

(19)
(12)

(KR)
(B1)

(51) 。 Int. Cl. 7
G09G 3/36

(45)
(11)
(24)

2002 08 13
10 - 0348644
2002 07 31

(21) 10 - 2000 - 0051443
(22) 2000 09 01

(65) 2001 - 0050298
(43) 2001 06 15

(30) 11 - 250113 1999 09 03 (JP)

(73) 가 가 5 7 1

(72) 5 7 1

(74)

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(54)

LCD (A1 A5) (VLCD1) (VLCD2) (11)
, LCD (VLCD1) (VLCD2)

3

LCD, , ,

1 LCD

2 LCD

3 1
 4 A B 3
 5 A B
 6 A B 3
 7 3 LCD
 8 7 LCD
 9 2

10 : 11 :

12 : 14 :

24 : 25 :

(intermediate tap) (voltage multiplier) , , LCD
 LCD IC

LCD LCD IC 5 20
 (power supply circuit) , IC IC IC 3 5 IC 3 5
 5 , LCD IC 2

(personal digital assistant;) LCD
 가 . 1

(30) (VDD) n n × VDD (VLCD) , n
 (30) (VLCD) (V1) (V5)
 (V1 V5) (voltage generator block; 32)

(32) (R1 R5) (voltage divider; 33) , VLCD
 (Vref) (V1) (voltage follower; A1), VLCD
 (33) (V2 V5)
 (A2 A5)

(30) , LCD (A1 A5)
 (33) (A1 A5) (output stages)
 (penetrating current) (power dissipation)

LSI , 1.5 2.0 (power supply voltage)
 (31) 6 9 가 (31) (driveability)
 (30) 가 (31) LCD

JP - A - 10 - 31200 2 LCD (40)
 (V1 V2) 1 (41), (V3 V4) 2
 (42) 1 (41) (43) (V0) (Vx)
 2 (42) (Vx) (43) (V5)

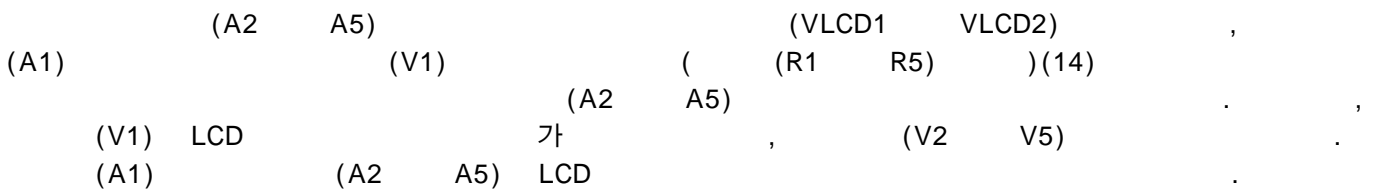
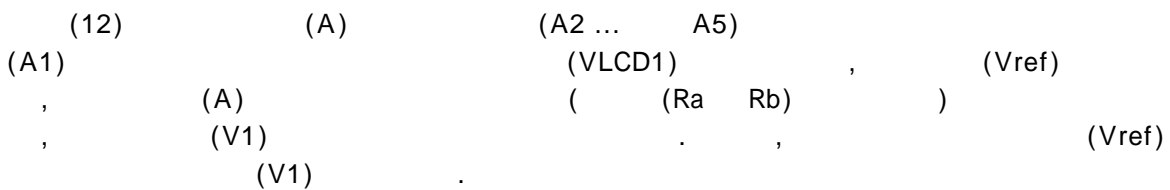
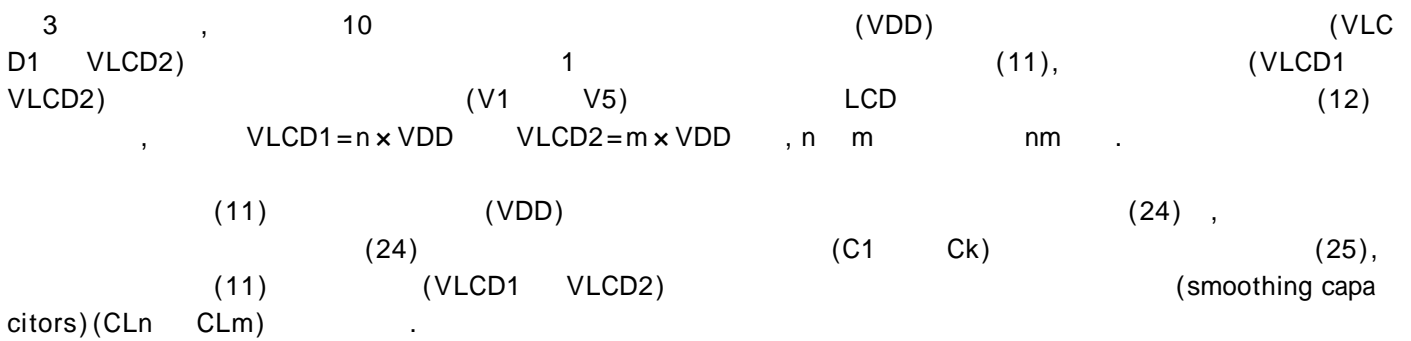
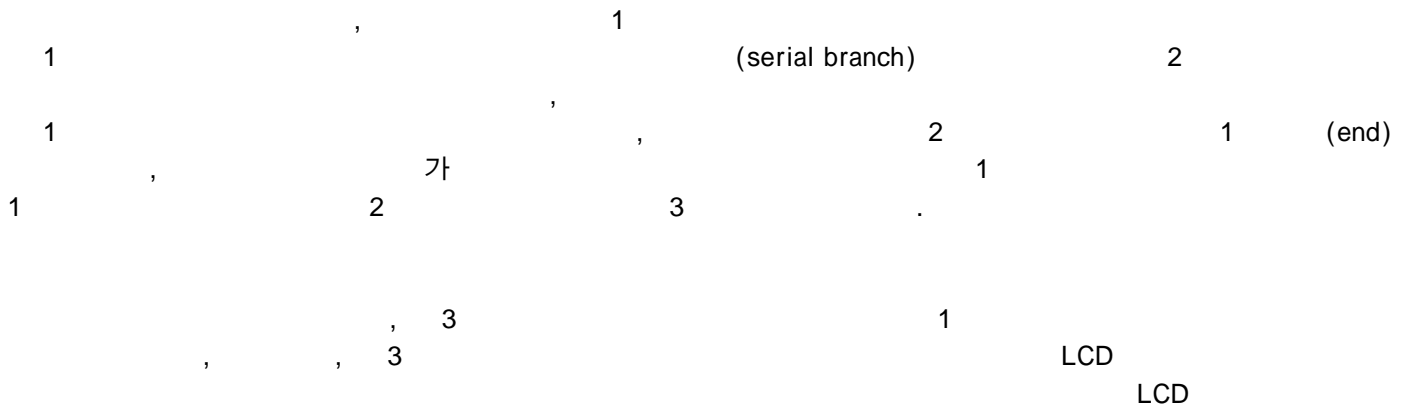
(Vx) (V0), (V5), (Tp Tn)
 1 (41) (OP3 OP4) (operational amplifiers; OP1 OP2)
 가 2 (42) (Vx) 1
 (Vx) (V0 V5)

LCD , LCD , 1
 (41) LCD (Vx)
 (C1) 2 (42) (Vx)
 (C1) (C1) (Vx) (v
 oltage fluctuation) (Vx) (Vx) ((

Tp Tn)

(Tp Tn)가 V0 Vx Vx V5 가
 가 (C1)

가



(11) IC (VDD) (VDD) "n" "m"
 (VLCD1 = n x VDD VLCD2 = m x VDD) "n" V1 VLCD1 n x VDD 가
 "m" VLCD1/2 VLCD2 VLCD1

(VDD) (11) (IA) :

$$I_A = n \times (I_1 + I_2 + I_3) + m \times (I_4 + I_5)$$

(14) (15) (IA) (V1) (V5) "n" 1/2

"m" $m = n/2$, (I4 I5) "m" $m = (n+1)/2$, (I4 I5) 1/2+n/2

3 , (VLCD2) (median tap) (C1m) (VLCD1) (resistor ladder) (VLCD1) (VLCD2)

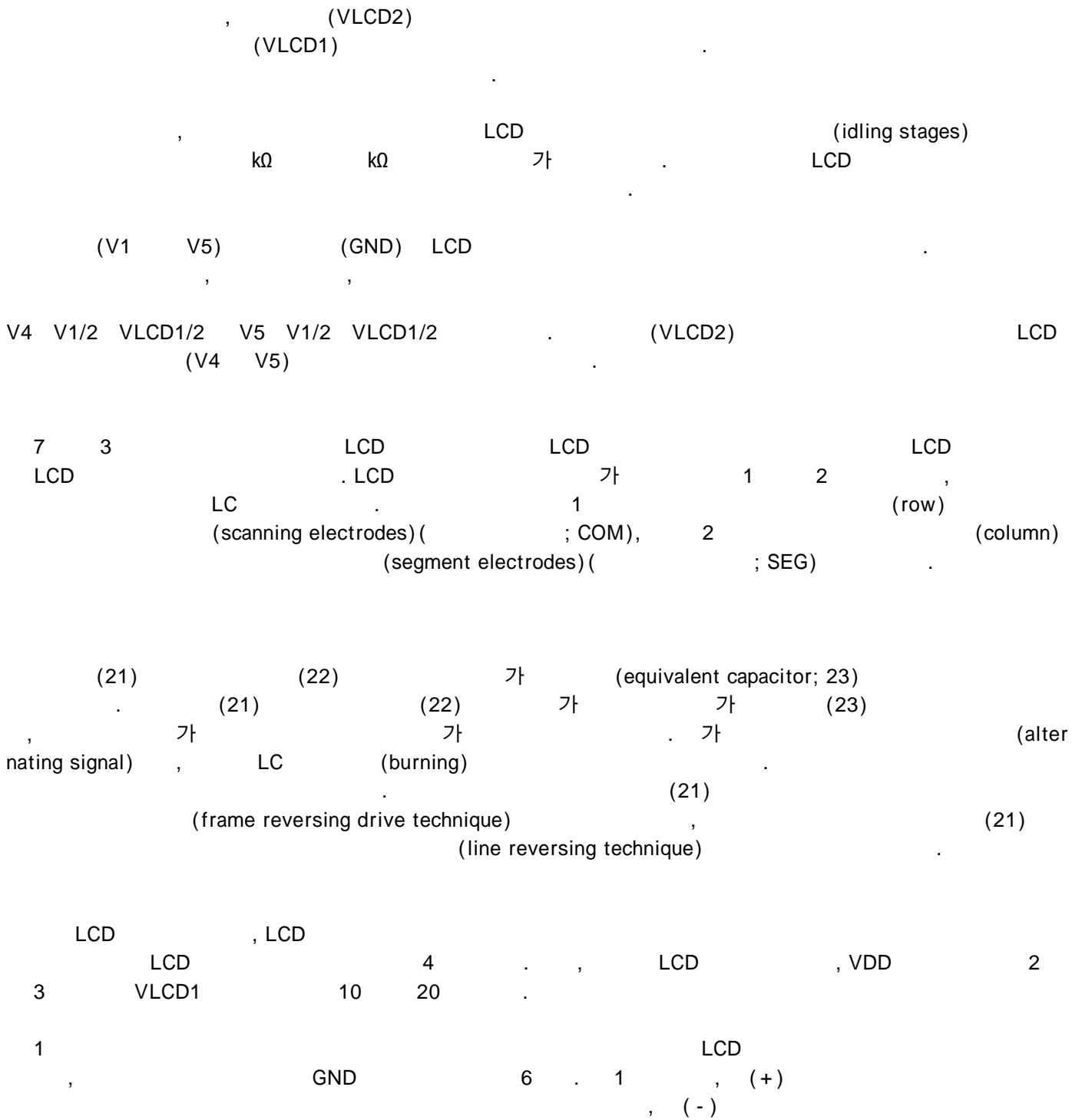
4 A B , (11) , "n" $m = n/2$. 4 (V DD) , (C1 Cn)가 (C1 Cn) (VLCD2) (distal end) (VLCD1) (proximal end) VDD

(VLCD2) (SW1) (VLCD1 VLCD2) (C1 Ck) (C1m C1m) (smoothed voltages) (24) (VLCD1 VLCD2) (SW1) (VLCD2) (m - 1) (Cm - 1) (

5 A B (charge pump circuit) . 5 A , (C1 Cn - 1)(Cn - 1) (VDD) 가 (C1 Cn - 1) (VDD) (Cn) Cn - 1 Cn

6 A B , 5 A B (VLCD1 = n × VDD) 가 (VLCD2 = m × VDD) (m - 1) (Cm - 1) (Swc)

6 A B , n "n - 1" "k" 2 , 1 , n k n - 1



[1]

		(+)		(-)	
V1		V5		GND	
GND		V4		V1	
				V2	
				V3	

1, 6, 4, GND, 5, 3, (V1, V2, V3), (V1, V4, V5), V1V2V3V4V5GND, V1 - V2 = V2 - V3 = V3 - V4 = V4 - V5 = V5 - GND = V1/a

LCD, V1, V1/2, (V5, V4), VLCD2, (V5, V4), (VLCD2 = VLCD1/2), VLCD1 = n x VDD, VLCD2 = m/n, = m x VDD, (VLCD2)

가 8, (COMp, COMq), (SEGk), (GND, V4), (row), (V1, V3), 가

(stage), 가, 가, (SEGk), (COMp, COMq), (SEGk - COMp, SEGk - COMq)가

가, OMq, V1, V3, V5, 8, SEGk - COMp, SEGk - C

LCD, V1, V3, V5, LCD, (IL), (V1, V3), (V5)

(A1, A2, ... A5), 가, (VLCD1), (A1, A2, A3), (I_{op1}), (VLCD2), (A4, A5), (I_{op2}), I_{op1} = I1 + I2 + I3 = 3I_{bias} + IL + If₁₂₃, I_{op2} = I4 + I5 = 2I_{bias} + IL + If₄₅, If₁₂₃, If₄₅, (A4, A)

$(I_{op1} \quad I_{op2})$
 VDD , VDD , VDD
 $n \times (5I_{bias} + 2IL + I_{f_{123}} + I_{f_{45}}) \quad 5nI_{bias} + 2n \times IL$, VDD
 $n \times (3I_{bias} + IL + I_{f_{123}}) + m \times (2I_{bias} + IL + I_{f_{45}}) \quad (3n+2m) \times I_{bias} + (n+m) \times IL$
 "m" $n/2$ $(n+1)/2$, VDD m/n .
 가 , $(I_{f_{123}} \quad I_{f_{45}})$ $1/10$ $1/100$, 가 가
 , (IL) .
 4 "n" , m/n 0.5 0.6 ,
 $(3n+2m)/5n$ 0.8 0.84 , LCD $(n+m)$
 $/n$ 0.75 0.8 , LCD LCD LCD
 75% 80% .
 LCD LCD IC .
 LCD IC
 9 , 2 LCD $(11A)$
 (12A) . (11A) (VDD) 5 (11A)
 VLCD1 VLCD5) (12A) .
 (12A) (Vref) (A1) , (Vref)
 (A1) (V1) . (12A) (VLCD2 VLCD5)
 (V2 V5) (A2 A5)
 (VLCD1 VLCD5), (VDD) (V1 V5)
 :
 $VLCD1 = n1 \times VDDV1,$
 $VLCD2 = n2 \times VDDV2,$
 $VLCD3 = n3 \times VDDV3,$
 $VLCD4 = n4 \times VDDV4,$
 $VLCD5 = n5 \times VDDV5,$
 $n1 \quad n5(n1n2n3n4n5)$ (VLCD1 VLCD5) .
 VDD $n1 \times I1 + n2 \times I2 + n3 \times I3 + n4 \times I4 + n5 \times I5$,
 $n1 \times (I1 + I2 + I3 + I4 + I5)$.
 , $n1=5, n2=4, n3=3, n4=2 \quad n5=1$ 가 , VDD 60% . 1
 , VDD 84% .
 가 ,

, , 3
 , 3
 1 LCD
 LCD

(57)

1.

(C1 Ck) (C1 Ck) , 1 (C1 Ck) 1 (VDD)
 erial branch) 2 1 (C1 Ck) (Sw1) (24) , (s
 2 (VLCD1) 1 (end) , (24)가
 (C1 Ck) 2 (VLCD1) 1 (Sw1) 1 (VDD)
 2 (VLCD1) 3 (VLCD2)

2.

1 , 2

3.

2 , .

4.

1 , 1 (CLn) 2
 (CLm) (CLn, CLm)

5.

1 , 1 (Sw1) 3 (VLCD2, VLCD3, VLCD4, VLCD5)
 1

6.

5 (A1) , 2 (VLCD1) 1
 3 (VLCD2, VLCD3, VLCD4, VLCD5)
 2 (A2, A3, A4, A5)

7.

1
(A1, A2, A3)
(A4, A5)

2 (VLCD1)
3 (VLCD2)

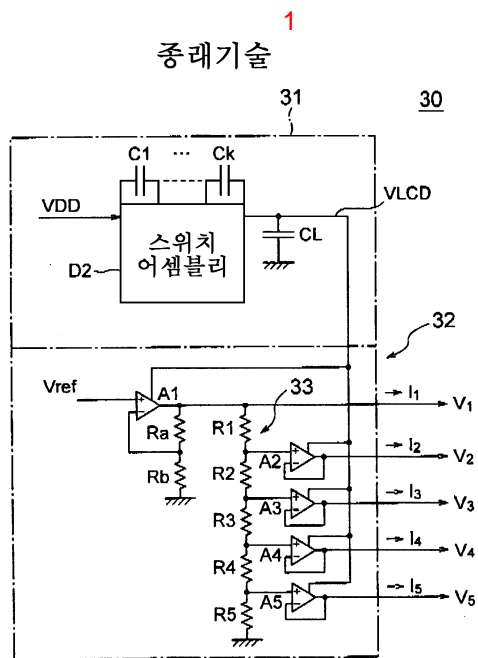
1
2

8.

7 (A1 A5)

9.

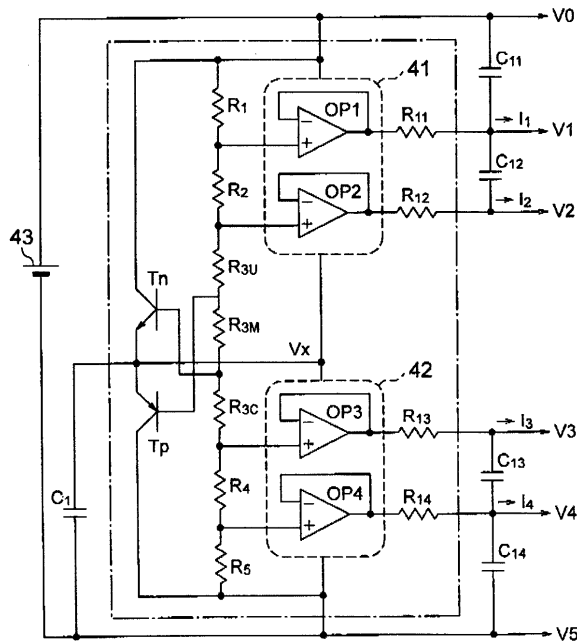
1 (11) LCD



2

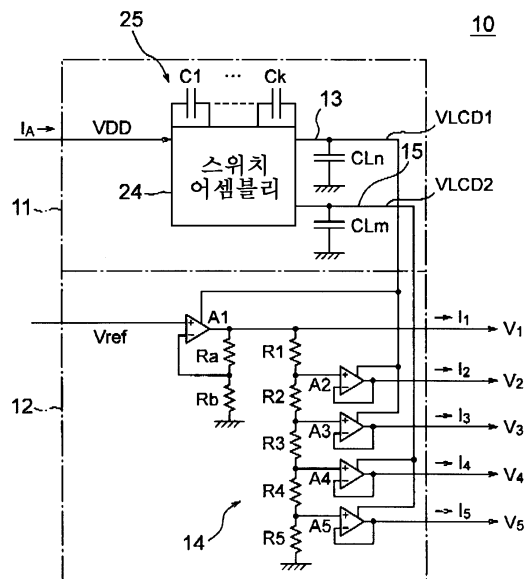
종래기술

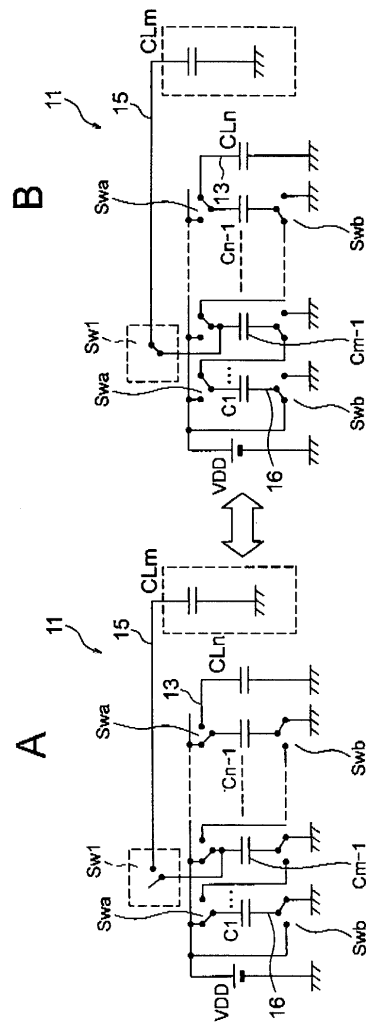
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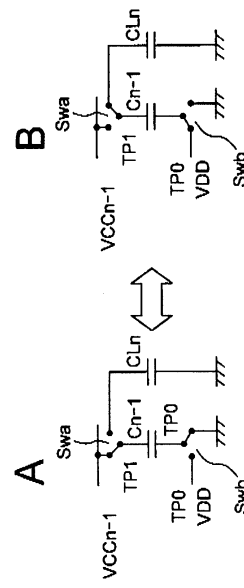
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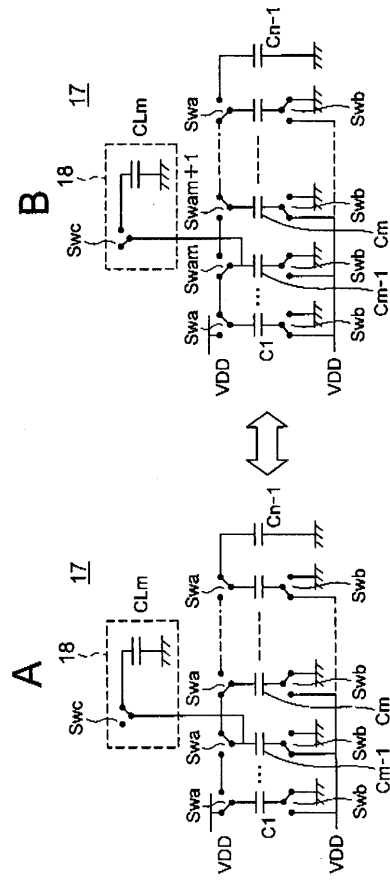


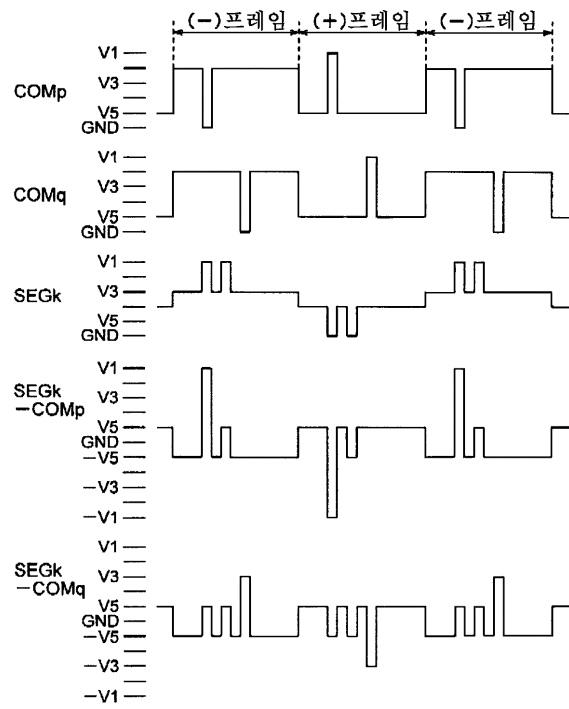


5



6





9

