

(19)
(12)

(KR)
(B1)

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(72) 325 801

(74)

:

(54)

가 .

1 , 1

1 , 1

1 , 1

2 가 가 , 1 1

1 2 .

,

1 ,

2 .

2

1

2

3

4

5

6

p) (non - volatile memory device) , (charge pump

(data) (read), (write) (programming)
(Vcc) (20V)

istor; , ' .) (substrate) (memory cell trans
(source), (drain)
(gate polysilicon) , (floating gate)가
(a gate insulting film), (control gate)가

cc) 가 , , (0V) , (V
(threshold level) 가 (Fowler - Nordheim tunneling)

가

가

가 .

1 (row address) (row decoder) (unit decoder

; ' ' .)

(bit line) 1 () 가

2 () (string)'

.) (NAND) EEPROM(electrically erasable and programmable read - only memo

ry; 'EEPROM' .)

1 (10) (1), (M1), (7),

(WLEN) (M6 - M7)

(string select line; 'SSL' .)

가 SSL (GND) 가 M4, M5, (ground select lin

e; 'GSL' ,) M8 .

(1) (Add)

(decoding) , (Add) (10)가 , N1 (Add)

(Vcc) , (10)가 N1 GND(0V)가

N1 (M1) (depletion) NMOS , (nBLKSHF)

N2

(7) N2 M2 M3가 - ()

(Vcc) (Vpp) N2 .

WLEN[0 : n] (word line driver;) , WLEN[0 : n] (V

cc) (M6 - M7) N2

- WLEN[0 : n] (word line; WL[0] - WL[n]) .

가 , 가 (layou

t)

(7) (Vpp) 가 (C)

(7)

(7)

가 ,

, 1 , 1 , 2 .

1 1 , 1 2
1 2 가 1 . 2
2 1 2 가 1 .

1 1 1 , 가 1 , 2
MOS .

OS S , 1 가 2 가 1 1 , 2 1 1M
1 2 MOS 1 , 2 1MO

, 1 2 .

1 , 2 2

1 1 , 2 , 2 1 . 1
1 1 1 가

2 1 가 1
가 .

1 1 1 , /
1 1 1 2 2 1 ,
1 2 2

1 , 1 2 , 2 / 1

2 (20A) 1 (N15), 1 (19A), 2 (M17 - M18) 2 (11) (20A)가 M16, M15, M18, SSL (Vss) (19A) (Vcc) (Vpp) N11, (GSi) N13, N15 (19A) M14 11, 가 13, 가 15 MO (GSi) (Add) (20A)가 (20A)가 (Vpp) N15 (Vcc) (turn - on) (Vcc) (M17 - M18) N15 (word line enable signal; 'W LEN[0 : n]' (word line) WL[0] - WL[n] (M17 - M18) NMOS (M17 - M18) NMOS (M17, M18) N15 (word line) WL[0] - WL[n] (11) 1 (12), 2 (13), 3 (15) NMOS (M12) (12) (Add) (20A) (20A)가 Addsel (20A) (Addsel) (13) Addsel Addsel (SEL) (Add) (20A)가 (20A)가 2 (SEL) (20A) (Add) (Add) (20A) 3 (ALLSEL) (Add) (11) 2 (13) (NAND) , ALLSEL가 (Add) 2 (SEL)가

2 ALLSEL (' ') Addsel (' ')
 (SEL)가 .

3 (15) , 2 (SEL) 2 (SEL) NMOS
 M12 (SEL)가 NMOS M12 -
 N15 (GND) (discharge) .

1 (GSi)가 N15가 , 1 (SEL)가 , N
 MOS M12 - N15 GND 1 (SEL)가
 D) 가 (15) NMOS M15가 , SSL (Vss GN
 (17) 1 (19A) N15 가 (Vpp)
 15 MOS (17) M13 N11 , 가 N15 , 가 N
 , MOS (17) 가 MOS

(M11) (ERSEN) 2 (SEL)가 N15
 가 , 가 (M11) 2 (13) (ERSEN)
 M11 (depletion N - type MOS transistor)

(ERSEN) (erasing of data) (' ') ,
 (' ') (SEL) N15 1 (SEL)가 N15 ,

3
 3 , (20A, 20B 20C), 1 (3
 1), 2 (33) (Address decoder) GSL (35), SSL (37)
 SSLGND (39) .

1 (31) (Add0) 1/N; N N=16 가 .)
 ((GSi)

1 (31) (20A, 20B, 20
 C)가 가 , (20A, 20B, 20C) GSi ,
 () GSi .

2 (33) (Add1) N (N=16 .) ()
 WELN[0 : n] (20A, 20B, 20C) .

GSL (35) GSL (Vpp) ,
 (Vcc) , (GND)) (20A, 20B, 20C)

SSL (37) SSL (Vcc)
 (20A, 20B, 20C) , SSLGND (39) SSL .

(Vpp) (Vcc)

- 12V) (20A, 20B 20C) (12V) , (

6 . 2, 3 6 .

1 (31) (Add0) (decoding) 1

/16 (20A, 20B, 20C) (20A, 20B, 20C) 1 (GSi)

1 (31) (20A, 20B, 20C)가 , (20A, 20B, 20C)

GSi(SEL) (Vpgm) .

1 (31) () GSi(Unsel) GND

, (20A, 20B, 20C) GSi(SEL) N13 (Vpgm)가 가

, M14가 - . , N15 (Vpgm) M14 (three

shold voltage; Vth) (Vpgm - Vth)가 (precharge) .

2 (33) (Add1) WLEN[0 : n] (20A, 20B, 20C)

. WLEN(Sel) (Vpgm), WLEN(Unsel) (Vpass)가 가

. Vpass Vpgm (Vcc) .

(20A) (11) (Add4) (20A)가

1 (SEL) .

(ERSEN) (GND) 1 (SEL) N15

, N15 Vpgm - Vth M15 2 (M17 - M1

8) N15 (Vpgm - Vth) .

, WLEN(sel) Vpgm WLEN(Unsel) Vpass가 가 , (M17 - M18) ,

N15 (boosting) N15 Vpgm + Vth

, N15 (M17 - M18) ,

(boosting) N15 Vpgm + Vth . SSLDRV 가

SSL

1 (GSi) 1 (SEL)가 N15

WLEN[0 : n] .

(11)가 2 (ALLSEL) 1 (SEL) .

, 2 (ALLSEL)가 (' ')

(' ') (transition) , (20A, 20B, 20C) 1 (SE

L) (Add2 - Add4)

(20A, 20B, 20C) (Add0) 1 (31) (GSi)가 (M16 - M17) W
 LEN[0 : n] N15 Vpgm - Vth
 WL[0] - WL[n]

ALLSEL (20A) (Add4) (SEL) N15 (20A)가 가
 (20B, 20C) 2 (SEL)
 M12가 N15 GND

1 (GSi) 1 (SEL)가 N15
 WLEN[0 : n]

4 (19B) 2 (19B) (

1 (19B) 1 (GSi) 2 (GSin) (Vpp) N15

1 (19B) N11 (N13B) 2 (GSin)가 M
 41 가 N15 (N13A) 1 (GSi)가 M41
 M14

N15 1 (GSi) (GSin)가 (Vpp)
 M14 41 Vpgm - 2Vth

(Add) 1 (SEL)가 N15 Vpgm
 - 2Vth (M16 - M18) N15 WLEN[0 : n]
 WL[0] - WL[n] 1 (SEL)가 M12가 N
 15 GND

WLEN(sel) Vpgm WLEN(Unsel) Vpass가 가 (M17 - M18)
 N15 (boosting) N15 Vpgm

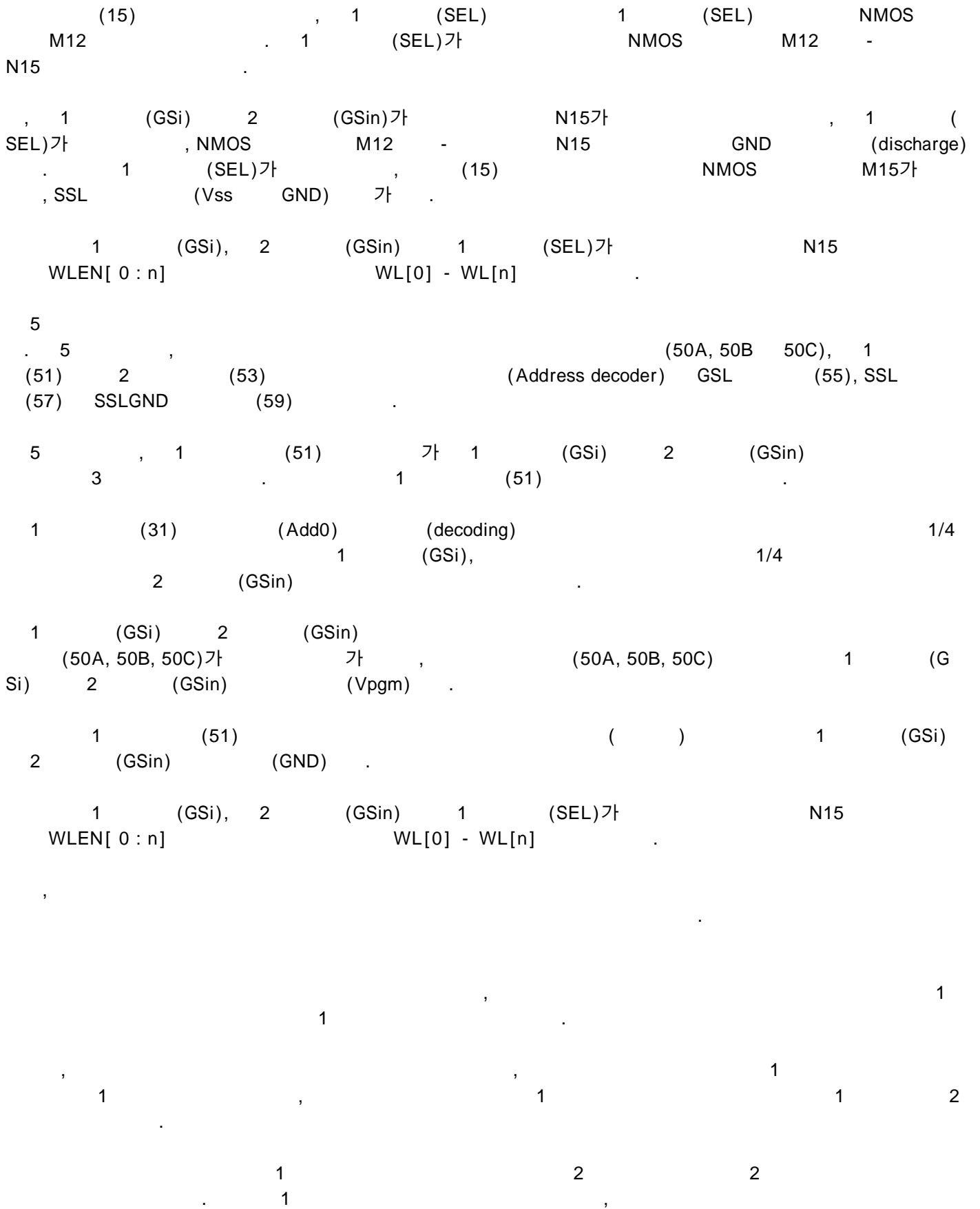
N15 (M17 - M18) (b
 oosting) N15 Vpgm SSLDRV 가 SSL

1 (GSi), 2 (GSin) 1 (SEL)가 N15
 WLEN[0 : n] WL[0] - WL[n]

1 (SEL)가 (20A) (Add) (Add)
 (20A) 2 (ALLESL)

4 (11) 2 (13) ALLSEL Addsel (NAND) , AL
 LSEL가 (' ') (Add) 1 (SEL)

ALLSEL (' ') Addsel (' ')
 1 (SEL)가



1 2 2 1
 , 1 , 1
 가 가
 가 가
 가 ,

(57)

1.
 ,
 1 ;
 1 ; 1 1
 1 ; 1 가
 1 1 ; 1 1 가
 1 1 가 1 2
 .
 2.
 1 , ,
 1 ;
 1 2 ; 2 1
 1 ;
 1
 .
 3.

1 , .

4.

1 , 1 ,

1 .

5.

1 , 1 ,

1 MOS , 가 1 , 2 1 .

6.

1 , 1 ,

가 1 , 2 1 1MOS ;

가 2 2 MOS 1 , 2 1MOS 1 .

7.

1 , ,

2 .

8.

9 , ,

9.

1 , 2 ,

MOS ,

MOS 가 가 1 , 2 , 1 .

10.

1 , ,

1 1

11.

10 , ,

2 , 1 1 MOS

12.

10 , ,

MOS 가

13.

;

;

;

1 ;

2 ,

,

1 ;

1 1 ;

1 1 가

1 ;

가 1
2

14.

13 , ,

1 ;

1 ;

1

15.

13 , ,

1 ;

1 2 ; 2 2

1 ;

1

16.

13 ,

17.

13 , 1 ,

1 MOS , 가 , 2 1

18.

13 , 1 ,

가 , 2 1 1MOS ;

1 가 2 MOS 1 , 2 1MOS

19.

13 , ,

2

20.

13 , ,

21.

13 , 2 ,
 MOS ,
 MOS 가 가 1 , 2 , 1

22.

13 , ,
 1 1

23.

13 , 1

24.

22 , ,
 2 , 1 1 MOS

25.

22 , ,
 MOS 가

26.

,
 ;
 1 1 ;
 / ;
 1 1 ;
 1 1 2 ;
 1 2 2 .

27.

26 , 1

28.

26 , /

29.

26 , 1 2 2 1

30.

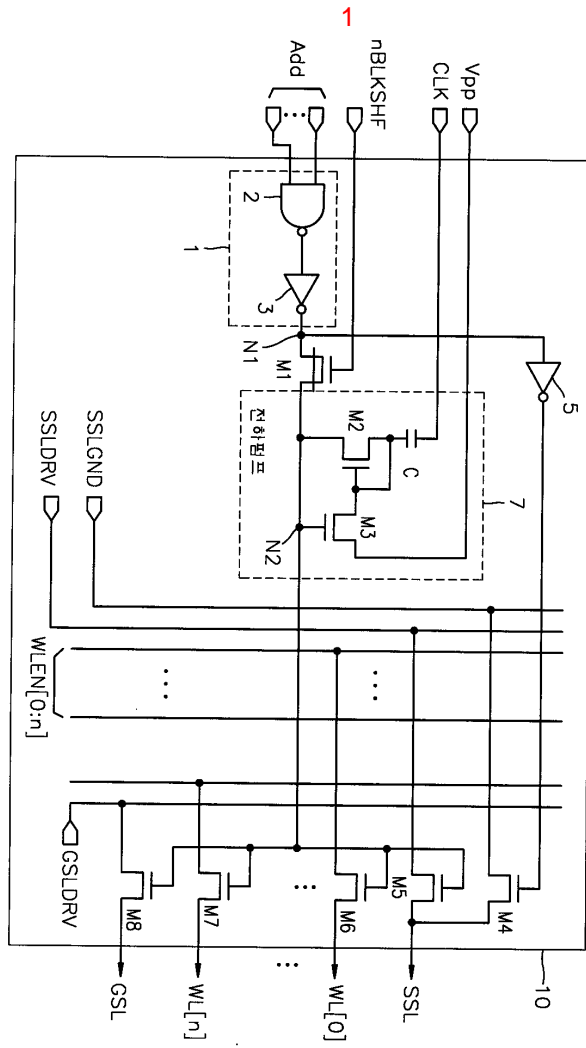
26 , 1

31.

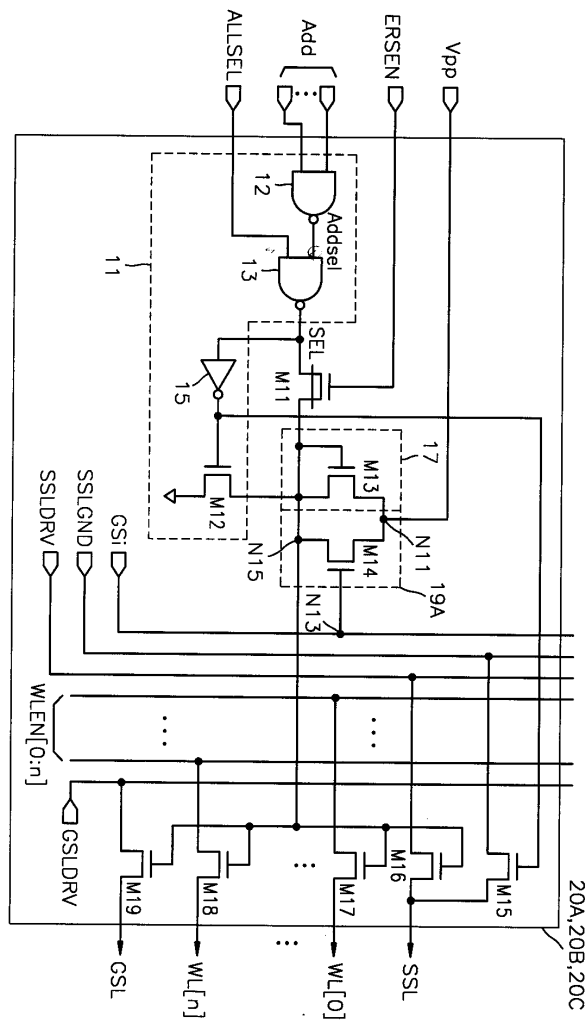
26 , 1

32.

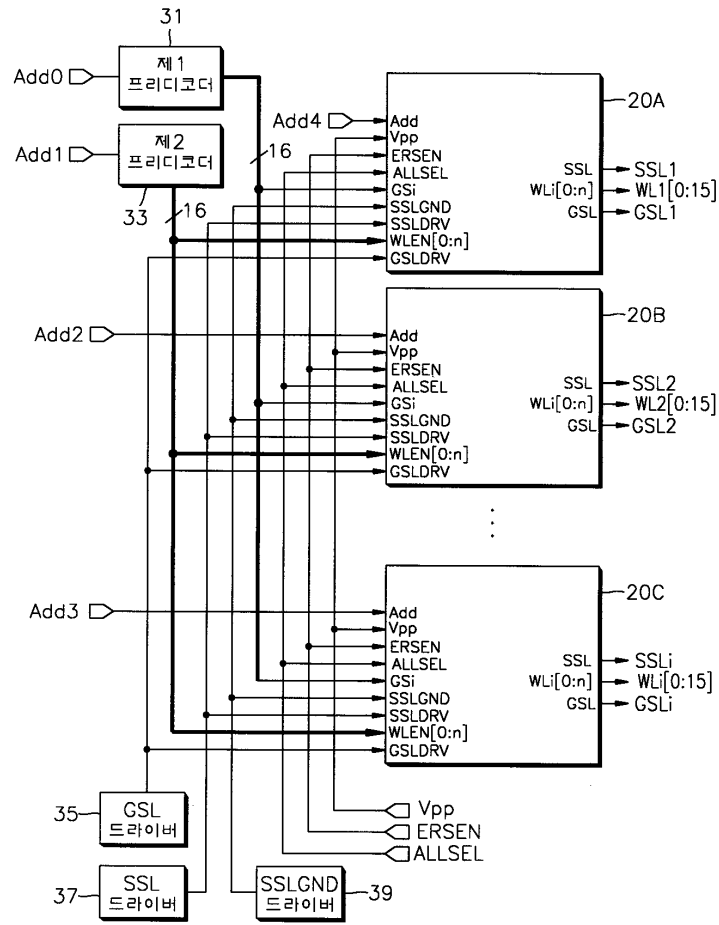
26 , 1 가



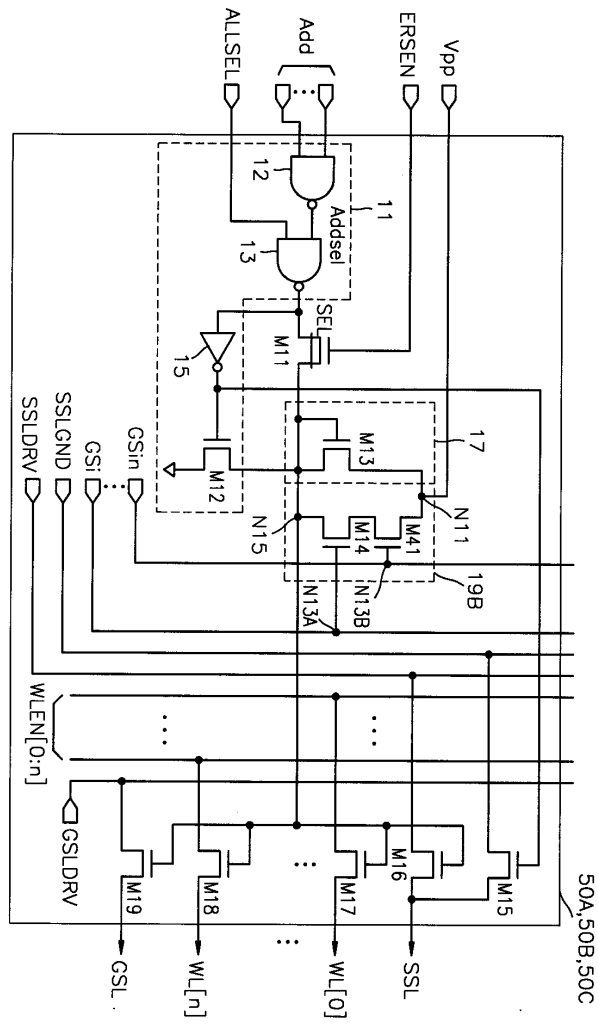
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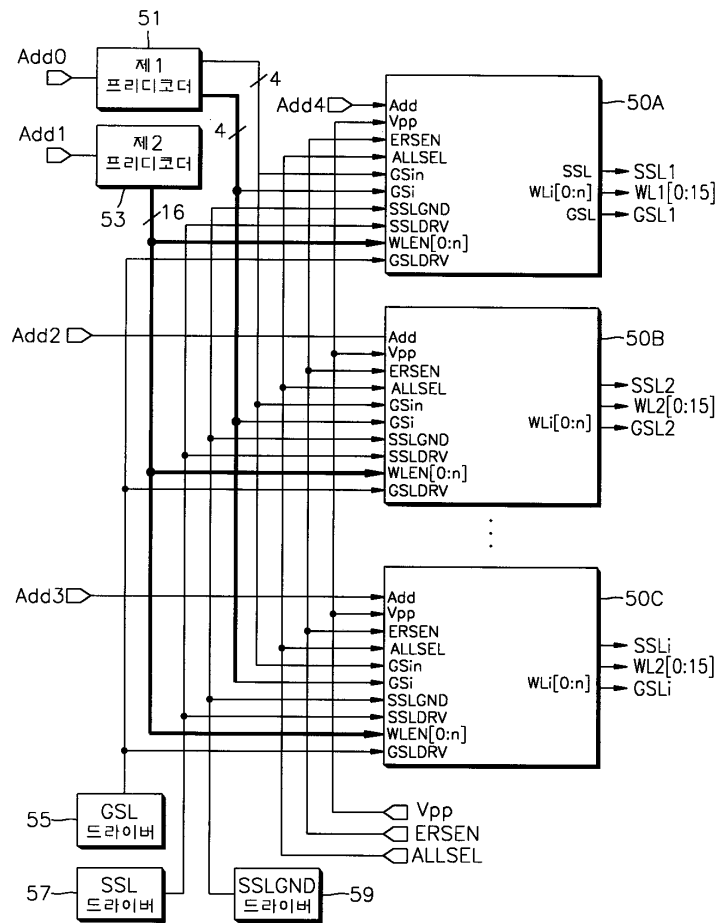
3



4



5



6

