



## TouchSense® Solution for Touchscreen Desktop Phones

As phone features increase, the user interface becomes more complex. Touchscreens provide a simpler user interface that eliminates control clutter, but that lacks confirming tactile response. Loss of tactile response reduces usability, user satisfaction, speed, and accuracy. The TouchSense system solves these problems and provides additional advantages.

The TouchSense tactile feedback system integrated into telephone touchscreens restores the certainty of response and tactile qualities people like about mechanical buttons and switches. TouchSense tactile feedback is direct, private, and quiet, just like mechanical buttons.

### Highlights

- Allows touchscreens to “touch back,” supplying quiet yet unmistakable confirmation
- Helps reduce errors, and increase user satisfaction, input speed, and accuracy
- Enables locating virtual touchscreen buttons by feel, supporting Americans with Disabilities Act requirements
- Enables eliminating or minimizing mechanical controls on touchscreen phones
- Replaces distracting audio feedback in quiet office environments

# Adding Immersion TouchSense tactile feedback to touchscreens in telephony equipment can create a competitive edge by providing unmistakable confirmation, supplying intuitive access to layers of functions, and increasing user satisfaction.

## Improves touchscreens

As phone features increase and become richer, the user interface becomes more complex. Touchscreens permit a simpler user interface that allows you to eliminate a cluttered and confusing array of buttons on:

- Enterprise phones
- Conferencing and videoconferencing systems
- Feature-rich home phones

The touchscreen interface offers many usability benefits for today's feature-rich phones. Perhaps the most obvious is clear presentation of only the options relevant to the task at hand, which makes the unfamiliar, for example, forwarding a call, very apparent. On a touchscreen, features that consumers have come to expect on their mobile phone, like scrolling through contact lists, can be easily implemented. And with fewer mechanical buttons, industrial design opportunities expand, making sleek designs possible.

However, one thing touchscreens don't supply is certainty of response. Visual feedback is often not effective because fingers can obscure graphical changes. Audio cues can be distracting during a conversation and an annoyance in open-cubicle offices.

## Competitive advantage

Touchscreens with TouchSense tactile feedback can help you create intuitive access to a growing number of features — and supply a better user experience.

Immersion's TouchSense haptic, or tactile, feedback system provides an ideal solution for touchscreen phones. On a TouchSense-enabled touchscreen, the user perceives that buttons seem to press and release like on a mechanical keyboard. This heightened interactivity increases user speed and accuracy. Independent research also shows that users prefer tactile feedback in their interactions.\*

### TouchSense tactile feedback:

- Restores the mechanical feel that users like about mechanical controls
- Supports dialing by feel and can provide unique tactility to help locate the '5' key
- Projects quality and responsiveness
- May improve device lifetime by helping to eliminate repeated and forceful taps

You can use the touchscreen's flexible display capability and the TouchSense system's natural interaction to guide and even delight the user. For example, many touchscreens can provide physics-based scrolling, characterized by more mechanical-like behavior and a feeling of inertia. Adding a slight pulse or the feel of small detents during scrolling gives the interaction a sense of even more familiarity and the user more sense of control.

\*For a summary of recent published findings on the value of tactile feedback in human-computer interaction, see the Immersion white paper *The Value of Haptics*, available at [www.immersion.com/docs/Value-of-Haptics\\_May07v1-lr.pdf](http://www.immersion.com/docs/Value-of-Haptics_May07v1-lr.pdf).

## Solves problems

Audio feedback is distracting in the work environment because it's broadcasted into the surroundings. It is also intrusive during telephone use, interrupting the flow of conversation because it can be heard by everyone on the call. Tactile feedback, on the other hand, is positive, private, and ideal for offices. It overcomes the problems associated with intrusive and distracting audio by providing quiet confirmation of touchscreen events.

On a mechanical keypad, making the '5' button feel differently, which is often accomplished with a raised bump, orients the user to the keypad. A similar accommodation can be achieved with a unique tactile feedback "effect" for a touchscreen's virtual '5' button. The ability for users to feel a button before they activate it can help a touchscreen satisfy Americans with Disabilities Act Section 508 requirements.

With the TouchSense system, users know immediately that their press registered, so fewer repeated and less forceful taps on the touchscreen may result. Alleviating excessive pressing and force can directly contribute to increased touchscreen and LCD longevity and can reduce the incidence of mechanical failures.

## How it works

In response to presses on a touchscreen, TouchSense software controls an actuator in producing a wide variety of vibrations or effects.

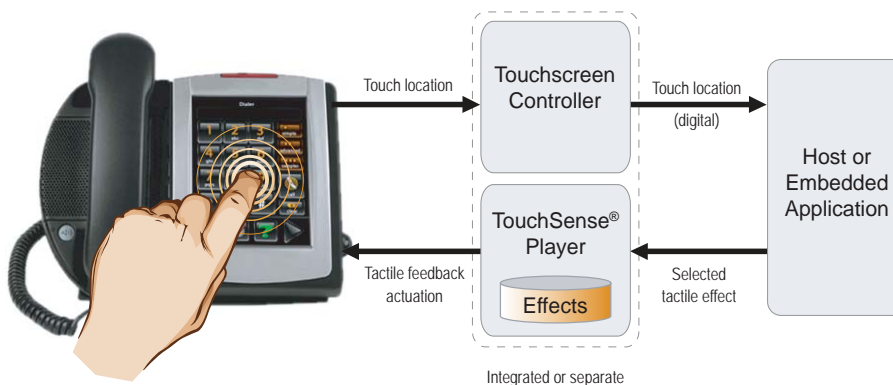
TouchSense system components include:

- TouchSense player software running on a microcontroller
- Tactile effects library for common touchscreen actions
- Off-the-shelf eccentric rotating mass (ERM) actuator

When the user touches the screen, a position signal is sent to the host application. The host application interprets this signal and commands TouchSense player to control the actuator in playing a specified tactile effect. The actuator's vibrations transfer to the touchscreen, which gives the user the perception of pressing a button or sliding a scrollbar.



Many touchscreens can provide physics-based scrolling, characterized by more mechanical-like behavior and a feeling of inertia. Adding a slight pulse or the feel of small detents during scrolling gives the interaction a sense of even more familiarity and the user more sense of control.





## About Immersion

### Flexible components

TouchSense technology provides high-speed control over standard vibration actuators like those used in billions of mobile phones. It controls the actuator in playing a wide range of tactile effects — from those that reproduce the press and push-away characteristics of various mechanical switches to complex nonlinear vibrations — enabling a rich tactile feedback vocabulary.

The compact TouchSense player and tactile effects library are embedded on a microcontroller that has been field-tested in tens of millions of products. The library contains predefined effects that can be customized to provide distinctive feedback for various user-interface functions, such as button location, button press, speaker volume adjustment, and contact list navigation. Consisting of readily available components, the entire haptics subsystem is fast and easy to implement. Detailed electromechanical design and integration guidelines help ensure optimal integration into the target device.

### Touch

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. And game developers are captivating users with more intense and enjoyable entertainment. Immersion technology puts the sensation of touch in the hands of visionary manufacturers worldwide.

### Medical

TouchSense haptic technology has revolutionized medical education. Medical schools and hospitals train practitioners in minimally invasive procedures using our surgical simulators. Our patented technologies bring tactile, audio, and visual realism to medical education, creating an engaging multisensory experience that increases clinical proficiency, decreasing medical errors and cost.

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 700 issued or pending patents in the U.S. and other countries.

For more information about adding tactile feedback to your touchscreen phone, visit [www.immersion.com/products/touchscreen-feedback/](http://www.immersion.com/products/touchscreen-feedback/) or e-mail us at [touch@immersion.com](mailto:touch@immersion.com).

immersion.com | 408.467.1900 | 801 Fox Lane | San Jose, California 95131

Copyright 2009 Immersion Corporation. All rights reserved. Immersion, the Immersion logo, and TouchSense are trademarks of Immersion Corporation in the U.S. and other countries. All other trademarks are the property of their respective owners.

This document and the content of this document shall be subject to the terms, conditions, and restrictions of Immersion Corporation's Terms of Use applicable to "Content" (as defined therein) listed at <http://www.immersion.com/legal.html>, including, but not limited to, the terms, conditions, and restrictions relating to Immersion's general disclaimers described therein. The terms, conditions, and restrictions of Immersion Corporation's Terms of Use are hereby incorporated herein by reference. By accessing this document, you hereby agree to follow and be bound by the terms, conditions, and restrictions described in this document and the applicable provisions of Immersion Corporation's Terms of Use.

Lit#MB-PHONE.0309.v2