



US005242536A

**United States Patent** [19]**Schoenborn**[11] **Patent Number:** **5,242,536**[45] **Date of Patent:** **Sep. 7, 1993****[54] ANISOTROPIC POLYSILICON ETCHING PROCESS****[75] Inventor:** Philippe Schoenborn, San Jose, Calif.**[73] Assignee:** LSI Logic Corporation, Milpitas, Calif.**[21] Appl. No.:** 632,461**[22] Filed:** Dec. 20, 1990**[51] Int. Cl.<sup>5</sup> .....** H01L 21/00**[52] U.S. Cl. ....** 156/643; 156/646;  
156/657; 156/662**[58] Field of Search .....** 656/657, 662, 643, 646**[56] References Cited****U.S. PATENT DOCUMENTS**

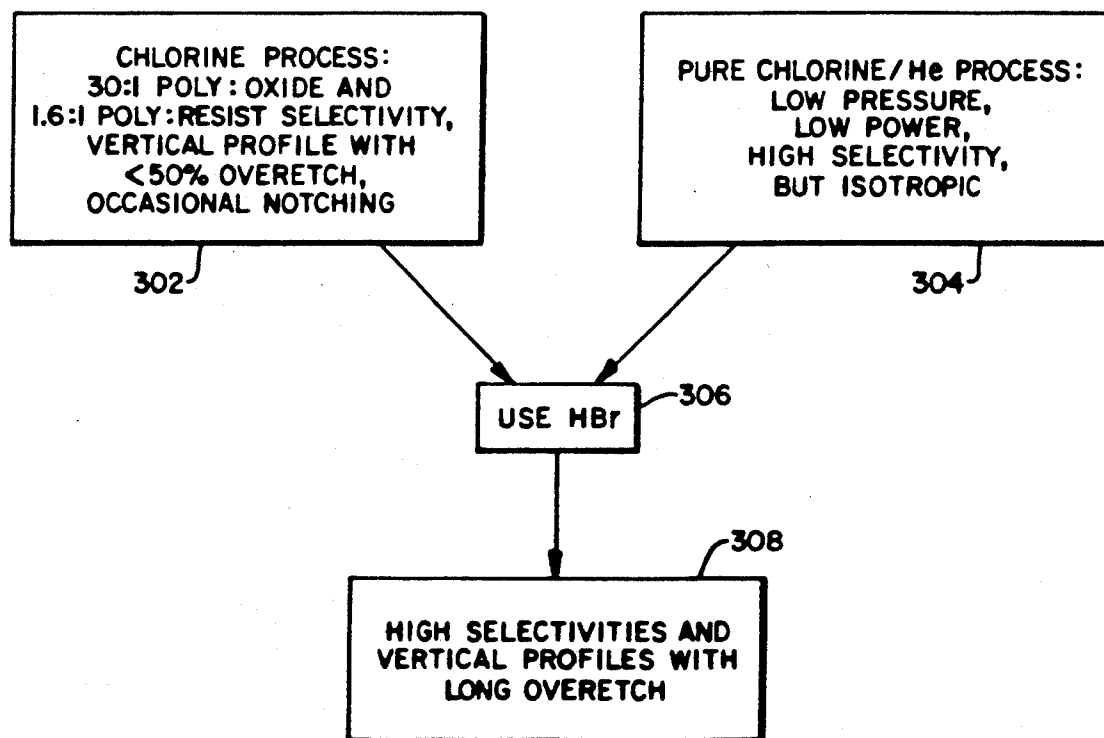
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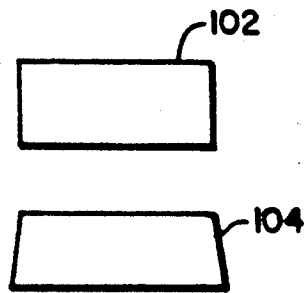
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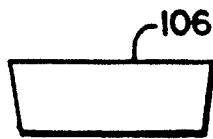
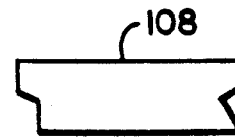
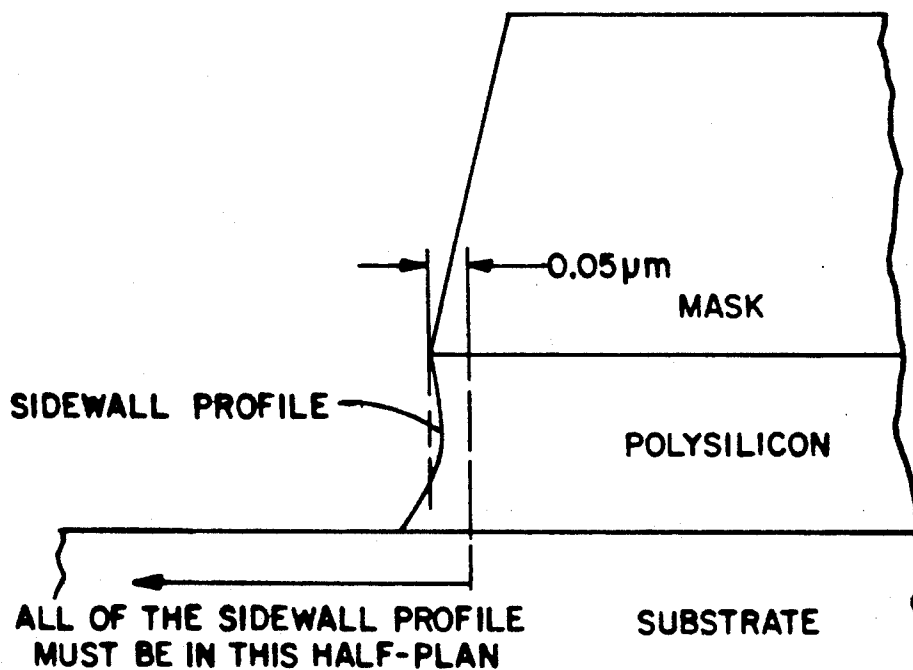
*Controlled Film Formation during CCl<sub>4</sub> Plasma Etching, Bernacki and Kosicki, J. Electrochem. Soc., Aug., 1984.**Selectivity and Feature Size Control, Dry Etching.**Primary Examiner—Thi Dang**Attorney, Agent, or Firm—Gerald E. Linden; Michael D. Rostoker***[57] ABSTRACT**

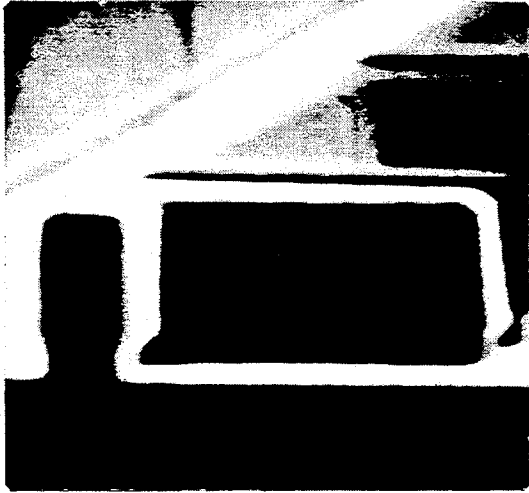
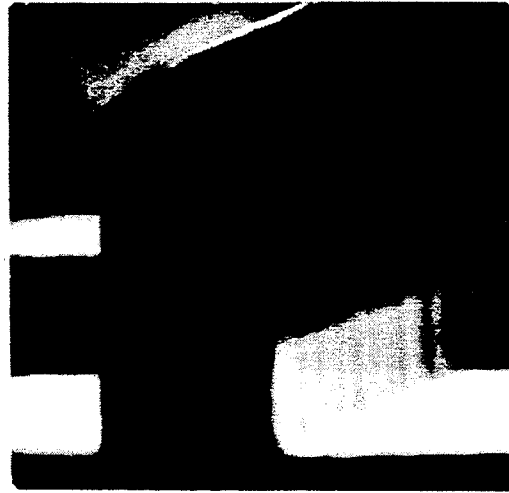
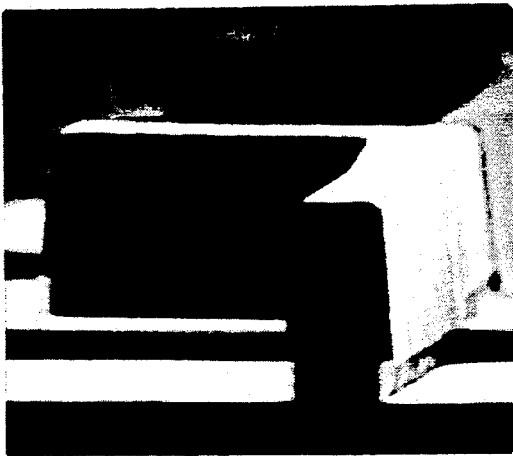
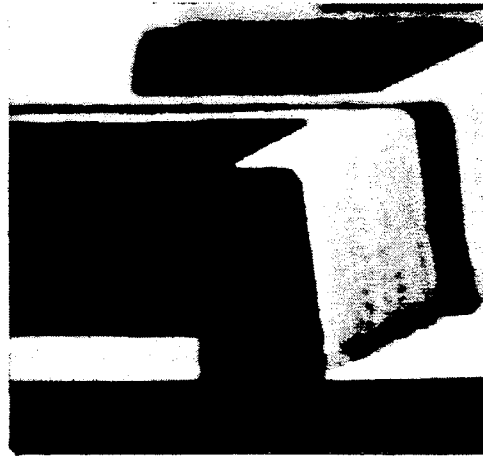
An anisotropic polysilicon etching process in Cl<sub>2</sub>/HBr/He is disclosed. The use of HBr allows etching to occur under high poly:oxide selectivity conditions (e.g., above 40:1) that would otherwise produce lateral etching of the poly under the photoresist mask (isotropy). The selectivity of poly:resist is also increased (e.g., above 4:1). Poly sidewall passivation is enhanced without relying on resist redeposition. Gate oxide loss is also minimized, and anisotropy is realized with increased overetch (e.g., 60%). Exemplary process settings are: 1) 250 mTorr, 190 Watts, 0.5 cm gap, 100 sccm Cl<sub>2</sub>, 50 sccm HBr and 40 sccm He; and 2) 270 mTorr, 200 Watts, 0.5 cm gap, 80 sccm Cl<sub>2</sub>, 55 sccm HBr and 45 sccm He.

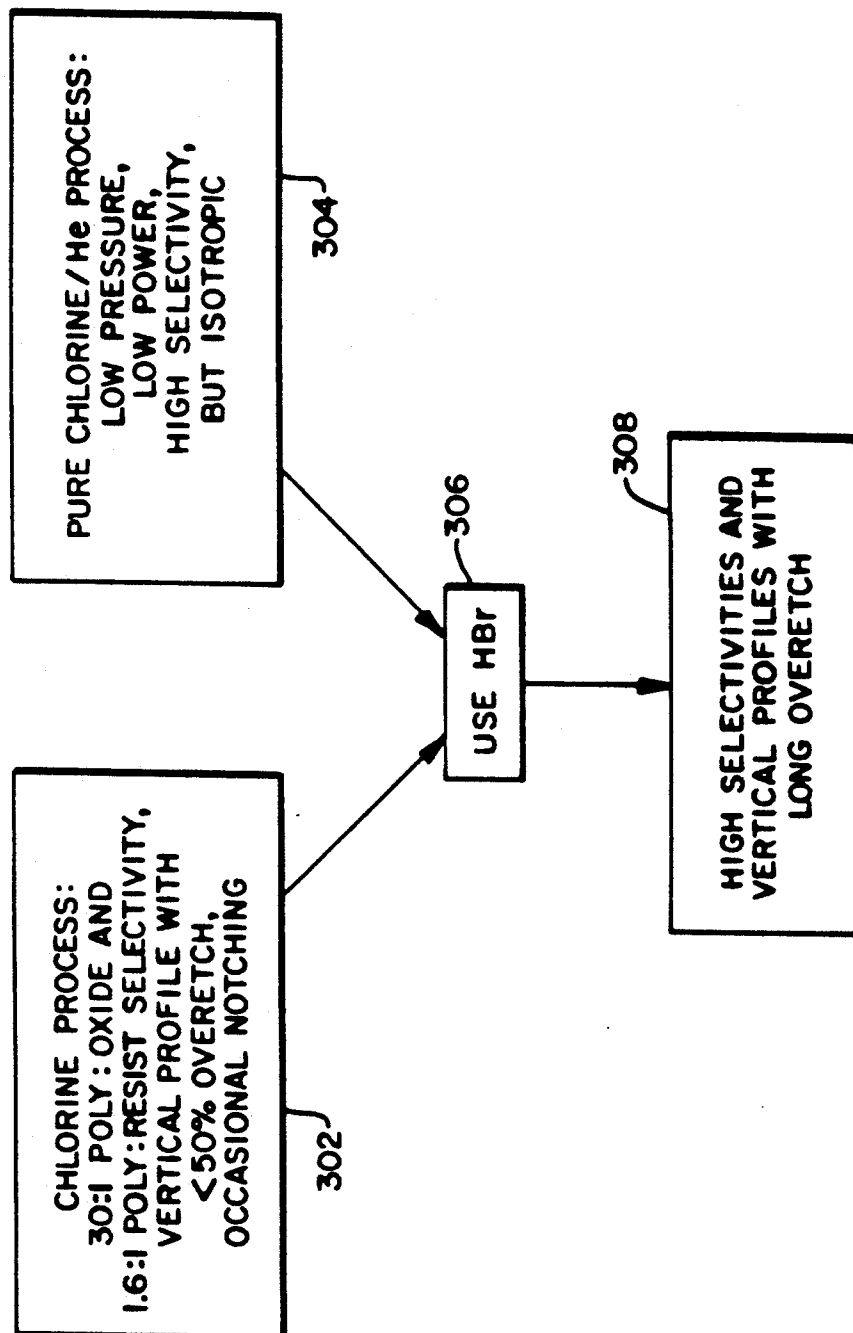
**19 Claims, 16 Drawing Sheets**

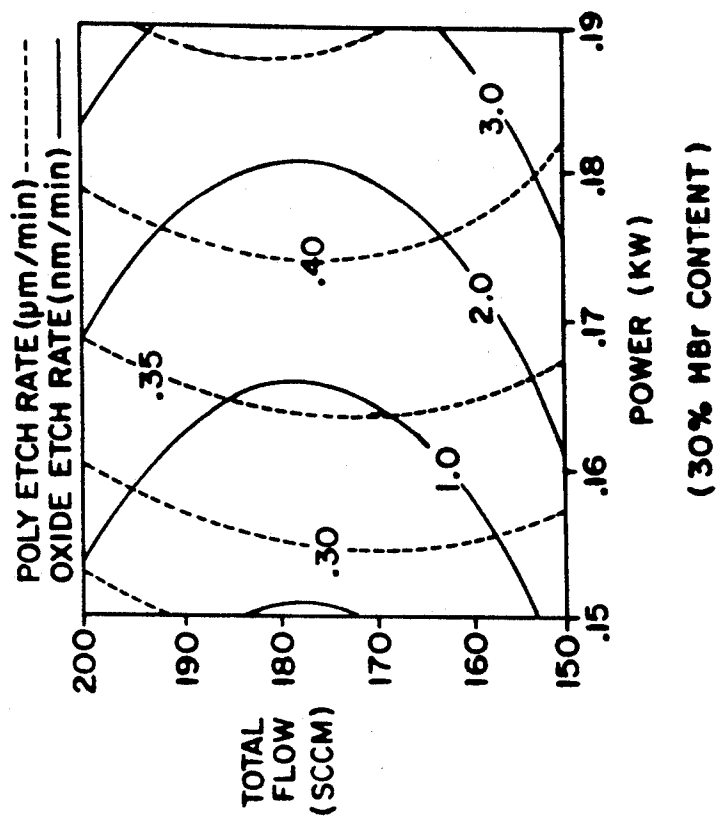
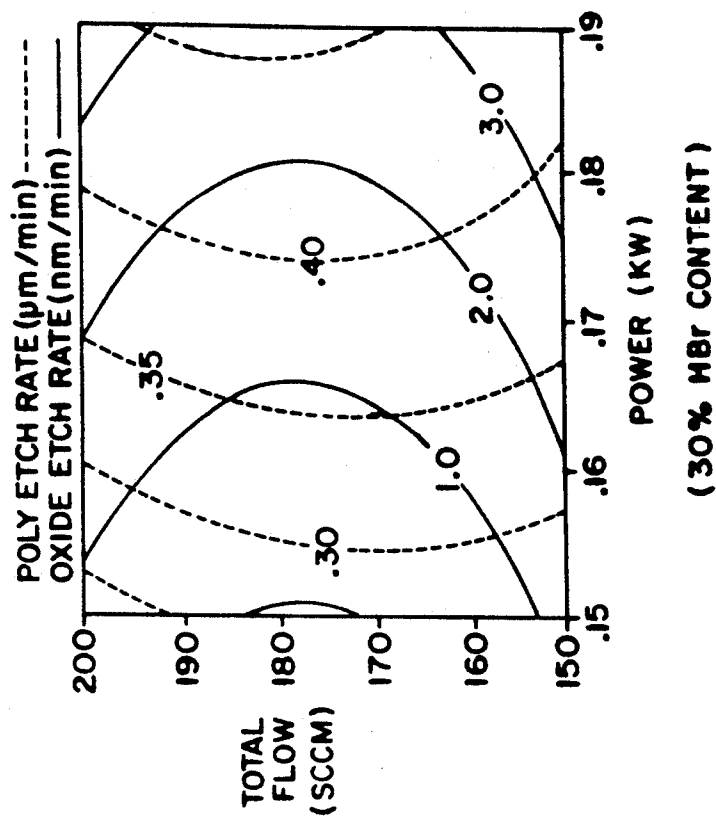


ACCEPTABLE

FIG. 1ARE-ENTRANT OR  
NEGATIVE, NOT  
ACCEPTABLEFIG. 1BNOTCHED  
NOT ACCEPTABLEFIG. 1CFIG. 1D

FIG. 2AFIG. 2BFIG. 4FIG. 5

FIG. 3

FIG. 6AFIG. 6B

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