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SPECIFICATION

VXT156HX1B-01

- Preliminary Specification
- Final Specification



Approved By:

Date:

RECORD OF REVISION

Revision Notice	Description	Page	Rev. Date
1	First revision	-	2023/10/20
2	update 8.1 Mechanical Specification	23	2023/11/17

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1. GENERAL DESCRIPTION

1.1 Product Features

- FHD Resolution (1920 * 1080)
- Very High Contrast Ratio: 3000:1
- Ultra Wide Viewing Angle: 178°(H)/178°(V) (CR ≥ 10)
- DE (Data Enable) Mode
- LVDS (Low Voltage Differential Signaling) Interface

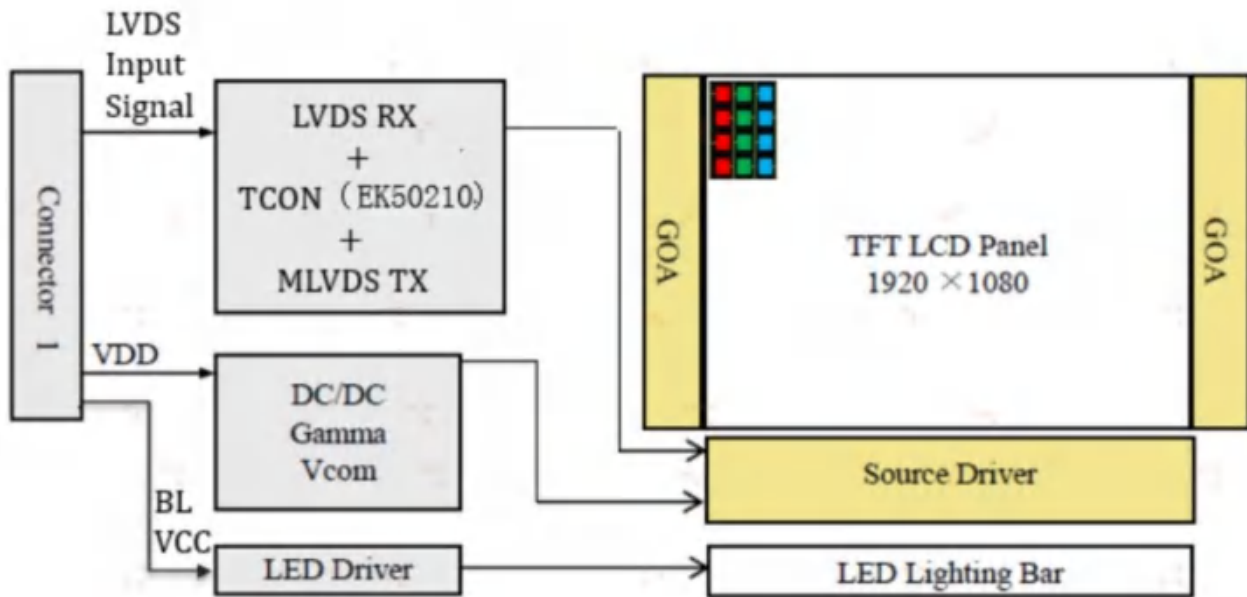


Fig. 1.1 Driver Architecture

1.2 OVERVIEW

VXT156HX1B-01 is a color active matrix liquid crystal display with a light emitting diode (LED) backlight assembly with LED driver. The matrix employs a-Si thin film transistor as the active element. This module is a diagonal 15.6" color active matrix LCD module with 2ch-LVDS interface, which open cell is a transmissive type display operating in the normally black mode. It supports 1920 * 1080 FHD resolution and can display up to 16.7M colors (8bit). Each pixel is divided into Red, Green and Blue sub-pixels which are arranged in vertical stripe.

This module dedicates for Monitor products and provides excellent performance which includes high contrast ratio, high color saturation and high color depth. Open cell comply with RoHS for identification.

1.3 GENERAL Information

Item	Specification	Unit	Note
Active Area	344.16 (H) * 193.59 (V)	mm	
Module Size	351.86 (H) *206.33 (V) * 6.30(D)	mm	With PCB
Module Size	351.86 (H) *206.33 (V) * 3.20(D)	mm	Without PCB
Driving Scheme	a-Si TFT Active Matrix	-	
Number of Pixels	1920 * 1080	pixel	
Pixel Pitch (Sub Pixel)	59.75*179.25	um	
Pixel Arrangement	RGB Vertical Stripe	-	
Display Colors	16.7 M	color	8bit
Display Mode	Transmissive Mode, Normally Black	-	VA Mode
Luminance	235(typ)	cd/m2	
Color Chromaticity	NTSC 72% (typ)		
Contrast Ratio	3000:1(Typ.)		
Weight	0.4	Kg	
View Angle (CR 10)	+89/-89 (H), +89/-89 (V) (Typ.)		
Surface Treatment	Anti-glare, Haze 25%, Hard Coating (3H)		
BLU Type	E-LED	-	

2. ABSOLUTE MAXIMUM RATINGS

2.1 Absolute Maximum Ratings (TA = 25 ± 2 °C)

The followings are maximum values which, if exceeded, may cause damage to the unit.

Item	Symbol	Value		Unit
		Min.	Max.	
Power Supply Voltage	V _{CC}	-0.3	13.2	V
Input Signal Voltage	V _{IN}	-0.3	3.6	V

2.2 Environment Requirement (Based on Victronix’s standard)

(1) Temperature and relative humidity range are shown as below.

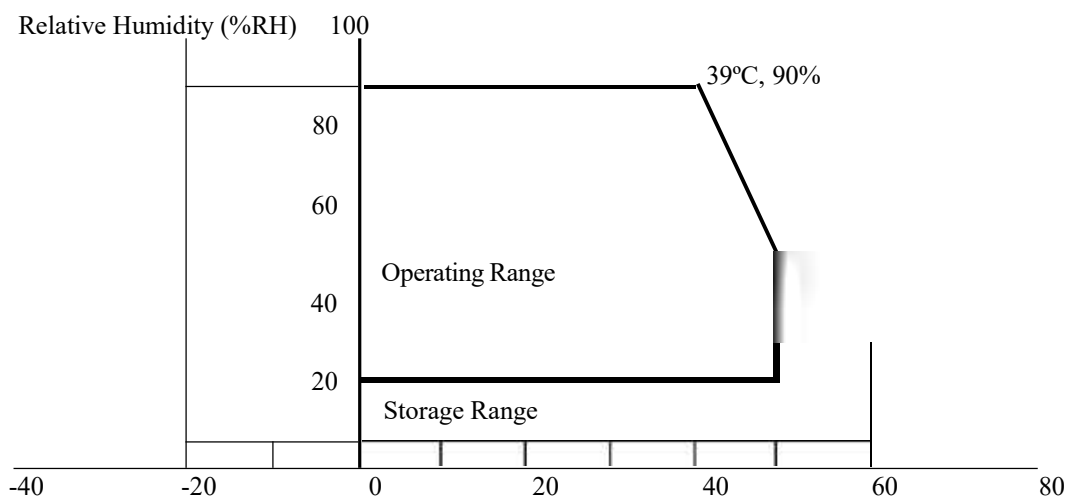


Fig. 2.1 Operating and storage environment

- (a) 90%RH maximum (T_A ≤ 39 °C).
- (b) Wet-bulb temperature should be 39°C maximum (T_A > 39 °C).
- (c) No condensation.

(2) The storage temperature is between - 20 °C to 60 °C, and the operating ambient temperature is between 0 °C to 50 °C. The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or

equal to 65°C with LCD module in a temperature controlled chamber alone. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65°C. The range of operating temperature may degrade in case of improper thermal management in the end product design.

(3) The rating of environment is based on LCD module. Leave LCD cell alone, this environment condition can't be guaranteed. Except LCD cell, the customer has to consider the ability of other parts of LCD module and LCD module process.

2.3 Absolute Ratings of Environment

When storing module as spares for a long time, please follow the precaution instructions:

- (1) Do not store the module in high temperature and high humidity for a long time. It is highly recommended to store the open cell with temperature from 20°C to 30°C in normal humidity (50 ± 10%RH) with shipping package.
- (2) The module should be kept within one month shelf life.

3. ELECTRICAL SPECIFICATIONS

3.1 Open Cell Power Consumption (TA = 25 ± 2 °C)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	VCC	10.8	12	13.2	V	(1)
Rush Current	IRUSH	-	-	3	A	(2)
Power Supply Current	White Pattern	-	0.47	0.57	A	(3) 60Hz
	Mosaic Stripe	-	0.65	0.78	A	
	Black Pattern	-	0.46	0.55	A	
	Horizontal Stripe	-	0.74	0.89	A	
Power Consumption (Mosaic Pattern)	Poc	--	3.7	4.45	Watt	60Hz

Note:

(1) The ripple voltage should be controlled less than 10% of VCC.

(2) Measurement condition: VCC rising time = 470µs.

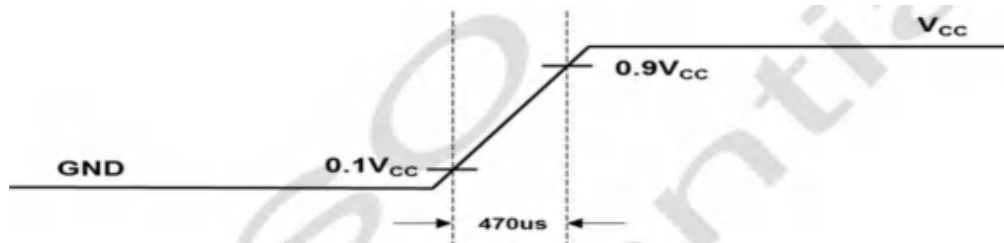


Fig. 3.1 VCC rising time condition

(3) Measurement condition: VCC = 12 V, Ta = 25 ± 2 °C. The test patterns are shown as below.

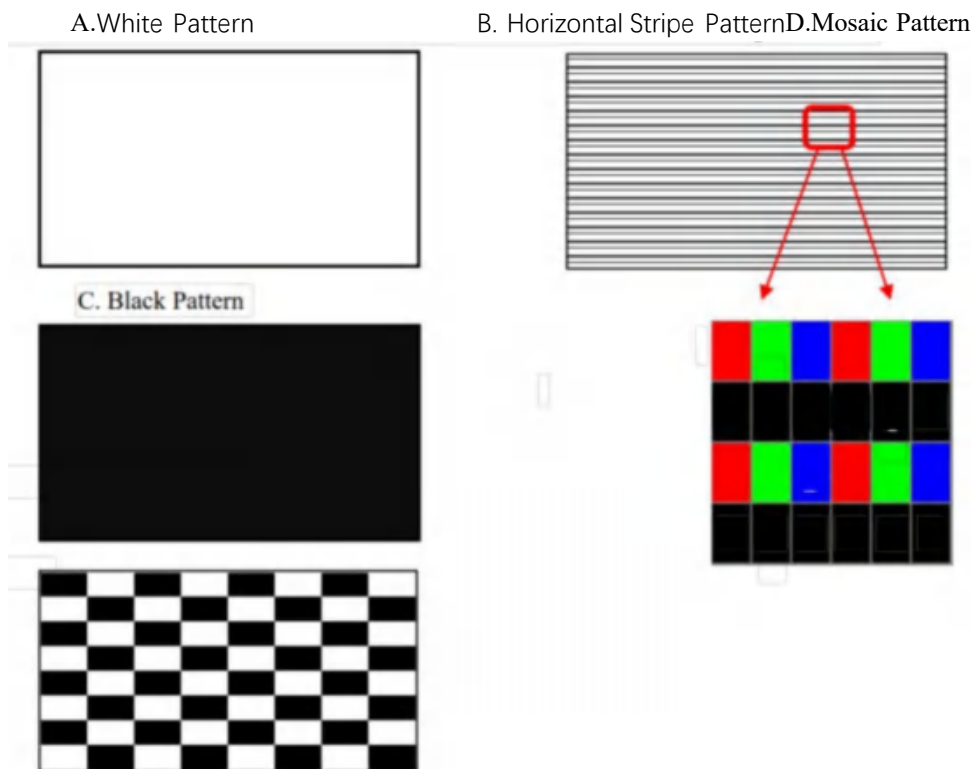


Fig. 3.2 Test patterns

3.2 LVDS Characteristics

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
LVDS Interface	Differential Input High Threshold Voltage	V _{TH}	+100	-	-	mV	(1)
	Differential Input Low Threshold Voltage	V _{TL}	-	-	-100	mV	
	Common Input Voltage	V _{CM}	1.0	1.2	1.4	V	
	Differential Input Voltage	V _{ID}	100	-	600	mV	
	Terminating Resistor	R _T	87.5	100	112.5	ohm	
CMOS Interface	Input High Threshold Voltage	V _{IH}	2.7	-	3.3	V	
	Input Low Threshold Voltage	V _{IL}	0	-	0.7	V	

Note:

- (1) The product should be always operated within above ranges.
- (2) The LVDS input signal has been defined as follows:

Single end Signals

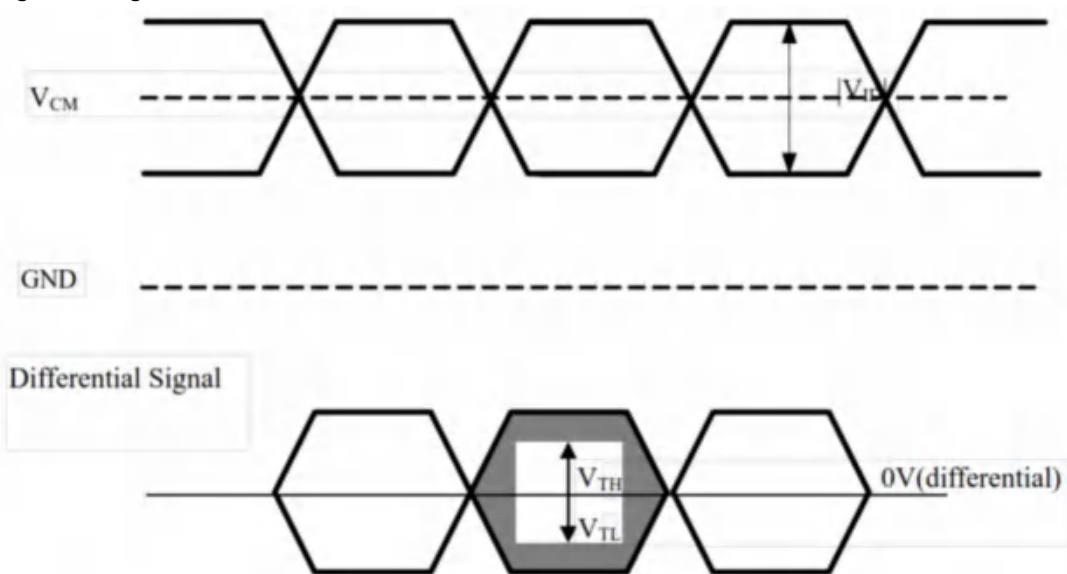


Fig. 3.3 LVDS input signal

3.3 Temperature Specifications

Parameter	Symbol	Spec			Unit	Note
		Min.	Typ.	Max.		
Source driver	T _{DRIVER}	-	-	115	°C	(1)
PMIC	T _{PMIC}	-	-	100	°C	(1)
TCON	T _{TCON}	-	-	105	°C	(1)

Note:

- (1) Any point on the IC surface must be less than Max. specification under any condition ,If the surface temperature is out of the specification, thermal solutions should be applied to avoid to be damaged.

3.4 Driver IC ESD Specification

The Electro-Static Discharge tolerance of Source COF IC is $\pm 2\text{KV}$ tested by ESD Gun. Especially if the LCD module is designed with the Plastic Bezel, we suggest ESD protection solutions should be applied to avoid be damaged, as shown in Fig.3.4

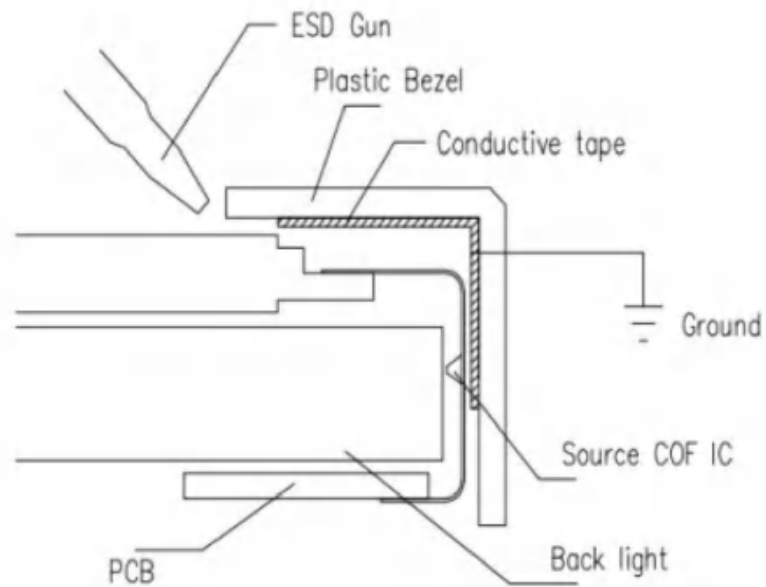


Fig. 3.4 Source COF IC ESD protection

4. Input Terminal Pin Assignment

4.1 Interface Pin Assignment

CN1: 300E40-0010RA-G3-D (CT) or equivalent (see Note (1))

Pin No.	Symbol	Description	Note
1	RxO0-	Negative LVDS differential data input (Odd data)	
2	RxO0+	Positive LVDS differential data input (Odd data)	
3	RxO1-	Negative LVDS differential data input (Odd data)	
4	RxO1+	Positive LVDS differential data input (Odd data)	
5	RxO2-	Negative LVDS differential data input (Odd data)	
6	RxO2+	Positive LVDS differential data input (Odd data)	
7	GND	Ground	
8	RxOCLK-	Negative LVDS differential clock input (Odd clock)	
9	RxOCLK+	Positive LVDS differential clock input (Odd clock)	
10	GND	Ground	
11	RxO3-	Negative LVDS differential data input (Odd data)	
12	RxO3+	Positive LVDS differential data input (Odd data)	
13	GND	Ground	
14	RxE0-	Negative LVDS differential data input (Even data)	
15	RxE0+	Positive LVDS differential data input (Even data)	
16	RxE1-	Negative LVDS differential data input (Even data)	
17	RxE1+	Positive LVDS differential data input (Even data)	
18	RxE2-	Negative LVDS differential data input (Even data)	
19	RxE2+	Positive LVDS differential data input (Even data)	
20	GND	Ground	
21	RxECLK-	Negative LVDS differential clock input (Even clock)	
22	RxECLK+	Positive LVDS differential clock input (Even clock)	
23	GND	Ground	
24	RxE3-	Negative LVDS differential data input (Even data)	
25	RxE3+	Positive LVDS differential data input (Even data)	
26	GND	Ground	
27	LCD_VCC	LCD VCC(12V)	
28	LCD_VCC	LCD VCC(12V)	
29	BIST	LCD self-test (Normal mode: NC or pull L; BIST mode: pull H)	
30	BL_ENABLE	Backlight on/off	(+3.3V Input)
31	BL_PWM_DIM	System PWM	
32	BL_POWER	LED Power Supply Input Voltage(12V)	
33	BL_POWER	LED Power Supply Input Voltage(12V)	
34	BL_POWER	LED Power Supply Input Voltage(12V)	

35	BL_POWER	LED Power Supply Input Voltage(12V)	
36	GND	Ground	
37	GND	Ground	
38	GND	Ground	
39	ID1	Reserved PIN, Default 'H' , Recommend NC	(2)
40	ID2	Reserved PIN, Default 'L' , Recommend NC	(2)

Note:

(1)The direction of pin assignment is shown as below:

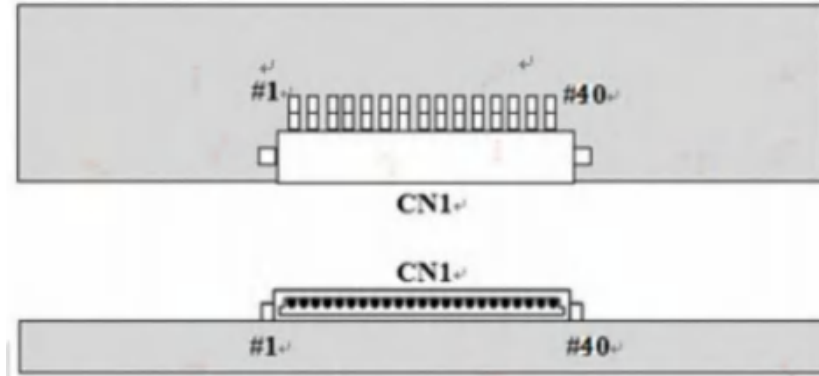


Fig. 4.1 LVDS connector direction sketch map

(2)Please let it open ifit do not used.

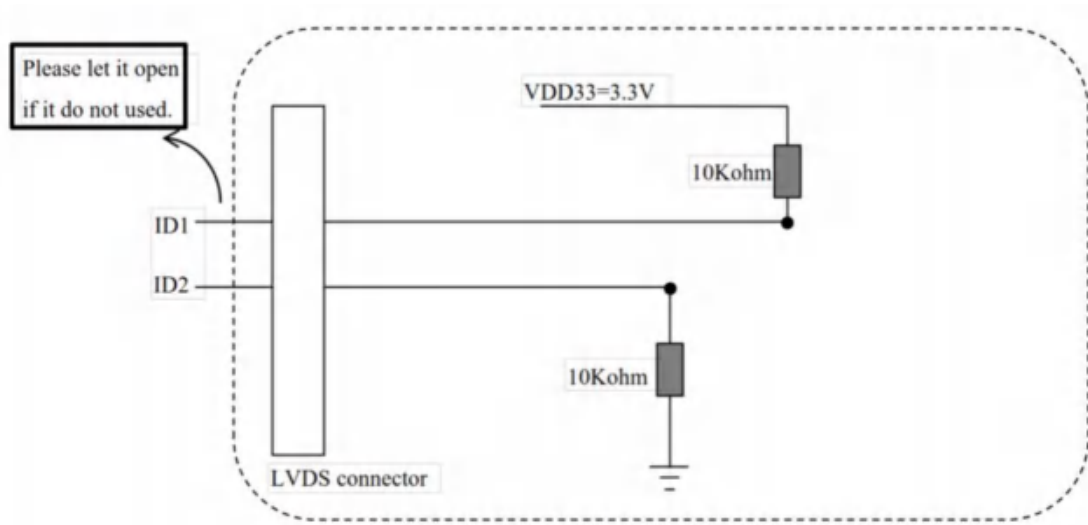


Fig. 4.2 ID1/ID2 set

4.2 Block Diagram of Interface

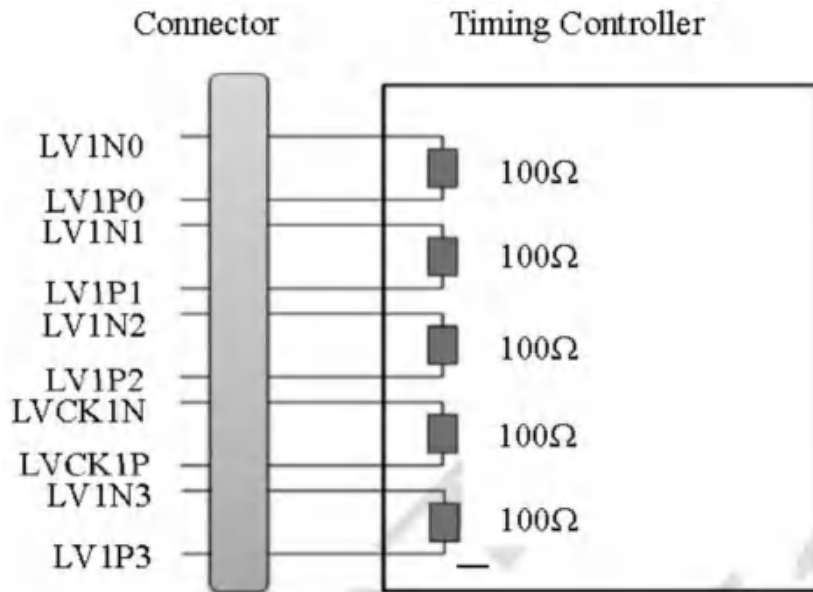


Fig. 4.4 Block diagram of interface

Attention:

- (1) This open cell uses a 100 ohms (Ω) resistor between positive and negative lines of each receiver input.
- (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line respectively.

4.3 LVDS Interface

4.3.1 VESA Format

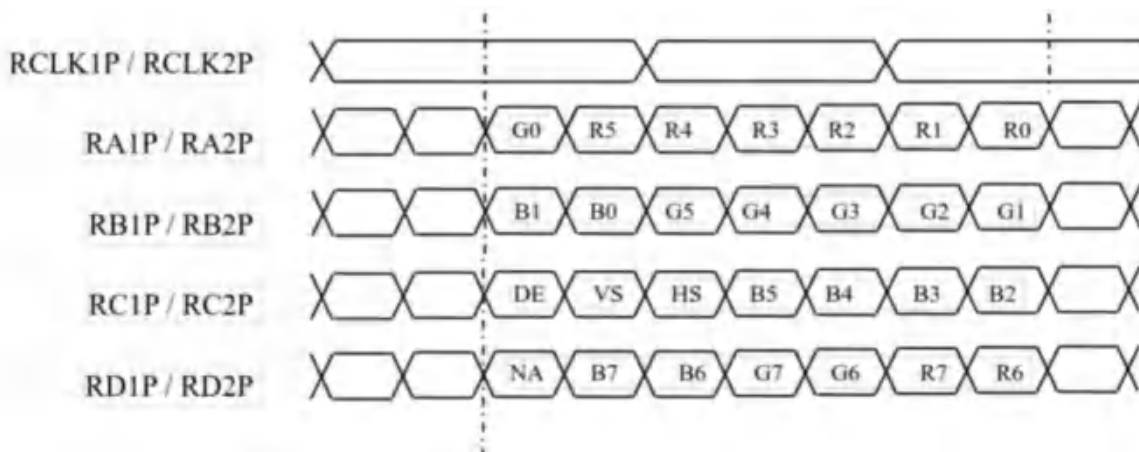
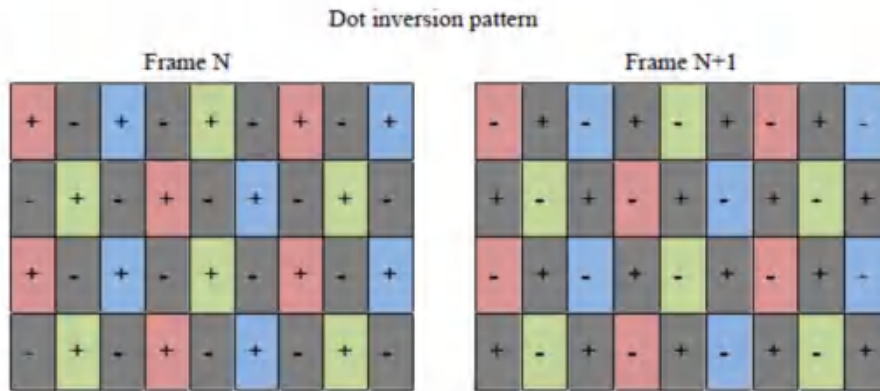


Fig. 4.5 VESA format

4.4 Flicker Pattern

Flicker should be adjusted by the Dot on/off pattern, where are displayed alternately at vertical line. (Dot inversion)



5. Interface Timing

5.1 Timing Table (DE Only Mode)

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	Fclk (=1/Tclk)	64	74.25	96	MHz	(1) (2)
	Input cycle to cycle jitter	Trcl	-	-	200	ps	(3)
	Spread spectrum modulation range	Fclk_mod	Fclk-2%	-	Fclk+2%	MHz	(4)
	Spread spectrum modulation frequency	FSSM	60	-	200	KHz	
LVDS Receiver Data	Receiver Skew Margin	TRSM	-400	-	400	ps	(5)
Vertical Active Display Term	Frame Rate	F	48	60	75	Hz	
	Total	TV	1092	1125	1380	TH	TV = TVD + TVB
	Display	TVD	1080				
	Blank	TVB	12	45	300	TH	
Horizontal Active Display Term	Total	TH	1046	1100	1174	TCLK	TH = THD + THB
	Display	THD	960				
	Blank	THB	86	140	214	TCLK	

Note:

(1) The TFT LCD open cell is operated in DE only mode, H sync and V sync input signal have no effect on normal operation.

(2) Please make sure the range of pixel clock follows the following equations:

$$Fclk(max) \geq Fmax \times Tv \times Th \quad Fmin \times Tv \times Th \geq Fclk(min)$$

Main frequency Max is 96Mhz without spread spectrum

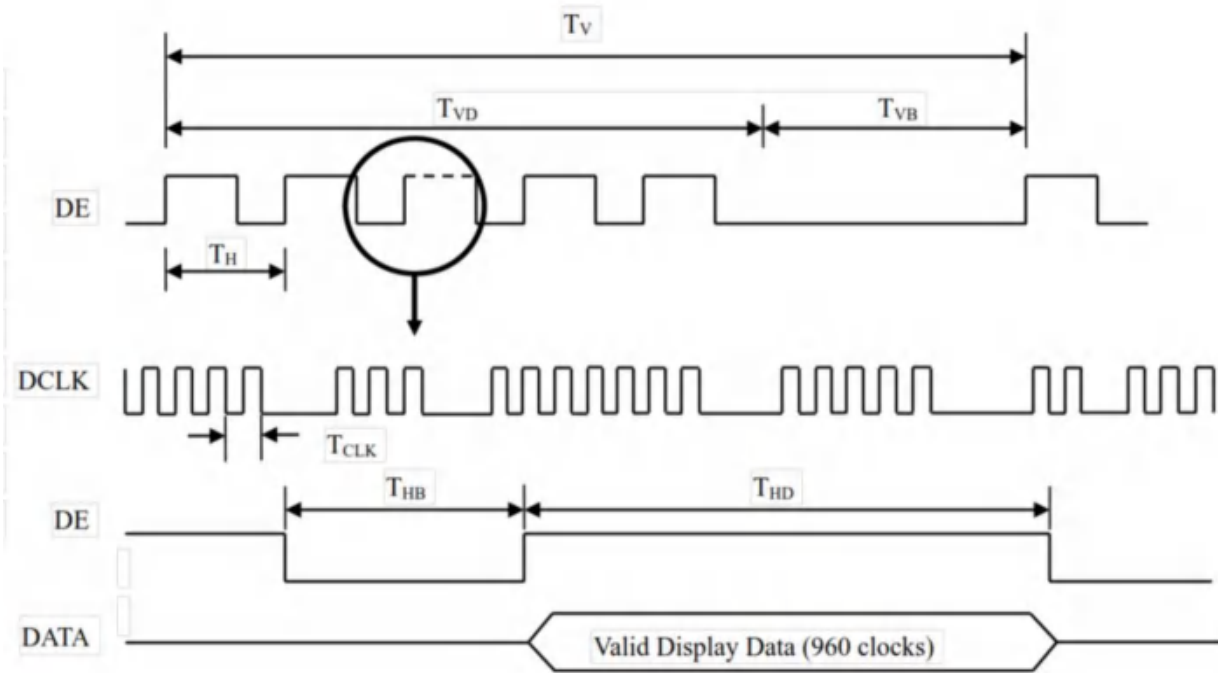


Fig. 5.1 Interface signal timing diagram

(3)The input clock cycle-to-cycle is defined as below figures.

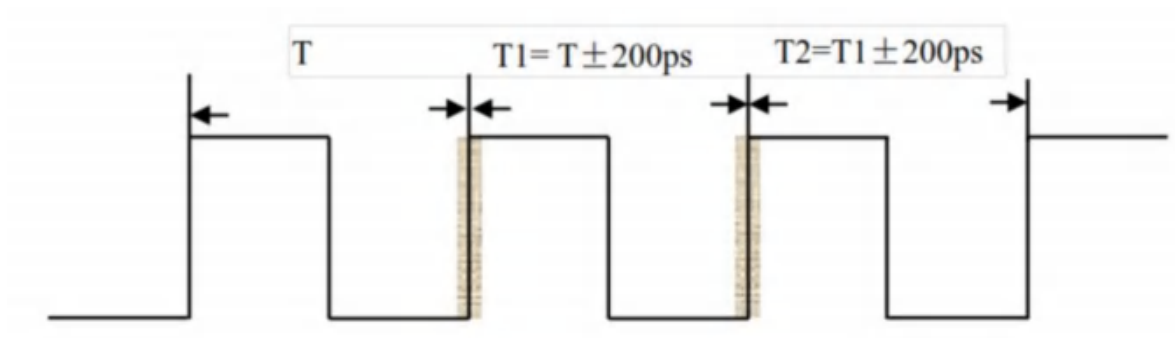


Fig. 5.2 Jitter

(4) The SSCG (Spread Spectrum Clock Generator) is defined as the following figure.

The LVDS SSCG's suggestion is off by default, SOC board must test all validation if SOC board open the LVDS SSCG.

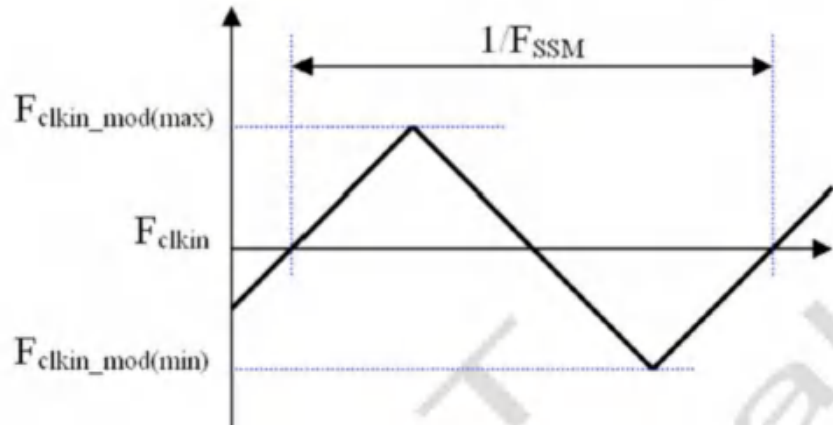


Fig. 5.3 SSCG

(5) The LVDS timing diagram and setup/hold time is defined and showed as the following figure.

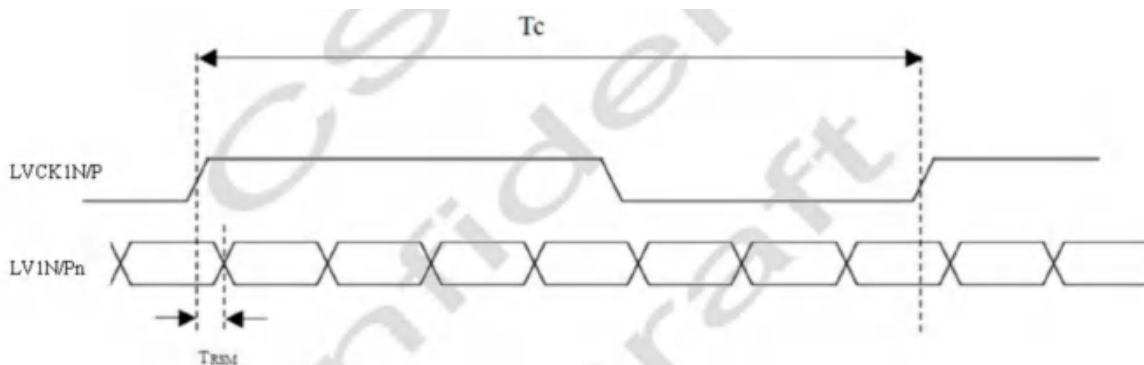


Fig.5.4 LVDS receive interface timing diagram

5.2 Power On/Off Sequence

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

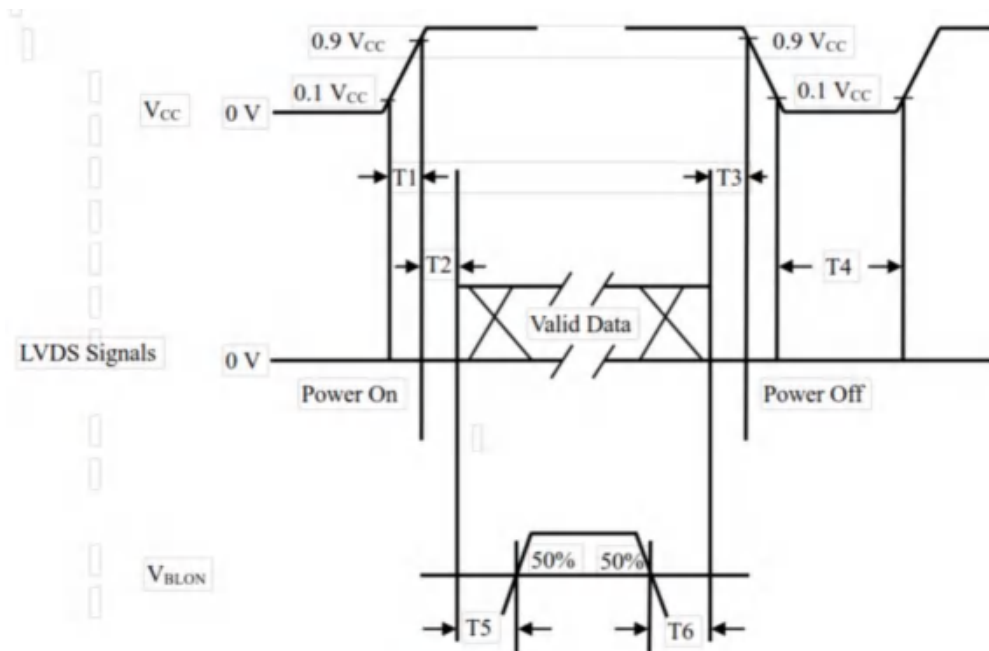


Fig.5.5 Power on/off sequence

Parameter	Values			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10.0	ms
T2	0.0	-	50	ms
T3	0.0	-	50	ms
T4	1000.0	-	-	ms
T5	500.0	-	-	ms
T6	100.0	-	-	ms

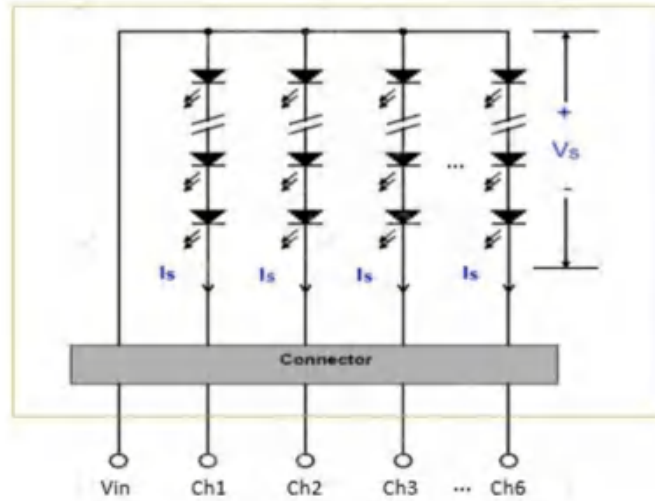
Attention:

- (1) The supply voltage of the external system for the open cell input should follow the definition of V_{CC}.
- (2) When the customer's backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.
- (3) In case that V_{CC} is in off level, please keep the level of input signals on the low or high impedance. If T₂ < 0, that may cause electrical overstress.
- (4) T₄ should be measured after the module has been fully discharged between power off and on period.
- (5) Interface signal shall not be kept at high impedance when the power is on.

6. Backlight Unit

6.1 Connector Pin Assignment

The following shows the block diagram of the 15.6 inch Backlight Unit. It includes 54 pcs LED in the LED lightbar. (6 strings and 9 pcs LED in one string).

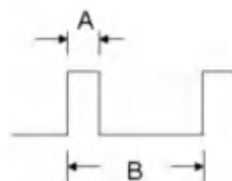


Pin#	Symbol	Description	Remark
1	Vout	LED anode connection	
2	Vout	LED anode connection	
3	Vout	LED anode connection	
4	NC	NC	
5	LED	LED Cathode connection	
6	LED	LED Cathode connection	
7	LED	LED Cathode connection	
8	LED	LED Cathode connection	
9	LED	LED Cathode connection	
10	LED	LED Cathode connection	

6.2 Absolute Maximum rating

Permanent damage may occur if exceeding the following maximum rating.

Symbol	Description	Min	Max	Unit	Remark
Is	LED String Current	0	30	[mA]	100%duty ratio
			60	[mA]	Duty ratio≤10% Pulse time=10ms



$$\text{Duty ratio} = (A/B) \times 100\%; \text{ (A: Pulse time, B: Period)}$$

6.3 Recommended Operating Condition

Symbol	Description	Min.	Typ.	Max.	Unit	Remark
Is	LED String Current	22.5	25	27.5	[mA]	100% duty ratio of LED chip
Vs	LED String Voltage	24.3	26	28.8	[Volt]	(1)
PBLU	LED Light Bar Power Consumption	4.05	4.32	4.59	[Watt]	(2)
LTLED	LED Life Time	15,000	-	-	[Hour]	If = 25mA (3)
V _{BL-EN}	Backlight On	1.6	3.3	3.6	V	
	Backlight Off	0	0	0.6	V	
V _{BL-PWM}	High level	1.6	3.3	3.6	V	
	Low level	0	0	0.6	V	
F _{PWM}	PWM Control Frequency	0.1	1	20	KHz	

Note:

(1): $V_s(\text{Typ.}) = V_f(\text{Typ.}) \times \text{LED No. (one string has 9 LEDs)}$;

The same equation to calculate $V_s(\text{Min.})$ & $V_s(\text{Max.})$ for respective $V_f(\text{Min.})$ & $V_f(\text{Max.})$

(2): $P_{BLU}(\text{Typ.}) = V_s(\text{Typ.}) \times I_s(\text{Typ.}) \times 6$; (6 is total String No. of LED Light bar)

$P_{BLU}(\text{Max.}) = V_s(\text{Max.}) \times I_s(\text{Typ.}) \times 6$;

(3): Definition of life time:

a. Brightness of LED becomes to 50% of its original value

b. Test condition : $I_s = 25\text{mA}$ and 25°C (Room Temperature)

7. Optical Characteristics

7.1 Measurement Conditions

The table below is the test condition of optical measurement.

Item	Symbol	Value	Unit
Ambient Temperature	T _A	25 ± 2	°C
Ambient Humidity	H _A	50 ± 10	%RH
Supply Voltage	V _{CC}	12 ± 1.2	V
Driving Signal	Refer to the typical value in Chapter 3: Electrical Specification		
Vertical Refresh Rate	F _R	60	Hz

To avoid abrupt temperature change during optical measurement, it's suggested to warm up the LCD module more than 20 minutes after lighting the backlight and in the windless environment.

To measure the LCD Module, it is suggested to set up the standard measurement system as Fig. 7.1. The measuring area S should contain at least 500 pixels of the LCD cell as illustrated in Fig. 7.2 (A means the area allocated to one pixel). In this model, for example, the minimum measuring distance Z is 370mm when θ is 2 degree. Hence, 500mm is the typical measuring distance. This measuring condition is referred to 301-2H of VESA FPDM 2.0 about viewing distance, angle, and angular field of view definition.

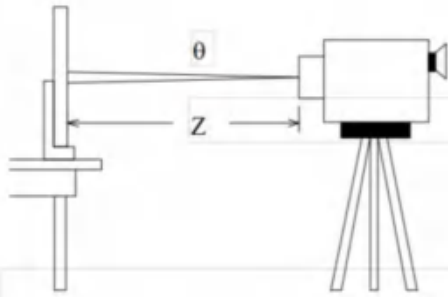


Fig. 7.1 The standard set-up system of measurement

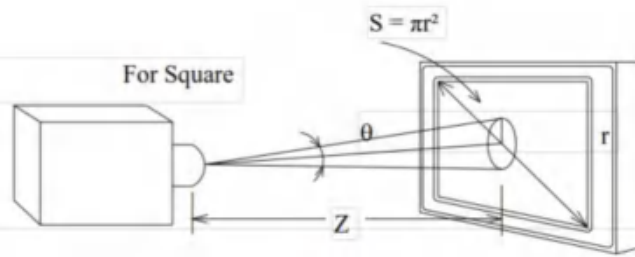


Fig. 7.2 The area S contains at least 500 pixels to be measured

$$N = \frac{S}{A} \geq 500 \text{ pixels}$$

N means the actual number of the pixels in the area S.

7.2 Optical Specifications

The table below of optical characteristics is measured by MINOLTA CS2000, ELDIM OPTI Scope-SA and ELDIM EZ contrast in dark room.

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Static Contrast Ratio	CR	Normal direction at center point with CSOT's BLU ILED = 25mA	2000	3000	-	-	(1) (2)	
Response Time	Ton+Toff			30	35	ms	(3)	
Crosstalk	CT-127			-	-	1.2	-	(2) (5)
Luminance (center position)	L			210	235	-	cd/m ²	(4)
Luminous Uniformity	5points 13points		ΔL5 ΔL13	80 62.5	85 70	-	%	(4) (4)
Color Chromaticity (CIE1931)	White		WX	Typ. - 0.03	0.313	Typ. + 0.03	-	(2) (6)
			WY		0.329		-	
	Red		RX		0.650		-	
			RY		0.338		-	
	Green		GX		0.312		-	
		GY	0.615		-			
	Blue	BX	0.150		-			
		BY	0.071		-			
Color Gamut	CG		68	72	-	% NTSC		
Viewing Angle	Horizontal	θH+	80	89	-	Deg.	(7)	
		θH-	80	89	-			
	Vertical	θV+	80	89	-			
		θV-	80	89	-			

Note:

(1) Definition of static contrast ratio (CR):

It's necessary to switch off all the dynamic and dimming function when measuring the static contrast ratio.

Static Contrast Ratio (CR) = 

CR-W is the luminance measured by LMD (light-measuring device) at the center point of the LCD module with full-screen displaying white. The standard setup of measurement is illustrated in Fig. 7.3; CR-D is the luminance measured by LMD at the center point of the LCD module with full-screen displaying black. The LMD in this item is CS2000.

(2) The LMD in the item could be a spectrometer such as (KONICA MINOLTA) CS2000, CS1000 (TOPCON), SR-UL2 or the same level spectrometer. Other display color analyzer (KONICA MINOLTA) CA210, CA310 or (TOPCON) BM-7 could be involved after being calibrated with a spectrometer on each stage of a product.

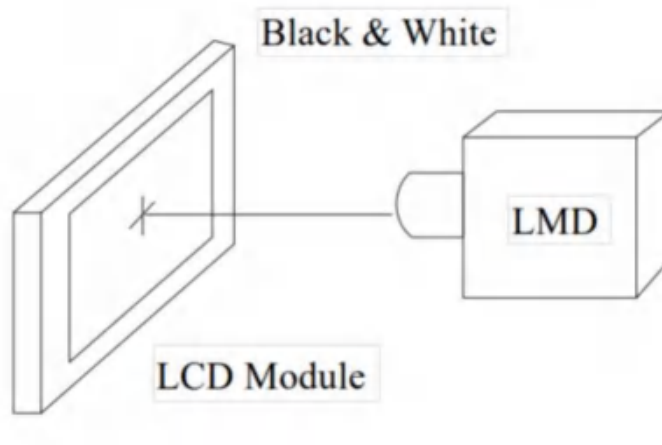


Fig. 7.3 The standard setup of CR measurement

(3) The electro-optical response time measurements shall be made as Figure 7.4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Ton, and 90% to 10% is Toff.

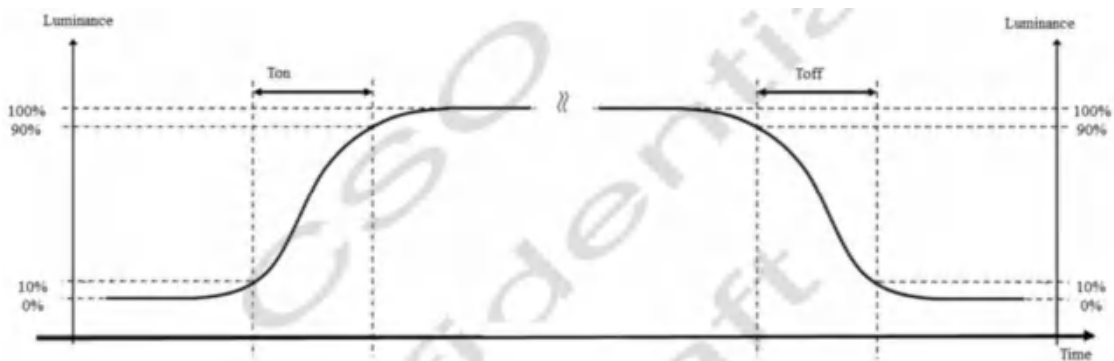


Fig. 7.4 The definition of Ton, Toff

All the transition time is measured at the center point of the LCD module by ELDIM OPTI Scope-SA.

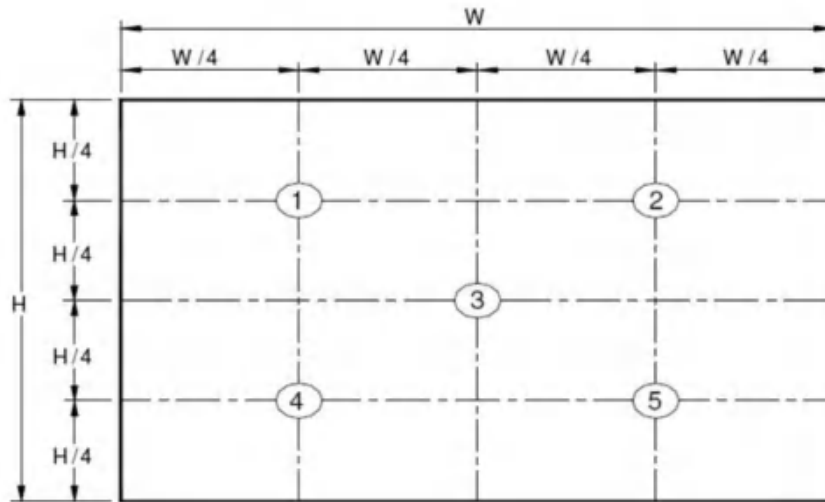
(4) Definition of Uniformity:

Definition of Luminance and Luminance uniformity:

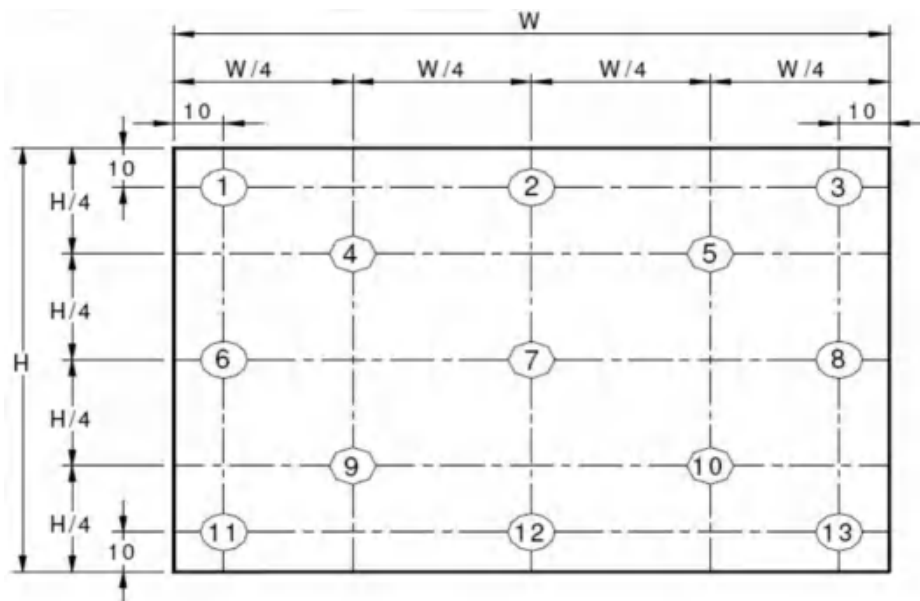
Luminance: To measure at the center position "3" on the screen (NO.3).

Luminance uniformity: L_w (MAX) and L_w (MIN) are the maximum and minimum luminance value measure at the position "1~9" on the screen (NO.1~9) and the equation:

$$\Delta L_w = L_w(\text{MIN}) / L_w(\text{MAX}) \times 100\%$$



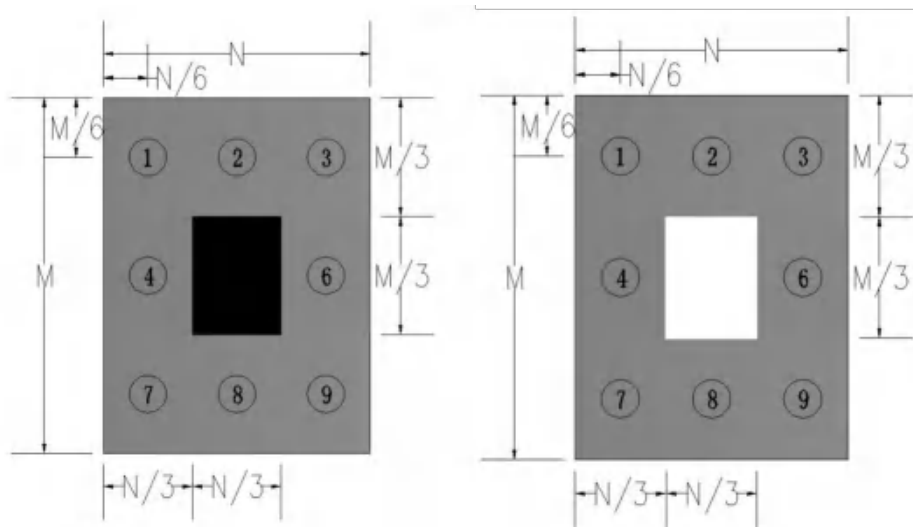
White Luminance and Uniformity Measurement Locations (5 points)



Uniformity Measurement Locations (13 points)

(5) Definition of the crosstalk:

- The point should be marked is, the background of Cross-talk Test Pattern- "gray " are defined as 50% gray scale .
- $\Delta B_{pn} = B_{pn}(\text{gray}) / B_{pn}(\text{white})$
- Which n means the dot No. In the Cross-talk Test Pattern ;
- $B_{pn}(\text{gray})$ means the brightness of the No.n spots in Cross-talk Test Pattern;
- $B_{pn}(\text{white})$ means the brightness of the No.n spots in Full white Test Pattern;
- $\Delta B_p(\text{Max.}) = \text{Maximum value in } \Delta B_{p1} \sim \Delta B_{p9}, \text{ except the No. 5 spot.}$
- $\Delta B_p(\text{Min.}) = \text{Minimum value in } \Delta B_{p1} \sim \Delta B_{p9}, \text{ except the No.5 spot.}$
- $\Delta CT = \Delta B_p(\text{Max.}) / \Delta B_p(\text{Min.}).$



Cross-talk Test Pattern

(6) Definition of color chromaticity:

Each chromaticity coordinates (x, y) are measured in CIE1931 color space when full-screen displaying primary color R, G, B and white. The color gamut is defined as the fraction in percent of the area of the triangle bounded by R, G, B coordinates and the area is defined by NTSC 1953 color standard in the CIE color space. Chromaticity coordinates are measured by CS2000 and the standard setup of measurement is shown in Fig. 7.6.

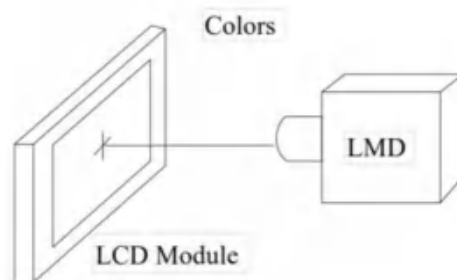


Fig. 7.6 The standard setup of color chromaticity measurement

(7) Definition of viewing angle coordinate system (θ_H , θ_V):

The contrast ratio is measured at the center point of the LCD module. The viewing angles are defined at the angle that the contrast ratio is larger than 10 at four directions relative to the perpendicular direction of the LCD module (two vertical angles: up θ_{V+} and down θ_{V-} ; and two horizontal angles: right θ_{H+} and left θ_{H-}) as illustrated in Fig. 7.7. The contrast ratio is measured by ELDIM EZ Contrast.

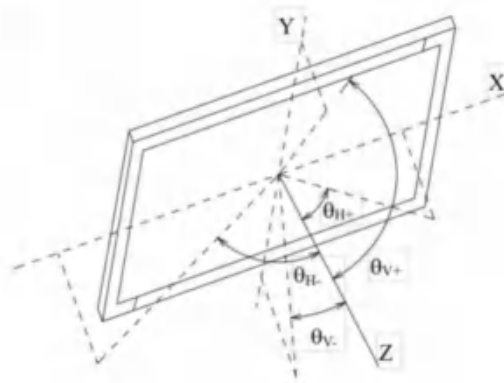


Fig. 7.7 Viewing angle coordination system

8. Mechanical Characteristics

8.1 Mechanical Specification

环保要求■ RoHS2.0■ 无卤要求■ REACH

Notes:

1. Unit: mm.
2. Do not scale drawing.
3. All radii without dimension R0.2.
4. \sqrt{n} Modification Mark.
5. draft angle: 1°
6. Backlight luminance: :200cd/m² (MIN), 220cd/m² (TYP)
7. Luminance uniformity: 75%(min)(min/max*100%)
8. UnSpecified Tolerance is ±0.5
9. Operation conditions: If= 120mA, Vf=25.2-29.7V
Color coordinate: X=0.27-0.35, Y=0.28-0.36
10. All materials comply with RoHS
11. The measured value of luminance and color coordinate bases FX's BM-7
12. Check item: 1~9

电路图:

Backlight LED9串6并54颗 Circuit

9	Double sided stick (双面胶)	2
8	HOUSING (塑胶框)	1
7	FPC(柔性电路板)	1
6	LED (发光二极管)	54
5	ICP(背光片)	2
4	Diffuser film (扩散片)	1
3	Light guide plate (导光板)	1
2	Reflector film (反射膜)	1
1	Rear iron frame (下铁框)	1
	TITLE	Quantity

REV.	DESCRIPTION	DATE	DESIGNER	SHEET	1/1
02					
01	亮度规格对标更正	2023-11-14	SMY	UNIT: mm	■■■■ HUF
NEW	初版制定	2023-10-19	SMY	SCALE: 1:1:1	■■■■ TBX ■■■■ LCM

Victronix Tecenstar INT'L Co., LTD

UNIT: mm ■■■■ HUF ■■■■ LCM

SCALE: 1:1:1 ■■■■ TBX ■■■■ 156FY01

REVISIONS

■■■■ ■■■■ 20 23-10-19 ■■■■

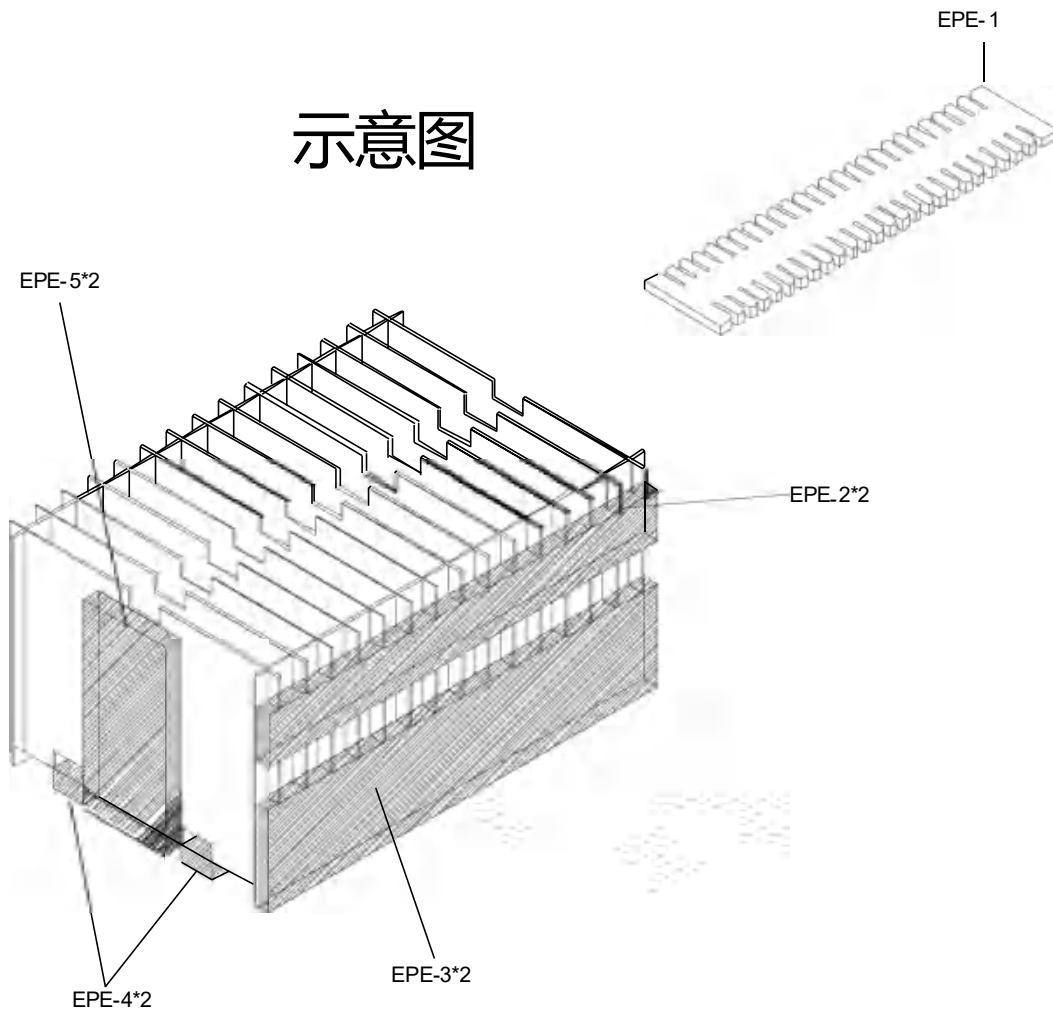
SMY ■■■■ 01

8.2 Packing

Carton Packing

(1) Carton Dimension: 470mm(L) X 350mm(W) X 305mm(H)

(2) Package Quantity in one Carton: 30pcs



Pallet Packing.

(1) 40 Carton (max.) / 1 pallet

(2) Pallet: 1200(L) X 1200(W) X 150(H) mm

(3) Pallet stack: 1200(L) X 1200(W) X 1700(H) mm

9. Precautions

9.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

9.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. We do not warrant the module, if customers disassemble or modify the module.

9.3 Breakage of LCD Panel

9.3.1. If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

9.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.

9.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

9.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

9.4 Electric Shock

9.4.1. Disconnect power supply before handling LCD module.

9.4.2. Do not pull or fold the CCFL cable.

9.4.3. Do not touch the parts inside LCD modules and the fluorescent lamp's connector or cables in order to prevent electric shock.

9.5 Absolute Maximum Ratings and Power Protection Circuit

9.5.1. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

9.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

9.5.3. It's recommended to employ protection circuit for power supply.

9.6 Operation

9.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

9.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

9.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

9.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may cause deformation or color fading.

9.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

9.7 Static Electricity

9.7.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence. 10.7.2 Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

9.8 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

9.9 Disposal

When disposing LCD module, obey the local environmental regulations.