INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer: _____

Model Name: LW700AT9309

Date: 2022/08/15

Version: 01

☐ Preliminary Specification

■ Final Specification

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by

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RECORD OF REVISIONS

Revision	Date	Page	Description
Fin-spec.01	2022/08/15	P6,P11,P19	Update Electrical Specifications, Optical Specification and Package Information

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1. SUMMARY

This technical specification applies to 7“ TFT-LCD module with a LED Backlight unit and a 40-pin RGB interface. This module supports 800*R.G.B x 480 WVGA mode and can display 262,144 colors.

2. PIN ASSIGNMENT

Pin No.	Symbol	I/O	Function	Remark
1	VSS	P	Power Ground	
2	VSS	P	Power Ground	
3	NC	-	For INX Using	
4	VCC	P	Power for Digital Circuit	
5	VCC	P	Power for Digital Circuit	
6	VCC	P	Common voltage	
7	VCC	P	Power for Digital Circuit	
8	NC	-	For INX Using	
9	DE	I	Data Input Enable	
10	VSS	P	Power Ground	
11	VSS	P	Power Ground	
12	VSS	P	Power Ground	
13	B5	I	Blue data	
14	B4	I	Blue data	
15	B3	I	Blue data	
16	VSS	P	Power Ground	
17	B2	I	Blue data	
18	B1	I	Blue data	
19	B0	I	Blue data	
20	VSS	P	Power Ground	
21	G5	I	Green data	
22	G4	I	Green data	
23	G3	I	Green data	
24	VSS	P	Power Ground	

25	G2	I	Green data	
26	G1	I	Green data	
27	G0	I	Green data	
28	VSS	P	Power Ground	
29	R5	I	Red data	
30	R4	I	Red data	
31	R3	I	Red data	
32	VSS	P	Power Ground	
33	R2	I	Red data	
34	R1	I	Red data	
35	R0	I	Red data	
36	VSS	P	Power Ground	
37	VSS	P	Power Ground	
38	DCLK	I	Sample clock	
39	VSS	P	Power Ground	
40	VSS	P	Power Ground	

3. GENERAL SPECIFICATIONS

Parameter		Specifications	Unit
Screen size		7”(Diagonal)	inch
Display Format		800 RGB x 480	dot
Active area		152.4x91.44	mm
Pixel size		190.5 x 190.5	um
Surface treatment		Anti-glare	
Color Saturation (NTSC)		50	%
Pixel Configuration		RGB Vertical Stripe	
Outline dimension		165(W) x 104.44(H) x 5.2 (D)	mm
Weight		122.9(TBD)	g
View Angle direction (Gray inversion)		6 o’clock	
Interface		RGB	
IC		EK79713B+EK73202A	
Inversion		1+2dot	
Temperature Range	Operation	-20~70	℃
	Storage	-30~80	℃

4. ABSOLUTE MAXIMUM RATINGS (GND=0V)

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power Voltage	Vcc	GND=0	0.3	6	V	-

5. ELECTRICAL SPECIFICATIONS

5.1 Recommended Operation condition (GND=0V，Ta=25℃)

Parameter		Symbol	Rating			Unit	Condition
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	**3.0**	**3.3**	**3.6**	**V**	
Input logic voltage	High Level	V_{IH}	**0.7Vcc**	**-**	**Vcc**	**V**	Note 1
	Low Level	V_{IL}	**0**	**-**	**0.3Vcc**	**V**	Note 1

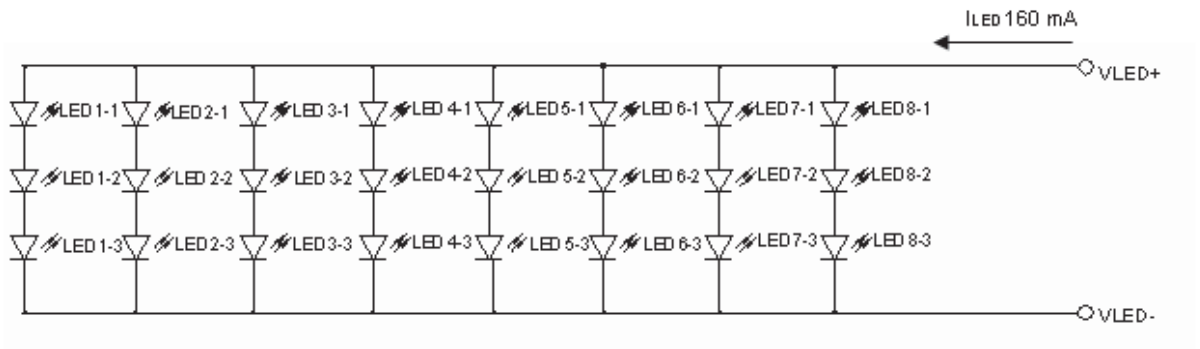
Note 1: DCLK, DE, R0~ R5, G0~ G5, B0~ B5.

5.2 LED Driving Conditions

Ta = 25℃

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I_{LED}	-	160	-	mA	Note 1
LED voltage	V_{LED}	-	9.3	-	V	
LED Life Time	-	15000	-	-	Hr	Note 2

Note 1 : There are 8 Groups LED shown as below , V_{LED}=9.3V , I_{LED}=160mA.



Note 2 : Brightess to be decreased to 50% of the initial value.

5.3 TFT-LCD current consumptionz

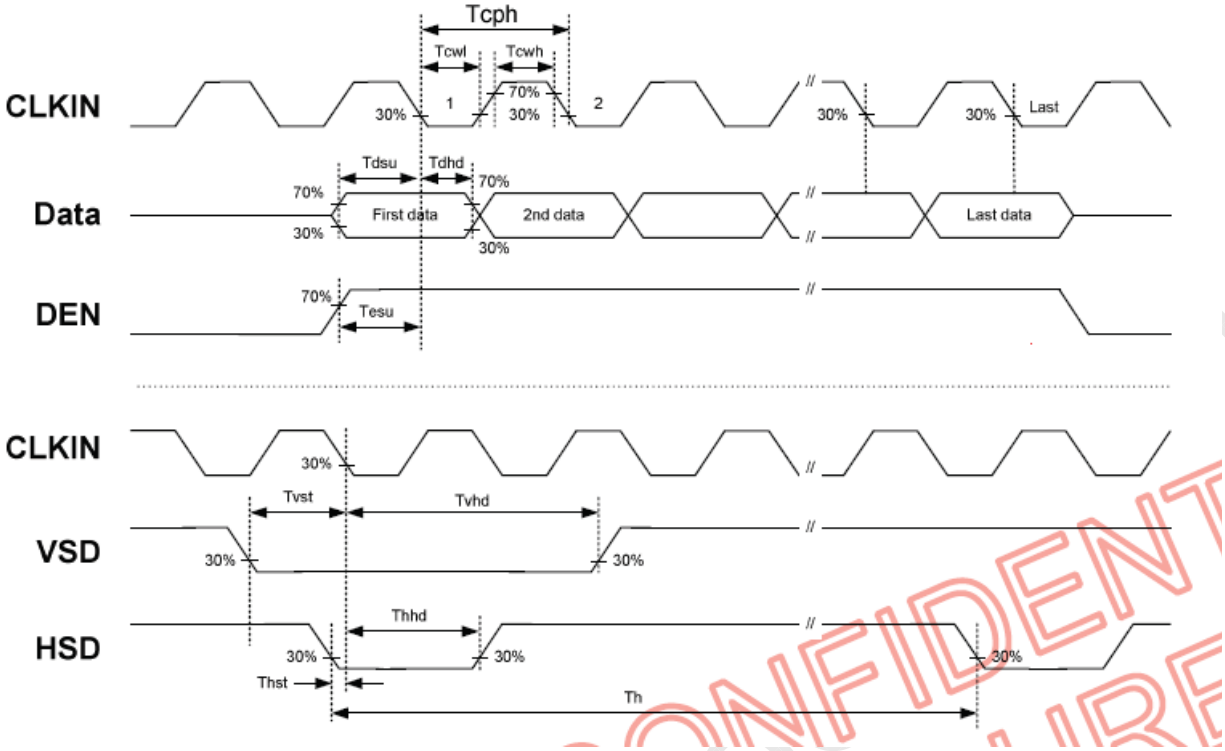
Parameter	Symbol	Rating			Unit	Condition
		Min.	Typ.	Max.		
LCD power current	Icc	**--**	**85**	**120**	**mA**	**black pattern**
LED power current	I_{LED}	**--**	**160**	**200**	**mA**	

6. AC CHARATERISTICS

6.1 AC Electrical CHARATERISTICS

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	Thst	8	-	-	ns	
HS hold time	Thhd	8	-	-	ns	
VS setup time	Tvst	8	-	-	ns	
VS hold time	Tvhd	8	-	-	ns	
Data setup time	Tdsu	8	-	-	ns	
Data hole time	Tdhd	8	-	-	ns	
DE setup time	Tesu	8	-	-	ns	
DE hole time	Tehd	8	-	-	ns	
DV_{DD} Power On Slew rate	TPOR	-	-	20	ms	From 0 to 90% DV_{DD}
RESET pulse width	TRst	1	-	-	ms	
DCLK cycle time	Tcph	20	-	-	ns	
DCLK pulse duty	Tcwh	40	50	60	%	

6.2 Clock and Data input waveforms



6.3 Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	6	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	204	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	3	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

Note: Frame rate is 60±5Hz

6.4 Data input format

Figure 3. 1 Horizontal input timing diagram.

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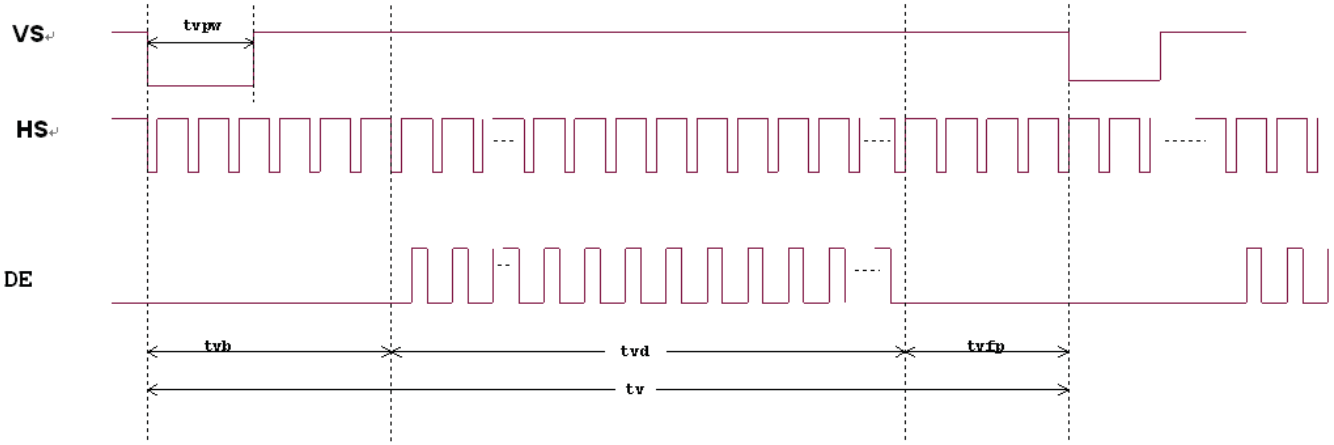
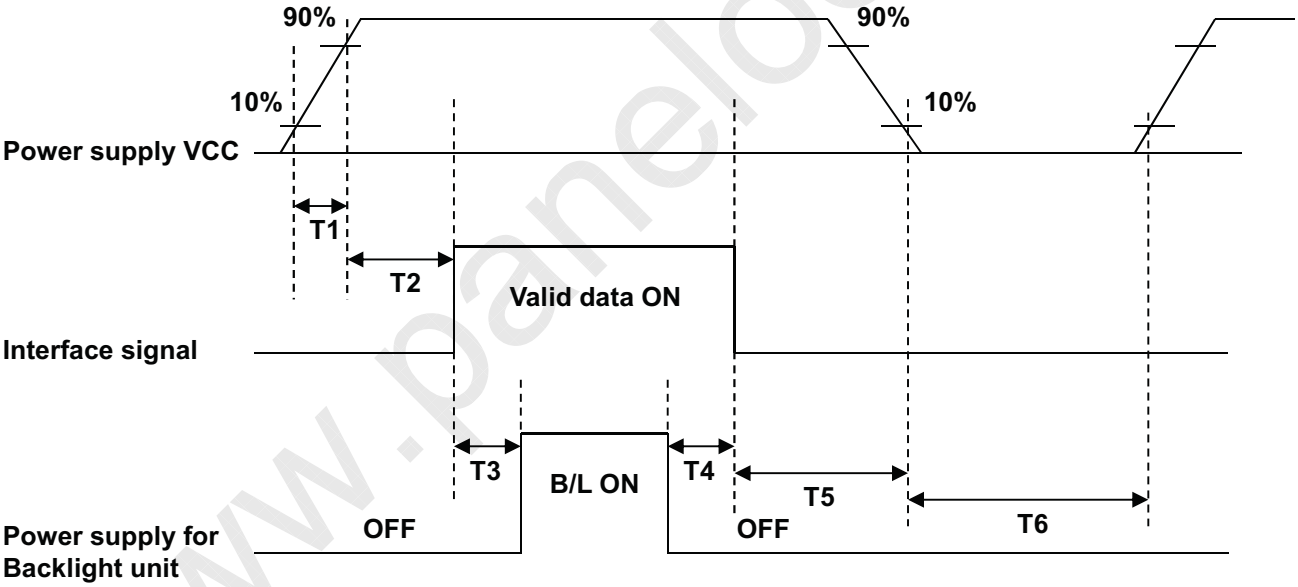


Figure 3. 2 Vertical input timing diagram.

6.5 Power ON/OFF sequence



Parameter	SPEC.			Unit
	Min.	Typ.	Max.	
T1	1		2	ms
T2	200			ms
T3	180			ms
T4	180			ms
T5	200			ms
T6	1000			ms

7. OPTICAL SPECIFICATIONS

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	60	70	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	60	70	-		
	θ_T	Φ=90°(12 o'clock)	50	60	-		
	θ_B	Φ=270°(6 o'clock)	60	70	-		
Response time	T_{ON+} T_{OFF}	Normal θ=Φ=0°	-	25	50	ms	Note 2 Note 3
Contrast ratio	CR		700	1000	-	-	Note 2 Note 4
Color chromaticity	WX		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	WY		0.28	0.33	0.38	-	
Luminance	L		340	400	-	cd/m^2	Note 2 Note 5 Note 6
Color Saturation (NTSC)	NTSC	Normal θ=Φ=0° CLE 1931	45	50	-	%	Note 2 Note 5 Note 6
Luminance uniformity	Yu	Normal θ=Φ=0°	70	75	-	%	Note 2 Note 6 Note 7

Test Conditions:

1. V_{CC}=3.3V, I_L =160mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

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Note 1: Definition of viewing angle range

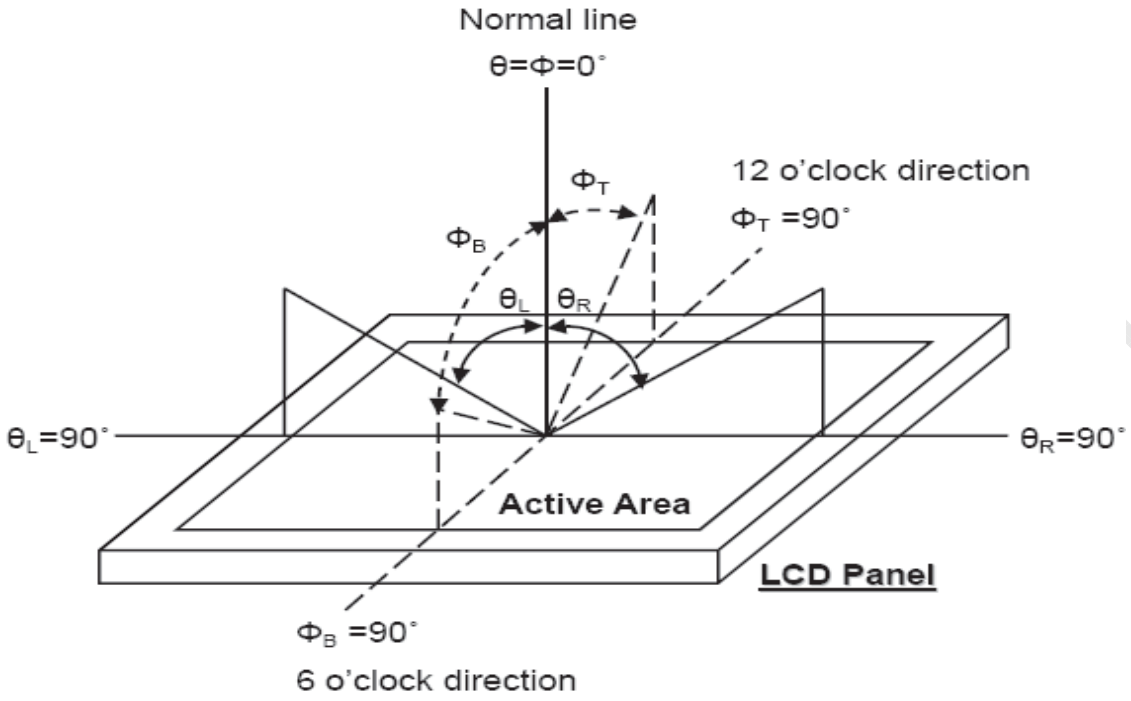


Fig. 7-1 Definition of viewing angle

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. Optical items are measured by CS2000/Field of view: 1°/Height: 500mm .

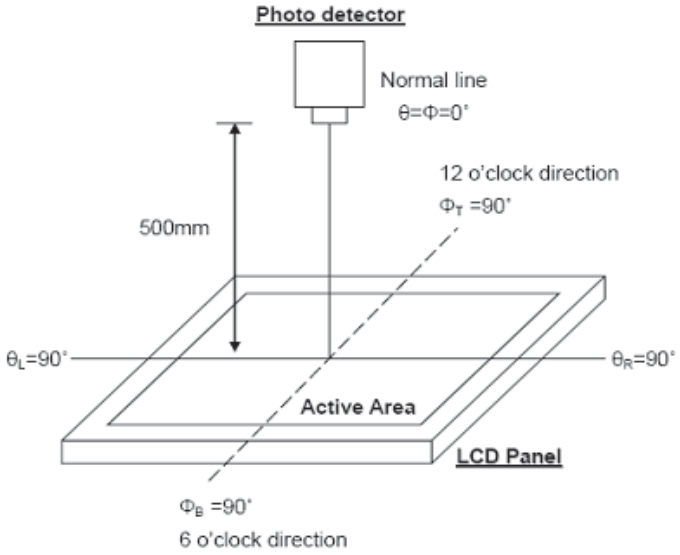


Fig.7-2 Optical measurement system setup

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, Tr, is the time between photo detector output intensity changed from 90% to 10% . And fall time, Tf, is the time between photo detector output Intensity changed from10% to 90% .

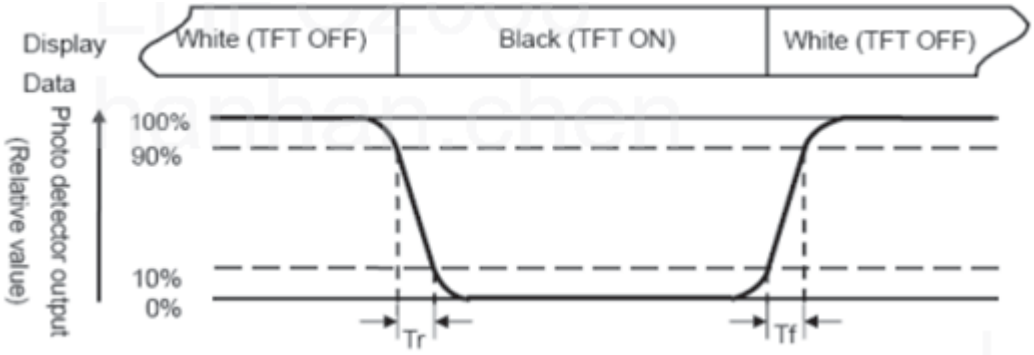


Fig. 7-3 Definition of response time

Note 4: Definition of contrast ratio:
The contrast ratio is defined as the following expression.

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

Note 5: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the 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=160 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.

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

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

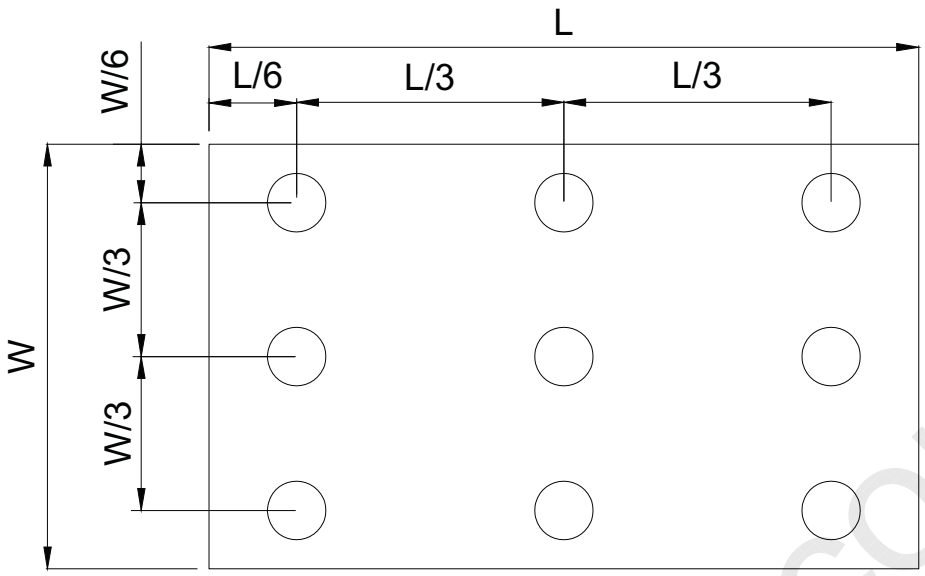


Fig. 7-4 Definition of measuring points

B_{max}: The measured maximum luminance of all measurement position.
B_{min}: The measured minimum luminance of all measurement position.

8. INTERFACE

8.1 LCM PIN Definition

Pin No.	Symbol	Description	Remark
1	GND	**Power Ground**	
2	GND	**Power Ground**	
3	NC	**Not Connect**	
4	Vcc	**Power Supply for Digital Circuit**	
5	Vcc	**Power Supply for Digital Circuit**	
6	Vcc	**Power Supply for Digital Circuit**	
7	Vcc	**Power Supply for Digital Circuit**	
8	NC	**Not Connect**	
9	DE	**Data Enable**	
10	GND	**Power Ground**	
11	GND	**Power Ground**	
12	GND	**Power Ground**	
13	B5	**Blue Data 5 (MSB)**	
14	B4	**Blue Data 4**	
15	B3	**Blue Data 3**	
16	GND	**Power Ground**	
17	B2	**Blue Data 2**	
18	B1	**Blue Data 1**	
19	B0	**Blue Data 0 (LSB)**	
20	GND	**Power Ground**	
21	G5	**Green Data 5 (MSB)**	
22	G4	**Green Data 4**	
23	G3	**Green Data 3**	
24	GND	**Power Ground**	
25	G2	**Green Data 2**	
26	G1	**Green Data 1**	
27	G0	**Green Data 0 (LSB)**	
28	GND	**Power Ground**	
29	R5	**Red Data 5 (MSB)**	
30	R4	**Red Data 4**	
31	R3	**Red Data 3**	
32	GND	**Power Ground**	
33	R2	**Red Data 2**	
34	R1	**Red Data 1**	
35	R0	**Red Data 0 (LSB)**	
36	GND	**Power Ground**	
37	GND	**Power Ground**	
38	DCLK	**Clock Signals ; Latch Data at the Falling Edge**	
39	GND	**Power Ground**	
40	GND	**Power Ground**	

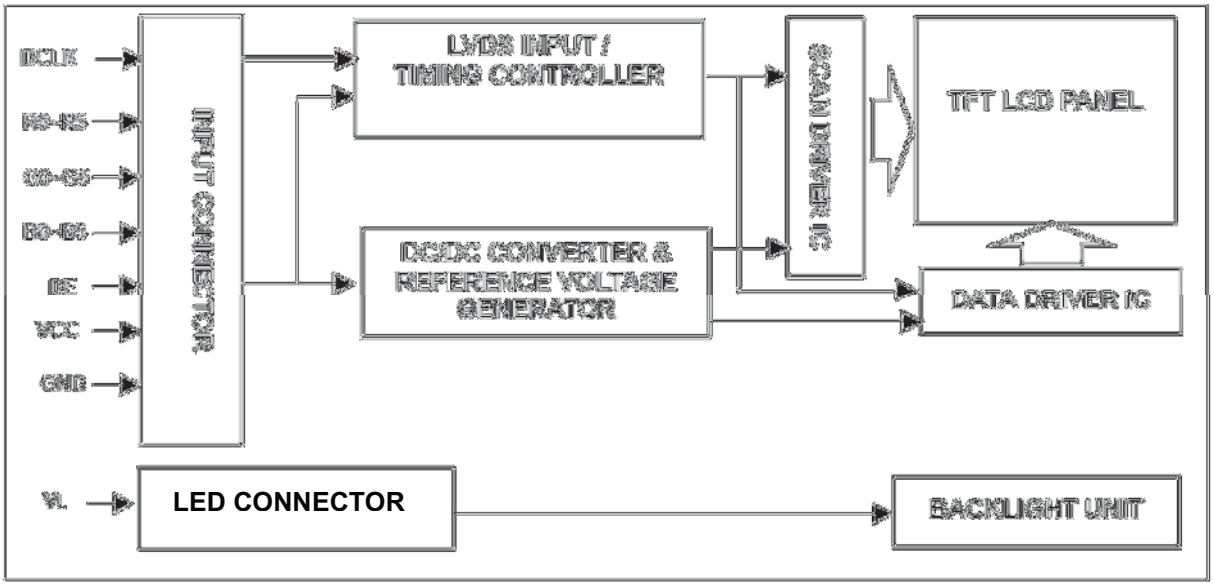
Note: User's connector part number is **CF39402D0R0-NH** manufactured by CviLux or equivalent.

8.2 Backlight Driving Part

Pin No.	Symbol	Description
1	VLED+	**Red, LED_ Anode**
2	VLED-	**White, LED_ Cathode**

Note: The backlight interface connector is a model **SM02B-BHSS-1-TB** manufactured by JST or equivalent. The matching connector part number is **BHSR-02VS-1** manufactured by JST or equivalent.

9. BLOCK DIAGRAM



10. QUALITY ASSURANCE

No.	Test Items	Test Condition	REMARK
1	High Temperature Storage Test	80℃, 240hours	Note 10.1 Note 10.2 Note 10.3
2	Low Temperature Storage Test	-30℃, 240hours	
3	High Temperature Operation Test	70℃, 240hours	
4	Low Temperature Operation Test	-20℃, 240hours	
5	High Temperature and High Humidity Operation Test	60℃, 90%RH,240hours	
6	Thermal Shock Storage Test	-20ºC, 0.5hour←→70℃, 0.5hour; 100cycles	
7	Electro Static Discharge Test	± 2KV, Human Body Mode, 100pF/1500Ω	Note 10.2 Note 10.3
8	Vibration Test (non-operating)	1.5G / 10-500 Hz, Sine wave, 30 min/cycle, 1cycle for each X, Y, Z	Note 10.2 Note 10.3

Note:

10.1 The test samples have recovery time need more than 2 hours at room temperature before the function check. In the standard conditions, there is no abnormal display function occurred.

10.2 After the reliability test, the product only guarantees operational function, but don't guarantee all of the cosmetic specification.

10.3 Under no condensation of dew.

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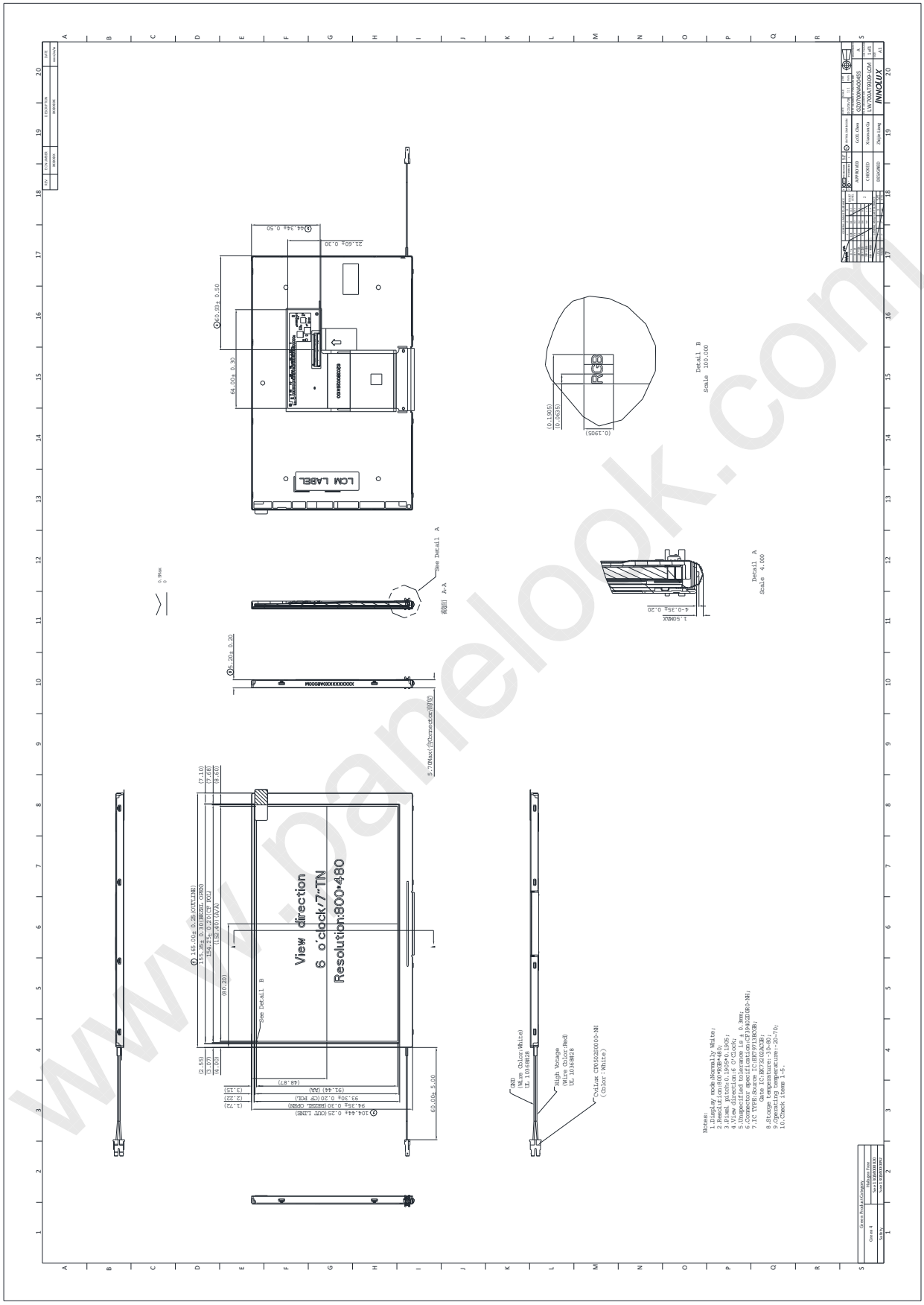
11. OUTLINE DRAWING



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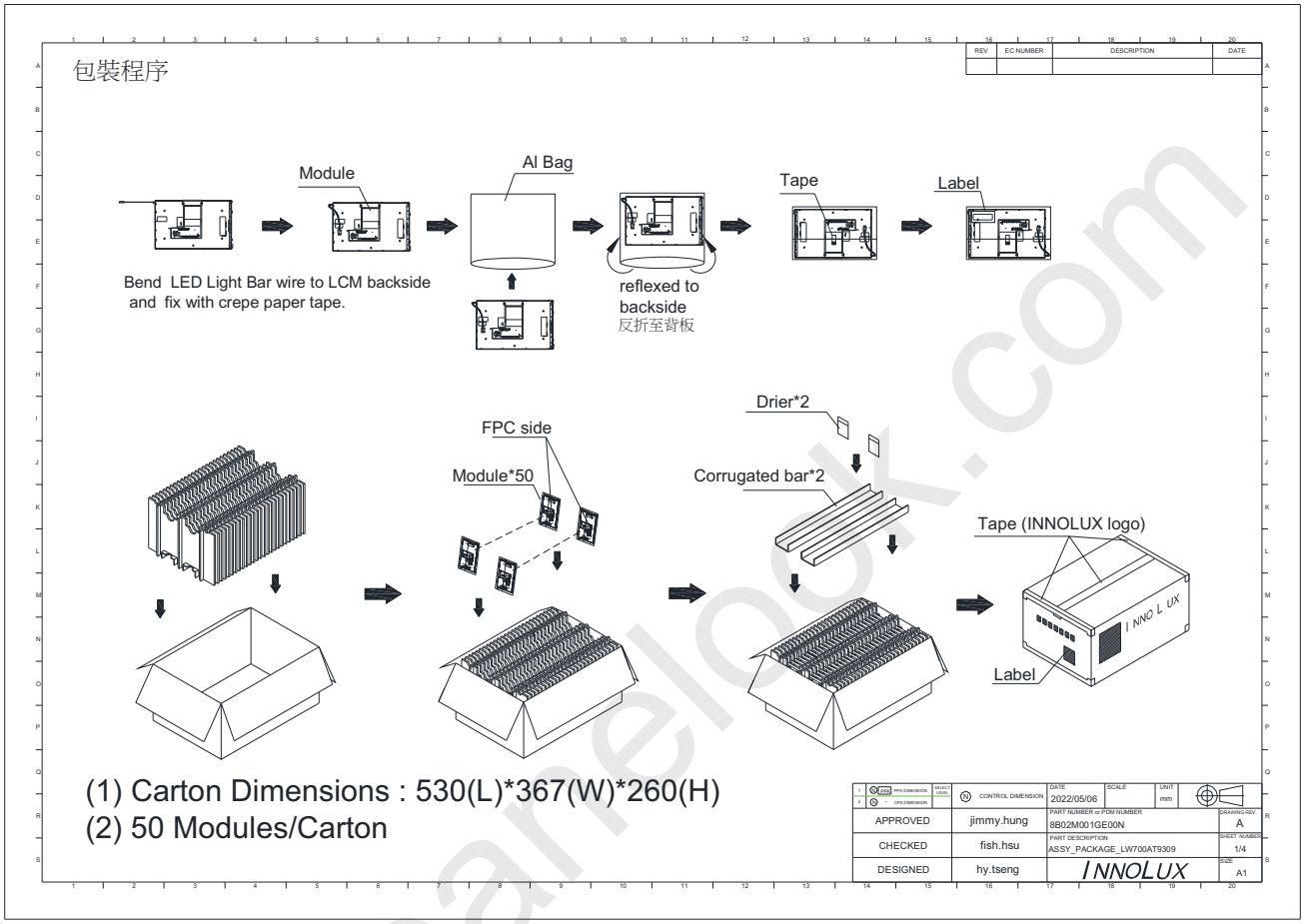
12. PACKAGE INFORMATION

12.1 Packaging Drawing



13. PRECAUTIONS

Please pay attention to the following when you use this TFT LCD module.

13.1 MOUNTING PRECAUTIONS

(1) You must mount a module using arranged in four corners or four sides.
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module.
And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach a transparent protective plate to the surface in order to protect the polarizer.
Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not describe because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are determined to the polarizer)
(7) When the surface becomes dusty, please wipe gently with adsorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

13.2 OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage：
V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower)
And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

13.3 ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wristband etc. And don't touch interface pin directly.

13.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

13.5 STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

13.6 HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.

(2) The protection film is attached to the polarizer with a small amount of glue. Is apt to remain on the polarizer.Please carefully peel off the protection film without rubbing it against the polarizer.

(3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.

(4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.