

# **INNOLUX DISPLAY CORPORATION**

## **LCD MODULE**

# **SPECIFICATION**

**Customer:** \_\_\_\_\_  
**Model Name:** LW700AT9309  
**Date:** 2022/03/22  
**Version:** 01

- Preliminary Specification**  
 **Final Specification**

**For Customer's Acceptance**

Approved by	Comment

Approved by	Reviewed by	Prepared by

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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	125(TBD)	g
View Angle direction (Gray inversion)	6 o'clock	
Interface	RGB	
IC	EK79713B+EK73202A	
Inversion	1+2dot	
Temperature Range	Operation	-20~70 °C
	Storage	-30~80 °C

**4. ABSOLUTE MAXIMUM RATINGS (GND=0V)**

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

**5. ELECTRICAL CHARACTERISTICS**

**5.1 Recommended Operation condition (GND=0V , Ta=25°C)**

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 <sub>IH</sub>	0.7Vcc	-	Vcc	V	Note 1
	Low Level	V <sub>IL</sub>	0	-	0.3Vcc	V	Note 1

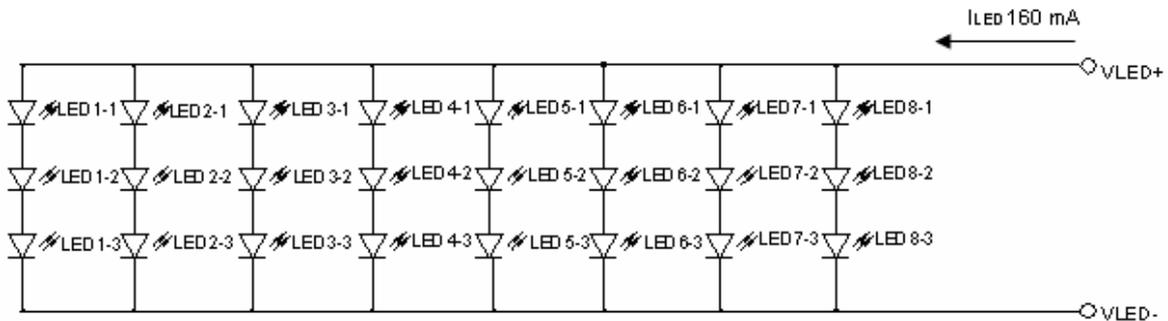
Note 1: DCLK, DE, R0~ R5, G0~ G5, B0~ B5.

**5.2 LED Driving Conditions**

Ta = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I <sub>LED</sub>	-	160	-	mA	Note 1
LED voltage	V <sub>LED</sub>	-	8.85	-	V	
LED Life Time	-	10,000	20,000	-	Hr	Note 2

Note 1 : There are 8 Groups LED shown as below , V<sub>LED</sub>=8.85V , I<sub>LED</sub>=160mA.



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

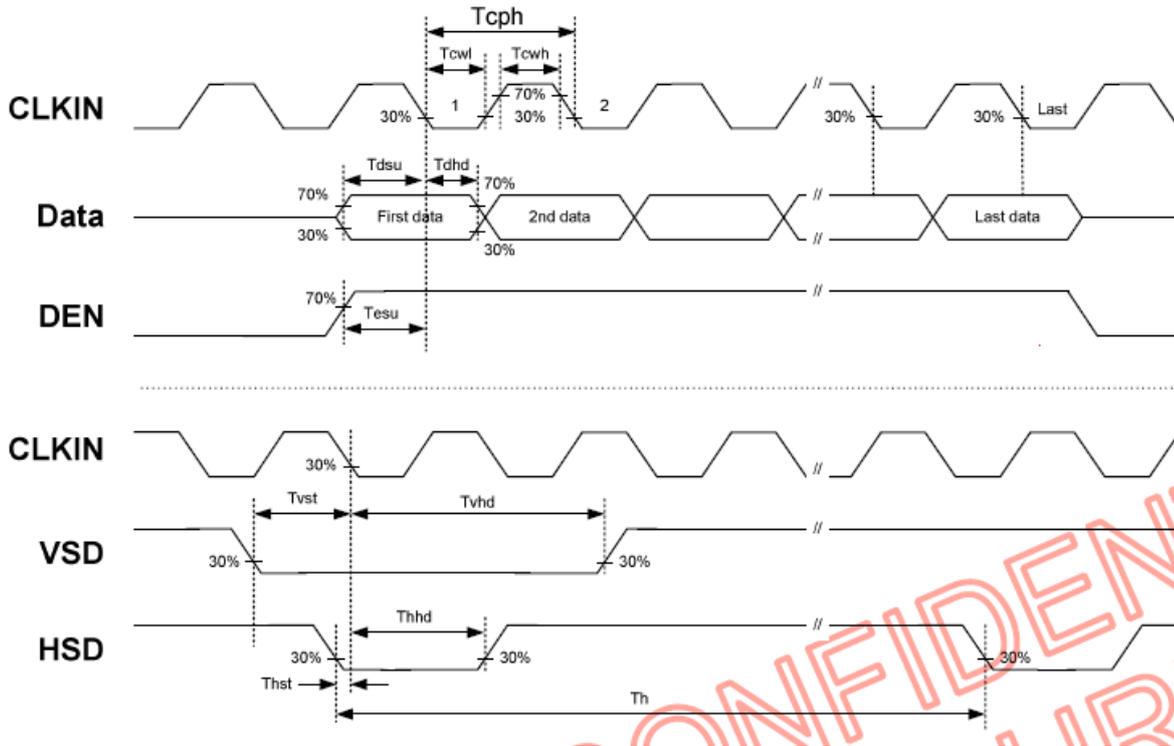
**5.3 TFT-LCD current consumptionz**

Parameter	Symbol	Rating			Unit	Condition
		Min.	Typ.	Max.		
LCD power current	I <sub>CC</sub>	--	TBD	TBD	mA	black pattern
LED power current	I <sub>LED</sub>	--	160	200	mA	

**6. AC CHARACTERISTICS**
**6.1 AC Electrical CHARACTERISTICS**

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	$T_{hst}$	8	-	-	ns	
HS hold time	$T_{hhd}$	8	-	-	ns	
VS setup time	$T_{vst}$	8	-	-	ns	
VS hold time	$T_{vhd}$	8	-	-	ns	
Data setup time	$T_{dsu}$	8	-	-	ns	
Data hole time	$T_{dhd}$	8	-	-	ns	
DE setup time	$T_{esu}$	8	-	-	ns	
DE hole time	$T_{ehd}$	8	-	-	ns	
DV <sub>DD</sub> Power On Slew rate	$T_{POR}$	-	-	20	ms	From 0 to 90% DV <sub>DD</sub>
RESET pulse width	$T_{Rst}$	1	-	-	ms	
DCLK cycle time	$T_{cph}$	20	-	-	ns	
DCLK pulse duty	$T_{cwh}$	40	50	60	%	

**6.2 Clock and Data input waveforms**



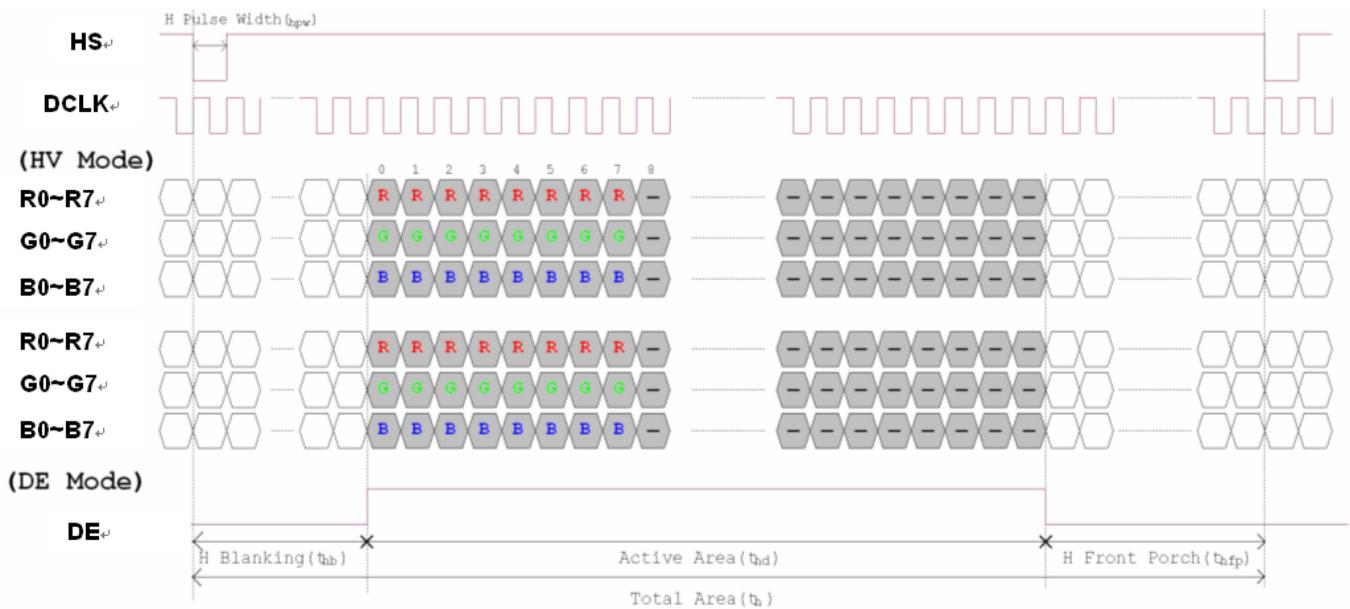
**6.3 Timing**

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  $60 \pm 5\text{Hz}$

**6.4 Data input format**



**Figure 3. 1 Horizontal input timing diagram.**

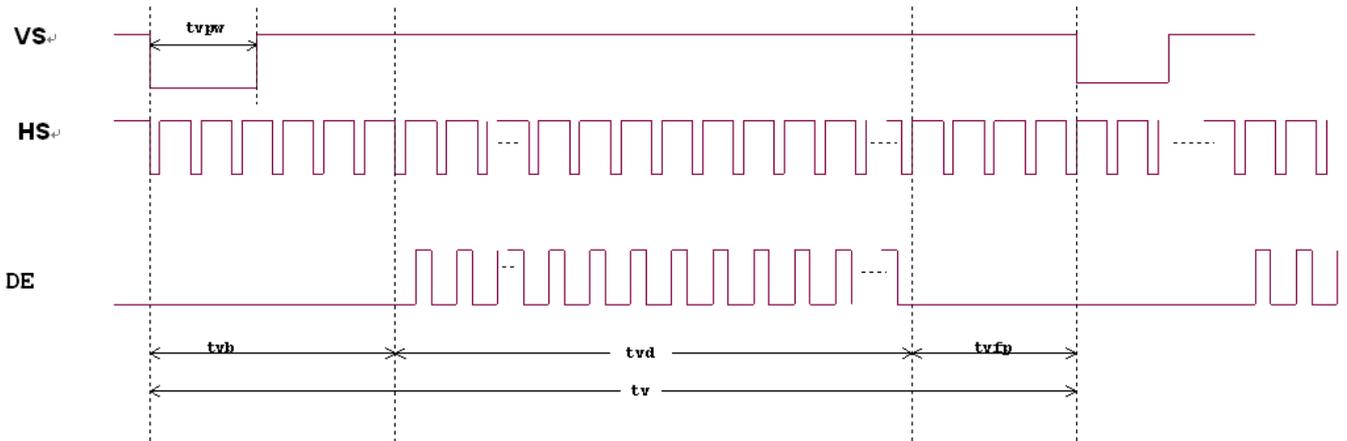
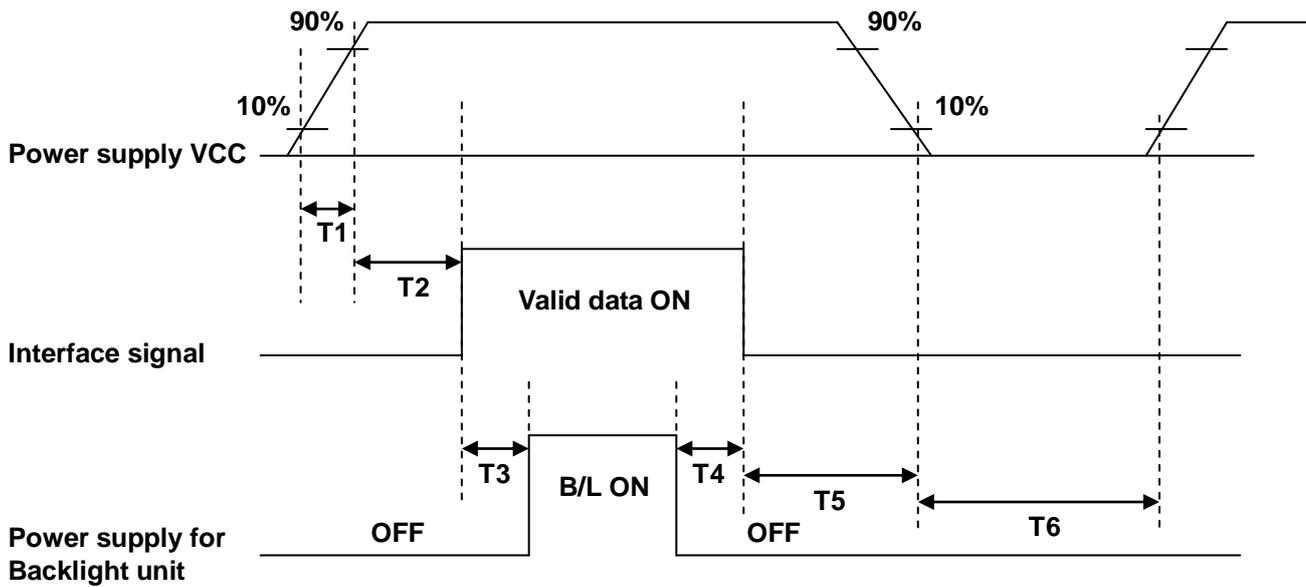


Figure 3. 2 Vertical input timing diagram.

**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 CHARACTERISTIC**

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Brightness	-	Viewing normal angle $\theta = \psi = 0$	320	390	-	cd/m <sup>2</sup>	Center of display
Response time	Tr		-	5	10	.ms	Note 3,5
	Tf		-	15	20	.ms	
Contrast ratio	CR		700	1000	-	-	Note 4,5
Color Chromaticity	White	Wx	0.26	0.31	0.36	-	Note 2,6,7
		Wy	0.28	0.33	0.38		
Viewing angle	Hor.	$\theta_R$	60	70	-	Deg.	Note 1
		$\theta_L$	60	70	-		
	Ver.	$\psi_T$	50	60	-		
		$\psi_B$	60	70	-		

Note 1: Definition of viewing angle range

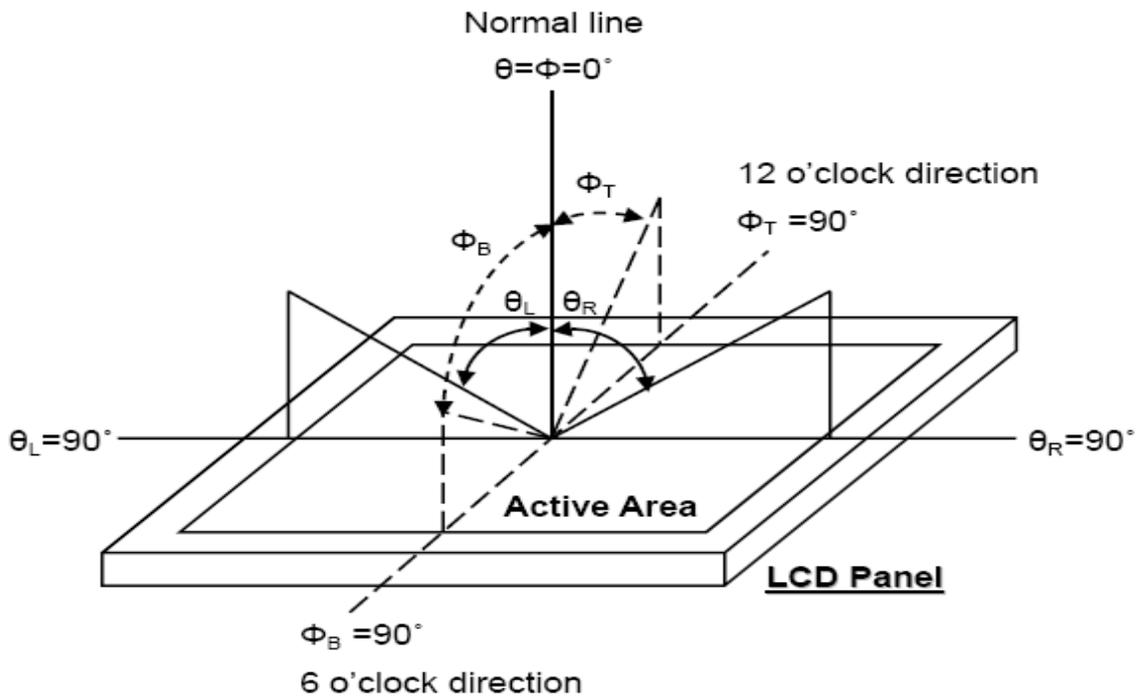


Fig. 7-1 Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

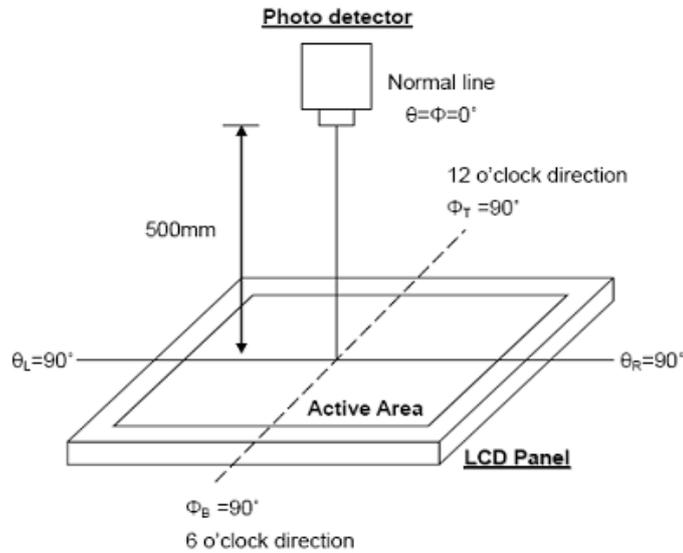


Fig.7-2 Optical measurement system setup

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,  $T_r$ , is the time between photo detector output intensity changed from 90% to 10% . And fall time,  $T_f$ , is the time between photo detector output Intensity changed from 10% to 90% .

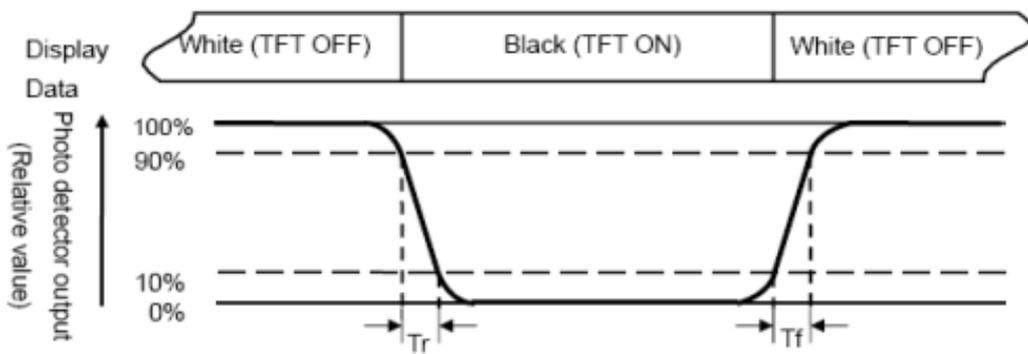


Fig. 3-3 Definition of response time

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: White  $V_i = V_{i50} \pm 1.5V$

Black  $V_i = V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

“±” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

$$\text{Note 8 : Uniformity (U)} = \frac{\text{Brightness (min)}}{\text{Brightness (max)}} \times 100\%$$

**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	

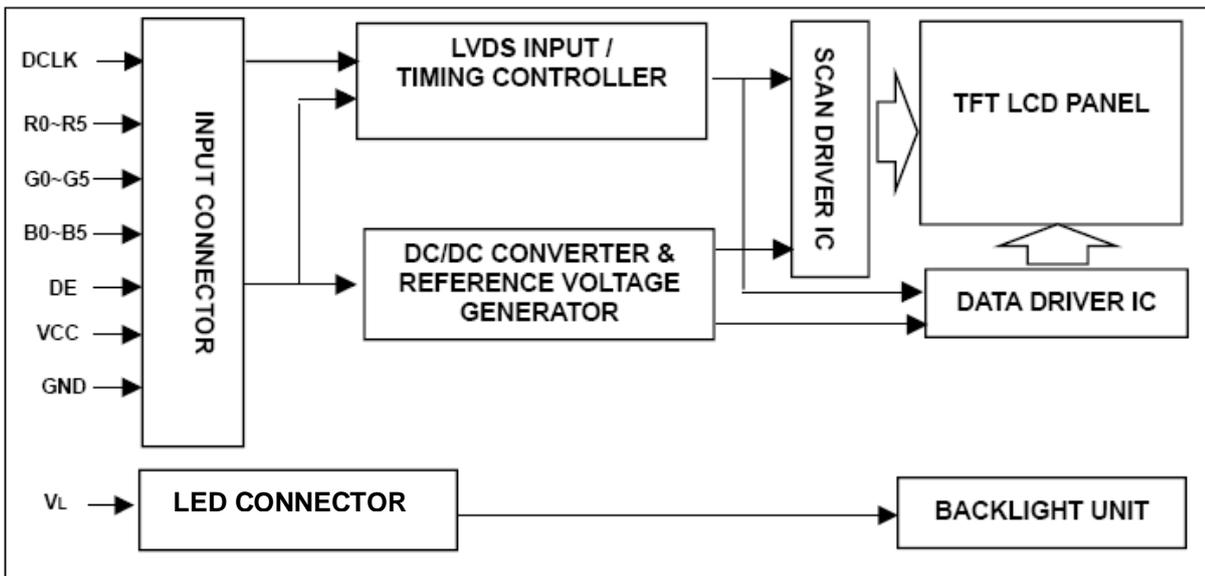
Note: User's connector part number is **CF39402D0R0-NH** manufactured by CviLux or equivalent.

**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°C, 240hours	Note 10.1 Note 10.2 Note 10.3
2	Low Temperature Storage Test	-30°C, 240hours	
3	High Temperature Operation Test	70°C, 240hours	
4	Low Temperature Operation Test	-20°C, 240hours	
5	High Temperature and High Humidity Operation Test	60°C, 90%RH,240hours	
6	Thermal Shock Storage Test	-20°C, 0.5hour←→70°C, 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.



**12. PACKAGE INFORMATION**

**12.1 Packaging Material Table**

**TBD (need to update)**

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	LW700AT9309	165 × 104.44 × 5.2	0.125	50 pcs	
2	Partition	BC Corrugated Paper	512 × 349 × 226	1.889	1 set	
3	Crepe Paper_Tape	四維CM35	30x10x0.1	0.001	100pcs	
5	Dust-Proof Bag	PE	700 × 530x0.05	0.048	1 pcs	
6	A/S Bag	PE	180 × 160 × 0.05	0.002	50 pcs	
7	Carton	Corrugated paper	530 × 355 × 255	0.950	1 pcs	
8	Total weight	9.44 Kg±5%				

**12.2 Packaging Quantity**

**TBD (need to update)**

Total LCM quantity in Carton: no. of Partition	2 Rows	x	quantity per Row	25	= 50
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### 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 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 :  
 $V = \pm 200\text{mV}$  (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°C and 35°C 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.