

Silicon Microstrip detector

Single sided and double sided

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Detector specifications

First Batch : $\langle 111 \rangle$, Resistivity 2k—4kohm Single sided、Prototype

Second Batch : $\langle 100 \rangle$, Resistivity 10k—20kohm
(Single sided and double sided detectors)

Third Batch : $\langle 111 \rangle$, Resistivity 9k — 12kohm、Single sided

Fourth Batch : $\langle 111 \rangle$, Resistivity 2k —4kohm Single sided

First Batch :

- **Main Features of the Detector :**

- 11 sets of different width and pitches in one detector

- Minimum Strip width of 12microns and strip pitch of 65microns for about 7.4cms long on a 4" silicon wafer.

- AC coupling, Common Bias via Polyresistor

- High value of resistance (1.5M to 3.5Mohms) achieved within less than 500microns of length and width of 30 to 60microns

- **Wafer** : n type Silicon, 4inch Diameter, 300 micron thickness, FZ type

- **Orientation** : <111>

- **Resistivity** : 5 Kohm-cm

- **No. Of Independent sets of detectors** : 11

- **Type of implantation for strips** : p+

- **No. strips per set** : 32

- **Polysilicon resistor value**: 2 to 4 Megaohms

- **Dark Current (at 100V reverse voltage) max** : 5 Microamps

First Batch

MASK DESIGNS

Mask 1 : p+

Mask2 : Capacitor (SiO_2)

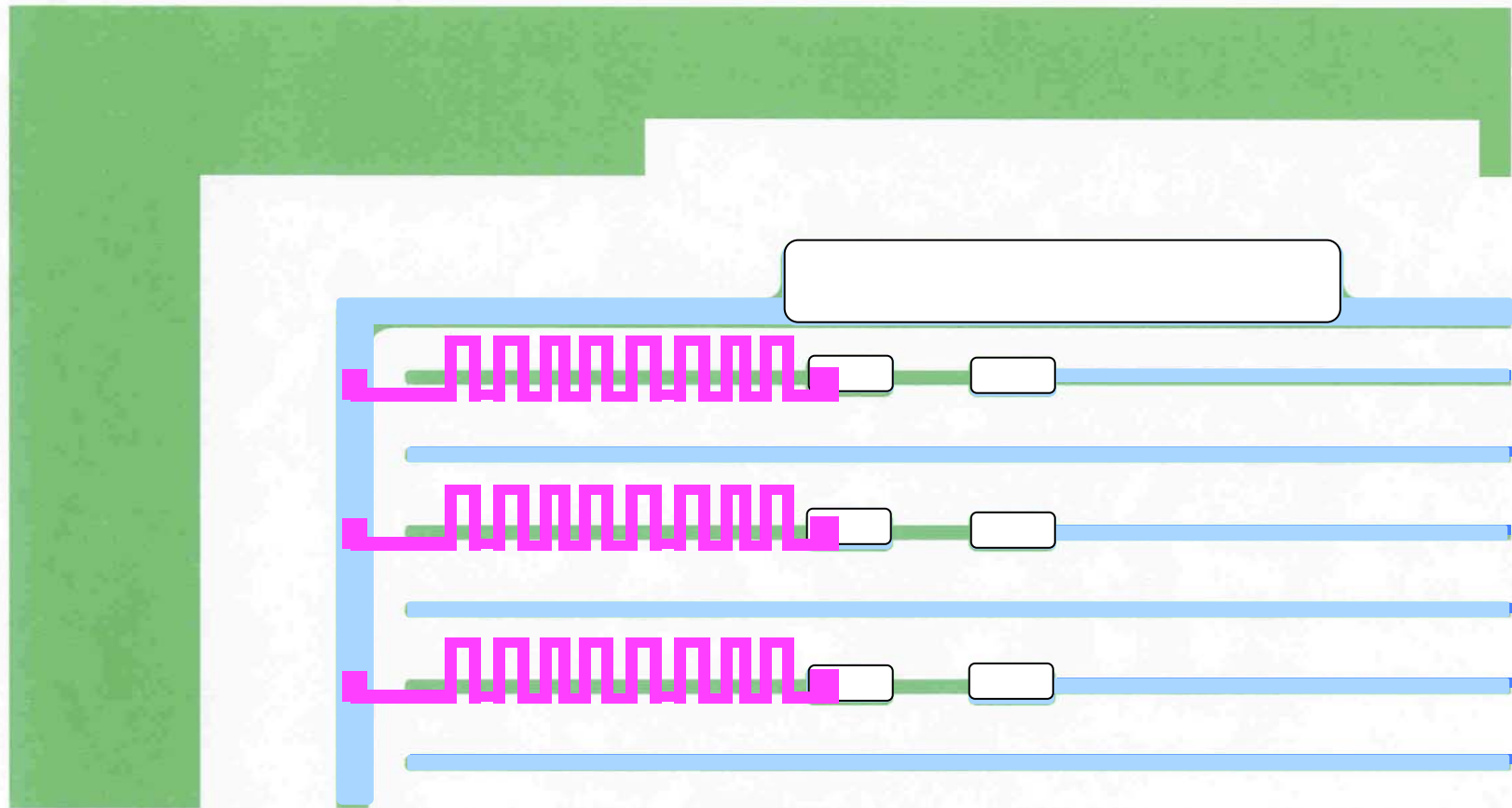
Mask3 : Polycontact opening

Mask4 : Polyresistor

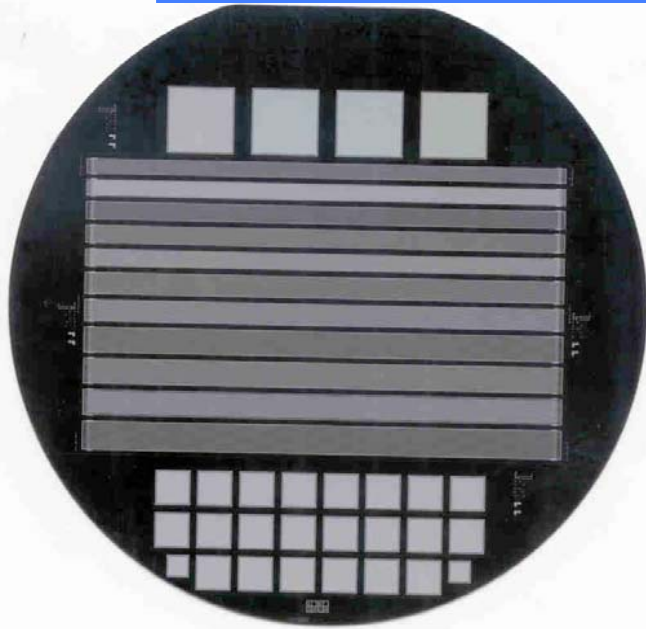
Mask 5 : Opening Contacts over dc pad, bias pad

Mask 6 : Metal

Mask 7 : Protective layer

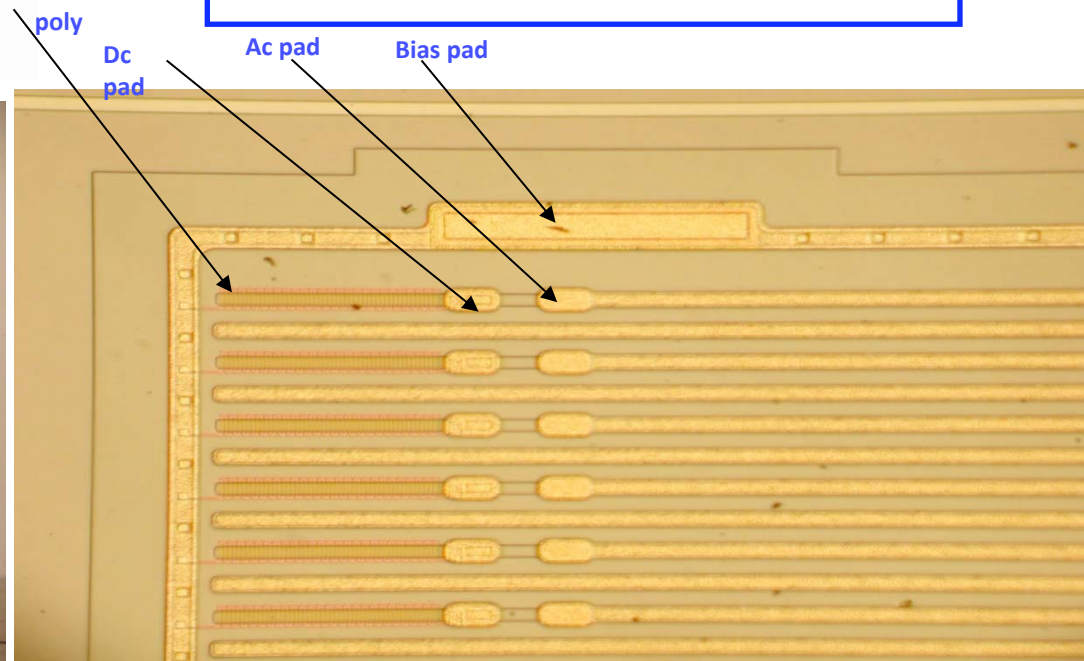


Actual Silicon Microstrip Detector

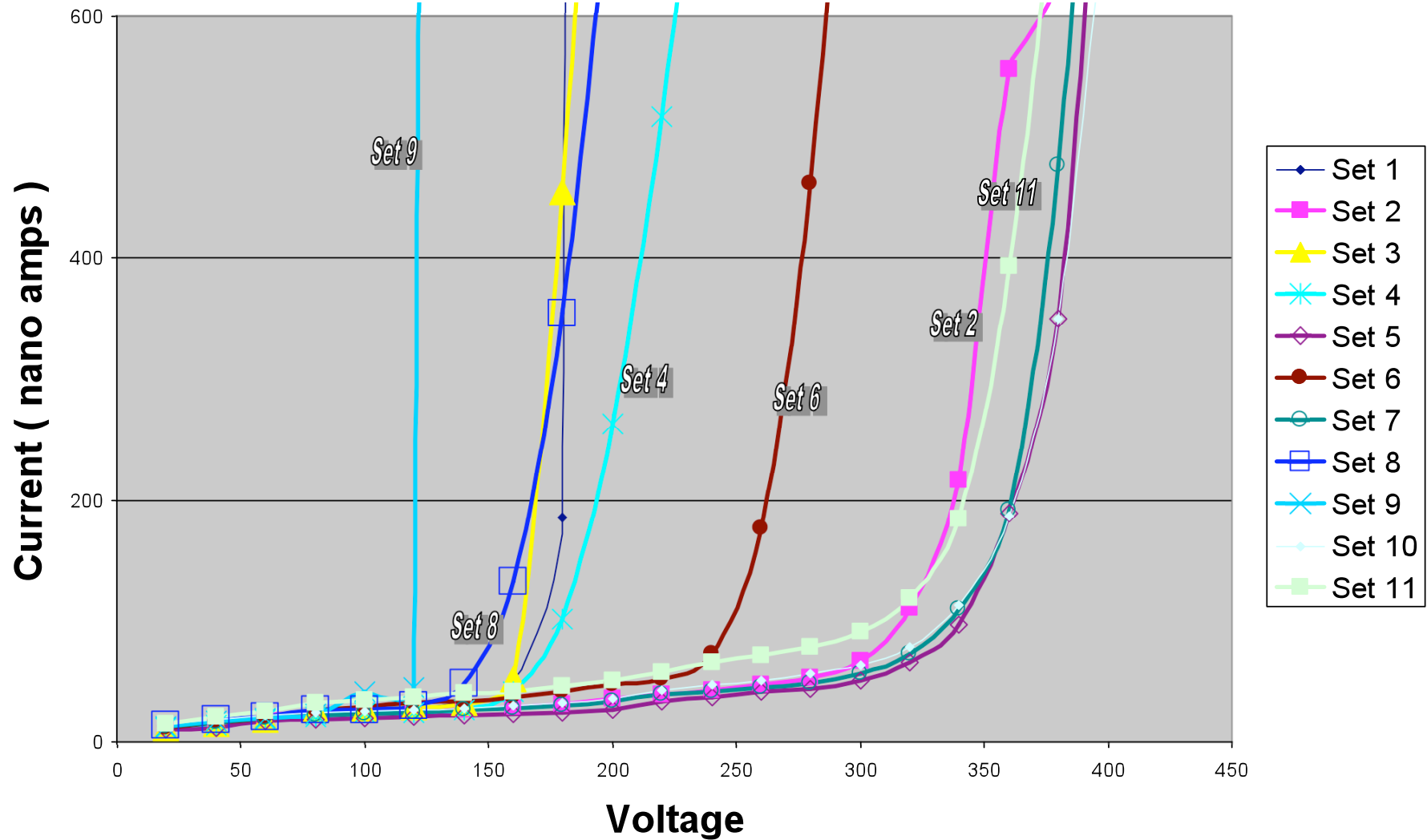


Geometry : 76mm * 47mm

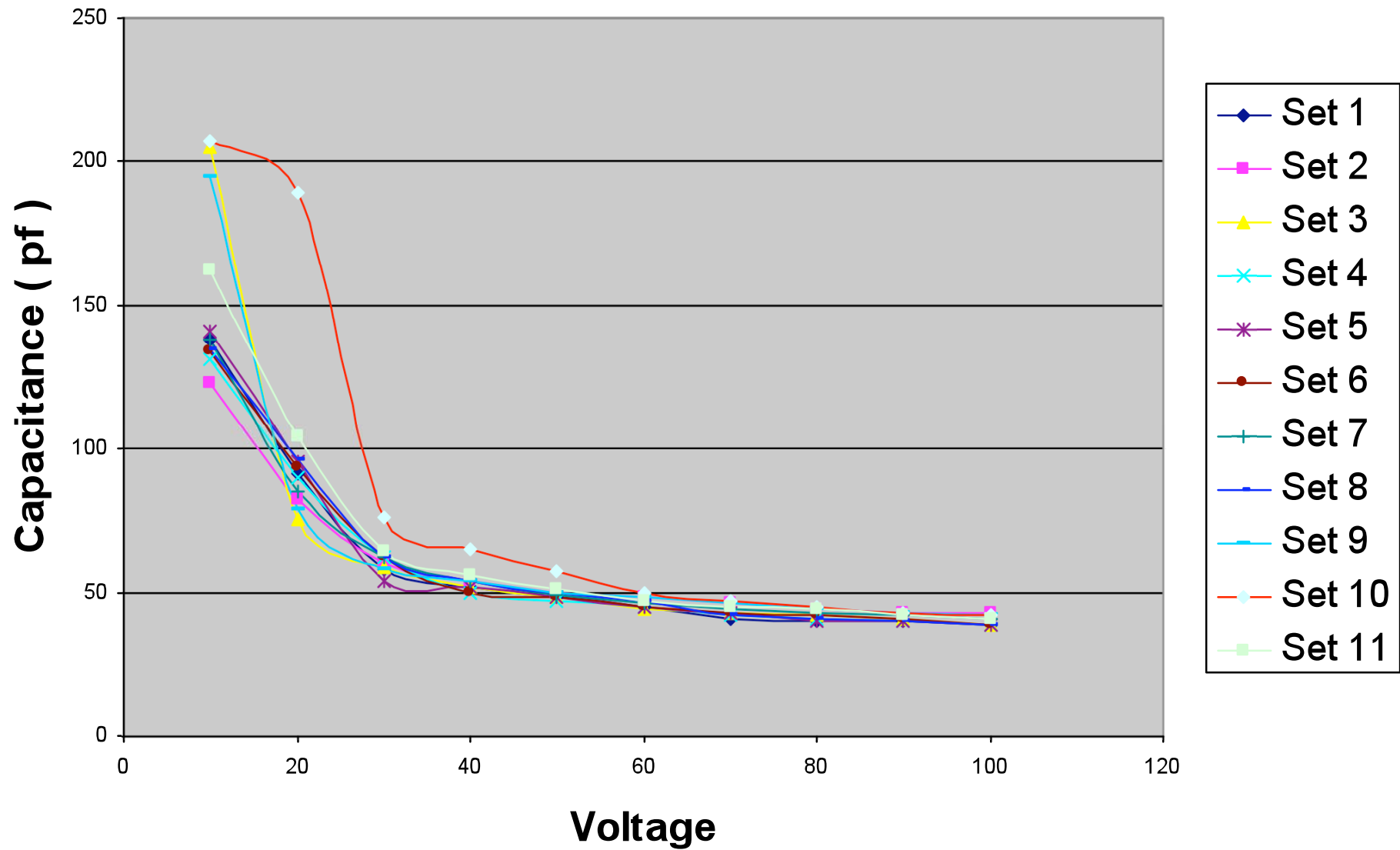
*Microscopic view of SILICON MICROSTRIP
DETECTOR*



I - V Characteristics of Silicon Microstrip Detector



C - V Characteristics



Second Batch :

Detectors Produced : 1) SSD - 5 No's
2) DSSD – SL - 10 No's
3) DSSD – DL - 10 No's

Wafer specifications :

- Wafer crystal orientation : $\langle 100 \rangle$
- Type : FZ
- Wafer thickness : 300 μm
- Size : 4 inch
- Resistivity : > 10 to 20 Kohm-cm
- Breakdown voltage : $> 300\text{V}$
- Polysilicon resistor value : > 4 Megaohms
- Total Dark current : ≤ 2 microamps @ 100V
- Area : 79600 x 28400
- Effective Area : 76800 x 25600

Double sided silicon detector specifications

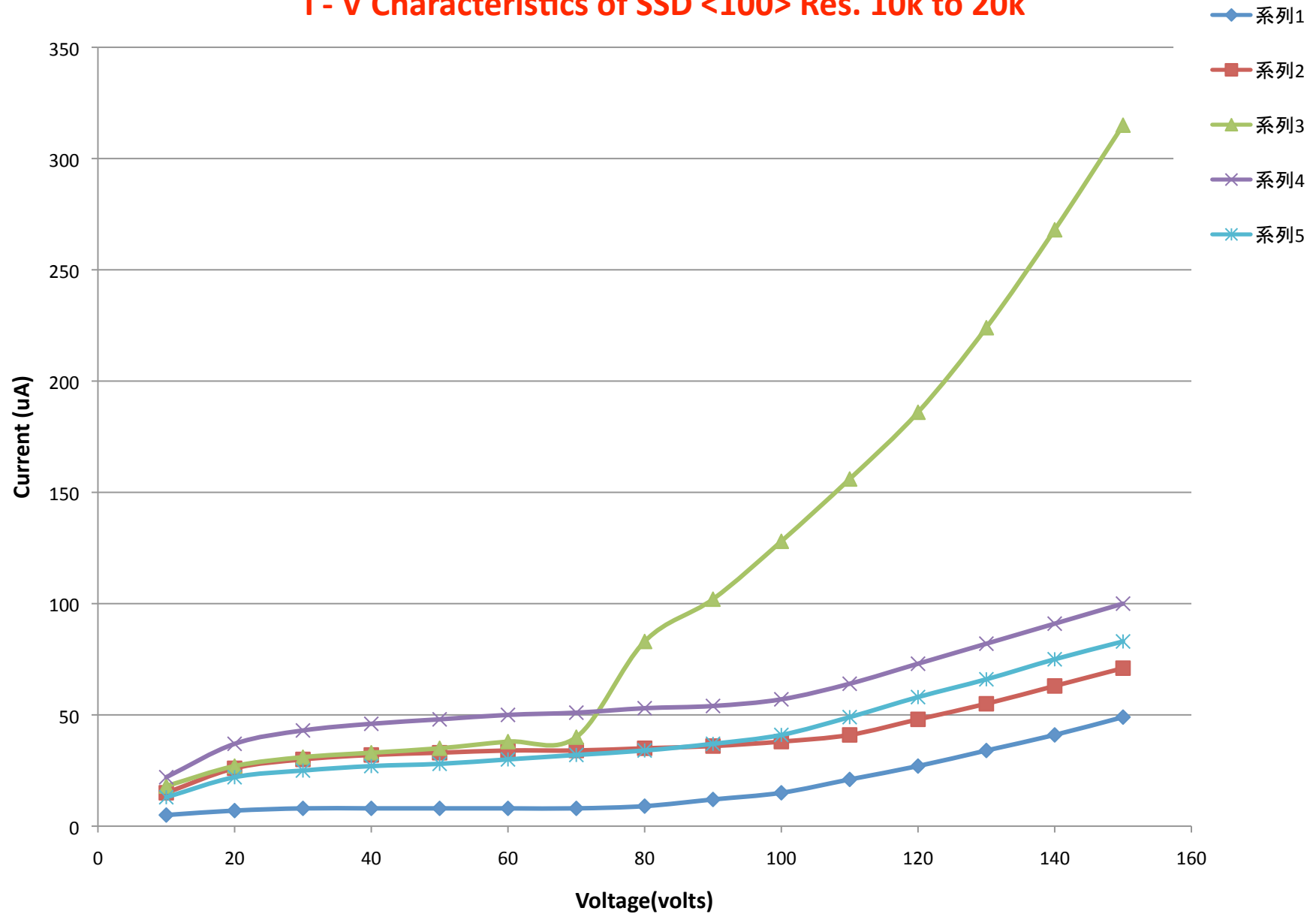
➤ P side : No. of Masks : 10 (double metal structure)

- Number of strips : 1024
Number of Readout strips : 512
Pitch : 75
P+ strip width : 50
P+ strip length : 25600

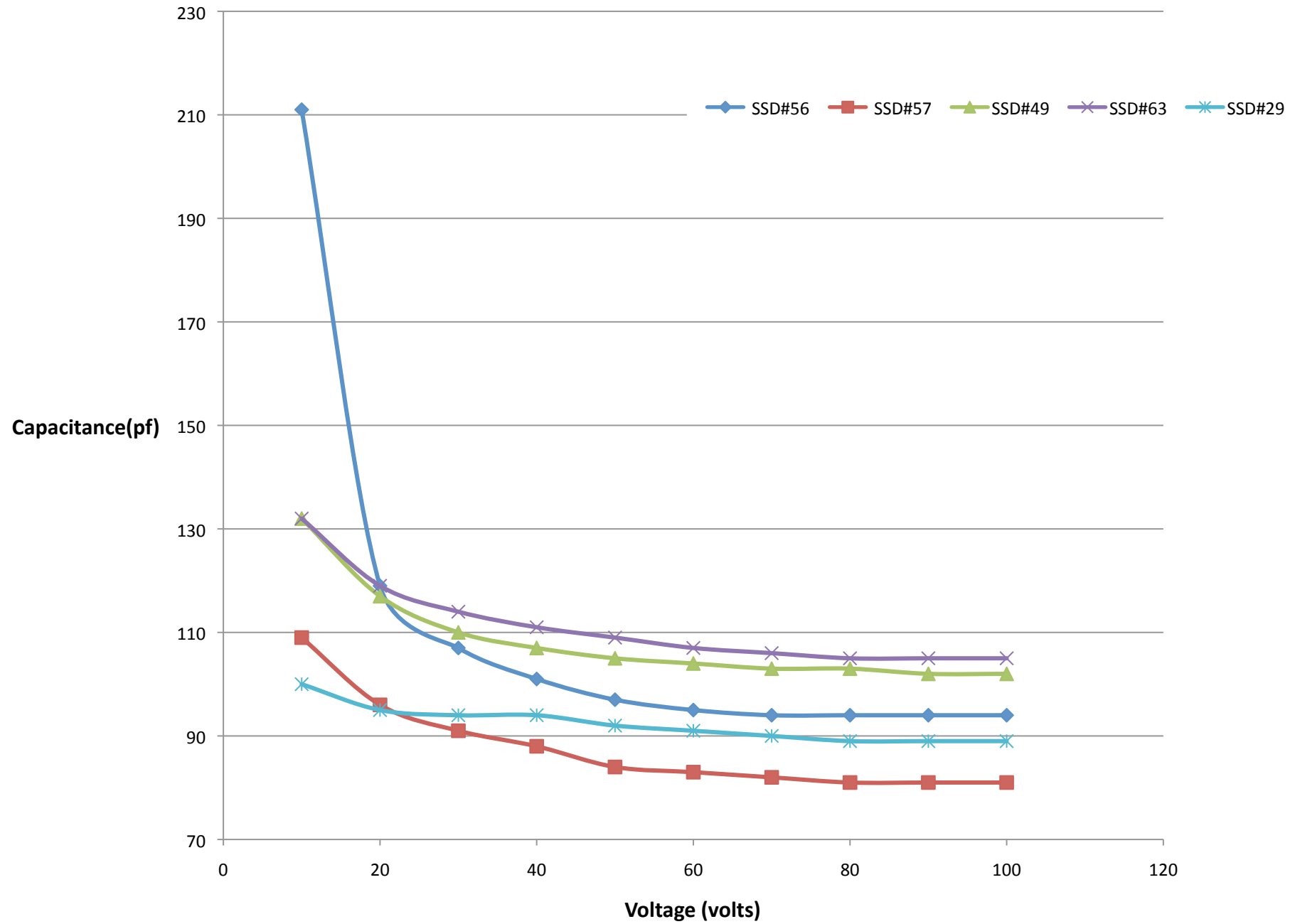
➤ N side : No. of Masks : 8

- Number of strips : 512
Pitch : 50
N+ strip width : 12
N+ strip length : 76800
P stop with ATTOL structure
- AC pad accessibility of the strips will be available with double metal structure and as well as without double metal structure (provision for bonding with kapton cable)

I - V Characteristics of SSD <100> Res. 10k to 20k



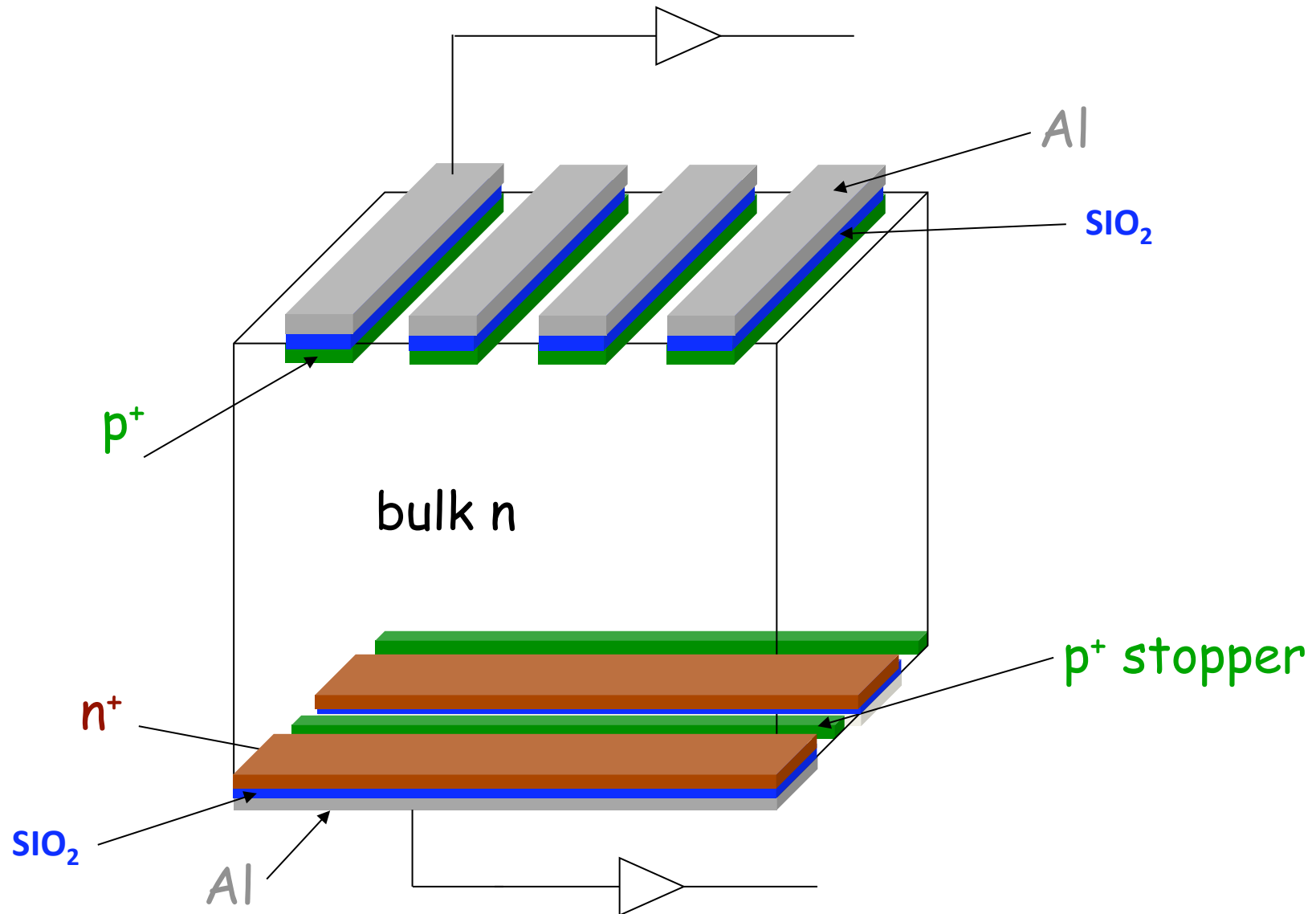
C - V Charcteristics of SSD <100>



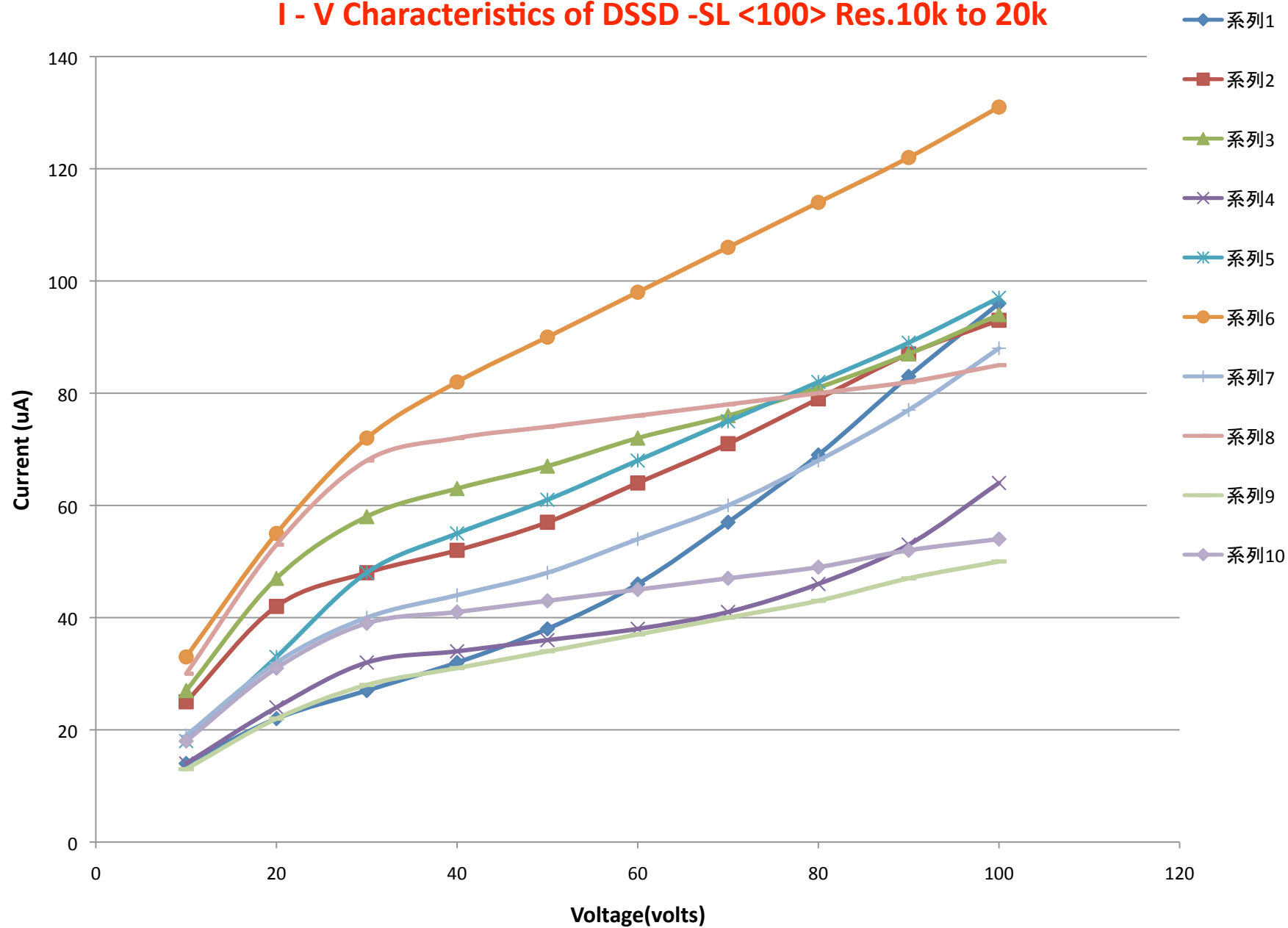
Double-sided Silicon Microstrip detector

Advantages :

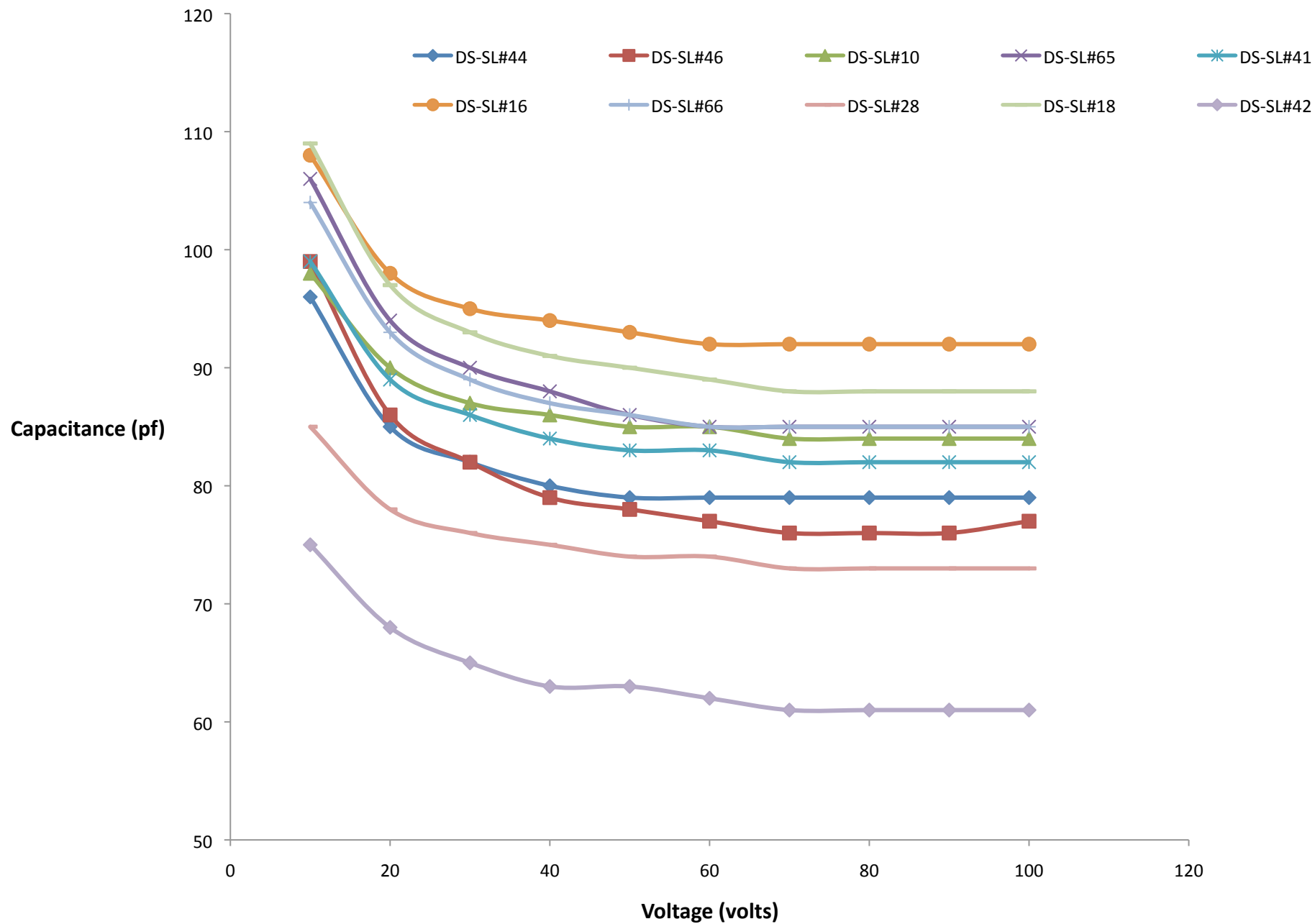
Two dimensional positional information



I - V Characteristics of DSSD -SL <100> Res.10k to 20k



C - V Characteristics of DSSD - SL



DSSD with double metal —P —side design with all masks

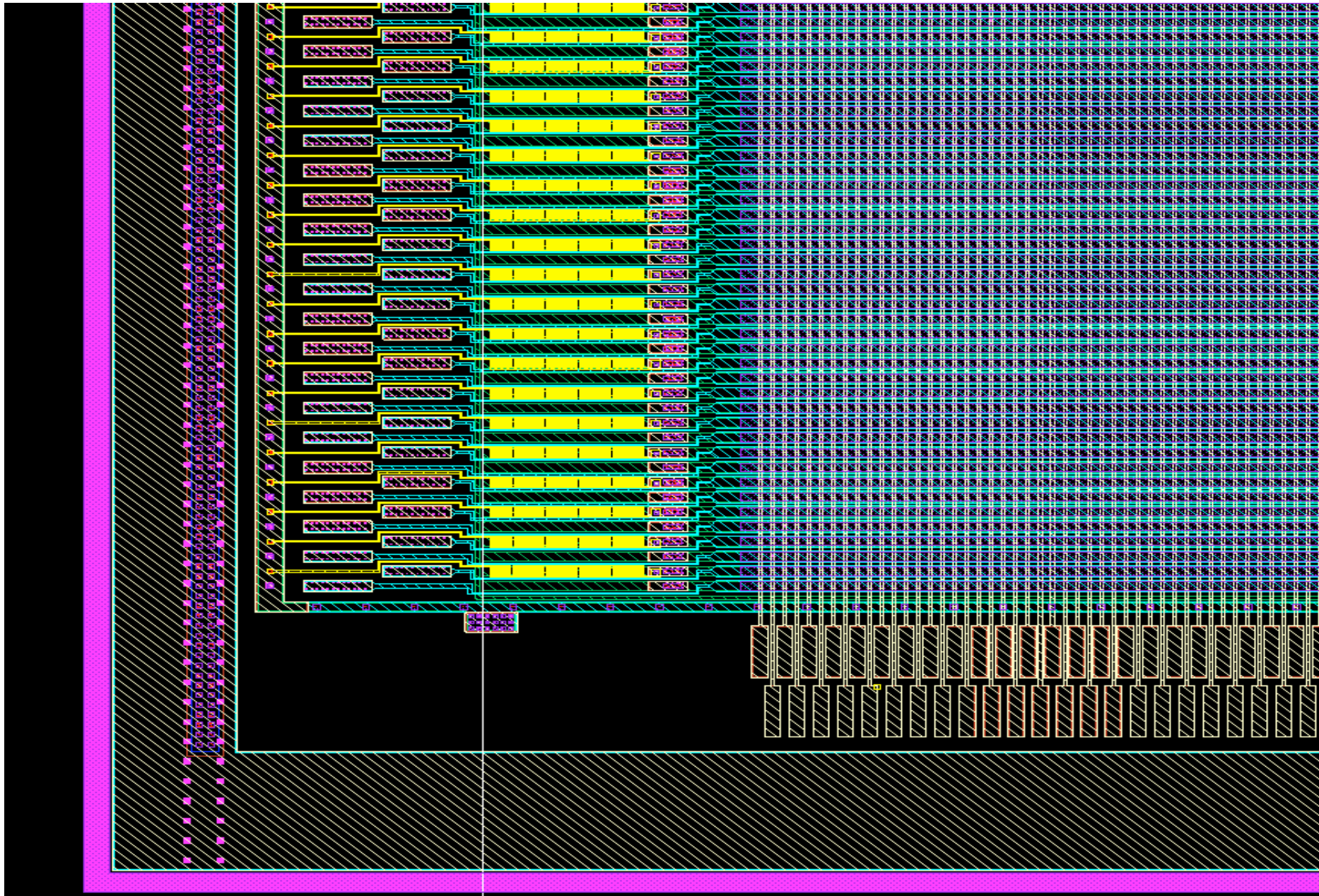


Photo of P - side Via's and Metal 2

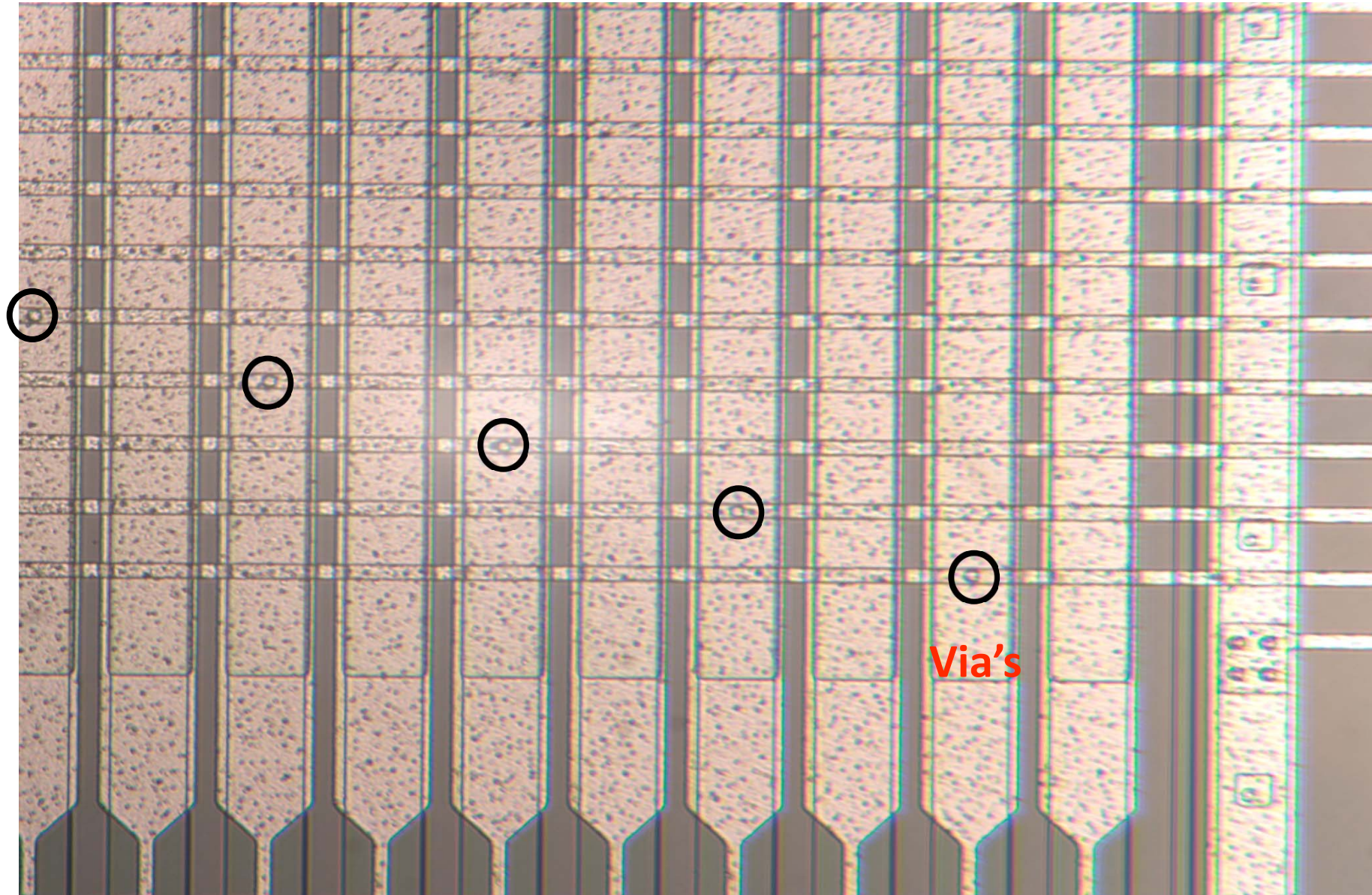
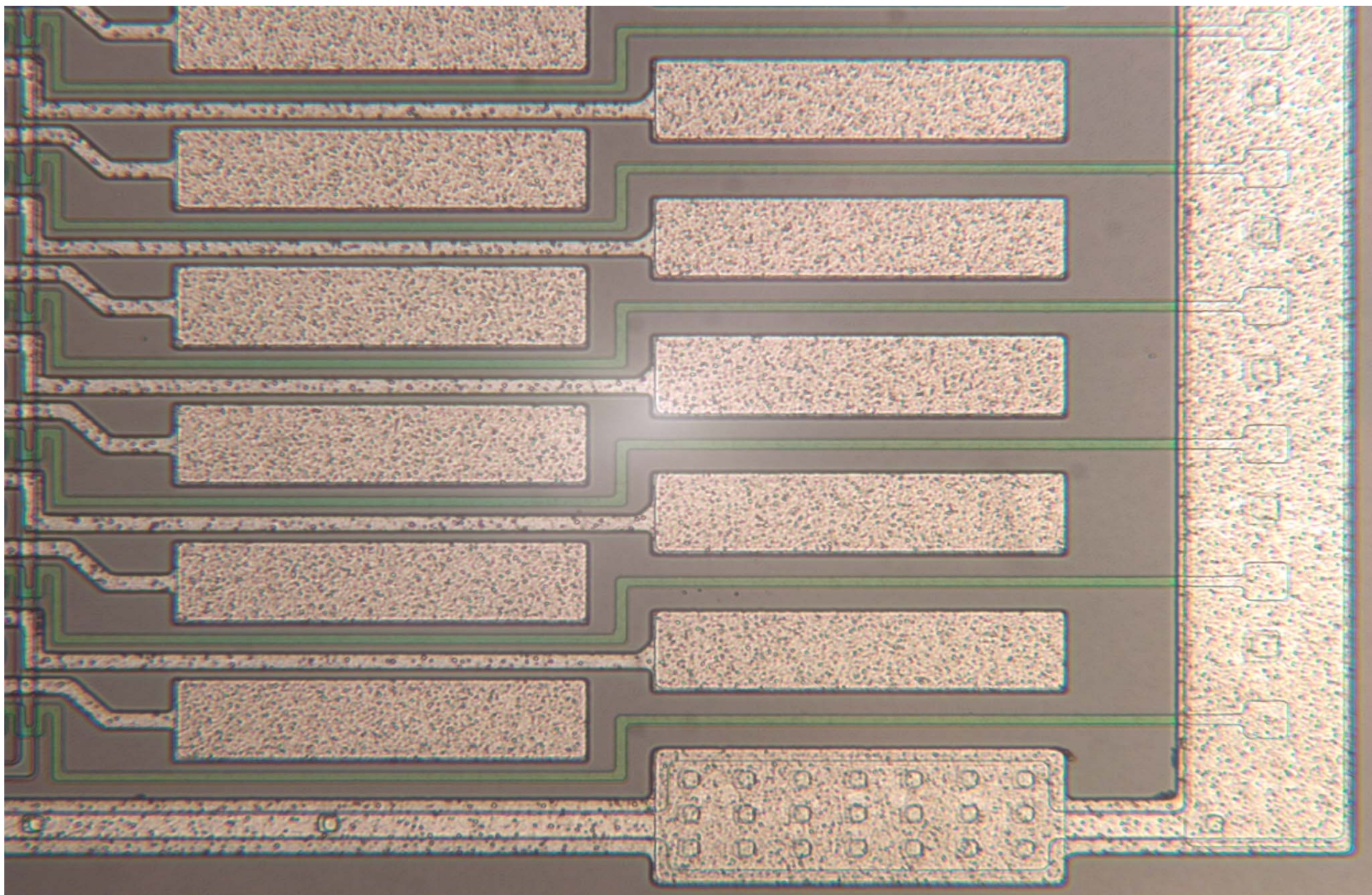
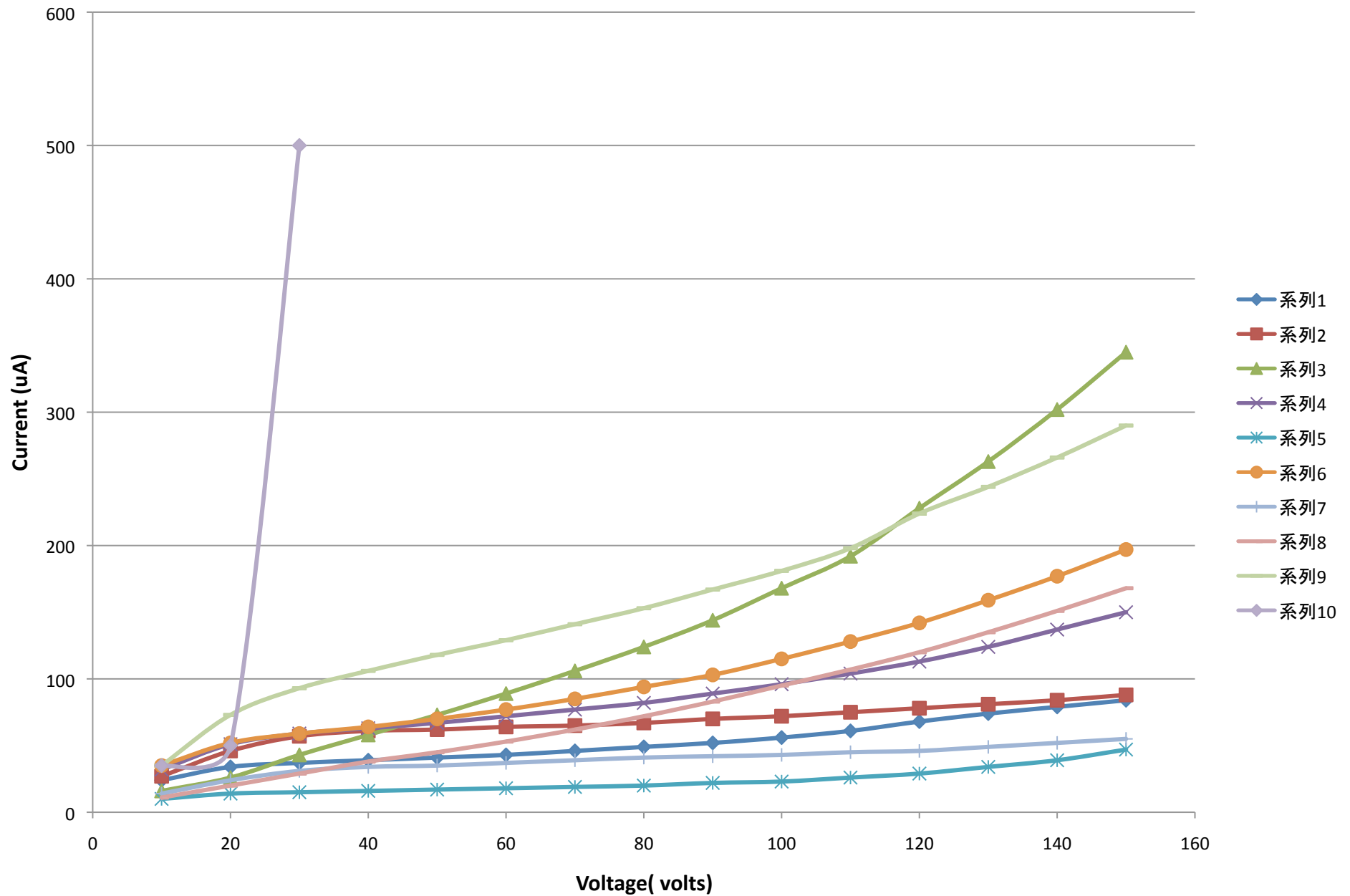


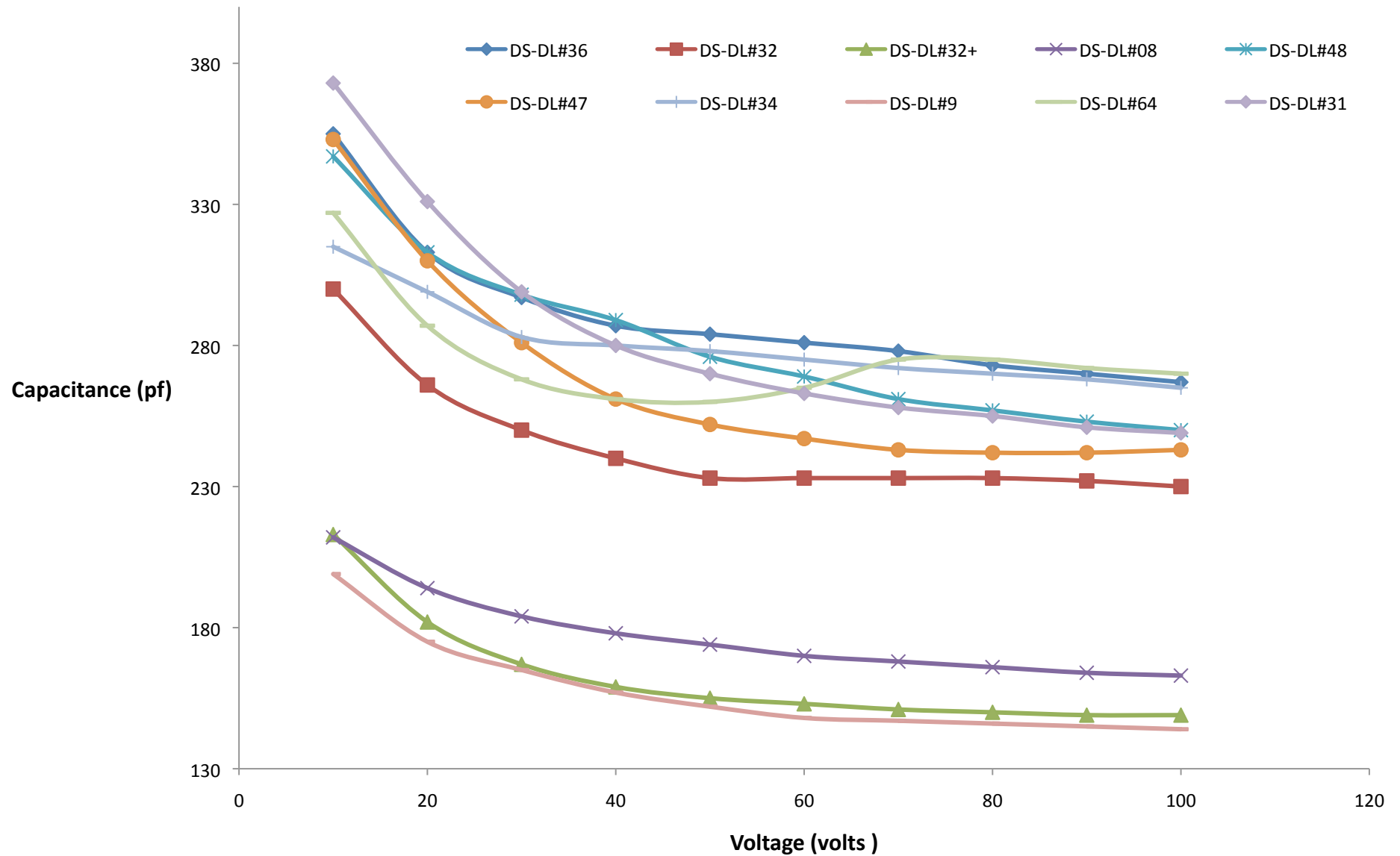
Photo of N side AC pads



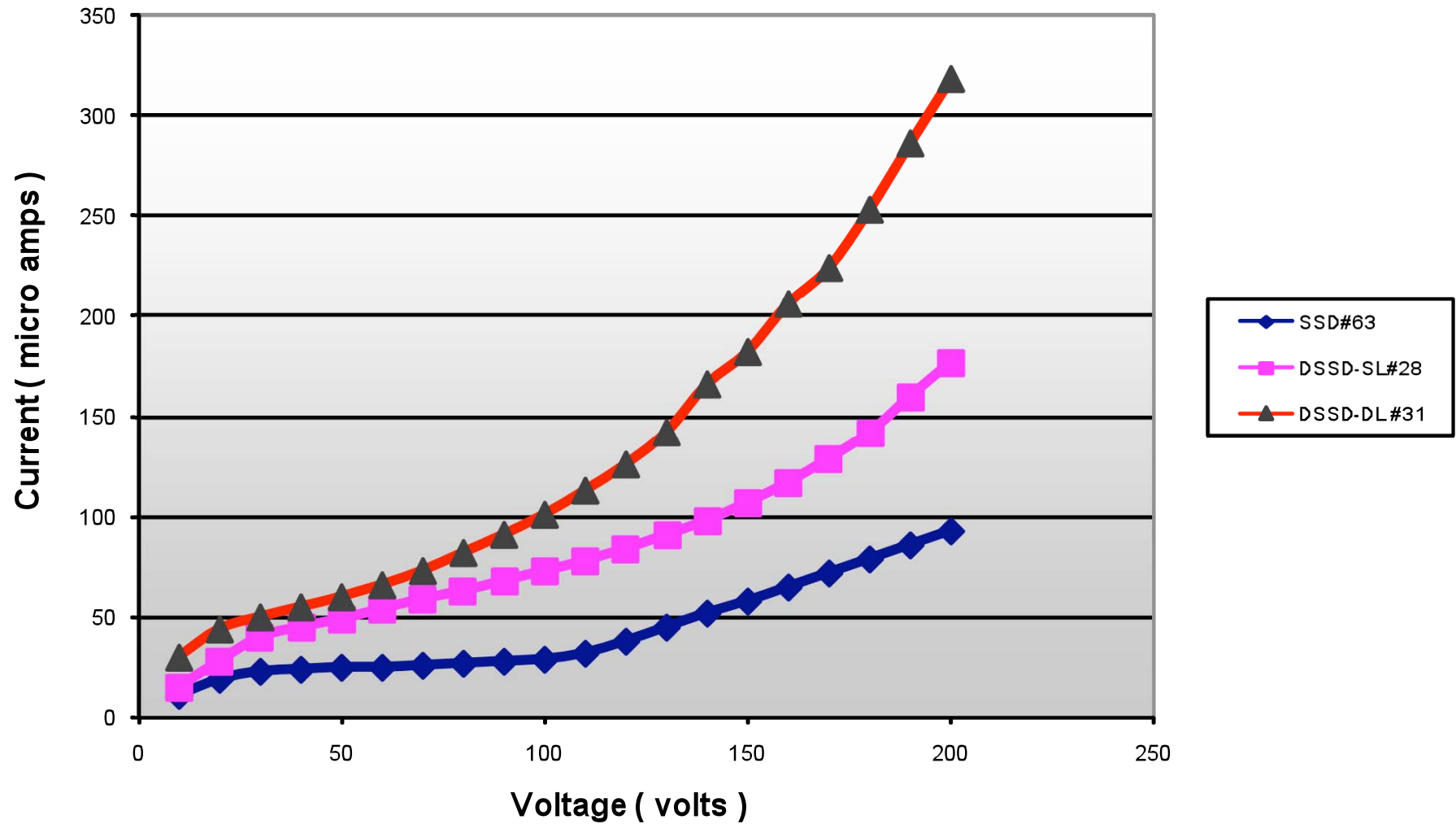
I - V Characteristics of DSSD - DL <100> Res. 10k to 20k



C - V Characteristics of DSSD - DL

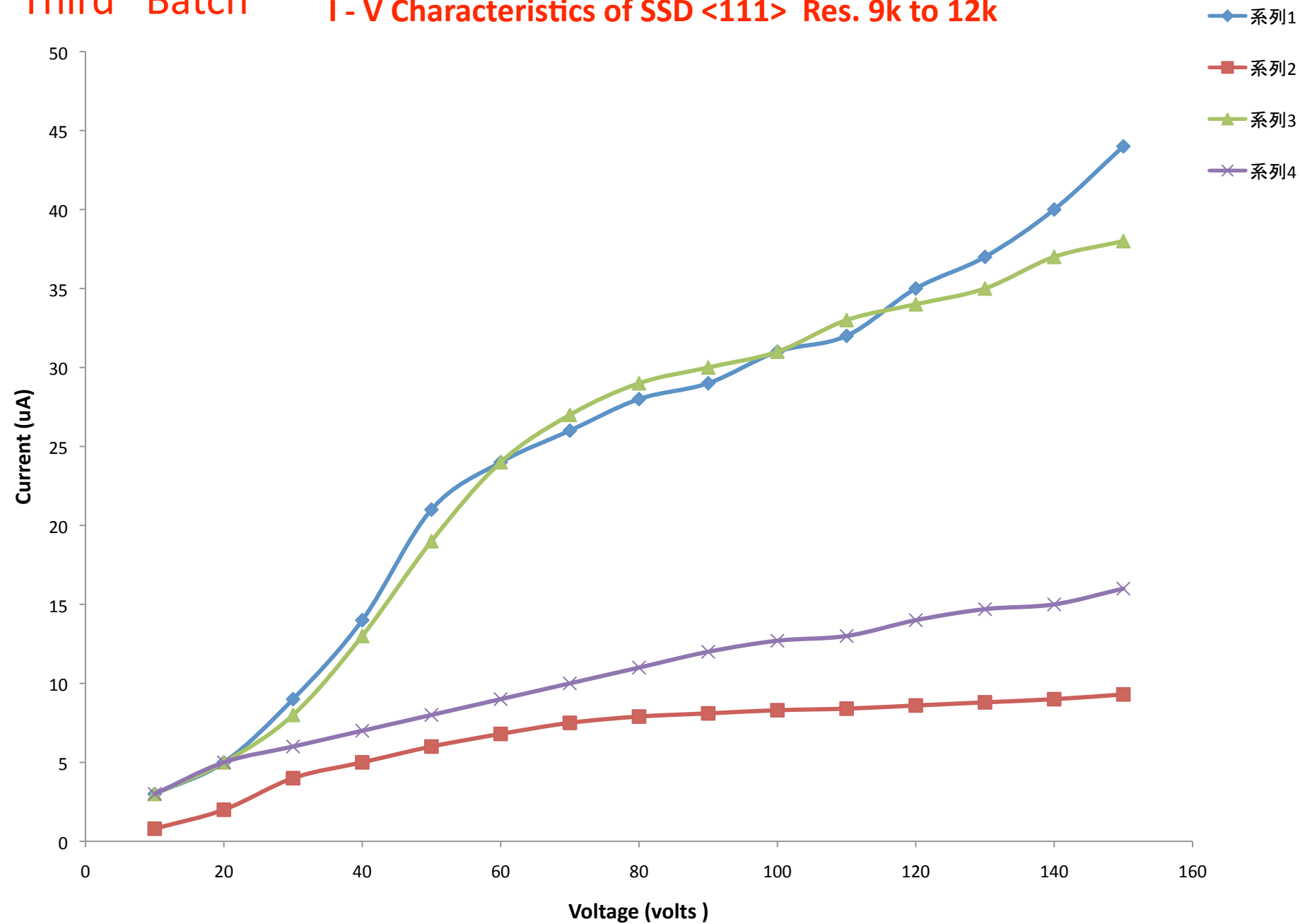


I - V Characteristics comparision of ssd and dssd

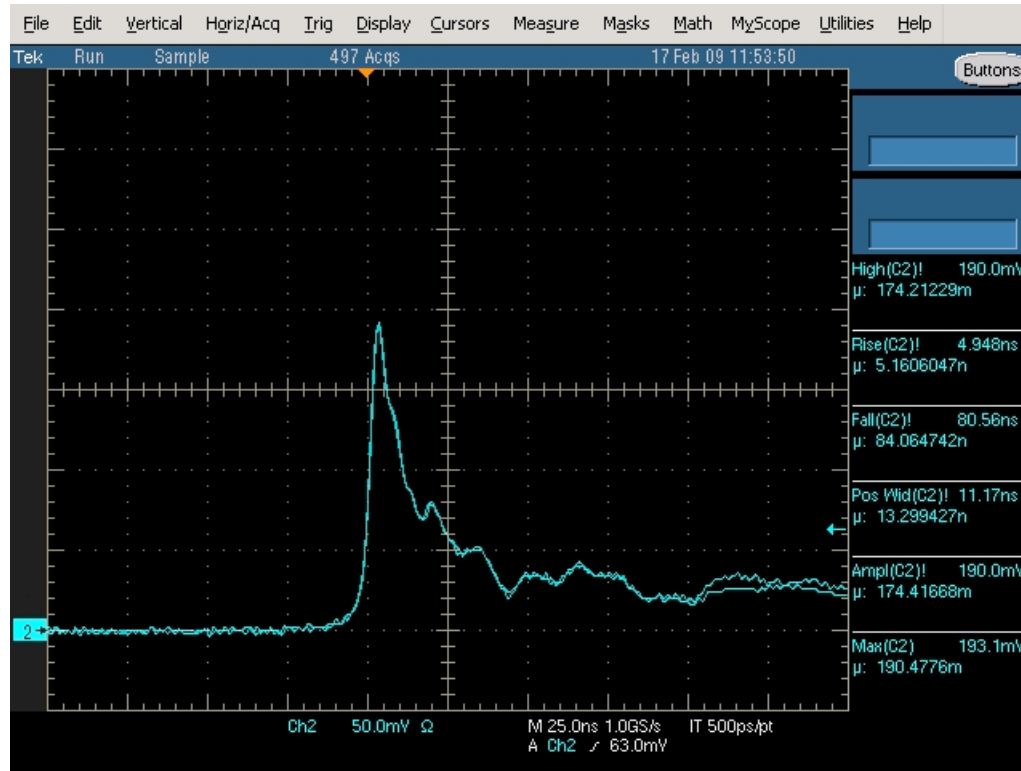


Third Batch

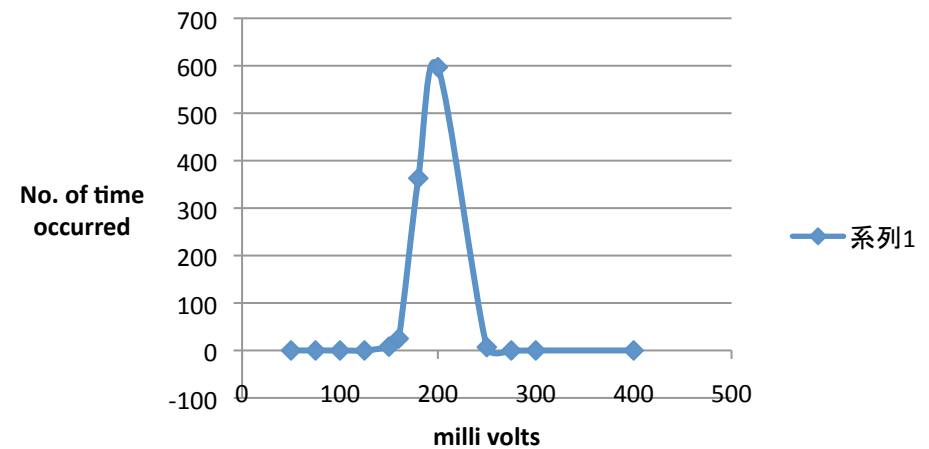
I - V Characteristics of SSD <111> Res. 9k to 12k



Response of silicon detector with 1064nm pulsed laser Tested with single sided detector

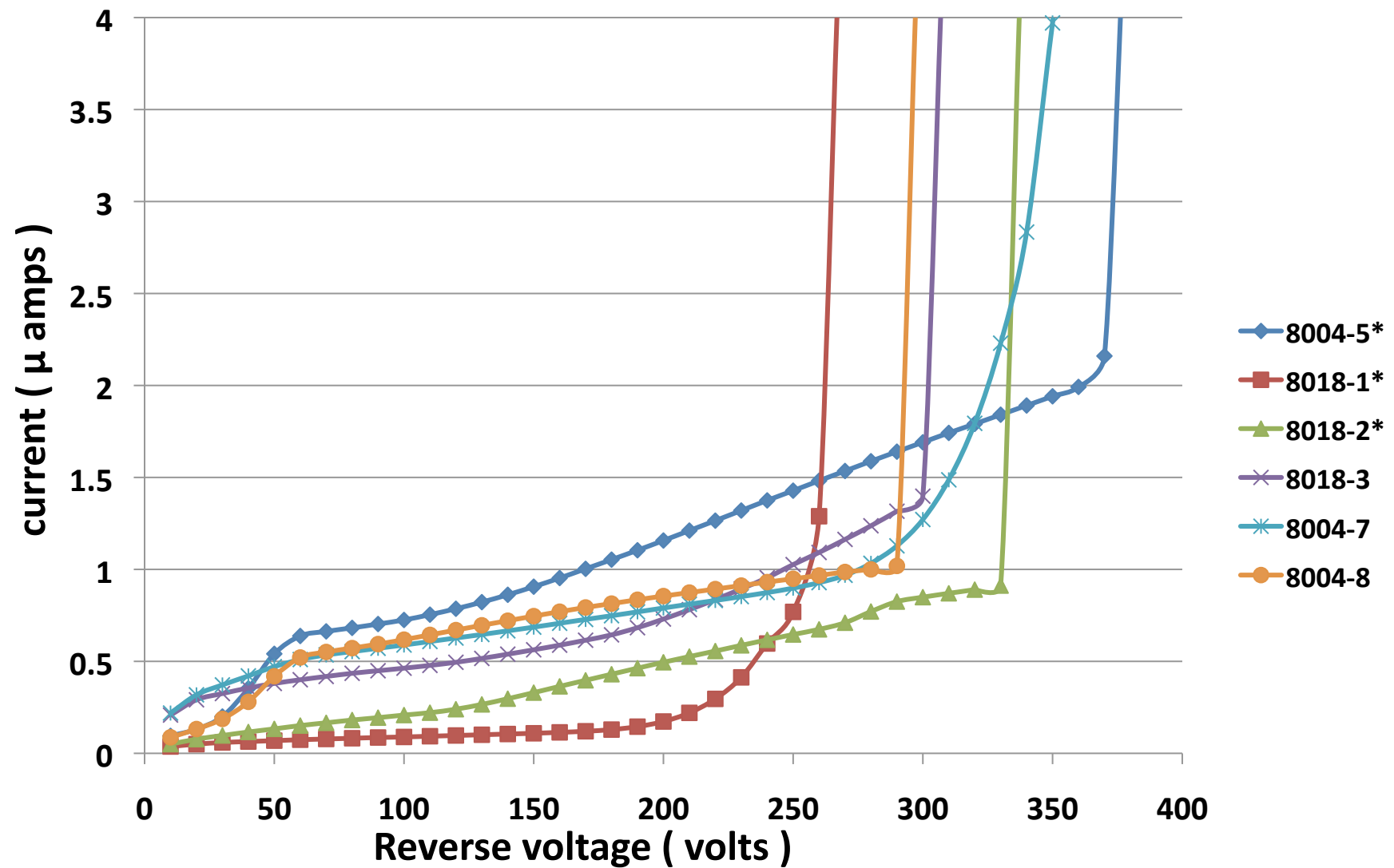


Pulse height distribution

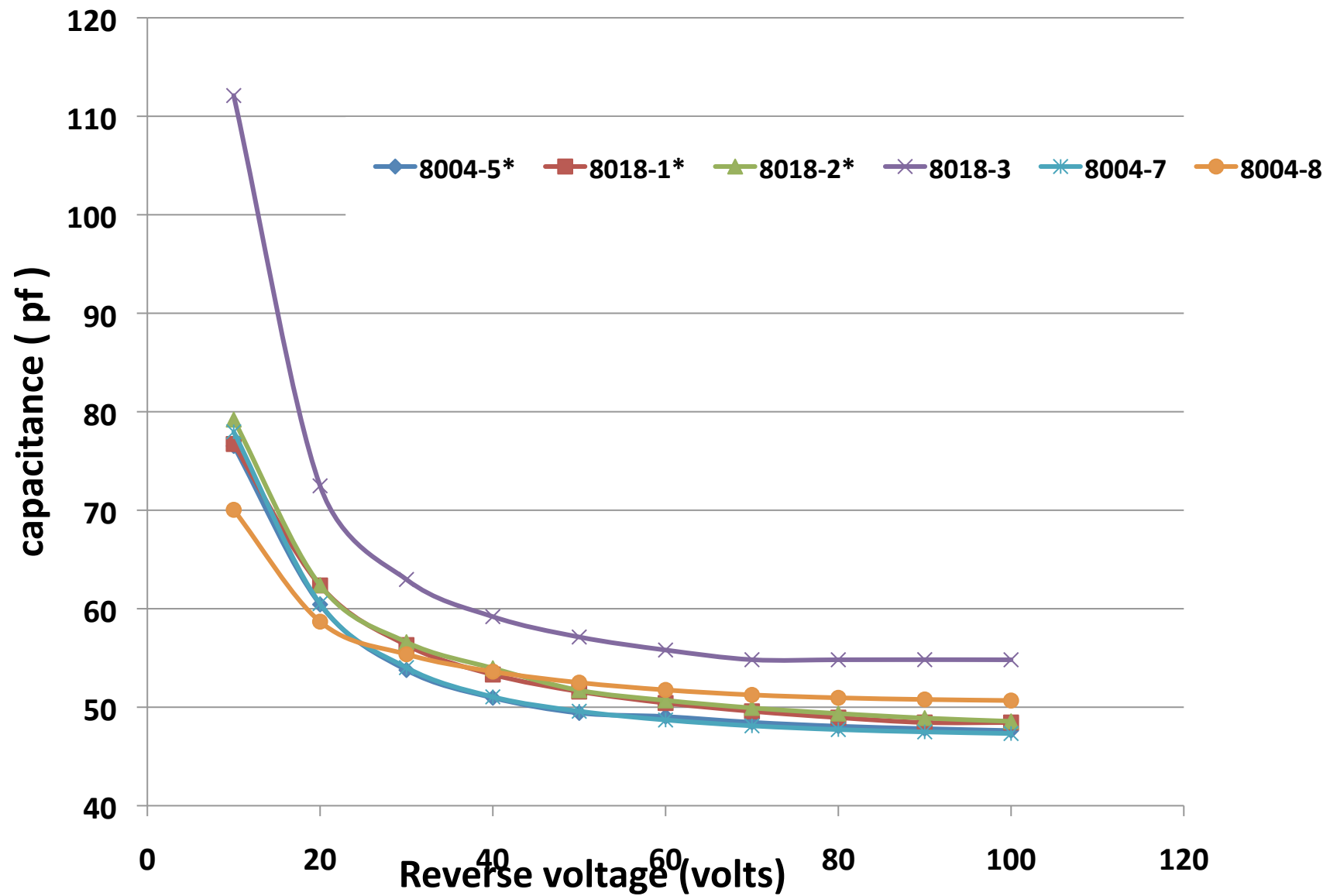


Fourth Batch

I — V characteristics of SSD with resistivity of 2-4kohm (03—03—09)



C-V characteristics of ssd (03-03-09)



Present status

Recently developed detectors has to under go different tests。

