METHOD FOR FABRICATING AN AIR GAP SHALLOW TRENCH ISOLATION (STI) STRUCTURE

Abstract

A method of manufacturing a shallow trench isolation (STI) with an air gap that is formed by decomposing an organic filler material through a cap layer. A pad layer and a barrier layer are formed over the substrate. The pad layer and the barrier layer are patterned to form a trench opening. We form a trench in substrate by etching through the trench opening. A first liner layer is formed on the sidewalls of the trench. A second liner layer over the barrier layer and the first liner layer. A filler material is formed on the second liner layer to fill the trench. In an important step, a cap layer is deposited over the filler material and the second liner layer. The filler material is subjected to a plasma and heated to vaporize the filler material so that the filler material diffuses through the cap layer to form a gap. An insulating layer is deposited over the cap layer. The insulating layer is planarized. The barrier layer is removed.

Fig. 8