

However, the implementation of a P+ doped substrate on an industrial manufacturing line of SOI substrates is of concern.

Indeed, in some manufacturing stations, for example during cleaning or heat treatment steps, boron diffusion out of the support substrate and scattering into the environment of the manufacturing line are observed.

But, the manufacturing line is generally not dedicated to a single type of SOI substrates, and can in particular lead to treat little or undoped substrates. However, boron diffused into the environment comes to contaminate said substrates and this diffusion does not allow an accurate control of their doping level, which can alter their electrical properties.

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Disclosure of the invention

Embodiments of the invention seek to overcome the abovementioned problem and to provide a "front-side" type image sensor comprising a substrate, which enables the dark current to be minimised without generating contamination problems on the manufacturing line of said substrate.

An aspect of the invention provides a front-side type image sensor, including:

a substrate successively comprising a P- type doped semiconducting support substrate, an electrically insulating layer and a semiconducting layer called an active layer, and

a matrix array of photodiodes in the active layer of said substrate,

characterised in that the substrate comprises, between the support substrate and the electrically insulating layer, a P+ type doped semiconducting epitaxial layer.

By "front side", it is meant in the present text the side of the image sensor intended to be exposed to a light radiation.

In the case where the support substrate would comprise a stack of different materials, by "material of the support substrate" it is meant the material located on the front side thereof, such that growing the epitaxial layer is performed

with the same lattice parameter (or sufficiently close to the same) as that of the underlying substrate.

According to one embodiment, the epitaxial layer is formed of the same semiconducting material as the support substrate.

In one particular implementation, the support substrate and the epitaxial layer are made of silicon.

According to one embodiment, the active layer is made of silicon.

Advantageously, the thickness of the electrically insulating layer is between 10 and 50 nm.

Preferably, the thickness of the epitaxial layer is between 0.1 and 3 μm .

Another aspect of the invention provides a method for manufacturing a front-side type image sensor, comprising the following steps of:

- providing a P- type doped semiconducting support substrate;
- epitaxially growing, on the support substrate, a P+ type doped semiconducting layer,
- providing a donor substrate comprising a superficial layer of semiconductor material;
- bonding the epitaxial layer to said layer of semiconductor material, an electrically insulating layer being located at the bonding interface;
- thinning the donor substrate so as to transfer a semiconducting active layer onto the support substrate; and
- forming a matrix array of photodiodes in the active layer of said substrate.

According to one embodiment, said method comprises a step of forming an embrittlement zone in the donor substrate so as to delimit said superficial layer, and thinning the donor substrate comprising detaching along said embrittlement zone.

In one implementation, forming the embrittlement zone comprises implanting atomic species in the donor substrate.