ABSTRACT

A METHOD FOR CONTROLLING THE SILICON NITRIDE PROFILE DURING PATTERNING USING A NOVEL PLASMA ETCH PROCESS

A novel anisotropic plasma etching process for forming patterned silicon nitride (Si_3N_4) layers with improved critical dimension (CD) control while minimizing the Si_3N_4 footing at the bottom edge of the Si_3N_4 pattern is achieved. A pad oxide/silicon nitride layer is deposited on a silicon substrate. A patterned photoresist layer is used as an etching mask for etching the silicon nitride layer. By this invention, a chlorine (Cl_2) breakthrough plasma pre-etch forms a protective polymer layer on the sidewalls of the patterned photoresist and removes residue in the open areas prior to etching the Si_3N_4. The Si_3N_4 is then anisotropically plasma etched using an etch gas containing SF_6. The polymer layer, formed during the Cl_2 pre-etch, reduces the lateral recessing of the photoresist when the Si_3N_4 is etched, and results in improved patterned Si_3N_4 profiles with reduced CD bias, and minimizes Si_3N_4 footings at the bottom edge of the Si_3N_4 pattern.

(FIGURE 1 IS SUGGESTED FOR PUBLICATION)