ORIENT DISPLAY

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SPECIFICATION
FOR
LCD MODULE

MODULE NO: AFS480234TG-2.4-Y000021
REVISION NO: 00

Customer's Approval:

	SIGNATURE	DATE
PREPARED BY (RD ENGINEER)		
CHECKED BY		
APPROVED BY		

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DOCUMENT REVISION HISTORY

Version	DATE	DESCRIPTION	CHANGED BY
00	Aug-06-2010	First Issue	lhm
01	Feb-21-2011	更改 FPC 线路和接口定义	Fr.li
02	Mar-09-2011	更改 FPC 长度和增加黑胶带	Ylh
03	Nov-17-2011	Revised “Outline Drawing”	Fr.li

CONTENTS

1. Features & Mechanical Specifications

Item	Contents	Unit
	LCD	
LCD Type	TFT / Transmissive / Normally White	--
Viewing direction	6:00	--
Backlight	White LED x 2 in Parallel	--
Interface	8-bit RGB Interface	--
Driver IC	OTA5182A	--
Outline Dimension	55.2(W) × 47.55(H) × 2.9(T)	mm
Glass area (W×H×T)	52.4 × 43.56 × 0.5mm	mm
Active area (W×H)	48.0 × 35.685	mm
Number of Dots	480 × 234	--
Dot pitch (W×H)	0.1 × 0.1525	mm
Pixel pitch (W×H)	0.3 × 0.1525	mm
Operating Temperature	-20 ～ +70	℃
Storage temperature	-30 ～ +80	℃

2. Dimensional Outline

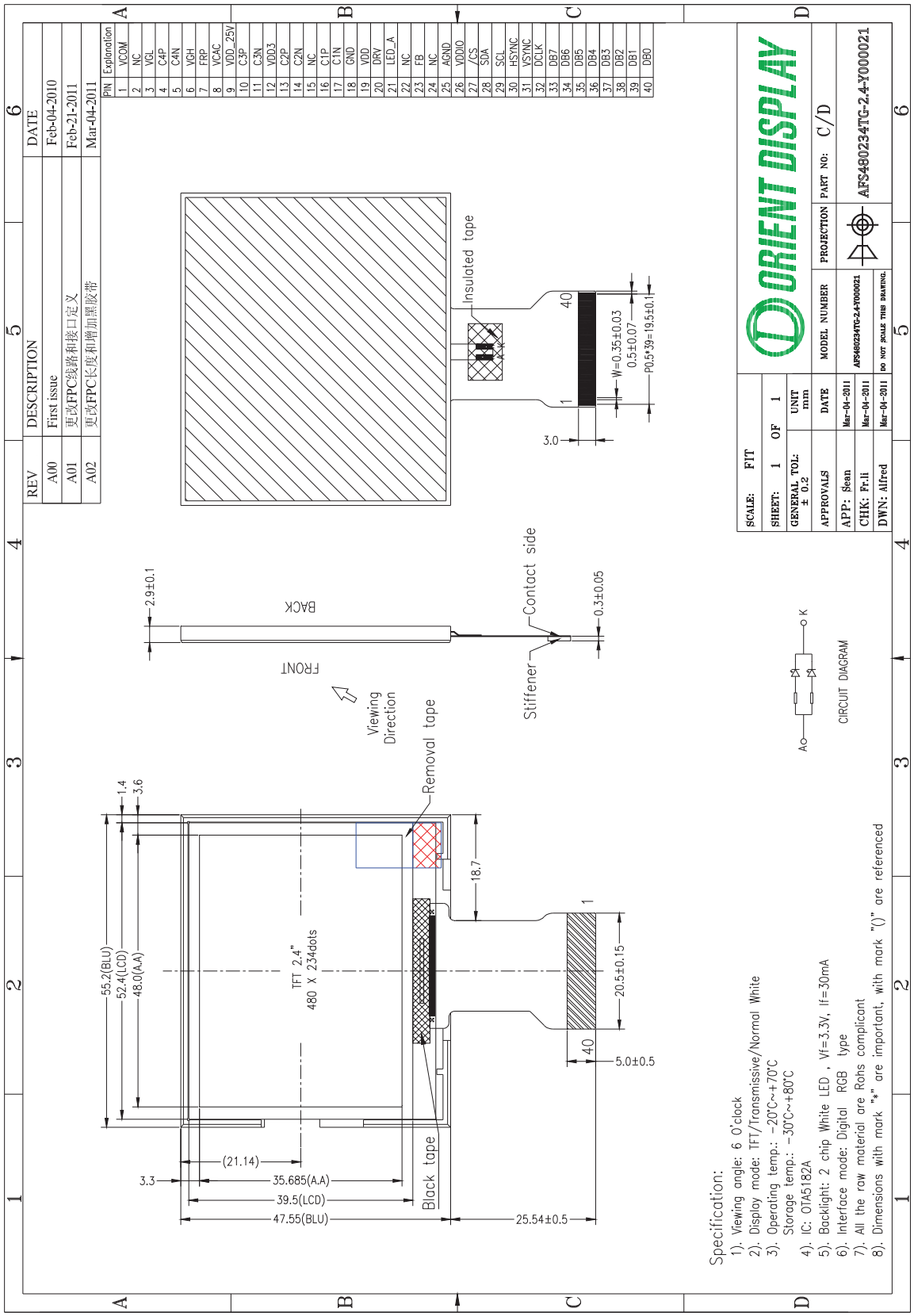


Figure 1. Dimensional outline

3. Block Diagram

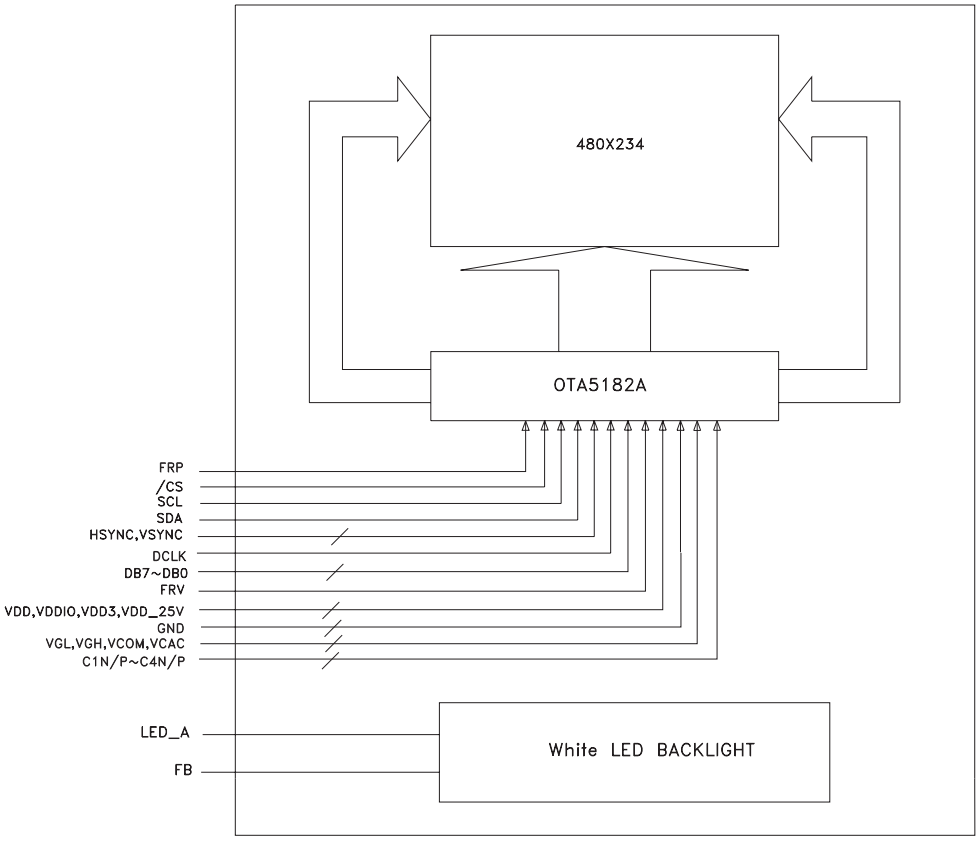


Figure 2. Block diagram

4. Pin Description

PIN No.	SYMBOL	Function
1	VCOM	Common electrode driving voltage
2	NC	NO Connection
3	VGL	Negative low power supply for gate driver output
4	C4P	Pins to connect capacitance for power circuitry
5	C4N	Pins to connect capacitance for power circuitry
6	VGH	Positive power supply for gate driver output
7	FRP	Frame polarity output for VCOM
8	VCAC	Define the amplitude of VCOM swing
9	VDD_25V	Define the amplitude of VCOM swing
10	C3P	Pins to connect capacitance for power circuitry
11	C3N	Pins to connect capacitance for power circuitry
12	VDD3	Intermediate voltage for charge Pump
13	C2P	Pins to connect capacitance for power circuitry
14	C2N	Pins to connect capacitance for power circuitry
15	NC	NO Connection
16	C1P	Pins to connect capacitance for power circuitry
17	C1N	Pins to connect capacitance for power circuitry
18	GND	Ground
19	VDD	Charge Pump Power supply
20	DRV	Gate signal for the power transistor of the boost converter
21	LED_A	LED power anode
22	NC	NO Connection
23	FB(LED_K)	LED power cathode
24	NC	NO Connection
25	AGND	Analog ground for source driver
26	VDDIO	Input I/O power supply
27	/CS	Serial communication chip select
28	SDA	Serial communication data input
29	SCL	Serial communication clock input
30	HSYNC	Horizontal sync input. Negative polarity.
31	VSYNC	Vertical sync input. Negative polarity.
32	DCLK	Clock signal
33~40	DB7~DB0	Data Bus

5. Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Logic supply	VDDIO	-0.5 to +6 .0	V
Power supply	VDD	-0.5 to +6 .0	V
Operating Temperature range	TOP	-20 to +70	℃
Storage Temperature range	TST	-30 to +80	℃

6. Electrical Characteristics

DC Characteristics

Item	Symbol	Min.	Type.	Max.	Unit
Supply Voltage	VDDIO	1.8	3.3	3.6	V
Supply Voltage	VDD	3.0	3.3	3.6	V

7. Backlight Characteristics

White LED × 2 in parallel **(Ta = 25°C)**

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=30mA	3.0	3.2	3.4	V
Uniformity	△Bp	-	80	-	-	%
Luminance for LCD	Lv	IF=30mA	1200	1500	-	cd/m^2

8. Electro-Optical Characteristics

ITEM		SYMBOL	CONDITION	Min.	TYP.	Max.
Color Filter Chromacicity (Note.1)	White	x	θ=ϕ= 0°	(0.282)	(0.302)	(0.322)
		y		(0.327)	(0.347)	(0.367)
		Y		(35.2)	(38.2)	(41.2)
	Red	x	θ=ϕ= 0°	(0.593)	(0.613)	(0.633)
		y		(0.311)	(0.331)	(0.351)
		Y		(18.4)	(21.4)	(24.4)
	Green	x	θ=ϕ= 0°	(0.298)	(0.318)	(0.338)
		y		(0.529)	(0.549)	(0.569)
		Y		(61.4)	(65.4)	(69.4)
	Blue	x	θ=ϕ= 0°	(0.132)	(0.152)	(0.172)
		y		(0.170)	(0.190)	(0.210)
		Y		(24.8)	(27.8)	(30.8)
Transmittance(%) (Note.3)		T	θ=ϕ= 0°		(8.5)	--

Note.1 These items are measured by C light.
Note.2 Definition of Viewing Angle(θ,ψ),refer to Fig.1 as below :

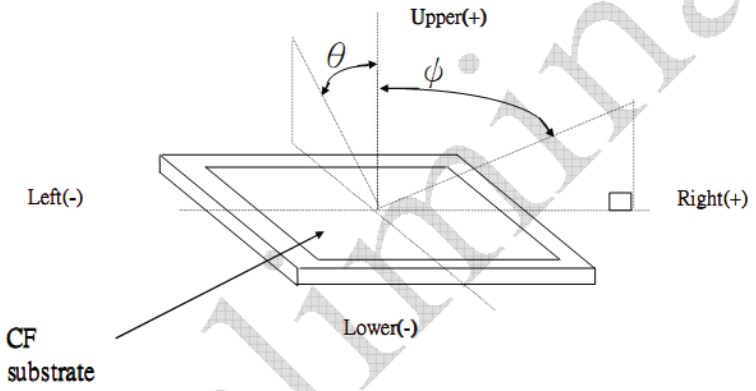
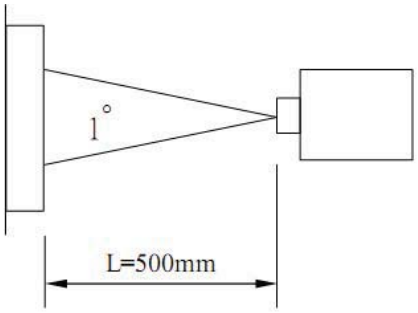


Fig.1 Definition of Viewing Angle

Note.3 Using CPT LC+ EWV Polarizer+Corresponding Backlight, reference only, Measure device：BM-5A (TOPCON)，viewing cone= 1°，I_L=20mA。



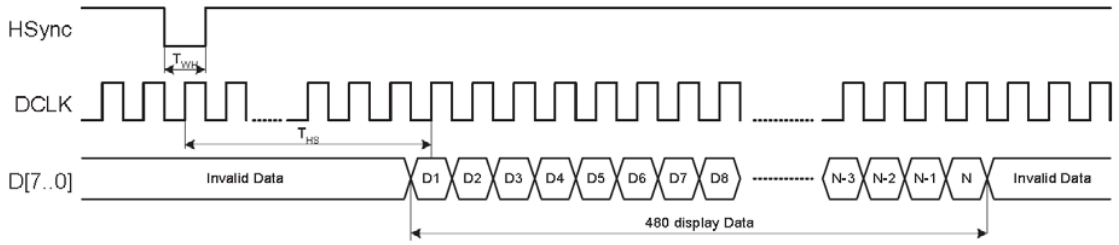
9. Instruction Description

Reg	ADRESS				CONTENT											
N°	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
S0	0	0	0	0	R/W	-	-	-	-				GRB (1)	STB (1)	SHDB (0)	SHCB (1)
S1	0	0	0	1	R/W	-	-	-	GAMAH (000)			PDTY (00)		FBV (100)		
S2	0	0	1	0	R/W	-	-				000			DITHB (0)	PFON (0)	1
S3	0	0	1	1	R/W	-	-	-	-	0	0	0	CONST (1000)			
S4	0	1	0	0	R/W	-	-	-	-	-			FPOL (0)	0	UD (1)	SHL (1)
S5	0	1	0	1	R/W	-				VDC EN(0)	VCOMDC (100000)					
S6	0	1	1	0	R/W	-	-	-	-	-		PALM (0)	PAL (0)	SEL (000)		
S7	0	1	1	1	R/W	-	-	-	-	BRADJ (1000000)						
S8	1	0	0	0	R/W	-	-					DDL (00000)				
S10	1	0	1	0	R/W	-	-	-	-	-	FRAD (00)		HDL (0000)			
S12	1	1	0	0	R/W	-	-	-	-					VCSL (101)		
S14	1	1	1	0	R/W	-	-	-				GAMSEL(0)	0	0	1	1

Note: Gray register are reserved registers.

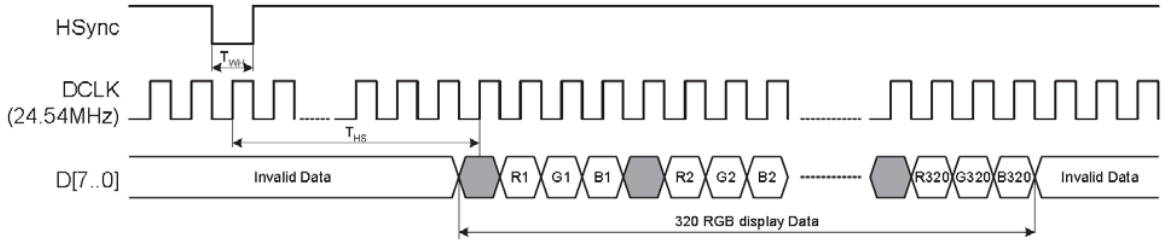
10. AC Characteristics

RAW DATA MODE



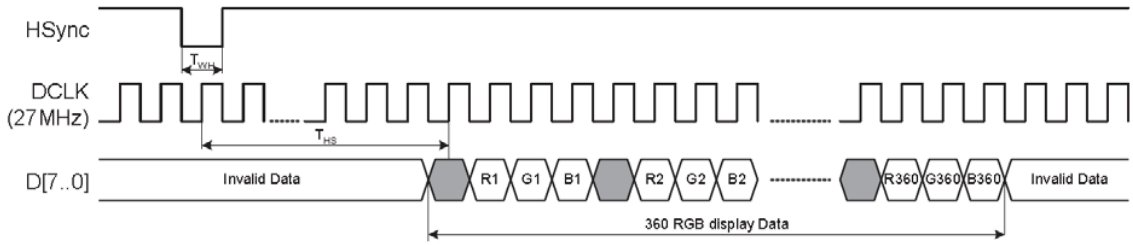
: RAW DATA MODE data input format

SERIAL MODE 24.54MHz



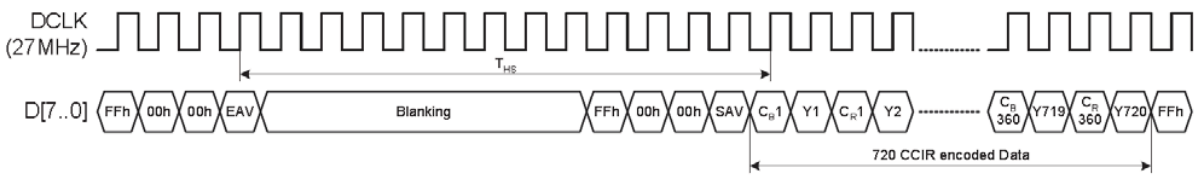
SERIAL MODE 24.54MHz Data input format (Sel=001)

SERIAL MODE 27MHz



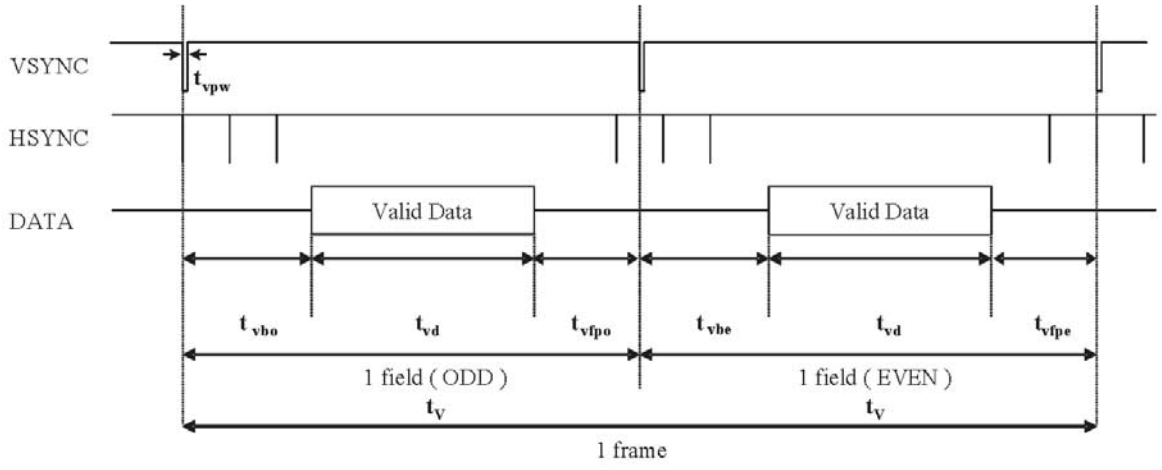
SERIAL MODE 27MHz Data input format (Sel=010)

CCIR 656

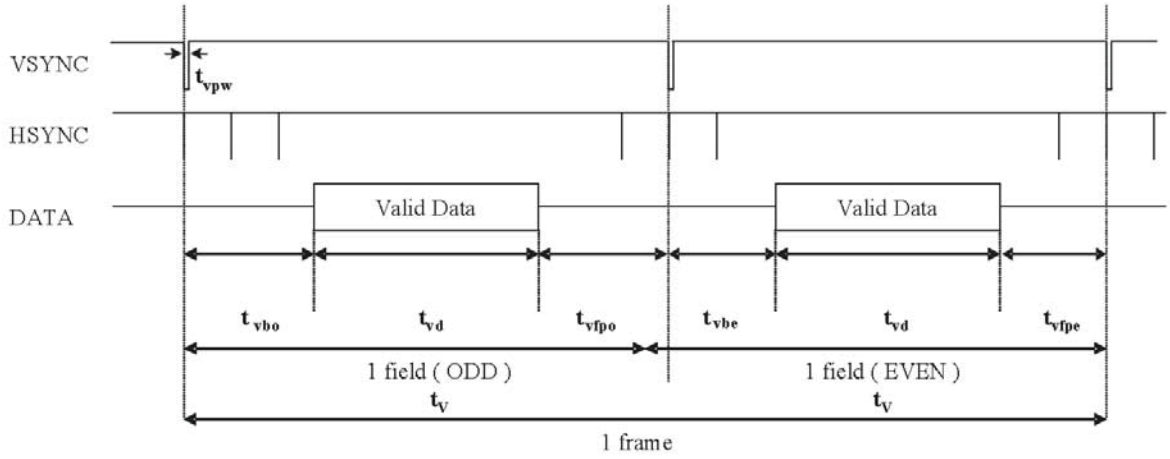


CCIR Data input format

Vertical input timing



Vertical input timing diagram for interlace application



Vertical input timing diagram for non-interlace application

Raw data vertical input timing

Parameter		Symbol	Interlace			(*)Non-Interlace			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Vertical display area		t_{vd}		240			240		H
VSYNC period time		t_v	247.5	262.5	277.5	247	262	277	H
VSYNC pulse width		t_{vpw}	1 DCLK	1H	6H	1 DCLK	1H	6H	
(*)VSYNC Blanking (t_{vb})	Odd field	t_{vbo}	6	13	21	6	13	21	H
	Even field	t_{vbe}	6.5	13.5	21.5				
VSYNC Front porch (t_{vfp})	Odd field	t_{vfpo}	1.5	9.5	16.5	1	9	16	H
	Even field	t_{vfpe}	1	9	16				

SERIAL RGB vertical input timing

NTSC

Parameter		Symbol	Interlace			(*)Non-Interlace			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Vertical display area		t_{vd}		240			240		H
VSYNC period time		t_v	247.5	262.5	277.5	247	262	277	H
VSYNC pulse width		t_{vpw}	1 DCLK	1H	6H	1 DCLK	1H	6H	
(*)VSYNC Blanking (t_{vb})	Odd field	t_{vbo}	6	13	21	6	13	21	H
	Even field	t_{vbe}	6.5	13.5	21.5				
VSYNC Front porch (t_{vfp})	Odd field	t_{vfpo}	1.5	9.5	16.5	1	9	16	H
	Even field	t_{vfpe}	1	9	16				

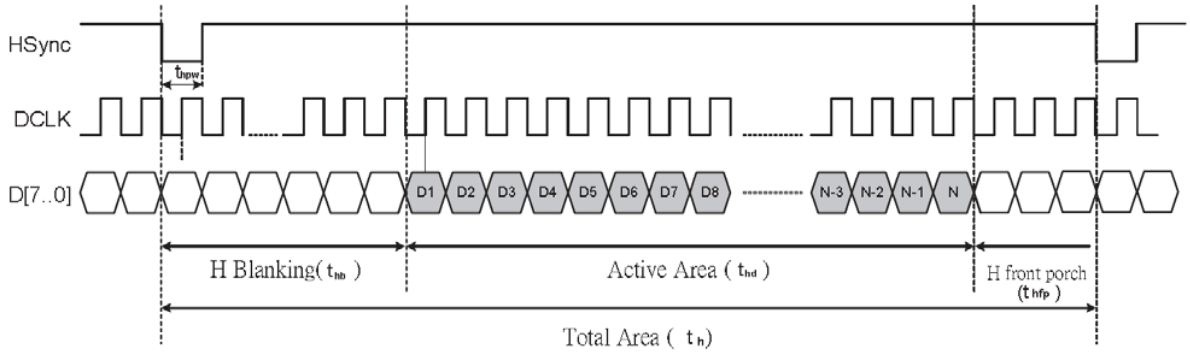
PAL

Parameter		Symbol	Interlace			(*)Non-Interlace			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Vertical display area		t_{vd}		288(280)			288(280)		H
VSYNC period time		t_v	295.5 (287.5)	312.5	325.5 (317.5)	295 (287)	312	325 (317)	H
VSYNC pulse width		t_{vpw}	1 DCLK	1H	6H	1 DCLK	1H	6H	
(*)VSYNC Blanking (t_{vb})	Odd field	t_{vbo}	6	13	21	6	13	21	H
	Even field	t_{vbe}	6.5	13.5	21.5				
VSYNC Front porch (t_{vfp})	Odd field	t_{vfpo}	1.5	11.5(19.5)	16.5	1	11(19)	16	H
	Even field	t_{vfpe}	1	11(19)	16				

(*) Non-interlace mode: NTSC is 262 lines (typical), but 263 is tolerant.

PAL is 312 lines (typical), but 313 is tolerant.

Horizontal input timing



Raw Data

Parameter		Symbol	Value			Unit
Horizontal display area		t_{hd}		480		DCLK
DCLK frequency		f_{clk}	Min.	Typ.	Max	
			8.1	9.7	11.3	Mhz
1 Horizontal Line		t_h		617		DCLK
HSYNC pulse width	Min.	t_{hpw}		1		
	Typ.			1		
	Max.			96		
HSYNC blanking		t_{hb}	84	100	115	
HSYNC front porch		t_{hfp}	53	37	22	

SERIAL RGB MODE

NTSC

Parameter		Symbol	Value			Value			Value			Unit
Horizontal display area		t_{hd}	1280			1408			1440			DCLK
DCLK frequency		f_{clk}	Min.	Typ.	Max	Min.	Typ.	Max	Min.	Typ.	Max	
			20.47	24.54	28.66	22.5	27	31.5	22.5	27	31.5	MHz
1 Horizontal Line		t_h	1560			1716			1716			DCLK
HSYNC pulse width	Min.	t_{hpw}	1			1			1			
	Typ.		1			1			1			
	Max.		96			96			96			
HSYNC blanking		t_{hb}	237	252	268	237	252	268	237	252	268	
HSYNC front porch		t_{hfp}	43	28	12	71	56	40	39	24	8	

PAL

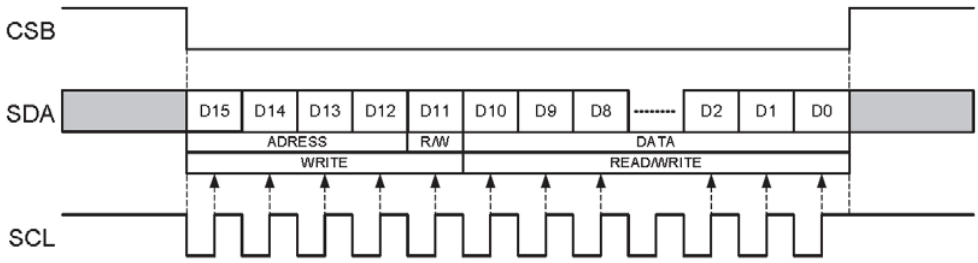
Parameter		Symbol	Value			Value			Unit
Horizontal display area		t_{hd}	1408			1440			DCLK
DCLK frequency		f_{clk}	Min.	Typ.	Max	Min.	Typ.	Max	
			22.5	27	31.5	22.5	27	31.5	MHz
1 Horizontal Line		t_h	1728			1728			DCLK
HSYNC pulse width	Min.	t_{hpw}	1			1			
	Typ.		1			1			
	Max.		96			96			
HSYNC blanking		t_{hb}	237	252	268	237	252	268	
HSYNC front porch		t_{hfp}	83	68	52	51	36	20	

3. CCIR

Parameter		Symbol	Mode(NTSC/PAL)	Unit
Horizontal display area		t_{hd}	1440	DCLK
DCLK frequency		f_{clk}	27	MHz
1 Horizontal Line		t_h	1716	DCLK
Internal HSYNC pulse width	Min.	t_{hpw}	1	
	Typ.		1	
	Max.		-	
HSYNC blanking		t_{hb}	268	

SPI timing

The serial register has read/write function. D[15:12] are the register address, D[11] defined the read or write mode and D[10:0] are the data.



Serial Interface read/write sequence

At power-on, the default values specified for each parameter (in Table 1) are taken.

All data, except S0 D[3:2], are validated on the negative edge of Vsync.

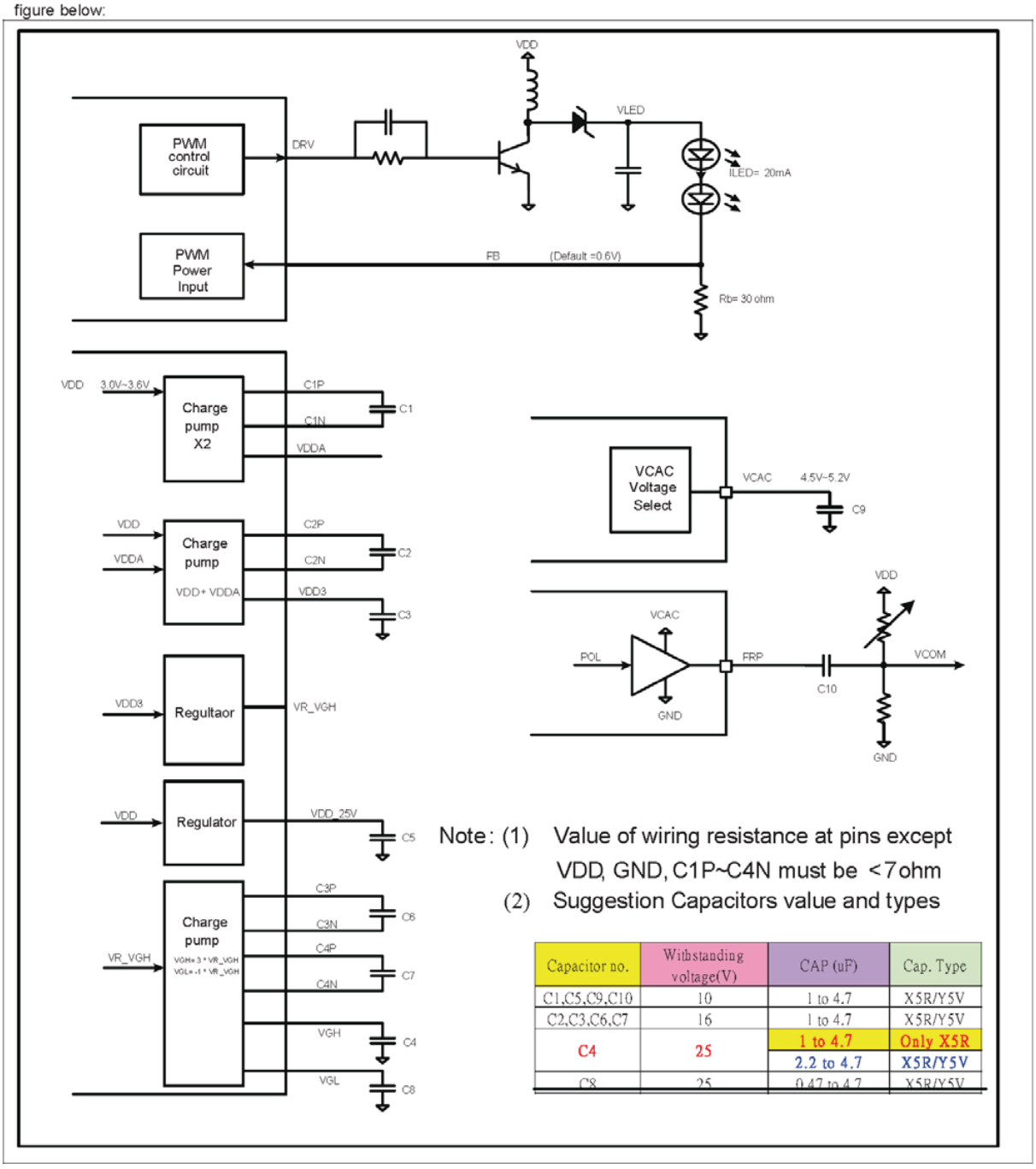
In 3-wire register, GRB clear registers to default value except GRB value.

If less than 16-bit data are read during the CS low time period the data is cancelled.

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Serial clock width low/high	Tssw		120			ns
Serial data setup time	Tist		120			ns
Serial data hold time	Tihd		120			ns
CSB setup time	Tcst		240			ns
CSB data hold time	Tchd		120			ns
Chip select distinguish	Tcd		1			us
Delay between CSB and Vsync	Tcv		1			us
Serial communication						
Serial clock period	Tsck		320	-	-	ns
Serial clock duty cycle	Tscw		40	50	60	%

APPLICATION NOTES

The OTA5182A has a built-in power supply which generates and controls several voltages for the gate driver (VGH, VGL), for the liquid crystal common plate (VCOM, VCAC) and for the external backlight (DRV, FB, VLED). An example of typical application is shown in the figure below:



Capacitor no.	Withstanding voltage(V)	CAP (uF)	Cap. Type
C1,C5,C9,C10	10	1 to 4.7	X5R/Y5V
C2,C3,C6,C7	16	1 to 4.7	X5R/Y5V
C4	25	1 to 4.7	Only X5R
		2.2 to 4.7	X5R/Y5V
C8	25	0.47 to 4.7	X5R/Y5V

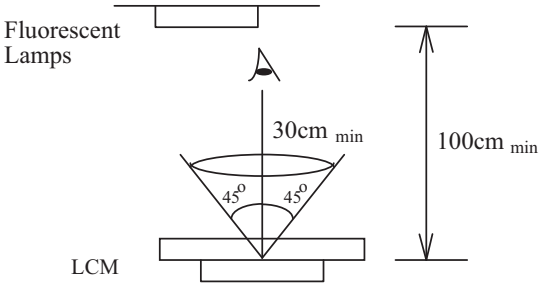
11.Quality Specifications

All The raw material are Rohs complicant.

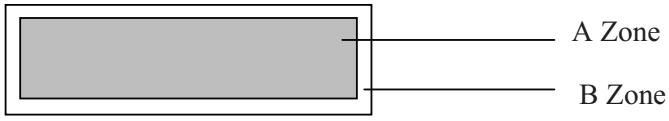
11.1 Standard of the product appearance test

Manner of appearance test: The inspection should be performed in using 20W x 2 fluorescent lamps. Distance between LCM and fluorescent lamps should be 100 cm or more. Distance between LCM and inspector eyes should be 30 cm or more.

Viewing direction for inspection is 45° from vertical against LCM.



Definition of zone:



A Zone: viewing area
B Zone: outside viewing area

11.2 Specification of quality assurance

AQL inspection standard

Sampling method: MIL-STD-105E, Level II, single sampling

Defect classification (Note: * is not including)

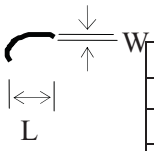
Classify	Item		Note	AQL
Major	Display state	Short or open circuit	1	0.65
		LC leakage		
		Flickering		
		No display		
		Wrong viewing direction		
		Contrast defect (dim, ghost)	2	
		Back-light	1,8	
	Non-display	Flat cable or pin reverse	10	
		Wrong or missing component	11	
Minor	Display state	Background color deviation	2	1.0
		Black spot and dust	3	
		Line defect, Scratch	4	
		Rainbow	5	
		Chip	6	
		Pin hole	7	
	Polarizer	Protruded	12	
		Bubble and foreign material	3	
	Soldering	Poor connection	9	
	Wire	Poor connection	10	
	TAB	Position, Bonding strength	13	

Note on defect classification

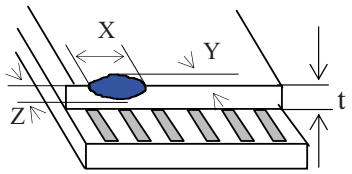
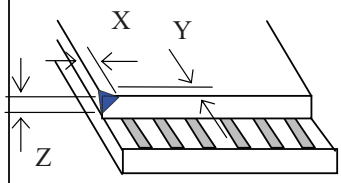
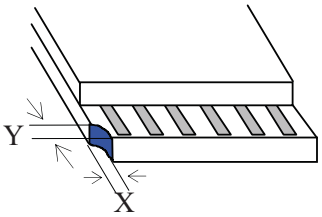
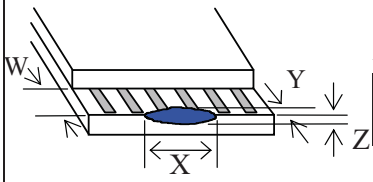
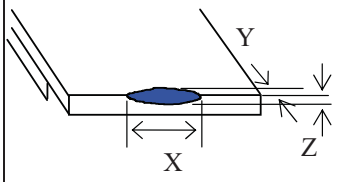
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td rowspan="6">1</td><td>Short or open circuit</td><td rowspan="6">Not allow</td></tr>
<tr><td>LC leakage</td></tr>
<tr><td>Flickering</td></tr>
<tr><td>No display</td></tr>
<tr><td>Wrong viewing direction</td></tr>
<tr><td>Wrong Back-light</td></tr>
<tr><td rowspan="2">2</td><td>Contrast defect</td><td rowspan="2">Refer to approval sample</td></tr>
<tr><td>Background color deviation</td></tr>
<tr><td>3</td><td>Point defect,
Black spot, dust
(including Polarizer)

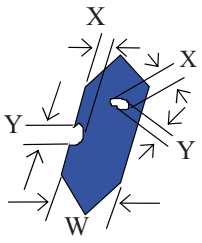
$\phi = (X+Y)/2$</td><td> 

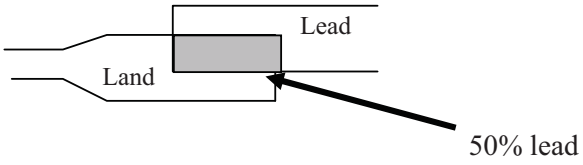
<table>
<tr><th>Point
Size</th><th>Acceptable Qty.</th></tr>
<tr><td>$\phi \leq 0.10$</td><td>Disregard</td></tr>
<tr><td>$0.10 < \phi \leq 0.20$</td><td>3</td></tr>
<tr><td>$0.20 < \phi \leq 0.25$</td><td>2</td></tr>
<tr><td>$0.25 < \phi \leq 0.30$</td><td>1</td></tr>
<tr><td>$\phi > 0.30$</td><td>0</td></tr>
</table>
Unit：mm</td></tr>
<tr><td>4</td><td>Line defect,

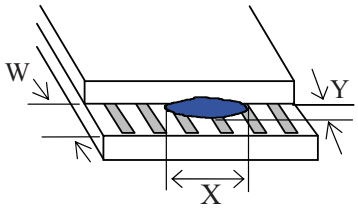
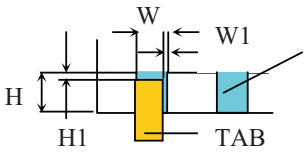
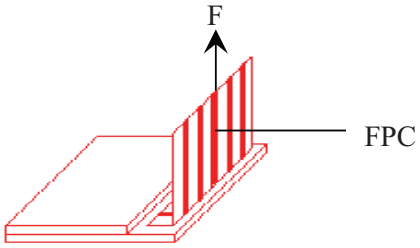
Scratch</td><td> 

<table>
<tr><th colspan="2">Line</th><th>Acceptable Qty.</th></tr>
<tr><td>L</td><td>W</td><td></td></tr>
<tr><td>---</td><td>$0.02 \geq W$</td><td>Disregard</td></tr>
<tr><td>$4.0 \geq L$</td><td>$0.03 \geq W > 0.02$</td><td rowspan="2">2</td></tr>
<tr><td>$2.0 \geq L$</td><td>$0.05 \geq W > 0.03$</td></tr>
<tr><td>$1.0 \geq L$</td><td>$0.1 > W > 0.05$</td><td>1</td></tr>
<tr><td>---</td><td>$0.1 < W$</td><td>Applied as point defect</td></tr>
</table>
Unit: mm</td></tr>
<tr><td>5</td><td>Rainbow</td><td>Not more than two color changes across the viewing area.</td></tr>
</table>

No	Item	Criterion
6	Chip Remark: X: Length direction Y: Short direction Z: Thickness direction t: Glass thickness W: Terminal Width	 Acceptable criterion X: ⩽2; Y: 0.5mm; Z: ⩽t/2  Acceptable criterion X: ⩽2; Y: 0.5mm; Z: ⩽t  Acceptable criterion X: ⩽3; Y: ⩽2; Z: ⩽t shall not reach to ITO  Acceptable criterion X: Disregard; Y: ⩽0.2; Z: ⩽t  Acceptable criterion X: ⩽5; Y: ⩽2; Z: ⩽t/3

<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>7</td><td>Segment
pattern
W = Segment width
ϕ = (X+Y)/2</td><td>(1) Pin hole
ϕ < 0.10mm is acceptable.
 

<table>
<tr><th>Point Size</th><th>Acceptable Qty</th></tr>
<tr><td>ϕ≤1/4W</td><td>Disregard</td></tr>
<tr><td>1/4W< ϕ≤1/2W</td><td>1</td></tr>
<tr><td>ϕ>1/2W</td><td>0</td></tr>
</table>
Unit: mm</td></tr>
<tr><td>8</td><td>Back-light</td><td>(1) The color of backlight should correspond its specification.
(2) Not allow flickering</td></tr>
<tr><td>9</td><td>Soldering</td><td>(1) Not allow heavy dirty and solder ball on PCB.
(The size of dirty refer to point and dust defect)
(2) Over 50% of lead should be soldered on Land.
 
</td></tr>
<tr><td>10</td><td>Wire</td><td>(1) Copper wire should not be rusted
(2) Not allow crack on copper wire connection.
(3) Not allow reversing the position of the flat cable.
(4) Not allow exposed copper wire inside the flat cable.</td></tr>
<tr><td>11*</td><td>PCB</td><td>(1) Not allow screw rust or damage.
(2) Not allow missing or wrong putting of component.</td></tr>
</table>

No	Item	Criterion
12	Protruded W: Terminal Width	 Acceptable criteria: Y ≤ 0.4
13	TAB	1. Position  W1≤1/3W H1≤1/3H 2 FPC bonding strength test  P (=F/FPC bonding width) ≥650gf/cm ,(speed rate: 1mm/min) 5pcs per SOA (shipment)
14	Total no. of acceptable Defect	A. Zone Maximum 2 minor non-conformities per one unit. Defect distance: each point to be separated over 10mm B. Zone It is acceptable when it is no trouble for quality and assembly in customer's end product.

11.3 Reliability of LCM

Reliability test condition:

Item	Condition	Time (hrs)	Assessment
High temp. Storage	60°C	48	No abnormalities in functions and appearance
High temp. Operating	50°C	48	
Low temp. Storage	-20°C	48	
Low temp. Operating	-10°C	48	
Humidity	40°C/ 90%RH	48	
Temp. Cycle	-20°C ← 25°C →60°C (60 min ← 5 min → 60min)	10cycles	

Recovery time should be 24 hours minimum. Moreover, functions, performance and appearance shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (20±8°C), normal humidity (below 65% RH), and in the area not exposed to direct sun light.

11.4 Precaution for using LCD/LCM

LCD/LCM is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification. The followings should be noted.

General Precautions:

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isoproply alcohol, ethyl alcohol or trichlorotriflorothane, do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not made any modification on the PCB without consulting Orient Display.
5. When mounting a LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.
7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

Static Electricity Precautions:

1. CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.
2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.
5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

Soldering Precautions:

1. Soldering should be performed only on the I/O terminals.
2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature: 280°C±10°C
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

Operation Precautions:

1. The viewing angle can be adjusted by varying the LCD driving voltage Vo.
2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage over 40°C is required, the relative humidity should be kept below 60%, and avoid direct sunlight.

Limited Warranty

Orient Display LCDs and modules are not consumer products, but may be incorporated by Orient Display's customers into consumer products or components thereof, Orient Display does not warrant that its LCDs and components are fit for any such particular purpose.

1. The liability of Orient Display is limited to repair or replacement on the terms set forth below. Orient Display will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between Orient Display and the customer, Orient Display will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with Orient Display general LCD inspection standard. (Copies available on request)
2. No warranty can be granted if any of the precautions state in handling liquid crystal display above has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.
3. In returning the LCD/LCM, they must be properly packaged; there should be detailed description of the failures or defect.