

Product Specification

SPECIFICATION FOR APPROVAL

- (●) Preliminary Specification
 () Final Specification

Title	4.70" (750xRGBx1334) TFT LCD
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BUYER	TBD
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LH470WX6
SUFFIX	SD01

*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

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RECORD OF REVISIONS

[illegible]

Product Specification

1. GENERAL DESCRIPTION

The LH470WX6 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 transreflective type display operating in the normally black mode. This TFT-LCD has 4.70 inch diagonally measured active display area with (750*RGB*1334) resolution. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes.

Block Diagram

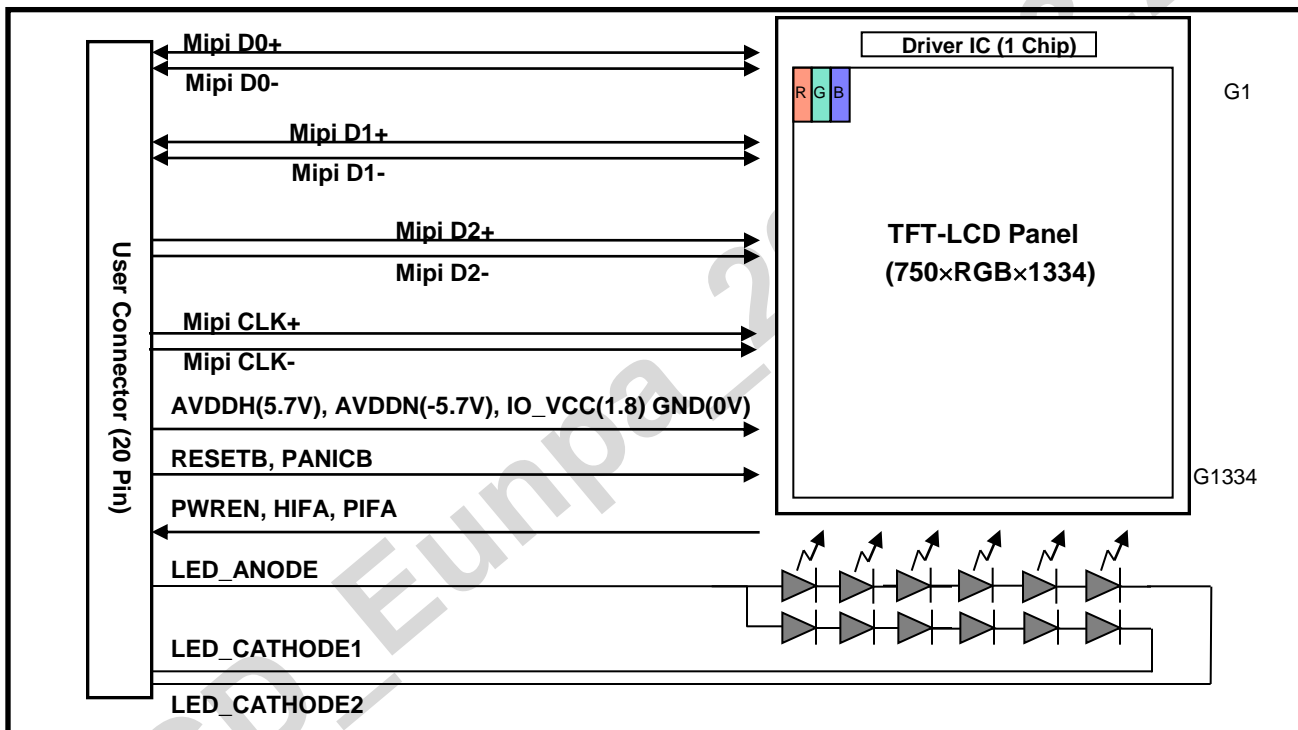


Fig 1.1 Block Diagram of TFT-LCD Module with LED Backlight Unit

General Features

Item	Specification
Active Screen Size	4.70" diagonal
Active Area	58.5 (H) mm x 104.052 (V) mm
Outline Dimension	61.61(H) x 135.77(V) x 2.00(T)
Pixel Pitch	0.026(H) x 0.078(V) mm
Pixel Format	750(H) x 1334(V) (RGB Stripe)
Color Depth	24-bits (R8, G8, B8)
Interface	MIPI 3-lane, 831 to 844 Mbps for high speed data
Power Consumption	768mW (Max. B/L), 73mW (Max. Panel) @ 4x4 checker pattern
Luminance	500nit(min.) @20mA
Viewing Direction	6:00 o'clock (Non-inversion)

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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)	DVDD – GND	-0.3 ~ 4.6	V	1,2
Power Supply Voltage(2)	AVDDH – AGND	-0.3 ~ 6.5	V	1,3
Power Supply Voltage(3)	AGND – AVDDN	-0.3 ~ 6.5	V	1,3
Power Supply Voltage(4)	VGH – AGND	-0.3 ~ 15.9	V	1,4
Power Supply Voltage(5)	VGH – AVDDH	-0.3 ~ 6.5	V	1,5
Power Supply Voltage(6)	AGND – VGL	-0.3 ~ 13.6	V	1,4
Power Supply Voltage(7)	AVDDN – VGL	-0.3 ~ 6.5	V	1,5
Power Supply Voltage(8)	VGH – VGL	-0.3 ~ 29.5	V	1,6
Input Voltage	Vt	-0.3 ~ DVDD+0.3	V	1,7
Input Voltage	Vt (DSI)	-0.3 ~ 1.8	V	1,8
Temperature for NVM programming	Tewep	20~30	°C	1
Storage temperature	Tstg	-55~110	°C	1

Notes.

- (1) If used beyond the absolute maximum ratings, the LSI may be destroyed. It is strongly recommended to use the LSI within the limits of its electrical characteristics during normal operation. The reliability of LSI is not guaranteed if used in the conditions above the limits and it may lead to malfunction.
- (2) Make sure DVDD (High) ≥ GND (Low).
- (3) Make sure AVDDH (High) ≥ AGND (Low), AGND (High) ≥ AVDDN (Low).
- (4) Make sure VCPH (High) ≥ AGND (Low), AGND (High) ≥ VCPL (Low).
- (5) Make sure VCPH (High) ≥ AVDDH (Low), AVDDN (High) ≥ VCPL (Low) .
- (6) Make sure VCPH (High) ≥ VCPL (Low).
- (7) DVDD amplitude input pin
- (8) DSI Input pin: DSICLK/P/N, DSID0P/N, DSID1P/N, DSID2P/N, DSID3P/N

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3. ELECTRICAL SPECIFICATIONS

3-1. ELECTRICAL CHARACTERISTICS

Table 3.1 Electrical Characteristics Of TFT-LCD Module

Item	Symbol	Values			Units	Note
		Min	Typ	Max		
Interface Power supply	DVDD	1.746	1.800	1.854	V	1,2,4
DPHY Power Supply	DPHYVDD	1.746	1.800	1.854	V	1,2,4
AVDDH	AVDDH	5.586	5.700	5.814	V	1,4,5
AVDDN	AVDDN	-5.8425	-5.700	-5.5575	V	1,4,5
VCPH		-	6.400	-	-	1,3
VCPL		-	-6.000	-	-	1,3
Operating Temp.	Ta	-20	25	70	°C	

Notes:

- (1) The voltages in the table are the electrical potentials from either one of GND or AGND level.
- (2) DVDD and DPHYVDD are connected on the FPC.
- (3) The internal charge pump (ICP) supplies VCPH and VCPL voltages to the R63318 in NVM programming.
- (4) The R63318 requires parasitic resistance (RCOG +RFOG + contact resistance) for each power supplies. The values are as follows.
- (5) Requires parasitic resistance: $R_{DVDD} \leq 3.23 \text{ ohm}$, $R_{DPHYVDD} \leq 8.61 \text{ ohm}$, $R_{AVDDH} \leq 3.56 \text{ ohm}$, $R_{AVDDN} \leq 3.56 \text{ ohm}$
- (6) Also allowance for ripple voltage is less than 60mV (The frequency is 0 to 1 MHz).

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3. ELECTRICAL SPECIFICATIONS

3-2. BACK LIGHT UNIT

The edge-lighting type of back light unit consists of 12 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	25	mA	
LED Forward Voltage	V_{LED}	-	3.0	3.2	V	

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3-3. INTERFACE CONNECTIONS (D-flex)

Interface Connector: Kyocera 14-5857-030-201-829+ (Plug)

Table 3.3 Module Connector Pin Configuration

Pin No.	Symbol	I/O	Description
1	LED_BL_C2	I	LED Backlight Cathode2
2	LED_BL_A	I	LED Backlight Anode
3	GND	-	Ground
4	LED_BL_C1	I	LED Backlight Cathode1
5	MIPI_D2N	I/O	Mipi Data lane
6	PIFA	O	Host interface signal
7	MIPI_D2P	I/O	Mipi Data lane
8	MSYNC	O	N/C
9	GND	-	Ground
10	PANICB	I	N/C
11	MIPI_CKN	I/O	Mipi Clk lane
12	HIFA	O	Test point(N/C)
13	MIPI_CKP	I/O	Mipi Clk lane
14	RESETB	I	Reset signal(Active Low)
15	GND	-	Ground
16	PWREN	O	Control signal out of D-IC to enable PMU
17	MIPI_D1N	I/O	Mipi Data lane
18	SCL	-	N/C
19	MIPI_D1P	I/O	Mipi Data lane
20	SDA	-	N/C
21	GND	-	Ground
22	VGL_REF	O	Analog reference for ECP VGL
23	MIPI_D0N	I/O	Mipi Data lane
24	VGH_REF	-	Analog reference for ECP VGH
25	MIPI_D0P	I/O	Mipi Data lane
26	AVDDH	I	Positive 5.7V Analog Supply
27	GND	-	Ground
28	AVDDN	I	Negative 5.7V Analog Supply
29	DVDD	I	Digital Power Supply
30	Vcom DC	O	Vcom voltage (Test Point)

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3-3. INTERFACE CONNECTIONS (T-flex)

Interface Connector: AA21-P046VA1 (JAE)

Table 3.3 Module Connector Pin Configuration

Pin No.	Symbol	I/O	Pin No.	Symbol	I/O
1	C6	Column Vcom_#6	24	R15	Row Vcom_#15
2	C7	Column Vcom_#7	25	R14	Row Vcom_#14
3	C9	Column Vcom_#9	26	R17	Row Vcom_#17
4	C10	Column Vcom_#10	27	R16	Row Vcom_#16
5	C8	Column Vcom_#8	28	R19	Row Vcom_#19
6	C11	Column Vcom_#11	29	R18	Row Vcom_#18
7	OIC_RIGHT	Ground	30	R20	Row Vcom_#20
8	GND	Ground	31	R22	Row Vcom_#22
9	GND	Ground	32	R21	Row Vcom_#21
10	R6	Row Vcom_#6	33	R23	Row Vcom_#23
11	R3	Row Vcom_#3	34	R0_LEFT	Row Vcom_#0_Left
12	R7	Row Vcom_#7	35	VGL	VGL Supply Voltage
13	R2	Row Vcom_#2	36	VGH	VGH Supply Voltage
14	R8	Row Vcom_#8	37	OIC_LEFT	Ground
15	R4	Row Vcom_#4	38	GND	Guard Vcom
16	R9	Row Vcom_#9	39	GND	Ground
17	R5	Row Vcom_#5	40	C0	Column Vcom_#0
18	R10	Row Vcom_#10	41	C1	Column Vcom_#1
19	R0_RIGHT	Row Vcom_#0_Right	42	C3	Column Vcom_#3
20	R11	Row Vcom_#11	43	C2	Column Vcom_#2
21	R1	Row Vcom_#1	44	C5	Column Vcom_#5
22	R13	Row Vcom_#13	45	C4	Column Vcom_#4
23	R12	Row Vcom_#12	46	G0	Guard Vcom

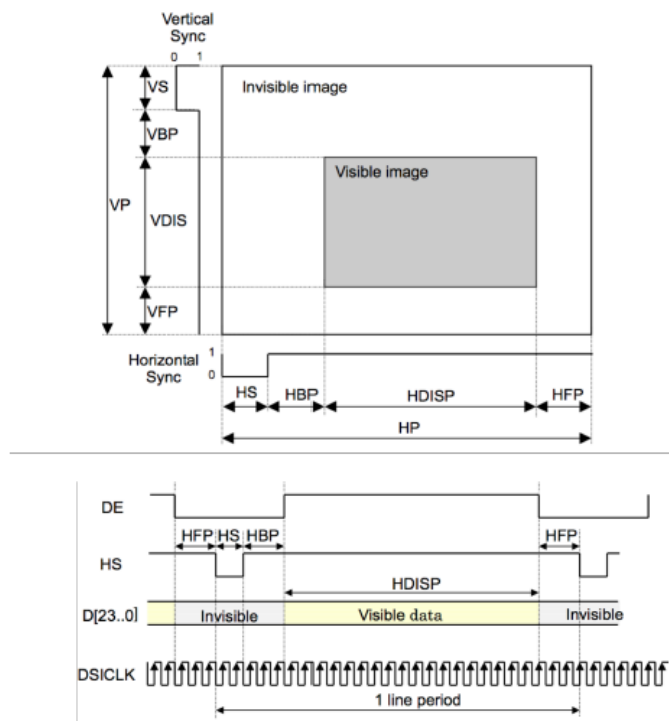
If Column, Row, Guide Vcom, is unused, these pin should be connected to Vcom.

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3-4. SIGNAL TIMING SPECIFICATIONS

Table 3.4 Timing Parameters

Item	Symbol	Timing	Unit	Remarks
Vertical cycle	VP	1881	Line	
Vertical front porch	VFP	540	Line	
Vertical Low Pulse Width	VS	3	Line	
Vertical back porch	VBP	4	Line	
Vertical display area	VDIS	1334	Line	
Horizontal cycle	HP	758	clk	
Horizontal low pulse width	HS	6	clk	
Horizontal front porch	HFP	2	clk	
Horizontal back porch	HBP	0	clk	
Horizontal display area	HDISP	750	clk	1,2
Frame Rate		60	Hz	
Line Time		8.86	usec	
Data Rate Per Lane		831-844	Mpbs	Typ=840Mbps



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3-5. COLOR INPUT DATA REFERENCE

Colors & Gray Scale	Gray Scale Level	Data Signal																												
		R 0	R 1	R 2	R 3	R 4	R 5	R 6	R 7	G 0	G 1	G 2	G 3	G 4	G 5	G 6	G 7	B 0	B 1	B 2	B 3	B 4	B 5	B 6	B 7					
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	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	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	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	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	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	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	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	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	0	0	0	0	0
↑ Darker ↑ ↓ Brighter ↓	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	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	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	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	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	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	0	0	0	0	0
↑ Darker ↑ ↓ Brighter ↓	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	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	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	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	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	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	0	0	0	0	0
↑ Darker ↑ ↓ Brighter ↓	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	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	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	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	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	1	1	1	1	1

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3-6. Power On/off Sequence

Power On Sequence

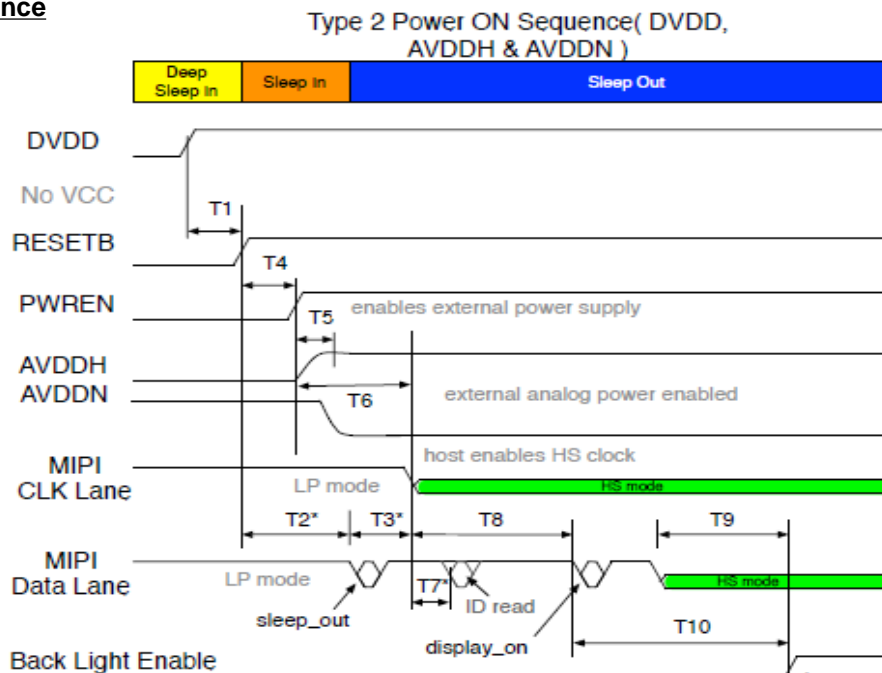


Fig 3.2 Power On Sequence

Power Off Sequence

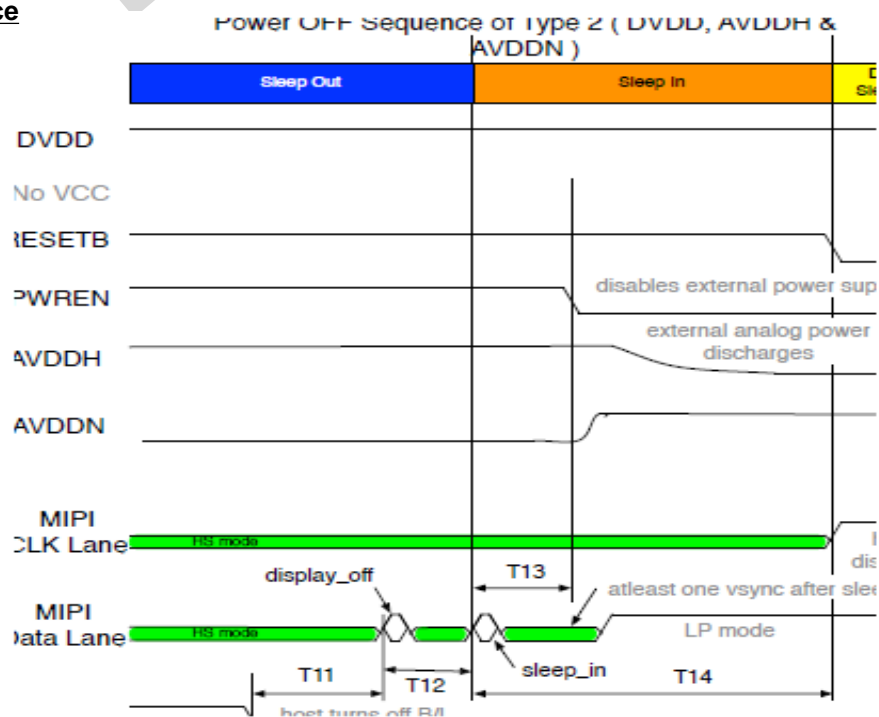


Fig 3.2 Power Off Sequence

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3-6. 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	25ms	–	–
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/clock enabled	T13	66.68ms	–	–
SLEEP IN to HS CLK Off & Reset	T14	100ms	–	–

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3-7. Display Flow

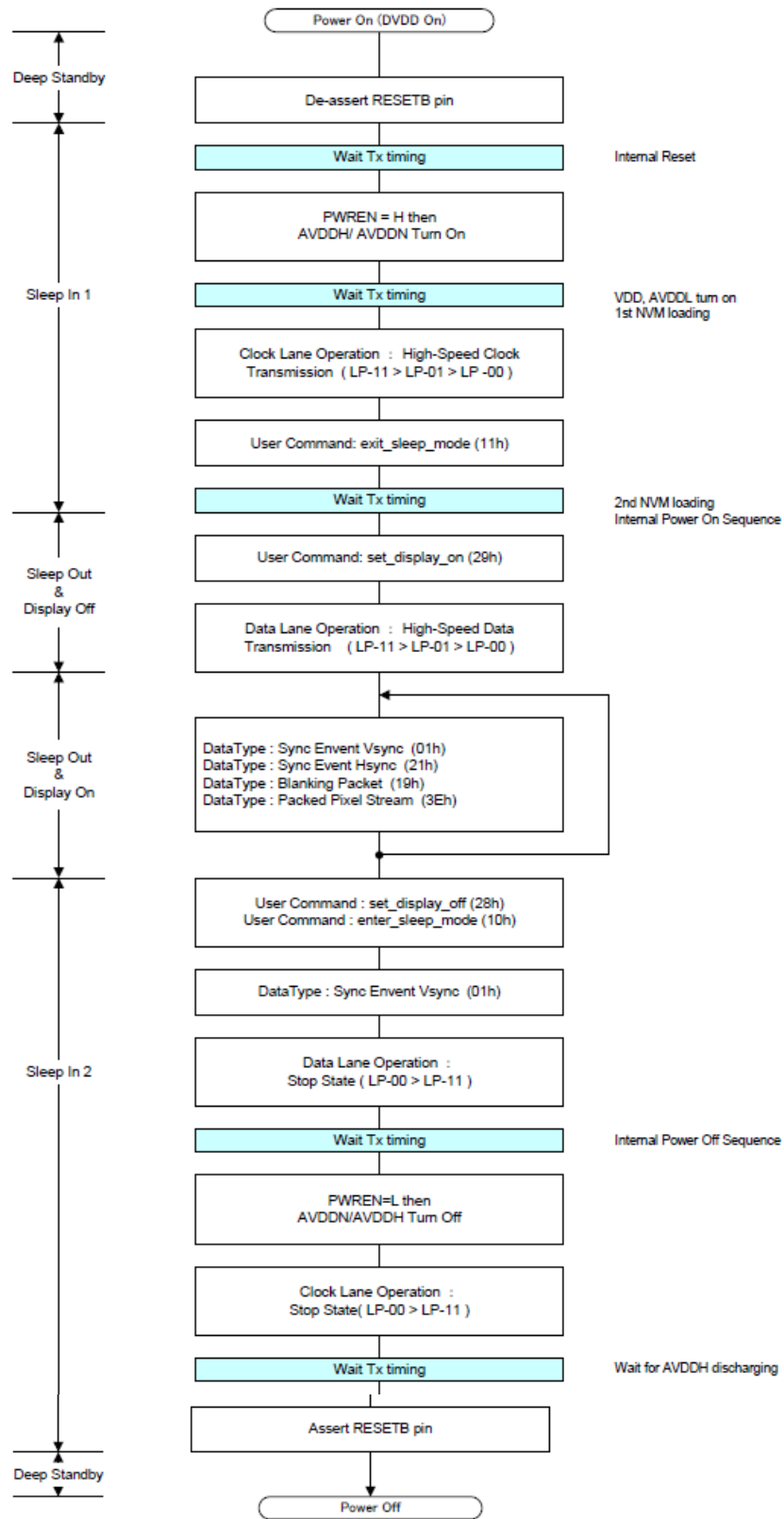


Fig 3.4 Display Flow chart

Product Specification

4. OPTICAL CHARACTERISTICS

4-1. Optical Characteristics – Backlight Off

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remarks
Viewing Angle Range	ΘUP	CR ≥100	80	-	-	°(degree)	
	ΘDOWN		80	-	-	°(degree)	
	ΘLEFT		80	-	-	°(degree)	
	ΘRIGHT		80	-	-	°(degree)	
Contrast Ratio	CR	Optimal	1400	1600	-		
Brightness	Y	Optimal	500	550	-	Cd/m ²	
Brightness Uniformity	Y	Optimal	85			%	
Response time: Tr+Td	tr+ td	Θ =0 ° Ta =25 °C		15	20	ms	
Max Gray to Gray	Tr or Td			25	35	ms	
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.

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[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.

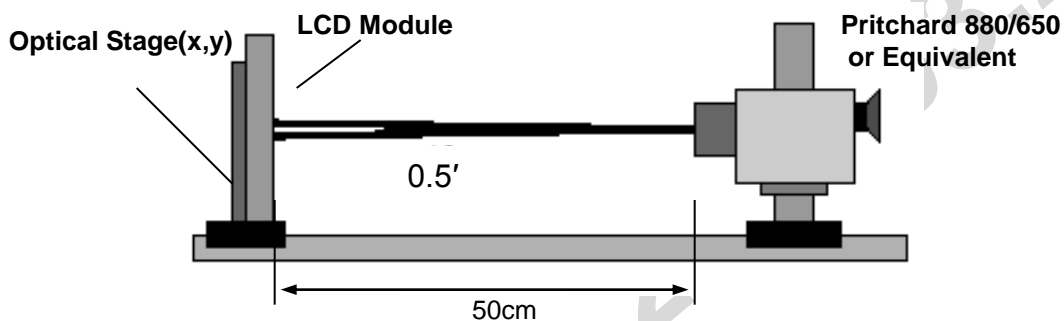


Fig 4.1. Optical Characteristic Measurement Equipment and Method

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[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;

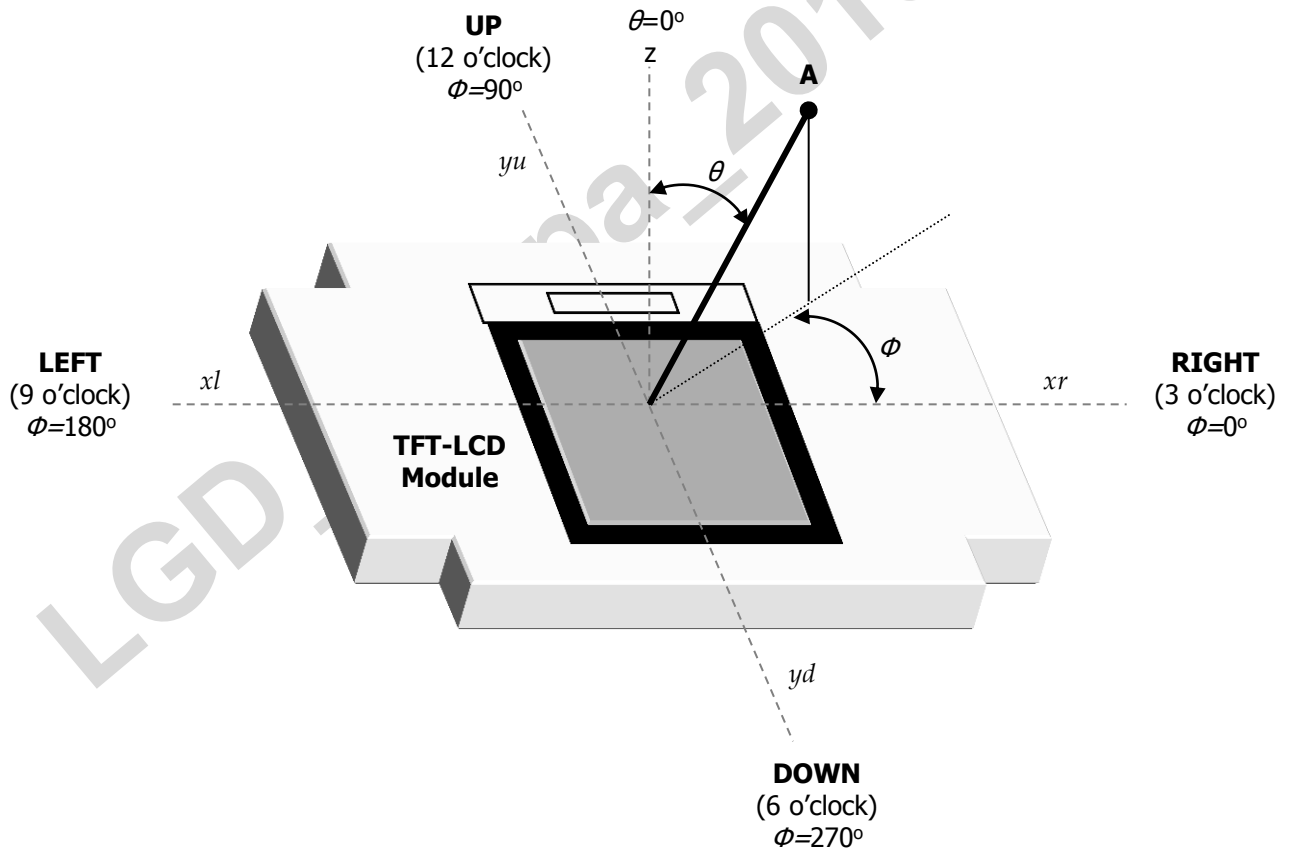


Fig 4.3 Viewing Angle Definitions

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[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”.

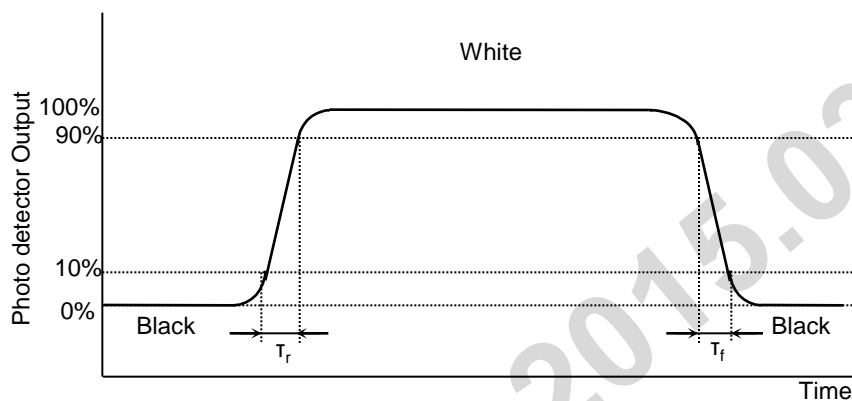


Fig 4.4 Response Time Definition

[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

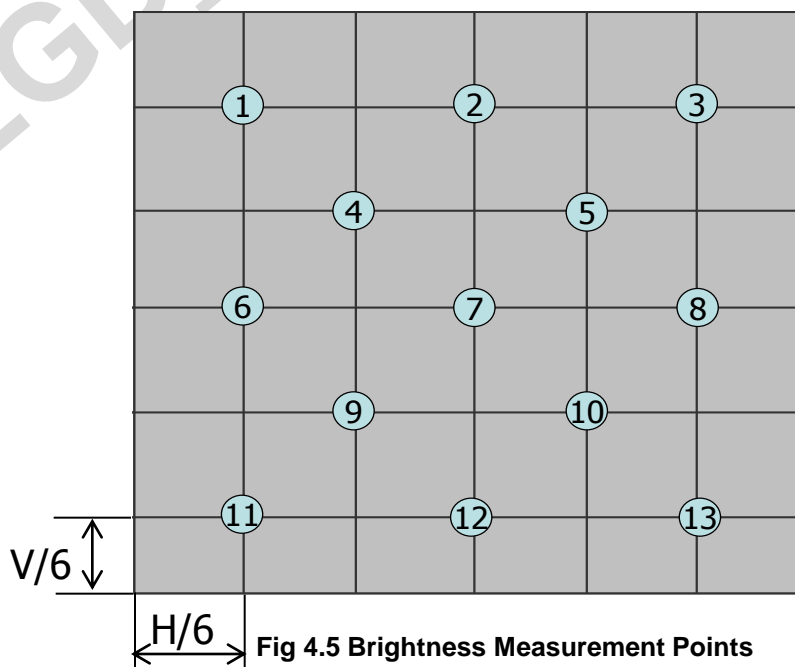


Fig 4.5 Brightness Measurement Points

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5. MECHANICAL CHARACTERISTICS

The contents provide general mechanical characteristics for the model.

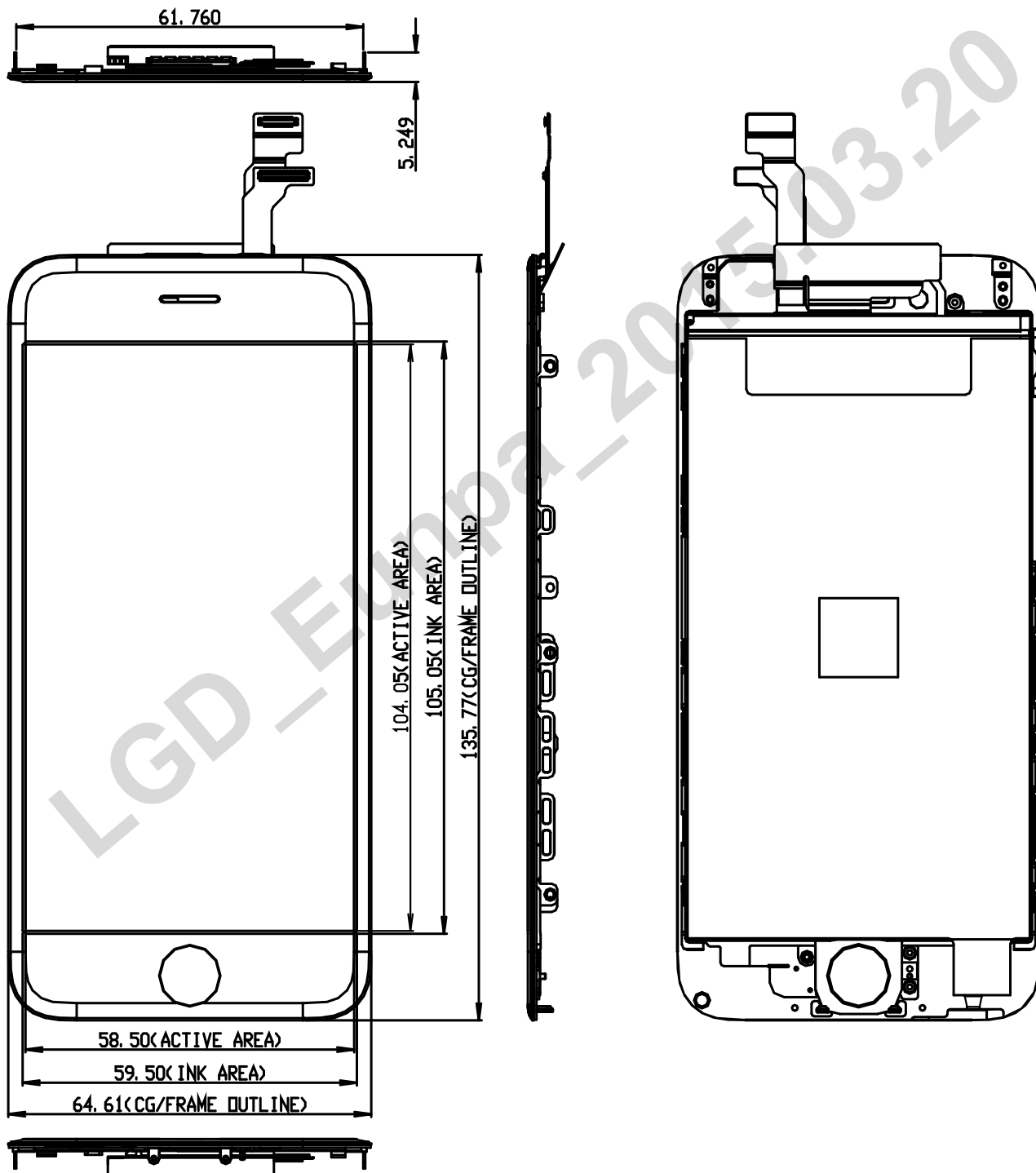
In addition the figures in the next page are detailed mechanical drawing of the LCD.

DIMENSION	MIN	TYP	MAX	UNIT
HORIZONTAL	-	64.61	-	mm
VERTICAL	-	135.77	-	mm
THICKNESS	-	2.000	2.073	mm
THICKNESS (LED Area)	-	2.120	2.220	mm

LGD_Eunpa_2015.03.20

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[Outline Dimension]



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6. RELIABILITY TEST

6-1. RELIABILITY 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.

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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

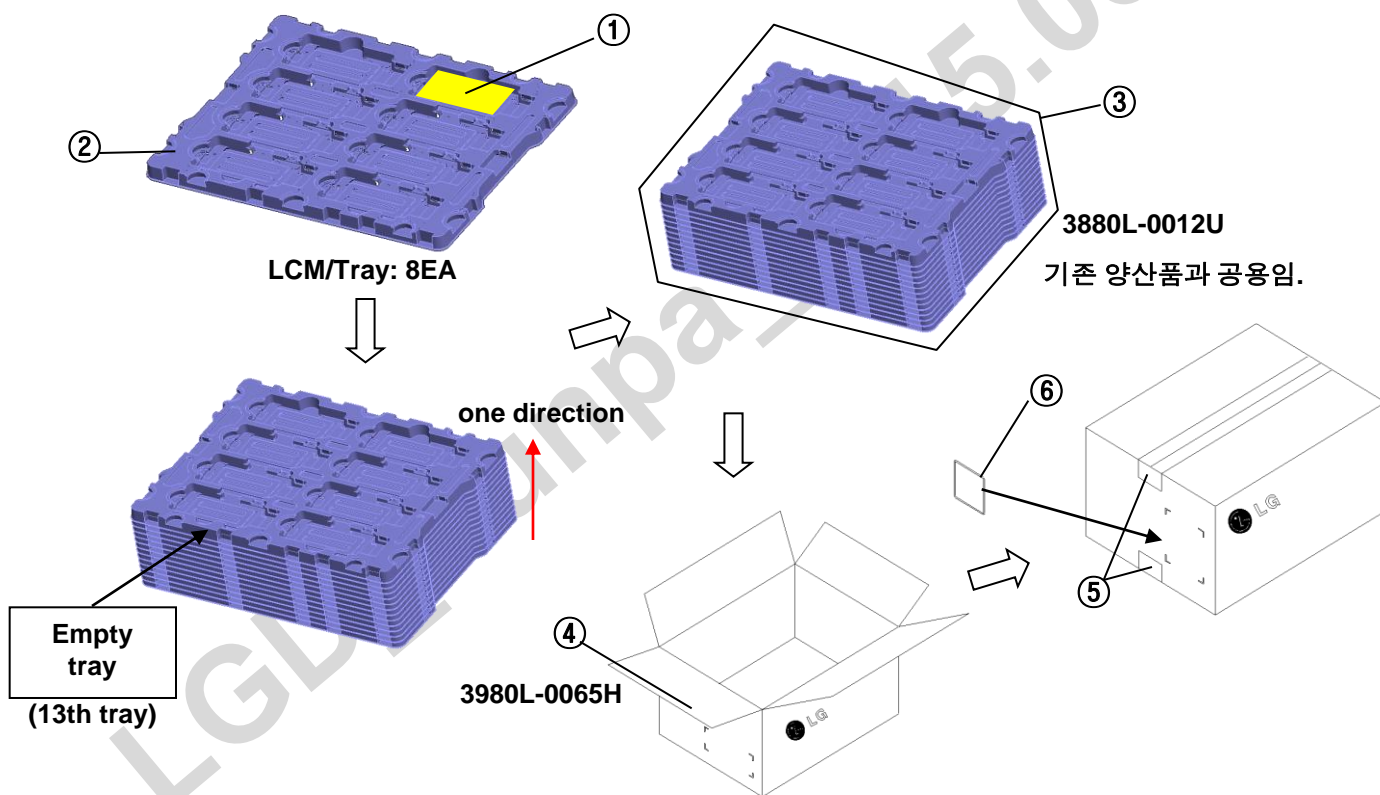
7-3. EMC

- 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)

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8. PACKING

1. The stacked tray per a box : 13pcs tray
 → Full (LCD Included) tray 12pcs + Empty tray 1pcs
 (LCM Ass'y 96pcs/1 box)
2. Stacking Method of Trays : one direction(not Zigzag)



NO.	Description	Material
1	LCM	96pcs/1 Box
2	Packing Tray	PET
3	Bag	AL
4	Carton Box	SWR4
5	Tape	OPP 70MMx300m
6	Label	YUPO Paper 100x70

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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 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 soaked with petroleum benzene. 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 :
 $V = \pm 200\text{mV}$ (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 minimize the interference.

Product Specification

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.