

Display Elektronik GmbH

# DATA SHEET

***TFT MODULE***

**DEM 800480I1 TMH-PW-N**

**7" TFT**

Product Specification

Ver.: 1

10.01.2018

**Revision History**

<b>Revision</b>	<b>Date</b>	<b>Originator</b>	<b>Detail</b>	<b>Remarks</b>
0	27.11.2018	MHI	Initial Release	-
1	10.01.2019	MH	Modify Weight Modify Chromacity Transmissive	P4 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)	7.0"	
LCD Type	TN TFT	
Display Mode	Transmissive / Normally White	
Resolution	800 x RGB x 480	Pixels
View Direction	12 O'CLOCK	Best Image
Gray Scale Inversion Direction	6 O'CLOCK	
Module Outline	165.00 x 100.05 x 3.30 (Note1 )	mm
Active Area	154.08 x 85.92	mm
Pixel Size	0.1926 x 0.1790	mm
Pixel Arrangement	RGB Vertical Stripe	
Polarizer Surface Treatment	Anti-Glare	
Display Colors	16.7 Million	
Interface	24 Bits RGB Interface	
With or Without Touch Panel	Without	-
Operating Temperature	-20~70	°C
Storage Temperature	-30~80	°C
Weight	~116	g

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

## 3. Absolute Maximum Ratings

$V_{SS}=0V$ ,  $T_a=25^{\circ}C$

Item	Symbol	Min.	Max.	Unit
Digital Supply Voltage	DVDD	-0.3	5.0	V
Analog Supply Voltage	AVDD	6.5	13.5	V
Gate On Voltage	VGH	-0.3	40	V
Gate Off Voltage	VGL	-20	0.3	V
Storage Temperature	$T_{STG}$	-30	+80	°C
Operating Temperature	$T_{OP}$	-20	+70	°C

**Note 1:** If  $T_a$  below  $50^{\circ}C$ , the maximal humidity is 90%RH, if  $T_a$  over  $50^{\circ}C$ , absolute humidity should be less than 60%RH.

**Note 2:** The response time will be extremely slow when the operating temperature is around  $-10^{\circ}C$ , and the back ground will become darker at high temperature operating.

4. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Digital Supply Voltage	DVDD	3.0	3.3	3.6	V
Analog Supply Voltage	AVDD	10.2	10.4	10.6	V
Gate On Voltage	VGH	15.3	16	16.7	V
Gate Off Voltage	VGL	-7.7	-7.0	-6.3	V
Common Voltage	VCOM	2.6	(3.6)	4.6	V
Logic Input Voltage	V <sub>IL</sub>	GND	-	0.3*DVDD	V
	V <sub>IH</sub>	0.7*DVDD	-	DVDD	V

Note: Typical VCOM is only a reference value. It must be optimized according to each LCM. Please use VR.

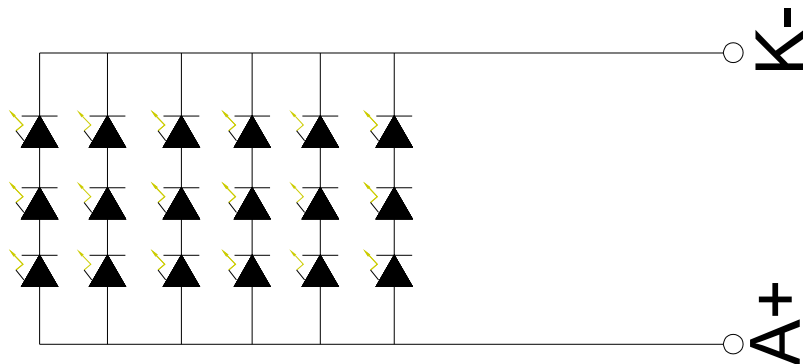
5. Backlight Characteristic

5.1. Backlight Characteristic

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Backlight Voltage	VLED	Ta=25 °C, I <sub>F</sub> =20mA/ LED	8.4	9.6	10.2	V
Backlight Current	ILED	-	-	120	-	mA
Power Dissipation	PD	-	-	1152	-	mW
Uniformity	Avg	-	-	80	-	%
LED Lifetime (25°C)	-	-	20,000	30,000	-	Hrs
Drive Method	Constant Current					
LED Configuration	18 White LEDs ( 3 LEDs in string and 6 groups 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 °C,60%RH±5%, I<sub>F</sub>=20mA/LED.

5.2. Backlighting Circuit



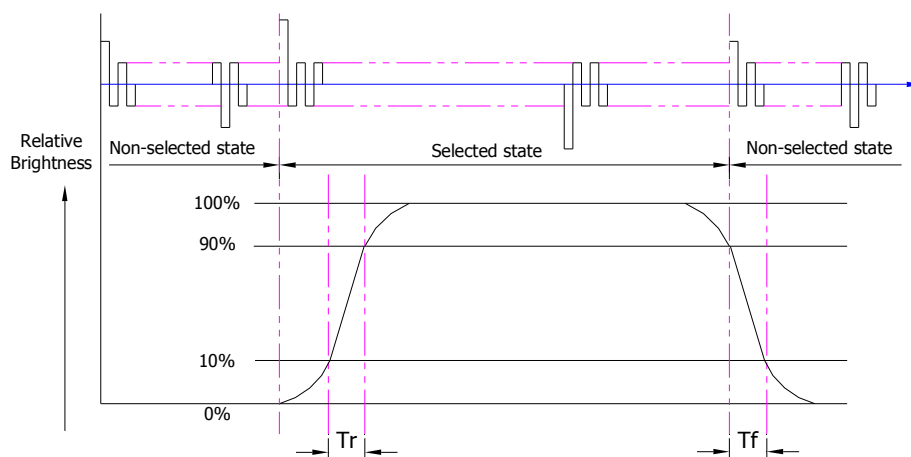
6. Optical Characteristics

6.1. Optical Characteristics  $T_a=25^{\circ}\text{C}$ ,  $V_{DD}=3.3\text{V}$

	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 $\theta_x = \phi_y = 0^{\circ}$	200	250	-	cd/m <sup>2</sup>	
	Contrast Ratio(See 6.3)	CR		400	500	-		
	Response Time (See 6.2)	$T_R+T_F$		-	25	50	ms	
	Chromaticity Transmissive (See 6.5)	Red	X <sub>R</sub>	Center CR $\geq 10$	0.494	0.544	0.594	
			Y <sub>R</sub>		0.292	0.342	0.392	
		Green	X <sub>G</sub>		0.268	0.318	0.368	
			Y <sub>G</sub>		0.570	0.620	0.670	
		Blue	X <sub>B</sub>		0.097	0.147	0.197	
			Y <sub>B</sub>		0.031	0.081	0.131	
	White	X <sub>W</sub>	0.225	0.275	0.325			
		Y <sub>W</sub>	0.270	0.320	0.370			
	Viewing Angle (See 6.4)	Horizontal	$\theta_{x+}$	Center CR $\geq 10$	60	70	-	Deg.
			$\theta_{x-}$		60	70	-	
Vertical		$\phi_{y+}$	40		50	-		
		$\phi_{y-}$	60		70	-		
NTSC				-	50	-	%	

6.2. Definition of Response Time

6.2.1. Normally Black Type (Negative)

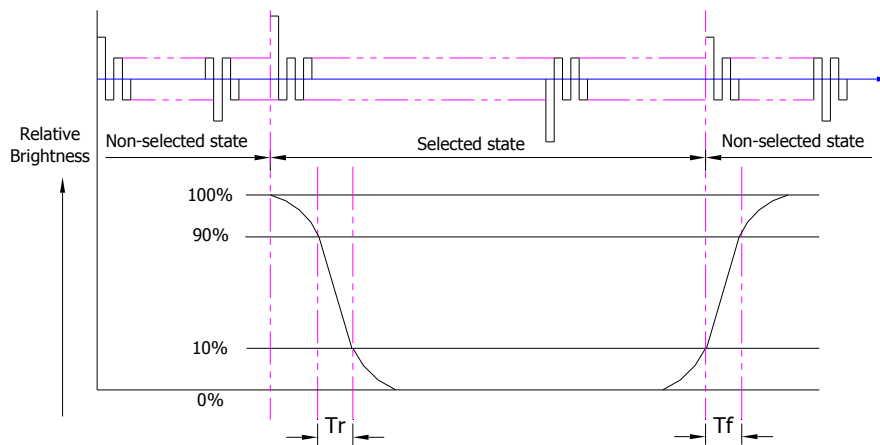


Tr is the time it takes to change from non-selected state with relative luminance 10% to selected state with relative luminance 90%;

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

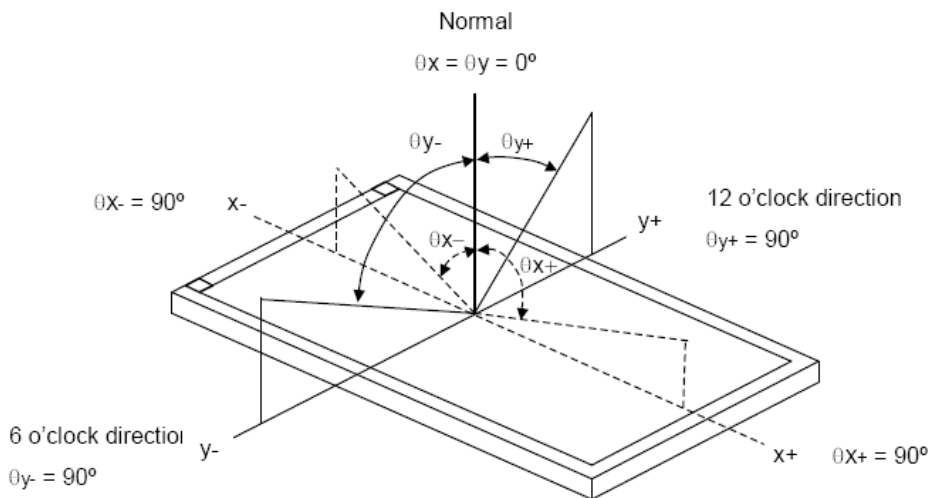
6.3. Definition of Contrast Ratio

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

Measuring Equipment	Eldim or 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

6.4. Definition of Viewing Angles



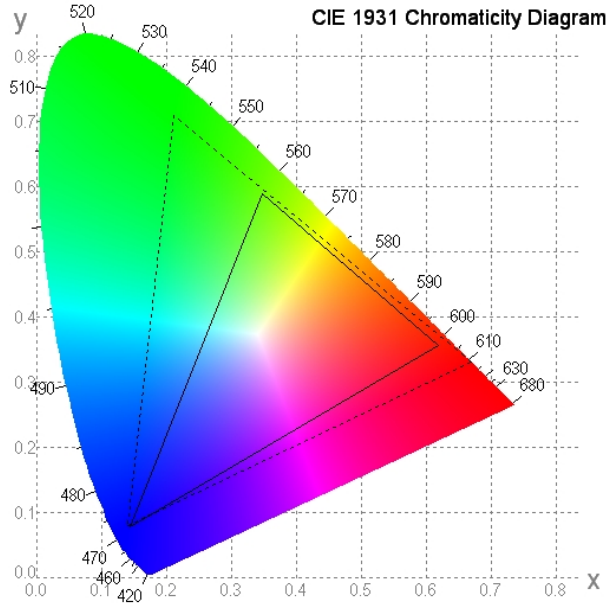
Measuring machine: LCD-5100 or EQUI

**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**

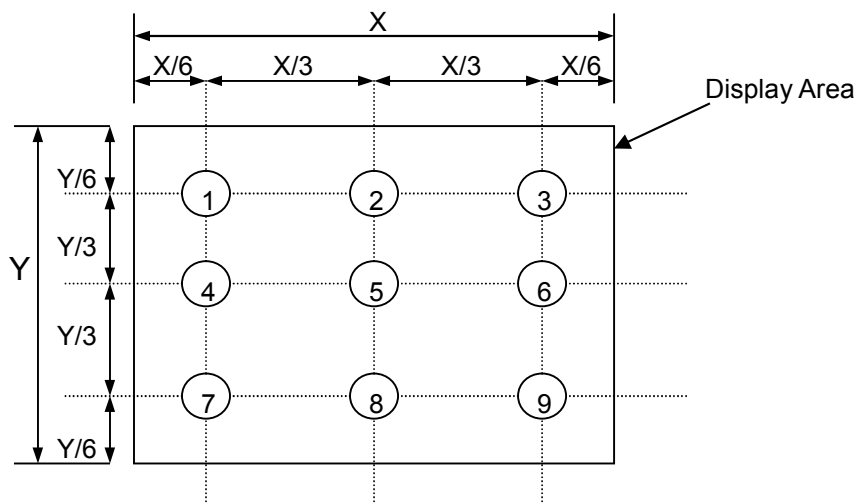
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

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

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

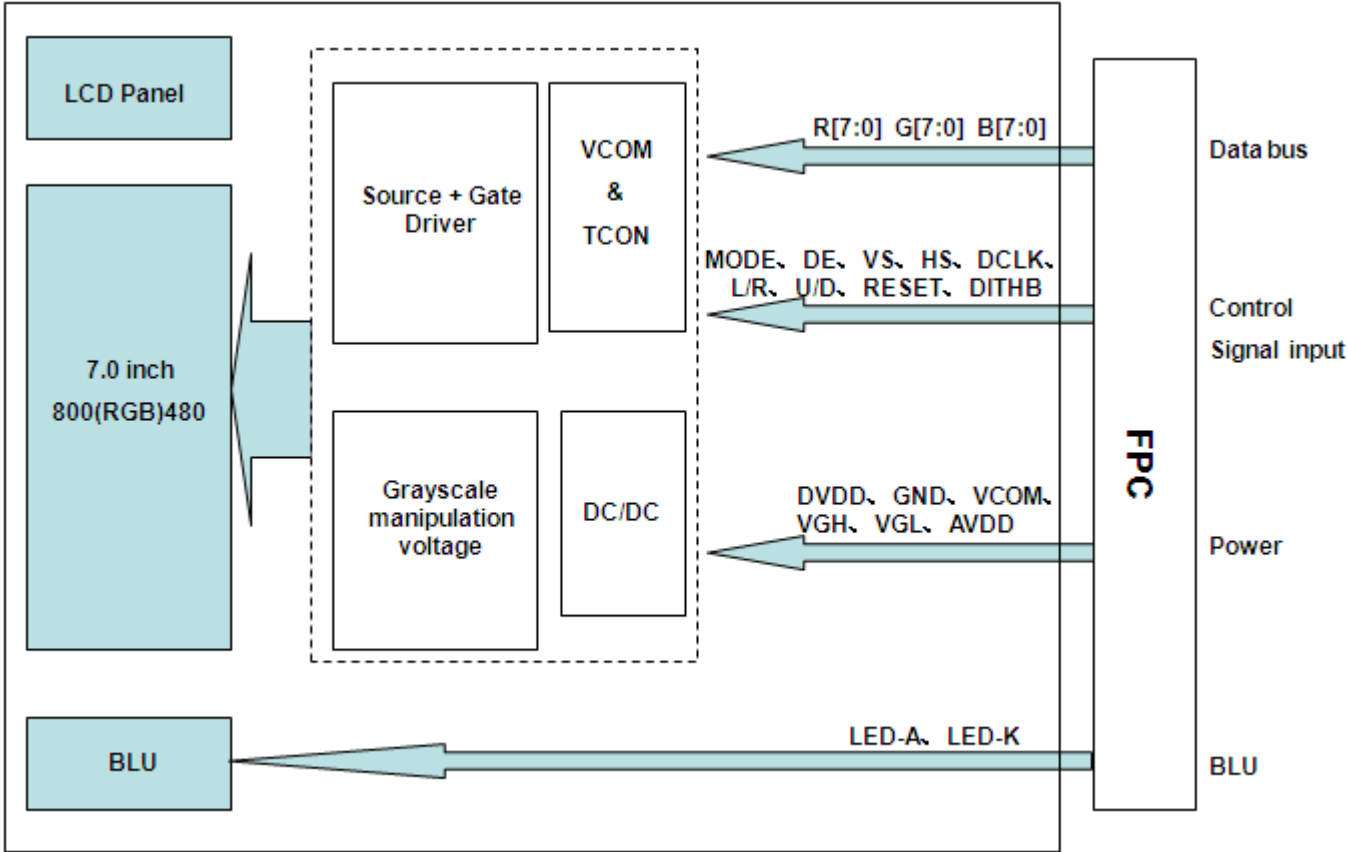
6.6.3. Transmittance =  $L_v \text{ on LCD} / L_v \text{ on Backlight} * 100\%$

Note: Measuring machine: BM-7





7. Block Diagram and Power Supply



## 8. Interface Pins Definition

No.	Symbol	Function
1	LED-A	Power for LED backlight (Anode)
2	LED-A	Power for LED backlight (Anode)
3	LED-K	Power for LED backlight (Cathode)
4	LED-K	Power for LED backlight (Cathode)
5	GND	Power ground
6	VCOM	Common voltage
7	DVDD	Digital Power
8	MODE	DE/SYNC mode select. Normally pull high H: DE mode. L: HSD/VSD mode
9	DE	Data Input Enable
10	VS	Vertical sync input. Negative polarity
11	HS	Horizontal sync input. Negative polarity
12	B7	Blue data (MSB)
13	B6	Blue data
14	B5	Blue data
15	B4	Blue data
16	B3	Blue data
17	B2	Blue data
18	B1	Blue data
19	B0	Blue data (LSB)
20	G7	Green data (MSB)
21	G6	Green data
22	G5	Green data
23	G4	Green data
24	G3	Green data
25	G2	Green data
26	G1	Green data
27	G0	Green data (LSB)
28	R7	Red data (MSB)
29	R6	Red data
30	R5	Red data
31	R4	Red data
32	R3	Red data
33	R2	Red data
34	R1	Red data
35	R0	Red data (LSB)
36	GND	Power ground
37	DCLK	Dot data clock
38	GND	Power ground
39	L/R	Left or Right Display Control
40	U/D	Up/Down Display Control

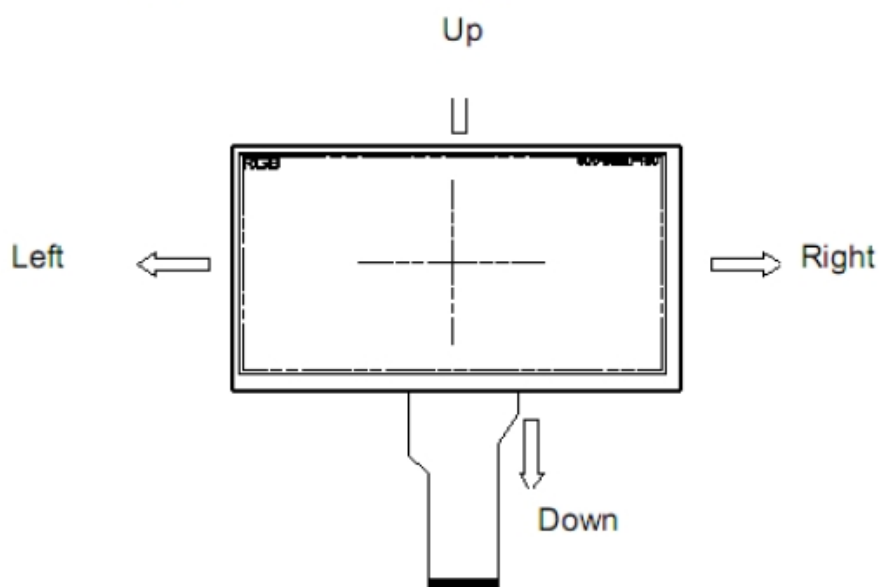
41	VGH	Positive Power for TFT
42	VGL	Negative Power for TFT
43	AVDD	Analog Power
44	RESET	Global reset pin. Active low to enter reset state.
45	NC	No connection
46	VCOM	Common Voltage
47	DITHB	Dithering setting: DITHB="H" 8 bit resolution (default setting) DITHB="L" L bit resolution (last 2 bit of input data truncated)
48	GND	Power ground
49	NC	No connection
50	NC	No connection

Note:

Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	DV <sub>DD</sub>	Up to down, left to right
DV <sub>DD</sub>	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV <sub>DD</sub>	DV <sub>DD</sub>	Down to up, left to right

Definition of scanning direction. Refer to the figure as below:

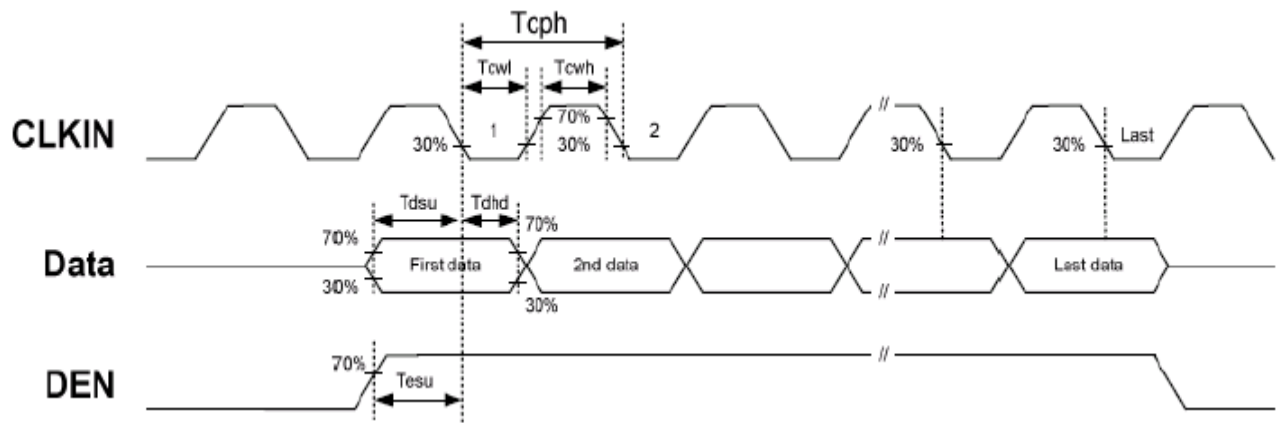


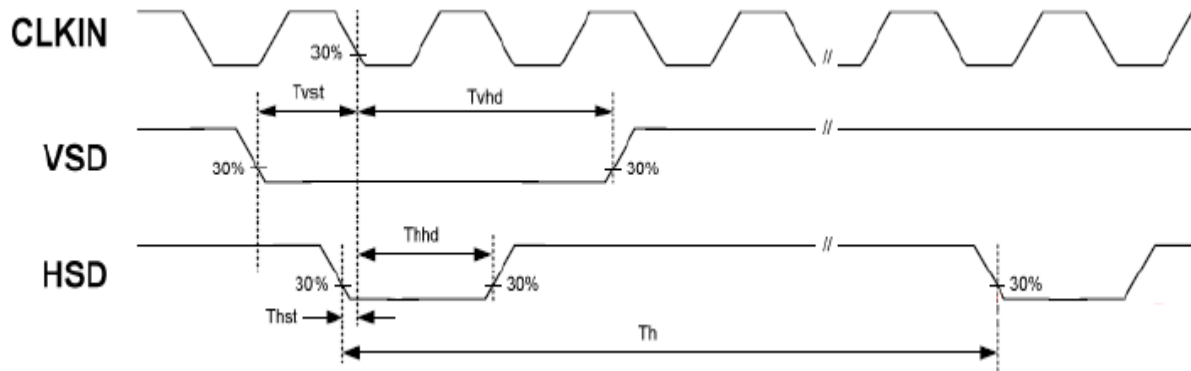
9. Input Signal Timing

9.1. AC Electrical Characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	$T_{hst}$	8	-	-	ns	
HS hold time	$T_{hhd}$	8	-	-	ns	
VS setup time	$T_{vst}$	8	-	-	ns	
VS hold time	$T_{vhd}$	8	-	-	ns	
Data setup time	$T_{dsu}$	8	-	-	ns	
Data hold time	$T_{dhd}$	8	-	-	ns	
DE setup time	$T_{esu}$	8	-	-	ns	
DE hole time	$T_{ehd}$	8	-	-	ns	
DV <sub>DD</sub> Power On Slew rate	$T_{POR}$	-	-	20	ms	From 0 to 90% DV <sub>DD</sub>
RESET pulse width	$T_{Rst}$	1	-	-	ms	
DCLK cycle time	$T_{coh}$	20	-	-	ns	
DCLK pulse duty	$T_{cwh}$	40	50	60	%	

9.2. Input Clock and Data Timing Diagram





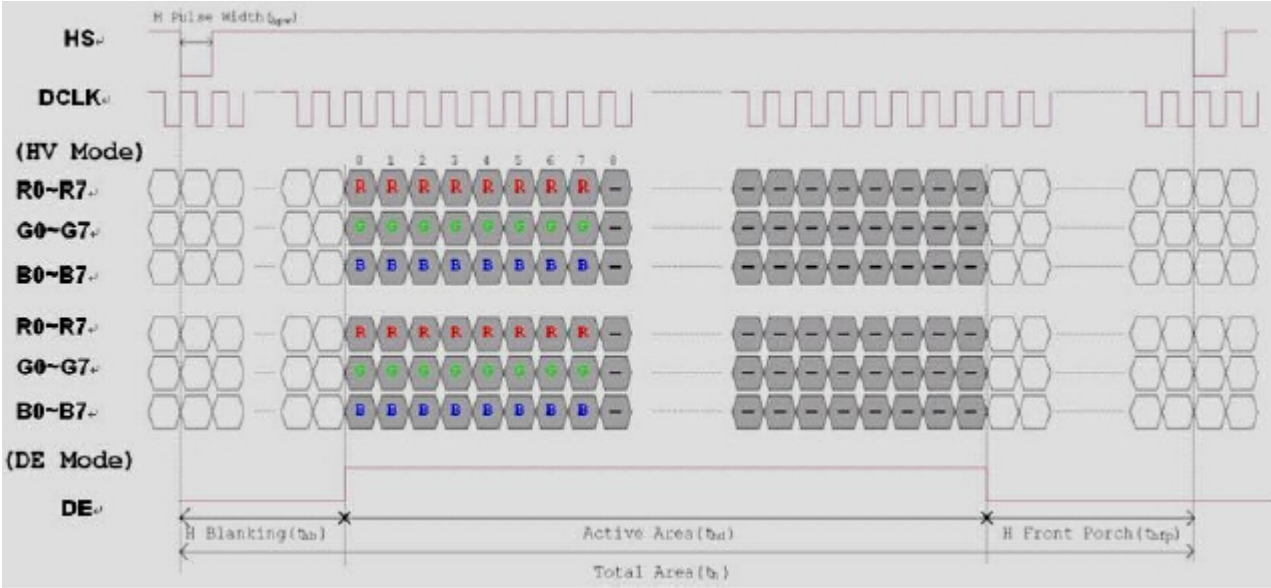
9.3. Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

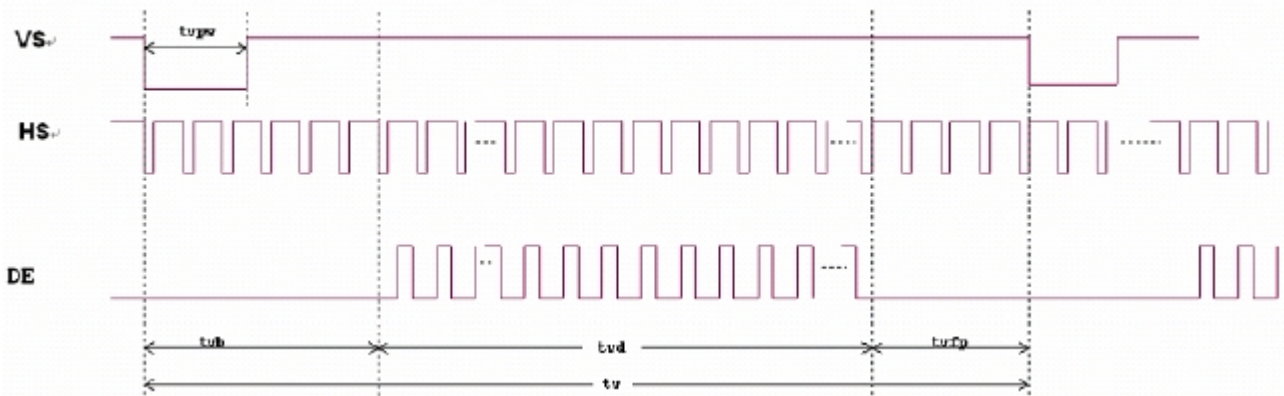
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

9.4. Data Input Format

Horizontal Input Timing Diagram:



Vertical input timing diagram:



## **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 cannot 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**

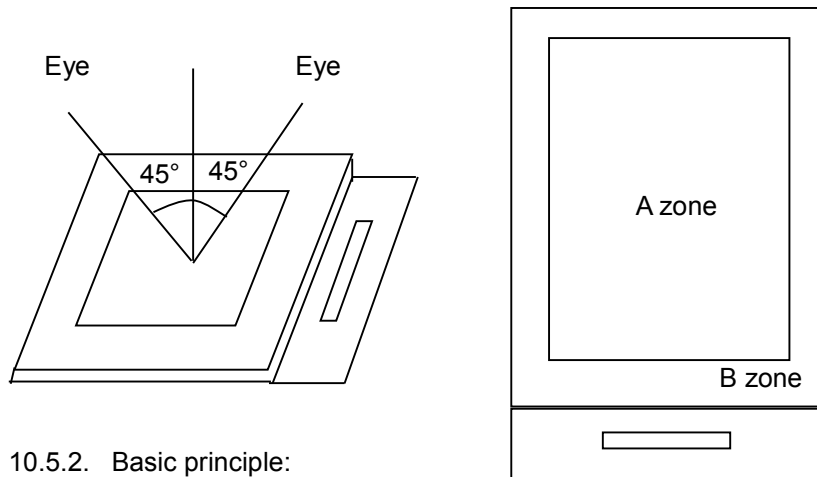
10.5.1. Appearance inspection:

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,

10.5.1.4.



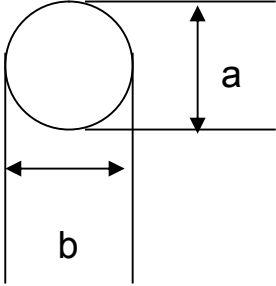
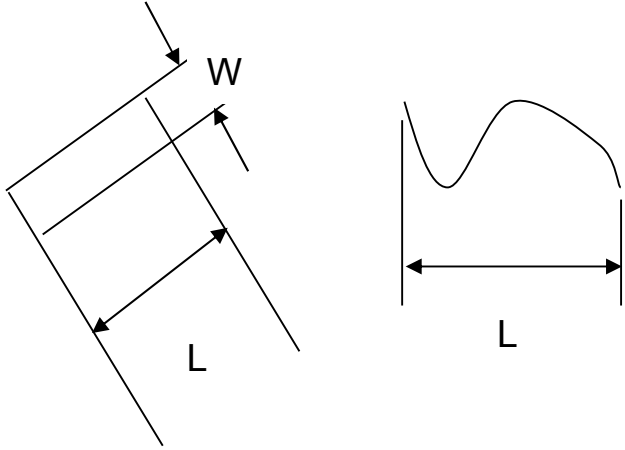
10.5.2. Basic principle:

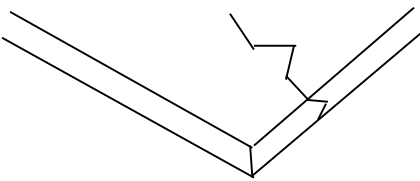
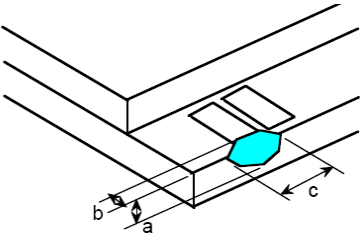
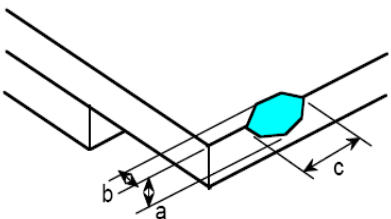
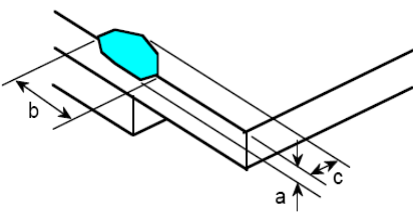
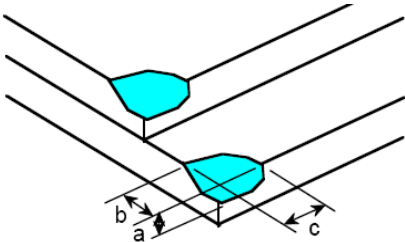
10.5.2.1. A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

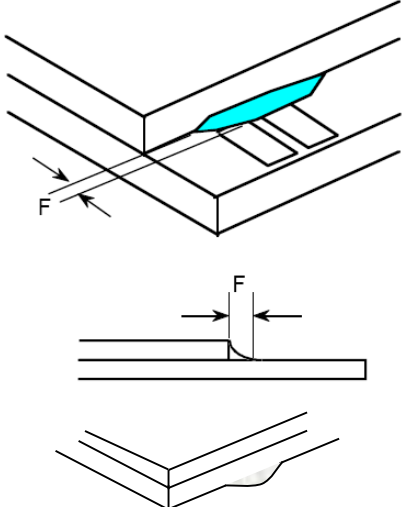
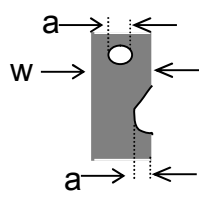
10.5.2.2. New item must be added on time when it is necessary.



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="900 344 1402 562"> <thead> <tr> <th>Size</th> <th>Area</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\varphi \leq 0.20</math></td> <td></td> <td>Ignore</td> </tr> <tr> <td><math>0.20 &lt; \varphi \leq 0.50</math></td> <td></td> <td><math>N \leq 3</math></td> </tr> <tr> <td><math>0.50 &lt; \varphi</math></td> <td></td> <td>0</td> </tr> </tbody> </table> <p><math>\varphi = (a + b) / 2</math> Distance between 2 defects should more than 5mm apart.</p>	Size	Area	Acc. Qty	$\varphi \leq 0.20$		Ignore	$0.20 < \varphi \leq 0.50$		$N \leq 3$	$0.50 < \varphi$		0				
Size	Area	Acc. Qty																
$\varphi \leq 0.20$		Ignore																
$0.20 < \varphi \leq 0.50$		$N \leq 3$																
$0.50 < \varphi$		0																
02	Electrical Defect (Minor defect)	<table border="1" data-bbox="549 775 1412 990"> <thead> <tr> <th rowspan="2">Bright dot</th> <th>Display Area</th> <th>Total</th> <th rowspan="2">Note1</th> </tr> </thead> <tbody> <tr> <td><math>N \leq 2</math></td> <td><math>N \leq 2</math></td> </tr> <tr> <th>Dark dot</th> <td><math>N \leq 4</math></td> <td><math>N \leq 4</math></td> </tr> <tr> <th>Total dot</th> <td><math>N \leq 4</math></td> <td><math>N \leq 4</math></td> </tr> <tr> <th>Mura</th> <td colspan="2">Not visible through 5% ND filters.</td> <th>Note2</th> </tr> </tbody> </table> <p>Remark: 1. Bright dot caused by scratch and foreign object accords to item 1.</p>	Bright dot	Display Area	Total	Note1	$N \leq 2$	$N \leq 2$	Dark dot	$N \leq 4$	$N \leq 4$	Total dot	$N \leq 4$	$N \leq 4$	Mura	Not visible through 5% ND filters.		Note2
Bright dot	Display Area	Total		Note1														
	$N \leq 2$	$N \leq 2$																
Dark dot	$N \leq 4$	$N \leq 4$																
Total dot	$N \leq 4$	$N \leq 4$																
Mura	Not visible through 5% ND filters.		Note2															
03	Black and White line Scratch Foreign material (Line type) (Minor defect)	 <table border="1" data-bbox="608 1659 1235 1921"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>/</td> <td><math>W \leq 0.1</math></td> <td>Ignore</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.1 &lt; W \leq 0.2</math></td> <td>3</td> </tr> <tr> <td><math>L &gt; 2.5</math></td> <td><math>0.2 &lt; W</math></td> <td>0</td> </tr> <tr> <td colspan="2">Total</td> <td>3</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	/	$W \leq 0.1$	Ignore	$L \leq 2.5$	$0.1 < W \leq 0.2$	3	$L > 2.5$	$0.2 < W$	0	Total		3	
Length	Width	Acc. Qty																
/	$W \leq 0.1$	Ignore																
$L \leq 2.5$	$0.1 < W \leq 0.2$	3																
$L > 2.5$	$0.2 < W$	0																
Total		3																

<p>04</p>	<p>Glass Crack (Minor defect)</p>	 <p>Crack is potential to enlarge, any type is not allowed.</p>										
<p>05</p>	<p>Glass Chipping Pad Area: (Minor defect)</p> 	<table border="1"> <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"><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											
$a < \text{Glass Thickness}$												
<p>06</p>	<p>Glass Chipping Rear of Pad Area: (Minor defect)</p> 	<table border="1"> <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"><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											
$a < \text{Glass Thickness}$												
<p>07</p>	<p>Glass Chipping Except Pad Area: (Minor defect)</p> 	<table border="1"> <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"><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											
$a < \text{Glass Thickness}$												
<p>08</p>	<p>Glass Corner Chipping: (Minor defect)</p> 	<table border="1"> <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"><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 1209 1204 1388"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\varphi \leq 0.30</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.30 &lt; \varphi \leq 0.50</math></td> <td><math>N \leq 2</math></td> </tr> <tr> <td><math>0.50 &lt; \varphi</math></td> <td><math>N = 0</math></td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\varphi \leq 0.30$	Ignore	$0.30 < \varphi \leq 0.50$	$N \leq 2$	$0.50 < \varphi$	$N = 0$
Diameter	Acc. Qty									
$\varphi \leq 0.30$	Ignore									
$0.30 < \varphi \leq 0.50$	$N \leq 2$									
$0.50 < \varphi$	$N = 0$									
<p>12</p>	<p>Dent on Polarizer (Minor defect)</p>	<table border="1" data-bbox="734 1456 1204 1635"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td><math>\varphi \leq 0.25</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.25 &lt; \varphi \leq 0.50</math></td> <td><math>N \leq 4</math></td> </tr> <tr> <td><math>0.50 &lt; \varphi</math></td> <td>None</td> </tr> </tbody> </table>	Diameter	Acc. Qty	$\varphi \leq 0.25$	Ignore	$0.25 < \varphi \leq 0.50$	$N \leq 4$	$0.50 < \varphi$	None
Diameter	Acc. Qty									
$\varphi \leq 0.25$	Ignore									
$0.25 < \varphi \leq 0.50$	$N \leq 4$									
$0.50 < \varphi$	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>								

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

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

**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.

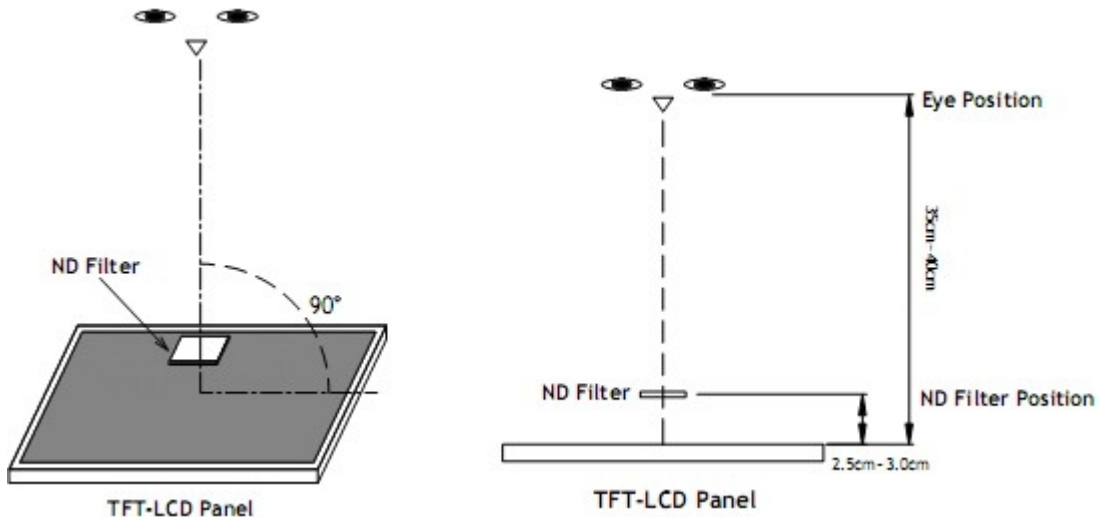
**10.8. Identification/marketing criteria**

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.

**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/330 Ω 5 times Contact: ±4kV 150pF/330 Ω 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 deflection 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.
- 12.3.2. Strong light exposure causes degradation of polarizer and color filter.

**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

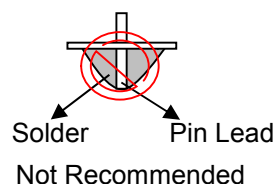
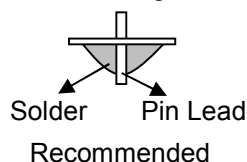
Maximum Solder Temperature: 370°C

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20°C

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°C

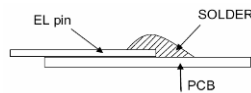
Typical Soldering Time: ≤2s

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

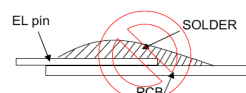
12.4.2.4. No horizontal press on the EL leads during soldering.

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

12.4.2.6. Solder Wetting

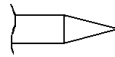


Recommended

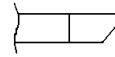


Not Recommended

12.4.2.7. The type of the solder iron:

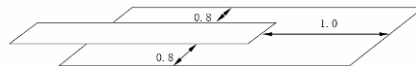


Recommended



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”.
- 12.5.5. Do not connect or disconnect the LCM to or from the system when power is on.
- 12.5.6. Never use the LCM under abnormal condition of high temperature and high humidity.
- 12.5.7. 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.
- 12.5.8. 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.

**12.6.Static Electricity**

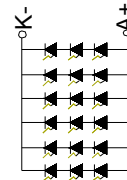
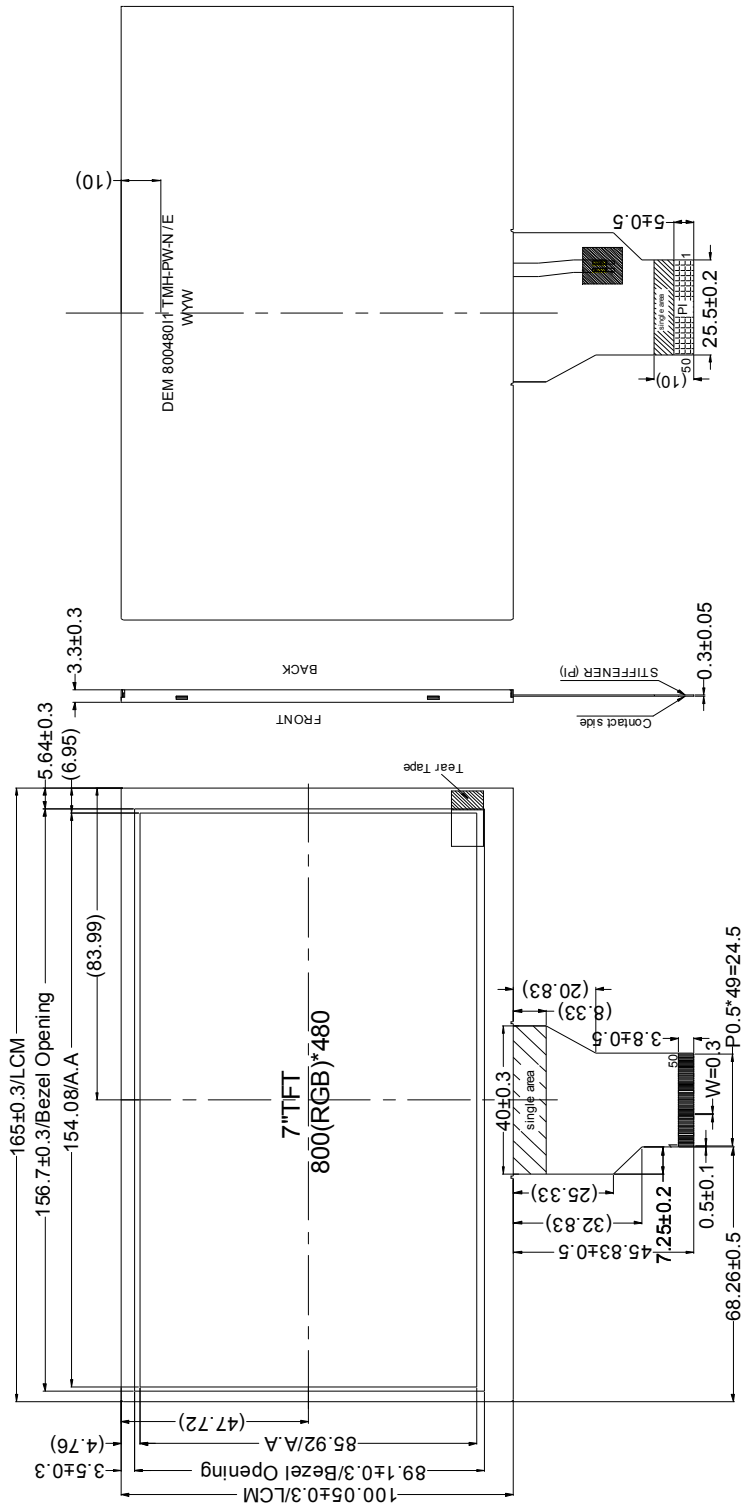
- 12.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.
- 12.6.2. The normal static prevention measures should be observed for work clothes and benches.
- 12.6.3. The module should be kept into anti-static bags or other containers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



Circuit Diagram (LED 3X6= 18)

NOTES:

1. Display size: 7.0" TFT
2. Viewing direction: 12 O'CLOCK
3. Gary Scale inversion direction: 6 O'CLOCK
4. Display mode: Transmissive/Normal white/Anti-glare
5. Operation temperature: -20°C~+70°C
6. Storage temperature: -30°C~+80°C
7. Power supply voltage: 3.3V
8. Backlight : White(18 LED)/9.6V(TYP) /120mA
9. Luminance: 250cd/m<sup>2</sup>(TYP)
10. ROHS must be complied

\* Unspecification tolerance are ±0.2mm  
 \* The dimension with mark brackets "( )" just for reference

PIN	SYMBOL	PIN	SYMBOL	PIN	SYMBOL	PIN	SYMBOL	PIN	SYMBOL
1	LED-A	11	HS	21	G6	31	R4	41	VGH
2	LED-A	12	B7	22	G5	32	R3	42	VGL
3	LED-K	13	B6	23	G4	33	R2	43	AVDD
4	LED-K	14	B5	24	G3	34	R1	44	RESET
5	GND	15	B4	25	G2	35	R0	45	NC
6	VCOM	16	B3	26	G1	36	GND	46	VCOM
7	DVDD	17	B2	27	G0	37	DCLK	47	DITHB
8	MODE	18	B1	28	R7	38	GND	48	GND
9	DE	19	B0	29	R6	39	L/R	49	NC
10	VS	20	G7	30	R5	40	U/D	50	NC

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