

DC DC Converters meets the FPGA

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Start with some Quotes

Nobody trust a computer simulation except the guy that did it, and everybody trust experimental data, except the guy who did it. Why not combine the two and get results everybody can mistrust a little.

Tony Kordyban

Hot Air Rises and Heat Sinks

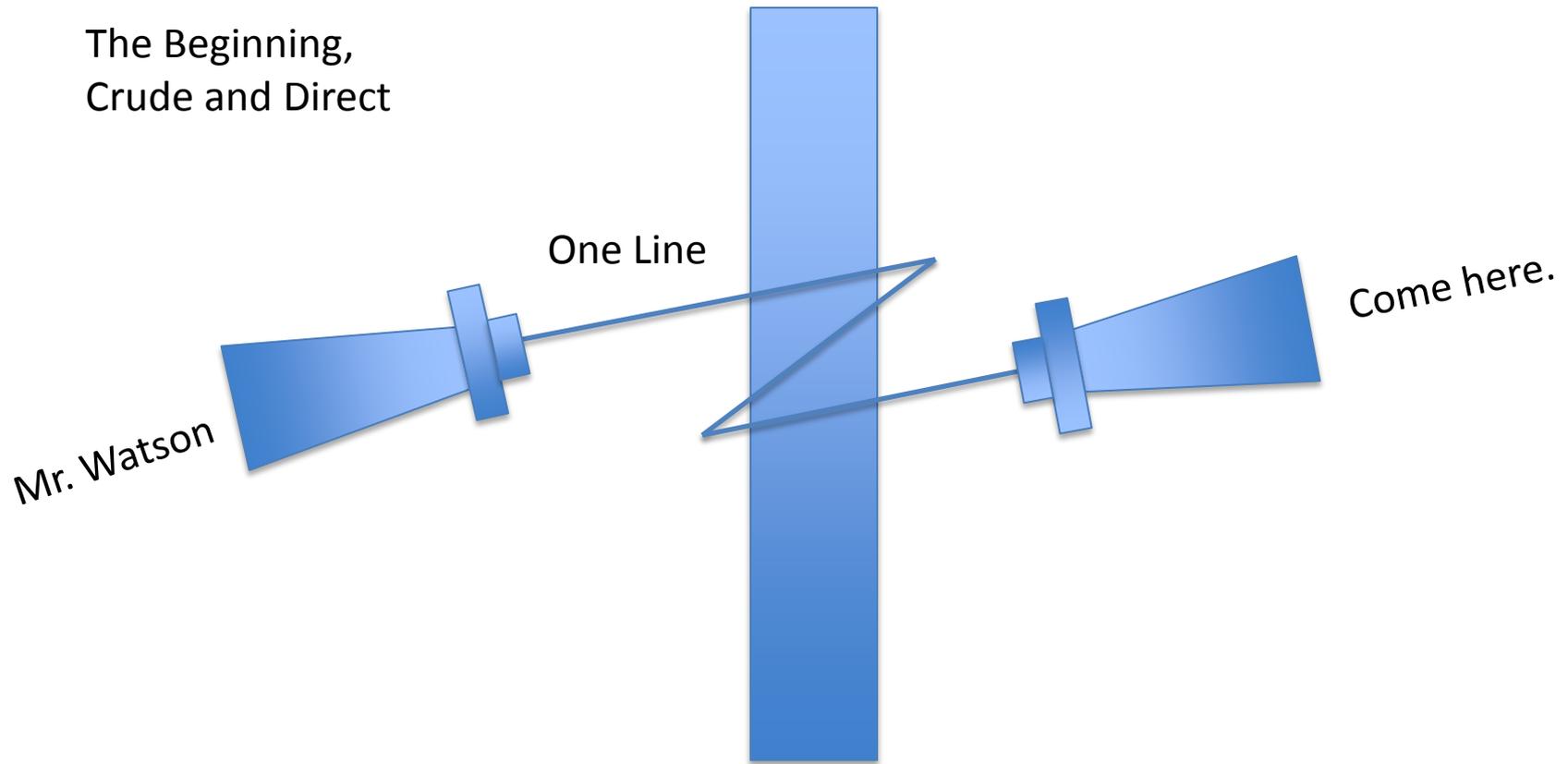
Start with some Quotes

If it were not for the FPGA, the DC DC Converter would be the number one problem on Center

So why not combine the FPGA and the
DC DC Converter for everyone to use,
and mis-use a little ?

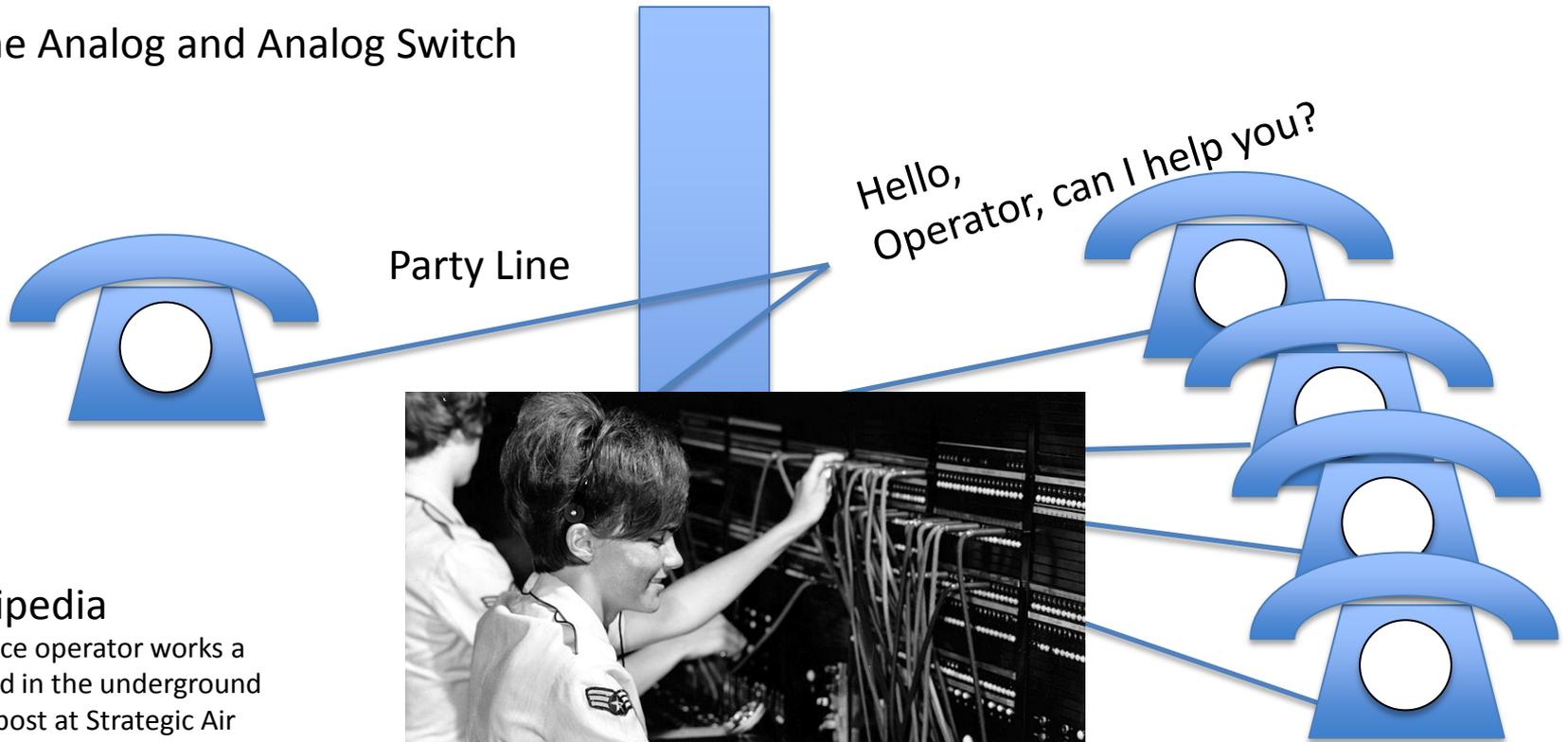
What can we gain?

Historical Note: A Lesson from the Phone Industry



Historical Note a Lesson from the Phone Industry

The Analog and Analog Switch



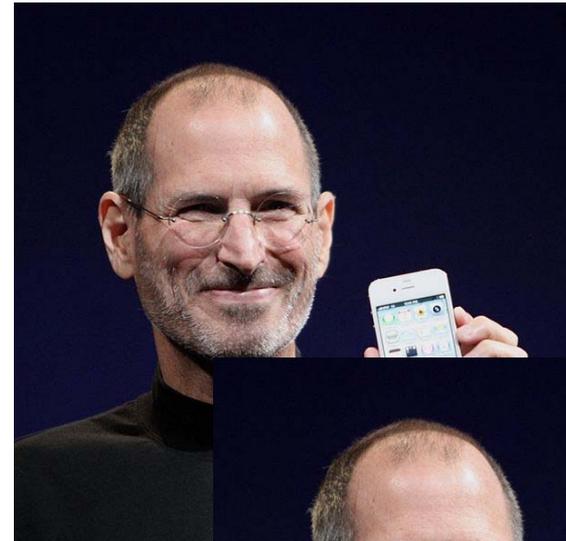
Wikipedia

U.S. Air Force operator works a switchboard in the underground command post at Strategic Air Command headquarters, Offutt Air Force Base, Nebraska in 1967.

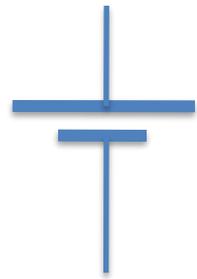


Historical Note a Lesson from the Phone Industry

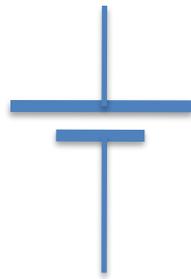
The Digital Phone



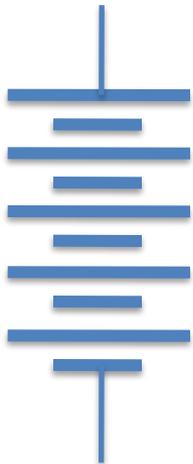
The Original Voltage Control



The Battery
1 Frog Leg
1.5 Volts



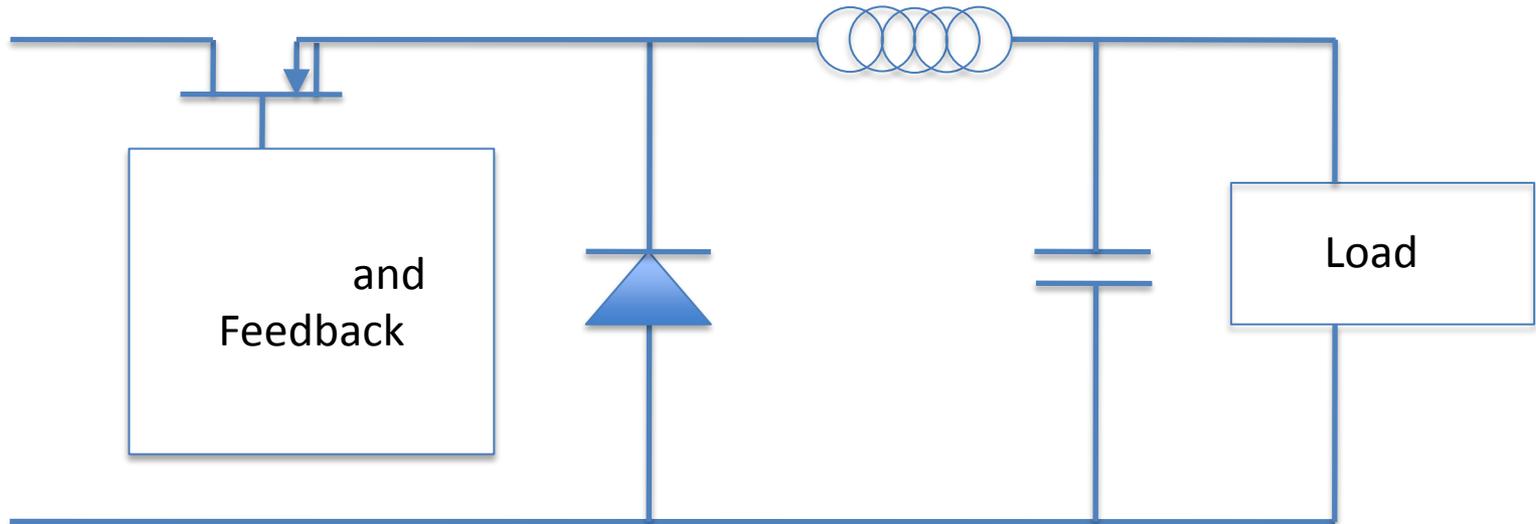
The Battery
Lead Acid
1.5 Volts



The Battery
More Voltage,
More Cells

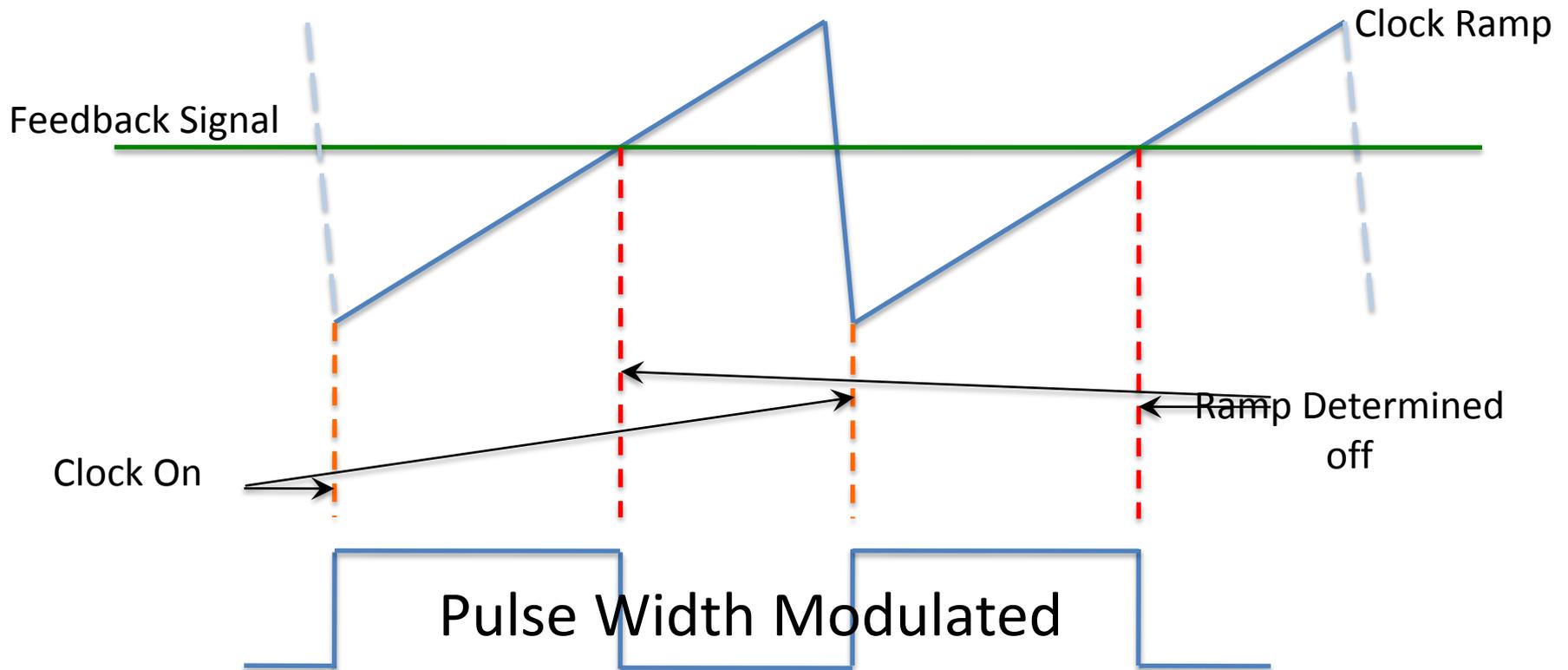
80 cells in series and you have enough for a
Neon Lamp Computer!

Buck Converter

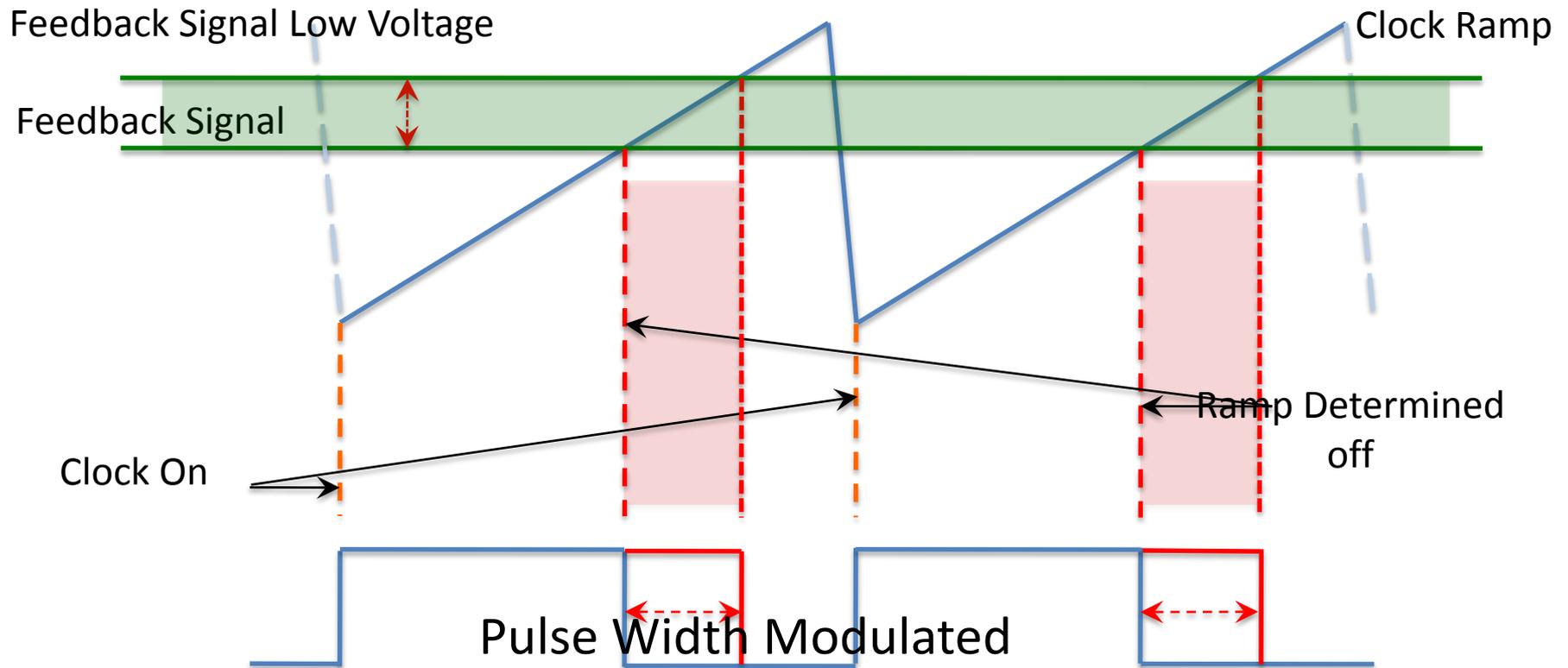


Quick Tutorial on DCDC Converters

Analog Feedback

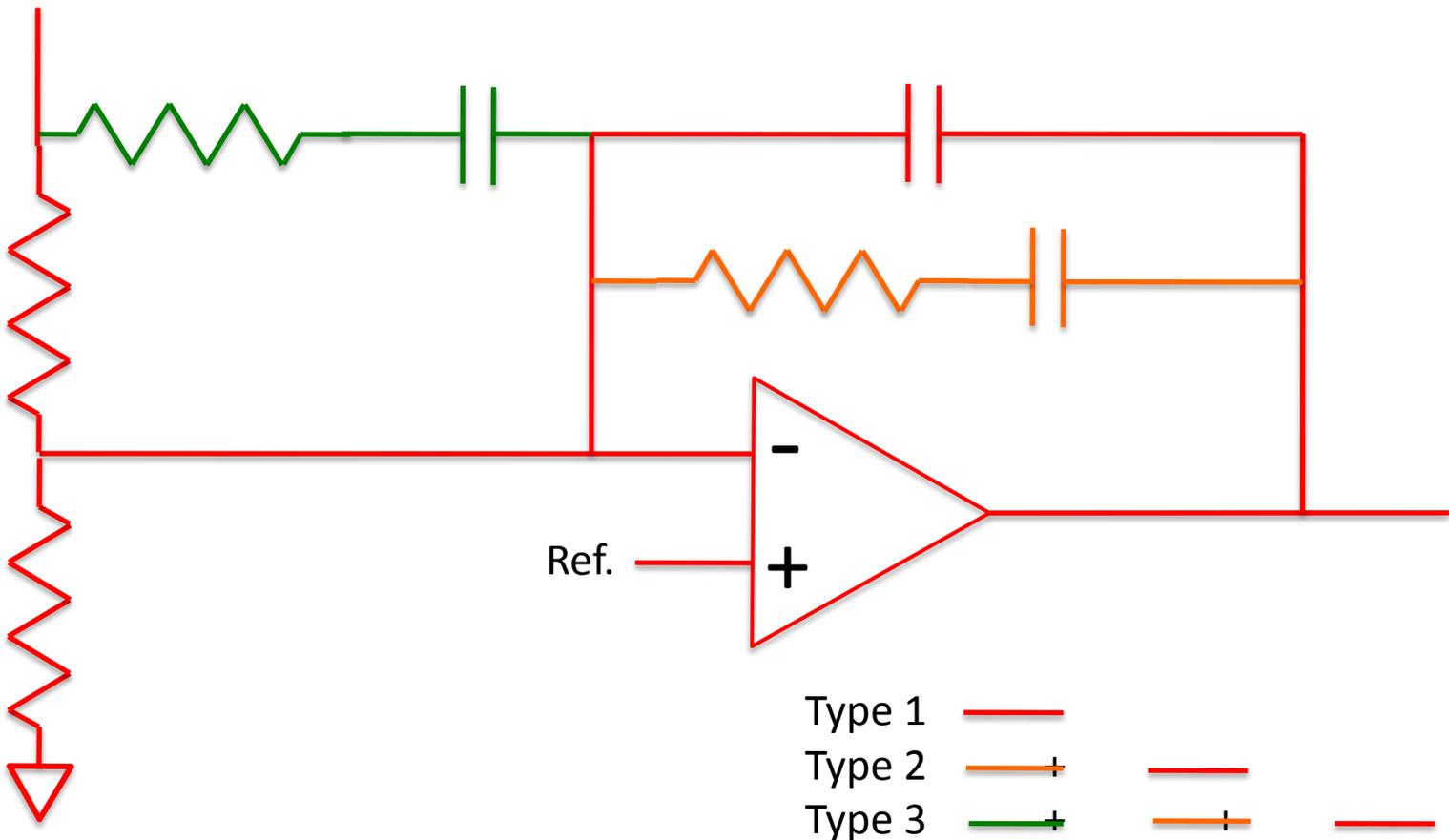


Quick Tutorial on DCDC Converters The PWM



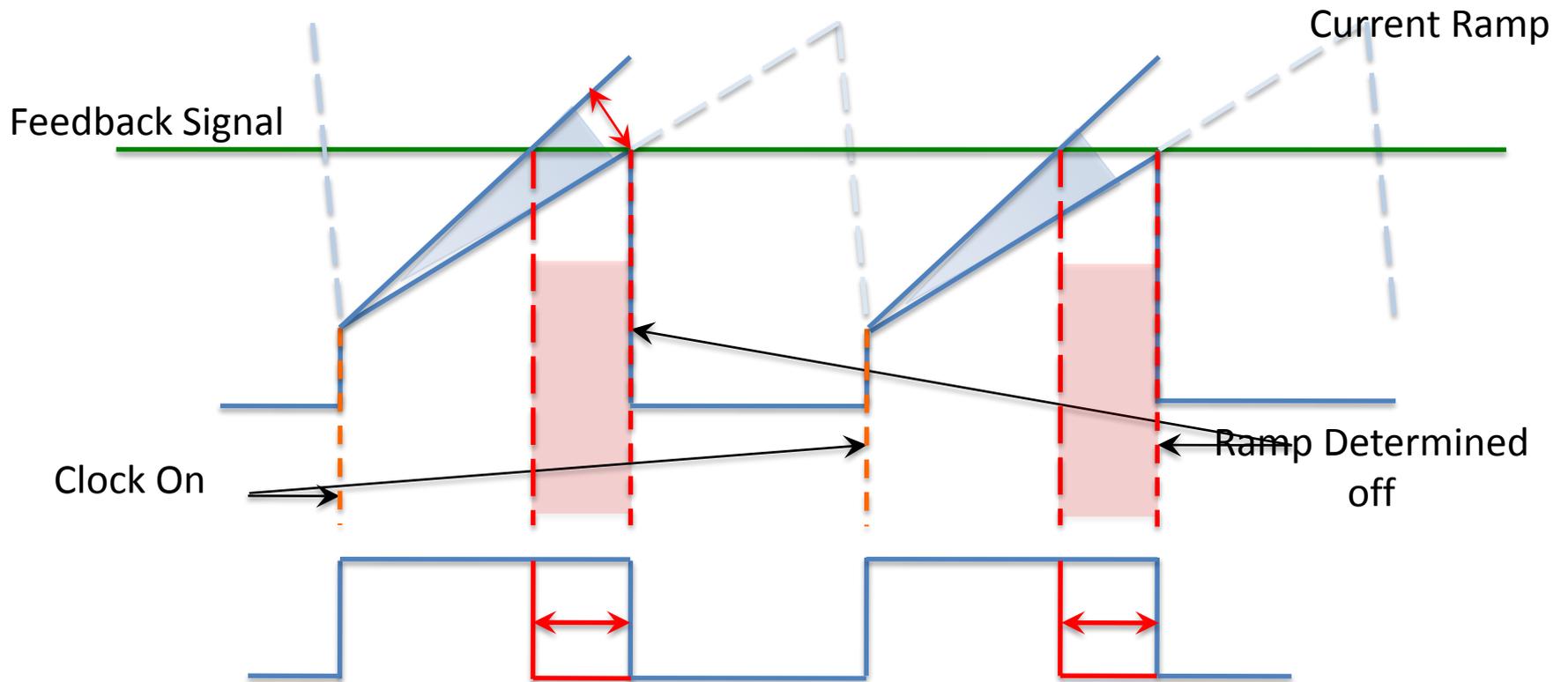
Controls - Active

Signal filtering (Feedback Loop Analog)



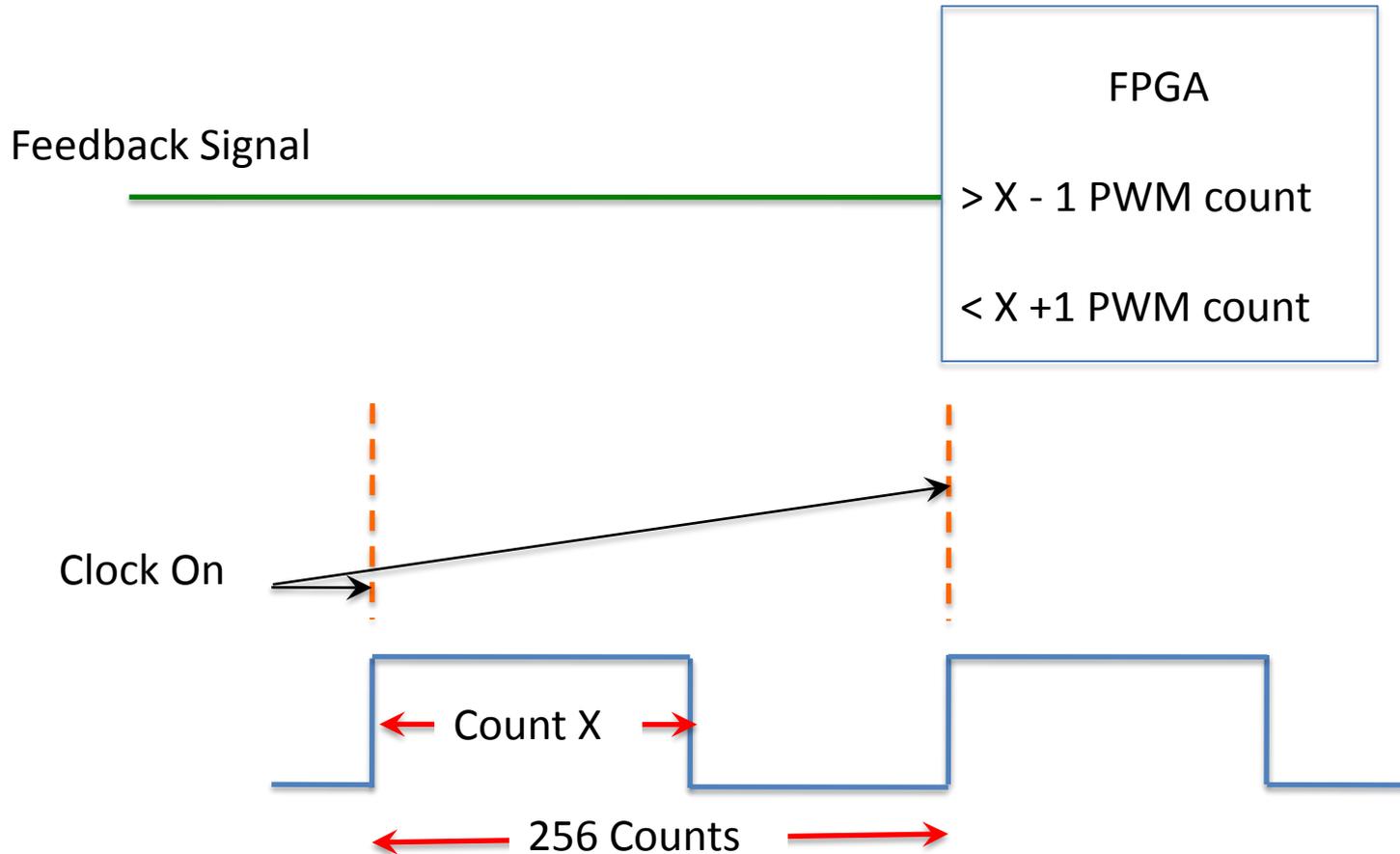
Quick Tutorial on DCDC Converters

Analog / Current Controlled Feedback



Quick Tutorial on DCDC Converters

Digital Feedback



FPGA Controls – Simple Passive

- Monitor Voltages
- Make adjustments in PWM.

For:

Lower voltage = $X - 1$ count

Same voltage = X

Higher voltage = $X + 1$ count

FPGA Controls - Active

FPGA joins TWITTER!

FPGA can talk to themselves.

FPGA Controls - Active

With self-monitoring, an FPGA could be able to ask for more power before normal feedback loop could respond, or even just before it needs it.

FPGA Controls - Active

With FPGA protection, circuits could be added with no extra parts.

Voltage Protection

Current Limiting

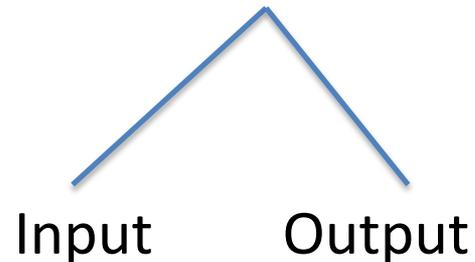
Power Correction

FPGA Controls - Active

Digital Filtering

Internal Noise Filtering

External Noise Filtering



FPGA could enable.

Active Noise Suppression

Use of Power Lines for Signal Lines

FPGA Control

We are now at the beginning

Where it will take us is at the moment unknown.