

(19)
(12)

(KR)
(A)

(51) 。 Int. Cl.⁷
G11C 11/407
G11C 8/04
G11C 8/00

(11)
(43)

10-2004-0103494
2004 12 08

(21) 10-2004-0039242
(22) 2004 05 31

(30) 1020030035140 2003 05 31 (KR)

(71) 136-1

(72) 5 501-401

(74)

:

(54)

DLL(register controlled DLL) (delay locked loop, DLL)

(35 가) 10 4 DLL

35 10 DLL

8

, , 가 , ,

1

SDRAM

DLL

2 1
 3 1
 4
 5 3
 6 1
 7 5
 8
 9
 10 8 9

DLL

*

slo, sle : 가

slo_old, sle_old :

sre, sro :

DLL(register controlled DLL) (delay locked loop, DLL)
 (error)
 (clock skew) DLL
 DLL (PLL) (noise) SDRAM(Sy
 nchronous DRAM), DDR SDRAM(Double Data Rate Synchronous DRAM) 가
 DLL DLL 가
 DLL

1 SDRAM DLL
 1 SDRAM DLL (CLK) (CLK)
 M(M ((M=8) (clk) 1/ (10) (ref)
 (11) (fb_div) 가 가 (12))
 (fb_div) 가 가

(12) 가 -(13) , (12) (13) (15)
 (17) , (13) (fb_fm) (ref) (16) ,
 (15) (16) (17)
 (18) .
 , (15) (10), () , ()
 가
 , DLL
 , (13) (clk) 1/M (CLK) M
 (ref, fb_div) . (ref) (fb_div)
 , (13) DLL , 가
 , DLL
 , (fb_div) (13) ()
) , (15)
 , (16) (ref) (15) (fb_dm)
 , (18) (SR, SL) (16) (17)
 , (22) (SR, SL) (12) (13)
 (12) (13)
 , SR
 , SL
 , (19) (fb_dm) (ref) 가 (jitter
) 가 (locking) , DLL (14) DLL (clk_dll
) (CLK)
 2 1 , (12) (13) 가
 2 , n (UD 1, ..., UD n) (clk_in)
 eg_n) 1 (17) (NAND100) , 1 (Reg_1, ..., Reg_n-3, Reg_n-2, Reg_n-1, R
 (INV100) (VDD) (NAND101) , 2 (NAND101)
 (DU 1) (NAND101)
 가
 100) UD 4 (Reg_n-3)가 , 1 (NAND
 (clk_in) (clk_in) , 2 (NAND101) (INV100)가
 1 (NAND100)가 (clk_in) (Reg_n-3)가 (NAND100)
 2 (NAND101) (INV100) (NAND100)
 (UD
 3)
 3 1 (22)
 3 Reg_2 , n 4 (NAND102) (I
 NV101) (S) , (L) , (sre, sro, slo, sle) (L) (/Q)
 (C) (L) (Q) (/Q)
 , (L) (resetb) (/Q)

(NAND102) , (NAND102) (Q) (/Q) (INV10
1) . (Q)

(S) (L) (Q) (/Q)
NMOS (M4) , (L) (/Q) (Q)

(M3) NMOS (M3) , (sre) NMOS (Q)
M1) , (L) (/Q) (sle) MOS (M4) NMOS (L) (Q)
(sro) , (S) (slo) NMOS (M2) (sre, sro, slo, sle)

(C) (L) (Q) (/Q)
) (NAND103) , (NAND103) (INV102)

(22) (resetb) (Q)
가 , Reg_1, Reg_2, ..., Reg_n '1, 0, ...,0'

2 (clk_in) (clk_in) (clk_in)

4

4 , (17) Reg_7 (13) 7
(UD 7)가 가 (clk) (fb_div) UD 7
(12) (13)

5 3 (17) , /Q1, /Q2, /Q3 (L) (/Q)

6 1 (16) (18)

6 , (16) (fb_dm) (fb_dmp)
(62) , (ref) (fb_dm) (fb_dmp)
RS- 가 (60) (add_dly) (ref) (red_dly) (fb_dm)

(64) (18) 가 (fb_dmp) T- (64) , T-
(sre, sro, slo, sle) (p1 p2) (add_dly) (red_dly)
dly), DLL (disable_dll), DLL (66) , (pwrapb), (sref_
(resetb) (DLL_reset) (68) (17)

7 slo 5 sre가 (16) (18)

7 가 (add_dly) (ref) (fb_dm) (slo)가
, (ref) (fb_dm) (sre)가 (red_d
ly)

sre , slo sle , sro
가 .

, , DLL DLL ()
 . , DLL slo sle (17) (UD) 100
 100
 DLL , 가 ,
 ,
 ,
 ,
 ,
 / 가 , / , 1 2 /
 , 1 , /
 가 .
 , , 1 2
 , 가 가 , 가 가 ,
 / 가 가 , / / 가 가 ,
 .
 DLL (가)
 10 4 , 35
 DLL 35 ,
 10
 , 가 가 가
 , 가
 DLL 1 DLL DLL (17) ()
 18) 가 , .
 8 DLL .
 8 , DLL , 3 (1
 7) 가 , , .
 , DLL , 가 slo, sl
 e, slo_old, sle_old 가 , 가

Reg_4

(sle, slo) , (slo_old, sle_old) 6
 (slo, sle) .

10 8 9 ,
 10 DLL .

, (resetb)가 , (Q)가
 (100) 가 (resetb)가 (fast_flag)가 , (UD) , Reg_1

, (fb_dm) (ref) 가 (sle, slo,
 add_dly)가 , sle_old가 sle_old가 ,
 slo_old가 sle, slo가 , Reg_1,

Reg_2, Reg_3 가 (Q) , NMOS M11 M12
 slo_old sle_old가 가 , Reg_4 가 , Reg_5, Reg_
 6, Reg_7, ... 가 , 가 ,
 4 (UD) 가 .

, (add_dly) 가 , sle, slo, sl
 e_old가 , slo_old가 , ,
 Reg_7 7 (UD) , 가 .

가 (red_dly)가 , ,가
 slo_old, sle_old sle, slo ,

, (red_dly)가 , 가
 (100) 가 (fast_flag)가 ,
 DLL (UD)

, ,
 가 가 , 가 ,
 , SDRAM DLL , DDR SDRAM , DLL DLL
 (CLK) (/CLK) , ,
 , 가 3 ,
 ,

DLL ,

(57)

1.

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

2.

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

3.

1 ,
 1 ,
 , 1 NMOS
 , / 가 2 NMOS

4.

3 ,
 2 ,
 , 3 NMOS
 3 NMOS 4 NMOS /

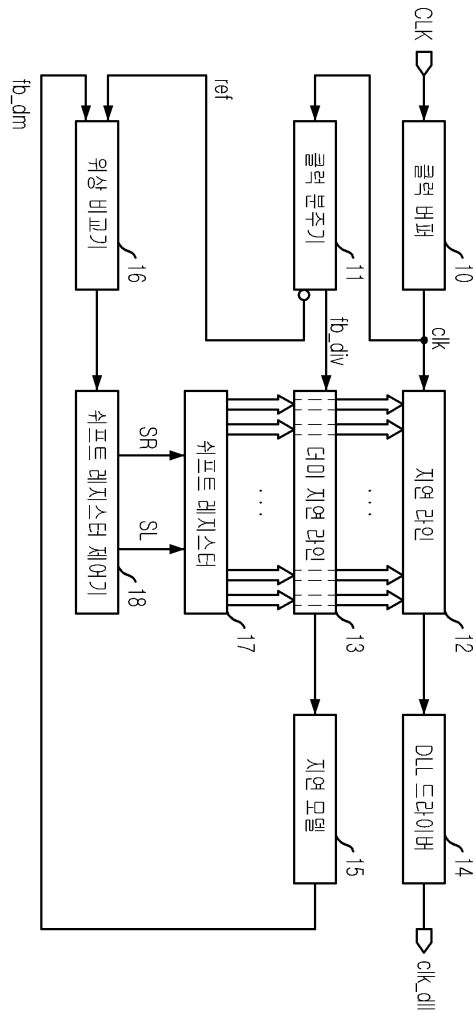
4 5. ,
가 1 ,

2 NMOS /
5 NMOS .

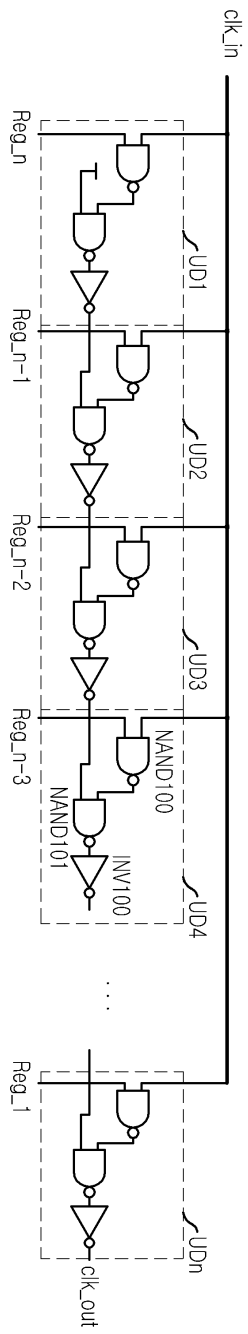
2 6. ,
가 ,
NMOS , PMOS
,
가 .

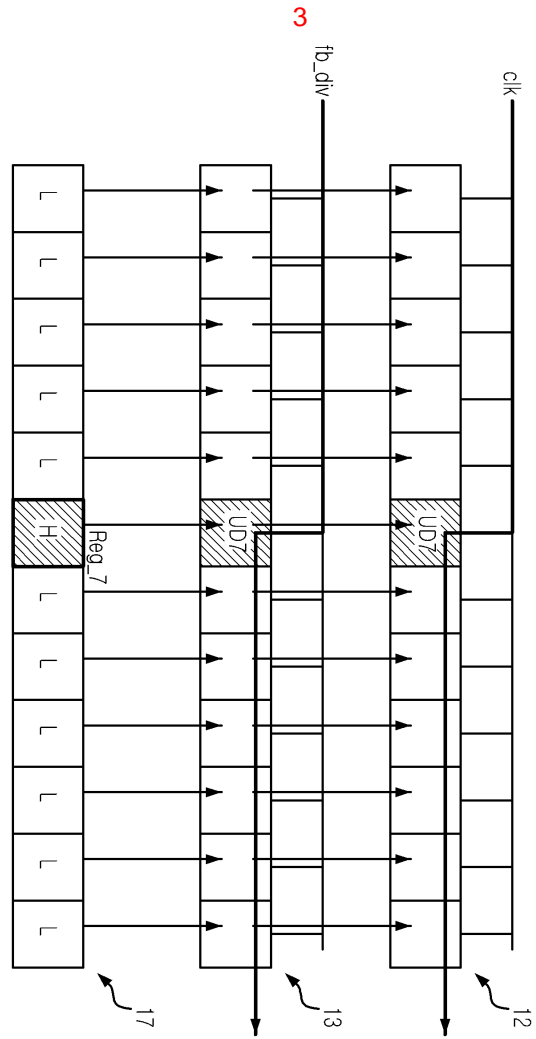
2 7. ,
,
1 1 ,
2 2 ,
가 1 ,
1 1 2 ,
1 2 3 ,
가 1 4 ,
4 3
,
가 2 5 ,
5 4
,
가 2 6 ,
6 가 5
,
가 3 7 ,
7 가 6
,
1 8 ,

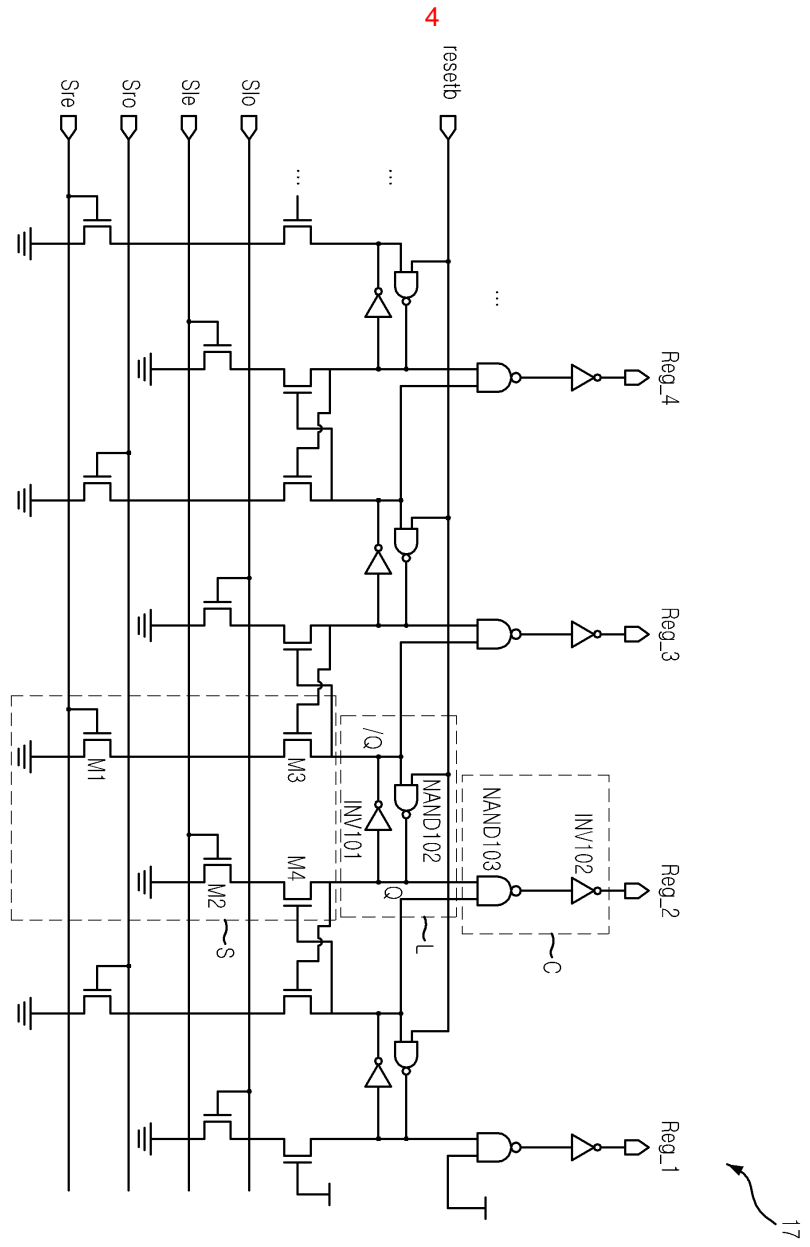
1



2

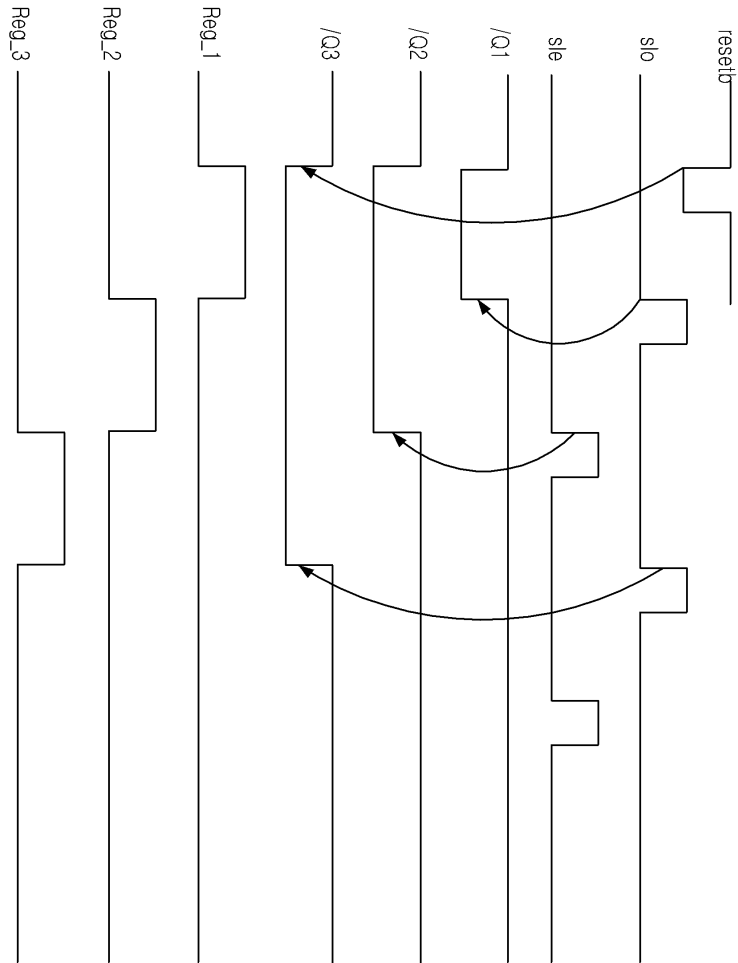




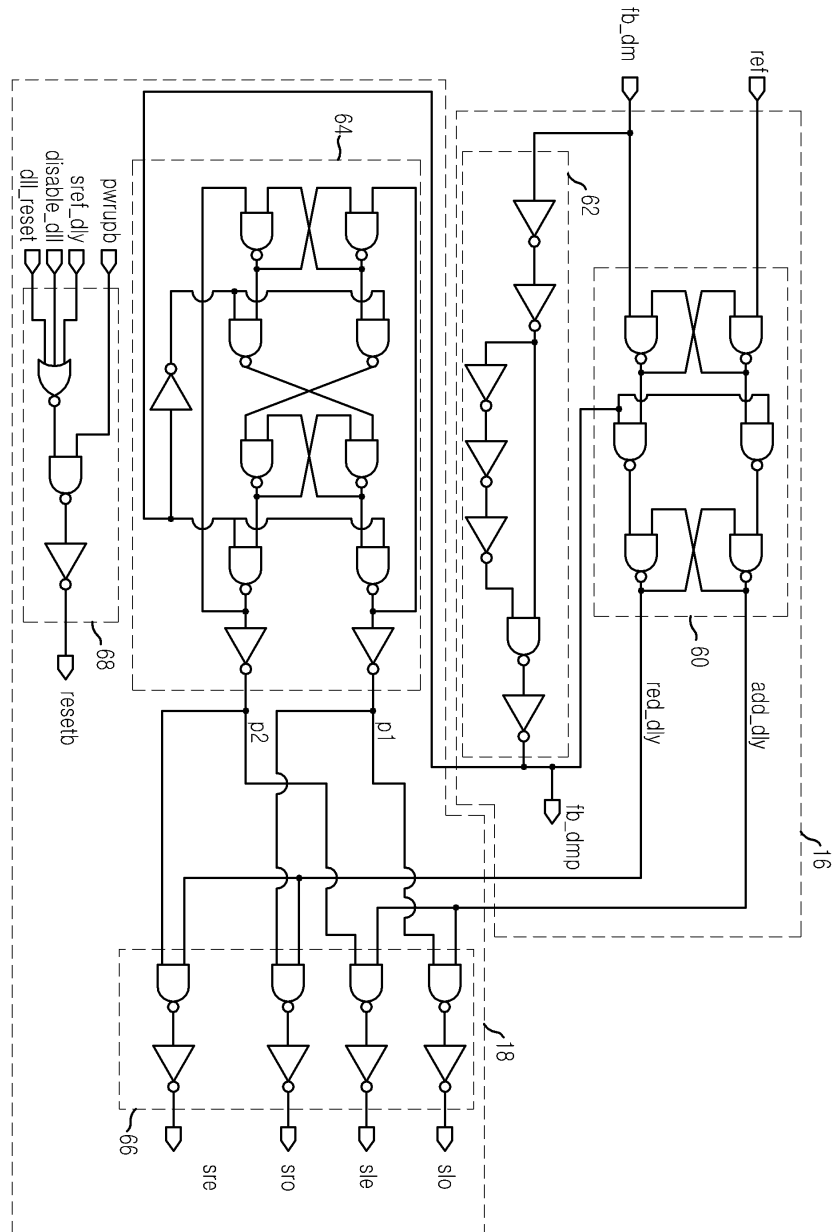


17

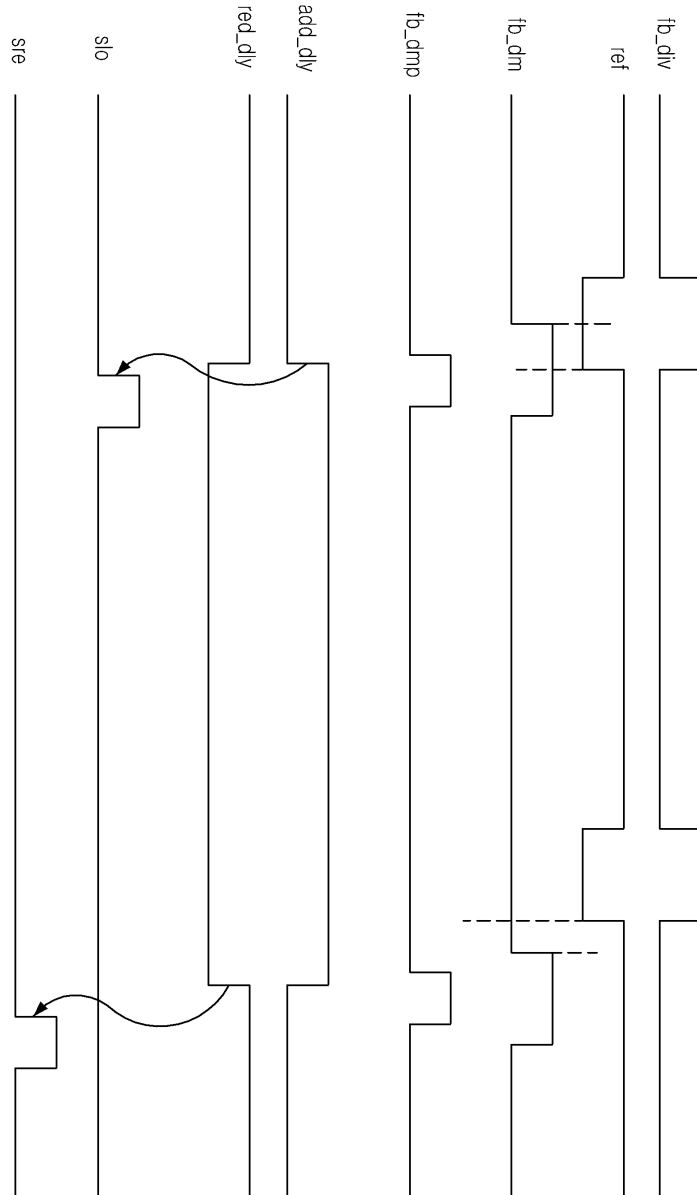
5



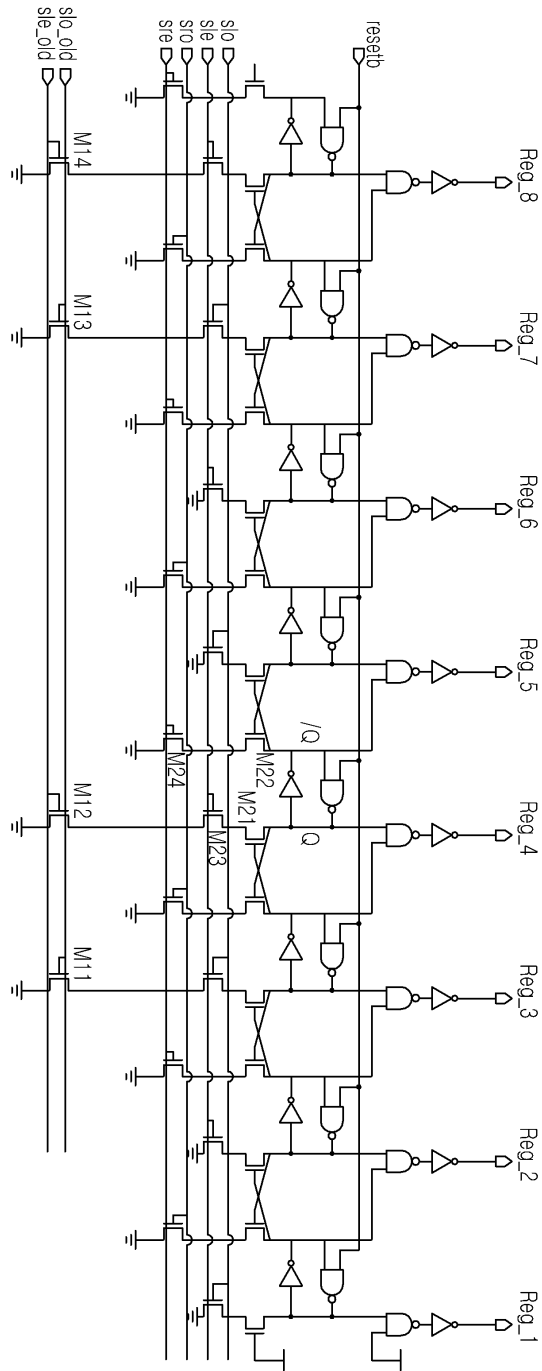
6



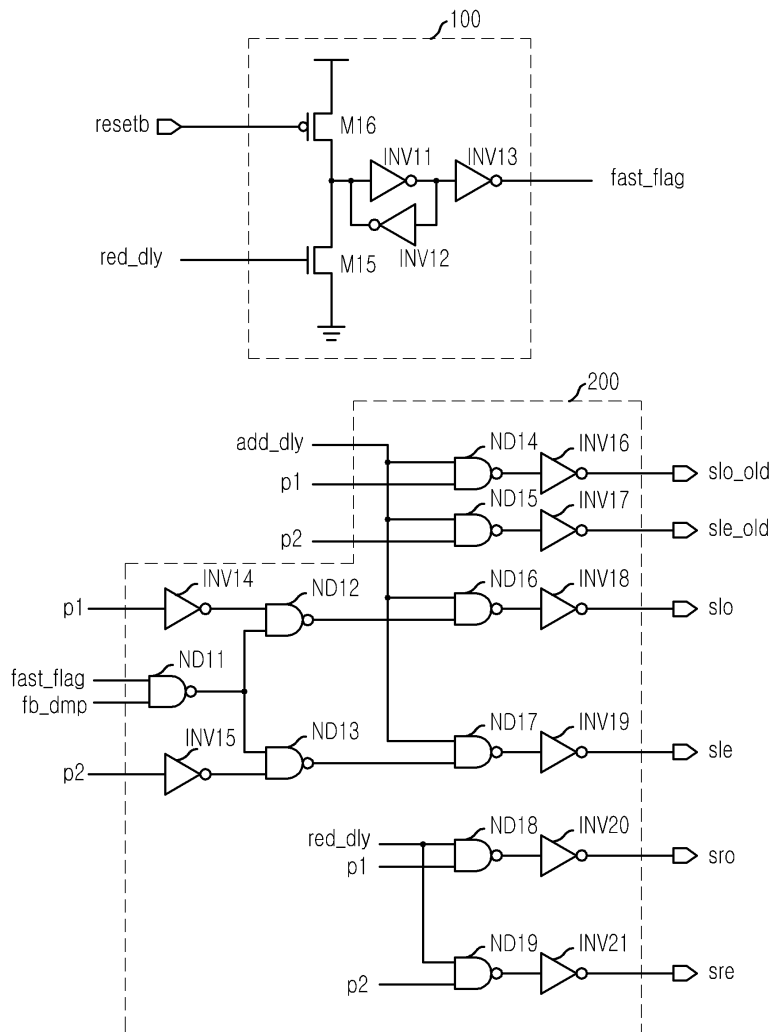
7



8



9



10

