PRODUCT SPECIFICATION

3.5”TN TFT LCD MODULE
MODEL: YDP LCD TN 6 350 004

ROHS

< ◇> Preliminary Specification

< ◆> Finally Specification

CUSTOMER’S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY

knitter-switch

Revision History

Revision	Date	Originator	Detail	Remarks
1.0	2016.03.22	ZFY	Initial Release	
1.1	2016.04.15	ZFY	Add weight Add Chromaticity Transmissive	P4 P7
1.2	2018.04.20	ZDT	Add LED working life Modify many details	P5 P6/P24/P25
1.3	2019.05.09	WQ	Modify Luminance Modify Outline Drawing	P7 P27

Table of Contents

1. General Description

The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel, driver Ics, a touch panel and a backlight unit.

2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	3.5”	
LCD type	TN TFT	
Display Mode	Transmissive /Normally White	
Resolution	320RGB x 480	Pixels
View Direction	6 O’clock	Best Image
Gray Scale Inversion Direction	12 O’clock	
Module Outline	55.7(H) x 84.8(V) x 3.9(T) (Note1)	mm
Active Area	48.96 (H) x73.44V)	mm
Pixel Pitch	153(H) x 153(V)	um
Pixel Arrangement	RGB Vertical Stripe	
Display Colors	262K	
Interface	RGB or 8/9/16/18 Parallel Interface	
Driver IC	ILI9488	-
With or Without Touch Panel	With	
Operating Temperature	**-20～70**	ºC
Storage Temperature	**-30～80**	ºC
Weight	32	g

Note 1: Exclusive hooks, posts, FFC/FPC tail etc.

3. Absolute Maximum Ratings

GND =0V, Ta=25ºC

Item	Symbol	Min.	Max.	Unit
Power supply voltage	VDD	-0.3	3.3	V
Storage temperature	T_{STG}	-30	+80	ºC
Operating temperature	T_{OP}	-20	+70	ºC

Note 1: If Ta below 50ºC, the maximal humidity is 90%RH, if Ta over 50ºC, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10℃, and the back ground will become darker at high temperature operating.

4. DC Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit
Supply Voltage		VDD	2.5	2.8	3.3	V
Logic Low input voltage		V_{IL}	-0.3	-	0.3*VDD	V
Logic High input voltage		V_{IH}	0.7*VDD	-	VDD	V
Logic Low output voltage		V_{OL}	0	-	0.2*VDD	V
Logic High output voltage		V_{OH}	0.8*VDD	-	VDD	V
Current Consumption All Black	Logic	I_{CC+} I_{IN}	-	10	20	mA
	Analog					

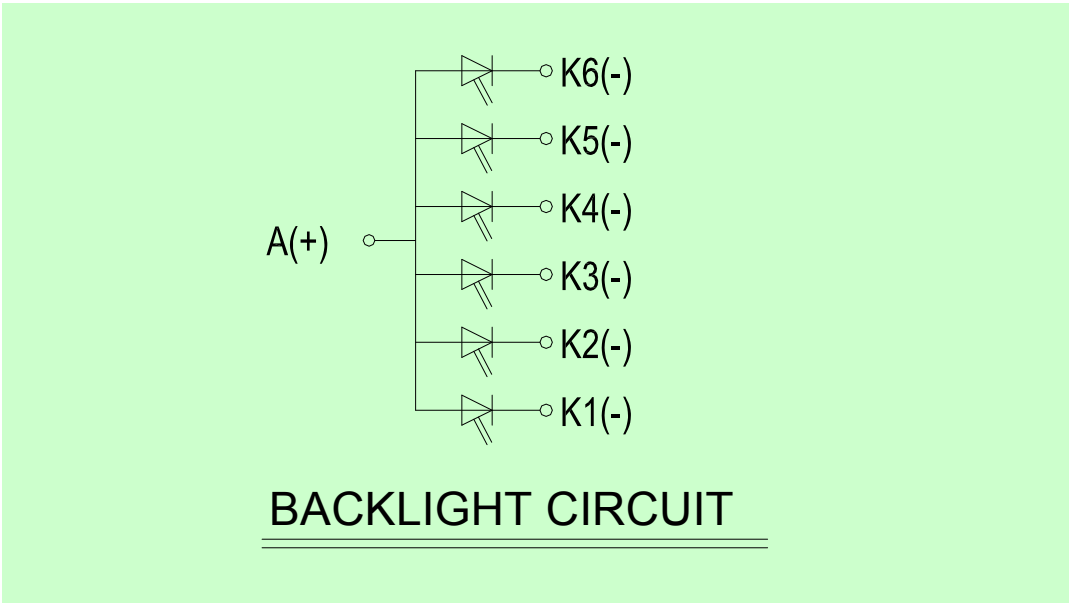
5. Backlight Characteristic

5.1. Backlight Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	Ta=25 ºC, I_F=20mA/LED	2.8	3.2	3.4	V
Forward Current	I_F	Ta=25 ºC, V_F=3.2V/LED	-	120	-	mA
Power dissipation	P_D	-	-	384	-	mW
Uniformity	Avg	-	80	-	-	%
LED working life(25℃)	-		-	30,000	-	Hrs
Drive method	Constant current					
LED Configuration	6 White LEDs in parallel					

Note1：LED life time defined as follows: The final brightness is at 50% of original brightness.
The environmental conducted under ambient air flow, at Ta=25±2 ºC,60%RH±5%, I_F=20mA/LED

5.2. Backlighting circuit



6. Touch Screen Panel Specifications

6.1 Electrical Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Linearity	-1.5	-	1.5	%	Analog X and Y directions
Terminal resistance	100	-	500	Ω	X (Film side)
	300	-	1000	Ω	Y (Glass side)
Insulation resistance	20	-	-	MΩ	DC ≤10V
Voltage	-	-	10	V	DC
Chattering	-	-	10	ms	

Caution (1): Do not operate it with a thing except a polyacetal pen (tip R0.8mm or less) or a finger nail, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.

Caution (2): RTP operation must be followed the parameter condition.

Caution (3): If ask for use glare ITO film , it's will has newton issue.

6.2 Mechanical & Reliability Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Activation force	20	-	100	g	(1)
Durability-surface scratching	Write 20,000	-	-	characters	(2)
Durability-surface pitting	1,000,000	-	-	touches	(3)
Surface hardness	3	-	-	H	

Note (1) Stylus pen Input: R0.8mm polyacetal pen or Finger nail

Note (2) Measurement for Surface area

- Force: 150-250gf
- Speed: 60mm/sec
- Stylus: R0.8 polyacetal pen or Finger nail

Note (3) Pit 1,000,000 times on the Film with a R3.75 silicon rubber.

- Force: Force: 2.45N
- Speed: 3times/sec

7. Optical Characteristics

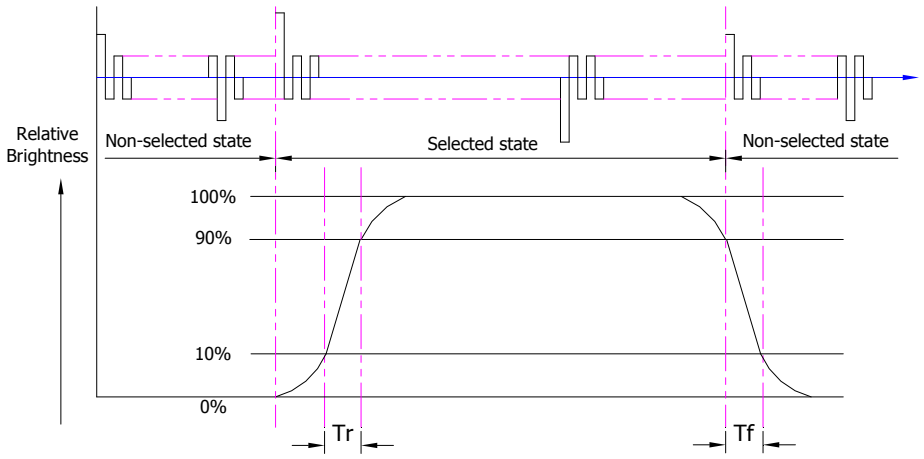
7.1. Optical Characteristics

Ta=25ºC, V_{DD} =2.8V

	Item		Symbol	Condition	Specification			Unit
					Min.	Typ.	Max.	
Backlight On (Transmissive Mode)	Luminance on TFT(I_f =20mA/LED)		Lv	Normally viewing angle θX = φY =0º	**250**	**310**	-	cd/m²
	Contrast ratio(See 7.3)		CR		400	500	-	
	Response time (See 7.2)		TR		-	20	40	ms
			TF					
	Chromaticity Transmissive (See 7.5)	Red	XR		**0.541**	**0.591**	**0.641**	-
			YR		**0.295**	**0.345**	**0.395**	-
		Green	XG		**0.256**	**0.306**	**0.356**	-
			YG		**0.574**	**0.624**	**0.674**	-
		Blue	XB		**0.095**	**0.145**	**0.195**	-
			YB		**0.022**	**0.072**	**0.122**	-
		White	XW		**0.213**	**0.263**	**0.313**	-
			YW		**0.250**	**0.300**	**0.350**	-
	Viewing Angle (See 7.4)	Horizontal	θX+	Center CR≥10	**55**	**70**	-	Deg.
			θX-		**55**	**70**	-	
		Vertical	φY+		**45**	**60**	-	
			φY-		**45**	**60**	-	
	NTSC Ratio(Gamut)		-	-	-	60	-	%

7.2. Definition of Response Time

7.2.1. Normally Black Type (Negative)



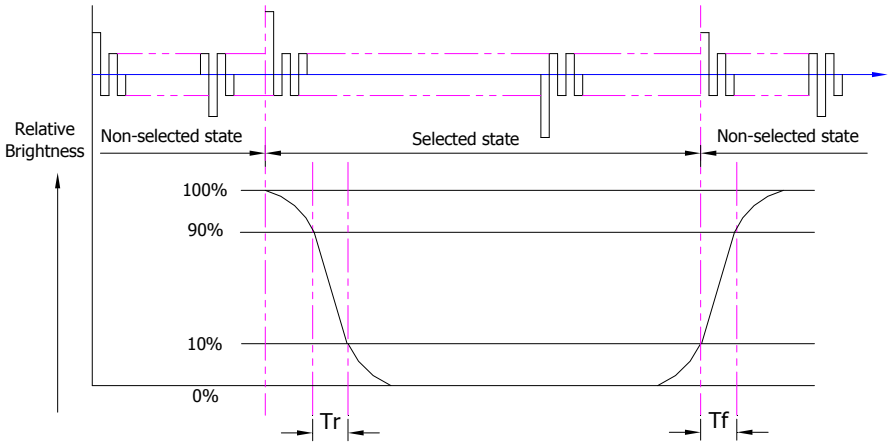
Tr is the time it takes to change form non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

Tf is the time it takes to change from selected state with relative luminance 90% to

non-selected state with relative luminance 10%.

Note: Measuring machine: LCD-5100

7.2.2. Normally White Type (Positive)



Tr is the time it takes to change form non-selected stage with relative luminance 90% to selected state with relative luminance 10%;

Tf is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note: Measuring machine: LCD-5100 or EQUI

7.3. Definition of Contrast Ratio

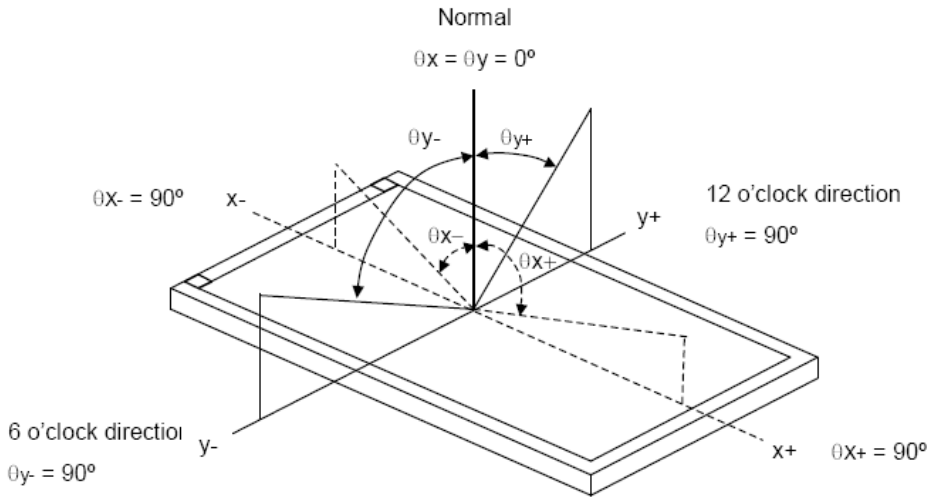
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

7.4. Definition of Viewing Angles



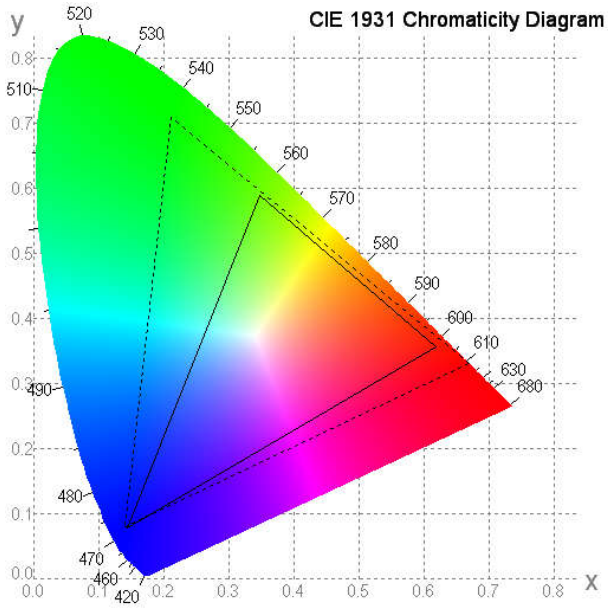
Measuring machine: LCD-5100 or EQUI

7.5. Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)



7.6. Definition of Surface Luminance, Uniformity and Transmittance

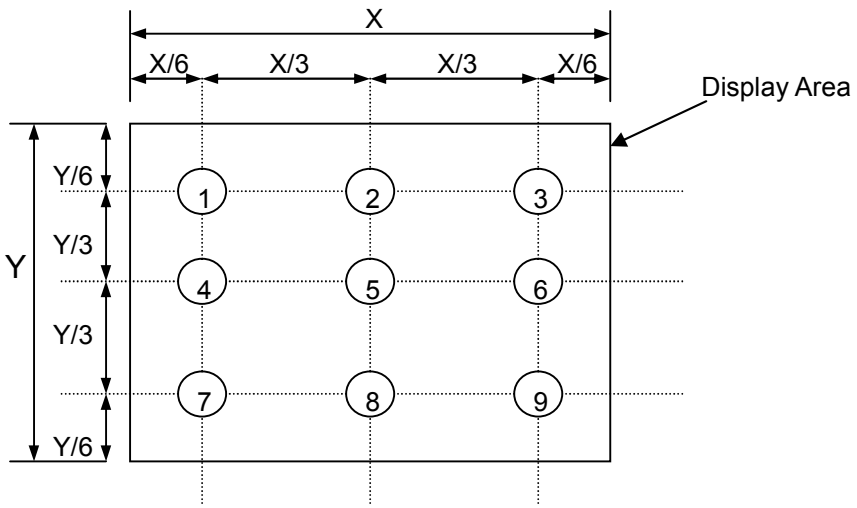
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

7.6.1. Surface Luminance: L_V = average (L_{P1}:L_{P9})

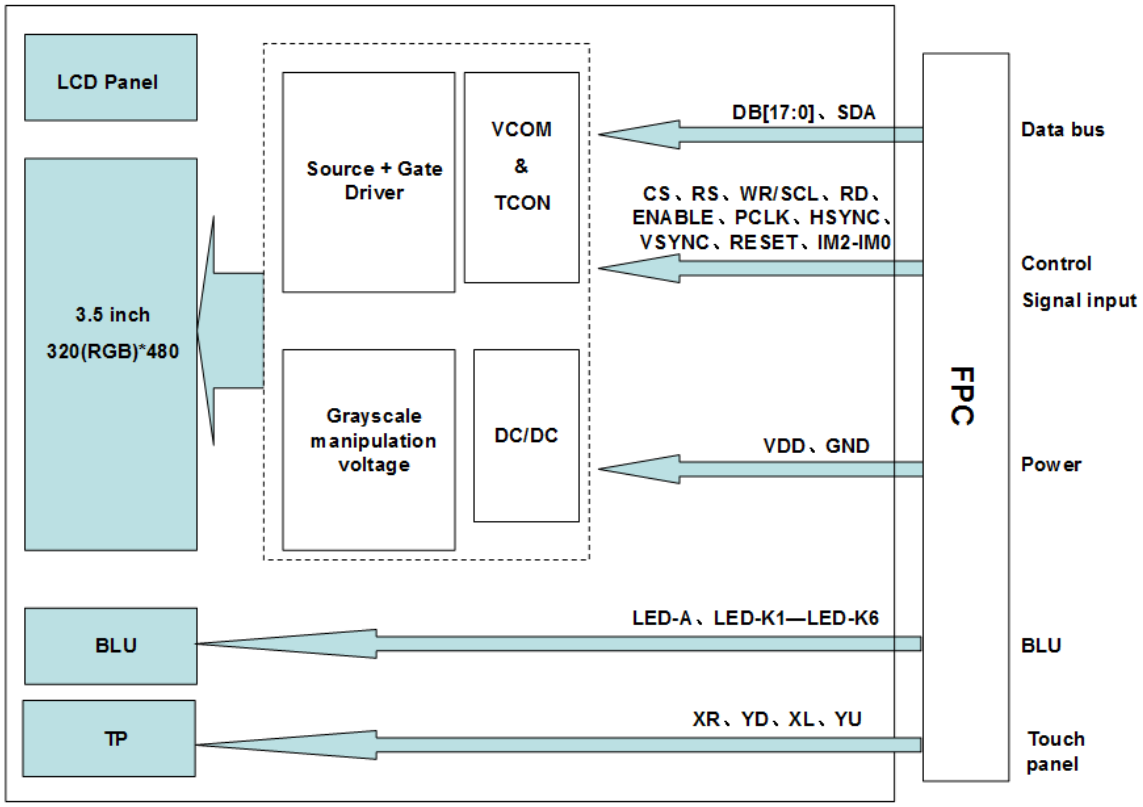
7.6.2. Uniformity = Minimal (L_{P1}:L_{P9}) / Maximal (L_{P1}:L_{P9}) * 100%

7.6.3. Transmittance = L_V on LCD / L_V on Backlight * 100%

Note: Measuring machine: BM-7



8. Block Diagram and Power Supply



9. Interface Pins Definition

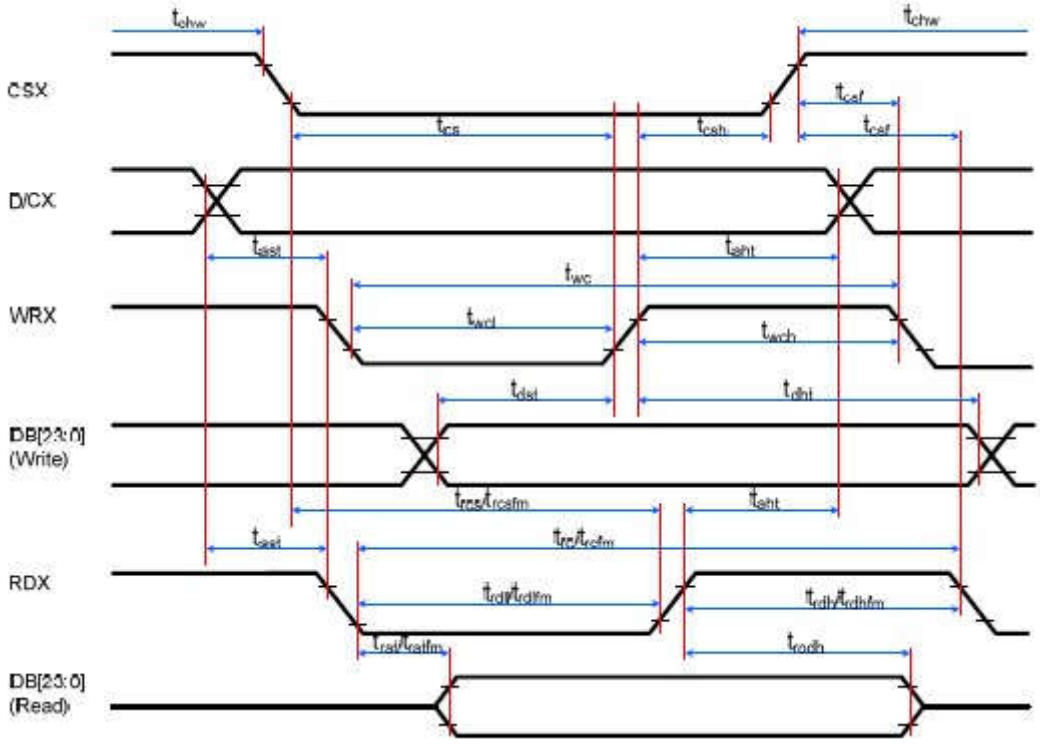
Connector type :FH23-51S-0.3SHW(05) or equivalent

FPC CON

<table>
<tr><th>No.</th><th>Symbol</th><th>Function</th></tr>
<tr><td>1</td><td>TE</td><td>Tearing effect output pin</td></tr>
<tr><td>2</td><td>GND</td><td>Power Ground</td></tr>
<tr><td>3-4</td><td>VDD</td><td>Power supply for LCM (2.8V TYPE).</td></tr>
<tr><td>5</td><td>CS</td><td>Chip select signal</td></tr>
<tr><td>6</td><td>RS</td><td>Command/Display data selection signal</td></tr>
<tr><td>7</td><td>WR/SCL</td><td>DBI Type B:WRX pin, serves as a write signal
DBI Type C:SCL pin as Serial Clock when operates in the serial interface</td></tr>
<tr><td>8</td><td>RD</td><td>LCD driver read enable</td></tr>
<tr><td>9</td><td>SDA</td><td>Serial data input pin.</td></tr>
<tr><td>10</td><td>RESET</td><td>Reset input pin. Signal is active low.</td></tr>
<tr><td>11-28</td><td>DB0-DB17</td><td>Data bus</td></tr>
<tr><td>29</td><td>ENABLE</td><td>Data Enable signal.</td></tr>
<tr><td>30</td><td>PCLK</td><td>Pixel clock signal for DPI I/F mode.</td></tr>
<tr><td>31</td><td>HSYNC</td><td>Horizontal Sync Signal</td></tr>
<tr><td>32</td><td>VSYNC</td><td>Vertical Sync Signal</td></tr>
<tr><td>33
34
35</td><td>IM2
IM1
IM0</td><td>Select the MPU system interface mode:
<table>
<tr><th>IM2</th><th>IM1</th><th>IM0</th><th>Interface mode</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>Not use</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>DBI Type B 18-bit bus(DB_EN=0)</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>DBI Type B 9-bit bus</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>DBI Type B 16-bit bus</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>DBI Type B 8-bit bus</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>DBI Type C Option 1(3-line SPI)</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>Not use</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>DBI Type C Option 1(4-line SPI)</td></tr>
</table></td></tr>
<tr><td>36</td><td>YD</td><td>Touch panel terminal</td></tr>
<tr><td>37</td><td>XL</td><td>Touch panel terminal</td></tr>
<tr><td>38</td><td>YU</td><td>Touch panel terminal</td></tr>
<tr><td>39</td><td>XR</td><td>Touch panel terminal</td></tr>
<tr><td>40-45</td><td>LED-K1-LED-K6</td><td>Cathode for back light driver voltage</td></tr>
<tr><td>46</td><td>LED-A</td><td>Anode for back light driver voltage</td></tr>
<tr><td>47</td><td>GND</td><td>Power Ground</td></tr>
<tr><td>48-51</td><td>NC</td><td>No Connection</td></tr>
</table>

10. AC Characteristics

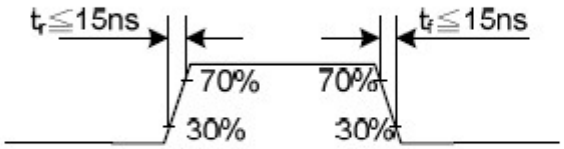
10.1. DBI Type B (Display Parallel 8-/9-/16-/18-/24-bit interface) Timing Characteristics



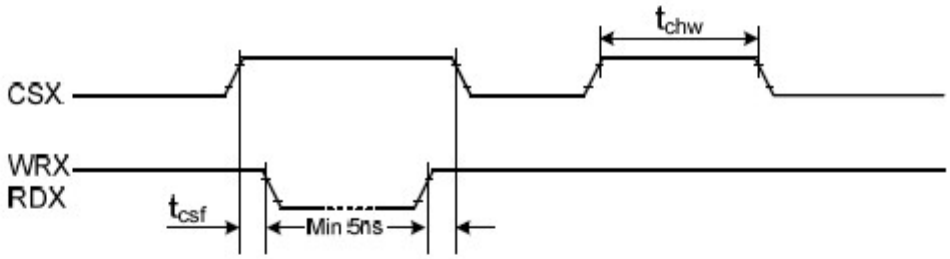
Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	-
	that	Address hold time (Write/Read)	0	-	ns	-
CSX	tchw	CSX "H" pulse width	0	-	ns	-
	tcs	Chip Select setup time (Write)	15	-	ns	-
	trcs	Chip Select setup time (Read ID)	45	-	ns	-
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	-
	tcsf	Chip Select Wait time (Write/Read)	0	-	ns	-
WRX	twc	Write cycle	30	-	ns	-
	twrh	Write Control pulse H duration	15	-	ns	-
	twrl	Write Control pulse L duration	15	-	ns	-
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	When read from Frame Memory
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	When read ID data
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
DB [23:0], DB [17:0], DB [15:0], DB [8:0], DB [7:0]	tdst	Write data setup time	10	-	ns	For maximum, CL=30pF For minimum, CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

Notes:

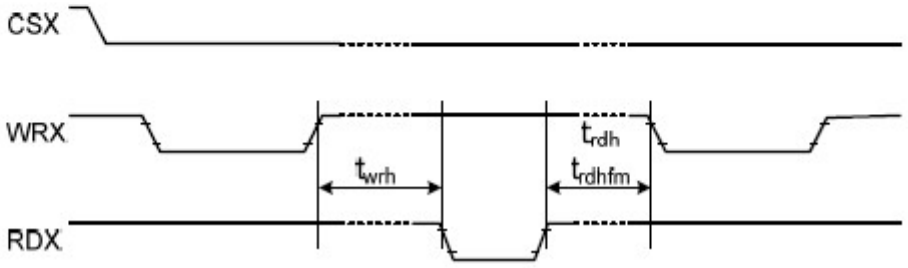
1. Ta = -30 to 70 ºC, IOVCC = 1.65V to 3.3V, VCI = 2.5V to 3.3V, AGND = DGND = 0V
2. Logic high and low levels are specified as 30% and 70% of IOVCC for input signals.
3. Input signal rising time and falling time:



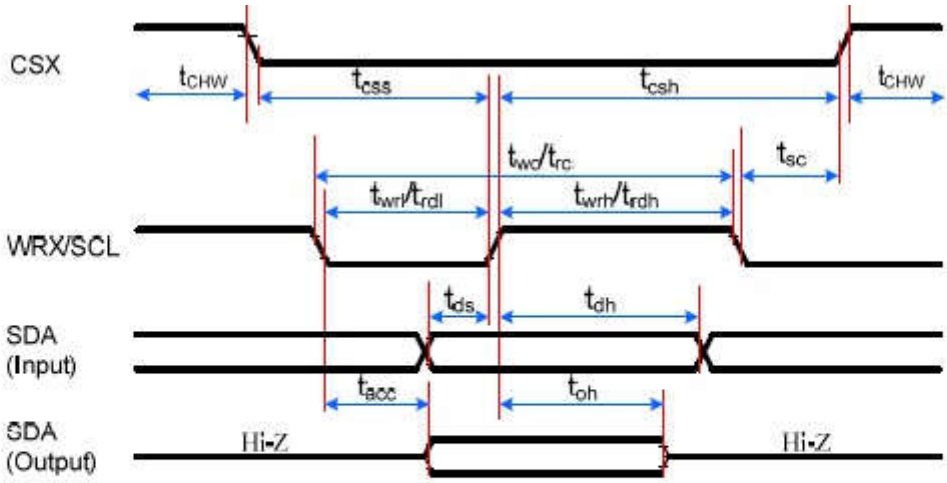
4. The CSX timing:



5. The Write to Read or the Read to Write timing:

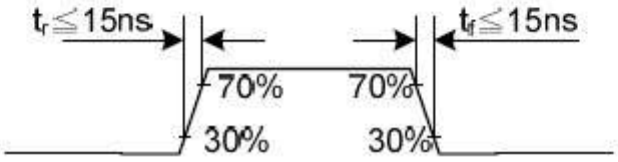


10.2. DBI Type C Option 1 (3-Line SPI System) Timing Characteristics

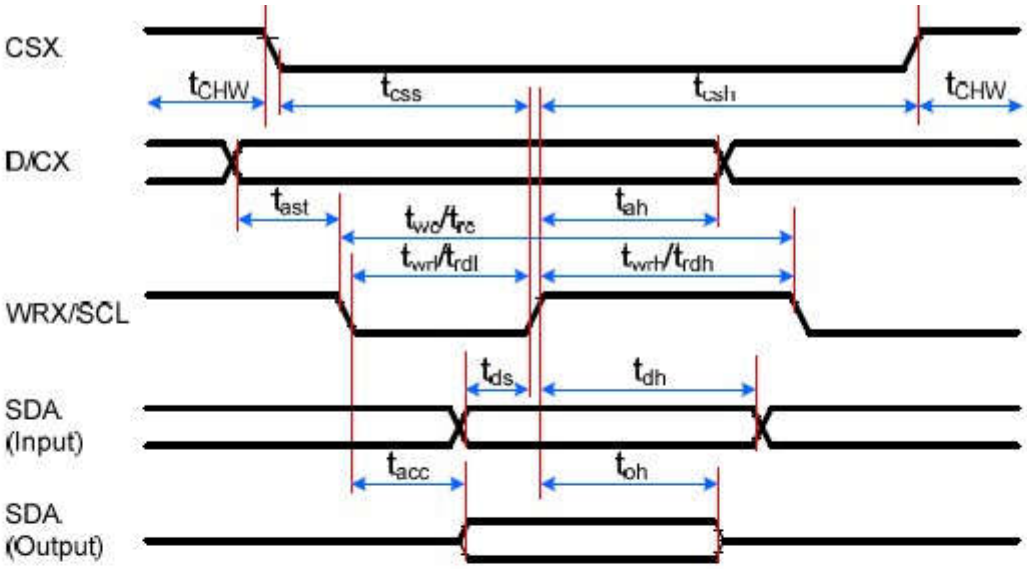


Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tsc	SCL-CSX	15	-	ns	
	tchw	CSX H Pulse Width	40	-	ns	
	tcss	Chip select time (Write)	60	-	ns	
	tcsh	Chip select hold time (Read)	65	-	ns	
SCL	twc	Serial Clock Cycle (Write)	66	-	ns	
	twrh	SCL H Pulse Width (Write)	15	-	ns	
	twrl	SCL L Pulse Width (Write)	15	-	ns	
	trc	Serial Clock Cycle (Read)	150	-	ns	
	trdh	SCL H Pulse Width (Read)	60	-	ns	
	trdl	SCL L Pulse Width (Read)	60	-	ns	
SDA/SDI (Input)	tds	Data setup time (Write)	10	-	ns	
	tdh	Data hold time (Write)	10	-	ns	
SDA/SDO (Output)	tacc	Access time (Read)	10	50	ns	For maximum CL=30pF
	toh	Output disable time (Read)	15	50	ns	For minimum CL=8pF

Note: Ta = -30 to 70 ℃, IOVCC = 1.65V to 3.6V, VCI = 2.5V to 3.6V, AGND = DGND = 0V, T = 10+/-0.5ns



10.3. DBI Type C Option 3 (4-Line SPI System) Timing Characteristics

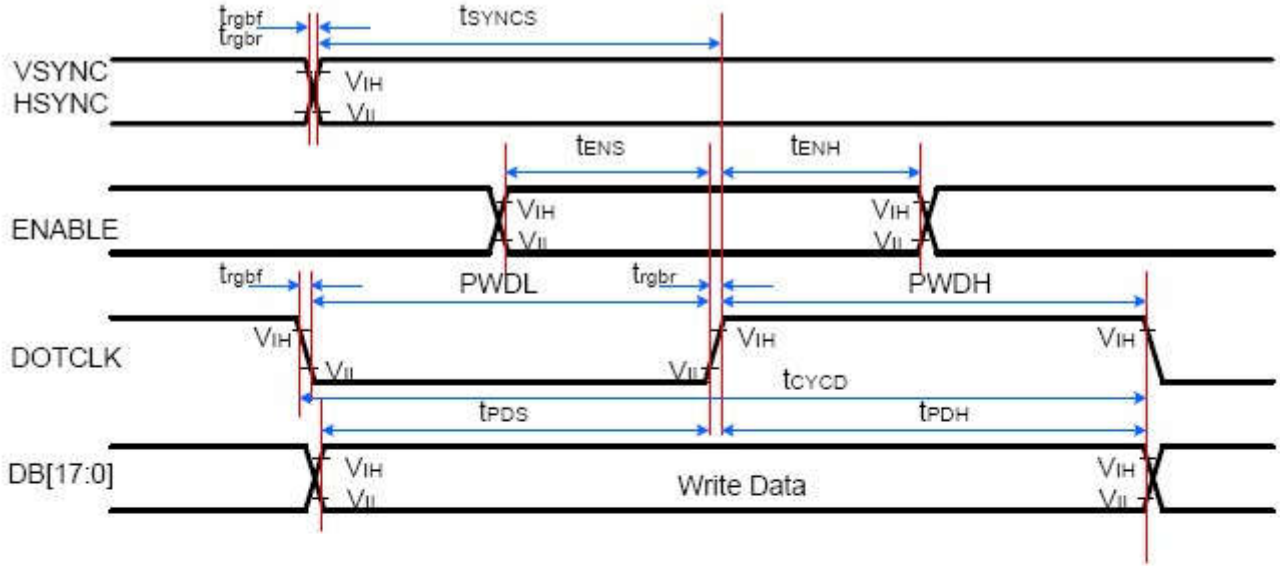


Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tcss	Chip select time (Write)	15	-	ns	
	tcsh	Chip select hold time (Read)	15	-	ns	
	tCHW	CS H pulse width	40	-	ns	
SCL	twc	Serial clock cycle (Write)	50	-	ns	
	twrh	SCL H pulse width (Write)	10	-	ns	
	twrl	SCL L pulse width (Write)	10	-	ns	
	trc	Serial clock cycle (Read)	150	-	ns	
	trdh	SCL H pulse width (Read)	60	-	ns	
	trdl	SCL L pulse width (Read)	60	-	ns	
D/CX	tas	D/CX setup time	10	-	ns	
	tah	D/CX hold time (Write/Read)	10	-	ns	
SDA/SDI (Input)	tds	Data setup time (Write)	10	-	ns	
	tdh	Data hold time (Write)	10	-	ns	
SDA/SDO (Output)	tacc	Access time (Read)	10	50	ns	For maximum CL=30pF
	tod	Output disable time (Read)	15	50	ns	For minimum CL=8pF

Notes:

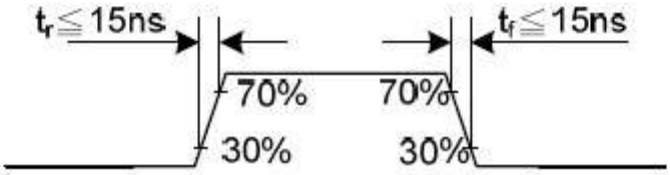
1. Ta = -30 to 70 °C, IOVCC = 1.65V to 3.3V, VCI = 2.5V to 3.3V, AGND = DGND = 0V, T = 10+/-0.5ns.
2. Does not include signal rising and falling times.

10.4. DPI (Display Parallel 16-/18-/24-bit interface) Timing Characteristics



Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC/ HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	16-/18-/24-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
ENABLE	t_{ENS}	ENABLE setup time	15	-	ns	
	t_{ENH}	ENABLE hold time	15	-	ns	
DB [23:0]	t_{PDS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	20	-	ns	
	PWDL	DOTCLK low-level period	20	-	ns	
	t_{CYCD}	DOTCLK cycle time	50	-	ns	
	t_{rgbr} , t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

Note: Ta = -30 to 70 ℃, IOVCC = 1.65V to 3.3V, VCI = 2.5V to 3.3V, AGND = DGND = 0V



11. Quality Assurance

11.1 Purpose

This standard for Quality Assurance assures the quality of LCD module products supplied to customer.

11.2 Standard for Quality Test

11.2.1 Sampling Plan:

GB2828.1-2012

Single sampling, normal inspection

11.2.2 Sampling Criteria:

Visual inspection: AQL 1.5%

Electrical functional: AQL 0.65%.

11.2.3 Reliability Test:

Detailed requirement refer to Reliability Test Specification.

11.3 Nonconforming Analysis & Disposition

11.3.1 Nonconforming analysis:

11.3.1.1 Customer should provide overall information of non-conforming sample for their complaints.

11.3.1.2 After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.

11.3.1.3 If can not finish the analysis on time, customer will be notified with the progress status.

11.3.2 Disposition of nonconforming:

11.3.2.1 Non-conforming product over PPM level will be replaced.

11.3.2.2 The cause of non-conformance will be analyzed. Corrective action will be discussed and implemented.

11.4 Agreement Items

Shall negotiate with customer if the following situation occurs:

11.4.1 There is any discrepancy in standard of quality assurance.

11.4.2 Additional requirement to be added in product specification.

11.4.3 Any other special problem.

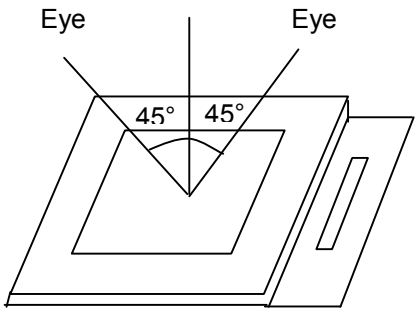
11.5 Standard of the Product Visual Inspection

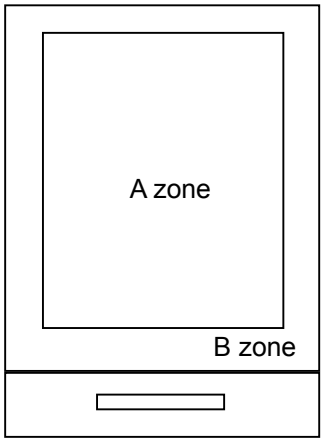
11.5.1 Appearance inspection:

11.5.1.1 The inspection must be under illumination about 1000 – 1500 lx, and the distance of view must be at 30cm ± 2cm.

11.5.1.2 The viewing angle should be 45° from the vertical line without reflection light or follows customer's viewing angle specifications.

11.5.1.3 Definition of area: A Zone: Active Area, B Zone: Viewing Area,



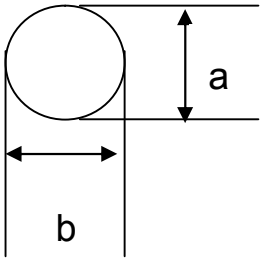


11.5.2 Basic principle:

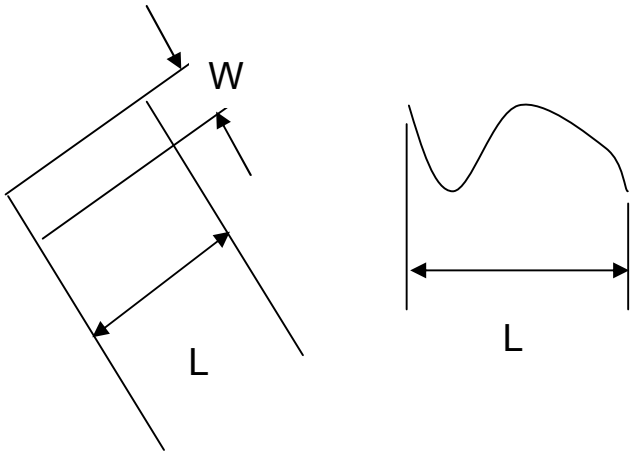
11.5.2.1 A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

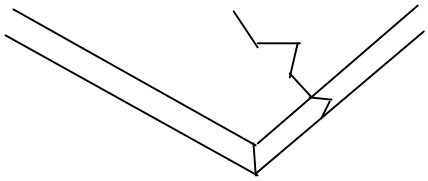
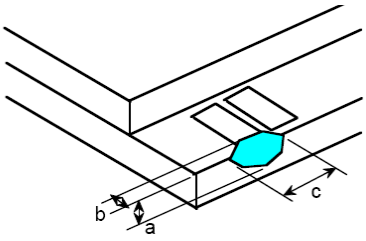
11.5.2.2 New item must be added on time when it is necessary.

11.6 Inspection Specification

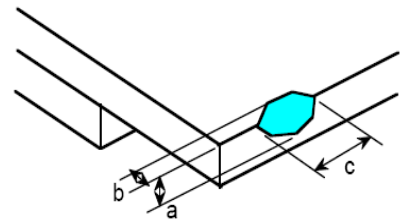
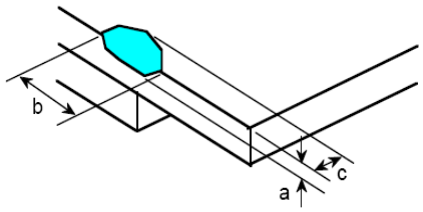
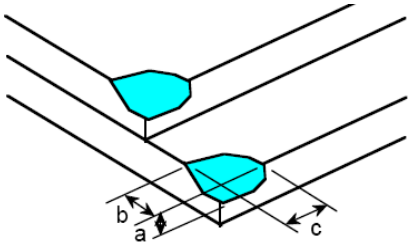
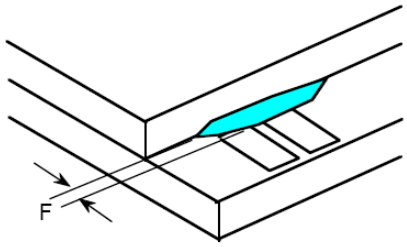
<table>
<tr><th>No.</th><th>Item</th><th>Criteria (Unit: mm)</th></tr>
<tr><td>01</td><td>Black / White spot
Foreign material
(Round type)
Pinholes
Stain
Particles inside cell.
(Minor defect)</td><td>


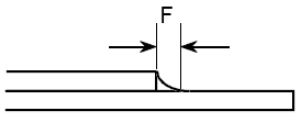
φ= (a + b) /2
<table>
<tr><th>Size \ Area</th><th>Acc. Qty</th></tr>
<tr><td>φ≤0.10</td><td>Ignore</td></tr>
<tr><td>0.10<φ≤0.15</td><td>2</td></tr>
<tr><td>0.15<φ≤0.25</td><td>1</td></tr>
<tr><td>0.25<φ</td><td>0</td></tr>
<tr><td>Total</td><td>2 no include φ≤ 0.10</td></tr>
</table>
Distance between 2 defects should more than 3mm apart.
</td></tr>
<tr><td>02</td><td>Electrical Defect
(Minor defect)</td><td>
<table>
<tr><td></td><td>Display Area</td><td>Total</td><td rowspan="4">Note1</td></tr>
<tr><td>Bright dot</td><td>0</td><td>0</td></tr>
<tr><td>Dark dot</td><td>N≤2</td><td>N≤2</td></tr>
<tr><td>Total dot</td><td>N≤2</td><td>N≤2</td></tr>
<tr><td>Mura</td><td colspan="2">Not visible through 5% ND filters.</td><td>Note 2</td></tr>
</table>
Remark:
1. Bright dot caused by scratch and foreign object accords to item 1.
</td></tr>
</table>

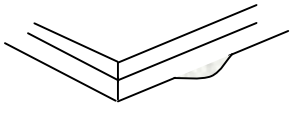
<table>
<tr>
<td>03</td>
<td>Black and White line
Scratch
Foreign material
(Line type)
(Minor defect)</td>
<td>


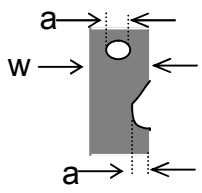
<table>
<tr><th>Length</th><th>Width</th><th>Acc. Qty</th></tr>
<tr><td>/</td><td>W ≦ 0.03</td><td>Ignore</td></tr>
<tr><td>L ≦ 2.5</td><td>0.03 ＜ W ≦ 0.05</td><td>3</td></tr>
<tr><td>L ≦ 2.5</td><td>0.05 ＜ W ≦ 0.10</td><td>2</td></tr>
<tr><td>/</td><td>0.1 ＜ W</td><td>0</td></tr>
<tr><td colspan="2">Total</td><td>3</td></tr>
</table>
Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.
</td>
</tr>
<tr>
<td>04</td>
<td>Glass Crack
(Minor defect)</td>
<td>

Crack is potential to enlarge, any type is not allowed.
</td>
</tr>
<tr>
<td>05</td>
<td>Glass Chipping Pad Area:
(Minor defect)


</td>
<td>
<table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c > 3.0, b< 1.0</td><td>1</td></tr>
<tr><td>c< 3.0, b< 1.0</td><td>3</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr>
<td>06</td>
<td>Glass Chipping Rear of Pad Area:
(Minor defect)
 
</td>
<td><table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c > 3.0, b< 1.0</td><td>1</td></tr>
<tr><td>c< 3.0, b< 1.0</td><td>2</td></tr>
<tr><td>c< 3.0, b< 0.5</td><td>4</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table></td>
</tr>
<tr>
<td>07</td>
<td>Glass Chipping Except Pad Area:
(Minor defect)
 
</td>
<td><table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c > 3.0, b< 1.0</td><td>1</td></tr>
<tr><td>c< 3.0, b< 1.0</td><td>2</td></tr>
<tr><td>c< 3.0, b< 0.5</td><td>4</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table></td>
</tr>
<tr>
<td>08</td>
<td>Glass Corner Chipping:
(Minor defect)
 
</td>
<td><table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c < 3.0, b< 3.0</td><td>Ignore</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table></td>
</tr>
<tr>
<td>09</td>
<td>Glass Burr:
(Minor defect)
 

  </td>
<td><table>
<tr><th>Length</th><th>Acc. Qty</th></tr>
<tr><td>F < 1.0</td><td>Ignore</td></tr>
</table>
Glass burr don’t affect assemble and module dimension.</td>
</tr>
</table>

<table>
<tr><td>10</td><td>FPC Defect:(Minor defect)
 
</td><td>10.1 Dent, pinhole width a<w/3.
(w: circuitry width.)
10.2 Open circuit is unacceptable.
10.3 No oxidation, contamination and distortion.</td></tr>
<tr><td>11</td><td>Bubble on Polarizer
(Minor defect)</td><td><table><tr><td>Diameter</td><td>Acc. Qty</td></tr><tr><td>φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20 <φ≤0.30</td><td>4</td></tr><tr><td>0.30 <φ≤0.50</td><td>1</td></tr><tr><td>0.50 < φ</td><td>None</td></tr></table></td></tr>
<tr><td>12</td><td>Dent on Polarizer
(Minor defect)</td><td><table><tr><td>Diameter</td><td>Acc. Qty</td></tr><tr><td>φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20 <φ≤0.30</td><td>4</td></tr><tr><td>0.30 <φ≤0.50</td><td>1</td></tr><tr><td>0.50 < φ</td><td>None</td></tr></table></td></tr>
<tr><td>13</td><td>Bezel</td><td>13.1 No rust, distortion on the Bezel.
13.2 No visible fingerprints, stains or other contamination.</td></tr>
<tr><td>14</td><td>Touch Panel</td><td>D: Diameter W: width L: length
14.1 Spot: D<0.25 is acceptable
0.25≤D≤0.4
2dots are acceptable and the distance between defects should more than 10 mm.
D>0.4 is unacceptable
14.2 Dent: D>0.40 is unacceptable
14.3 Scratch: W≤0.03, L≤10 is acceptable,
0.03<W≤0.10, L≤10 is acceptable
Distance between 2 defects should more than 10 mm.
W>0.10 is unacceptable.</td></tr>
<tr><td>15</td><td>LCD Ripple</td><td>Touch the touch panel, cannot see the LCD ripple.
Pen: R 0.8mm silicon rubber.
Operation Force:100g</td></tr>
<tr><td>16</td><td>PCB</td><td>16.1 No distortion or contamination on PCB terminals.
16.2 All components on PCB must same as documented on the BOM/component layout.
16.3 Follow IPC-A-600F.</td></tr>
</table>

17	Soldering	Follow IPC-A-610C standard
18	Electrical Defect (Major defect)	The below defects must be rejected. 18.1 Missing vertical / horizontal segment, 18.2 Abnormal Display. 18.3 No function or no display. 18.4 Current exceeds product specifications. 18.5 LCD viewing angle defect. 18.6 No Backlight. 18.7 Dark Backlight. 18.8 Touch Panel no function.

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

11.7 Classification of Defects

11.7.1 Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.

11.7.2 Two minor defects are equal to one major in lot sampling inspection.

11.8 Identification/marking criteria

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

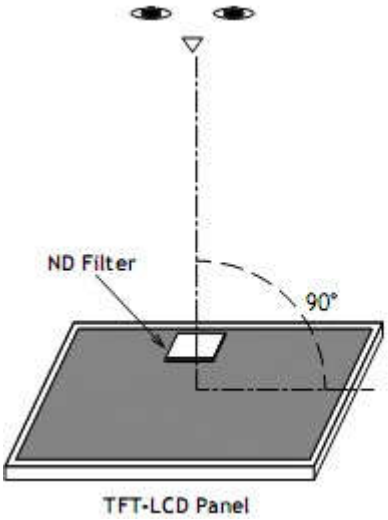
11.9 Packaging

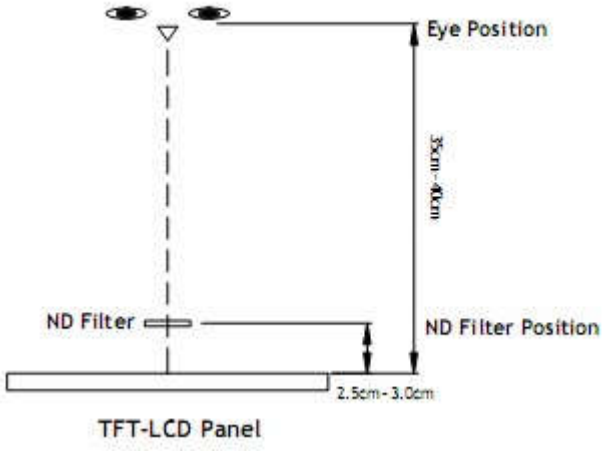
11.9.1 There should be no damage of the outside carton box, each packaging box should have one identical label.

11.9.2 Modules inside package box should have compliant mark.

11.9.3 All direct package materials shall offer ESD protection

Note1: Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.





Bright dot: The bright dot size defect at black display pattern. It can be recognized by 2% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Dark dot: Cyan, Magenta or Yellow dot size defect at white display pattern. It can be recognized by 5% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Note2: Mura on display which appears darker / brighter against background brightness on parts of display area.

12. Reliability Specification

No	Item	Condition	Quantity	Criteria
1	**High Temperature Operating**	**70℃, 96Hrs**	2	GB/T2423.2 -2008
2	**Low Temperature Operating**	**-20℃, 96Hrs**	2	GB/T2423.1 -2008
3	**High Humidity**	**50℃, 90%RH, 96Hrs**	2	GB/T2423.3 -2006
4	**High Temperature Storage**	**80℃, 96Hrs**	2	GB/T2423.2 -2008
5	**Low Temperature Storage**	**-30℃, 96Hrs**	2	GB/T2423.1 -2008
6	Thermal Cycling Test	-20℃, 60min~70℃, 60min, 20 cycles.	2	GB/T2423.22 -2012
7	Packing vibration	Frequency range:10Hz~50Hz Acceleration of gravity:5G X, Y, Z 30 min for each direction.	2	GB/T5170.14 -2009
8	Electrical Static Discharge	Air:±8KV 150pF/330Ω 5 times	2	GB/T17626.2 -2006
		Contact:±4KV 150pF/330Ω 5 times		
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	2	GB/T2423.8 -1995

Note1. No defection cosmetic and operational function allowable.

Note2. Total current Consumption should be below double of initial value

13. Precautions and Warranty

13.1 Safety

13.1.1 The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

13.1.2 Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

13.2 Handling

13.2.1 Reverse and use within ratings in order to keep performance and prevent damage.

13.2.2 Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

13.3 Storage

13.3.1 Do not store the LCD module beyond the specified temperature ranges.

13.3.2 Strong light exposure causes degradation of polarizer and color filter.

13.4 Metal Pin (Apply to Products with Metal Pins)

13.4.1 Pins of LCD and Backlight

13.4.1.1 Solder tip can touch and press on the tip of Pin LEAD during the soldering

13.4.1.2 Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

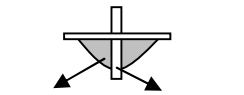
Maximum Solder Temperature: 370℃

Maximum Solder Time: 3s at the maximum temperature

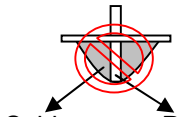
Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

13.4.1.3 Solder Wetting



Recommended



Not Recommended

13.4.2 Pins of EL

13.4.2.1 Solder tip can touch and press on the tip of EL leads during soldering.

13.4.2.2 No Solder Paste on the soldering pad on the motherboard is recommended.

13.4.2.3 Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270～290℃

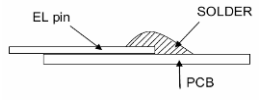
Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body):2.0mm

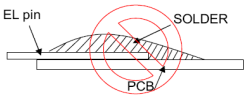
13.4.2.4 No horizontal press on the EL leads during soldering.

13.4.2.5 180° bend EL leads three times is not allowed.

13.4.2.6 Solder Wetting

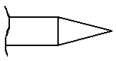


Recommended

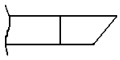


Not Recommended

13.4.2.7 The type of the solder iron:

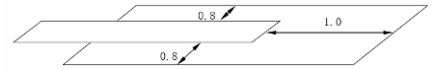


Recommended



Not Recommended

13.4.2.8 Solder Pad



13.5 Operation

13.5.1 Do not drive LCD with DC voltage

13.5.2 Response time will increase below lower temperature

13.5.3 Display may change color with different temperature

13.5.4 Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.

13.5.5 Do not connect or disconnect the LCM to or from the system when power is on.

13.5.6 Never use the LCM under abnormal condition of high temperature and high humidity.

13.5.7 Module has high frequency circuits. Sufficient suppression to the electromagnetic interface shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

13.5.8 Do not display the fixed pattern for long time（we suggest the time not longer than one hour）because it may develop image sticking due to the TFT structure.

13.6 Static Electricity

13.6.1 CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.

13.6.2 The normal static prevention measures should be observed for work clothes and benches.

13.6.3 The module should be kept into anti-static bags or other containers resistant to static for storage.

13.7 Limited Warranty

13.7.1 Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.

13.7.2 If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.

13.7.3 After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

14. Packaging

TBD

15. Outline Drawing