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# 7寸产品承认书

## SPECIFICATION

<b>承认印 Approved by</b>	
审核:	确认:
客户确认结果:	

Customer: 客 户:

Product: 品 名: 7寸LCD

Part NO: 产品料号: GMT07-02

DATE: 日 期: 2017/5/10

Approved 核 准	Checked 审 核	Prepared 制 作

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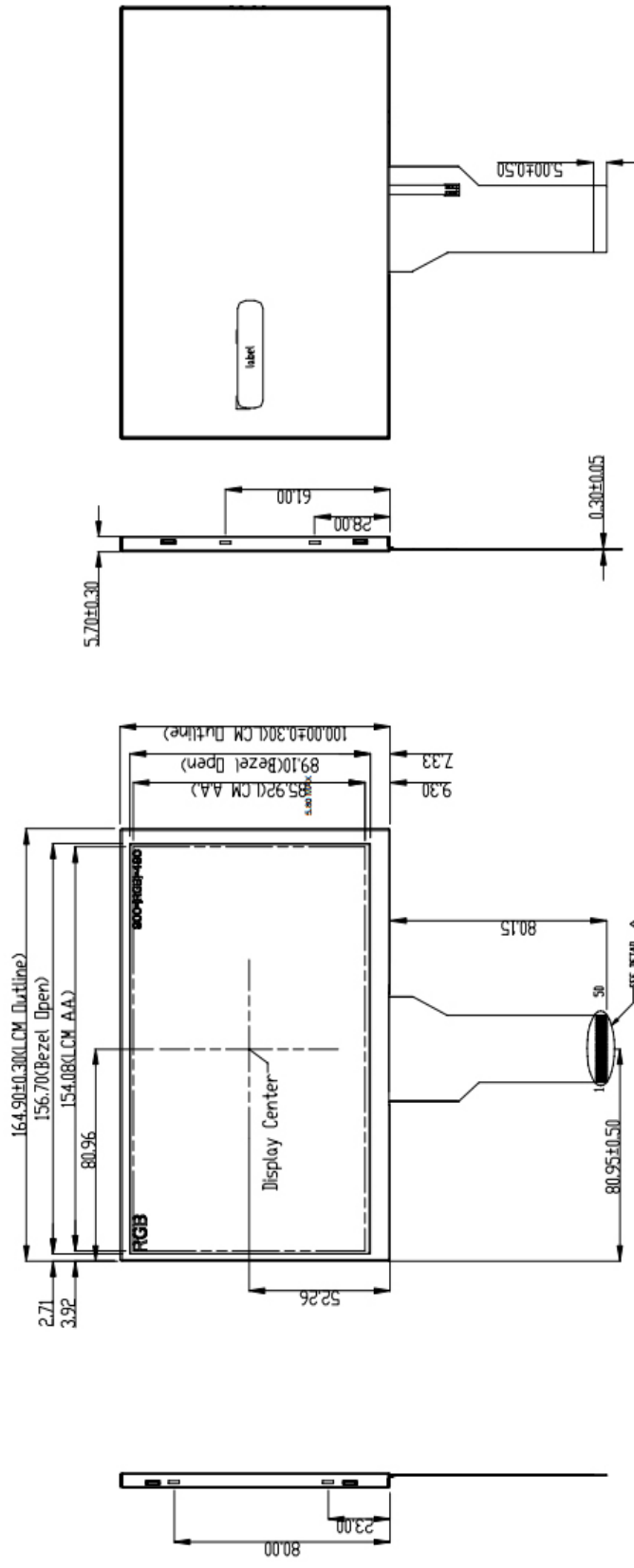
## 1. 适用范围

本承认书适用本公司生产的 7.0 寸背光模组，型号：GMT07-02

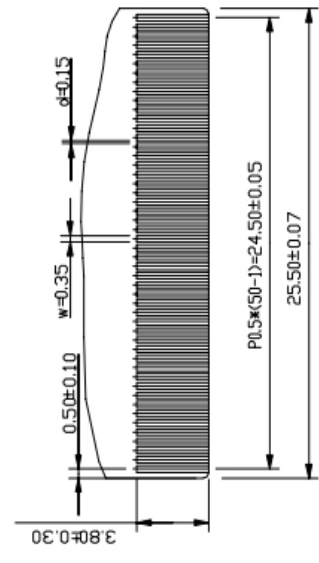
## 2. 产品规格

### 2.1 主要零部件构成

序	部件名	备 注	用量
1	上钢框	镀锌板	1PCS
2	下钢框	镀锌板	1PCS
3	胶框	黑色PC	1PCS
4	导光板	透明PMMA	1PCS
5	反射片	白反射	1PCS
6	端子线	UL1501	1PCS
7	扩散片	雾面半透明	1PCS
8		FR-4 丝印白油	1PCS
9		白光发光二极管	27PCS
10	增光片	KL66-150T	2PCS



SCALE 3:5



DETAIL A  
SCALE 4:1

- Notes:  
 1.FPC connector suggest to be Hirose "FH2A-50S-03W".  
 2.The bending radius of FPC should be larger than 166;  
 3.General tolerance ±0.3mm

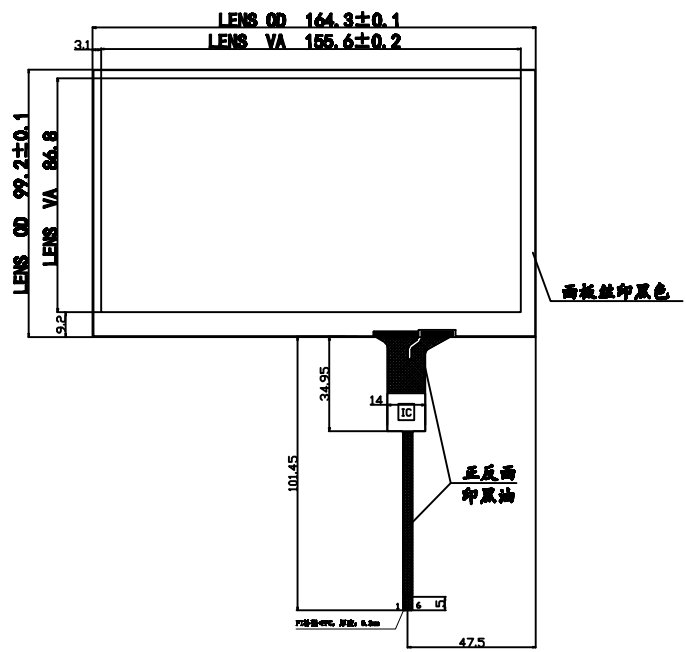
Shenzhen GoldenMorning Electronic Co.,Ltd	
FPC NO. A:	VERSION: 1.0
FPC NO. B:	NO.: 1 OF 1
FPC NO. C:	UNIT: MM
DESIGNED BY: QJC	
APPROVED BY:	DATE: 2011-12-14

A	B	C	D	E	F	G	H	I
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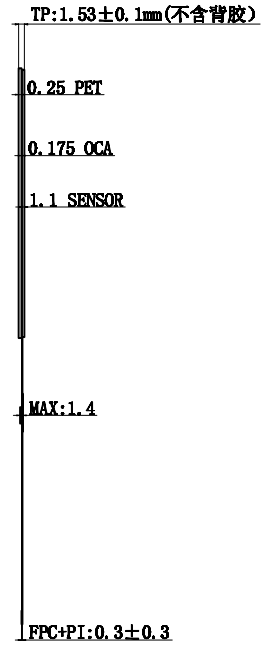
1	CUSTOMER APPROVAL:					Ver	Date	History	Name	1
						⚠		初始版本		

2										2

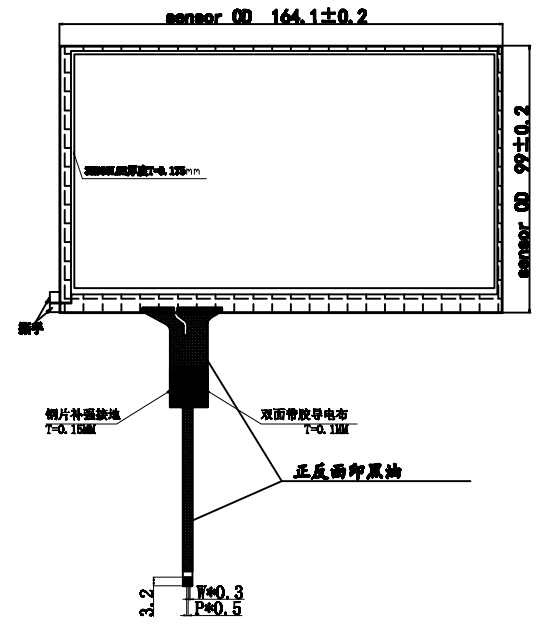
3										3



正视图



侧视图



背视图

由 Autodesk 教育版产品制作

由 Autodesk 教育版产品制作

6										6
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Item	Specification
1. 结构	P/G
2. IC	GT911
3. 工作温度	-10℃~60℃≤90%RH
4. 存储温度	-20℃~70℃≤90%RH
5. 透光率	83% Min
6. 表面硬度	3H(Pencil)
7. 未注明公差	±0.2
8. 产品符合 RoHS 标准。	

CTP interface

1	RST				
2	VDD3.3				
3	GND				
4	INT				
5	SDA3.3				
6	SCL3.3				
		Description	Unit	Scale	Sheet
		工程图	毫米 mm	1:1	1/1
		CUSTOMER NUMBER:	Edition:	APPROVED	CHECKED
		XXJ CTP70190	V1		DRAWN
		Date	2022-11-21		

7										7

A	B	C	D	E	F	G	H	I
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# Shenzhen GoldenMorning Electronic Co.,Ltd

测定条件:

在无特别指定条件下, 产品于温度  $25 \pm 2^{\circ}\text{C}$ , 湿度  $60 \pm 10\%$  环境条件进行测试。

品质要求:

## 4.1 光学特性

项目	符号	条件	规格			单位	备注
			Min	Typ	Max		
辉度	I	中心点	400	430		$\text{cd}/\text{m}^2$	
均匀度	AI	面内九点	75			%	
色度	X	中心点	0.260		0.360		
	Y	中心点	0.280		0.380		

注 1: 表内测定点规格需在发光条电流 (180) mA, 周围环境温度  $25 \pm 2^{\circ}\text{C}$  测试。

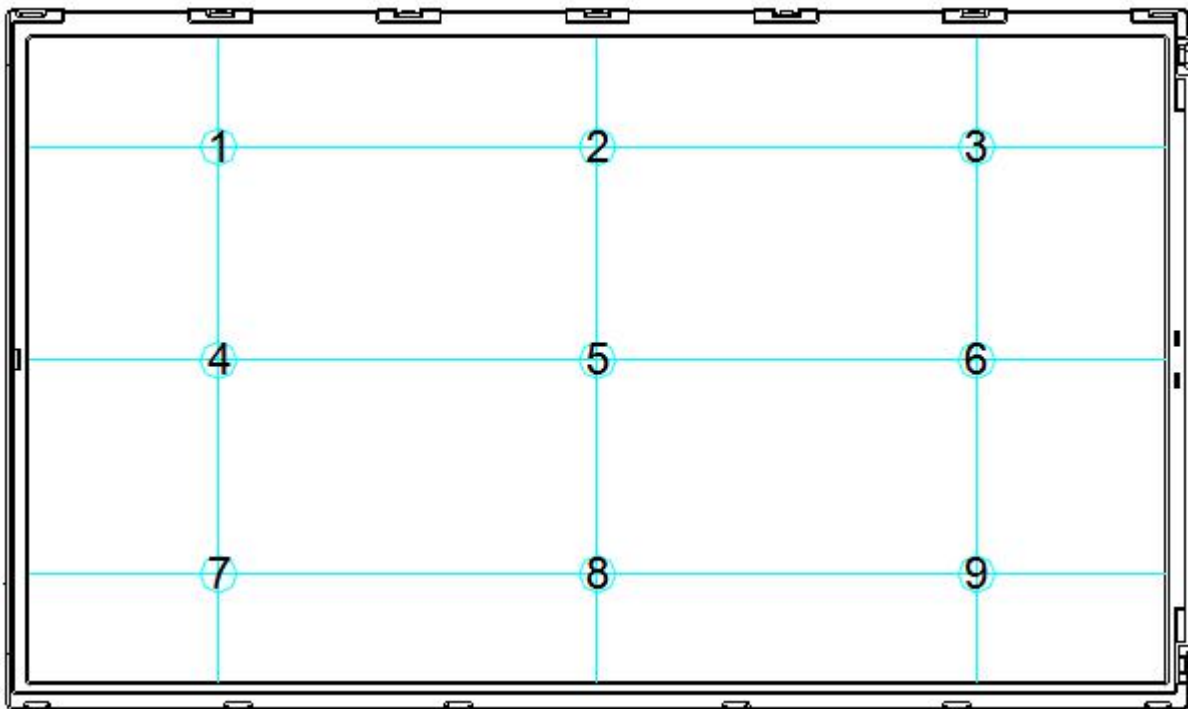
注 2: 测试条件: 1) 以规定的电流电压正常点亮;

2) 测试环境: 暗室 (10L x 以下)

3) 辉度、色坐标测试点: 见下图

4) 光学特性测试点图

注 3: 均匀性  $\Delta I = (I_{\text{MIN}} \div I_{\text{MAX}}) \times 100\%$



# Shenzhen GoldenMorning Electronic Co.,Ltd

## 4. 2 电气特性

### 4. 2. DEL 电性规格

项目	符号	条件	规格			单位	备注
			M	T	Ma		
LED电流	I	常温25℃	-	20	-	mA	
LED电压	V	常温25℃				V	I <sub>L</sub> =20mA
点亮延迟	T	注2				s	

注1: LED点亮电流不可超过最大电流限定值, 否则LED寿命和亮度将会受到严重影响。  
注2: 点亮测试延迟时间: ON 30sec--OFF 30sec

### 4. 2. 2 LED灯条适用电性规格

项目	符号	条件	规格			单位	备注
			M	T	Ma		
灯条电压	V	常温25℃	9	9.9	10.5	V <sub>rms</sub>	I <sub>L</sub> =180mA
灯条电流	I	常温25℃		180		mA <sub>rms</sub>	
点亮功率	W <sub>L</sub>	常温25℃	(0.54	(0.594	(0.63	W <sub>rms</sub>	I <sub>L</sub> =180mA

注1: 灯条点亮功率需在要求范围以内。

### 4. 3LED 寿命 (环境条件为周围温度: 25±2℃)

LED点亮寿命在30,000小时以上, 条件必须满足4.2中涉及的使用条件。LED寿命终止判定条件: a 正常点亮中心辉度小于初始辉度50%。

b 无法正常点亮。

### 4. 4. 4 使用环境

环境条件	环境温度	环境湿度
环境操作	-20° C- 70° C	RH: 90% , 无结露
存储环境	-30° C- 80° C	RH: 90% , 无结露

## 4. 5 信赖性试验

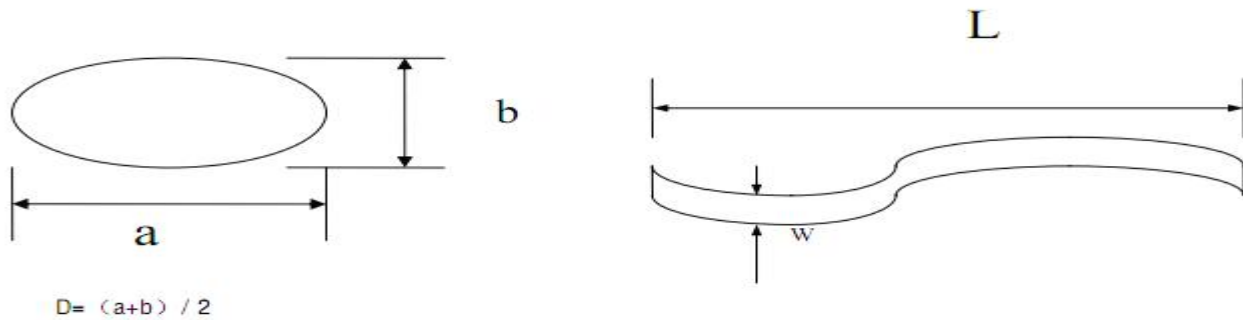
试验项目		试验条件	判定条件
操作实验	高温高湿	50 °C； 90%RH； 240 小时	(a) (b) (c) (e) (f)
	低温	-20°C； 192 小时	(a) (b) (c) (e) (f)
	高温	20°C - 70°C 192小时	(a) (b) (c) (e) (f)
	点灭动作	30秒： ON/30秒:OFF； 10000Cycle	(b) (c) (d) (f)
放置实验	低温	-30 ° C； 192 小时	(a) (b) (c) (e) (f)
	高温	80°C； 192 小时	(a) (b) (c) (e) (f)
	冷热冲击	60 °C： 1 小时 / -10°C； 1 小时； 50 Cycle	(a) (b) (c) (e) (f)
	-	-	--
	-	-	--

- 注 1：背光在点亮状态下测定；  
 注 2：高温试验可以高温高湿试验代替；  
 注 3：试验须于无结露状态下进行；  
 注 4：试验后，需取出 2 小时后常态检验；  
 注 5：各试验以原则上适用模组成品状态进行；  
 判定条件：

- (a) 实验后较初期辉度值下降比率应在 50%以内；
- (b) 发光区内9点均匀性不可小于06 %；
- (c) X、Y 色坐标变化值应在初期的±0.030. 以内
- (d) 测试产品符合4.3项内



项目	条件	规格	判定基准	备注	
点缺陷		点直径: $D < 0.15\text{mm}$	盖上屏后 正常点亮		
		黑点、 白点			$0.5\text{mm} < D$
		异物			$0.1\text{mm} < D < 0.5\text{mm}$
					$0.1\text{mm} < D < 0.5\text{mm}$
线缺陷	背光正常 点亮状态	$W < 0.05\text{mm}$ $L < 5\text{mm}$	背光可接 受判定OK	备注: 1: 检验视角: 法线方向上下 $35^\circ$ , 左右 $45^\circ$ 2: 特殊情况判定依据: 限度样品或双方达成协议. 3: 最终的外观判定以 盖上玻璃后可接受为 OK. 4: 直径: D; 宽度: W; 长度: L	
		白线	$0.02\text{mm} < W < 0.05\text{mm}$ $L < 5\text{mm}$		
		线状	$0.02\text{mm} < W < 0.05\text{mm}$ $L < 5\text{mm}$		
		异物	$W < 0.05\text{mm}$ $L < 5\text{mm}$		
其他缺陷	背光正常 点亮状态	背光有效发光面内不可有辉线等明显的明暗现象, 如有此现象 视具体场合以限度样品定。			
	无条件	机 品质上不可有下列缺点: 构, 1. 严重刮伤, 压痕, 油污, 污染等;			
		2. 严重的变形 (折弯, 弯曲已经不能组装上对应的结构件);			
		3. 膜片, cushion 浮起;			
		4. 发光面外凸影响到玻璃组装;			
		5. LOT 标示不清;			
		6. LED 损坏等导致背光不亮;			
		7. 连接器损坏或焊接不良造成的背光不亮, 部分LED不亮;			



测产品

## 5.1 测量仪器

5.1.1 色彩辉度计: BM-7 yuanfang.

5.1.2 直流数显电流计.

## 5.2 测定条件:

10.2.1 环境温度:  $25 \pm 2^\circ\text{C}$ .

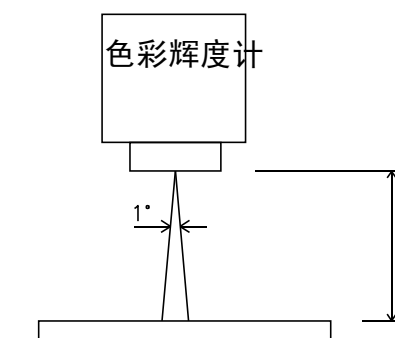
10.2.2 环境湿度:  $60 \pm 10\%$ .

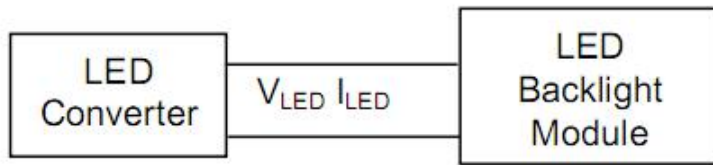
10.2.3 环境照度: 10LUX 无风状态.

10.2.5 测定距离:  $L=500 \pm 50\text{mm}$

10.2.6 测定视野角:  $1^\circ$

## 5.3 测量方法:





注意它其

- a 本规格书经客户确认签字后立即生效。
- b 对本规格书中如有疑问，需经双方沟通确认达成一致后另行修订。
- c 产品常态保存有效期限为出厂日起一年。
- d 产品尽量避免长时间在高温高湿或低温的环境下使用和存储。

## SPECIFICATION

Customer: \_\_\_\_\_ Model Name:

GMT07-02

Date:

2018/06/12

Version:

08

Preliminary Specification

Final Specification

Remark
7DD FOG (FPC:47.51mm)

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by
Henry Chien Cs chang	Sunny Sun Cc01 chen Wenguo deng	Yali.huo

## Record of Revision

Version	Revise Date	Page	Content
Final-spec.01	2010/01/19	All	Initial Release
Final-spec.02	2010/03/22	1	Add the Value of Weight
		17	Add Packaging Material Table & Packaging Quantity
		18	Add Packaging Drawing
Final-spec.03	2010/04/28	All	Add the Model Name, Spec NO., and Update the Logo
Final-spec.04	2010/11/03	6	Modify $V_{COM}$ values and add note 4
Final-spec.05	2011/09/05	16	Modify mechanical drawing from 1+2 to 1+1 IC
		17	Modify Packaging Material Table & Packaging
Final-spec.06	2011/12/15	16	Update mechanical drawing: the size of Gate IC
Final-spec.07	2016/09/18	1	Add IC & Driving methods
		7~11	Add the Value of min& typ.&max& notes
		13	Add notes
		14	Add notes&ESD
		16	Update mechanical drawing
		17/18	Update Package Drawing
Final-spec.08	2018/03/20		Add T2 Cell as 2nd source & change module name from AT070TN90 V.1 to NE070NB-04F.
		1	Update the Display Color& power consumption
		6~8	Update the Value of $V_{GH}$ & $V_{GL}$ & $V_{COM}$
		11~13	Update the Transmittance and notes
		16~18	Update the Package Drawing

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# 1. General Specifications

No.	Item	Specification	Remark
1	LCD size	7.0 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	0.0642(W) × 0.1790(H) mm	
6	Active area	154.08(W) × 85.92(H) mm	
7	Panel size	162.5(W) × 96.62(H) × 1.43(D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Display Color	16.7M	
11	Interface	Digital, Parallel 8-bit RGB	
12	Panel power consumption	0.240W (Typ.)	
13	Weight	46g(Typ.)	
14	Source-IC Gate-IC	EK9713/ NT39419 EK73002 / NT52001	
15	Driving methods	1+2 dot	

Note 1: Refer to Mechanical Drawing.

## 2. Pin Assignment

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Remark
1	V <sub>LED+</sub>	P	Power for LED backlight (Anode)	
2	V <sub>LED+</sub>	P	Power for LED backlight (Anode)	
3	V <sub>LED-</sub>	P	Power for LED backlight (Cathode)	
4	V <sub>LED-</sub>	P	Power for LED backlight (Cathode)	
5	GND	P	Power ground	
6	V <sub>COM</sub>	I	Common voltage	
7	DV <sub>DD</sub>	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 1
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	Note 2
19	B0	I	Blue data(LSB)	Note 2
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	
25	G2	I	Green data	



26	G1	I	Green data	Note 2
27	G0	I	Green data(LSB)	Note 2
28	R7	I	Red data(MSB)	
29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	Note 2
35	R0	I	Red data(LSB)	Note 2
36	GND	P	Power Ground	
37	DCLK	I	Sample clock	Note 3
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	Note 4,5
40	U/D	I	Up/down selection	Note 4,5
41	V <sub>GH</sub>	P	Gate ON Voltage	
42	V <sub>GL</sub>	P	Gate OFF Voltage	
43	AV <sub>DD</sub>	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	Note 6
45	NC	-	No connection	
46	V <sub>COM</sub>	I	Common Voltage	
47	DITHB	I	Dithering function	Note 7
48	GND	P	Power Ground	
49	NC	-	No connection	
50	NC	-	No connection	

I: input, O: output, P: Power

Note 1: DE/SYNC mode select. Normally pull high.

When select DE mode, MODE="1", VS and HS must pull high.

When select SYNC mode, MODE="0", DE must be grounded.

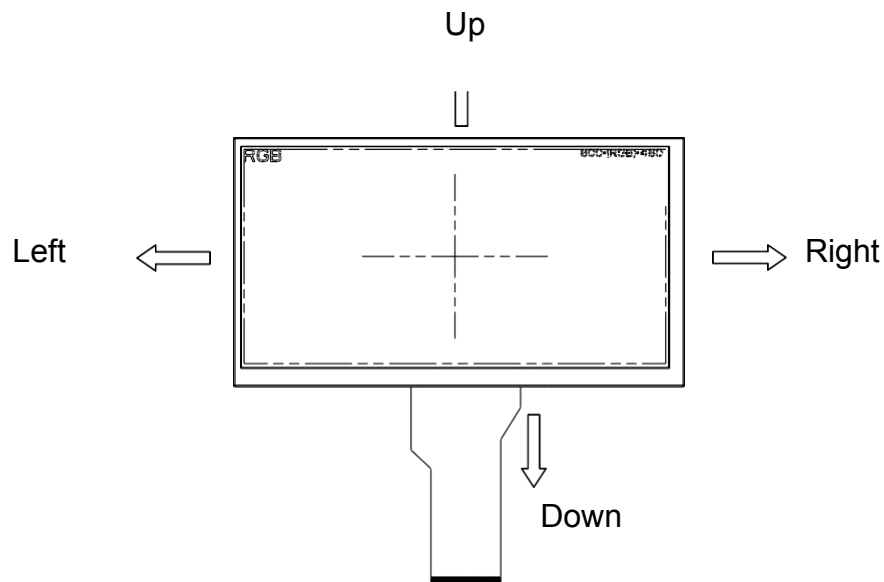
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	DV <sub>DD</sub>	Up to down, left to right
DV <sub>DD</sub>	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV <sub>DD</sub>	DV <sub>DD</sub>	Down to up, left to right

Note 5: Definition of scanning direction.  
Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.  
When DITHB="1", Disable internal dithering function,  
When DITHB="0", Enable internal dithering function,

Note 8: Reserve for LED power input.

## 3. Operation Specifications

### 3.1. Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	$DV_{DD}$	-0.3	5.0	V	
	$AV_{DD}$	6.5	13.5	V	
	$V_{GH}$	-0.3	40.0	V	
	$V_{GL}$	-20.0	0.3	V	
Operation Temperature	$T_{OP}$	-20	70	°C	
Storage Temperature	$T_{ST}$	-30	80	°C	

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.

## 3.1.1. Typical Operation Conditions

( Note 1)

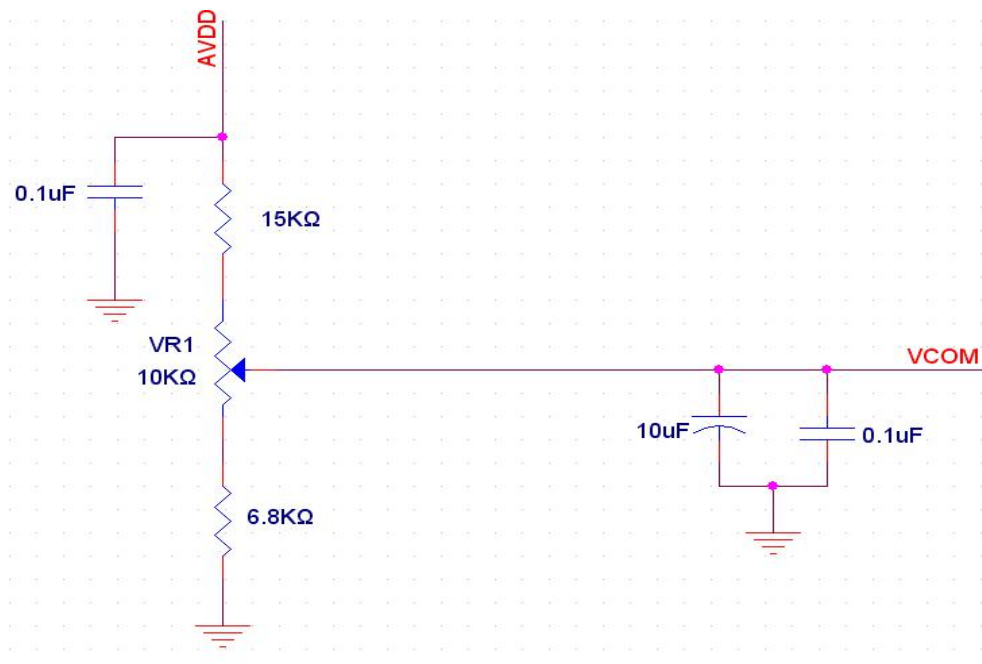
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	DV <sub>DD</sub>	3.0	3.3	3.6	V	Note 2
	AV <sub>DD</sub>	10.2	10.4	10.6	V	
	V <sub>GH</sub>	14.5	15	15.5	V	
	V <sub>GL</sub>	-10.5	-10	-9.5	V	
Input signal voltage	V <sub>COM</sub>	3.54	(4.04)	4.54	V	Note 4
Input logic high voltage	V <sub>IH</sub>	0.7 DV <sub>DD</sub>	/	DV <sub>DD</sub>	V	Note 3
Input logic low voltage	V <sub>IL</sub>	0	/	0.3 DV <sub>DD</sub>	V	

Note 1: Be sure to apply DV<sub>DD</sub> and V<sub>GL</sub> to the LCD first, and then apply V<sub>GH</sub>.

Note 2: DV<sub>DD</sub> setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

Note 4: Typical V<sub>COM</sub> is only a reference value. It must be optimized according to each LCM. Please use VR and base on below application circuit.

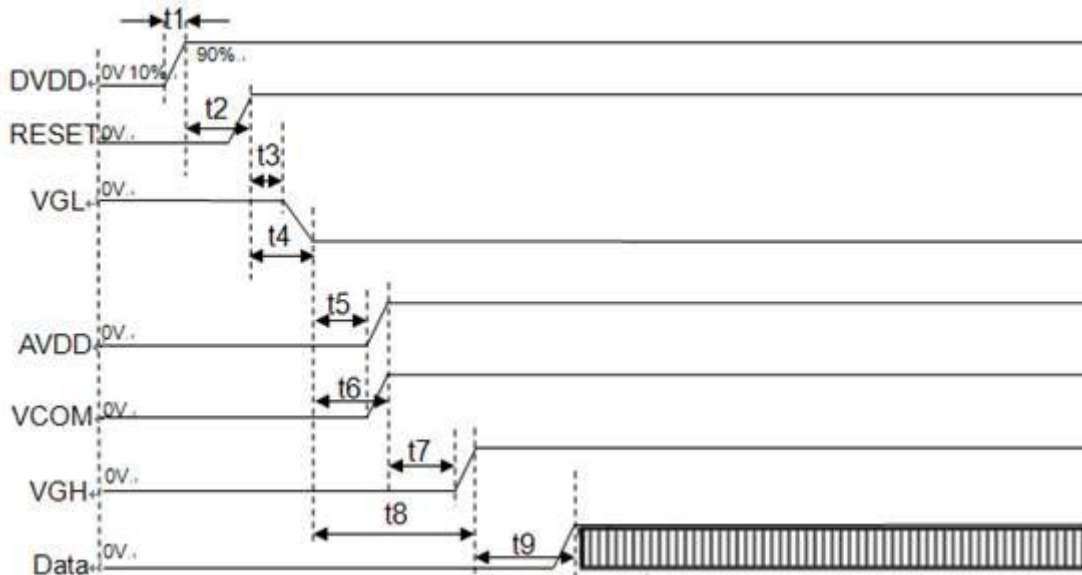


### 3.1.2. Current Consumption

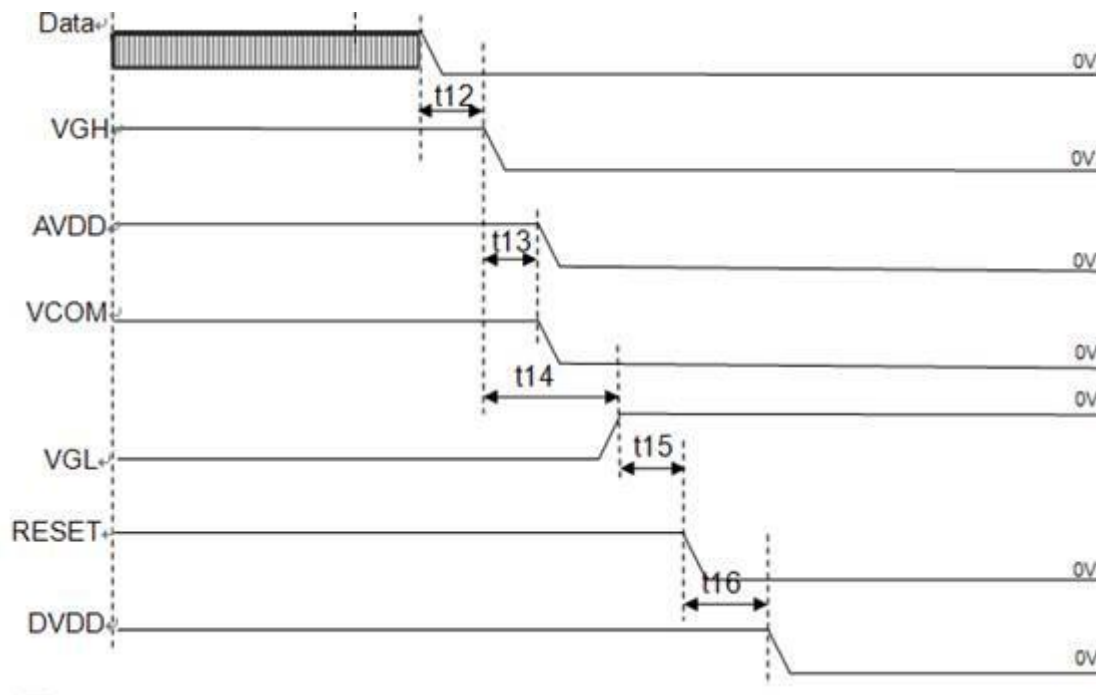
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	$I_{GH}$	0.05	0.2	1.0	mA	$V_{GH} = 15.0V$
	$I_{GL}$	0.2	0.5	1.0	mA	$V_{GL} = -10.0V$
	$IDV_{DD}$	1	4.0	10	mA	$DV_{DD} = 3.3V$
	$I_{AV_{DD}}$	5	20	50	mA	$AV_{DD} = 10.4V$

## 3.2. Power Sequence

### a. Power on:



Symbol	SPEC			Unit
	Min.	Typ.	Max.	
$t_1$	0.5	5	20	ms
$t_2$	1	1	1.5	ms
$t_3$	10	15	20	ms
$t_4$	20	22	24	ms
$t_5$	1	2	3	ms
$t_6$	5	6	7	ms
$t_7$	1.5	2	4	ms
$t_8$	10	12	15	ms
$t_9$	10	15	20	ms

**b. Power off:**

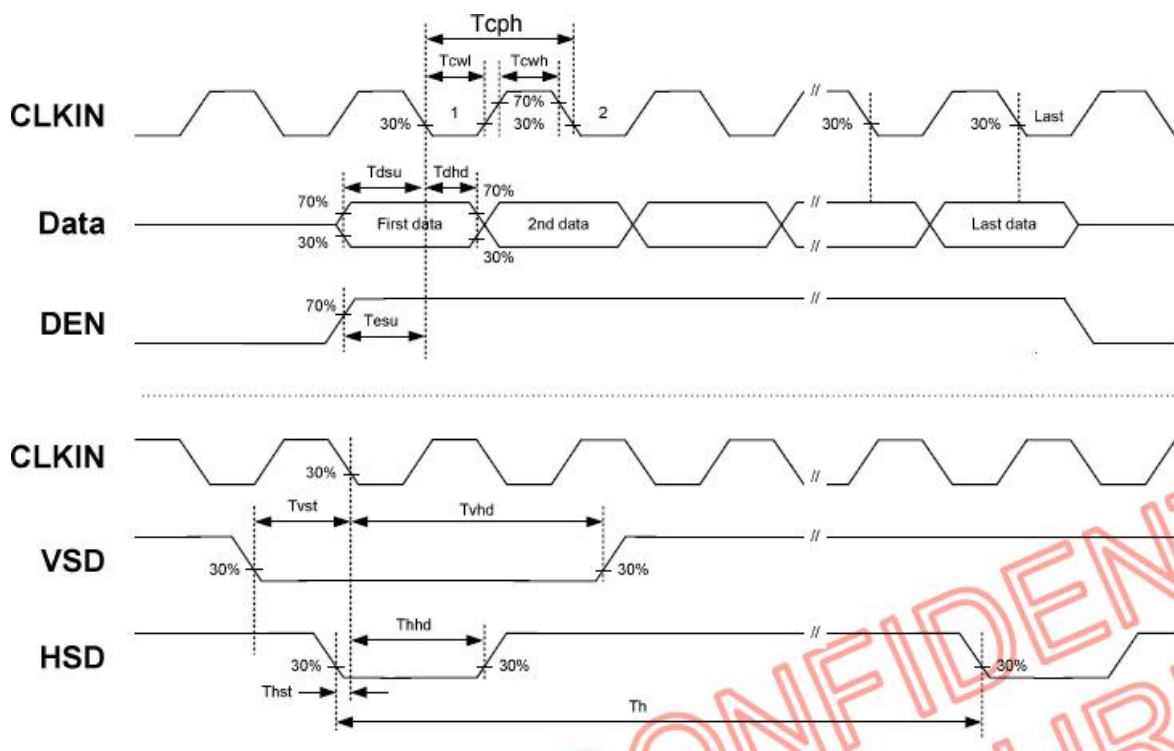
Symbol	SPEC			Unit
	Min.	Typ.	Max.	
$t_{12}$	10	15	20	ms
$t_{13}$	5	6	7	ms
$t_{14}$	10	12	15	ms
$t_{15}$	20	22	24	ms
$t_{16}$	1	1.5	3	ms

**3.3. Timing Characteristics****3.3.1. AC Electrical Characteristics**

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	$T_{hst}$	8	10	20	ns	
HS hold time	$T_{hhd}$	8	120	800	ns	
VS setup time	$T_{vst}$	8	10	20	ns	
VS hold time	$T_{vhd}$	8	96000	640000	ns	
Data setup time	$T_{dsu}$	8	10	20	ns	
Data hole time	$T_{dhd}$	8	15	20	ns	

DE setup time	$T_{esu}$	8	15	20	ns	
DE hole time	$T_{ehd}$	8	15	20	ns	
DV <sub>DD</sub> Power On Slew rate	$T_{POR}$	1	10	20	ms	From 0 to 90% DV <sub>DD</sub>
RESET pulse width	$T_{Rst}$	1	2	5	ms	
DCLK cycle time	$T_{coh}$	20	30	40	ns	
DCLK pulse duty	$T_{cwh}$	40	50	60	%	

### 3.3.2. Input Clock and Data Timing Diagram



### 3.3.3. Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	/	800	/	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	6	40	DCLK	Note1
HS Blanking	thb	46	46	46	DCLK	Note1

HS Front Porch	thfp	16	210	354	DCLK	
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Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	/	480	/	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	3	20	TH	Note2
VS Blanking	tvb	23	23	23	TH	Note2
VS Front Porch	tvfp	7	22	147	TH	

Note1: HS Blanking has included HS pulse width  
 Note2: VS Blanking has included VS pulse width  
 Note: Frame rate 60±5Hz

### 3.3.4. Data Input Format



Figure 3. 1 Horizontal input timing diagram.



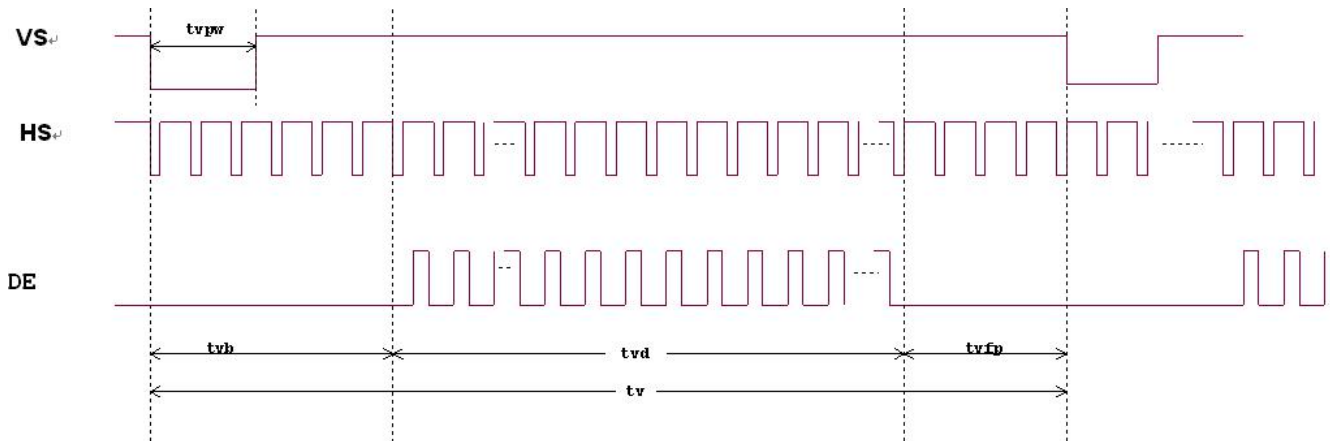


Figure 3. 2 Vertical input timing diagram.

## 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)	60	70	-	degree	Note 1
	$\theta_R$	$\Phi=0^\circ$ (3 o'clock)	60	70	-		
	$\theta_T$	$\Phi=90^\circ$ (12 o'clock)	40	50	-		
	$\theta_B$	$\Phi=270^\circ$ (6 o'clock)	60	70	-		
Response time	$T_{ON+}$ $T_{OFF}$	Normal $\theta=\Phi=0^\circ$	-	25	50	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4 Note 7
Color chromaticity	$W_X$		0.26	0.31	0.36	-	Note 2 Note 5 Note 6 Note 7
	$W_Y$		0.28	0.33	0.38	-	
Transmittance	Tr		Normal $\theta=\Phi=0^\circ$	4.26	4.86	-	%

Test Conditions:

1.  $DV_{DD}=3.3V$ , the ambient temperature is  $25^\circ C$ .
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

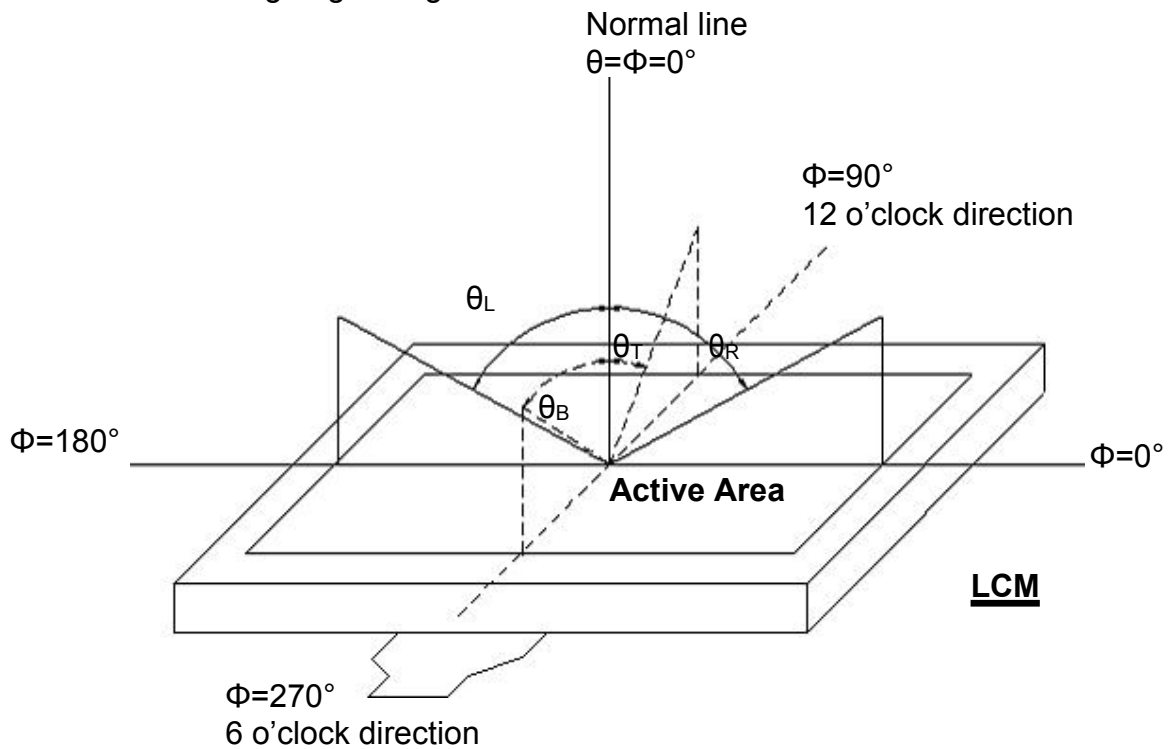


Fig. 4-1 Definition of viewing angle

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 SR3-AR/Field of view:  $1^\circ$  /Height: 500mm.)

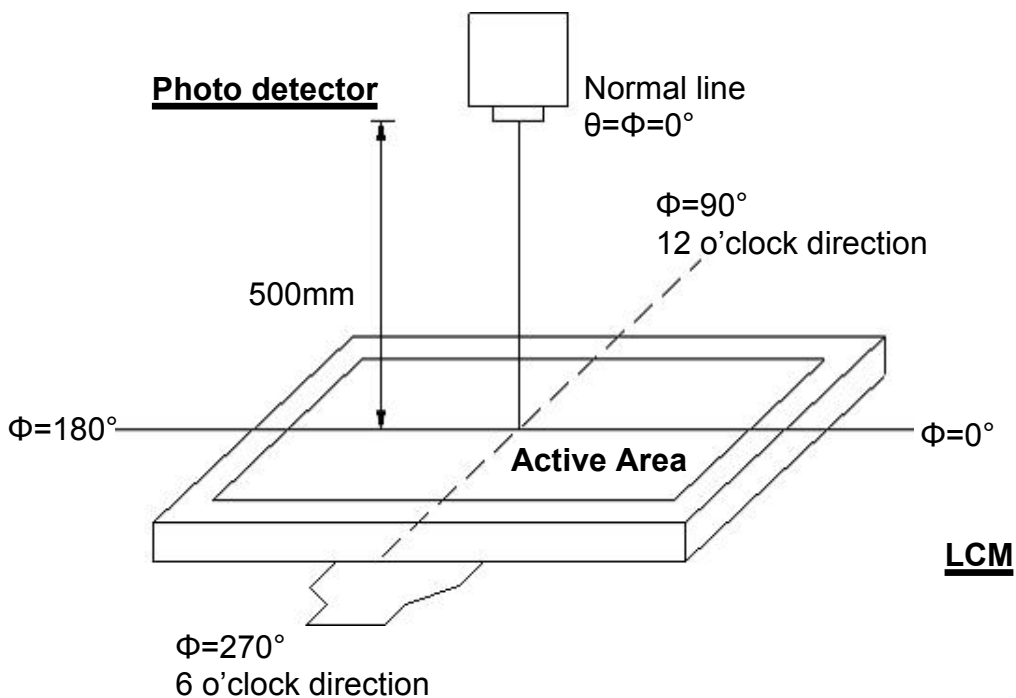


Fig. 4-2 Optical measurement system setup

**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%.

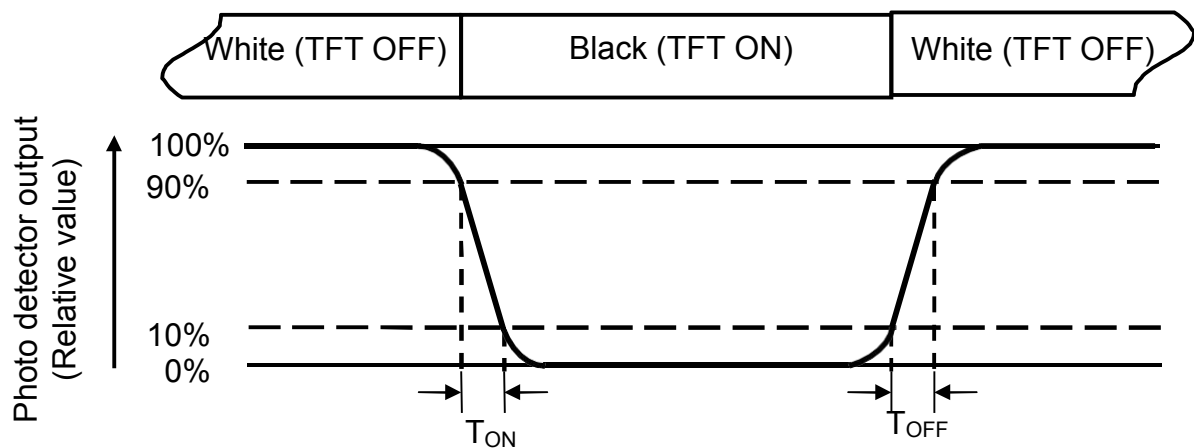


Fig. 4-3 Definition of response time

**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: Base on backlight structure of LCM is Diffuser+ BEF +BEF. The color rank of LED is Sa627.

## 5. Reliability Test Items

(Note3)

Item	Test Conditions	Remark
High Temperature Storage	Ta = 80°C                                  240hrs	Note 1, Note3, Note 4, Note5
Low Temperature Storage	Ta = -30°C                                  240hrs	Note 1, Note3, Note 4, Note5
High Temperature Operation	Ts = 70°C                                  240hrs	Note 2, Note3, Note 4 , Note5
Low Temperature Operation	Ta = -20°C                                  240hrs	Note 1, Note3, Note 4, Note5
Operate at High Temperature and Humidity	+60°C , 90%RH                          240hrs	Note3, Note 4, Note5
Thermal Shock	-30°C/30 min ~ +80°C/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note3, Note 4, Note5
Electro Static Discharge	±2KV, Human Body Mode, 100pF/1500 Ω	

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.

Note 5: A certain level of Mura (non-uniformity) of dark / black image will happen several days after high temperature testing (H.T.T.). There is a slowly part recovery over a long time (several months). Such a long exposure time like in H.T.T. will normally not happen in a real application. Therefore the test H.T.T. was introduced to simulate cycles with normal conditions in-between but with the same total exposure time what show a significant reduced Mura.

The root cause is related to tension generated due to different amount of shrinking in the stack of layers in the polarizer sheet. The effect is more significant on larger displays like this size. An investigation into alternative polarizer material showed that there is no better alternative currently available.

## 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  $25\pm 10^{\circ}\text{C}$  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.