

KOE

JDI Group

Kaohsiung Opto-Electronics Inc.

FOR MESSRS : _____

DATE : Jul. 8th,2020

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

TX26D207VM0AVA

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ACCEPTED BY: _____

PROPOSED BY: John Chou

2. RECORD OF REVISION

DATE	SHEET No.	SUMMARY

3. GENERAL DATA

3.1 DISPLAY FEATURES

This module is a 10.1" WXGA of 16:9 format 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	TX26D207VM0AVA
Module Dimensions	265(W) mm × 180 (H) mm × 13.42 (D) mm (max)
LCD Active Area	217.344(W)mm x 135.84(H)mm
Pixel Pitch	0.1698 (W) mm × 0.1698 (H) mm
Resolution	1280× 3 (RGB) (W) × 800 (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	580g(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}	-0.5	4.5	V	-
Input Voltage of Logic	V _I	-0.5	4.5	V	Note 1
Operating Temperature	Top	-30	80	°C	Note 2
Storage Temperature	T _{st}	-30	80	°C	Note 2
Backlight Input Voltage	V _{LED}	-	15	V	-
Input Voltage of BL Signal	V _I	-0.3	6	V	Note 3

Note 1: The rating is defined for the signal voltage of the interface such as CLK, SD 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.

Note 3: The rating is defined for the signal voltage based on the interface such as BLEN and BLPWM.

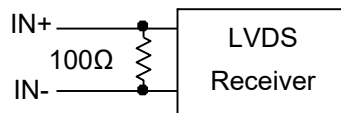
5. ELECTRICAL CHARACTERISTICS

5.1 LCD CHARACTERISTICS

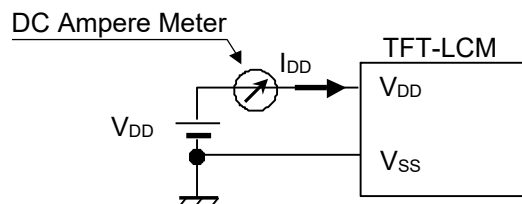
$T_a = 25\text{ }^\circ\text{C}$, $V_{SS} = 0\text{V}$

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}	$V_{DD}-V_{SS}=3.3\text{V}$	60	80	150	mA	Note 2,3
Frame Frequency	f_{Frame}	-	-	60	63	Hz	Note 4
CLK Frequency	f_{CLK}	-	67.1	71	74.6	MHz	
Supply Voltage for Digital I/O	SD	"H" level	$0.7 V_{DD}$	-	V_{DD}	V	Note 5
		"L" level	0	-	$0.3V_{DD}$		

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: 2A fuse is applied in the module for I_{DD} . For display activation and protection purpose, power supply is recommended larger than 4A to start the display and break fuse once any short circuit occurred.

Note 4: For LVDS transmitter input.

Note 5: Rated values indicate operating range of electrical function.

5.2 BACKLIGHT CHARACTERISTICS

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

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	-	620	-	mA	Note 2
		0% duty	-	10	-		
LED Lifetime	-	$I_{LED}=620\text{ mA}$	-	70K	-	hrs	Note 3
Backlight Enable	BLEN	Backlight Unit	1.5	-	5.5	V	-
PWM signal	BLPWM	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 CN3. The recommended PWM signal is 1K ~ 10KHz with 3.3 V amplitude.

Note 3: The estimated lifetime is specified as the time to reduce 50% brightness by applying 620mA at 25°C .

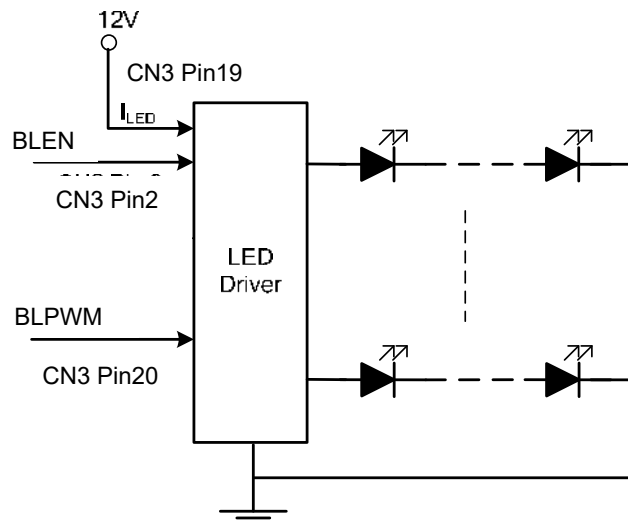


Fig 5.1

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.

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

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks	
Brightness of White	-	$I_{LED} = 620\text{mA}$ $\phi = 0^\circ, \theta = 0^\circ$	700	880	-	cd/m ²	Note 1	
Brightness Uniformity	-		70	-	-	%	Note 2	
Contrast Ratio	CR		1000	1500	-	-	Note 3	
Response Time	Tr + Tf	$\phi = 0^\circ, \theta = 0^\circ$	-	-	25	ms	Note 4	
NTSC Ratio	-	$\phi = 0^\circ, \theta = 0^\circ$	-	65	-	%	-	
Viewing Angle	θ_x	$\phi = 0^\circ, CR \geq 10$	-	85	-	Degree	Note 5	
	$\theta_{x'}$	$\phi = 180^\circ, CR \geq 10$	-	85	-			
	θ_y	$\phi = 90^\circ, CR \geq 10$	-	85	-			
	$\theta_{y'}$	$\phi = 270^\circ, CR \geq 10$	-	85	-			
Color Chromaticity	Red	X	$\phi = 0^\circ, \theta = 0^\circ$	0.572	0.622	0.672	-	Note 6
		Y		0.297	0.347	0.397		
	Green	X		0.262	0.312	0.362		
		Y		0.565	0.615	0.665		
	Blue	X		0.096	0.146	0.196		
		Y		0.040	0.090	0.140		
	White	X		0.240	0.290	0.340		
		Y		0.270	0.320	0.370		

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:

$$\text{Brightness uniformity} = \frac{\text{Min. Brightness}}{\text{Max. Brightness}} \times 100\%$$

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

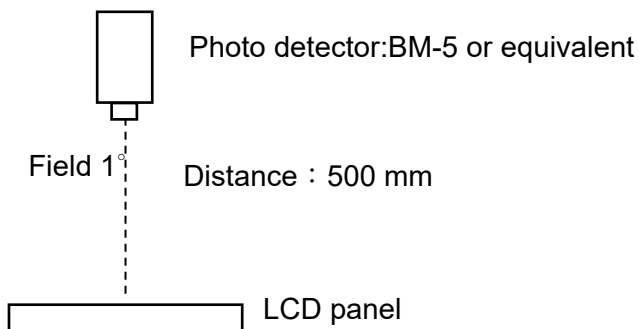


Fig. 6.1

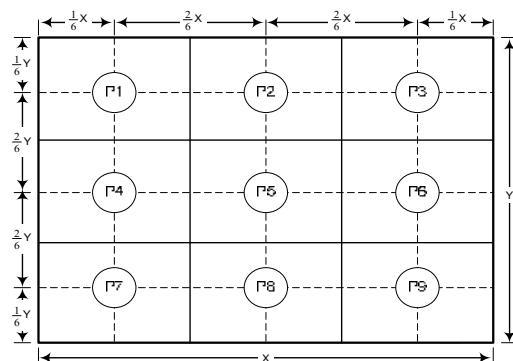


Fig. 6.2

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 falling to 10% brightness.

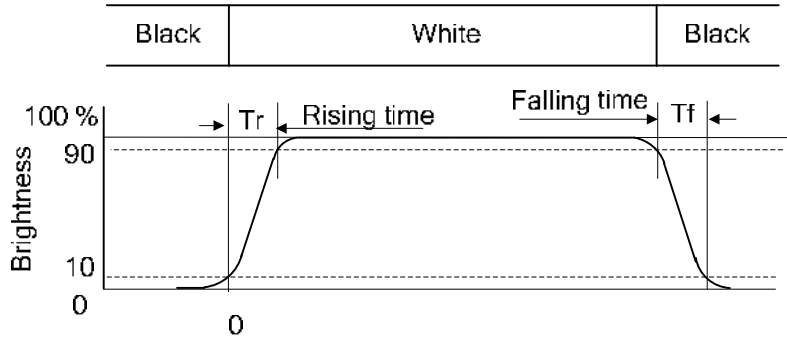


Fig. 6.3

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.

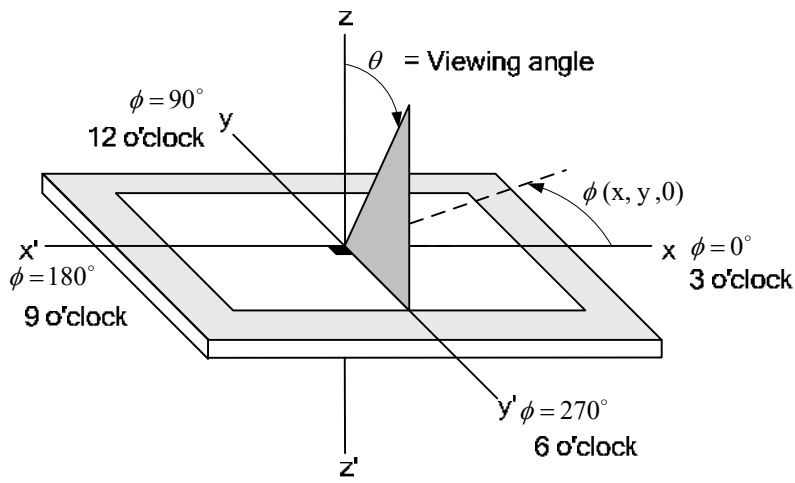
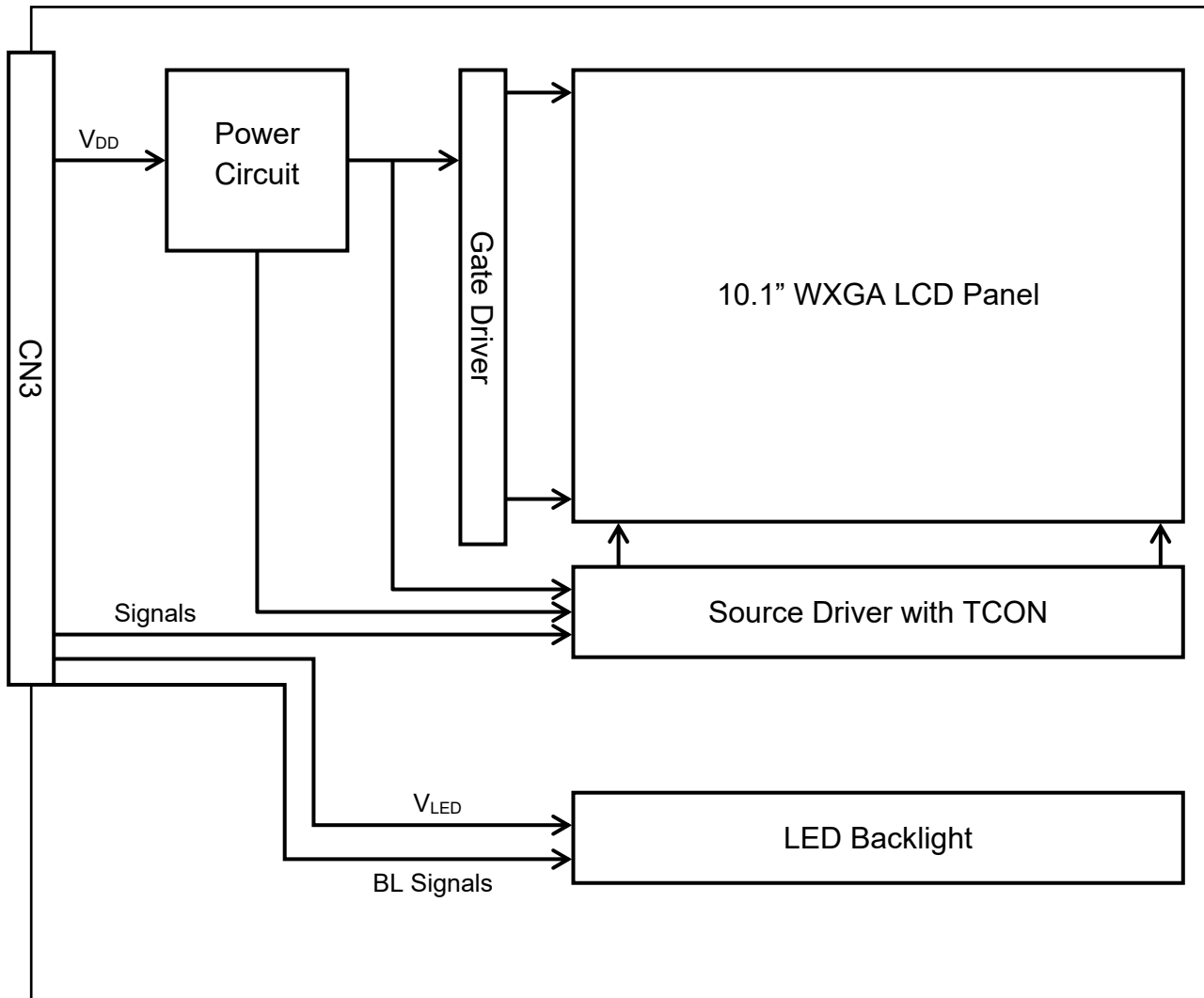


Fig. 6.4

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 UD/LR, CLK and pixel data pairs.
- 2) BL signals are BLEN and BLPWM.

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) -20 °C ~70 °C 3) 3hrs~1hr~3hrs	240 hrs
Thermal Shock	1) Non-Operating 2) -35 °C ↔ 85 °C 3) 0.5 hr ↔ 0.5 hr	240 hrs
High Temperature & Humidity	1) Operating 2) 40 °C & 85%RH 3) Without condensation	240 hrs (Note 3)
Vibration	1) Non-Operating 2) 20~200 Hz 3) 2G 4) X, Y, and Z directions	1 hr for each direction
Mechanical Shock	1) Non-Operating 2) 10 ms 3) 50G 4) ±X, ±Y and ±Z directions	Once for each direction
ESD	1) Operating 2) Tip: 150 pF, 330 Ω 3) Air discharge for glass: ± 8KV 4) Contact discharge for metal frame: ± 8KV	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.

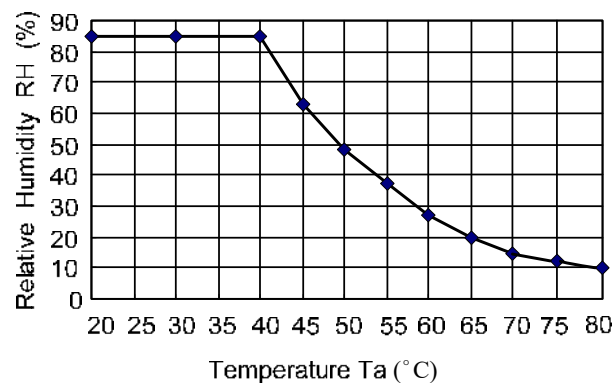


Fig. 8.1

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 (CN3) is FI-SEB20P-HF13E made by JAE and pin assignment is as below:

Pin No.	Symbol	Signal	Pin No.	Signal	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	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	BLPWM	Backlight Dimming

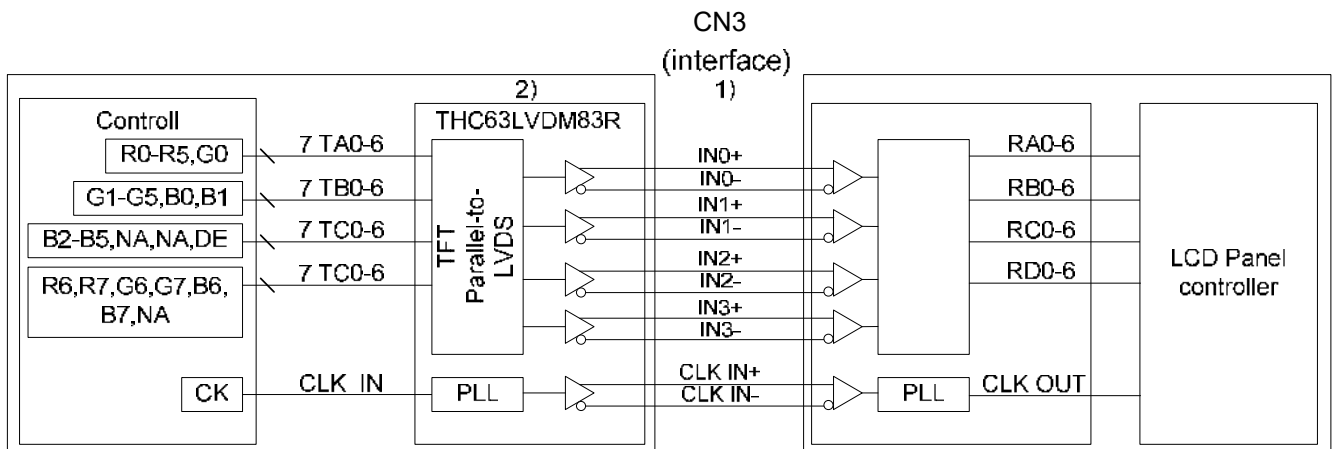
Note 1: IN n- and IN n+ (n=0, 1, 2, 3), CLK IN- and CLK IN+ should be wired by twist-pairs.

The capacitive touch panel interface FPC : Pitch 0.5mm 8pins

Pin assignment is as below :

Pin No.	Symbol	Signal	Pin No.	Symbol	Signal
1	VDD	Power Supply for PCAP 5V	5	NC	No Connection
2	VSS	GND	6	NC	
3	D-	USB D-	7	NC	
4	D+	USB D+	8	NC	

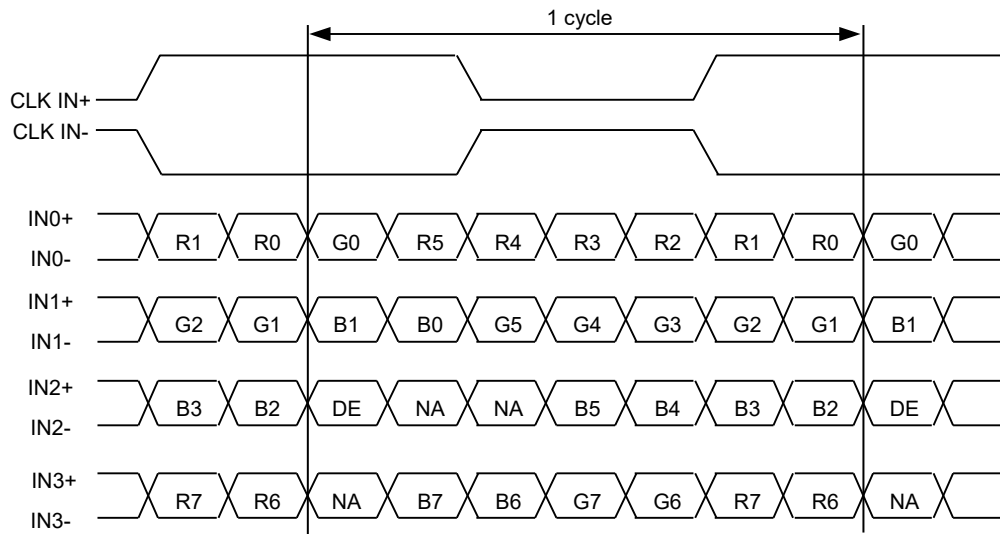
9.2 LVDS INTERFACE



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 LVDS DATA FORMAT



DE: Display Enable

NA: Not Available

9.4 TIMING CHART

Horizontal timing

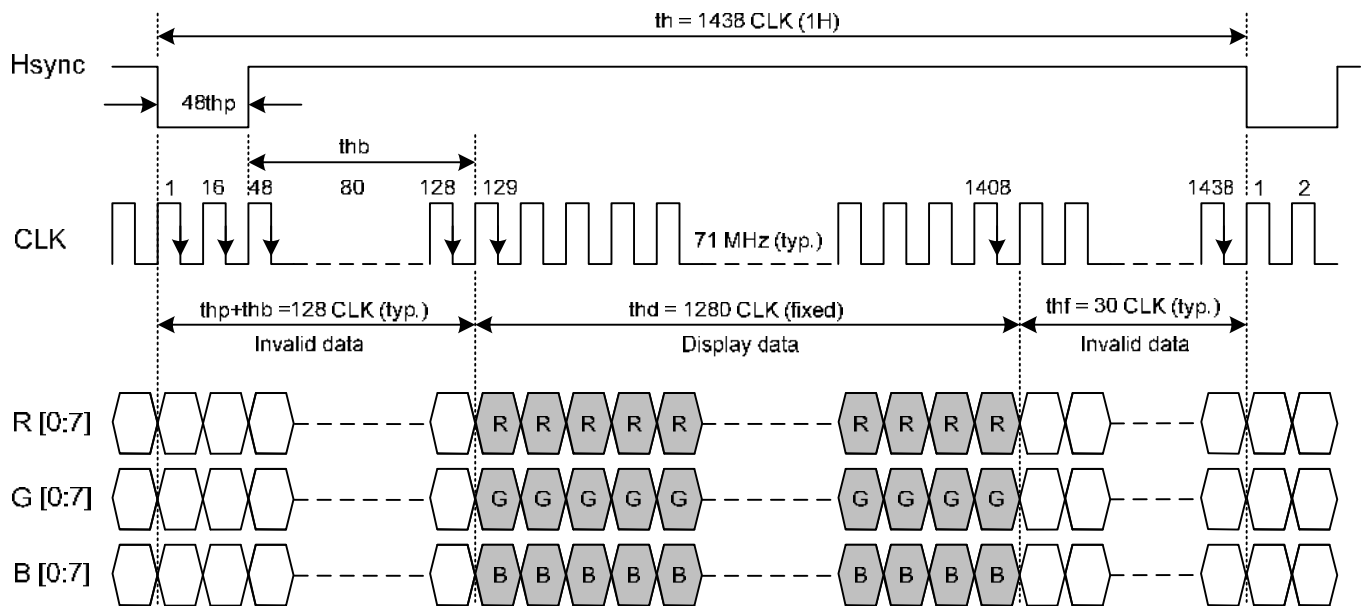


Fig. 9.1 Horizontal Timing of Synchronous Mode

Note 1: CLK's falling edge is the time to latch data and count ($t_{hp} + t_{hb}$), therefore, data sending and Hsync's falling edge should start when CLK's rise edge.

Vertical timing

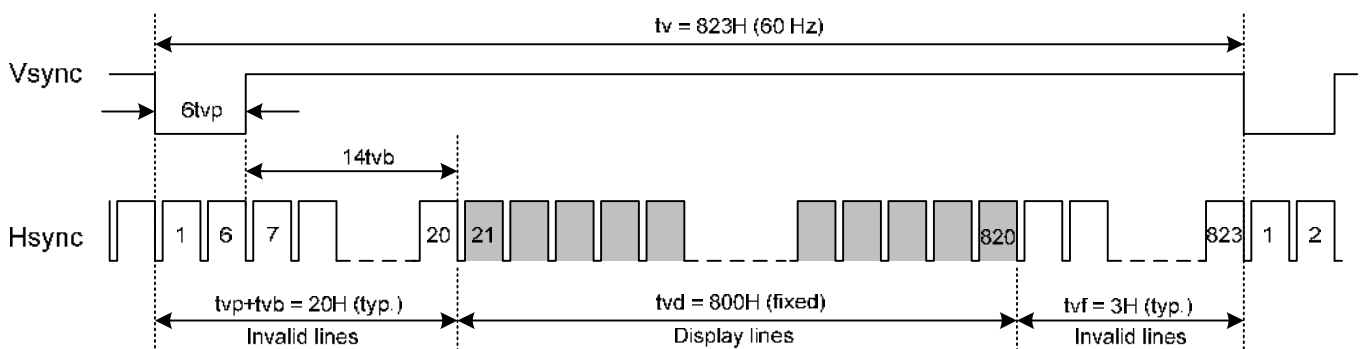


Fig. 9.2 Vertical Timing of Synchronous Mode

Note 2: Vsync's falling edge needs to start with Hsync's falling edge simultaneously to count ($t_{vtp} + t_{vfb}$)

9.5 TIMING TABLE

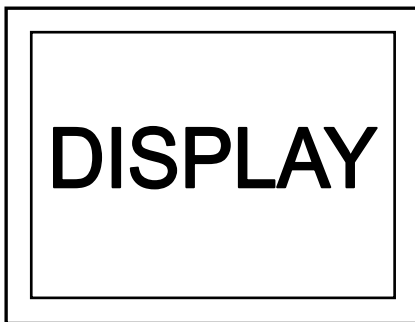
The column of timing sets including minimum, typical, and maximum as below are based on the best optical performance, frame frequency (f_{Frame}) = 60 Hz to define.

A. DE MODE

Parameter		Symbol	Min.	Typ.	Max.	Unit	
Clock	Frequency	fCLK	67.1	71.0	74.6	M Hz	
	Frequency	fVD	60	60	60	Hz	
Vertical timing	Cycle	tVD	823	823	823	Line	
	Pulse width	tVPW	-	6	-	Line	
	Back porch	tVBP	-	14	-	Line	
	Front porch	tVFP	-	3	-	Line	
	Porch period	tVPW+tVBP+tVFP	23	23	23	Line	
	Display period	tVA	800	800	800	Line	
	Horizontal timing	Cycle	tHD	1360	1438	1510	CLK
		Pulse width	tHPW	10	48	90	CLK
Back porch		tHBP	50	80	100	CLK	
Front porch		tHFP	20	30	40	CLK	
Porch period		tHPW+tHBP+tHFP	80	158	230	CLK	
Display period		tHA	1280	1280	1280	CLK	

9.6 DISPLAY MODE CONTROL

Scan direction is available to be switched as below by setting CN3's SD pin.

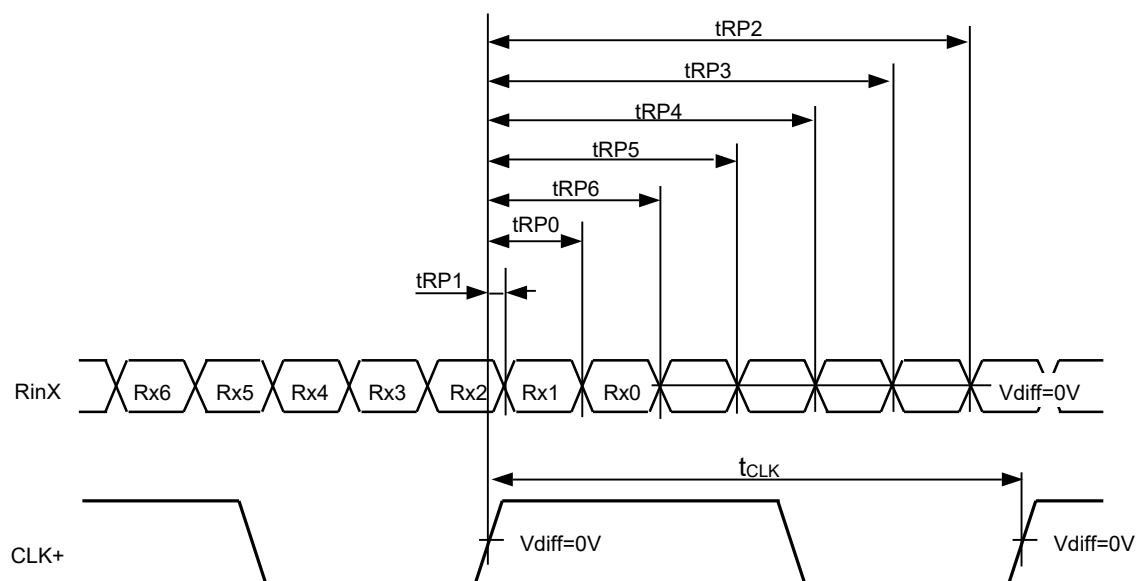


SD : High



SD :Low or Open

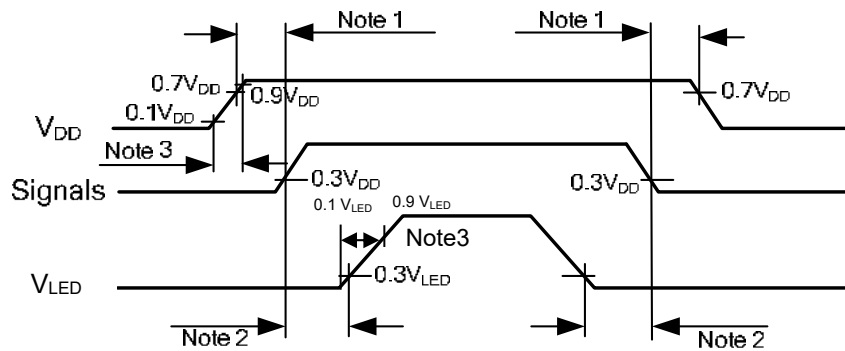
9.7 LVDS RECEIVER TIMING



$$RinX = (RinX+) - (RinX-) \quad (X=0, 1, 2)$$

	Item	Symbol	Min.	Typ.	Max.	Unit
CLK	Cycle frequency	$1/t_{CLK}$	-	71	-	MHz
RinX (X=0,1,2)	0 data position	t_{RP0}	-	$1/7 * t_{CLK}$	-	ns
	1st data position	t_{RP1}	-	0	-	
	2nd data position	t_{RP2}	-	$6/7 * t_{CLK}$	-	
	3rd data position	t_{RP3}	-	$5/7 * t_{CLK}$	-	
	4th data position	t_{RP4}	-	$4/7 * t_{CLK}$	-	
	5th data position	t_{RP5}	-	$3/7 * t_{CLK}$	-	
	6th data position	t_{RP6}	-	$2/7 * t_{CLK}$	-	

9.8 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.

9.9 DATA INPUT for DISPLAY COLOR

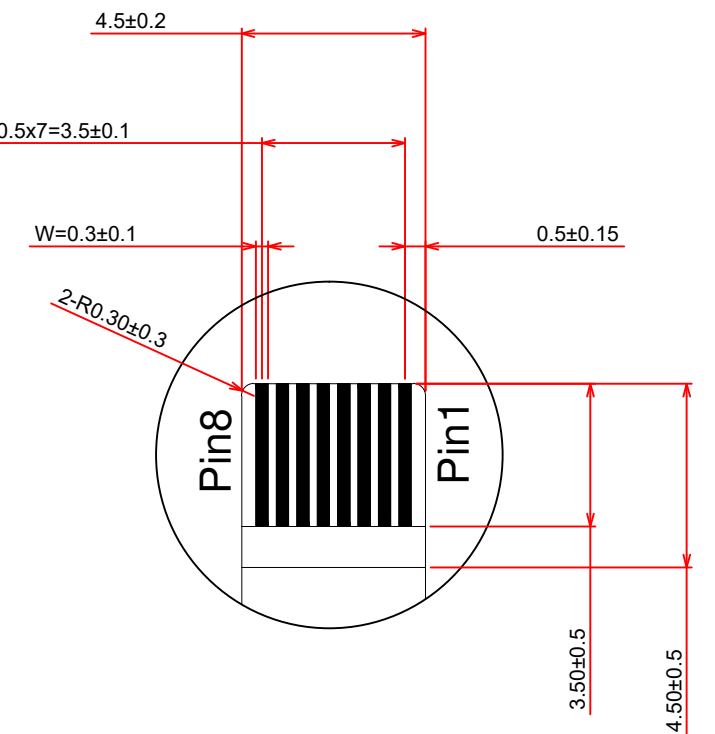
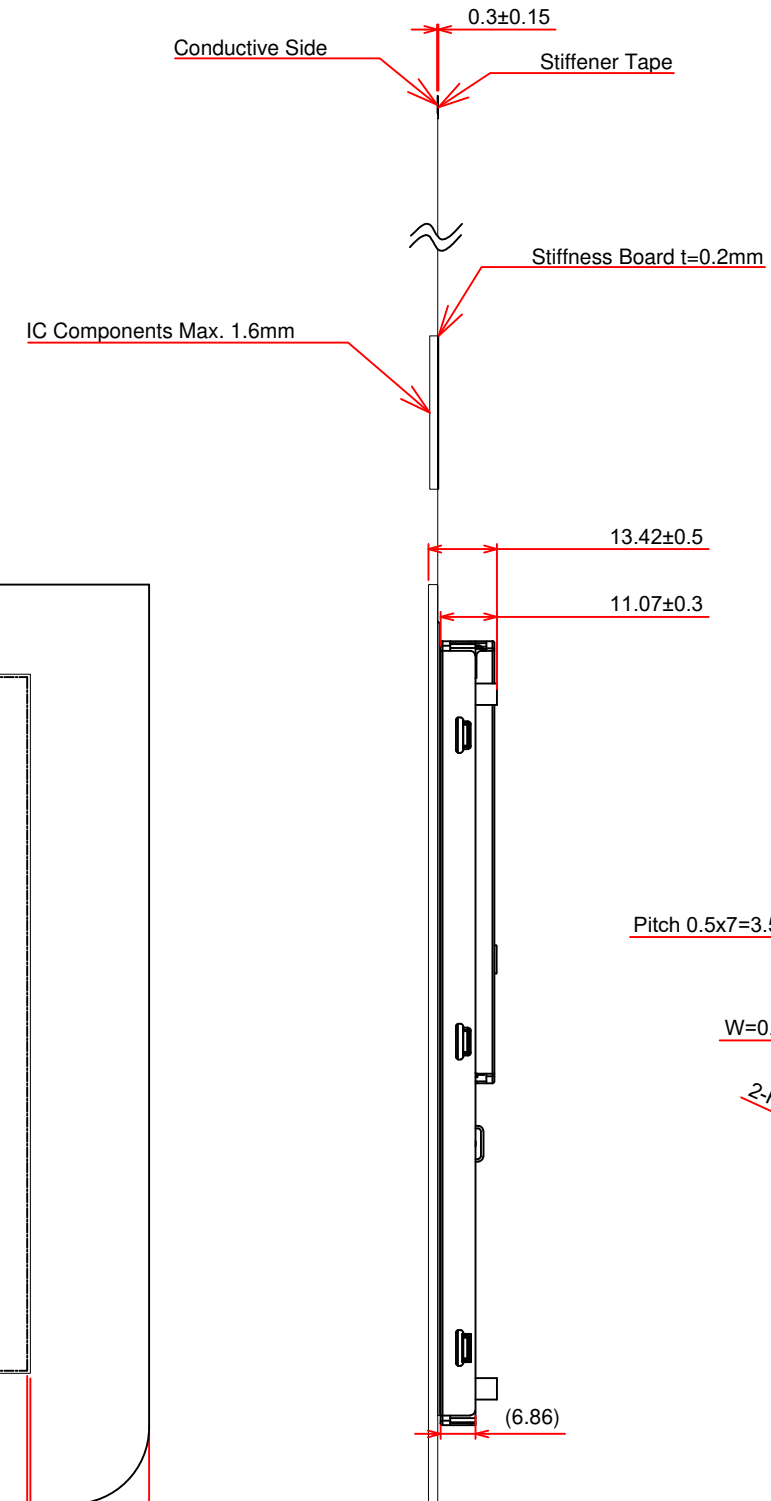
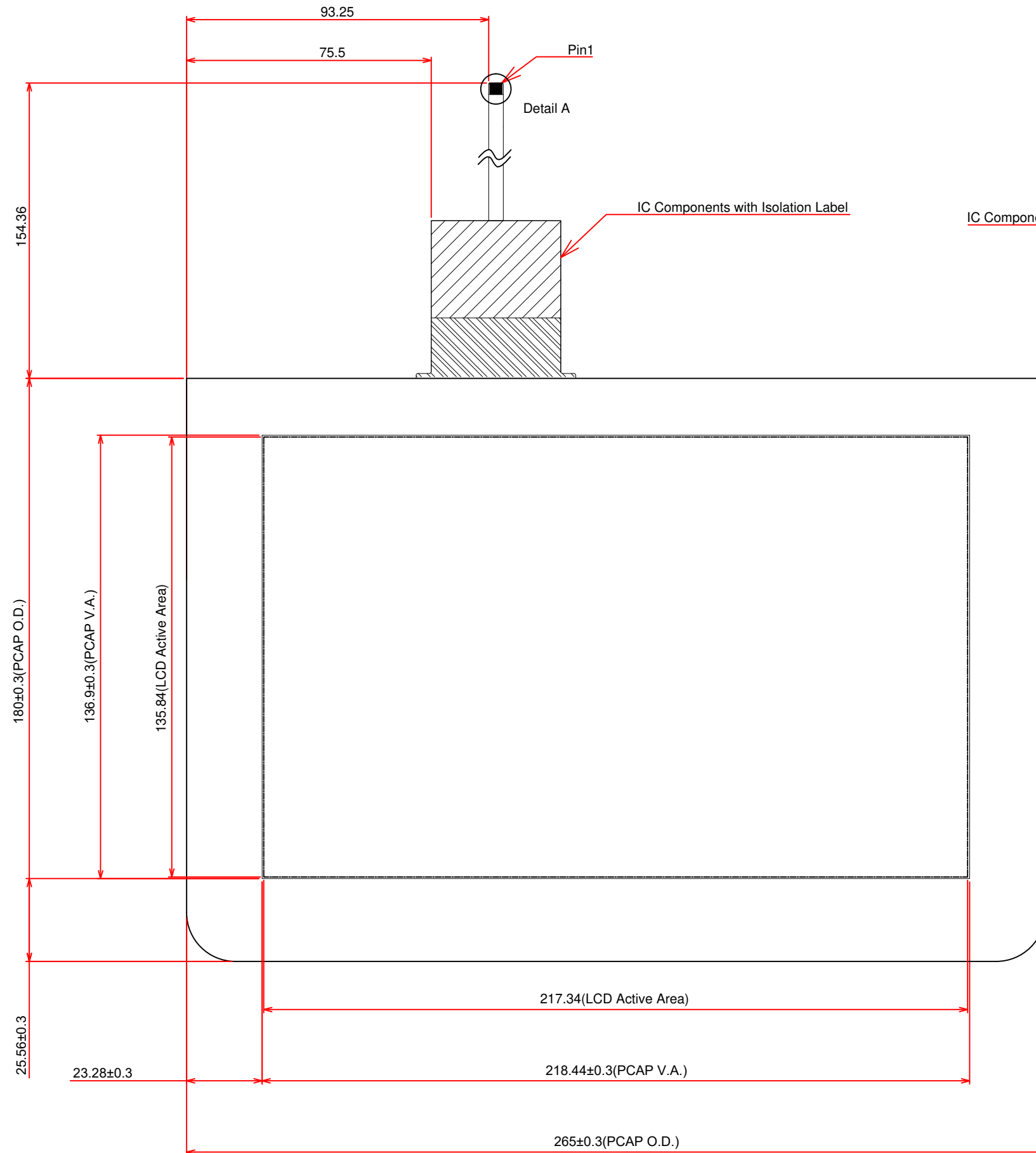
Input color		Red Data								Green Data								Blue Data													
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0						
		MSB								LSB								MSB								LSB					
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0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

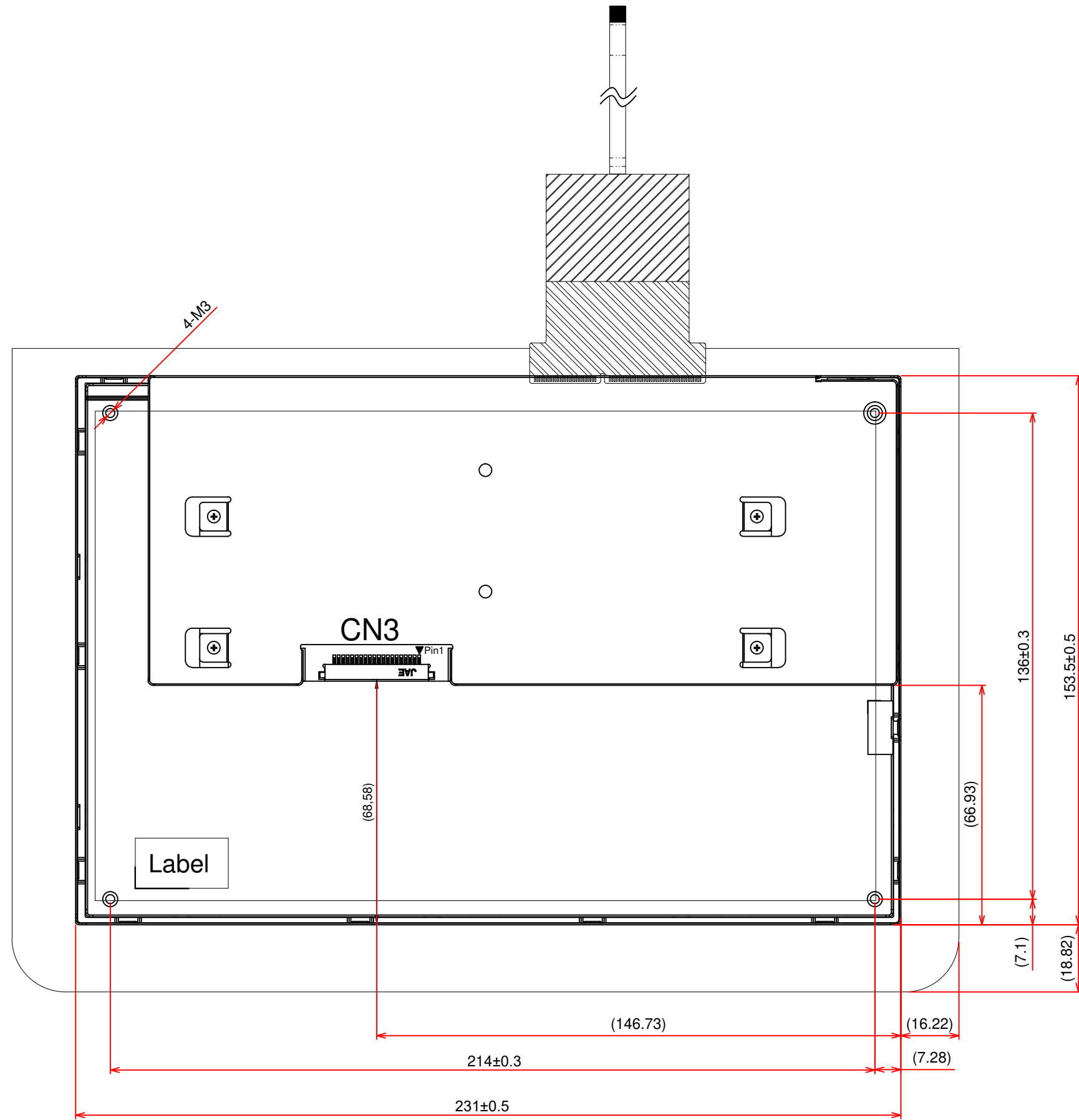
10.1 FRONT VIEW



Detail A

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

10.2 RAER VIEW



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

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 = 2.15	-
Cover Glass	t = 1.8	Strengthened Glass
Surface Hardness	7H	-
Input Method	Through a special stylus or finger	-
FPC Peeling Force	5N min.	Peeling upward by 90°
Touch Panel	10 points	-

11.2 ELECTRICAL CHARACTERISTICS

Item	Symbol	Symbol	Value			Unit	Remarks
			Min.	Typ.	Max.		
Power supply voltage	V _{DD}	V _{DD} -GND	3.0	3.3	3.6	V	-
Power supply voltage for USB	V _{USB}	V _{USB} -GND	3.5	5.0	5.5	V	-
Operation Current	I _{DD}	V _{DD} =3.3V	-	-	100	mA	-
Idle Mode Current	I _{idid}	GND=0V T _a =25°C	-	-	100	mA	-
Input High Level Voltage	V _{IH}	-	V _{DD} -0.8	-	-	V	-
Input Low Level Voltage	V _{IL}	-	-	-	0.8	V	-
Operating Frequency	1/t _{clcl}	-	-	12	-	MHz	-
Operating High Level Voltage	V _{OH}	I=2mA	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 EXC3146,
- Interface : USB
- OS : Windows, Android, Linux
- Firmware information:

Mode Name: SIRIUS_4738

Type Name: PCAP3146UR SERIES

Version: 00_TEST2

12. APPEARANCE STANDARD

The appearance inspection is performed in a dark 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.

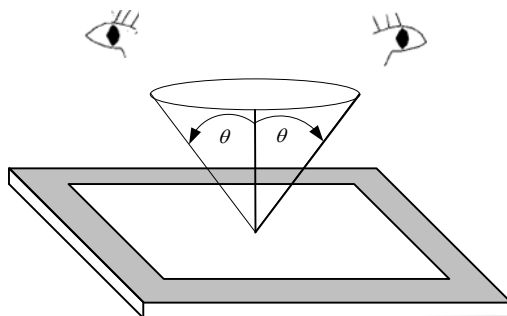


Fig. 12.1

12.1 THE DEFINITION OF LCD ZONE

LCD panel is divided into 2 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.

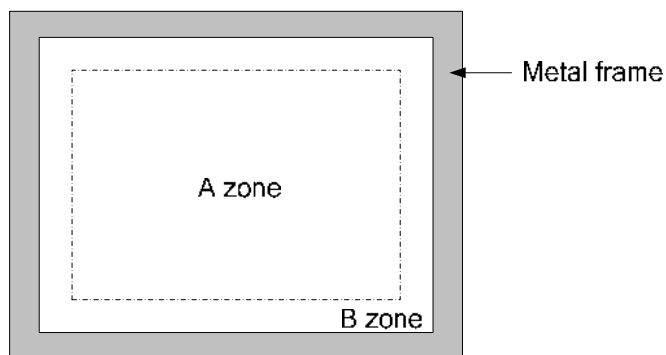


Fig. 12.2

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.

Item	Criteria				Applied zone	
	Length (mm)	Width (mm)	Maximum number	Minimum space		
Scratches	Ignored	$W \leq 0.02$	Ignored	-	A, B	
	$L \leq 40$	$0.02 < W \leq 0.04$	10	-		
	-	$0.04 < W$	Not allowed	-		
	Serious one is not allowed					
Dent	Serious one is not allowed				A	
Wrinkles in polarizer	Serious one is not allowed				A	
Bubbles on polarizer	Average diameter (mm)		Maximum number		A	
	$D \leq 0.3$		Ignored			
	$0.3 < D \leq 0.5$		12			
	$0.5 < D$		Not allowed			
1) Stains 2) Foreign Materials 3) Dark Spot	Filamentous (Line shape)				A, B	
	Length (mm)	Width (mm)	Maximum number			
	$L \leq 2.0$	$W \leq 0.03$	Ignored			
	$L \leq 3.0$	$0.03 < W \leq 0.05$	10			
	$L \leq 2.5$	$0.05 < W \leq 0.1$	1			
	Round (Dot shape)				A, B	
	Average diameter (mm)		Maximum number	Minimum Space		
	$D \leq 0.2$		Ignored	-		
	$0.2 < D \leq 0.3$		10	10 mm		
	$0.3 < D \leq 0.4$		5	30 mm		
	$0.4 < D$		Not allowed	-		
	In total		Filamentous + Round=10			
	Those wiped out easily are acceptable					
	Dot-Defect (Note 1)			Type	Maximum number	A
Bright dot-defect		1 dot	0			
Dark dot-defect				1 dot	5	
				2 adjacent dot	2	
				3 adjacent dot or above	Not allowed	
				In total	5	
In total		5				
Mura	Invisible through 2% ND filter				A (Note 2)	

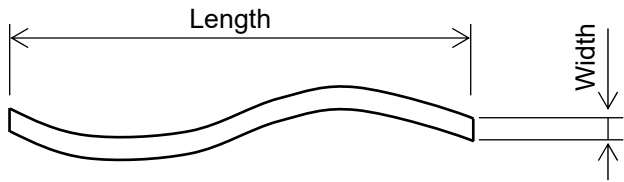


Fig 12.3

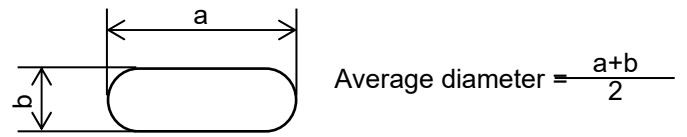


Fig 12.4

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

- The defect area of the dot must be bigger than half of a dot.
- 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.
- 2-adjacent dot is two dot defects.
- 3-adjacent dot is not allowed.

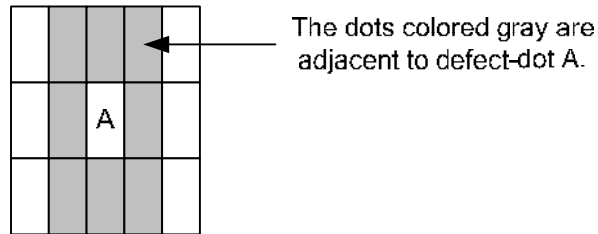
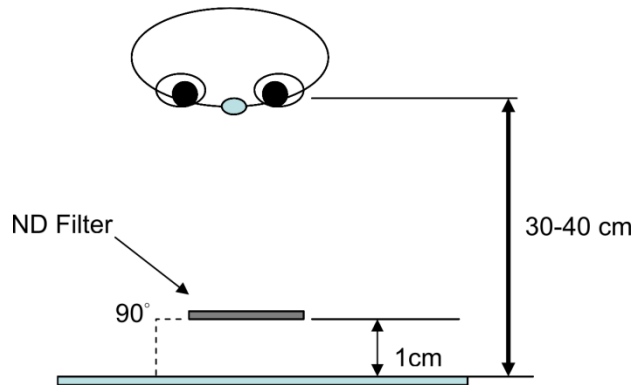


Fig.12.5

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.

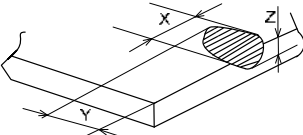
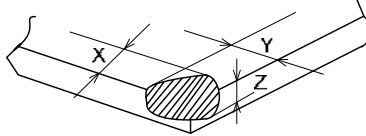
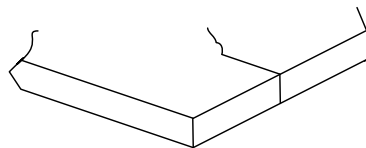


12.3 TOUCH PANEL APPEARANCE SPECIFICATION

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

Item	Criteria			Applied zone
Scratches	Width (mm)	Length (mm)	Maximum number	A
	$W \leq 0.03$	-	Ignored	
	$0.03 < W \leq 0.07$	$L \leq 10$	3	
	$0.07 < W$	$10 < L$	Not allowed	
Foreign materials and spot	Round (Dot shape)			A
	$D \leq 0.2$	Ignored		
	$0.2 < D \leq 0.5$	3; 2-defect distance > 20 mm		
	$0.5 < D$	Not allowed		
	Filamentous (Line shape)			
	Width (mm)	Length (mm)	Maximum number	
	$W \leq 0.03$	-	Ignored	
	$0.03 < W \leq 0.07$	$L \leq 10$	5	
$0.07 < W$	$10 < L$	Not allowed		
Stain	Round (Dot shape)			A
	Average diameter (mm)	Maximum number		
	$D \leq 0.2$	Ignored		
	$0.2 < D \leq 0.5$	2; 2-defect distance > 20 mm		
	$0.5 < D$	Not allowed		
Bubble	Round (Dot shape)			A
	Average diameter (mm)	Maximum number		
	$D \leq 0.2$	Ignored		
	$0.2 < D \leq 0.5$	5; 2-defect distance > 20 mm		
	$0.5 < D$	Not allowed		
Pin hole on printing area	$D \leq 0.1$	Acceptable		B
	$D > 0.1$	Unacceptable		

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

Item	Specifications	
Edge flaw		$X \leq 0.3$ mm $Y \leq 0.2$ mm $Z \leq 1/2$ Thickness
Corner flaw		$X \leq 0.2$ mm $Y \leq 0.2$ mm $Z \leq 1/2$ Thickness
Progressive flaw		Not allowed

13. PRECAUTIONS

13.1 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.

13.2 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 1.96×10^4 Pa. If the area of adding pressure is less than 1 cm^2 , the maximum pressure must be less than 1.96N.

13.3 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° . 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 $\pm 100 \text{ mV}$.

13.4 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 C° ~35 C° 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.

13.5 PRECAUTIONS OF TOUCH PANEL

The housing should not cover the active area of touch panel.

14. DESIGNATION of LOT MARK

1) The lot mark is showing in Fig.14.1. First 4 digits are used to represent production lot, T represented made in Taiwan, and the last 6 digits are the serial number.

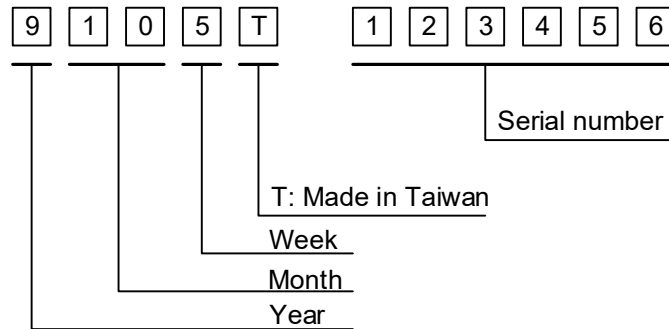


Fig. 14.1

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

Year	Lot Mark
2020	0
2021	1
2022	2
2023	3
2024	4

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.

4) The location of the lot mark is on the back of the display shown in Fig. 14.2.

Label example:

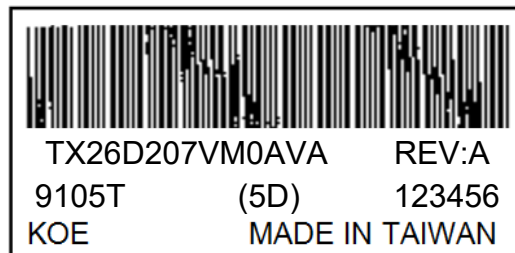


Fig. 14.2