

Display Elektronik GmbH

# DATA SHEET

***TFT MODULE***

**DEM 240320P TMH-PW-N**

**3,5" TFT**  
(Portrait Mode)

Product Specification

Ver.: 1

04.01.2016

**Revision History**

<b>Revision</b>	<b>Date</b>	<b>Detail</b>	<b>Remarks</b>
0	14.11.2015	Initial Release	-
1	04.01.2016	Modify Backlight Characteristics	P6

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## 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 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	240 x RGB x 320	Pixels
View Direction	12 O'clock	Best Image
Gray Scale Inversion Direction	6 O'clock	-
Module Outline	59.86 x 81.08 x 2.70 ( Note1 )	mm
Active Area	52.56 x 70.08	mm
Pixel Size	0.219 x 0.219	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Polarizer Surface Treatment	Anti-Glare	-
Display Colors	262k	-
Interface	3-wire 9-bit SPI + 18-Bit-RGB	-
With or without Touch Panel	Without	-
Driver IC	ILI9341V (Ilitek)	-
Operating Temperature	-20~70	°C
Storage Temperature	-30~80	°C
Weight	33	g

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

## 3. Absolute Maximum Ratings

V<sub>SS</sub>=0V, Ta=25°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage	DVDD	-0.3	4.6	V
Storage Temperature	T <sub>STG</sub>	-30	+80	°C
Operating Temperature	T <sub>OP</sub>	-20	+70	°C

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

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

4. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	
Supply Voltage	DVDD	2.5	2.8	3.3	V	
Logic Low Input Voltage	V <sub>IL</sub>	VSS	-	0.3* DVDD	V	
Logic High Input Voltage	V <sub>IH</sub>	0.7* DVDD	-	DVDD	V	
Logic Low Output Voltage	V <sub>OL</sub>	VSS	-	0.2* DVDD	V	
Logic High Output Voltage	V <sub>OH</sub>	0.8* DVDD	-	DVDD	V	
Current Consumption All Black	Logic Analog	I <sub>CC+ IIN</sub>	-	TBD	-	mA

5. Backlight Characteristic

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V <sub>F</sub>	Ta=25°C, I <sub>F</sub> =20mA/LED	22.4	25.6	27.2	V
Forward Current	I <sub>F</sub>	Ta=25°C, V <sub>F</sub> =3.2V/LED	-	20	-	mA
Power Dissipation	P <sub>D</sub>		-	512	-	mW
Uniformity	Avg		80	85	-	%
LED Lifetime (25°C)	-		-	30,000	-	Hrs
Drive Method	Constant Current					
LED Configuration	8 White LEDs in serials					

Note: 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 °C, 60%RH±5%, I<sub>F</sub>=20mA.



6. Optical Characteristics

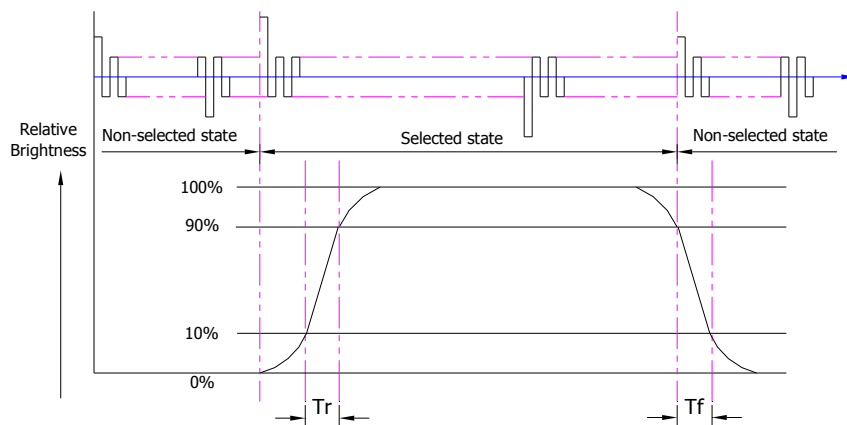
6.1. Optical Characteristics

Ta=25°C, DVDD=2.8V, TN LC+ Polarizer

	Item	Symbol	Condition	Specification			Unit	
				Min.	Typ.	Max.		
Backlight On (Transmissive Mode)	Luminance on TFT( $I_f = 20\text{mA/LED}$ )	Lv	Normally Viewing Angle $\theta_x = \phi_y = 0^\circ$	320	(400)	-	cd/m <sup>2</sup>	
	Contrast Ratio(See 6.3)	CR		300	400	-		
	Response Time (See 6.2)	T <sub>R</sub> +T <sub>F</sub>		-	25	50	ms	
	Chromaticity Transmissive (See 6.5)	Red	X <sub>R</sub>	Center CR≥10	0.584	0.634	0.684	
			Y <sub>R</sub>		0.295	0.345	0.395	
		Green	X <sub>G</sub>		0.261	0.311	0.361	
			Y <sub>G</sub>		0.604	0.654	0.704	
		Blue	X <sub>B</sub>		0.095	0.146	0.196	
			Y <sub>B</sub>		0.054	0.094	0.154	
		White	X <sub>W</sub>		0.238	0.288	0.338	
			Y <sub>W</sub>		0.318	0.358	0.418	
	Viewing Angle (See 6.4)	Horizontal	$\theta_{x+}$	50	65	-	Deg.	
			$\theta_{x-}$	50	65	-		
Vertical		$\phi_{y+}$	40	55	-			
		$\phi_{y-}$	50	65	-			
NTSC Ratio(Gamut)			-	62.2	-	%		

6.2. Definition of Response Time

6.2.1. Normally Black Type (Negative)

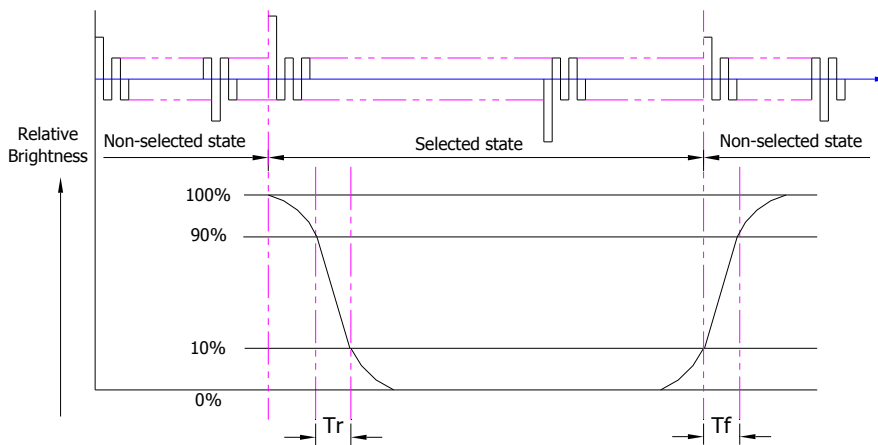


Tr is the time it takes to change from non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

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

6.2.2. Normally White Type (Positive)



Tr is the time it takes to change from 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

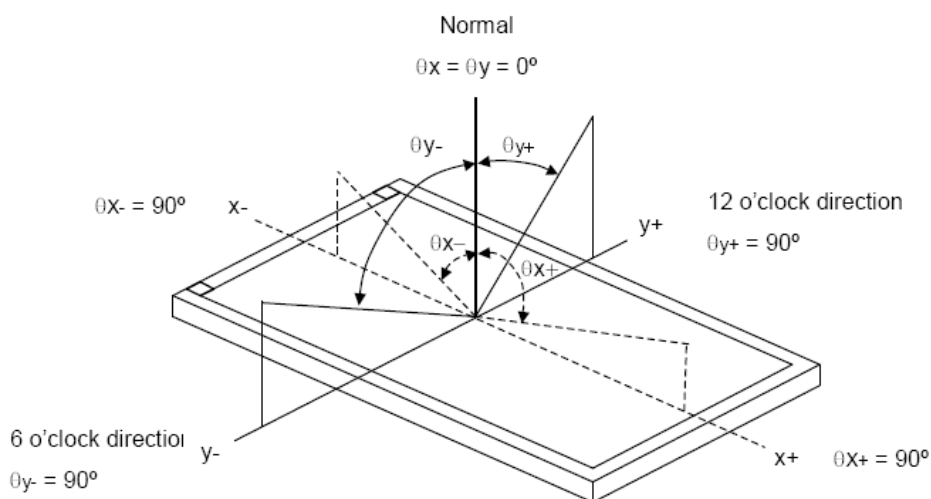
6.3. Definition of Contrast Ratio

Contrast is measured perpendicular to display surface in reflective and transmissive mode. The measurement condition is:

Measuring Equipment	Eldim or Euvelent
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

6.4. Definition of Viewing Angles



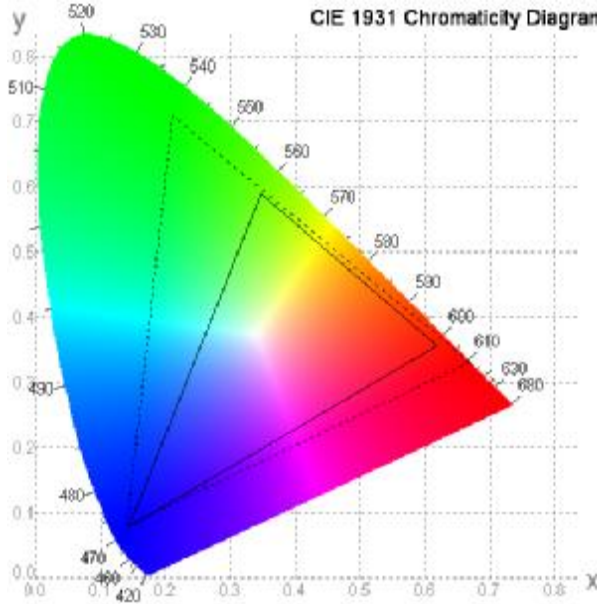
Measuring machine: LCD-5100 or EQUI

**6.5. 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)



**6.6. Definition of Surface Luminance, Uniformity and Transmittance**

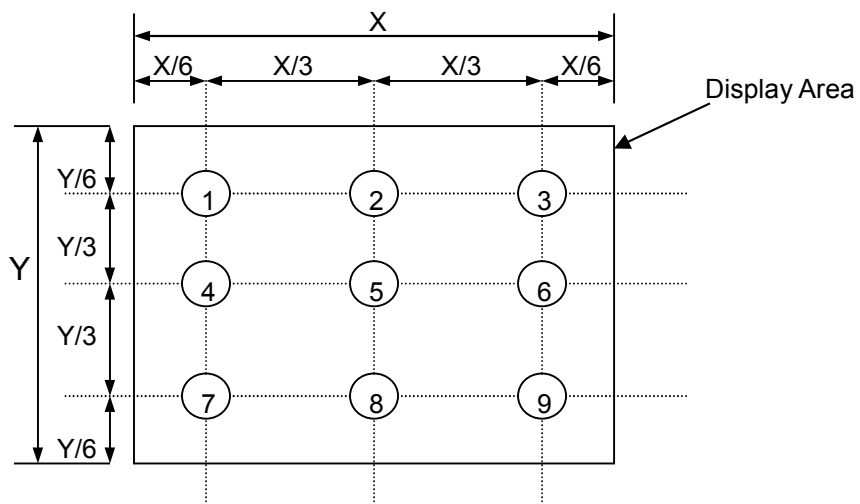
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

6.6.1. Surface Luminance:  $L_v = \text{average} (L_{P1}:L_{P9})$

6.6.2. Uniformity =  $\text{Minimal} (L_{P1}:L_{P9}) / \text{Maximal} (L_{P1}:L_{P9}) * 100\%$

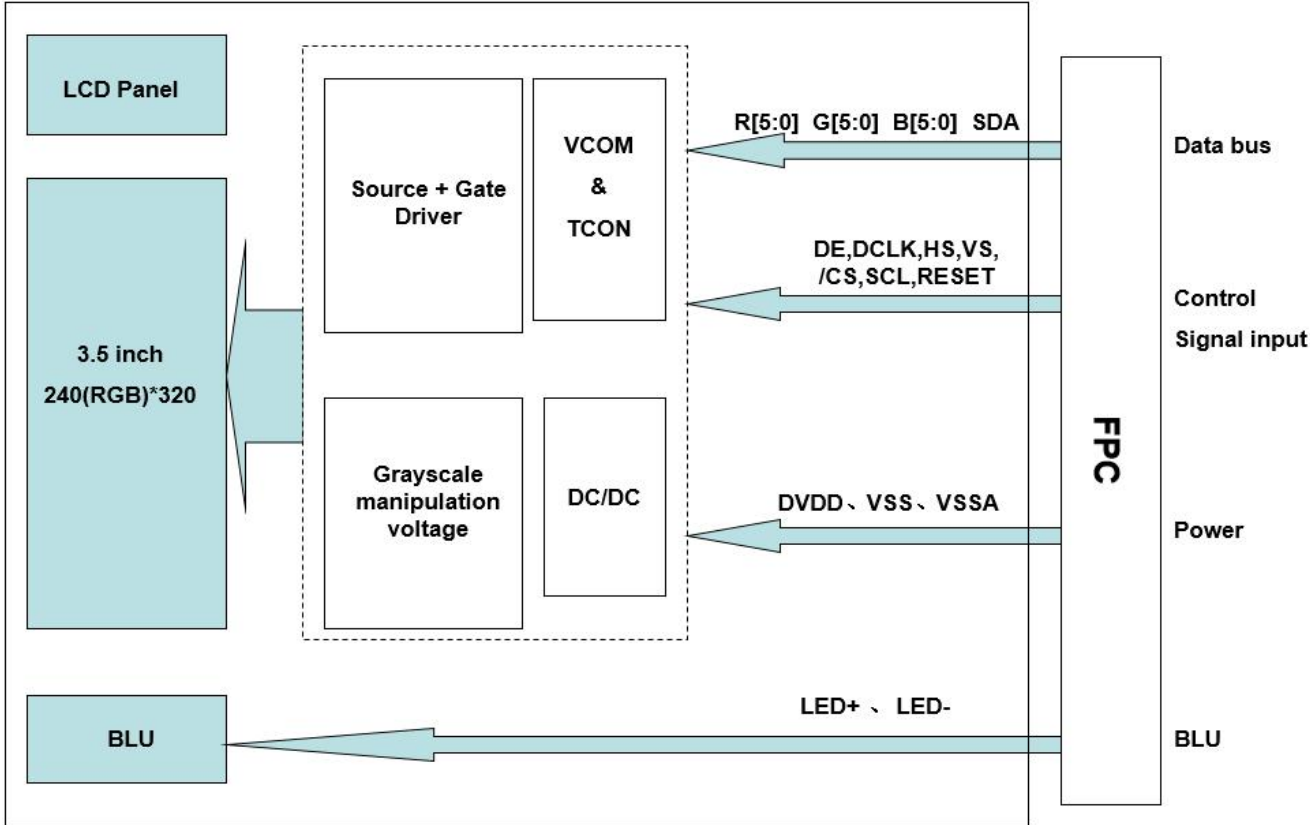
6.6.3. Transmittance =  $L_v \text{ on LCD} / L_v \text{ on Backlight} * 100\%$

Note: Measuring machine: BM-7





7. Block Diagram and Power Supply



## 8. Interface Pins Definition

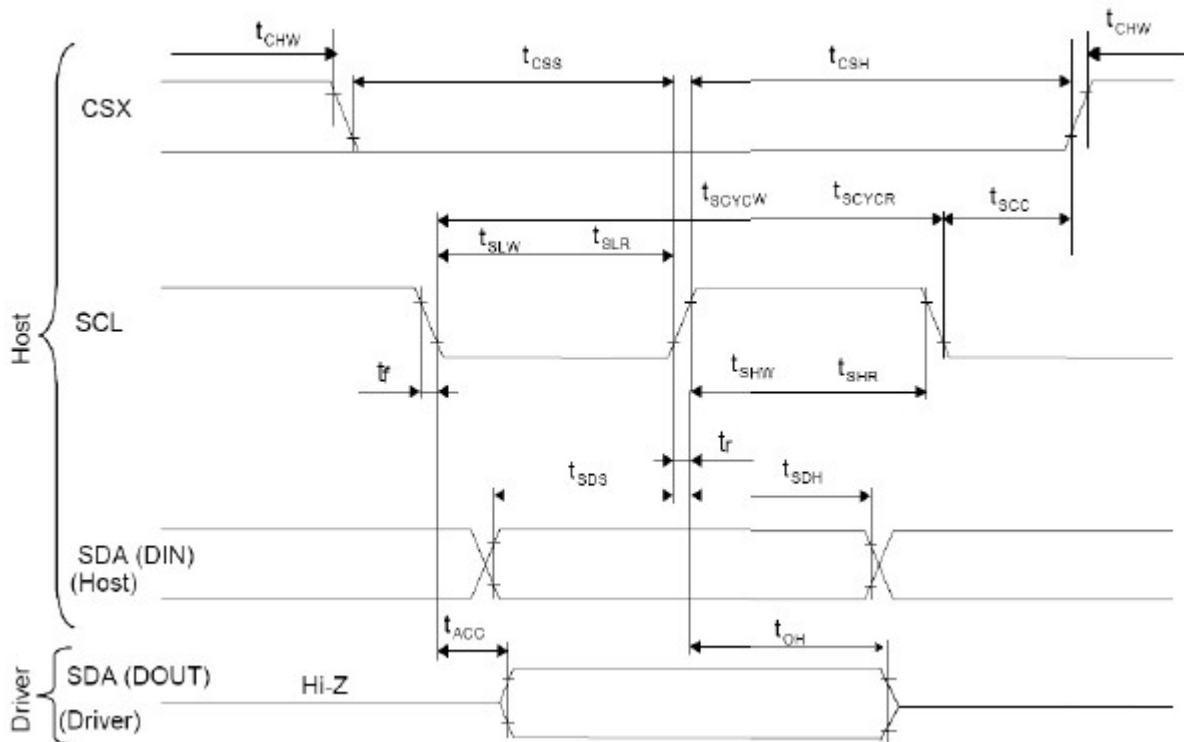
Recommended Connector Type: Hirose - FH23-61S-0.3SHW (or equivalent)

No.	Symbol	Function	Remark
1	DE	Input data enable control	
2	DCLK	Clock signal to sample each data	
3	RESET	Reset Pin	
4	NC/YU	No connection (Touch panel terminal)	
5	VSS	Ground	
6-7	NC	No connection	
8	VSSA	Ground	
9-12	NC	No connection	
13	VSS	Ground	
14	NC/XL	No connection (Touch panel terminal)	
15-18	NC	No connection	
19	VSSA	Ground	
20-21	DVDD	Power source	
22-23	NC	No connection	
24	NC/YD	No connection (Touch panel terminal)	
25	VSS	Ground	
26	NC	No connection	
27	NC/XR	No connection (Touch panel terminal)	
28	NC	No connection	
29	R5	Data bus	
30	R4	Data bus	
31	R3	Data bus	
32	R2	Data bus	
33	R1	Data bus	
34	R0	Data bus	
35	G5	Data bus	
36	G4	Data bus	
37	G3	Data bus	
38	G2	Data bus	
39	G1	Data bus	
40	G0	Data bus	
41	B5	Data bus	
42	B4	Data bus	
43	B3	Data bus	
44	B2	Data bus	
45	B1	Data bus	
46	B0	Data bus	
47	NC	No connection	

48	SCL	Serial clock pin	
49	SDA	Serial data pin	
50	/CS	Chip selection pin	
51	VSS	Ground	
52	HS	Horizontal synchronizing signal	
53	VSS	Ground	
54-55	NC	No connection	
56	VS	Vertical synchronizing signal	
57-58	LED+	Backlight Anode	
59-60	LED-	Backlight Cathode	
61	VSS	Ground	

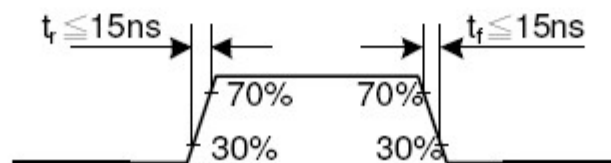
9. AC Characteristics

9.1. Display Serial Interface Timing Characteristics (3-line SPI system)

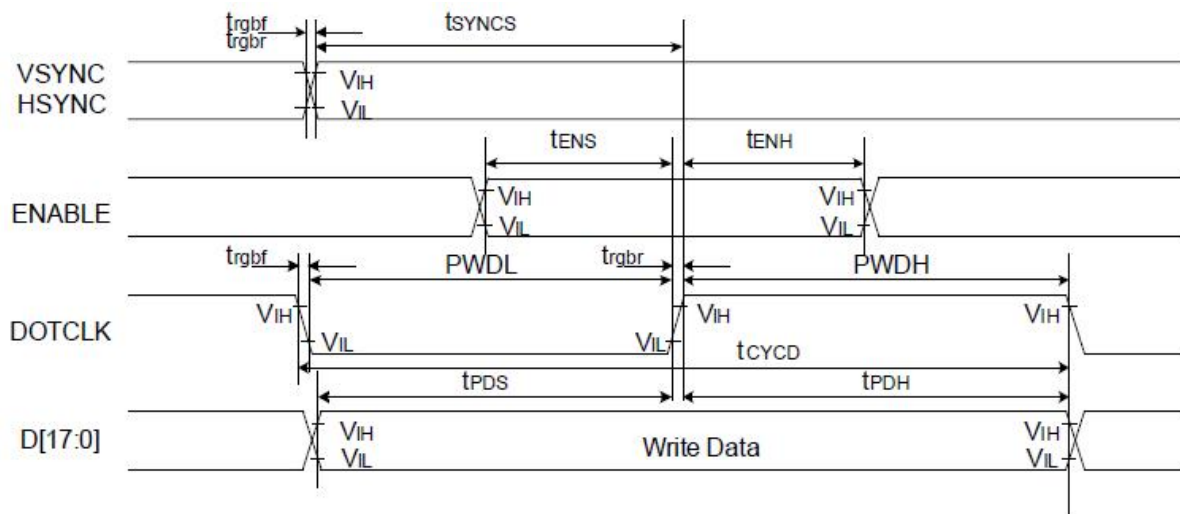


Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA / SDI (Input)	tsds	Data setup time (Write)	30	-	ns	
	tsdh	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	-	ns	
	toh	Output disable time (Read)	10	50	ns	
CSX	tsc	SCL-CSX	20	-	ns	
	tch	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
			65	-	ns	

Note:  $T_a = 25\text{ }^\circ\text{C}$ ,  $V_{DDI}=1.65\text{V to }3.3\text{V}$ ,  $V_{CI}=2.5\text{V to }3.3\text{V}$ ,  $AGND=V_{SS}=0\text{V}$



9.2. Parallel 18/16/6-bit RGB Interface Timing Characteristics

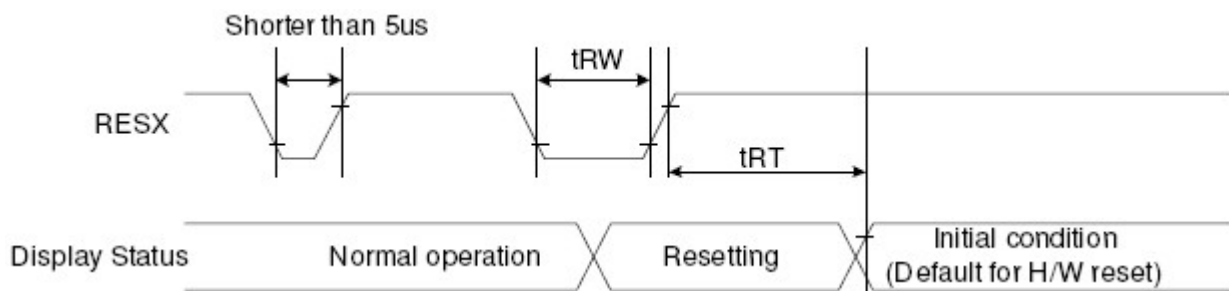


Signal	Symbol	Parameter	min	max	Unit	Description	
VSYNC / HSYNC	$t_{syncs}$	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode	
	$t_{synch}$	VSYNC/HSYNC hold time	15	-	ns		
DE	$t_{ens}$	DE setup time	15	-	ns		
	$t_{enh}$	DE hold time	15	-	ns		
D[17:0]	$t_{pos}$	Data setup time	15	-	ns		
	$t_{pdh}$	Data hold time	15	-	ns		
DOTCLK	$PWDH$	DOTCLK high-level period	15	-	ns		
	$PWDL$	DOTCLK low-level period	15	-	ns		
	$t_{cycd}$	DOTCLK cycle time	100	-	ns		
	$t_{rgbr}, t_{rgbf}$	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns		
VSYNC / HSYNC	$t_{syncs}$	VSYNC/HSYNC setup time	15	-	ns		6-bit bus RGB interface mode
	$t_{synch}$	VSYNC/HSYNC hold time	15	-	ns		
DE	$t_{ens}$	DE setup time	15	-	ns		
	$t_{enh}$	DE hold time	15	-	ns		
D[17:0]	$t_{pos}$	Data setup time	15	-	ns		
	$t_{pdh}$	Data hold time	15	-	ns		
DOTCLK	$PWDH$	DOTCLK high-level pulse period	15	-	ns		
	$PWDL$	DOTCLK low-level pulse period	15	-	ns		
	$t_{cycd}$	DOTCLK cycle time	50	-	ns		
	$t_{rgbr}, t_{rgbf}$	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns		

Note:  $T_a = -30$  to  $70$  °C,  $V_{DDI} = 1.65V$  to  $3.3V$ ,  $V_{CI} = 2.5V$  to  $3.3V$ ,  $AGND = VSS = 0V$



9.3. Reset Timing



Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

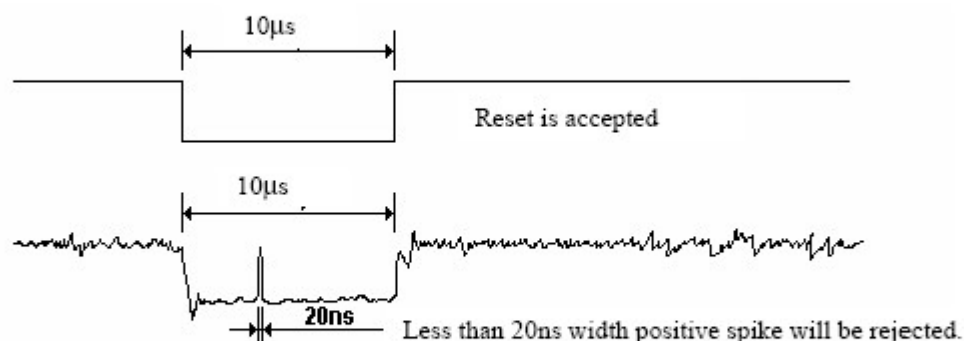
Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

Note 2: Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below: -

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts

Note 3: During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In -mode.) And then return to Default condition for Hardware Reset.

Note 4: Spike Rejection also applies during a valid reset pulse as shown below:



Note 5: When Reset applied during Sleep In Mode.

Note 6: When Reset applied during Sleep Out Mode.

Note 7: It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

## **10. Quality Assurance**

### **10.1.Purpose**

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

### **10.2.Standard for Quality Test**

#### 10.2.1. Sampling Plan:

GB2828.1-2012

Single sampling, general inspection level II.

#### 10.2.2. Sampling Criteria:

Visual inspection: AQL 1.5%

Electrical functional: AQL 0.65%.

#### 10.2.3. Reliability Test:

Detailed requirement refer to Reliability Test Specification.

### **10.3.Nonconforming Analysis & Disposition**

#### 10.3.1. Nonconforming analysis:

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

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

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

#### 10.3.2. Disposition of nonconforming:

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

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

### **10.4.Agreement Items**

Shall negotiate with customer if the following situation occurs:

10.4.1. There is any discrepancy in standard of quality assurance.

10.4.2. Additional requirement to be added in product specification.

10.4.3. Any other special problem.

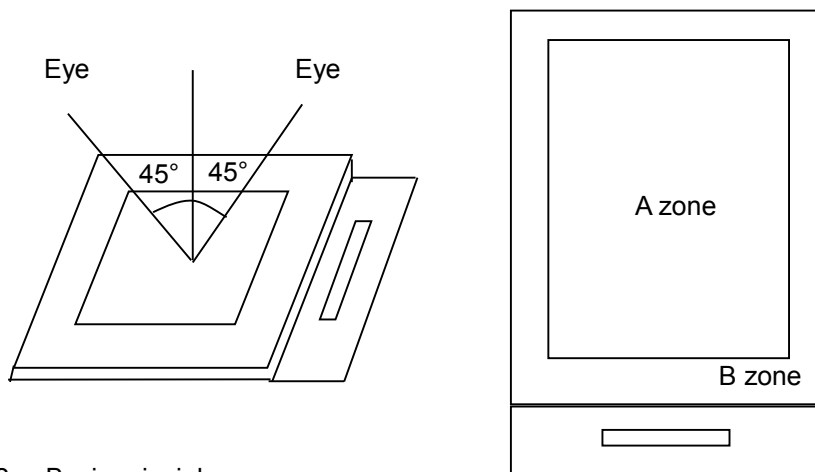
**10.5. Standard of the Product Visual Inspection**

10.5.1. Appearance inspection:

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

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

10.5.1.3. Definition of area: A Zone: Active Area, B Zone: Viewing Area,



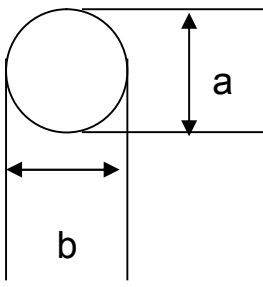
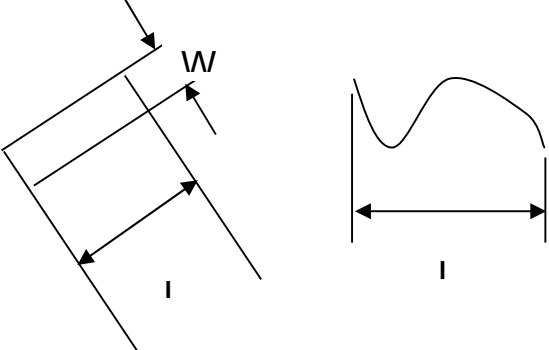
10.5.2. Basic principle:

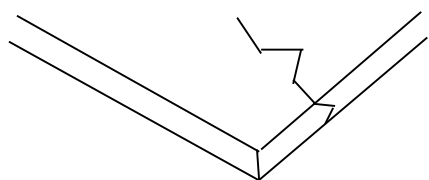
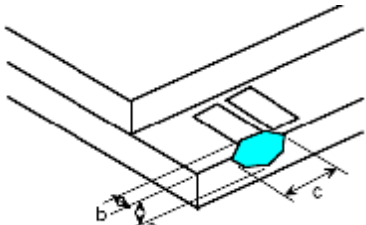
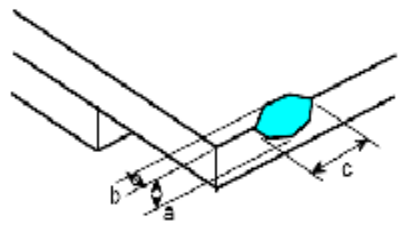
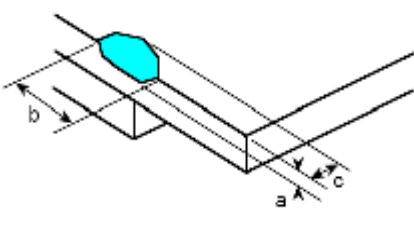
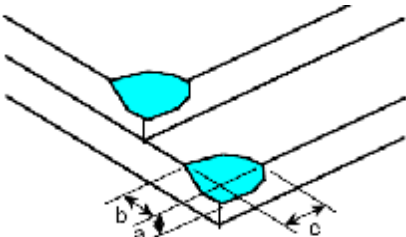
10.5.2.1. A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

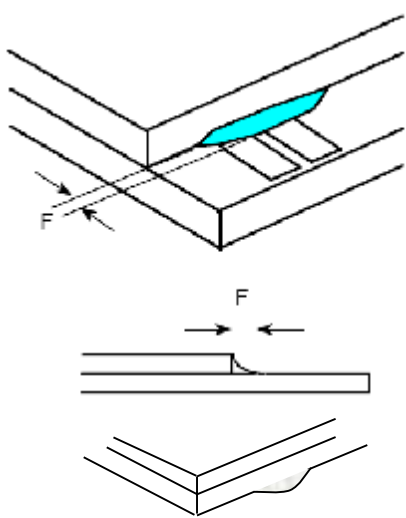
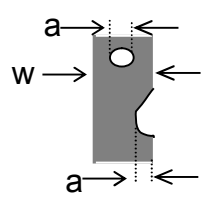
10.5.2.2. New item must be added on time when it is necessary.



10.6. Inspection Specification

No.	Item	Criteria (Unit: mm)																		
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	 <table border="1" data-bbox="901 347 1404 689"> <thead> <tr> <th>Size</th> <th>Area</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\varphi \leq 0.10</math></td> <td></td> <td>Ignore</td> </tr> <tr> <td><math>0.10 &lt; \varphi \leq 0.15</math></td> <td></td> <td>2</td> </tr> <tr> <td><math>0.15 &lt; \varphi \leq 0.25</math></td> <td></td> <td>1</td> </tr> <tr> <td><math>0.25 &lt; \varphi</math></td> <td></td> <td>0</td> </tr> <tr> <td><b>Total</b></td> <td></td> <td><b>2 no include <math>\varphi \leq 0.10</math></b></td> </tr> </tbody> </table> <p><math>\varphi = (a + b) / 2</math> Distance between 2 defects should more than 3mm apart.</p>	Size	Area	Acc. Qty	$\varphi \leq 0.10$		Ignore	$0.10 < \varphi \leq 0.15$		2	$0.15 < \varphi \leq 0.25$		1	$0.25 < \varphi$		0	<b>Total</b>		<b>2 no include <math>\varphi \leq 0.10</math></b>
Size	Area	Acc. Qty																		
$\varphi \leq 0.10$		Ignore																		
$0.10 < \varphi \leq 0.15$		2																		
$0.15 < \varphi \leq 0.25$		1																		
$0.25 < \varphi$		0																		
<b>Total</b>		<b>2 no include <math>\varphi \leq 0.10</math></b>																		
02	Electrical Defect (Minor defect)	<table border="1" data-bbox="459 772 1279 990"> <thead> <tr> <th></th> <th>Display Area</th> <th>Total</th> <th rowspan="4">Note1</th> </tr> </thead> <tbody> <tr> <td><b>Bright dot</b></td> <td><b>0</b></td> <td><b>0</b></td> </tr> <tr> <td><b>Dark dot</b></td> <td><b>N ≤ 2</b></td> <td><b>N ≤ 2</b></td> </tr> <tr> <td><b>Total dot</b></td> <td><b>N ≤ 2</b></td> <td><b>N ≤ 2</b></td> </tr> <tr> <td><b>Mura</b></td> <td colspan="2"><b>Not visible through 5% ND filters.</b></td> <td>Note2</td> </tr> </tbody> </table> <p>Remark: 1. Bright dot caused by scratch and foreign object accords to item 1.</p>		Display Area	Total	Note1	<b>Bright dot</b>	<b>0</b>	<b>0</b>	<b>Dark dot</b>	<b>N ≤ 2</b>	<b>N ≤ 2</b>	<b>Total dot</b>	<b>N ≤ 2</b>	<b>N ≤ 2</b>	<b>Mura</b>	<b>Not visible through 5% ND filters.</b>		Note2	
	Display Area	Total	Note1																	
<b>Bright dot</b>	<b>0</b>	<b>0</b>																		
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<b>Mura</b>	<b>Not visible through 5% ND filters.</b>		Note2																	
03	Black and White line Scratch Foreign material (Line type) (Minor defect)	 <table border="1" data-bbox="518 1467 1141 1774"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>/</td> <td><math>W \leq 0.03</math></td> <td>Ignore</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> <td>3</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.05 &lt; W \leq 0.10</math></td> <td>2</td> </tr> <tr> <td>/</td> <td><math>0.1 &lt; W</math></td> <td>0</td> </tr> <tr> <td colspan="2"><b>Total</b></td> <td><b>3</b></td> </tr> </tbody> </table> <p>Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.</p>	Length	Width	Acc. Qty	/	$W \leq 0.03$	Ignore	$L \leq 2.5$	$0.03 < W \leq 0.05$	3	$L \leq 2.5$	$0.05 < W \leq 0.10$	2	/	$0.1 < W$	0	<b>Total</b>		<b>3</b>
Length	Width	Acc. Qty																		
/	$W \leq 0.03$	Ignore																		
$L \leq 2.5$	$0.03 < W \leq 0.05$	3																		
$L \leq 2.5$	$0.05 < W \leq 0.10$	2																		
/	$0.1 < W$	0																		
<b>Total</b>		<b>3</b>																		

04	Glass Crack (Minor defect)	 <p>Crack is potential to enlarge, any type is not allowed.</p>										
05	Glass Chipping Pad Area: (Minor defect)	 <table border="1" data-bbox="861 515 1332 683"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &gt; 3.0, b &lt; 1.0</math></td> <td>1</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 1.0</math></td> <td>3</td> </tr> <tr> <td colspan="2" style="text-align: center;"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	3	$a < \text{Glass Thickness}$			
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	3											
$a < \text{Glass Thickness}$												
06	Glass Chipping Rear of Pad Area: (Minor defect)	 <table border="1" data-bbox="861 840 1332 1064"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &gt; 3.0, b &lt; 1.0</math></td> <td>1</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 1.0</math></td> <td>2</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 0.5</math></td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
07	Glass Chipping Except Pad Area: (Minor defect)	 <table border="1" data-bbox="861 1176 1332 1400"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &gt; 3.0, b &lt; 1.0</math></td> <td>1</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 1.0</math></td> <td>2</td> </tr> <tr> <td><math>c &lt; 3.0, b &lt; 0.5</math></td> <td>4</td> </tr> <tr> <td colspan="2" style="text-align: center;"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
08	Glass Corner Chipping: (Minor defect)	 <table border="1" data-bbox="861 1512 1332 1646"> <thead> <tr> <th>Length and Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>c &lt; 3.0, b &lt; 3.0</math></td> <td>Ignore</td> </tr> <tr> <td colspan="2" style="text-align: center;"><math>a &lt; \text{Glass Thickness}</math></td> </tr> </tbody> </table>	Length and Width	Acc. Qty	$c < 3.0, b < 3.0$	Ignore	$a < \text{Glass Thickness}$					
Length and Width	Acc. Qty											
$c < 3.0, b < 3.0$	Ignore											
$a < \text{Glass Thickness}$												

<p>09</p>	<p>Glass Burr: (Minor defect)</p> 	<table border="1" data-bbox="861 257 1332 347"> <thead> <tr> <th>Length</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>F &lt; 1.0</math></td> <td>Ignore</td> </tr> </tbody> </table> <p>Glass burr don't affect assemble and module dimension.</p>	Length	Acc. Qty	$F < 1.0$	Ignore						
Length	Acc. Qty											
$F < 1.0$	Ignore											
<p>10</p>	<p>FPC Defect: (Minor defect)</p> 	<p>10.1 Dent, pinhole width <math>a &lt; w/3</math>. (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.</p>										
<p>11</p>	<p>Bubble on Polarizer (Minor defect)</p>	<table border="1" data-bbox="734 1164 1204 1388"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\varphi \leq 0.20</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.20 &lt; \varphi \leq 0.30</math></td> <td>4</td> </tr> <tr> <td><math>0.30 &lt; \varphi \leq 0.50</math></td> <td>1</td> </tr> <tr> <td><math>0.50 &lt; \varphi</math></td> <td>None</td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi \leq 0.50$	1	$0.50 < \varphi$	None
Diameter	Acc. Qty											
$\varphi \leq 0.20$	Ignore											
$0.20 < \varphi \leq 0.30$	4											
$0.30 < \varphi \leq 0.50$	1											
$0.50 < \varphi$	None											
<p>12</p>	<p>Dent on Polarizer (Minor defect)</p>	<table border="1" data-bbox="734 1444 1204 1657"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\varphi \leq 0.20</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.20 &lt; \varphi \leq 0.30</math></td> <td>4</td> </tr> <tr> <td><math>0.30 &lt; \varphi \leq 0.50</math></td> <td>1</td> </tr> <tr> <td><math>0.50 &lt; \varphi</math></td> <td>None</td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi \leq 0.50$	1	$0.50 < \varphi$	None
Diameter	Acc. Qty											
$\varphi \leq 0.20$	Ignore											
$0.20 < \varphi \leq 0.30$	4											
$0.30 < \varphi \leq 0.50$	1											
$0.50 < \varphi$	None											
<p>13</p>	<p>Bezel</p>	<p>13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.</p>										

<p><b>14</b></p>	<p>Touch Panel</p>	<p>D: Diameter W: width L: length                      14.1 Spot: <math>D &lt; 0.25</math> is acceptable  <math>0.25 \leq D \leq 0.4</math>                      2dots are acceptable and the distance between defects should more than 10 mm.  <math>D &gt; 0.4</math> is unacceptable                      14.2 Dent: <math>D &gt; 0.40</math> is unacceptable                      14.3 Scratch: <math>W \leq 0.03</math>, <math>L \leq 10</math> is acceptable,  <math>0.03 &lt; W \leq 0.10</math>, <math>L \leq 10</math> is acceptable                      Distance between 2 defects should more than 10 mm.  <math>W &gt; 0.10</math> is unacceptable.</p>
<p><b>15</b></p>	<p>PCB</p>	<p>15.1 No distortion or contamination on PCB terminals.                      15.2 All components on PCB must same as documented on the BOM/component layout.                      15.3 Follow IPC-A-600F.</p>
<p><b>16</b></p>	<p>Soldering</p>	<p>Follow IPC-A-610C standard</p>
<p><b>17</b></p>	<p>Electrical Defect (Major defect)</p>	<p>The below defects must be rejected.                      17.1 Missing vertical / horizontal segment,                      17.2 Abnormal Display.                      17.3 No function or no display.                      17.4 Current exceeds product specifications.                      17.5 LCD viewing angle defect.                      17.6 No Backlight.                      17.7 Dark Backlight.                      17.8 Touch Panel no function.</p>

**10.7. Classification of Defects**

- 10.7.1. Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.
- 10.7.2. Two minor defects are equal to one major in lot sampling inspection.

**10.8. Identification/marketing criteria**

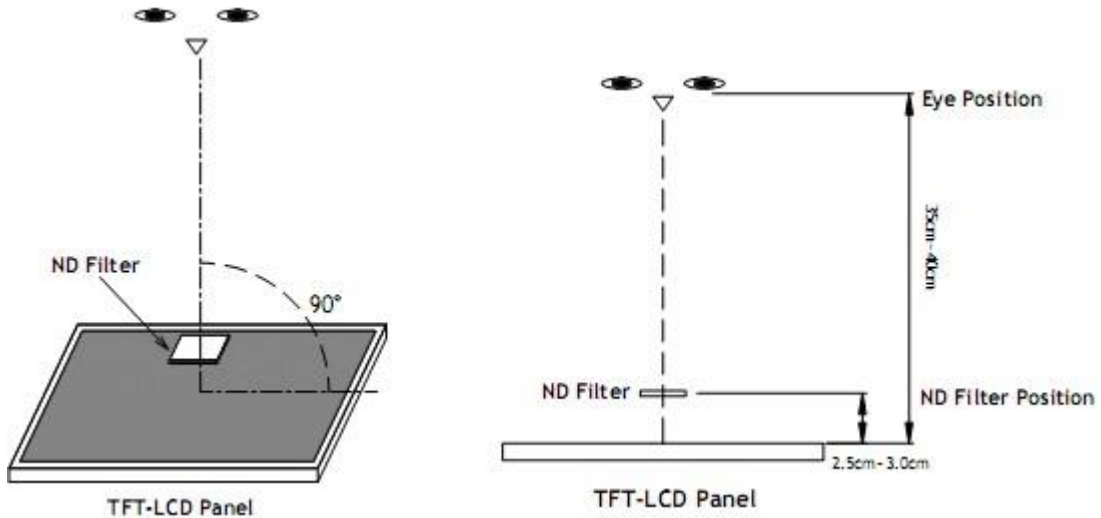
Any unit with illegible / wrong /double or no marking/ label shall be rejected.

**10.9.Packing**

- 10.9.1. There should be no damage of the outside carton box, each packaging box should have one identical label.
- 10.9.2. Modules inside package box should have compliant mark.
- 10.9.3. All direct package materials shall offer ESD protection

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

**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.

## 11. Reliability Specification

No	Item	Condition	Quantity	Criteria
1	High Temperature Operating	70°C, 96Hrs	2	GB/T2423.2-2008
2	Low Temperature Operating	-20°C, 96Hrs	2	GB/T2423.1-2008
3	High Humidity	50°C, 90%RH, 96Hrs	2	GB/T2423.3-2006
4	High Temperature Storage	80°C, 96Hrs	2	GB/T2423.2-2008
5	Low Temperature Storage	-30°C, 96Hrs	2	GB/T2423.1-2008
6	Thermal Cycling Test	-20°C, 60min~70°C, 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 Contact: ±4KV 150pF/330Ω 5 times	2	GB/T17626.2-2006
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.

**12. Precautions and Warranty**

**12.1. Safety**

- 12.1.1. 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.
- 12.1.2. Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

**12.2. Handling**

- 12.2.1. Reverse and use within ratings in order to keep performance and prevent damage.
- 12.2.2. 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.

**12.3. Storage**

- 12.3.1. Do not store the LCD module beyond the specified temperature ranges.

**12.4. Metal Pin (Apply to Products with Metal Pins)**

12.4.1. Pins of LCD and Backlight

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

12.4.1.2. Recommended Soldering Conditions

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

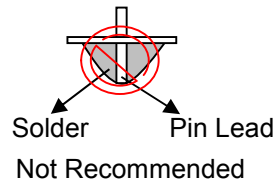
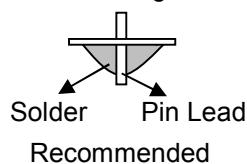
Maximum Solder Temperature: 370℃

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

12.4.1.3. Solder Wetting



12.4.2. Pins of EL

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

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

12.4.2.3. Recommended Soldering Conditions

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

Recommended Solder Temperature: 270~290℃

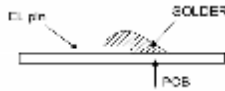
Typical Soldering Time: ≤2s

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

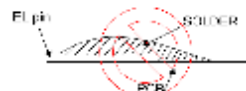
12.4.2.4. No horizontal press on the EL leads during soldering.

12.4.2.5. 180° bend EL leads three times is not allowed.

12.4.2.6. Solder Wetting

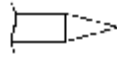


Recommended

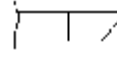


Not Recommended

12.4.2.7. The type of the solder iron:

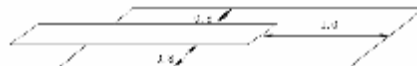


Recommended



Not Recommended

12.4.2.8. Solder Pad



**12.5. Operation**

- 12.5.1. Do not drive LCD with DC voltage
- 12.5.2. Response time will increase below lower temperature
- 12.5.3. Display may change color with different temperature
- 12.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.

**12.6. Static Electricity**

- 12.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.
- 12.6.2. The normal static prevention measures should be observed for work clothes and benches.
- 12.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

**12.7. Limited Warranty**

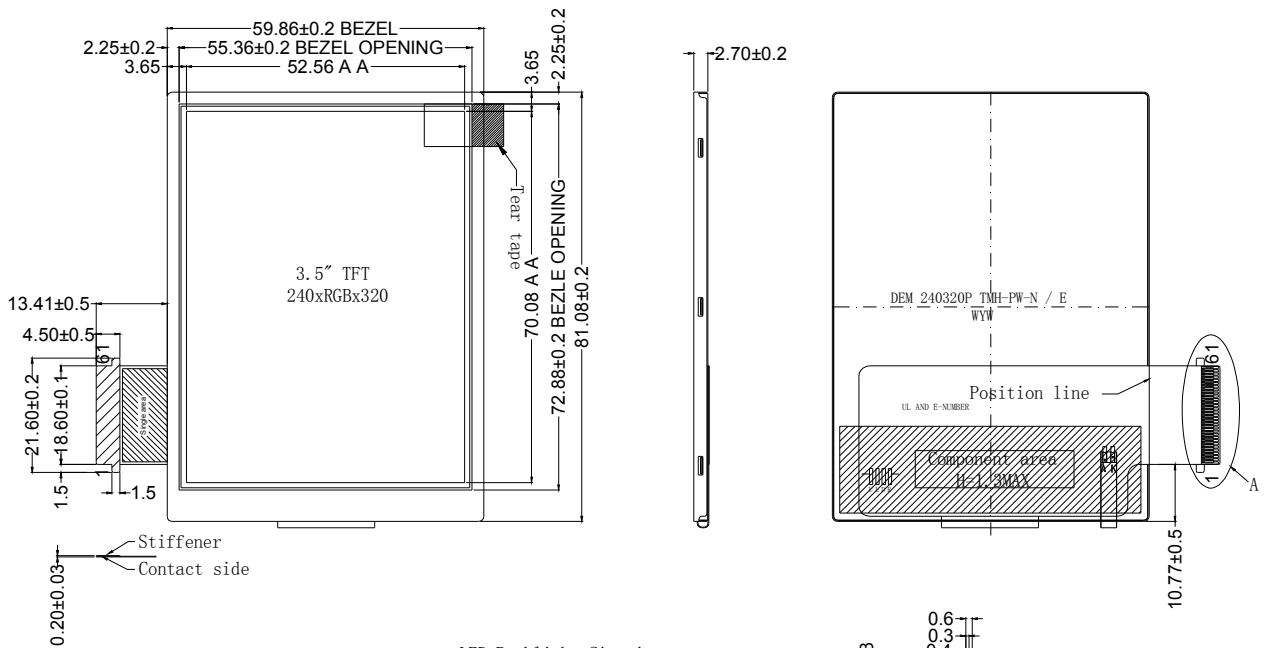
- 12.7.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.
- 12.7.2. If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used
- 12.7.3. 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.



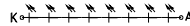
**13. Packaging**

t.b.d.

14. Outline Drawing



LED Backlight Circuit:



NOTES:

1. Display Type: 3.5" TFT
  2. Viewing Direction: 12 O' CLOCK
  3. Gray Scale Inversion Direction: 6 O' CLOCK
  4. Polarizer Mode: Transmissive / Normally White / Anti-Glare
  5. Operation Temperature: -20°C to +70°C
  6. Storage Temperature: -30°C to +80°C
  7. Driver IC: ILI9341V (Ilitek)
  8. Power Supply Voltage: 2.8 Volt (typ.)
  9. Backlight: White (8xLEDs) / 25.6 Volt(typ) / 20mA (typ.)  
LED Lifetime: 30000h (typ.)
  10. ROHS must be complied
- \* Unspecification Tolerances are ±0.2mm

Detail:2/1  
Recommended Connector:  
HIROSE: FH23-61S-0.3SHW or equivalent