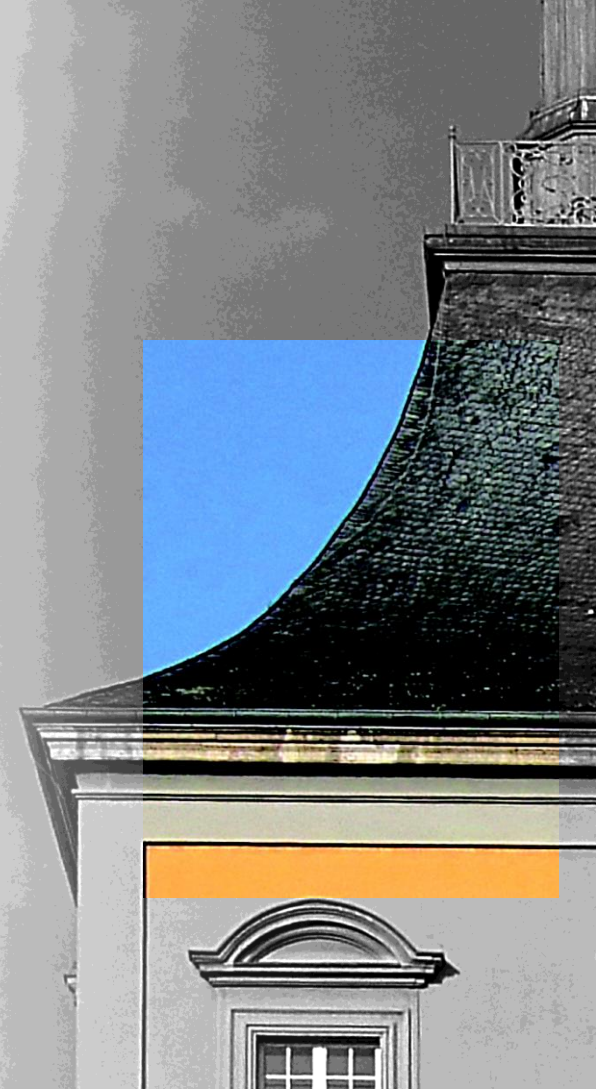


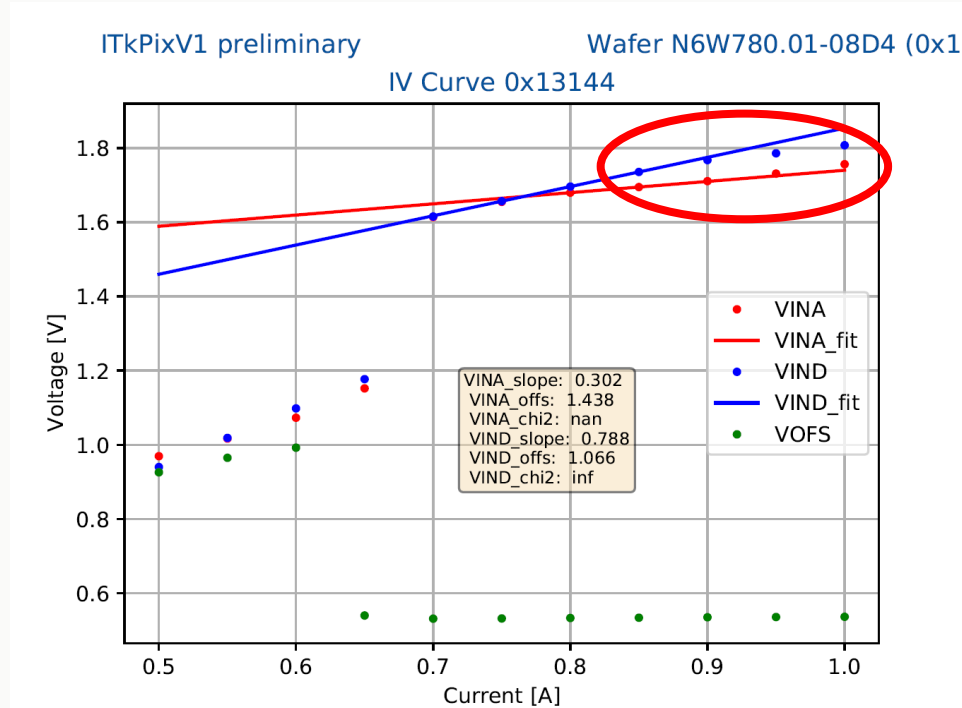
RD53 - ITKPIX

FIX FOR AMBIGUOUS IV CURVES DURING WAFER PROBING

M. Daas, Y. Dieter, T. Hemperek, F. Hinterkeuser,
F. Hügging, H. Krüger, D. Pohl, L. Schall,
M. Standke, M. Vogt

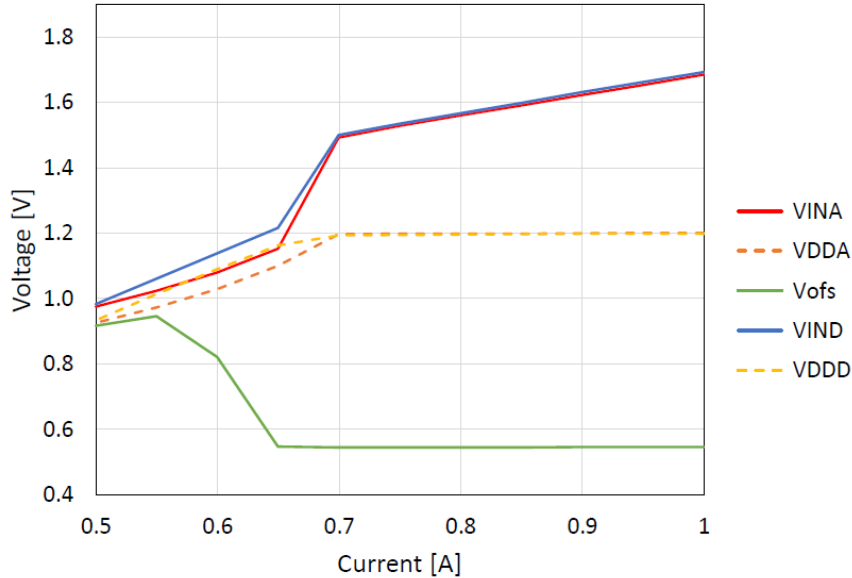


PROBLEM IN CURRENT IV DATA

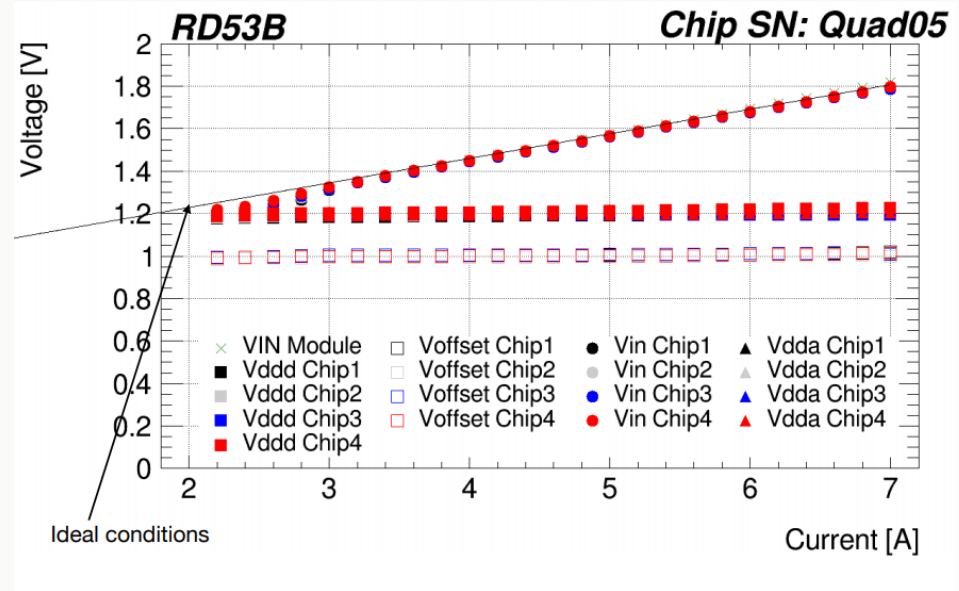


Nonlinear behavior @ high currents

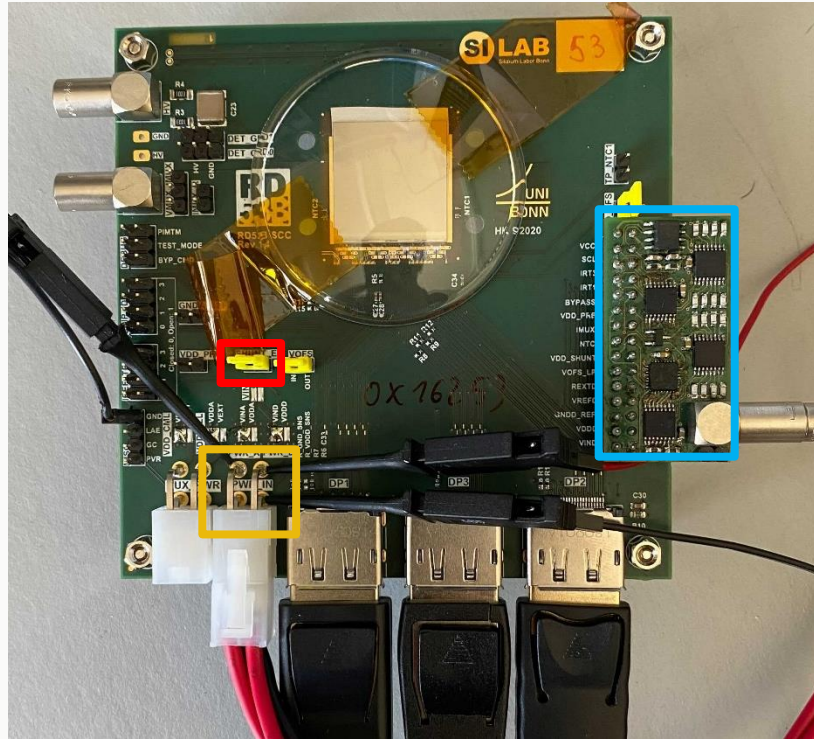
From bench testing on SCC



[D. Koukola 10.02.2021](#)



[A. Dimitrievska 24.03.2021](#)



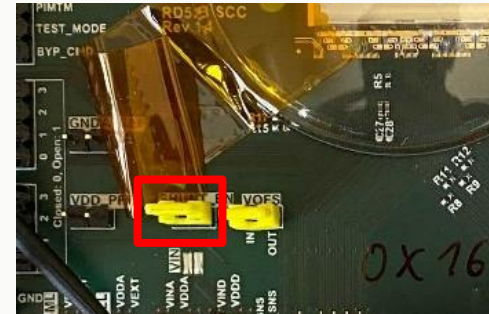
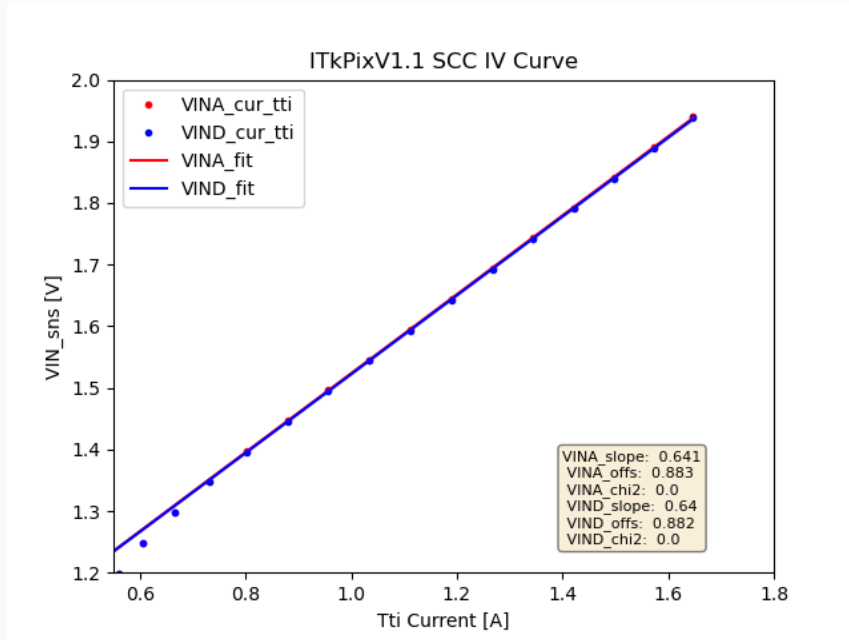
SHUNT EN
Jumper

VIN Sensing

Analog
Monitoring Board

RextA & RextD = 600 Ohm

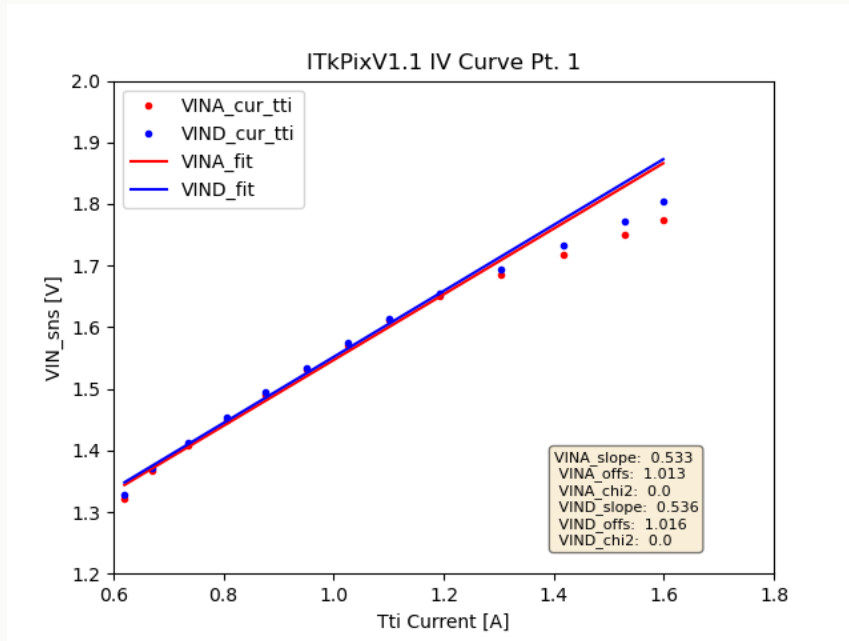
MEASUREMENTS ON SCC SHOW LINEAR BEHAVIOR



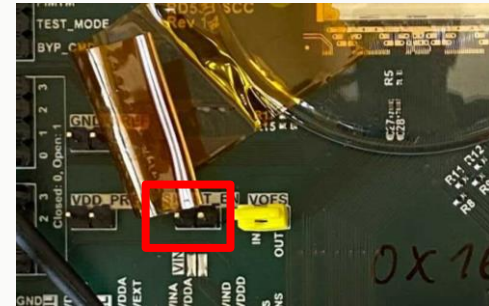
Shunt EN jumper set

IV Curve Measurement, Bonn 08.04.21 on SCC, looks good

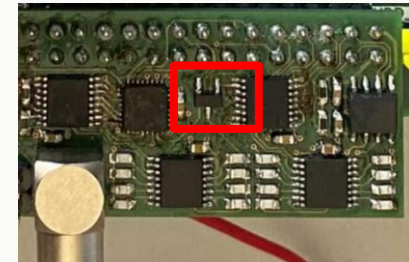
MEASUREMENTS ON SCC SHOW LINEAR BEHAVIOR IF SHUNT JUMPER IS SET



IV Curve Measurement, Bonn 08.04.21 on SCC, looks bad

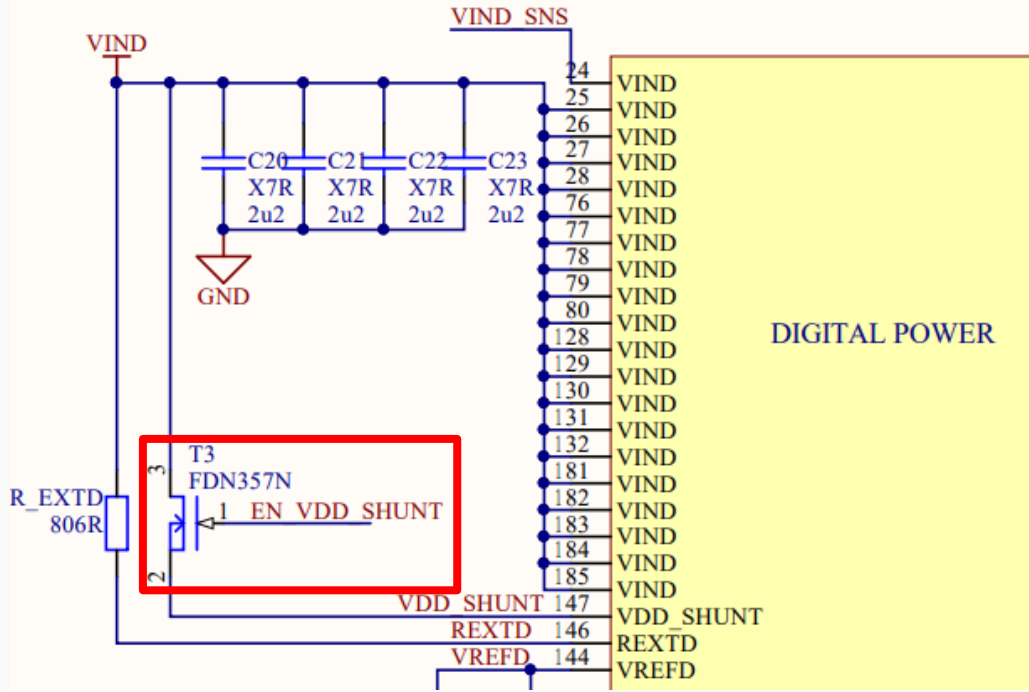


Shunt EN jumper **not** set



SHUNT_EN controlled by transistor

HOW CAN THE JUMPER MAKE THE DIFFERENCE?



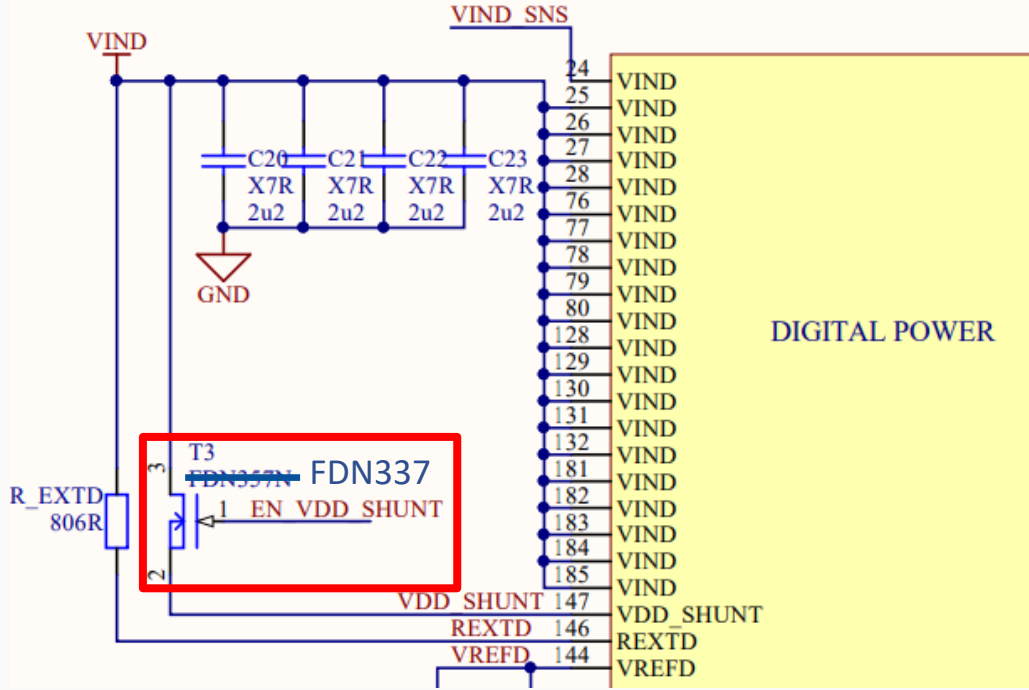
EN_VDD_SHUNT = 3.3 V

FND357		
Vin_tti [V]	VDD_SHUNT[V]	VIND [V]
1.9	1,531	1,896
1.8	1,496	1,797
1.7	1,478	1,697
1.6	1,461	1,598
1.5	1,435	1,498
1.4	1,376	1,398
1.3	1,29	1,299
1.2	1,196	1,199
1.1	1,099	1,1

All three values in the table should be the same!

→ Transistor resistance is != 0 for high VIN

CHANGE TRANSISTOR TO FDN337



EN_VDD_SHUNT = 3.3 V

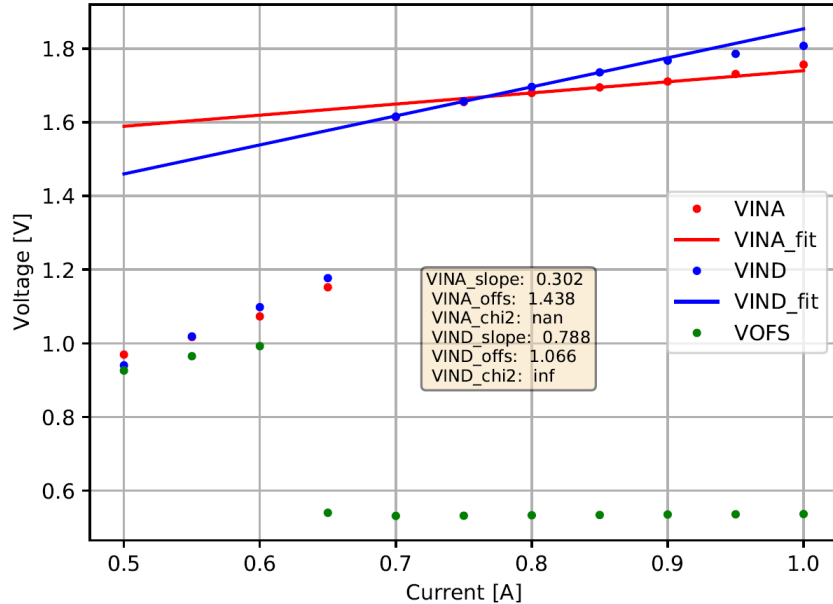
FDN337		
Vin_tti [V]	VDD_SHUNT[V]	VIND [V]
1.9	1,895	1,895
1.8	1,796	1,796
1.7	1,697	1,697
1.6	1,597	1,597
1.5	1,498	1,498
1.4	1,398	1,398
1.3	1,299	1,299
1.2	1,199	1,199
1.1	1,1	1,1

→ VDD SHUNT looks much better

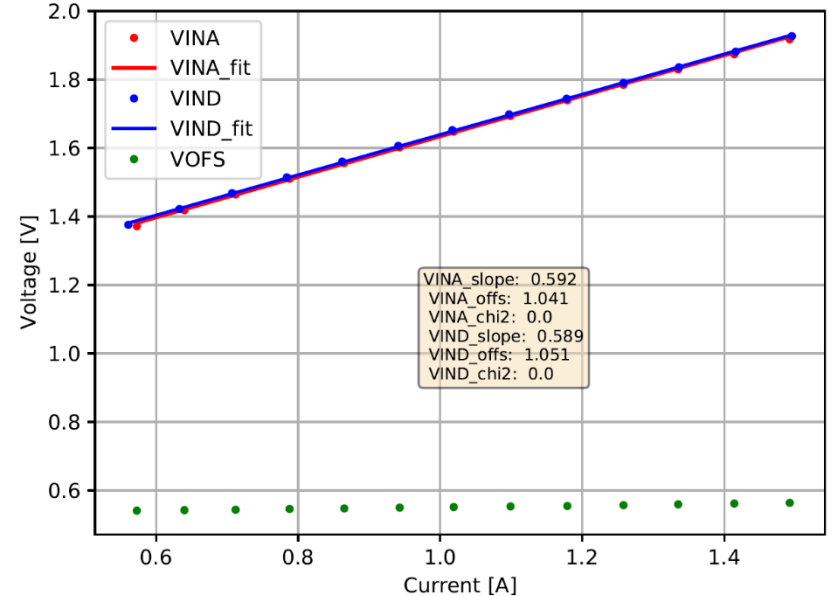
SAME CHIP WITH OLD AND NEW TRANSISTOR



IV Curve 0x13144



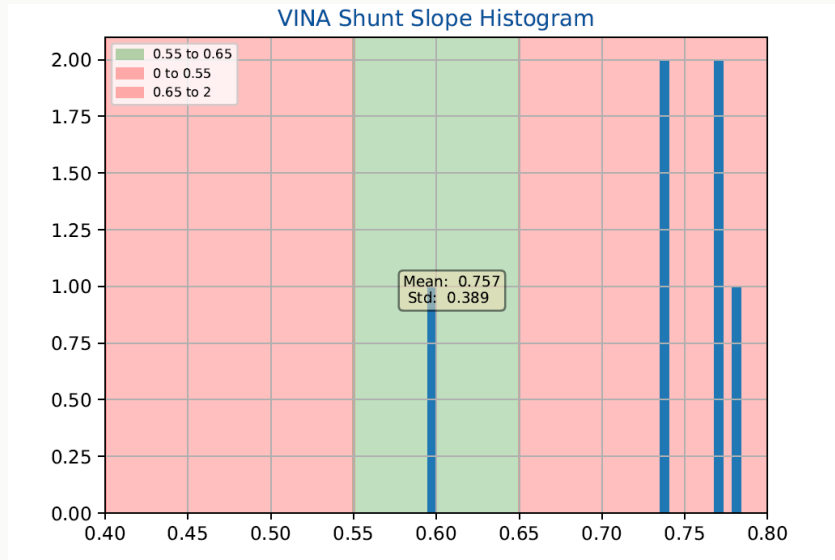
IV Curve 0x13144



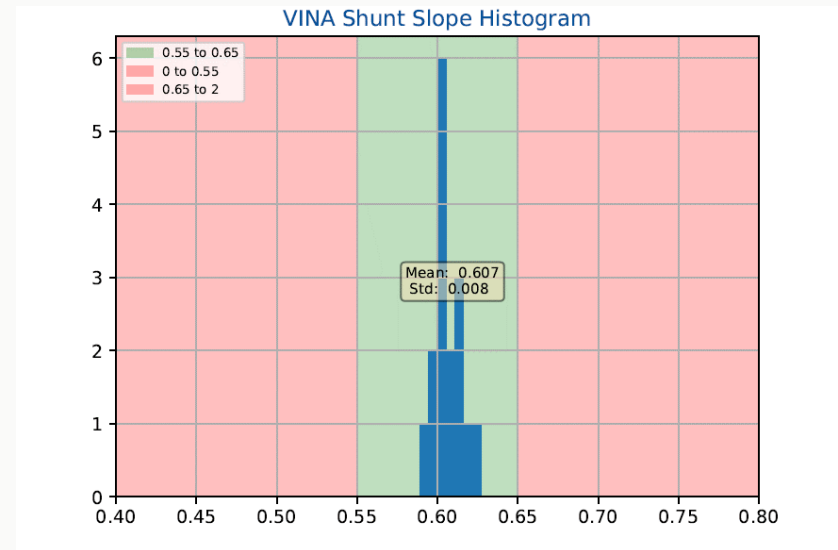
→ VDD_SHUNT drop is visible for high VIND

→ VDD_SHUNT is always equal to VIND

VINA SHUNT Slopes



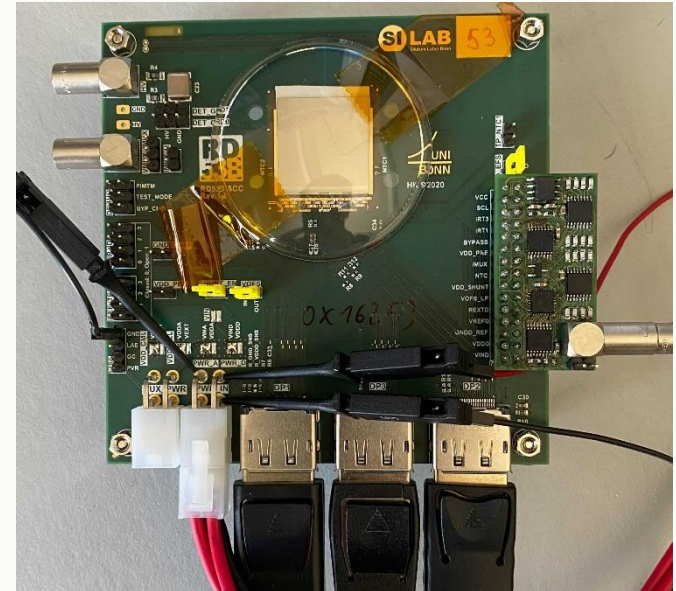
→ IV curves are all over the place



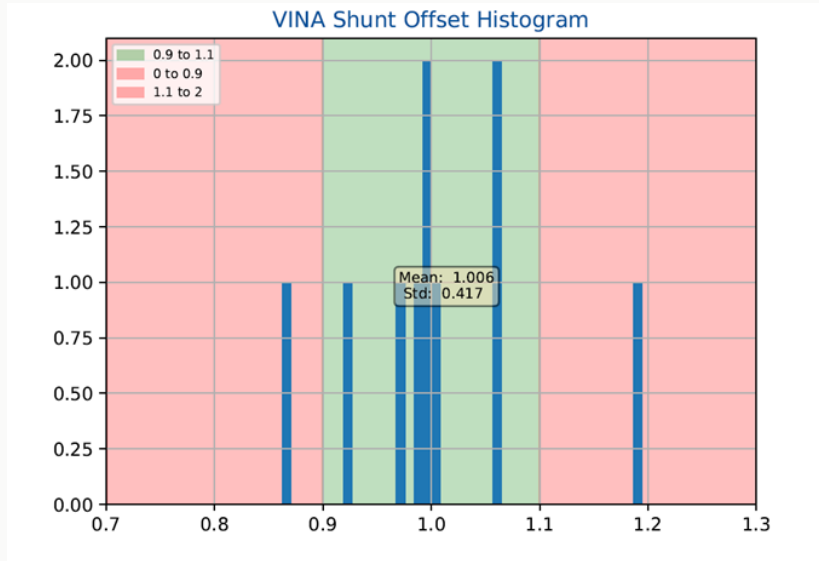
→ Much less spread with new transistor

- **Bad shunt IV curves** during wafer probing were a setup feature
- **Fixed by exchanging transistor** on current probe crads
- Shunt **divergence** for 16 chips:

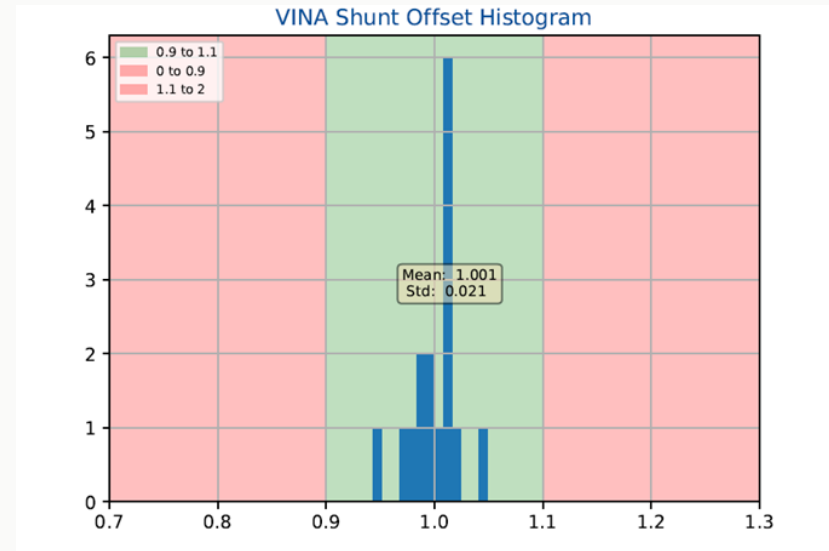
VIN	Slope Mean	Slope Std	Offset Mean	Offset Std
VINA	0.607	0.008	1.00	0.021
VIND	0.601	0.007	1.02	0.015



VINA SHUNT Offsets

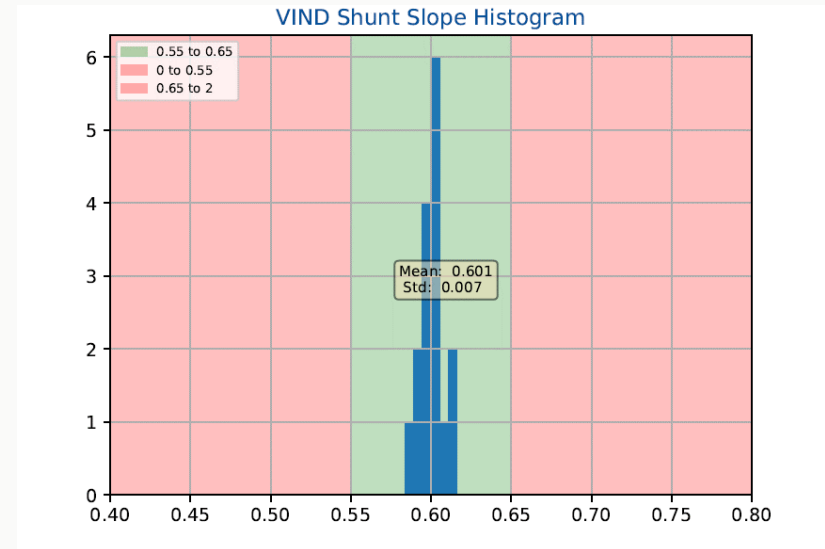
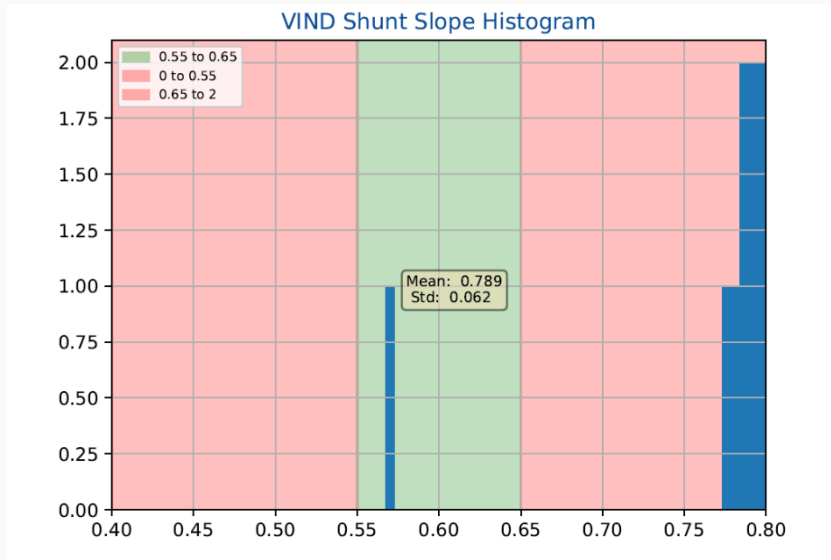


→ IV curves are all over the place



→ Much less spread with new transistor

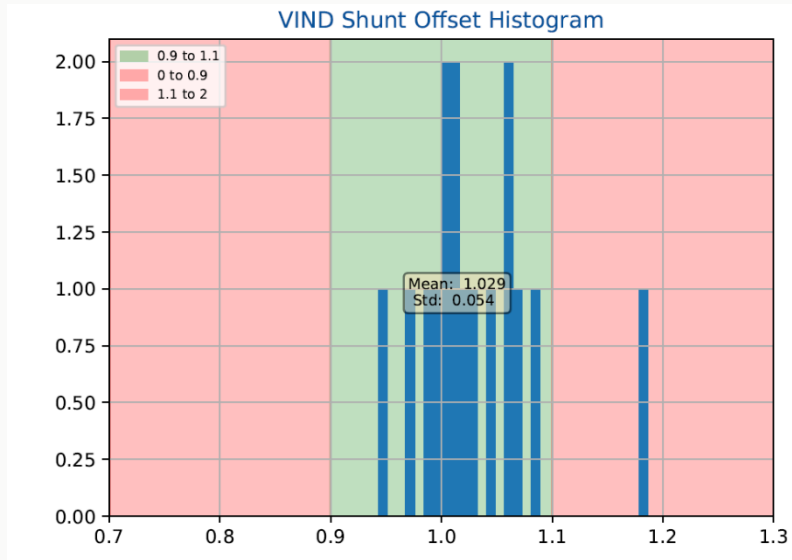
VIND SHUNT Slopes



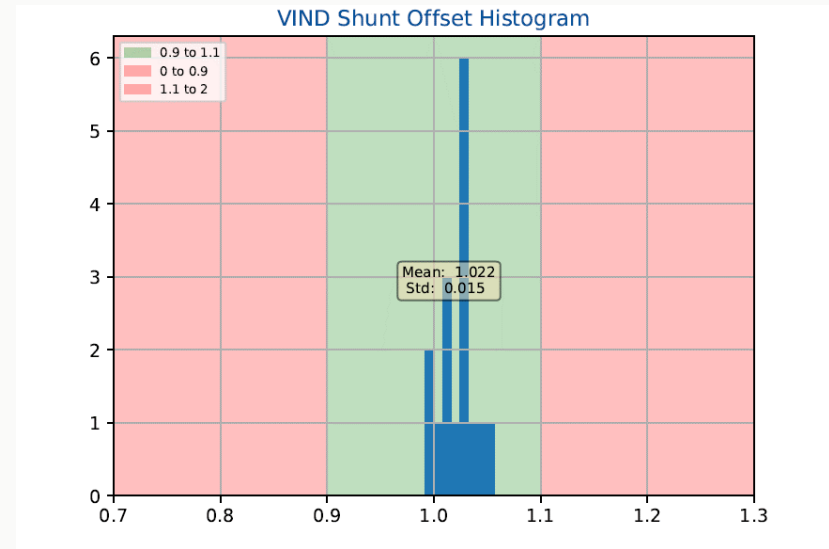
→ IV curves are all over the place

→ Much less spread with new transistor

VIND SHUNT Offsets



→ IV curves are all over the place



→ Much less spread with new transistor