

Letter of Reasons for Petition and Reply

(1) We have received your office's notification of review opinion dated April 21, 2016.

(2) Description of revised matters:

Claim 11 was amended to add the qualifying feature "wherein a portion of the epitaxial layer is covered by the sidewall substructure." This amendment is supported by Figure 4 and does not exceed the initial content of the application, complying with Article 43 of the Patent Law.

(3) Reasons why the invention claimed in this case is progressive:

(1) The applicant believes that the ion implantation in Reference 1 cannot be compared with the epitaxial layer in Claim 1 of this case.

According to conventional technology, the ion implantation described in Reference 1 involves implanting ions that provide primary carriers (holes or electrons) into a silicon substrate to form source/drain regions. The epitaxial layer in this case is a strained silicon substrate, which can be considered a specialized silicon substrate. Replacing the silicon substrate with strained silicon in the source/drain regions can impart compressive or tensile stress to the primary carriers (holes or electrons) in the source/drain regions, thereby increasing their mobility. Generally, after forming the epitaxial layer, an additional ion implantation step is performed to provide the primary carriers that form the source/drain regions of the device.

In other words, from the perspective of the invention as a whole (i.e., a method for manufacturing a transistor), ion implantation and epitaxial layer formation are actually two steps with different purposes. They can exist simultaneously at different time points in the process and cannot be arbitrarily selected or directly replaced. Therefore, technicians in this field cannot simply replace ion implantation with epitaxial layer formation to understand the technical content of the current claim 1 of this case.

Furthermore, since ion implantation and epitaxial layer are not equivalent steps that can be directly replaced, if a technician in this field wants to combine the epitaxial layer based on Citation 1, it is reasonable not to think of setting the epitaxial growth step at the time point of ion implantation in Citation 1 and thus obtain the technical content of the current claim 1.

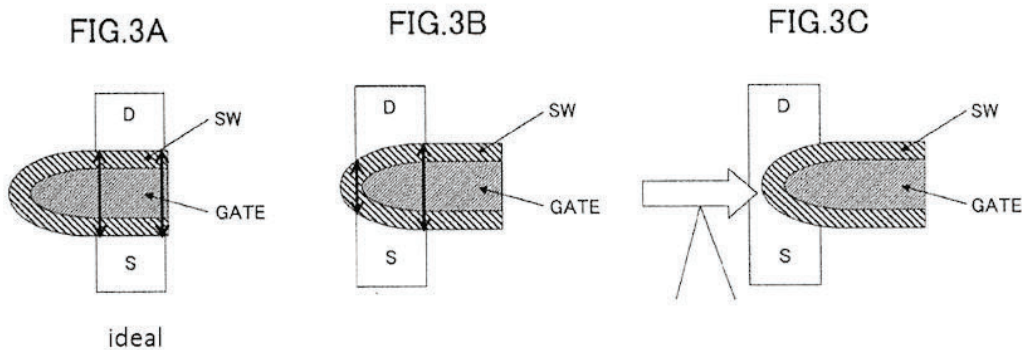
Furthermore, since the entire content of Citation 1 does not include the epitaxial growth step and cannot provide any insight into the relationship between gate separation and defects such as bridge epitaxial growth/gate sidewall epitaxial growth, a person skilled in the art would be motivated to "place the epitaxial growth step before the gate separation step" and thus understand the technical content of the current claim 1.

(2) The applicant believes that claim 1 actually has an effect that cannot be anticipated in citation 1.

There are many reasons for semiconductor component failure, including failures caused by physical defects such as falling particles, short circuits or open circuits in wiring patterns, and component structural damage, as well as failures caused by electrical property fluctuations such as electrical drift and degradation of components.

The defects to be avoided in this case are epitaxial bridges or gate sidewall epitaxial growth, which occur between the gate terminals or on the gate sidewalls and are considered physical defects. Reference 1 aims to avoid unintended ion implantation, which is actually located in the active region (substrate) and is considered electrical property fluctuation. The locations and types of defects addressed in this case and Reference 1 are different.

Furthermore, by performing gate separation after epitaxial growth, this approach, compared to prior techniques, is no longer limited by the concerns of excessive hard mask/sidewall wear, allowing for sufficient etching to ensure gate line separation. This advancement over prior techniques is not disclosed in Reference 1. Conversely, the approach of Reference 1 cannot arbitrarily increase the etch depth during the gate separation etch step, as this could increase the amount of SRAM gate line end setback, making it more likely that the gate line end rounding area will cross over into the active region, causing a change in channel length (e.g., FIG. 3B ). In severe cases, this could even lead to the situation shown in FIG. 3C .



Based on the above (1)(2), the applicant believes that the "epitaxial layer" in claim 1 of this case and the "ion implantation" in citation 1 are distinguishing features that cannot be simply replaced. Moreover, the technical personnel in this field cannot get the inspiration of "forming the epitaxial layer first and then performing gate separation" based on the content of citation 1, and cannot predict the

This solution avoids bridging epitaxy/sidewall epitaxy and provides a larger etching process window. Therefore, based on Citation 1, Claim 1 complies with Article 22, Paragraph 2 of the Patent Law and possesses progressiveness.

(IV) Regarding the unity of invention between claim 1 and claim 11 as amended:

According to the content of the modified claim 11, "and two of the four sidewalls have a sidewall sub-structure while the other two sidewalls do not have the sidewall sub-structure," it can be reasonably inferred that the above structure can only be obtained by first forming the sidewall sub-structure and then performing gate separation.

In addition, from the newly added content of "part of the epitaxial layer is covered by the sidewall" in the amended claim 11, it can be reasonably understood that the structure in which part of the epitaxial layer is covered by the sidewall is obtained by first forming the epitaxial layer and then forming the sidewall.

Combining the above two points, it can be concluded that the order of steps for forming the structure of amended claim 11 should be "forming an epitaxial layer → forming sidewalls → gate separation." In other words, the structure of amended claim 11 implicitly implies the order of "forming an epitaxial layer → gate separation," which is the technical feature defined in claim 1: "After forming the epitaxial layer, performing a second lithography and etching process on the gate pattern..." Therefore, amended claim 11 and claim 1 share the same technical features and fall within the same broad inventive concept. Furthermore, if these technical features demonstrate advancement over Citation 1, amended claim 11 and claim 1 meet the requirements for unity of invention under Article 33 of the Patent Law.

(5) In summary, the applicant believes that claim 1 of this case, based on Citation 1, is an improvement, and that the amended claim 11 should overcome the deficiency of unity of invention. We sincerely hope that the Office will further examine this case in detail and grant the patent as soon as possible.