SPECIFICATION
FOR
APPROVAL

(●) Preliminary Specification
( ) Final Specification

Title	**4.0" (640xRGBx1136) TFT LCD**

BUYER	
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LH400WS1
SUFFIX	SD03

*When you obtain standard approval,
please use the above model name without suffix.

SIGNATURE	**DATE**
/	
/	
/	

Please return 1 copy for your confirmation with your signature and comments.

APPROVED BY	**DATE**
REVIEWED BY	
PREPARED BY	

Product Engineering Dept.
LG Display Co., Ltd

Product Specification

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RECORD OF REVISIONS

Revision No.	Revision Date	Page	Description
0.1	Apr. 08, 2014	-	First Draft, Preliminary Specifications

Product Specification

1. GENERAL DESCRIPTION

The LH400WS1 is a Color Active Matrix Liquid Crystal Display with Light Emission Diode(LED) backlight system. The matrix employs poly-Si Thin Film Transistor as the active element.

It is transmissive type display operating in the normally black mode. This TFT-LCD has 3.54 inch diagonally measured active display area with (640*RGB*1136) resolution. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes.
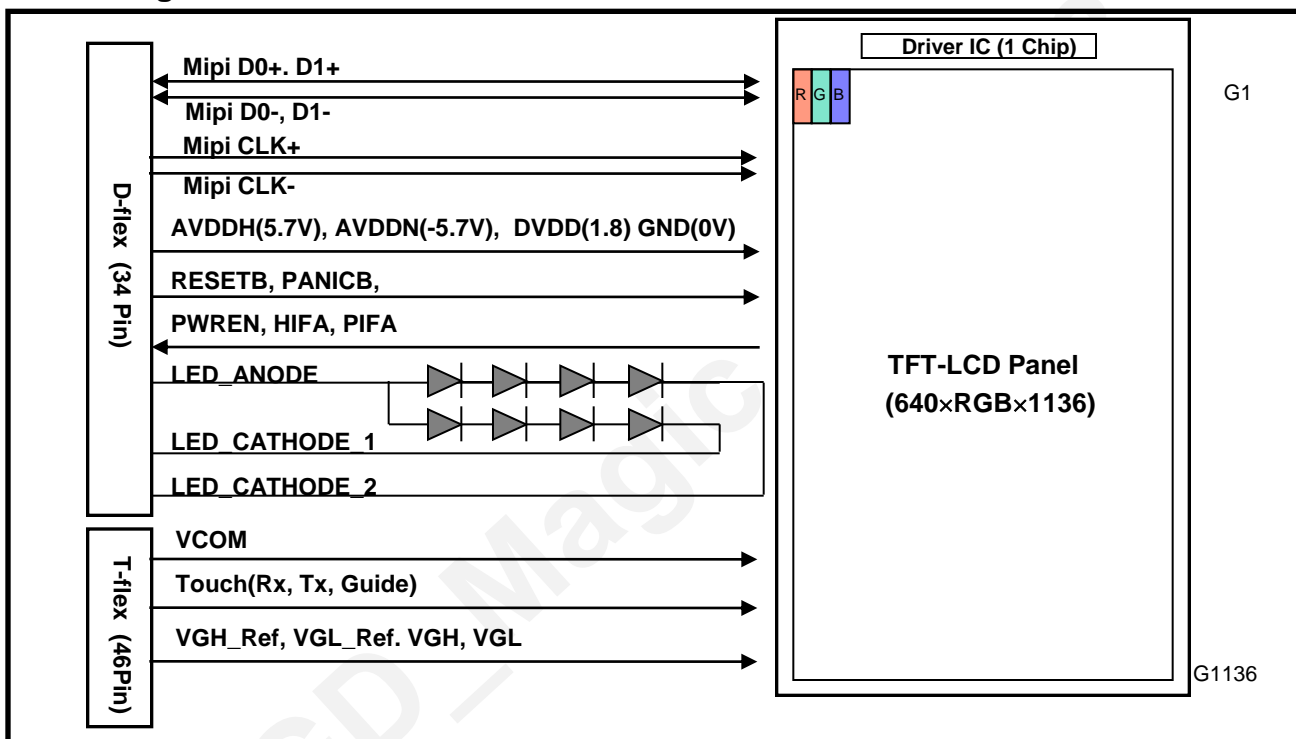
Block Diagram

Fig 1.1 Block Diagram of TFT-LCD Module with LED Backlight Unit

General Features

Item	Specification
Active Screen Size	4.0" diagonal
Active Area	49.92(H) x 88.608(V)
Pixel Pitch	0.026(H) x 0.078(V)
Pixel Format	640(H) x 1136(V) (RGB Vertical Stripe)
Color Depth	24-bits (R8, G8, B8)
Interface	MIPI 4-lane, 252.5 to 257.5 MHz for high speed data.
Power Consumption	499mW (Max. B/L), 90mW (Max. Panel)
Luminance	460nit(min.) @20mA
Viewing Direction	6:00 o'clock (Non-inversion)

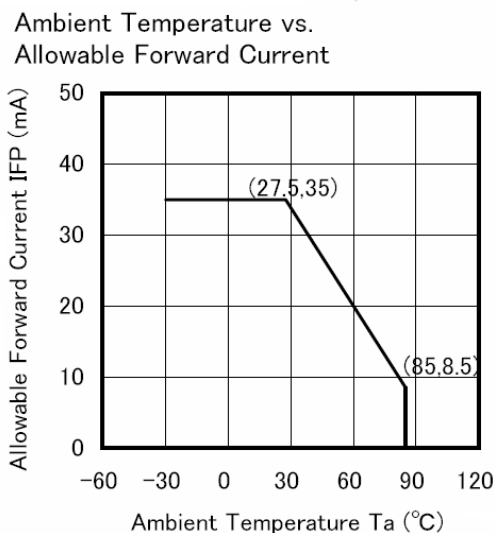## Product Specification

2. ABSOLUTE MAXIMUM RATINGS

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 2.1 Absolute Maximum Ratings

Parameter	Symbol	Ratings	Units	Notes
Power Supply Voltage(1)	AVDDH – AGND	-0.3 ~ 6.5	V	**1.2**
	AGND – AVDDN	-0.3 ~ 6.5	V	**1.3**
Power Supply Voltage(2)	DVDD – GND	-0.3 ~ 4.6	V	**1.3**
Power Supply Voltage(3)	VGH – AGND	-0.3 ~ 15.9	V	1,4
Power Supply Voltage(4)	VGH – AVDDH	-0.3 ~ 7.0	mW	1,5
Power Supply Voltage(5)	AGND – VGL	-0.3 ~ 13.6	mA	1,4
Power Supply Voltage(6)	AVDDN – VGL	-0.3 ~ 6.5	℃	1,5
Power Supply Voltage(7)	VGH – VGL	-0.3 ~ 29.5	℃	1,6
Input Voltage	Vt	-0.3 ~ DVDD+0.3	RH	1
Analog Positive Supply Current	I_AVDDH	<150	mA	7
Analog Negative Supply Current	I_AVDDN	<70	mA	7

Notes:
(1) If used exceed the absolute ratings, the Drive IC may be destroyed. It is strongly recommended to use the Drive IC within the limits of the electrical characteristics during normal operation.
(2) DVDD(High) > GND (Low)
(3) AVDDH(High) > AGND(Low), AGND(High) > AVDDN(Low)
(4) VGH(High) > AGND(Low), AGND(High) > VGL(Low)
(5) VGH(High) > AVDDH(Low), AVDDN(High) > VGL(Low)
(6) VGH(High) > VGL(Low)
(7) Inrush current maximum, not operating

Fig 2.1 Ambient Temperature vs. Allowable Forward Current

3. ELECTRICAL SPECIFICATIONS

3-1. ELECTRICAL CHARACTERISTICS

Table 3.1 Electrical Characteristics Of TFT-LCD Module

Parameter	Description	Values			Units
		Min	Typ	Max	
AVDDH	LCD 5.7V Positive	5.529	5.7	5.871	V
AVDDH_RIPPLE	AVDDH Ripple Requirement	-	-	50	mV
AVDDN	LCD 5.7V Negative	-5.871	-5.7	-5.529	V
AVDDN_RIPPLE	AVDDN Ripple Requirement	-	-	50	mV
$I_{AVDDH/AVDDN-peak}$	AVDDH Peak AC Current	-	-	200/150	mA/ 150us
DVDD	Digital I/O Voltage	1.71	1.8	1.89	V
DVDD_Ripple	DVDD Peak Ripple Requirement	-	-	72	mVpp
I_{DVDD}	DVDD Current	4.5	12	14	mA

Notes:
 (1) The specified current and power consumption are under the conditions at AVDDH = VDD = 5.7V,
    DVDD = VEE = 1.8V, T = 25°C, and fv = 60 Hz.
(2) Input mode of RESETB, PIFA, HIFA, PWREN, STSTB.
(3) LED Backlight assumptions: 3Vf, 20 mA, 8 LED's
(4) DVDD present only, display off, reset asserted.
(5) Time from AVDDH and DVDD applied until driver power supplies are stable.

3. ELECTRICAL SPECIFICATIONS

3-2. BACK LIGHT UNIT

The edge-lighting type of back light unit consists of 8 LEDs which is connected in serial.

Table 3.2 Electrical Characteristics Of Back Light Unit

Parameter	Symbol	Values			Units	Notes
		Min	Typ.	Max		
LED Current	I_{LED}	-	20	-	mA	
LED Forward Voltage	V_{LED}	-	3.0	3.3	V	

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3-3. INTERFACE CONNECTIONS (D-flex)

Interface Connector: AA22LA-S028VA1 (JAE)

Table 3.3 Module Connector Pin Configuration

Pin No.	Symbol	I/O	Description
1	AVDDH	I	Negative 5.7V Analog Supply
2	VCPL	I	Negative gate voltage for TFT
3	AVDDN	I	Positive 5.7V Analog Supply
4	GND	I	system ground
5	DVDD	I	Digital Supply
6	MIPI_D0P	I/O	MIPI Data Lane
7	PWREN	O	Control signal out of Nugget to enable PMU
8	MIPI_D0N	I/O	MIPI Data Lane
9	RESETB	I	system ground
10	GND	I	system ground
11	HIFA	O	Touch Enable
12	MIPI_D1P	I	MIPI Data Lane
13	PANIC	I	MIPI Data Lane
14	MIPI_D1N	I	MIPI Data Lane
15	PIFA	O	host interface signal
16	GND	-	system ground
17	LED_BL_A	I	LED anode voltage
18	MIPI_CKP	I	MIPI HS clock
19	LED_BL_C1	I	LED cathode 1 voltage
20	MIPI_CKN	I	MIPI HS clock
21	LED_BL_C2	I	LED cathode 2 voltage
22	GND	-	system ground

3-3. INTERFACE CONNECTIONS (T-flex)

Interface Connector: AXE342124 (Panasonic)

Table 3.3 Module Connector Pin Configuration

| Pin No.	Symbol	I/O	Pin No.	Symbol	I/O
1	C5	Column Vcom_#5	22	GND	Ground
2	C6	Column Vcom_#6	23	R7	Row Vcom_#7
3	C4	Column Vcom_#4	24	R17	Row Vcom_#17
4	GS3	Guide Vcom #3	25	R1	Row Vcom_#1
5	C0	Column Vcom_#0	26	R16	Row Vcom_#16
6	C7	Column Vcom_#7	27	R5	Row Vcom_#5
7	C3	Column Vcom_#3	28	R15	Row Vcom_#15
8	VGH_Ref	VGH Ref. Voltage	29	R6	Row Vcom_#6
9	GS1	Guide Vcom_#1	30	R14	Row Vcom_#14
10	VGL_Ref	VGL Ref. Voltage	31	R8	Row Vcom_#8
11	C2	Column Vcom_#2	32	R13	Row Vcom_#13
12	VCOM	Vcom	33	R9	Row Vcom_#9
13	C1	Column Vcom_#1	34	R12	Row Vcom_#12
14	GS2	Guide Vcom_#2	35	R4	Row Vcom_#4
15	GS0	Guide Vcom_#0	36	R11	Row Vcom_#11
16	C9	Column Vcom_#9	37	R3	Row Vcom_#3
17	VGL	Gate Low Voltage	38	R0_Right	Row Vcom_#0_Right
18	C8	Column Vcom_#2	39	R2	Row Vcom_#2
19	VGH	Gate High Voltage	40	R18	Row Vcom_#18
20	GS4	Guide Vcom_#4	41	R0_Left	Row Vcom_#0_Left
21	R10	Row Vcom_#2	42	R19	Row Vcom_#19

If Column, Row, Guide Vcom, is unused, these pin should be connected to Vcom.

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3-4. SIGNAL TIMING SPECIFICATIONS

Table 3.4 Timing Parameters

Item	Symbol	Timing	Unit	Remarks
Vertical cycle	VP	1500	Line	1
Vertical low pulse width	VS	3	Line	1
Vertical front porch	VFP	348	Line	1
Vertical back porch	VBP	13	Line	1
Vertical display area	VDISP	1136	Line	1
Horizontal cycle	HP	760	clk	1
Horizontal low pulse width	HS	40	clk	1
Horizontal front porch	HFP	40	clk	1
Horizontal back porch	HBP	40	clk	1
Horizontal display area	HDISP	640	clk	1,2
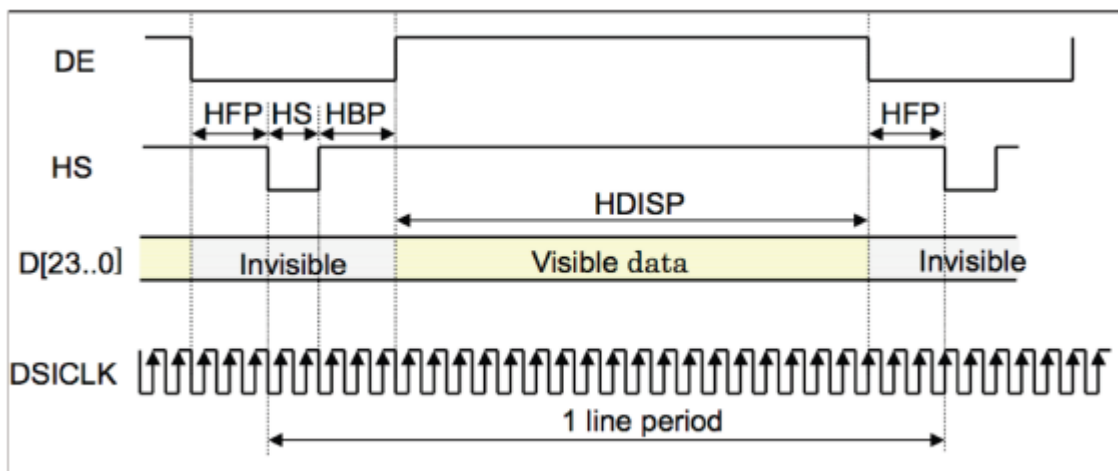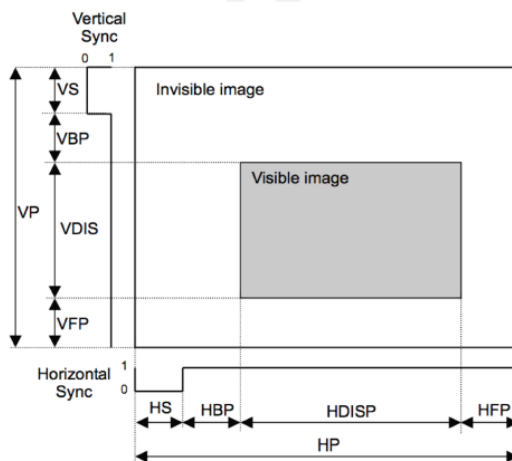
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3-5. COLOR INPUT DATA REFERENCE

| Colors & Gray Scale	Gray Scale Level	R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
Black	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blue	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Green	-	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Cyan	-	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	-	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magenta	-	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Yellow	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
White	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
↑ Darker ↑ ↓ Brighter ↓ (Red)	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↓	↓								↓								↓							
	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red	GS255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
↑ Darker ↑ ↓ Brighter ↓ (Green)	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↓	↓								↓								↓							
	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Green	GS255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
↑ Darker ↑ ↓ Brighter ↓ (Blue)	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	↓	↓								↓								↓							
	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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3-6. Power On/off Sequence

Power On Sequence
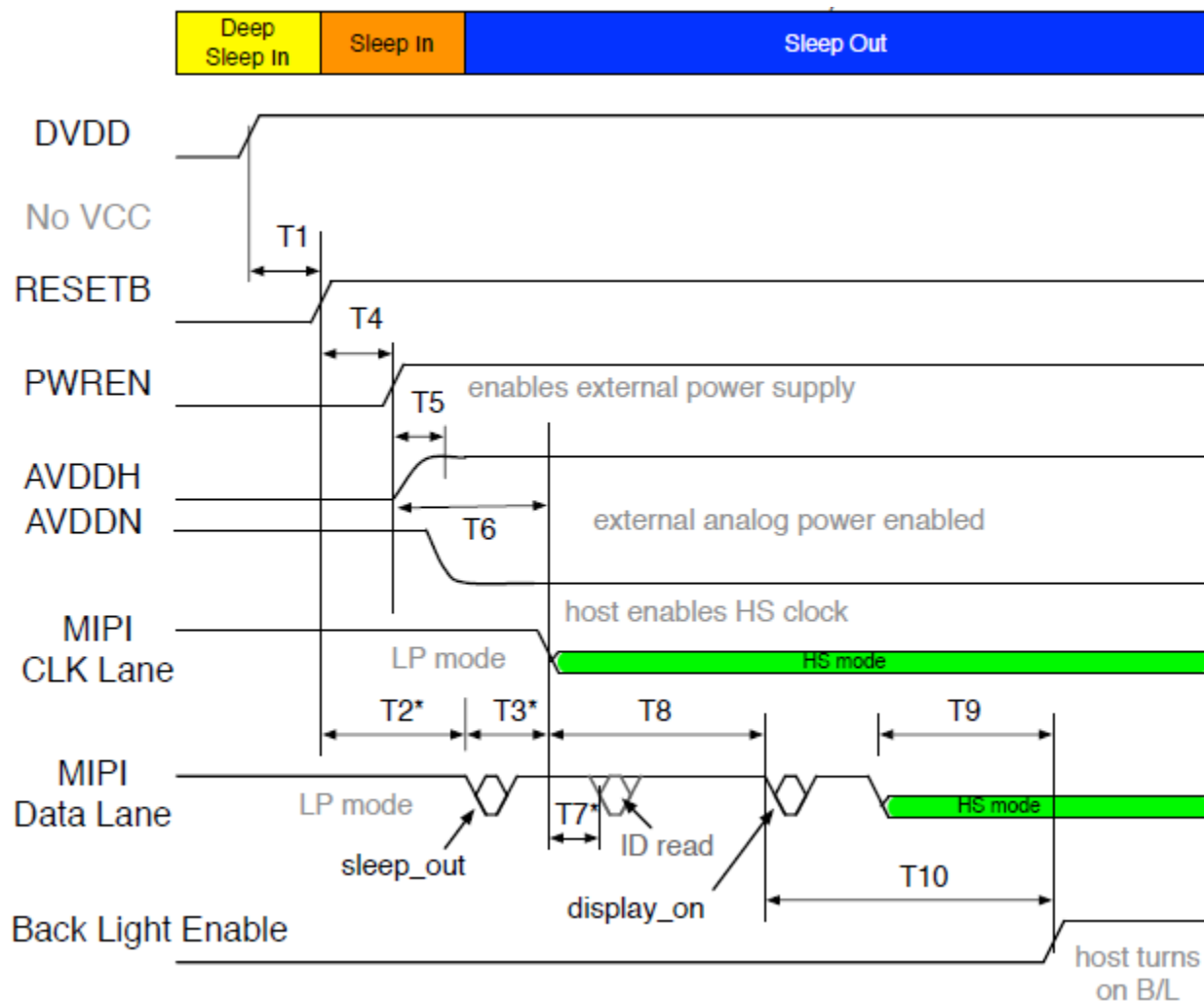
Fig 3.2 Power On Sequence

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3-6. Power On/off Sequence

Power Off Sequence
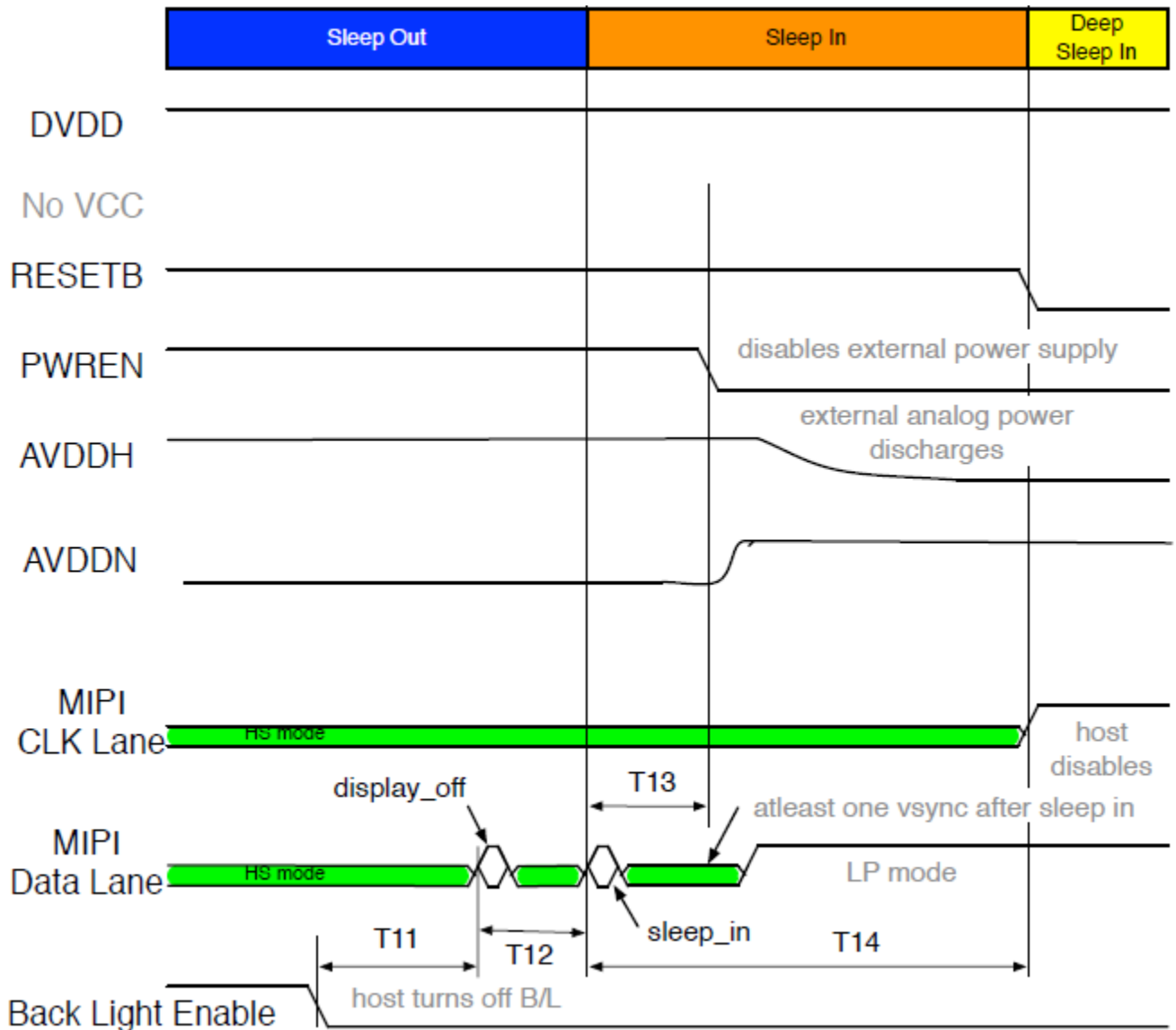
Note: Before power off, insert one black frame, in the power off sequence.

Fig 3.3 Power Off Sequence

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3-6. Power On/off Sequence

Table 3. 5 Power On/Off Sequence

Parameter	Ref	Timing requirements		
		Min	**Typ**	**Max**
DEEP SLEEP IN to RESET deassert	T1	5mS	10mS	-
RESET to first MIPI LP Command	T2	6.5mS	7mS	10mS
LP Command to HS CLK	T3	15uS	-	
RESET to PWREN	T4	-	-	1mS
PWREN to AVDDH Turn on	T5	-	-	3.5mS
PWREN to AVDDN Turn on	T6	-	-	4.0mS
MIPI HS CLK to next LP Command (e.g., panel ID read)	T7	25 mS	-	-

MIPI HS CLK to DISPLAY ON	T8	100mS	-	-
Valid Display Image (CLCD) to BACKLIGHT ON	T9	16.66mS	33.33mS	
DISPLAY ON to BACKLIGHT ON	T10	51mS	-	-
BACKLIGHT OFF until DISPLAY OFF	T11	16.66mS	-	-
DISPLAY OFF to SLEEP IN	T12	16.66mS		
SLEEP IN to PWREN Low Internal Power Off and video data/clk enabled	T13	66.68mS	-	-
SLEEP IN to HS CLK Off & Reset	T14	100mS	-	-
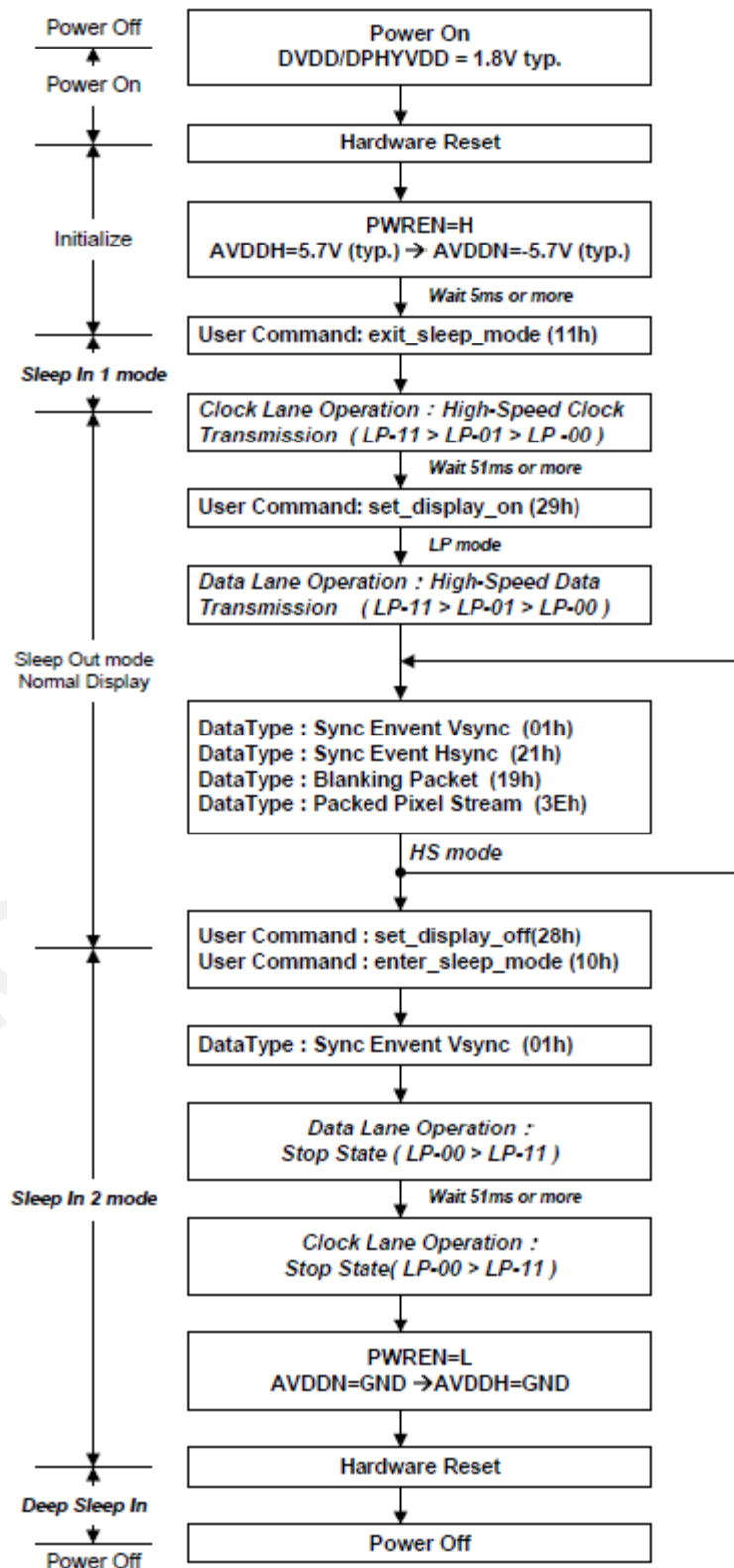
3-7. Display Flow

Fig 3.4 Display Flow

LG Display

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4. OPTICAL CHARACTERISTICS

4-1. Optical Characteristics – Backlight Off

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remarks
Viewing Angle Range	ΘUP	CR ≥10	80	-	-	°(degree)	
	ΘDOWN		80	-	-	°(degree)	
	ΘLEFT		80	-	-	°(degree)	
	ΘRIGHT		80	-	-	°(degree)	
Contrast Ratio	CR	Optimal	800	1000	-		
Brightness	Y	Optimal	480	580	-	Cd/m^2	
Brightness Uniformity	Y	Optimal	85			%	
Response time: Tr+Td	τr+ τd	Θ =0 ° Ta =25 °C		20	25	ms	
Max Gray to Gray	Tr or Td			25	35	ms	
Color Gamut	NTSC	-	-	72	-	%	
White Chromaticity	x	CIE 1931		0.308			
	y			0.326			
Red Chromaticity	x	CIE 1931		0.640			
	y			0.330			
Green Chromaticity	x	CIE 1931		0.300			
	y			0.600			
Blue Chromaticity	x	CIE 1931		0.150			
	y			0.060			

1. Optical Test Equipment & Method Refer to Note 1,2,3,4.

[Note 1] Optical Test Equipment Setup

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes
in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the LCD surface.
In case of backlight on, measured on the center area of the panel by PHOTO RESEARCH photometer
PR-880&PR650 or Equivalent.

Optical Stage(x,y)   **LCD Module**   **Pritchard 880/650**
                                                              or Equivalent

0.5′

50cm
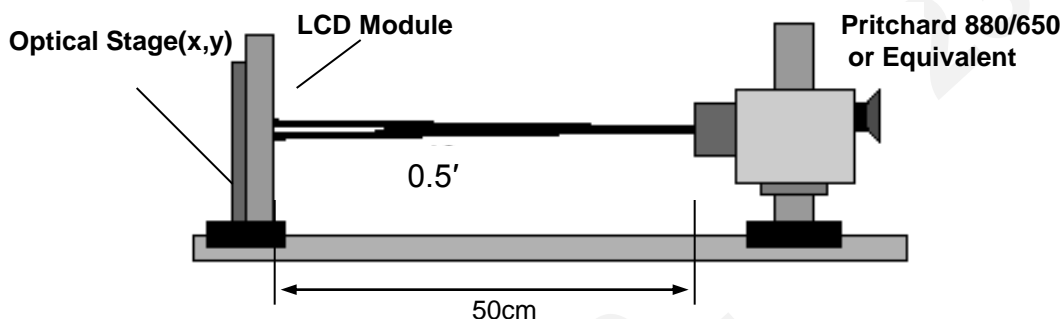
Fig 4.1. Optical Characteristic Measurement Equipment and Method

[Note 2]

Contrast Ratio is defined as follows ;

$$\text{Contrast Ratio(CR)} = \frac{\text{Photo detector output with LCD being "White"}}{\text{Photo detector output with LCD being "Black"}}$$

[Note 3]

Viewing Angle Range is defined as follows;
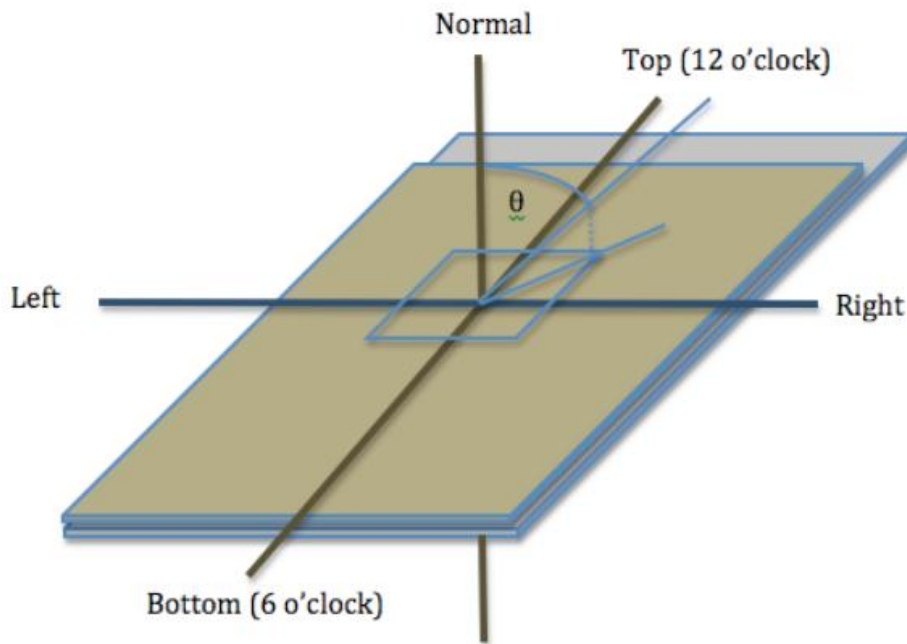
Fig 4.3 Viewing Angle Definitions

[Note 4]

Response time is obtained by measuring the transition time of photo detector output, when input signals are applied so as to make the area "black" to and from "white".
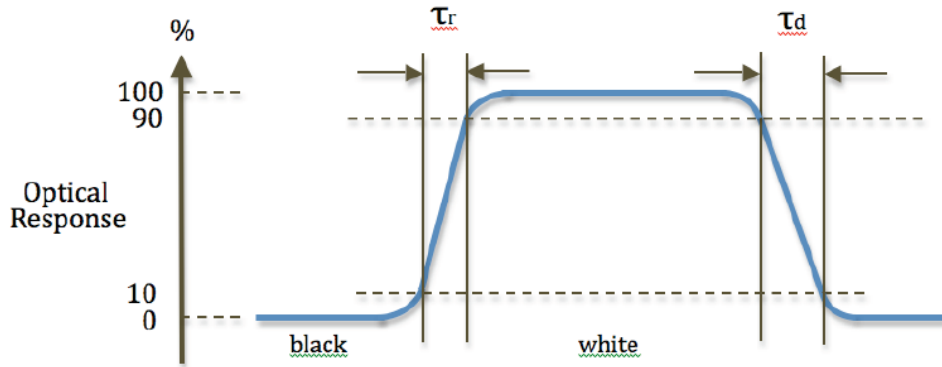
Fig 4.4 Response Time Definition

[Note 5]

The brightness measurement is taken at point B5.

$$\text{Brightness Uniformity} = \frac{\text{Minimum Photo detector output for B1-B9 with all pixels white}}{\text{Maximum Photo detector output for B1-B9 with all pixels white}} \times 100$$

D-IC side
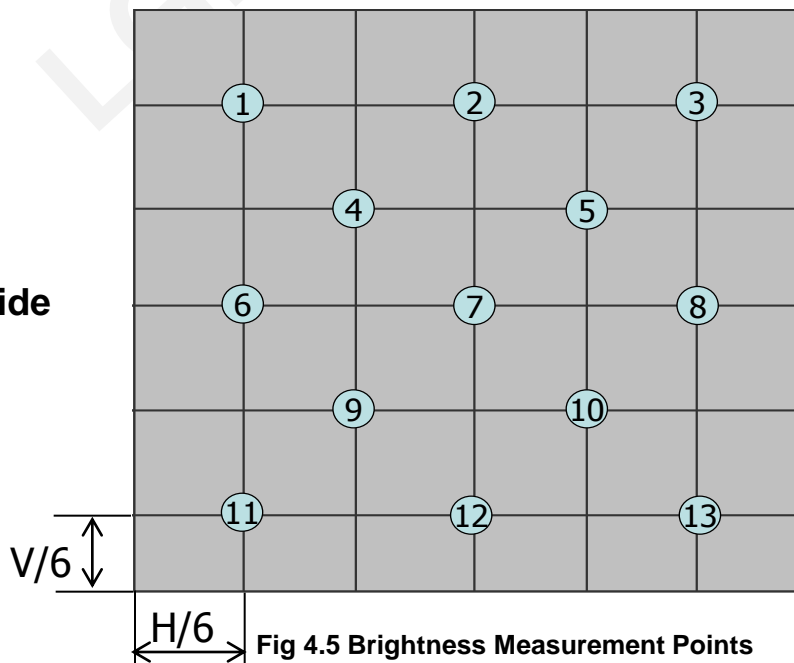
Fig 4.5 Brightness Measurement Points

5. MECHANICAL CHRACTERISTICS

The contents provide general mechanical characteristics for the model.
In addition the figures in the next page are detailed mechanical drawing of the LCD.

DIMENSION	MIN	TYP	MAX	UNIT
HORIZONTAL	-	54.52	-	mm
VERTICAL	-	96.888	-	mm
THICKNESS		1.45	1.53	mm

[LCM Dimension w/o Cover Glass]

[Outline Dimension]
- w/o CG Ass'y

88.608(ACTIVE AREA)
92.068±0.15(TOP POL)
95.258±0.15(GLASS)
96.458±0.1(LCM OUT LINE)

49.92(ACTIVE AREA)
53.02±0.15(TOP POL)
53.62±0.15(GLASS)
54.42±0.10(LCM OUTLINE)
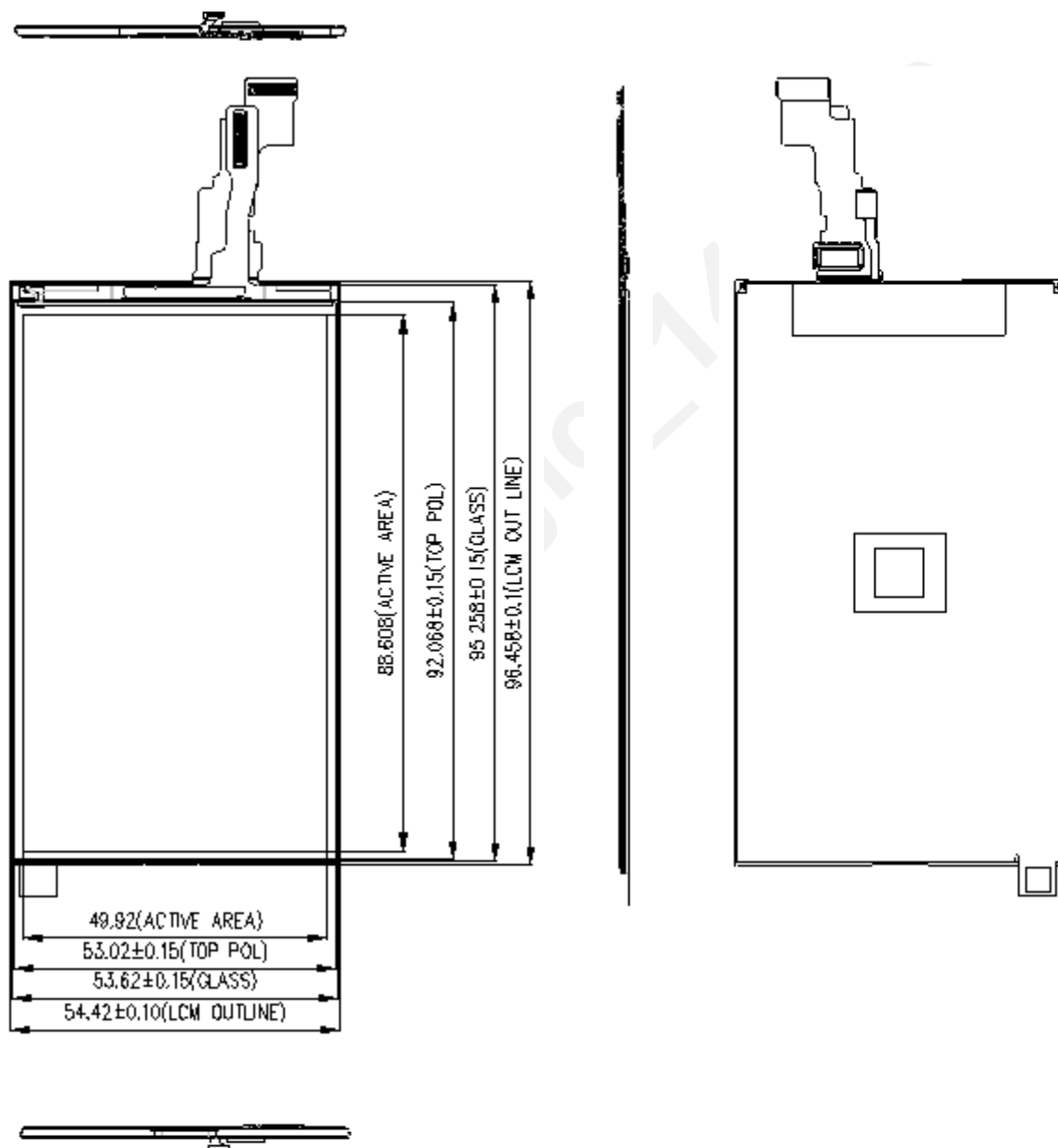
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6. RELIABLITY TEST

6-1. RELIABLITY TEST

No.	Test Items	Test Condition	Remark
1	Low Temperature Storage	Ta = -30℃ 240hrs	
2	High Temperature Storage	Ta = 80℃ 240hrs	
3	Low Temperature Operation	Ta = -20℃ 240hrs	
4	High Temperature Operation	Ta = 70℃ 240hrs	
5	High Temperature and High Humidity Operation	Ta = 50℃ 90%RH 240hrs	
6	High Temperature and Humidity Storage	Ta = 60℃ 90%RH 240hrs	

{ Result Evaluation Criteria }
 TFT-LCD Panel should be at room temperature for 2 hours after the reliability test is over.
 There should be no particular change which might affect the practical display function
 and the display quality should be conducted under normal operating condition.

7. International Standards

7-1. Safety

a) UL 60950-1, Second Edition, Underwriters Laboratories Inc.
   Information Technology Equipment - Safety - Part 1 : General Requirements.

b) CAN/CSA C22.2 No.60950-1-07, Second Edition, Canadian Standards Association.
   Information Technology Equipment - Safety - Part 1 : General Requirements.

c) EN 60950-1:2006 + A11:2009, European Committee for Electrotechnical Standardization (CENELEC).
   Information Technology Equipment - Safety - Part 1 : General Requirements.

7-2. Environment

a) RoHS, Directive 2002/95/EC of the European Parliament and of the council of 27 January 2003

7-3. EMC

a) ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHZ to 40GHz. "American National Standards Institute(ANSI), 1992

b) CISPR22 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment." International Special Committee on Radio Interference.

c) EN 55022 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment." European Committee for Electrotechnical Standardization.(CENELEC), 1998
 (Including A1: 2000)

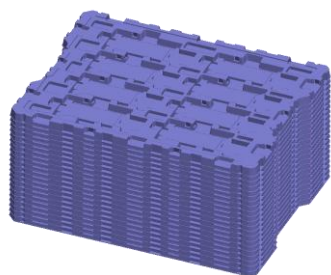## 8. PACKING

1) LH400WS1-SD01
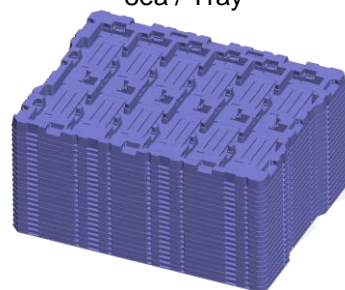
① The stacked tray per a box : 21pcs tray → Full (LCD Included) tray 20pcs + Empty tray 1pcs

(LCM Ass'y 160pcs/1 box)

② Stacking Method of Trays : one direction (Zigzag)

2) LH400WS1-SD03 / LH400WS1-SD04
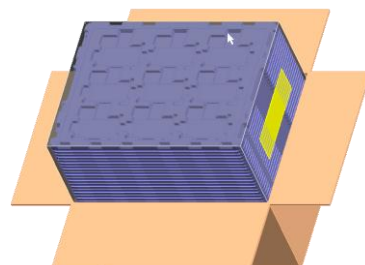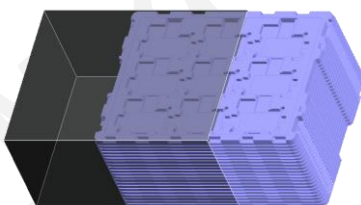
① The stacked tray per a box : 21pcs tray → Full (LCD Included) tray 20pcs + Empty tray 1pcs

(LCM Ass'y 240pcs/1 box)

② Stacking Method of Trays : one direction (None Zigzag)

<LH400WS1-SD01>
8ea / Tray

<LH400WS1-SD03 & SD04>
12ea / Tray

NO.	Description	Material
1	LCM	LH400WS1-SD01 : 160pcs/1 Box LH400WS1-SD03 : 240pcs/1 Box LH400WS1-SD04 : 240pcs/1 Box
2	Packing Tray	PET
3	Bag	AL
4	Carton Box	SWR4
5	Tape	OPP 70MMx300m
6	Label	YUPO Paper 100x70

9. PRECAUTIONS

Please pay attention to the following when you use this TFT LCD module.

9-1. ASSEMBLY PRECAUTIONS

(1) Please attach a transparent protective plate to the surface in order to protect the polarizer.
Transparent protective plate should have sufficient strength in order to the resist external force.
(2) You should adopt radiation structure to satisfy the temperature specification.
(3) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(4) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics deteriorate the polarizer.)
(5) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(6) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(7) Do not open the case because inside circuits do not have sufficient strength.
(8) The metal case of a module should be contacted to electrical ground of your system.

9-2. OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.

9-3. ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

9-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

9-5. STORAGE

When storing modules as spares for a long time, the following precautions are necessary.
(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

9-6. HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
(2) The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer.
Please carefully peel off the protection film without rubbing it against the polarizer.
(3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
(4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.