

Gas Dome Dielectric Systems For ULSI Interconnects

Researchers at the University of South Florida have developed a novel technique to reduce the interconnect line capacitance using unity-k Gas Dome Dielectric Systems (GDDS).

Delays in high-speed integrated circuits is rapidly becoming the limiting factor with design below 250nm(0.25 μm). As the packing density increases, the cross sectional area of line interconnects decreases causing the resistance to length ratio to dramatically increase. The adoption of Copper (Cu) as the conductor of choice can improve the resistance component by almost a factor of two over that of Aluminum (Al). A dramatic reduction in the dielectric constant of the inter-metal dielectric material over the silicon dioxide is also needed to address the capacitance component for future high-speed circuitry.

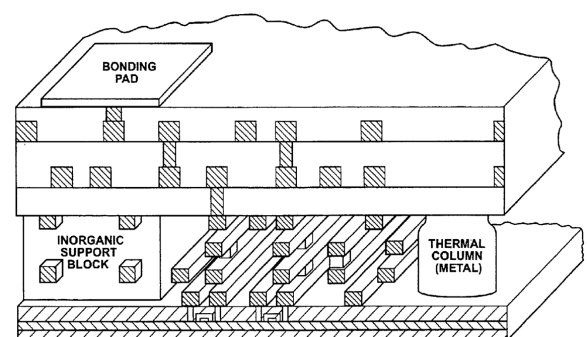
In order to overcome these inadequacies USF inventors have developed a method of fabricating electrical conductors for an integrated circuit (IC) having improved electrical properties. A unity K-dielectric system (GDDS) is developed that uses a light molecular gas having good electrical properties for its interlayer and intralayer dielectric material. The proposed processing scheme utilizes only current technologies and therefore should be realizable. The final structure incorporates only high conductivity metal and widely used inorganic dielectrics materials, eliminating the reliability issue associated with most low-k materials. The invention effectively reduces the dielectric constant of insulating material between conductors in ULSI (Ultra Large Scale Integrated) circuits.

The invention has a wide application in Integrated Circuit fabrication and all other areas where high speed Integrated circuits are manufactured.

ADVANTAGES:

- Unity dielectric constant ($k=1$)
- Optimal Electrical properties
- High Breakdown strength
- Low ionic/contamination/migration/mobile ion/charge trapping effects
- High volume and Surface resistivity
- No polarization effects
- Low leakage
- Reduced Over-all cost of ownership

New innovation for efficient High speed integrated circuits



The "Gas Dome Dielectric System" uses an oxide dome to contain a gas dielectric. Thick metal towers and oxide supports for metal traces and bond pads complete the system.

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