

LCM Specification

() Preliminary Specification
() Final Specification

PRODUCT TYPE: TFT MODULE

PRODUCT P/N: YXD FPC-Y80216

VERSION: 1.0

YXD

DESIGNED BY	
CHECKED BY	
APPROVED BY	

Customer

INSPECTION RESULT	
TESTED BY	
APPROVED BY	

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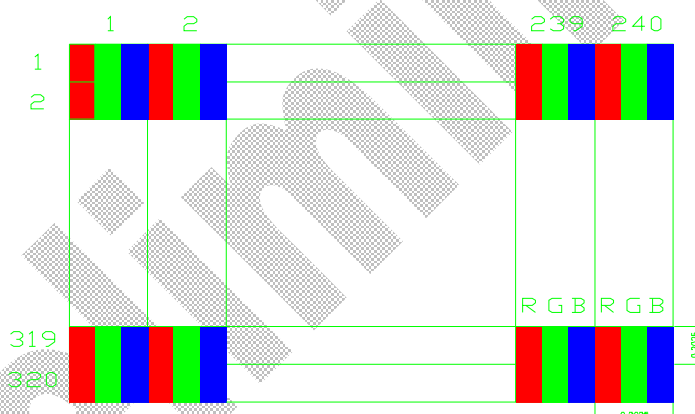
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1. General Description

2. General Features

Item	Display Panel	Remark
Display Mode	Normally White, Transmissive LCD	
Viewing Direction	9 O'CLOCK	
Input Signals	16Bits	
Outside Dimensions	57.45 mm(W)*78.95 mm(H)*4.5mm(T)	
Effective Area	-	
Active Area	64.8mm(H)×48.6mm(W)	
Number of Pixels	240×RGB×320Pixels	Note1)
Pixel Pitch	0.2025mm(H)×0.0675mm(W)	Note1)
Pixel Arrangement	RGB Vertical stripes	Note1)
Drive IC	SSD1298	

Note1)



3. Absolute Maximum Ratings

The following are maximum values which, if exceeded may cause operation or damage to the unit.

ITEM	Symbol	Min.	Typ.	Max.	Unit	Remark
Power for Circuit Driving	VDD	-0.3	-	3.3	V	
Power for Circuit Logic	VCI	-0.3	-	5.0	V	
LC Operating Voltage *1)	Vop		3.3		V	
LED Forward Voltage	V _f	3.0	-	3.6	V	per LED
LED Forward Current	I _r	-	-	20	mA	per LED
LED Luminance	B _P	-	3000	-	cd/m ²	
Storage Humidity	H _{ST}	10	-	90	%RH	At 25±5℃
Storage Temperature	T _{ST}	-40	-	85	℃	
Operating Ambient Humidity	H _{OP}	10	-	90	%RH	
Operating Ambient temperature	T _{OP}	-20	-	70	℃	

Note:

*1) Liquid Crystal driving voltage.

Due to the characteristics of LC Material, this voltage vary with environmental temperature.

*2) Temp. >60°C, Absolute humidity shall be less than 90%RH at 60°C

*3) Temp. ≤60°C, 90%RH MAX.

4. Electrical Specification

Main Window Display

(Unless specified, the ambient temperature Ta=25°C)

Properties		Sym.	Min	Typ.	Max	Unit	Note
Power for Circuit Driving		VDD	1.65	1.8	3.3	V	Note
Power for Circuit Logic		VCI	2.7	2.8	3.0	V	Note
BLU Driving Logic		Vbat	-	9.6	-	V	
Logic Input Voltage	Low Voltage	VIL	0	-	0.2VDD	V	
	High Voltage	VIH	0.8VDD	-	VDD	V	
Logic Output Voltage	Low Voltage	VOL	0	-	0.1VDD	V	
	High Voltage	VOH	0.9VDD	-	VDD	V	
Power Consumption	White	P _w	T.B.D	T.B.D	T.B.D	mW	
	Black	P _b	T.B.D	T.B.D	T.B.D	mW	
	Vertical Stripe	P _v	T.B.D	T.B.D	T.B.D	mW	

Note:

The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings.

Accordingly, please make sure that the module is used within this range. And these current values are measured under the condition that all devices are stopped, each component is stable and logic signal is input.

5. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 °C. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

Measurement condition:

*1):with Polarizer

*2):without Polarizer

*3):only color filter glass

Spec	Parameter	Sym.	Values			Unit	Note
			Min.	Typ.	Max.		
With Back light LED ON	*1) Contrast Ratio	C/R	150	200	-		Note
	*1) Threshold Voltage	Vsat	2.0	2.1	2.2	V	FIG.2
		Vth	1.0	1.1	1.2	V	
	*2) Transmittance	T%	-	6.2	-	%	FIG.1
	*1) Response Time	Tr+Tf	*3)	30	-	msec	FIG.4
	*1) Viewing Angle	θL	-	40	-	Degree	FIG.5
		θr	-	40	-		
		θu	-	60	-		
		θd	-	15	-		
	*3) CIE Color Coordinate	Wx	-	0.30	-		
		Wy	-	0.32	-		
		Rx	-	0.58	-		
		Ry	-	0.34	-		
		Gx	-	0.32	-		
		Gy	-	0.58	-		
		Bx	-	0.15	-		
		By	-	0.11	-		
	Color Gamut	S(%)	-	61.5	-	%	FIG.3

Measurement System

Notes:

- Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$
- Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.
- Response time is the time required for the display to transition from white to black

(Rising Time, T_r) and from black to white (Falling Time, T_f). For additional information see FIG 3.

4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 4.

FIG. 1 Optical Characteristic Measurement Equipment and Method

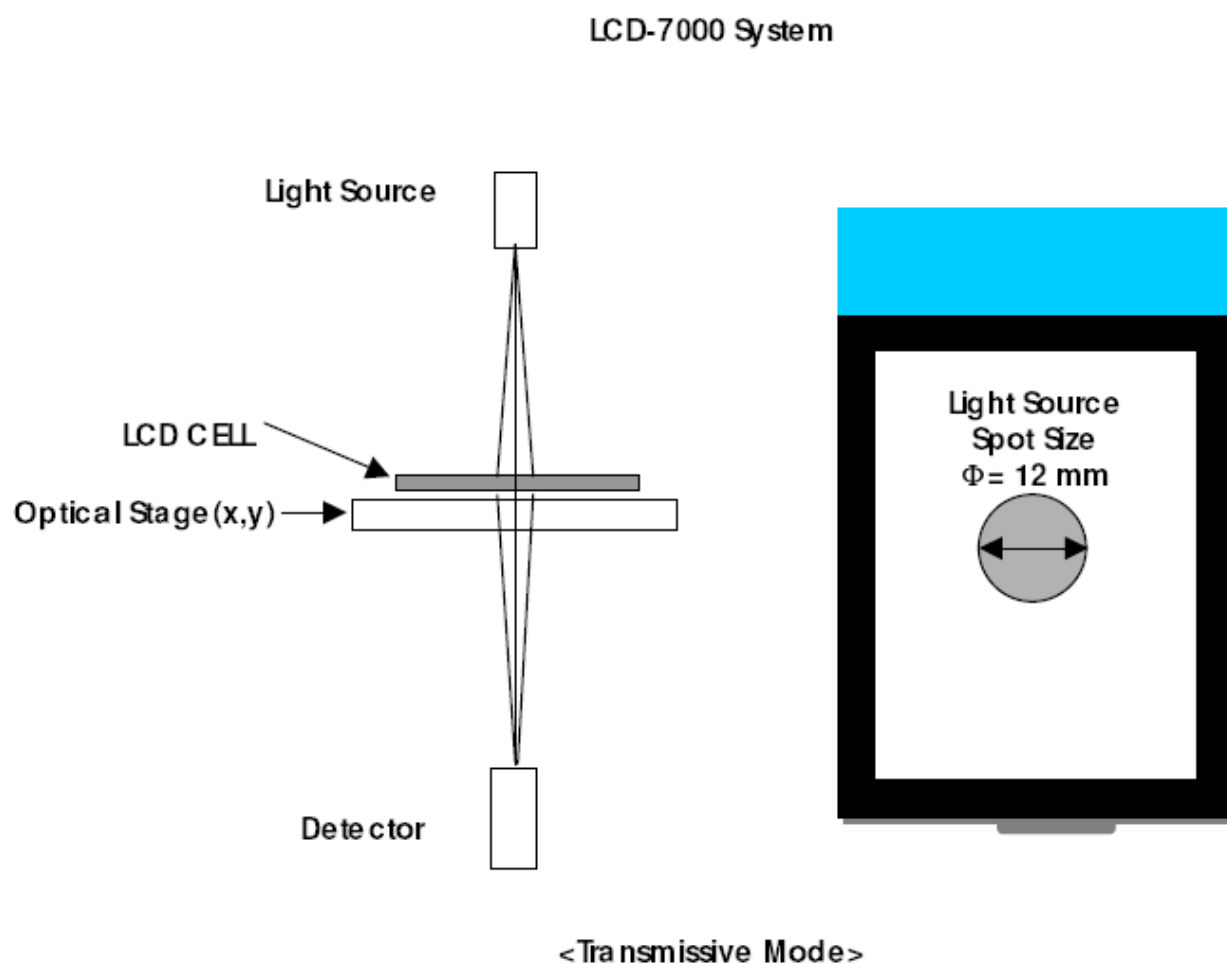


Fig. 2 The Definition of V_{th} and V_{sat}

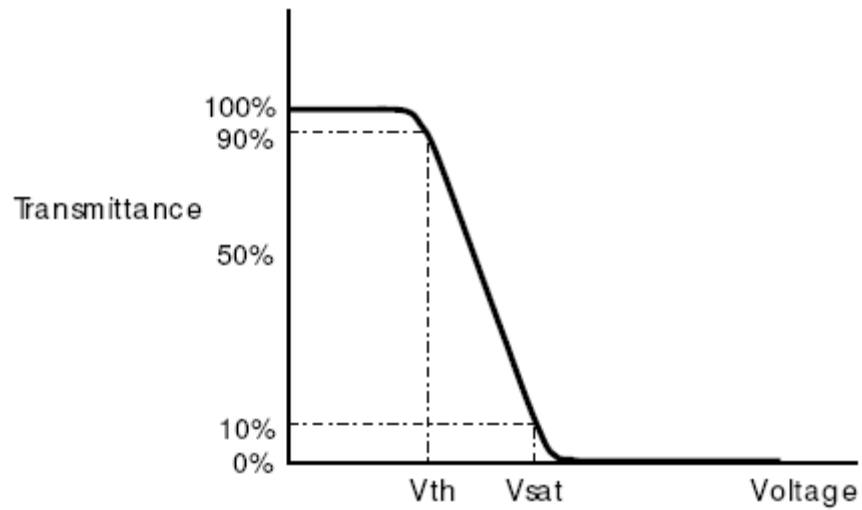


Fig. 3 The Definition of Color Gamut

Color Gamut : $S(\%) = (\text{RGB Triangle Area} / \text{NTSC Triangle Area}) \times 100$

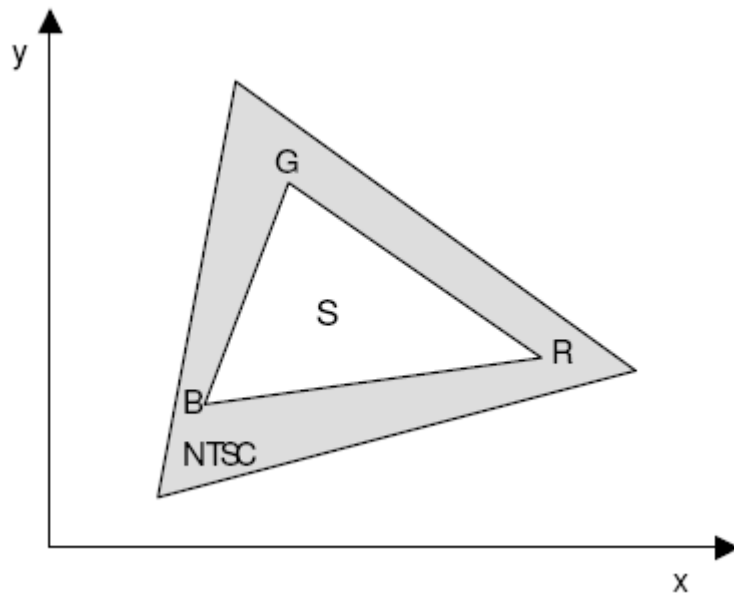


FIG. 4 The definition of Response Time

The response time is defined as the following figure and shall be measured by

switching the input signal for “black” and “white”.

Response Time = Rising Time(T_r) + Falling Time(T_f)

- Rising Time(T_r) : Full White 90% \rightarrow Full White 10% Transmittance.
- Falling Time(T_f) : Full White 10% \rightarrow Full White 90% Transmittance.

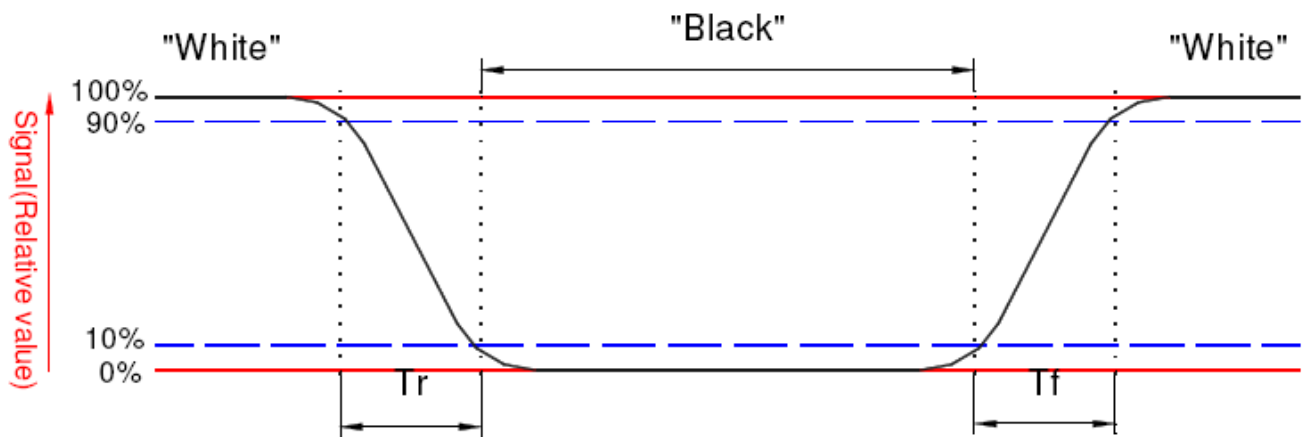
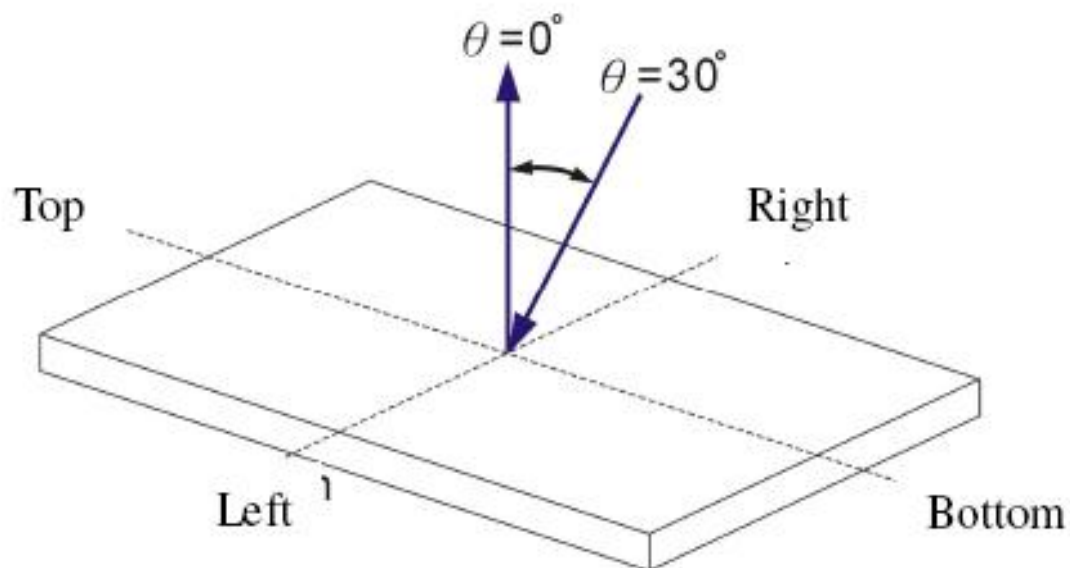
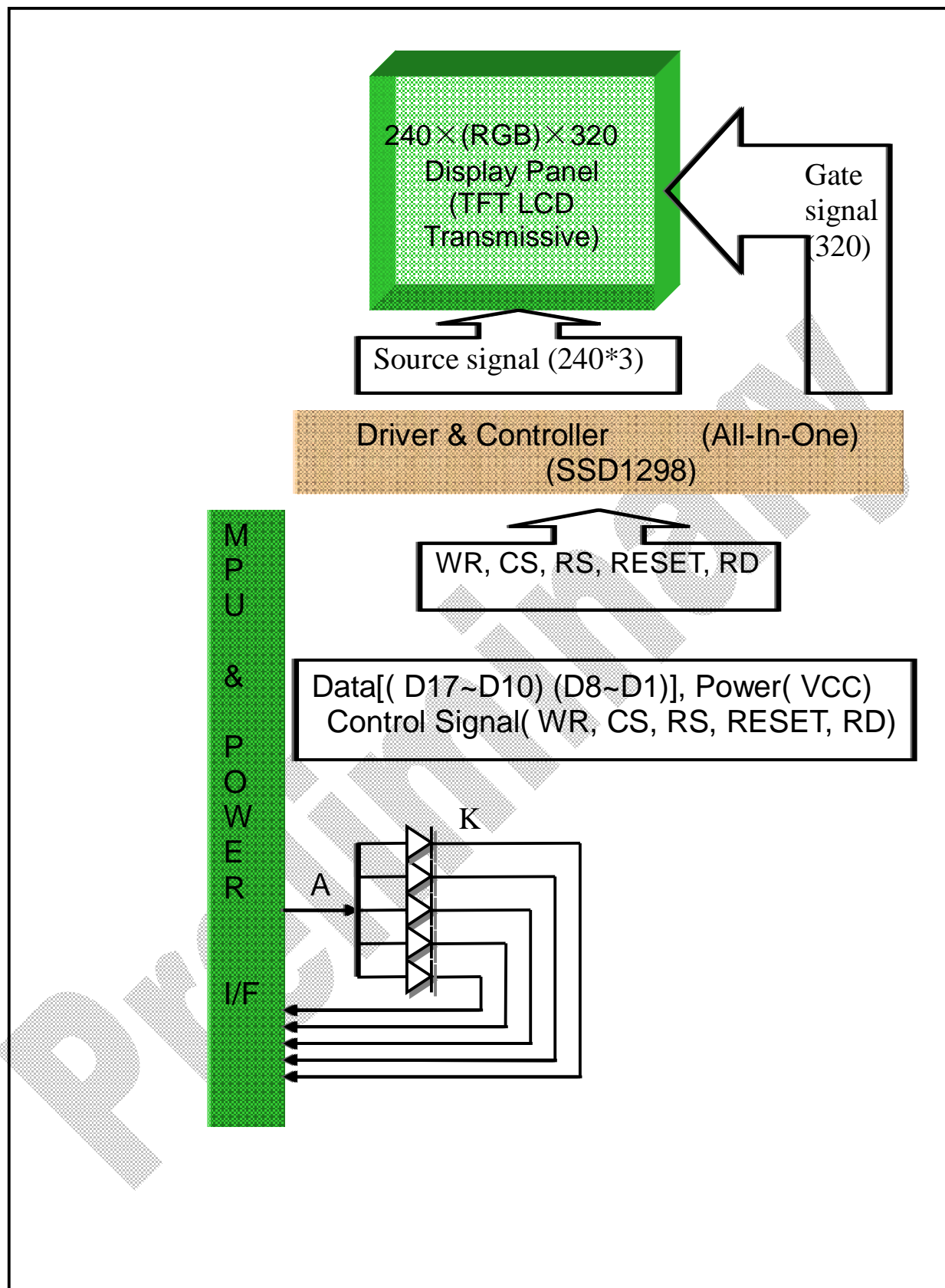


FIG. 5 The definition of Viewing Angle

Use Fig. 1 (Test Procedure) under Measurement System to measure the contrast from the measuring direction specified by the conditions as the following figure.



6. Block Diagram

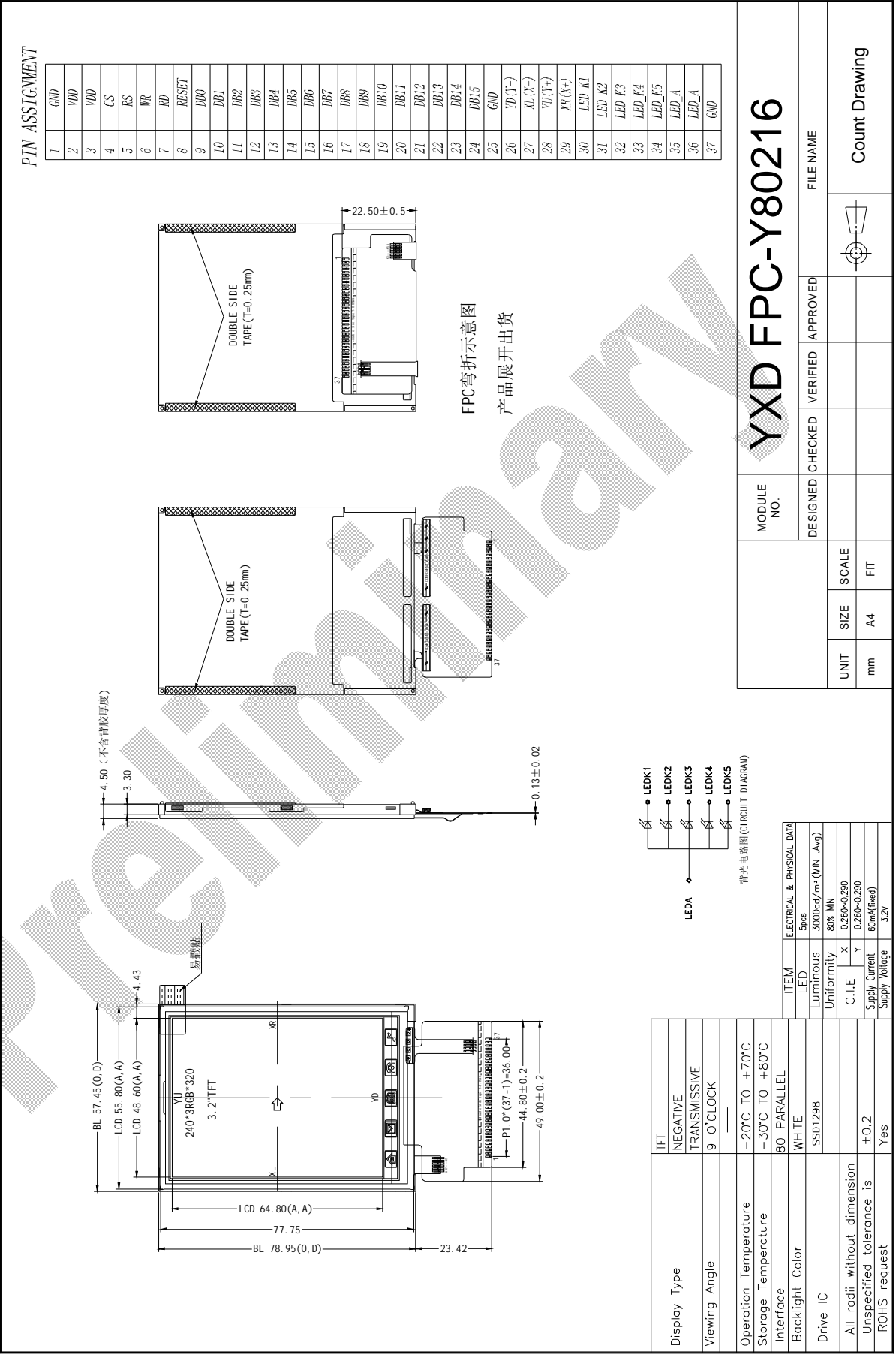


7. Pin Description

Input Signal and Power(35 Pins FPC PAD)

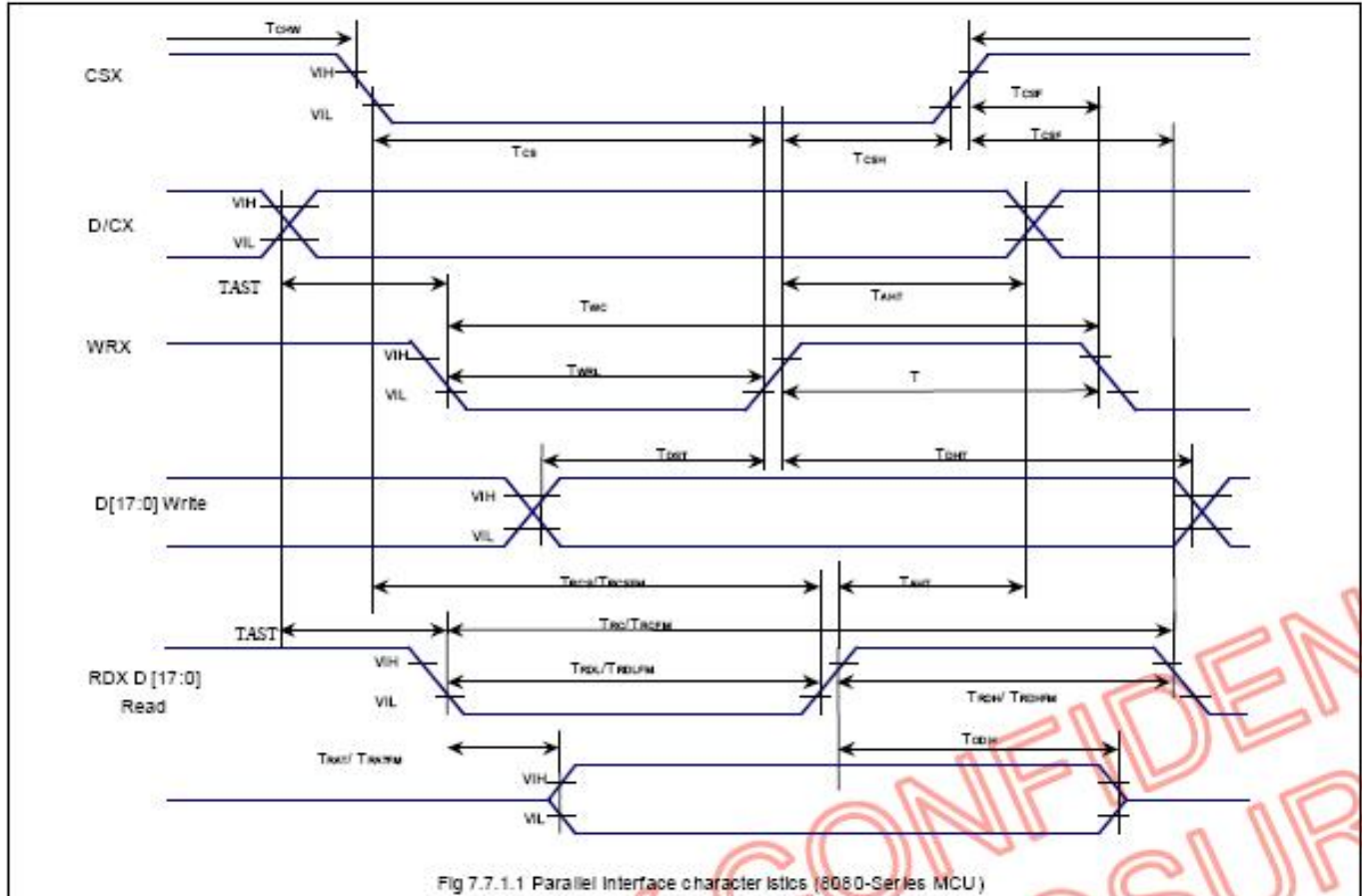
Pin NO.	Symbol	Description	Remark
1	GND	O	Ground
2	VDD	I	Power supply
3	VDD	I	Power supply
4	CS	I	Chip Select Pin
5	RS	I	Command/display data select pin
6	WR	I	Write enable clock input pin
7	RD	I	Read enable clock input pin
8	RESET	I	RESET set pin
9~24	DB0~DB15	I/O	Data Bus
25	GND	O	Ground
26	YD	I	Touch panel Down pin
27	XL	I	Touch panel Left pin
28	YU	I	Touch panel Up pin
29	XR	I	Touch panel Right pin
30	LEDK1	I	The led power supply(-)
31	LEDK2	I	The led power supply(-)
32	LEDK3	I	The led power supply(-)
33	LEDK4	I	The led power supply(-)
34	LEDK5	I	The led power supply(-)
35	A	I	The led power supply(+)
36	A	I	The led power supply(+)
37	GND	O	Ground

8. Outline Dimension



9. Timing Characteristics

9.1. 80-System bus interface operation

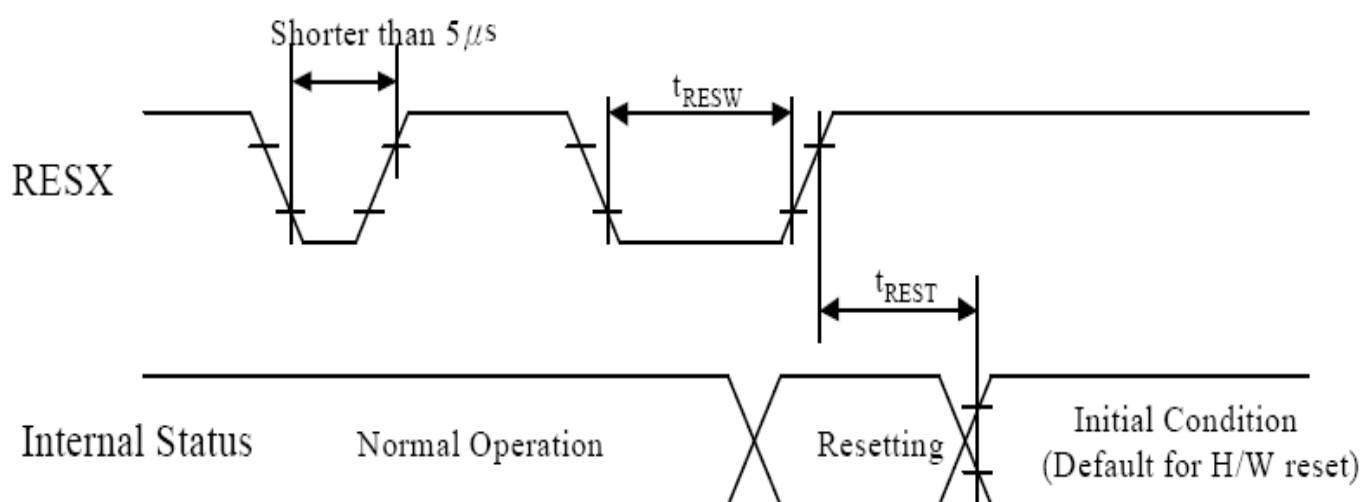


9.2. Timing Characteristics

Normal Write Mode(HWM='0'), IOVcc=1.65V~3.6V,Vcc=2.5V~3.6V

Parameter	Symbol	Unit	Min.	Max.	Unit
Bus cycle time write	t_{CYCW}	ns	100	-	-
Bus cycle time read	t_{CYCR}	ns	160	-	-
Write low-level pulse width	PW_{LW}	ns	35	-	-
Read low-level pulse width	PW_{LR}	ns	45	-	-
Write high-level pulse width	PW_{HW}	ns	35	-	-
Read high-level pulse width	PW_{HR}	ns	90	-	-
Write/Read rise/fall time	t_{WR}, t_{WRf}	ns	-	-	25
Setup time Write	t_{AS}	ns	0	-	-
Setup time Read	t_{AS}	ns	10	-	-
Address hold time	t_{AH}	ns	2	-	-
Write data setup time	t_{DSW}	ns	25	-	-
Write data hold time	t_H	ns	5	-	-
Read data delay time	t_{DDR}	ns	-	-	100
Read data hold time	t_{DHR}	ns	5	-	-

9.3. Reset Operation



($V_{DD1}=V_{DD}=2.3\sim 3.3\text{ V}$, $T_a=-40\sim +85^{\circ}\text{C}$)

Parameter	Symbol	Unit	Min.	Typ.	Max.
Reset rise time	t_{rRES}	μs	-	-	10
Reset LOW-level width	t_{RES}	ms-	10	-	-

10. Reliability and Inspection Standard

No.	Test Item		Test Conditions	Remark
1	High Temperature	Storage	70°C , 120Hr	Note
		Operation	60°C , 120Hr	Note
2	Low Temperature	Storage	-30°C , 120Hr	Note
		Operation	-20°C , 120Hr	
3	High Temperature and High Humidity		60°C , 90%RH, 120Hr	Note
4	Temperature Cycle	Storage	-10°C (1Hr) $\rightarrow 25^{\circ}\text{C}$ (5min) $\rightarrow 60^{\circ}\text{C}$ (1Hr) 32 Cycles	Note
		Operation	-20°C (1Hr) $\rightarrow 25^{\circ}\text{C}$ (5min) $\rightarrow 60^{\circ}\text{C}$ (1Hr) 25 Cycles	
5	Peeling Off (Storage)		$\geq 500\text{gf/cm}$	Note
6	FPC Bending Test		$\geq 6,000$ times, 2/sec	Note
7	Vibration Test(Storage)		50HZ, 30min, Amplitude: 2 cm, X/Y/Z directions	Note
8	Drop Test		60cm/ 3Corner/ 8Face, 1Cycle	Note

Note:

- 1) The test samples should be applied to only one test item.
- 2) Sample size for each test item is 5~10pcs.
- 3) For Damp Proof Test, pure water(Resistance>1MΩ) should be used.
- 4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
- 5) EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and fluorescence EL has.
- 6) After the reliability test, the test samples should be inspected after 2 hours at least.
- 7) Functional test is OK. Missing segment, shorts, unclear segment, non display, display abnormally, liquid crystal leak are not allowed.
- 8) After testing, the current Idd should be within initial value $\pm 20\%$.
- 9) No low temperature bubbles ,end seal loose and fall, frame rainbow, ACF bubble growing are allowable in the appearance test.

11. Inspection Criterion

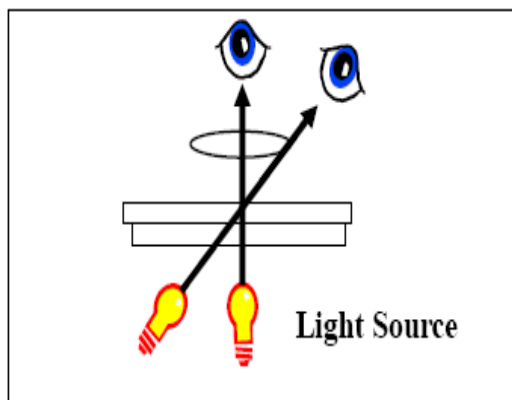
12.1. Sampling Method

Unless otherwise agreed upon in writing, the sampling inspection shall be applied to the Customer's incoming inspection.

- 1) Lot size: Quantity per shipment lot
- 2) Sampling type: Normal inspection , single sampling
- 3) Inspection level: II
- 4) Sampling table: MIL-STD-105D
- 5) Acceptable Quality Level(AQL): Major=0.65 Minor=1.5

12.2. Inspection Method

- 1) Ambient Condition:
 - a. Temperature: Room temperature $25\pm 5^{\circ}\text{C}$
 - b. Illumination: Single fluorescent lamp non-directive(300 to 700 Lux)
- 2) Viewing distance
The distance between the LCD and the inspector' s eyes shall be at least 30-50cm.
- 3) Viewing Angle
The inspection shall be conducted within normal viewing angle range.

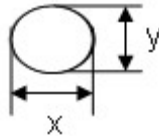



12.3. Inspection Criteria

12.3.1. Major defect

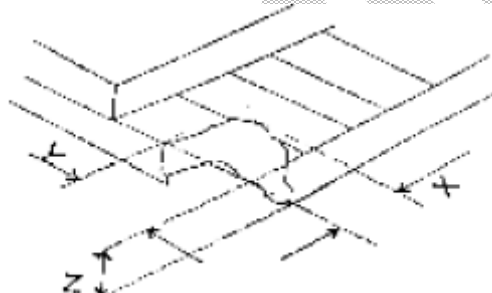
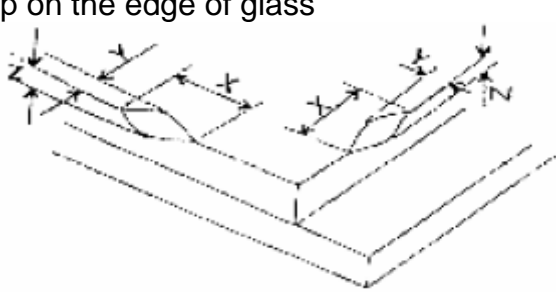
No.	Item	Inspection Standard	Classification of defects
1	All functional defects	1) No display 2) Display abnormally 3) Open or missing segment 4) Short circuit 5) Excess power consumption 6) Backlight no lighting, flickering and abnormal lighting	Major
2	Missing	Missing component	Major
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	Major

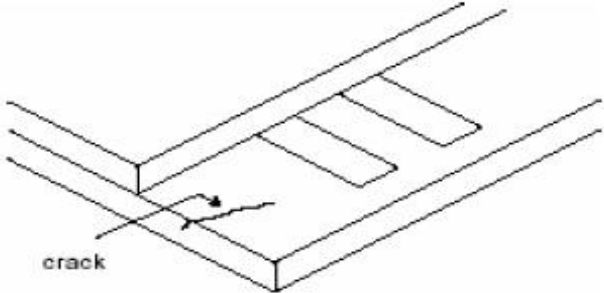
12.3.2. Cosmetic Defect

No.	Item	Inspection Standard		Classification of defects							
1	(spot defect) Black and White spot pinhole	For dark/white spot, size Φ is defined as $\Phi=(x+y)/2$		Minor							
		<table> <tr> <th>Size Φ (mm)</th> <th>Acceptable Quantity</th> </tr> <tr> <td>$\Phi \leq 0.1$</td> <td>Ignore</td> </tr> <tr> <td>$0.10 \leq \Phi \leq 0.15$</td> <td>2</td> </tr> <tr> <td>$0.15 \leq \Phi \leq 0.2$</td> <td>1</td> </tr> <tr> <td>$0.2 < \Phi$</td> <td>0</td> </tr> </table>			Size Φ (mm)	Acceptable Quantity	$\Phi \leq 0.1$	Ignore	$0.10 \leq \Phi \leq 0.15$	2	$0.15 \leq \Phi \leq 0.2$
Size Φ (mm)	Acceptable Quantity										
$\Phi \leq 0.1$	Ignore										
$0.10 \leq \Phi \leq 0.15$	2										
$0.15 \leq \Phi \leq 0.2$	1										
$0.2 < \Phi$	0										
2	(line defect) Black and White line Polarizer scratch	Define: 		Minor							
		<table> <tr> <th>Width(mm)</th> <th>Length(mm);Acceptable Qty</th> </tr> <tr> <td>$\Phi \leq 0.03$</td> <td>Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.05$</td> <td>$L \leq 3.0$; $N \leq 2$</td> </tr> <tr> <td>$0.05 < W \leq 0.1$</td> <td>$L \leq 2.0$; $N \leq 2$</td> </tr> <tr> <td>$0.1 < W$</td> <td>Define as spot defect</td> </tr> </table>			Width(mm)	Length(mm);Acceptable Qty	$\Phi \leq 0.03$	Ignore	$0.03 < W \leq 0.05$	$L \leq 3.0$; $N \leq 2$	$0.05 < W \leq 0.1$
Width(mm)	Length(mm);Acceptable Qty										
$\Phi \leq 0.03$	Ignore										
$0.03 < W \leq 0.05$	$L \leq 3.0$; $N \leq 2$										
$0.05 < W \leq 0.1$	$L \leq 2.0$; $N \leq 2$										
$0.1 < W$	Define as spot defect										

3	Polarizer defect	Dent or bubble(between the polarizer and glass)		Minor
		Size Φ (mm)	Acceptable Qty	
		$\Phi \leq 0.10$	Ignor	
		$0.10 < \Phi \leq 0.20$	2	
		$0.20 < \Phi \leq 0.30$	1	
		$0.30 < \Phi$	0	

12.3.3. Cosmetic Defect

No.	Item	Inspection Standard	Classification of defects						
1	Glass defect	<div>1) Chip on the corner</div> <div></div> <div><table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0</td><td>≤S</td><td>≤T</td></tr></table></div> <div><div>Remark: S=contact pad length; T=the thickness of glass</div><div>Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal. Acceptable Quantity N≤2.</div></div>	X	Y	Z	≤3.0	≤S	≤T	Minor
		X	Y	Z					
≤3.0	≤S	≤T							
<div>2) Chip on the edge of glass</div> <div></div> <div><table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>Ignore</td><td>≤0.5</td><td>≤T</td></tr></table></div>	X	Y	Z	Ignore	≤0.5	≤T	Minor		
X	Y	Z							
Ignore	≤0.5	≤T							

		Acceptable Quantity: $N \leq 2$	
		3) Creak Creaks tend to break are not allowed. 	

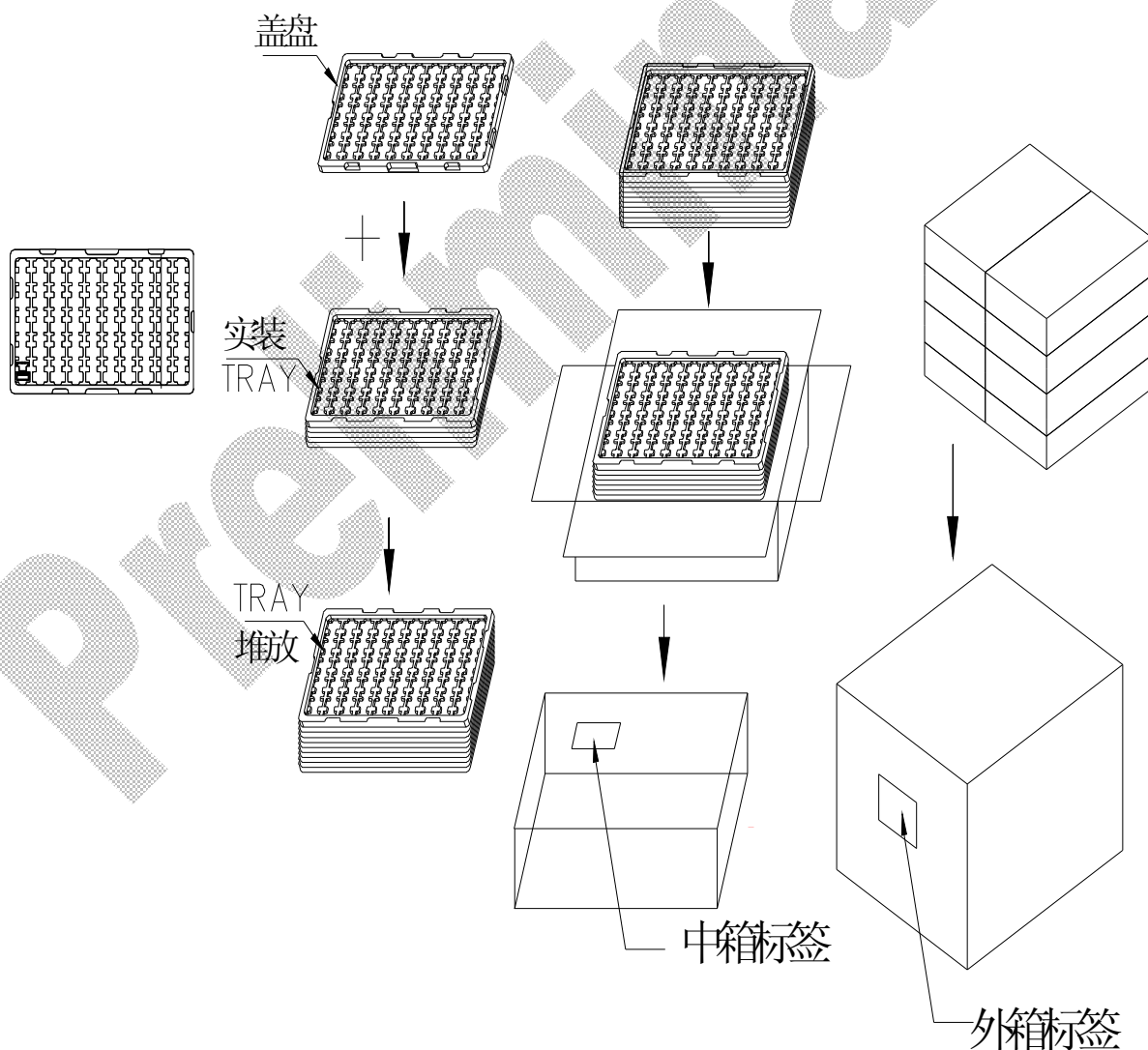
13. Packing Dimension

Packaging Quantity:

One tray Include: **10** pcs module;

One B-F Box Include: **10** pcs tray; **100** pcs Module;

One Carton Include: **TBD**-set B-F Box; **TBD** pcs tray; **TBD** pcs Module



PRECAUTIONS FOR USING LCD MODULES

Handling Precautions

- (1) The display panel is made of glass and polarizer. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
- (2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in contact with room temperature air.
- (5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
 - Isopropyl alcohol
 - Ethyl alcoholDo not scrub hard to avoid damaging the display surface.
- (6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solventsWipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.
- (7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- (8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
- (9) Do not attempt to disassemble or process the LCD module.
- (10) NC terminal should be open. Do not connect anything.
- (11) If the logic circuit power is off, do not apply the input signals.
- (12) Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.
 - Do not alter, modify or change the shape of the tab on the metal frame.
 - Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
 - Do not damage or modify the pattern writing on the printed circuit board.
 - Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
 - Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
 - Do not drop, bend or twist LCM.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.
- (2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
- (3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

Others

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.

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 regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
- Terminal electrode sections.