



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

LCD MODULE SPECIFICATION

Customer: _____

Module No.: TL068WXH14-B1747A

Date: 2023-07-08

Version: 0.1

- Pre-Specification for parameter checking
- Final-Specification for sample approval

For Customer's Acceptance:

Approved by	Comment

Approved by	Checked by	Prepared by
Kanglin.Zhong	Xianren.Zhou	Zaiping.Yang

The copyright belongs to Shanghai Top Display Optoelectronics Co.,Ltd. Any unauthorized use is prohibited.

Table of Contents

Record of Revision.....	3
1 General Specifications.....	4
2 Pin Assignment.....	5
3 Absolute Maximum Ratings	6
4. Electrical Characteristics	6
5 Timing Chart.....	7
6 Optical Characteristics	12
7 Environmental / Reliability Test	15
8 Mechanical Drawing.....	16
9 Precautions for Use of LCD Modules	17

Record of Revision

Rev.	Date	Description	Editor
0.1	2023-07-08	First release	Zaiping.Yang

1 General Specifications

No.	Item	Specification	Remark
1	LCD Size	6.75 inch (Diagonal)	
2	Driver Element	a-Si TFT active matrix	
3	Resolution	480 (RGB) ×1280	
4	Display Mode	Normally Black, Transmissive	
5	Pixel Pitch(mm)	0.0418 (H) × 0.1254 (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)	66.60 (W) × 181.0 (H) × 4.75 (T)	
13	Active Area (mm)	60.19(W) × 160.51 (H)	
14	Touch Screen	Without CTP	
15	Display Driver IC	FL7703NI	
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 : 0.5mm pitch FPC/FFC,T=0.3mm.

Type of connector on FPC: XF2M-4015-1A (OMRON) or equivalent.

N	Symbol	I/O	Description	Remark
1	GND	P	Ground	
2	D0P	I/O	MIPI DSI differential data pair (Data lane 0)	
3	D0N	I/O	MIPI DSI differential data pair (Data lane 0)	
4	GND	P	Ground	
5	D1P	I	MIPI DSI differential data pair (Data lane 1)	
6	D1N	I	MIPI DSI differential data pair (Data lane 1)	
7	GND	P	Ground	
8	CLKP	I	MIPI DSI differential clock pair	
9	CLKN	I	MIPI DSI differential clock pair	
10	GND	P	Ground	
11	D2P	I	MIPI DSI differential data pair (Data lane 2)	
12	D2N	I	MIPI DSI differential data pair (Data lane 2)	
13	GND	P	Ground	
14	D3P	I	MIPI DSI differential data pair (Data lane 3)	
15	D3N	I	MIPI DSI differential data pair (Data lane 3)	
16	GND	P	Ground	
17	GND	P	Ground	
18	VCC_1V8	P	LCD I/O power supply(1.8V)	
19	VCC_1V8	P	LCD I/O power supply(1.8V)	
20	REFCLK/NC	--	Not connect, open pin	
21	SDA/NC	--	Not connect	
22	SCL/NC	--	Not connect	
23	BIST/NC	--	Not connect	
24	RSTB	I	This external reset signal,Active Low(1.8V)	
25	STBYB	--	Not connect, open pin	
26	AVDD/NC	--	Not connect, open pin	
27	GND	P	Ground	
28	LED-K	P	LED CATHODE	
29	LED-K	P	LED CATHODE	
30	GND	P	Ground	
31	VGL/NC	--	Not connect	
32	GND	P	Ground	

33	GND	P	Ground	
34	VGH/NC	--	Not connect, open pin	
35	LED-A	P	LED ANODE	
36	LED-A	P	LED ANODE	
37	GND	P	Ground	
38	VDD-3V3	P	LCD analog power supply (3.3V)	
39	VDD-3V3	P	LCD analog power supply (3.3V)	
40	VCOM/NC	--	Not connect, open pin	

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

3 Absolute Maximum Ratings

Ta = 25°C

Item	Symbol	Min.	Max.	Unit	Remark
Power Voltage	VDD-3V3	-0.30	+4.5	V	
	VCC_1V8	-0.30	+3.6	V	
Operating Temperature	Top	-20.0	70.0	°C	
Storage Temperature	T _{st}	-30.0	80.0	°C	
Operating and Storage Humidity	H _{stg}	10%	90%	%(RH)	

4. Electrical Characteristics

4.1 Recommended Operating Condition

VDD-3V3, GND=0V, Ta = 25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Digital supply Voltage	VCC_1V8	1.65	1.8	3.3	V	
Analog supply Voltage	VDD-3V3	2.8	3.0	3.3	V	
Input Signal Voltage	Low Level V _{IL}	0	-	0.3 x VCC_1V8	V	
	High Level V _{IH}	0.7 x VCC_1V8	-	VCC_1V8	V	
Current of digital supply voltage	I _{VCC_1V8}	-	20	30	mA	
Current of analog supply voltage	I _{VDD-3V3}	-	60	80	mA	VDD-3V3=3.3V, color bar pattern

4.2 Backlight Unit Driving Condition

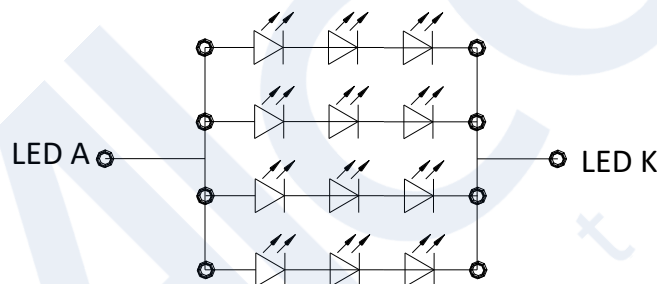
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward Current	I_F	-	120	140	mA	12 LEDs (3 LED Serial, 4 LED Parallel)
Forward Current Voltage	V_F	-	9.6	10.5	V	
Backlight Power Consumption	W_{BL}	-	1152	1470	mW	
Operating Life Time	--	30000	50000	--	hrs	Note 2, Note 3

Note1: The LED driving condition is defined for each module (3 LED Serial, 4 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 $T_a=25^\circ\text{C}$ 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 Timing Characteristics

High Speed Mode

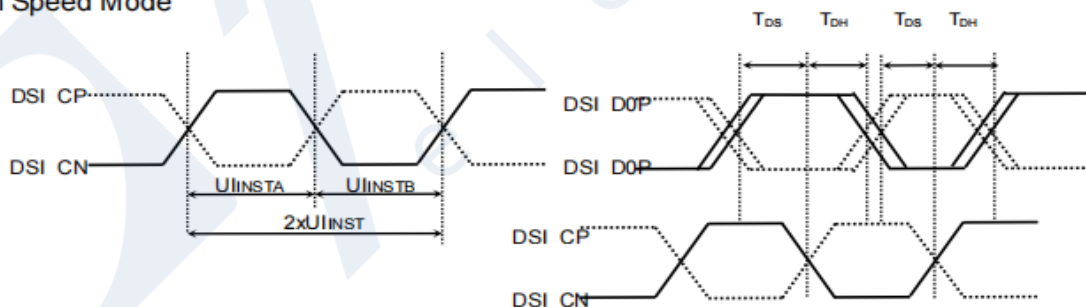
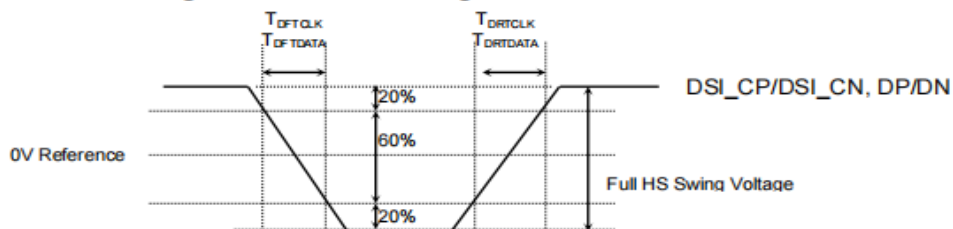


Figure 7-4: DSI clock timing Characteristics

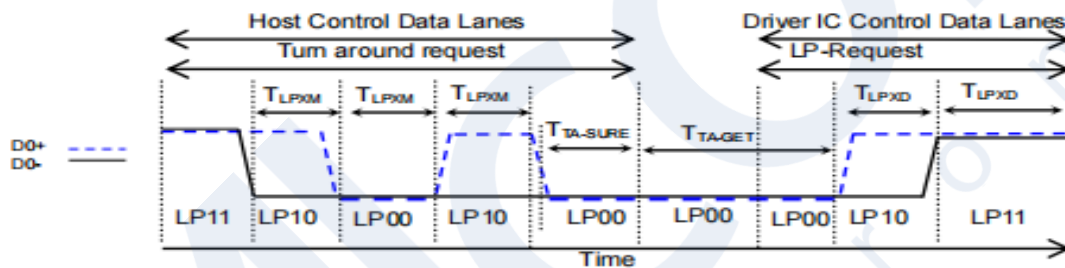


Rising and falling time on clock and data channel

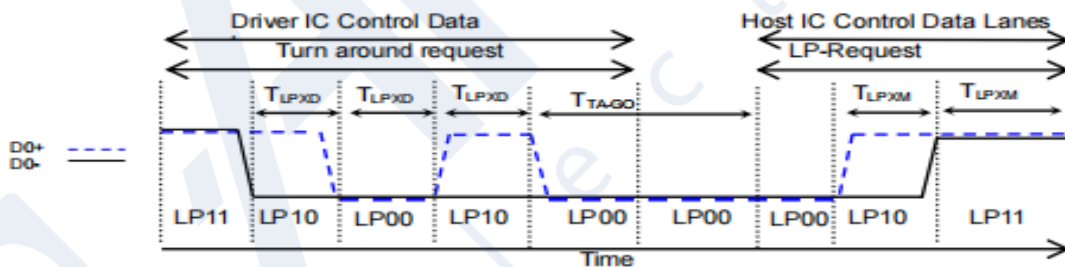
(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.5V to 3.3V, T_A = -30 to 70°C)

Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_CP/ DSI_CN	Double UI instantaneous	2xUI _{INST}	4LANE: 3.30 3LANE: 2.85 @ VDDD=1.8V	-	25	ns
	UI instantaneous	U _{INSTA} U _{INSTB}	4LANE: 1.67 3LANE: 1.43 @ VDDD=1.8V	-	12.5	ns
DP/DN	Data to clock setup time	T _{DS}	0.15xUI	-	-	ps
	Data to clock hold time	T _{DH}	0.15xUI	-	-	ps
DSI_CP/ DSI_CN	Differential rise time for clock	T _{DRTCLK}	150	-	0.3UI	ps
	Differential fall time for clock	T _{DFTCLK}	150	-	0.3UI	ps
DP/DN	Differential rise time for data	T _{DRTDATA}	150	-	0.3UI	ps
	Differential fall time for data	T _{DFTDATA}	150	-	0.3UI	ps

Low Power Mode



BTA from HOST to Display Module Timing



BTA from Display Module Timing to HOST

 (VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.3V to 3.3V, T_A = -30 to 70°C)

Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_D0P/ DSI_D0P	Length of LP-00/LP01/LP10/LP11 Host → Display module	T _{LPXM}	50	-	-	ns
	Length of LP-00/LP01/LP10/LP11 Display module → Host	T _{LPXD}	50	-	-	ns
	Time-out before the MPU start driver	T _{TA-SURE}	T _{LPXD}	-	2xT _{LPXD}	ns
	Time to drive LP-00 by display module	T _{TARGET}	5xT _{LPXD}	-	-	ns
	Time to drive LP-00 after turnaround request Host	T _{TAGO}	4xT _{LPXD}	-	-	ns

DSI Low Power Mode Characteristics

5.2 Recommended Timing Setting of TCON

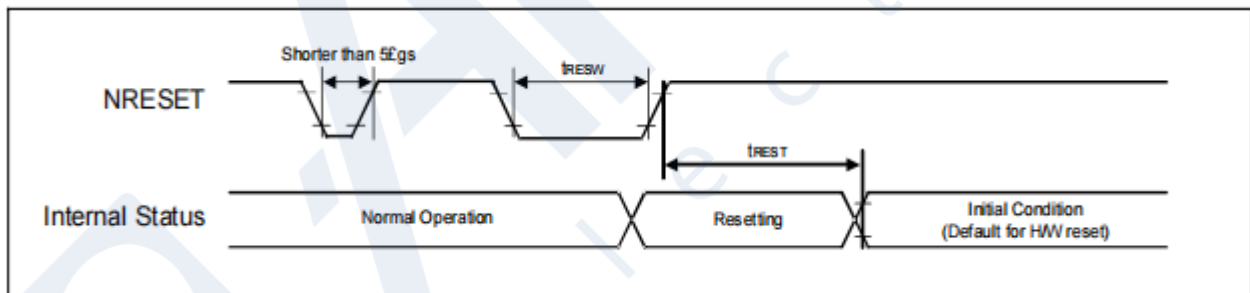
TCON (Embedded in Source IC) Input Timing (DCLK, HS, VS, DE)

VDD-3V3=3.3V, GND=0V, Ta=25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK	Fclk	-	92	-	MHz	
	tclk	-	10.86	-	ns	
HSD	thd	-	600	-	tclk	
	thpw	-	92	-	tclk	
	thb	-	110	-	tclk	
	thfp	-	110	-	tclk	
VSD	tvd	-	1280	-	th	
	tpw	-	4	-	th	
	tvb	-	16	-	th	
	tvfp	-	16	-	th	

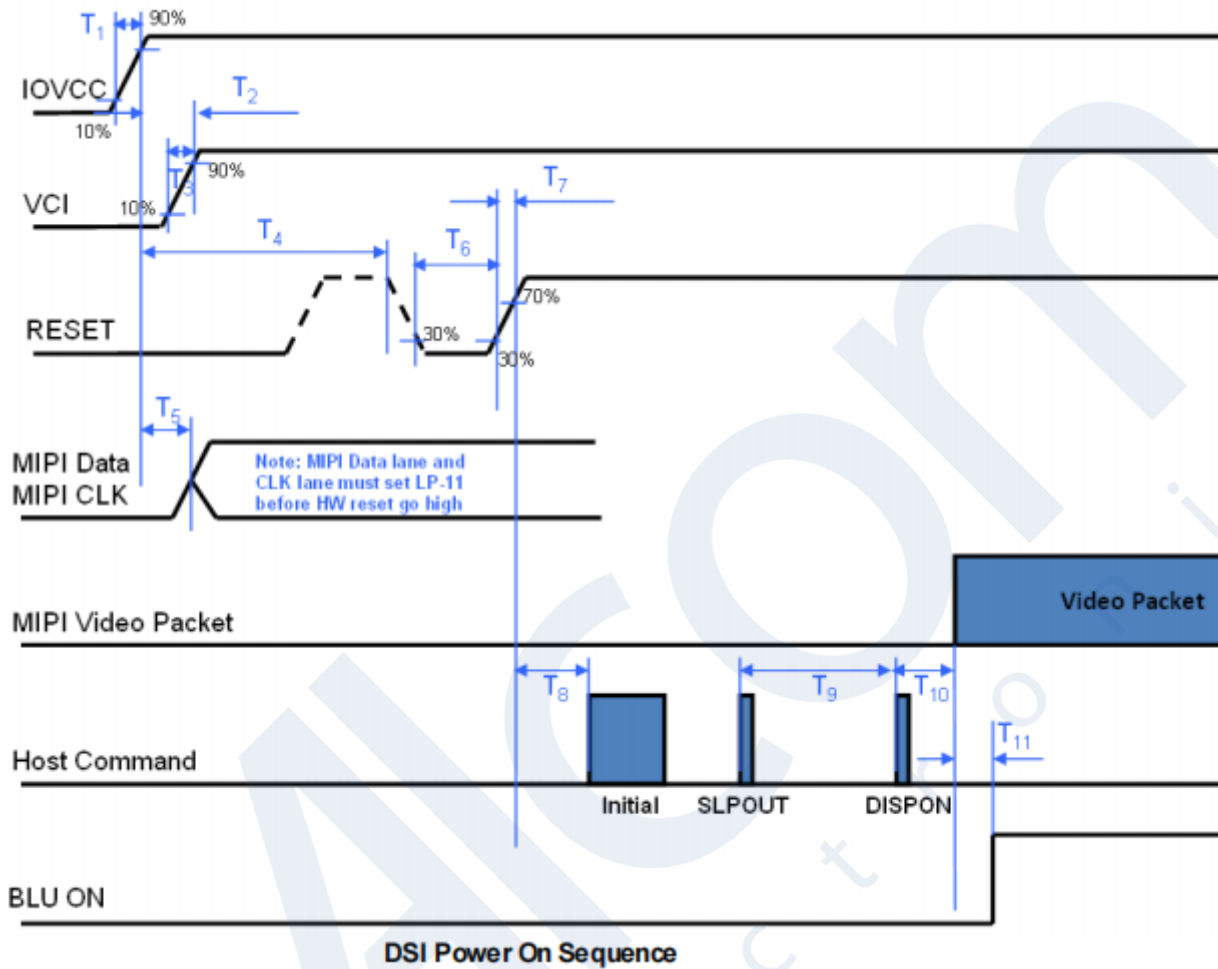
Note: For reference only, it needs to be adjusted according to the actual display effect.

5.3 Reset input timing



Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width ⁽¹⁾	NRESET	10	-	-	-	μs
tREST	Reset complete time ⁽²⁾	-	15	-	-	When reset applied during SLPIN mode	ms
		-	120	-	-	When reset applied during SLPOUT mode	ms

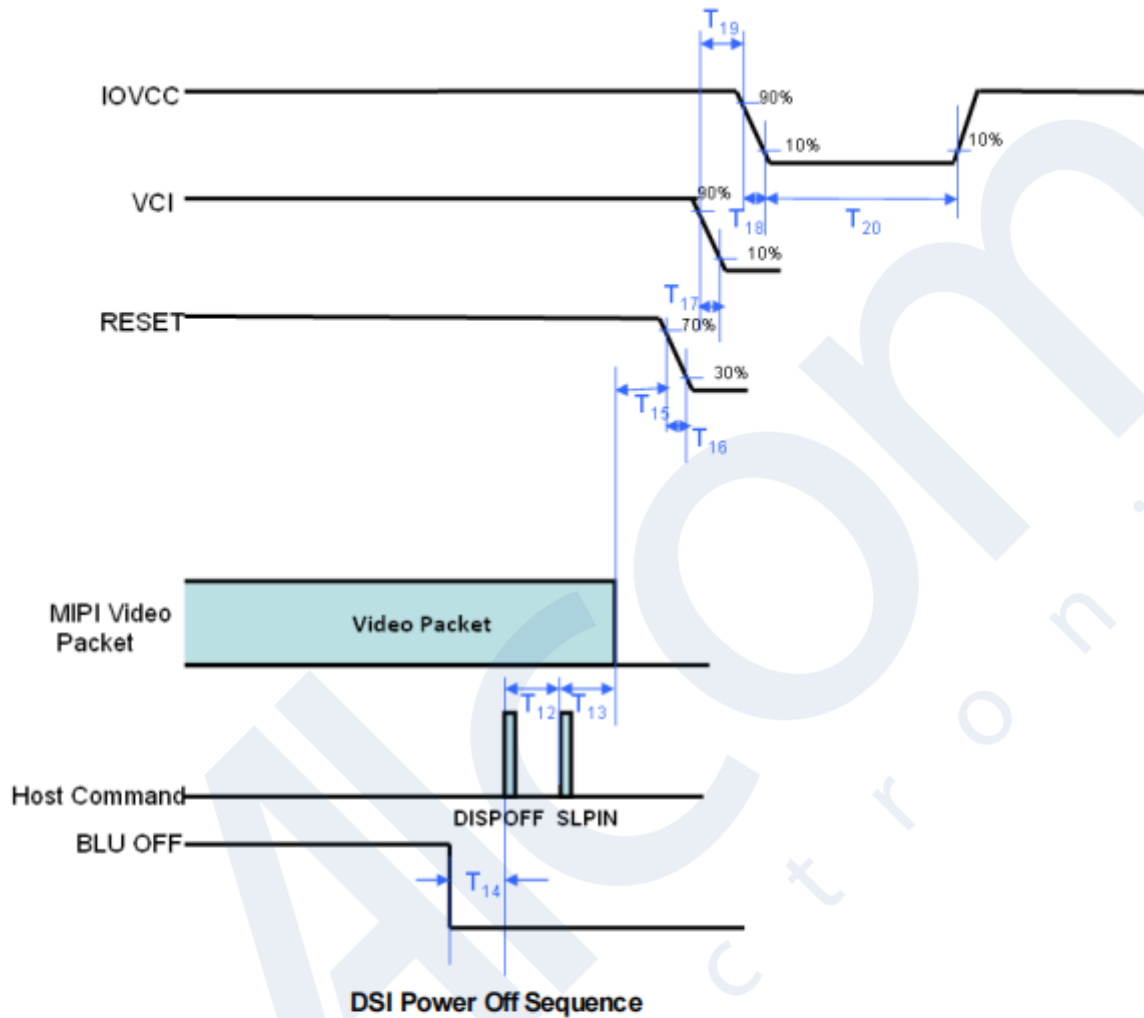
5.4 Power On Timing



	Min.	Typ.	Max.	Unit
T1	0.01	-	10	ms
T2	No Limit			ms
T3	0.01	-	10	ms
T4	1	-	-	ms
T5	1	-	-	ms
T6	10	-	-	us
T7	No Limit			ns
T8	15	-	-	ms
T9	120	-	-	ms
T10	No Limit			ms
T11	100	150	-	ms

DSI Power On Timing

5.5 Power Off Timing



	Min.	Typ.	Max.	Unit
T12	2	-	-	Frame
T13	2	-	-	Frame
T14	40	100	-	ms
T15	10	-	-	ms
T16	No Limit			ms
T17	No Limit			ms
T18	No Limit			ms
T19	No Limit			ms
T20	100			ms

DSI Power Off Timing

6 Optical Characteristics

Ta=25°C

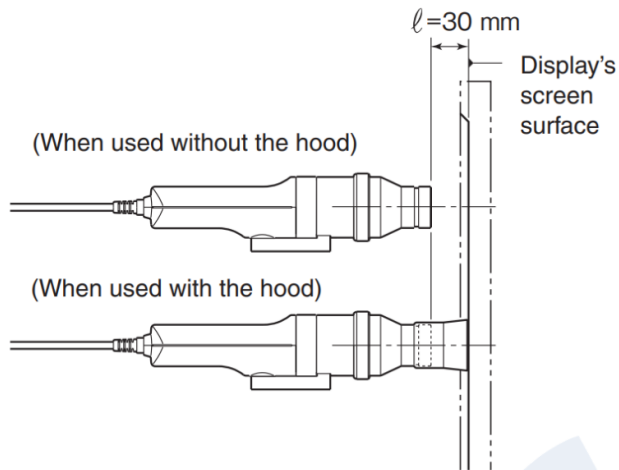
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
View Angles	θT	$CR \geq 10$	75	85	-	Degree	Note 2
	θB		75	85	-		
	θL		75	85	-		
	θR		75	85	-		
Contrast Ratio	CR	$\theta=0^\circ$	1000	1500	-		Note1 Note3
Response Time	T_{ON}	25°C	--	25	35	ms	Note1 Note4
	T_{OFF}						
Chromaticity	White	x	Backlight is on	0.222	0.252	0.282	Note1 Note5
		y		0.250	0.270	0.300	
	Red	x		0.591	0.621	0.651	
		y		0.301	0.331	0.361	
	Green	x		0.244	0.274	0.304	
		y		0.551	0.581	0.611	
	Blue	x		0.117	0.147	0.177	
		y		0.028	0.058	0.088	
Uniformity	U		75	80	-	%	Note1 Note6
NTSC			65	70	-	%	Note 5
Luminance	L		-	420	-	cd/m ²	Note1 Note7

Test Conditions:

1. $I_F=120\text{ mA}$, $V_F=9.6\text{ V}$ and the ambient temperature is $25\pm 2^\circ\text{C}$. humidity is $65\pm 7\%$
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

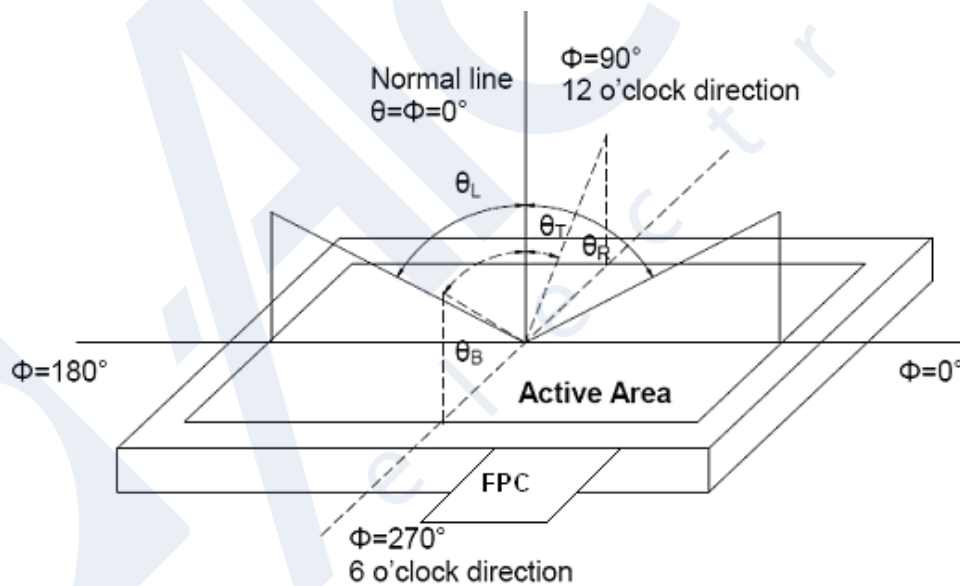
Properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



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

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

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

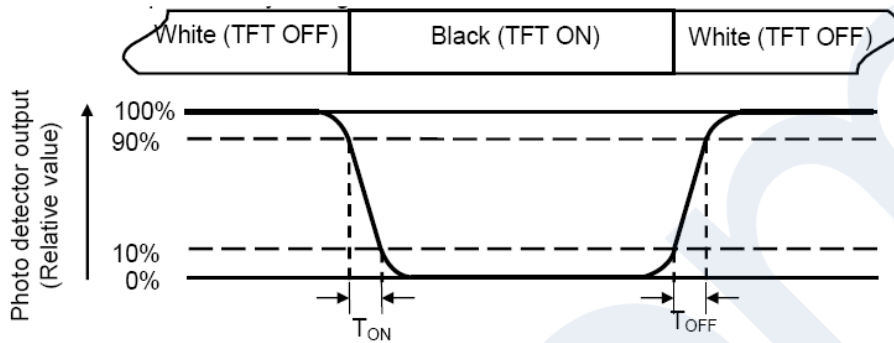
“White state “: The state is that the LCD should drive by V_{white} .

“Black state” : The state is that the LCD should drive by V_{black} .

V_{white} : To be determined V_{black} : 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)

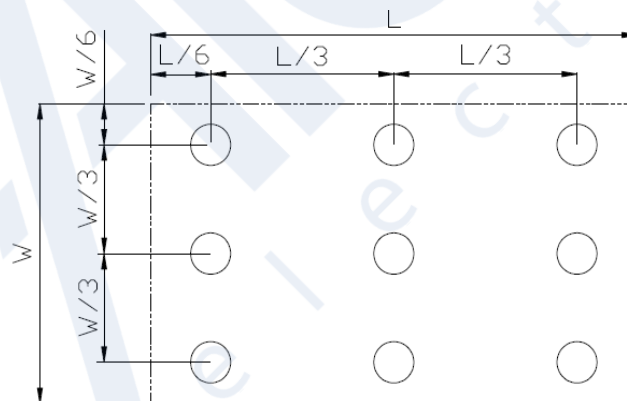
Color coordinates measured at center point of LCD.

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.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

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



L_{\max} : The measured Maximum luminance of all measurement position.

L_{\min} : The measured Minimum luminance of all measurement position.

Note 7: Definition of luminance:

Measure the luminance of white state at center point.

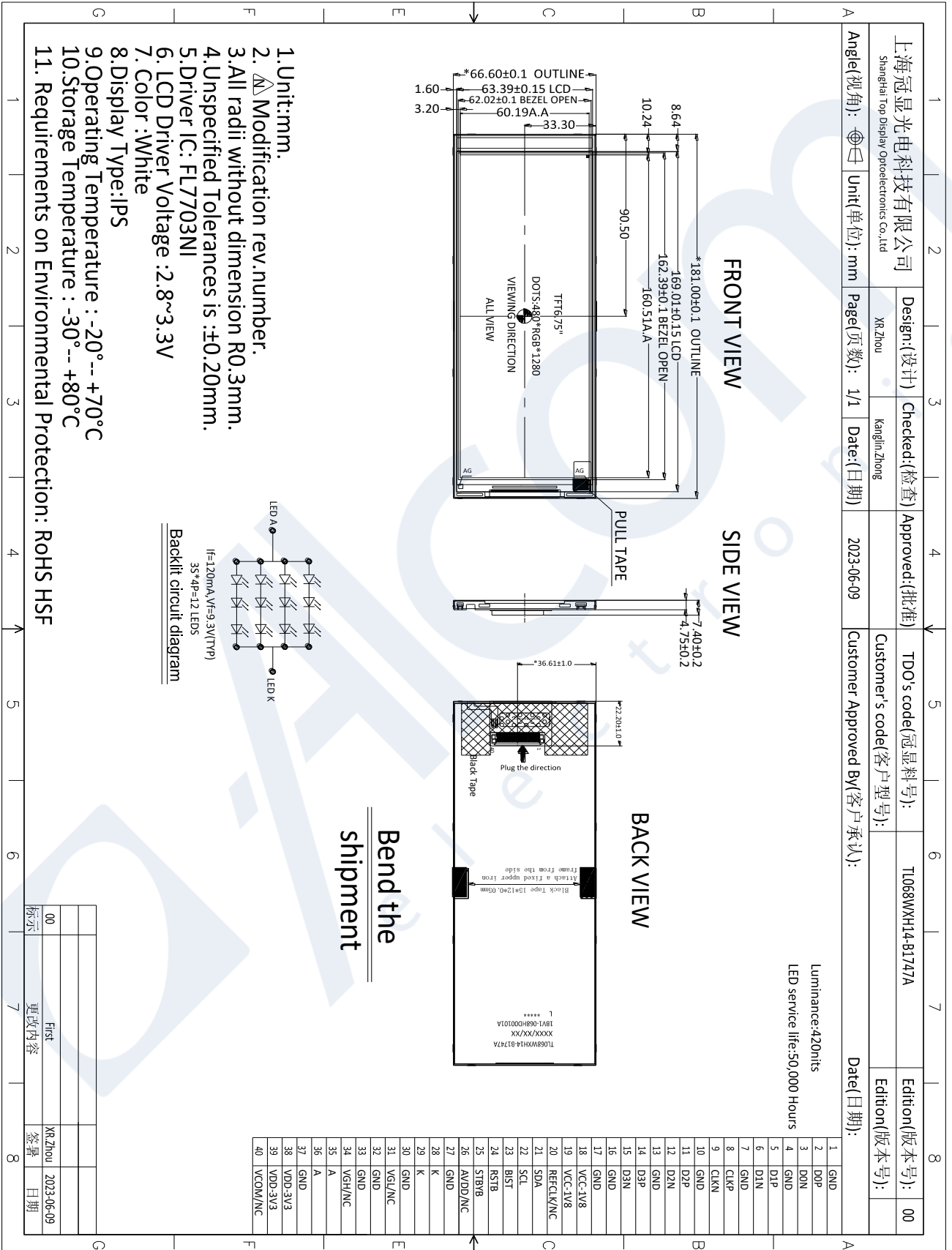
6 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70°C, 240 hours	No abnormalities in functions
2	Low Temperature Operation	Ta = -20°C, 240 hours	No abnormalities in functions
3	High Temperature Storage	Ta = +80°C, 240 hours	No abnormalities in functions
4	Low Temperature Storage	Ta = -30°C, 240 hours	No abnormalities in functions
5	Storage at High Temperature and Humidity	Ta = +60°C, 90% RH max, 240 hours	No abnormalities in functions
6	Thermal Shock (non-operating)	-30°C 30 min ~ +70°C 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°C~35°C, 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°C ~ 40°C 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.