

(19)
(12)

(KR)
(B1)

(51) 。 Int. Cl.⁷
G11C 16/12

(45)
(11)
(24)

2003 12 01
10-0407572
2003 11 18

(21) 10-2001-0001363
(22) 2001 01 10

(65)
(43)

2002-0060339
2002 07 18

(73) 3 416

(72) 1 518-8

가 APT5 510

(74)

:

(54)

가 ,

가 ,

가 ,

4

1
2A 2B
3

4 가
 5
 6 5 /
 7 6
 8 1
 9 2
 10 3
 11 4
 12A 12B 1 2
 13A , 13B 13C 3 4
 < >
 Vps : Voe :
 Vel : Veh :

(flash)
 (tunneling)
 (hard disk) 가
 (NOR)
 1 , , 가 , , 10 ,
 40 , 20 30 20 30 , 10 WL
 10 WL (page) 50 60 가
 (string)
 MS BL , SST GST
 (, 0V) 가
 , CSL 0V가 가) 가
 (on-cell) (off-cell)
 , < 1> (floating;
 SS 가 GS) (bulk) 24V (Ver) 가
 (bulk) 가 Vcc SSL GSL
 0V (stress)가

< 1 >

	BL	BL	BL	BL
BL	-> Ver		-> Ver	
SSL	-> Ver		-> Ver	
WL	Vss ()		-> Ver	
GSL	-> Ver			

CSL	-> Ver
P /N	Ver (; 24V)

(PASS) (FAIL)
 (status register) Ver (capacit
 iva coupling) 가 가
 가
 (< 2>)
 0V 가 Vpgm 가 ()
 가 < 2> M13

< 2 >

	BL	BL	BL	BL
BL	0V	Vcc	0V	Vcc
SSL	Vcc		0V	
WL15	Vpass (7~10V)			
WL14	0V			
WL13	Vpgm (14~20V)			
WL12	0V			
WL11~WL0	Vpass			
GSL	0V			
CSL	Vss			
P /N	0V			

(, WL13) 가
 가 (" ") 가
) (가
 (capacitive coupling) 가 (self-boosting)
 가 (WL12, WL14) 0V 가 (charge sharing) (WL13)
 가 (local self-boosting)
 가 (distribution profile)가
 가
 2A M13 M13pd가 (stre
 ss) M12oe가 가 (,)
 M13pd M12oe (-6V;) (6V)
 ((Vch2= 6V) , 2B Vch1(9V)
 M13pi 9V Vch1 M13pd 가 가)
 M12ne(-3V 가)

(soft erase) 가 (soft program) 가 (PASS) 가

가 가 가 1 가 2 3 가

(block soft erase; "BSE") (weak) (block soft program; "BSP")
 B Vph , BSP
 Vel (가)
 24V Ver . BSE , < 3> < 1>
 0V 가 Ves가 가 Ves 가
 (가) 가가 20V

< 3 >

	BL	BL	BL	BL
BL	-> Ves		-> Ves	
SSL	-> Ves		-> Ves	
WL	Vss		-> Ves	
GSL	-> Ves			
CSL	-> Ves			
P/N	Ves (20V)			

BSP , < 4> . 4 , BSP
 SST Vpgm Vpass 13V (WL0~WL15 soft program voltage) Vps(Vpass<Vps<Vpgm) 가

< 4 >

	BL	BL	BL	BL
BL	0V	Vcc	(No Bias)	

SSL	Vcc	0V
WL	Vps (13V)	
GSL	Vps (13V)	
CSL	Vss	
P/N ()	0V	

BSP가 , 가 BSP

5 BSE BSP

s), (Vread) (Vers) / (Vpgm/Vps), (Vpas
 VPGMEN, VPASSEN, VREADEN VERSEN 20, 30, 40 50 / (Vpgm/Vps)
 RSEN 20 VPSEN VPEN E

10 PDn SP0~SP15 PDn SP0~SP15
 가 가 SS, Si

0~Si15 PDn GS 4 (MBn) ()
)가 가 5

5 Vpgm/Vps 20 BSP 가 6 VCC
 가 21 R1 , 21 GND 6 22
 가 R2 , 21 GND 23 가 R3 가

ERSEN (ERASE) 6 (BSP) 7 VE
 RSEN VPSEN 23
 VPGMEN 22

, BSP BSE
 , 8 8 11
 , 8 BSP (S51 S55),
 S56 / (fail) (pass) (bad block) S57 BSP

9 BSP 9 S54 , S61 BSP . 8
 S62 (verification resd-out) , S63 / . 8
 S63

8 9 BSP 8 9 12B
 12A Vel Voe A 12B
 BSP가 , Veh 가 BSP Veh*
 , Veh가 Veh*
 , Veh가 Veh* 가
 10 11

, 10 BSP BSE . 10
 S57 S72 8 (- -BSP), S71
 , S72 () S73 BSE (bad block)

11 , BSP BSE S63 9
 (-BSP-), (, S63)
 S81 BSE S63
 S81 , S82 , S83
 8 9 , 10
 11 BSP Veh 가 BSE
 가 11
 13C , 10 Veh 11
 , BSP(10 S57 11 S61) , 13A
 13B Veh가 +
 Veh'가 (未) (under-erased) 가 (over-post-programme
 d cells) C가 , BSE(10 S73 11
 S81) , 13B Veh'가 Veh"(Veh*) C가
) BSP (post-program (BSE
 ms(mili-second) μs(micro-second)

(57)

1. 가 ,
 1 , 가 2 ,
- 2 3
 2. ,
- 1 3
 3. 가 ,
 1 , 가 2 ,
- 3 , 3
 2 3
 4. ,
 3 , 1
5. 가 ,
 1 ,
 2 . , 2
 가 3 ,
 3

4 가

6.

5 ,

7.

가 ,

1 ,

가 2 ,

1 2

3 ,

3

4 가

8.

7 ,

9.

가 ,

1 ,

, 2

가 3 ,

4

4

5 가

10.

9 ,

1

11.

가 ,

1 ,

가 2 ,

2

3 ,

3 ,

4 ,

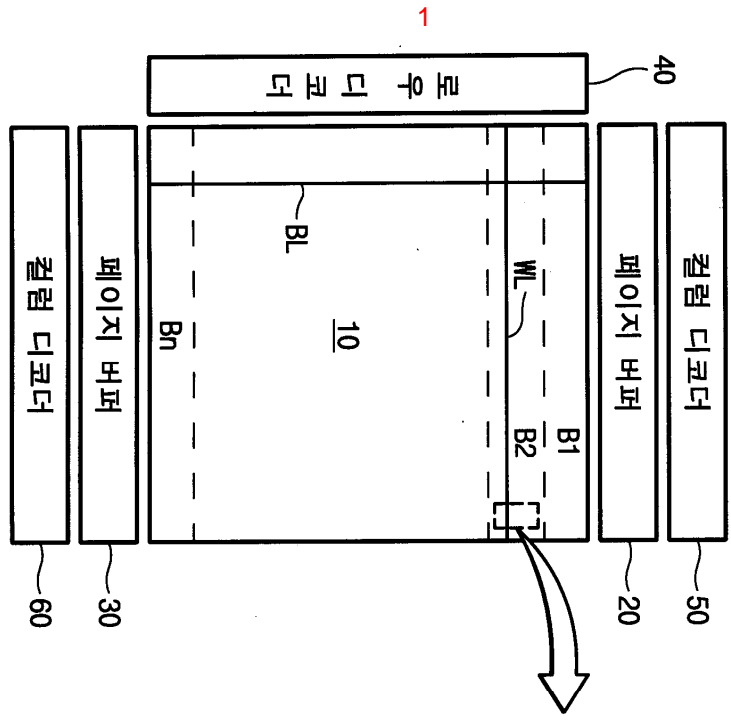
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5 가

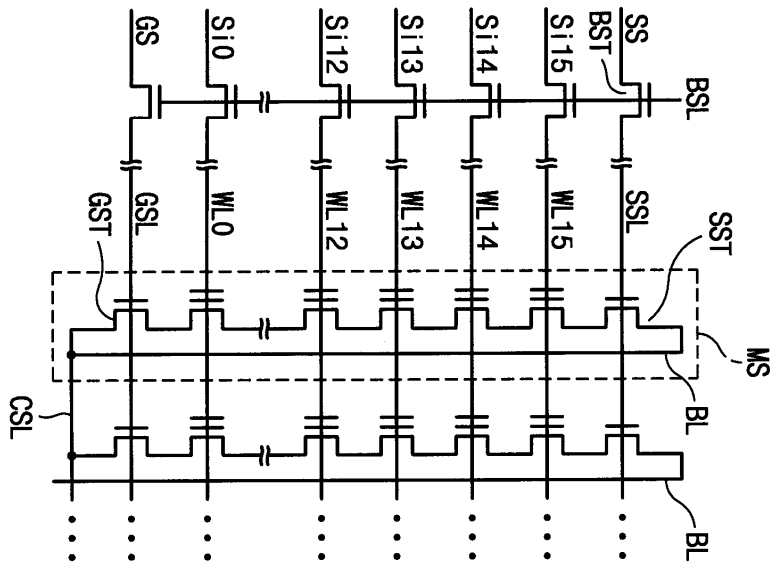
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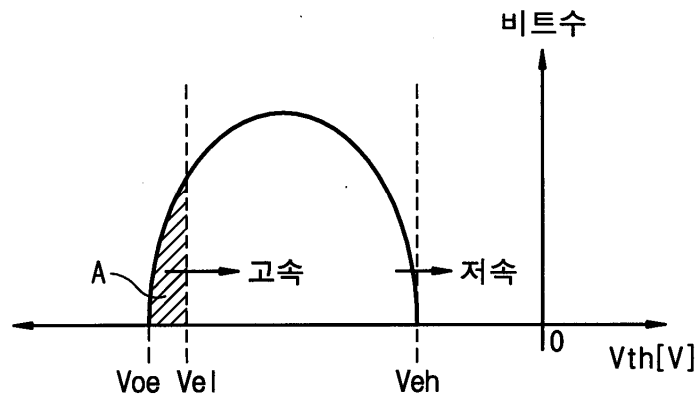
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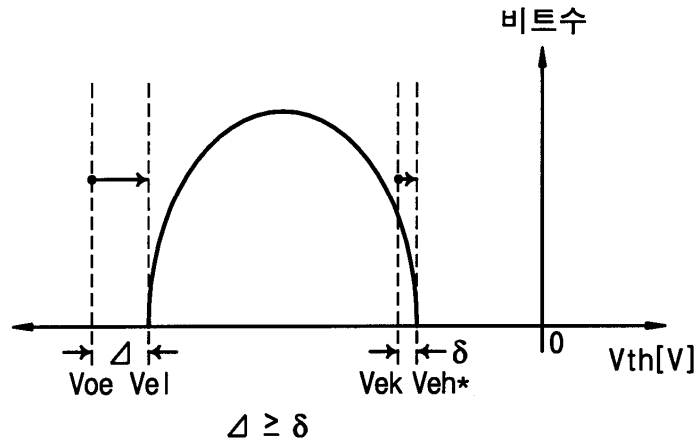
(종래 기술)



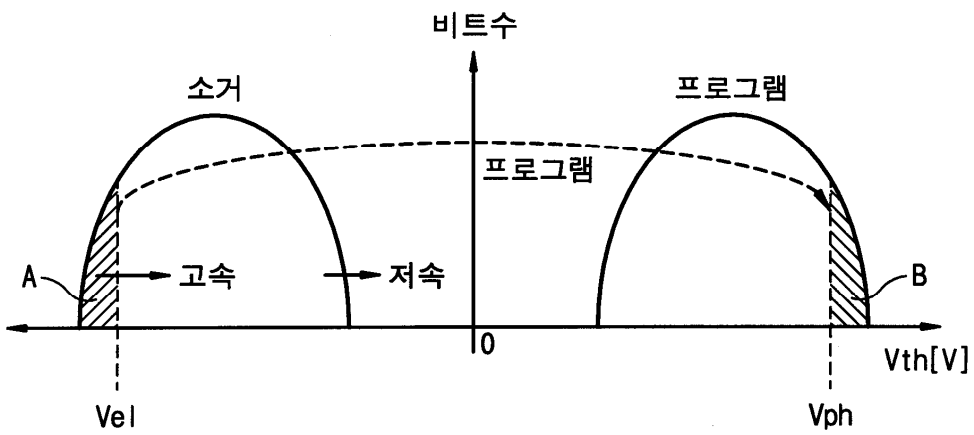
2a



2b

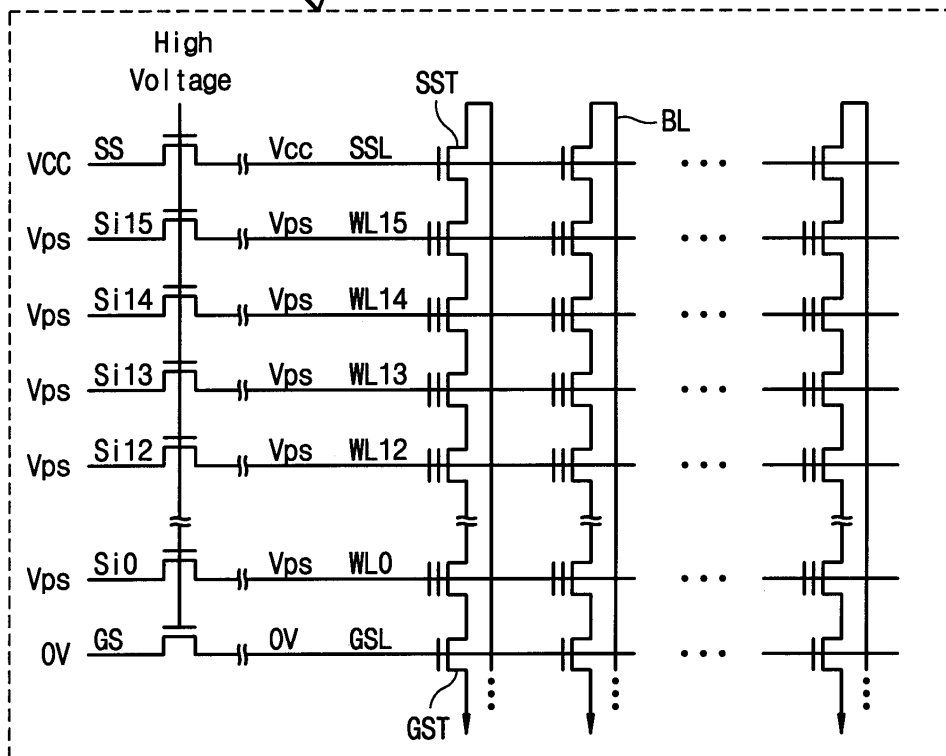


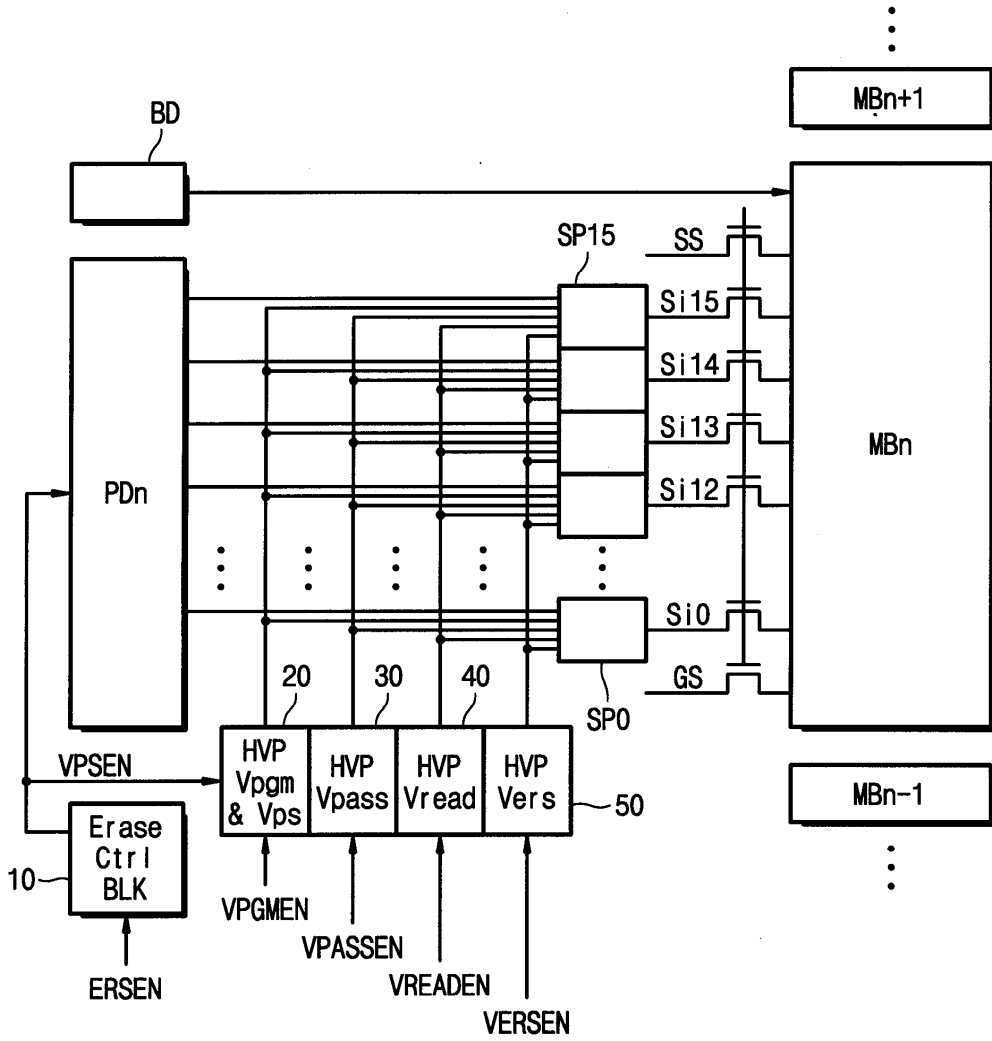
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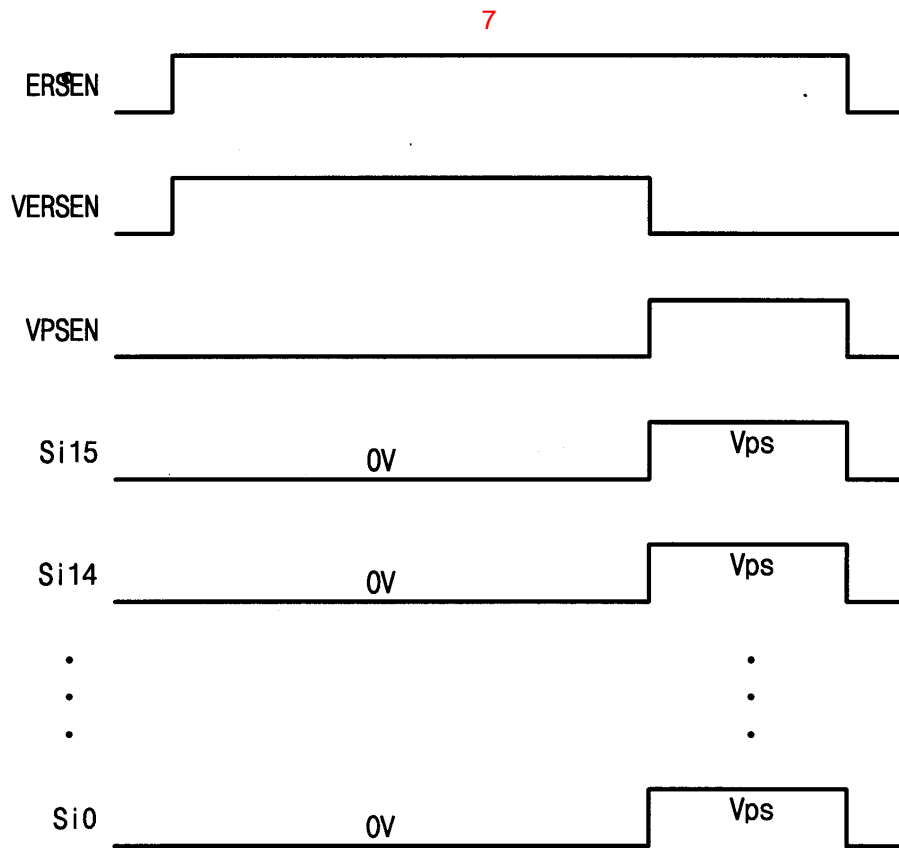
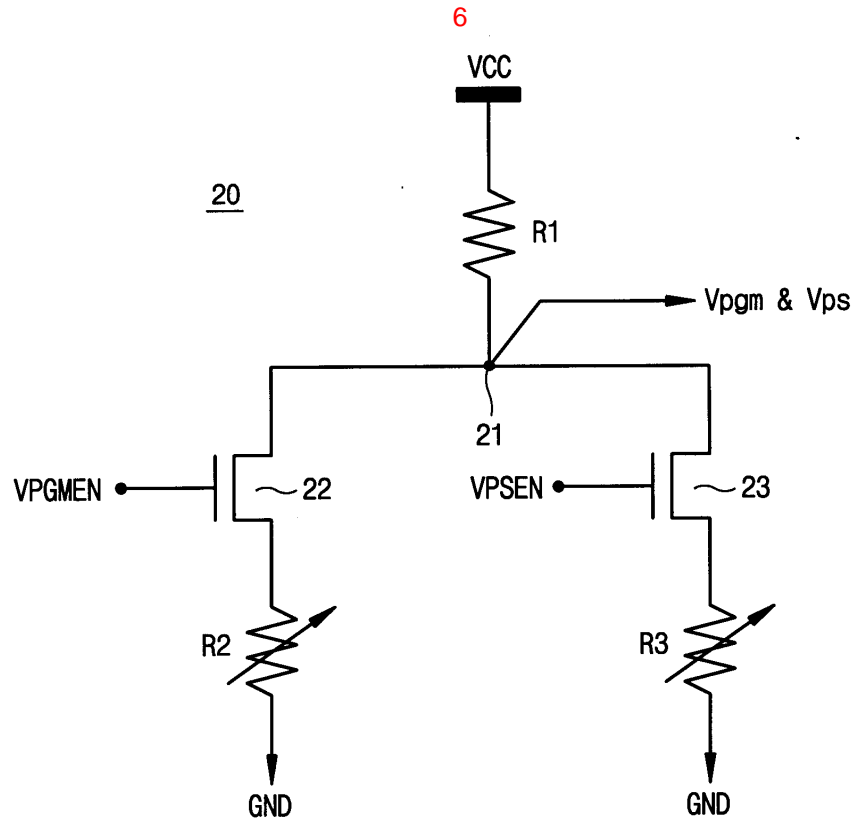


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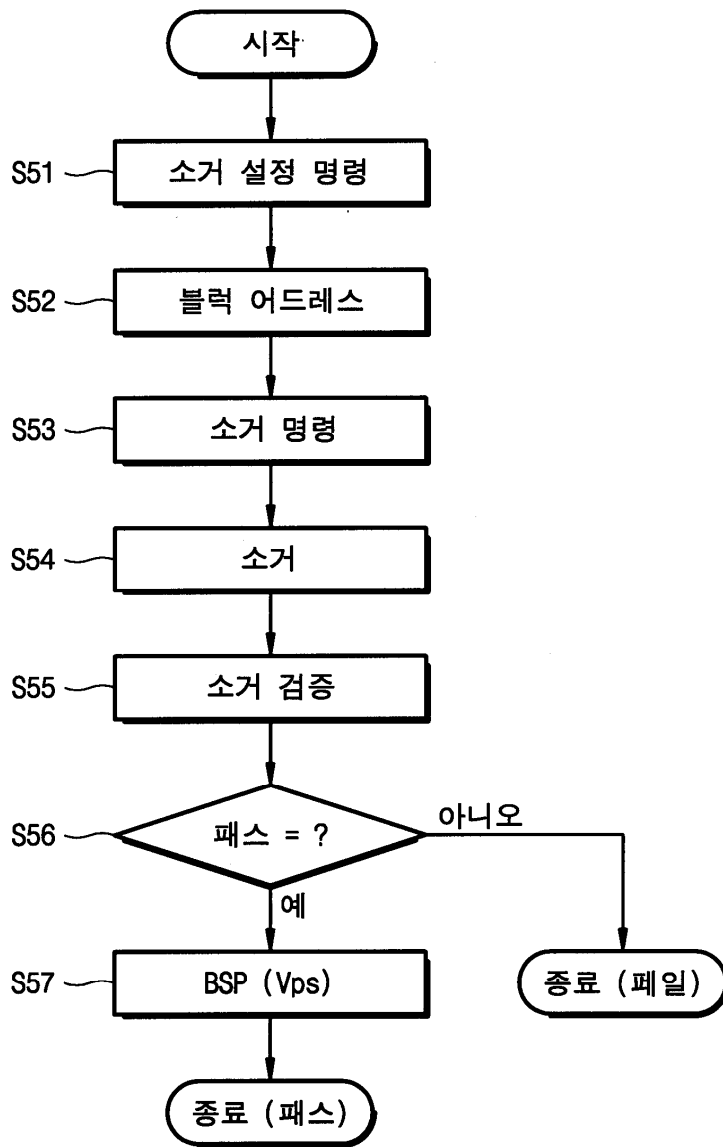
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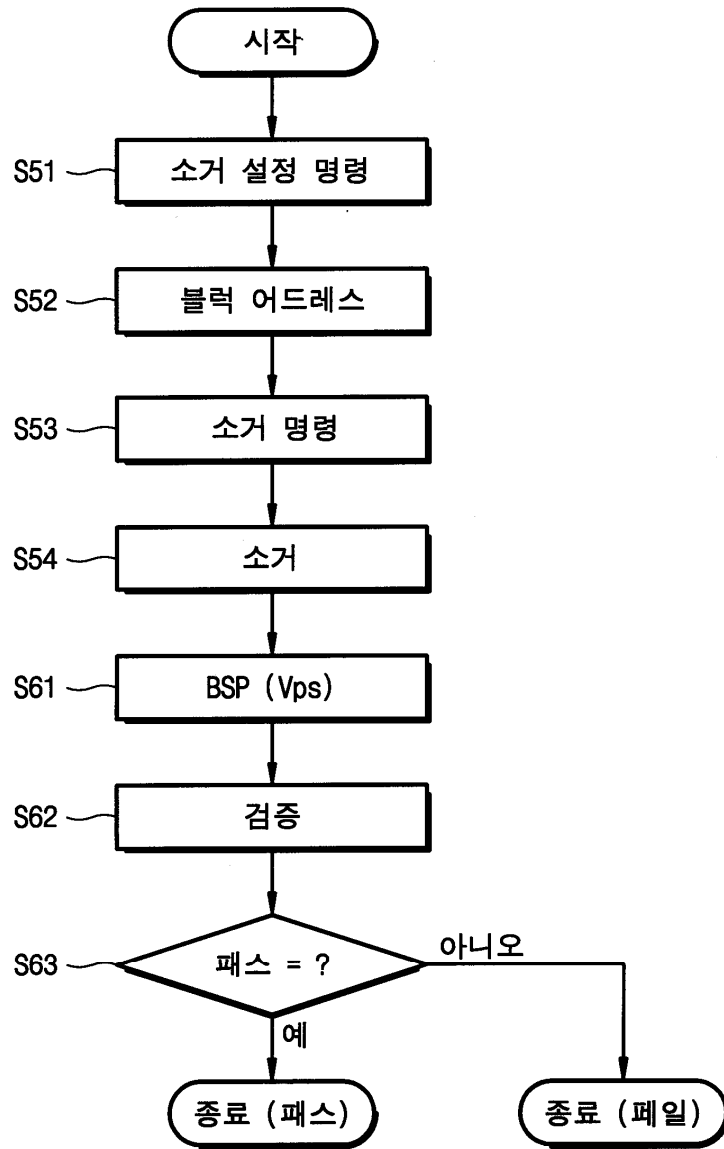




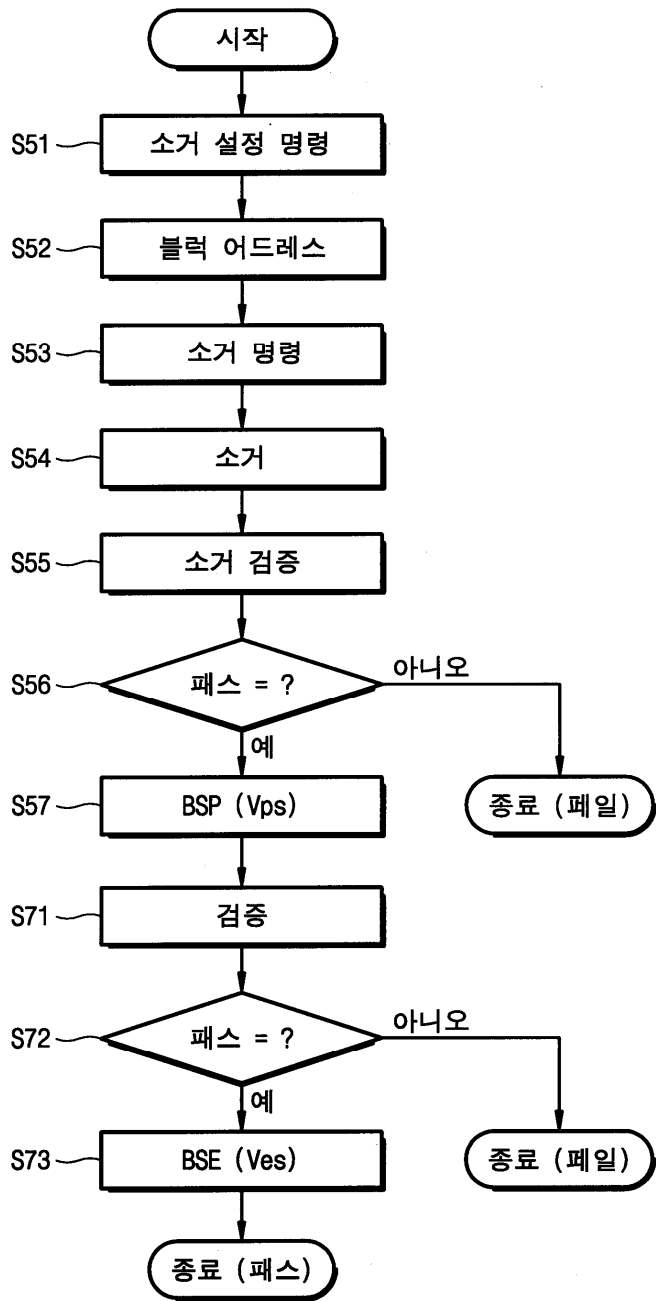


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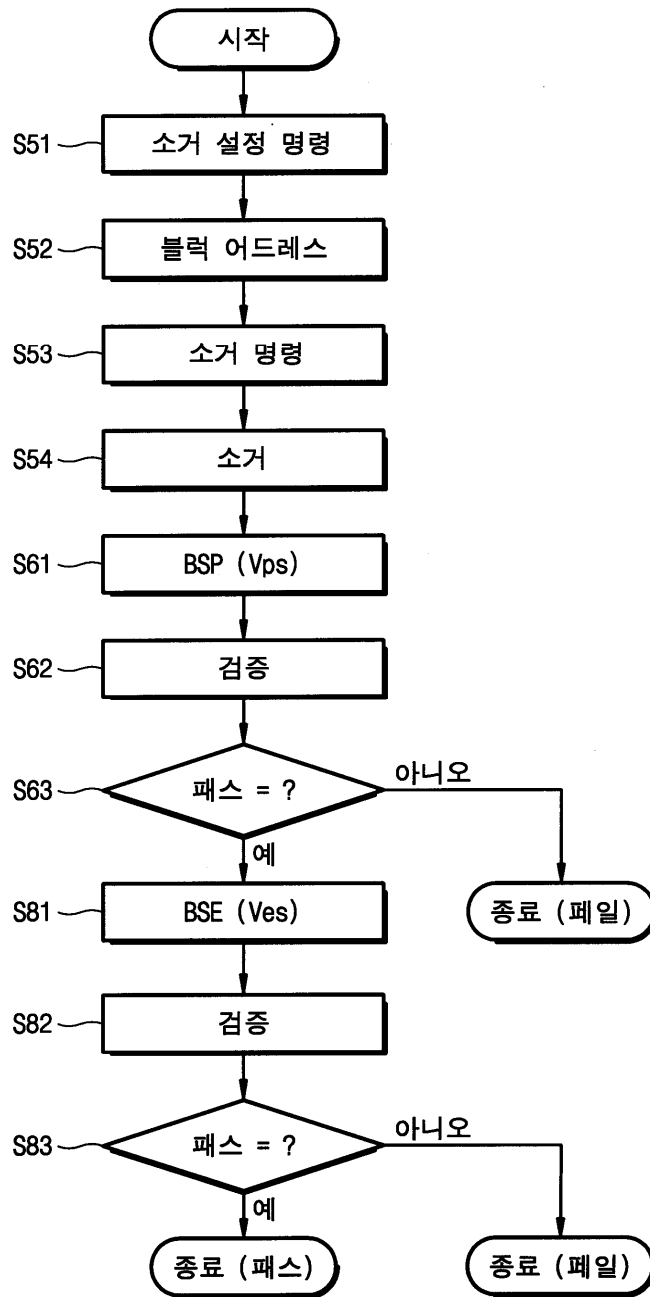




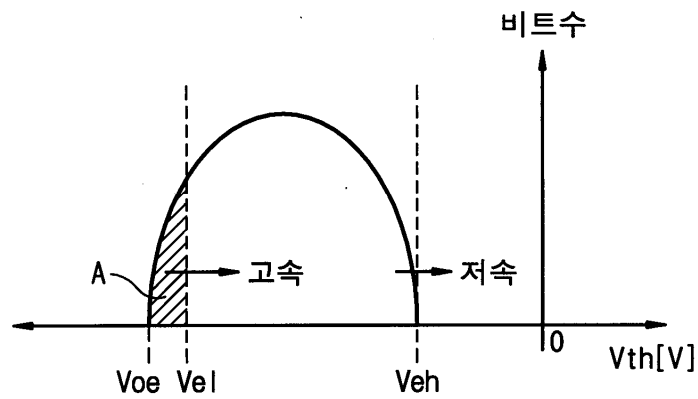
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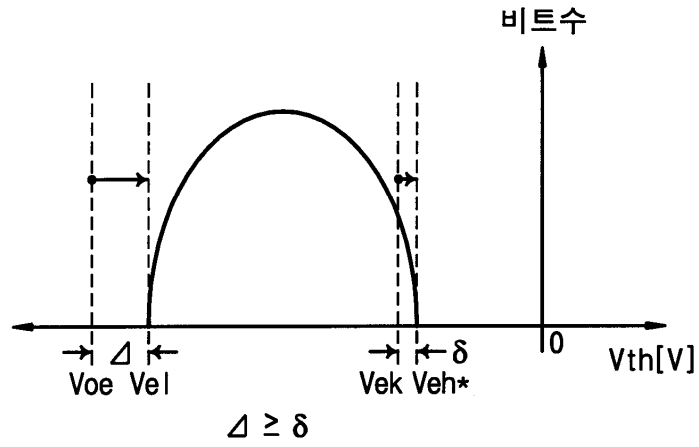
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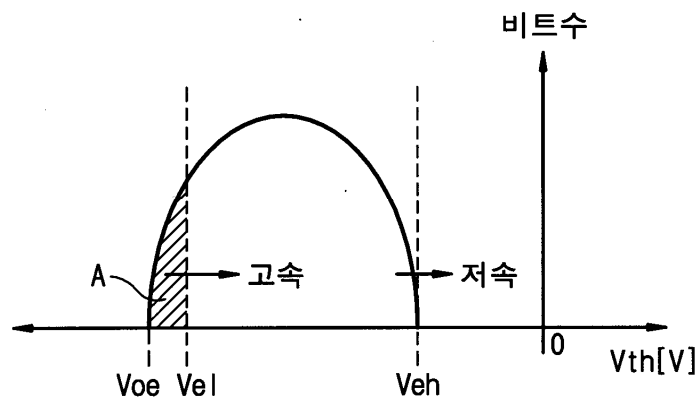
12a



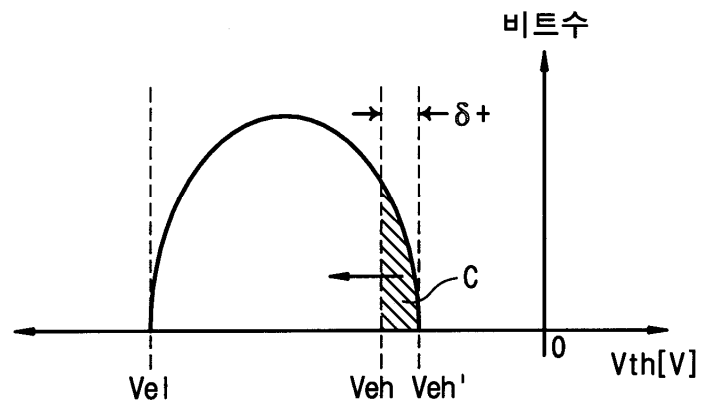
12b



13a



13b



13c

