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SPECIFICATION

Customer: _____
Model Name: _____
SPEC NO.: _____
Date: _____
Version: **01**

■ **Preliminary Specification**
□ **Final Specification**

Designed by	Checked by	Approved by

Final Approval by Customer

□ **LCM Machinery OK** Checked By _____ □ **LCM Display OK** Checked By _____	□ **LCM OK** □ **NG，Problem survey:** Approved By _____

※The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

Revision History

Version	Contents	Date	Note
A	Original	2013.3.15	

Contents

1. General Specifications 1
2. Pin Assignment 2
3. Operation Specifications 4
3.1. Absolute Maximum Ratings 4
3.1.1. Typical Operation Conditions 4
3.1.2. Backlight Driving Conditions 5
3.2. Power Sequence 5
3.3. Timing Characteristics 6
3.3.1. Sync Mode 6
3.3.2. De Mode 8
3.3.3. Input Setup Timing Requirement .....
4. Optical Specifications 9
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 15

1. General Specifications

No.	Item	Specification	Remark
1	**LCD size**	**5.0 inch(Diagonal)**	
2	**Driver element**	**a-Si TFT active matrix**	
3	**Resolution**	**800× 3(RGB) × 480**	
4	**Display mode**	**Normally White, Transmissive**	
5	**Dot pitch**	**0.135(W) ×0.135(H) mm**	
6	**Active area**	**108(W) ×64.8 (H) mm**	
7	**Module size**	**120.7(W) ×75.8(H) ×3.1(D) mm**	**Note 1**
8	**Surface treatment**	**Anti-Glare**	
9	**Color arrangement**	**RGB-stripe**	
10	**Interface**	**Digital**	
11	**Backlight power consumption**	**TBD**	
12	**Panel power consumption**	**TBD**	
13	**Weight**	**TBD**	

Note 1: Refer to Mechanical Drawing.

2. Pin Assignment

1	**GLED**	**GND for LED**
2	**VLED**	**Power for LED**
3	**GND**	**Ground**
4	**VDD**	**Digital power supply(+3.3V)**
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**	**Ground**
30	**DCLK**	**Data clk**

31	**DISP**	**Display ON/OFF control. Internally pulled high**
32	**HS**	**Horizontal sync input in RGB mode**
33	**VS**	**Vertical sync input in RGB mode**
34	**DE**	**Data Enable**
35	**NC**	**No connection**
36	**GND**	**Ground**
37	**XR**	**T/p X-Right(No connection)**
38	**YD**	**T/p Y-Bottom(No connection)**
39	**XL**	**T/p X-Left(No connection)**
40	**YU**	**T/p Y-Up(No connection)**

3. Operation Specifications

3.1. Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Supply voltage	V_{DD}	-0.3	4.5	V	
Operation Temperature	T_{OP}	-20	60	℃	
Storage Temperature	T_{ST}	-30	70	℃	
LED Reverse Voltage	VR	-	5	V	Each LED Note 2
LED Forward Current	IF	-	25	mA	Each LED

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 2: V_R Conditions: Zener Diode 20mA

3.1.1. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ	Max.		
Power voltage	V_{DD}	3.0	3.3	3.6	V	Note 2
Current for Driver	IV_{DD}	-	17	25	mA	
Input logic high voltage	V_{IH}	0.8 V_{DD}	-	V_{DD}	V	Note 3
Input logic low voltage	V_{IL}	0	-	0.2 V_{DD}	V	

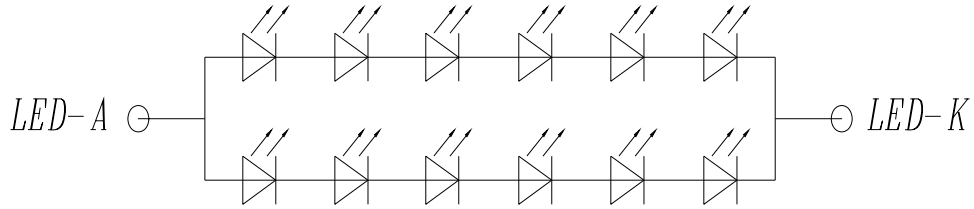
3.1.2. Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V_L	--	19.8	--	V	Note 1
Current for LED backlight	I_L	--	40	--	mA	
LED life time	-	-	20,000	-	Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and I_L =40mA.

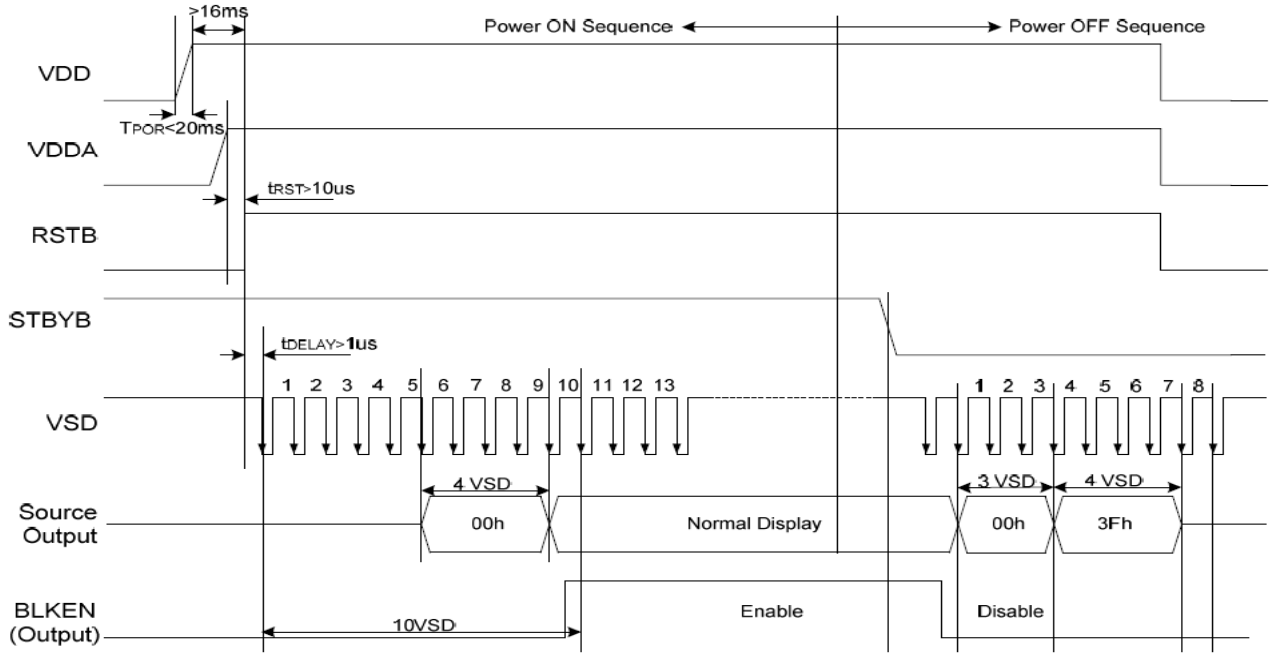
Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and I_L =40mA. The LED lifetime could be decreased if operating I_L is lager than 40mA.

LED CIRCUIT



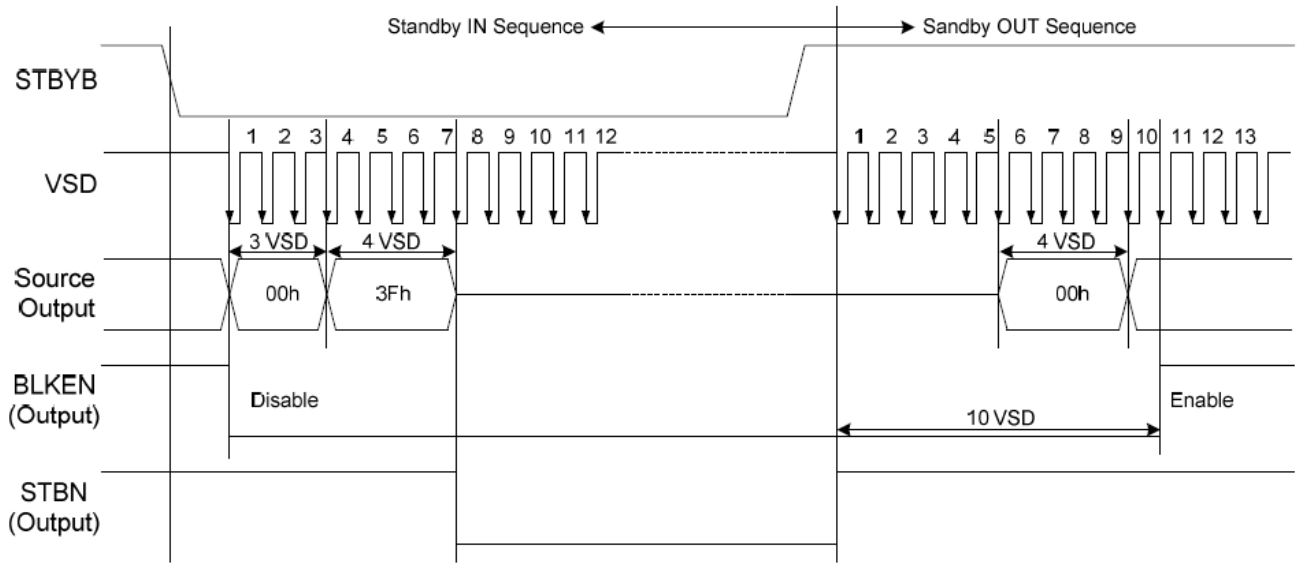
3.2. Power Sequence

Power on sequence



Note: For prevent anormal operation, t_{RST} must be longer than 10us during Power ON sequence.

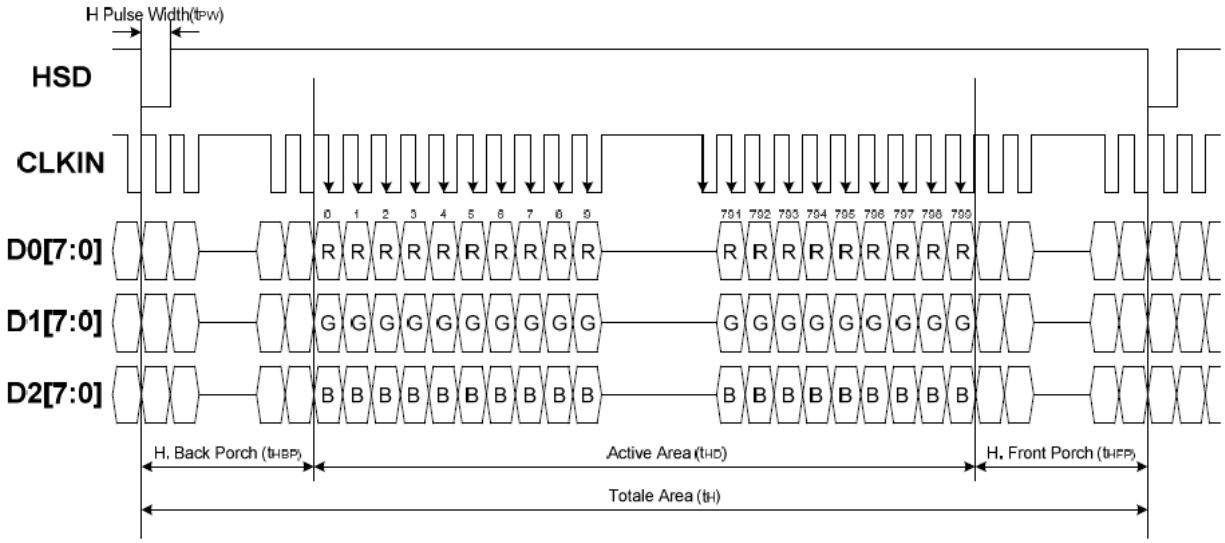
Power off sequence

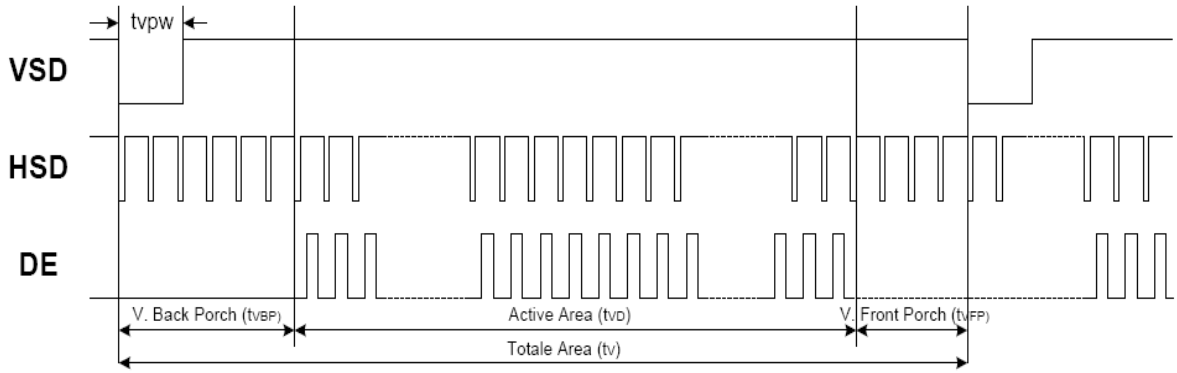


3.3. Timing Characteristics

3.3.1. Sync Mode

Horizontal Input Timing





Timing Table

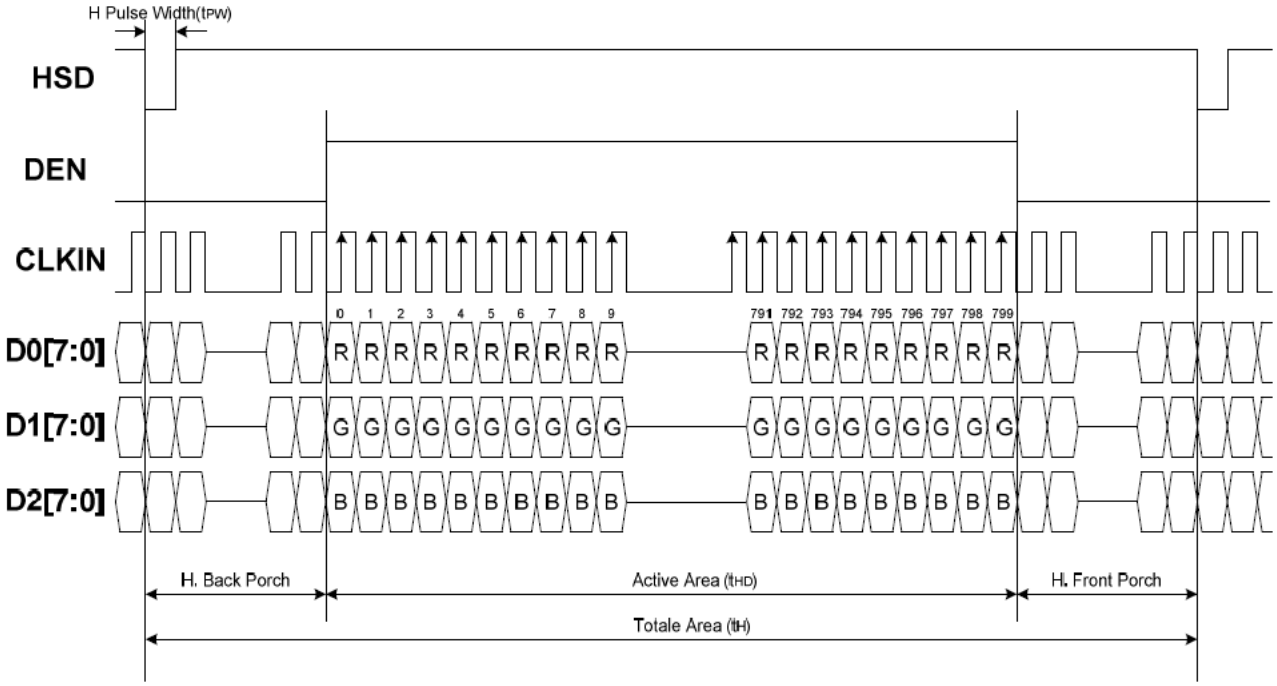
Parameter	Symbol	Spec			Unit	Conditions
		Min.	Typ.	Max.		
VDD Power ON slew rate	t_{POR}	--	--	20	ms	0V ~ 0.9VDD
RSTB pulse width	t_{RST}	10	--	--	us	CLKIN=50MHz
CLKIN cycle time	t_{CPH}	20	--	--	ns	
CLKIN pulse duty	t_{CWH}	40	50	60	%	
VSD setup time	t_{VST}	8	--	--	ns	
VSD hold time	t_{VHD}	8	--	--	ns	
HSD setup time	t_{HST}	8	--	--	ns	
HSD hold time	t_{HHD}	8	--	--	ns	
Data setup time	t_{DST}	8	--	--	ns	D0[7:0], D1[7:0], D2[7:0] to CLKIN
Data hold time	t_{DHD}	8	--	--	ns	D0[7:0], D1[7:0], D2[7:0] to CLKIN
DE setup time	t_{EST}	8	--	--	ns	
DE hold time	t_{EHD}	8	--	--	ns	
Output stable time	t_{SST}	--	--	6	us	10% to 90% target voltage. CL=120pF, R=10KΩ
CLKIN frequency	f_{CLK}	--	40	50	MHz	VDD=3.0 ~ 3.6V
CLKIN cycle time	t_{CLK}	20	25	--	ns	
CLKIN pulse duty	t_{CWH}	40	50	60	%	T_{CLK}
Time from HSD to Source output	t_{HSO}	--	20	--	CLKIN	
Time from HSD to LD	t_{HLD}	--	20	--	CLKIN	Note (2)
Time from HSD to STV	t_{HSTV}	--	2	--	CLKIN	
Time from HSD to CKV	t_{HCKV}	--	20	--	CLKIN	
Time from HSD to OEV	t_{HOEV}	--	4	--	CLKIN	
LD pulse width	t_{WLD}	--	10	--	CLKIN	Note (2)
CKV pulse width	t_{WCKV}	--	66	--	CLKIN	
OEV pulse width	t_{WOEV}	--	74	--	CLKIN	

Note: (1) VDD=3.0 ~ 3.6V, VDDA=6.5~13.5V, DGND=AGND=0V, Ta=-20~+85℃

(2) The contents of the data register are transferred to the latch circuit at the rising edge of LD. Then the gray scale voltage is output from the device at the falling edge of LD.

(3) Output loading condition :

3.3.2. De Mode


H Pulse Width(tPW)
HSD
DEN
CLKIN
D0[7:0]
D1[7:0]
D2[7:0]
0 1 2 3 4 5 6 7 8 9
791 792 793 794 795 796 797 798 799
R
G
B
H. Back Porch
Active Area (tHD)
H. Front Porch
Totale Area (tH)

4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	-	70	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	-	70	-		
	θ_T	Φ=90°(12 o'clock)	-	50	-		
	θ_B	Φ=270°(6 o'clock)	-	70	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	10	20	msec	Note 3
	T_{OFF}		-	10	20	msec	Note 3
Contrast ratio	CR		500	700	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		200	250	-	cd/m²	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test Conditions:

1. V_{DD}=3.3V, I_L=40mA (Backlight current), the ambient temperature is 25℃.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

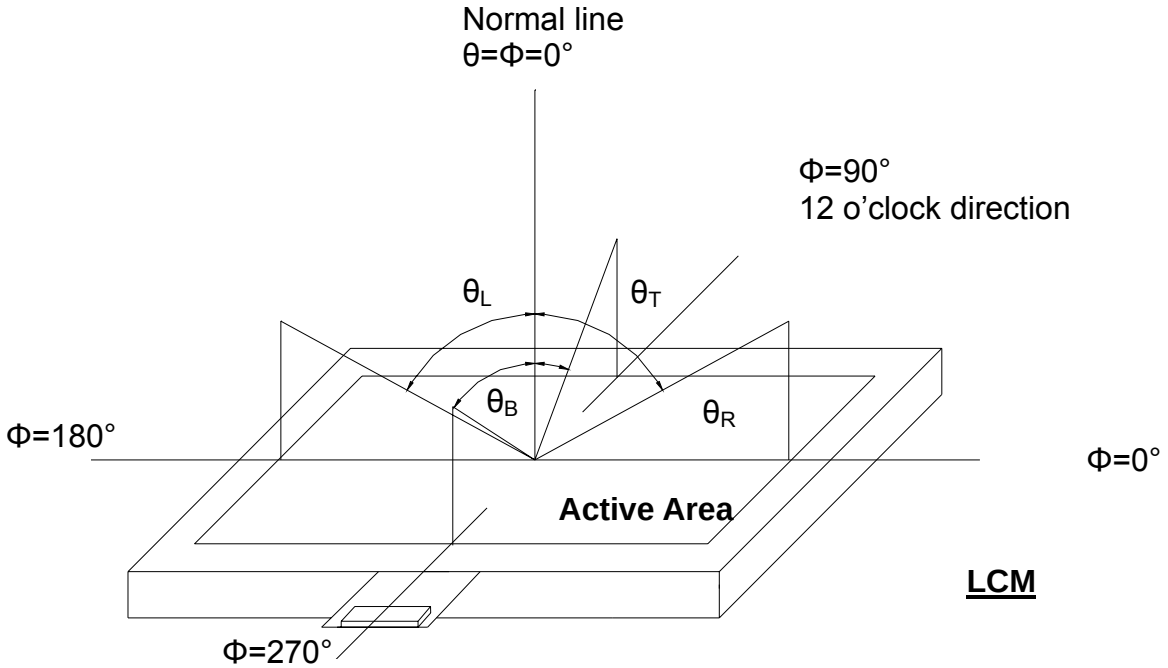


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

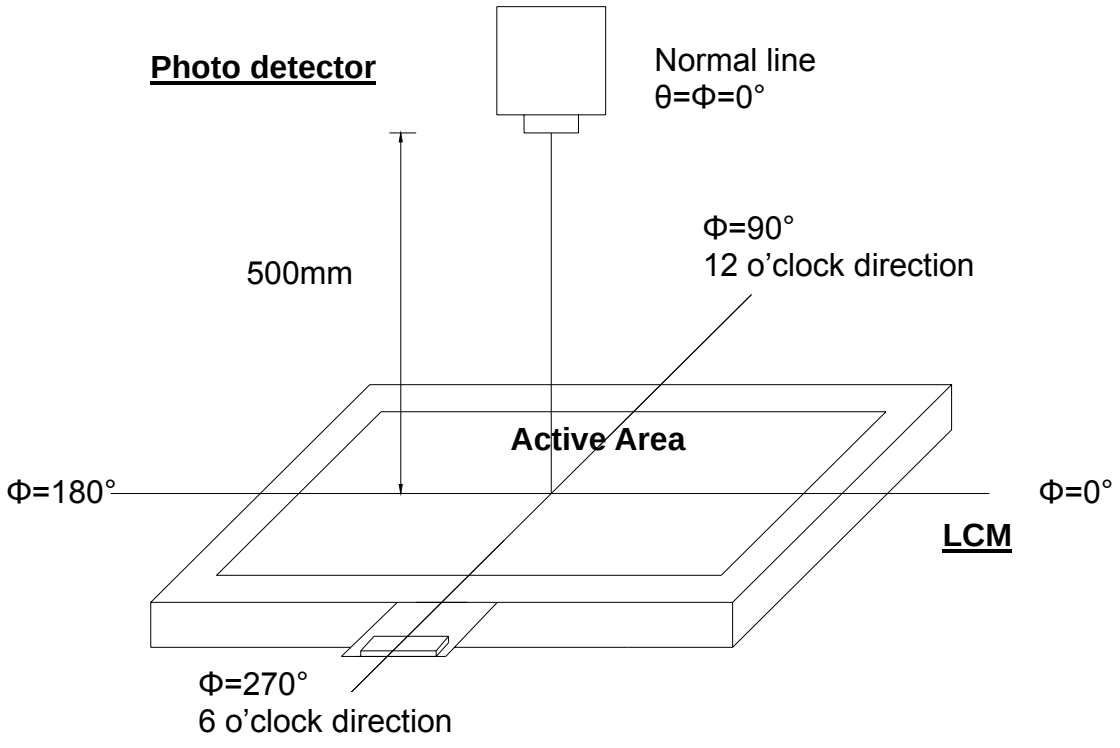


Fig. 4-2 Optical measurement system setup

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%.

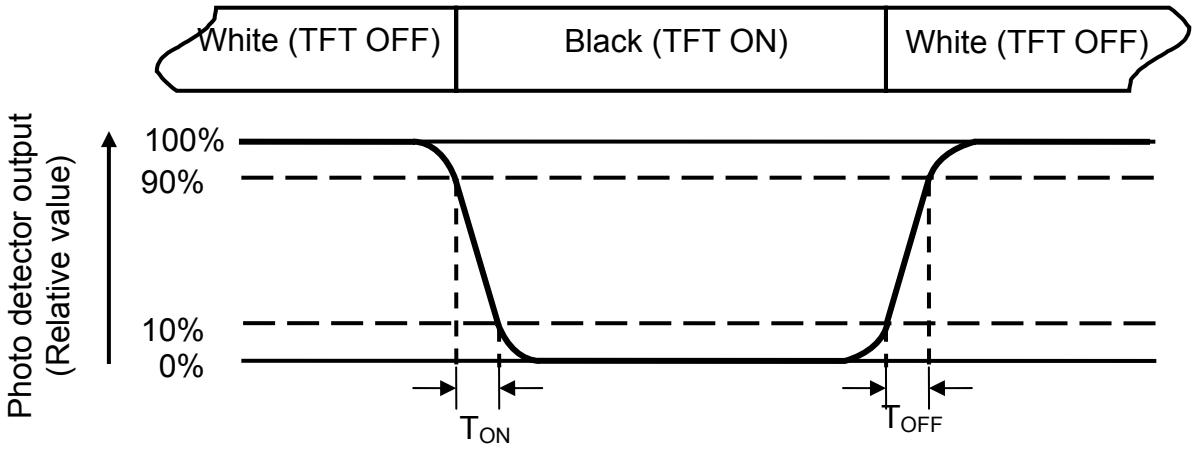


Fig. 4-3 Definition of response time

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. The LED driving condition is I_L=40mA .

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.

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

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

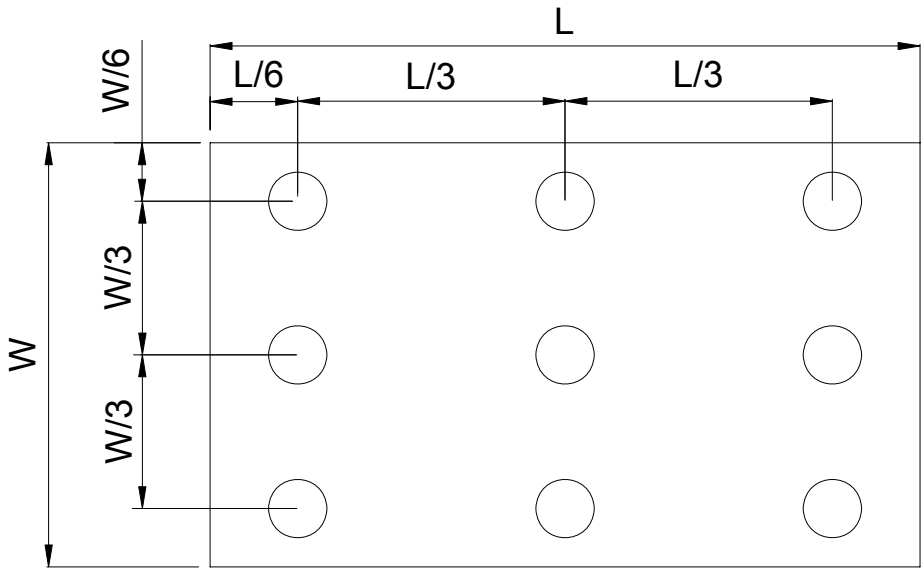


Fig. 4-4 Definition of measuring points

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

5. Reliability Test Items

(Note3)

Item	Test Conditions	Remark
High Temperature Storage	Ta = 70℃ 240hrs	Note 1，Note 4
Low Temperature Storage	Ta = -30℃ 240hrs	Note 1，Note 4
High Temperature Operation	Ts = 60℃ 240hrs	Note 2，Note 4
Low Temperature Operation	Ta = -20℃ 240hrs	Note 1，Note 4
Operate at High Temperature and Humidity	+40℃, 90%RH 240hrs	Note 4
Thermal Shock	-30℃/30 min ~ +70℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note 4
Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.
Note 2: Ts is the temperature of panel's surface.
Note 3: 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.
Note 4: 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 ICs.

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℃ 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