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DATE	

No	PART NO.	DESCRIPTION	SPECIFICATION
	FOB: GV185FHB-N10-3M31 LCM: GV185FHM-N10-3M31	**B3 18.5 FHD ADS 工控应用 A-si 60Hz NTSC 70%**	**SPEC:**B3 18.5 FHD ADS 工控应用 A-si 60Hz NTSC 70%项目规格书-FOB B3 18.5 FHD ADS 工控应用 A-si 60Hz NTSC 70%项目规格书-LCM **IIS文件:** B3 18.5 FHD ADS 工控应用 A-si 60Hz NTSC 70%项目IIS

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SPEC. NUMBER	PRODUCT GROUP	REV.	ISSUE DATE	PAGE
	TFT- LCD	P0	2024.04.16	1 OF 29

B3 GV185FHB-N10 Product Specification Rev.P0

SUPPLIER	HEFEI BOE Optoelectronics Technology CO., LTD
FG-Code	GV185FHB-N10-3M31

ITEM	BUYER SIGNATURE	DATE

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REVISION HISTORY

REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0	-	Initial Release	2024.04.16	Hu bing

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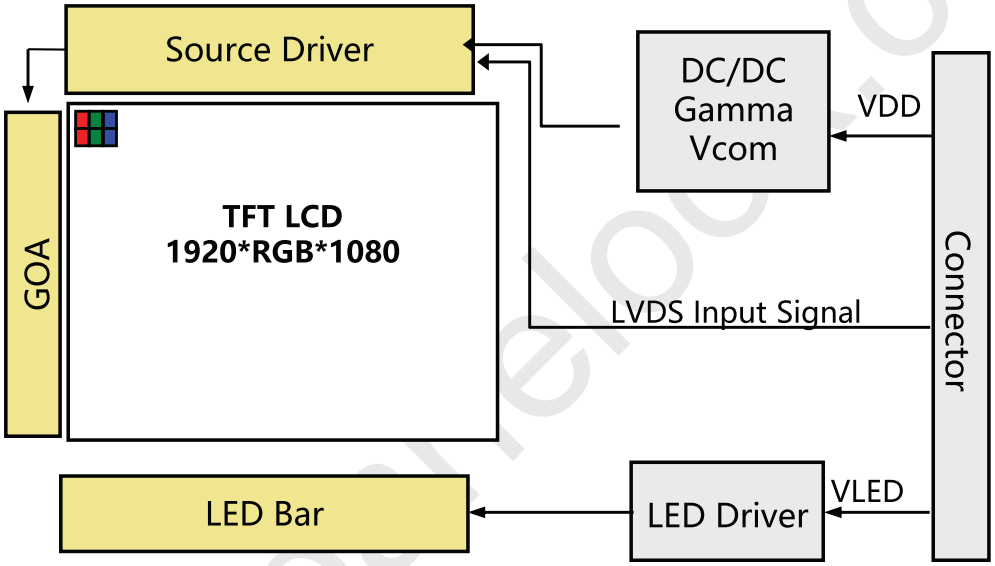
1.0 GENERAL DESCRIPTION

1.0.1 Introduction

GV185FHB-N10-3M31 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 18.5 inch diagonally measured active area with FHD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7 M colors.



1.0.2 Features

- LVDS interface
- RoHS Compliant
- 16.7M color depth

1.0.3 Application

- Industrial display or HMI etc.

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1.0.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	408.96 (H) × 230.04(V)	mm	
Number of pixels	1920(H) × 1080(V)	Pixels	
Pixel pitch	0.213(H) × 0.213 (V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M(8bit)	Colors	
Display mode	Normally Black		
Dimensional outline	414.96 (H) × 239.14(V) × 1.05(D) typ.	mm	W/O PCB
Weight	280±20	g	
Surface treatment	AG25，3H		

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2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Environment Absolute Maximum Ratings> [Ta =25±2 ℃]

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Back-light Power Supply Voltage	HV_{DDOUT}	-	-	-	V	Ta = 25 ℃ Note 1&2
Back-light LED Current	I_{HVDD}	-	-	-	mA	
Back-light LED Reverse Voltage	V_R	-	-	-	V	
Power Supply Input Voltage	VCC	-0.3	-	7	V	
Operating Temperature	T_{OP}	-30	-	80	℃	Environment Temperature
Storage Temperature	T_{ST}	-30	-	80	℃	
Heat Release Requirement	Trls	15			℃	Note3

Note:
1. These range above is maximum value not the actual operating temperature . Actual Operating temperature is no more than 40℃ and temperature refers to the LCM surface temperature ;
2.BOE is not responsible for product problems beyond the use conditions.
3.When the ambient temperature is T ℃, the surface temperature of Panel can not exceed (T+15)℃.

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3.0 ELECTRICAL SPECIFICATIONS

3.0.1 TFT LCD Module

< Table 3. LCD Module Electrical Specifications > [Ta =25±2 ℃]

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Power Supply Input Voltage	V_{DD}	4.5	5	5.5	V	Note 1
Power Supply Current	I_{DD}	-	600	1500	mA	
Power Supply inrush Current	Inrush	-	-	3	A	
LED Driver Power Supply Voltage	H_{VDD}	10.8	12	13.2	V	Note 2
LED Driver Power Supply Current	I_{HVDD}	-	1500	1700	mA	
LED Power Consumption	P_{LED}	-	18	20	W	
LED Driver Power Supply inrush Current	Inrush	-	-	3	A	
Positive-going Input Threshold Voltage	V_{IT+}	-	-	+100	mV	Vcom = 1.2V typ.
Negative-going Input Threshold Voltage	V_{IT-}	-100	-	-	mV	
Differential input common mode voltage	V_{com}	-	1.2	-	V	V_{IH}=100mV, V_{IL}=-100mV

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 5V at 25 ℃
Max value at Black Pattern
2. Calculated value for reference $I_{LED} \times V_{LED} \div 0.85 = P_{LED}$

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3.2 Back-light Unit

< Table 4. LED Driving guideline specifications > Ta=25+/-2°C

Parameter			Min.	Typ.	Max.	Unit	Remarks
EN Control Level	Backlight on	V_{ENH}	2	-	-	V	EN logic high voltage
	Backlight off	V_{ENL}	-	-	0.8	V	EN logic low voltage
PWM Control Level	PWM High Level	V_{PML}	2	-	-	V	
	PWM Low Level	V_{PML}	-	-	0.8	V	
PWM Control Frequency		F_{PWM}	0.1	-	50	KHz	
Duty Ratio		-	5	-	100	%	

Notes : 1. The LED Life-time define as the estimated time to 50% degradation of initial luminous under the condition of the ambient temperature of 25℃.

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4.0 INTERFACE CONNECTION.

4.0.1 Electrical Interface Connection

The electronics interface connector is IS100-L30R-C23 (UJU) or equivalent
The connector interface pin assignments are listed in Table 6 、 7and8.

<Table 6. Pin Assignments for the Interface Connector>

Pin No.	Symbol	Description	remark
1	RxOIN0-	LVDS data input	
2	RxOIN0+	LVDS data input	
3	RxOIN1-	LVDS data input	
4	RxOIN1+	LVDS data input	
5	RxOIN2-	LVDS data input	
6	RxOIN2+	LVDS data input	
7	VSS	Ground	
8	RxOCLKIN-	LVDS clock input	
9	RxOCLKIN+	LVDS clock input	
10	RxOIN3-	LVDS data input	
11	RxOIN3+	LVDS data input	
12	RxEIN0-	LVDS data input	
13	RxEIN0+	LVDS data input	
14	VSS	Ground	
15	RxEIN1-	LVDS data input	
16	RxEIN1+	LVDS data input	
17	VSS	Ground	
18	RxEIN2-	LVDS data input	
19	RxEIN2+	LVDS data input	
20	RxECLKIN-	LVDS clock input	
21	RxECLKIN+	LVDS clock input	
22	RxEIN3-	LVDS data input	
23	RxEIN3+	LVDS data input	
24	VSS	Ground	
25	SCL	NC (I2C BUS)	Only BOE use
26	SDA	NC (I2C BUS)	Only BOE use
27	WP	NC (EEPROM write EN)	Only BOE use
28	VCC	Power supply(5V)	
29	VCC	Power supply(5V)	
30	VCC	Power supply(5V)	

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4.0 INTERFACE CONNECTION.

4.0.1 Electrical Interface Connection

The LED connector is CI4205M2HRD-NH or equivalent.
The LED connector is CI4208M2HRD-NH or equivalent.
The connector interface pin assignments are listed in Table 6 、7and8.

<Table 7. Pin Assignments for the LED Driver Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	VCC	12V
2	GND	GND
3	Enable	5V-On / 0V-Off
4	Dimming	PWM Dimming
5	NC	No Connection

<Table 8. Pin Assignments for the LED Bar Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	LED_CH4	LED Channel 4 Positive
2	LED_CH3	LED Channel 3 Positive
3	LED_CH2	LED Channel 2 Positive
4	LED_CH1	LED Channel 1 Positive
5	NC	No Connection
6	NC	No Connection
7	VLED	LED Out Negative
8	VLED	LED Out Negative

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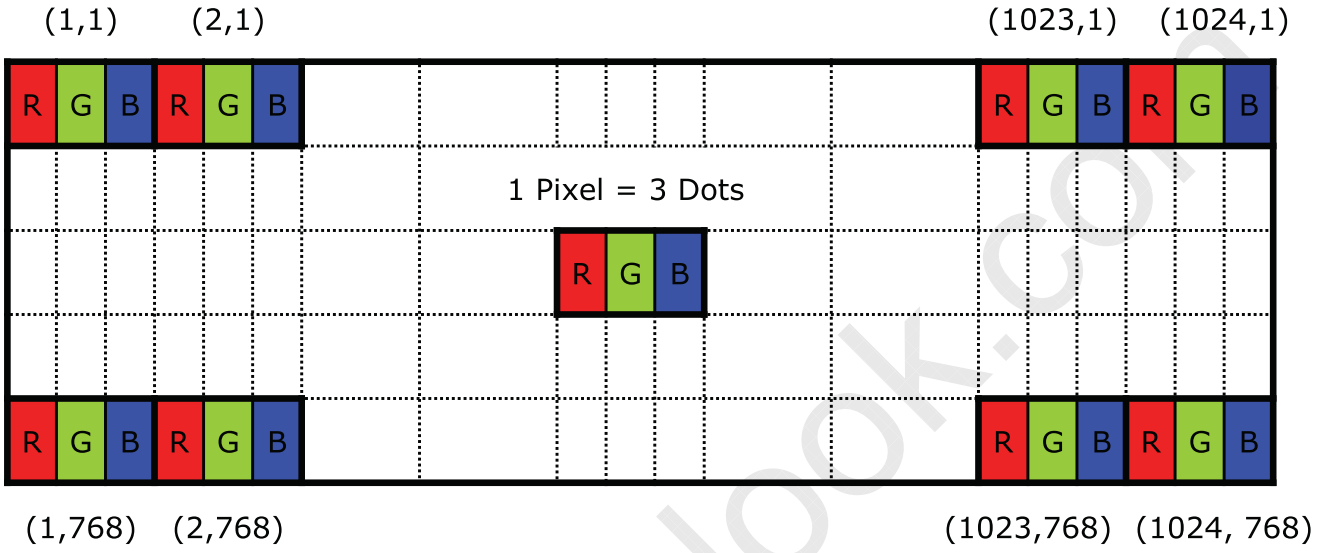
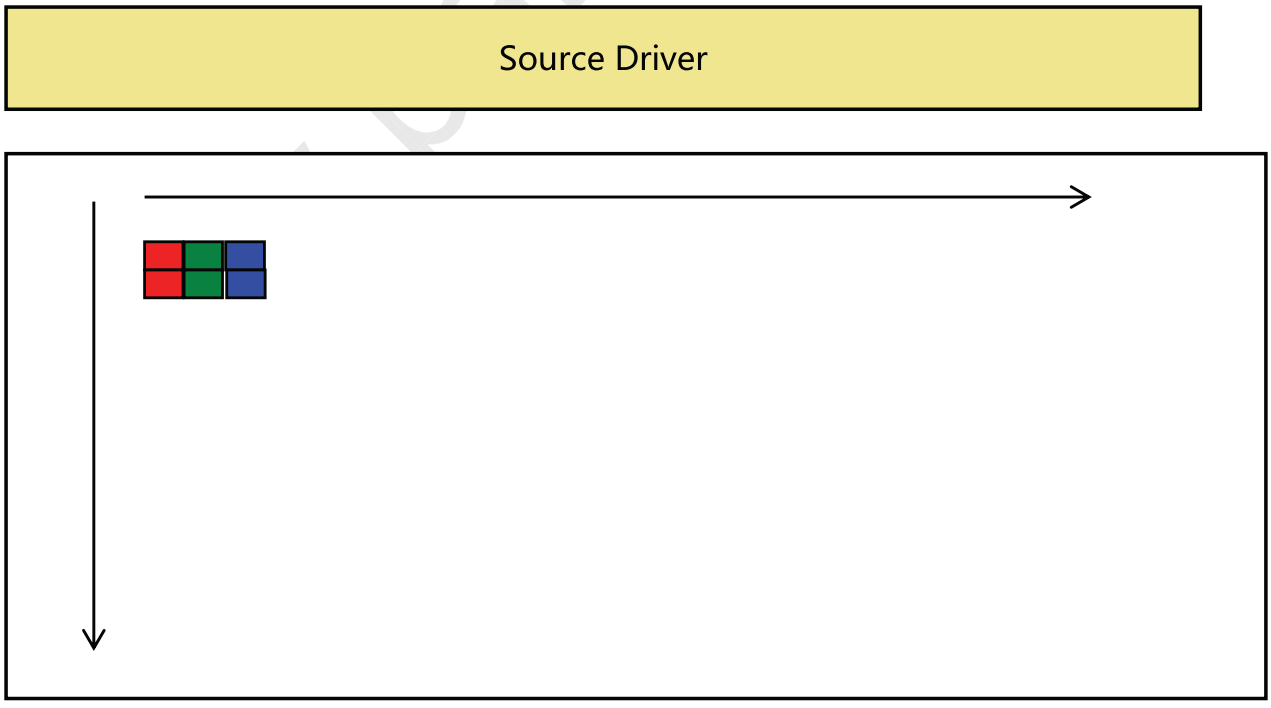
4.2 Data Input Format

Figure 5. Pixel Format



Display Position of Input Data (V-H)

Figure 6. Scan direction



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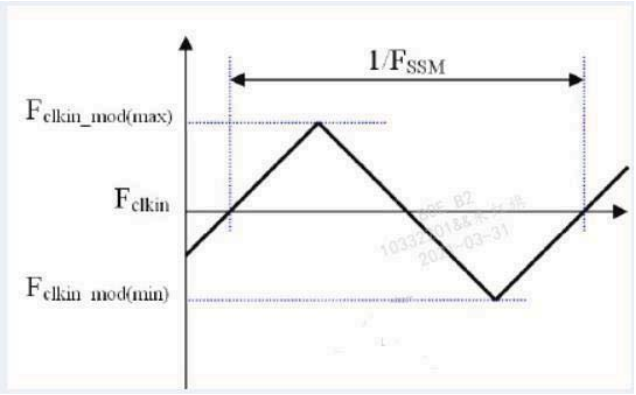
5.0 SIGNAL TIMING SPECIFICATION

5.0.1 The GV185FHB-N10 is operated by the DE only.

Item	Symbols		Min	Typ	Max	Unit	Note
DCLK	Period	tCLK	9.5	-	25	ns	Note 1
	Frequency	-	40	-	105	MHz	
Hsync	Period	tHP	990	1040	-	tCLK	
	Horizontal Valid	tHV	-	960	-	tCLK	
	Horizontal Blank	tHB	30	80	-	tCLK	
	Frequency	fH	45	60	75	KHz	
Vsync	Period	tVP	1100	1125	1138	tHP	
	Vertical Valid	tVV	-	1080	-	tHP	
	Vertical Blank	tVB	30	45	58	tHP	
	Frequency	fV	45	60	75	Hz	
LVDS Receiver clock	Input spread spectrum ratio	SSr	-	1.5	2	%	Note 2
	spread spectrum modulation frequency	Fssm	-	-	100	KHZ	

Note 1: The DCLK range at last line of V-blanking should be set in 0-H-active/2.
Note 2: The SSGG(spread Spectrum Clock Generator) is defined as following figure:



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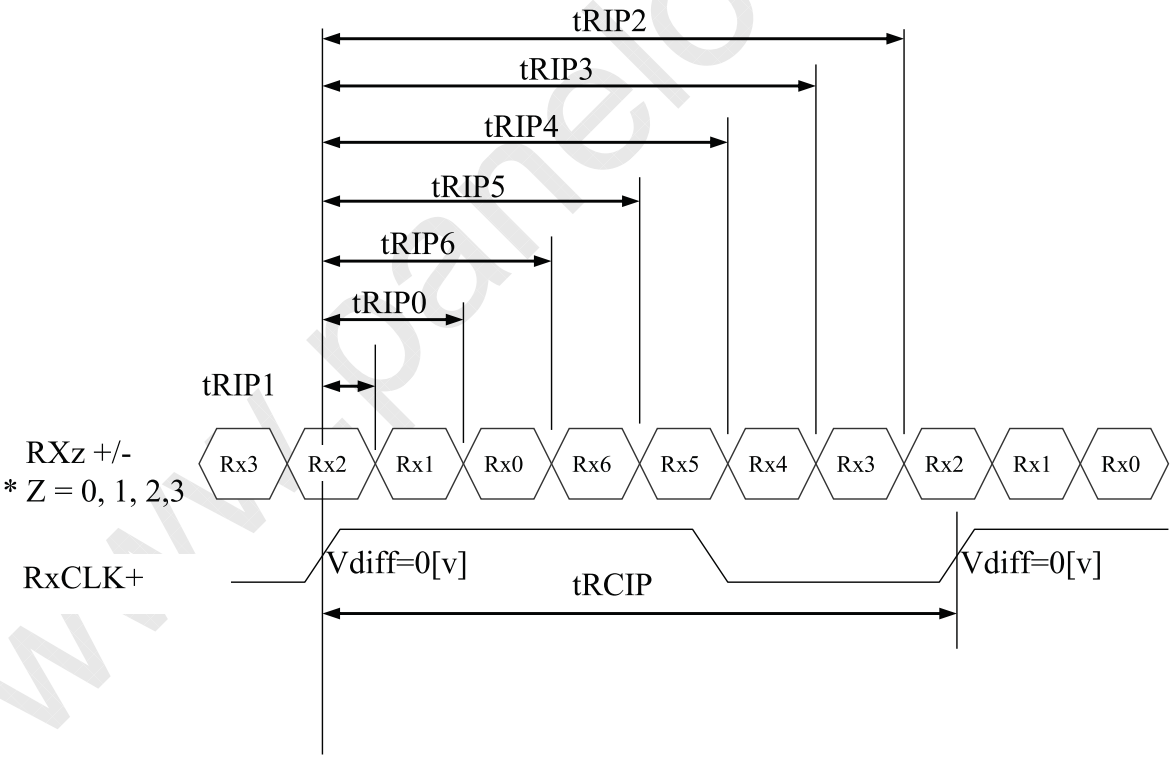
5.02 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 4.

<Table 4. LVDS Rx Interface Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	9.5	-	25	nsec	
Input Data 0	tRIP1	-0.4	0.0	0.4	nsec	
Input Data 1	tRIP0	tRCIP/7-0.4	tRCIP/7	tRCIP/7+0.4	nsec	
Input Data 2	tRIP6	2 ×tRCIP/7-0.4	2 ×tRCIP/7	2 ×tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3 ×tRCIP/7-0.4	3 ×tRCIP/7	3 ×tRCIP/7+0.4	nsec	
Input Data 4	tRIP4	4 ×tRCIP/7-0.4	4 ×tRCIP/7	4 ×tRCIP/7+0.4	nsec	
Input Data 5	tRIP3	5 ×tRCIP/7-0.4	5 ×tRCIP/7	5 ×tRCIP/7+0.4	nsec	
Input Data 6	tRIP2	6 ×tRCIP/7-0.4	6 ×tRCIP/7	6 ×tRCIP/7+0.4	nsec	



* Vdiff = (RXz+)-(RXz-),…. ,(RXCLK+)-(RXCLK-)

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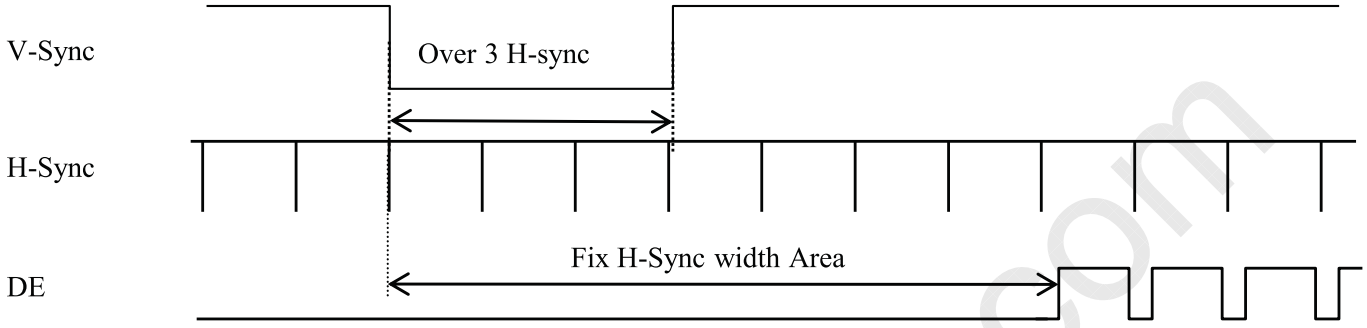
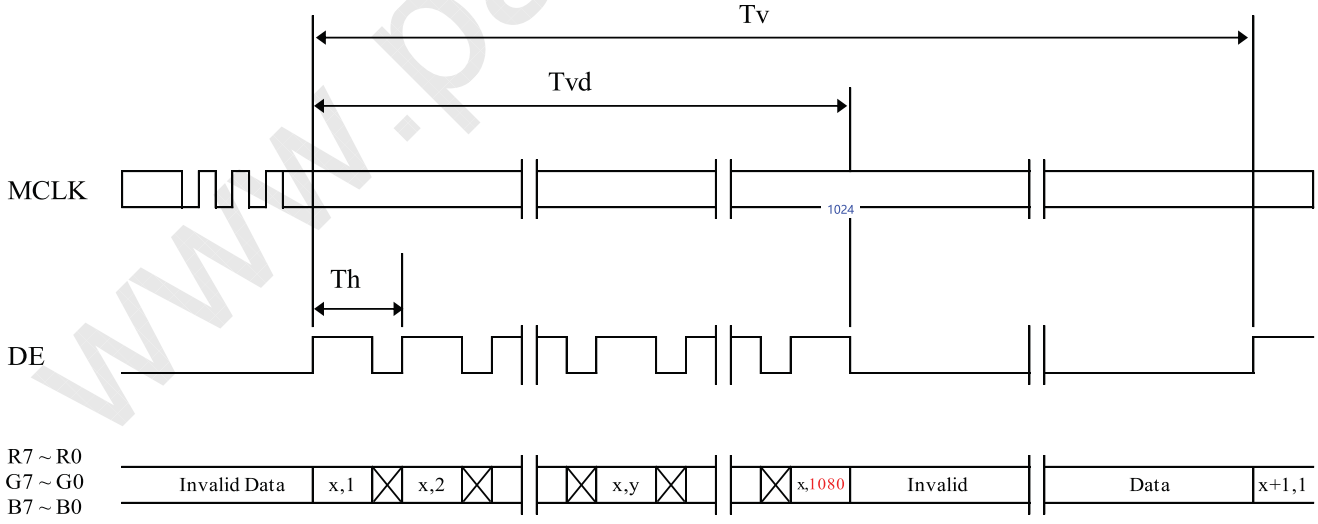
6. SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

6.01 Sync Timing Waveforms



1) Need over 3 H-sync during V-Sync Low
2) Fix H-Sync width from V-Sync falling edge to first rising edge

6.02 Vertical Timing Waveforms



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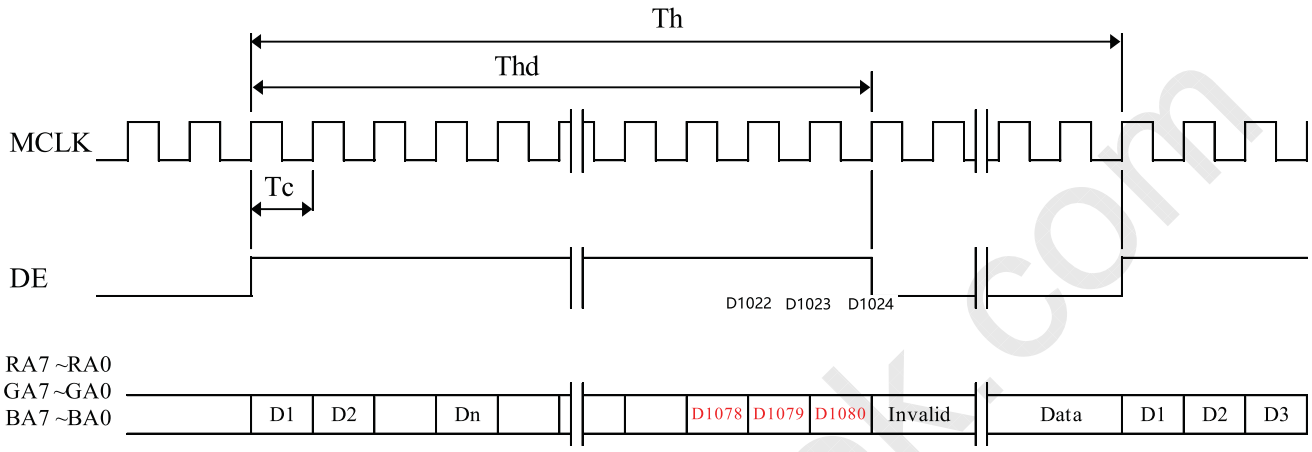
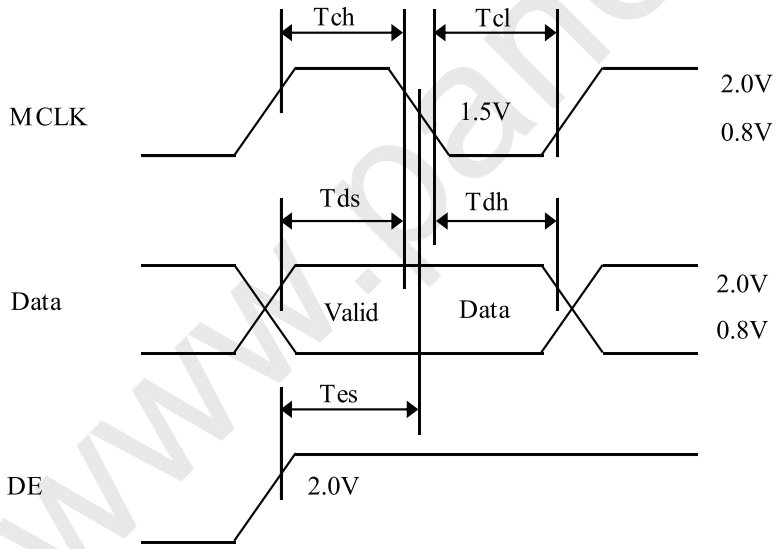
6.03 Horizontal Timing Waveforms





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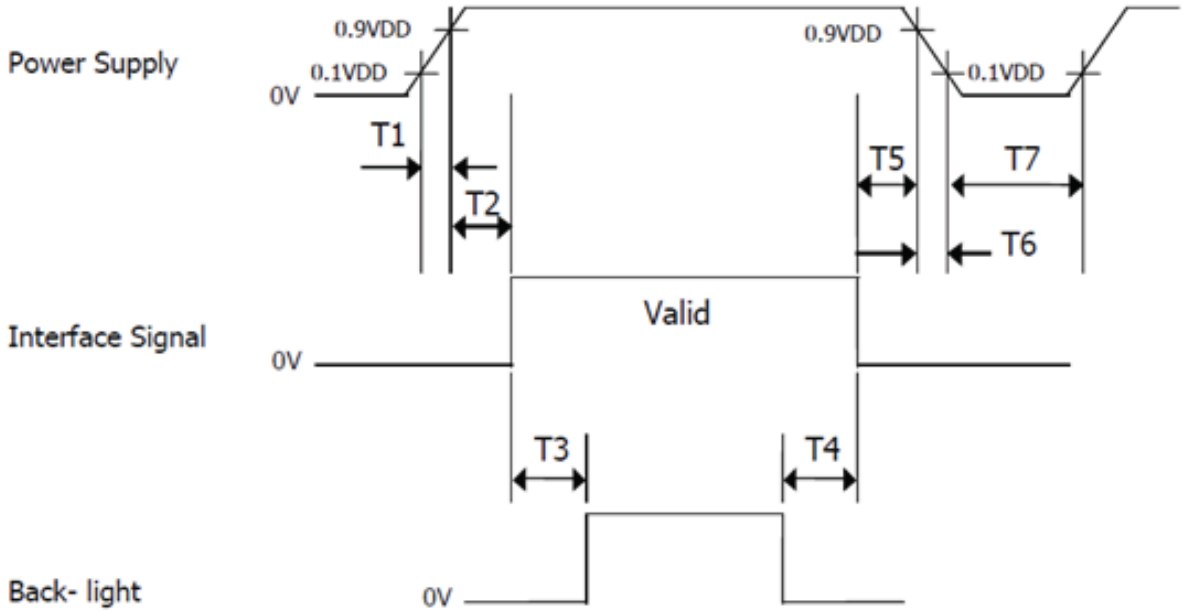
7.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below



Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	300	-	-	ms
T4	500	-	-	ms
T5	0	-	50	ms
T6	0	-	10	ms
T7	500	-	-	ms

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8.0 OPTICAL SPECIFICATION

8.0.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON CS2000/CA310) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θØ=0 (=θ3) as the 3 o'clock direction (the "right"), θ Ø=90 (= θ12) as the 12 o'clock direction ("upward"), θ Ø=180 (= θ9) as the 9 o'clock direction ("left") and θ Ø=270(= θ6) as the 6 o'clock direction ("bottom"). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The luminance, color and uniformity (etc) should be tested by CS2000/CA310. The backlight should be operating for 10 minutes prior to measurement. VDD shall be 3.3 ± 0.3V at 25°C. Optimum viewing angle direction is 6 'clock

<Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	80	85	-	Deg.	Note 1
		Θ_9		80	85	-	Deg.	
	Vertical	Θ_{12}		80	85	-	Deg.	
		Θ_6		80	85	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0°	900	1200	-		Note 2
Color Gamut	NTSC	CIE1931	Θ = 0°	65	70	-	%	Based on C light Note 3
Response Time		Tr+Td	Ta= 25° C Θ = 0°	-	30	35	ms	Note 4

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Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

4. The electro-optical response time measurements shall be made as FIGURE 3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

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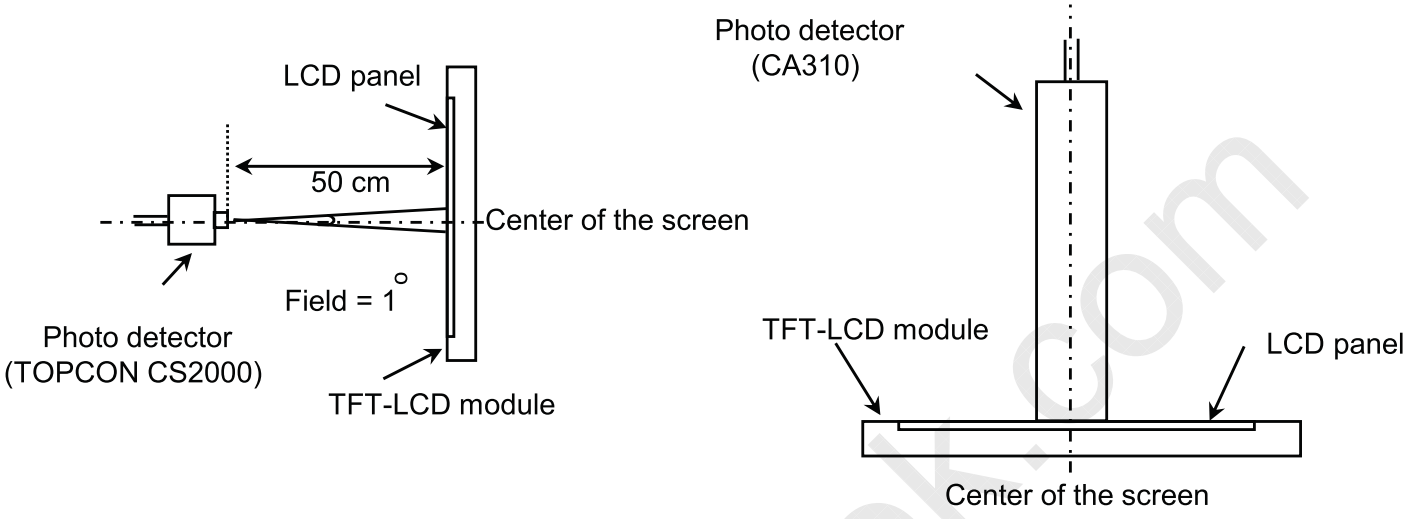
8.0.2 Optical measurements

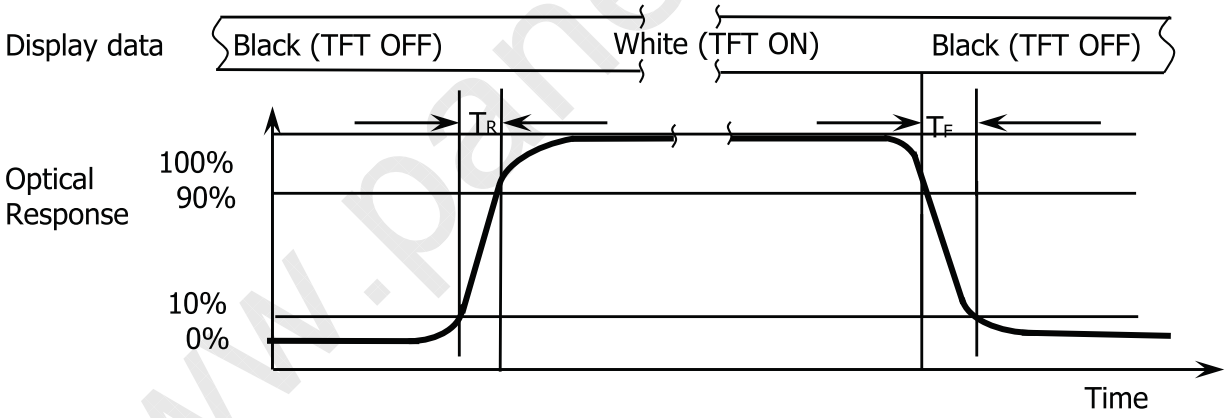
Figure 1. Measurement Set Up



View angel range, uniformity, etc. measurement setup

Flicker, measurement setup

Figure 2. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 3 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr and 90% to 10% is Td.

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9.0 MECHANICAL OUTLINE DIMENSION

Figure 1. TFT-LCD Module Outline Dimension (Front View)

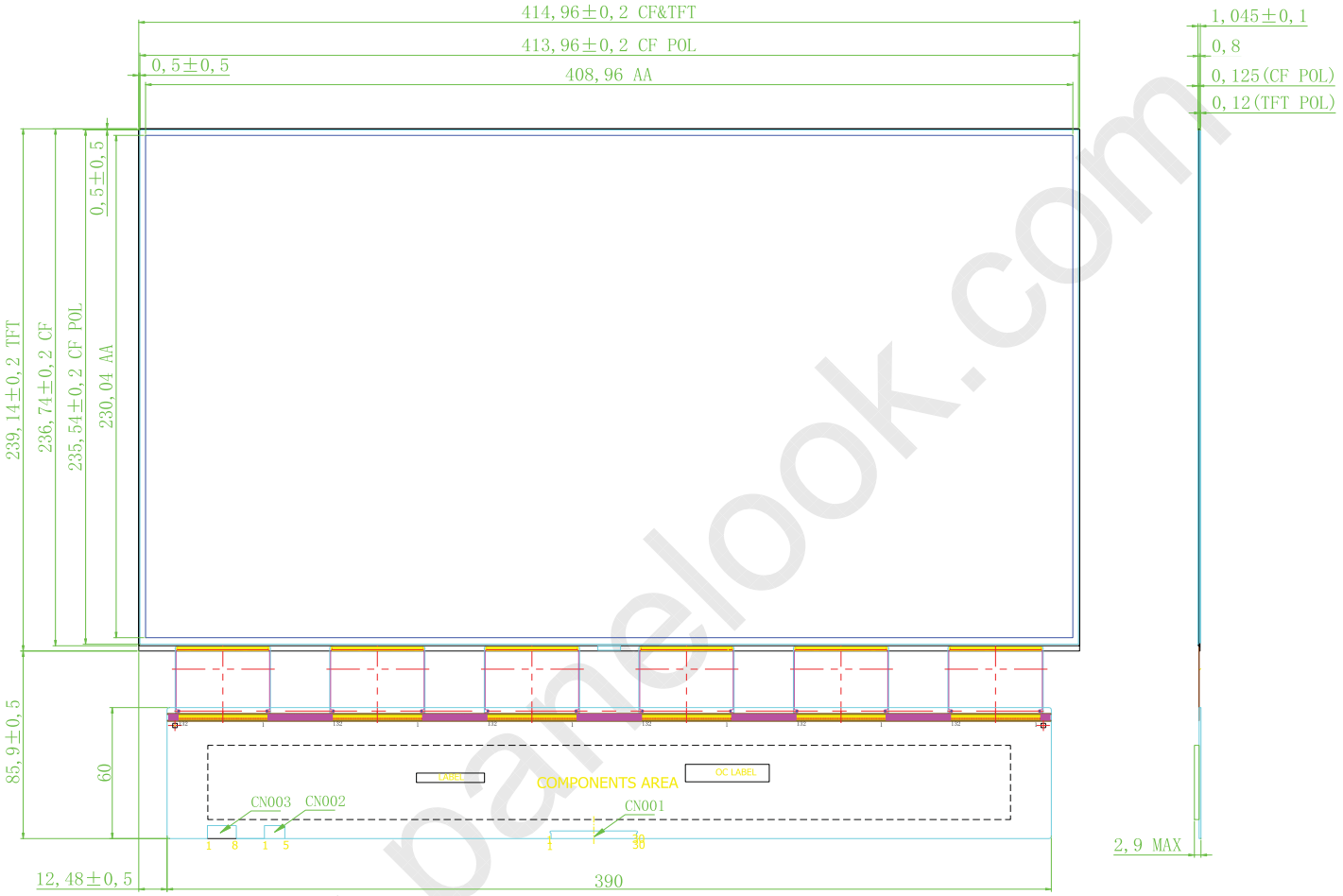

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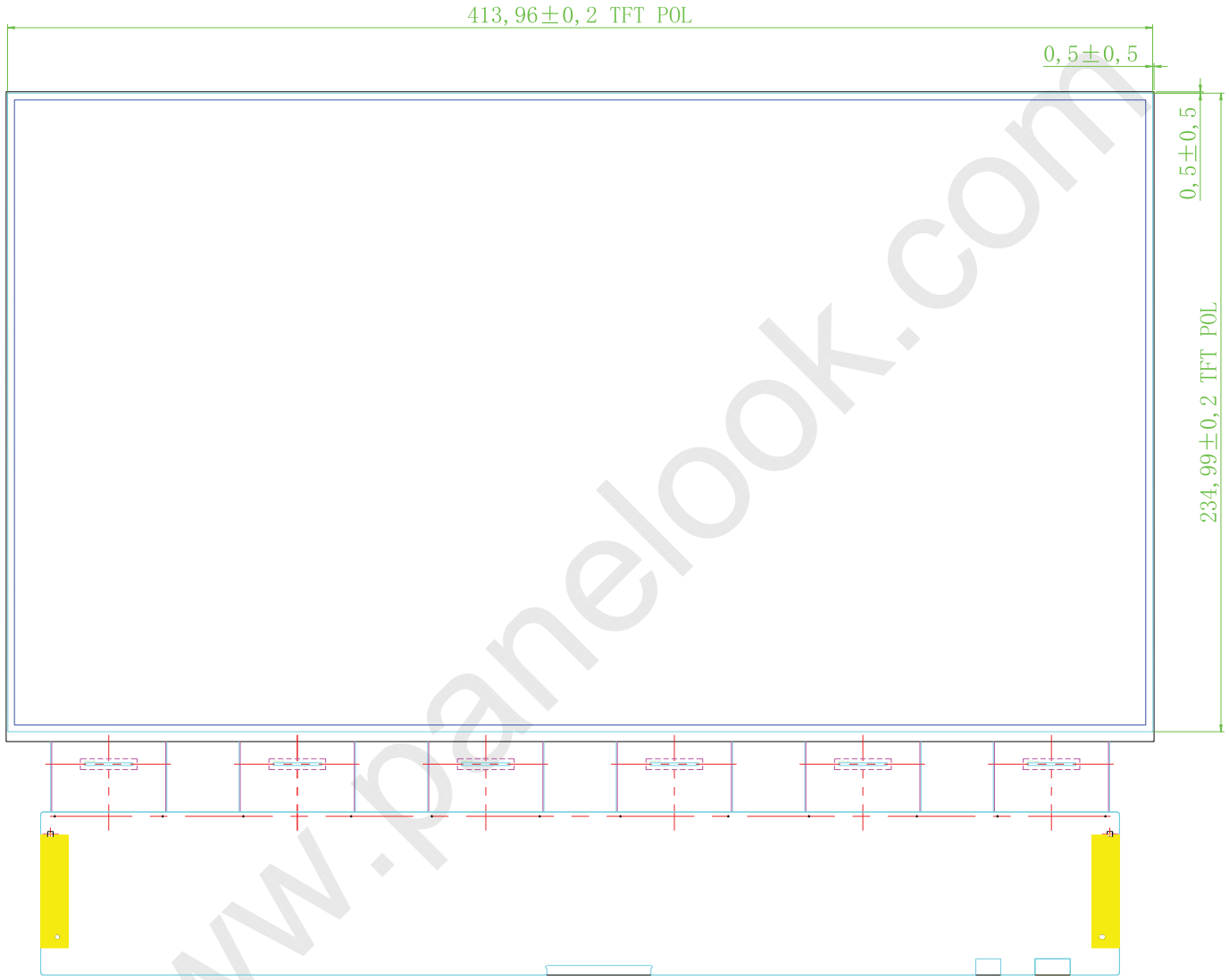
Figure 2. TFT-LCD Module Outline Dimensions (Rear view)



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10.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

<Table 9. Reliability test>

No	Test Items	Conditions	Remark
1	High temperature storage test	Ta = 80℃, 240 hrs	
2	Low temperature storage test	Ta = -30℃, 240 hrs	
3	High temperature operation test	Ta = 80℃, 240 hrs	
4	Low temperature operation test	Ta = -30℃, 240 hrs	
5	High temperature & high humidity operation test	Ta = 60 ℃, 90%RH, 240 hrs	
6	Thermal shock	Ta = -30 ℃ ↔ 80℃ (0.5 hr), 1hour/Cycle,100 cycle	Non-operation
7	ESD test	C=150pF, R=330Ω, Air: ±15KV, Contact: ±8KV,100point	
8	Vibration Test（Non-operation）	1.5G,10~200Hz,30min/AXIS ; X,Y,Z directions ; Wave: random	

Note: After the reliability test, the product only guarantee function normally without any fatal defect (non-display, line defect, abormal display etc). All the cosmetic specification is judged before the reliablity test.

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11.0 Precautions

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

11.1 Mounting Precautions

(1) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(2) You must mount a module using specified mounting holes (Details refer to the drawings).

(3) Please make sure to avoid external forces applied to the Source PCB or FPC and D-IC during the process of handling or assembling. If not, It causes panel damage or malfunction.

(4) Note that polarizers are very fragile and could be easily damaged. 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.

(5) Do not pull or fold the source D-IC which connect the source PCB or FPC and the panel.

Do not pull or fold the LED wire.

(6) After removing the protective film, when the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with alcohol or purified water.

Do not strong polar solvent because they cause chemical damage to the polarizer.

(7) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

(8) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(9) Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.

(10) Do not disassemble the module.

(11) To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.

(12) If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by the way of mutual agreement.

(13)Do not drop water or any chemicals onto the LCD’s surface.

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11.2 Operating Precautions

- (1) 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.
- (2) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
- (3) The electrochemical reaction caused by DC voltage will lead to LCD degradation, so DC drive should be avoided.
- (4) The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
- (5) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (6) Design the length of cable to connect between the connector for back-light and the converter as short as possible and the shorter cable shall be connected directly.
The longer cable between that of back-light and that of converter may cause the luminance of LED to lower and need a higher startup voltage(Vs).
- (7) Connectors are precise devices for connecting PCB and transmitting electrical signals. Operators should insert and unplug MDL in parallel when assembling MDL.
- (8) Do not connect or disconnect the cable to/ from the module at the "Power On" condition.
- (9) When the module is operating, do not lose CLK, ENAB signals. If any one these signals is lost, the LCD panel would be damaged.
- (10) Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- (11) Do not re-adjust variable resistor or switch etc.
- (12) Long Side LED Bar design is recommended when using E-LED type Back Light.

11.3 Electrostatic Discharge Control

- (1) Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly. Keep products as far away from static electricity as possible.
- (2) Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- (3) In order to prevent potential problems, Flicker should be adjusted by Optimizing the Vcom value in customer LCM line through the I2C interface.

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11.4 Precautions for Strong Light Exposure

It is not allowed to store or run directly in strong light or in high temperature and humidity for a long time; Strong light exposure causes degradation of polarizer and color filter.

11.5 Storage Precautions

When storing modules as spares for a long time, the following precautions are necessary.

•(1) 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.
Temperature : 5 ~ 40 ℃

•(2) Humidity : 35 ~ 75 %RH

•(3) Period : 6 months

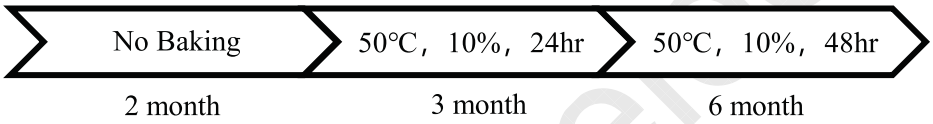
•(4) Control of ventilation and temperature is necessary.

•(5) Please make sure to protect the product from strong light exposure, water or moisture.
Be careful for condensation.

•(6) Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.

•(7)Do not store the LCD near organic solvents or corrosive gasses.

•(8) Please keep the Modules/OC/FOG at a circumstance shown below Fig.



11.6 Precautions for Protection Film

• (1) Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.

• (2) In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

11.7 Appropriate Condition for Display

•(1) Normal operating condition
- Temperature: 0 ~ 40℃
- Operating Ambient Humidity : 10 ~ 90 %
- Display pattern: dynamic pattern (Real display)
- Suitable operating time: under XX hours a day. （ Please contract BOE in advance for 7*24hrs or more than suggested Operating time）
-Long-term lighting products recommended regular shutdown

•(2) Special operating condition

If the product will be used in extreme conditions such as high temperature, humidity, display patterns or 7*24hrs operation time etc.., It is strongly recommended to contact BOE for Application engineering advice. Otherwise, its reliability and function may not be guaranteed.

•(3)Black image or moving image is strongly recommended as a screen save.

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- (4) Lifetime in this spec. is guaranteed only when commercial display is used according to operating usages.
- (5) Please contract BOE in advance when you want to switch between portrait and landscape screen.
- (6) Please contact BOE in advance for outdoor operation.
- (7) Please contact BOE in advance when you display the same pattern for a long time.
- (8) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen. To avoid image sticking, it is recommended to use a screen saver.
- (9) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (10) Dew drop atmosphere should be avoided.
- (11) The storage room should be equipped with a good ventilation facility and avoid to expose to corrosive gas , which has a temperature controlling system.
- (12) When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- (13) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation

11.8 Others

A. LC Leak

- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- If LC in mouth, mouth need to be washed, drink plenty of water to induce vomiting and follow medical advice.
- If LC touch eyes, eyes need to be washed with running water at least 15 minutes.

B. Rework

- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

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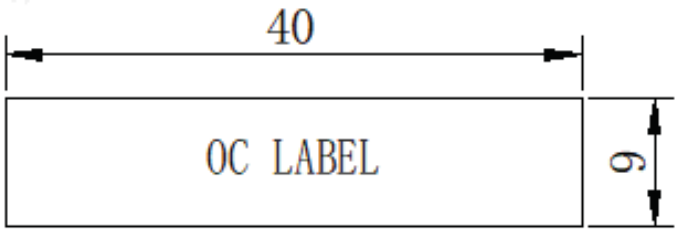
12.0 LABEL

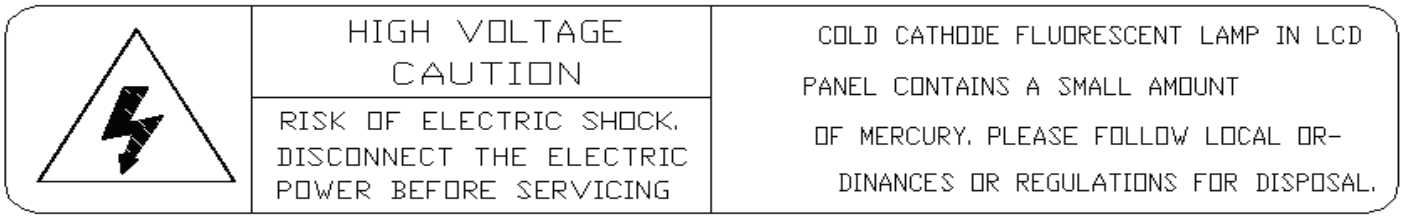
(1) Product label



MDL ID :

Digit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Code	X	X	X	3	X	X	X	X	X	X	X	X	X	X	X	X	X
Description	GBN Code		Grade	Line	Y	M	D	Last 4 Digit of FG Code				Serial Number:000001~ZZZZZZ					

(2) High voltage caution label



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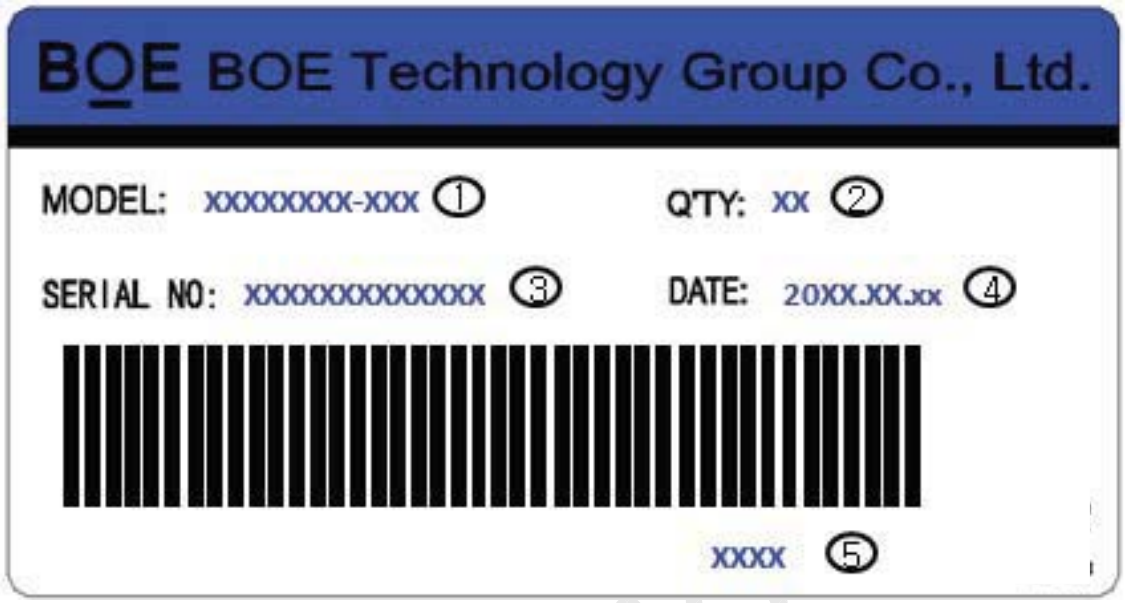
(3) Box label



Serial number marked part needs to print, show as follows:

1. FG-CODE(Before 12 bit) :
2. Product quantity
3. Box ID
4. Date
5. FG-Code After four

Total Size:110×55mm

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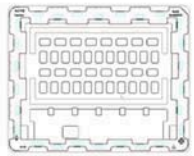
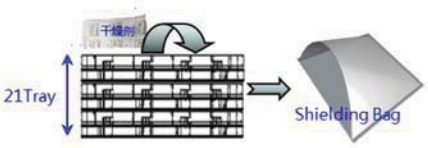
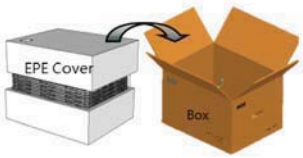
13.0 PACKING INFORMATION

将1pcs FOB 平放入Tray，上下各放置1pcs EPE Spacer，CF侧向上放置 容量： 1pcs FOB/2pcs EPE Spacer/Tray	堆叠放置20pcs Tray（不旋转堆叠），顶部再放置1pcs 空Tray，将1pcs 干燥剂放入顶层空Tray产品槽内，然后将21pcs Tray 平放入Shieding Bag	在Inner Box放置1pcs EPE Cover，将堆叠好的21pcs Tray平放入Box，再放置1pcs EPE Cover 容量：20pcs FOB/Box
 Step 1	 Step 2	
对Box进行封箱，并粘贴Box标签	Box四层码拍，每层4箱，Box标签统一朝向外侧以便扫码，捆绑带“井”字型打包，pallet外进行缠绕膜包装。 容量：320pcs FOB/16ea Box/Pallet	厢车装载方式：一横一竖双层码放 厢车装载量_12m：12800pcs（40托）
 Step 4	 Step 5	

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Incoming Inspection Spec Approval Sheet

Product Description：____TFT-LCD____

_BOEHF__ Product Name:____18.5''(1920*1080)_____

Customer :_____

Customer Signature	Date	BOE Signature	Date

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Record of Revision

Version	Revision Date	Content	Page
2	2018.12.29	第二版	ALL

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A: 来料检查基准

1.0 介绍

1.1. 范围

这份 IIS 基准适用于京东方科技集团股份有限公司（下面叫做“供应商”）生产的 TFT-LCD。

1.2. 来料检查权利

买家（顾客）应该在收到 LCD 的 20 天之内（检查期）自费检查。检查结果（接受或是拒绝）应该告知给供应商。 买家在商业允许的拒收程序下才能在检查期内拒绝接受全部的 Lot，根据来料标准来判定拒收的 LCD 数量。如果在检查期间买家没有告知供应商结果，那么买家将失去拒收 LCD 的权利，并且会被供应商默认为已经接受了产品。

1.3. 操作说明

1.3.1 操作手法

- LCD 的 Panel 包括两张薄玻璃，非常容易被损坏，所以在处理 LCD 时应该极其小心。
- 施加过多的压力在 LCD 的 Panel 表面是不允许的，务必确保在组装过程中没有扭转力和压缩力作用在 LCD 上。
- 如果是因为客户压力设置出问题，LCD 可能会出现异显情况，但是这个现象不能说明是 LCD 出现故障，最终结果需要经过双方共同确认。
- 根据视觉角度的规格范围确定每个 MDL 的光学组装角度。
- 组装 LCD MDL 时根据组装规格书来。
- 标注放置温湿度条件。

1.3.2 LCD 处理和清洗注意事项

- LCD 的 Panel 包括两张薄玻璃，非常容易被损坏，所以在处理 LCD 时应该极其小心。LCD 是由玻璃制造而成，因此表面不能承受住强烈的机械撞击或是静态的压力，在处理时避免撞击、振动。粗心对待会严重影响产品，如果 LCD 从高处掉落或是受到强烈的撞击，玻璃可能会碎掉。
- Panel 表面的偏光片是由有机物构成，所以要避免化学品接触到偏光片，否则会导致偏光片的损坏。
- 如果无法避免使用了化学品，需用柔软的布条蘸上下面溶液轻轻擦拭 LCD 表面。
  -IPA(异丙醇),乙醇；不能用干燥、坚硬的材料擦拭 LCD 表面，不然会损坏偏光片和其他部分。不能使用以下溶液擦拭：水、酮类、芳香类溶液。
- LCD 在装配过程中要用柔软的材料包裹运送，因为 LCD 表面的偏光片极易受到坚硬异物的刮伤而损坏。
- 不要让水、化学品掉落在 LCD 表面。
- 对待 ITO pad 区时要特别小心，因为这部分极易被腐蚀，不能让 HCFC、焊剂、氯、硫、唾液或手指接触到 ITO Pad 区。为了保护这个区域，客户要求 ITO 区域要用 UV 胶或是硅胶覆盖。
- 为避免发生线路断开，不要用超声波清洗 LCD。
- 清洗和烘烤温度应低于 80℃。

1.3.3 静电告诫

- LCD 模组使用 C-MOS LSI 驱动，没用信号的输入都会影响到 Vdd 和 Vss，因此建议客户电源开启前不要输入信号，作业时身体要接地，设备要有防静电装置。
- 撕除 LCD 保护膜要慢，角度大约为 30°，不要垂直于 Panel 表面撕膜；可能的话在离子风

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机下，湿度 50%下进行以降低静电风险。

- 工作布条应避免使用合成纤维，应使用棉布或是导电纤维布。
- 接触 LCD 前要戴防静电手套和接地的手脚环并穿上接地的防静电鞋。

1.3.4 操作小心事项

- 在规格电压范围内施加工作电压，电压超过会缩短 LCD 寿命，为避免电化学腐蚀应避免使用直流电。
- 不要在电源打开的情况下连接或断开 LCD 与设备。
- 在高温高湿等不正常条件下不要使用 LCD。
- 当 LCD 暴露下强烈气温起伏的环境中（从热到冷或是从冷到热）时可能会受到影响，特别是在从冷到热的强烈气温起伏环境中，产品表面可能会产生水珠并影响偏光片和 LCD 的功能。
- 温度低于规格范围温度时 LCD 响应时间会变长，高于规格温度范围会黑屏，然而这些现象并不意味着 LCD 有故障，回归正常温度范围后 LCD 会变正常。
- 由于 LCD 结构原因，不能长时间显示一个固定模式，会造成残像；如果屏幕显示为多种模式，请添加一个屏幕保护程序。
- ESD 会损坏 Panel，确保作业员在作业过程中佩戴防静电手套，并且在作业过程中工作台和设备要有效接地。
- 将 LCD 放在 BOE Tray 盘中转运，以防止机械损伤。
- LCD 应该被存储在要求的湿度环境下，低湿度会导致静电，高湿度会导致 ITO 腐蚀。
- 使用产品前检查工程说明书。
- 不能将没包装材料覆盖的 LCD 进行堆积重叠。
- LCD 含有液晶，请按当地规定制度处理。
- 不要直接用手触摸 TCP（驱动 IC）、PWB 板。
- 不要触摸玻璃（偏光片）表面。

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2.0 概括

2.1. 抽样方法

除非有其他书面的协议，不然抽样检查标准按下面的抽样标准执行；

2.1.1. Lot 大小： 每个型号 1 个托盘；

2.1.2. 抽样类型： 随机抽样

2.1.3. 检查等级： II

2.1.4. 抽样表： MIL-STD-105E

主要不良：AQL=0.65

次要不良：AQL=1.5

2.2. 检查环境

2.2.1.检查环境条件：

a. 室内温度: 23±2℃；

b. 湿度: 60±10% RH；

c. 外部环境光照：300~700LUX（功能测试为150~250LUX）；

2.2.2. 检查距离

Panel和检查者眼睛之间的距离：30CM~50CM；

2.2.3. 检查角度

ADS产品：面向Panel，所有方向45° 角内（与垂直线）（参照产品视角）；

TN产品：面向Panel，所有方向10° 角内（与垂直线）（参照产品视角）；

2.2.4. 检查区域 ：

显示区域(Active区域) ；

2.3. 主要不良定义

2.3.1. 黑/白点

显示区域显示时在L0/L127/L255画面显示为黑色/白色的点；

2.3.2. 亮/暗线

显示区域显示时在R/G/B画面下可见的明亮/暗色的线，纵向的、横向的、或者是交叉的；

2.3.3. 亮点(Bright Dot)

显示区域显示时在R/G/B画面下可见的明亮的点（sub-pixels）；

2.3.4. 暗点(Dark Dot)

显示区域显示时在R/G/B画面下可见的暗色的点（sub-pixels）；

2.3.5. Mura

显示区域显示时在L0/L127/L255画面可见的发亮程度不均一的现象区域；

2.3.6. 视觉检查

在通电状态下对产品进行检查；

2.3.7. 外观检查

在未通电状态下对产品进行外部检查；

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3.0 检查基准

3.1. 视觉检查基准

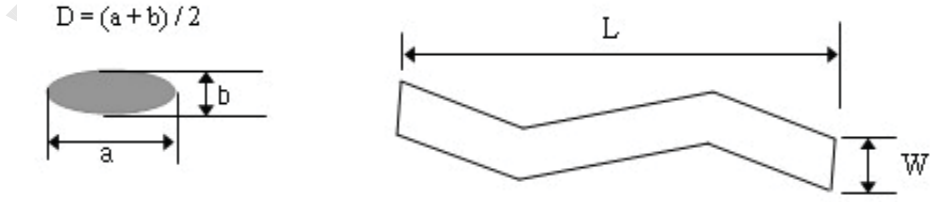
单元尺寸: mm

Items		Details	Inspection Criteria		Type
			A Area	B/C Area	
Visual (Function) Inspection	Foreign Material /Dent/ Bubble/ Spots//Extraneous Substances/Dot	Circular Type	0.2<D≤0.5,N≤4	Ignore	Minor
		Linear Type	0.05<W ≤0.10, L ≤3, N≤3		
	Pixel Defects	Bright Dot	N≤1	Ignore	Major
		Dark Dot	N≤4		
		Bright + Dark Dot	N≤5		
		2S	N≤1		
	Line Defects	Bright Line, Dark Line	Not Allowed		
	No Display		Not Allowed		
	Abnormal Display		Not Allowed		
	Mura		5%ND 不可见，或参照限度样本		Minor

注意: 所有不良的的测定都基于 Panel 上有偏光片

※ 备注 1) D =直径, L = 长度, W = 宽度, N = 数量

※ 备注 2) 区域定义 A Area:显示区 B/C Area:非显示区



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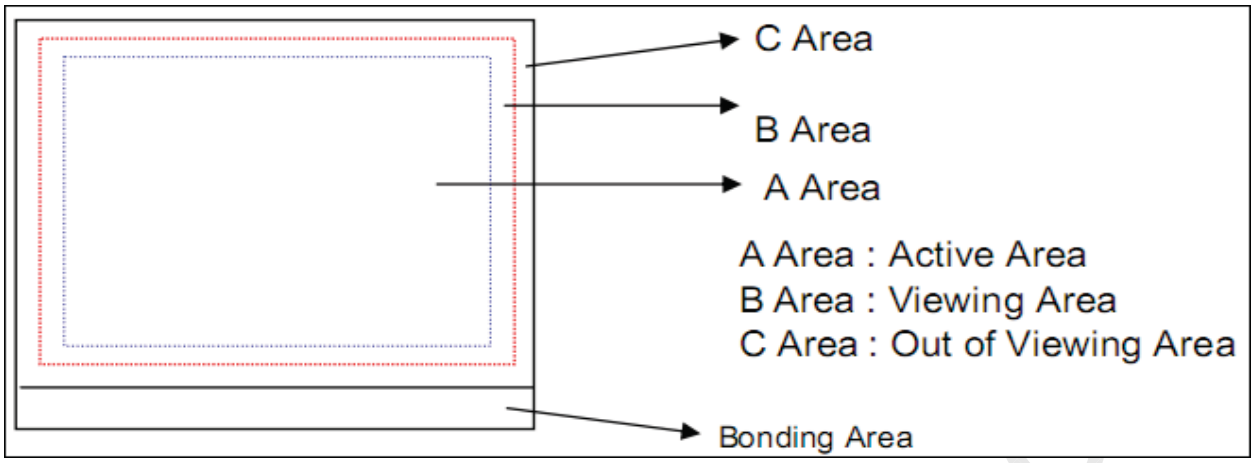
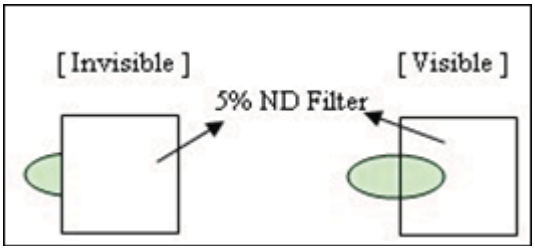
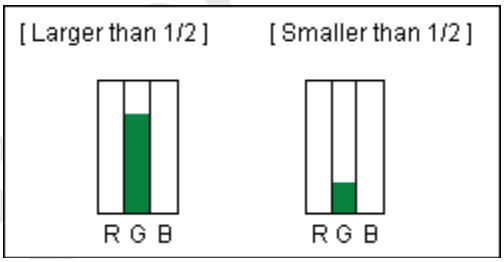


※Note 3) For pixel defect, dot means a sub-pixel. Dot defects should be larger than half size of a sub-pixel. Dot which is invisible through 5% ND filter or smaller than 1/2 of sub-pixel size will not counted as "1 dot" defect.



"No dot defect" (=ignored)

"1 dot defect" (=counted)

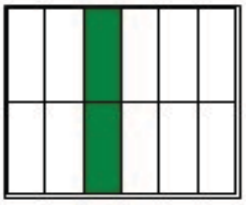


"1 dot defect" (=counted)

"No dot defect" (=ignored)

[2 adjacent dots defect]

Type 1



Type 2

Type 3

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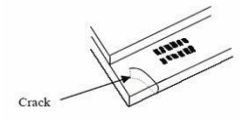
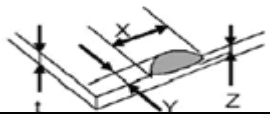
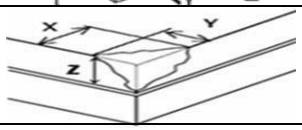
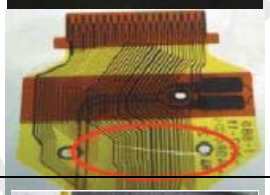
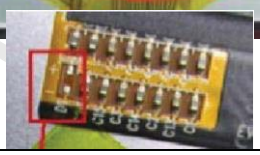
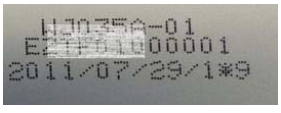
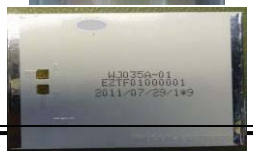
3.2. 外观检查基准

不良位置	Items	Criterion for Defects		Type	适用范围
All	Stain		可擦拭 OK		All
PNL 相关	Crack		不允许	Major	出货状态为 Single Cell/FOG /MDL 产品适用
	Side Chipping		不影响功能和组装	Minor	
	Corner Chipping		不影响功能和组装	Minor	
	Burr		不影响功能和组装	Minor	
	划伤/凹点		贴 POL 之后，参点状/线状异物（划伤）基准进行判定	Minor	
FPC/PCB 相关	短路/断路		不允许	Major	出货状态为 FOG/MDL 产品适用
	元器件		元器件缺失不允许	Minor	
Backlight 相关	喷码		关键信息可识别 OK	Minor	出货状态为 MDL 产品适用
	划伤		Limit Sample	Minor	
	污渍		可擦拭 OK	Minor	

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- 客户要对来料产品做IQC检查。
- 检查基准由BOE提供，并由客户确认通过，检查手法和不良按双方达成的基准协议确认。
- 为了保证和客户端及时的产品质量沟通和有效的服务，客户端QA部门每周向BOE CS部门提供周别质量报告。
- 客户使用BOE产品要遵守说明书，对于违反说明书的使用BOE不负责。
- 双方在处理产品质量问题时要遵循友好合作策略，对于责任方归属不明确时，双方要谈判解决。
- 产品保质期为12个月，从交货日期开始算。

质保期失效

在下列情况中，质保期将会失效：

a. 质保时间超期；

b. LCM在没有供应商的允许下交由第三方修复；

c. LCM在没有供应商的允许下，被客户或是客户的代表方拆开或是维修时。

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SPEC. NUMBER	PRODUCT GROUP	REV.	ISSUE DATE	PAGE
	TFT- LCD	P1.0	2024.04.22	1 OF 29

B3 GV185FHM-N10 Product Specification Rev.P1.0

SUPPLIER	HEFEI BOE Optoelectronics Technology CO., LTD
FG-Code	GV185FHM-N10-3M31

ITEM	BUYER SIGNATURE	DATE

ITEM	SUPPLIER SIGNATURE	DATE
Prepared		
Reviewed		
Approved		

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REVISION HISTORY

REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0	-	Initial Release	2024.01.30	Hu Bing
P1.0	-		2024.04.22	Hu Bing

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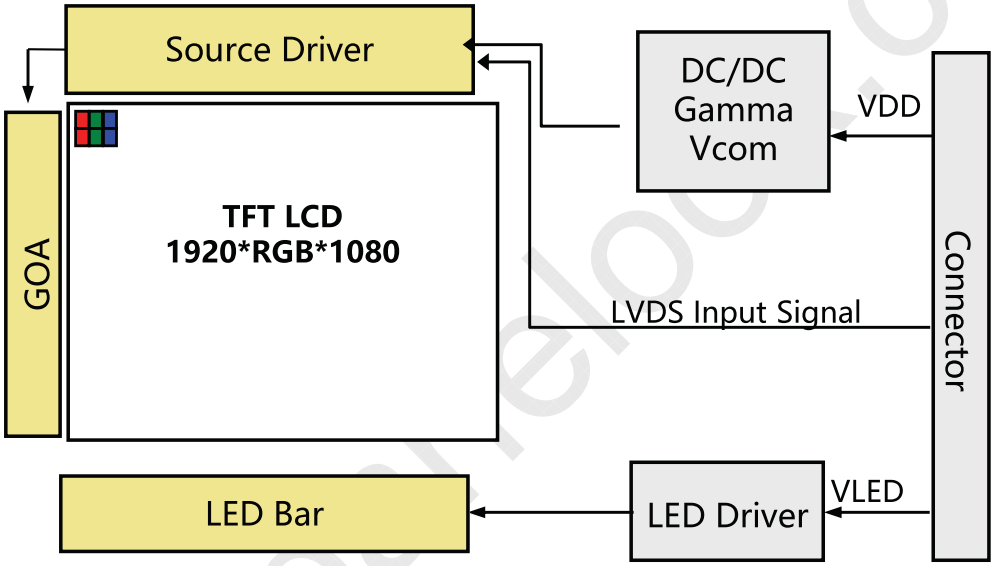
1.0 GENERAL DESCRIPTION

1.0.1 Introduction

GV185FHM-N10-3M31 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 18.5 inch diagonally measured active area with FHD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7 M colors.



1.0.2 Features

- LED back-light
- LVDS interface
- RoHS Compliant
- 16.7M color depth

1.0.3 Application

- Industrial display or HMI etc.

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1.0.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	408.96 (H) × 230.04(V)	mm	
Number of pixels	1920(H) × 1080(V)	Pixels	
Pixel pitch	0.213(H) × 0.213 (V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M(8bit)	Colors	
Display mode	Normally Black		
Dimensional outline	430.4 (H) × 254.6(V) × 12(D) typ.	mm	
Weight	1150±50	g	
Surface treatment	AG25，3H		
Back-light	Edge side, 1-LED Lighting Bar Type		56*LED

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2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Environment Absolute Maximum Ratings> [Ta =25±2 ℃]

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Back-light Power Supply Voltage	HV_{DDOUT}	-	42	-	V	Ta = 25 ℃ Note 1&2
Back-light LED Current	I_{HVDD}	-	360	-	mA	
Back-light LED Reverse Voltage	V_R	-	-	-	V	
Power Supply Input Voltage	VCC	-0.3	-	7	V	
Operating Temperature	T_{OP}	-30	-	80	℃	Environment Temperature
Storage Temperature	T_{ST}	-30	-	80	℃	
Heat Release Requirement	Trls	15			℃	Note3

Note:
1. These range above is maximum value not the actual operating temperature . Actual Operating temperature is no more than 40℃ and temperature refers to the LCM surface temperature ;
2.BOE is not responsible for product problems beyond the use conditions.
3.When the ambient temperature is T ℃, the surface temperature of Panel can not exceed (T+15)℃.

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3.0 ELECTRICAL SPECIFICATIONS

3.0.1 TFT LCD Module

< Table 3. LCD Module Electrical Specifications > [Ta =25±2 ℃]

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Power Supply Input Voltage	V_{DD}	4.5	5	5.5	V	Note 1
Power Supply Current	I_{DD}	-	600	1500	mA	
Power Supply inrush Current	Inrush	-	-	3	A	
LED Driver Power Supply Voltage	H_{VDD}	10.8	12	13.2	V	Note 2
LED Driver Power Supply Current	I_{HVDD}	-	1500	1700	mA	
LED Power Consumption	P_{LED}	-	18	20	W	
LED Driver Power Supply inrush Current	Inrush	-	-	3	A	
Positive-going Input Threshold Voltage	V_{IT+}	-	-	+100	mV	Vcom = 1.2V typ.
Negative-going Input Threshold Voltage	V_{IT-}	-100	-	-	mV	
Differential input common mode voltage	V_{com}	-	1.2	-	V	V_{IH}=100mV, V_{IL}=-100mV
LED Lifetime	-	50000	-	-	Hours	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 5V at 25 ℃
Max value at Black Pattern
2. Calculated value for reference $I_{LED} \times V_{LED} \div 0.85 = P_{LED}$

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3.2 Back-light Unit

< Table 4. LED Driving guideline specifications > Ta=25+/-2°C

Parameter			Min.	Typ.	Max.	Unit	Remarks
Power supply voltage for Back light		V_{LED}	-	42	-	V	
Power supply Current for Back light		I_{LED}	-	360	-	mA	
Power supply for Back light		P_{LED}	-	15.12	-	W	Note 1
EN Control Level	Backlight on	V_{ENH}	2	-	-	V	EN logic high voltage
	Backlight off	V_{ENL}	-	-	0.8	V	EN logic low voltage
PWM Control Level	PWM High Level	V_{PML}	2	-	-	V	
	PWM Low Level	V_{PML}	-	-	0.8	V	
PWM Control Frequency		F_{PWM}	0.1	-	50	KHz	
Duty Ratio		-	5	-	100	%	

Notes : 1. Calculator Value for reference $I_{LED} \times V_{LED} = P_{LED}$
2. The LED Life-time define as the estimated time to 50% degradation of initial luminous under the condition of the ambient temperature of 25℃.

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4.0 INTERFACE CONNECTION.

4.0.1 Electrical Interface Connection

The electronics interface connector is IS100-L30R-C23 (UJU) or equivalent
The LED connector is CI4205M2HRD-NH or equivalent.
The connector interface pin assignments are listed in Table 6 and 7.

<Table 6. Pin Assignments for the Interface Connector>

Pin No.	Symbol	Description	remark
1	RxOIN0-	LVDS data input	
2	RxOIN0+	LVDS data input	
3	RxOIN1-	LVDS data input	
4	RxOIN1+	LVDS data input	
5	RxOIN2-	LVDS data input	
6	RxOIN2+	LVDS data input	
7	VSS	Ground	
8	RxOCLKIN-	LVDS clock input	
9	RxOCLKIN+	LVDS clock input	
10	RxOIN3-	LVDS data input	
11	RxOIN3+	LVDS data input	
12	RxEIN0-	LVDS data input	
13	RxEIN0+	LVDS data input	
14	VSS	Ground	
15	RxEIN1-	LVDS data input	
16	RxEIN1+	LVDS data input	
17	VSS	Ground	
18	RxEIN2-	LVDS data input	
19	RxEIN2+	LVDS data input	
20	RxECLKIN-	LVDS clock input	
21	RxECLKIN+	LVDS clock input	
22	RxEIN3-	LVDS data input	
23	RxEIN3+	LVDS data input	
24	VSS	Ground	
25	SCL	NC (I2C BUS)	Only BOE use
26	SDA	NC (I2C BUS)	Only BOE use
27	WP	NC (EEPROM write EN)	Only BOE use
28	VCC	Power supply(5V)	
29	VCC	Power supply(5V)	
30	VCC	Power supply(5V)	

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4.0 INTERFACE CONNECTION.

4.0.1 Electrical Interface Connection

The electronics interface connector is IS100-L30R-C23 (UJU) or equivalent
The LED connector is CI4205M2HRD-NH or equivalent.
The connector interface pin assignments are listed in Table 6 and 7.

<Table 7. Pin Assignments for the LED Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	VCC	12V
2	GND	GND
3	Enable	5V-On / 0V-Off
4	Dimming	PWM Dimming
5	NC	No Connection

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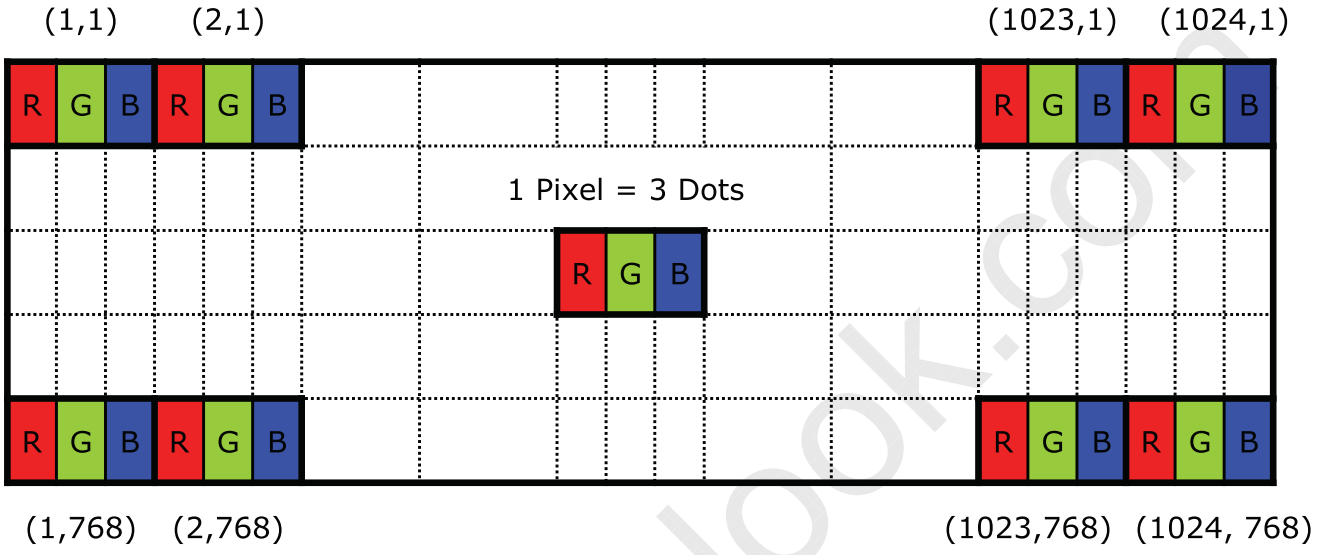
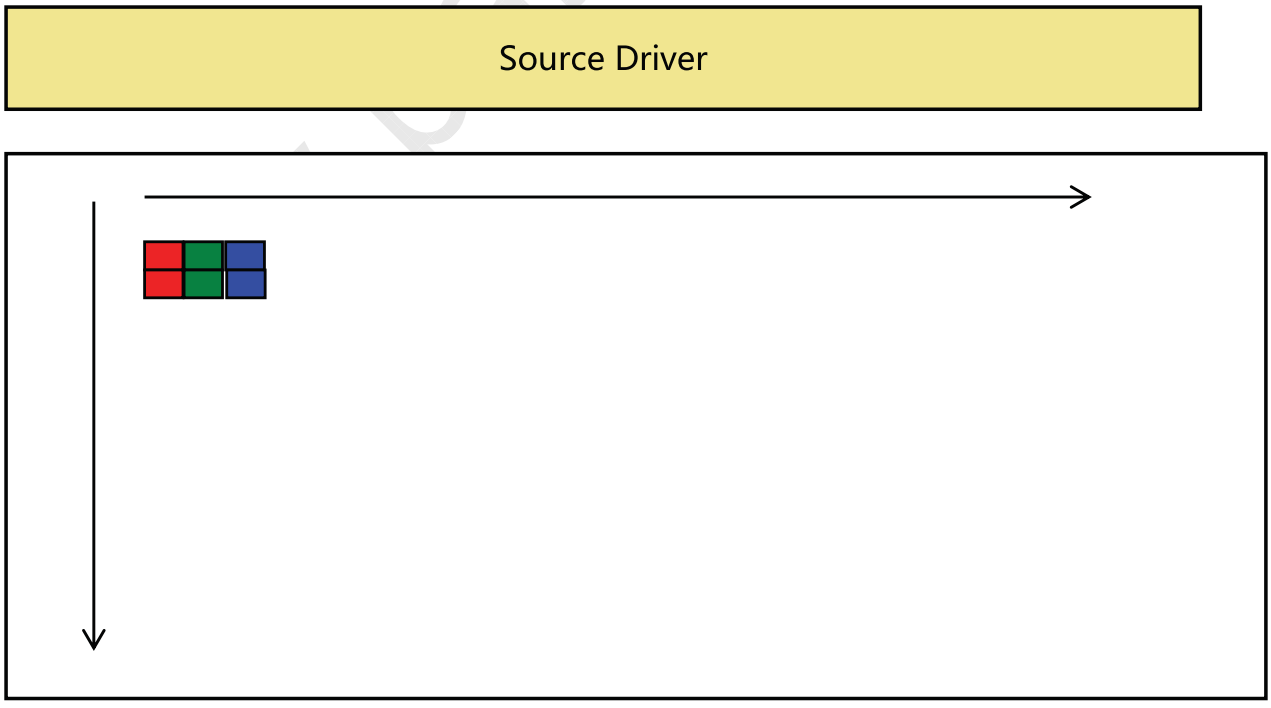
4.2 Data Input Format

Figure 5. Pixel Format



Display Position of Input Data (V-H)

Figure 6. Scan direction



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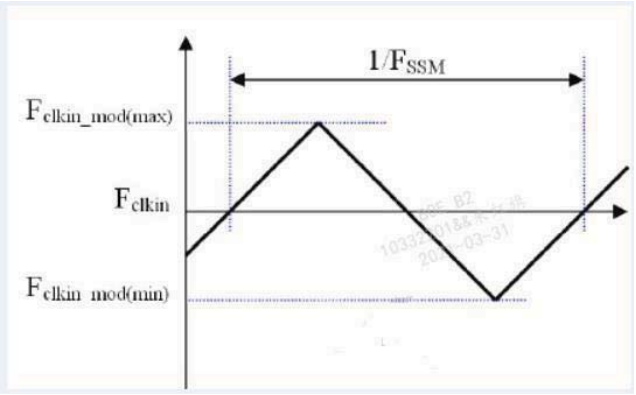
5.0 SIGNAL TIMING SPECIFICATION

5.0.1 The GV185FHM-N10 is operated by the DE only.

Item	Symbols		Min	Typ	Max	Unit	Note
DCLK	Period	tCLK	9.5	-	25	ns	Note 1
	Frequency	-	40	-	105	MHz	
Hsync	Period	tHP	990	1040	-	tCLK	
	Horizontal Valid	tHV	-	960	-	tCLK	
	Horizontal Blank	tHB	30	80	-	tCLK	
	Frequency	fH	45	60	75	KHz	
Vsync	Period	tVP	1100	1125	1138	tHP	
	Vertical Valid	tVV	-	1080	-	tHP	
	Vertical Blank	tVB	30	45	58	tHP	
	Frequency	fV	45	60	75	Hz	
LVDS Receiver clock	Input spread spectrum ratio	SSr	-	1.5	2	%	Note 2
	spread spectrum modulation frequency	Fssm	-	-	100	KHZ	

Note 1: The DCLK range at last line of V-blanking should be set in 0-H-active/2.
Note 2: The SSGG(spread Spectrum Clock Generator) is defined as following figure:



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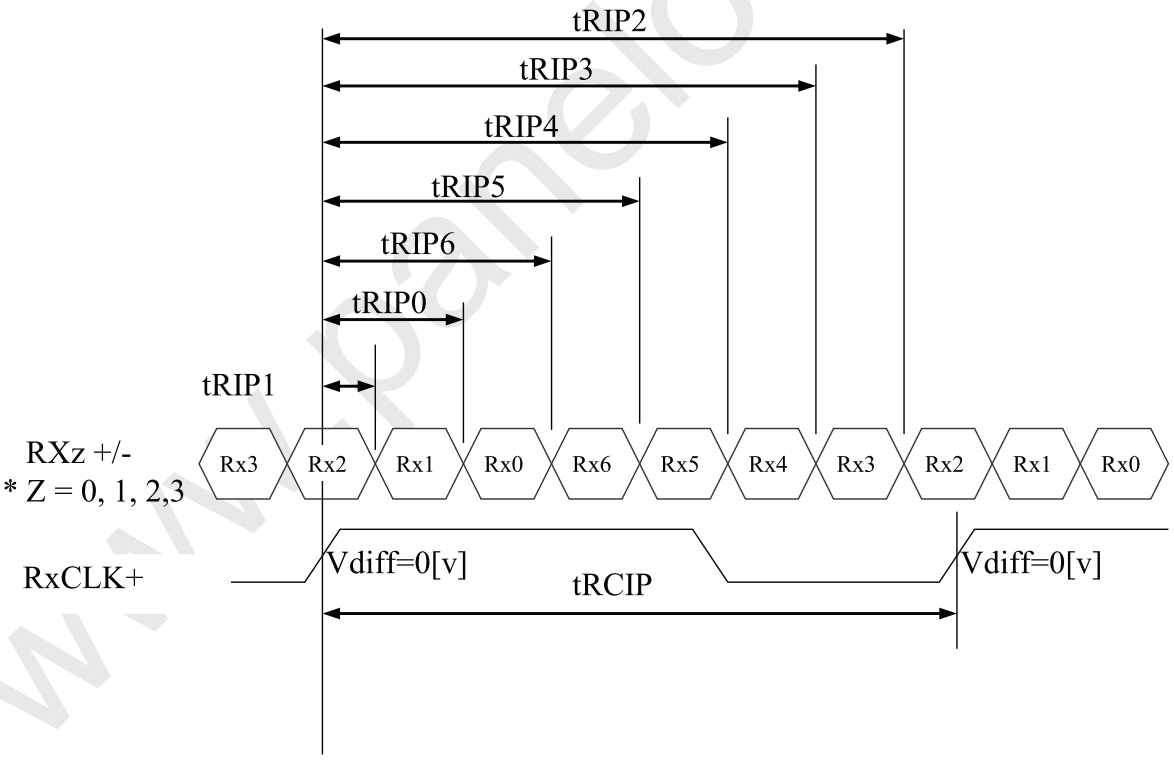
5.02 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 4.

<Table 4. LVDS Rx Interface Timing Specification>

Item	Symbol	Min	Typ	Max	Unit	Remark
CLKIN Period	tRCIP	9.5	-	25	nsec	
Input Data 0	tRIP1	-0.4	0.0	0.4	nsec	
Input Data 1	tRIP0	tRCIP/7-0.4	tRCIP/7	tRCIP/7+0.4	nsec	
Input Data 2	tRIP6	2 ×tRCIP/7-0.4	2 ×tRCIP/7	2 ×tRCIP/7+0.4	nsec	
Input Data 3	tRIP5	3 ×tRCIP/7-0.4	3 ×tRCIP/7	3 ×tRCIP/7+0.4	nsec	
Input Data 4	tRIP4	4 ×tRCIP/7-0.4	4 ×tRCIP/7	4 ×tRCIP/7+0.4	nsec	
Input Data 5	tRIP3	5 ×tRCIP/7-0.4	5 ×tRCIP/7	5 ×tRCIP/7+0.4	nsec	
Input Data 6	tRIP2	6 ×tRCIP/7-0.4	6 ×tRCIP/7	6 ×tRCIP/7+0.4	nsec	



* Vdiff = (RXz+)-(RXz-),…. ,(RXCLK+)-(RXCLK-)

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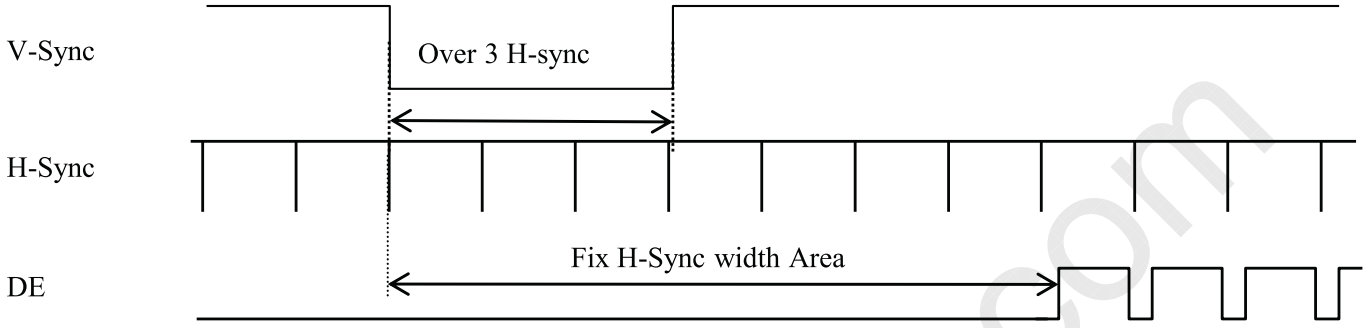
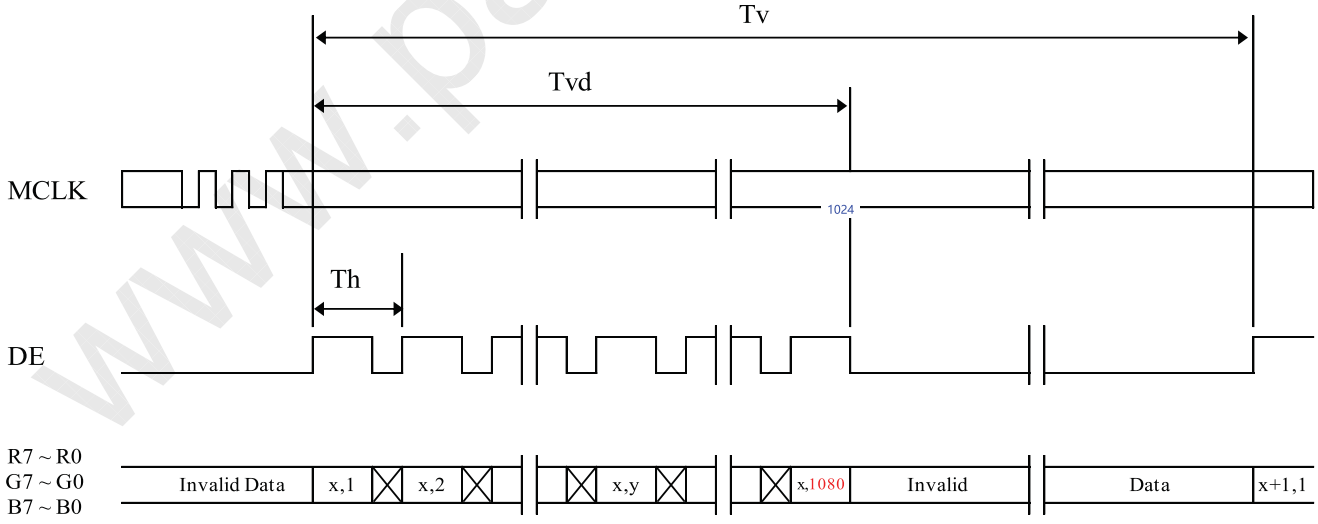
6. SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

6.01 Sync Timing Waveforms



1) Need over 3 H-sync during V-Sync Low
2) Fix H-Sync width from V-Sync falling edge to first rising edge

6.02 Vertical Timing Waveforms



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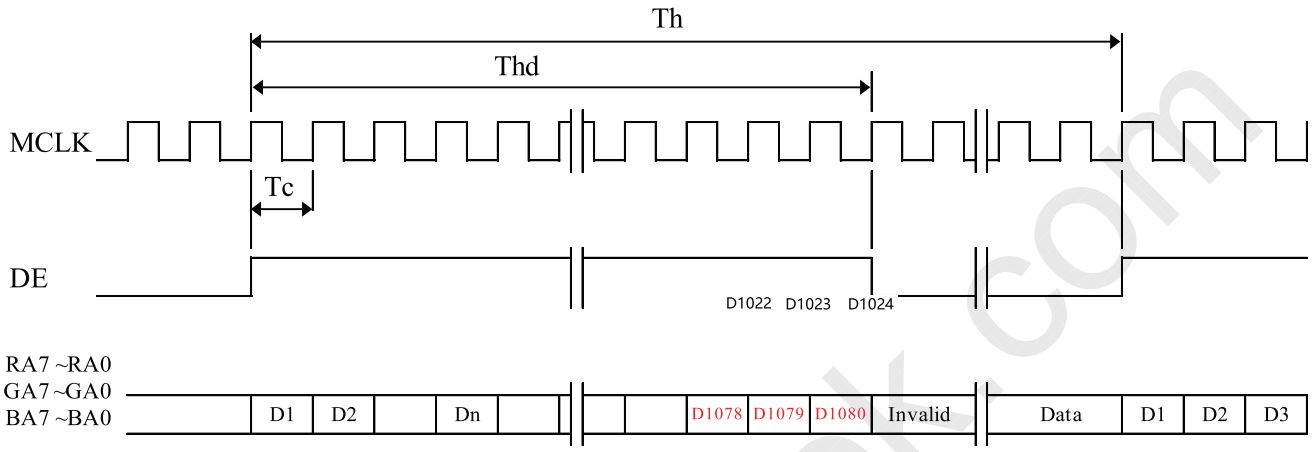
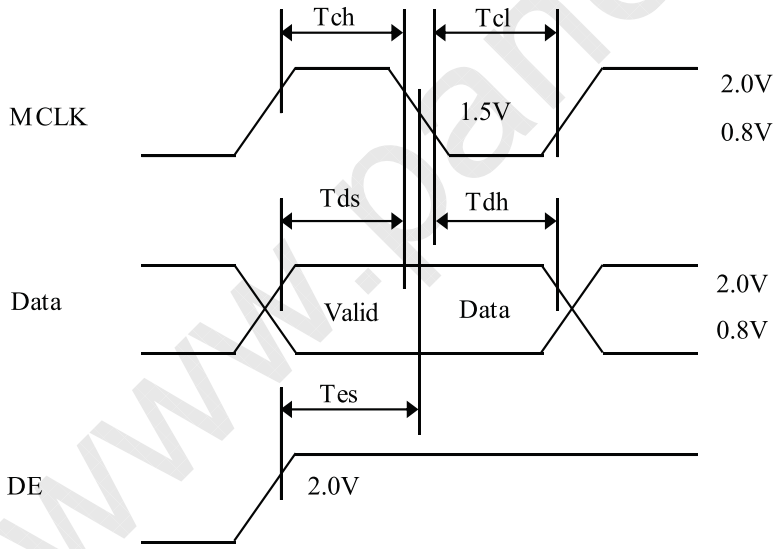
6.03 Horizontal Timing Waveforms





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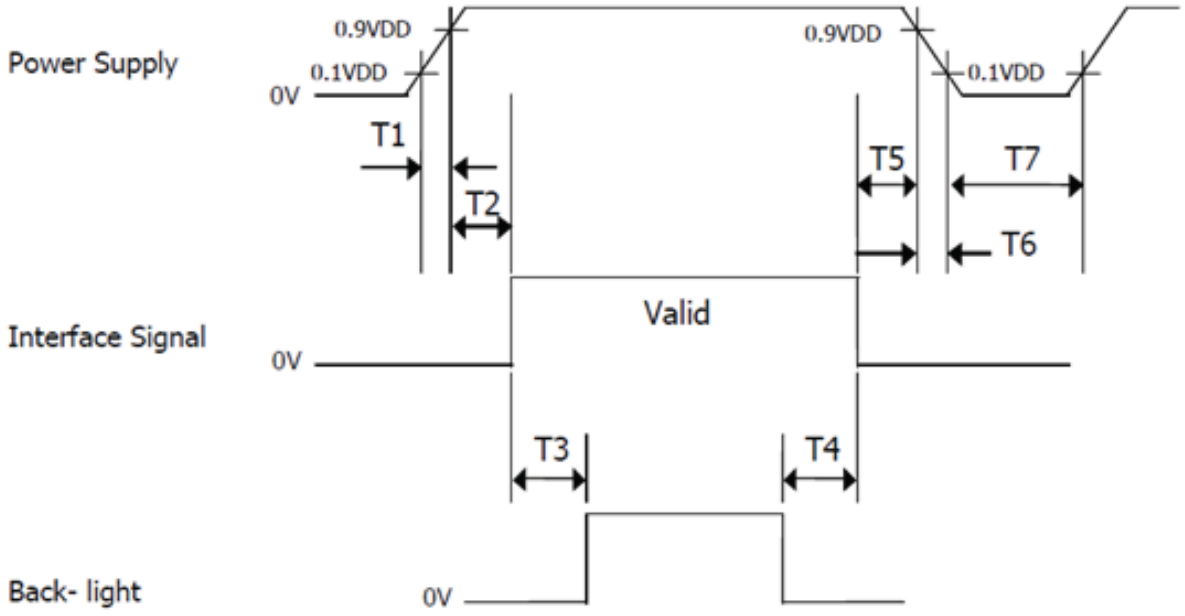
7.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below



Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	300	-	-	ms
T4	500	-	-	ms
T5	0	-	50	ms
T6	0	-	10	ms
T7	500	-	-	ms

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8.0 OPTICAL SPECIFICATION

8.0.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON CS2000/CA310) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θØ=0 (=θ3) as the 3 o'clock direction (the "right"), θ Ø=90 (= θ12) as the 12 o'clock direction ("upward"), θ Ø=180 (= θ9) as the 9 o'clock direction ("left") and θ Ø=270(= θ6) as the 6 o'clock direction ("bottom"). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The luminance, color and uniformity (etc) should be tested by CS2000/CA310. The backlight should be operating for 10 minutes prior to measurement. VDD shall be 3.3 ± 0.3V at 25°C. Optimum viewing angle direction is 6 'clock

<Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	80	85	-	Deg.	Note 1
		Θ_9		80	85	-	Deg.	
	Vertical	Θ_{12}		80	85	-	Deg.	
		Θ_6		80	85	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0°	900	1200	-		Note 2
Luminance of White	Center	Y_w	Θ = 0°	425	500	-	cd/m^2	Note 3
White Luminance uniformity	9 Points	ΔY9		80	85	-	%	Note 4
Color Gamut	NTSC	CIE1931	Θ = 0°	65	70	-	%	Note 5
Reproduction of color	White	Wx	Θ = 0°	Typ -0.05	0.286	Typ +0.05		
		Wy			0.296			
Response Time		Tr+Td	Ta= 25° C Θ = 0°	-	30	35	ms	Note 6

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Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Luminance of white is defined as luminance values of center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display. The luminance is measured by CS2000/CA310 when the LED current is set at 60mA.

4. The White luminance uniformity on LCD surface is then expressed as : ΔY = Minimum Luminance of 9 Points / Maximum Luminance of 9 Points (See FIGURE 2).

5. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

6. The electro-optical response time measurements shall be made as FIGURE 3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

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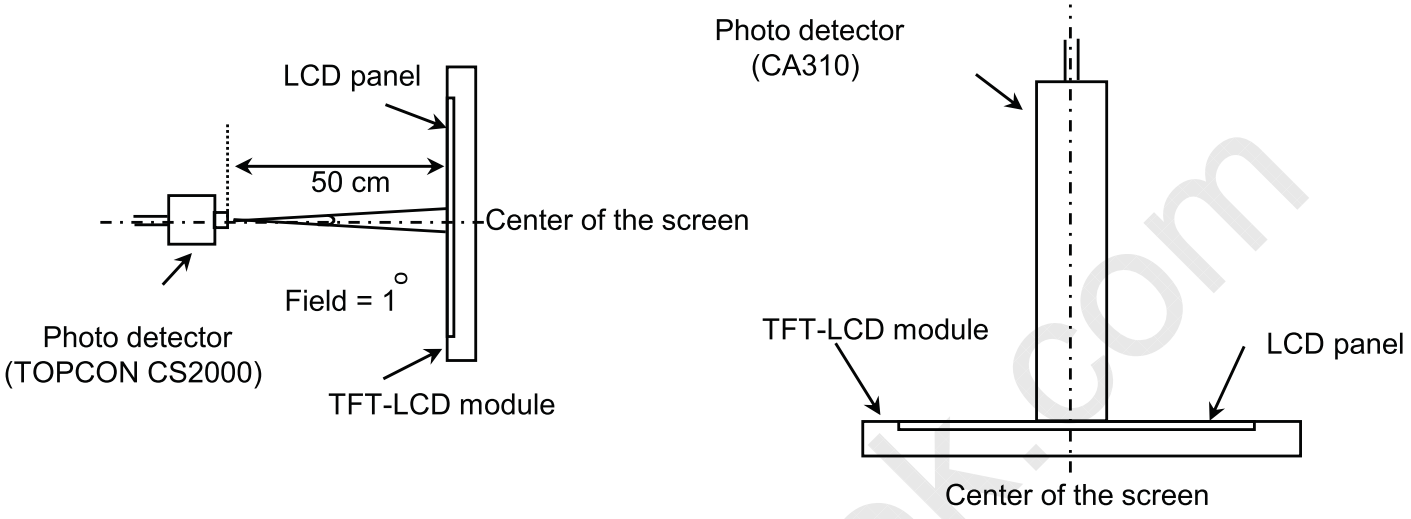
8.0.2 Optical measurements

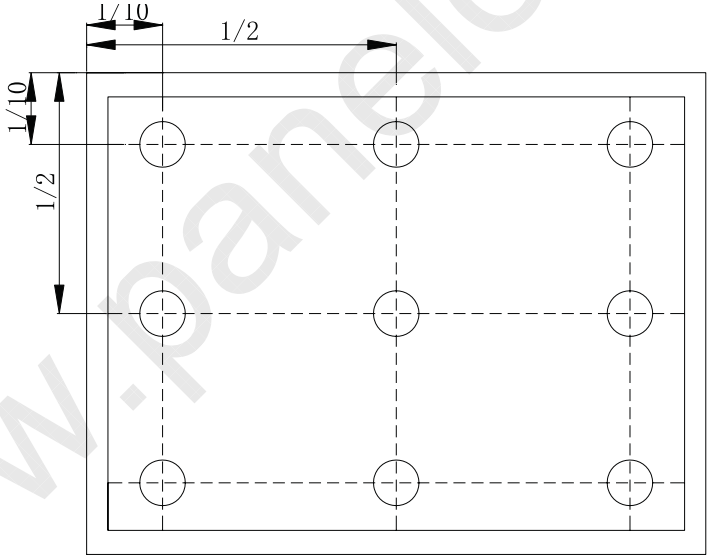
Figure 1. Measurement Set Up



View angel range, uniformity, etc. measurement setup

Flicker, measurement setup

Figure 2. White Luminance and Uniformity Measurement Locations (9 points)



Luminance of white is defined as luminance values of center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

The White luminance uniformity on LCD surface is then expressed as : ΔY9 = Minimum Luminance of 9 points / Maximum Luminance of 9points (see FIGURE 2).

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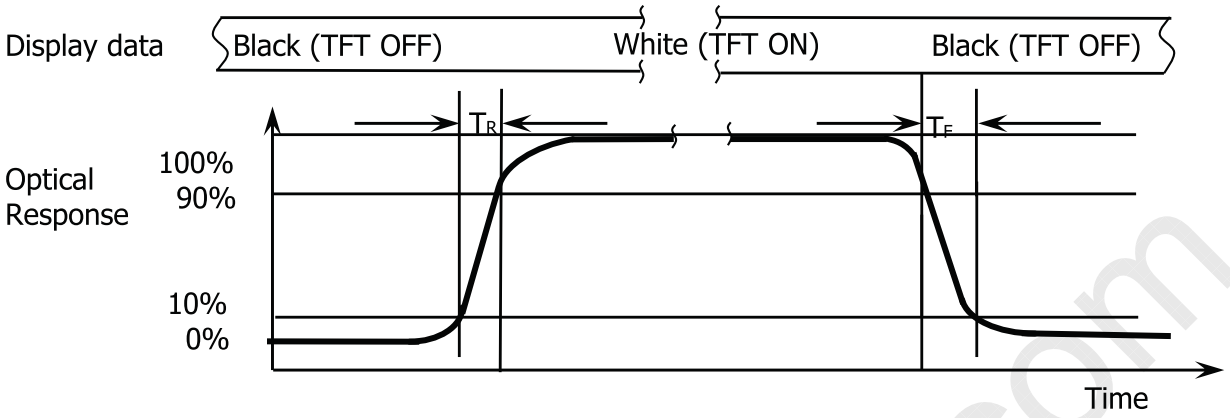
Figure 3. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 3 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr and 90% to 10% is Td.

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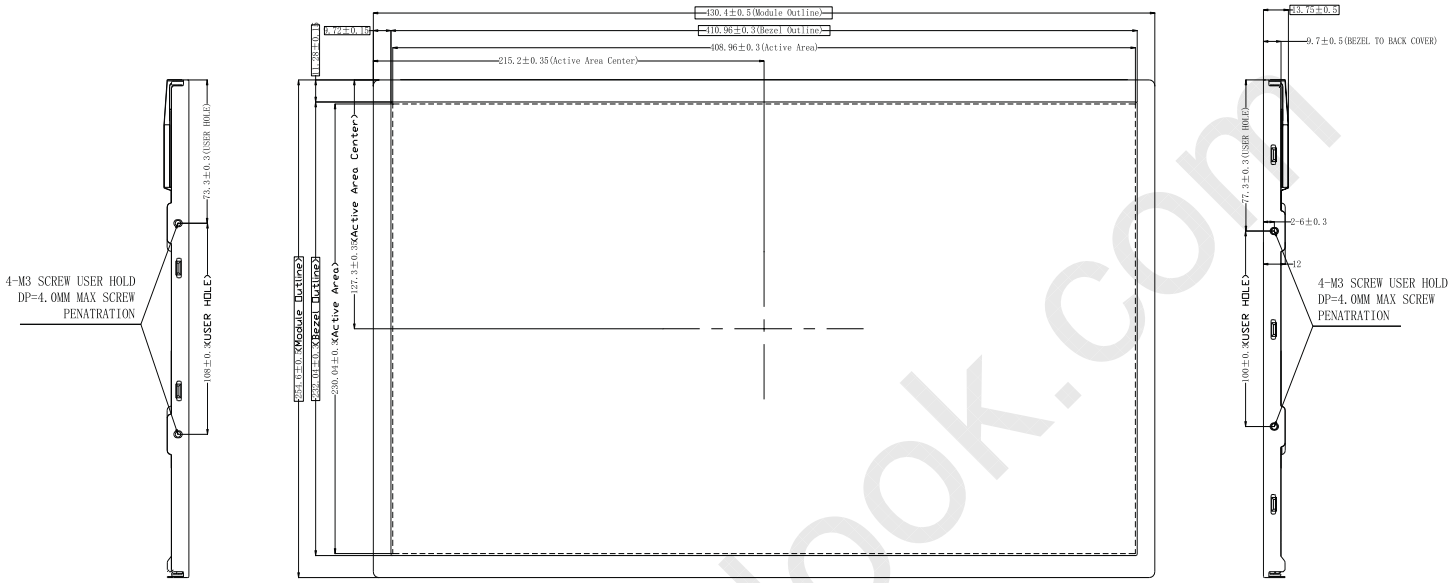
9.0 MECHANICAL OUTLINE DIMENSION

Figure 1. TFT-LCD Module Outline Dimension (Front View)



NOTE:

1. BLACK LIGHT: LED WHITE;
   LCM BRIGHTNESS(CENTER POINT): 425cd/m²(Min),500cd/m²(Typ)
2. GENERAL TOLERANCE: ±0.5mm;
3. CRITICAL CONTRAL POINT [ ],
   REFERENCED DIMENSION ( );
4. CONFORMITY WITH RoHS AND HALOGEN FREE;
5. OPERATING TEMPERATURE: −20°C(Min.), 70°C(Max.);
6. STORAGE TEMPERATURE: −30°C(Min.), 80°C(Max.);
7. LCM HOMOGENEITY: 80%(min), 85%(typ),L255@9 Point;
8. CN1: IS100−L300−C23 CN2&CN3: CI4216S;

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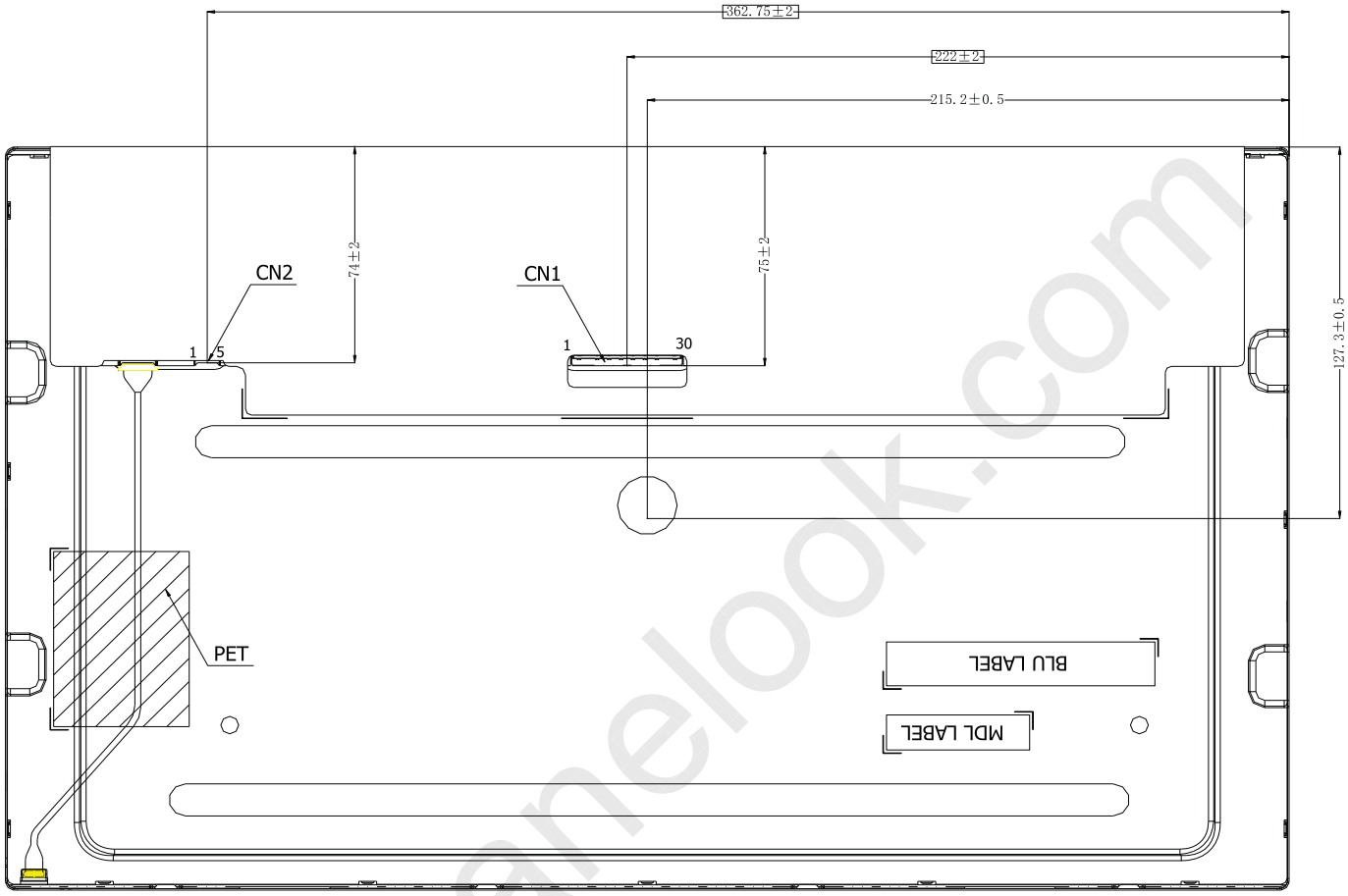
Figure 2. TFT-LCD Module Outline Dimensions (Rear view)



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10.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

<Table 9. Reliability test>

No	Test Items	Conditions	Remark
1	High temperature storage test	Ta = 80℃, 240 hrs	
2	Low temperature storage test	Ta = -30℃, 240 hrs	
3	High temperature operation test	Ta = 80℃, 240 hrs	
4	Low temperature operation test	Ta = -30℃, 240 hrs	
5	High temperature & high humidity operation test	Ta = 60 ℃, 90%RH, 240 hrs	
6	Thermal shock	Ta = -30 ℃ ↔ 80℃ (0.5 hr), 1hour/Cycle,100 cycle	Non-operation
7	ESD test	C=150pF, R=330Ω, Air: ±15KV, Contact: ±8KV,100point	
8	Vibration Test（Non-operation）	1.5G,10~200Hz,30min/AXIS ; X,Y,Z directions ; Wave: random	

Note: After the reliability test, the product only guarantee function normally without any fatal defect (non-display, line defect, abormal display etc). All the cosmetic specification is judged before the reliablity test.

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• 11.0 Precautions

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

• 11.1 Mounting Precautions

• (1) Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

• (2) You must mount a module using specified mounting holes (Details refer to the drawings).

• (3) Please make sure to avoid external forces applied to the Source PCB or FPC and D-IC during the process of handling or assembling. If not, It causes panel damage or malfunction.

• (4) Note that polarizers are very fragile and could be easily damaged. 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.

• (5) Do not pull or fold the source D-IC which connect the source PCB or FPC and the panel.

• Do not pull or fold the LED wire.

• (6) After removing the protective film, when the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with alcohol or purified water.

• Do not strong polar solvent because they cause chemical damage to the polarizer.

• (7) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

• (8) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

• (9) Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.

• (10) Do not disassemble the module.

• (11) To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.

• (12) If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by the way of mutual agreement.

• (13)Do not drop water or any chemicals onto the LCD’s surface.

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11.2 Operating Precautions

- (1) 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.
- (2) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
- (3) The electrochemical reaction caused by DC voltage will lead to LCD degradation, so DC drive should be avoided.
- (4) The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
- (5) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (6) Design the length of cable to connect between the connector for back-light and the converter as short as possible and the shorter cable shall be connected directly.
The longer cable between that of back-light and that of converter may cause the luminance of LED to lower and need a higher startup voltage(Vs).
- (7) Connectors are precise devices for connecting PCB and transmitting electrical signals. Operators should insert and unplug MDL in parallel when assembling MDL.
- (8) Do not connect or disconnect the cable to/ from the module at the "Power On" condition.
- (9) When the module is operating, do not lose CLK, ENAB signals. If any one these signals is lost, the LCD panel would be damaged.
- (10) Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- (11) Do not re-adjust variable resistor or switch etc.
- (12) Long Side LED Bar design is recommended when using E-LED type Back Light.

11.3 Electrostatic Discharge Control

- (1) Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly. Keep products as far away from static electricity as possible.
- (2) Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- (3) In order to prevent potential problems, Flicker should be adjusted by Optimizing the Vcom value in customer LCM line through the I2C interface.

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11.4 Precautions for Strong Light Exposure

It is not allowed to store or run directly in strong light or in high temperature and humidity for a long time; Strong light exposure causes degradation of polarizer and color filter.

11.5 Storage Precautions

When storing modules as spares for a long time, the following precautions are necessary.

•(1) 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.
Temperature : 5 ~ 40 ℃

•(2) Humidity : 35 ~ 75 %RH

•(3) Period : 6 months

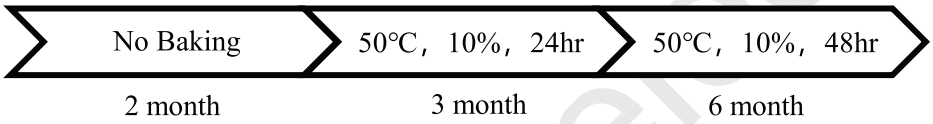
•(4) Control of ventilation and temperature is necessary.

•(5) Please make sure to protect the product from strong light exposure, water or moisture.
Be careful for condensation.

•(6) Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.

•(7)Do not store the LCD near organic solvents or corrosive gasses.

•(8) Please keep the Modules/OC/FOG at a circumstance shown below Fig.



11.6 Precautions for Protection Film

• (1) Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.

• (2) In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

11.7 Appropriate Condition for Display

•(1) Normal operating condition
- Temperature: 0 ~ 40℃
- Operating Ambient Humidity : 10 ~ 90 %
- Display pattern: dynamic pattern (Real display)
- Suitable operating time: under XX hours a day. （ Please contract BOE in advance for 7*24hrs or more than suggested Operating time）
-Long-term lighting products recommended regular shutdown

•(2) Special operating condition

If the product will be used in extreme conditions such as high temperature, humidity, display patterns or 7*24hrs operation time etc.., It is strongly recommended to contact BOE for Application engineering advice. Otherwise, its reliability and function may not be guaranteed.

•(3)Black image or moving image is strongly recommended as a screen save.

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- (4) Lifetime in this spec. is guaranteed only when commercial display is used according to operating usages.
- (5) Please contract BOE in advance when you want to switch between portrait and landscape screen.
- (6) Please contact BOE in advance for outdoor operation.
- (7) Please contact BOE in advance when you display the same pattern for a long time.
- (8) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen. To avoid image sticking, it is recommended to use a screen saver.
- (9) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- (10) Dew drop atmosphere should be avoided.
- (11) The storage room should be equipped with a good ventilation facility and avoid to expose to corrosive gas , which has a temperature controlling system.
- (12) When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- (13) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation

11.8 Others

A. LC Leak

- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.
- If LC in mouth, mouth need to be washed, drink plenty of water to induce vomiting and follow medical advice.
- If LC touch eyes, eyes need to be washed with running water at least 15 minutes.

B. Rework

- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

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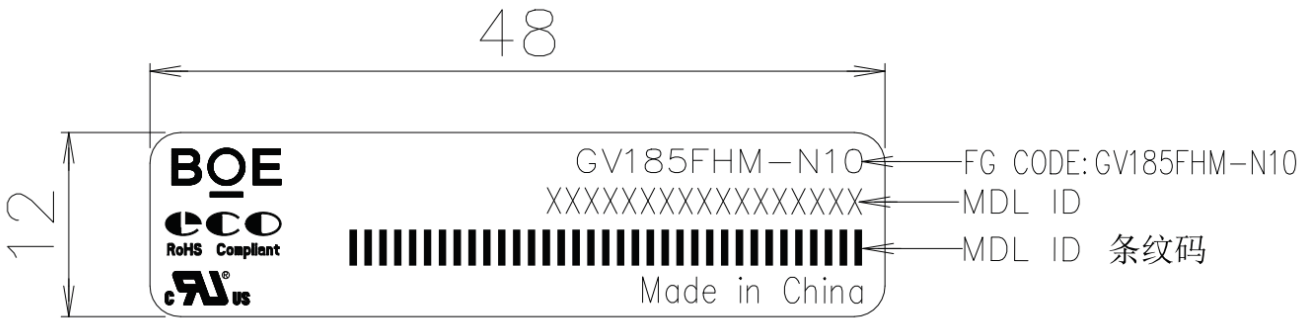
12.0 LABEL

(1) Product label

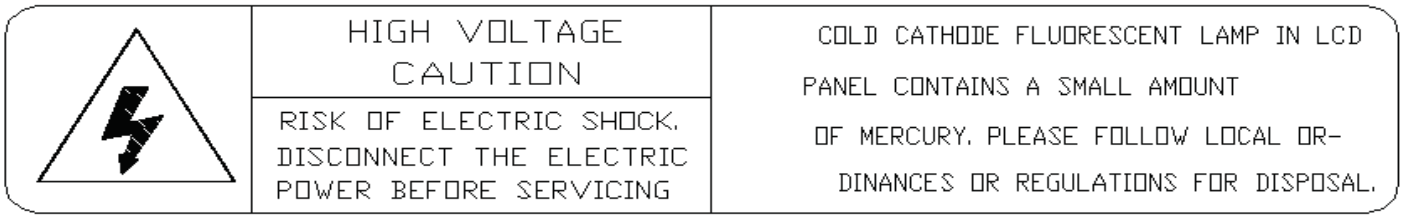


MDL ID 编码规则

序列号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
代码	X	X	P	3	5	2	7	X	X	X	X	0	0	1	E	E	J
描述	生管指定		等级 S,A,P,Q 等	工厂 B3	年		月	FG Code后四位				流水码 36进制(无I 和 O)					

年: 2015—15, 2016—16 …… 2020---20, 2021---21…..
月: 1~12月→ 1~9, X, Y, Z

(2) High voltage caution label



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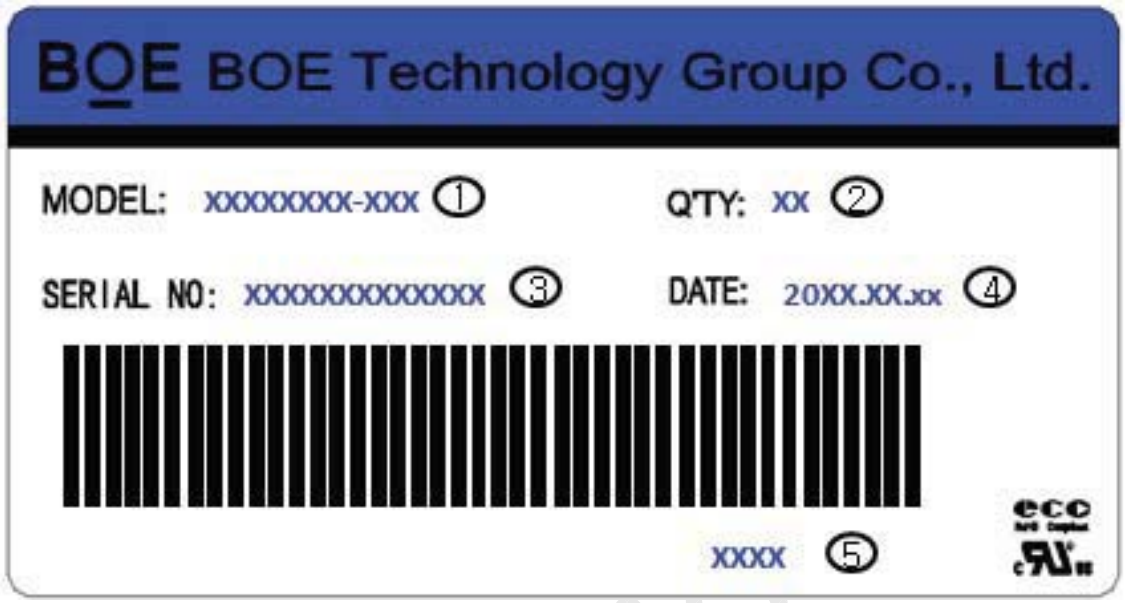
(3) Box label



Serial number marked part needs to print, show as follows:

1. FG-CODE(Before 12 bit) :
2. Product quantity
3. Box ID
4. Date
5. FG-Code After four

Total Size:110×55mm

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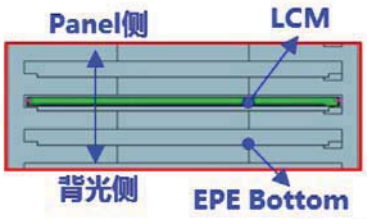
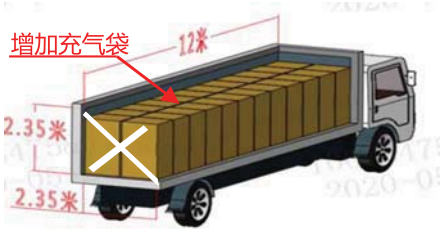
13.0 PACKING INFORMATION

将 EPE Bottom 放入纸箱内	将LCM装入PE袋中，并沿产品边缘折叠，再将9pcs套有PE袋的LCM依次放入Bottom对应的卡槽内，PCB朝下，Panel侧朝向EPE平面侧，注意PCB应放置于EPE Bottom避让槽内，避免元器件与Bottom干涉
 Step 1	  Step 2
将 EPE Cover 盖在 Bottom 上，再将纸箱用胶带封装 容量：9 LCM/Box， 9 PE Bag/Box	将16ea 封装好的纸箱放到木托上，回字形排布 容量：144 LCM/Pallet
 Step 3	 Step 4
放置8ea纸护角，用缠绕裹包（≥3层）再用打包带“井”字形固定	厢车装载方式：两横摆放，单层码放 厢车装载量_12m：3168 pcs（22托）
 Step 5	 Step 6

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