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	MOBILE LIQUID CRYSTAL DISPLAY GROUP SHARP CORPORATION SPECIFICATION	APPLICABLE GROUP MOBILE LIQUID CRYSTAL DISPLAY GROUP

DEVICE SPECIFICATION FOR

TFT-LCD Module

MODEL No.

LQ035Q3DG03

These parts have corresponded with the RoHS directive.

☐ CUSTOMER'S APPROVAL

DATE

BY

PRESENTED

BY

FOR

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SHARP CORPORATION

RECORDS OF REVISION

LQ035Q3DG03

SPEC No.	DATE	SUMMARY		NOTE
		PAGE		
LD-21X03	Oct.30.2009	-	-	1st. Issue

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1. Applicable Scope

This specification is applicable to TFT-LCD Module “LQ035Q3DG03”.

2. General Description

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor).
It is composed of a color TFT-LCD panel, driver IC, Input FPC and a back light unit.
Graphics and texts can be displayed on a 320 × RGB × 240 dots panel with about 16 million colors
by supplying 24bit data signals (8bit × RGB), four timing signals, 3wires 24bit serial interface signals, logic (Typ. +3.3V), analog (Typ. +3.3V) supply voltages for TFT-LCD panel driving and supply voltage for back light.

3. Mechanical (Physical) Specifications

Item	Specifications	Unit
Screen size	8.8 (3.5”)	cm
Active area	70.56 (H) × 52.92 (V)	mm
Pixel format	320 (H) × 240 (V)	pixel
	1 Pixel = R+G+B dots	-
Pixel pitch	0.2205 (H) × 0.2205 (V)	mm
Pixel configuration	R,G,B vertical stripes	-
Display mode	Normally white	-
Unit outline dimensions *	76.9 (W) × 63.9 (H) × 4.7 (D)	mm
Mass	42	g
Surface treatment	Anti glare	-

*The above-mentioned table indicates module sizes without some projections and FPC.
For detailed measurements and tolerances, please refer to Outline Dimensions in page 25.

4. Input Terminal Names and Functions

Pin No.	Symbol	I/O	Description	Note
1	GND	—	GND(0V)	
2	GND	—	GND(0V)	
3	VDDIO	—	+3.3V power source(Logic I/O power supply voltage)	
4	VCI	—	+3.3V power source(Analog power supply)	
5	R0	I	RED data signal (8 bit LSB)	Note 1
6	R1	I	RED data signal(8 bit)	Note 1
7	R2	I	RED data signal(LSB)	
8	R3	I	RED data signal	
9	R4	I	RED data signal	
10	R5	I	RED data signal	
11	R6	I	RED data signal	
12	R7	I	RED data signal(MSB)	
13	G0	I	GREEN data signal(8 bit LSB)	Note 1
14	G1	I	GREEN data signal(8 bit)	Note 1
15	G2	I	GREEN data signal(LSB)	
16	G3	I	GREEN data signal	
17	G4	I	GREEN data signal	
18	G5	I	GREEN data signal	
19	G6	I	GREEN data signal	
20	G7	I	GREEN data signal(MSB)	
21	B0	I	Blue data signal(8 bit LSB)	Note 1
22	B1	I	Blue data signal(8 bit)	Note 1
23	B2	I	BLUE data signal(LSB)	
24	B3	I	BLUE data signal	
25	B4	I	BLUE data signal	
26	B5	I	BLUE data signal	
27	B6	I	BLUE data signal	
28	B7	I	BLUE data signal(MSB)	
29	GND	—	GND(0V)	
30	DOTCLK	I	Pixel clock signal	
31	CSB	I	Chip select / Power On	
32	HSYNC	I	Horizontal synchronizing signal	
33	VSYNC	I	Vertical synchronizing signal	
34	DEN	I	Data Enable	
35	GND	—	GND(0V)	
36	REST	I	Reset	
37	SCK	I	Serial clock	

38	SDI	I	Serial data input	
39	GND	—	GND(0V)	
40	X1	—	Should be Open	
41	Y1	—	Should be Open	
42	X2	—	Should be Open	
43	Y2	—	Should be Open	
44	GND	—	GND（0V）	
45	LED1(－)	—	LED 1 (Cathode side)	
46	NC	—	—	
47	LED1(＋)	—	LED 1 (Anode side)	
48	LED2(＋)	—	LED 2 (Anode side)	
49	NC	—	—	
50	LED2(－)	—	LED 2 (Cathode side)	

Note 1) Please connect these signals with GND or higher bit, when use 6 bit mode.

5. Absolute Maximum Ratings

Item	Symbol	Conditions	Rated value	Unit	Remarks
Input voltage	VI	Ta = 25°C	-0.3 ~ V_{DDIO}+0.3	V	Note 2
Logic I/O power supply voltage	V_{DDIO}	Ta = 25°C	-0.3 ~ +4.0	V	
Analog power supply voltage	V_{CI}	Ta = 25°C	AGND-0.3 ~ +5.0	V	
Temperature for storage	Tstg	-	-30 ~ +80	°C	Note 3
Temperature for operation	Topr	-	-20 ~ +70	°C	Note 3, 4
LED input electric current	I_{LED}	Ta = 25°C	70	mA	Note 5
LED electricity consumption	P_{LED}	Ta = 25°C	238	mW	Note 5

Note 2) REST, CSB, SDI, SCK, DEN, B7~B0, G7~G0, R7~R0, VSYNC, HSYNC, DOTCLK

Note 3) Humidity: 95%RH Max. (Ta = 40°C)
Maximum bulb temperature under 39°C (Ta>40°C) See to it that no dew will be condensed.

Note 4) Panel surface temperature prescribes.

Note 5) Power consumption of one LED (Ta = 25°C) (use 6 pieces LED)

6. Electrical Characteristics

6-1. TFT LCD Panel Driving

Ta = 25°C

Item		Symbol	Min.	Typ.	Max.	Unit	Remarks
Logic I/O power supply	DC voltage	V_{DDIO}	+2.5	+3.3	+3.6	V	
	DC Current	I_{VDDIO}	-	0.35	0.50	mA	Note 6
Analog power supply	DC voltage	V_{CI}	+3.0	+3.3	+3.6	V	
	DC Current	I_{VCI}	-	13	18	mA	Note 6
Permissive input Ripple voltage		$V_{RFVDDIO}$	-	-	100	mVp-p	Note 7
		V_{RFVCI}	-	-	100	mVp-p	Note 7
Logic Input Voltage	High	V_{IH}	0.8 V_{DDIO}	-	V_{DDIO}	V	Note 8
	Low	V_{IL}	0	-	0.2 V_{DDIO}	V	Note 8
Logic Input Current	High	I_{IH}	-1	-	1	μA	Note 8
	Low	I_{IL}	-1	-	1	μA	Note 8

Note 6) $V_{DDIO} = V_{CI} = +3.3V$

Current situation for I_{VDDIO}: Black & White checker flag pattern

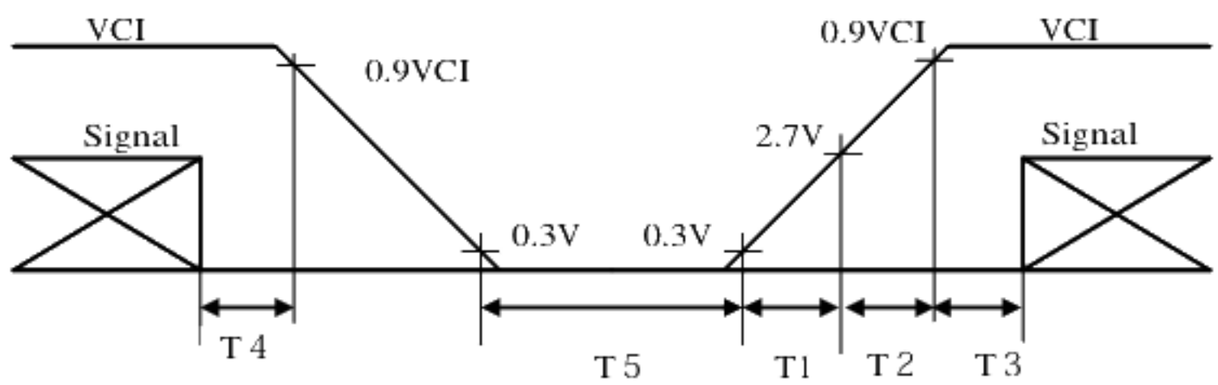
Current situation for I_{VCI}: All black patterns

Note 7) $V_{DDIO} = V_{CI} = +3.3V$

Note 8) REST, CSB, SDI, SCK, DEN, B7~B0, G7~G0, R7~R0, VSYNC, HSYNC, DOTCLK

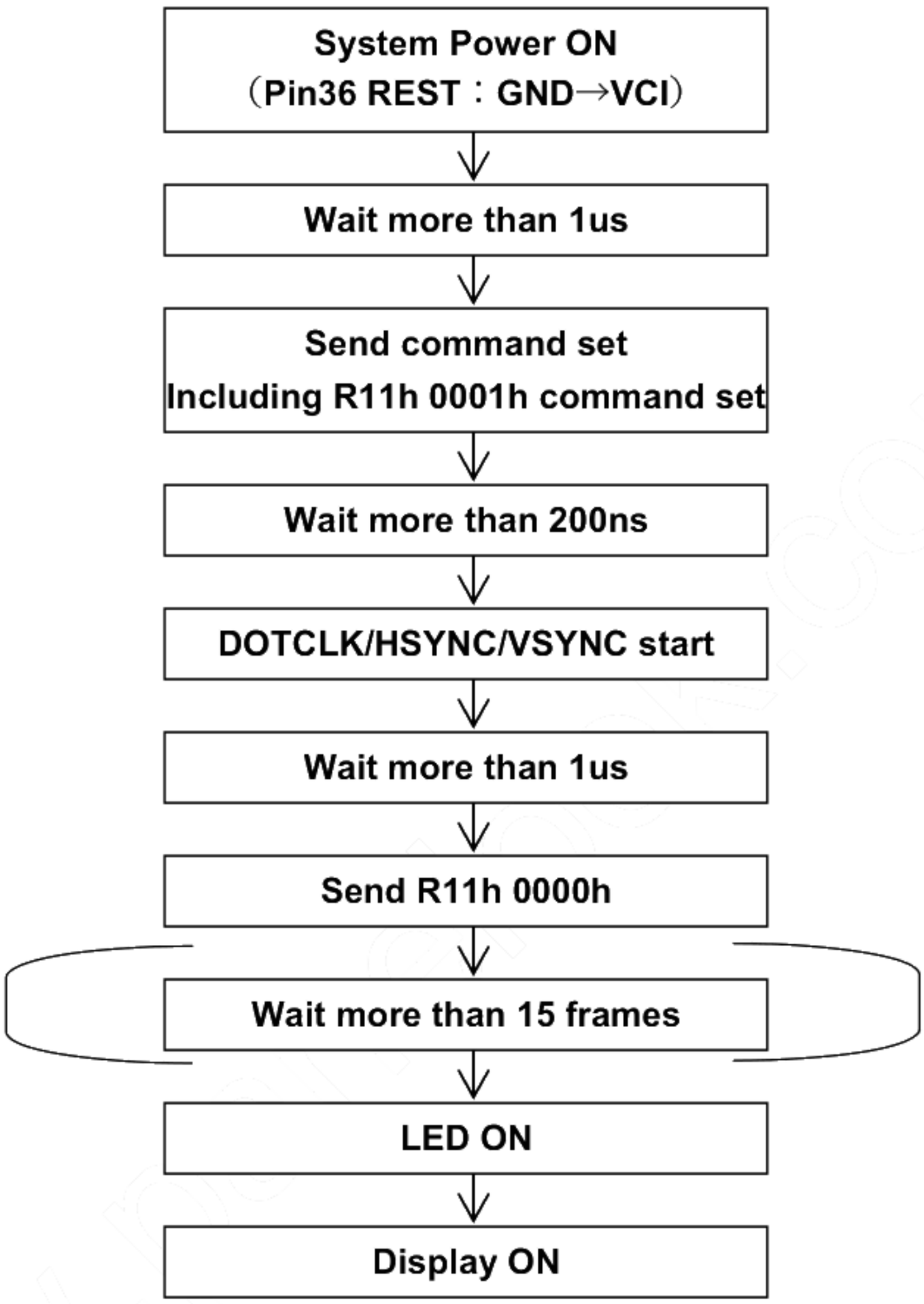
Input voltage sequence

$0 < T1 \leqq 15$ m s
$0 < T2 \leqq 10$ m s
$0 < T3 \leqq 100$ m s
$0 < T4 \leqq 1$ s
$T5 > 200$ m s



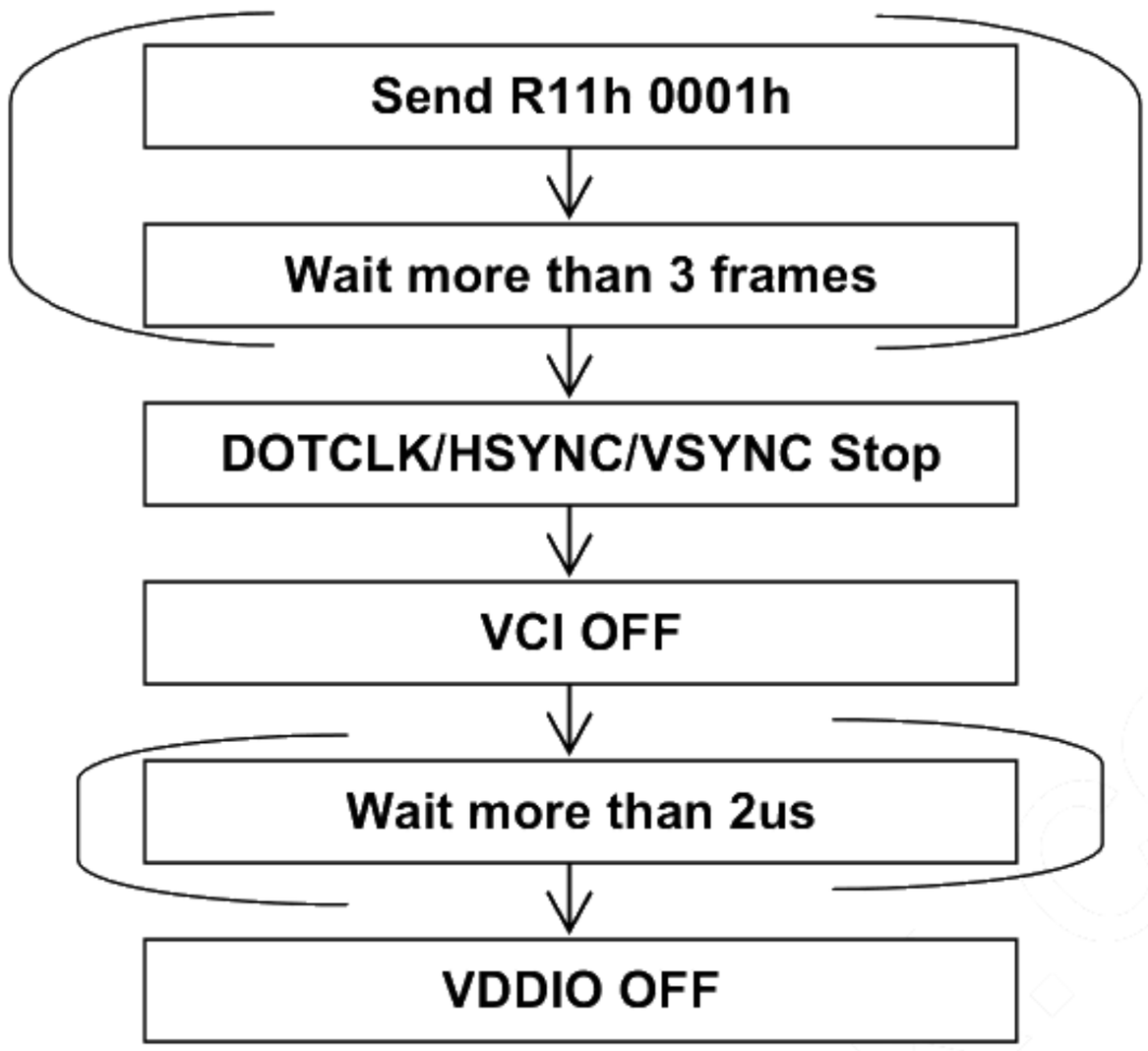
6-2. Start up sequence

Recommended setting



6-3. Power down sequence

Recommended setting



a) Though operation in（ ）is recommended, it never becomes a breakdown even if it omits it.

b) It is possible to turn off VCI and VDDIO at the same time. But don't turn it off in order of VDDIO and VCI.

6-4. Register Setting

Please confirm the display quality enough to the register setting when you use the module by the frequencies other than DOTCLK=5MHz.

Reg. #	Register	Data	Remark
R01 h	Driver output control	2AEF h	Note 9
R02 h	LCD drive AC control	0300 h	
R03 h	Power control (1)	080E h	
R0B h	Frame cycle control	D000 h	
R0C h	Power control (2)	0005 h	
R0D h	Power control (3)	000F h	
R0E h	Power control (4)	2C00 h	
R16 h	Horizontal Porch	9F86 h	Note 10
R17 h	Vertical Porch	0002 h	Note 11
R1E h	Power control (5)	0000 h	
R10 h	Power control (6)	00DE h	
R28 h	Extended command 1	0006 h	
R2A h	Extended command 2	0187 h	
R30 h	Gamma control (1)	0000 h	
R31 h	Gamma control (2)	0103 h	
R32 h	Gamma control (3)	0001 h	
R33 h	Gamma control (4)	0501 h	
R34 h	Gamma control (5)	0607 h	
R35 h	Gamma control (6)	0406 h	
R36 h	Gamma control (7)	0707 h	
R37 h	Gamma control (8)	0305 h	
R3A h	Gamma control (9)	0F0F h	
R3B h	Gamma control (10)	0F02 h	

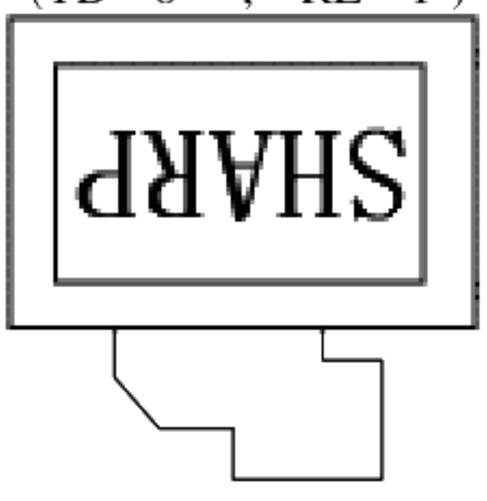
Note 9) Flip vertical and horizontal function（TB、RL）

(TB=”1” , RL=”0”)

(TB=”1” , RL=”1”)

(TB=”0” , RL=”0”)

(TB=”0” , RL=”1”)



Driver output control (R01h)

R/W	DC	IB15	IB14	IB13	IB12	IB11	IB10	IB9	IB8	IB7	IB6	IB5	IB4	IB3	IB2	IB1	IB0
W	1	CF1	CF0	REV	MOD	BGR	SM	TB	RL	1	1	1	0	1	1	1	1
POR		0	0	1	0	1	0	x	x	1	1	1	0	1	1	1	1

↑ ↑

Flip vertical Flip horizontal

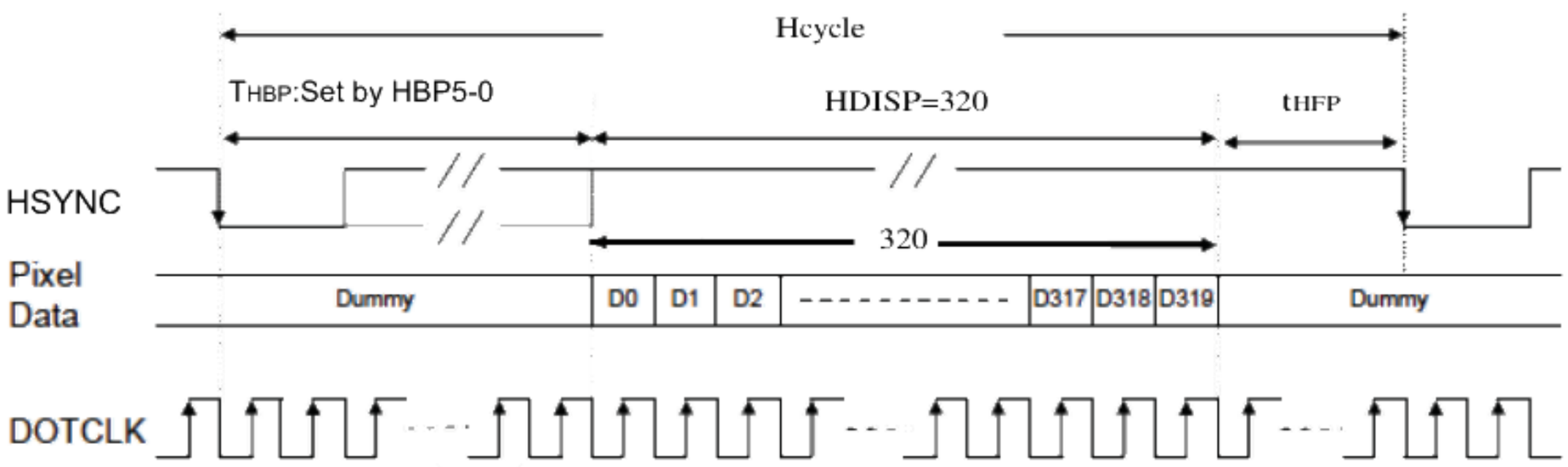
Note 10)

Horizontal porch (R16h)

R/W	DC	IB15	IB14	IB13	IB12	IB11	IB10	IB9	IB8	IB7	IB6	IB5	IB4	IB3	IB2	IB1	IB0
W	1	XL8	XL7	XL6	XL5	XL4	XL3	XL2	XL1	XL0	0	HBP5	HBP4	HBP3	HBP2	HBP1	HBP0
POR		1	0	0	1	1	1	1	1	1	0	0	0	0	1	1	0

HBP5-0：Horizontal back porch set up

HBP5	HBP4	HBP3	HBP2	HBP1	HBP0	Clock number
0	0	0	0	0	0	2
0	0	0	0	0	1	3
0	0	0	0	1	0	4
			⋮			⋮ Step = 1 ⋮
1	1	1	1	1	0	64
1	1	1	1	1	1	65



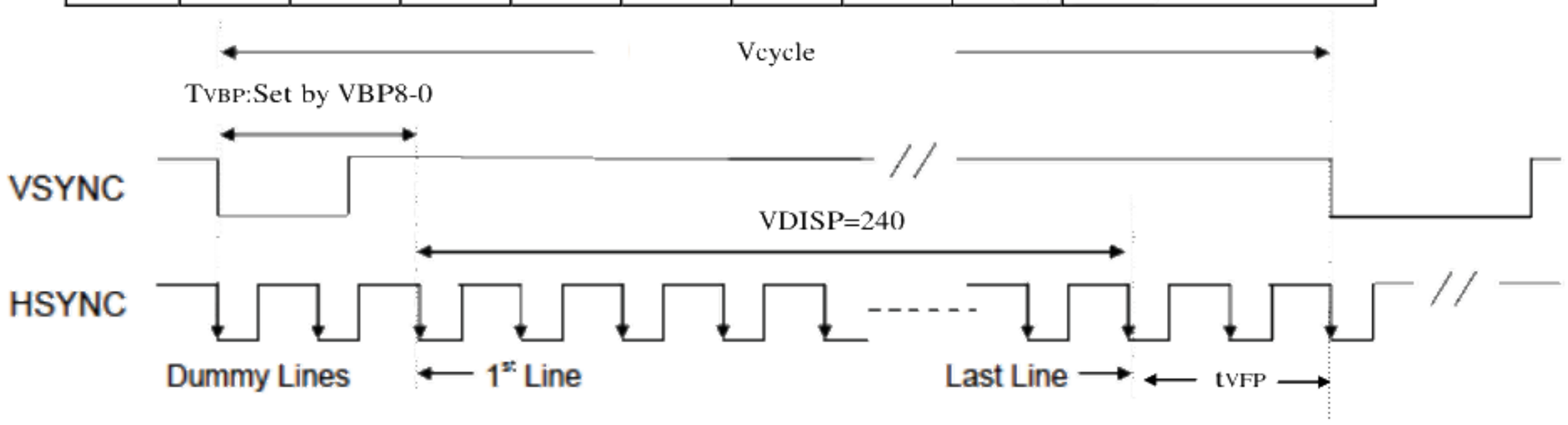
Note 11)

Vertical porch (R17h)(POR=0002h)

R/W	DC	IB15	IB14	IB13	IB12	IB11	IB10	IB9	IB8	IB7	IB6	IB5	IB4	IB3	IB2	IB1	IB0
W	1	0	0	0	0	0	0	0	VBP8	VBP7	VBP6	VBP5	VBP4	VBP3	VBP2	VBP1	VBP0
POR		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

VBP8-0：Vertical back porch set up

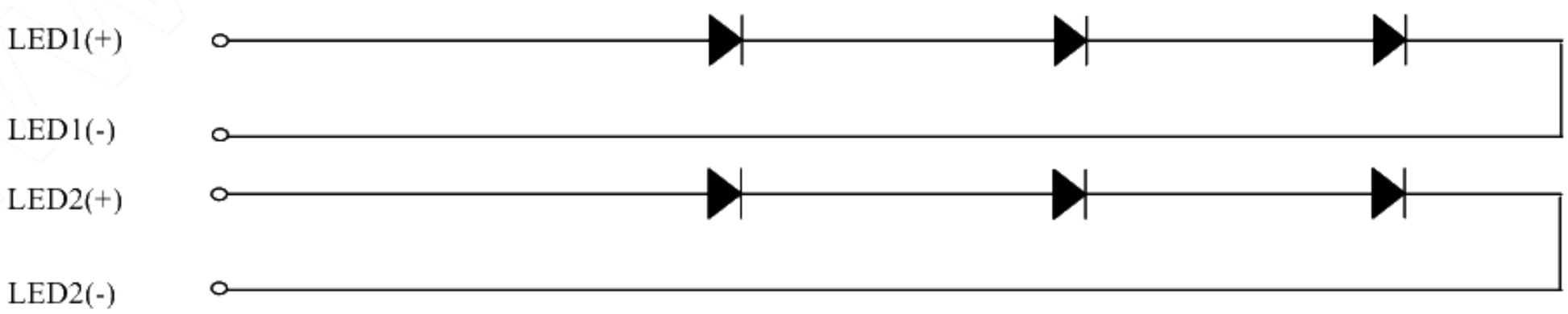
VBP8	VBP7	VBP6	VBP5	VBP4	VBP3	VBP2	VBP1	VBP0	Line number
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	0	1	0	2
				:					: Step = 1 :
0	1	1	1	0	1	1	1	1	239
0	1	1	1	1	0	0	0	0	240
1	0	1	*	*	*	*	*	*	Reserved
1	1	*	*	*	*	*	*	*	Reserved



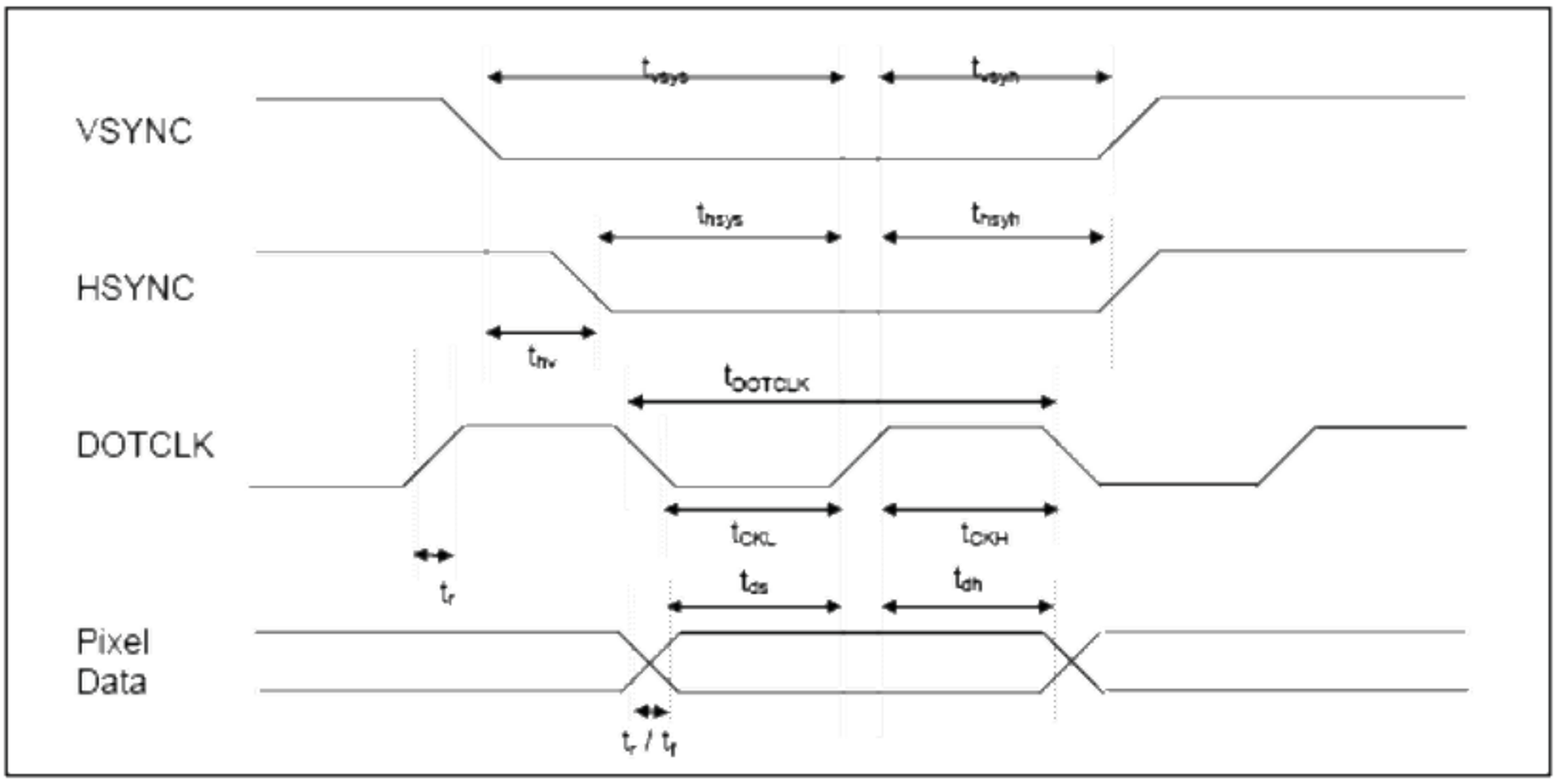
6-5. Back light driving

The back light system has 6 LED (3LED × 2 circuits)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Rated Voltage	V_{BL}	—	9.45 / 1 circuit	10.2 / 1 circuit	V	
Rated Current	I_L	—	40 / 1 circuit	60 / 1 circuit	mA	Ta=25°C
Power consumption	W_L	—	378 / 1 circuit	612 / 1 circuit	mW	



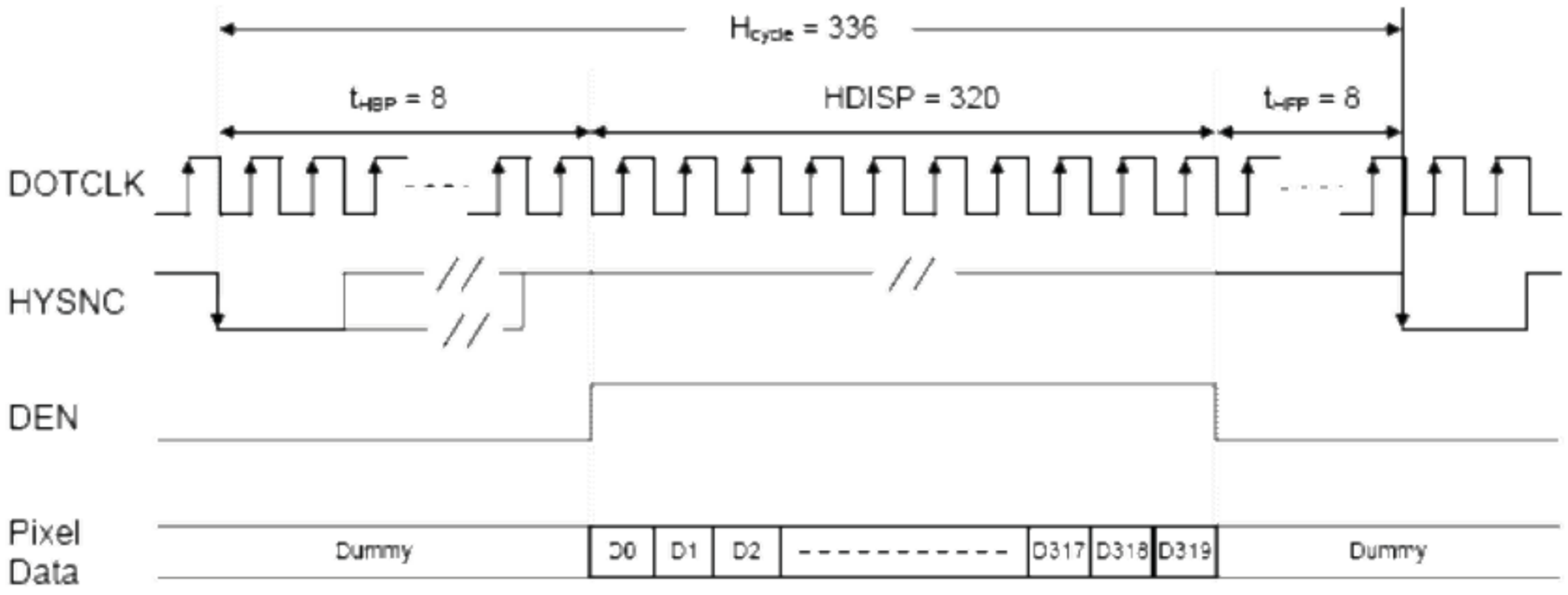
7. Timing characteristics of input signals



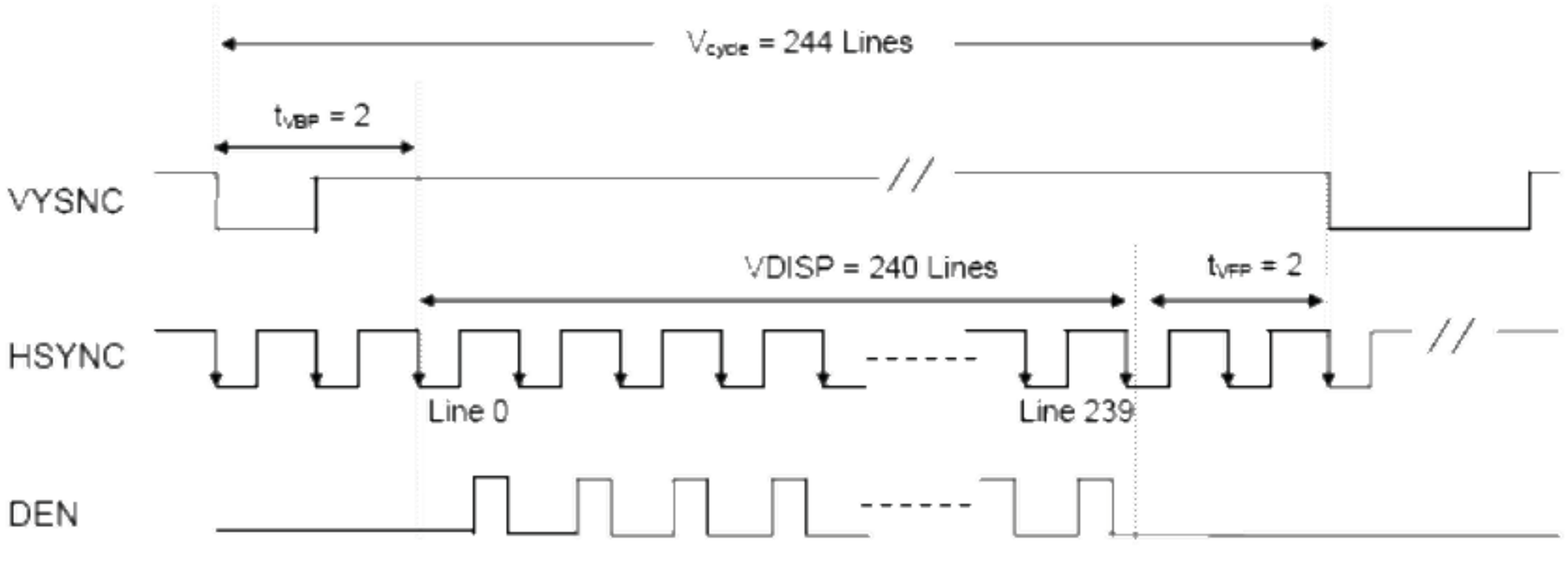
7-1. Pixel clock timing

Item		Symbol	Min	Typ	Max	Units
Clock	Frequency	f_{DOTCLK}	-	5.0	8.0	MHz
	Period	t_{DOTCLK}	125	200	-	ns
	High time	t_{CKH}	62	-	-	ns
	Low time	t_{CKL}	62	-	-	ns
Data	Set up time	t_{ds}	30	-	-	ns
	Hold time	t_{dh}	30	-	-	ns
Vsync	Set up time	t_{vsys}	20	-	-	ns
	Hold time	t_{vsyh}	20	-	-	ns
Hsync	Set up time	t_{hsys}	20	-	-	ns
	Hold time	t_{hsyh}	20	-	-	ns
Phase difference of Sync Signal Falling Edge		t_{hv}	0	-	320	t_{DOTCLK}
Reset pulse width		t_{RES}	10	-	-	ns
Rise/Fall time		t_r/t_f	5	-	100	ns

7-2. Data timing characteristics (262k color)



a) Horizontal Data Transaction Timing



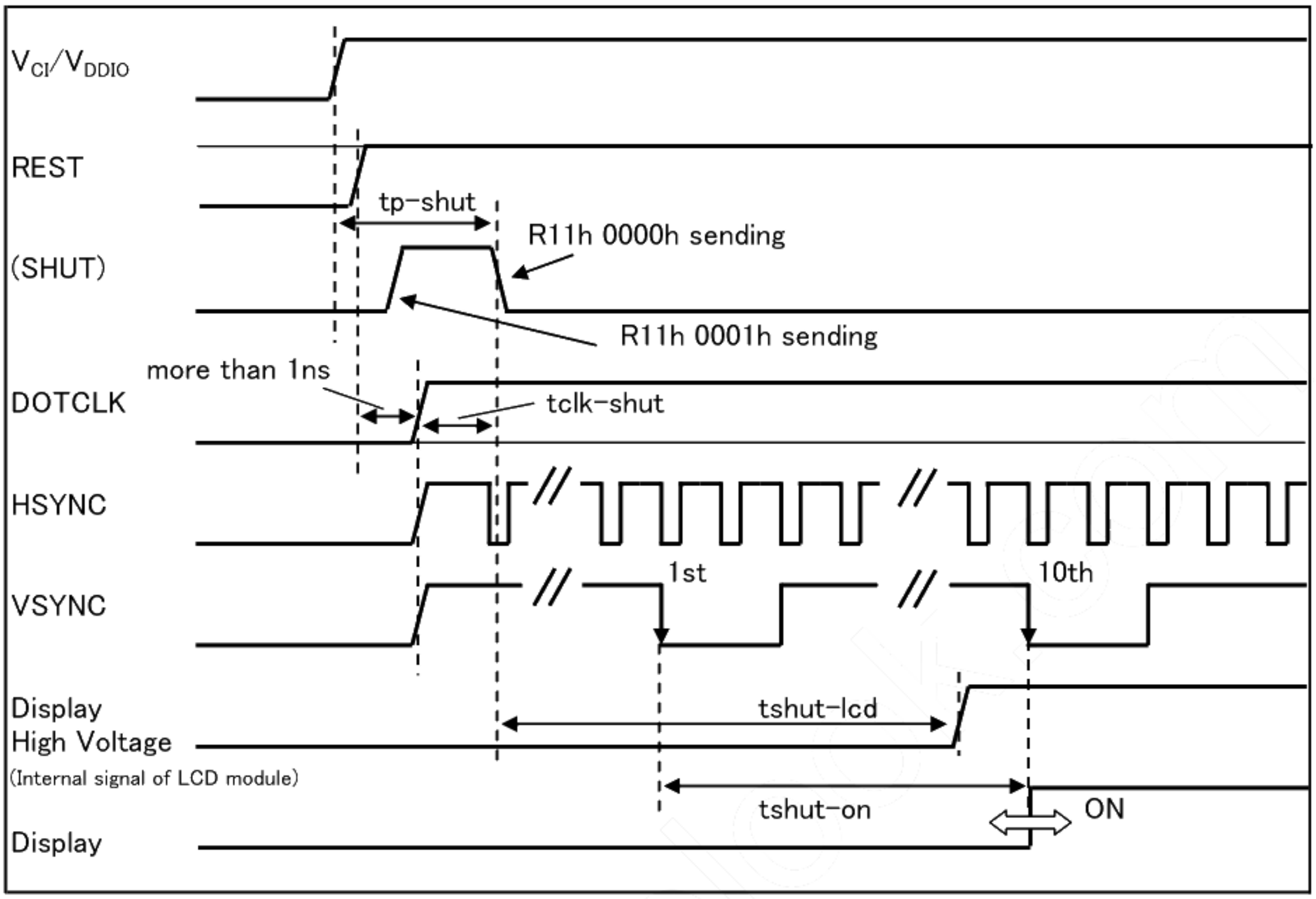
b) Vertical Data Transaction Timing

Item		Symbol	Min	Typ	Max	Units
Clock	Frequency	f_{DOTCLK}	-	5.0	8.0	MHz
	Period	t_{DOTCLK}	125	200	-	ns
Horizontal synchronized signal	Frequency	f_h	-	14.9	18.18	kHz
	Period	H_{cycle}	-	336	-	Clock
Vertical synchronized signal	Frequency	f_v	50	60.1	-	Hz
	Period	V_{cycle}	-	244	-	line
Horizontal back porch		t_{HBP}	-	8	-	Clock
Horizontal front porch		t_{HFP}	-	8	-	Clock
Horizontal blank period		$t_{HBP}+t_{HFP}$	-	16	-	Clock
Horizontal display area		HDISP	-	320	-	Clock
Vertical back porch		t_{VBP}	-	2	-	line
Vertical front porch		t_{VFP}	-	2	-	line
vertical blank period		$t_{HBP}+t_{HFP}$	-	4	-	line
Vertical display area		VDISP	-	240	-	line

It becomes the horizontal data beginning position after the horizontal backing porch period from falling edge of HSYNC.

It becomes a vertical data beginning position after the vertical backing porch period from falling edge of VSYNC.

7-3. Power ON Sequence

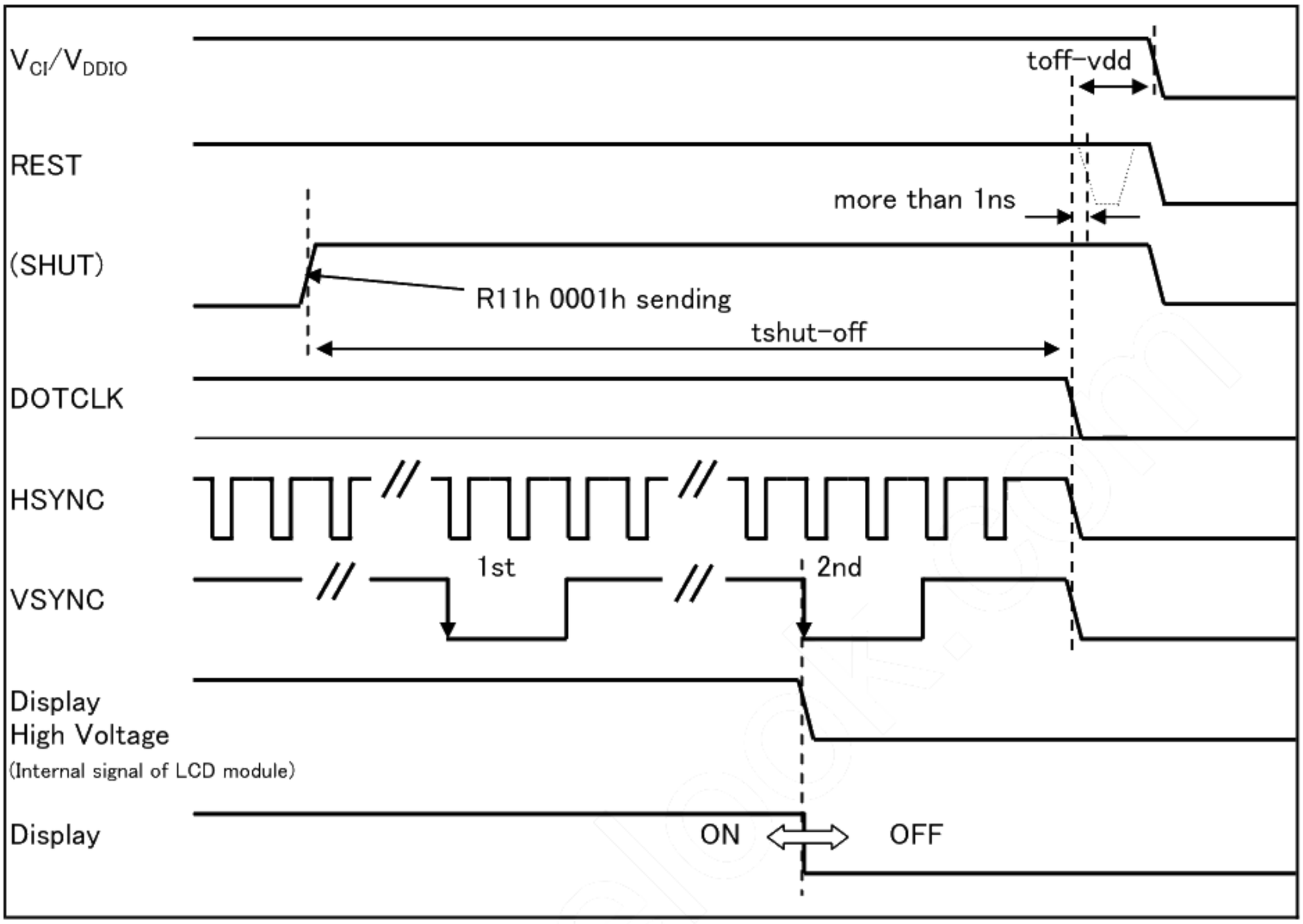


Item	Symbol	Min	Typ	Max	Units
V_{DDIO} ON－SHUT	tp-shut	1	-	-	us
DOTCLK	tclk-shut	1	-	-	clk
SHUT－LCD ON	tshut-lcd	-	-	164	ms
SHUT－diplayON －1 line：336clk －1frame：244line －DOTCLK：5.0MHz	tshut-on	-	-	10	frame
		-	164	-	ms

Note12) Please input DOTCLK before making SHUT Low.

Note13) Display starts after ten frames, after the falling edge of SHUT.

7-4. Power OFF Sequence



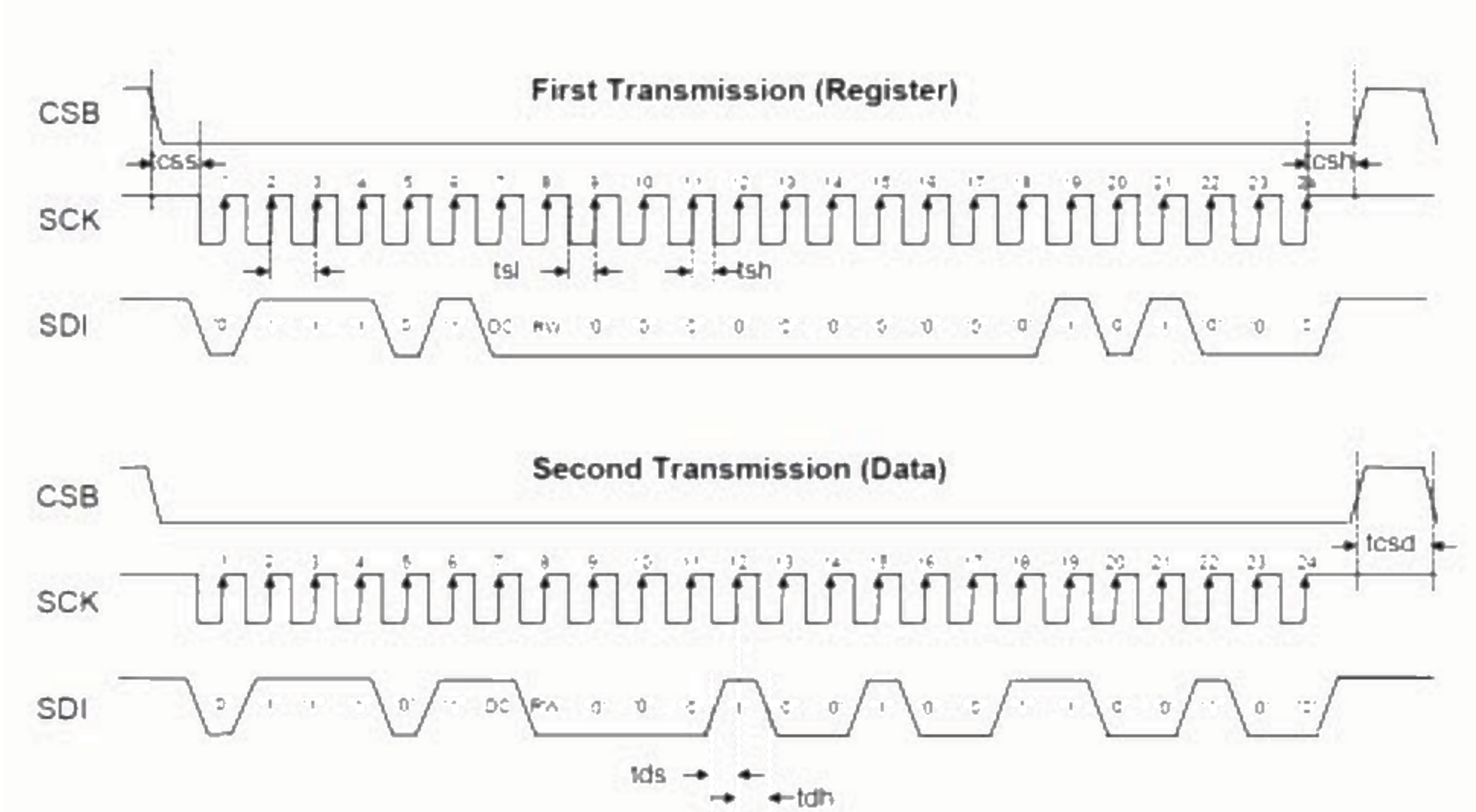
Item	Symbol	Min	Typ	Max	Units
Rising of SHUT—Display OFF -- 1 line = 336 clk -- 1 frame = 244 line --DOTCLK = 5.0 MHz	tshut-off	2	-	-	frame
		32.8	-	-	ms
Input signal OFF—V_{CI}/V_{DDIO}OFF	toff-vdd	1	-	-	us

Note14) DOTCLK must be maintained at lease 2 frames after the rising edge of SHUT.

Note15) Display becomes off at the 2nd falling edge of VSYNC after the falling edge of SHUT.

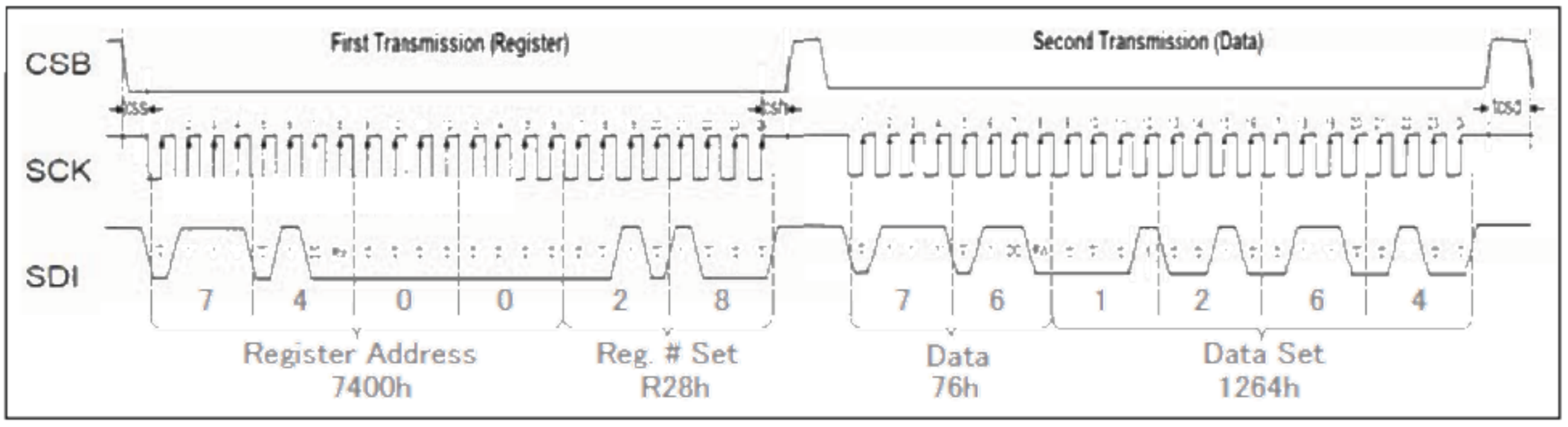
Note16) If RESET signal is necessary for power down, provide it after 2 frames edge of the SHUT period.

7-5. SPI Interface Timing Diagram & Transaction Example (3-wires 24 bit)

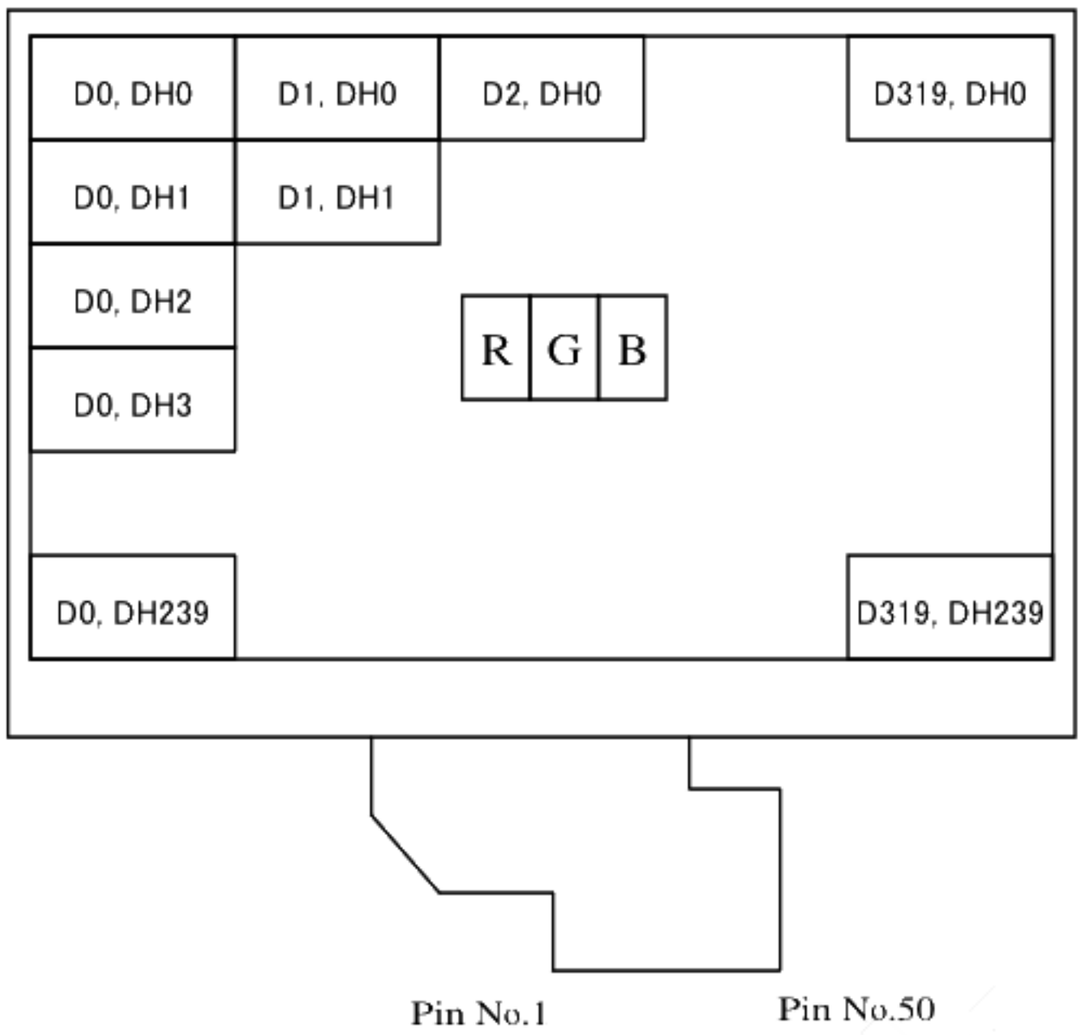


Characteristics	Symbol	Min	Typ	Max	Units
Serial Clock Frequency	fclk	-	-	20	MHz
Serial Clock Cycle Time	tclk	50	-	-	nsec
Clock Low Width	tsl	25	-	-	nsec
Clock High Width	tsh	25	-	-	nsec
Chip Select Setup Time	tcss	0	-	-	nsec
Chip Select Hold Time	tcsh	10	-	-	nsec
Chip Select High Delay Time	tcsd	20	-	-	nsec
Data Setup Time	tds	5	-	-	nsec
Data Hold Time	tdh	10	-	-	nsec

Sample) When driver output control (R28h) (1264h) is writing



7-6. Input Data Signals and Display Position on the screen



Please refer to [4.Input Terminal Names and Functions].

8. Input Signals, Basic Display Colors and Gray Scale of Each Color (8bit)

	Colors & Gray scale	Gray Scale	Data signal																							
			R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
Basic Color	Black	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	—	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	—	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	—	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	—	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	—	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	—	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇧	↓					↓								↓								↓			
	⇩	↓					↓								↓								↓			
	Brighter	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	⇩	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

0: Low level voltage, 1: High level voltage

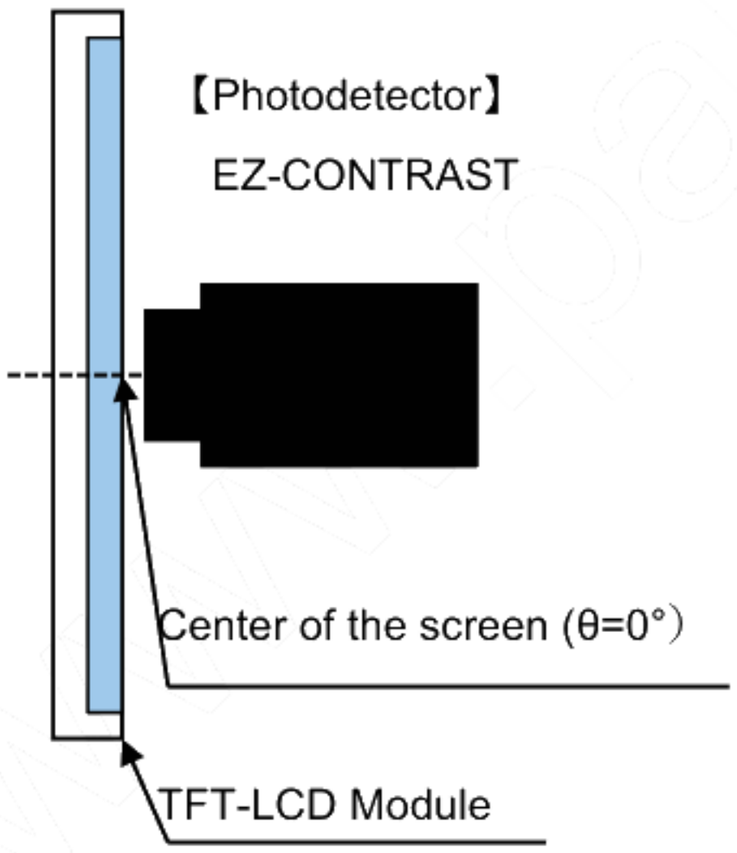
Each basic color can be displayed in 256 gray scales from 8 bit data signals. According to the combination of total 24 bit data signals, the 16-million-color display can be achieved on the screen.

9. Optical Characteristics

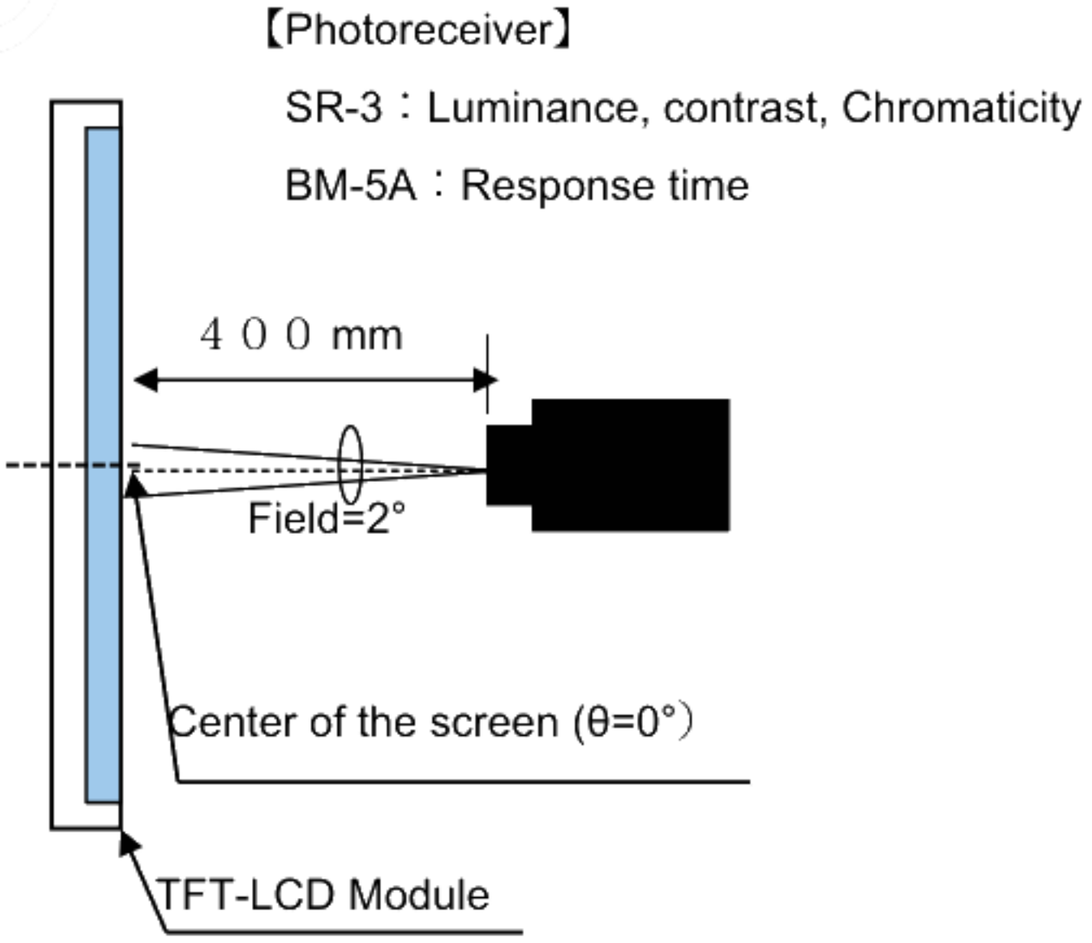
Ta = 25°C, V_{DDIO} = +3.3V, V_{CI} = +3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ3	CR＞10	-	60	-	deg.	Note17.20
		θ9		-	60	-	deg.	
	Vertical	θ12		-	40	-	deg.	
		θ6		-	60	-	deg.	
Contrast ratio		CR	Optimum viewing angle	100	300	-	-	Note18,20
Response Time	Rise	τr	θ=0°	-	30	45	ms	Note19,20
	Fall	τd		-	30	45	ms	
Chromaticity of White		x		0.26	0.31	0.36	-	Note20
		y		0.29	0.34	0.39	-	
Luminance of white		XL1		300	450	-	cd/m^2	I_{LED}=40mA / 1 circuit Note20
LED life time		L_L	continuation	-	50,000	-	hour	Note21

*The optical characteristic measurements are operated by using the measuring method of the figure below in the darkroom or in the same situation as the darkroom.

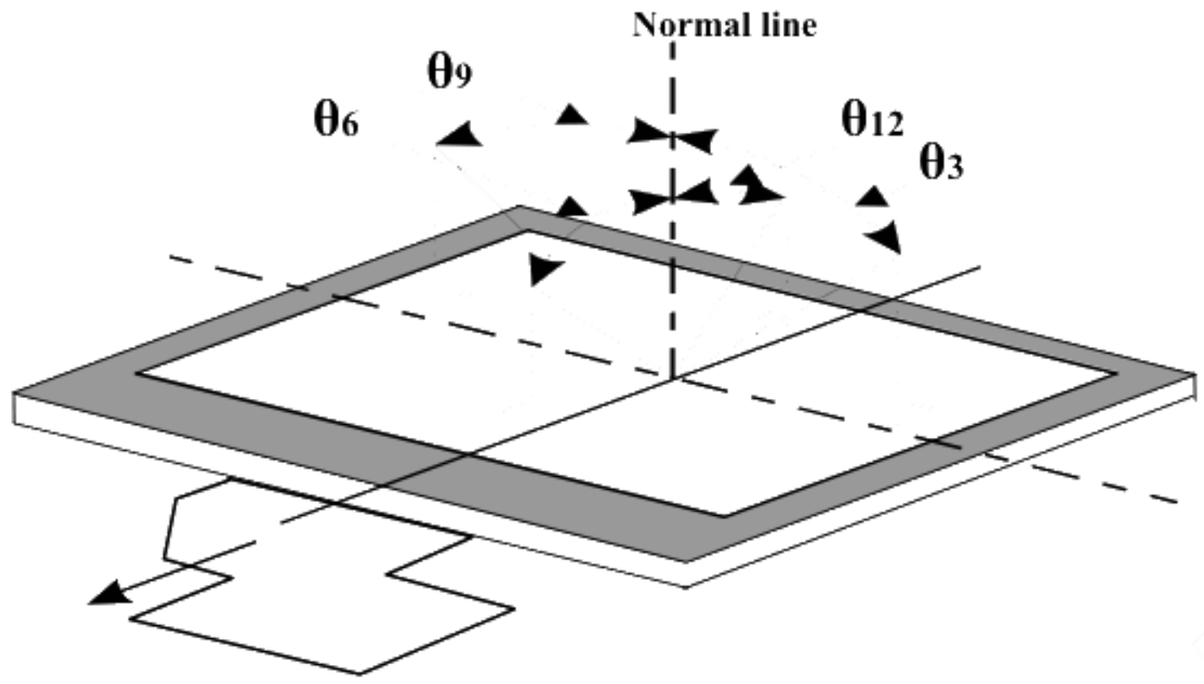


Viewing angle range measurement method



Luminance/contrast/chromaticity/ response time measurement method

Note17) Definitions of viewing angle range



6 o'clock direction

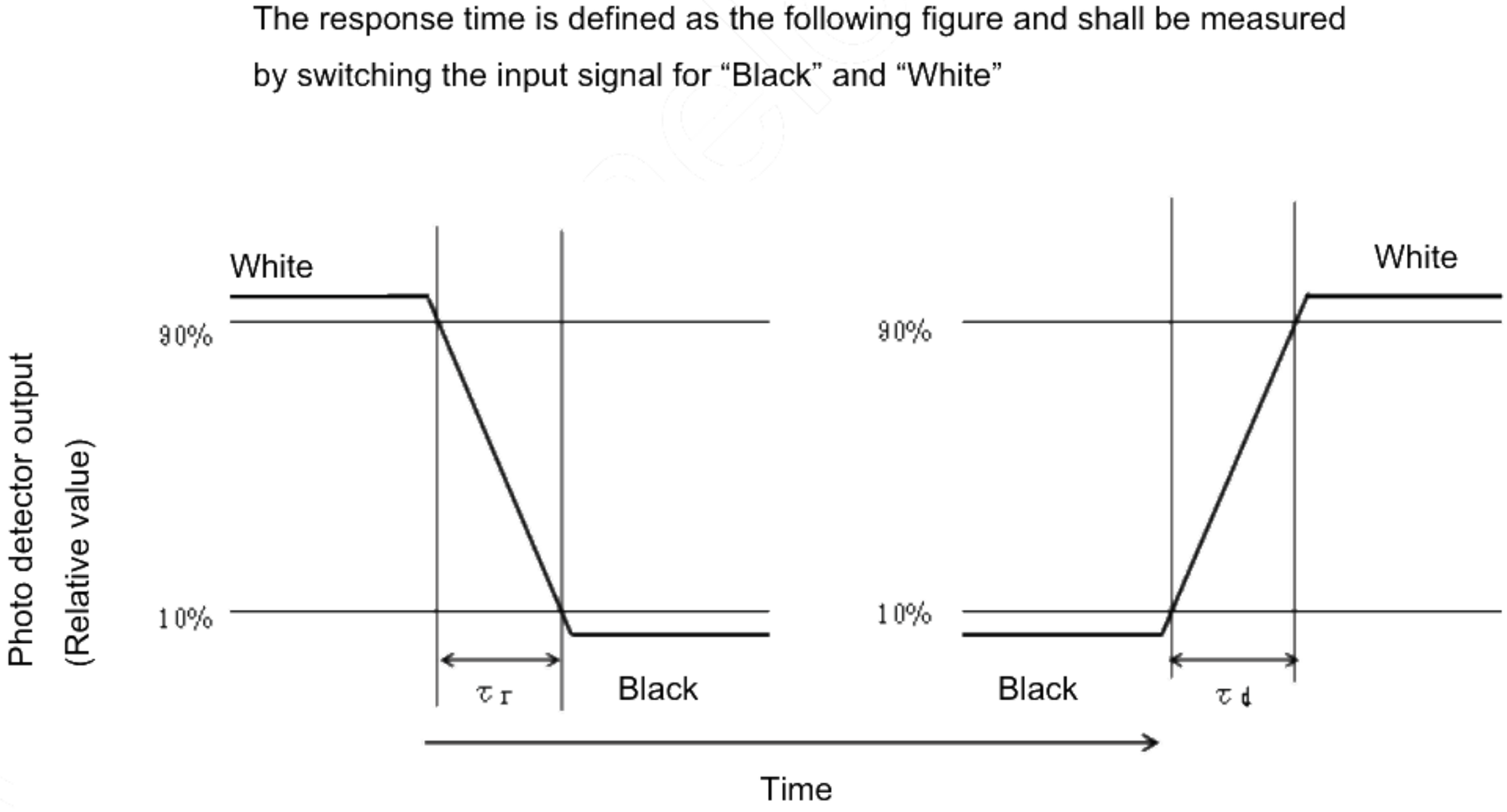
Note18) Definition of contrast ratio

The contrast ratio is defined as the following

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

Note19) Definition of response time

The response time is defined as the following figure and shall be measured by switching the input signal for "Black" and "White"



Note20) It shall be measured at center of the screen.

Note21) This is the reference value. The LED life time is defined as a time when brightness not to become under 50% of the original value(at Ta=25℃、I_{LED}=40mA/ 1 circuit)

10. Handling of modules

10-1. Inserting the FPC into its connector and pulling it out

1) Be sure to turn off the power supply and the signals when inserting or disconnecting the cable.

2) Please insert for too much stress not to join FPC in the case of insertion of FPC.

10-2. About handling of FPC

1) The bending radius of the FPC should be more than 1.4mm, and it should be bent evenly.

2) Do not dangle the LCD module by holding the FPC, or do not give any stress to it.

10-3. Mounting of the module

1) The module should be held on to the plain surface. Do not give any warping or twisting stress to the module.

2) Please consider that GND can ground a modular metal portion etc. so that static electricity is not charged to a module.

10-4. Cautions in assembly / Handling pre cautions

As the polarizer can be easily scratched, be most careful in handling it.

1) How to peel off lamination on the polarizer

A) Work environments in assembly.

Working under the following environments is desirable:

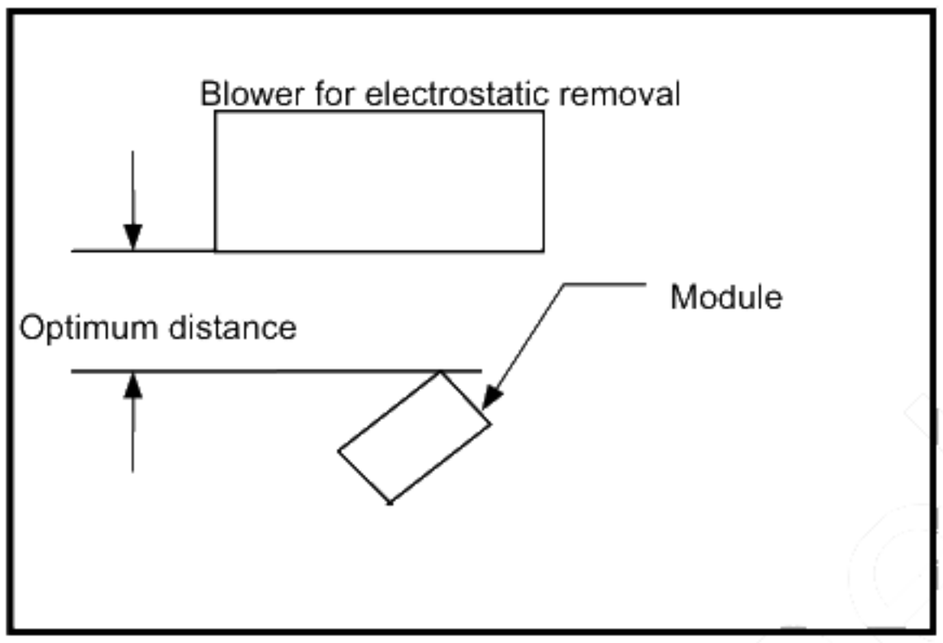
a) Implement more than 1MΩ conductive treatment (by placing a conductive mat or applying conductive paint) on the floor or tiles.

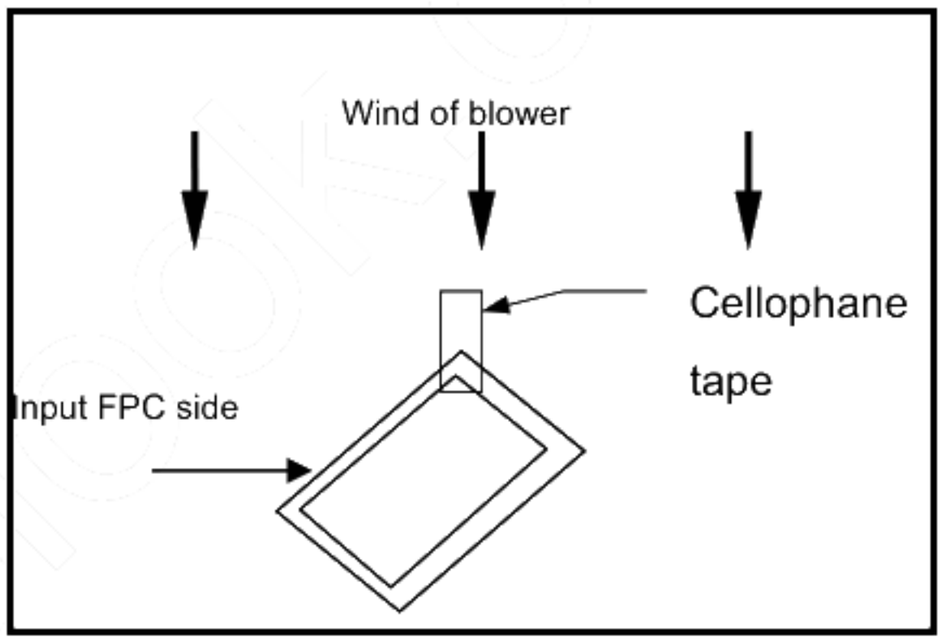
b) No dusts come in to the working room. Place an adhesive, anti-dust mat at the entrance of the room.

c) Humidity of 50 to 70% and temperature of 15 to 27°C are desirable.

d) All workers wear conductive shoes, conductive clothes, conductive fingerstalls and grounding belts without fail.

B) Work method





a)Use a blower for electrostatic removal. Set it in a direction slightly tilt downward so that each module can be well subjected to its wind. Set the blower at an optimum distance between the blower and the module. (Refer to above figure.)

b)Because the polarizing plate is not scratched, the tape of the strong sticking is held to lamination part near the blower. (Refer to above figure.)

c)Peel off lamination while pulling the cellophane tape forward.
The time of peeling off is five seconds or more.

d) Please move the module after peeling off to the following work at once so that dust dose not attach.

2) How to remove dust on the polarizer

a) Blow out dust by the use of an N2 blower with antistatic measures taken. Use of an ionized air Gun is recommendable.

b) When the panel surface is soiled, wipe it with soft cloth.

3) In the case of the module's metal part (shield case) is stained, wipe it with a piece of dry, soft cloth.
If rather difficult, give a breath on the metal part to clean better.

4) If water dropped, etc. remains stuck on the polarizer for a long time, it is apt to get discolored or cause stains. Wipe it immediately.

5) As a glass substrate is used for the TFT-LCD panel, if it is dropped on the floor or hit by something hard, it may be broken or chipped off.

6) Since CMOS LSI is used in this module, take care of static electricity and take the human earth into consideration when handling.

10-5. Others

1) Regarding storage of LCD modules, avoid storing them at direct sunlight-situation.
2) If stored at temperatures below the rated values, the inner liquid crystal may freeze, causing cell destruction. At temperatures exceeding the rated values for storage, the liquid crystal may become isotropic liquid, making it no longer possible to come back to its original state in some cases.
3) If the LCD is broken, the liquid crystal in the panel might leak. Please wash in water at once when it enters eyes and mouths by mistake.
4) If a water drop or dust adheres to the polarizer, it is apt to cause deterioration. Wipe it immediately.
5) Be sure to observe other caution items for ordinary electronic parts and components.
6) When handling LCD modules and assembling them into cabinets, that long-terms storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, causes corrosion and discoloration of the modules. Therefore, please avoid these use. Epoxy resin (amine series curing agent), silicone adhesive material (dealcoholization series and oxime series), tray forming agent (azo compound) etc, in the cabinet

or the packing materials may induce abnormal display with polarizer film deterioration regardress of contact or noncontact to polarizer film. Be sure to confirm the component of them.

7) In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.
8) The LED used for this product is very sensitive to the temperature. Luminance decreases rapidly when it issued for a long time under the environment of the high temperature. Please consult our company when it is used under the environment like the above mentioned.
9) Be careful when using it for long time with fixed pattern display as it may cause afterimage. (Please use a screen saver etc., in order to avoid an afterimage.)
10) Notice:Never dismantle the module , because it will cause failure. Moreover, please do not peel off the tapes other than the creped paper tape (yellow tape) of a protection film pasted to the product.
11) If a minute particle enters in the module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.
12) VCOM must be adjusted on condition of your final product. No adjustment causes the deterioration for display quality.
13) Be sure to use a power supply with the safety protection circuit such as the fuse for the excess voltage, excess current, electric discharge waveform and or Latch-up occurring.

11. Reliability test items

No.	Test item	Conditions
1	High temperature storage test	Ta = 80°C 240h
2	Low temperature storage test	Ta = -30°C 240h
3	High temperature & high humidity operation test	Tp = 40°C ; 95%RH 240h (No condensation)
4	High temperature operation test	Tp= 70°C 240h
5	Low temperature operation test	Ta = -20°C 240h
6	Vibration test (non- operating)	Frequency range: 10 to 55Hz Stroke: 1.5mm Sweep time: 1minutes Test period: 2 hours (for each direction of X,Y,Z 40minites)
7	Shock test	Direction: ±X, ±Y, ±Z, Time: Third for each direction. Impact value: 980m/s², Action time 6ms
8	Thermal shock test	Ta=-30°C to 80°C /10 cycles (30 min) (30min)

【Check items】

In the standard condition, there shall be no practical problems that may affect the display function.

12. Display Grade

The standard regarding the grade of color LCD displaying modules should be based on the incoming inspection standard.

13. Delivery Form

13-1. Carton storage conditions

1) Carton piling-up: Max 8 rows

2) Environments

Temperature: 0～40°C

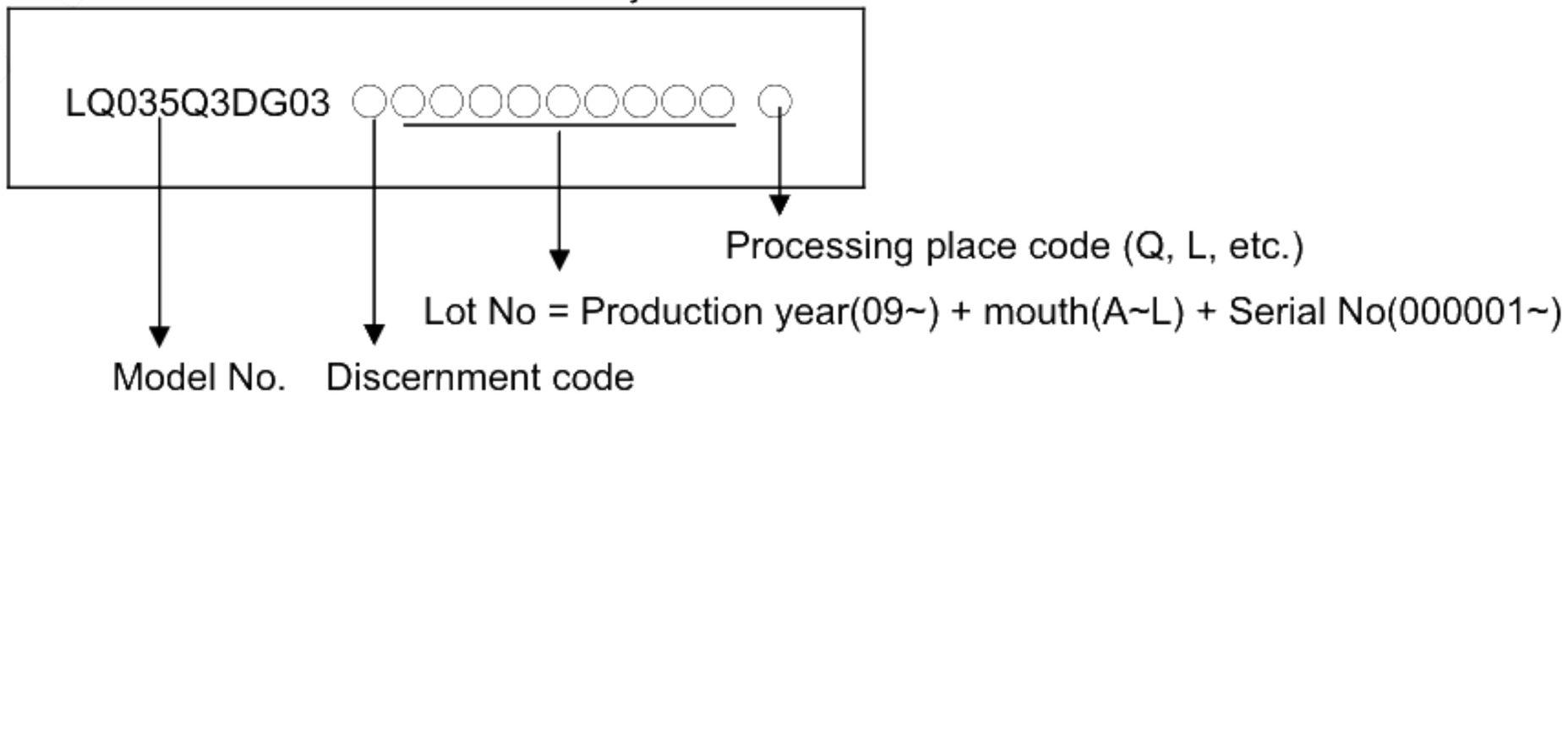
Humidity: 65% RH or less (at 40°C)

There should be no dew condensation even at a low temperature and high humidity.

3) Packing form: As shown in 15. LCD module packing carton

14. Lot No. marking

The lot No. will be indicated on individual inkjet. The location is as shown



15. LCD module packing carton

Product countries / Areas	CHINA
Piling number of cartons	8
Package quantity in one carton	120pcs
Carton size(TYP)	525×360×225(H) [mm]
Total mass of one carton filled with full modules	6.2 Kg (typ)

1 tray: 12 modules (MAX)

1 sleeve: 60 modules (MAX)

1 carton: 120 modules (MAX)