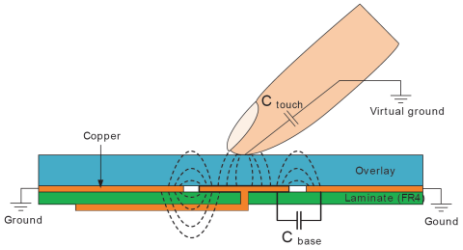
Master Thesis Overview

Capacitive Ultra Low Power Analog Front End

Abstract



Recent advances in mixed signal technology availed the cost effective implementation of capacitive touch sensors. With their small form factors and plain-surface structures, they become really attractive for developing novel human machine interfaces. In addition, they are more reliable compared to heritage mechanical buttons, because the mechanical parts tend to wear out faster and they are more vulnerable to physical strains compared to plain-surface touch buttons. However, reading out touch sensors is not an easy task. Because of the capacitive nature of these sensors, the interface circuits can be quite demanding in power and area. Thus, accommodating touch sensitive buttons is a burden, when there is no access to a permanent power supply. In addition, the base capacitances of touch sensors are quite high. This makes the capacitance added by touching quite low compared to the total capacitance sensed by the interface. This situation gets worse, when the touch sensor is a slider. Therefore, the interface is desired to cancel out the base capacitance and at the same time resolve the touch information precisely. There is a need for building ultra low power sensor interfaces with sufficiently high resolutions, which can operate within a reasonable range of sensor capacitances. This work addresses these challenges and offers an instrumentation solution for capacitive touch sensors.

Number One Result

An 8-bit Delta Sigma capacitance-to-digital converter has been built, which can interface up to 100 capacitive touch sensors consuming 5.22 µW/ sensor with a refresh rate of 10 Hz.

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