NPTEL ONLINE CERTIFICATION COURSES

DIGITAL CONTROL IN SMPCs AND FPGA-BASED PROTOTYPING

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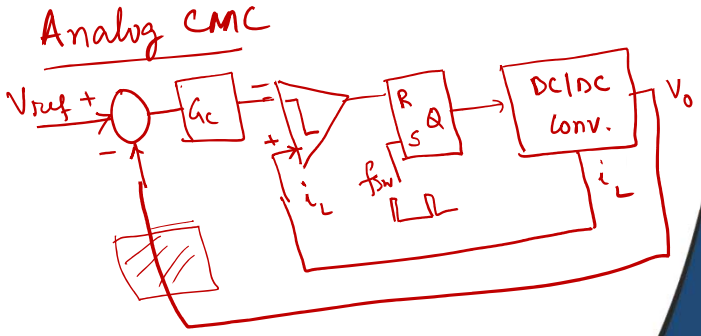
Module 02: Fixed and Variable Frequency Digital Control Architectures

Lecture 15: Overview of Fixed Frequency Current Mode Control Architectures

CONCEPTS COVERED

- Overview of fixed frequency current mode control architectures
- Summary of mixed-signal current mode control architectures
- Summary of fully digital current mode control architectures

Digital Current Mode Control Architectures



Digital CMC Architectures

(Voltage-loop digital)

Current-loop in analog domain

Mixed-signal CMC

- Peak CMC
- Valley CMC

Average CMC

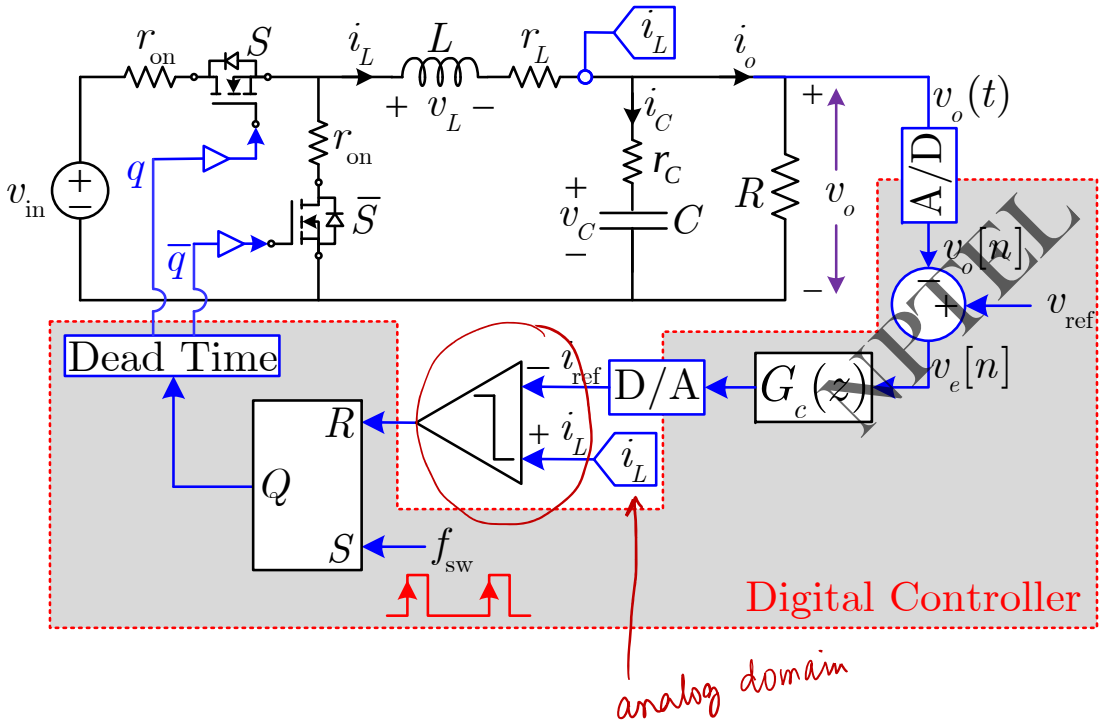
Current-loop in digital domain

Fully Digital CMC

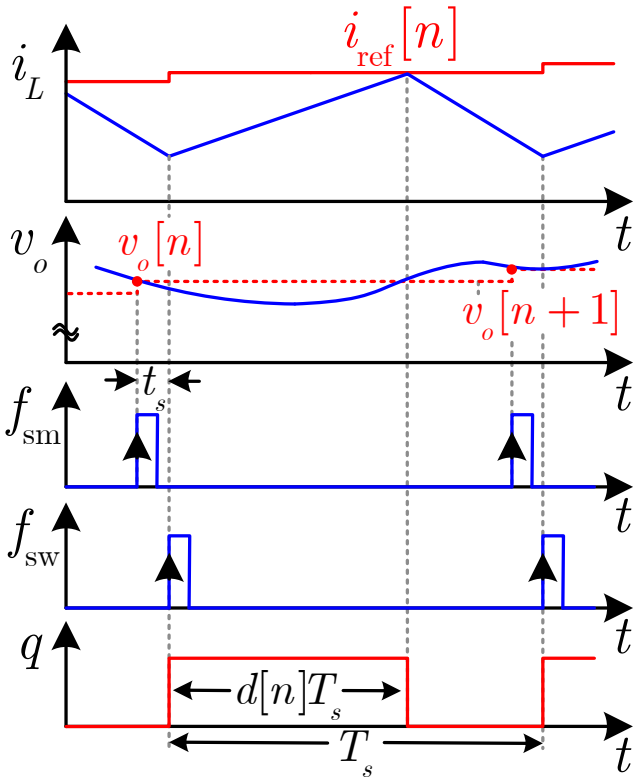
- Peak CMC
- Valley CMC

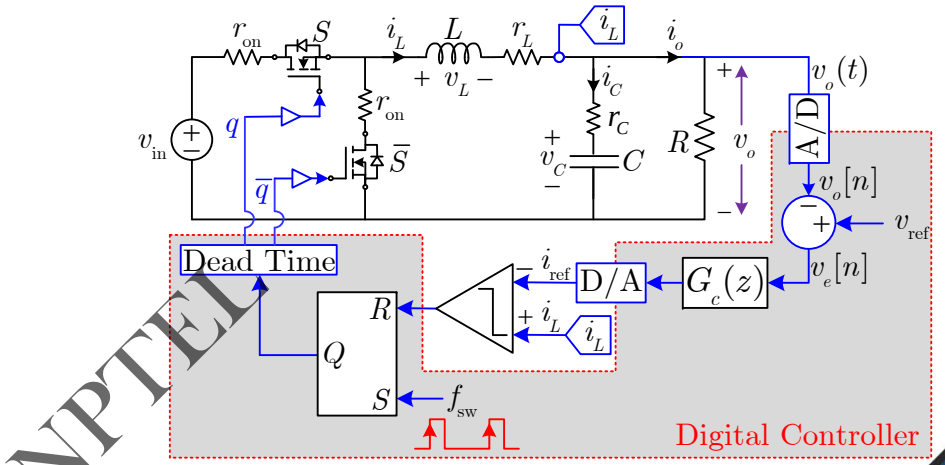
Average CMC

Peak CMC in Mixed-signal Implementation



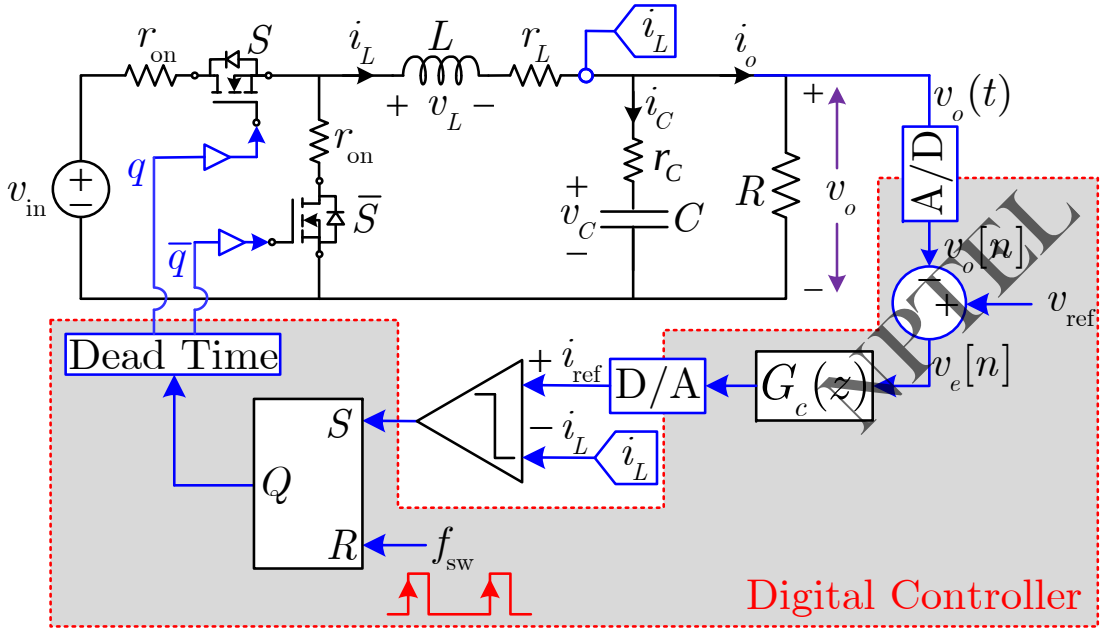
Peak CMC in Mixed-signal Implementation (contd…)



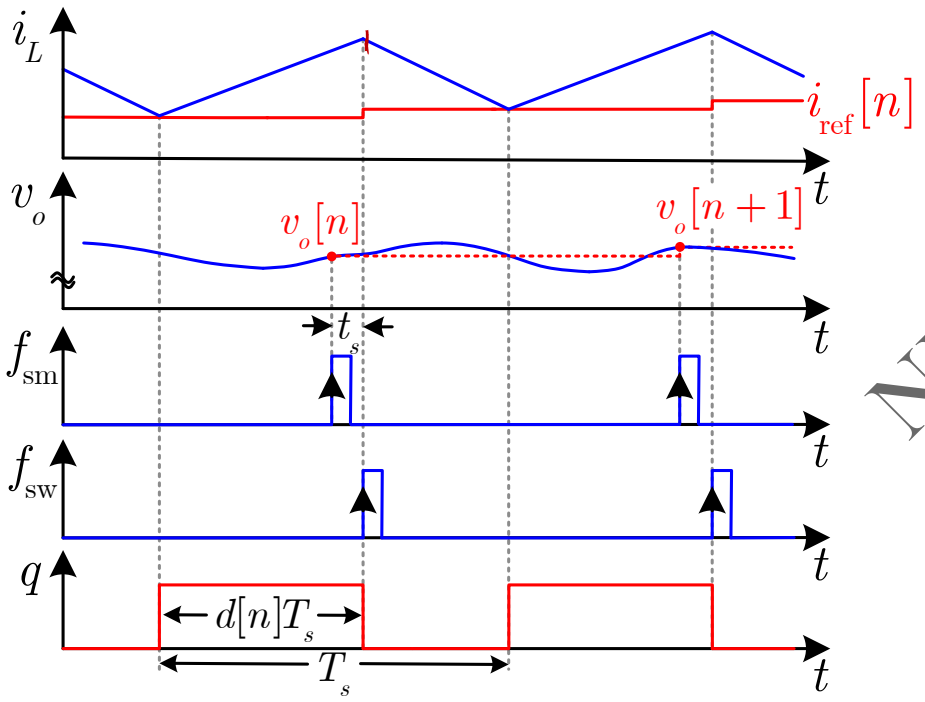


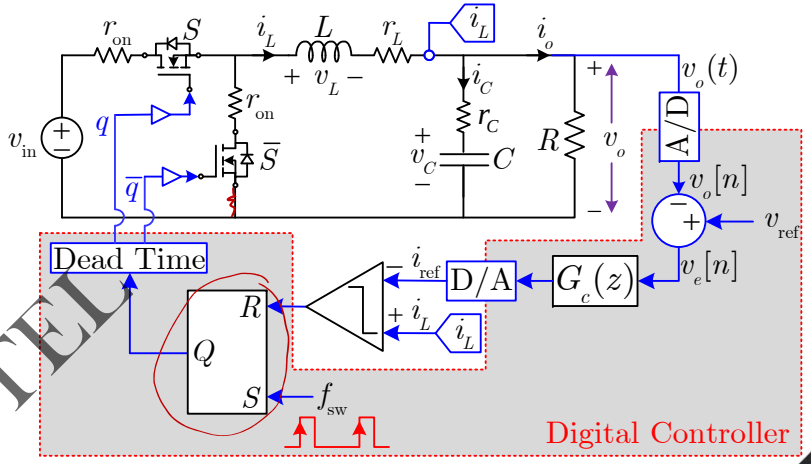
- Trailing-edge modulation with interval-2 sampling

Valley CMC in Mixed-signal Implementation



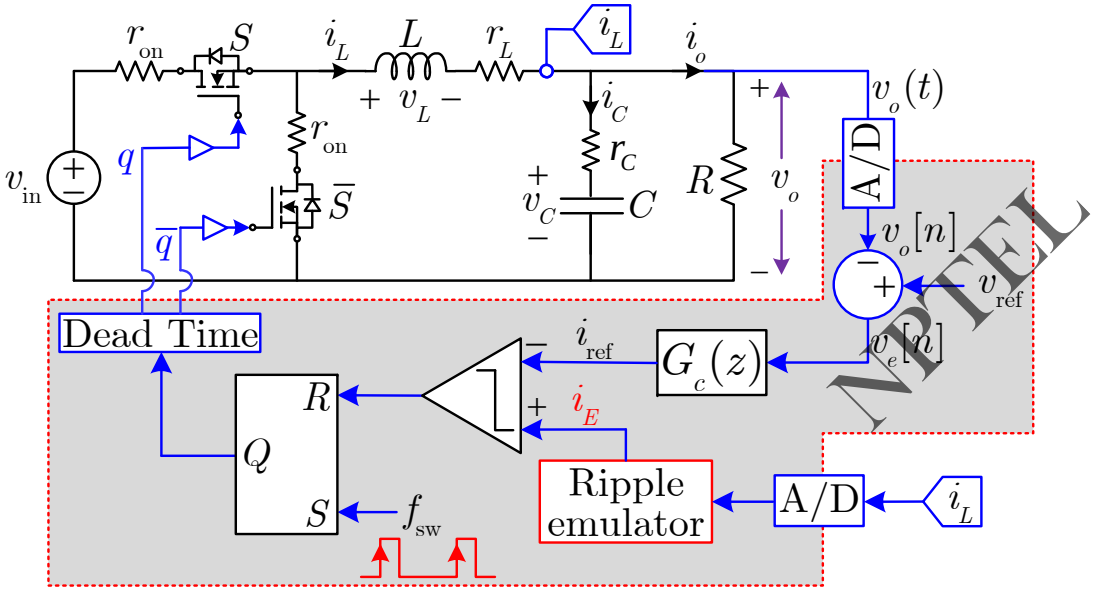
Valley CMC in Mixed-signal Implementation (contd…)



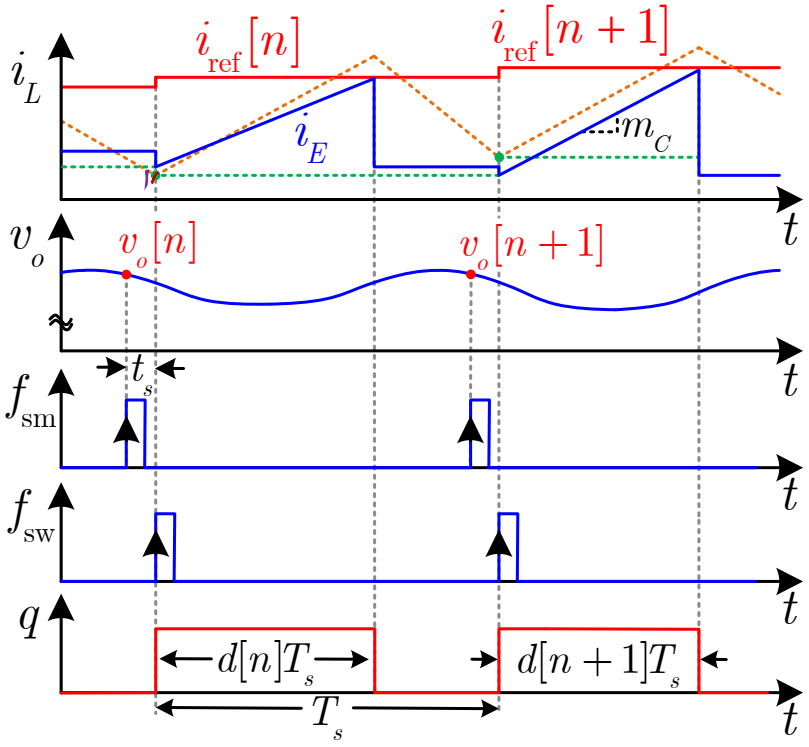


- Leading-edge modulation with interval-1 sampling

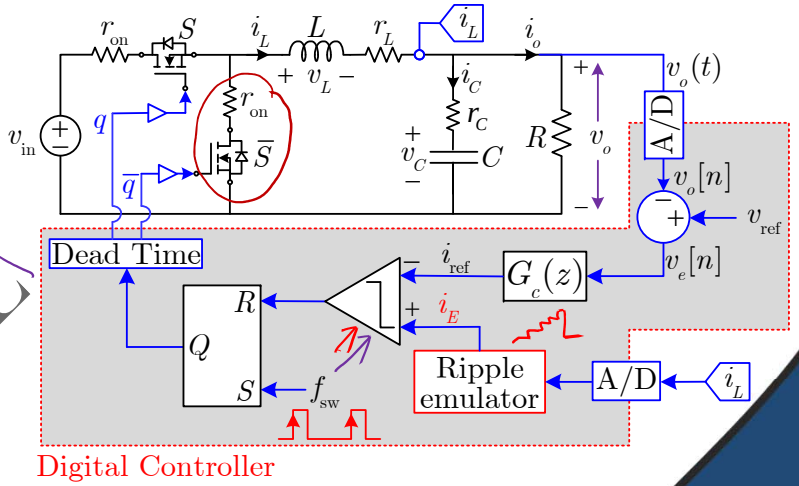
Fully Digital Peak CMC Architecture



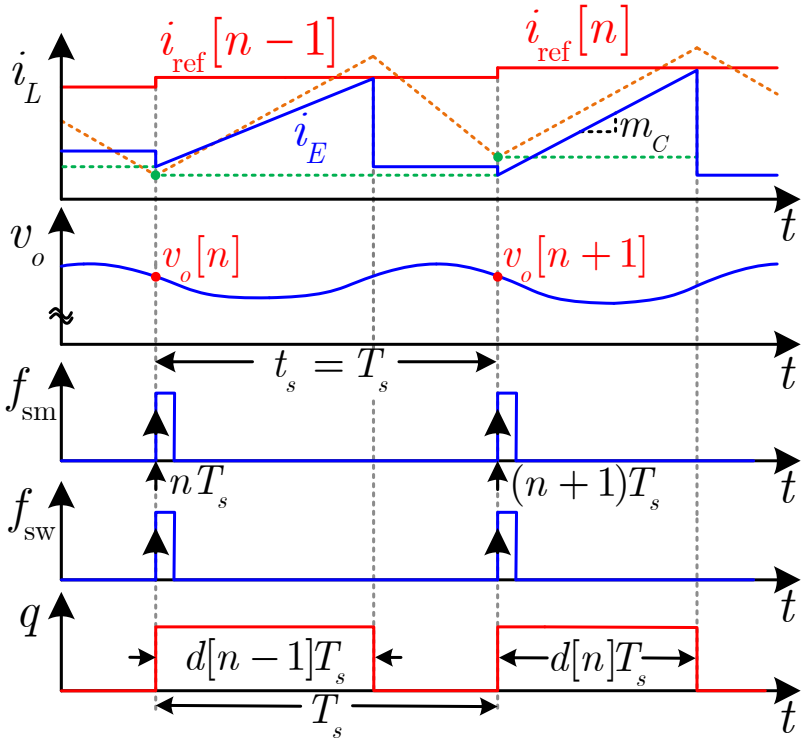
Fully Digital Peak CMC Architecture (contd…)



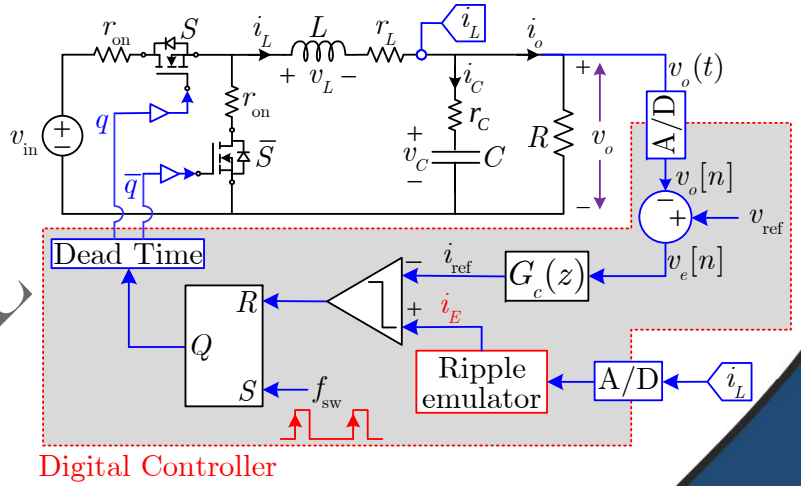
Uniform Sampling



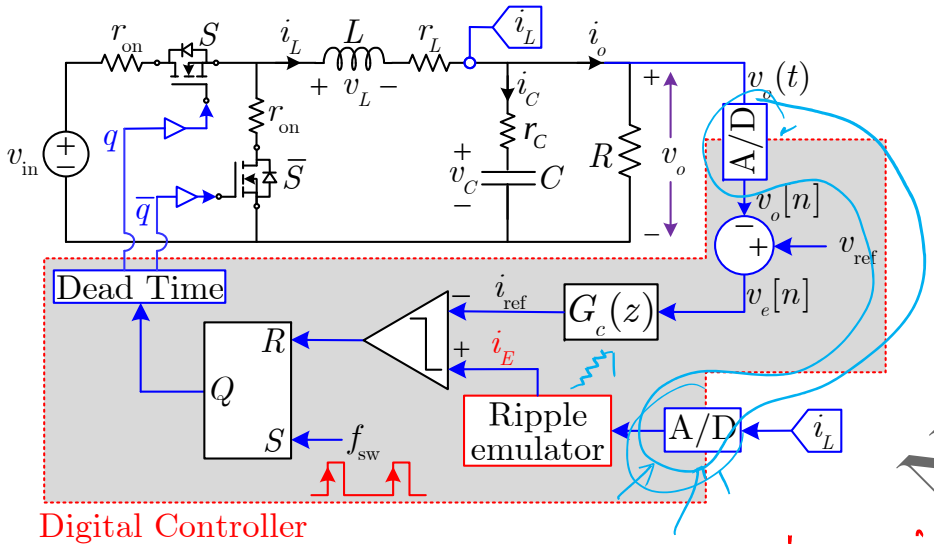
Fully Digital Peak CMC Architecture (contd…)

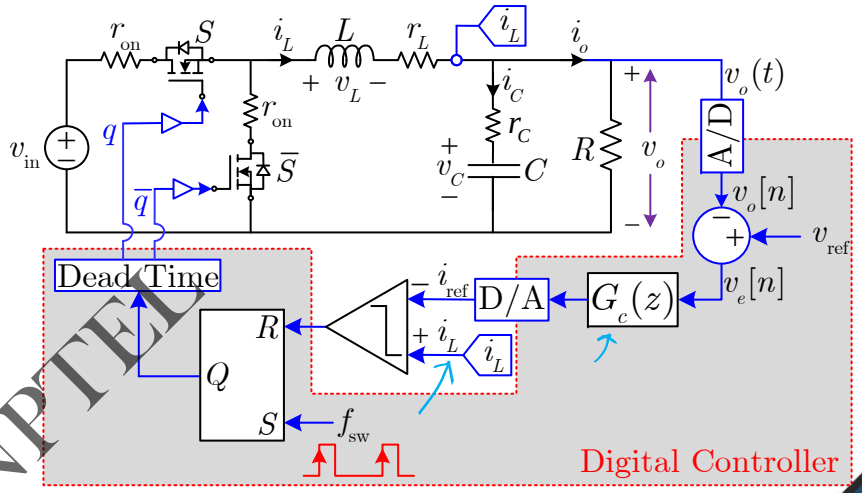


Uniform Sampling with one cycle delay



Fully Digital vs Mixed-Signal Peak CMC Architecture





Fully Digital peak CMC

Mixed-Signal peak CMC

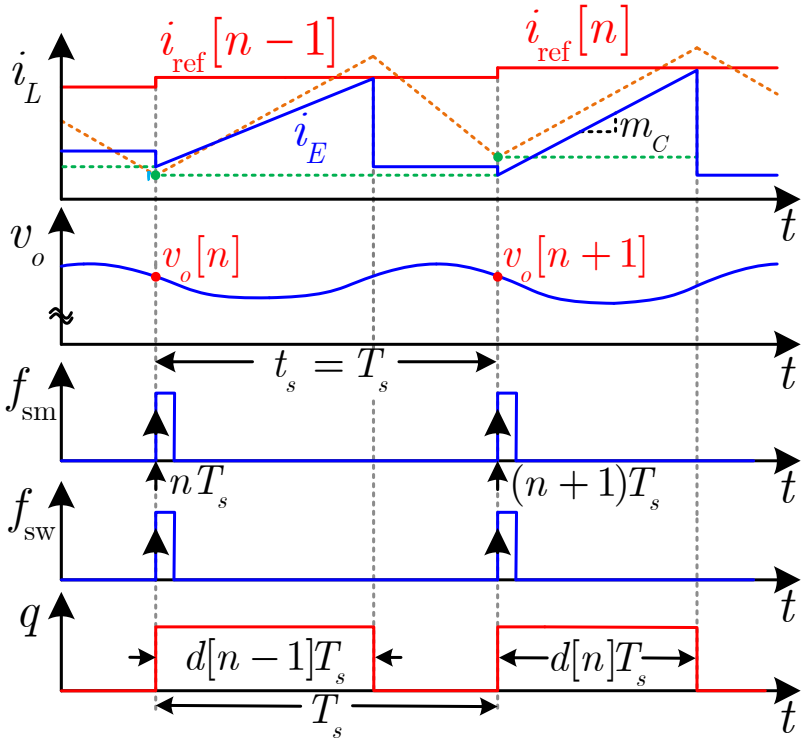
Low side current sense

Peak CMC

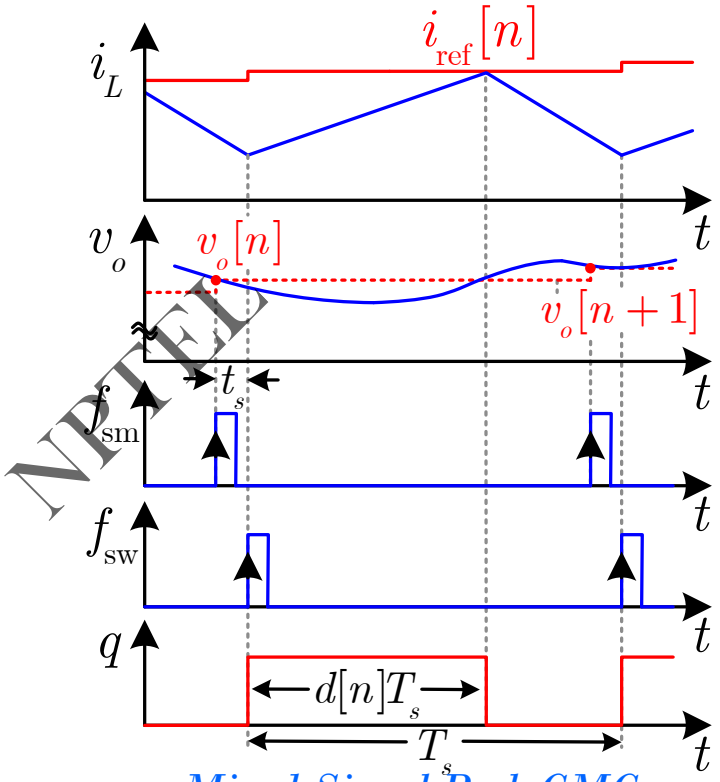
Valley CMC

Valley CMC

Fully Digital vs Mixed-Signal Peak CMC



Fully Digital Peak CMC



Mixed-Signal Peak CMC

CONCLUSION

- Overview of fixed frequency current mode control architectures
- Summary of mixed-signal current mode control architectures
- Summary of fully digital current mode control architectures

THANK YOU !