

Product Specification

SPECIFICATION FOR APPROVAL

Preliminary Specification
 Final Specification

Title	LB043WV2-SD01
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BUYER	
MODEL	

SUPPLIER	LG Display Co., Ltd.
MODEL	LB043WV2
SUFFIX	SD01

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

Record of Revisions

Revision No.	Revision Date	Page	Description	Note
1.0	Mar. 14. 2012	-	First Draft	
2.0	Dec. 22. 2015	36	Change product site -. MADE IN KOREA → MADE IN CHINA	
		37	Update to the latest lot mark information	
3.0	Nov. 17. 2016	All	Fab. Transition model First Draft (P2 → P5)	

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◆ Caution & Handling Precaution

- ▶ Safety
- ▶ Installation in Assembly
- ▶ Transportation and Storage

Product Specification

1. General Description

The **LB043WV2-SD01** model is a Color TFT(Main) LCD supplied by LG Display. This Module has a **4.3 inch** diagonally measured active display area with 480(RGB)X800 resolution. Each pixel is divided into Red, Green and Blue sub-pixels and dots which are arranged in vertical stripes.

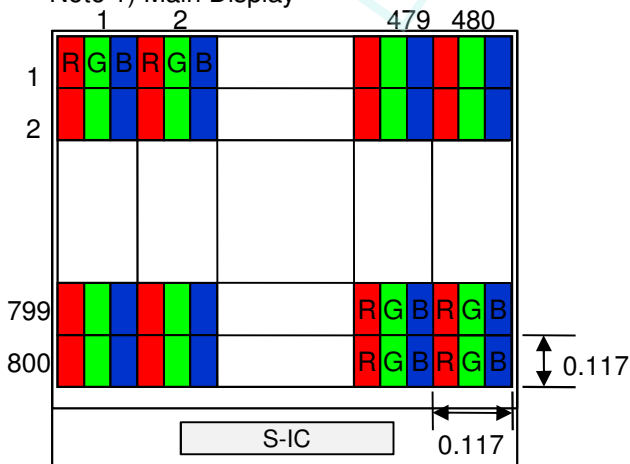
The LCD color is determined with 16.7M colors signal for each pixel. The **LB043WV2-SD01** has been designed to apply the interface method that enables low power, high speed, and high contrast.

The **LB043WV2-SD01** is intended to support applications where thin thickness, wide viewing angle and low power are critical factors and graphic displays are important.

2. General Features

Item	Main Display	Remark
Display Mode	Normally Black, Transmissive	
Viewing Direction	Wide View Angle	
Driving Method	a-si TFT Active Matrix	
Input Signals	24Bit RGB I/F	
Outside Dimensions	60.06mm(W) × 102.87mm(H) × 1.95mm(D)	
Active Area	56.16mm(W) × 93.6mm(H)	
Number of Pixels	480×RGB×800 Pixels	Note 1)
Pixel Pitch	0.117mm × 0.117mm (217ppi)	Note 1)
Pixel Arrangement	RGB Vertical stripes	Note 1)
Drive IC	HX8379-A 23.96(H) × 840(V) × 0.20(D)	
Weight	TBDg	

Note 1) Main Display



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3. Absolute Maximum Ratings

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

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power for Analogue Circuit	V _{cc}	-0.3	2.8	3.3	V	VCC
Power for Logic Circuit	IOV _{cc}	-0.3	1.8	3.3	V	IOVCC
LED Forward Current	I _F	-	20	25	mA	Per LED
LED Reverse Voltage	V _R	-	-	5	V	Per LED
LED Permissible Loss	P _D	-	-	120	mW	Per LED
Storage Humidity	H _{stg}	10	-	90	%RH	Note 1), 2)
Storage Temperature	T _{STG}	-30	-	80	°C	Note 1), 2)
Operating Ambient Humidity	H _{OP}	10	-	90	%RH	Note 1), 2)
Operating Ambient Temperature	T _{OP}	-20	-	70	°C	Note 1), 2)

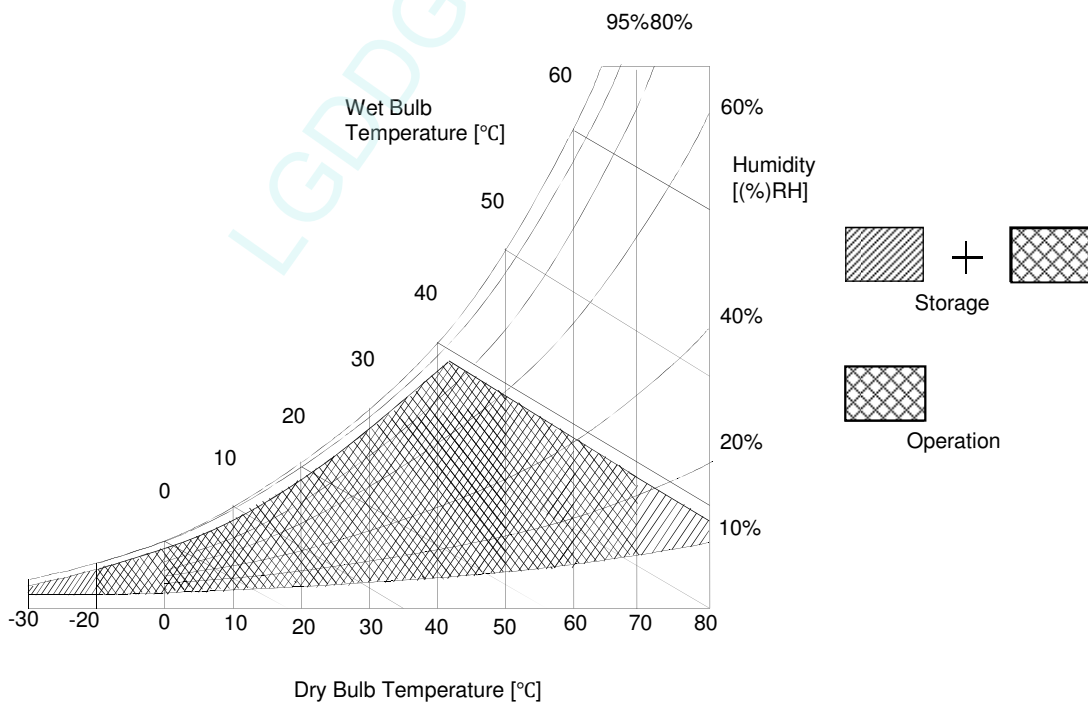
Note 1) Temp. ≤ 60°C , 90% RH MAX.

Temp. > 60°C , Absolute humidity shall be less than 90% RH at 60°C.

Note 2) The diagram below indicates the peripheral environment of the module.

The wet bulb temperature should be kept under 39 °C and there should be no compensation.

If the LSI is used above these absolute maximum ratings, it may become permanently damaged.



Product Specification
4. Electrical Specification
4.1. Main Display

(Ta=25°C)

Properties		Sym.	Min	Typ.	Max	Unit	Note
Power for VDD Generation		VCC	2.6	2.8	3.3	V	
Power for Logic Circuit		IOVCC	1.65	1.8	3.3	V	
Power for Analog Circuit		VCI	2.6	2.8	3.3	V	
Power for BLU Driving		VBAT	-	3.3	-	V	20mA/LED
Logic Input Voltage		V _{IL}	-0.3	-	0.2×IOVCC	V	
		V _{IH}	0.8×IOVCC	-	IOVCC	V	
I/O Leakage Current		I _{LI}	-1	-	1	μA	
Current Consumption	Normal Display	I _{CI}	-	(36)	60	mA	Note 3.
	Standby Mode	I _{STB}	-	(0.5)	1	mA	
	BLU Driving	IBAT	-	40	-	mA	20mA@Chip (2String)
Power Consumption	Normal Display	P _{CI}	-	(101)	198	mW	Note 3.
	Standby Mode	P _{STB}	-	(1.4)	3.3	mW	

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Note 3)

1. The recommended operating conditions refers to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings.
Accordingly, please make sure that the module is used within this range.
And these current values are measured under the condition that all device are stopped, each component is stable and logic signal is input.

2. All the unused input terminals have to be connected to VCC or GND. Please select appropriate one which meet the function required by unused terminal.

3. Power Consumption

1) Display IC standstills while LCD is in the sleep mode.

The sleep mode means VCI is supplied and then oscillator off .
And these values are not peak current but constant current.

2) In standby mode, display operation is completely halted and VCC is ON (VBAT is OFF)

3) In standby mode, power consumption measurement is based on 1.8V logic voltage.

4) Input VCC & IOVCC Voltage : 2.8V & 1.8V

- Test Equipment : Oscilloscope TDS5104 (Maker : Tektronix)

5) Measure the current after set up a current meter on VCI Line.

- Test Equipment : Multi-Tester 85III (Maker : FLUKE)

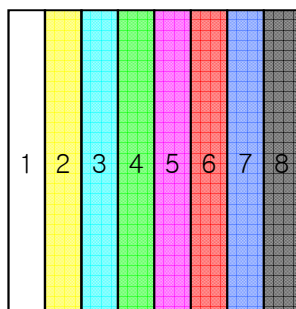
- Display Tester : WLT-1000A (Using recommend LGD Initial code)

- Resolving Power : 1/100 mA

6) Measure Power Consumption of the display pattern, the "Color-Bar".

(These peak value is Black pattern in whole area)

- 1. White
- 2. Yellow
- 3. Light blue
- 4. Green
- 5. Purple
- 6. Red
- 7. Blue
- 8. Black



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5. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 5 minutes in a dark environment at 25 °C. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0 °.

5.1. Main Display

 (T_A = 25 °C)

Spec	Parameter	Symbol	Condition	Values			Unit	Notes
				Min	Typ	Max		
With Backlight LED ON	Contrast Ratio	C/R	$\theta = 0^\circ$	700	1,000	-		Fig.1
	Luminance	BP	$\theta = 0^\circ$	450	600	-	cd/m ²	Fig.2
	Luminance Uniformity	ΔL	$\theta = 0^\circ$	70	80	-	%	Fig.2
	Response Time	T _r +T _f	$\theta = 0^\circ$	-	40	60	ms	Fig.3
	Viewing Angle	$\Phi = 180^\circ$	CR>10	-	80	-	°	Fig.4
		$\Phi = 0^\circ$		-	80	-	°	
		$\Phi = 90^\circ$		-	80	-	°	
		$\Phi = 270^\circ$		-	80	-	°	
	CIE Color Coordinate 1931	W _x	$\theta = 0^\circ$	Typ-0.04	(0.310)	Typ+0.04		Fig.1
		W _y		Typ-0.04	(0.330)	Typ+0.04		
		R _x	$\theta = 0^\circ$	Typ-0.04	(0.642)	Typ+0.04		
		R _y		Typ-0.04	(0.339)	Typ+0.04		
		G _x	$\theta = 0^\circ$	Typ-0.04	(0.339)	Typ+0.04		
		G _y		Typ-0.04	(0.608)	Typ+0.04		
B _x		$\theta = 0^\circ$	Typ-0.04	(0.145)	Typ+0.04			
B _y			Typ-0.04	(0.049)	Typ+0.04			
Color Gamut		$\theta = 0^\circ$	65	70	-	%		

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5.2. LED Specification

- LED Part Name : SWCA07
- Maker : SEOUL SEMICONDUCTOR
- Luminous Intensity : 2.4~2.6cd, Color Rank : D2S, F2S, LED current value = 20mA (per chip)

▣ Electro-Optical characteristics

 (T_A = 25 °C)

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	Rank Z28	V _F	I _F = 20mA	2.8	-	3.0	V
	Rank Z30	V _F		3.0	-	3.2	
	Rank Z32	V _F		3.2	-	3.4	
	Rank z30	V _F		3.0	-	3.4	
Reverse Current		I _R	V _R = 5V	-	-	50	μA
Luminous Intensity*1	Rank S24H	I _V	I _F = 20mA	2400	-	2500	mcd
	Rank S25H			2500	-	2600	
Viewing Angle *2		2θ _{1/2}	I _F = 20mA	120			deg.
Life time*3		-	T _a = 25°C I _F = 20mA	15,000	-	-	hr

▣ Absolute Maximum Ratings

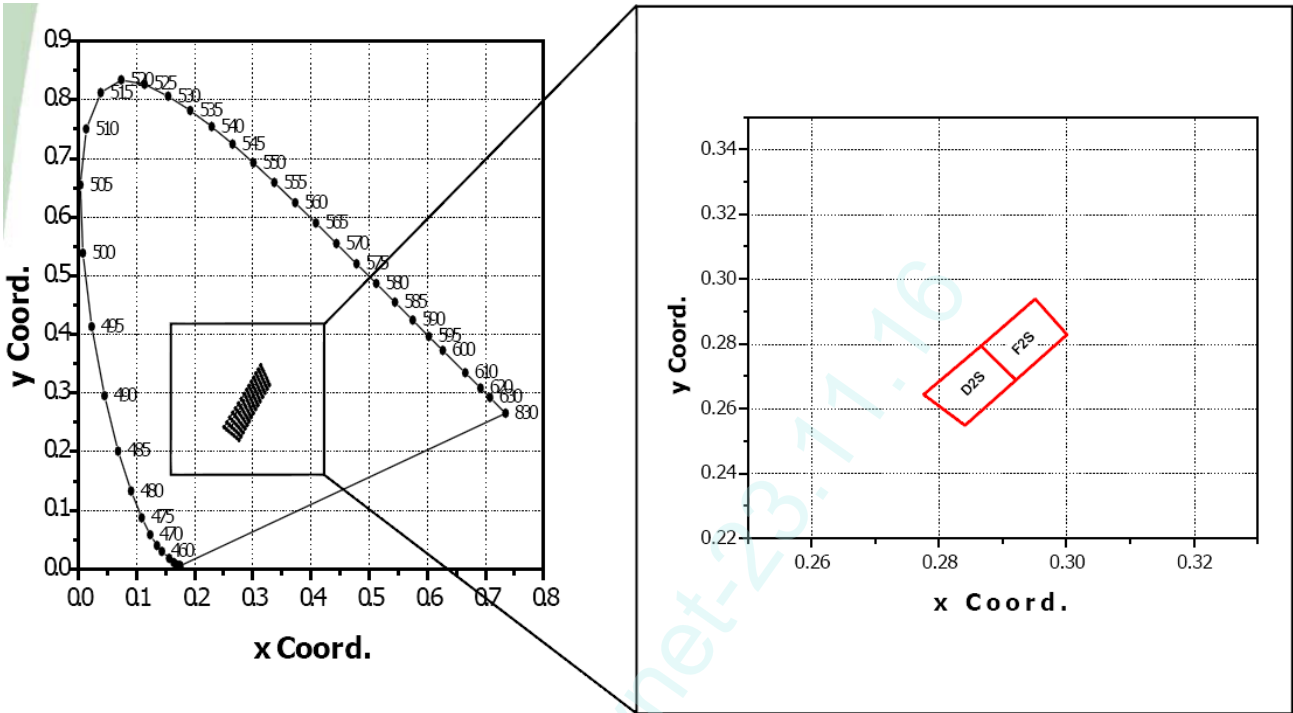
 (T_A = 25 °C)

Parameter	Symbol	Value	Unit
Power Dissipation	P _D	120	mW
Forward Current	I _F	30	mA
Pulse Forward Current	I _{FM} *2	100	mA
Reverse Voltage	V _R	5	V
Operating Temp.	T _{OPR}	-30 to 85	°C
Storage Temp.	T _{STG}	-40 to 100	°C
Junction Temp.	T _{Jmax}	125	°C

- 1. Care is to be taken that power dissipation does not exceed the absolute maximum rating of the product.
- 2. I_{FM} was measured at T_w ≤ 0.1msec of pulse width and D ≤ 1/10 of duty ratio.

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■ **Color Coordinate of LED**



■ **Color Rank**

Parameter Symbol		Value Unit	
x	y	x	y
0.2775	0.2645	0.2865	0.2795
0.2865	0.2795	0.2950	0.2940
0.2920	0.2690	0.3000	0.2830
0.2840	0.2550	0.2920	0.2690

* Measurement Uncertainty of the Color Coordinates is ± 0.005

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◆ Measurement System

Notes :

1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

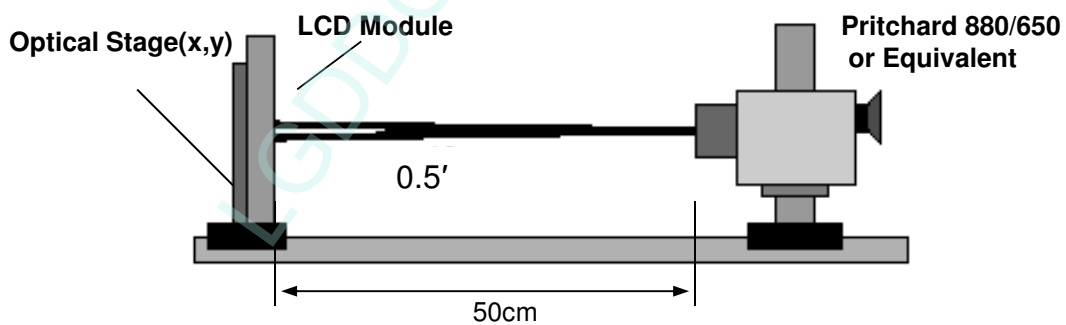
2. Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.

3. Response time is the time required for the display to transition from white to black (Rising Time, Tr) and from black to white (Falling Time, Tf). For additional information see FIG 3.

4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 4.

FIG. 1 Optical Characteristic Measurement Equipment and Method

▶ Test procedure



※ Measuring Condition:

- Measuring surroundings : Dark Room
- Measuring temperature : T_a=25°C
- Adjust operating voltage to get optimum contrast at the center of the display.
- Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.

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Fig. 2 Measurement Points for Luminance

► **Luminance Uniformity**

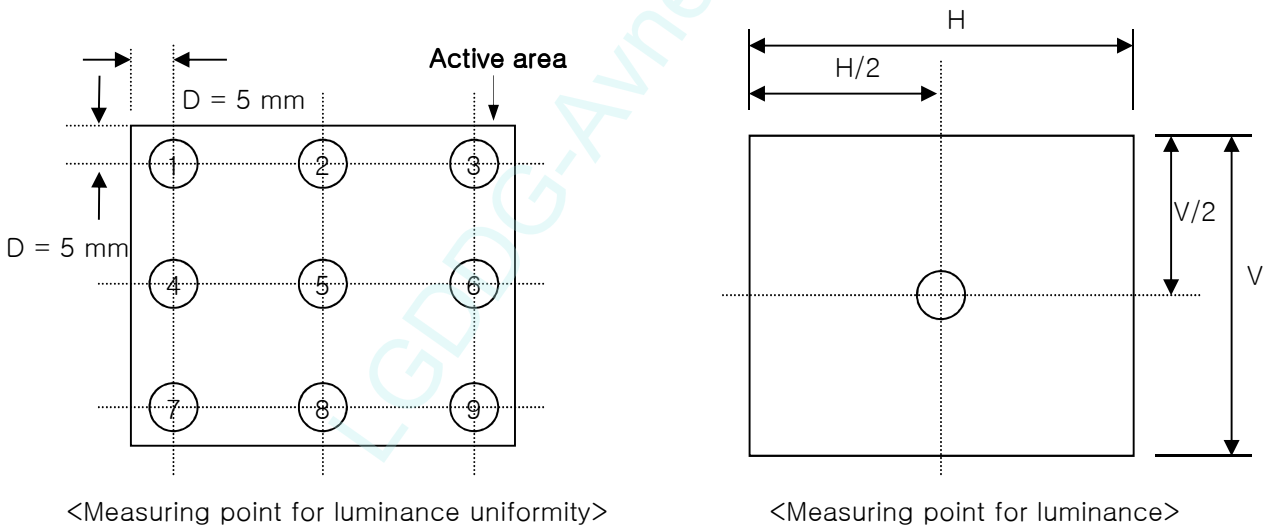
Use FIG.1 (Test Procedure) under Measurement System with the backlight turned on, the luminance uniformity should be obtained from the next expression, when white raster (white : gradation level L63) is displayed: (* LED Current = 20mA@Chip)

$$\text{Luminance Uniformity} = L_{\min} / L_{\max} \times 100 (\%)$$

, L_{\min} = Minimum luminance point
 L_{\max} – Maximum luminance point

► **Luminance**

Use FIG.1 (Test Procedure) under Measurement System with the backlight turned on to measure the luminance when white raster (white: Gradation level L63) is displayed.



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FIG. 3 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

Response Time = Rising Time(T_r) + Falling Time(T_f)

- Rising Time(T_r) : Full White 10% \rightarrow Full White 90% Transmittance.
- Falling Time(T_f) : Full White 90% \rightarrow Full White 10% Transmittance.

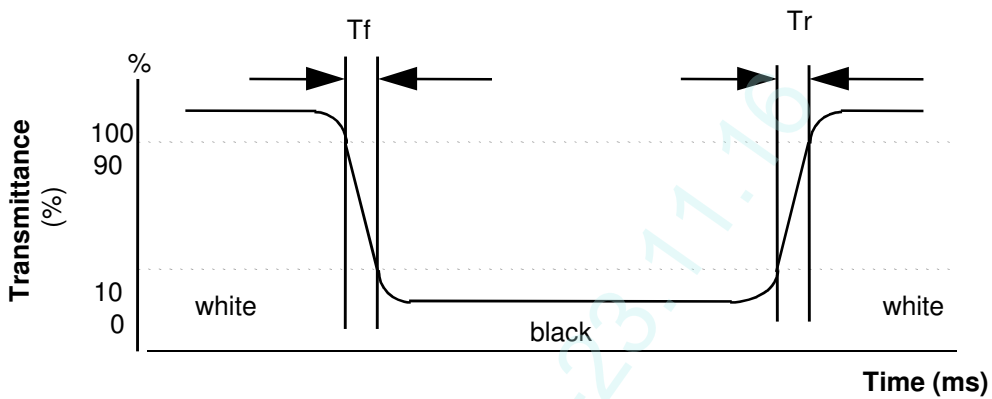
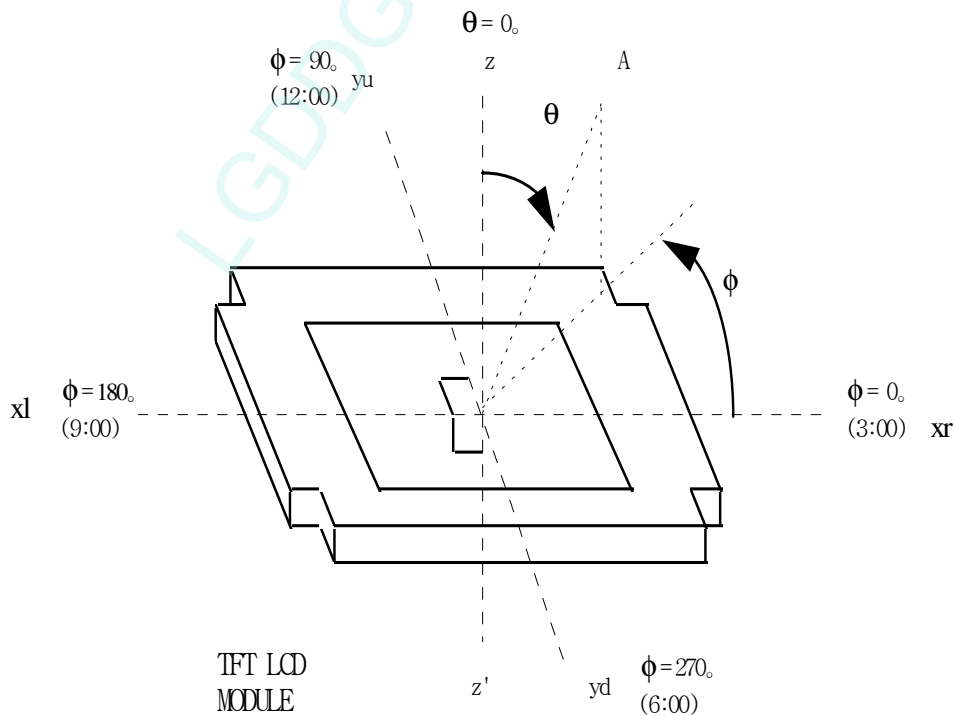


FIG. 4 The Definition of Viewing Angle

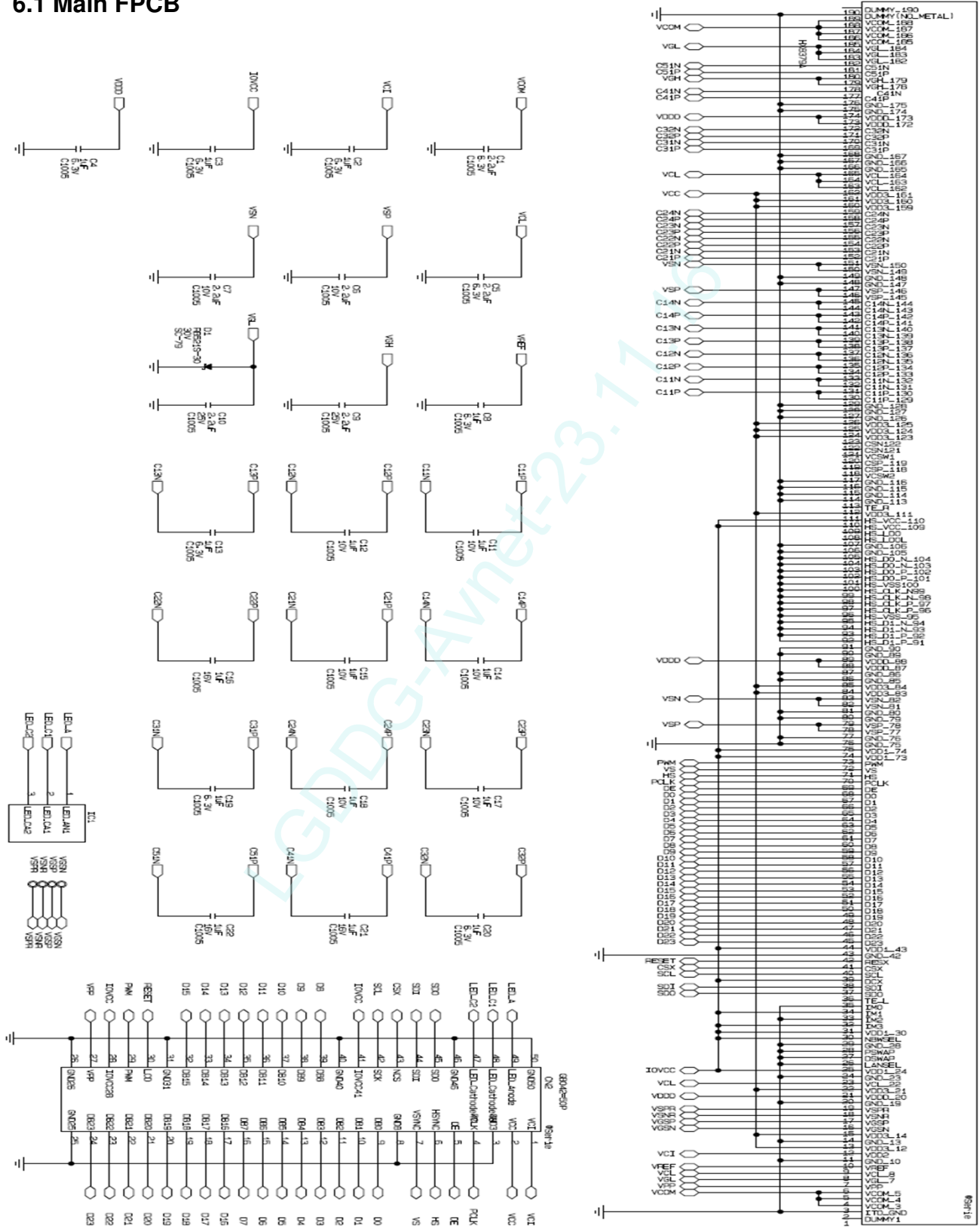
Use Fig. 1 (Test Procedure) under Measurement System to measure the contrast from the measuring direction specified by the conditions as the following figure.

<dimension of viewing angle range>



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6. Schematic
6.1 Main FPCB



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7. Part List
7. 1. Module Part List

No	Part Name	Specification	Maker	EA	Note
1	PANEL	4.3" WVGA (480*800) IPS	LGD	1	
2	LDI	HX8379-A	HIMAX	1	
3	UPPER POL	58.56×95.8×0.135t, ARC + Haze 44%	Nitto	1	
4	LOWER POL	58.56×96.35×0.135t, Haze 13% + AS	Nitto	1	
5	ACF (COG)	CP33731-18RB, 1.6mm	Sony	-	
6	ACF (FOG)	AC-7823YM-18,1mm	Hitachi	-	
7	UV(전면)	UC-2U18		-	
8	UV(배면)	UC-2U17	신광	-	
9	FPCB	0.13T 2-Layer	Circuit Flex	1	
10	AG DOT	NSP-B500		-	
11	BLU	LB043WV2-SD01 BLU (1-Way, 10-LED, Insert mold)	KJP	1	
12	Insulation Tape	36.5×12×0.05	BY KOREA	1	
13	Remove Tape	12×6×0.1	DAEHYUN ST	1	

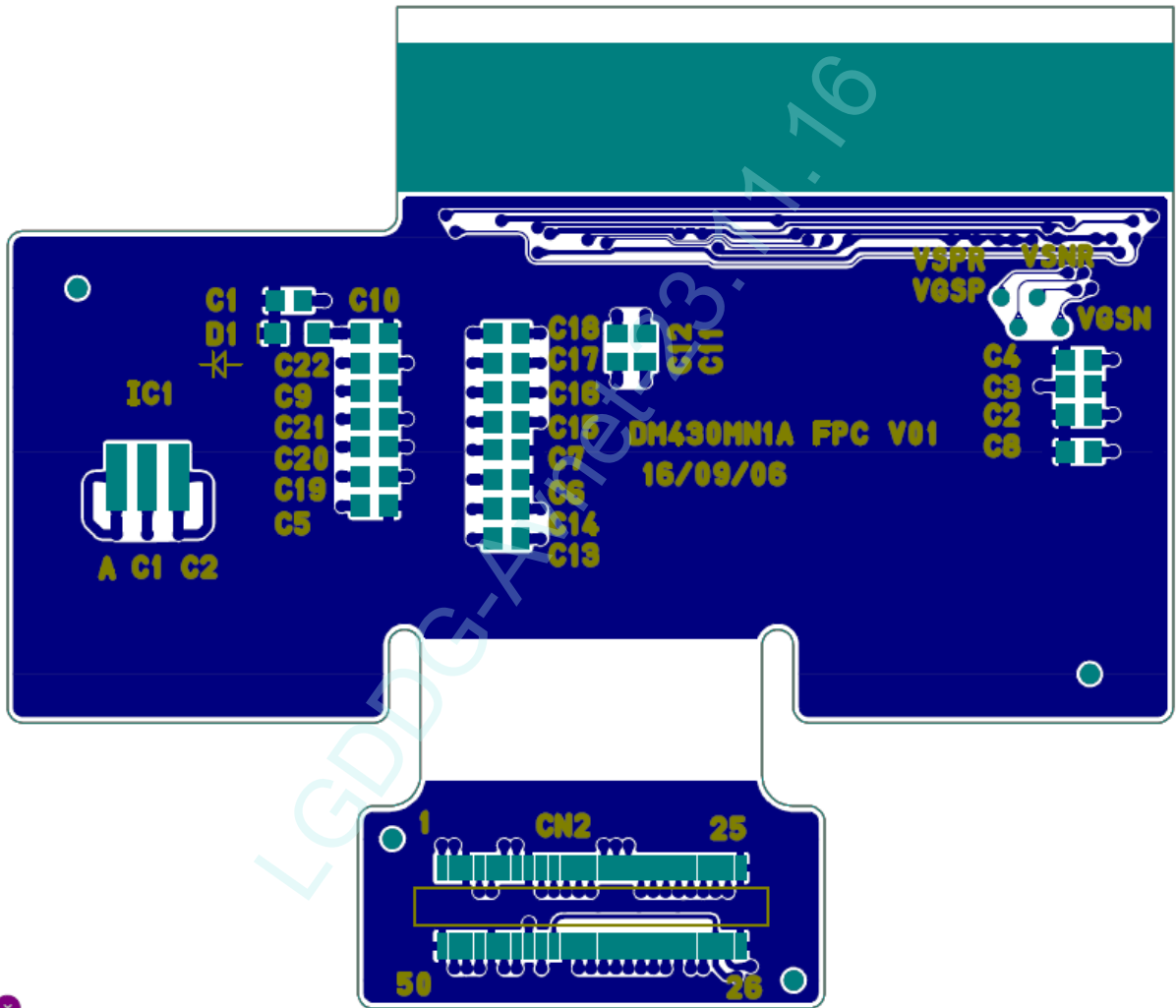
7. 2. SMT Part List on FPCB

No	Part Name	Specification	Maker	EA	Note
1	CHIP CAPACITOR	2.2uF, 6.3V, ±10%, X5R, 1005, 0.5t	MURATA, TAYO YUDEN, TDK, AVX- KYOCERA, Samsung Electro- Mechanics, Walsin	2	C1, C5
2		1uF, 6.3V, ±10%, X5R, 1005, 0.5t		7	C2,C3,C4,C8,C13, C19,C20
3		2.2uF, 10V, ±10%, X5R, 1005, 0.5t		2	C6,C7
4		2.2uF, 25V, ±10%,X5R, 1005, 0.5t		2	C9, C10
5		1uF, 10V, ±10%, X5R, 1005, 0.5t		6	C11,C12,C14,C15, C17,C18
6	SCHOTTKY DIODE	KDR730F, KEC, TFSC	KEC	1	D1
7	FPC	2LAYER, 32.19*37.48*0.13	Circuit Flex	1	-
8	CONNECTOR	50Pin [Plug] : GB042-50P-H10-E3000	LS엠트론	1	CN2

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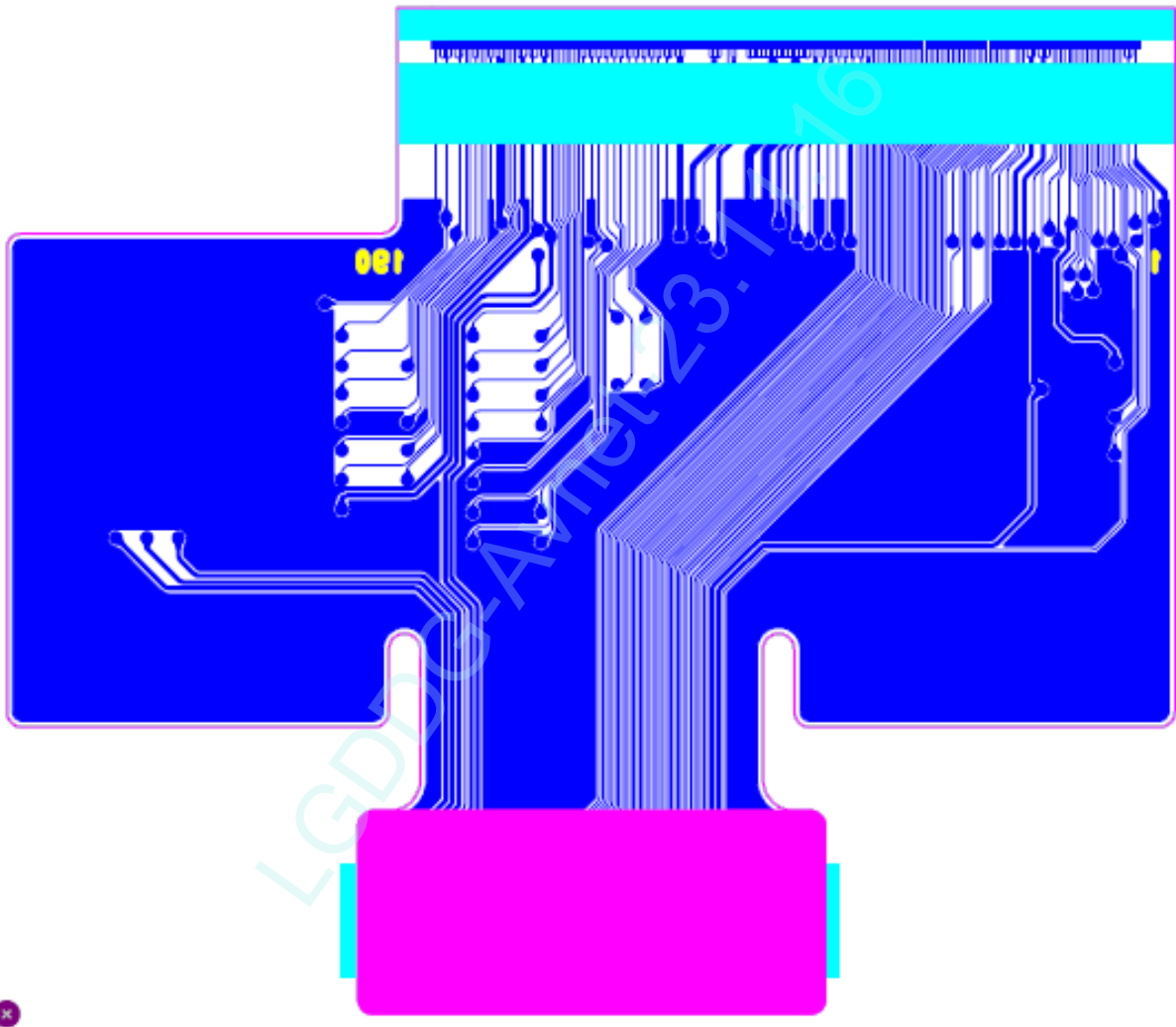
8. FPCB Layout

8.1. Main Top Layer



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8.2. Main Bottom Layer



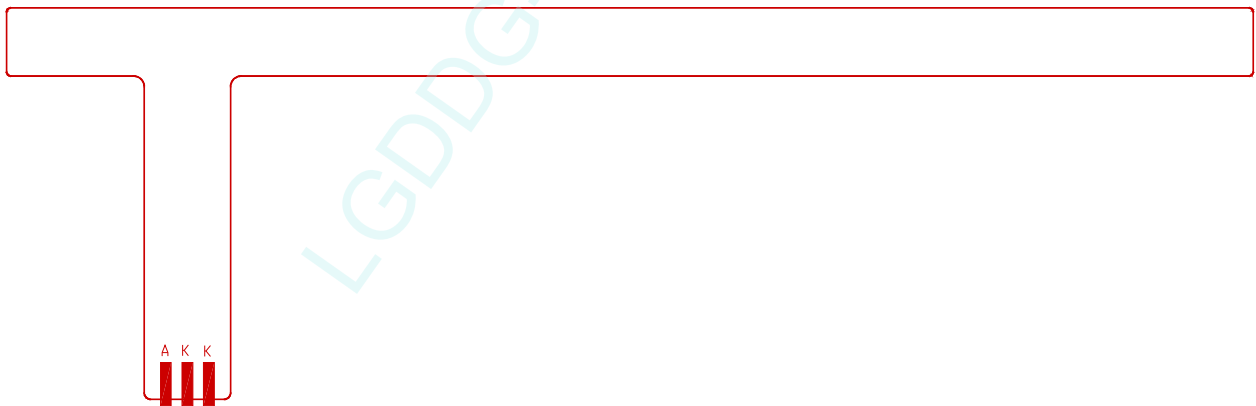
Product Specification

8.3. BLU LED Layer

8.3.1 Top Pattern



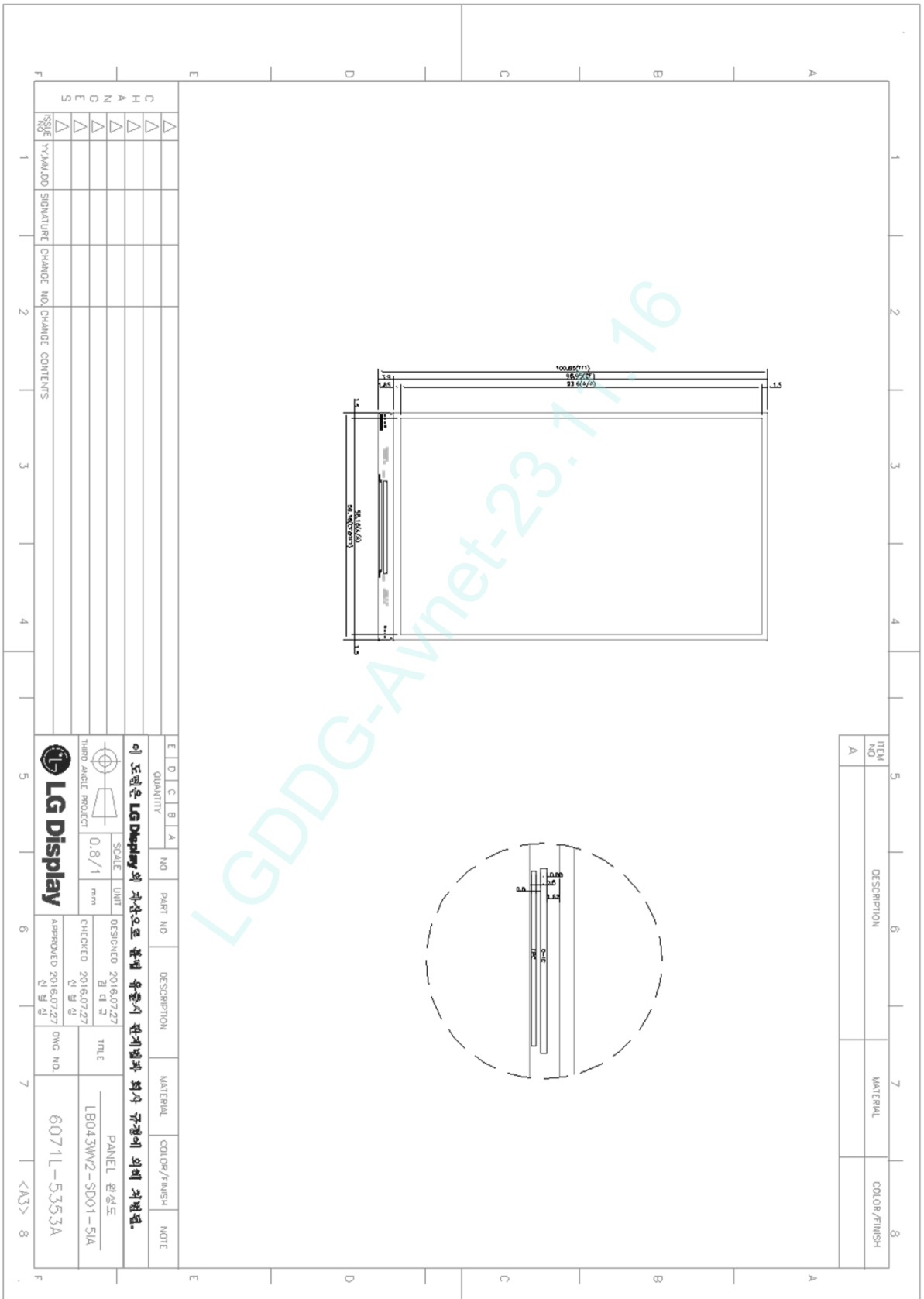
8.3.2 Bottom Pattern



LGDDG-Avnet-23.17.16

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9. Panel Layout



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10. BLU Layout

CONFIDENTIAL

No.	Date	editor	Contents	2	3	4	5	6	7	8
Tovis Co., Ltd										

Normal Tol.	±0.1	Sheets	1 / 1	Model No.	DM430N1A
Material		Date	2016.09.21	Part Name	BLU ASSEMBLY
Scale	1 : 1	Qty	1	Draw No.	-
Drawn by	J.Y.JUNG	Designed by	Y.K.CHANG	Checked by	S.H.JUNG
Fovis Total Visual Appliance					

ITEM	REV	DATE	BY	CHK	REMARK
1	1	2016.09.21	JYJ	YKC	Initial Release
2	2	2016.09.21	JYJ	YKC	Change of Part
3	3	2016.09.21	JYJ	YKC	Change of Part
4	4	2016.09.21	JYJ	YKC	Change of Part
5	5	2016.09.21	JYJ	YKC	Change of Part
6	6	2016.09.21	JYJ	YKC	Change of Part
7	7	2016.09.21	JYJ	YKC	Change of Part
8	8	2016.09.21	JYJ	YKC	Change of Part
9	9	2016.09.21	JYJ	YKC	Change of Part
10	10	2016.09.21	JYJ	YKC	Change of Part

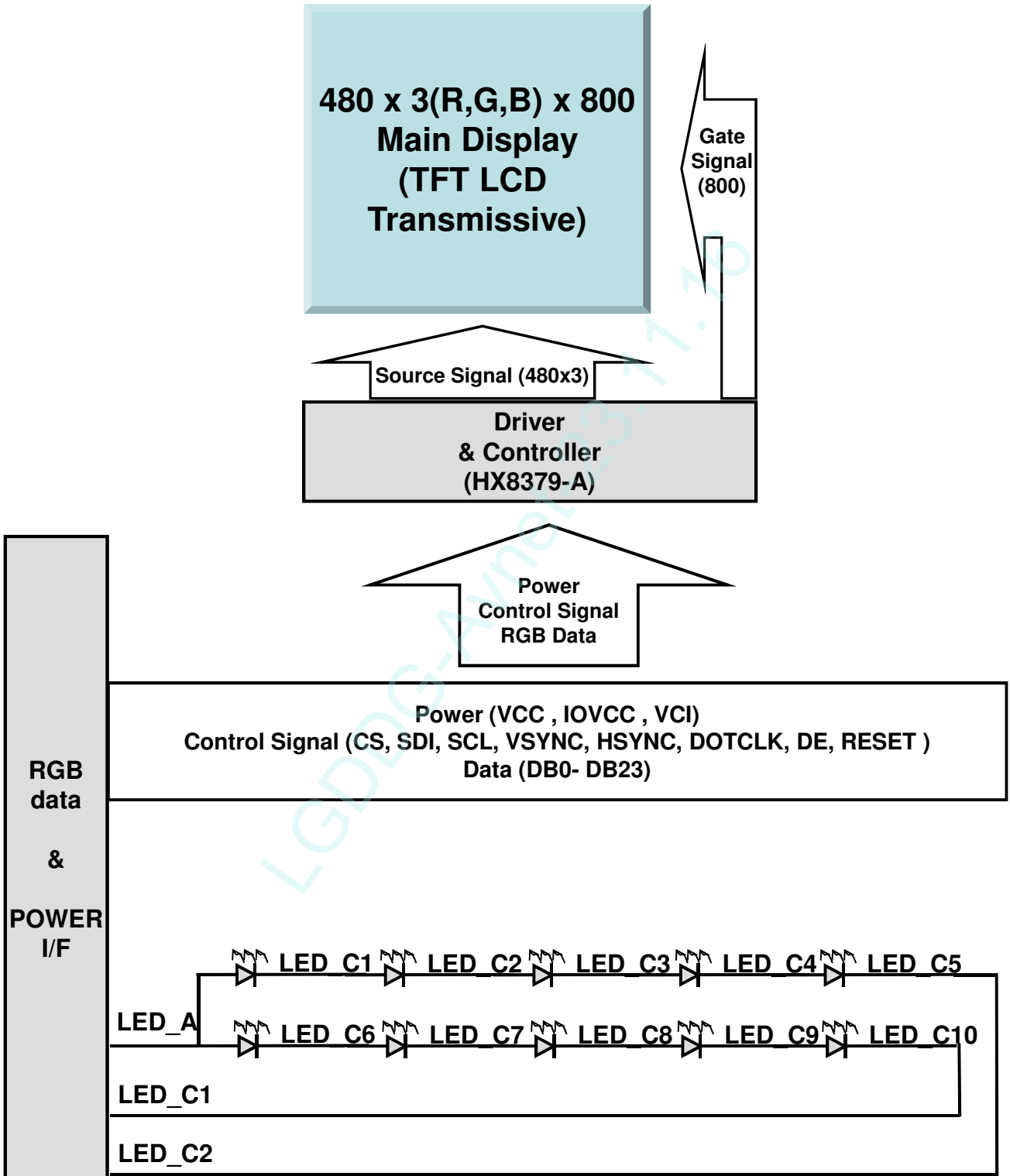
REV	REV	DATE	BY	CHK	REMARK
1	1	2016.09.21	JYJ	YKC	Initial Release
2	2	2016.09.21	JYJ	YKC	Change of Part
3	3	2016.09.21	JYJ	YKC	Change of Part
4	4	2016.09.21	JYJ	YKC	Change of Part
5	5	2016.09.21	JYJ	YKC	Change of Part
6	6	2016.09.21	JYJ	YKC	Change of Part
7	7	2016.09.21	JYJ	YKC	Change of Part
8	8	2016.09.21	JYJ	YKC	Change of Part
9	9	2016.09.21	JYJ	YKC	Change of Part
10	10	2016.09.21	JYJ	YKC	Change of Part

REV	REV	DATE	BY	CHK	REMARK
1	1	2016.09.21	JYJ	YKC	Initial Release
2	2	2016.09.21	JYJ	YKC	Change of Part
3	3	2016.09.21	JYJ	YKC	Change of Part
4	4	2016.09.21	JYJ	YKC	Change of Part
5	5	2016.09.21	JYJ	YKC	Change of Part
6	6	2016.09.21	JYJ	YKC	Change of Part
7	7	2016.09.21	JYJ	YKC	Change of Part
8	8	2016.09.21	JYJ	YKC	Change of Part
9	9	2016.09.21	JYJ	YKC	Change of Part
10	10	2016.09.21	JYJ	YKC	Change of Part

Unit:mm

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11. Block Diagram



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12. Pin Description

12.1. Input Signal and Power

- . Connector : 50Pin B to B → GB042-50P-H10-E3000 (Maker : LS Mtron)

Pin No.	Symbol	Description	Remark
1	VCI	I	Power supply for internal analog circuits
2	VCC	I	Power supply for internal regulator circuits
3	GND	-	Ground
4	PCLK	I/O	Pixel Clock
5	DE	I/O	Data Enable
6	HSYNC	I/O	Horizontal Sync
7	VSYNC	I/O	Vertical Sync
8	GND	-	Ground
9	DB0	I/O	DATA BUS
10	DB1	I/O	DATA BUS
11	DB2	I/O	DATA BUS
12	DB3	I/O	DATA BUS
13	DB4	I/O	DATA BUS
14	DB5	I/O	DATA BUS
15	DB6	I/O	DATA BUS
16	DB7	I/O	DATA BUS
17	DB16	I/O	DATA BUS
18	DB17	I/O	DATA BUS
19	DB18	I/O	DATA BUS
20	DB19	I/O	DATA BUS
21	DB20	I/O	DATA BUS
22	DB21	I/O	DATA BUS
23	DB22	I/O	DATA BUS
24	DB23	I/O	DATA BUS
25	GND	-	Ground

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Pin No.	Symbol	Description	Remark
26	GND	-	Ground
27	VPP	I	OTP(Open, only use for LCD)
28	IOVCC	I	Power supply for internal logic circuits
29	PWM	O	Backlight Control (CABC)
30	LCD Reset	I	Reset Control
31	GND	-	Ground
32	DB15	I/O	DATA BUS
33	DB14	I/O	DATA BUS
34	DB13	I/O	DATA BUS
35	DB12	I/O	DATA BUS
36	DB11	I/O	DATA BUS
37	DB10	I/O	DATA BUS
38	DB9	I/O	DATA BUS
39	DB8	I/O	DATA BUS
40	GND	-	Ground
41	IOVCC	I	Power supply for internal logic circuits
42	SCK	I	Serial Clock (SPI)
43	NCS	I	Serial Chip Select
44	SDI	I	Serial Data Input
45	SDO	O	Serial Data Output
46	GND	-	Ground
47	LED_Cathode	I	LED Cathode connection
48	LED_Cathode	I	LED Cathode connection
49	LED_Anode	I	LED Anode connection
50	GND	-	Ground

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12.2. Relation between Input Signal and Color

COLOR	DISPLAY	DATA SIGNAL																				GRAY SCALE LEVEL				
		RED								GREEN								BLUE								
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4		B3	B2	B1	B0
BASIC COLOR	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	-
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0	
	DARK	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1	
	.	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2	
	.	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R252	
	.	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	.	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253	
	LIGHT	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254	
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R255	
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0	
	DARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	G1	
	.	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	G2	
	.	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G252	
	.	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	.	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	G253	
	LIGHT	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	G254	
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G255	
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0	
	DARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	B1	
	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	B2	
	.	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B252	
	.	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	B253	
	LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254	
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B255	

Note) Gray definition

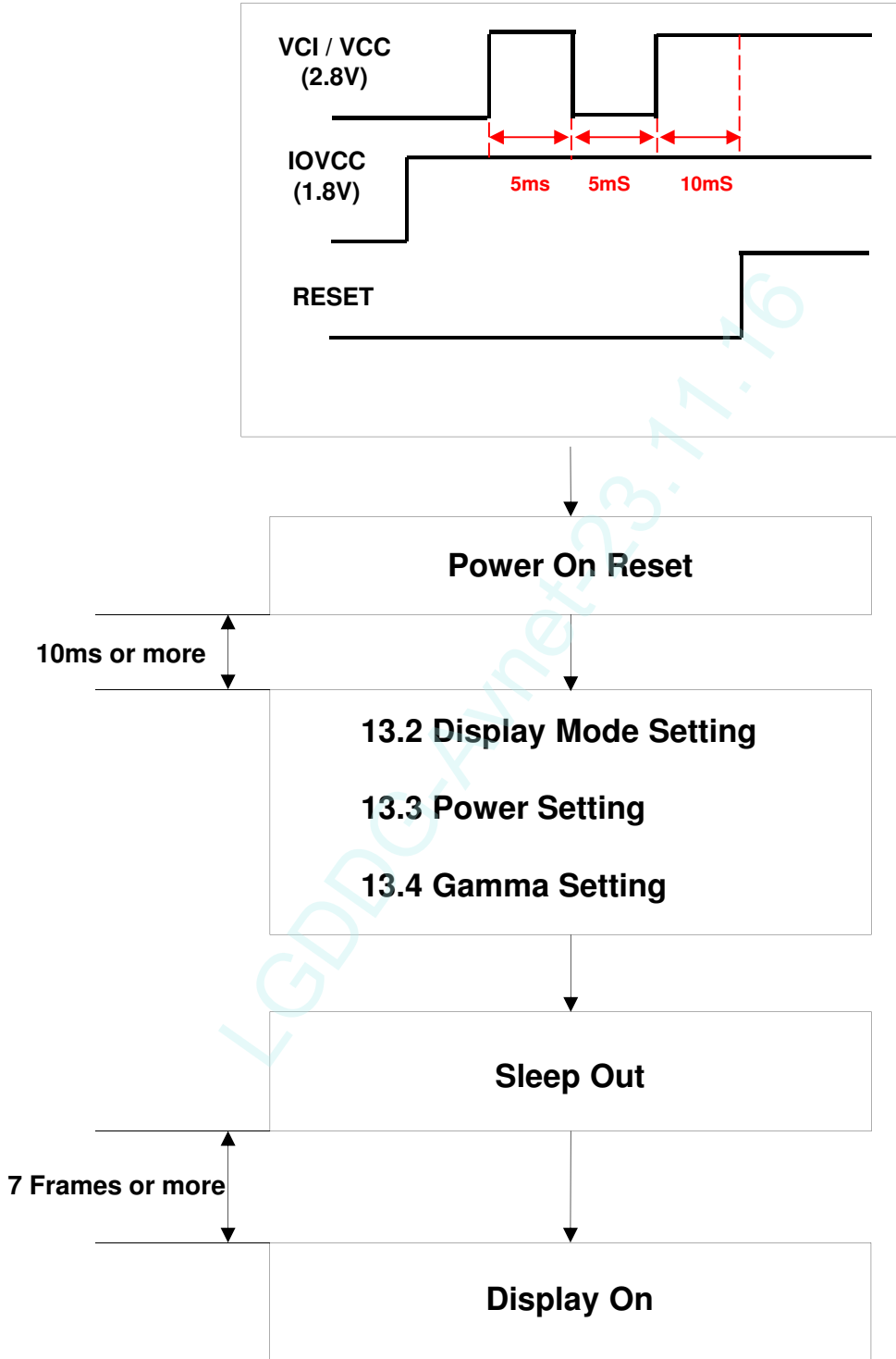
Rn : RED Gray, Gn : GREEN Gray, Bn : BLUE Gray (n = Gray Level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

Product Specification

13. Register Values

13.1 Flow Chart



Product Specification
13.2 Extension command setting

REGISTER FUNCTION	INDEX/DATA	HEX
Set display related register	INDEX	0xB9
	DATA	0xFF
	DATA	0x83
	DATA	0x79

13.3 Display Mode Setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set display related register	INDEX	0xB2
	DATA1	0x00
	DATA2	0x00
	DATA3	0x3C
	DATA4	0x0B
	DATA5	0x11
	DATA6	0x19
	DATA7	0x52
	DATA8	0x00
	DATA9	0xFF
	DATA10	0x0B
	DATA11	0x11
	DATA12	0x19
	DATA13	0x20

Product Specification
13.4 Power setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set power	INDEX	0xB1
	DATA1	0x00
	DATA2	0x50
	DATA3	0x36
	DATA4	0xE2
	DATA5	0x4F
	DATA6	0x08
	DATA7	0x11
	DATA8	0x14
	DATA9	0x14
	DATA10	0x3D
	DATA11	0x45
	DATA12	0xBF
	DATA13	0x3F
	DATA14	0x42
	DATA15	0x05
	DATA16	0x76
	DATA17	0xF1
	DATA18	0x00
	DATA19	0xE6
	DATA20	0xE6
	DATA21	0xE6
	DATA22	0xE6
	DATA23	0xE6
	DATA24	0x00
	DATA25	0x04
	DATA26	0x05
	DATA27	0x0A
	DATA28	0x0B
	DATA29	0x04
	DATA30	0x05
	DATA31	0x6F

Product Specification

13.5 Panel driving timing setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set panel driving timing	INDEX	0xB4
	DATA1	0x12
	DATA2	0x06
	DATA3	0x00
	DATA4	0x32
	DATA5	0x10
	DATA6	0x04
	DATA7	0x00
	DATA8	0x00
	DATA9	0x00
	DATA10	0x00
	DATA11	0x00
	DATA12	0x00
	DATA13	0x37
	DATA14	0x0A
	DATA15	0x40
	DATA16	0x08
	DATA17	0x37
	DATA18	0x15
	DATA19	0x33
	DATA20	0x14
	DATA21	0x3C
	DATA22	0x51
	DATA23	0x0A
	DATA24	0x0A
	DATA25	0x40
	DATA26	0x0A
	DATA27	0x30
	DATA28	0x14
	DATA29	0x40
	DATA30	0x55
DATA31	0x0A	

Product Specification

13.6 VCOM setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set VCOM voltage	INDEX	0xB6
	DATA1	0x00
	DATA2	0x77
	DATA3	0x00
	DATA4	0x77

13.7 Internal TE function setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set internal TE function	INDEX	0xB7
	DATA1	0x10
	DATA2	0x50
	DATA3	0x00

13.8 Panel setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set panel	INDEX	0xCC
	DATA1	0x02

Product Specification
13.9 GIP setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set GIP	INDEX	0xD5
	DATA1	0x00
	DATA2	0x00
	DATA3	0x0A
	DATA4	0x00
	DATA5	0x01
	DATA6	0x03
	DATA7	0x00
	DATA8	0x14
	DATA9	0x00
	DATA10	0x88
	DATA11	0x88
	DATA12	0x01
	DATA13	0x88
	DATA14	0x67
	DATA15	0x88
	DATA16	0x45
	DATA17	0x88
	DATA18	0x23
	DATA19	0x88
	DATA20	0x01
	DATA21	0x88
	DATA22	0x23
	DATA23	0x88
	DATA24	0x88
	DATA25	0x88
	DATA26	0x88
	DATA27	0x88
	DATA28	0x88
	DATA29	0x88
	DATA30	0x88
	DATA31	0x88

Product Specification

13.9 GIP setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set GIP	DATA32	0x88
	DATA33	0x88
	DATA34	0x88
	DATA35	0x88
	DATA36	0x88
	DATA37	0x88
	DATA38	0x88
	DATA39	0x88
	DATA40	0x88
	DATA41	0x88
	DATA42	0x01
	DATA43	0x01
	DATA44	0x00
	DATA45	0x00
	DATA46	0x03
DATA47	0x00	

13.10 Power option setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set power option	INDEX	0xDE
	DATA1	0x05
	DATA2	0x70
	DATA3	0x04

Product Specification
13.11 Gamma setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set gamma curve related setting	INDEX	0xE0
	DATA1	0x79
	DATA2	0x01
	DATA3	0x11
	DATA4	0x13
	DATA5	0x24
	DATA6	0x26
	DATA7	0x3A
	DATA8	0x18
	DATA9	0x32
	DATA10	0x06
	DATA11	0x0B
	DATA12	0x0D
	DATA13	0x10
	DATA14	0x13
	DATA15	0x11
	DATA16	0x14
	DATA17	0x12
	DATA18	0x16
	DATA19	0x00
	DATA20	0x09
	DATA21	0x11
	DATA22	0x24
	DATA23	0x26
	DATA24	0x39
	DATA25	0x16
	DATA26	0x30
	DATA27	0x06
	DATA28	0x0B
	DATA29	0x0D
	DATA30	0x10
	DATA31	0x13

Product Specification
13.11 Gamma setting (temporary)

REGISTER FUNCTION	INDEX/DATA	HEX
Set gamma curve related setting	DATA32	0x11
	DATA33	0x14
	DATA34	0x12
	DATA35	0x16

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Product Specification

13.12 Stand-by In Sequence

REGISTER FUNCTION	INDEX/DATA	HEX
Display OFF	INDEX	0x0028
<i>Wait typ. 120ms</i>		
Sleep In	INDEX	0x0010
Link Shutdown		

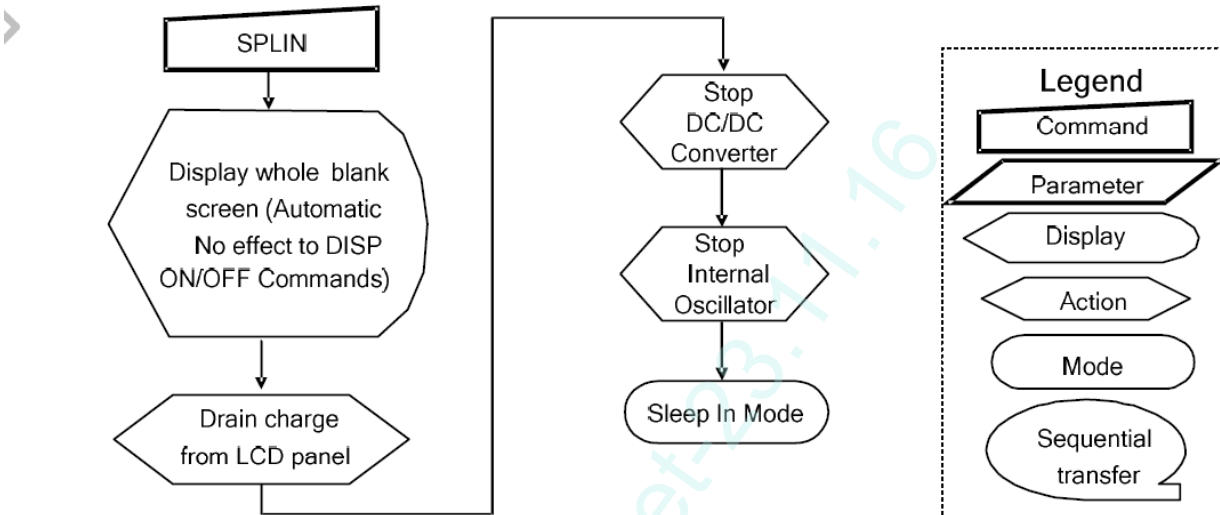
13.13 Stand-by Out Sequence

REGISTER FUNCTION	INDEX/DATA	HEX
Link Wake up		
Sleep Out	INDEX	0x0011
<i>Wait typ. 120ms</i>		
Display ON	INDEX	0x0029

Product Specification

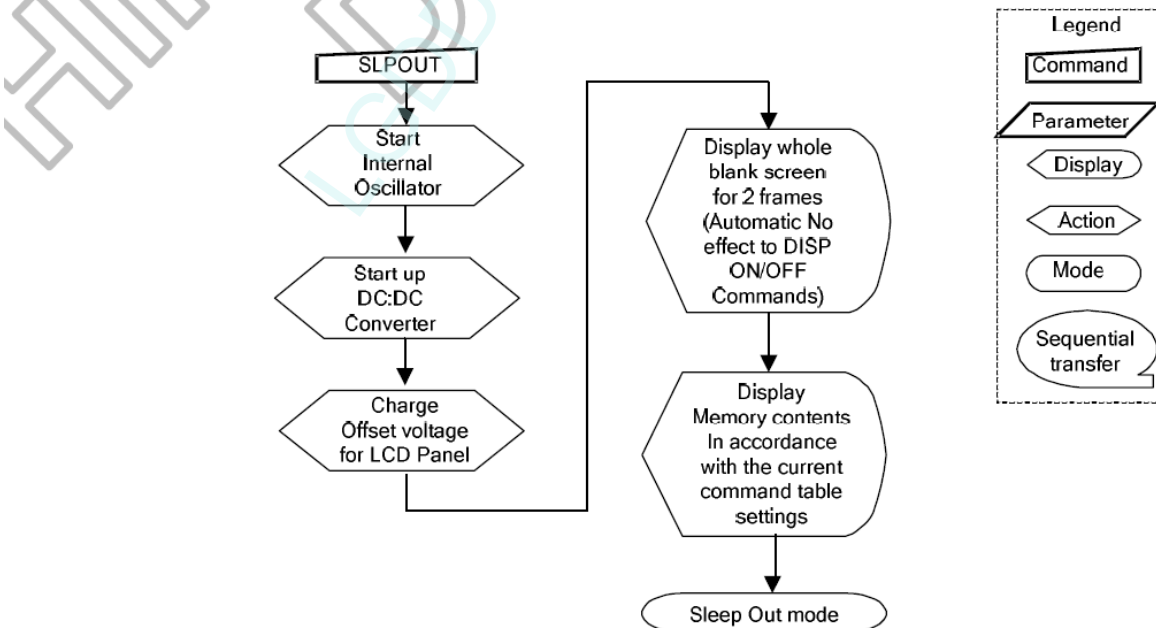
13.14 Deep Standby-In Sequence

It takes 120msec to get into Sleep In mode after SLPIN command issued.



13.15 Deep Standby Out Sequence

It takes 120msec to become Sleep Out mode after SLPOUT command issued.

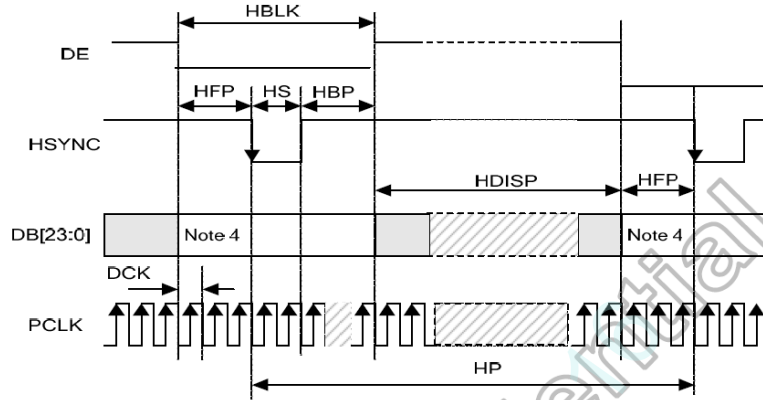


Product Specification

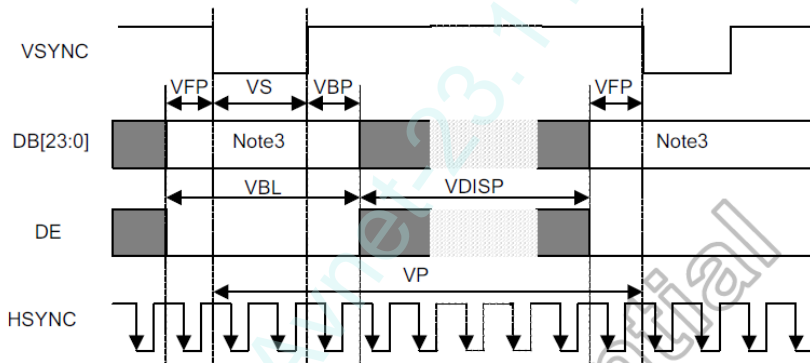
14. Timing Characteristics

14.1. SIGNAL TIMING SPECIFICATIONS

Horizontal Timing



Vertical Timing



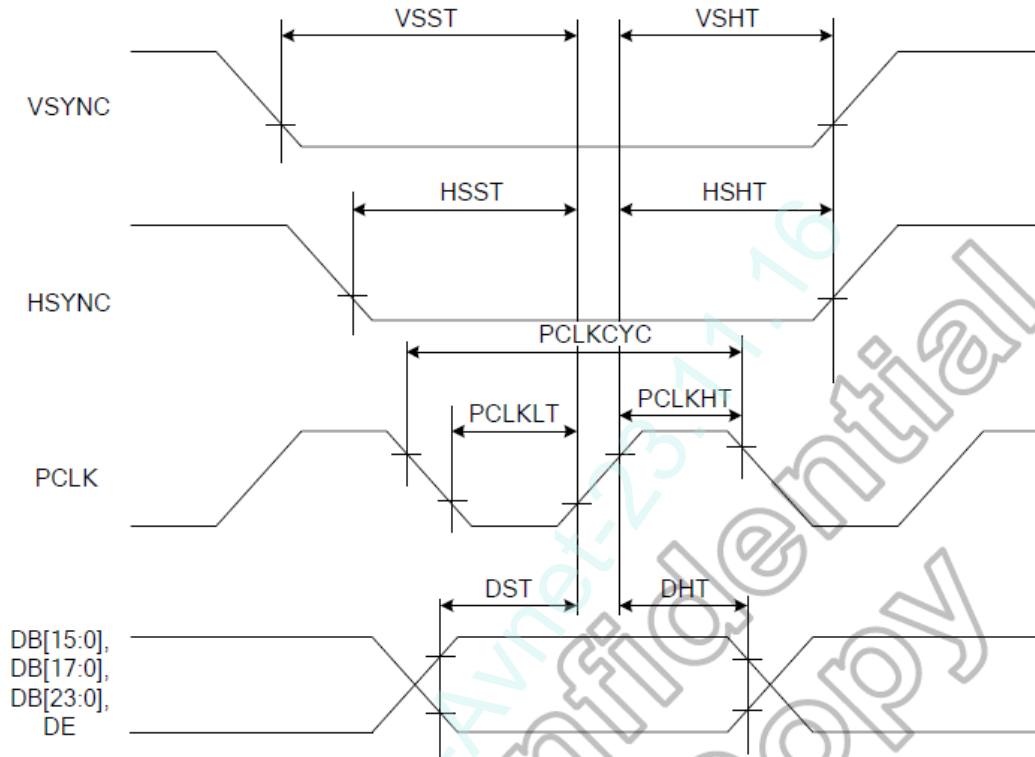
RGB Timing has not fixed yet

Item	Symbol	Typ.	Unit	Remarks
Pixel Clock	DCK	(27.5)	MHz	
Hsync low pulse width	HS	(5)	clk	
Number of Horizontal		(560)	clk	
Horizontal back porch	HBP	(35)	clk	
Hsync front porch	HFP	(40)	clk	
Horizontal data start point	HS+HBP	(40)	clk	
Hsync blanking period	HS+HBP+HFP	(80)	clk	
Vsync low pulse width	VS	(2)	line	
Number of vertical		(819)	line	
Vsync back porch	VBP	(11)	line	
Vsync front porch	VFP	(6)	line	
Vertical blanking period	VS+VBP+VFP	(19)	line	
Vertical refresh rate		(60)	Hz	

Product Specification

14.1. SIGNAL TIMING SPECIFICATIONS

RGB Timing characteristic

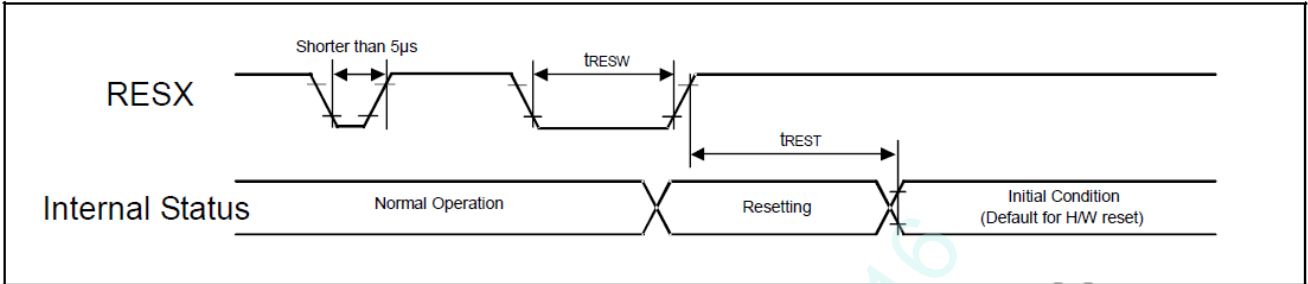


RGB Timing Characteristic

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Vsync setup time	VSST	10	-	-	ns	
Vsync hold time	VSHT	10	-	-	ns	
Hsync setup time	HSST	10	-	-	ns	
Hsync hold time	HSHT	10	-	-	ns	
Pixel clock low time	PCLKLT	10	-	-	ns	
Pixel clock high time	PCLKHT	10	-	-	ns	
Data setup time	DST	10	-	-	ns	
Data hold time	DHT	10	-	-	ns	

Product Specification

14.2. Reset TIMING SPECIFICATIONS

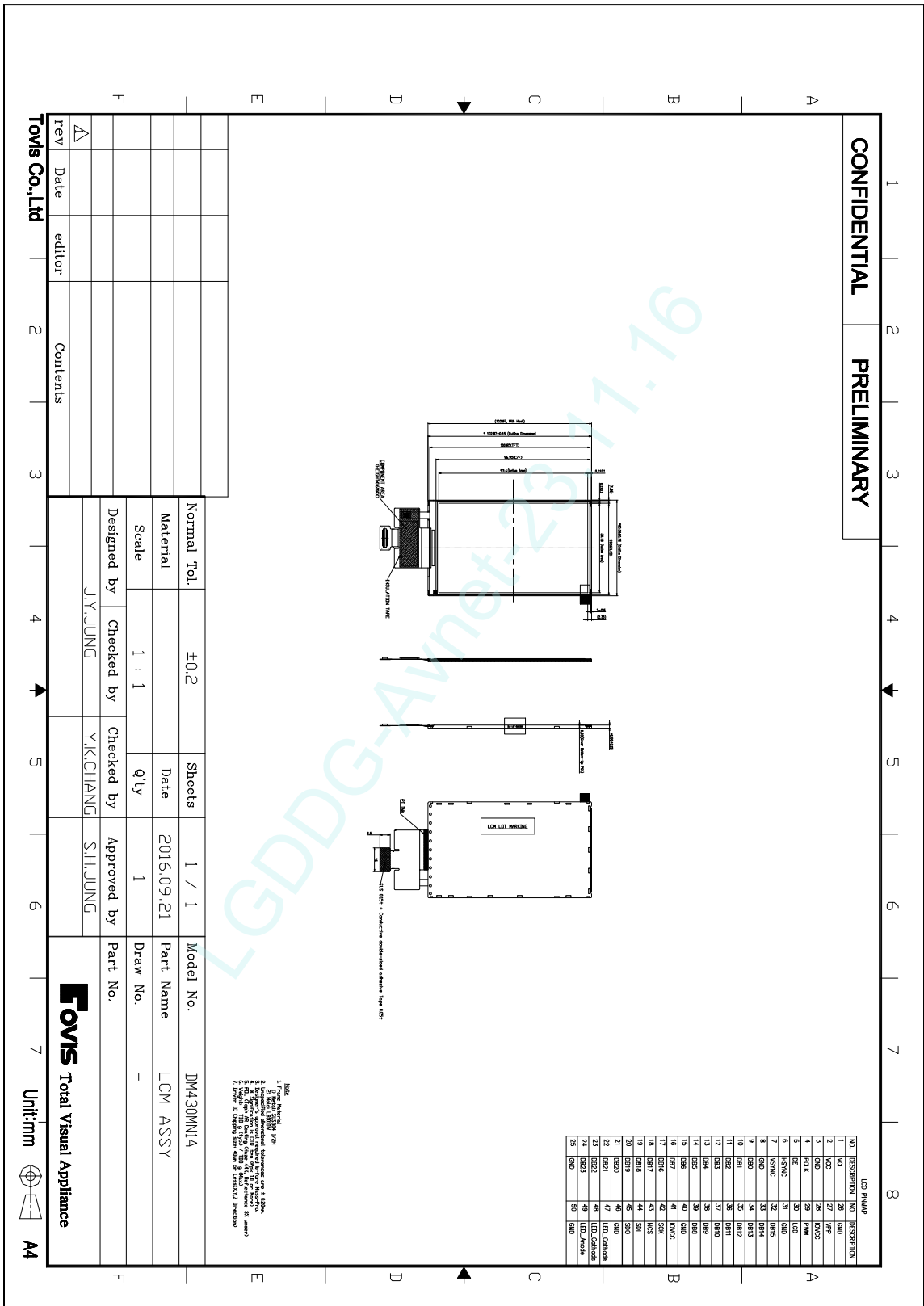


Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Reset low pulse width	t_{RESW}	10	-	-	µs	

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Product Specification

15. Outline Dimension



Rev	Date	editor	Contents
Δ			

Normal Tol.	±0.2	Sheets	1 / 1	Model No.	DM430M1A
Material		Date	2016.09.21	Part Name	LCM ASSY
Scale	1 : 1	q'ty	1	Draw No.	-
Designed by	J.Y. JUNG	Checked by	Y.K. CHANG	Approved by	S.H. JUNG

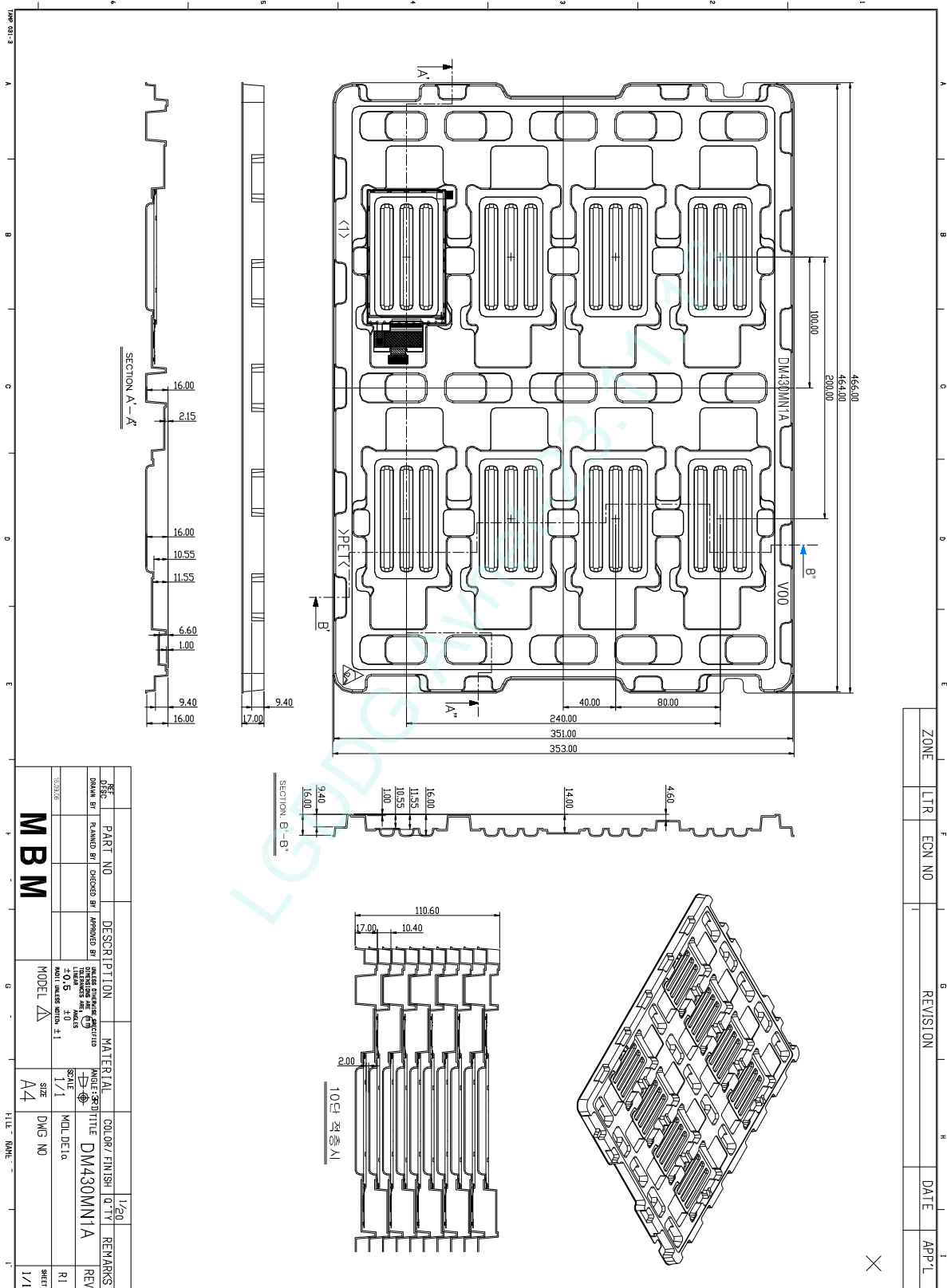
TOVIS Total Visual Appliance

Unit:mm A4

Product Specification

16. Packing

16.1. Packing Dimension



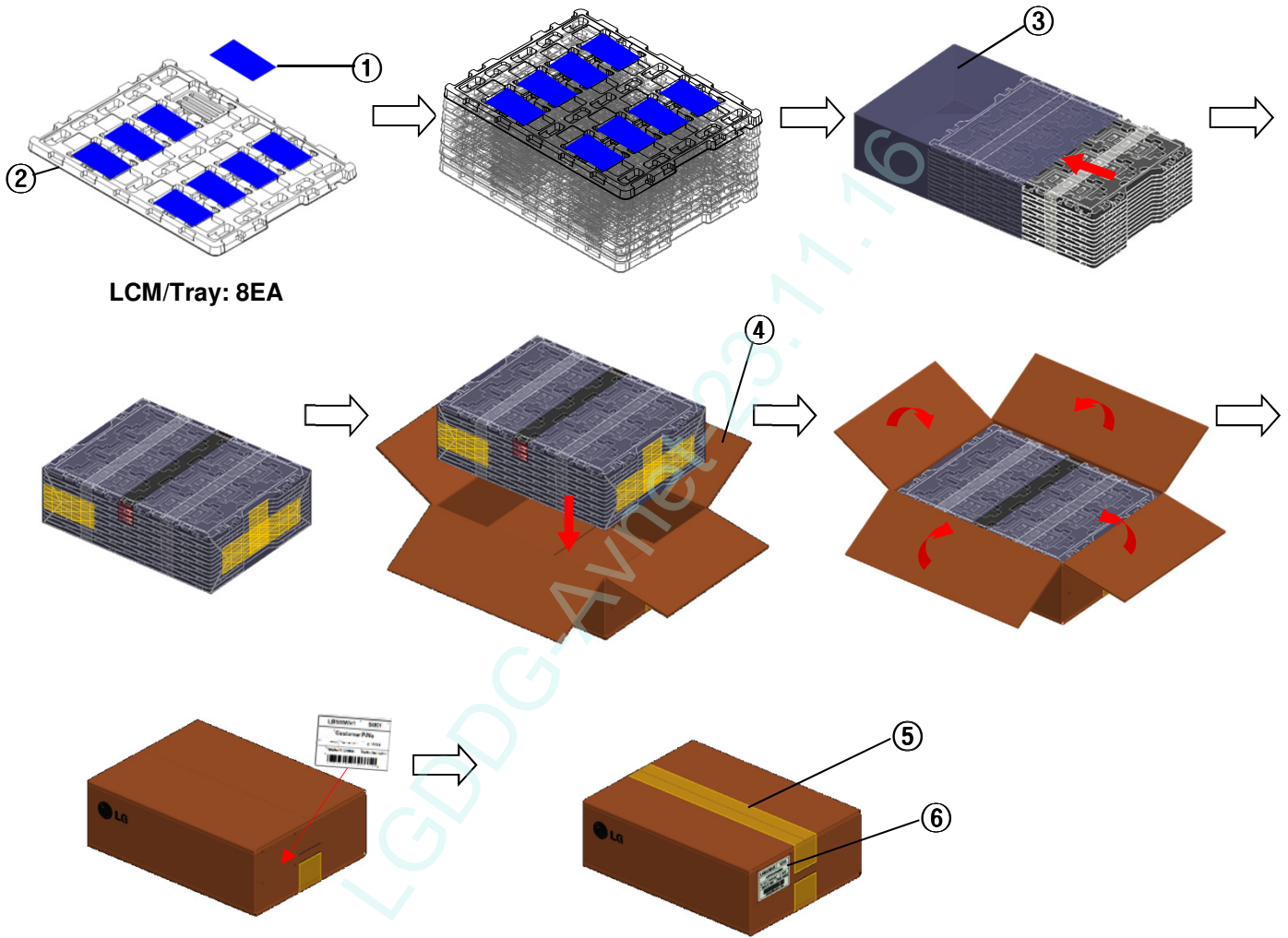
ZONE	LTR	ECN NO	REVISION	DATE	APP'L
------	-----	--------	----------	------	-------

DATE	PART NO	DESCRIPTION	MATERIAL	CO. OR / ENHSH	QTY	REMARKS
1/20						
DRAWN BY	ISSUED BY	DESIGNED BY	APPROVED BY	DATE	SCALE	MODEL
					1/1	MDL.DELA
DRAWN BY		ISSUED BY		DATE		SCALE
M B M				1/1		MDL.DELA
MODEL		A4		DWG NO		SHEET
1/1						1/1

Product Specification

16.2. Packing Description

1. The stacked tray per a box : 13pcs tray
→ Full (LCD Included) tray 12pcs + Empty tray 1pcs
2. Stacking Method of Trays : Zigzag

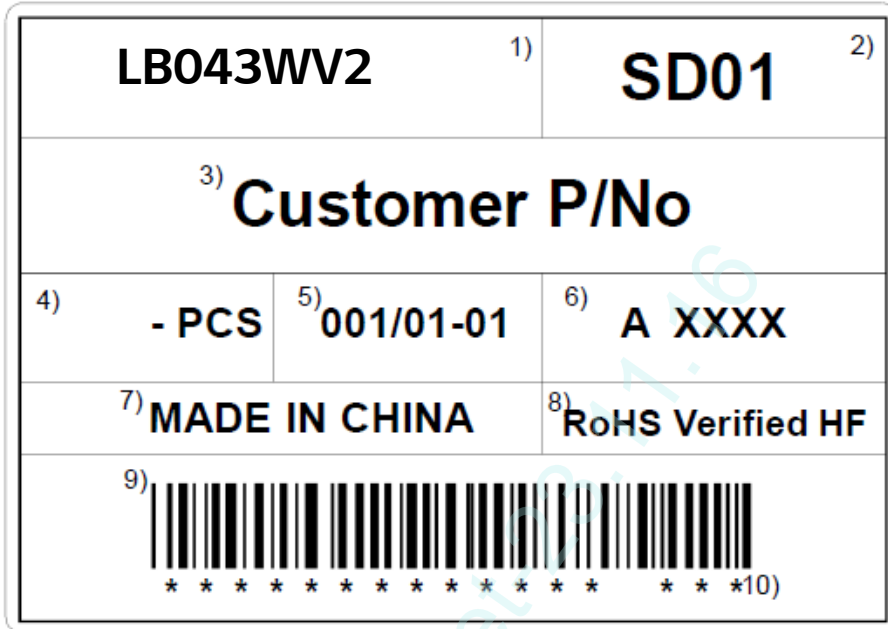


LCM/Tray: 8EA

NO.	Description	Material
1	LCM	96pcs/1 Box
2	Packing Tray	PET (antistatic)
3	Bag	PE
4	Carton Box	SW
5	Tape	OPP 70MMx300m
6	Label	Box Label

Product Specification

16.3. Packing Label Design



< BOX, Pallet Label >

- 1) Base model name : LB043WV2
- 2) Suffix1 : SD01
- 3) LCD's Part Number at Customer
- 4) Product Volume : declaring the volume of product in the BOX/PALLET
- 5) Lot/MM-DD
 - Lot No : declaring the BOX/PALLET No. in the number according to Production plan in sequence.
 - MM-DD :declaring packing Month/day
- 6) REMARK
 - Register the Production change facts
- 7) Origin declaration : (Only Module business)
 - TOVIS Dalian : MADE IN CHINA
- 8) Declaration RoHS and halogen free verified expression
- 9) Barcode Type : Code 128A Type
- 10) Suffix2

Product Specification

16.4. Designation of Lot Mark(TBD)

Byte	1	2	3	4	5	6	7	8	9	10	11	-	12	13
------	---	---	---	---	---	---	---	---	---	----	----	---	----	----

1. Factory Code

Byte	1	2
------	---	---

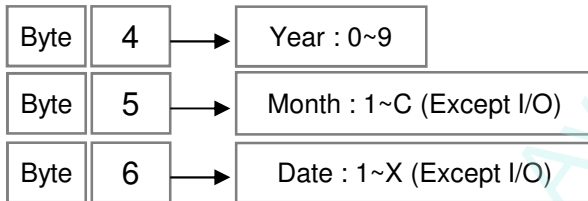
Mark	Description	Mark	Description
M 4	M4	J 1	LGD Y1 (Yantai)
X C	KREMS	X L	Raygen (Yantai)
X W	육일	X 3	Heesung Y3 (Yantai)
X P	Suntel	X K	Huaan (Yantai)
X U	Tovis (Dalian)		

2. Lot Type

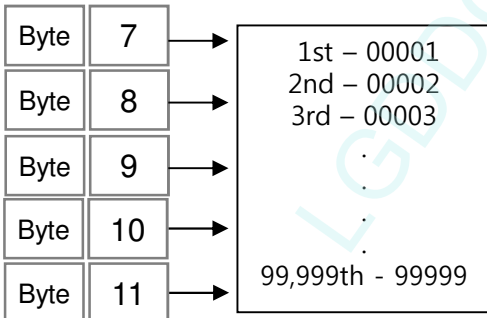
Byte	3
------	---

Mark	Desc.
N	Normal
A	C/P Line
B	D/B Line
C	조립 Line
R	Rework
G	GIB
P	Packing

3. Year/Month/Data of Production



4. Assembly Information of



5. Sample Code

Byte	12	13
------	----	----

MP	Code "Delete"
BS	Buyer sample
DV	DV Event
RV	RV Event
PV	PV Event



Product Specification
17. Reliability and Inspection Standard
17.1. Reliability

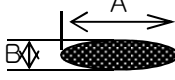
No	Test Item	Test Conditions	Remark
1	High Temperature	70°C , 96 Hr	Operation
2	Low Temperature	-20°C, 96 Hr	Operation
3	High Temperature and High Humidity	60°C, 90% RH, 96 Hr	Operation
4	Low Temperature Storage	-30°C, 96 Hr	Non Operation
5	High Temperature Storage	80°C, 96 Hr	Non Operation
6	Thermal Shock	-30°C, 80°C(30Min) 20clcyce	Non Operation
7	Vibration Test	Random truck & air 1.5Grms , 1Hr (Packaged in a box)	Non Operation
8	Drop Test	76cm / 3Corner / 6Face, 1clcyce (Packaged in a box)	Non Operation
9	Electrostatic withstanding voltage	Air : 330Ohm 150pF ± 15kV	Non Operation
		Contact : 0Ohm 200pF ± 200V	Non Operation

17.2. Fault Judgment Criteria

TFT- LCD Module should be at room temperature for 24hours when the display quality test is over. There should be no particular change which might affect the practical display function and the display quality test should be conducted under normal operating condition.

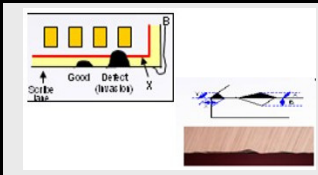
Product Specification

17.3. Inspection Standard for Main LCD

No	Item	Criterion for Defects	Defect type												
1	Non Lighting	Nothing	Major												
2	Irregular Operation	Nothing	Major												
3	Short	Nothing	Major												
4	Open	Nothing	Major												
5	Dot (Pixel) Defect	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Item</th> <th>Bright Dot</th> <th>Dark Dot</th> </tr> </thead> <tbody> <tr> <td>Acceptable No.</td> <td style="text-align: center;">1</td> <td style="text-align: center;">2</td> </tr> </tbody> </table> <p>Note 1) Case of Dot defect is below ① Bright Dot (white spot) : "1" ② Dark Dot (black spot) : "2" (In case of Dark Dot on Main TFT LCD) - NG if there's full Dot defect. - Damaged less than half size of sub-pixel is not counted as defect - Dots darker than half size of sub-pixel are not defined as bright dot defect</p>	Item	Bright Dot	Dark Dot	Acceptable No.	1	2	Minor						
Item	Bright Dot	Dark Dot													
Acceptable No.	1	2													
6	Foreign material / particle Size : $\Phi=(A+B)/2$	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Size Φ (mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center;">Circle</td> <td style="text-align: center;">$\Phi \leq 0.10$</td> <td style="text-align: center;">Ignore (note1)</td> </tr> <tr> <td style="text-align: center;">$0.10 < \Phi \leq 0.20$</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">$0.20 < \Phi$</td> <td style="text-align: center;">0</td> </tr> </tbody> </table> <p>Note 1) Particle specification is applied either dark or bright. 2) If any tendency appears, particle specification may be changed by the conference.</p>		Size Φ (mm)	Acceptable number	Circle	$\Phi \leq 0.10$	Ignore (note1)	$0.10 < \Phi \leq 0.20$	1	$0.20 < \Phi$	0	Minor		
	Size Φ (mm)	Acceptable number													
Circle	$\Phi \leq 0.10$	Ignore (note1)													
	$0.10 < \Phi \leq 0.20$	1													
	$0.20 < \Phi$	0													
7	Line type Particle	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Length (mm)</th> <th>Width (mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Linear $L \leq 2.0$</td> <td style="text-align: center;">$W \leq 0.03$ $0.03 < W \leq 0.05$</td> <td style="text-align: center;">Ignore (note 2) 1</td> </tr> </tbody> </table>	Length (mm)	Width (mm)	Acceptable number	Linear $L \leq 2.0$	$W \leq 0.03$ $0.03 < W \leq 0.05$	Ignore (note 2) 1	Minor						
Length (mm)	Width (mm)	Acceptable number													
Linear $L \leq 2.0$	$W \leq 0.03$ $0.03 < W \leq 0.05$	Ignore (note 2) 1													
8	Back Light	① No light is rejectable ② Flickering and abnormal lighting are rejectable ※ In case of the model with back light (E/L, LED)	Major												
9	Scratch on Polarizer 	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Width (mm)</th> <th>Length (mm)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$W \leq 0.02$</td> <td style="text-align: center;">$L < 1.0$</td> <td style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.02 < W \leq 0.03$</td> <td style="text-align: center;">$L \leq 1.0$</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">$0.03 < W$</td> <td style="text-align: center;">-</td> <td style="text-align: center;">0</td> </tr> </tbody> </table>	Width (mm)	Length (mm)	Acceptable number	$W \leq 0.02$	$L < 1.0$	Ignore	$0.02 < W \leq 0.03$	$L \leq 1.0$	1	$0.03 < W$	-	0	Minor
Width (mm)	Length (mm)	Acceptable number													
$W \leq 0.02$	$L < 1.0$	Ignore													
$0.02 < W \leq 0.03$	$L \leq 1.0$	1													
$0.03 < W$	-	0													


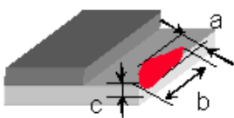
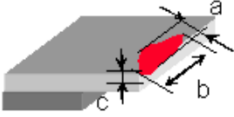
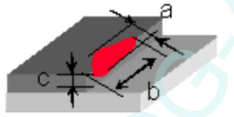
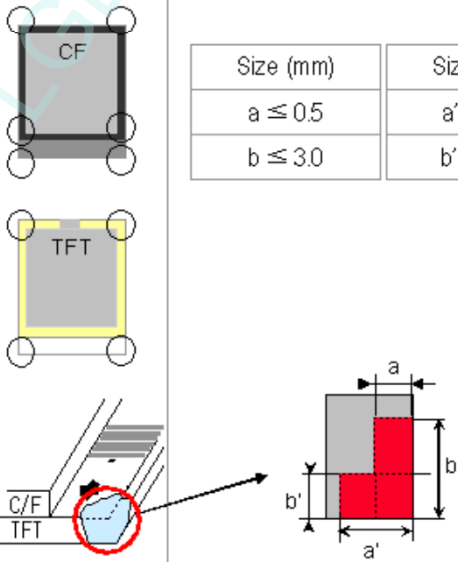
Product Specification

17.3. Inspection Standard for Main LCD

No	Item	Criterion for Defects	Defect type								
10	Dent/Bubble in Polarizer Φ : Average Diameter	<table border="1" style="width: 100%; text-align: center;"> <tr> <th>Size Φ (mm)</th> <th>Acceptable number</th> </tr> <tr> <td>Φ ≤ 0.10</td> <td>Ignore (note1)</td> </tr> <tr> <td>0.10 < Φ ≤ 0.20</td> <td>1</td> </tr> <tr> <td>0.20 < Φ</td> <td>0</td> </tr> </table>	Size Φ (mm)	Acceptable number	Φ ≤ 0.10	Ignore (note1)	0.10 < Φ ≤ 0.20	1	0.20 < Φ	0	Minor
		Size Φ (mm)	Acceptable number								
Φ ≤ 0.10	Ignore (note1)										
0.10 < Φ ≤ 0.20	1										
0.20 < Φ	0										
Note 1) Damaged protect film is ignored as long as Polarizer has no defects such as stain, dent, scratch and etc.											
11	Stains on LCD Panel Surface	Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning too are rejectable.	Minor								
12	Rust in Bezel	Rust which is visible in the bezel is rejectable.	Minor								
13	Defect of land surface Contact	Evident crevices which is visible are rejectable.	Minor								
14	Parts Mounting	<ul style="list-style-type: none"> ① Failure to mount parts ② Parts not in the specifications are mounted ③ Polarity, for example, is reversed 	Major Major Major								
15	Parts Alignment	<ul style="list-style-type: none"> ① LSI, IC Lead width is more than 50% beyond pad outline. ② Chip component is off center and more than 50% of the leads is off the pad outline. 	Minor Minor								
16	Conductive Foreign matter	<ul style="list-style-type: none"> ① On open space(GND, manual solder) solder ball is allowed up to Φ0.1mm(1EA). ② In case of shield space is allowed up to Φ0.2mm(1EA) 	Major								
17	Faculty PWB correction	① Due to PWB copper foil pattern burnout, the pattern is connected using a jumper wire for repair ; 2 or more places are corrected per PWB	Minor								
		② Short circuited part is cut, and no resist coating has been performed.	Minor								
18	Drive IC Chipping	<div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Scribe Line 침범 없을 것 (Red Line)</p> <p>X, Y(모서리) ≤ 50um</p> <p>A, B(중앙) ≤ 40um</p> </div> <div style="margin-left: 10px; border: 1px solid black; padding: 5px;"> <p>Top Side Spec.</p> <p>Back Side Spec.</p> </div> </div>	Minor								

Product Specification

17.4. Chipping and Broken

Item	Criterion for Defects			Defect Type	Remark											
[Line] Black Line White Line Foreign Particle Scratch		<table border="1"> <tr> <th>Width (mm)</th> <th>Length (mm)</th> <th>Acc. Num.</th> </tr> <tr> <td>$W \leq 0.03$</td> <td>Ignore</td> <td>Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.05$</td> <td>$L \leq 2.0$</td> <td>$N \leq 1$</td> </tr> <tr> <td>$0.05 < W \leq 0.1$</td> <td>$L \leq 2.0$</td> <td>$N \leq 1$</td> </tr> </table>	Width (mm)	Length (mm)	Acc. Num.	$W \leq 0.03$	Ignore	Ignore	$0.03 < W \leq 0.05$	$L \leq 2.0$	$N \leq 1$	$0.05 < W \leq 0.1$	$L \leq 2.0$	$N \leq 1$	Minor	
		Width (mm)	Length (mm)	Acc. Num.												
$W \leq 0.03$	Ignore	Ignore														
$0.03 < W \leq 0.05$	$L \leq 2.0$	$N \leq 1$														
$0.05 < W \leq 0.1$	$L \leq 2.0$	$N \leq 1$														
•If we cannot see any line in the appropriate operating condition of LCM, It is Acceptable.																
Glass Chipping [Pad Area]		<table border="1"> <tr> <th>Size (mm)</th> </tr> <tr> <td>$a \leq 0.3$</td> </tr> <tr> <td>$b \leq 5.0$</td> </tr> <tr> <td>$c \leq t$</td> </tr> </table>	Size (mm)	$a \leq 0.3$	$b \leq 5.0$	$c \leq t$	Minor									
Size (mm)																
$a \leq 0.3$																
$b \leq 5.0$																
$c \leq t$																
Glass Chipping [Rear of Pad Area]		<table border="1"> <tr> <th>Size (mm)</th> </tr> <tr> <td>$a \leq 0.5$</td> </tr> <tr> <td>$b \leq 5.0$</td> </tr> <tr> <td>$c \leq t$</td> </tr> </table>	Size (mm)	$a \leq 0.5$	$b \leq 5.0$	$c \leq t$	Minor									
Size (mm)																
$a \leq 0.5$																
$b \leq 5.0$																
$c \leq t$																
Glass Chipping [Except Pad Area]		<table border="1"> <tr> <th>Size (mm)</th> </tr> <tr> <td>$a \leq 0.5$</td> </tr> <tr> <td>$b \leq 5.0$</td> </tr> <tr> <td>$c \leq t$</td> </tr> </table>	Size (mm)	$a \leq 0.5$	$b \leq 5.0$	$c \leq t$	Minor									
Size (mm)																
$a \leq 0.5$																
$b \leq 5.0$																
$c \leq t$																
Glass Chipping [Corner]		<table border="1"> <tr> <th>Size (mm)</th> <th>Size (mm)</th> </tr> <tr> <td>$a \leq 0.5$</td> <td>$a' \leq 3.0$</td> </tr> <tr> <td>$b \leq 3.0$</td> <td>$b' \leq 0.5$</td> </tr> </table>	Size (mm)	Size (mm)	$a \leq 0.5$	$a' \leq 3.0$	$b \leq 3.0$	$b' \leq 0.5$	Minor							
Size (mm)	Size (mm)															
$a \leq 0.5$	$a' \leq 3.0$															
$b \leq 3.0$	$b' \leq 0.5$															

Product Specification**Caution AND Handling Precaution**

To avoid causing extended damages such as accidents resulting in injury or death, fire accidents, or social damages or social damages if the LCD module fails, , LG Display is always endeavor to maintain sufficient quality of the LCD module in process of designing and manufacturing.

Please pay attention to the followings when you use this TFT LCD Module.

* We can not guarantee to yellowish phenomenon that occurs when directly Bonding Touch window or Touch panel on the this LCD Module.

**Safety****1) DISASSEMBLING OR MODIFICATION**

Do not disassemble or modify the modules. Sensitive parts inside LCD module may be damaged, and dusts or scratches may mar the displays. Toshiba Matsushita Display Technology does not warrant the modules, if customer disassembled or modified them.

2) BREAKAGE OF LCD PANEL

Do not Ingest liquid crystal material, Do not Inhale this material, and Do not Permit this material to contact the skin, if glass of LCD panel is broken. If liquid crystal material contacts the skin, mouth or clothing, take the following actions immediately.

In case contact to the eye or mouth, rinse with large amount of running water for more than 15 minutes. In case contact to the skin or clothing, wipe it off immediately and wash with soap and large amount of running water for more than 15 minutes. The skin or closing may be damaged if liquid crystal material is left adhered. In case ingestion, rinse out the mouth well with water. After spewing up by drinking large amount of water, get medical treatment.

3) GLASS OF LCD PANEL

Be careful with chips of Grass that may cause injuring fingers or skin, when the glass is broken.

4) ABSOLUTE MAXIMUM RATINGS

Do not exceed the absolute maximum rating values under the worst probable conditions caused by the supply voltage variation, input voltage variation, variation in parts' constants, environmental temperature, etc., otherwise LCD module may be damaged.

5) POWER PROTECTION CIRCUIT

Employ protection circuit for power supply, whenever the specification specifies it.

A suitable protection circuit should be applied, based on each system design.

A fuse is not fitted to this module. Therefore, without a suitable power-supply protection device, dust or partial circuit failure may cause overheating and/or burning , which may lead to injury.

6) DISPOSAL

Always comply with all applicable environmental regulations, when disposing of the LCD.

Product Specification

7) EDGES OF PARTS

Be careful with edges of glass parts and metal frame, it may cause injuring.

For designing the system, give special consideration that the wiring and parts do not touch those edges.

8) RECOMMENDED OPERATING CONDITIONS

Don't exceed "the recommended operation conditions" in this specification. The performance and quality of the LCD module are warranted only when the LCD module is used within "the recommended operation conditions". To use the LCD module over "the recommended operation conditions" may have bad influence on the characteristics and reliability of the LCD module and may shorten the life of the LCD module.

Therefore, when designing the whole set, not to be over "the recommended operation conditions", you should fully take care of supply voltage change, characteristic of connection parts, surge of input-and-output line, and surrounding temperature.



Installation in Assembly

1. ESD (ELECTRO-STATIC DISCHARGE) PREVENTION

The circuit used in LCD module is very sensitive to ESD. The following caution should be taken when installing LCD module to an enclosure of the system in order to prevent damage of circuit used in LCD module.

1) HUMIDITY

Ambient humidity of working area is recommended to be higher than 50%(RH) in order to avoid ESD.

2) GROUNDING

- Person handling LCD modules should be grounded with wrist band.
- Tools like soldering iron and screw drivers and working benches should be grounded.
- Grounded electro-conductive mats are recommended to be covered on the floor of working area and surface of working benches.
- The grounding should be done through a resistor of 0.5~1Mohms in order to prevent spark of ESD.

3) Be careful with touching metal portion of testing instruments in order to prevent unnecessary ESD.

4) Do not touch the electrode area of PCB and electrical parts like LSI, capacitor, connector pin, etc.

5) IONIZER

Using ionizer (an antistatic blower) is recommended at working area in order to reduce electro-static voltage.

6) REMOVING PROTECTION FILM

When removing protection film from LCD panel, peel off the tag slowly (more than one second) while blowing with ionizer toward the peeling face to minimize ESD which may damage electrical circuit.

2. DUST AND STAIN PREVENTION

1) WORKING AREA

Reduce dust level in working area. Especially the level of metal particle should be decreased, otherwise electrical circuit in LCD module may be damaged due to short circuit by metal particles.

Product Specification

2) FINGER PRINT

Use finger stalls or soft and dust-free gloves in order to keep clean appearance of LCD module when handled for incoming inspection and assembly.

3) PROTECTION FILM

LCD module may be shipped with "protection film" on LCD panel in order to prevent from scratches and dust. It is recommended to remove the film at later process of assembling.

4) WIPING OFF DUST ON THE PANEL

When LCD panel becomes dirty, wipe the panel surface off softly with absorbent cotton or another soft cloth. If necessary, breathe upon the panel surface and then wipe off immediately and softly again. Be careful not to spill organic solvents into the inside of LCD module. The solvents may damage driver IC and PCB area used inside module. The polarizer laminated to LCD panel and adhesives may be damaged by the solvents, so do not use any organic solvents for wiping off LCD panel.

5) ADHESIVE ON LCD PANEL

Be careful not to attach adhesive, grease, etc., on LCD panel, because it is difficult to remove them without any damages on LCD panel.

6) WATER SPOTS ON THE PANEL

Avoid the dewing or water condensation.

Wipe off a spot or spots of water or mist on LCD panel softly with absorbent cotton or another cloth as soon as possible if happened, otherwise discoloration or stain may be caused. And, damage may occur if water penetrates the inside.

3. INSTALLING LCD MODULE TO THE ENCLOSURE

1) INSTALLING LCD MODULE TO THE ENCLOSURE

Do not bend or twist LCD module even momentarily when the LCD module is installed into the system.

Bending or twisting the LCD module may cause permanent damage.

When the FPC is bent, the radius of FPC curvature must be more than value of recommendation to prevent bending and twisting forces from affecting the connection of FPC.

Even temporary bending or twisting sometimes causes damage.

2) INTERFACE

Do not fasten screws, with catching interface FPC between LCD module and the enclosure.

This may cause bending of LCD module, or become the cause of a failure by damaging FPC.

4. MECHANICAL FORCES

1) CARRY

Hold the side of the plastic frame when you carry an LCD module by hand. If an LCD is carried using the FPC, it is likely to be damaged and the LCD will then malfunction. If you turn on the LCD with a broken FPC, it may cause smoke or burning.

Protection (eg gloves) for fingers and hands is recommended to avoid injury by broken glass.

2) STRONG MECHANICAL SHOCK

Avoid strong mechanical shock, such as dropping the LCD from the work bench, or knocking it against a hard object.

These may cause the glass panel to crack, or cause other mis-operation.

3) EXCESSIVE FORCE

Avoid applying excessive force, like pushing the surface of LCD panel. This may cause scratches or breakage of the panel, or a failure of the module.

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4) SCRATCHES ON THE PANEL

Do not put heavy object such as tools, books, etc., and do not pile up LCD modules. Be careful not to touch the surface of the polarizer with any hard and sharp object. These parts are so sensitive and can easily be scratched, even if protected by a film.

5) Connector

When inserting or disconnecting the connector into a connector of the LCD module, care should be taken to ensure that no strong external force is applied to the connector on the LCD module side. A strong external force applied to the connector or the FPC may damage their connections. When assembling a module into a system, pay extra attention to ensure that no part such as the FPC etc. should be caught between the case of the system and the module. Make sure that the input signal connector of a module is securely and correctly connected to the connector on the system, not skewed, or incompletely connected. Inputting a signal etc. into the module with connectors incorrectly inserted may cause a circuit component or components to malfunction.

6) FPC

When inserting or disconnecting the connector of the LCD module into a connector of the system, care should be taken to ensure that no strong external force is applied to the FPC on the LCD module side. A strong external force applied to the FPC may damage their connections. When assembling a module into a system, pay extra attention to ensure that no part such as the FPC etc. should be caught between the case of the system and the module. Make sure that the input signal connector of a module is securely and correctly connected to the connector on the system, not skewed, or incompletely connected. Inputting a signal etc. into the module with connectors incorrectly inserted may cause a circuit component or components to malfunction. Be careful not to pull or damage the FPC cables, to avoid mechanical damage in FPC and connection part of FPC and cell.

5. OPERATION

1) POWER SUPPLY

Power supplies should always be turned off during the assembly process. Do not connect or disconnect the power cables and connectors with power applied to LCD module. This may cause damage to the LCD module circuit. In operating module at the inspection process, and so on, the supply voltage and signals of driving device must satisfy the sequence of power supplies and signals described in this specifications.

2) GAS

Do not expose the LCD module to any gas which is not normally contained in the atmosphere, it may cause mis-operation or defects.

3) USED FOR LONG TERM

When a LCD module is used for a long term, the characteristics of LCD module might be changed and it may be out of the standard of "4.3 Optical Specifications" due to LED discoloration. LED has the characteristics of shifting optical characteristics by the long term use.

Product Specification**Transportation and Storage****1) TEMPERATURE**

Do not store LCD modules in a high temperature and high humidity condition, higher than 35°C and 70%(RH) for a long term, meaning about one month or more, otherwise this may deteriorate the quality of the display. When you unavoidably store LCD modules for a long time, store between 0 and 35°C, with a relative humidity 70% or lower.

2) LOW TEMPERATURE

Be careful not to leave it where the temperature is below specified storage temperature because the liquid crystal of the display panel may be damaged.

3) ULTRA VIOLET RAY

Store LCD module without exposure to direct sunlight or fluorescent lamps in order to prevent the module from strong ultra violet ray.

4) CLEANLINESS

Keep the LCD module in clean place, because any dust, hard particle may damage the polarizer, or dust invades the inside of the LCD module.

5) CONDENSATION OF WATER

The modules should be stored under a condition where no condensation of water is allowed. It may cause mis-operation or defects. Be especially careful not to make a module work under the condition that condensation of water appears.

6) PACKAGING

When you must re-package a LCD module after it has been removed from the original packaging, it is recommended to re-pack using the original package box and package material.