

(19)  
(12)

(KR)  
(B1)

(51) 。 Int. Cl.<sup>6</sup>  
H01L 27/085

(45)  
(11)  
(24)

2004 09 18  
10-0440508  
2004 07 06

(21) 10-1997-0048906  
(22) 1997 09 26

(65)  
(43)

10-1998-0024988  
1998 07 06

(30) 196 39 874.6 1996 09 27 (DE)

(73) 80333 2

(72) 81737 33

81739 - - 27

85635 - . 33

(74)

:

(54) CMOS

(island) Si<sub>1-x</sub>Ge<sub>x</sub> Si<sub>1-x</sub>Ge<sub>x</sub>  
p- MOS / n- MOS

9

1  
2 MOS  
3 2  
4 p- / 1  
5 2  
6 p-

7 - p- / 2

8 .

9 / .

\* \*

1 : 4 : Si<sub>1-x</sub>Ge<sub>x</sub>

5 : 6 :

MOS , 100nm , MOS CMOS (short channel) (punch) 가

가 (d ln(I )/d V ) , 100nm MOS 가

가 / , 100 μm (distorted) (K. Rim , IEEE IEDM Tech. Dig., 가 가

517 n- p- (1995) ). 가 2 가

. Si<sub>1-x</sub>Ge<sub>x</sub> 가 . Si<sub>1-x</sub>Ge<sub>x</sub> 가

SOI 4, 1856 (1994) ). Si<sub>1-x</sub>Ge<sub>x</sub> Si<sub>1-x</sub>Ge<sub>x</sub> 15% (A. R. Powell , Appl. Phys. Lett. 6 , Si<sub>1-x</sub>Ge<sub>x</sub> (relax) / 가 (

Y. Mitani , IEEE VLSI Tech. Dig., 91 (1996) ). , 가 (

가 가 CMOS

CMOS , (island) . Si Si<sub>1-x</sub>Ge<sub>x</sub> Si<sub>1-x</sub>Ge<sub>x</sub> . Si<sub>1-x</sub>Ge<sub>x</sub> Si

1-x Ge<sub>x</sub> . Si<sub>1-x</sub>Ge<sub>x</sub> , Si<sub>1-x</sub>Ge<sub>x</sub> , 15% 가 40% Si<sub>1-x</sub>Ge<sub>x</sub> 가 10nm가 . Si<sub>1-x</sub>Ge<sub>x</sub> , 10 50

nm 20nm가 40% 20 50% 가 10nm가 . 0 20nm 5 20nm

n- p- MOS , Si<sub>1-x</sub>Ge<sub>x</sub> y = x

$\text{Si}_{1-y}\text{Ge}_y$  p- CMOS  
 n- p+ MOS (Si<sub>x</sub>Ge<sub>1-x</sub>) 가 p+ MOS  
 가 MOS p- n- MOS  
 $\text{Si}_{1-x}\text{Ge}_x$  SOI Si  
 가 Si<sub>1-x</sub>Ge<sub>x</sub>  
 / 2 1 2 /  
 2 1 LDD 가 HDD  
 1 2 1 2  
 p- / 가 가  
 400nm 가 SiO<sub>2</sub> (2) (1) 10nm  
 가 (3), 15nm 35% Si<sub>1-x</sub>Ge<sub>x</sub> (4), 5nm  
 (5) (2) (3), Si<sub>1-x</sub>Ge<sub>x</sub> (4)  
 SOI (5) (6) (1) SOI (1)  
 SiO<sub>2</sub> HF Si<sub>1-x</sub>Ge<sub>x</sub> (4) 500 900 1 760 Torr 가  
 H<sub>2</sub>, SiH<sub>2</sub>Cl<sub>2</sub>, GeH<sub>4</sub> Si<sub>1-x</sub>Ge<sub>x</sub> (3)  
 Si<sub>1-x</sub>Ge<sub>x</sub> (4) 가 가  
 Torr가 H<sub>2</sub>, SiH<sub>2</sub>Cl<sub>2</sub>가 가 600 800 1 760  
 (6) (2) 2μm × 5μm 가  
 5) Si<sub>1-x</sub>Ge<sub>x</sub> 가 Si<sub>1-y</sub>Ge<sub>y</sub> 가 (y)  
 0 35 1  
 (6) n- p- TEOS SiO<sub>2</sub> (scatter)  
 20nm ( ) n- p- (7) p- (7) p-  
 $\times 10^{12} \text{ cm}^{-2}$  (8) (2) 15 keV 7 keV 2  
 n- (8) 3 × 10<sup>12</sup> cm<sup>-2</sup>  
 가 CHF<sub>3</sub>/CF<sub>4</sub> ( ) HBr(Si/SiG  
 e ) (2)  
 n- (9)가 Si<sub>3</sub>N<sub>4</sub> (10), (11) (12)  
 x가 0.15 3nm SiO<sub>2</sub> 600 , 200nm SiO<sub>2</sub>  
 Si<sub>1-x</sub>Ge<sub>x</sub> HBr  
 11) TEOS SiO<sub>2</sub> Si<sub>3</sub>N<sub>4</sub> 1 (13) 100nm가  
 . 60nm 2 (14) 10nm 2 (14)

1 (140)( 3 ) HBr 1 (13) 2 (14) (11) 1 (15) n- (8)  
 . 30 KeV  $2 \times 10^{15} \text{ cm}^{-2}$  n- (15)가  
 / 가 1 (16) 1 (16) -  
 , n- 800 60 1 (16) -  
 2 (17) p- (7) p- / 1  
 (18) 10 KeV  $2 \times 10^{15} \text{ cm}^{-2}$  . n- .  
 1 (16) p- 2 (18) (softened) (6)  
 , (2) (dissipate)  
 . 2 (17)가 (140) (choline) 1  
 (13) ( 5 ) .  
 3 (19) n- (8) . n- /  
 2 (20)  $2 \times 10^{14} \text{ cm}^{-2}$  ( 5 ) . /  
 (20) 1 (16) , 2 (20)  
 3 (19) , 가 p- 1 (16) . (18) n-  
 2 (20) -  
 . 750 30 . , n  
 2 (20) .  
 F<sub>3</sub> CF<sub>4</sub> 4 (21)가 p- (7) . 1 (13) CH  
 (11) (130) 1 (13) p- .  
 (22) (130) ( 6 ) .  
 (11) . 가 p- (130)  
 x (4) . (22) (22) 15nm Si<sub>1-x</sub>Ge<sub>x</sub> (4) Si<sub>1-x</sub>Ge  
 , (21) (22) HF  
 2 (23) (22) - GeH<sub>4</sub> SiH<sub>4</sub> p- 가 750 - /  
 - Si 750 10 Torr H<sub>2</sub>, SiH<sub>2</sub>Cl<sub>2</sub>, HCl B<sub>2</sub>H<sub>6</sub> 가  
 . (3), Si<sub>1-x</sub>Ge<sub>x</sub> (4)  
 가 2 (23)  
 2 B<sub>2</sub>H<sub>6</sub> 가 . -  
 (23) , p- 2 (23) 15nm 가  
 ( 7 ) .  
 , CHF<sub>3</sub> CF<sub>4</sub> n-  
 , 1 (13) (130)가 (6) . n-  
 , p- 가  
 , Si<sub>1-z</sub>Ge<sub>z</sub> (24) . Si<sub>1-z</sub>Ge<sub>z</sub> (24)  
 , HF 750 , Si<sub>1-z</sub>Ge<sub>z</sub>  
 H<sub>2</sub>, SiH<sub>2</sub>Cl, HCl GeH<sub>4</sub> 가 650 10 Torr  
 가 가 Si<sub>1-z</sub>Ge<sub>z</sub> (24) 가 Si<sub>1-x</sub>Ge<sub>x</sub> (4) ,  
 (11) (12)  
 , Si<sub>1-z</sub>Ge<sub>z</sub> (24)  
 1 (16, 18) pn- 2 (20, 23) . (11) . n- (24)  
 , p- / n- p- n-

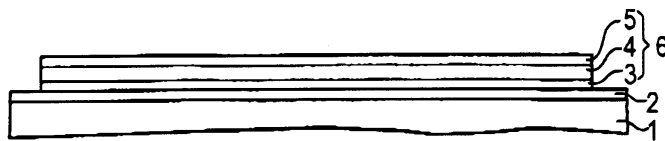
150nm 가 , (11) T- (9)  
 (6) (11) MOS 가 , Si<sub>3</sub>N<sub>4</sub> (9)  
 SiO<sub>2</sub> (10) 가 (6) 가 SiO<sub>2</sub> 가 2 ,  
 (11) , 가 SiO<sub>2</sub> 가 2 ,  
 , p- n- n- p- ,  
 가 , n- p- ,  
 (6) (20, 23) (2) (1) / 1 (16,  
 18) 2 (2) 400nm (2) GaAs MOS (2)  
 CMOS , - Si-MOS 가 , GaAs  
 ,  
 가 ,

Si<sub>1-x</sub>Ge<sub>x</sub> Si<sub>1-x</sub>Ge<sub>x</sub> 가 가  
 CMOS

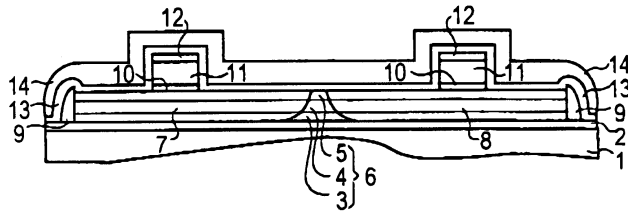
- (57)
1. (1) (2) (6) (6) Si<sub>1-x</sub>Ge<sub>x</sub>  
 - x Ge<sub>x</sub> (4) (5) MOS , n- MOS 가 CMOS  
 - (6), p- MOS , n- MOS 가 CMOS  
 - (6) p- MOS n- MOS 가  
 - p- MOS n- (8) , n- MOS n-  
 (8) p- (7) , Si<sub>1-x</sub>Ge<sub>x</sub> (4) , Si<sub>1-x</sub>Ge<sub>x</sub> (4)  
 - (5) CMOS
  2. (3) Si<sub>1-x</sub>Ge<sub>x</sub> (4) (2)  
 1 CMOS
  3. 2 ,  
 - Si<sub>1-x</sub>Ge<sub>x</sub> (3) 0 20nm 가 ,  
 - (4) 10 50nm 20 50 가 ,  
 - (5) 5 20nm 가 CMOS
  4. 1 , 2 3 , Si<sub>1-y</sub>Ge<sub>y</sub>  
 Si<sub>1-x</sub>Ge<sub>x</sub> (4) (5) CMOS
  5. 1 , 2 3 , MOS (11)  
 CMOS
  6. (3) (3) (2) (1) SOI (3)  
 - (3) (2) (6) Si<sub>1-x</sub>Ge<sub>x</sub> (4) (5)  
 CMOS  
 - (5) Si<sub>1-x</sub>Ge<sub>x</sub> (4) ,

- (4) 가 (3)  $Si_{1-x}Ge_x$  (4) ,  $Si_{1-x}Ge_x$
- (6) p- (7) n- MOS (7) p- (7) n- (8) p- MOS
- 가 (7) n- MOS CMOS 가 n- (8) p- MOS
- 7.
- 6 , (3) 5 20nm 가 , (x) 20 50 CMOS
- $Si_{1-x}Ge_x$  (4) 10 50nm (5) 5 50nm CMOS
- 8.
- 6 7 , (6) ,  $Si_{1-x}Ge_x$  (4) CMOS (3)
- 9.
- 6 7 , (6) ,  $Si_{1-x}Ge_x$  (4) CMOS (3)
- 10.
- 6 7 ,  $Si_{1-y}Ge_y$  (5) CMOS  $Si_{1-x}$
- $y = x$   $Ge_x$  (4)
- 11.
- 6 7 (10), (11) (12) p- MOS (6) MOS
- n- (13) MOS (13) , (140)가 / 1 (16,18)
- n- (140)가 , p- MOS (140)가 / 2 (20,23) CMOS 가 1 (16,18)
- 12.
- 11 p- MOS / 2 (23) CMOS
- (5)
- 13.
- 11 MOS (11) CMOS

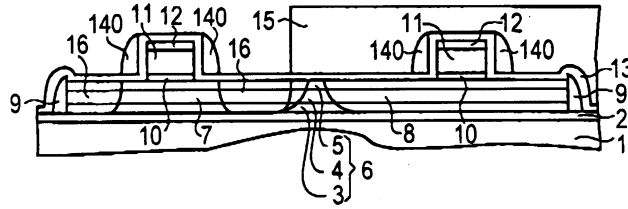
1



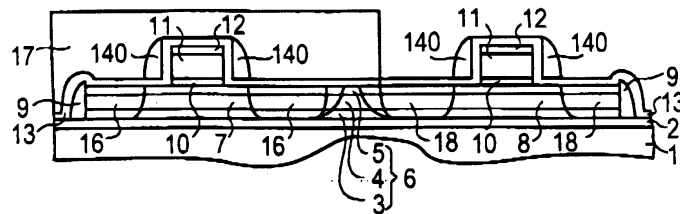
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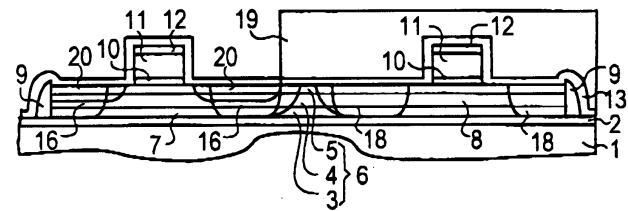
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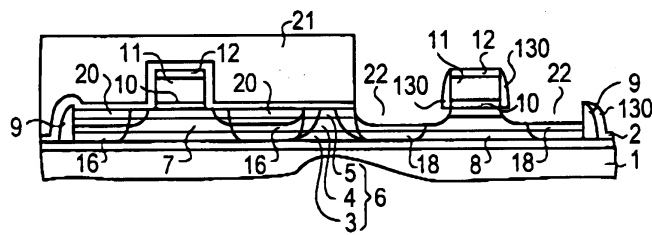
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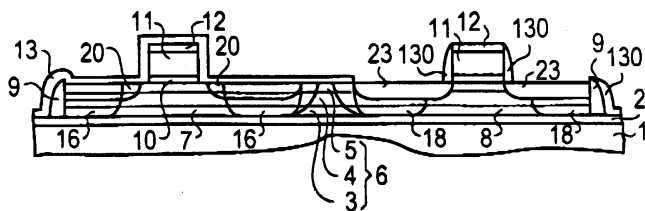
5



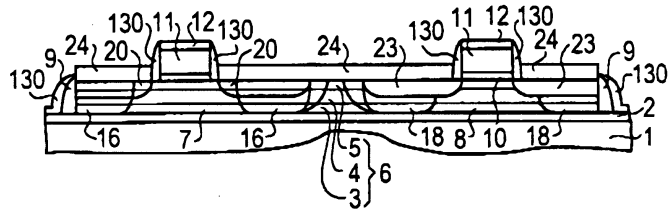
6



7



8



9

