ORIENT DISPLAY

Your Total LCD Solution Provider

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SPECIFICATION
FOR
LCD MODULE

MODULE NO: AFS240400TG-2.8-M01-00
REVISION NO: 00

Customer's Approval:

	SIGNATURE	DATE
PREPARED BY (RD ENGINEER)	FR. LI	JUN-30-2009
CHECKED BY	SEAN	JUN-30-2009
APPROVED BY	RIO	JUN-30-2009

Orient Display (N.A.) Ltd.
145 Royal Crest Court Unit 42, Markham, ON, Canada L3R 9Z4
Tel: 905-477-1166 Fax: 905-477-1782

Orient Display (USA) Corp.
1315 NW Mall St. Suite 5, Issaquah, WA, USA 98027
Tel: 425-392-6880 Fax: 425-557-6560

DOCUMENT REVISION HISTORY

Version	DATE	DESCRIPTION	CHANGED BY
00	Jun-30-2009	First Issue	

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1. Features & Mechanical Specifications

Item	Contents	Unit
	LCD	
LCD Type	TFT Transmissive Normally White	--
Viewing direction	12 O'clock	--
Backlight	White LED Backlight	--
Interface	8080-16bit parallel interface	--
Driver IC	ILI9326	--
Outline Dimension	43.22(W) × 74.8(H) × 2.25(T)	mm
Glass area (H×V×T)	41.1 × 65.0/70.0 × 0.5	mm
Active area (H×V)	36.72 × 61.2	mm
Number of Dots	240(RGB) × 400	--
Pixel pitch (H×V)	0.153 × 0.153	mm
Dot pitch (H×V)	0.051 × 0.153	mm
Operating Temperature	-20 ～ +70	℃
Storage temperature	-30 ～ +80	℃

2. Dimensional Outline

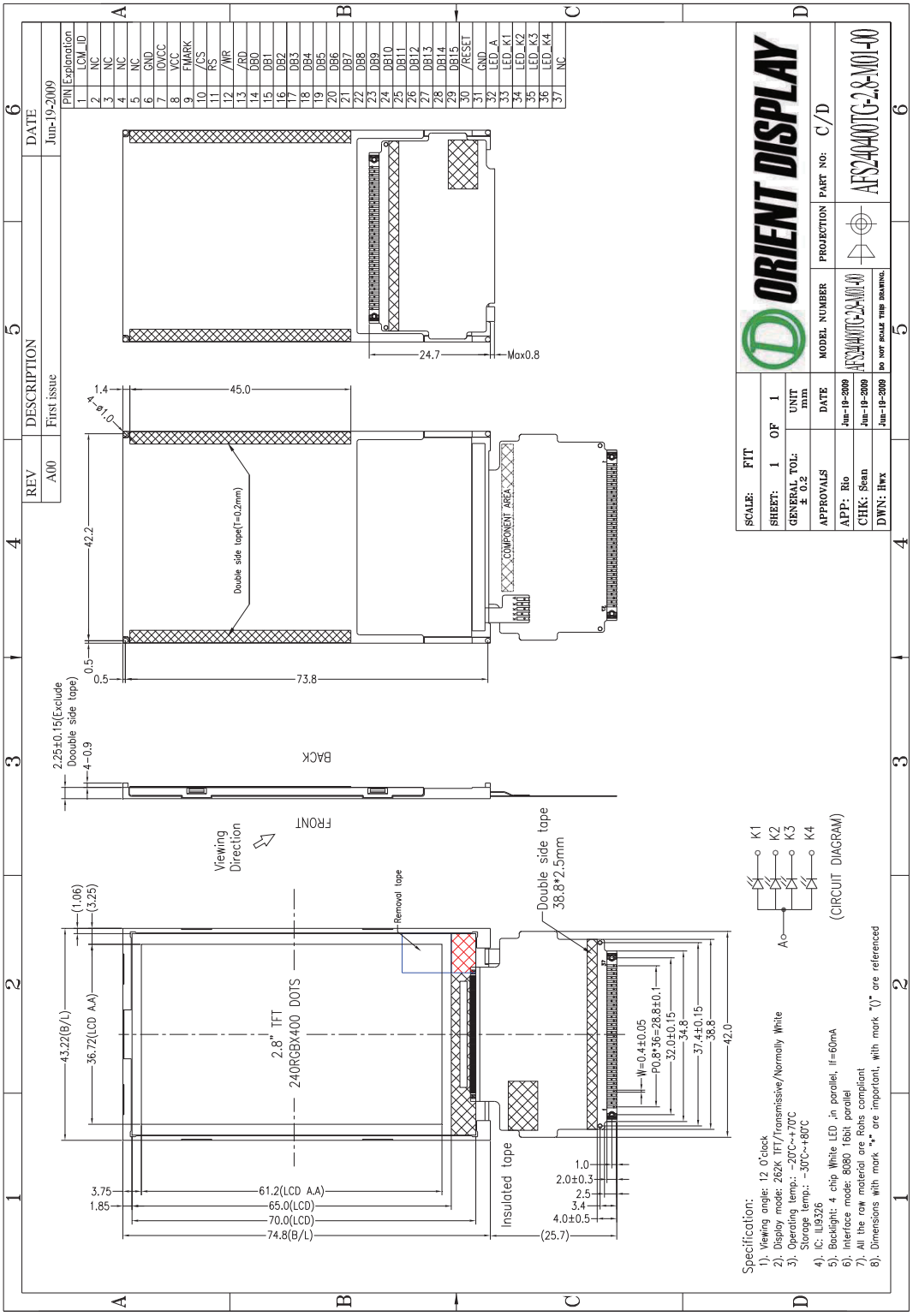


Figure 1. Dimensional outline

3. Block Diagram

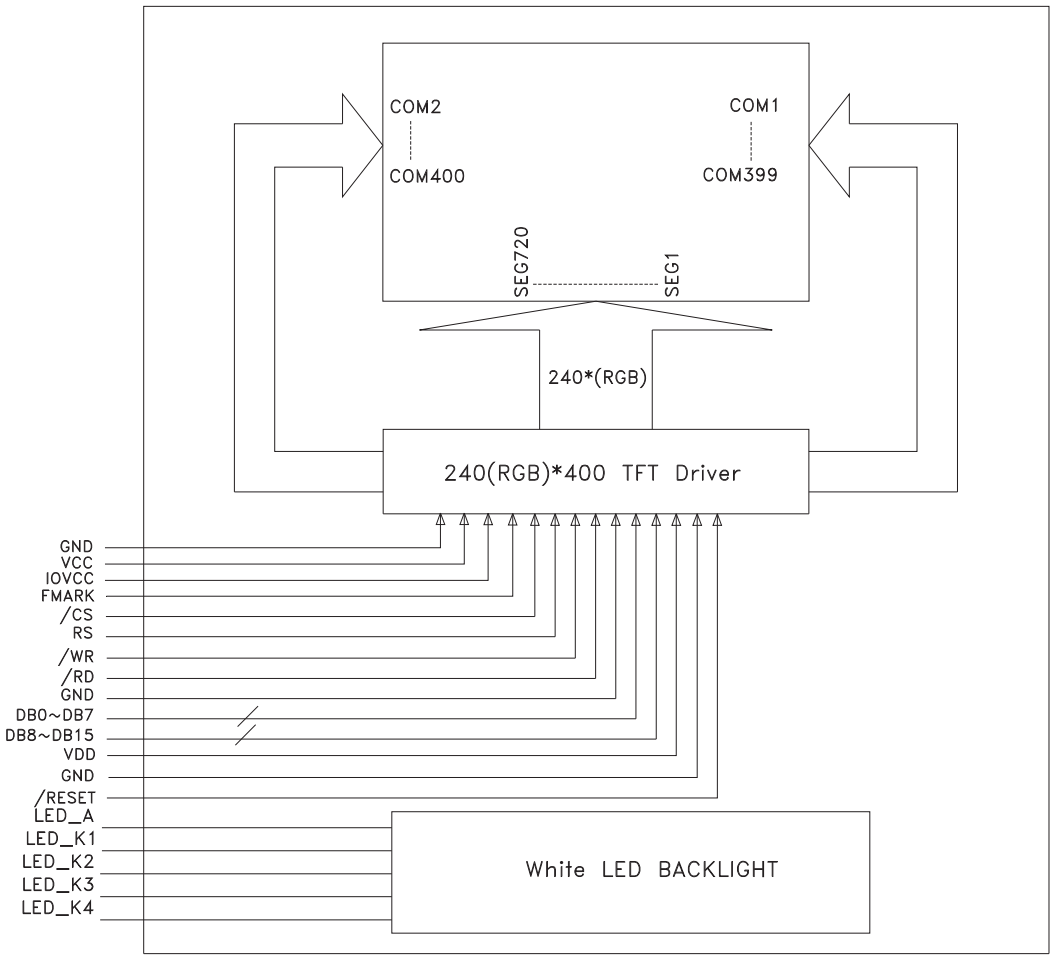


Figure 2. Block diagram

4. Pin Description

PIN No.	SYMBOL	Function
1	NC	No Connection.
2	NC	No Connection.
3	NC	No Connection.
4	NC	No Connection.
5	NC	No Connection.
6	GND	System Ground.
7	IOVCC	Power supply for I/O system.
8	VCC	Power supply for analog circuit, internal logic.
9	FMARK	Output a frame head pulse signal. Leave the pin open when not in use.
10	/CS	Chip Select input pin. (Active Low)
11	RS	A register select signal. Low: select an index or status register High: select a control register
12	/WR	Write Signal.
13	/RD	Read Signal.
14~21	DB0~DB7	Data Bus.
22~29	DB8~DB15	Data Bus.
30	/RESET	Reset Signal pin (“Low” is enable).
31	GND	System Ground.
32	LED_A	Backlight LED Anode.
33	LED_K1	Backlight LED1 Cathode.
34	LED_K2	Backlight LED2 Cathode.
35	LED_K3	Backlight LED3 Cathode.
36	LED_K4	Backlight LED4 Cathode.
37	NC	No Connection.

5. Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply Voltage range	VCI, IOVCC	-0.3 to +4.6	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
Power supply for analog circuit, internal logic.	VCC	2.5	2.8	3.3	V
Power supply for I/O system.	IOVCC	1.65	1.8/2.8	3.3	

7. Backlight Characteristics

White LED x 4 in Parallel **(Ta = 25°C)**

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=60mA	-	3.2	-	V
Uniformity	△Bp	-	80	-	-	%
Luminance for LCD	Lv	IF=60mA	2800	-	-	cd/m^2

8. Electro-Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.
Color Filter Chromacicity (Note.1)	White	x	θ=ϕ= 0°	(0.286)	(0.306)	(0.326)
		y		(0.320)	(0.340)	(0.360)
		Y		(26.8)	(30.8)	(34.8)
	Red	x	θ=ϕ= 0°	(0.635)	(0.655)	(0.675)
		y		(0.320)	(0.330)	(0.340)
		Y		(15.2)	(18.2)	(21.2)
	Green	x	θ=ϕ= 0°	(0.301)	(0.311)	(0.321)
		y		(0.555)	(0.575)	(0.595)
		Y		(54.5)	(58.5)	(62.5)
	Blue	x	θ=ϕ= 0°	(0.124)	(0.134)	(0.144)
		y		(0.121)	(0.136)	(0.151)
		Y		(12.6)	(15.6)	(18.6)

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

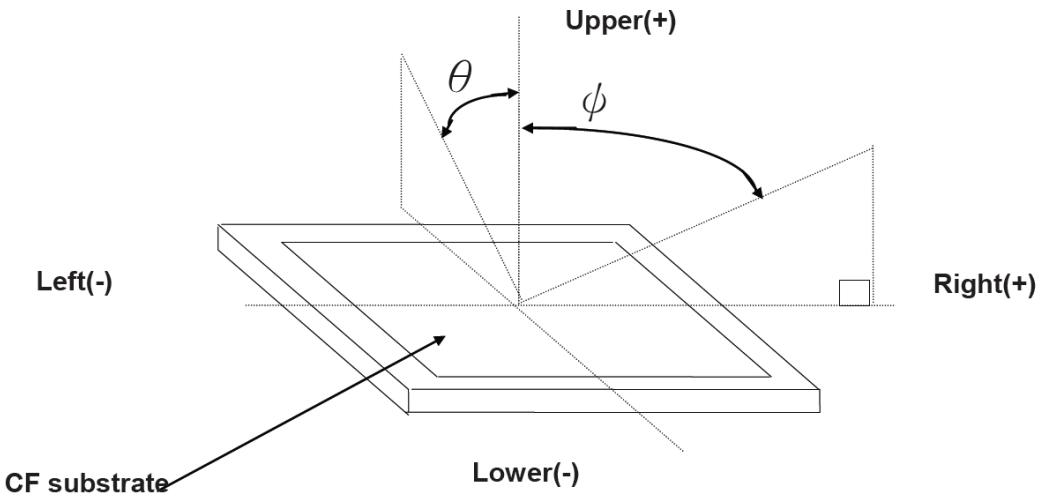


Fig.1 Definition of Viewing Angle

9. Instruction Description

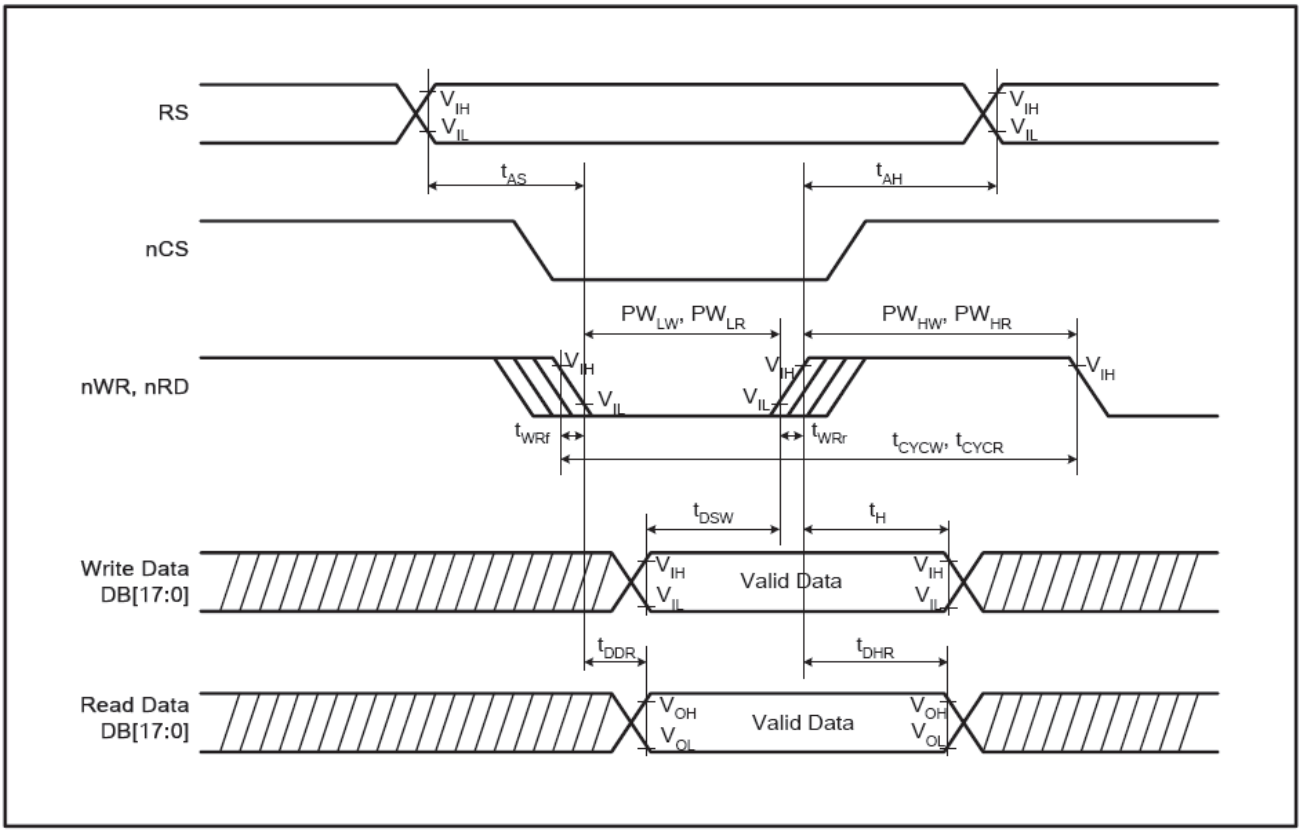
No.	Registers Name	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
IR	Index Register	W	0	-	-	-	-	-	ID10	ID9	ID8	ID7	ID6	ID5	ID4	ID3	ID2	ID1	ID0
001h	Driver Output Control 1	W	1	0	0	0	0	0	SM	0	SS	0	0	0	0	0	0	0	0
002h	LCD Driving Control	W	1	0	0	0	0	0	0	0	B/C	0	0	NW[5]	NW[4]	NW[3]	NW[2]	NW[1]	NW[01]
003h	Entry Mode	W	1	TRI	DFM	0	BGR	0	0	HWM	0	ORG	0	I/D1	I/D0	AM	0	EPF[1]	EPF[0]
006h	Outline Sharpening Control	W	1	EGMODE	0	0	0	0	0	AVST[2]	AVST[1]	AVST[0]	ADST[2]	ADST[1]	ADST[0]	DTHU[1]	DTHU [0]	DTHL[1]	DTHL [0]
007h	Display Control 1	W	1	0	0	PTDE1	PTDE0	0	0	0	BASEE	0	VON	GON	DTE	0	0	D1	D0
008h	Display Control 2	W	1	0	0	0	0	FP3	FP2	FP1	FP0	0	0	0	0	BP3	BP2	BP1	BP0
009h	Display Control 3	W	1	0	0	0	0	PTV	PTS2	PTS1	PTS0	0	0	PTG1	PTG0	ISC3	ISC2	ISC1	ISC0
00Bh	Low Power Control	W	1	0	0	0	0	0	0	0	0	0	0	0	VEM	0	0	0	COL
00Ch	RGB Display Interface Control 1	W	1	0	ENC2	ENC1	ENC0	0	0	0	RM	0	0	DM1	DM0	0	0	RIM1	RIM0
00Fh	RGB Display Interface Control 2	W	1	0	0	0	0	0	0	0	0	0	0	0	VSPL	HSPL	0	EPL	DPL
010h	Panel Interface Control 1	W	1	0	0	0	0	0	0	DIVI1	DIVI0	0	0	0	RTNI4	RTNI3	RTNI2	RTNI1	RTNI0
011h	Panel Interface Control 2	W	1	0	0	0	0	0	NOWI[2]	NOWI[1]	NOWI[0]	0	0	0	0	0	SDTI2	SDTI1	SDTI0
012h	Panel Interface Control 3	W	1	0	0	0	0	0	VEQWI1	VEQWI0	0	0	0	0	0	0	0	0	0
020h	Panel Interface Control 4	W	1	0	0	0	0	0	0	DIVE1	DIVE0	0	0	RTNE5	RTNE4	RTNE3	RTNE2	RTNE1	RTNE0
021h	Panel Interface Control 5	W	1	0	0	0	0	NOWE[3]	NOWE[2]	NOWE[1]	NOWE[0]	0	0	0	0	SDTE3	SDTE2	SDTE1	SDTE0
022h	Panel Interface Control 6	W	1	0	0	0	0	0	VEQWE2	VEQWE1	VEQWE0	0	0	0	0	0	0	0	0
090h	Frame Marker Position			FMKM	FMI2	FMI1	FMI0	0	0	0	FMP8	FMP7	FMP6	FMP5	FMP4	FMP3	FMP2	FMP1	FMP0
100h	Power Control 1			0	0	0	SAP	0	BT2	BT1	BT0	APE	AP2	AP1	AP0	0	0	SLP	STB
101h	Power Control 2			0	0	0	0	0	DC12	DC11	DC10	0	DC02	DC01	DC00	0	VC2	VC1	VC0
102h	Power Control 3			0	0	0	0	0	0	0	0	VREG1R	0	PSON	PON	VRH3	VRH2	VRH1	VRH0
103h	Power Control 4			0	0	VCOMG	VDV4	VDV3	VDV2	VDV1	VDV0	0	0	0	0	0	0	0	0
107h	Power Control 5			0	0	0	0	0	0	0	0	0	0	DCM1	DCM0	DCT3	DCT2	DCT1	DCT0
200h	Horizontal GRAM Address Set	W	1	0	0	0	0	0	0	0	0	AD7	AD6	AD5	AD4	AD3	AD2	AD1	AD0
201h	Vertical GRAM Address Set	W	1	0	0	0	0	0	0	0	AD16	AD15	AD14	AD13	AD12	AD11	AD10	AD9	AD8
202h	Write Data to GRAM	W	1	D[17:0] write to GRAM															
20Bh	Frame Rate and Color Control	W	1	0	0	0	0	0	0	0	0	0	0	0	0	FRS3	FRS2	FRS1	FRS0
210h	Horizontal Address Start Position	W	1	0	0	0	0	0	0	0	0	HSA7	HSA6	HSA5	HSA4	HSA3	HSA2	HSA1	HSA0
211h	Horizontal Address End Position	W	1	0	0	0	0	0	0	0	0	HEA7	HEA6	HEA5	HEA4	HEA3	HEA2	HEA1	HEA0
212h	Vertical Address Start Position	W	1	0	0	0	0	0	0	0	VSA8	VSA7	VSA6	VSA5	VSA4	VSA3	VSA2	VSA1	VSA0
213h	Vertical Address End Position	W	1	0	0	0	0	0	0	0	VEA8	VEA7	VEA6	VEA5	VEA4	VEA3	VEA2	VEA1	VEA0
280h	User Identification Code	R	1	0	0	0	0	0	0	0	0	0	0	0	0	UID3	UID2	UID1	UID0
281h	VCOM High Voltage (VCOMH)	W	1	0	0	0	0	0	0	0	0	0	0	VCM5	VCM4	VCM3	VCM2	VCM1	VCM0
290h	MTP VCM Programming	W	1	UID_PGM_EN	0	0	0	VCM_PGM_EN	0	0	0	0	0	MTP_D5	MTP_D4	MTP_D3	MTP_D2	MTP_D1	MTP_D0
291h	MTP VCM Status and Enable	R/W		PGM_CNT1	PGM_CNT0	VCM_D5	VCM_D4	VCM_D3	VCM_D2	VCM_D1	VCM_D0	0	0	0	0	0	0	0	VCM_EN
295h	MTP Programming Key	R/W		KEY15	KEY14	KEY13	KEY12	KEY11	KEY10	KEY9	KEY8	KEY7	KEY6	KEY5	KEY4	KEY3	KEY2	KEY1	KEY0
300h	Gamma Control 1	W	1	0	0	0	0	0	KP1[2]	KP1[1]	KP1[0]	0	0	0	0	0	KP0[2]	KP0[1]	KP0[0]
301h	Gamma Control 2	W	1	0	0	0	0	0	KP3[2]	KP3[1]	KP3[0]	0	0	0	0	0	KP2[2]	KP2[1]	KP2[0]
302h	Gamma Control 3	W	1	0	0	0	0	0	KP5[2]	KP5[1]	KP5[0]	0	0	0	0	0	KP4[2]	KP4[1]	KP4[0]
305h	Gamma Control 4	W	1	0	0	0	0	0	RP1[2]	RP1[1]	RP1[0]	0	0	0	0	0	RP0[2]	RP0[1]	RP0[0]
306h	Gamma Control 5	W	1	0	0	0	VRP1[4]	VRP1[3]	VRP1[2]	VRP1[1]	VRP1[0]	0	0	0	0	VRP0[3]	VRP0[2]	VRP0[1]	VRP0[0]
307h	Gamma Control 6	W	1	0	0	0	0	0	KN1[2]	KN1[1]	KN1[0]	0	0	0	0	0	KN0[2]	KN0[1]	KN0[0]
308h	Gamma Control 7	W	1	0	0	0	0	0	KN3[2]	KN3[1]	KN3[0]	0	0	0	0	0	KN2[2]	KN2[1]	KN2[0]
309h	Gamma Control 8	W	1	0	0	0	0	0	KN5[2]	KN5[1]	KN5[0]	0	0	0	0	0	KN4[2]	KN4[1]	KN4[0]
30Ch	Gamma Control 9	W	1	0	0	0	0	0	RN1[2]	RN1[1]	RN1[0]	0	0	0	0	0	RN0[2]	RN0[1]	RN0[0]
30Dh	Gamma Control 10	W	1	0	0	0	VRN1[4]	VRN1[3]	VRN1[2]	VRN1[1]	VRN1[0]	0	0	0	0	VRN0[3]	VRN0[2]	VRN0[1]	VRN0[0]
400h	Base Image Display Control 1	W	1	GS	0	NL5	NL4	NL3	NL2	NL1	NL0	0	0	SCN5	SCN4	SCN3	SCN2	SCN1	SCN0
401h	Base Image Display Control 2	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	NDL	VLE	REV
404h	Base Image Display Control 3	W	1	0	0	0	0	0	0	0	VL8	VL7	VL6	VL5	VL4	VL3	VL2	VL1	VL0
500h	Partial Image 1 Display Position	W	1	0	0	0	0	0	0	0	PTDP08	PTDP07	PTDP06	PTDP05	PTDP04	PTDP03	PTDP02	PTDP01	PTDP00
510h	Partial Image 1 Area (Start Line)	W	1	0	0	0	0	0	0	0	PTSA08	PTSA07	PTSA06	PTSA05	PTSA04	PTSA03	PTSA02	PTSA01	PTSA00
502h	Partial Image 1 Area (End Line)	W	1	0	0	0	0	0	0	0	PTEA08	PTEA07	PTEA06	PTEA05	PTEA04	PTEA03	PTEA02	PTEA01	PTEA00
503h	Partial Image 2 Display Position	W	1	0	0	0	0	0	0	0	PTDP18	PTDP17	PTDP16	PTDP15	PTDP14	PTDP13	PTDP12	PTDP11	PTDP10
504h	Partial Image 2 Area (Start Line)	W	1	0	0	0	0	0	0	0	PTSA18	PTSA17	PTSA16	PTSA15	PTSA14	PTSA13	PTSA12	PTSA11	PTSA10
505h	Partial Image 2 Area (End Line)	W	1	0	0	0	0	0	0	0	PTEA18	PTEA17	PTEA16	PTEA15	PTEA14	PTEA13	PTEA12	PTEA11	PTEA10

10. AC Characteristics

i80-System Interface Timing Characteristics

Normal Write Mode (IOVCC = 1.65~3.3V, VCC=2.4~3.3V)

Item		Symbol	Unit	Min.	Typ.	Max.	Test Condition
Bus cycle time	Write	t_{CYCW}	ns	100	-	-	-
	Read	t_{CYCR}	ns	300	-	-	-
Write low-level pulse width		PW_{LW}	ns	50	-	500	-
Write high-level pulse width		PW_{HW}	ns	50	-	-	-
Read low-level pulse width		PW_{LR}	ns	150	-	-	-
Read high-level pulse width		PW_{HR}	ns	150	-	-	
Write / Read rise / fall time		t_{WRr}/t_{WRf}	ns	-	-	25	
Setup time	Write (RS to nCS, E/nWR)	t_{AS}	ns	10	-	-	
	Read (RS to nCS, RW/nRD)			5	-	-	
Address hold time		t_{AH}	ns	5	-	-	
Write data set up time		t_{DSW}	ns	10	-	-	
Write data hold time		t_H	ns	15	-	-	
Read data delay time		t_{DDR}	ns	-	-	100	
Read data hold time		t_{DHR}	ns	5	-	-	



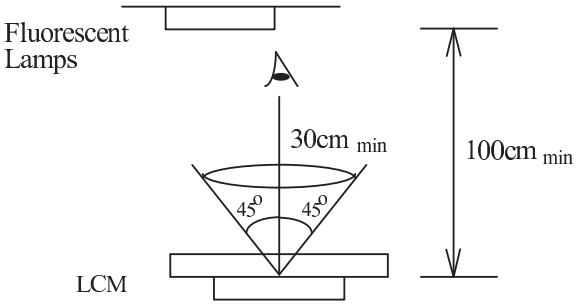
11.Quality Specifications

All The raw material are Rohs compliant.

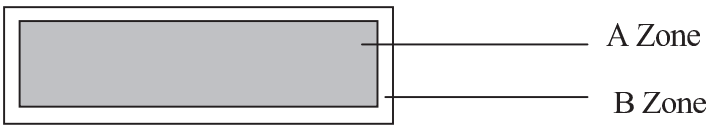
11.1 Standard of the product appearance test

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

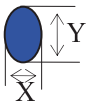
Sampling method: MIL-STD-105E, Level II, single sampling

Defect classification (Note: * is not including)

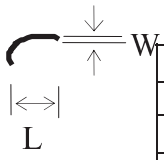
Classify	Item		Note	AQL
Major	Display state	Short or open circuit	1	0.65
		LC leakage		
		Flickering		
		No display		
		Wrong viewing direction		
		Contrast defect (dim, ghost)	2	
		Back-light	1,8	
	Non-display	Flat cable or pin reverse	10	
		Wrong or missing component	11	
Minor	Display state	Background 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

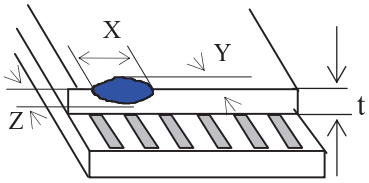
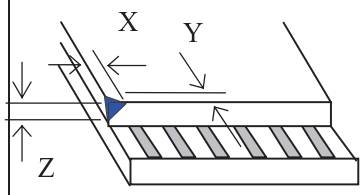
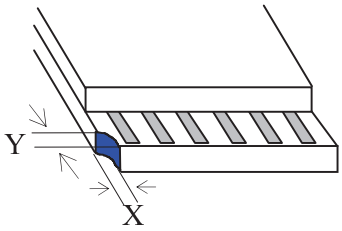
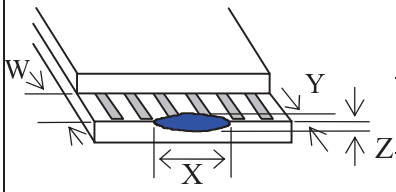
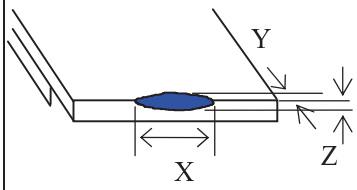
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td rowspan="6">1</td><td>Short or open circuit</td><td rowspan="6">Not allow</td></tr>
<tr><td>LC leakage</td></tr>
<tr><td>Flickering</td></tr>
<tr><td>No display</td></tr>
<tr><td>Wrong viewing direction</td></tr>
<tr><td>Wrong Back-light</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)

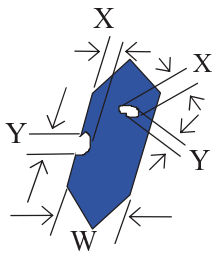
$\phi = (X+Y)/2$</td><td> 

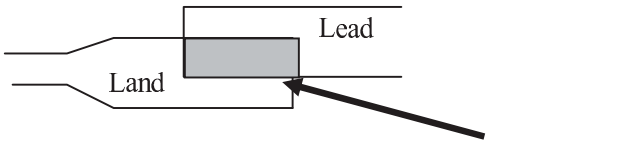
<table>
<tr><th>Point
Size</th><th>Acceptable Qty.</th></tr>
<tr><td>$\phi \leq 0.10$</td><td>Disregard</td></tr>
<tr><td>$0.10 < \phi \leq 0.20$</td><td>3</td></tr>
<tr><td>$0.20 < \phi \leq 0.25$</td><td>2</td></tr>
<tr><td>$0.25 < \phi \leq 0.30$</td><td>1</td></tr>
<tr><td>$\phi > 0.30$</td><td>0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

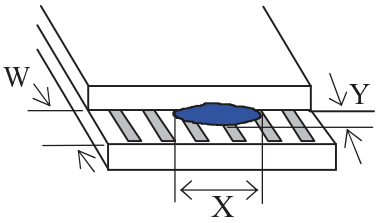
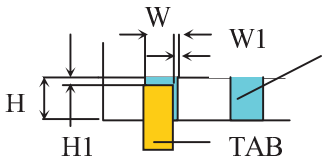
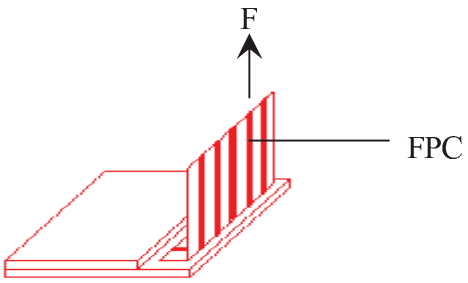
Scratch</td><td> 

<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≥W</td><td>Disregard</td></tr>
<tr><td>4.0≥L</td><td>0.03≥W>0.02</td><td rowspan="2">2</td></tr>
<tr><td>2.0≥L</td><td>0.05≥W>0.03</td></tr>
<tr><td>1.0≥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 OD's customers into consumer products or components thereof, OD does not warrant that its LCDs and components are fit for any such particular purpose.

1. The liability of OD is limited to repair or replacement on the terms set forth below. OD 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 OD and the customer, OD will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with OD 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.