

[54] MULTILEVEL INTEGRATED CIRCUITS EMPLOYING FUSED OXIDE LAYERS

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[51] Int. Cl.⁴ H01L 21/70; H01L 27/00

[52] U.S. Cl. 437/51; 437/915; 437/84; 437/208; 437/984; 437/974; 148/DIG. 135; 148/DIG. 164; 156/657; 156/633; 357/75

[58] Field of Search 357/75; 148/DIG. 12, 148/DIG. 135, DIG. 164; 156/633, 657, 653; 437/974, 984, 40, 51, 83, 84, 225, 208, 915

[56] References Cited

U.S. PATENT DOCUMENTS

- 3,508,980 4/1970 Jackson, Jr. et al. 148/DIG. 12
- 3,564,358 2/1971 Hahnlein 148/DIG. 164
- 3,959,045 5/1976 Antypas 148/DIG. 135
- 3,997,381 12/1976 Wanlass 156/657
- 4,009,057 2/1977 de Brebisson et al. 437/31
- 4,142,925 3/1979 King et al. 148/DIG. 135
- 4,169,000 9/1979 Riseman 156/645
- 4,309,811 1/1982 Calhoun 437/915
- 4,601,779 7/1986 Abernathy et al. 148/1.5
- 4,612,083 9/1986 Yasumoto et al. 148/DIG. 164
- 4,638,552 1/1987 Shimbo et al. 148/DIG. 12
- 4,649,627 3/1987 Abernathy et al. 148/DIG. 164

FOREIGN PATENT DOCUMENTS

0161740 11/1985 European Pat. Off. 148/DIG. 12

OTHER PUBLICATIONS

Ghandhi, *VLSI Fabrication Principles*, John Wiley and Sons, Inc., 1983.

Primary Examiner—Brian E. Hearn

Assistant Examiner—M. Wilczewski

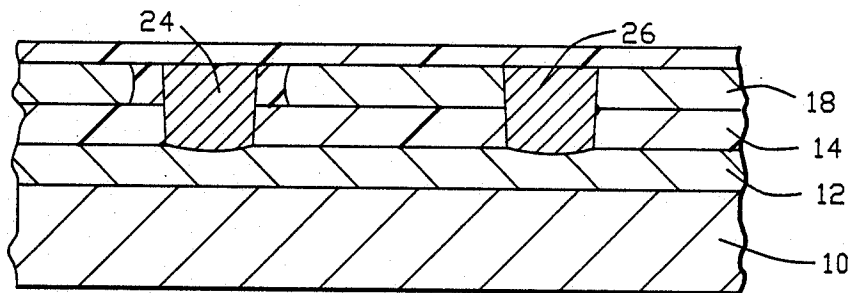
Attorney, Agent, or Firm—Flehr, Hohbach, Test,

Albritton & Herbert

[57] ABSTRACT

A multilevel semiconductor integrated circuit is fabricated by providing a plurality of substrates having an epitaxial layer on one surface and a silicon oxide layer on the surface of the epitaxial layer. The substrates are sequentially stacked with the silicon oxide layers in contact and fused together. One substrate is retained as a support, and other substrates are removed by etching after the fusion of the silicon oxide layers, thereby leaving only the stacked epitaxial layers separated by silicon oxide. The stacked structure facilitates the vertical fabrication of CMOS transistor pairs sharing a common gate electrode in an epitaxial layer between the two transistors. Electrical isolation between the epitaxial layers is provided by the fused silicon oxide or by removing the silicon oxide and some of the silicon thereby forming a void between adjacent epitaxial layers. Circuit devices in the plurality of epitaxial layers are readily interconnected by forming conductive vias between the epitaxial layers.

2 Claims, 7 Drawing Sheets



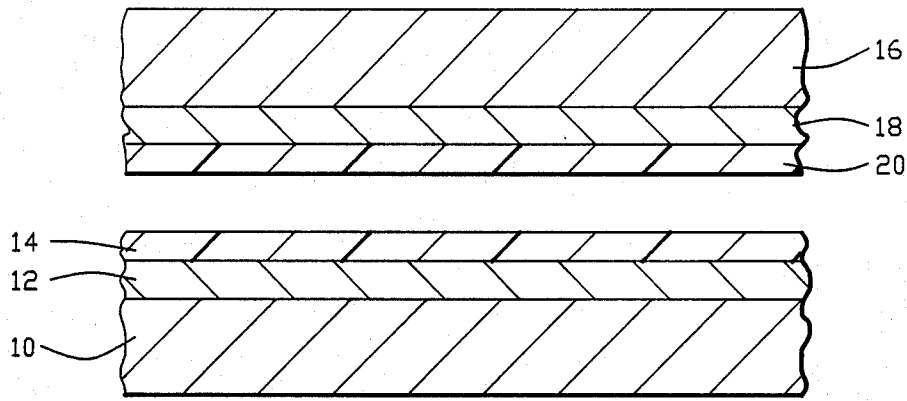


FIG.-1

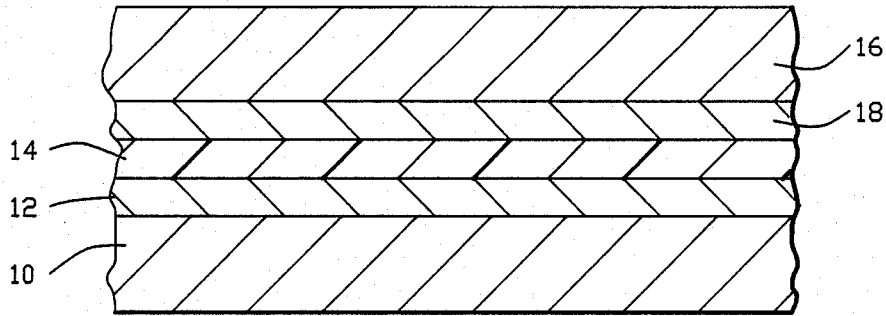


FIG.-2

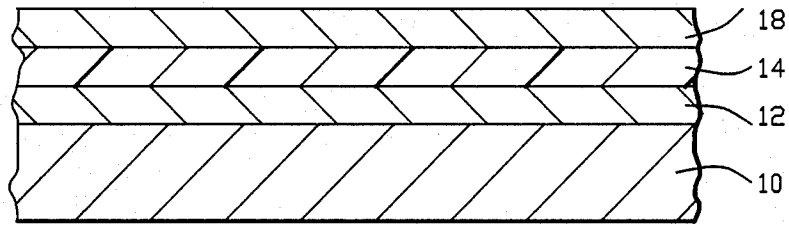


FIG.-3

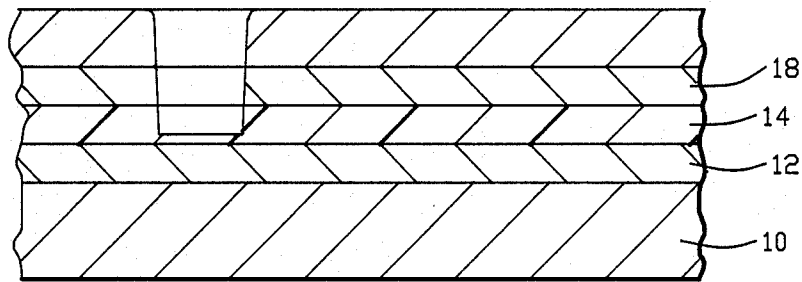


FIG.-4

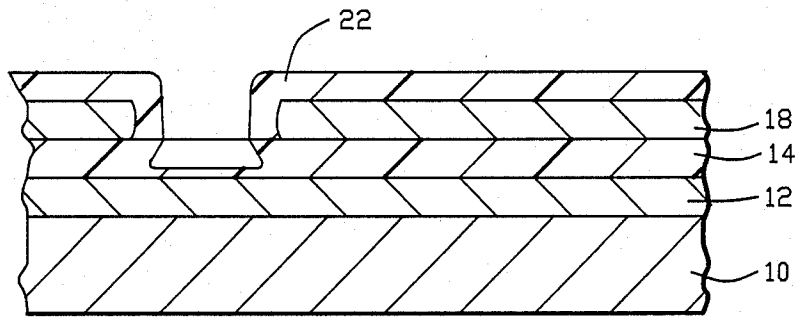


FIG.-5

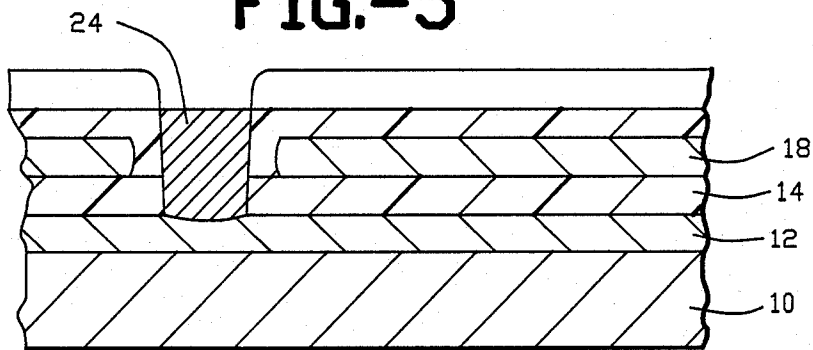


FIG.-6

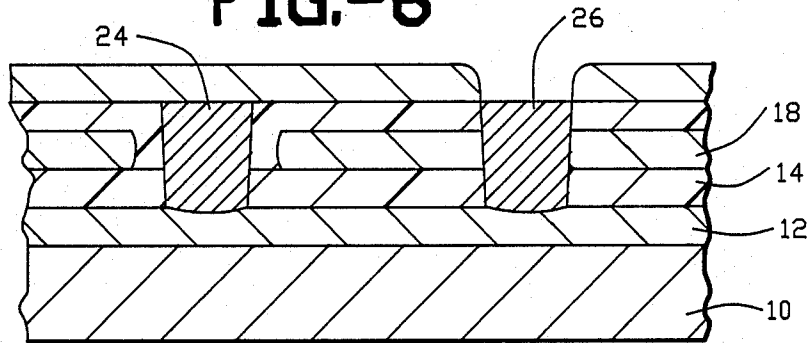


FIG.-7

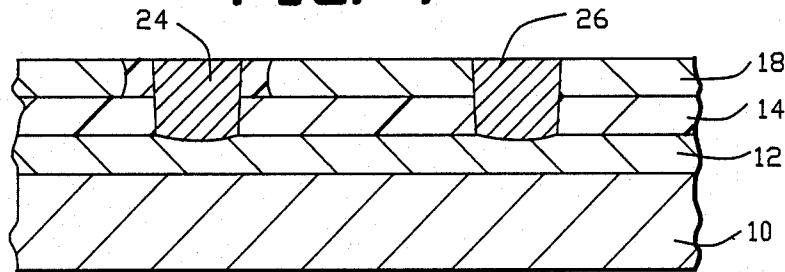


FIG.-8

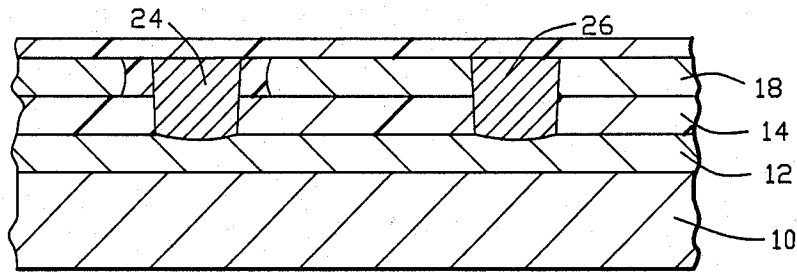


FIG.-9

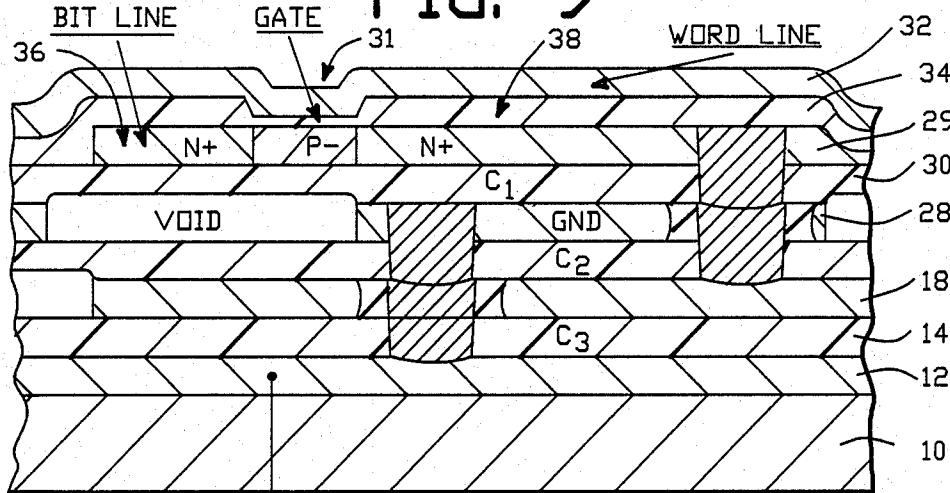


FIG.-10A $C=C_1+C_2+C_3$

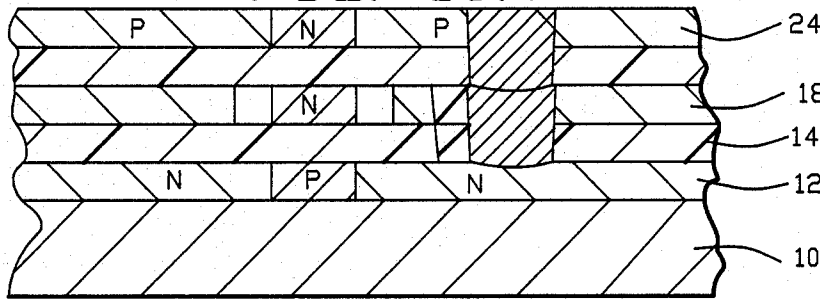


FIG.11A

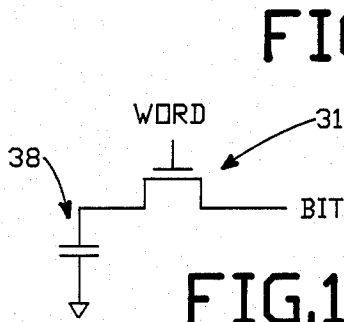


FIG.10B

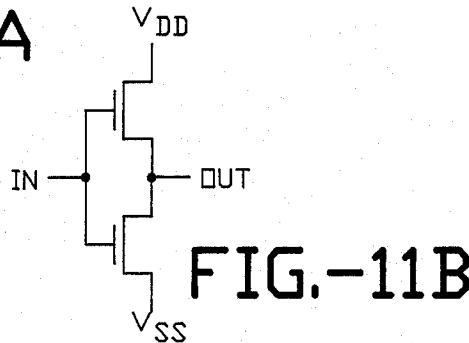


FIG.-11B

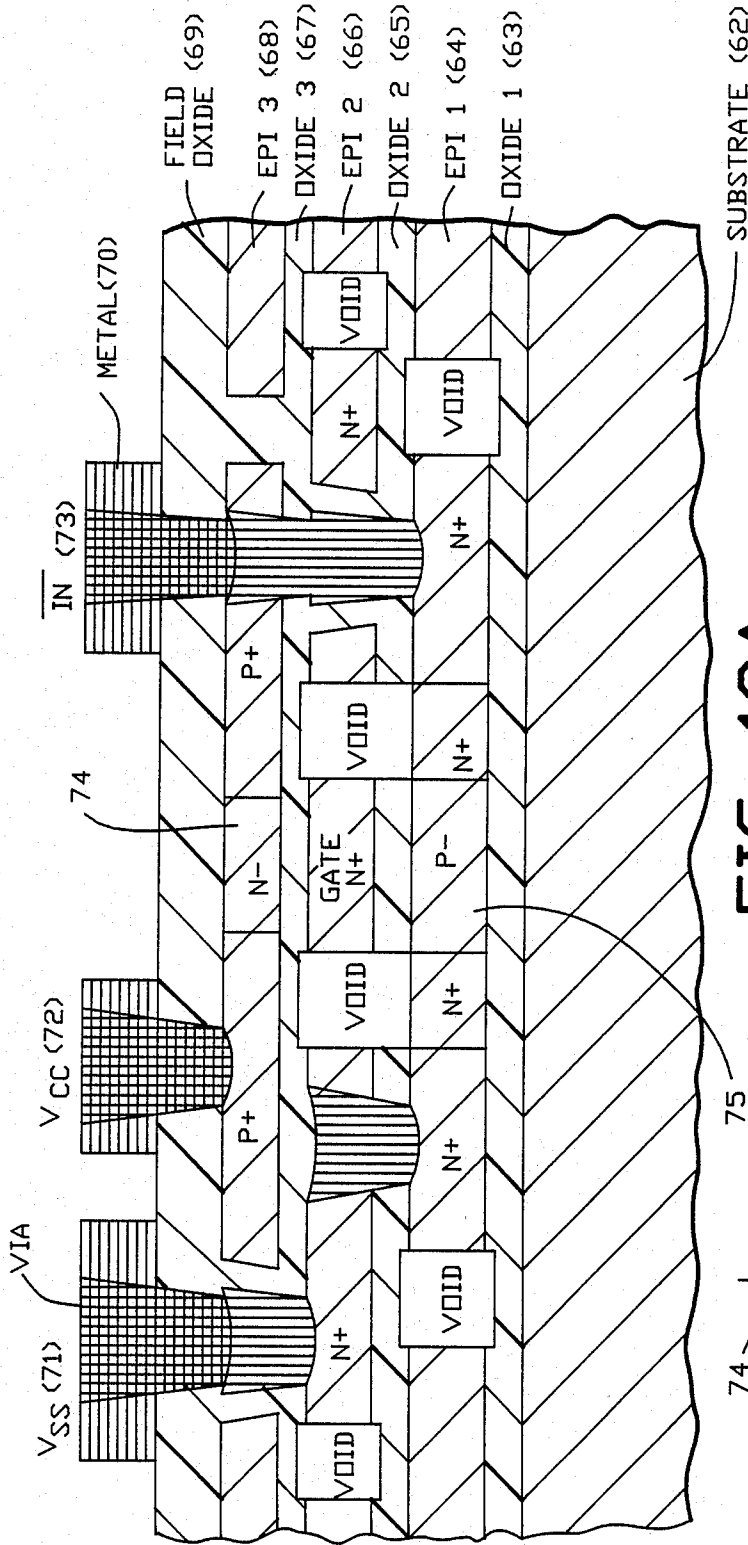


FIG.-12A

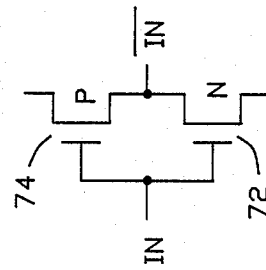


FIG.-12B

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