



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

Doc.No.: FRD350H54004-A

REV : A

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SPEC TITLE
DOCUMENT CONTROL SPECIFICATION

EFFECTIVE DATE : 2018-07-19

PRODUCT SPECIFICATION TFT-LCD MODULE

Model No: FRD350H54004-A

For Customer's Acceptance	
Approved by	Comment

	Signature	Date
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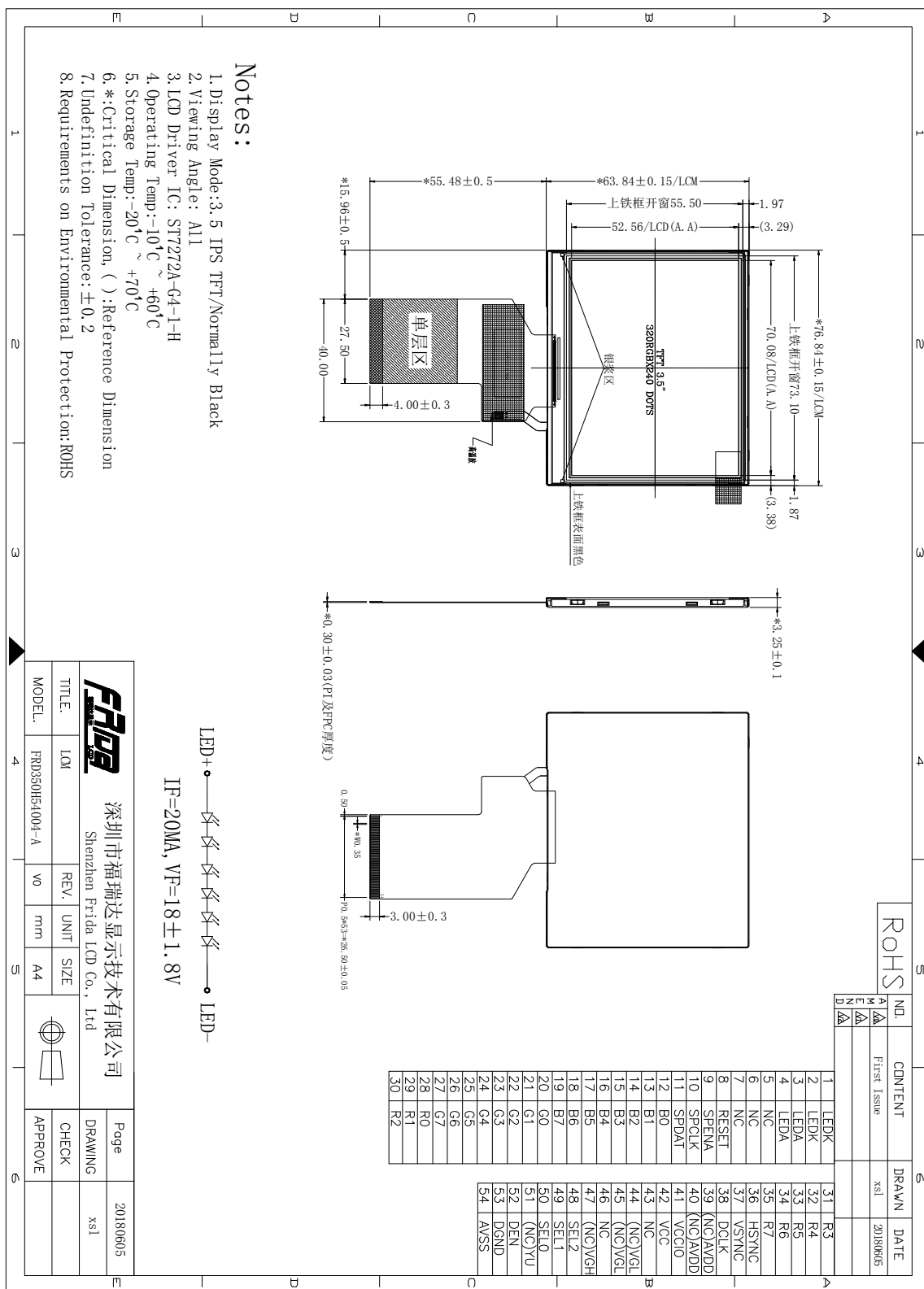
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2. General Description

No	Item	Specification	Remark
1	Screen Size	3.5 inch	
2	Display Mode	Normally Black	
3	Resolution	320 × RGB × 240	
4	Active Area	70.08*52.56	
5	Outline Dimension	76.84*63.84*3.25	
6	Viewing Direction	ALL	
7	Driver IC	ST7272A-G4-1-H	
8	Color Number	16.7M	
9	Interface	3Line SPI+RGB 24Bit	
10	Back Light	White Led*6	
11	Touch Panel	-	





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4. Interface Specification

Pin No	Symbol	Description	Note
1-2	LEDK	Power Supply For LED Backlight Cathode Input.	
3-4	LED A	Power Supply For LED Backlight Anode Input.	
5-7	NC	No Connection.	
8	RESET	Global reset pin. When GRB is “ L ” , internal initialization procedure is executed.	
9	SPENA (CS)	Chip selection signal pin.	
10	SPCLK (SCL)	Serial clock signal pin.	
11	SPDAT (SDA)	Serial data input/output pin.	
12-19	B0-B7	Blue data (B0-LSB;B7-MSB)	
20-27	G0-G7	Green data (G0-LSB; G7-MSB)	
28-35	R0-R7	Red data (R0-LSB;R7-MSB)	
36	HSYNC	Line synchronous signal for RGB interface operation.	
37	VSYNC	Frame synchronous signal for RGB interface operation.	
38	DOTCLK	Dot clock signal for RGB interface operation.	
39-40	AVDD(NC)	No Connection.	
41	VCCIO	Power supply for digital I/O pin	
42	VCC	Power Supply For LCD.	
43-45	VGL(NC)	No Connection.	
46	NC	No Connection.	
47	VGH(NC)	No Connection.	
48	SEL2	No Connection.	
49	SEL1	No Connection.	
50	SEL0	No Connection.	
51	YU(NC)	No Connection.	
52	DEN	Data enable signal for RGB interface operation.	
53	DGND	Ground.	
54	AVSS	Ground.	



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NOTE: Pin function description

(1) HDIR: Horizontal scan direction control pin.

HDIR	Function Description
L	From right to left
H	From left to right

HDIR=H (R1=NC; R2=0欧姆/0402=DVDD)

(2) VDIR:Vertical scan direction control pin

VDIR	Function Description
L	From down to up.
H	From up to down.

VDIR=H (R3=NC; R4=0欧姆/0402=DVDD)

(3) DCLPOL:VDPOL sets DCLK polarity in RGB interface.

VDLKPOL	Function Description
L	VSNC polarity: positive
H	YSNC polarity: negative

DCLPOL=H (R5=NC; R6=0欧姆/0402=DVDD)

(4) VDPOL:VDPOL sets VSYNCC polarity in RGB interface.

DCLKPOL	Function Description
L	HSYNC polarity: positive
H	HSYNC polarity: negative

VDPOL=H (R7=NC; R8=0欧姆/0402=DVDD)

(5) HDPOL:HDPOL sets HSYNC polarity in RGB interface.

HDLKPOL	Function Description
L	HSYNC polarity: positive
H	HSYNC polarity: negative

HDPOL=H (R9=NC; R10=0欧姆/0402=DVDD)

(6) SPI_12C_SEL:3-wire SPI and I²C interface control.

SPI_12C_SEL	Function Description
L	I ² C interface
H	3-wire SPI interface

SPI_12C_SEL=H (R11=NC; R12=0欧姆/0402=DVDD)



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(7)AUTODL:OTP trim function control pin.

AUTODL	Function Description
L	Disable auto-refresh function
H	Enable auto-refresh function

AUTODL=L (R13=0欧姆/0402=GND; R14=NC)

5.Absolute Maximum Ratings

Electrical Maximum Ratings – for IC Only

Parameter	Symbol	Min.	Max.	Unit	Note
Power supply voltage (VCC)	VCC	-0.3	+4.0	V	1
Power supply voltage (VCCIO)	VCCIO	-0.3	+4.0	V	1

Note:

- 1.VCCIO,VCI, 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, VDD = 3.0V to 3.6V, GND=0V.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage	VDD-GND		3.0	3.3	3.6	V
Supply voltage	VCCIO-GND		3.0	-	3.6	V
Supply current (Logic & LCD)	ICC	VCC=2.8V	-	-	TBD	mA
Supply voltage of white LED backlight	VLED	Forward current =20mA Number of LED = 6	-	18	-	V

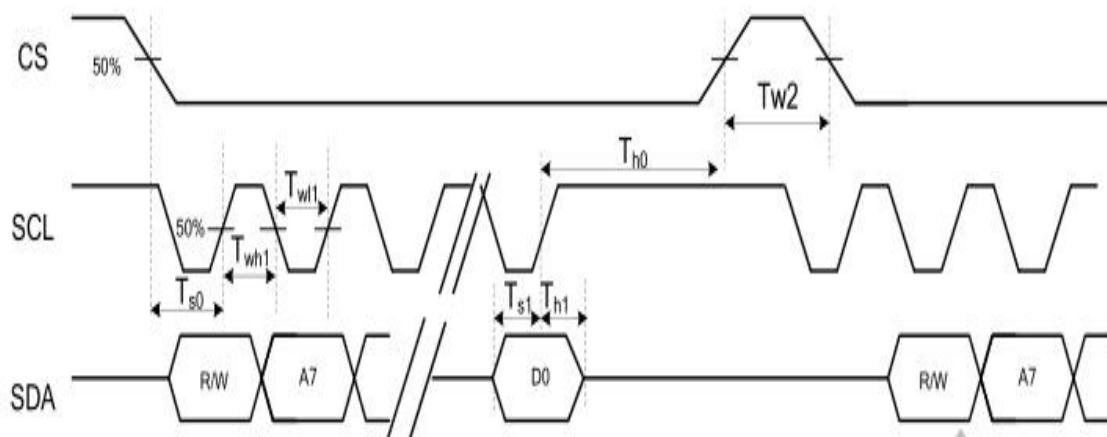
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7. Timing Characteristics

7.1 System Bus Timing for 3-Wire SPI Interface



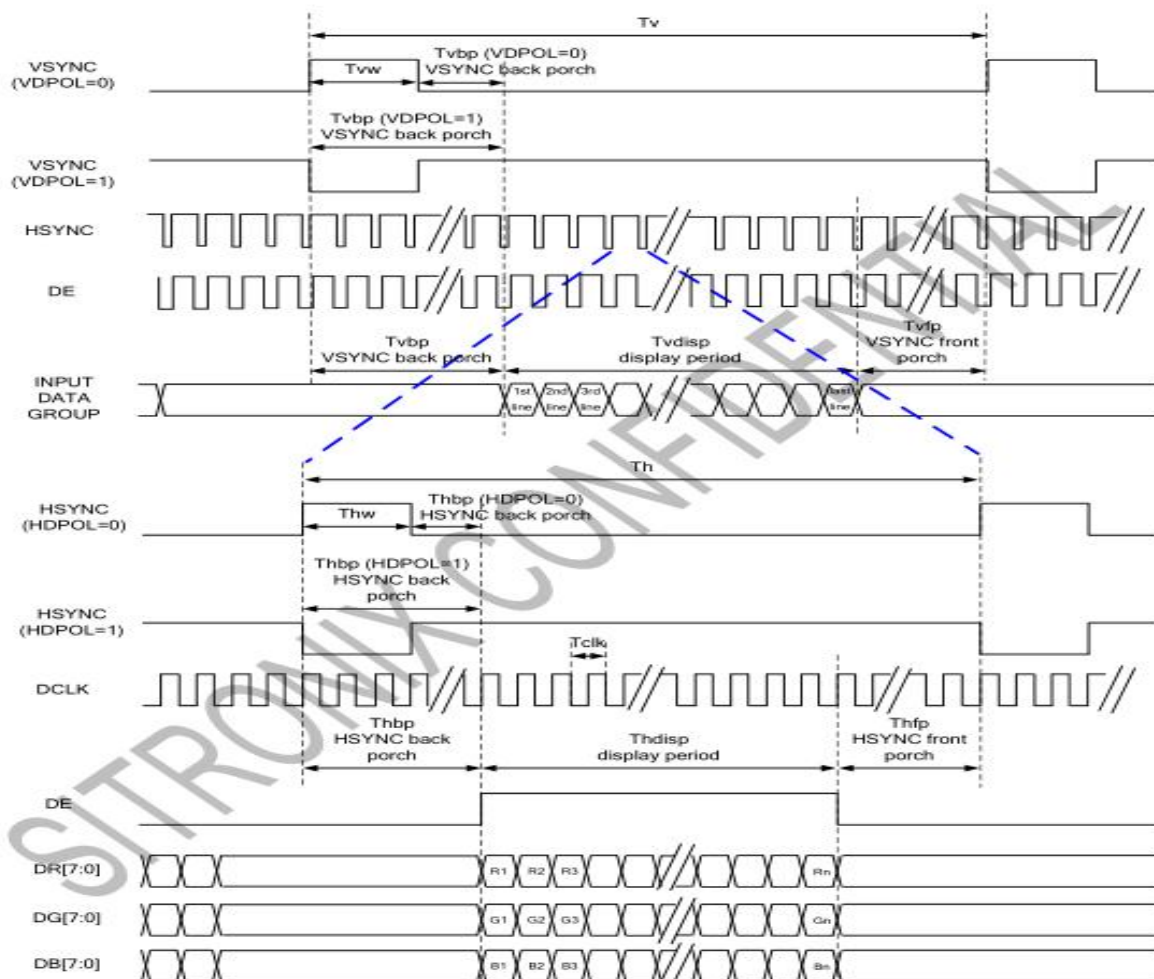
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CS Input Setup Time	T_{s0}	50	-	-	ns	
Serial Data Input Setup Time	T_{s1}	50	-	-	ns	
CS Input Hold Time	T_{h0}	50	-	-	ns	
Serial Data Input Hold Time	T_{h1}	50	-	-	ns	
SCL Write Pulse High Width	T_{wh1}	50	-	-	ns	
SCL Write Pulse Low Width	T_{wl1}	50	-	-	ns	
SCL Read Pulse High Width	T_{rh1}	300			ns	
SCL Read Pulse Low Width	T_{rl1}	300			ns	
CS Pulse High Width	T_{w2}	400	-	-	ns	

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7.3.2 SYNC-DE Mode



7.3.4 Parallel 24-bit RGB Input Timing Table

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Parallel 24-bit RGB Input Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	5	6	8	MHz	
DCLK Period		Tclk	125	167	200	ns	
HSYNC	Period Time	Th	325	371	438	DCLK	
	Display Period	Thdisp		320		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp		240		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	By V_BLANKING setting
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

Note: It is necessary to keep Tvpb =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

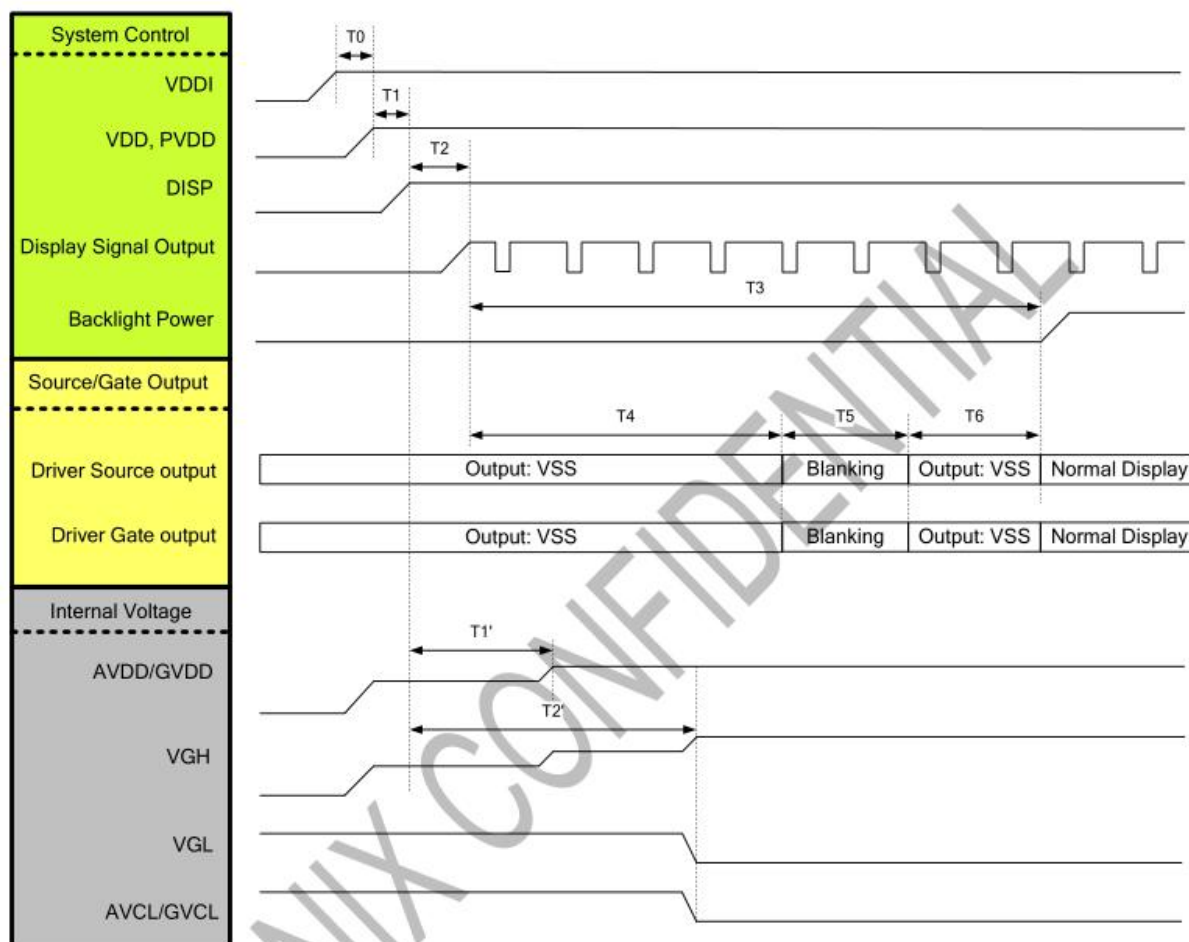
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8. Power Supply Configuration

8.1 Power On Sequence



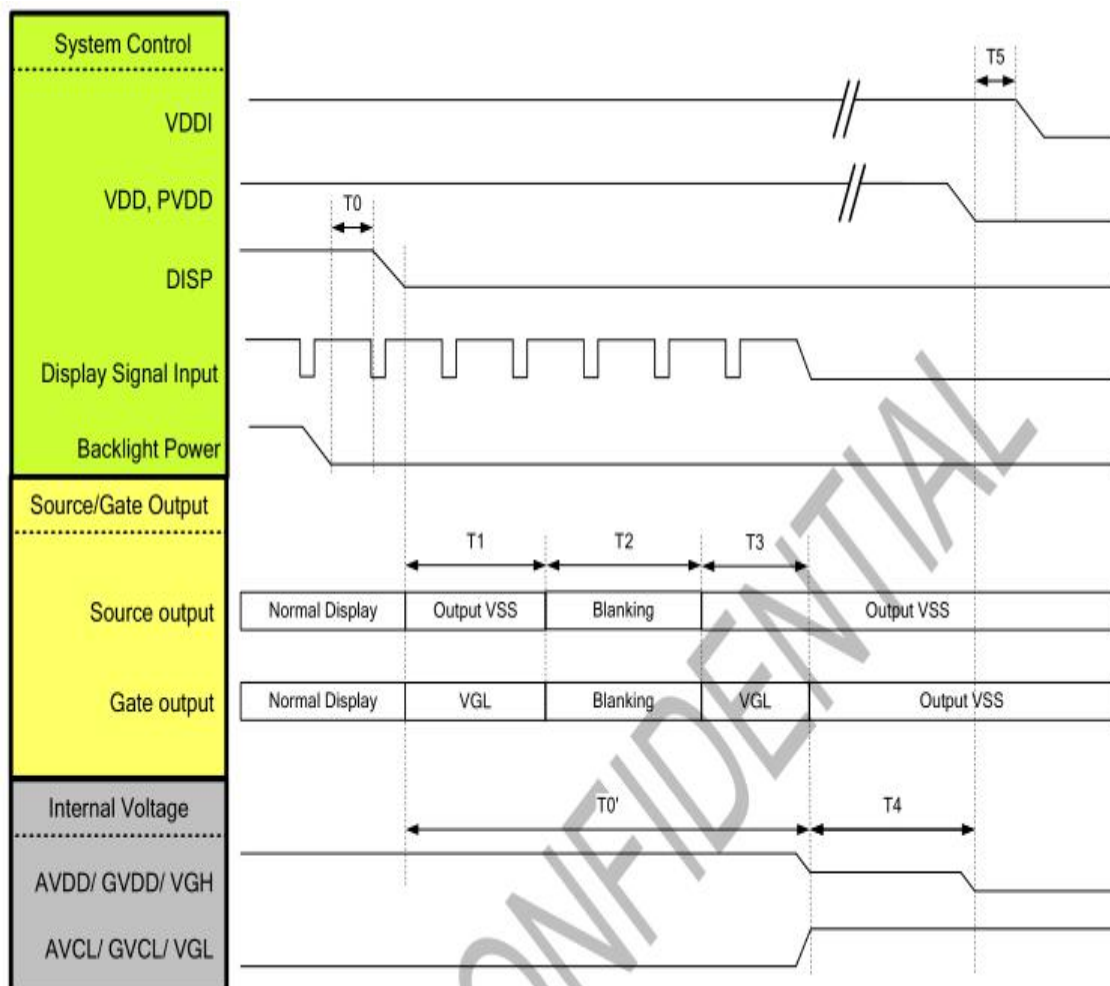
Symbol	Description	Min. Time	Unit
T0	Analog power on delay time	0	ms
T1	System power stability to DISP= "High"	0	ms
T2	DISP= "High" to display signal output	10	ms
T3	Display signal output to backlight power on	250	ms
T4	Display signal output to source output	100	ms
T5	Source/ Gate blanking time	30	ms
T6	Source/ Gate automatic output VSS	80	ms
T1'	DISP= "High" to AVDD/GVDD voltage stable time	20	ms
T2'	DISP= "High" to VGH/VGL/AVCL/GVCL voltage stable time	60	ms

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8.2 Power Off Sequence



Symbol	Description	Min. Time	Unit
T0	Backlight power off to DISP off	5	ms
T1	Source voltage output VSS and Gate voltage output VGL	30	ms
T2	Source/ Gate blanking time	30	ms
T3	Source voltage output VSS and Gate voltage output VGL	20	ms
T4	AVDD/ GVDD/ VGH discharge time	5	ms
T5	Analog power off to digital power off time	0	ms
T0'	Source and Gate voltage discharge complete width	80	ms



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	$\Theta=0^{\circ}$ $\varnothing=0^{\circ}$ Ta=25°C	-	30	40	ms	1
Contrast ratio 对比度	Cr		640	800	-	-	2
Color gamut 饱和度	S(%)		55	60	-	%	-
Luminance uniformity 均匀度	δ WHITE		80	-	-	%	3
Viewing angle range 视角范围	Θ_{x+}	CR $\geq$ 10 Ta=25°C	-	80	-	deg	4
	Θ_{x-}		-	80	-	deg	
	Θ_{y+}		-	80	-	deg	
	Θ_{y-}		-	80	-	deg	
LCM Luminance LCM 亮度	Lv	$\Theta=0^{\circ}$ $\varnothing=0^{\circ}$ Ta=25°C	-	350	-	Cd/m ²	5
CIE (X,Y) Chromaticity 色度坐标	White(X)		0.27	0.30	0.33	-	6
	White(Y)		0.30	0.33	0.36	-	

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,.....)

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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.

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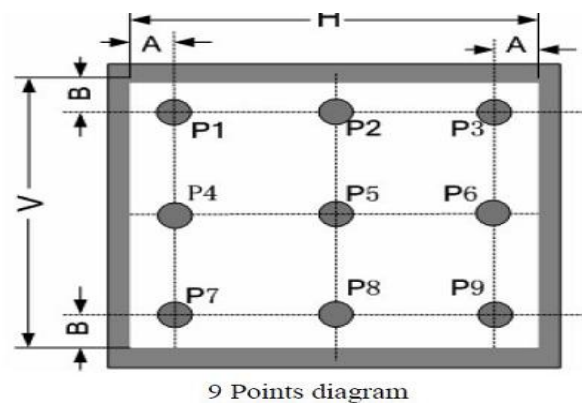
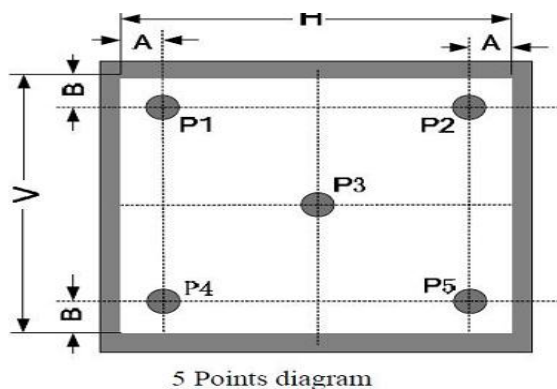
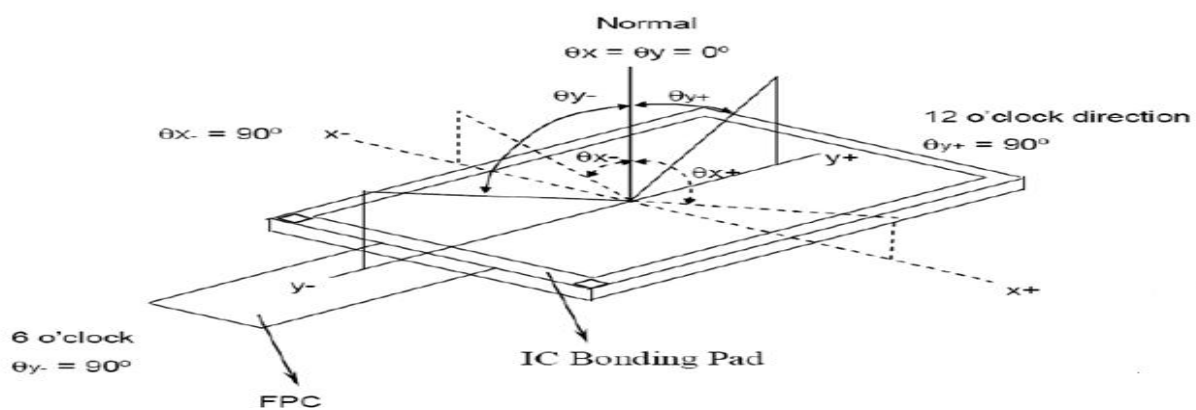


FIG3 The definition of viewing angle 视角定义





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°C, 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

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



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- (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

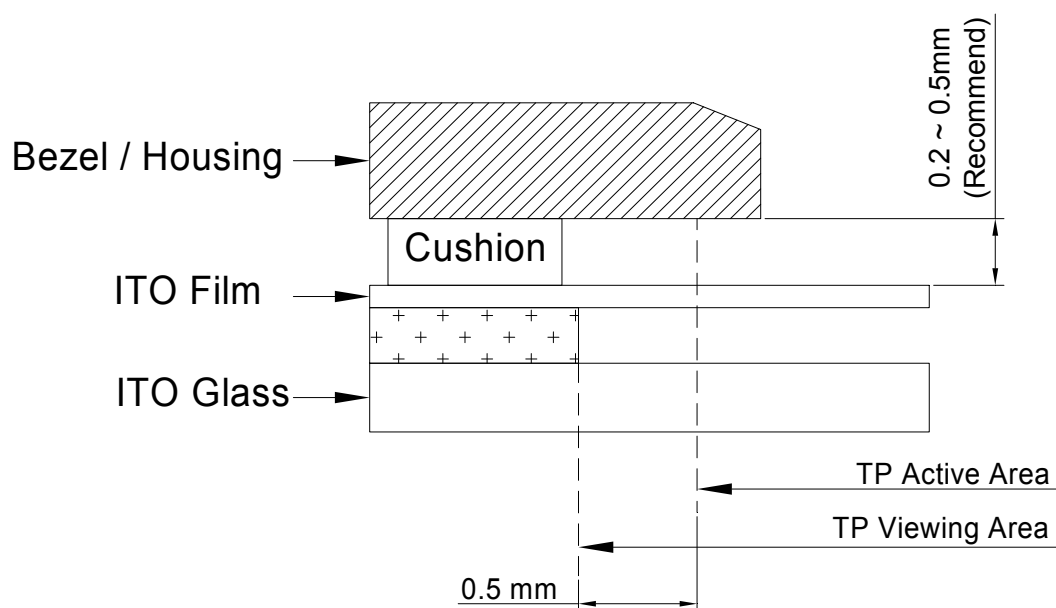
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absorbed if the liquid is accumulated near the air vent.

- (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.