



**RAYSTAR**

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## RFF500E-AWH-DNN

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### SPECIFICATION

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

Release DATE:

## Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	2018/06/20		First issue

RAYSTAR OPTRONICS

# Contents

1. Module Classification Information
2. Summary
3. General Specification
4. Interface
5. Contour Drawing
6. Block Diagram
7. Absolute Maximum Ratings
8. Electrical Characteristics
9. DC Characteristics
10. AC Characteristics
11. Optical Characteristics
12. Reliability
13. Other



## 2.Summary

TFT 5.0” is a IPS transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT\_LCD module, It is usually designed for industrial application and this module follows RoHs.

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### 3.General Specifications

- Size: 5.0 inch
- Dot Matrix: 800× 3(RGB) × 480 dots
- Module dimension: 121.0(W) ×77.4(H) ×3.0(D)mm
- Active area: 108(W) ×64.8 (H) mm
- Dot pitch: 0.045(W) ×0.135(H) mm
- LCD type: TFT, Normally Black, Transmissive
- View Direction: Wide View
- Aspect Ratio: 16:9
- TFT Driver IC: HX8249-A+ HX8678-C,
- TFT Interface: RGB-24bit
- Backlight Type: LED ,Normally White
- With /Without TP: Without TP
- Surface: Anti-Glare

\*Color tone slight changed by temperature and driving voltage.

## 4.Interface

### 4.1. LCM PIN Definition

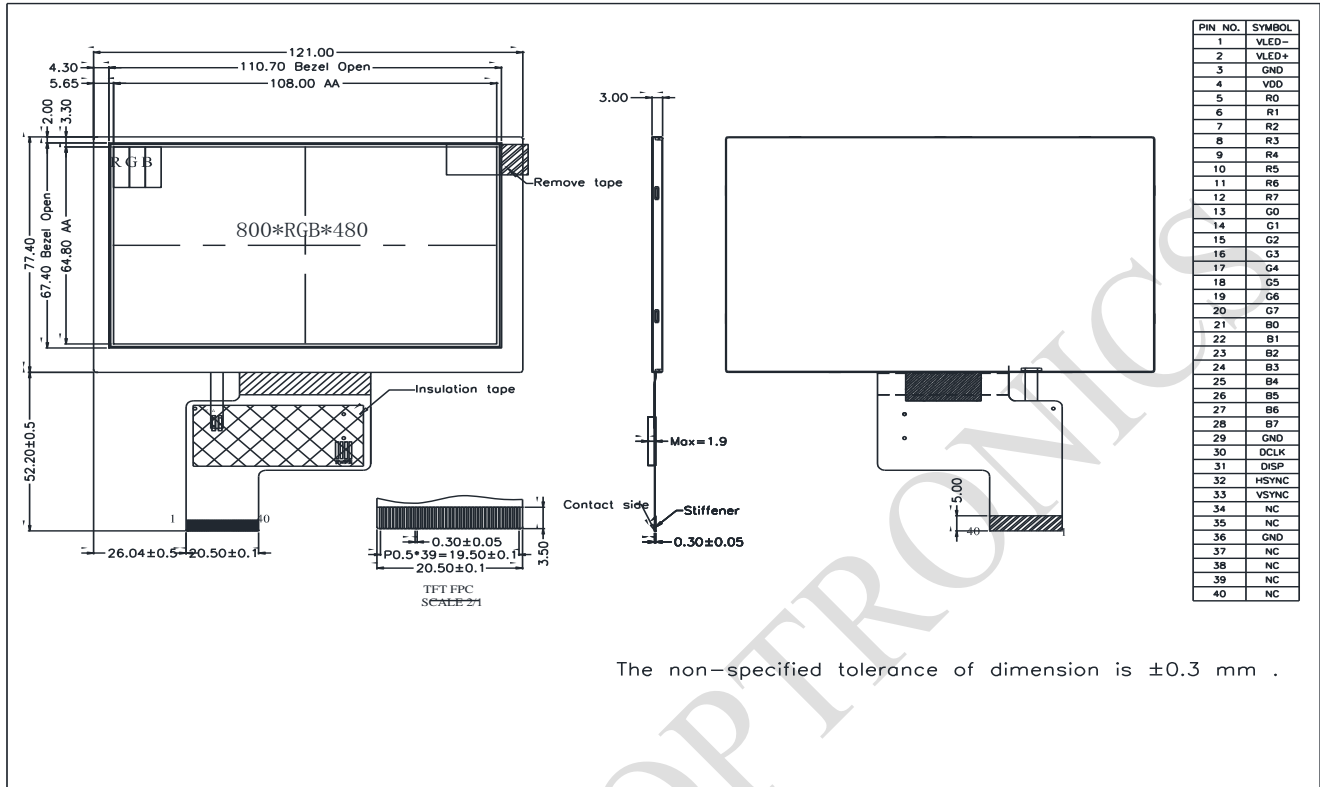
Pin	Symbol	Function	Remark
1	VLED-	Power for LED backlight (Cathode)	
2	VLED+	Power for LED backlight (Anode)	
3	GND	Power Ground	
4	VDD	Power voltage	
5	R0	Red data (LSB)	
6	R1	Red data	
7	R2	Red data	
8	R3	Red data	
9	R4	Red data	
10	R5	Red data	
11	R6	Red data	
12	R7	Red data(MSB)	
13	G0	Green data(LSB)	
14	G1	Green data	
15	G2	Green data	
16	G3	Green data	
17	G4	Green data	
18	G5	Green data	
19	G6	Green data	
20	G7	Green data(MSB)	
21	B0	Blue data(LSB)	
22	B1	Blue data	
23	B2	Blue data	
24	B3	Blue data	
25	B4	Blue data	
26	B5	Blue data	
27	B6	Blue data	
28	B7	Blue data(MSB)	
29	GND	Power Ground	

30	DCLK	Sample clock	
31	DISP	Display on/off	
32	HSYNC	Horizontal sync input	
33	VSYNC	Vertical sync input	
34	NC	No connection	
35	NC	No connection	
36	GND	Power Ground	
37	NC	No connection	
38	NC	No connection	
39	NC	No connection	
40	NC	No connection	

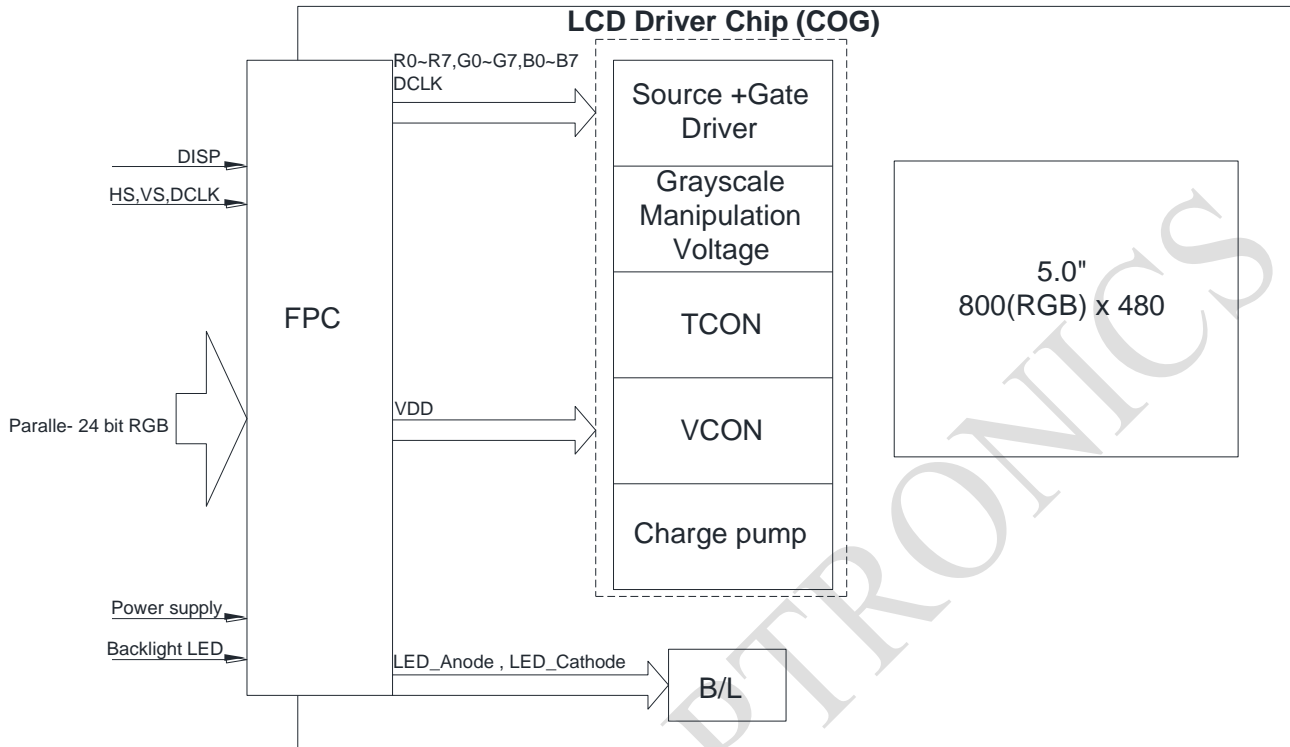
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# 5. Contour Drawing



## 6. Block Diagram



## 7. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+80	°C
Storage Temperature	TST	-30	—	+80	°C

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

- Temp.  $\leq 60^{\circ}\text{C}$ , 90% RH MAX. Temp.  $> 60^{\circ}\text{C}$ , Absolute humidity shall be less than 90% RH at  $60^{\circ}\text{C}$

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## 8. Electrical Characteristics

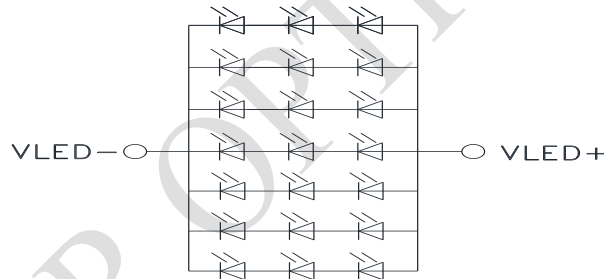
### 8.1. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	2.7	3.3	3.6	V	
Current for Driver(Black)	IDD	-	150	230	mA	VDD=3.3V

### 8.2. Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	VL	16.5	18	21	V	Note 1
Current for LED backlight	IL	--	140	--	mA	
LED life time	-	--	50,000	-	Hr	Note 2

Note 1 : There are 1 Groups LED



LED CIRCUIT DIAGRAM

Note 2 :  $T_a = 25\text{ }^\circ\text{C}$

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

## 9.DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	$V_{IL}$	0	-	0.3VDD	V	
High level input voltage	$V_{IH}$	0.7VDD	-	VDD	V	

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## 10.AC CHARATERISTICS

### 10.1. Parallel SYNC mode RGB input timing table

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
DCLK frequency	$F_{DCLK}$	25.2	27.2	30.5	MHz	
Horizontal line	$t_h$	856	860	920	DCLK	
Horizontal valid data	$t_{hd}$	800			DCLK	
Hsync pulse width	$t_{hpw}$	1	2	100	DCLK	
Hsync back width	$t_{hbp}$	5	16	101	DCLK	
Hsync front width	$t_{hfp}$	19	44	115	DCLK	
Vertical valid data	$t_{vd}$	480			H	
Vsync pulse width	$t_{vpw}$	1	2	66	H	
Vsync back width	$t_{vbp}$	5	5	67	H	
Vsync front width	$t_{vfp}$	5	43	67	H	
Vertical field	$t_v$	490	528	552	H	

## 10.2. Input Clock and Data Timing Diagram

- Horizontal

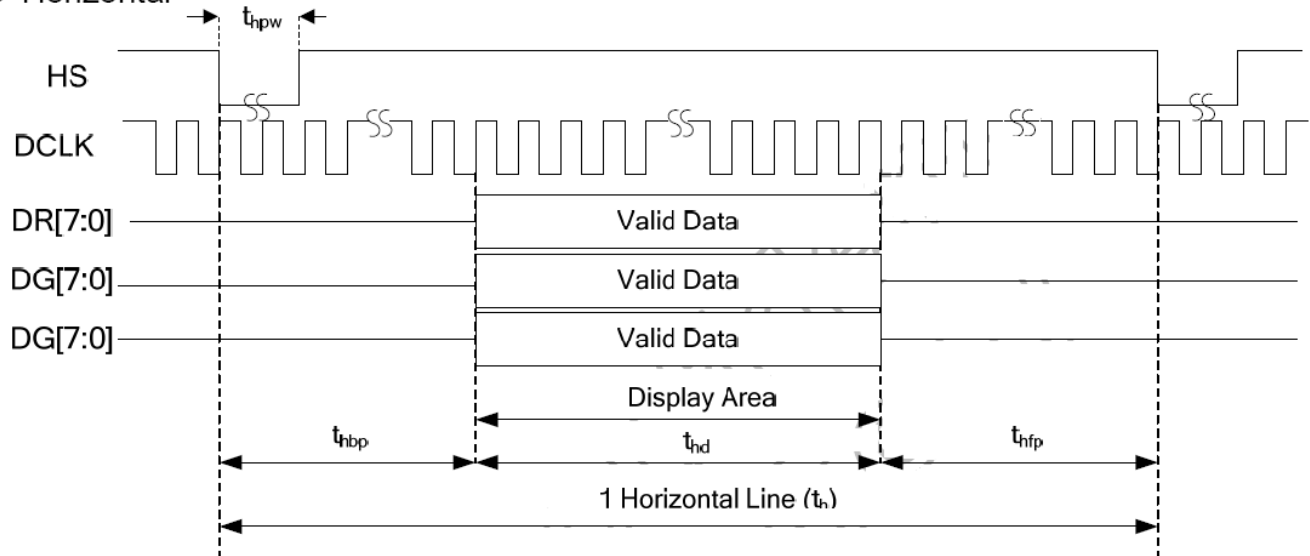


Fig. 7.1. Horizontal input Timing at Sync mode

- Vertical

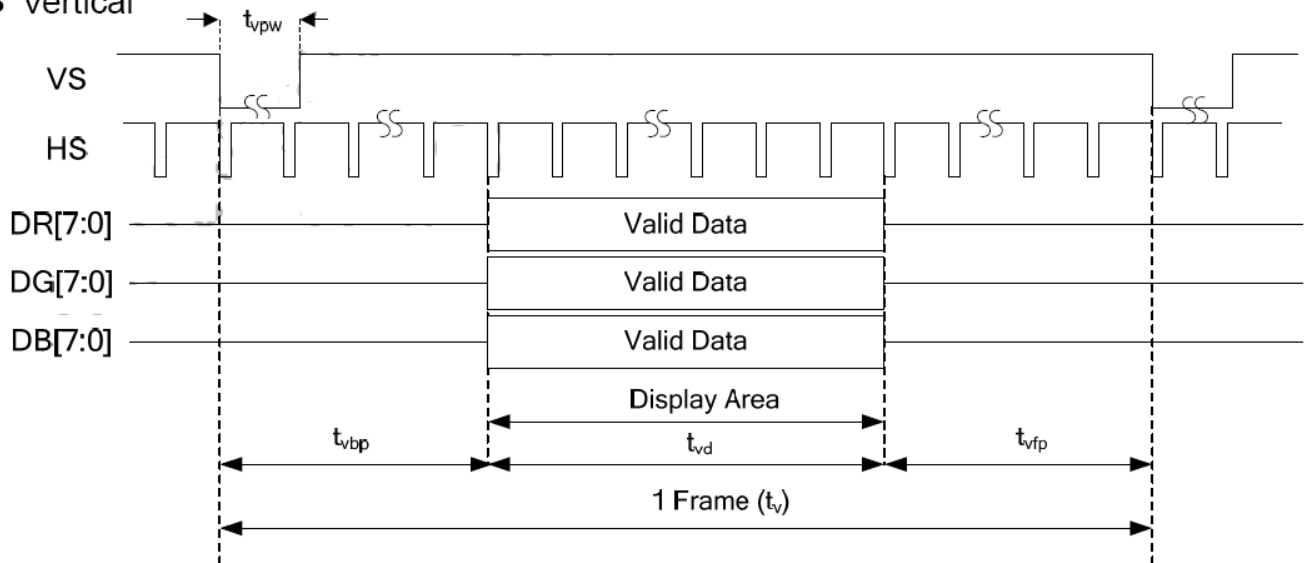


Fig. 7.2. Vertical input Timing at Sync mode

# 11. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response time	Tr	$\theta=0^\circ$ 、 $\phi=0^\circ$	-	20	-	ms	Note 3	
	Tf		-	20	-			
Contrast ratio	CR	At the center point of AA	800	1000	-	-	Note 4	
Color Chromaticity	White	$\theta=0^\circ$ 、 $\phi=0$	Wx	0.242	0.292	0.342		Note 2,6,7
			Wy	0.269	0.319	0.369		
Viewing angle	Hor.	$CR \geq 10$	$\theta_R$	-	85	-	Deg.	Note 1
			$\theta_L$	-	85	-		
	Ver.		$\phi_T$	-	85	-		
			$\phi_B$	-	85	-		
Brightness	-	-	800	1000	-	cd/m <sup>2</sup>	Center of display	
Uniformity	(U)		75	-	-	%	Note5	

Ta=25±2℃ , IL=140mA

Note 1: Definition of viewing angle range

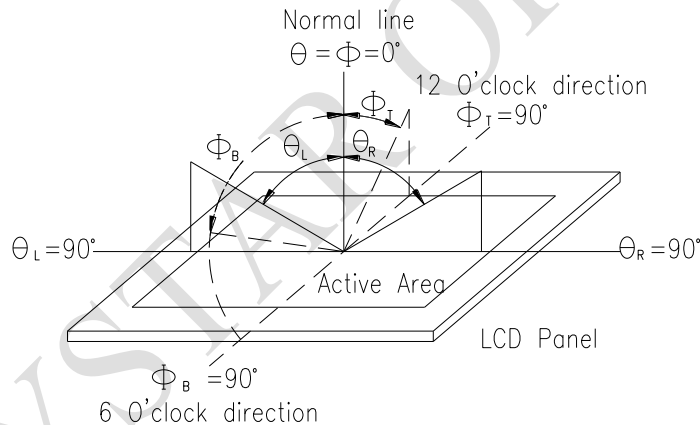


Fig 11.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.



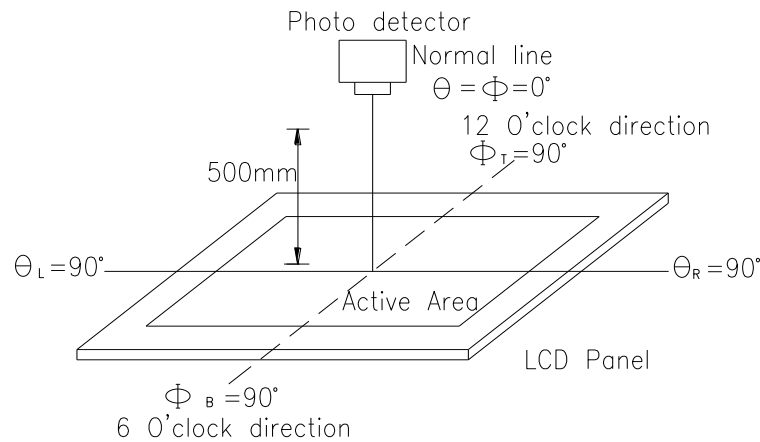
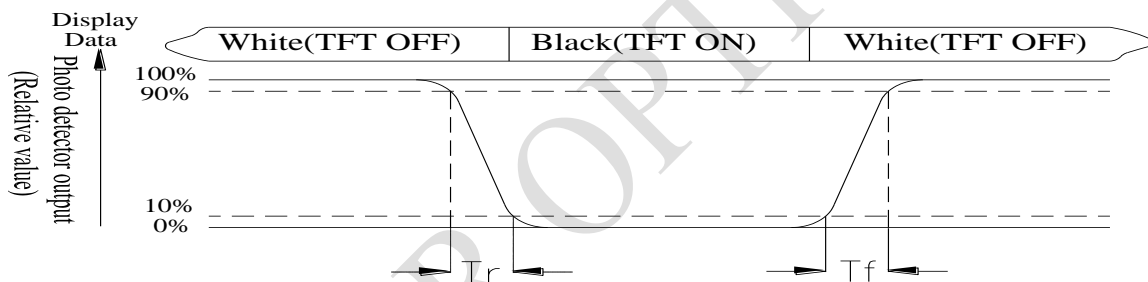


Fig 11.2. Optical measurement system setup

**Note 3: Definition of Response time:**

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time,  $T_r$ , is the time between photo detector output intensity changed from 90% to 10%. And fall time,  $T_f$ , is the time between photo detector output intensity changed from 10% to 90%



**Note 4: Definition of contrast ratio:**

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

**Note 5: Definition of Luminance Uniformity**

Active area is divided into 9 measuring areas (Refer Fig. 8.3). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = L_{\min}/L_{\max} \times 100\%$$

L = Active area length

W = Active area width

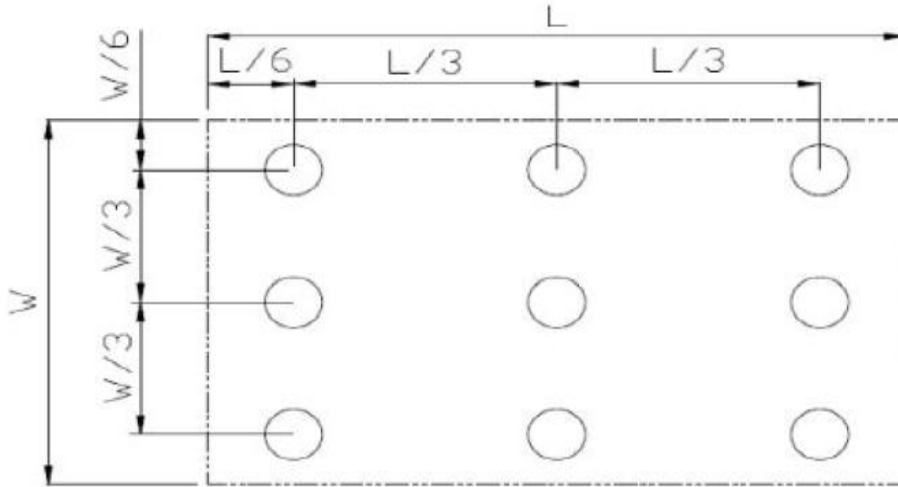


Fig 11.3. Definition of uniformit

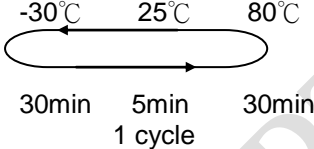
**Note 6: Definition of color chromaticity (CIE 1931)**

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

## 12. Reliability

Content of Reliability Test (Super Wide temperature, -30°C~80°C)

Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	80°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30°C 200hrs	1
High Temperature/ Humidity storage	The module should be allowed to stand at 60°C,90%RH max	60°C,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation  <div style="text-align: center;">  <p>-30°C    25°C    80°C</p> <p>30min    5min    30min</p> <p>1 cycle</p> </div>	-30°C/80°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 3 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact) ,±800v(air), RS=330Ω CS=150pF 10 times	—

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

**LCM Sample Estimate Feedback Sheet**

**Module Number :** \_\_\_\_\_

**1 、 Panel Specification :**

1. Panel Type :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. View Direction :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Numbers of Dots :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. View Area :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Active Area :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6. Operating Temperature :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7. Storage Temperature :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8. Others :	_____	

**2 、 Mechanical Specification :**

1. PCB Size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. Frame Size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Material of Frame :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. Connector Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Fix Hole Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6. Backlight Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7. Thickness of PCB :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8. Height of Frame to PCB :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
9. Height of Module :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
10. Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

**3 、 Relative Hole Size :**

1. Pitch of Connector :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. Hole size of Connector :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Mounting Hole size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. Mounting Hole Type :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

**4 、 Backlight Specification :**

1. B/L Type :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. B/L Color :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. B/L Driving Voltage (Reference for LED Type) :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. B/L Driving Current :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Brightness of B/L :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6. B/L Solder Method :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7. Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

>> **Go to page 2** <<

<b>Module Number :</b> _____		
<b>5 · <u>Electronic Characteristics of Module</u> :</b>		
1.Input Voltage :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2.Supply Current :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3.Driving Voltage for LCD :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4.Contrast for LCD :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5.B/L Driving Method :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6.Negative Voltage Output :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7.Interface Function :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8.LCD Uniformity :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
9.ESD test :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
10.Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
<b>6 · <u>Summary</u> :</b>		
<p style="text-align: right; margin-right: 100px;"> <b>Sales signature :</b> _____  <b>Customer Signature :</b> _____      <b>Date :</b>   /   / _____         </p>		