

# GLAST SENSOR SPECIFICATION for RFI

10/29/98

1) Sensor Type: n-bulk, p-strip, single-sided, AC coupled readout

2) Substrate

option A= 6 inch wafer,  
option B= 5 inch wafer,  
option C = 4 inch wafer

type:	n type
resistivity:	4-8 kΩcm
absolute thickness	400 +5, -15 um
uniformity of thickness:	+/- 5 um
Local surface flatness:	+/- 1 um

3) Size

There are three sizes of silicon strip detector, depending on the wafer size (option A-C).

3-1) Outside Dimensions

	width x length x thickness	wafer size
Option-A:	95.6 mm x 95.6 mm x 0.4 mm	6 inch
Option-B:	76.85mm x 76.85 mm x 0.4 mm	5 inch
Option-C:	64.37 mm x 64.37 mm x 0.4 mm	4 inch

3-2) Sensitive area of unit sensor

	width	length	No. of channels
Option A:	93.6mm	94.03mm	480
Option B:	74.88 mm	75.28 mm	384
Option C:	62.40 mm	62.80 mm	320

4) Detailed dimensions

strip pitch:	195 um
strip width implanted:	50 um
Al readout strip width:	52 um
edge dead area to edge of bias ring	
strip end;	775 um
side edge:	888 um

	Option-A	Option-B	Option-C
length of implanted strip:	94010 um	75260 um	62780 um
length of Al readout strip:	~93310 um	~74560 um	~62080 um

5) Technology

5-1) positioning accuracy of mask pattern: <+/- 1 um

5-2) Implanted strip

implant-ion density:	>1 x 10**14
implant + diffusion depth:	1.0 +/- 0.3 um
radius	
of any corner of the implant and Al electrode:	> 10 um

5-3) Biasing resistor: Poly-Si, implant-density: > 10\*\*14

5-4) Guard ring; one extra-guard ring with the extended Al electrode [1] outside of the bias ring, with a gap of 40 um from the bias ring (to improve the breakdown voltage).

5-5) Bias ring: Bias ring consists of Al electrode (extended electrode structure) and an p-implant underneath the Al electrode to collect leakage current from the edges.

5-6) N-side (ohmic contact side) n+ implantation. technology selection is left to the manufacturer to minimize the leakage current.

## 6) Electrical properties

6-1) Full depletion voltage:	70V - 125V
6-2) Leakage current (at 125V and 25°C); dI/dV/cm**2 at 125V:	< 50 nA/cm**2 < 0.2 nA/V/cm**2
6-3) Resistance of biasing resistors: (variation sensor to sensor)  maximum variation in one sensor:	20 - 53 MOhm (Option A), 24 - 64 MOhm (Option B), 30 - 80 MOhm (Option C) < +/- 10 %
6-4) Breakdown voltage of junction: catastrophic breakdown at 25° C: on-set of micro-discharge [2]:	> 200 V > 165V
6-5) Breakdown voltage of coupling capacitor:	> 100 V
6-6) Capacitance of coupling capacitor:	> 40 pF/cm
6-7) Resistance of Al electrode on the strip:	< 5 Ohm / cm
6-8) Isolation between adjacent strips:	> 30 GOhm
7) Maximum tolerable number of bad strips: (Sum of shorted capacitors, bad isolation, shorted Al electrodes, disconnected strip implant, open Al electrode)	< 0.5%

## 8) Required Tests by the manufacturer and supplied with each sensors.

8-1) Total leakage current as a function of bias voltage up to 200 V (5 volt steps)

8-2) leakage current of individual channels at 165V to check micro-discharge

8-3) List of dead channel for each sensor  
(isolation check of each channel, capacitor punch through check at 100V)

8-4) Resistance value of every 20th channel for one sensor in each processing batch.

8-5) Coupling capacitor value of every 20th channel for one sensor in each processing batch.

## 9) Radiation hardness

to be tested with <sup>60</sup>Co up to 10kRad: leakage current increase less than 2pA/rad/cm<sup>2</sup>

## References:

[1] T. Ohsugi et al., NIM A, 383 (1996) 167.

[2] T. Ohsugi et al., NIM A 342 (1996) 22, T. Ohsugi et al., NIM A, 383 (1996) 116.