

江华飞信达科技有限公司

JIANGHUA FEXDA Technology Co. Ltd

**SPECIFICATION
FOR
LCD MODULE**

Customer : _____

Product Model: FXD035HV213B-R-A

Sample code: _____

Designed by	Checked by	Approved by

Final Approval by Customer

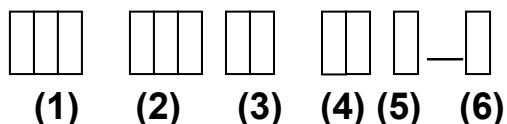
<input type="checkbox"/> LCM Machinery OK Checked By _____	<input type="checkbox"/> LCM OK
<input type="checkbox"/> LCM Display OK Checked By _____	<input type="checkbox"/> NG, Problem survey: Approved By _____

※ The specification of “TBD” should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

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1. Numbering System



No	Definition	Specifications
(1)	TFT LCM Productor No.	FXD ---- FEXDA technology Co.,Ltd
(2)	Display monitor opposite angle line size	Unit : inch
(3)	Product Resolution	... QQ: QQVGA 128*160 C: QCIF 186*220 Q: QVGA 240*320, H: HVGA320*480, WV:WVGA 480*800, QH:QHD 540*960 HD:720*1280, FHD1080*1920 ...
(4)	Product Development Series No.	By two figures characters expression from 01 to 99
(5)	LCD Type	A----AUO ; M----CMI ; C----CPT; B----BOE; G----LG; S---CTC; H----HSD; T----Tianma; Y----Hydis; I----INNOLUX; L---- IVO
(6)	Product Development edition No.	By The English litters : A~ Z

2. Scope

This specification applies to the TFT LCD module which is designed and manufactured by LCM Factory of JIANGHUA FEXDA Technology Co. Ltd.

3. Normative Reference

GB/T4619-1996 《Liquid Crystal Display Test Method》

GB/T2424 《Basic environmental Testing Procedures for Electric and Electronic Products.》

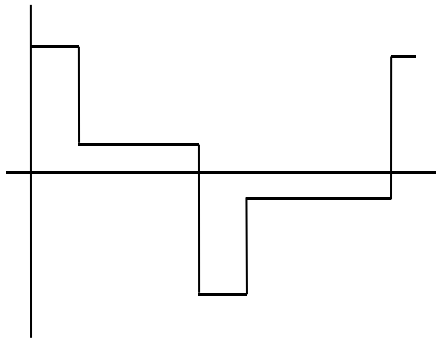
GB/T2423 《Basic Testing Procedures for Electric and Electronic Products》

IEC61747-1 《SIXTH PART GB2828`2829-87 《National Standard of PRC》

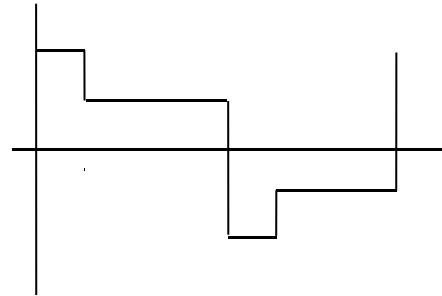
4. Definitions

4.1 Definitions of Vop

The definitions of threshold voltage V_{th1} , V_{th2} the following typical waveforms are applied on liquid crystal by the method of equalized voltage for each duty and bias.



【 selected waveform 】



【 non-selected waveform 】

① V_{th1} : The voltage which the brightness of segment indicates 50% of saturated value on the conditions of selected waveform

($f_r=80\text{Hz}$, $\Phi=10^\circ$ $\theta=270^\circ$ at 25°C)

② V_{th2} : The voltage which the brightness of segment indicates 50% of saturated value on the conditions of non-selected waveform

($f_r=80\text{Hz}$, $\Phi=10^\circ$ $\theta=270^\circ$ at 25°C)

③ V_{op} : $(V_{th1}(50\%)+V_{th2}(50\%))/2$ ($f_r=80\text{Hz}$, $\Phi=10^\circ$ $\theta=270^\circ$ at 25°C)

4.2 Definition of Response Time T_r , T_d

① T_r : The time required which the brightness of segment becomes 10% from 100% when waveform is switched to selected one from non-selected one. ($f_r=80\text{Hz}$, $\Phi=10^\circ$ $\theta=270^\circ$ at 25°C)

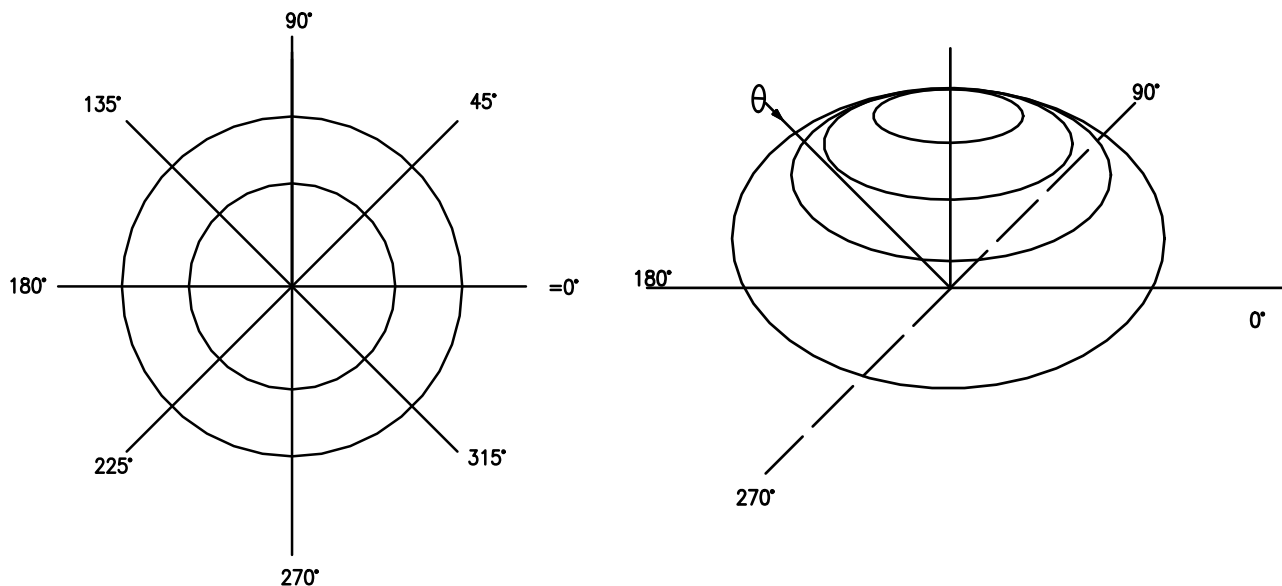
② T_d : The time required which the brightness of segment becomes 90% from 10% when waveform is switched to selected one from selected one. ($f_r=80\text{Hz}$, $\Phi=10^\circ$ $\theta=270^\circ$ at 25°C)

4.3 Definition of Contrast Ratio Cr

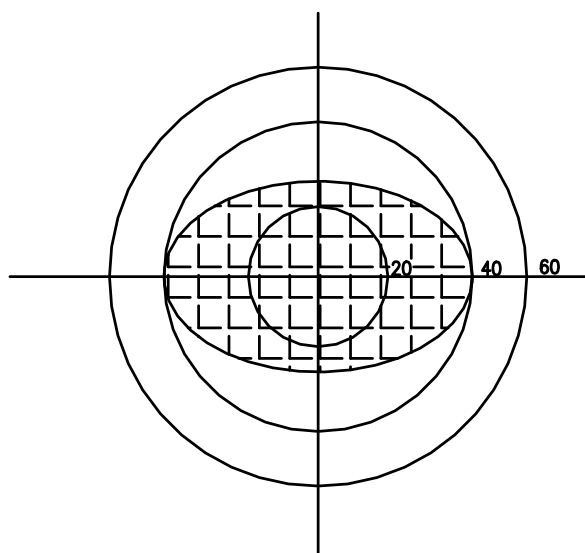
$$Cr=A/B$$

- ① A: Segments brightness in case of non-selected waveform
- ② B: Segments brightness in case of selected waveform

4.4 Definition of Angle and Viewing Range



Angular Graph: Constrast Ratio



Such as:

Viewing Angle Range:

80(Cr>2) Horizontal

70(Cr>2) Vertical

5. Technology Specifications

5.1 Features

The LCD adopts one backlight with High brightness 6-lamps white LED.

Construction: .3.5" a-Si color TFT-LCD ,White LED backlight and FPC .

5.2 General Specifications

No.	Item	Specification
1	LCD size	3.5 inch
2	Resolution	320 (RGB)X480
3	Display mode	Normally black
4	Pixel pitch	51 (W)X153 (H) um
5	Active area	48.96 (W)X73.44 (H) mm
6	Module size	54.38(W)X84.61(H)X3.05(D)mm
7	Pixel arrangement	RGB-stripe
8	Interface	SPI+RGB 18bit

5.3 Interface Pin Connection

Pin No.	Symbol	Function
1	LEDK	LED Cathode
2	LEDA	LED Anode
3	YU	Touch panel coordinate in the up
4	XL	Touch panel coordinate in the left
5	YD	Touch panel coordinate in the down
6	XR	Touch panel coordinate in the right
7	GND	Power Ground
8	VCI(A-VCC)	VCI
9	IOVCC	Supply voltage to the interface pins. (1.8V ~ 3.3V).
10	TE	Frame head pulse for tearing effect.
11	/RES	Reset signal input terminal
12	SDA	Serial input/ouput signal
13	SCL	Clock signal
14	CS	Chip select signal ("L" →Active)
15	ID-VDD	ID-VDD
16	IDO	IDO
17	ID1	ID1
18	ID-GND	ID-GND
19	GND	Power Ground
20	R5	Red data
21	R4	Red data
22	R3	Red data
23	R2	Red data
24	R1	Red data
25	R0	Red data
26	GND	Power Ground
27	G5	Green data
28	G4	Green data
29	G3	Green data
30	G2	Green data
31	G1	Green data
32	G0	Green data
33	GND	Power Ground
34	B5	Blue data
35	B4	Blue data
36	B3	Blue data
37	B2	Blue data
38	B1	Blue data
39	B0	Blue data
40	DE	Data enable signal for RGB interface operation.
41	PCLK	Dot Clock Signal for RGB Interface Operation
42	HS	Horizontal sync. Signal in RGB I/F.
43	VS	Vertical sync. Signal in RGB I/F.
44-45	GND	Power Ground

5.4 Absolute Max. Rating

Item	Symbol	Values		Unit
		Min.	Max.	
Power Voltage	IOVCC	-0.3	3.6	V
	VCC	-0.3	3.6	V
	VIN	-0.3	IOVCC+0.3	V
Backlight forward current	I _{LED}	0	25	mA (For each LED)
Operation Temperature	T _{OP}	-20	70	°C
Storage Temperature	T _{ST}	-30	80	°C

5.5 DC Characteristics

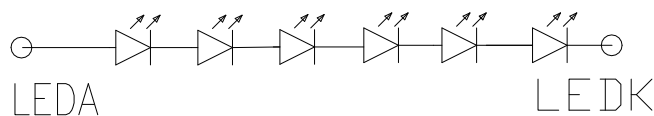
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Logic Supply Voltage	IOVCC	1.65	1.8/2.8	3.3	V	-
Analog Supply Voltage	VCC	2.6	2.8	3.3	V	-
VGL Voltage	VGL	-11.3	-10.3	-8.3	V	-
VGH Voltage	VGH	11.8	12.8	13.8	V	-
Input High Voltage	V _{IH}	0.7VCC	-	VCC	V	Digital input pins
Input Low Voltage	V _{IL}	GND	-	0.3VCC	mV	Digital input pins
Output High Voltage	V _{OH}	0.8VCC	-	VCC	mV	Digital input pins
Output Low Voltage	V _{OL}	GND	-	0.2VCC	mV	Digital input pins
(Panel+LSI) Power Consumption	Black Mode	-	-	60	mA	VCC=2.8V
	Sleeping Mode	-	-	100	uA	VCC=2.8V

5.6 LED Back Light Specification

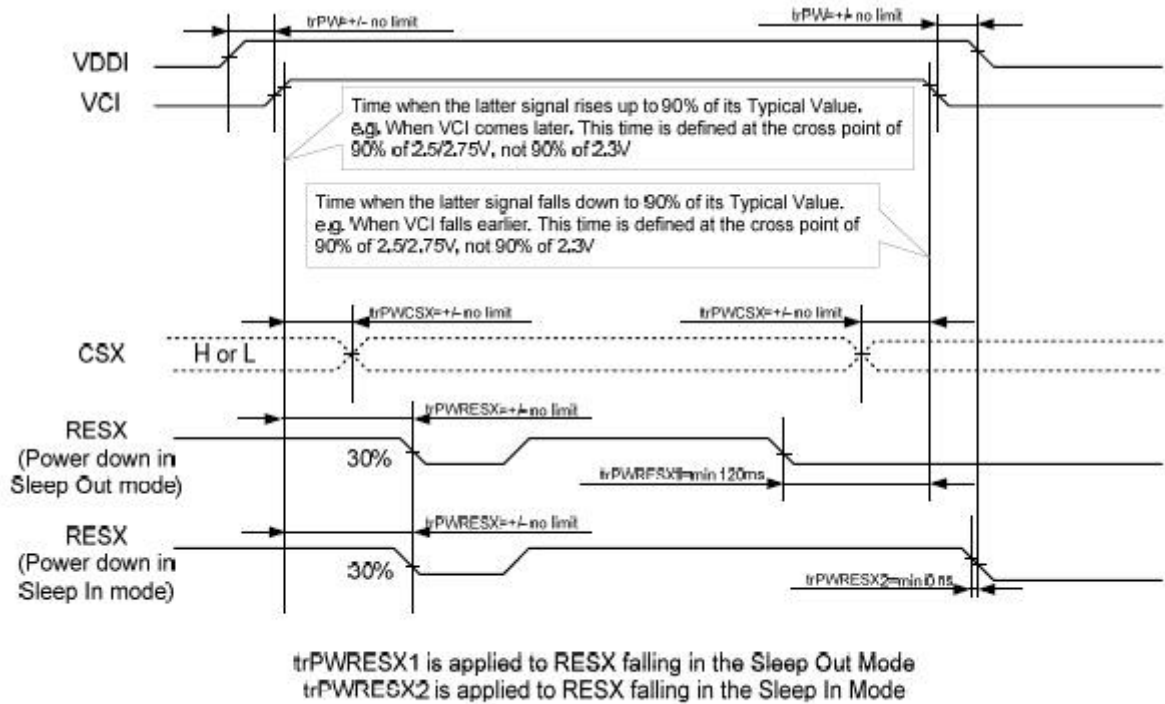
Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V _f	I _f =20mA	-	19.2	-	V
Uniformity (with L/G)	Δ B _p	I _f =20mA	75	80	-	%
Luminance for LCM	/	I _f =20mA	-	TBD	-	cd/m ²
Backlight Power Consumption	WBL	I _f =20mA	-	384	-	mW
Backlight Color	White					

Note:LED Circuit

Backlight LED Circuit



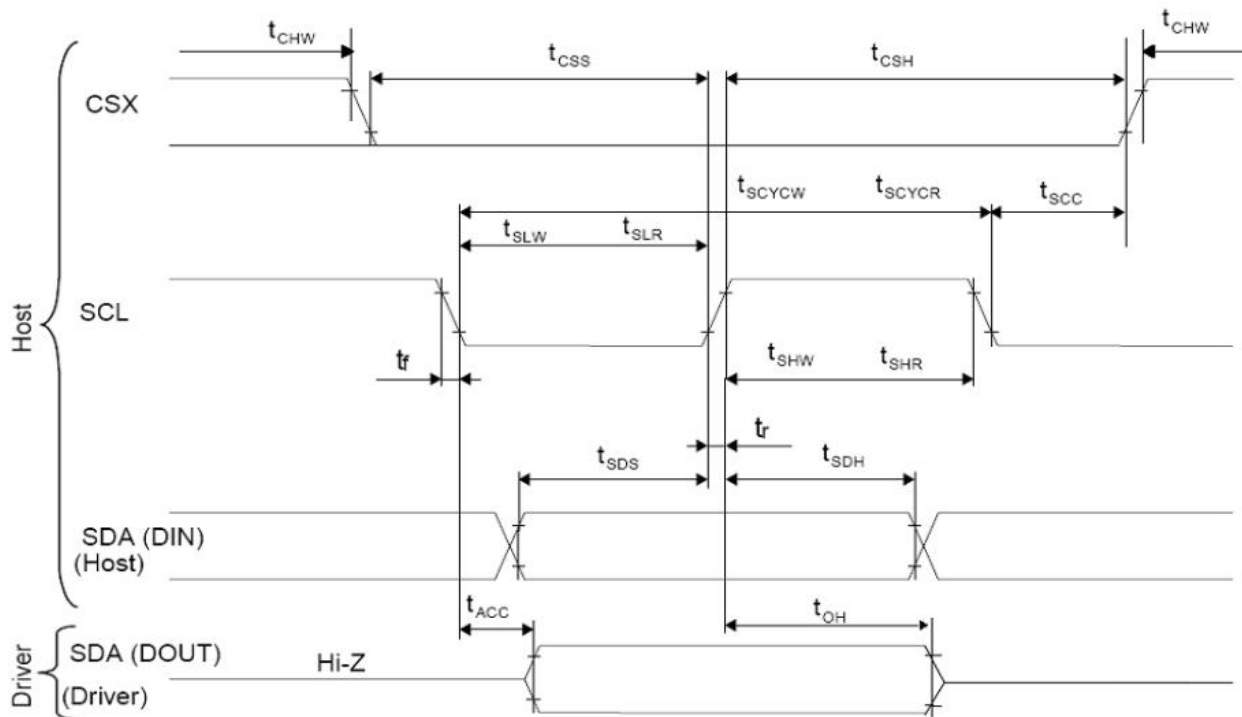
5.7 Power Sequence



Note 1: Unless otherwise specified, timings herein show cross point at 50% of signal power level.

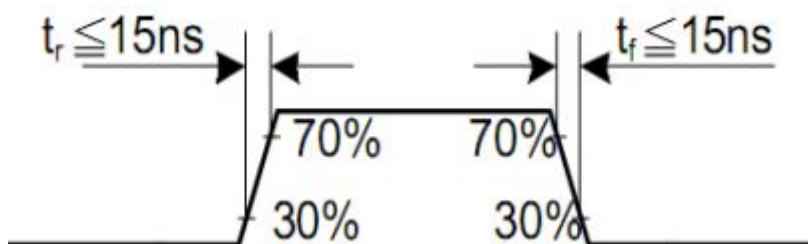
5.8 Timing Conditions AC Characteristics

5.8.1 Serial Interface Timing Characteristics (3-line SPI system)

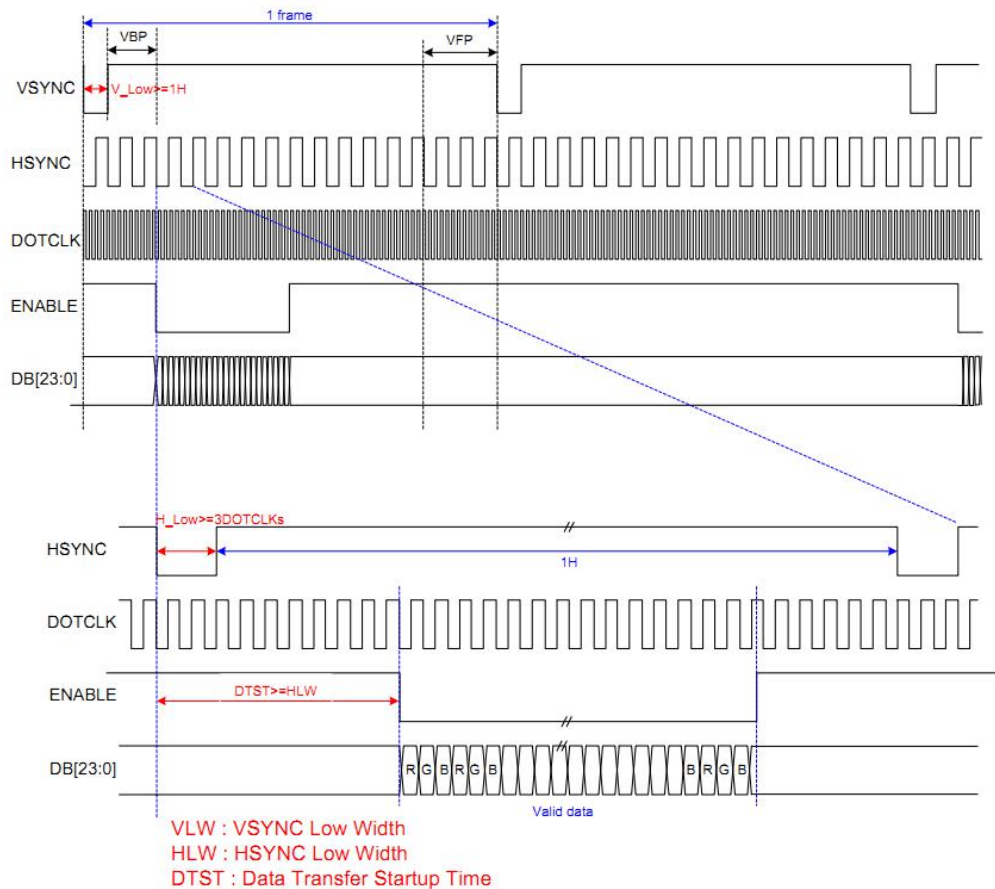


Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA / SDI (Input)	tsds	Data setup time (Write)	30	-	ns	
	tsdh	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	-	ns	
	toh	Output disable time (Read)	10	50	ns	
CSX	tsc	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcs		65	-	ns	

Note: $T_a = 25\text{ }^{\circ}\text{C}$, $V_{DDI}=1.65\text{V to }3.3\text{V}$, $V_{CI}=2.5\text{V to }3.3\text{V}$, $AGND=VSS=0\text{V}$



5.8.1 Display parallel RGB Interface Timing characteristics

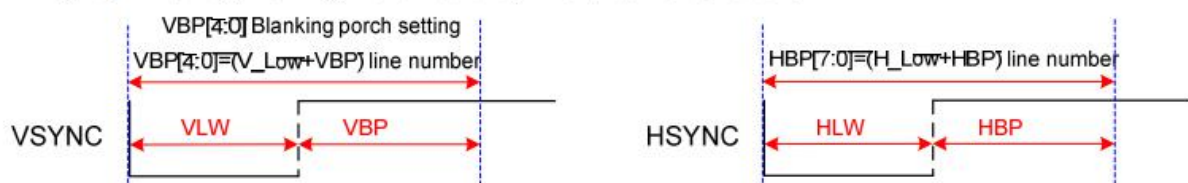


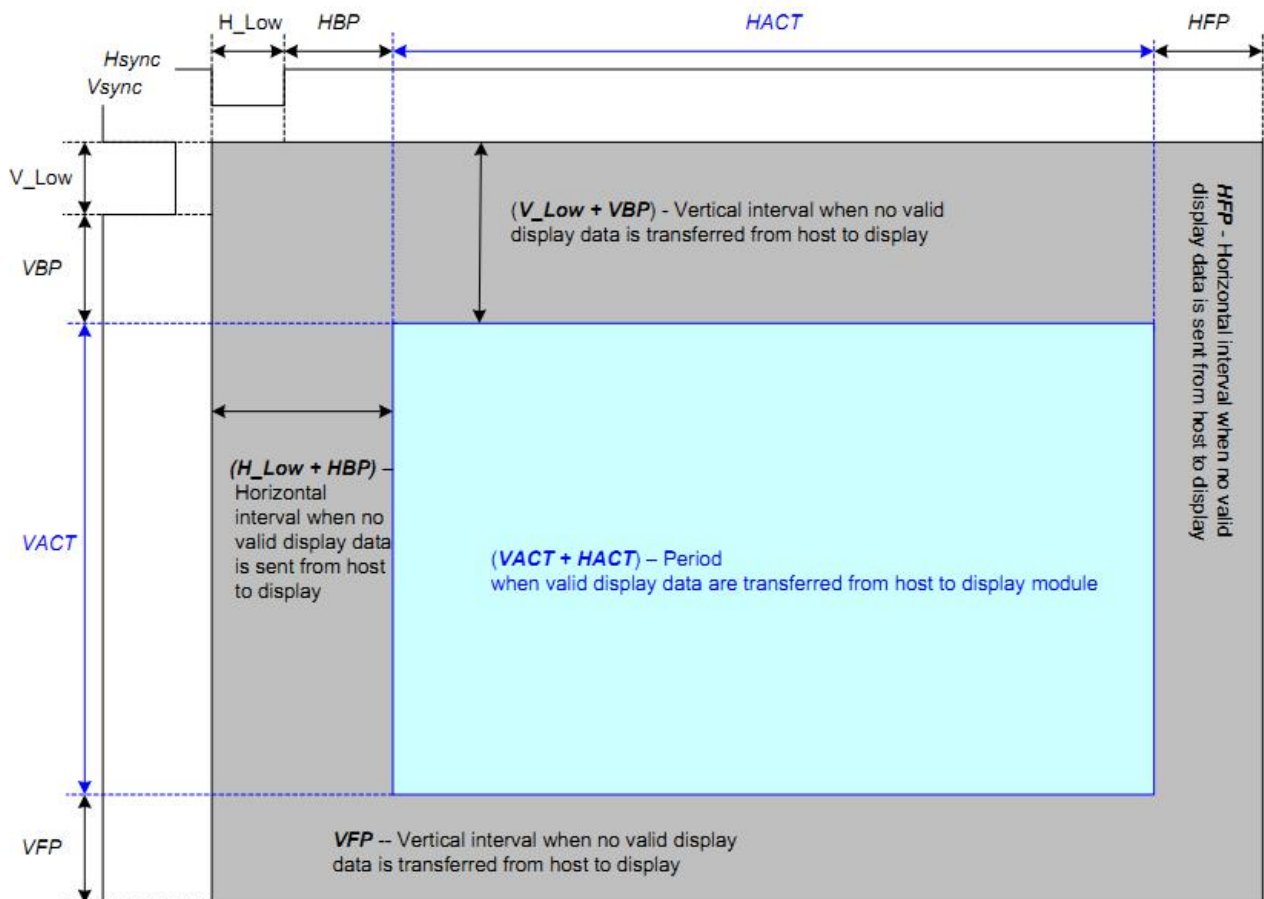
Note: VSPL = 0, HSPL = 0, DPL = 0 and EPL = 0 of Interface Mode Control B0h command.

Parameters	Symbols	Min.	Typ.	Max.	Units
Horizontal Synchronization	H_Low	3	-	H_Low+HBP < 192	DOTCLK
Horizontal Back Porch	HBP	3	-		DOTCLK
Horizontal Front Porch	HFP	3	-	255	DOTCLK
Horizontal Address	HACT	-	320	-	DOTCLK
Horizontal Frequency		-	-	33	KHz
Vertical Synchronization	V_Low	1	-	V_Low+VBP+VFP < 32	Line
Vertical Back Porch	VBP	2	-		Line
Vertical Front Porch	VFP	2	-		Line
Vertical Address	VACT	-	480	-	Line
Vertical Frequency		60	-	70	Hz
DOTCLK cycle		100	-	50	ns
DOTCLK Frequency		10	-	20	MHz

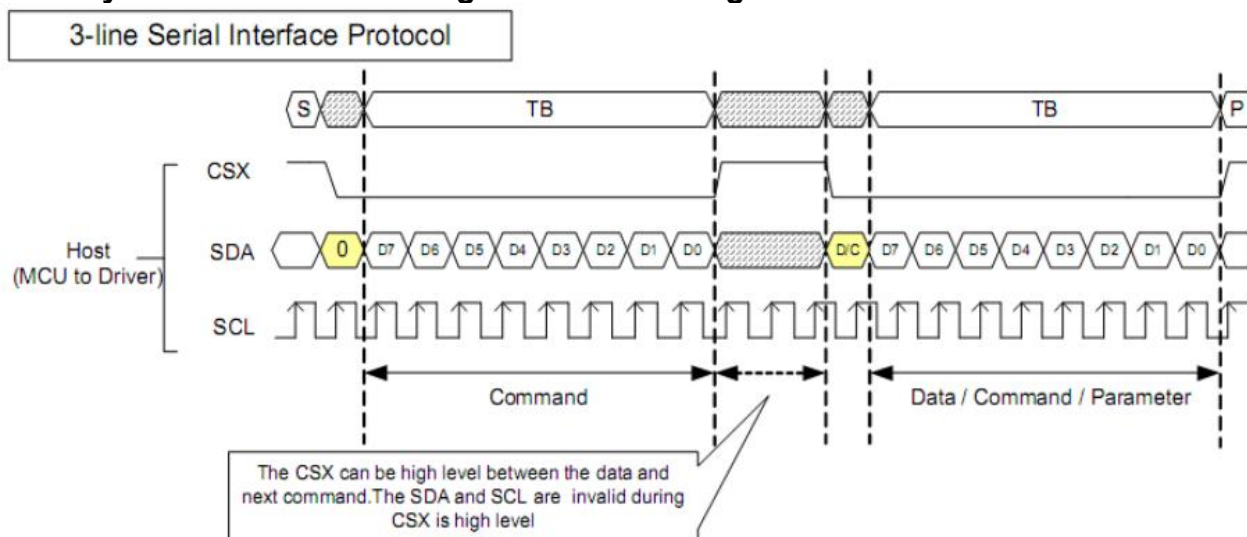
Example: DOTCLK = 20Mhz, TE=70Hz, V_Low+VBP=2, VFP=2, H_Low+HBP=100, HFP=170.

Note: VBP[4:0]/HBP[7:0] (Blanking Porch Control, RB5h) define as follows:



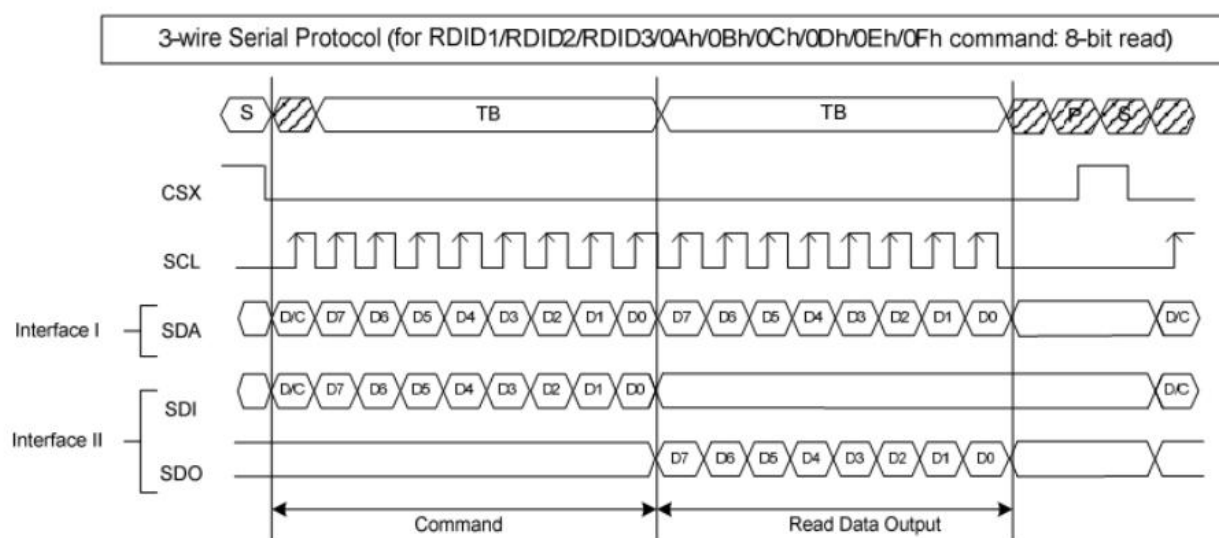


5.8.3 System Bus Interface Register Write Timing



5.8.4 System Bus Interface Register Read Timing

3-wire Serial Interface Protocol



5.9 Optical specifications

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle	Horizontal	Θ3	CR>10	80	85		°	Note 1
		Θ9		80	85		°	
	Vertical	Θ12		80	85		°	
		Θ6		80	85		°	
Contrast Ratio		CR	Θ= 0°	800	1000			Note 2
Transmittance		T(%)	Θ= 0°	3.75	4.2			Note 3
NTSC		%	Θ= 0°	65	70			Note 4 *Color filter Glass With OC
Reproduction Of color	Red	Rx	Θ= 0°	0.641	0.656	0.671		
		Ry		0.311	0.326	0.341		
	Green	Gx		0.245	0.26	0.275		
		Gy		0.564	0.579	0.594		
	Blue	Bx		0.125	0.14	0.155		
		By		0.064	0.079	0.094		
White		Wx	Θ= 0°	0.284	0.299	0.314		
		Wy		0.307	0.322	0.337		
Response Time		Tr+Tf	Θ= 0°		30	35	ms	Note 5
Gamma		-	Θ= 0°	2.0	2.2	2.4	-	-

Note:

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing 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 FIG.1).
2. Contrast measurements shall be made at viewing angle of $\Theta = 0^\circ$ 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 FIG. 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. Transmittance is the value with TLCM.

4. The color chromaticity coordinates specified in Table1 shall be calculated from

The spectral data measured with all pixels first in red, green, blue and white.

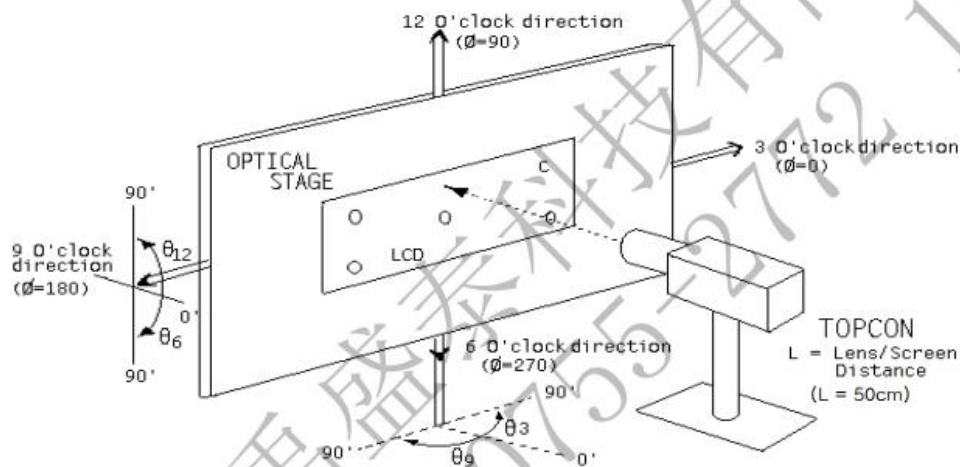
Measurements shall be made at the center of the C/F.

Measurement condition is C - light source & Halogen Lamp

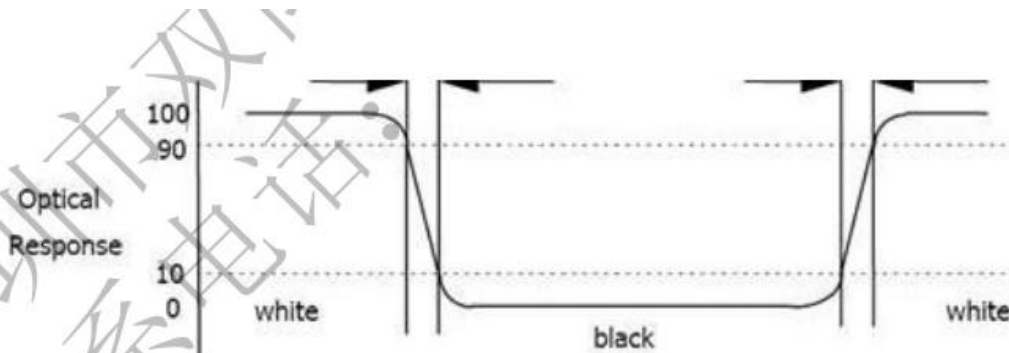
5. The electro-optical response time measurements shall be made as FIG.2 by switching the "data" input signal ON and OFF.

The time taken for the response to reach 90% is Tf.

Fig



Fig



6. Reliability Test Conditions And Methods

Item	Test Conditions		Remark
High Temperature Storage	Ta = 80℃	72hrs	
Low Temperature Storage	Ta = -30℃	72hrs	
High Temperature Operation	Ts = 70℃	72hrs	
Low Temperature Operation	Ta = -20℃	72hrs	
Operate at High Temperature and Humidity	60℃, 90%RH max.	72hrs	Operation
Thermal Shock	-20℃~ +70℃ 10 cycles 1Hrs/cycle		Non-operation
Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5mm X,Y,Z direction for total 3hours (Packing Condition)		
Drooping Test	Drop to the ground from 1M height one time every side of carton. (Packing Condition)		
Electrostatic Discharge	Contact=±4KV, class B Air=±8KV, class B		

7. Handling Precautions

7.1 Mounting method

The LCD panel of FEXDA LCD module consists of two thin glass plates with polarizers which easily be damaged. And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

7.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent [recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

7.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend that you:

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

7.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity

7.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.

- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.
Usage under the maximum operating temperature, 50%Rh or less is required.

7.6 storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

7.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

8. Precaution for use

8.1

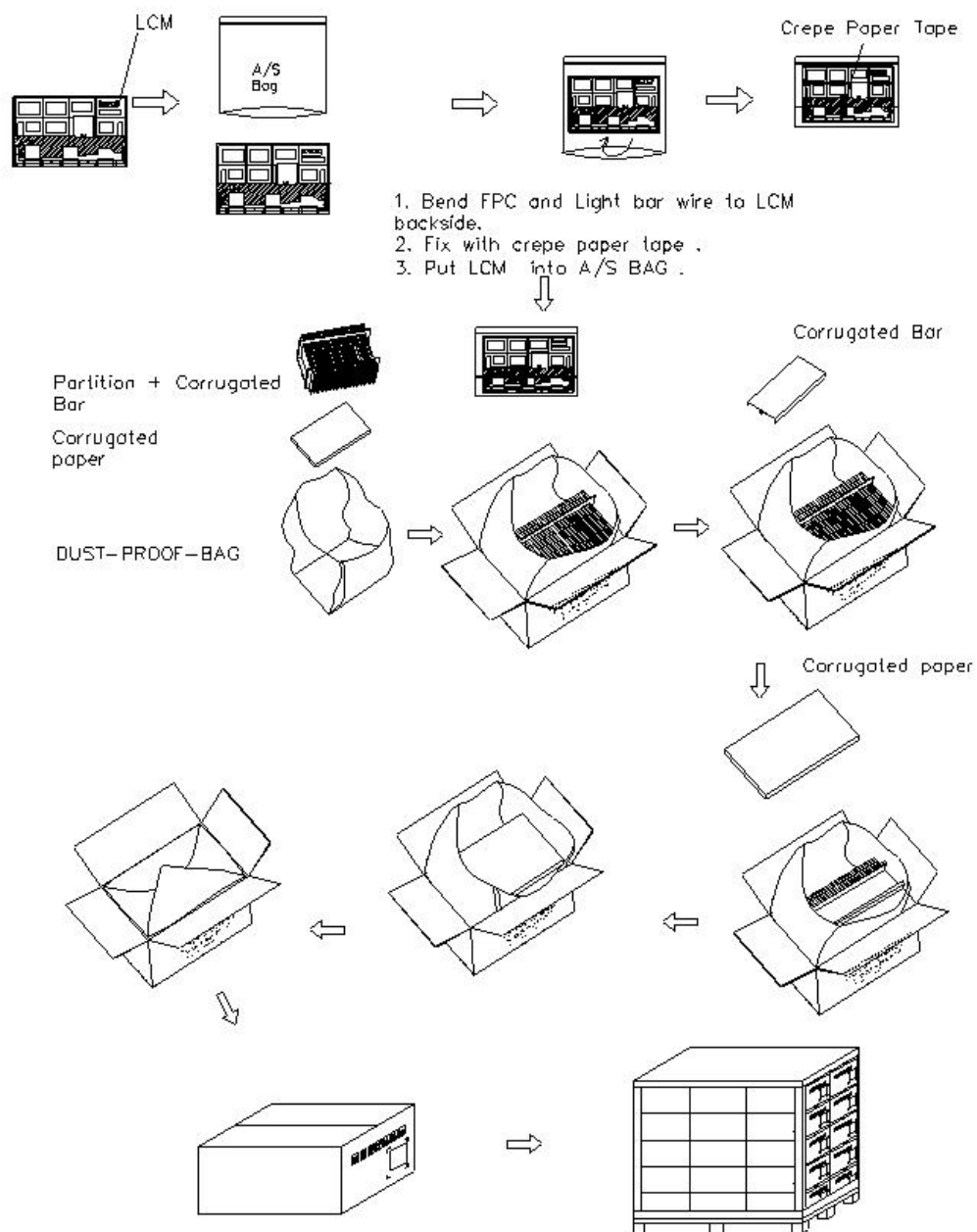
A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

8.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to FEXDA , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

9. Package Drawing



10. Outline Dimension

