

INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer: Philips
Model Name: AT070TN83
SPEC NO.: A070-83-TT-02
Date: 2007/03/28
Version: 02

Preliminary Specification

Final Specification

Option

AT070TN83 LCM

LED Driving Board

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by
 167 0329 0938	 2007.3.29	 03/28/2007

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Record of Revision

Version	Revise Date	Page	Content
Pre spec 01	2006/07/06		Initial release.
Pre spec 02	2006/08/02	5	Modify the model name from AT070TN08 V.1 to AT070TN83.
		13	Modify the power voltage and input signal voltage in absolute maximum rating.
Pre spec 03	2006/10/31	1	Modify the viewing angle.
		7	Add the power consumption and weight values.
		13	Modify the LED voltage and current.
		19	Modify the Typ. luminance from 300nits to 250nits.
		20	Modify the color chromaticity tolerance from ± 0.05 to ± 0.04 .
Pre spec 04	2007/01/25	5	Modify the lightbar wire length from 100mm to 60mm in the mechanical drawing.
		8	Add the weight.
		17	Add LED reverse voltage & forward current.
Final spec 01	2007/03/07	2	Modify the power sequence. Add the Note.
		17	Add the Note4.
		17	Modify TTL connector model from "FH19S-40S-0.5SH" to "FH19SC-40S-0.5SH".
		18	Modify connector model in the mechanical drawing.
		19	Add the weight of LED Driving Board.
		20~23	Modify the packaging drawing (with LED Driving Board)
		20~23	Add appendix (LED Driving Board).
02	2007/03/28	11	Modify the color chromaticity tolerance from ± 0.04 to ± 0.03 .
		18	Add the weight of Corrugated Board.

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1. General Specifications

No.	Item	Specification	Remark
1	LCD size	7.0 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	800X3(RGB)X480	
4	Display mode	Normally white, Transmissive	
5	Dot pitch	0.0635(W)X0.1905(H) mm	
6	Active area	152.4 (W)X91.44 (H) mm	
7	Module size	165(W)X104(H)X5.5(D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Interface	Digital(TTL)	
11	Backlight power consumption	0.80W(Typ.)	
12	Panel power consumption	0.99W(Typ.)	(including T-con Board power consumption)
13	Weight	130g(Typ.)	(Without LED Driving Board)

Note 1: Refer to Mechanical Drawing.

2. Pin Assignment

2.1. TFT LCD Panel Driving Section

TTL Connector is used for the module electronics interface. The recommended model is FH19SC-40S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Remark
1	GND	P	Power ground	
2	GND	P	Power ground	
3	NC	-	No Connection	
4	VCC	I	Power supply for digital circuit	
5	VCC	I	Power supply for digital circuit	
6	VCC	I	Power supply for digital circuit	
7	VCC	I	Power supply for digital circuit	
8	NC	-	No Connection	
9	DE	I	Data enable	
10	GND	P	Power ground	
11	GND	P	Power ground	
12	GND	P	Power ground	
13	B5	I	Blue data input (MSB)	
14	B4	I	Blue data input	
15	B3	I	Blue data input	
16	GND	P	Power ground	
17	B2	I	Blue data input	
18	B1	I	Blue data input	
19	B0	I	Blue data input(LSB)	

20	GND	P	Power ground	
21	G5	I	Green data input(MSB)	
22	G4	I	Green data input	
23	G3	I	Green data input	
24	GND	P	Power ground	
25	G2	I	Green data input	
26	G1	I	Green data input	
27	G0	I	Green data input(LSB)	
28	GND	P	Power ground	
29	R5	I	Red data input(MSB)	
30	R4	I	Red data input	
31	R3	I	Red data input	
32	GND	P	Power ground	
33	R2	I	Red data input	
34	R1	I	Red data input	
35	R0	I	Red data input(LSB)	
36	GND	P	Power ground	
37	GND	P	Power ground	
38	DCLK	I	Sample clock	
39	GND	P	Power ground	
40	GND	P	Power ground	

I: input, O: output, P: Power

2.2. Backlight Unit Section

LED Light Bar Connector is used for the integral backlight system. The recommended model is BHSR-02VS-1 manufactured by JST.

Pin No.	Symbol	I/O	Function	Remark
1	HI	P	Power supply for backlight unit(High voltage)	Pink
2	GND	P	Ground for backlight unit	White

3. Operation Specifications

3.1. Absolute Maximum Rating

(GND=AV_{SS}=0V, Note 2)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	V _{CC}	-0.3	6.0	V	
Input signal voltage	V _i	-0.3	6.3	V	Note 1
Operation Temperature	T _{OP}	-20	70	°C	
Storage Temperature	T _{ST}	-30	80	°C	
LED Reverse Voltage	V _r	-	1.2	V	Each LED
LED Forward Current	I _F	-	25	mA	Each LED

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

Note 2: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

3.1.1. Typical Operation Conditions

(GND=AV_{SS}=0V)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V _{CC}	3.0	3.3	3.6	V	Note 1
Current Consumption	I _{CC}	-	300	350	mA	
Input logic high voltage	V _{IH}	0.7V _{CC}	-	V _{CC}	V	Note 2
Input logic low voltage	V _{IL}	0	-	0.3V _{CC}	V	

Note 1: V_{CC} setting should match the signals output voltage (refer to Note 2) of customer's system board .

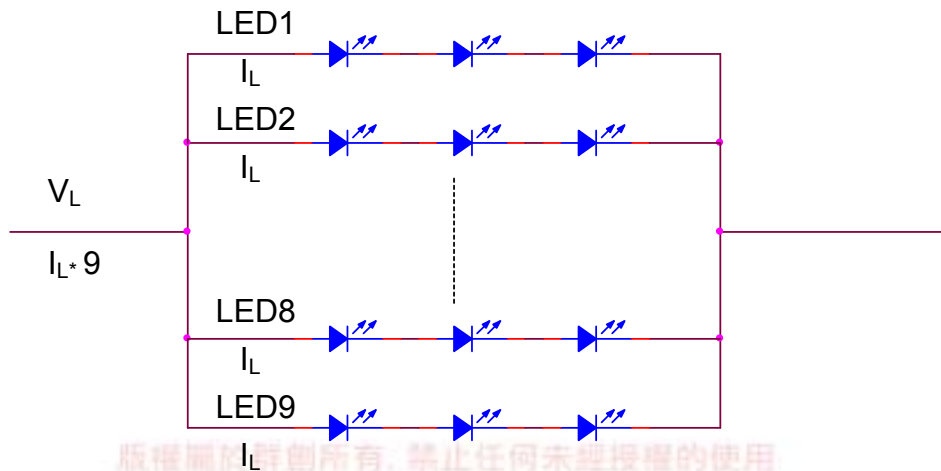
Note 2: DCLK,DE,R0~ R5,,G0~ G5,B0~ B5.

3.1.2. Backlight Driving Conditions

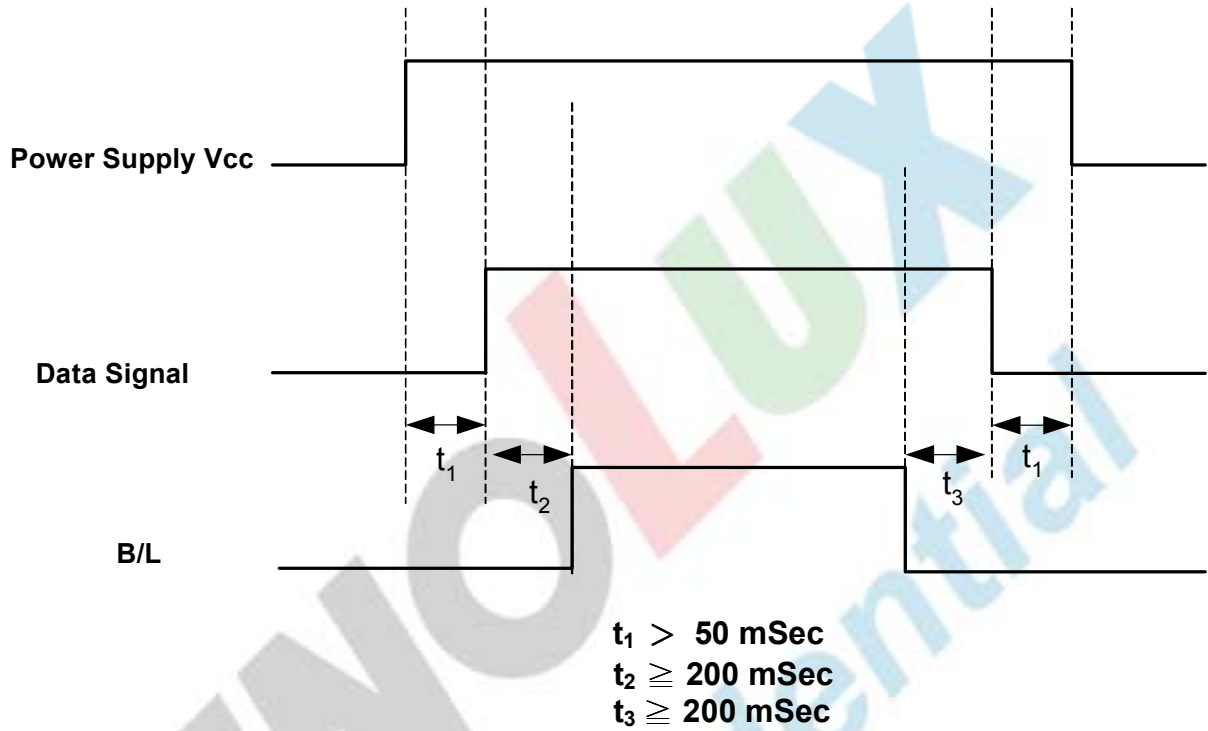
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LED voltage	V _L	-	6.6	12	V	Note 2
LED current	I _L	-	13.4	-	mA	Note 2
LED life time	-	20,000	-	-	Hr	Note 1

Note 1: The "LED life time" is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25°C and I_L =13.4mA.

Note 2: The LED driving condition is defined for each LED module.(3 LED Serial)



3.2. Power Sequence



Note: Data Signal includes DCLK, DE, R0~ R5, G0~ G5, B0~ B5.

3.3. Timing Characteristics

3.3.1. Timing Conditions

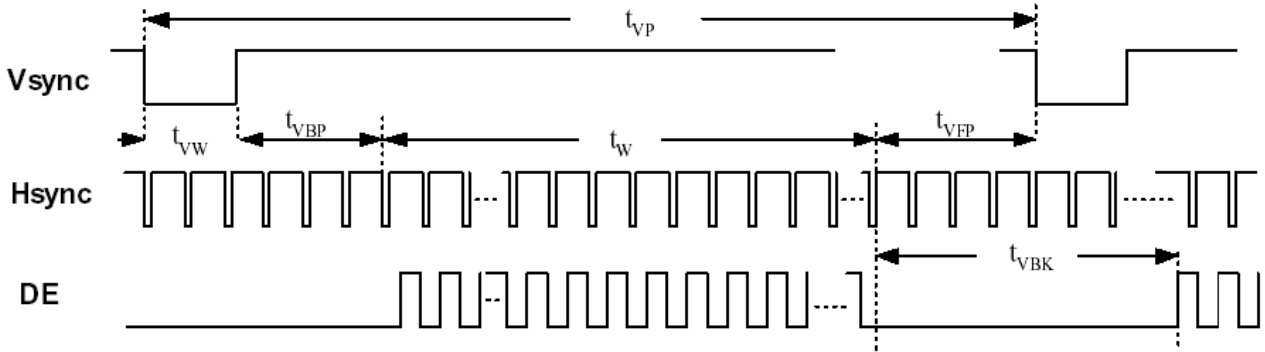
SYNC mode Input signal characteristics (800 x 480)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Period	t _{CLK}	20.0	30.0	-	ns	
Clock Frequency	f _{CLK}	-	33.3	50	MHz	
Clock Low Level Width	t _{WCL}	8	-	-	ns	
Clock High Level Width	t _{WCH}	8	-	-		
Clock Rise/Fall Time	t _{CLKr} , t _{CLKf}	-	-	3		
HSYNC Period	t _{HP}	-	928	-	t _{CLK}	
HSYNC Pulse Width	t _{HW}	-	48	-	t _{CLK}	
HSYNC Back Porch	t _{HBP}	-	40	-	t _{CLK}	
HSYNC Width + Back Porch	t _{HW} + t _{HBP}	88			t _{CLK}	
Horizontal valid data width	t _{HV}	800			t _{CLK}	
HSYNC Front Porch	t _{HFP}	t _{HP} - t _{HW} - t _{HBP} - t _{HV}			t _{CLK}	
Horizontal Blank	t _{HBK}	t _{HP} - t _{HV}			t _{CLK}	
VSYNC Period	t _{VP}	-	525	-	t _{HP}	
VSYNC Pulse Width	t _{VW}	-	3	-	t _{HP}	
VSYNC Back Porch	t _{VBP}	29			t _{HP}	
Vertical valid data width	t _V	480			t _{HP}	
Vertical Front Porch	t _{VFP}	t _{VP} - t _{VW} - t _{VBP} - t _V			t _{HP}	
Vertical Blank	t _{VBK}	t _{VP} - t _V			t _{HP}	
Data Setup Time	t _{DS}	5	-	-	ns	
Data Hold Time	t _{DH}	10	-	-	ns	

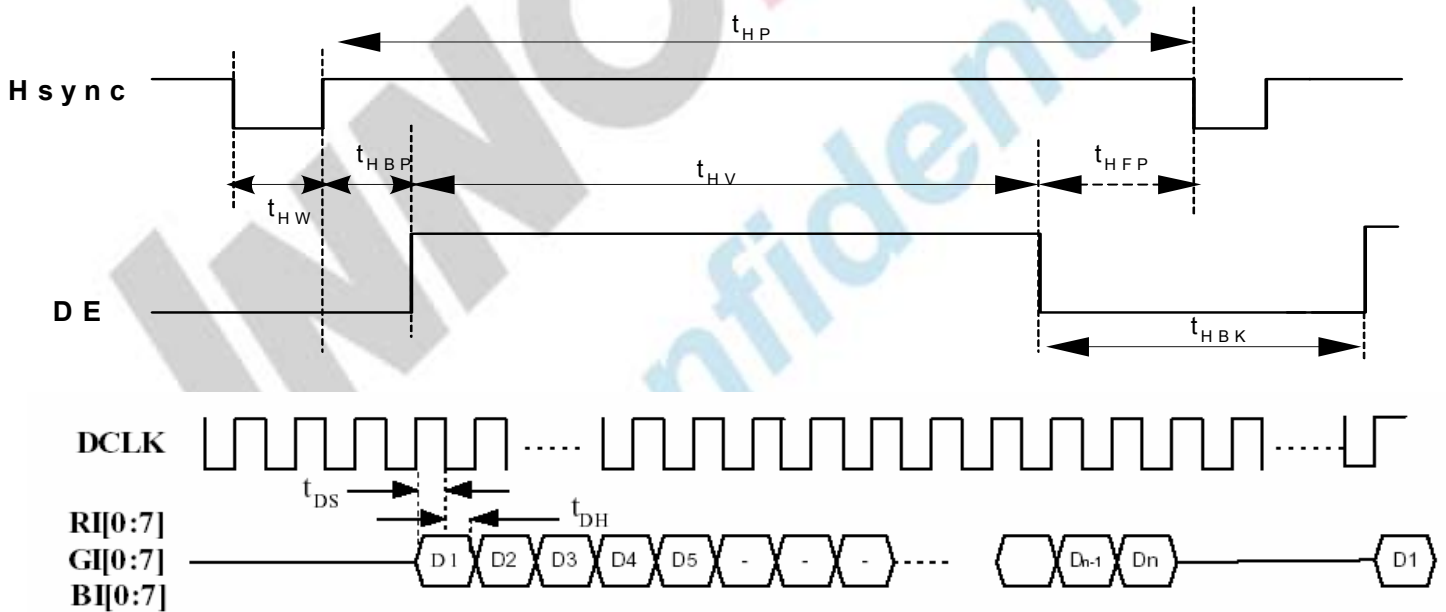
DE mode Input signal characteristics (800 x 480)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
DCLK	Period	t _{CLK}	20.0	30.0	-	ns
	Frequency	f _{CLK}	-	33.3	50	MHz
	Low Level Width	t _{WCL}	6	-	-	ns
	High Level Width	t _{WCH}	6	-	-	
	Rise/Fall Time	t _{CLKr} , t _{CLKf}	-	-	3	
	Duty	-	0.45	0.50	0.55	-
DE	Setup Time	t _{DES}	5	-	-	ns
	Hold Time	t _{DEH}	10	-	-	
	Rise/Fall Time	t _{DEr} , t _{DEf}	-	-	16	
	Horizontal Period	t _{HP}	-	928	-	t _{CLK}
	Horizontal Valid	t _{HV}	800			
	Horizontal Blank	t _{HBK}	t _{HP} - t _{HV}			
	Vertical Period	t _{VP}	-	525	-	t _{HP}
	Vertical Valid	t _w	480			
Vertical Blank	t _{VBK}	t _{VP} - t _w				
DATA	Setup Time	t _{DS}	5	-	-	ns
	Hold Time	t _{DH}	10	-	-	
	Rise/Fall Time	t _{Dr} , t _{Df}	-	-	3	

3.3.2. Timing Diagram



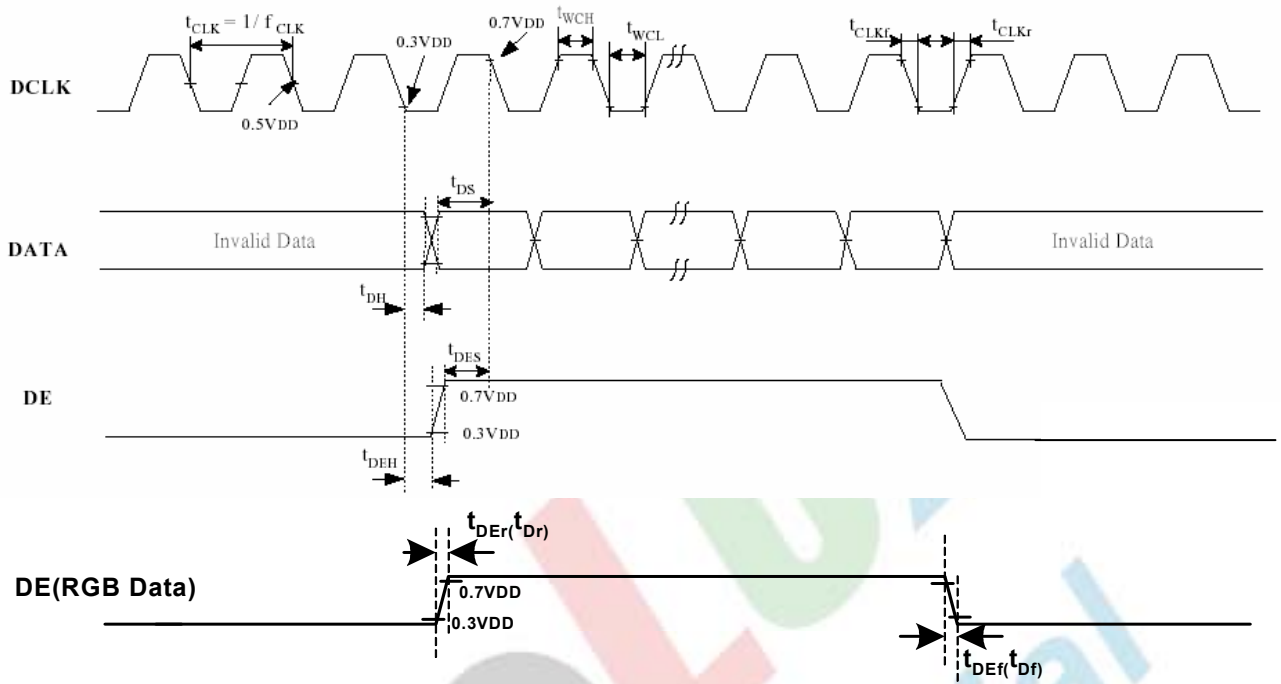
Input Vertical Timing



Input Horizontal Timing

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DE and RGB Input Timing

4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	60	70	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	60	70	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	40	50	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	60	70	-		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	W_X		0.28	0.31	0.34	-	Note 2 Note 5
	W_Y		0.30	0.33	0.36	-	Note 6
Luminance	L		200	250	-	-	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test Conditions:

1. $V_{CC}=3.3V$, $I_{L*9}=120.6mA$ (Backlight current), the ambient temperature is $25^\circ C$.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

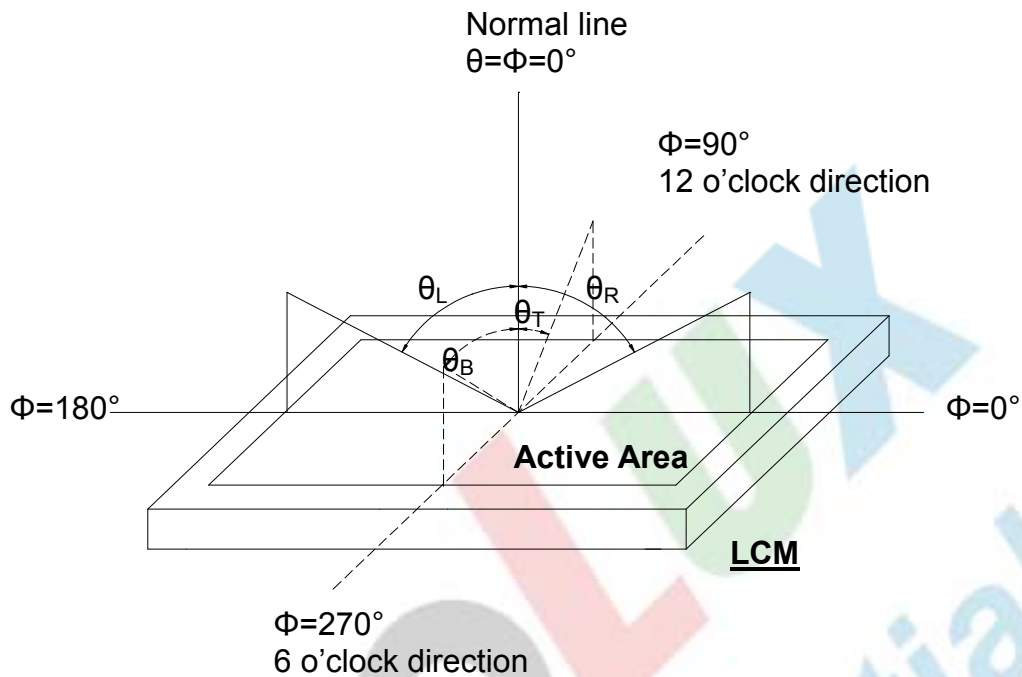


Fig. 4-1 Definition of viewing angle

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. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

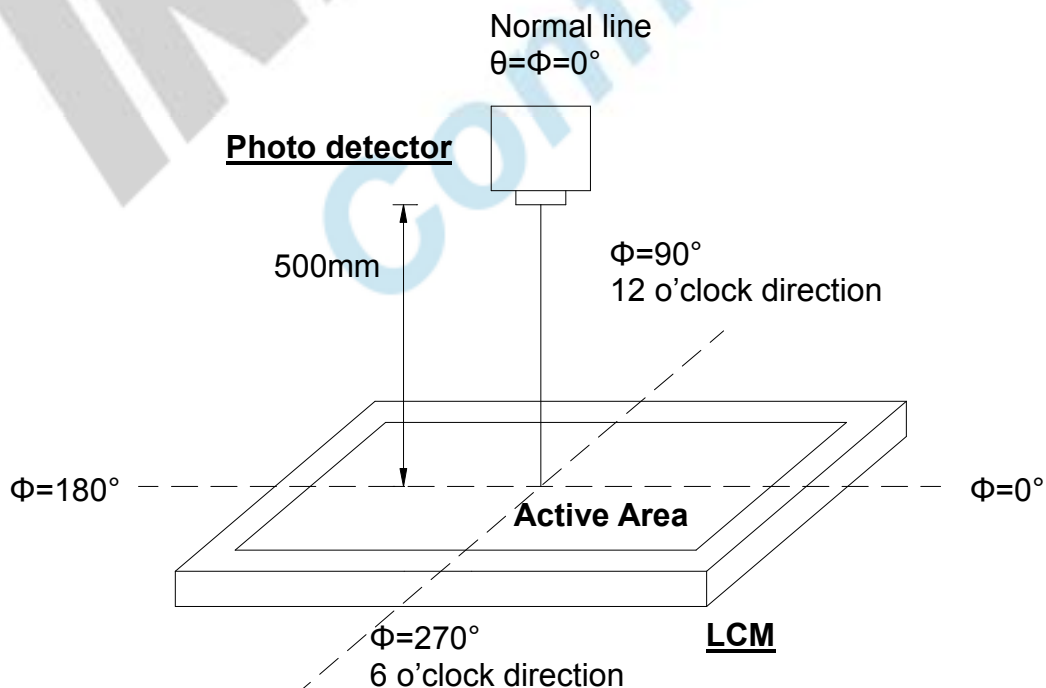


Fig. 4-2 Optical measurement system setup

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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%.

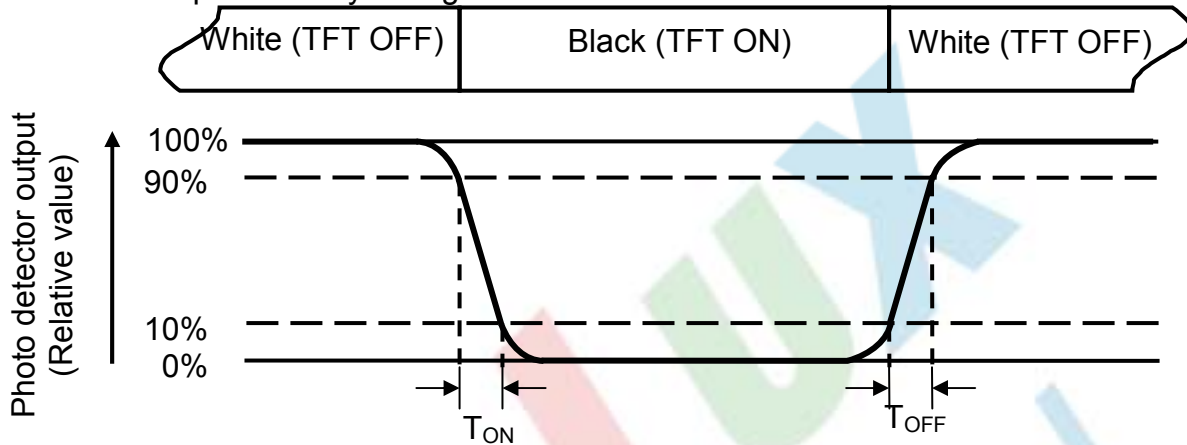


Fig. 4-3 Definition of response time

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.

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

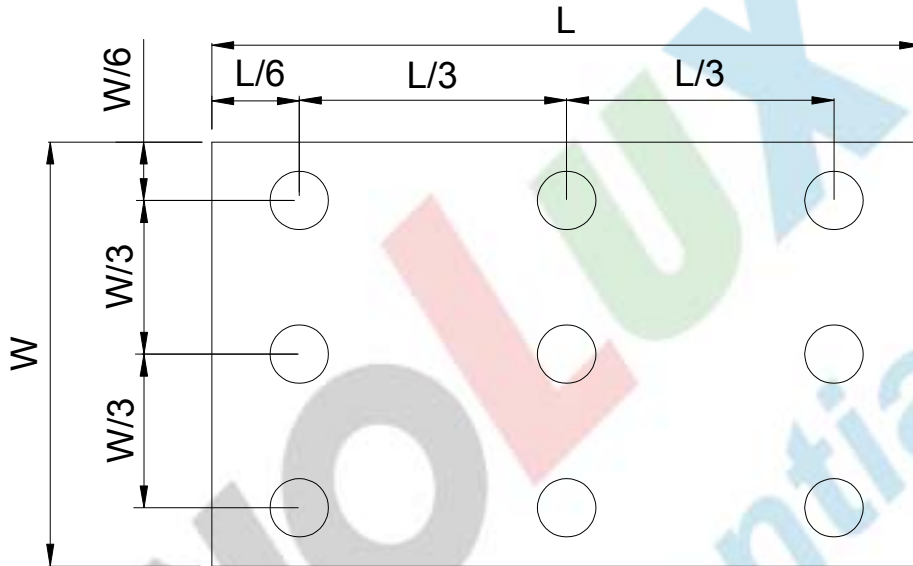


Fig. 4-4 Definition of measuring points

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

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

5. Reliability Test Items

(Note3)

Item	Test Conditions	Remark
High Temperature Storage	Ta = 80°C 240 hrs	Note 1, Note 4
Low Temperature Storage	Ta = -30°C 240hrs	Note 1, Note 4
High Temperature Operation	Ts = 70°C 240hrs	Note 2, Note 4
Low Temperature Operation	Ta = -20°C 240hrs	Note 1, Note 4
Operate at High Temperature and Humidity	+40°C, 90%RH max. 240 hrs	Note 4
Thermal Shock	-30°C/30 min ~ +80°C/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note 4
Vibration Test	Frequency range: 10~55Hz Stroke: 1.5mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Mechanical Shock	100G 6ms, ±X, ±Y, ±Z 3 times for each direction	
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)	
Package Drop Test	Height: 60 cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

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6. General Precautions

6.1. 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.

6.2. 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.

6.3. 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.

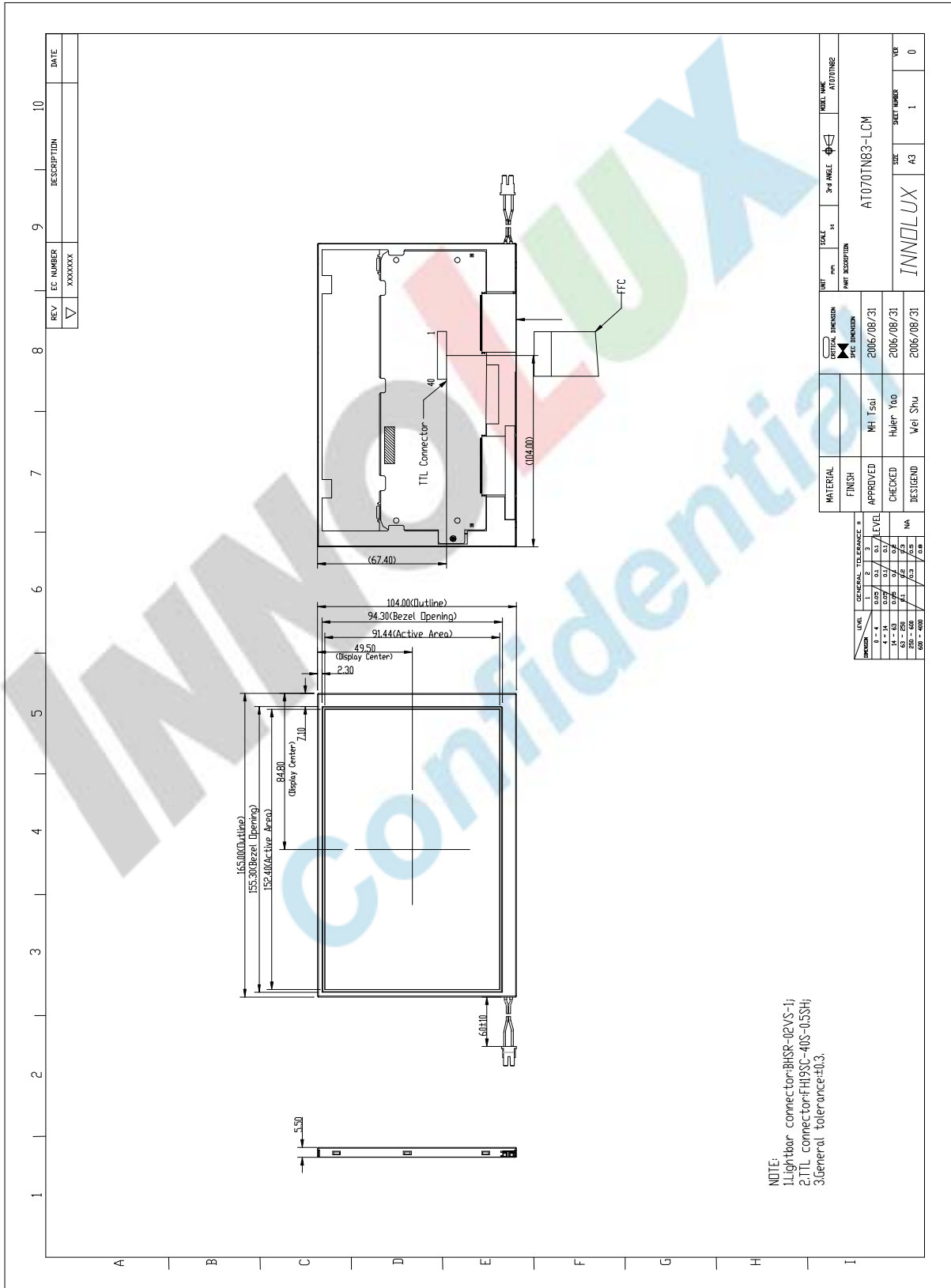
6.4. Storage

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.

6.5. 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.

7. Mechanical Drawing



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8. Package Drawing

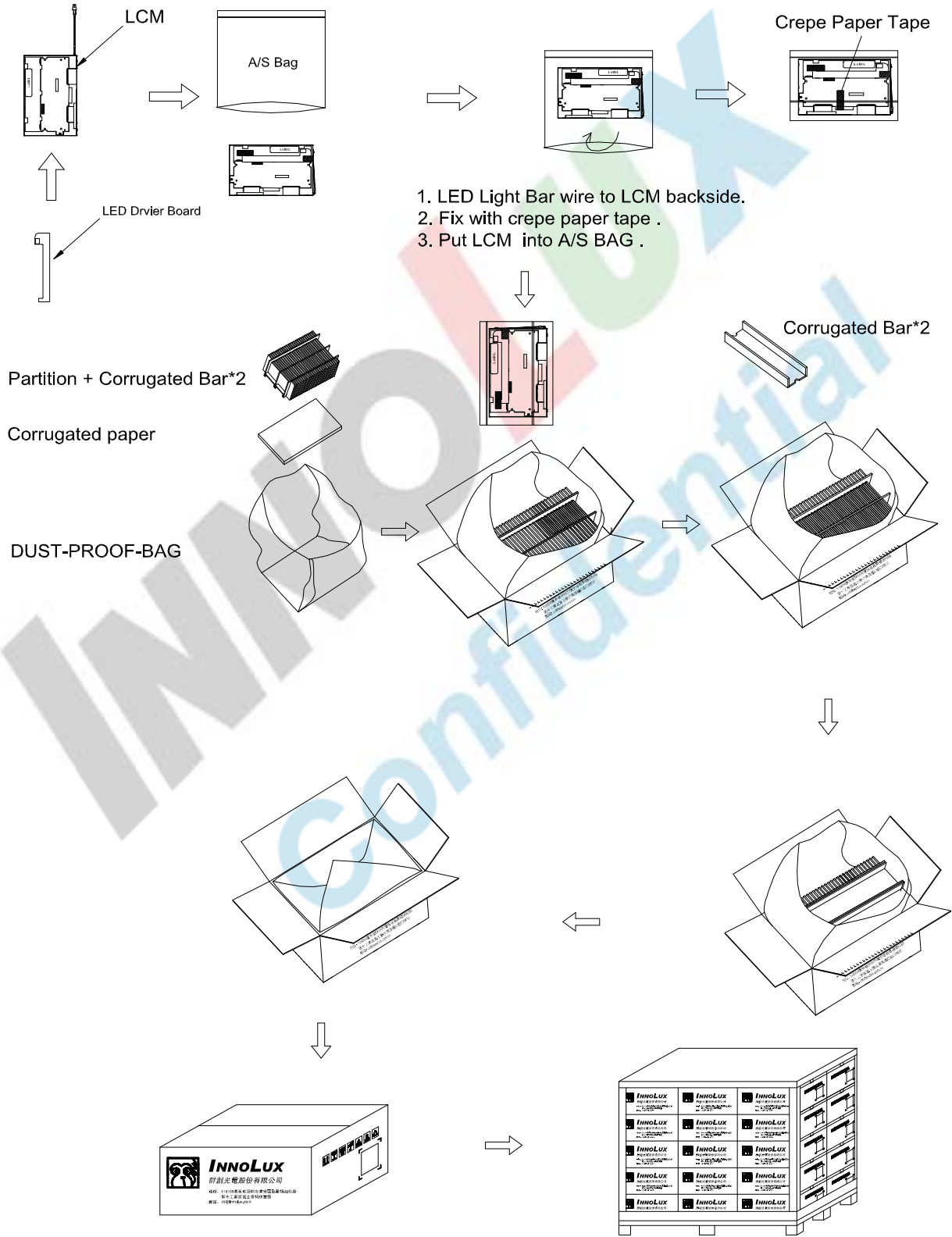
8.1. Packaging Material Table

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	AT070TN83	165X104X5.5	0.130	50pcs	
2	LED Driving Board	—	136.6*28.2	0.007	50pcs	
3	Partition	BC Corrugated Paper	512×349×226	1.466	1 set	
4	Corrugated Bar	B Corrugated Paper	512X162	0.046	4 set	
5	Corrugated Board	BC Corrugated Paper	510×343	0.130	1pcs	
6	Dust-Proof Bag	PE	700X530	0.048	1pcs	
7	A/S Bag	PE	180×160×0.05	0.002	50pcs	
8	Carton	Corrugated paper	530*355*255	1.100	1pcs	
9	Total weight	9.878 Kg ± 5%				

8.2. Packaging Quantity

Total LCM quantity in Carton: no. of Partition	2 Rows x	quantity per Row	25	= 50
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8.3. Packaging Drawing



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APPENDIX-----LED Driving Board

1. Electrical Characteristics

1.1 Absolute Maximum Rating

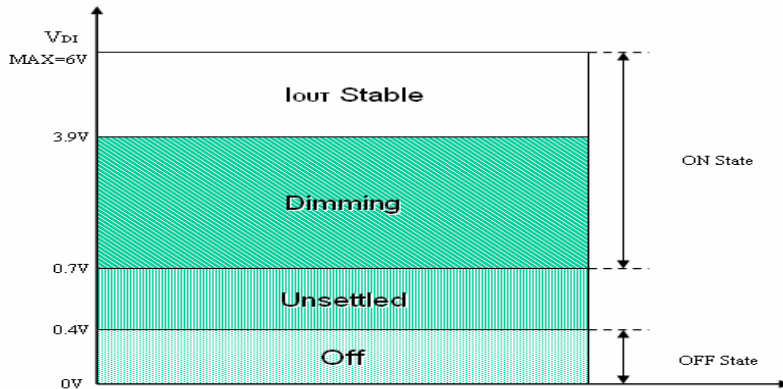
Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Input Voltage	V_{IN}	—	16	VDC	
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tstg	-30	80	°C	
Operate at High Temperature and Humidity	RH	—	90	%	
	RT	—	40	°C	

1.2. Operating Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Input Voltage	V_{IN}	4.5	12	16	VDC	
Input Current	I_{IN}	—	—	420	mA	AT 4.5VDC Input
Output Current	I_{OUT}	108	120	132	mA	
Output Power	P_o	—	1.2	—	W	
ON/OFF/ Dimming Control	V_{DI}	—	—	6	VDC	Note 1
Over-voltage Protection	—	—	—	28	VDC	

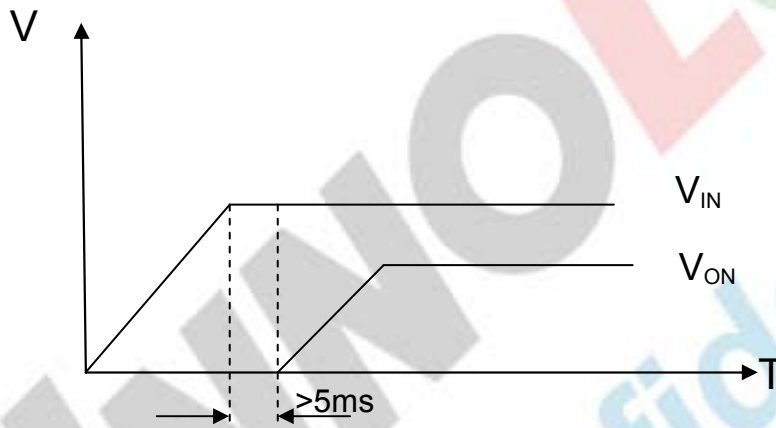
Note 1:

V_{DI} have dimming & ON/OFF function when input different voltage as follow diagram:

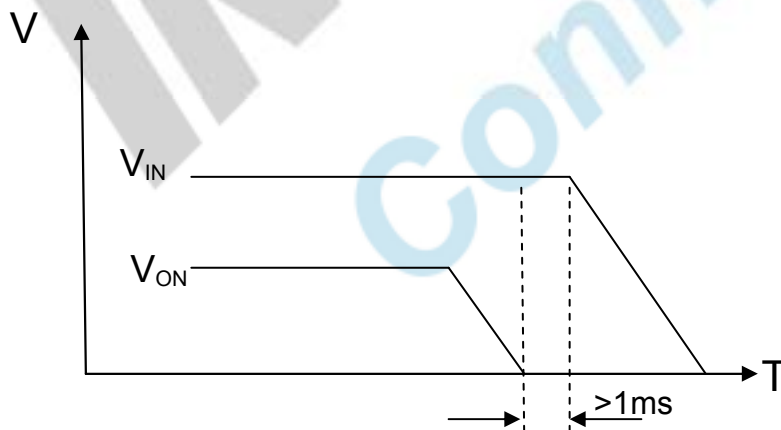


1.3 Power Sequence

1.3.1 Power on:



1.3.2 Power off:



2. Interface Specification

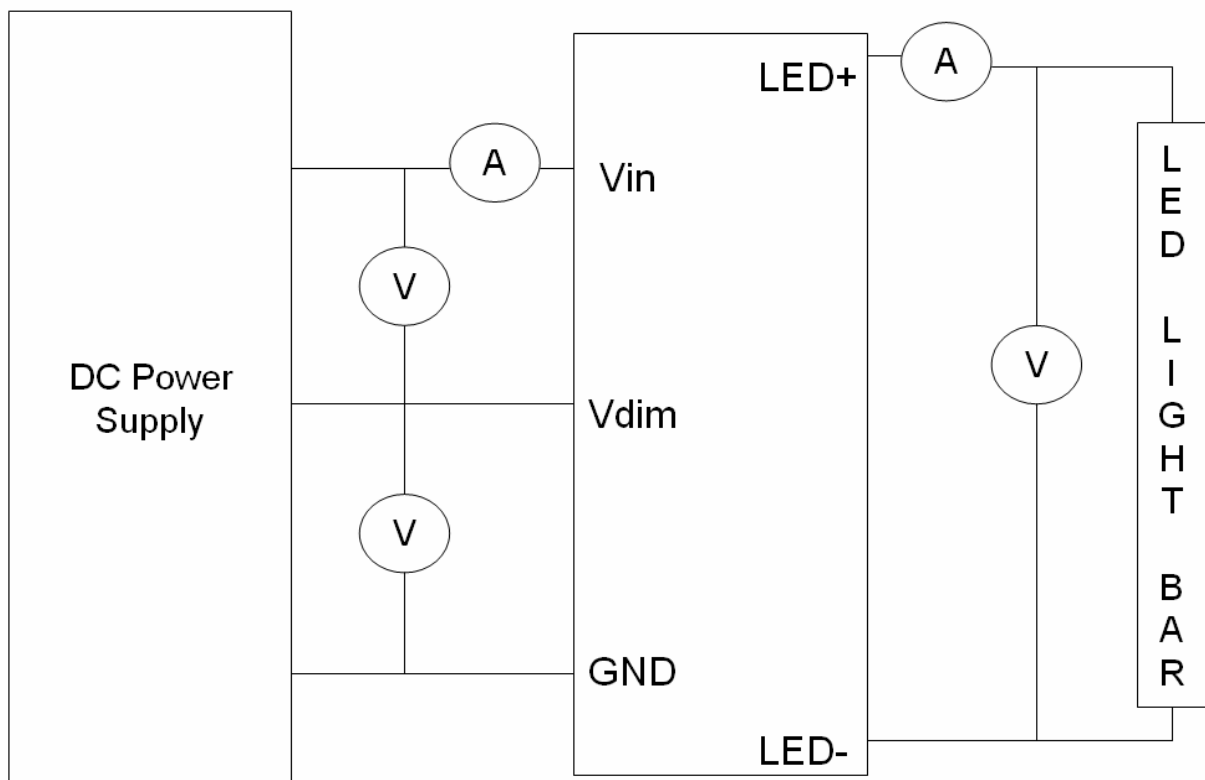
2.1 Input Connector (CN1)

Pin Number	Function	Remark
1,6	VIN	
2,5	GND	
3,4	ON/OFF/Dimming Control	

2.2 Output Connector (CN2)

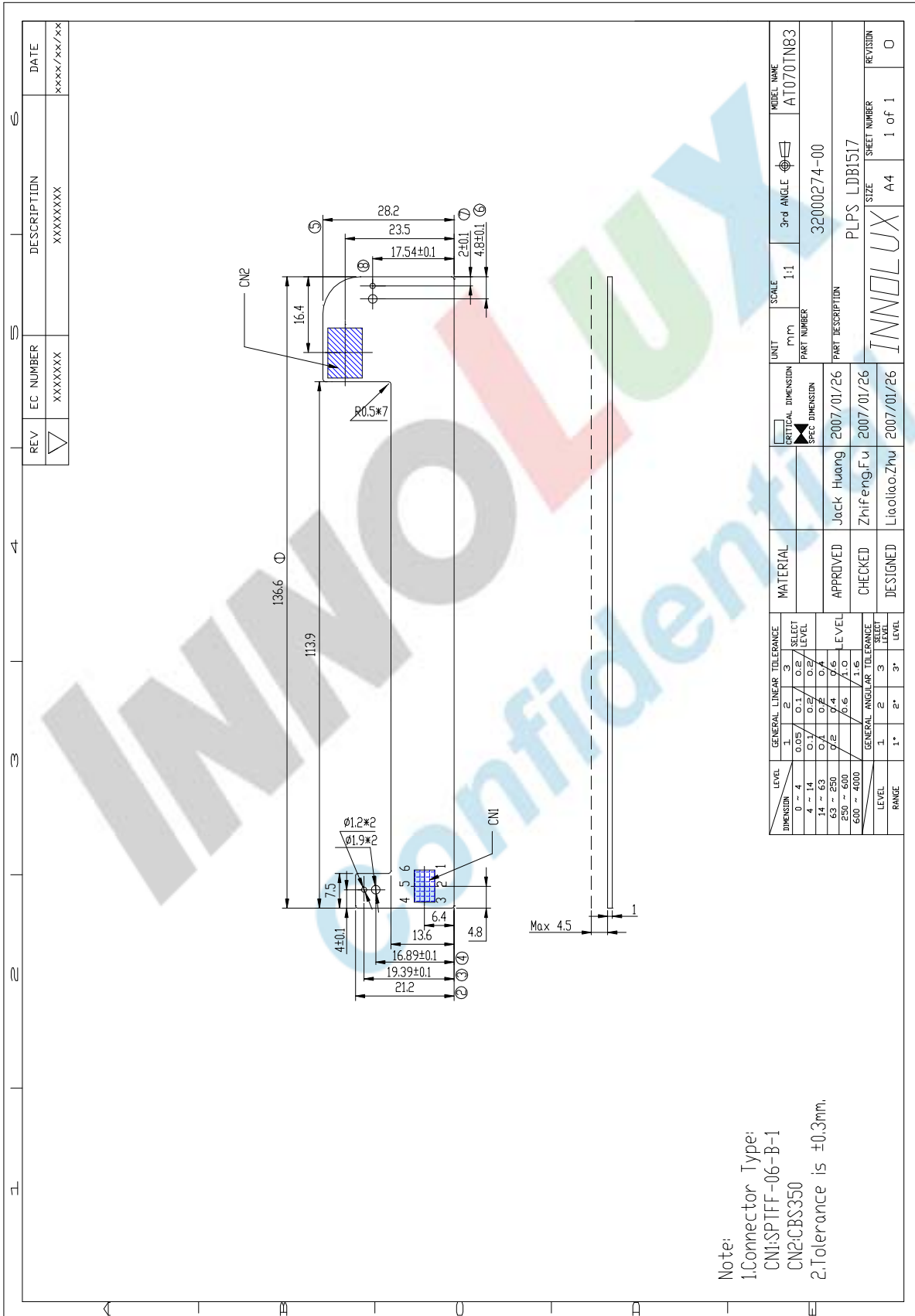
Pin Number	Function	Remark
1	LED HV Output	
2	LED LV Output	

3. Testing Block Diagram



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4. Mechanical Drawing



Note:
 1.Connector Type:
 CNI:SPTFF-06-B-1
 CN2:CBSS350
 2.Tolerance is ±0.3mm.