

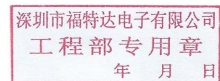


APPROVAL SHEET
承认书

Customer 客户名称	
Part NO. 产品型号	FSD27G8001-A
Product type 产品内容	Mode: Transmissive type .NormallyWhite. TFT LCD Module LCD Module: Graphic320RGB*240Dot-matrix
Remarks 备注栏	☐ APPROVAL FOR SEPCIFICATIONS ONLY ☒ APPROVAL FOR SEPCIFICATIONS AND SAMPLE
Signature by Customer: 客户确认签章	

LEAGEND LCM R&D CENTER:

Technical Department: 研发部门	Quality Assurance Department 质量保证部门	Approved by:核准
Iijian	LaiYong	Kevin





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1. General Description

FSD27G8001-A is a transmissive type a-Si TFT-LCD module, which is composed of a TFT-LCD

panel, a driver circuit and a backlight unit. The panel size is 2.7 inch and the resolution is 320*240, the panel can display up to 16.7M colors.

2. Physical Features

Display Mode	TFT-LCD Module
	Active matrix TFT, Transmissive type
Display Format	Graphic320 ×240 Dot-matrix
Input Data	Serial 8bit RGB interface
Viewing Direction	6 O'clock
Driver IC	ILI8961

3. Mechanical Specification

Item	Contents	Unit
Module size	67.45 × 39.05× 2.40	mm
Number of dots	320×240	---
Active area	58.8 × 33.06	mm

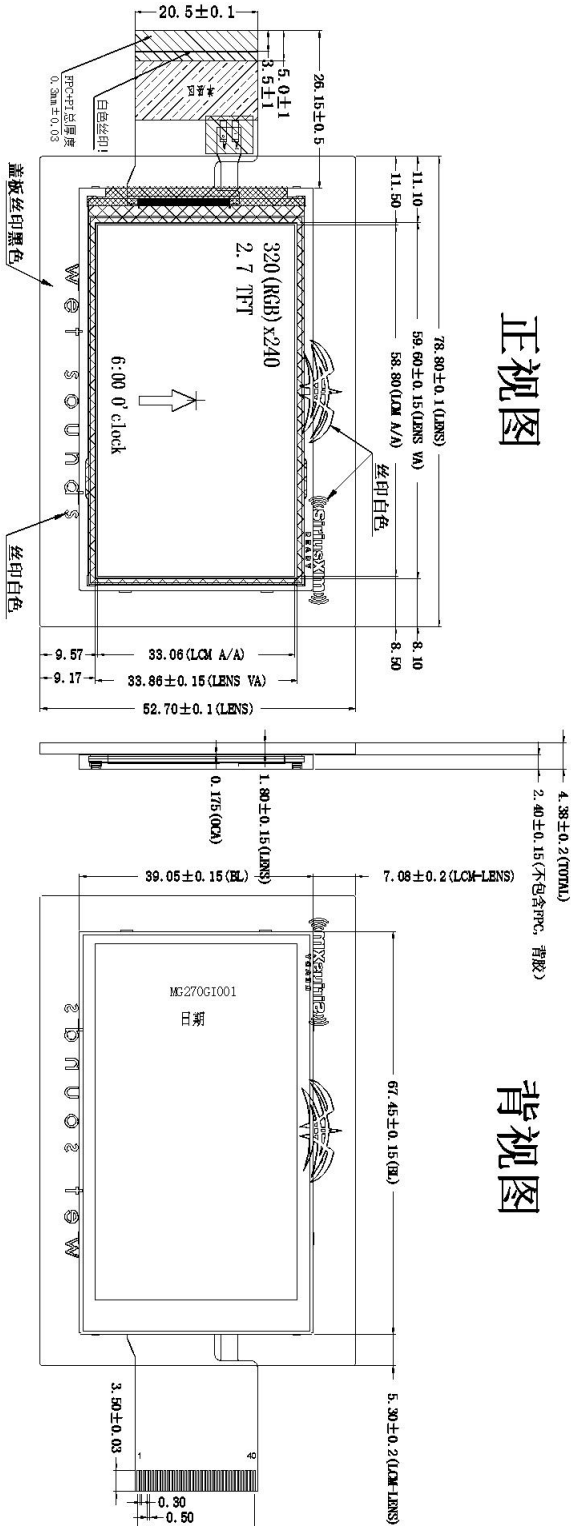


REV.	DESCRIPTION OF MODIFY	MODIFY BY:	DATE
A0	1'ST DESIGN		2024-06-22

侧视图

正视图

背视图



FPC展开出货



技术要求:

- 1 UV精工油墨 过UV和盐雾测试
- 2、盖板材质为旭硝子: 6H
- 3、无细小崩角、崩边、无积墨现象、无针孔漏光、无划伤沾污等。
- 4、盖板按键字符, L060粗细公差为±0.05mm
- 5、标注尺寸和公差都为管控尺寸;未注公差±0.10mm
- 6、符合BHS-001标准

福建福盛达电子有限公司

LCM NO:GB+LCM_FSD27G8001-A

UNIT: MM	SCALE:	FIT	DESIGNED BY:	CHECKED BY:	APPROVED BY:
	SHEET:	1 OF 1			
	DATE				



5. Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit
Supply voltage	VDD	-0.3	9	V
Intreface supply voltage	VDDIO	-0.3	VDD+0.3	V
Operating temperature	TOPR	-20	70	°C
Storage temperature	TSTR	-30	80	°C

Recommended operation range
(DGND=AGND= 0V, TA = -10 to 60°C)

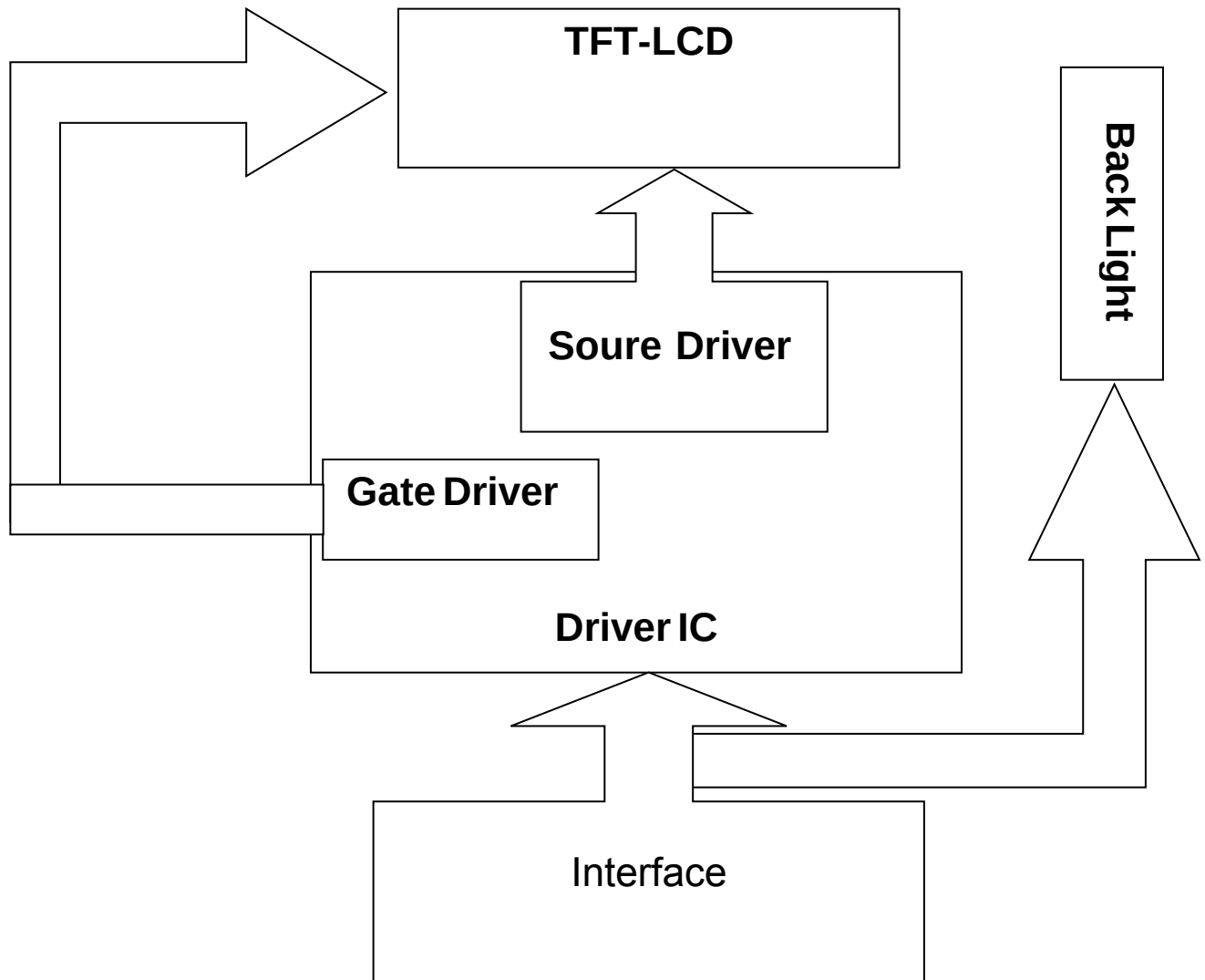
Item	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	VDD	8.7	9.3	9.6	V
Intreface supply voltage	VDDIO	7.65	9.3	VDD	V

6. Electrical Characteristics

Item		Symbol	Rating			Unit	Remark
			Min	Typ	Max		
Power Voltage		VDDIO	7.65	9.3	9.6	V	---
		VDD	8.7	9.3	9.6	V	---
Input Voltage	L level	VIL	GND	---	0.3*VDDIO	V	---
	H level	VIH	0.7*VDDIO	---	VDDIO	V	
LCD Drive Power current		ILCD	---	20	---	mA	---

7. Module Function Description

7-1. Block Diagram Of LCM





7-2. Pin Description

PIN NO.	Symbol	Description
1	VCOM	Common electrode driving voltage
2	LEDK	LED power cathode
3	LED A	LED power anode
4	DRV	VLED boost transistor for VCOM AC
5	VCAC	Power setting
6	VCOMDC	VCOM DC voltage output pin
7	FRP	Frame polarity output for VCOM
8	AGND	Ground terminal in the Analog circuit
9	VGL	Power setting capacitor connect pin
10	VGH	Power setting capacitor connect pin
11	V4M	Capacitor connect pin for internal charge pump.
12	V4P	Capacitor connect pin for internal charge pump.
13	VINT3	Power setting capacitor connect pin.
14	VINT4	Power setting capacitor connect pin.
15	V3M	Capacitor connect pin for internal charge pump.
16	V3P	Capacitor connect pin for internal charge pump.
17	VINT1	Power setting capacitor connect pin.
18	V2M	Capacitor connect pin for internal charge pump.
19	V2P	Capacitor connect pin for internal charge pump.
20	V1M	Capacitor connect pin for internal charge pump.
21	V1P	Capacitor connect pin for internal charge pump.
22	DVDD	Charge Pump Power GND
23	IOVCC1.8V	Digital voltage input
24	VDD2.8V	Analog voltage input



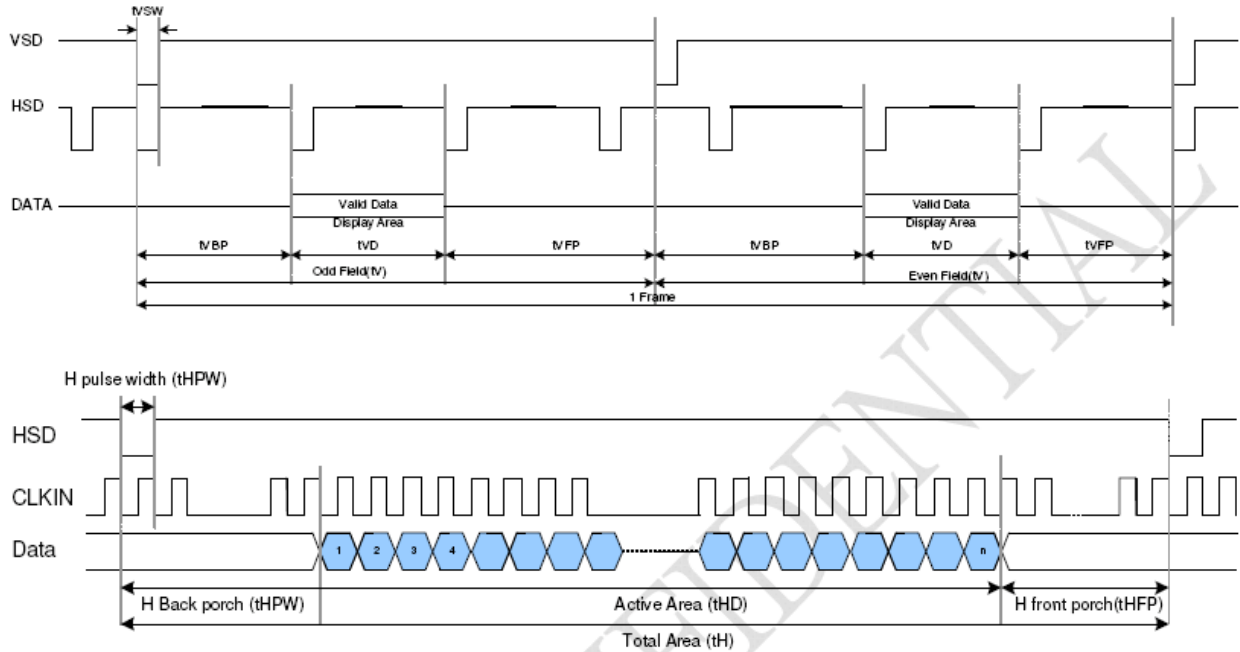
25	GND	Ground terminal in the logic circuit
26~33	D0~D7	Data bus
34	DCLK	Data clock input
35	VSYNC	Vertical sync input
36	HSYNC	Horizontal sync input
37	SCL	Serial command clock input
38	SDA	Serial command data input
39	CS	Serial communication chip select
40	VCOM	Common electrode driving voltage



7-3. Input Timing Waveform

7-3-1 Input Timing Chart

8-bit RGB/8-bit Dummy RGB/YUV /Parallel RGB Input Timing Chart



7-3-2 8-bit RGB Input Timing

Parameter	Symbol	Interface			Unit
		Min.	Typ.	Max.	
CLKIN frequency	fCLKIN	13.5	27	27.19	MHz
HSD period	tH	1024	1716	1728	CLKIN
HSD display period	tHD		960		CLKIN
HSD back porch	tHBP	50	70	255	CLKIN
HSD front porch	tHFP	14	686	718	CLKIN
HSD pulse width	tHSW	1	1	tHBP-1	CLKIN
VSD period time	tV	242.5	262.5	450.5	H
Vertical display area	tVD		240		H
VSD back porch	tVBP	1	21	31	H
		1.5	21.5	31.5	
VSD front porch	tVFP	1.5	1.5	179.5	H
		1	1	179	
VSD pulse width	tVSW	1CLKIN	1CLKIN	6H	
1 Frame		485	525	901	H

7-3-3 8-bit Dummy RGB Input Timing

8-bit Dummy RGB (320 mode/NTSC/24.535Mhz) Input Timing

Parameter	Symbol	Interface			Unit
		Min.	Typ.	Max.	
CLKIN frequency	fCLKIN	20.45	24.535	30	MHz
HSD period	tH	1306	1560	1907	CLKIN
HSD display period	tHD		1280		CLKIN
HSD back porch	tHBP	40	241	255	CLKIN
HSD front porch	tHFP	0	39	372	CLKIN
HSD pulse width	tHSW	1	1	200	CLKIN
VSD period time	tV	242.5	262.5	450.5	H
Vertical display area	tVD		240		H
VSD back porch	tVBP	1	21	31	H
		1.5	21.5	31.5	
VSD front porch	tVFP	1.5	1.5	179.5	H
		1	1	179	
VSD pulse width	tVSW	1	1	200	CLKIN
1 Frame		485	525	901	H



8-bit Dummy RGB (320 mode/PAL/24.375Mhz) Input Timing

Parameter		Symbol	Interface			Unit
			Min.	Typ.	Max.	
CLKIN frequency		fCLKIN	20.45	24.375	30	MHz
HSD period		tH	1306	1560	1920	CLKIN
HSD display period		tHD		1280		CLKIN
HSD back porch		tHBP	3	241	255	CLKIN
HSD front porch		tHFP	25	39	385	CLKIN
HSD pulse width		tHSW	1	1	200	CLKIN
VSD period time		tV	292.5	312.5	450.5	H
Vertical display area		tVD		288		H
VSD back porch	Odd field	tVBP	3	23	34	H
	Even field		3.5	23.5	34.5	
VSD front porch	Odd field	tVFP	1.5	1.5	128.5	H
	Even field		1	1	128	
VSD pulse width		tVSW	1	1	200	CLKIN
1 Frame			585	625	901	H

8-bit Dummy RGB (360 mode/NTSC/27Mhz) Input Timing

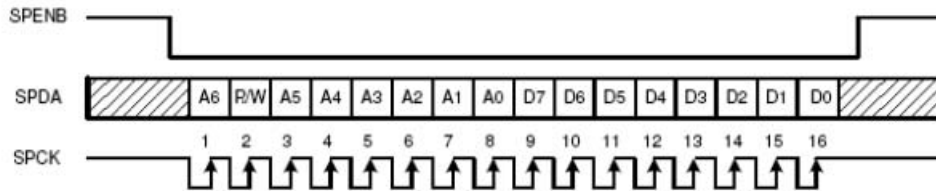
Parameter		Symbol	Interface			Unit
			Min.	Typ.	Max.	
CLKIN frequency		fCLKIN	23	27	30	MHz
HSD period		tH	1466	1716	1907	CLKIN
HSD display period		tHD		1440		CLKIN
HSD back porch		tHBP	3	241	255	CLKIN
HSD front porch		tHFP	25	35	212	CLKIN
HSD pulse width		tHSW	1	1	200	CLKIN
VSD period time		tV	242.5	262.5	450.5	H
Vertical display area		tVD		240		H
VSD back porch	Odd field	tVBP	1	21	31	H
	Even field		1.5	21.5	31.5	
VSD front porch	Odd field	tVFP	1.5	1.5	179.5	H
	Even field		1	1	179	
VSD pulse width		tVSW	1	1	200	CLKIN
1 Frame			485	525	901	H

8-bit Dummy RGB (360 mode/PAL/27Mhz) Input Timing

Parameter		Symbol	Interface			Unit
			Min.	Typ.	Max.	
CLKIN frequency		fCLKIN	23	27	30	MHz
HSD period		tH	1466	1728	1920	CLKIN
HSD display period		tHD		1440		CLKIN
HSD back porch		tHBP	3	241	255	CLKIN
HSD front porch		tHFP	25	47	225	CLKIN
HSD pulse width		tHSW	1	1	200	CLKIN
VSD period time		tV	292.5	312.5	450.5	H
Vertical display area		tVD		288		H
VSD back porch	Odd field	tVBP	3	23	34	H
	Even field		3.5	23.5	34.5	
VSD front porch	Odd field	tVFP	1.5	1.5	128.5	H
	Even field		1	1	128	
VSD pulse width		tVSW	1	1	200	CLKIN
1 Frame			585	625	901	H

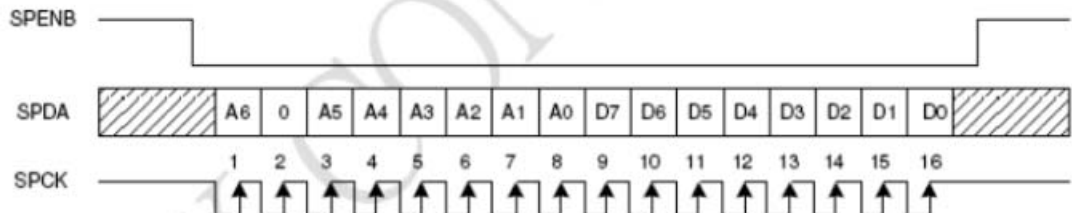
7-3-4 3-wire Serial Interface

3-Wire Serial command format

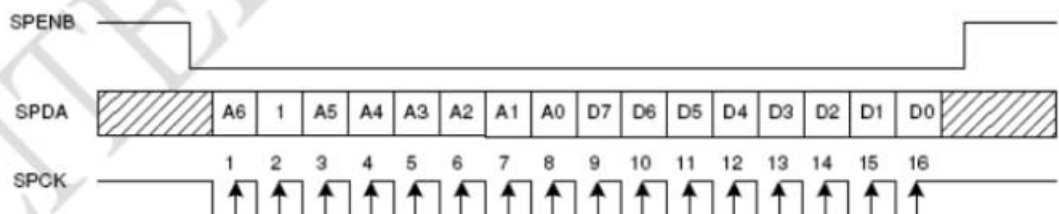


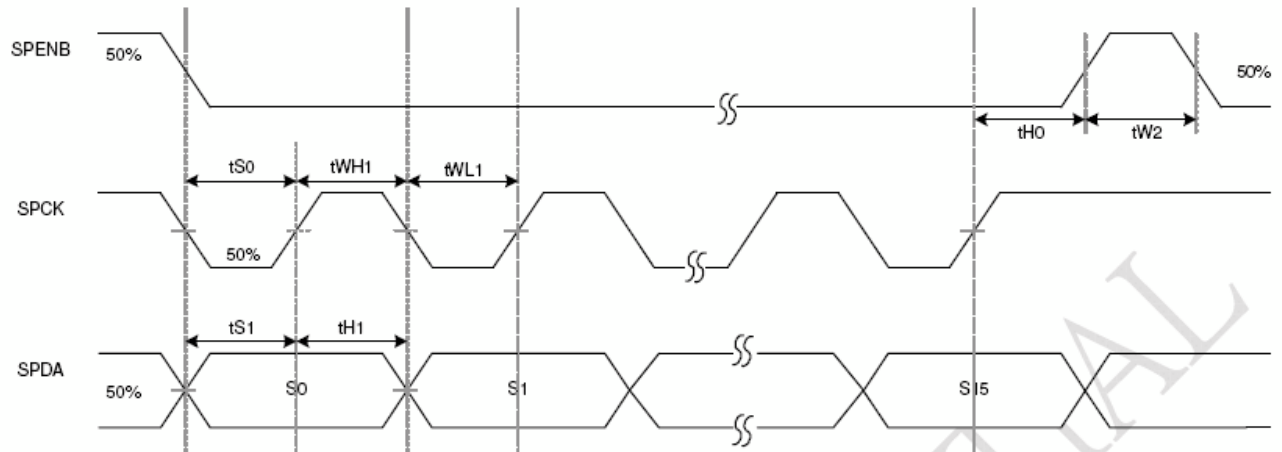
- Each serial command consists of 16 bits of data that is loaded one bit a time at the rising edge of serial clock SPCK. Command loading operation starts from the falling edge of SPENB and is completed at the next rising edge of SPENB.
- The serial control block is operational after power on reset, but commands are established by the VSD signal. If command is transferred multiple times for the same register, the last command before the VSD signal is valid.
- If less than 16 bits of SPCK are input while SPENB is low, the transferred data is ignored.
- If 16 bits or more of SPCK are input while SPENB is low, the first 16 bits of transferred data before the rising edge of SPENB pulse are valid data.
- Serial block operates with the SPCK clock.
- Serial data can be accepted in the power save modes.

Serial Interface Write Sequence



Serial Interface Read Sequence



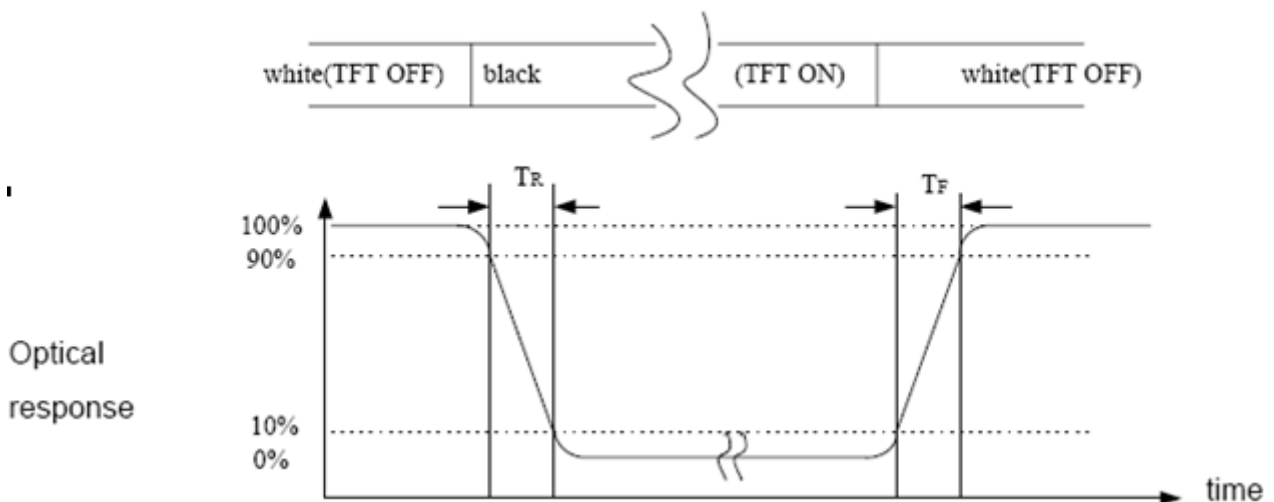


Item	symbol	Min.	Typ.	Max.	Unit
SPENB input setup time	tS0	50			ns
Serial data input setup time	tS1	50			ns
SPENB input hold time	tH0	50			ns
Serial Data Input hold time	tH1	50			ns
SPCK pulse high width	tWH1	50			ns
SPCK pulse low width	tWL1	50			ns
SPENB pulse high width	tW2	400			ns

8. Electro-Optical Characteristics

Item		Symbol	Condi tion	Min.	Typ.	Max.	Unit	Remark
Response time		Tr +Tf	$\theta_x = \theta_y = 0$	---	30	---	ms	Note 1
Contrast Ratio		CR		---	400	---	---	Note 2
Transmittance		T%		5.6	6.2	---	%	
Color chromaticity	white	Wx		0.286	0.296	0.306	---	Reference Only
		Wy		0.322	0.332	0.342		
	Red	Rx		0.593	0.603	0.613		
		Ry		0.312	0.322	0.332		
	Green	Gx		0.275	0.285	0.295		
		Gy		0.535	0.545	0.555		
	Blue	Bx		0.137	0.147	0.157		
		By	0.153	0.163	0.173			
NTSC			---	48.2%	---			
Viewing angle		U	$CR \geq 10$	55	65	---	Deg.	Note 3
		D		40	50	---		
		R		50	60	---		
Luminance ($I_F = 40mA$				250	300	350	cd/m ²	Note 4

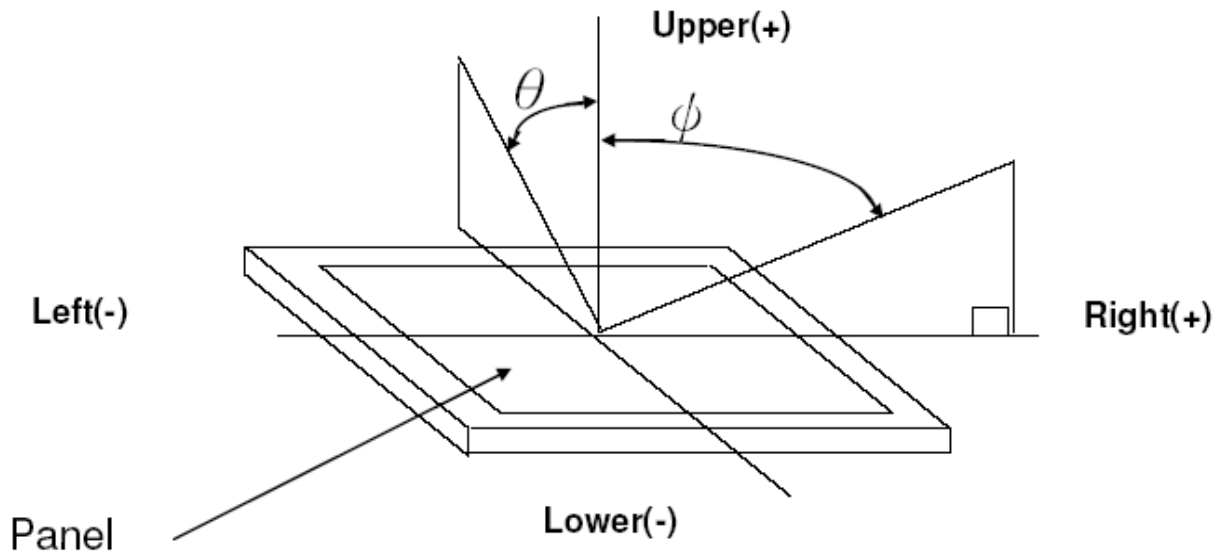
Note(1) Definition of Response Time:Sum of T_R and T_F



Note (2) Definition of Contrast Ratio(CR):measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3) Definition of Viewing Angle:



Definition of Viewing Angle

Note(4)

- Test Instrument: BM-7 (Distance: 500mm; Field = 1°)
- Light Source: LED*2 (White)



CIRCUIT DIAGRAM

- Conditions: $I_F = 40\text{mA}$, $V_{LED} = 3.2\text{V}$
- Uniformity = (Min. Brightness / Max. Brightness) * 100%
- Uniformity $\geq 80\%$



9. Reliability

Test condition:

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating Test	80℃ * 240Hrs	◦ No Defect Of Operational Function In Room Temperature Are Allowable. ◦ IDD of LCM in Pre-and Post-Test Should Follow Specification
2	Low Temperature Non-Operating Test	-30℃ * 240Hrs	
3	High Temperature/Humidity Non-Operating Test	50℃ * 90%RH * 240 Hrs	
4	High Temperature Operating Test	70℃ * 240Hrs	
5	Low Temperature Operating Test	-20℃ * 240Hrs	
6	Thermal Shock Test	-30℃ (30Min)↔ 80(30Min)* 10 Cycles	

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.

10. Inspection Standards

1. AQL(Acceptable Quality Level)

AQL of major and minor defect

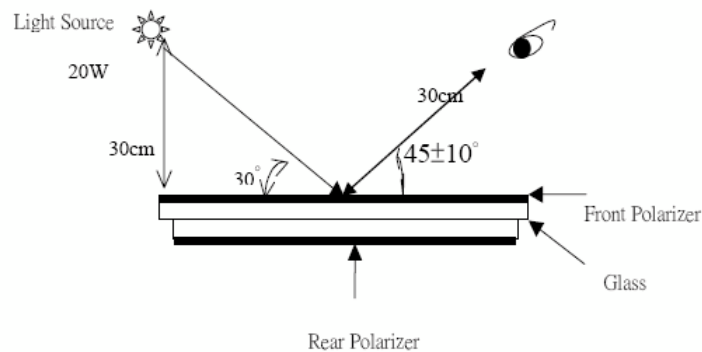
	MAJOR DEFECT	MINOR DEFECT	MAJOR+MINOR
APPEARANCE	0.40%	1.0%	1.0%
ELECTRIC-OPTICAL	0.15%	0.15%	0.15%

2. Basic conditions for inspection

The LCM face to us, in normal environment, the lux is 1000 ± 200 . (Darkroom's lux: 100 ± 50),

About an angle of incidence 30, a distance of 30cm with normal eye, with an angle of 45 degree to check the products without uncovering the film!

(As shown below)



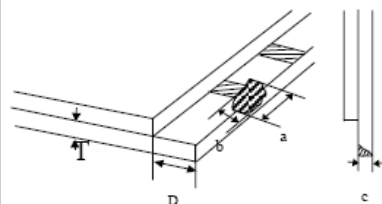
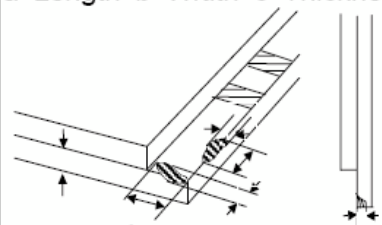
3. Inspection item and criteria

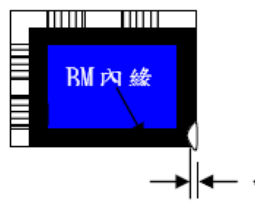
3.1 Visual inspection criterion in immobility

3.1.1 Glass defect

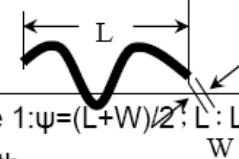
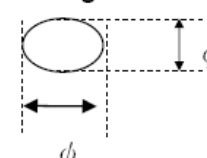
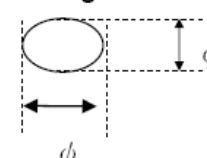
No	Defect item	Criteria	Remark
1	Dimension Unconformity (Major defect)	By Engineering Drawing	



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 $\leq 0.5\text{mm}$ 【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 (Inclueing 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 $c = T$ b not touch the seal glue 【Reject】 【Reject】	c : Thickness b: width of damage 

3.1.2 LCD appearance defect (View area)

No	Defect item	Criteria		Remark
1	Fiber 、glass cratch 、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.

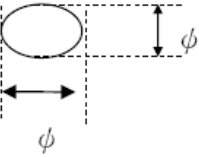
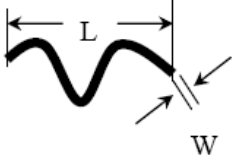


No	Defect item	Criteria	Remark
2	Tuffy glue (minor defect)	1. Uncover the reveal copper area 【Reject】 2. Cover layer 0.3mm(Min) ~ 3.0mm(Max) 【accept】	note:if customer has special requirement , refer to the technical document. 
3	Depth of glue covering (minor defect)	Depth of glue covering overtop front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



11. Precautions For Using LCD Modules

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

11.1 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.

11.2 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.

11.3 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.

11. 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.



12. Records Of Version

Version	Revise Date	Page	Content
0.0	20246-24	All	New released