

Display Elektronik GmbH

# DATA SHEET

*TFT MODULE*

## DEM 480272H TMX-PW-N

### 4,3" TFT

Product Specification

Ver.: 1

25.01.2014

**Revision History**

<b>Revision</b>	<b>Date</b>	<b>Detail</b>	<b>Remarks</b>
0	14.12.2013	Initial Release	-
1	25.01.2014	Add Weight Modify Chromacity Transmissive Modify Reliability Specification	P4 P6 P20

**Table of Contents**

No.	Item	Page
1.	General Description .....	4
2.	Module Parameter .....	4
3.	Absolute Maximum Ratings .....	4
4.	DC Characteristics .....	5
5.	Backlight Characteristic .....	5
5.1.	Backlight Characteristics.....	5
5.2.	Backlighting circuit .....	5
6.	Optical Characteristics .....	6
6.1.	Optical Characteristics .....	6
6.2.	Definition of Response Time .....	6
6.3.	Definition of Contrast Ratio .....	7
6.4.	Definition of Viewing Angles.....	7
6.5.	Definition of Color Appearance .....	8
6.6.	Definition of Surface Luminance, Uniformity and Transmittance.....	8
7.	Block Diagram and Power Supply .....	9
8.	Interface Pins Definition .....	10
9.	AC Characteristics .....	11
10.	AC Timing Diagram.....	12
11.	INPUT DATA FORMAT .....	12
12.	Quality Assurance .....	14
12.1	Purpose .....	14
12.2	Standard for Quality Test.....	14
12.3	Nonconforming Analysis & Disposition .....	14
12.4	Agreement Items.....	14
12.5	Standard of the Product Visual Inspection.....	15
12.6	Inspection Specification .....	15
12.7	Classification of Defects.....	20
12.8	Identification/marketing criteria .....	20
12.9	Packing .....	20
13.	Reliability Specification .....	21
14.	Precautions and Warranty .....	22
14.1	Safety.....	22
14.2	Handling .....	22
14.3	Storage.....	22
14.4	Metal Pin (Apply to Products with Metal Pins).....	22
14.5	Operation .....	23
14.6	Static Electricity .....	23
14.7	Limited Warranty .....	23
15.	Packaging .....	23
16.	Outline Drawing .....	24

## 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)	4.3"	-
LCD Type	TN TFT	-
Display Mode	Transmissive / Normally White	-
Resolution	480 x RGB x 272	Pixels
View Direction	6 O'clock	Best Image
Gray Scale Inversion Direction	12 O'clock	-
Module Outline (W x H x T)	105.50 x 67.20 x 2.90 (Note1 )	mm
Active Area (W x H)	95.04 x 53.86	mm
Pixel Pitch	0.198 x 0.198	mm
Pixel Arrangement	Stripe	-
Polarizer Surface Treatment	Anti-Glare	-
Display Colors	16M	-
Interface	24-bit RGB interface	-
Driver IC	ILI6480G2	-
With or Without Touch Panel	Without	-
Operating Temperature	-30~85	°C
Storage Temperature	-40~90	°C
Weight	~ 45	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	VDD	-0.5	5	V
Storage Temperature	T <sub>STG</sub>	-40	+90	°C
Operating Temperature	T <sub>OP</sub>	-30	+85	°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	
Digital Interface Supply Voltage	VDD	3.0	3.3	3.6	V	
Logic Low Input Voltage	V <sub>IL</sub>	GND	-	0.3*VDD	V	
Logic High Input Voltage	V <sub>IH</sub>	0.7*VDD	-	VDD	V	
Logic Low Output Voltage	V <sub>OL</sub>	GND	-	GND+0.4	V	
Logic High Output Voltage	V <sub>OH</sub>	VDD-0.4	-	-	V	
Current Consumption All Black	Logic	I <sub>CC</sub> + I <sub>IN</sub>	-	TBD	-	mA
	Analog					

**5. Backlight Characteristic**

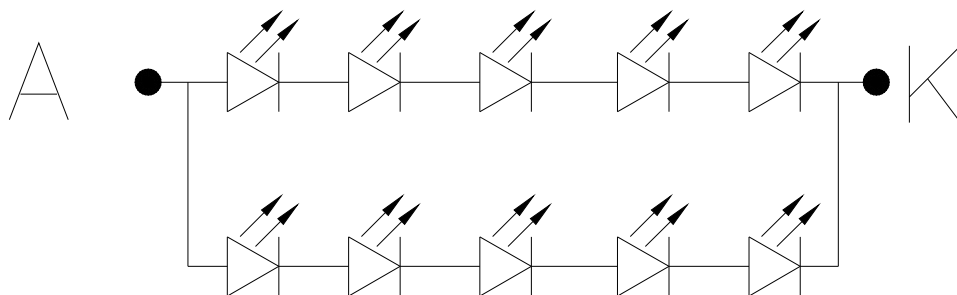
**5.1. Backlight Characteristics**

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V <sub>F</sub>	T <sub>a</sub> =25 °C, I <sub>F</sub> =20mA/LED	15.5	16	16.5	V
Forward Current	I <sub>F</sub>	T <sub>a</sub> =25 °C, V <sub>F</sub> =3.2V/LED	-	40	-	mA
Power Dissipation	P <sub>D</sub>		-	640	660	mW
LED Lifetime(25 °C)	-	-	(30,000)	-	-	Hrs
Uniformity	Avg		-	80	-	%
Drive Method	Constant current					
LED Configuration	10 White LEDs (5 LEDs in one string and 2 groups in parallel)					

Note: LED lifetime defined as follows: The final brightness is at 70% of original brightness.

The environmental conducted under ambient air flow, at T<sub>a</sub>=25±2 °C, 60%RH±5%, I<sub>F</sub>=20mA.

**5.2. Backlighting Circuit**



6. Optical Characteristics

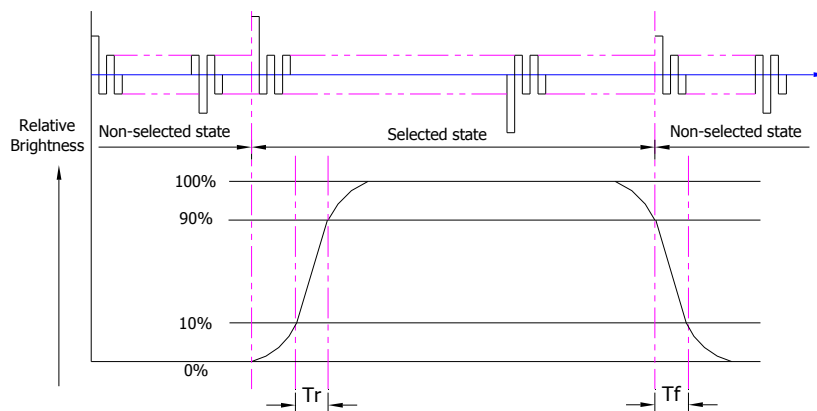
6.1. Optical Characteristics

Ta=25°C, V<sub>DD</sub>=3.3V, TN LC+ Polarizer

Item	Symbol	Condition	Specification			Unit
			Min.	Typ.	Max.	
Luminance on TFT(I <sub>f</sub> =20mA/LED)	Lv	Normally viewing angle θ <sub>x</sub> = φ <sub>y</sub> = 0°	360	400	-	cd/m <sup>2</sup>
Contrast Ratio(See 6.3)	CR		250	350	-	
Response Time (See 6.2)	T <sub>R</sub> +T <sub>F</sub>		-	30	45	ms
Chromaticity Transmissive (See 6.5)	Red	X <sub>R</sub>	0.529	0.579	0.629	
		Y <sub>R</sub>	0.282	0.332	0.382	
	Green	X <sub>G</sub>	0.265	0.315	0.365	
		Y <sub>G</sub>	0.562	0.612	0.662	
	Blue	X <sub>B</sub>	0.097	0.147	0.197	
		Y <sub>B</sub>	0.065	0.115	0.165	
	White	X <sub>W</sub>	0.252	0.302	0.352	
		Y <sub>W</sub>	0.276	0.326	0.376	
Viewing Angle (See 6.4)	Horizontal	θ <sub>x+</sub>	-	60	-	Deg.
		θ <sub>x-</sub>	-	60	-	
	Vertical	φ <sub>y+</sub>	-	55	-	
		φ <sub>y-</sub>	-	50	-	
NTSC Ratio(Gamut)			-	50	-	%

6.2. Definition of Response Time

6.2.1. Normally Black Type (Negative)

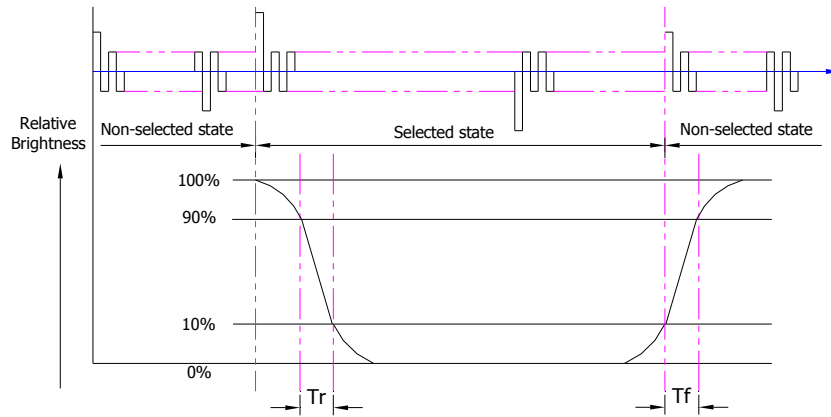


Tr is the time it takes to change from non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

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)**



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

$T_f$  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**

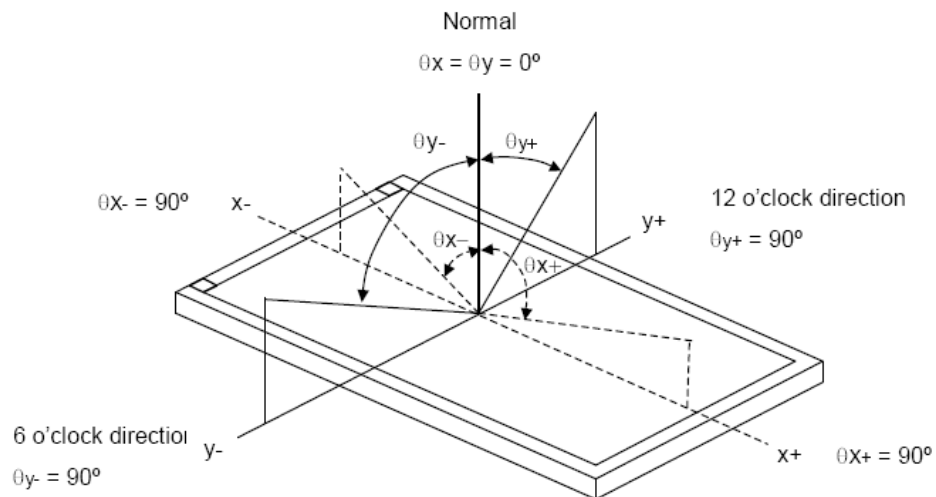
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

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**



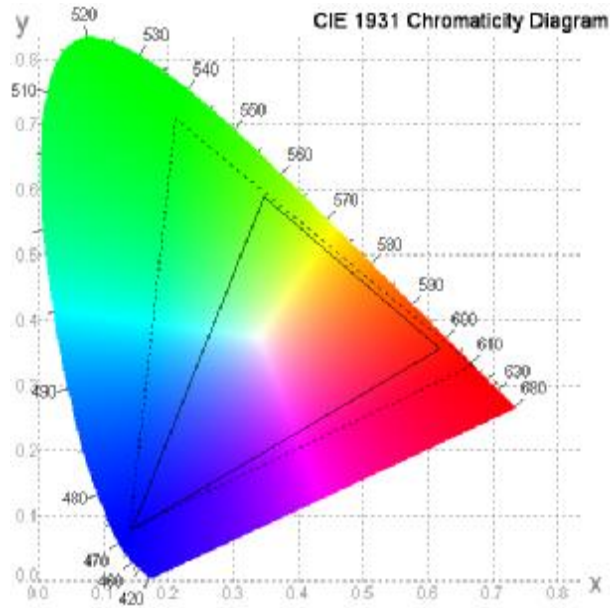
Measuring machine: LCD-5100 or EQUI

**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**

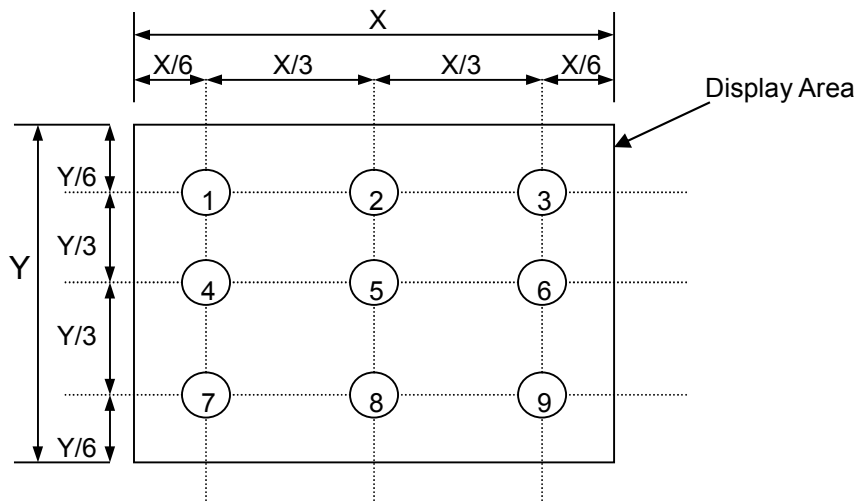
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

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

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

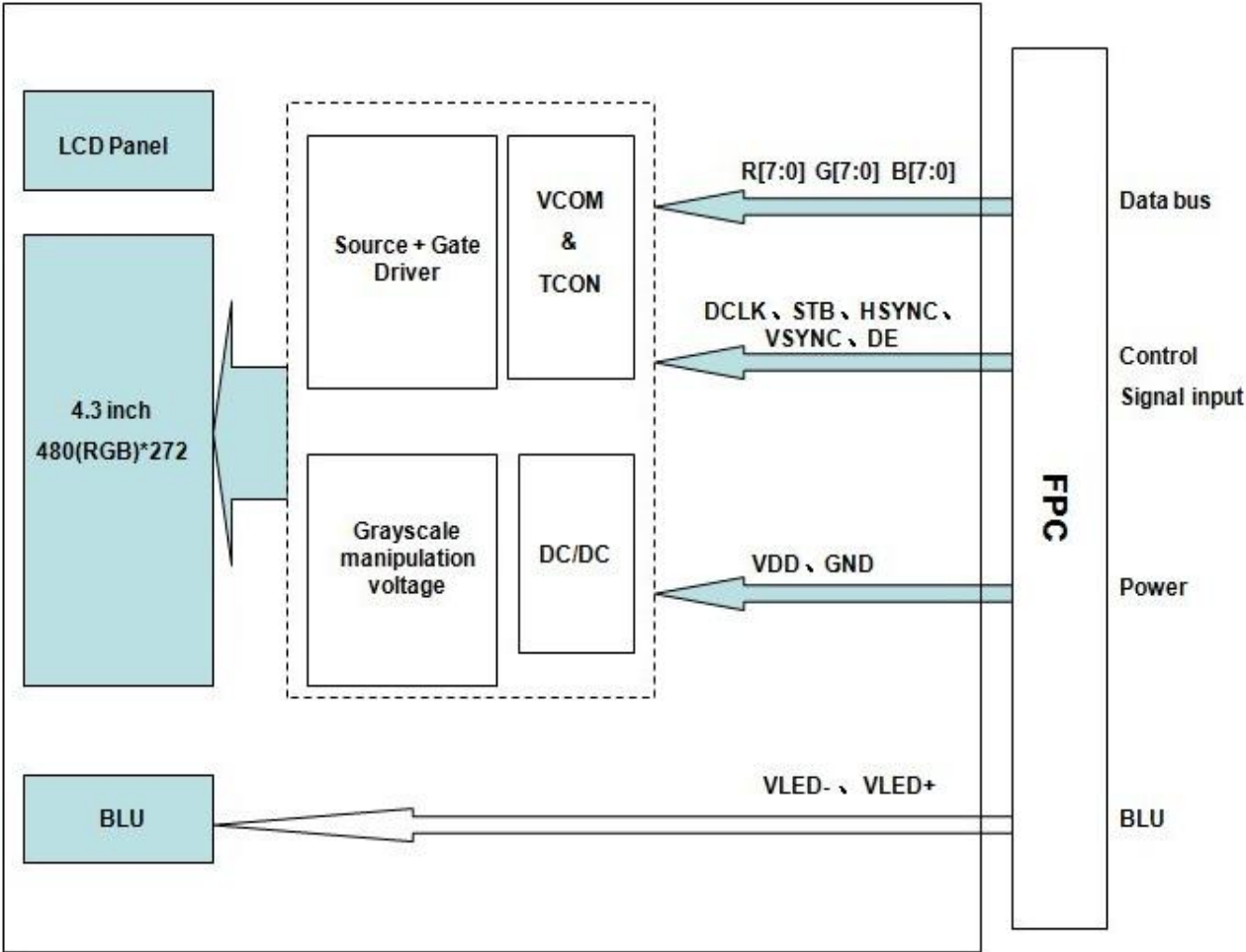
6.6.3. Transmittance =  $L_v \text{ on LCD} / L_v \text{ on Backlight} * 100\%$

Note: Measuring machine: BM-7





7. Block Diagram and Power Supply



## 8. Interface Pins Definition

No.	Symbol	Function
1	VLED-	Backlight Cathode
2	VLED+	Backlight Anode
3	GND	Ground
4	VDD	Power source
5	R0	Red data signal
6	R1	Red data signal
7	R2	Red data signal
8	R3	Red data signal
9	R4	Red data signal
10	R5	Red data signal
11	R6	Red data signal
12	R7	Red data signal
13	G0	Green data signal
14	G1	Green data signal
15	G2	Green data signal
16	G3	Green data signal
17	G4	Green data signal
18	G5	Green data signal
19	G6	Green data signal
20	G7	Green data signal
21	B0	Blue data signal
22	B1	Blue data signal
23	B2	Blue data signal
24	B3	Blue data signal
25	B4	Blue data signal
26	B5	Blue data signal
27	B6	Blue data signal
28	B7	Blue data signal
29	GND	Ground
30	DCLK	Clock signal to sample each data
31	STB	Standby setting for testing, it should be connected to VDD in normal operation mode. If connected to GND , the IC is in standby mode.
32	HSYNC	Horizontal synchronizing signal
33	VSYNC	Vertical synchronizing signal
34	DE	Input data enable control.
35	NC	No connection
36	GND	Ground
37	NC(XR)	No connection
38	NC(YD)	No connection
39	NC(XL)	No connection
40	NC(YU)	No connection

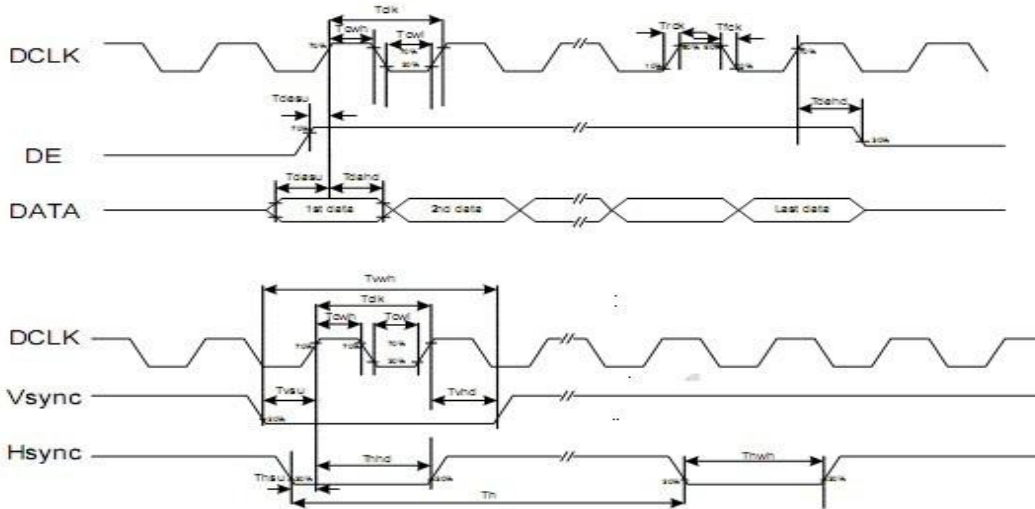
## 9. AC Characteristics

AC Electrical Characteristics (VDDIO=VDD=3.0 to 3.6v, GND=0V, TA=-20 to +85 °C)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
<b>System operation timing</b>						
VDD power source slew time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
<b>Input Output timing</b>						
DCLK clock time	Tclk	33.3	-	-	ns	DCLK=30MHz
DCLK clock low period	Tcwl	40	-	60	%	
DCLK clock high period	Tcwh	40	-	60	%	
Clock rising time	Trck	9	-	-	ns	
Clock falling time	Tfck	9	-	-	ns	
HSD width	Thwh	1	-	-	DCLK	
HSD period time	Th	55	60	65	us	
HSD setup time	Thsu	12	-	-	ns	
HSD hold time	Thhd	12	-	-	ns	
VSD width	Tvwh	1	-	-	Th	
VSD setup time	Tvsu	12	-	-	ns	
VSD hold time	Tvhd	12	-	-	ns	
Data setup time	Tdasu	12	-	-	ns	
Data hold time	Tdahd	12	-	-	ns	
DE setup time	Tdesu	12	-	-	ns	
DE hold time	Tdehd	12	-	-	ns	
Source output setting time	Tsst	-	-	12	us	10% to 90% CL=60pF, RL=2Kohm
Gate output setting time	Tgst	-	-	1200	ns	10% to 90%, CL=60pF
VCOM output setting time	Tcst	-	-	12	us	10% to 90%, CL=40nF, RL=50ohm
Time from VSD to 1st line data input	Tvs	3	8	31	Th	HV mode By HDL[4:0] setting

## 10. AC Timing Diagram

### 10.1.1 Clock and Data Input waveforms



## 11. INPUT DATA FORMAT

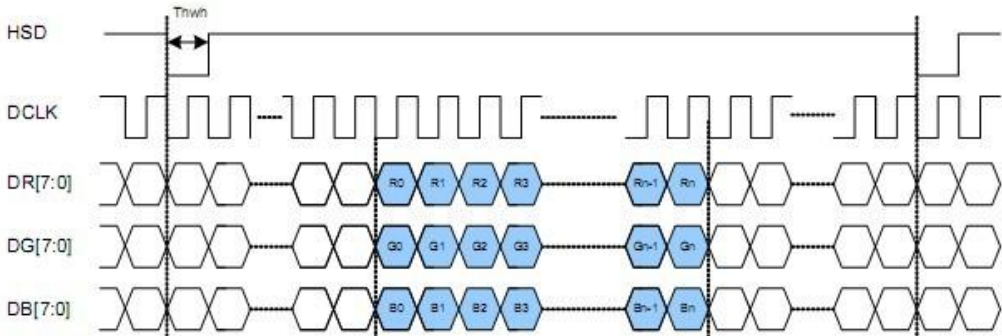
### 11.1 Parallel RGB Data Format

#### 11.1.1 Parallel RGB Input Timing Table

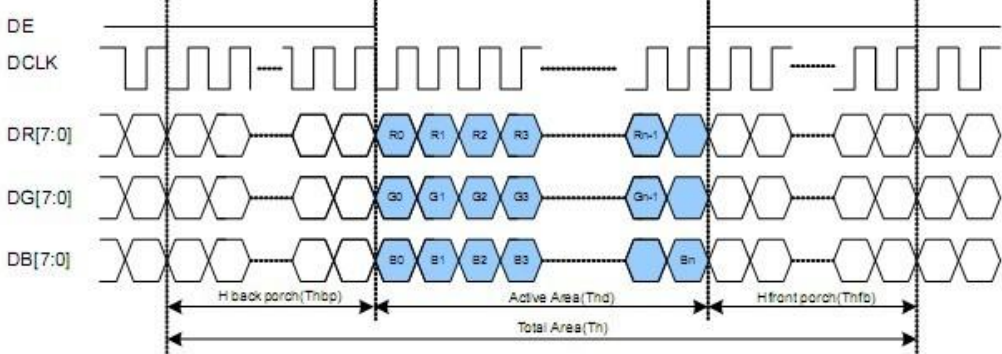
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	5	9	12	MHz
VSD period time	Tv	277	288	400	H
VSD display area	Tvd	272			H
VSD back porch	Tvb	3	8	31	H
VSD front porch	Tvfp	2	8	97	H
HSD period time	Th	520	525	800	DCLK
HSD display area	Thd	480			DCLK
HSD back porch	Thbp	36	40	255	DCLK
HSD front porch	Thfp	4	5	65	DCLK

Parallel RGB Mode Data format

(HV Mode)



(DE Mode)



## **12. Quality Assurance**

### **12.1 Purpose**

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

### **12.2 Standard for Quality Test**

#### 12.2.1 Sampling Plan:

ANSI / ASQC Z1.4-1993.

Single sampling, normal inspection.

#### 12.2.2 Sampling Criteria:

Visual inspection: AQL 1.5%

Electrical functional: AQL 0.65%.

#### 12.2.3 Reliability Test:

Detailed requirement refer to Reliability Test Specification.

### **12.3 Nonconforming Analysis & Disposition**

#### 12.3.1 Nonconforming analysis:

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

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

12.3.1.3 If cannot finish the analysis on time, customer will be notified with the progress status.

#### 12.3.2 Disposition of nonconforming:

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

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

### **12.4 Agreement Items**

Shall negotiate with customer if the following situation occurs:

12.4.1 There is any discrepancy in standard of quality assurance.

12.4.2 Additional requirement to be added in product specification.

12.4.3 Any other special problem.

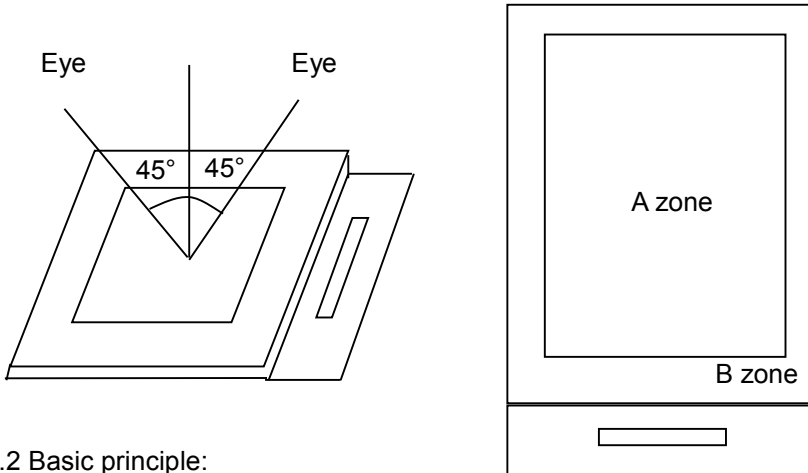
**12.5 Standard of the Product Visual Inspection**

12.5.1 Appearance inspection:

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

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

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



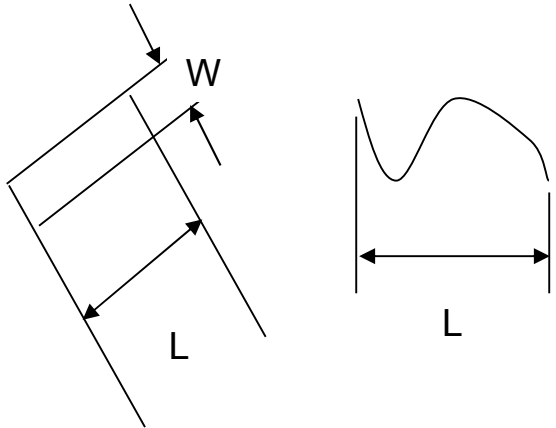
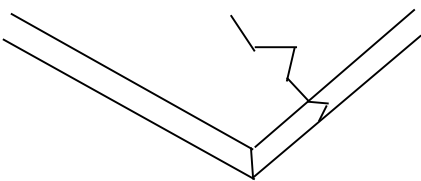
12.5.2 Basic principle:

12.5.2.1 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.

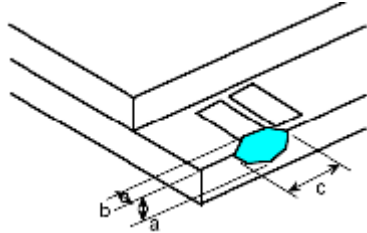
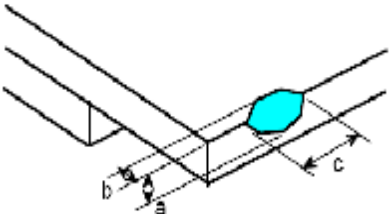
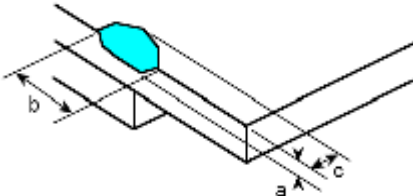
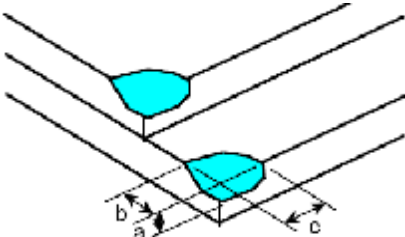
12.5.2.2 New item must be added on time when it is necessary.

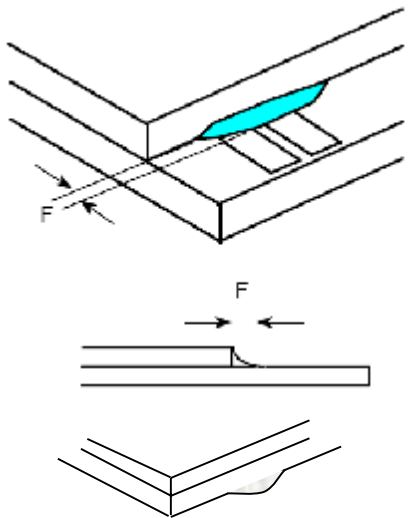
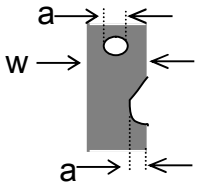
**12.6 Inspection Specification**

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><math>\phi \leq 0.10</math></td> <td></td> <td>Ignore</td> </tr> <tr> <td><math>0.10 &lt; \phi \leq 0.15</math></td> <td></td> <td>2</td> </tr> <tr> <td><math>0.15 &lt; \phi \leq 0.25</math></td> <td></td> <td>1</td> </tr> <tr> <td><math>0.25 &lt; \phi</math></td> <td></td> <td>0</td> </tr> <tr> <td>Total</td> <td></td> <td>2 no include <math>\phi \leq 0.10</math></td> </tr> </tbody> </table>	Size	Area	Acc. Qty	$\phi \leq 0.10$		Ignore	$0.10 < \phi \leq 0.15$		2	$0.15 < \phi \leq 0.25$		1	$0.25 < \phi$		0	Total
Size	Area	Acc. Qty																
$\phi \leq 0.10$		Ignore																
$0.10 < \phi \leq 0.15$		2																
$0.15 < \phi \leq 0.25$		1																
$0.25 < \phi$		0																
Total		2 no include $\phi \leq 0.10$																
Distance between 2 defects should more than 3mm apart.																		

<p>02</p>	<p>Black and White line Scratch Foreign material (Line type) (Minor defect)</p>	 <table border="1" data-bbox="614 772 1236 1086"> <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">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	/	$W \leq 0.03$	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	Total		3
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																		
Total		3																		
<p>03</p>	<p>Glass Crack (Minor defect)</p>	 <p>Crack is potential to enlarge, any type is not allowed.</p>																		



<p>04</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>05</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>06</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>07</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>08</p>	<p>Glass Burr: (Minor defect)</p> 	<table border="1" data-bbox="866 232 1339 322"> <tr> <th>Length</th> <th>Acc. Qty</th> </tr> <tr> <td><math>F &lt; 1.0</math></td> <td>Ignore</td> </tr> </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>09</p>	<p>FPC Defect: (Minor defect)</p> 	<p>9.1 Dent, pinhole width <math>a &lt; w/3</math>. (w: circuitry width.) 9.2 Open circuit is unacceptable. 9.3 No oxidation, contamination and distortion.</p>								
<p>10</p>	<p>Bubble on Polarizer (Minor defect)</p>	<table border="1" data-bbox="743 1348 1214 1523"> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> <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</math></td> <td>None</td> </tr> </table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi$	None
Diameter	Acc. Qty									
$\varphi \leq 0.20$	Ignore									
$0.20 < \varphi \leq 0.30$	4									
$0.30 < \varphi$	None									
<p>11</p>	<p>Dent on Polarizer (Minor defect)</p>	<table border="1" data-bbox="743 1590 1214 1765"> <tr> <th>Diameter</th> <th>Acc. Qty</th> </tr> <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</math></td> <td>None</td> </tr> </table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi$	None
Diameter	Acc. Qty									
$\varphi \leq 0.20$	Ignore									
$0.20 < \varphi \leq 0.30$	4									
$0.30 < \varphi$	None									
<p>12</p>	<p>Bezel</p>	<p>12.1 No rust, distortion on the Bezel. 12.2 No visible fingerprints, stains or other contamination.</p>								

13	Touch Panel	<p>D: Diameter W: width L: length</p> <p>13.1 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.</p> <p><math>D &gt; 0.4</math> is unacceptable</p> <p>13.2 Dent: <math>D &gt; 0.40</math> is unacceptable</p> <p>13.3 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.</p> <p><math>W &gt; 0.10</math> is unacceptable.</p>
14	PCB	<p>14.1 No distortion or contamination on PCB terminals.</p> <p>14.2 All components on PCB must same as documented on the BOM/component layout.</p> <p>14.3 Follow IPC-A-600F.</p>
15	Soldering	Follow IPC-A-610C standard
16	Electrical Defect (Major defect)	<p>The below defects must be rejected.</p> <p>16.1 Missing vertical / horizontal segment,</p> <p>16.2 Abnormal Display.</p> <p>16.3 No function or no display.</p> <p>16.4 Current exceeds product specifications.</p> <p>16.5 LCD viewing angle defect.</p> <p>16.6 No Backlight.</p> <p>16.7 Dark Backlight.</p> <p>16.8 Touch Panel no function.</p> <p>16.9 Dark Dot –one Allowed.</p> <p>16.10 Bright Dot – one Allowed.</p> <p>Remark:</p> <p>1. A pixel defect is acceptable if one color is none functional and causes a bright dot. The display may have one case where one color is out and cause a dark dot.</p> <p>2. Bright dot caused by scratch and foreign object accords to item 1.</p>

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

**12.7 Classification of Defects**

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

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

**12.8 Identification/marketing criteria**

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

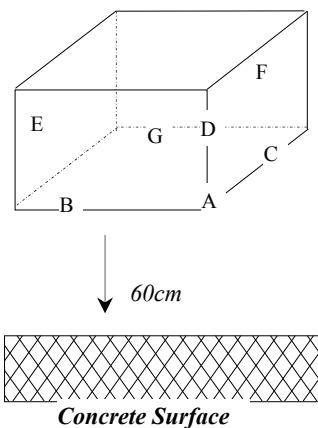
**12.9 Packing**

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

12.9.2 Modules inside package box should have compliant mark.

12.9.3 All direct package materials shall offer ESD protection

13. Reliability Specification

No	Item	Condition	Quantity
1	High Temperature Operating	85□, 96Hrs	5
2	Low Temperature Operating	-30□, 96Hrs	5
3	High Humidity	50□, 90%RH, 96Hrs	5
4	High Temperature Storage	90□, 96Hrs	5
5	Low Temperature Storage	-40□, 96Hrs	5
6	Thermal shock	-30□, 30min~85□, 30min, 10 cycles.	5
7	Packing vibration	Frequency range:10Hz~55Hz Amplitude of vibration:1.5mm Sweep time:12min X,Y,Z 2 hours for each direction.	5
8	Electrical Static Discharge	Air: ±4KV 150pF/330Ω 5 times Contact: ±2KV 150pF/330Ω 5 times	5
9	Drop Test	<p>To be measured after dropping from 60cm high on the concrete surface in packing state.</p>  <p><i>Dropping method corner dropping</i> A corner: once <i>Edge dropping</i> B, C, D edge: once <i>Face dropping</i> E, F, G face: once</p> <p><b>Concrete Surface</b></p>	5

Note1. No deflection cosmetic and operational function allowable.

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

## 14. Precautions and Warranty

### 14.1 Safety

14.1.1 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.

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

### 14.2 Handling

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

14.2.2 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.

### 14.3 Storage

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

### 14.4 Metal Pin (Apply to Products with Metal Pins)

#### 14.4.1 Pins of LCD and Backlight

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

#### 14.4.1.2 Recommended Soldering Conditions

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

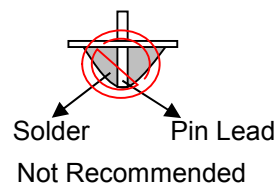
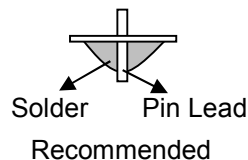
Maximum Solder Temperature: 370°C

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20°C

Typical Soldering Time: ≤3s

#### 14.4.1.3 Solder Wetting



#### 14.4.2 Pins of EL

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

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

#### 14.4.2.3 Recommended Soldering Conditions

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

Recommended Solder Temperature: 270~290°C

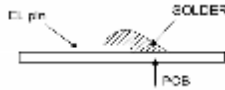
Typical Soldering Time: ≤2s

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

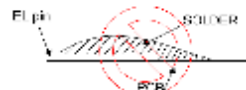
14.4.2.4 No horizontal press on the EL leads during soldering.

14.4.2.5 180° bend EL leads three times is not allowed.

14.4.2.6 Solder Wetting

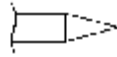


Recommended

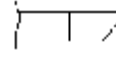


Not Recommended

14.4.2.7 The type of the solder iron:

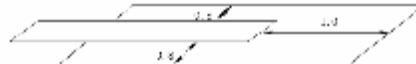


Recommended



Not Recommended

14.4.2.8 Solder Pad



**14.5 Operation**

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

**14.6 Static Electricity**

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

**14.7 Limited Warranty**

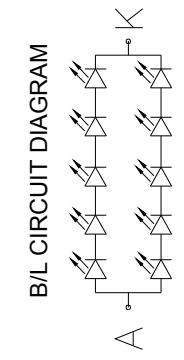
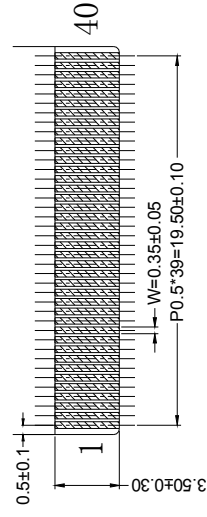
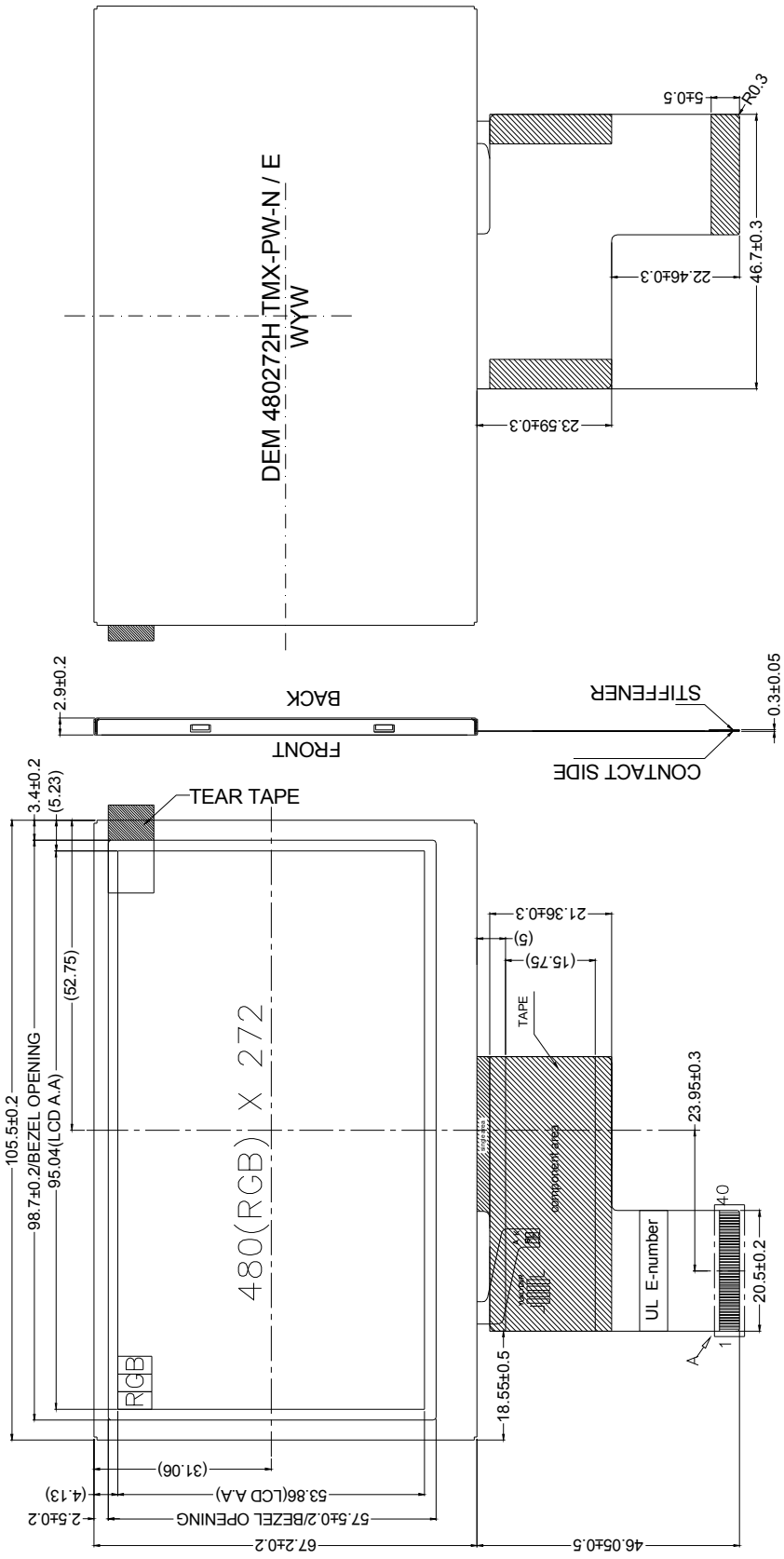
- 14.7.1 Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.
- 14.7.2 If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be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

**15. Packaging**

t.b.d

16. Outline Drawing

Pin assignment	PIN	SYMBOL
	1	VLED-
	2	VLED+
	3	GND
	4	VDD
	5	R0
	6	R1
	7	R2
	8	R3
	9	R4
	10	R5
	11	R6
	12	R7
	13	G0
	14	G1
	15	G2
	16	G3
	17	G4
	18	G5
	19	G6
	20	G7
	21	B0
	22	B1
	23	B2
	24	B3
	25	B4
	26	B5
	27	B6
	28	B7
	29	GND
	30	DCLK
	31	STB
	32	HSYNC
	33	VSYNC
	34	DE
	35	NC
	36	GND
	37	NC(XR)
	38	NC(YD)
	39	NC(XL)
	40	NC(YU)



- NOTES:
1. Display size: 4.3" TFT
  2. Viewing direction: 6 O'CLOCK
  3. Gary Scale inversion direction: 12 O'CLOCK
  4. Display mode: Transmissive/Normal white/Anti-glare
  5. Operation temperature: -30°C ~ +85°C
  6. Storage temperature: -40°C ~ +90°C
  7. Driver IC: ILI6480G2
  8. Power supply voltage: 3.3V
  9. Backlight : White(10 LED) / 16V (typ.) / 40mA
  10. ROHS must be complied
- \* Unspecification tolerance are ± 0.2mm