



ONation Corporation

CUSTOMER' S APPROVAL SPECIFICATIONS

MODEL: OT104ZXDWL V-02
(Complied with RoHS)

CUSTOMER: _____

Version: P0.2

C O N T E N T S

ISSUE: MAR.25.2013

Spec Condition: Preliminary

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CUSTOMER	ONATION		
APPROVAL	APPROVAL	CHECKER	PREPARE
	<i>ch lee</i>	<i>ch lee</i>	<i>kevin</i>

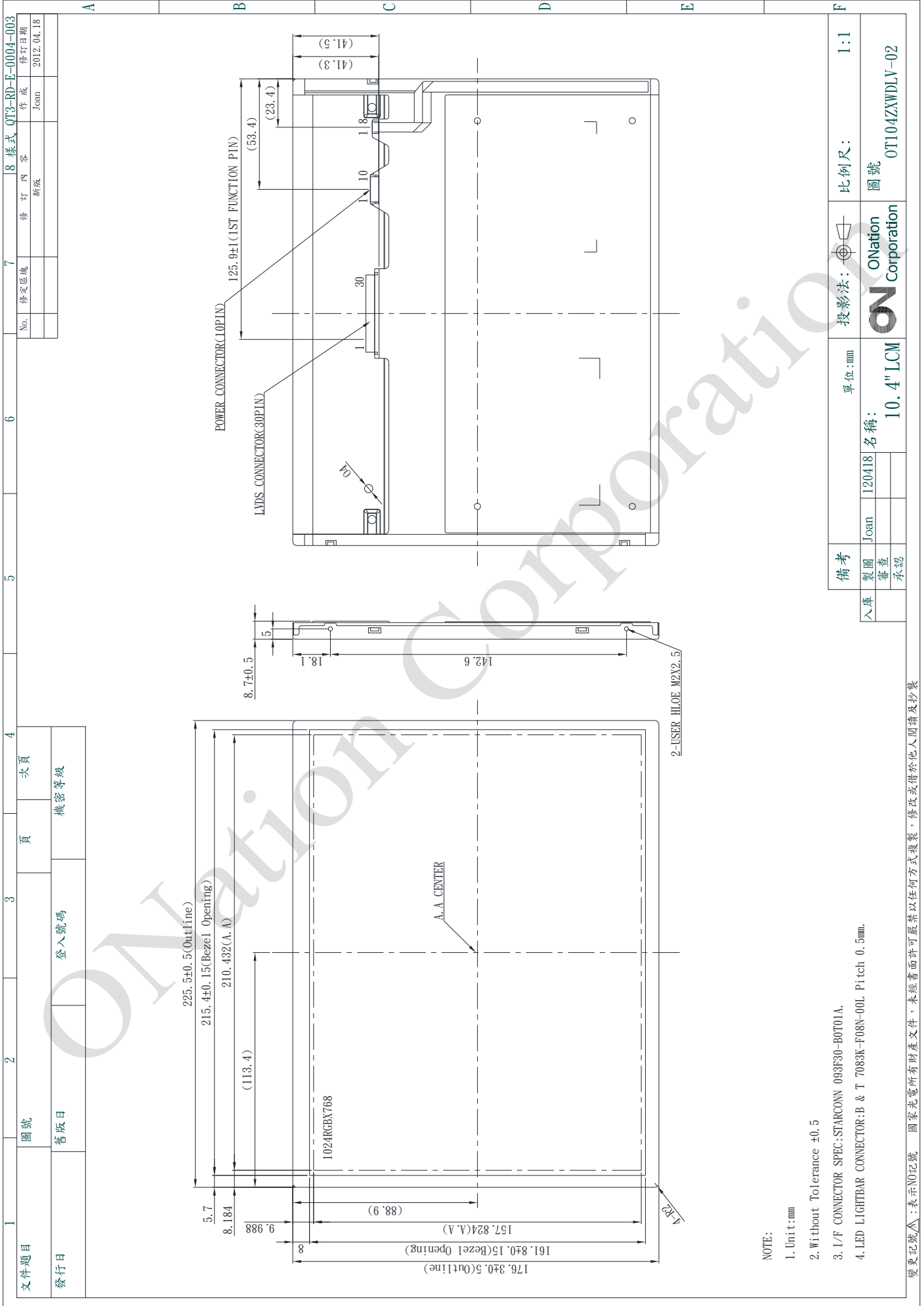
2.RECORD OF REVISION

Rev	DATE	PAGE	SUMMARY																																																																																																																																																																																																																				
0.1	2012.04.18	ALL	Preliminary specification was first issued.																																																																																																																																																																																																																				
0.2	2013.03.25	6	<p>Modify: 8.2 BACKLIGHT UNITS</p> <table border="1"> <thead> <tr> <th>ITEM[⊖]</th> <th>SYMBOL[⊖]</th> <th>MIN.[⊖]</th> <th>TYP.[⊖]</th> <th>MAX.[⊖]</th> <th>UNIT[⊖]</th> <th>REMARK[⊖]</th> </tr> </thead> <tbody> <tr> <td>LED Driving Voltage[⊖]</td> <td>V_{LED}[⊖]</td> <td>10.8[⊖]</td> <td>12.0[⊖]</td> <td>13.2[⊖]</td> <td>V[⊖]</td> <td>⊖</td> </tr> <tr> <td>LED Driving Current[⊖]</td> <td>I_{LED}[⊖]</td> <td>-[⊖]</td> <td>0.7[⊖]</td> <td>-[⊖]</td> <td>A[⊖]</td> <td>100% PWM duty[⊖]</td> </tr> <tr> <td>LED Driving Power[⊖]</td> <td>P_{LED}[⊖]</td> <td>-[⊖]</td> <td>8[⊖]</td> <td>-[⊖]</td> <td>W[⊖]</td> <td>100% PWM duty[⊖]</td> </tr> <tr> <td rowspan="2">LED Driving Enable[⊖]</td> <td>EN-On[⊖]</td> <td>2.0[⊖]</td> <td>-[⊖]</td> <td>3.3[⊖]</td> <td>V[⊖]</td> <td>⊖</td> </tr> <tr> <td>EN-Off[⊖]</td> <td>0[⊖]</td> <td>-[⊖]</td> <td>0.8[⊖]</td> <td>V[⊖]</td> <td>⊖</td> </tr> <tr> <td rowspan="2">V_{PWM} Input Voltage[⊖]</td> <td>V_{PWM}-H[⊖]</td> <td>2.0[⊖]</td> <td>-[⊖]</td> <td>3.3[⊖]</td> <td>V[⊖]</td> <td>⊖</td> </tr> <tr> <td>V_{PWM}-L[⊖]</td> <td>0[⊖]</td> <td>-[⊖]</td> <td>0.15[⊖]</td> <td>V[⊖]</td> <td>⊖</td> </tr> <tr> <td>V_{PWM} Frequency[⊖]</td> <td>F_{PWM}[⊖]</td> <td>190[⊖]</td> <td>200[⊖]</td> <td>210[⊖]</td> <td>Hz[⊖]</td> <td>⊖</td> </tr> <tr> <td>V_{PWM} Duty Cycle[⊖]</td> <td>D_{PWM}[⊖]</td> <td>20[⊖]</td> <td>-[⊖]</td> <td>100[⊖]</td> <td>%[⊖]</td> <td>⊖</td> </tr> <tr> <td>LED Life Time[⊖]</td> <td>-[⊖]</td> <td>50000[⊖]</td> <td>-[⊖]</td> <td>-[⊖]</td> <td>Hr[⊖]</td> <td>Note 1,2[⊖]</td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1"> <thead> <tr> <th>ITEM[⊖]</th> <th>SYMBOL[⊖]</th> <th>MIN.[⊖]</th> <th>TYP.[⊖]</th> <th>MAX.[⊖]</th> <th>UNIT[⊖]</th> <th>REMARK[⊖]</th> </tr> </thead> <tbody> <tr> <td>LED Driving Voltage[⊖]</td> <td>V_{LED}[⊖]</td> <td>10.8[⊖]</td> <td>12.0[⊖]</td> <td>13.2[⊖]</td> <td>V[⊖]</td> <td>⊖</td> </tr> <tr> <td>LED Driving Current[⊖]</td> <td>I_{LED}[⊖]</td> <td>-[⊖]</td> <td>0.7[⊖]</td> <td>-[⊖]</td> <td>A[⊖]</td> <td>100% PWM duty[⊖]</td> </tr> <tr> <td>LED Driving Power[⊖]</td> <td>P_{LED}[⊖]</td> <td>-[⊖]</td> <td>8[⊖]</td> <td>-[⊖]</td> <td>W[⊖]</td> <td>100% PWM duty[⊖]</td> </tr> <tr> <td rowspan="2">LED Driving Enable[⊖]</td> <td>EN-On[⊖]</td> <td>2.0[⊖]</td> <td>-[⊖]</td> <td>5[⊖]</td> <td>V[⊖]</td> <td>⊖</td> </tr> <tr> <td>EN-Off[⊖]</td> <td>0[⊖]</td> <td>-[⊖]</td> <td>0.8[⊖]</td> <td>V[⊖]</td> <td>⊖</td> </tr> <tr> <td rowspan="2">V_{PWM} Input Voltage[⊖]</td> <td>V_{PWM}-H[⊖]</td> <td>2.0[⊖]</td> <td>-[⊖]</td> <td>5[⊖]</td> <td>V[⊖]</td> <td>⊖</td> </tr> <tr> <td>V_{PWM}-L[⊖]</td> <td>0[⊖]</td> <td>-[⊖]</td> <td>0.15[⊖]</td> <td>V[⊖]</td> <td>⊖</td> </tr> <tr> <td>V_{PWM} Frequency[⊖]</td> <td>F_{PWM}[⊖]</td> <td>190[⊖]</td> <td>200[⊖]</td> <td>20K[⊖]</td> <td>Hz[⊖]</td> <td>Note 3[⊖]</td> </tr> <tr> <td>V_{PWM} Duty Cycle[⊖]</td> <td>D_{PWM}[⊖]</td> <td>2[⊖]</td> <td>-[⊖]</td> <td>100[⊖]</td> <td>%[⊖]</td> <td>Note 3[⊖]</td> </tr> <tr> <td>LED Life Time[⊖]</td> <td>-[⊖]</td> <td>50000[⊖]</td> <td>-[⊖]</td> <td>-[⊖]</td> <td>Hr[⊖]</td> <td>Note 1,2[⊖]</td> </tr> </tbody> </table>	ITEM [⊖]	SYMBOL [⊖]	MIN. [⊖]	TYP. [⊖]	MAX. [⊖]	UNIT [⊖]	REMARK [⊖]	LED Driving Voltage [⊖]	V _{LED} [⊖]	10.8 [⊖]	12.0 [⊖]	13.2 [⊖]	V [⊖]	⊖	LED Driving Current [⊖]	I _{LED} [⊖]	- [⊖]	0.7 [⊖]	- [⊖]	A [⊖]	100% PWM duty [⊖]	LED Driving Power [⊖]	P _{LED} [⊖]	- [⊖]	8 [⊖]	- [⊖]	W [⊖]	100% PWM duty [⊖]	LED Driving Enable [⊖]	EN-On [⊖]	2.0 [⊖]	- [⊖]	3.3 [⊖]	V [⊖]	⊖	EN-Off [⊖]	0 [⊖]	- [⊖]	0.8 [⊖]	V [⊖]	⊖	V _{PWM} Input Voltage [⊖]	V _{PWM} -H [⊖]	2.0 [⊖]	- [⊖]	3.3 [⊖]	V [⊖]	⊖	V _{PWM} -L [⊖]	0 [⊖]	- [⊖]	0.15 [⊖]	V [⊖]	⊖	V _{PWM} Frequency [⊖]	F _{PWM} [⊖]	190 [⊖]	200 [⊖]	210 [⊖]	Hz [⊖]	⊖	V _{PWM} Duty Cycle [⊖]	D _{PWM} [⊖]	20 [⊖]	- [⊖]	100 [⊖]	% [⊖]	⊖	LED Life Time [⊖]	- [⊖]	50000 [⊖]	- [⊖]	- [⊖]	Hr [⊖]	Note 1,2 [⊖]	ITEM [⊖]	SYMBOL [⊖]	MIN. [⊖]	TYP. [⊖]	MAX. [⊖]	UNIT [⊖]	REMARK [⊖]	LED Driving Voltage [⊖]	V _{LED} [⊖]	10.8 [⊖]	12.0 [⊖]	13.2 [⊖]	V [⊖]	⊖	LED Driving Current [⊖]	I _{LED} [⊖]	- [⊖]	0.7 [⊖]	- [⊖]	A [⊖]	100% PWM duty [⊖]	LED Driving Power [⊖]	P _{LED} [⊖]	- [⊖]	8 [⊖]	- [⊖]	W [⊖]	100% PWM duty [⊖]	LED Driving Enable [⊖]	EN-On [⊖]	2.0 [⊖]	- [⊖]	5 [⊖]	V [⊖]	⊖	EN-Off [⊖]	0 [⊖]	- [⊖]	0.8 [⊖]	V [⊖]	⊖	V _{PWM} Input Voltage [⊖]	V _{PWM} -H [⊖]	2.0 [⊖]	- [⊖]	5 [⊖]	V [⊖]	⊖	V _{PWM} -L [⊖]	0 [⊖]	- [⊖]	0.15 [⊖]	V [⊖]	⊖	V _{PWM} Frequency [⊖]	F _{PWM} [⊖]	190 [⊖]	200 [⊖]	20K [⊖]	Hz [⊖]	Note 3 [⊖]	V _{PWM} Duty Cycle [⊖]	D _{PWM} [⊖]	2 [⊖]	- [⊖]	100 [⊖]	% [⊖]	Note 3 [⊖]	LED Life Time [⊖]	- [⊖]	50000 [⊖]	- [⊖]	- [⊖]	Hr [⊖]	Note 1,2 [⊖]																																																														
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3.MECHANICAL SPECIFICATIONS

(1)	Number Of Dots (Dots)	1024(R.G.B) X 768
(2)	Module Size(mm)	225.5(W) X 176.3(H) X 8.7(D)
(3)	Active Area(mm)	210.4(W) X 157.8(H)
(4)	Pixel Pitch(mm)	0.2055(W) X 0.2055(H)
(5)	LCD Model	TFT , Transmissive, Normally/Black
(6)	Polarizer Model	Anti-glare
(7)	LED Backlight Color	White
(9)	Viewing Direction	Wide View
(11)	Color Configuration	R.G.B Vertical Stripe
(13)	Total power consumption(W)	(10)
(14)	Module Weight(g)	(430)

4. OUTLINE DIMENSIONS



備考		單位:mm		投影法:		比例尺:	1:1
製圖	Joan	名稱:	10.4" LCM	ON Corporation	圖號	OT104ZXWDLV-02	
入庫		120418					
審查							
承認							

變更記號△:表示NO記號 國家光電所有財產文件,未經書面許可嚴禁以任何方式複製,修改或借於他人閱讀及抄襲

5. INTERFACE PIN CONNECTION

5.1 LCM PANEL DRIVING SECTION

CN1 Connector: JAE, FI-XB30SRL-HL11 or compatible.

PIN No	SYMBOL	FUNCTION	REMARK
1	VCC	Power supply for LCD circuit	
2	VCC	Power supply for LCD circuit	
3	VCC	Power supply for LCD circuit	
4	GND	Ground	
5	GND	Ground	
6	GND	Ground	
7	RPMI	Reverse Panel Function(Display Rotation)	
8	NC	No connection	
9	NC	No connection	
10	NC	No connection	
11	SEL68	Selection for either 6 bit or 8bit LVDS input: SEL68='L' or 'NC', accepts 8 bit LVDS data input; SEL68='H', accepts 6 bit LVDS data input.	
12	GND	Ground	
13	NC	No connection	
14	GND	Ground	
15	RxIN0-	Negative LVDS differential input(R0-R5, G0)	
16	RxIN0+	Positive LVDS differential input(R0-R5, G0)	
17	GND	Ground	
18	RxIN1-	Negative LVDS differential input(G1-G5, B0-B1)	
19	RxIN1+	Positive LVDS differential input(G1-G5, B0-B1)	
20	GND	Ground	
21	RxIN2-	Negative LVDS differential input(B2-B5, DE, VS, HS)	
22	RxIN2+	Positive LVDS differential input(B2-B5, DE, VS, HS)	
23	GND	Ground	
24	RxCLK-	Negative LVDS differential clock input	
25	RxCLK+	Positive LVDS differential clock input	
26	GND	Ground	
27	RxIN3-	Negative LVDS differential input (R6,R7,G6,G7,B6,B7, RSV)	
28	RxIN3+	Positive LVDS differential input (R6,R7,G6,G7,B6,B7, RSV)	
29	GND	Ground	
30	NC	No connection	

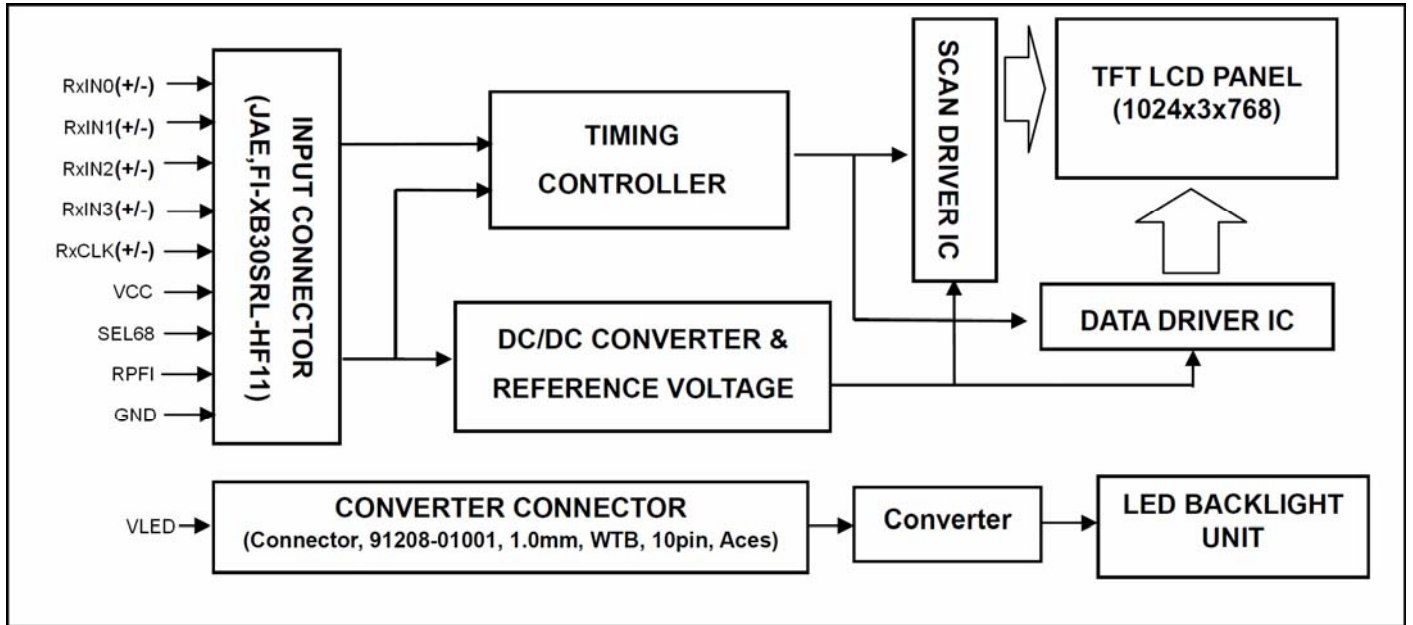
5.2 BACKLIGHT DRIVING SECTION

CN2 Connector: JAE, FI-XB30SRL-HF11 or STARCONN, 093F30-B0B01A.

Mating Connector: 91209-01011(ACES) or equivalent.

PIN No	SYMBOL	FUNCTION	REMARK
1	V _{LED}	Power supply for Backlight drive circuit	
2	V _{LED}	Power supply for Backlight drive circuit	
3	V _{LED}	Power supply for Backlight drive circuit	
4	V _{LED}	Power supply for Backlight drive circuit	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	EN	LED On or Off('H': On, 'L' or 'NC': Off)	
10	PWM	Brightness control for LED Backlight	

6. BLOCK DIAGRAM



7. ABSOLUTE MAXIMUM RATINGS

7.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	COMMENT
Power Supply Voltage	VCC	-0.3	+7.0	V	
LED Backlight Drive Voltage	V_{LED}	-0.3	18	V	
LED Enable Voltage	V_{EN}	-	5.5	V	
LED Dimming Input Voltage	V_{PWM}	-	3.3	V	

7.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature(°C)	-30	70	-30	80	Note 1,2
Humidity(% RH)	Note3		Note3		

Note 1 : The response time will become lower when operated at low temperature.

Note 2 : Background color changes slightly depending on ambient temperature.

Note 3 : Operation $T_a=40^{\circ}\text{C}$ & $H=90\% \leq 240\text{Hrs}$.

8. ELECTRICAL CHARACTERISTICS

8.1 ELECTRICAL CHARACTERISTICS OF LCD

Ta=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Power Voltage for LCD	VCC	3.0	3.3	3.6	V	Note 1
	ICC	380	420	460	mA	
Power for LCD	P _L	-	1.9	-	W	
Rush Current	I _{RUSH}	-	-	4.0	A	
LVDS differential input voltage	VID	100	-	600	mV	
LVDS common input voltage	VICM	0.7	-	1.6	V	

Note 1: test pattern: all black, VCC=3.3V, at 60Hz.

8.2 BACKLIGHT UNITS

Ta=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
LED Driving Voltage	V _{LED}	10.8	12.0	13.2	V	
LED Driving Current	I _{LED}	-	0.7	-	A	100% PWM duty
LED Driving Power	P _{LED}	-	8	-	W	100% PWM duty
LED Driving Enable	EN-On	2.0	-	5	V	
	EN-Off	0	-	0.8	V	
V _{PWM} Input Voltage	V _{PWM-H}	2.0	-	5	V	
	V _{PWM-L}	0	-	0.15	V	
V _{PWM} Frequency	F _{PWM}	190	200	20K	Hz	Note 3
V _{PWM} Duty Cycle	D _{PWM}	2	-	100	%	Note 3
LED Life Time	-	50000	-	-	Hr	Note 1,2

Note 1: If the module is driven at high ambient temperature & humidity condition. The operating life will be reduced.

Note 2: The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ± 2 °C and I_{LED} = 80mADC(LED forward current) until the brightness becomes ≤ 50% of its original value. And minimum LED lifetime is estimated and provided by Nichia in Japan. Operating LED under high temperature environment will reduce life time and lead to color shift.

Note 3: At 190~1KHz PWM control frequency, duty ratio range is restricted from 2% to 100%. 1K~20KHz PWM control frequency, minimum duty on-time ≥ 20us.

9. OPTICAL CHARACTERISTICS

Ta=25°C

ITEM	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT	REMARK
Contrast Ratio	CR		700	1000	-	-	Note (1)
Response Time	TR		-	14	19	ms	Note (2)
	TF		-	11	16	ms	
Color Chromaticity	White	Wx	0.263	0.313	0.363	-	Note (4)
		Wy	0.279	0.329	0.379	-	
	Red	Rx	0.567	0.617	0.667	-	
		Ry	0.307	0.357	0.407	-	
	Green	Gx	0.286	0.336	0.386	-	
		Gy	0.517	0.567	0.617	-	
	Blue	Bx	0.097	0.147	0.197	-	
		By	0.037	0.087	0.137	-	
Brightness	L		400	500	-	cd/m ²	D _{PWM} =100% (center point)
Uniformity	YU		70	-	-	%	Note(5)
Viewing Angle	Θ _{X+}	Viewing Angle Θ _X =Θ _Y =0° CR ≥ 10	80	88	-	Deg.	Note (3)
	Θ _{X-}		80	88	-		
	Θ _{Y+}		80	88	-		
	Θ _{Y-}		80	88	-		

*Note (1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

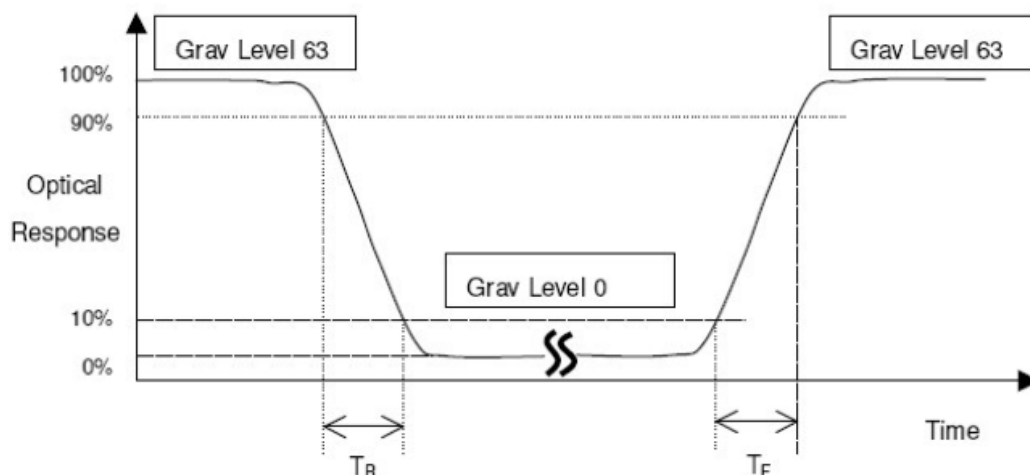
L₆₃: Luminance of gray level 63

L₀: Luminance of gray level 0

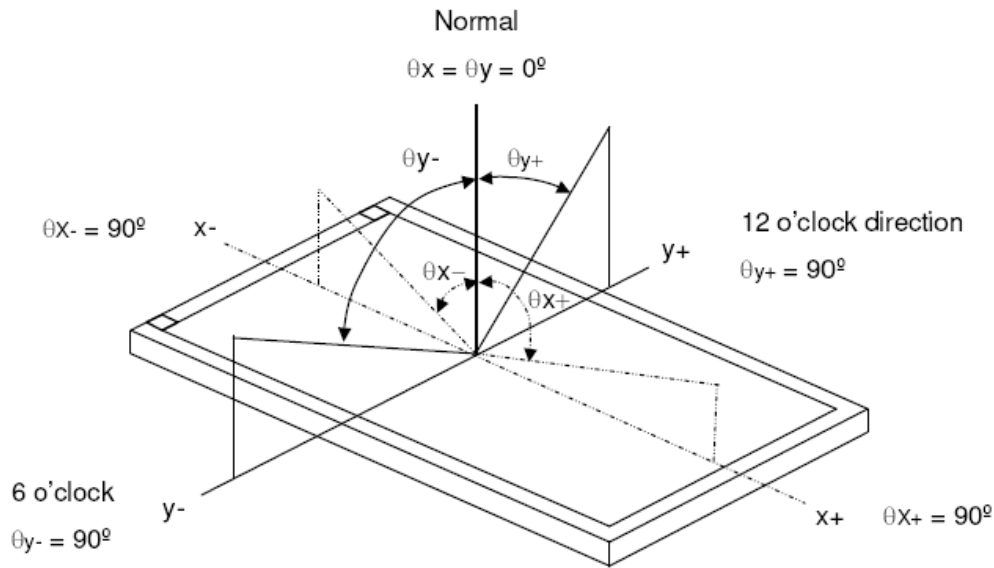
$$CR = CR (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

*Note (2) Definition of Response Time (T_R, T_F):

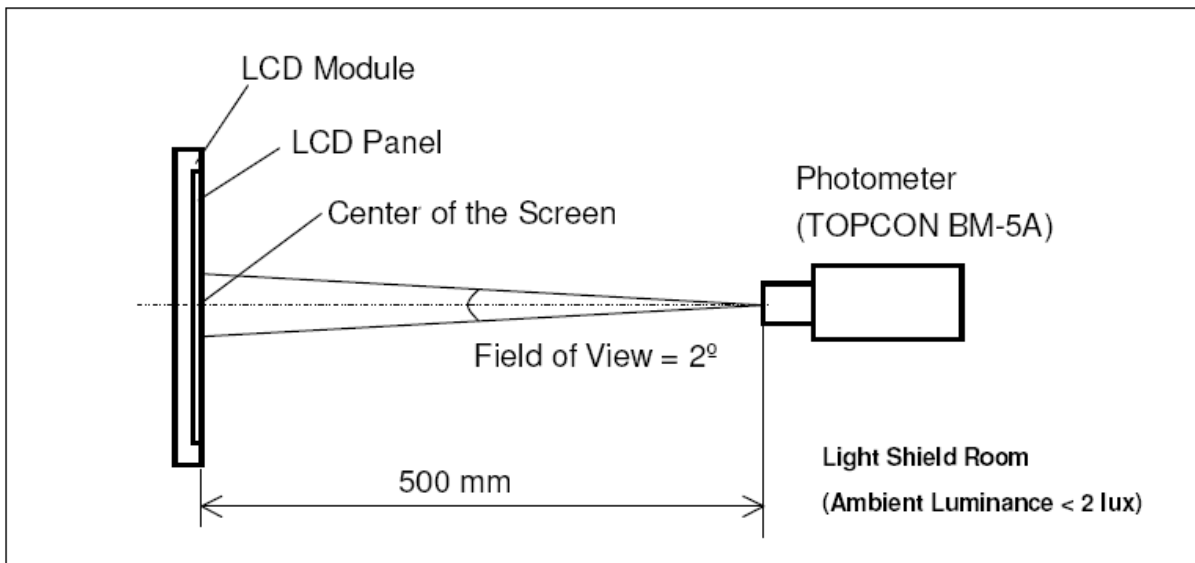


*Note(3) Definition of Viewing Angle

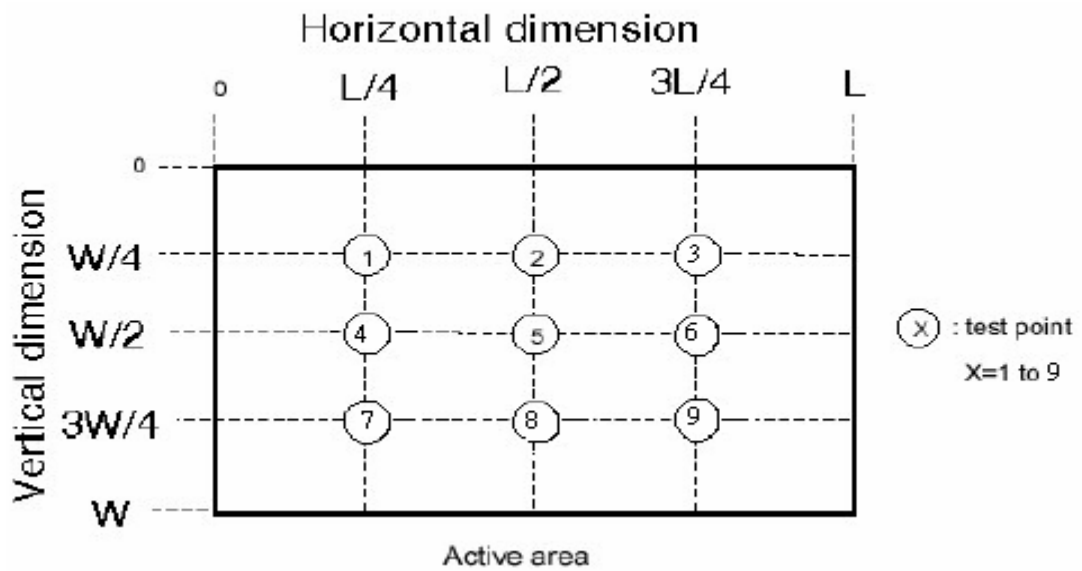


*Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



*Note (5)

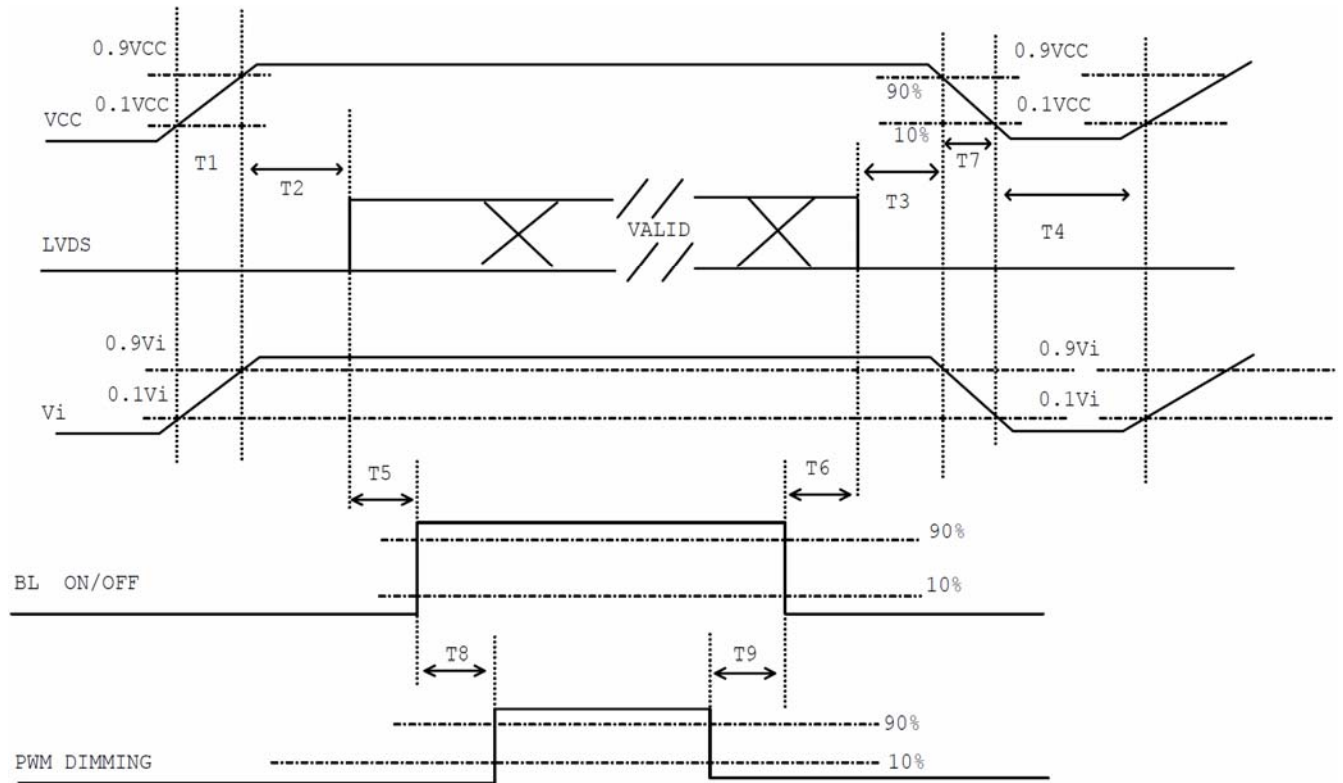


$$\left(1 - \frac{\text{MAX Luminance} - \text{Average Luminance}}{\text{Average Luminance}} \right) \times 100\% > 70\%$$

10. TIMING SPECIFICATIONS

10.1 POWER SIGNAL SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



Power ON/OFF sequence timing

PARAMETER	MIN.	TYP.	MAX.	UNIT
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	200	-	-	ms
T6	20	-	-	ms
T7	5	-	300	ms
T8	10	-	-	ms
T9	10	-	-	ms

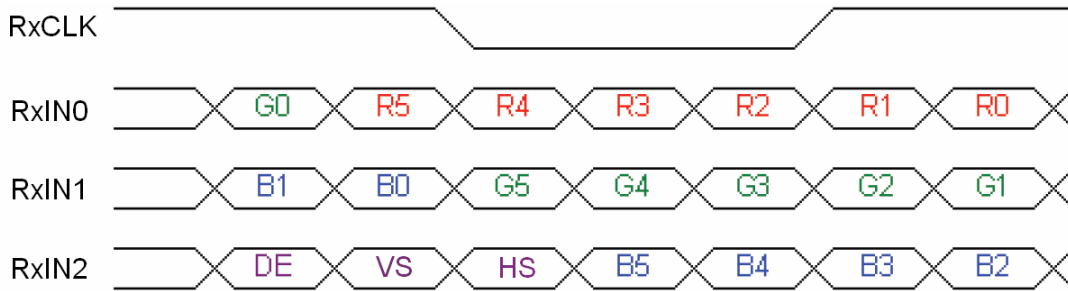
Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.

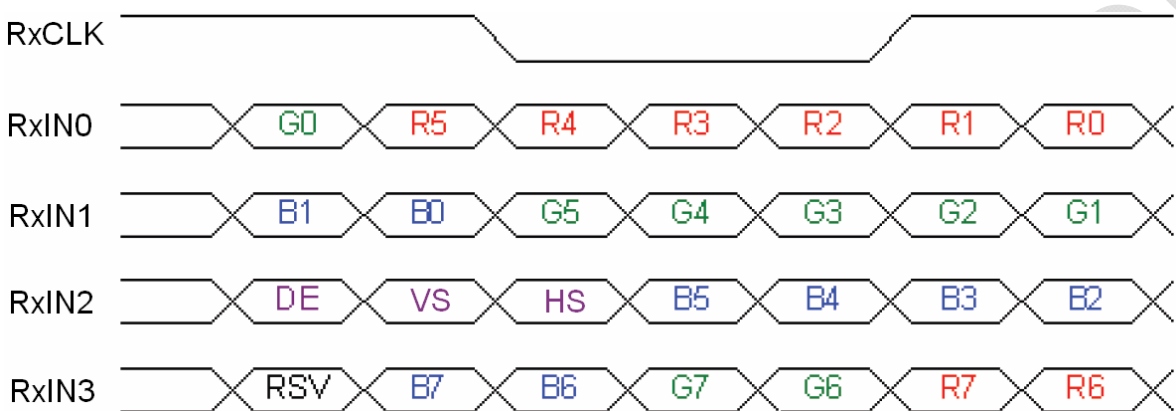
Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

10.2 THE INPUT DATA FORMAT

10.2.1 SEL68='H' for 6 bits LVDS input



10.2.2 SEL68='L' or 'NC' for 8 bits LVDS input



SIGNAL NAME	DESCRIPTION	REMARK
R7	Red Data 7	Red-pixel Data For 8Bits LVDS input MSB : R7 ; LSB : R0
R6	Red Data 6	
R5	Red Data 5	
R4	Red Data 4	
R3	Red Data 3	
R2	Red Data 2	
R1	Red Data 1	
R0	Red Data 0	
G7	Green Data 7	Green-pixel Data For 8Bits LVDS input MSB : G7 ; LSB : G0
G6	Green Data 6	
G5	Green Data 5	
G4	Green Data 4	
G3	Green Data 3	
G2	Green Data 2	
G1	Green Data 1	
G0	Green Data 0	
B7	Blue Data 7	Blue-pixel Data For 8Bits LVDS input MSB : B7 ; LSB : B0
B6	Blue Data 6	
B5	Blue Data 5	
B4	Blue Data 4	
B3	Blue Data 3	
B2	Blue Data 2	
B1	Blue Data 1	
B0	Blue Data 0	
RxCLK	LVDS Data Clock	
DE	Data Enable Signal	When the signal is high, the pixel data shall be valid to be displayed.
RSV	Reserved Signal	'H' or 'L' is acceptable
VS	Vertical Sync	
HS	Horizontal Sync	

10.3 AC TIMING CHARACTERISTICS

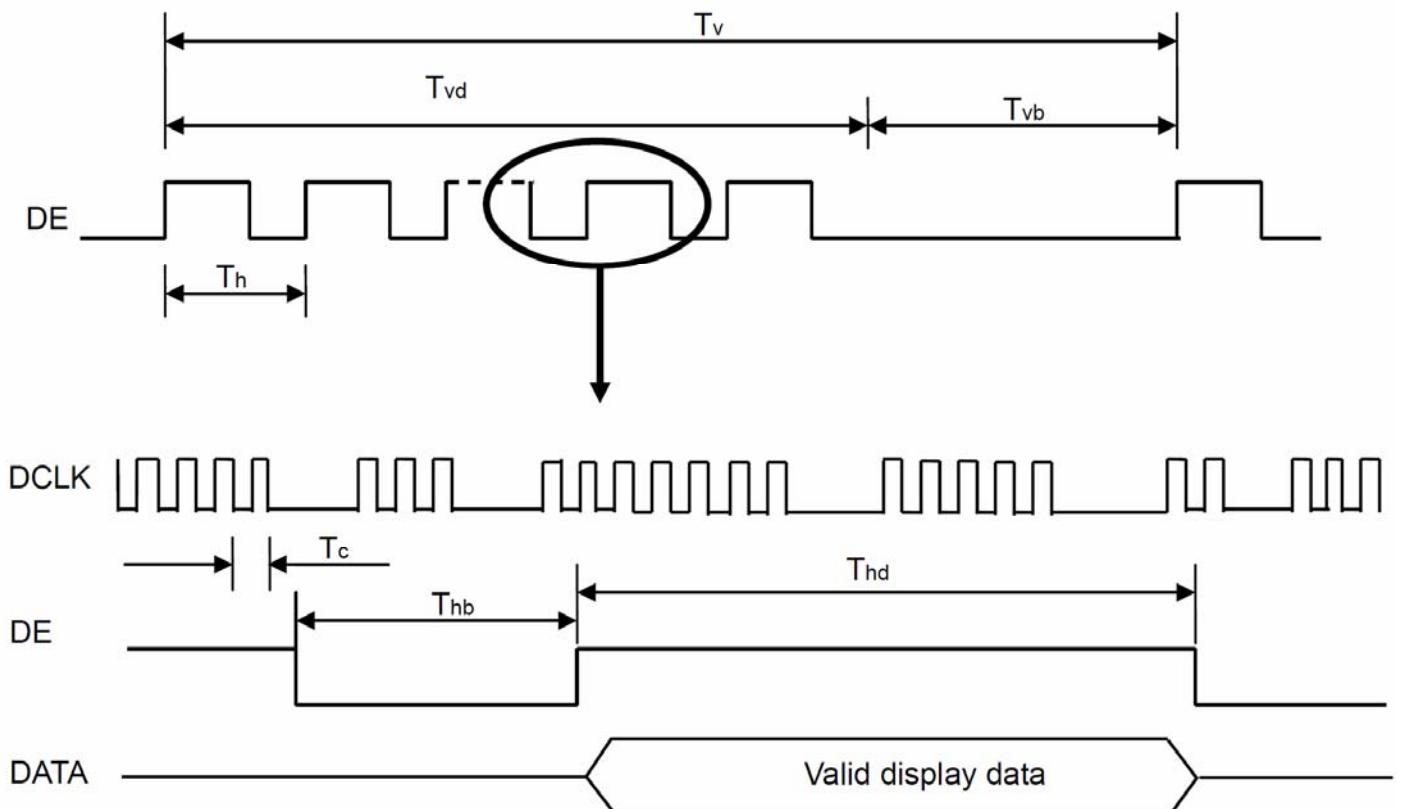
The input signal timing specifications are shown as the following table and timing diagram.

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Clock frequency(DOTCLK)	F_C	55	65	75	MHz
Horizontal Section Period	T_H	1104	1344	1800	T_C
Horizontal Section Active	T_{HD}	1024			T_C
Horizontal Section Blanking	T_{HB}	76	320	776	T_C
Vertical Section Period	T_V	770	806	950	T_H
Vertical Section Active	T_{VD}	768			T_H
Vertical Section Blanking	T_{VB}	2	38	182	T_H

Note (1): Recommended frame rate is 60Hz.

Note (2): Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.

Timing Diagram



11. RELIABILITY TEST

Environmental Test				
NO.	ITEM	CONDITIONS	TIME PERIOD	REMARK
1	High Temperature Storage	80°C	240HRS	
2	Low Temperature Storage	-30°C	240HRS	
3	High Temperature Humidity Storage	60°C 90%RH	240HRS	NOTE(2)
4	High Temperature Operation	70°C	240HRS	NOTE(2)
5	Low Temperature Operation	-30°C	240HRS	NOTE(2)
6	Temperature Cycle	-20°C ← → 70°C (30min) (30min)	100CYCLE	NOTE(2)

NOTE (1): a. THE MODULE SHOULD WORK PROPERLY.

b. BEFORE AND AFTER FUNCTION TEST, THE DIFFERENCE OF CONSUMPTIVE CURRENT SHOULD BE WITHIN 10%

NOTE (2) : a. THE MODULE SHOULD WORK PROPERLY.

b. THE MODLUE WON'T BE DEFORMATIVE, COLOR CHANGEABLE OR BROKEN.

c. THE MODULES CAN'T BE APART.

NOTE (3) : ENVIRONMENTAL TEST ITEM 1.~6. MEASURE AFTER 12 HOURS LEFT AT NOMAL TEMPERATURE AND HUMIDITY.