



NPTEL ONLINE CERTIFICATION COURSES

DIGITAL CONTROL IN SMPCs AND FPGA-BASED PROTOTYPING

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Module 02: Fixed and Variable Frequency Digital Control Architectures

Lecture 20: Summary of Digital Current Mode Control Architectures

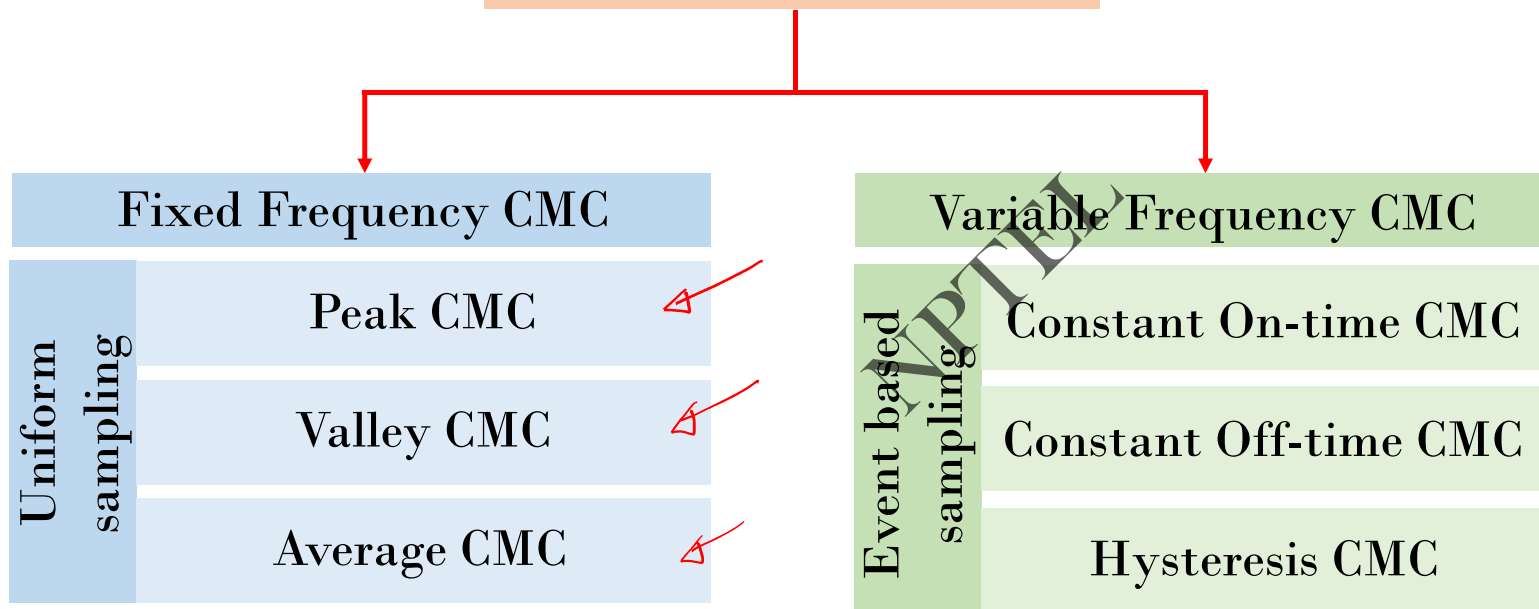


CONCEPTS COVERED

- Summary of various digital CMC architectures
- Fixed frequency digital CMC using uniform sampling
- Variable frequency digital CMC using event-based sampling
- Applications of various digital CMC methods – discussions

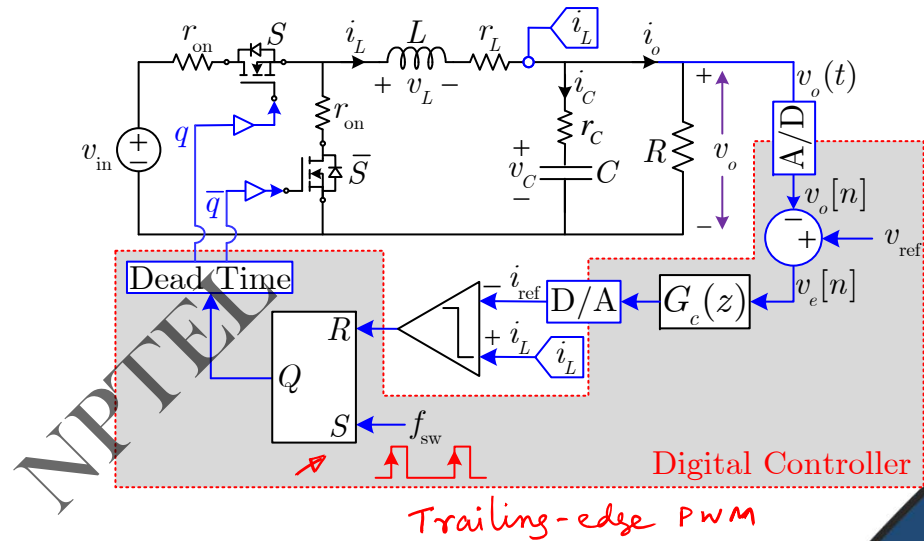
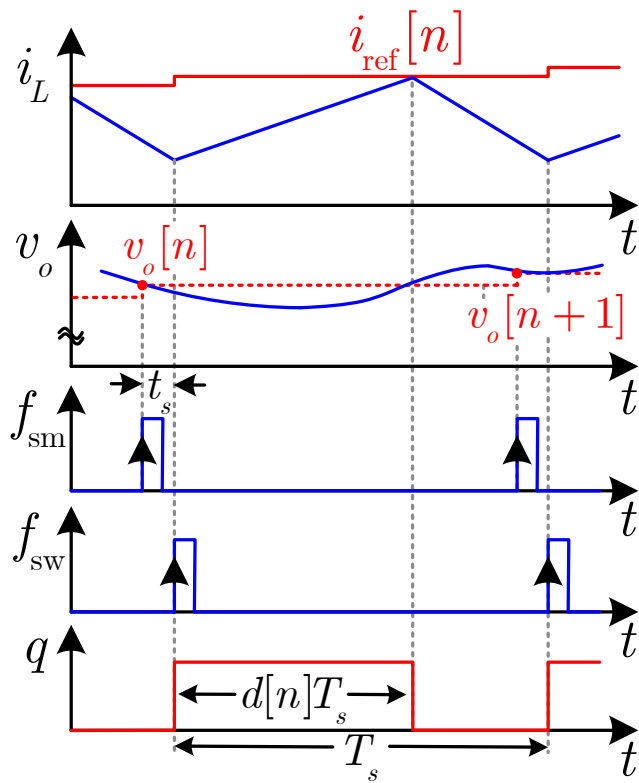
Digital Current Mode Control Architectures

Digital CMC Architectures

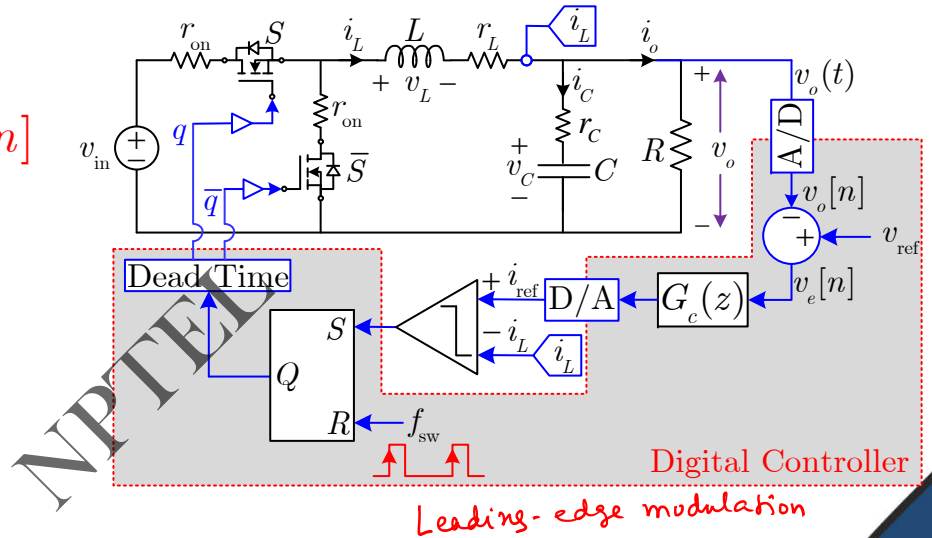
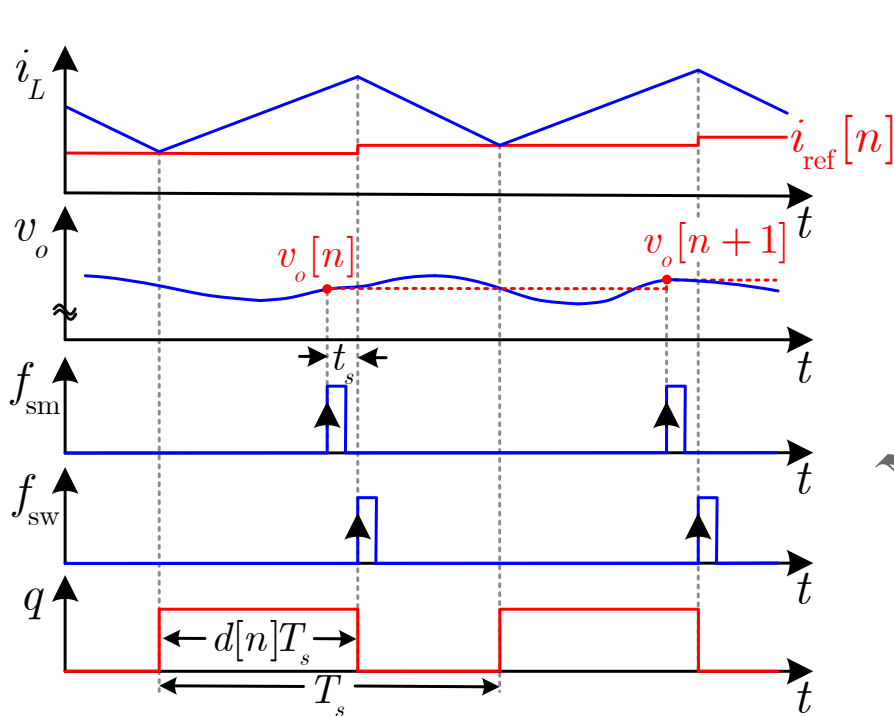


analogous to valley cmc
analogous to peak cmc

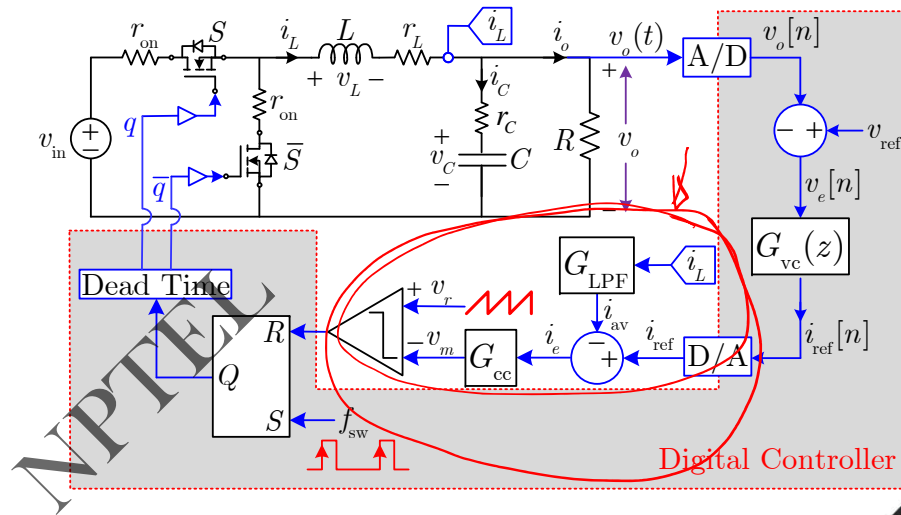
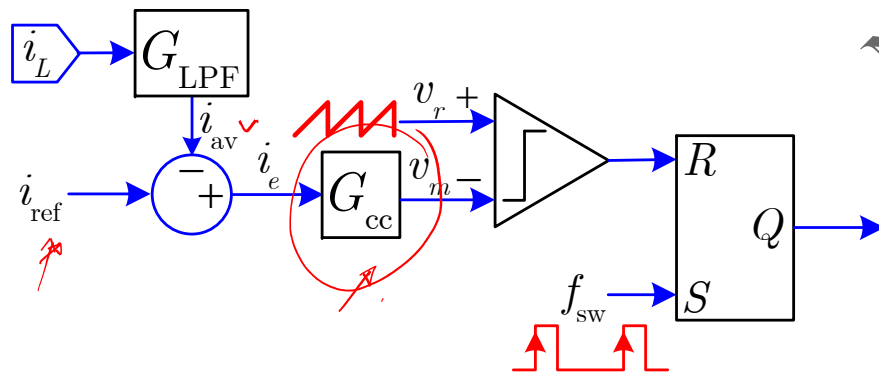
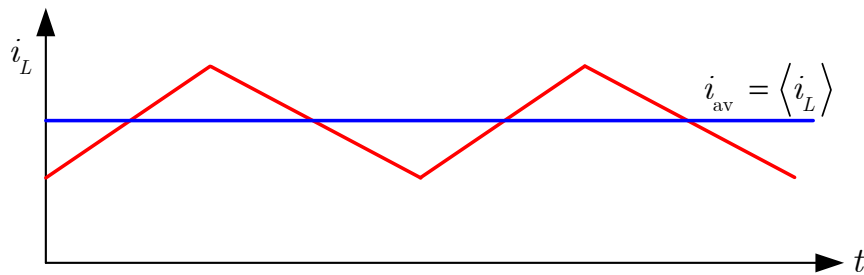
Mixed-Signal Peak CMC Architecture



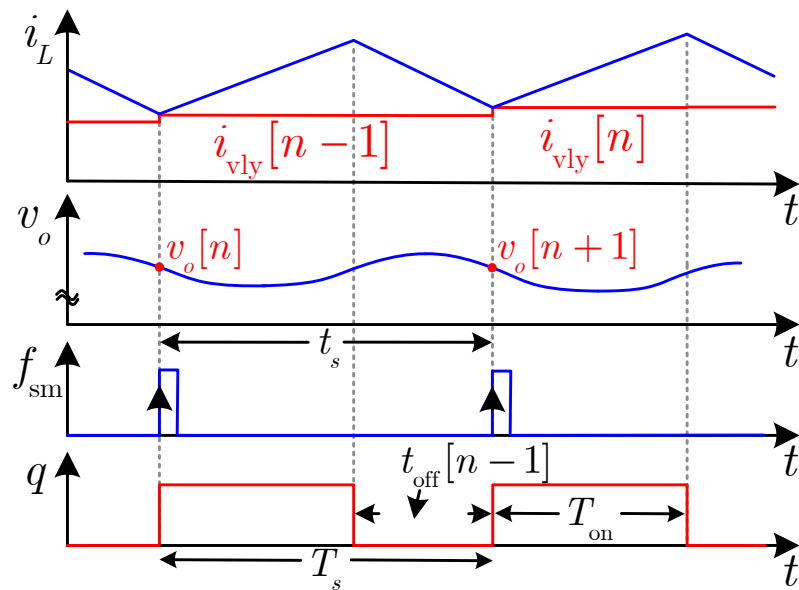
Mixed-Signal Valley CMC Architecture



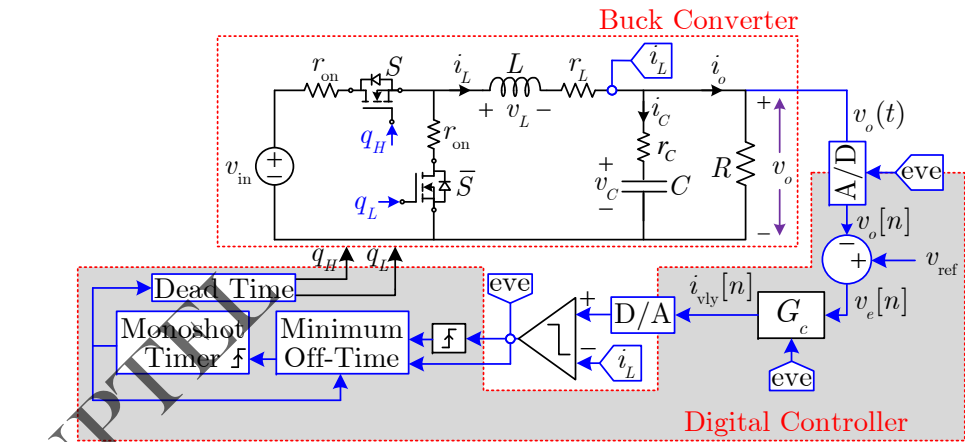
Mixed-Signal Average CMC Architecture



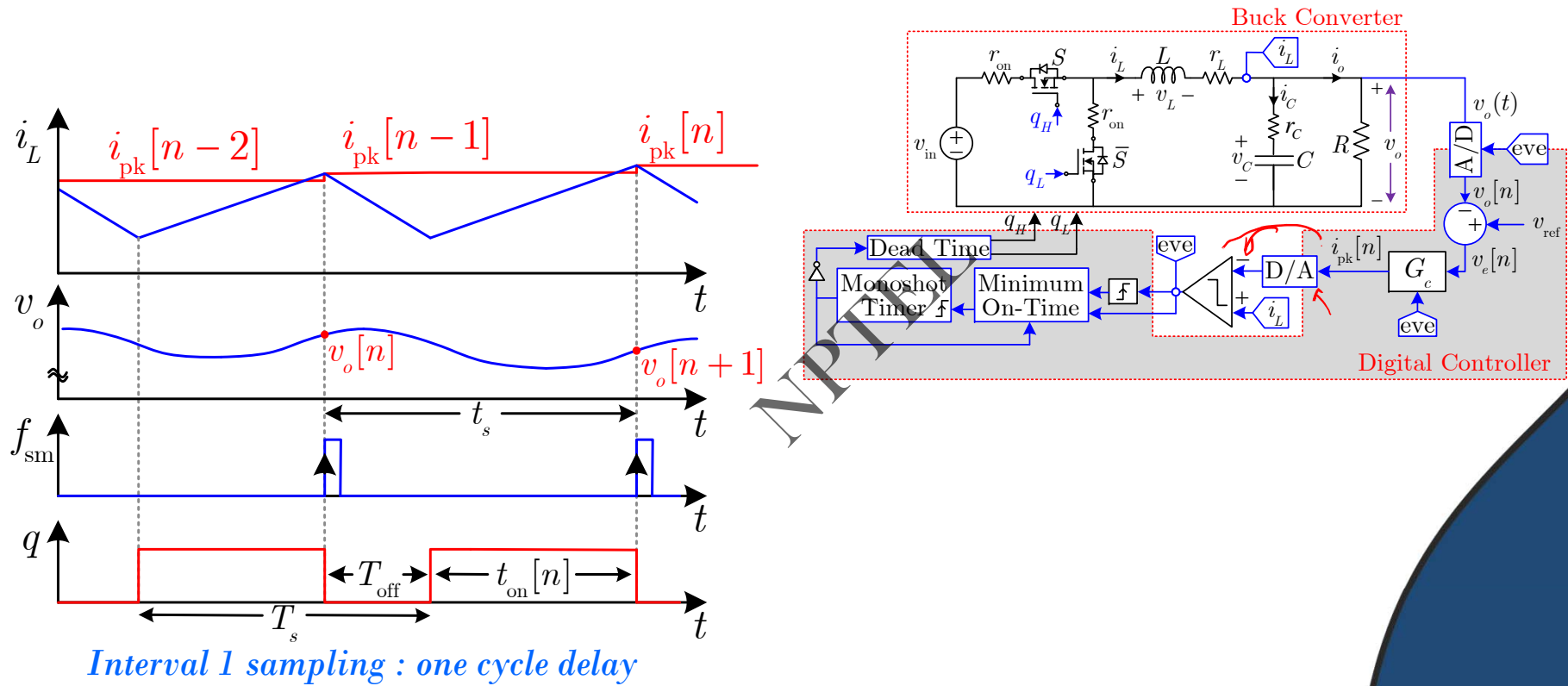
Mixed-Signal Constant On-time CMC Architecture



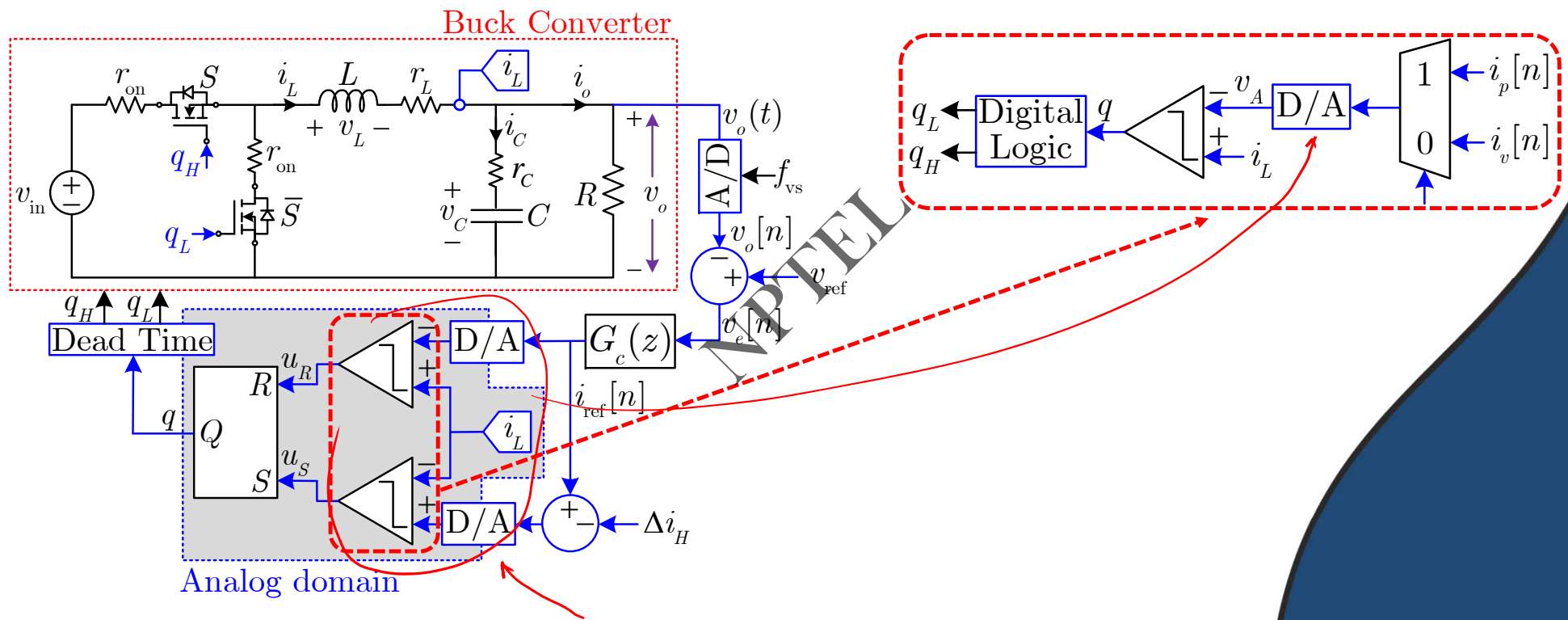
Interval 2 sampling : one cycle delay



Mixed-Signal Constant Off-time CMC Architecture



Mixed-Signal Hysteresis Current Control Architecture

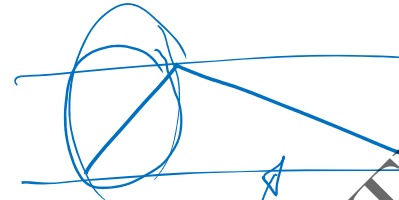
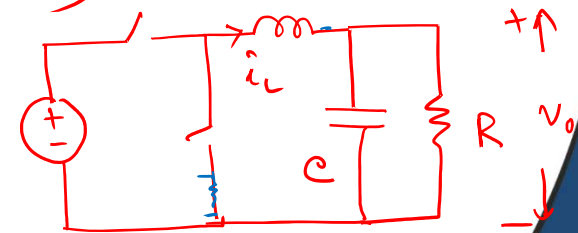


Digital current mode control methods for low duty ratio applications

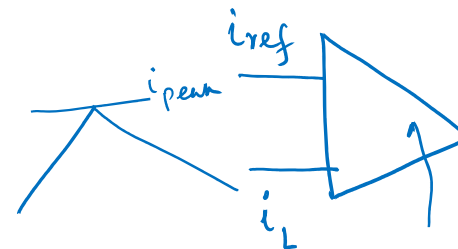
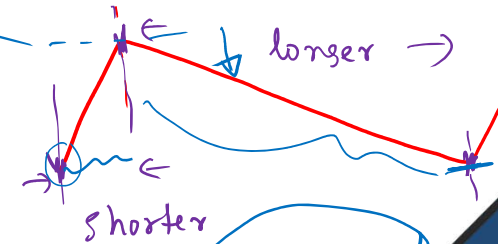
12 to 1 V PoL converter (buck conv.)

10 MHz

$$T_{on} = \frac{150}{12} \text{ ns}$$
$$\approx 8.33 \dots \text{ ns}$$



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Constant on-time

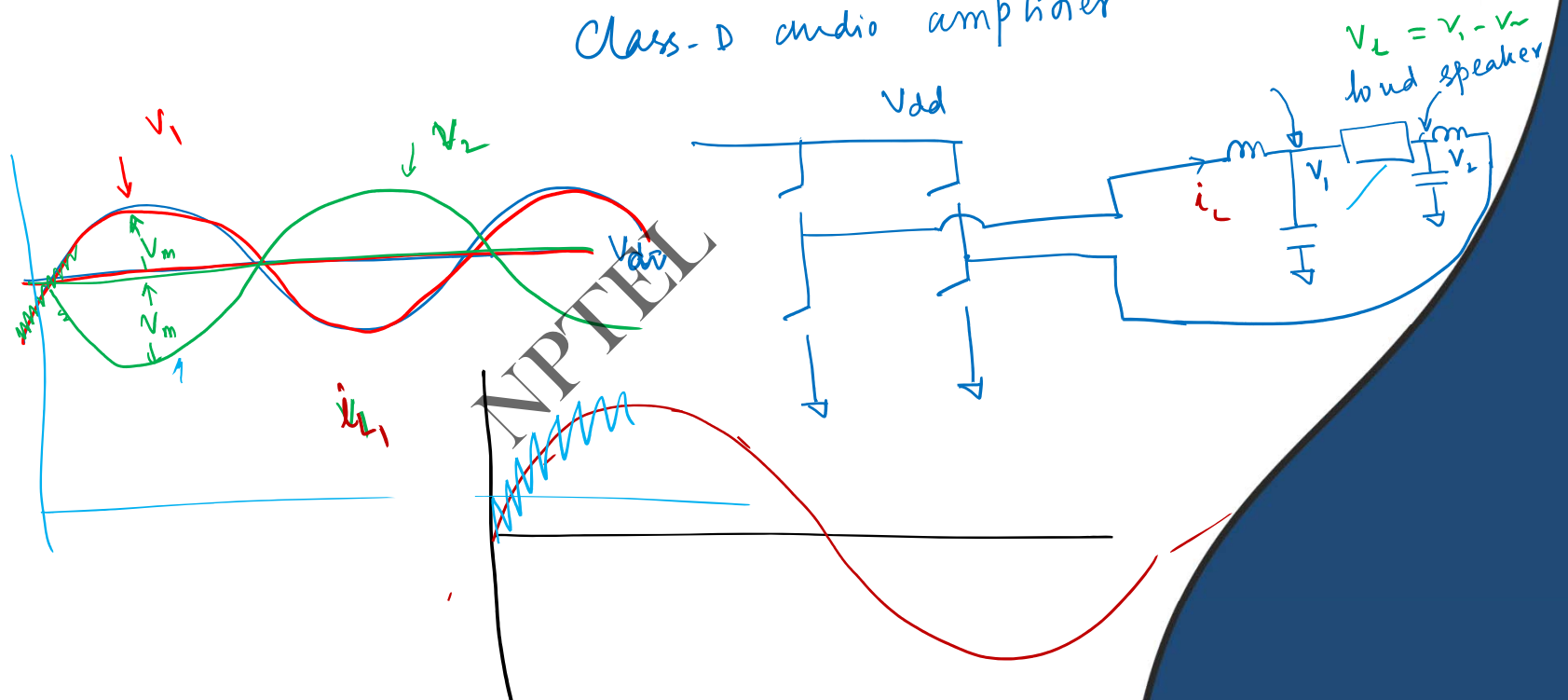
high duty ratio

5 to 3.3 V

4.2 - 3.3

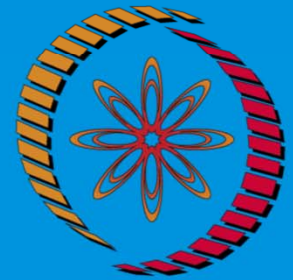
Digital current mode control methods for wide duty ratio applications

Class-D audio amplifier



CONCLUSION

- Summary of various digital CMC architectures
- Fixed frequency digital CMC using uniform sampling
- Variable frequency digital CMC using event-based sampling
- Applications of various digital CMC methods – discussions



**THANK
YOU !**