



# SPECIFICATION FOR TFT LCD MODULE

CUSTOMER : \_\_\_\_\_

CUSTOMER MODULE : \_\_\_\_\_

HL MODEL : \_\_\_\_\_ HG097XG008

Preliminary Specification

Final Specification

Customer Confirmation column:

Approved by : \_\_\_\_\_ Dept. : \_\_\_\_\_ Data : \_\_\_\_\_

Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

Designed by	Checked by	Approved by



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## 1. General Description

HG097XG008 is a 1024RGB\*768 dots matrix TFT LCD module. It has a TFT panel composed of 1024 sources and 768gates. The LCM can be easily accessed by micro-controller.

## 2. Features

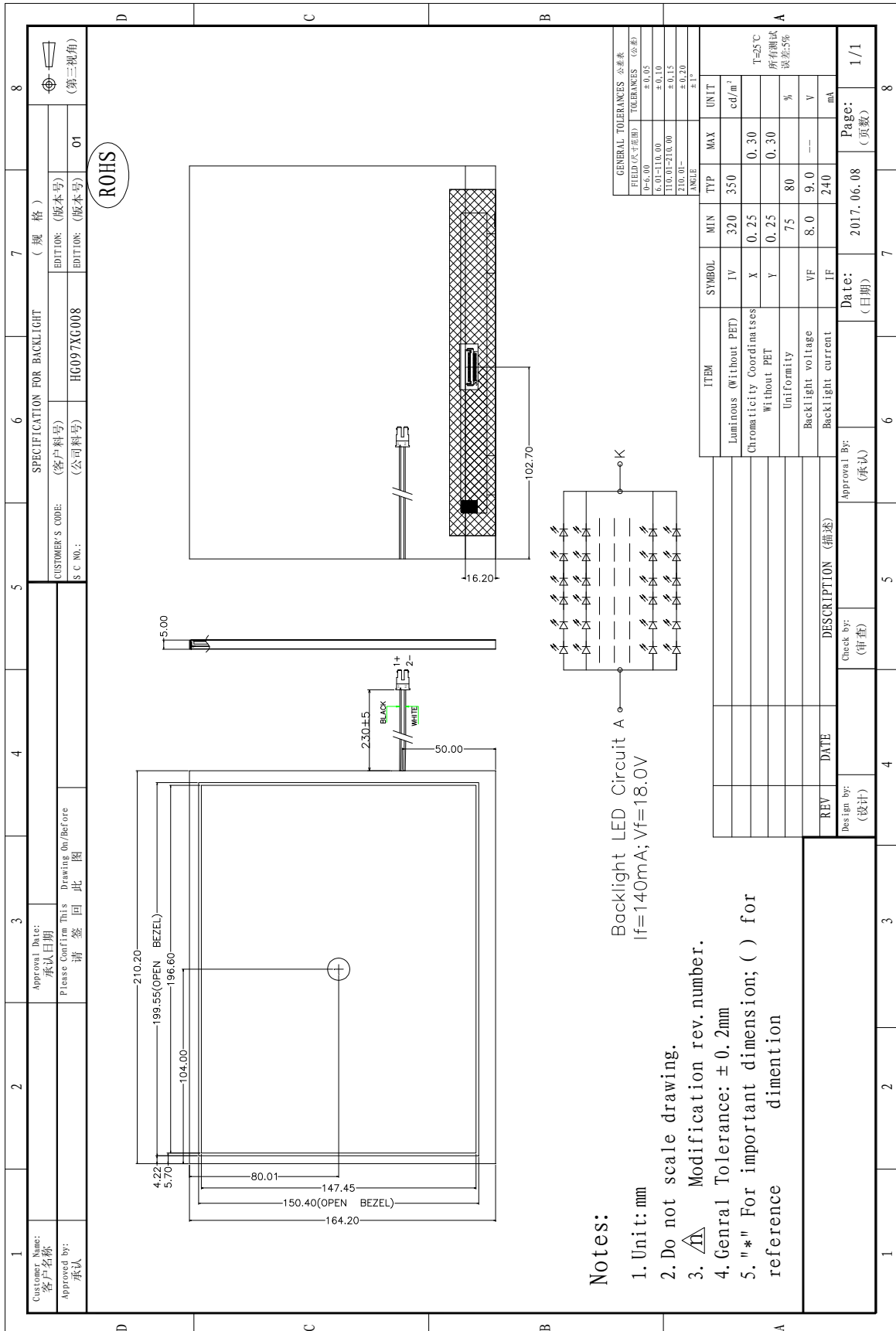
Display Mode	Transmissive
	a-TFT
Display Format	Graphic 1024RGB*768Dot-matrix
Input Data	LVDS interface
Viewing Direction	Free
Drive	

## 3. Mechanical Specification

Item	Specifications	Unit
Dimensional outline	210.16MM*164.25MM*5.0MM	mm
Resolution	1024RGB*768	dots
LCD Active area	196.61(W)*147.46(H)	mm
Pixel size	0.192 (W)* 0.192 (H)	mm



## 4. Mechanical Dimension





## 5. Maximum Ratings

Item	Symbol	Min	Max	Unit	Note
Supply voltage	V	3.2	3.6	V	
Operating temperature	T <sub>OPR</sub>	-20	70	°C	
Storage temperature	T <sub>STR</sub>	-30	80	°C	

## 6. Electrical Characteristics

No.	Item	MIN	TYP	MAX	Unit
1	Vcom voltage	2.45	3.45	4.45	V
2	Vgl voltage	-8.5	-7.5	-6.5	V
3	Vgh voltage	17	18	19	V
4	Vdl voltage	0	0.2	0.7	V
5	Vdh voltage	7	8.2	8.7	V
6	Vadd	--	8.42	--	V

**NOTE1: VCOM** 电压根据客户主板实际效果而定

## 7. Backlight Characteristic

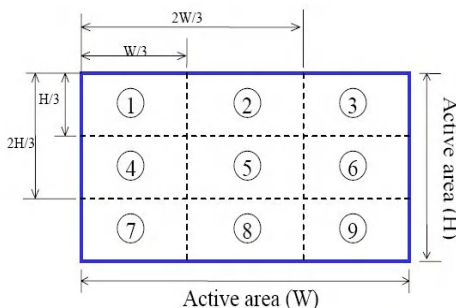
Item	Symbol	Min	Typical	Max	Unit
LED module Forward voltage	V <sub>LED</sub>	17	18	20	V
LED module current	V <sub>LED</sub>		140		mA
Lcd interface Luminance ★1	L <sub>S</sub>	320	350		Cd/m <sup>3</sup>
LCM Surface brightness uniform ★2	L <sub>D</sub>	75			%

★ 1Test condition is:

- (a) Center point on active area.
- (b)Best Contrast.

★2Uniform measure condition:

- (1)Measure 9 point. Measure location show below;
- (2)Uniform=(Min. brightness /Max. brightness)\*100%
- (3)Best Contrast.





## 8. Module Function Description

### 8.1 Pin Descriptions

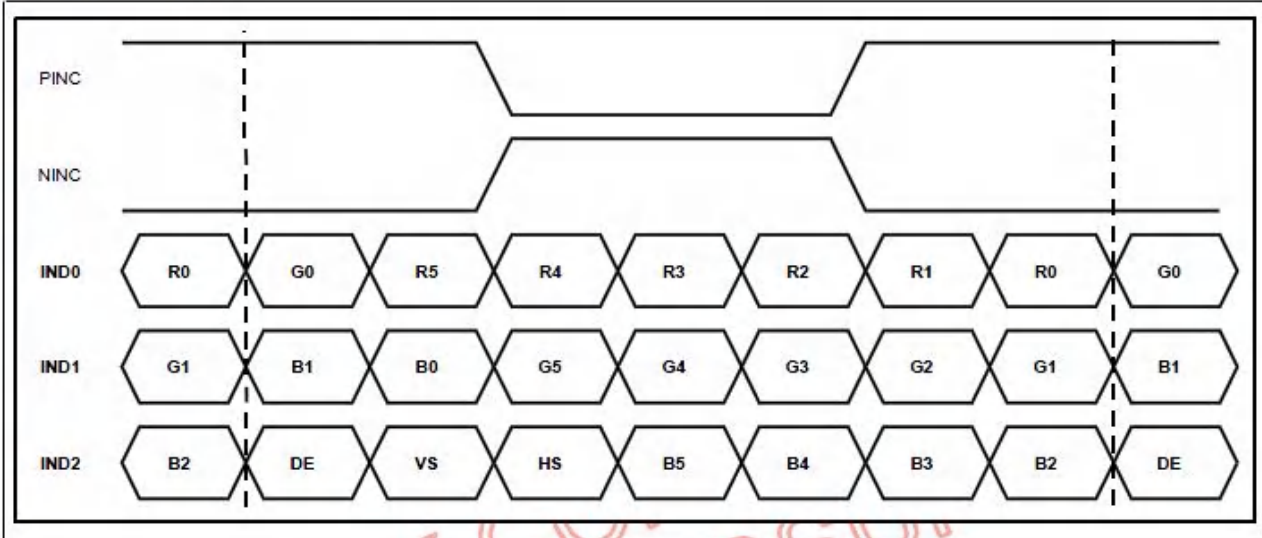
Pin No.	Symbol	Type	Function
1	VCOM	P	Common voltage
2-3	VDD	P	Digital power
4	NC	-	Not connect
5	RESET	I	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10K $\Omega$ , C=0.1 $\mu$ F)
6	U/D	I	Vertical inversion
7	L/R	I	Horizontal inversion
8	STBYB	I	Standby mode, normally pull high STBYB="1", normal operation STBYB="0", timing control, source driver will turn off, all output are high-Z
9	GND	P	Ground
10	RXCLKIN-	I	Negative LVDS differential clock inputs
11	RXCLKIN+	I	Positive LVDS differential clock inputs
12	GND	P	Ground
13	RXIN0-	I	Negative LVDS differential data inputs
14	RXIN0+	I	Positive LVDS differential data inputs
15	GND	P	Ground
16	RXIN1-	I	Negative LVDS differential data inputs
17	RXIN1+	I	Positive LVDS differential data inputs
18	GND	P	Ground
19	RXIN2-	I	Negative LVDS differential data inputs
20	RXIN2+	I	Positive LVDS differential data inputs
21	GND	P	Ground
22	RXIN3-	I	Negative LVDS differential data inputs
23	RXIN3+	I	Positive LVDS differential data inputs
24	GND	P	Ground
25	SELB	I	6bit/8bit mode select H : 6bit / L : 8bit
26	GND	P	Ground
27	AVDD	P	Power for Analog Circuit
28	GND	P	Ground
29	VGH	P	Positive power for TFT
30-31	NC	-	Not connect
32	VGL	P	Negative power for TFT
33	GND	P	Ground
34-40	NC	-	Not connect



## 8.2 Timing characteristics. Data Input Format

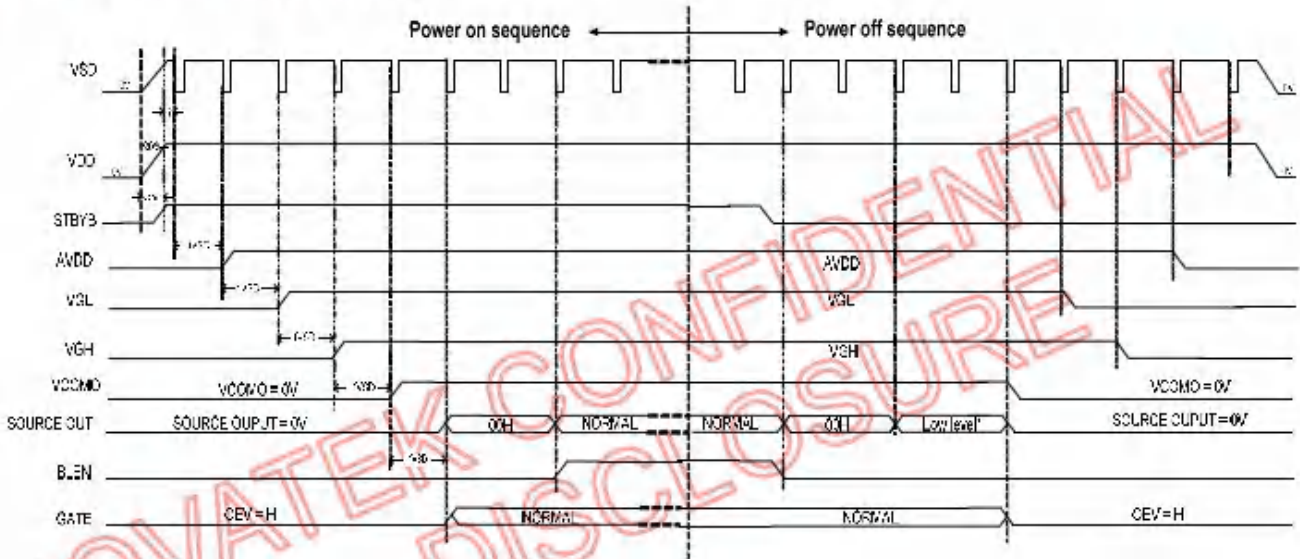
### Data Input Format for lvds

#### 6bit LVDS input



### Power On/Off Timing

#### Power-On/Off Timing Sequence:



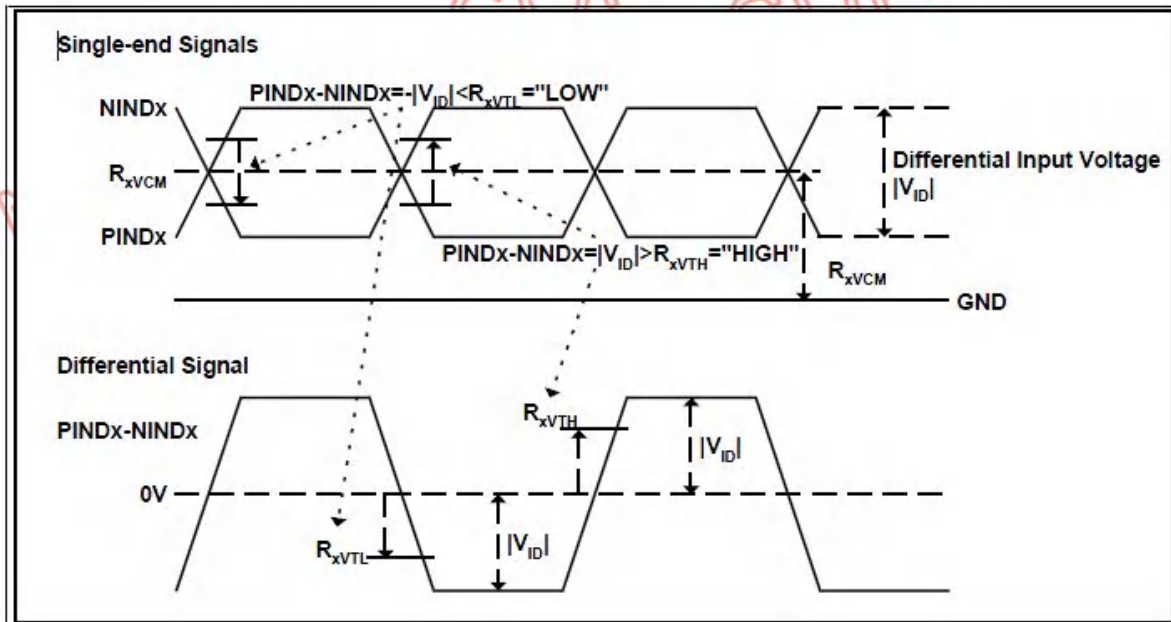




## Dc Electrical Characteristics

LVDS mode (Receiver Differential Input: PIND0~PIND3, NIND0~NIND3, PINC, NINC)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential input high threshold voltage	$R_{xVTH}$			+0.1	V	$R_{xVCM} = 1.2V$
Differential input low threshold voltage	$R_{xVTL}$	-0.1			V	
Input voltage range (singled-end)	$R_{xVIN}$	0		2.4	V	
Differential input common mode voltage	$R_{xVCM}$	$ V_{ID} /2$		$2.4 -  V_{ID} /2$	V	
Differential input voltage	$ V_{ID} $	0.2		0.6	V	
Differential input leakage current	$R_{V_{xliz}}$	-10		+10	$\mu A$	
LVDS Digital Operating Current	$I_{ddlvs}$	-	40	50	mA	Fclk=65 MHz, VDD=3.3V
LVDS Digital Stand-by Current	$I_{stlvs}$	-	10	50	$\mu A$	Clock & all Functions are stopped



## Resolution

DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	52	65	71	MHz
Horizontal Display Area	thd		1024		DCLK
HSD Period	th	1114	1344	1400	DCLK
HSD Blanking	thb+ thfp	90	320	376	DCLK
Vertical Display Area	tvd		768		$T_H$
VSD Period	tv	778	806	845	$T_H$
VSD Blanking	tvbp+ tvfp	10	38	77	$T_H$





HV mode

## Horizontal timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	57	65	70.5	MHz
Horizontal Display Area	thd		1024		DCLK
HSD Period	th	1200	1344	1400	DCLK
HSD Pulse Width	thpw	1		140	DCLK
HSD Back Porch	thbp		160		DCLK
HSD Front Porch	thfp	16	160	216	DCLK

## Vertical timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd		768		T <sub>H</sub>
VSD Period	tv	792	806	840	T <sub>H</sub>
VSD Pulse Width	tvpw	1	-	20	T <sub>H</sub>
VSD Back Porch	tvbp		23		T <sub>H</sub>
VSD Front Porch	tvfp	1	15	49	T <sub>H</sub>

## Read Timing Characteristics

Reset Timing Characteristics (VCC=1.8~3.3V, IOVCC=1.65~3.3V)

Item	Symbol	Unit	Min.	Typ..	Max
Reset low-level width	t <sub>RES</sub>	ms	1		
Reset rise time	t <sub>RES</sub>	μs			10

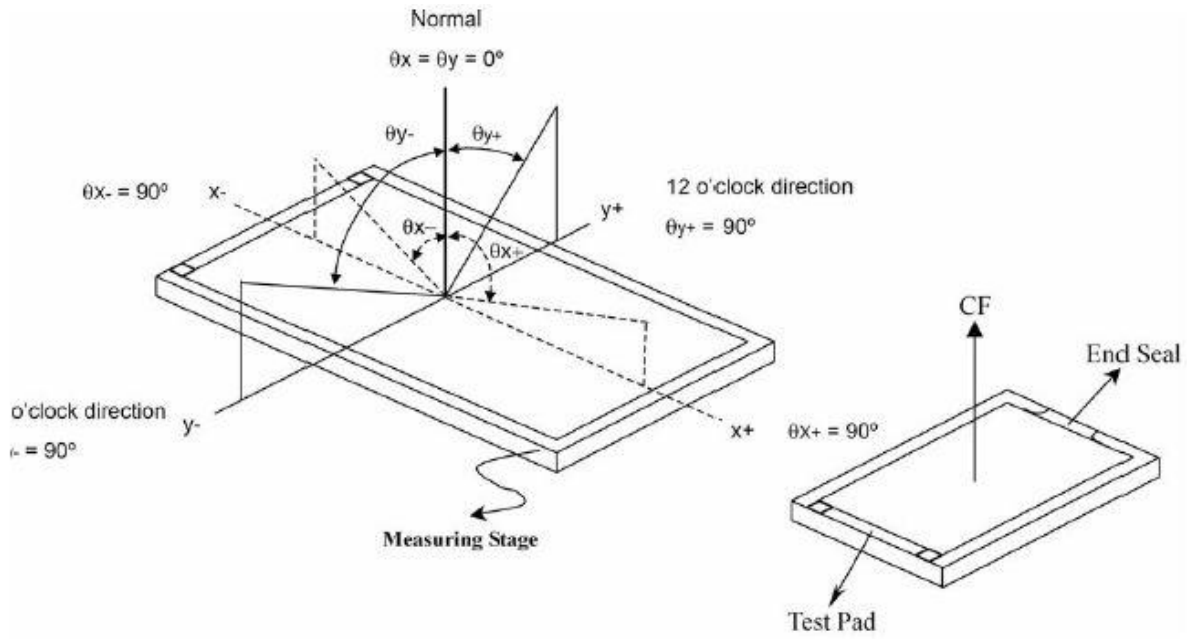
## 9. Electro-optical Characteristics

Item	Symbol	Conditions	Temp	Min.	Typ.	Max.	Unit	Note
Response Time	T <sub>R</sub>	θ = φ = 0	25°C		TBD	TBD	msec	NOTE2
	T <sub>F</sub>				TBD	TBD		
Viewing Angle Range	φ = 0° (6" )	φ = 90° (3" )	φ = 180° (12" )			φ = 270° (9" )		NOTE3
θ (25°C) CR ≥ 10	TBD	TBD	TBD			TBD		NOTE3

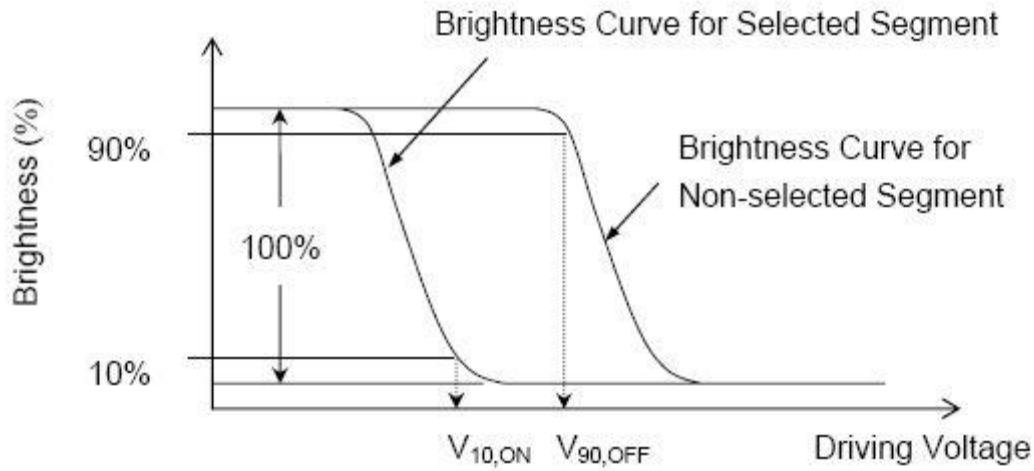
The above "viewing angle" is the measuring position with the largest contrast ratio. Not for good image quality.

Viewing direction for good image quality is 12 O'clock.

- For panel only
- Electro-Optical Characteristics Test Method

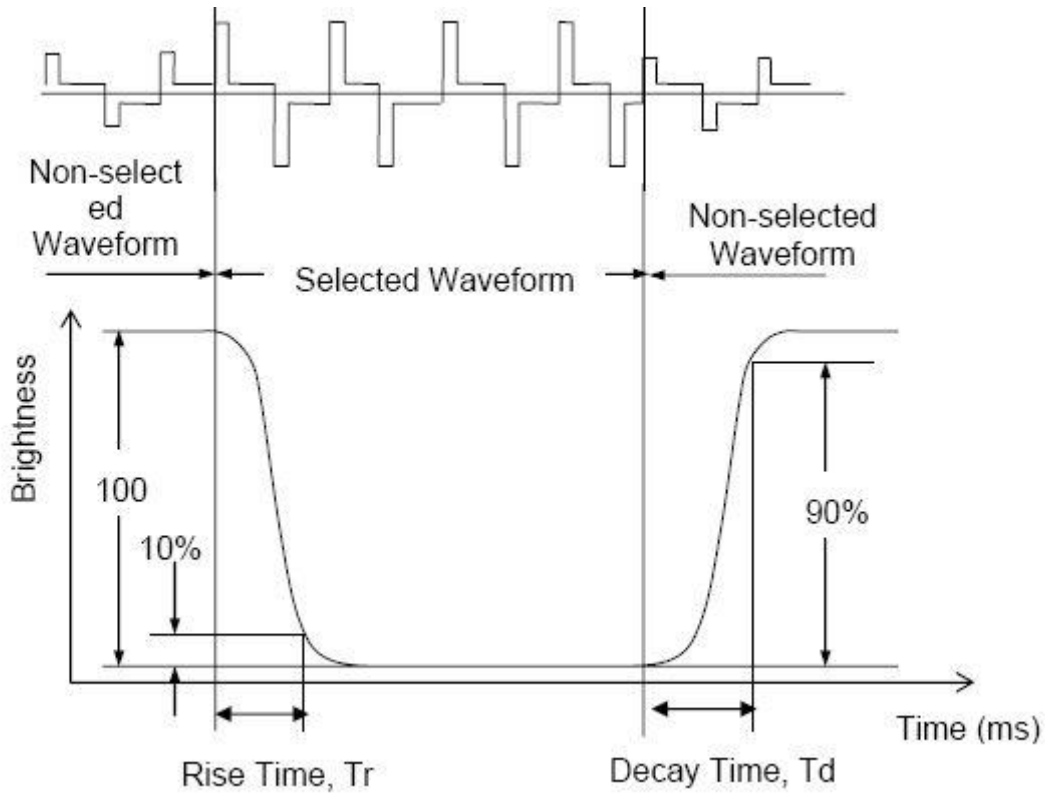


$$V_{op} = (V_{10, ON} + V_{90, OFF})/2$$

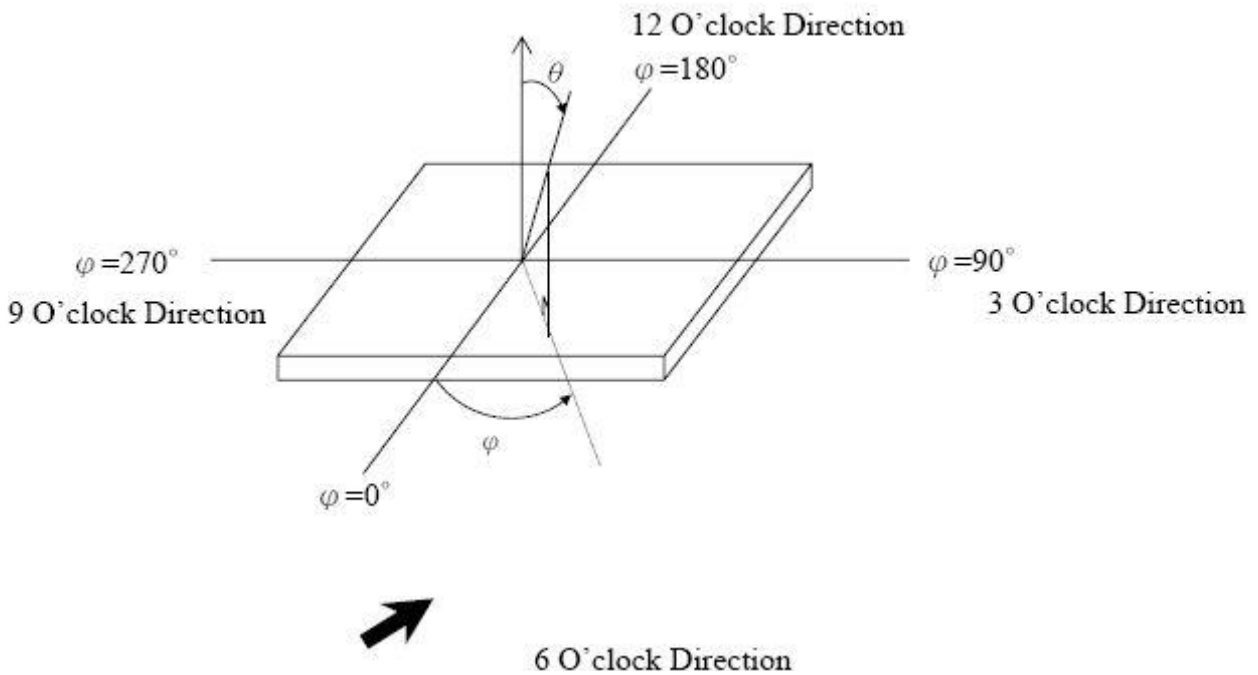




**.Note2.Definition of Optical Response Time:**



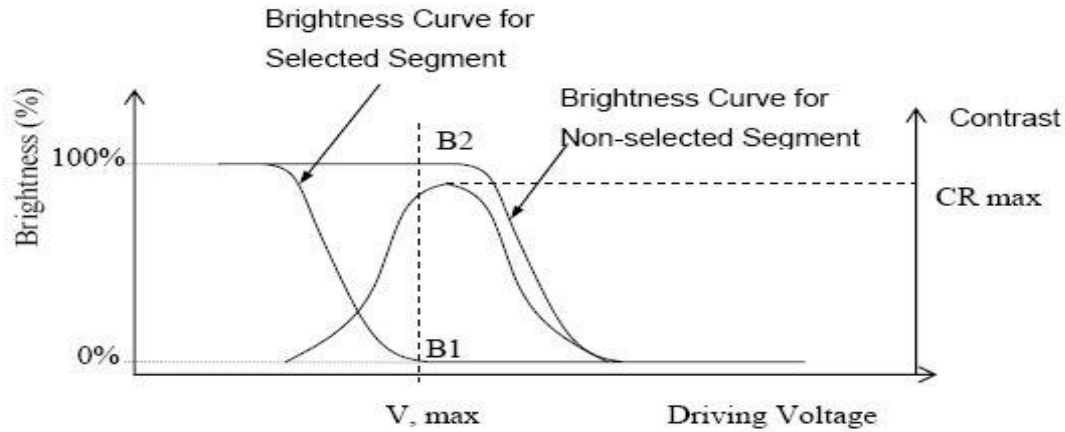
**.Note3.Definition of Viewing Angle  $\theta$  and  $\phi$  :**





## Note4.Definition of Contrast ratio (CR):

$$CR = \frac{\text{Brightness of Non-selected Segment (B2)}}{\text{Brightness of Selected Segment (B1)}}$$



## 10. Reliability

### 10.1MTBF

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal

### 10.2Test condition

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating Test	80°C*240Hrs	<ul style="list-style-type: none"> <li>◦ No Defect Of Operational Function In Room Temperature Are Allowable</li> <li>◦ IDD of LCM in Pre-and Post-Test Should Follow Specification</li> </ul>
2	Low Temperature Non-Operating Test	-30°C*240Hrs	
3	High Temperature/Humidity Non Operating Test	70°C*90%RH*240Hrs	
4	High Temperature Operating Test	70°C*240Hrs	
5	Low Temperature Operating Test	-20°C*240Hrs	
6	Thermal Shock Test	-20°C (30Min) ↔70°C (30Min) *10CYCLES	

Notes:

1. Judgments should be made after exposure in room temperature for two hours.
2. The distill water is used for the high temperature/humidity test.
3. The sample above is individually for every reliability tests condition.

## 11. Precautions for using LCD modules.

### 11.1 Safety

- (1)Do not swallow any liquid crystal ,even if there is no proof that liquid crystal is poisonous.
- (2)If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3)If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

### 11.2Srorang Conditions

- (4)Store the panel or module in a dark place where the temperature is  $23 \pm 5^\circ\text{C}$  and the humidity is below  $45 \pm 20\%RH$ .
- (5) Store in anti-static electricity container.



- (6) Store in clean environment, free from dust, active gas, and solvent.
- (7) Do not place the module near organics solvents or corrosive gases.
- (8) Do not crush, shake, or jolt the module.

## 11.3 Handling Precautions

- (9) Avoid static electricity, which can damage the CMOS LSI.
- (10) The polarizing plate of the display is very fragile, please handle it very carefully.
- (11) Do not give external shock.
- (12) Do not apply excessive force on the surface.
- (13) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (14) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (15) Do not operate it above the absolute maximum rating.
- (16) Do not remove the panel or frame from the module.

## 11.4 Warranty

The period is within twelve months since the date of shipping out under normal using and storage conditions.

## 12. Revision history

Version	Revise record	Date
A	Original version	-----

## 13. Inspection standards

### 13.1. AQL (Acceptable Quality Level)

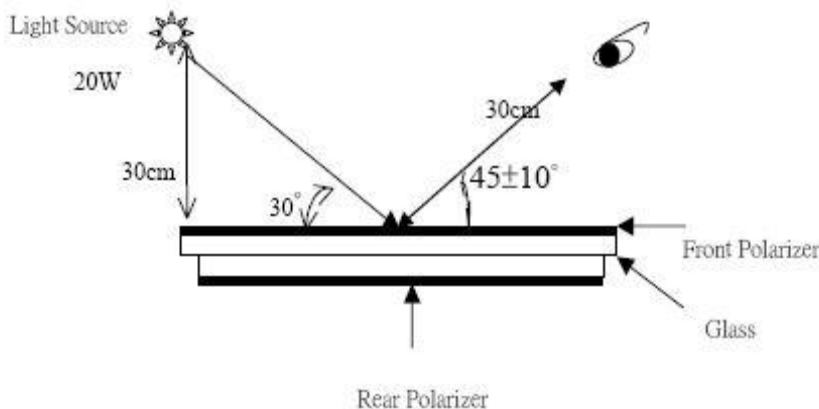
AQL of major or minor defect.

	MAJOR DEFECT	MINOR DEFECT
AQL	0.65	1.5

### 13.2. Basic conditions for inspection

The LCM face to us, in normal environment, the lux is  $1000 \pm 200$ . (Darkroom's lux:  $100 \pm 50$ ), About an angle of incidence  $30^\circ$ , a distance of 30 cm with an angle of  $45 \pm 10^\circ$  to check the products without uncovering the film!

(As shown below)


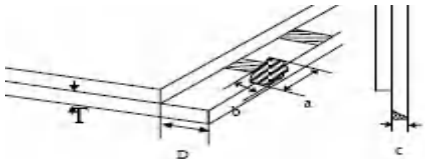
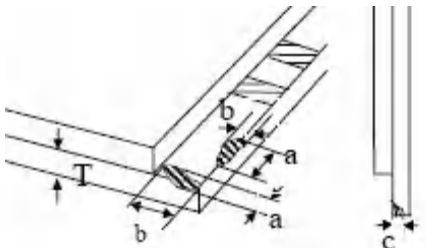
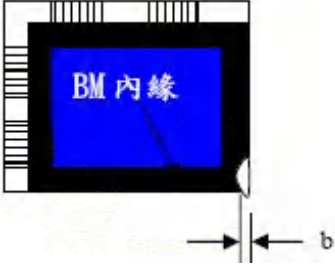




## 13.3. Inspection item and criteria

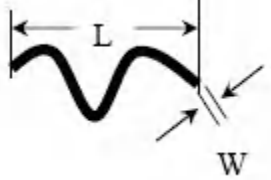
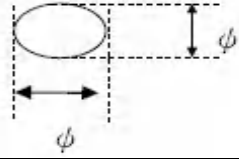
### 13.3.1 Visual inspection criterion in immobility

#### 13.3.1.1 Glass defect

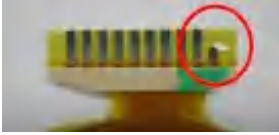
NO	Defect item	Criteria	Remark
1	Dimension Unconformity (Major defect)	By Engineering Drawing	
2	Cracks (Major defect)	1. Linear cracks panel <b>【Reject】</b> 2. Nonlinear crack contrast by limited sample	
3	Glass extrude the conductive area (minor defect)	a: disregards and no influence assemblage. 1) $b \leq 1/3$ Pin width (non bonding area) <b>【Accept】</b> 2) bonding area $\leq 0.5$ mm <b>【Accept】</b>	A: Length, b: Width
4	Pin-side ,conductive area damaged (minor defect)	(a c: disregards) $b \leq 1/3$ of effective length for bonding electrode <b>【Accept】</b>	a: length, b: Width, c: Thickness 
5	Pin-side, non-conductive area damaged (minor defect)	1) Damage area don't touch the ITO (Including contraposition mark, except scribing mark) <b>【Accept】</b> 2) $C < T$ $b \equiv BM 1/3$ of width <b>【Accept】</b> 3) $c = T$ b not touch the seal glue <b>【Accept】</b> 4) a disregards	a: Length, b: Width c: Thickness 
6	Non-pin-side damage (minor defect)	$c < T$ 1) b exceeds $1/3 B_m$ <b>【Reject】</b> $c = T$ b not touch the seal glue <b>【Reject】</b>	c: Thickness b: width of  damage



## 13.3.1.2LCD appearance defect (View area)

NO	Defect item	Criteria		Remark
1	Fiber、 glass	Specification	Allowable	note1:L: Length, W: Width
	scratch、 polarizer scratch/folded (minor defect)	$W \leq 0.03\text{mm}$	disregard	note2: disregard if out of AA 
		$0.03\text{mm} < W \leq 0.05\text{mm};$ $L \leq 3.0\text{mm}$	2	
		$0.05\text{mm} < W \leq 0.1\text{mm};$ $L \leq 3.0\text{mm}$	1	
		$W > 0.1\text{mm}; L > 3.0\text{mm}$	0	
2	Polarizer bubble、 concave and convex (minor defect)	$\phi \leq 0.2\text{mm}$	disregard	note1: $\phi = (L+W)/2$ , L:Length, W :Width note2:disregard if out of AA
		$0.2\text{mm} < \phi \leq 0.3\text{mm}$	2	
		$0.3\text{mm} < \phi \leq 0.5\text{mm}$	1	
		$0.5\text{mm} < \phi$	0	
3	Black dots、 dirty dots、 impurities、 eye winker (minor defect)	$\phi \leq 0.15\text{mm}$	disregard	note2:disregard if out of AA 
		$0.15\text{mm} < \phi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \phi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \phi$	0	
4	Polarizer prick (minor defect)	$\phi \leq 0.1\text{mm}$	disregard	note1: $\phi = (L+W)/2$ , L=Length, W=Width note2:the distance between two dots>5mm
		$0.1\text{mm} < \phi \leq 0.25\text{mm}$	3	
		$\phi > 0.25\text{mm}$	0	

## 13.3.1.3FPC

NO	Defect item	Criteria		Remark
1	Copper screen peel (minor defect)	Copper screen peel 【Reject】		
2	No release tape or peel	No release tape or peel 【Reject】		
3	Dirty dot and impurity of FPC for customer using side (minor defect)	Specification	Allowable	Note1: Cannot have stride ITO impurities
		$\phi \leq 0.25\text{mm}$	2	
		$\phi > 0.25$	0	





## 13.3.1.4 Black tape & Mara tape

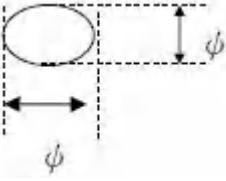
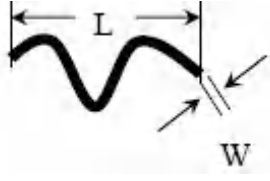
NO	Defect item	Criteria	Remark
1	FPC or H/S black tape (minor defect)	1. shift spec: 1) glue to the polarize <b>【Reject】</b> 2) IC bare <b>【Reject】</b> 2. left-and-right spec: 1) exceed of FPC edge or H-S edge <b>【Reject】</b> 2) IC bare <b>【Reject】</b>	<p>The diagram illustrates the assembly of an LCD panel. It shows the LCD panel at the top, with a Mara tape attached to its bottom edge. The Mara tape is secured by a Heat Seal. Dimensions are indicated: 'x' for the width of the Mara tape, 'y1' for the vertical offset from the LCD edge, 'x1' for the width of the Heat Seal, and 'y2' for the vertical offset from the Heat Seal edge.</p>
2	No black tape (major defect)	No black tape <b>【Reject】</b>	
3	Tape position mistake (minor defect)	Not by engineering drawing	
4	Mara tape defect (minor defect)	Peel before pulling the protecting film <b>【Reject】</b>	

## 13.3.1.5 Silicon and Taffy glue

NO	Defect item	Criteria	Remark
1	Quantity of silicon (major defect)	Uncover the ITO and circuit area <b>【Reject】</b>	note: compared by engineering
2	Taffy glue (major defect)	1. Uncover the reveal copper area <b>【Reject】</b> 2. Cover layer 0.3mm(Min)~3.0mm(Max) <b>【Reject】</b>	note: if customer has special requirement, refer to the technical document <p>The diagram shows a cross-section of a layer with a maximum thickness of 3.0mm. The layer is shown as a series of horizontal lines, with a dimension line indicating the thickness.</p>
3	Depth of glue covering (major defect)	Depth of glue covering overtop front Polarizer <b>【Reject】</b>	Except of the special requirement



## 13.3.2 Electrical criteria

NO	Defect item	Criteria	Remark	
1	No display (major defect)	No display 【Reject】		
2	Missing line (major defect)	Missing line 【Reject】		
3	Seg-com light and dark (major defect)	Seg-com light and dark 【Reject】	ND filter 2% test	
4	No display in immobility (major defect)	No display in immobility 【Reject】		
5	Flicker of Pattern (major defect)	Flicker of Pattern 【Reject】		
6	Mura (major defect)	ND filter 2% test		
7	Over current (major defect)	Over current 【Reject】		
8	Voltage out of specification (major defect)	Voltage out of specification 【Reject】		
9	Pattern blur, error code (major defect)	Pattern blur, error code 【Reject】		
10	Dark light, Flicker (major defect)	Dark light, Flicker 【Reject】		
11	Black/white dots、 Dirty dots、 eye winker (major defect)	Specification	Allowable	Note1:disregard if out of AA 
		$\phi \leq 0.15\text{mm}$	disregard	
		$0.15\text{mm} < \phi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \phi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \phi$	0	
12	Fiber、 glass crutch、 Polarizer scratch/folded (major defect)	$W \leq 0.03\text{mm}$	disregard	Note1:L: Length, W: Width Note2: disregard if out of AA 
		$0.03\text{mm} < W \leq 0.05\text{mm}$ $L \leq 3.0\text{mm}$	2	
		$0.05\text{mm} < W \leq 0.1\text{mm}$ $L \leq 3.0\text{mm}$	1	
		$W > 0.1\text{mm}; L > 3.0\text{mm}$	0	