



SPECIFICATIONS

CUSTOMER : _____
MODEL NO. : GFTO035CA320240
VERSION : A
DATE : 2024.04.17
CERTIFICATION : ROHS

Customer Sign	Approved By	Prepared By	Prepared By
			

晶發科技股份有限公司
GI FAR TECHNOLOGY CO., LTD .

新北市樹林區東豐街 81 號

No. 81, Dongfeng St, Shulin District, 238034, New Taipei City, Taiwan, R.O.C.

TEL: +886-2-8684-1188 FAX: +886-2-8684-8532

[illegible]



Contents

1. General Description	3
2. Physical Features	3
3. Mechanical Specification	3
4. Outline Dimension	4
5. Absolute Maximum Ratings	5
6. Electrical Characteristics	5
7. Module Function Description	6
8. Backlight Characteristics	10
9. Electro-Optical Characteristics	11
10. Reliability	13
11. Inspection Standards	14
12. Precautions For Using LCD Modules	19



1. General Description

This 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 3.5 inch and the resolution is 320*240, the panel can display up to 16M colors. The LCM can be easily accessed by RGB interface.

2. Physical Features

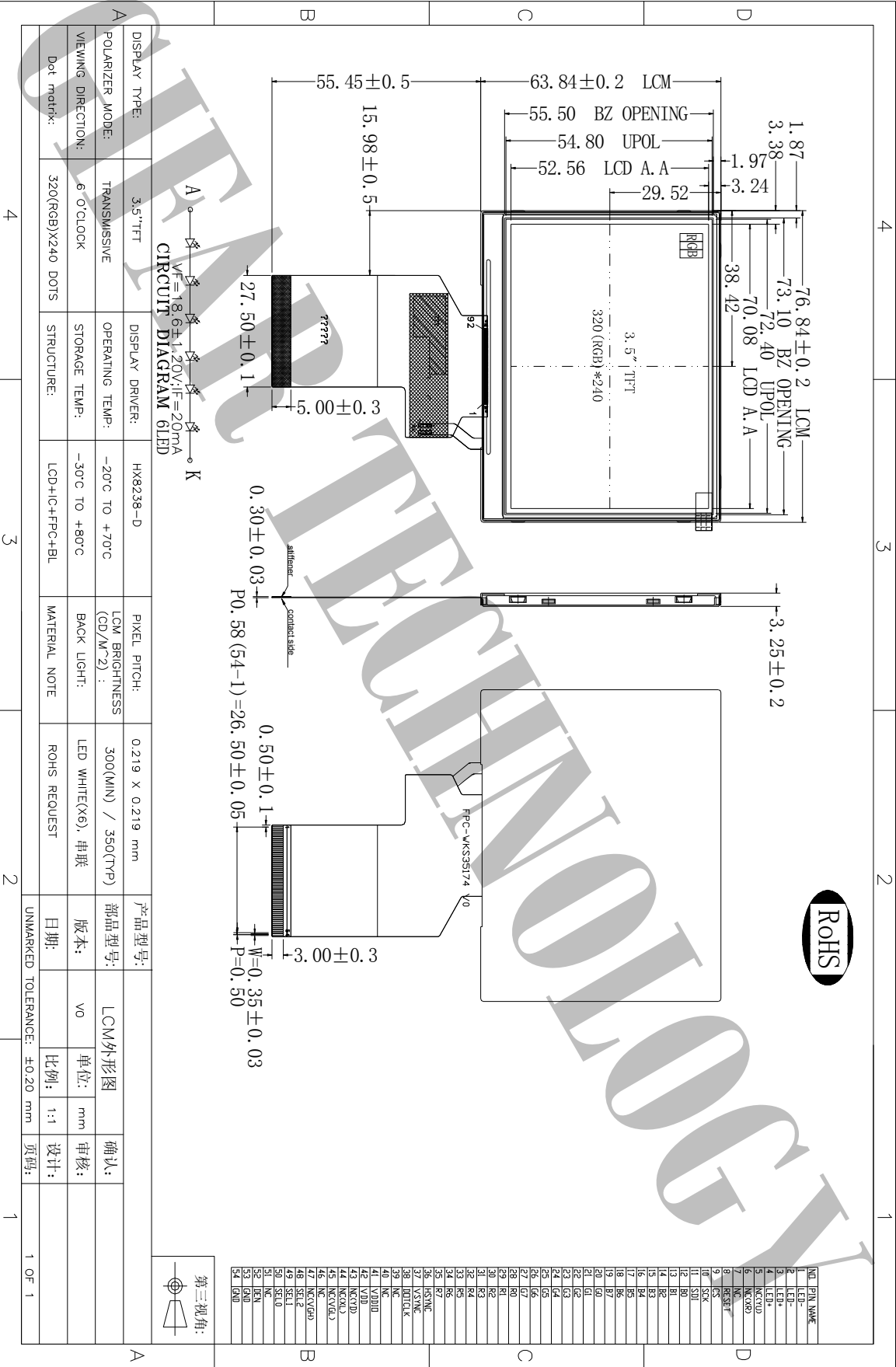
Display Mode	TFT-LCD Module
	Active matrix TFT, Transmissive type
Display Format	Graphic 320×RGB×240 Dot-matrix
Input Data	24 bit RGB with Serial Interface
Viewing Direction	6 O'clock
Drive	HX8238-D

3. Mechanical Specification

Item	Contents	Unit
Module size (W×H×T)	76.84 × 63.84 × 3.25	mm
Number of dots	320(RGB) × 240	---
Active area (W×H)	70.08 × 52.56	mm



4.Outline





5. Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VCC	-0.3	4	V	Note1、 Note2
Input Voltage	VIN	-0.3	VCC+0.3	V	
Operating temperature	TOPR	-20	70	°C	
Storage temperature	TSTR	-30	80	°C	
Humidity	---	---	90	%RH	---

Remark:

Note 1) The HX8238-D may be permanently damaged if it is used under the condition exceeding the above absolute maximum values. It is also recommended to use the HX8238-D within the limit of its electric characteristics during normal operation. Exceeding the conditions may lead to malfunction of HX8238-D and affect its credibility.

Note 2) The voltage from VSS.

6. Electrical Characteristics

Item		Symbol	Rating			Unit	Remark
			Min	Typ	Max		
Power Voltage	Logic	VCC	2.5	3.3	3.6	V	Note1
Input Voltage	L level	VIL	-0.3	----	0.2*VCC	V	VCC=2.5 ~ 3.6V
	H level	VIH	0.8* VCC	---	---	V	
LCD Drive Power current		ILCD	---	TBD	---	mA	---

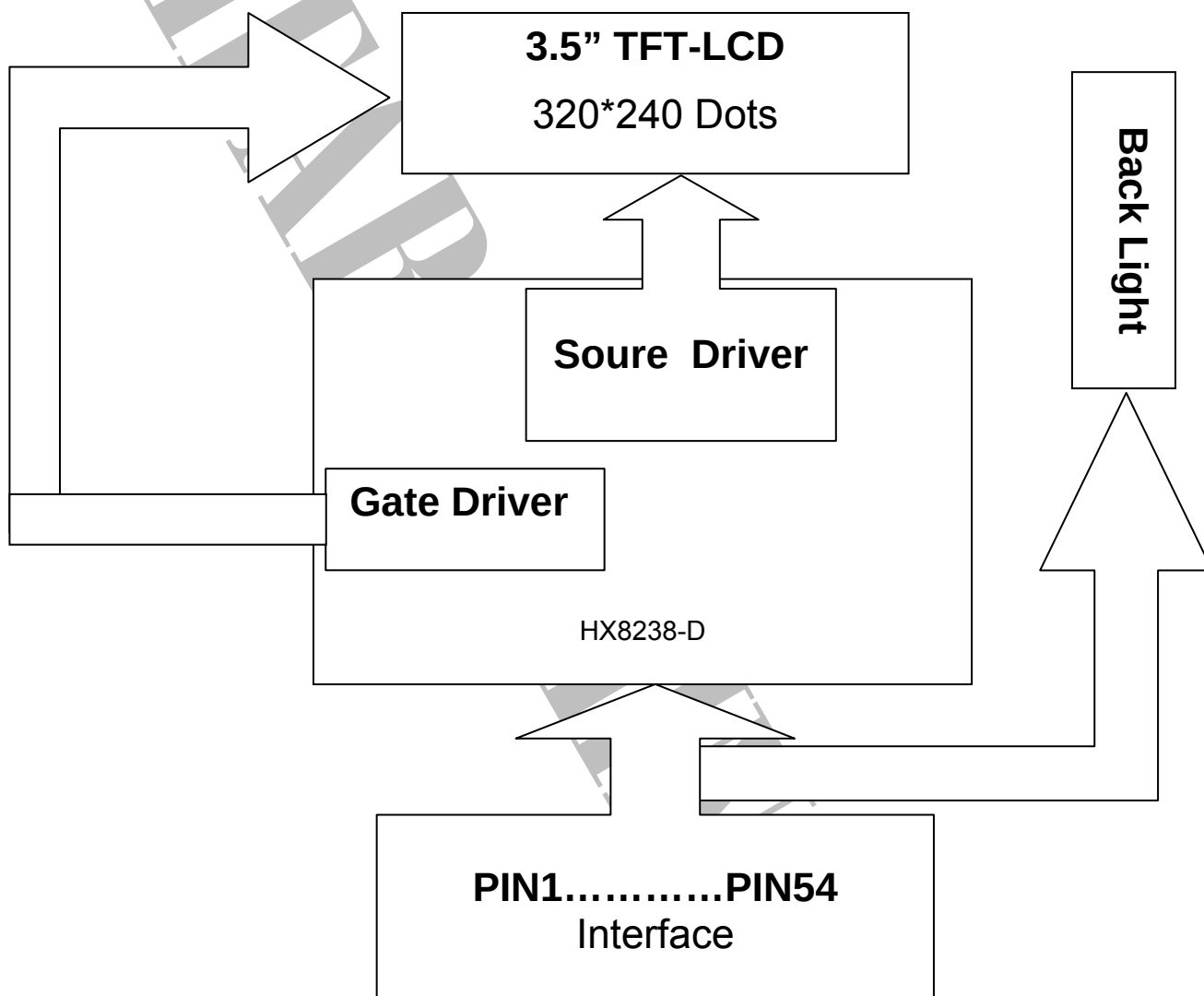
Remark:

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

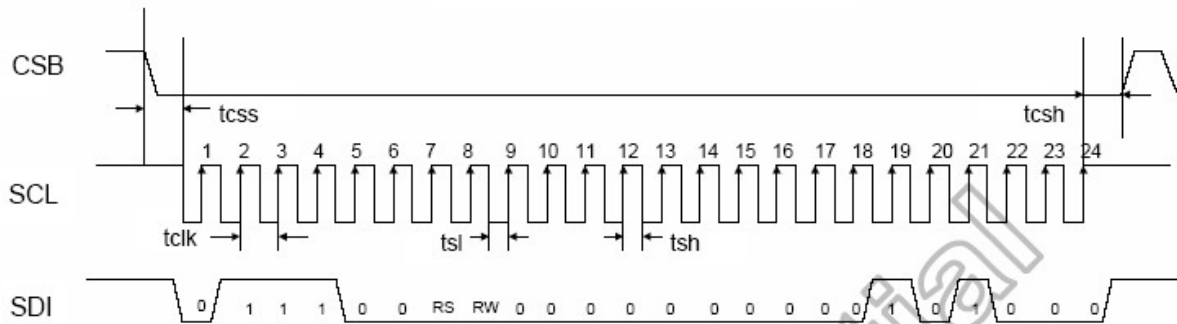
NO.	SYMBOL	FUNCTION
1-2	LED-	Cathode Of Backlight Led
3-4	LED+	Anode Of Backlight Led
5	YU	Touch Panel Pin (Nc)
6	XR	Touch Panel Pin (Nc)
7	NC	Dummy Pin
8	RESET	System Reset
9	CS	Serial Data Enable Signal
10	SCL	Serial Clock Signal
11	SDI	Serial Data Signal
12~19	B0~B7	Blue Data
20~27	G0~G7	Green Data
28~35	R0~R7	Red Data
36	HSYNC	Line Synchronization Signal
37	VSYNC	Frame Synchronization Signal
38	DOTCLK	Dot Data Clock
39~40	NC	Dummy Pins
41	VDDIO	Power Supply Of Io Pins
42	VCC	System Vcc
43	YD	Touch Panel Pin (Nc)
44	XL	Touch Panel Pin (Nc)
45~51	NC	Dummy Pins
52	DEN	Display Enable Pin From Controller
53~54	GND	System Gnd



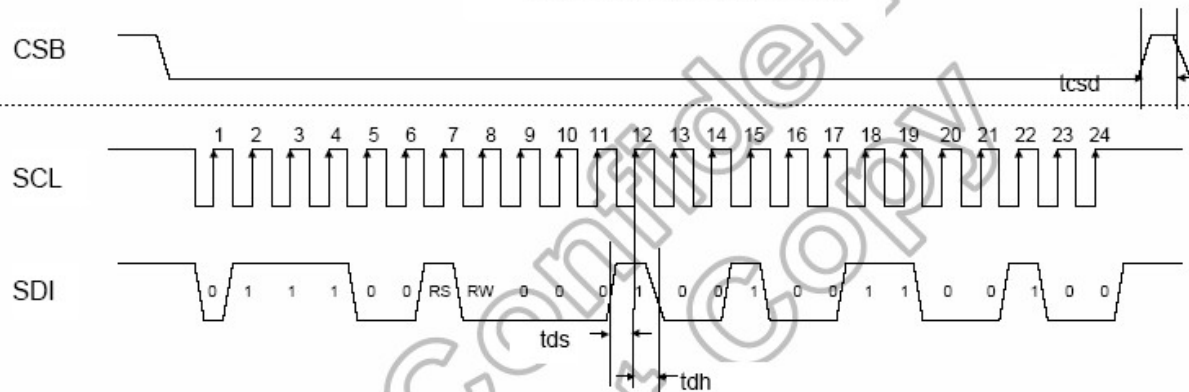
7-3. Timing Characteristics

7.3.1 3Wire SPI Timing Characteristics

First Transmission (Register)



Second Transmission (Data)



Note: The example writes "0x1264h" to register R28h.
SPID connected to VSS.

Characteristics	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Serial Clock Frequency	fclk	-	-	20	MHz
Serial Clock Cycle Time	tclk	50	-	-	ns
Clock Low Width	tsl	25	-	-	ns
Clock High Width	tsh	25	-	-	ns
Clock Rising Time	trs	-	-	30	ns
Clock Falling Time	tfl	-	-	30	ns
Chip Select Hold Time	tcsh	10	-	-	ns
Chip Select High Delay Time	tcsd	20	-	-	ns
Data Setup Time	tds	5	-	-	ns
Data Hold Time	tdh	10	-	-	ns



7.3.2 RGB Interface Timing Characteristics

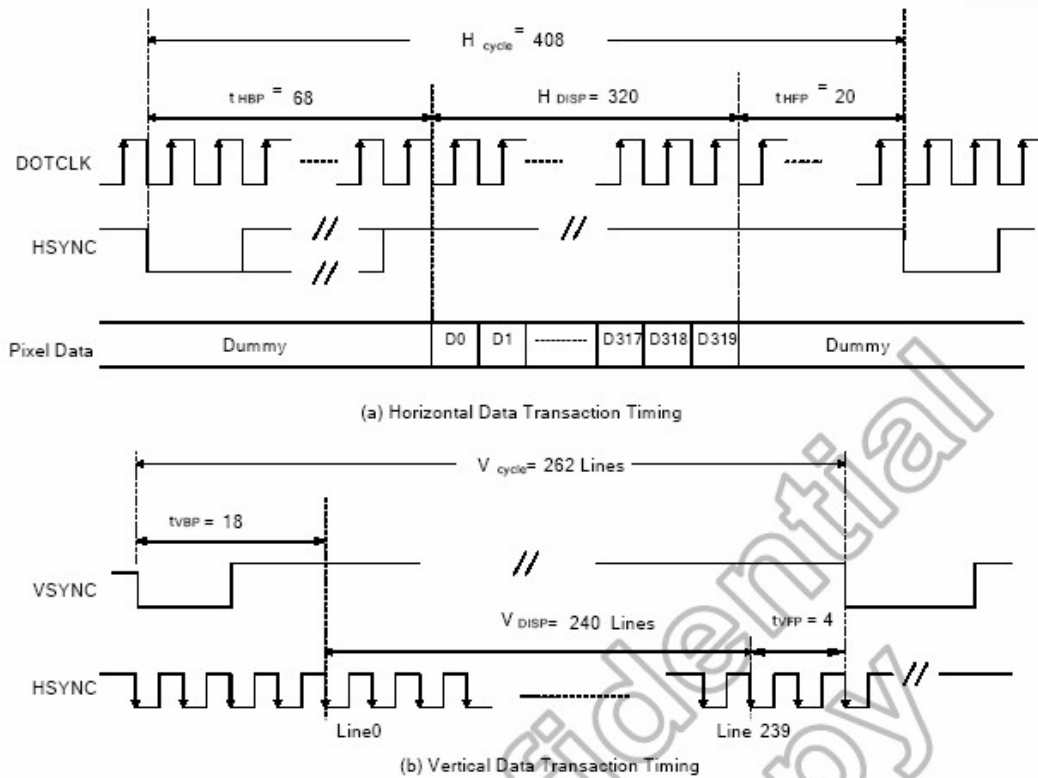


Figure 12. 2: Data transaction timing in parallel RGB (24-bit) interface (SYNC mode)

7.3.3 Input timing specifications

Characteristics	Symbol	Min.		Typ.		Max.		Unit
		24-bit	8-bit	24-bit	8-bit	24-bit	8-bit	
DOTCLK Frequency	fDOTCLK	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Horizontal Frequency (Line)	fH	-	-	14.9	-	22.35	-	KHz
Vertical Frequency (Refresh)	fV	-	-	60	-	90	-	Hz
Horizontal Back Porch	tHBP	-	-	68	204	-	-	tDOTCLK
Horizontal Front Porch	tHFP	-	-	20	60	-	-	tDOTCLK
Horizontal Data Start Point	tHBP	-	-	68	204	-	-	tDOTCLK
Horizontal Blanking Period	tHBP + tHFP	52	146	88	264	180	960	tDOTCLK
Horizontal Display Area	HDISP	-	-	320	960	-	-	tDOTCLK
Horizontal Cycle	Hcycle	372	1106	408	1224	500	1920	tDOTCLK
Vertical Back Porch	tvBP	-	-	18	-	-	-	Lines
Vertical Front Porch	tvFP	-	-	4	-	-	-	Lines
Vertical Data Start Point	tvBP	-	-	18	-	-	-	Lines
Vertical Blanking Period	NTSC	10	-	22	-	47	-	Lines
	PAL	20	-	33	-	120	-	
	PAL	12	-	25	-	112	-	
Vertical Display Area	NTSC	-	-	240	-	-	-	Lines
	PAL	-	-	280(PALM=0)	-	-	-	
	PAL	-	-	288(PALM=1)	-	-	-	
Vertical Cycle	NTSC	250	-	262	-	287	-	Lines
	PAL	300	-	313	-	400	-	



8. Backlight Characteristics

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward voltage	V_{BL}	18	18.6	20	V	-
Current	I_{BL}	-	20	-	mA/chip	-
ICE	X	0.23	-	0.33	-	-
	Y	0.23	-	0.33	-	
Brightness	-	300	350	-	cd/m ²	★1
Uniformity	-	80	-	-	%	★2

★1 Test condition is :

(a) Center point on active area

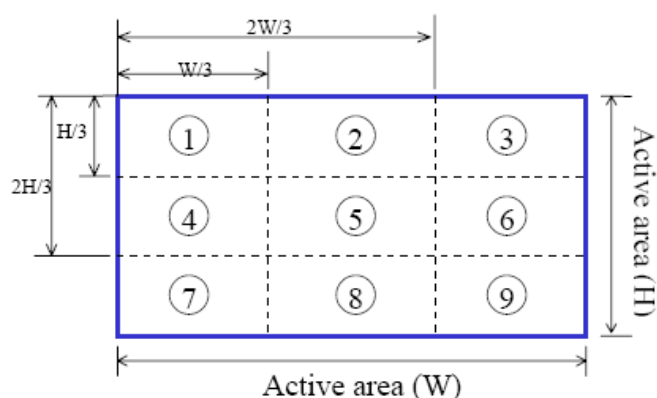
(b) Best Contrast

★2 Uniform measure condition :

(1) Measure 9 point. Measure location is show below :

(2) Uniform = (Min. brightness / Max. brightness) × 100%

(3) Best Contrast.





9. Electro-Optical Characteristics

Item		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Transmittance		T%	Viewing normal angle $\theta_X = \theta_Y = 0^\circ$		7.4		%	All left side data are based on CMO's following condition -T6 NTSC: 60% LC:5091 Light : C light (Machine:BM5A) Normal Polarizer Without DBEF "Simulation Data Reference Only"
Contrast Ratio		CR		200	300		--	
Response Time		T_R			15	30	ms	
		T_F			35	50	ms	
Chromaticity	Red	X_R		0.609	0.639	0.669		
		Y_R		0.314	0.344	0.374		
	Green	X_G		0.264	0.294	0.324		
		Y_G		0.557	0.587	0.617		
	Blue	X_B		0.102	0.132	0.162		
		Y_B		0.106	0.136	0.166		
	White	X_W		0.282	0.312	0.342		
		Y_W		0.319	0.349	0.379		
Viewing Angle	Hor.	θ_{X+}	Center $CR \geq 10$		45		deg.	
		θ_{X-}			45			
	Ver.	θ_{Y+}			15			
		θ_{Y-}			35			

*Note (1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

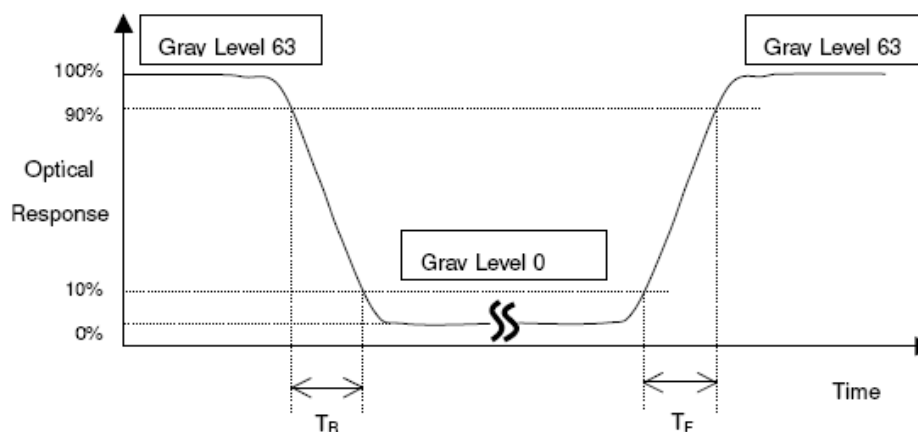
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$CR = CR(10)$$

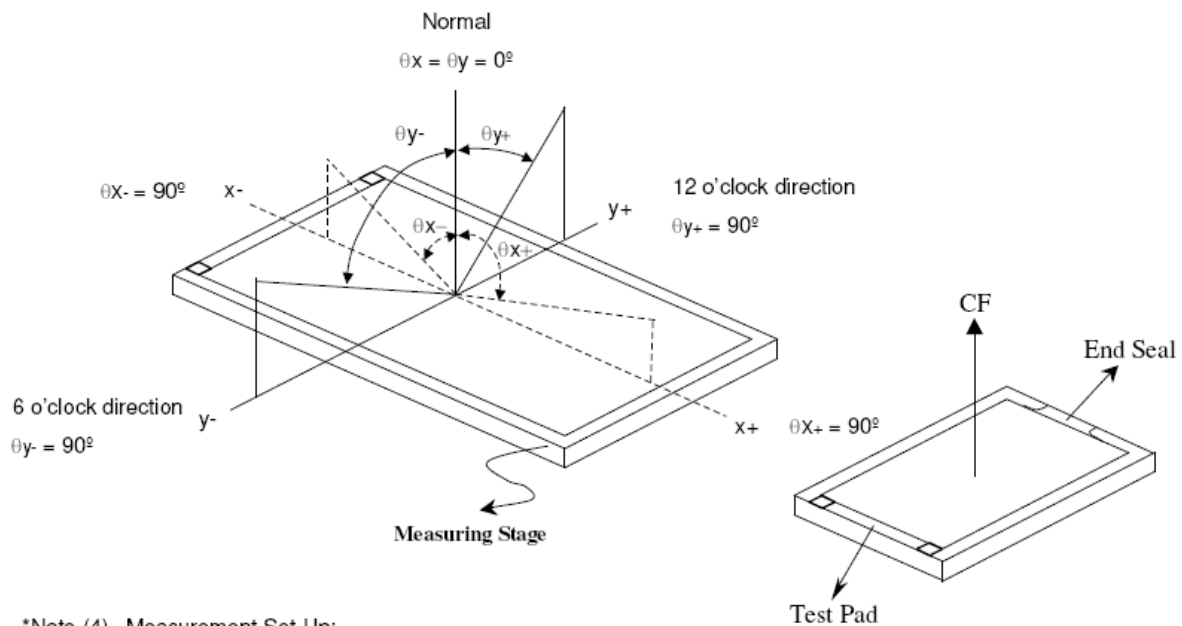
CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

*Note (2) Definition of Response Time (T_R , T_F):



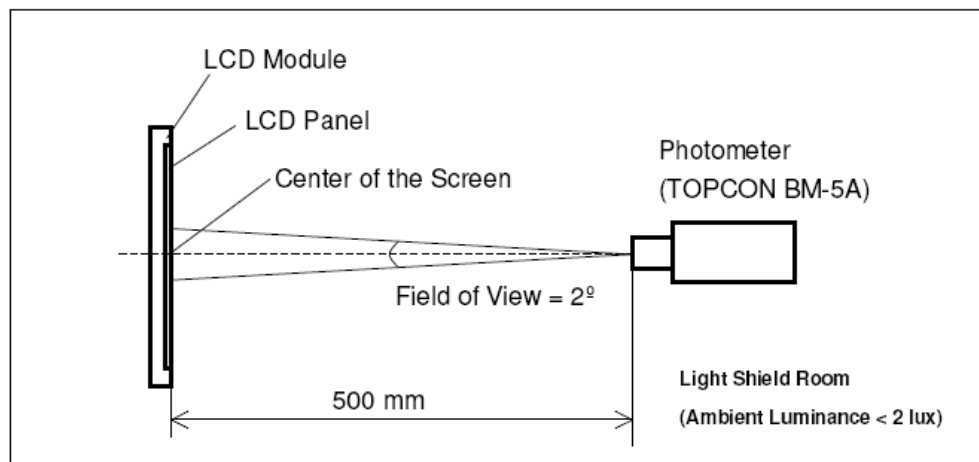


*Note(3) Definition of Viewing Angle

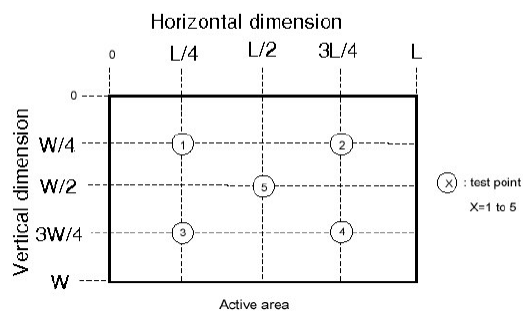


*Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (5)





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	40°C 90%RH 48HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION

Note: The need to restore at room temperature for 2 hours after the test.



11. Inspection Standards

1. AQL(Acceptable Quality Level)

AQL of major and minor defect

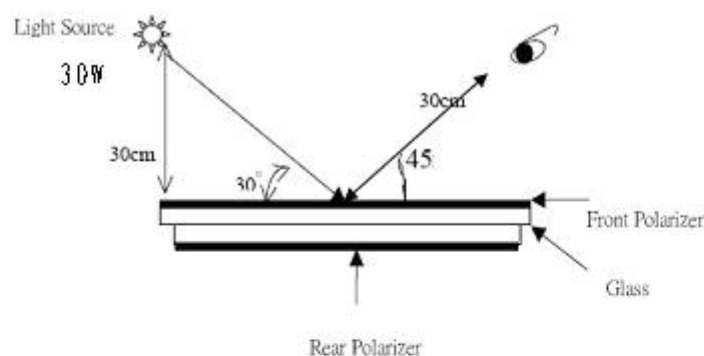
According to GB/T 2828-2003 ; , normal inspection, Class II

MAJOR DEFECT	MINOR DEFECT
0.65	1.5

2. Basic conditions for inspection

The LCM face to us, in normal environment, 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)



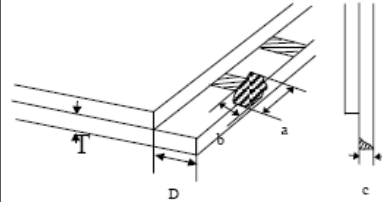
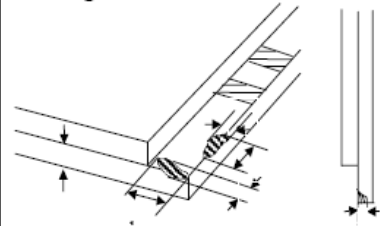
3. Inspection item and criteria

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 ≤ 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 (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.

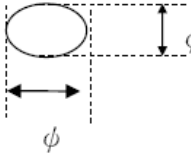
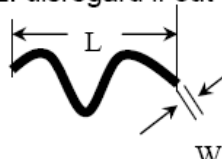


No	Defect item	Criteria	Remark
2	Tuffy glue (minor defect)	1. Uncover the reveal copper area 【 Reject 】 2. Cover layer 0.3mm(Min) ~ 3.0mm(Max) 【 accept 】	note:if customer has special requirement , refer to the technical document.
3	Depth of glue covering (minor defect)	Depth of glue covering overtop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

FORN TO GOY