SAR REF Input: The Capacitive DAC (CDAC)

TIPL 4503

TI Precision Labs – ADCs

Created by Luis Chioye

Presented by Cynthia Sosa

Agenda

Reference Performance Specifications:

- Initial Accuracy, Drift, Long Term Drift, and Noise

Overview of SAR REF Drive Topologies:

- Reference standalone VS Buffered Reference
- SAR ADCs with Internal Reference Buffer

SAR REF Input Overview: The Capacitive DAC (CDAC)

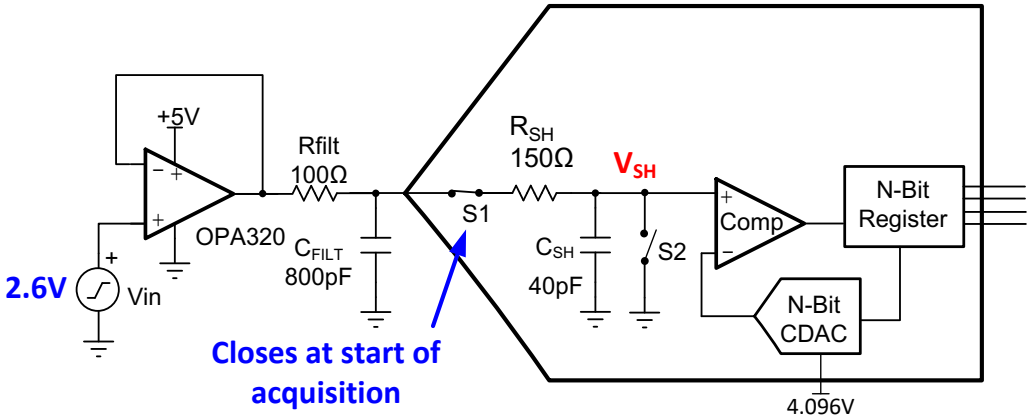
Build TINA REF Input Model for a SAR:

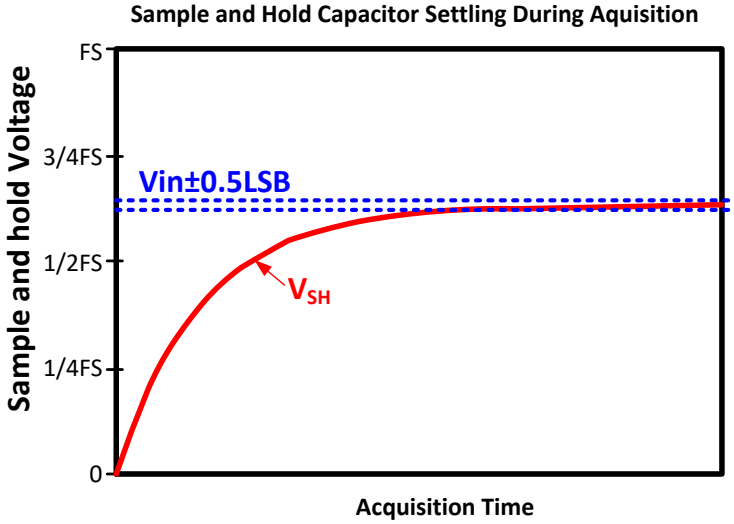
- Discrete Charge Model
- TI Device Specific Model

SAR REF Drive Circuit Design:

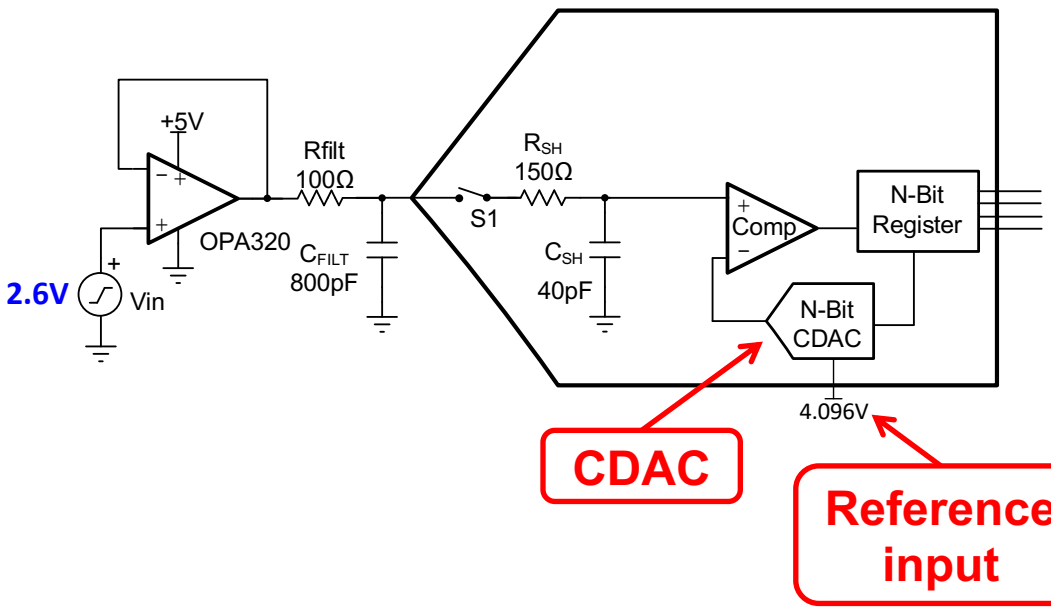
- Reference Bypass Capacitor
- Reference Buffer Stability and Compensation

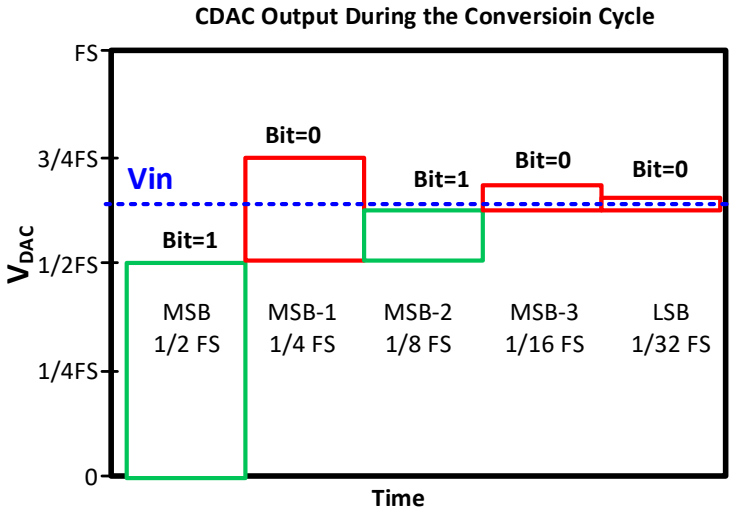
Acquisition phase





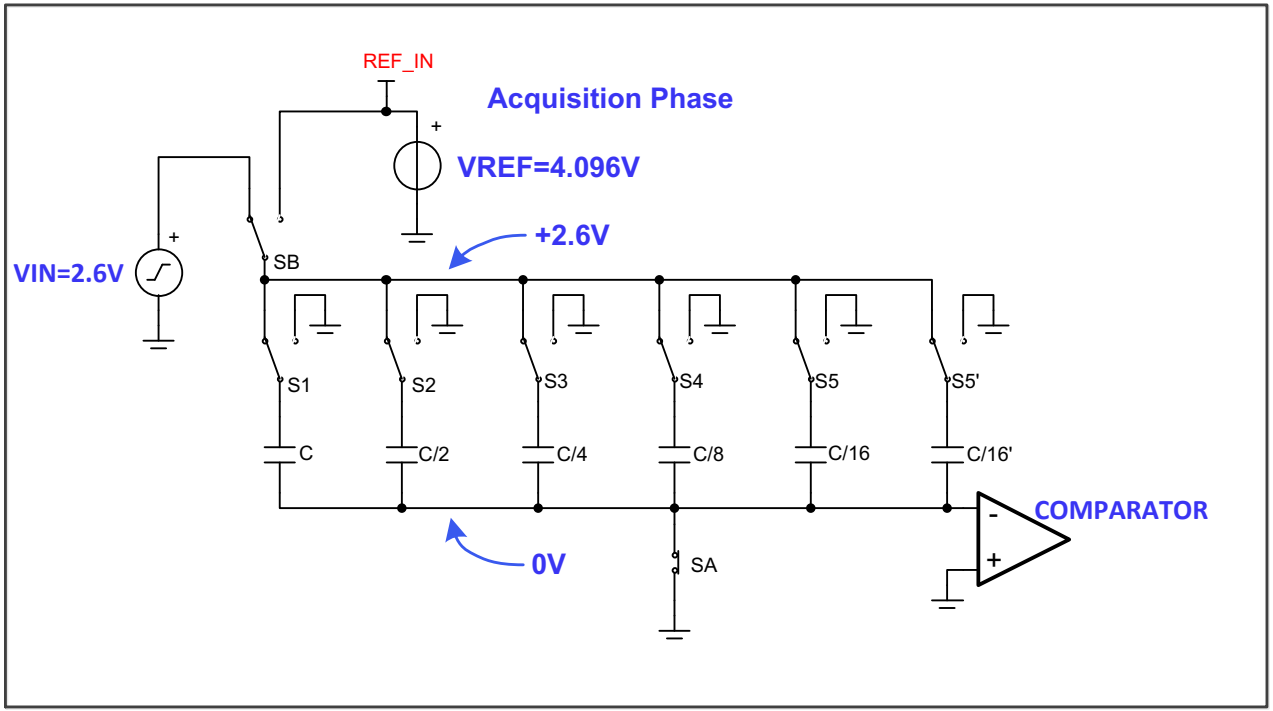
Conversion Phase

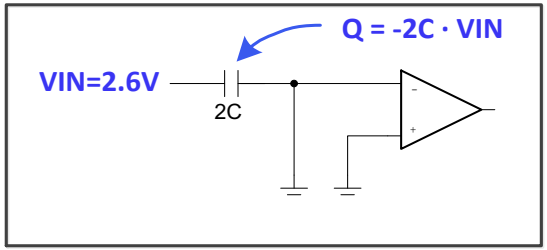




SAR ADC Architecture: The Capacitive DAC (1)

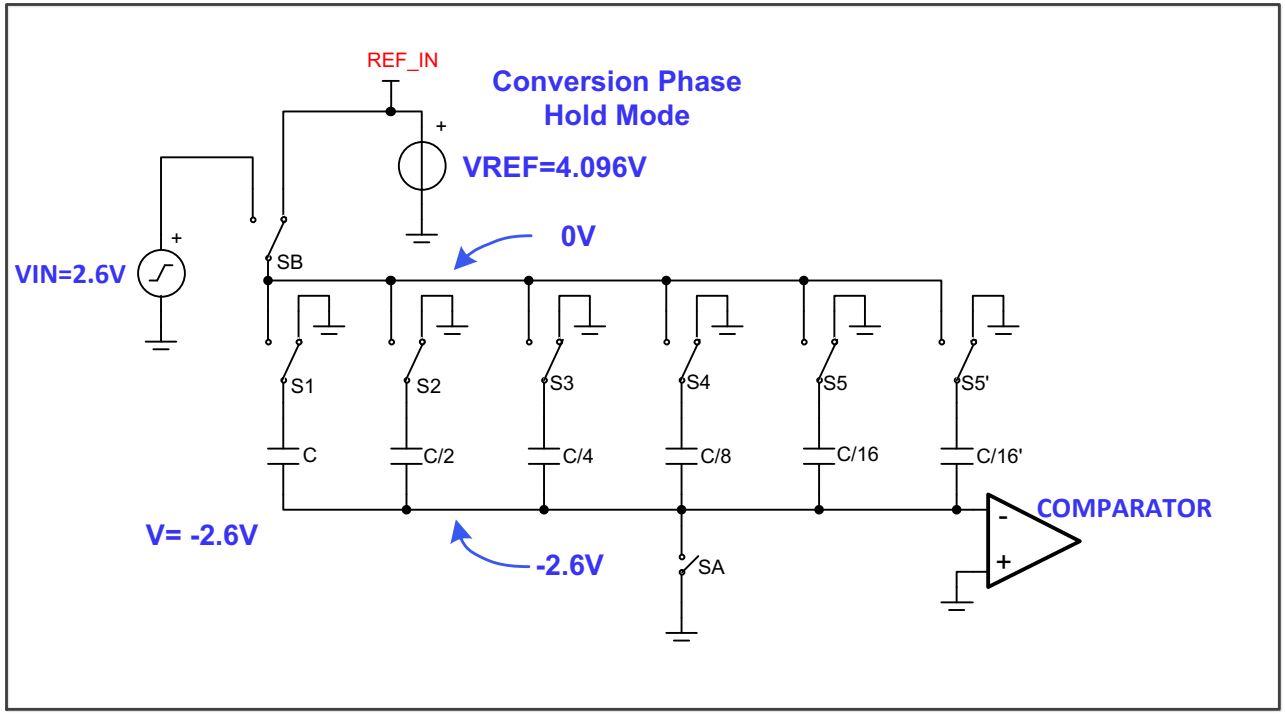
Based on TLV- Series SAR ADCs

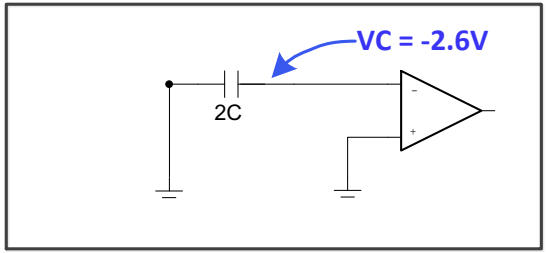




SAR ADC Architecture: The Capacitive DAC (2)

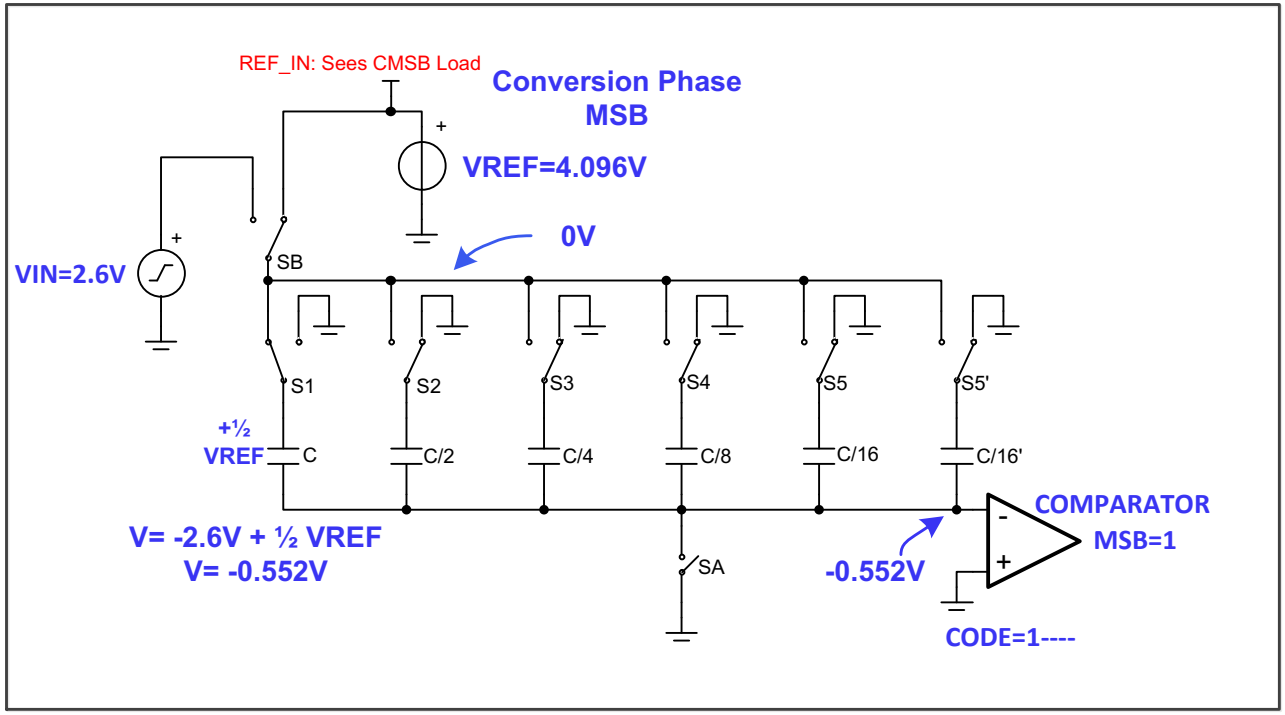
Based on TLV- Series SAR ADCs

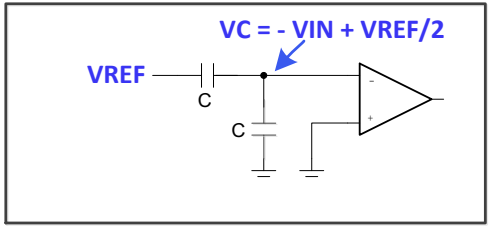




SAR ADC Architecture: The Capacitive DAC (3)

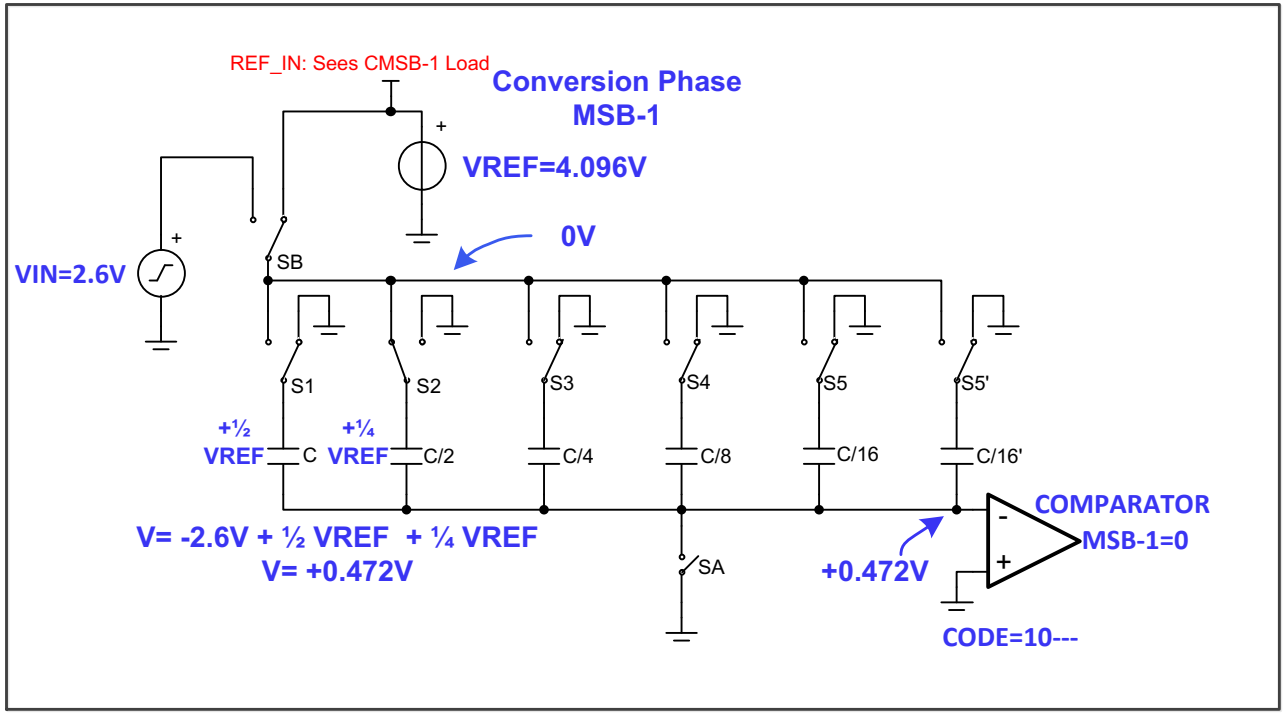
Based on TLV- Series SAR ADCs

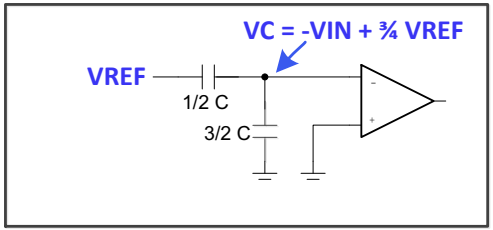




SAR ADC Architecture: The Capacitive DAC (4)

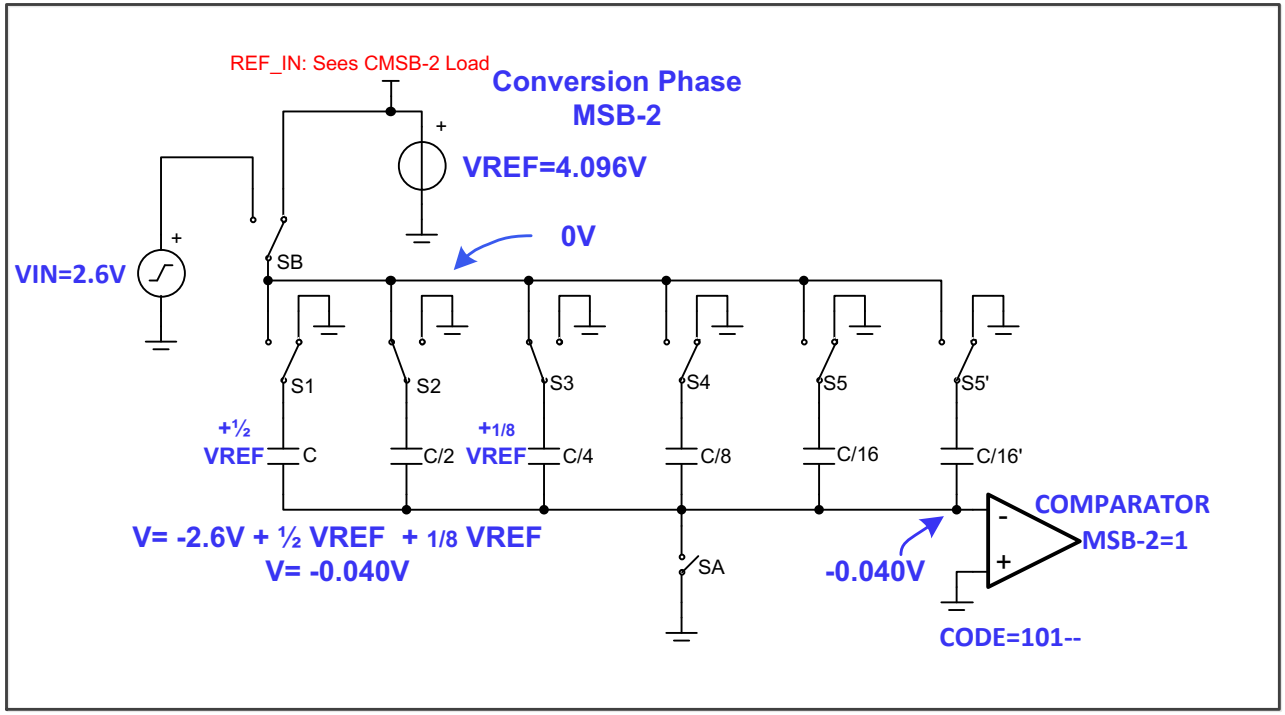
Based on TLV- Series SAR ADCs

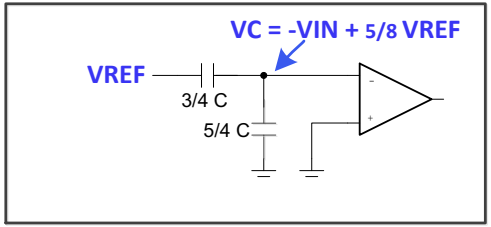




SAR ADC Architecture: The Capacitive DAC (5)

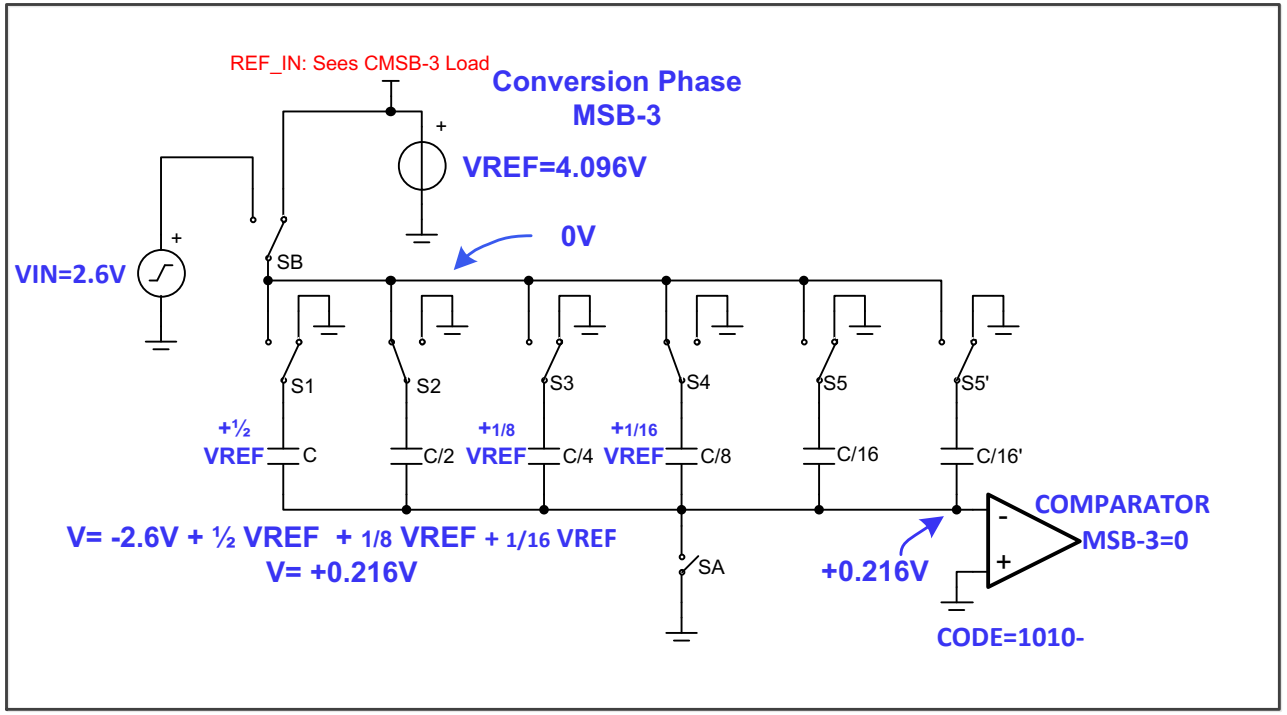
Based on TLV- Series SAR ADCs

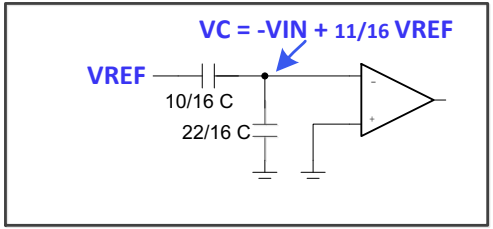




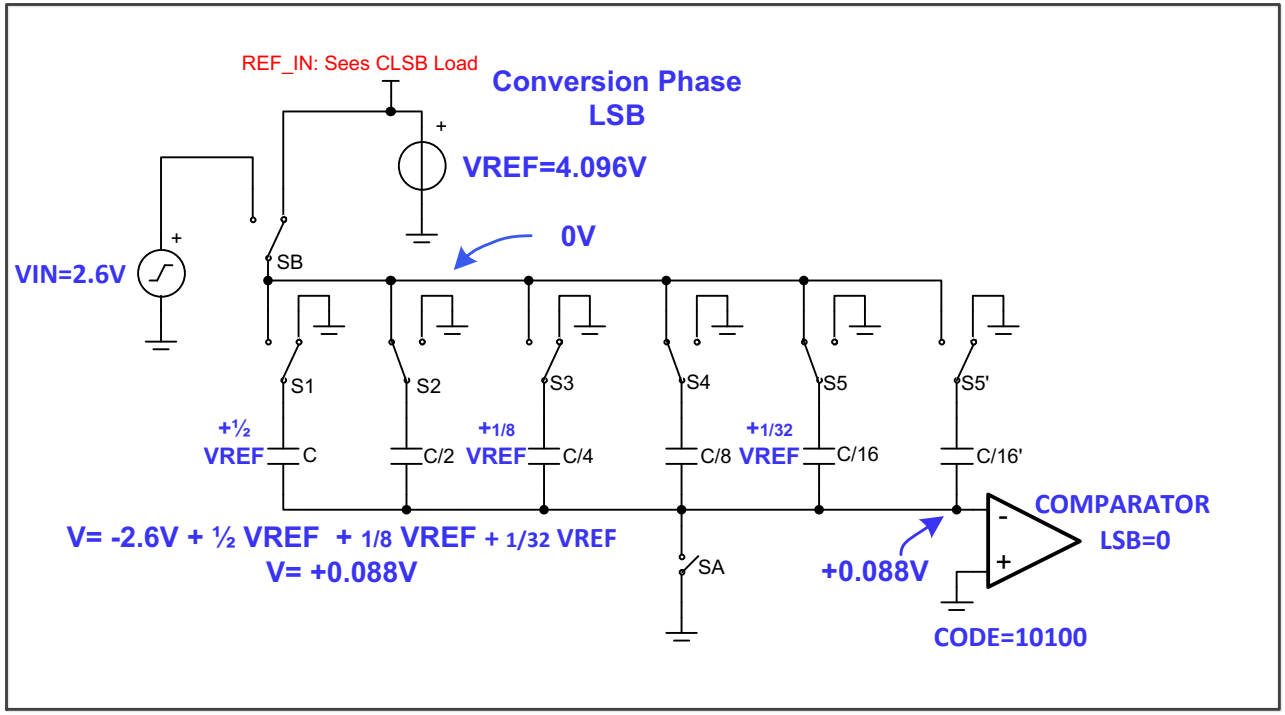
SAR ADC Architecture: The Capacitive DAC (6)

Based on TLV- Series SAR ADCs

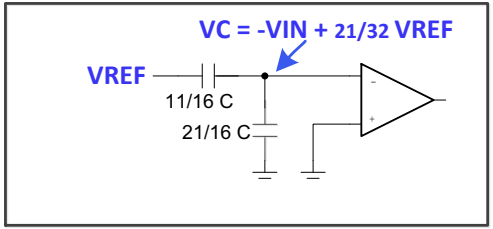




SAR ADC Architecture: The Capacitive DAC (7)



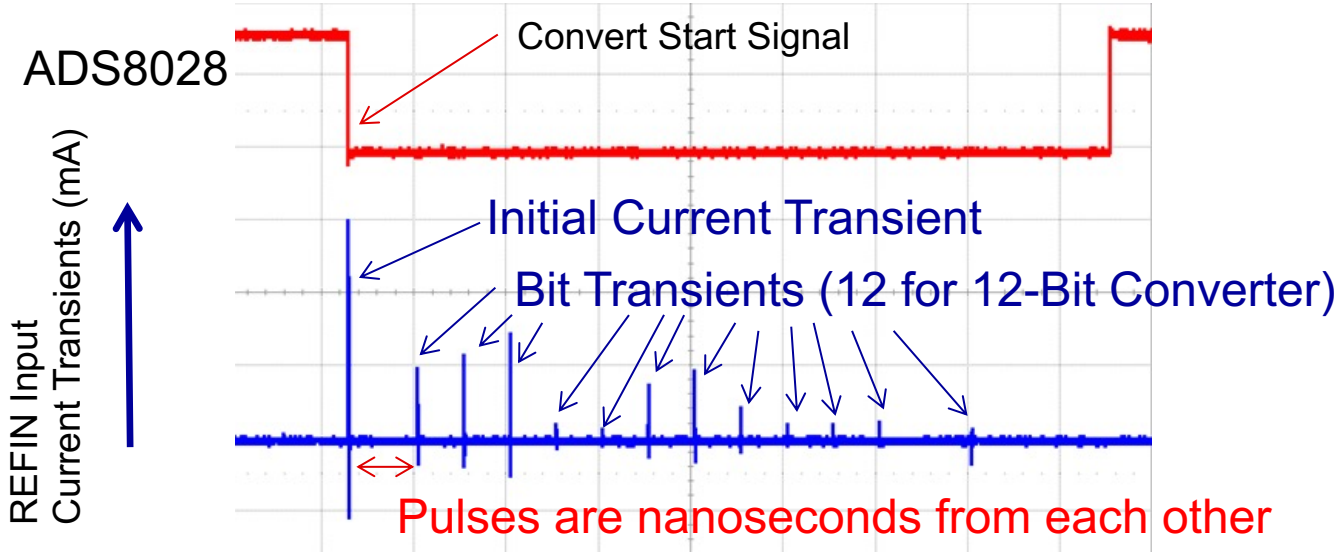
Based on TLV- Series SAR ADCs



Thomas Kulgelstad:
The operation of the SAR-ADC based on charge redistribution,
Analog Applications Journal (slyt176), Texas Instruments, February 2000.

SAR ADC Architecture

- The Reference is sampled several times during each conversion
- High-current transients (~10's mA range) are present in this REF input where the ADC's internal capacitor array is switched and charged as the bit decisions are made.
- Current transient pulses occur only a few nanoseconds away of each other during conversion.



Thanks for your time!
Please try the quiz.