

(19) (KR)  
(12) (B1)

(51) 。 Int. Cl. 6  
H01L 21/768

(45)  
(11)  
(24)

2003 05 12  
10-0372467  
2003 02 04

(21) 10-1997-0051378  
(22) 1997 10 07

(65)  
(43)

1998-0032600  
1998 07 25

(30) 727,159 1996 10 07 (US)

(73) , 60196, , 1303

(72) , 78754, , 8808

, 78735, , 4710

, 78759, , 10611

(74)

:

(54)

가 (21)  
(18) (16)  
(22) (21) (16)  
(22) (21) (22)  
(2L) (21)  
) - (cross-talk) , (thermal dissipation) 가 (stress)

6

1 6

7 10

11 15

16 (non-conformal deposition)

\*  
 12. 1 14.  
 16. 18. 2  
 20. 21.  
 22. 3

\_\_\_\_\_ , (cross-talk)  
 \_\_\_\_\_ 가 가  
 가 가 ,  
 가 가 ,  
 (BPSG), (phosphosilicate) (PSG) (borophosphosilicate)  
 (TEOS) (doped) (undoped) 가

가 ,  
 가 , (reliability)가  
 , (thermal dissipation)

\_\_\_\_\_ RC 가 (IC) 1  
 2 ,  
 -K (higher)-K -K 가 -K (sacrificial)  
 -K

-K RC 가  
 2 1 2 2 가  
 2 1 가 (stiff polymer backbone) -K - (spin-on) ( ) 2 2  
 -laid) 2 (in  
 (polymeric resin)  
 s content) (atmospheric pressure of formation) 가 (atomic ga  
 (=1) (adverse capacitive coupling)  
 2 2  
 가  
 1 6 1 16  
 1 1 (12), (16) 2 (18) (10)  
 1 1 (12), (16) 2 (18) 가  
 2 F 6 / 가 (12, 16, 18) CHF<sub>3</sub>, CF<sub>4</sub>, C  
 ) (14) 가 1 (12)  
 (well contact), / (TFT)  
 (amorphous silicon),  
 (epitaxially grown silicon)  
 2 1 (12) 2 (18) 1 (12)  
 (tetraethylorthosilicate)(TEOS) (borophosphosilicate) (BPSG) ,  
 (phosphosilicate) (PSG) ,  
 가 (18) (12)  
 (LPCVD) 1 (12), 2 (18) (16) (12, 18)  
 (enhanced) (ARC: anti-reflective co  
 ating) (16)  
 (etch-back stopping layer) (CMP)  
 (SiON) SiON  
 (ARC) (18) 1 (1  
 2) (18)  
 (damascene)) 2 (18)  
 (16) 2 (18)  
 (20) 가 1 2  
 1 3 가 (14) (20)  
 (21) (14) CMP / (20) (14) (2  
 1) (20) (REB) / (timed) (21) (CMP)  
 (14, 20) ( ) (21)

(21) (C)  
 VD) , (electrode plating) , (sputtering) /  
 4 , 2 (18) ( ) (16)  
 (18) (18) / HF (wet etching)  
 (18) (21)  
 5 , ( ) 3 (22) (21)  
 -K 3.5 3.0 -K 가 , 2.7  
 가 (22) - (SOGs) (hydrog  
 en silsesquioxane)(HSQ), (benzocyclo butene)(BCB), (polyimide) (hydrog  
 polyarylether) (PAE) , (22) =3.0 BCB 가 , HSQ (thermal se  
 tting resin) , (22) =2.6 PAE PAE2  
 (polyaryl ether) . 3.5 가 3.9 4.3  
 TEOS (22)  
 CVD -  
 , 6 , (22) (21) (top portion) .  
 , (22) (21) 6 (20) . 6 (22)  
 22)( 3,5) 가 ( >3.5) , (22) / 6 (12, 16) (22)  
 (ARC) (22)  
 -K ( , 20 , 6 (22) ) (22)  
 , (capping)/ 가 6 6  
 7 10  
 7 (32), 1 (34) (36) (32) 1 (34) 1 (30)  
 (34) (38) , (32) ,  
 ( 7 ) (32)  
 L) / (ARC) 1 (34) , (ES  
 CVD) (CVD) , BPSG, PSG, TEOS, 가 (LP  
 8 , (36)가 (40) (34) (38)  
 ) (40) (capped) (bridged), ( , 8 ( )  
 38') 7 (38) ) . , (ARC) (42)  
 (40) , (40) 3.0 가 ( ) , (4  
 0) (polyphenylquinoxaline)(PPQ) =3.0 , (40)  
 =2.6 ( ) 8 - ( )  
 38') 8 (38') (blistering) , (40) (anneal) 가 가  
 8 (solvent-removal annealing) 100 , 300 , (40) 가 -  
 (38') 100 300 , (38') (sub-  
 atmospheric) - / (38')  
 , 9 , (41) 8  
 (38') (38) , (42) (40)  
 (38') 8 ,

가 (40)

(44) (40) (40) (44)

(49) (49) (38) (41) (48) (48)

(ARC) (46) (40) (CMP) (48) (46) 10 (48)

(48) 가 (48) 7 10 -K (thermal dissipatio

n) (40)가: (1) (48) (2) 10

11 15 (52) (54) (50)

11 (52) 1 (52) (CVD) (54) , BPSG, PSG, TEOS,

가 (54) (54)

12 (56) 1 (52) (54)

(56) 가 가 (56)

(54) (56) 12 (misalignment) 13 (60) 14

(short circuiting) (56)

가 가

13 (56) 2 (58) (60) (60)

2 (58) (56) (56) (stiffness) (60) (60) (58)

(54) (air spacer)

58) 30 (58) 3.5 PPQ (58) (56) (58) 3.0 (

(60) 14 3 (62) 2 (58) (62) 가

( ) , BPSG, PSG, TEOS,

(54) (via opening) 3 (62), 2 (58) (56) 12 (56)

material)(66)가 (64) (64) (64) (66) 가 (64)

(conductive vias)(68) (66) (conductive fill

(a like conductor) (66) (composite conductive layer)

15 (70) (72) (72) (68)

(70) (70) (70) (74)

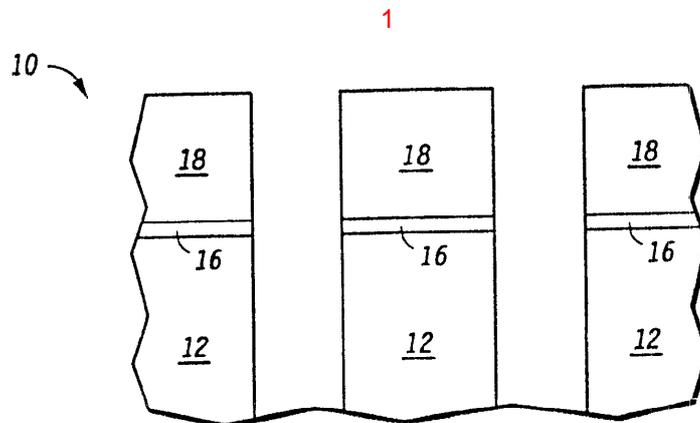
(70) (72)

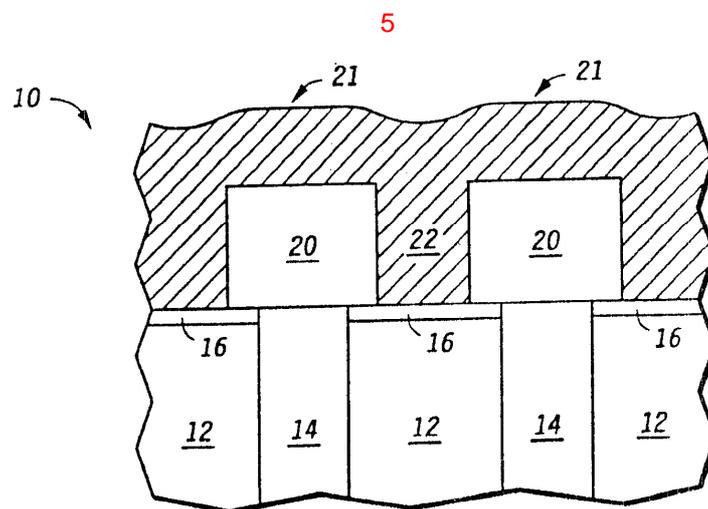
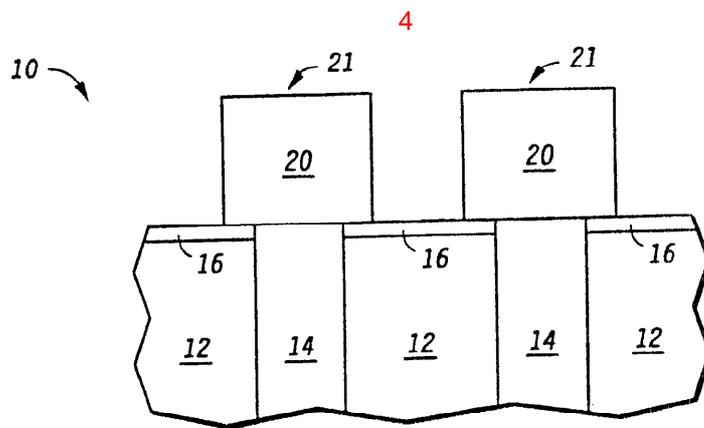
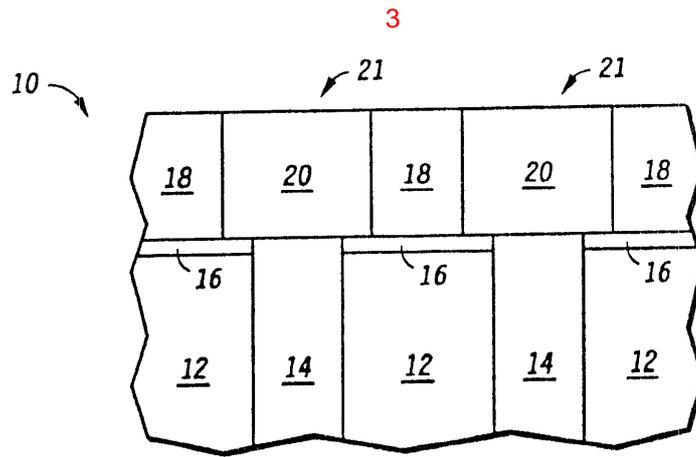
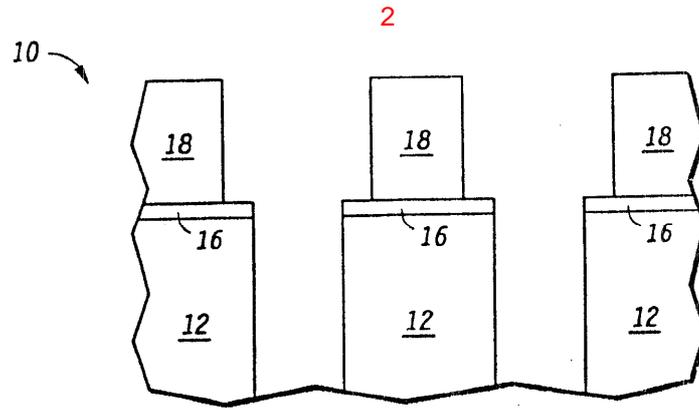
16 (66), (64) 3 (70) 16 1 (62),

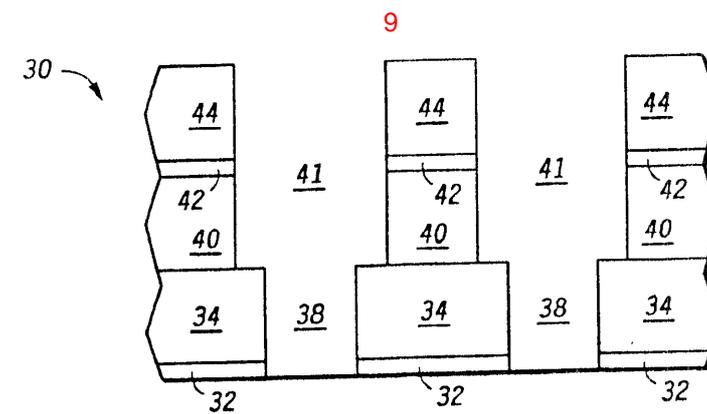
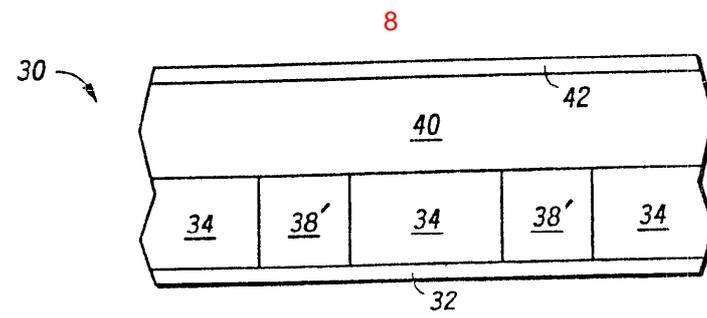
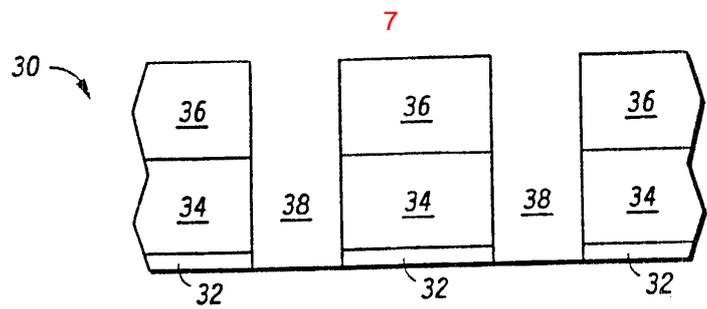
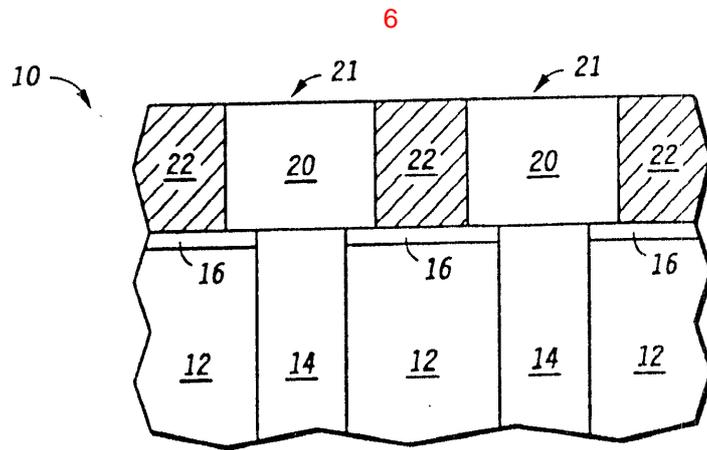
62) (64) 1 (62) BPSG , PSG , 가 (

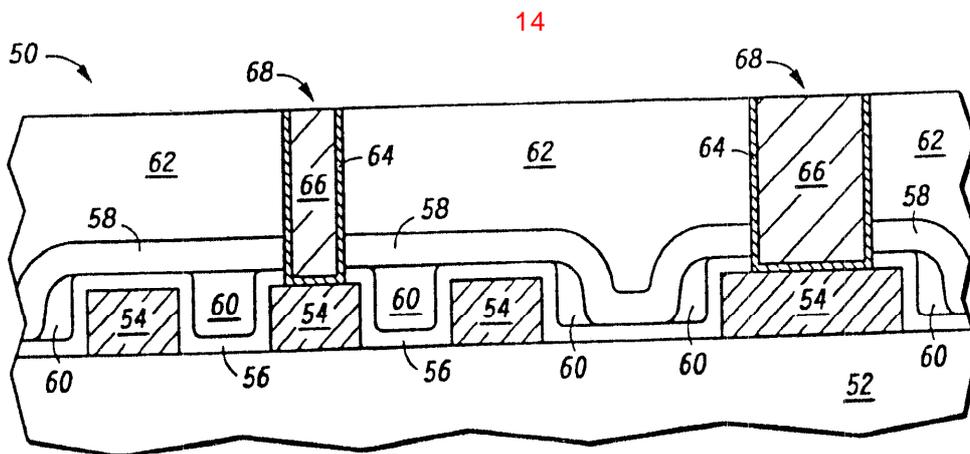
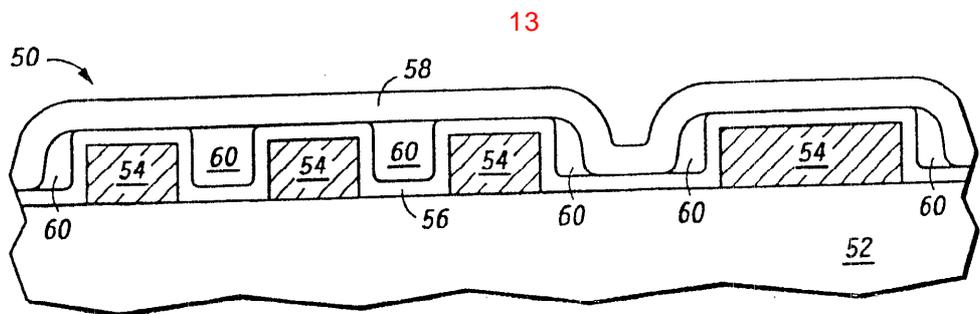
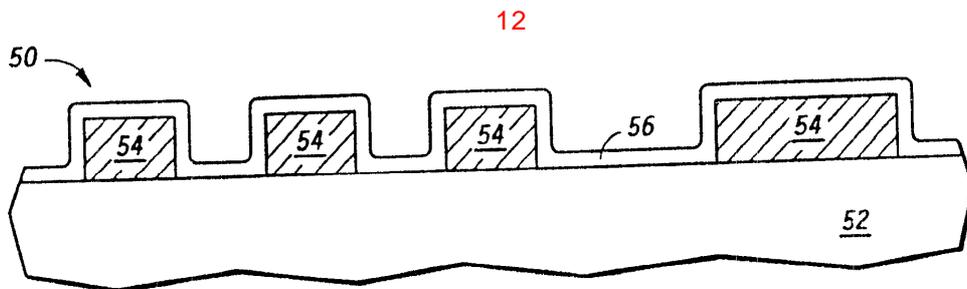
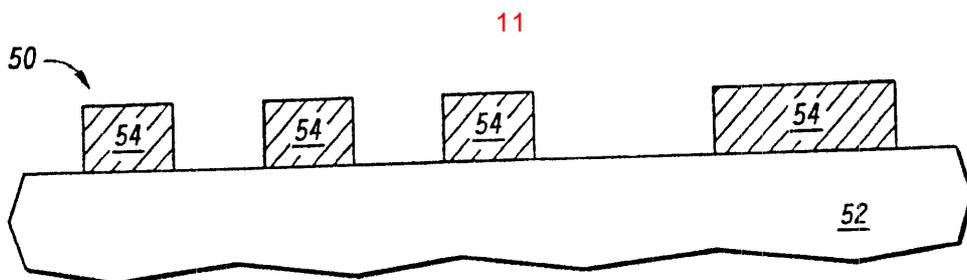
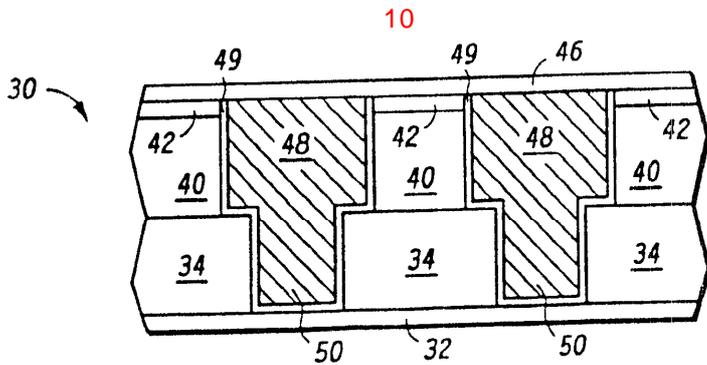


( 11 15 ) ,  
 (54) , ,  
 (60) (spin-on process) , 1 (58)  
 , 가 (60) 1  
 , 2.0 (isolation) , 1 - (spin-  
 on polyimide material), PPQ (polymer), ( ) (poly(amic acid solution)  
 (imidized) (58) ,  
 1  
 4. ( 16 ) ,  
 , 1 (62) ,  
 1 (62) 1 (X) (64) , (64)  
 (nonconformal dielectric layer)(66)  
 (chemical vapor deposition) (sealed void region)  
 , 1 (X) 50 (spanning) ,  
 1 2 (70)  
 5. ( 11 15 ) ,  
 (54) , ,  
 (60) 1 (52) (sidewall spacer) ,  
 1 - , 1 2 (58)  
 , 가 (60) 2 ,  
 2.0 , 2 (58) ,

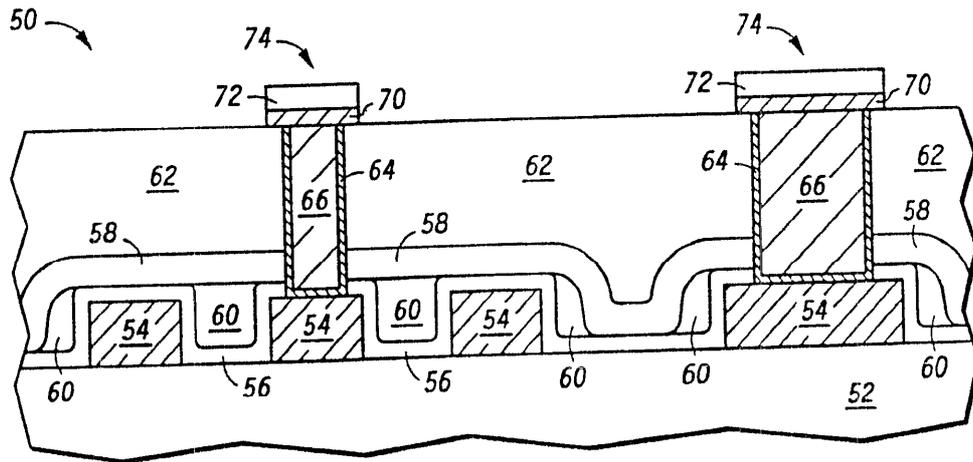








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