Interface State Density Measurement of Three Dimensional Silicon Structures by Charge Pumping Method

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Background

Planar bulk FET
Planar SOI FET
Multi Gate FET
Nanowire FET

MOS devices with 3D channels
 Excellent short channel effect immunity

A promising Device to replace planar Si MOSFET

Experimental Method

Charge pumping method has been applied to 3D structures fabricated on a SOI wafer by forming gated PIN diodes.

Charge pumping current (Icp) measurements were performed by changing the rise (tr) and fall time (tf) parameters of the trapezoidal pulse waves applied to the gate electrode.

Results

Conclusions

Direct measurement of cross-sectional shape dependent Dit and its distribution in the energy gap is needed.

Interfacial state density of three dimensional Si channels with a rectangular cross section has been measured by charge pumping method using gated PIN diodes formed on an SOI wafer.

An increase in the Dit has been observed with narrower fin structures. It can be modeled that Dit can be estimated by the average Dit of top and the sidewall surface, in proportion to the channel width.

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