

Common RD50 6" Project

Fabrication of silicon strip detectors in various geometries and substrates

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- 1) Motivation:
 - a. P-type isolation study
 - b. Geometry dependence
 - c. Charge collection studies
 - d. Noise studies
 - e. System studies: cooling, high bias voltage operation,
 - f. Different materials (MCz, FZ, DOFZ)
 - g. Thickness
 - h. Stability Test (21 days @ 10^{-6} atm and RT))

- 2) Mask Set: 7 masks (8 if moderated spray needs extra one)
 Multi-chip design arranged by Rd50 (Gianluigi Casse), see attached map

- 3) Target # of working wafers: 25 (17 p-type, 8 n-type)

- 4) Wafer (from different suppliers) furnished by RD50
 6"
 p-type > 4 kOhm Orientation: <100>, thickness 300um
 n-type ~ 1 kOhm, thickness 200um, 300um

- 5) Processing:
 - Oxygenation (for part of the wafers): 24h @ 1050 °C, 12h @ 110 °C (Zheng uses 7 days at 1200 °C) (TBD)
 - Single-sided processing only (even for n-on-n)
 - Single-metal
 - Polysilicon resistor biasing (~ 1Mohm)
 - Mostly AC coupling with integrated coupling cap
 - Isolation with "combined" P-stray [p-spray & p-stops]

Wafer	bulk	#	Thickness [um]	SSD
MCz	p	7	300	n-on-p
DOFZ	p	5	300	n-on-p
FZ	p	5	300	n-on-p
MCz	n	3	300	p-on-n +n-on-n (no backside)
Fz	n	2	300	p-on-n +n-on-n (no backside)
MCz	n	3	200	p-on-n +n-on-n (no backside)

6) Irradiation Plan
 Irradiations at CERN Spring/Summer 2006
 Target Fluence: $F_{\text{ew}} * 10^{15}$

7) Details of strip detectors
 Length: mainly 3 cm length
 Width: 128 strips matches ASIC and allows CCE measurements.
 Pitch: 80 micron (also 50um and 100mu)
 Width/pitch ~ 0.25
 Modified P-stray [p-spray & p-stops]
 3 um overhang on both sides

8) Layout on Wafer
 See picture

List of SSD and Pads

Inst.	Device	# of dev.	Footprint	Pitch	# of strips	Len gth	Metal	Bias	Coupling	Isolation	w/p	p-implant
UCSC	Short strips	1	6.2 x 0.80	50	128	2 x 3	Single	poly 1M	AC	Mod p	0.3	15
UCSC	Short strips	1	6.2 x 1.2	80	128	2 x 3	Single	poly 1M	AC	Mod p	0.3	30
UCSC	Short strips	1	6.2 x 1.5	100	128	2 x 3	Single	poly 1M	AC	Mod p	0.3	40
UCSC	Medium strips	1	6.2 x 1.2	80	128	6	Single	poly 1M	AC	Mod p	0.3	25
BNL	2-D	1	3.2 x 3	50	256	6	Single		DC	p-spray	0.6	
Ioffe	very short strips	3	1.2 x 1.2	100	64	~1		poly 1M	AC and DC	Mod p		
PSI etc	Pixel 1	2	1.04 x 0.98							Mod p		
PSI etc	Pixel 2	2	1.02 x 0.99							Mod p		
PSI etc	Pixel 3	2	0.62 x 0.54							Mod p		
Liverpool	Test structures	3	1 x 0.8	50	128	1	Single	poly 1M	AC	All?		
Liverpool	Test structures	4	1 x 1.2	80	128	1	Single	poly 1M	AC	All?		
Liverpool	Test structures	3	1 x 1.5	100	128	1	Single	poly 1M	AC	All?		
Syracuse	Pixel1x4	1	0.85x3.93	50	22x128x4		Single		dc	mod p		28um (n+ implant)
Syracuse	Pixel 1x1	3	0.85x1.14	50	22x128		Single		dc	Mod p		28um(n+ implant)
4"	Short strips	1	3.1 x 0.8	50	128	3	single	poly 1M	AC	Mod p	0.25	15
4"	Short strips	1	3.1 x 0.8	50	128	3	single	poly 1M	AC	Mod p	0.25	20
4"	Short strips	1	3.1 x 0.8	50	128	3	single	poly 1M	AC	Mod p	0.3	15
4"	Short strips	1	3.1 x 0.8	50	128	3	single	poly 1M	AC	Mod p	0.2	20
4"	Short strips	1	3.1 x 1.2	80	128	3	single	poly 1M	AC	Mod p	0.25	40
4"	Short strips	1	3.1 x 1.2	80	128	3	single	poly 1M	AC	Mod p	0.3	10
4"	Short strips	1	3.1 x 1.2	80	128	3	single	poly 1M	AC	Mod p	0.3	35
4"	Short strips	1	3.1 x 1.5	100	128	3	single	poly 1M	AC	Mod p	0.3	30
4"	Short strips	1	3.1 x 1.5	100	128	3	single	poly 1M	AC	Mod p	0.3	50

Proposed 6" Wafer Mask Layout

- 5 mm x 5 mm pads
- Strips 3 cm long, 128 strips wide, common to 4" and 6"
- 2D strip detectors 3 cm x 3 cm
- 6 cm (2 x 3cm) strip detectors
- Ioffe 1cm x1cm
- 6 cm strip detectors
- PSI Pixel detectors
- Liverpool 1 cm tests
- major cut line
- Syracuse pixel 4 x1, 1x1

