

Display Elektronik GmbH

DATA SHEET

TFT MODULE

**DEM 1024105A
TMH-PW-N**

9,0" TFT

Product Specification

Ver.: 2

12.12.2014

Revision History

Revision	Date	Detail	Remarks
1.0	24.09.2014	Initial Release	-
1.1	14.11.2014	Modify DC Characteristics Modify Optical Characteristics Modify AC Electrical Characteristics	P5 P6 P12
1.2	12.12.2014	Modify Outline Drawing	P24

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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)	9.0"	-
LCD Type	TN TFT	-
Display Mode	Transmissive / Normally White	-
Resolution	1024 x RGB x 105	Pixels
View Direction	12 O'CLOCK	Best Image
Gray Scale Inversion Direction	6 O'CLOCK	-
Module Outline	240.08 x 37.80 x 4.3 (Note1)	mm
Active Area	230.40 x 23.62	mm
Pixel Size	0.225 x 0.225	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Polarizer Surface Treatment	Anti-Glare	-
Display Colors	16.7 Million	-
Interface	24-Bit-RGB-Interface	-
Driver IC	ILI6150 & ILI5120	-
With or Without Touch Panel	Without	-
Operating Temperature	-20~70	°C
Storage Temperature	-30~80	°C
Weight	85	G

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

3. Absolute Maximum Ratings

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

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VDD	-0.5	5.0	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
Supply Voltage	VDD	2.3	3.3	3.6	V
	AVDD	-	10	-	V
	VGH	-	22	-	V
	VGL	-	-7	-	V
	COM	-	4.4	-	V
Logic Low Input Voltage	V _{IL}	0	-	0.3*VDD	V
Logic High Input Voltage	V _{IH}	0.7*VDD	-	VDD	V
Logic Low Output Voltage	V _{OL}	-	-	0GND+0.4	V
Logic High Output Voltage	V _{OH}	VDD-0.4	-	-	V
Current Consumption All Black	Logic	I _{CC+I_{IN}}	20	40	mA
	Analog				

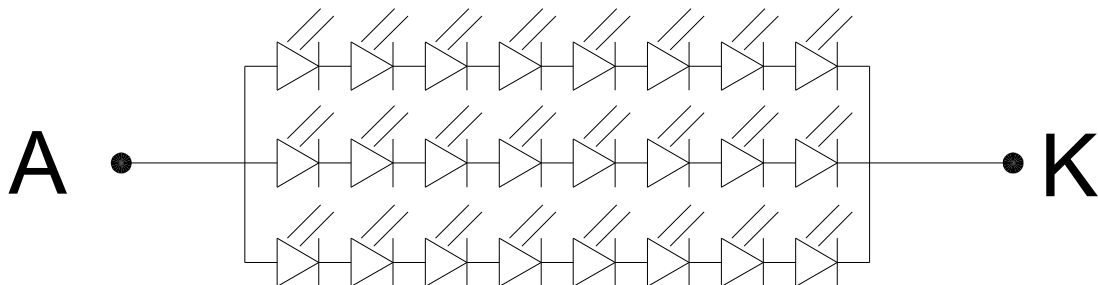
5. Backlight Characteristic

5.1. Backlight Characteristic

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V _F	T _a =25 °C, I _F =20mA/LED	23.2	25.6	26.4	V
Forward Current	I _F	T _a =25 °C, V _F =3.2V/LED	-	60	-	mA
Power Dissipation	P _D		-	1536	-	mW
LED Life Time(25 °C)	-	-	-	30000	-	hrs
Uniformity	Avg		80	-	-	%
Drive Method	Constant current					
LED Configuration	24 White LEDs(8 LEDs in one string and 3 groups in parallel)					

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

5.2. Backlight Characteristic



6. Optical Characteristics

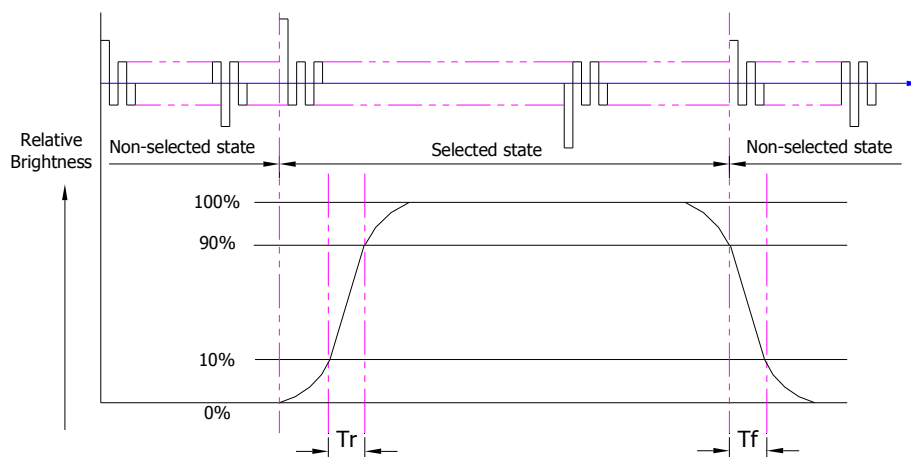
6.1. Optical Characteristics

Ta=25°C, VCC=3.3V, TN LC+ Polarizer

	Item	Symbol	Condition	Specification			Unit
				Min.	Typ.	Max.	
Backlight On (Transmissive Mode)	Luminance on TFT	Lv	Normally viewing angle $\theta_x = \phi_y = 0^\circ$	320	400	-	cd/m ²
	Contrast ratio(See 6.3)	CR		300	400	-	
	Response time (See 6.2)	TR+TF		-	25	50	ms
	Chromaticity Transmissive (See 6.5)	Red	X _R	0.536	0.586	0.636	
			Y _R	0.274	0.324	0.374	
		Green	X _G	0.265	0.315	0.365	
			Y _G	0.568	0.618	0.668	
		Blue	X _B	0.098	0.148	0.198	
			Y _B	0.027	0.077	0.127	
	White	X _W	0.228	0.278	0.328		
		Y _W	0.261	0.311	0.361		
	Viewing Angle (See 6.4)	Horizontal	θ_{x+}	55	70	-	Deg.
			θ_{x-}	55	70	-	
		Vertical	ϕ_{y+}	35	50	-	
ϕ_{y-}			55	70	-		
NTSC Ratio(Gamut)			-	58	-	%	

6.2. Definition of Response Time

6.2.1. Normally Black Type (Negative)

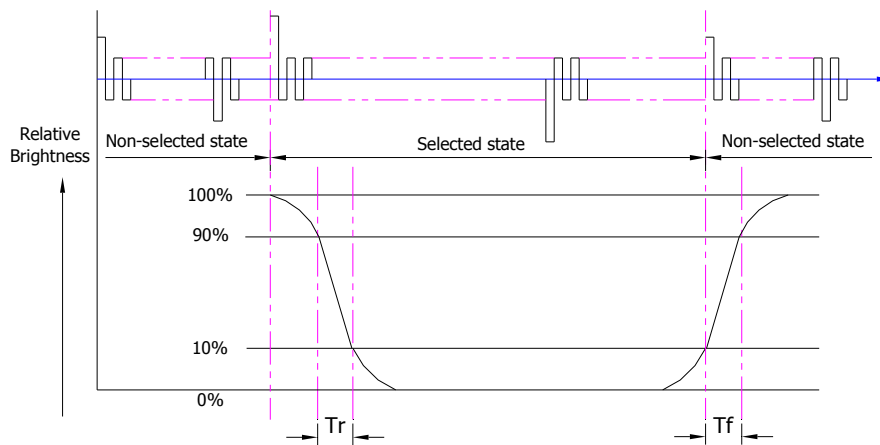


Tr is the time it takes to change from non-selected state with relative luminance 10% to selected state with relative luminance 90%;

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

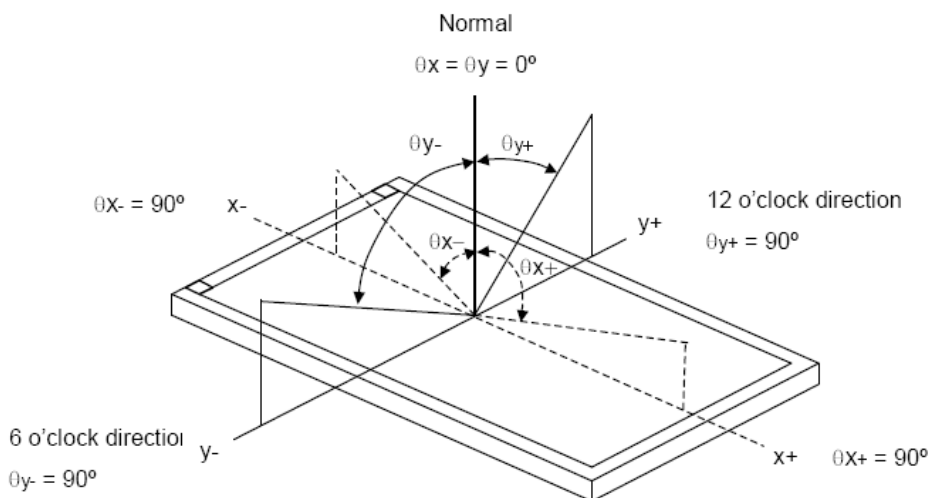
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

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



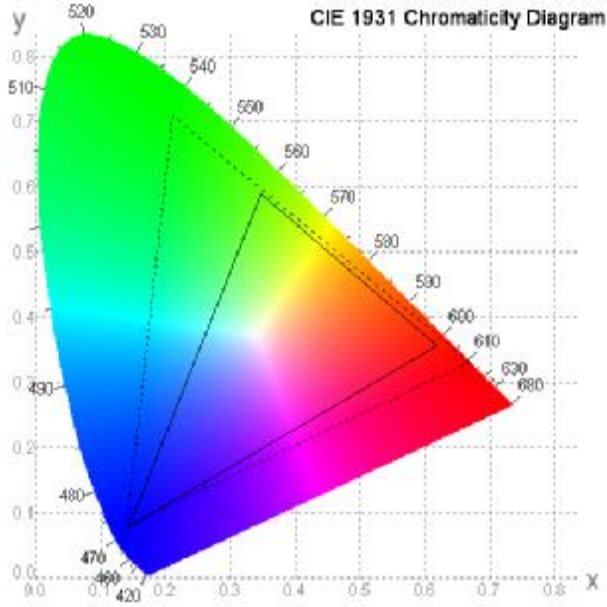
Measuring machine: LCD-5100 or EQUI

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

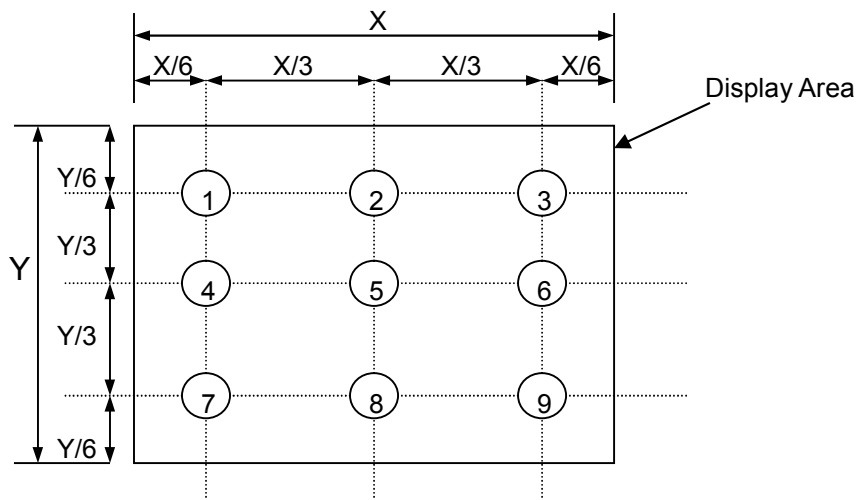
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

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

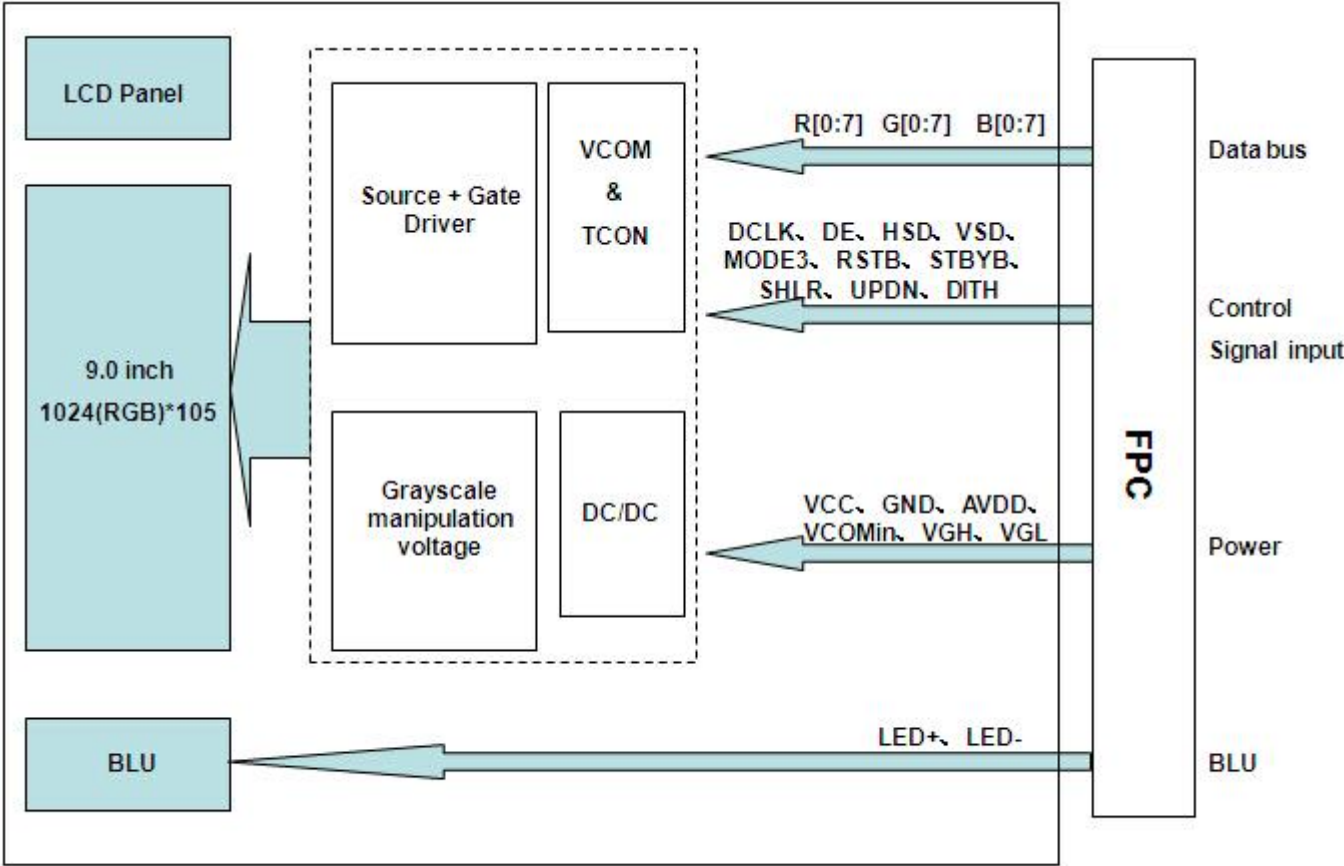
6.6.2. Uniformity = $\text{Minimal}(L_{P1}:L_{P9}) / \text{Maximal}(L_{P1}:L_{P9}) * 100\%$

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



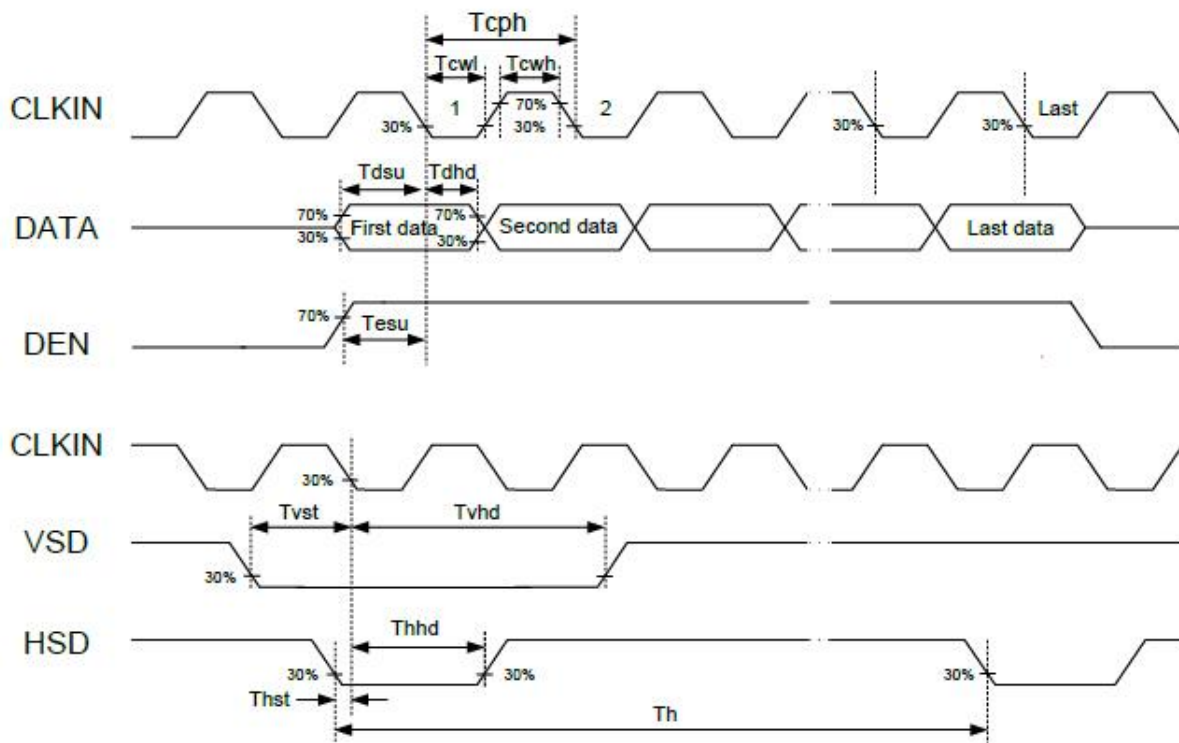
8. Interface Pins Definition

No.	Symbol	Function
1	GND	Ground.
2	AVDD	Analog Power.
3	VCC	Digital Power.
4	R0	Data bus.
5	R1	Data bus.
6	R2	Data bus.
7	R3	Data bus.
8	R4	Data bus.
9	R5	Data bus.
10	R6	Data bus.
11	R7	Data bus.
12	G0	Data bus.
13	G1	Data bus.
14	G2	Data bus.
15	G3	Data bus.
16	G4	Data bus.
17	G5	Data bus.
18	G6	Data bus.
19	G7	Data bus.
20	B0	Data bus.
21	B1	Data bus.
22	B2	Data bus.
23	B3	Data bus.
24	B4	Data bus.
25	B5	Data bus.
26	B6	Data bus.
27	B7	Data bus.
28	DCLK	Clock input.
29	DE	Data enable signal.
30	HSD	Horizontal sync input.
31	VSD	Vertical sync input.
32	MODE3	DE/SYNC mode select. Normally pull high. H:DE mode, L:HSD/VSD mode.
33	RSTB	Reset signal.
34	STBYB	Standby mode, normally pull high STBYB="1", normal operation STBYB="0", timing control, source driver will turn off, all output are high-Z.
35	SHLR	Source right or left sequence control.
36	VCC	Digital Power.
37	UPDN	Gate up or down scan control.
38	GND	Ground.
39	GND	Ground.
40	AVDD	Analog Power.

41	VCOMin	For external VCOM DC input(optical)
42	DITH	Dithering setting: DITH="H" 6bit resolution (last 2 bits of input data truncated) (default setting). DITH="L" 8bit resolution.
43	NC	No connection.
44	NC	No connection.
45	NC	No connection.
46	NC	No connection.
47	NC	No connection.
48	NC	No connection.
49	NC	No connection.
50	NC	No connection.
51	NC	No connection.
52	NC	No connection.
53	NC	No connection.
54	NC	No connection.
55	NC	No connection.
56	VGH	Positive power for TFT.
57	VCC	Digital Power.
58	VGL	Negative power for TFT.
59	GND	Ground.
60	NC	No connection.

9. Timing Diagram

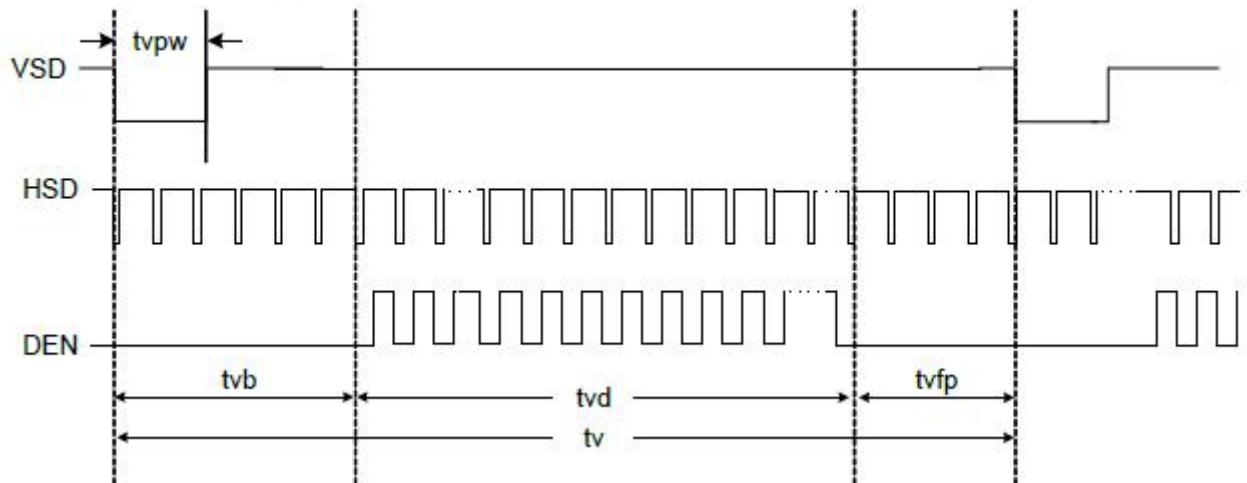
9.1. AC Electrical Characteristics



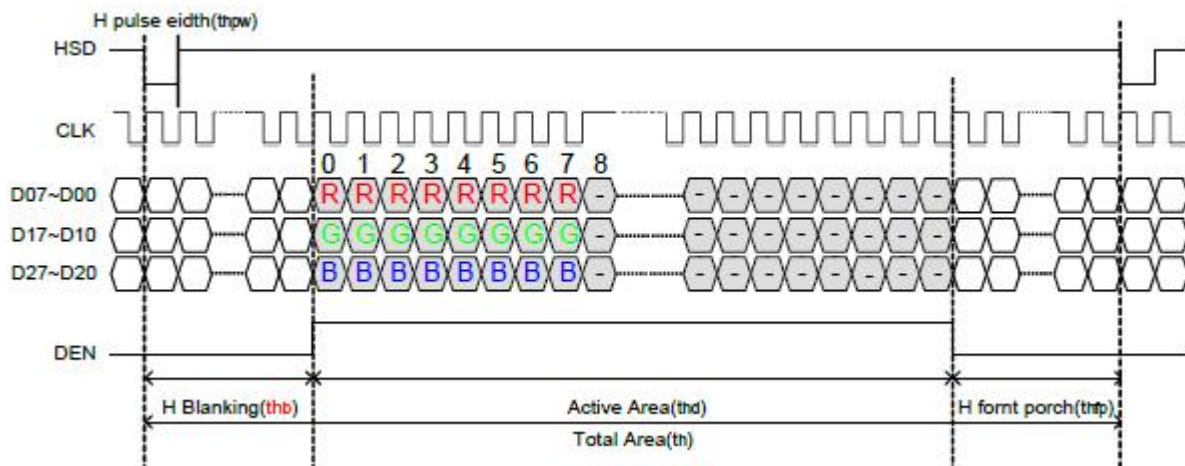
Parameter	Symbol	Min	Typ.	Max	Unit	Conditions
VDD power on Slew rate	TPOR	-	-	20	ms	From 0V to 0.9VDD
RSTB pulse width	TRst	50	-	-	us	DCLK=10.5MHz
DCLK cycle time	Tcph	84	-	-	ns	
DCLK pulse duty	Tcwh	40	50	60	%	
VSD setup time	Tvst	5	-	-	ns	
VSD hold time	Tvhd	5	-	-	ns	
HSD setup time	Thst	5	-	-	ns	
HSD hold time	Thhd	5	-	-	ns	
Data setup time	Tdsu	5	-	-	ns	D0[7:0],D1[7:0],D2[7:0] to DCLK
Data hold time	Tdhu	5	-	-	ns	D0[7:0],D1[7:0],D2[7:0] to DCLK
OE setup time	Tesu	5	-	-	ns	
OE hold time	Tehd	5	-	-	ns	
Output stable time	Tsst	-	-	6	us	10% to 90% target Voltage. CL=90pF,R=10K ohm (Cascade)
				3		

9.2. Data Input Format for TTL

Vertical input timing



Horizontal input timing



Parameter	Symbol	Value			Unit
		Min	Typ.	Max	
DCLK frequency Frame rate = 60Hz	fclk	-	9.6	-	MHz
Horizontal display area	thd		1024		DCLK
HSYNC period time	th	-	1244	-	DCLK
HSYNC blanking	thb+thfp	-	140	-	DCLK
Vertical display area	tvd		105		H
VSYNC period time	tv	-	139	-	H
VSYNC blanking	tvb+tvfp	-	24	-	H

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.

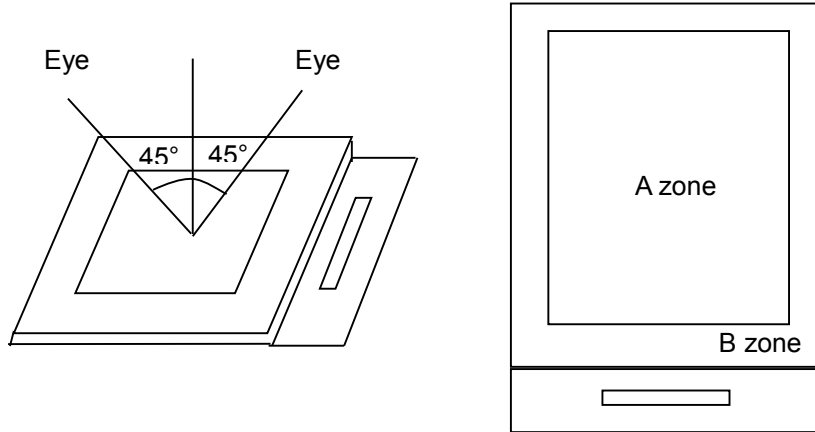
10.5 Standard of the Product Visual Inspection

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,



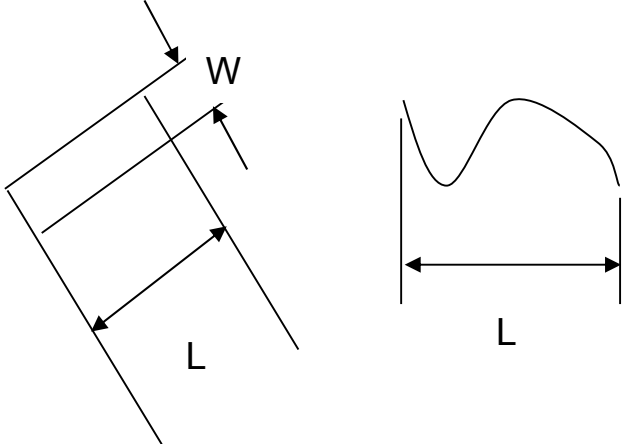
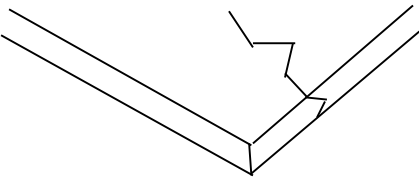
10.5.2 Basic principle:

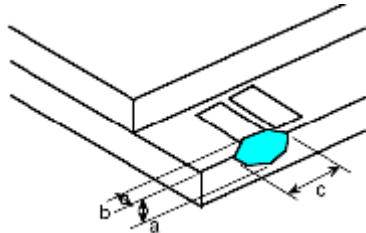
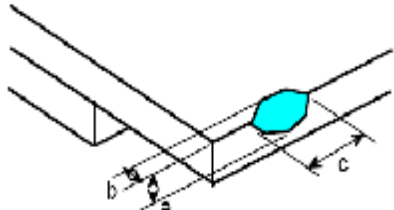
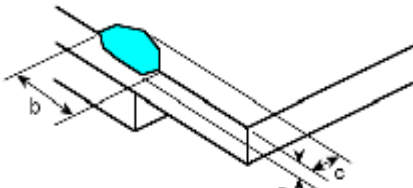
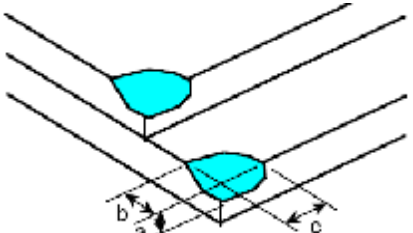
10.5.2.1 A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

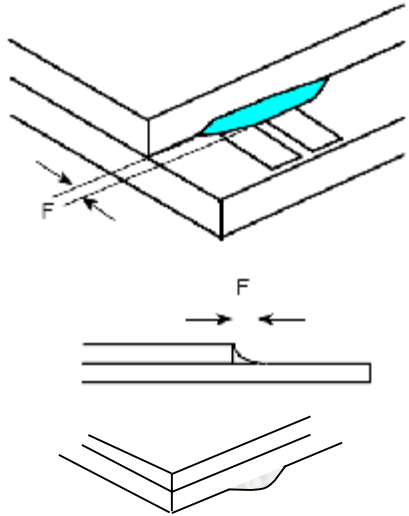
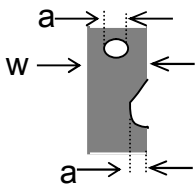
10.5.2.2 New item must be added on time when it is necessary.

10.6 Inspection Specification

No.	Item	Criteria (Unit: mm)										
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	$\phi = (a + b) / 2$										
		<table border="1"> <thead> <tr> <th>Size</th> <th>Area</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\phi \leq 0.20$</td> <td></td> <td>Ignore</td> </tr> <tr> <td>$0.20 < \phi \leq 0.50$</td> <td></td> <td>$N \leq 3$</td> </tr> <tr> <td>$0.50 < \phi$</td> <td></td> <td>0</td> </tr> </tbody> </table>	Size	Area	Acc. Qty	$\phi \leq 0.20$		Ignore	$0.20 < \phi \leq 0.50$		$N \leq 3$	$0.50 < \phi$
Size	Area	Acc. Qty										
$\phi \leq 0.20$		Ignore										
$0.20 < \phi \leq 0.50$		$N \leq 3$										
$0.50 < \phi$		0										
Distance between 2 defects should more than 5mm apart.												

02	Electrical Defect (Minor defect)	<table border="1" data-bbox="549 226 1414 443"> <tr> <td rowspan="2">Bright dot</td> <td>Display Area</td> <td>Total</td> <td rowspan="3">Note1</td> </tr> <tr> <td>$N \leq 2$</td> <td>$N \leq 2$</td> </tr> <tr> <td>Dark dot</td> <td>$N \leq 4$</td> <td>$N \leq 4$</td> </tr> <tr> <td>Total dot</td> <td>$N \leq 4$</td> <td>$N \leq 4$</td> <td></td> </tr> <tr> <td>Mura</td> <td colspan="2">Not visible through 5% ND filters.</td> <td>Note 2</td> </tr> </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.		Note 2
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.		Note 2																
03	Black and White line Scratch Foreign material (Line type) (Minor defect)	 <table border="1" data-bbox="608 1066 1235 1330"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>/</td> <td>$W \leq 0.1$</td> <td>Ignore</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.1 < W \leq 0.2$</td> <td>3</td> </tr> <tr> <td>$L > 2.5$</td> <td>$0.2 < W$</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																	
04	Glass Crack (Minor defect)	 <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>$c > 3.0, b < 1.0$</td> <td>1</td> </tr> <tr> <td>$c < 3.0, b < 1.0$</td> <td>3</td> </tr> <tr> <td colspan="2">$a < \text{Glass Thickness}$</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>$c > 3.0, b < 1.0$</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">$a < \text{Glass Thickness}$</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>$c > 3.0, b < 1.0$</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">$a < \text{Glass Thickness}$</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>$c < 3.0, b < 3.0$</td> <td>Ignore</td> </tr> <tr> <td colspan="2">$a < \text{Glass Thickness}$</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="858 264 1332 353"> <thead> <tr> <th>Length</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$F < 1.0$</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 $a < w/3$. (w: circuitry width.)</p> <p>10.2 Open circuit is unacceptable.</p> <p>10.3 No oxidation, contamination and distortion.</p>								
<p>11</p>	<p>Bubble on Polarizer (Minor defect)</p>	<table border="1" data-bbox="735 1339 1206 1512"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\varphi \leq 0.30$</td> <td>Ignore</td> </tr> <tr> <td>$0.30 < \varphi \leq 0.50$</td> <td>$N \leq 2$</td> </tr> <tr> <td>$0.50 < \varphi$</td> <td>$N = 0$</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="735 1585 1206 1758"> <thead> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> </thead> <tbody> <tr> <td>$\varphi \leq 0.25$</td> <td>Ignore</td> </tr> <tr> <td>$0.25 < \varphi \leq 0.50$</td> <td>$N \leq 4$</td> </tr> <tr> <td>$0.50 < \varphi$</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.</p> <p>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: $D < 0.25$ is acceptable $0.25 \leq D \leq 0.4$</p> <p>2dots are acceptable and the distance between defects should more than 10 mm.</p> <p>$D > 0.4$ is unacceptable</p> <p>14.2 Dent: $D > 0.40$ is unacceptable</p> <p>14.3 Scratch: $W \leq 0.03$, $L \leq 10$ is acceptable, $0.03 < W \leq 0.10$, $L \leq 10$ is acceptable</p> <p>Distance between 2 defects should more than 10 mm. $W > 0.10$ 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.

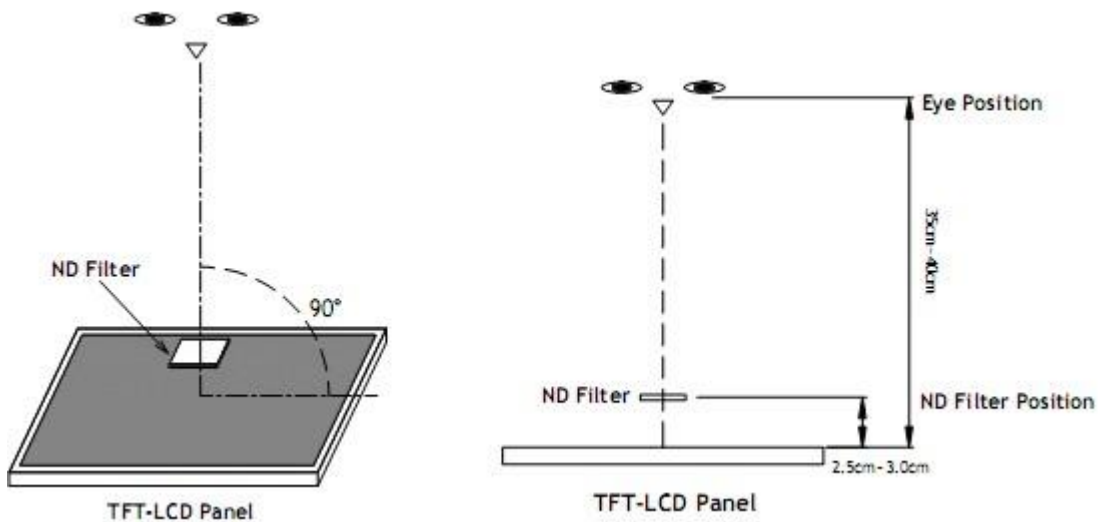
10.9 Packaging

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□, 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°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	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 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.

12.4 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

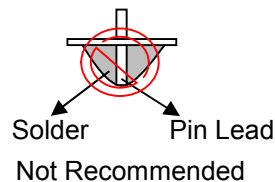
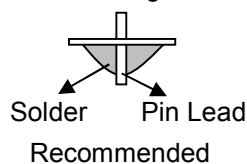
Maximum Solder Temperature: 370℃

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℃

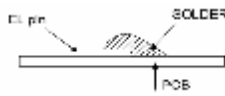
Typical Soldering Time: ≤2s

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

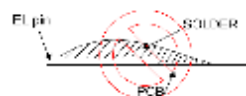
- 12.4.2.4 No horizontal press on the EL leads during soldering.

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

12.4.2.6 Solder Wetting



Recommended

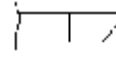


Not Recommended

12.4.2.7 The type of the solder iron:

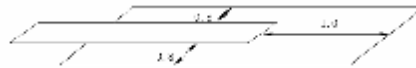


Recommended



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.

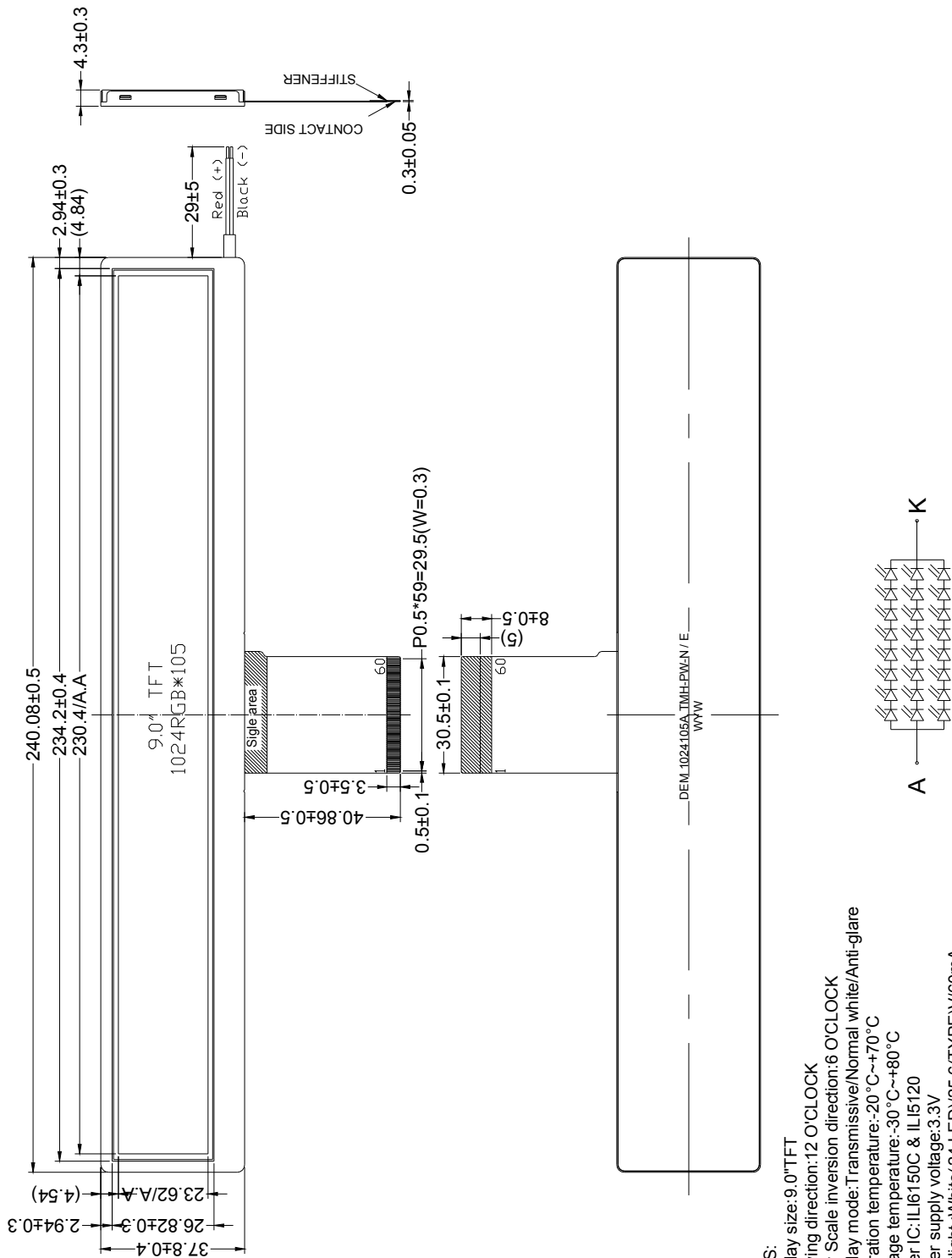
12.7 Limited Warranty

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. Outline Drawing



- NOTES:
1. Display size: 9.0" TFT
 2. Viewing direction: 12 O'CLOCK
 3. Gary Scale inversion direction: 6 O'CLOCK
 3. Display mode: Transmissive/Normal white/Anti-glare
 4. Operation temperature: 20 °C ~ +70 °C
 5. Storage temperature: -30 °C ~ +80 °C
 6. Driver IC: ILI6150C & ILI5120
 7. Power supply voltage: 3.3V
 8. Backlight : White (24 LED)/25.6(TYPE)/60mA
 9. ROHS must be complied
- * Unspecification tolerance are ± 0.3mm