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Custom Display

Production Custom designs Installation

Mechanical design



LCD MODULE SPECIFICATION

Customer: _____
Model Name: ET101WX03-M
Date: 2020/04/02
Version: 00

For Customer's Acceptance

Approved by	Comment

Approved By	Checked By	Prepared By
Lee	CoCo	WG

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1. General Specifications

No.	Item	Specification	Remark
1	LCD size	10.1 inch	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1280(W) RGB x800(H)	
4	Display mode	Normally Black, Transmissive	
5	Dot pitch	0.1695(W) x 0.1695(H)	
6	Active area	216.96(W) x 135.6(H) mm	
7	Module size	229.60(W) ×148.8(H) ×5.9(D) mm	
8	View direction	ALL	O 'clock
9	Surface treatment	Hard coating	
10	Color arrangement	RGB-stripe	
11	Interface	LVDS	
12	Lcm power consumption	7.4W	TYP.
13	Drive IC	TBD	

Note 1: Refer to Assembly Drawing.

2. Pin Assignment

FPC Connector is used for the module electronics interface. The recommended model is HD1S040HA1 or equivalent

Pin No	Symbol	I/O	Function	Remark
1	NC	-	No Connection	
2-4	VDD	P	Power supply	
5	NC	-	No Connection	
6-7	NC	-	No Connection	
8	RIN0-	I	-LVDS Differential Data Input	
9	RIN0+	I	+LVDS Differential Data Input	
10	GND	P	Ground	
11	RIN1-	I	-LVDS Differential Data Input	
12	RIN1+	I	+LVDS Differential Data Input	
13	GND	P	Ground	
14	RIN2-	I	-LVDS Differential Data Input	
15	RIN2+	I	+LVDS Differential Data Input	
16	GND	P	Ground	
17	LVDS_CLK-	I	-LVDS Differential Clock Input	
18	LVDS_CLK+	I	+LVDS Differential Clock Input	
19	GND	P	Ground	
20	RIN3-	I	-LVDS Differential Data Input	
21	RIN3+	I	+LVDS Differential Data Input	
22	GND	P	Ground	
23-24	NC	-	No Connection	
25	GND	P	Ground	
26	NC	-	No Connection	
27	NC	-	No Connection	
28	GND	P	Ground	
29-30	NC	-	No Connection	
31-33	VLED_GND	P	Ground	
34	NC	-	No Connection	
35	VPWM_EN	P	LED PWM signal pin	

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36	VLED_EN	-	Backlight ON/OFF	
37	NC	-	No Connection	
38-40	VLED_12V	P	LED Power supply Input voltage	

Note I: input; O: output; P: Power or Ground(0V).

3. Operation Specifications

3.1. Absolute Maximum Ratings

Test condition: GND=0V, T_A=25 °C

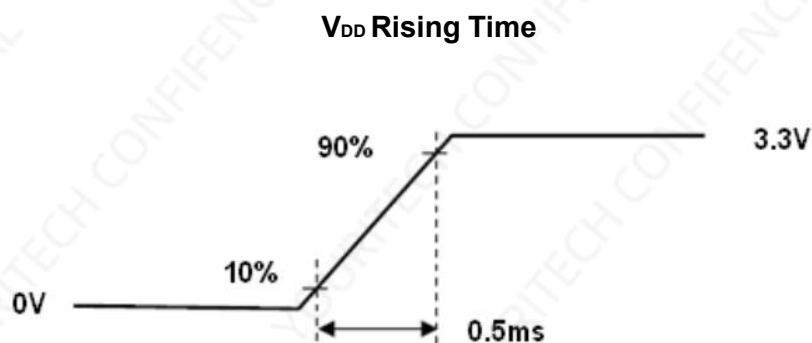
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
System Power Supply						
LCD Drive Voltage (Logic)	V _{DD}	3.0	3.3	3.6	V	(1), (2)
VDD Current	I _{DD}	-	0.295	-	A	(1),(3),
VDD Power Consumption	P _{DD}	-	-	1.2	W	
Rush Current	I _{Rush}	-	-	1.5	A	(1), (4)
Allowable Logic/LCD Drive Ripple Voltage	V _{VDD-RP}	-	-	300	mV	(1)

Note (1) All of the specifications are guaranteed under normal conditions. Normal conditions are defined as follow: Temperature: 25°C, Humidity: 55± 10%RH.

Note (2) All of the absolute maximum ratings specified in the table, if exceeded, may cause faulty operation or unrecoverable damage. It is recommended to follow the typical value.

Note (3) The specified V_{DD} current and power consumption are measured under the V_{DD} = 3.3 V, F_V = 60 Hz condition and white pattern.

Note (4) The figures below is the measuring condition of V_{DD}. Rush current can be measured when T_{RUSH} is 0.5 ms.



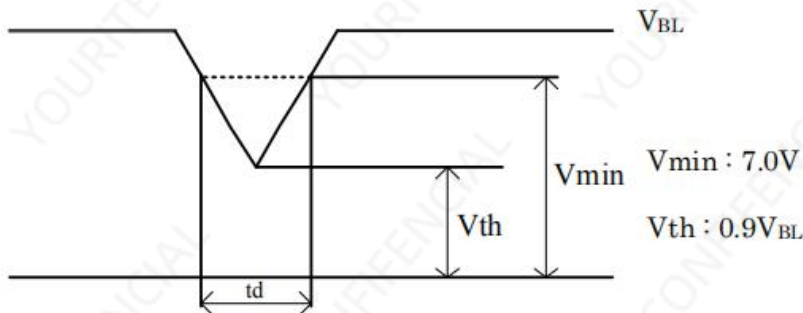
3.1.1. Backlight driving

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Supply voltage	BL_PWR	5	12	18	V	V _{BL} =12.0V Duty Ratio =100%
Current dissipation		-	600	-	mA	
Modulated light signal voltage	V _{PWMH}	1.85	-	VDD	V	
	V _{PWML}	0	-	0.7	v	
Brightness Control Duty Ratio	Duty	1	-	100	%	Note1
Brightness Control pulse width	T _{PWM}	5	-	-	us	Note2
Brightness Control frequency	f _{PWM}	200	-	2000	Hz	
BL_ENABLE	V _{CNTH}	1.3	-	VDD	V	Note3
	V _{CNTL}	0	-	0.5	V	
Input signal (H level) pin	I _{IN}	-	-	V _{IN} /56KΩ		
LED lifetime	-	-	20,000	-	h	LED

Note1: VPWM Input : 100%= Max luminance 1%= Min luminance

Note2: The minimum value of the dimming signal pulse width is assumed regulations of the width of high and the width of low.

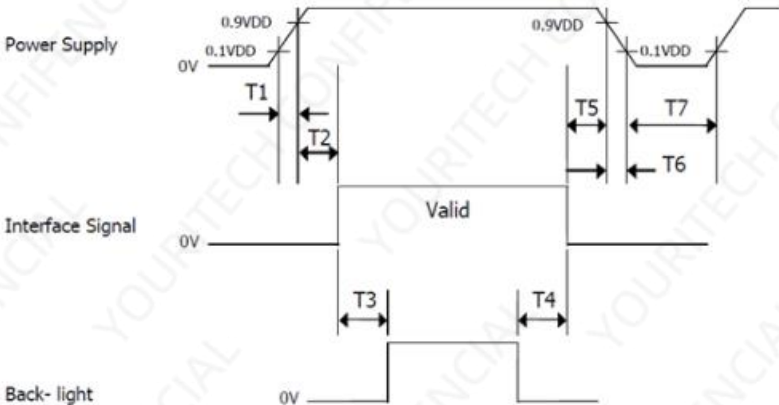
Note3:VCNT Input : High = BL turn on, or Low =BL turn off



1) $V_{th} \leq V_{BL} < V_{min}$: $t_d \leq 20ms$

2) $V_{BL} < V_{th}$: The condition of instantaneous voltage drop is apply to input voltage sequences

3.2. Power, Signal sequence

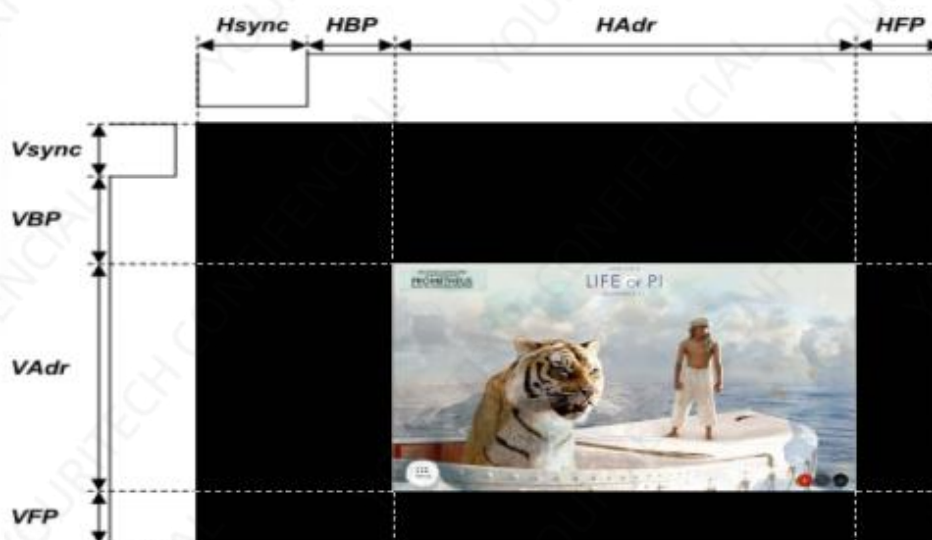


< Table6. Sequence Table >

Parameter	Values			Units
	Min	Typ	Max	
T1	0	-	10	ms
T2	0	-	50	ms
T3	200	-	-	ms
T4	500	-	-	ms
T5	0	-	50	ms
T6	0	-	10	ms
T7	500	-	-	ms

3.3. Timing Characteristics of input signals

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK Frequency	Fdclk	66.3	72.4	78.9	MHz
Horizontal display area	Thd	1280			pixel
HSYNC period time	Th	1380	1440	1500	pixel
HSYNC blanking	thbp+ thfp	100	160	220	pixel
Vertical display area	Tvd	800			H
Frequency	fV	55	60	65	Hz
VSYNC period time	Tv	824	838	872	H
VSYNC blanking	Tvbp+ Tvfp	24	38	72	H

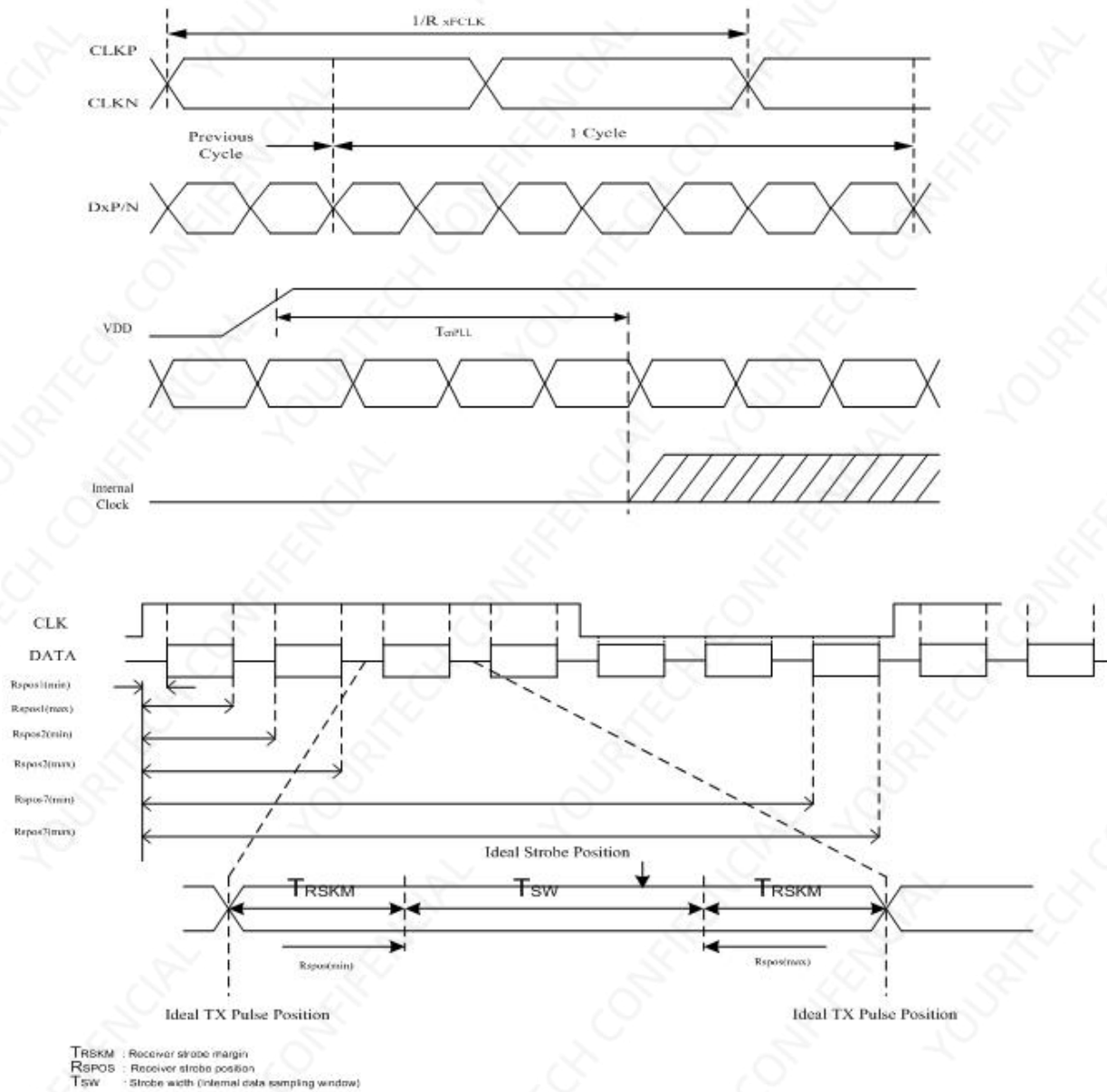


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LVDS AC Timing Specification:

Item	Symbol	Min	Typ	Max	Unit	Remark
Clock frequency	RxFCLK	30	-	TBD	MHz	Refer to input timing table for each display resolution
Input data skew margin	TRSKM	500	-	-	ps	VID = 200mV RxVCM = 1.2V RxFCLK = 81MHz
Clock high time	TLVCH	-	$4/(7 * RxFCLK)$	-	ns	
Clock low time	TLVCL	-	$3/(7 * RxFCLK)$	-	ns	
PLL wake-up time	TenPLL	-	-	150	us	
Clock frequency	RxFCLK	30	-	TBD	MHz	Refer to input timing table for each display resolution
Input data skew margin	TRSKM	500	-	-	ps	VID = 200mV RxVCM = 1.2V RxFCLK = 81MHz
Clock high time	TLVCH	-	$4/(7 * RxFCLK)$	-	ns	
Clock low time	TLVCL	-	$3/(7 * RxFCLK)$	-	ns	

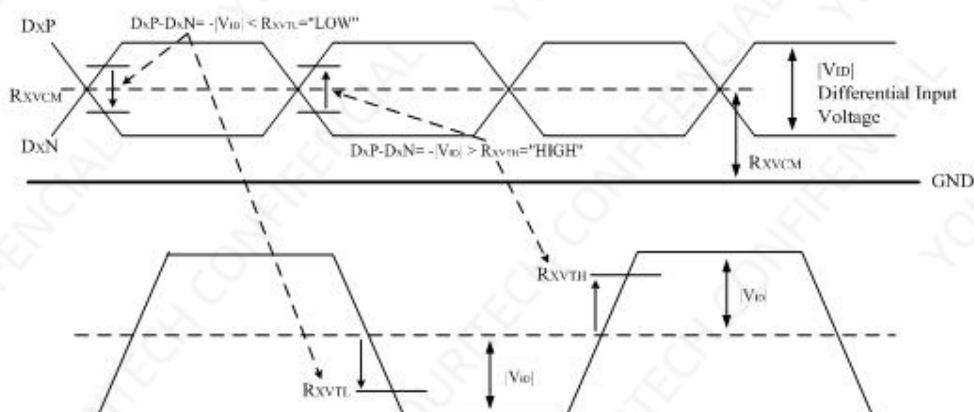
Interface timing Parameter:



LVDS DC Timing Specification:

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential input high threshold voltage	RXVTH	+0.1	0.2	0.3	V	RXVCM=1.2V
Differential input low threshold voltage	RXVTL	-0.3	-0.2	-0.1	V	
Input voltage range (single-end)	RXVIN	0.7	-	1.7	V	
Differential input common mode voltage	RXVCM	1	1.2	1.4	V	VID =0.2
Differential input impedance	ZID	80	100	125	ohm	
Differential input voltage	VID	0.2	-	0.6	V	
Differential input leakage current	ILCLVDS	-10	-	+10	uA	
LVDS Digital Operating Current	IVDDMIP I	-	15	20	mA	FDCLK=80MHz, VDD=3.3V, Input pattern: 55h->Aah->55h->Aah
LVDS Digital Stand-by Current	ISTMIPI	-	-	250	uA	Clock & all Functions are stopped

Single-end Signals



4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	70	80	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	70	80	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	70	80	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	70	80	-		
Response time	T_{ON+} T_{OFF}	Normal $\theta=\Phi=0^\circ$	-	30	35	msec	Note 3
Contrast ratio	CR		-	1000	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2
	W_Y		0.30	0.35	0.40	-	Note 5 Note 6
Luminance	L		1000	1200	-	cd/m ²	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7
Color Gamut	NTSC	CIE1931	45	50	-	%	

The test systems refer to Note 2.

Note 1: Definition of viewing angle range

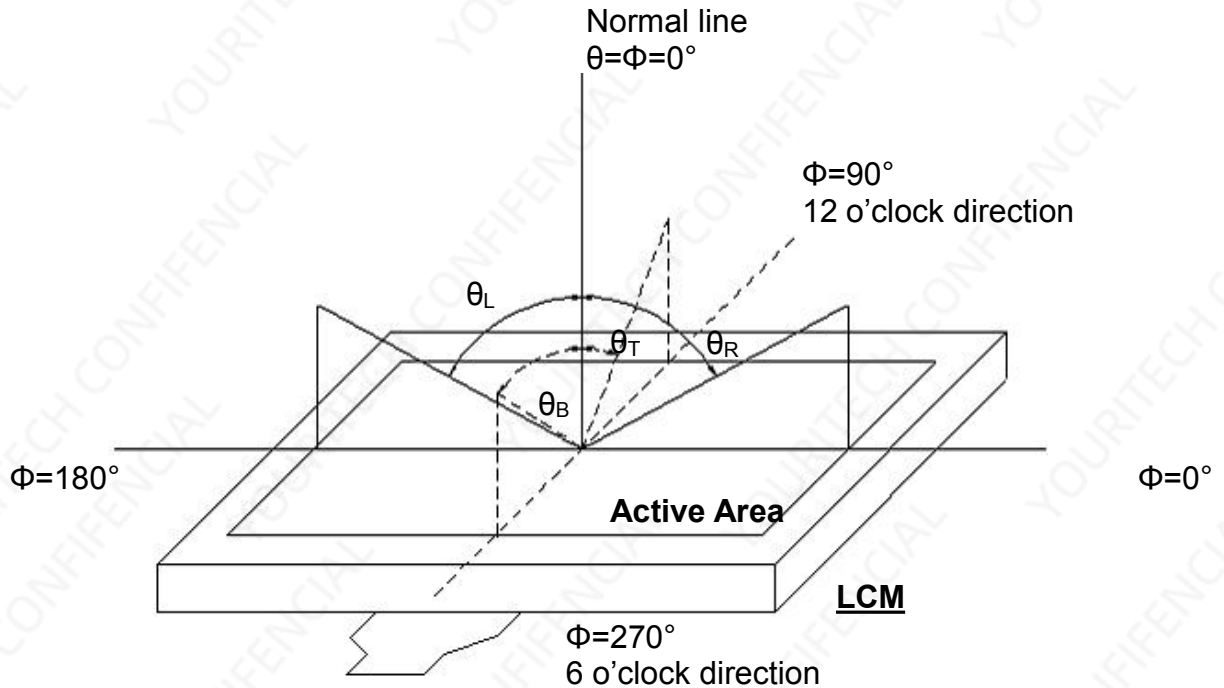


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.) or CA-210.

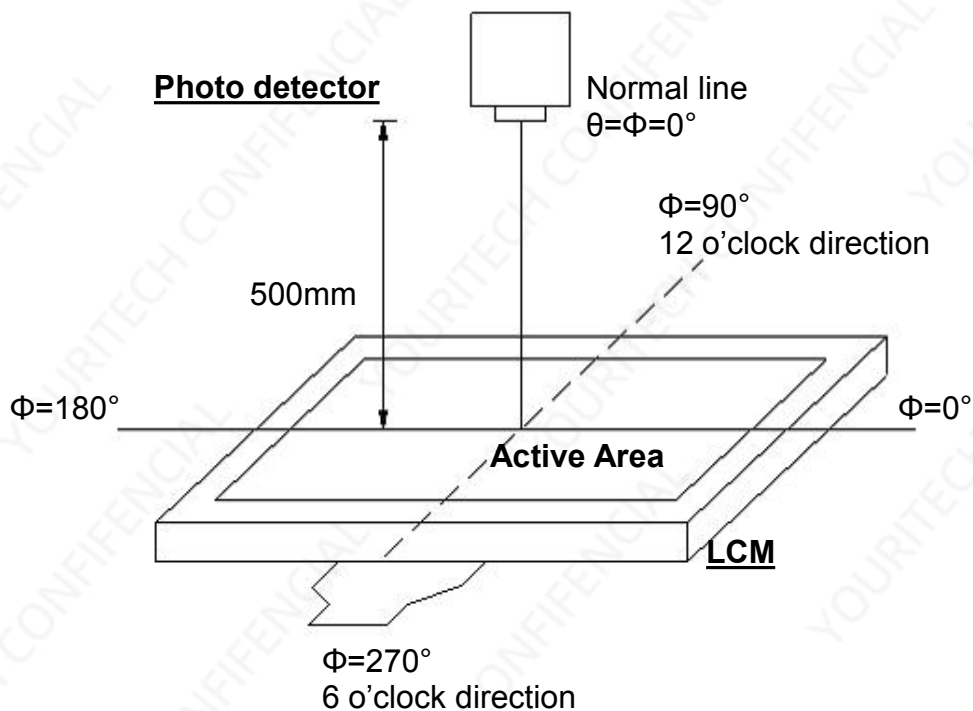


Fig. 4-2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

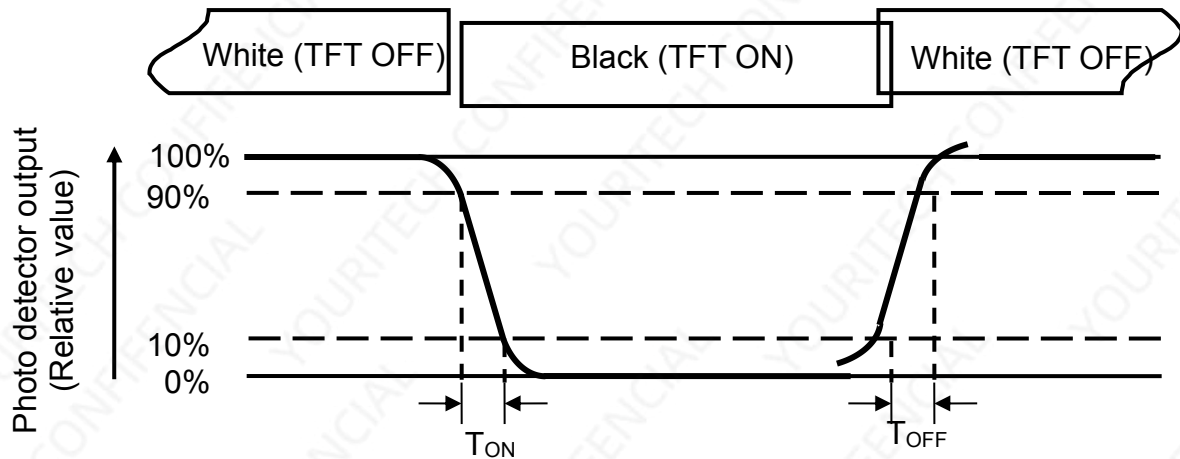


Fig. 4- 3 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_L=240\text{mA}$.

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas(Refer to Fig. 4-4).

Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{\min}}{B_{\max}}$$

L-----Active area length

W----- Active area width

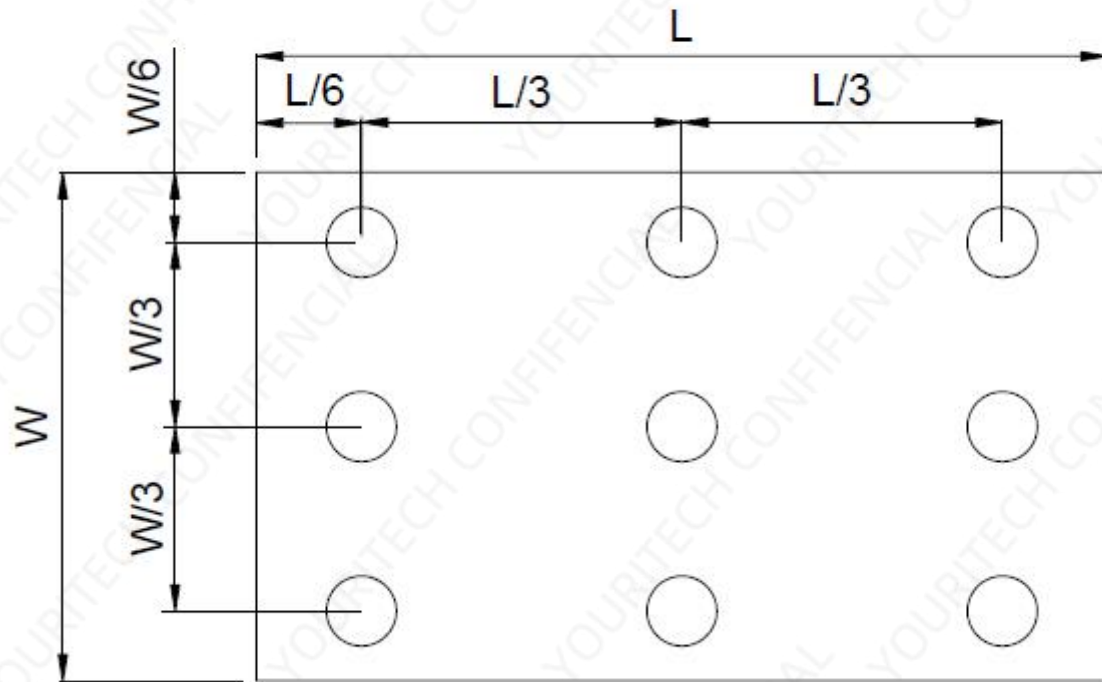


Fig. 4-4 Definition of measuring points

$B_{\max}$: The measured maximum luminance of all measurement position.

$B_{\min}$: The measured minimum luminance of all measurement position.

5. Reliability Test

Item	Test Conditions	Criterion
High Temperature Storage	Ta = 80℃ 240hrs	A,B,C,D,E
Low Temperature Storage	Ta = -40℃ 240hrs	A,B,C,D,E
High Temperature Operation	Ts = 80℃ 240hrs	A,B,C,D,E
Low Temperature Operation	Ta = -30℃ 240hrs	A,B,C,D,E
Operate at High Temperature and Humidity	+60℃, 90%RH 240hrs	A,B,C,D,E
Thermal Shock(non operation)	-30℃/30 min ~ +80℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	A,B,C,D,E
Vibration Test	Sweep:10Hz~55Hz~10Hz 2G 2 hours for each direction of X. Y. Z. (6 hours for total)	A,B,C,D,E
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	A,B,C,D,E
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	A,B,C,D,E
Electro Static Discharge	Contact=+/-4KV, Air=+/-8KV,(R=330R,C=150pF), 1 sec,9point,10times/point;	A,B,C,D,E

※Criterion:

A.LCM each function is OK,.

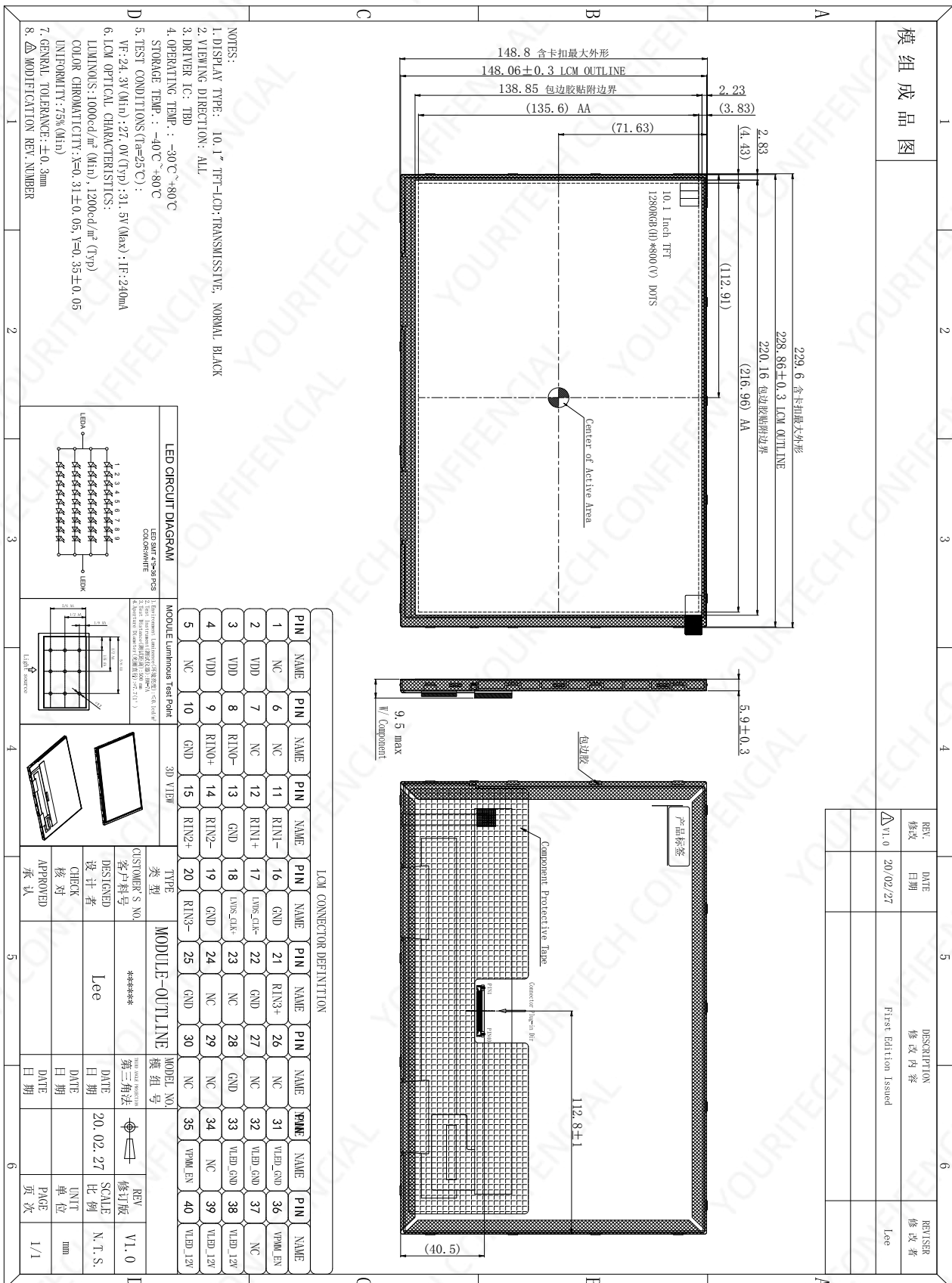
B.LCM appearance inspection without abnormalities (Including scratch, damage, corrosion and serious deformation)

C.LCM brightness above the Min. value of Spec.

D. Luminance uniformity above the Min. value of Spec.

E. Color chromaticity within tolerance range

6. Mechanical Drawing



7. Package Drawing

TBD

8. General Precautions

8.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

8.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.

2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.

3. To avoid contamination on the display surface, do not touch the module surface with bare hands.

4. Keep a space so that the LCD panels do not touch other components.

5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.

6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.

7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

8.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.

2. Do not apply voltage which exceeds the absolute maximum rating value.

8.4. Storage

1. Store the module in a dark room where must keep at $25\pm 10^{\circ}\text{C}$ and 65%RH or less.

2. Do not store the module in surroundings containing organic solvent or corrosive gas.

3. Store the module in an anti-electrostatic container or bag.

8.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.

2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.