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(12)

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(65) 1997 - 0067772
(43) 1997 10 13

(30) 96 - 045864 1996 03 04 (JP)

(73) 가 가 , 2 2 3

(72) 2 2-3 가 가
2 2-3 가 가
가 2 2-3 가 가

(74)
:

(54)

DRAM MOS 가 ,
c n / MOS 111c 72b V_{BL} V_{BR} 72
72cb 가 72b .

12

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| | | | |
|----|---|------|-------|
| 1 | 1 | DRAM | . |
| 2 | 1 | DRAM | . |
| 3 | 1 | DRAM | . |
| 4 | 1 | DRAM | CBR . |
| 5 | 1 | DRAM | . |
| 6 | 1 | DRAM | . |
| 7 | 1 | DRAM | . |
| 8 | 1 | DRAM | . |
| 9 | 1 | DRAM | . |
| 10 | 1 | DRAM | . |
| 11 | 1 | DRAM | . |
| 12 | 1 | DRAM | . |
| 13 | 1 | DRAM | . |
| 14 | 1 | DRAM | . |
| 15 | 1 | DRAM | . |
| 16 | 1 | DRAM | . |
| 17 | 1 | DRAM | . |
| 18 | 1 | DRAM | / . |
| 19 | 1 | DRAM | CBR . |
| 20 | 1 | DRAM | . |
| 21 | 2 | DRAM | . |
| 22 | 2 | DRAM | . |
| 23 | 2 | DRAM | . |

| | | | |
|----|----|----------|-----|
| 24 | 2 | DRAM | . |
| 25 | 2 | DRAM | . |
| 26 | 2 | DRAM | . |
| 27 | 3 | DRAM | . |
| 28 | 4 | DRAM | . |
| 29 | 4 | DRAM | . |
| 30 | 4 | DRAM | . |
| 31 | 4 | DRAM | . |
| 32 | 4 | DRAM | . |
| 33 | 4 | DRAM CBR | . |
| 34 | 5 | DRAM | . |
| 35 | 5 | DRAM | . |
| 36 | 5 | DRAM | . |
| 37 | 6 | DRAM | . |
| 38 | 6 | DRAM | . |
| 39 | 9 | DRAM | . |
| 40 | 9 | DRAM | . |
| 41 | 9 | DRAM | . |
| 42 | 9 | DRAM | 가 . |
| 43 | 9 | DRAM | 가 . |
| 44 | 9 | DRAM | 가 . |
| 45 | 9 | DRAM | . |
| 46 | 10 | DRAM | . |
| 47 | 10 | DRAM | . |
| 48 | 11 | DRAM | . |

| | | | | |
|----|------------|----|------|---|
| 49 | | 11 | DRAM | . |
| 50 | | 11 | DRAM | . |
| 51 | | 12 | DRAM | . |
| 52 | | 12 | DRAM | . |
| 53 | | 12 | DRAM | . |
| 54 | | 13 | DRAM | . |
| 55 | | 13 | DRAM | . |
| 56 | | 14 | DRAM | . |
| 57 | | 14 | DRAM | . |
| 58 | SOI - DRAM | | | . |
| 59 | SOI - MOS | | | . |

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72b : 72ba, 72bb :

72c : 72ca :

72cb : MOS 72caa :

72cac : 72cba, 72cbb : /

72cbc : 72cbe :

111b :

111c : /

112b : I/O 112c : I/O

115 : 510 : SOI

511 : 512 :

513 :

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Access Memory)(SOI - DRAM) , SOI(Silicon On Insulator) DRAM(Dynamic Random

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가 , 가
DRAM(Dynamic Random Access Memory)

SOI - MOS 가 , 가 , 가 ,
가 , 가 가 1G DRAM($G=10^9$)
가 .

58 F.Morishita et al., 1995 Symposium on VLSI Technology Digest of Technical Papers, pp 1
41 - 142 SOI - DRAM SOM - DRAM

1 , 1 2 가 . SOI - DRAM
2 SOI - IMOS (3) 가 . SOI - MOS (3) n+ 3aa n+
3aa 가 n⁻ 3ab 가 / 3a , n+ 3ba n+ 3
ba 가 n⁻ 3bb 가 / 3b , / 3a 3b 3c
, 3c 3d , 3d 3c 3e ,
3e 3f .

SOI ,
MOS (3) / 3b SOI - MOS (4) 가 . SOI DRAM SOI - MOS
(4) 가 . SOI - MOS (3)

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3) SOI - DRAM , SOI - MOS ((4) V_{SN} , (3c)
(深部)(3g) 가 (3c) , / (3b) / (3a) 가
가 (3) / (3a), (3b) (3c) 가 PN 가

59 SOI - MOS 가 , / (3a), (3b) ((3c)
3c) , (5) ,

(3c) 가 59 (3c) L
(3ca) (-) (3c) 1 SOI - MOS
, 1G ($G=10^9$) SOI - MOS 가 DRAM

가 가 , SOI - MOS 가 SOI - DRA
M SOI - MOS 가 SOI - DRA

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, MOS / 가 , /

MOS , MOS

MOS / 1 1 , MOS

가 .

, 1 , 1

, 1 2 , 1 2

,

, / / , / 가 가 ,

MOS / , I/O , I/O

, I/O 1 I/O

, L .

, MOS L MOS L ,

, MOS 가 ,

,

, HOS , 가 SOI

, 가 , MOS

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[1]

DRAM(Dynamic Random Access Memory) 1 20
 , DRAMDM (10a) Vcc 20 (10b)
 Vss Vss
 $V_{BLP} (=1/2)(V_{CC}+V_{SS})$, (1/2)(Vcc+Vss)
 V_{CP} Vcc Vpp
 Vss VBR (10)

, DRAMDM ext/RAS
 /RAS /RAS 20 ext/C S
 /CAS /C S (30)

, DR M DM (40) (40) /RAS (20)
 /R S /C S (30) /CAS
 /R S가 H L /CAS가 H L
 CBR(/CAS Before/RAS) H CBR CBR, CBR CBR가 H L
 $k(2^{13})$ H H BRE BRE가 H
 CBR CBR CBR CBR가 CBR H
 가(increment) REFA₀ - REF₁₄

, DR M DM $i(i=0, 1, \dots, 14)$, /RAS (20)
 /RAS, /C S (30) /CAS, (40)
 REFA_i, CBR CBR BRE
 RA_i, /RA_i(i=0, 1, ..., 14) C_i/CA_i(i=0, 1, ..., 9) (50)

(50) CBR CBR가 CBR L
 /R S가 H L
 (40) REFA_i RA_i
 A_i , /R_i , CBR RA_i
 H , REF_i CBR
 REFA_i , RA_i REF_i
 /RA_i REFA_i

(50) /R S가 L /C S가
 H L CA_i
 BRE가 H A_i (50)
 L C_i /CA_i R_i /RA_i
 DR M DM (50) RA_i, /R_i , RA₀, R₀, R₁, /R₁
 가 H X₀ - X₃, RA₂, /RA₂, RA₃, /R₃ 가 H
 X₄ - X₇, RA₄, /R₄, R₅, /R₅ 가 H X₈ - X₁₁,
 R₆, /RA₆, R₇, /R₇ 가 H X₁₂ - X₁₅, RA₉, RA₉, R₁₀, RA
 H X₁₆ - X₁₉, RA₁₁, /R₁₁, RA₁₂, /RA₁₂ 가
 X₂₀ - X₂₃ R₁₃, /R₁₃, RA₁₄, R₁₄ 가 H
 X₂₄ - X₂₇ (60)

DRAM DM (70) (70) 256M(32k × 8k)
 가 4 가 , 2M(256 × 8k)

가 128 , , 256 , , 256
 8k(8192) 8k(8192) 가 , , 1k(1024)
 가 8 . . .

, DR M EM (80) , (80) 512
 , (60) X₀ - X₁₅
 BS_j (j=0, 1, ..., 511) , 256
 X₀ - X₁₅ (RA₀, /RA₀ - RA₇, /RA₇)1 Vcc

, DRAM DM (50) C_i, /CA_i , CA₀, /CA₀, CA₁, /CA₁
 가 H Y₀ - Y₃, CA₂, /CA₂, CA₃, /C₃ 가 H
 Y₄ - Y₇, CA₄, /CA₄, CA₅, /CA₅ 1 가 H Y₈ - Y₁₁, CA
 6, /CA₆, CA₇, /CA₇ 가 H Y₁₂ - Y₁₅, CA₈, /CA₈, CA₉, /CA₉
 1 가 H Y₁₆ - /Y₁₉ (90) .

DRAMDM (100) , (100) 1
 28 32 가 , Y₀ - Y
 19 , Y₄ - Y₁₉ 가 H (90) CSL_k (k=0,1, ..., 255)
 . CSL_k , BS_j 4
 4 128 (100) 32
 Y₃ 32 128 128 Y₀ -
 DS_m (m=0, 1, ..., 127) .

DRMM DM , 8k(8192) 516 , ,
 516 508 2 , 2 2
 (, 2) 2
 I/O I/O I/O 가 ,
 110 .

DRAM DM (120) , (120) /RAS (20)
 /R S , (40) BRE ,
 (50) RA₈, /R₈ 60 X₁₆ - X₂₇ ,
 /RAS가 L 가 RA₈, /RA₈ X₁₆
 - X₂₇ (R₈, /RA₈ - R₁₄, /RA₁₄) 4 H
 BS_j (j=0, 1, ..., 511) . BS_j , BRE가
 H , RA₈ /RA₈ L ,
 L .

(120) RA₈, /RA₈ X₁₆ - X₂₇

(isolation) /BLI_n (n=0, 1, ..., 1023),
 /PSE_p, NSE_p, (p=0, 1, ..., 515), V

BLP SEL_p P_{RP} I/O I/O V
 /BLI_n V_{pp} BRE가 H H
 NSE_p CBR CBR H PR_p H H
 SEL_p CBR CBR H L PR_p L H
 BRE가 L PR_p L H
 /RAS 가 L H /R
 S가 H H

DRAMDM /RAS /C S
 /W ext/OE /WE
 ext/OE 가 L (130) /OE H
 /WE /RAS가 L H
 /W가 L /C S가 L L

, DR M DM / (130) /WE /OE
 /WE가 L 32 D_q (q=0, 1, ..., 31)
 L 110 I/O /OE가
 110 I/O D_q
 (140)

2 1 (70), (80), (100) (110)
 , DR M DM 4 (71) , (71)
 128 (72) 가 , (72) 8 (73) 가 , DR M
 DM (80) (80) (72) 512
 (81) 가 . DR M DM (100) (100)
 (71) (73) 128 (73)
 (101) 가 . DRAM DM (72) (111)
 (73) , (73) (
 1) I/O 2 112d

3 (40) (40) /R S
 /C S , /RAS가 L H CBR
 /C S가 L CBR H CBR CBR C
 /RAS가 L H H L CBR CBR C
 BR (41) 가 .

, CBR (40) CBR CBR, BRE /RAS
 , CBR H BRE가 L , CBR CBR가 CBR
 H 1BRE가 가(increment) H , CBR CBR
 L 가 AIN 가 (42) 가 .

(40) 가 IN , 가 AIN H
 가 REF₀, REF₁, ..., BEF₁₄ (43)
 가 REF₀, REF₁, ..., BEF₁₄ 가 AIN H
 (BEF₀, REF₁, ..., REFA₁₄) = (L, L, L, L, L, L, L, L, L, L, L, L, L, L, L) (REF₀, REFA₁, ..., REFA₁₄) = (H, L, L, L, L, L, L, L, L, L, L, L, L, L, L) , (REF₀, REF₁, ..., REFA₁₄) = (H, H, L, L, L, L, L, L, L, L, L, L, L, L, L) , (REFA₀, REFA₁, ..., REFA₁₄) = (H, H, L, L, L, L, L, L, L, L, L, L, L, L, L) , (REF₀, REF₁, ..., REFA₁₄) = (H, H, H, H, H, H, H, H, H, H, H, H, H, H, H) 가 , (REFA₀, REFA₁, ..., REFA₁₄) = (L, L, L, L, L, L, L, L, L, L, L, L, L, L, L) 가 .

REFA₀, REFA₁, ..., REFA₁₄ 가 (REFA₀, REFA₁, ..., REFA₁₄) = (L, L, L, L, L, L, L, L, L, L, L, L, L, L, L) (REFA₀, REFA₁, ..., REFA₁₄) = (H, H, H, H, H, H, H, H, H, H, H, H, H, H, H) 가 , 가 (一巡) 2¹⁵ (32k) 가 가 , 32k DRAM , 128msec , 4 μ sec(128msec /32k) REFA₀, REFA₁, ..., REFA₁₄ 가

(40) REF₁₂ , REFA₁₂ L /RAS (44)
 H H BRE REF₀, REFA₁, ..., REFA₁₄ 가 (REF₀, REF₁, ..., REF₁₄) = (L, L, L, L, L, L, L, L, L, L, L, L, L, L, L) (REFA₀, REFA₁, ..., REFA₁₄) = (H, H, H, H, H, H, H, H, H, H, H, H, H, H, H) 가 4 H

BRE (REF₀, REF₁, ..., REFA₁₄) = (H, H, H, H, H, H, H, H, H, H, H, H, L, L, L) (REFA₀, REFA₁, ..., REFA₁₄) = (L, L, L, L, L, L, L, L, L, L, L, L, H, L, L) 가 , (REFA₀, REF₁, ..., REFA₁₄) = (H, H, H, H, H, H, H, H, H, H, H, H, L, H, L) (REF₀, REFA₁, ..., REFA₁₄) = (L, L, L, L, L, L, L, L, L, L, L, L, H, H, L) 가 , (REF₀, REF₁, ..., REFA₁₄) = (H, H, H, H, H, H, H, H, H, H, H, H, H, H, H) (REF₀, REF₁, ..., REFA₁₄) = (L, L, L, L, L, L, L, L, L, L, L, L, L, L, H) 가 (REFA₀, REFA₁, ..., REFA₁₄) = (H, H, H, H, H, H, H, H, H, H, H, H, L, H, L) (REF₀, REFA₁, ..., REFA₁₄) = (L, L, L, L, L, L, L, L, L, L, L, L, L, H, H) 가 4 H .

, 가 (42) (42a), BRE , (42a) CBR CBR /CBR , BRE가 H CBR CBR가 CBR H CBR CBR가 L L H 가 AIS , 가 AIS , 가 IN 가 H , 가 IS가 H CBR CBR 가 AIN L 가 (42c) 가 .

가 (42b) CBR (42ba), NAND (42bb), NOR (42bc), (42bd), NAND (42be),
 N ND (42bf) N ND (42bf) RS N ND (42bg) .
 (42ba) (奇數段) . 가 (42c) NOR
 (42ca) .

(43) 15 (43a), (43b), (43c), ..., (43d), (43e), (43f) 가
 (43a), (43b), (43c), ..., (43d), (43e), (43f) CNT
 0, CNT₁, CNT₂, ..., CNT₁₁, CNT₁₂, CNT₁₃, CNT₁₄ , REFA₀, REFA₁, REFA₂,
 ..., REF₁₁, REFA₁₂, REFA₁₃, REFA₁₄ 15 (43g), (43h), (43i), ..., (43j), (43k), (43m),
 (43n) . (43a),(43b),(43c), ..., (43d), (43e),(43f) L H

(44) , (44a), NAND (44b), (42ba) REFA₁₂
 (44c), NAND (44d), NAND (44d) RS N ND (44e)
 (44f) .

4 (40) CBR (41) . CBR (4
 1) , (41a), (41b), N ND (41c), N ND (41c) NAND (41d),
 N ND (41e), NAND (41e) NAND (41f) (41g) .

5 6 (40) , 5
 BRE 가 H 가 (42) . ,
 /CAS가 5 (b) t₀ L ,
 /RAS가 5 (a) t₁ L , CBR CBR가 5
 (c) CBR H , (42a)
 /CBR L .

, BRE 5 (d) L , BRE
 N ND (42be) (S₃) 5 (g) H , L
 /CBR NAND (42bb) (S₁) 5 (e) H ,
 H (S₁) NOR (42bc) L , (42bd)
 (S₂) 5 (f) H . NAND (42bf) (42bg)
 RS , 가 AIS 5 (h) L
 . L /CBR 가 AIS 가 (42c)
 NOR (42ca) 가 AIN 5 (i) H .
 BRE가 5 (d) t₂ H .

, /R S /C S가 5 (a) (b)
 t₃ H , CBR CER가 5 (c)
 /RAS H L , (42a) /CBR H
 . 가 (42c) /CBR H 가 AIN
 5 (i) L , BRE 5 (d)
 t₄ H H , /CBR BRE 5 (d)
 (42be) (S₃) 5 (g) t₄ L . BRE NAND

, NAND (42bf) L (S₃) 가 IS 5 (h)
H , , /CBR가 H , t₄ 5 (42ba)
L , N ND (42bb) (S₁) 5 (e)
t₄ L (42bd) (S₂) 5 (f) BRE H , NOR (42bc)
L , 가 .

, CBR CBR L , (42ba) 가 L
, NAND (42bb) (S₁) 5 (e) t₄ H
, /R S가 H BRE 5 (d)
t₄ L .

, /CAS가 5 (b) , L , CBR , CBR 5
, /RAS가 5 (a) t₆ L , CBR , CBR 5
(c) H (42a) , /CBR L , ,
t₀ t₄ CBR BRE가 H , ,
가 AIS가 5 (h) H 가 (42
c) NOR (42a) 가 AIN 5 (i) L , .
IN CBR CBR H CBR , 가

, /RAS /CAS가 5 (a) (b)
, t₇ H , CBR CBR /R S가 H
, 5 (c) L . N ND (42bb) (S₁)
5 (e) t₃ t₄ 가 CBR CBR L
t₈ L . BRE , 5 (d) L
, L L BRE (S₁) NOR (42bc) H ,
(42bd) (S₂) 5 (f) L . L (S₂)
NAND (42bg) H , L BRE NAND (42be)
(S₃) 5 (g) , H , N ND (42bf)
가 AIS 5 (h) L .

, BRE가 H 4 μ sec t₅ t₈ 가
CBR (t₈ t₉) , CBR C
BR , 4 μ sec , CER
, CBR
, BRE가 H , CBR CBR 가
REF_i 가 , CBR 가

6 (40)

(43a), (43b), ... , (43f) CNT₀, CNT₁, ... , CNT₁₄ L
REF₀ - REF₁₄ 6 (f) - (k)
H , , /CAS가 6 (b)
t₀ L , /R S가 6 (a) , t₁ L
가 IN , CBR CBR 6 (c) H .
CBR H BRE가 H CBR

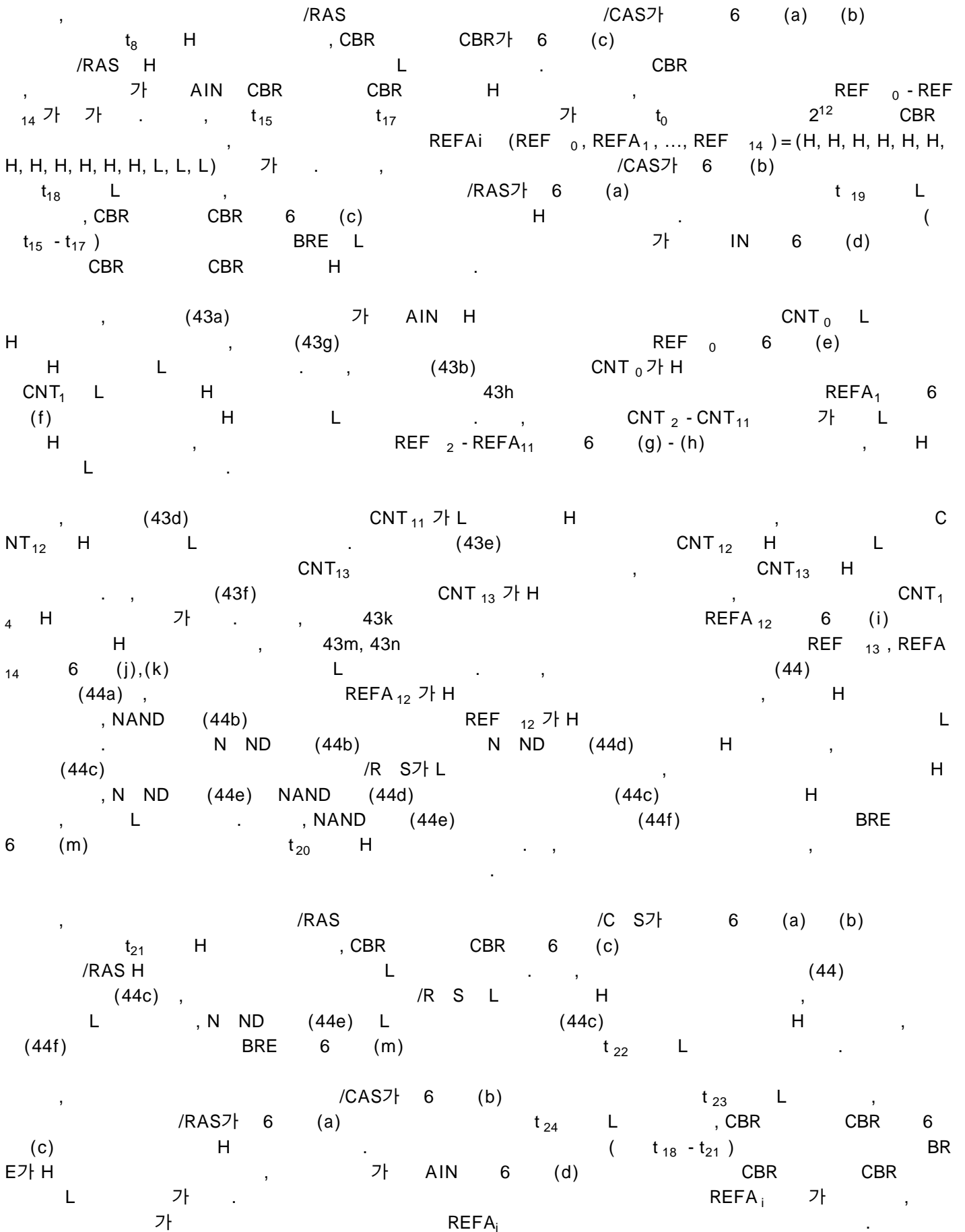
(43a) 가 AIN H , CNT₀ L
 H , (43b) CNT₀가 H , CNT₁ L
 H H 가 , (43c), ..., (43d), (43e), (43f) CNT_r가
 H , CNT_{R+1} H , REFA₀
 - REFA₁₄ , 6 (e) - (k) L , /RA
 S /CAS가 6 (a) (b) t₂ H ,
 CBR CBR가 6 (c) /RAS H

, /CAS가 6 (b) , t₃ L ,
 /R S가 6 (a) t₄ L , CBR CBR
 6 (c) H . IN 6 (d) (t₀ - t₂)
 BRE L , CBR CBR
 H .

(43a) 가 AIN H CNT₀ H
 L , (43g) REFA₀ 6 (e)
 CNT₁ L H , (43b) CNT₀가 L
 L 가 , (43h) REFA₁ 6 (f)
 , (43c) (43f) CNT_r가 H
 CNT_{r+1} H , 43i - 43n
 REF₂ - REF₁₄ 6 (g) - (k) L 가 .

, /R S , CBR CBR가 6 (a) (b)
 t₅ H , CBR CBR가 6 (c)
 /RAS H L .
 /RAS가 6 (a) /CAS가 6 (b) t₆ L ,
 (c) H 가 . IN 6 (d) t₇ L , CBR CBR 6
 L (t₃ - t₅) CBR CBR BRE
 H .

(43a) 가 AIN H CNT₀ L
 H , (43g) REFA₀ , 6 (e)
 H H L , (43b) CNT₀가 H
 CNT₁ H L , 43H REF₁ ,
 6 (f) L H , 43c - 43f CNT_r가
 L H CNT_{r+1} H , 43i - 4
 3n REFA₂ - REFA₁₄ , 6 (g) - (k) L
 가 .



/R S가 6 (a) /CAS가 6 (b) t_{26} L , CBR CBR 6 (c)
 H , 가 AIN 6 (d) t_{27} L ($t_{23} - t_{25}$) BRE L
 , REFA_i 6 (e) - (k) , CBR CBR H

 7 (50) (50) /R S (51),
 BRE /RAS가 H L /R S , BRE가 L ,
 H /R S , BRE가 가 H ,
 /R S RE (52) , L
 /CAS , /R S가 H ,
 CAL /CAS가 L , H
 (53) 가 .

 (50) 0, 1, ..., 14 (54) (54)
 (55) , /RAS가 L (55) 가 . A_i ,
 (51) R L A₁ ,
 RE가 L , R_i /RA_i L ,
 RE가 H CBR CBR가 L , RA_i R
 i /R_i 가 H , CBR H REFA_i ,
 RA_i /R_i 가 H .

 (55) CAL , /C
 S가 L A_i C L H CA_i /C_i , 가 H A_i .

 8 7 (55) (5
 5a) (55b) (55a) (55aa),
 p MOS (55aba), 55abb n MOS (55abc), (55abd) 가 (55ab)
 (55ac) . (55b) (55ba), n MOS (55b
 ba) p MOS 55bb 가 (55bb), p MOS (55bca) n MOS
 (55bcb) 가 (55bc), (55bd), (55bc)가 가 ,
 (55bd) (55be), n MOS (55bfa) p MOS (55bf
 b) 가 (55bf), p MOS (55bga) n MOS (55bgb) 가
 (55bg), (55bh), (55bi), (55bj), N ND (55bk), (55bm) (55bn), (55bp)

(55a) MOS (55aba) n MOS (55abd)가 H , (55ab) p
 (55b) (55bc)가 , R L H , A_i가
 (55bb)가 CBR (55bf)가 (55bg)가 가 ,
 CBR가 L R S 가 L (55bf)가 R_i /RA_i 가 H , CBR CBR H
 /RAS가 L (55bf)가 (55bg)가 가 , REF_i
 R_i /R_i 1 가 H .
 9 (81) (81) Vcc - Vss
 X₀ - X₃ BRE RE , Vpp - Vss
 LB₀ - LB₃ (81a) BS_j, /BS_j X₄ - X₁₅
 LB₀ - LB₃ 256 (72a) 1 64
 (81b) 가 (81a) BRE
 H RE X₀ - X₃ LB₀ - LB₃ LB₀ - LB₃
 L BRE가 L LB₀ - LB₃
 X₀ - X₃ (R₀, RA₁, /RA₀, /RA₁) 1
 RE가 H Vcc
 .
 (81b) BS_j p MOS (81ba),
 X₄ - X₇ 1 n MOS (81bb), X₈ - X₁₁ 1
 n MOS (81bc) /BS_j n MOS (81bd) 가 X₁₂ - X₁₅ 1 /
 f), (81b) (81be), (81be) p MOS (81b)
 Vcc n MOS (81bg), (81bh), (81bi), (81bj), n MOS
 (81bk), (81bm), (81bn), (81bp), (81bq), (81br), (81bs), (81bt) 가 . ,
 BS_j /BS_j가 H L , p MOS (81ba)
 , 64 (81b) 1 , n MOS (81bb), (81bc), (81bd)가
 가 , (81bu) L (81be)가 H 63
 (81b) n MOS (81bb), (81bc) (81bd) 1 가 , (81b)
 u) (81be) p MOS (81bf) H
 (81be) L .

(81bu) 가 L (81b) (81bu) n MOS
 (81bm), (81bp), (81br), (8bt)가 가 , n MOS (81bg), (81
 bh), (81bi), (81bj) (81be) n n10S (81bk), (81bn), (81bq), (81bs)
 가 가 , LB₀ - LB₃ 4 (72a) 1 가 , Vcc (81b) , (81bu)
 n MOS (81bm), (81bp), (81br), (81bt)가 가 , (81b)
 n M10S (81bg), (81bh), (81bi), (81bj) (81be) n MOS
 (81bk), (81bn), (81bq), (81bs)가 가 , (72a)가 L .
 IO (81a) (81a) ,
 RE BRE , BRE가 H ,
 RE MB L , BRE가 L
 RE가 H MB Vpp
 (81aa) MB X₀ - X₃ ,
 LB₀ - LB₃ , X₀ - X₃ 1 MB가 Vpp
 81ab 가 .

(81aa) Vcc - Vss RE가 L H
 Vss Vpp (81aa), Vcc - Vss (81aa)
 BRE가 L Vpp H Vss Vpp MOR (81aad)

(81ab) MB가 Vpp
 Vpp (81aba), n MOS (81abb), (81abc), n MOS
 (81abd), n MOS (81abe), (81abf), (81abg), (81abh), n MOS (81abe), (
 81abf), (81abg), (81abu) n MOS (81abi), (81abj), (81abk),
 (81abm), (81abn) n MOS (81abp) , BRE가 L
 RE가 H X₀ - X₃ 1 가 H , n
 MOS (81abe), (81abf), (81abg), (81abh) H 1 가
 가 , MB가 Vpp , n MOS (81abe), (81abf), (8
 1abg), (81abh) 가 , 가

11 (70) 110
 (73) (72ba) (72bb) 가 1024(1k) (72b)
 (111) (72b) (72ba) (72bb) BL_s /BL_s
 V_{BLP} (= (1/2)(Vcc+Vss)) / / (111a) 가

(110) , n MOS (112aa) (112ab) 가 , /BLI_n
 (72b) / / (111a) (112a), I/O
 (112ba) (112bb) 가 I/O (112b), n MOS (112ca) (112cb) 가 ,
 CSL_k 72b I/O (112b) I/O (112c),
 (73) , I/O (112da) I/O (112db) 가
 I/O (112d) n MOS (112ea) (112eb) 가 , SEL_p I/O
 (112b) I/O (112d) I/O (112e)
 (112a), I/O (112b), I/O (112c), I/O (112d) I/O
 (112e) I/O

12 (72) 11 (72a) (72b) (110)
 V_{CP} , 가 (72a) (72ca) (72ca) (72cb) 가 (72a) (72bb) (72c)

(110) 가 P (111e) p MOS
 (111ba), (111bb) 가 , (72ba) (72bb) 가 (111f) n MO
 V_{CC} p , 가 n (111f) n MO
 S (121bc), (121bd) 가 , (72ba) (72bb) 가 (112a) (72b)
 V_{SS} n , (112a) (72b)
 11f) NCS_p 가 $/PSE_p$ NSE_p p (111e) PCS_p n (1
 c , V_{CC} V_{SS} (111b) , V_C

(110) 가 V_{SS} PR_p (72
 ba) (72bb) n MOS (111ca) (111g) ,
 BRE가 H V_{BR} , BRE가
 BRE가 L V_{BLP} 가 V_{BL} (72ba) (72bb) BRE가
 P_{BR} , H PR_p 72ba 72bb V_{BLP}
 n MOS BRE가 L (111cb), (111cc) 가 / (111c)
 n MOS (111cb), (111cc) V_{SS} , (111e) (111
 f) n MOS (111da) , 가 V_{SS} , (111
 db), (111dc) 가 (111e) (111f) V_{BL} n MOS (111
 / (111c) / / (111d) , (111b)
 (111a)

(112a) n MOS (112aa), (112ab) I/O (112e)
 n MOS (112ea), (112eb) V_{SS} .

13 (111) (111h)
 (111h) 가 V_{CC} , p (111h)
 (111e) PCS_p V_{CC} , p $/PSE_p$ p MOS (11
 1ha) 가 V_{SS} , n NSE_p n MOS (11
 1f) NCS_p V_{SS} , n (111h) $/PSE_p, NSE_p$ (111hb) 가

14 (110) V_{BL} BRE
 (113) (113) BRE가 H
 V_{BLP} V_{BR} , BRE가 L V_{BL}
 V_{BL} V_{BR} ,
 V_{BLP} .

RE, (113) BRE, Vcc - Vss, B
 $V_{CC} - V_{BR}$ / 0 (BRE
 $V_{CC} - V_{BR}$ 0 / 0) (113a) 0 / 0
 , V_{BL} V_{BLP} V_{BR}
 (113b) 가 .

(113a) (113aa), p MOS (113ab), (113ac), n MOS
 (113ad), n MOS (113ad) n MOS (113ae)
 V_{CC} V_{BR} (113af), (113ag)
 (113b) n MOS (113ba) (113bb) .

15 (120) (121) (121)
 . $RA_8, /RA_8$ $X_{16} - X_{15}$
 27 $BS_0 - BS_{511}$, $/BID_0 - /BID_{1023}$ $PD_0 - PD_{515}$
 (121a) , $/BID_0 - /BID_{1023}$ BRE ,
 BRE가 H , $/BLI_0 - /BLI_{1023}$ V_{pp}
 , BRE가 L , $/BID_0 - /BID_{1023}$ $/BLI_0$
 $- /BLI_{1023}$ (121b) , $PD_0 - PD_{515}$ BRE
 , BRE가 H $PR_0 - PR_{515}$
 $PR_0 - PR_{515}$ BRE가 L (121c) 가 . $PD_0 - PD_{515}$

$BS_0 - BS_{511}$ $BS_0 - BS_{127}$, # 0 (71)
 (72) , $BS_{128} - BS_{255}$ # 1 (71) 72
 , $BS_{256} - BS_{383}$ # 2 71 ,
 $BS_{384} - BS_{511}$, # 3 71 72
 $RA_8, /RA_8$ $X_{16} - X_{27}$ $BS_0 - BS_{127}$ 1 가,
 H , 가 BS_{128} / BS_{255} 1 가 H ,
 $BS_{256} - BS_{383}$ 1 가 H , $BS_{384} - BS_{511}$ 1 가 H , $(RA_8,$
 $/RA_8, X_{16}, X_{17}, X_{18}, X_{19}, X_{20}, X_{21}, X_{22}, X_{23}, X_{24}, X_{25}, X_{26}, X_{27}) = (L, H, H, L, L, L, H, L, L, L, H, L,$
 L, L) , $BS_0, BS_{128}, BS_{256}, BS_{384}$ 가 H . , BS_j 2
 가 $/BID_{2j} /BID_{2j+1}$, 72 2
 $/BID_0, /BID_{256}, /BID_{512}, /BID_{768}$ 71 72
 72가 H L V_{pp} 가 $BS_0, BS_{128}, BS_{256}, BS_{384}$ 가
 72 $/BID_{255}, /BID_{511}, /BID_{767}, /BID_{1023}$ B
 $S_{127}, BS_{255}, BS_{383}, BS_{511}$ 가 72가 H L V_{pp} .
 , 71 111 72 (s
 hare)

, $/BID_n$ 72 ,
 L . $(RA_8, /RA_8, X_{16}, X_{17}, X_{18}, X_{19}, X_{20}, X_{21}, X_{22}, X_{23}, X_{24}, X_{25}, X_{26}, X_{27}) = (H, L, H, L, L, L, H, L, L, L, H, L, L, L)$ 71 2
 72 $BS_1, BS_{129}, BS_{257}, BS_{385}$ 가 H .
 $D_{516}, /BID_{772}$ L $/BID_1, /BID_{257}, /BID_{513}, /BID_{769}$ $/BID_4, /BID_{260}, /BI$
 111 2 72 71

$PD_0, PD_{129}, PD_{258}, PD_{387}$, 72
 $BS_0, BS_{128}, BS_{256}, BS_{384}$, $PD_{128}, PD_{257}, PD_{386}, P$
 D_{515} , 72 $BS_{127}, BS_{255}, BS_{383}, B$
 S_{511} , PD_p , # 0 71 2
 BS_{p-1}, BS_p , # 1 71 2 BS_{p-2}, BS_{p-1} , # 2
71 2 BS_{p-3}, BS_{p-2} , # 3 71 2 BS_{p-4}, BS
P-3 .

$PD_0 - PD_{515}$, 1 가 H
 L , $(RA_8, /RA_8, X_{16}, X_{17}, X_{18}, X_{19}, X_{20}, X_{21}, X_{22}, X_{23},$
 $X_{24}, X_{25}, X_{26}, X_{27}) = (H, L, H, L, L, L, H, L, L, L, H, L, L, L)$ 71
2 72 $BS_1, BS_{129}, BS_{257}, BS_{385}$ 가 H ,
 BS_1 $PD_1, PD_2,$ BS_{129} PD_{130}, PD_{131} ,
 PD_{259}, PD_{260} BS_{385}
 PD_{388}, PD_{389} 가 L .

121b $/BID_n$ V_{pp}
NOR 121a 121bb , BRE가 H
 $/BL1_n$ V_{pp} , BRE가 L
 $/BID_n$, $/BL1_n$, L

121c PD_p NOR 121ca 121c
BRE가 H PR_p
BRE가 L PD_p
L .

16 120 122
H n MNS , n RE가 H H
p MPS MNS가 H 가/PSE_p,
NSE_p 122a 122b 가 .

122b , $PD_p,$ n MNS, p
BRE , BRE가 H
P $/PSE_p$ n NSE_p
H L , BRE가 L , PD_p 가
L n MNS가 H , n
NSE_p H p MPS가 H
, p $/PSE_p$ L .

BRE가 L 516 p $/PSE_p$ NSE_p
4 가 p L , 516 n
4 가 n H .

(RA₈, /RA₈, X₁₆, X₁₇, X₁₈, X₁₉, X₂₀, X₂₁, X₂₂, X₂₃, X₂₄, X₂₅, X₂₆, X₂₇) = (H, L, H, L, L, L, L, H, L, L, L, H, L, L, L)

71 2 72

BS₁₂₉, BS₂₅₇, BS₃₈₅ 가 H , BS₁ p /PSE₁₃₀, /PSE₁₃₁, BS₂₅₇

1, /PSE₂, BS₁₂₉ p /PSE₂₅₉, /PSE₂₆₀ BS₃₈₅ p BS₁ n

가/PSE₃₈₈, /PSE₃₈₉ 가 p L , NSE₁₃₀, NSE₁

NSE₁, NSE₂, BS₁₂₉ n NSE₂₅₉, NSE₂₆₀ BS₃₈₅

31, BS₂₅₇ n NSE₃₈₈, NSE₃₈₉ 가 n H .

122b , 122baa, NAND 122bab 122bac ,

PD_p, n MNS , MPS PD_p가

L , MNS가 H , n L

NS_p L , p MPS가 H , p L

PS_p L 122ba 가 .

122b , NOR 122bha, 122bbb, NOR 122bbc

BRE, n LNS_p, p LPS

122bbd, 122bbe , BRE가 P H , n LNS_p NSE_p

p LPS_p , p /PSE_p n BRE가 L , p

/PSE_p n NSE_p n LNS_p P LPS_p

122bb 가 .

17 72c . 17 2 72c

, SOI(Silicon On Insulator) 510 511,

511 512 , 512

513 . 72c n MOS 72cb , 513 n

/ 72cba , 513 / 72cba n / 72

cbb , 513 / 72cba 72cbb p 72c

bc , 72cbc 72cbd , 72cbd 72

cbc 72a 72cbe . 2 n MOS

72c / 72cbb .

, 513 2 n MOS 72cb가 , 513

LOCOS(LOCAl Oxidation of Silicon) 513a , 72c

n MOS 72cb , 72ca n MOS 7

2cb / 72cba , n , 72ca

72caa 72caa ,

72cab , V_{Cp} 가 , 72caa 72cab , n

, 72ca 72cac .

, 72b(72bb) , n 72baa n M0

S 72c / 72cbb , n MOS 72cb

72ca 72caa 72baa () . 521 523

. 72cac 72baa 524

, 72b 72baa 525 525a . 72a

72aa , 가 n MOS 72b 72cbe , 72aa
 526 , 72a .

522 72a 72ab ,
 72c n MOS 72cb 가 .

18 DRAMDM / (read/write) H
 ext/RAS가 18 (a) ,
 t₀ RE 18 (f) L
 LB₀ - /LB₃ 18 (i) , 72a WL t 1
 8 (j) Vss , 72c n MOS 72cb
 가 , 72c .

/BLI_n 18 (h) Vpp , 72b가
 111b / 111c 가 , PR_p 18
 (g) H , BRE 18 (e) L ,
 113 VBL V_{BLP} ,
 / 111c 72ba 72bb BLs/BLs(s=0, 1, ..., 1023) 18 (p) /
 (1/2)(V_{cc}+V_{ss}) V_{BLP}
 111d , 111e 111f PCS_p NCS_p 18 (n) V
 BLP .

/PSE_p NSE_p 18 (m) H L
 111h p MOS 111ha n MOS 111hb
 가 , p 111e PCS_p n 111f NCS_p 18 (n)
 V_{BLP} , 111b .

CSL_k 18 (q) L , CSL_k I/O
 112c n MOS 112ca 112cb 가 , 72b I/O
 112b가 , SEL_p 18 (k) L , SEL_p
 I/O 112e n MOS 112ea 112eb가 가 , I/O 11
 2b I/O 112d가 , 140 / 130
 D_q 18 (r) .

ext/RAS가 18 (a) t₀ L , /RA
 S 20 /RAS L , 50 40
 CBR CBR가 18 (d) L , A_i
 , RE가 18 (f) t₁ H
 , RA_i , /RA_i A_i .

121 , RA₈ , /RA₈ X₁₆ -
 X₂₇ (, RA₈ , /RA₈ - RA₁₄ , /RA₁₄) PR_p 18 (g)
 L , RA₈ , /RA₈ X₁₆ - X₂₇
 , 72 , / 111c , 72ba 72bb
 11e 111f , 72 / 111d , 1

$RA_8, /RA_8 - RA_{14}, /RA_{14}$ 121, 18 (h) t_2
 72 72 $/BLI_n$ V_{pp}
 72 $72b$ $112a$ $111b$ /
 111c
 SEL_p 18 (k) $RA_8, /RA_8 - /RA_{14}$ 72
 72 I/O 112b, H I/O 112e
 $LB_0 - LB_3$, I/O 112b, I/O 112d가
 t_3 V_{cc} $RA_0, /RA_0, RA_1, /RA_1$ 1가, 18 (i)
 $72a$ (71 , 72 1, $RA_i, /RA_i$ 72 7
 2a가 1 WL_i 가 18 (g)
 $72a$ 8k $72c$ n MOS $72cb$ 가 가,
 $72ca$ $72ba$ $72bb$ $72c$ $72a$ $72ba$
 $72bb$ $BLs, /BLs$ 가 18 (p) V_{BLP} (L
 가)
 t_4 H 72 n NSE_p 가 18 (m) n MOS
 $111hb$ 가 가, n $111f$ NCS_p 가 18 (n) V_{ss}
 $72ba$ $72bb$ 가 n MOS $111bc$ $111bd$ n 가,
 V_{ss} BLs $/BLs$ 18 (p)
 t_5 L 72 P $/PSE_p$ 가 18 (m) p MOS
 $111ha$ 가 가, p $111e$ PCS_p 가 18 (n) V_{cc}
 가 $72ba$ $72bb$ 가 MOS $111ba$ $111bb$ p
 V_{cc} BLs BLs , 18 (p)
 t/CAS 가 18 (b) 가 $111b$ ex
 $/CAS$ L, t_6 L, $/CAS$ 30 C
 $A_i, /CA_i$ A_i , 50 $CA_i, /CA_i$
 CSL_k (73 1 CSL_k 가)가 18 (q)
 t_7 H, H CSL_k $72b$ 가 I/O 112b
 I/O 112c, $111b$ $72b$ 가 I/O
 $112b$ I/O 112d
 140 $/W$ 가 H ext $/OE$ 가 L /
 130 I/O 112d
 t_8 DS_m , 32 D_q 18 (r) ext $/OE$ 가 H
 140 $/W$ 가 L, 128 I/O 112d,
 DS_m / 130 I/O 112d, 32
 D_q 32 I/O 112d I/O 112b
 $72b$ 32 $72c$

, ext/RAS가 18 (a) t₉ H ,
 RE가 18 (f) L , 72a
 WL_t 18 (j) /BLI_n 18 (h1)
 V_{pp} , LB₀ - LB₃ 18 (i) SEL_p
 18 (k) /PSE_p NSE_p 18 (m) CSL_k 18 (q) L
 , PR_p 18 (g) H PR_p
 / P111c 72b BL_s, /BL_s가 18 (p)
 V_{BLP} 111e 111f PCS_p NCS_p가 18 (n) /
 111d V_{BLP}

, DRAMDM CBR 19 CBR
 (, CBR 가)
 CBR 가
 CBR

, ext/RAS가 L ext/CAS가 19 (b)
 t₀ L , ext/RAS가 19 (a) H
 t₁ L , CBR CBR 19 (d) L
 . 50 /RAS, /CAS L
 100 A_i CSL_k 19 (q) CA_i, /CA_i L , H
 CBR CBR 120 I/O 112b I/O 112d
 SEL_p 19 (k) L

, CBR CBR가 H REFA_i가 19 (c)
 . , BRE 19 (e) L ,
 ext/RAS가 L , RE가 19 (f)
 t₂ H . 50 CBR CBR가 H ,
 RE가 H , RA_i, /RA_i 40
 REFA_i

, 121 RA₈, /RA₈ X₁₆ -
 X₂₇ (, RA₈, /RA₈ - RA₁₄, /RA₁₄) PR_p 19 (g)
 L , RA₈, /RA₈ X₁₆ - X₂₇
 72 / 111c 72ba 72bb
 , 72 / 111d 111e 111f

, 121 19 (h) t₃
 RA₈, /RA₈ - RA₁₄, /RA₁₄ 72 /BLIn V_{pp}
 , 72 72 /BLIn L ,
 72 72b 112a 111b /
 111c

t_4 $LB_0 - LB_3$ V_{cc} $RA_0, /RA_0, RA_1, /RA_1$ 1 가 19 (i)
 $72a($ $72a$ 71 1 $72가$ $RA_i, /RA_i$ 72
 $72a가$ 1 $)$ $WL_i가$ 19 (g)

$72a$ $8k$ $72c$ n MOS $72cb가$
 $72ca$ $72ba$ $72bb$ $72c$ $72ba$
 $72bb$ $BLS, /BLS가$ 19 (p) $72c$ $72ca$ H
 L V_{BLP} $($ L
 $가$ $)$.

72 n $NSEp가$ 19 (m)
 t_5 H $NSEp$ $111h$ n MOS
 $111hb가$ $, n$ $111f$ $NCSp가$ 19 (n) V_{ss}
 $, n$ $111b$ n MOS $111bc$ $111bd$ n $가$
 $72ba$ $72bb$ $가$ BLS $/BLS$ 19 (p)
 V_{ss}

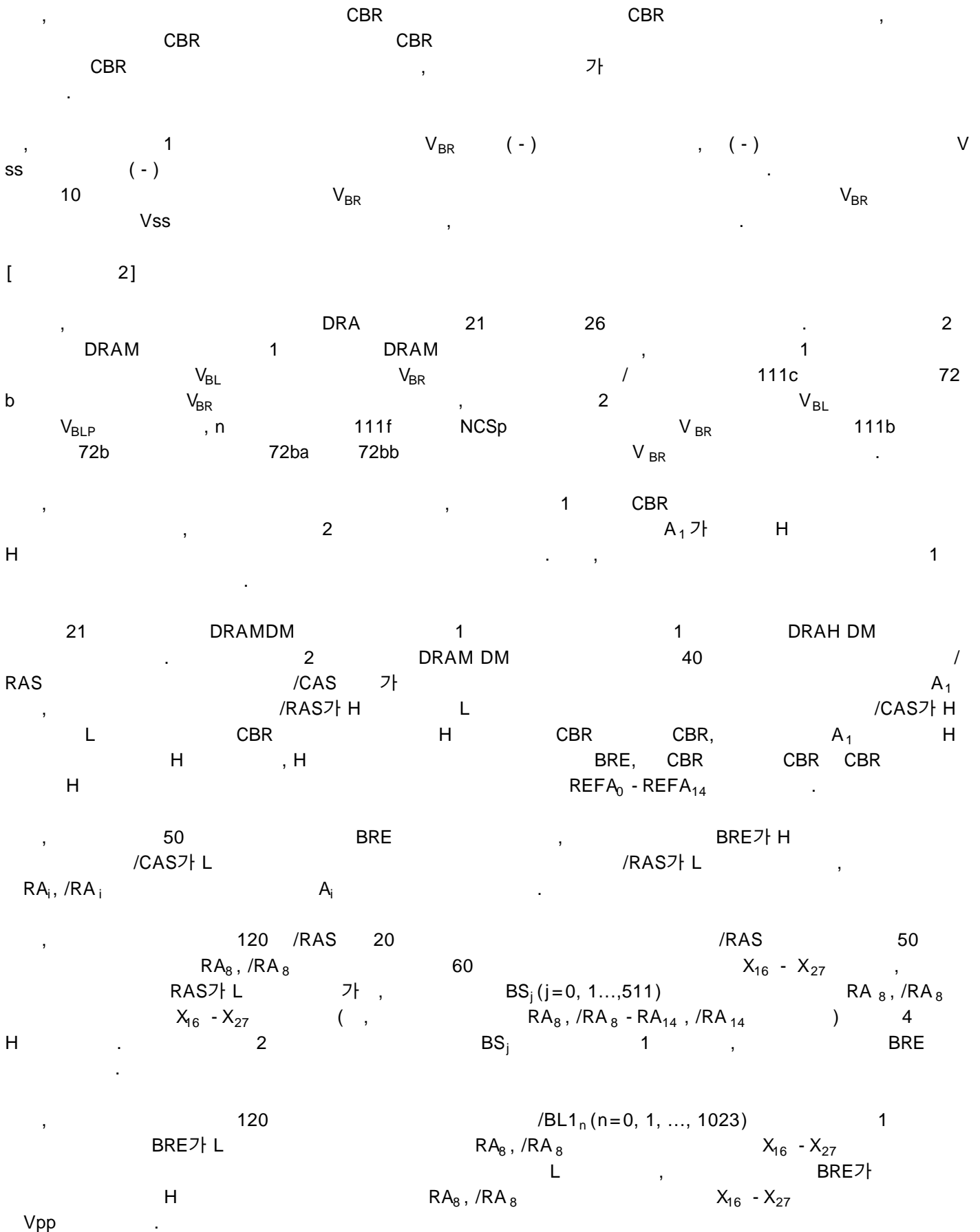
72 p $가/PSEp가$ 19 (m)
 t_6 L $/PSEp$ $111hR$ p MOS
 $111ha가$ $, p$ $111e$ $PCSp가$ 19 (n) V_c
 c $, p$ $111b$ p MOS $111ba$ $111bb$ p $가$
 $72ba$ $72bb$ $가$ BLS $/BLS$ 19 (p)
 V_{cc}

$72b$ $가$ $111b$
 $ext/RAS가$ 19 (a) t_7 H
 $RE가$ 19 (f) L $, 72a$ $72c$ H WL_t 19 (j)
 L $, RE가$ L $72a$ $/BL_i$ 19 (h)
 V_{pp} $, LB_0 - LB_3$ 19 (f) H L
 $/PSEp$ $NSEp$ 19 (m)

PRp 19 (g) H PRp
 $/$ $111c$ $72b$ $BLS, /BLS가$ 19 (p)
 V_{BLP} $, PRp$ $/$
 $111d$ $111e$ $111f$ $PCSp,$ $NCSp가$ 19 (n)
 V_{BLP} $, CBR$

$, DRAMDM$ 20
 $ext/RAS가$ L $ext/CAS가$ 20 (b) t_0 L
 $, CBR$ CBR 20 (d) $ext/RAS가$ 20 (a) t_1 L
 0 (c) $, 19$ H $, CBR$ $REFA_i가$ 2

t_2 H BRE가 REFA_i 20 (c) V_{BL} V_{BLP}
 RE 20 (f) L BRE가 H LB₀ - BL₃ 20 (i) P Rp 2
 0 (g) H V_{pp} /PSEp, NSEp 20 (m) /BL1_n 20 (h)
 H 20 (j) L WL_t LB₀ - LB₃가 L
 V_{BL} / 111d H PRp V_{BR}
 V_{BR} 111e 111f PCSp NCSp 20 (n) P_{RP} V
 BR V_{BL} / 72b BL_s, /BL_s 20 (P) P_{RP}
 72cbb V_{BR} 72c n MOS 72cb /
 72cbb V_{BR} , n MOS 72cb 가 가
 72cbc 가 / 72bb (順) 가 ,
 c 가 / 72cbb 72ba 72bb , 72cb
 V_{BR} 가 L 72a WL_t n MOS 72cb
 V_{th} (1.0V) n MOS 72cb가 가 , 72ca
 72caa 가 V_{BR} V_{ss} - V_{th} , V_s
 s 가 .
 ext/RAS가 20 (a) t₃ H ,
 CBR CBR가 20 (d) L , CBR CBR가 L
 BRE가 20 (e) L , 111e
 111f V_{BL} PCS, NCSp 20 (n) V_{BLP} ,
 72b BL_s, /BL_s 20 (p) V_{BLP} ,
 72cb 1 DRAMDM 가 , 72c n MOS
 72cbc , 72c .
 72c 가 DRAM
 가 2 μ sec 4 μ sec
 , DRAM .
 / 111c 72c ,
 72b V_{BR} / , 72b
 V_{BLP} 가 , 111c
 V_{BL} 111g V_{BLP} V_{BR}
 , CBR CBR ,
 가 .



120 BRE /PSE_p /RAS가 L X₁₆ - X₂₇ NSE_p /PSE_p, NSE_p(p=0, 1, ..., 515)

RA₈, /RA₈ RA₈, /RA₈ X₁₆ - X₂₇ L , n

120 PR_p 1 BRE RA₈, /RA₈ /RAS가 L X₁₆ - X₂₇ L ,

120 SEL_p BRE , CBR CBR가 H CBR가 L /RAS가 L H

RA₈, /RA₈ X₁₆ - X₂₇ RA₈, /RA₈ X₁₆ - X₂₇ H

22 40 2 42가 43 1

40 3 1 40 40 43 CBR CBR 45가 1

43a 1 AIN 44 CBR 45가

H 45 H A₁ BRE H /RAS A₁ /RAS 가 H BRE L

45 가 45a, V_{thn} n MOS 45ba, 45bb Vcc 45bc A₁가 Vcc + |V_{thp}| + 2V_{thn} , 45g H 45b, /RAS 45ca, NAND 45cb, 45cc, p MOS 45bc n M 45cd , BRE L OS

Vcc n MOS 45c, 45g 10b , 45g Vss 45d, 45e, 45f 45e 45g 가 H p MOS 45h 가 .

45bc가 A₁가 Vcc + |V_{thp}| + 2V_{thn} , 45b p MOS 45d Vss BRE L 45g A₁가 Vcc + |V_{thp}| + 2V_{thn} H 45b p MOS 45bc가 가 , 45g , 45d 45da, 45db, 45dc, 45dd 45b BRE H 45g H

5cb 2 H L /RAS가 L H 45ca L , 45ca , NAND 4 45cb H , NAND 45cd L 가 . /RAS가 H , NAND 45cc /RAS가 H ,

OS 45ca L , n MOS 44cd , n M
 45cd p MOS 45h , 45g 가 Vss

BRE L .

50 2 50 7
 1 52가 BRE 50 BRE가 H
 RE /RAS , L
 2 BRE 50 52 BRE /RAS
 , BRE RE 1 .

110 2 V_{BL}
 V_{BLP} , 14 . V_{BLP} 가 113 V_{BL}
 , V_{BL} BRE , BRE가 L 23 V_{ss} ,
 BRE가 H V_{BR} n NS 1
 114가 13 V_{ss} 2 114
 11h n MOS 111hb 111hb 23
 111h n MOS 111hb NS .

114 BRE , V_{cc} - V_{ss} BRE V_{cc}
 - V_{BR} 1 / 1) 114a, 1 / 1 n V_{cc} - V_B
 R NS V_{ss} V_{BR} n 114b 가 114
 a 114aa, p MOS 114ab, 114ac, n MOS 114ad, n MOS 114ad
 n MOS 114ae V_{cc} V_{BR}
 114af, 114ag , n 114b n MOS 114ba 114bb

120 2 120
 1 120 가 15 121 가 24 , 1
 2 121 15 BRE가 H
 PR₀ - PR₅₁₅ H 121c가 ,
 , PD₀ - PD₅₁₅ PR₀ - PR₅₁₅ 가 . H
 PR₀ - PR₅₁₅ , BS₀ - BS₅₁₁ L .

, 2 120 1 120
 가 16 122 가 25 , 2 122 16
 122b가 1 BRE , PR_p가 PD_p가 , PR_p
 BRE PR_p가 L n
 MNS가 H n NSE_p H
 , p MPS가 H p /PSE
 L .
 , 2 122b 16 1
 , 122b가 122bad, 122bae, 122baf 가 , 122bb가 ,
 가 p /PSE_p n NSE_p , 122ba
 122ba n PR_p가 L , n MNS가 H
 MPS가 H p NSE_p H , p
 가/PSE_p L .
 , 2 DRAMDH 2 DRAI DH
 / 18 , CBR 19 1 DRAMDM 2 /
 CBR DRAMDM 20 1 DRAMDM
 DRAMDM 26 . DRAMDM 1
 , A₁ 26 (d) t₀ H H
 , BRE 26 (g) , H
 , BRE H V_{pp} , /BL_{1n} 26 (j)
 , L , LB₀ - LB₃ L LB₀ - LB₃ 26 (k)
 26 (m) L WL_t
 , 가 D_p 26 (t) , A
 1 A₀, A₂ - A₁₄ 가 ext/RAS가 26 (a) 26 (d) (e) t₁ L
 , RE가 26 (h) t₂
 H PR_p , RA_i, /RA_i가 A_i ,
 L RA_i, /RA_i 26 (i) RA₁, RA_i 26 (n)
 t₃ I/O 112b H , I/O 112b가
 I/O 112d .
 , n NSE_p , RA_i, /RA_i 26 (p)
 111f t₄ H , n NSE_p n
 n NCSp가 26 (q) , V_{BR} , 111b
 26 (r) 가 , 72b 72ba 72bb BLs /BLs
 V_{BR} , V_{BLP} , 111b

, p /PSEp RAi, /RAi 26 (p)
 111e t₅ L PCSp가 26 (q) Vcc /PSEp p 111b p
 가 , 72b 72ba 72bb BLs /BLs 가
 26 (r) Vcc .
 , A1 A₀, A₂ - A₁₄ 가 26 (d)
 (e) , /W가 26 (c) L ,
 ext/CAS가 26 (b) t₆ L ,
 CAi, /CAi Ai Ai CSLk CAi, /C
 Ai CAi, /CAi I/O t₇ 112c가 72b I/O .
 , / 130 /RAS가 L
 /CAS가 L /W가 L
 /WE L 140 /WE가 L D_q
 가 , I/O , 가 128 I/O 11
 2d DSM 32 , I/O 112e I/O
 112b , I/O 112c 72b .
 11b 72b 72ba 72bb BLs /BLs 26 (r) 1
 V_{BR} , Vcc .
 BR 가 72a , WL_t가 L 111b 72b V
 72cb , / 72cbb V_{BR} 가 72c n MOS
 가 가 72cbc 72cbc 가 / 72cbb 72cb
 , 72cbc 72cbc 가 / 72cbb V_{BR} 가
 , ext/RAS가 26 (a) t₉ H ,
 BRE 26 (g) L , RE
 26 (h) L , p
 /PSEp n NSEp 26 (p) H L
 , PRp 26 (i) H , p
 111e PCSp n 111f NCSp 26 (q) .
 V_{BLP} / V_{BLP} / 72b BLs, /BLs 26 (r)
 L , CSL_k 26 (s) SELP 26 (n)
 . Ai , Dq 72c
 . Dq 72c . , 72a ,
 72c가 72 CSL_k 72b 72c
 , 72 72 72 72b 111b ,
 72c Dq H L . ,
 Dq H L .

2 DRAMDM 가 , 72c n MOS
 72cb 72cbc , 72c
 , 72c 가 DRAM
 가 24 μ sec 4 μ sec
 , DRAM
 , 111b 72c 가
 . 72b V_{BR} , 72b 가
 V_{BR} 111b 가 111b
 V_{SS} n 111f
 , 72 111b , 111b
 , 72 72ba(72bb) 72c
 , 가 .
 , 2 V_{SS} (-) V_{BR} 1 (-) , (-)
 , V_{BR} 10 V_{SS} V_{BR} .
 [3]
 RAM 2 DRAM 27 . 3 D
 I/O 112b DRAM I 72b 2 CSL_k
 , 3 CSL_k가 BRE , BRE가
 H H , I I/O 112b I/O
 72b .
 112b 72b
 72c 가 , 2 .
 27 , 3 DRAMDM 100 101
 CSL_k 256 101a 가 . 101a
 Y₄ - Y₇ 1 , Y₈ - Y₁₁ 1 , Y₁₂ - Y₁₉ 1
 , BRE , BRE가 H H
 BRE가 L CSL_k ,
 , BRE가 H 256 CSL_k가 H , 72b
 가 I/O 112b , BRE가 L 256 101
 a 1 가 H , 256 CSL_k 1 가 H
 , I/O 112b 1 72b가 .
 3 DRAMDM 가 H
 가 Dq 가 2 DRAMDM . 72b
 가 111b V_{BR} I/O 112b 72c 가
 , 72b V_{BR} Dq

3 DRAMDM 가 , 72c n MOS
 72cb 72cbc , 72c
 , 72c 가 2 μ sec , 4 μ sec DRAM
 , 111b 72c 가
 , 72b V_{BR} , 72b
 111b , 111f
 V_{BR} V_{SS} n
 1b , 72 111b , 11
 72 72ba(72bb) 72c
 , CSL_k가 H , I/O 112b
 72b I/O 112b 1 72b
 2 DRAMDM
 , 3 V_{SS} (-) V_{BR} 2 (-) , (-)
 V_{BR} 10 V_{BR}
 [4]
 DRAM DRAM 28 33 4
 DRAM V_{BL} V_{BR} / V_{BL} 111c
 V_{BLP} 72b , n 111f NCSp 4 V_{BR} V_{BR} 111b
 72b 72ba 72bb V_{BR}
 , 1 가 CBR CBR
 , 4 CBR 가 CBR REFA_i 가 CBR
 1
 28 DRAMDM I 1 DRAMDM , CBR
 CBR CBR CBR
 4 DRAMDM 40 1 DRAMDM BR
 E 가 CBR 4 DRAMDM 40 1
 , CBR CBR 가 CBR H REF
 A₀ - REFA₁₄ 가

50 BRE , CBR CBR가 CBR
H RA_i, /RA_i REFA_i
80 BRE RA_i, /RA_i
72a
120 BRE /RAS 20
50 RA₈, /1RA₈ 60
/RAS X₁₆ - X₂₇ /RAS가 L BSj(j=0,1, ... ,511)
/RA₁₄ RA₈, /RA₈ X₁₆ - X₂₇ (RA₈, /RA₈ - RA₁₄ ,
) 4 H 4 BSj 1
BRE 120 /BL1n
(n=0,1, ... ,1023) 1 BRE , RA₈, /R
A₈ X₁₆ - X₂₇
L
120 /PSEp, NSEp (p=0, 1, ... , 515)
1 BRE /RAS가 L
, p /PSEp RA₈, /RA₈ X₁₆ - X₂₇ NSEp
RA₈/RA₈ L , n
H X₁₆ - X₂₇
120 PRp 1 BR
E /RAS가 L RA₈, /R
A₈ X₁₆ - /X₂₇ L
120 SELp BRE , CBR CBR가 H
L , CBR CBR가 L /RAS 가 L
H RA₈, /RA₈ X₁₆ - X₂₇
29 40 4 가 42가
40 3 1 40 40 가 43
1 43
43a 가 AIN CBR CBR가
45
50 4 50 7
1 52가 BRE 50 H
50 RE /RAS L
4 BRE 50 52 BRE
S BRE RE 1 /RA

9 80 1 80 4 80 81 1 81

81 H 81a LB₀ - LB₃ BRE BRE가 L

A₀, RA₁, /RA₁) V_{CC} LB₀ - LB₃ 81a X₀ - X₃ (RE가 H RA₀, /R

30 4 81a 81a 10 1 81aac

NOR 81aad 가 81aa가 BRE , 81aac

V_{BLP} 110 4 V_{BL} 113

V_{BL} , 14 V_{BLP} 가 114가 23

2 4 114 114 2 31 114

BRE CBR CBR CBR

114 CBR CBR가 L V_{SS} , CBR CBR가

NS 111h n MOS 111h 23 H 2 V_{BR} n

NS 111hb 가 114 n

120 4 120

121 1 32 120 가 15 121 가 32 ,

4 121 121 15 121 1 H

/BLI₀ - /BLI₁₀₂₃ V_{pp} 121b가 ,

/BID₀ - /BID₁₀₂₃ /BLI₀ - /BLI₁₀₂₃ L .

4 121 15 BRE가 1

1 H , PR₀ - PR₅₁₅ H PR₀ - PR₅₁₅ 1

21c가 , PD₀ - PD₅₁₅ PR₀ - PR₅₁₅

1 가 H PR₀ - PR₅₁₅ BS₀ - BS₅₁₁ L .

0가 가 16 4 120 1 12

122 122 , 25 2

122 122 가 .

4 DRAMDM 4 DRAMDM

/ 18 1 DRAMDM /

4 DRAMDM CBR

19 20 1 DRAMDM CBR
 4 DRAMDM CBR
 33
 , ext/RAS가 L ext/CAS 가 33 (b)
 , t₀ L , , ext/RAS가 33 (a)
 , t₁ L , CBR CBR가 33 (d) H
 . 50 /RAS, /CAS L
 , A_i CA_i /CA_i L
 100 CSL_k 33 (p)
 , H CBR CBR 120 I/O 112b I/O
 112d SELp 33 (j) L , , n
 110 NS V_{BR} 114 CBR CBR가 H
 , CBR CBR가 H REFA_i가 33 (c)
 , 가 RE가 33 (e) ext/RAS가 L ,
 CBR가 H RE가 H 50 CBR
 40 REFA_i RA_i /RA_i
 , -X₂₇ (RA₈ /RA₈ - /RA₁₄ , /RA₁₄) RA₈ /RA₈ X₁₆
 X₂₇ L 72 / RA₈ /RA₈ PRp 33 (f)
 111e 111f 72 / 111c 72ba 72bb X₁₆ -
 111d
 , RA₈ /RA₈ - RA₁₄ , /RA₁₄ 121 33 (g) t₃
 , 72 72 /BLIn Vpp ,
 72 72b 112a /BLIn L /
 111c
 , LB₀ - /LB₃ RA₀ /RA₀ , RA₁ /RA₁ 1 가 33 (h)
 , t₄ Vcc , RA_i /RA_i
 72 72a(71 1 72 ,
 72a가 1) WLt가 33 (i)
 , 72a 8k 72c n MOS 72cb 가
 , 72ca 72ba 72bb 72c , 7
 2ba 72bb BLs /BLs 가 33 (n) V_{BLP} 72c 72ca ()
 , H L 가)
 L 가

t_5 H, 72 n, NSEp 가 33 (k), 111h n MOS
 111hb 가, n, 111f, NCSp 가 33 (m), 111bc, 111bd
 V_{BR} 가, 72ba, 72bb, 111b 가, n MOS, BLs /BLs 33 (n)

t_6 L, 72 p, /PSEp, /PSEp 가 33 (k), 111h p MOS
 111ha 가, p, /PSEp, 111e, PCSp가 33 (m), 111ba, 111bb p
 V_{cc} 가, 72ba, 72bb, 111b 가, p MOS, BLs /BLs 33 (n)
 V_{cc}

ext/RAS가 33 (a), 72b 가, 111b,
 RE가 33 (e), L, t_7 H, 72a, WLt 33 (i),
 L, 72a, 72c H, 72b, 72ba, 72bb,
 V_{BR} 가, VBR가, Vs
 72a, 72c 가

RE가 L, /BLIn 33 (g),
 V_{pp} , LB₀ - BL₃ 33 (h), L, PR
 /PSEp, NSEp 33 (k), H, PRp,
 111c, 72b, BL_s, /BL_s가 33 (n), /
 111e, 111f, PCSp, NCSp가 33 (m), /, 111d, V_{BLP}
 , CBR

가, 4, DRAMDM, CBR, 가,
 72c, n, MOS, 72cb, 72cbc,
 72c

, 72c, 가, DRAM
 가 2 μ sec, 4 μ sec
 , DRAM

, 111b, 72c, 가,
 , 72b, V_{BR} , 72b,
 V_{BR} , 111b, V_{ss} , n, 111f, 111b

, CBR, 가,
 , DRAM 가

, V_{BR} 4 (-) VBR (-) , (-) V_{BR} V_{BR}

10 V_{BR} 가 V_{BR} 4 72a WL_t L V_{BR} 72c n M OS 72cb 가 CBR Yamagata 1995 ISSCC Diges 72a L

t of Technical Papers, pp 248 - 249 V_{BR} V_{BR}

[5]

DRAM 34 36 5

DRAM 1 DRAM 1 V_{BR} 72 72b L V_{BR} (0.5V)

5 DRAM 72b L V_{BR} (0.5V)

- 1309 V_{BSG} , M. Asakura , 1994 IEEE Journal of Solid - State Circuits vol. 29, pp 1303 BSG(Boosted Sense Ground) . BSG F. Morishi

ta , 1995 Symposium on VLSI Technology Digest of Technical Papers, pp141 - 142 SOI 가

, V_{BR} 1 (-) , 5 V_{BR} V_{BR} V_{BR} 1

34 DRAMDM 1 1 DRAMDM (-) 5

10 V_{CP} V_{BSG} 1 1/2(V_{CC}+V_{SS}) 5 1/2(V_{CC}+V_{BSG}) V_{BLP} 1 1/2(V_{CC}+V_{BSG}) 110

110 111h 13 111h 35 , 111hb 가 V_{BR} V_{BSG} 110 113

36 , 5 113 113 14 1 113bb 113a가 113bc 가 , 113bc 113b , n MOS MOS 113ba 113bc BRE , n MOS 113bb BRE

2b 가 DRAMDM 111b $V_{CC} - V_{BSG}$, / 72b BLs, /BLs 7

V_{BLP} $1/2(V_{CC} + V_{BSG})$, P 111e PCSp n 111f

NCSp V_{BLP} $1/2(V_{CC} + V_{BSG})$, 72a

L Vss 18 1 DRAMDM

. CBR 72b 가 111b $V_{CC} - V_{BSG}$

, 72b BLs, /BLs V_{BLP} $1/2(V_{CC} + V_{BSG})$, P

111e PCSp n 111f NCSp V_{BLP} $1/2(V_{CC} + V_{BSG})$

19 1 DRAMDM

, V_{BR} 가 Vss , 72b BLs,

BLs 111f V_{BLP} $1/2(V_{CC} + V_{BSG})$, P 111e PCSp n

1 NCSp V_{BLP} $1/2(V_{CC} + V_{BSG})$, 20

V_{BSG} DRAMDM L Vss Vss

1 L Vss V_{BSG} DRAM Vss

V_{BR} .

n MOS 5 72cb 1 DRAMDM 가 , 72c

DRAM , 72c 72cbc 가 , 72c 가

가 $2\mu sec$ $4\mu sec$ DRAM

, 1 / 111c 72c

111c , 72b 가 V_{BLP} , 72b Vss

Vss 가 V_{BL} , V_{BLP} 111g

, 1 CBR CBR

, 가 .

, 1 CBR CBR CBR CBR 가

, CBR CBR 가

, BSG 5 DRAMDM L Vss V_{BSG}

72a 72c , n MOS 72a가 Vss ,

가 V_{BSG} , 72cb - (,

V_{BSG} Vss) , L Vss DRAM

72a L Vss가 (-) , 72c n MOS

72cb 가 , 72c ,

| | | | | | | | |
|-------|----|---|---|---|--|---|---|
| | 5 | DRAMDM | BSG | | | Vss | |
| | | | | | | 가 | |
| [| 6] | | | | | | |
| | | DRAM | 2 | 37 | 38 | | 6 |
| | | DRAM | | DRAM | 가 | | DRA |
| M | | 2 | DRAM | | 2 | / | 6 |
| | | 72 | | 72b | L | Vss | 6 |
| 5V) | | DRAM | 5 | 72b | L | Vss | 0. |
| | | V _{BSG} | , BSG | | | | |
| | | V _{BR} | | 2 | (-) | | 6 |
| | 5 | | V _{BR} | | Vss | | |
| | | 2 | | | 2 | | |
| | | 37 | DRAMDM | 21 | 2 | DRAMDM | |
| | | | 6 | | 10 | (-) | V _{BR} |
| | | | | V _{BSG} | | | |
| 6 | 10 | | V _{CP} | 2 | 1/2(V _{CC} +V _{SS}) | | |
| ss) | | 1/2(V _{CC} +V _{BSG}) | | | V _{BLP} | 2 | 1/2(V _{CC} +V _{SS}) |
| | | 2 | | | | 110 | |
| | | 38 | | 110 | | 111h | |
| | | | | 6 | | 114 | 23 |
| | | Vss가 | | BRE | L | n | MOS |
| | | 114b | 114bc | 가 | | 114bb | |
| | | | 114bc | | | n | MOS |
| | | V _{BSG} | , n | BRE | | Vss | 114ba |
| | | V _{BR} | MOS | 114bb | | BRE | |
| | | | Vss | | | | |
| | | 2b | DRAMDM | | | / | 7 |
| | | | 가 | 111b | V _{CC} - V _{BSG} | 72b | BLs, /BLs |
| | | V _{BLP} 가 | 1/2(V _{CC} +V _{BSG}) | | p | 111e | PCSp n |
| | | NCSp | V _{BLG} 가 | 1/2(V _{CC} +V _{BSG}) | | | 72a |
| | | L | Vss | | | 2 | DRAMDM |
| 18 | | | 1 | DRAMDM | | | |
| | | CBR | | 72b | 가 | 111b | V _{CC} - V _{BSG} |
| | | 72b | BLs, /BLs | | V _{BLP} | 1/2(V _{CC} +V _{BSG}) | , P |
| | | PCSp n | | 111f | NCSp | V _{BLP} | 1/2(V _{CC} +V _{BSG}) |
| | | 2 | DRAMDM | | | 19 | 1 |
| RAMDM | | | | | | | D |

s, /BLs
 111f 2 V_{BSG}
 Vss V_{BR}
 V_{BLP} 가 $1/2(V_{CC}+V_{BSG})$
 NCSp DRAMDM
 V_{BR} 가
 V_{BLP} 가 $1/2(V_{CC}+V_{BSG})$
 Vss P
 111e 72b BL
 PCSp n
 26
 Vss Vss
 Vss DRAM
 n MOS 6 72cb 2 72cbc DRAMDM 가 72c
 DRAM 가 2 μ sec 4 μ sec DRAM
 가
 가 2 111b 72c
 72b 111b Vss Vss Vss
 111f
 가 2 111b 72 111b 72ba(72bb) 72c
 72b
 가
 6 DRAMDM 5 L Vss
 V_{BSG} BSG 72a 72c n MOS 72cb Vss
 72a L Vss DRAM 72a L V
 ss가 (-) 72c n MOS 72cb
 가
 6 DRAMDM BSG Vss
 가
 [7]
 3 DRAM 7 DRAM
 7 DRAM 3 DRAM I/O
 / 72 72b L 3
 (0.5V) DRAM Vss 6 72b L Vss
 Vss , BSG Vss

V_{BR} 3 (-) 7
 6 V_{BR} 3 V_{SS} 3
 7 10, 37 6 V_{BSG}
 10 (-) 10 V_{CP} 3
 $1/2(V_{CC}+V_{SS})$ 7 $1/2(V_{CC}+V_{BSG})$ 7 $1/2(V_{CC}+V_{BSG})$
 V_{BLP} 3 110 3
 7 110 114 38
 6 114 BRE L n 가 MOS 114bb 가 Vs
 s가 114a가 114a가 114b n MOS 114b
 a 114b 114bc 가 114b n MOS 114b
 V_{BSG} , n MOS 114bb V_{SS} BRE
 V_{BR} V_{SS}
 DRAMDM / 7
 2b 가 111b $V_{CC} - V_{BSG}$ 72b BLs, /BLs 111f
 V_{BLP} 가 $1/2(V_{CC}+V_{BSG})$ 111e PCSp n
 NCSp V_{BLP} 가 $1/2(V_{CC}+V_{BSG})$ 72a
 L V_{SS} 3 DRAMDM
 CBR 72b 가 111b $V_{CC} - V_{BSG}$
 72b BLs, /BLs V_{BLP} $1/2(V_{CC}+V_{BSG})$ P 111e
 PCSp n 111f NCSp V_{BSP} 가 $1/2(V_{CC}+V_{BSG})$
 3 DRAMDM
 BLs, /BLs V_{BR} 가 V_{SS} 111e 72b
 3 111f NCSp V_{BLP} 가 $1/2(V_{CC}+V_{BSG})$ L V_{SS} PCSp n
 V_{BSG} 2 L V_{SS} DRAM V_{SS}
 V_{BR} V_{SS}
 n MOS 7 72cb 3 DRAMDM 가 72c
 72cb 72cbc 72c 72c
 DRAM 가 2 μ sec 4 μ sec
 DRAM

3 111b 72b 72c Vss
 72b 111b Vss V_{BSG} n
 111f

3 72 111b 72ba(72bb) 72c
 111b

3 CSL_k가 H I/O
 112b 72b I/O 112b 1 72b
 6 DRAMDM

7 DRAMDM 6 L Vss
 V_{BSG} BSG 72a가 Vss
 72a 72c n MOS 72cb - Vss
 L Vss DRAM 72a L Vss
 (-) 가 72c n MOS 72cb

7 DRAMDM BSG Vss 가

[8]

4 DRAM DRAM CBR 8 DRAM , CBR
 4 Vss / 8 DRAM 4 DRAM 72b
 L 72b L Vss (0.5V) V_{BSG} , BSG 6

6 V_{BR} 4 (-) 8
 4 V_{BR} Vss 4

8 10 37 6 V_{BSG}
 10 (-) 10 V_{CP} 4
 1/2(V_{CC}+V_{SS}) 8 1/2(V_{CC}+V_{BSG})
 V_{BLP} 4 1/2(V_{CC}+V_{SS}) 8 12(V_{CC}+V_{BSG})
 110 4

114 6 8 114 110 가 , 114 38
 BRE L n MOS 114bb 가 Vss가
 114a가
 114b 114bc 가 , 114b n MOS 11
 4ba 114bc , n MOS 114bb BRE ,
 V_{BSG} , n MOS V_{SS} BRE ,
 V_{BR} V_{SS} .
 DRAMDM . , VK /
 72b 가 111b $V_{CC} - V_{BSG}$, 72b BLs, /BLs
 V_{BLP} 가 $1/2(V_{CC} + V_{BSG})$, p 111e PCSp n 111f
 NCSp V_{BLP} 가 $1/2(V_{CC} + V_{BSG})$, 72a
 L V_{SS} 4 DRAMDM .
 , CBR , V_{BR} 가 V_{SS}
 111e 72b BLs, /BLs V_{BLP} 가 $1/2(V_{CC} + V_{BSG})$, p
 PCSp n 111f NCSp V_{BLP} 가 $1/2(V_{CC} + V_{BSG})$,
 33 4 DRAMDM . ,
 L V_{BSG} V_{SS} V_{SS} V_{BSG} 2 L V
 ss DRAM V_{SS} V_{BR} .
 8 4 DRAMDM CBR
 가 72c n MOS 72cb 72cbc
 , 72c 가 DRAM , 72c 가 2 μ sec
 4 μ sec
 DRAM .
 , 4 111b 72c ,
 72b . , 72b V_{BR} ,
 111b V_{BR} 111b V_{SS} n 111f . ,
 , 4 CBR , 가 , ,
 DRAM 가 . ,
 , 8 DRAMDM 6 L V_{SS}
 V_{BSG} BSG , 72a가 V_{SS}
 72a L 72c n MOS 72b - V_{SS}
 , 72c V_{SS} DRAM 72 L 72cb V_{SS} 가
 (-) , 72c n MOS 72cb
 가 , 72c , .

8 DRAMDM BSG , Vss 가 ,

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2c DRAM 72ca 1 DRAM 72cac 39 45 9 7
 (1/2)(V_{CC}+V_{SS}) V_{CP} 1 V_{CC} 10 72ca 72cac V_{CP} 가 가

39 DRAMDM 9 DRAMDM 70 1 DRAMDM 10 V_{CP} 110 V_{CPP}

40 115aa 115 BRE 115aa, 115 V_{CC} ,
 V_{CP} BRE p MOS 115ab,
 115a 가 H V_{CPP} V_{CP} V_{CC} 115ac BBE가 BR

E가 L 41 70 70 1 12 1
 V_{CP} 9 72c 72a 72a
 40 115 CPP 72a

72c 42 V_{CPP} 가
 가 (-) V_{BR} 가 V_{SS}가
 72cbf 가 72cbc 72caa 72cbc / 72cba
 2cbb 가 72cbg 가 , 72cbc 72ba 72cbc - / 7
 72cbc 72cbe 72cbh

43 72c H 가 72caa SN V_{CC} ,
 72CBC BD가 V_{SS}, 72ba BL V_{SS} 가 V_{CPP} 가 V_{CP} ,
 V_{CP} V_{CC} 43 (b) V_{CPP} 가 V_{CC}
 V_{CC}+ V₁ V₁ 72caa SN V_{CC}
 72cbf 72ca 72caa SN
 72cbf가 72cbc BD가 V_{SS}+ V₂ V₂ ,
 72cbh V₂ V₁

72cbb BD가 , 72cbc / 72cbb 가 ,
 72cbc / 72cbb 72ba 가 , 43 (c)
 72cbc BD Vss+ V₃ , 43 (d) V_C
 PP 가 Vcc 가 , V_{CP} , 72caa SN
 Vcc 가 , 72cbc BD Vss+ V₃ - V₂ ,
 , 72c L 가 , 72caa SN Vss ,
 44 , 44 (a) 72caa , 72cbc
 BD, 72ba BL Vss 가 ,
 . 가 44 (b) V_{CPP} 가 V_{CP}
 Vcc , 72caa SN Vss Vss+ V₁
 V₂ , 72caa SN 72cbc BD가 Vss+

72cbc BD가 , 72cbc / 72cbb 가 ,
 72cbc / 72cbb 72ba 가 , 44 (c)
 72cbc BD Vss+ V₃ , 44 (d)
 V_{CPP} 가 Vcc 가 , V_{CP} , 72caa S
 N Vss 가 , 72cbc BD Vss+ V₃ - V₂ ,

9 DRAMDM 9 DRAMDM
 / 18 1 DRAMDM /
 . , CM 19 1 DRAMDM
 CBR 20
 1 DBAM DM 9 DRAMM
 45 .

45 , 9 DRAMDM V_{CPP} 가 4
 5 (s) 1 가 . V_{CP} Vcc 20
 9 V_{CP} Vcc 1 가 , V_{CPP}
 V_{CP} V_{CP} 가 ,
 .
 , (-) V_{BR} Vss , (-)
 V_{BR}
 V_{CPP} V_{CP} Vcc 가
 .
 , 9 1 DRAM V_{CPP}
 7 V_{CP} DRAM Vcc , 9 가 , 2,3,5,6
 가 가 .

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DRAM 46 47 10
 DRAM 9 DRAM 9 72
 72a 72ac 가 (1/2)(V_{CC}+V_{SS}) V_{CP} 72c
 V_{CC} , , 10 V_{CP} V_{CC} ,
 72ca 72cac V_{PP} , 9
 , 46 110 115 115 40 115 9
 10 115 115a가 115aa ,
 BRE V_{CC} - V_{SS} BRE V_{PP} - V_{SS} ,
 3 / 3 (3 / 3)
 115b 가 H BRE가 V_{CP}
 BRE가 L V_{CPP} V_{CPP} V_{CC} V_{CP} V_{PP}
 , 115b 115ba, p MOS 115bb, p MOS 115bb
 p MOS 115bc, n MOS 115bd, 115be V_{PP}
 V_{SS} 115bf, 115bg .
 47 10 11
 11c, V_{CC} V_{SS} , CLK 11a, 11b,
 11d, 11e, 가 V_{SS} 11e , / 가 11d
 n MOS , CLK n MOS 11f /
 11e 11d / V_{CC}
 11g 가 , 11g 11ga, n MOS 11gb,
 n MOS 11gc, 11gd, 11ge n MOS 11gf, 11gg , L
 X가 L n MOS 11f / V_{CC} .
 , CLK가 L n MOS 11f / V_{CC}
 CLK가 H , 11e 11d n MOS 11
 f / 가 n / MOS 11f V_{CC} 2V_{CC}가 , V_{PP}가
 / V_{PP} 가 n / MOS 11f / V_{PP}가 V_{th}
 2V_{CC} - V_{th} .
 M / 10 DRAMDM 9 DRAMDM 10 DRAMDM
 9 45 V_{CPP} 가 45 (s) 9 DRAMDM ,
 V_{CP} V_{CC} , 10 V_{CP} V_{PP}

10 V_{CP} V_{CC} 9 가 , , V_C
 PP 가 , , V_{pp} , ,
 , , VBR (-) VBR V_{SS} , (-)
 VBR V_{CPP} V_{CP} V_{pp} , 가
 , , V_{pp} , , 가
 , , 10 V_{CP} 9 DRAM 가 , V_{CPP} 2,3,5,
 6 7 DRAM V_{pp} , 10 가 ,
 [11]
 1 DRAM 9 DRAM 48 50 . 1
 1 가 , 가 . 1
 . 49 49 50 - 50 50 48 , 16
 가 , S. Maeda et al. 1994 Symposium on VLSI Technology Digest of Technical Papers,
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48 , , SOI 72ba, 72ba
 , 72a, 72a , 72a 72a 531 , 72a 72a 531 ,
 72a , 72cbd, 72caa , 531 ,
 531
 49 , , 531 72caa 72a 72ba , ,
 72a 72ba . 50 , 72ba
 512 , , 531 / n 72cba, p 72c
 bc / n 72cbb . p 72cbc SOI - MOS
 가 , 가
 , p 72cbc , p 72cbc 72a
 72a , n 72cba, 72cbb, p 72cbc,
 72cbd 72a MOS

, n 72cba 72caa 72caa, 72cab
 72a 72cac 532 72ba 72a 72caa, 72caa
 72caa / 72cba가
 / 가 , SOI MOS SOI - MOS
 / 가 SOI SOI - MOS
 43 44 V₂ 가
 11 9
 10
 [12]
 2 DRAM 51 53 1 1
 511 DRAM 1 DIRAM 12 511 가
 (-) V_{BB} V_{CC} 가
 1
 51 12 10 V_{CC},
 13 (-) H V_{BB} BRE , BRE가
 V_{SUB} V_{BB} V_{CC}
 12 가
 52 12 12 , 12a, n MOS
 12b,12c, n MOS 12d, n MOS 12d 12f, V_{CC}
 MOS 12e, V_{CC} 510a V_{BB} V_{SUB} 12g , V_{CC} - V_{SS}
 V_{BB} BRE V_{CC} - V_{BB} V_{SUB} 가
 53 511 V_{SUB} 511 511
 512 , 511 V_{SUB} V_{SUB}
 513 12 12 V_{SUB} 510a
 511 510b , 510b 510a 510b
 510c 510b 12 V_{SBU} 510a,
 511
 513 511 512 511 V_{SUB} 가 V_{BB} 511
 513 가 가 72cbc 511 V_{SUB} 511 V_{CC}

가 , 12 , 511 , BRE가 L , 511 , V_{SUB} , V_{BB} , 72cbc

가 , 12 , V_{BB} (-) , (-) , V_{SS} , V_{BB} , 1 , DRAM

가 , V_{SUB} , 2,3,5,6,7,9, 10 , V_{BB} , DRAM , V_{CC} , 12 , 가

[13]

511 DRAM , 12 , DRAM , 54 , 55 , 13

가 , V_{SUB} 가 , V_{BB} , V_{CC} , 12 , V_B

B , V_{CC} , 12 , V_{SUB} , V_{pp} ,

54 , 13 , 12 , 51 , 12

V_{BB} , 12 , V_{CC} , BRE가 , 11 , H , V_{SUB} ,

V_{pp} ,

12 , 55 , 13 , 12 , 52

OS , 12i, 12j, n , V_{CC} , V_{BB} , 12h, , p , M

V_{pp} , $V_{CC} - V_{SS}$, V_{SUB} , BRE , 12f , 12g , $V_{CC} - V_{BB}$, V_{CC}

가 , V_{BB} , 13 , V_{CC} , 12 , 가 , V_{SUB} , 가

V_{pp} , 11

가 , 13 , V_{BB} (-) , (-) , V_{SS} , V_{BB} , 1 , DRAM

가 , V_{SUB} , 2,3,5,6,7,9, 10 , V_{BB} , V_{pp} , DRAM , 13

[14]

DRAM , 56 , 57 , 14

DRAM , /RAS , DRAM

DRAM RAS 가 , DRAM 가

DRAM 가 , 가 , 가

가 DRAM Y. Konishi et al., 1990 IEEE Journal of Solid - State Circuits, vol. 25, pp 1112
 - 1117 가 4M DRAM 4M DRAM
 16msec , 가 , /CAS /RAS(
 CBR) ext/CAS가 L , ext/RAS가 16msec L

64 μ sec , ext/CAS가 H 1
 가 , 1/4

14 DRAM , SOI - DRAM

/CAS , DRAM 56 , 14 DRAM DRAM 40
 /RAS(CBR) L CBR CBR H /RAS가 H
 , t_{RFT} H , t_{SRP} H CBR 41, CBR CBR H SRP
 t_{RFT} H t_{RFT} BRPS 46 가 . t_{BRS} H
 , 40 CBR 41 CBR CBR , 46
 t_{RFT} CBR SRP CBR가 L REFT , CBR CBR가 H
 t_{SRP} H SRFD , 47 가 .
 , 40 46 BRPS
 PS BRPS가 H H BR
 48 가 .

, 40 SRFD BRES ,
 BRES가 L SRFD가 H , H ,
 BRES가 H SRFD ,
 L SREF 49 가 .
 , BRE BRES ,
 SRFD 가 , , RE ,
 /PSE, NSE /RAS , ,
 , 가 DRAM .
 , 46 CBR CBR가 H ,
 46a 46a 2 46b . ,
 , 49a, NAND 49b 49c , BRES
 , SRFD가 H , 가 SRFD H
 SREF H , 가 가 .
 57 , 48 , 48aa NAND 48ab
 , BRPS가 H L
 , 48a, NAND 48ba, 48bb 48b, 48c,
 48d 가 , BRES가 H
 BRES 48d H .
 , 14 DRAM ,
 , 가 , DRAM
 .
 []
 , MOS ,
 .
 , 가 ,
 , 가 I/O , I/O
 , 가 가 가 .

, 가 L 가 .
 , 가 가 L
 , 가 , 가 .
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(57)

1.

1 2 가 , 1 2 / , 1 2 /
 MOS , MOS 가 2
 MOS MOS 2 /

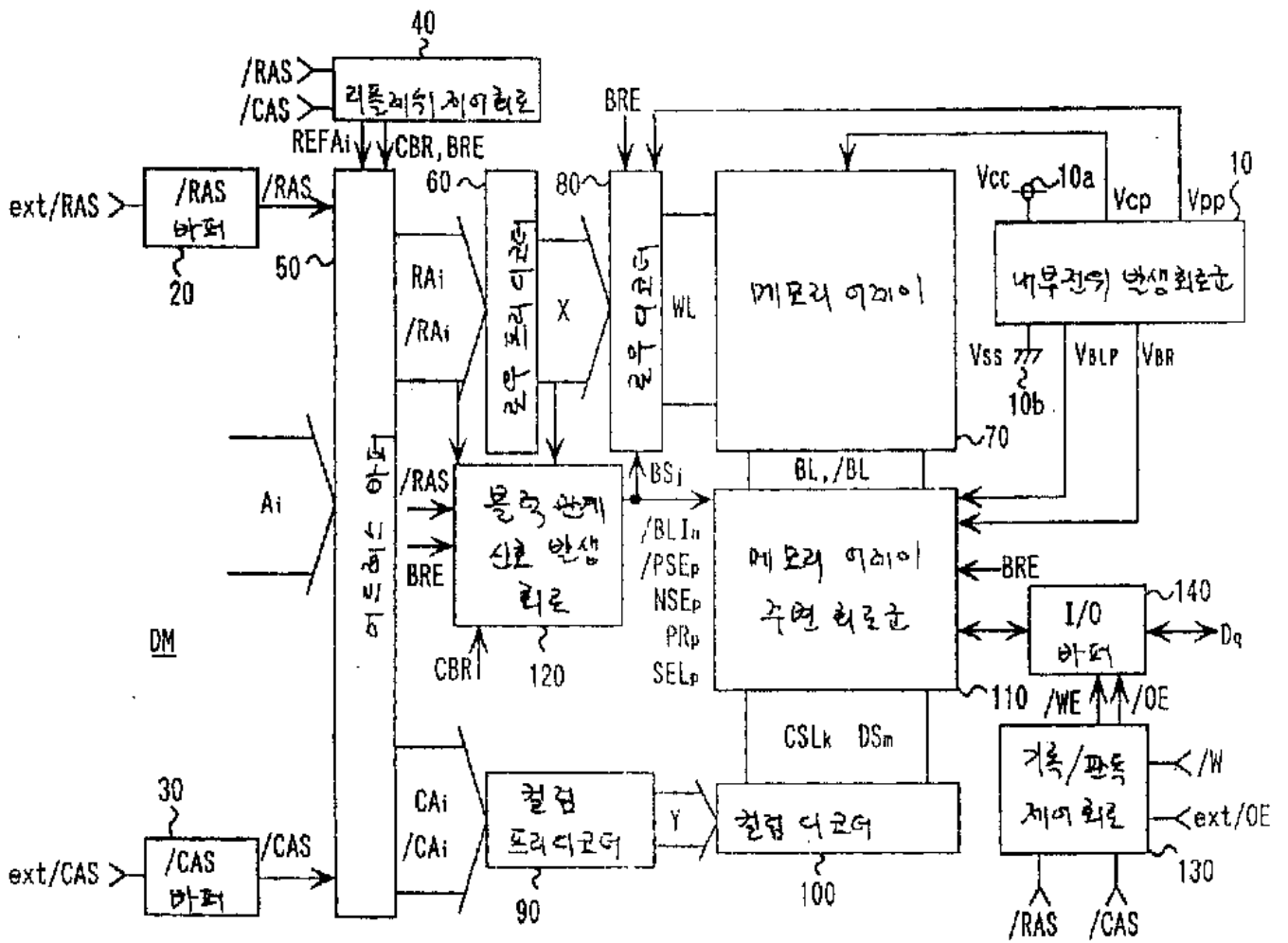
2.

1 , MOS 2 / 1 , 1
 MOS MOS 가 . 1

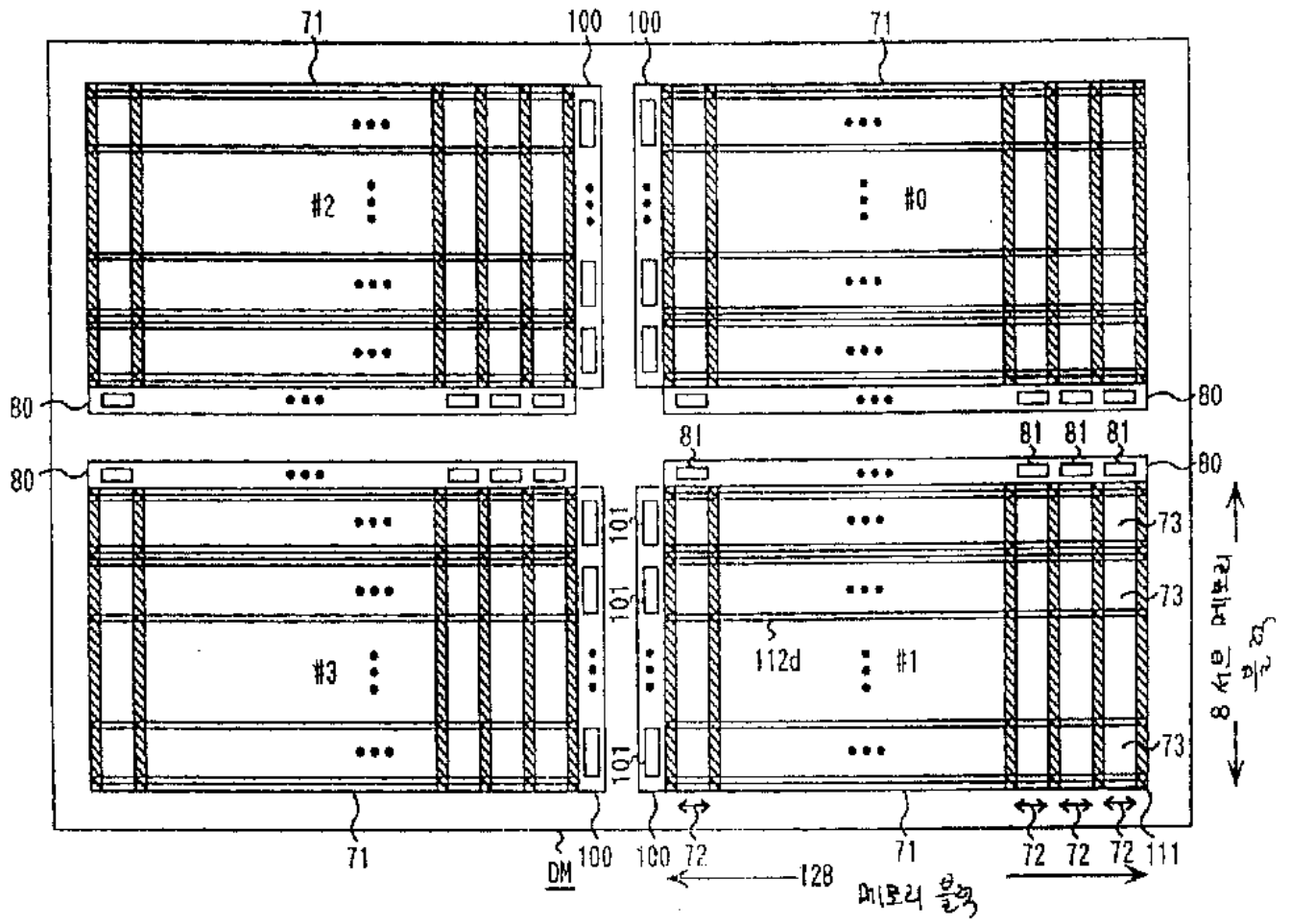
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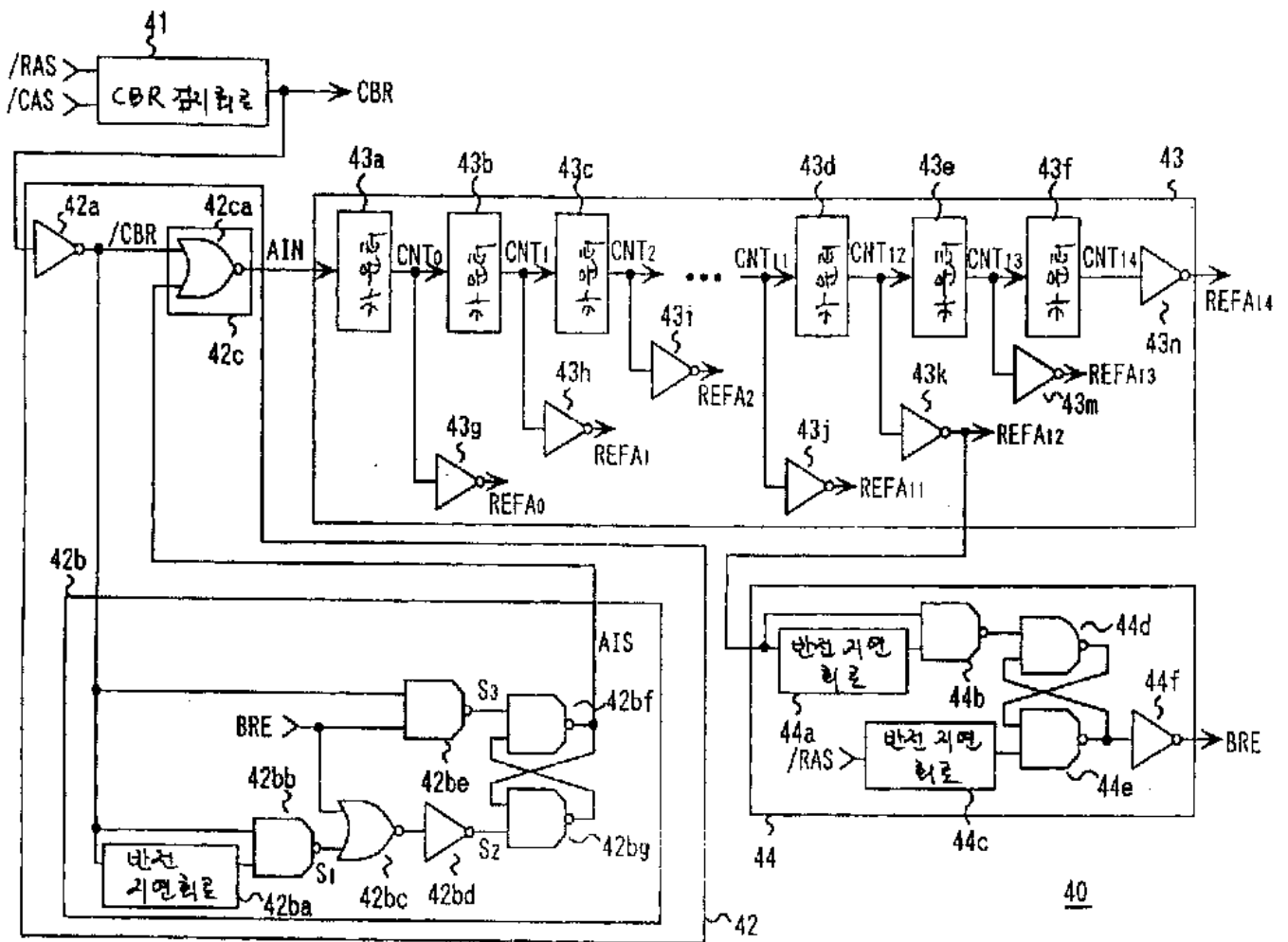
1 2 가 , 1 2 / , 1 2 /
 , 가 , 1 / MOS 2 /
 , MOS 가 ,
 MOS MOS 가 ,
 MOS , I/O , 1 I/O
 , 1 I/O I/O , I/O

1

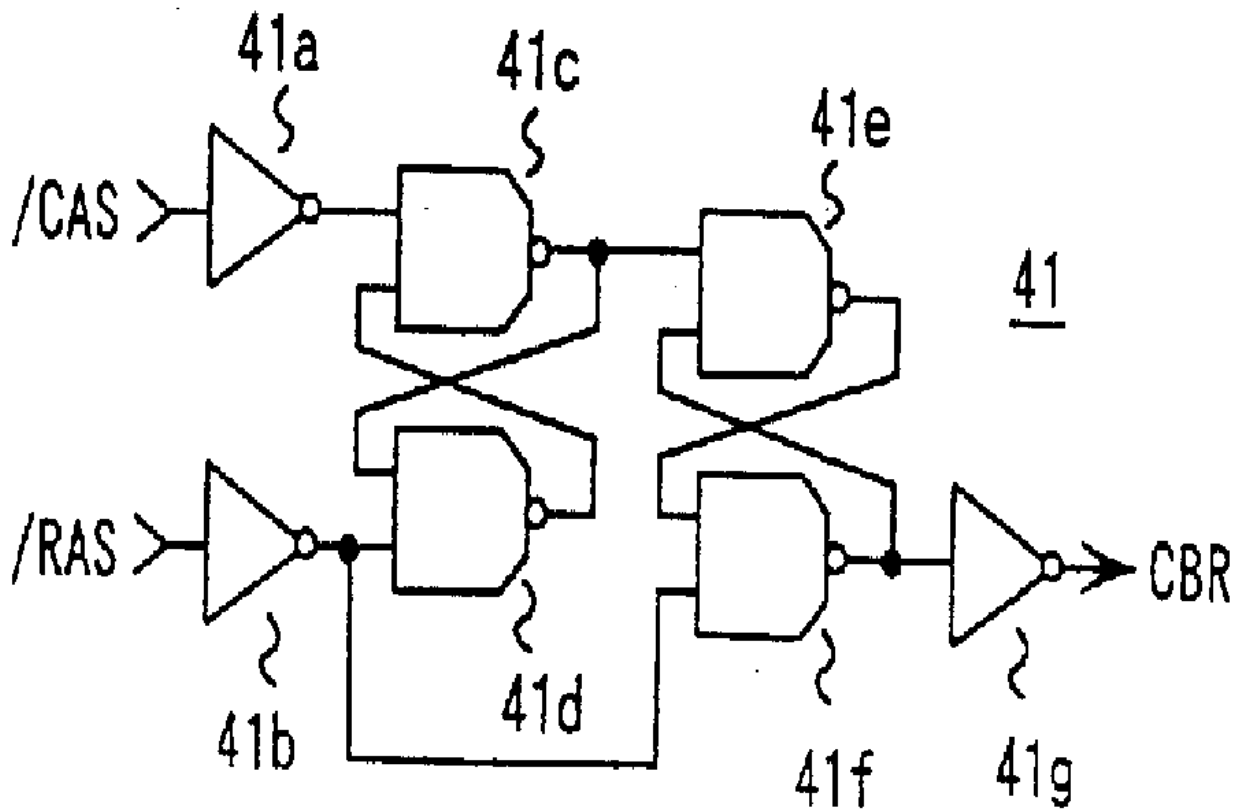


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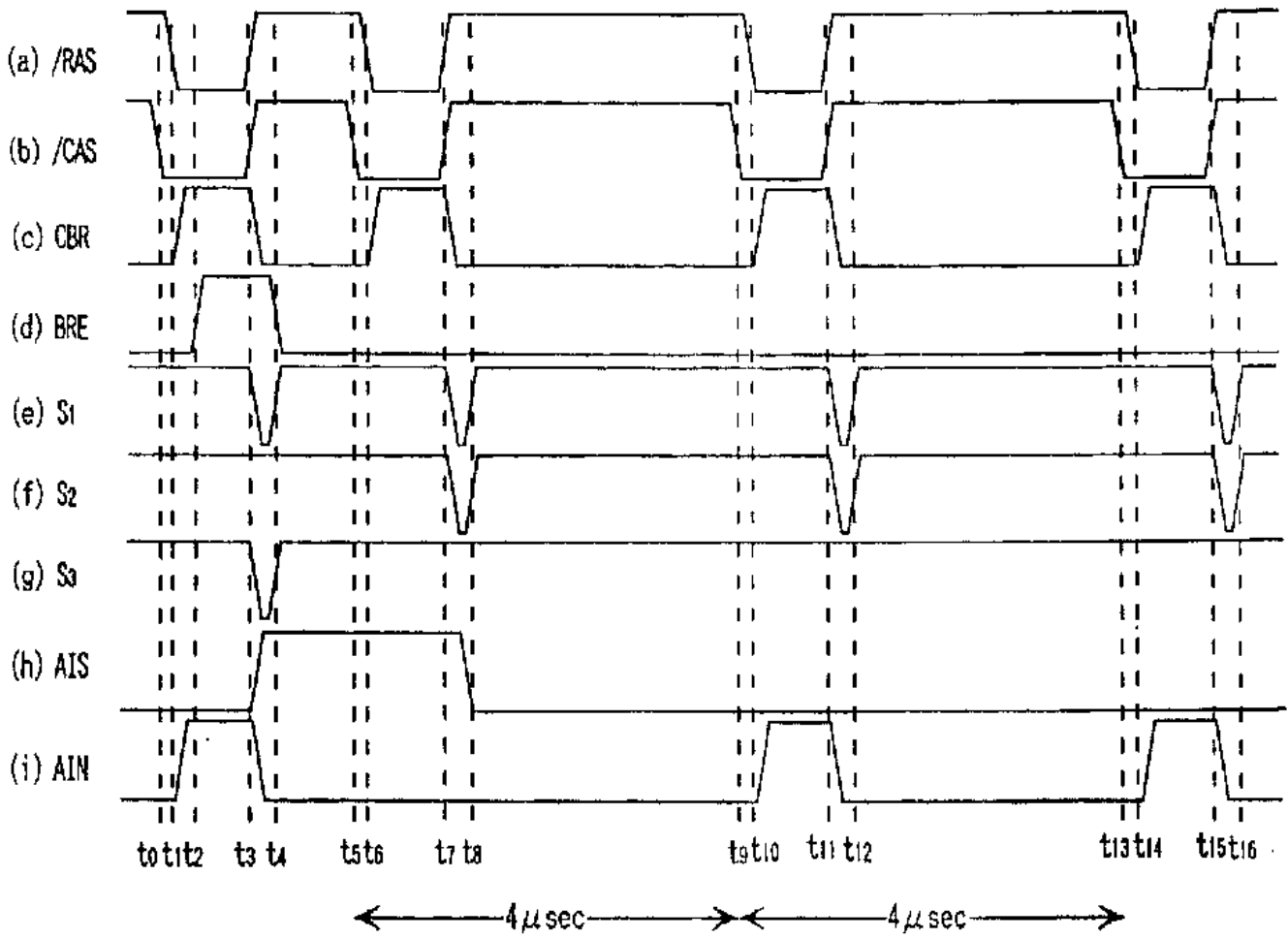


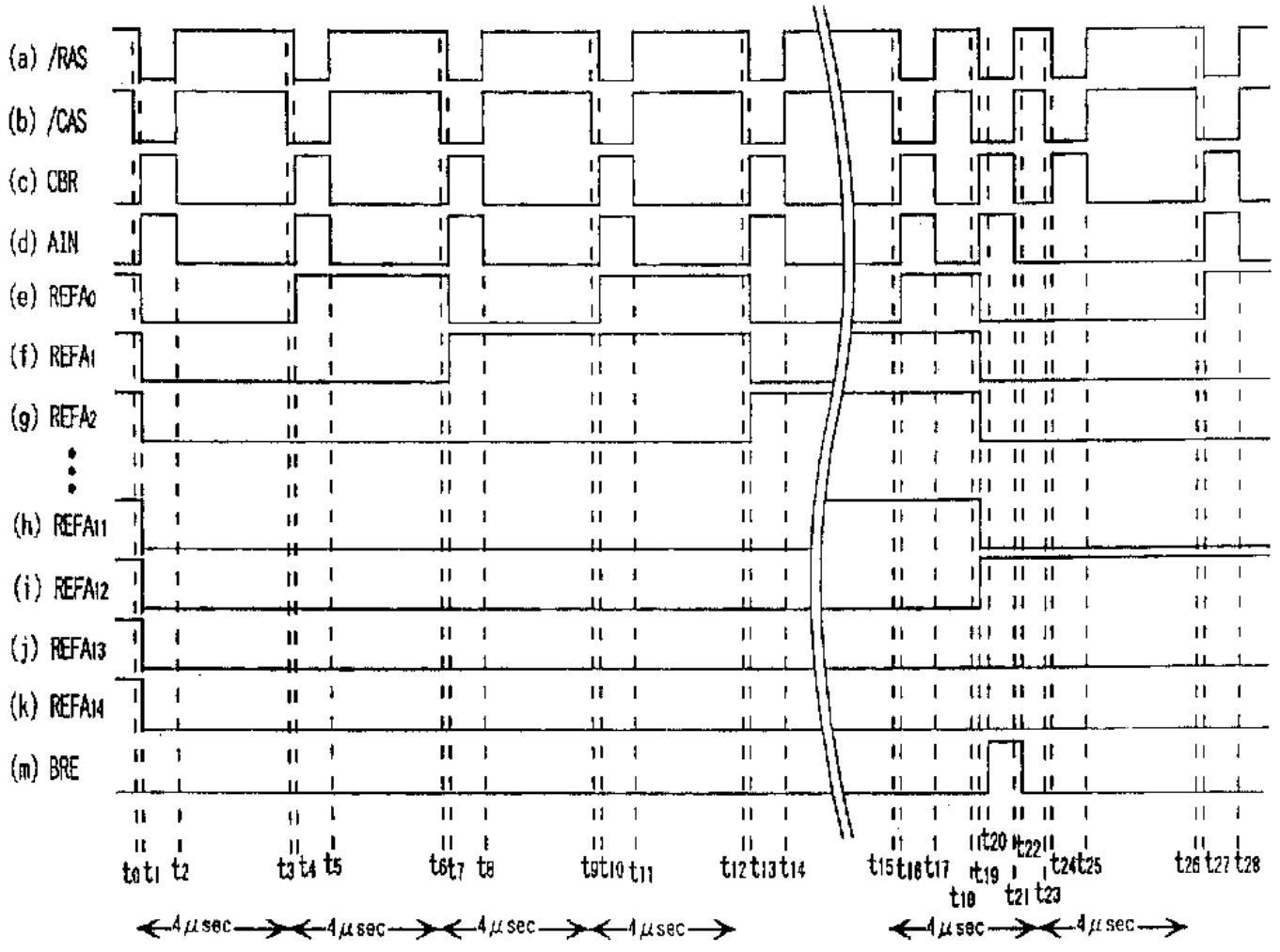


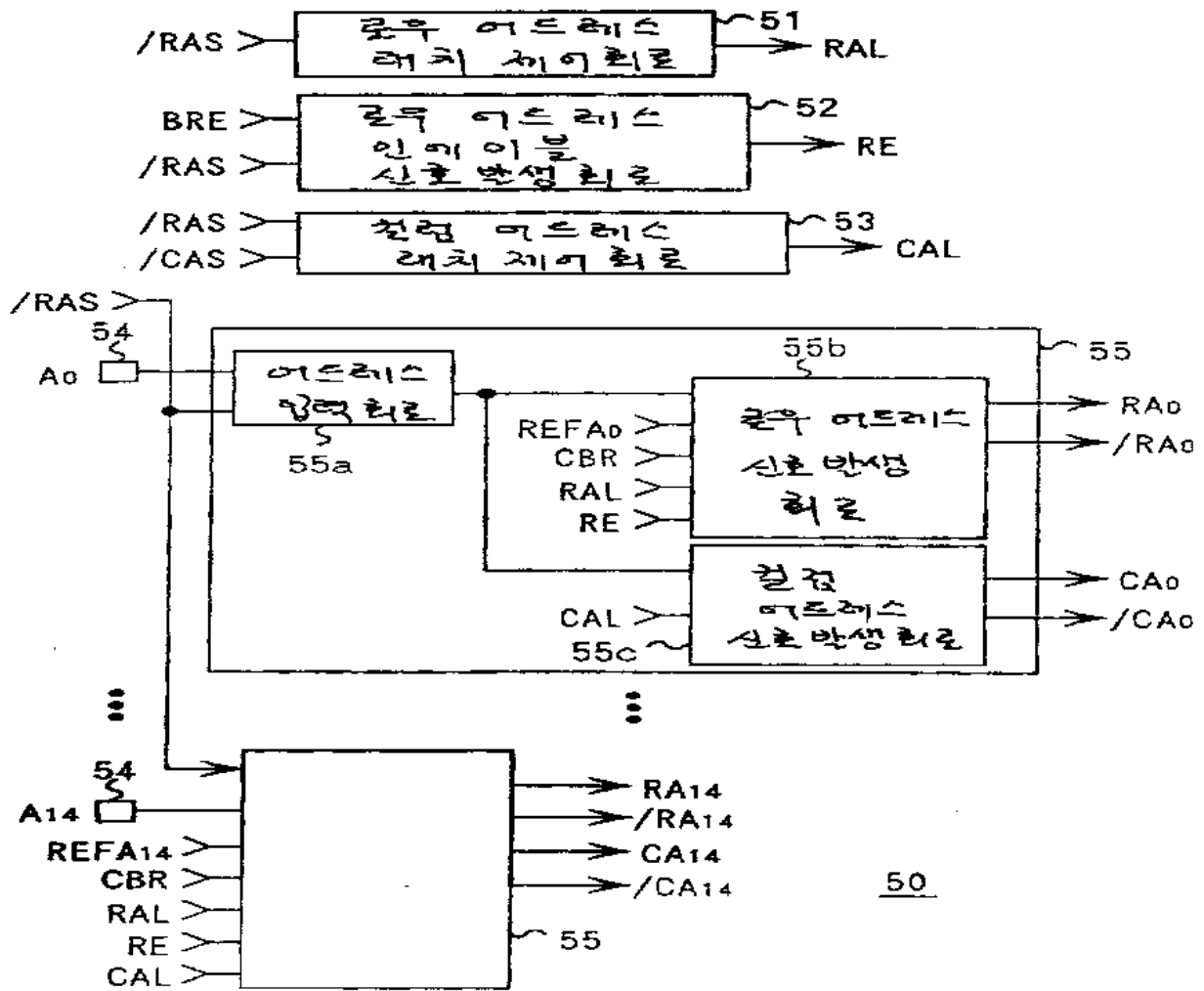
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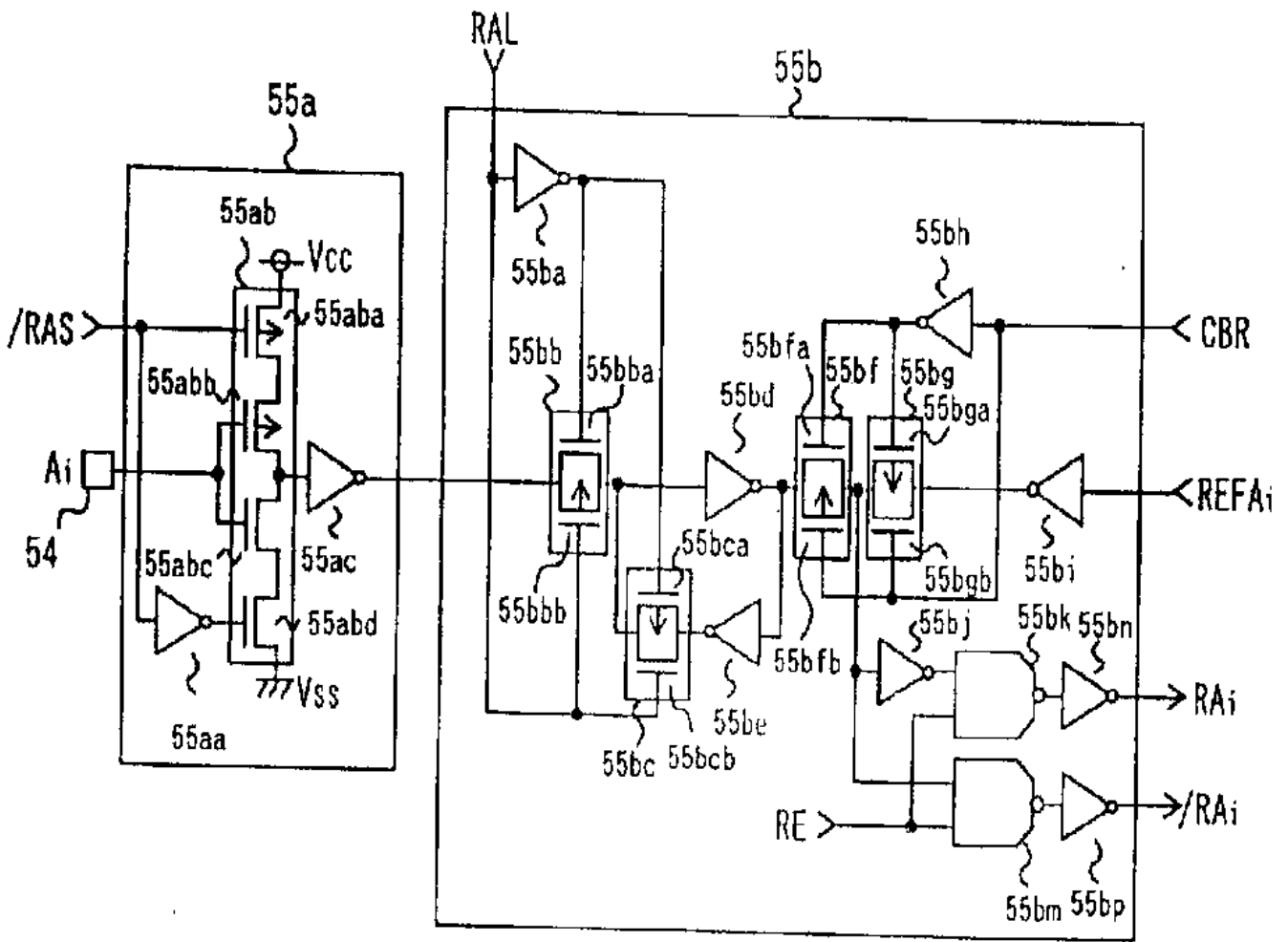


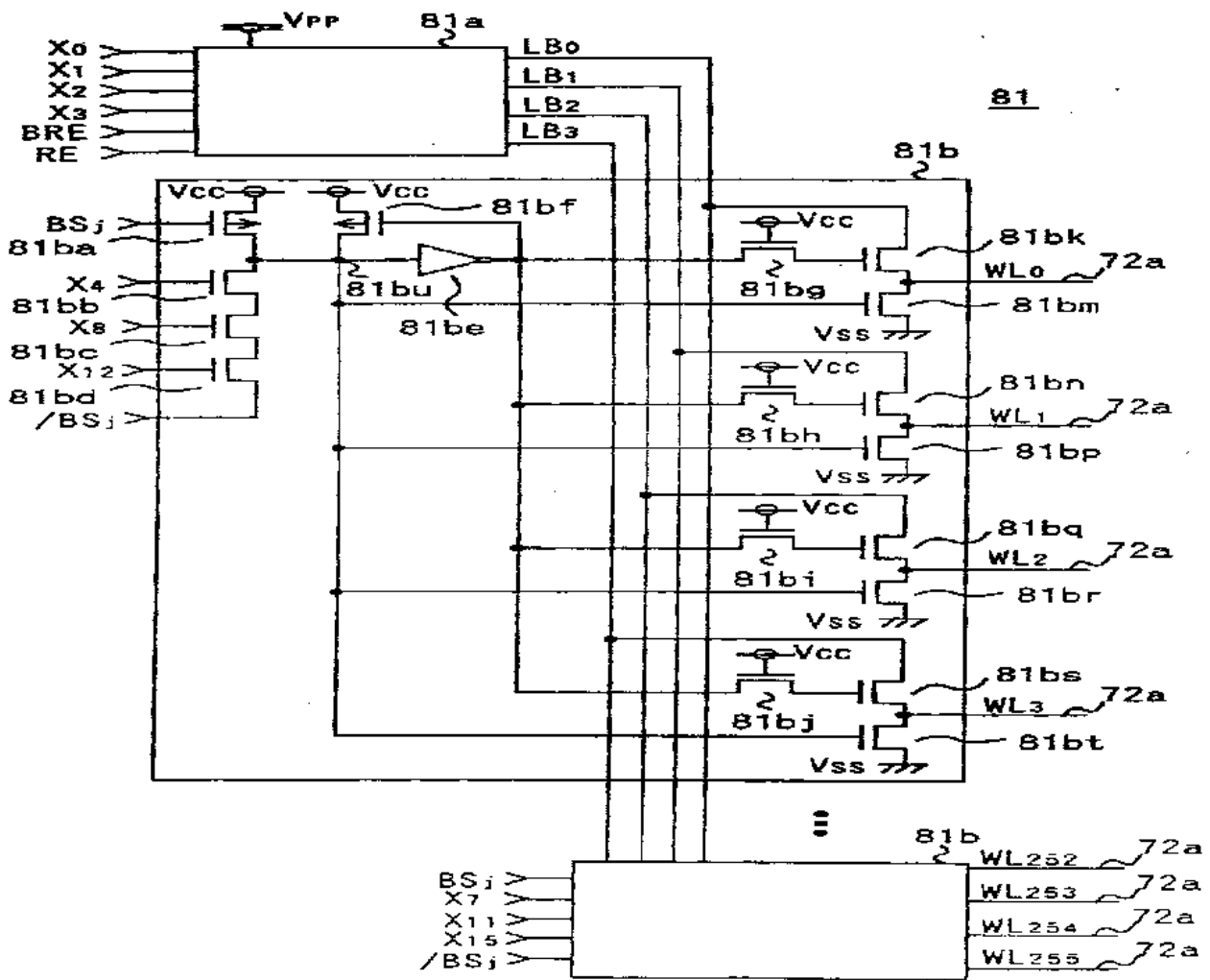
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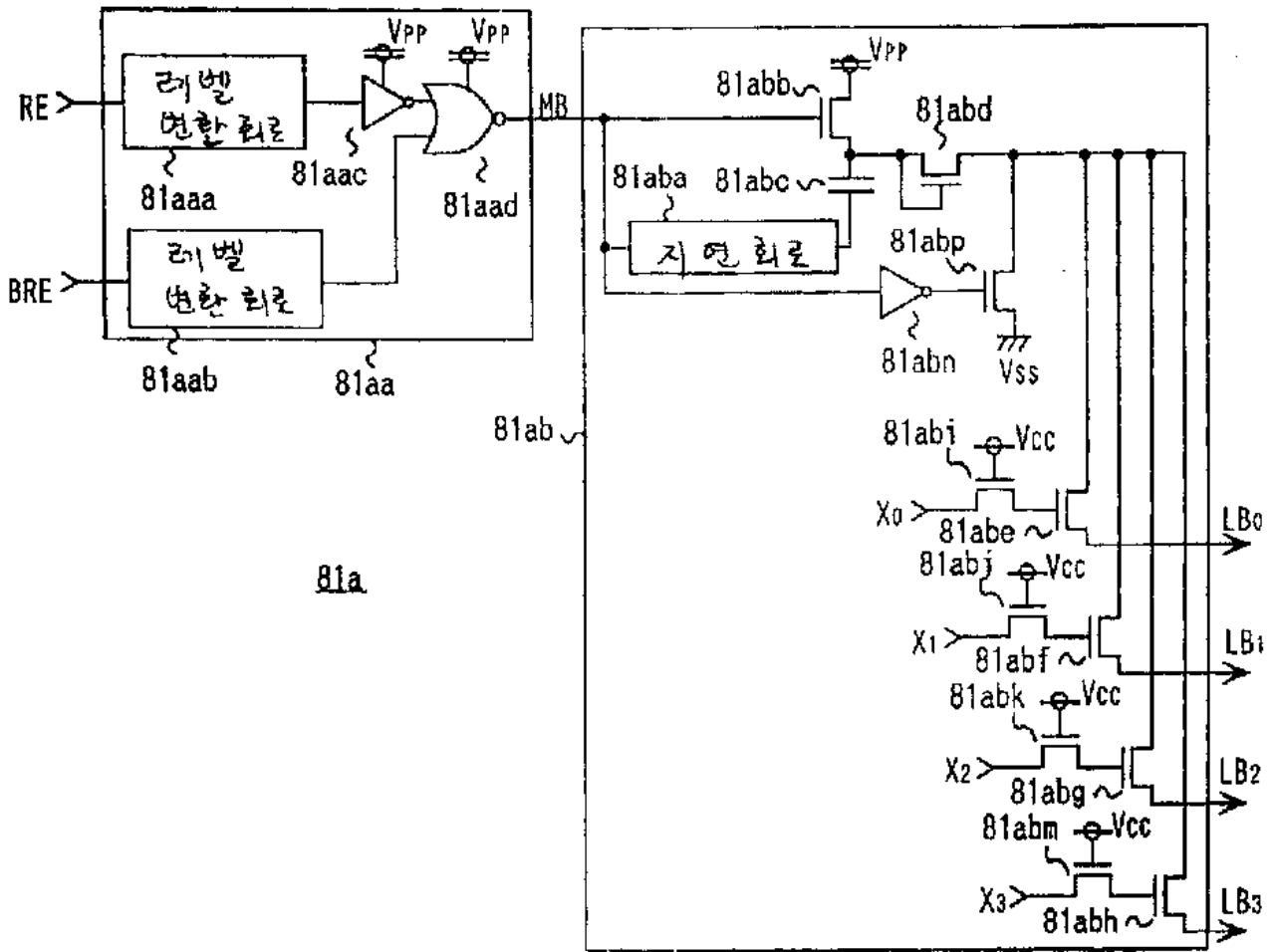


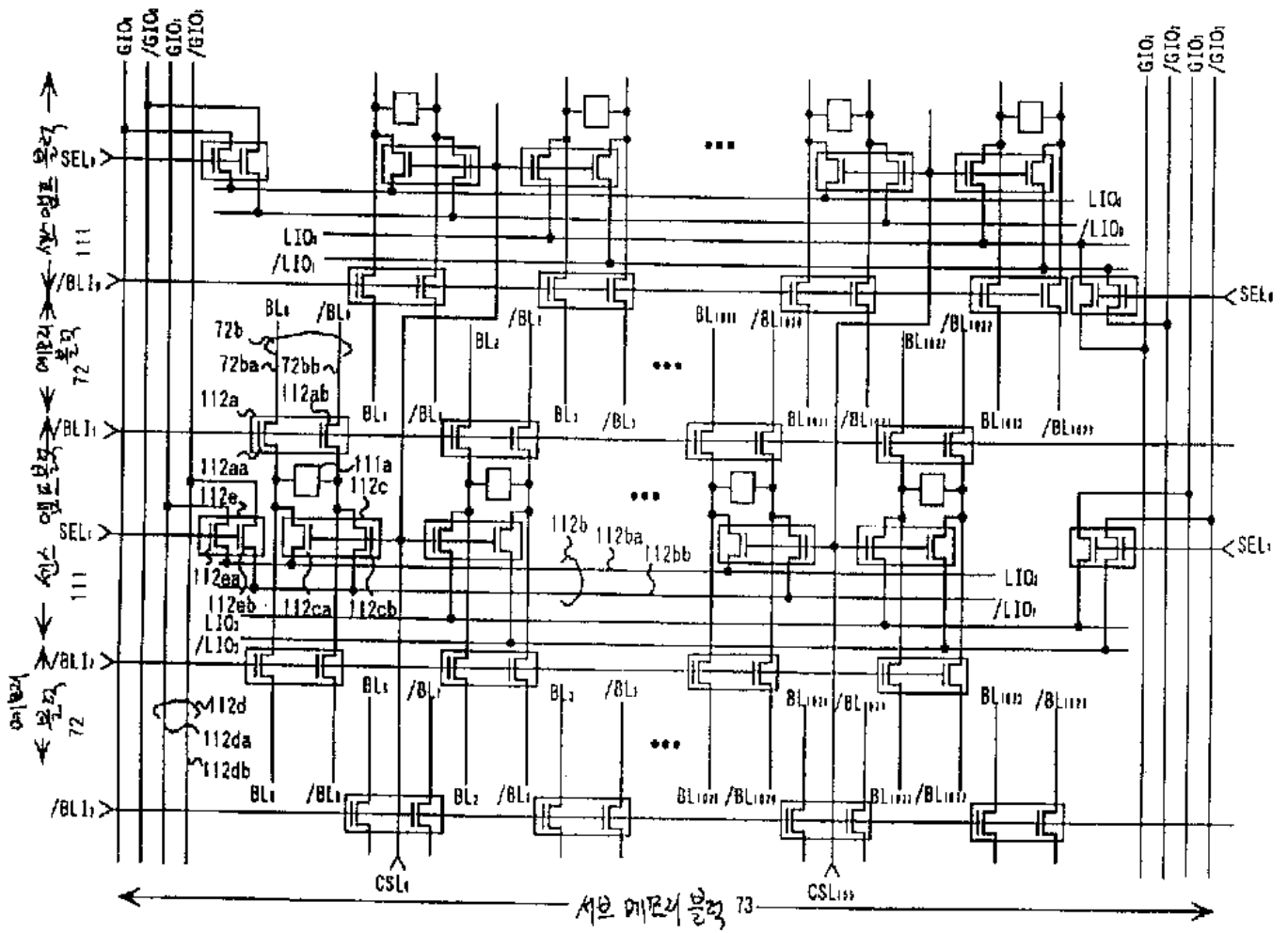


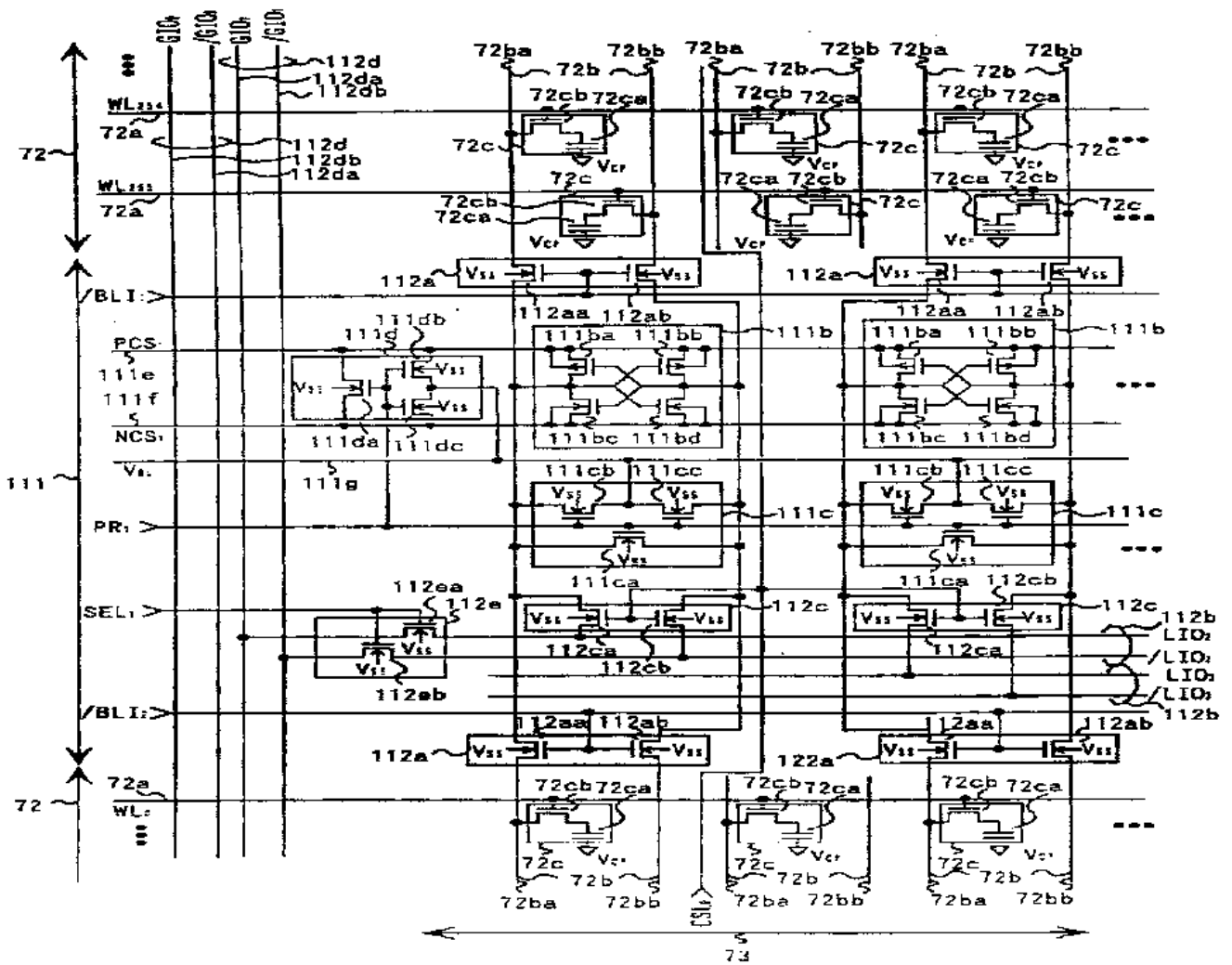


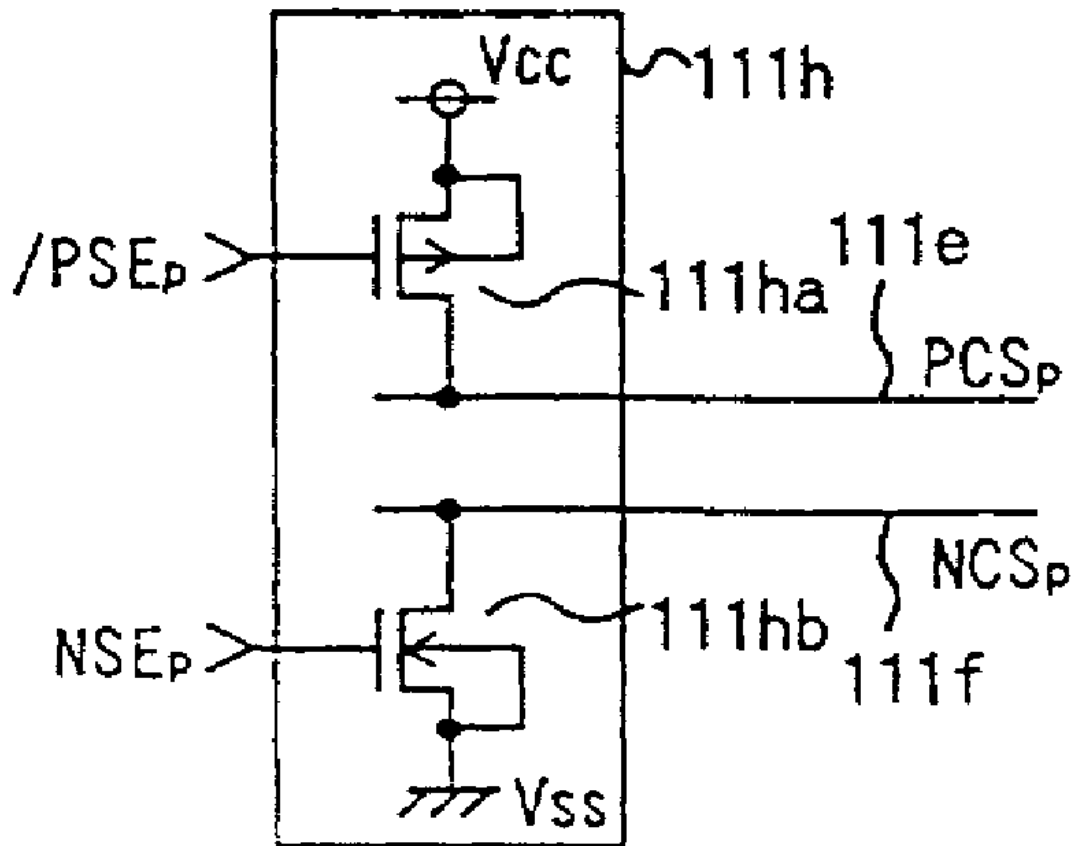


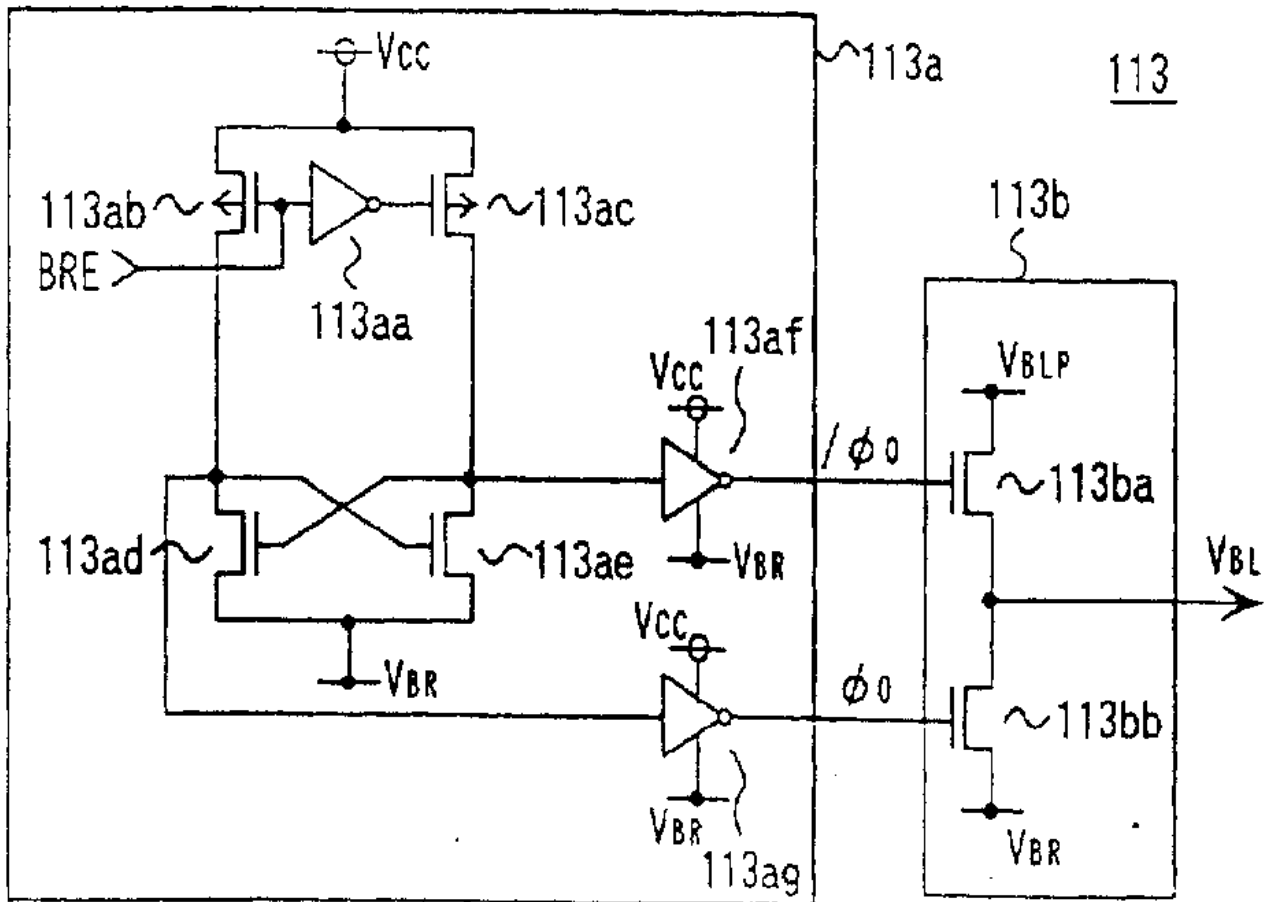


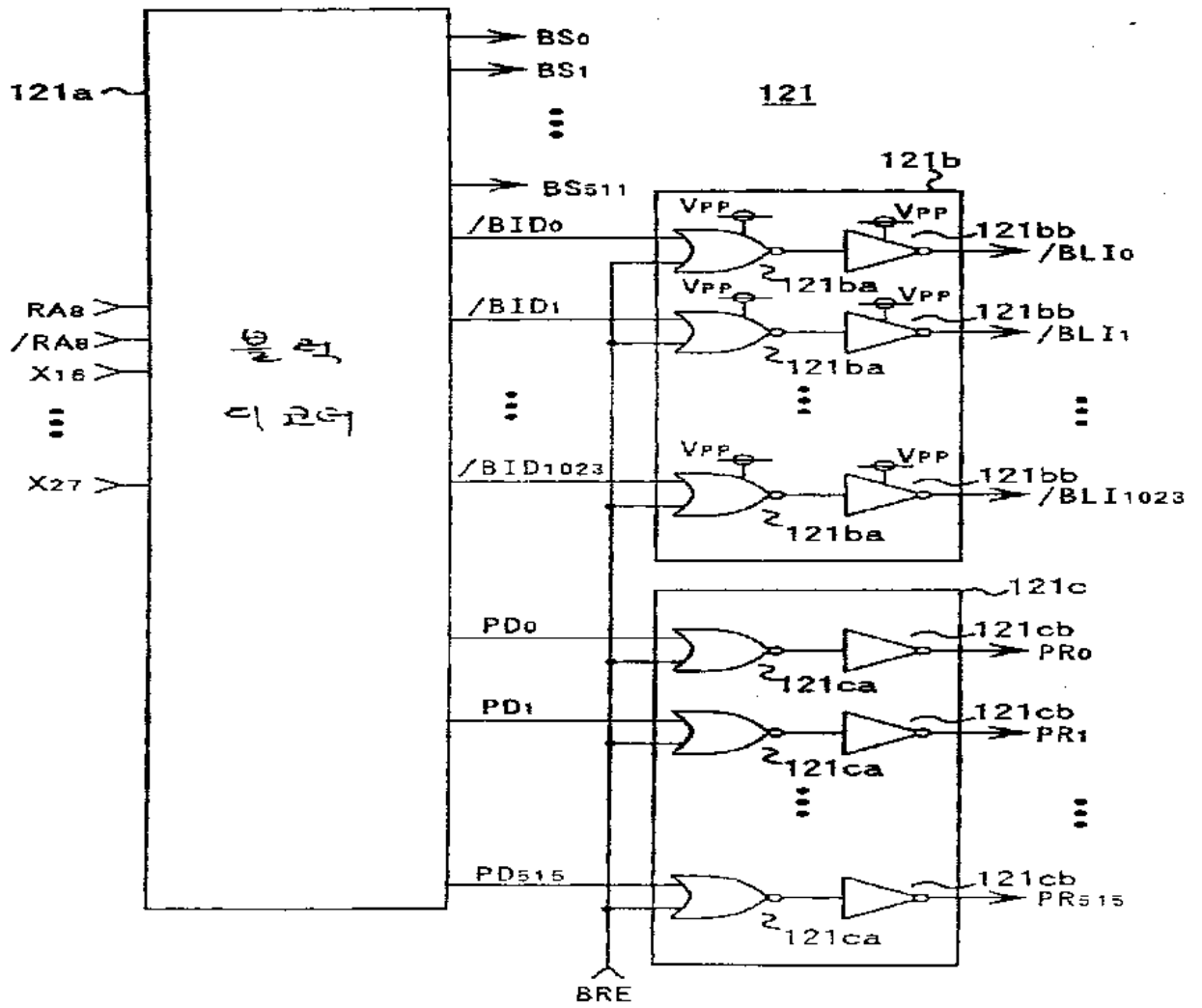


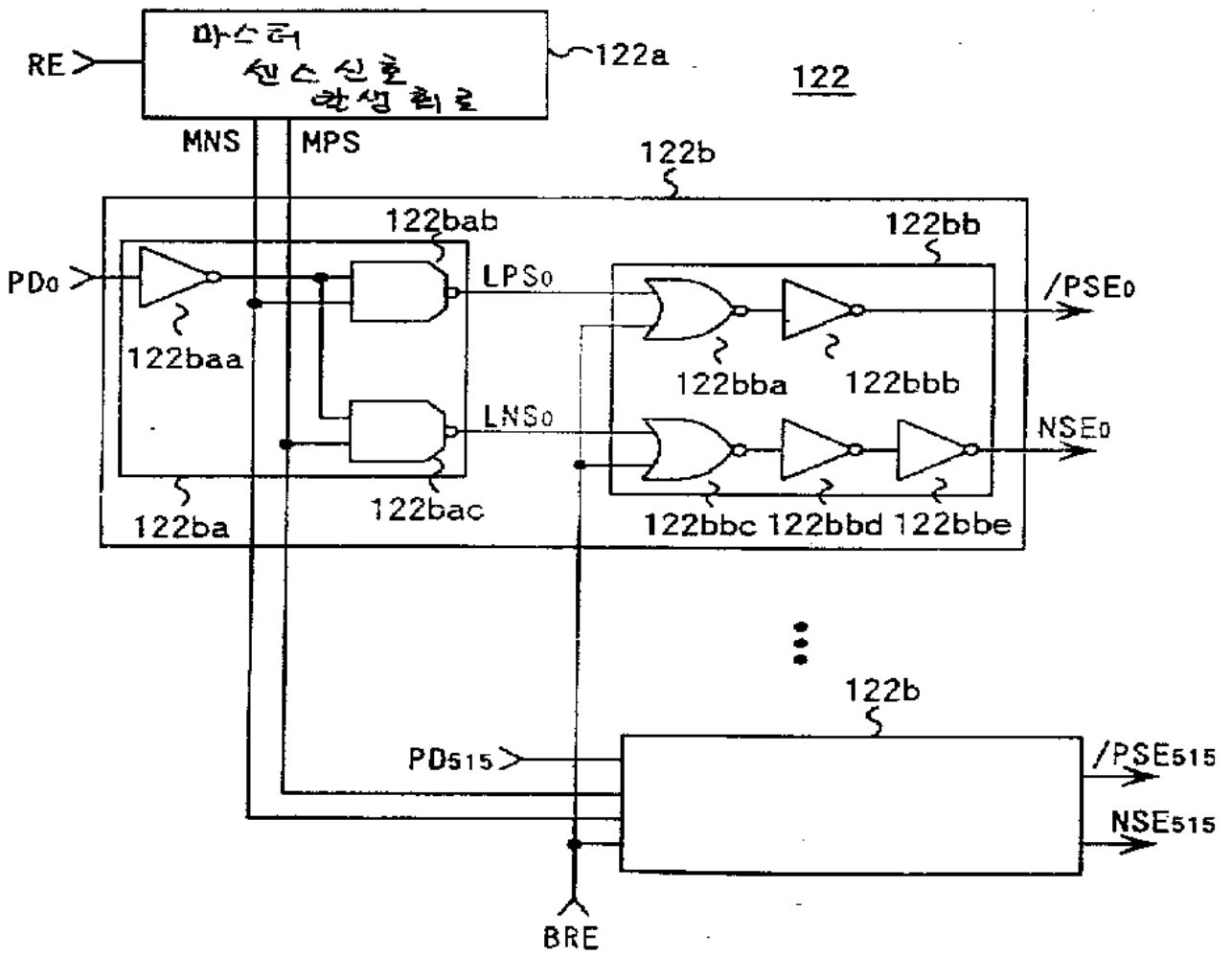




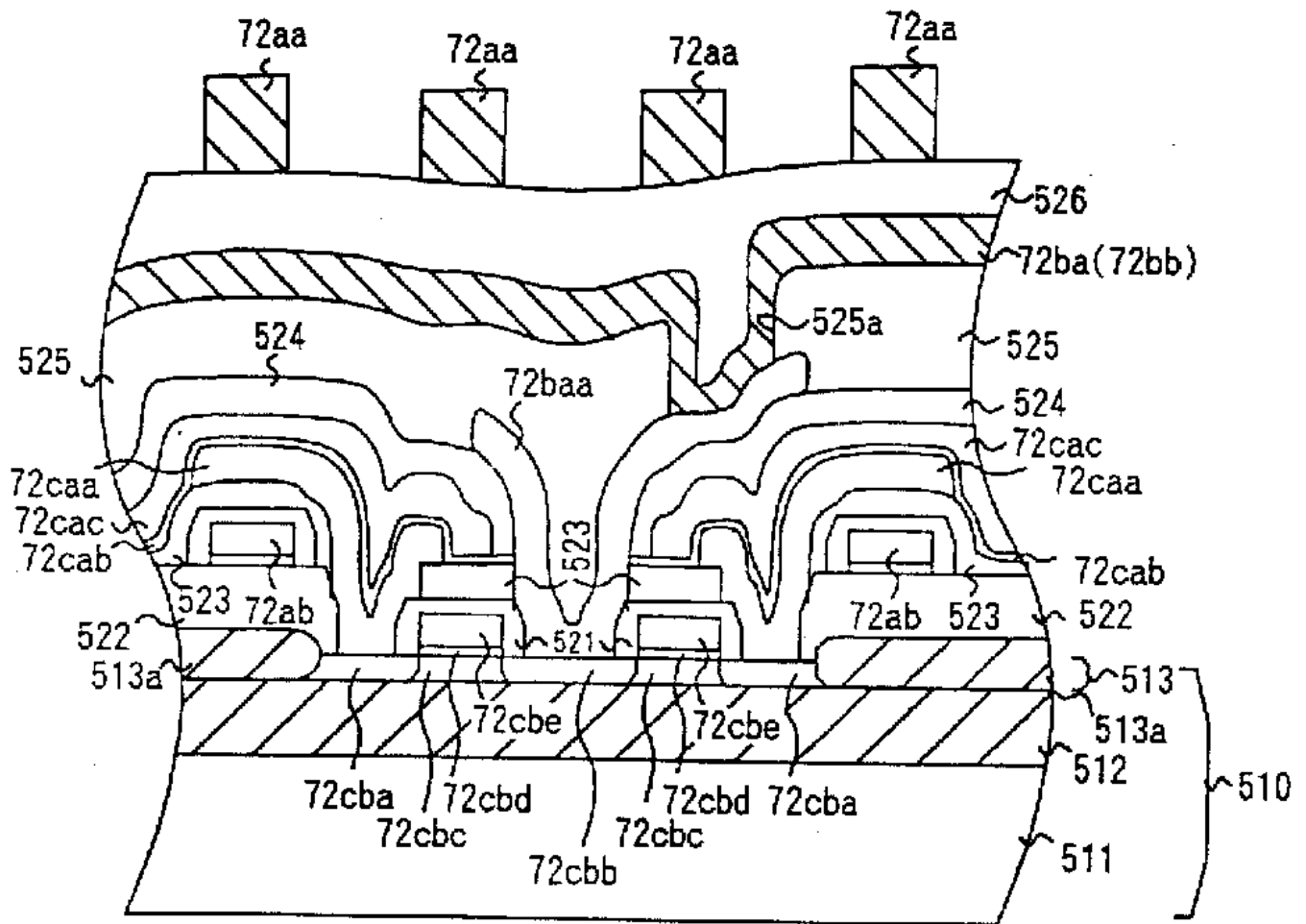




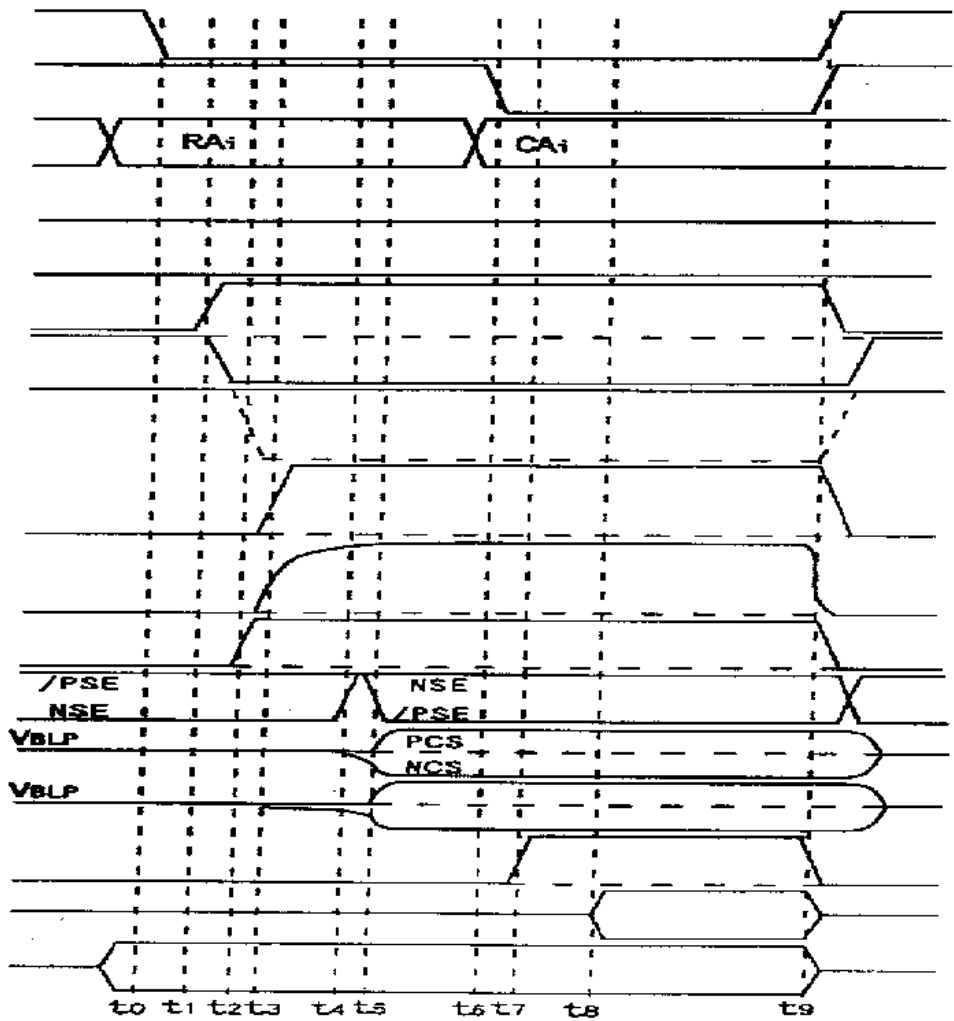


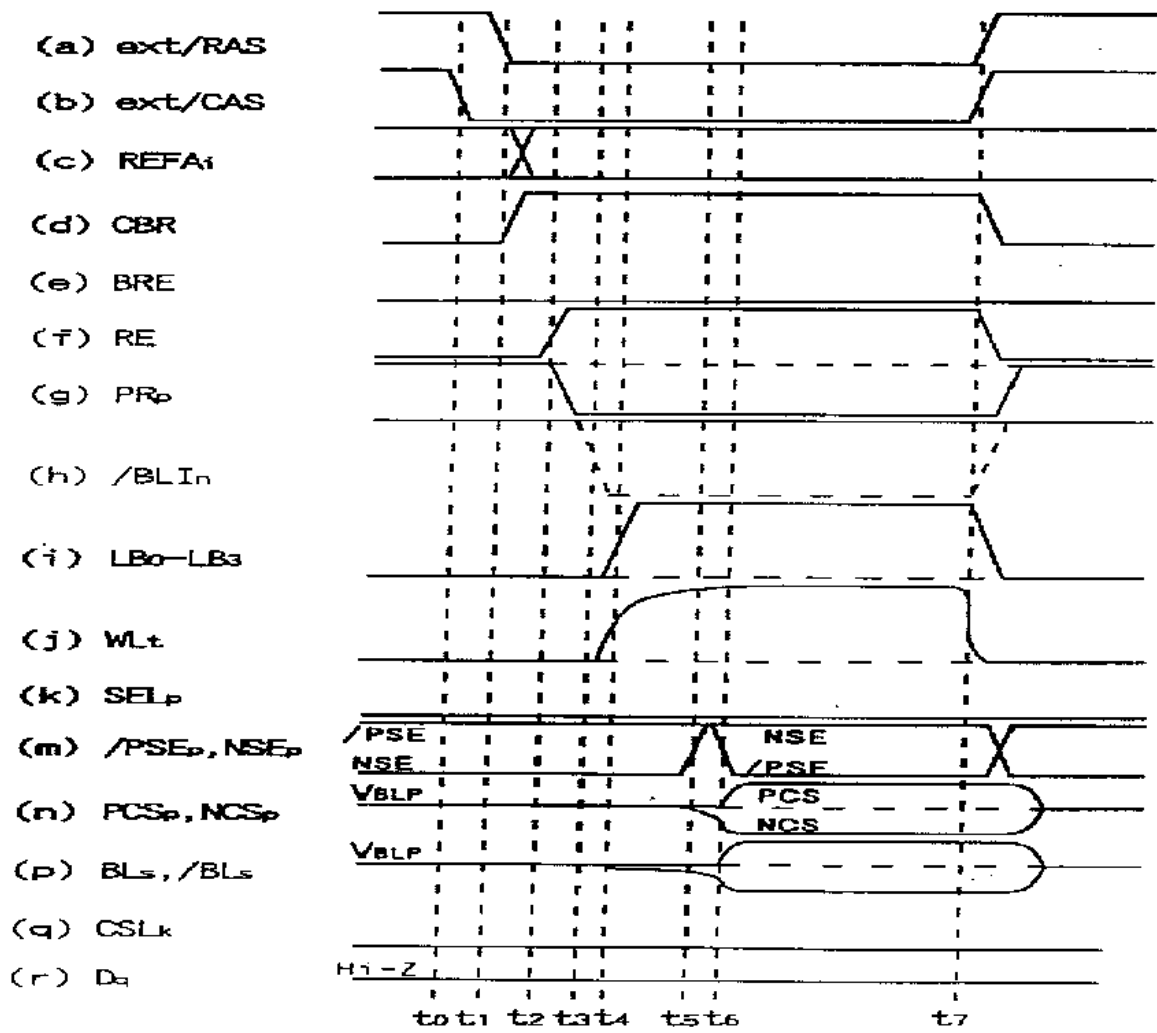


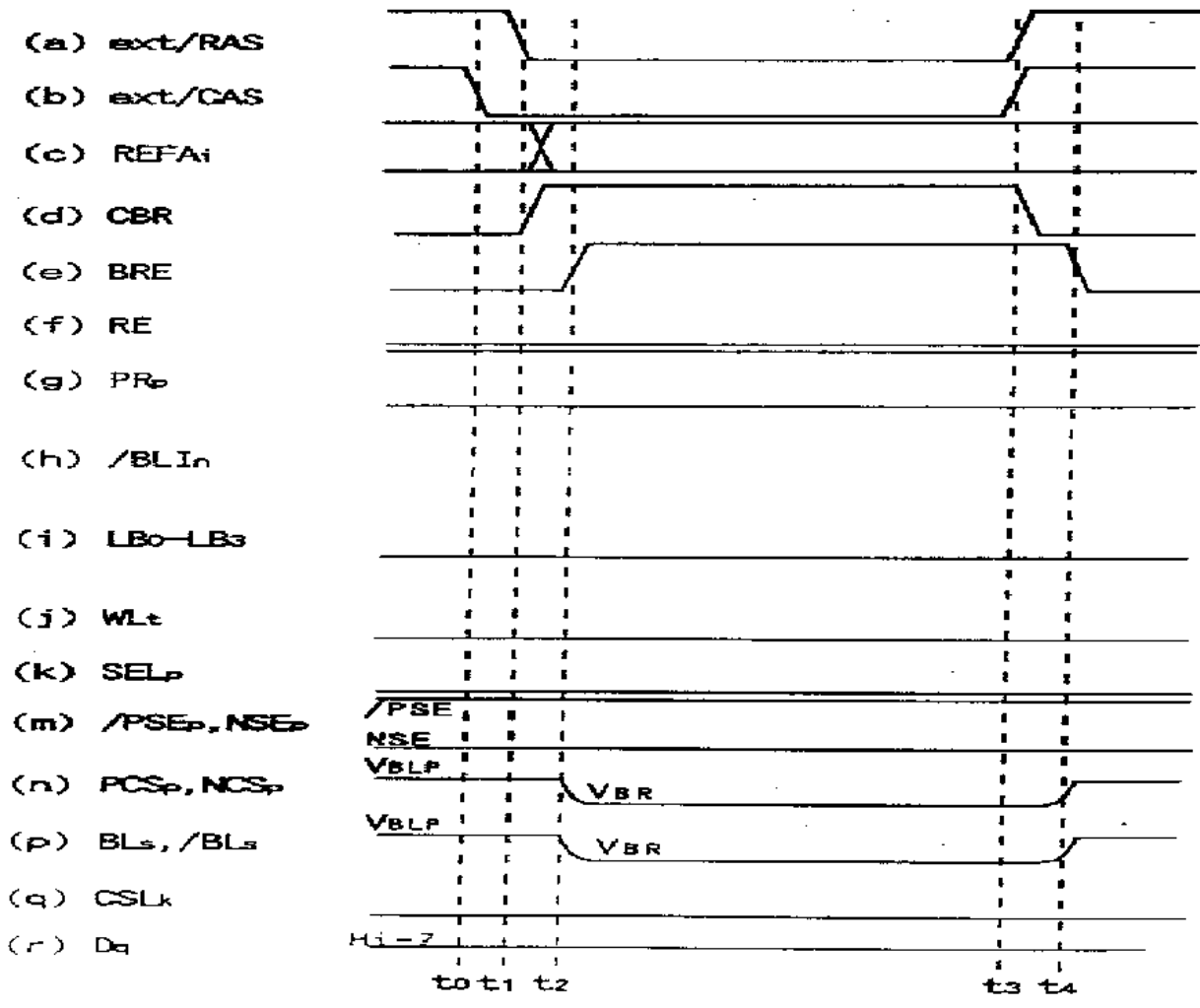
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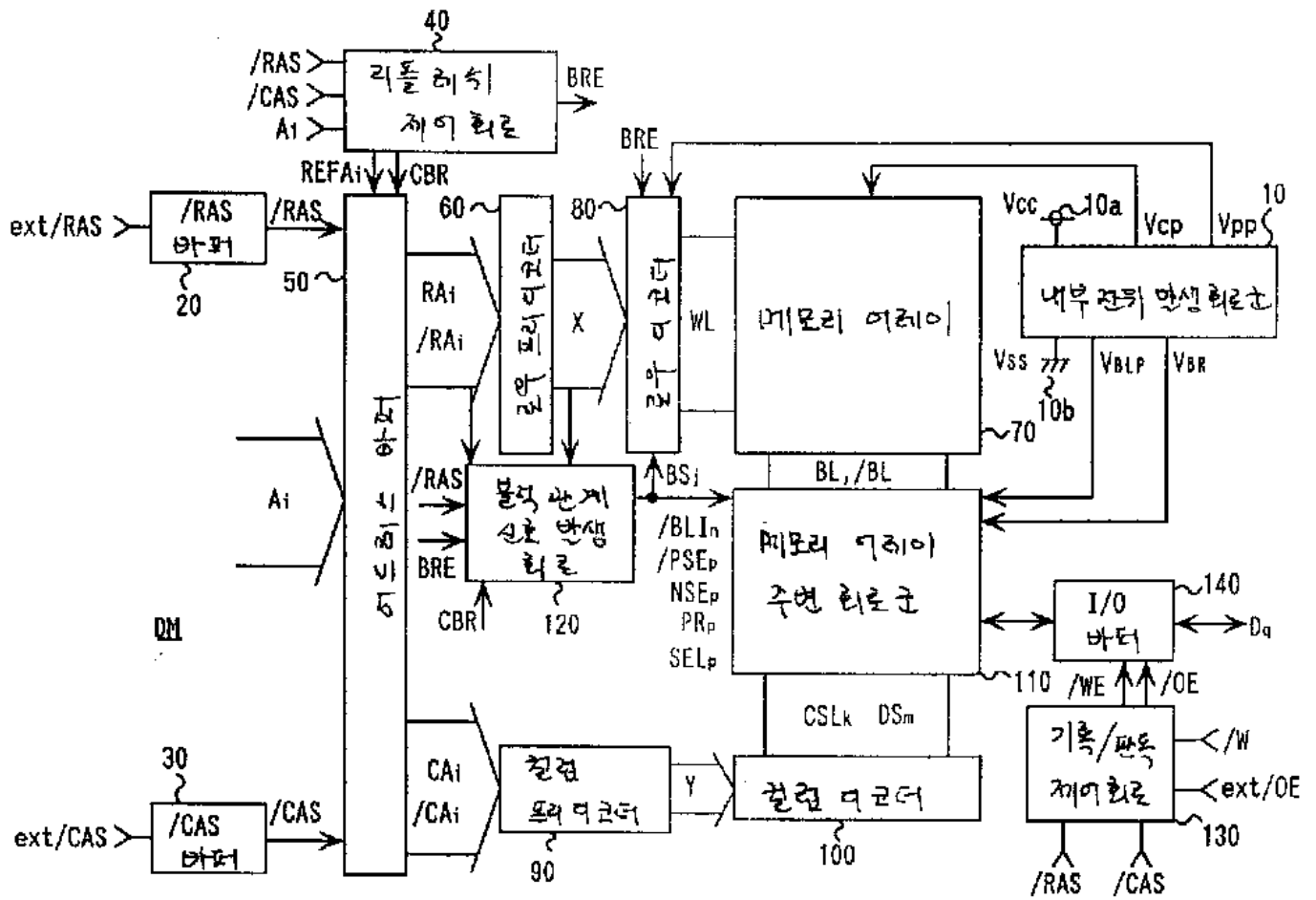


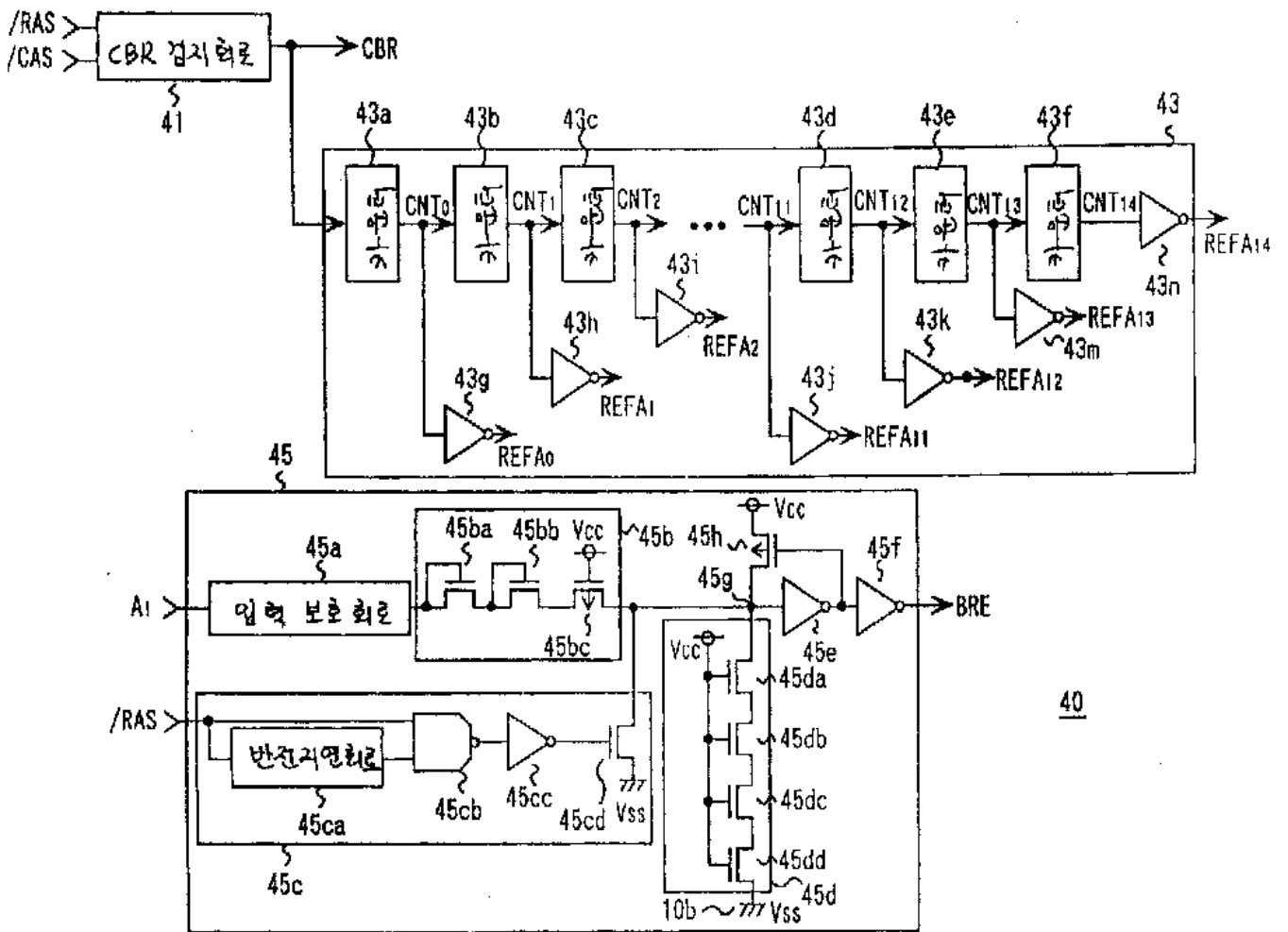
- (a) ext/RAS
- (b) ext/CAS
- (c) A_i
- (d) CBR
- (e) BRE
- (f) RE
- (g) PR_p
- (h) /BLI_n
- (i) LB₀-LB₃
- (j) WL_t
- (k) SEL_p
- (m) /PSE_p, NSE_p
- (n) PCS_p, NCS_p
- (p) BL_s, /BL_s
- (q) CSL_k
- (r) D_q(read)
- (s) D_q(write)

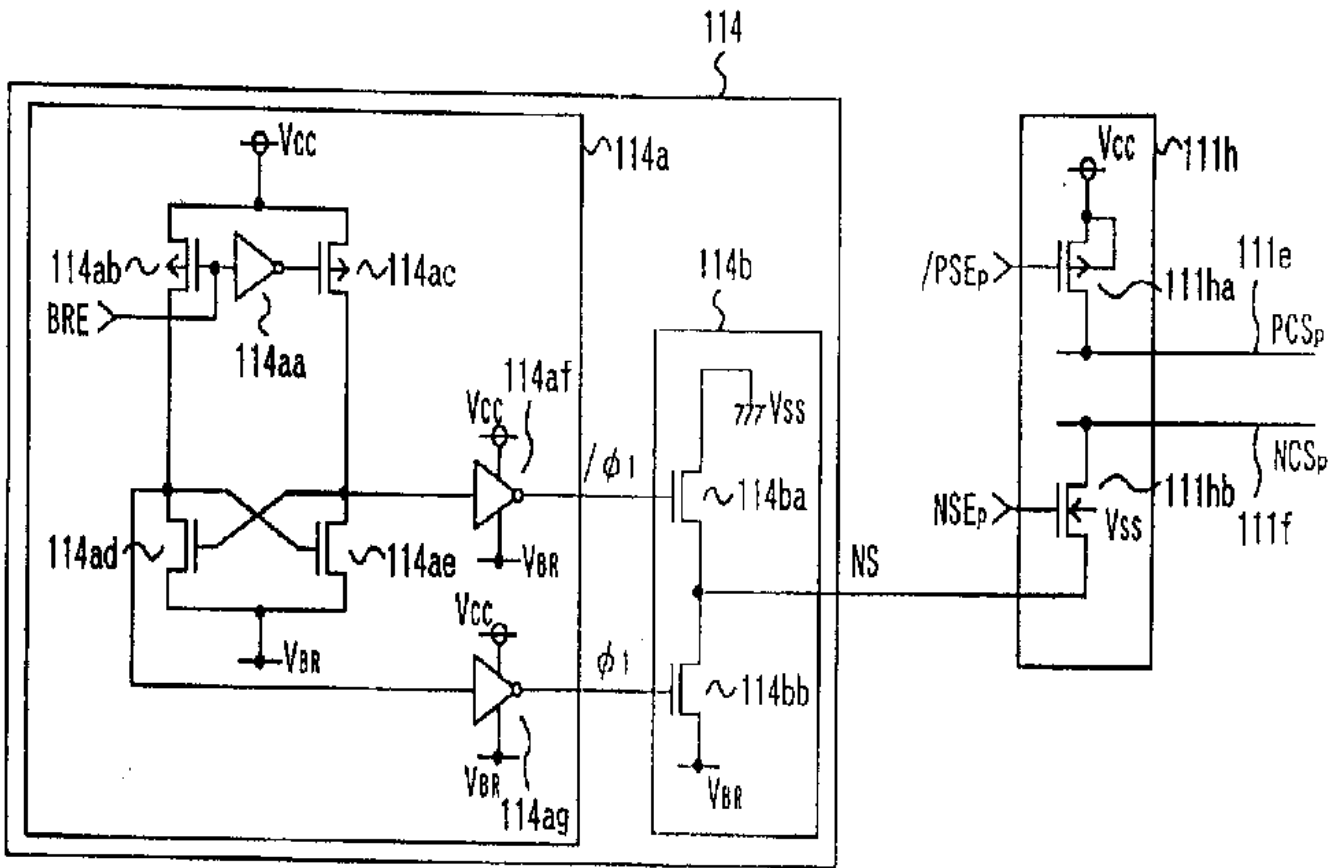


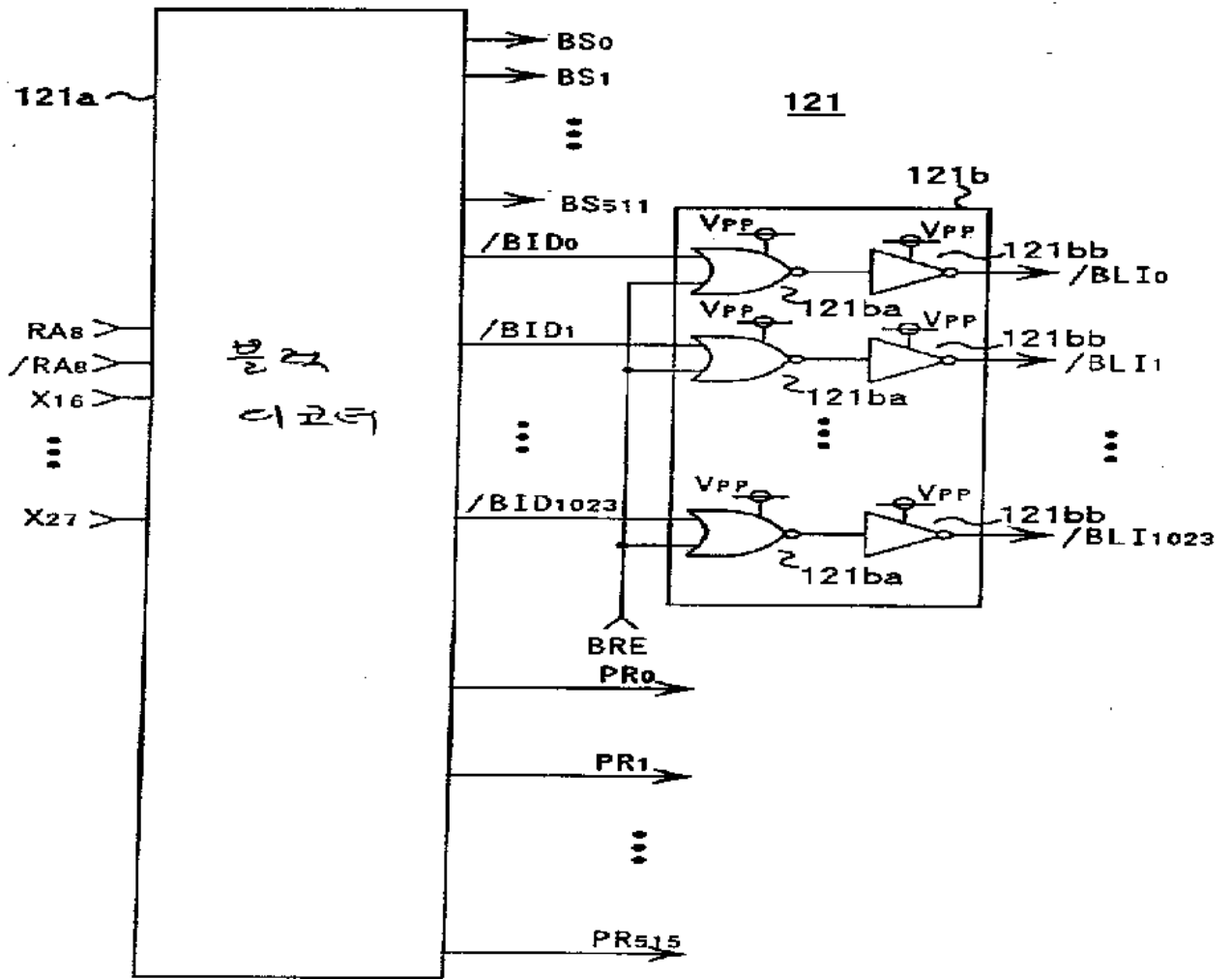


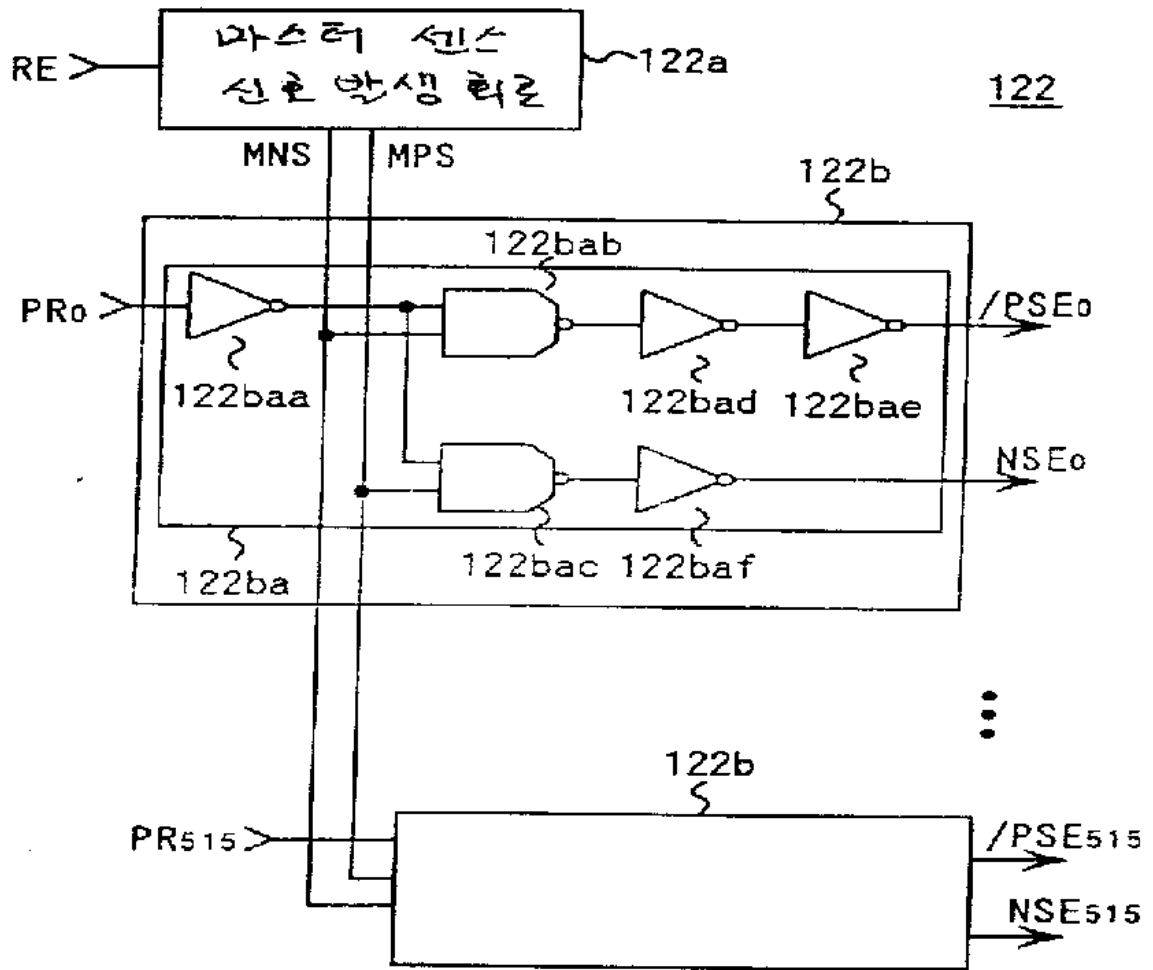


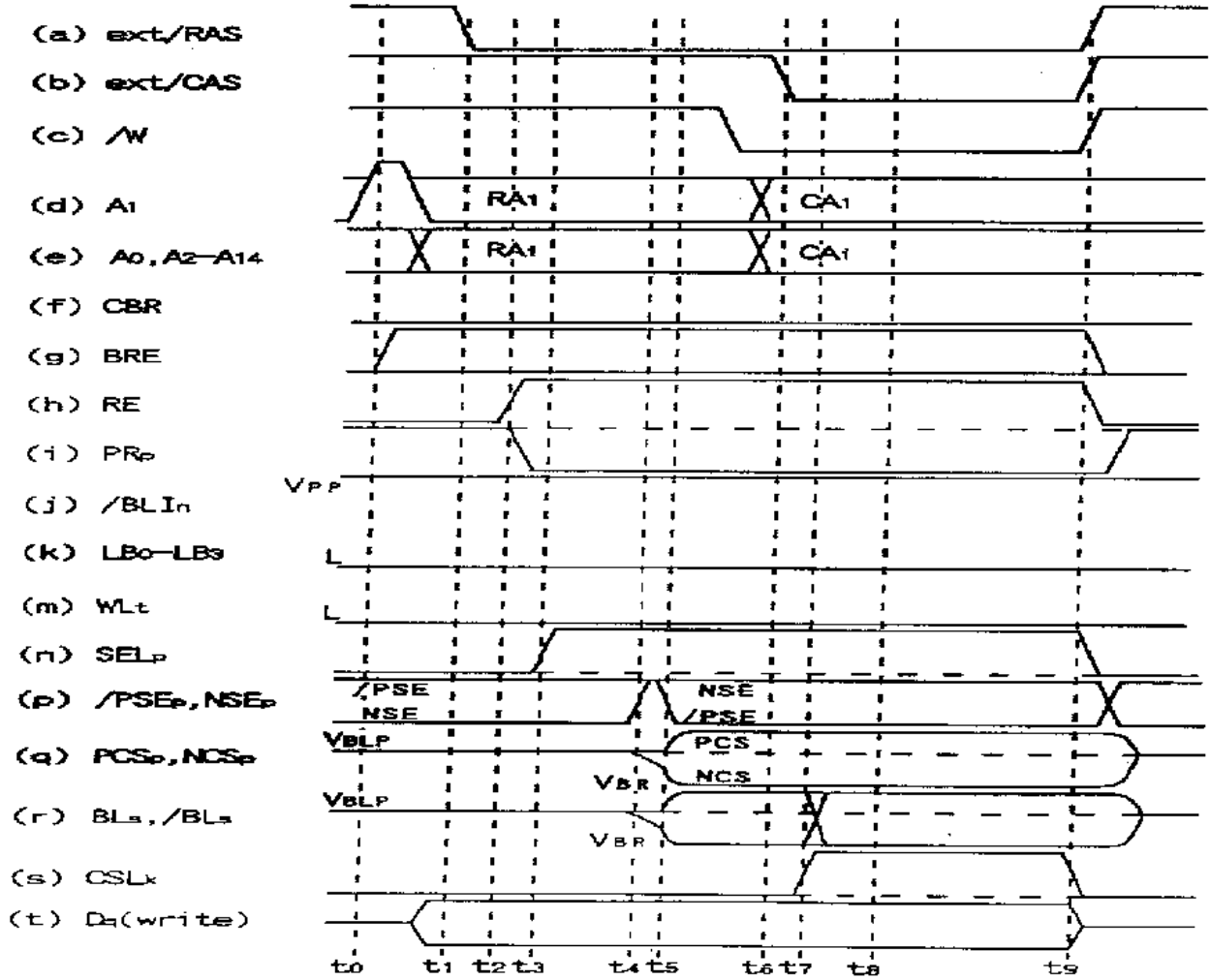


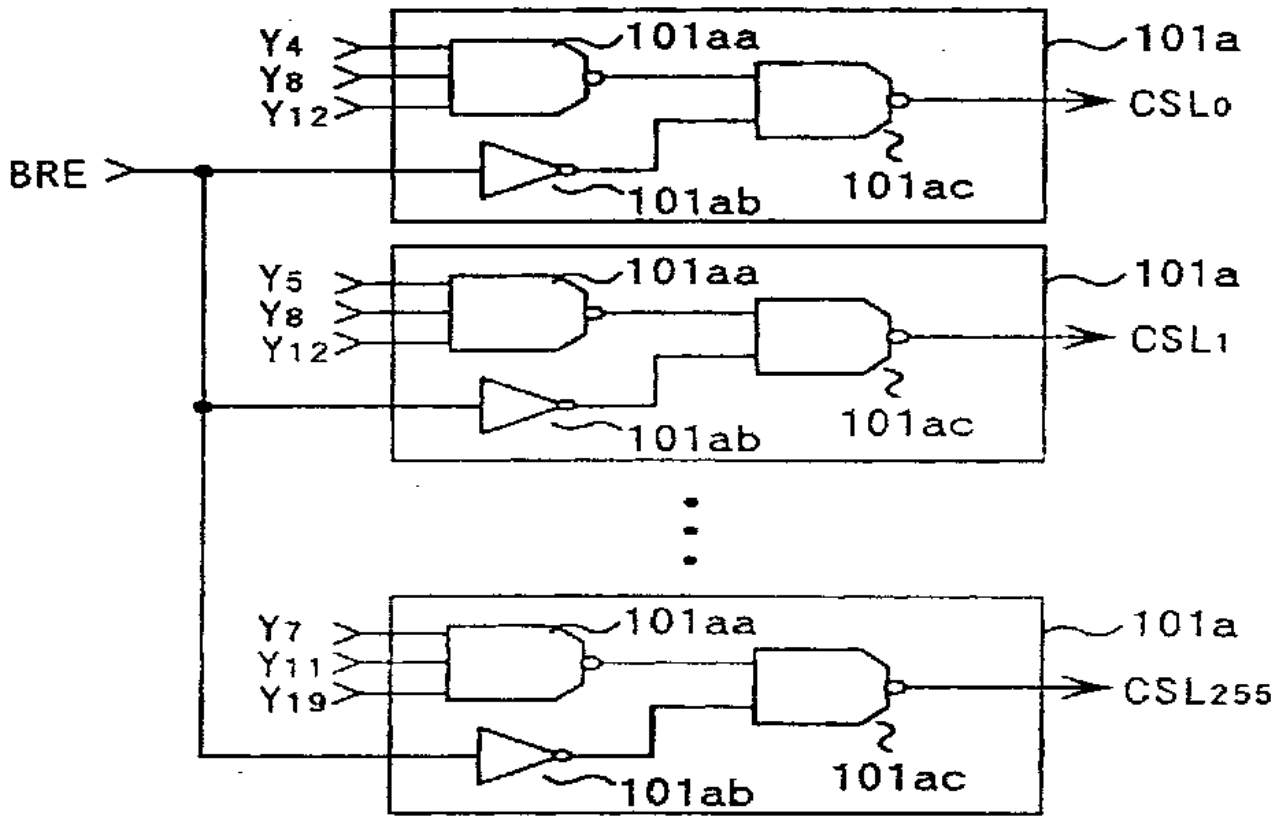




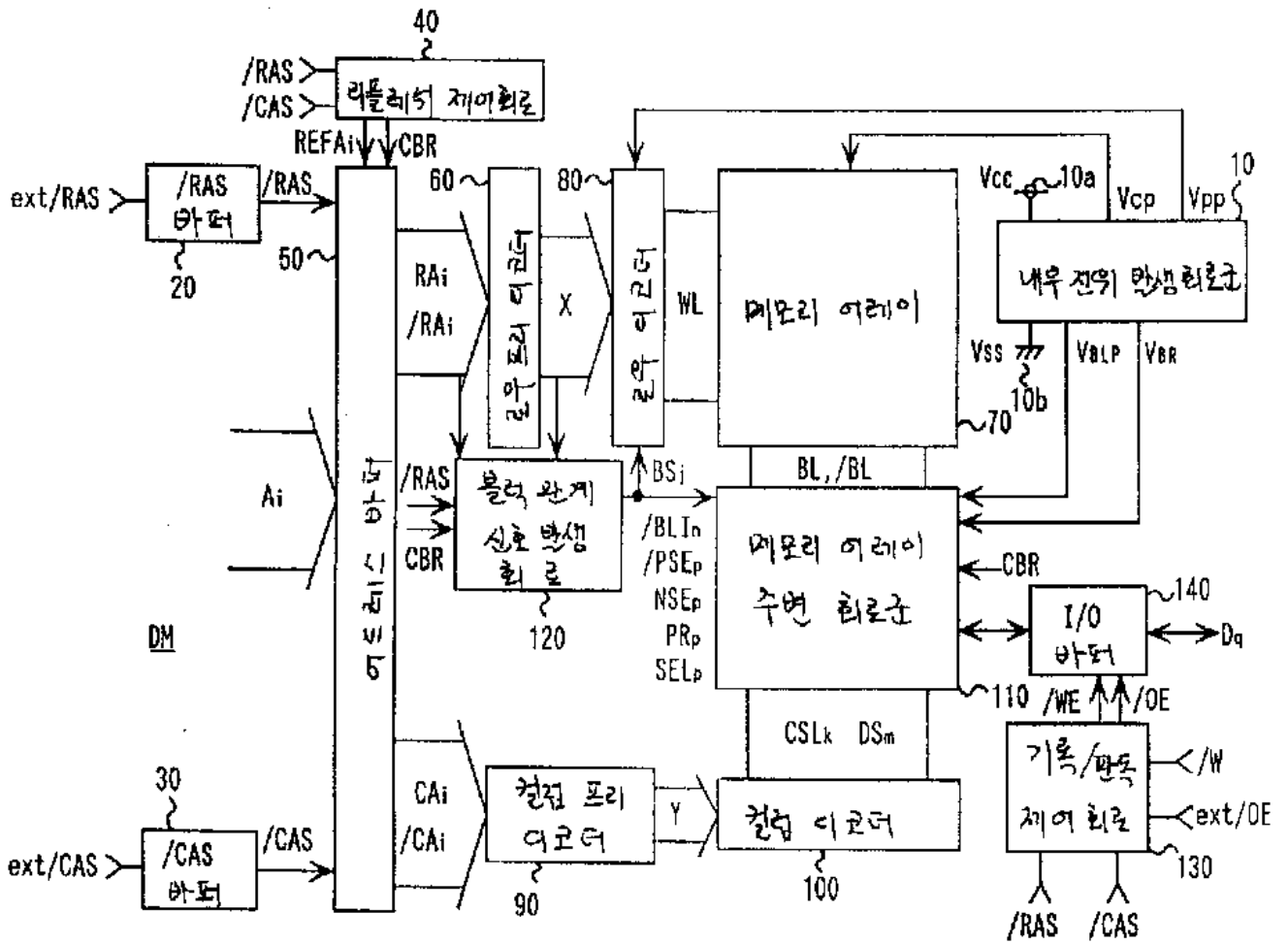


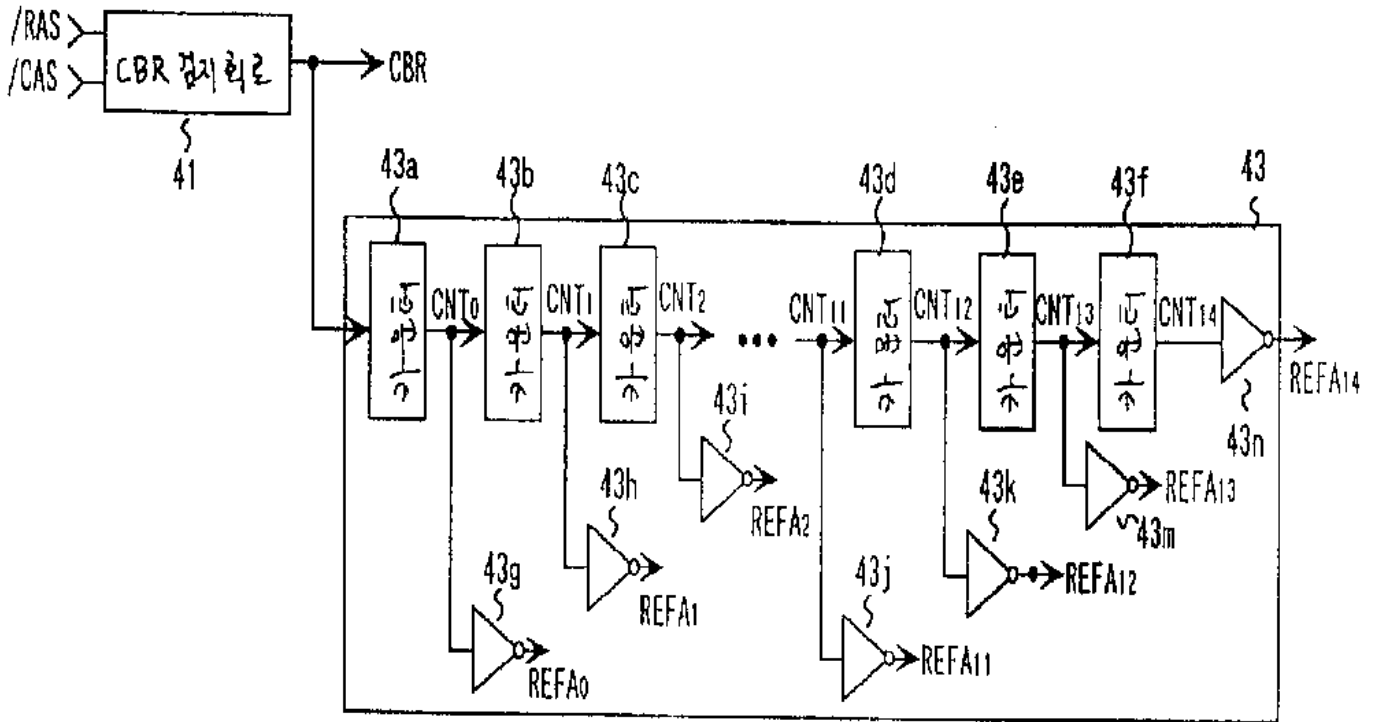


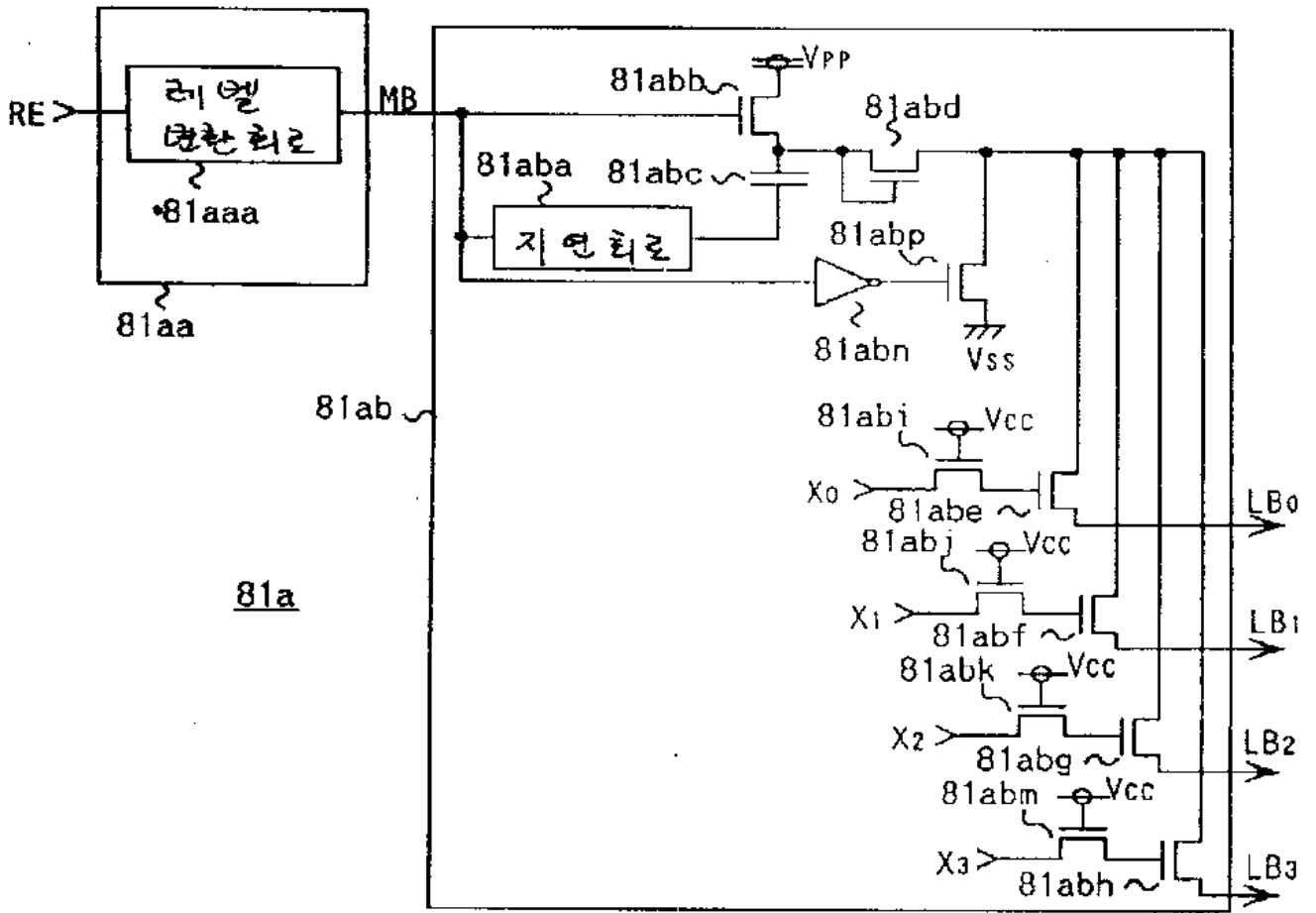


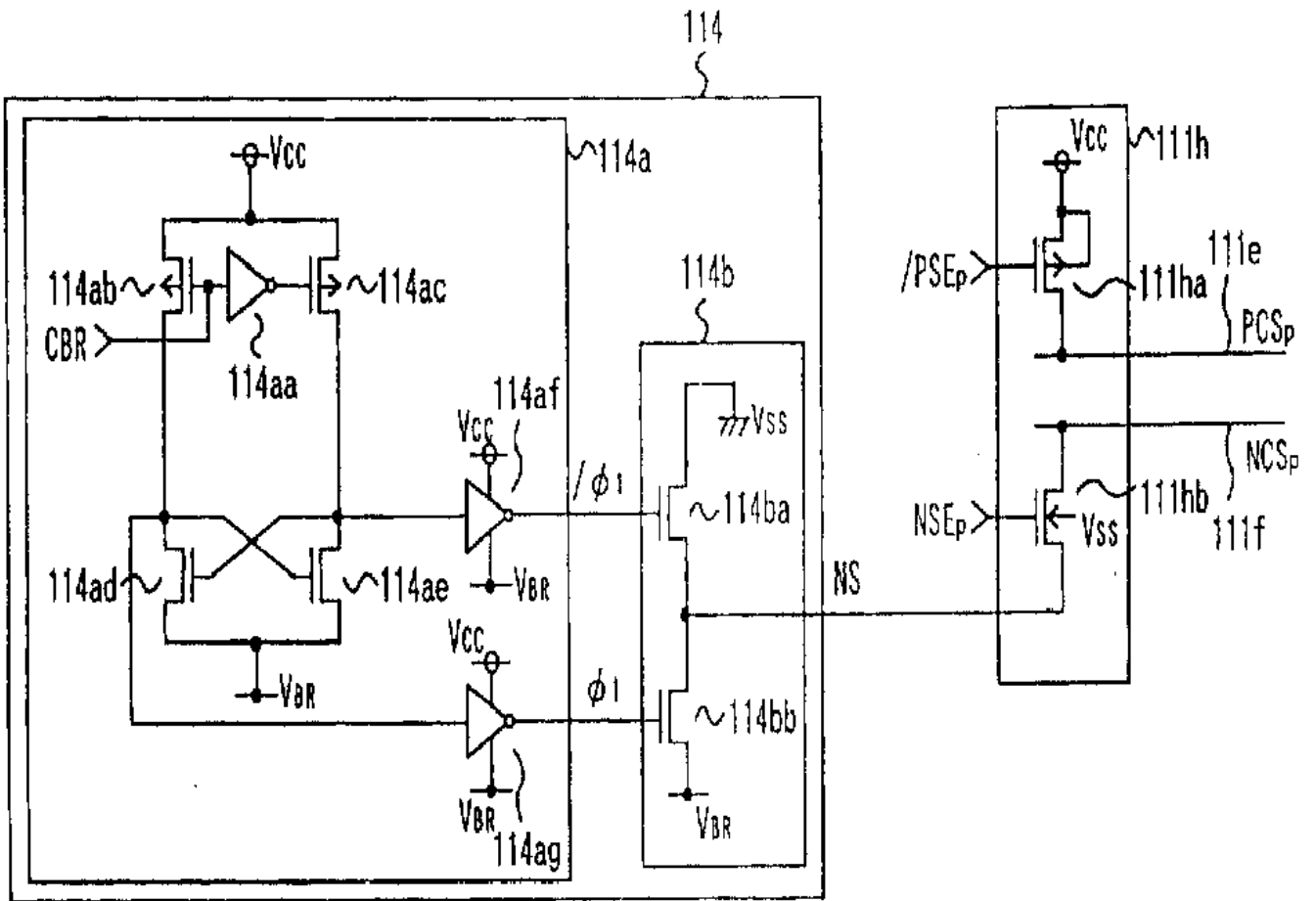


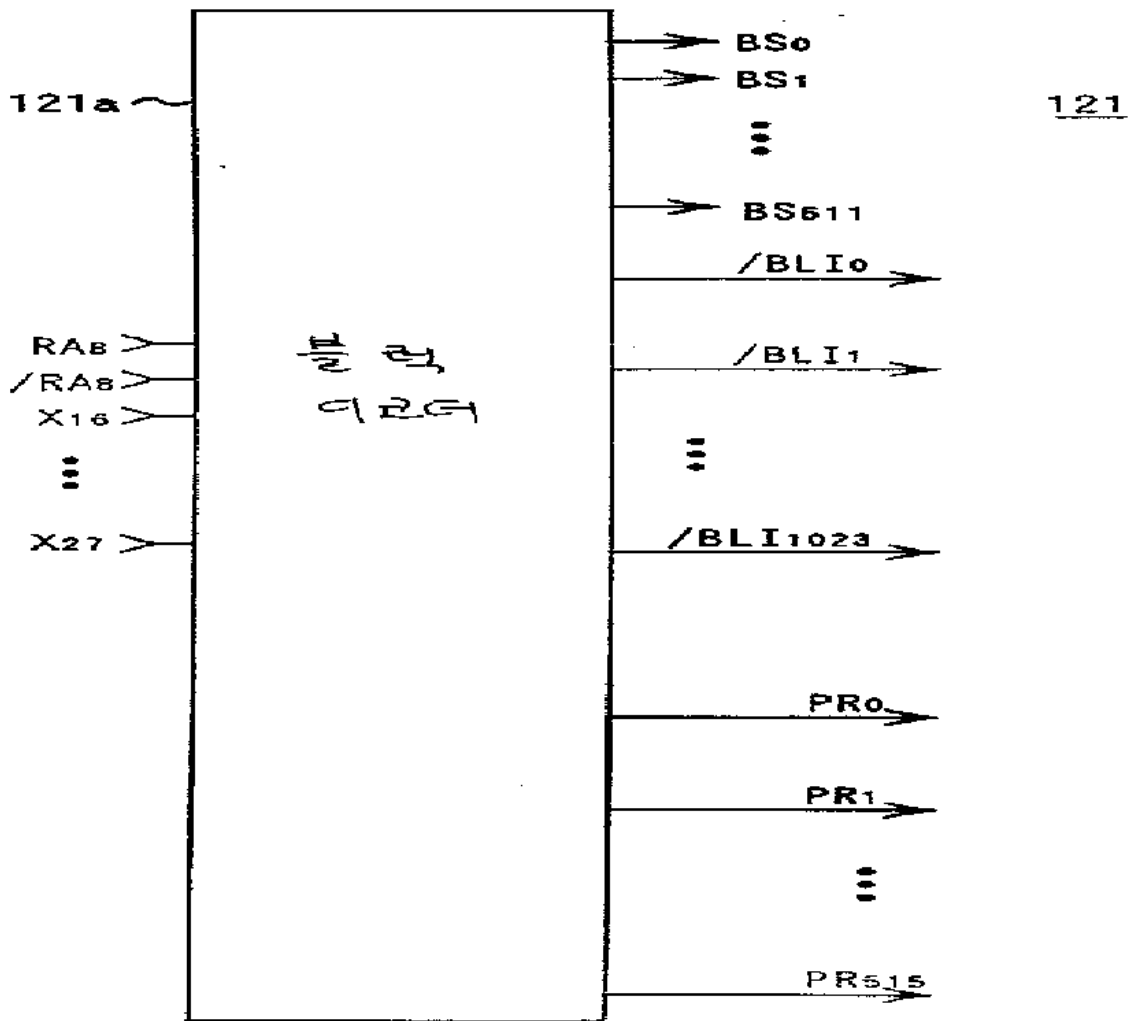
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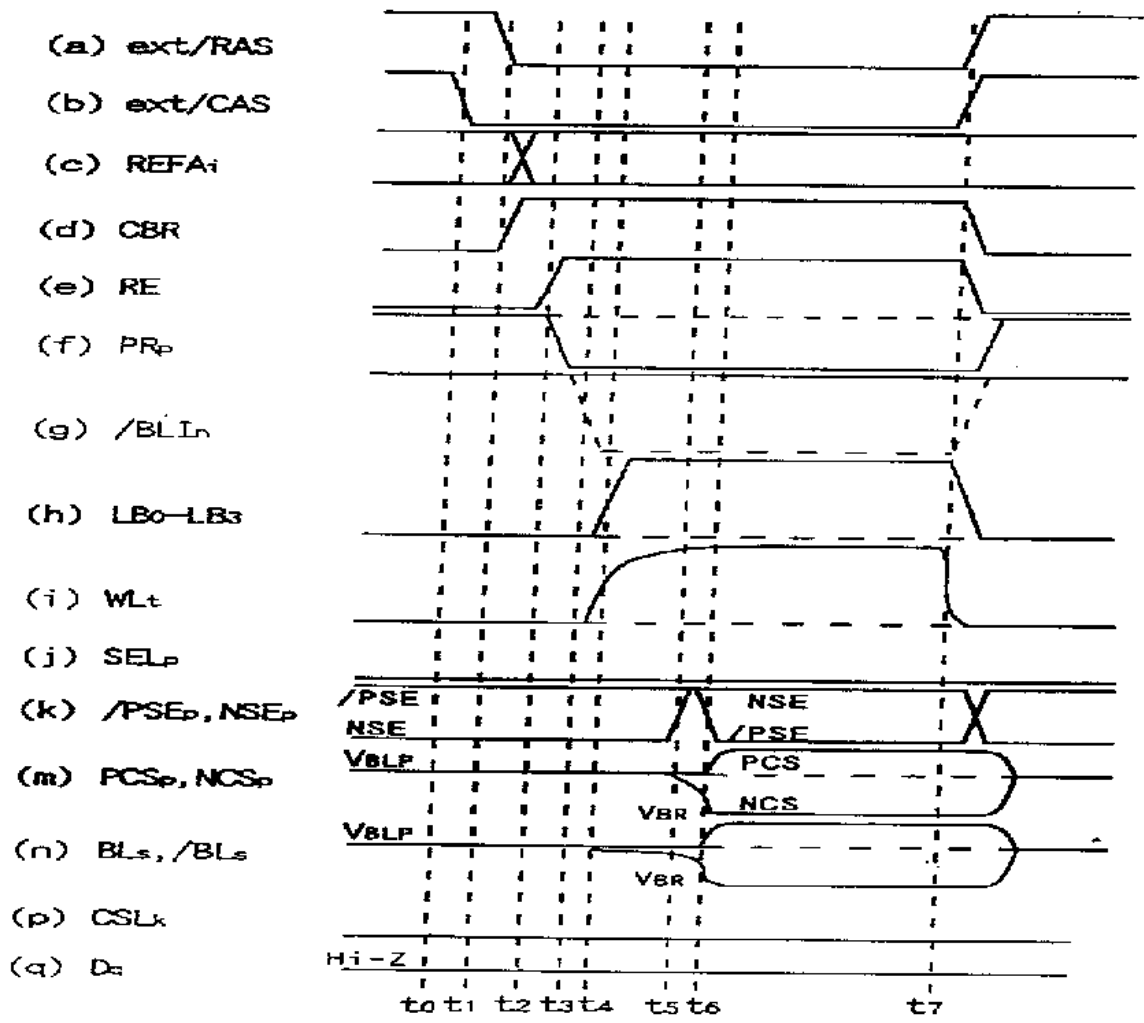


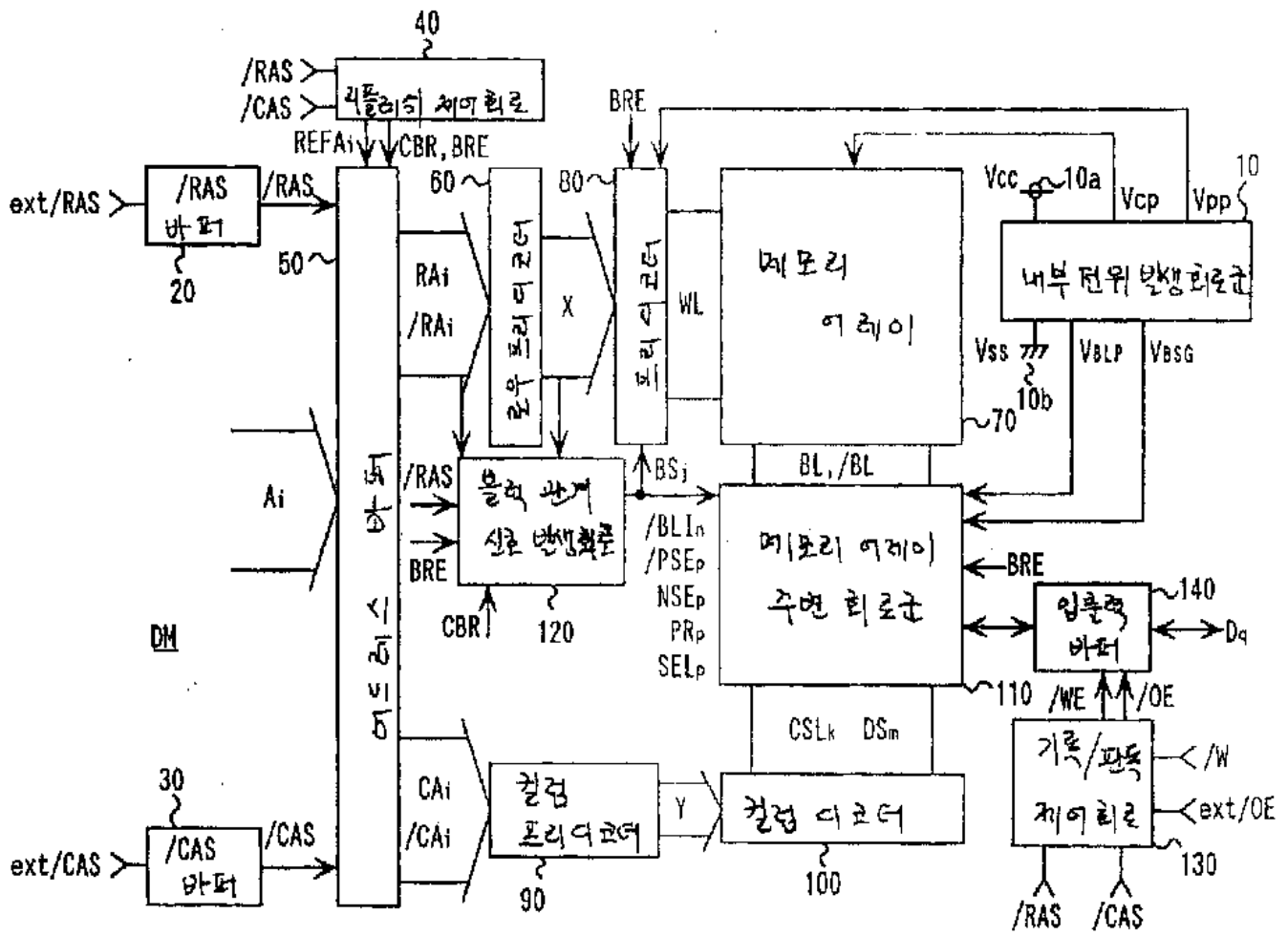




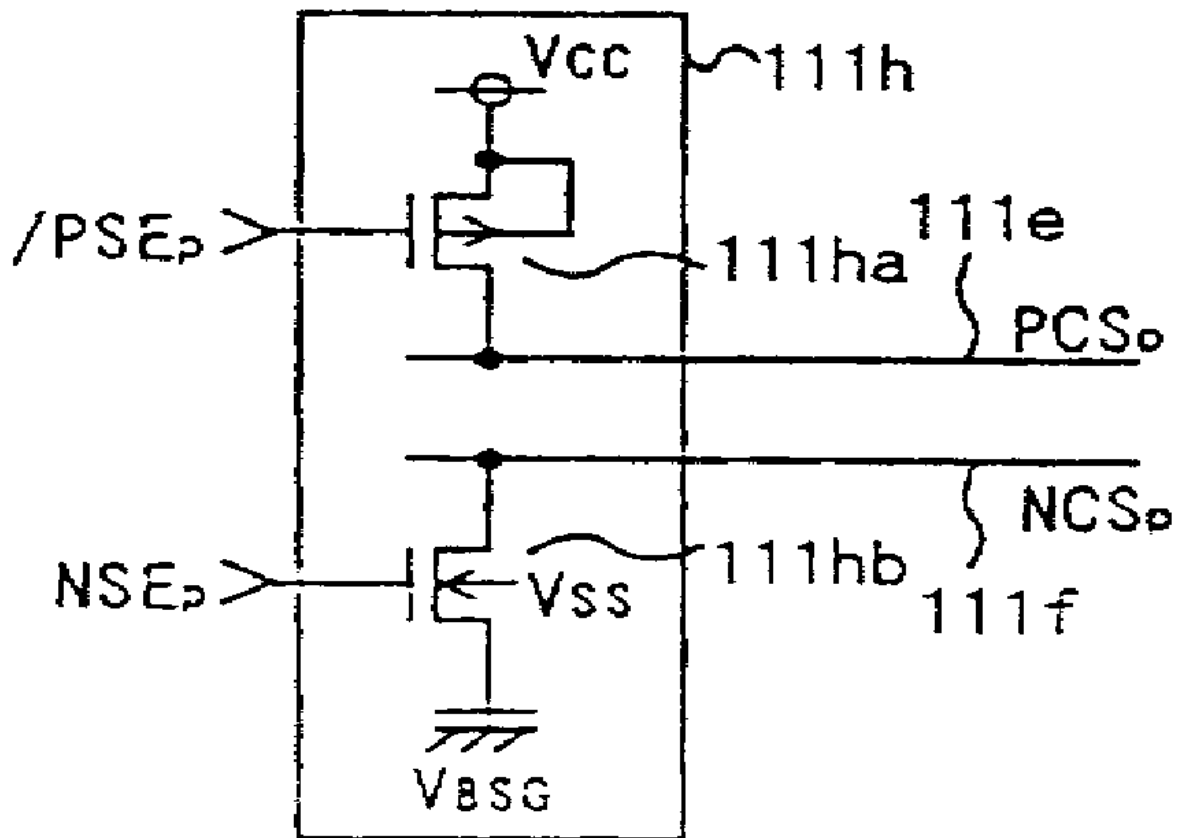


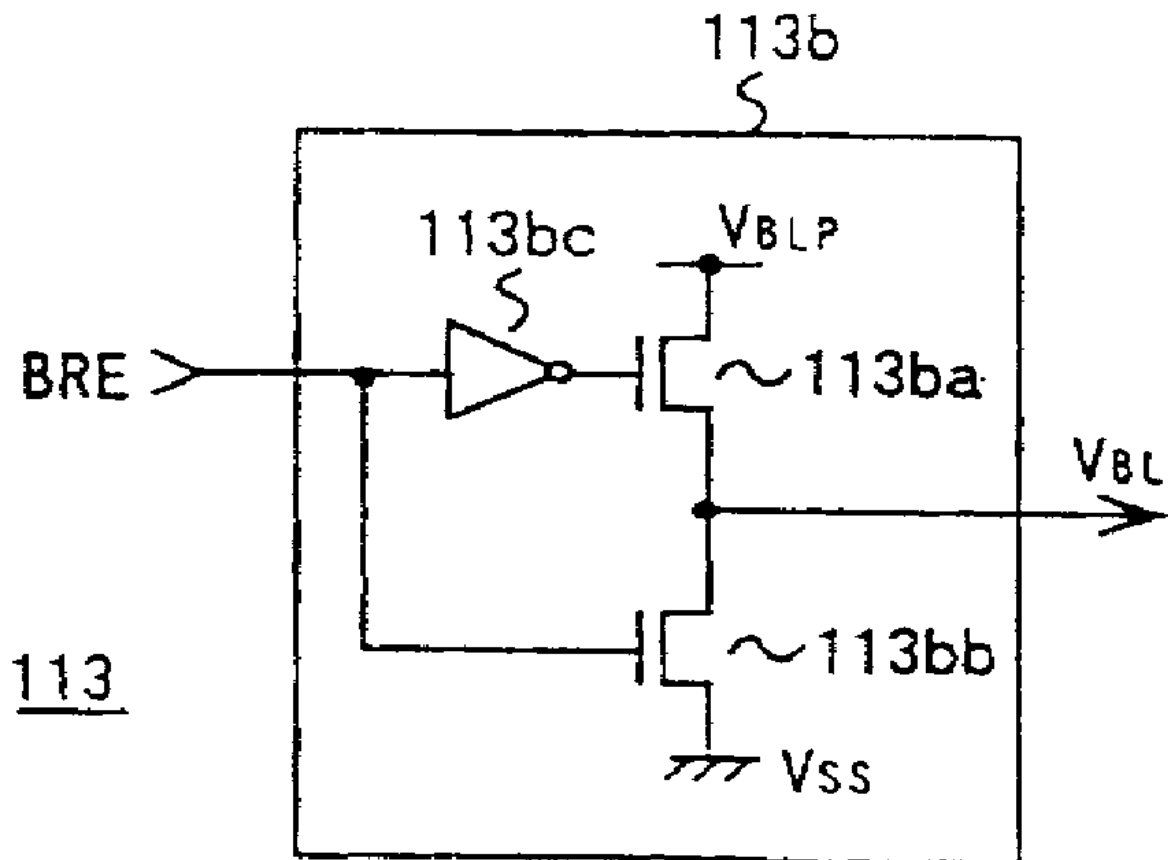


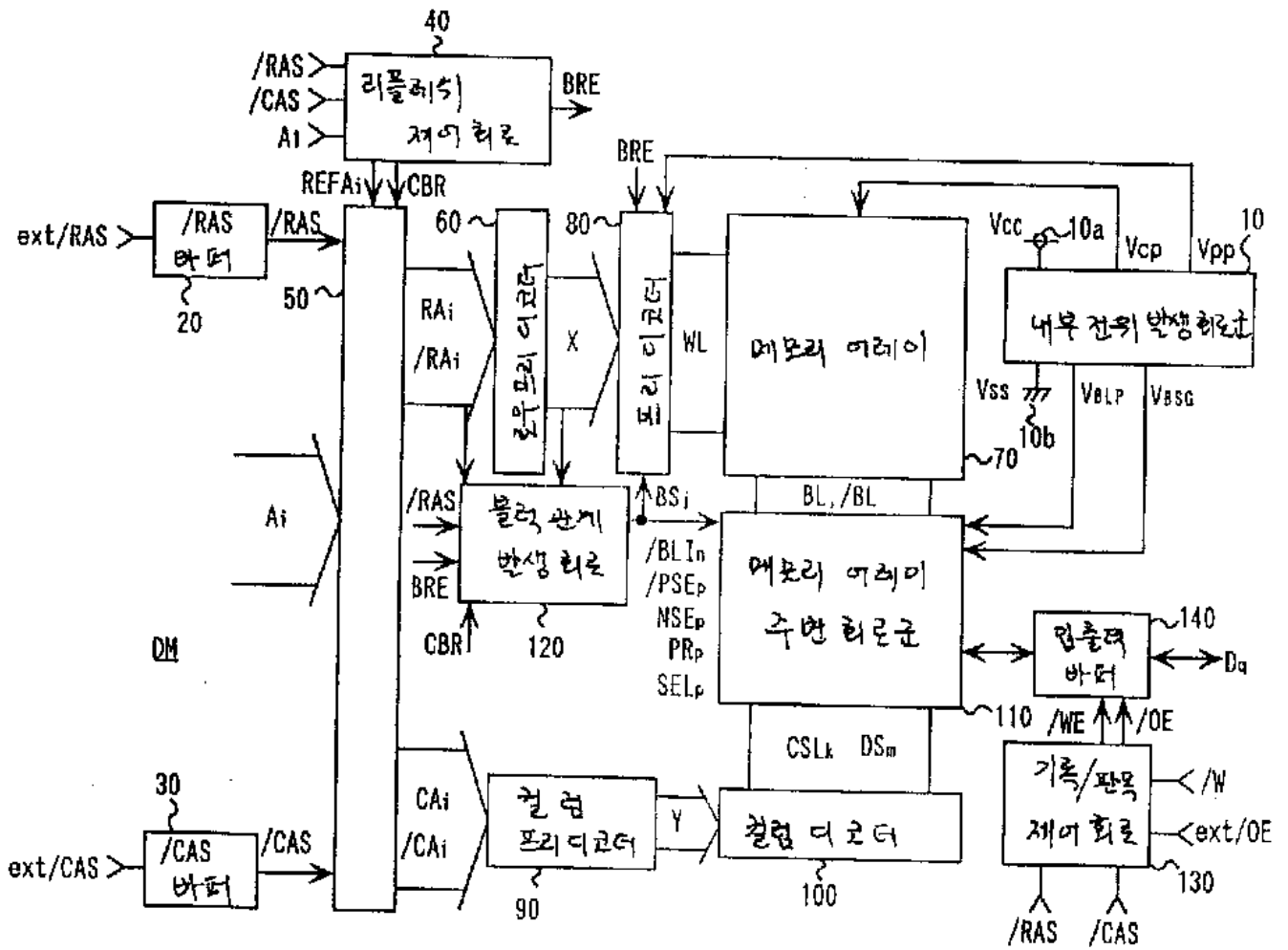


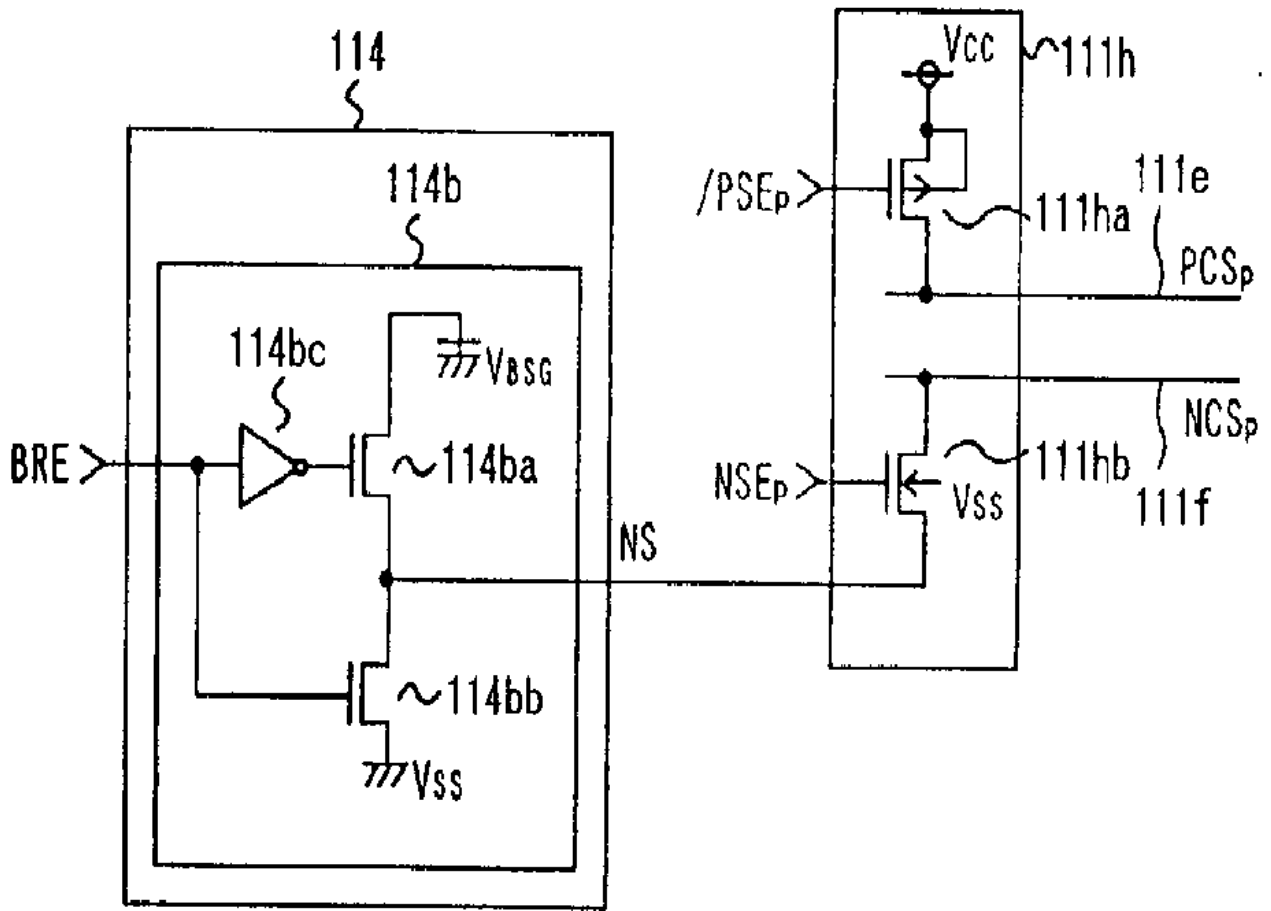


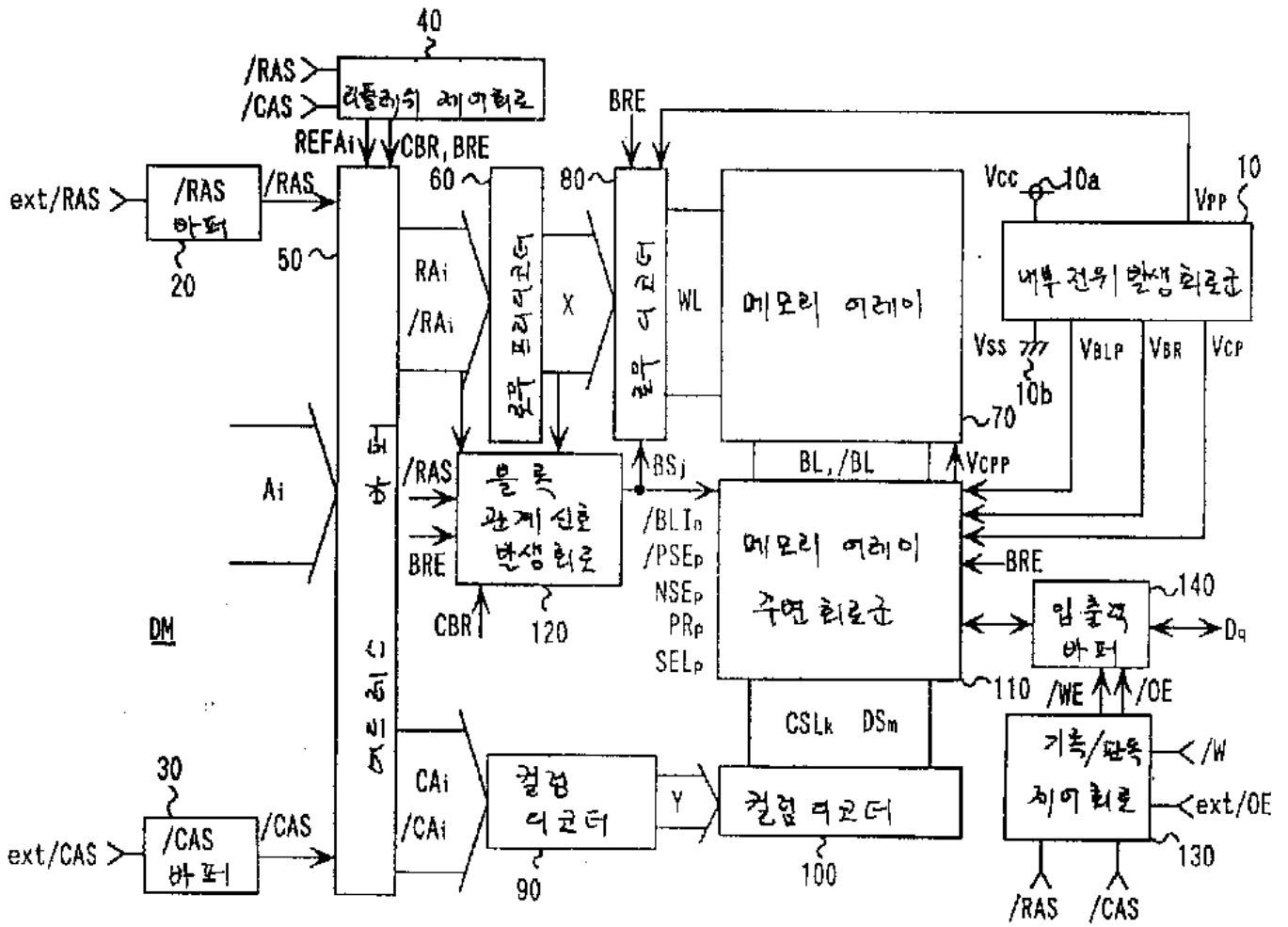
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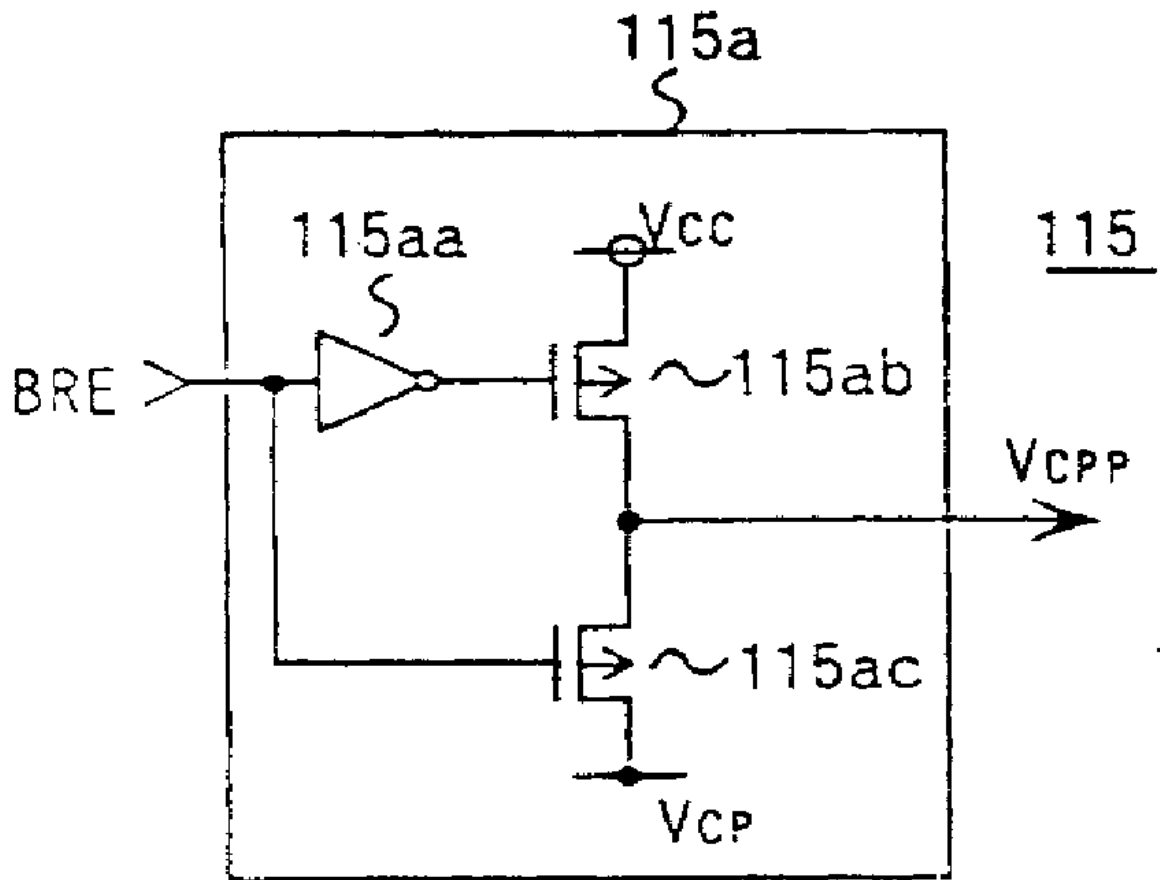


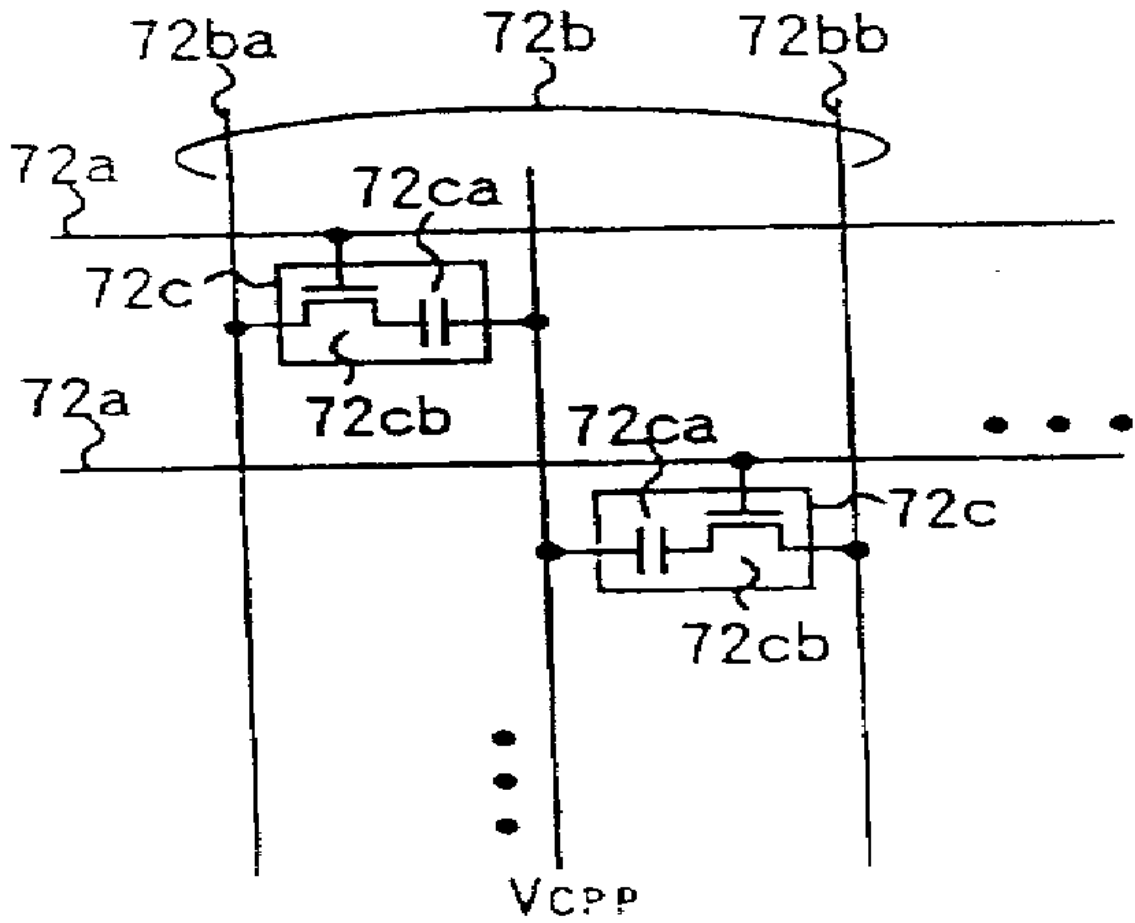


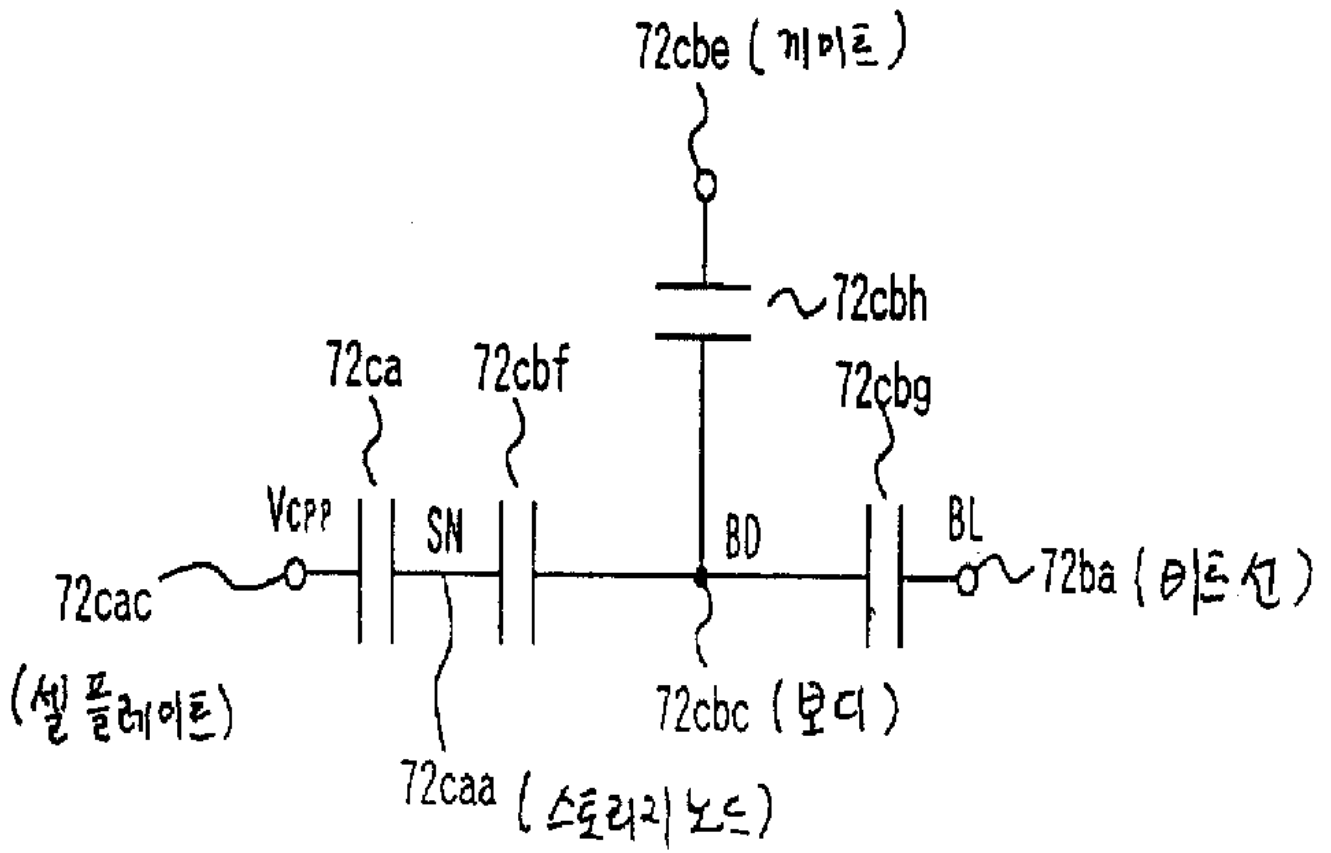




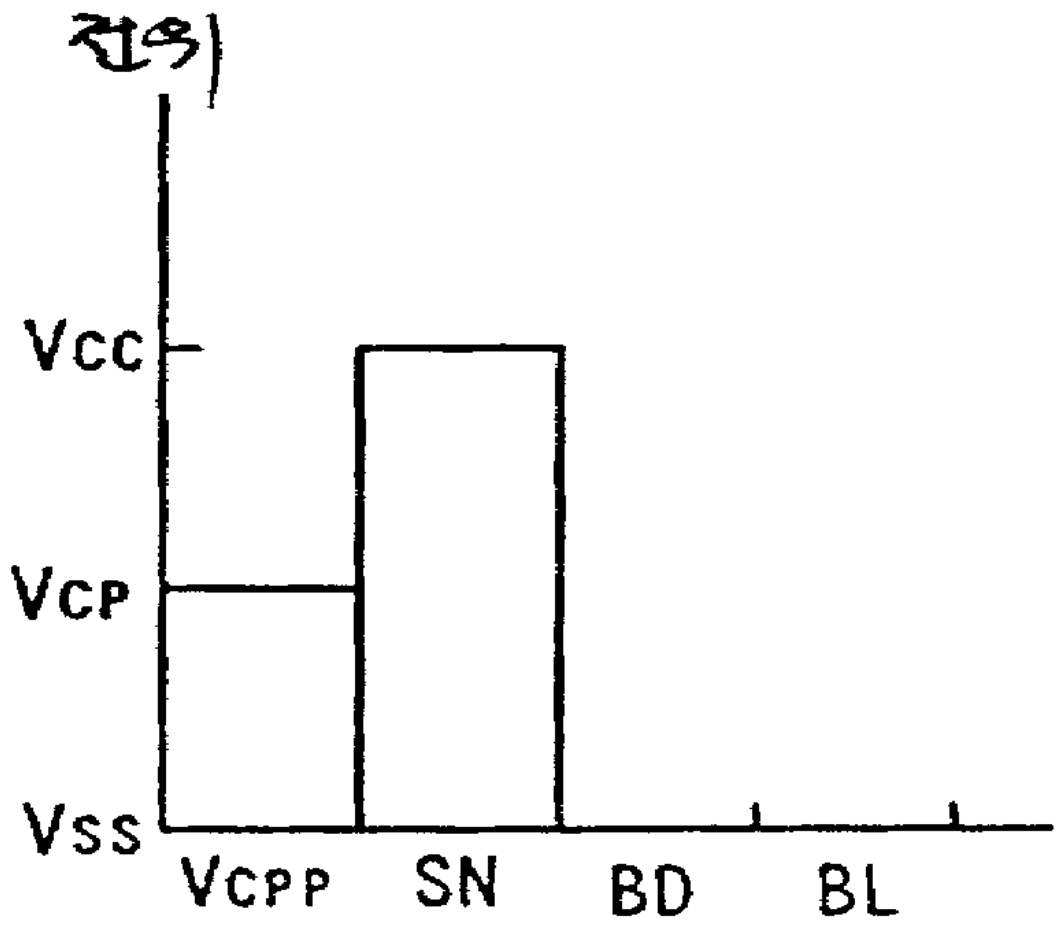
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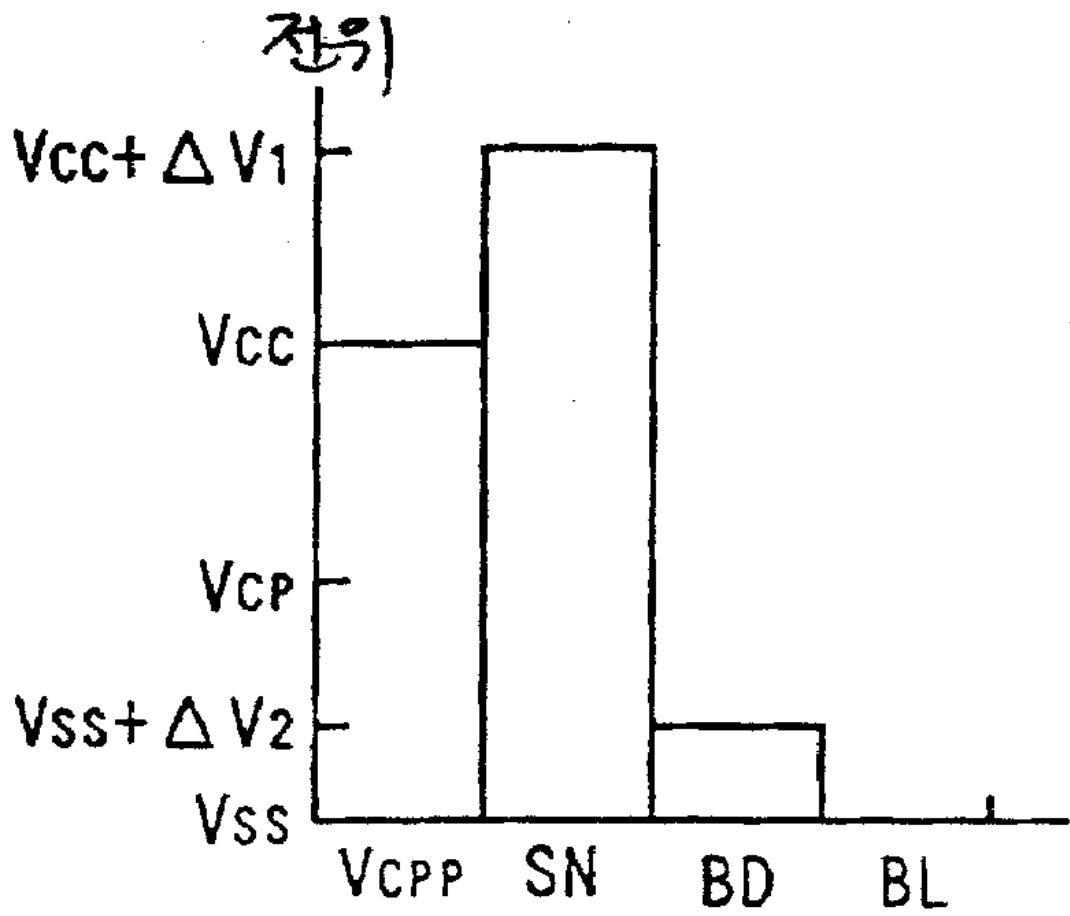




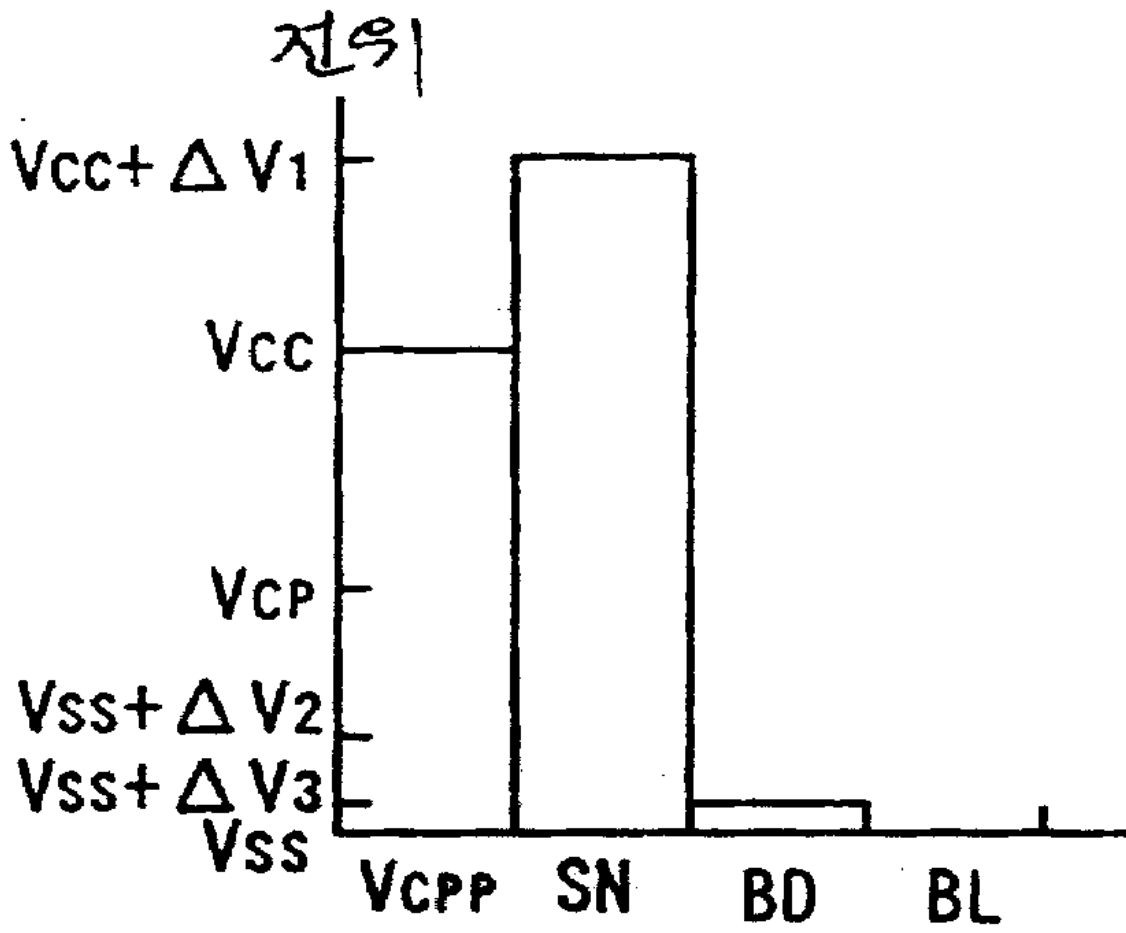
43a



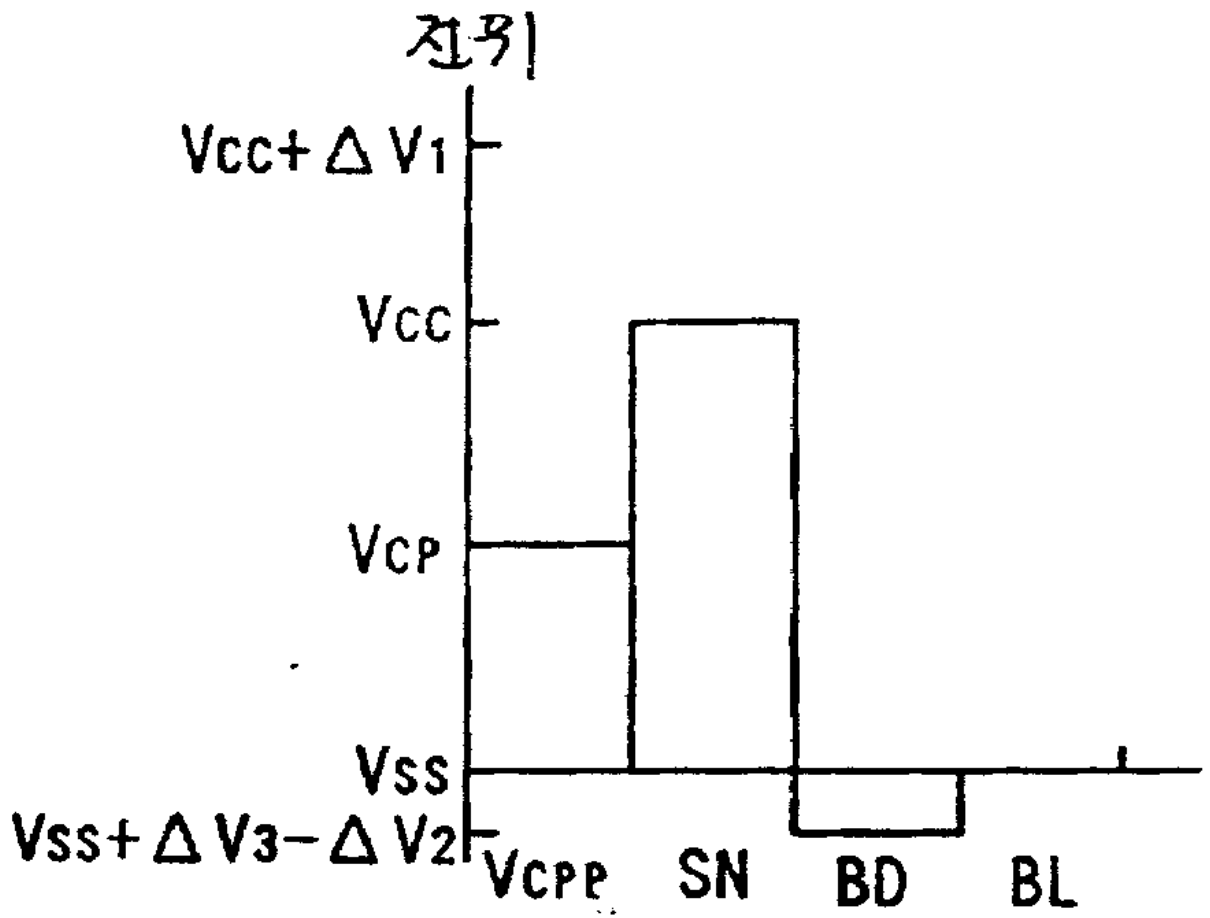
43b



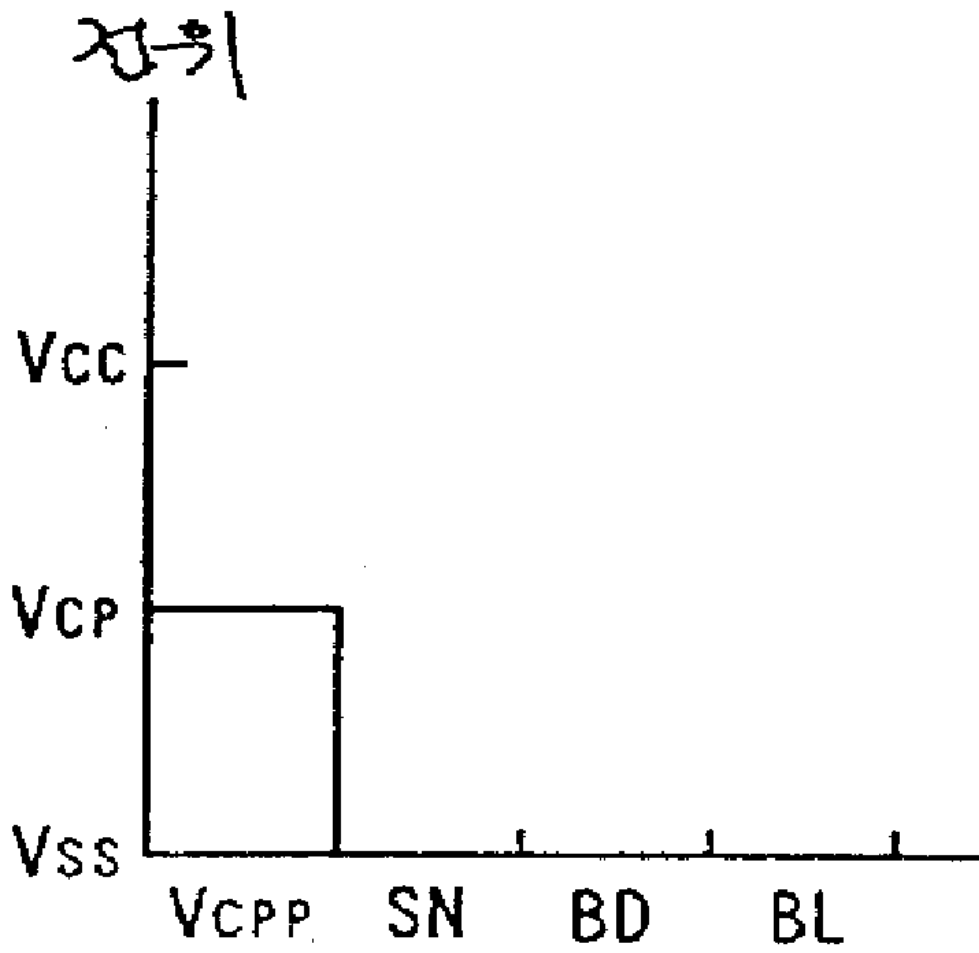
43c



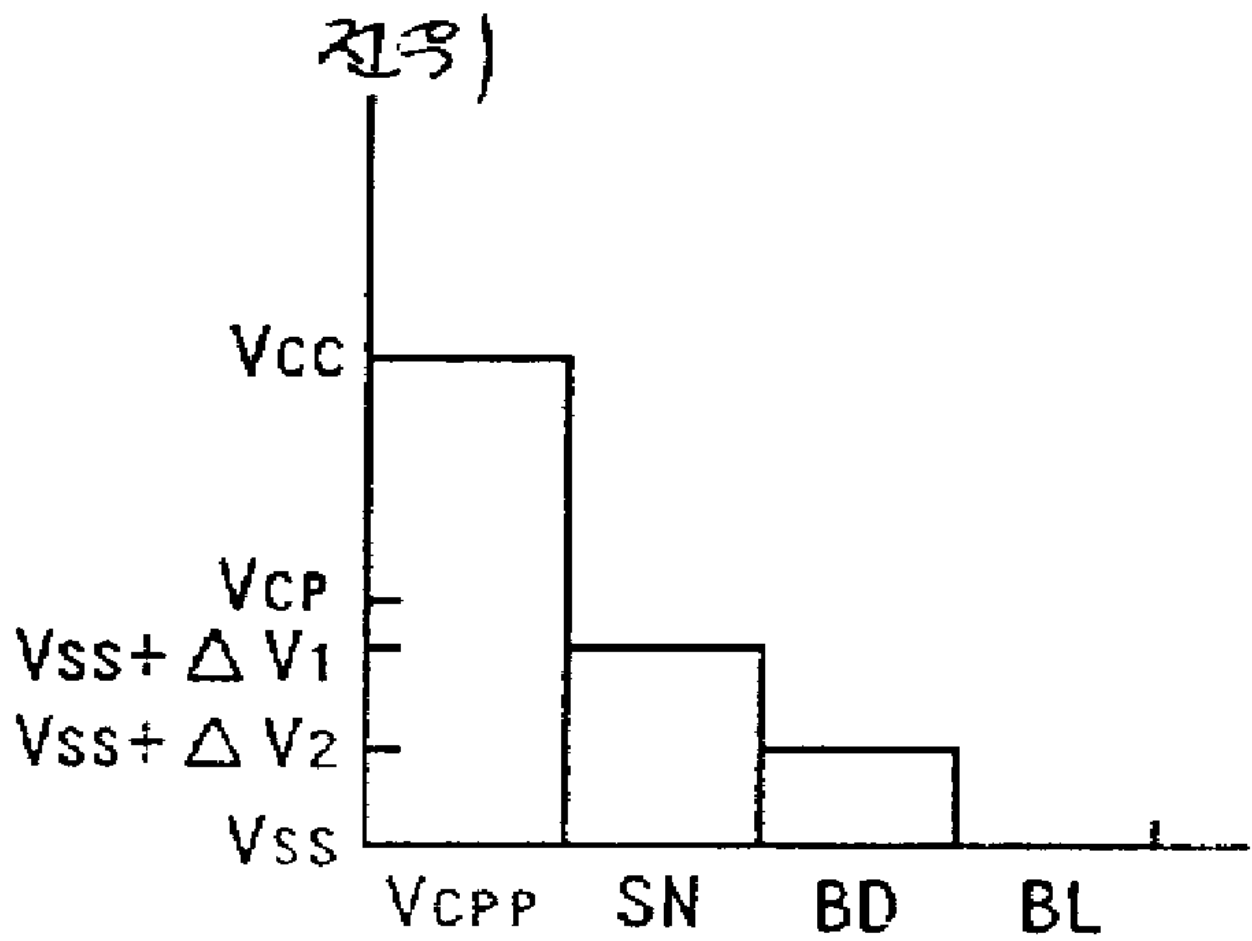
43d



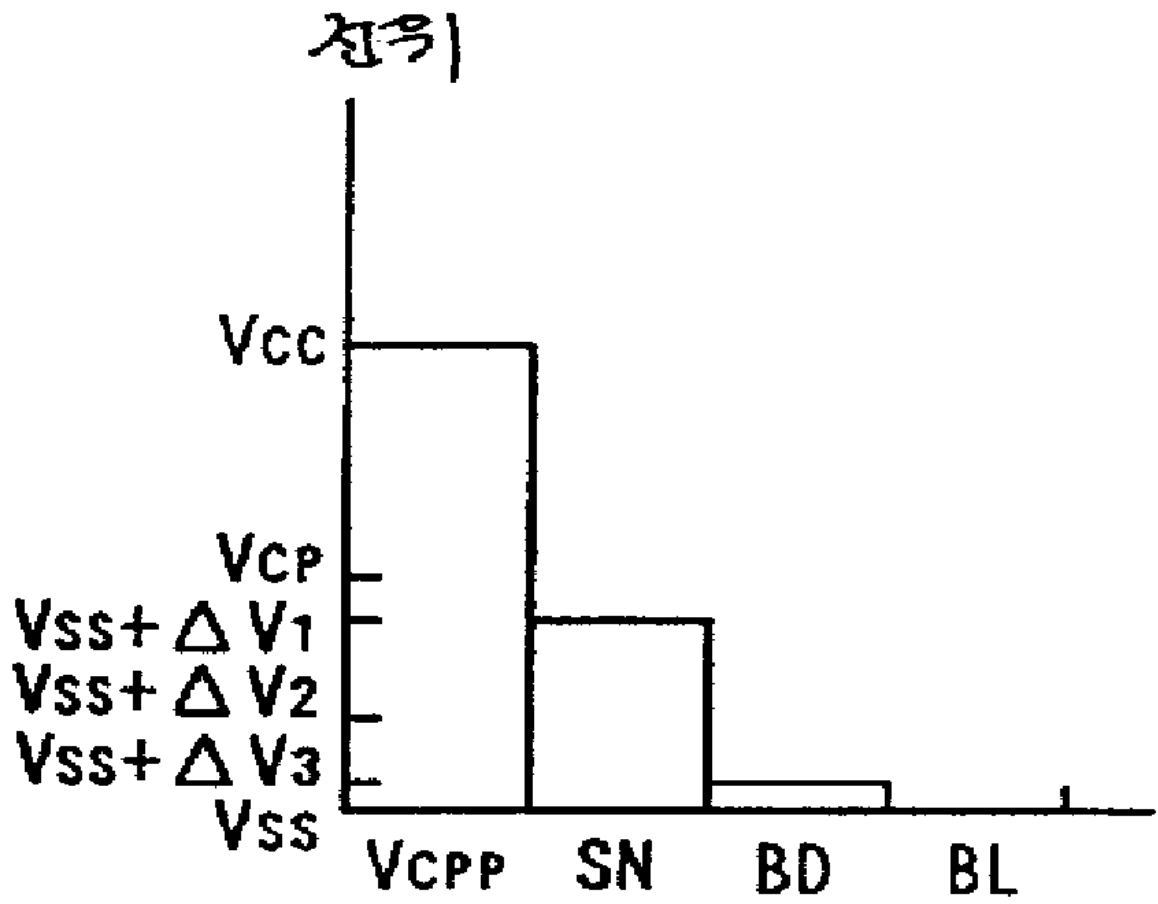
44a



44b

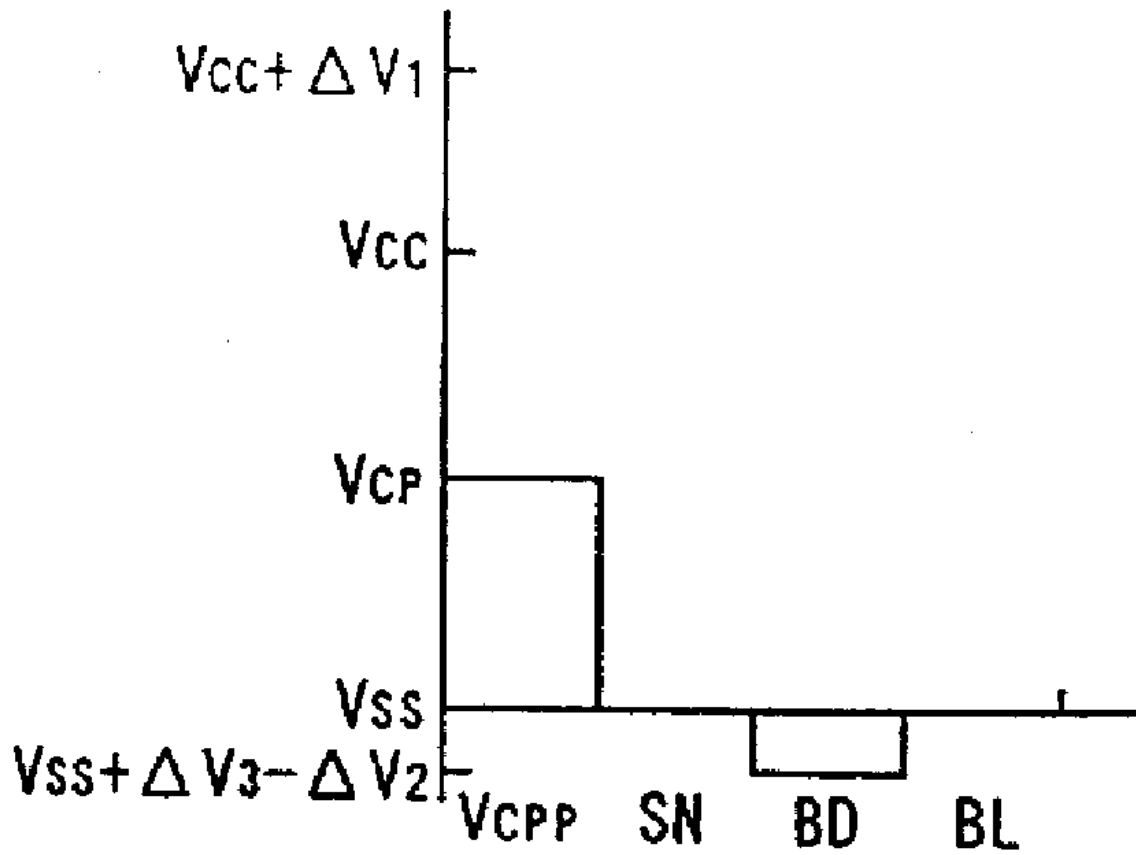


44c

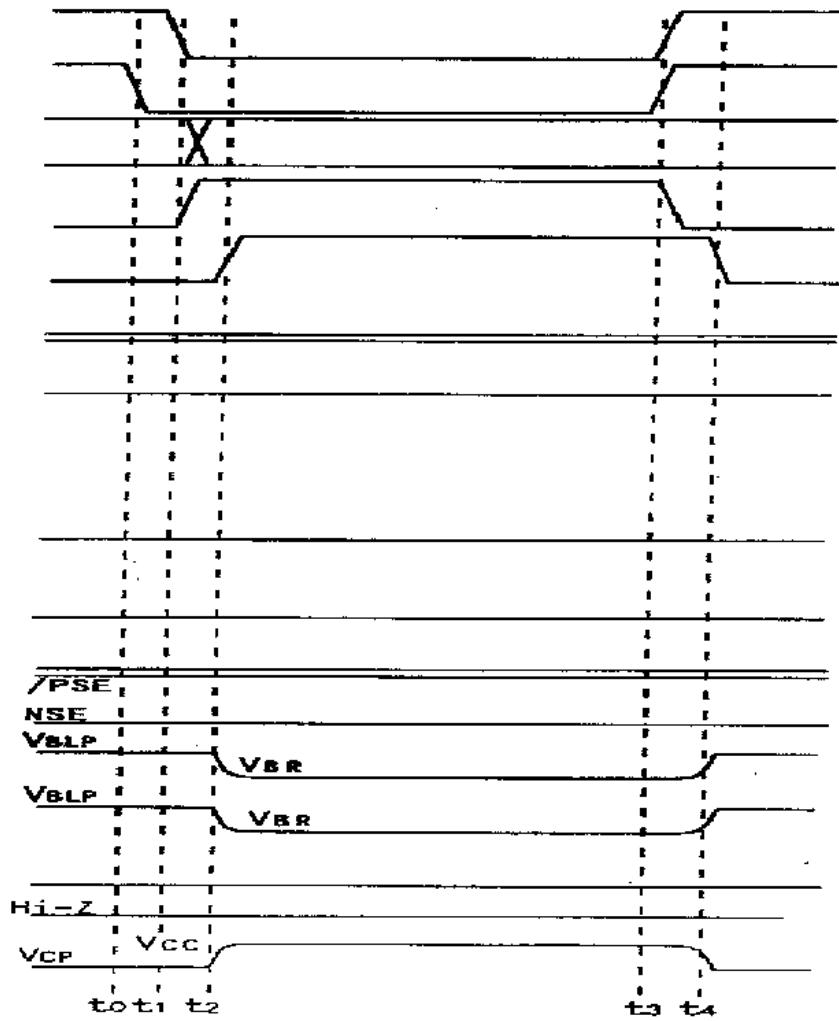


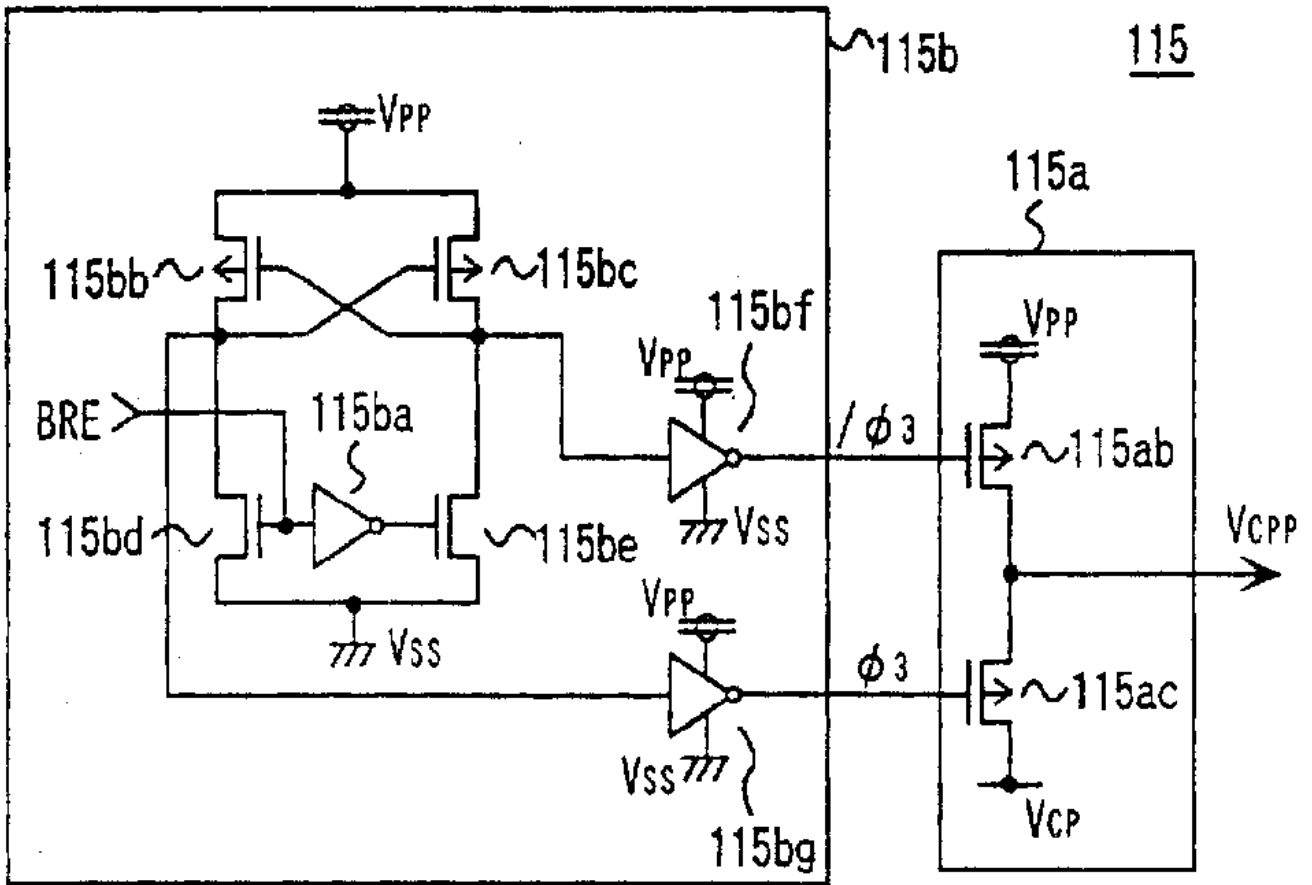
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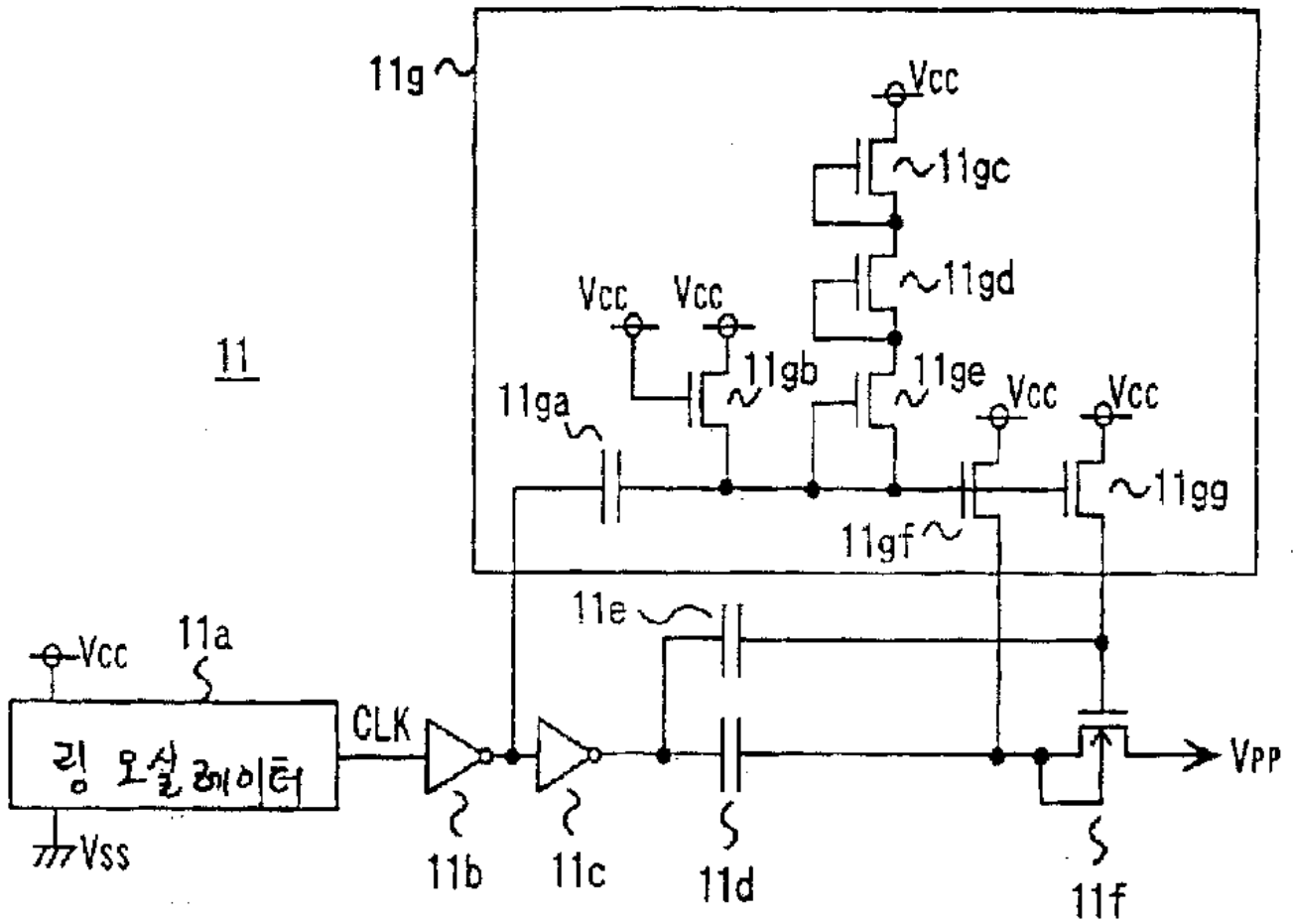
전위

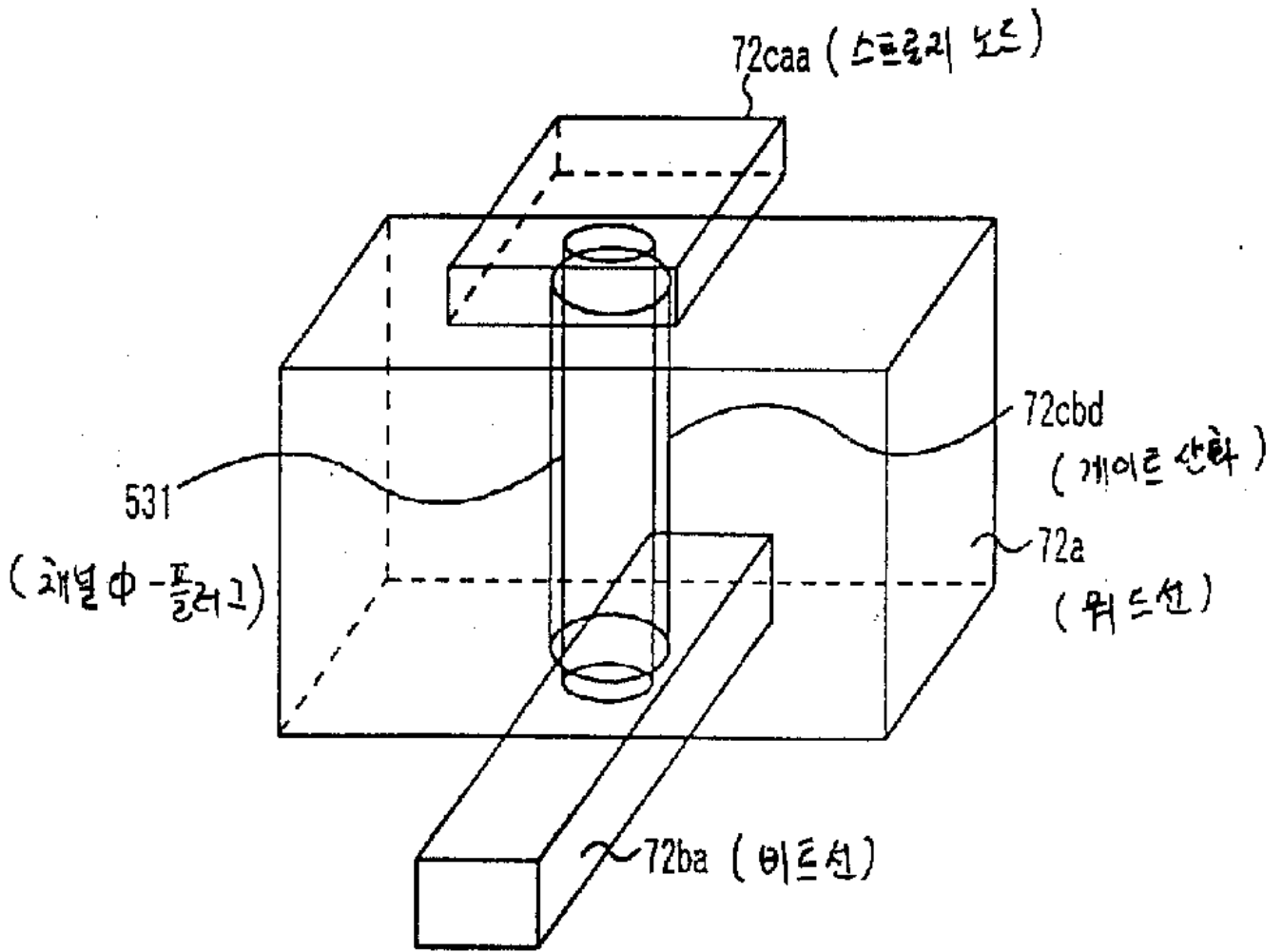


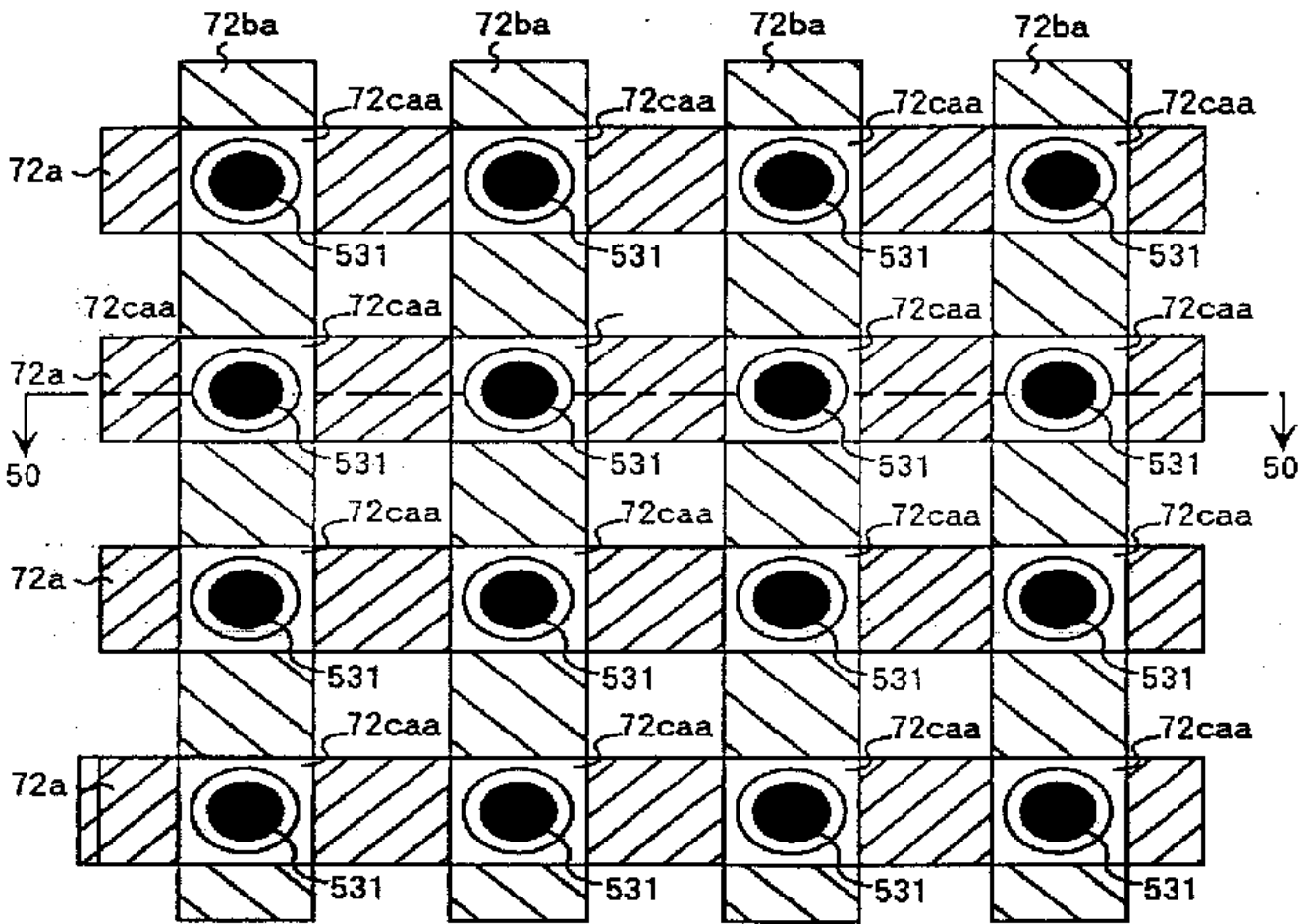
- (a) ext/RAS
- (b) ext/CAS
- (c) REFA_i
- (d) CBR
- (e) BRE
- (f) RE
- (g) PR_p
- (h) /BLIn
- (i) LBo-LB_s
- (j) WL_t
- (k) SEL_p
- (m) /PSE_p, NSE_p
- (n) PCS_p, NCS_p
- (p) BL_s, /BL_s
- (q) CSL_k
- (r) D_a
- (s) V_{CP}



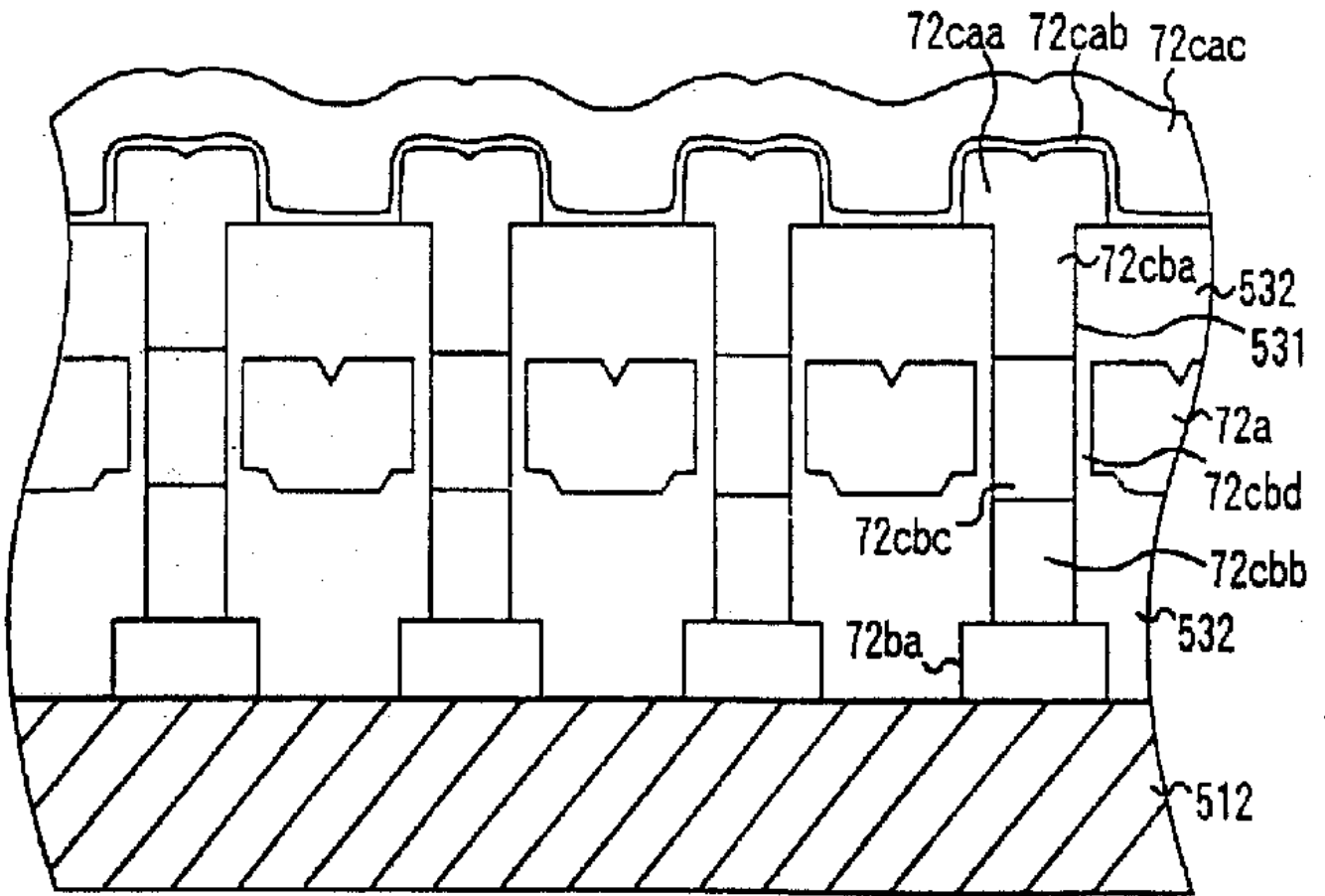




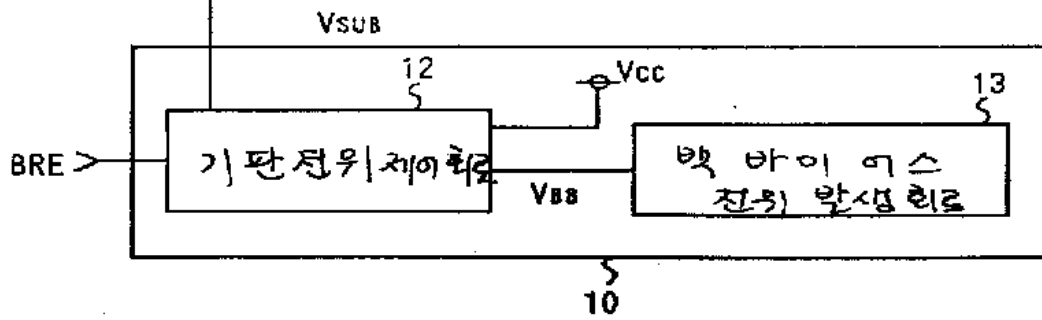
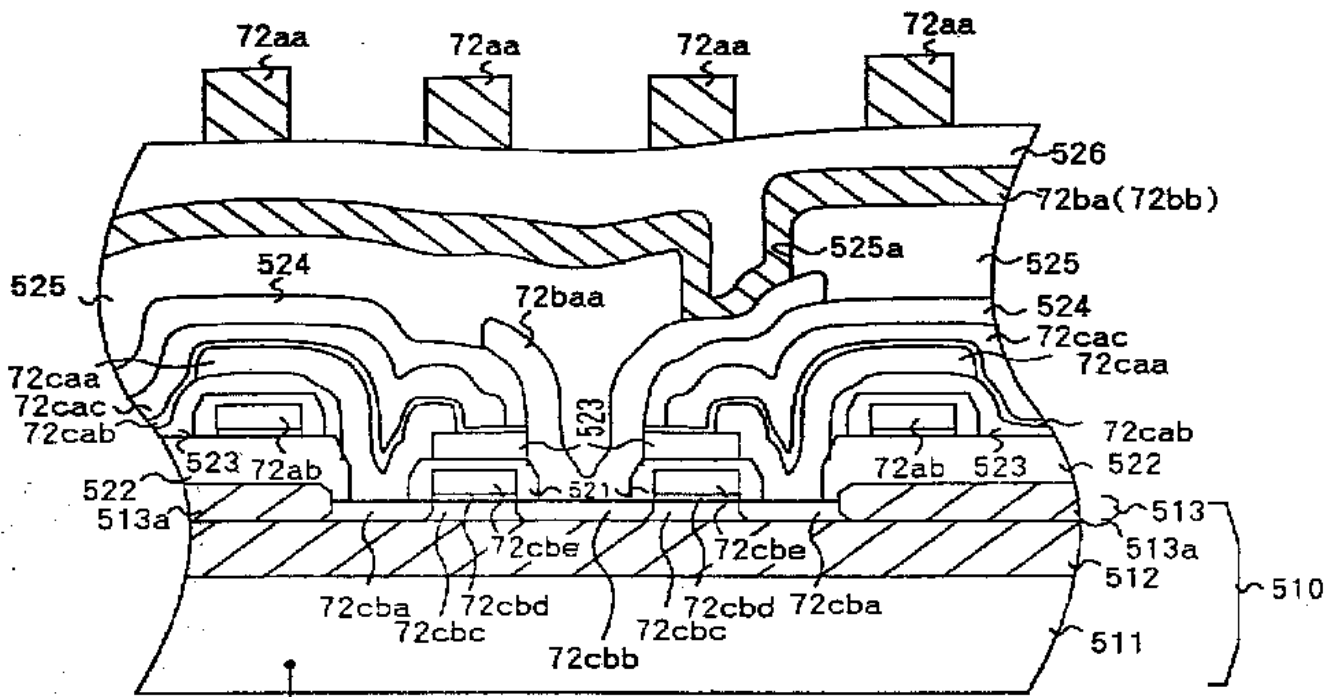


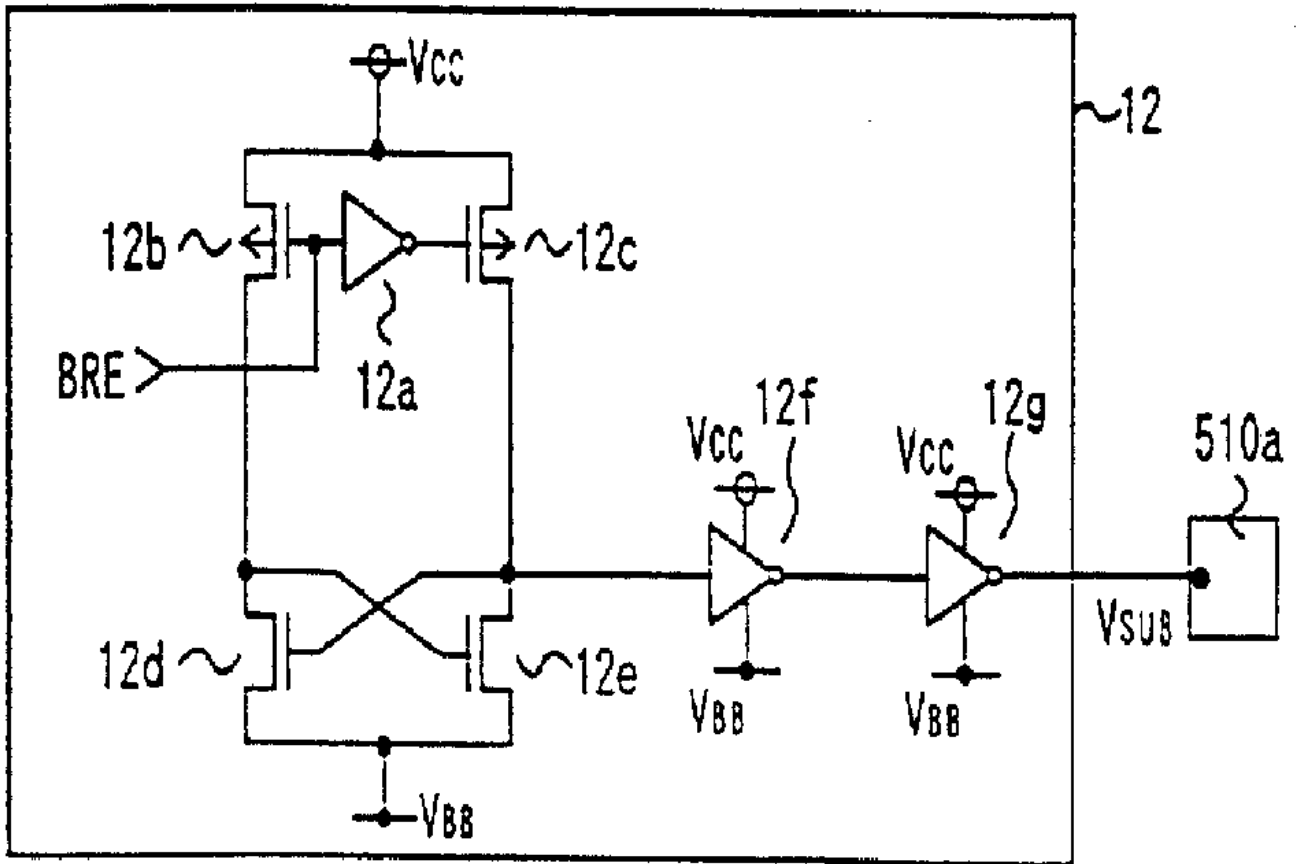


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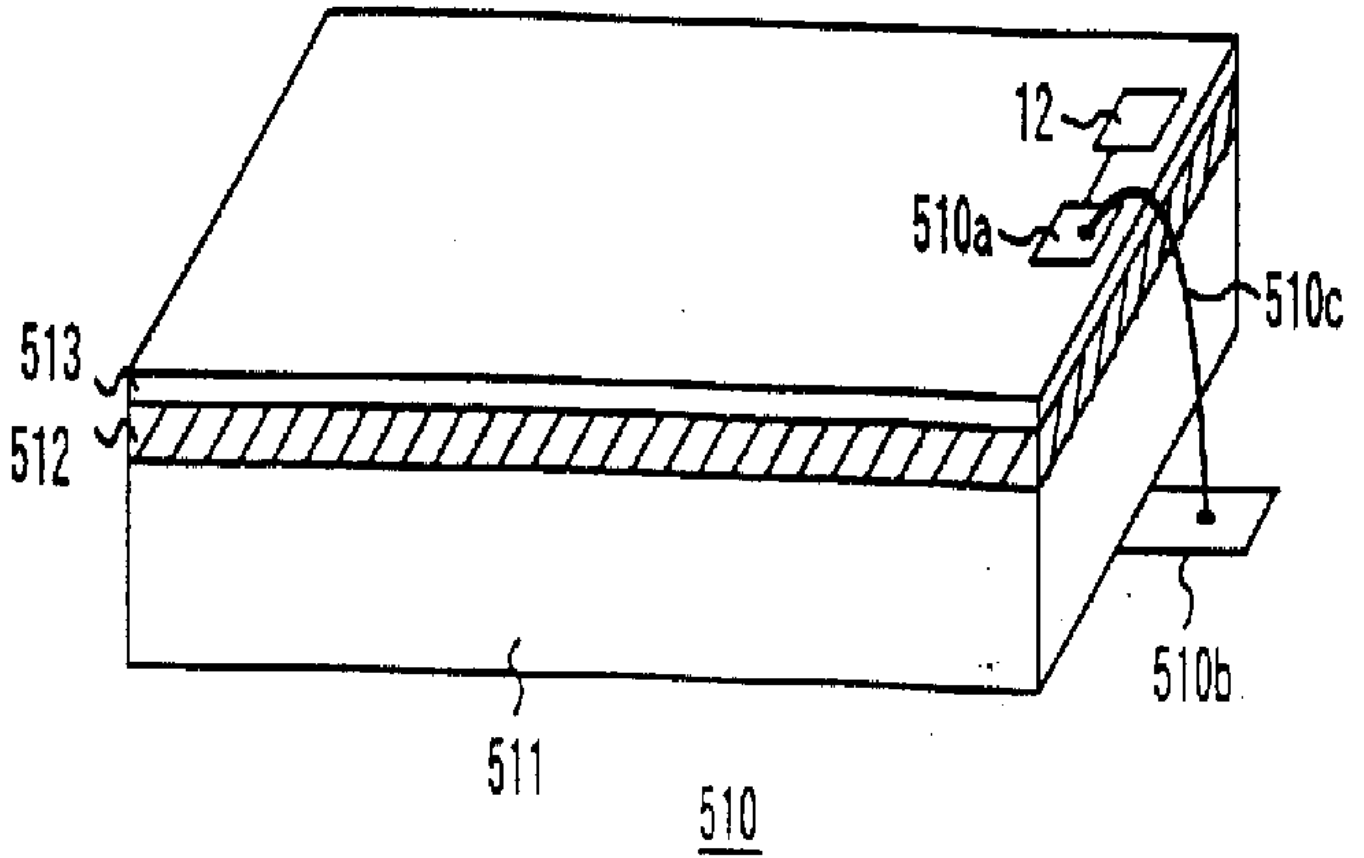


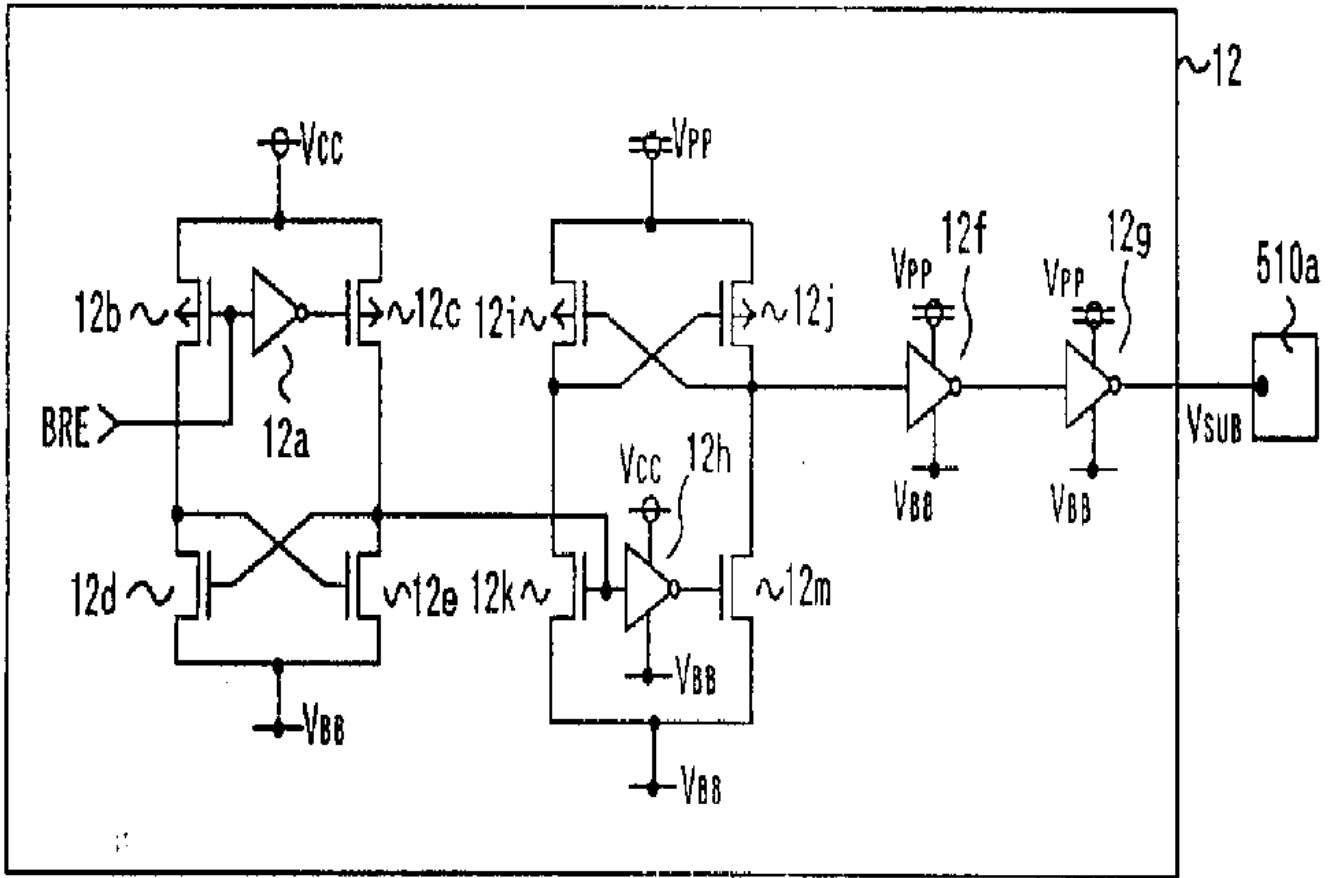
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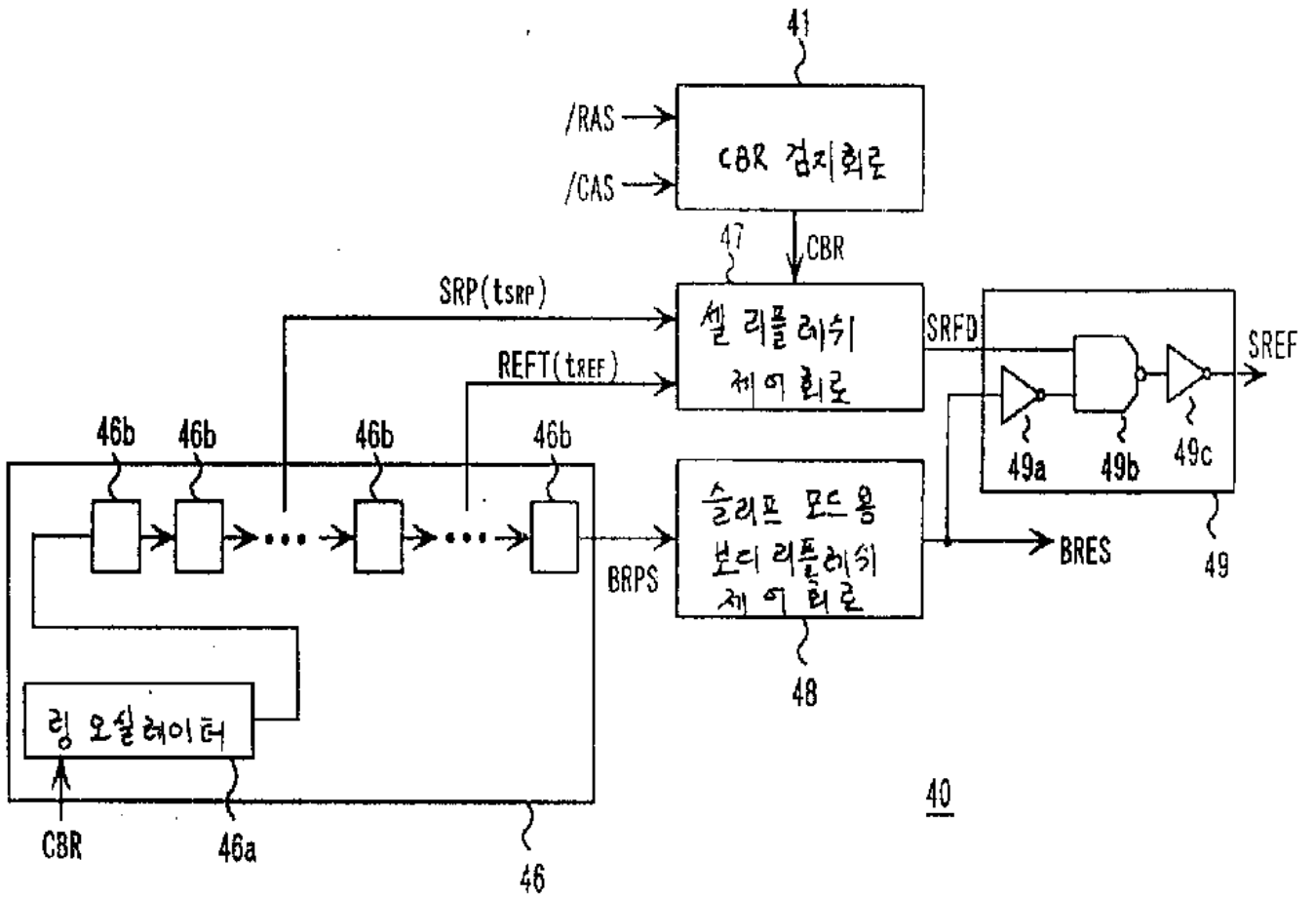




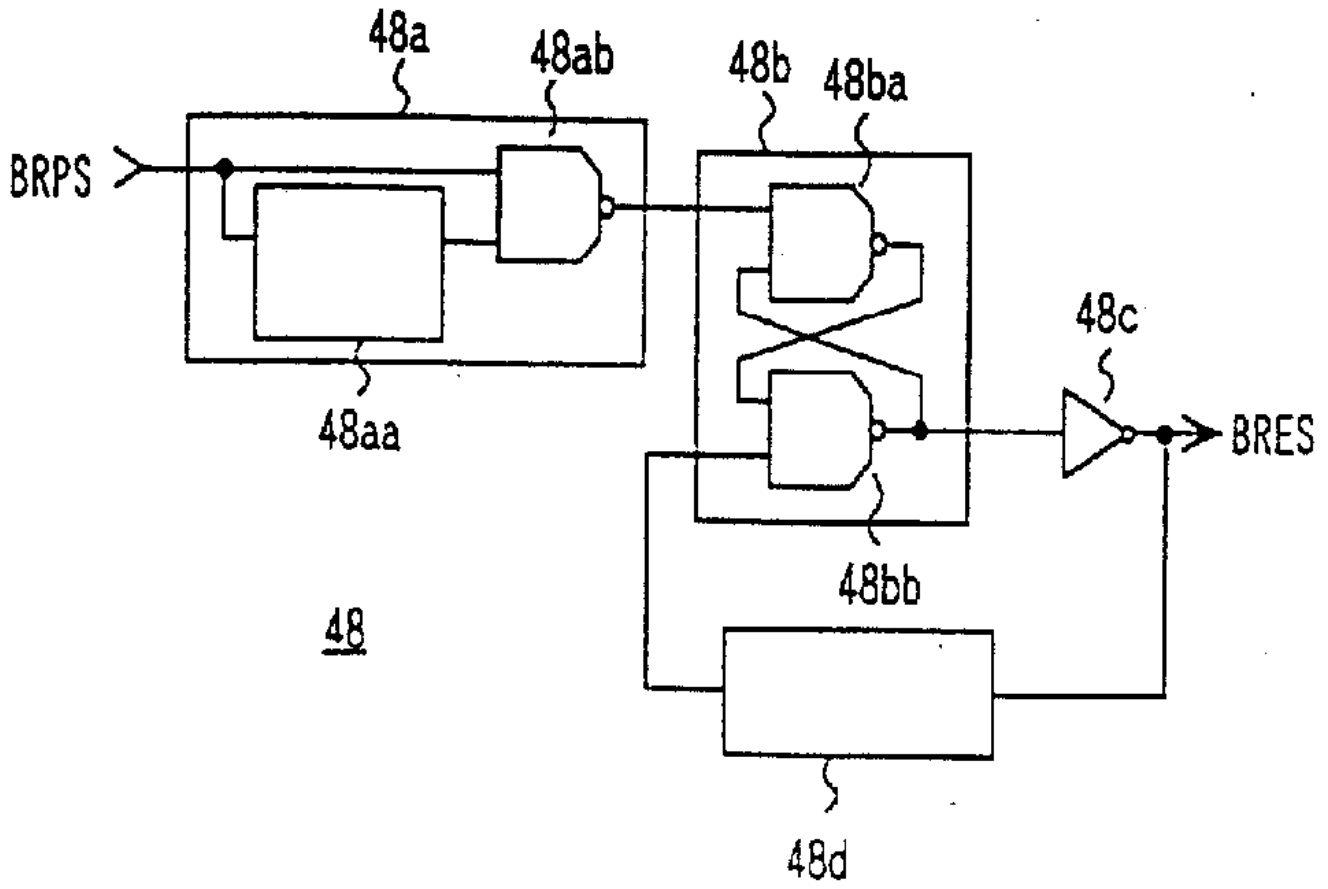
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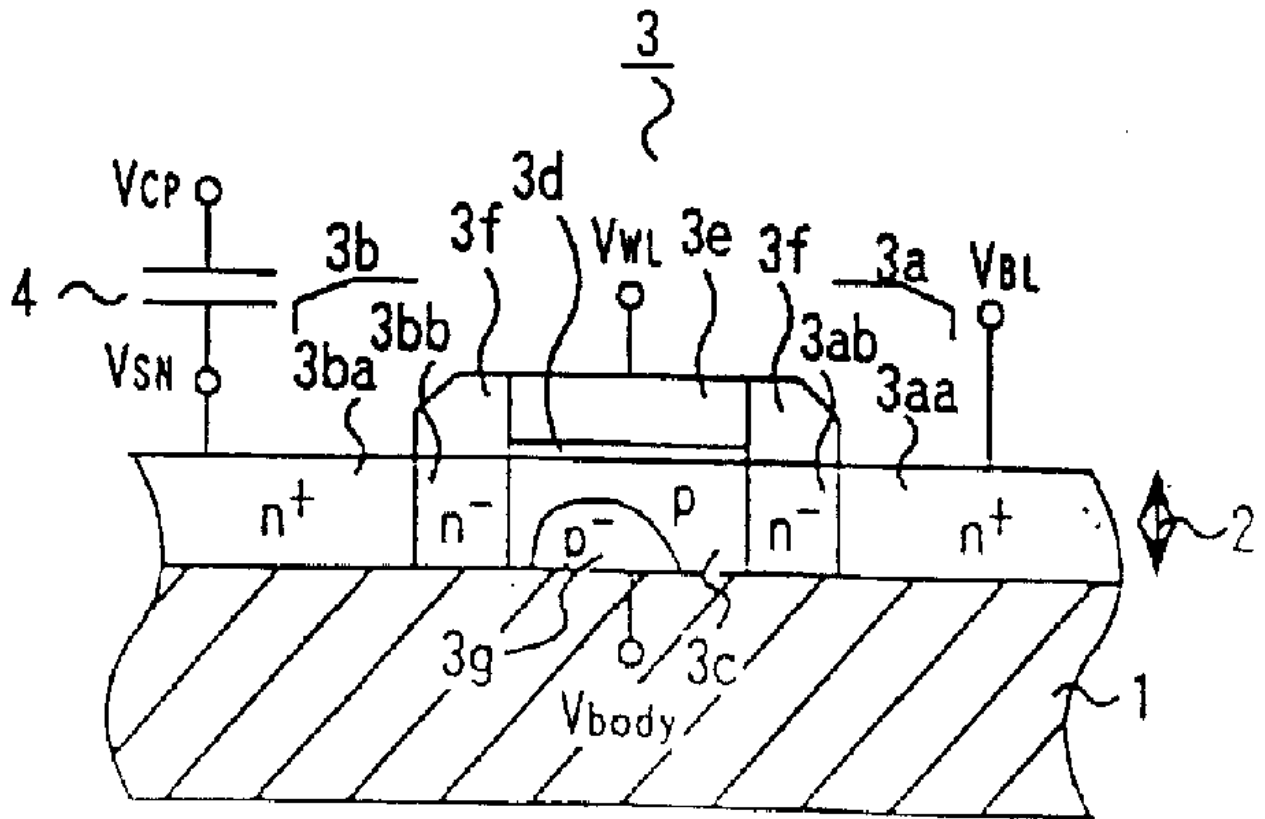






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