

INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer: _____
Model Name: **ZB070BF-09G**
Date: **2022/02/17**
Version: **01**

☒ **Preliminary Specification**
☐ **Final Specification**

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by

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RECORD OF REVISIONS

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1. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Screen size	7"(Diagonal)	inch
Display Format	800 RGB x 480	Dot
Active area	152.4x91.44	mm
Pixel size	190.5 x 190.5	um
Surface treatment	Anti-glare	
Pixel Configuration	RGB Vertical Stripe	
Outline dimension(cell)	160(W) x 102.34(H) x 1.43 (D)	mm
Weight	48	g
View Angle direction	6 o'clock	
Interface	RGB	
IC	EK79713B+EK73202A	
Inversion	1+2dot	

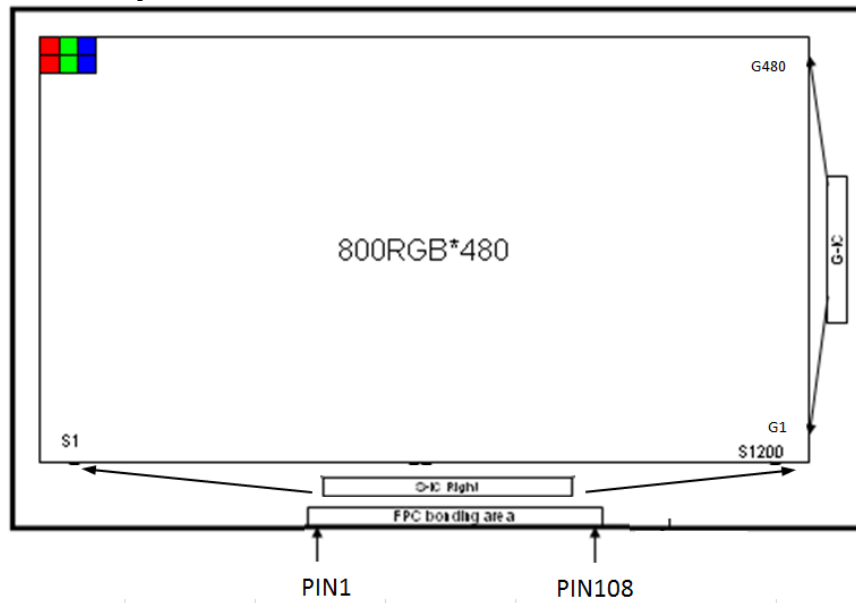
2. Pin Assignment

2.1 TFT LCD Panel Driving Section

Pin No.	Symbol	Pin No.	Symbol
1	DUMMY	61	V12
2	VCOM_CF	62	V11
3	VCOM_CF	63	V10
4	VCOM_TFT	64	V9
5	VCOM_TFT	65	V8
6	AVDD	66	V7
7	AVDD	67	V6
8	DASHD	68	V5
9	D00	69	V4
10	D01	70	V3
11	DASHD	71	V2
12	D02	72	V1
13	D03	73	AVDD
14	DASHD	74	AVDD
15	D04	75	TP17
16	D05	76	TP16
17	DASHD	77	TP15
18	D06	78	VSET
19	D07	79	BLKEN
20	DASHD	80	RSTB
21	D10	81	STBYB
22	D11	82	UPDN
23	DASHD	83	SHLR
24	D12	84	MODE

25	D13	85	DITHB
26	DASHD	86	CLKPOL
27	D14	87	CFSEL
28	D15	88	RES0
29	DASHD	89	BIST
30	D16	90	GOSEQ
31	D17	91	TB4
32	DASHD	92	TB3
33	D20	93	TB2
34	D21	94	TB1
35	DASHD	95	AVSS
36	D22	96	AVSS
37	D23	97	VCOM_TFT
38	DASHD	98	VCOM_TFT
39	D24	99	VCOM_CF
40	D25	100	VGH
41	DASHD	101	VGH
42	D26	102	VCC
43	D27	103	VCC
44	DASHD	104	VGL
45	CLKIN	105	VGL
46	DASHD	106	GND
47	DEN	107	GND
48	DASHD	108	DUMMY
49	HSD		
50	DASHD		
51	VSD		
52	DASHD		
53	VDD		
54	VDD		
55	VSS		
56	VSS		
57	AVSS		
58	AVSS		
59	V14		
60	V13		

2.2 Schematic Panel Layout



3. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power Voltage	V _{CC}	GND=0	-0.3	5.0	V	-
	AVDD	GND=0	6.5	13.5	V	-
	V _{GH}	GND=0	-0.3	40	V	-
	V _{GL}	GND=0	-20	0.3	V	-
	V _{GH} -V _{GL}	GND=0	-	40	V	-
Operation Temperature	Top	-	-30	85	°C	-
	Tst	-	-30	85	°C	-

4. ELECTRICAL CHARACTERISTICS

Recommended Operation condition(GND=0V , Ta=25°C)

Parameter	Symbol	Rating			Unit	Condition
		Min.	Typ.	Max.		
Power Supply Voltage	V _{CC}	3.0	3.3	3.6	V	
	AVDD	10.2	10.4	10.6	V	
	V _{GH}	15.3	16	16.7	V	
	V _{GL}	-7.7	-7	-6.3	V	
Input Signal Voltage	V _{COM}	-	5.1	-	V	
LCD power current	I _{CC}	--	210		mA	black pattern
Digital Input Voltage	High Level	V _{IH}	0.7V _{CC}	-	V _{CC}	Note 1
	Low Level	V _{IL}	0	-	0.3V _{CC}	Note 1

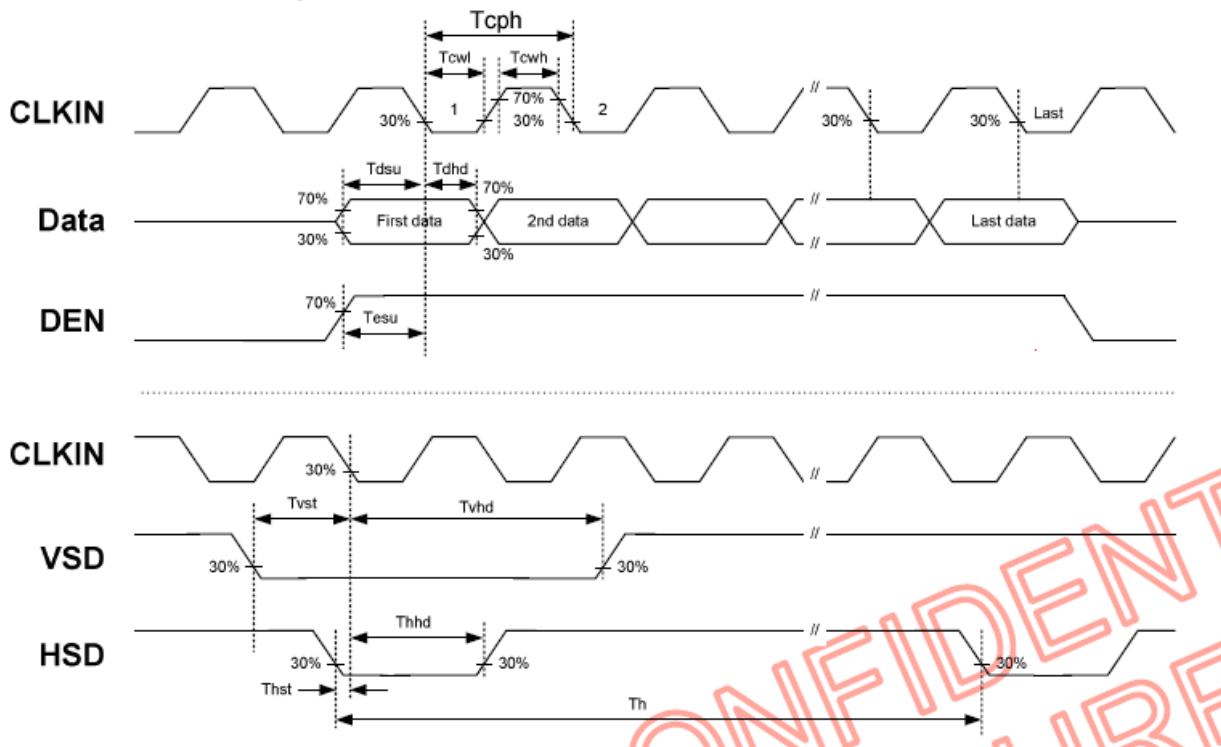
Note 1: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

5. AC CHARACTERISTICS

5.1 AC Electrical Characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	T_{hst}	8	-	-	ns	
HS hold time	T_{hhd}	8	-	-	ns	
VS setup time	T_{vst}	8	-	-	ns	
VS hold time	T_{vhd}	8	-	-	ns	
Data setup time	T_{dsu}	8	-	-	ns	
Data hole time	T_{dhd}	8	-	-	ns	
DE setup time	T_{esu}	8	-	-	ns	
DE hole time	T_{ehd}	8	-	-	ns	
DV _{DD} Power On Slew rate	T_{POR}	-	-	20	ms	From 0 to 90% DV _{DD}
RESET pulse width	T_{Rst}	1	-	-	ms	
DCLK cycle time	T_{cph}	20	-	-	ns	
DCLK pulse duty	T_{cwh}	40	50	60	%	

5.2 Clock and Data input waveforms



5.3 Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	6	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	204	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tpw	1	3	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

Note: Frame rate is $60 \pm 5\text{Hz}$

5.4 Data Input Format

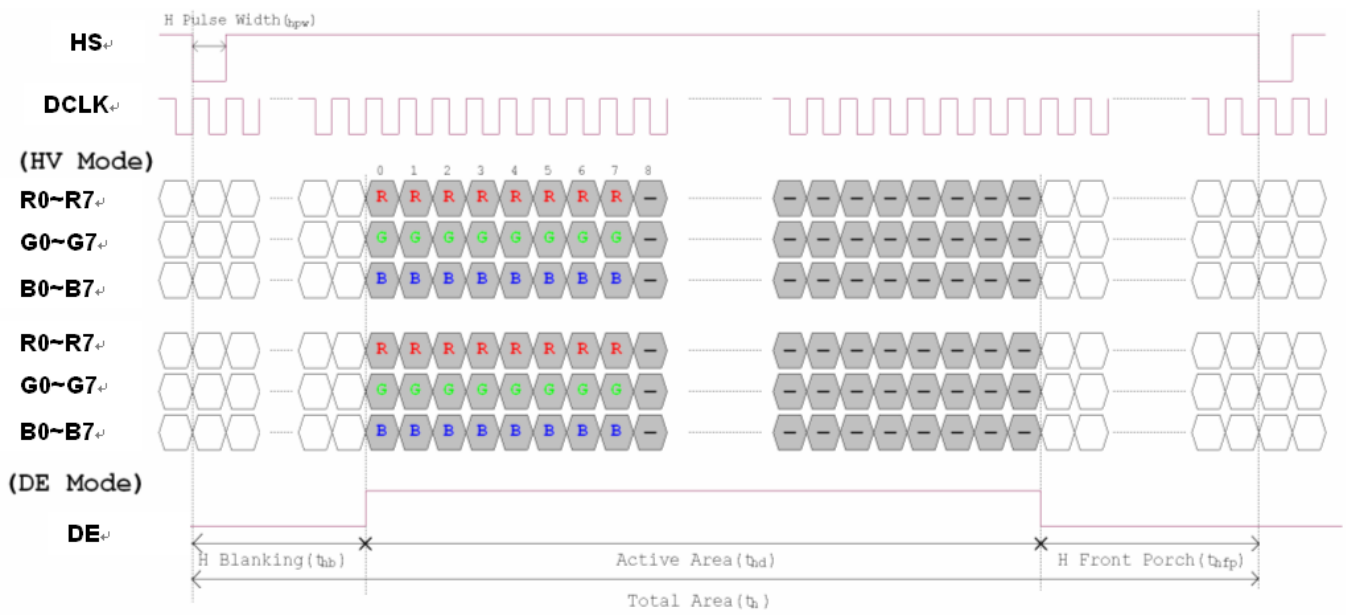


Figure 3. 1 Horizontal input timing diagram.

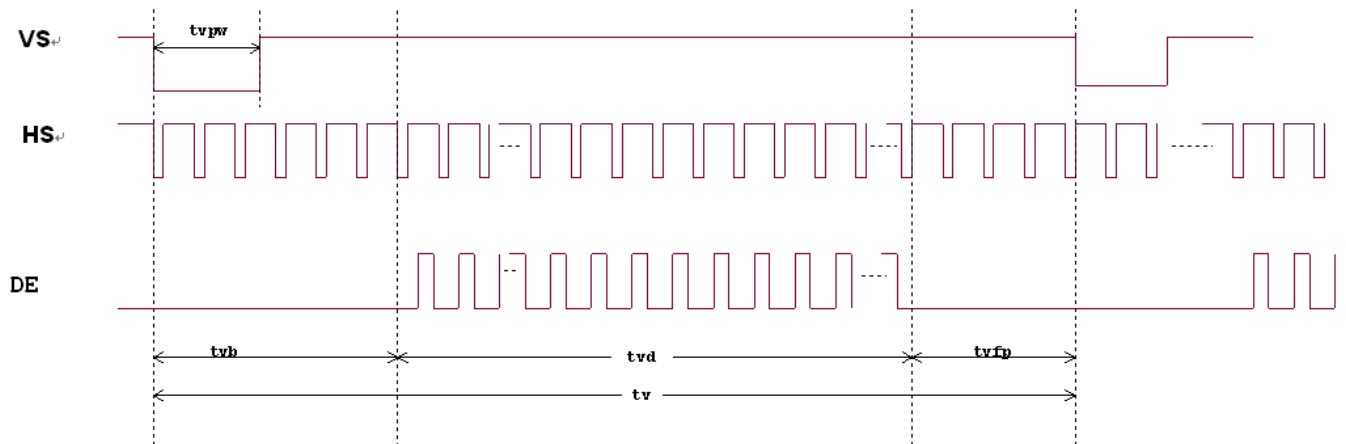


Figure 3. 2 Vertical input timing diagram.

5.5 Recommend circuit



6. OPTICAL CHARACTERISTIC

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time		Tr	$\theta = 0^{\circ}$ 、 $\Phi = 0^{\circ}$	-	5	10	.ms	Note 3,5
		Tf		-	15	20	.ms	
Contrast ratio		CR	At optimized viewing angle	700	1000	-	-	Note 4,5
Color Chromaticity	White	Wx	$\theta = 0^{\circ}$ 、 $\Phi = 0^{\circ}$	Typ-0.05	0.31	Typ+0.05	-	Note 2,6,7,8
		Wy			0.33			
Color Saturation (NTSC)		-	-	-	50%	-	-	-
Viewing angle		θ L	$CR \geq 10$	60	70	-	Deg.	Note 1
		θ R		60	70	-		
		ψ T		50	60	-		
		ψ B		60	70	-		
Transmittance		Tr	$\theta = 0^{\circ}$ 、 $\Phi = 0^{\circ}$	4.94	5.62	-	%	Note 2,7,8

Note 1: Definition of viewing angle range

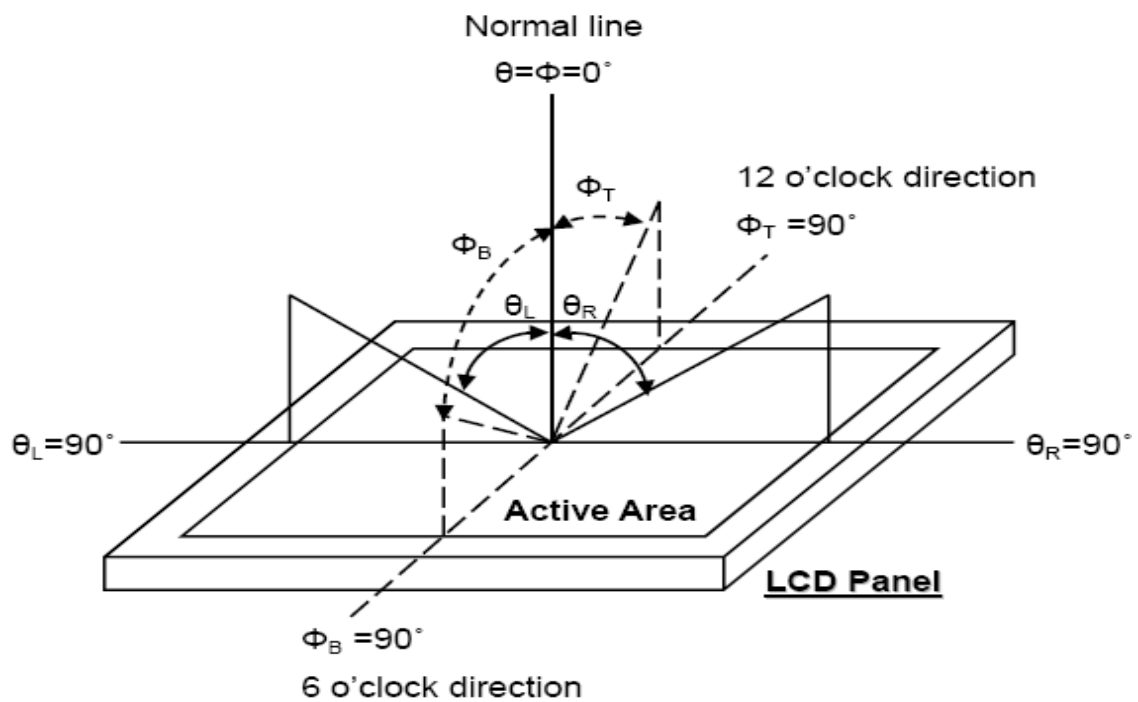


Fig. 7-1 Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

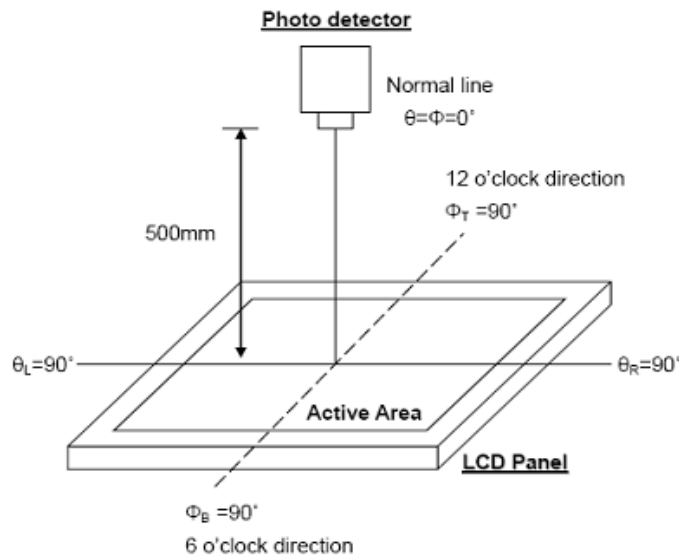


Fig. 7-2 Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White state and “Black” state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10% . And fall time, T_f , is the time between photo detector output Intensity changed from 10% to 90% .

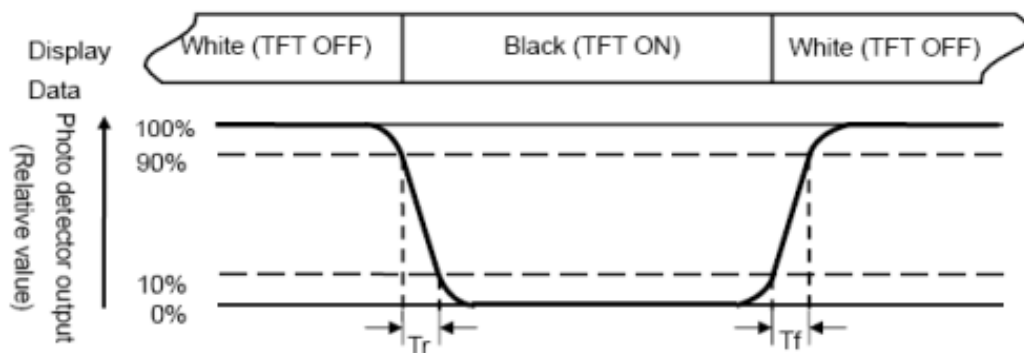


Fig. 3-3 Definition of response time

Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

"±" means that the analog input signal swings in phase with VCOM signal.

"±" means that the analog input signal swings out of phase with VCOM signal.

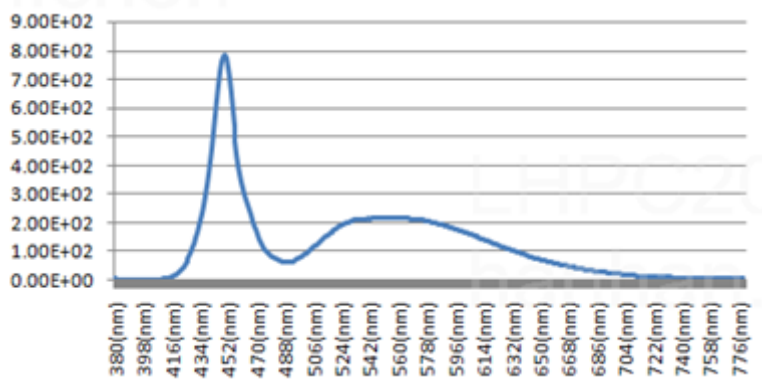
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)

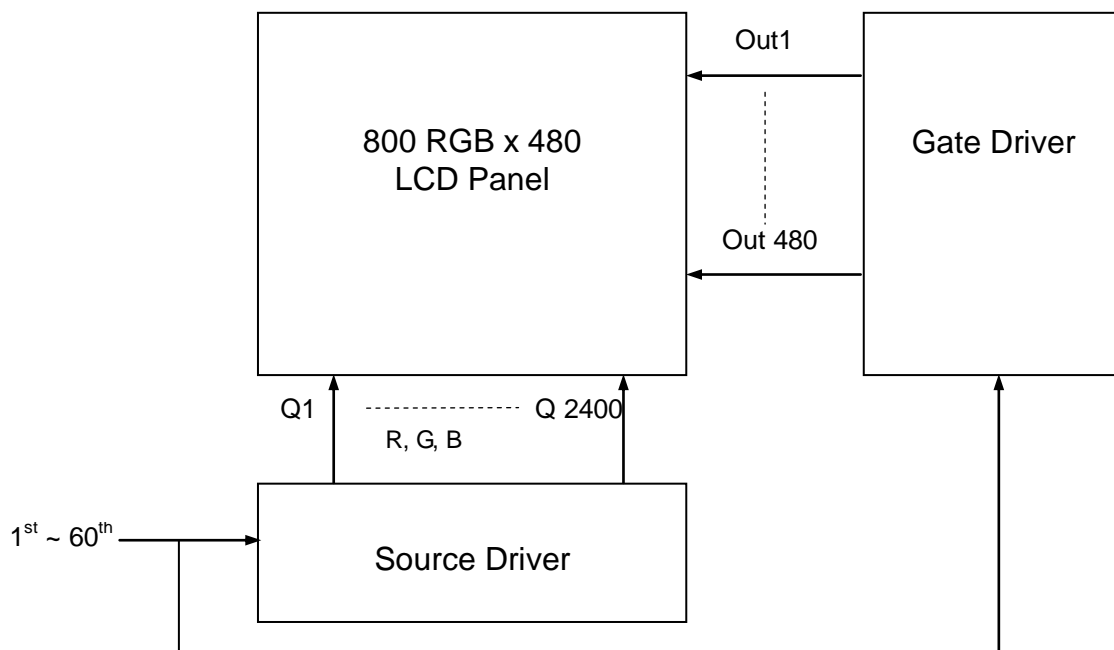
Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened. (Reference : Backlight's brightness is 350 nit)

Note 8: Base on the following INX BLU data evaluation



7. BLOCK DIAGRAM



8. QUALITY ASSURANCE

No.	Test Items	Test Condition	REMARK
1	High Temperature Storage Test	80°C, 240hours	Note 1 Note 2 Note 3
2	Low Temperature Storage Test	-30°C, 240hours	
3	High Temperature Operation Test	70°C, 240hours	
4	Low Temperature Operation Test	-20°C, 240hours	
5	Thermal Shock Storage Test	-20°C, 0.5hour←→70°C, 0.5hour; 100cycles	

Note:

1. The test samples have recovery time need more than 2 hours at room temperature before the function check. In the standard conditions, there is no abnormal display function occurred.
2. After the reliability test, the product only guarantees operational function, but don't guarantee all of the cosmetic specification.
3. Under no condensation of dew.



10. PACKAGE INFORMATION

10.1 Packaging Material Table

TBD (need to update)

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity (pcs)	Remark
1	Panel Assembly	EB070NA-09A	160 x102.34 x 1.43	0.048	80	
2	Dust-Proof Bag	PE	700 x 530	0.048	1	
3	Tray	PET	505 x 338 x 16.5	0.233	21	Anti-static
4	Partition	Corrugated Paper	1152 x 512	0.290	1	
5	Carton	Corrugated Paper	530 x 355 x 255	0.810	1	
6	Total weight	9.88± 5%Kg				

10.2 Packaging Quantity

TBD (need to update)

(1) LCM quantity per tray :	2 row x 2column = 4 pcs
(2) Total LCM quantity of per Carton:	4 pcs/ tray x 20 tray / Box = 80 pcs

11. PRECAUTIONS

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

11.1 MOUNTING PRECAUTIONS

- (1) You must mount a module using arranged in four corners or four sides.
- (2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module.
And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- (3) Please attach a transparent protective plate to the surface in order to protect the polarizer.
Transparent protective plate should have sufficient strength in order to the resist external force.
- (4) You should adopt radiation structure to satisfy the temperature specification.
- (5) Acetic acid type and chlorine type materials for the cover case are not describe because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- (6) 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 are determined to the polarizer)
- (7) When the surface becomes dusty, please wipe gently with adsorbent cotton or other soft materials like chamois soaks 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.
- (8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (9) Do not open the case because inside circuits do not have sufficient strength.

11.2 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.

11.3 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 wristband etc. And don't touch interface pin directly.

11.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

11.5 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.

11.6 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. 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.