

# PRODUCT SPECIFICATION

**Doc. Number:**

- Tentative Specification
- Preliminary Specification
- Approval Specification

**MODEL NO.: N070ICE**  
**SUFFIX: HB1**

<b>Customer:</b>	
<b>APPROVED BY</b>	<b>SIGNATURE</b>
<u>Name / Title</u>	_____
Note :	
○ Only for reference	
_____	
Please return 1 copy for your confirmation with your signature and comments.	

Approved By	Checked By	Prepared By

# PRODUCT SPECIFICATION

## CONTENTS

<b>1. GENERAL DESCRIPTION .....</b>	<b>4</b>
1.1 OVERVIEW .....	4
1.2 GENERAL SPECIFICATIONS .....	4
<b>2. MECHANICAL SPECIFICATIONS .....</b>	<b>4</b>
2.1 CONNECTOR TYPE .....	4
<b>3. ABSOLUTE MAXIMUM RATINGS .....</b>	<b>4</b>
3.1 ABSOLUTE RATINGS OF ENVIRONMENT .....	5
3.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL) .....	5
3.3 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL) .....	6
<b>4. ELECTRICAL SPECIFICATIONS .....</b>	<b>7</b>
4.1 FUNCTION BLOCK DIAGRAM .....	7
4.2. INTERFACE CONNECTIONS .....	7
4.3 ELECTRICAL CHARACTERISTICS .....	9
4.3.1 LCD ELETRONICS SPECIFICATION .....	9
4.4 MIPI DSI INPUT SIGNAL TIMING SPECIFICATIONS .....	10
4.4.1 DC ELECTRICAL CHARACTERISTIC .....	10
4.4.2 AC ELECTRICAL CHARACTERISTIC .....	13
4.4.3 LP TRANSMISSION .....	12
4.5 MIPI INTERFACE (MOBILE INDUSTRY PROCESSING INTERFACE) .....	14
4.6 POWER ON/OFF SEQUENCE .....	14
<b>5. OPTICAL CHARACTERISTICS .....</b>	<b>15</b>
5.1 TEST CONDITIONS .....	15
5.2 OPTICAL SPECIFICATIONS .....	15
<b>6. PACKING .....</b>	<b>18</b>
6.1 MODULE LABEL .....	18
6.2 PACKING RELIABILITY .....	19
6.3 CARTON .....	19
6.4 PALLET .....	20
<b>7. PRECAUTIONS .....</b>	<b>21</b>
7.1 HANDLING PRECAUTIONS .....	21
7.2 STORAGE PRECAUTIONS .....	21
7.3 OPERATION PRECAUTIONS .....	21
Appendix. EDID DATA STRUCTURE .....	22
Appendix. OUTLINE DRAWING .....	22

**PRODUCT SPECIFICATION**  
REVISION HISTORY

Version	Date	Page	Description
2.0	April, 2, 2013	All	Spec Ver.2.0 was first issued.

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# PRODUCT SPECIFICATION

## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

N070ICE-HB1 is a 7" (7" diagonal) TFT Liquid Crystal Display module with a **36 pins MIPI DSI** interface circuit board. This module supports 800 x 1280 WXGA mode. The backlight unit is not built in.

### 1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Screen Size	7" diagonal		
Driver Element	a-si TFT active matrix	-	-
Pixel Number	800 x R.G.B. x 1280	pixel	-
Pixel Pitch	0.11775 (H) x 0.11775 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16,777,216 (8bit color depth)	color	-
Transmissive Mode	Normally black	-	-
Surface Treatment	Hard coating (3H), Glare	-	-

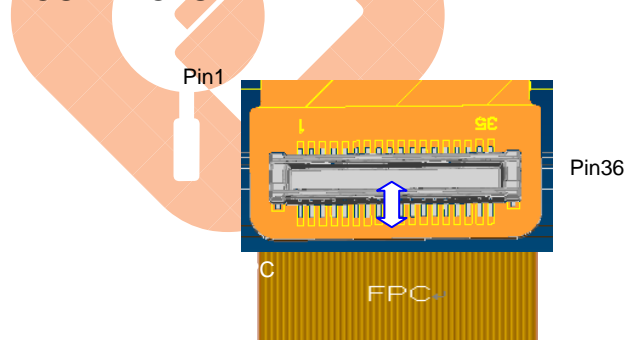
## 2. MECHANICAL SPECIFICATIONS

item		Min.	Typ.	Max.	Unit	Note
Size	Horizontal (H) with PCB	101.59	101.79	101.99	mm	(1) (2)
	Horizontal (H) w/o PCB	101.4	101.5	101.6	mm	
	Vertical (V) with PCB	209.03	209.33	209.63	mm	
	Vertical (V) w/o PCB	159.42	159.52	159.62	mm	
	Thickness (T) with PCB	0.74	0.77	0.8	mm	
	Thickness (T) w/o PCB	0.74	0.77	0.8	mm	
Weight		-	-	30	g	
I/F connector mounting position		The mounting inclination of the connector makes the screen center within $\pm 0.5$ mm as the horizontal.				

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

(2) Connector mounting position

### 2.1 CONNECTOR TYPE



Please refer Appendix Outline Drawing for detail design.

Connector Part No.: **Panasonic AXT636124**

#### 2.1.2 LED Light-Bar Connector

STM MSAK 24037P9 or equivalent

**3. ABSOLUTE MAXIMUM RATINGS**

**3.1 ABSOLUTE RATINGS OF ENVIRONMENT**

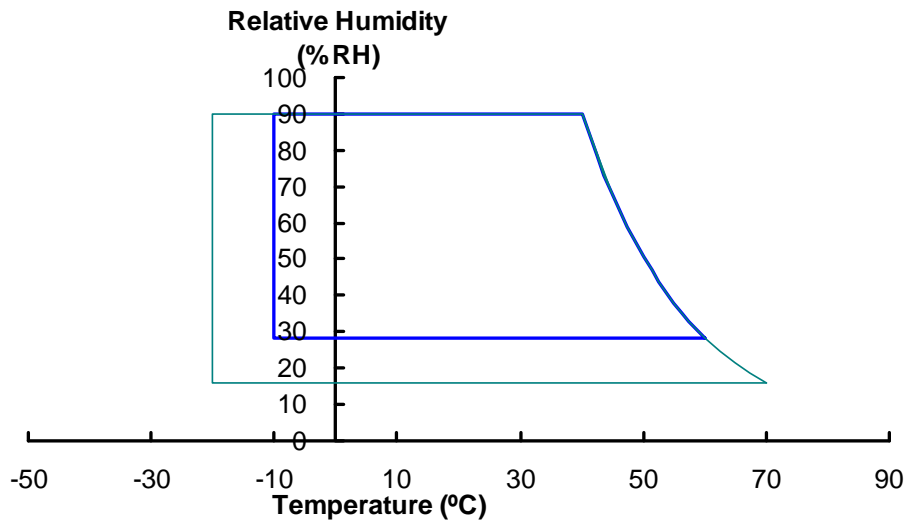
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T <sub>ST</sub>	-20	+70	°C	(1)
Operating Ambient Temperature	T <sub>OP</sub>	-10	+60	°C	(1), (2)

Note (1) (a) 90 %RH Max. (Ta <= 40 °C).

(b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).

(c) No condensation.

Note (2) The temperature of panel surface should be -10 °C min. and 70 °C max.



**3.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)**

High temperature or humidity may reduce the performance of panel. Please store LCD panel within the specified storage conditions.

Storage Condition: With packing.

Storage temperature range: 25±5 °C.

Storage humidity range: 50±10%RH.

Shelf life: 30days

## PRODUCT SPECIFICATION

### 3.3 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

#### 3.3.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	<b>-0.3</b>	<b>+5.0</b>	V	(1)
Logic Input Voltage	V <sub>IN</sub>	<b>-0.3</b>	<b>+2.0</b>	V	

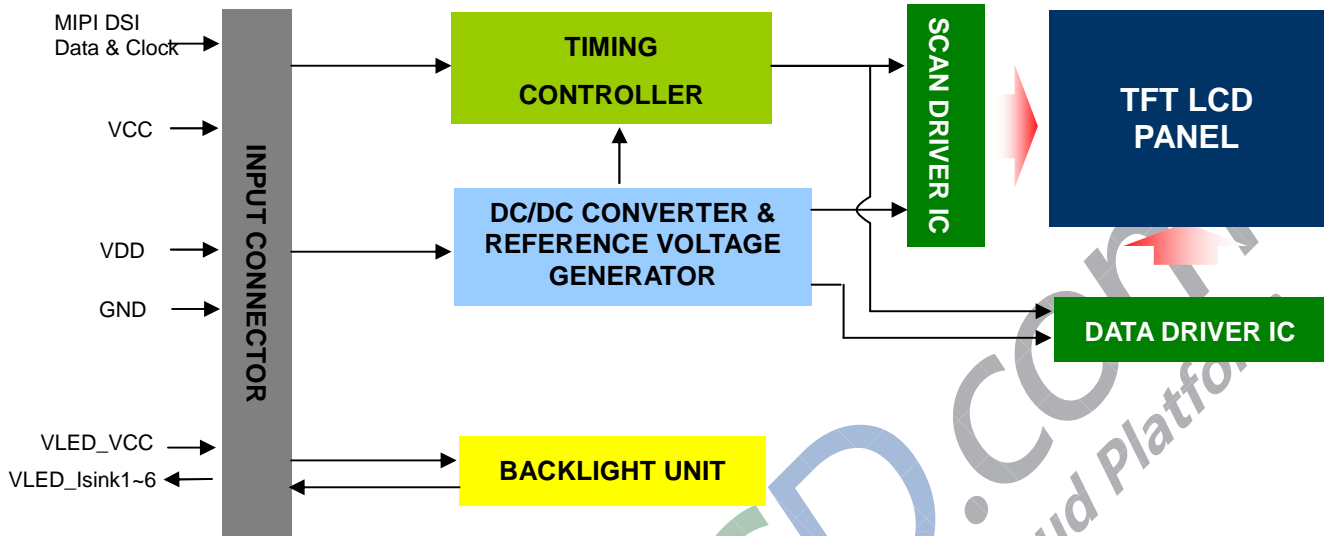
Note (1) Stresses beyond those listed in above "ELECTRICAL ABSOLUTE RATINGS" may cause permanent damage to the device. Normal operation should be restricted to the conditions described in "ELECTRICAL CHARACTERISTICS".



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## 4. ELECTRICAL SPECIFICATIONS

### 4.1 FUNCTION BLOCK DIAGRAM



### 4.2. INTERFACE CONNECTIONS

#### PIN ASSIGNMENT

Pin No	Symbol	I/O	Function	Remark
1	GND	P	Grounding for digital circuit	
2	VDD (3.3V)	P	Power supply for digital circuit	
3	D0N	I	MIPI lane0 negative	
4	VDD (3.3V)	P	Power supply for digital circuit	
5	D0P	I	MIPI lane0 positive	
6	VDD (3.3V)	P	Power supply for digital circuit	
7	GND	P	Grounding for digital circuit	
8	GND	P	Grounding for digital circuit	
9	D1N	I	MIPI lane1 negative	
10	VCC (1.8V)	P	VCC LDO output for internal digital circuit use	
11	D1P	I	MIPI lane1 positive	
12	VCC (1.8V)	P	VCC LDO output for internal digital circuit use	
13	GND	P	Grounding for digital circuit	
14	GND	P	Grounding for digital circuit	
15	CLKN	I	MIPI CLK input negative	
16	ANODE	P	Power for LED BL anode	
17	CLKP	I	MIPI CLK input positive	
18	ANODE	P	Power for LED BL anode	
19	GND	P	Grounding for digital circuit	
20	NC	I	BIST pattern	Note2
21	D2N	I	MIPI lane2 negative	
22	CATHODE1	P	LED string 1 cathode	
23	D2P	I	MIPI lane2 positive	
24	CATHODE2	P	LED string 2 cathode	
25	GND	P	Grounding for digital circuit	
26	CATHODE3	P	LED string 3 cathode	

## PRODUCT SPECIFICATION

27	D3N	I	MIPI lane3 negative	
28	CATHODE4	P	LED string 4 cathode	
29	D3P	I	MIPI lane3 positive	
30	CATHODE5	P	LED string 5 cathode	
31	GND	P	Grounding for digital circuit	
32	CATHODE6	P	LED string 6 cathode	
33	LED_EN	I	LEDON / LEDPWM signal on/off control.	
34	STBYB		STBYB mode	Note3
35	LED_PWN	O	PWM type control signal for brightness of the LED backlight.	
36	LED_ON	O	It is a LED driver control signal which is used for turning on/off the LED backlight.	

Note (1) The first pixel is odd as shown in the following figure.

Note (2) Normal operation/BIST pattern selection. (Pull UP/ down :  $R < 10K\Omega$ )

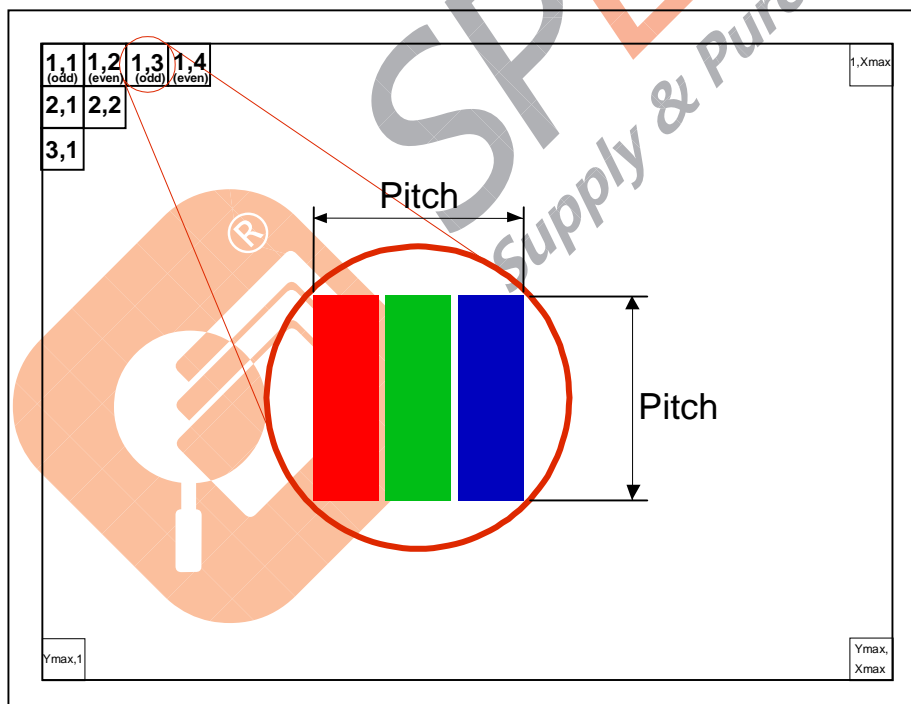
BIST\_EN=L, BIST(Clock input is not needed)

BIST\_EN=H, Normal operation.

Note (3) STBYB mode

STBYB = L, Timing controller, Source driver will turn off+

STBYB = H, Normal operation.





# PRODUCT SPECIFICATION

## 4.3 ELECTRICAL CHARACTERISTICS

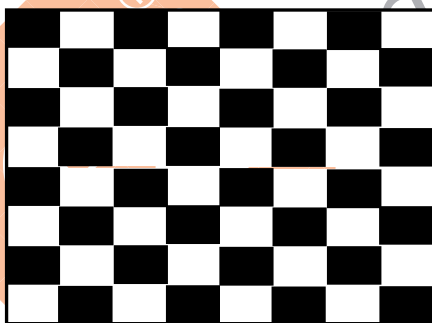
### 4.3.1 LCD ELETRONICS SPECIFICATION

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power supply voltage	VDD	3.0	3.3	3.6	V	
	VCC	1.7	1.8	1.9	V	
MIPI supply voltage	Ivcc_IF	1.7	1.8	1.9	V	
VCC High level input voltage	V <sub>IH2</sub>	0.7 VCC	-	VCC	V	For I/O circuit
VCC Low level input voltage	V <sub>IL2</sub>	0	-	0.3 VCC	V	
Power Supply Current	White	I <sub>DD</sub>	48	120	mA	
		I <sub>Core_VDD</sub>	31	58	mA	

Note (1) The ambient temperature is  $T_a = 25 \pm 2 \text{ }^\circ\text{C}$ .

Note (2) The specified power supply current is under the conditions at  $V_{DD} = 3.3 \text{ V}$ ,  $V_{CC} = 1.8 \text{ V}$ ,  $T_a = 25 \pm 2 \text{ }^\circ\text{C}$ , DC Current and  $f_v = 60 \text{ Hz}$ , whereas a power dissipation check pattern below is displayed.

a. Mosaic Pattern



Active Area

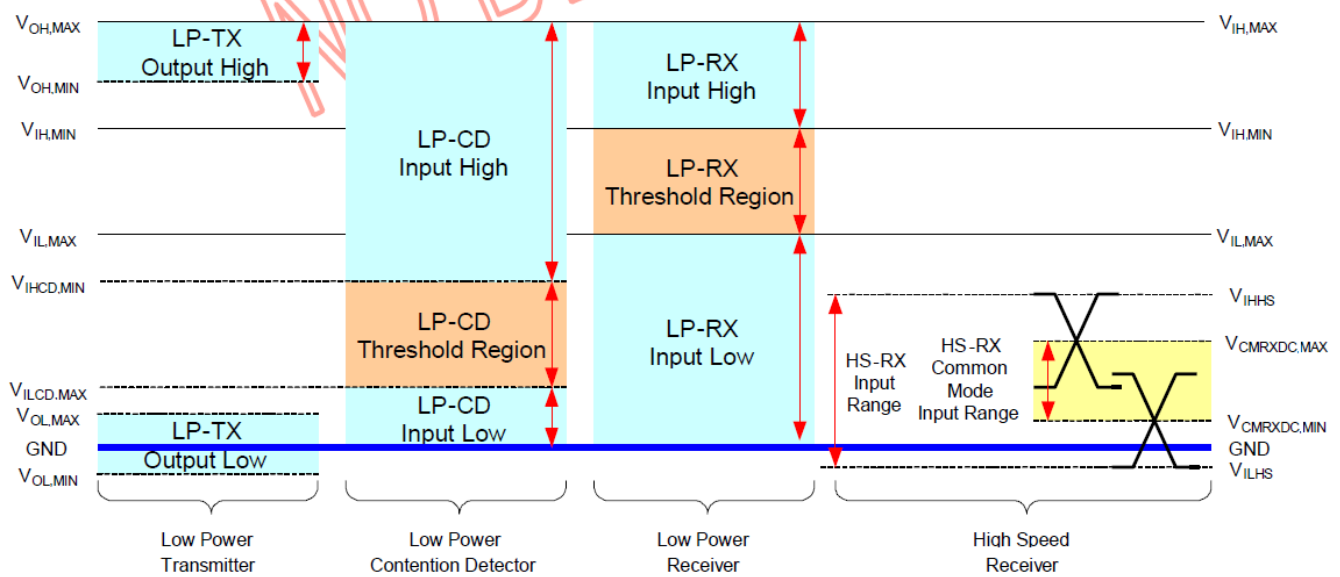
b. White Pattern



Active Area

# PRODUCT SPECIFICATION

## 4.4 MIPI DSI INPUT SIGNAL TIMING SPECIFICATIONS



MIPI DC Diagram

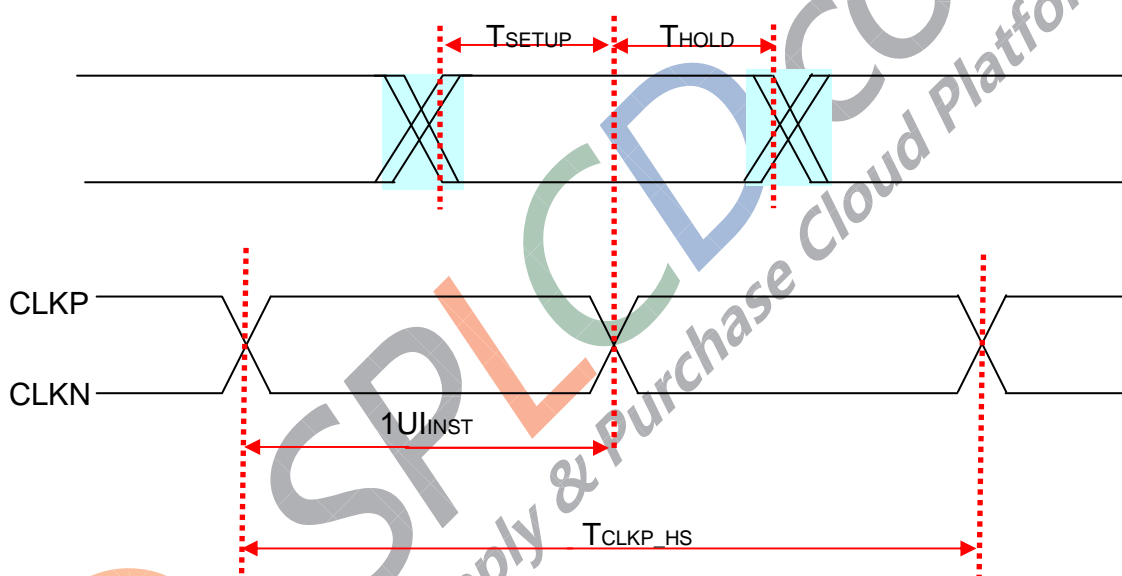
### 4.4.1 DC Electrical Characteristic

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
<b>MIPI Characteristics for High Speed Receiver</b>						
Single-ended input low voltage	$V_{ILHS}$	-40	-	-	mV	
Single-ended input high voltage	$V_{IHHS}$	-	-	460	mV	
Common-mode voltage	$V_{CMRXDC}$	155	200	330	mV	
Differential input impedance	$Z_{ID}$	85	100	115	ohm	
HS transmit differential voltage ( $V_{OD} = V_{DP} - V_{DN}$ )	$ V_{OD} $	85	200	250	mV	
<b>MIPI Characteristics for Low Power Mode</b>						
Pad signal voltage range	$V_I$	-50	-	1350	mV	
Ground shift	$V_{GNDSH}$	-50	-	50	mV	
Logic 0 input threshold	$V_{IL}$	0	-	500	mV	
Logic 1 input threshold	$V_{IH}$	1000	-	1350	mV	

4.4.2 AC Electrical Characteristics

HS Transmission

Parameter	Symbol	Min	Typ	Max	Units	Notes
UI instantaneous	$U_{INST}$	2	-	5.56	ns	1,2
Data to Clock Skew [measured at tansmitter]	$T_{SKEW(TX)}$	-0.1	-	0.1	ns	3
Data to Clock Setup Time [measured at receiver]	$T_{SETUP(RX)}$	0.55	-	-	ns	4
Data to Clock Hold Time [measured at reciever]	$T_{HOLD(RX)}$	0.55	-	-	ns	4
20% - 80% rise time and fall time	$t_R / t_F$	150	-	-	ps	
		-	-	0.3	$U_{INST}$	

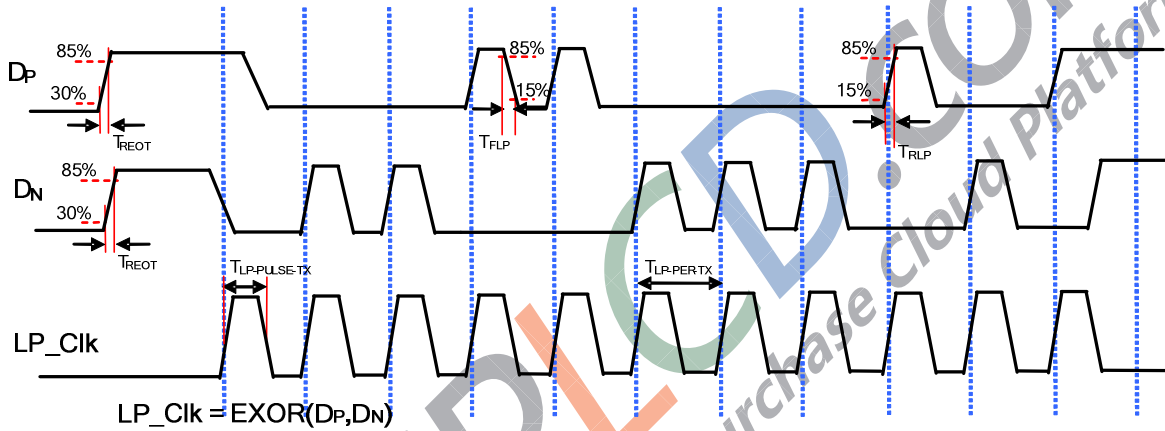


Data to Clock Timing Definitions



4.4.3 LP Transmission

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
15%-85% rise time and fall time	$T_{RLP} / T_{FLP}$	-	-	35	ns	
30%-85% rise time(from HS to LP)	$T_{REOT}$	-	-	35	ns	
Pulse width of the LP exclusive-OR clock	$t_{LP-PULSE-TX}$	50	65	-	ns	
Period of the LP exclusive-OR clock	$t_{LP-PRE-TX}$	100	130	-	ns	



## PRODUCT SPECIFICATION

### 4.5 MIPI interface (Mobile Industry Processing Interface)

The Display Serial Interface standard defines protocols between a host processor and peripheral devices that adhere to MIPI Alliance standards for mobile device interfaces. The DSI standard builds on existing standards by adopting pixel formats and command set defined in MIPI Alliance standards.

DSI-compliant peripherals support either of two basic modes of operation: Command Mode and Video Mode.

Note: The product only supports Video Mode operation.

Video Mode refers to operation in which transfers from the host processor to the peripheral take the form of a real-time pixel stream. In normal operation, the display module relies on the host processor to provide image data at sufficient bandwidth to avoid flicker or other visible artifacts in the displayed image. Video information should only be transmitted using High Speed Mode. To reduce complexity and cost, systems that only operate in Video Mode may use a unidirectional data path.

#### 4.5.1 MIPI Lane Configuration

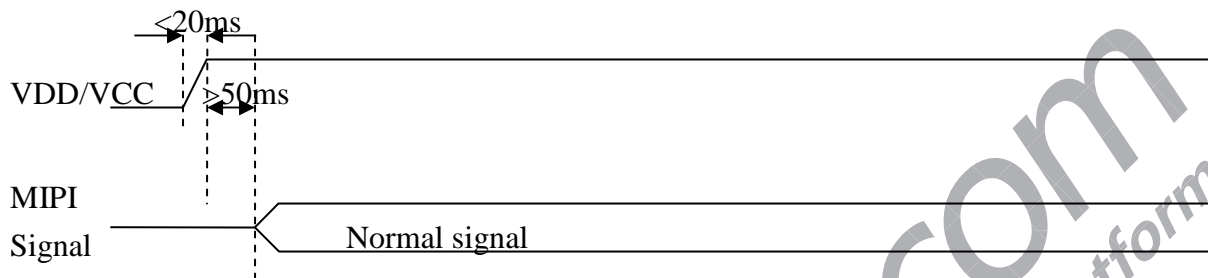
	MCU (Master)	Display Module (Slave)
Clock Lane+/-	Unidirectional Lane ■ Clock Only ■ Escape Mode(ULPS Only)	
Data Lane0+/-	Bi-directional Lane ■ Forward High-Speed ■ Bi-directional Escape Mode ■ Bi-directional LPDT	
Data Lane1+/-	Unidirectional ■ Forward High speed	
Data Lane2+/-	Unidirectional ■ Forward High speed	
Data Lane3+/-	Unidirectional ■ Forward High speed	

The connection between host device and display module is as reference.

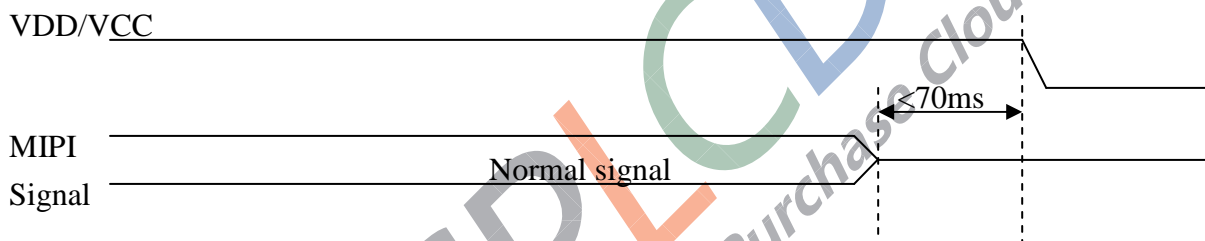
**4.6 POWER ON/OFF SEQUENCE**

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

**a. Power on:**



**b. Power off:**



# PRODUCT SPECIFICATION

## 5. OPTICAL CHARACTERISTICS

### 5.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V <sub>CC</sub>	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I <sub>L</sub>	114	mA

The measurement methods of optical characteristics are shown in Section 5.2. The following items should be measured under the test conditions described in Section 5.1 and stable environment shown in Note (5).

### 5.2 OPTICAL SPECIFICATIONS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio	CR		700	1000	-	-	(2), (3)
Response Time	T <sub>R</sub>		-	14	17	ms	(4)
	T <sub>F</sub>		-	11	14	ms	
Color Chromaticity	Red	Rx	Viewing Normal Angle Standard light source "C"	Typ 0.03	Typ + 0.03	-	(0),(2), (5),(6)
		Ry				0.619	
	Green	Gx				0.348	
		Gy				0.311	
	Blue	Bx				0.602	
		By				0.148	
	White	Wx				0.107	
		Wy				0.306	
Viewing Angle	Horizontal	θ <sub>x+</sub>	85	89	-	Deg.	(2), (5)
		θ <sub>x-</sub>	85	89	-		
	Vertical	θ <sub>y+</sub>	85	89	-		
		θ <sub>y-</sub>	85	89	-		

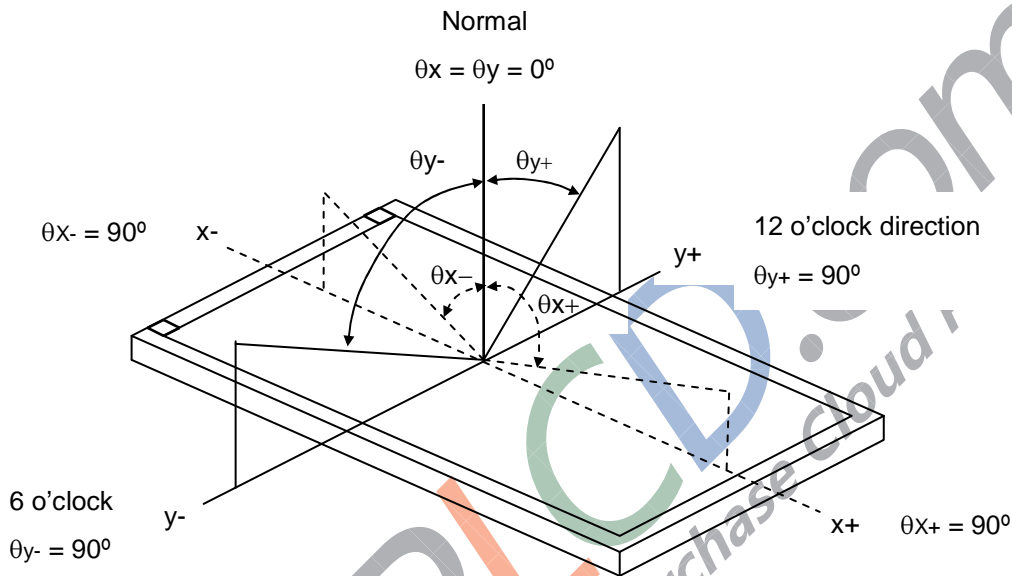
Note (0) Light source is the standard light source "C" which is defined by CIE and driving voltages are based on suitable gamma voltages. The calculating method is as following :

1. Measure Module's and BLU's spectrums. White is without signal input and R, G, B are with signal input. BLU is supplied by CMI.
2. Calculate cell's spectrum.
3. Calculate cell's chromaticity by using the spectrum of standard light source "C"

# PRODUCT SPECIFICATION

Note (1) Light source is the BLU which is supplied by CMO and driving voltages are based on suitable gamma voltages. White is without signal input and R, G, B are with signal input. SPEC is judged by CMO's golden sample.

Note (2) Definition of Viewing Angle ( $\theta_x, \theta_y$ ):



Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

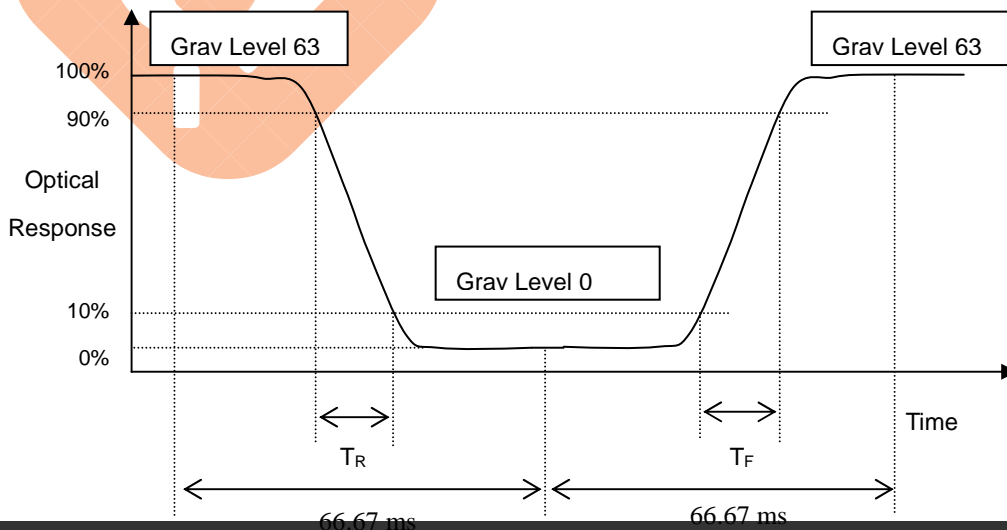
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$CR = CR (1)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (4) Definition of Response Time ( $T_R, T_F$ ):

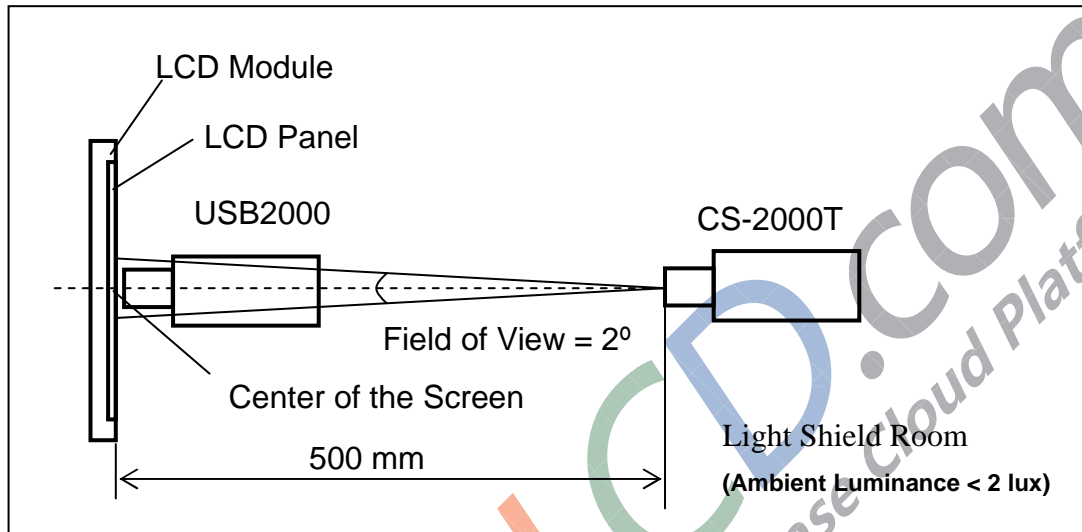




## PRODUCT SPECIFICATION

Note (5) 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 (6) The listed optical specifications refer to the initial value of manufacture, but the condition of the specifications after long-term operation will not be warranted.



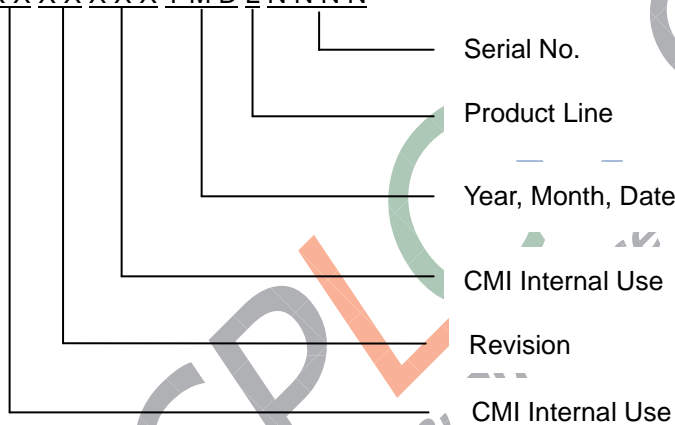
**6. PACKING**

**6.1 CMI OPEN CELL LABEL**

The barcode nameplate is pasted on each OPEN CELL as illustration for CMI internal control.



- (a) Model Name: N070ICE – HB1
- (b) Revision: Rev. XX, for example: C1, C2 ...etc.
- (c) Serial ID: X X X X X X Y M D L N N N N



Serial ID includes the information as below:

- (a) Manufactured Date: Year: 0~9, for 2010~2019  
Month: 1~9, A~C, for Jan. ~ Dec.  
Day: 1~9, A~Y, for 1<sup>st</sup> to 31<sup>st</sup>, exclude I , O and U
- (b) Revision Code: cover all the change
- (c) Serial No.: Manufacturing sequence of product
- (d) Product Line: 1 -> Line1, 2 -> Line 2, ...etc.

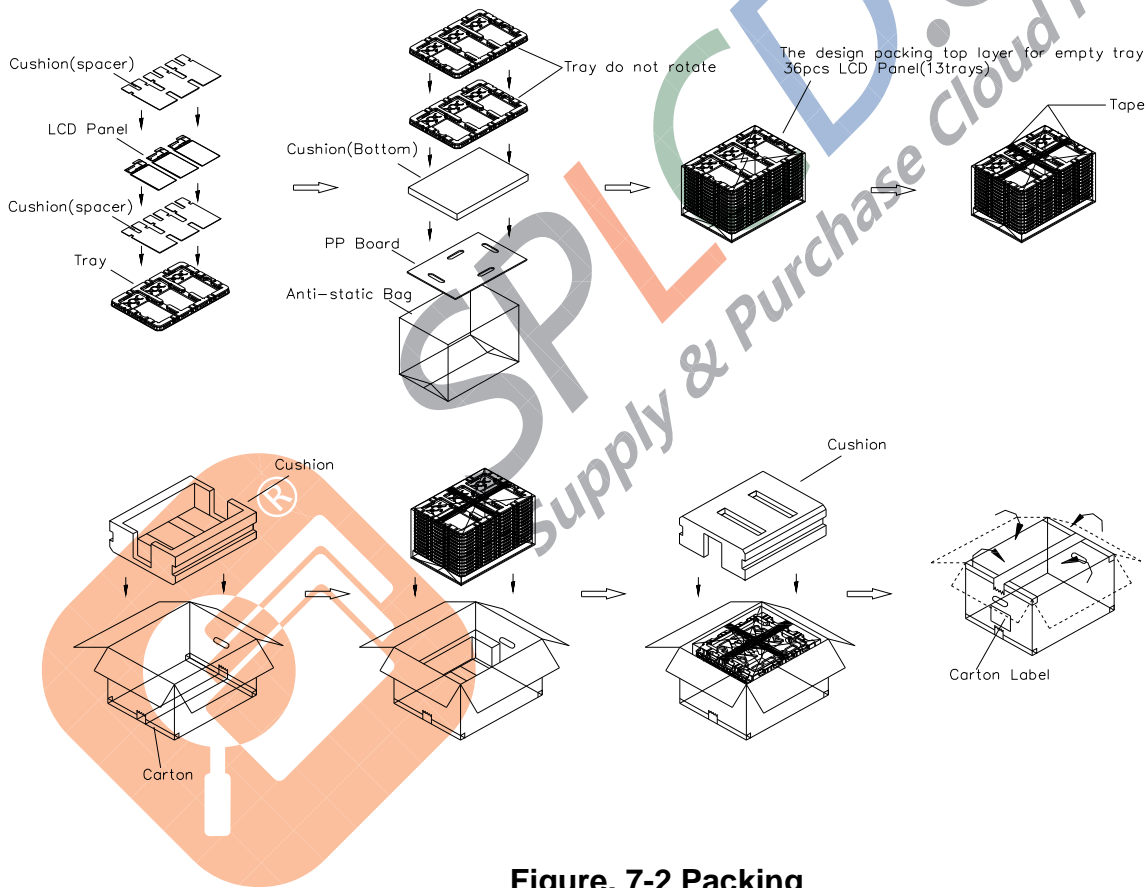
**6.2 Package Reliability**

(1) Carton Packing should have no failure in the following reliability test items

Test Item	Test Conditions	Note
Packing Vibration	ISTA STANDARD Random, Frequency Range: 1 – 200 Hz Top & Bottom: 30 minutes (+Z), 10 min (-Z), Right & Left: 10 minutes (X) Back & Forth 10 minutes (Y)	Non Operation

**6.3 CARTON**

- (1) Carton Dimensions: 475(L)x390(W)x320(H)mm
- (2) 36 LCD Cells+PCB/Carton

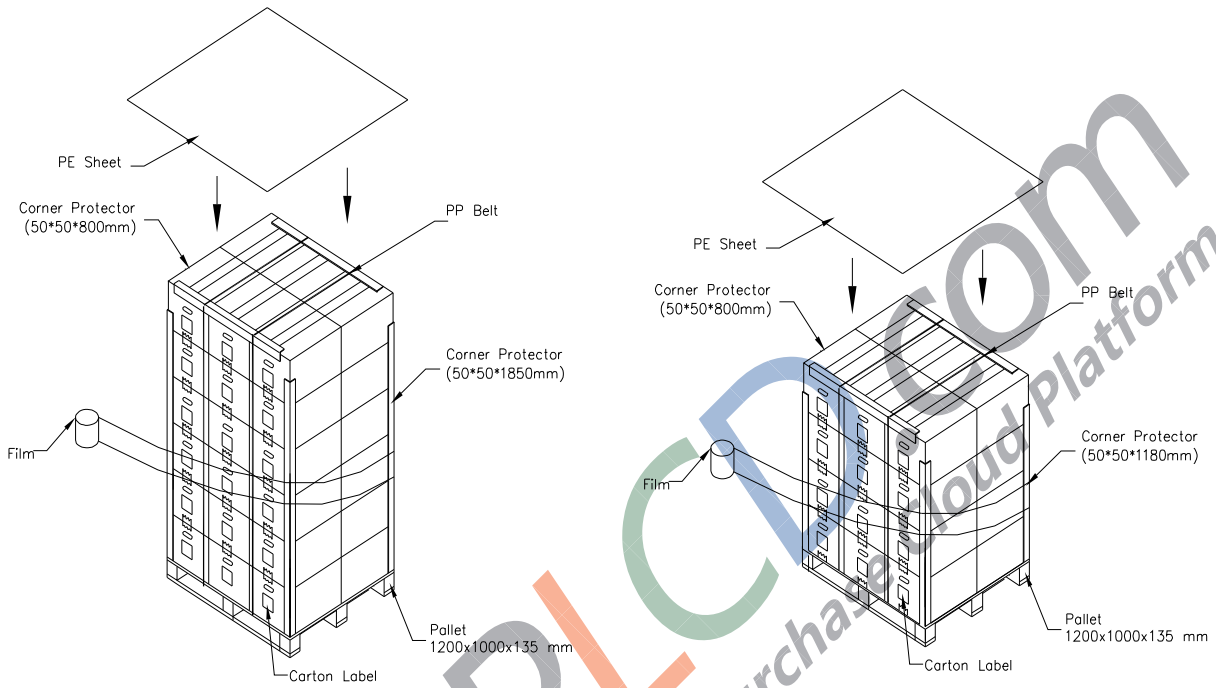


**Figure. 7-2 Packing**

**6.4 PALLET**

Sea and Land Transportation

Air Transportation



**Figure. 7-3 Packing**



## 7. PRECAUTIONS

### 7.1 HANDLING PRECAUTIONS

- (1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.
- (2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.
- (3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.
- (5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.
- (6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.
- (8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.
- (9) Do not disassemble the module.
- (10) Do not pull or fold the LED wire.
- (11) Pins of I/F connector should not be touched directly with bare hands.

### 7.2 STORAGE PRECAUTIONS

- (1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.
- (3) It may reduce the display quality if the ambient temperature is lower than 10 °C. For example, the response time will become slowly, and the starting voltage of LED will be higher than the room temperature.

### 7.3 OPERATION PRECAUTIONS

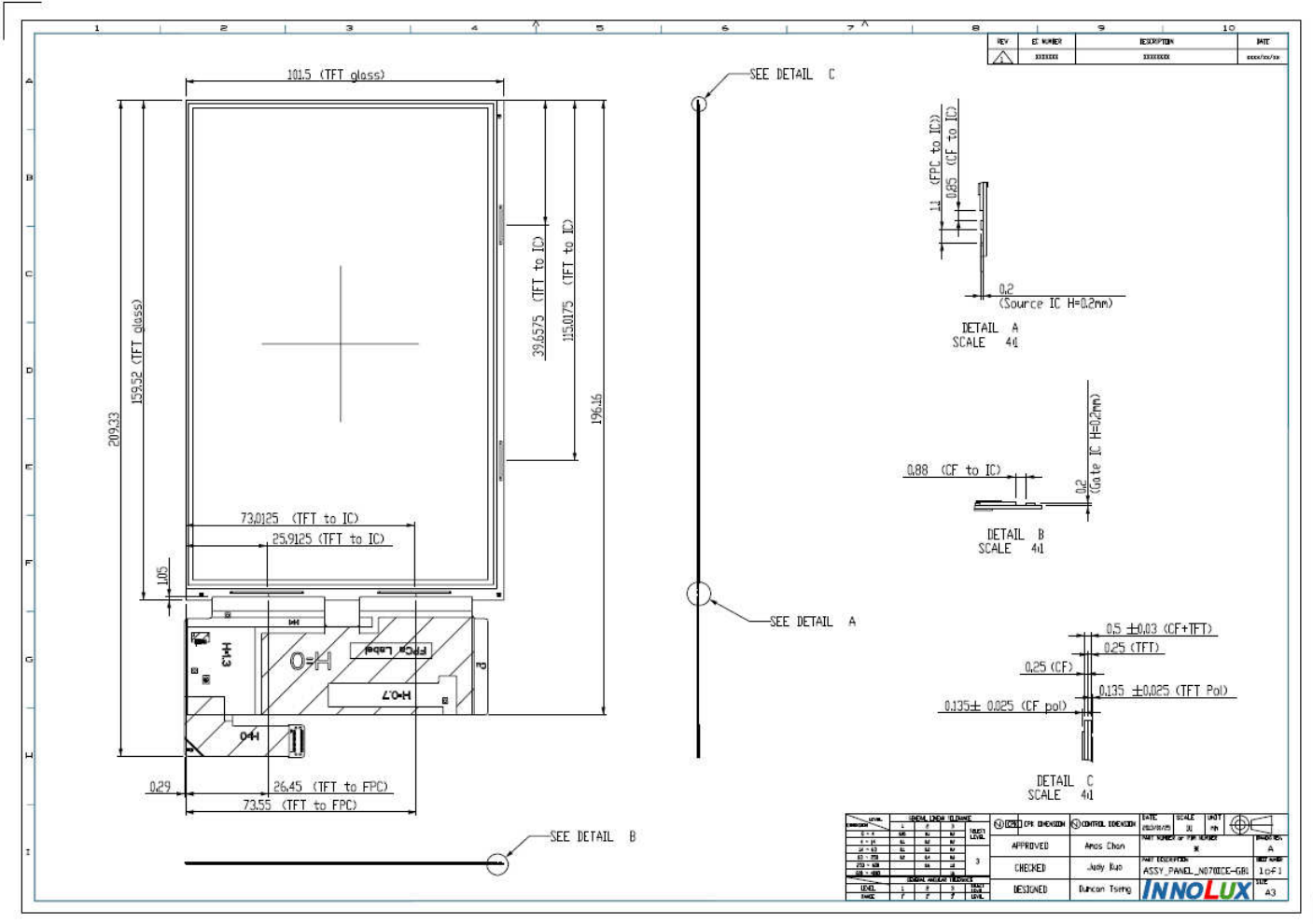
- (1) Do not pull the I/F connector in or out while the module is operating.
- (2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.
- (3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with converter. Do not disassemble the module or insert anything into the Backlight unit.

# PRODUCT SPECIFICATION

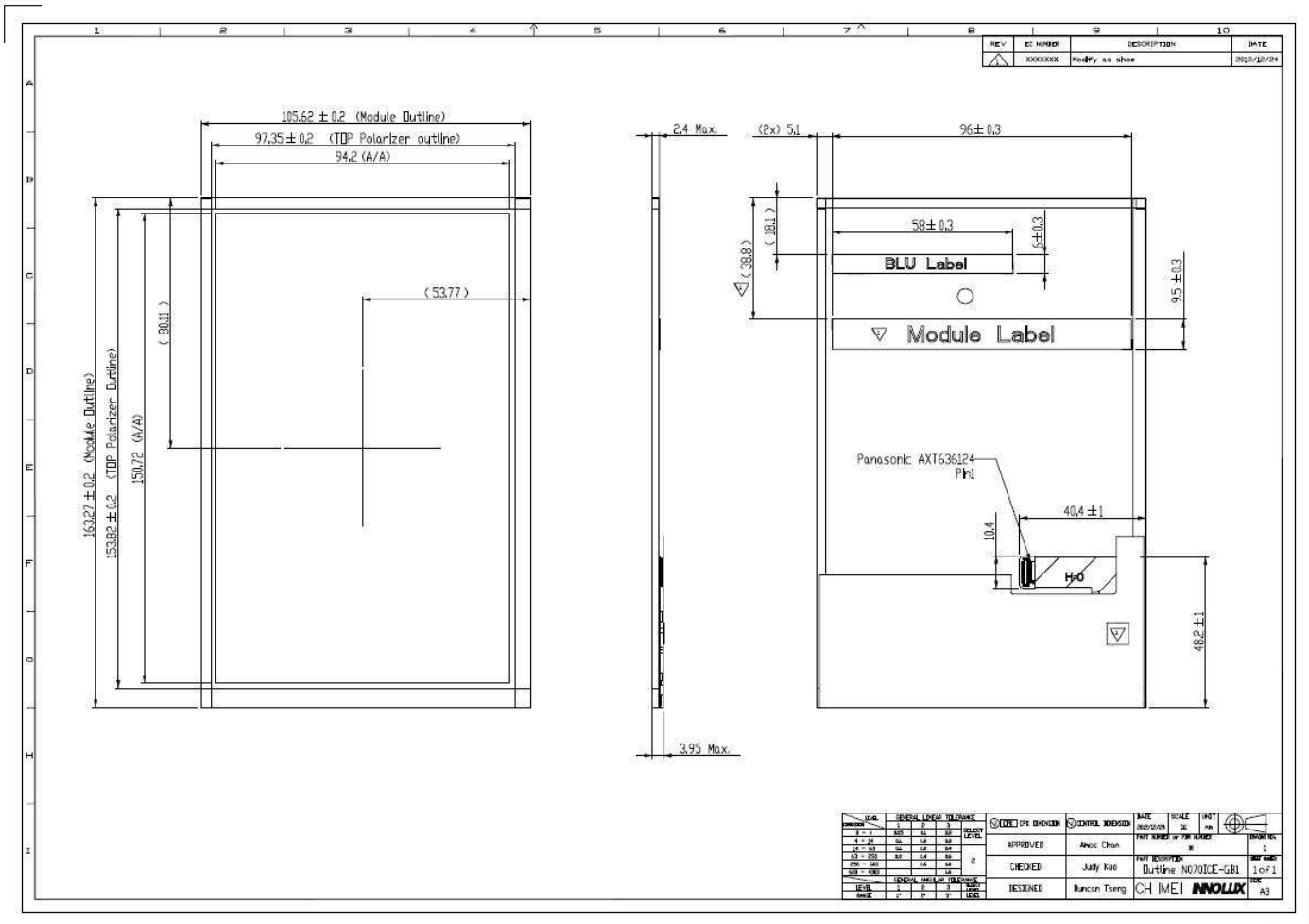
## Appendix. EDID DATA STRUCTURE

N/A

## Appendix. OUTLINE DRAWING



# PRODUCT SPECIFICATION



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