Serial Power & Protection ASIC for 1 to 2.5V Hybrid Operation

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Mitch Newcomer

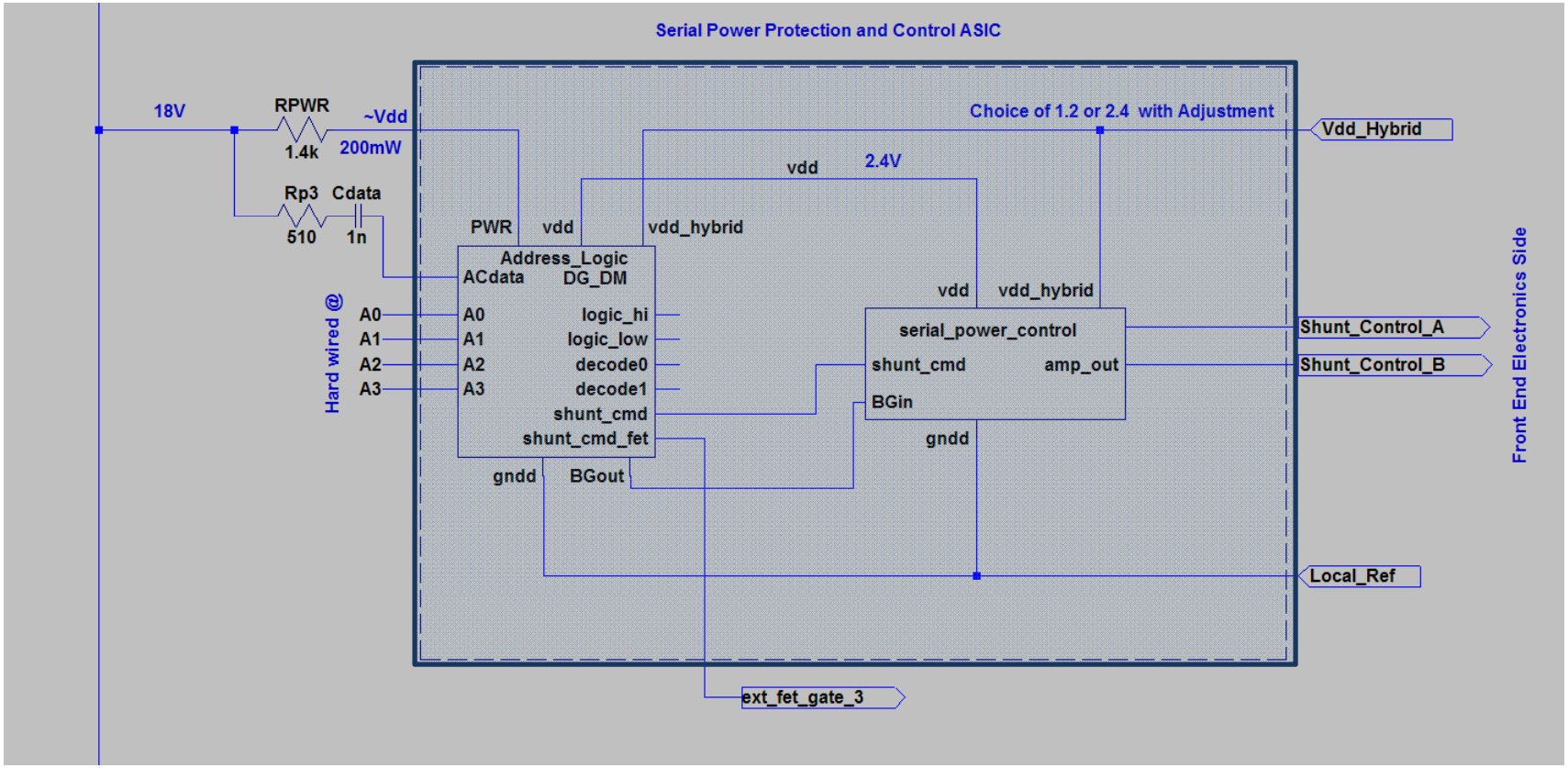
Nandor Dressnandt

Serial Power and Protection ASIC

Independently powered remote and local SP control.

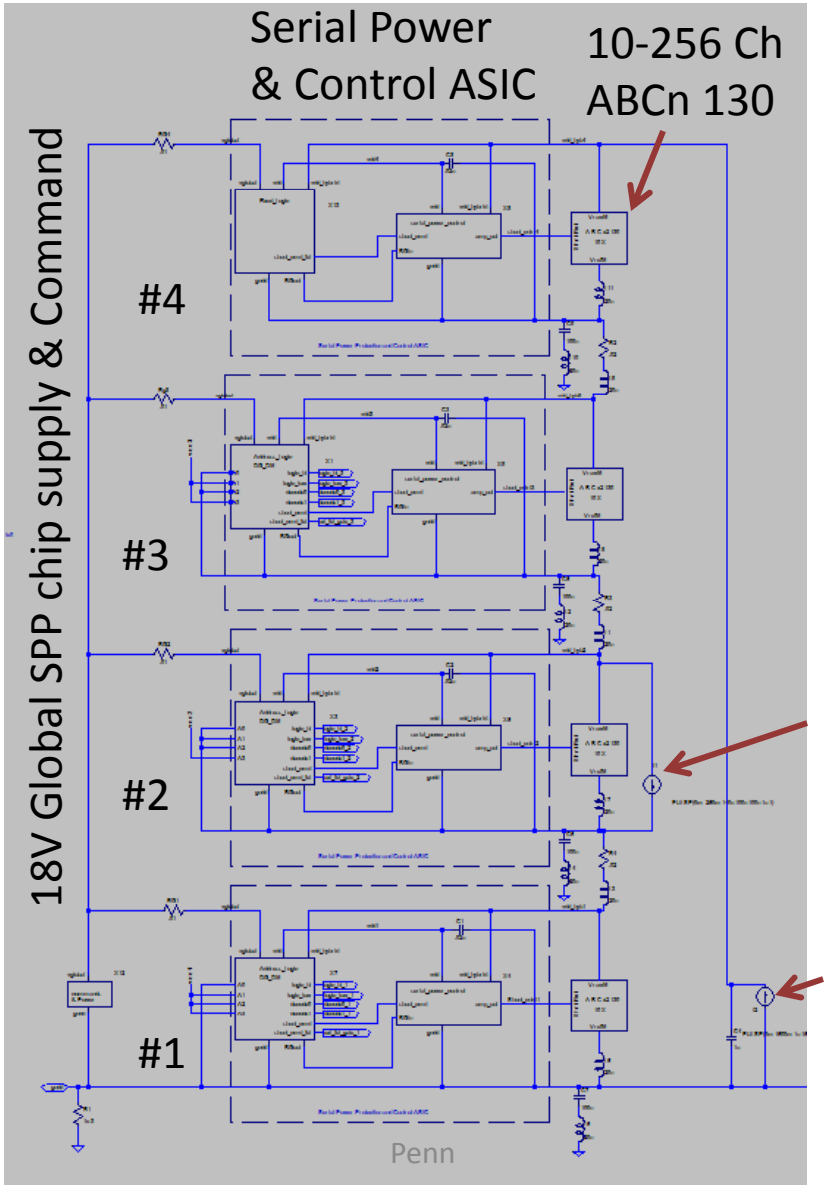
- Addressable "off" "on" commands by hybrid.
  - Expandable command set.
- Local Band Gap for autonomous hybrid regulation.
- Single Line for power and command.
- Provides control for distributed shorting and shunt regulation. Robust against single device failures.
- Autonomous hybrid shut-down on Over V condition.

Serial Power & Protection Block

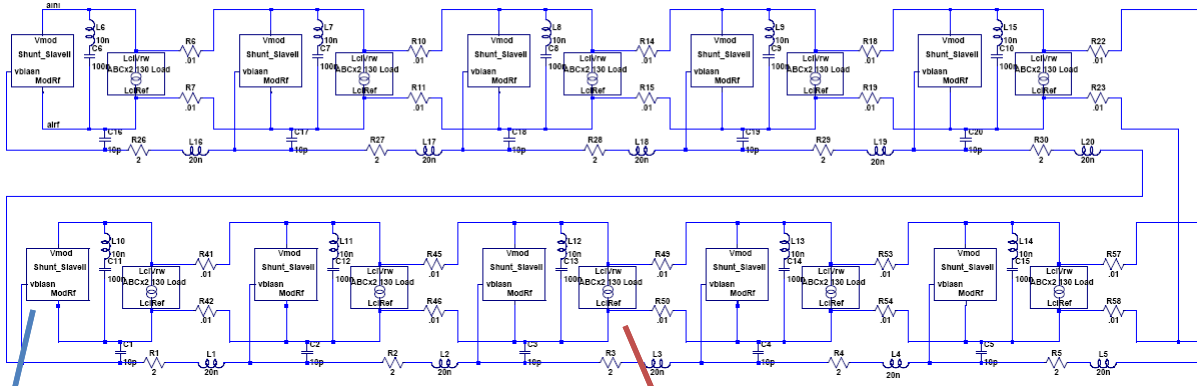


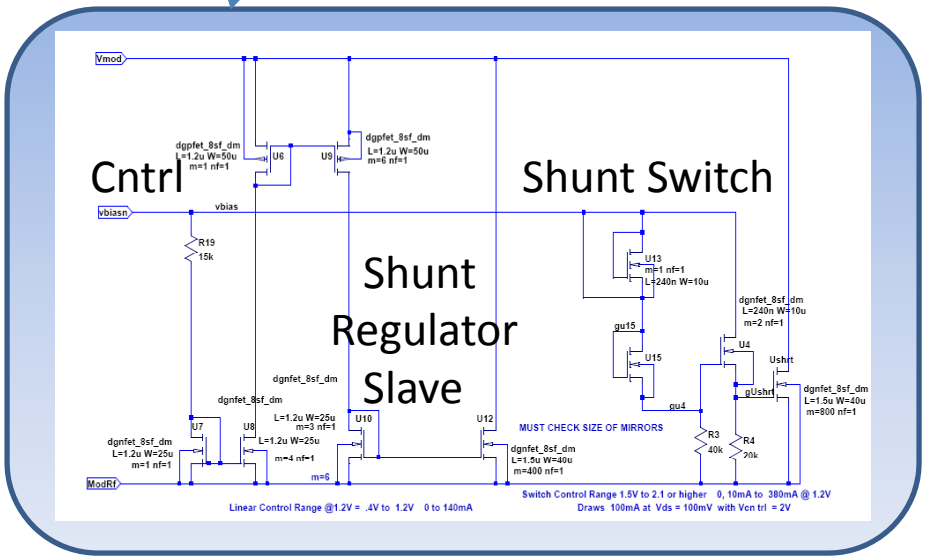
** “External FET gate” to accommodate Shutdown mode when used with ABCn

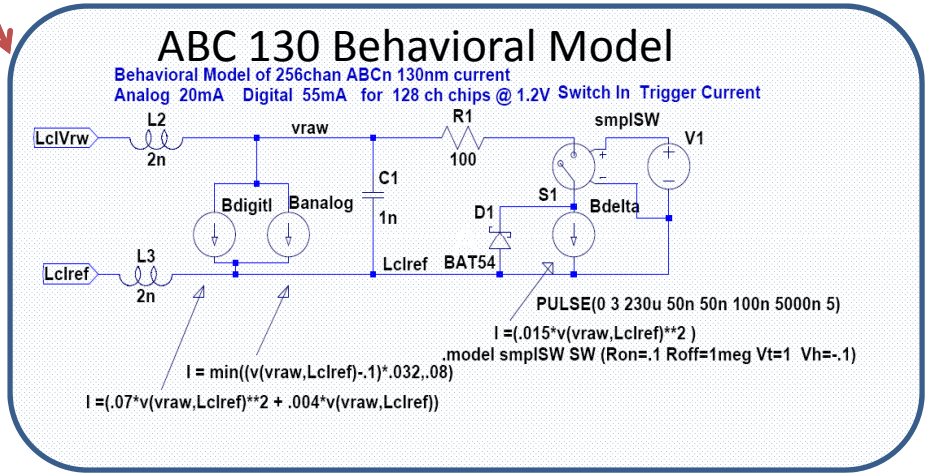
Four Module Serial Powered Hybrid Sim Model



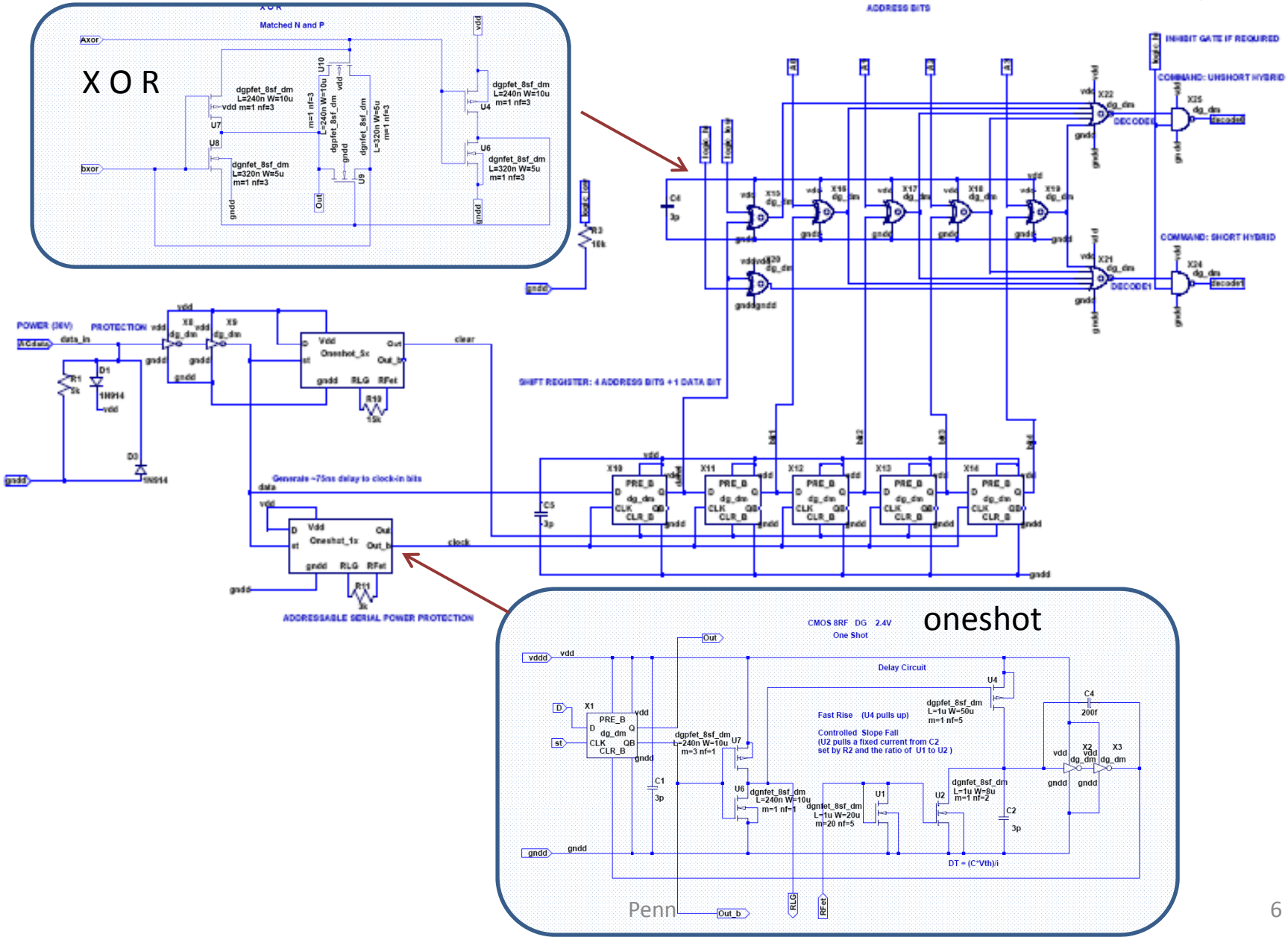
Ten 256 ch ABCn 130nm







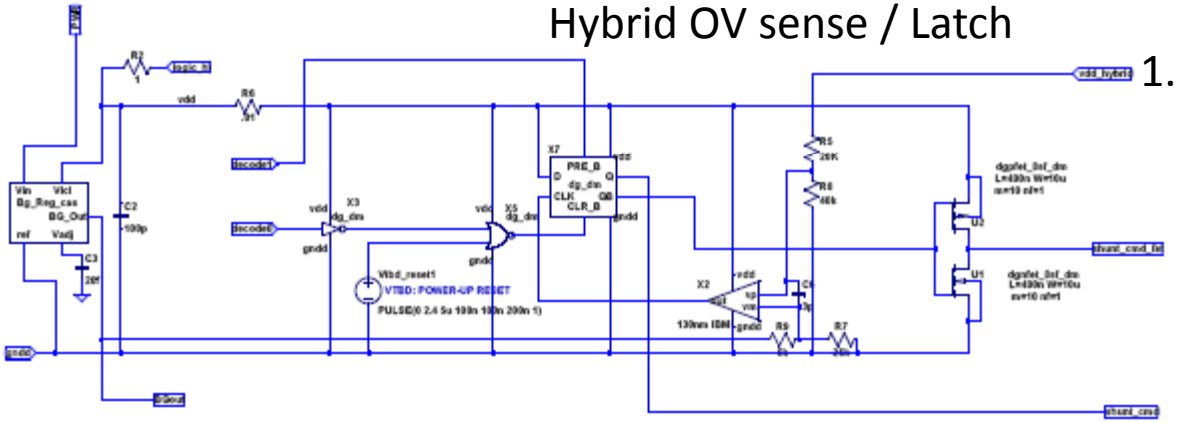
Serial Power & Protection (2.4V) Logic



Bandgap Shunt Regulator Hybrid OV sense

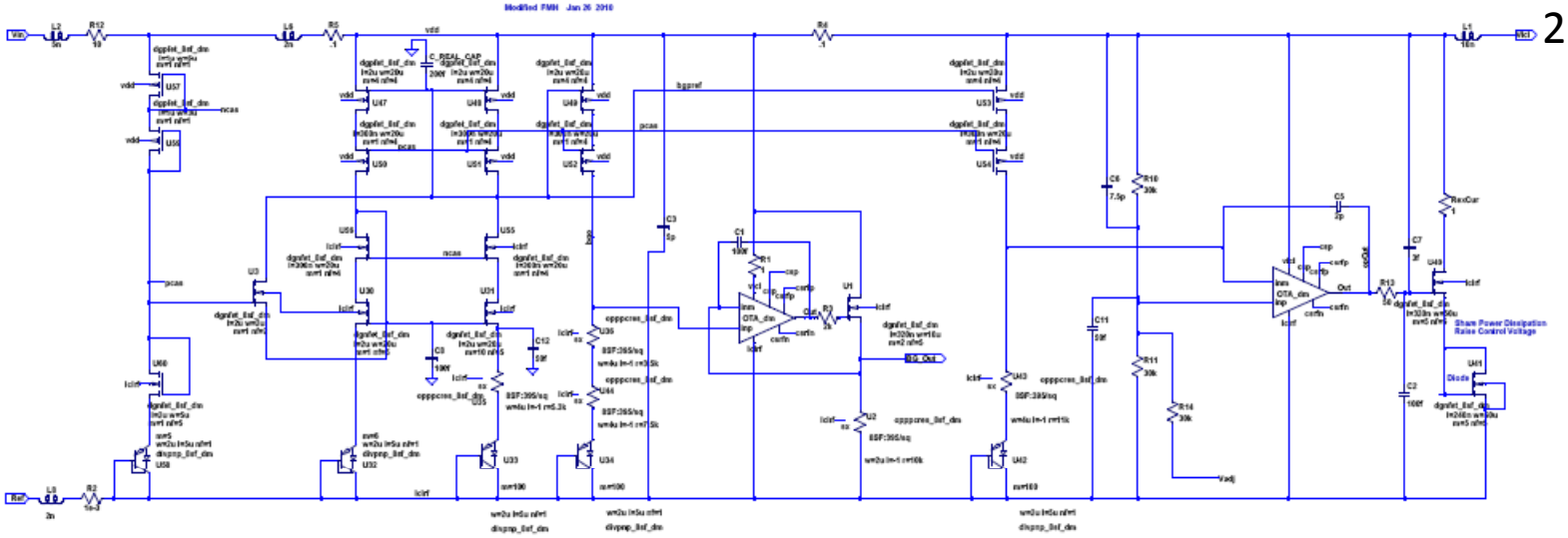
Hybrid OV sense / Latch

1.2V or 2.4V

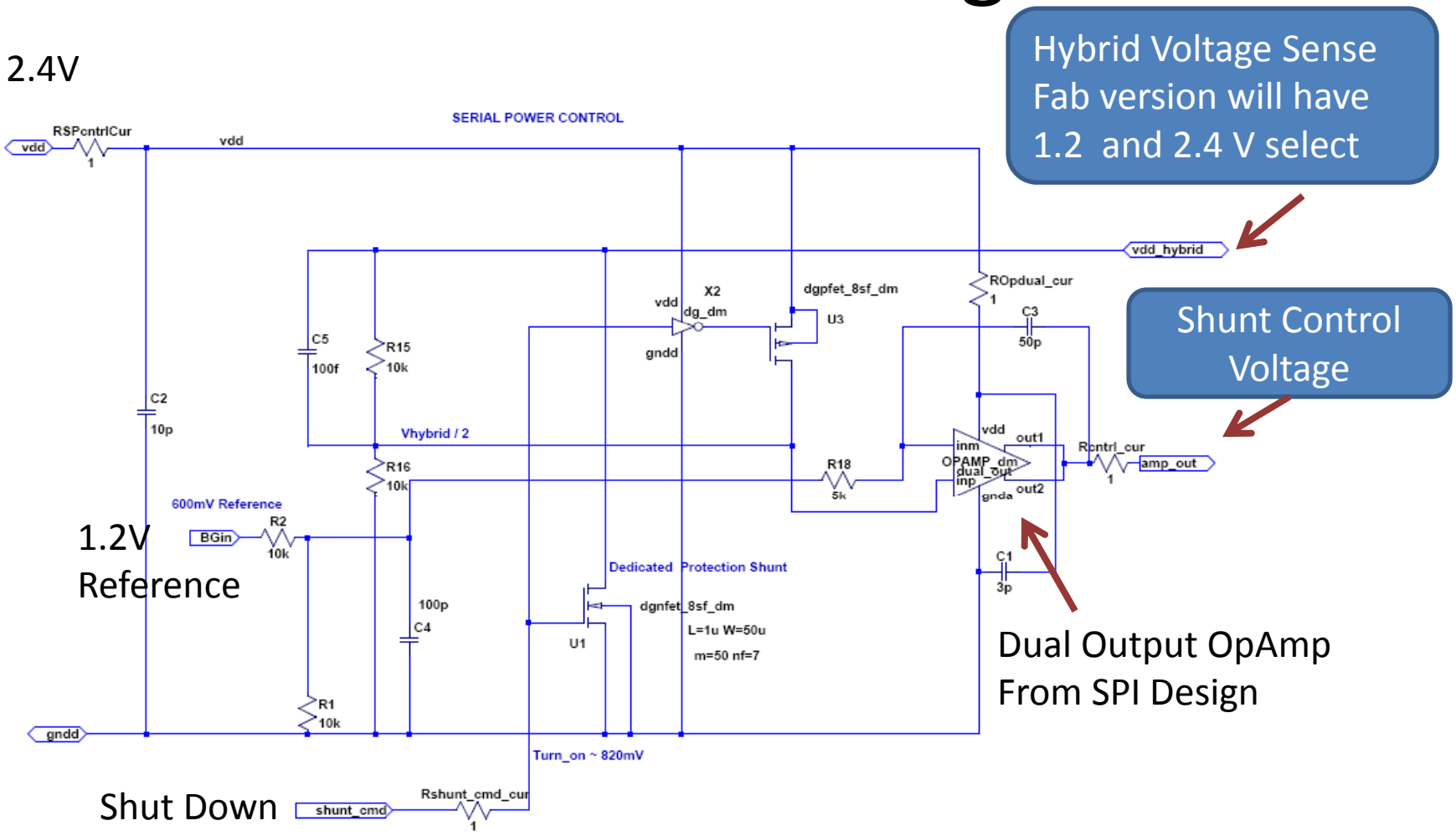


SPP Bandgap Regulator with Buffered output

2.4V



Serial Power Shunt Regulation

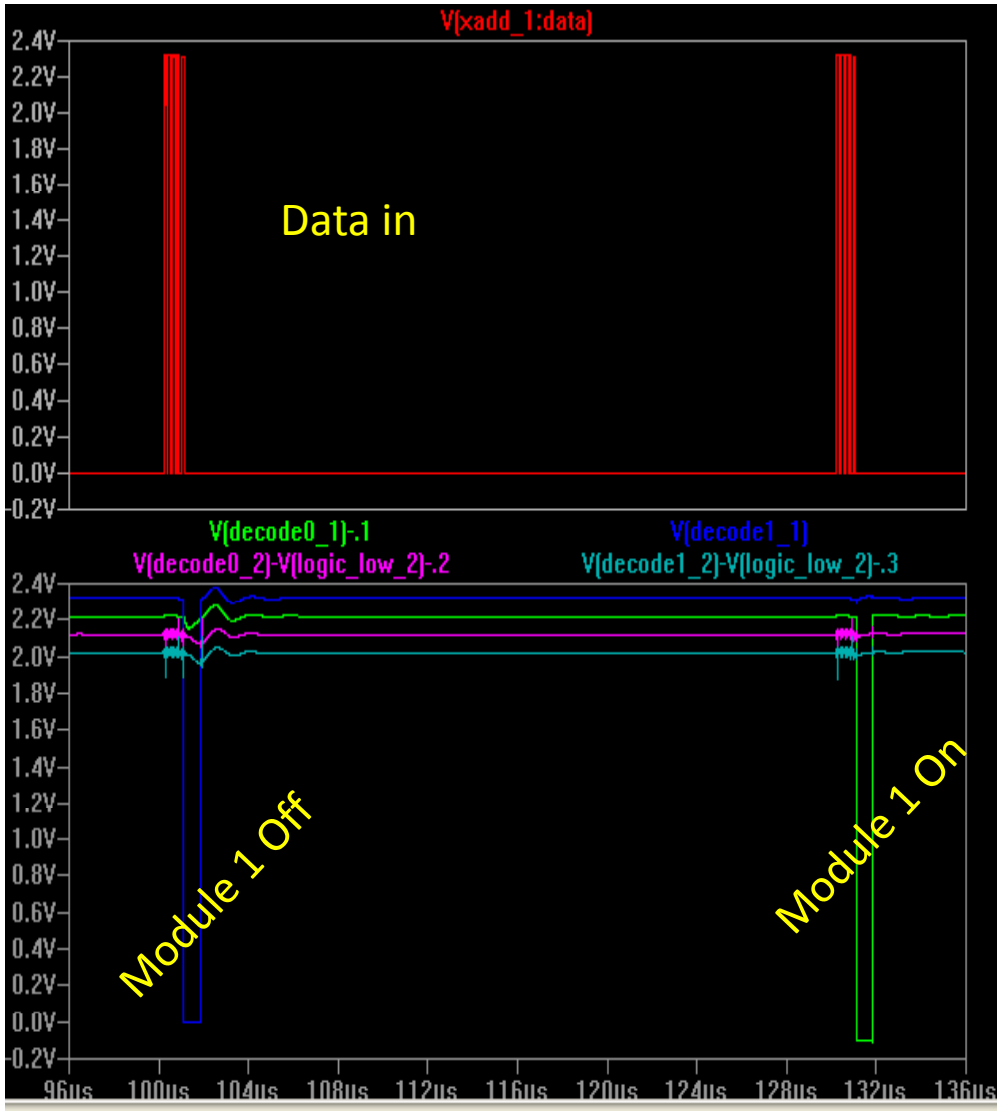


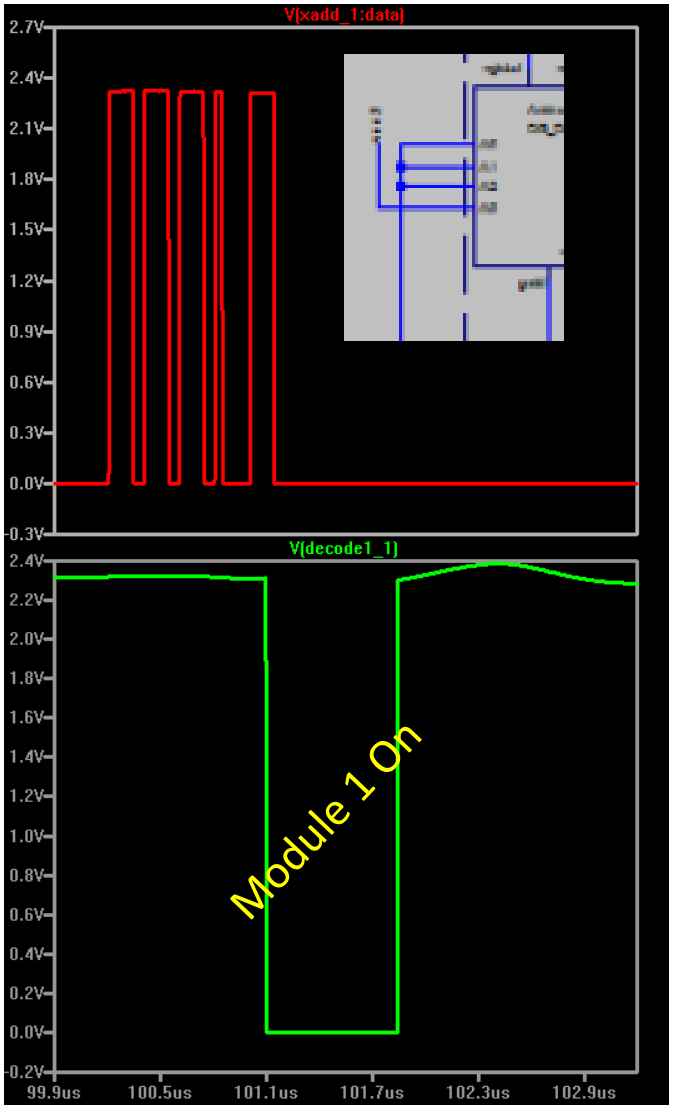
Simulations of a Serial Powered Stave

Objective is to gain experience operating a serial powered system.

- Chose a 4 hybrid sim to maintain reasonable processing time. Only three modules have full addressing logic. Varied ramp up time from 1us to 500us. No problems observed after Band Gap wakeup is fixed.
- Ramp up SPP Voltage 0-18V first then current source for ABCn 0-1.6A

SPP Addressing & Decoding





Absolute Voltages V(hybrid), V(spp)

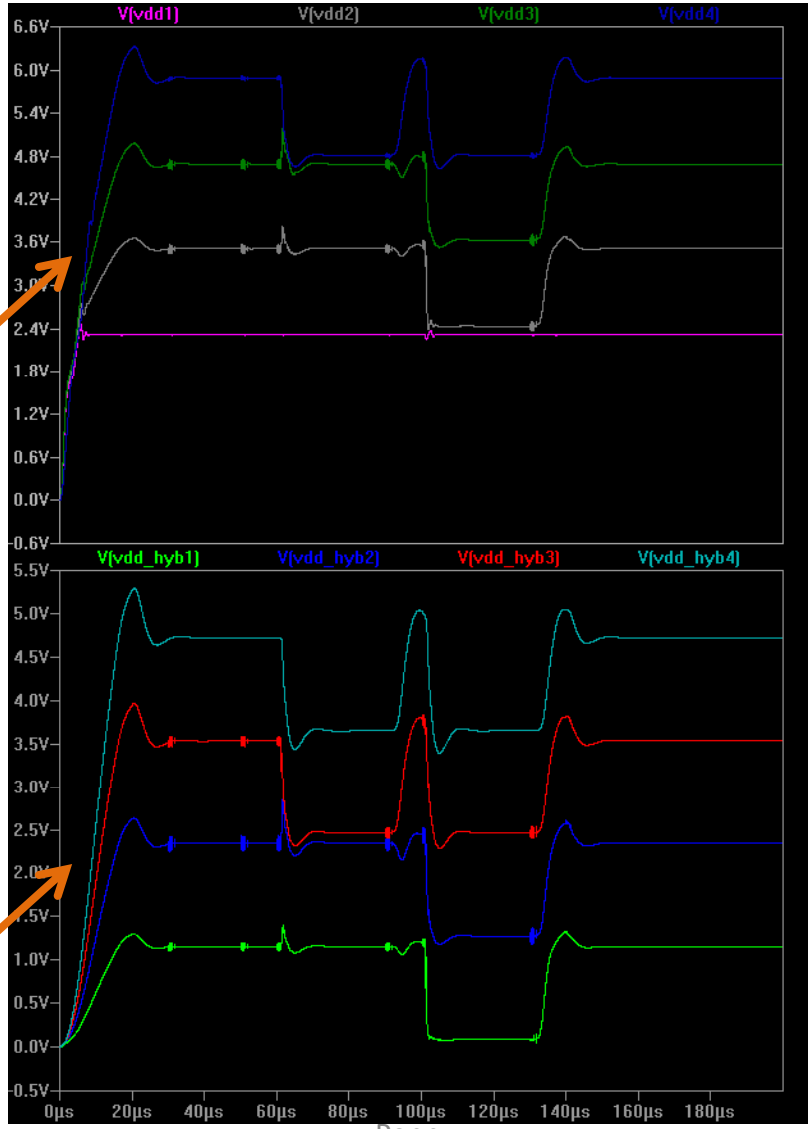
4 Hybrids serially connected **Normal Operation**

Vdd SPP Chips

Ramp Voltage for SPP Reference 10us

Vdd Hybrids

Ramp up hybrid Current 0 – 1.6A



6V

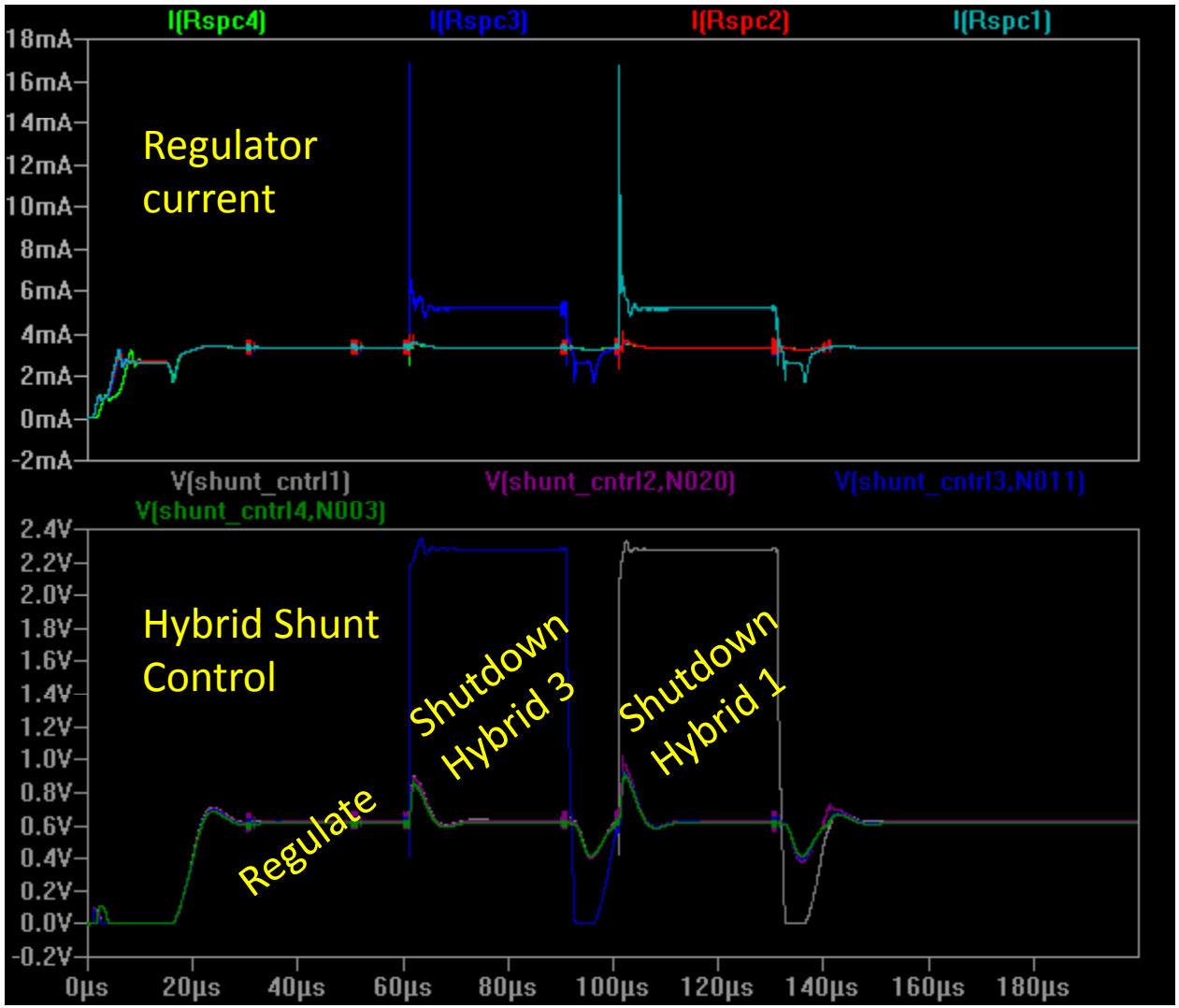
2.4V

4.8V

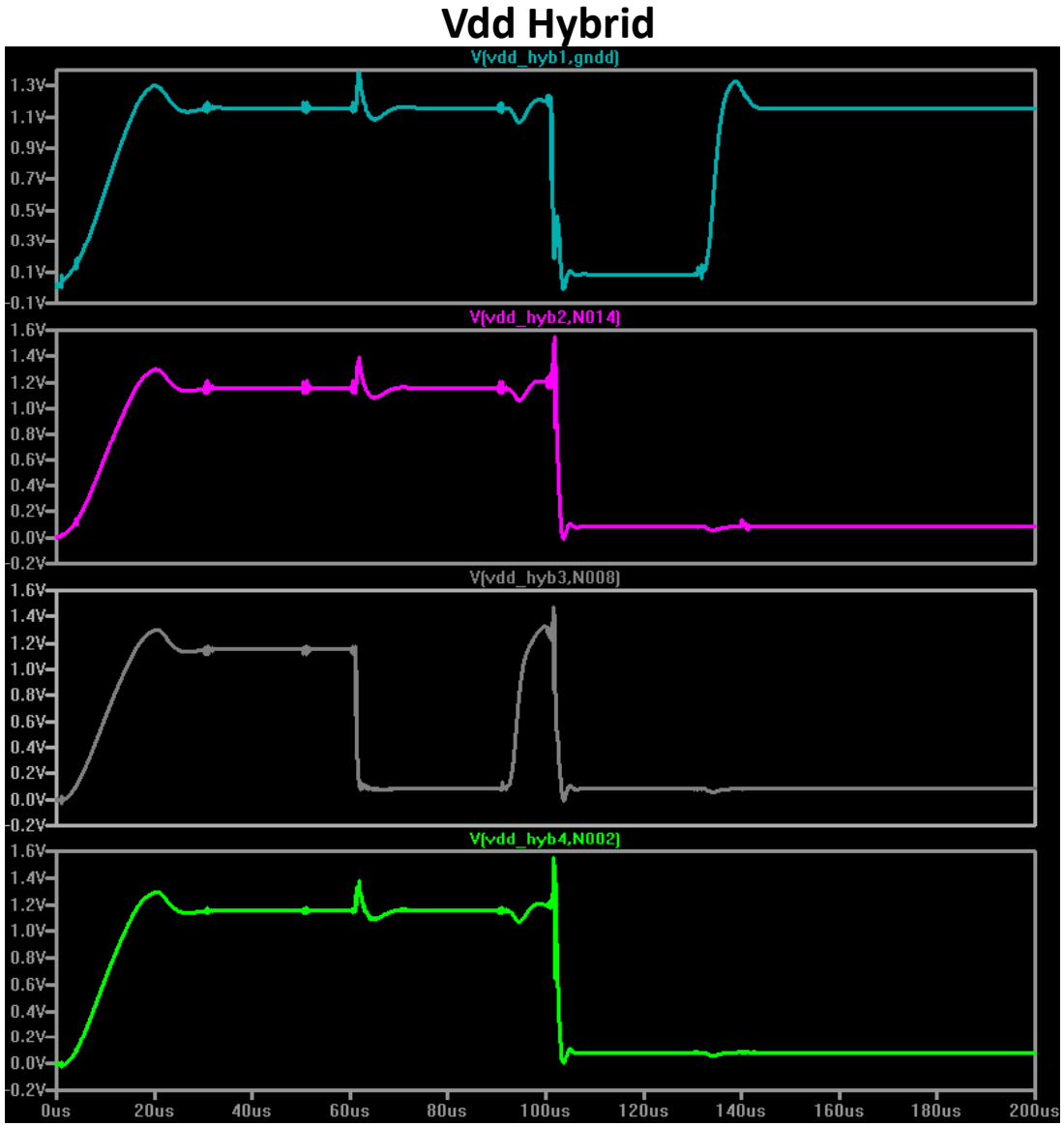
1.2V

Serial Power Regulator Block

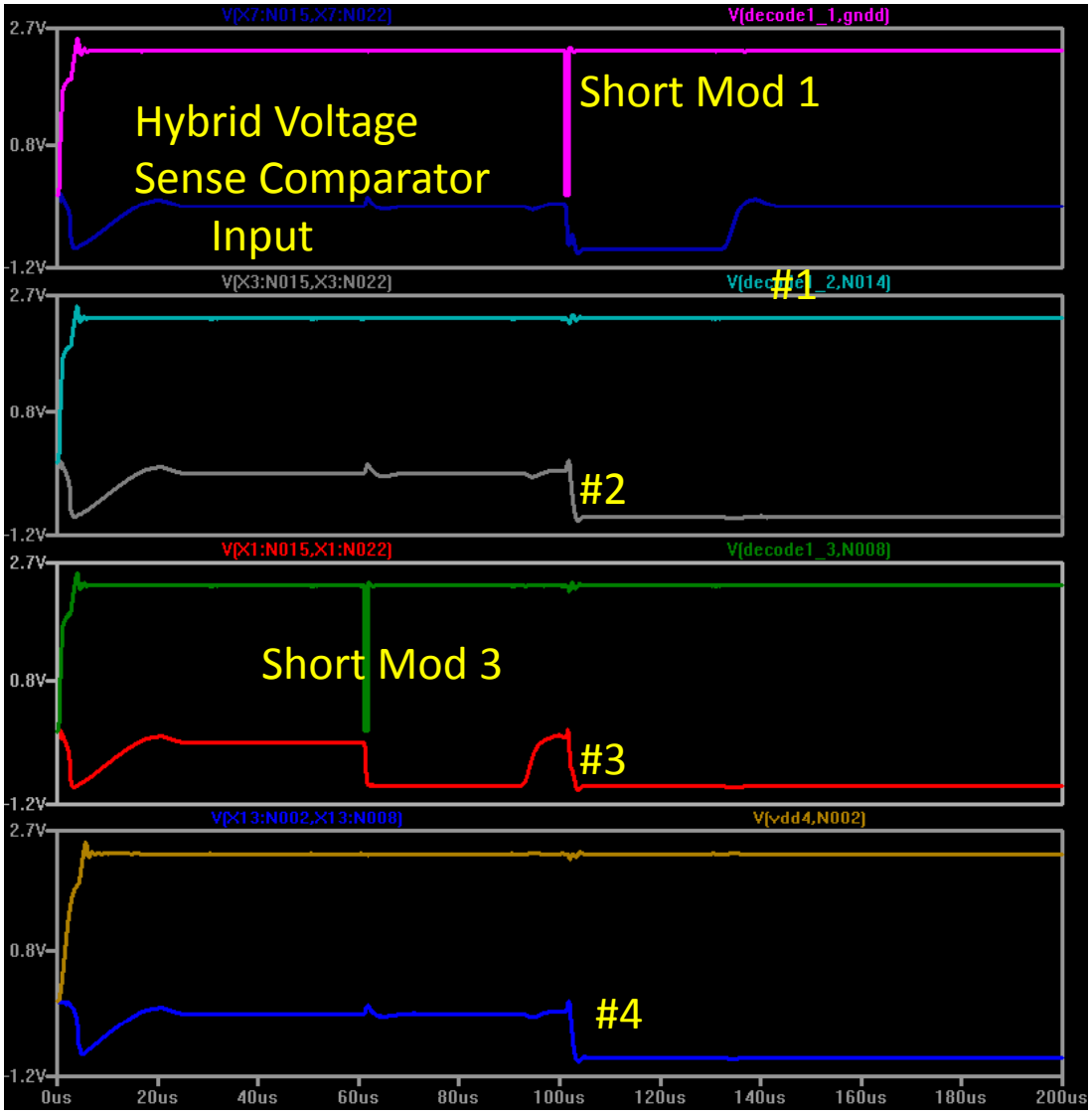
Values for all 4 Modules relative to their reference Voltage superimposed,



Cascade Failure Hybrid Reference too Low



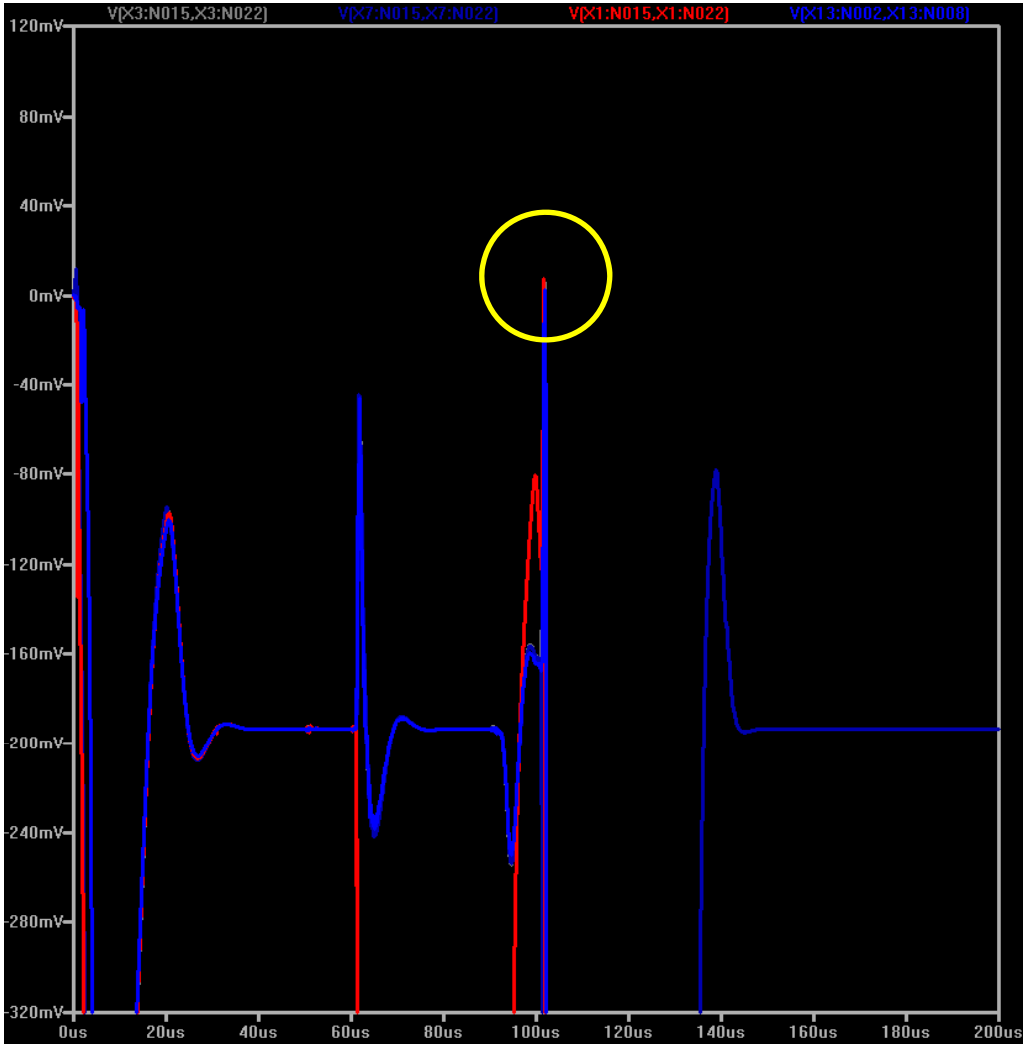
Vdd hybrid Sense Comparator Input



All 4 Comparators Input

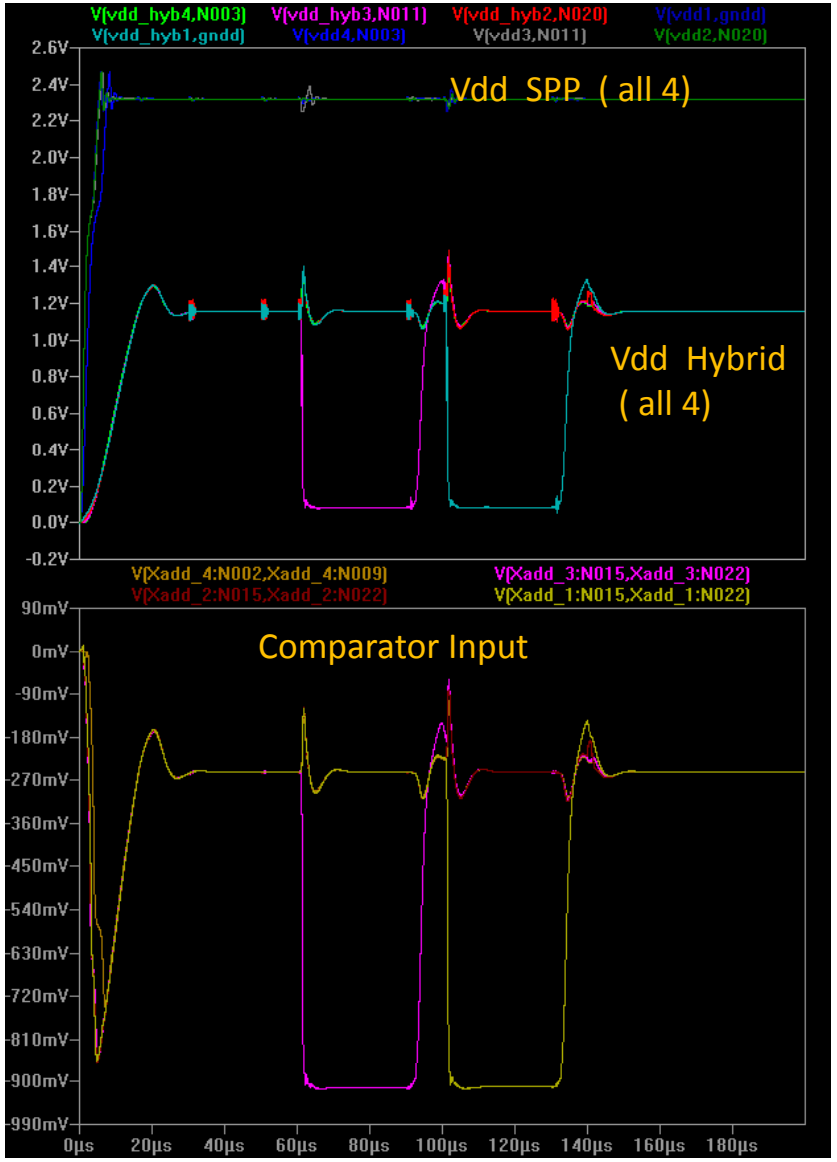
Voltage Spike from
Module #1 Shut down
Over Reference Causes
Other 3 to shutdown.

Solution is to raise threshold
External control should be
Available in prototype.

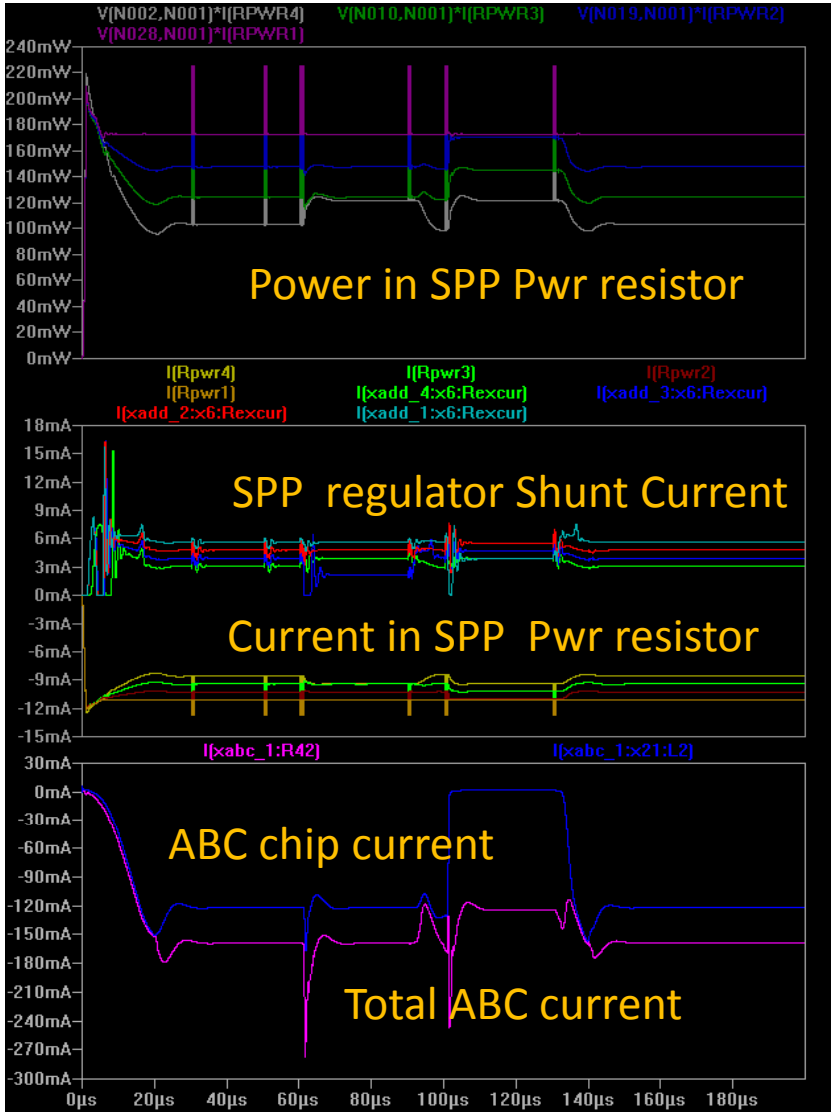


Reference Threshold Raised,
re-run sim on the 4 modules.
Shutdown commands
Only affect addressed modules

Trigger Point →



Currents and Voltages



Status

- Cadence OA schematic entered, simulations underway
- Dual Output OpAmp layout complete, waiting for fully operational OA environment to continue layout.
- Ready for a May submission with the objective of using it on ABCn Stavelet.