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(71) 가 가 가 가 3 17 2
가 가

(72) 가 1-22-12

1-8-32 205

(74)

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(54) -

(1) (1) A-D (10) A-D 2 (2, 3)
(AD1 ADm)

3

1 1

2 1 (1) A-D

3 2 A-D (ADk)

4 2 A-D (21)

5 2 (25)

6 4 5 A-D (21) (25)
 .
 7 5 (1)
 .
 8 2
 .
 9 5 (25) 8 (50)
 .
 10 A-D
 .

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1, 50 : 2, 3 :
 10 : A-D 11 : S/H
 12 : A-D 13 :
 14 : 15 :
 AD1 ADm : A-D 21 : A-D
 22 : D-A 23a, 23b :
 25 : 31, 32 :
 33 : C51 C54 :
 55 : 56 :

2 , A-D ,
 .
 10 (100) A-D 가 10 (MP1) (V_n1) 가 (V_p1) NMOS
 가 , NMOS (MN3) (MN4) , PMOS (100) , (ViA, ViB) 2 NMOS
 .
 , PMOS (MP2) NMOS (MN2) (100)
 , (VoA, VoB) 가 , NMOS (MN1)
 (CMFB) 가 , (VoA, VoB)
 , NMOS (MN3) lo , NMOS (MN2, MN1)
 (A1, A2) lo/4 가 가 . PMOS (MP2) NMOS (MN2, MN1)
 lo 가 가 . 2 (SW1, SW2) A-D 가
 가 가 , A-D 가

A-D , 가 가 , CMOS , ,
A-D , 10 , (100) , A-D (100) ,
, , 가 , A-D ,
, , 2 ,
, A-D ,
, 2 1 , 1 2 , 1 2 ,
, 가 , 1 2 ,
, 1 2 , 가 ,
2 3 4 , 1 2 , 1 2 , 1 ,
, 가 , , 1 2 ,
2 , 1 2 , 가 , , 3 4 1 ,
, 가 , ,
A-D ,
, A-D ,
, A-D A-D , A-D A-D , A-D ,
, D-A A-D D-A , D-A , A-D ,
, ,
A-D , A-D A-D A-D ,
, , A-D , A-D A-D ,
, A-D A-D A-D A-D ,
D A-D , A-D D-A D-A , D-A , A-D A-

, A-D A-D A-D A-D A-D A-D
 가 A-D A-D A-D A-D A-D
 , A-D A-D D-A D-A D-A A-D A-D
 4 3 4 1 2 1 2 3
 가 1 2 가 3 4
 가 1 2 가 가 가
 1 1 2 1
 1 (1) 2 (2, 3) (2, 3)
 b. 1999) (IEIC Trans. Fundamentals, Vol. E82 - A, No. 2 Fe
 가 (2) (2, 3)
 (2) (A1, A2), PMOS (MP1, MP2), NMOS (MN1, MN2), (SW1,
 SW2) (C1, C2) (MN2) NMOS (VDD) PMOS (MP1), PMOS
 (MP2), NMOS (MP1) (MP2) NMOS (MN1) 가 (MN1) PMOS
 , PMOS (MP2) NMOS (MN2) (2) (2)
 A2) (A1) (C1) NMOS PMOS (MP2) (SW1) (
 (C2) (MN2) (SW2) (A2)
 (A1) (SW1, SW2) 가 (SW1, SW2) A-D
 (1)가 가 가 가 A-D 가
 가 가 가 A-D 가
 (1) 10 (1) (A1, A2) lo/4 2 x lo
 (MP2) NMOS (MN2, MN1) lo , PMOS
 3 x lo (1) (1)
 5 x lo
 , 1 (1) A-D 2

1 (1) A-D

2 A-D (10) , S/H (11), m(m))
 2 A-D 가 (AD1 ADm) A-D (12), A-D (12) (13)

A-D (10) A-D (AD1 ADm) S/H
 (11), A-D (12) (14), (13) (CLK) (15)

S/H (11) A-D (10) (+) (-)
 (+) (-) (+) (-) S/H (11)
 (+) (-) (15)

A-D (12) m A-D (AD1 ADm) ,
 A-D (AD1 ADm) n(n>0) A-D

A-D (ADk) (+) (-)
 , 1 A-D (AD1) S/H (11) (+) (+) (-) (-) , A-D
 (ADk)(2 k m) A-D (AD(k-1)) (+) (-)

3 A-D (ADk) 3 A-D (ADk) n
 A-D (23a, 23b), 1 A-D (2, 3) (21), n D-A D-A (22),
) A-D (21) (+) (ViP) (-) (ViM) A-D (21)
 (13) , n A-D (22)

2 가 , A-D (AD1 ADm) n
 (13) A-D (AD1 ADm) n
 , A-D (OUT) , A-D (AD1 ADm) 1.5
 가 (13) 1.5 1 , A-D

3 D-A (22) A-D (21) (23a, 2
 (23a) (+) (ViP) D-A (22)
 , (2) , (23b) (-) (ViM) D-A (22)
 (+) (VoP) , (3) (-) (2) (VoM)

A-D (21)가 1.5 A-D , D-A (22)가 1.5 D-A
 A-D (ADk)

A-D (21) (+) (ViP) (-) (ViM) (1) (Vi)

Vi = ViP - ViM . . . (1)

A-D (21) (14) (VrCP, VrCM) A-D
 (21) (1) (Vi) (VrCP, VrCM) , (2) (4)
 (Dk) :

Dk = 1 (VrCP < Vi) . . . (2)

$D_k = 0 (V_{rCM} \quad V_i \quad V_{rCP}) \dots (3)$

$D_k = -1 (V_i < V_{rCM}) \dots (4)$

$$\begin{aligned} & \text{D-A (22)} & \text{(14)} & & \text{(VrR, Vcom, VrM)} \\ & \text{, VrCP = VrP/4, VrCM = VrM/4, Vcom = 0, Vr} & & & \text{VrP = Vr, VrM =} \\ -Vr & \text{, VrCP = Vr/4, VrCM = -Vr/4가} & \text{D-A (22), (23a)} & \text{(2)} & \text{(5)} \\ 2, 3) & \text{(25)} & \text{(22), (23b)} & \text{(3)} & \text{(6)} \\ & \text{(+) (VoP)} & \text{D-A (22), (23b)} & & \\ & \text{(-) (VoM)} & & & \end{aligned}$$

$VoP = 2 \times ViP - RkP \dots (5)$

$VoM = 2 \times ViM - RkM \dots (6)$

$D_k = 1, RkP = VrP, RkM = VrM,$

$D_k = 0, RkP = Vcom, RkM = Vcom,$

$D_k = -1, RkP = VrM, RkM = VrP$

가 .

$$\begin{aligned} & \text{(25) (+) (ViP) (-) (ViM) 2, A-D (21)} \\ & \text{(DK) 가 (+) (VoP) (-) (VoM)} \\ M) & \text{, A-D (ADm) (25)가} \end{aligned}$$

$$\begin{aligned} & \text{A-D (21) (25)} \\ & \text{4 A-D (21) (25), 5 (25)} \\ 6 & \text{A-D (21) (25)} \\ & \text{4 A-D (21) 2 (31, 32), (31, 32)} \\ & \text{(Sp, Sm, Sz) D-A (22) (33)} \end{aligned}$$

$$\begin{aligned} & \text{, Vi = ViP - ViM, VR = VrCP - VrCM, (31) Vi VR/4} \\ & \text{(SU) (33) (32) Vi VR/4} \\ & \text{(SU, SL) (SL) (33) VR/4 < Vi} \\ U) & \text{('Low'), (SL) 'High'가 Vi < - VR/4, (SU, SL) (S)} \\ & \text{'Low'가} \end{aligned}$$

$$\begin{aligned} & \text{(33) (SU, SL)가 VR/4 < Vi, (Sp) 'High'} \\ & \text{(Sm, Sz) 'Low' (33) (SU, SL)가 - VR/4 Vi VR} \\ /4 & \text{(33) (Sz) 'High', (Sp, Sm) 'Low'} \\ p, Sz) & \text{'Low' (Sm) 'High', (S)} \end{aligned}$$

$$\begin{aligned} & \text{(33) (SU, SL)가 VR/4 < Vi, Dk = 1} \\ & \text{(13) (SU, SL)가 - VR/4 Vi VR/4, Dk = 0} \\ & \text{(13) (SU, SL)가 Vi < - VR/4, Dk = -1} \\ & \text{(13)} \end{aligned}$$

5 (Q11, Q14) D-A (22) NMOS (C11, C12) (Q1, Q4) (23b) NMOS (Q21, Q24) (23a) NMOS (C21, C22) (2, 3) (1) (CKIo)

D-A (22) NMOS (Q1, Q4) A-D (21) (Sp)가 NMOS (Q2, Q5) A-D (21) (Sz) 가 NMOS (Q3, Q4) A-D (21) (Sm)가 NMOS (Q1, Q4) (14) (VrP) 가 NMOS (Q1)가 (23a) (C12) (VrP) 가 (23b) (C22) (VrP) 가

NMOS (Q2, Q5) (14) (Vcom) 가 NMOS (Q2, Q5)가 (23a) (C12) (23b) (C22) (Vcom) 가 NMOS (Q3, Q6) (14) (VrM) 가 NMOS (Q3)가 (23a) (C12) (VrM) 가 NMOS (Q6)가 (23b) (C22) (VrM) 가

(23a) NMOS (Q11) (15) (CK1)가 NMOS (Q12) (15) (CK2) 가 NMOS (Q13, Q14) (CK2) (CK2B)가 NMOS (Q13, Q14)가 (C11, C12) (+) (ViP) (2) (ViP) (+) (2) (ViP) (2) (CKIo) 1 (SW1, SW2) (A1, A2)

(2) NMOS (Q11, Q13, Q14) NMOS (Q12) (A1, A2) (C11) (CKIo) 1 (SW1, SW2) (2)가 (SW1, SW2) (33) (Sp, Sz, S) (A1, A2) NMOS (Q1, Q3) 가 (VrP, Vcom, VrM) (C12) 가 (23a) (+) (VoP) (2)

가 (23b) NMOS (Q21) (15) (CK1)가 NMOS (Q22) (15) (CK2)가 NMOS (Q23, Q24) (CK2B)가 NMOS (Q23, Q24)가 (C21, C22) (-) (ViM) 가 NMOS (Q21) NMOS (Q22) 가 (3)가 NMOS (C21, C22) (-) (ViM) (-) (ViM) (-) (ViM) (3) (CKIo) 1 (SW1, SW2) (3) (A1, A2)

(3) NMOS (Q21, Q23, Q24) NMOS (Q22) (A1, A2) (C21) (3) (CKIo) 1 (SW1, SW2) (3)가 (SW1, SW2) (33) (Sp, Sz, Sm)가 (A1, A2) NMOS (Q4, Q5, Q6) A-D (21) 가 (VrP, Vcom, VrM) (C22) 가 (23b) (3) (-) (VoM)

(1) A-D (10) A-D (AD1, ADm) (25) 1 (1) A-D (10)

P) (-) (VoM) (1) (2, 3) (+) (VoM)
A-D (10) A-D (AD1 ADm) (m)가

40) A-D (1) (41) A-D (10) A-D (10)
(AD1 ADm) (40) (100) A-D (10) A-D (10)
(41) A-D (2, 3)

(2, 3) (1)
(1) A-D (10) A-D (AD1 ADm)
(25) A-D

가 1 (1) (2, 3)
2 8

2
8 2 8 1
(50)가 (C51 C54), (55) (56) 1 8 (56)

8 (50) (2, 3), (C51 C54), (55) (56) (2)
(2) (3) (C51, C52)가 (C51, C52)
(3) (C53, C54)가 (C51, C52)
(55) (C53, C54) (55)
(C51, C52) (56) (Vcom) 가

(Vcom) 가 (C51, C52) (56)가 (C51, C52)
(-) (VoM) ((VoP+VoM)/2) (+) (VoP) (3)
(56)가 가 (C51, C52) 가 (55)
(C53, C54) 가 (2, 3)

(2) (VoP) (3) (VoM) ((VoP+VoM)/2) (Vcom)
(55) (ViB) 가 가 (55)
(C53, C54) 가 가 (C53, C54)
(2, 3)

) 0) (+) (-) (VoM) ((VoP+VoM)/2) (Vcom) (2) (VoP)
(3) 가

8 (50) 5 (25) 9
9 (50)

9 (56) (15) (CK1)
1 (25) (+) (ViP) (-) (ViM)
2 (VrP, Vcom, VrM) (25) A-D (21)

(25) (25) (+) (ViP) 2

(C11, C12) (25) , (-) (ViM) 2 (C21, C22) (ViM) (25) (+) (ViP) (-) (2) (25) 2- 1 (ViM) (2) NMOS (Q11)가 (3) (Q21)가 NMO (50) (56)가 (55) (C51) (7) (Vc1) (C52) (8) (Vc2) (C51) (7) (Vc1) (C51, C52)

$$Vc1 = Vcom - VoS \dots (7)$$

$$Vc2 = Vcom - VoS \dots (8)$$

(VoM) , Vc1 (C51) , Vc2 (C52) , VoS (2) (+) (VoP) (3) (-)

(56) (9) (55) (Q) (C51, C52)

$$Q = C \times (Vc1 + Vc2) \dots (9)$$

(Q) NMOS (Q11, Q21)가 (2) (5) (+) (VoP) (3) 가 (6) (-) (VoM) (5) (5) V1 (55) (10)

$$Q = C \times (V1 - VoP) + C \times (V1 - VoM) \dots (10)$$

$$\dots (7) (10) (11)$$

$$V1 - Vcom = (VoP + VoM) / 2 - VoS \dots (11)$$

(11) (+) (VoP) (-) (VoM) VoS (55) (C53, C54) V1

(+) NMOS (Q11, Q21)가 (+) (VoP) (-) (VoM) (VoM) (ViP) (-) (ViM) (55) VoS V1 (C53, C54) 가 (2, 3) (C11, C21) 가

(Vcom) A-D (AD1 ADm) (+) (VoP) (-) (VoM) VoS (+) (VoP) (-) (VoM) (AD1 ADm) 가 A-D (40)가 가

(VoM) 2 (VoM) (2) (VoP) (3) (C53, C54) (Vcom) 가 (C51, C52) (2, 3) (55) 가

1 (SW1, SW2) 2 (56) 가

(2, 3) (1) (1)
 A-D (10) A-D (AD1 ADm) (25) , A-D
 (Vcom) (2) (VoP) (3) (VoM)
 3, C54) 가 (C51, C52) (2, 3) (55) (C5
 가
 가

(57)

1.

1 1 ,
 1 2 2 ,
 1 2 가 , 1 2

2.

1 , 1 2 1 2 ,
 1 2 3 4 ,
 1 2 3 4 ,
 , 1 2 가

3.

2 , 1 2 1 2 가 , 1 2
 3 4 가 가 ,

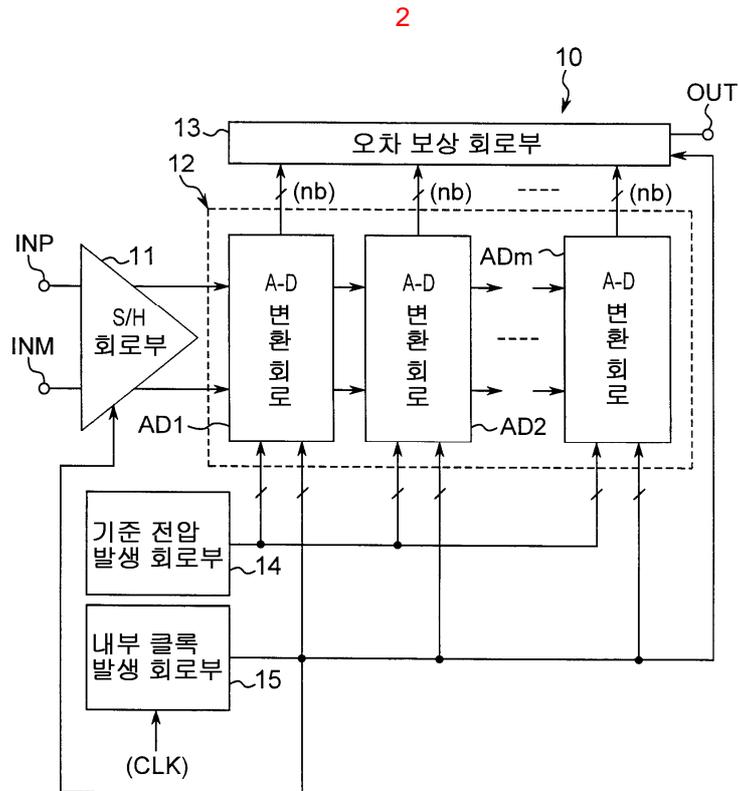
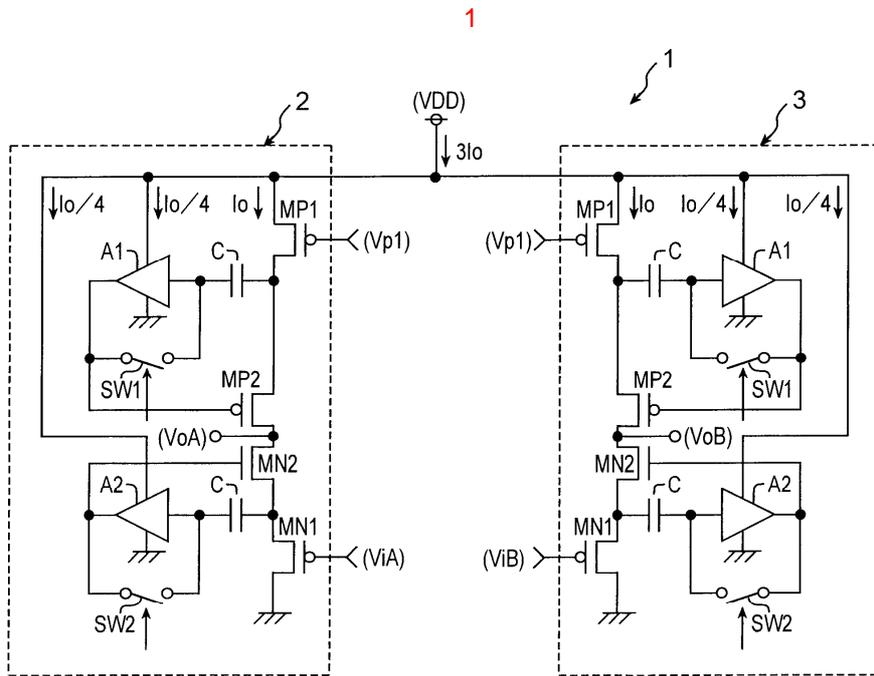
4.

1 , 2 3 , 1 2

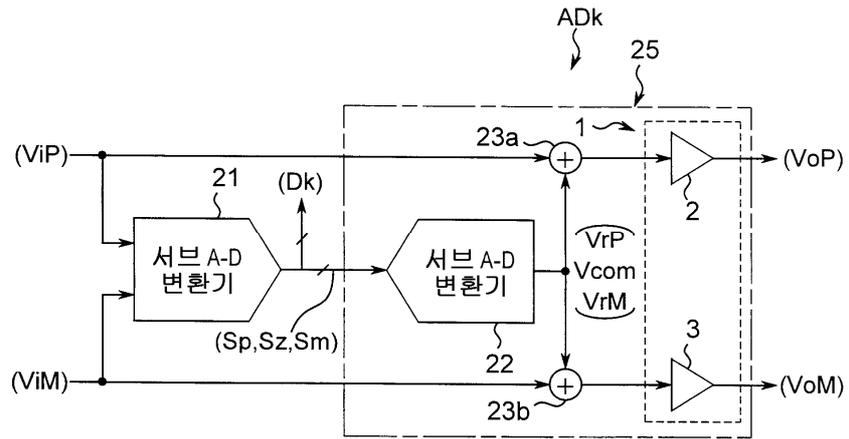
5.

A-D A-D A-D A-D ,
 A-D ,
 A-D A-D ,

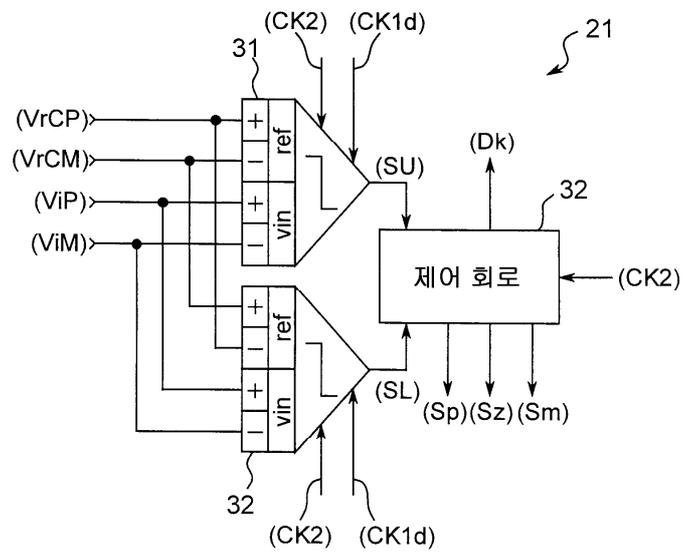
A-D



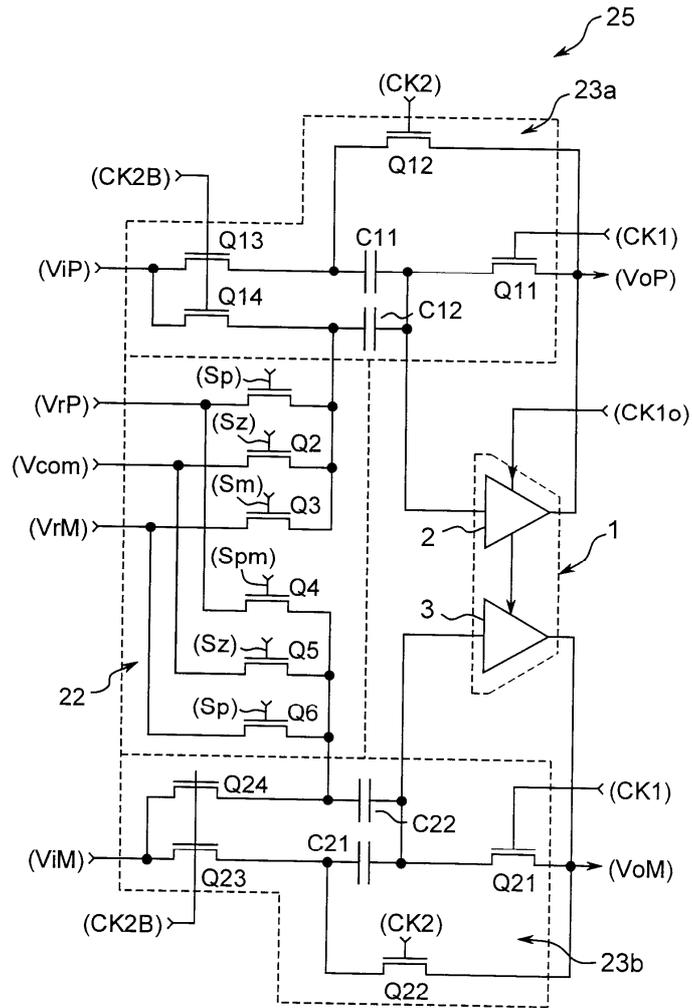
3



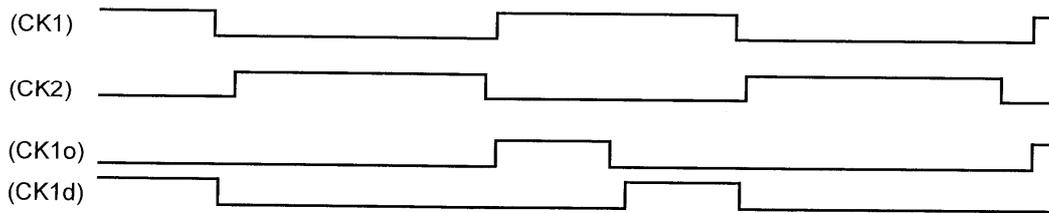
4



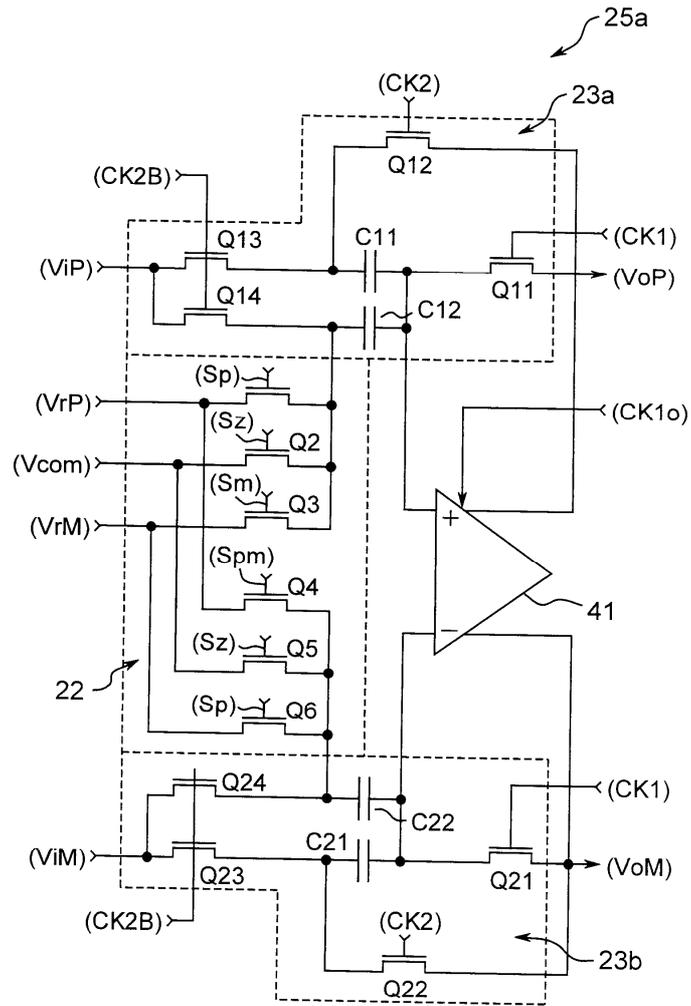
5



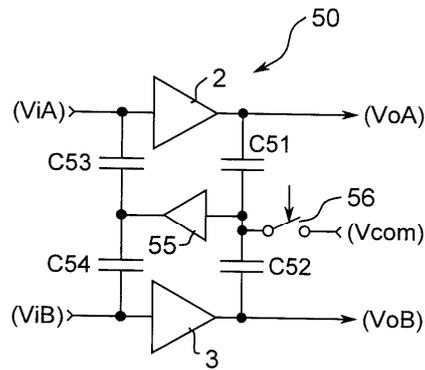
6



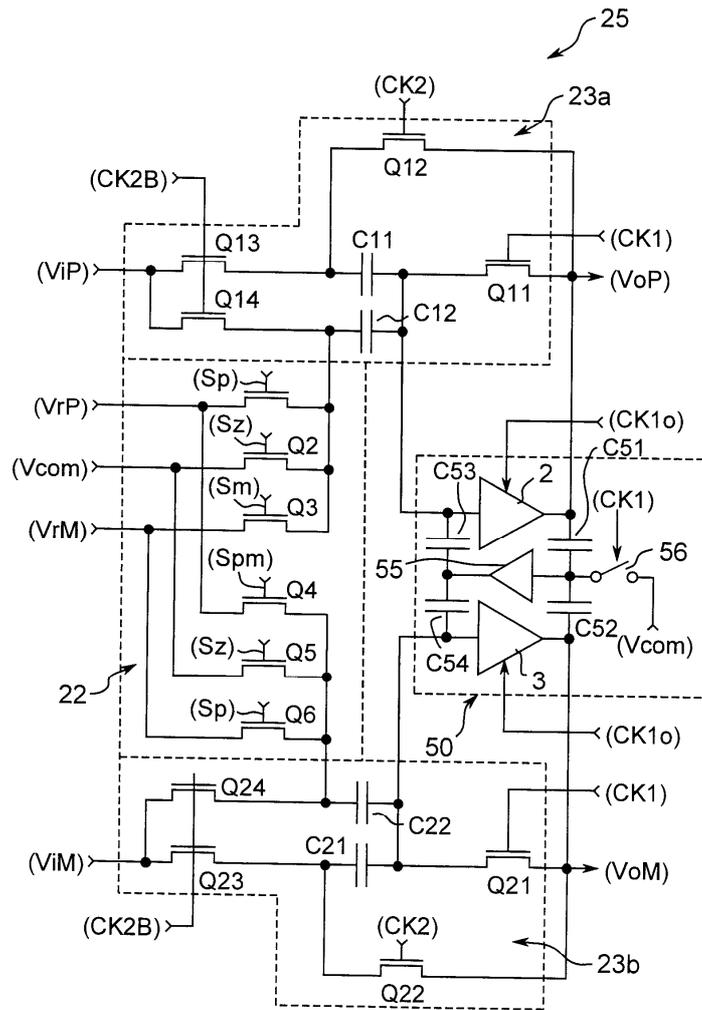
7



8



9



10

