Application Note: AZD050
IQ Switch® - ProxSense™ Series
The Effect of Large Floating Metal on ProxSense Technology

1. Introduction

This application note addresses two aspects of floating metal (or unconnected conductors) that influence the working capacitive sensing.

1.1 Erratic Behavior

In general, having any floating metal around the sense antennas of ProxSense IC's is strongly discouraged. As floating metal in close proximity has a tendency to store and discharge charge at irregular intervals, floating metal is normally associated with erratic behavior.

However, when the floating metal surrounding the sense antennas is large enough, the amplitude of the influence on ProxSense IC's is reduced. Typically, when the floating metal is large enough, such as for television screen frames or stove tops (see Figure 1.1); the erratic behavior (stuck conditions, large jumps in current samples in both directions, etc.) can be reduced to small false proximity events, which can be removed by the correct threshold implementation.

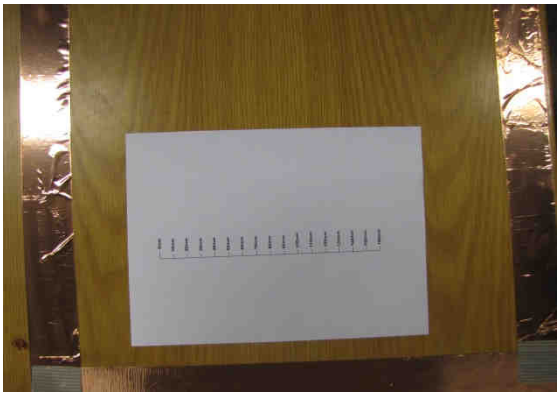

Figure 1.1 Large Floating metal, more than 200mm.

1.2 Noise

The second problem with floating metal (even if made very large), is the effect of noise coupling into the IC. Depending on the level of the current samples and the compensation of the touch channel, the AC noise on a particular channel could be +-200 counts when in contact with the metal while making the touch event. Depending on the thresholds used, this could have the adverse effect of a touch output toggle while the user hand remains fixed.

2 Solutions

There are two possible solutions to stabilize the touch output for ProxSense devices operating in close proximity to large floating metal planes. The solutions can be used together or independently of each other.

2.1 Filtering

If possible, select an IC from the ProxSense family which deploys an AC filter.

However, if the chosen IC for the application does not filter its touch channel(s), a custom FIR filter can be implemented on the MCU (when using ProxSense IC's in data streaming mode).

2.2 Zero Cross

The second solution would be to use the "Zero Cross" (ZC) input on the IC (not available on all ProxSense IC's). The ZC enables the IC to sync conversions with AC supply frequencies (typically 50/60Hz, region specific – charge transfers to occur

at 20ms nominally). Otherwise the IC will run at its internal clock frequency.

There are two possibilities when incorporating the ZC:

- Electrically – more stable.
- Capacitive - better ESD protection for the IC.

Typical values for current protection resistors when synchronising to 220VAC is 2 x 510k. When synchronising to any other device and the synchronization pulses exceed VDDHI, current protection resistors should be used.

The following patents relate to the device or usage of the device: US 6,249,089 B1, US 6,621,225 B2, US 6,650,066 B2, US 6,952,084 B2, US 6,984,900 B1, US 7,084,526 B2, US 7,084,531 B2, US 7,119,459 B2, US 7,265,494 B2, US 7,291,940 B2, US 7,329,970 B2, US 7,336,037 B2, US 7,443,101 B2, US 7,466,040 B2, US 7,498,749 B2, US 7,528,508 B2, US 7,755,219 B2, US7,772,781, US 7,781,980 B2, EP 1 120 018 B1, EP 1 206 168 B1, EP 1 308 913 B1, EP 1 530 178 B1, ZL 99 8 14357.X, AUS 761094