上海冠显光电科技有限公司
Shanghai Top Display Optoelectronics Co., LTD

LCD MODULE SPECIFICATION

Customer: _____

Module No.: TL101WSH31RT-B1634A

Date: 2025-7-11

Version: 1.0

For Customer's Acceptance:

Approved by	Comment

Approved by	Checked by	Prepared by
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Record of Revision

Rev.	Date	Description	Editor
1.0	2025-7-11	First release	Ruipan.Zhao

1 General Specifications

No.	Item	Specification	Remark
1	LCD Size	10.1 inch (Diagonal)	
2	Driver Element	a-Si TFT active matrix	
3	Resolution	1024 (RGB) ×600	
4	Display Mode	Normally Black, Transmissive	
5	Pixel Pitch(mm)	0.0725 (H) × 0.2088 (V)	
6	Display Colors	16.7M	
7	Surface Treatment	--	
8	Color Arrangement	RGB-Stripe	
9	Interface	MIPI	
10	Viewing Direction	All	
11	Gray Scale Inversion Direction	/	Note 1
12	Outline Dimension (mm)	235.0(W) × 143.0(H) × 4.63 (T)	
13	Active Area (mm)	223.92 (W) × 125.28 (H)	
14	Touch Screen	With RTP	
15	Display Driver IC	EK79007AD3/EK73217BCGA	
16	Touch Driver IC	/	

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180°shift.

Note 2: RoHS compliant.

2 Pin Assignment

2.1 LCD Pin assignment

Match connector: XF2M-3015-1A（OMRON）or equivalent.

N	Symbol	I/O	Description	Remark
1	LED+	P	LED Anode	
2	LED+	P	LED Anode	
3	LCD_VGH	P	Gate on voltage	
4	LCD_VGL	P	Gate off voltage	
5	UPDN	I	Gate up or down scan control	
6	SHLR	I	Source right or left sequence	
7	LED-	P	LED Cathode	
8	LED-	P	LED Cathode	
9	AVDD	P	Power for analog circuit	
10	GND	P	GROUND	
11	MIPI_TDP3	I	MIPI Data lane3 input	
12	MIPI_TDN3	I	MIPI Data lane3 input	
13	GND	P	Ground	
14	MIPI_TDP2	I	MIPI Data lane2 input	
15	MIPI_TDN2	I	MIPI Data lane2 input	
16	GND	P	Ground	
17	MIPI_TCP	I	MIPI CLK input	
18	MIPI_TCN	I	MIPI CLK input	
19	GND	P	Ground	
20	MIPI_TDP1	I	MIPI Data lane1 input	
21	MIPI_TDN1	I	MIPI Data lane1 input	
22	GND	P	Ground	
23	MIPI_TDP0	I/O	MIPI Data lane0 input	
24	MIPI_TDN0	I/O	MIPI Data lane0 input	
25	GND	P	Ground	
26	STBYB	I	Standby mode	
27	LRSTB	I	Global reset pin	
28	VDD	P	Power Supply (1.8V)	LCM Power
29	VDD	P	Power Supply (1.8V)	LCM Power
30	VCOM	P	Common Voltage	

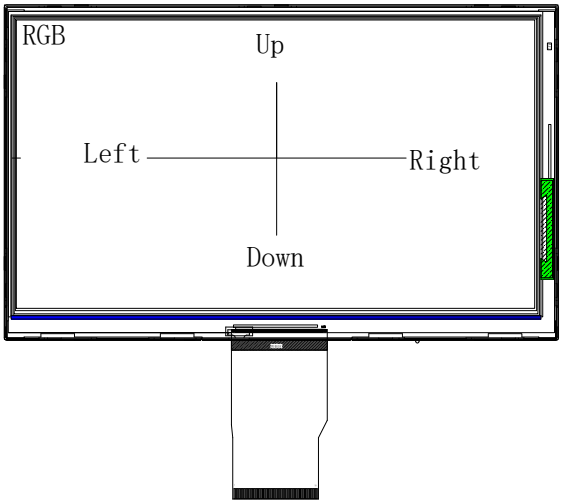
I---Input, O---Output, P--- Power/Ground

RTP Pin assignment

1	XL	Resistive Touch Panel PIN left.	
2	YD	Resistive Touch Panel PIN down.	
3	XR	Resistive Touch Panel PIN right.	
4	YU	Resistive Touch Panel PIN up.	

U/D R/L Function Description

Scan control input		Scanning direction
UPDN	SHLR	
GND	VDD	Up to down, left to right
VDD	GND	Down to up, right to left
GND	GND	Up to down, right to left
VDD	VDD	Down to up, left to right



3 Absolute Maximum Ratings

Ta = 25℃

Item	Symbol	Min.	Max.	Unit	Remark
Power Voltage	VDD	-0.30	2.00	V	LCM Power
	AVDD	-0.50	15.00	V	
	VGH	-0.30	42.00	V	
	VGL	-20.00	0.30	V	
	VGH-VGL	-0.30	40.00	V	
Operating Temperature	Top	-20.0	70.0	℃	
Storage Temperature	T_{st}	-30.0	80.0	℃	
Operating and Storage Humidity	H_{stg}	10%	90%	%(RH)	

4. Electrical Characteristics

4.1 Recommended Operating Condition

VDD=1.8V， GND=0V， Ta = 25℃

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Digital supply Voltage		VDD	1.71	1.8	1.89	V	LCM Power
Analog supply Voltage		AVDD	9.4	9.6	9.8	V	
Gate on voltage		VGH	17	18	19	V	
Gate off voltage		VGL	-6.50	-6.0	-5.50	V	
Vcom voltage		VCOM	3.6	3.8	4.0	V	
Input Signal Voltage	Low Level	V_{IL}	0	-	0.3 x VDD	V	
	High Level	V_{IH}	0.7 x VDD	-	VDD	V	
Current of digital supply voltage		I_{VDD}	-	20	30	mA	VDD=1.8V, color bar pattern
Current of analog supply voltage		I_{AVDD}	-	25	50	mA	AVDD=10.2V
Current of Gate on voltage		I_{VGH}	-	1	2	mA	VGH=18.0V
Current of Gate off voltage		I_{VGL}	-	1	2	mA	VGL=-6.0V
Current of VCOM		I_{vcom}	-	1	2	mA	VCOM=3.8V

4.2 Backlight Unit Driving Condition

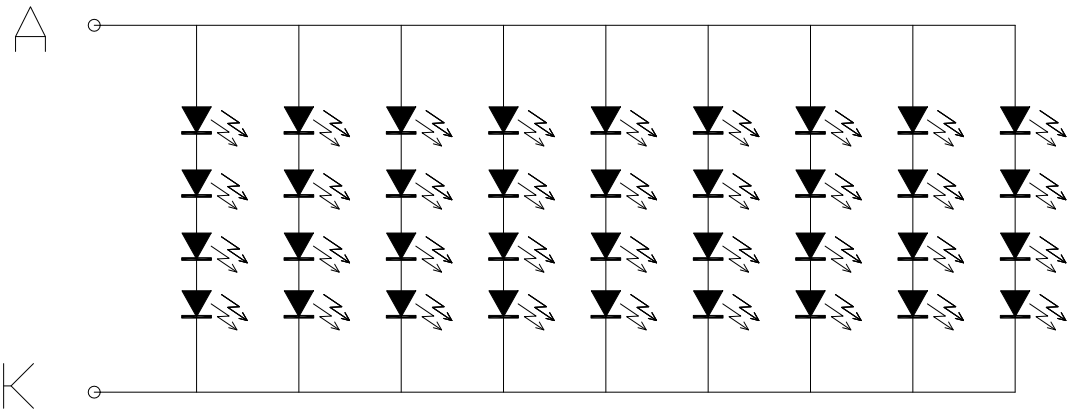
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward Current	I_F	-	180	225	mA	36 LEDs (4 LED Serial, 9 LED Parallel)
Forward Current Voltage	V_F	-	12.0	13.6	V	
Backlight Power Consumption	W_{BL}	-	2160	3060	mW	
Operating Life Time	--	30000	--	--	hrs	Note 2, Note 3

Note1: The LED driving condition is defined for each module (4 LED Serial, 9 LED Parallel).

Note2: When LCM is operated, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: Optical performance should be evaluated at Ta=25℃ When LED is driven at high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

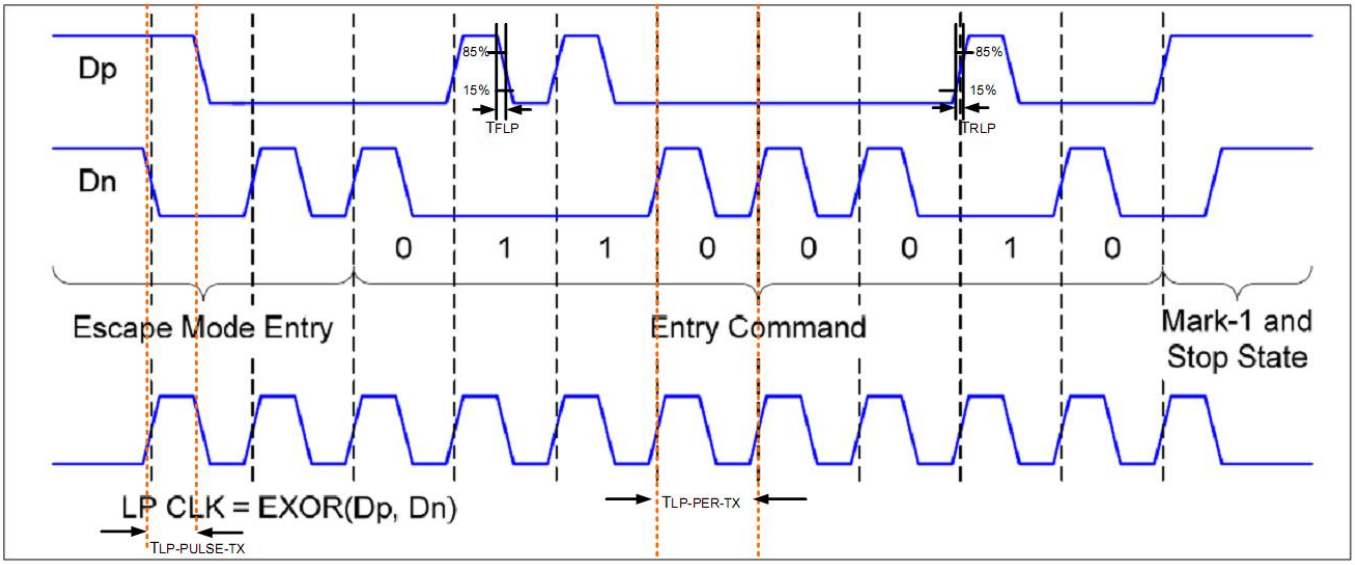
Note4: The LED driving condition is defined for each LED module.



5 Timing Chart

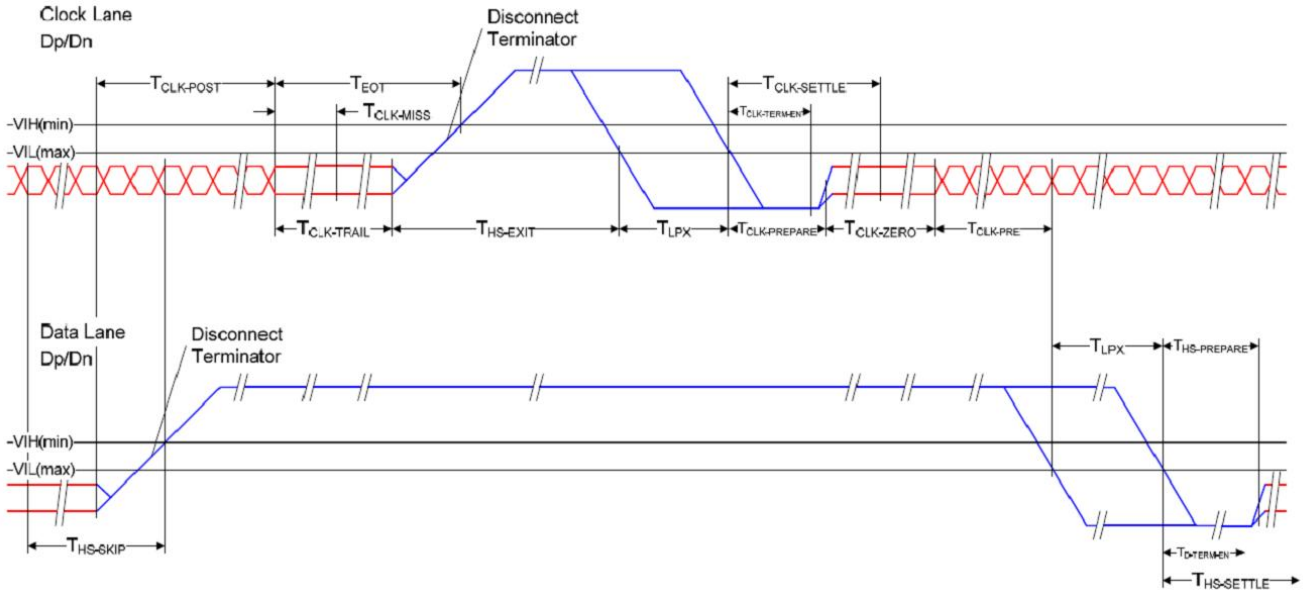
5.1 DSI Interface MIPI mode LP Transmitter AC Specification

Parameter		Symbol	Min	Typ	Max	Units	Notes
15%~85% rising time and falling time		T_{RLP} /T_{FLP}	-	-	25	ns	-
30%~85% rising time and falling time		T_{REOT}	-	-	35	ns	-
Pulse width of LP exclusive-OR clock	First LP EXOR clock pulse after STOP state or Last pulse before stop state	$T_{LP-PULSE-TX}$	40	-	-	ns	-
	All other pulses		20	-	-	ns	-
Period of the LP EXOR clock		$T_{LP-PER-TX}$	90	-	-	mV/ns	-
Slew Rate @C_{LOAD} =0pF		δ V/δ t_{SR}	30	-	500	mV/ns	-
Slew Rate @C_{LOAD} =5pF			30	-	200	mV/ns	-
Slew Rate @C_{LOAD} =20pF			30	-	150	mV/ns	-
Slew Rate @C_{LOAD} =70pF			30	-	100	mV/ns	-
Load Capacitance		T_{RLP}	-	-	70	pF	-

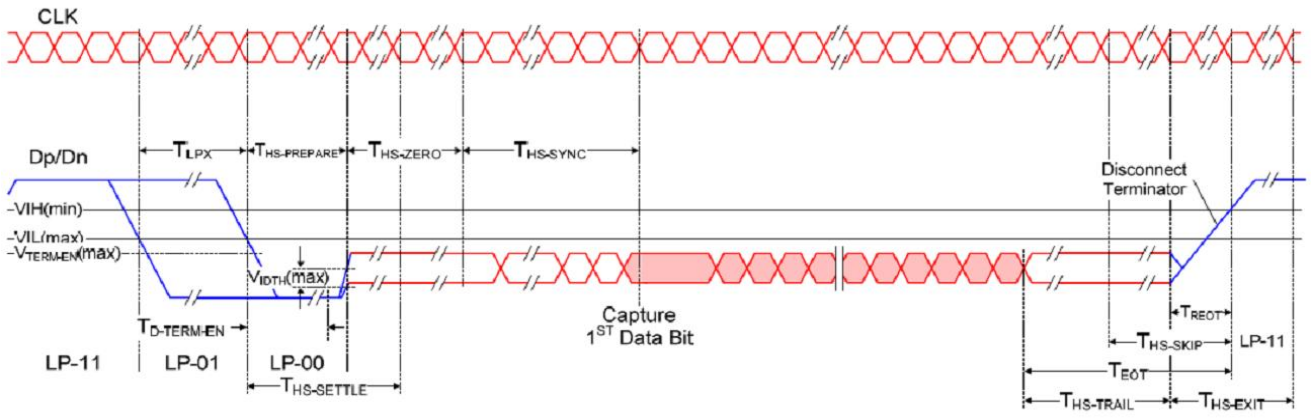


5.2 DSI Interface MIPI mode High Speed Clock Transmission

Parameter	Symbol	Min	Typ	Max	Units
Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	$T_{CLK-POST}$	60+52UI	-	-	ns
Detection time that the clock has stopped toggling	$T_{CLK-MISS}$	-	-	60	ns
Time to drive LP-00 to prepare for HS clock transmission	$T_{CLK-PREPARE}$	38	-	95	ns
Minimum lead HS-0 drive period before starting clock	$T_{CLK-PREPARE}$ + $T_{CLK-ZERO}$	300	-	-	ns
Time to enable Clock Lane receiver line termination measured from when Dn cross $V_{IL,MAX}$	$T_{HS-TERM-EN}$	-	-	38	ns
Minimum time that the HS clock must be prior to any associated data lane beginning the transmission from LP to HS mode	$T_{CLK-PRE}$	8	-	-	UI
Time to drive HS differential state after last payload clock bit of a HS transmission burst	$T_{CLK-TRAIL}$	60	-	-	ns



5.3 DSI Interface MIPI mode High Speed Data Transmission in Bursts



5.4 Recommended Timing Setting of TCON

TCON (Embedded in Source IC) Input Timing (DCLK, HS, VS, DE)

VDD=1.8V, GND=0V, Ta=25℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK	Fclk	-	51	-	MHz	
	tclk	-	19.6	-	ns	
HSD	thd	-	1024	-	tclk	
	thpw	-	10	-	tclk	
	thb	-	160	-	tclk	
	thfp	-	160	-	tclk	
VSD	tvd	-	600	-	th	
	tvpw	-	1	-	th	
	tvb	-	23	-	th	
	tvfp	-	12	-	th	

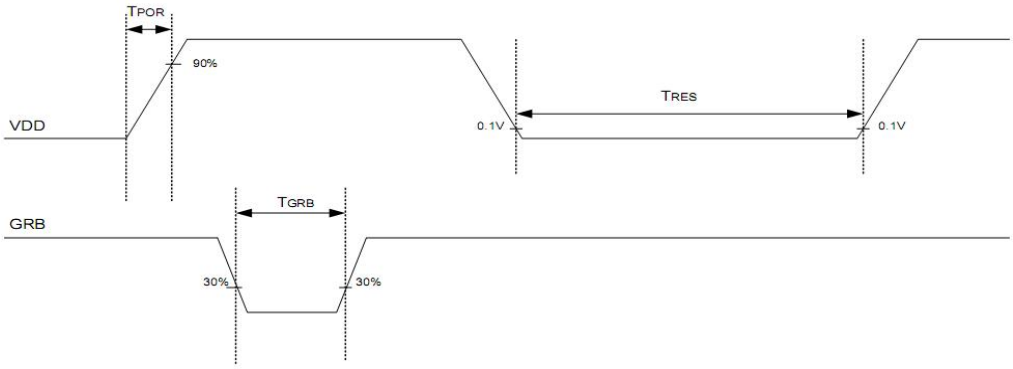
Note: For reference only, it needs to be adjusted according to the actual display effect.

5.5 Basic AC Characteristic

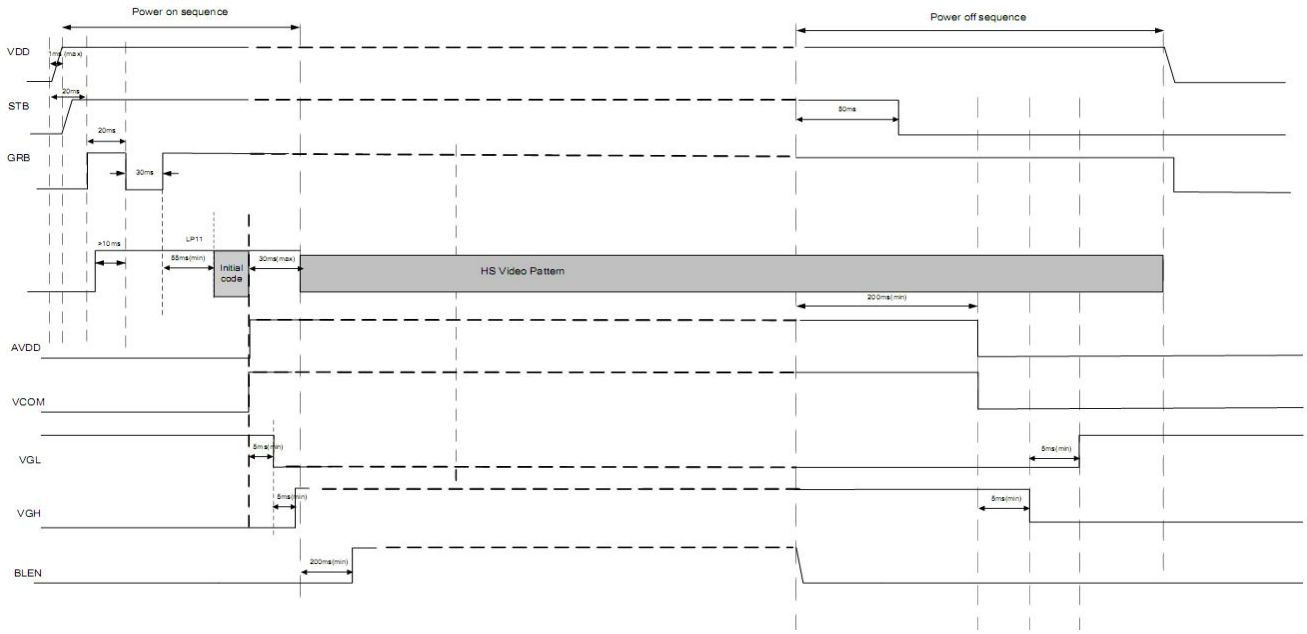
(VDD=VDD_IF=1.8V, AVDD=8 to 13.5V, GND=AGND=GND_IF=0V,TA=-20 to +85℃)

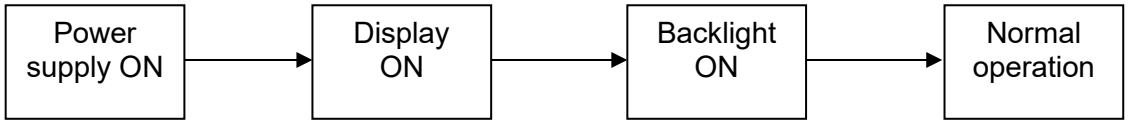
VDD/GRB AC characteristic

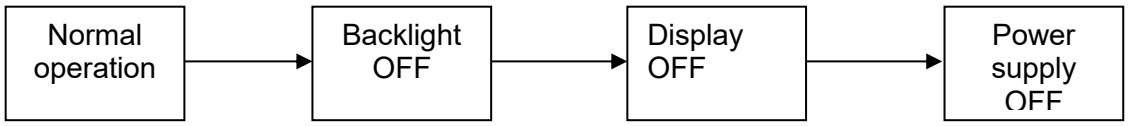
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
VDD power slew rate	T_{POR}	-	-	20	ms	From 0 to 90% VDD
GRB active pulse width	T_{GRB}	1	-	-	ms	VDD=VDD_IF= 1.8V
VDD resettle time	T_{RES}	1	-	-	s	



5.6 POWER ON/OFF SEQUENCE


Power on sequence
Power off sequence
VDD
STB
GRB
20ms
20ms
30ms
50ms
>10ms
LP11
55ms(min)
Initial code
30ms(max)
HS Video Pattern
200ms(min)
AVDD
VCOM
VGL
VGH
BLEN
5ms(min)
5ms(min)
5ms(min)
5ms(min)
200ms(min)


Power supply ON
Display ON
Backlight ON
Normal operation


Normal operation
Backlight OFF
Display OFF
Power supply OFF

6 Optical Characteristics

Ta=25℃

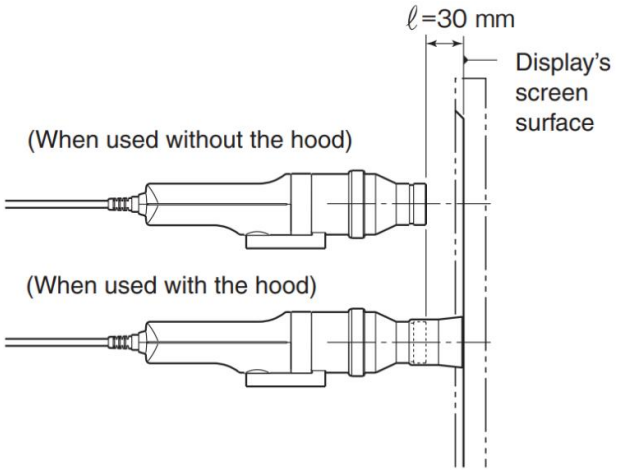
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
View Angles		θT	CR≧10	-	85	-	Degree	Note 2
		θB		-	85	-		
		θL		-	85	-		
		θR		-	85	-		
Contrast Ratio		CR	θ=0°	-	800	-		Note1 Note3
Response Time		T_{ON}	25℃	--	30	40	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.281	0.311	0.341		Note1 Note5
		y		0.318	0.348	0.378		
	Red	x		0.566	0.596	0.626		
		y		0.312	0.342	0.372		
	Green	x		0.320	0.350	0.380		
		y		0.562	0.592	0.622		
	Blue	x		0.129	0.159	0.189		
		y		0.094	0.124	0.154		
Uniformity		U		70	80	-	%	Note1 Note6
NTSC				-	50	-	%	Note 5
Luminance		L		-	450	-	cd/m^2	Note1 Note7

Test Conditions:

1. I_F= 180 mA, V_F=12.0V and the ambient temperature is 25±2℃.humidity is 65±7%
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

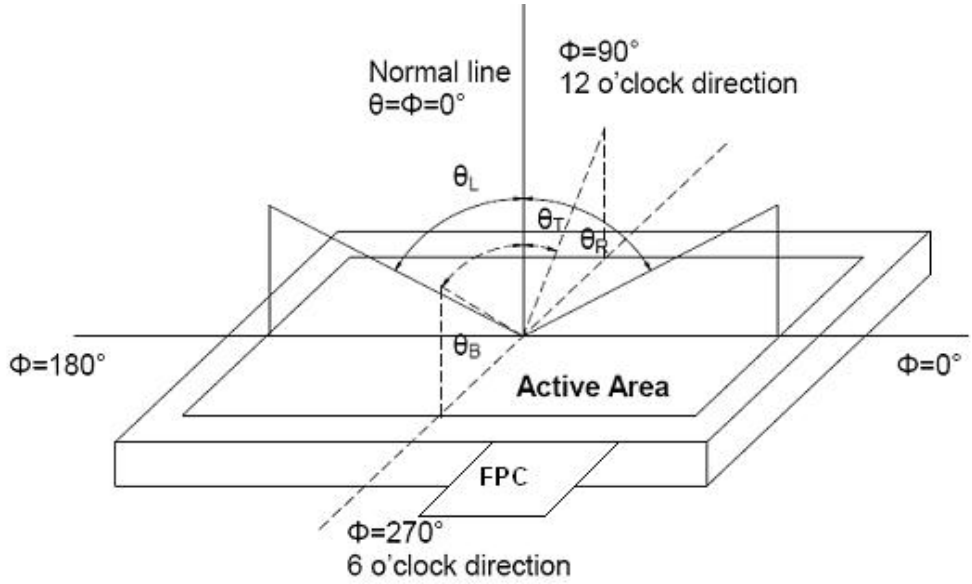
Properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	CA210 or similar equipment	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

Viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。



Note 3: Definition of contrast ratio

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

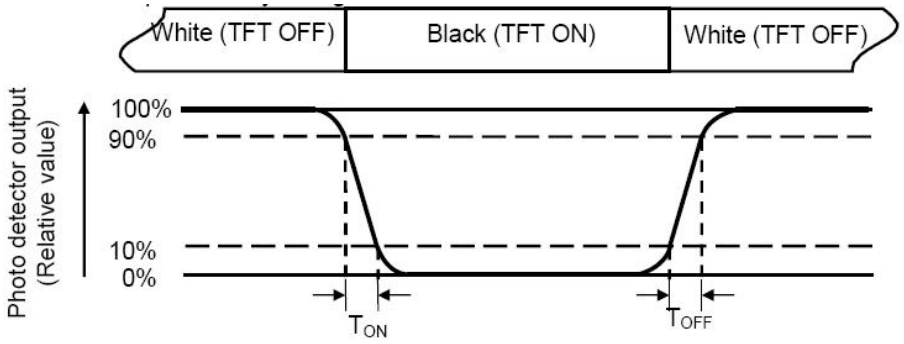
“White state “: The state is that the LCD should drive by Vwhite.

“Black state”: The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: 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%.



Note 5: Definition of color chromaticity (CIE1931)

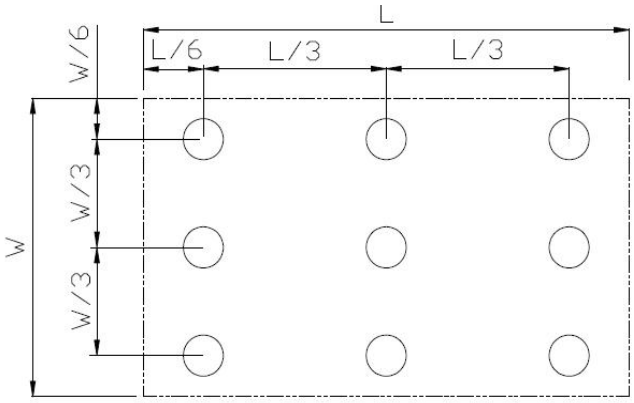
Color coordinates measured at center point of LCD.

Note 6: Definition of luminance uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

L-------Active area length W----- Active area width



Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

Note 7: Definition of luminance:

Measure the luminance of white state at center point.

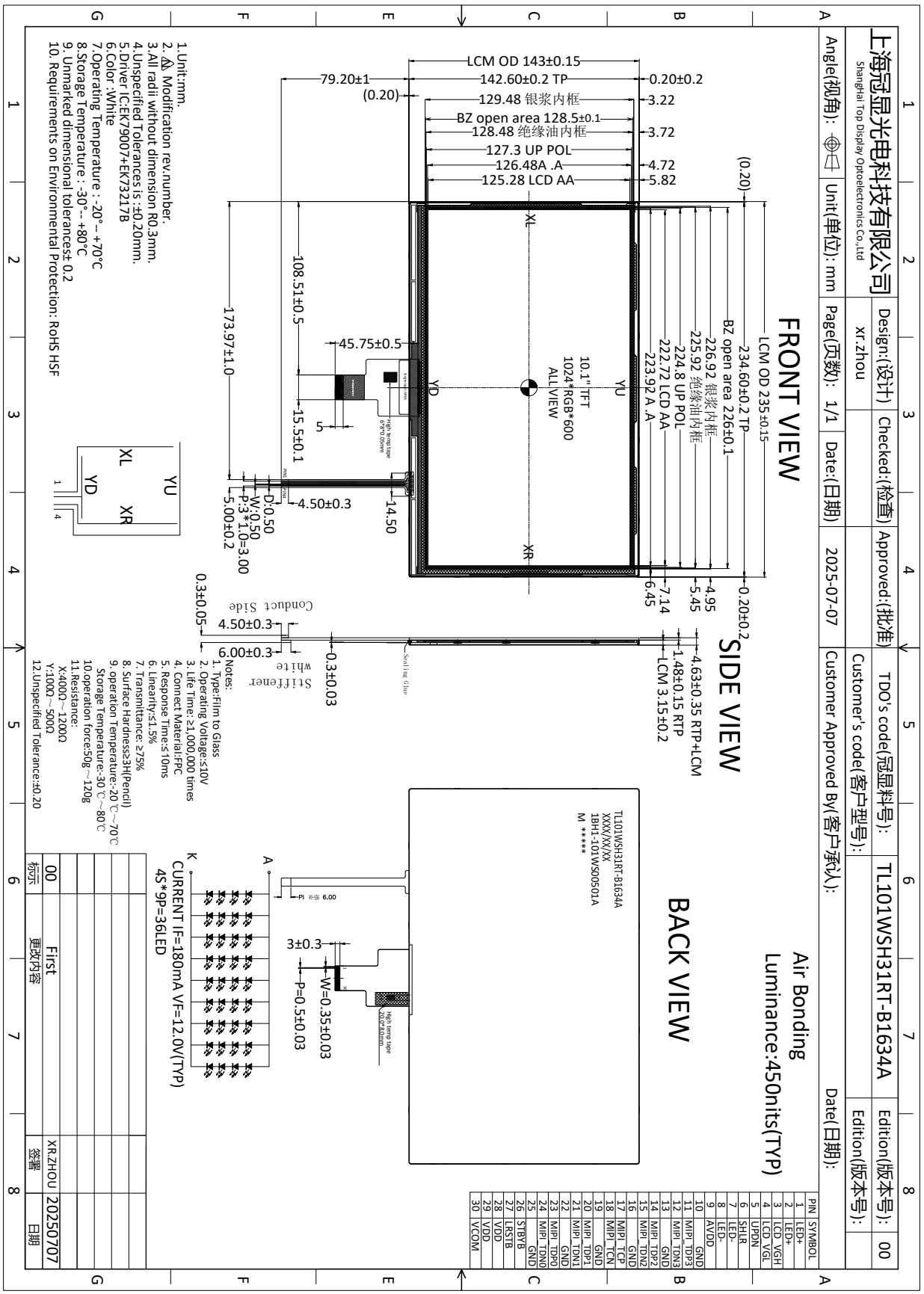
7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours	No abnormalities in functions
2	Low Temperature Operation	Ta = -20℃, 240 hours	No abnormalities in functions
3	High Temperature Storage	Ta = +80℃, 240 hours	No abnormalities in functions
4	Low Temperature Storage	Ta = -30℃, 240 hours	No abnormalities in functions
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max,240hours	No abnormalities in functions
6	Thermal Shock (non-operating)	-30℃ 30 min~ +70℃ 30 min, Change time: 0.5 hour ← 5 min → 0.5 hour.10 Cycle	Start with cold temperature, End with high temperature,
7	ESD	C=150pF, R=330Ω,5point/panel Air: ±8Kv, 5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	No abnormalities in functions

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of samples.

8 Mechanical Drawing



9 Precautions for Use of LCD Modules

Handling Precautions

9.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

9.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

9.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

9.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

9.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

9.1.6 Do not attempt to disassemble the LCD Module.

9.1.7 If the logic circuit power is off, do not apply the input signals.

9.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

9.1.8.1 Be sure to ground the body when handling the LCD Modules.

9.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

9.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

9.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

Storage Precautions

9.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

9.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is: Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

9.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

Transportation Precautions

9.3.1 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.