

# SPECIFICATION

**Customer:** \_\_\_\_\_  
**Model Name:** WL156FI5L0  
**SPEC NO.:** \_\_\_\_\_  
**Date:** 2023.12.06  
**Version:** V01

- Preliminary Specification**  
 **Final Specification**

**For Customer's Acceptance**

Approved by	Comment

Approved by	Reviewed by	Prepared by

# Record of Revision

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Version	Revise Date	Page	Content

试用水印

# Contents

Record of Revision .....	2
Contents .....	
1.General Specifications .....	
2.Pin Assignment .....	4
3.Operation Specifications .....	6
3.1.Absolute Maximum Ratings.....	7
3.1.1.Typical Operation Conditions .....	7
3.1.2.Backlight Driving Conditions .....	7
3.2.Power Sequence .....	8
3.3. Timing Characteristics .....	9
3.3.1.Signal Electrical Characteristics.....	9
3.3.2.Timing Setting Table .....	10
4. Optical Specifications.....	11
5. Reliability Test Items .....	13
6. General Precautions .....	14
6.1.Safety .....	14
6.2.Handling .....	14
6.3.Static Electricity .....	14
6.4. Storage.....	14
6.5. Cleaning .....	14
7.Mechanical Drawing.....	14
8.Package Drawing .....	14

## 1. General Specifications

No.	Item	Specification	Unit
1	LCD size	15.6	inch
2	Pixel pitch	0.17925 (H) x 0.17925 (V)	mm
3	Active area	344.160(H) x 193.590(V)	mm
4	Module size(FOG)	360(H)X212.3(V)X6.4(T)	mm
5	Number of pixel	1920 RGB(H)X 1080 (V)	pixels
6	Number of colors	16.7M	colors
7	Interface	LVDS	
8	Display mode	Normally Black	
9	Pixel arrangement	RGB Vertical stripe	
10	Surface Treatment	AG	
11	NTSC	45	%
12	Brightness	350	cd/m2
13	Backlight power consumption	7.6(typ)	W
14	Panel power consumption	TBD	W
15	Module Weight	500	g

Note 1: Refer to Mechanical Drawing.

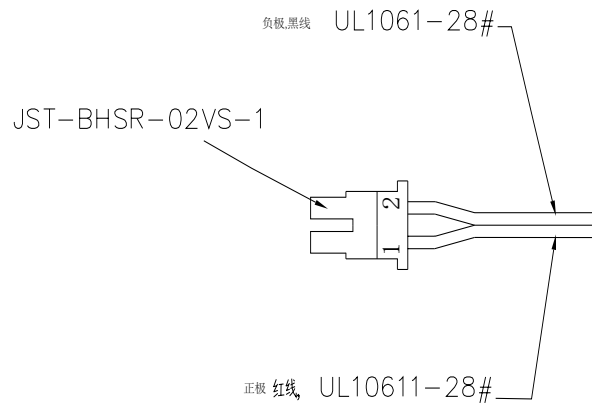
## 2.INTERFACE CONNECTIONS

### 2.1 Input CONN Pin Assignment

LV0510P-040G0LS or equivalent

Pin No.	Symbol	Description	Remark
1	RxO0-	Negative LVDS differential data input (Odd data)	
2	RxO0+	Positive LVDS differential data input (Odd data)	
3	RxO1-	Negative LVDS differential data input (Odd data)	
4	RxO1+	Positive LVDS differential data input (Odd data)	
5	RxO2-	Negative LVDS differential data input (Odd data)	
6	RxO2+	Positive LVDS differential data input (Odd data)	
7	GND	Ground	
8	RxOCLK-	Negative LVDS differential clock input (Odd clock)	
9	RxOCLK+	Positive LVDS differential clock input (Odd clock)	
10	GND	Ground	
11	RxO3-	Negative LVDS differential data input (Odd data)	
12	RxO3+	Positive LVDS differential data input (Odd data)	
13	GND	Ground	
14	RxE0-	Negative LVDS differential data input (Even data)	
15	RxE0+	Positive LVDS differential data input (Even data)	
16	RxE1-	Negative LVDS differential data input (Even data)	
17	RxE1+	Positive LVDS differential data input (Even data)	
18	RxE2-	Negative LVDS differential data input (Even data)	
19	RxE2+	Positive LVDS differential data input (Even data)	
20	GND	Ground	
21	RxECLK-	Negative LVDS differential clock input (Even clock)	
22	RxECLK+	Positive LVDS differential clock input (Even clock)	
23	GND	Ground	
24	RxE3-	Negative LVDS differential data input (Even data)	
25	RxE3+	Positive LVDS differential data input (Even data)	
26	GND	Ground	
27	LCD_VCC	LCD VCC(3.3V)	
28	LCD_VCC	LCD VCC(3.3V)	
29	BIST	LCD self-test (Normal mode: NC or pull L; BIST mode: pull H)	
30	BL_ENABLE	Backlight on/off	
31	BL_PWM_DIM	System PWM	
32	BL_POWER	LED Power Supply Input Voltage(12V)	
33	BL_POWER	LED Power Supply Input Voltage(12V)	
34	BL_POWER	LED Power Supply Input Voltage(12V)	
35	BL_POWER	LED Power Supply Input Voltage(12V)	
36	GND	Ground	
37	GND	Ground	
38	GND	Ground	
39	ID1	Reserved PIN, Default 'H', Recommend NC	
40	ID2	Reserved PIN, Default 'L', Recommend NC	

## 2.2 BL Power Output CONN Pin Assignment



## 2.3 CONN Pin1 location

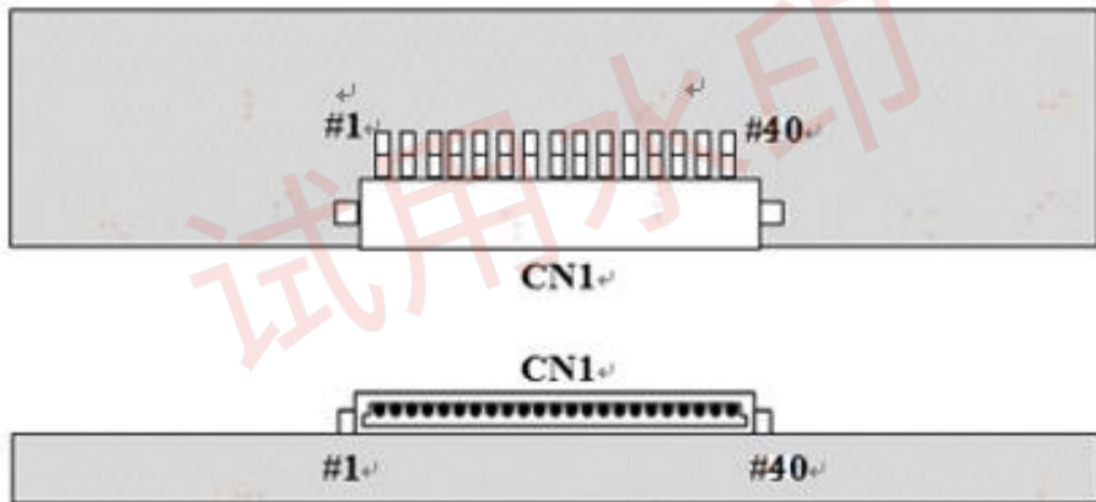


Fig. 1.1 LVDS connector direction sketch map

### 3. Operation Specifications

#### 3.1.1.LCD ELETRONICS SPECIFICATION

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	LCD_VCC	3.0	3.3	3.6	V	
	BL_POWER	-	-	-	V	
Current Consumption	I <sub>VDD</sub>	-	TBD	-	mA	
	I <sub>LED</sub>	-	TBD	-	mA	
Power Consumption	P <sub>LCD</sub>	-	TBD	-	W	
	P <sub>LED</sub>	-	TBD	-	W	
EN Control Level	On	1.9	-	VCC	V	
	Off	0	-	0.7	V	
PWM Control Level	H	1.9	-	VCC	V	
	L	0	-	0.7	V	
PWM Control Frequency	f	200	-	20K	Hz	

Note 1:Frame Rate=60Hz,VDD=3.3V,DC Current; Operating at 25°C at Mosaic pattern.

#### 3.1.2 Connector Pin Assignment

The following shows the block diagram of the 15.6 inch Backlight Unit. It includes 70 pcs LED in the LED lightbar. (14 strings and 5pcs LED in one string).

CN2: JST-BHSR-02VS-1 or equal

Pin#	Symbol	Description	Remark
1	A	LED +	
2	K	LED -	

### 6.2 Recommended Operating Condition

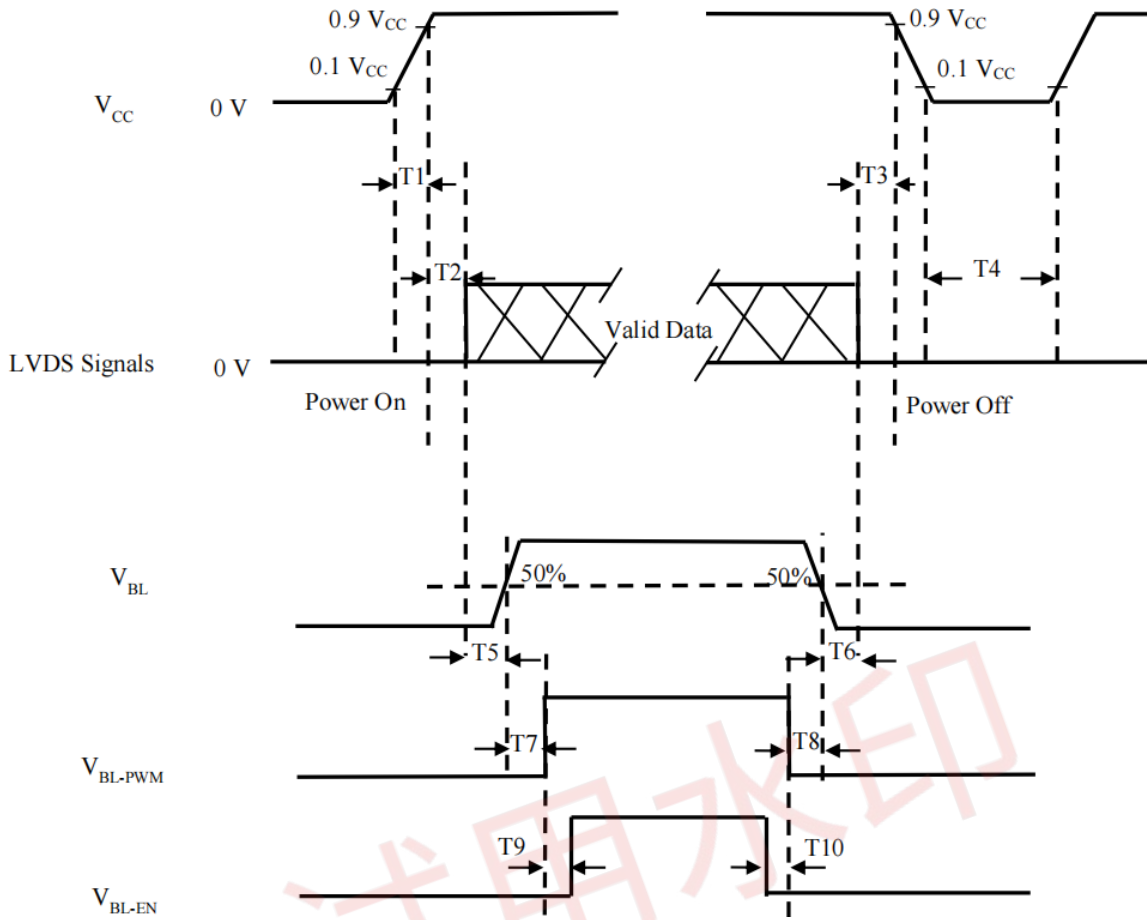
The characteristics of the LED are shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED current	IL	160	180	185	mA	(2)
LED Voltage	VL	38	42	47.6	V	
Operating LED life time	Hr	30000	-	-	Hour	(1)(2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=180mA. The LED lifetime could be decreased if operating IL is larger than 180mA. The constant current driving method is suggested

### 3.2. Power On/Off Sequence

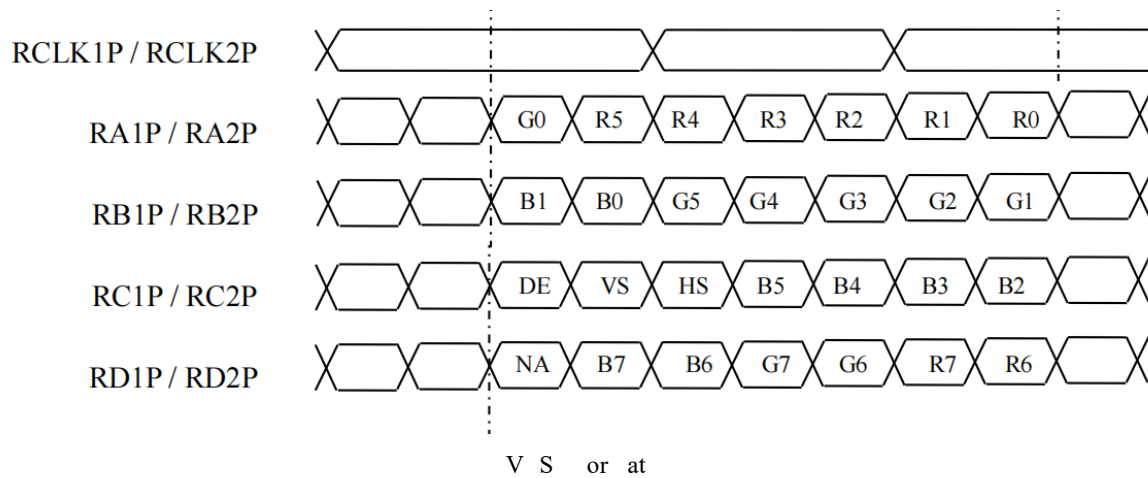


Parameter	Values			Unit	Note
	Min.	Typ.	Max.		
T1	0.5	-	10.0	ms	
T2	0.0	50	200	ms	
T3	0.0	50	200	ms	
T4	1000.0	-	-	ms	
T5	500.0	-	-	ms	
T6	100.0	-	-	ms	
T7	0	-	-	ms	
T8	0	-	-	ms	
T9	0	-	-	ms	
T10	0	-	-	ms	



### 3.3 Timing Characteristics

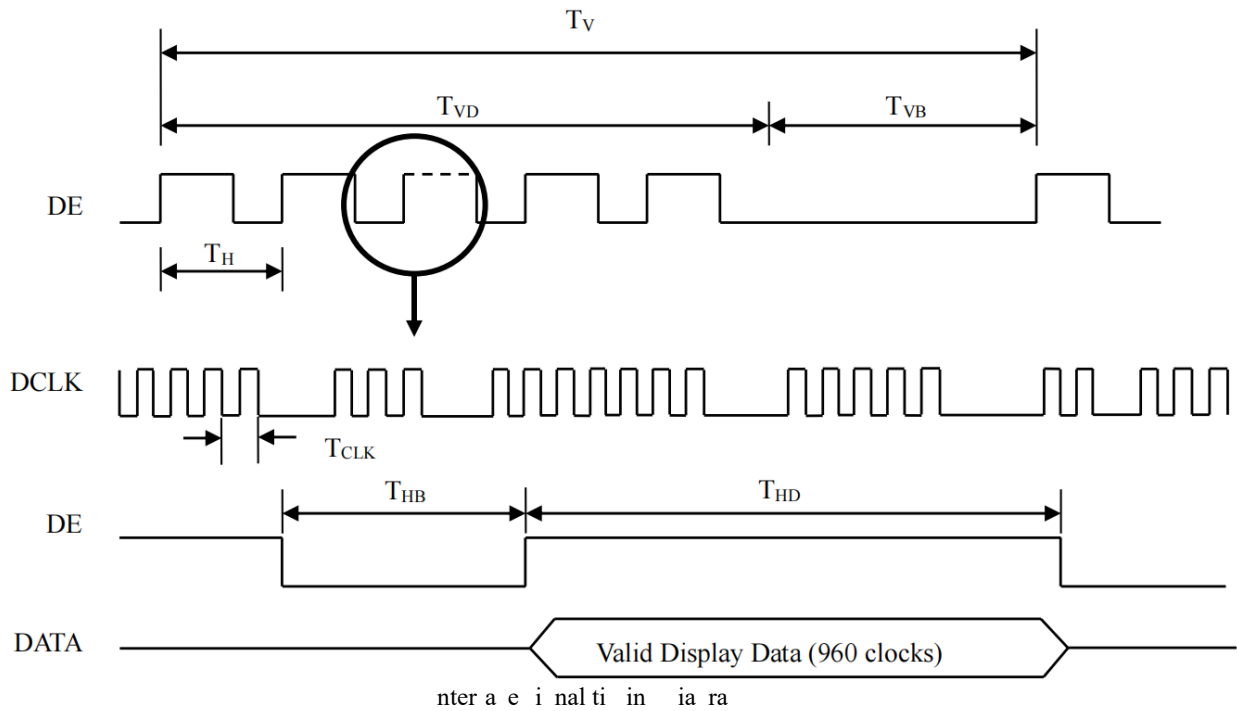
#### 3.3.1. LVDS Interface



### 3.4 DISPLAY TIMING SPECIFICATIONS

#### Timing Table (DE Only Mode)

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	Felkin (=1/TClk)	59.4	74.25	77.34	MHz	(1) (2)
	Input cycle to cycle jitter	Trcl	-	-	200	ps	(3)
	Spread spectrum modulation range	Felkin_mod	Felkin-2%	-	Felkin+2%	MHz	(4)
	Spread spectrum modulation frequency	FSSM	60	-	200	KHz	
LVDS Receiver Data	Receiver Skew Margin	TRSM	-400	-	400	ps	(5)
Vertical Active Display Term	Frame Rate	F	48	60	62.5	Hz	
	Total	TV	1092	1125	1380	TH	TV = TVD + TVB
	Display	TVD	1080				
Horizontal Active Display Term	Blank	TVB	12	45	300	TH	
	Total	TH	1046	1100	1174	TCLK	TH = THD + THB
	Display	THD	960				960=1920/2port
Horizontal Active Display Term	Blank	THB	86	140	214	TCLK	



#### 4. Optical specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle ( $CR \geq 10$ )	$\theta_L$	$\Phi = 180^\circ$ (9 o'clock)	75	80	-	degree	Note 1
	$\theta_R$	$\Phi = 0^\circ$ (3 o'clock)	75	80	-		
	$\theta_T$	$\Phi = 90^\circ$ (12 o'clock)	75	80	-		
	$\theta_B$	$\Phi = 270^\circ$ (6 o'clock)	75	80	-		
Response time Rise+Fall	$T_{RT}$	Normal $\theta = \Phi = 0^\circ$	-	-	30	msec	Note 3
Contrast ratio	CR		800	1000	-	-	Note 4
Color chromaticity	$W_X$		0.275	0.305	0.338	-	Note 2
	$W_Y$		0.312	0.342	0.372	-	Note 5
NTSC	Ratio		-	45	-	%	Note 6
Luminance	L		280	350	-	cd/	Note 6
Luminance uniformity	$Y_U$	9 AVG	70	75	-	%	Note 6-7

Note 1: Definition of viewing angle range

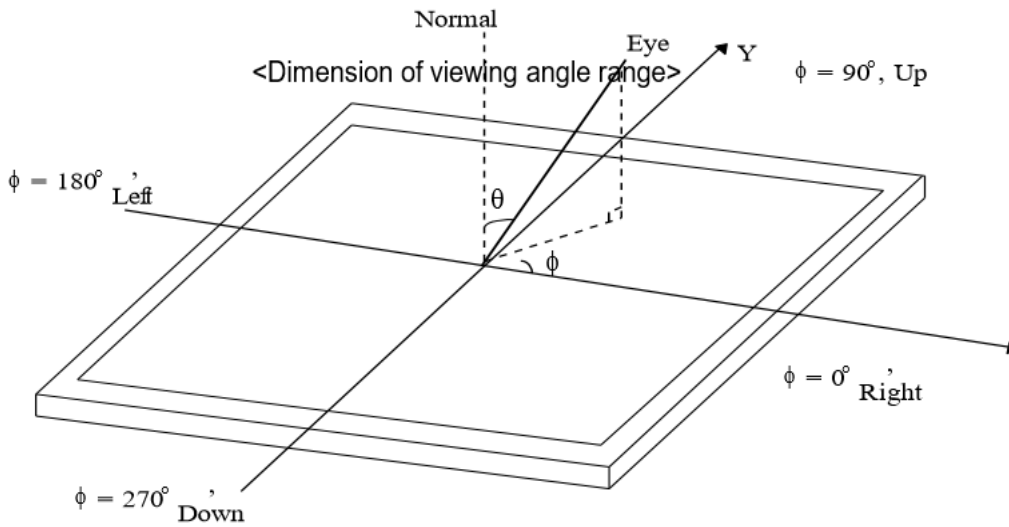


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm ,Response time is measured by Photo detector TOPCON BM-5A, other items are measured by BM-7A/Field of view: 1° /Height: 500mm.)

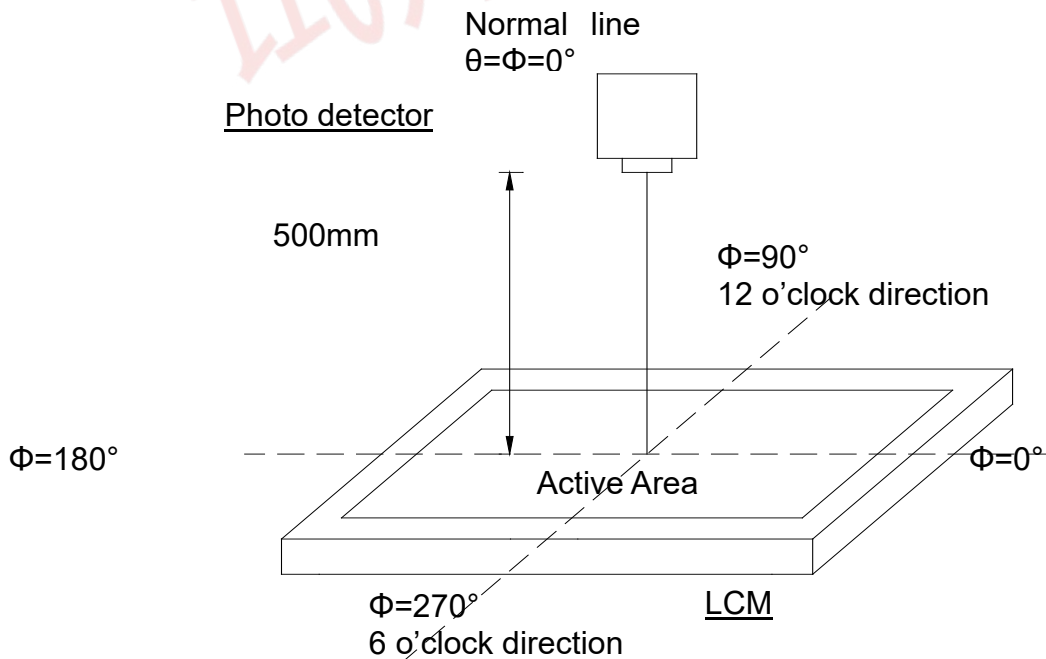


Fig. 4-2 Optical measurement system setup

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 ( $T_{ON}$ ) is the time between photo detector output

intensity changed from 90% to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.

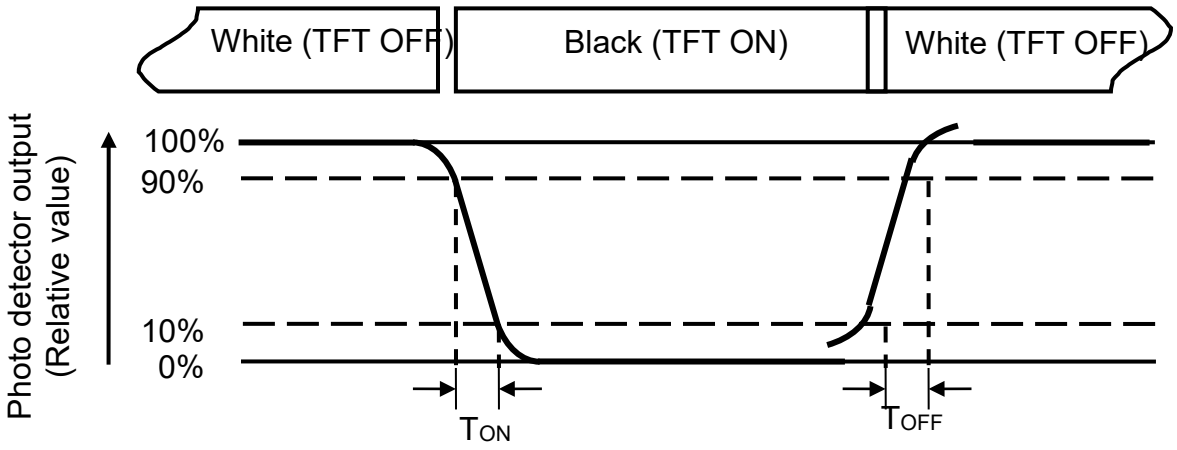


Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

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

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel.

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4 ).Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

L-----Active area length      W----- Active area width

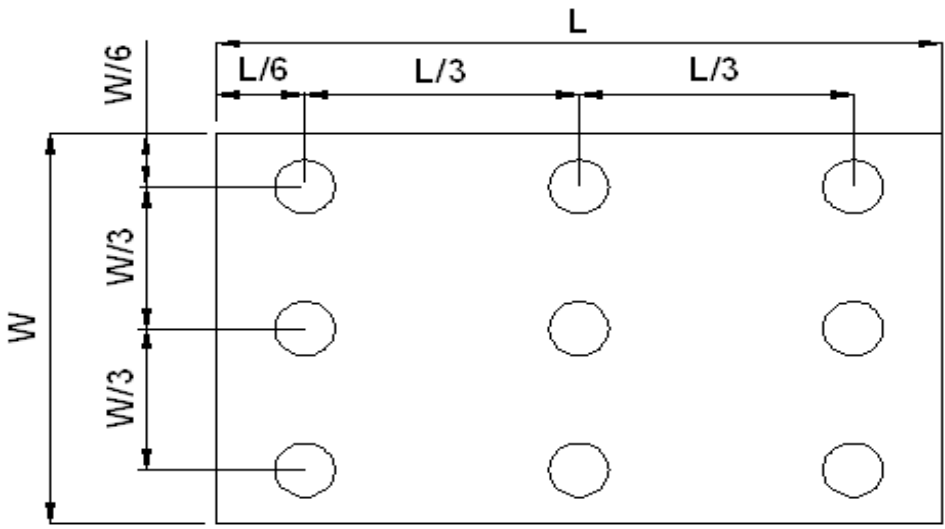


Fig. 4-4 Definition of measuring points

$B_{max}$ : The measured maximum luminance of all measurement position.  
 $B_{min}$ : The measured minimum luminance of all measurement position.

## 5. Reliability Test Items

Item	Test Conditions	Remark
High Temperature Storage	Ta=70°C 240hrs	
Low Temperature Storage	Ta = -20°C 240hrs	
High Temperature Operation	Ts = 70°C 240hrs	
Low Temperature Operation	Ta = -20°C 240hrs	
Operate at High Temperature and Humidity	50°C, 80%RH max. 240hrs	Operation
Thermal Shock	-20°C~+70°C 10cycles 0.5Hrs/cycle	Non-operation
Electrostatic Discharge	Contact=±4KV, class B Air=±8KV, class B	

Note1: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

## 6. General Precautions

### 6.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

### 6.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.

2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.

3. To avoid contamination on the display surface, do not touch the module surface with bare hands.

4. Keep a space so that the LCD panels do not touch other components.

5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.

6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.

7. Do not leave module in direct sunlight to avoid malfunction of the lcs.

### 6.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.

2. Do not apply voltage which exceeds the absolute maximum rating value.

### 6.4. Storage

1. Store the module in a dark room where must keep at 25±10°C and 65% RH or less.

2. Do not store the module in surroundings containing organic solvent or corrosive gas

3. Store the module in an anti-electrostatic container or bag.

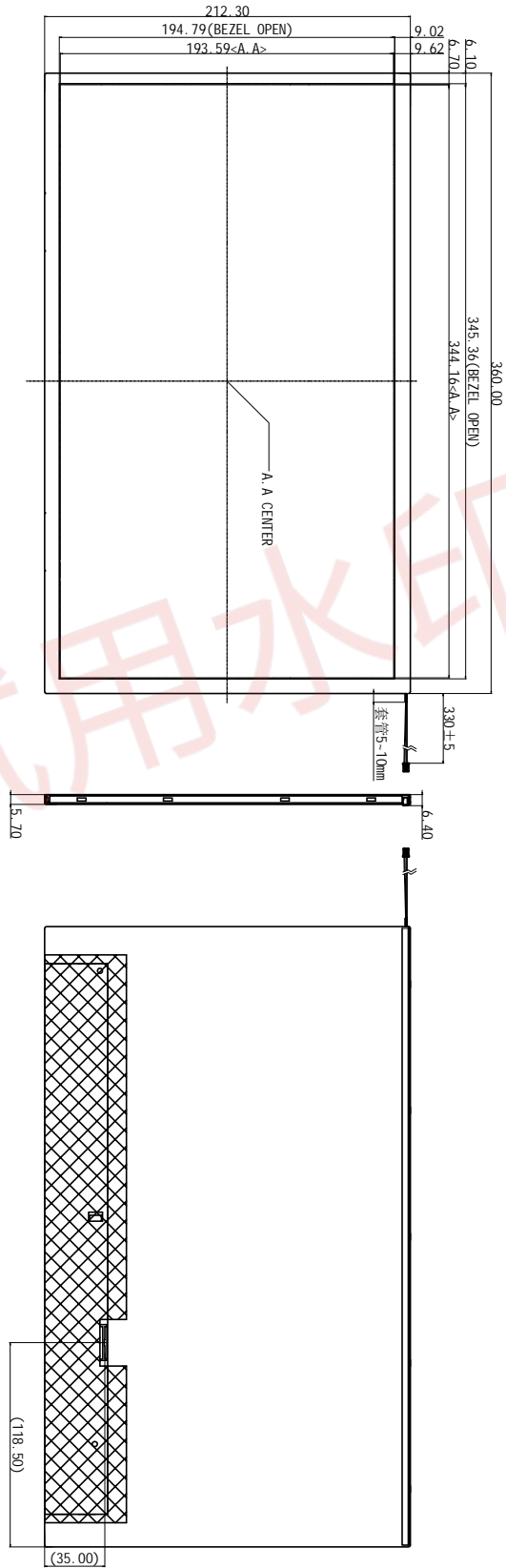
### 6.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.

2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

# 7.Mechanical Drawing

Unspecified tolerance:  $\pm 0.3\text{mm}$



## 8. Packing and Label Format

TBD

试用水印