BV050WVM-N00-1800

Product Specification

Rev.P0

BEIJING BOE OPTOELECTRONICS TECHNOLOGY

SPEC. NUMBER	PRODUCT GROUP	REV.	ISSUE DATE	PAGE
S	TFT-LCD	O	2015.01.12.	1 OF 27

REVISION HISTORY

REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED
O	-	Initial Release	2015.01.12	Liujinshan

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

BF050WVM is a color active matrix TFT LCD panel using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 5.01 inch diagonally measured active area with WVGA resolutions (480 horizontal by 800 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.

1.2 Features

- Thin and light weight
- Display 16.7M colors
- High luminance and contrast ratio, low reflection and wide viewing angle
- RoHS Compliant

1.3 Application

●Mobile application

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	65.52(H) x 109.20(V)	mm	
Number of pixels	480(H) ×800(V)	pixels	
Pixel pitch	0.0455(H) ×RGB ×0.1365(V)	mm	
Pixel arrangement	Pixels RGB stripe arrangement		
Display colors	16.7M (8bits)	colors	
Display mode	Transmission mode, Normally black		
Outline Dimension	70.12(H) ×118.98(V) × 1.80(D) typ.	mm	
Weight	35.0(typ.)±10%	gram	
Surface Treatment	3H, LR		CF Pol. : 0.111 TFT Pol. : 0.137
Back-light	Bottom edge side, 1-LED Lighting Bar Type		

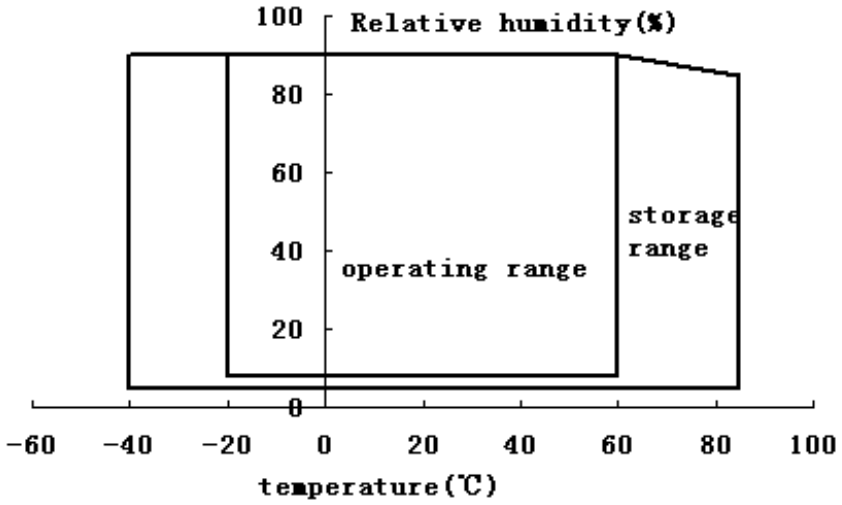
2.0 ABSOLUTE MAXIMUM RATINGS

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Logic voltage	I_{OVCC}	-0.3	-	5	V	
Analog voltage	V_{CI}	-0.3	-	5	V	
Input signal voltage	V_{IN}	-0.3	-	IOVCC+0.3	V	
Back-light Power Supply Voltage	HV_{DD}	-	16.0	17.0	V	
Back-light LED Current	I_{LED}	-	15		mA	
Operating Temperature	T_{OP}	-20		+65	℃	1)
Storage Temperature	T_{ST}	-40		+85	℃	

Note : 1) Temperature and relative humidity range are shown in the Figure below.
Wet bulb temperature should be 39 ℃ max. and no condensation of water.



3.0 ELECTRICAL SPECIFICATIONS

3.1 TFT LCD Module

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

Items		Symbol	Min.	Typ.	Max.	Unit	Remark
Logic voltage		I_{OVCC}	1.65	1.8	3.3	V	
Anolog voltage		V_{CI}	2.5	3.3	4.8	V	
Gate voltage	High level	V_{GH}	9	-	13	V	Note 1
	Low level	V_{GL}	-13	-	-11	V	
Input signal voltage	High level	V_{IH}	0.7Xlovcc	-	lovcc	V	
	Low level	V_{IL}	0	-	0.3Xlovcc	V	
current consumption		Icc	-	TBD	50mA	mA	Note 2

Note 1) The value can be adjusted by software to optimize display quality

Note 2) Display White Pattern(Column Inversion)

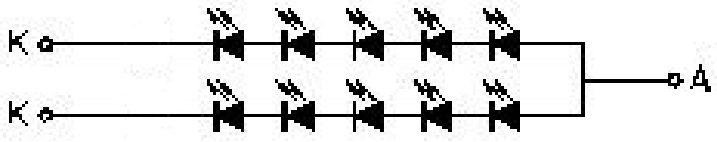
3.2 Back-light Unit

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

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage	V_F	-	-	3.40	V	-
LED Forward Current	I_F	-	15	-	mA	-
LED Power Consumption	P_{LED}	-	-	0.51	W	Note 1

Notes : 1. Calculator Value for reference $I_{LED} \times V_{LED} \times$ LED Quantity= P_{LED}

2. The LED Life-time define as the estimated time to 50% degradation of initial luminous.



BL CIRCUIT

4.0 OPTICAL SPECIFICATION

4.1 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 BM-5A) 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"), θØ=90 (= θ12) as the 12 o'clock direction ("upward"), θØ=180 (= θ9) as the 9 o'clock direction ("left") and θØ=270(= θ6) as the 6 o'clock direction ("bottom"). While scanning θand/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The luminance, color and uniformity should be tested by BM-5A. The backlight should be operating for 30 minutes prior to measurement. VDD shall be 3.7 ± 0.5V at 25°C. Optimum viewing angle direction is 3 O 'clock (see Figure 1) .

4.2 Optical Specifications <Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	-	85	-	Deg.	Note 1
		Θ_9		-	85	-	Deg.	
	Vertical	Θ_{12}		-	85	-	Deg.	
		Θ_6		-	85	-	Deg.	
Color Gamut				46	51	56	%	
Luminance Contrast ratio		CR	Θ = 0°	700	900	-		Note 2
Luminance of White	Centre	Y_w	Θ = 0°	(360)	(435)	-	cd/m^2	Note 3
White Luminance uniformity	9 nits	ΔY9		80%	90%	-		Note 4
Reproduction of color	White	Wx	Θ = 0°	0. 281	0. 301	0. 321		Note 5
		Wy		0. 300	0. 320	0. 340		
	Red	R_x		0. 575	0. 595	0. 615		
		R_y		0. 317	0. 337	0. 357		
	Green	G_x		0. 312	0. 342	0. 372		
		G_y		0. 554	0. 584	0. 614		
	Blue	B_x		0. 127	0. 147	0. 167		
		B_y		0. 078	0. 098	0. 118		
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C Θ = 0°	-	30	40	ms	Note 6
Cross Talk		CT	Θ = 0°	-	-	2.0	%	Note 7
Flicker			Θ = 0°	-	-	10.0	%	Note8
Gamma			Θ = 0°	2.6	2.4	2.2		Note9

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 Figure1).

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. Center Luminance of white is defined as luminance values of 5 nit average across 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 Figure2 for a total of the measurements per display. The luminance is measured by CA210 when the LED current is set at 18.8m.

. 4. The White luminance uniformity on LCD surface is then expressed as : ΔY = Minimum Luminance of 5 nits / Maximum Luminance of 5 nits (see Figure2).

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.

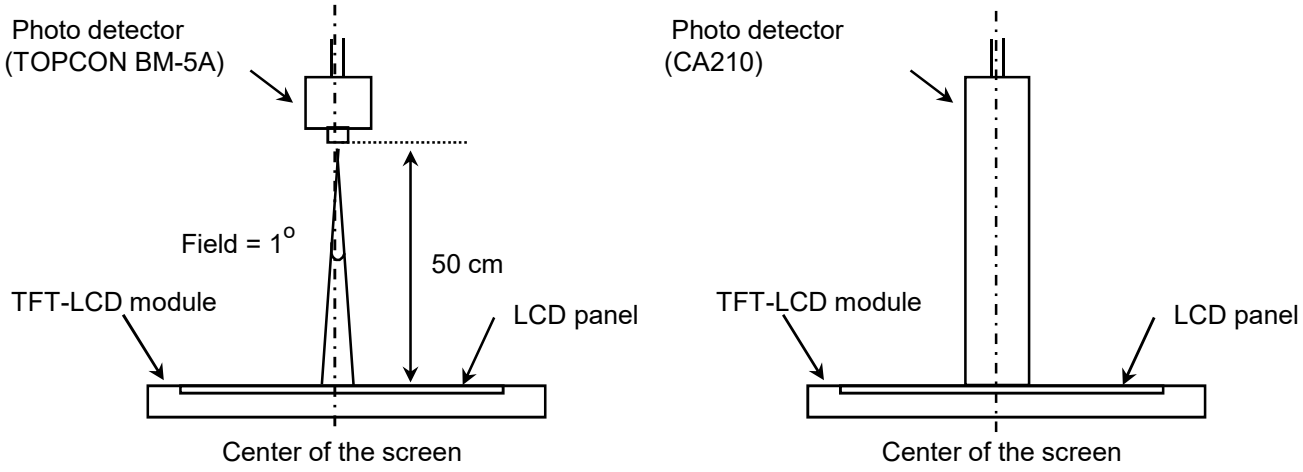
7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark. (See Figure4).

8. Flicker measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. The date is measured by CA210 with Luminance at L127 and column inversion.

9.From GL0 to GL255, Gamma curve fit by 17 test points which is tested by starting at GL0, and step 16 gray level，More than 13 points spec. in (2.4<2.2<2.0) is Gamma OK.

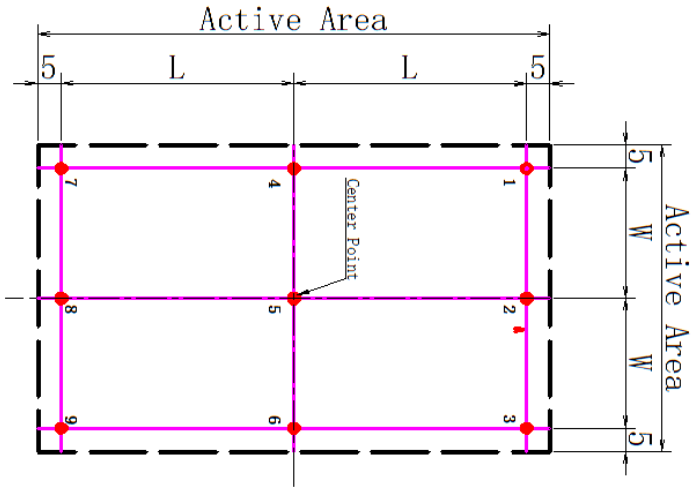
4.3 Optical measurements

Figure1. Measurement Set Up



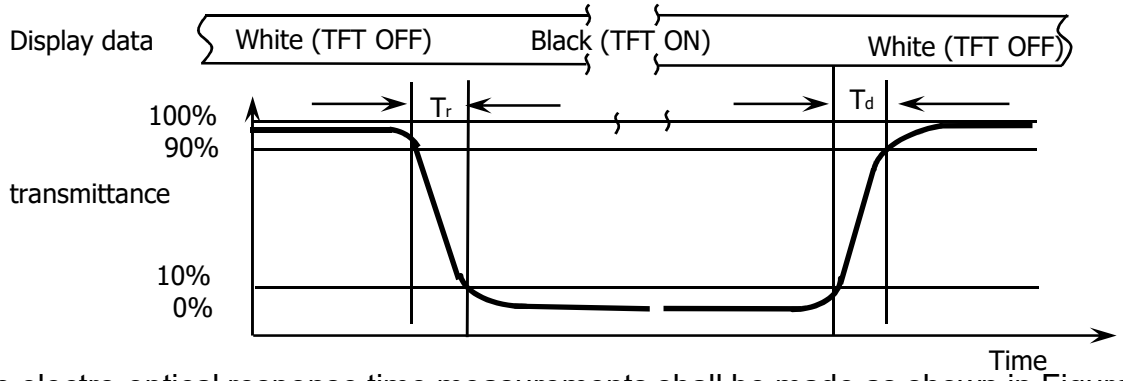
View angel range measurement setup Luminance , uniformity and color measurement setup

Figure2. White Luminance and Uniformity Measurement Locations (9 nits)



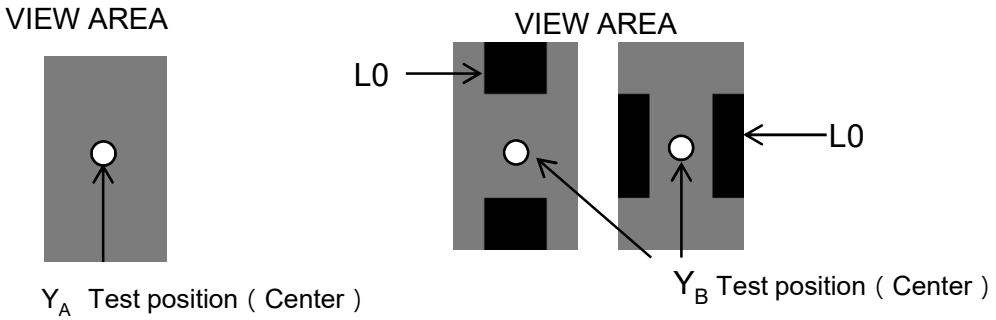
Center Luminance of white is defined as luminance values of center points across the LCD Active Area. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in Figure2 for a total of the measurements per display.
The White luminance uniformity on LCD surface is then expressed as : Uniformity = Minimum Luminance of 9 points / Maximum Luminance of 9 points (see Figure2).

Figure3. Response Time Testing



The electro-optical response time measurements shall be made as shown in Figure3 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 90% to 10% is Tr, and 10% to 90% is Td.
TN mode is normal white, so at the stage of TFT on, the transmittance is nearly 100%.

Figure4. Cross ModulationTest Description



$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Where:

Y_A = Initial luminance of measured area (cd / m^2)
Y_B = Subsequent luminance of measured area (cd / m^2)
Resolution ratio is 480(H)x800(V).

The location measured will be exactly the same in both patterns.

Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark (Refer to Figure4).

5.0 INTERFACE CONNECTION.

5.1 Electrical Interface Connection

The electronics interface connector is MOLEX 503304-3051. The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

NO	Pinmap	I/O	Discription	NO.	Pinmap	I/O	Discription
1	GND	GND	GROUND	2	GND	GND	GROUND
3	TSP_INT_N	O	TSP Interrupt Signal(1.8V I/O)	4	CABCPWM	O	PWM for Back Light
5	TSP_I2C_SCL	I/O	TSP I2C CLOCK (1.8V I/O)	6	VCI	Power	Analog Power
7	TSP_I2C_SDA	CLK	TSP I2C Data(1.8V I/O)	8	IOVCC	Power	Digtal Power
9	V_TSP_3.3V	Power	Power Supply for TSP 3.3V	10	ESD_DET	O	ESD_Detection
11	V_TSP_1.8V	Power	Power Supply for TSP1.8V	12	GND	GND	GROUND
13	NC	NC	MTP Power （VPP）, SDC Use	14	D0-	I	MIPI DATA Negative Signal
15	LEDA	Power	LED Anode(+)	16	D0+	I	MIPI DATA Postive Signal
17	NC	NC	Not Connect	18	GND	GND	GROUND
19	LEDK1	Power	LED Cathode 1(-)	20	CLK-	I	MIPI Clock Negative Signal
21	LEDK2	Power	LED Cathode 2(-)	22	CLK+	I	MIPI Clock Postive Signal
23	NC	NC	Measuring VCOM R （CONTACT_R）,SDC Use	24	GND	GND	GROUND
25	RESX	I	Hardware Reset Signal	26	D1-	I	MIPI DATA Negative Signal
27	LCDID	O	VDD/GND	28	D1+	I	MIPI DATA Postive Signal
29	GND	GND	GROUND	30	GND	GND	GROUND

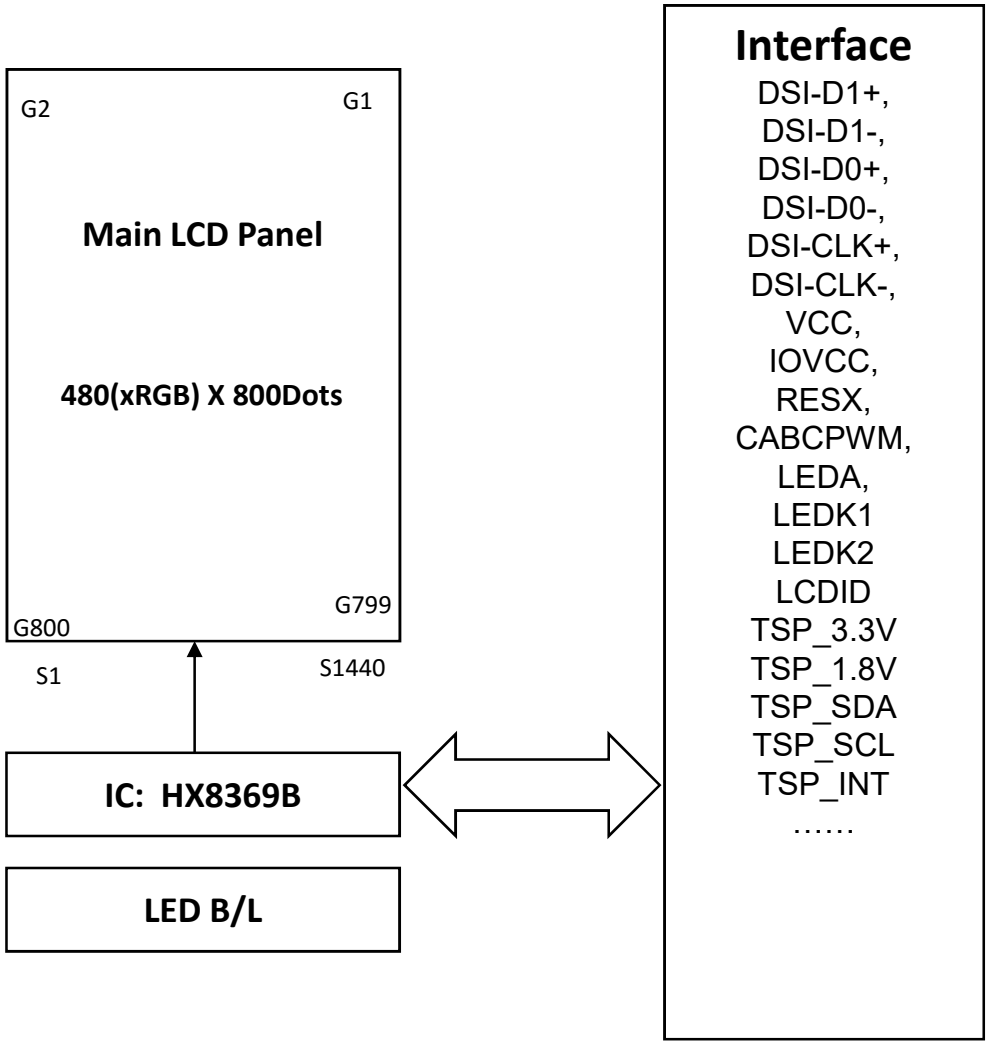
The Touch connector is Hirose TF37-6S-0.4SH. The connector interface pin assignments are listed in Table 7.

<Table 7. Pin Assignments for the Touch Interface Connector>

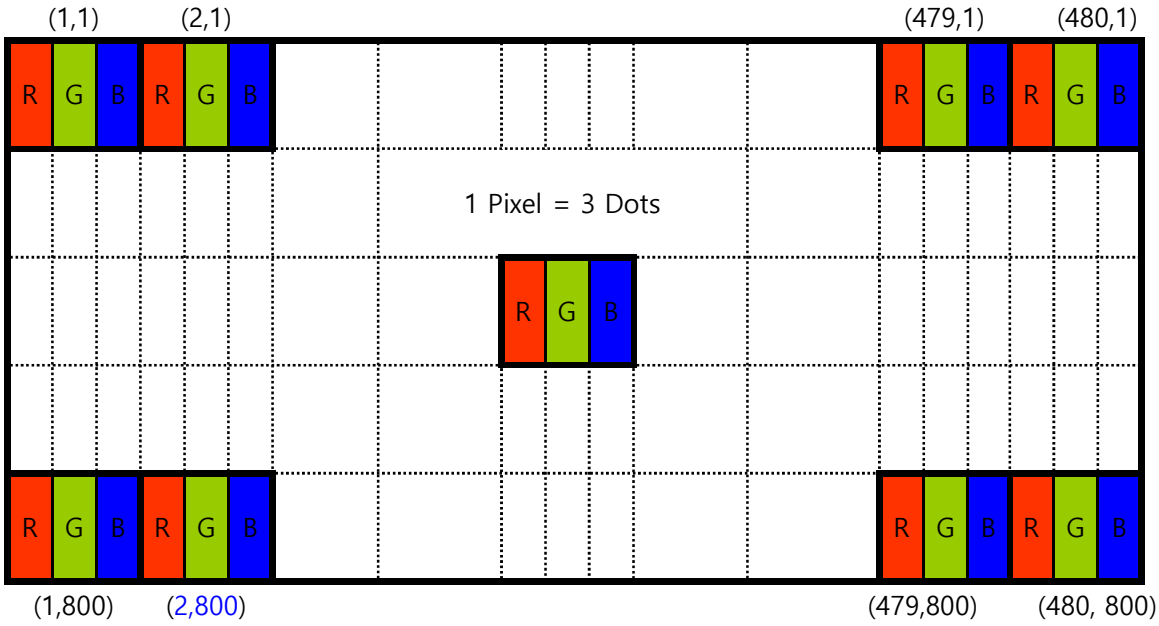
NO.	Pinmap	I/O	Discription
1	V_TSP_1.8V	Power	Power Supply for TSP1.8V
2	V_TSP_3.3V	Power	Power Supply for TSP 3.3V
3	TSP_I2C_SDA	CLK	TSP I2C Data(1.8V I/O)
4	TSP_I2C_SCL	I/O	TSP I2C CLOCK (1.8V I/O)
5	TSP_INT_N	O	TSP Interrupt Signal(1.8V I/O)
6	GND	GND	GROUND

6.0 Block Diagram.

Figure 5. Block diagram



7.0 Data Input Format



Display Position of Input Data (V-H)

8 SIGNAL TIMING SPECIFICATION

8.1 Power on/OFFSEQUENCE （2 Case）

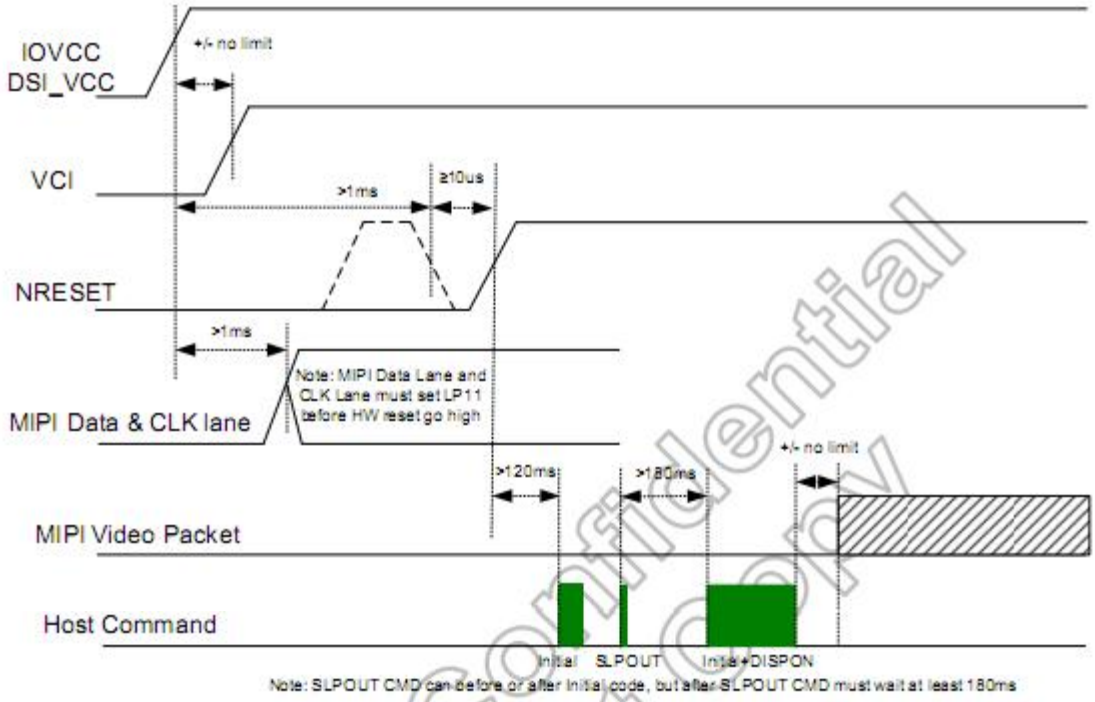
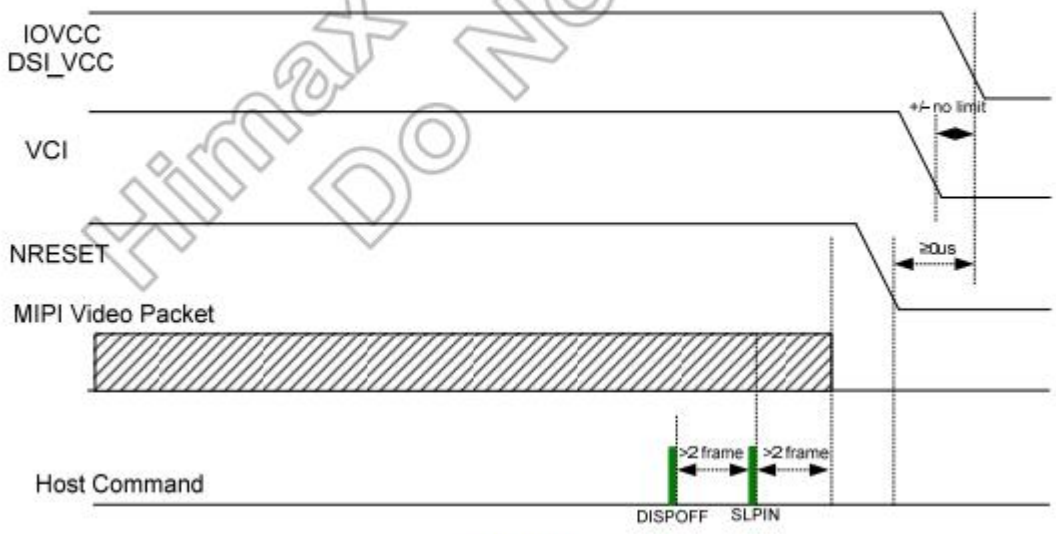


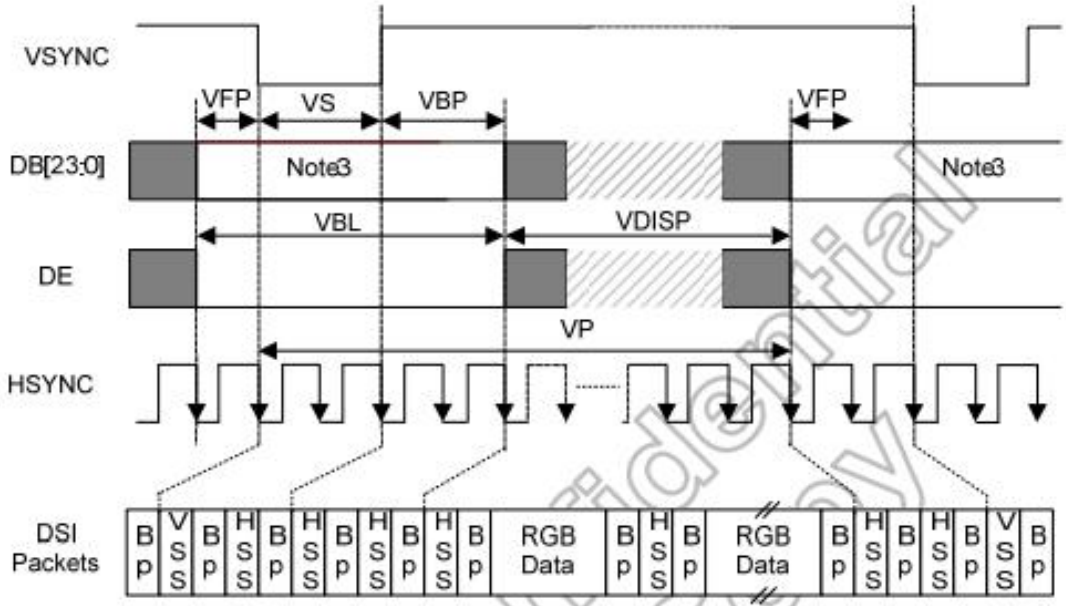
Figure 8.8: DSI Power On Timing



DSI Power Off Timing

9.0 Timings for DSI Video Mode

DSI Vertical Timing



Vertical Timings for DSI I/F

(VSSA=0V, IOVCC=1.8V, VCI=2.8V, T_A=25℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	Resolution=480x854	860	-	-	Line
		Resolution=480x800	806	-	-	Line
		Resolution=360x640	646	-	-	Line
Vertical low pulse width	VS	-	2	-	255	Line
Vertical front porch	VFP	-	2	-	255	Line
Vertical back porch	VBP	-	2	-	255	Line
Vertical data start point	-	VS+VBP	4	-	510	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	765	Line
Vertical active area	-	VDISP(480x854)	-	854	-	Line
		VDISP(480x800)	-	800	-	Line
		VDISP(360x640)	-	640	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Vertical Timings for DSI I/F

DSI Horizontal Timing

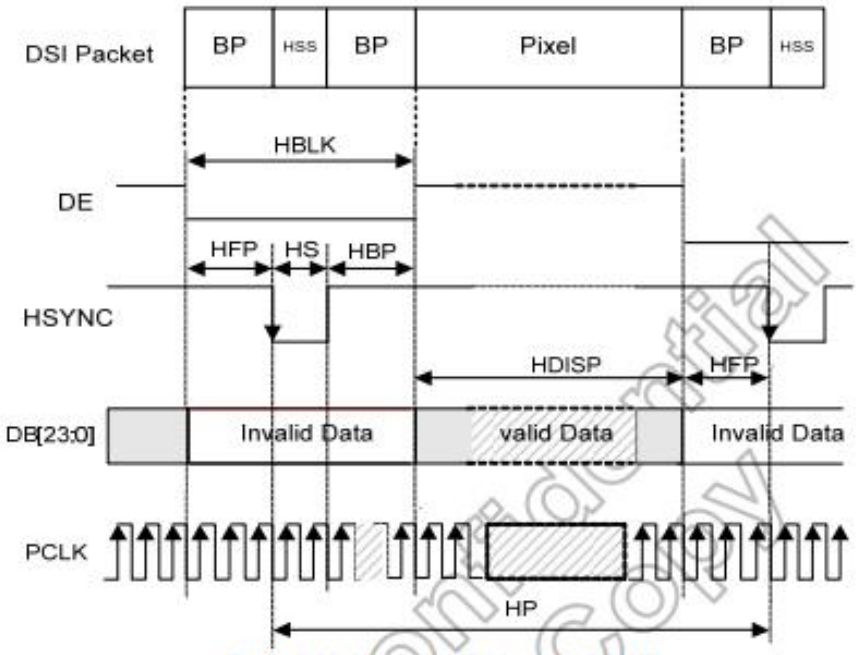


Figure 8.16: Horizontal Timings for DSI I/F

(VSSA=0V, IOVCC=1.8V, VCI=2.8V, T_A=25℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	Resolution=480x854	504	-	1023	DCK
		Resolution=480x800	504	-	1023	DCK
		Resolution=360x640	384	-	1023	DCK
HS low pulse width (for DSI 2-lane)	HS	DSI speed = 450~500Mbps	21	-	255	DCK
		DSI speed = 400~450Mbps	19			
		DSI speed = 350~400Mbps	17			
Horizontal back porch (for DSI 2-lane)	HBP	DSI speed = 450~500Mbps	58	-	255	DCK
		DSI speed = 400~450Mbps	53	-	255	DCK
		DSI speed = 350~400Mbps	47	-	255	DCK
Horizontal front porch (for DSI 2-lane)	HFP	DSI speed = 450~500Mbps	58	-	255	DCK
		DSI speed = 400~450Mbps	53	-	255	DCK
		DSI speed = 350~400Mbps	47	-	255	DCK
Horizontal data start point (for DSI 2-lane)	HS+HBP	DSI speed = 450~500Mbps	58	-	510	DCK
		DSI speed = 400~450Mbps	53	-	510	DCK
		DSI speed = 350~400Mbps	47	-	510	DCK
Horizontal blanking period (for DSI 2-lane)	HBLK	DSI speed = 450~500Mbps	137	-	765	DCK
		DSI speed = 400~450Mbps	125	-	765	DCK
		DSI speed = 350~400Mbps	111	-	765	DCK
Horizontal active area	HDISP	Resolution=480x854	-	480	-	DCK
		Resolution=480x800	-	480	-	DCK
		Resolution=360x640	-	360	-	DCK

Horizontal Timings for DSI I/F

10.0 Connector Description

Physical interface is described as for the connector on LCM.
These connectors are capable of accommodating the following signals and will be following components.

10.1 TFT LCD Module

Main Connector	**For Signal Connector**
Manufacturer	MOLEX
Type/ Part Number	MOLEX 30pin: 503304-3051

Touch Connector	**For Signal Connector**
Manufacturer	Hirose
Type/ Part Number	Hirose 6pin: TF37-6S-0.4SH

11.0 MECHANICAL CHARACTERISTICS

11.1 Dimensional Requirements

Figure5 shows mechanical outlines for the model BF050WVM
Other parameters are shown in Table 9.

<Table 9. Dimensional Parameters>

Parameter	Specification	Unit
Active Area	65.52(H) x 109.20(V)	
Number of pixels	480(H) ×800(V)(1 pixel = R + G + B dots)	
Pixel pitch	0.0455(H) ×RGB ×0.1365(V)	
Pixel arrangement	RGB Vertical stripe	
Display colors	16.7M(8bits)	
Display mode	Normally Black	
Dimensional outline	70.12(H) ×118.98(V) × 1.80(D) typ.	mm
Weight	35.0(typ.)±10%	gram
Back-light	LED, Horizontal-LED Array type	

11.2Glare and Polarizer Hardness.

The surface of the LCD has an low reflection coating and hard coating to reduce scratching.

11.3 Light Leakage

There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 150lux.

12.0 RELIABILITY TEST

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

<Table 10. Reliability test>

No.	Test Items	Conditions
1	High temperature & high humidity	60℃ 90%RH 96H
2	High temperature operation test	60℃ 24H
3	Low temperature operation test	-20℃ 24H
4	Thermal shock test	-40℃/85℃ , 30cycle , (30Min)
5	ALT Test	-10℃~65℃ , 0%~93% , 10 CYCLE
6	8585 Test	85℃ 85%RH 120H
7	Cold Bubble	-20℃, 5 times dropping (height of 10cm) iron ball(5.4g, ¢ 11.0) 24H,48H
8	High Temperature Image sticking	60℃ 1H , 5*8 CHESS PATTERN
9	LCM 3-point Bending	Press JIG ¢ 6mm,Support JIG ¢ 6mm, Speed:3mm/min
10	Panel 3-point Bending	Press JIG ¢ 6mm,Support JIG ¢ 6mm, Speed:3mm/min
11	Ball Drop Test	High:10cm 45Point 36g Ball Drop
12	Cell Gap	Power:70kgf(2 seconds hold),Speed:5mm/min
13	Peel off	5mm/min Push JIG: ¢ 5mm , Min 2.0Kgf

13.0 HANDLING & CAUTIONS

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

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

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

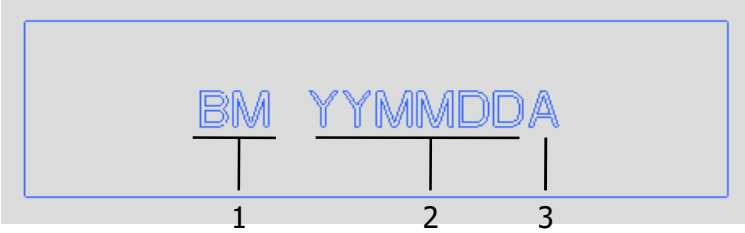
(4) Cautions for the atmosphere
- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

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

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

14.0 LABEL

(1) Product Ink print



Type designation

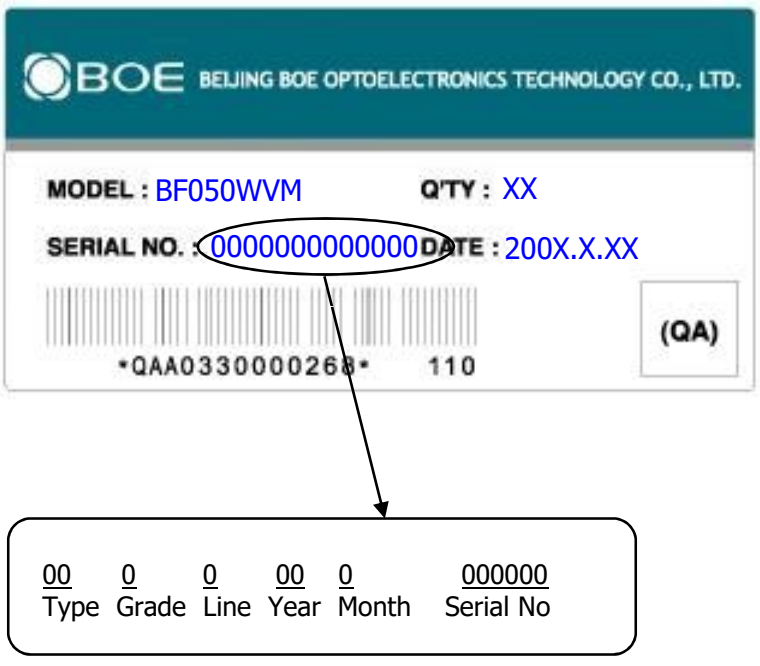
No 1. Vendor (Producing Area)

No 2. Product date, YYMMDD

No 3. Class No.

(2) Box label

Label Size: 110 mm (L) × 56 mm (W)
Contents
Model: BF050WVM
Q`ty: Module Q`ty in one box
Serial No.: Box Serial No. See next Figurefor detail description.
Date: Packing Date
Internal use of Product

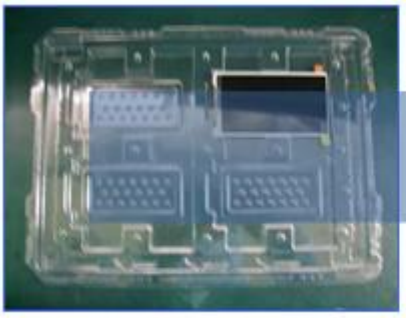


15.0 PACKING INFORMATION

15.1 Packing order

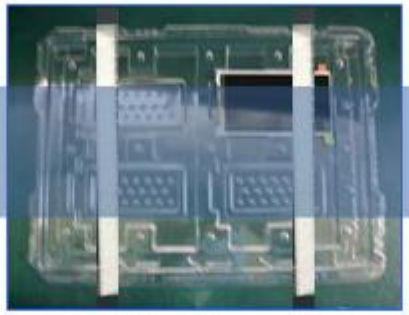
Packing Method

-将产品依次放入PET Tray，
每个卡槽1pcs产品；
-人工方式；
-容量：4pcs/ PET Tray；



step 1

-将PET Tray互旋180°后叠放；
-最上层为空PET Tray；
-人工方式；



step 2

-将N+1层PET Tray缠绕纸胶
带后放入防静电屏蔽袋；
-将屏蔽袋抽真空并封口；
-容量：8*1；

step 3

step 6

-将大箱按照2*3*4（长*宽*
高）的规格摆放在地拖上；
-使用打包带打包；

step 5

-将6小箱放入对应箱号的大
箱中；
-人工方式；
-容量：8*1*6；

step 4

-将装有产品的屏蔽袋放入小
箱中；
-人工方式；

15.0 PACKING INFORMATION

15.1 Packing order

外箱实物图

16.0 MECHANICAL OUTLINE DIMENSION

Figure6. TFT-LCD Module Outline