



INNOLUX DISPLAY CORPORATION

SPECIFICATION

Customer: _____

Model Name: NE070NB-04G

Date: 2023/01/31

Version: 11

☐ Preliminary Specification

☒ Final Specification

Remark
7DD FOG (FPC: 81.35mm)

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by
Joko.Wang	Menghsu.Lu Chien.Chan	Yahsin.Hung



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1Record of Revision

Version	Revise Date	Page	Content
Final-spec.01	2010/01/19	All	Initial Release
Final-spec.02	2010/03/22	1	Add the Value of Weight
		17	Add Packaging Material Table & Packaging Quantity
		18	Add Packaging Drawing
Final-spec.03	2010/04/28	All	Add the Model Name, Spec NO., and Update the Logo
Final-spec.04	2010/11/03	6	Modify V_{COM} values and add note 4
Final-spec.05	2011/09/05	16	Modify mechanical drawing from 1+2 to 1+1 IC
		17	Modify Packaging Material Table & Packaging
Final-spec.06	2011/12/15	16	Update mechanical drawing: the size of Gate IC
Final-spec.07	2016/09/18	1	Add IC & Driving methods
		7~11	Add the Value of min& typ.&max& notes
		13	Add notes
		14	Add notes&ESD
		16	Update mechanical drawing
		17/18	Update Package Drawing
Final-spec.08	2018/03/20		Add T2 Cell as 2nd source & change module name from AT070TN90 to NE070NB-04G.
		1	Update the Display Color& power consumption
		6~8	Update the Value of V_{GH} & V_{GL} & V_{COM}
		11~13	Update the Transmittance and notes
		16~18	Update the Package Drawing
Final-spec.09		11	Update the Transmittance
Final-spec.10	2021/09/04	16	Update mechanical drawing
Final-spec.11	2023/01/31	16	Update mechanical drawing



Contents

1. General Specifications	1
2. Pin Assignment	2
3. Operation Specifications	5
3.1. Absolute Maximum Ratings	5
3.1.1. Typical Operation Conditions	6
3.1.2. Current Consumption	7
3.2. Power Sequence	7
3.3. Timing Characteristics	8
3.3.1. AC Electrical Characteristics	8
3.3.2. Input Clock and Data Timing Diagram	9
3.3.3. Timing	9
3.3.4. Data Input Format	10
4. Optical Specifications	11
5. Reliability Test Items	14
6. General Precautions	15
6.1. Safety	15
6.2. Handling	15
6.3. Static Electricity	15
6.4. Storage	15
6.5. Cleaning	15
7. Mechanical Drawing	16
8. Package Drawing	17
8.1. Packaging Material Table	17
8.2. Packaging Quantity	17
8.3. Packaging Drawing	18



1. General Specifications

No.	Item	Specification	Remark
1	LCD size	7.0 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	800 × 3(RGB) × 480	
4	Display mode	Normally White, Transmissive	
5	Dot pitch	0.0642(W) × 0.1790(H) mm	
6	Active area	154.08(W) × 85.92(H) mm	
7	Panel size	162.5(W) × 96.62(H) × 1.43(D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Display Color	16.7M	
11	Interface	Digital, Parallel 8-bit RGB	
12	Panel power consumption	0.240W (Typ.)	
13	Weight	47g(Typ.)	
14	Source-IC Gate-IC	EK9713/ NT39419 EK73002 / NT52001	
15	Driving methods	1+2 dot	

Note 1: Refer to Mechanical Drawing.



2. Pin Assignment

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Remark
1	V _{LED+}	P	Power for LED backlight (Anode)	
2	V _{LED+}	P	Power for LED backlight (Anode)	
3	V _{LED-}	P	Power for LED backlight (Cathode)	
4	V _{LED-}	P	Power for LED backlight (Cathode)	
5	GND	P	Power ground	
6	V _{COM}	I	Common voltage	
7	DV _{DD}	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 1
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	Note 2
19	B0	I	Blue data(LSB)	Note 2
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	
25	G2	I	Green data	



26	G1	I	Green data	Note 2
27	G0	I	Green data(LSB)	Note 2
28	R7	I	Red data(MSB)	
29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	Note 2
35	R0	I	Red data(LSB)	Note 2
36	GND	P	Power Ground	
37	DCLK	I	Sample clock	Note 3
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	Note 4,5
40	U/D	I	Up/down selection	Note 4,5
41	V _{GH}	P	Gate ON Voltage	
42	V _{GL}	P	Gate OFF Voltage	
43	AV _{DD}	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	Note 6
45	NC	-	No connection	
46	V _{COM}	I	Common Voltage	
47	DITHB	I	Dithering function	Note 7
48	GND	P	Power Ground	
49	NC	-	No connection	
50	NC	-	No connection	

I: input, O: output, P: Power

Note 1: DE/SYNC mode select. Normally pull high.

When select DE mode, MODE="1", VS and HS must pull high.

When select SYNC mode, MODE="0", DE must be grounded.

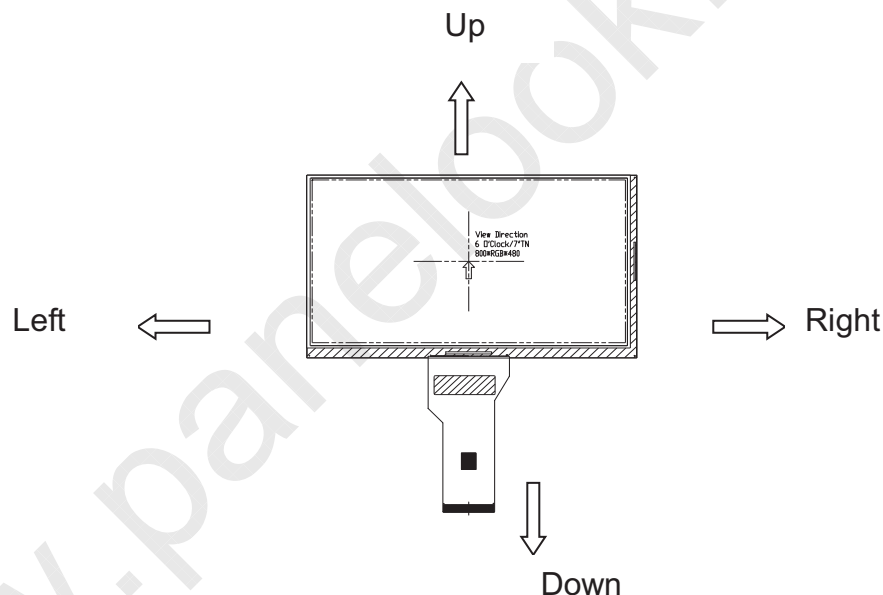
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	DV _{DD}	Up to down, left to right
DV _{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV _{DD}	DV _{DD}	Down to up, left to right

Note 5: Definition of scanning direction.
Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.
When DITHB="1", Disable internal dithering function,
When DITHB="0", Enable internal dithering function,

Note 8: Reserve for LED power input.



3. Operation Specifications

3.1. Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	DV _{DD}	-0.3	5.0	V	
	AV _{DD}	6.5	13.5	V	
	V _{GH}	-0.3	40.0	V	
	V _{GL}	-20.0	0.3	V	
Operation Temperature	T _{OP}	-20	70	°C	
Storage Temperature	T _{ST}	-30	80	°C	

Note 1: 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

(Note 1)

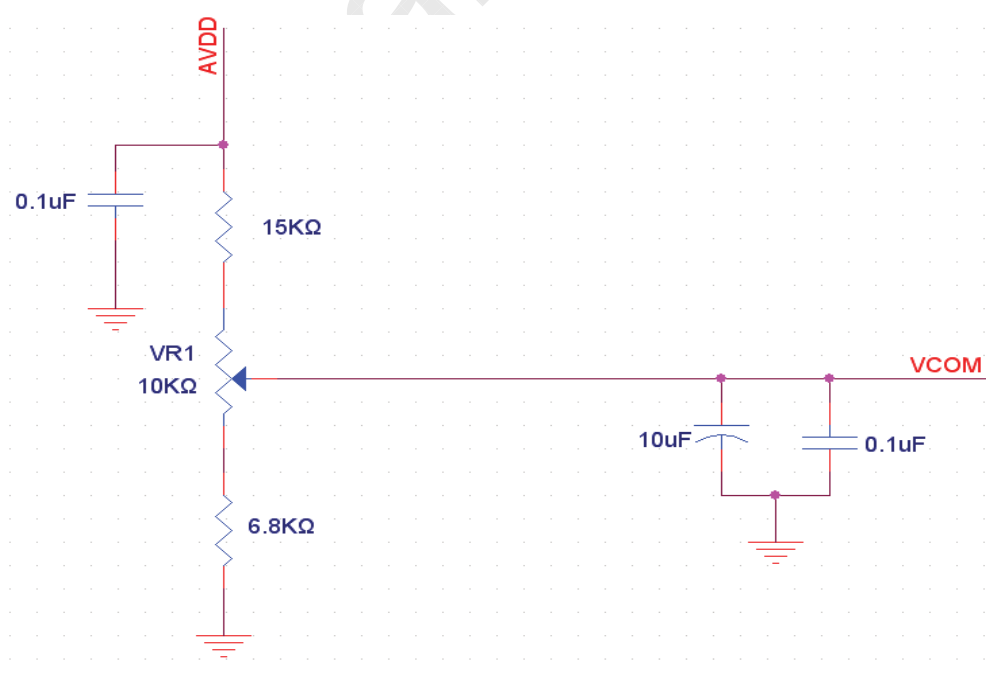
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	DV _{DD}	3.0	3.3	3.6	V	Note 2
	AV _{DD}	10.2	10.4	10.6	V	
	V _{GH}	14.5	15	15.5	V	
	V _{GL}	-10.5	-10	-9.5	V	
Input signal voltage	V _{COM}	3.54	(4.04)	4.54	V	Note 4
Input logic high voltage	V _{IH}	0.7 DV _{DD}	/	DV _{DD}	V	Note 3
Input logic low voltage	V _{IL}	0	/	0.3 DV _{DD}	V	

Note 1: Be sure to apply DV_{DD} and V_{GL} to the LCD first, and then apply V_{GH}.

Note 2: DV_{DD} setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

Note 4: Typical V_{COM} is only a reference value. It must be optimized according to each LCM. Please use VR and base on below application circuit.

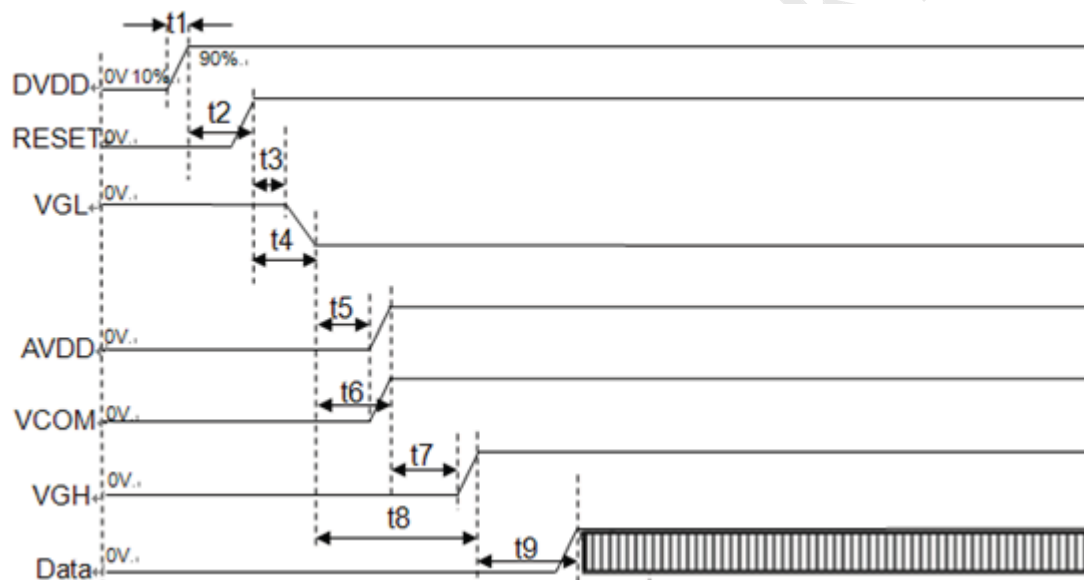


3.1.2. Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I_{GH}	0.05	0.2	1.0	mA	$V_{GH} = 15.0V$
	I_{GL}	0.2	0.5	1.0	mA	$V_{GL} = -10.0V$
	IDV_{DD}	1	4.0	10	mA	$DV_{DD} = 3.3V$
	$I_{AV_{DD}}$	5	20	50	mA	$AV_{DD} = 10.4V$

3.2. Power Sequence

a. Power on:



Symbol	SPEC			Unit
	Min.	Typ.	Max.	
t_1	0.5	5	20	ms
t_2	1	1	1.5	ms
t_3	10	15	20	ms
t_4	20	22	24	ms
t_5	1	2	3	ms
t_6	5	6	7	ms
t_7	1.5	2	4	ms
t_8	10	12	15	ms
t_9	10	15	20	ms

b. Power off:

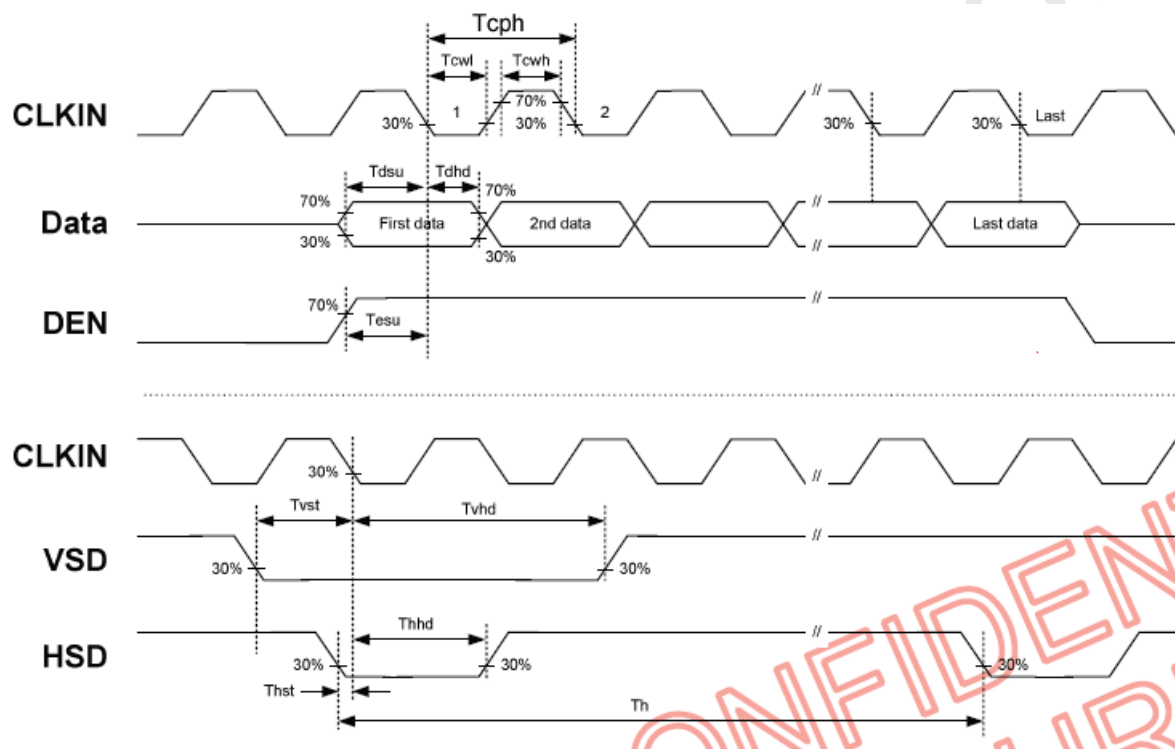
Symbol	SPEC			Unit
	Min.	Typ.	Max.	
t12	10	15	20	ms
t13	5	6	7	ms
t14	10	12	15	ms
t15	20	22	24	ms
t16	1	1.5	3	ms

3.3. Timing Characteristics**3.3.1. AC Electrical Characteristics**

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	T _{hst}	8	10	20	ns	
HS hold time	T _{hhd}	8	120	800	ns	
VS setup time	T _{vst}	8	10	20	ns	
VS hold time	T _{vhd}	8	96000	640000	ns	
Data setup time	T _{dsu}	8	10	20	ns	
Data hole time	T _{dhd}	8	15	20	ns	

DE setup time	T_{esu}	8	15	20	ns	
DE hole time	T_{ehd}	8	15	20	ns	
DV _{DD} Power On Slew rate	T_{POR}	1	10	20	ms	From 0 to 90% DV _{DD}
RESET pulse width	T_{Rst}	1	2	5	ms	
DCLK cycle time	T_{coh}	20	30	40	ns	
DCLK pulse duty	T_{cwh}	40	50	60	%	

3.3.2. Input Clock and Data Timing Diagram



3.3.3. 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	Note1
HS Blanking	thb	46	46	46	DCLK	Note1

HS Front Porch	thfp	16	210	354	DCLK	
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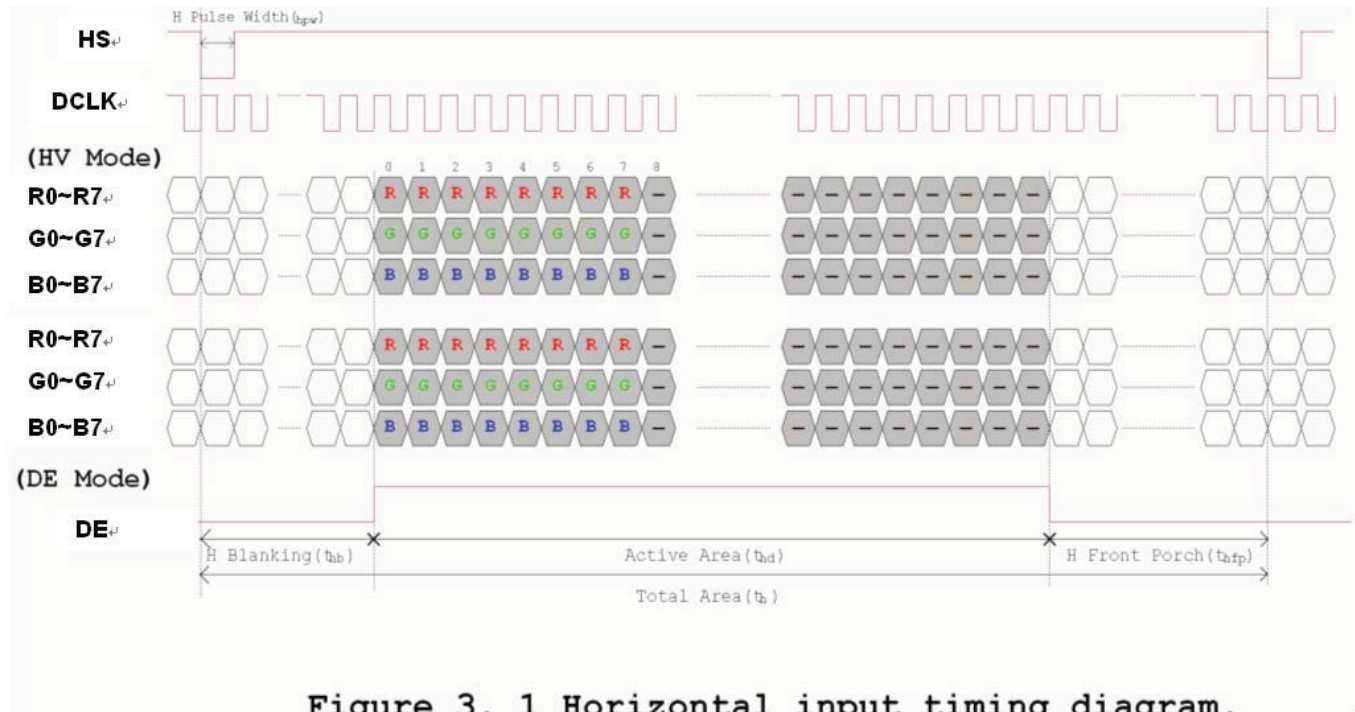
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	/	480	/	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	3	20	TH	Note2
VS Blanking	tvb	23	23	23	TH	Note2
VS Front Porch	tvfp	7	22	147	TH	

Note1: HS Blanking has included HS pulse width

Note2: VS Blanking has included VS pulse width

Note: Frame rate $60 \pm 5\text{Hz}$

3.3.4. Data Input Format



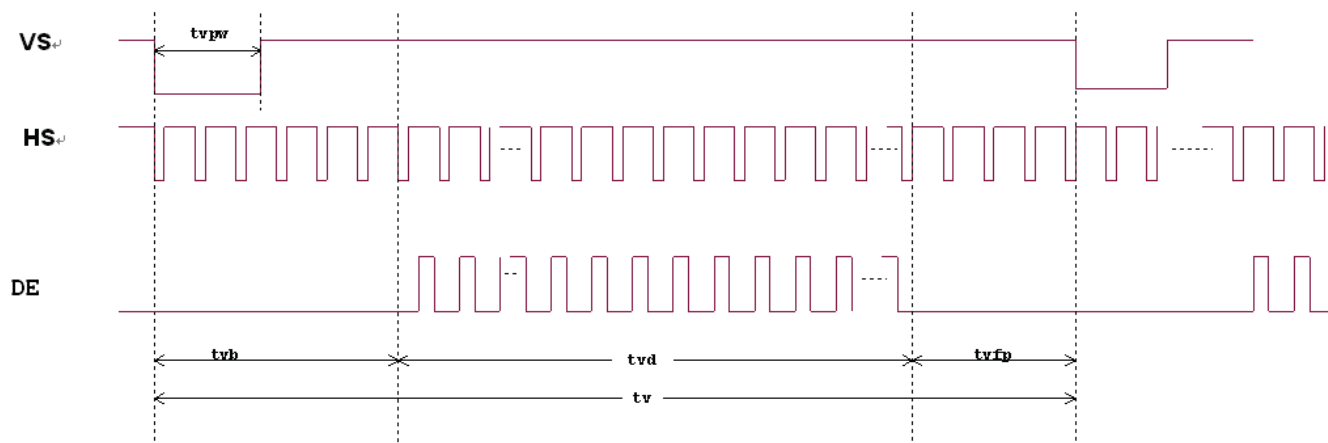


Figure 3. 2 Vertical input timing diagram.

4. Optical Specifications

Note; Base on INNOLUX LCM

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+} T_{OFF}	Normal $\theta=\Phi=0^\circ$	-	25	50	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4 Note 7
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5
	W_Y		0.28	0.33	0.38	-	Note 6 Note 7
Transmittance	Tr	Normal $\theta=\Phi=0^\circ$	4.06	4.61	-	%	Note 7

Test Conditions:

1. $DV_{DD}=3.3V$, the ambient temperature is $25^\circ C$.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

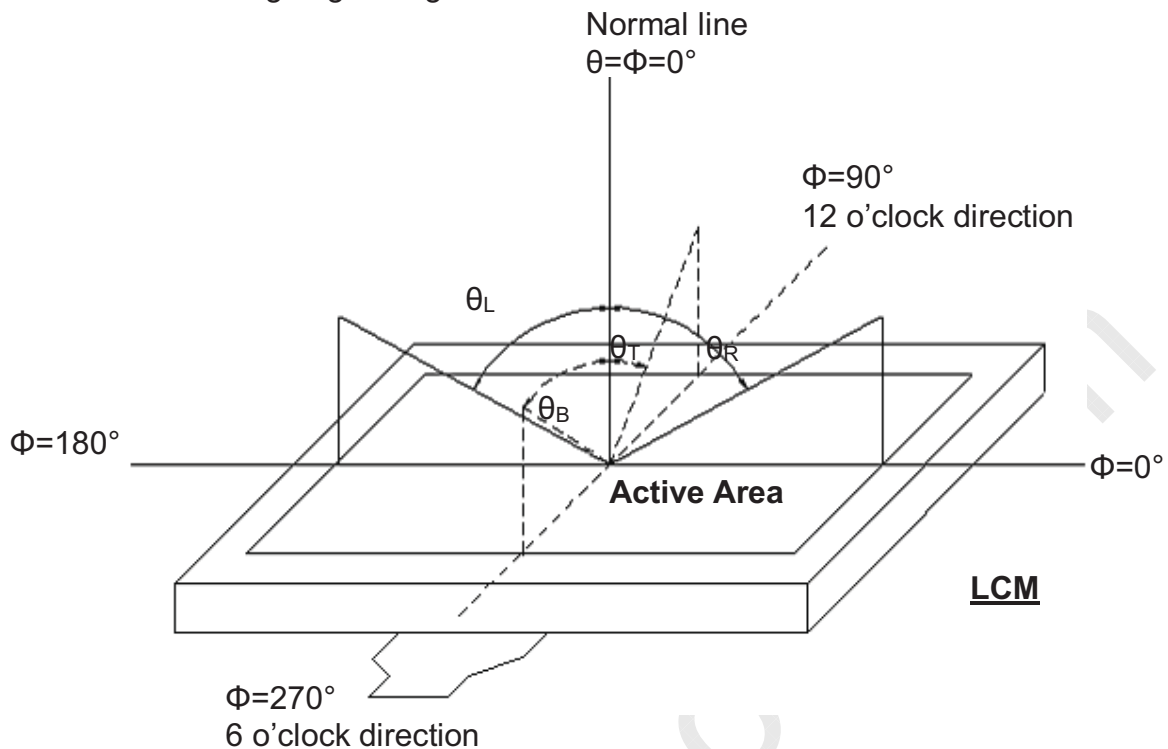


Fig. 4-1 Definition of viewing angle

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 SR3-AR/Field of view: 1° /Height: 500mm.)

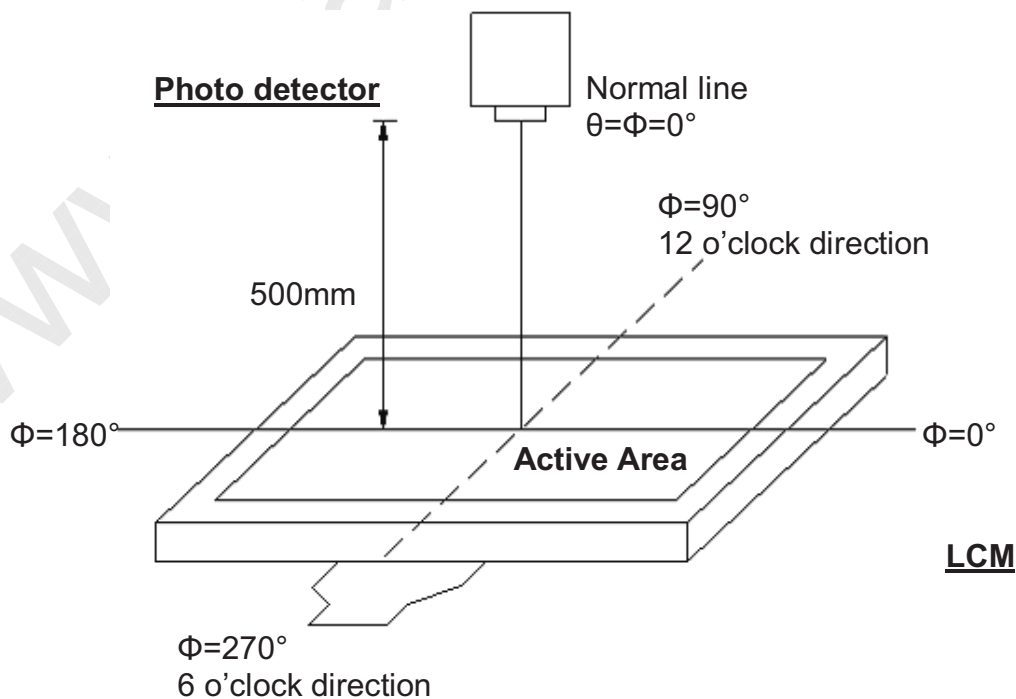


Fig. 4-2 Optical measurement system setup

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_{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%.

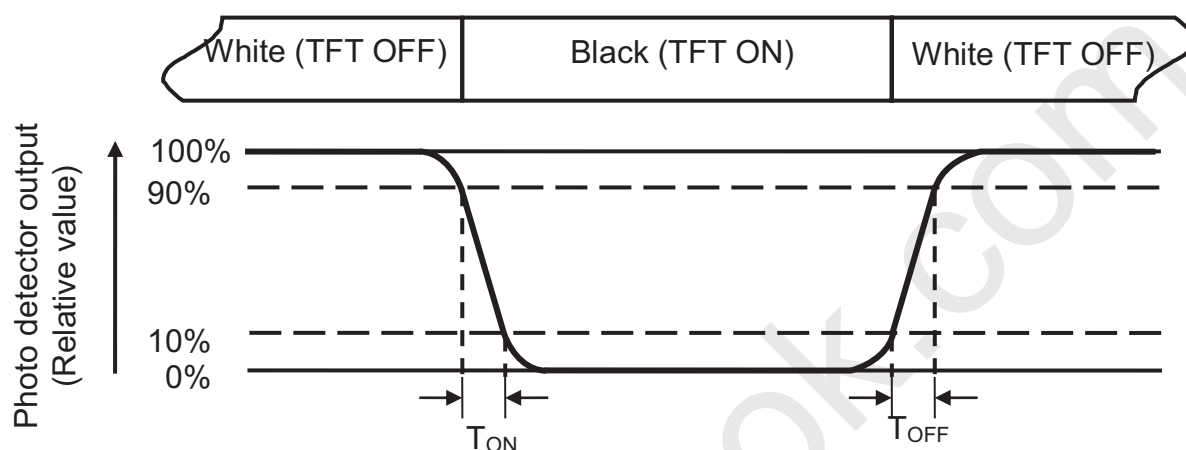


Fig. 4-3 Definition of response time

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: Base on backlight structure of LCM is Diffuser+ BEF +BEF.The color rank of LED is Sa627.



5. Reliability Test Items

(Note3)

Item	Test Conditions	Remark
High Temperature Storage	Ta = 80℃ 240hrs	Note 1, Note3, Note 4, Note5
Low Temperature Storage	Ta = -30℃ 240hrs	Note 1, Note3, Note 4, Note5
High Temperature Operation	Ts = 70℃ 240hrs	Note 2, Note3, Note 4 , Note5
Low Temperature Operation	Ta = -20℃ 240hrs	Note 1, Note3, Note 4, Note5
Operate at High Temperature and Humidity	+60℃, 90%RH 240hrs	Note3, Note 4, Note5
Thermal Shock	-30℃/30 min ~ +80℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note3, Note 4, Note5
Electro Static Discharge	±2KV, Human Body Mode, 100pF/1500 Ω	

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 don't guarantee all of the cosmetic specification.

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

Note 5: A certain level of Mura (non-uniformity) of dark / black image will happen several days after high temperature testing (H.T.T.). There is a slowly part recovery over a long time (several months). Such a long exposure time like in H.T.T. will normally not happen in a real application. Therefore the test H.T.T. was introduced to simulate cycles with normal conditions in-between but with the same total exposure time what show a significant reduced Mura.

The root cause is related to tension generated due to different amount of shrinking in the stack of layers in the polarizer sheet. The effect is more significant on larger displays like this size. An investigation into alternative polarizer material showed that there is no better alternative currently available.



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.



8. Package Drawing

8.1. Packaing Material Table

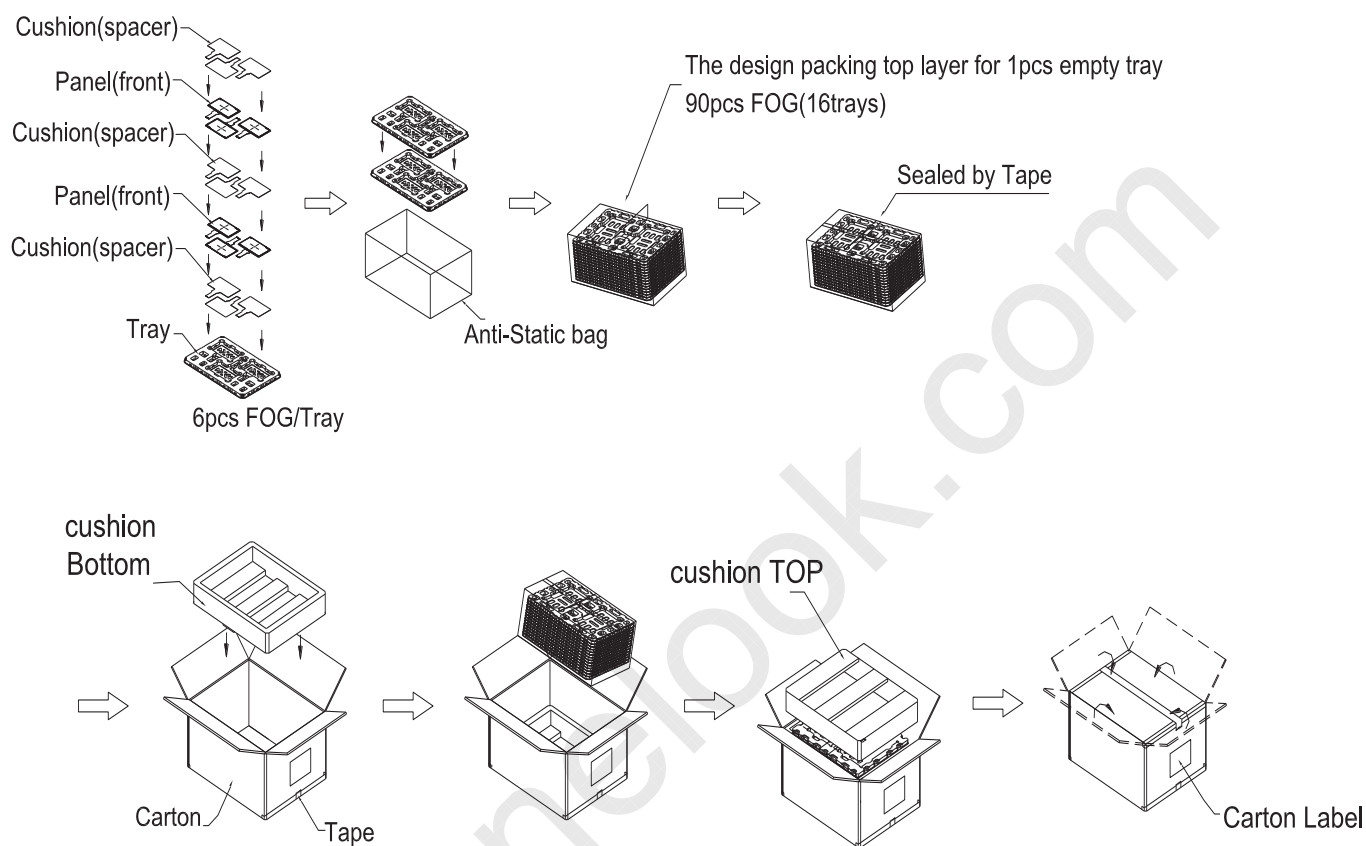
No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	FOG	NE070NB-04G	162.5×96.62×1.43	0.047	90	
2	Dust- Proof Bag	PE	700 x 530x0.05	0.0579	1	
3	Tray	PET	472x310x16.4	0.196	16	
4	Spacer	EPE	158.5x92.6x1.5	0.001	135	
5	Cushion	EPE	518x356x90	0.14	2	
6	Drier	SILICA GEL	100 x 75	0.035	2	
7	Carton	Corrugated paper	530 × 367 × 260	0.95	1	
8	Total weight	8.86± 5% Kg				

8.2. Packaging Quantity

Total LCM quantity of per Carton:	6 pcs/ tray x15(16-1) tray / Box = 90pcs
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8.3. Packaging Drawing



(1) Box Dimensions : 530(L)*367(W)*260(H)

(2) 90 panel/Carton