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A MODIFIED TUNGSTEN-PLUG CONTACT PROCESS

ABSTRACT

An improved method for the fabrication of an ohmic, low resistance contact to heavily doped silicon is described using a CVD deposited tungsten plug provided with Ti/TiN barrier metallurgy. The method provides for surface planarization using a borophosphosilicate glass insulator deposited on the silicon. After the glass is flowed to planarize its surface, contact holes are patterned in the glass and the exposed silicon substrate contacts are implanted. Instead of activating the implant with a rapid-thermal-anneal at this point the Ti/TiN barrier metallurgy is applied first followed by the anneal. This provides support for the glass at the upper corners of the contact opening during the anneal and thus prevents them from deforming and encroaching into the contact hole opening.

By using the Ti/TiN metallurgy to support the glass, higher annealing temperatures are permitted, providing not only for adequate dopant activation but also for a lower contact resistance and improved bonding of the metallurgy to the silicate glass. The preserved integrity of the contact opening walls results in complete filling of the contact opening by the tungsten. Additionally, a second annealing step is unnecessary.

(FIGURE 2A IS SUGGESTED FOR PUBLICATION)