KOE

JDI Group

Kaohsiung Opto-Electronics Inc.

FOR MESSRS : _____ DATE : Mar. 1st ,2017

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

TX23D201VM0BAA

Contents

ACCEPTED BY: _____ PROPOSED BY: Oblack Tsai

2. RECORD OF REVISION

<table>
<tr><th>DATE</th><th>SHEET No.</th><th>SUMMARY</th></tr>
<tr><td rowspan="4">Aug.30,’16</td><td>7B64PS 2703 –
TX23D201VM0BAA-2
Page 3-1/1</td><td>3.1 DISPLAY FEATURES
Revised :
<table>
<tr><td>Power Consumption</td><td>1.4 W for LCD ; 8.64W for backlight</td></tr>
<tr><td colspan="2">↓</td></tr>
<tr><td>Power Consumption</td><td>1.4 W for LCD ; 6.12W for backlight</td></tr>
</table></td></tr>
<tr><td>7B64PS 2705 –
TX23D201VM0BAA-2
Page 5-2/2</td><td>5.2 BACKLIGHT CHARACTERISTICS
Revised :
<table>
<tr><th>Item</th><th>Condition</th><th>Min.</th><th>Typ.</th><th>Max.</th></tr>
<tr><td>LED Forward Current</td><td>0V; 0% duty</td><td>680</td><td>720</td><td>760</td></tr>
<tr><td>LED lifetime</td><td>I_{LED}= 720 mA</td><td>-</td><td>70K</td><td>-</td></tr>
<tr><td colspan="5">↓</td></tr>
<tr><th>Item</th><th>Condition</th><th>Min.</th><th>Typ.</th><th>Max.</th></tr>
<tr><td>LED Forward Current</td><td>0V; 0% duty</td><td>470</td><td>510</td><td>550</td></tr>
<tr><td>LED lifetime</td><td>I_{LED}= 510 mA</td><td>-</td><td>70K</td><td>-</td></tr>
</table>
Note1、2 : 720mA → 510mA</td></tr>
<tr><td>7B64PS 2706 –
TX23D201VM0BAA-2
Page 6-1/2</td><td>6. OPTICAL CHARACTERISTICS
Revised :
<table>
<tr><th colspan="2">Item</th><th>Symbol</th><th>Condition</th><th>Min.</th><th>Typ.</th><th>Max.</th></tr>
<tr><td colspan="2">Brightness of White</td><td>-</td><td rowspan="3">$\phi=0^\circ,\theta=0^\circ$,
I_{LED}= 720 mA</td><td>800</td><td>1000</td><td>-</td></tr>
<tr><td colspan="2">Brightness Uniformity</td><td>-</td><td>75</td><td>-</td><td>-</td></tr>
<tr><td colspan="2">Contrast Ratio</td><td>CR</td><td>500</td><td>800</td><td>-</td></tr>
<tr><td rowspan="2">Color Chromaticity</td><td rowspan="2">Green</td><td>X</td><td rowspan="2">$\phi=0^\circ,\theta=0^\circ$</td><td>0.27</td><td>0.32</td><td>0.37</td></tr>
<tr><td>Y</td><td>0.50</td><td>0.55</td><td>0.60</td></tr>
<tr><td colspan="7">↓</td></tr>
<tr><th colspan="2">Item</th><th>Symbol</th><th>Condition</th><th>Min.</th><th>Typ.</th><th>Max.</th></tr>
<tr><td colspan="2">Brightness of White</td><td>-</td><td rowspan="3">$\phi=0^\circ,\theta=0^\circ$,
I_{LED}= 510 mA</td><td>800</td><td>1000</td><td>-</td></tr>
<tr><td colspan="2">Brightness Uniformity</td><td>-</td><td>75</td><td>-</td><td>-</td></tr>
<tr><td colspan="2">Contrast Ratio</td><td>CR</td><td>500</td><td>800</td><td>-</td></tr>
<tr><td rowspan="2">Color Chromaticity</td><td rowspan="2">Green</td><td>X</td><td rowspan="2">$\phi=0^\circ,\theta=0^\circ$</td><td>0.27</td><td>0.32</td><td>0.37</td></tr>
<tr><td>Y</td><td>0.53</td><td>0.58</td><td>0.63</td></tr>
</table></td></tr>
<tr><td>7B64PS 2713 –
TX23D201VM0BAA-2
Page 13-1/1</td><td>13. DESIGNATION of LOT MARK
Added :
<table>
<tr><th>Rev.No</th><th>Item</th><th>Remarks</th></tr>
<tr><td>A</td><td>-</td><td>-</td></tr>
<tr><td>B</td><td>LED Change</td><td>PCN0927</td></tr>
</table>
Revised :
 
</td></tr>
<tr><td>Mar.1,’17</td><td>7B64PS 2711 –
TX23D201VM0BAA-3
Page 11-2/3~3/3</td><td>Revised : 11.2 LCD APPEARANCE SPECIFICATION

Note 1 : Revise The definitions of dot defect</td></tr>
</table>

3. GENERAL DATA

3.1 DISPLAY FEATURES

This module is a 9” WVGA of 16:9 format of amorphous silicon TFT. The pixel format is vertical stripe and sub pixels are arranged as R(red), G(green), B(blue) sequentially .This display is RoHS compliant , and COG (chip on glass) technology and LED backlight are applied on this display.

Part Name	TX23D201VM0BAA
Module Dimensions	218.0(W) mm x 135.0(H) mm x 11.15 (D) mm
LCD Active Area	196.8(W) mm x 118.08(H) mm
Pixel Pitch	0.246(W) mm x 0.246(H) mm
Resolution	800 x 3(RGB)(W) x 480(H) Dots
Color Pixel Arrangement	R, G, B Vertical stripe
LCD Type	Transmissive Color TFT; Normally Black
Display Type	Active Matrix
Number of Colors	16.7M Colors(6-bit RGB+ FRC)
Backlight	Light Emitting Diode (LED)
Weight	330 g
Interface	LVDS ; 20 pins
Power Supply Voltage	3.3V for LCD ; 12.0V for Backlight
Power Consumption	1.4 W for LCD ; 6.12W for backlight
Viewing Direction	Super Wide Version (In Plane Switching)

4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Remarks
Supply Voltage	V_{DD}	-0.3	4.0	V	-
Input Voltage of Logic	V_I	-0.3	V_{DD}+0.3	V	Note 1
Operating Temperature	T_{op}	-30	80	°C	Note 2
Storage Temperature	T_{st}	-40	90	°C	Note 2
Backlight Input Voltage	V_{LED}	-	15	V	-

Note 1: The rating is defined for the signal voltages of the interface such as DCLK, DE, DIM and RGB data bus.

Note 2: The maximum rating is defined as above based on the chamber temperature, which might be different from ambient temperature after assembling the panel into the application. Moreover, some temperature-related phenomenon as below needed to be noticed:

- Background color, contrast and response time would be different in temperatures other than 25°C.
- Operating under high temperature will shorten LED lifetime.

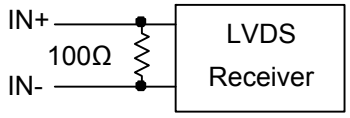
5. ELECTRICAL CHARACTERISTICS

5.1 LCD CHARACTERISTICS

$T_a = 25\ ^{\circ}C,\ \text{Vss} = 0\text{V}$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	-	3.0	3.3	3.6	V	-
Input Voltage of Logic	V_I	"H" level	-	-	+100	mV	Note 1
		"L" level	-100	-	-		
Signal Input Voltage	V_I	"H" level	$0.7V_{DD}$	-	V_{DD}	V	CMOS Level
		"L" level	0	-	$0.3V_{DD}$		
Power Supply Current	I_{DD}	V_{DD}-V_{SS} =3.3V	-	430	560	mA	Note 2,3
Frame Frequency	f_{Frame}			60	66	Hz	-
DCLK Frequency	f_{CLK}	-	-	33.3	35	MHz	

Note 1: VCM 1.2V is common mode voltage of LVDS transmitter and receiver .The input terminal of LVDS receiver is terminated with 100Ω.



Note 2: An all white check pattern is used when measuring I_{DD}. f_{Frame} is set to 60 Hz.

Note 3: 1.0A fuse is applied in the module for I_{DD}. For display activation and protection purpose, power supply is recommended larger than 2.5A to start the display and break fuse once any short circuit occurred.

5.2 BACKLIGHT CHARACTERISTICS

$T_a = 25\ ^{\circ}C$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
LED Input Voltage	V_{LED}	-	11.5	12.0	12.5	V	Note1
LED Forward Current	I_{LED}	0V; 0% duty	470	510	550	mA	
		3.3VDC; 100% Duty	15	30	45		
LED lifetime	-	I_{LED} = 510 mA	-	70K	-	hrs	Note 2

Note 1: As Fig. 5.1 shown, LED current is constant, 510 mA, controlled by the LED driver when applying 12V V_{LED}.

Note 2: The estimated lifetime is specified as the time to reduce 50% brightness by applying 510 mA at 25°C.

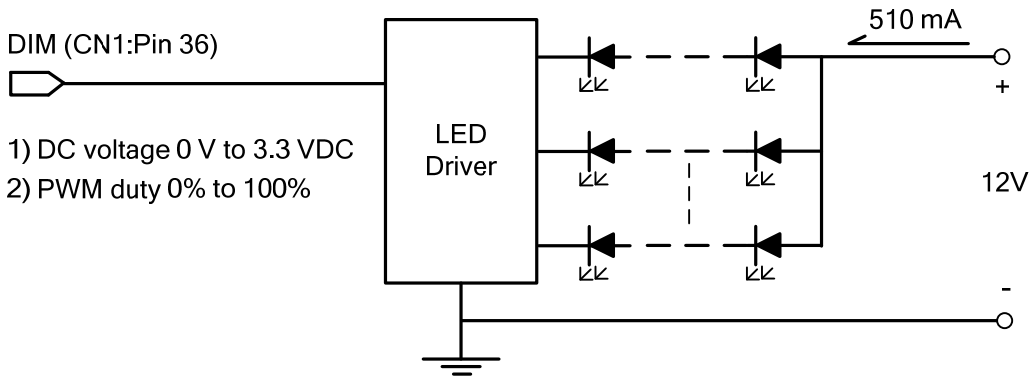


Fig. 5.1

6. OPTICAL CHARACTERISTICS

The optical characteristics are measured based on the conditions as below:

- Supplying the signals and voltages defined in the section of electrical characteristics.
- The backlight unit needs to be turned on for 30 minutes.
- The ambient temperature is 25°C.
- In the dark room less than 100 lx, the equipment has been set for the measurements as shown in Fig 6.1.

$T_a = 25\ ^{\circ}C,\ f_{Frame} = 60\,\text{Hz}, V_{DD} = 3.3\text{V}$

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Brightness of White		-	$\phi = 0^{\circ}, \theta = 0^{\circ}$, I_{LED}= 510mA	800	1000	-	cd/m^2	Note 1
Brightness Uniformity		-		75	-	-	%	Note 2
Contrast Ratio		CR		500	800	-	-	Note 3
Response Time		Tr + Tf	$\phi = 0^{\circ}, \theta = 0^{\circ}$	-	40	-	ms	Note 4
NTSC Ratio		-	$\phi = 0^{\circ}, \theta = 0^{\circ}$	-	50	-	%	-
Viewing Angle		θ x	$\phi = 0^{\circ}$, CR ≥ 10	-	85	-	Degree	Note 5
		θ x′	$\phi = 180^{\circ}$, CR ≥ 10	-	85	-		
		θ y	$\phi = 90^{\circ}$, CR ≥ 10	-	85	-		
		θ y′	$\phi = 270^{\circ}$, CR ≥ 10	-	85	-		
Color Chromaticity	Red	X	$\phi = 0^{\circ}, \theta = 0^{\circ}$	0.56	0.61	0.66	-	Note 6
		Y		0.28	0.33	0.38		
	Green	X		0.27	0.32	0.37		
		Y		0.53	0.58	0.63		
	Blue	X		0.10	0.15	0.20		
		Y		0.07	0.12	0.17		
	White	X		0.27	0.32	0.37		
		Y		0.26	0.31	0.36		

Note 1: The brightness is measured from 9 point of the panel, P1~P9 in Fig. 6.2, for the average value.

Note 2: The brightness uniformity is calculated by the equation as below:

$$\text{Brightness uniformity} = \frac{\text{Min. Brightness}}{\text{Max. Brightness}} \text{ X100\%}$$

which is based on the brightness values of the 9 points in active area measured by BM-5 as shown in Fig. 6.2.

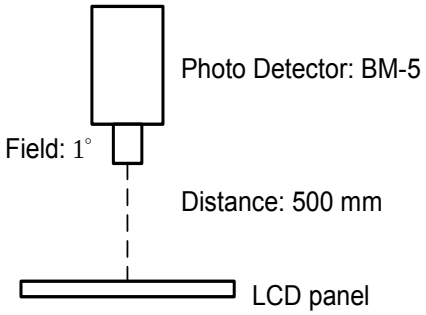


Fig 6.1

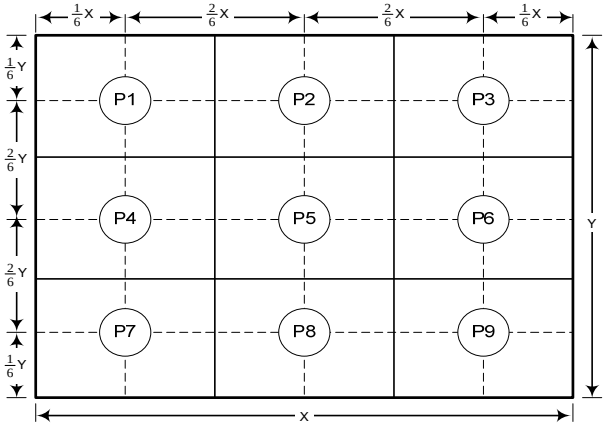


Fig 6.2

Note 3: The Contrast Ratio is measured from the center point of the panel, P5, and defined as the following equation:

$$CR = \frac{\text{Brightness of White}}{\text{Brightness of Black}}$$

Note 4: The definition of response time is shown in Fig. 6.3. The rising time is the period from 10% brightness to 90% brightness when the data is from black to white. Oppositely, Falling time is the period from 90% brightness rising to 10% brightness.

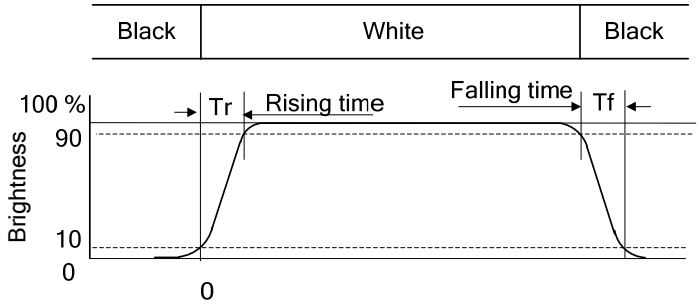


Fig 6.3

Note 5: The definition of viewing angle is shown in Fig. 6.4. Angle ϕ is used to represent viewing directions, for instance, $\phi = 270^\circ$ means 6 o'clock, and $\phi = 0^\circ$ means 3 o'clock. Moreover, angle θ is used to represent viewing angles from axis Z toward plane XY.

The display is super wide viewing angle version; 85° viewing angle can be obtained from each viewing direction.

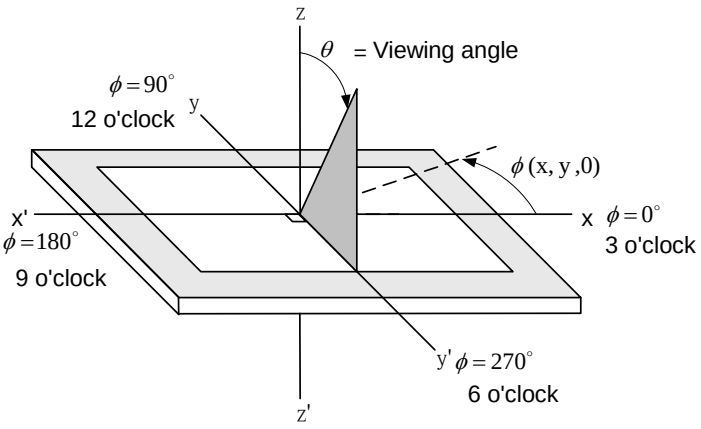
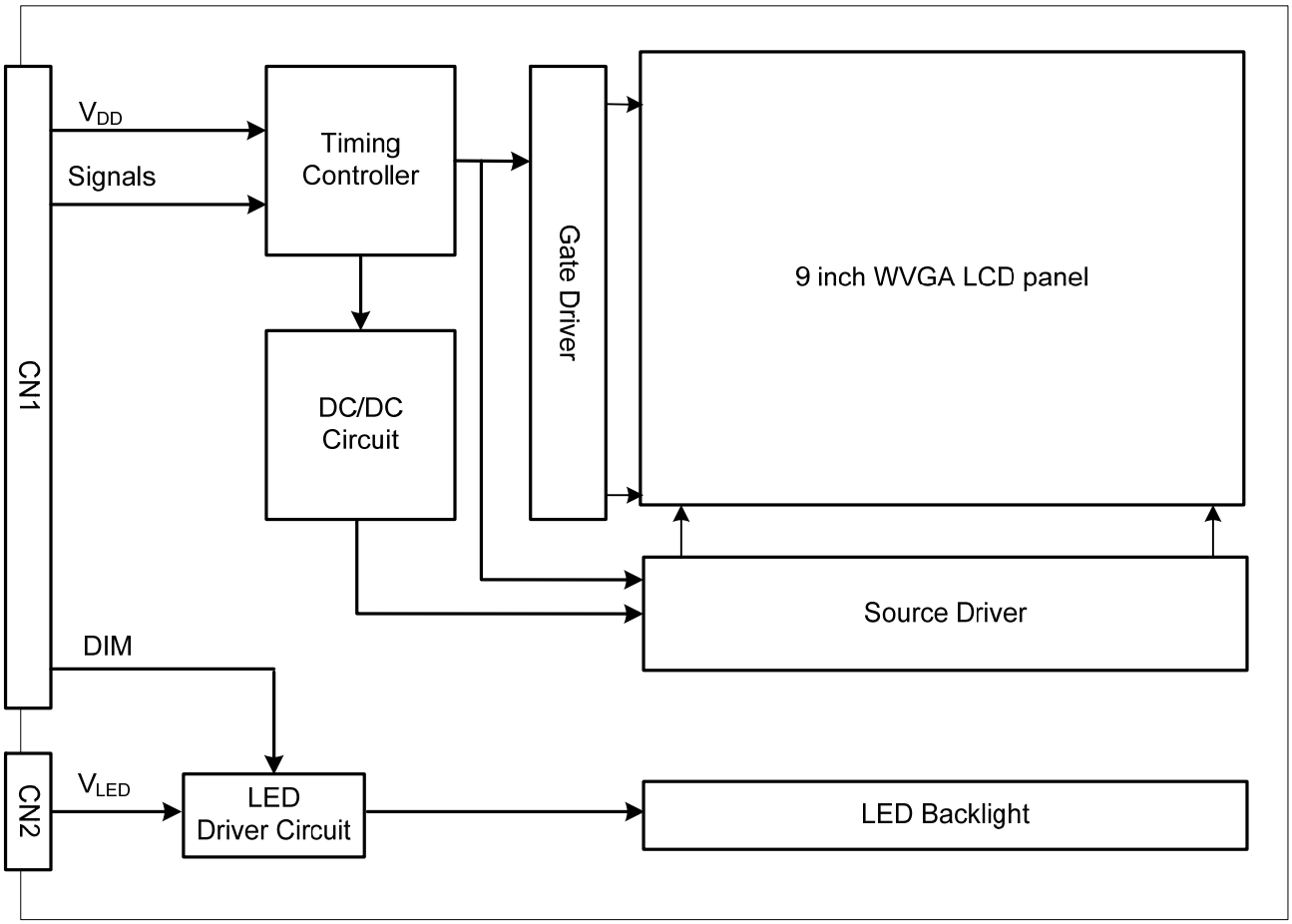


Fig 6.4

Note 6: The color chromaticity is measured from the center point of the panel, P5, as shown in Fig. 6.2.

7 BLOCK DIAGRAM



8. RELIABILITY TESTS

Test Item	Condition	
High Temperature	1)Operating 2) 80°C	500 hrs
Low Temperature	1)Operating 2) -30°C	500 hrs
High Temperature	1) Storage 2) 90°C	500 hrs
Low Temperature	1) Storage 2) -40°C	500 hrs
Heat Cycle	1) Operating 2) –30°C~80°C 3) 3hrs~1hr~3hrs	500 hrs
Thermal Shock	1) Non-Operating 2) -35°C ↔ 85°C 3) 0.5 hr ↔ 0.5 hr	500 hrs
High Temperature & Humidity	1) Operating 2) 40& 85%RH 3) Without condensation	500 hrs (Note 3)
Vibration	1) Non-Operating 2) 10~200 Hz 3) 5G 4) X, Y, and Z directions	1 hr for each direction
Mechanical Shock	1) Non-Operating 2) 10 ms 3) 80G 4) ±X, ±Y and ±Z directions	Once for each direction
ESD	1) Operating 2) Tip:150 pF,330 Ω 3) Air discharge for glass: ±12KV 4) Contact discharge for metal frame: ±15KV	1) Glass: 9 points 2) Metal frame: 8 points (Note 4)

Note 1: Display functionalities are inspected under the conditions defined in the specification after the reliability tests.

Note 2: The display is not guaranteed for use in corrosive gas environments.

Note 3: Under the condition of high temperature & humidity, if the temperature is higher than 40°C, the humidity needs to be reduced as Fig. 8.1 shown.

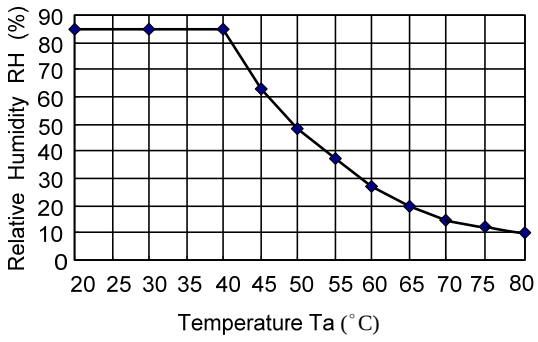


Fig. 8.1

Note 4: All pins of LCD interface (CN1) have been tested by ±100V contact discharge of ESD under non-operating condition.

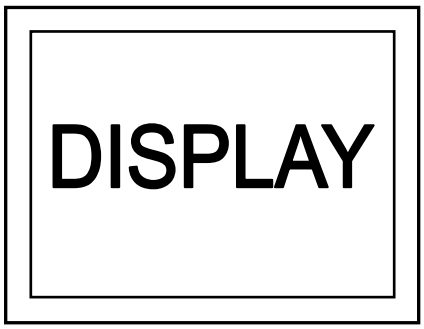
9. LCD INTERFACE

9.1 INTERFACE PIN CONNECTIONS

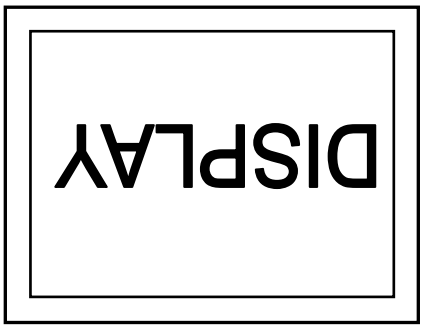
The display interface connector CN1 is FI-SEB20P-HF13E made by JAE and more details of the connector are shown in the section of outline dimension. Pin assignment of LCD interface is as below:

Pin No.	Signal	Signal	Pin No.	Signal	Signal
1	V_{DD}	Power Supply (typ.+3.3V)	11	IN2-	Pixel Data
2	V_{DD}		12	IN2+	
3	DIM	Backlight diming (Note 3)	13	V_{SS}	GND
4	V_{SS}	GND	14	CLK IN-	Pixel Clock
5	IN0-	Pixel Data	15	CLK IN+	
6	IN0+		16	V_{SS}	GND
7	V_{SS}	GND	17	IN3-	Pixel Data
8	IN1-	Pixel Data	18	IN3+	
9	IN1+		19	SD	Scan Direction Control (Note 1)
10	V_{SS}	GND	20	AMODE	L:8bit(default),H:8bit/6bit

Note 1: Scan direction is available to be switched as below.



SD：Low or Open (Default)



SD：High

Note 2: In n- and n+ (n=0,1,2,3), CLK IN- and CLK IN+ should be wired by twist-pairs or side by side FPC patterns, respectively.

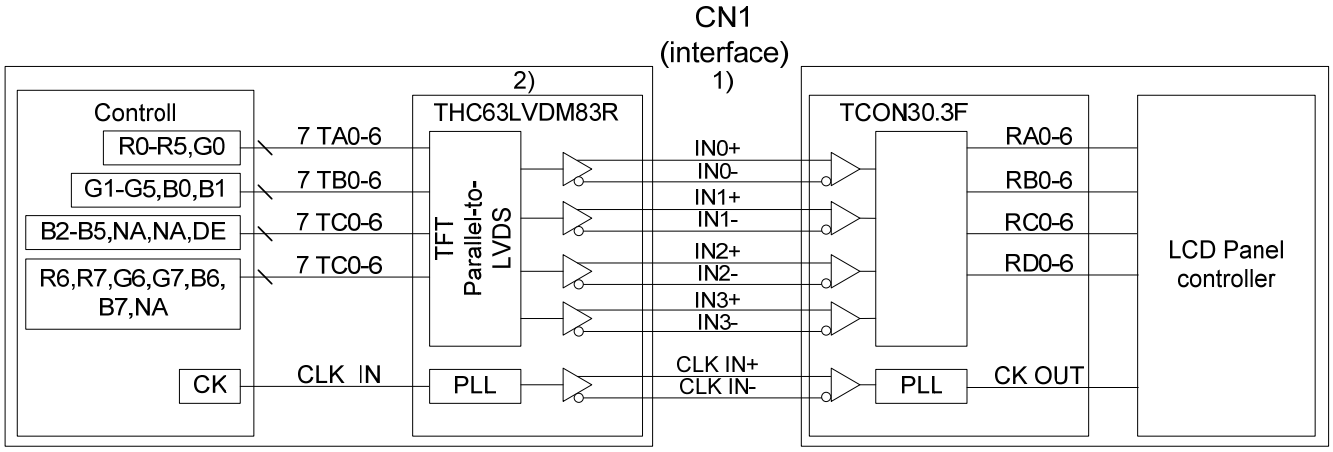
Note 3: Normal brightness: 0V or 0% PWM duty; Brightness control: 0V to 3.3V DC or 0% to 100% PWM duty.

The backlight interface connector CN2 is SM08B-SRSS-TB made by JST, and pin assignment of backlight is as below:

Pin No.	Signal	Function
1~3	V_{LED}+	Power Supply for LED(12V)
4~5	NC	No Connection
6~8	V_{LED}-	GND

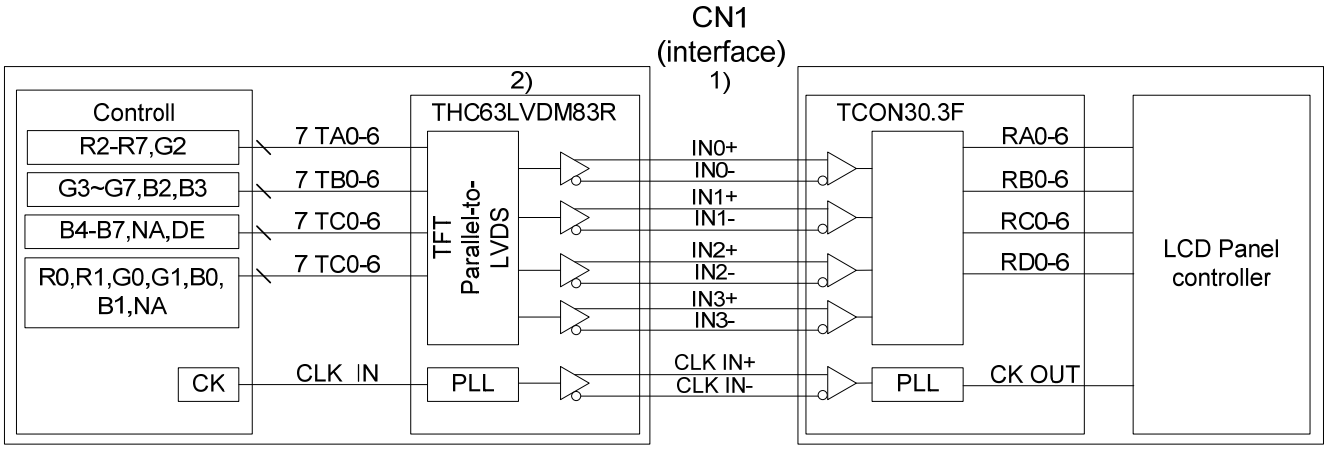
9.2 LVDS INTERFACE

1) 8Bit Mode (AMODE = LOW)

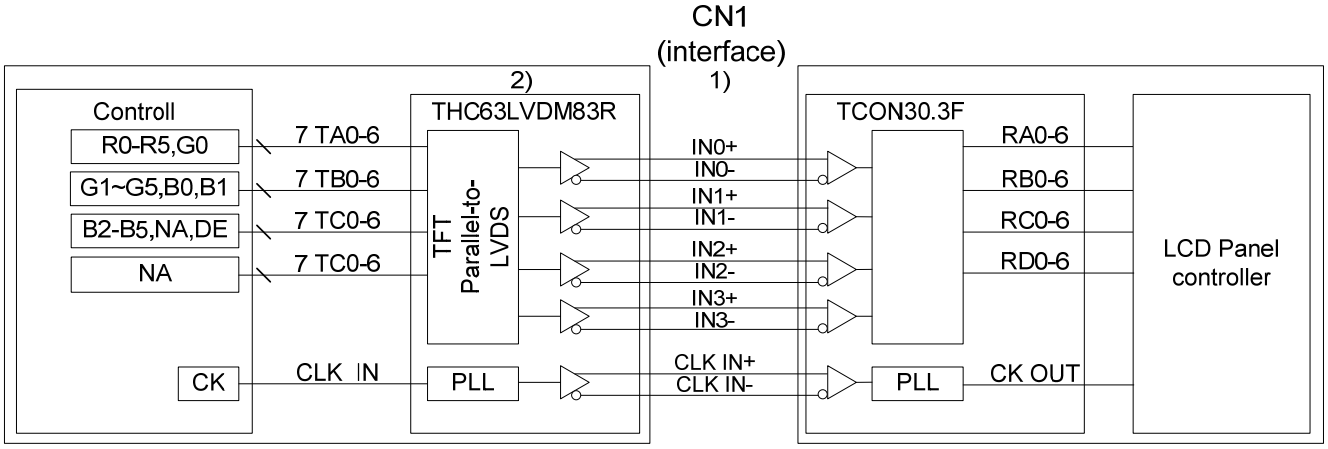


2) 8Bit / 6Bit Mode(AMODE = HIGH)

① 8Bit Mode



② 6Bit Mode



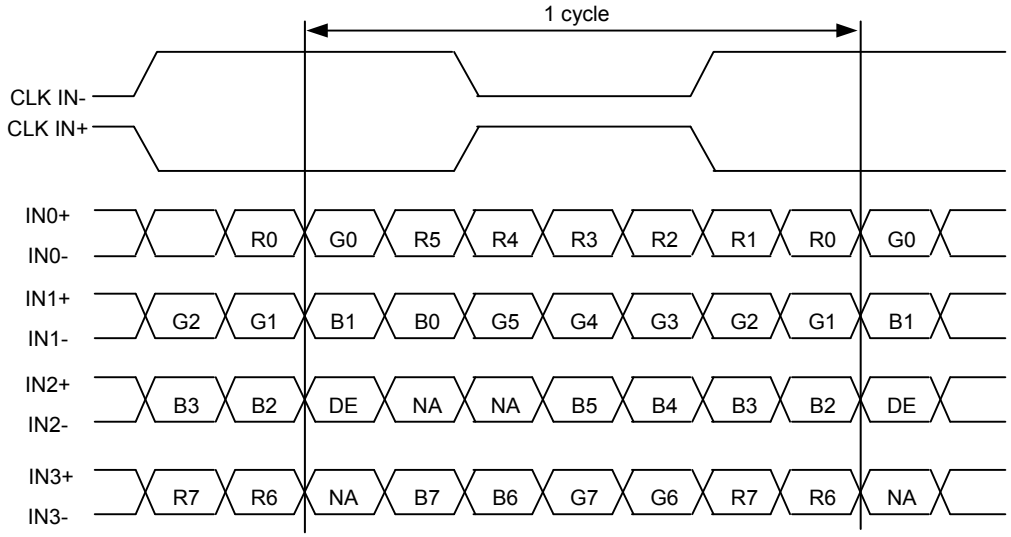
Note 1: 100Ω impedance of LVDS cable is recommended for best optical performance.

Note 2: Transmitter Made by Thine : THC63LVDM83R or equivalent.

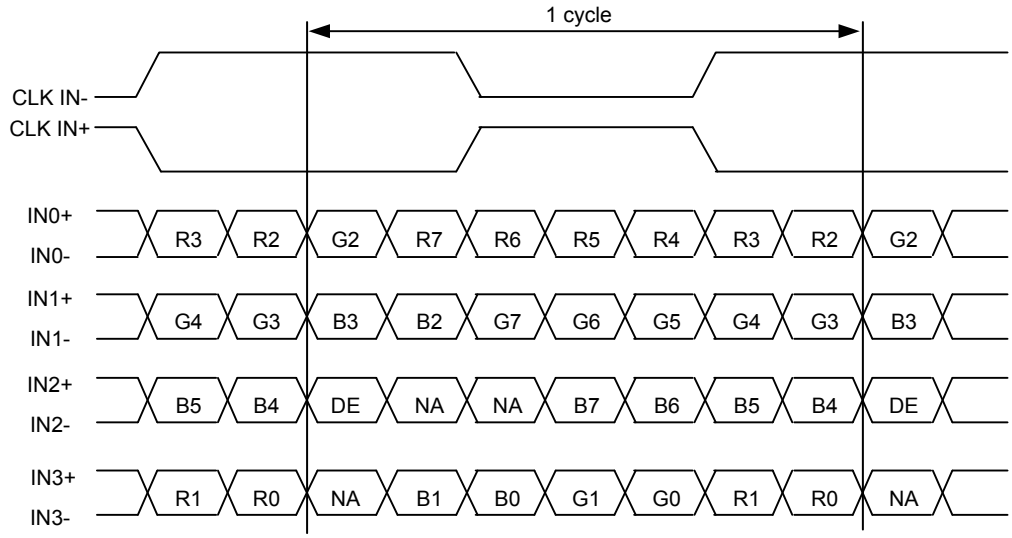
9.3 DATA MAPPING

Transmitter		8Bit Mode	8Bit Mode	6Bit Mode
Pin No.	Pin name	AMODE		
		LOW	HIGH	
51	TA0	R0(LSB)	R2	R0(LSB)
52	TA1	R1	R3	R1
54	TA2	R2	R4	R2
55	TA3	R3	R5	R3
56	TA4	R4	R6	R4
3	TA5	R5	R7(MSB)	R5(MSB)
4	TA6	G0(LSB)	G2	G0(LSB)
6	TB0	G1	G3	G1
7	TB1	G2	G4	G2
11	TB2	G3	G5	G3
12	TB3	G4	G6	G4
14	TB4	G5	G7(MSB)	G5(MSB)
15	TB5	B0(LSB)	B2	B0(LSB)
19	TB6	B1	B3	B1
20	TC0	B2	B4	B2
22	TC1	B3	B5	B3
23	TC2	B4	B6	B4
24	TC3	B5	B7(MSB)	B5(MSB)
27	TC4	(NA)	(NA)	(NA)
28	TC5	(NA)	(NA)	(NA)
30	TC6	DE	DE	DE
50	TD0	R6	R0(LSB)	(NA)
2	TD1	R7(MSB)	R1	(NA)
8	TD2	G6	G0(LSB)	(NA)
10	TD3	G7(MSB)	G1	(NA)
16	TD4	B6	B0(LSB)	(NA)
18	TD5	B7(MSB)	B1	(NA)
25	TD6	(NA)	(NA)	(NA)

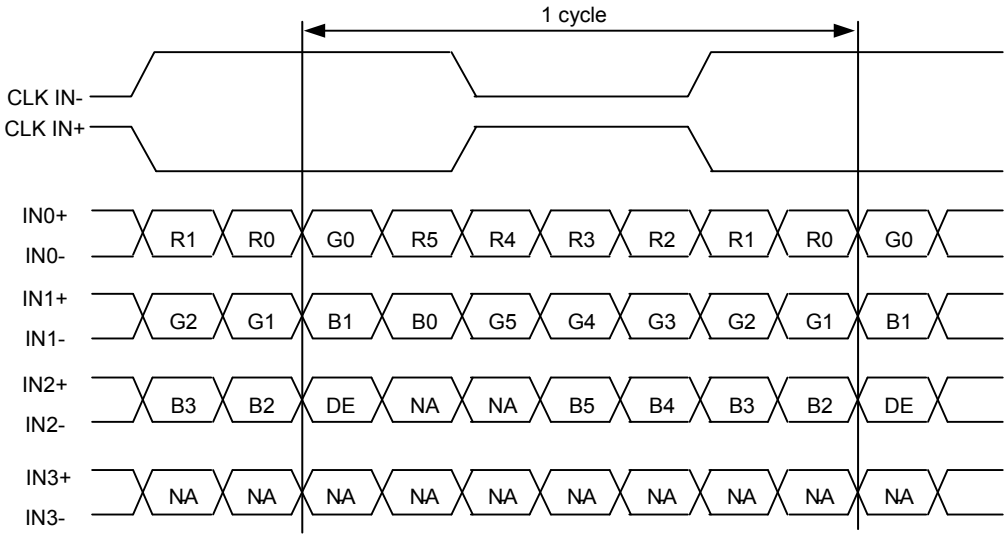
(1) 8Bit Mode (Amode=Low)



(2) 8Bit Mode (Amode=High)



(3) 6Bit Mode (Amode=High)



DE : Display Enable

NA : Not Available

9.4 DATA INPUT for DISPLAY COLOR

(8BIT MODE)

Input color		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
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
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	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
	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
Red	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
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	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
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	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(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note 1: Definition of gray scale : Color(n) Number in parenthesis indicates gray scale level. Larger number corresponds to brighter level.

Note 2: Data Signal : 1 : High, 0 : Low

(6BIT MODE)

Input		Red Data						Green Data						Blue Data					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
color		MSB					LSB	MSB					LSB	MSB					LSB
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

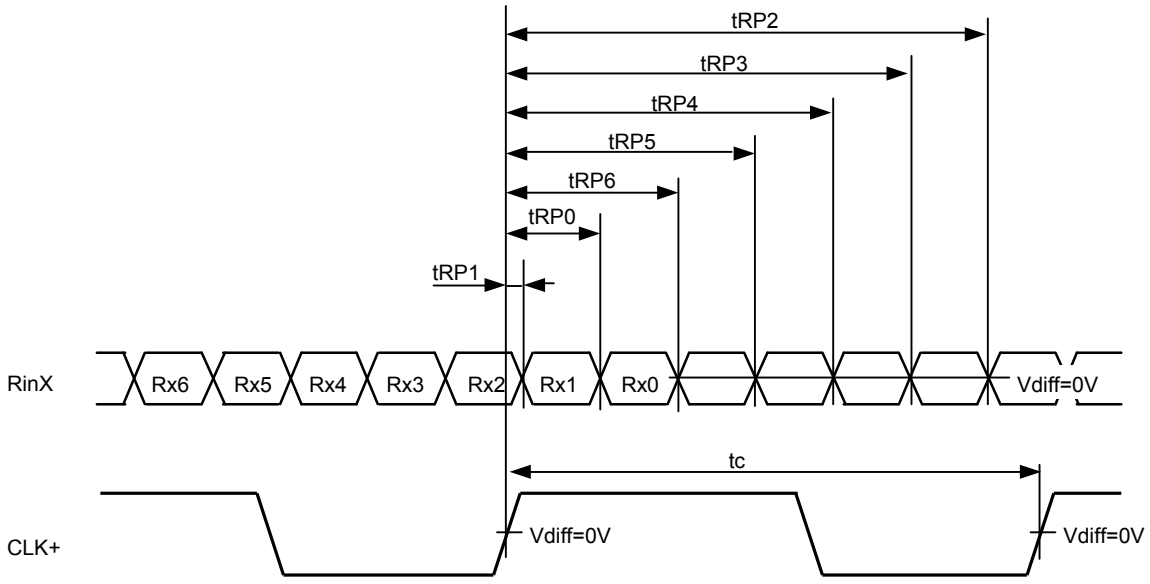
Note 1: Definition of gray scale : Color(n) Number in parenthesis indicates gray scale level. Larger number corresponds to brighter level.

Note 2: Data Signal : 1 : High, 0 : Low

9.5 INTERFACE TIMING

(1) LVDS Receiver Timing

(Interface of TFT module)



RinX=(RinX+)-(RinX-) (X=0,1,2)

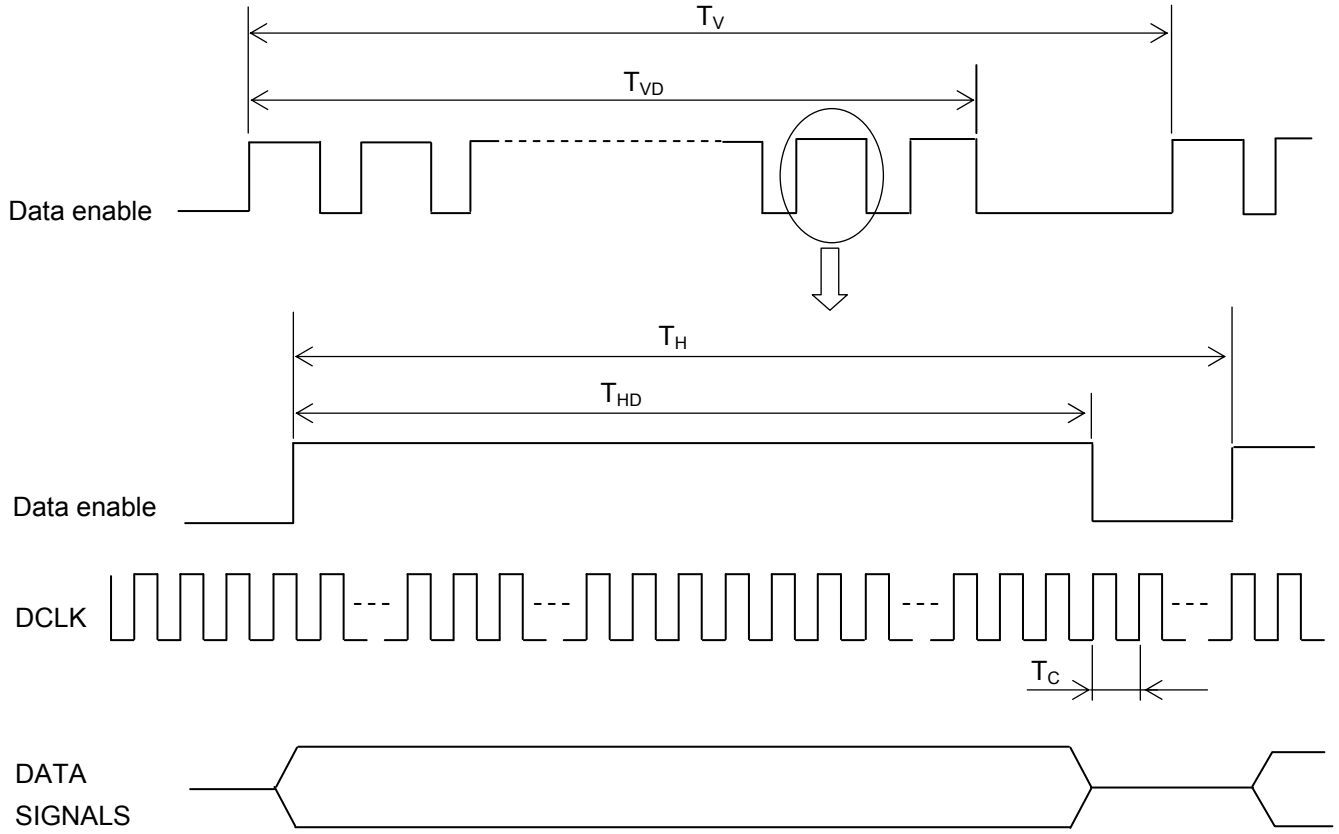
Item		Symbol	Min.	Typ.	Max.	Unit
DCLK	FREQUENCY	1/tc	25.0	28.0 1) 33.3 2)	35.0	MHz
RinX (X=0,1,2)	0 data position	t_{RP0}	$1/7t_{CLK}$-0.65	$1/7*t_{CLK}$	$1/7t_{CLK}$+0.65	ns
	1st data position	t_{RP1}	-0.65	0	-0.65	
	2nd data position	t_{RP2}	$6/7t_{CLK}$-0.65	$6/7*t_{CLK}$	$6/7t_{CLK}$+0.65	
	3rd data position	t_{RP3}	$5/7t_{CLK}$-0.65	$5/7*t_{CLK}$	$5/7t_{CLK}$+0.65	
	4th data position	t_{RP4}	$4/7t_{CLK}$-0.65	$4/7*t_{CLK}$	$4/7t_{CLK}$+0.65	
	5th data position	t_{RP5}	$3/7t_{CLK}$-0.65	$3/7*t_{CLK}$	$3/7t_{CLK}$+0.65	
	6th data position	t_{RP6}	$2/7t_{CLK}$-0.65	$2/7*t_{CLK}$	$2/7t_{CLK}$+0.65	

Note 1: f_{Frame}=50Hz

Note 2: f_{Frame}=60Hz

(2) Timing converter timing

(Input timing for transmitter)

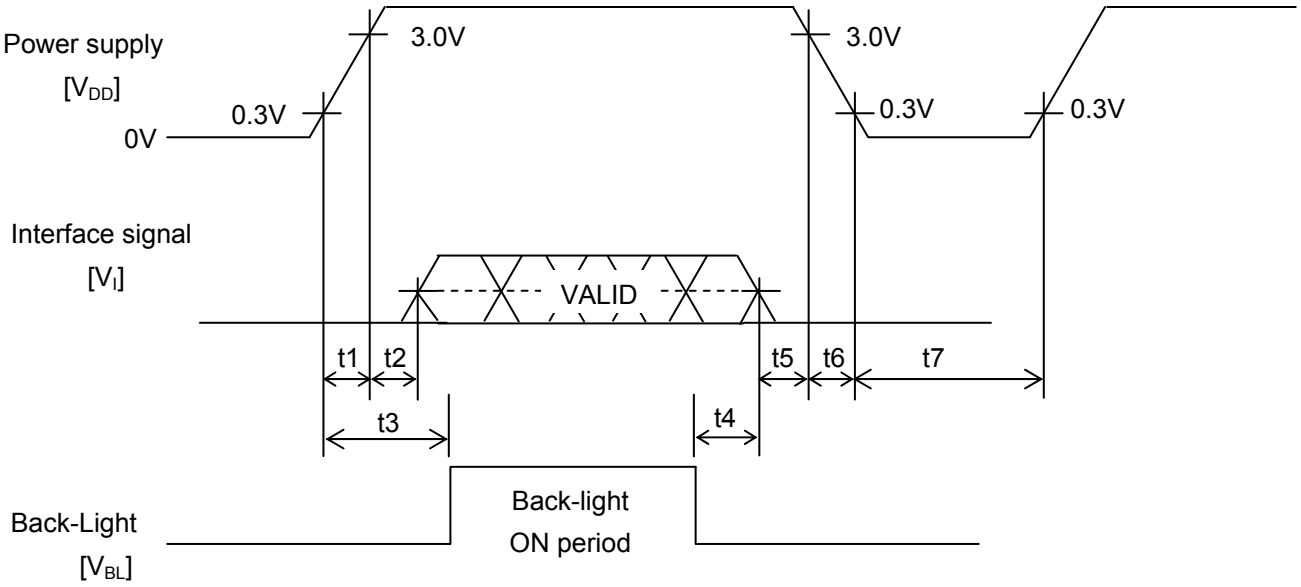


The timings except mentioned above are referred to the specifications of your transmitter.

Item		Symbol	Min.	Typ.	Max.	Unit	Remarks
DCLK	Cycle time	T_C	28.6	30.0	40.0	ns	
Data Enable	Duty	D	0.45	0.5	0.55	-	
	Horizontal period	T_H	845	1056	1500	T_C	
	Horizontal width-Active	T_{HD}	800	800	800	T_C	
	Vertical period	T_V	483	525	640	T_H	
	Vertical width-Active	T_{VD}	480	480	480	T_H	
	Frame frequency	f_{Frame}	42	60	75	H_Z	

(3) Timing between interface signal and power supply

Power Supply, Input Signal and Backlight Voltage should comply with the following sequence.



POWER ON	POWER OFF
0< t1≦15ms	5ms≦ t4
0< t2 ≦45ms	0≦ t5 ≦45ms
100ms≦t3	0≦ t6 ≦20ms
	500ms≦t7

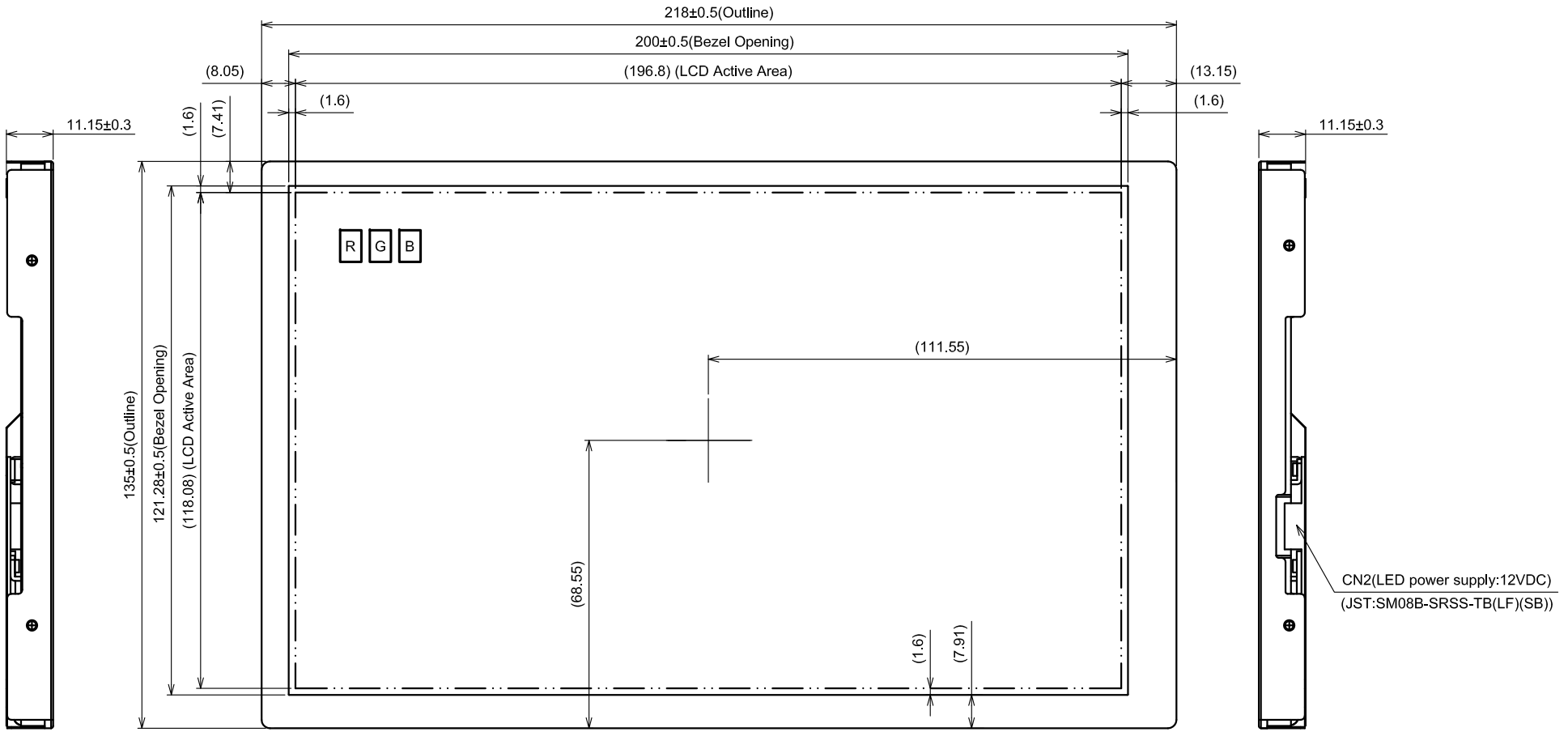
Note 1: In order to prevent electronic parts from destruction caused by latch-up, please input signal after Power Supply Voltage ON. In addition, please turn off signals before power supply voltage OFF.

Note 2: In order to prevent from function error due to residual charge, please reenter power supply voltage after time stipulated with t7.

Note 3: Please turn on Backlight after signals fix and turn off before signals down, otherwise noise appears in the display. The noise cause no problem with display performance in case of timing sequence comply with the spec.

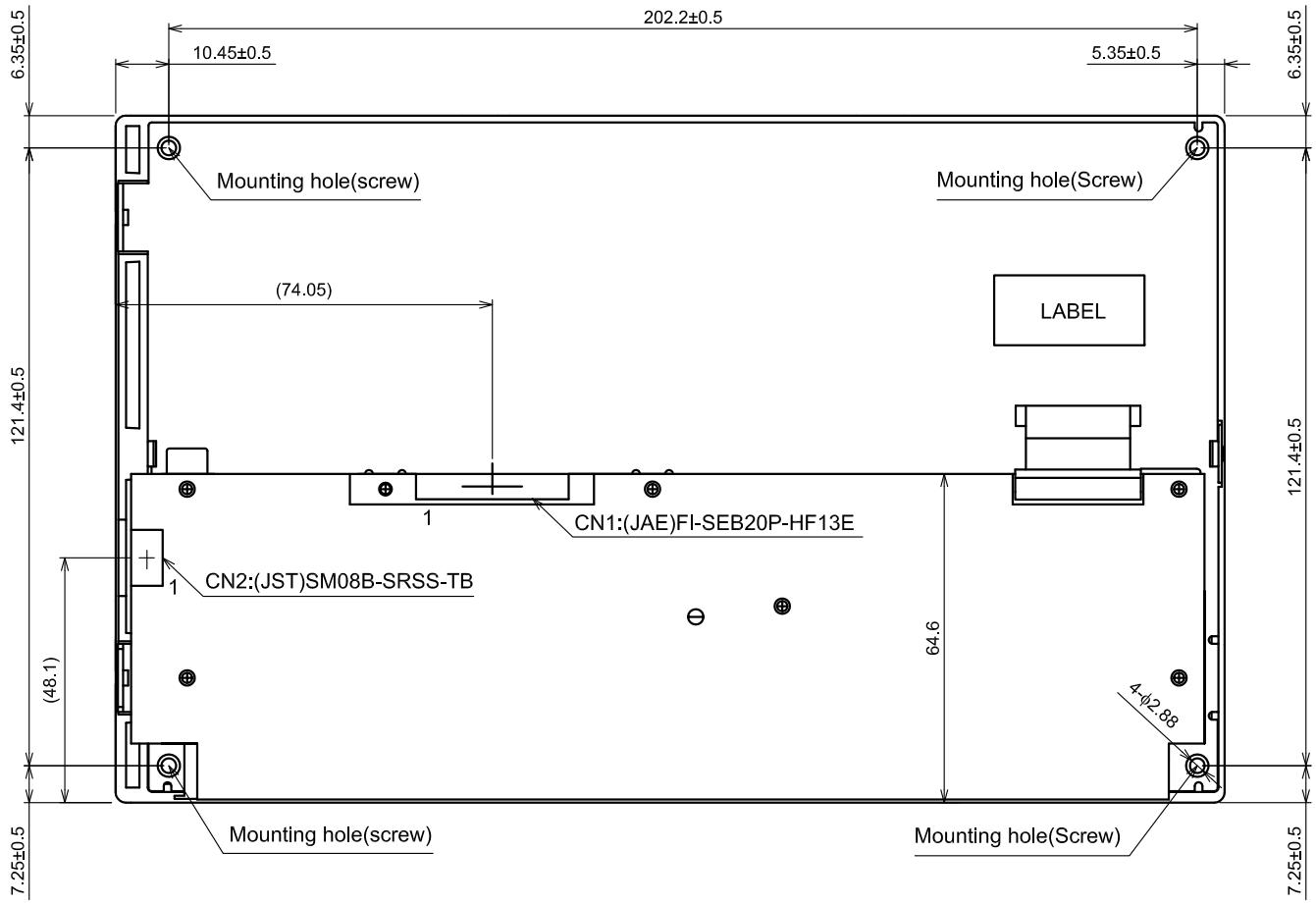
10. OUTLINE DIMENSIONS

10.1 FRONT VIEW



General Tolerance:±0.5mm
Scale : NTS
Unit : mm

10.2 RAER VIEW



Note 1: Maximum length of screw for the mounting hole is 3.3mm

General Tolerance:±0.5mm
Scale : NTS
Unit : mm

KAOHSIUNG OPTO-ELECTRONICS INC.	SHEET No.	7B64PS 2710-TX23D201VM0BAA-3	PAGE	10-2/2

11. APPEARANCE STANDARD

The appearance inspection is performed in a room around 500~1000 lx based on the conditions as below:

- The distance between inspector's eyes and display is 30 cm.
- The viewing zone is defined with angle θ shown in Fig. 11.1 The inspection should be performed within 45° when display is shut down. The inspection should be performed within 5° when display is power on.

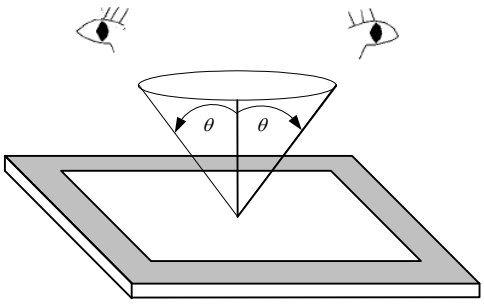


Fig. 11.1

11.1 THE DEFINITION OF LCD ZONE

LCD panel is divided into 2 areas as shown in Fig.11.2 for appearance specification in next section. A zone is the LCD active area (dot area); B zone is the area, between A zone and metal frame.

In terms of housing design, B zone is the recommended window area customers' housing should be located in.

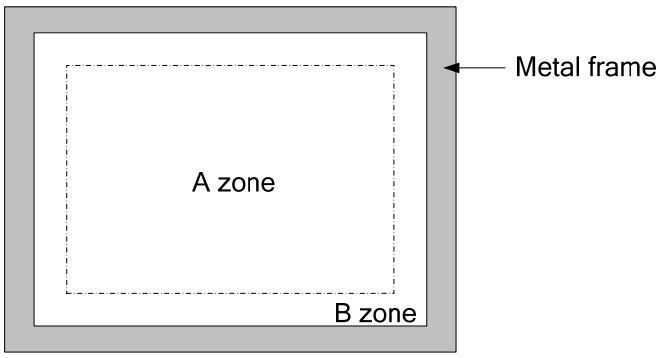


Fig. 11.2

11.2 LCD APPEARANCE SPECIFICATION

The specification as below is defined as the amount of unexpected phenomenon or material in different zones of LCD panel. The definitions of length, width and average diameter using in the table are shown in Fig. 11.3 and Fig. 11.4.

No	Item			Max. acceptable number A-ZONE	Unit	Applied Zone
1	Dot defect	Bright dot-defect	1-dot	0	pcs	A
		Dark dot-defect	1-dot	3	pcs	
			2-dots	2	Units	
			3-dots	0		
			Total	3	Units	
		Total	Density	1	Units	
			Total	3	Units	
2	Line defect			Serious one is not allowed	-	-
3	Uneven brightness					
4	Stain inclusion	W≦0.02	L : Ignore	Ignore	pcs	A,B
	Line shape W : width (mm) L : length (mm)	W≦0.03	L≦2.0	10		
			L＞2.0	0		
		W≦0.06	L≦1.0	10		
			L＞1.0	0		
		W＞0.06	-	(See dot shape)		
5	Stain inclusion	D≦0.22		Ignore	pcs	A,B
	Dot shape D : ave. dia (mm)	D≦0.33		5		
		D＞0.33		0		
6	Scratch on polarizer	W≦0.01	L : Ignore	Ignore	pcs	A,B
	Line shape W : width (mm) L : length (mm)	W≦0.02	L≦40	10		
			L＞40	0		
		W≦0.04	L≦20	10		
			L＞20	0		
7	Scratch on polarizer	D≦0.2		Ignore	pcs	A,B
	Dot shape D : ave. dia (mm)	D≦0.4		10		
		D＞0.4		0		
8	Bubbles, peeling In polarizer 〔 D:ave.dia(mm) 〕	D≦0.3		Ignore	pcs	A
		D≦0.5		10		
		D≦1.0		5		
		D＞1.0		0		
9	Wrinkles on polarizer			Serious one is not allowed	-	-

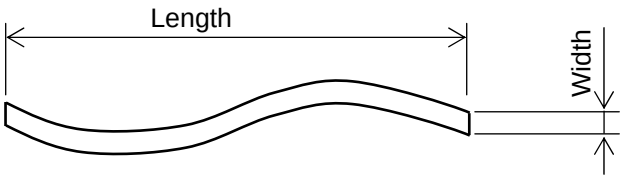


Fig 11.3

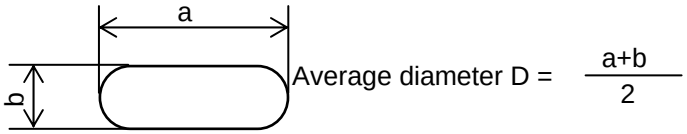


Fig 11.4

Note 1: The definitions of dot defect are as below:

- For bright dot-defect, showing black pattern, visible with 5% ND filter is defined.
- For dark dot-defect, showing white pattern, defect size over 1/2 dot area is defined.
- The definition of 1-dot-defect is the defect-dot, which is isolated and no adjacent defect-dot.
- The definition of adjacent dot is shown as Fig. 11.5.
- The Density of dot defect is defined in the area within diameter ϕ =10mm.

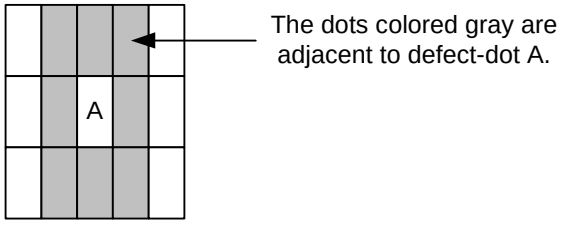


Fig. 11.5

12. PRECAUTIONS

12.1 PRECAUTIONS of ESD

1) Before handling the display, please ensure your body has been connected to ground to avoid any damages by ESD. Also, do not touch display's interface directly when assembling.

2) Please remove the protection film very slowly before turning on the display to avoid generating ESD.

12.2 PRECAUTIONS of HANDLING

1) In order to keep the appearance of display in good condition, please do not rub any surfaces of the displays by sharp tools harder than 3H, especially touch panel, metal frame and polarizer.

2) Please do not pile the displays in order to avoid any scars leaving on the display. In order to avoid any injuries, please pay more attention for the edges of glasses and metal frame, and wear finger cots to protect yourself and the display before working on it.

3) Touching the display area or the terminal pins with bare hand is prohibited. This is because it will stain the display area and cause poor insulation between terminal pins, and might affect display's electrical characteristics furthermore.

4) Do not use any harmful chemicals such as acetone, toluene, and isopropyl alcohol to clean display's surfaces.

5) Please use soft cloth or absorbent cotton with ethanol to clean the display by gently wiping. Moreover, when wiping the display, please wipe it by horizontal or vertical direction instead of circling to prevent leaving scars on the display's surface, especially polarizer.

6) Please wipe any unknown liquids immediately such as saliva, water or dew on the display to avoid color fading or any permanently damages.

7) Maximum pressure to the surface of the display must be less than $1{,}96 \times 10^4$ Pa. If the area of adding pressure is less than $1\,cm^2$, the maximum pressure must be less than 1.96N.

12.3 PRECAUTIONS OF OPERATING

1) Please input signals and voltages to the displays according to the values defined in the section of electrical characteristics to obtain the best performance. Any voltages over than absolute maximum rating will cause permanent damages to this display. Also, any timing of the signals out of this specification would cause unexpected performance.

2) When the display is operating at significant low temperature, the response time will be slower than it at $25\,C^\circ$. In high temperature, the color will be slightly dark and blue compared to original pattern. However, these are temperature-related phenomenon of LCD and it will not cause permanent damages to the display when used within the operating temperature.

3) The use of screen saver or sleep mode is recommended when static images are likely for long periods of time. This is to avoid the possibility of image sticking.

4) Spike noise can cause malfunction of the circuit. The recommended limitation of spike noise is no bigger than ± 100 mV.

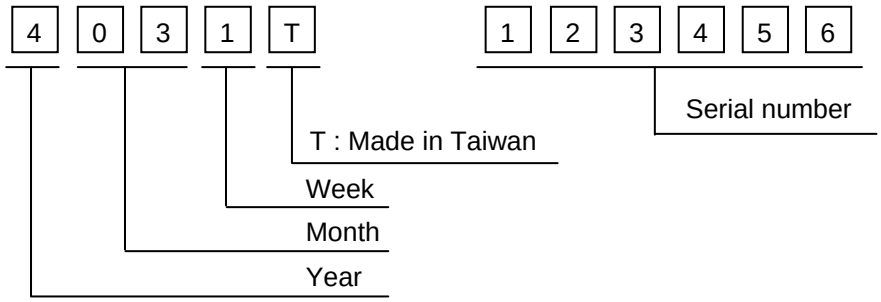
12.4 PRECAUTIONS of STORAGE

If the displays are going to be stored for years, please be aware the following notices.

1) Please store the displays in a dark room to avoid any damages from sunlight and other sources of UV light.
2) The recommended long term storage temperature is between 10℃~35℃ and 55%~75% humidity to avoid causing bubbles between polarizer and LCD glasses, and polarizer peeling from LCD glasses.
3) It would be better to keep the displays in the container, which is shipped from KOE, and do not unpack it.
4) Please do not stick any labels on the display surface for a long time, especially on the polarizer.

13. DESIGNATION of LOT MARK

1) The lot mark is showing in Fig.13.1. First 4 digits are used to represent production lot, T represented made in Taiwan, and the last 6 digits are the serial number.



2) The tables as below are showing what the first 4 digits of lot mark are shorted for.

Year	Mark
2014	4
2015	5
2016	6
2017	7
2018	8

Month	Mark	Month	Mark
1	01	7	07
2	02	8	08
3	03	9	09
4	04	10	10
5	05	11	11
6	06	12	12

Week (Days)	Mark
1~7	1
8~14	2
15~21	3
22~28	4
29~31	5

3) Except letters I and O, revision number will be shown on lot mark and following letters A to Z.

Rev.No	Item	Remarks
A	-	-
B	LED Change	PCN0927

4) The location of the lot mark is on the back of the display shown in Fig. 13.1.

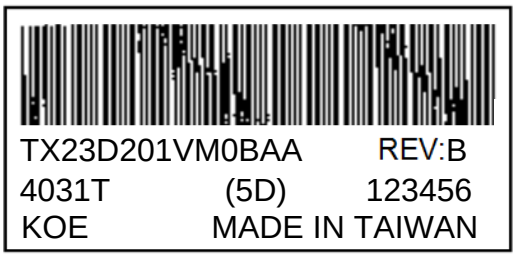


Fig 13.1