Checking the Effects of External Noise on Atmel® Capacitive-touch ICs

1. Introduction

Although Atmel capacitive-touch integrated circuits (QT ICs) include many noise suppression features, to optimize product design and improve performance it is useful to measure the effects of noise on raw touch-detection signals and signal delta values.

2. Sources of Noise

Electrical noise can emanate from one or more sources such as:

- Noisy power supply
- Insufficient or improperly located decoupling capacitors
- Decoupling capacitors that are too large or too small
- Interfering signals near the electrodes or electrode traces
- Nearby devices such as liquid crystal displays (LCDs) and oscillators
- Radiating devices such as television signals and induction heating (IH) cookers

3. Jitter

In an optimum design, the signal levels display little variation when there is no change in touch. Jitter of no more than ±2 points is typical. In a noisy design, the signal can vary significantly from plus or minus ten points or even hundreds of points. Extreme jitter can cause false, or missed, detections.

4. Reading Signal Data

Many QT ICs permit the signal levels for each sensor to be read through a serial connection such as serial peripheral interface (SPI), universal asynchronous receiver transmitter (UART), Inter Integrated Circuit (I^2C-compatible). Refer to the datasheet of the QT IC used for details on retrieving signal level data.

5. Retrieving and Displaying Information

If the product has a display that can show multiple numeric values, the use of a diagnostic mode that can present signal level data is beneficial. Otherwise, to retrieve data, it may be necessary to use an isolated connection such as an optically-coupled RS-232 port or USB connection. A wireless connection such as Bluetooth® is also an option.

Effects of External Noise on QT ICs

Application Note QTAN0017

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6. Connections to External Devices

If the product has different connections to external devices such as battery chargers, headsets, or download cables, make sure that the product is tested in every possible combination of connection. Some types of noise change significantly – depending on the combination of connections and whether or not they are grounded.

7. Quick Tests

Figures 7-1 and 7-2 illustrate methods of quickly testing the product to determine whether shielding, synchronization, or other noise suppression measures are necessary.

Figure 7-1. Quick Test A

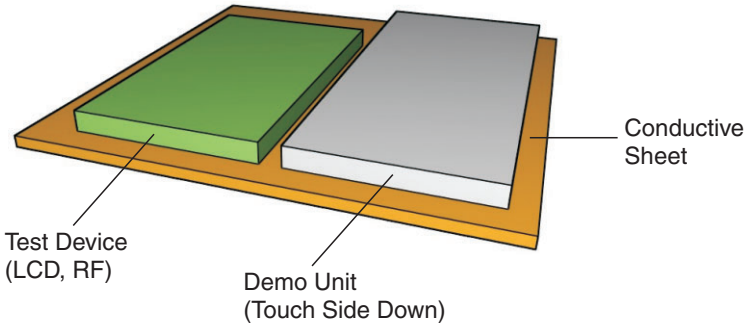
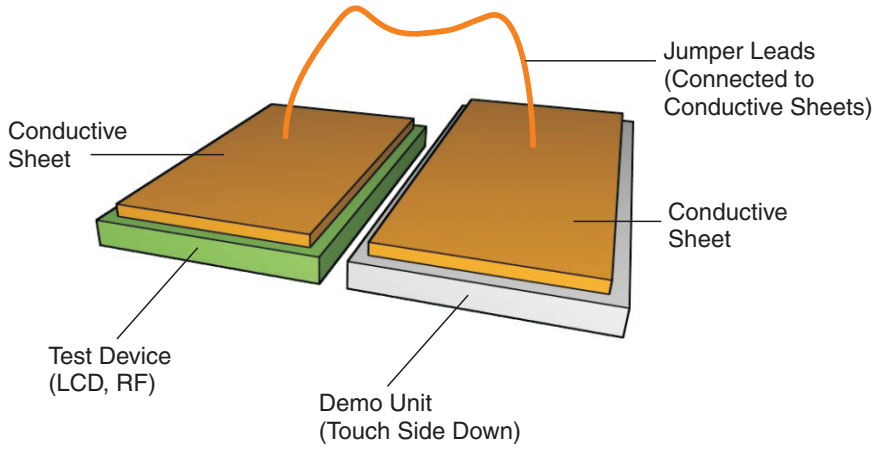


Figure 7-2. Quick Test B



1. Place the demonstration unit and the test device (for example, LCD or RF) on the conductive sheet, sensor side to sheet (see Figure 7-1). Alternatively, use two conductive sheets connected by a jumper wire (see Figure 7-2). Ensure that the conductive sheet (typically copper) faces the touch sensor. For example, in a touch LCD design, the conductive sheet should face the view side of the LCD.
2. Connect the Ground of the demonstration unit to the Ground of the test device.
3. Connect the appropriate software for the demonstration unit to the PC.
4. Ensure the devices are mechanically stable.
5. Recalibrate the demonstration unit.
6. Using the demonstration unit software check for noise affecting the touch signals.

8. Associated Publications

The following documents published by Atmel's Touch Technology Division are also of interest:

- QTAN0015 – Power Supply Considerations for Atmel Capacitive-touch ICs
- QTAN0016 – Diagnostic Modes for Products with Atmel Capacitive-touch ICs

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