ORIENT DISPLAY

Your Total LCD Solution Provider

http://www.orientdisplay.com

SPECIFICATION
FOR
TFT MODULE

MODULE NO: AFS320240TG-2.3-A200001
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	Dec-5-2011	First Issue	Ylh

CONTENTS

1. Features & Mechanical Specifications

Item	Contents	Unit
	LCD	
LCD Type	TFT / Transmissive / Normal White	--
Viewing direction	6 O'clock	--
Backlight	4 Chip White LED in serial	--
Interface	8080-8/bit parallel bus interface	--
Driver IC	HX8368-A03	--
Outline Dimension	50.9(W) × 45.8(H) × 2.3(T)	mm
Glass area (W×H×T)	49.752 ×41.664× 1.0	mm
Active area (W×H)	46.752 × 35.064	mm
Number of Dots	320(RGB) × 240	--
Dot pitch (W×H)	0.1461 × 0.1461	mm
Pixel pitch (W×H)	0.0487 × 0.0487	mm
Operating Temperature	-20 ～ +70	℃
Storage temperature	-30 ～ +80	℃

2. Dimensional Outline

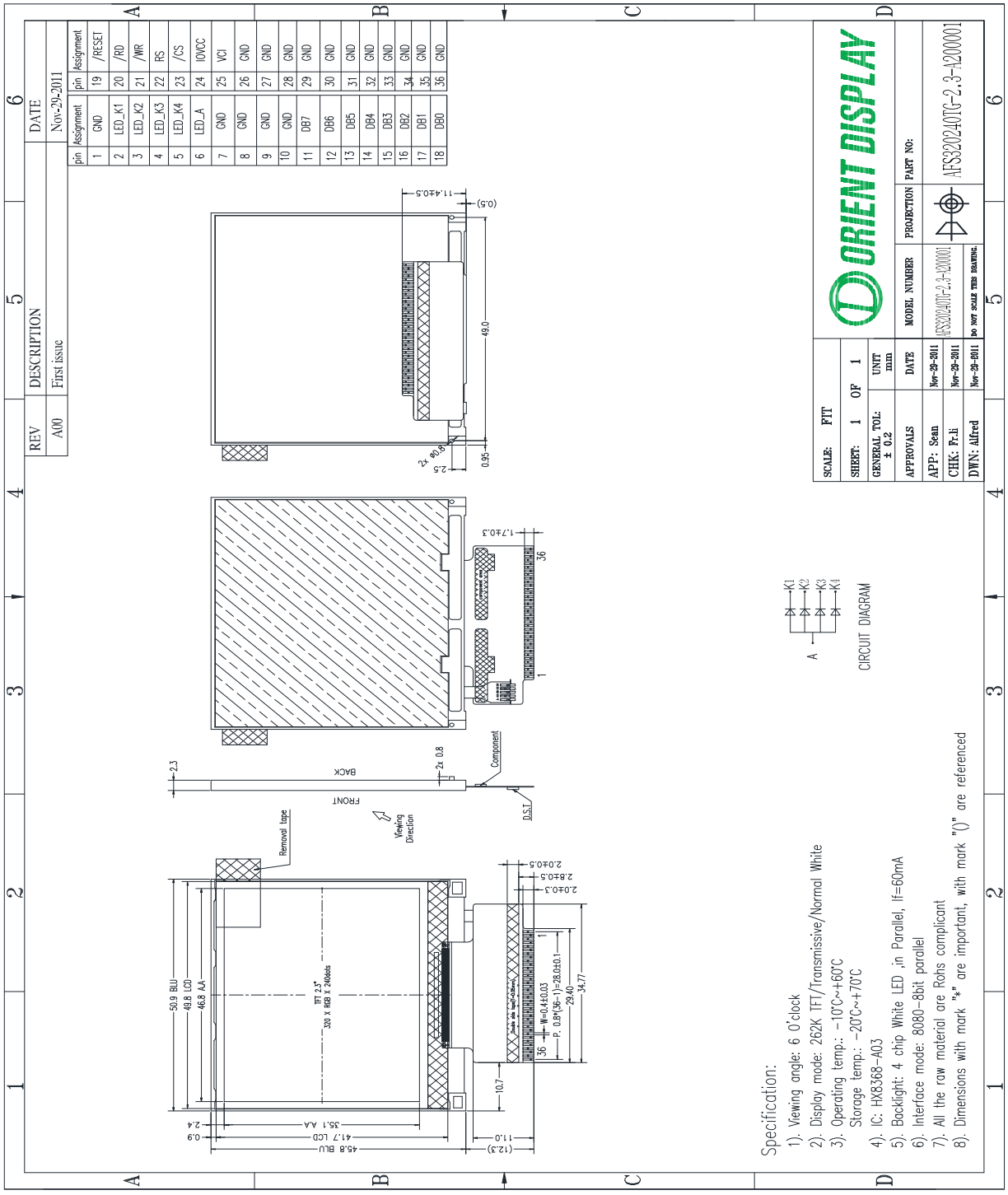


Figure 1. Dimensional outline

3. Block Diagram

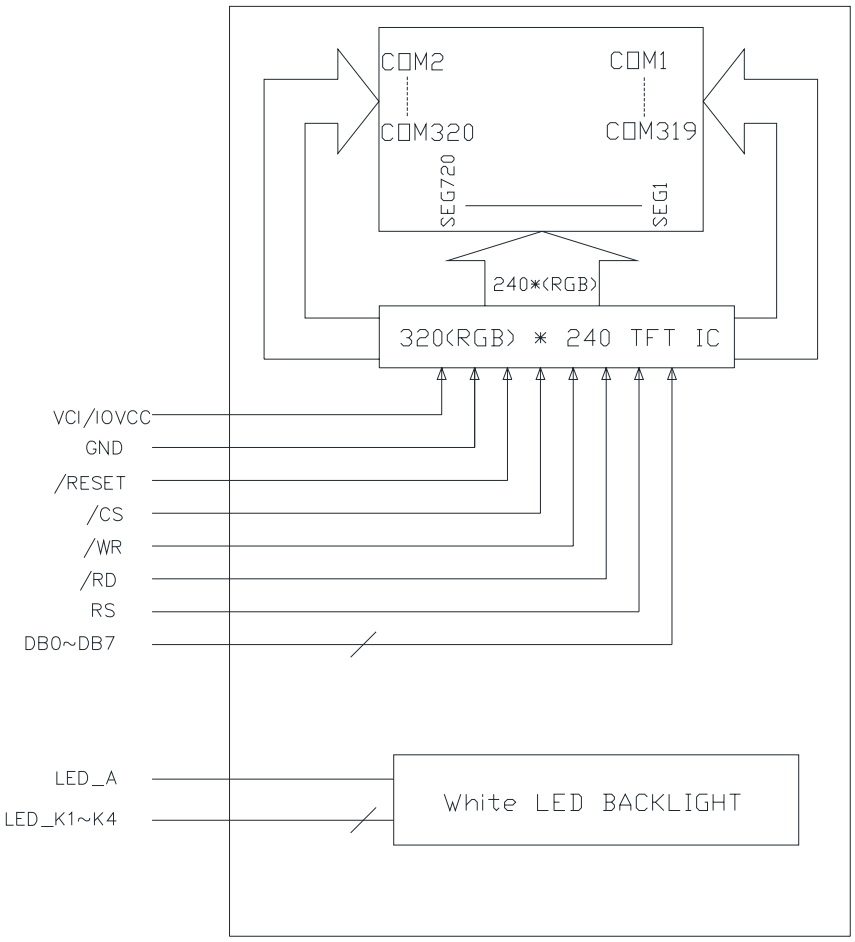


Figure 2. Block diagram

4. Pin Description

PIN No.	SYMBOL	Function
1	GND	Ground
2~5	LED_K1~K4	Backlight LED Cathode
6	LED_A	Backlight LED Anode
7~10	GND	Ground
11~18	DB7~DB0	Data Bus
19	/RESET	Reset pin. (Active Low)
20	/RD	Read signal input pin. (Active Low)
21	/WR	Write signal input pin. (Active Low)
22	RS	Data or command select pin. “H”: Date, “L”: Command.
23	/CS	Chip Select input pin. (Active Low)
24	IOVCC	Power supply for I/O
25	VCI	Power supply for Analog
26~36	GND	Ground

5. Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply Voltage range	VCI	-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
Logic Supply Voltage	VCI	2.5	-	3.3	V

7. Backlight Characteristics

White LED × 3 **(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	3200	-	-	cd/m^2

8. Electro-Optical Characteristics

Item	Symbol	Specification			Unit	Remark
		Min	Typ	Max		
TFT gate on voltage	VGH	-	15	-	V	
TFT gate off voltage	VGL	-	-10	-	V	

Note:
(1) Vcom must be adjusted to optimize display quality: cross talk, contrast ratio and etc.
(2) VGH is TFT gate operating voltage
(3) VGL is TFT gate operating voltage
The storage capacitance structure of this product is Cst(Storage on Common).
The low voltage level of VGL signal must be fluctuated with same phase as Vcom, in case of Storage on Gate structure.
(4) Environmental condition : 25℃.

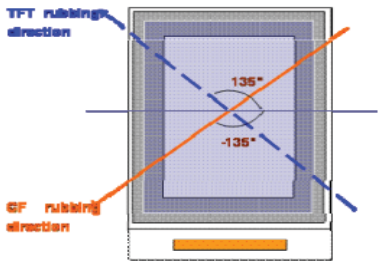
EWV Polarizer;Ta=25℃

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	60	70	-	Degree	Note 2
		θB		50	60	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	400	500	-	-	Note1 Note3
Response Time		T_{ON}	25℃	-	20	30	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	C-Light	0.255	0.305	0.355	-	Note5 Note1
		y		0.311	0.361	0.411		
	Red	x		0.571	0.621	0.671		
		y		0.269	0.319	0.369		
	Green	x		0.252	0.302	0.352		
		y		0.515	0.565	0.615		
	Blue	x		0.087	0.137	0.187		
		y		0.114	0.164	0.214		
NTSC		-	-	45	50	-	%	Note 5
Transmittance		T	-	6.0	6.3	-	%	Note1

Test Conditions:

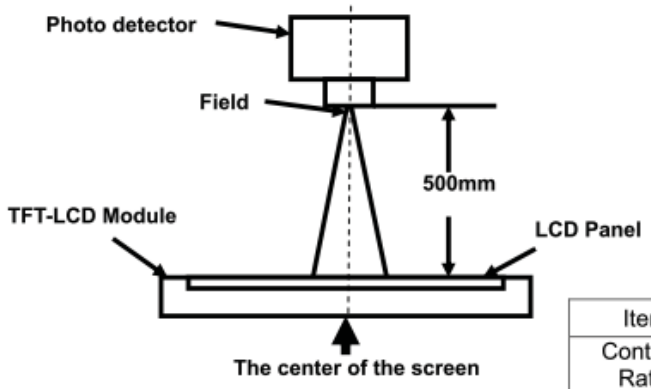
1. The ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

6.2 Rubbing Direction



Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Chromaticity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。

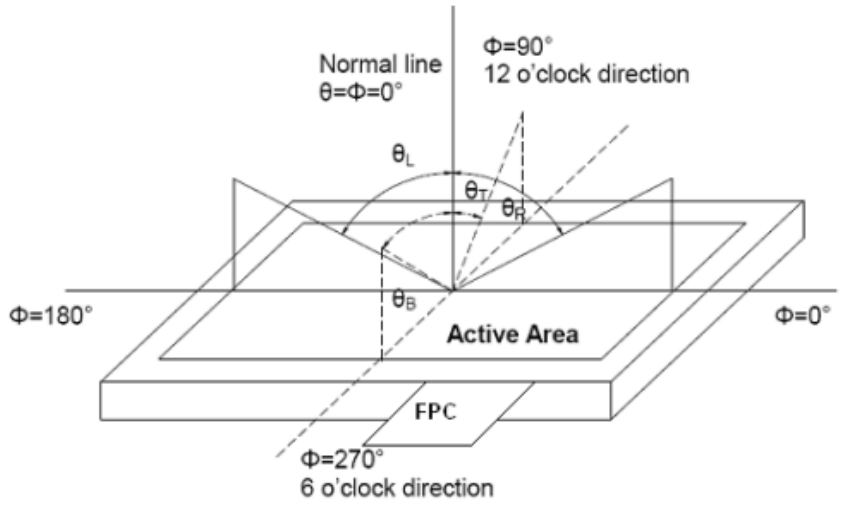


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

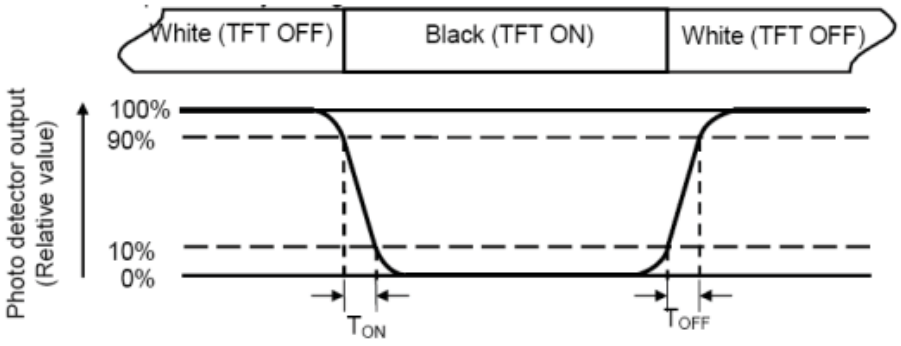
“White state “:The state is that the LCD should driven by Vwhite.

“Black state”: The state is that the LCD should driven by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

9. Instruction Description

OTP_INDEX	D7	D6	D5	D4	D3	D2	D1	D0
0x00h	ID17	ID16	ID15	ID14	ID13	ID12	ID11	ID10
0x01h	ID27	ID26	ID25	ID24	ID23	ID22	ID21	ID20
0x02h	ID37	ID36	ID35	ID34	ID33	ID32	ID31	ID30
0x03h	VMF17	VMF16	VMF15	VMF14	VMF13	VMF12	VMF11	VMF10
0x04h	VMF27	VMF26	VMF25	VMF24	VMF23	VMF22	VMF21	VMF20
0x05h	VMF37	VMF36	VMF35	VMF34	VMF33	VMF32	VMF31	VMF30
0x06h	VMH7	VMH6	VMH5	VMH4	VMH3	VMH2	VMH1	VMH0
0x07h	VML7	VML6	VML5	VML4	VML3	VML2	VML1	VML0
0x08h	Vaild_ID	SELF_DIAG	CLR_RAM	Valid_VML	Valid_VMH	Valid_VMF3	Valid_VMF2	Valid_VMF1
0x09h	Valid_panel	VPNL_ENB	DDVDH_TRI	SM_Panel	SS_Panel	GS_Panel	REV_Panel	BGR_Panel
0x0Ah	Himax internal use (not open)							
0x0Bh	Himax internal use (not open)							
0x0Ch	Himax internal use (not open)							
0x0Dh	Himax internal use (not open)							
0x0Eh	Himax internal use (not open)							
0x0Fh	Himax internal use (not open)							
0x10h	Himax internal use (not open)							
0x11h	Himax internal use (not open)							
0x12h	Himax internal use (not open)							
0x13h	Himax internal use (not open)							
0x14h	Himax internal use (not open)							
0x15h	Himax internal use (not open)							
0x16h	Himax internal use (not open)							
0x17h	Himax internal use (not open)							
0x18h	ID47	ID46	ID45	ID44	ID43	ID42	ID41	ID40
0x19h	Himax internal use (not open)							
0x1Ah	Himax internal use (not open)							
0x1Bh	Himax internal use (not open)							
0x1Ch	Himax internal use (not open)							
0x1Dh	Himax internal use (not open)							
0x1Eh	Himax internal use (not open)							
0x1Fh	Himax internal use (not open)							
0x20h	Himax internal use (not open)							
0x21h	Himax internal use (not open)							
0x22h	Himax internal use (not open)							
0x23h	Valid_gamma1	(no use)	VRP0[5:0]					
0x24h	(no use)	(no use)	VRP1[5:0]					
0x25h	(no use)	(no use)	VRP2[5:0]					
0x26h	(no use)	(no use)	VRP3[5:0]					
0x27h	(no use)	PRP0[6:0]						
0x28h	(no use)	RPR1[6:0]						
0x29h	VRP4[5:3]			PKP0[4:0]				
0x2Ah	VRP4[2:0]			PKP1[4:0]				
0x2Bh	VRP5[5:3]			PKP2[4:0]				
0x2Ch	VRP5[2:0]			PKP3[4:0]				
0x2Dh	(no use)	(no use)	(no use)	PKP4[4:0]				

0x2Eh	(no use)	(no use)	VRN0[5:0]			
0x2Fh	(no use)	(no use)	VRN1[5:0]			
0x30h	(no use)	(no use)	VRN2[5:0]			
0x31h	(no use)	(no use)	VRN3[5:0]			
0x32h	(no use)	PRN0[6:0]				
0x33h	(no use)	PRN1[6:0]				
0x34h	VRN4[5:3]		PKN0[4:0]			
0x35h	VRN4[2:0]		PKN1[4:0]			
0x36h	VRN5[5:3]		PKN2[4:0]			
0x37h	VRN5[2:0]		PKN3[4:0]			
0x38h	(no use)	(no use)	(no use)	PKN4[4:0]		
0x39h	CGMN1[1:0]		CGMN0[1:0]		CGMP1[1:0]	CGMP0[1:0]
0x3Ah	Valid_gamma2	(no use)	VRP0[5:0]			
0x3Bh	(no use)	(no use)	VRP1[5:0]			
0x3Ch	(no use)	(no use)	VRP2[5:0]			
0x3Dh	(no use)	(no use)	VRP3[5:0]			
0x3Eh	(no use)	PRP0[6:0]				
0x3Fh	(no use)	RPR1[6:0]				
0x40h	VRP4[5:3]		PKP0[4:0]			
0x41h	VRP4[2:0]		PKP1[4:0]			
0x42h	VRP5[5:3]		PKP2[4:0]			
0x43h	VRP5[2:0]		PKP3[4:0]			
0x44h	(no use)	(no use)	(no use)	PKP4[4:0]		
0x45h	(no use)	(no use)	VRN0[5:0]			
0x46h	(no use)	(no use)	VRN1[5:0]			
0x47h	(no use)	(no use)	VRN2[5:0]			
0x48h	(no use)	(no use)	VRN3[5:0]			
0x49h	(no use)	PRN0[6:0]				
0x4Ah	(no use)	PRN1[6:0]				
0x4Bh	VRN4[5:3]		PKN0[4:0]			
0x4Ch	VRN4[2:0]		PKN1[4:0]			
0x4Dh	VRN5[5:3]		PKN2[4:0]			
0x4Eh	VRN5[2:0]		PKN3[4:0]			
0x4Fh	(no use)	(no use)	(no use)	PKN4[4:0]		
0x50h	CGMN1[1:0]		CGMN0[1:0]		CGMP1[1:0]	CGMP0[1:0]
0x51h	Valid_gamma3	(no use)	VRP0[5:0]			
0x52h	(no use)	(no use)	VRP1[5:0]			
0x53h	(no use)	(no use)	VRP2[5:0]			
0x54h	(no use)	(no use)	VRP3[5:0]			
0x55h	(no use)	PRP0[6:0]				
0x56h	(no use)	RPR1[6:0]				
0x57h	VRP4[5:3]		PKP0[4:0]			
0x58h	VRP4[2:0]		PKP1[4:0]			
0x59h	VRP5[5:3]		PKP2[4:0]			
0x5Ah	VRP5[2:0]		PKP3[4:0]			
0x5Bh	(no use)	(no use)	(no use)	PKP4[4:0]		
0x5Ch	(no use)	(no use)	VRN0[5:0]			
0x5Dh	(no use)	(no use)	VRN1[5:0]			
0x5Eh	(no use)	(no use)	VRN2[5:0]			
0x5Fh	(no use)	(no use)	VRN3[5:0]			
0x60h	(no use)	PRN0[6:0]				
0x61h	(no use)	PRN1[6:0]				

0x62h	VRN4[5:3]			PKN0[4:0]			
0x63h	VRN4[2:0]			PKN1[4:0]			
0x64h	VRN5[5:3]			PKN2[4:0]			
0x65h	VRN5[2:0]			PKN3[4:0]			
0x66h	(no use)	(no use)	(no use)	PKN4[4:0]			
0x67h	CGMN1[1:0]		CGMN0[1:0]		CGMP1[1:0]		CGMP0[1:0]
0x68h	Valid_gamma4	(no use)	VRP0[5:0]				
0x69h	(no use)	(no use)	VRP1[5:0]				
0x6Ah	(no use)	(no use)	VRP2[5:0]				
0x6Bh	(no use)	(no use)	VRP3[5:0]				
0x6Ch	(no use)	PRP0[6:0]					
0x6Dh	(no use)	RPR1[6:0]					
0x6Eh	VRP4[5:3]			PKP0[4:0]			
0x6Fh	VRP4[2:0]			PKP1[4:0]			
0x70h	VRP5[5:3]			PKP2[4:0]			
0x71h	VRP5[2:0]			PKP3[4:0]			
0x72h	(no use)	(no use)	(no use)	PKP4[4:0]			
0x73h	(no use)	(no use)	VRN0[5:0]				
0x74h	(no use)	(no use)	VRN1[5:0]				
0x75h	(no use)	(no use)	VRN2[5:0]				
0x76h	(no use)	(no use)	VRN3[5:0]				
0x77h	(no use)	PRN0[6:0]					
0x78h	(no use)	PRN1[6:0]					
0x79h	VRN4[5:3]			PKN0[4:0]			
0x7Ah	VRN4[2:0]			PKN1[4:0]			
0x7Bh	VRN5[5:3]			PKN2[4:0]			
0x7Ch	VRN5[2:0]			PKN3[4:0]			
0x7Dh	(no use)	(no use)	(no use)	PKN4[4:0]			
0x7Eh	CGMN1[1:0]		CGMN0[1:0]		CGMP1[1:0]		CGMP0[1:0]
0x7Fh	Himax internal use (not open)						

10. AC Characteristics

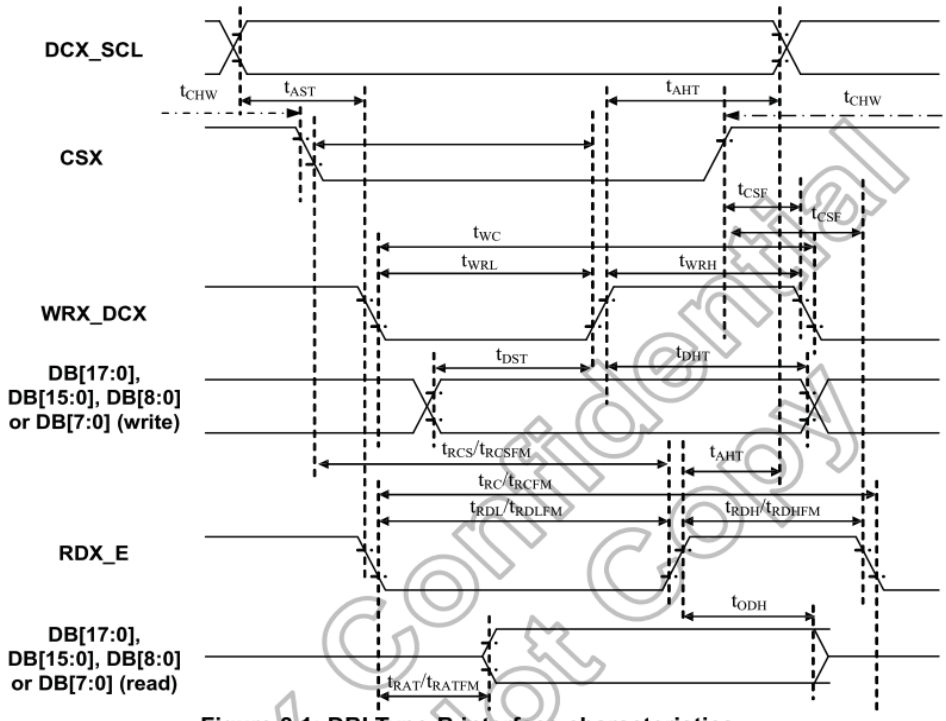


Figure 8.1: DBI Type-B interface characteristics

(VSSA=0V, IOVCC=1.65V to 3.3V, VCC=2.3V to 3.3V, VCI=2.3V to 3.3V, T_A = -30 to 70℃)

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
DCX_SCL	t_{AST}	Address setup time	0	-	ns	-
	t_{AHT}	Address hold time (Write/Read)	10	-		
CSX	t_{CHW}	CSX "H" Pulse Width	0	-	ns	-
	t_{CS}	Chip Select setup time (Write)	15	-		
	t_{RCS}	Chip Select setup time (Read ID)	45	-		
	t_{RCSFM}	Chip Select setup time (Read FM)	355	-		
	t_{CSF}	Chip Select Wait time (Write/Read)	10	-		
WRX_DCX	t_{WC}	Write cycle	66	-	ns	-
	t_{WRH}	Control pulse H duration	15	-		
	t_{WRL}	Control pulse L duration	15	-		
RDX_E (ID)	t_{RC}	Read cycle (ID)	160	-	ns	When read ID data
	t_{RDH}	Control pulse H duration (ID)	90	-		
	t_{RDL}	Control pulse L duration (ID)	45	-		
RDX_E (FM)	t_{RCFM}	Read cycle (FM)	450	-	ns	When read from frame memory
	t_{RDHFM}	Control pulse H duration (FM)	90	-		
	t_{RDLFM}	Control pulse L duration (FM)	355	-		
DB[17:0], DB[15:0], DB[8:0], or DB[7:0]	t_{DST}	Data setup time	10	-	ns	For maximum C_L=30pF For minimum C_L=8pF
	t_{DHT}	Data hold time	10	-		
	t_{RAT}	Read access time (ID)	-	40		
	t_{RATFM}	Read access time (FM)	-	340		
	t_{ODH}	Output disable time	20	80		

Note: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.
Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.
t_{WC} min is 100nS at 18-bit mode.

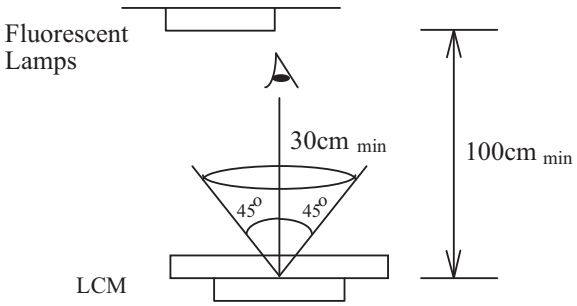
11.Quality Specifications

All The raw material are Rohs complicant.

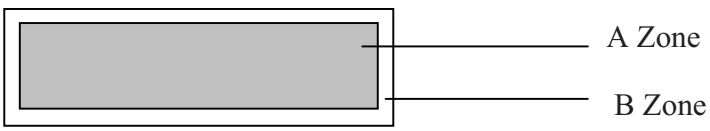
11.1 Standard of the product appearance test

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

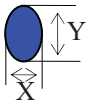
Sampling method: MIL-STD-105E, Level II, single sampling

Defect classification (Note: * is not including)

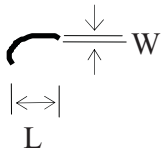
Classify	Item		Note	AQL
Major	Display state	Short or open circuit	1	0.65
		LC leakage		
		Flickering		
		No display		
		Wrong viewing direction		
		Contrast defect (dim, ghost)	2	
		Back-light	1,8	
	Non-display	Flat cable or pin reverse	10	
		Wrong or missing component	11	
Minor	Display state	Background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

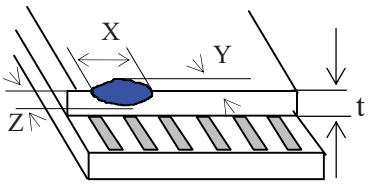
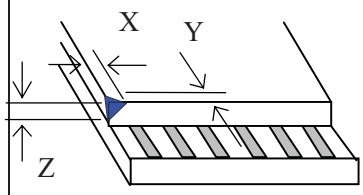
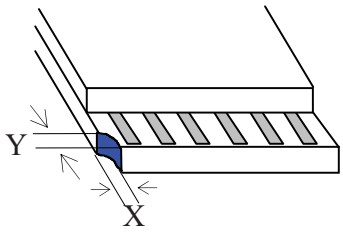
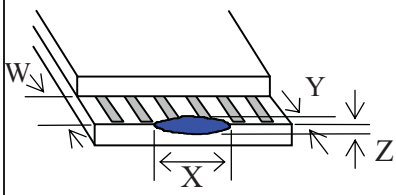
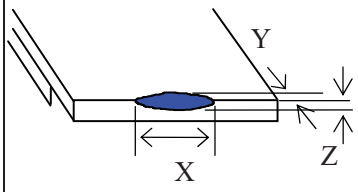
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>1</td><td>Short or open circuit</td><td rowspan="6">Not allow</td></tr>
<tr><td></td><td>LC leakage</td></tr>
<tr><td></td><td>Flickering</td></tr>
<tr><td></td><td>No display</td></tr>
<tr><td></td><td>Wrong viewing direction</td>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

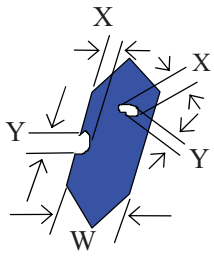
□ = (X+Y)/2</td><td> 

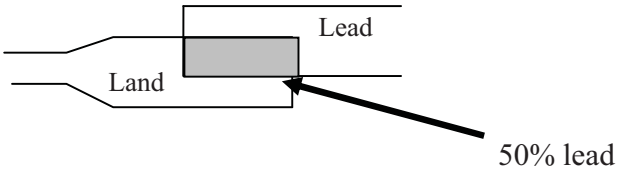
<table>
<tr><th>Point
Size</th><th>Acceptable Qty.</th></tr>
<tr><td>□≦0.10</td><td>Disregard</td></tr>
<tr><td>0.10＜□≦0.20</td><td>3</td></tr>
<tr><td>0.20＜□≦0.25</td><td>2</td></tr>
<tr><td>0.25＜□≦0.30</td><td>1</td></tr>
<tr><td>□＞0.30</td><td>0</td></tr>
</table>
Unit：mm</td></tr>
<tr><td>4</td>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

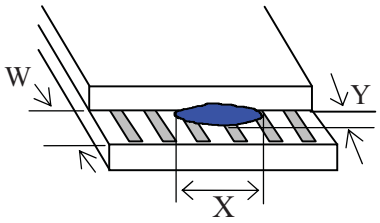
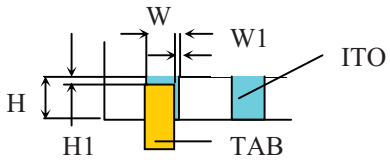
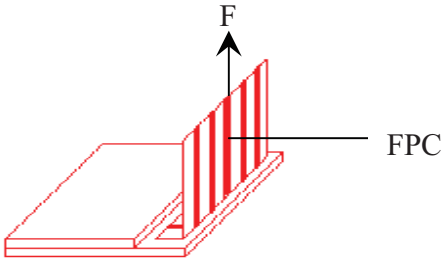
Scratch</td><td> 

<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>0.015≧W</td><td>Disregard</td></tr>
<tr><td>3.0≧L</td><td>0.03≧W</td><td rowspan="2">2</td></tr>
<tr><td>2.0≧L</td><td>0.05≧W</td></tr>
<tr><td>1.0≧L</td><td>0.1＞W</td><td>1</td></tr>
<tr><td>---</td><td>0.05□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
□ = (X+Y)/2</td><td>(1) Pin hole
□ < 0.10mm is acceptable.
 

<table>
<tr><th>Point Size</th><th>Acceptable Qty</th></tr>
<tr><td>□≤1/4W</td><td>Disregard</td></tr>
<tr><td>1/4W□ □≤1/2W</td><td>1</td></tr>
<tr><td>□>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	80℃	48	No abnormalities in functions and appearance
High temp. Operating	70℃	48	
Low temp. Storage	-30℃	48	
Low temp. Operating	-20℃	48	
Humidity	60℃/ 90%RH	48	
Temp. Cycle	-30℃ → 25℃ → 80℃ (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℃), 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℃ is required, the relative humidity should be kept below 60%, and avoid direct sunlight.

Limited Warranty

Orient Disply 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.