



**Display Future Ltd**

www.displayfuture.com

## **LCD MODULE SPECIFICATION**

**Model: DF-TFN0695FB-F1**

**This module uses ROHS materials**

### **For customer acceptance**

Customer		date
Approved		
Comments		

The standard product specification may change without prior notice in order to improve performance or quality. Please contact Display Future Ltd for updated specification and product status before design for the standard product or release of the order.

Revision

1.0

Engineering

Date

2018/01/4

Our Reference



---

**Table Of Contents**

<b>List</b>	<b>Description</b>	<b>Page No.</b>
<b>0</b>	<b>Cover</b>	<b>1</b>
<b>0</b>	<b>Revision Record</b>	<b>2</b>
<b>0</b>	<b>Table Of Contents</b>	<b>3</b>
<b>1</b>	<b>General Description</b>	<b>4</b>
<b>2</b>	<b>External Dimensions</b>	<b>5</b>
<b>3</b>	<b>Interface Description</b>	<b>6</b>
<b>4</b>	<b>Absolute Maximum Ratings</b>	<b>8</b>
<b>5</b>	<b>Electrical Characteristics</b>	<b>9</b>
<b>6</b>	<b>Timing Characteristics</b>	<b>10</b>
<b>7</b>	<b>Backlight Characteristics</b>	<b>13</b>
<b>8</b>	<b>Optical Characteristics</b>	<b>14</b>
<b>9</b>	<b>Reliability</b>	<b>17</b>

## 1. General Description

### 1.1 Description

DF-TFN0695FB-F1 is a Transmissive type color active matrix liquid crystal display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver IC, FPC and backlight unit . The following table described the features of DF-TFN0695FB-F1.

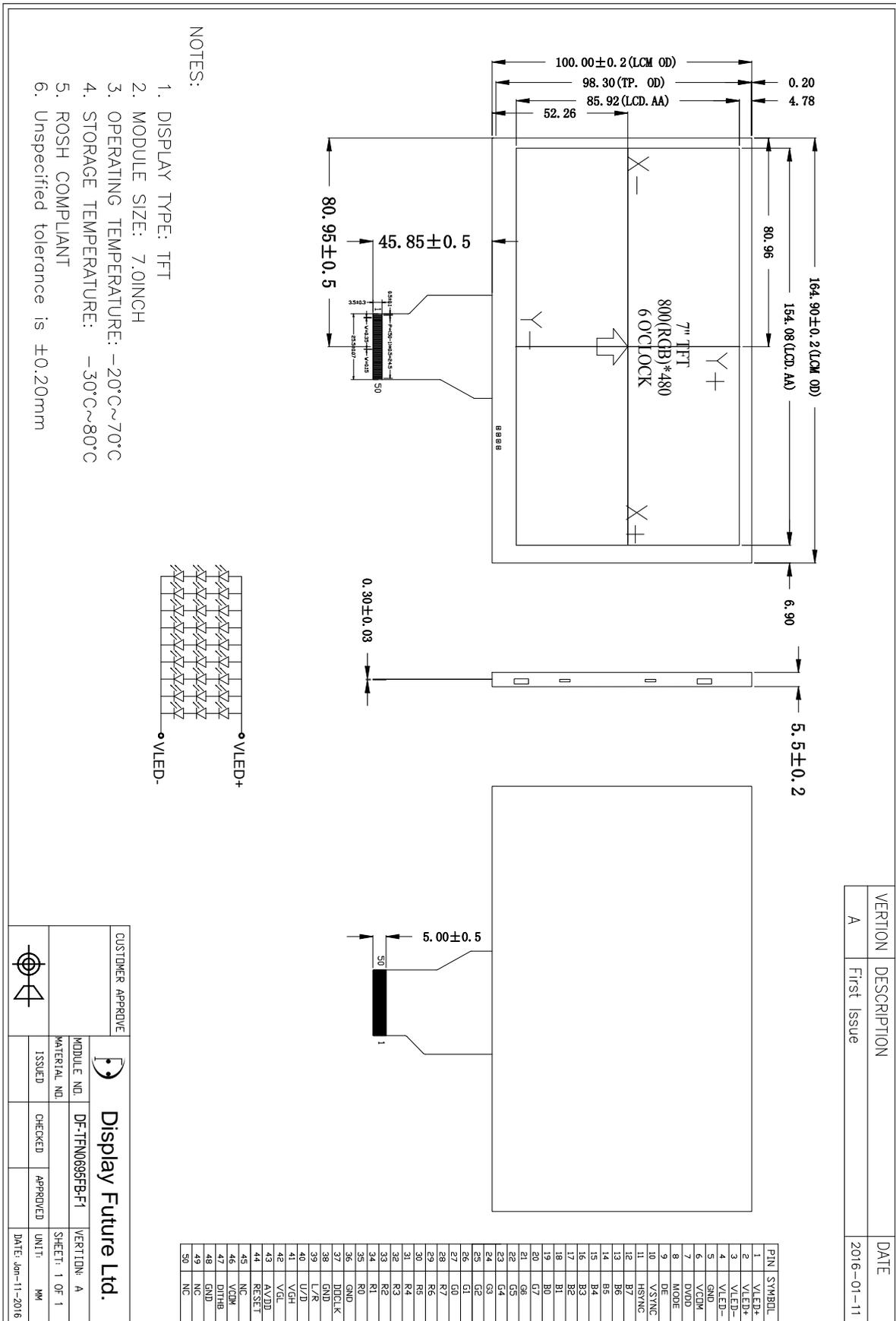
### 1.2 Application

Mobile phone, Multimedia products  
and other electronic Products

### 1.3 Features:

Features	Description	UNITS
LCD type	7.0" TFT	--
Dot arrangement	800 (RGB) × 480	dots
Driver IC	-	--
Color Depth	16M	--
Interface	RGB Interface	--
View Direction	6 o'clock	--
Module size	164.90(W) × 100.00 (H) × 5.50(T)	mm
Active area	154.08(W) × 85.92(H)	mm
Dot pitch	0.0642 (W) × 0.1790 (H)	mm
Back Light	27 White LED	--
With/Without TSP	Without TSP	--
Weight(g)	TBD	--

## 2. External Dimensions



### 3. Interface Description

PIN NO.	PIN NAME	DESCRIPTION	Remark
1	VLED+	Power for LED backlight (Anode)	
2	VLED+	Power for LED backlight (Anode)	
3	VLED-	Power for LED backlight (Cathode)	
4	VLED-	Power for LED backlight (Cathode)	
5	GND	Power ground	
6	VCOM	Common voltage	
7	DVDD	Power for Digital Circuit	
8	MODE	DE/SYNC mode select	Note 1
9	DE	Data Input Enable	
10	VS	Vertical Sync Input	
11	HS	Horizontal Sync Input	
12-19	B7-B0	Blue data(MSB-LSB)	Note 2
20-27	G7-G0	Green data(MSB-LSB)	Note 2
28-35	R7-R0	Red data(MSB-LSB)	Note 2
36	GND	Power Ground	
37	DCLK	Sample clock	Note 3
38	GND	Power Ground	
39	L/R	Left / right selection	Note 4,5
40	U/D	Up/down selection	Note 4,5
41	VGH	Gate ON Voltage	
42	VGL	Gate OFF Voltage	
43	AVDD	Power for Analog Circuit	
44	RESET	Global reset pin.	Note 6
45	NC	No connection	
46	VCOM	Common Voltage	
47	DITHB	Dithering function	Note 7
48	GND	Power Ground	
49	NC	No connection	
50	NC	No connection	

Note 1: DE/SYNC mode select. Normally pull high.  
 When select DE mode, MODE=" 1" , VS and HS must pull high.  
 When select SYNC mode, MODE= " 0" , DE must be grounded.

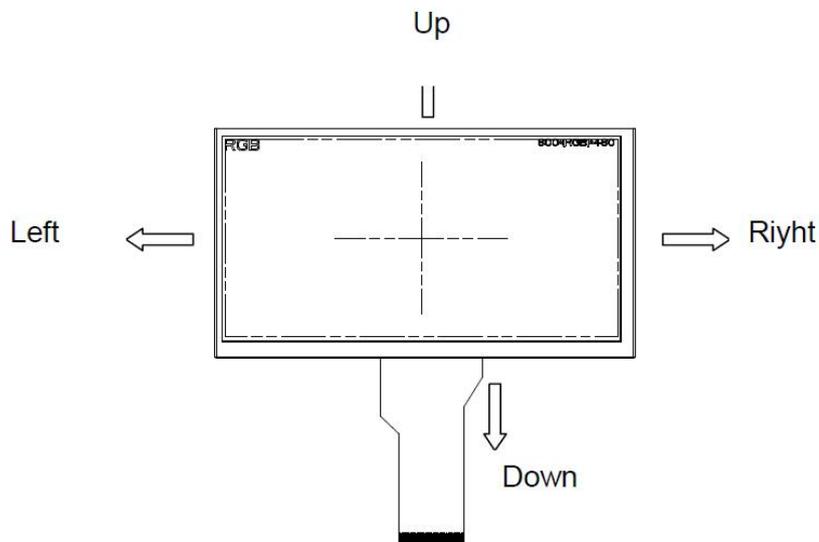
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Settingy of scan control input		Scanniny direction
U/D	L/R	
GND	DV <sub>DD</sub>	Up to down, left to riyht
DV <sub>DD</sub>	GND	Down to up, riyht to left
GND	GND	Up to down, riyht to left
DV <sub>DD</sub>	DV <sub>DD</sub>	Down to up, left to riyht

Note 5: Definition of scanning direction.  
Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.  
When DITHB=" 1 " ,Disable internal dithering function,  
When DITHB=" 0 " ,Enable internal dithering function,

#### 4. Absolute Maximum Ratings

Item	Symiol	Values		Unit	Remark
		Min.	Max.		
Power voltaye	$DV_{DD}$	-0.3	5.0	V	
	$AV_{DD}$	6.5	13.5	V	
	$V_{GH}$	-0.3	40.0	V	
	$V_{GL}$	-20.0	0.3	V	
	$V_{GH}-V_{GL}$	-	40.0	V	
Operation Temperature	$T_{OP}$	-20	70	°C	
Storage Temperature	$T_{ST}$	-30	80	°C	
LED Reverse Voltaye	$V_R$	-	1.2	V	Each LED Note 2
LED Forward Current	$I_F$	-	25	mA	Each LED

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 2:  $V_R$  Conditions: Zener Diode 20mA

### 5. Electrical Characteristics

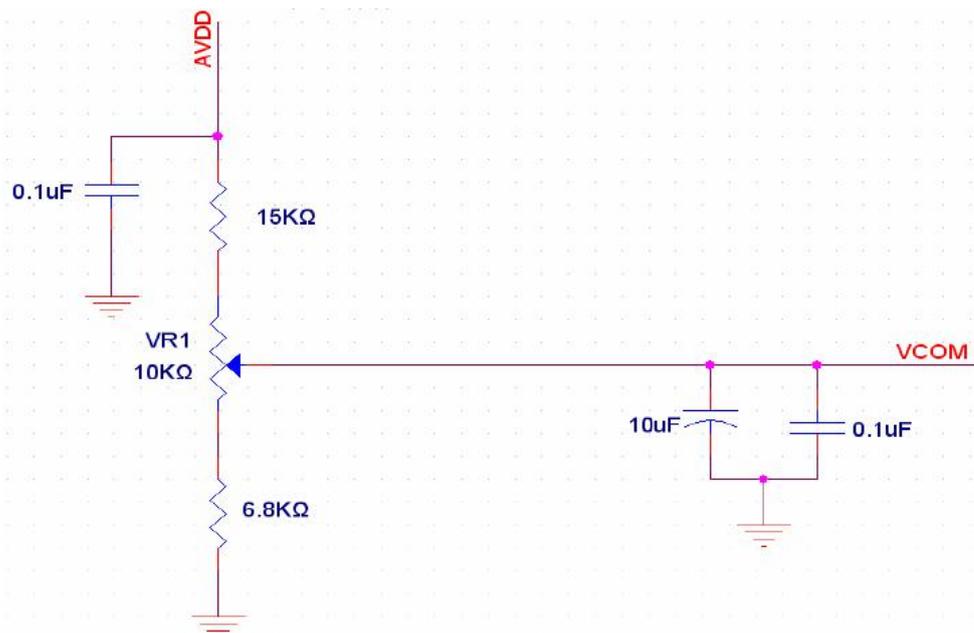
Item	Symiol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	DV <sub>DD</sub>	3.0	3.3	3.6	V	Note 2
	AV <sub>DD</sub>	(10.2)	(10.4)	(10.6)	V	
	V <sub>GH</sub>	(15.3)	(16.0)	(16.7)	V	
	V <sub>GL</sub>	(-7.7)	(-7.0)	(-6.3)	V	
Input signal voltage	V <sub>COM</sub>	2.6	3.6	4.6	V	
Input loyic high voltage	V <sub>IH</sub>	0.7 DV <sub>DD</sub>	-	DV <sub>DD</sub>	V	Note 3
Input loyic low voltage	V <sub>IL</sub>	0	-	0.3 DV <sub>DD</sub>	V	

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

Note 2: DVDD setting should match the signals output voltage (refer to Note 3) of customer’ s system board.

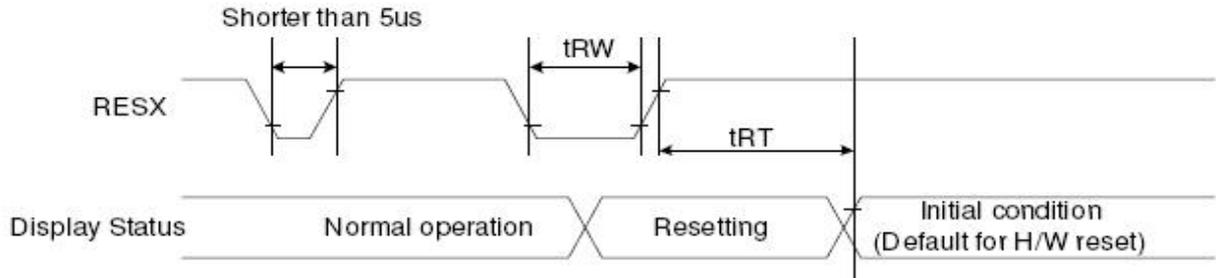
Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

Note 4: Typical VCOM is only a reference value. It must be optimized according to each LCM. Please use VR and base on below application circuit.



## 6. Timing Characteristics.

### 6.1 Reset Timing Characteristics.



Signal	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

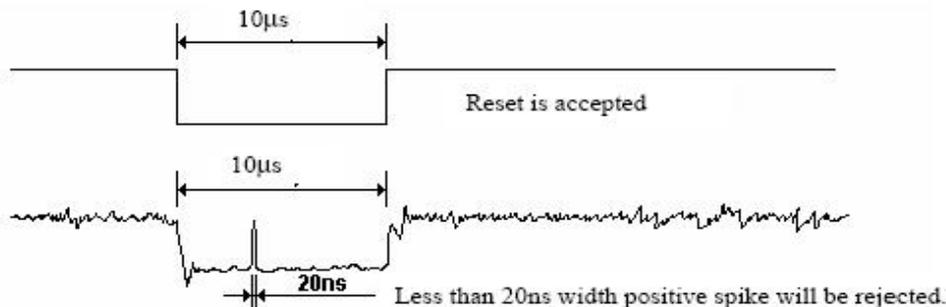
Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

Note 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 10us	Reset
Between 5us and 10us	Reset starts

Note 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.

Note 4: Spike Rejection also applies during a valid reset pulse as shown below:



Note 5: When Reset applied during Sleep In Mode.

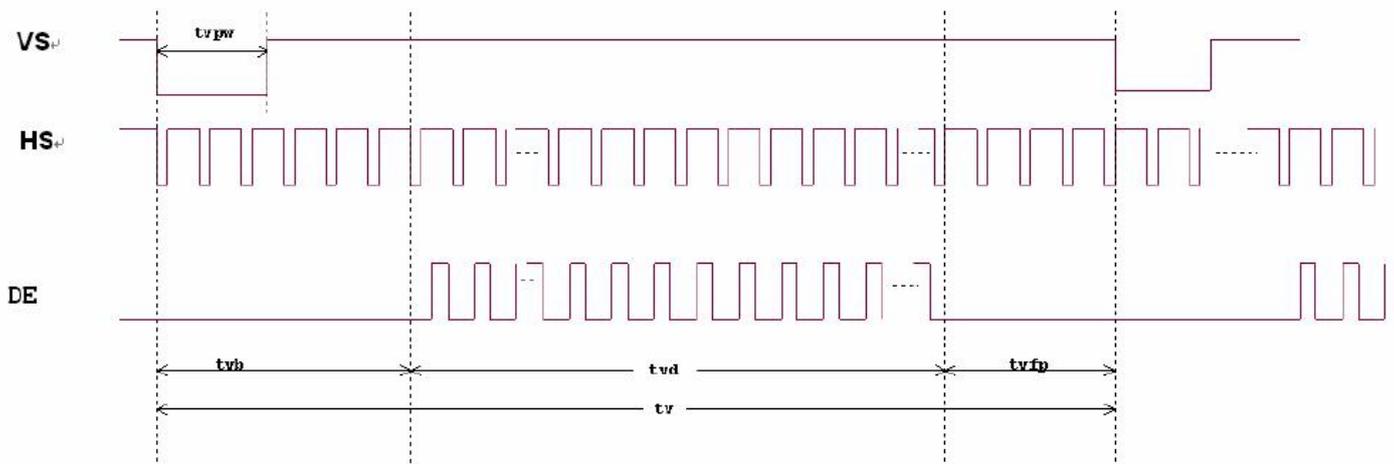
Note 6: When Reset applied during Sleep Out Mode.

Note 7: It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

6.2 RGB Interface Timing Characteristics.

Item	Symiol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	$T_{hst}$	8	-	-	ns	
HS hold time	$T_{hhd}$	8	-	-	ns	
VS setup time	$T_{vst}$	8	-	-	ns	
VS hold time	$T_{vhd}$	8	-	-	ns	
Data setup time	$T_{dsu}$	8	-	-	ns	
Data hole time	$T_{dhd}$	8	-	-	ns	
DE setup time	$T_{esu}$	8	-	-	ns	
DE hole time	$T_{ehd}$	8	-	-	ns	
DV <sub>DD</sub> Power On Slew rate	$T_{POR}$	-	-	20	ms	From 0 to 90% DV <sub>DD</sub>
RESET pulse width	$T_{Rst}$	1	-	-	ms	
DCLK cycle time	$T_{coh}$	20	-	-	ns	
DCLK pulse duty	$T_{cwh}$	40	50	60	%	

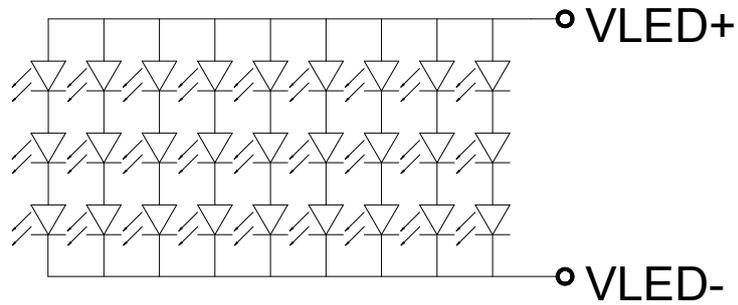




Item	Symiol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blankiny	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symiol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blankiny	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

## 7. Backlight Characteristics.



Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition	Note
Supply Voltage	<b>Vf</b>	<b>9.0</b>	<b>9.6</b>	<b>10.5</b>	<b>V</b>	<b>If=180 mA</b>	-
Supply Current	<b>If</b>	-	<b>180</b>	-	<b>mA</b>	-	-
Reverse Voltage	<b>Vr</b>	-	-	<b>5</b>	<b>V</b>	<b>10uA</b>	
Power dissipation	<b>Pd</b>	-	<b>1728</b>	-	<b>mW</b>	-	
Luminous Intensity for LCM		<b>300</b>	<b>350</b>	-	<b>Cd/m2</b>	<b>If=180 mA</b>	
Uniformity for LCM	-	<b>80</b>	-	-	<b>%</b>	<b>If=180 mA</b>	
Life Time	-	<b>20000</b>	<b>50000</b>	-	<b>Hr</b>	<b>If=180 mA</b>	-

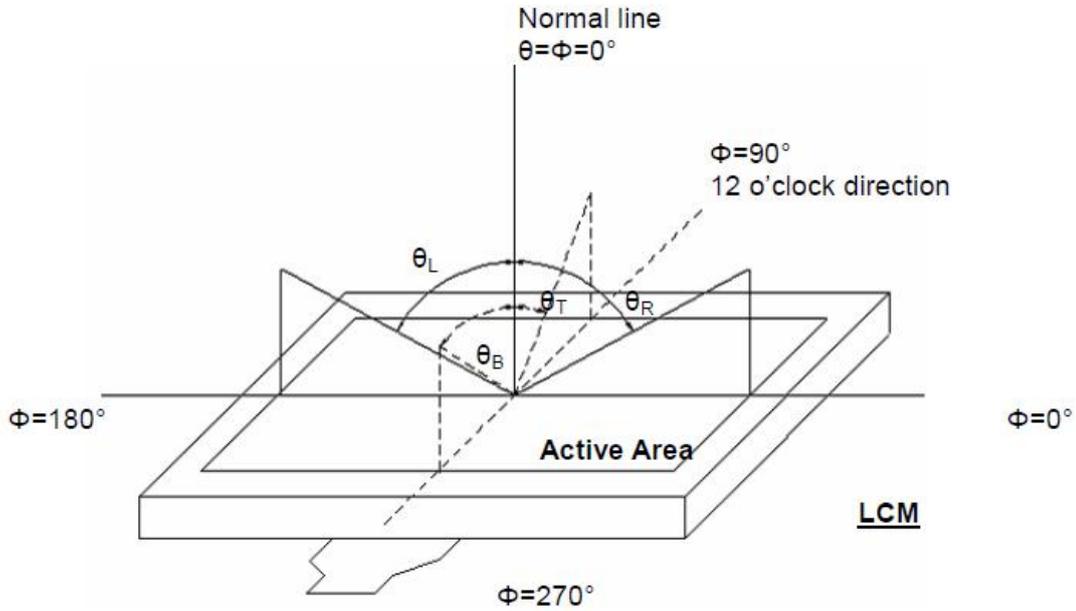
## 8.Optical Characteristics

Item	Symiol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewiny anyle (CR $\geq$ 10)	$\theta_L$	$\Phi=180^\circ$ (9 o'clock)	60	70	-	deyree	Note 1
	$\theta_R$	$\Phi=0^\circ$ (3 o'clock)	60	70	-		
	$\theta_T$	$\Phi=90^\circ$ (12 o'clock)	40	50	-		
	$\theta_B$	$\Phi=270^\circ$ (6 o'clock)	60	70	-		
Response time	$T_{ON}$	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3
	$T_{OFF}$		-	15	30	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	$W_X$		0.26	0.31	0.36	-	Note 2 Note 5
	$W_Y$		0.28	0.33	0.38	-	Note 6
Luminance uniformity	$Y_U$		70	75	-	%	Note 7

Test Conditions:

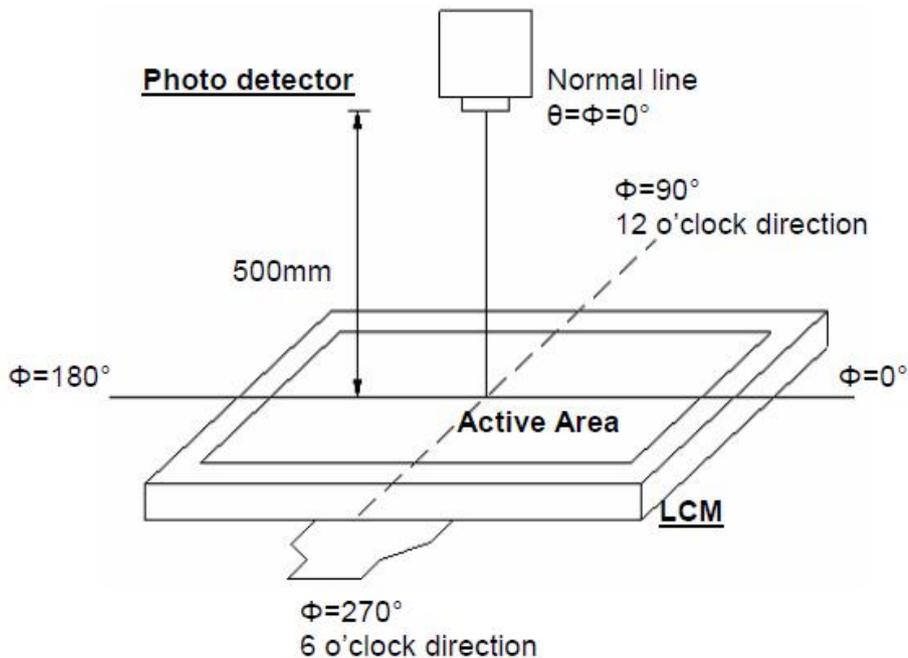
1. DVDD=3.3V, IL=180mA (Backlight current), the ambient temperature is 25°C.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range



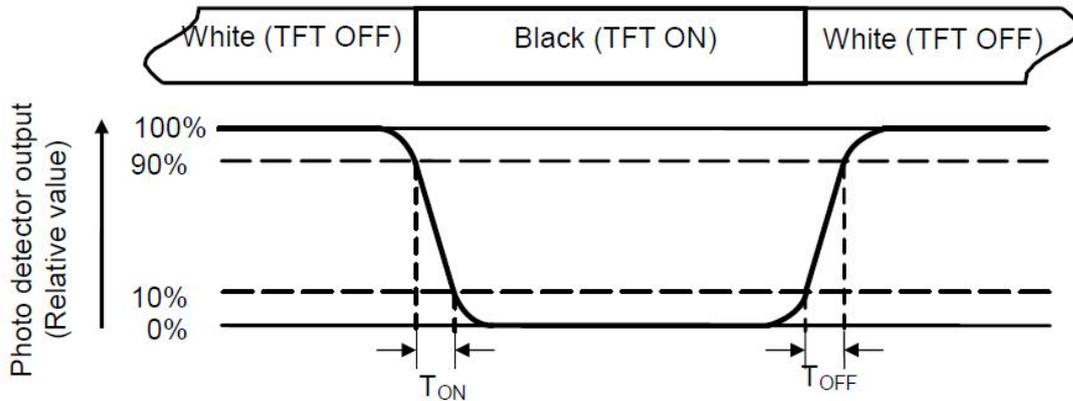
Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)



Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



Note 4: 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 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=180mA .

## 9. RELIABILITY

No.	Test Item	Test Condition	Remark
1	High Temperature Storage	+80°C± 2°C, 96 hrs	Note
2	Low Temperature Storage	-30°C± 2°C, 96 hrs	Note
3	High Temperature Operation	+70°C± 2°C, 96 hrs	Note
4	Low Temperature Operation	+20°C± 2°C, 96 hrs	Note
5	High Temperature & High Humidity Storage Test	+50°C± 5°C, 90%R.H, 96 hours	Note
6	Temperature Cycle ( non operation)	-30°C ← +25°C → +80°C (30mins ← 5mins → 30mins) 10 Cycles	Note
7	Electronic Static Discharge	Air Discharge: 2KV to with 5 times	Discharge for each polarity Mode of Operation: Single Discharge, successive discharge at least 1 sec
		Ambiance: 15°C~35°C, 30%~60%R.H Resistance(Rd): 330Ω ±10% Capacitance(Cs + Cd): 150pF±10%	
8	Vibration (Packaged)	Frequency range: 10Hz ~ 55 Hz Amplitude: 1.5mm Direction of X.Y. Z for 3 Hrs in total	
9	Drop Test ( Packaged)	Height: 80cm, Time: 1 1 corner, 3 edged, 6 surfaces	

Note : Recovery Time should be 2~4 hours at room temperature (20±8°C) and humidity ( below 60% R.H). No abnormalities in functions and appearance

## ■ Inspection Standard

Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

If the Customer has other agreements with Display Future Ltd for standards, please refer to that agreement.

### Inspection Condition

Room Temperature: 25±5°C.

Humidity: 65±5% RH. Illu-

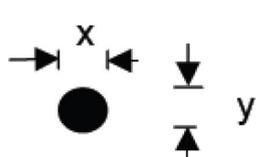
mination: 300 ~ 700 Lux.

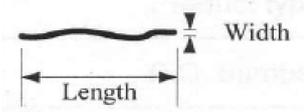
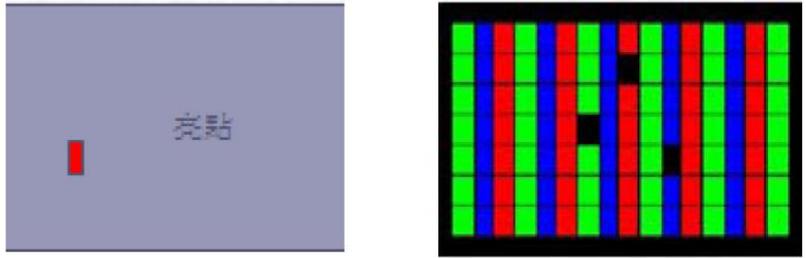
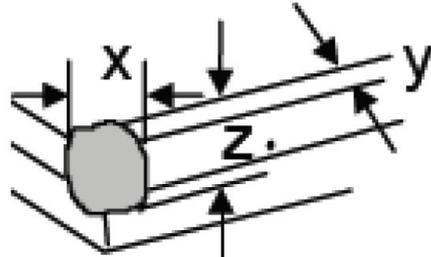
Distance: 35±5 cm

### Major defect.

Item No	Items to be inspected	Inspection Standard
1	All functional defects	1) No display 2) Display abnormally 3) Short circuit 4) line defect
2	missing	Missing function component
3	Crack	Glass Crack

### Minor defect.

Item No	Items to be inspected	Inspection standard	
1	Spot Defect Including Black spot White spot Pinhole Foreign particle Polarizer dirt	For dark/white spot is defined:  $\varphi = (x+y) / 2$ 	
		Size $\varphi$ (mm)	Size $\varphi$ (mm)
		$\varphi \leq 0.15$	Ignore
		$0.15 < \varphi \leq 0.30$	3
		$0.30 < \varphi$	Not allowed

2	Line Defect Including Black line White line Scratch	Define:			
					
		Width(mm) Length(mm)		Acceptable Quantity	
		W≤0.03		Ignore	
		0.03 < W≤0.05 L ≤ 4.0		3	
0.03 < W≤0.08 L ≤ 4.0		1			
0.08 < W L>4.0		Not allowed			
3	Polarizer Dent/Bubble	Width(mm) Length(mm)		Acceptable Quantity	
		φ≤0.25		Ignore	
		0.2 < φ≤0.3		3	
		0.3 < φ≤0.5		1	
0.5 < φ		0			
4.	Electrical Dot Defect	Bright and Black dot define:			
					
		Inspection pattern: Full white、 Full black、 Red、 green and blue screens			
		Item	Acceptable Quantity		
			I area	O area	Total
		Black dot defect	1	3	3
Bright dot defect	1	1	1		
Total Dot	2	4	4		
5	Glass defect	1.Corner Fragment:			
					
		Size(mm)	Acceptable Quantity		

		$X \leq 4.0\text{mm}$ $Y \leq 3.0\text{mm}$ $Z \leq T$	Ignore T: Glass thickness X: Length Y: Width Z: thickness
		2.Side Fragment:	
		Size(mm)	Acceptable Quantity
		$X \leq 5.0\text{mm}$ $Y \leq 2.0\text{mm}$ $Z \leq T$	Ignore T: Glass thickness X: Length Y: Width $Z \leq T$ Z: thickness

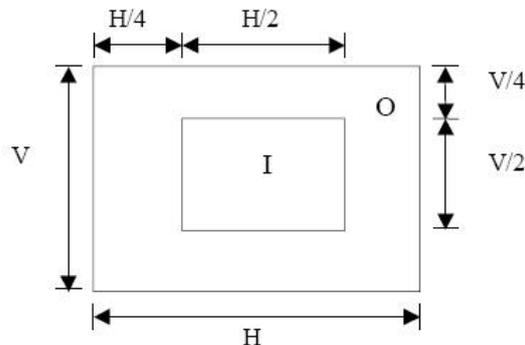
Note:

1. Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.
2. The distance between two bright dot defects (red, green, blue, and white) should be larger than 15mm.
3. The distance between black dot defects or black and bright dot defects should be more than 5mm apart.
4. The definitions of the inner display area

And outer display area

I: Inner display area

O: Outer display area



## ■ PRECAUTIONS FOR USING LCD MODULES

### Handing 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 is contacting 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 alcohol

Do 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 solvents

Wipe 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) Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.

- Tools required for assembling, such as soldering irons, must be properly grounded. make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential

- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated

(13) 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.

**Handling precaution for LCM**

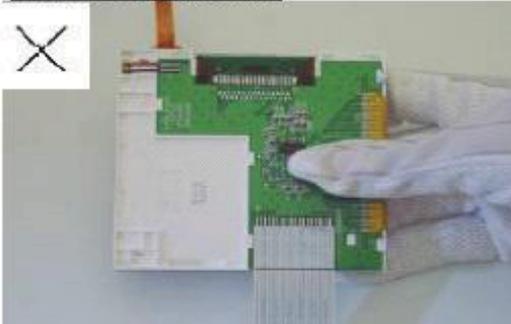
LCM is easy to be damaged.  
Please note below and be careful for handling!

**Correct handling:**

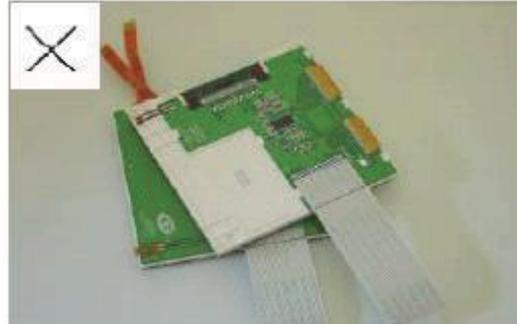


As above picture, please handle with anti-static gloves around LCM edges.

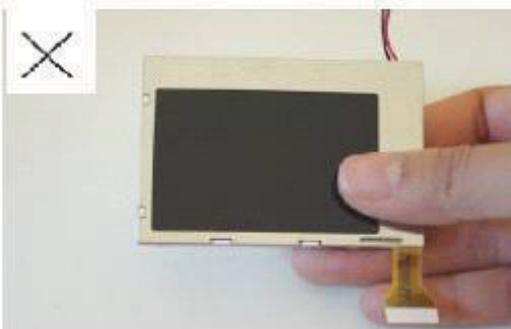
**Incorrect handling:**



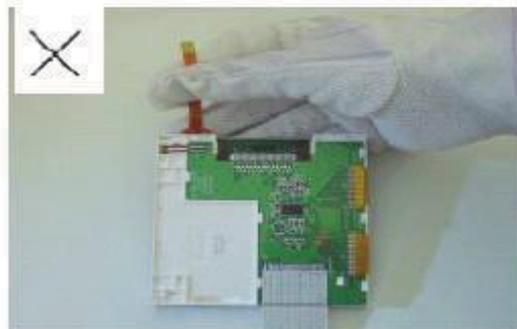
Please don't touch IC directly.



Please don't stack LCM.



Please don't hold the surface of panel.

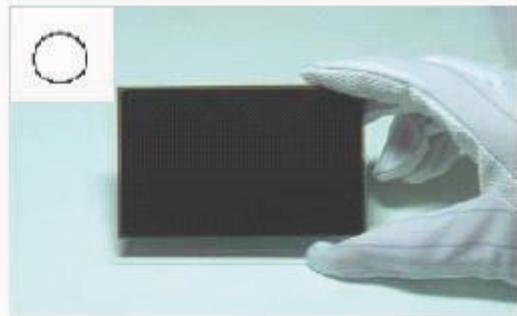
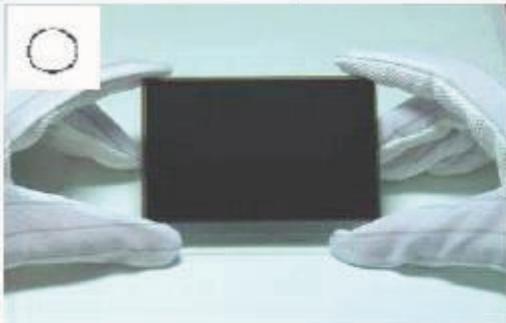


Please don't stretch interface of output, such as FPC cable.

**Handling precaution for LCD**

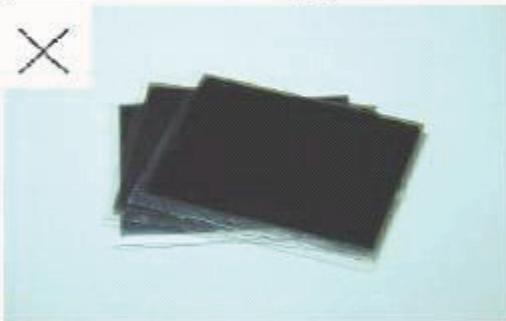
LCD is easy to be damaged.  
Please note below and be careful for handling!

**Correct handling:**

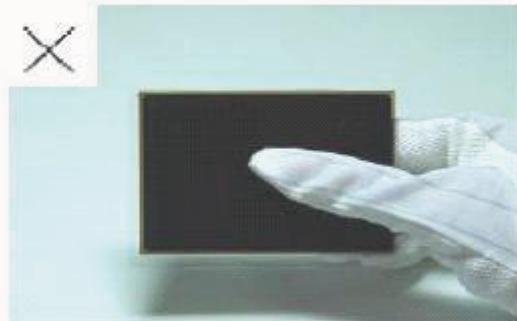


As above photo, please handle with anti-static gloves around LCD edges.

**Incorrect handling:**



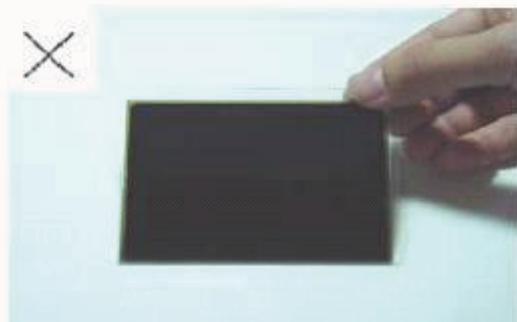
Please don't stack the LCDS.



Please don't hold the surface of LCD.



Please don't operate with sharp stick such as pens.



Please don't touch ITO glass without anti-static gloves.

**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, and keep the relative humidity between 40%RH and 60%RH.
- (3) 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.

**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.

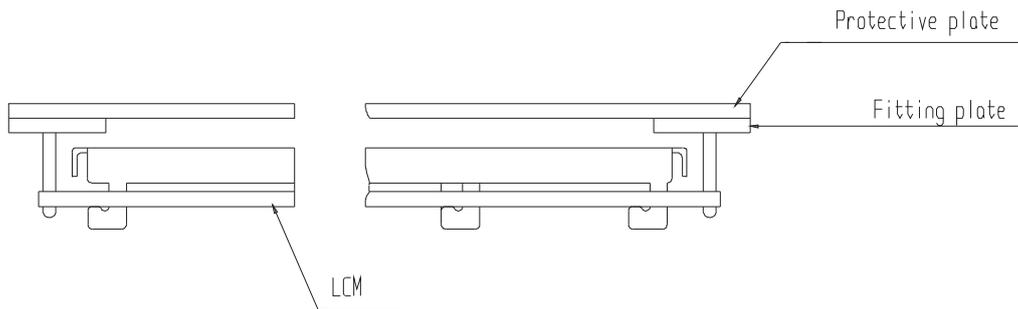
- Exposed area of the printed circuit board.
- Terminal electrode sections.

**USING LCD MODULES**

**Installing LCD Modules**

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

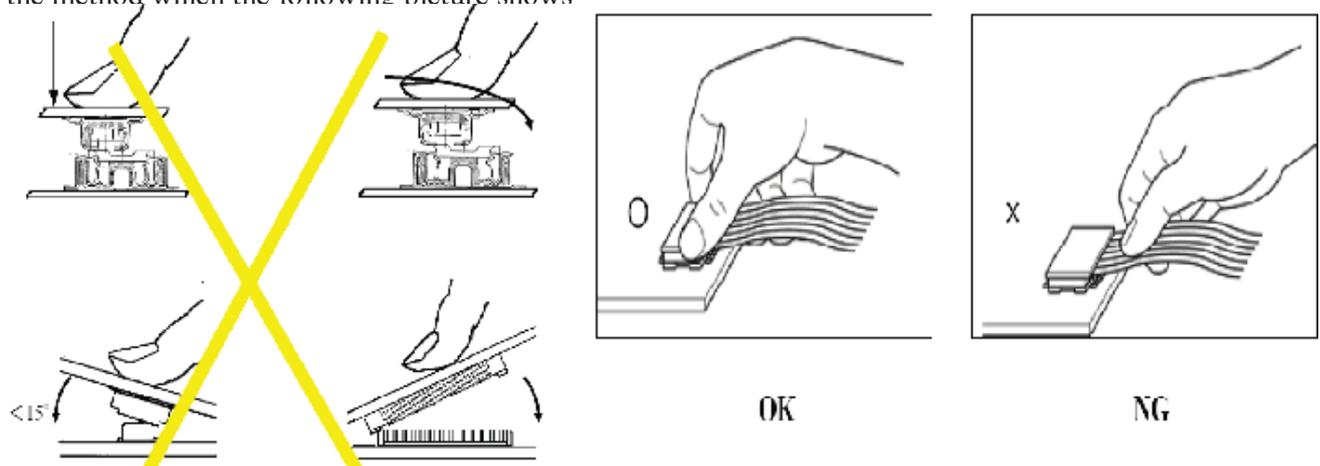
- (1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



- (2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be  $\pm 0.1$ mm.

**Precaution for assemble the module with BTB connector:**

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows



**Precaution for soldering to the LCM**

	Hand soldering	Machine drag soldering	Machine press soldering
No ROHS product	290°C ~350°C. Time : 3-5S.	330°C ~350°C. Speed : 4-8 mm/s.	300°C ~330°C. Time : 3-6S. Press: 0.8~1.2Mpa
ROHS product	340°C ~370°C. Time : 3-5S.	350°C ~370°C. Time : 4-8 mm/s.	330°C ~360°C. Time : 3-6S. Press: 0.8~1.2Mpa

(1) If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

(2) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

(3) When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

**Precautions for Operation**

(1) Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.

(2) It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.

(3) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, Which will come back in the specified operating temperature.

(4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

(5) A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature,50%RH or less is required.

(6) Input each signal after the positive/negative voltage becomes stable.

(7) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

**Safety**

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

(2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

**Safety**

- (1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- (2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

**Limited Warranty**

Unless agreed otherwise between Display Future Ltd and customer, Display Future will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with LCD acceptance standards (copies available upon request) for a period of one year from date of production. Cosmetic/visual defects must be returned within 90 days of the shipment. Confirmation of such date shall be based on data code on the product.

The warranty liability of Display Future limited to repair and/or replacement on the terms set forth above. Display Future will not be responsible for any subsequent or consequential events.

**Return LCM under warranty**

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

- Broken LCD glass.
- PCB eyelet is damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
- Soldering to or modifying the bezel in any manner.

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 eyelet, conductors and terminals.

**■ PRIOR CONSULT MATTER**

- 1.①For Display Future standard products, we keep the right to change material and processes for improving the product, without notice to our customers.  
②For OEM products, if any change is needed, which may affect the product property, we will consult with our customer in advance.
2. If you have special requirement about reliability condition, please let us know before you start the test on our samples.