高展光电 SUPERVIEW

REV	00

广 东 高 展 光 电 股 份 有 限 公 司

GUANGDONG SUPERVIEW OPTOELECTRONICS CO.,LTD.

样 品 承 认 书

APPROVAL SHEET

Product Model	G02403AD01B8(GD3220A)		
Remarks	TFT MODULE,240(RGB) *320PIXELS		
APPROVED SIGNATURE BY SUPERVIEW	PREPARED BY	CHECKED BY	APPROVED BY

APPROVED SIGNATURE BY CUSTOMER:		
PREPARED BY	CHECKED BY	APPROVED BY

RECORDS OF REVISION

REV.	DATE	Page	DESCRIPTION OF CHANGES
00	2020.12.02		在 G02403AD01B1(59-163103-003-000)的基础上改偏光片(不含 UV328).

CONTENT

1. GENERAL SPECIFICATION

1.1 Description

The G02403AD01B8(GD3220A)is a color active matrix Thin Film Transistor (TFT) Liquid Crystal Display (LCD) that uses amorphous silicon(a-Si) TFT as a switching device. This model is composed of a single 1.77inches transmissive type main TFT-LCD panel. The resolution of the panel is 240*320 pixels and can display up to 262K color.

1.2 Feature

-TN type for main TFT-LCD panel

-Structure COG+FPC+BL

-Full, Normal (Still), Partial, Sleep, mode are available

1.3 Application

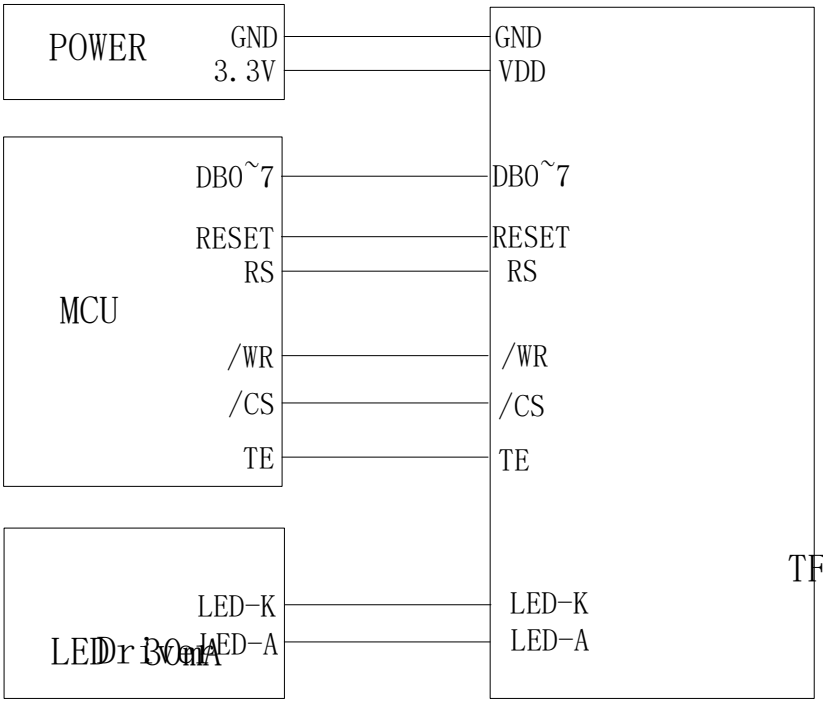
-Display terminals for Toys

1.4 General Specification

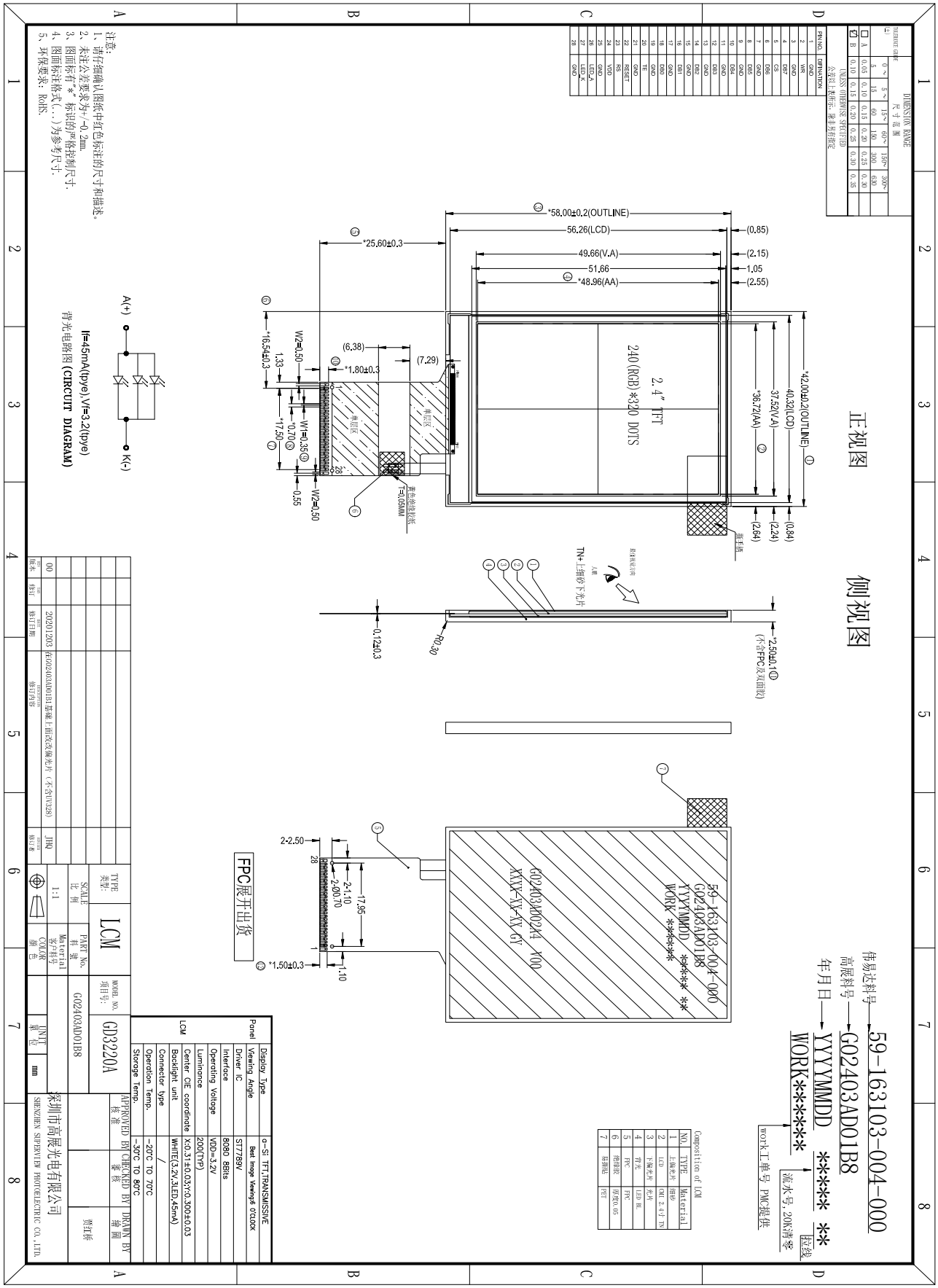
No.	Item	Specification	Unit	Remark
1	LCD Size	2.4	inch	-
2	Panel Type	a-Si TFT transmissive	-	-
3	Resolution	240 x (RGB) x 320	pixel	-
4	Display Mode	Normally White	-	-
5	Display Number of Colors	262K	-	-
6	ViewingDirection (Best Image Viewing)	6 o'clock	-	Note
7	Contrast Ratio	250(Typ)	-	-
8	Luminance	200(MIN)	cd/m2	-
9	Module Size	42(W) x58(L) x2.5(T)	mm	Note
10	Active Area	36.72(W) x 48.96(L)	mm	Note
11	Pixel Pitch	0.153(W) x 0.153（L）	mm	-
12	Weight	TBD(TYP)	g	-
13	Driver IC	ST7789V	-	-
14	Light Source	3 White LEDs	-	-
15	Interface	MCU	-	-
16	Operating Temperature	-20~70	℃	-

Note: Please refer to the mechanical drawing.

2. BLOCK DIAGRAM



3. MECHANICALDRAWING

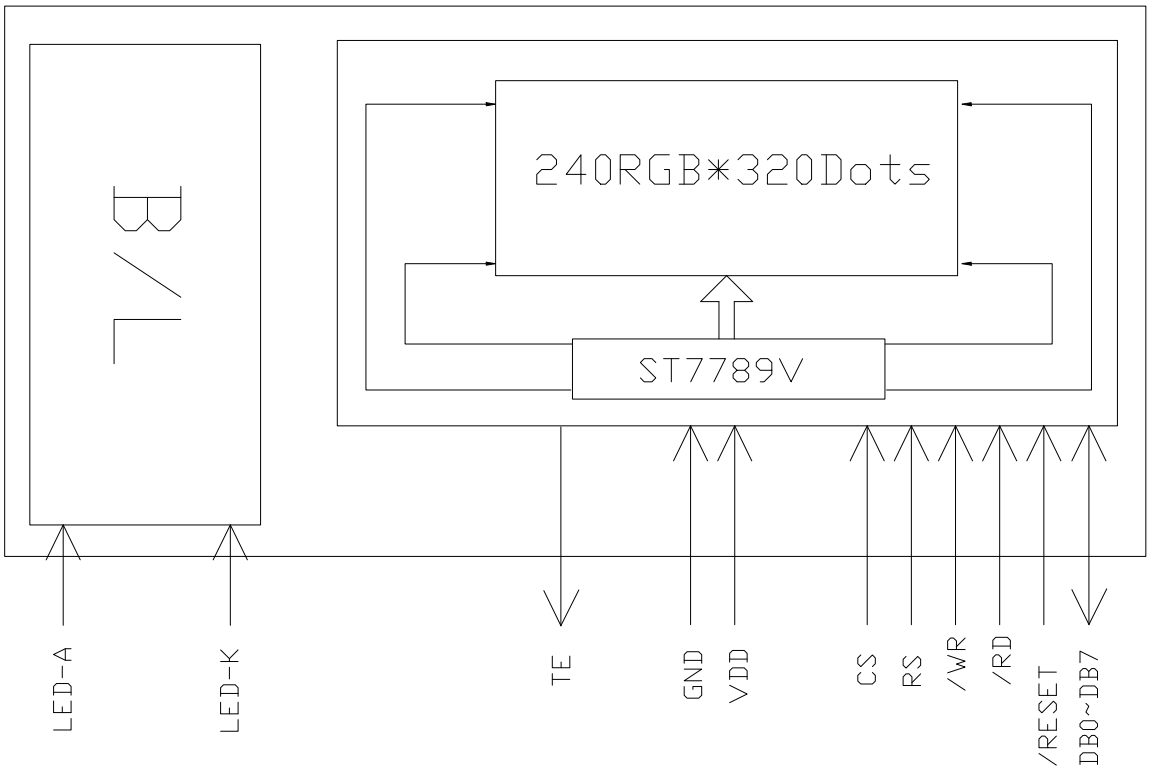


4.INTERFACE PIN ASSIGNMENT

1	GND	Ground
2	WR	Write strobe signal to write data when RD is “Low” in MPU interface.
3	GND	Ground
4	DB7	Data bus
5	CS	Chip select input pin (“Low”enable)in MPU I/F and SPI I/F
6	DB6	Data bus
7	GND	Ground
8	DB5	Data bus
9	GND	Ground
10	DB4	Data bus
11	GND	Ground
12	DB3	Data bus
13	GND	Ground
14	DB2	Data bus
15	GND	Ground
16	DB1	Data bus
17	GND	Ground
18	DB0	Data bus
19	GND	Ground
20	TE	Tearing effect output
21	GND	Ground
22	RESET	Reset signal(Low:active)
23	RS	Display data/command selection in 80-series MPU I/F.RS=”0”:Command RS=”1”:Display data.
24	VDD	a **supply** voltage to the analog circuil
25	GND	Ground
26	LEDA	LED anode
27	LEDK	LED cathode
28	GND	Ground

5. ELECTRICAL SPECIFICATION for TFT

5.1. APPLICATION CIRCUIT



5.2. TFT ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	STANDARD VALUE			UNIT
		MIN	TYP	MAX	
Power Supply for Analog	VCC	-0.3	-	5.5	V
Power Supply for Digital IO	IOVCC	-0.3	-	3.5	V

Note: Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is applied.

5.3. TFT TYPICAL OPERATION CONDITION

5.3.1 TFT DC Characteristics

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
Power Supply for Analog	VDD	Ta=25 ºC	2.5	2.8	3.5	V
Power Supply for Digital IO	IOVDD	Ta=25 ºC	1.65	1.8	3.3	V
Input Signal “H” Level	V_{IH}	-	0.7IOVDD	-	IOVDD	V
Input Signal “L” Level	V_{IL}	-	0	-	0.3IOVDD	V
Output Signal “H” Level	V_{OH}	I_{OH}=-1.0mA	0.8IOVDD	-	IOVDD	V
Output Signal “L” Level	V_{OL}	I_{OL}=1.0mA	0	-	0.2IOVDD	V
Frame Frequency	FRAME	-	50	70	80	Hz

Note: IOVDD=1.65 to 3.3V, VDD=2.5 to3.5V, AGND=GND=0V, Ta=-20 to 70° C

5.3.2 TFT Current Consumption

Item	Symbol	Values		Unit	Remark
		type	Max.		
8080 8Bits					
Normal(Still) Mode	I_{CC1}	40	60	mA	Note1
Standby Mode	I_{CC1}	-	150	uA	Note2

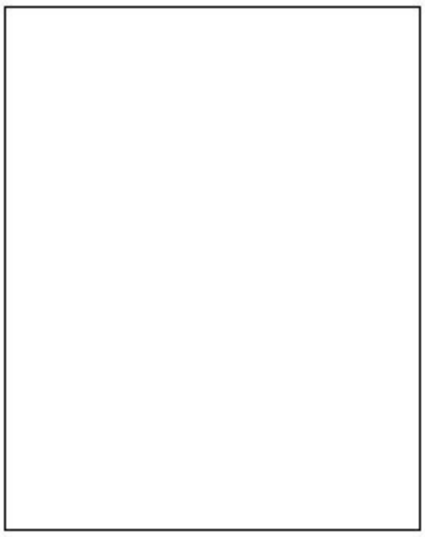
Note1: Test Condition

Typ: IOVCC=VCI=2.85V

Display Pattern: All Pixel White

Frame Rate=60Hz at 2-dot Inversion

Max. current check pattern:

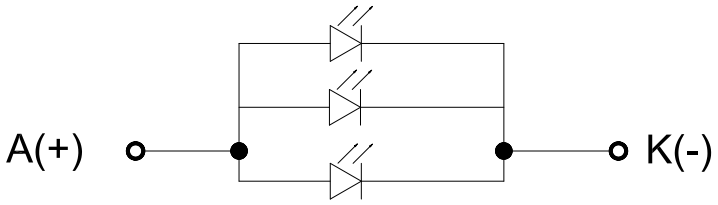


White

Note2: In the standby mode, all the internal display operations are suspended including the internal R-C oscillator.

5.4. BACKLIGHT SPECIFICATION

5.4.1 BACKLIGHT CIRCUIT



If=45mA(tpye),Vf=3.2(tpye)

背光电路图(CIRCUIT DIAGRAM)

5.4.2 ELECTRICAL CHARACTERISTICS

(T=25℃)

PARAMETER	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
FORWARD VOLTAGE	VF	IF=45mA	2.8	3.2	3.6	v

5.5. 3-wire Serial Interface

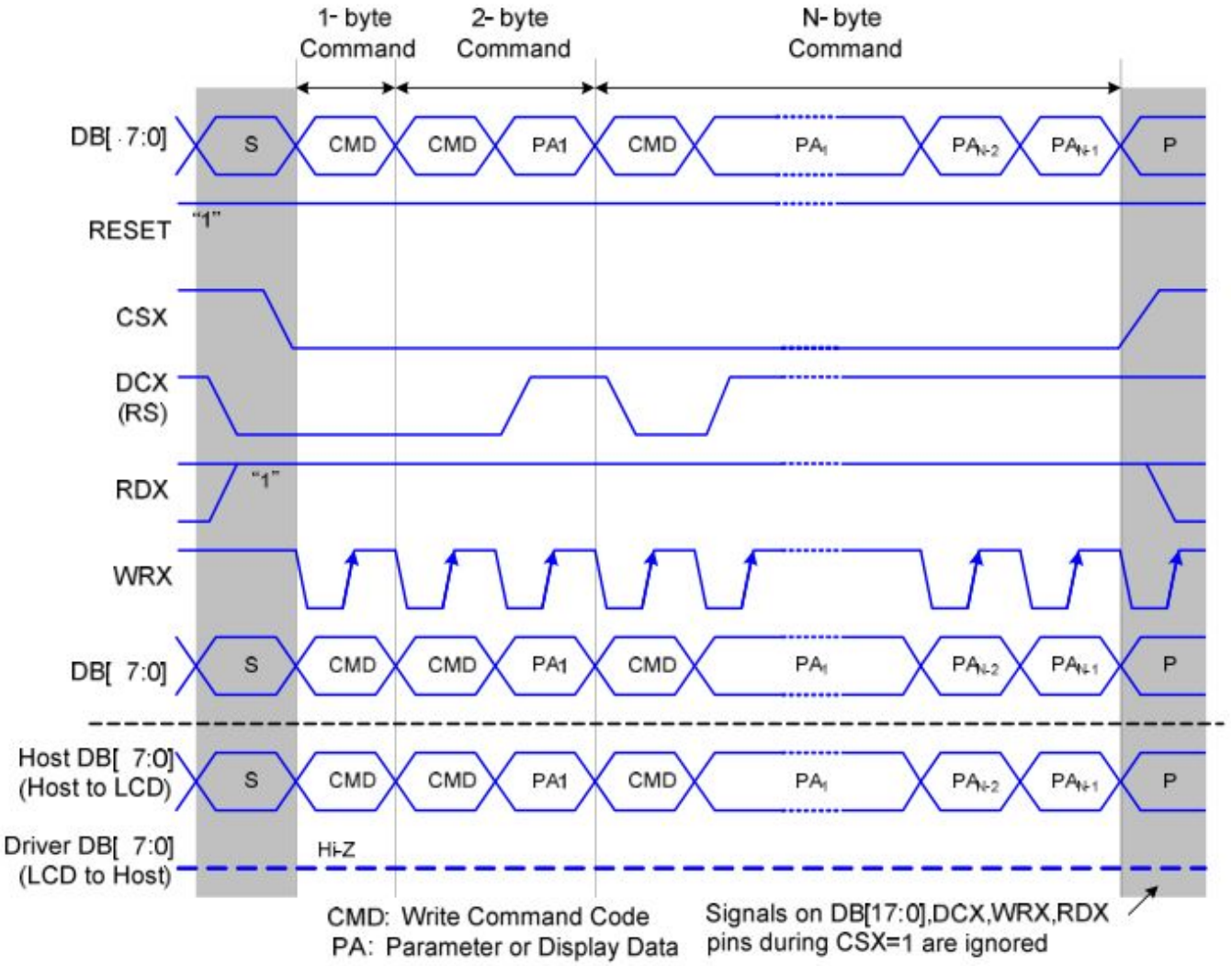


Fig. 5.5.1 8080-Series Parallel Bus Protocol, Write to Register or Display RAM

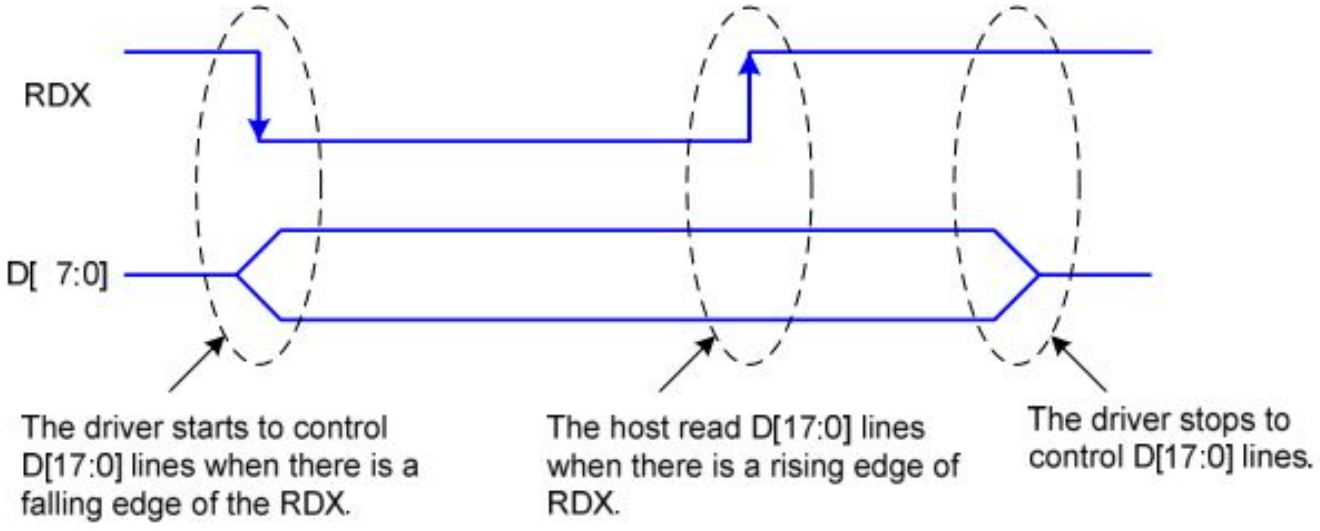


Fig 5.5.2. Serial Control Timing

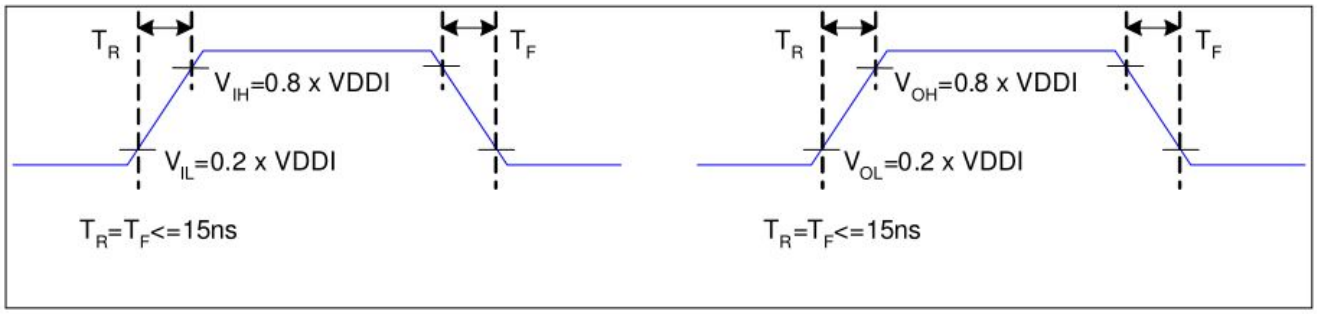
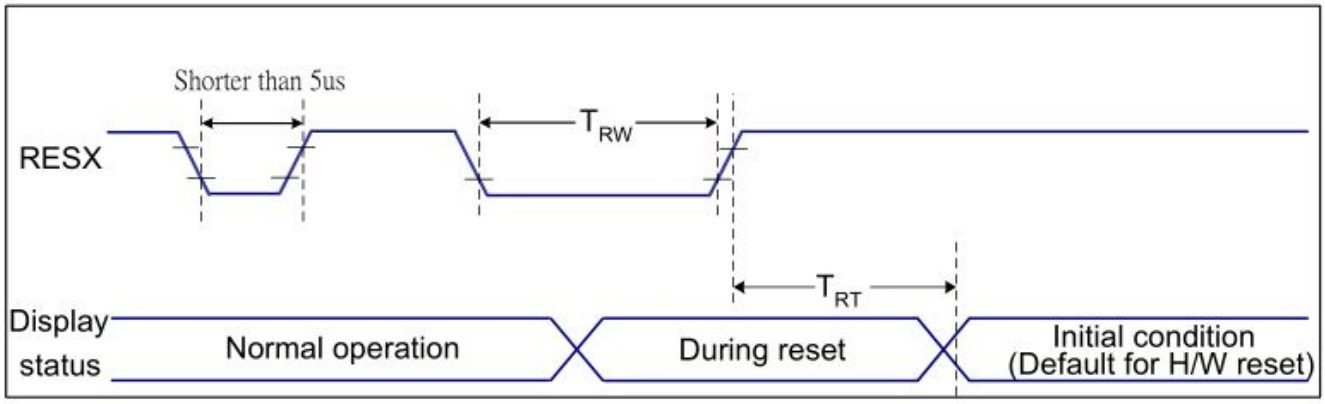


Fig 5.5.3 Rising and Falling Timing for I/O Signal

Note: The rising time and falling time (Tr, Tf) of input signal and fall time are specified at 15 ns or less. Logic high and low levels are specified as 20% and 80% of VDDI for Input signals.

5.6. TFT RESET TIMING CHARACTERISTICS



Reset Timing

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 ~ 70 ℃

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120 (Note 1, 6, 7)	ms

Table Reset Timing

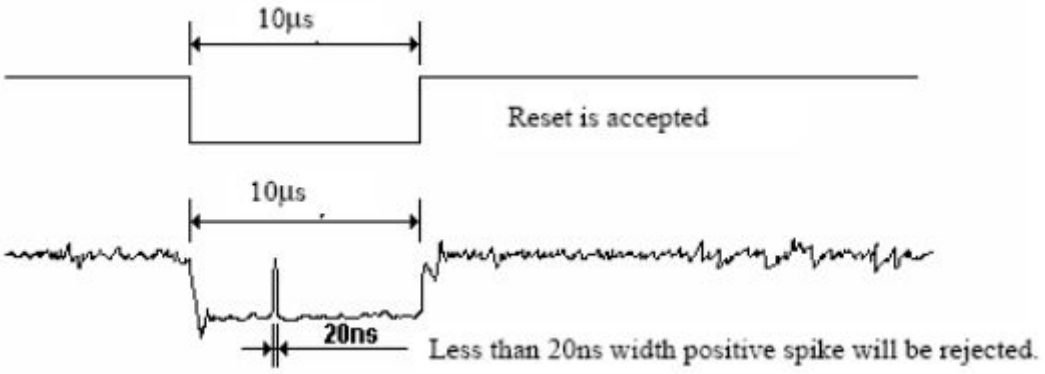
Notes:

1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to
registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3. During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120
ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode.) and then return to Default condition
for Hardware Reset.
4. Spike Rejection also applies during a valid reset pulse as shown below:



5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for
120msec.

6.OPTICAL CHA

(T_a=+25ºC, VCI=+2.85V IOVCC=+1.8V, I_B=20mA)

Item		Symbol	Condition	Values			Unit	Remark
				Min.	Typ.	Max.		
Viewing Angle Range	Left	θ_L	CR≧10	-	45	-	degree	Note 1
	Right	θ_R		-	45	-		
	Top	Φ_T		-	45	-		
	Bottom	Φ_B		-	20	-		
Response Time		Tr+Tf	Normal θ=Φ=0°	-	30	-	ms	Note 2
Contrast Ratio		CR	Normal θ=Φ=0°	--	250	-	-	Note 3
Luminance		L	Normal θ=Φ=0°		200	--	cd/m^2	Note 4
Color temperaturey	White		Normal θ=Φ=0°	-750	7800	+750	K	Note 5

Judgement criterion：

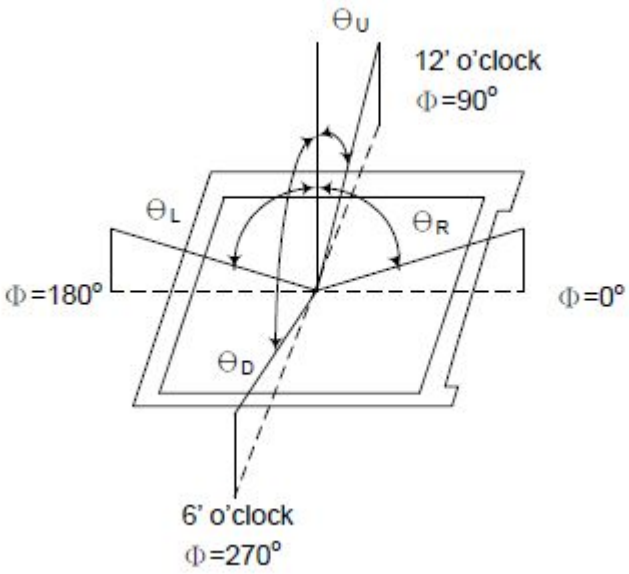
$$\Delta c_{白}' = \sqrt{(\Delta u')^2 + (\Delta v'/1.5)^2} = \sqrt{(u'_{白} - u'_{白0})^2 + [(v'_{白} - v'_{白0})/1.5]^2}$$

， the "$u'_{白0}$"and "$u'_{白0}$" is the type value in the Figure 1.

the error of the Red 、 Green and Blue must be controlled as follow

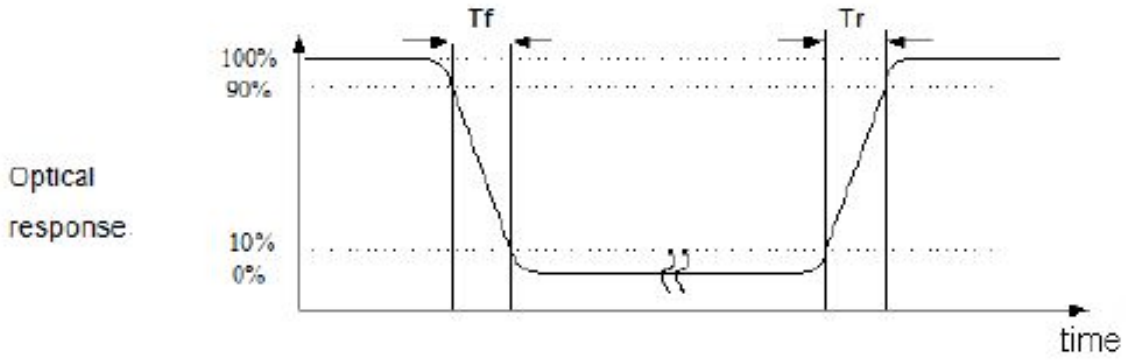
$\Delta c_{白}' \leqslant 0.0115$， $\Delta c_{红}' \leqslant 0.0230$， $\Delta c_{绿}' \leqslant 0.0230$， $\Delta c_{蓝}' \leqslant 0.0230$。

Note 1: Definition of viewing angle range



Note 2: Definition of response time

The output signals of TRD-100 are measured when the input signals are changed to “White” (falling time) and from “White” to Black” (rising time). respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.



Note 3: 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 4: Definition of luminance

Measured at the center area of the panel when LCD panel is driven at “white” state.

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD when panel is driven at “White”, “Red”, “Green” and “Blue” state respectively.

7.THE STANDARD OF INSPECTION FOR TFT

1. Scope

Specifications contain1

* Display Quality Evaluation lity
* Mechanics Specification

2. Sampling plan

Unless there is other agreement , sampling plan for incoming inspection should follow GB2828-2003.

2.1 Lot size: Quantity per shipment as one lot (different model as different lot .)

2.2 Sampling type: Normal inspection, single sampling.

2.3 Sampling level: Level II.

2.4 AQL

Acceptable Quality Level

MA : AQL 0.40

Major defect: AQL=0.40

MI : AQL 0.65

Minor defect: AQL=0.65

MA+MI : AQL 0.65

Total defect : AQL=0.65

3. Panel inspection condition

3.1 Environment:Room Temperature: 25±5℃.Humidity: 55±5% RH.Illumination: 800~1200Lux.

3.2 Inspection Distance：25±5 cm from the inspector to the module.

3.3 Inspection Angle:The vision of inspector should be perpendicular to the surface of the module.

4. Display Quality

4.1 Function Related:

defect type	definition
重缺陷（MA）	show or functional defects, serious deviation from the specifications, customers can not work properly.
	Severe skin defects, serious deviation from the specifications, the client does not work properly.
轻缺陷（MI）	slightly deviate from the specifications, does not affect the product function, but the appearance of an impact on product

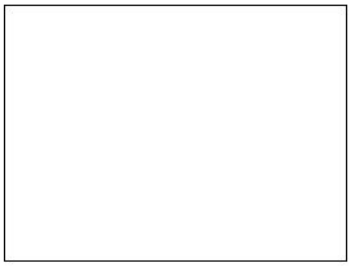
Note: 1. The following standards unless otherwise specified, units are mm .

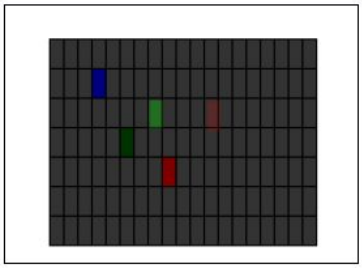
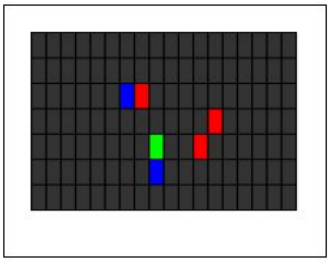
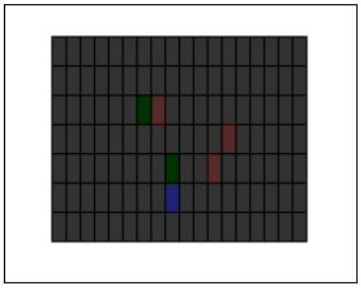
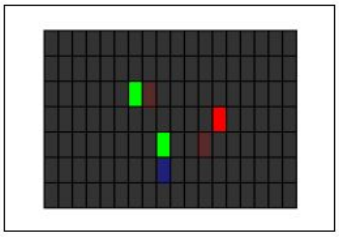
2. The following criteria for use in TFT small size: 7 inches or less (does not contain a 7-inch) TFT products.

4.2 functional test

Defect Type		Inspection method and acceptance		A level
LCD/Pol /BL/TP screen point defect	4.3 inches below	Line film card	$\Phi \leqslant 0.1$	ignore
			$0.1 < \Phi \leqslant 0.15$	2
			$0.15 < \Phi \leqslant 0.2$	1
			$\Phi > 0.2$	0

dot shape defect of LCD/POL/BLU/TP	4.3 inches above		Φ≤0.1	ignore
			0.1＜Φ≤0.15	2
			0.15＜Φ≤0.2	1
			0.2＜Φ≤0.25	1
			Φ ＞0.25	0
	distance between dots	**Line film card**	/	≥5
Line shape defect of LCD/POL/BLU/TP	/	Line film card	w≤0.02	ignore
	/		L≤4, 0.02＜w≦0.03	2
	/		L≤4, 0.03＜w≦0.05	2
			w>0.05	follow dot defect
	distance between lines	Line film card	/	≥5
show state	no display	visible	/	NG
	abnormal display		/	
	Lack of planning		/	
	Muiti plan		/	
	Lack of screen		/	
	White		/	follow the limited sample
	Mura		/	
	Triad/white		/	
	flash		/	
	strong/light		/	

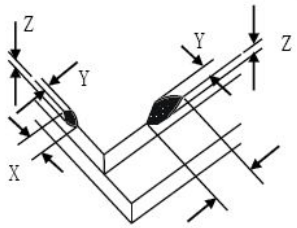
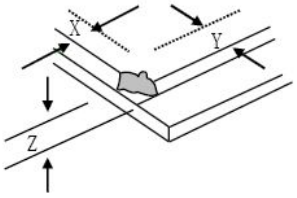
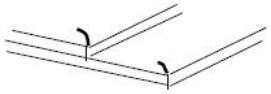
	Interference pattern		/	
POL	lack of border	visible	See the border of an right view	NG
BLU	LED no display	visible	/	NG
	LED Unstable		/	
	LED dark		/	
	dirt		/	
	mura		/	follow the limited sample
	light leakage		/	
	film bump		/	
	white line	Line film card	/	Follow line defect
	dark line		/	
	scratch		/	
TP	do not convert	When Click the screen ,touch screen test point can not convert		NG
	automatically convert	Do not click on the touch screen when the test point test point automatically converted		
dots	bright dots（4.3 inches below）	Leak 10x eyepiece		1
	bright dots（4.3 inches above）			1

	dark dots（4.3 inches below）	Leak 10x eyepiece		ignore
	dark dots（4.3 inches above）			
	2-adjacent bright dots（4.3 inches below）	Leak 10x eyepiece		0
	2-adjacent bright dots（4.3 inches above）			1
	2-adjacent dark dots (4.3 inches below)	Leak 10x eyepiece		ignore
	2-adjacent dark dots (4.3 inches above)			
	Bright and Dark Dots（4.3 inches below）	Leak 10x eyepiece		1
	Bright and Dark Dots（4.3 inches above）			1

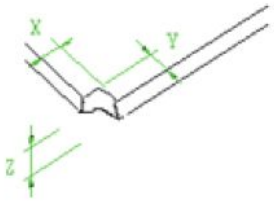
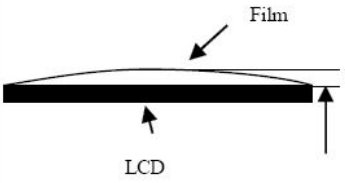
	distance between two dots	Line film card	/	≥5

4.3 Visual Inspection specification

defect type		Inspection method and acceptance		
dot defect of pol/TP	4.3 inches below	Leak 10x eyepiece.Line film card	Φ≤0.1	ignore
			0.1<Φ≤0.15	2
			0.15<Φ≤0.2	1
			Φ > 0.2	0
	4.3 inches above		Φ≤0.1	ignore
			0.1<Φ≤0.15	2
			0.15<Φ≤0.2	1
			0.2<Φ≤0.25	1
			Φ > 0.25	0
	Distance between dot defect	Line film card	/	≥5
line shape defect	/	Leak 10x eyepiece.Line film card	w≤0.02	ignore
	/		L≤4, 0.02<w≦0.03	2
	/		L≤4, 0.03<w≦0.05	2
			w>0.05	Follow dot defect
	Distance between dot defect	Line film card	/	≥5
tape	Adhesion is not enough	tear the protective film can not afford		NG
protective film	dirt	visible	oil, jelly, finger printing	NG

pol	indentation	/	/	Follow limited sample
	skin dirt	visible	/	NG
	bubble	Visible,Line film card	border area	Φ≤width of dark border
			view area	Follow dot defect
broken	edge broken	Visible,Line film card		X ignore Y ≤ black border width Z ≤ single glass thickness
	corner broken	Visible,Line film card		X ≤ black border width Y ≤ black border width Z ≤ single glass thickness
			corner chipping	X*Y ≤4mm² / Z ≤T
	crack	visible		NG
Cell bubble	/	visible	/	NG
Lc leakage	/	visible	/	NG
Silicone	does not cover ITO lead	visible	/	NG
FPC	broken	visible	/	NG
	scratch	Line film card	Injury to the base material and influence electricity	NG
	dirt	visible	/	NG
	fold	visible	/	NG

	burr	Visible	/	NG
	connecting finger dirt	Visible	oil, jelly, finger printing	NG
	PI film	Visible	Skew ,dislocation	NG
tape	peeling	Visible	/	NG
BLU	Location column fracture,deformation	Visible	/	NG
	FPC broken		/	
	Plastic box broken,deformation		/	
bezel	scratch	Visible	oil, jelly, finger printing	NG
	Clasp is not tightened	Visible	/	NG
	wrap	Visible	Follow specification	NG
	deformation	Visible	/	NG
Touch panel	pattern	Visible	Pattern dimness	NG
	dot or line defect	Leak 10x eyepiece.Line film card	/	follow dot or line defect
	dirt	Visible	/	Limit sample
	Top wound, scratch, surface crease	Visible Visual mirror	/	follow dot or line defect

	Scratch、drape	Leak 10x eyepiece.Line film card		
	FPC broken	visible	/	NG
	edge broken	Line film card		X ≤black border width Y ≤ black border width Z ≤ single glass thickness Note: enter the display area is NG
	crack	visible		NG
	newtong ring	visible		≤1/5 panel
	irregular newtong ring	visible		≤1/4 panel
	film rouse	Line film card		≤0.4

X	Y	Z
≤2	≤2	≤T

Note：

1.Inspection conditions and environment:

(1) lighting:100W cool white fluorescent lamp,the distance between illuminant and TP is 500 to 550mm, illuminance is 600 to 800 Lux.

(2) Distance:The distance between eyes and the surface of TP is 300 to 350mm.

(3) location:It is 45°from the examine plane to the desktop.Up and down,left and right,each turn 90°.

(4) The time to examine each piece is not less than 12 seconds.

2.Under 25% contrast,if the defect can be seem,is Hard Scratch, if can't be seem,is Soft Scratch.

3.The standard must be checked with Cover Glass.

8.RELIABILITY TESTS

ITEM	CONDITION	CRITERION
Operating Temperature Test	High Temperature: +60 ºC, 120 hrs	No defects in display and operational functions
	Low Temperature: -20 ºC,120 hrs	
Storage Temperature Test	High Temperature: +70 ºC, 120 hrs	No defects in display and operational functions
	Low Temperature: -20 ºC, 120 hrs	
Humidity Endurance Test	60ºC, 90%RH, 120 hrs	No defects in display and operational functions
Thermal Shock Test	-20 ºC (30mins)～ +70 ºC (30mins) 10 cycles	No defects in display and operational functions
Electro Static Discharge	± 4KV, Human BodyMode,150pF/330Ω; ± 8KV,Air Mode,150pF/330Ω	No defects in display and operational functions

NOTE:

1) The samples must be free from defect before test, must be restored at room condition at least for 2 hours after reliability test before any inspection.

2) Before test the function of TP, the sample must be placed in room temperature for 24hrs after RA test.

9. PRECAUTIONS

9.1. HANDLING

10.1.1. Polarizer Cleaning, Petroleum ether (or N-hexane) is recommended for cleaning the front/rear polarizers and reflectors, acetone, toluene and ethanol are not allowed to avoid damaging the surface.

10.1.2. Body grounding, must wear Anti-ESD wrist strap while pick up LCDs.

10.1.3. FPC Soldering, less than 300℃/3S, solder must be grounding on grounding bench.

10.1.4. If use electric Screwdriver to do assembly, screwdriver must be grounding.

9.2. STORAGE

11.2.1. Keep in a sealed polyethylene bag.

11.2.2. Keep in a dark place.

11.2.3. Keep in temperature between 0ºC and 35ºC.

NOT allowed at 70ºC for more than 160 Hours, or at -20ºC for more than 48 Hrs.

9.3. SAFETY

If liquid crystal leak out of a damaged glass cell, DO NOT put it in your mouth or touch eyes, if the liquid crystal touch your skin or clothes, please wash it off immediately using soap and water.

10. LIMITED WARRANTY

Unless otherwise agreed between Superview and customer, Superview will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with Superview LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects over specs must be returned to Superview within 30 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of Superview limited to repair and/or replacement on the terms set forth above. Superview shall not be responsible for any subsequent or consequential events.

10.1. RETURNING LCM UNDER WARRANTY – TERMS AND CONDITIONS

12.1.1. No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- Circuit modified in any way, including addition of components.

11.1.2. Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB's eyelet, conductors and terminals.