



深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAYTECH. CO, LTD.

TFT-LCD FOG Specification

Module NO.: FOG-TST034WVBJ-01

Version: V1.1

APPROVAL FOR SPECIFICATION

APPROVAL FOR SAMPLE

For Customer' s Acceptance:	
Approved by	Comment

Team Source Display:		
Presented by	Reviewed by	Approved by
Hcr	Aron	Aron

Version No.	Date	Content	Remark
V1.0	2020-11-7	Initial Release	
V1.1	2021-1-22	Added power on/off sequence	Page 10

CONTENTS

1 GENERAL CHARACTERISTICS..... - 3 -

2 PRODUCT DRAWINGS..... - 4 -

3 INTERFACE DESCRIPTION..... - 5 -

4 LCM INTERFACE TIMING..... - 6 -

 4.1 RESET TIMING..... - 6 -

 4.2 SPI TIMING..... - 6 -

 4.3 RGB TIMING..... - 7 -

 4.3.1 SYNC MODE..... - 7 -

 4.3.2 DE MODE..... - 9 -

5 POWER ON/OFF SEQUENCE..... - 10 -

 5.1.1 POWER ON SEQUENCE..... - 10 -

 5.1.2 POWER OFF SEQUENCE..... - 10 -

6 ABSOLUTE MAXIMUM RATINGS..... - 11 -

7 ELECTRICAL CHARACTERISTICS..... - 11 -

8 LCD OPTICAL SPECIFICATIONS..... - 11 -

9 RELIABILITY TEST..... - 13 -

10 HANDDLING & CAUTIONS..... - 14 -

 10.1 MOUNTING METHOD..... - 14 -

 10.2 CAUTION OF LCM HANDLING AND CLEANING..... - 14 -

 10.3 CAUTION AGAINST STATIC CHARGE..... - 15 -

 10.4 CAUTION FOR OPERATION..... - 15 -

 10.5 PACKAGING..... - 15 -

 10.6 STORAGE..... - 15 -

 10.7 SAFETY..... - 16 -

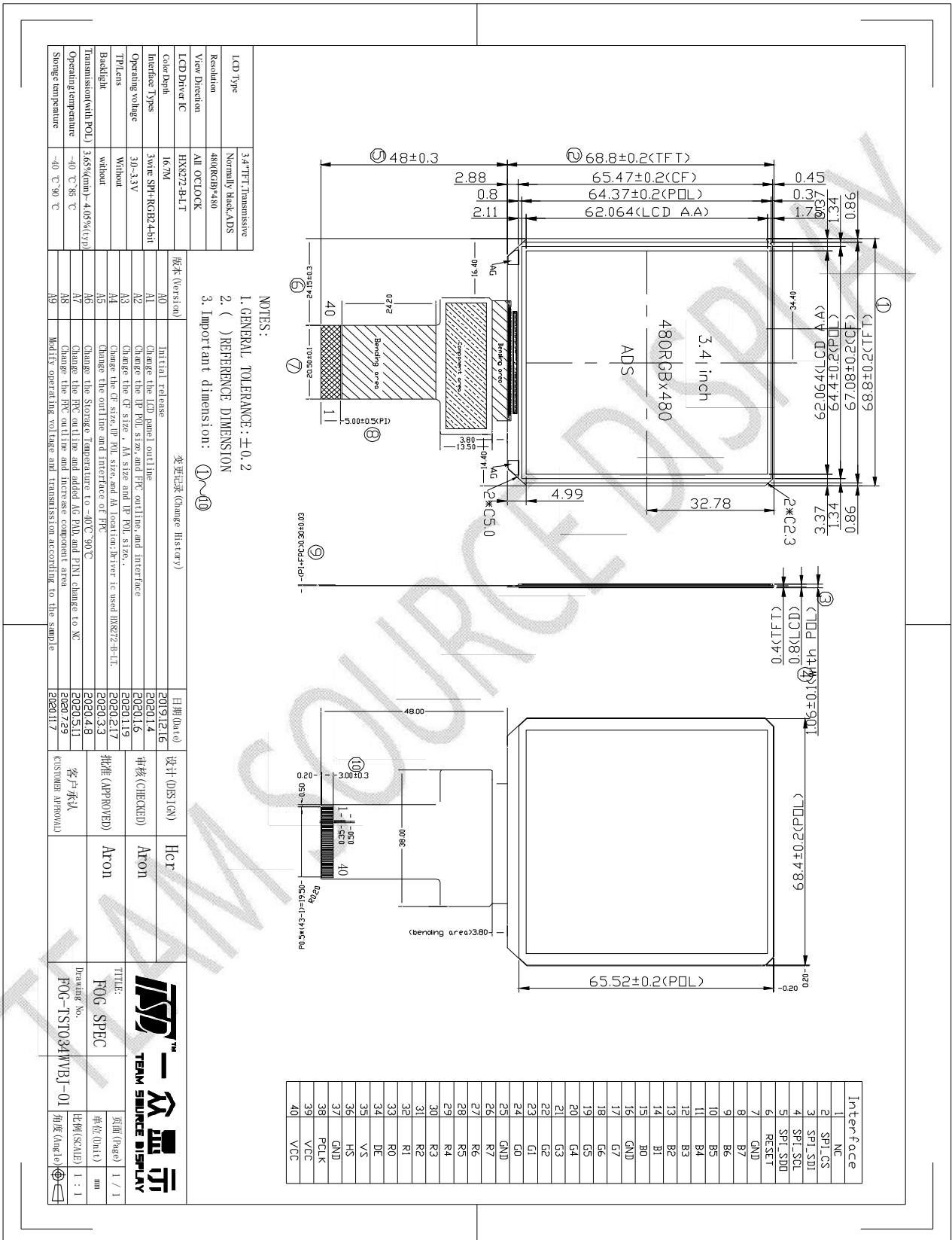
1 General Characteristics

ITEM	Specification	Unit
LCD Type	a-si TFT, Transmissive, Normally Black	-
LCD Size	3.46	inch
Resolution (H x V)	480x (RGB) × 480	pixel
LCD Outline	68.8(H) x 68.8(V) x 0.8(D)	mm
Active Area (H × V)	62.064 (H) x 62.064 (V)	mm
Pixel Pitch (H × V)	0.1293(H) x 0.1293(V)	mm
Viewing Direction	All o'clock	-
Viewing Angle	85/85/85/85 (Typ)	deg.
Color Depth	16.7M	-
Pixel Arrangement	RGB Vertical stripe	-
Polarizer	UP: AG; Down: Clear	-
Driver IC	HX8272-B-LT	-
Interface Type	RGB24-bit+SPI	-
Input Voltage	3.3(Typ)	V
Weight	TBD	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

2 Product drawings

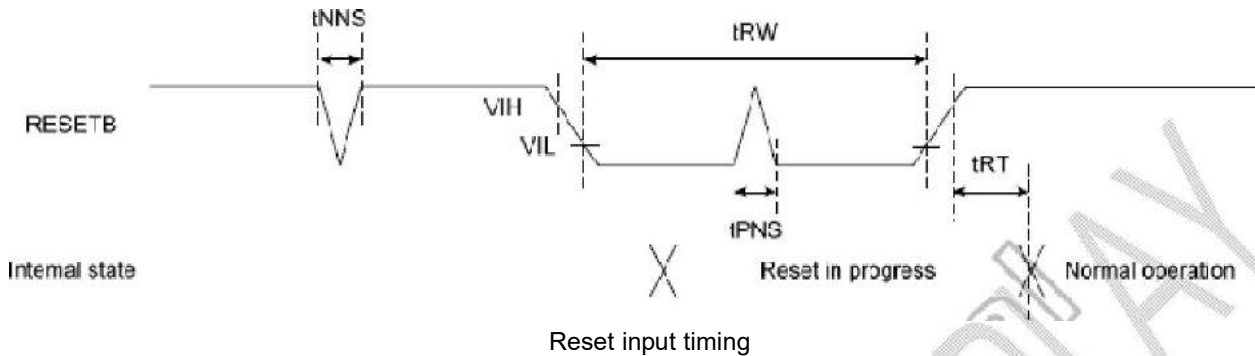


3 Interface description

PIN NO.	Symbol	Description
1	NC	No connect
2	SPI_CS	Serial interface chip select signal for SPI interface.
3	SPI_SDI	Serial interface data input for SPi interface
4	SPI_SCL	Serial interface clock input for SPI interface
5	SPI_SDO	Serial interface data output for SPi interface
6	RESET	Reset input signal,active low.the chip is in reset state when RESET=0
7	GND	System Ground. (0V)
8~15	B7~B0	Blue Data input
16	GND	System Ground. (0V)
17~24	G7~G0	Green Data input
25	GND	System Ground. (0V)
26~33	R7~R0	Red Data input
34	DE	Data enable signal for RGB interface operation.
35	VS	Vertical sync input in digital parallel RGB.
36	HS	Horizontal sync input in digital parallel RGB.
37	GND	System Ground. (0V)
38	PCLK	Dot clock signal for RGB interface operation.
39	VCC	Power supply: 3.3V
40	VCC	

4 LCM Interface Timing

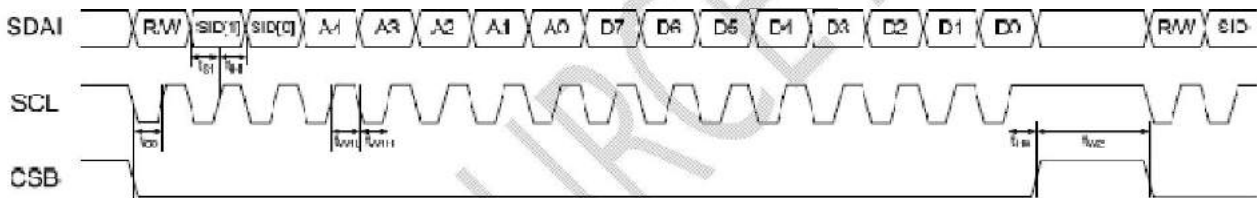
4.1 Reset Timing



VCCI=3.0 to 3.6V, GND=0V, Ta=-40 to 85 ℃

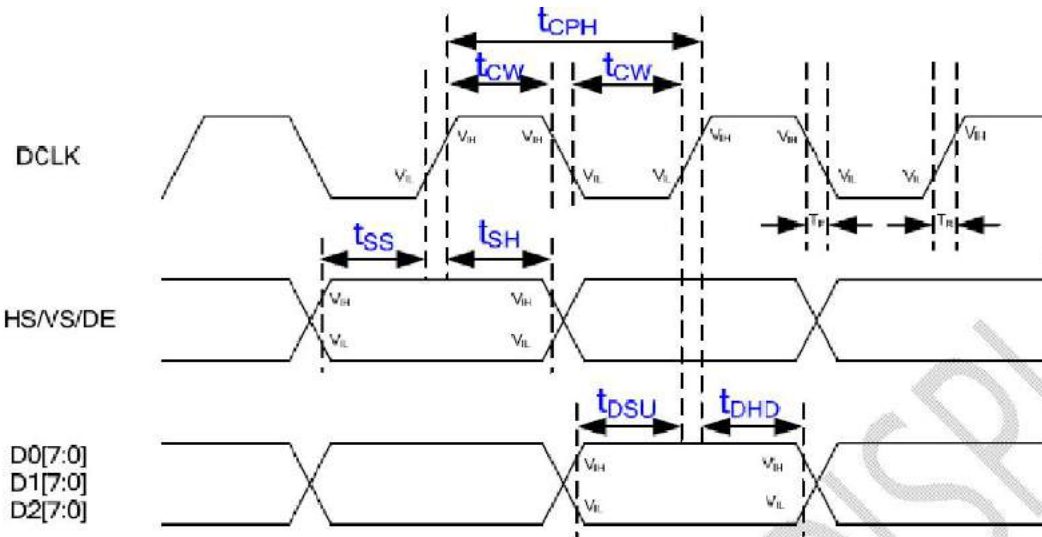
Signal	Symbol	Parameter	Min	Max	Unit
RESET	tRW	Reset low pulse width	10	-	us
	tRT	Reset complete time	-	5	us

4.2 SPI timing



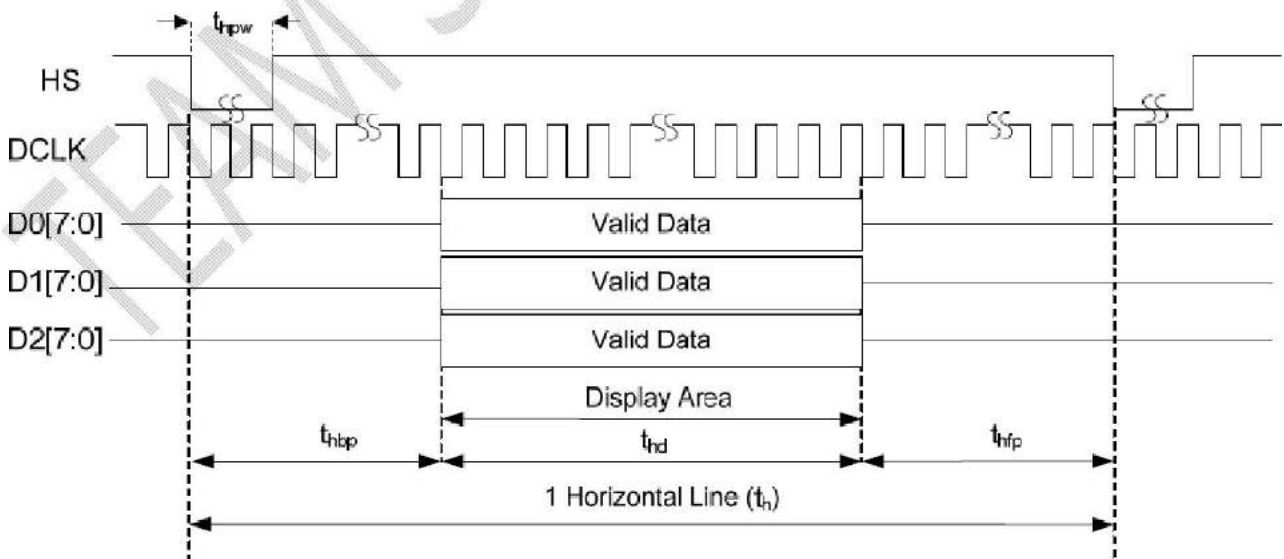
Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
SDAI Setup Time	t_{SD}	CSB to SCL	60	-	-	ns
	t_{SH}	SDAI to SCL	60	-	-	ns
SDAI Hold Time	t_{H0}	CSB to SCL	60	-	-	ns
	t_{H1}	SDAI to SCL	60	-	-	ns
Pulse Width	t_{W1L}	SCL pulse width	100	-	-	ns
	t_{W1H}	SCL pulse width	100	-	-	ns
	t_{W2}	CSB pulse width	1	-	-	μs
Clock duty	-	-	40	50	60	%

4.3 RGB timing

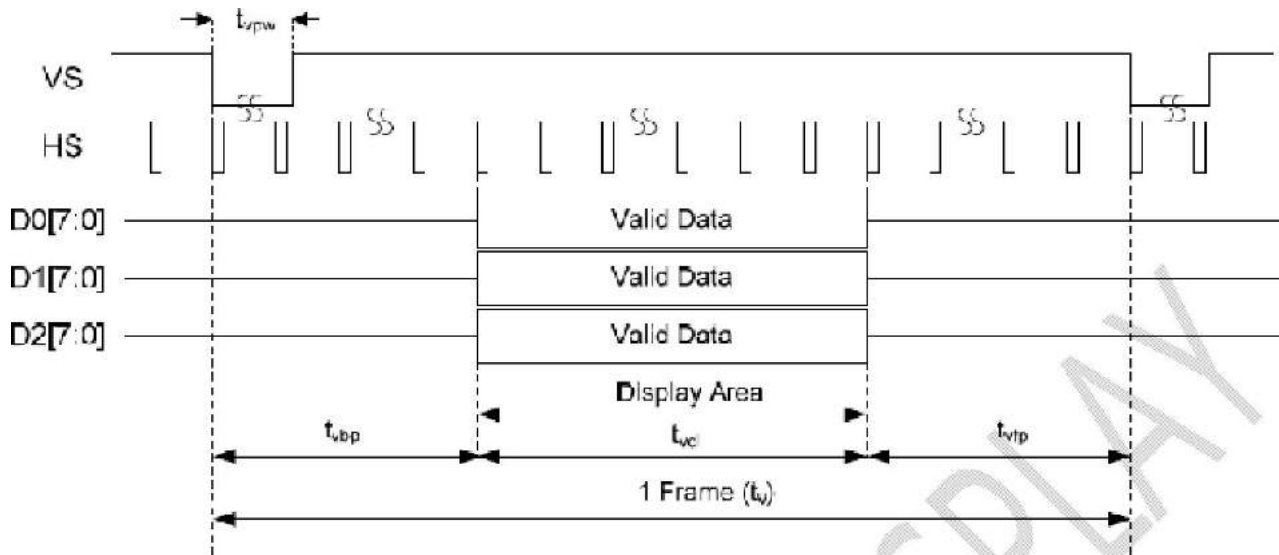


Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK period	T_{CPH}	16.67	-	-	ns
DCLK clock high/low width	T_{CW}	6	-	-	ns
Data setup time	T_{DSU}	5	-	-	ns
Data hold time	T_{DHD}	5	-	-	ns
VS/HS/DE setup time	T_{SS}	5	-	-	ns
VS/HS/DE hold time	T_{SH}	5	-	-	ns
Input signal rising time	T_R	-	-	10	ns
Input signal falling time	T_F	-	-	10	ns

4.3.1 Sync mode



Horizontal input timing at Sync mode

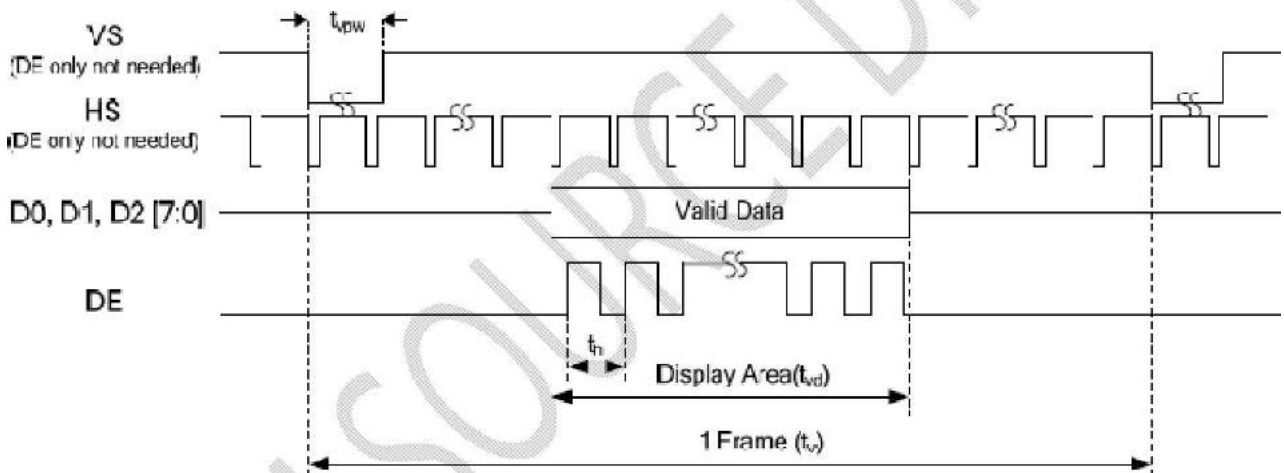
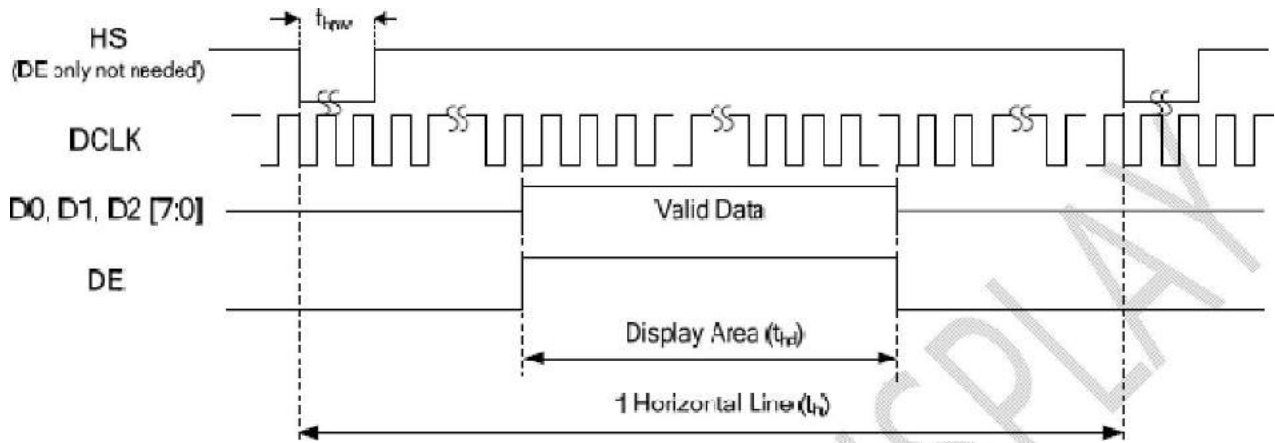


Vertical input timing at Sync mode

Parameter	Symbol	Panel Resolution			Unit
		480x RGBx480			
		Min.	Typ.	Max.	
PCLK frequency	Fpclk	-	17.22	-	MHz
Horizontal valid data	HD	480			PCLK
Hsync pulse Width	HPW	6	12	254	PCLK
Hsync back porch	HBP	5	16	255	PCLK
Hsync front porch	HFP	50	56	-	PCLK
1 horizontal line	H	535	552	800	PCLK
Vertical valid data	VD	480			H
Vsync pulse width	VPW	1	3	254	H
Vsync back porch	VBP	2	24	255	H
Vsync front porch	VFP	6	16	-	H
1 vertical field	V	488	520	750	H
Frame rate	FR	-	60	-	Hz

4.3.2 DE mode

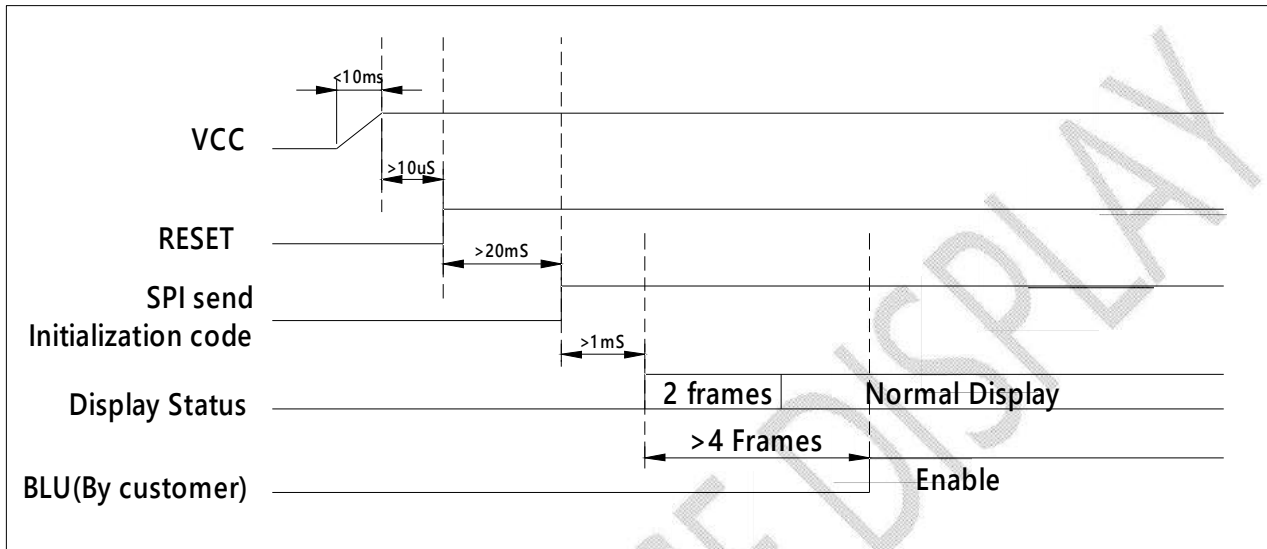
It just needs DE signal only, when DE only mode enable.



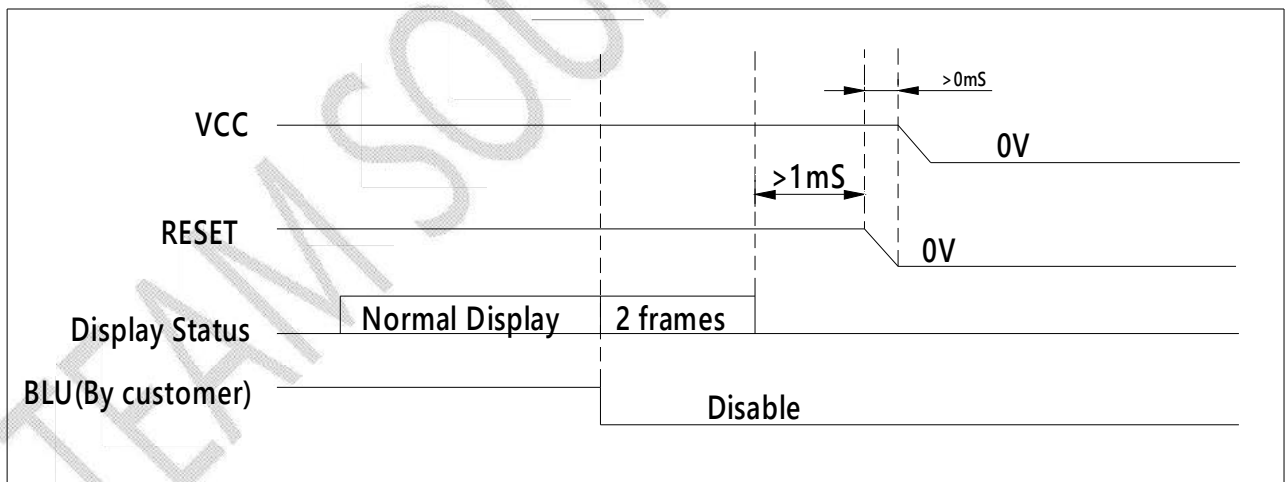
Parameter	Symbol	Panel Resolution			Unit
		480x RGBx480			
		Min.	Typ.	Max.	
PCLK frequency	Fpclk	-	17.22	-	MHz
Horizontal valid data	HD	480			PCLK
1 horizontal line	H	535	552	800	PCLK
Vertical valid data	VD	480			H
1 vertical field	V	488	520	750	H
Frame rate	FR	-	60	-	Hz

5 Power on/off sequence

5.1.1 Power on sequence



5.1.2 Power off sequence



6 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage (Analog)	VCC~GND	-0.3	4.0	V
Logic signal voltage(I/O)	IOVCC~GND	-0.3	4.0	V
Operating Temperature	TOP	-40	85	°C
Storage Temperature	TST	-40	90	°C
Humidity	RH	-	90%(Max 60°C)	RH

7 Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Main operating voltage	VCC	3.0	3.3	3.6	V
Input Current	Ivcc	-	38	-	mA
Input Voltage ' H ' level	VIH	0.7VCC	-	VCC	V
Input Voltage ' L ' level	VIL	GND-0.3	-	0.3VCC	
Output Voltage ' H ' level	VOH	VCC-0.4	-	VCC	
Output Voltage ' L ' level	VOL	GND	-	GND+0.4	

8 LCD Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min	Typ	Max		
Response time (By Quick)	Tr+Tf	$\theta = 0^\circ$	-	-	30	ms	Note 5
Contrast ratio	CR	$\theta = 0^\circ$	900	1100	-		Note 2
Viewing angle	$\theta 12$	$CR \geq 10$	80	85	-	Deg.	Note 2,6,7
	$\theta 6$	$CR \geq 10$	80	85	-		
	$\theta 3$	$CR \geq 10$	80	85	-		
	$\theta 9$	$CR \geq 10$	80	85	-		
Color chromaticity (CF only with ITO, light source is C light, CIE 1931)	Wx	$\theta = 0^\circ$	-0.02	0.299	+0.02		Note 3
	Wy			0.323			
	Rx			0.657			
	Ry			0.320			
	Gx			0.262			
	Gy			0.579			
	Bx			0.139			
	By			0.085			
NTSC		$\theta = 0^\circ$	65	70	-	%	Note 3
Transmittance		$\theta = 0^\circ$	3.65	4.05	-	%	Note 4

Note 1: Ambient temperature = 25°C.

Note 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.

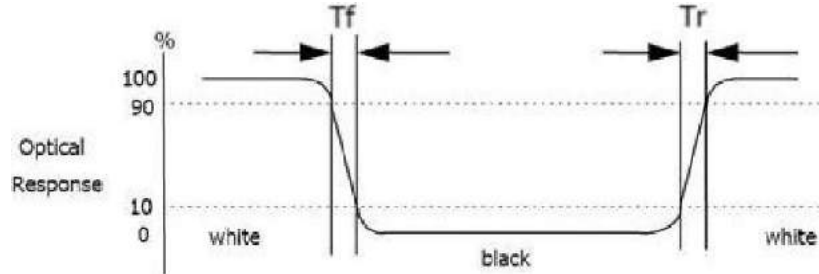
Note 3: The color chromaticity coordinates specified in Table1 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the C/F.

Measurement condition is C - light source & Halogen Lamp.

Note 4: The shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer.

Note 5: Definition of response time:

The output signals of TRD-100 are measured when the input signals are changed to “White” (falling time) and from “White” to “Black” (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.

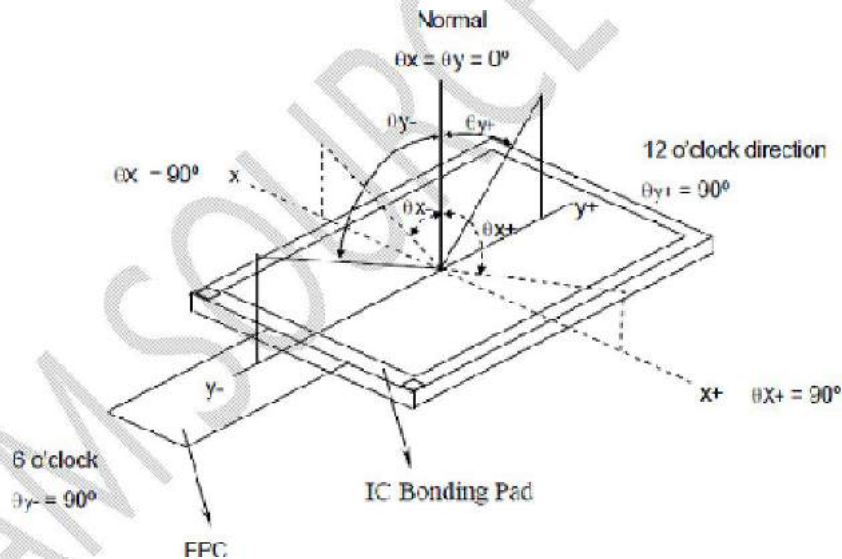


Note 6: Definition of contrast ratio:

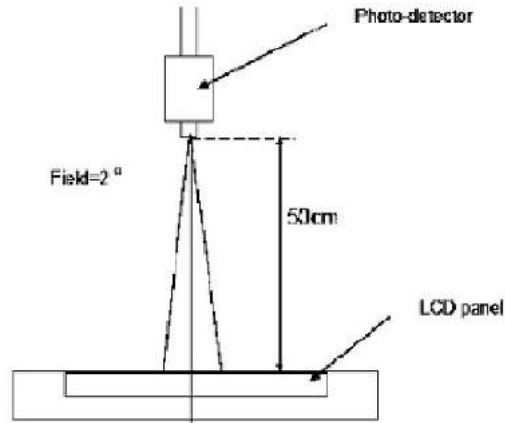
Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

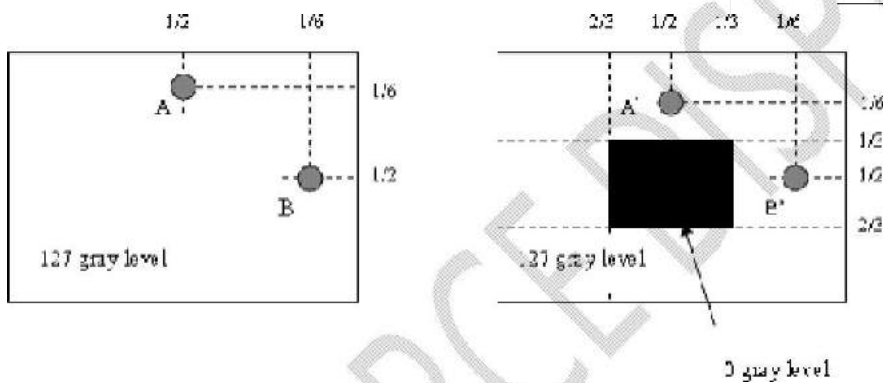
Note 7: Definition of viewing angle



Note 8: Optical characteristic measurement setup.



Note 9:



1 LA-LA' 1 / LA x 100%= 2% max., LA and LA' are brightness at location A and A'.

1 LB-LB' 1 / LB x 100%= 2% max., LB and LB' are brightness at location B and B'.

9 RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	90±2°C/240hours	The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours. These defects can't be accepted: 1.Air bubble 2.Seal leak 3.Non-display 4.Missing segments 5.Glass crack
2	Low Temperature Storage	-40±2°C/240 hours	
3	High Temperature Operating	80±2°C/240hours	
4	Low Temperature Operating	-40±2°C/240hours	
5	Temperature & Humidity Test storage	85°C , 85%RH/240 hours	
6	Image Sticking	Burn in 5*5 chess board 1h@25°C Inspection @50% grey, perpendicular view, the muramust disappear after 5s.	

7	Image Retention	Measured 30 mm white square is displayed for 8 hours at 25 °C (or room temp.) with the remainder of the display area driven black. And then white display full screen 1 minute. Luminance of 30mm square area(L1) and out area(L2) shall be measure. Image retention is $Max.(L1,L2)/Min.(L1,L2)=1.05(Max.)$	
8	ESD Test	LCD only : the contact pressure is 4KV, and the air gap is 8KV	

10 HANDDLING & CAUTIONS

10.1 Mounting Method

- The FOG of the LCM consists of two thin glasses with polarizer which easily get damaged. So extreme care should be taken when handling the LCM.
- Excessive stress or pressure on the glass of the LCM should be avoided. Care must be taken to insure that no torsional or compressive forces are applied to the LCM unit when it is mounted.
- If the customer's set presses the main parts of the LCM, the LCM may show the abnormal display. But this phenomenon does not mean the malfunction of the LCM and should be pressed by the way of mutual agreement.
- To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Mount a LCM with the specified mounting parts.

10.2 Caution of LCM Handling and Cleaning

- Since the LCM 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 maybe broken.
- The polarizer on the surface of panel are made from organic substances. Be very careful for chemicals not to touch the polarizer or it leads the polarizer to be deteriorated.
- If the use of a chemical is unavoidable, use soft cloth with solvent recommended below to clean the LCM's surface with wipe lightly.
-IPA (Isopropyl Alcohol), Ethyl Alcohol, Tri-chloro, tri-florothane.
- Do not wipe the LCM's surface with dry or hard materials that will damage the polarizer and others. Do not use the following solvent—Water, acetone, Aromatics.
- It is recommended that the LCM be handled with soft gloves during assembly, etc. The polarizer on the LCM's surface are vulnerable to scratch and thus to be damaged by shape particles.
- Do not drop water or any chemicals onto the LCM's surface.
- A protective film is supplied on the LCM and should be left in place until the LCM is required for operation.
- The ITO pad area needs special careful caution because it could be easily corroded. Do not

contact the ITO pad area with HCFC, Soldering flux, Chlorine, Sulfur, saliva or fingerprint. To prevent from the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.

- Please clean the LCD without ultrasonic to avoid line open.

10.3 Caution Against Static Charge

- The LCM 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.

- 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.

- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

- In handling the LCM, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

10.4 Caution For Operation

- It is indispensable to drive the LCM within the specified voltage limit since the high voltage than the limit causes LCM's lifeshorter. An electro-chemical reaction due to DC causes undesirable deterioration of the LCM so that the use of DC drive should avoid.

- Do not connect or disconnect the LCM to or from the system when power is on.

- Never use the LCM under abnormal conditions of high temperature and high humidity.

- When expose to drastic fluctuation of temperature (hot to cold or cold to hot), the LCM may be affected; specifically, drastic temperature fluctuation from cold to hot, produces dew on the LCM's surface which may affect the operation of the polarizer on the LCM.

- Response time will be extremely delay at lower temperature than the operating temperature range and on the other hand LCM may turn black at temperature above its operational range. However those phenomenon do not mean malfunction or out of order with the LCM. The LCM will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.

- Do not display the fixed pattern for a long time because it may develop image sticking due to the LCM structure. If the screen is displayed with fixed pattern, use a screen saver.

- Do not disassemble and/or re-assemble LCM module

10.5 Packaging

- Modules use LCM element, 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 for long periods.

10.6 Storage

- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Relative humidity of the environment should therefore be kept below 60%RH.

- Original protective film should be used on LCM's surface (polarizer). Adhesive type protective film

should be avoided, because it may change color and/or properties of the polarizer.

- Do not store the LCM near organic solvents or corrosive gasses.
- Keep the LCM safe from vibration, shock and pressure.
- Black or white air-bubbles may be produced if the LCM is stored for long time in the lower temperature or mechanical shocks are applied onto the LCM.
- In the case of storing for a long period of time for the purpose or replacement use, the following ways are recommended.
 - Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.
 - Store in a dark place where neither exposure to direct sunlight nor light is.
 - Keep temperature in the specified storage temperature range.
 - Store with no touch on polarizer surface by anything else. If possible, store the LCM in the packaging situation when it was delivered.

10.7 Safety

- For the crash damaged or unnecessary LCM, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol and should be burned up later.
- In the case of LCM is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water and soap as soon as possible.
- If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.
- If the liquid crystal get in your eyes, flush your eyes with running water for at least fifteen minutes.
- If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.