Japan Display Inc.

FOR MESSRS : _____ DATE : Mar. 8 th,2023

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

TX20D207VM0AVA

Contents

ACCEPTED BY: _____ PROPOSED BY: Alex Lee

2. RECORD OF REVISION

DATE	SHEET No.	SUMMARY

3. GENERAL DATA

3.1 DISPLAY FEATURES

This module is a 8.0” WXGA of 16:9 format LTPS 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	TX20D207VM0AVA
Module Dimensions	200.0 (W) mm × 124.0 (H) mm × 14.25 (D) mm (Typ.)
LCD Active Area	173.952 (W)mm x 104.3712(H)mm
Pixel Pitch	0.1359 (W) mm × 0.1359 (H) mm
Resolution	1280× 3 (RGB) (W) × 768 (H) dots
Color Pixel Arrangement	RGB Vertical Stripe
LCD Type	Transmissive Type, Normally Black
Display Type	Active Matrix
Number of Colors	16.7M Colors (8-bit RGB)
Backlight	Light Emitting Diode (LED)
Weight	700g(typ)
Interface	LVDS；20pins
Power Supply Voltage	3.3V for LCD；12V for Backlight
Viewing Direction	Super Wide Version
Touch Panel	Projected Capacitive type; Cover Glass on ITO Film

4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Remarks
Supply Voltage	V_{DD}	-0.3	4.6	V	-
Input Voltage of Logic	V_I	-0.3	3.6	V	Note 1
Operating Temperature	Top	-30	80	°C	Note 2
Storage Temperature	Tst	-30	80	°C	Note 2
Backlight Input Voltage	V_{LED}	-	15	V	-

Note 1: The rating is defined for the signal voltage of the interface such as CLK, BLEN, SD, BL_PWM and pixel data pairs.

Note 2: The maximum rating is defined as above based on the panel surface 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.

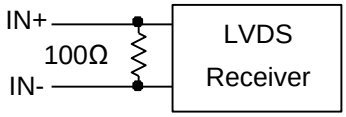
5. ELECTRICAL CHARACTERISTICS

5.1 LCD CHARACTERISTICS

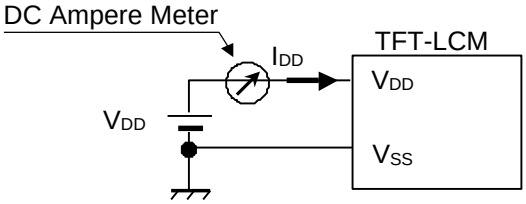
$T_a = 25\ ^{\circ}C,\ V_{SS} = 0V$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	-	3.0	3.3	3.6	V	-
Differential Input Voltage for LVDS Receiver Threshold	V_I	V_{IH}	-	-	+100	mV	Note 1
		V_{IL}	-100	-	-		
Power Supply Current	I_{DD}	V_{DD}-V_{SS} =3.3V	80	100	143	mA	Note 2,3
Frame Frequency	f_{Frame}	-	58.2	60	61.8	Hz	Note 4
CLK Frequency	f_{CLK}	-	65	67	69	MHz	

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



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



Note 3: 1.5A fuse is applied in the module for I_{DD}. For display activation and protection purpose, power supply is recommended larger than 3.75A to start the display and break fuse once any short circuit occurred.

Note 4: For LVDS transmitter input.

5.2 BACKLIGHT CHARACTERISTICS

$T_a = 25\ ^\circ C$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
LED Input Voltage	V_{LED}	Backlight Unit	10.8	12	13.2	V	Note 1
LED Forward Current (Dim Control)	I_{LED}	100% duty	-	570	630	mA	Note 2
		0% duty	-	6.0	-		
Backlight Enable	BLEN	Backlight Unit	1.5	-	5.5	V	
LED Lifetime	-	I_{LED}=570mA	-	70K	-	hrs	Note 3
PWM signal	BL_PWM	Backlight Unit	1.5	-	5.5	V	

Note 1: Fig. 5.1 shows the LED backlight circuit.

Note 2: Dimming function can be obtained by applying PWM signal from the display interface CN7. The recommended PWM signal is 1K ~ 10KHz with 3.3 V amplitude.

Note 3: The estimated lifetime is specified as the time to reduce 100% brightness by applying 570mA at 25°C.

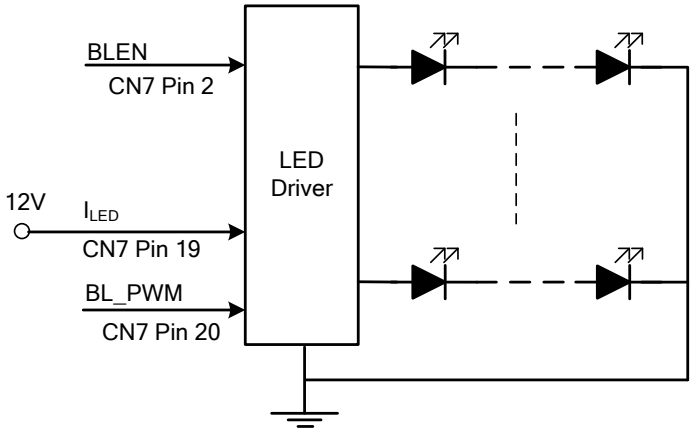


Fig 5.1

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 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.

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

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Brightness of White		-	I_{LED}= 570mA $\phi = 0^{\circ}, \theta = 0^{\circ}$	800	1000	-	cd/m^2	Note 1
Brightness Uniformity		-		70	-	-	%	Note 2
Contrast Ratio		CR		1000	1400	-	-	Note 3
Response Time		Tr + Tf	$\phi = 0^{\circ}, \theta = 0^{\circ}$	-	19	25	ms	Note 4
NTSC Ratio		-	$\phi = 0^{\circ}, \theta = 0^{\circ}$	-	70	-	%	-
Viewing Angle		θ x	$\phi = 0^{\circ}, CR \geq 10$	75	85	-	Degree	Note 5
		θ x′	$\phi = 180^{\circ}, CR \geq 10$	75	85	-		
		θ y	$\phi = 90^{\circ}, CR \geq 10$	75	85	-		
		θ y′	$\phi = 270^{\circ}, CR \geq 10$	75	85	-		
Color Chromaticity	Red	X	$\phi = 0^{\circ}, \theta = 0^{\circ}$	0.61	0.66	0.71	-	Note 6
		Y		0.27	0.32	0.37		
	Green	X		0.26	0.31	0.36		
		Y		0.58	0.63	0.68		
	Blue	X		0.09	0.14	0.19		
		Y		0.00	0.04	0.09		
	White	X		0.25	0.30	0.35		
		Y		0.26	0.31	0.36		

Note 1: The brightness is measured from the center point of the panel, P5 in Fig. 6.2, for the typical 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 measured by BM-5 as shown in Fig. 6.2.

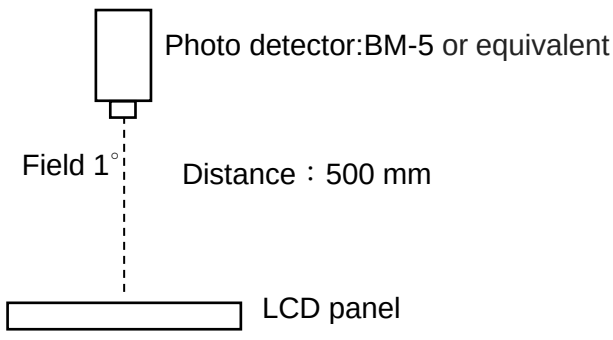


Fig. 6.1

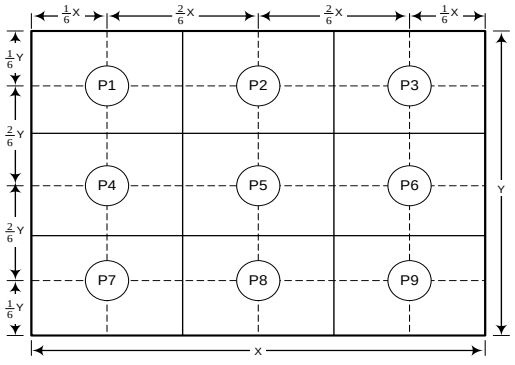


Fig. 6.2

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.

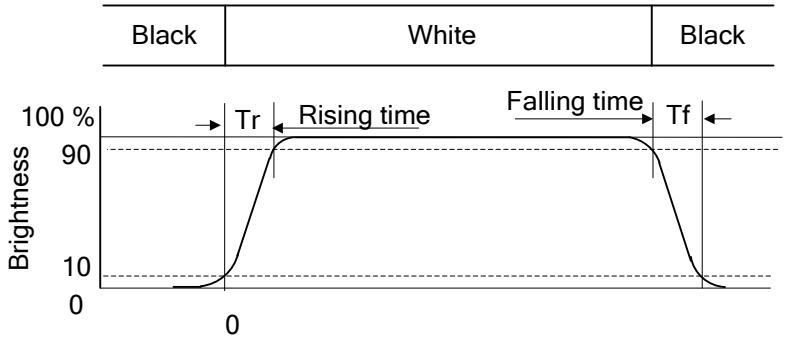


Fig. 6.3

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, so that the best optical performance can be obtained from every viewing direction.

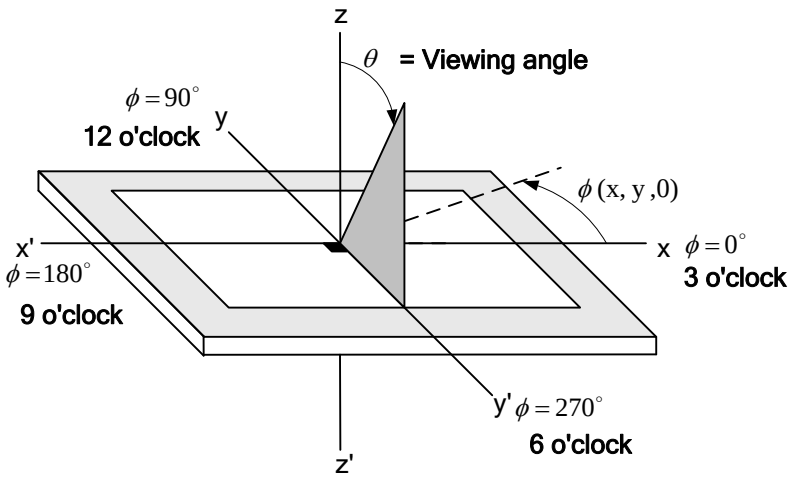
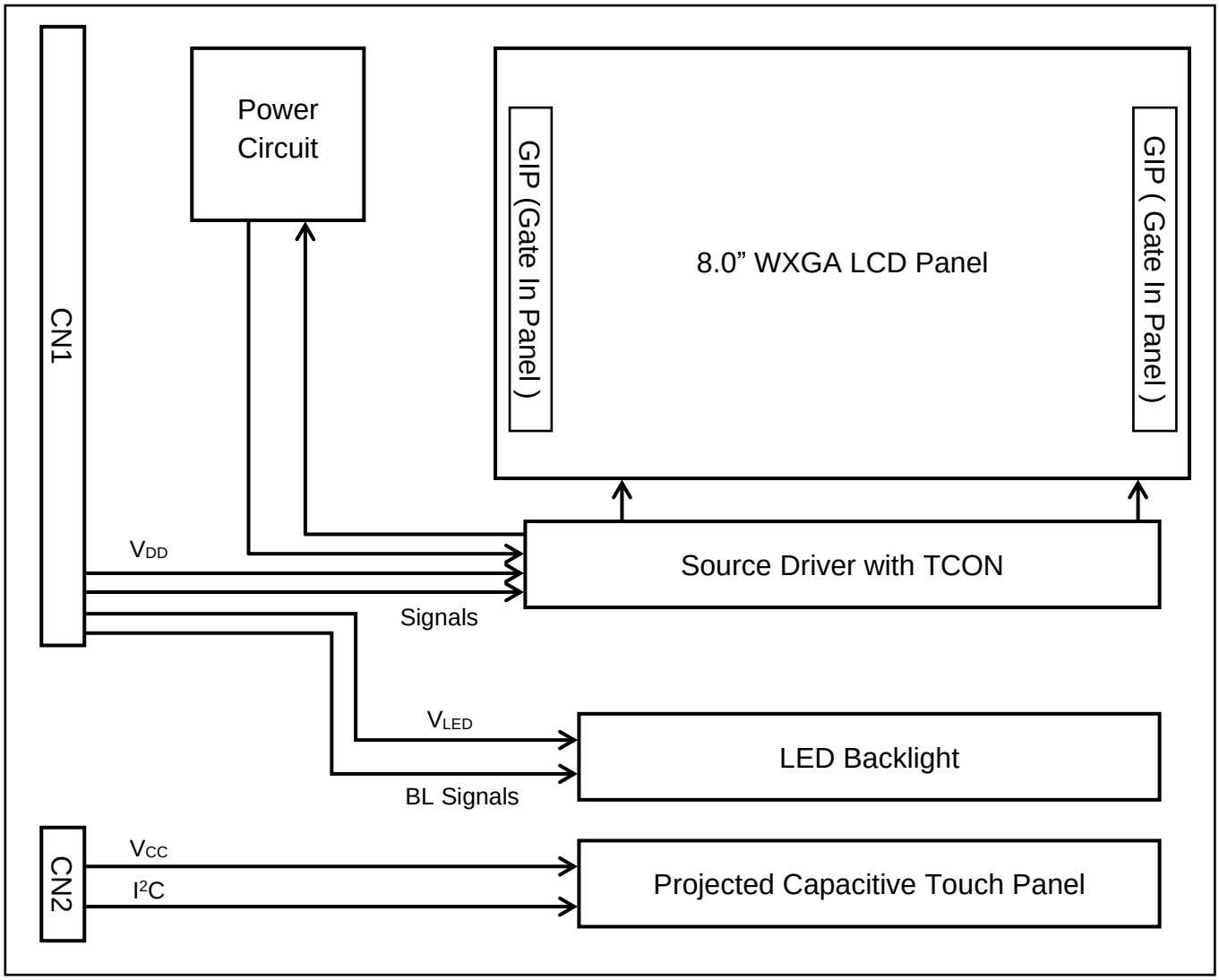


Fig. 6.4

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

7. BLOCK DIAGRAM



Note :

1) Signals are SD, CLK and pixel data pairs
2) BL signals are BLEN and BL_PWM.
3) I^2C are INT, SDA and SCL

8. RELIABILITY TESTS

Test Item	Condition	
High Temperature	1) Operating 2) 80°C	240 hrs
Low Temperature	1) Operating 2) -30°C	240 hrs
High Temperature	1) Storage 2) 80°C	240 hrs
Low Temperature	1) Storage 2) -30°C	240 hrs
Heat Cycle	1) Operating 2) –30°C ~80°C 3) 3hrs~1hr~3hrs	240 hrs
Thermal Shock	1) Non-Operating 2) -30°C ↔ 80°C 3) 0.5 hr ↔ 0.5 hr	240 hrs
High Temperature & Humidity	1) Operating 2) 65°C & 85%RH 3) Without condensation	240 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, 330Ω 3) Air discharge for glass: ± 12KV 4) Contact discharge for metal frame: ± 15KV	1) Glass: 9 points 2) Metal frame: 8 points (Note4)

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 60℃, the humidity needs to be reduced as Fig. 8.1 shown.

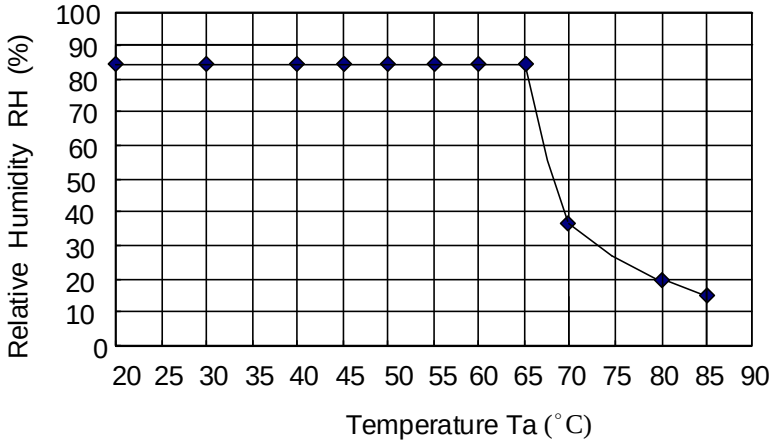


Fig. 8.1

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 pin assignment is as below:

Pin No.	Symbol	Signal	Pin No.	Symbol	Signal
1	V_{DD}	Power Supply for Logic	11	IN2-	B2~B5, DE
2	BLEN	Backlight Enable	12	IN2+	
3	V_{SS}	GND	13	V_{SS}	GND
4	SD	Scan Direction Control High :Normal, Low :Reverse	14	CLK IN-	Pixel Clock
5	IN0-	R0~R5, G0	15	CLK IN+	
6	IN0+		16	V_{SS}	GND
7	V_{SS}	GND	17	IN3-	R6, R7, G6, G7, B6, B7
8	IN1-	G1~G5, B0~B1	18	IN3+	
9	IN1+		19	V_{LED}	Backlight power input
10	V_{SS}	GND	20	BL_PWM	Backlight Dimming

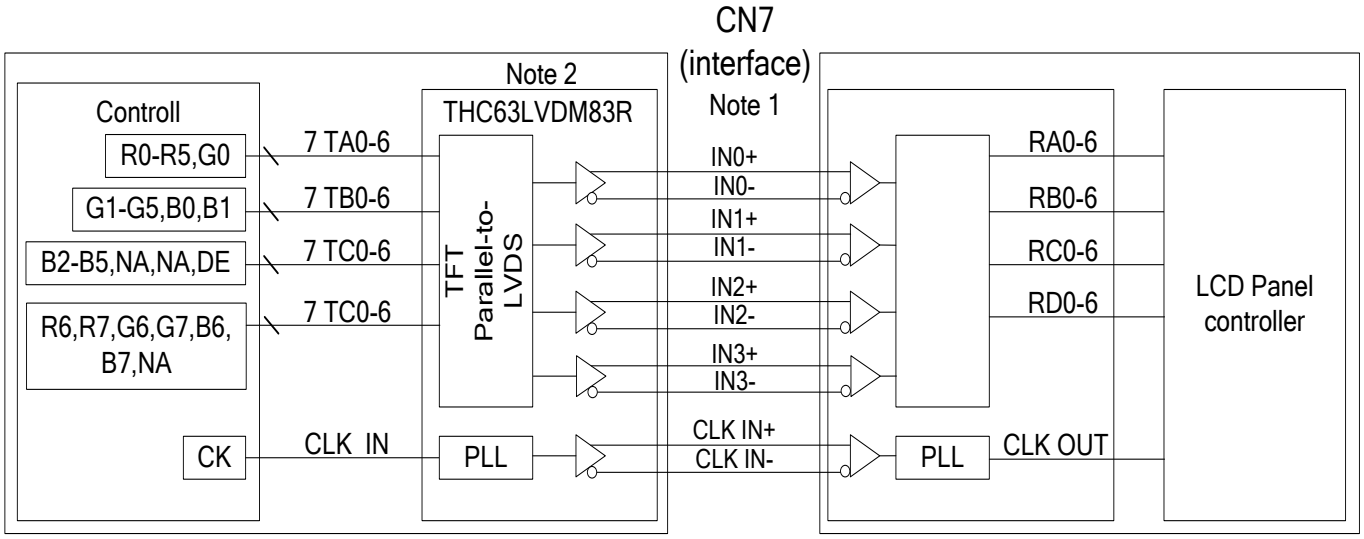
Note 1: IN n- and IN n+ (n=0, 1, 2, 3), CLK IN- and CLK IN+ should be wired by twist-pairs.

The capacitive touch panel interface connector (CN2) is 50224-00501-001 made by ACES and

Pin assignment is as below :

Pin No.	Signal	Function
1	V_{CC}	Power Supply for PCAP
2	SCL	Serial Clock Input
3	SDA	Serial Data Input / Output
4	INT	Inform Host to Get Finger Information Low Active
5	GND	GND

9.2 LVDS INTERFACE



Note 1: LVDS cable impedance should be 100 ohms per signal line when each 2-lines (+, -) is used in differential mode.

Note 2: The recommended transmitter, THC63LVDM83R, is made by Thine or equivalent, which is not contained in the module.

9.3 TIMING CHART

Horizontal timing

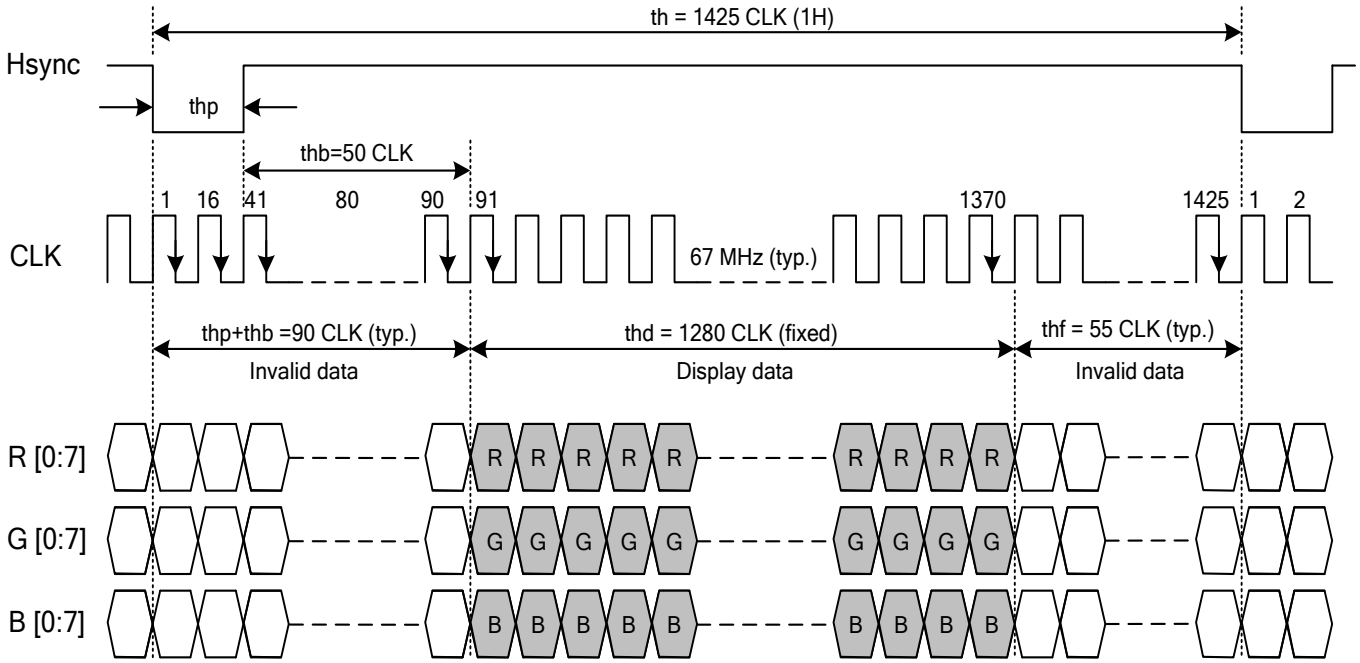


Fig. 9.1 Horizontal Timing of Synchronous Mode

Note 1: CLK's falling edge is the time to latch data and count (thp + thb), therefore, data sending and Hsync's falling edge should start when CLK's rise edge.

Vertical timing

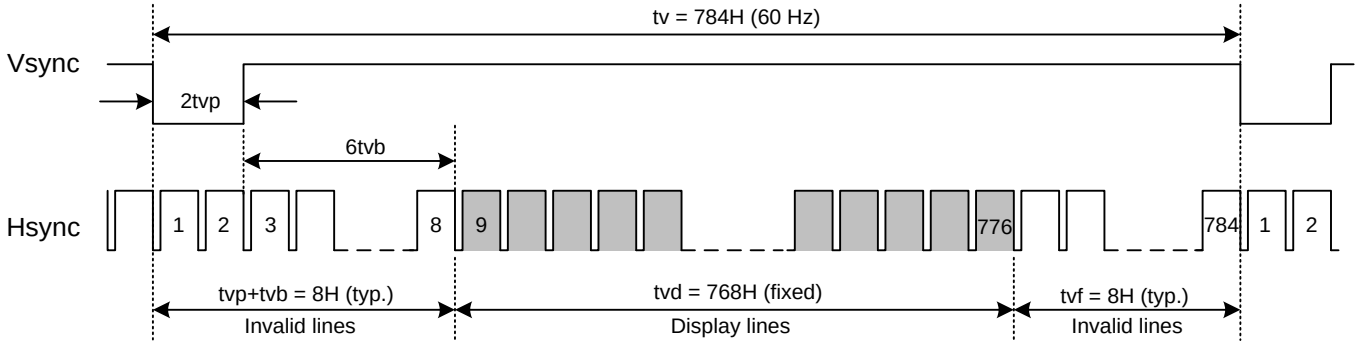


Fig. 9.2 Vertical Timing of Synchronous Mode

Note 2: Vsync's falling edge needs to start with Hsync's falling edge simultaneously to count (tvp + tvb)

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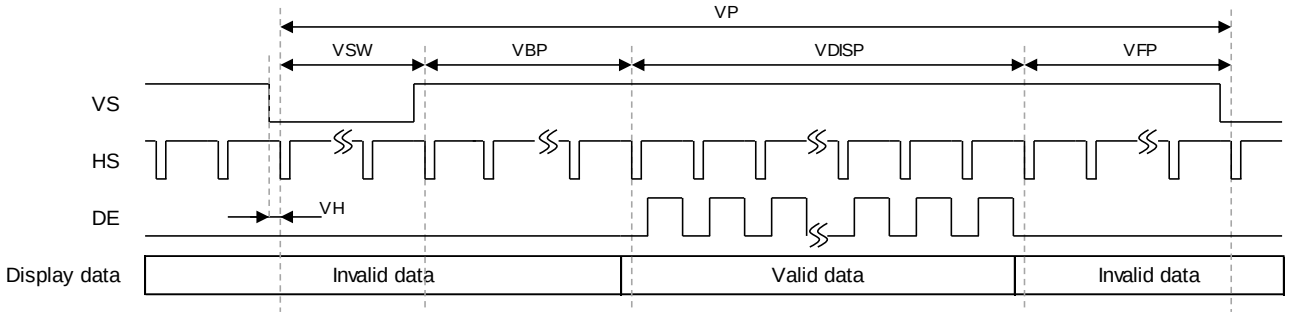
9.4 TIMING TABLE

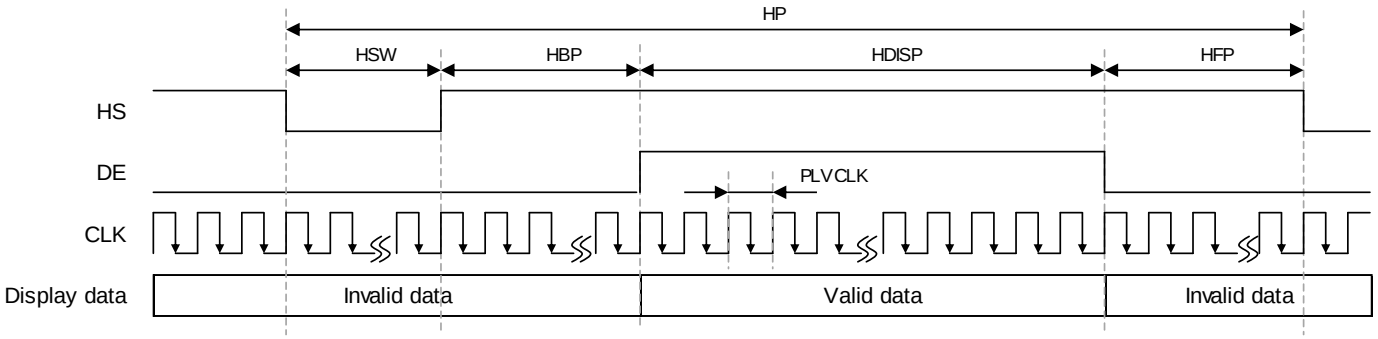
The column of timing sets including minimum, typical, and maximum as below are based on the best optical performance, frame frequency (f_{Frame}) = 60 Hz to define.

(1) Vertical timing



Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Vertical cycle	VP	784	784	784	Line	
Vertical Low pulse width	VSW	2	2	8	Line	
Vertical back porch	VBP	4	6	10	Line	
Vertical front porch	VFP	4	8	10	Line	
Vertical active area	VDISP	768	768	768	Line	
Vertical data start position	VSW+VBP	6	8	12	Line	
Vertical total porch	VSW+VBP+VFP	16	16	16	Line	
Frame rate	VRR	58.2	60.0	61.8	Hz	

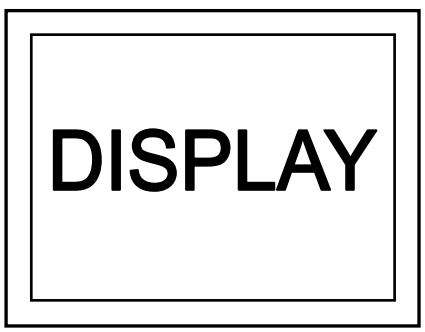
(2) Horizontal timing



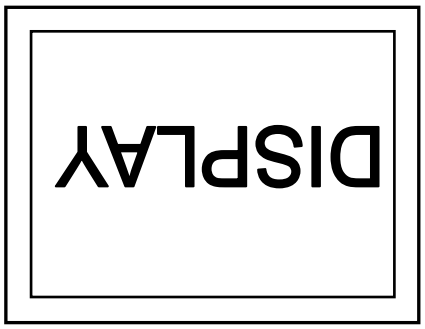
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
HS cycle	HP	1425	1425	1425	CLK	
HS low pulse width	HSW	20	40	85	CLK	
Horizontal back porch	HBP	20	50	85	CLK	
Horizontal front porch	HFP	40	55	105	CLK	
Horizontal active area	HDISP	1280	1280	1280	CLK	
Horizontal data start position	HSW+HBP	40	90	105	CLK	
Horizontal total porch	HSW+HBP+HFP	145	145	145	CLK	
Pixel clock frequency	fLVCLK	65.0	67.0	69.0	MHz	
	PLVCLK	14.5	14.9	15.4	ns	

9.5 DISPLAY MODE CONTROL

Scan direction is available to be switched as below by setting CN1's SD pin.

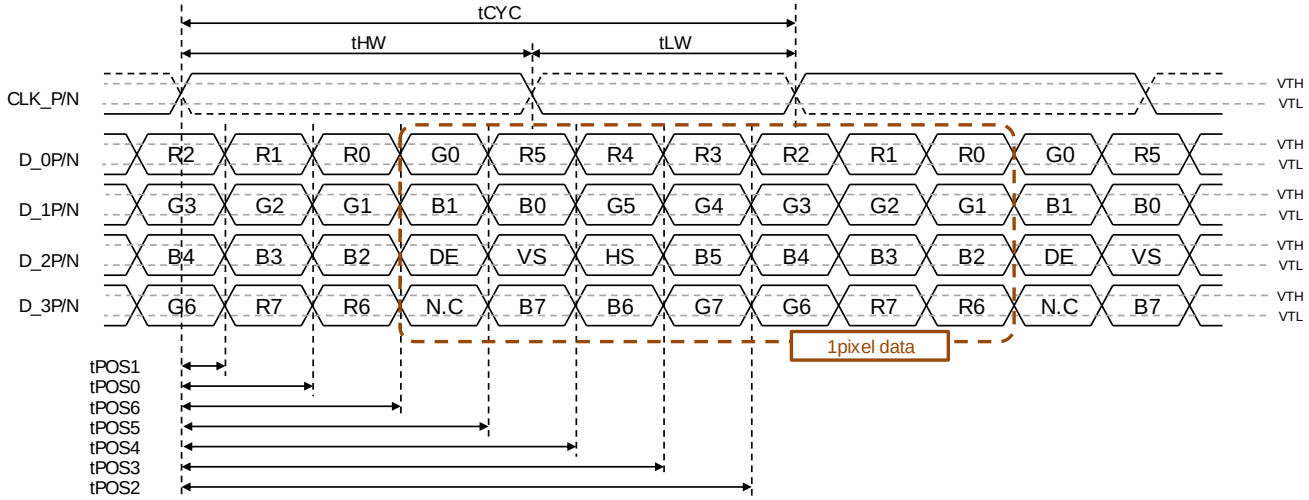


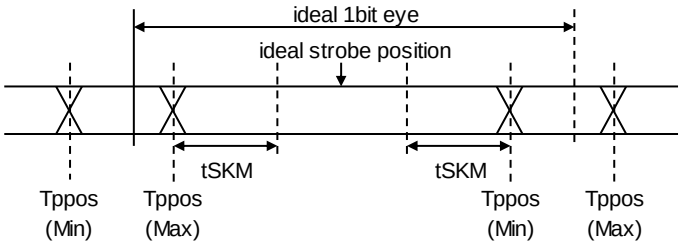
SD : High



SD : Low

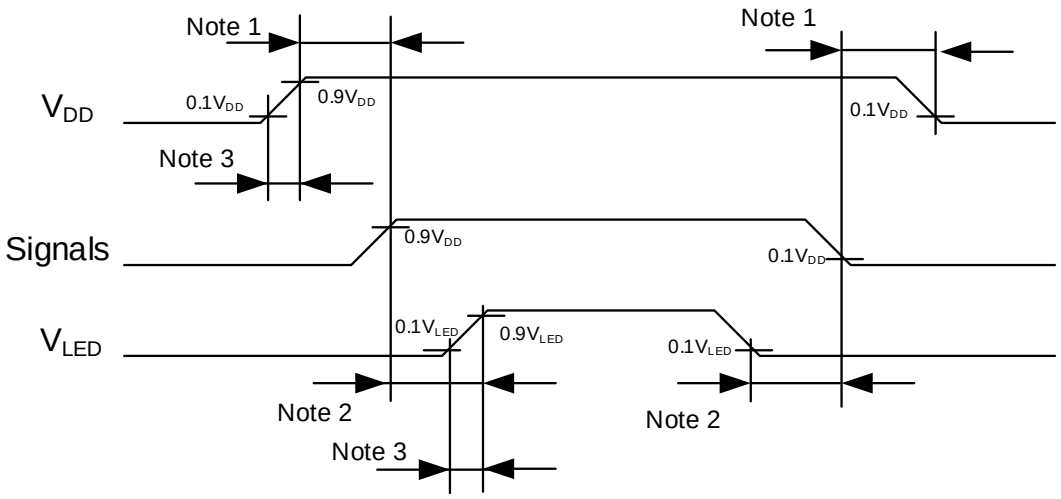
9.6 LVDS RECEIVER TIMING





Signal	Symbol	Parameter	Min.	Typ.	Max.	Unit
CLK_P/N	tCYC	clock cycle time	14.5	14.9	15.4	ns
	tHW	clock "H" pulse width	0.4 x tCYC	0.5 x tCYC	0.6 x tCYC	ns
	tLW	clock "L" pulse width	0.4 x tCYC	0.5 x tCYC	0.6 x tCYC	ns
D[3:0]P/N,	tPOS1	tPOS1 position	- tSKM	0	+ tSKM	ns
	tPOS0	tPOS0 position	(1/7)x tCYC - tSKM	(1/7)x tCYC	(1/7)x tCYC + tSKM	ns
	tPOS6	tPOS6 position	(2/7)x tCYC - tSKM	(2/7)x tCYC	(2/7)x tCYC + tSKM	ns
	tPOS5	tPOS5 position	(3/7)x tCYC - tSKM	(3/7)x tCYC	(3/7)x tCYC + tSKM	ns
	tPOS4	tPOS4 position	(4/7)x tCYC - tSKM	(4/7)x tCYC	(4/7)x tCYC + tSKM	ns
	tPOS3	tPOS3 position	(5/7)x tCYC - tSKM	(5/7)x tCYC	(5/7)x tCYC + tSKM	ns
	tPOS2	tPOS2 position	(6/7)x tCYC - tSKM	(6/7)x tCYC	(6/7)x tCYC + tSKM	ns
	tSKM	Skew margin	-	-	(300)	ps

9.7 POWER SEQUENCE



Note 1: In order to avoid any damages, V_{DD} has to be applied before all other signals. The opposite is true for power off where V_{DD} has to be remained on until all other signals have been switch off. The recommended time period is 1 second.

Note 2: In order to avoid showing uncompleted patterns in transient state. It is recommended that switching the backlight on is delayed for 1 second after the signals have been applied. The opposite is true for power off where the backlight has to be switched off 1 second before the signals are removed.

Note 3: In order to avoid high Inrush current, V_{DD} rising time need to set more than 0.5ms.

9.8 DATA INPUT for DISPLAY COLOR

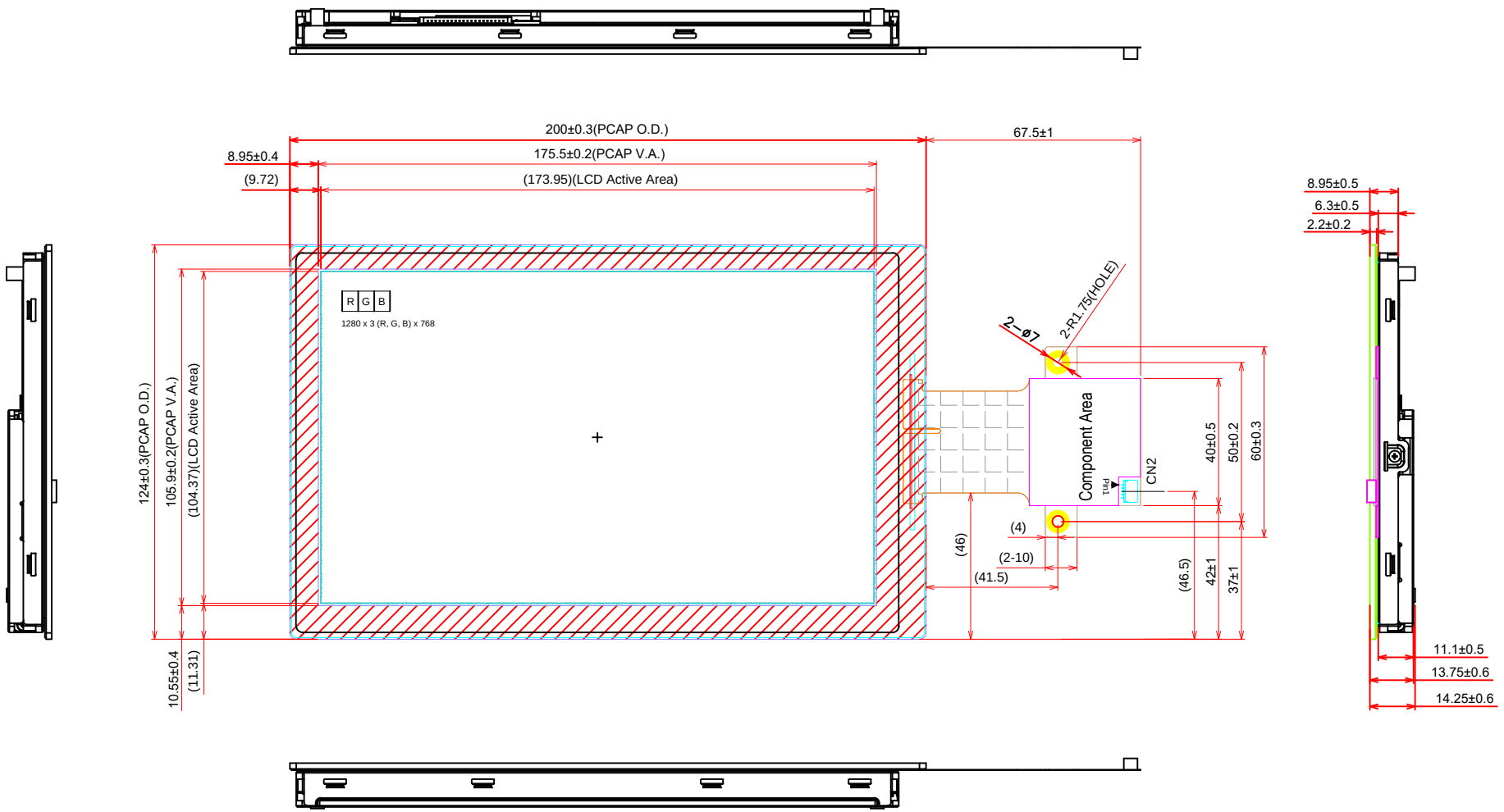
Input color		Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0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

10. OUTLINE DIMENSIONS

10.1 FRONT VIEW



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

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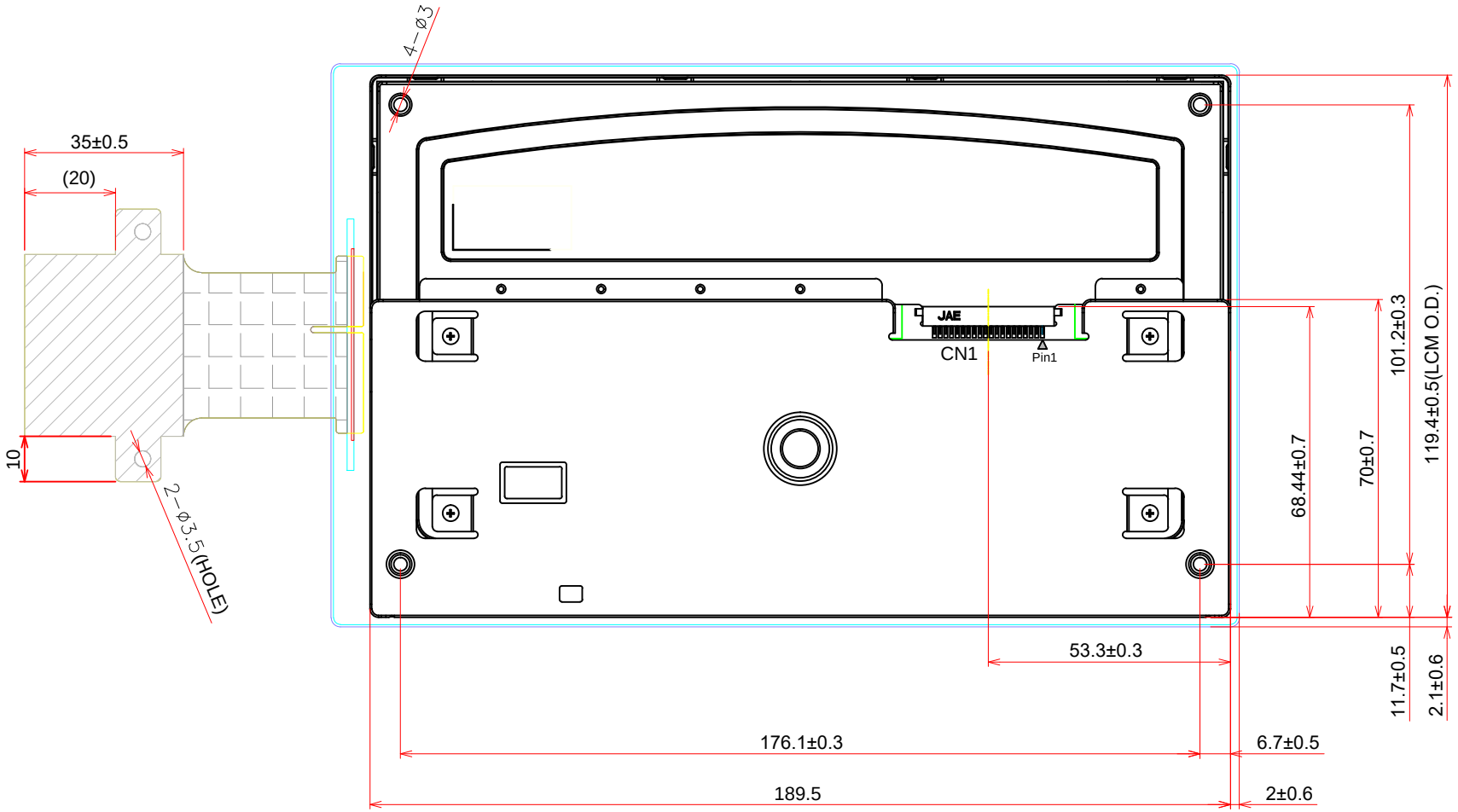
10.2 REAR VIEW



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

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11. TOUCH PANEL

The type of touch panel used on this display is capacitive touch panel film, and more characteristics are shown as below:

11.1 MECHANICAL CHARACTERISTICS

Item	Specification	Remarks
Thickness	t = 2.2 ± 0.2mm	-
Cover Glass	t = 1.8 ± 0.3mm	Strengthened Glass
Surface Hardness	7H	-
Input Method	Through a special stylus or finger	-
Touch Panel	10 points	-

11.2 ELECTRICAL CHARACTERISTICS

Item	Symbol	Value			Unit
		Min.	Typ.	Max.	
Power supply voltage	V_{CC}	3.0	3.3	3.6	V
Operation Current	I_{CC}	-	-	200	mA
Input High Level Voltage	V_{IH}	$0.7V_{DD}$	-	-	V
Input Low Level Voltage	V_{IL}	-	-	$0.3V_{DD}$	V
Operating High Level Voltage	V_{OH}	V_{DD}-0.4		-	V
Operating Low Level Voltage	V_{OL}		-	0.4	V

11.3 CONTROLLER CHARACTERISTICS

The Capacitive Touch Panel features as below:

- Controller IC is EXC81W32
- Interface : I^2C
- Firmware information:

  Model Name: Orion_0369_0001

  Type Name: PCAP81X32 Series

  Version: 01

12. 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. 12.1 The inspection should be performed within 45° when display is shut down. The inspection should be performed within 5° when display is power on.

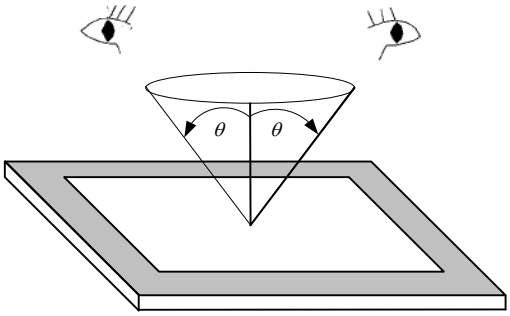


Fig. 12.1

12.1 THE DEFINITION OF LCD ZONE

LCD panel is divided into 3 areas as shown in Fig.12.2 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.

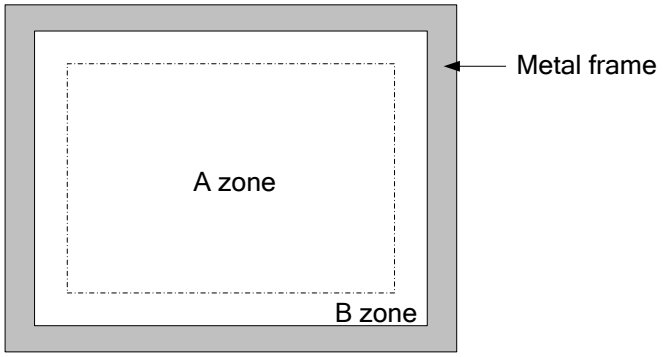


Fig. 12.2

12.2 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. 12.3 and Fig. 12.4.

<table>
<tr><td>Item</td><td colspan="5">Criteria</td><td>Applied zone</td></tr>
<tr><td rowspan="4">Scratches</td><td>Length (mm)</td><td>Width (mm)</td><td colspan="2">Maximum number</td><td>Minimum space</td><td rowspan="4">A, B</td></tr>
<tr><td>Ignored</td><td>W≦0.02</td><td colspan="2">Ignored</td><td>-</td></tr>
<tr><td>L≦40</td><td>0.02＜W≦0.05</td><td colspan="2">10</td><td>-</td></tr>
<tr><td>-</td><td>0.05＜W</td><td colspan="2">Not allowed</td><td>-</td></tr>
<tr><td>Dent</td><td colspan="5">Serious one is not allowed</td><td>A</td></tr>
<tr><td>Wrinkles in polarizer</td><td colspan="5">Serious one is not allowed</td><td>A</td></tr>
<tr><td rowspan="4">Bubbles on polarizer</td><td colspan="3">Average diameter (mm)</td><td colspan="2">Maximum number</td><td rowspan="4">A</td></tr>
<tr><td colspan="3">D≦0.3</td><td colspan="2">Ignored</td></tr>
<tr><td colspan="3">0.3＜D≦0.5</td><td colspan="2">12</td></tr>
<tr><td colspan="3">0.5＜D</td><td colspan="2">Not allowed</td></tr>
<tr><td rowspan="14">1) Stains
2) Foreign Materials
3) Dark Spot</td><td colspan="4">Filamentous (Line shape)</td><td rowspan="4">A, B</td></tr>
<tr><td>Length (mm)</td><td colspan="2">Width (mm)</td><td>Maximum number</td></tr>
<tr><td>L≦2.0</td><td colspan="2">W≦0.03</td><td>Ignored</td></tr>
<tr><td>L≦3.0</td><td colspan="2">0.03＜W≦0.05</td><td>10</td></tr>
<tr><td>L≦2.5</td><td colspan="2">0.05＜W≦0.1</td><td>1</td><td rowspan="10">A, B</td></tr>
<tr><td colspan="4">Round (Dot shape)</td></tr>
<tr><td>Average diameter (mm)</td><td colspan="2">Maximum number</td><td>Minimum Space</td></tr>
<tr><td>D≦0.2</td><td colspan="2">Ignored</td><td>-</td></tr>
<tr><td>0.2＜D≦0.3</td><td colspan="2">10</td><td>10 mm</td></tr>
<tr><td>0.3＜D≦0.4</td><td colspan="2">5</td><td>30 mm</td></tr>
<tr><td>0.4＜D</td><td colspan="2">Not allowed</td><td>-</td></tr>
<tr><td>In total</td><td colspan="3">Filamentous + Round=10</td></tr>
<tr><td colspan="4">Those wiped out easily are acceptable</td></tr>
<tr><td rowspan="6">Dot-Defect
(Note 1)</td><td></td><td colspan="2">Type</td><td>Maximum number</td><td rowspan="6">A</td></tr>
<tr><td>Bright dot-defect</td><td colspan="2">1 dot</td><td>0</td></tr>
<tr><td rowspan="3">Dark dot-defect</td><td colspan="2">1 dot</td><td rowspan="2">5</td></tr>
<tr><td colspan="2">2 adjacent dot</td></tr>
<tr><td colspan="2">3 adjacent dot or above</td><td>Not allowed</td></tr>
<tr><td colspan="2">In total</td><td>5</td></tr>
<tr><td colspan="3">In total</td><td>5</td></tr>
<tr><td>Mura</td><td colspan="4">Invisible through 2% ND filter</td><td>A
(Note 2)</td></tr>
</table>

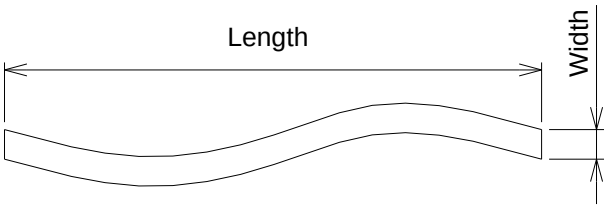


Fig 12.3

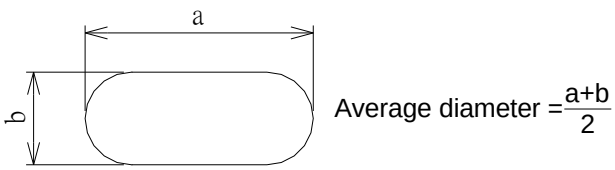


Fig 12.4

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. 12.5.
- The Density of dot defect is defined in the area within diameter ϕ =10mm.

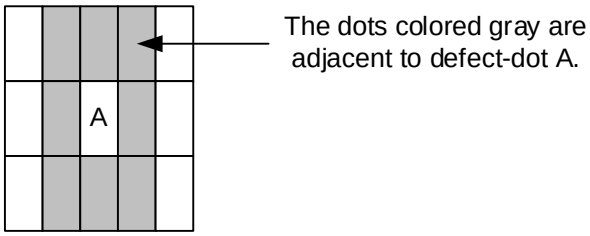
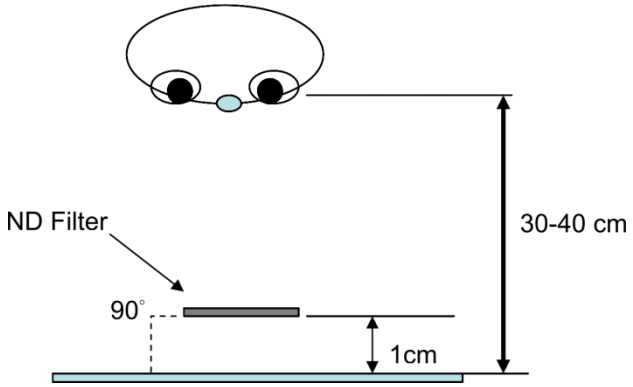


Fig. 12.5

Note 2: The inspection method with ND Filter is to hold it in front of the panel around 1 cm and inspect the panel with 35±5 cm distance for 1 second.

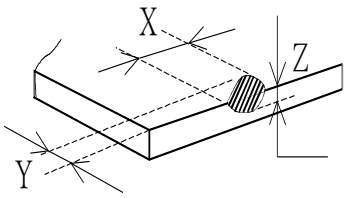
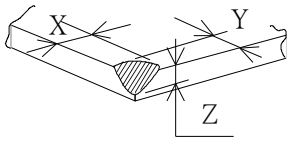
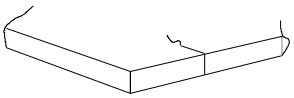


12.3 TOUCH PANEL APPEARANCE SPECIFICATION

The specification as below is defined by the amount of unexpected material in different zones of touch panel.

<table>
<tr><td>Item</td><td colspan="4">Criteria</td><td>Applied zone</td></tr>
<tr><td rowspan="4">Scratches</td><td>Width (mm)</td><td>Length (mm)</td><td>Maximum number</td><td>Maximum Space</td><td rowspan="4">A</td></tr>
<tr><td>W≦0.05</td><td>L≦5</td><td>Ignored</td><td>-</td></tr>
<tr><td>0.1＜W≦0.15</td><td>L≦5</td><td>3</td><td>5 mm</td></tr>
<tr><td>0.15＜W</td><td>-</td><td>Not allowed</td><td>-</td></tr>
<tr><td rowspan="10">1) Foreign materials
2) spot</td><td colspan="4">Round (Dot shape)</td><td rowspan="10">A</td></tr>
<tr><td colspan="2">Average diameter (mm)</td><td>Maximum number</td><td>Maximum Space</td></tr>
<tr><td colspan="2">D≦0.2</td><td>Ignored</td><td>-</td></tr>
<tr><td colspan="2">0.2＜D≦0.4</td><td>5</td><td>10 mm</td></tr>
<tr><td colspan="2">0.4＜D</td><td>Not allowed</td><td>-</td></tr>
<tr><td colspan="4">Filamentous (Line shape)</td></tr>
<tr><td>Width (mm)</td><td>Length (mm)</td><td>Maximum number</td><td>Maximum Space</td></tr>
<tr><td>W≦0.1</td><td>L≦4</td><td>Ignored</td><td>-</td></tr>
<tr><td>0.15＜W≦0.10</td><td>L≦5</td><td>3</td><td>10 mm</td></tr>
<tr><td>0.15＜W</td><td>-</td><td>Not allowed</td><td>-</td></tr>
<tr><td colspan="5">Round + Filamentous total N≦5</td><td>A</td></tr>
<tr><td rowspan="5">Bubble</td><td colspan="4">Round (Dot shape)</td><td rowspan="5">A</td></tr>
<tr><td colspan="2">Average diameter (mm)</td><td>Maximum number</td><td>Maximum Space</td></tr>
<tr><td colspan="2">D≦0.15</td><td>Ignored</td><td>-</td></tr>
<tr><td colspan="2">0.15＜D≦0.40</td><td>3</td><td>5 mm</td></tr>
<tr><td colspan="2">0.40＜D</td><td>Not allowed</td><td>-</td></tr>
<tr><td rowspan="3">Pin hole on printing area</td><td colspan="2">Average diameter (mm)</td><td colspan="2">Maximum number</td><td rowspan="3">B</td></tr>
<tr><td colspan="2">D≦0.2</td><td colspan="2">Acceptable</td></tr>
<tr><td colspan="2">D＞0.2</td><td colspan="2">Unacceptable</td></tr>
</table>

The limitation of glass flaw occurred on touch panel is defined in the table as below.

Item	definition	Specifications	Qty
Edge flaw		X ≤ 0.3 mm Y ≤ 0.3 mm Z ≤ 1/2 Thickness	Ignored
		0.3 < X ≤ 0.5 mm 0.3 < Y ≤ 0.5 mm Z ≤ 1/2 Thickness	N ≤ 3
Corner flaw		X ≤ 0.3 mm Y ≤ 0.3 mm Z ≤ 1/2 Thickness	Ignored
		0.3 < X ≤ 0.5 mm 0.3 < Y ≤ 0.5 mm Z ≤ 1/2 Thickness	N ≤ 1
Progressive flaw		Not allowed	

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.

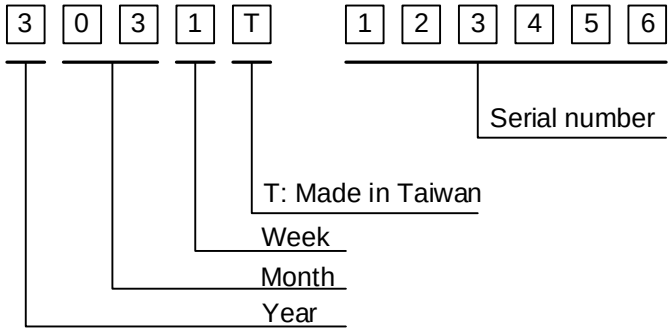


Fig. 13.1

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

Year	Lot Mark
2023	3
2024	4
2025	5
2026	6
2027	7

Month	Lot Mark	Month	Lot Mark
Jan.	01	Jul.	07
Feb.	02	Aug.	08
Mar.	03	Sep.	09
Apr.	04	Oct.	10
May	05	Nov.	11
Jun.	06	Dec.	12

Week	Lot Mark
1~7 days	1
8~14 days	2
15~21 days	3
22~28 days	4
29~31 days	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	-	-

4) The location of the lot mark is on the back of the display shown in Fig. 13.2

Label example :

Fig. 13.2