ABSTRACT

REPLACEMENT OF SILICON NITRIDE COPPER BARRIER WITH A SELF-ALIGNING METAL BARRIER

An improved and new process for fabricating self-aligned metal barriers by atomic layer deposition, ALD, capable of producing extremely thin, uniform, and conformal metal barrier films, selectively depositing on copper, not on silicon dioxide interlevel dielectric, in multi-layer dual damascene trench/via processing. Silicon nitride is presently used as a insulating copper barrier. However, silicon nitride has a relatively high dielectric constraint, which deteriorates ICs with increased RC delay. Copper metal barriers of niobium and tantalum have been deposited by atomic layer deposition on copper. With high deposition selectivity, the barrier metal is only deposited over copper, not on silicon dioxide, which eliminates the need of an insulating barrier of silicon nitride.

FIGURE 2D