



深圳市福瑞达显示技术有限公司
SHENZHEN FRIDA LCD CO.,LTD

Doc.No.:FRD154BP2902-D-CTQ

SPEC TITLE

REV : A

PAGE : 1/15

DOCUMENT CONTROL SPECIFICATION

EFFECTIVE DATE : 2019-01-04

PRODUCT SPECIFICATION

TFT-LCD MODULE

Model No: FRD154BP2902-D-CTQ

For Customer's Acceptance

Approved by	Comment

	Signature	Date
Prepared by		20190104
Checked by		2019.01.05
Approved by		2019.1.5

深圳市福瑞达显示技术有限公司

地址: 深圳市光明新区公明田寮第二工业区田荣路 68 号

Add:The 68th,Tianrong Road,Tianliao Community,Gongming Town,Guangming new district, shenzhen.

电话(Tel): (0755) 33563741 (0755) 33563743

传真(Fax): (0755) 29351371

网址(Web): www.fridalcd.com



Contents

No.	ITEM
1	Document Revision History
2	General Description
3	Outline Dimension
4	Interface Specification
5	Absolute Maximum Ratings
6	Electrical Specifications
7	Timing Characteristics
8	Power Supply Configuration
9	Optical Specification
10	Reliability Test Items
11	Precautions



1. Document Revision History :

DOCUMENT REVISION	DATE	DESCRIPTION	PREPARED BY
A	2019-01-04	First Release.	



2. General Description

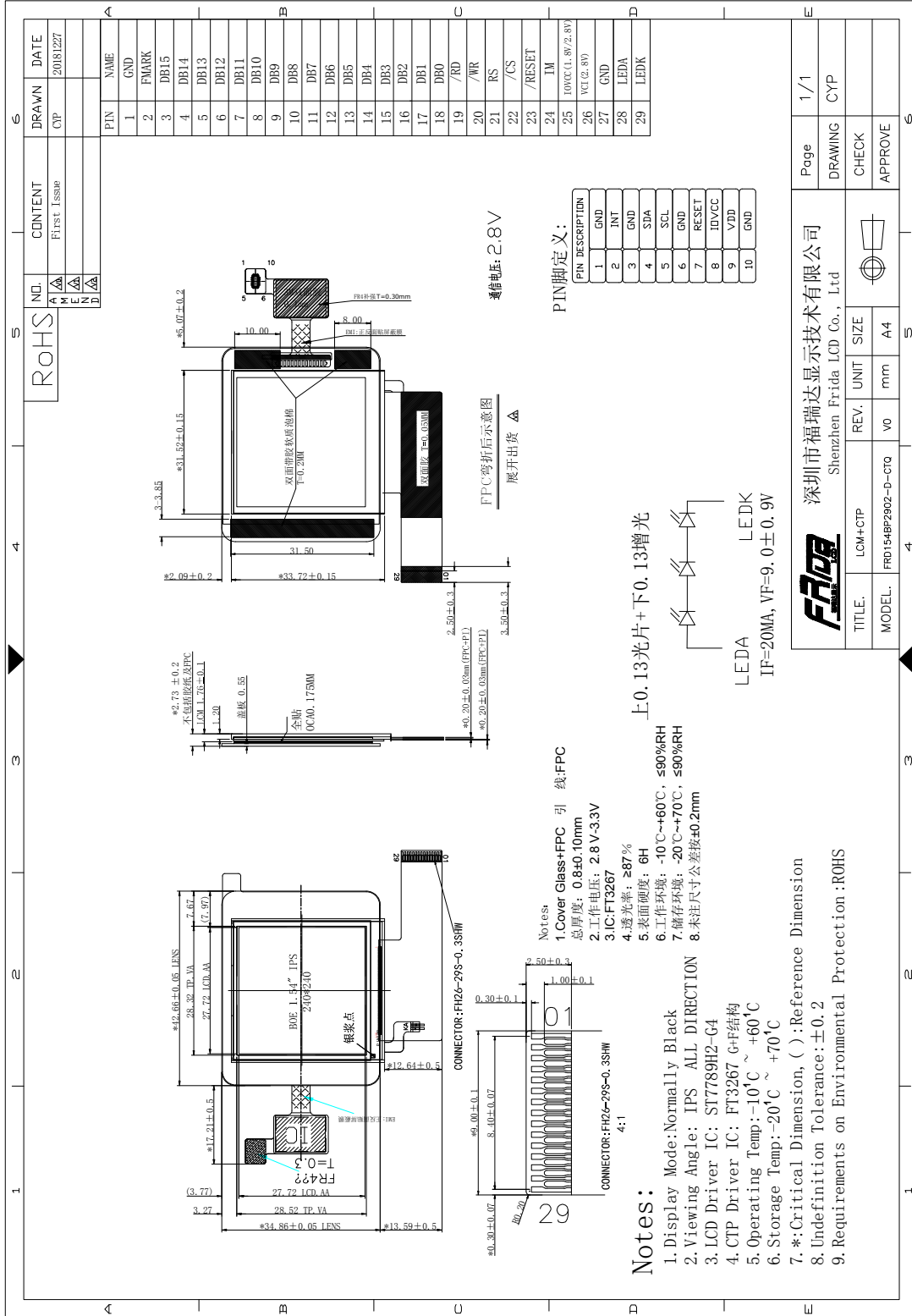
No	Item	Specification	Remark
1	Screen Size	1.54inch	
2	Display Mode	Normally Black	
3	Resolution	240×RGB ×240	
4	Active Area	27.72X27.72	mm
5	Outline Dimension	42.66*34.86*2.73	mm
6	Viewing Direction	All	
7	Driver IC	ST7789H2-G4	
8	Interface	MCU	
9	Back Light	White Led3*1	
10	Touch Panel	With CTP	

SPEC TITLE

DOCUMENT CONTROL SPECIFICATION

EFFECTIVE DATE : 2019-01-04

3. Outline Dimension

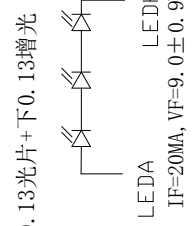


NO.	CONTENT	DRAWN	DATE
1	First Issue	CYP	20181227

PIN	NAME
1	GND
2	FMARK
3	DB15
4	DB14
5	DB13
6	DB12
7	DB11
8	DB10
9	DB9
10	DB8
11	DB7
12	DB6
13	DB5
14	DB4
15	DB3
16	DB2
17	DB1
18	DB0
19	/RD
20	/WR
21	RS
22	/CS
23	/RESET
24	IM
25	IOVCC (1.8V/2.8V)
26	VCC (2.8V)
27	GND
28	LEDA
29	LEDK

PIN脚定义:

PIN	DESCRIPTION
1	GND
2	INT
3	GND
4	SDA
5	SCL
6	GND
7	RESET
8	IOVCC
9	VDD
10	GND



- Notes:
1. Cover Glass+FPC 引线:FPC
 2. 总厚度: 0.8±0.10mm
 3. IC: FT3267
 4. 透光率: ≥87%
 5. 表面硬度: 6H
 6. 工作环境: -10℃~+60℃, ≤90%RH
 7. 储存环境: -20℃~+70℃, ≤90%RH
 8. 未注尺寸公差按±0.2mm

- Notes:
1. Display Mode: Normally Black
 2. Viewing Angle: IPS ALL DIRECTION
 3. LCD Driver IC: ST7789H2-G4
 4. CTP Driver IC: FT3267 G+P结构
 5. Operating Temp: -10℃ ~ +60℃
 6. Storage Temp: -20℃ ~ +70℃
 7. *:Critical Dimension, ():Reference Dimension
 8. Undefined Tolerance: ±0.2
 9. Requirements on Environmental Protection: ROHS

RoHS	RoHS	RoHS	RoHS	RoHS	RoHS
TITLE: LCM+CTP			REV. UNIT	SIZE	Page
MODEL: FRD154BP2902-D-CTQ			V0	A4	DRAWING
					CYP
					CHECK
					APPROVE
					1/1

深圳市福瑞达显示技术有限公司
Shenzhen Frida LCD Co., Ltd



4. Interface Specification

Pin No	Symbol	Description	Note
1	GND	Ground.	
2	FMARK	Frame head pulse for tearing effect.	
3~18	DB15~DB0	MCU parallel interface data bus.	
19	/RD	Read strobe signal.	
20	/WR	Write strobe signal.	
21	RS	Data / Command Selection pin.	
22	/CS	Chip selection signal pin.	
23	/RESET	Reset Signal input pin.	
24	IM(IM0)	The MCU interface mode select.	NOTE1
25	IOVCC(1.8V/2.8V)	Power Supply For I/O.	
26	VCI(2.8V)	Power Supply For LCD.	
27	GND	Ground.	
28	LEDA	Power Supply For LED Backlight Anode Input.	
29	LEDK	Power Supply For LED Backlight Cathode Input.	

NOTE1:

-The MCU interface mode select.

IM3	IM2	IM1	IM0	MPU Interface Mode	Data pin
0	0	0	0	80-8bit parallel I/F	DB[7:0]
0	0	0	1	80-16bit parallel I/F	DB[15:0]

4.1 CTP Interface Specification

CTP Interface Specification			
Pin No	Symbol	Description	Note
1	GND	Ground.	
2	INT	External interrupt to the host	
3	GND	Ground.	



SPEC TITLE

DOCUMENT CONTROL SPECIFICATION

EFFECTIVE DATE : 2019-01-04

4	SDA	Serial data input/output pin.	
5	SCL	Serial clock signal pin.	
6	GND	Ground.	
7	RESET	External Reset, active low	
8	GND	Ground.	
9	VDD	Power supply input for CTP	
10	GND	Ground.	

5. Absolute Maximum Ratings

Electrical Maximum Ratings – for IC Only

Parameter	Symbol	Min.	Max.	Unit	Note
Power supply voltage (VCI)	VCI	-0.3	+4.6	V	1
Power supply voltage (IOVCC)	IOVCC	-0.3	+4.6	V	1

Note:

- 1.VCI,IOVCC, GND must be maintained.
- 2.The modules may be destroyed if they are used beyond the absolute maximum ratings.

6. Electrical Specifications

At Ta = 25 °C, vci = 2.4V to 3.3V, iovcc= 1.65V to 3.3V, GND=0V.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (analog)	VCI-GND		2.4	2.8	3.3	V
Supply voltage (logic)	IOVCC-GND		1.65	1.8	3.3	V
Supply current (Logic & LCD)	ICC		-	-	-	mA
Supply voltage of white LED backlight	VLED	Forward current =20mA Number of LED = 3	8.1	9.0	9.9	V

7. Timing Characteristics

7.1. 8080 Series MCU Parallel Interface Characteristics: 18/16/9/8-bit Bus

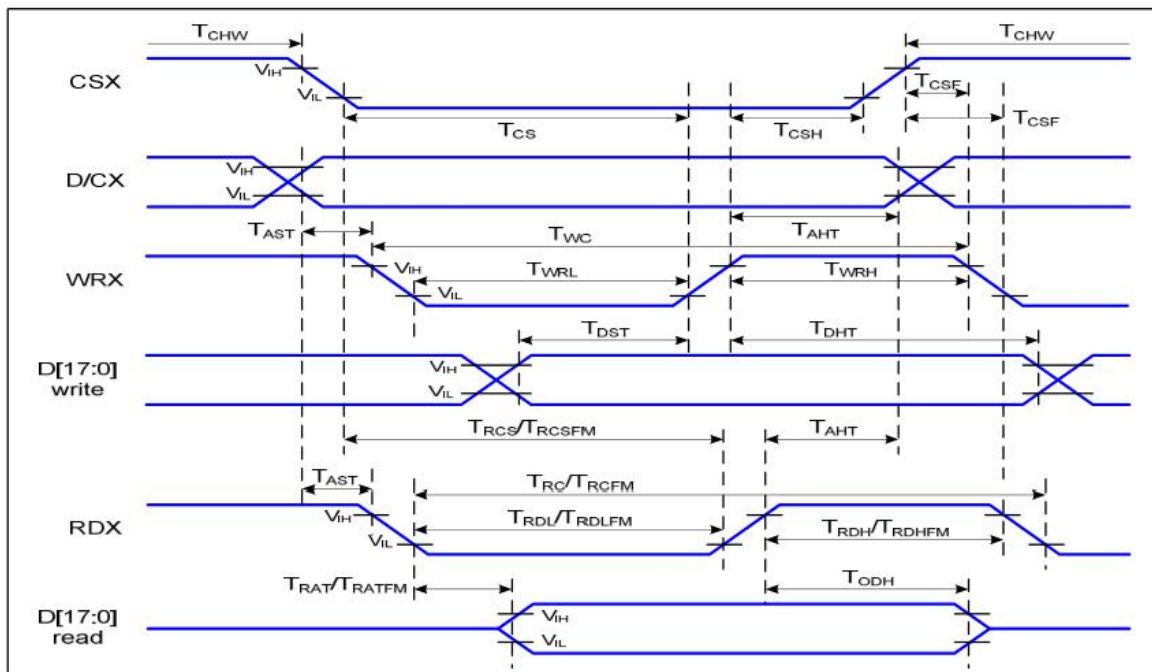


Figure 1 Parallel Interface Timing Characteristics (8080-Series MCU Interface)

$V_{DD1}=1.65$ to $3.3V$, $V_{DD}=2.4$ to $3.3V$, $AGND=DGND=0V$, $T_a=-30$ to 70 °C

Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	T_{AST}	Address setup time	0		ns	
	T_{AHT}	Address hold time (Write/Read)	10		ns	
CSX	T_{CHW}	Chip select "H" pulse width	0		ns	
	T_{CS}	Chip select setup time (Write)	15		ns	
	T_{RCS}	Chip select setup time (Read ID)	45		ns	
	T_{RCSFM}	Chip select setup time (Read FM)	355		ns	
	T_{CSF}	Chip select wait time (Write/Read)	10		ns	
	T_{CSH}	Chip select hold time	10		ns	
	WRX	T_{WC}	Write cycle	66		
T_{WRH}		Control pulse "H" duration	15		ns	
T_{WRL}		Control pulse "L" duration	15		ns	
RDX (ID)	T_{RC}	Read cycle (ID)	160		ns	When read ID data
	T_{RDH}	Control pulse "H" duration (ID)	90		ns	
	T_{RDL}	Control pulse "L" duration (ID)	45		ns	
RDX (FM)	T_{RCFM}	Read cycle (FM)	450		ns	When read from frame memory
	T_{RDHFM}	Control pulse "H" duration (FM)	90		ns	
	T_{RDLFM}	Control pulse "L" duration (FM)	355		ns	
D[17:0]	T_{DST}	Data setup time	10		ns	For $CL=30pF$

T_{DHT}	Data hold time	10		ns
T_{RAT}	Read access time (ID)		40	ns
T_{RATFM}	Read access time (FM)		340	ns
T_{ODH}	Output disable time	20	80	ns

Table 4 8080 Parallel Interface Characteristics

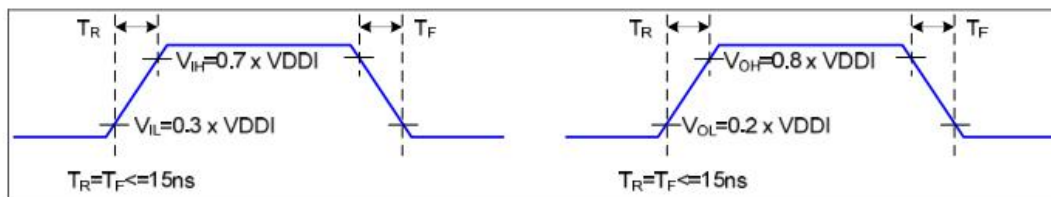


Figure 2 Rising and Falling Timing for I/O Signal

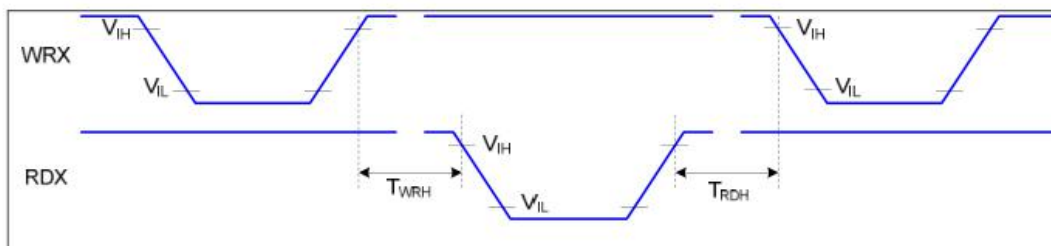


Figure 3 Write-to-Read and Read-to-Write Timing

Note: The rising time and falling time (T_r , T_f) of input signal and fall time are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

SPEC TITLE

DOCUMENT CONTROL SPECIFICATION

EFFECTIVE DATE : 2019-01-04

8. Power Supply Configuration

8.1 Power on/off sequence

VDDI and VDD can be applied in any order.

VDD and VDDI can be power down in any order.

During power off, if LCD is in the Sleep Out mode, VDD and VDDI must be powered down minimum 120msec after RESX has been released.

During power off, if LCD is in the Sleep In mode, VDDI or VDD can be powered down minimum 0msec after RESX has been released.

CSX can be applied at any timing or can be permanently grounded. RESX has priority over CSX.

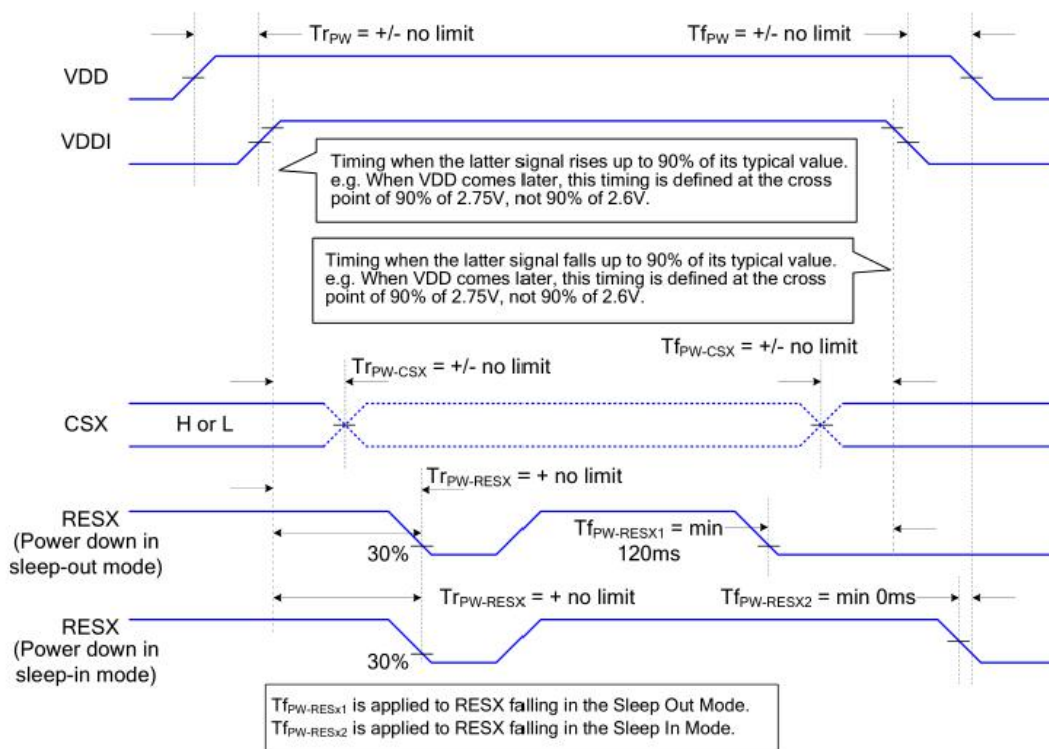
Note 1: There will be no damage to the display module if the power sequences are not met.

Note 2: There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.

Note 3: There will be no abnormal visible effects on the display between end of Power On Sequence and before receiving Sleep Out command. Also between receiving Sleep In command and Power Off Sequence.

Note 4: If RESX line is not held stable by host during Power On Sequence as defined in the sequence below, then it will be necessary to apply a Hardware Reset (RESX) after Host Power On Sequence is complete to ensure correct operation. Otherwise function is not guaranteed.

The power on/off sequence is illustrated below





9.Optical Specification

Item 项目	Symbol 符号	Condition 条件	Min 最小值	Typ 典型值	Max 最大值	Unit 单位	Note 备注
Response time 响应时间	Tr+Tf	$\theta=0^{\circ}$ $\phi=0^{\circ}$ $T_a=25^{\circ}\text{C}$	-	30	35	ms	1
Contrast ratio 对比度	Cr		700	900	-	-	2
Color gamut 饱和度	S(%)		45	50	-	%	-
Luminance uniformity 均匀度	δ WHITE		80	-	-	%	3
Viewing angle range 视角范围	θ_{x+}	$CR \geq 10$ $T_a=25^{\circ}\text{C}$	-	80	-	deg	4
	θ_{x-}		-	80	-	deg	
	θ_{y+}		-	80	-	deg	
	θ_{y-}		-	80	-	deg	
LCM Luminance LCM 亮度	Lv	$\theta=0^{\circ}$ $\phi=0^{\circ}$ $T_a=25^{\circ}\text{C}$	-	TBD	-	Cd/m ²	5
CIE (X,Y) Chromaticity 色度坐标	White(X)		-	TBD	-	-	6
	White(Y)		-	TBD	-	-	

Note1.Response time is the time required for the display to transition from White to black(Rise Time,Tr)and from black to white(Decay Time,Tf).For additional information see FIG1...

Note2.contrast Ratio(CR) is defined mathematically by the following formula ,For more information see FIG2.

Contrast Ratio(CR)=Average Surface Luminance with all white pixels/ Average Surface Luminance with all black pixels

Note3.The uniformity in surface luminance(WHITE) is determined by measuring luminance at each test position,and then dividing the maximum luminance of all white pixels by minimum luminance of all white pixels,For more information seeFIG2.

WHITE=Minimum Surface Luminance with all white pixels(P1,P2,.....)/Maximum Surface Luminance with all white pixels(P1,P2,.....)

SPEC TITLE

DOCUMENT CONTROL SPECIFICATION

EFFECTIVE DATE : 2019-01-04

Note4.Viewing angle is the angel at which contrast ratio is greater than a specific value.For TET module,the specific value of contrast ratio is 10.For monochrome and color stn module,the specific value of contrast ratio is2.The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.For more information see FIG3

Note5. Surface luminance is the LCD surface luminance with all white pixels,For more information see FIG2.

LV=Average Surface Luminance with all white pixels(P1,P2,.....)

Note6.CIE(X,Y)chromaticity is the Center point value.For more information see FIG2.

Note7.For Viewing angle and response time testing,the testing date is base on Autronic-Melchers' s ConScope.Series instruments.For contrast ratio,Surface Luminance,Luminance uniformity and CIE,the testing date is base on CS-2000 photo detector.

Note8.For TN type TFT transmissive module,Gray scale reverse occurs in the direction of panel viewing angle

FIG1. The definition of Response time

响应时间定义



FIG2. Measuring method for Contrast ratio,surface luminance,Luminance uniformity,CIE(X,Y)chromaticity.

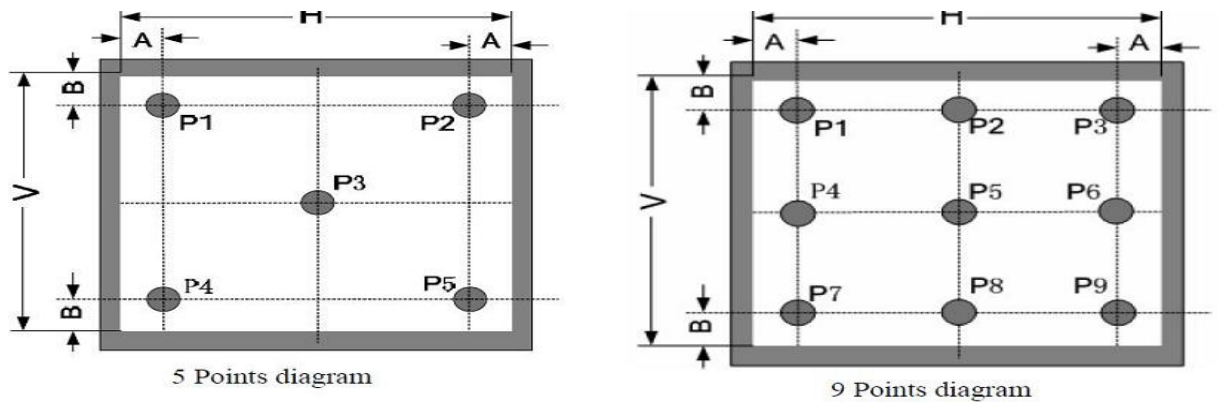
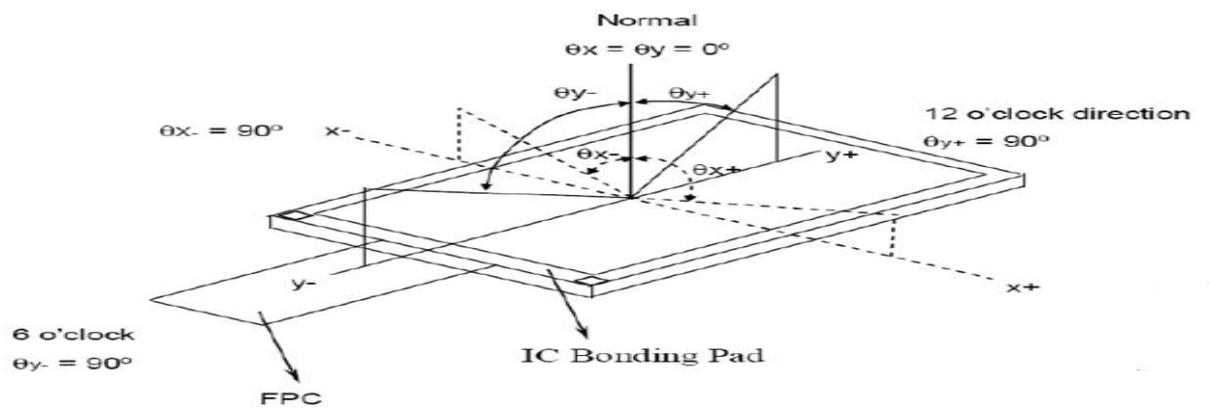


FIG3 The definition of viewing angle 视角定义





10. Reliability Test Items

Item	Test Condition	Criterion
High Temperature Storage	70°C, 48 hrs	Note1,Note2
Low Temperature Storage	-20°C, 48 hrs	
High Temp. & High Humidity Storage	40 °C, 80% RH, 48hrs	
Thermal Shock (Static)	-20°C, 30 min /70, 30 min, 20 cycles	
High Temperature Operation	60°C, 48 hrs	
Low temperature Operation	-10 °C, 48 hrs	

Note1: Evaluation should be tested after storage at room temperature for two hours.

Note2:

Pass: Normal display image no line defect.

Fail: No display image, or line defects.

Partial transformation of the module parts should be ignored.

11. Precautions

Please pay attentions to the followings as using the LCD module.

Handling

- (a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.
- (b) Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.
- (c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.
- (d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.



SPEC TITLE

DOCUMENT CONTROL SPECIFICATION

EFFECTIVE DATE : 2019-01-04

- (e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the touch panel surface permanently. The recommended solvents are water and Isopropyl alcohol.
- (f) Wipe off water droplets or oil immediately.
- (g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.
- (h) Do not touch the output pins directly with bare hands.
- (i) Do not disassemble the LCD module.
- (j) Do not lift the FPC of Touch Panel.

Storage

- (a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.
- (b) Do not expose the LCD modules to sunlight directly.
- (c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.
- (d) Avoid condensation of water. It may cause improper operation.
- (e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

Operation

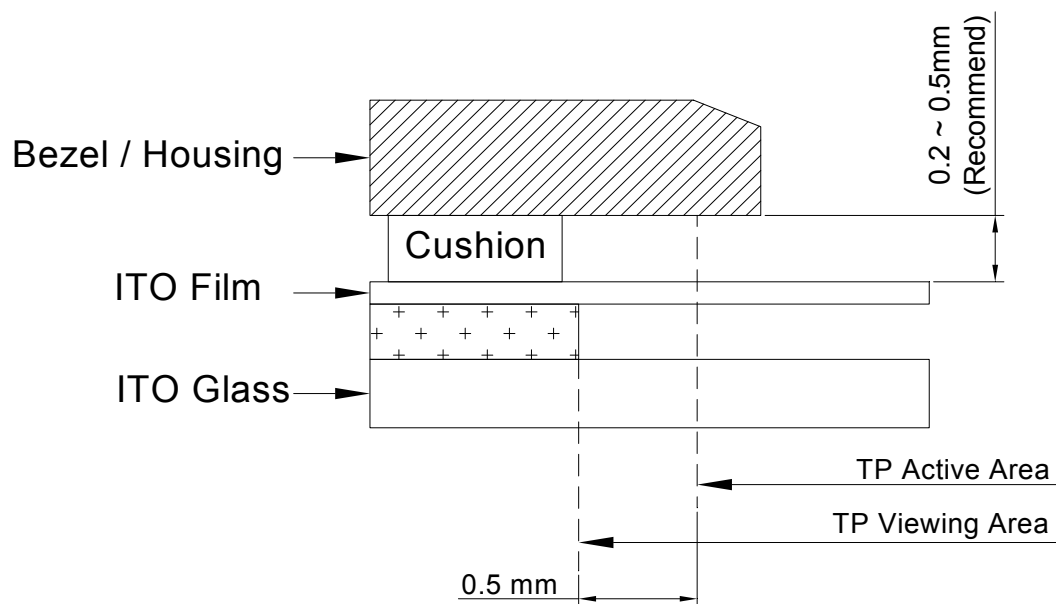
- (a) When mounting or dismounting the LCD modules, turn the power off.
- (b) Protect the LCD modules from electric shock.
- (c) The Driver IC control algorithms stated above should always obeyed to avoid damaging the LSI and electronic circuit.
- (d) Be careful to avoid mixing up the polarity of power supply for backlight.
- (e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.
- (f) When a static image is displayed for a long time, remnant image is likely to occur.
- (g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.
- (h) Most of the touch screens have air vent to equalize the inside air pressure to the outside one. The air vent must be open and liquid contact must be avoided as the liquid may be

absorbed if the liquid is accumulated near the air vent.

- (i) For the fragility of ITO film, it should avoid to use too tapering pen as the input material.

Touch Panel Mounting Notes

- (a) If a cushion is used between bezel/housing and film must be choose as free as enough to absorb the expansion and contraction to avoid the distortion of film.
- (b) The cushion must be placed out of the Viewing Area.
- (c) Bezel/Housing edge must be posited between Key Area and Viewing Area. The edge enters the Key Area may cause unexpected input if the gap is too narrow or foreign particles like dusts exist between Bezel/Housing and ITO film.
- (d) Mounting example:



The corner part has conductivity. Do not touch any metal part after mounting.

Others

- a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.
- b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.
- c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.