

CHIMEI INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer: Quanta
Model Name: EJ1011A-02A
Date: 2012/08/08
Version: 1.2

- Preliminary Specification
 Final Specification

For Customer's Acceptance

Approved by	Comment

Approved by	Prepared by
	Victor Lin 2012/08/08

1. General Specifications.....	1
2. Pin Assignment.....	2
3. Electrical Specifications	3
3.1. Interface Specification.....	3
3.2. Block Diagram of Display.....	3
3.3. Absolute Maximum Ratings	3
3.5. LVDS Timing Diagram	4
3.6. AC / Timing Characteristics over Operating voltage and Temperature Range:	4
3.7. Power-UP Power-Down Sequence and Timing	6
3.8. Pixel Format	8
3.9. Display Modes and Advanced Functions	8
3.11. Backlight Driving Conditions.....	10
3.11.1. Light Bar characteristics	10
4. Optical Specifications.....	11
5. Reliability Test Items	15
6. General Precautions	15
6.1. Safety	15
6.2. Handling	15
6.3. Static Electricity.....	16
6.4. Storage	16
6.5. Cleaning.....	16
7. Mechanical Drawing	17
8. Package Drawing	18

1. General Specifications

No.	Item	Specification	Remark
1	LCD size	10.1 inch diagonal	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1280 × (RGB) × 800	
4	Display mode	Normally Black, Transmissive	
5	Dot pitch	0.1695 x 0.1695 mm	
6	Active area	216.96 x 135.6 mm	
7	Module size	226.33(W) x 146.73(H) x 2.3(T) mm w/ PCBA part 183.5(W) x 10.57(L) x 2.94(T) mm	Note 1
8	Light source	6 LEDs in series w/ 6 parallel	
9	Display Number of Colors	16.2M	
10	Interface	LVDS	
11	Backlight power consumption	2088 mW (Typ)	
12	DC/DC Supply Voltage (VDD to Ground)	3V min, 3.3V typ, 3.6V max	
13	Panel power consumption	803 mW (Typ), 1084 mW (Max)	
14	Surface treatment	AG	
15	Weight	135±10 g	

Note 1: Refer to Mechanical Drawing page.18.

2. Pin Assignment

A 45pin connector is used for the module electronics interface, another 6pin connector is used for Touch panel.

Pin #	Symbol	Description	Pin #	Symbol	Description
1	Touch_VCC	Touch_VCC	24	GND	GND
2	Touch_RST	Touch_RST	25	RIN3-	Receiver signal of LVDS CH3 (-)
3	Touch_INT	Touch_INT	26	RIN3+	Receiver signal of LVDS CH3 (+)
4	Touch_GND	Touch_GND	27	GND	GND
5	Touch_SCLK	Touch_SCLK	28	Color_EN	Color Management Selection
6	Touch_SDAT	Touch_SDAT	29	CABC_EN	CABC Function Enable
7	VDD	+3.3V Power Supply	30	GND	GND
8	VDD	+3.3V Power Supply	31	WP_E	EDID WP
9	VDD	+3.3V Power Supply	32	WP_G	Gamma EPROM WR Enable
10	SCLK	I2C Serial Input Clock	33	GND	GND
11	SDAT	I2C Serial Data I/O	34	LED_PWM_O	Backlight Dimming Control Output
12	GND	GND	35	LED_PWM_I	Backlight Dimming Control Input
13	RIN0-	Receiver signal of LVDS CH0 (-)	36	GND	GND
14	RIN0+	Receiver signal of LVDS CH0 (+)	37	LED_Cathode1	LED Cathode1
15	GND	GND	38	LED_Cathode2	LED Cathode2
16	RIN1-	Receiver signal of LVDS CH1 (-)	39	LED_Cathode3	LED Cathode3
17	RIN1+	Receiver signal of LVDS CH1 (+)	40	LED_Cathode4	LED Cathode4
18	GND	GND	41	LED_Cathode5	LED Cathode5
19	RIN2-	Receiver signal of LVDS CH2 (-)	42	LED_Cathode6	LED Cathode6
20	RIN2+	Receiver signal of LVDS CH2 (+)	43	LED_VCC	LED Anode
21	GND	GND	44	LED_VCC	LED Anode
22	RCLK-	Receiver signal of LVDS CLK (-)	45	NC	No Connect / This pin for CMI test.
23	RCLK+	Receiver signal of LVDS CLK (+)			

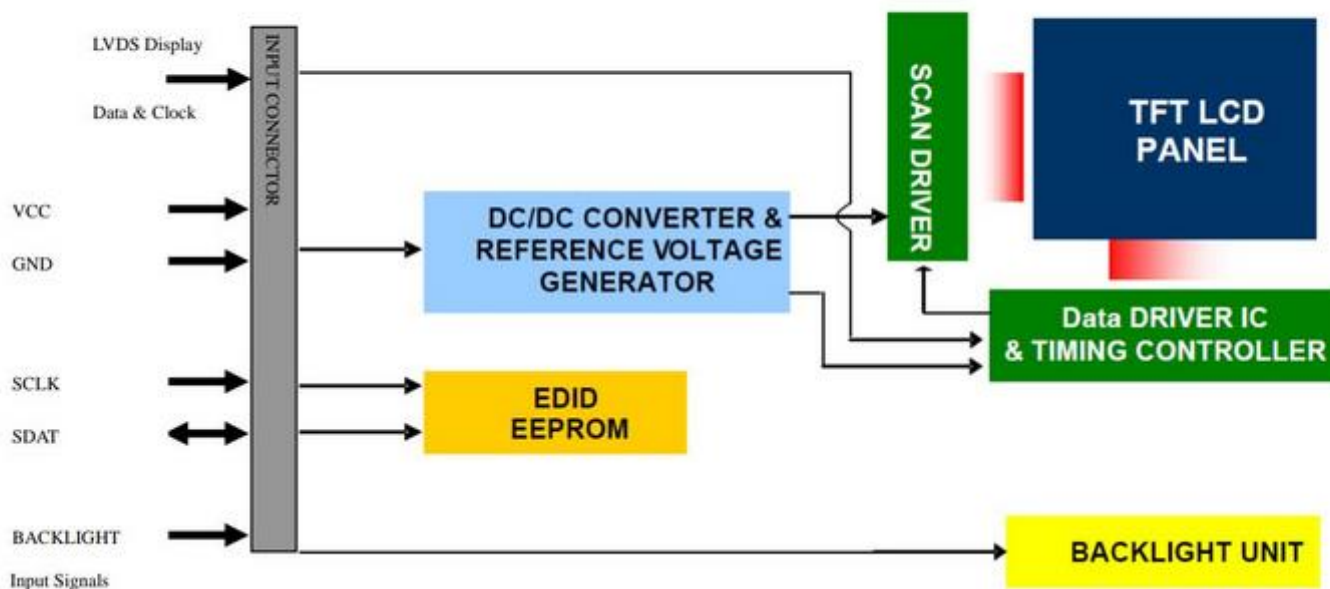
Touch Pin Define		
Pin #	Symbol	Description
1	Touch_VCC	Touch_VCC
2	Touch_SCLK	Touch_SCLK
3	Touch_SDAT	Touch_SDAT
4	Touch_GND	Touch_GND
5	Touch_RST	Touch_RST
6	Touch_INT	Touch_INT

3. Electrical Specifications

3.1. Interface Specification

Low Voltage Differential Signaling (LVDS) V0.95 JEIDA

3.2. Block Diagram of Display



3.3. Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units	Conditions
DC/DC Supply Voltage	VDD	GND - 0.3	5	V	Tambient = 25°C
Logic Input Voltage	VI	GND - 0.3	5	V	Tambient = 25°C
LED current	ILED	-	15.5	mA	-10°C to +60°C

Non volatile memory contents shall not be corruptible by any combination of inputs and voltage supply characteristics including rapid power loss, nor shall subsequent power-up sustain any deviation in performance. Any electrical malfunction of the IC from an abnormal power-down will not be tolerated.

3.4. DC Characteristics over Operating Voltage and Temperature Range: (Unless otherwise specified)

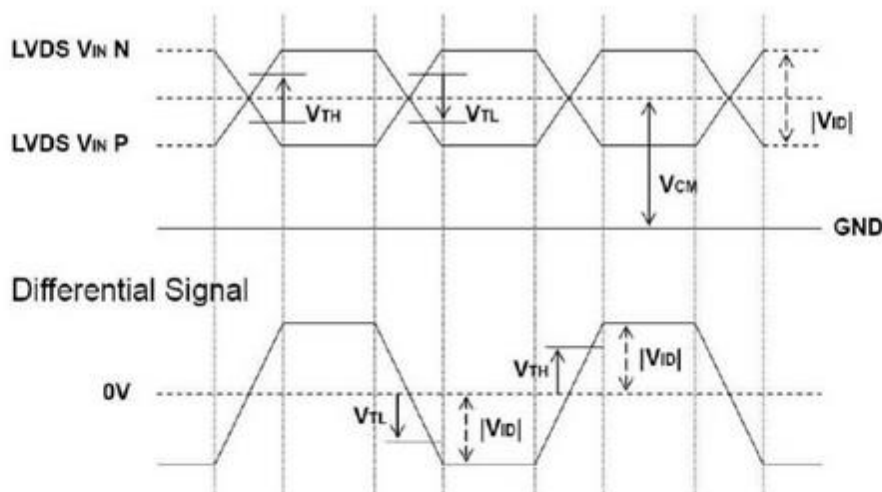
Characteristics	Symbol	Min	Typical	Max	Unit
DC/DC Supply Voltage	VDD	3	3.3	3.6	V
Logic Input High Voltage		0.7*VDD	-	VDD	V
Logic Input Low Voltage		0	-	0.3*VDD	V
PWM output High Voltage	VPWM_OH	0.7*VDD	-	VDD	V
PWM output Low Voltage	VPWM_OL	0	-	0.3*VDD	V

Frame Frequency	FFR	-	60	-	Hz
High LVDS Input Threshold (Vcm=1.2V)	Vth	-	-	+100	mV
Low LVDS Input Threshold (Vcm=1.2V)	Vtl	-100	-	-	mV
Input Voltage Range (Single End)	Vin	0	-	2.4	V
Differential Input Voltage	Vid	0.1	-	0.6	V
LVDS Input Common Mode Voltage	Vcm	0.7	-	1.6	V
I2C High Input Voltage Fixed Level I2C High Input Voltage VDD Level	Vil	3 0.7* VDD	-	VDD-MA X	V
I2C Low Input Voltage Fixed Level I2C Low Input Voltage VDD Level	Vih	-0.5 -0.5	-	1.5 0.3*VDD	V

Power consumption in Normal Mode	PNormal	-	803	1084	mW
VDD Current consumption in Normal	I _{vdd - Normal}	-	244	302	mA
Power consumption in Normal Mode, 25 C and nominal voltages (VDD =3.3V), Worst case pattern.	P _{Normal-Nominal}	-	1000	1154.9	mW
VDD Current consumption in Normal Mode, 25 C and nominal voltages(VDD =3.3V), Worst case pattern	I _{vdd -Normal-nominal}	-	304	350	mA

3.5. LVDS Timing Diagram

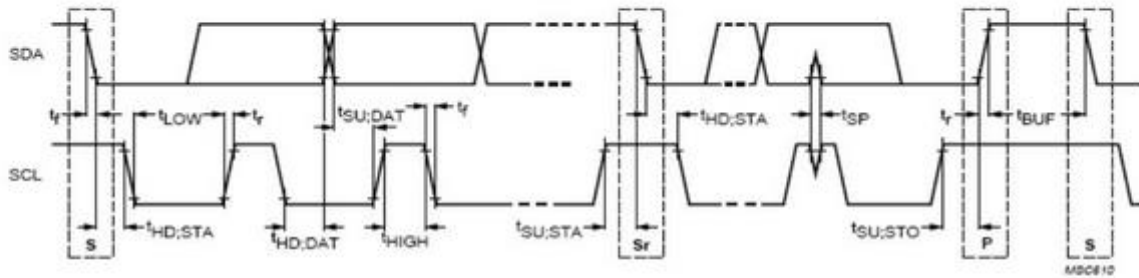
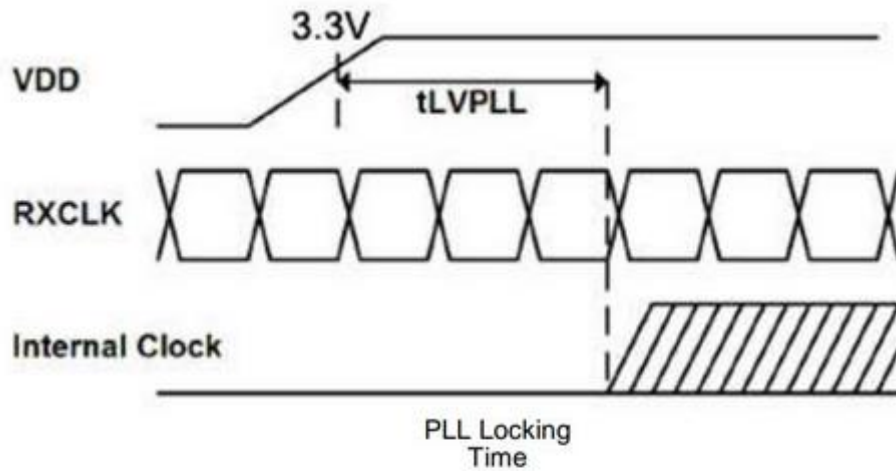
Single-End



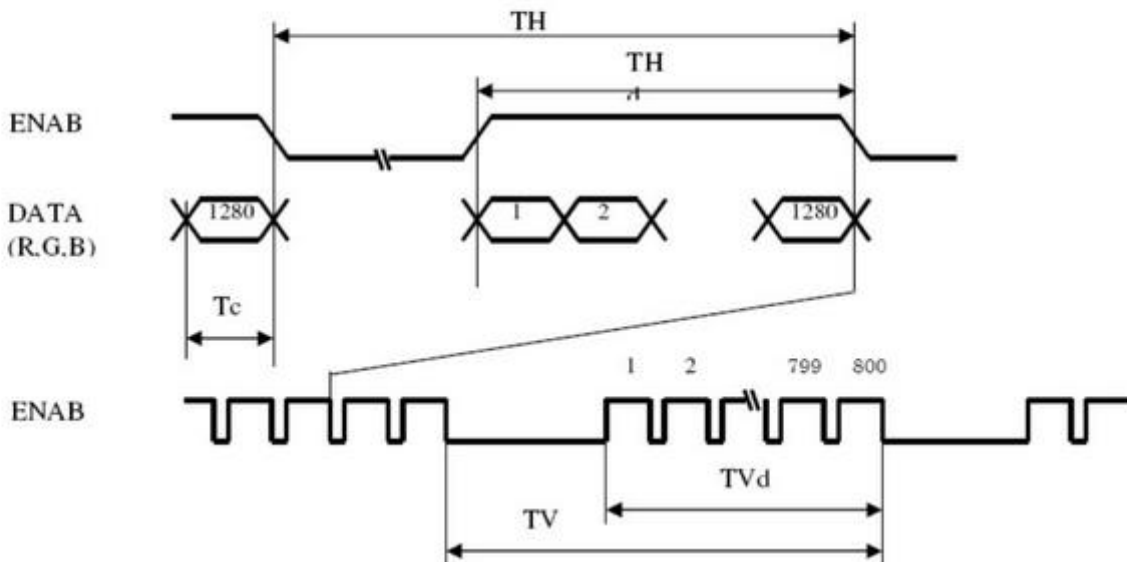
3.6. AC / Timing Characteristics over Operating voltage and Temperature Range:

Characteristics	Symbol	Min	Typ	Max	Units
LVDS CLK Period	fLVCP	11.1	T	40	ns
LVDS CLK High Time	tLVCH	-	4T/7	-	ns
LVDS CLK LoW Time	tLVCL	-	3T/7	-	ns
LVDS PLL Wakeup Time	tLVPLL	-	-	1	ms
LVDS 1nput SkeW margin (f = 85MHZ)	T _{LVSK}	-400	-	400	ps
12C SCL Frequency (Standard Mode)	fSC	0	-	100	kHZ
12C SCL Frequency (Fast Mode)	fSC	0	-	400	kHZ

High Period of 12C SCL (Standard Mode)	t_{H1GH}	4	-	-	us
High Period of 12C SCL (Fast Mode)		0.6			
LoW Period of 12C SCL (Standard Mode)	t_{LoW}	4.7	-	-	us
LoW Period of 12C SCL (Fast Mode)		1.3			



I2C-bus Timing Diagram



Interface Timing

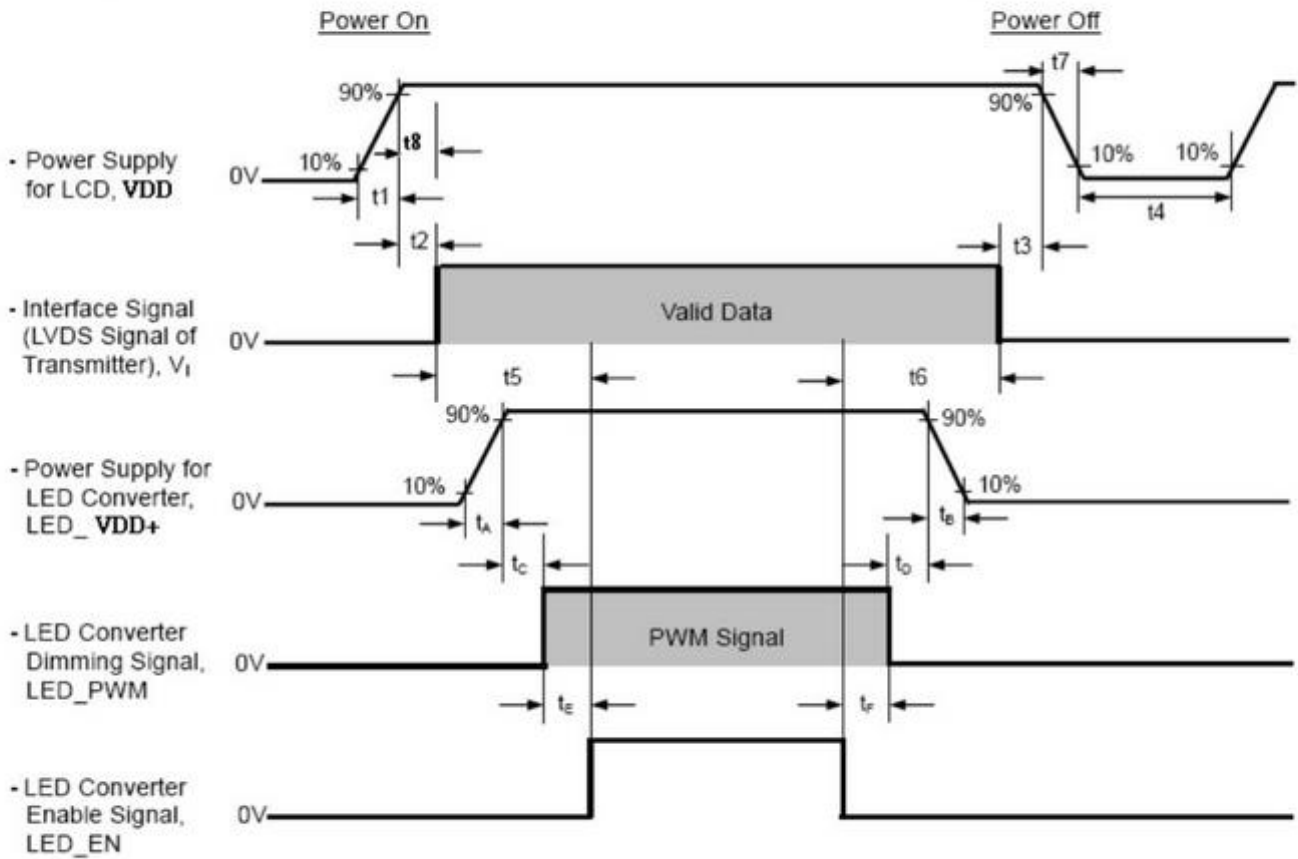
Parameter	Symbol	Min.	Typ.	Max.	Unit
Clock Frequency	1/Tc	60	65	80	MHZ

Data Enable	Horizontal Period	TH	19.5	20.46	21.5	uS
	Horizontal Period	THd	-	1280	-	clk
	Horizontal Period	TV	-	812	-	line
	Horizontal Period	TVd	-	800	-	line

3.7. Power-UP Power-Down Sequence and Timing

The power sequence specifications are shown as the following table and diagram.

Symbol	Value			Unit	Note
	Min.	Typ.	Max.		
t1	0.5	-	10	ms	
t2	50	-	-	ms	
t3	80	-	-	ms	
t4	500	-	-	ms	
t5	200	-	-	ms	
t6	200	-	-	ms	
t7	0.5	-	10	ms	
t8	200	-	-	ms	
t _A	0.5	-	10	ms	
t _B	0	-	10	ms	
t _C	10	-	-	ms	
t _D	10	-	-	ms	
t _E	10	-	-	ms	
t _F	10	-	-	ms	



Note(1) Please don't plug or unplug the interface cable when system is turned on.

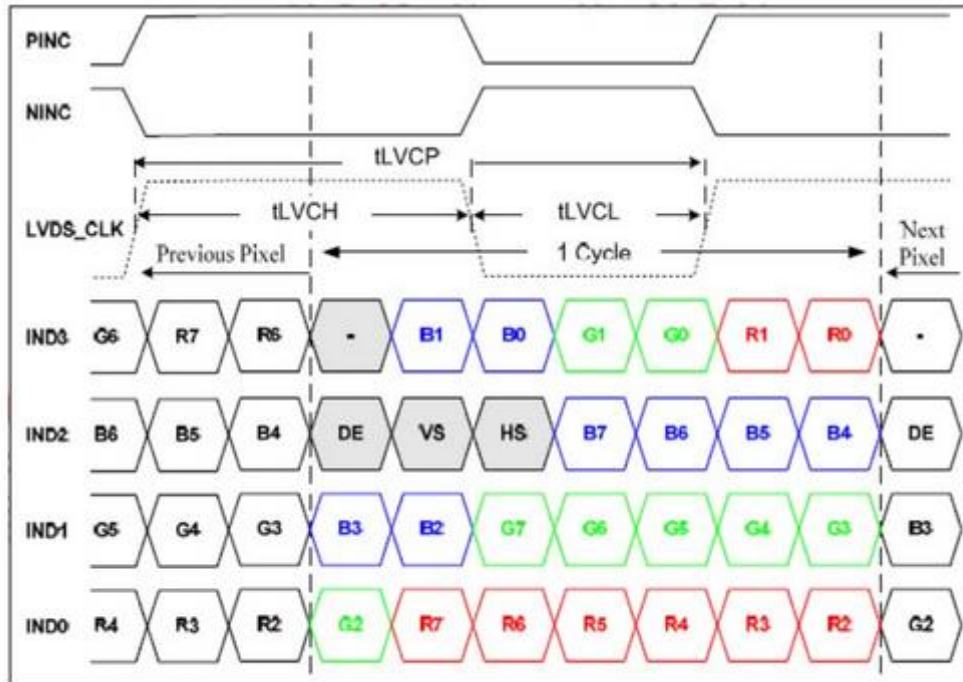
Note(2) Please avoid floating state of the interface signal during signal invalid period.

Note(3) It is recommended that the backlight power must be turned on after the power supply for LCD and the interface signal is valid.

Note(4) Please avoid TCON read state of the I2C interface operating during t_8 period.

3.8. Pixel Format

24-bit single pixel format is supported by this display, pixel is represented by three 8-bit values, R7~0, G7~0, and B7~0. This pixel format should be as defined for format 24h in VESA EDID V-3 standard.



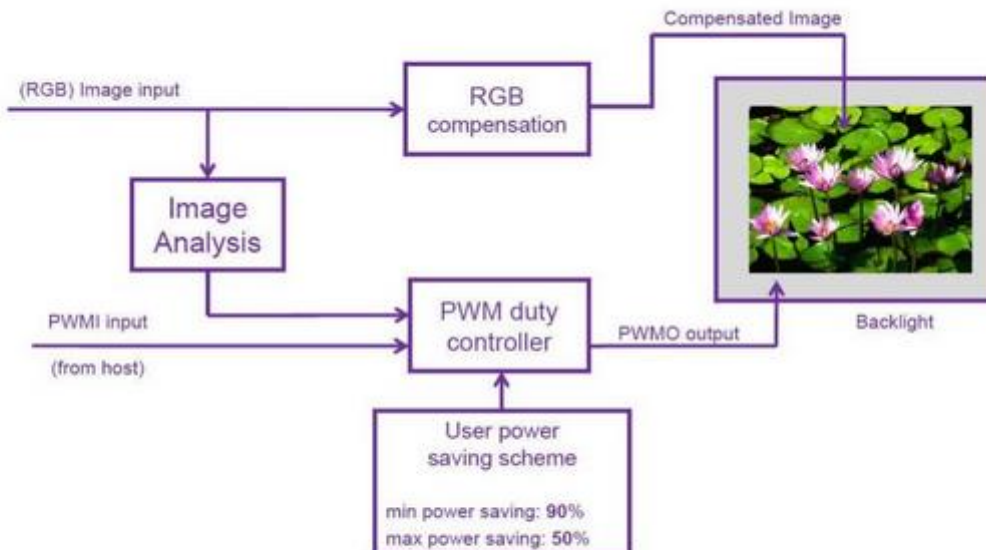
24 bit JEIDA Like LVDS Format Waveform and Input Data

3.9. Display Modes and Advanced Functions

This section describes some of the more advanced mode of operation for this display.

3.9.1. Dynamic Backlight Control

This display has dynamic backlight control function to provide PWM feedback signal to external LED drivers to throttle LED currents in order to save power. This is an advanced function where the brightness of the backlight and gamma are automatically adjusted in accordance with the average picture level (APL) of the input image data by changing the PWM output and gamma. The selection of external LED driver is outside the scope of this document.



Dynamic backlight control functions are controlled by following signals.

PWMI	I	PWM Input	
PWMO	O	PWM output	
CABC_EN	I	CABC Function Enable Selection: CABC_EN = L : CABC disable CABC_EN = H : CABC enable	3.3V tolerance, internal pull low

PWMI: PWN Input

PWMO: Output PWM duty base on input data(content adaptive), output frequency is defined to be 1KHz, maximum value of PWMO duty is defined by PWMI duty,.

3.9.2. Color Management

This display supports color management function. This function enhances image quality by automatic identification of a need to adjust and strengthen global Hue, Saturation, Intensity and localized independent colors.

Color management function is controlled by following signal.

Color_EN	I	Color management Function Selection: Color_EN = L : Color management disable Color_EN = H : Color management enable	
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See optical section for more optical requirements.

3.10. Extended Display Identification Data (EDID)

Extended Display Identification Data (EDID) contains basic information about this display and its capabilities, including manufacture information, production type, size, color, timing supported by this display. EDID can be accessed Via I²C lanes of this display. Data structure is defined by EDID V1.3 standard.

Address	Description	Default Value	Explanation
0X00	Header	0X00	EDID Header
0X01		0XFF	
0X02		0XFF	
0X03		0XFF	
0X04		0XFF	
0X05		0XFF	
0X06		0XFF	
0X07		0X00	
0X08	Manufacture ID	0X0D	0x0D,0xA9 = CMI
0X0g		0XAg	
0X0A	Assembly Location	Various	0x0A[7:4] = TFT Front End Location; 0x01 = TBD 0x0A[3:0] = Backend Assembly Location; 0x01 = TBD
0X0B	Hardware Revision	Various	0x0B[7:6] = PCB Rev,0x01 = Rev. 0 0x0B[5:4] = TCON; 0x03 = NT71556 0x0B[3:2] = Source Driver; 0x0B[1:0] = Gate Driver;
0X10	Week of Manufacture	Various	Week of Module Manufacture in hex
0X11	Year of Manufacture	Various	Year of Module Manufacture in hex
0X12	Version Number	0X03	0X03 = 10.1"
0X13	Revision Number	Various	0X01 = Rev. 00 0X02 = Rev. 01

0X14	Video Input Definition	0X01	0X01 = LVDS JEIDA
0X15	Horizontal Screen Size	0X80	0X80 = 1280 pixels
0X16	Vertical Screen	0X50	0X5A = 800 pixels
0X17	Gamma	Various	[7:4] 0x01 = Gamma Rev.0 [7:4] 0x02 = Gamma Rev.1 [3:0] 0x01 = 2.0 Gamma [3:0] 0x02 = 2.2 Gamma [3:0] 0x03 = 2.5 Gamma [3:0] 0x04 = 3.0 Gamma
0X18	Feature Support	0X11	0x18[7:4] = 01 → CABC supported 0x18[3:0] = 01 → CE supported

- Revision number should be incremented any time there are changes
- Starting with ES1 all display should be program according to the table listed above.

3.11. Backlight Driving Conditions

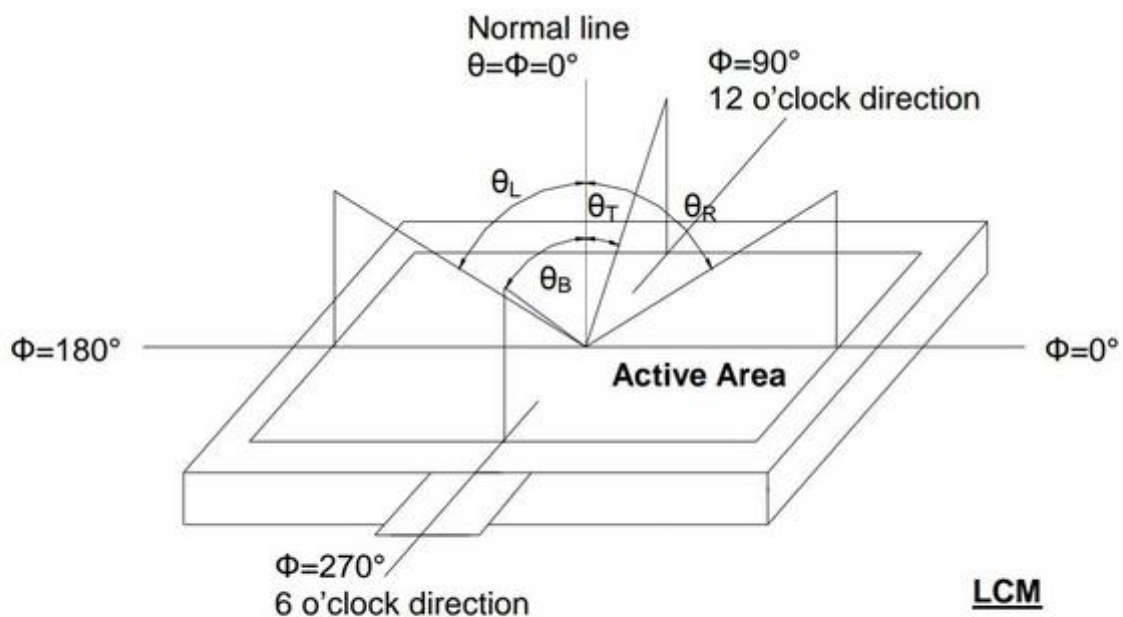
3.11.1. Light Bar characteristics

Parameter	Symbol	Minimum	Typical	Maximum	Units
Light bar Voltage	--	--	17.4	--	V
Light bar Current	--	--	120	--	mA

4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark	
			Min.	Typ.	Max.			
Viewing Angle Range	Left	θ_L	CR \geq 10	-	89	-	degree	Note 1,2
	Right	θ_R		-	89	-		
	Top	θ_T		-	89	-		
	Bottom	θ_B		-	89	-		
Response Time	$T_{on} + T_{off}$	Normal $\theta = \Phi = 0^\circ$	-	25	35	ms	Note 2,3	
Contrast Ratio	CR	Normal $\theta = \Phi = 0^\circ$	600	900	-	-	Note 2,4	
Luminance	L	Normal $\theta = \Phi = 0^\circ$	320	400	-	cd/m ²	Note 2,5	
Color Chromaticity (CIE1931)	White	W_x	Normal $\theta = \Phi = 0^\circ$	0.27	0.31	0.35	-	Note 2,6
		W_y		0.3	0.34	0.38		
	Red	R_x		0.566	0.601	0.636		
		R_y		0.312	0.347	0.382		
	Green	G_x		0.28	0.315	0.350		
		G_y		0.534	0.569	0.604		
	Blue	B_x		0.115	0.15	0.185		
		B_y		0.099	0.134	0.169		
Color Gamut	NTSC	CIE1931	40	50	-	%	-	
Luminance Uniformity	U_L	Normal $\theta = \Phi = 0^\circ$	70	80	-	%	Note 2,7	

Note 1: Definition of viewing angle range



LCM

Fig. 1 Definition of viewing angle

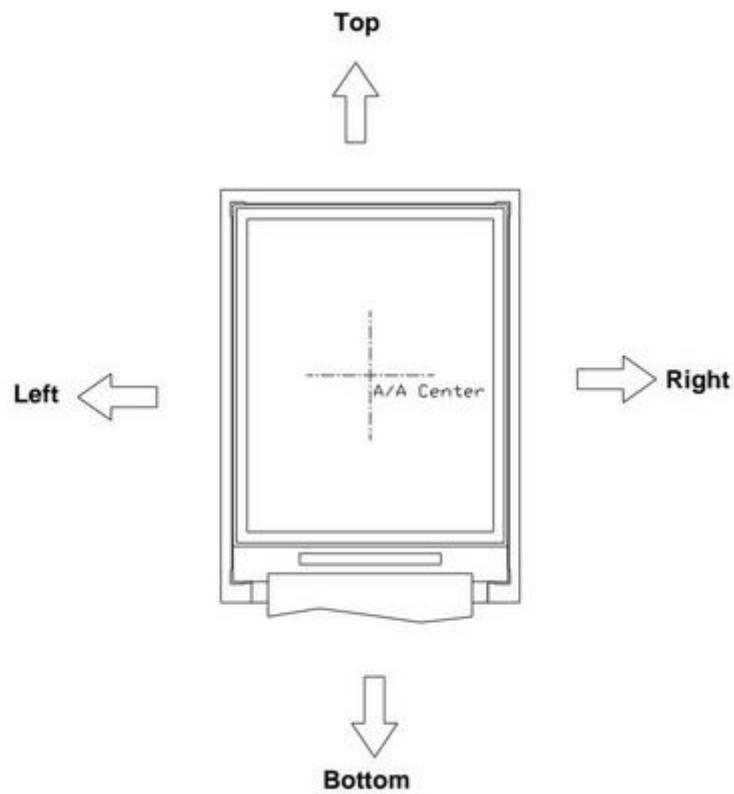


Fig. 1 Definition of viewing angle for display

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in a dark room with ambient temperature $T_a=+25^{\circ}\text{C}$. The optical properties are measured at the center point of the LCD screen after 5 minutes operation. (Equipment: Photo detector TOPCON BM-5A or BM-7 /Field of view: 1° /Height: 500mm.)

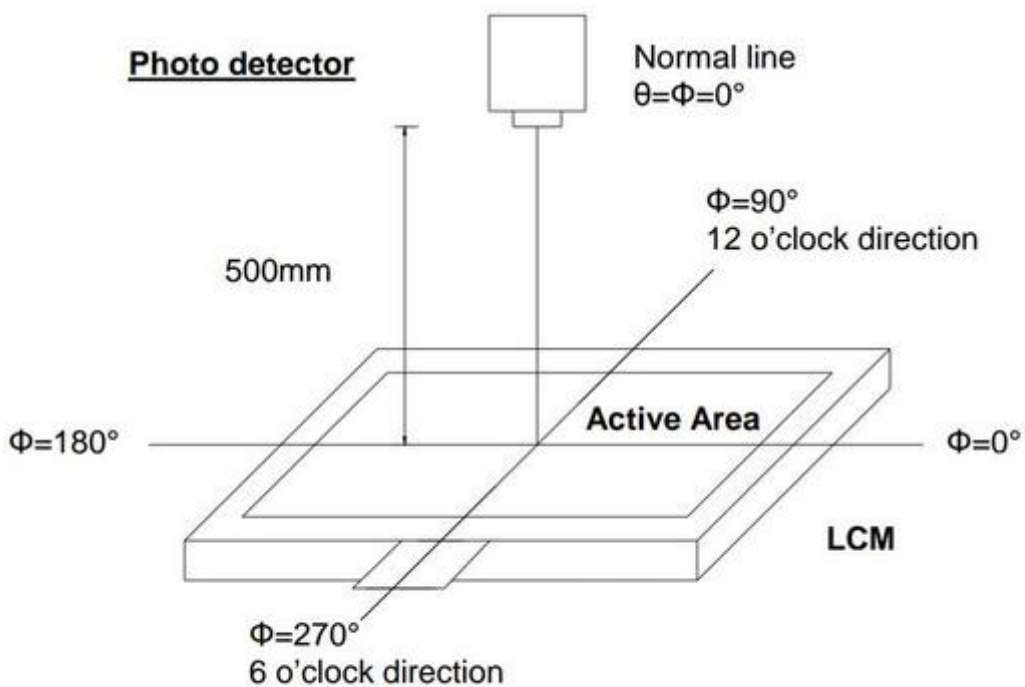


Fig. 3 Optical measurement system setup

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%.

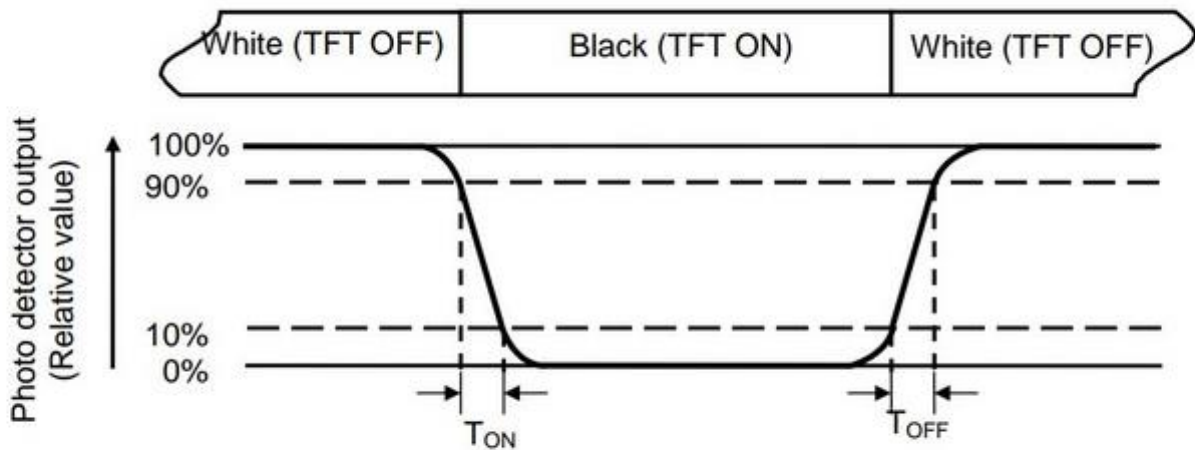


Fig. 4 Definition of response time

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 luminance:

Measured at the center area of the panel when LCD panel is driven at "white" state.

Note 6: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 7: Definition of luminance uniformity

To test for uniformity, the tested area is defined as below. The measurement spot is placed at the center of each circle as below.

$$\text{Luminance Uniformity (U}_L) = \frac{L_{\min}}{L_{\max}}$$

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

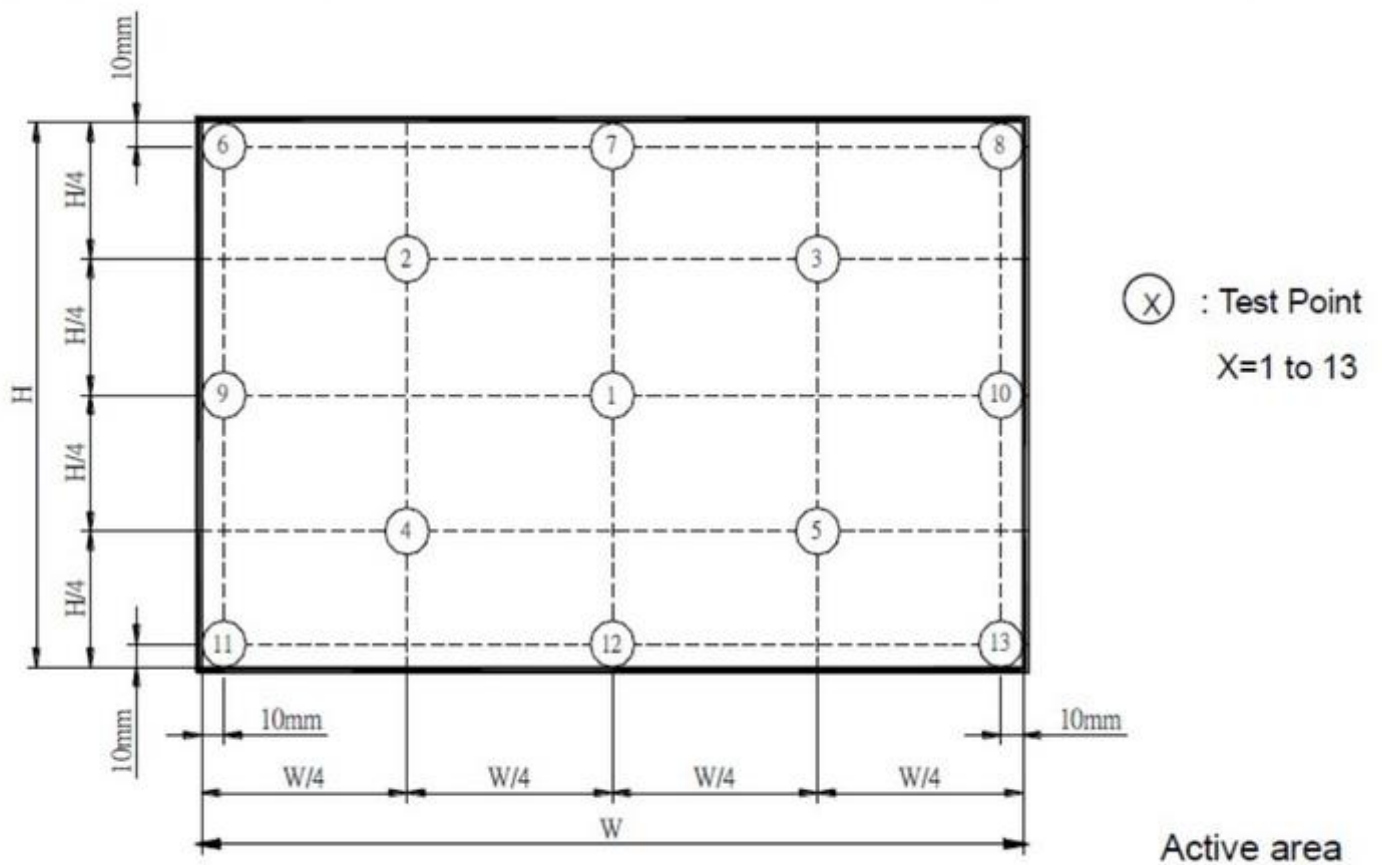


Fig. 2 Definition of luminance uniformity

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

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

5. Reliability Test Items

No	Test Item	Test Condition
1	High Temperature Operation Test	+50°C, 240 hours.
2	High Temperature Storage Test	+60°C, 240 hours.
3	Low Temperature Operation Test	-10°C, 240 hours.
4	Low Temperature Storage Test	-20°C, 240 hours.
5	High Temperature & High Humidity Operation Test	+40°C · 95% RH · 240 hours
6	Thermal Shock Storage Test	-20°C, 0.5hr<->70°C, 0.5hr; 50cycles, 1hr/cycle
7	ESD Test (MM)	C=200pF, R=0Ω Discharge: > ±200V 1 times / Terminal
8	Shock Test- Non Operation	100G 6ms, ±X, ±Y, ±Z 1 times for each direction
9	Vibration (Non-Operation)	Frequency range:10~55~10Hz Acceleration:0.5G Sweep Mode: Log Sweep Sweep Mode: 1Oct/min 2 hours for each direction of X. Y. Z.

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.

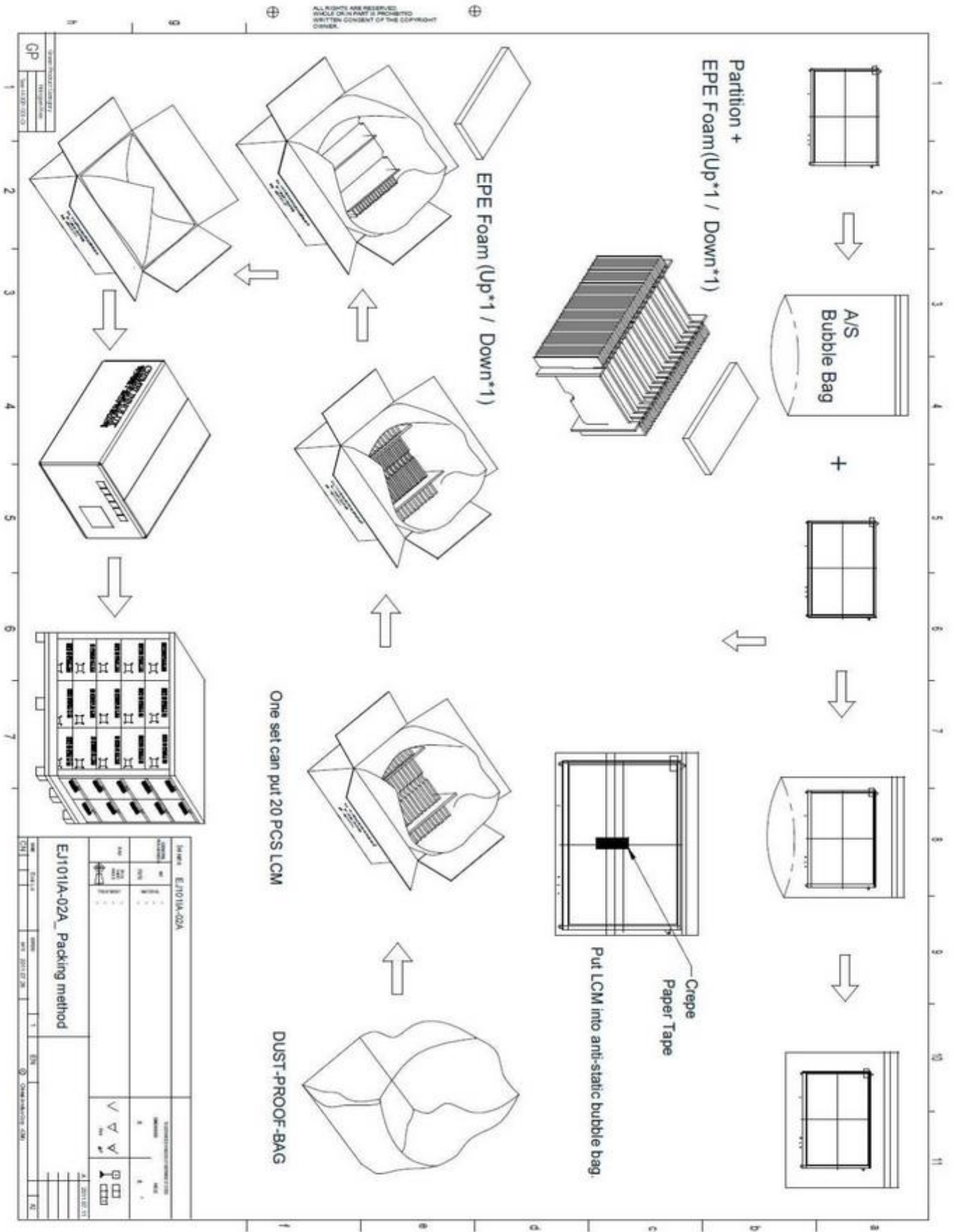
6.4. Storage

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



Model: E11011A-02A Part No.: E11011A-02A Packing method: E11011A-02A	
DATE: 2012/07/26 DRAWN: CHEN HONG-CHANG CHECKED: CHEN HONG-CHANG	DATE: 2012/07/26 DRAWN: CHEN HONG-CHANG CHECKED: CHEN HONG-CHANG