

# Capacitance-To-Digital Converter

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**Abstract** - Capacitive sensors have more applications in the fields ranging from consumer electronics to automobiles, healthcare, and automation multiple design techniques are introduced for capacitive sensor readout circuits, that is also known as capacitance-to-digital converters (CDCs). T-capacitance to digital converter (CDC) moves the conversion process from the analog domain into the digital domain. It offers outstanding flexibility with respect to power consumption, resolution and speed.

**Keywords** – CDC, T-CDC, flexibility

## I. REFERENCE CIRCUIT DETAILS

The sensor capacitance is the load capacitance of a voltage-to-time converter (VTC) circuit based on current starved inverters. The VTC circuit used has improved sensitivity, linearity and dynamic range. The time delay provided by the VTC circuit is buffered providing a time pulse proportional to the sensor capacitance ( $C_s$ ). Thus, the VTC circuit becomes a capacitance-to-time converter (CTC) circuit. The time pulse is then digitized using a time-to-digital converter (TDC) circuit providing an output digital code proportional to the sensor capacitance. T-CDC system is a time-based ADC, but with the sensor capacitance as the load capacitance of the used VTC circuit and the input voltages of the current starved inverters in the VTC circuit are fixed and used for biasing.

## II. REFERENCE CIRCUIT

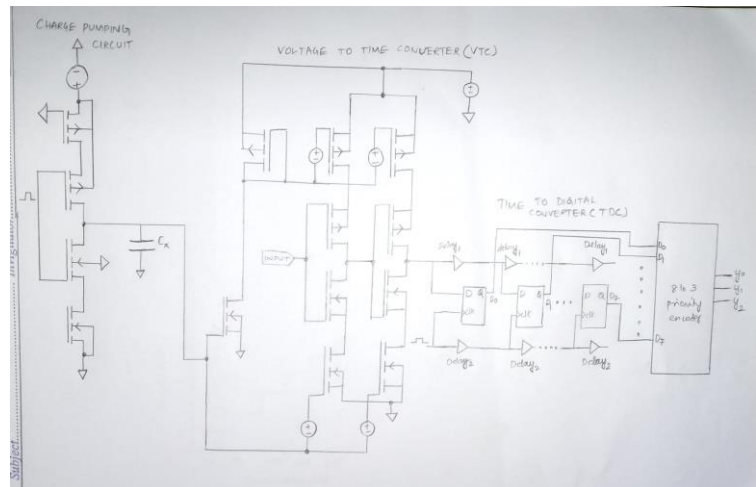


Figure 1: Reference circuit diagram.

## III. REFERENCE CIRCUIT WAVEFORM

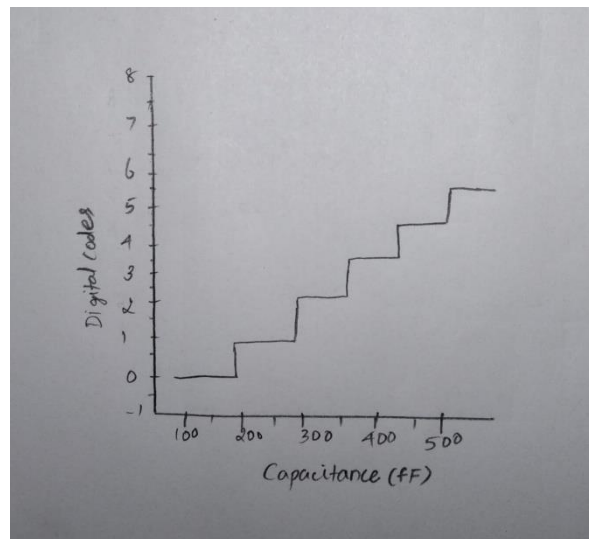


Figure 2: Reference waveform.

## REFERENCES

- A. Fouad, Y. Ismail and H. Mostafa, "Design of a time-based capacitance-to-digital converter using current starved inverters," 2017 29th International Conference on Microelectronics (ICM), 2017, pp. 1-4, doi: 10.1109/ICM.2017.8268882.