SPEC. NUMBER	PRODUCT GROUP	Rev.0.2	ISSUE DATE	2017/12/05

TITLE : TV101WXM-NF0

Product Specification

BOE Technology Group Co., Ltd.

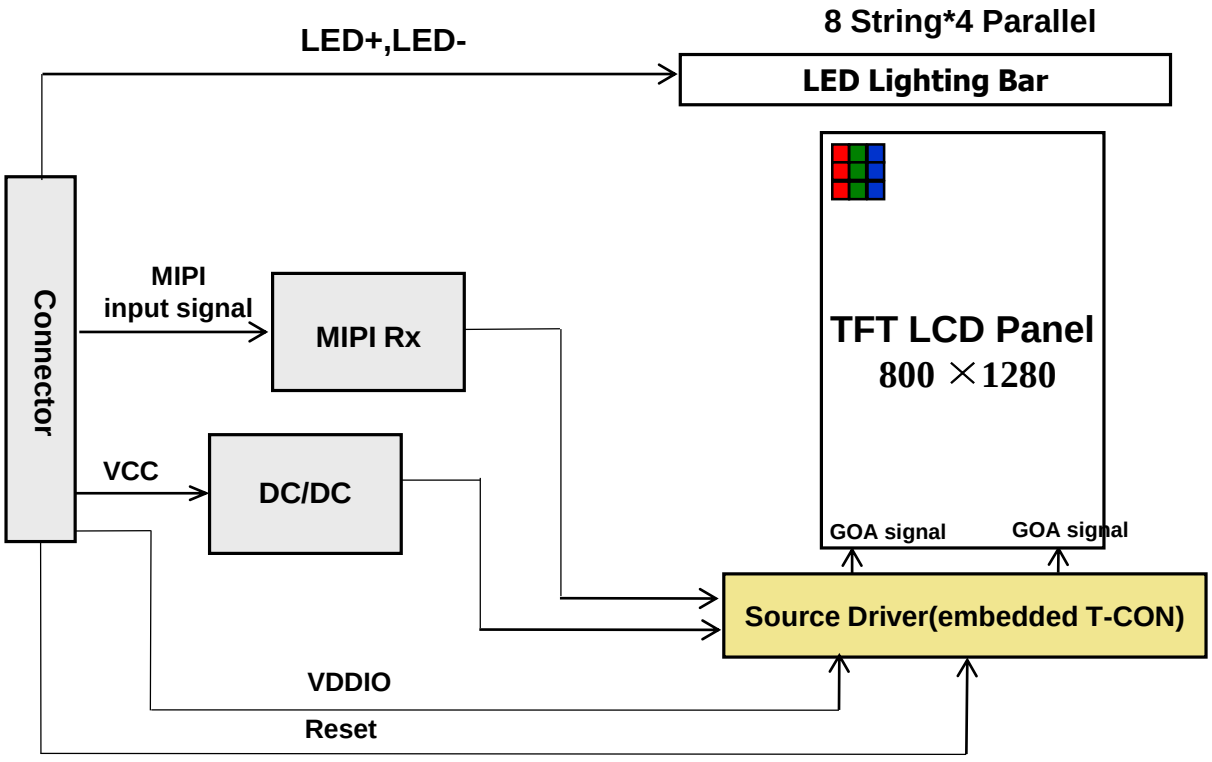
SPEC. NUMBER	PRODUCT GROUP	Rev.0.2	ISSUE DATE	2017/12/05

REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED
0.0	-	Initial Release	2017.10.24	Zhang CJ
0.1	-	Update optics Spec.	2017.11.01	Zhang CJ
0.2	-	Updates and additional details	2017.12.05	Zhang CJ

Contents

1-1. GENERAL DESCRIPTION

Block Diagram



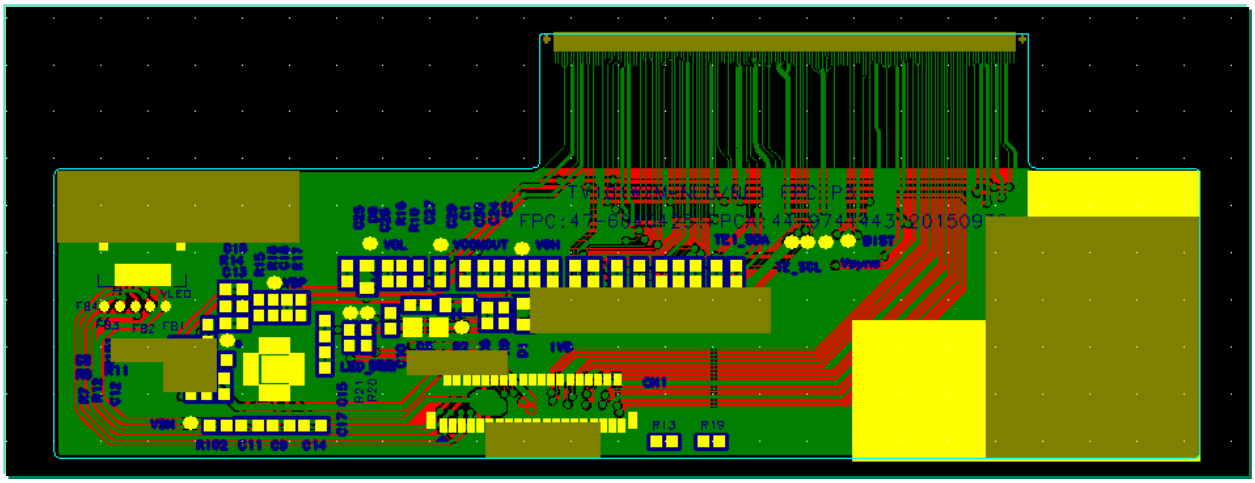
Features

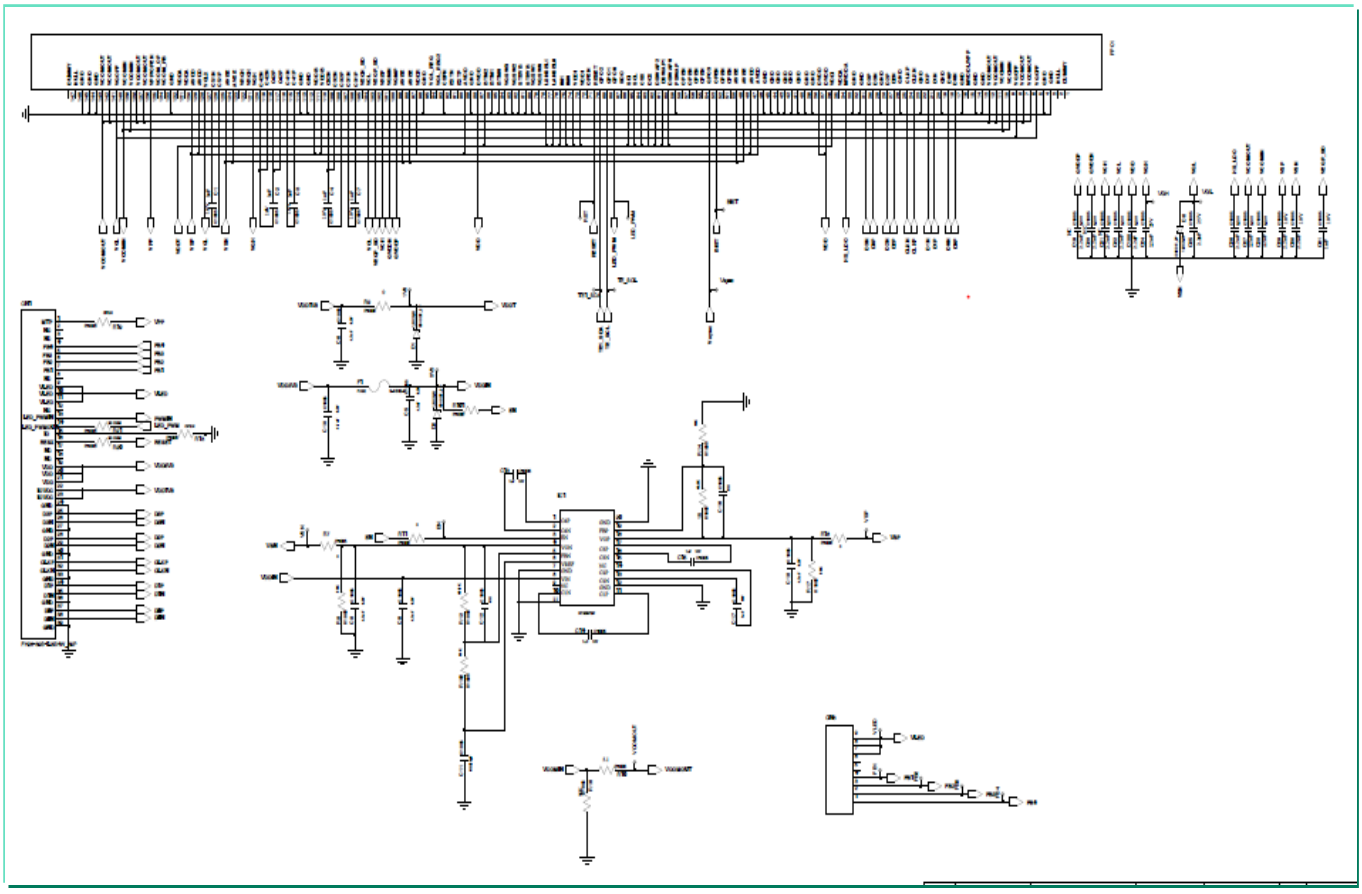
TV101WXM-NF0 is 10.1” color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, MIPI driver ICs, control circuit and backlight. By applying 8 bit digital data, 800×RGB (3) ×1280, 16.7M color images are displayed on the 10.1” diagonal screen.

1-2. General Spec

No	Item	Specification	unit	Remark
1	Screen Size	10.1	inch	-
2	Active Area	135.36 x 216.576	mm	-
3	Panel Size	139.76 x 225.8	mm	-
4	Outline Dimension	142 x 228.5	mm	w/o PCB
5	Display Resolution	800*RGB*1280	pixel	-
6	Pixel Pitch	169.2x169.2	um	-
7	Display Method	Active TFT (a-Si)	-	-
8	Display Mode	HADS	-	-
9	Display Color	RGB	-	-
10	Color Gamut	72	%	typ
11	Luminance	350	nit	Typ, center Point
12	Contrast Ratio	1000	-	Typ, center Point
13	Viewing Angle	80/80/80/80	°	CR>10(U/D/L/R)
14	Pol Surface Treatment	AG25	-	-
15	Weight	150	g	max
16	D-IC	NT35521S	-	RAMless
17	Inversion Method	Column		-
18	LED Q'ty	32	ea	8 String*4 Parallel
19	Power Consumption	2208+230 (max.)	mw	Backlight + Logic

1-3-1. PCBA Gerber/Layout and Schematic Diagram





1-3-2. FPC Pin Assignment

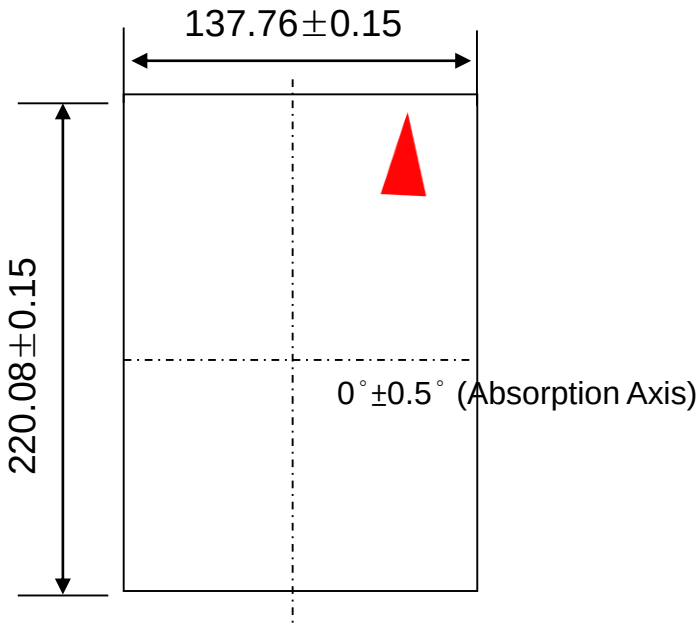
Please pay attention that IC bump down(TFT glass up and C/F glass down)

No.1	DUMMY	No.41	GND	No.75	IM1	No.110	VDDB
No.2	NULL	No.42	GND	No.76	LANSEL0	No.111	VDDB
No.3	GND	No.43	GND	No.77	LANSEL1	No.112-113	VSSB(2)
No.4	GND	No.44	GND	No.78	VGSW0	No.114	C41P
No.5	VGOFF	No.45	GND	No.79	VGSW1	No.115	C41N
No.6-7	VCOMOUT(2)	No.46	AVDD	No.80	STBYB	No.116	C42P
No.8	VGOFF	No.47	AVDD	No.81	STBYB	No.117	C42P
No.9-10	VCOMOUT(2)	No.48	AVEE	No.82	VGSW2	No.118	C42N
No.11-12	VCOMIN(2)	No.49	AVEE	No.83	VGSW3	No.119	C42N
No.13-14	GND(2)	No.50	OPEN	No.84	BTM0	No.120	VGH
No.15	MVDDL	No.51	OPEN	No.85	BTM1	No.121	VRGH
No.16	GND	No.52	BIST_EN	No.86	BTM2	No.122	VRGH
No.17	D0N	No.53	GPO3	No.87	DVDD	No.123-124	AVEE(2)
No.18	D0P	No.54	OPEN	No.88	GND	No.125	C51P
No.19	GND	No.55	OPEN	No.89	AVDD	No.126	C51N
No.20	D1N	No.56	OPEN	No.90	EXTP	No.127	VGLX
No.21	D1P	No.57	OPEN	No.91	EXTN	No.128	AVDD
No.22	GND	No.58	PSWAP	No.92	CSPN	No.129	AVDD
No.23	CLKN	No.59	DSWAP0	No.93	VGL_REG2	No.130	VDDA
No.24	CLKP	No.60	DSWAP1	No.94	VGL_REG	No.131	VDDA
No.25	GND	No.61	DSWAP2	No.95	GND	No.132	GND
No.26	D2N	No.62	DCX	No.96	VDDR	No.133	VCOM_FB
No.27	D2P	No.63	CSX	No.97-98	AVEE(2)	No.134	VCOM_OP
No.28	GND	No.64	SCL	No.99	VGMP	No.135	VPP/OPEN
No.29	D3N	No.65	SDI	No.100	VGMN	No.136-137	VCOMOUT(2)
No.30	D3P	No.66	SDO	No.101	VREF	No.138-139	VCOMIN(2)
No.31-32	GND(2)	No.67	GPO0	No.102	VEQP_SD	No.140	VGOFF
No.33	MVDDA	No.68	GPO1	No.103	VCL	No.141-142	VCOMOUT(2)
No.34	VDDA	No.69	GPO2	No.104	VEQN_SD	No.143-145	GND(3)
No.35	VDDI	No.70	RESET	No.105	C31P	No.146	NULL
No.36	DVDD	No.71	OPEN	No.106	C31N	No.147	DUMMY
No.37	DVDD	No.72	VDDI	No.107	C32P		
No.38-39	GND(2)	No.73	VDDI	No.108	C32N		
No.40	GND	No.74	IM0	No.109	C32N		

1-3-3. Pol General Spec

Upper Polarizer (C/F Side)

Code Name: POL_101WXGA_F_02_Normal_AG25_HADS_LGC



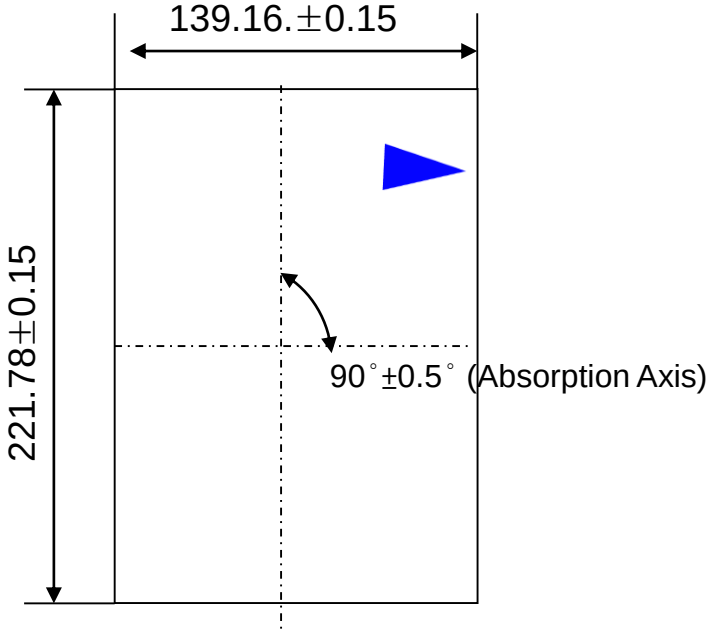
Adhesive Downwards

AG25 (129μm)

Protect Film	
AG25	5μm
TAC	40μm
PVA	22μm
TAC	40μm
PSA	22μm
Separator	

Lower Polarizer (TFT Side)

Code Name: POL_101WXGA_R_02_Normal_Clear_HADS_LGC



Adhesive Downwards

Clear(124μm)

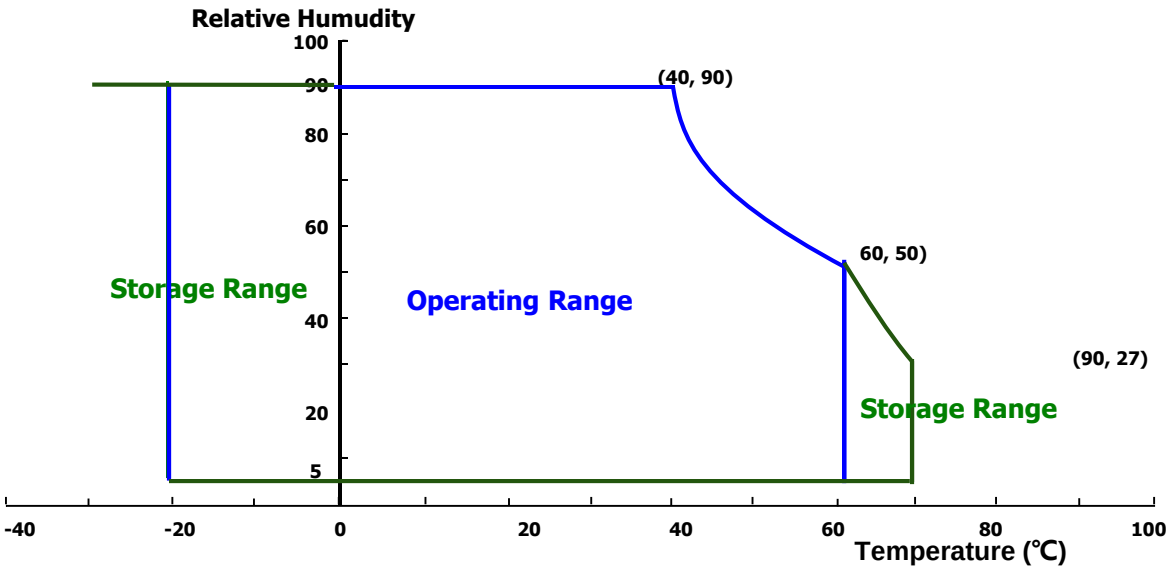
Protect Film	
TAC	40
PVA	22
TAC	40
PSA	22
Separator	

2. Absolute Maximum Ratings

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

Table 2.1 Absolute Maximum Ratings

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Power Supply Voltage	VDDIO	-0.3	1.8	5.5	V	
	VCC	-0.3	3.3	5.5	V	
LED Current	ILED	-	-	30	mA	
Frame Frequency	fFrame	55	60	-	HZ	
Storage Humidity	Hstg	5	-	90	%RH	
Storage Temperature	Tstg	-20	25	70	℃	
Operational Humidity	Hstg	5	-	90	%RH	
Operational Temperature	Tstg	0	-	60	℃	



3-1. ELECTRICAL CHARACTERISTICS

Table 3.1 Electrical Characteristics Of TFT-LCD Module

Parameter		Symbol	Values			Units	Notes
			Min	Typ	Max		
LCD Input Logic Voltage		VDDIO	1.7	1.8	1.9	V	
LCD Input Analog Voltage		VCC	3.1	3.3	3.5	V	
"H" Level Input Voltage		V_{IH}	0.7*VDDIO	-	VDDIO	V	Applicable Pin： RESET
"L" Level Input Voltage		V_{IL}	VSS	-	0.3*VDDIO	V	Applicable Pin： RESET
"H" Level Output Voltage		V_{OH}	0.8*VDDIO	-	VDDIO	V	
"L" Level Output Voltage		V_{OL}	VSS	-	0.2*VDDIO	V	
Input high level leakage current		I_{IH}	-	-	1	μA	For the digital, I/O circuit (Not include the pull-up/down)
Input low level leakage current		I_{IL}	-1	-	-	μA	
LCD Power Consumption	Normal	P_D	-	200	230	mW	1
	Sleep in	V_{IH}	--	20	30	mW	
	BLU	P_B	-	2208	-	mW	2

Notes:
(1) The specified current and power consumption are under the conditions at VCC = 3.3V, T = 25°C, and fv = 60 Hz, at white pattern
(2) LED Backlight assumptions: 3.0V(MAX), 92mA. (8S4P LED Total Input)

3-2. Logic Power Consumption

Power Supply: Frame Frequency: Frame =60HZ @ 25degC

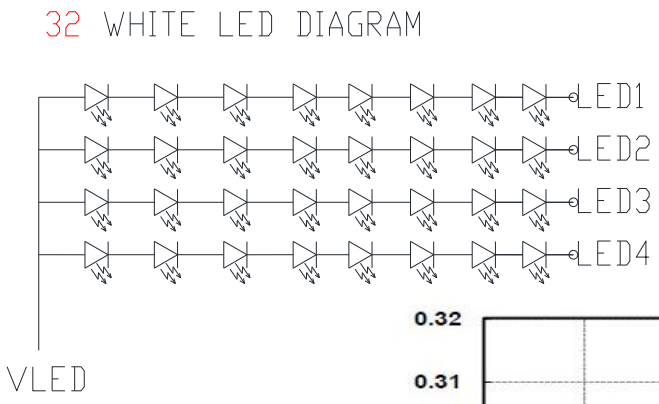
Display Mode	Item	Symbol	Value		Unit	Remark
			Typ	Max		
Display White	Current of VDDIO	IVDDIO	20	30	mA	
	Current of VCC	IVCC	49	75	mA	
Standby Mode	Current of VDDIO	IVDDIO	-	200	uA	
	Current of VCC	IVCC	-	10	uA	

3-3. BACK LIGHT UNIT

3-3-1 The edge-lighting type of back light unit consists of 32LEDs which are connected in serial.

Table 3.3.1 Electrical Characteristics Of Back Light Unit

Parameter	Symbol	Values			Units	Notes
		Min	Typ.	Max		
LED Current	I_{LED}	-	23	-	mA	8S4P
LED Forward Voltage	V_{LED}	2.8	2.9	3.0	V	8S4P
Max backlight current value	I_{BLU}	-	-	100	mA	-



3-3-2 LED Rank

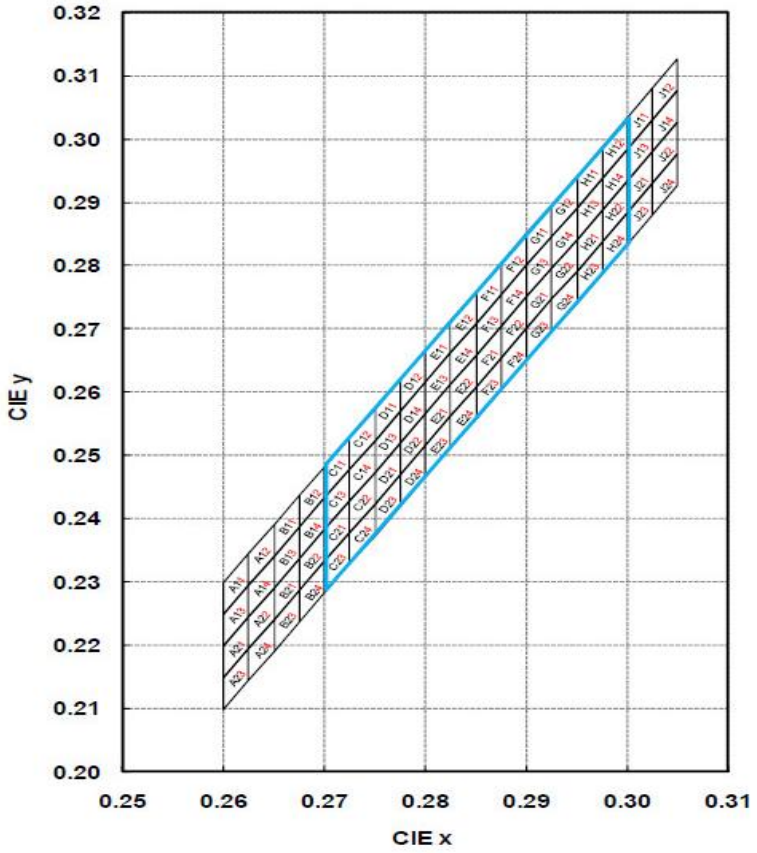
Luminance Rank : 2850mcd

Color Rank : E21

Time to half Brightness:15000 hours

LED Vendor: Lextar

LED Tech. : YAG



*Color Coordinates Measurement allowance is ± 0.005.

3-4. LCD INTERFACE CONNECTIONS

Interface Connector: **FH26W-39S-0.3SHW(Hirose)**, filled by supplier

Table 3.4 LCD Connector Pin Configuration

Pin No.	Symbol	Description	I/O
1	MTP	Power supply for MTP	P
2	NC	NC	-
3	NC	NC	-
4	FB4	Cathode	P
5	FB3	Cathode	P
6	FB2	Cathode	P
7	FB1	Cathode	P
8	NC	NC	-
9	VLED	Anode	P
10	VLED	Anode	P
11	VLED	Anode	P
12	NC	NC	-
13	LEDPWMIN	LEDPWMIN(NC)	I
14	LEDPWMOUT	PWM output	O
15	ID	ID	O
16	RESX	Device Reset Signal	I
17	NC	NC	-
18	NC	NC	-
19	VCC	Power supply , 3.3V	P
20	VCC	Power supply , 3.3V	P
21	VCC	Power supply , 3.3V	P
22	VDDIO	Logical voltage , 1.8V	P
23	VDDIO	Logical voltage , 1.8V	P
24	GND	Ground	P
25	MIPI_D3_P	MIPI Differential Data3 Input	I

3-4. LCD INTERFACE CONNECTIONS

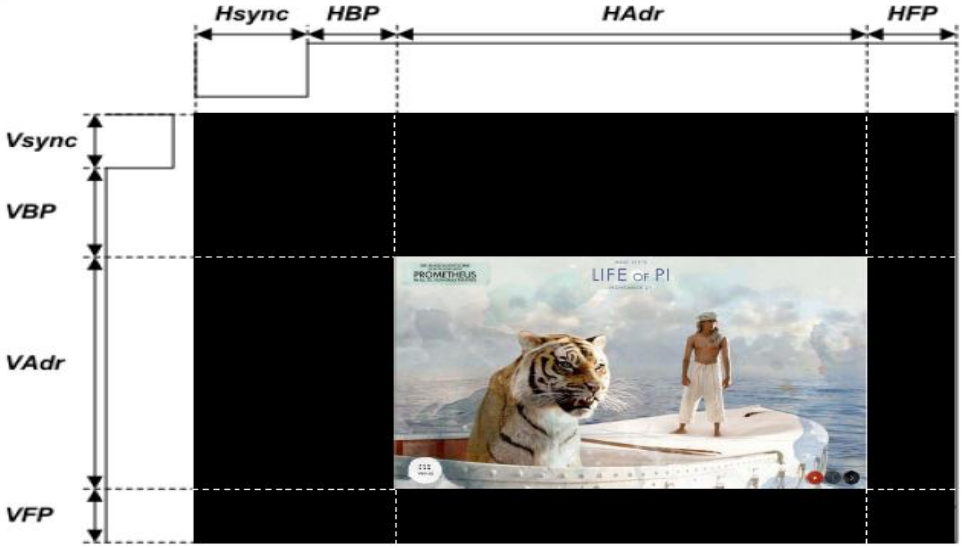
Interface Connector: **FH26W-39S-0.3SHW(Hirose)**, filled by supplier

Table 3.4 LCD Connector Pin Configuration

Pin No.	Symbol	Description	I/O
26	MIPI_D3_N	MIPI Differential Data3 Input	I
27	GND	Ground	P
28	MIPI_D2_P	MIPI Differential Data2 Input	I
29	MIPI_D2_N	MIPI Differential Data2 Input	I
30	GND	Ground	P
31	MIPI_CLK_P	MIPI Differential CLOCK Input	I
32	MIPI_CLK_N	MIPI Differential CLOCK Input	I
33	GND	Ground	P
34	MIPI_D1_P	MIPI Differential Data1 Input	I
35	MIPI_D1_N	MIPI Differential Data1 Input	I
36	GND	Ground	P
37	MIPI_D0_P	MIPI Differential Data0 Input	I
38	MIPI_D0_N	MIPI Differential Data0 Input	I
39	GND	Ground	P

3-5. SIGNAL TIMING SPECIFICATIONS

Item			SYNBOL	Min.	Typ.	Max.	UNIT
LCD	Frame Rate		-	-	60	-	Hz
	Pixels Rate		-	-	83.4	-	MHz
Timing	DCLK	Frequency	fCLK	-	250	-	MHz
		Period	Tclk	-	4	-	ns
	Horizontal	Horizontal total time	tHP	-	1060	-	t_{CLK}
		Horizontal Active time	tHadr	800			t_{CLK}
		Horizontal Pulse Width	tHsync	16	16	-	t_{CLK}
		Horizontal Back Porch	tHBP	48	64	-	t_{CLK}
		Horizontal Front Porch	tHFP	16	180	-	t_{CLK}
	Vertical	Vertical total time	tvp	-	1312	-	t_H
		Vertical Active time	tVadr	1280			t_H
		Vertical Pulse Width	tVsync	4	4	-	t_H
		Vertical Back Porch	tVBP	12	12	-	t_H
		Vertical Front Porch	tVFP	16	16	-	t_H
Bit Rate			TX SPD (MBPS)	-	500	-	Mbps
Lane				-	4	-	Lane

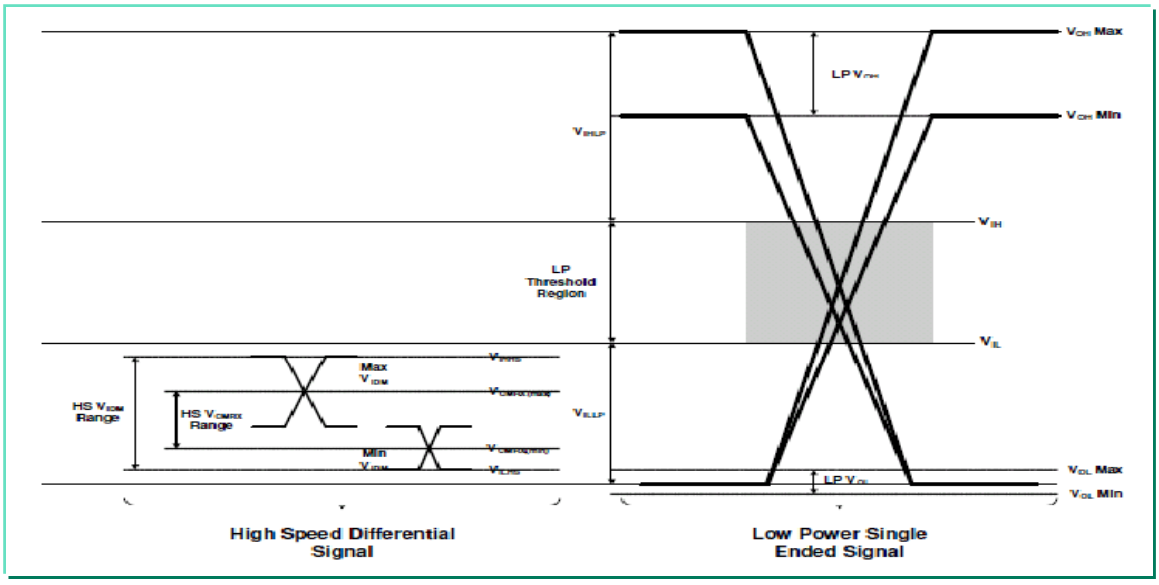


3-6. MIPI Interface DC/AC Characteristic

MIPI Interface Timing Sequence

(a) MIPI Interface characteristic ：

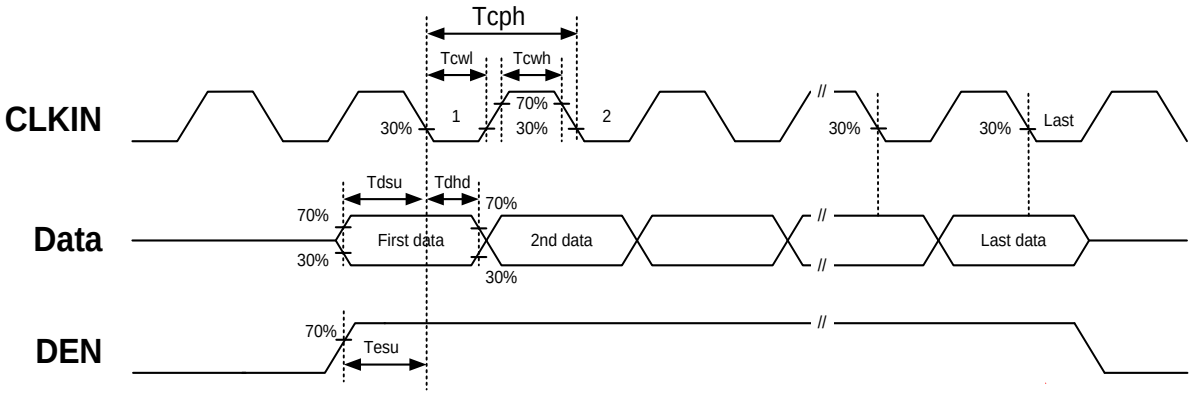
Parameter	Symbol	Min	Typ	Max	Unit	Condition
MIPI digital operation current	I_{VCCIF}	-	16	24	mA	-
MIPI digital stand-by current	$I_{VCCIFST}$	-	-	200	uA	-
MIPI Characteristics for High Speed Receiver						
Single-ended input low voltage	V_{ILHS}	-40	-	-	mW	
Single-ended input high voltage	V_{IHHS}	-	-	460	mV	
Common-mode voltage	V_{CMRXDC}	70	-	330	mV	
Differential input impedance	Z_{ID}	80	100	125	Ω	
HS transmit differential voltage($V_{OD}=V_{DP}-V_{DN}$)	$\|V_{OD}\|$	85	200	250	mV	
MIPI Characteristics for Low Power Receiver						
Pad signal voltage range	V_I	880	-	1350	mV	
Ground shift	V_{GNDSH}	-50	-	50	mV	
Output low level	V_{OL}	-50	-	50	mV	
Output high level	V_{OH}	1.1	1.2	1.3	V	



3-6. MIPI Interface DC/AC Characteristic

MIPI Interface Timing Sequence

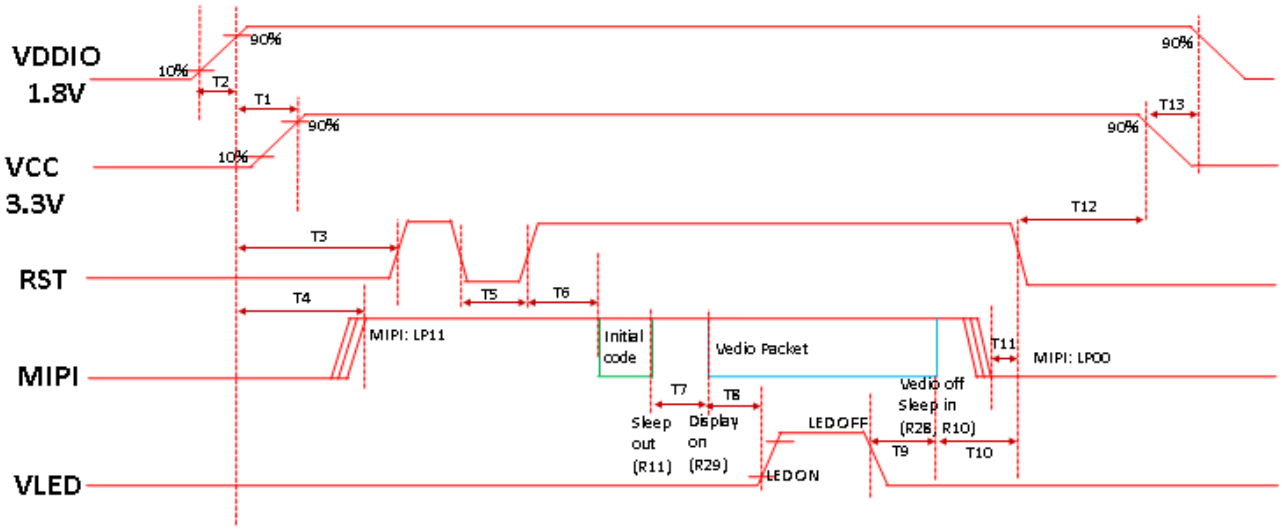
(b) Signal Timing wave forms



3-7. Power On/Off Sequence

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

VDDI=1.8V,VDDA,VDDR,VDDB=3.3V



ITEM	Min	Typ	Max	Unit	Remark
T1	-	no limit	-	ms	
T2	-	-	2	ms	
T3	15	-	-	ms	
T4	0	-	T3	ms	
T5	10	-	-	us	
T6	20		-	ms	
T7	120		300	ms	
T8	6	-	-	Frame	
T9	0	-	-	ms	
T10	100	-	-	ms	
T11	0	-	-	ms	
T12	0	-	-	ms	
T13	-	no limit	-		

3-8. Software Flow

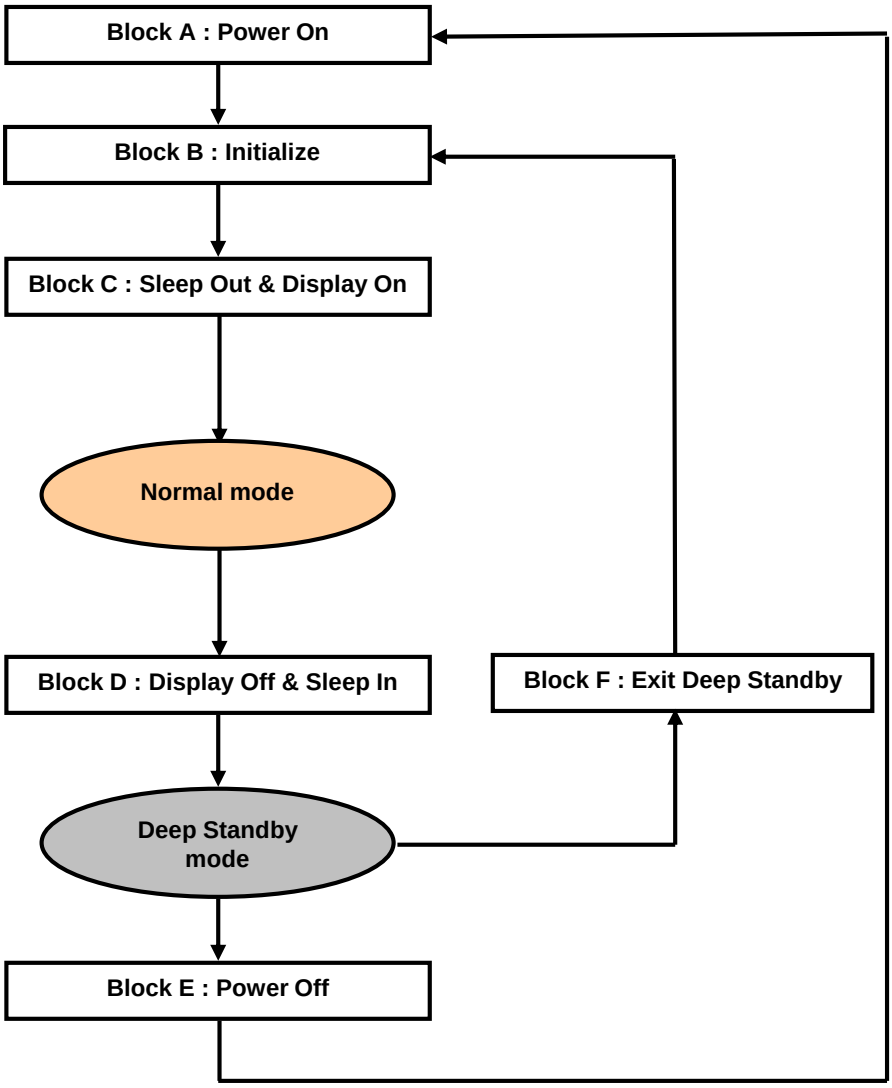
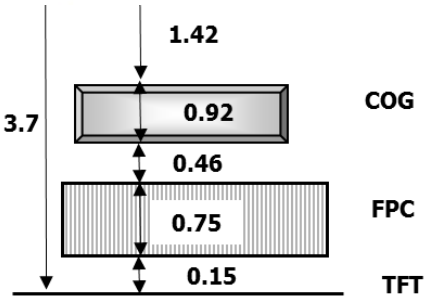


Fig 3.8 Software Flowchart

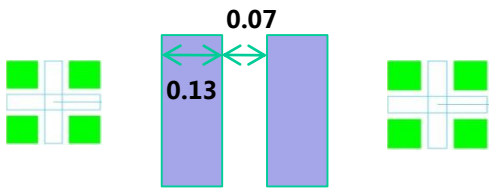
3-9. IC General Spec and Size

9 Chip Information

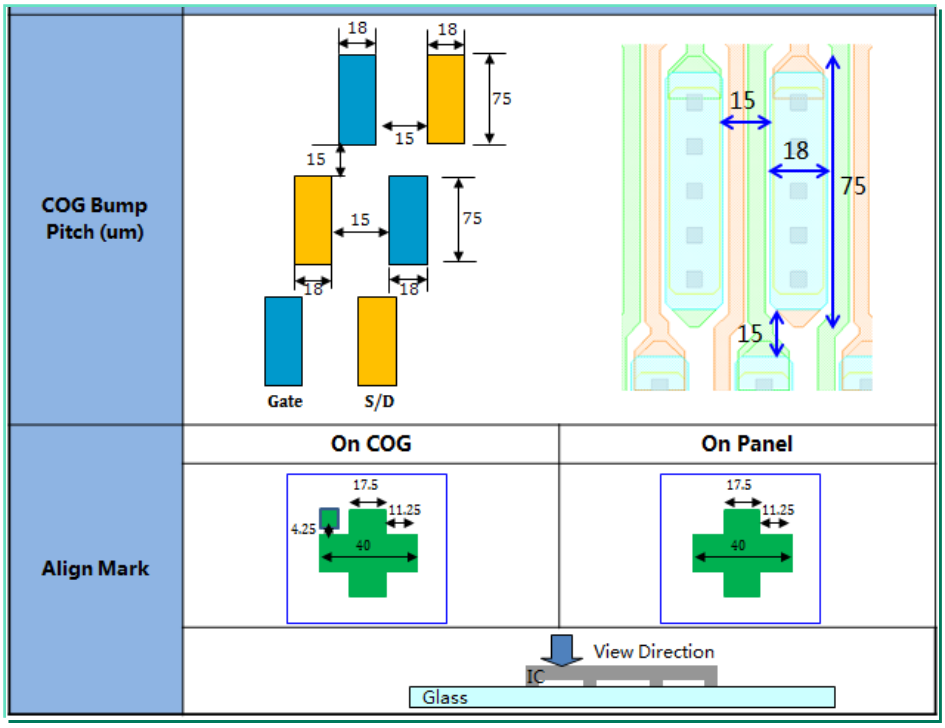
- Chip Size= 27630um x 898um *(include Scribe Line)*
- Chip Window= 27470um x 828um *(without Scribe Line)*
- Chip Thickness = 200um +/- 10um
- Bump height = 12μm



FPC Contact Pad Size



Unit: mm



3-10. Power Consumption

	Parameter	Symbol	Typ	Unit	Remarks
CABC off	Logic Power	L0	173	mW	
		L32	180	mW	
		L64	180	mW	
		L96	180	mW	
		L127	180	mW	
		L160	180	mW	
		L192	180	mW	
		L224	180	mW	
		L255	180	mW	
		R255	175	mW	
		G255	175	mW	
		B255	175	mW	
		8 color bar	181	mW	
		0-255 Gray Transition	180	mW	
	BLU	25% on	0.55	W	
		50% on	1.1	W	
		75% on	1.65	W	
		100% on	2.2	W	

Notes:
(1)CABC is off

4. OPTICAL CHARACTERISTICS

4-1. Optical Characteristics – Backlight 100%

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remarks
Viewing Angle	Θ12	CR >10	75	80	-	-	Note 1
	Θ6		75	80	-	-	Note 1
	Θ9		75	80	-	-	Note 1
	Θ3		75	80	-	-	Note 1
	Θ1	CR>10	75	80	-	-	Note 1
	Θ4		75	80	-	-	Note 1
	Θ7		75	80	-	-	Note 1
	Θ11		75	80	-	-	Note 1
Contrast Ratio	CR	Optimal	800	1000	-	-	Note 1,4
Brightness	Lv	Optimal	300	350	-	nit	Note 1
Brightness Uniformity	Y	Optimal	75%	80%	-	-	Note 1,7(5P)
	Y	Optimal	70%	75%	-	-	Note 1,7(13P)
Flicker			-	-	-30	dB	Note 1,2
Crosstalk			-	-	2%		Note 1,3
Response time	τ_f or τ_r	Θ =0 ° Ta =25 °C	-	30	-	ms	Note 1,6
Color Gamut	NTSC	-	TBD	72%	TBD	-	Note 1
White Chromaticity	x	CIE 1931	0.283	0.313	0.343	-	Note 1
	y		0.299	0.329	0.359	-	Note 1
Red Chromaticity	x	CIE 1931	0.605	0.635	0.665	-	Note 1
	y		0.299	0.329	0.359	-	Note 1
Green Chromaticity	x	CIE 1931	0.266	0.296	0.326	-	Note 1
	y		0.587	0.617	0.647	-	Note 1
Blue Chromaticity	x	CIE 1931	0.125	0.155	0.185	-	Note 1
	y		0.034	0.064	0.094	-	Note 1

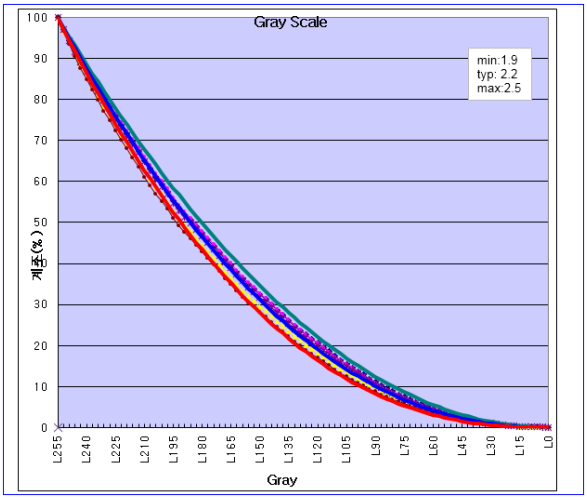
4-2. Cell&BLU Optical Characteristics

Parameter	Typ.	Unit	Remarks
Aperture Ratio	-	%	
Upper Pol Trans.	42.5	%	
Lower Pol Trans.	43	%	
Panel Trans.	4.81	%	w/o APF
Panel Trans.	-	%	with APF
BLU Luminance	7280	Cd/m^2	Center
BLU Luminance Uniformity	80%@5P,75%@13P	%	Note1,7

4-3. Gamma/Color Coordinate Uniformity/CE Function/CABC Function

4-3-1 Gamma Curve

Request: R/G/B/W, 0-255 gray scale, step 1 gray scale



4-3-2 Color Coordinate Uniformity

Request: white pattern, 0-255 gray scale, step 15 gray scale.

Gray Scale	x	y	Gray Scale	x	y
0	0.259	0.240	135	0.318	0.336
15	0.296	0.300	150	0.318	0.336
30	0.310	0.324	165	0.318	0.336
45	0.314	0.330	180	0.318	0.336
60	0.316	0.333	195	0.317	0.336
75	0.317	0.334	210	0.317	0.335
90	0.317	0.335	225	0.317	0.335
105	0.317	0.335	240	0.316	0.333
120	0.318	0.335	255	0.313	0.329

4-3-3 CE function(on and off)

Request: Macbeth color checker. Please provide all CE on data if there is more than one CE solution. Need color coordinate of Macbeth color checker, while CE on and CE off

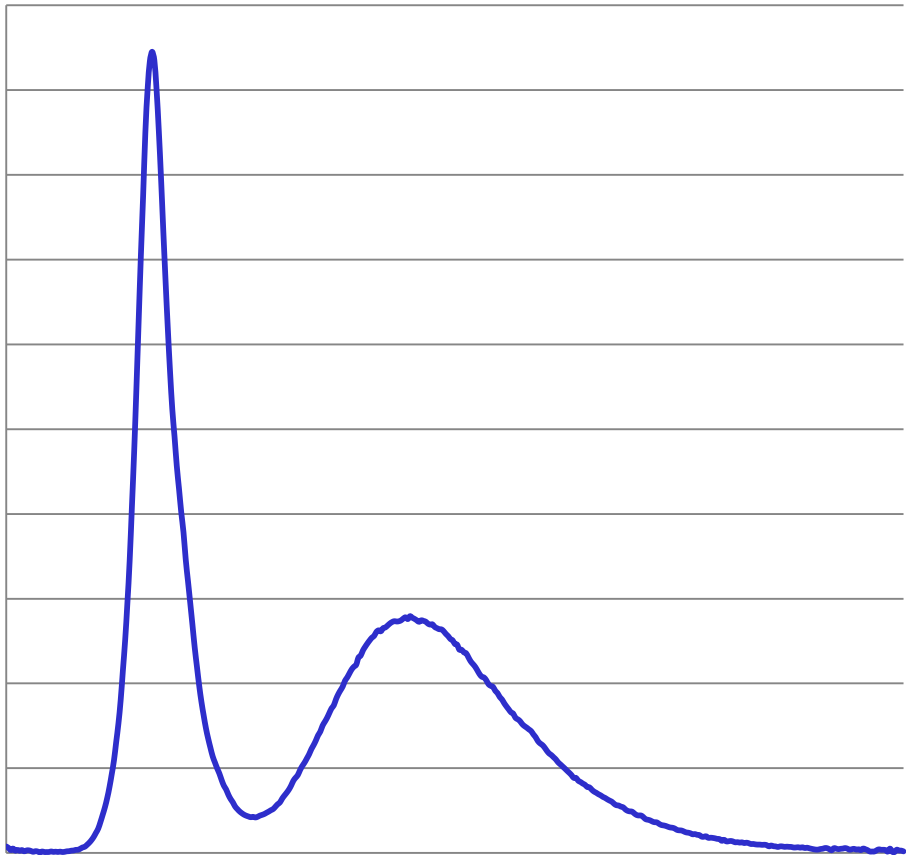
Notes:
(1)CE is off

4-3-4 CABC function(on and off)

Request: Movies comparison(three segments with different frames details, lighter, light+dark, darker) Measure LCD power consumption of three segments , including logic and BLU

4-4. LCD Spectrum and BLU Spectrum

Center Point



wavelength/nm

[Note 1] Optical Test Equipment Setup

The LCD module should be turn-on to a stable luminance level to be reached. The measurement should be executed after lighting Backlight for 20 minutes and in a dark room.

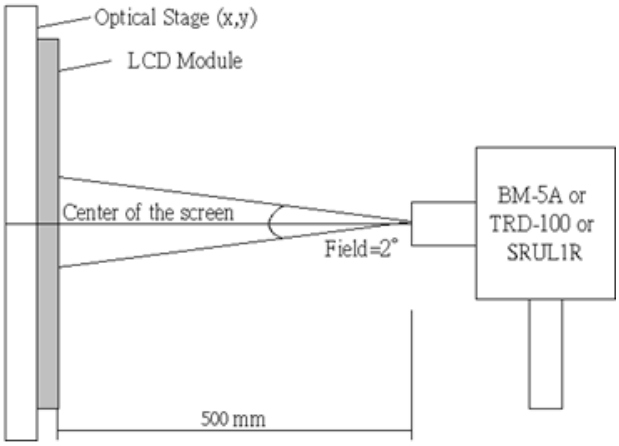
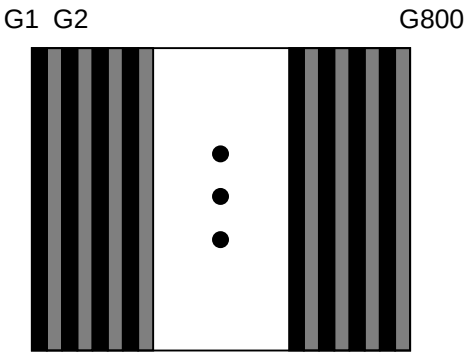


Fig 4.1. Optical Characteristic Measurement Equipment and Method

[Note 2] Flicker

The flicker level should be measured with horizontal gray/black stripes. The flicker is essentially a ratio of the powers in the frequency spectrum at 30 Hz (P_X) and 0 Hz (P_0- DC level).

$$F = 20 \text{ Log } (P_X / P_0)$$



[Note 3] Crosstalk

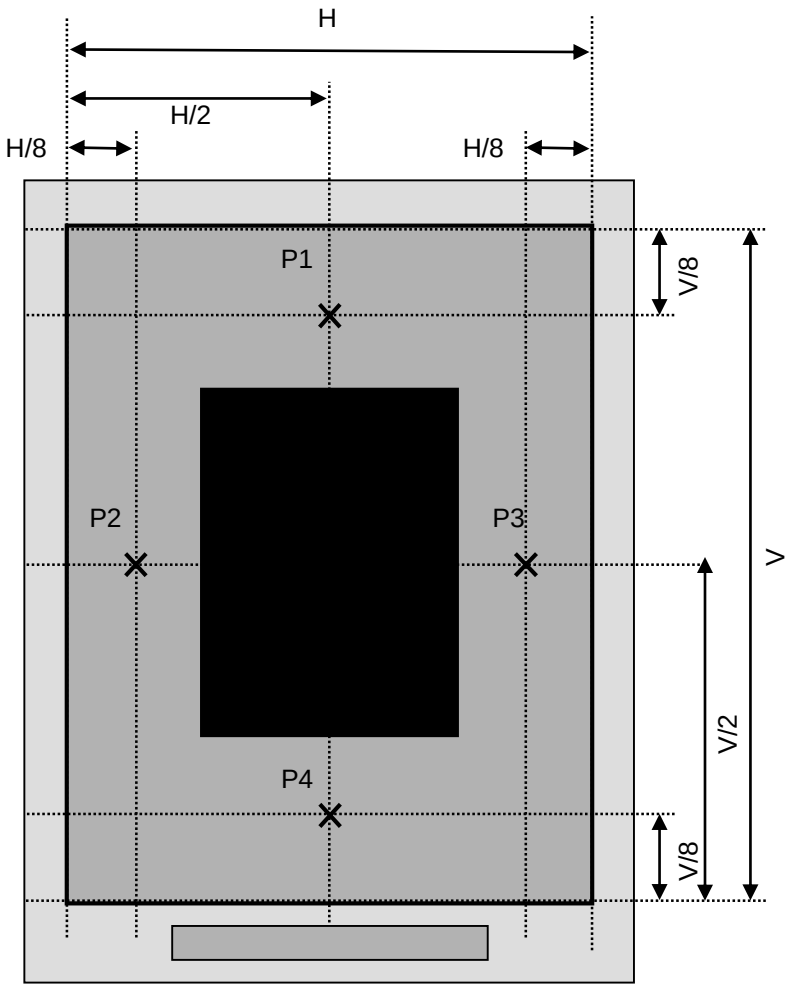


Fig 4.2 Crosstalk measurement points

A: Luminance for P1 ~ P4 with all 127gray pixels

B: Luminance for P1 ~ P4 with 127gray pixels when the black box is applied

$$\text{Crosstalk [\%]} = \text{Maximum}\left[\text{Absolute}\left(\frac{A - B}{A}\right)\right]$$

[Note 4]

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 5]

Viewing Angle Range is defined as follows;

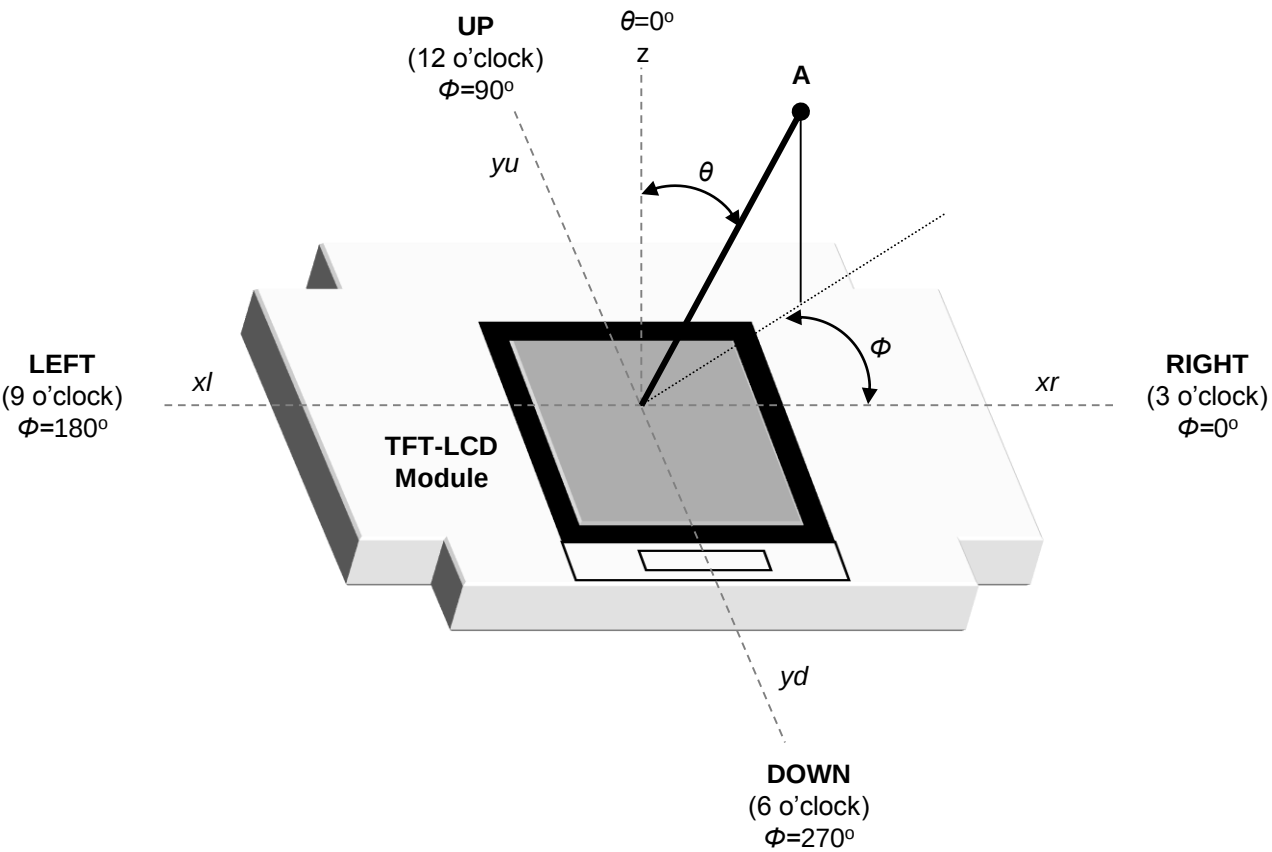


Fig 4.3 Viewing Angle Definitions

[Note 6]

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”.

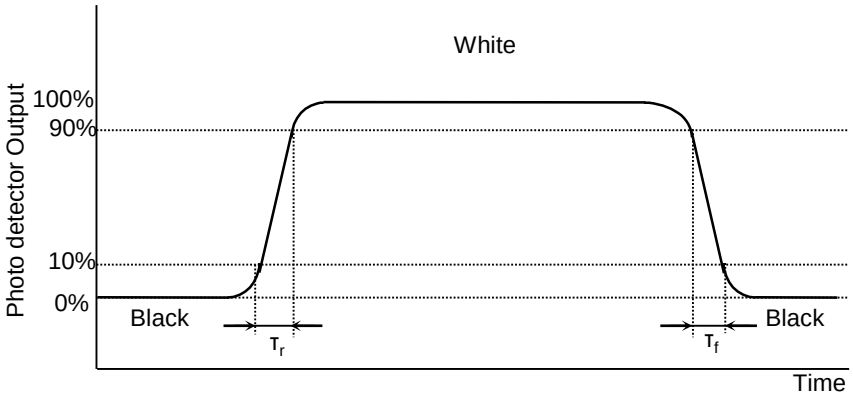


Fig 4.3 Response Time Definition

[Note 7]

The brightness measurement is taken at point 5P/13P.

$$\text{Brightness Uniformity} = \frac{\text{Minimum Photo detector output for P1-P5(P13) with all pixels white}}{\text{Maximum Photo detector output for P1-P5(P13) with all pixels white}} \times 100$$

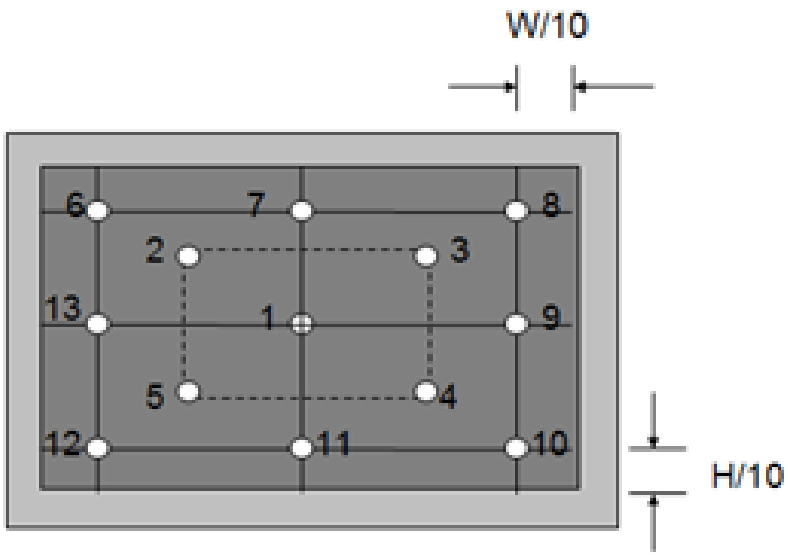
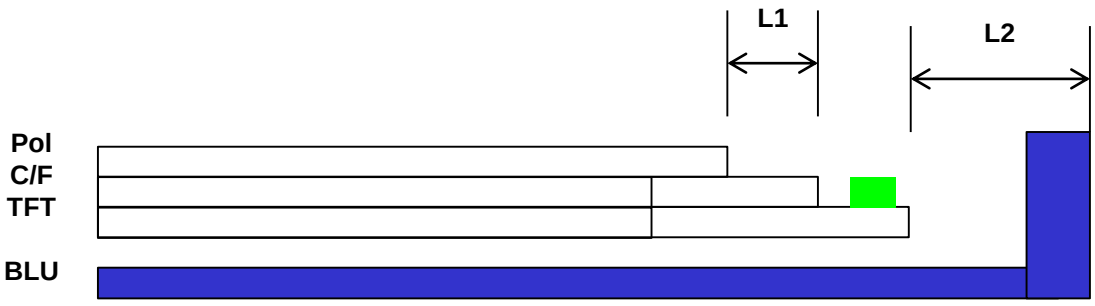


Fig 4.4 Brightness Measurement Points

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.

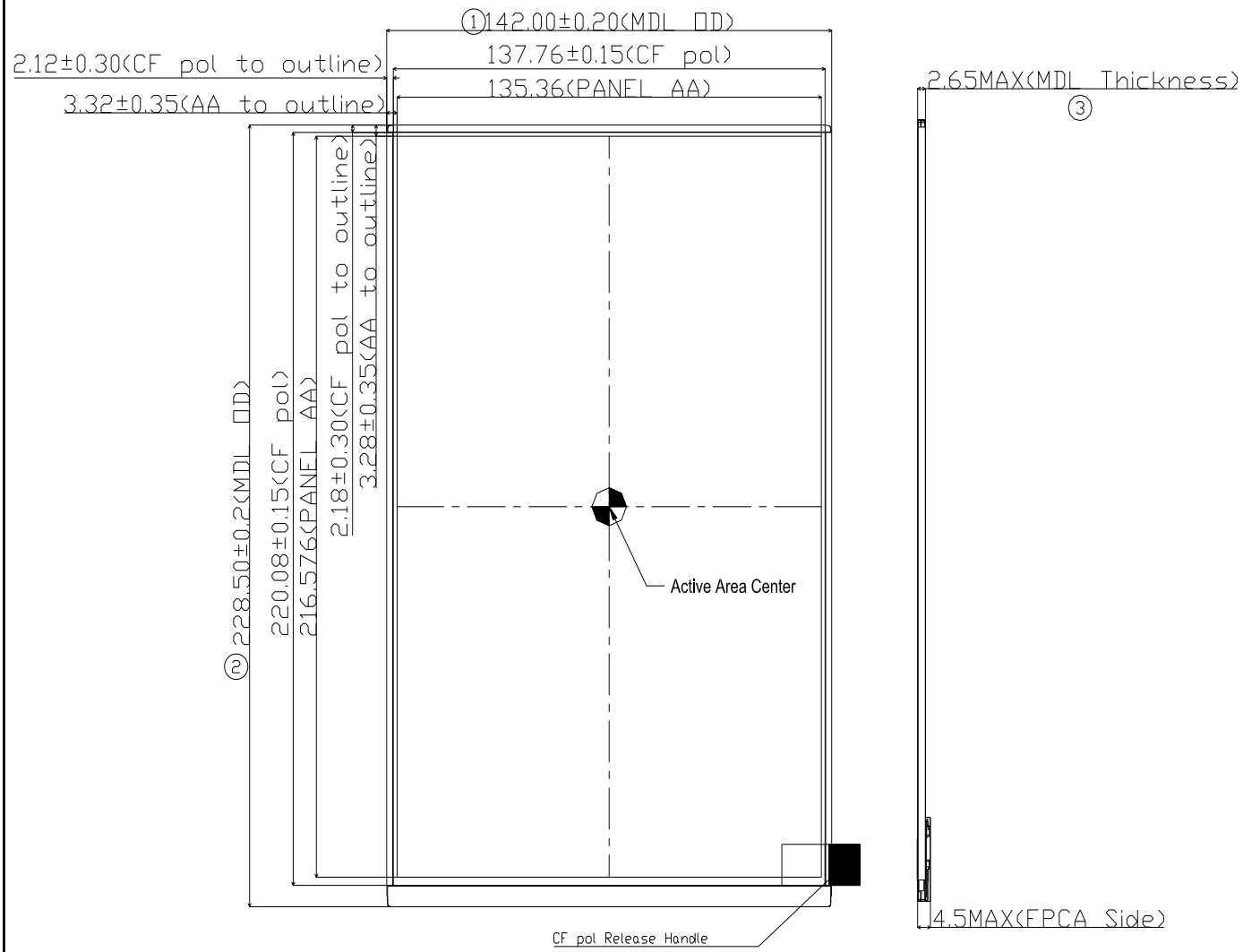
Items	Description	Typ.	Tolerance	Unit
CF Glass	Thickness	0.4	±0.03	mm
TFT Glass	Thickness	0.5	±0.03	mm
Panel	A/A	135.36x216.576	-	mm
	C/F	139.76x222.10	±0.2	mm
	TFT	139.76x225.80	±0.2	mm
	BM(U/D/L/R)	2.0/7.224/2.2/2.2	±0.05	mm
	Gap Between Pol~C/F border (U/D/L/R)	0.9/1.12/1.0/1.0	-	mm
Module	Horizontal	142.0	±0.2	mm
	Vertical	228.5	±0.2	mm
	Thickness	2.50	±0.15	mm
	UV Glue Thickness	0.25	±0.15	mm
	Gap between Glass~LCM outline	1.12/1.12/1.13/1.37	±0.2	mm



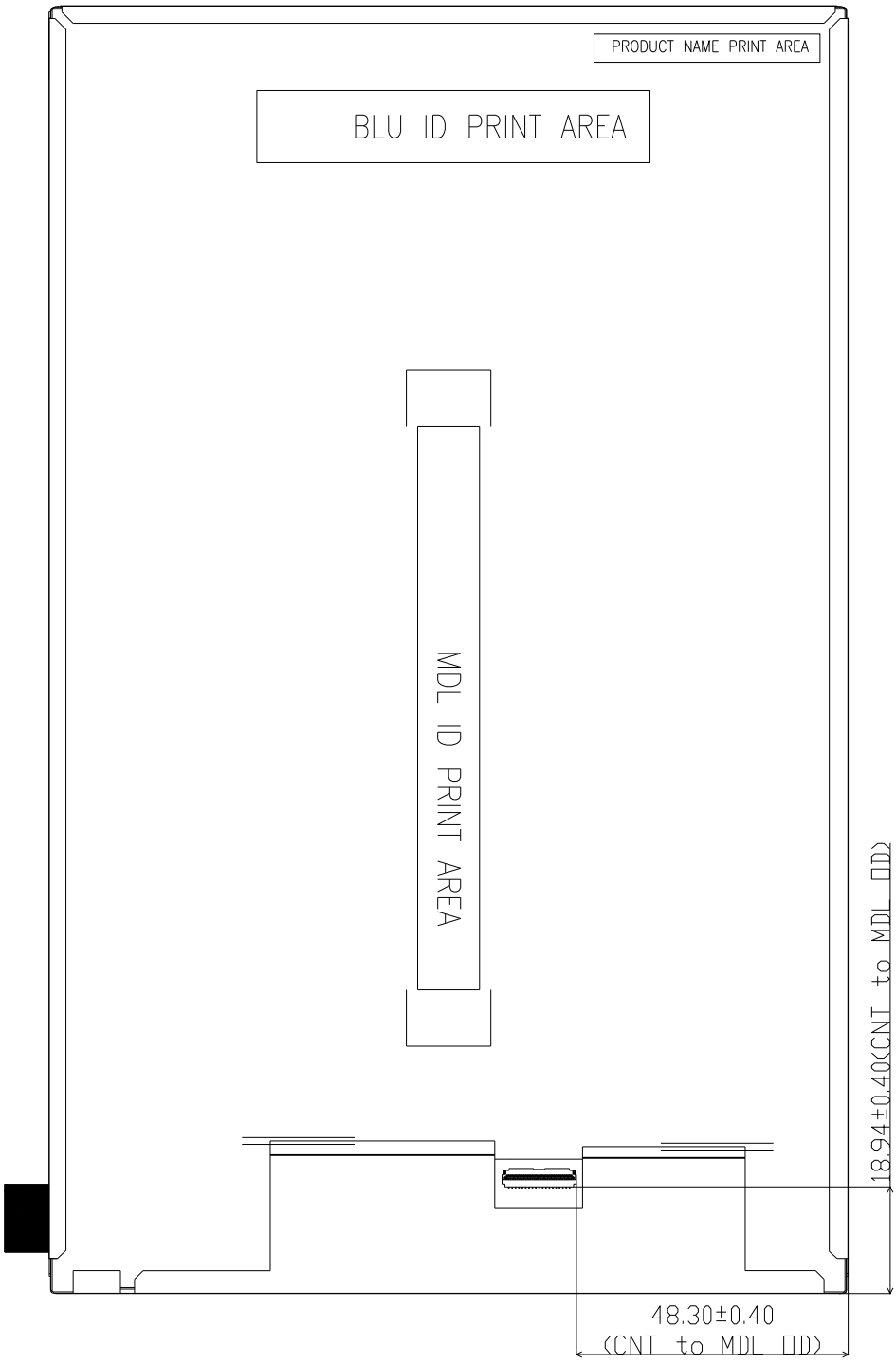
5.1 LCM Drawing

Folded and unfolded status

(1) Front side



(2) Rear side


PRODUCT NAME PRINT AREA
BLU ID PRINT AREA
MDL ID PRINT AREA
18.94±0.40(CNT to MDL □D)
48.30±0.40
(CNT to MDL □D)

6. RELIABLITY TEST

Must be accordance with Facebook RA test items

No	Test Item	Test Condition	Remark
1	High temperature storage test	Ta = 70 ℃, 240 hrs	-
2	Low temperature storage test	Ta = -30℃, 240 hrs	
3	Thermal Shock Test	-30℃/1hr → 60℃/1hr ×30Cycle	
4	High temperature Operate test	Ta = 60 ℃,240hrs,	
5	Low temperature Operate test	Ta = -20 ℃, 240hrs	
6	High temperature High humidity	Ta = 60 ℃, 90%, 240hrs	

Note (1) criteria : Normal display image with no obvious non-uniformity and no line defect.
Note (2) Evaluation should be tested after storage at room temperature for more than two hour

7. ESD TEST

Temperature condition：15-30℃

Relative Humidity condition：35-45%

Measurement conditions:

Power-off test : Contact: ±2KV (Figure 1.HBM, 5times)

Air ：±4KV (Figure 2. The system model, 5times)

Power-on test ： Contact: ±4KV (Figure 2. The system model, 5times)

Air ：±8KV (Figure 2. The system model, 5times)

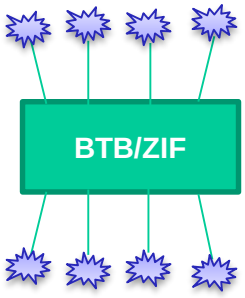


Figure 1 Human body mode (HBM)

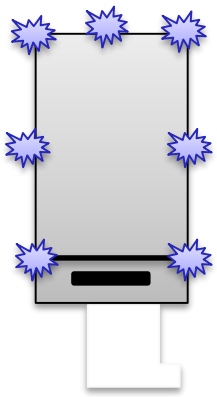


Figure 2 The system model

8. Key Material BOM List

Item		Part Name	Vendor
Mother Glass		-	Corning
Panel		-	BOEDT
Polarizer		Ag25	LGC
FPC		73mmx27.mm,2Layer	Hongxin / Biaiqi
Digital Part	T-CON	NA	-
	Source IC	NT35521S	Novatek
Analog Part	PMIC	ICN7815	IML
Connector	MIPI CNT	FH26W-39S-0.3SHW(60)	Hirose
	LED CNT	PF040-B09B-C09	UJU
Back light unit		-	Zhaoji
LED		YAG	Lextar

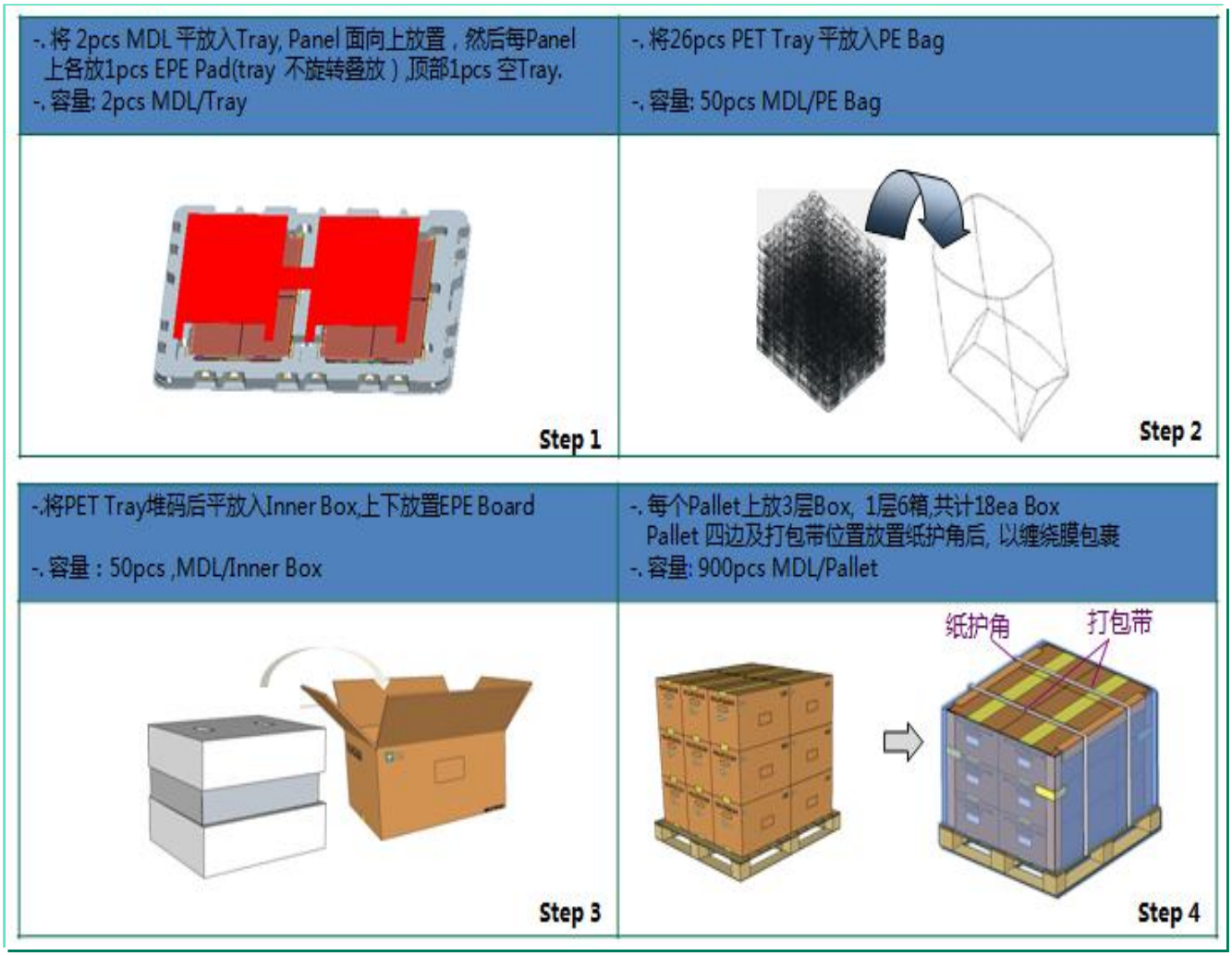
8. Package

8.1. Packing Description

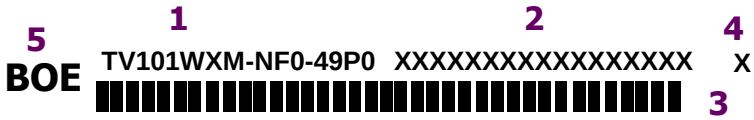
The stacked tray per a box : 26pcs tray

→ Full (LCD Included) tray 25pcs + Empty tray 1pcs

(LCM 50 pcs/1 box)



8.2. MDL code-spurting



喷码至背板, 信息如下

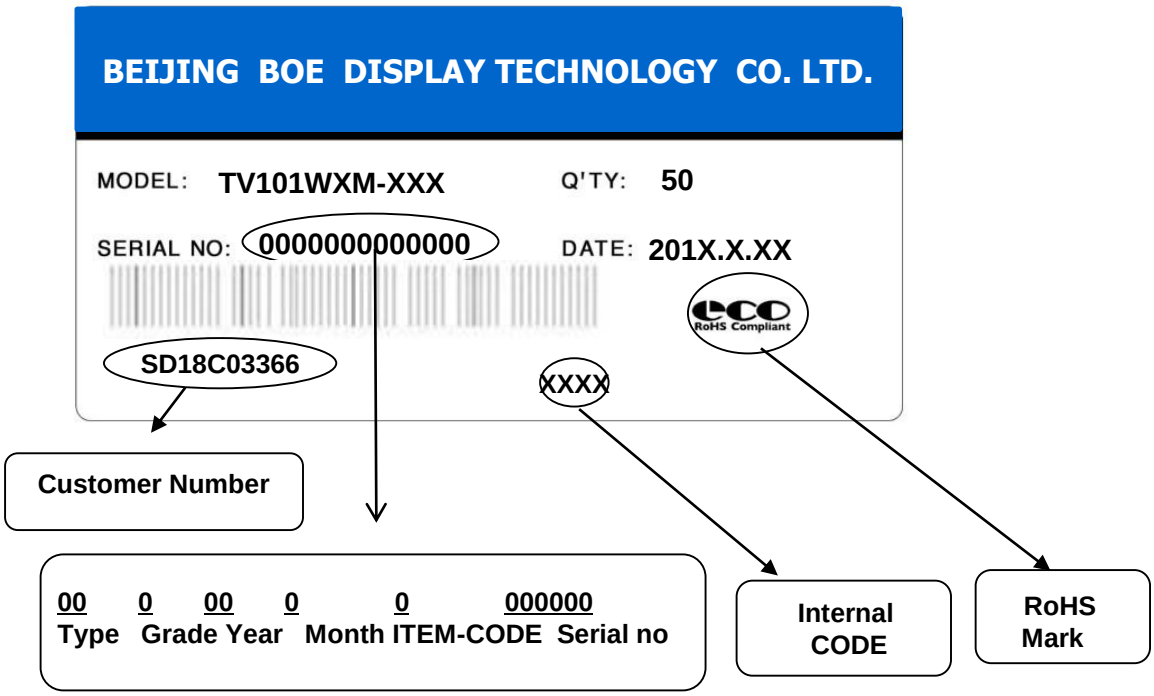
1. **FG-CODE**

   TV101WXM-NF0-49P0

2. **MDL ID**
3. **MDL ID 条纹码**
4. **等级**
5. **BOE标识**

Digit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Code Code	S	L	S	8	1	0	8	5	9	4	2	0	0	0	1	D	B
Description	Product Code /GBN		Grade	Line	Year		Month	Model Extension Code (Last 4 Digits Of FGCODE)				Serial No Hex-Decimal 000000-FFFFFF					

8.3. Box Label



9.0 Handing & Cautions

(1) Cautions when taking out the module
- Pick the pouch only, when taking out module from a shipping package.

(2) Cautions for handling the module
- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Do not pull the interface connector in or out while the LCD module is operating.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

(3) Cautions for the operation
- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

(4) Cautions for the atmosphere
- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(5) Cautions for the module characteristics
- Do not apply fixed pattern data signal to the LCD module at product aging.
- Applying fixed pattern for a long time may cause image sticking.

(6) Other cautions
- Do not disassemble and/or re-assemble LCD module.
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.