

NOVEL LINEAR WIDE-RANGE CAPACITANCE MEASUREMENT METHOD

Referenz Nr. B75281

CHALLENGE

Goal of the development is to make wide-range capacitance measurement as cheap as possible when a processing unit and a comparator are already available. Measuring a physical quantity by measuring a capacitance is a widely used sensor principle. This is usually done by measuring amplitude and/or phase of an oscillating signal sent through the capacitor to be measured. Measuring large ranges with non-linear transfer characteristics, e.g. of an RC low-pass, can cause problems for several reasons: Some parts of the transfer function have a large and others a small slope, which corresponds to the sensor's sensitivity, and the non-linear curve must be linearized with particular linearization formulae adopted to the sensor.

Linearization of capacitance measurement is obtained with switched-capacitor (SC) techniques as illustrated in Fig. 1(a). SC's translate a capacitance into an equivalent conductance. However, SC techniques come with several drawbacks: The required capacitively balanced switches are additional devices needing supply power and non-overlapping two-phase clocks (labelled $\Phi 1$ and $\Phi 2$). The capacitive clock-feedthrough is a major problem with capacitors in data processing.

INNOVATION

The presented technique combines the advantages of the switched-capacitor technique with the advantage of replacing switches by diodes. By the use of diodes instead of switches the major problems mentioned above can be avoided. Moreover, a significant increase of the switching speed can be achieved and difficulties like e.g. error voltage can be handled. The replacement of the switches is realized by manipulating the measurement circuitry in such a way, that current flows through switches in one direction only as illustrated in Fig. 1(b). Then switches can be replaced by diodes which operate as self-controlled switches without external control logic and wirelines.

COMMERCIAL OPPORTUNITIES

- Capacitive sensors
- Wireless sensor networks
- Touch screens

DEVELOPMENT STATUS

Prototype

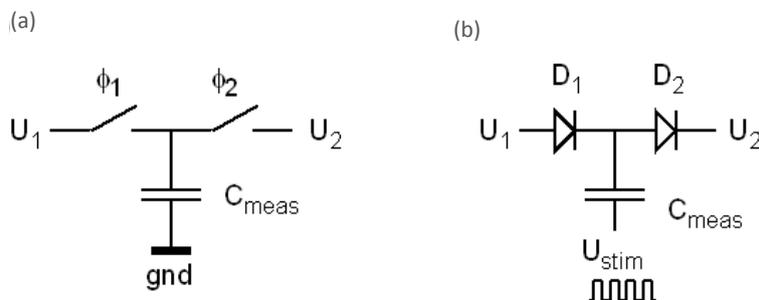


Fig. 1: (a) Typical Switched Capacitor (SC) technique to measure C_{meas}
(b) New method using diodes as switches.

References:

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- [2] S. Zenger, M. J. W. Schubert, F. Schmidl, C. Seebauer, "A Linear Capacitance Measurement Method for Wireless Sensor Networks", invited paper for Sensors and Actuators Conference, SAC 2018, Stockholm, Sept. 3-6, 2018.



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filed in 2016
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