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A-7-2 THRESHOLD VOLTAGE ENGINEERING WITH ESFI SOS MOST'S

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With complementary MOST's produced from bulk silicon one has a number of restrictions, like considering parasitic capacitances or breakdown voltages of insulation wells, which confine the doping tolerances within relatively small limits. As most of those restrictions are not valid, if thin Epitaxial Silicon Films on Insulators (ESFI ®) are used, some interesting combinations of doping for the two transistor types can be carried out.

Depending on type and concentration of doping, transistors of different type and threshold voltage can be produced, ranging from depletion or deep-depletion type to inversion type with small or with larger threshold voltages. The adjustment of threshold voltage in such a degree is called by us "threshold voltage engineering" and can be verified today experimentally very easy by the use of ion implantation, which allows the adjustment of a very definite dose of dopants.

In principle all the enumerated transistors can be realized with bulk silicon, too. But with ESFI SOS it is possible to integrate the different types in various combinations, so that by suitable combinations desired properties of devices and circuits can be achieved, especially by application of selective ion implantation.

Some already studied complementary combinations will be discussed and the results compared:

p-channel deep-depletion and n-channel inversion,

n-channel depletion/deep depletion and p-channel inversion,

or n-channel and p-channel, both inversion type.

One result of the comparison is, that depending on the application it has to be decided which property is the most significant for the respective application, e.g. low threshold voltage, high switching speed, very low leakage current, and from that the right combination has to be chosen.