Densitron

TFT LCD DISPLAY MODULE

Product Specification

Customer	Standard		UReady™ 16600
Product Number	DMT066YYHLNT0-1A		
Customer Part Number			
Customer Approval		**Date:**	

Internal Approvals		
Product Mgr	Doc. Control	Electr. Eng.
Luo Luo	Filip Kaczorowski	Filip Kaczorowski
Date: 31/05/2018	**Date: 31/05/18**	**Date: 31/05/18**

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Revision Record

Rev.	Date	Page	Chapt.	Comment	ECR no.
1.0	31/05/18	--	--	Initial Release	

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1.0 General Description

1.1 Introduction

The DMT066YYHLNT0-1A is a colour active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 6.6 " TFT-LCD contains 1440x240 pixels, and can display up to 16.7M colours.

1.2 Main Features

Item	Contents
Display Type	TFT LCD
Screen Size	6.6” Diagonal
Display Format	1440 x RGB x 240 Dots
N° of Colour	65K/262K/16.7M
Overall Dimensions	178.4 mm (H) x 40.0 mm (V) x 3.35 mm (D)
Active Area	164.16 mm (H) x 27.36 mm (V)
Mode	IPS Transmissive / Normally Black
Pixel Arrangement	RGB vertical stripe
Viewing Direction	All round
Interface	6/8Bit LVDS
Driver IC	2*HX8249+HX8678
Backlight Type	LED, White, 32 chips
Operating Temperature	-30C ~ +85°C
Storage Temperature	-40°C ~ +90°C
ROHS	Compliant to 2011/65/EU

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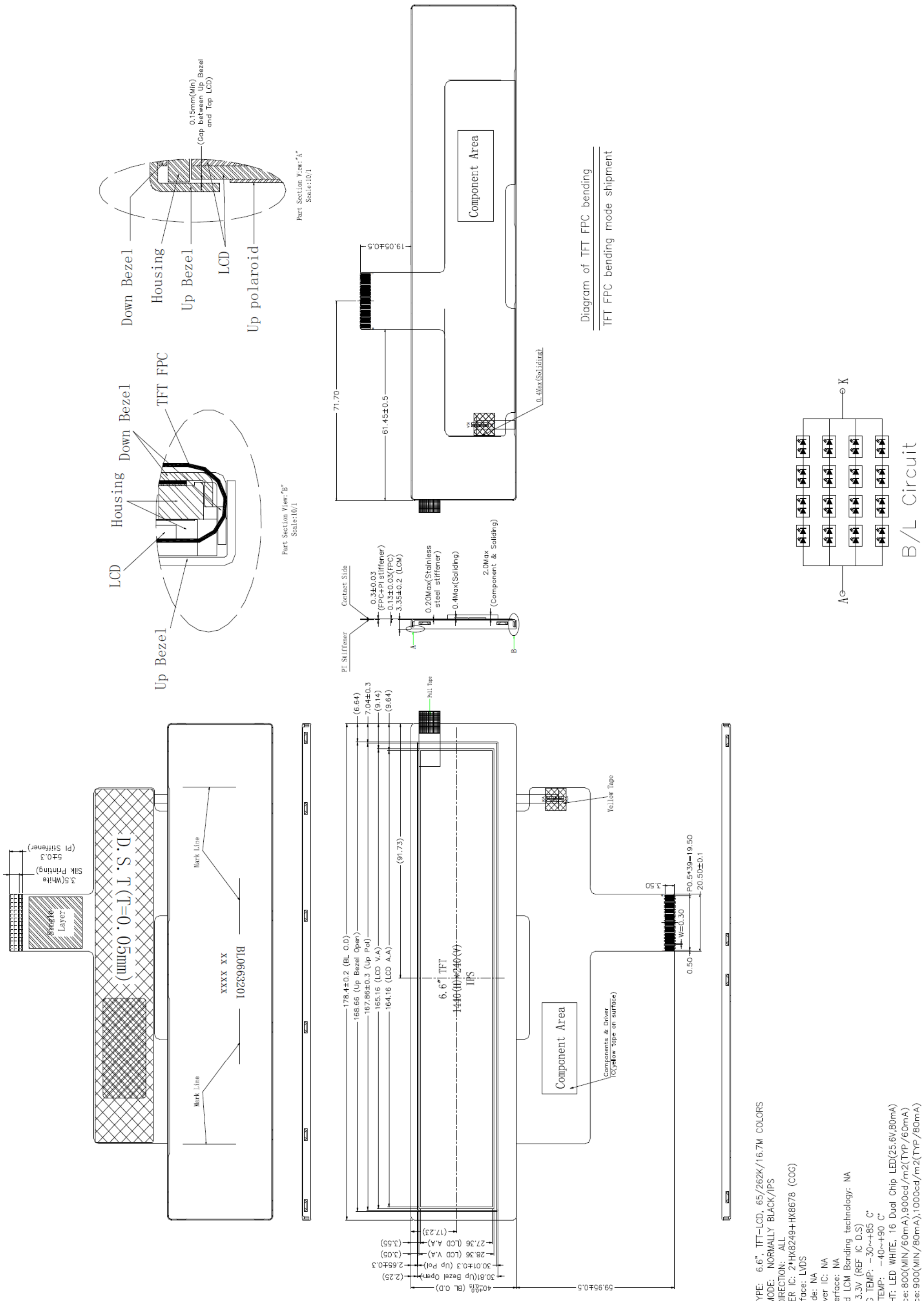
2.0 Mechanical Specification

2.1 Mechanical Characteristics

Item	Characteristic	Unit
Display Format	1440 x RGB x 240 Dots	Dots
Overall Dimensions	178.4 mm (H) x 40.0 mm (V) x 3.35 mm (D)	mm
Active Area	164.16 mm (H) x 27.36 mm (V)	mm
Pixel Pitch	0.114 (H) x 0.114 (V)	mm
Weight	54	g

2.2 Mechanical Drawing

NO.	Pin Name
1	STBYB
2	RESET
3	VDD
4	VDD
5	SELB
6	GND
7	GND
8	RXIN0-
9	RXIN0+
10	GND
11	RXIN1-
12	RXIN1+
13	GND
14	RXCLKIN-
15	RXCLKIN+
16	GND
17	RXIN2-
18	RXIN2+
19	GND
20	RXIN3-
21	RXIN3+
22	GND
23	NC
24	NC
25	NC
26	NC
27	NC
28	NC
29	GND
30	RL
31	TB
32	ATREN
33	CSB
34	SCL
35	SDA
36	VDD-OTP
37	LED-
38	LED-
39	LED+
40	LED+



NOTES:
1. DISPLAY TYPE: 6.6", TFT–LCD, 65/262K/16.7M COLORS
2. DISPLAY MODE: NORMALLY BLACK/IPS
3. VIEWING DIRECTION: ALL
4. LCM DRIVER IC: 2*HX8249+HX8678 (COG)
   LCM Interface: LVDS
5. Touch Mode: NA
   Touch Driver IC: NA
   Touch Interface: NA
   Touch and LCM Bonding technology: NA
6. VDD/VCI: 3.3V (REF IC D.S)
7. OPERATING TEMP: −30~+85 C°
   STORAGE TEMP: −40~+90 C°
8. BACK LIGHT: LED WHITE, 16 Dual Chip LED(25.6V,80mA)
9. Luminance: 800(MIN/60mA),900cd/m2(TYP/60mA)
   Luminance: 900(MIN/80mA),1000cd/m2(TYP/80mA)
10. RoHS COMPLIANT.

3.0 Electrical Specification

3.1 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	-0.3	4.0	V	-
Operating Temperature	T_{OP}	-30	+85	°C	1
Storage Temperature	T_{ST}	-40	+90	°C	1,2,3

Note 1: 90% RH Max for Ta<50°C, and 60% RH for Ta≥50°C.
Note 2: In case of below 0°C, the response time of liquid crystal (LC) becomes slower and the colour of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's characteristics.
Note 3: Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

3.2 Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V_{DD}	2.7	3.3	3.6	V	
Normal mode Current	I_{DD}	--	75	--	mA	
High Level Input	V_{IH}	$0.7*V_{DD}$	-	$V_{DD}+0.3$	V	
Low Level Input	V_{IL}	GND-0.3	-	$0.3*V_{DD}$	V	
High Level Output	V_{OH}	$V_{DD}-0.4$	-	--	V	
Low Level Output	V_{OL}	GND	-	GND+0.4	V	

3.3 Interface Pin Assignment

<table>
<tr><th>No.</th><th>Symbol</th><th colspan="2">Function</th></tr>
<tr><td>1</td><td>STBYB</td><td colspan="2">Enable IC. HIGH = 3.3V LOW = GND</td></tr>
<tr><td>2</td><td>RESET</td><td colspan="2">Hardware Reset input.
RC reset circuit is suggested for stability (47kΩ + 0.1µF). Normally pull high.</td></tr>
<tr><td>3</td><td>VDD</td><td colspan="2">Digital supply voltage.
Typical value of 3.3V.</td></tr>
<tr><td>4</td><td>VDD</td><td colspan="2">Digital supply voltage.
Typical value of 3.3V.</td></tr>
<tr><td rowspan="4">5</td><td rowspan="4">SELB</td><td colspan="2">6bit/8bit mode select.</td></tr>
<tr><td>SELB</td><td>Function</td></tr>
<tr><td>0</td><td>6 bit</td></tr>
<tr><td>1</td><td>8 bit</td></tr>
<tr><td>6</td><td>GND</td><td colspan="2">Ground of Logic Circuit.
This is a ground pin, to be connected to external ground.</td></tr>
<tr><td>7</td><td>GND</td><td colspan="2">Ground of Logic Circuit.
This is a ground pin, to be connected to external ground.</td></tr>
<tr><td>8</td><td>RXIN0-</td><td colspan="2">Negative LVDS differential data input.</td></tr>
<tr><td>9</td><td>RXIN0+</td><td colspan="2">Positive LVDS differential data input.</td></tr>
<tr><td>10</td><td>GND</td><td colspan="2">Ground of Logic Circuit.
This is a ground pin, to be connected to external ground.</td></tr>
<tr><td>11</td><td>RXIN1-</td><td colspan="2">Negative LVDS differential data input.</td></tr>
<tr><td>12</td><td>RXIN1+</td><td colspan="2">Positive LVDS differential data input.</td></tr>
<tr><td>13</td><td>GND</td><td colspan="2">Ground of Logic Circuit.
This is a ground pin, to be connected to external ground.</td></tr>
<tr><td>14</td><td>RXCLKIN-</td><td colspan="2">Negative LVDS differential clock input.</td></tr>
<tr><td>15</td><td>RXCLKIN+</td><td colspan="2">Positive LVDS differential clock input.</td></tr>
<tr><td>16</td><td>GND</td><td colspan="2">Ground of Logic Circuit.
This is a ground pin, to be connected to external ground.</td></tr>
<tr><td>17</td><td>RXIN2-</td><td colspan="2">Negative LVDS differential data input.</td></tr>
<tr><td>18</td><td>RXIN2+</td><td colspan="2">Positive LVDS differential data input.</td></tr>
<tr><td>19</td><td>GND</td><td colspan="2">Ground of Logic Circuit.
This is a ground pin, to be connected to external ground.</td></tr>
<tr><td>20</td><td>RXIN3-</td><td colspan="2">Negative LVDS differential data input.</td></tr>
</table>

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No.	Symbol	Function
21	RXIN3+	Positive LVDS differential data input.
22	GND	Ground of Logic Circuit. This is a ground pin, to be connected to external ground.
23	NC	Not Connected. These pins are left not connected.
24	NC	Not Connected. These pins are left not connected.
25	NC	Not Connected. These pins are left not connected.
26	NC	Not Connected. These pins are left not connected.
27	NC	Not Connected. These pins are left not connected.
28	NC	Not Connected. These pins are left not connected.
29	GND	Ground of Logic Circuit. This is a ground pin, to be connected to external ground.
30	RL	Horizontal shift direction. (Note 1)
31	TB	Vertical shift direction. (Note 1)
32	ATREN	ATREN should be kept HIGH.
33	CSB	No connection.
34	SCL	No connection.
35	SDA	No connection.
36	VDD-OTP	7.5V for OTP program (Not connected).
37	LED-	LED backlight Negative Supply pin. These pins are to be connected to external source.
38	LED-	LED backlight Negative Supply pin. These pins are to be connected to external source.
39	LED+	LED backlight Positive Supply pin. These pins are to be connected to external source.
40	LED+	LED backlight Positive Supply pin. These pins are to be connected to external source.

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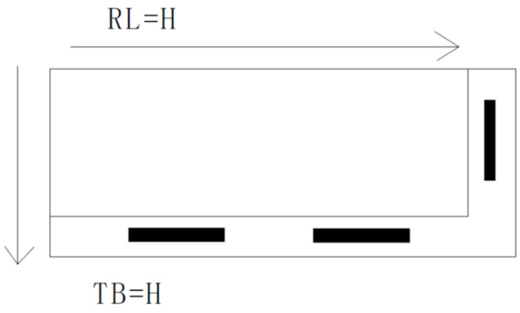
Note 1:

Scan control input		Scanning direction
RL	TB	
VDD	VDD	Up to Down, Left to Right
GND	VDD	Up to Down, Right to Left
VDD	GND	Down to Up, Left to Right
GND	GND	Down to Up, Right to Left



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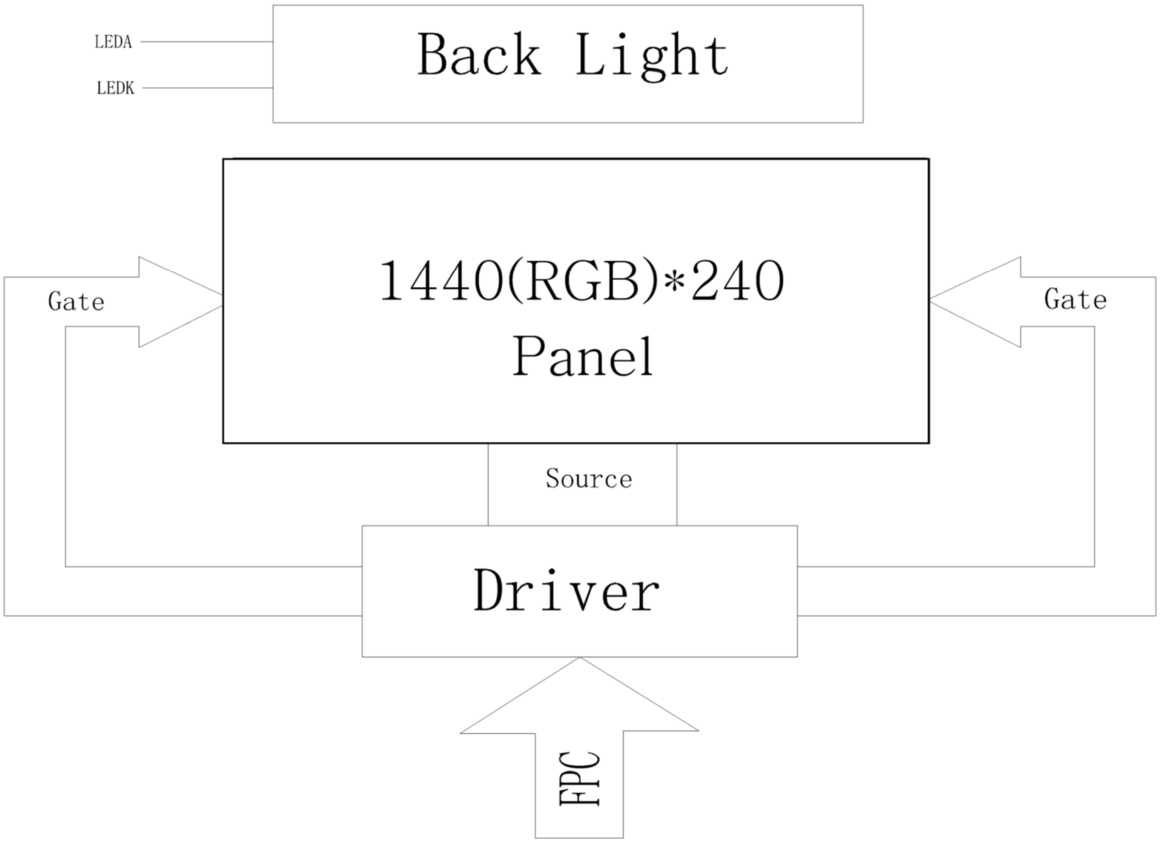
3.4 Block Diagram



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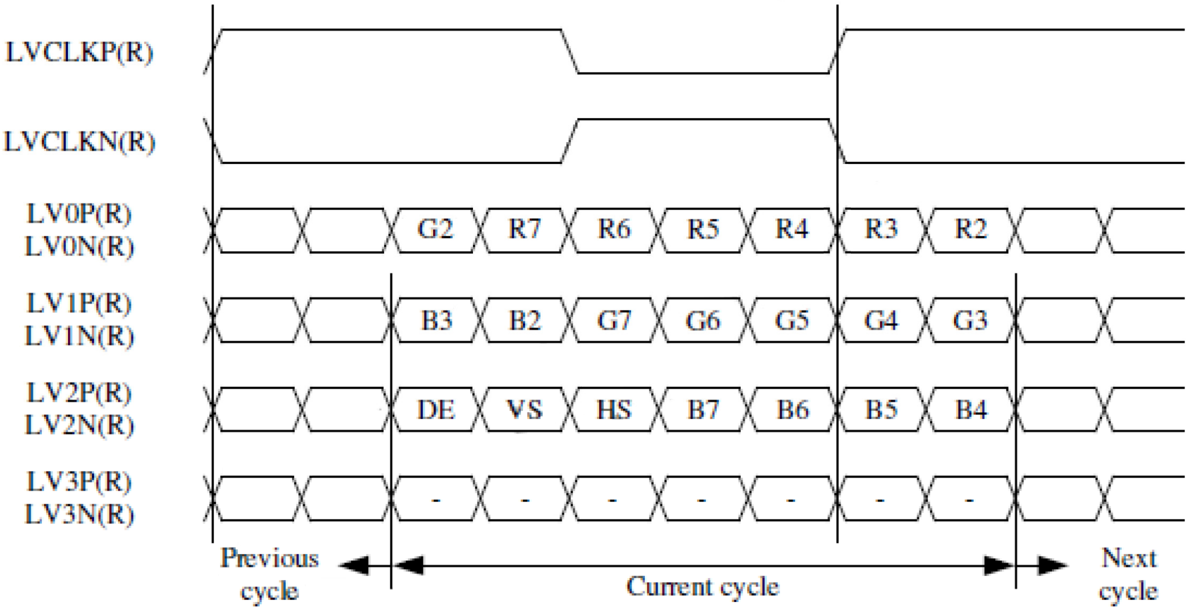
3.5 Timing Characteristics

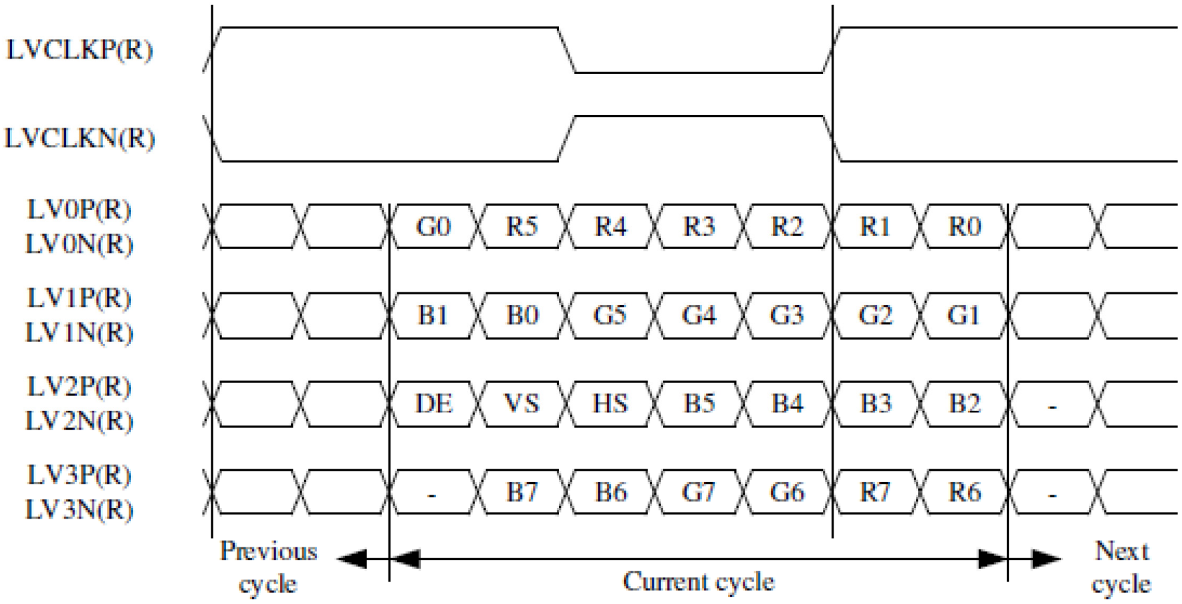
Please refer to Himax IC HX8249 and HX8678 datasheet for more information.

3.5.1 LVDS 6-bit vs. 8-bit mode

- 6-bit LVDS



- 8-bit LVDS (VESA format)



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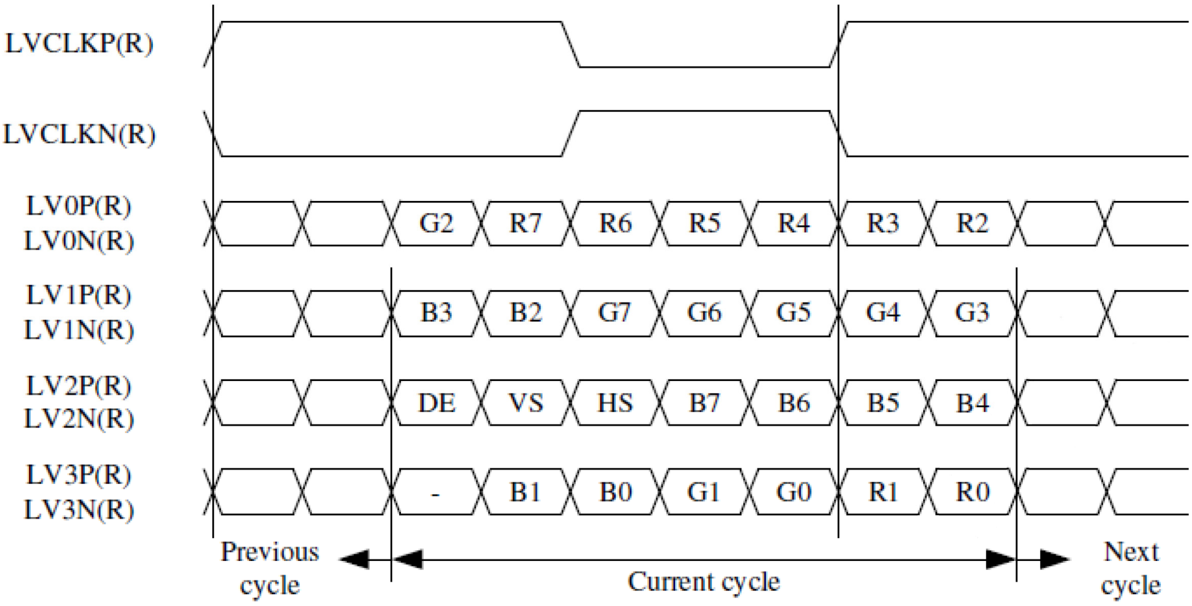
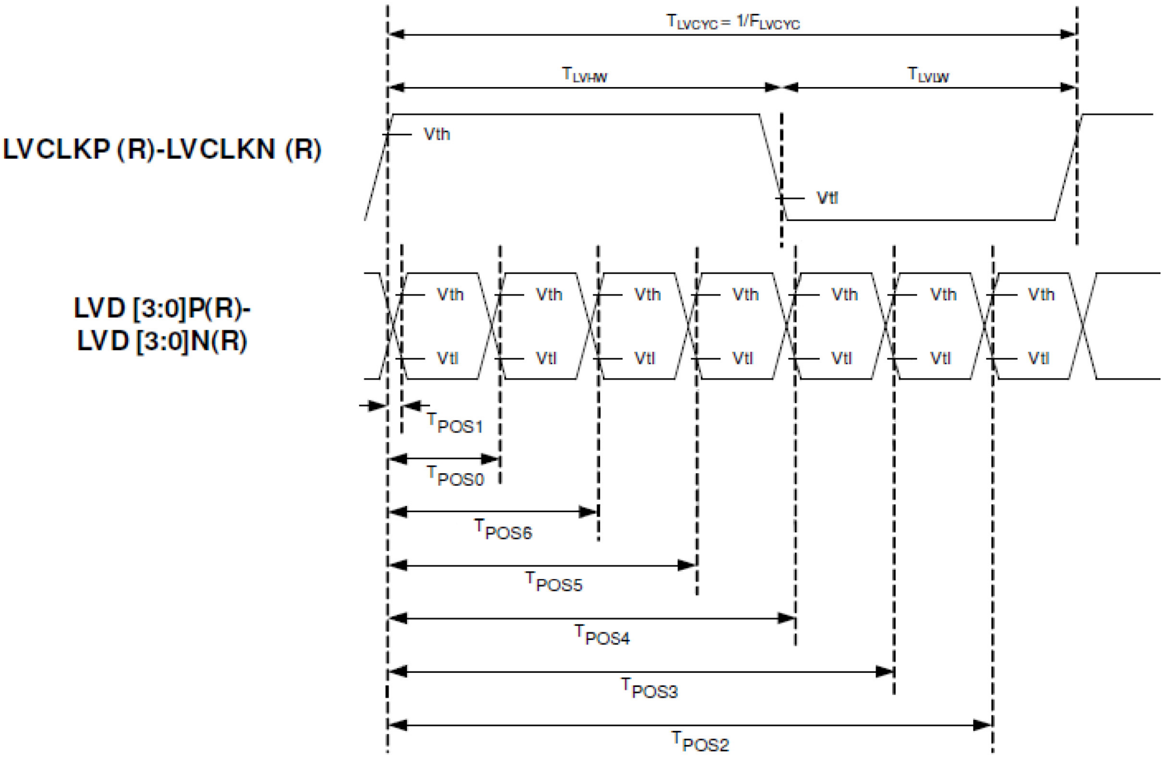
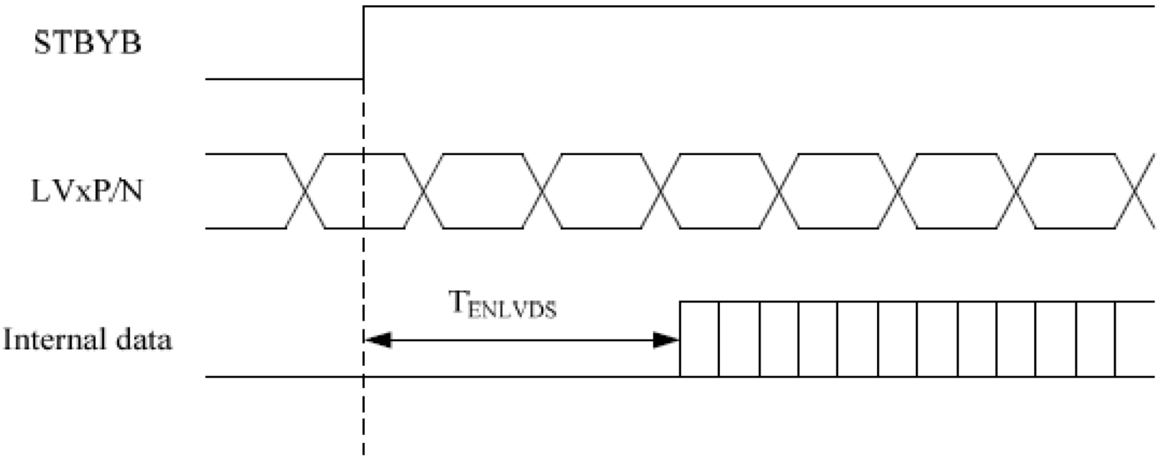
- 8-bit LVDS (JEIDA format)



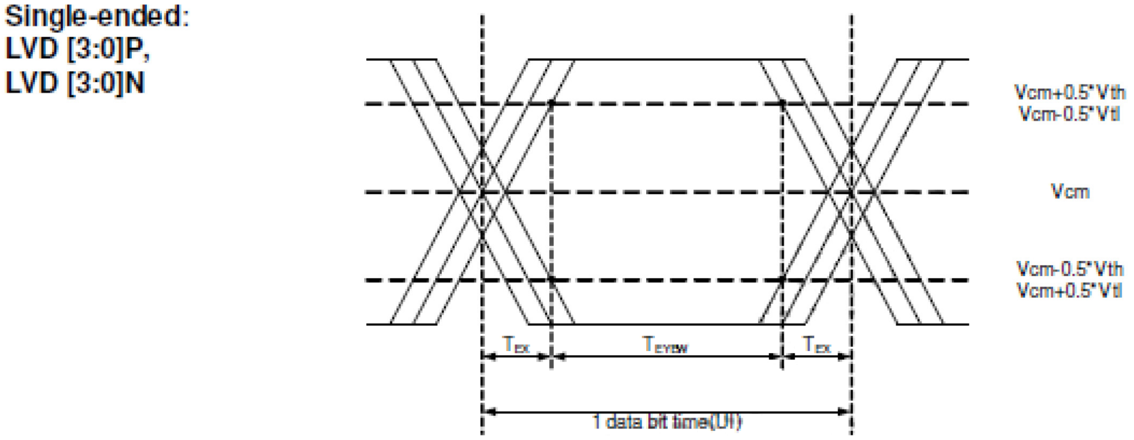
3.5.2 LVDS input timing

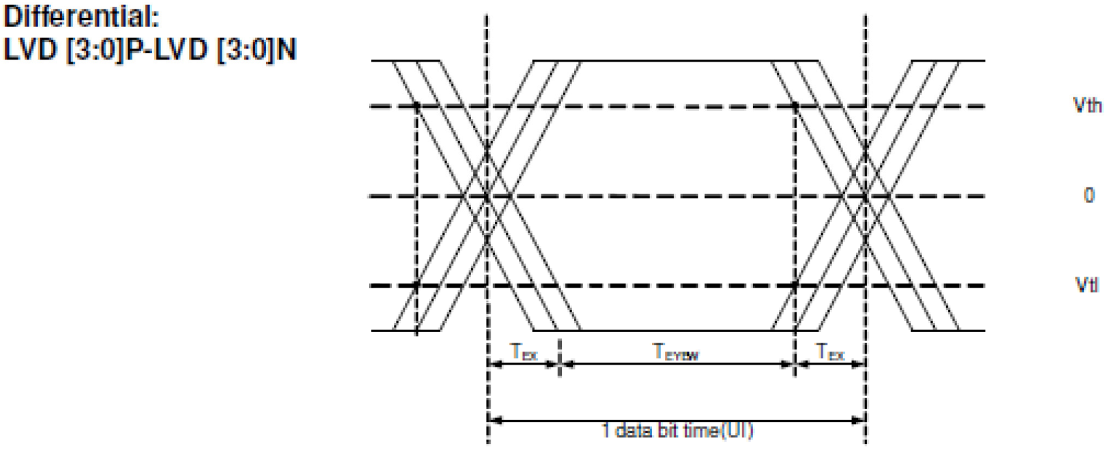


- LVDS wake up time



- LVDS input eye diagram

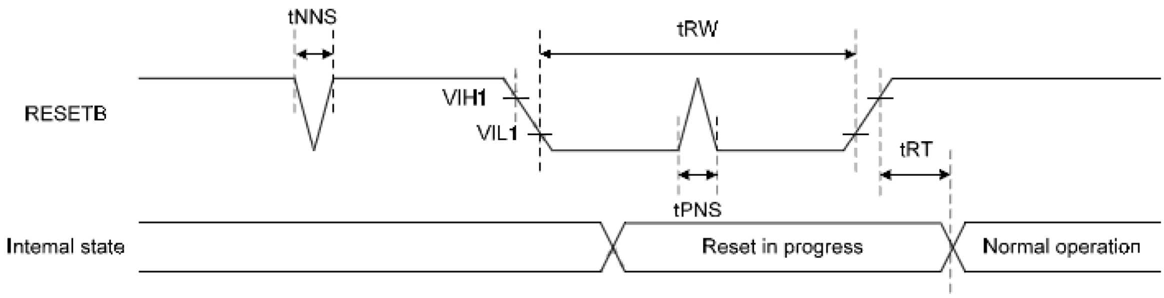




- LVDS input timing parameters

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Clock frequency	FLVCYC	10	-	85	MHz
Clock period	TLVCYC	11.76	-	100	ns
1 data bit time	UI	-	1/7	-	TLVCYC
Clock high time	LVHW	2.9	4	4.1	UI
Clock low time	LVHW	2.9	3	4.1	UI
Position 1	TPOS1	-0.2	0	0.2	UI
Position 0	TPOS0	0.8	1	1.2	UI
Position 6	TPOS6	1.8	2	2.2	UI
Position 5	TPOS5	2.8	3	3.2	UI
Position 4	TPOS4	3.8	4	4.2	UI
Position 3	TPOS3	4.8	5	5.2	UI
Position 2	TPOS2	5.8	6	6.2	UI
Input eye width	TEYEW	0.6	-	-	UI
Input eye border	TEX	-	-	0.2	UI
LVDS wake up time	TENLVDS	-	-	150	µs

3.5.3 Reset timing characteristics



Signal	Parameter	Symbol	Min	Max	Unit
RESETB	Rested pulse width	tRW	10	-	µs
	Reset complete time	tRT	-	5	µs
	Positive spike noise width	tPNS	-	100	µs
	Negative spike noise width	tNNS	-	100	µs

VDD1=VDD2=2.7 to 3.6V, GND=0V, T_A=-40 to +95 °C

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4.0 Optical Specification

4.1 Optical Characteristics

Measuring instruments:	LCD-5100, Eldim, Topcon BM-7
Driving condition:	V_{DD} = 3.3V, V_{SS} = 0V
Backlight:	IF = 75mA
Measured temperature:	Ta = 25°C

Characteristics		Symbol	Conditions	Min	Typ	Max	Unit	Note
Response time		TR+TF	θ=Φ=0° Normal Viewing Angle	-	25	-	ms	2
Contrast Ratio		CR		600	800	-	-	3
Uniformity		S(%)		-	60	-	%	
Viewing Angle	Left	θL	CR≥10	-	80	-	deg	4
	Right	θR		-	80	-		
	Up	θU		-	80	-		
	Down	θD		-	80	-		
Colour Chromaticity	Red	Rx	CR≥10	0.552	0.592	0.632	-	5
		Ry		0.287	0.327	0.367		
	Green	Gx		0.319	0.359	0.399		
		Gy		0.553	0.593	0.633		
	Blue	Bx		0.108	0.148	0.188		
		By		0.061	0.101	0.141		
	White	Wx		0.271	0.311	0.351		
		Wy		0.293	0.333	0.373		
Centre Brightness				900	1000	-	Cd/m^2	6
Brightness Distribution				80	-	-	%	7

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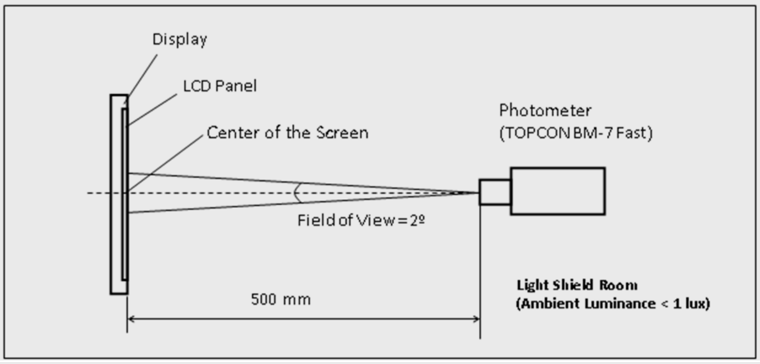
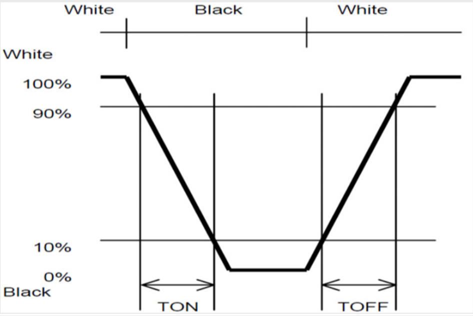
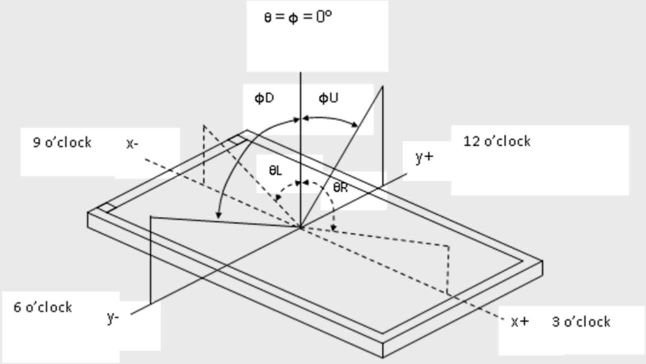
Note	Item	Test method
1	Setup	The display should be stabilised at a given temperature for 30 minutes to avoid abrupt temperature change during measuring. To stabilise the luminance, measurements should be executed after lighting the backlight for 30 minutes in a windless room. 
2	Response time	Measure output signal waveform by the luminance meter when raster of window pattern is changed from white to black and from black to white. 
3	Contrast ratio	Measure maximum brightness and minimum brightness at the centre of the screen by displaying raster or window pattern. Then calculate the ratio between these two values. $$\text{Contrast Ratio (CR)} = \frac{\text{Brightness of unselected position (white)}}{\text{Brightness of selected position (black)}}$$
4	Viewing angle Horizontal θ Vertical Ø	Move the luminance meter from right to left and up and down and determinate the angles where contrast ratio is 10 
5	Colour chromaticity	Measure chromaticity coordinates x and y of CIE1931 colorimetric system
6	Brightness distribution	(Brightness distribution) = 100 x B/A % A: max. brightness of the 9 points B: min. brightness of the 9 points

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5.0 LED Backlight Specification

5.1 LED Backlight Characteristics

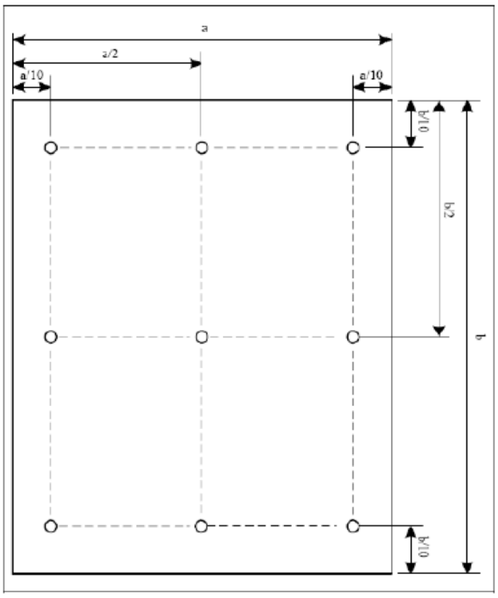
The back-light system is edge-lighting type with 32 chips LED

Characteristics	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	I_F	60	80	-	mA	-
Forward Voltage	V_F	-	25.6	-	V	-
LCM Luminance at 60mA	LV	800	900	-	Cd/m^2	3
LCM Luminance at 80mA	LV	900	1000	-	Cd/m^2	3
LED life time	Hr	-	50000	-	Hour	1,2
Uniformity	Avg	80	-	-	%	3

Note 1: LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=80mA. The LED lifetime could be decreased if operating IL is larger than 80mA. The constant current driving method is suggested.

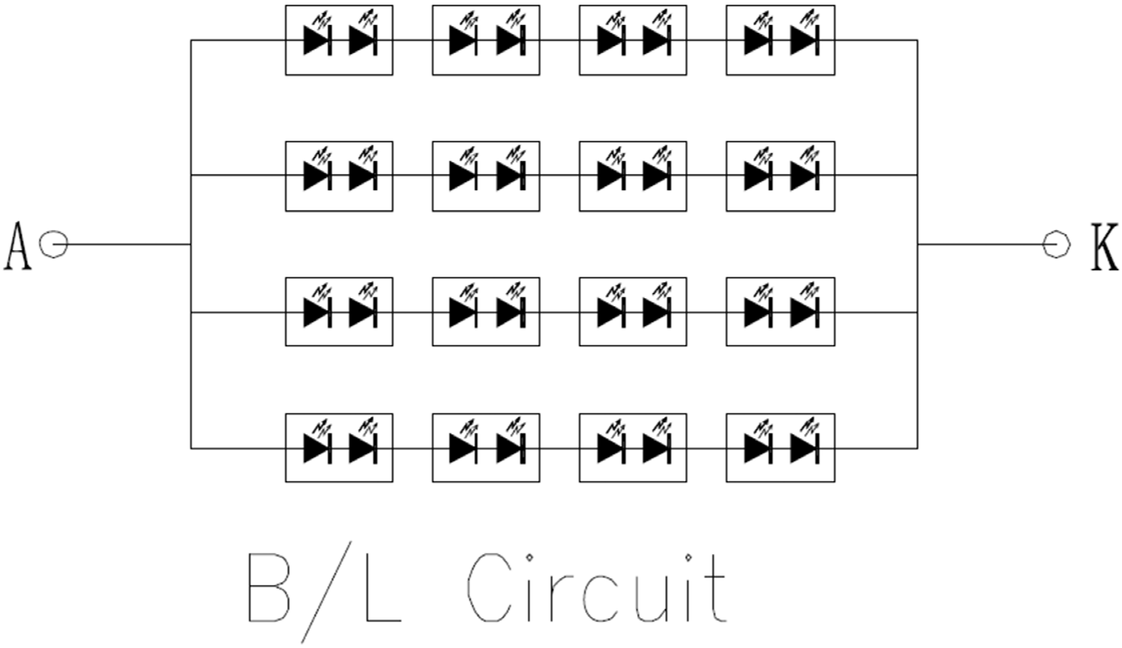
Note 3: Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

5.2 Internal Circuit Diagram



6.0 Quality Assurance Specification

6.1 Delivery Inspection Standards

6.1.1 Inspection Conditions

Inspection distance:	30 cm ± 2cm
Viewing angle:	±45°

6.1.2 Environmental Conditions

Ambient temperature:	25°C ± 5°C
Ambient humidity:	65±10% RH
Ambient illumination:	300~700 lux

6.1.3 Sampling Conditions

1. Lot size: quantity of shipment lot per model
2. Sampling method:

Sampling plan		GB/T 2828-2003
		Normal inspection, Class II
AQL	Major Defect	0.65%
	Minor Defect	1.5%

No.	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Colour tone	Colour unevenness, refer to limited sample	Minor
5	Spot Line defect	Light dot, Dim spot, Polarizer bubble; Polarizer accidented spot.	
6	Soldering appearance	Good soldering, peeling off is not allowed.	
7	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

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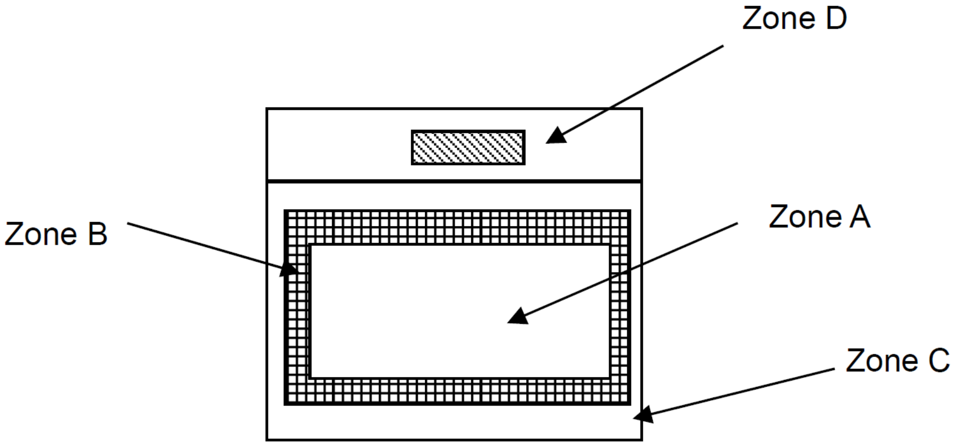
6.1.4 Zone Definition

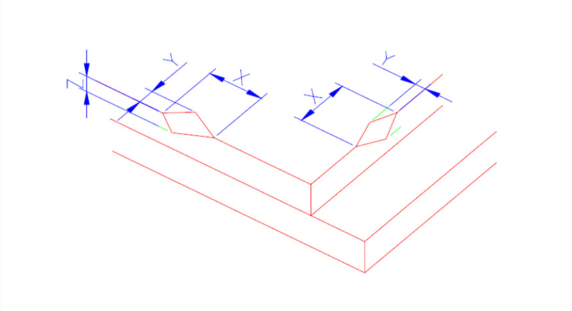
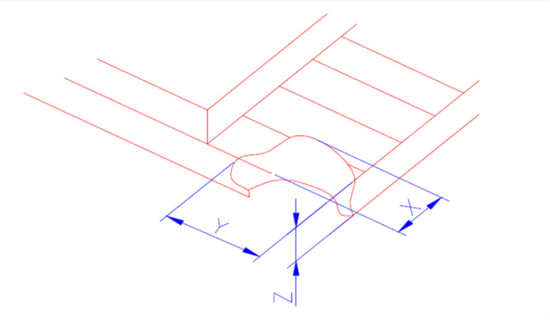
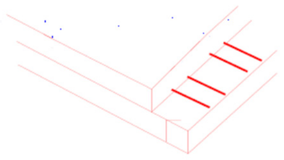


Zone A: Effective Viewing Area (Character or Digit can be seen)
Zone B: Viewing Area except Zone A
Zone C: Outside (ZoneA+ZoneB) which can't be seen after assembly by customer.
Zone D: IC Bonding Area
Note: Generally, visual defects in Zone C can be ignored when it doesn't affect product function or appearance after assembly by customer.

6.1.5 Basic Principle

A set of sample to indicate the limit of acceptable quality level shall be discussed should a dispute occur.

6.1.6 Inspection Criteria

Number	Items	Criteria (mm)		
1.0 LCD Crack/ Broken	(1) The edge of LCD broken			
		X	Y	Z
Note: X: Length Y: Width Z: Height L: Length of ITO T: Height of LCD		≤3.0mm	<Inner border line of the seal	≤T
	(2) LCD corner broken			
		X	Y	Z
		≤3.0mm	≤L	≤T
	(3) LCD crack	 Crack Not allowed		

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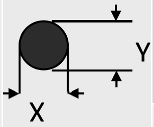
Number	Items	Criteria (mm)
2.0	Spot defects  Φ=(X+Y) /2	① Light dot (LCD/TP/Polarizer black/white spot, light dot, pinhole, dent, stain)

① Light dot (LCD/TP/Polarizer black/white spot, light dot, pinhole, dent, stain)

Size (mm)	Zone	Acceptable Qty		
		A	B	C
Φ≤0.10		Ignore		Ignore
0.10<Φ≤0.25		4(distance≧10mm)		
0.25<Φ≤0.35		3		
Φ>0.4		0		

②Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot)

Size (mm)	Zone	Acceptable Qty		
		A	B	C
Φ≤0.1		Ignore		Ignore
0.10<Φ≤0.25		4(distance≧10mm)		
0.25<Φ≤0.35		3		
Φ＞0.40		0		

③ Polarizer accidented spot

Size (mm)	Zone	Acceptable Qty		
		A	B	C
Φ≤0.2		Ignore		Ignore
0.3<Φ≤0.5		3(distance≧10mm)		
Φ>0.5		1		

④ Pixel bad points (light dot, Dim dot, colour dot)

Size (mm)	Zone	Acceptable Qty		
		A	B	C
Φ≤0.15		Ignore	Ignore	
0.2<Φ≤0.3		2(distance≧10mm)		
Φ>0.4		1		

⑤ Polarizer Bubble

Size (mm)	Zone	Acceptable Qty		
		A	B	C
Φ≤0.2		Ignore		Ignore
0.3<Φ≤0.4		4(distance≧10mm)		
0.4<Φ≤0.5		3		
Φ>0.5		1		

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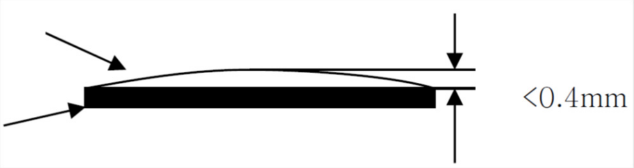
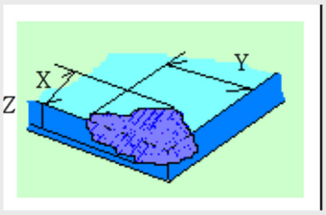
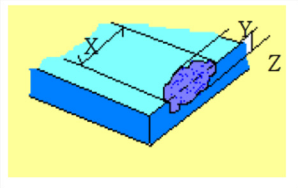
<table>
<tr><td rowspan="6">3.0</td><td rowspan="6">Line defect (LCD/TP/ Polarizer black/ white line, scratch, stain)</td><td rowspan="2">Width (mm)</td><td rowspan="2">Length (mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.05</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.05<W≤0.06</td><td>L≤5.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.07<W≤0.08</td><td>L≤4.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.08<W</td><td colspan="4">Define as spot defect</td></tr>
<tr><td>4.0</td><td>SMT</td><td colspan="5">Do not allow: missing parts, solderless connection, cold solder joint, miss match, the positive and negative polarity oppose</td></tr>
<tr><td>5.0</td><td>Display colour & Brightness</td><td colspan="5">1. Colour: Measuring the colour coordinates, The measurement standard according to the datasheet or samples
2. Brightness: Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples</td></tr>
<tr><td>6.0</td><td>LCD Mura</td><td colspan="5">By 5% ND filter invisible</td></tr>
<tr><td rowspan="16">7.0</td><td rowspan="16">RTP Related</td><td colspan="5">TP bubble / accidented spot</td></tr>
<tr><td rowspan="2">Size Φ(mm)</td><td rowspan="2">Zone</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td colspan="2">Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td colspan="2">0.1<Φ≤0.25</td><td colspan="2">4(distance≧ 10mm)</td></tr>
<tr><td colspan="2">0.25<Φ≤0.35</td><td colspan="2">3</td></tr>
<tr><td colspan="2">0.4<Φ</td><td colspan="2">1</td></tr>
<tr><td colspan="5">TP film scratch</td></tr>
<tr><td rowspan="2">Width(mm)</td><td rowspan="2">Length (mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.05</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.05<W≤0.06</td><td>L≤5.0</td><td colspan="2">N≤3</td></tr>
<tr><td>0.07<W≤0.08</td><td>L≤4.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.08<W</td><td colspan="4">Define as spot defect</td></tr>
<tr><td>Assembly deflection</td><td colspan="4">Beyond the edge of backlight ≤0.2mm</td></tr>
<tr><td>Bulge (undulation included)</td><td colspan="4">The ITO film plumped below 0.40mm is acceptable
 </td></tr>
</table>

Number	Items	Criteria (mm)				
5.0	RTP Related	Newton Ring	Newton Ring area>1/3 TP area not acceptable Newton Ring area≤1/3 TP area acceptable			
		TP corner broken X: length Y: Width Z: Height	X	Y	Z	
			X≤3.0 mm	Y≤3.0 mm	Z< LCD thickness	
			Circuitry broken is not allowed			
		TP edge broken X: length Y: Width Z: Height	X	Y	Z	
			X≤6.0 mm	Y≤2.0 mm	Z< LCD thickness	
			Circuitry broken is not allowed			

- Criteria (functional items)

Number	Items	Criteria
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

6.2 Dealing with Customer Complaints

6.2.1 Non-conforming Analysis

Purchaser should supply Densitron with detailed data of non-conforming sample.

After accepting it, Densitron should complete the analysis in two weeks from receiving the sample.
If the analysis cannot be completed on time, Densitron must inform the purchaser.

6.2.2 Handling of Non-conforming Displays

If any non-conforming displays are found during customer acceptance inspection which Densitron is clearly responsible for, return them to Densitron.
Both Densitron and customer should analyse the reason and discuss the handling of non-conforming displays when the reason is not clear.
Equally, both sides should discuss and come to agreement for issues pertaining to modification of Densitron quality assurance standard.

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7.0 Reliability Specification

7.1 Reliability Tests

Test Item	Test Condition		Sample Size
High Temperature Operation	Ta = 85°C	96 h	3pcs
Low Temperature Operation	Ta = -30°C	96 h	3pcs
High Temperature Storage	Tp = 90°C	96 h	3pcs
Low Temperature Storage	Tp = -40°C	96 h	3pcs
High Temperature & High Humidity Operation	60°C, 90% RH	96 h	3pcs
Thermal Shock (Non-operation)	-30℃, 30 min ⟷ +85℃, 30 min, Change time: 5min 20CYC.		3pcs
ESD Test	C=150pF, R=330,5points/panel Air: ±8KV, 5times; Contact: ±6KV, 5 times; (Environment: 15℃~35℃, 30%~60%).		3pcs
Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.5mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).		3pcs
Box Drop Test	1 Corner 3 Edge 6 faces, 80 cm (Medium Box)		1 box

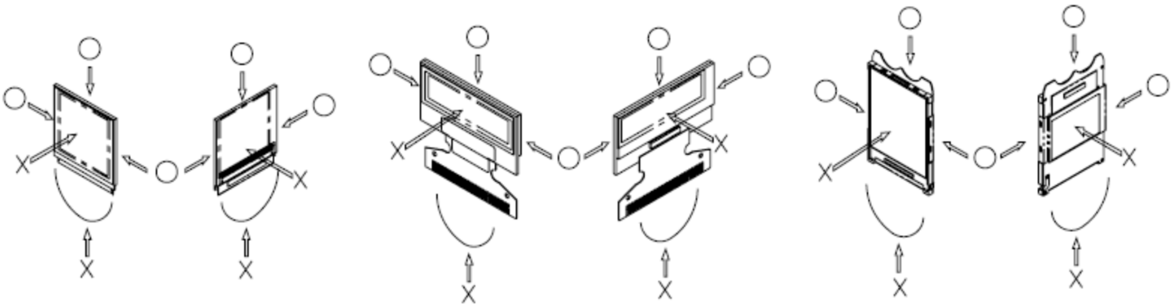
Note: Ta = ambient temperature, Tp= panel temperature

Notes:
1. No dew condensation to be observed.
2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
3. No cosmetic or functional defects should be allowed.
4. Total current consumption should be less than twice the initial value.

8.0 Handling Precautions

8.1 Handling Precautions

1) Since the display panel is being made of glass, do not apply mechanical impacts such us dropping from a high position.
2) If the display panel is broken by some accident and the internal organic substance leaks out, be careful not to inhale nor lick the organic substance.
3) If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water
4) If pressure is applied to the display surface or its neighbourhood of the display module, the cell structure may be damaged and be careful not to apply pressure to these sections.
5) The polarizer covering the surface of the display module is soft and easily scratched. Please be careful when handling the display module.
6) When the surface of the polarizer of the display module has soil, clean the surface. It takes advantage of by using following adhesion tape.
    a. Scotch Mending Tape No. 810 or an equivalent
2. Never try to breathe upon the soiled surface nor wipe the surface using cloth containing solvent such as ethyl alcohol, since the surface of the polarizer will become cloudy.
3. Also, pay attention that the following liquid and solvent may spoil the polarizer:
    - Water
    - Ketone
    - Aromatic Solvents
7) Hold the display module very carefully when placing it into the system housing. Do not apply excessive stress or pressure to display module. And, do not over bend the film with electrode pattern layouts. These stresses will influence the display performance. Also, secure sufficient rigidity for the outer cases.



8) Do not apply stress to the LSI chips and the surrounding molded sections.
9) Do not disassemble nor modify the display module.
10) Do not apply input signals while the logic power is off.
11) Pay sufficient attention to the working environments when handing display modules to prevent occurrence of element breakage accidents by static electricity.
    - Be sure to make human body grounding when handling display modules.
    - Be sure to ground tools to use or assembly such as soldering irons.
    - To suppress generation of static electricity, avoid carrying out assembly work under dry environments.

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- Protective film is being applied to the surface of the display panel of the display module. Be careful since static electricity may be generated when exfoliating the protective film.

12) Protection film is being applied to the surface of the display panel and removes the protection film before assembling it. If the display module has been stored for a long period of time, residue adhesive material of the protection film may remain on the surface of the display panel after removed of the film. In such case, remove the residue material by the method introduced in the above Section 5).
13) If electric current is applied when the display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful to avoid the above.

8.2 Storage Precautions

1) When storing display modules, put them in static electricity preventive bags avoiding exposure to direct sun light nor to lights of fluorescent lamps, etc. and, also, avoiding high temperature and high humidity environments or low temperature (less than 0°C) environments. (We recommend you to store these modules in the packaged state when they were shipped from Densitron) At that time, be careful not to let water drops adhere to the packages or bags nor let dewing occur with them.
2) If electric current is applied when water drops are adhering to the surface of the display module, when the display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful about the above.

8.3 Designing Precautions

1) The absolute maximum ratings are the ratings which cannot be exceeded for display module, and if these values are exceeded, panel damage may be happen.
2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specifications and, at the same time, to make the signal line cable as short as possible.
3) We recommend you to install excess current preventive unit (fuses, etc.) to the power circuit (VDD). (Recommend value: 0.5A)
4) Pay sufficient attention to avoid occurrence of mutual noise interference with the neighbouring devices.
5) As for EMI, take necessary measures on the equipment side basically.
6) When fastening the display module, fasten the external plastic housing section.
7) If power supply to the display module is forcibly shut down by such errors as taking out the main battery while the display panel is in operation, we cannot guarantee the quality of this display module.

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8.4 Operation Precautions

1) It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life.
2) Direct current causes an electrochemical reaction with remarkable deterioration of the display quality. Consider prevent direct current during ON/OFF timing and during operation.
3) Response time is extremely delayed at temperatures lower than the operating temperature range while, at high temperatures, displays become dark. However, this phenomenon is reversible and does not mean a malfunction or a display that has been permanently damaged.
4) To protect display modules from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the display modules.
    - Pins and electrodes
    - Pattern layouts such as the FPC
5) When the driver is being exposed (COG), semiconductor elements change their characteristics when light is radiated according to the principle of the solar battery. Consequently, if the driver is exposed to light, malfunctioning may occur.
    - Design the product and installation method so that the driver may be shielded from light in actual usage.
    - Design the product and installation method so that the driver may be shielded from light during the inspection processes.
6) Although the display module stores the operation state data by the commands and the indication data, when excessive external noise, etc. enters the module, the internal status may be changed. It therefore is necessary to take appropriate measures to suppress noise generation or to protect from influences of noise on the system design.
7) We recommend you construct its software to make periodical refreshment of the operation statuses (re-setting of the commands and re-transference of the display data) to cope with catastrophic noise.

8.5 Other Precautions

Request the qualified companies to handle industrial wastes when disposing of the display modules. Or, when burning them, be sure to observe the environmental and hygienic laws and regulations.

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