



华田信科电子有限公司  
HTDISPLAY ELECTRONICS CO.,LTD.

The professional LCD manufacturer

[www.htdisplay.com](http://www.htdisplay.com)

SPECIFICATIONS

Product Name: LCM

Model PartNumber: HT240028G-HQ-RTP

Revision: V0

Date: 2012.12.21

Prepared By:	Reviewed By:	Approved By:
HT		

\_\_\_\_\_

Customer: \_\_\_\_\_

Custoer Approved Result: \_\_\_\_\_  OK  NG

Custoer Confirmed Message: \_\_\_\_\_

\_\_\_\_\_

Approved By: \_\_\_\_\_ Date: \_\_\_\_\_



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## 1. General Description

HT240028G-HQ-RTP is a transmissive type a-Si TFT-LCD (amorphous silicon thin film transistor liquid crystal display) module, which is composed of a TFT-LCD panel, a driver circuit and a backlight unit. The panel size is 2.8 inch and the resolution is 240\*320, the panel can display up to 262K colors. The LCM can be easily accessed by micro-controller via MCU interface.

## 2. Physical Features

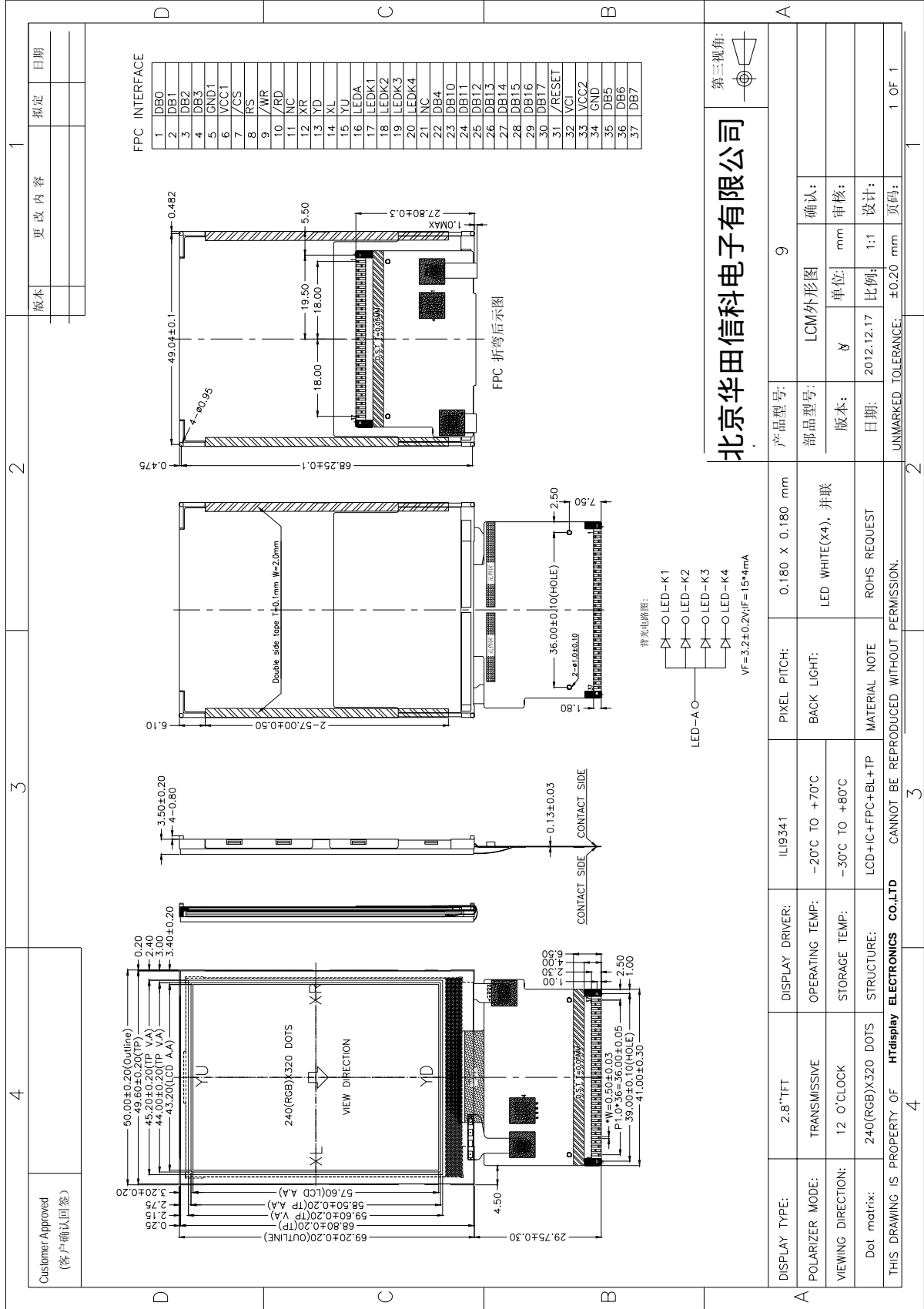
Display Mode	TFT-LCD Module
	Active matrix TFT, Transmissive type
Display Format	Graphic 240×RGB×320 Dot-matrix
Input Data	The Data input by MCU interface
Viewing Direction	12 O'CLOCK
Drive	ILI9341

## 3. Mechanical Specification

Item	Contents	Unit
Module size (W×H×T)	50.00× 69.20× 3.50	mm
Number of dots	240(RGB) × 320	---
Active area (W×H)	43.20×57.60	mm



## 4. Outline Dimension





## 5. Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VCC	-0.3	4.6	V	
Input Voltage	VIN	-0.3	VCC+0.3	V	
Operating temperature	TOPR	-20	70	°C	
Storage temperature	TSTR	-30	80	°C	
Humidity	---	---	90	%RH	---

If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

## 6. Electrical Characteristics

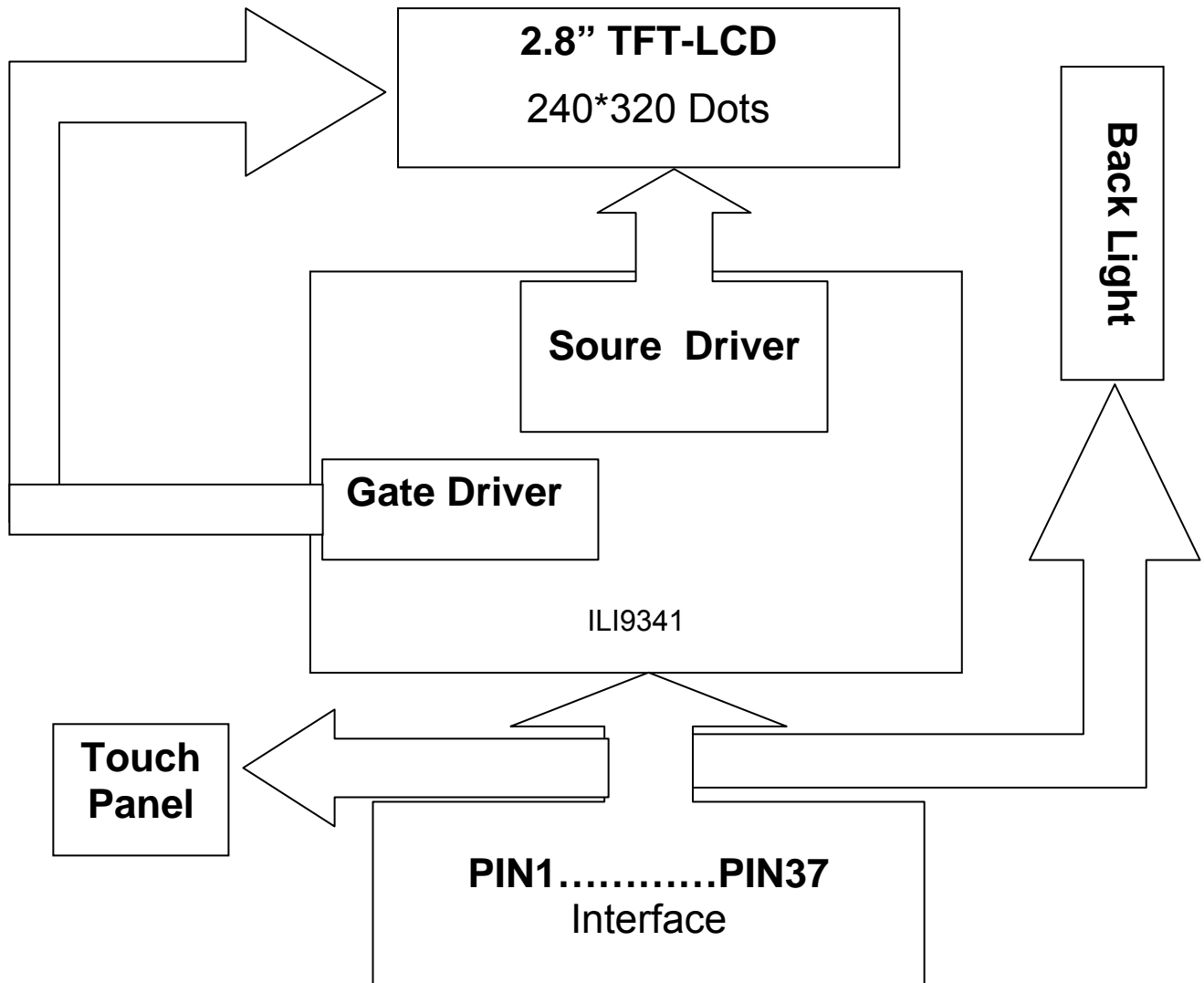
Item		Symbol	Rating			Unit	Remark
			Min	Typ	Max		
Power Voltage	Logic	VCC	2.5	2.8	3.3	V	Note1
Input Voltage	L level	VIL	VSSD	---	0.3IOVCC	V	IOVCC= 1.65- 3.3V
	H level	VIH	0.7IOVCC	---	IOVCC	V	
LCD Drive Power current		ILCD	---	---	---	mA	---

Remark:

Note1:Vcom must be adjusted to optimize display quality: Cross-talk, Contrast Ratio and etc.

## 7. Module Function Description

### 7-1. Block Diagram Of LCM





## 7-2. Pin Description

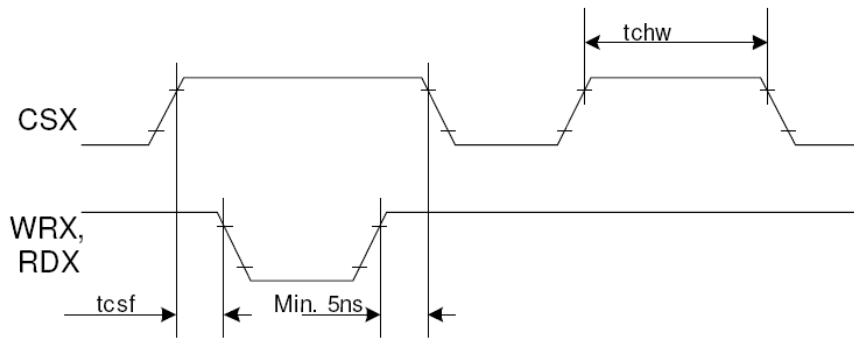
PIN NO.	Symbol	I/O	Description
1~4	DB0-DB3	I/O	Data Bus
5	GND	P	Ground
6	VCC1	P	Digital IO Pad power supply(1.8V/2.8V)
7	/CS	I	Chip select pin
8	RS	I	Command and Data select pin
9	/WR	I	Write enable pin
10	/RD	I	Read enable pin
11	NC	I	NC
12	XR	I	Touch panel connect PIN
13	YD	I	Touch panel connect PIN
14	XL	I	Touch panel connect PIN
15	YU	I	Touch panel connect PIN
16	LEDA	BL POWER SUPPLY	Anode pin of backlight
17-20	LEDK1-4	BL POWER SUPPLY	Cathode pin of backlight
21	NC	NC	NC
22	DB4	I/O	Data Bus
23-30	DB8-DB15	I/O	Data Bus
31	/RESET	I	Reset pin.
32	VCI	P	Analog power supply
33	VCC2	P	Analog power supply
34	GND	P	Ground
35-37	DB5-DB7	I/O	Data Bus





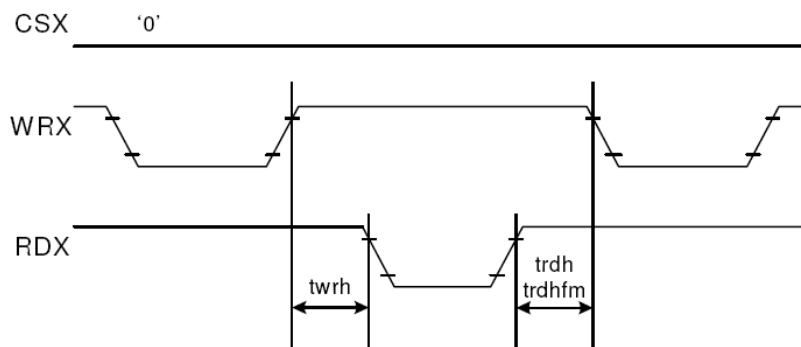


CSX timings :



Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Write to read or read to write timings:



Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

## 8. Backlight Characteristics

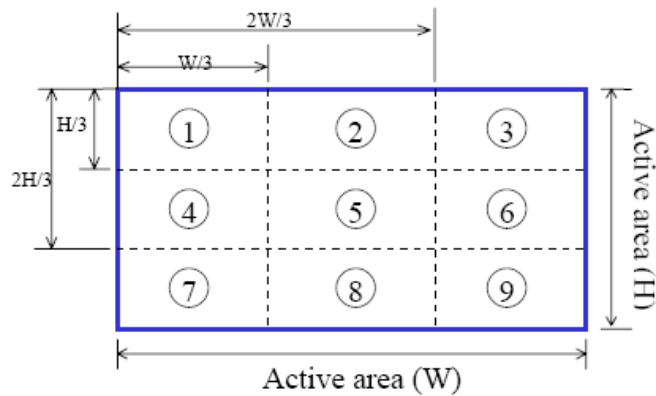
Item	Symbol	Min	Typ	Max	Unit	Remark
Forward voltage	$V_{BL}$	-	3.2	-	V	-
Current	$I_{BL}$	-	60	-	mA	-
ICE	X	0.26	-	0.31	-	-
	Y	0.26	-	0.31	-	-
Brightness	-	3200	-	-	cd/m <sup>2</sup>	★1
Uniformity	-	80	-	-	%	★2

★1 Test condition is :

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

★2 Uniform measure condition :

- (1) Measure 9 point. Measure location is show below :
- (2)  $Uniform = (Min. \text{ brightness} / Max. \text{ brightness}) \times 100\%$
- (3) Best Contrast.

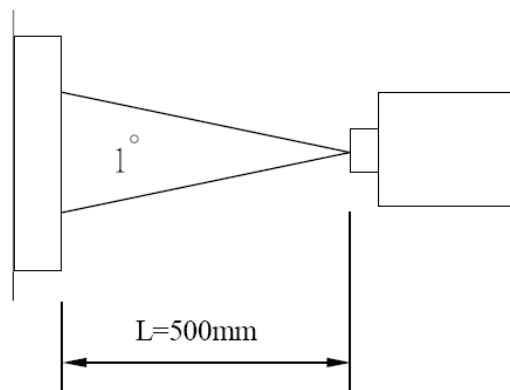


## 9. Electro-Optical Characteristics

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK	
Transmittance	T			(5.8)		%		
Contrast Ratio	CR	$\theta = \psi = 0^\circ$		(300)		--	Note 3	
Response Time	Tr+ Tf	$\theta = \psi = 0^\circ$		(25)		ms	Note 4	
Viewing Angle	Upper	$\theta$	$CR \geq 10$		(60)		$^\circ$	Note 5
	Down				(55)		$^\circ$	
	Right	$\psi$			(50)		$^\circ$	
	Left				(50)		$^\circ$	
Color Filter Chromacicity	White	x	$\theta = \phi = 0^\circ$	(0.288)	(0.308)	(0.328)	--	Note 6
		y		(0.319)	(0.339)	(0.359)	--	
		Y		(27.1)	(30.1)	(33.1)	--	
	Red	x	$\theta = \phi = 0^\circ$	(0.632)	(0.652)	(0.672)	--	
		y		(0.311)	(0.331)	(0.351)	--	
		Y		(14.8)	(17.8)	(20.8)	--	
	Green	x	$\theta = \phi = 0^\circ$	(0.294)	(0.314)	(0.334)	--	
		y		(0.555)	(0.575)	(0.595)	--	
		Y		(53.7)	(57.7)	(61.7)	--	
	Blue	x	$\theta = \phi = 0^\circ$	(0.118)	(0.138)	(0.158)	--	
		y		(0.112)	(0.132)	(0.152)	--	
		Y		(11.8)	(14.8)	(17.8)	--	
NTSC			--	(61)	--	%		

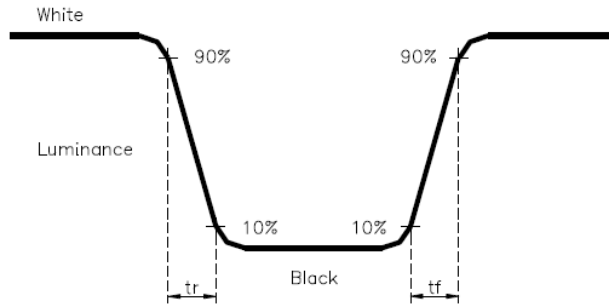
Note 1. Ambient condition :  $25^\circ\text{C} \pm 2^\circ\text{C}$  ,  $60 \pm 10\% \text{RH}$  , under 10 Lunx in the darkroom .  
Lighting the LCM and measuring after 10 minutes.

Note 2. Measure device : BM-5AS (TOPCON) , viewing cone= $1^\circ$  ,  $I_{\text{Led}}=20 \text{ mA}$  .

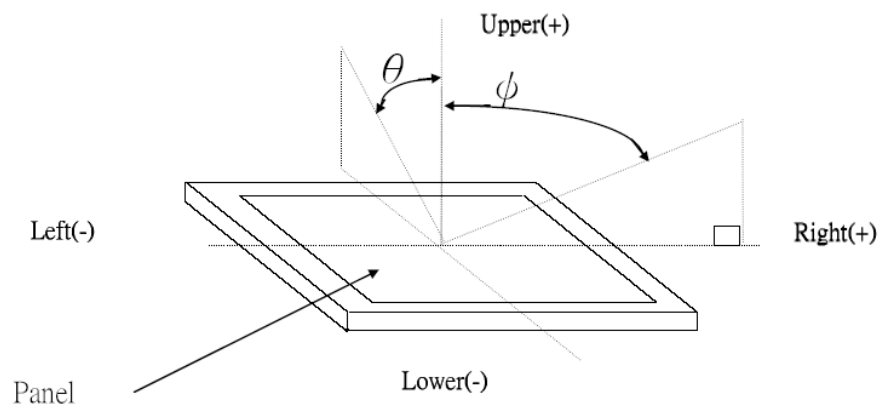


Note 3. Definition of Contrast Ratio :  
 $CR = \text{White Luminance (ON)} / \text{Black Luminance (OFF)}$

Note 4. Definition of response time : The response time is defined as the time interval between the 10% and 90% amplitudes.



Note 5. Definition of view angle( $\theta$  ,  $\psi$ ) :



Note 6. Light source: C light.



## 10. Reliability

### 10.1. MTBF

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal. (25°C in the room without sunlight)

### 10.2. Test condition

ITEM	CONDITIONS	CRITERION
OPERATING TEMPERATURE	HIGH TEMPERTURE +70°C 48HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERTURE -20°C 48HRS	
STORAGE TEMPERATURE	HIGH TEMPERTURE +80°C 48HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERTURE -30°C 48HRS	
HUMIDITY	60°C 90%RH 48HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION

## 11. Inspection Standards

### 1. AQL(Acceptable Quality Level)

AQL of major and minor defect

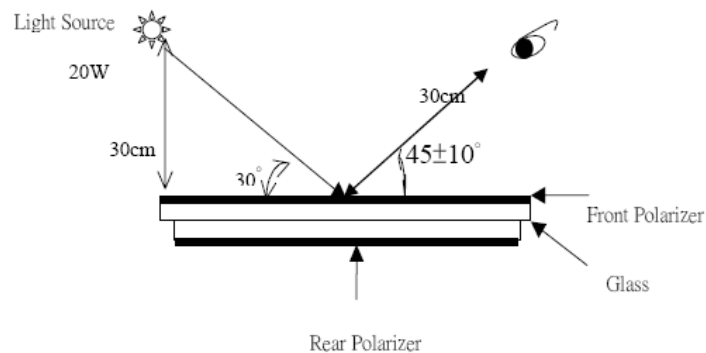
	MAJOR DEFECT	MINOR DEFECT	MAJOR+MINOR
APPEARANCE	0.40%	1.0%	1.0%
ELECTRIC-OPTICAL	0.15%	0.15%	0.15%

### 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 30cm with normal eye, with an angle of  $45^\circ$  to check the products without uncovering the film!

(As shown below)

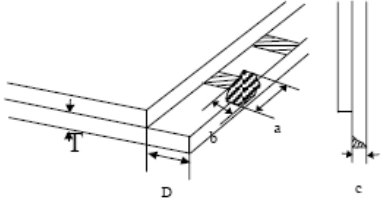
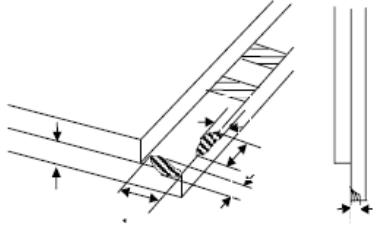


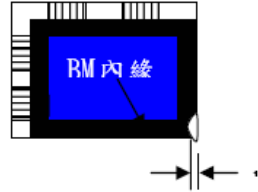
### 3. Inspection item and criteria

#### 3.1 Visual inspection criterion in immobility

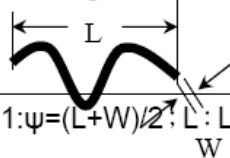
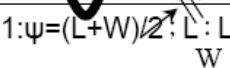
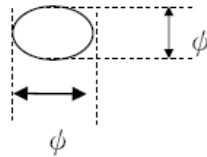
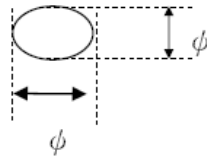
##### 3.1.1 Glass defect

No	Defect item	Criteria	Remark
1	Dimension Unconformity  (Major defect)	By Engineering Drawing	

No	Defect item	Criteria	Remark
2	Cracks  (Major defect)	1.Linear cracks on panel 【Reject】 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) 【Accept】 2) bonding area $\leq 0.5$ mm 【Accept】	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  【Accept】	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) 【Accept】 2) $c < T$ $b \leq BM$ 1/3 of width 【Accept】 3) $c = T$ b not touch the seal glue 【Accept】 4) a disregards	a:Length · b:Width · c:Thickness 

No	Defect item	Criteria	Remark
6	Non-pin-side damage  (minor defect)	$c < T$  1) b exceeds 1/3 BM  <b>【Reject】</b>	c : Thickness    b: width of damage  
		$c = T$ b not touch the seal glue  <b>【Reject】</b>	

### 3.1.2 LCD appearance defect (View area)

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





### 3.1.3 .FPC

No	Defect item	Criteria		Remark
1	Copper screen peel (Major defect)	Copper screen peel 【 Reject】		
2	No release tape or peel (Major defect)	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
		$\psi \leq 0.25\text{mm}$	2	
		$\psi > 0.25$	0	

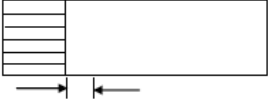
### 3.1.4 Black tape & Mara tape

1	FPC or H/S black tape shift  (minor defect)	1.shift spec: 1)glue to the polarize 【 Reject】 2) IC bare 【 Reject】 2. left-and-right spec: 1) exceed of FPC edge or H-S edge 【 Reject】 2)IC bare 【 Reject】	
2	No black tape (Major defect)	No black tape 【 Reject】	
3	Tape position mistake (minor defect)	Not by engineering drawing 【 Reject】	
4	Mara tape defect  (minor defect)	Peel before pulling the protecting film. 【 Reject】	

### 3.1.5 Silicon and Tuffy glue

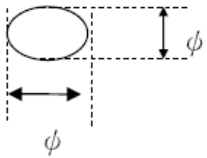
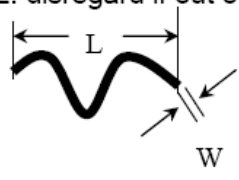
No	Defect item	Criteria	Remark
1	Quantity of silicon (minor defect)	Uncover the ITO and circuit area. 【 Reject】	note: compared by engineering drawing.



No	Defect item	Criteria	Remark
2	Tuffy glue (minor defect)	1. Uncover the reveal copper area 【Reject】 2. Cover layer 0.3mm(Min) ~ 3.0mm(Max) 【accept】	note:if customer has special requirement , refer to the technical document. 
3	Depth of glue covering (minor defect)	Depth of glue covering overtop front Polarizer 【Reject】	Except of the special requirement .

### 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】	

No	Defect item	Criteria	Allowable	Remark
11	Black/White dots · Dirty dots · eyewinker  (Major defect)	Specification	Allowable	Note1: disregard if out of AA  
		$\psi \leq 0.15\text{mm}$	disregard	
		$0.15\text{mm} < \psi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \psi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \psi$	0	
12	Fiber · glass cratch · polarizer scratch/folded  (minor 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	



## 12. Precautions For Using LCD Modules

Please pay attentions to the followings as using the LCD module.

### 12.1 Handling

- (a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.
- (b) Because the ITO film very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.
- (c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.
- (d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.
- (e) Wipe off water droplets or oil immediately.
- (f) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.
- (g) Do not touch the output pins directly with bare hands.
- (h) Do not disassemble the LCD module.

### 12.2 Storage

- (a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.
- (b) Do not expose the LCD modules to sunlight directly.
- (c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.
- (d) Avoid condensation of water. It may cause improper operation.
- (e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

### 12.3 Operation

- (a) When mounting or dismounting the LCD modules, turn the power off.
- (b) Protect the LCD modules from electric shock.
- (c) The Driver IC control algorithms stated above should always obeyed to avoid damaging the LSI and electronic circuit.
- (d) Be careful to avoid mixing up the polarity of power supply for backlight.



- (e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.
- (f) When a static image is displayed for a long time, remnant image is likely to occur.
- (g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.

## 12.4 Others

- (a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.
- (b) It is recommended to peel off the protection film on the ITO film slowly so that the electrostatic charge can be minimized.
- (c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.



### 13. Records Of Version

Version	Revise Date	Page	Content
V0	2012-12-21	All	New Version