

Box Isolation Technique

Advanced

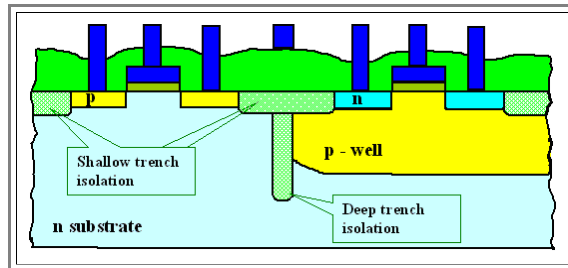
Advanced devices nowadays use a box isolation technique. However, the accepted name for that is "**shallow trench isolation**" or **STI**.

- If the trench is "**deep**" you may still call it **STI**, or possibly DTI, but this abbreviation may also mean "double trench isolation" - just get used to the fact that the semiconductor industry moves so fast to have time for standardizing those things and to force people to stick to it.

How is it done? And why do we need it? Let's just look at this issue very briefly.

First, we note that all the problems with **LOCOS** already mentioned in the [backbone](#) get rapidly worse as dimensions get smaller. On top of that, new problems develop, and the process flow becomes increasingly complicated (and expensive).

- Many problems would disappear if you just would etch a suitable "hole", i.e. a trench in your substrate wherever you need isolation, and then fill it with oxide.
- Or **CMOS** structure [from before](#) then would look like this:



- Of course, nobody would superimpose a shallow and a deep trench isolation as shown (you just would have the deep one and move the transistors closer together), but the picture illustrates the point nicely.

- So why hasn't it been done long since?

Because it is neither easy to etch the required trenches, to fill them with (high-quality) oxide, and to planarize the surface.

- The latter point is the key: Whatever process you use to **fill** the trenches with oxide, after your oxide deposition you have oxide everywhere, and you must take it off again wherever you don't want it, i.e. outside the trenches
- If you wonder why you **fill** the trenches with oxide, and why you don't use simple **thermal** oxidation anymore, you missed some the essentials! Figure it out yourself; it is enough to consider what would happen if you start thermally oxidizing your **Si** after you etched the deep trench.