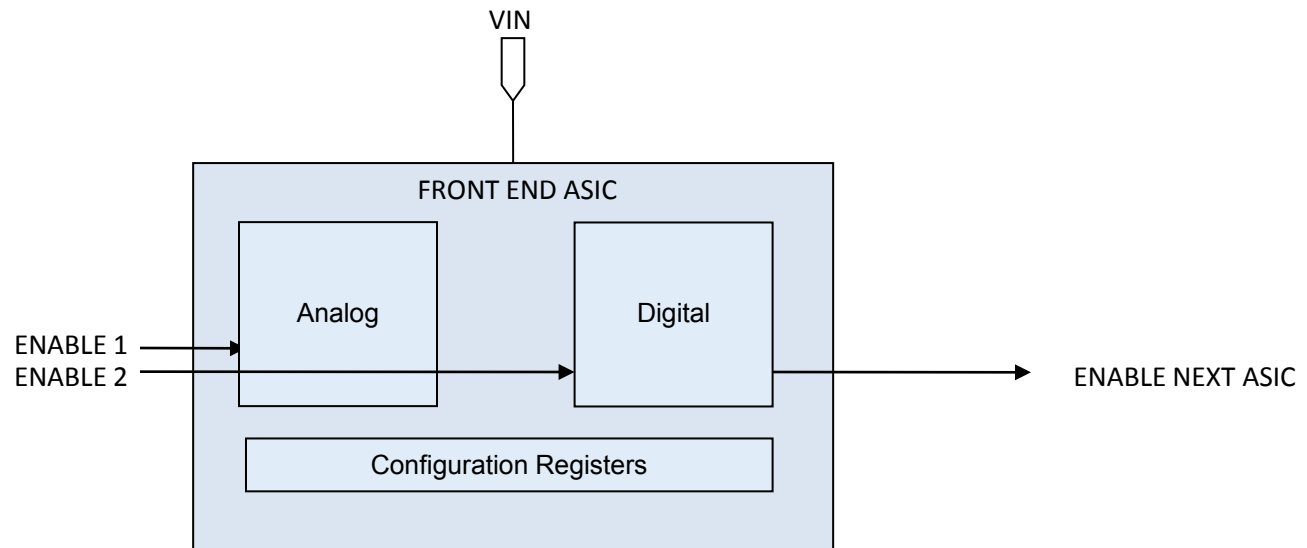


CLIC and ILC Power Distribution and Power Pulsing Workshop

Summary Document

- **Defining “Power Pulsing”.**
- **Power Pulsing Challenges (Marc).**
- **Main Schemes that were presented.**
- **How to test / What to test.**



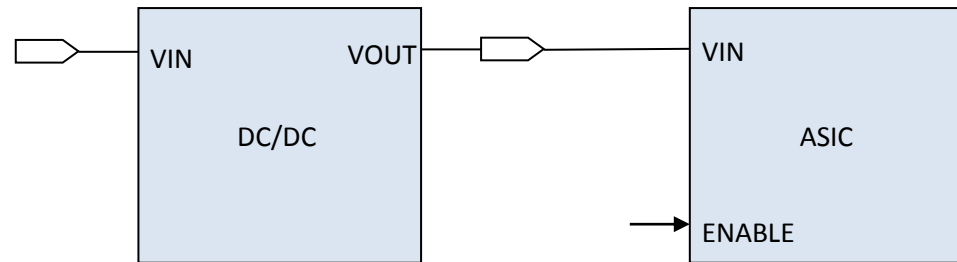
- **Enable/Disable of internal functions of FE ASICs to reduce current consumption.**
- **Analog and Digital Functions can be enabled independently.**
- **Configuration registers are always powered to avoid reconfigurations.**
- **Enable signals can be daisy chained for sequencing several ASICs.**

- **Mechanical system issues**
 - Mechanical stress due to Lorentz forces
 - Resonant vibration of wire-bonds
- **Electrical system issues**
 - induced voltage due to cable inductance (and IR drops)
 - Electromagnetic interference
- **Other**
 - severe mass constraints and lack of space for near chip and near module charge storage
 - severe mass constraints and lack of space for near module regulators and DC-DC converters
 - radiation effects on electronics

- **With DC to DC Converters**
- **With LDO regulators and BestCaps/SuperCaps.**
- **Constant current source and storage caps + LDO/DCDC**
- **In serial powering configuration.**

- With DC to DC Converters

VIN is constant
 $I_{IN} < I_{OUT}$, it follows the load current variations.



VOUT is constant,
independently of the load current.
 $V_{OUT} < V_{IN}$

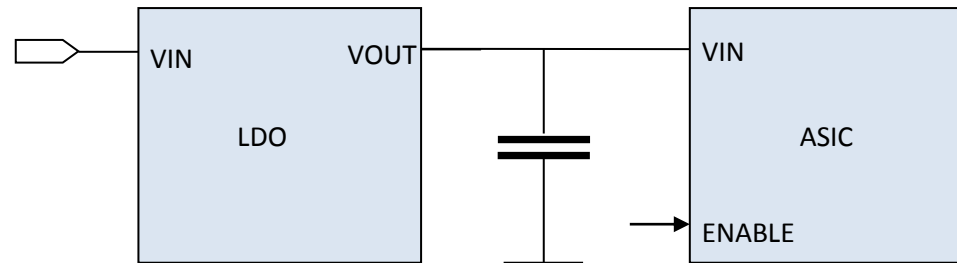
$$D = \frac{V_{OUT}}{V_{IN}}$$

$$I_{IN} = I_{OUT} \cdot D$$

- ENABLE function implemented at FE ASIC
- Turn on/off times of FE Power Pulsed Function Blocks.
- DCDC follows the load current variations.

- With Regulators

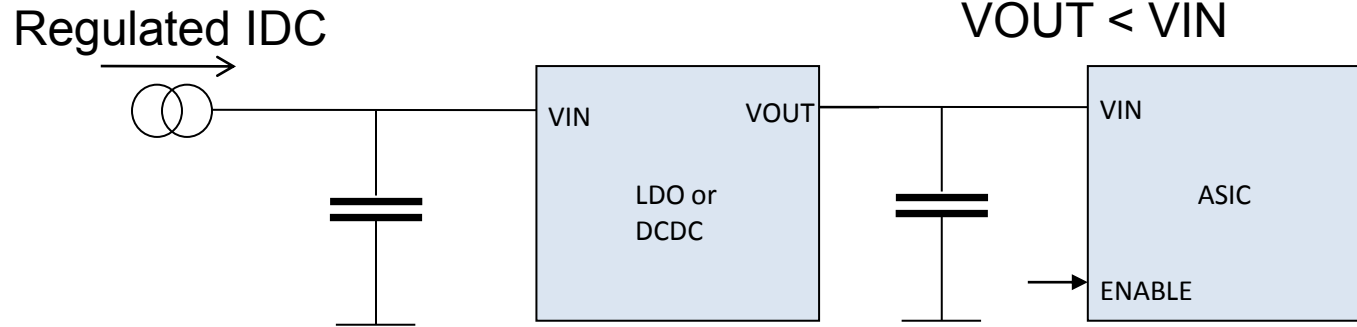
VIN is constant
 $I_{IN} = \langle I_{load} \rangle$,
 no peak current
 at input.



VOUT is constant,
 independently of the load
 current.
 $V_{OUT} < V_{IN}$

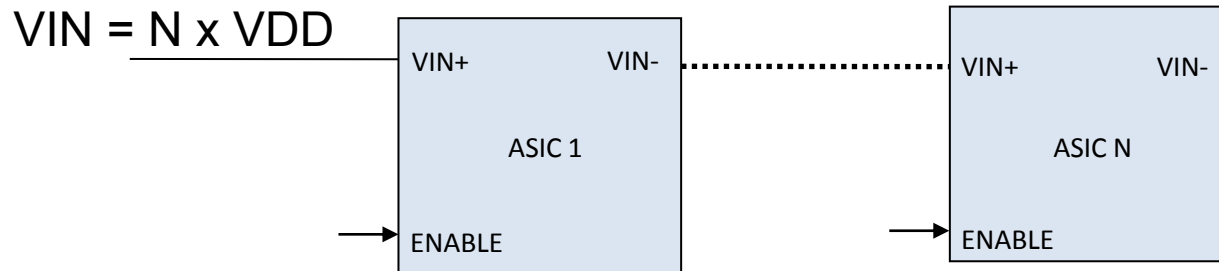
- ENABLE function implemented at FE ASIC
- Turn on/off times of FE Power Pulsed Function Blocks.
- The LDO is unable to deliver the peak current.
 - The transient charge is delivered by a storage capacitor

- With constant current source



- Keep input current low and stable, energy in first storage cap
- LDO or DCDC to deliver FE voltage with power peak capability
 - Eventually with output storage cap?

- Serial Powering



V_{OUT} is constant,
independently of the load
current.
 $V_{OUT} < V_{IN}$

- High Voltage on V_{IN} , constant current, shunt regulators.
- Load current variations regulated by shunt regulator in ASICs
 - Does not lead to reduced power: the current is just shunted in a resistor.
- Combination with storage caps might be considered.

- Lab condition testing using active loads instead of detectors
 - DCDC dynamic behavior with peak transient currents
 - Dynamic studies of LDO/BestCap behavior.
 - Optimized configurations can after that be tested on real setups.

- What are the real setups available for these tests?