

SPECIFICATION FOR LCM MODULE

MODULE NO.: BF10150-01

REVISION NO.: A

Customer Approval:

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	SIGNATURE
PREPARED BY	
VERIFIED BY	
APPROVED BY	

REVISION STATUS

Version	Revise Date	Page	Content	Modified by
V1.0	2022.6.22	-	First Issued.	

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1.0 GENERAL DESCRIPTION

1.1 Introduction

The model BF10150-01 is a color active matrix thin film transistor (TFT) liquid crystal display without plagiarizer. This model is composed of amorphous silicon TFT as a switching device.

This TFT LCD has a 10.1-inch wide (16:9) diagonally measured active display area with WVGA (1024 horizontal by 600 vertical pixel) resolution. Each pixel is divided into Red, Green, Blue dots which are arranged in vertical stripes.

1.2 Features

- 10.1 inch configuration.
- 16.7M color by 8 bit R.G.B. signal input
- RoHS/Halogen Free Compliance

1.3 Applications

- Mobile NB
- Digital Photo frame
- Display terminal for AV application

1.4 General information

Item	Specification	Unit
Screen Size	10.1 inches	Diagonal
Number of Pixel	1024 RGB (H) ×600(V)	Pixels
Display area	222.72(H) x 125.28(V)	mm
Outline Dimension	235.0 x 143.0 x 5.00(Typ)	mm
Display mode	Normally Black	--
Pixel arrangement	RGB Vertical stripe	--
Pixel pitch	0.2175(H) ×0.2088(V)	mm
Back-light	LED Side-light type	--
Surface treatment	Anti - glare	--
Interface	RGB	

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	234.8	235.0	235.2	mm
	Vertical (V)	142.8	143.0	143.2	mm
	Depth (D)	4.90	5.00	5.10	mm
Weight		--	TBD	--	g

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min	Max	Unit	Note
Power supply voltage	VDD	-0.5	3.96	V	GND=0
	AVDD	--	14.85	V	AGND=0

Note:

1. Stresses above those listed under” Absolute Maximum Rating” may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at indicated in the operational sections(6.1) of this specification.

2. $T_a=25\pm 2^{\circ}\text{C}$

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-30	80	$^{\circ}\text{C}$	
Operating temperature	T_{OPR}	-20	70	$^{\circ}\text{C}$	

Note: If users use the product out off the environmental operation range(temperature and humidity), it will have visual quality concerns.

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min	Type	Max	Unit	Note
White luminance (Center)		YL	Θ=0 Normal Viewing Angle	--	400	TBD	nits	(1)(4)(6)
Response time		T _r + T _f		--	25	35	msec	(1)(3)
Contrast ratio		CR		800	1000	--	--	(1)(2)
C o l o r Chromaticity (CIE 1931)	white	W _x		0.260	0.310	0.360		(1)(4)
		W _y	0.280	0.330	0.380			
Viewing Angle	Hor.	Θ _L	C 10	80	85	--		(1)(4)
		Θ _R		80	85	--		
	Ver.	Θ _U		80	85	--		
		Θ _D		80	85	--		
Brightness		B _{UNI}	Θ=0	70	80	--	%	(5)
Color gamut (NTSC)		S		--	50.81	--	%	C-light
Optima View Direction		ALL VIEW						

1), 客户签样亮度 $\pm 10\%$ = 大货亮度, 小于10%视为不良。

2), 大货同一批色调一致的情况下（目视同为冷色或暖色）与客户签样相比, X色坐标相差 ± 0.015 , Y色坐标相差 ± 0.02 以内视为正常OK品。

3.2 Measuring Condition

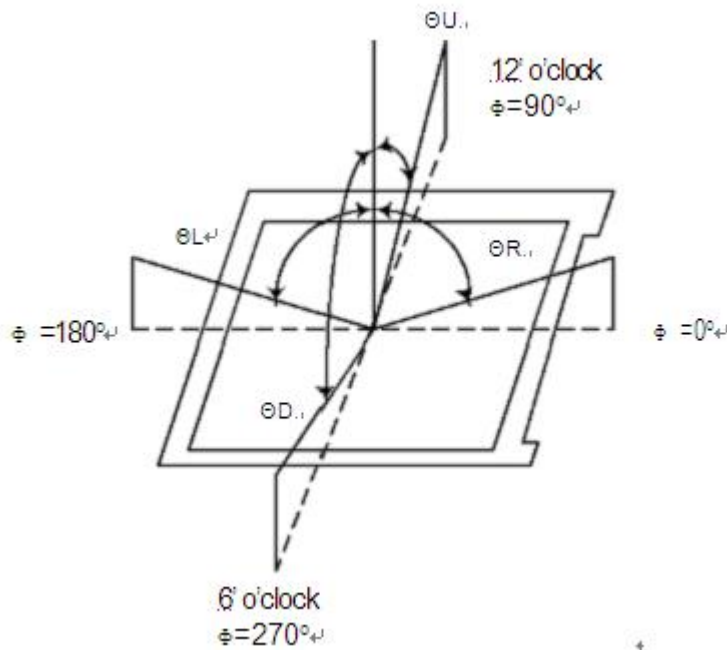
- Measuring surrounding: dark room
- LED current IL: 200mA
- Ambient temperature: $25 \pm 2^\circ\text{C}$
- 30min. warm-up time

3.3 Measuring Equipment

- BM-7 optical characteristics.
- Measuring spot size: 20 ~ 21mm

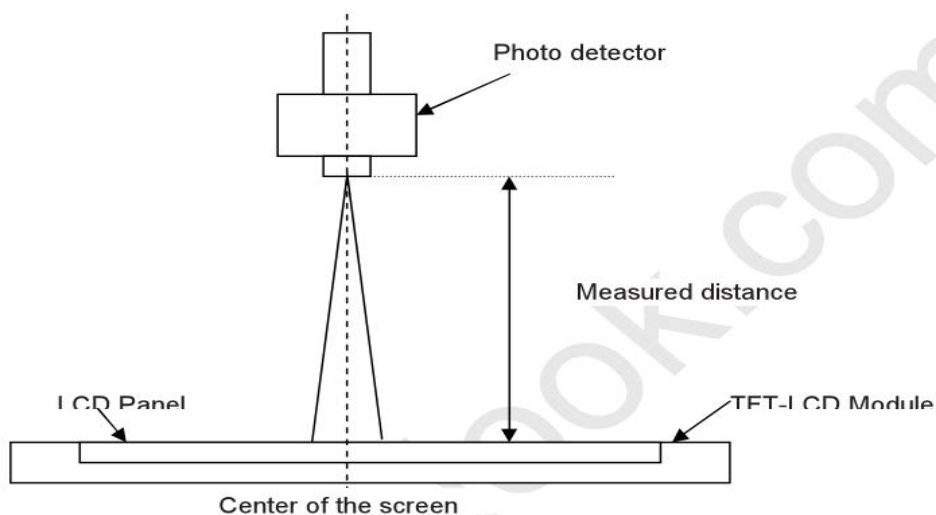
Note (1) Definition of Viewing angle range:

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).

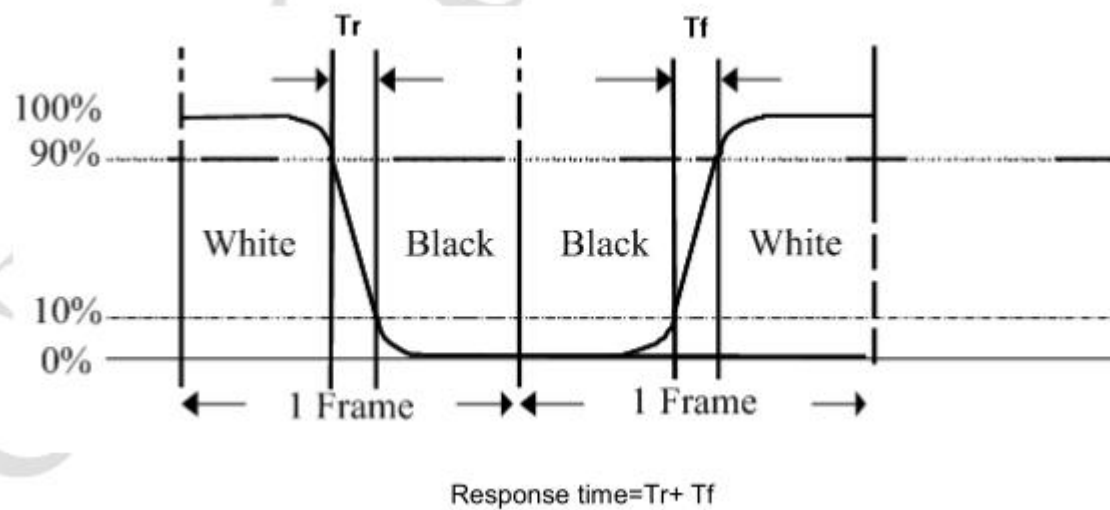


Note (2) Definition of Contrast Ratio(CR):Measured at the center point of panel

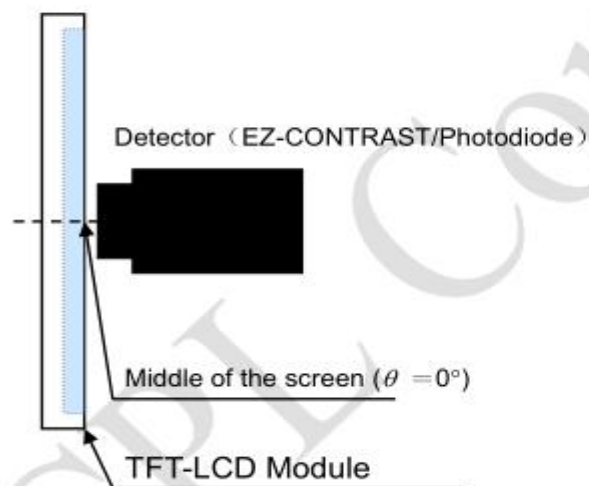
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$



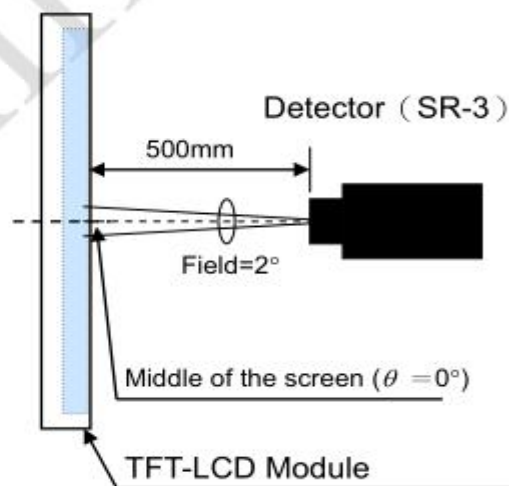
Note (3) Definition of Response Time: Sum of T_r and T_f



Note (4) Definition of optical measurement setup

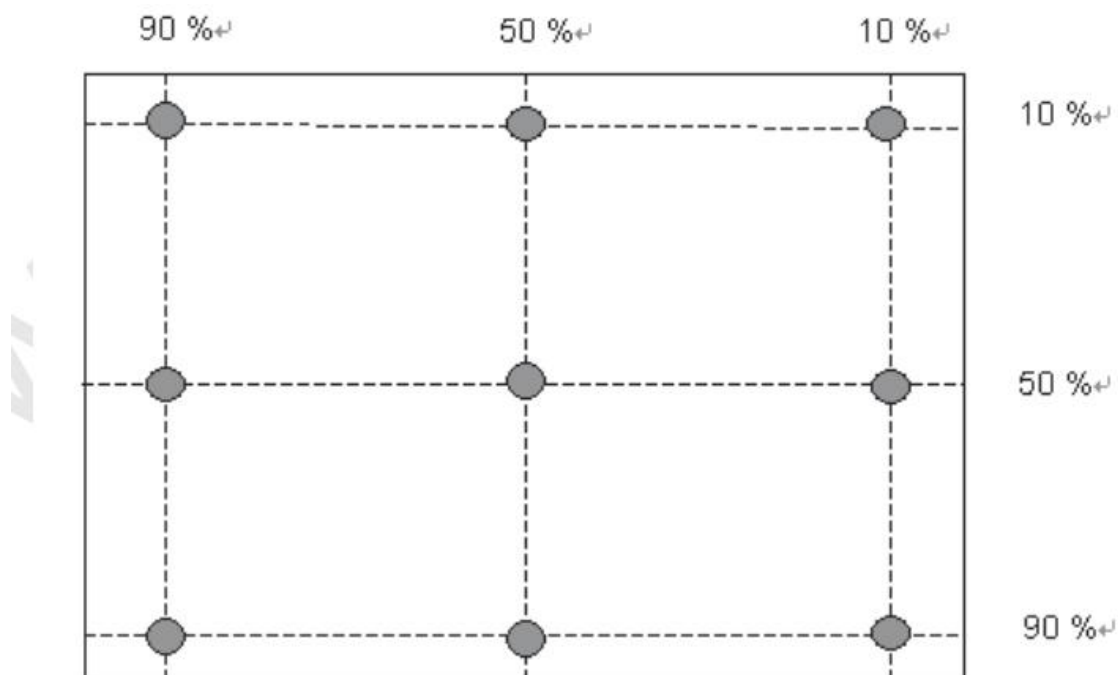


Measurement of viewing angle range, Response time.



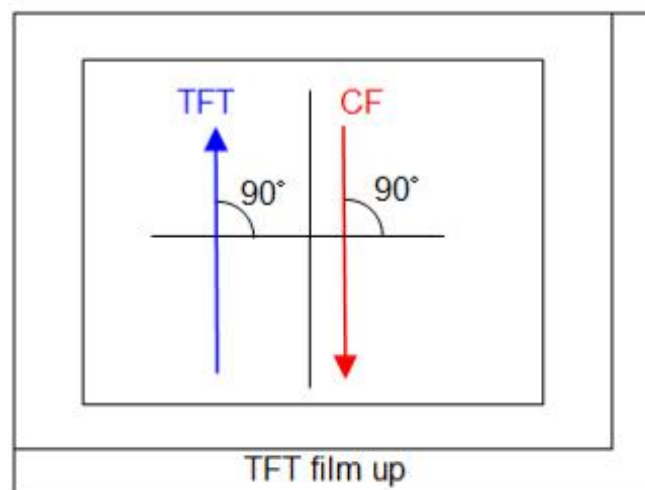
Measurement of Contrast, Luminance, Chromaticity.

Note (5) Definition of brightness uniformity



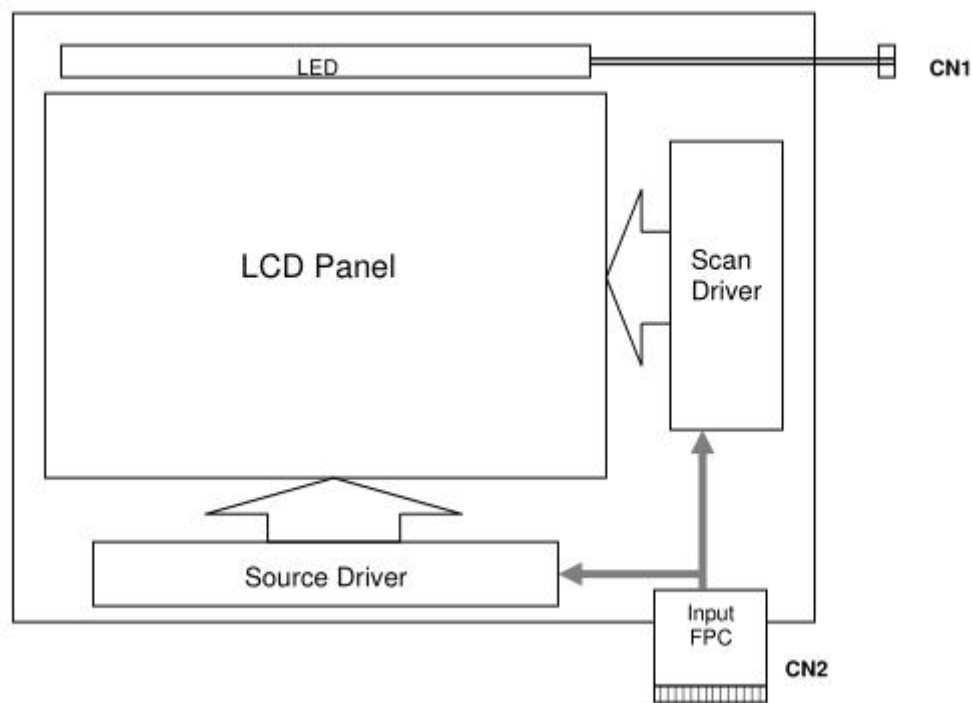
$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100 \%$$

Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction).

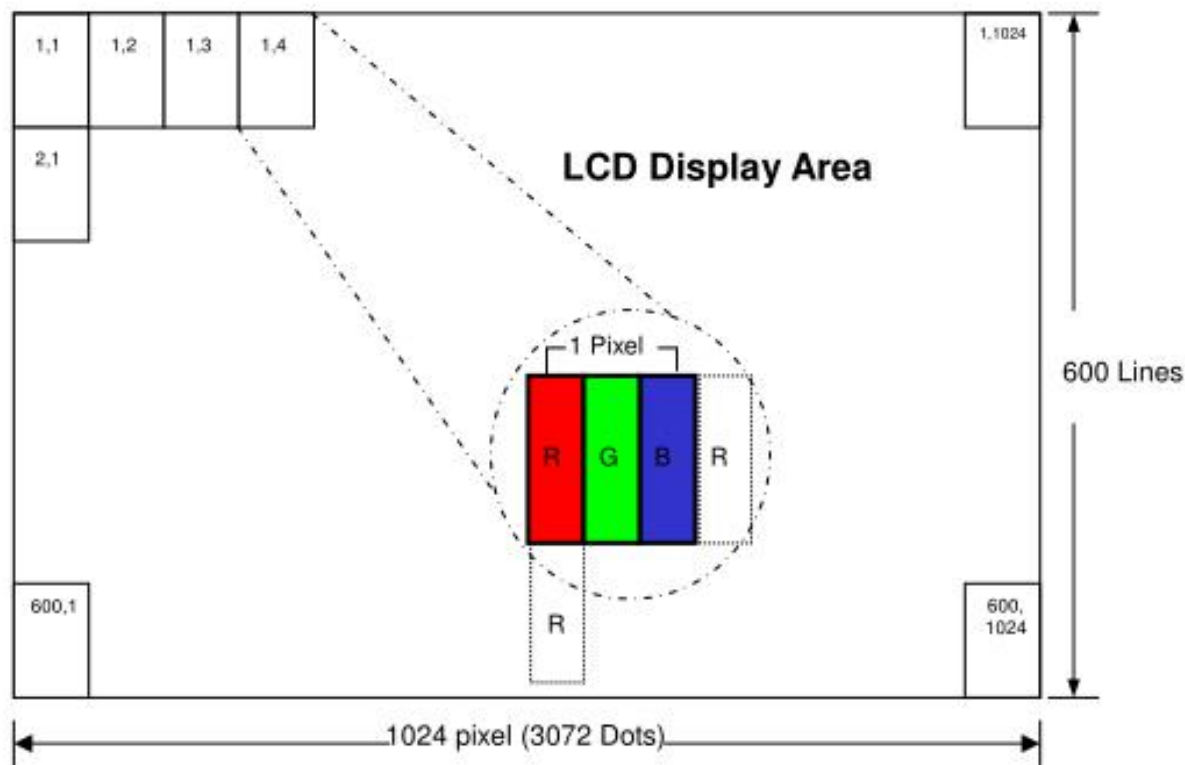


4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Pixel Format



5.0 INTERFACE PIN CONNECTION

5.1 TFT LCD Module: FPC UP Connector, (FH28-60S-0.5H (HIROSE), 50pin,pitch = 0.5mm)

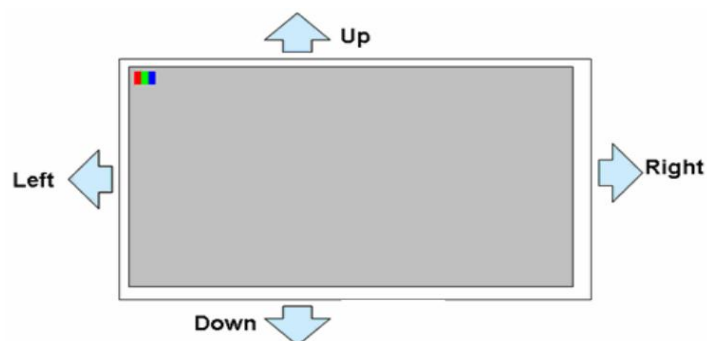
Pin No.	Symbol	I/O	Function	Remark
1	V _{LED+}	P	Power for LED backlight (Anode)	
2	V _{LED+}	P	Power for LED backlight (Anode)	
3	V _{LED-}	P	Power for LED backlight (Cathode)	
4	V _{LED-}	P	Power for LED backlight (Cathode)	
5	GND	P	Power ground	
6	V _{COM}	I	Common voltage	
7	DV _{DD}	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	
19	B0	I	Blue data(LSB)	
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	

25	G2	I	Green data	
26	G1	I	Green data	
27	G0	I	Green data(LSB)	
28	R7	I	Red data(MSB)	
29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	
35	R0	I	Red data(LSB)	
36	GND	P	Power Ground	
37	DCLK	I	Sample clock	
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	
40	U/D	I	Up/down selection	
41	V _{GH}	P	Gate ON Voltage	
42	V _{GL}	P	Gate OFF Voltage	
43	AV _{DD}	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	
45	NC	-	No connection	
46	V _{COM}	I	Common Voltage	
47	DITHB	I	Dithering function	
48	GND	P	Power Ground	
49	NC	-	No connection	
50	NC	-	No connection	

Notel: Global reset pin: Active low to enter reset mode. Suggest connecting with an RC reset circuit for stability.

Normally pull high. (R=10KΩ, C=0.1μF)

Note: If RC is not added, users must follow the rule, T2 > 15ms on page 18 item 6.5 power on/off sequence.



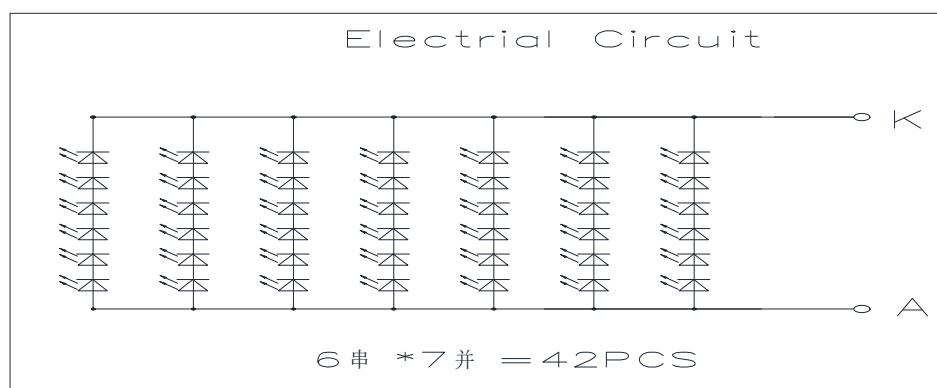
5.2 Back-Light Unit

The backlight system is an edge-lighting type with 6C * 7P=42 LED.

The characteristics of the LED are shown in the following tables.

Item	Symbol	Min	Typ	Max	Unit	Note
LED current	IL		140	160	mA	
LED voltage	VL	18.0	19.2	21.0	V	
Operating LED life time	Hr	15000	20000	--	Hour	(1)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm3\text{ }^{\circ}\text{C}$, typical IL value indicated in the above table and the $f_L=50\text{k}$ Hz until the brightness becomes less than 50%.



6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Power Supply Voltage For LCD	DVDD	3.0	3.3	3.6	V	
Analog Power Supply Voltage	AVDD	10.7	12.2	12.7	V	调整对比度, 调大颜色变深, 调小颜色变浅
Gate On Power Supply Voltage	VGH	18.5	22.0	23.5	V	
Gate Off Power Supply Voltage	VGL	-10.5	-10.0	-9.5	V	
Common Power Supply Voltage	VCOM	4.7	5.39	5.7	V	Note 1
Data (RGB signal) Voltage	Vsig	0.2	--	12.9		
Operation frequency	FCLK	--	--	200	KHZ	

Note 1: Please adjust VCOM to make the flicker level be minimum. Typ VCOM 电压值 只做参考, 具体以实际效果为准 (根据FLICKER 状态可调整)

Note (2): Be sure to apply the power Voltage as the power sequence spec.

Note (3): GND=0V

6.2 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VDD	3	3.3	3.6	V	Note (1)
	V _{IH}	0.7VDD		VDD	V	Note (2)
	V _{IL}	GND		0.3VDD	V	Note (2)
Current of power supply	IDD		320		mA	VDD=3.3V

Note :

(1) : VDD setting should match the signals output voltage of customer's system board.

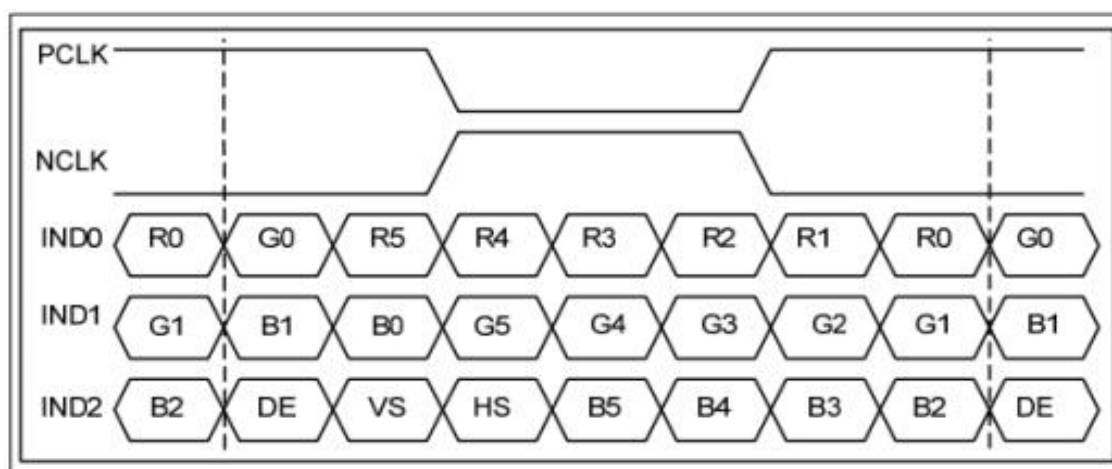
(2) : RESET, STBYB, SELB(DINT), L/R, U/D

6.3 Switching Characteristics for RGB Receiver

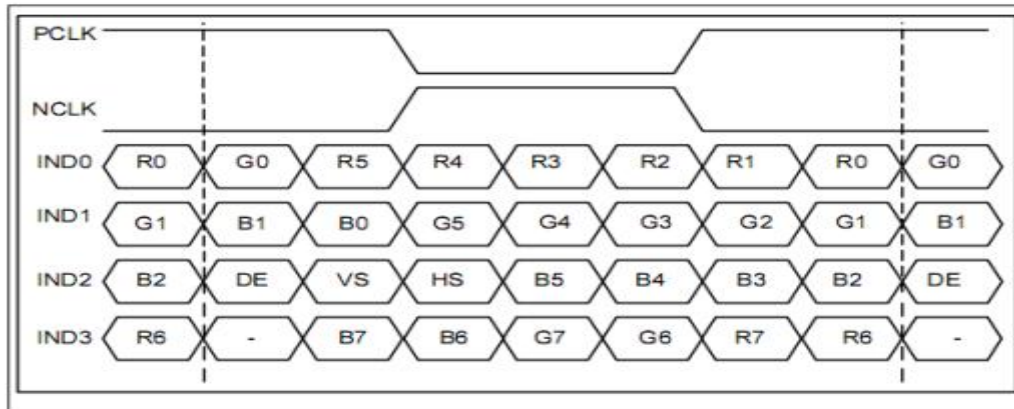
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V _{TH}			100	mV	
Differential Input Low Threshold	V _{TL}	-100			mV	
Differential input common mode voltage	V _{CM}	0.6	0.9	1.2	V	
Input Current	I _{IN}	-10		10	uA	RX+/-, RXC+/-
Differential input Voltage	V _{IH} / V _{IL}	100		300	mV	

6.4 Bit LVDS input

6.4.1 6bit LVDS input



6.4.2 8bit RGB input



6.5 Interface Timing (DE mode)

Parameter	Symbol	Value			Unit
		Min	Typ.	Max	
DCLK frequency Frame rate = 60Hz	fclk	42.6	51.2	67.2	MHz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1164	1344	1400	DCLK
HSYNC blanking	thb+thfp	140	320	376	DCLK
Vertical display area	tvd	600			H
VSYNC period time	tv	610	635	800	H
VSYNC blanking	tvb+tvfp	10	35	200	H

HV Mode

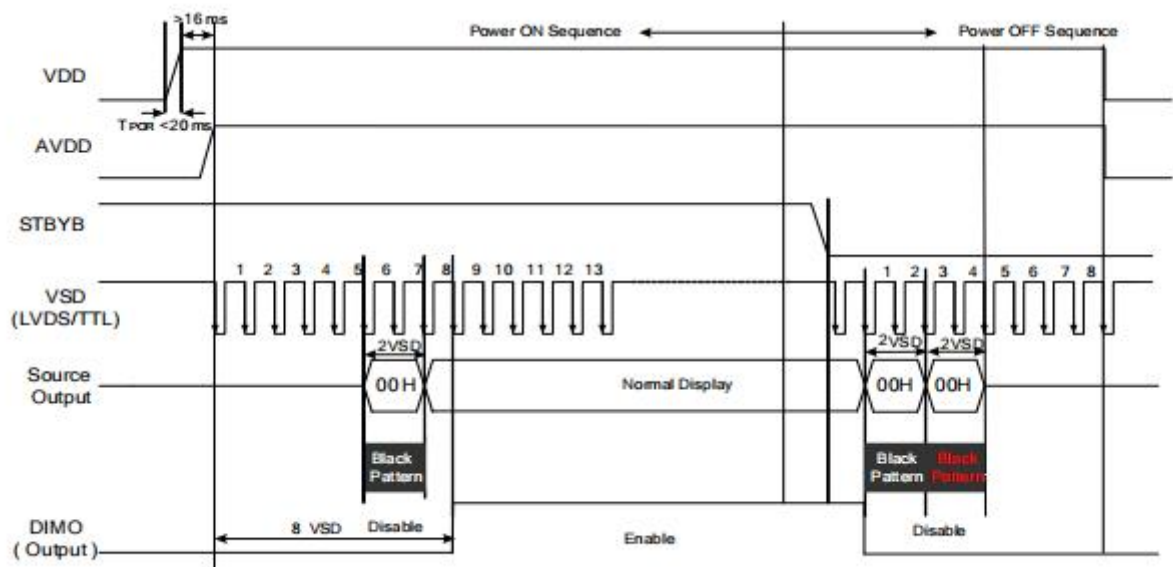
a. Horizontal input timing

Parameter		Symbol	Value			Unit
Horizontal display area		thd	1024			DCLK
DCLK frequency Frame rate = 60Hz		fclk	Min	Typ.	Max	
			44.9	51.2	63	MHz
1 Horizontal Line		th	1200	1344	1400	DCLK
HSYNC pulse width	Min	thpw	1			DCLK
	Typ.		-			
	Max		140			
HSYNC blanking		thb	160	160	160	
HSYNC front porch		thfp	16	160	216	

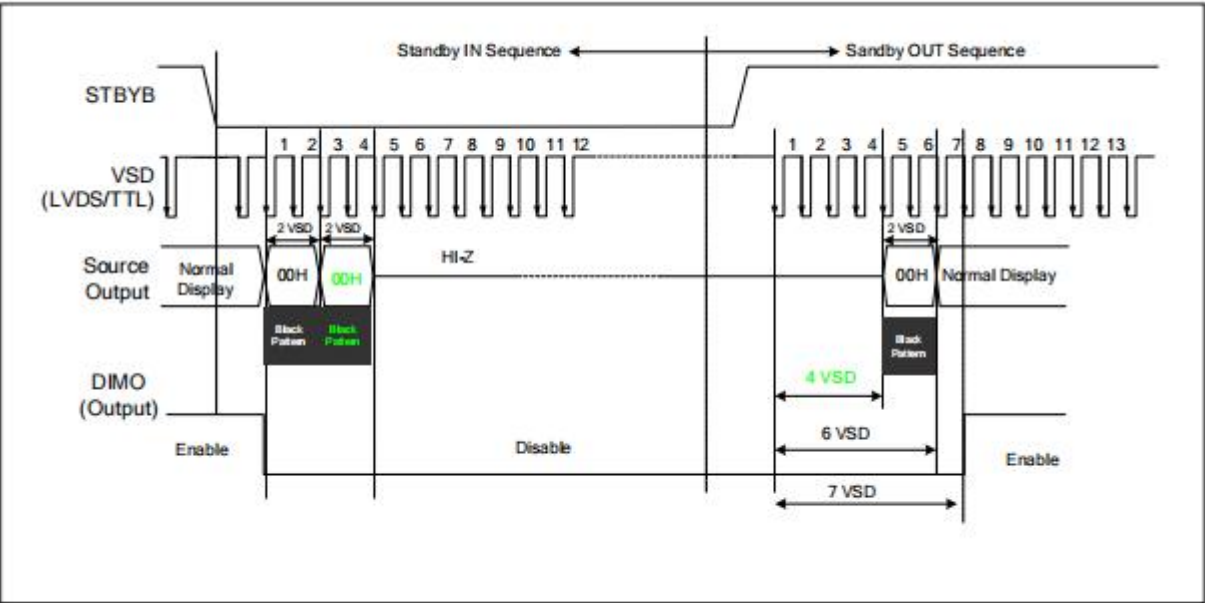
b. Vertical input timing

Parameter	Symbol	Value			Unit
		Min	Typ.	Max	
Vertical display area	tvd	600			H
VSYNC period time	tv	624	635	750	H
VSYNC pulse width	tvpw	1	-	20	H
VSYNC blanking	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

6.6 Power On/Off Sequence Timing



6.7 Standby On-Off Sequence Timing



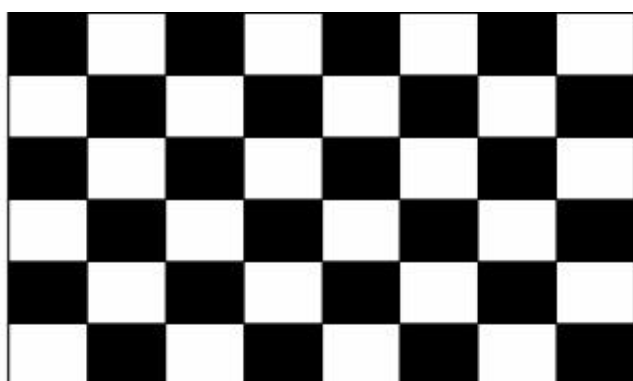
7.0 RELIABILITY TEST ITEMS

No.	Test Item	Conditions	Note
1	High Temperature Storage	Ta=+80℃, 24hrs	
2	Low Temperature Storage	Ta=-30℃, 24hrs	
3	High Temperature Operation	Ta=+70℃, 24hrs	
4	Low Temperature Operation	Ta=-20℃, 24hrs	
5	High Temperature and High Humidity(operation)	Ta=+60℃, 80%RH 24hrs	
6	Thermal cycling Test	-20℃/30 min ~ +70℃/30 min for a total 10cycles, Start with cold temperature and end with high temperature.	
7	Vibration Test (Non-operation)	● Frequency range:8~33.3Hz ● Stoke: 1.3 mm ● Vibration: sinusoidal wave, perpendicular axis(both x, z axis: 2hrs ,y axis: 4hrs). ● Sweep: 2.9G,33.3 Hz -400 Hz ● Cycle time: 15 min	
8	Shock Test (Non-operation)	● Shock level: 980m/s 2 (equal to 100G). ● Waveform: half sinusoidal wave,6ms. ● Number of shocks: ±X,±Y,±Z axes for a total of six shock inputs.	
9	ESD Test	150pF, 330Ω, ±8kV&±15kV air& contact test	1
		200pF, 0Ω, ±200V contact test	2

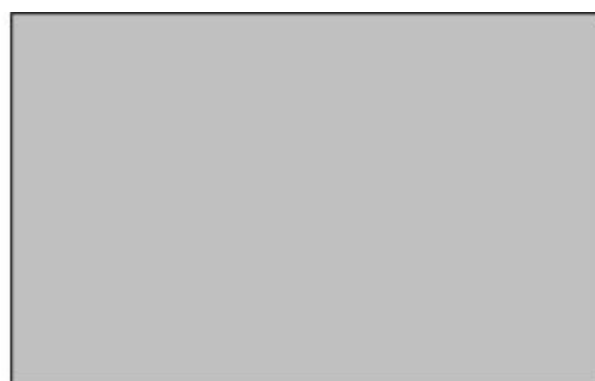
Note 1: LCD glass and metal bezel

Note 2: IF connector pins

Note 3: Operation with test pattern sustained for 4hrs, then change to gray pattern immediately.

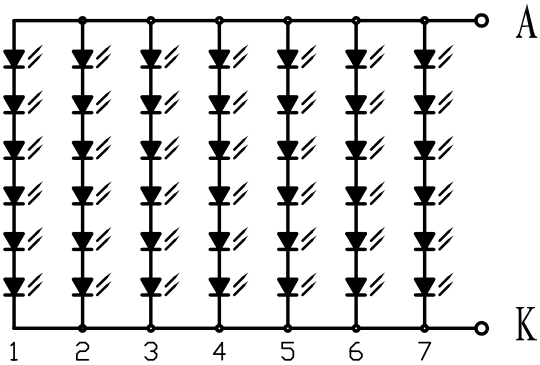
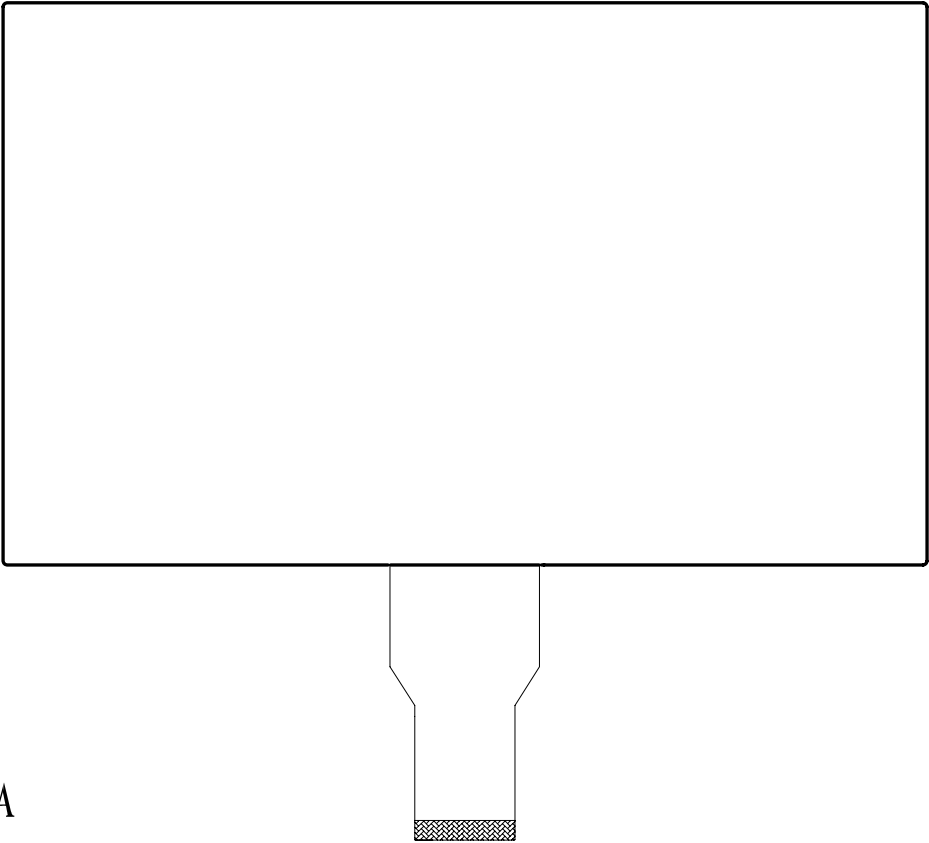
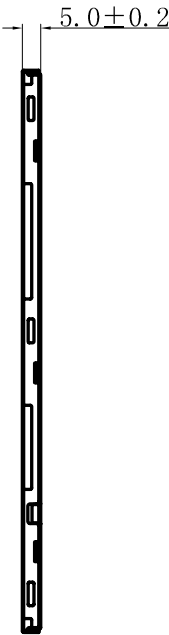
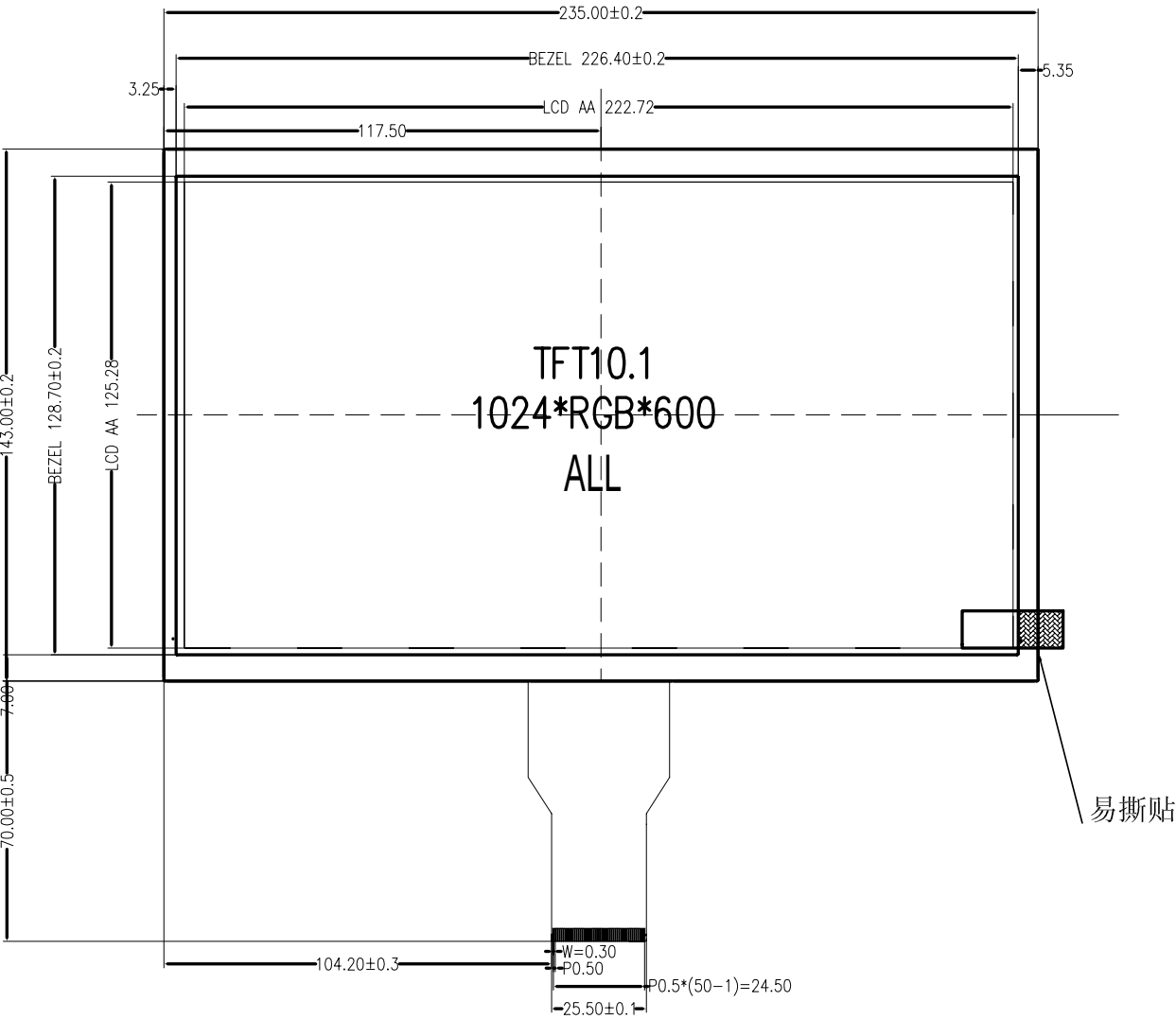


(a) Test Pattern (chess board Pattern)



(b) Gray Pattern

Revised Record	1. 0	2022-6-22	New Issue						

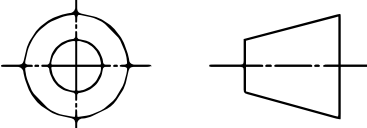


LED 电路图

PIN	SYMBOL
1	VLED+
2	VLED+
3	VLED-
4	VLED-
5	GND
6	VCOM
7	DVDD
8	MODE
9	DE
10	VS
11	HS
12~19	B7~B0
20~27	G7~G0
28~35	R7~R0
36	GND
37	DCLK
38	GND
39	L/R
40	U/D
41	VGH
42	VGL
43	AVDD
44	RESET
45	NC
46	VCOM
47	DITHB
48	GND
49	NC
50	NC

SPECIFICATIONS:

1. DISPLAY TYPE:
- 10.1" / 1024(H) x 3(RGB) x 600(V)
2. DRIVE IC:
- HX8282A11+HX8696
3. OPERATING TEMPERATURE:
- 20 ~ 70°C
4. STORAGE TEMPERATURE:
- 30 ~ 80°C
5. VIEWING ANGLE:
- ALL
6. BACKLIGHT:
- 42 LED, Vf = 12~16V
7. BRIGHTNESS:
- 500 CD/M2
8. CUSTOMER PART NO.:
- BOCEN STANDARD PRODUCT

BOCEN DISPLAY TECHNOLOGY CO., LTD.		
DESIGNED BY: Shawn	BF10150-01	VERSION: 1.0
CHECKED BY: William		NO.: 1 OF 1
APPROVED BY: Rio		UNIT: mm
Website: http://www.bocentech.com		DATE: 2022-6-22

9.0 LOT MARK

9.1 Location of Lot Mark

- (1) Location: The label is attached to the backside of the LCD module.
- (2) Detail of the Mark: as attached below.
- (3) This is subject to change without prior notice.

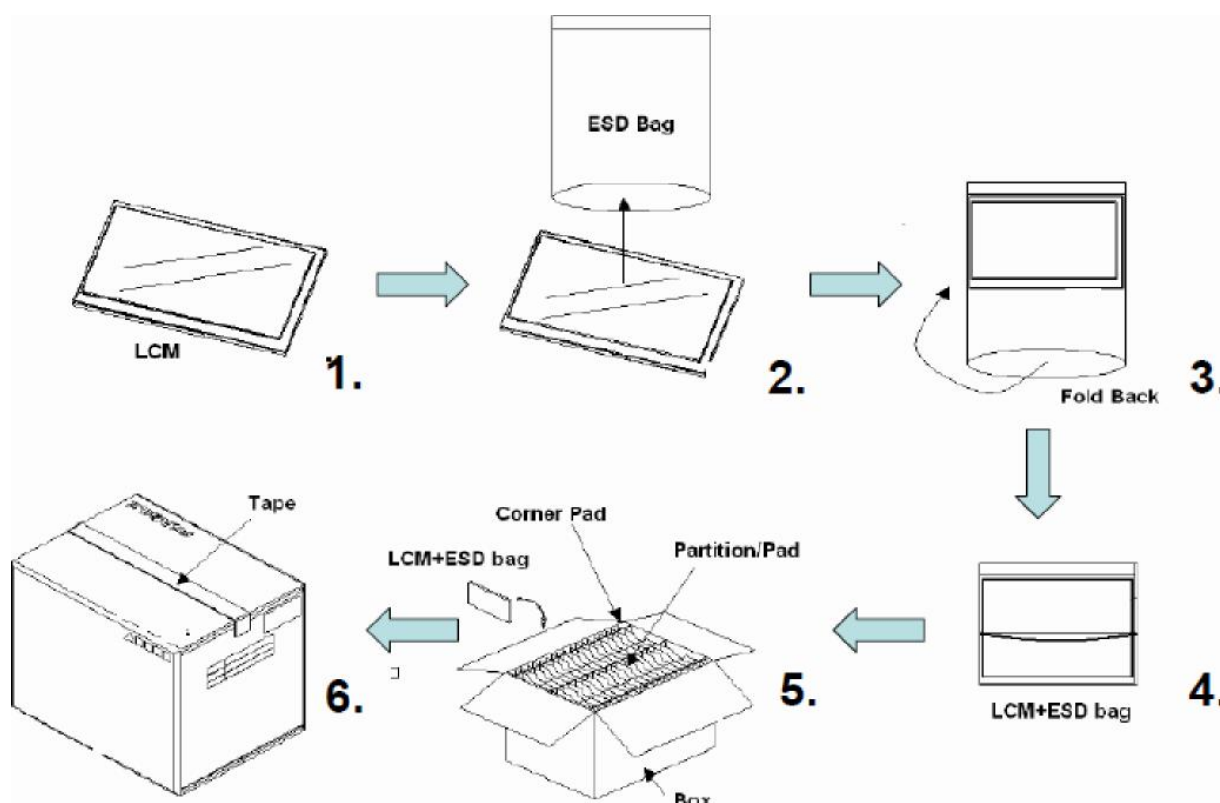
---T.B.D

10.0 PACKAGE SPECIFICATION

10.1 Packing form

LCM Model	LCM Qty. in the box	Inner Box Size (mm)	Note
	50 pcs/box	383±5 x 373±5 x 275±5	

10.2 Packing assembly drawings



Items	Material	Notice
Box	Corrugated Paper Board	AB Flute
Partition/Pad	Corrugated Paper Board	B Flute
Corner Pad	Corrugated Paper Board	AB Flute
ESD bag	PE	

11.0 GENERAL PRECAUTION

11.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

11.2 Assembly Precaution

- 11.2.1 Please use the mounting hole on the module side in installing and do not bending or wrenching LCD in assembling. And please do not drop, bend or twist LCD module in handling.
- 11.2.2. Please design display housing in accordance with the following guide lines.
 - 11.2.2.1 Housing case must be destined carefully so as not to put stresses on LCD all sides and not to wrench module. The stresses may cause non-uniformity even if there is no non-uniformity statically.
 - 11.2.2.2 Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. The clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.
- 11.2.3 Please do not push or scratch LCD panel surface with any-thing hard. And do not soil LCD panel surface by touching with bare hands.(Polarizer film, surface of LCD panel is easy to be flawed.)
- 11.2.4 Please do not press any parts on the rear side such as source IC, gate IC, and FPC during handling LCD module, If pressing rear part is unavoidable, handle the LCD module with care not to damage them.
- 11.2.5 Please wipe out LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.
- 11.2.6 Please wipe out drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.
- 11.2.7 Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.

11.3 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. Century does not warrant the module, if customers disassemble or modify the module.

11.4 Breakage of LCD Panel

- 11.4.1.If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- 11.4.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 11.4.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 11.4.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

11.5 Absolute Maximum Ratings and Power Protection Circuit

- 11.5.1. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- 11.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- 11.5.3. It's recommended to employ protection circuit for power supply.

11.6 Operation

- 11.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
- 11.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- 11.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- 11.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.
- 11.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

11.7 Static Electricity

- 11.7.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- 11.7.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.
- 11.7.3 Persons who handle the module should be grounded through adequate methods.

11.8 Disposal

When disposing LCD module, obey the local environmental regulations.

11.9 Others

- 11.9.1 A strong incident light into LCD panel might cause display characteristics' changing inferior because of Polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight Land Strong UV rays.
- 11.9.2 Please pay attention to a panel side of LCD module not to contact with other materials in pressing it alone.
- 11.9.3 For the packaging box, please pay attention to the followings:
 - 11.9.3.1 Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.
 - 11.9.3.2 Please do not pile them up more than 6 boxes(They are not designed so) And please do not turn over.
 - 11.9.3.3 Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
 - 11.9.3.4 Packing box and inner case for LCDs are made of cardboard, So please pay attention not to get them wet(Such like keeping them in high humidity or wet place can occur getting them wet.)