INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer: _____

Model Name: HJ070IA-04P

Date: 2013/07/02

Version: V01

■ Preliminary Specification

□ Final Specification

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by
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Record of Revision

Version	Revise Date	Page	Content
Pre-spec 01	2013/07/02		Initial Release.

INNOLUX

Contents

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) × 1280	
4	Display mode	Normally Black, Transmissive	
5	Dot pitch	0.03925(W) ×0.11775(H)mm	
6	Active area	94.20(W) × 150.72(H)mm	
7	Module size	104.43 x 161.78 x 2.30 (D) MAX mm	Note 1
8	Surface treatment	Hard coating	
9	Color arrangement	RGB-stripe	
10	Interface	LVDS	
11	Backlight power consumption	1.54W(typ)	
12	Panel power consumption	0.267W(typ)	
13	Weight	TBD	

Note 1: Refer to Mechanical Drawing.

2.Pin Assignment

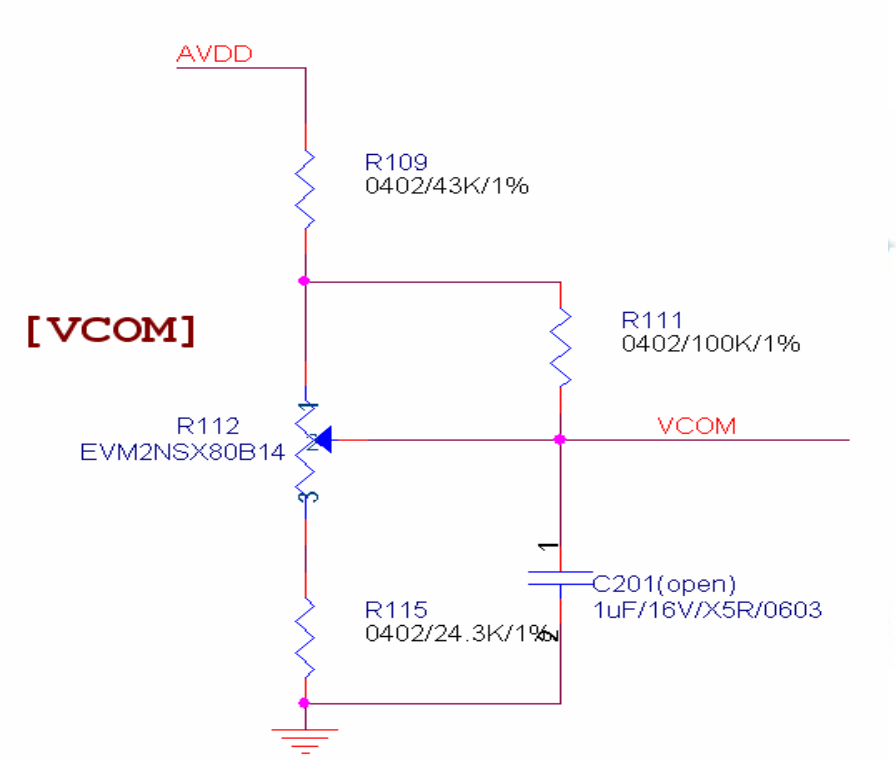
A 40pin connector is used for the module electronics interface.

Pin No.	Symbol	I/O	Function	Remark
1	VCOM	P	Common Voltage	Note 1
2	VDD(3.3V)	P	Power supply	
3	VDD(3.3V)	P	Power supply	
4	NC	---	No connection	
5	NC	---	No connection	
6	NC	---	No connection	
7	GND	P	Grounding for digital circuit	
8	RXIN0-	I	-LVDS Differential Data Input	R0-R5, G0
9	RXIN0+	I	+LVDS Differential Data Input	
10	GND	P	Grounding for digital circuit	
11	RXIN1-	I	-LVDS Differential Data Input	G1~G5, B0,B1
12	RXIN1+	I	+LVDS Differential Data Input	
13	GND	P	Grounding for digital circuit	
14	RXIN2-	I	-LVDS Differential Data Input	B2-B5,HS,VS, DE
15	RXIN2+	I	+LVDS Differential Data Input	
16	GND	P	Grounding for digital circuit	
17	RXCLKIN-	I	-LVDS Differential Clock Input	LVDS CLK
18	RXCLKIN+	I	+LVDS Differential Clock Input	
19	GND	P	Grounding for digital circuit	
20	RXIN3-	I	-LVDS Differential Data Input	R6, R7, G6, G7, B6, B7
21	RXIN3+	I	+LVDS Differential Data Input	
22	GND	P	Grounding for digital circuit	
23	NC	---	No connection	
24	NC	---	No connection	
25	GND	P	Grounding for digital circuit	
26	NC	---	No connection	
27	NC	---	No connection	
28	NC	---	No connection	
29	AVDD	P	Power supply for Analog circuit	
30	GND	P	Grounding for digital circuit	
31	LED-	P	LED cathode	
32	LED-	P	Grounding for digital circuit	
33	SHLR	I	Left / right selection	Note 2,3
34	UPDN	I	Up/down selection	Note 2,3
35	VGL	P	Gate OFF Voltage	
36	NC	---	No connection	
37	NC	---	No connection	

38	VGH	P	Gate ON Voltage	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

I: input, O: output, P: Power

Note1:typical VCOM is only a reference value,it must be optimized according to each LCM,Be sure to use VR

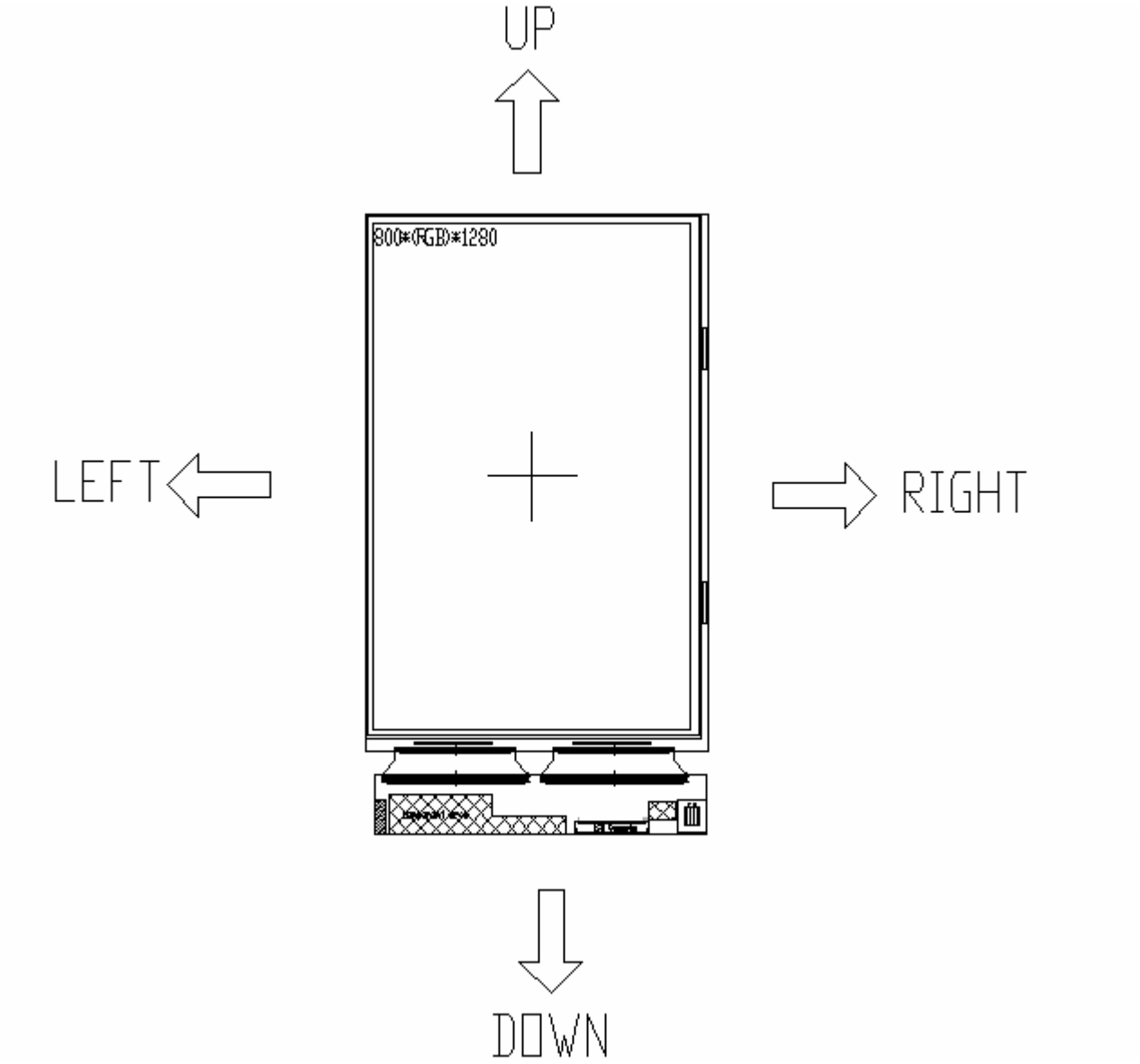


Note 2: Selection of scanning mode

Setting of scan control input		Scanning direction
UPDN	SHLR	
1.8V	1.8V	Up to down, left to right
GND	GND	Down to up, right to left
1.8V	GND	Up to down, right to left
GND	1.8V	Down to up, left to right

Default: Scanning direction is Up to down, left to right

Note 3: Definition of scanning direction.
Refer to the figure as below:



3.Operation Specifications

3.1. Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	VDD	-0.3	3.6	V	
	AVDD	8	13.5	V	
	VCOM	-0.3	5	V	
	VGH	-0.3	42.0	V	
	VGL	-20.0	0.3	V	
Operation Temperature	T_{OP}	-10	50	℃	
Storage Temperature	T_{ST}	-20	60	℃	
LED Reverse Voltage	V_R	-	5	V	Each LED
LED Forward Current	I_F	-	30	mA	Each LED

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	V_{DD}	3.0	3.3	3.6	V	
	AV_{DD}	8.7	8.8	8.9	V	
	V_{GH}	21.3	22	22.7	V	
	V_{GL}	-7.7	-7.0	-6.3	V	
Input signal voltage	V_{COM}		(3.0)		V	Note 1
Input logic high voltage	V_{IH}	1.7	1.8	1.95	V	
Input logic low voltage	V_{IL}	0	-	0.7	V	

Note 1: Typical V_{COM} is only a reference value, it must be optimized according to each LCM. Be sure to use VR.

3.1.2. Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I_{GH}	-	(0.297)	-	mA	V_{GH} =22V
	I_{GL}	-	(0.31)	-	mA	V_{GL} = -7.0V
	IVDD	-	(26.3)	-	mA	V_{CC} =3.3V
	IAV_{DD}	-	(19.5)	-	mA	AV_{DD} =8.8V

3.1.3. Backlight Driving Conditions

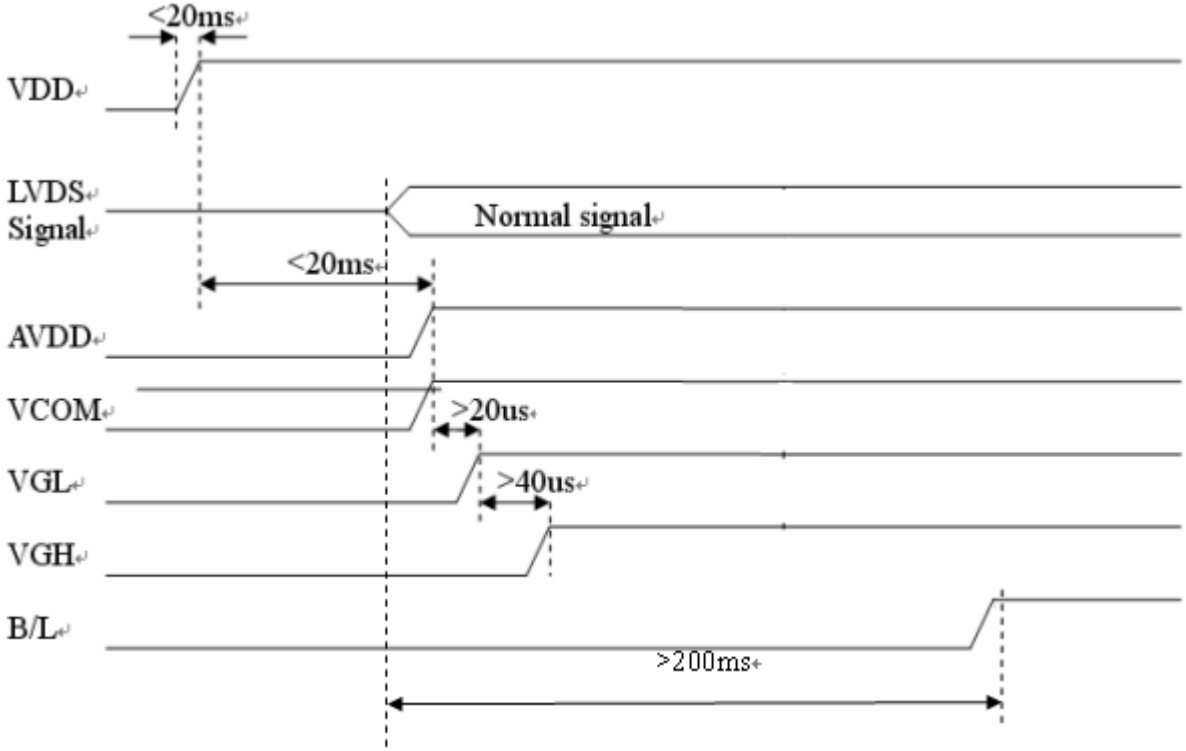
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V_L	9	9.6	10.6	V	Note 1
Current for LED backlight	I_L	145	160	175	mA	
LED life time	-	15000	-	-	Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and I_L =160mA.

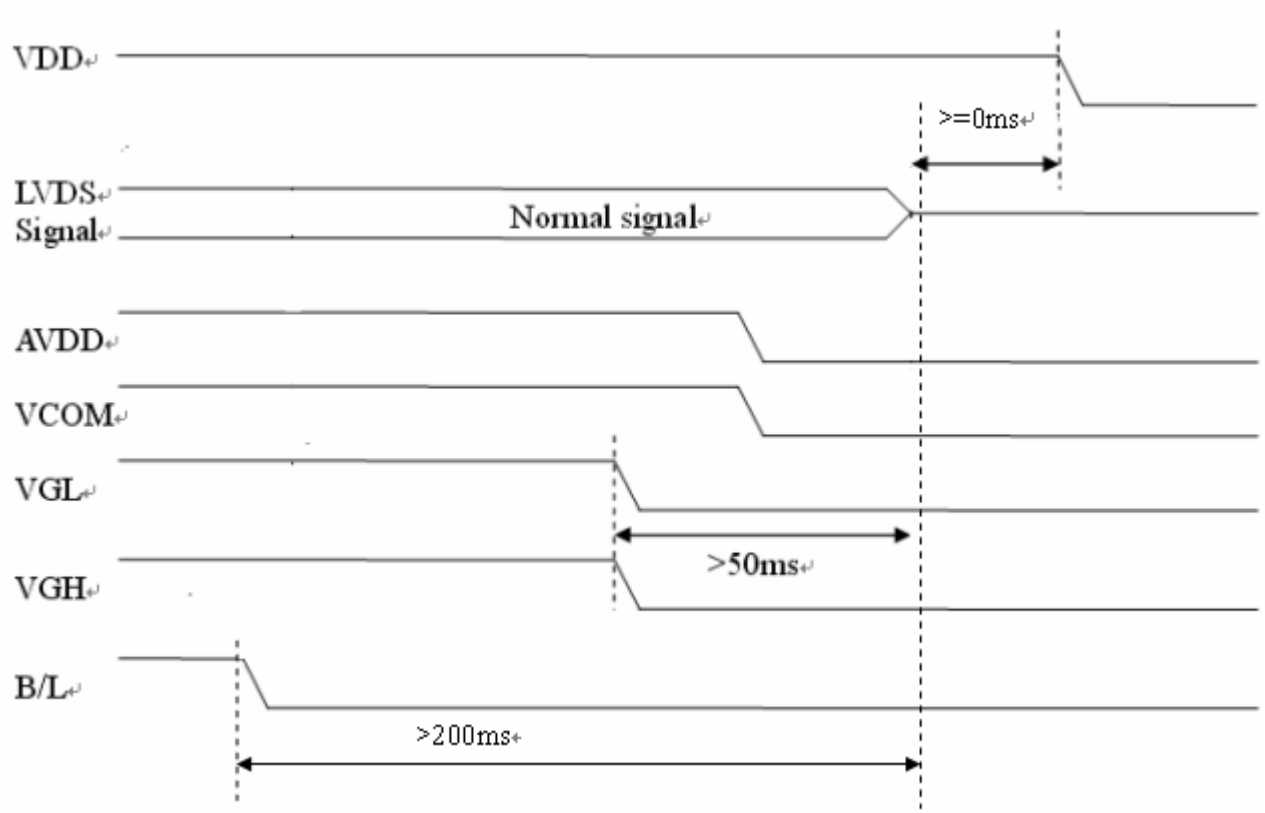
Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and I_L =160mA. The LED lifetime could be decreased if operating I_L is lager than 160mA.

3.2. Power Sequence

a. Power on:



b. Power off:



3.3. Timing Characteristics

3.3.1AC Electrical Characteristics

(VDD= 3.3V, AVDD= 8 .8V, GND=AGND= 0V, TA= -20 to +85°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	R_{xFCLK}	30	-	85	MHz	Refer to input timing table for each display resolution.
Input data skew margin	T_{RSKM}	500	-	-	pS	$\|V_{ID}\|$ = 200mV R_{xVCM} = 1.2V R_{xFCLK} = 81 MHz
Clock high time	T_{LVCH}	-	4/(7* R_{xFCLK})	-	ns	
Clock low time	T_{LVCL}	-	3/(7* R_{xFCLK})	-	ns	
PLL wake-up time	T_{enPLL}	-	-	150	uS	

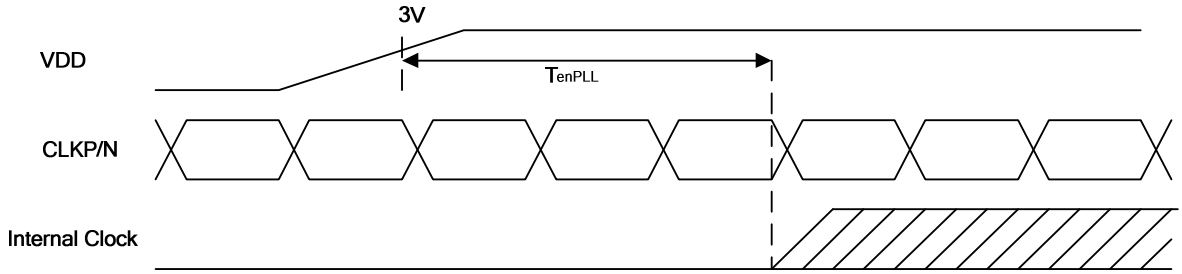


Figure1. Relationship between VDD, LVDS clock, and internal clock

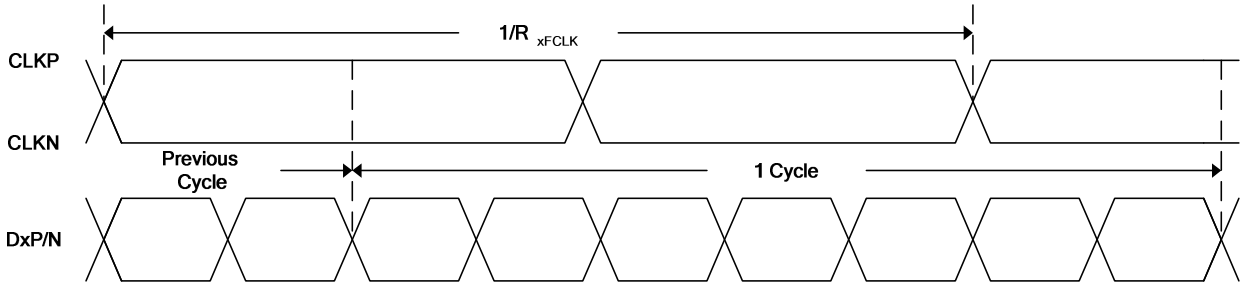
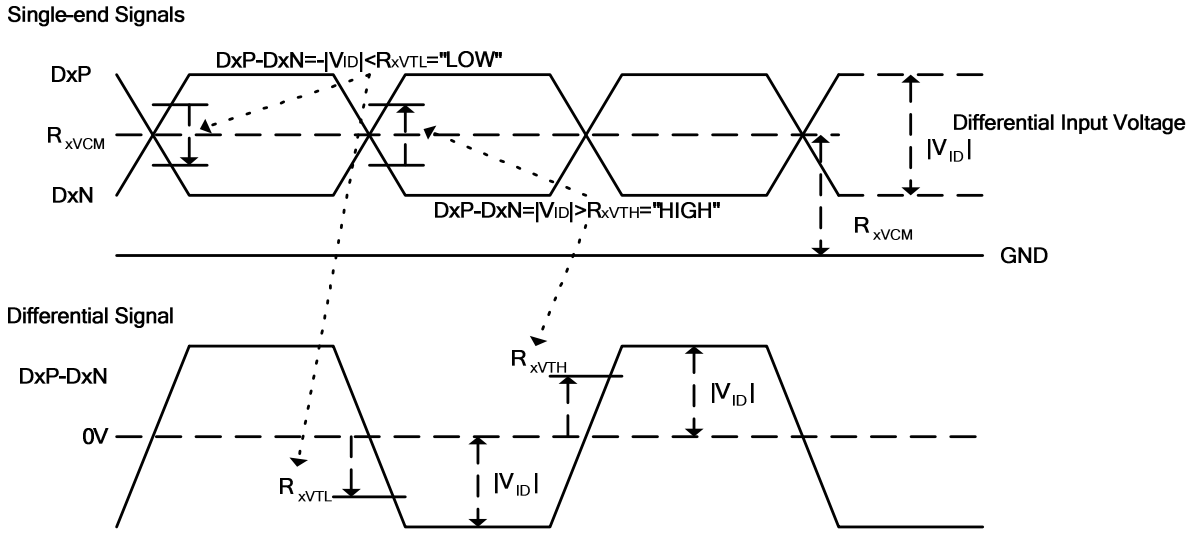


Figure2. 1 cycle time of LVDS

3.3.2. DC Electrical Characteristics

(VDD= 3.3 V, AVDD= 8.8 V, GND=AGND= 0V, TA= -20 to +85°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential input high threshold voltage	R_{xVTH}	+0.1	0.2	0.3	V	R_{xVCM} =1.2V
Differential input low threshold voltage	R_{xVTL}	-0.3	-0.2	-0.1	V	
Input voltage range (singled-end)	R_{XVIN}	0.7	-	1.7	V	
Differential input common mode voltage	R_{xVCM}	1	1.2	1.4	V	$\|V_{ID}\|$=0.2V
Differential input impedance	Z_{ID}	80	100	125	ohm	
Differential input voltage	$\|V_{ID}\|$	0.2	-	0.6	V	
Differential input leakage current	I_{LCLVDS}	-10	-	+10	uA	
LVDS Digital Operating Current	$I_{VDDLVDS}$	-	15	20	mA	VDD=3.3V, F_{DCLK}=80MHz, Input pattern: 55h->AAh->55h->AAh
LVDS Digital Stand-by Current	I_{STLVDS}	-	-	250	uA	Clock & all Functions are stopped



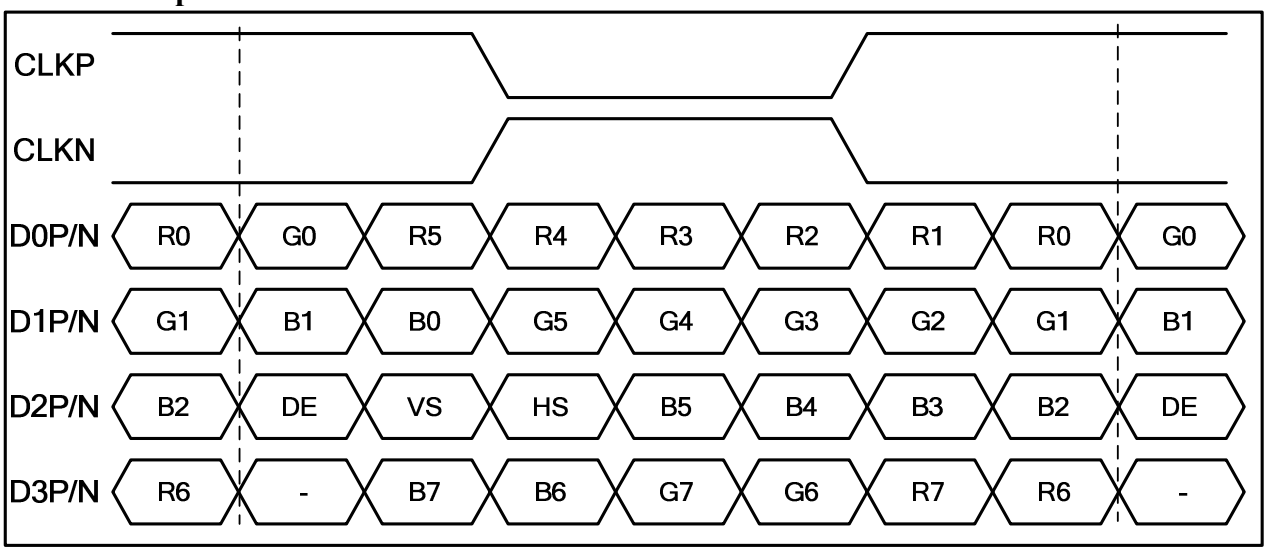
3.3.3. Timing

DE mode for 800RGBx1280

Parameter	Symbol	Min.	Typ.	Max.	Unit
DCLK frequency	F_{DCLK}	30	66.8	85	MHz
Horizontal display area	T_{HD}		800		DCLK
HSD period time	T_H	860	864	1344	DCLK
HSD blanking	$T_{HBP}+T_{HFP}$	60	64	544	DCLK
Vertical display area	T_{VD}		1280		H
VSD period time	T_V	1286	1288	1510	H
VSD blanking	$T_{VBP}+T_{VFP}$	6	8	230	H

3.3.3. Data Input Format

8bit LVDS input



Note: Support DE timing mode only, SYNC mode not supported

4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	80	85	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	80	85	-		
	θ_T	Φ=90°(12 o'clock)	80	85	-		
	θ_B	Φ=270°(6 o'clock)	80	85	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	15	20	msec	Note 3
	T_{OFF}		-	20	30	msec	Note 3
Contrast ratio	CR		600	800		-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		350	400	-	cd/m²	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test Conditions:

1. VDD=3.3V, IL=160mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

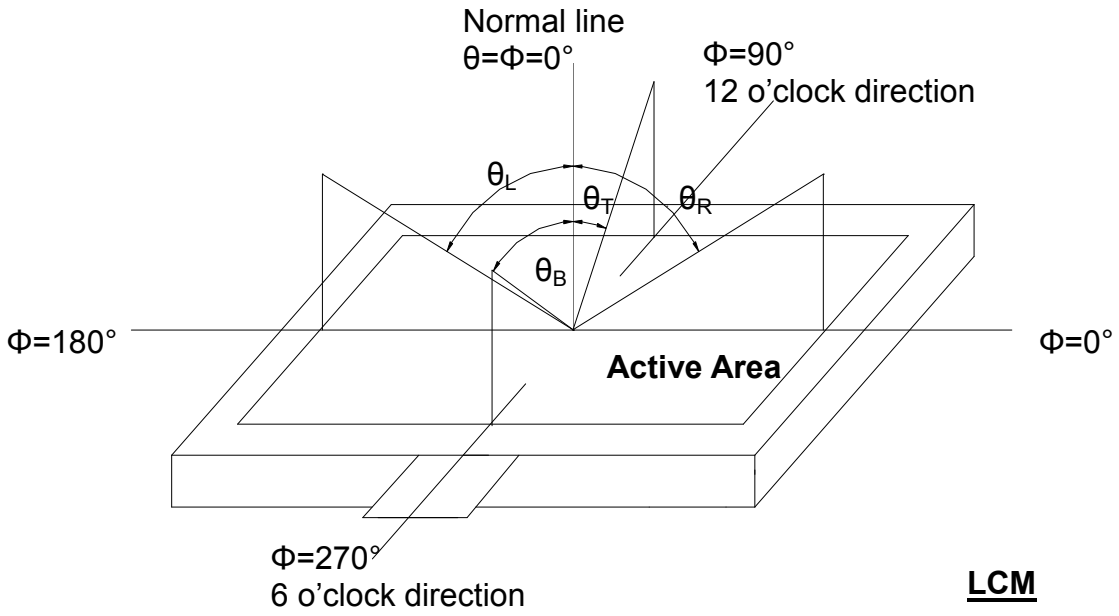
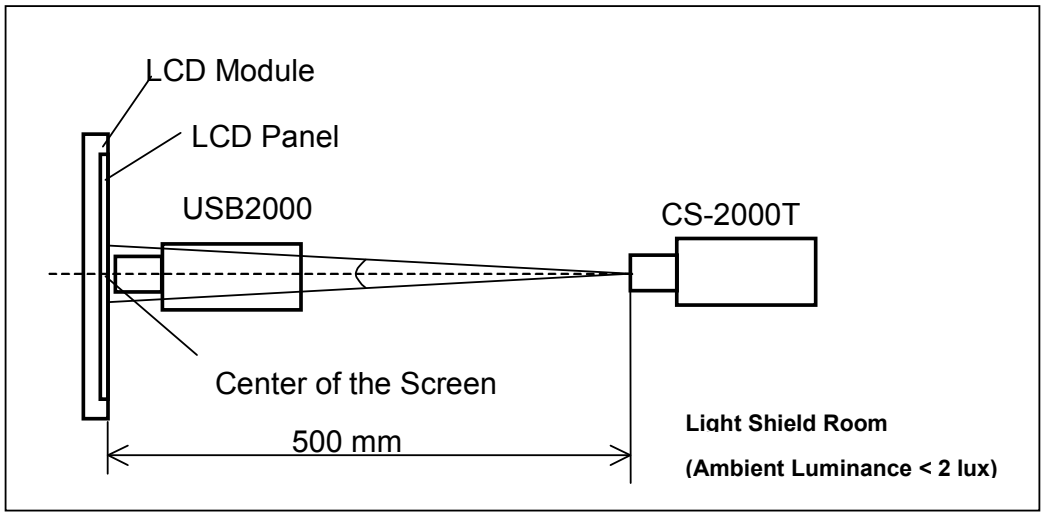


Fig. 4-1 Definition of viewing angle

Note 2: Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



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%

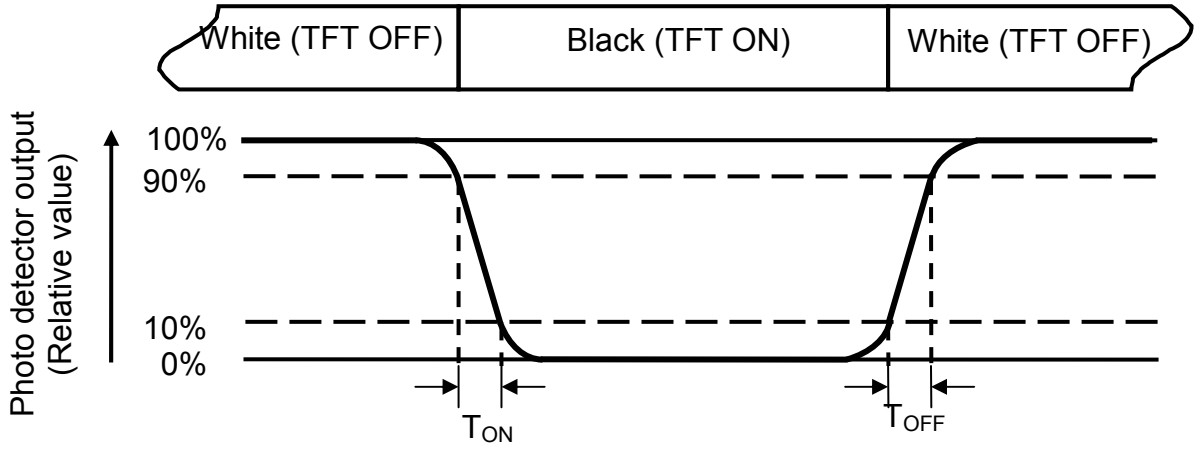


Fig. 4-3 Definition of response time

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. The LED driving condition is I_L=160mA .

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.

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

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

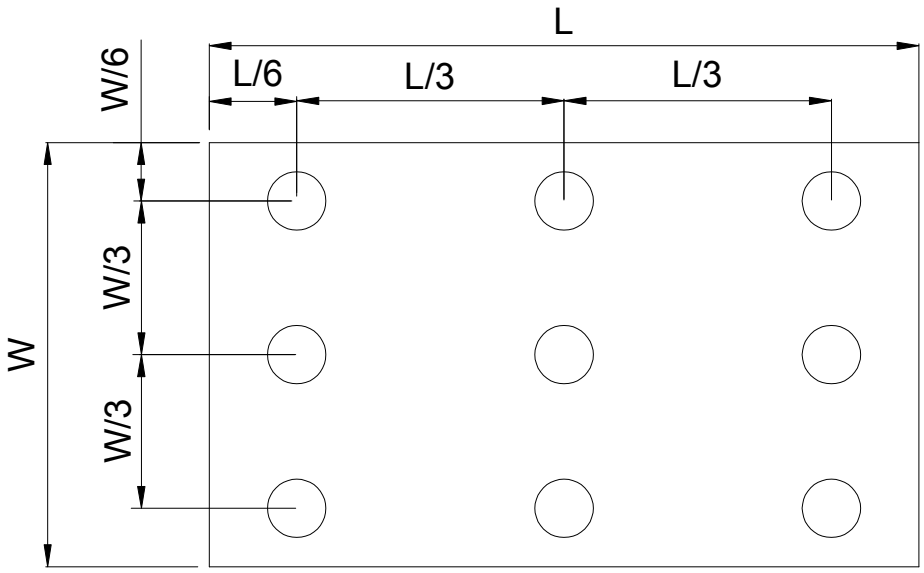


Fig. 4-4 Definition of measuring points

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 = 60℃ 120hrs	Note 1，Note 4
Low Temperature Storage	Ta = -20℃ 120hrs	Note 1，Note 4
High Temperature Operation	Ts = 50℃ 120hrs	Note 2，Note 4
Low Temperature Operation	Ta = -10℃ 120hrs	Note 1，Note 4
Operate at High Temperature and Humidity	+40℃, 90%RH 120hrs	Note 4
Thermal Shock	-10℃/30 min ~ +50℃/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 : ISTA-3A 1Hz~200Hz,Grms=0.53 Half hours for direction of Z.	
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 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.

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.

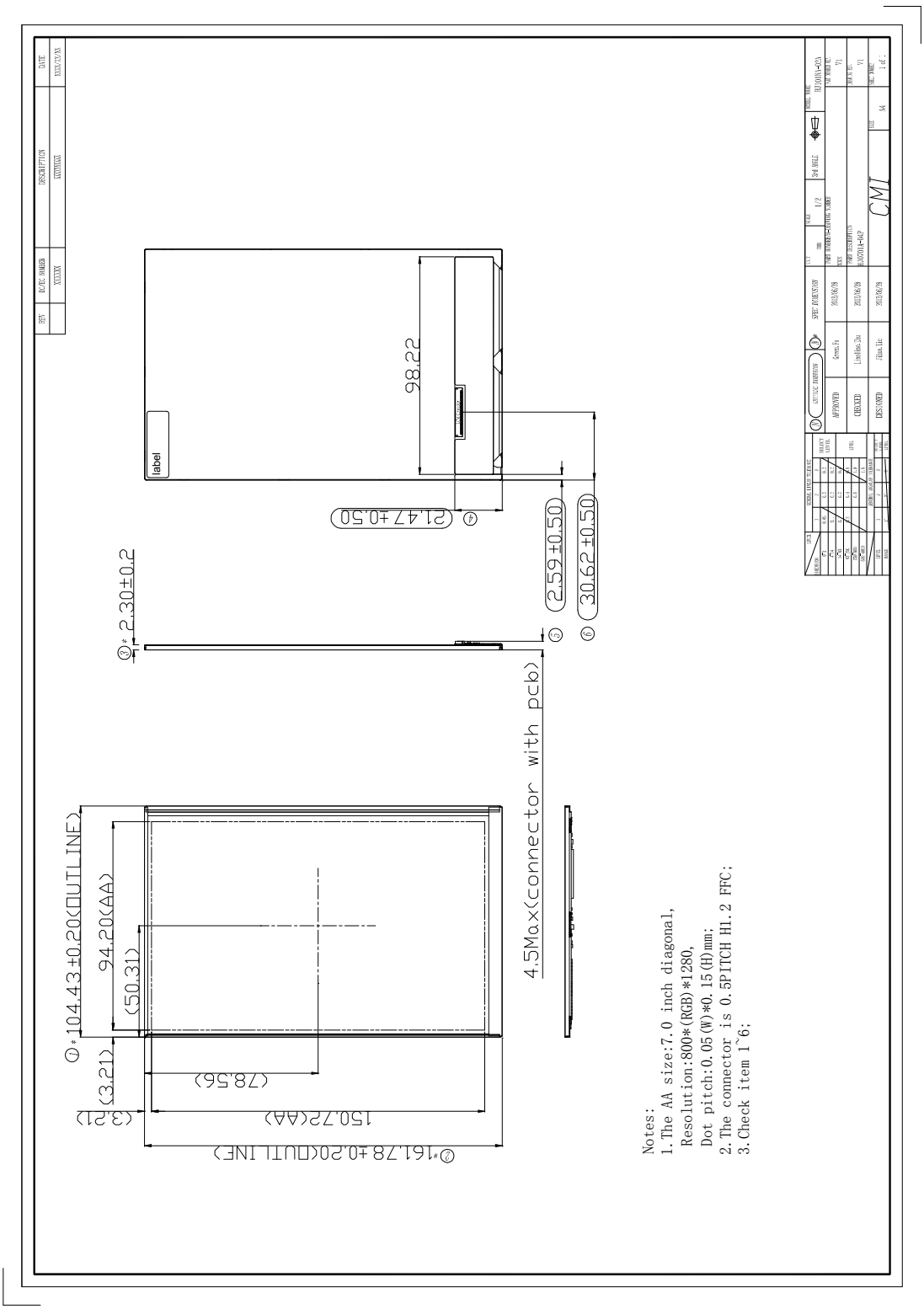
6.4. Storage

1. Store the module in a dark room where must keep at 25±10℃ 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



8. Package Drawing

8.1. Packaging Material Table

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	HJ070IA-04P	104.43 x 161.78 × 2.3	TBD	TBD	
2	Partition	BC Corrugated paper	TBD	TBD	TBD	
3	Corrugated Paper	B Corrugated paper	TBD	TBD	TBD	
4	Corrugated Bar	B Corrugated paper	TBD	TBD	TBD	
5	Dust-Proof Bag	PE	TBD	TBD	TBD	
6	A/S Bag	PE	TBD	TBD	TBD	
7	Carton	Corrugated paper	TBD	TBD	TBD	
8	Total weight	TBD				

8.2. Packaging Quantity

Total LCM quantity in Carton: 2 Rows x quantity per Row 25 =50

8.3. Packaging Drawing

TBD