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(12) (B1)

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(24) 2002 11 21

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(22) 2000 12 21 (43) 2002 06 27

(73) 3 416

(72) 94 - 16

APT3 411

(74)

:

(54)

, 가

, , 가 가
가 가 , , 가 가
가 가

1 :	2 :
3 :	4 :
5, 50 :	52 :
54 :	56 :
100 :	

, (Liquid Crystal)
가 . , 가 LCD(Liquid Crystal Display)

1 (10) (1), (1) (2), (3), (4),
(10) (gray voltage generating circuit) (5)
(gamma reference voltage
generating circuit)) (5)

(1) , $(G_0 - G_n)$, $(G_0 - G_n)$
 $(D_1 - D_m)$. $(G_0 - G_n)$ (2)가 ,
 $(D_1 - D_m)$ (3)가 . (1)
 $(pixel)$ 가 , (Thin Film Transis
tor ; TFT), (storing capacitor ; Cst), (liquid crystal capacit
or ; Cp) . (1) (red ; R), (green ; G), (blue ; B)
 $(subpixels)$. (1) R, G,
B . (10)
, , , (gray scales)

(4) (R, G, B), (HSync, VSync), (CLK)
 (2) (3) () (Gate Clock),
 (Gate On Signal) . , (5) (3) ,
 (Vdrive) (gray voltage ; Vgray) (gamma re
 ference voltage)) . (5) 2000 5 23 , Kim
 6,067,063 , "LIQUID CRYSTAL DISPLAY HAVING A WIDE VIEW ANGLE AND METHOD FOR DRIVING
 THE SAME"
 . (5) , (VCC) (GND)
 (R1 Rn+1) , (R1 Rn+1) (VCC)
 , n (VG1 VGn) .

가 (10) . , (2)가 (V
(1) 1 , (3) (R, G, B) (5) (Vdrive)
gray) (4) (1) 가 , (Vdrive)

가 , (TFT) , (Vdrive) , (Cp) 가
가 , (1) (TFT) (Cp) (3) .
(Vdrive) .

가
(Cp)
· , 가 , (Cp)
(Vdrive)
, (Cp)
(Vdrive)

(2) **가** **가** . , (3) . , (3) , (2, 3) (Vdrive) (Vdrive)

1

가

가

()

2 13

가

2 (100)
(10) (1), (1) (2),
(3), (4), (50) . , 1
(10) , (4) (Gate Clo
ck) (Vgray') (50) 1
(10) 1
가 . , 가

, (R, G, B) , (3) , (1)
 (Vdrive) 가 . , (Cp)
 (Cp)
 (Vdrive) , (50) , (Vgray') . ,
 (100) , (1) , (Cp) 가 . ,

(3) (4) 가 , (50) (Vdrive) 가 , (100) (2), (3) .

3 (50) 3
 (50) (52), (54), (56)
 (52) (4) (Gate Clock)
 n (G_CLK1, ...G_CLKn), (54) (V_{DD})
 n (Vref1, ...Vrefn), (54) (V_{DD})
 , (3)

(52) (Vref1, ...Vrefn) n)	(54) (56) (Vref1, ...Vrefn)	n ,	(56) .	(G_CLK1, ...G_CLKn) 가 ,	n m (Vgr ay1', ..., Vgraym')
(3) (high)	(3) (low)	(Gate Clock)	(clock period)	(Vdrive')	(Gate Clock)
가 (Cp)	가 ,	(3)	(Vdrive')	(1)	.
			(100)	가	.

4	3	(52)	,	5	3	(54)	.	,
6	3	(56)	.	4	5	(52)		(5)
4)	6	(G_CLK1, ...G_CLK6)	6		(Vref1, ...Vref6)	,	6	
		(56)	6	(G_CLK1, ...G_CLK6)	6	(Vref1, ...Vref6)		
10		(Vgray1', ..., Vgray10')	.	,				

5 , (54) (V_{DD}) 가 6
 (Vref1, ..., Vref6) 1 6 (54a - 54f) . 1
 6 (54a - 54f) (V_{DD}) (GND) ,
 (54a - 54f) (V_{DD}) (GND) ,

$$\begin{array}{ccccccccc}
 6 & & & & (56) & & & 1 & 5 \\
 (\text{Vgray1}', \dots, \text{Vgray5}') & & 1 & & (56a) & , & & & \\
 10 & (\text{Vgray6}', \dots, \text{Vgray10}') & & & 2 & & (56b) & & . \\
 \end{array}$$

1 (56a) (52) (G_CLK1, G_CLK4, G_CLK5)
 (54) (Vref1, Vref4, Vref5) 1 6 ,
 (G_CLK1, G_CLK4, G_CLK5) (Vref1, Vref4, Vref5) 가
 (Vgray1', Vgray4', Vgray5') 1 3
 (AMP1 - AMP3), (AMP1, AMP3) (Vgray1', Vgray4',
 Vgray5') . 1 (AMP1) 1 (G_CLK1)
 1 (Vref1) 가 1 (Vgray1') , 2
 (AMP2) 4 (G_CLK4) 4 (Vref4) 가 4
 (Vgray4') . 3 (AMP3) 5 (G_CLK5) 5 (Vref5)
 가 5 (Vgray5') . 1 (56a)
 1 3 (AMP1 - AMP3) (Vgray1', Vgray4', Vgray5')

[1]

$$V_{gray1'} = \frac{R19+R20}{R19} \left[V_{ref1} + \frac{R1}{R1+R19} V_{G_CLK} \right]$$

[2]

$$V_{gray4'} = \frac{R25+R26}{R25} \left[V_{ref4} + \frac{R4}{R4+R25} V_{G_CLK} \right]$$

[3]

$$V_{gray5'} = \frac{R27+R28}{R27} \left[V_{ref5} + \frac{R5}{R5+R27} V_{G_CLK} \right]$$

, V_{G_CLK} (Gate Clock) .
 1 (56a) , (Vgray1', Vgray4', Vgray5') 2 3
 (Vgray2', Vgray3') , (Vgray2', Vgray3') 1 2 (AMP1, AM
 P2) (R31, R32, R33) 가 .

, 2 (56b) , 2 (56b) (52)
 (G_CLK2, G_CLK3, G_CLK6) (54) (Vref2, Vref3, Vref6)
 7 12 , (Vref2, Vref3, Vref6)
 (G_CLK2, G_CLK3, G_CLK6) (Vgray6', Vgray7', Vgray10')
 4 6 (AMP4 - AMP6), (AMP4 - AMP6)
 (Vgray6', Vgray7', Vgray10') . 4 (AMP4) 2
 (Vref2) 2 (G_CLK2) 6 (Vgray6')
 , 5 (AMP5) 3 (Vref3) 3 (G_CLK3)
 7 (Vgray7') . 6 (AMP6) 6 (Vref6)
 6 (G_CLK6) 10 (Vgray10') .

, 2 (56b) 4 6 (AMP4 - AMP6)
 $(V_{gray6'}, V_{gray7'}, V_{gray10'})$.

[4]

$$V_{gray6'} = \frac{R2 + R21 + R22}{R22} \left[V_{ref2} - \frac{R22}{R2 + R21} V_{G_CLK} \right]$$

[5]

$$V_{gray7'} = \frac{R3 + R23 + R24}{R24} \left[V_{ref3} - \frac{R24}{R3 + R23} V_{G_CLK} \right]$$

[6]

$$V_{gray10'} = \frac{R6 + R29 + R30}{R30} \left[V_{ref6} - \frac{R30}{R6 + R29} V_{G_CLK} \right]$$

, V_{G_CLK} (Gate Clock)

2 (56b) , (Vgray6', Vgray7', Vgray10') 8 9
 (Vgray8', Vgray9') , (Vgray8', Vgray9') 5 6 (AMP5, A
 MP6) (R38, R39, R40) 가 .

가
 , 4 (Vgray4') 7 (Vgray7') 4 (Vgray4') 2 (A
 . , 4 , 5 4 (Vgray4')
 MP2 (AMP2) (56) (Vgray1', ..., Vgray10') ,
 2 , , , 4 7 (Vgray4', Vgray7')
 , , , 4 7 (Vgray4', Vgray7')
 ay7') 가

7a 7b
7a , 7b

8 9 (4) (Gate Clock), (100)
 (3) (Vdrive'), n n+3 (4)
 (Gate On(n) - Gate On(n+3))

,
 V_{F+} V_{F-} (Vdrive) (Gate Clock)
 (Vcom) (Vdrive)

, (100) (3) (Gate Clock)
 (Gate Clock) (Vdrive' = Vgray(t)) (Vdrive')
 (Vdrive') (Vgray'(t)) (1)
 (Cp)

,
 8 (dot inversion), n (3) (Gate Clock) 가
 Gate On(n) 가 가 , , 1 (Vdrive') , (Vdrive')
 , (Gate Clock) 가 , , 2 (Vdrive') V_{F+} 1 2
 2 (Vdrive') 가 , 1 2 (Vdrive') 가
 (Vcom) 가 , 1 2 (Vdrive') 가
 , n+1 (Gate On(n)) 가 가 , (Vdrive)
 (3) (Gate Clock) 가 , (Vdrive') , (Gate Clock) 가
 (Vdrive) V_{F-} 4 (Vdrive') , (Vdrive')
 . , 3 (Vdrive') 가 3 4 (Vdrive') 가
 , 3 4 (Vdrive') 가 3 4 (Vdrive') 가

9 , 2 - (2 - line inversion), n n+1 (3) (Ga
 te Clock) 가 가 , (Vdrive)
 , (Gate Clock) 가 , (Vdrive') , (Vdrive') V_{F+}
 (Vdrive') , n+2 n+3 (3) (Gate Clock) 가
 Gate On(n) 가 가 , (Vdrive)
 , (Gate Clock) 가 , (Vdrive') V_{F-}
 (Vdrive') , 7 8 (Vdrive) (3)
 , , (Vdrive) (n - line inversion)

10a 13b 7a 7b (3) 0 - 32, 0 - 48, 0 - 64, 3
 2 - 64 , , 10b 10a
 0 - 32 , , 11b 0 - 32 , , 11a
 0 - 48 , , 12b 0 - 64 , , 12b
 , , 12a

0 - 64	,	13a	32 - 64	,
13b				
,	가	5	7a	7b
(') 64	(')	,		
(rising time)				
g time)				
10a	10b	, 0 - 32	,	,
( ,	) 26.0ms	,	) 3.6ms	,
( ,	) 24.2ms	,	) 3.6ms	,
	가	,	26ms	24.2ms
			1.8ms	가
11a	11b	, 0 - 48	,	,
( ,	) 36.8ms	,	) 3.6ms	,
( ,	) 26.2ms	,	) 4.4ms	,
0.8ms	가	,	36.8ms	26.2ms
			10.6ms	가
12a	12b	, 0 - 64	,	,
( ,	) 22.6ms	,	) 4.7ms	,
( ,	) 15.1ms	,	) 4.6ms	,
0.1ms		,	22.6ms	15.1ms
			7.5ms	가
13a	13b	, 32 - 64	,	,
( ,	) 20.8ms	,	) 3.4ms	,
( ,	) 15.0ms	,	) 3.4ms	,
	가	,	20.8ms	15.0ms
			5.8ms	가
10a	13b	,	(3)	, 0 - 32
4.2ms	1.8ms	가	26.2ms	10.6ms
6ms	15.1ms	7.5ms	20.8ms	15.0ms
		가	5.8ms	가
				26ms 2
				22.

[1]

0 - 32	26.0 ms (1.00)	24.2 ms (0.93)
0 - 48	36.8 ms (1.00)	26.2 ms (0.71)
0 - 64	22.6 ms (1.00)	15.1 ms (0.67)
32 - 64	20.8 ms (1.00)	15.0 ms (0.72)

[1]

(normalization)

[1] , 0 - 32 , 26.0ms 24.2ms 1.8ms 가 , 0 - 48 , 36.8ms 26.2ms 10.6ms 가 , 0 - 64 , 22.6ms 15.1ms 7.5ms 가 , 32 - 64 , 20.8ms 15.0ms 5.8ms 가 , 0 - 32 7% 가 , 0 - 48 29% 가 , 0 - 64 3 , 3% 가 , 32 - 64 28% 가 , [1] 가 ,

, (50) , (3) 7 8
 가 (Vdrive') (Vgray')
 (3) (Gate Clock) (1) (Cp) , (3)
 $V_{drive'} = V_{gray'}(t)$ (falling time)
 가 (Vdrive') 가 ,

(57)

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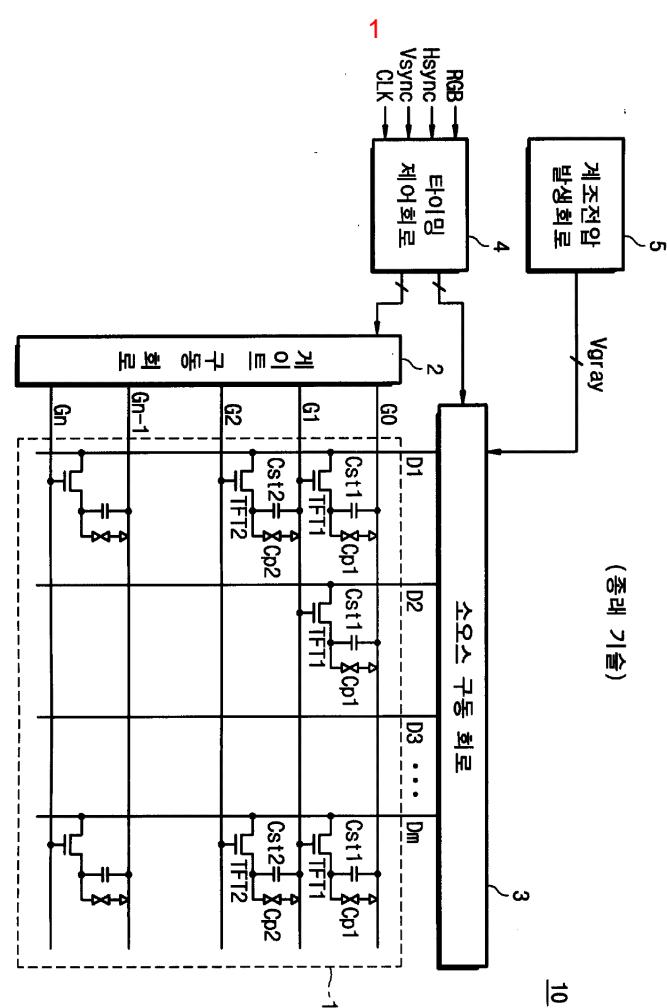
2

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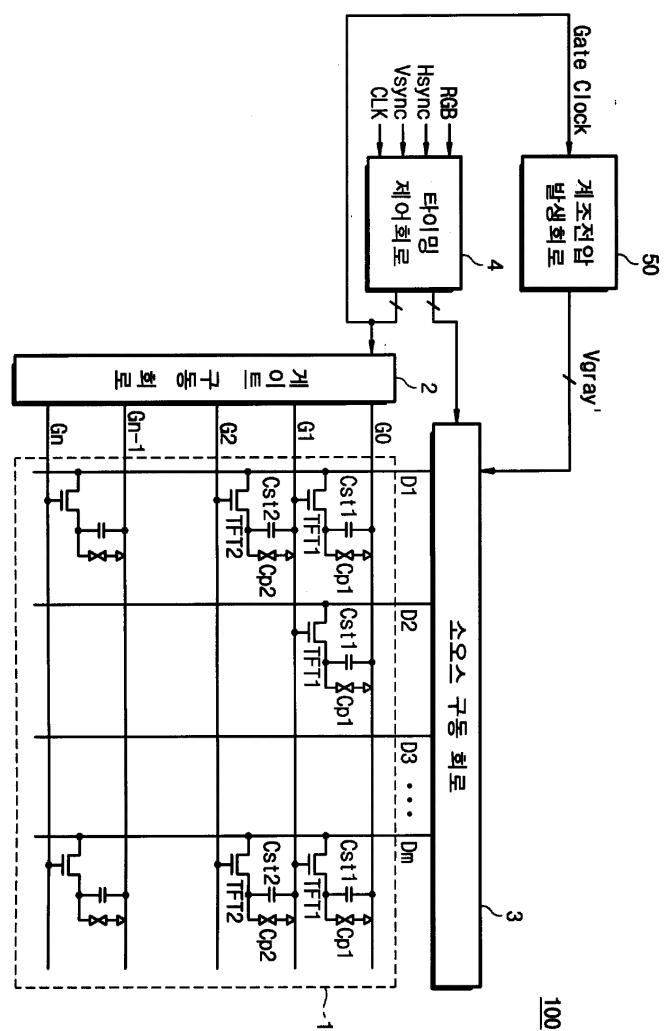
21

23.

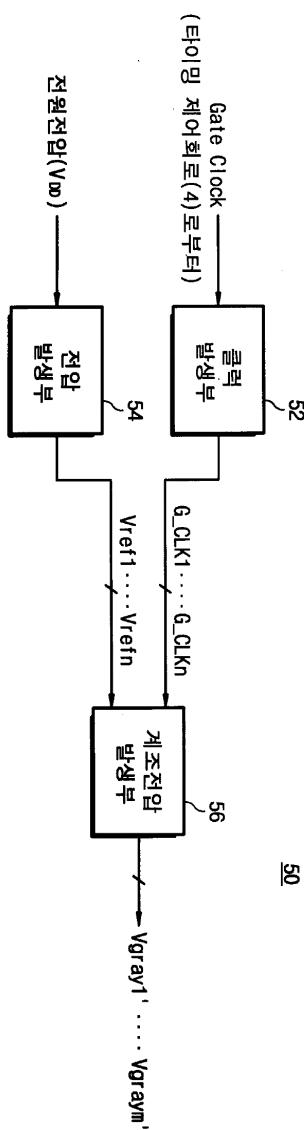
21

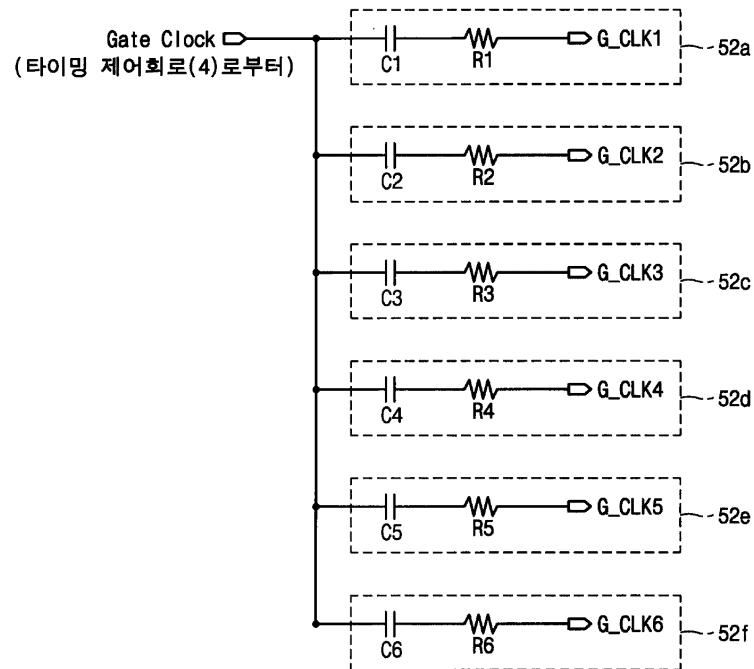


2

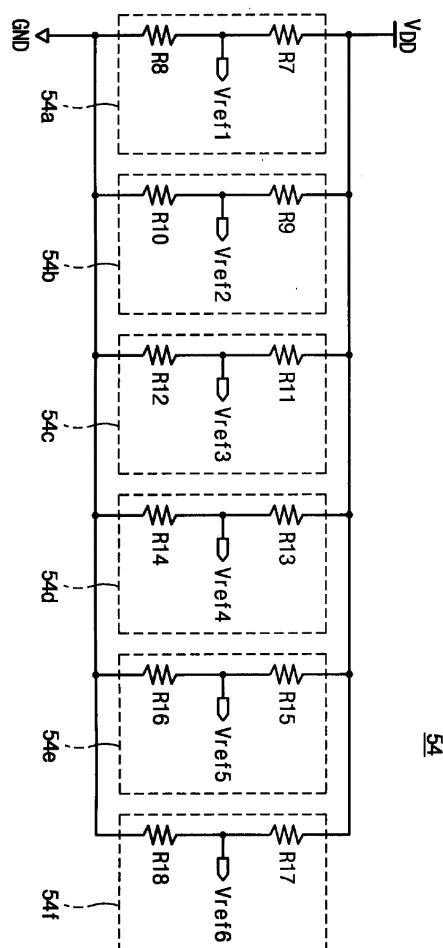


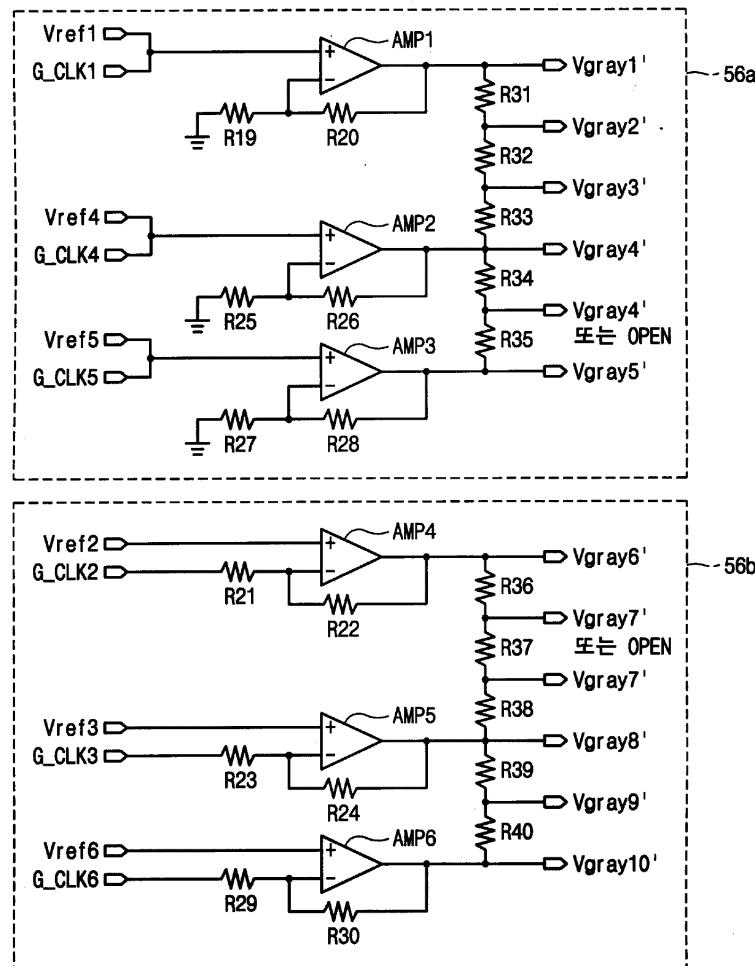
3





5

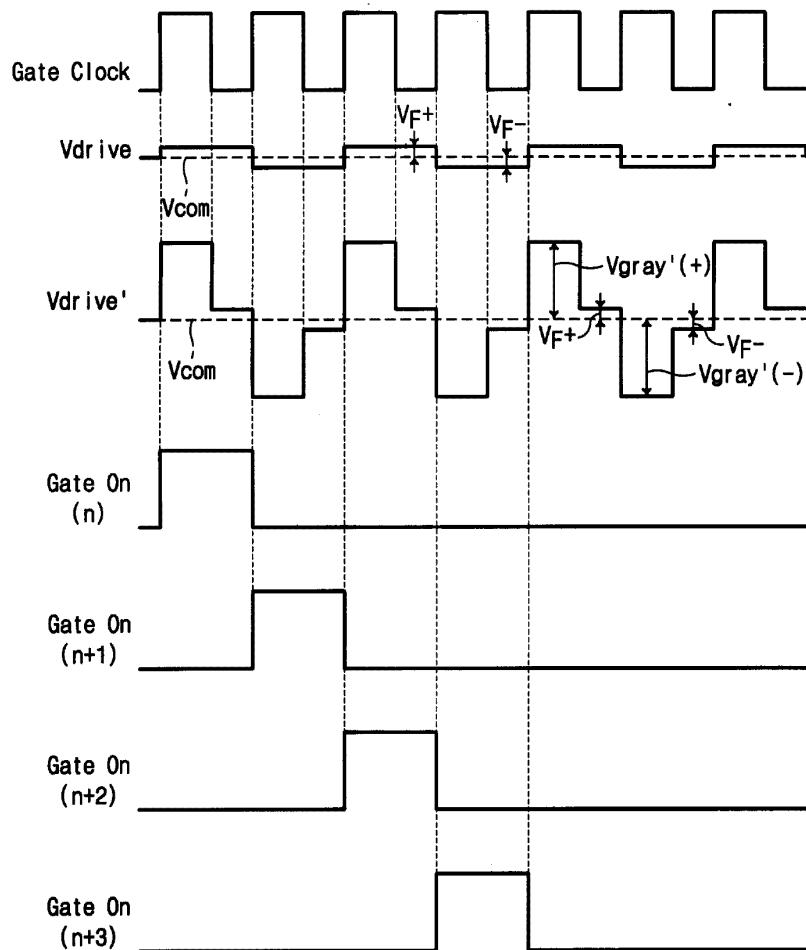




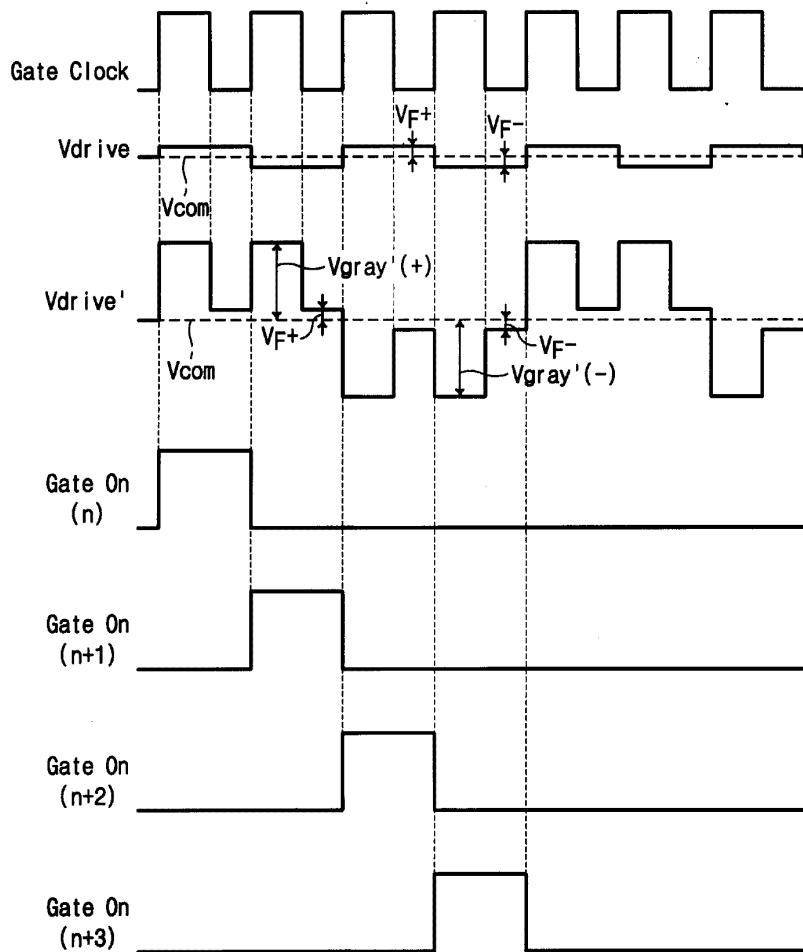
7b



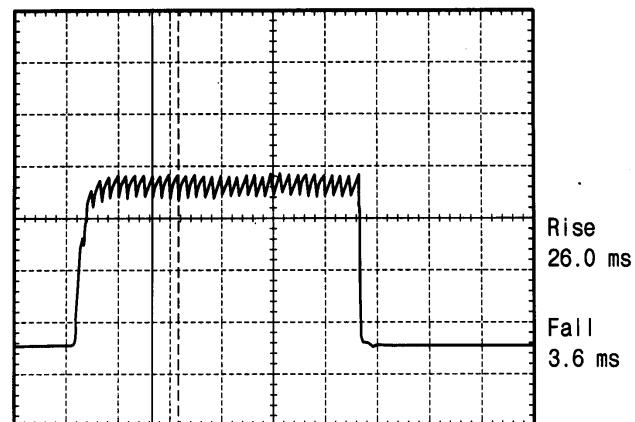
8



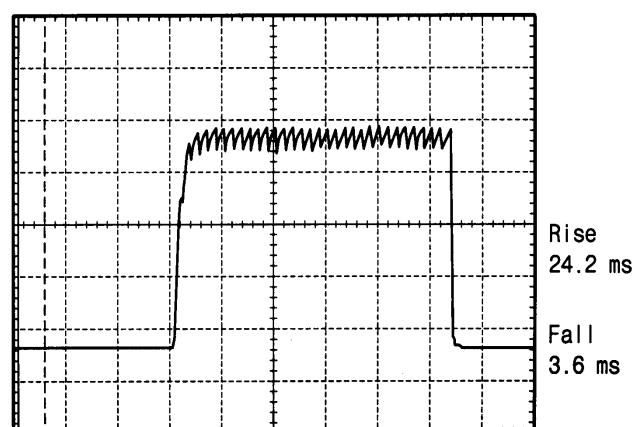
9



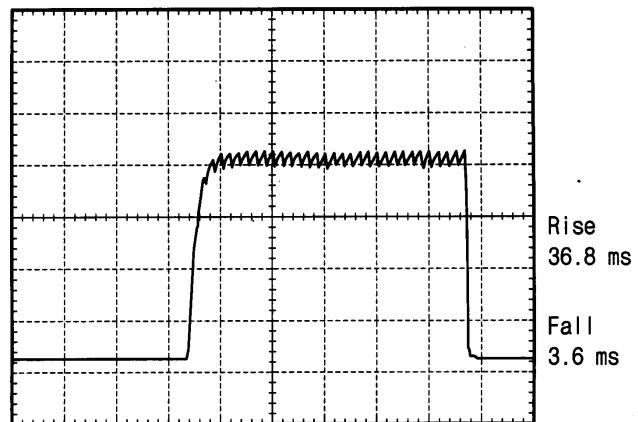
10a



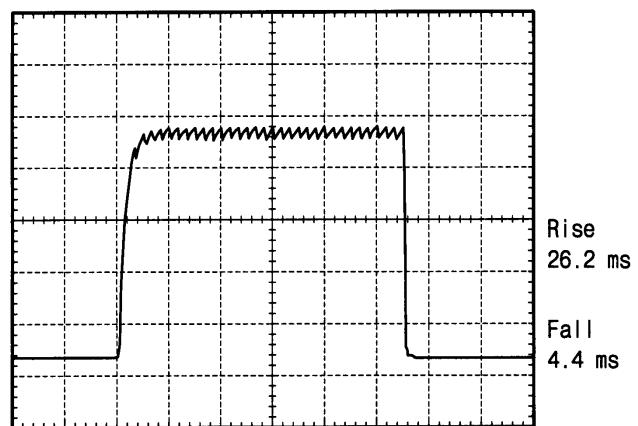
10b



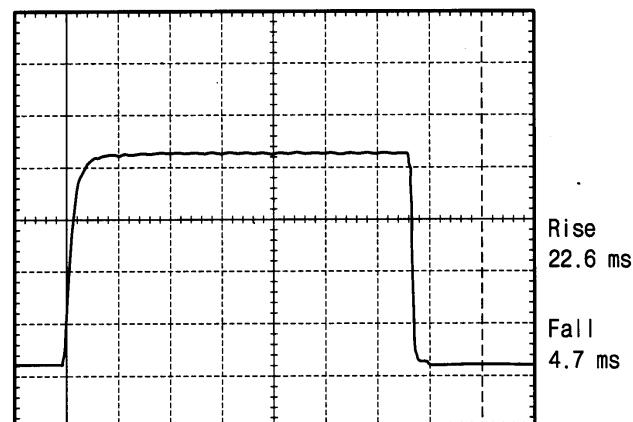
11a



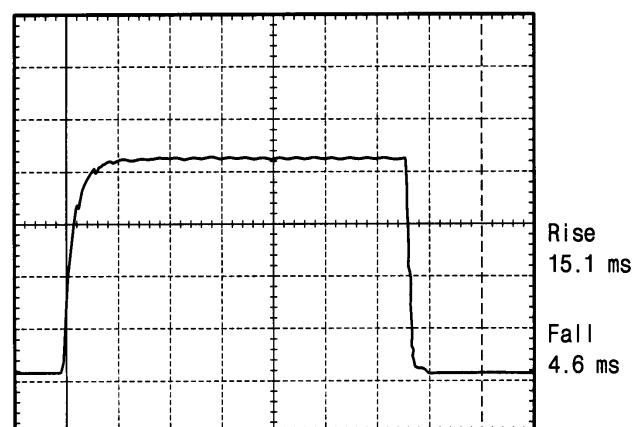
11b



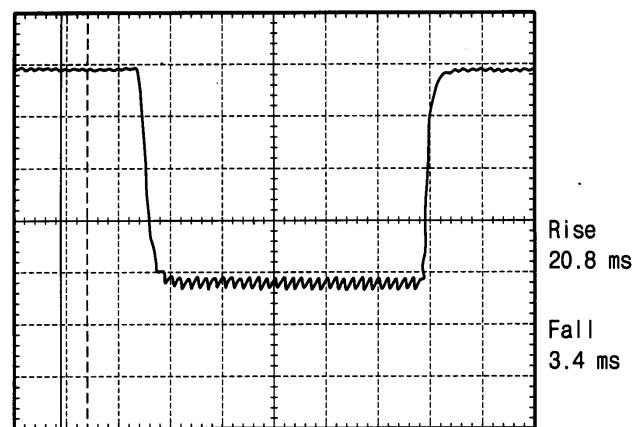
12a



12b



13a



13b

