中国科学院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

TaichuPix-3 test

Ying ZHANG

2022-9-15

Effect of top IO

- **Test chip#8 with all IO connected, and then redo the testing after cut the bonding wires on the top IO.**
  - Power current: nearly consistent with/without Top-IO
  - Bias voltage: nearly consistent with/without Top-IO

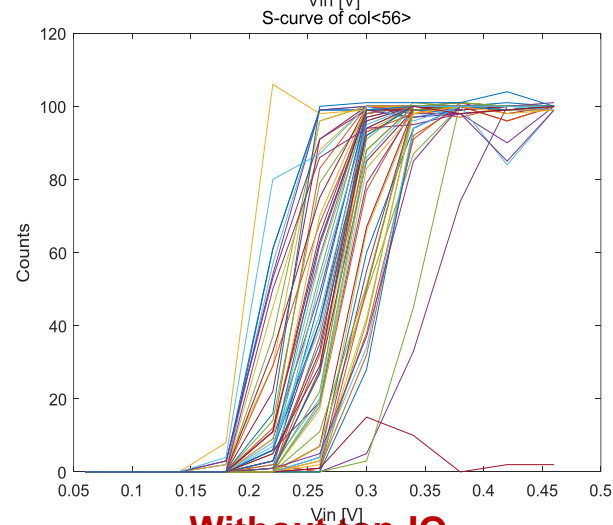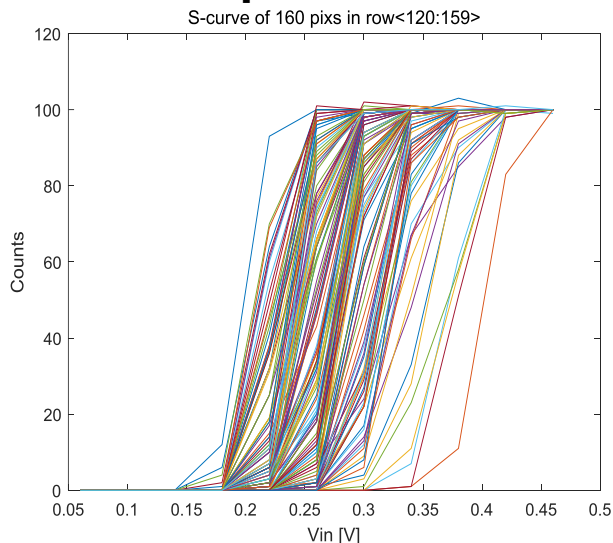| Chip #8	All connected	No top-IO	Code
1.8V power current	212 +10 mA 222 +63 mA	212 +10 mA 217 +73 mA 223 + 69 mA	DAC off DAC on @ IBIAS=10
VBG	0.732 V	0.734 V	10 (BGR_OFFSET)
VCLIP	80 mV	77 mV	0
VCASP	85 mV	81 mV	100
VCASN	536 mV	538 mV	100101011
VCASN2	615 mV	615 mV	101000100

  - S-curve of different columns/rows

Effect of top IO

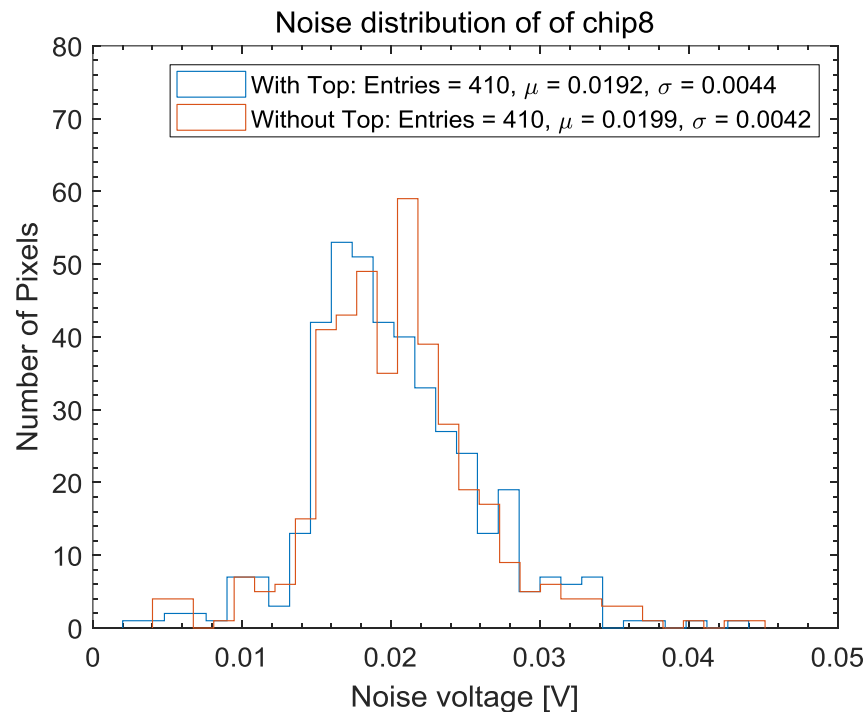■ **S-curves of different row/col. with/without top-IO**
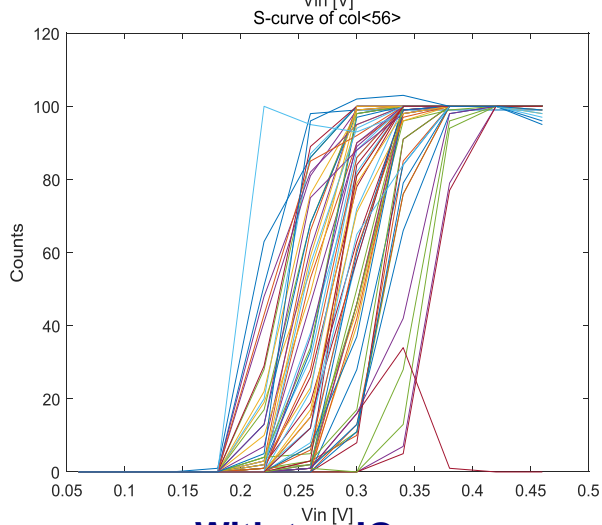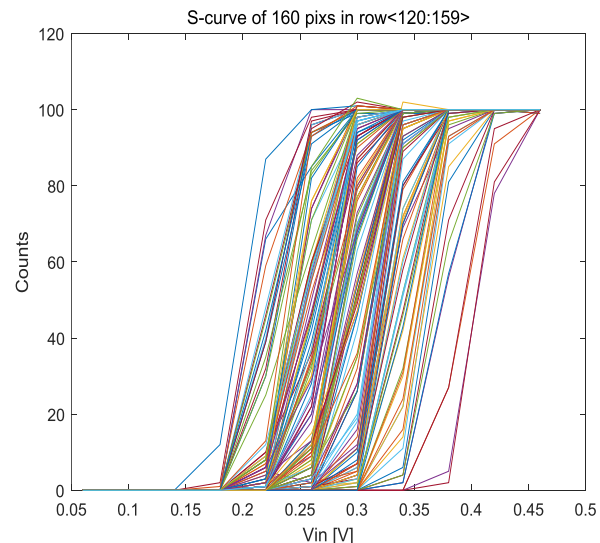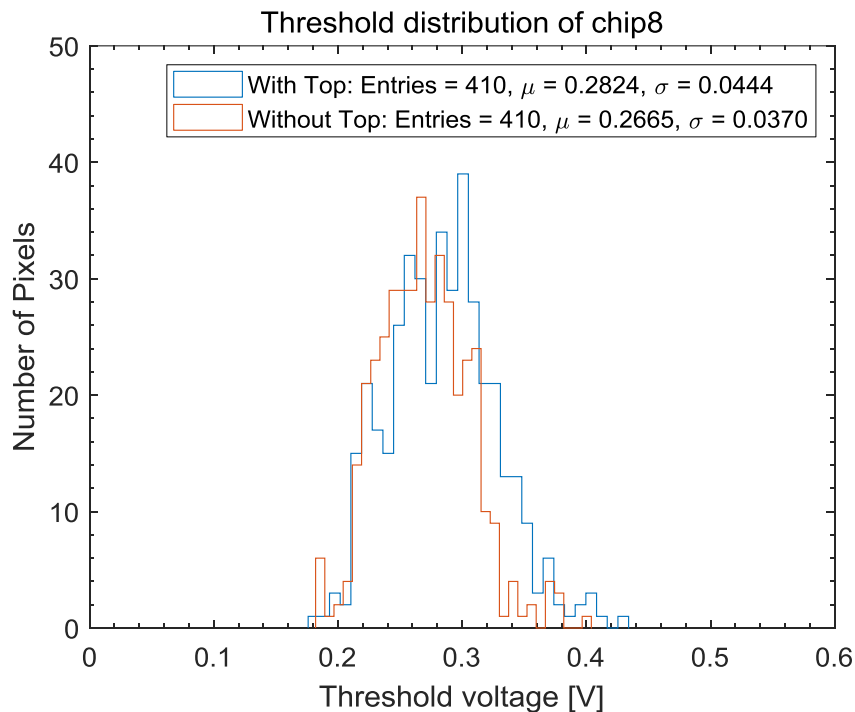

With top-IO   Without top-IO

Effect of top IO

- **Threshold and noise distribution with/without top-IO @ ITHR=32 (TC2 nominal)**
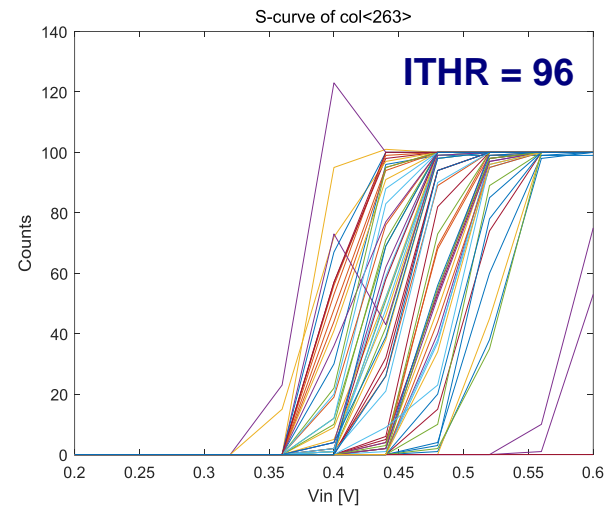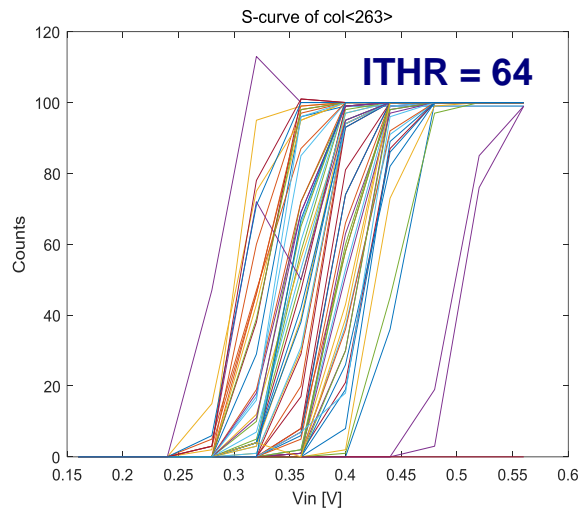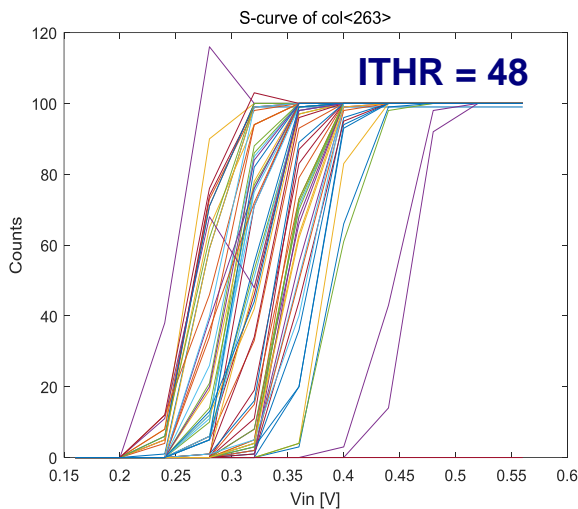

Threshold distribution of chip8

With Top: Entries = 410, μ = 0.2824, σ = 0.0444
Without Top: Entries = 410, μ = 0.2665, σ = 0.0370

Noise distribution of of chip8

With Top: Entries = 410, μ = 0.0192, σ = 0.0044
Without Top: Entries = 410, μ = 0.0199, σ = 0.0042

	Mean threshold	Threshold rms.	Mean noise	Noise rms.
With top	310.4 e	48.8 e	21.1 e	4.8 e
Without top	292.9 e	40.7 e	21.9 e	4.7 e

Effect of top IO
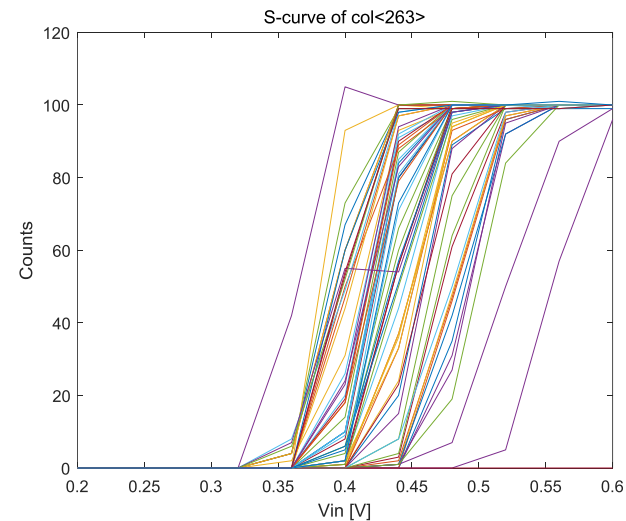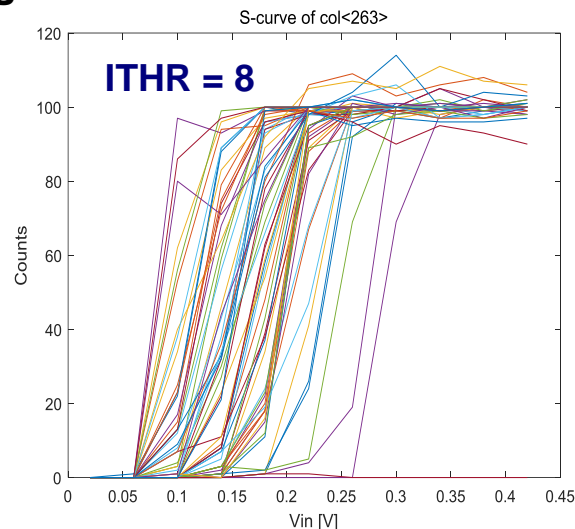
- **S-curves at different ITHR setting**

Effect of top IO
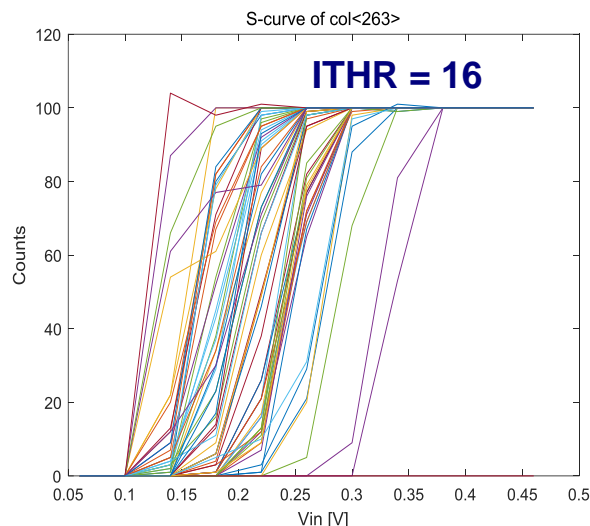
- **S-curves at different ITHR setting**

With top-IO

S-curve of col<263>

ITHR = 16

S-curve of col<263>

ITHR = 8

Without top-IO

S-curve of col<263>
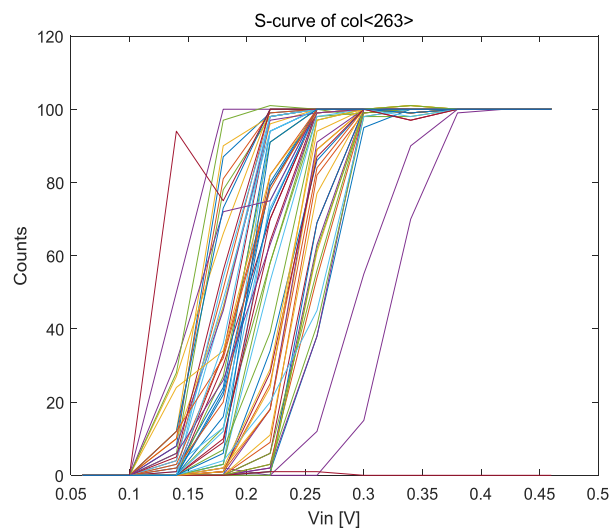
Without top-IO connected, when set ITHR =8:
DVDD power current increases up to 0.5 A (limit)
AVDD power current increases up to 0.2 A
suspecting an oscillation on pixel analog occurs
Analog output of chip8 not available after cutting top-IO

Chip 9

DVDD

OUT1

Discussion

- **Removing top-IO connection has a lightly effect on the mean threshold, and threshold dispersion @ TC2's threshold level**
  - ➤ Lower mean Vth and FPN without top-IO
- **Without top-IO, a bit more nosey pixel found**
- **At low threshold (ITHR < 16), easier to be oscillating**
  - ➤ Need to be check with light shielding