Question:
What is the advantage/disadvantage of using epitaxial substrates in analog or mixed signal IC designs?

Answer:
There are a number of factors to consider when choosing epitaxial wafers for IC designs. Epitaxial substrate starting material is preferred because these wafers permit IC designs that are significantly more robust against latch-up than designs using bulk silicon wafers. Most submicrometer fabrication lines use epitaxial wafer starting material for digital IC fabrication because if the improved latch-up robustness. Although analog designs will benefit from latch-up robustness other factors favor using bulk wafer starting material.

Analog designs require good isolation between circuits to achieve low noise performance. A bulk substrate, with its high bulk resistivity, acts as a filter to attenuate high frequency noise rapidly minimizing coupling to surrounding circuitry. Epitaxial substrates have a low bulk resistivity material underneath the epitaxial layer which is able to couple noise more efficiently to nearby circuits. Also, the presence of a low resistivity layer under the epitaxial layer will cause spiral inductors to have lower Q due to the close proximity of the lower resistivity bulk substrate. As a result of these design issues, most foundries that advertise mixed signal IC fabrication will offer either epitaxial wafers or bulk wafers as options to please both digital designers and analog designers.

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