

(19)
(12)

(KR)
(B1)

(51) 。 Int. Cl. ⁶
G11C 11/22

(45)
(11)
(24)

2002 05 27
10 - 0338552
2002 05 17

(21) 10 - 1999 - 0030873
(22) 1999 07 28

(65) 2001 - 0011483
(43) 2001 02 15

(73)

3 416

(72)

APT403 2002

(74)

:

(54)

2 , 1 2 가 1 , 1 2 , 1
, 가 가 1 2 .

2

1 I - V ;

2 ;

(the degree of polarization) ($\mu C/cm^2$)

FRAM, 2, 1, 'B', 'D', 'D', 'D', FRAM, 1

FRAM

가, Vcc, 가, 'C', 'B', 'D', 가, dQ1

'0'가, 'D', 'C', (3), Vcc) 가, (

FRAM 가 가 COB (capacitor - on - bit line)

(V_b)

1

$$V_b = \frac{Q_m}{C_b}$$

C_b , Q_m , (Q_m), (V_b), (V_b), (FR, AM)

가

()

1, 2, 1

, 2 , 1 , 1 . 1 1 1
 , 1 1 , 1 1
 1 가 , 1 1 2
 2 , 2 , 2 2 , 2
 . 2 2 1 2
 . 가 , 1 1 2 2

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

, 1 2 , 3 4
 2 가 1 2 가 . 1 2
 , 1 2 .

, , , , , ,

; 가

;

()

, (FRAM) .

()

2

(folded bit line scheme)

'FOLDED BIT LINE FERROELECTRIC MEMORY DEVICE' U.S. Patent No. 5,541,872
 가 () DRO (destructive read out)
 가 () NDRO
 NDRO FRAM 'FERROELECTRIC MEMORY' U.S. Patent No. 5,753,949
 NDRO FRAM U.S. Patent No. 5,753,949
 NDRO FRAM 'SEMICONDUCTOR MEMORY DEVICE HAVING FERROELECTRIC FILM' U.S. Patent No. 5,345,414
 'FERROELECTRIC ADAPTIVE - LEARNING TYPE PRODUCT - SUM OF OPERATION ELEMENT AND CIRCUIT USING SUCH ELEMENT' U.S. Patent No. 5,519,949

2, FRAM (1) 1 (10), 1 (12), 1
 (14) (16) (BL1_T) - (BLi_T)
 1 (10) (WL1_T) - (WLi_T) (PL1_T) - (PLi_T)
 가 (WL1_T) - (WLi_T) (PL1_T) - (PLi_T)
 1 (12) (RWL_T) (RPL_T) 가
 (RWL_T) (RPL_T)

FRAM (1) 2 (20), 2 (22), 2
 (24) (16) (BL1_T) - (BLi_T)
 (BL1_B) - (BLi_B) 2 (20) (WL1_B) - (BLi_B)
 Li_B (PL1_B) - (PLi_B) 가 2 (22)
 (RWL_B) (RPL_B) (WL1_B) - (WLi_B)
 (PL1_B) - (PLi_B) (RWL_B) (RPL_B)

(20) 1 (10)가 (26) 2
 (12) (22)
 (BL1_B) - (BLi_B) 2
 (20)가 (26) (10) 2
 (22) (12)
 (BL1_T) - (BLi_T) (14)
 2 (BL1_T) - (BLi_T) () 가
 (24) (BL1_B) - (BLi_B)

(26) 가 'DYNAMIC ADJUSTING REFERENCE VOLTAGE FOR FERROELECTRIC CIRCUITS' U.S. Patent No. 5,128,566

FRAM (1) 1 (28) 2 (30) 1 (2)
 8) (BL1_T) - (BLi_T) (AWL_T) (APL_T) 1

1 (28)가 (28) (BL1_T) - (BLi_T) 가 (BL1_T) - (BLi_T) 가 , 2
 (30) (BL1_B) - (BLi_B) , (AWL_B) (APL_B)
 2 (30)가 (30) (BL1_T) - (BLi_T)
 2 (30) (BL1_B) - (BLi_B) ,
 (28) (30) (BL1_B) - (BLi_B) 가 , 1 2
 (26)

FRAM (1) , 가 가 ,
 (16) 1 2 (28) (30) (BL1_T) - (BLi_T)
 T) (BL1_B) - (BLi_B) 가

1 2 (28) (30) . 3 , 1 2
 (28) (30) 1 (10) 2 (22)
 가 . 3 , 4 (BL1_T), (BL2_T), (BL1_B), (BL2_B)
 3

(BL1_T) (BL1_B) . 3
 , 1 (10) (101) (102) 1T/1C
 (MC) (101) (BL1_T) 1 ,
 (WLi_T) , (102) (PLi_T) 2
 . 1 가 (14) NMOS (103) (BL1_T)
 가 , (BLP_T)

07) (104 1 (28) (BL1_T) NMOS (104) (1
 NMOS (104)) (105) 가 (AWL_T)
 NMOS 2 (105) 1 (105) 2 (L_T) 1
 (107) (APL_T) , (BL1_T)
 (105) 1 (R_T) . NMOS (104) (107)
 (105)가 (BL1_T) - (BLi_T) 1
 (28)

3 , 2 (22) (110) (111)
 (RMC) , (BL1_B) (BL2_B)
 (111) (1 'B' 'D') , 1 (10)
 (102) 가 (RWL_B) (110)
 (BL1_B) 1 가 , 2 (111)
 (RPL_B) . (110) 2 (111)
 (RPS_B) (RFDIN/RFDINB) 1 NMOS (1
 12) 2 . 3 , (BL
 (i-1)_B) (BLi_B)

13) 1 (BL1_B) (14) 가 , 2 (24) NMOS (1 (BLP_B)

S (SA) 3 (114) (117) (114) (30) (BL1_B) (BL2_B) , (30) (BL1_B) NMO (114) (AWL_B) (115) . NMO (115) (APL_B) , (BL1_B) 1 (BL1_B) (115) (L_B) NMOS (117) (R_B) NMOS (114) (117) (115)가 (BL1_B) - (BLi_B) 2 (30)

(BL1_T) (BL1_B) (BL2_T) (BL2_B) , (B (SA)가 3 (((BL1_T), (BL2_T), (BL1_B) (BL2_B)) (12)가 (16) 3 2 (22) 1 (10) 2 (20)가 (16) , 1

4 1 2 (28) (30) (105) (115) 1 ('B') 가 .

FRAM (BL1_T), (BL2_T), (BL1_B) (BL2_B) (BLP_T) (BLP_B) (high) 1 2 (14) (24) (BL1_T), (BL2_T), (BL1_B) (BL2_B)

(RWL_B) 1 (10) (WLi_T) 2 (22) 4 (101) (110) (WLi_T) (RWL_B) (102) (111) (BL1_T), (BL2_T), (BL1_B) (BL2_B) (AWL_T) (AWL _B) 1 2 (28) (30) (105) (115) (BL1_T), (BL2_T), (BL1_B) (BL2_B)

i_T) '1' 1 (10) (MC) (PL (102) 'C' 'B' 'D' , dQ1 (102) (BL1_T) (BL2_T) (102) 'Qm' (RPL_T) (REQ) (BL1_B) (BL2_B)

가 , (APL_T) (APL_B) , (105) (115)
 'C' 'B' 'D' , dQ1 (105) (115)
 (BL1_T), (BL2_T), (BL1_B) (BL2_B)
 (105) (115) 'Qa'

(Qt) (Qm+Qa) , (BL1_T), (BL2_T), (BL1_B) (BL2_B)
 1 2 (BL1_T), (BL2_T), (BL1_B) (BL2_B)
 가 (28) (30) FRAM (1)

(BL1_B) (BL1_T) (BL2_T) (SA)
 (SA) (BL2_B) (, Vcc)
 (SA) (BL1_T) (BL2_T) (1
 02) (WLi_T) 'A' 'D' 'B'
 4 (AWL_T) (AWL_B) (R_T), (R_B),
 (L_T) (L_B) (105) (115) 'A'
 'D' 'B'

1 2 (BL1_T), (BL2_T), (BL1_B) (BL2_B)
 (BL2_B) (Qa) (BL1_T), (BL2_T), (BL1_B)
 2_T), (BL1_B) (BL2_B) (BL1_T), (BL

2

$$V_b = \frac{(Q_m + Q_a)}{C_b}$$

(MC) (RMC) 가 가
 (BL1_T), (BL2_T), (BL1_B) (BL2_B)
 가 가
 (FRAM)

가 1 2 (28) (30)
 (R_T), (R_B), (L_T) (L_B) NMOS (107) (117)
 1 2 (28) (30) 가
 가

, 1 2 . , 가 가 .

(57)

1.

1 ;

1 ;

1 2 ;

1 2 , 1 2 ;

가 1 2 가 ,

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

2.

1 ,

3.

4.

1 ,

1 2 .

5.

4 ,

1 2 .

6.

5 ,

1 2 1 2
.

7.

1 ,

2 , 2 가

8.

4 ,

1 2 , 1 2 가 가 ,
NMOS 1 2 .

9.

1 , 1 1 , 1 1 ; 1

1 2 ;

1 1 ; 가 , 2 1

1 1 ;

1 2 , 1 2 ;

가 1 2 .

10.

9 ,

2 , 2 2 , 2 ; 2

1 , 2 2 가 ,
1 2 2

11.

10 ,
 1 1 2 2

12.

11 ,
 1 1 1 1
 ,
 1 1 1 1 가 , 1 , 3
 1 2 ,

13.

12 ,
 2 2 2 2
 ,
 2 2 2 1 가 , 2 , 4
 2 2 ,

14.

13 ,
 1 2 , 3 4
 NMOS 가 1 2 1
 2 2 가 가 .

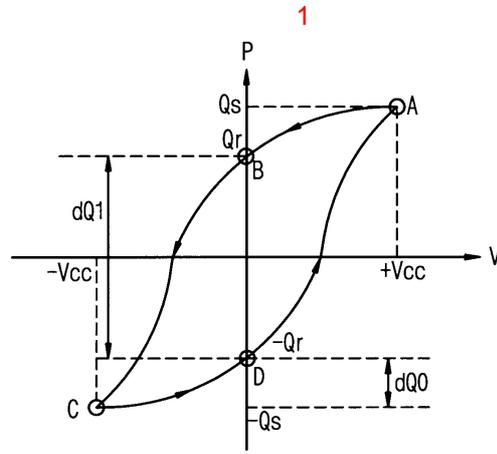
15.

1 ;
 1 1 1 , 1 1 1
 2 ;
 1 2 ;
 2 1 2 , 2 2 2
 2 ;
 1 2 , 1 2 ;

20.

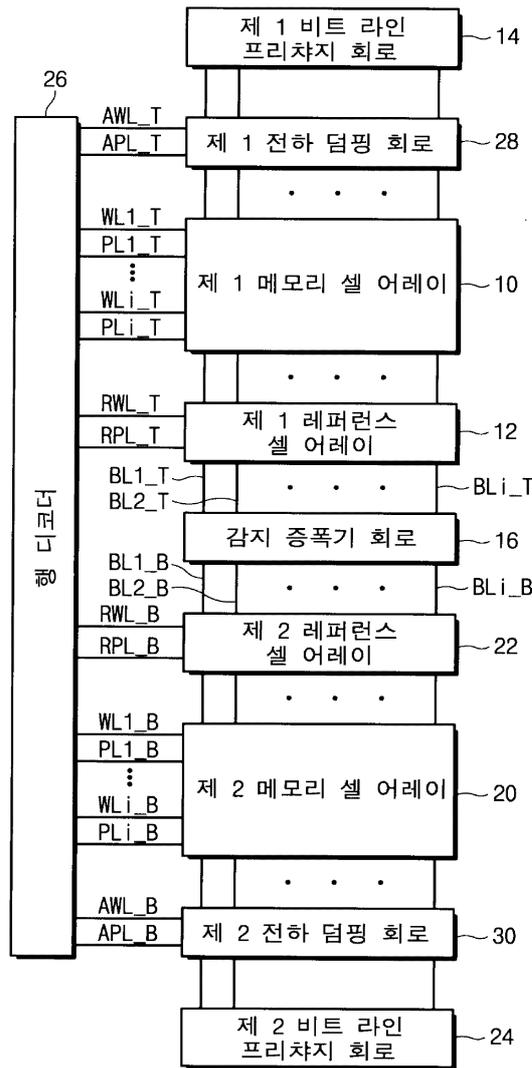
18

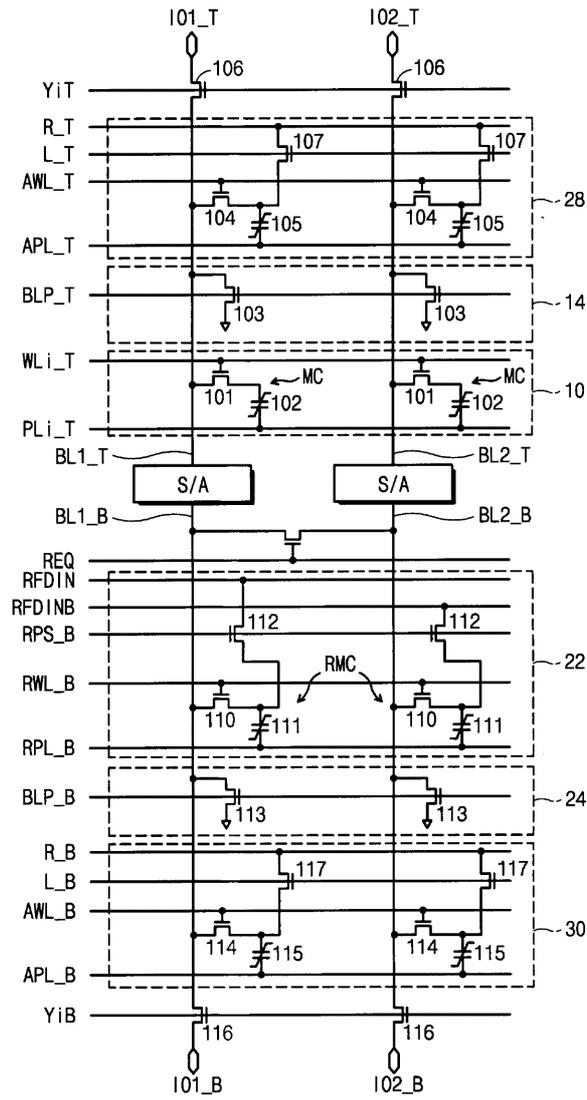
1 2



2

1





4

