

KNOWLEDGE PROBE 2: Types of Analog-to-Digital Converters Data Conversion Part 2

Learning Objectives

1. Describe the operation of the switched capacitor successive approximations, flash, pipelined, and sigma-delta converters.
 2. Differentiate between methods used to convert an analog signal into a sequence of binary numbers.
 3. Compare advantages and disadvantages of different types of analog-to-digital converters.
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1. The most widely used type of ADC is the
 - a. Flash
 - b. Pipeline
 - c. Sigma-delta
 - d. Successive approximations
 2. In the SA type of ADC, the input analog signal is compared to
 - a. DAC output
 - b. Itself
 - c. Reference
 - d. SAR output
 3. How many comparisons does a 12-bit SA ADC make before zeroing in on a final output?
 - a. 6
 - b. 10
 - c. 12
 - d. 24
 4. The absolute maximum sampling rate of a SA type of ADC is about
 - a. 1 MHz
 - b. 5 MHz
 - c. 10 MHz
 - d. 20 MHz
 5. What is used to correct an aperture error?
 - a. Comparator
 - b. Low pass filter
 - c. S/H amplifier
 - d. Voltage divider



6. What component determines the state of an S/H amplifier?
 - a. Capacitor
 - b. Flip flop
 - c. MOSFET
 - d. Op amp
7. An R-2R DAC may be used as part of a SA ADC.
 - a. True
 - b. False
8. In a switched capacitor ADC, which circuit is made with capacitors?
 - a. DAC
 - b. SAR
 - c. Switches
 - d. None of the above
9. The switched capacitor array is actually a
 - a. Capacitive voltage divider
 - b. Parallel circuit
 - c. R-2R network
 - d. Series resistive circuit
10. A capacitive SA ADC is better than an R-2R SA ADC because
 - a. It is faster
 - b. It takes up less space on the chip
 - c. May be integrated with other circuits
 - d. No separate S/H amplifier is needed
 - e. All of the above
11. The fastest type of ADC is the
 - a. Flash
 - b. Pipeline
 - c. Sigma-delta
 - d. Successive approximations
12. The number of comparators needed for a 9-bit flash converter is
 - a. 255
 - b. 392
 - c. 408
 - d. 511
13. A major disadvantage of a flash converter is its
 - a. Complexity
 - b. High power consumption
 - c. High speed
 - d. Low speed



14. The maximum resolution of a practical flash converter is about
 - a. 6 bits
 - b. 8 bits
 - c. 9 bits
 - d. 10 bits
15. Most pipeline converters use flash converters internally.
 - a. True
 - b. False
16. Pipeline converters are
 - a. Composed of capacitive arrays
 - b. Faster than flash converters
 - c. Faster than successive approximations converters
 - d. MOSFET switches
17. The maximum sampling rate of the fastest pipeline converter is about
 - a. 5 MSPS
 - b. 20 MSPS
 - c. 100 MSPS
 - d. 20 GSPS
18. Oversampling means
 - a. Not sampling fast enough
 - b. Sampling at the Nyquist rate
 - c. Sampling fast enough to avoid aliasing
 - d. Sampling four or more times the Nyquist rate
19. Which ADC uses oversampling?
 - a. Flash
 - b. Pipeline
 - c. Sigma-delta
 - d. Successive approximations
20. The most common application for sigma-delta converters is
 - a. Cell phones
 - b. Digital audio
 - c. RF
 - d. Video
21. What is the output of a sigma-delta converter?
 - a. A serial bit stream where the number of binary 1s symbolizes the average analog input value
 - b. Parallel binary words
 - c. Serial binary words
 - d. Stepped approximation of the analog input



22. Upon each sample in a sigma-delta converter, the comparator output is stored in the
- DAC
 - Flip flop
 - Integrator
 - Inverter
23. The ADC with the best SNR is the
- Flash
 - Pipeline
 - Sigma-delta
 - Successive approximations