

SPECIFICATIONS

Version: V0

This module uses ROHS material

PRODUCT: TFT LCD MODULE

MODEL NO: HT0240AT01BR1

SUPPLIER: HTDisplay

ISSUED DATE: 2019-12-23

- Preliminary Specification
- Final Product Specification

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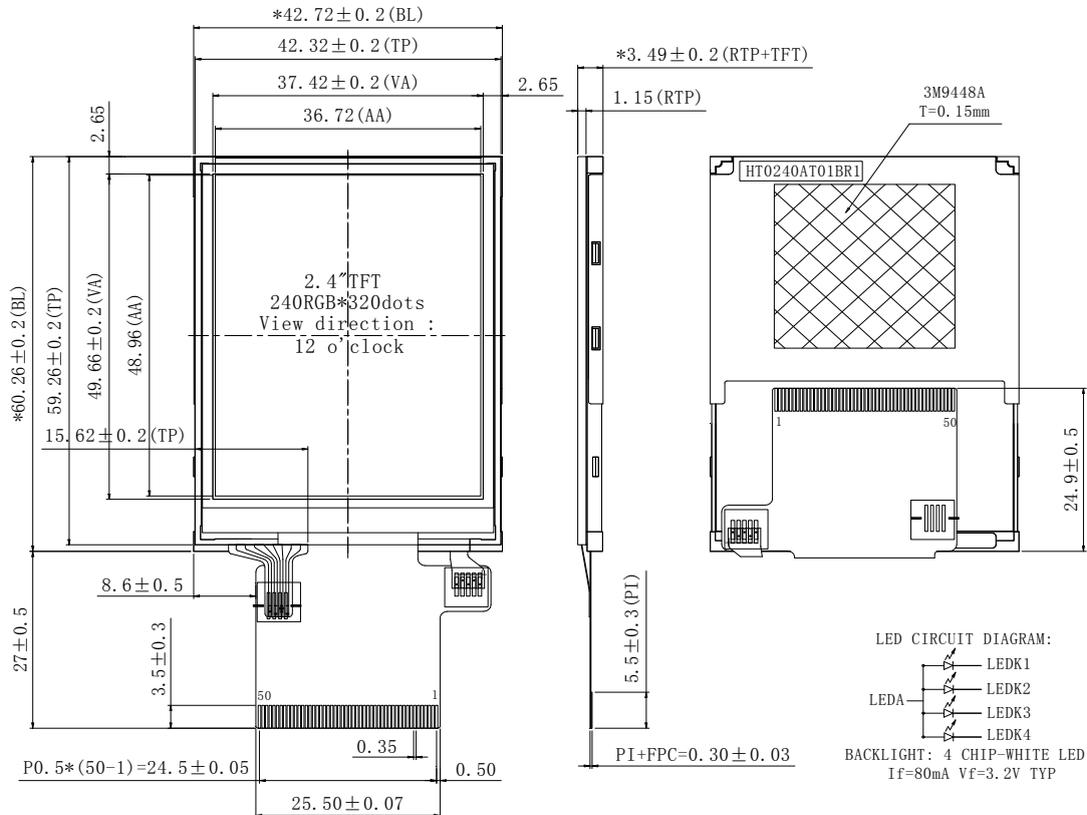
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1. General information

Feature	Spec	Unit
LCD size	2.4	inch
Resolution	240 RGB x 320 Dots	---
Pixel pitch (WxH)	0.153 x 0.153	mm
Active area	36.72 (W) x 48.96 (H)	mm
Viewing area	37.42 x 49.66	mm
Display Mode	TN,NW	---
LCM Outline(with TP) (WxHxT)	42.72 × 60.26 × 3.49	mm
With/Without TP	With RTP	---
Weight (g)	TBD	g
TFT Driver IC	ILI9341V	---
TFT Interface	MCU/RGB	---
TFT Input voltage	2.8	V
TFT Power consumption	TBD	mW
Backlight Power consumption	TBD	mW
LCM brightness	MIN 270	Cd/m ²

2. Mechanical drawing



3. Absolute maximum ratings

Item	Symbol	Min.	Max.	Unit
Supply voltage for logic	VDD	-0.3	3.3	V
Input voltage	VIN	-0.3	3.6	V
Operating temperature	TOP	-20	70	°C
Storage temperature	TST	-30	80	°C
Humidity	RH	--	90%(Max60 °C)	RH

4. Electrical characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply voltage for logic	VDD	2.7	2.8	3.3	V
Input Current	I _{dd}	--	TBD	TBD	mA
Input voltage 'H' level	V _{IH}	0.7VDD	--	VDD	V
Input voltage 'L' level	V _{IL}	VSS	--	0.3VDD	V
Output voltage 'H' level	V _{OH}	0.8VDD	--	VDD	V
Output voltage 'L' level	V _{OL}	VSS		0.2VDD	V

5. Backlight characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Current	I _f	72	80	88	mA	
Forward Voltage	V _f	2.8	3.2	3.4	V	
LED Life Time	L _L	--	30000	--	Hrs	T _a =25°C

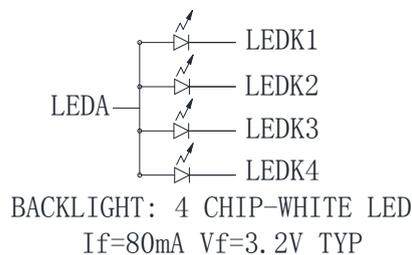


Figure 2

Note1: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note2: Optical performance should be evaluated at T_a=25°C. if LED is driven by high current, high ambient temperature & Humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data

6. Electro-optical characteristics

Optical Specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Transmittance	T(%)		--	5	—	%	(4)	
Contrast Ratio	CR	$\Theta=0^\circ$	—	250	—	—	(2)(6)	
Response Time	$T_{ON}+T_{OFF}$	$\Theta=0^\circ$	—	30	—	msec	(5)	
NTSC	--	--	--	55	--	%	(3)	
Cross talk	Ct			2				
Color Chromaticity (CIE1931)	White	Wx	$\Theta=0^\circ$	-0.02	0.308	+0.02	—	
		Wy			0.325			
	Red	Rx			0.612			—
		Ry			0.329			—
	Green	Gx			0.299			—
		Gy			0.567			—
	Blue	Bx			0.144			—
		By			0.110			—
Viewing Angle	Hor.	Θ_l	Cr>10	—	45	—	—	
		Θ_r		—	45	—		
	Ver.	Θ_u		—	45	—		
		Θ_d		—	20	—		
Optimal View Direction	12 O' CLOCK							

Note 1: Ambient temperature = 25°C.

Note 2: To be measured with a viewing cone of 2by Top con luminance meter BM-5A.

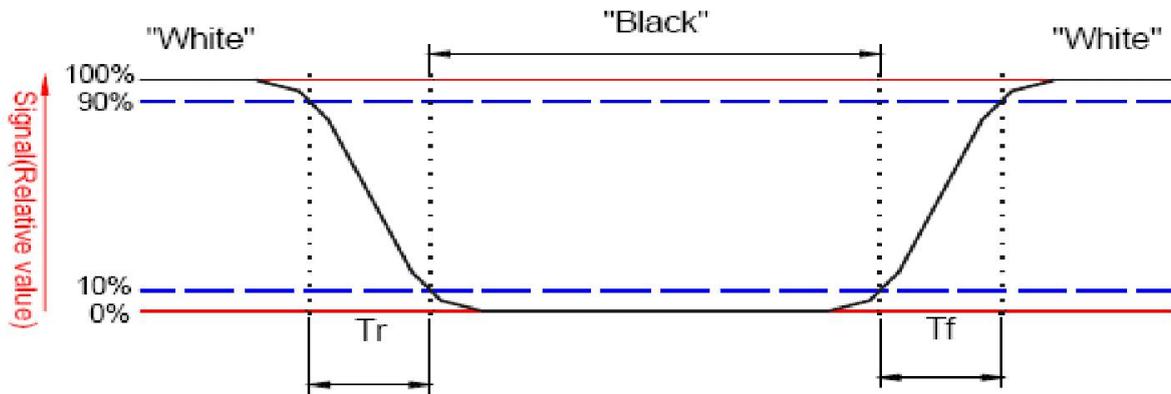
Note 3: To be measured with Outstay chromaticity meter LCF-2100M, CF only measure under C light simulation.

Note 4: CTC shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer. The tolerance of Transmittance is $\pm 10\%$

Note 5: Definition of response time:

The output signals of TRD- 100 are measured when the input signals are changed to "White"(allying time) and from "White" to "Black" (rising time), respectively.

The interval is between the 10% and 90% of amplitudes. Refer to figure as below.

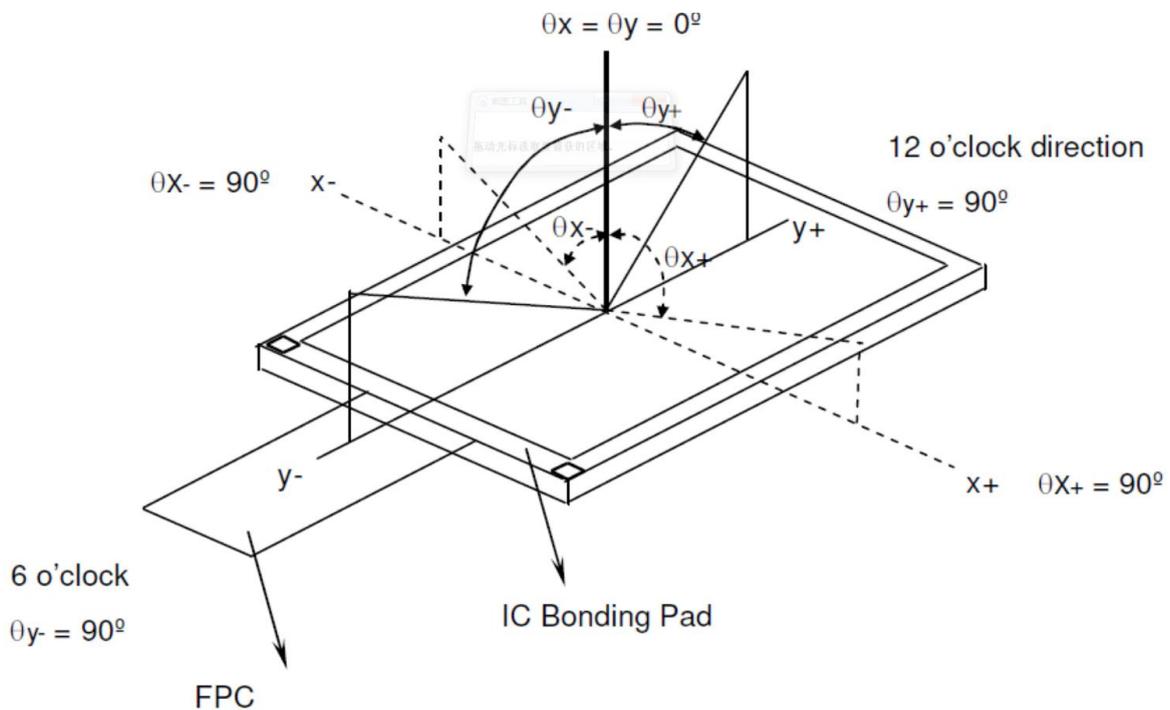


Note 6: Definition of contrast ratio:

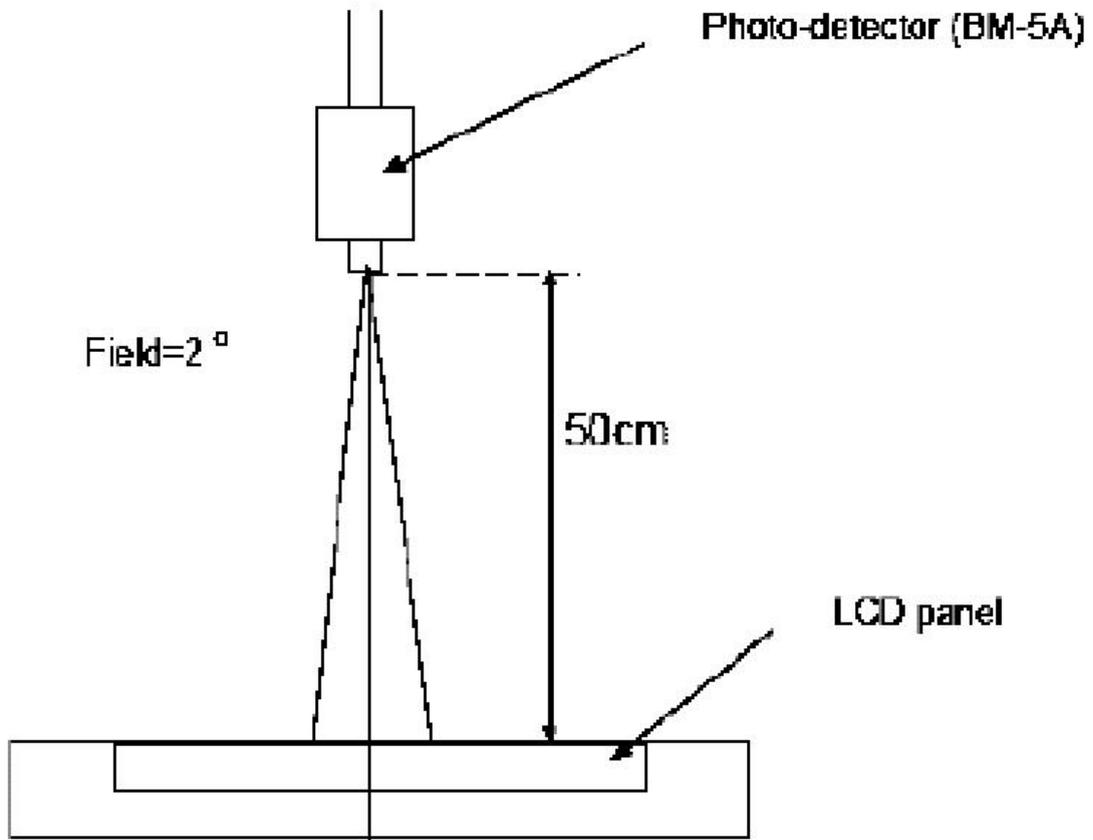
Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

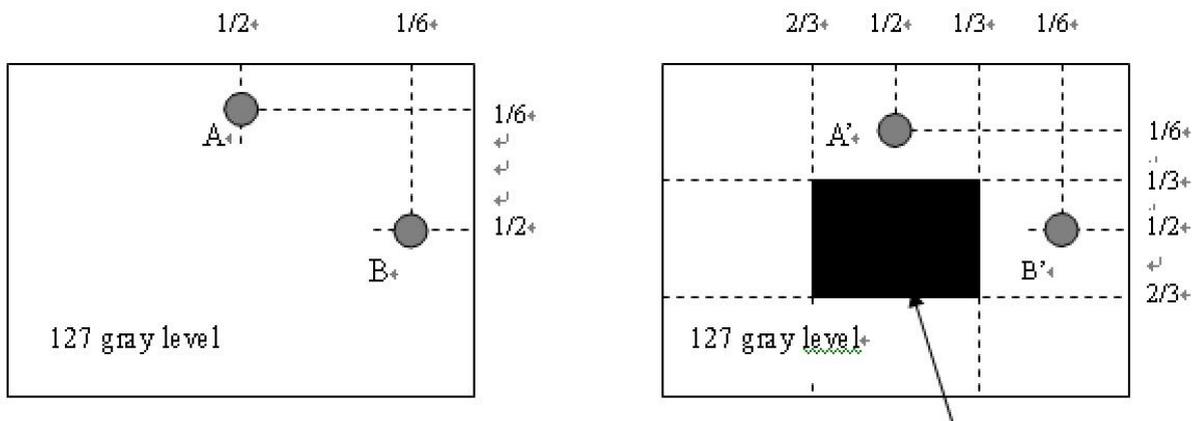
Note 7: Definition of viewing angle



Note 8: Optical characteristic measurement setup.



Note9: Crosstalk

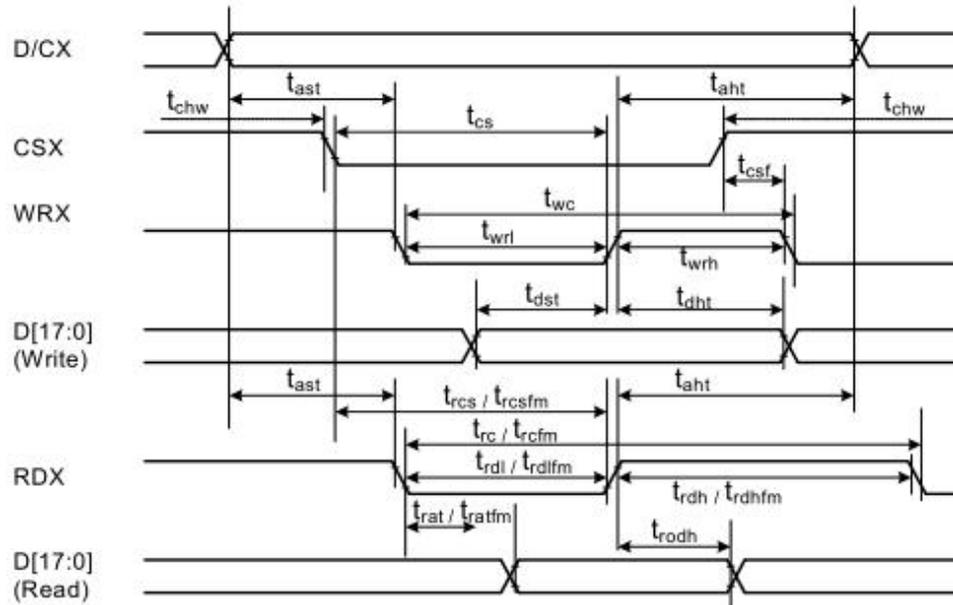


$ILA-L A'/LA \times 100\% = 2\% \text{ max.}$, LA and LA' are brightness at location A and A'

$ILB-LB'/LB \times 100\% = 2\% \text{ max.}$, LB and LB' are brightness at location B and B'

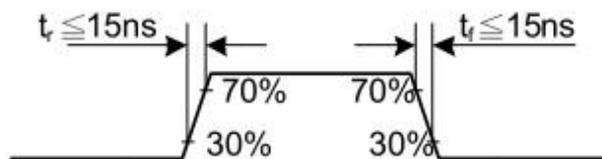
7. Read/Write timing

Display Parallel 18/16/9/8-bit Interface Timing Characteristics (8080- I system)



Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	0	-	ns	
CSX	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
WRX	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
	twc	Write cycle	66	-	ns	
	twrh	Write Control pulse H duration	15	-	ns	
RDX (FM)	twrl	Write Control pulse L duration	15	-	ns	
	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
RDX (ID)	trdlfm	Read Control L duration (FM)	355	-	ns	
	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
D[17:0], D[15:0], D[8:0], D[7:0]	trdl	Read Control pulse L duration	45	-	ns	
	tdst	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
tratfm	Read access time	-	340	ns		
	trod	Read output disable time	20	80	ns	

Note: $T_a = -30$ to 70 °C, $V_{DDI}=1.65V$ to $3.3V$, $V_{CI}=2.5V$ to $3.3V$, $V_{SS}=0V$



Note: This section is only for reference, Details please refer to the IC specification.

8. Interface description

TFT interface

No.	SYMBOL	Description
1	LEDA	LED power anode
2-5	LEDK	LED power cathode
6-9	IM0-IM3	MPU Parallel interface bus and serial interface select.If use RGB Interface must select serial interface.
10	RES	This signal will reset the device and must be applied to properly initialize the chip. Signal is active low.
11	VSYNC	Vertical sync signal.
12	HSYNC	Horizontal sync signal.
13	DCLK	Pixel clock input pin.
14	DE	Data input enable. Display access is enabled when DE is "H".
15-32	D[17:0]	18-bit parallel bi-directional data bus for MCU system and RGB interface mode.
33	SDO	Serial communication data output.
34	SDI	Serial communication data input.
35	RD	Read Enable in MCU Parallel Interface.
36	WR/DCX	WR:Write Enable in MCU Parallel Interface. DCX: Display data/command Selection Pin in MCU Interface. When DCX = 1, data is selected. When DCX = 0, command is selected.
37	RS/SCL	RS: Display data/command Selection Pin in MCU Interface. SCL:Serial communication clock input.
38	CS	Chip selection pin.
39	TE	Tearing effect output pin to synchronize MCU to frame rate, activated by S/W command.
40	VDDI	Power Supply for I/O(VDDI=1.8/2.8/3.3V).
41	VDDI	Power Supply for I/O(VDDI=1.8/2.8/3.3V).
42	VDD	Power Supply for Logic.
43	GND	System ground
44	NC(XR)	NC(Touch panel Right Glass Terminal).
45	NC(YD)	NC(Touch panel Bottom Film Terminal).
46	NC(XL)	NC(Touch panel LEFT Glass Terminal).
47	NC(YU)	NC(Touch panel Top Film Terminal).
48-50	GND	System ground.

9. Reliability test conditions

No.	Test Item	Test condition	Remark
1	High Temperature Storage	80°C±2°C 96H	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Storage	-30°C±2°C 96H	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Operation	70°C±3°C 96H	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Operation	-20°C±3°C 96H	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature /Humidity Storage	60°C 90%RH 96H	IEC60068-2-78:2007 GB2423.3-2006
6	Temperature Cycle	-30°C/30min←→80°C/30min For a total 100 cycles. Start with cold temperature and end with high temperature.	IEC60068-2-14:1984 GB2423.22-2002
7	Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2hours for each direction of X,Y,Z. Component handle as note1	IEC60068-2-6:1982 GB/T2423.10-1995
8	Mechanical shock	100G ±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5-1995
9	Packing vibration test	0.015G ² /Hz from 50~200Hz -6dB/Octave from 200~500Hz 2hours for each direction of X,Y,Z	IEC60068-2-34 GB/T2423.11
10	Dropping test	Height:60cm 1conner ,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8-1995
11	ESD test	±2kv,human body mode 100pF/1500Ω	IEC61000-4-2:2001 GB/T17626.2-2006

Note1:

The component placed on a vibrating platform as it is assembled in the machine, wires included, is subjected to sinusoidal vibration in all directions XYZ

Note2:

After completing the reliability test, leave the samples under the room temperature and for the following inspection items:

1. No clearly visible defects or deterioration of display quality allowed.
2. No function-related abnormalities.
3. Connected parts still connecting tightly.
4. Display characteristics fulfill initial value contrast ratio should be at least 30% of initial value.

10. Storage and use precautions

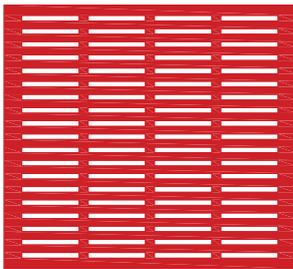
When storing and using the LCD modules, the following precaution are necessary:

- 10.1 Store them in a sealed polyethylene bag. If properly sealed, there is no need for the desiccant.
- 10.2 Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.
- 10.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.
- 10.4 The polarizer surface should not come in contact with any other objects (We advise you to store them in the anti-static electricity container in which they were shipped).
- 10.5 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.
- 10.6 Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.
- 10.7 If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be gained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
- 10.8 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 10.9 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
- 10.10 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- 10.11 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 10.12 If the display surface is contaminated, gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:
 - Isopropyl alcohol
 - Ethyl alcoholSolvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- 10.13 Do not attempt to disassemble the LCD Module.
- 10.14 If the logic circuit power is off, do not apply the input signals.
- 10.15 To prevent destruction of the elements by static electricity, be careful to

maintain an optimum work environment.

- Be sure to ground the body when handling the LCD Modules.
- Tools required for assembly, such as soldering irons, must be properly ground.
- To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions
- The LCD Module is coated with a film to protect the display surface. -
- Be care when peeling off this protective film since static electricity may be generated.
- Exposed area of the printed circuit board.
- Terminal electrode sections

11. Packing

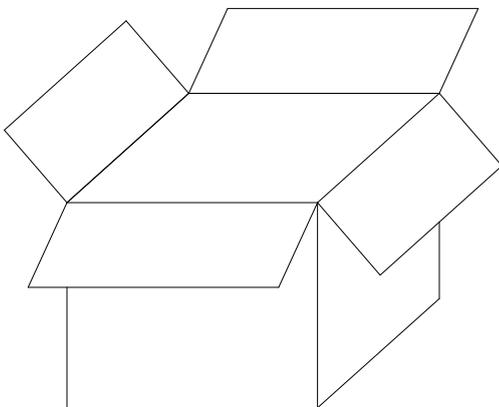


(1)

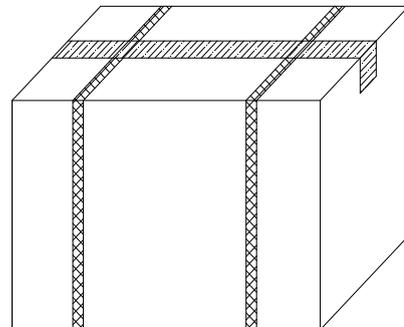
(1) Place the module into the pearl cotton tray.

(2) Place the pearl cotton tray into the carton.

(3) Wrap the carton well.



(2)



(3)