices, automotive controls, and gaming peripherals. Immersion's TouchSense solutions:

- **Transform the User Experience** with unique and customizable touch feedback effects.
- **Excite the Senses** in games, video and music.
- **Improve Safety** by overcoming distractions.
- **Restore "Mechanical" Feel** providing intuitive and unmistakable confirmation.
- **Expand Usability** when audio and visual feedback are ineffective.

Documentation CD



Haptic Sampler Board

Sanyo Actuator

Jinlong
Inertial Actuator

Johnson Electric
Actuator

The TouchSense 2000 Design Kit contains three types of actuators that are paired to particular prototyping control modules. The modules are preloaded with haptic control software specific to the actuators, haptics effect library, and amplification circuitry.

Prototyping Kit

The TouchSense Design Kit – 2000 Series includes electromechanical components and documentation that enable OEMs, ODMs, and system integrators to quickly evaluate and experience rich tactile feedback in small touch screen products.

The integration kit lets you build functional haptic-enabled prototypes in either of two ways:

1. A simple integration, with tactile effects triggered by an external, standalone haptics sampler board. This prototyping method provides the quickest path to experiencing rich haptics in the target platform.
2. A system-level integration, with effects triggered by commands from the system processor. This prototyping method provides more of a production-quality implementation suitable for formal usability or focus-group testing.

Both methods enable rich, market-proven TouchSense tactile feedback technology for your touch based device — the same technology at work in millions of devices.

Kit Components

Haptics sampler board

The sampler board lets you experience the TouchSense haptic effects library right out of the box; includes 5V power adapter.

Electromechanical actuators

The kit includes a selection of actuators for delivering TouchSense tactile feedback in a range of touch screen or touch control sizes and for a wide variety of devices. The actuators are commercially available off-the-shelf components that have been tested and qualified by Immersion as providing the required dynamic range and reliability.

Control prototyping modules

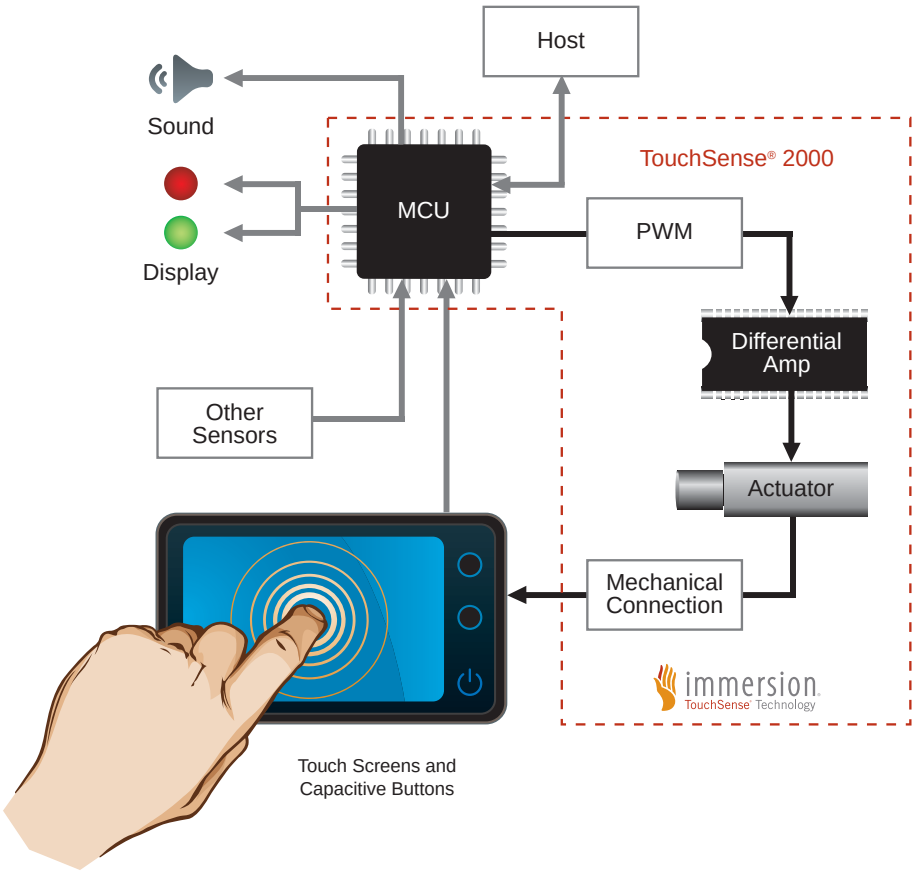
Control prototyping modules (boards) incorporate a haptic microcontroller with embedded tactile effect player software and either the TouchSense 2000 or 2100 library of tactile effects, an amplifier, and the supporting circuitry needed to drive the actuator. Mount an actuator and a control prototyping module within the target product and make the electrical connections between the module and the system. By adding commands to the system application, you can call the control prototyping module via standard interface protocols, commanding it to trigger haptic effects.

Technical Documentation

A full set of technical documentation provides reference schematics, electrical interface guidelines, and mechanical mounting details for optimum TouchSense 2000 Series implementation.

How it works

When the user touches the screen, a position signal is sent to the microprocessor. The host application interprets this position and commands the lightweight TouchSense player, embedded on the processor, to play a specified tactile effect. The player responds by exerting control over a small actuator, causing it to play the tactile effect, which gives the user the perception of pressing a button.



Improve accuracy, effi ciency, safety, and overall user experience with tactile response that eases and confi rms interactions.

The tactile effects library, stored in microcontroller memory, supplies a rich tactile feedback vocabulary. It contains predefined waveforms that vary in frequency, magnitude, wave shape, and duration, creating a wide range of tactile effects—from those that reproduce the press and push-away characteristics of various mechanical switches to complex nonlinear vibrations. Customized effects can be added to achieve unique tactile sensations for various UI functions, such as button-press confirmation, map scrolling, and map zooming.

For personal computers, the TouchSense player and effects library can be embedded on a microcontroller that has been field-tested in tens of millions of products. The system works with a selection of market-proven third-party actuators, like those used in billions of mobile phones. Detailed electromechanical design and integration guidelines help ensure an optimal implementation of the TouchSense system in your device.

About Immersion

Haptic technologies are transforming digital devices everywhere. Electronics manufacturers are providing digital controls with authentic tactile confirmation. Industrial and commercial manufacturers are increasing the accuracy, efficiency, and safety of the user experience. Content developers are creating a more engaging experience for mobile handset users. Game developers are captivating users with more intense and enjoyable entertainment. Medical schools and hospitals create a more realistic and engaging multisensory experience for surgical simulation training. Immersion technology puts the sensation of touch in the hands of visionary manufacturers worldwide.

Founded in 1993, Immersion Corporation is the recognized leader in digital touch technology and products. Immersion's technology is deployed across automotive, consumer electronics, entertainment, industrial, medical training, and mobile products. Immersion holds more than 900 issued or pending patents in the U.S. and other countries.

Learn more

Adding Immersion TouchSense tactile feedback to industrial controls can increase user satisfaction, speed, and accuracy. For more information about adding tactile feedback to your touch-control interface, visit us at http://www.immersion.com/products/touchsense-tactile-feedback/2000-series or e-mail us at touch@immersion.com.

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