A Digital Readout Technique for Capacitive Sensor Applications

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Introduction

In this article, a technique for capacitance measurement is discussed, based on the work of Kung et al.[1].

The approach presented gives a digital output, that could be converted to analog by a DAC(*Digital to Analog Converter*) for further processings. This technique allows to reach high measurment resolution since it deletes errors due to: Parasitic capacitances, op-amp offset or charge injection from MOS switch. In figure Fig. 1 is showed the circuit that performs the described functions.

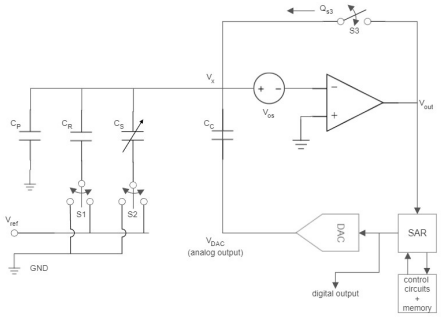

Figure 1: Capacitance measurement circuit.

Ideal Analysis

A first analysis is performed assuming an ideal circuit, so there is no charge injection ($Q_{s3} = 0$), no parasitic capacitance ($C_P = 0$) and ideal op-amp (offset $V_{os} = 0$ and ∞ gain). The circuit becomes as showed in figure Fig. 2.

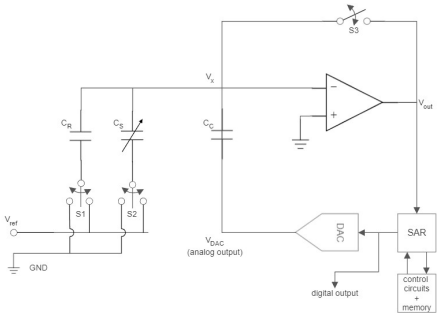

Figure 2: Capacitance measurement circuit without nonidealities.

Bibliography

[1] J. T. Kung, H. S. Lee, and R. T. Howe, "A Digital Readout Technique for Capacitive Sensor Applications," *IEEE Journal of Solid-State Circuits*, vol. 23, no. 4, pp. 972–977, 1988.