



# How Synaptics TDsync™ Technology Eliminates Problems Caused by Display Noise in Smartphones and Tablets

PN: 507-000174-01 Rev. 1

---

## Table of Contents

---

Introduction.....	1
Completely Avoiding Display Noise .....	2
The TDsync Advantage .....	2

### *Touch and Display Integration Advantages*

Synaptics' display integration solutions afford numerous advantages in both the design and the manufacture of smartphones and tablets.

These advantages are outlined in a Synaptics white paper titled *Latest Advances in Touch and Display Integration for Smartphones and Tablets* (PN: 507-000167-01).

## Introduction

Synaptics' patent-pending TDsync™ technology coordinates and synchronizes the touch sensing and display update functions to eliminate problems caused by display-induced noise in the touch sensing subsystem. The result is a more responsive and reliable touchscreen with best-in-class capacitive sensing performance, delivering a better user experience.

Modern smartphones and tablets are required to detect the presence of objects that have very small touch signal strength, such as a gloved finger or a 1 mm passive stylus. In fact, the signal strength from these objects may be less than the magnitude of the display-induced noise. If not adequately mitigated, electrical noise from the display can interfere with touch sensing—reducing a device's ability to accurately detect finger location and movement.

Inaccurate touch sensing can cause touches and gestures to be missed, requiring the user to repeat the action. Alternatively, the touch sensor may report a “ghost finger”; in effect, an unintended touch or gesture, which can be even more problematic. Imagine inadvertently launching an app which you must then close, or worse, accidentally completing a banking transaction that you intended to cancel. In these situations, users are forced to conclude that the device is slow, unresponsive, or even malfunctioning, resulting in higher levels of frustration and dissatisfaction.

## Completely Avoiding Display Noise

The source of display noise is the on/off switching of the crystals in the LCD. Synaptics' TDsync technology synchronizes the touch sensing and display update functions to occur during distinct timing intervals, thus eliminating the problems caused by display noise. Even a small amount of noise makes it difficult to detect the tiny capacitance signals associated with advanced touch features such as a passive stylus or proximity detection.

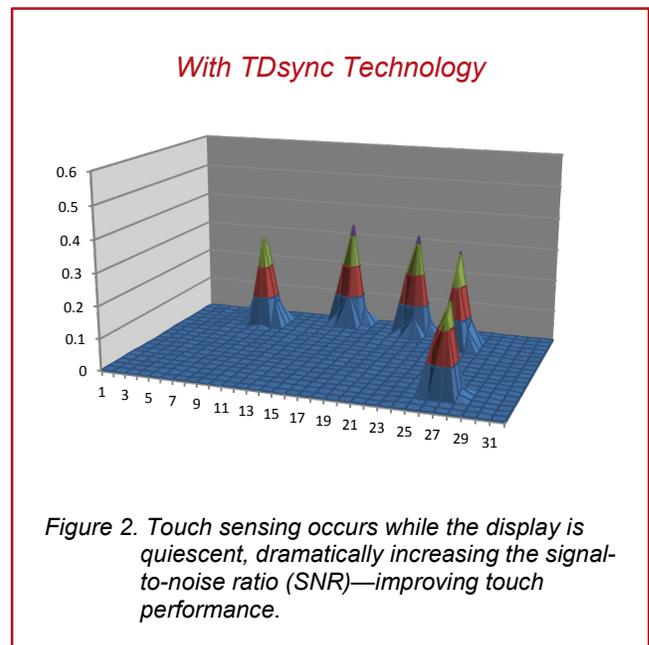
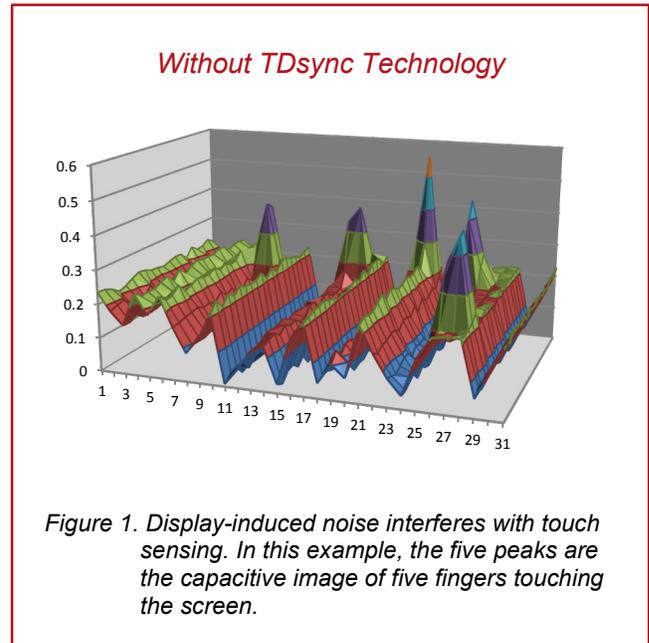
Most touchscreen designs employ at least some means of mitigating display noise, including the use of fixed-interval touch/display synchronization, a higher touch transmission voltage and/or sophisticated waveform analysis algorithms. However, these methods can impose design trade-offs and increase production costs.

As display resolutions increase, so too must display driver performance in order to maintain image quality with an acceptable refresh rate. However, recent display driver advances have outpaced increases in resolution, and a screen refresh can now occur in less time than is allotted by a standard 60 Hz or 120 Hz refresh rate. This creates intervals of time during which the display is not being driven, and is thus free of electrical display noise. TDsync algorithms interleave touch sensing with display updates so that sensing always occurs when the display is idle and absent of any display-induced noise.

## The TDsync Advantage

The superior touch performance enabled by TDsync technology is available with Synaptics In-Cell touchscreen controller implementations. Focused engineering investments and strategic acquisitions have made Synaptics the industry leader in display integration. With state-of-the-art touch-and-display engineering and technology, Synaptics is uniquely positioned to deliver the optimum user experience by satisfying both the need for display driver performance and touch controller synchronization.

To learn more about TDsync technology and display integration, please visit Synaptics on the Web at [www.synaptics.com](http://www.synaptics.com) or send an email to [info@synaptics.com](mailto:info@synaptics.com).



## About Synaptics

Synaptics is the pioneer and leader of the human interface revolution, bringing innovative and intuitive user experiences to intelligent devices. Synaptics' broad portfolio of touch, display, and biometrics products is built on the company's rich R&D and supply chain capabilities. With solutions designed for mobile, PC and automotive industries, Synaptics combines ease of use, functionality and aesthetics to enable products that help make our digital lives more productive, secure and enjoyable. (NASDAQ: SYNA) [www.synaptics.com](http://www.synaptics.com).

### Revision history

Revision	Reason for Change
1	Initial release.

### Copyright

Copyright © 2015 Synaptics Incorporated. All rights reserved.

### Trademarks

Synaptics, the Synaptics logo, ChiralMotion, ChiralMotion logo, ClearButtons, ClearPad, ClickButtons, ClickEQ, ClickEQ logo, ClickPad, ClickSmart, ClickZones, DDI, DesignSafe, Design Studio, DesignWorks, DisplayPad, DualMode, DualPointing, EdgeMotion, EGR, EGR-Enhanced Gesture Recognition, Enhanced Gesture Recognition, EZSense, FaceDetect, FaceDetect Plus, Fingerprint figure, FlexPad, ForcePad, HapticTouch, InterTouch, LinkXtend, LiveFlex, MapRamp, MobileTouch, Momentum, NavPoint, Natural ID, OTLIB, PalmCheck, PanelPort, ProductionSafe, QuickStroke, SafePass, SafeSense, ScrollStrip, Sensitivity Tuning Wizard, SecureSense, SGS, SignalClarity, SmartSense, Synaptics | Scribe, Synaptics | Scribe logo, Synaptics Gesture Suite, Synaptics OneTouch, Synaptics OneTouch Studio, Synaptics OneTouch logo, Synaptics TypeGuard, TDsync, ThinTouch, TouchButtons, TouchPad, TouchStyk, UltraKey, Validity, Validity Sensors, ViewXpand, and Wake On Touch are trademarks or registered trademarks of Synaptics Incorporated or its affiliates in the United States and/or other countries. All other trademarks are the properties of their respective owners.

### Notice

This document contains information that is proprietary to Synaptics Incorporated ("Synaptics"). The holder of this document shall treat all information contained herein as confidential, shall use the information only for its intended purpose, and shall not duplicate, disclose, or disseminate any of this information in any manner unless Synaptics has provided express, written permission otherwise.

Use of the materials may require a license of intellectual property from a third party or from Synaptics. Information contained in this document is provided as-is, with no express or implied warranties, including any warranty of merchantability, fitness for any particular purpose, or non-infringement. Synaptics assumes no liability whatsoever for any use of the information contained herein, including any liability for intellectual property infringement. This document conveys no express or implied licenses to any intellectual property rights belonging to Synaptics or any other party. Synaptics may, from time to time and at its sole option, update the information contained herein this document without notice.

INFORMATION CONTAINED IN THIS DOCUMENT IS PROVIDED "AS-IS," WITH NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES OF NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT SHALL SYNAPTICS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OF THE INFORMATION CONTAINED IN THIS DOCUMENT, HOWEVER CAUSED AND BASED ON ANY THEORY OF LIABILITY, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, AND EVEN IF SYNAPTICS WAS ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. IF A TRIBUNAL OF COMPETENT JURISDICTION DOES NOT PERMIT THE DISCLAIMER OF DIRECT DAMAGES OR ANY OTHER DAMAGES, SYNAPTICS' TOTAL CUMULATIVE LIABILITY TO ANY PARTY SHALL NOT EXCEED ONE HUNDRED U.S. DOLLARS.