



# FORMIKE ELECTRONIC CO.,LTD

## PRODUCT SPECIFICATION

### TFT LCD MODULE

MODEL: KWH101FL06-F02

- Preliminary Specification  
 Finally Specification

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

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Http:// www.wandisplay.com

- This specification is subject to change without notice.Please contact FORMIKE or it's representative before designing your product based on this specification.

### 1. Record of Revision

Version	Issued Date	Page	Content	Created or Modified by
1.0	2013/12/20	All	New Creation	Tom

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### 3. General Description

#### 3.1 Description

FORMIKE KWH101FL06-F02 is a TFT active matrix electrophoretic display, color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit. Graphics and texts can be displayed on 1024 (W) x 3 x600 (H) dots with LVDS data signal. The following table described the features of FORMIKE KWH101FL06-F02

#### 3.2 Application

Portable DVD  
 GPS  
 Notebook

#### 3.3 Advantage

High Resolution: WSVGA 1024(RGB) x 600 Dots  
 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock  
 adopting a high aperture ratio  
 Dot-Inversion

#### 3.4 Features

Feature	Description
Size	10.1 inches (16:9 Diagonal)
Driver element	a-Si TFT active matrix
Display mode	Normally White, transmissive
Display Resolution	1024x 600 (H x V)
Active area	222.72 x 125.28 mm
Dot pitch	0.2175 (W) x 0.2088(H)
Outline Dimension (W x H x D)	235 x 143 x 5.9mm
Luminance	150cd/m2 (Typ.)
constrast ratio	500
Surface treatment	Anti-Glare,
Color Arrangement	RGB stripe
interface	LVDS
View Direction	12 o'clock
Module weight	TBD

NOTE: about Viewing Direction, the best viewing direction is 12 o'clock, and the optimum contrast direction is at 6 o'clock.

## 4. ABSOLUTE MAXIMUM RATINGS

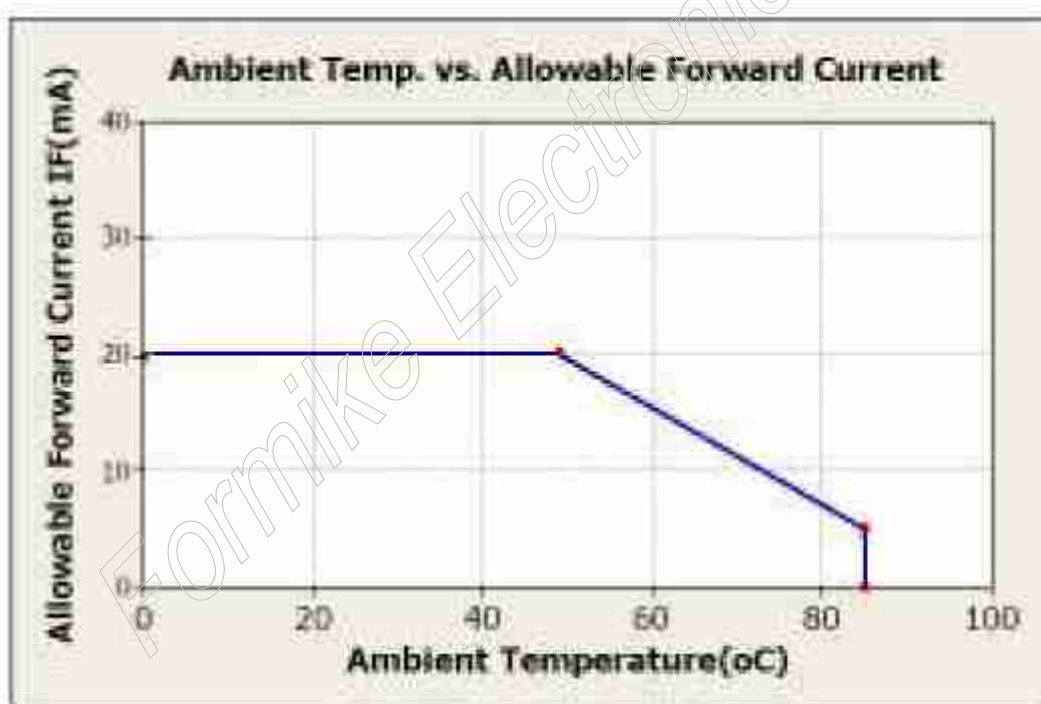
Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power Voltage	VDD,	GND=0	-0.3	4	V	
Power Voltage	V <sub>in</sub>	GND=0	-0.3	VDD+0.3	V	NOTE
Logic Output Voltage	V <sub>OUT</sub>	GND=0	-0.3	VDD+0.3	V	NOTE
Storage Temperature(Ambient)		TSTG	-20	+60	°C	
Operation Temperature(Ambient)		TOPR	0	+50	°C	

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. \_ 60, 90% RH MAX\_ .

Temp. \_ 60\_, Absolute humidity shall be less than 90% RH at 60\_

2.



## 5. ELECTRICAL SPECIFICATIONS(Ta=25°C)

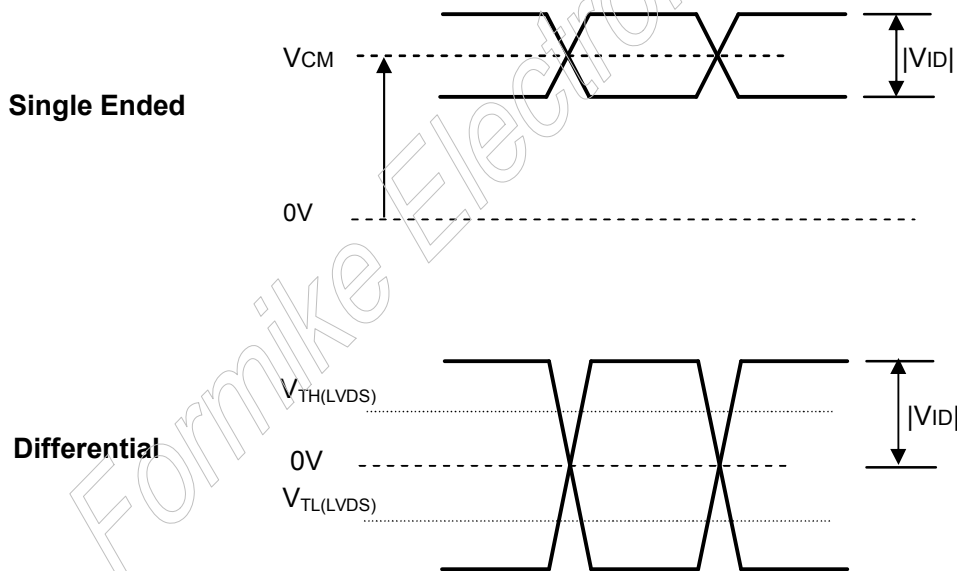
### 5.1. Operating conditions:

 $T_a = 25 \pm 2^\circ\text{C}$ 

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power Supply Voltage	DVDD	3	3.3	3.6	V	
LVDS Differential Input High Threshold	$V_{TH(LVDS)}$	-	-	+100	mV	Note2
LVDS Differential Input Low Threshold	$V_{TL(LVDS)}$	-100	-	-	mV	Note 2
LVDS Common Mode Voltage	$V_{CM}$	1.125	-	1.375	V	Note 2
LVDS Differential Input Voltage	$ V_{ID} $	100	-	600	mV	Note 2
Terminating Resistor	$R_T$	-	100	-	Ohm	

Note 1: The ambient temperature is  $T_a = 25 \pm 2^\circ\text{C}$ .

Note 2: The parameters of LVDS signals are defined as the following figures.



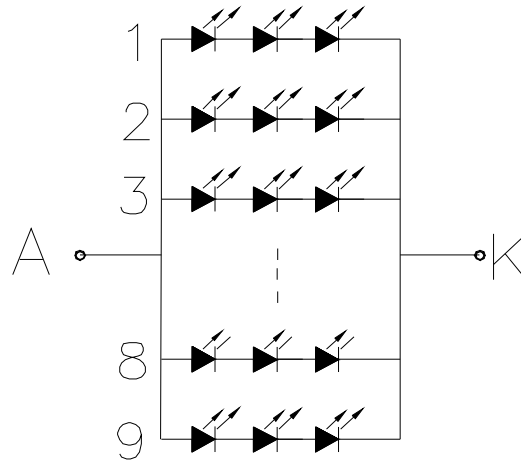
### 5.2. Backlight Driving Section

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Voltage	LED-VDD	4.8	5	5.5	V	Note 1
LED Current	IL	-	180	-	mA	
Power Consumption	PLED	-			mW	
Life Time	-	-	(25,000)	-	hr	Note2;3

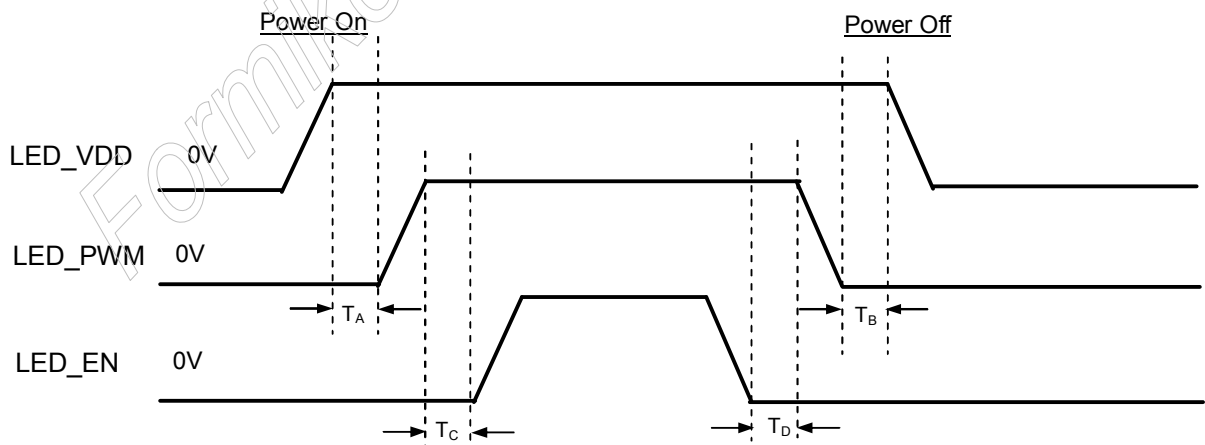
Note 1: There are 1 Groups LED

Note 2: The ambient temperature is  $T_a = 25 \pm 2^\circ\text{C}$ .

Note 3: Brightness to be decreased to 50% of the initial value


**BLU CIRCUIT DIAGRAM**
**5.3.RECOMMENDED OPERATING RATINGS**

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
EN Control Level	Backlight on		1.8	-	5	V	
	Backlight off		0	-	0.8	V	
PWM Control Level	PWM High Level		1.3	-	5	V	
	PWM Low Level		0	-	0.15	V	
PWM Control Duty Ratio			20		100	%	
PWM Control Permissive Ripple Voltage		$V_{PWM\_pp}$			100	mV	
PWM Control Frequency		$f_{PWM}$	200	400	500	Hz	

**5.4 LED BACKLIGHT CONTROL ON/OFF SEQUENCE**

**Timing Specifications:**
 $T_A \cong 0ms$ 
 $T_B \cong 0ms$ 
 $T_C \cong 10ms$ 
 $T_D \cong 0ms$ 

Note (1) Please follow the LED backlight power sequence as above. If the cust could not follow, it might cause backlight flash issue during dis ON/OFF or damage the LED backlight controller

## 6. OPTICAL SPECIFICATIONS(Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Contrast Ratio	C/R	150	500	-		Fig.1
Brightness		-	150	-	cd/m2	Full White Pattern
Brightness Uniformity		-	80%	-	%	Full White Pattern Fig.1,2
Response Time	Tr+Tf	-	8	-	ms	Fig.3
Color Coordinate	WHITE	Wx	0.28	0.31	0.35	IBL=20mA Full White Pattern
		Wy	0.29	0.34	0.38	
view angle	$\theta_l$	-	60	-	Degree	Fig.4 Center (C/R>10)
	$\theta_r$	-	60	-		
	$\theta_u$	-	50	-		
	$\theta_d$	-	55	-		
Transmittance Ratio	TR	6.2	6.6	6.68	%	LCD With POL

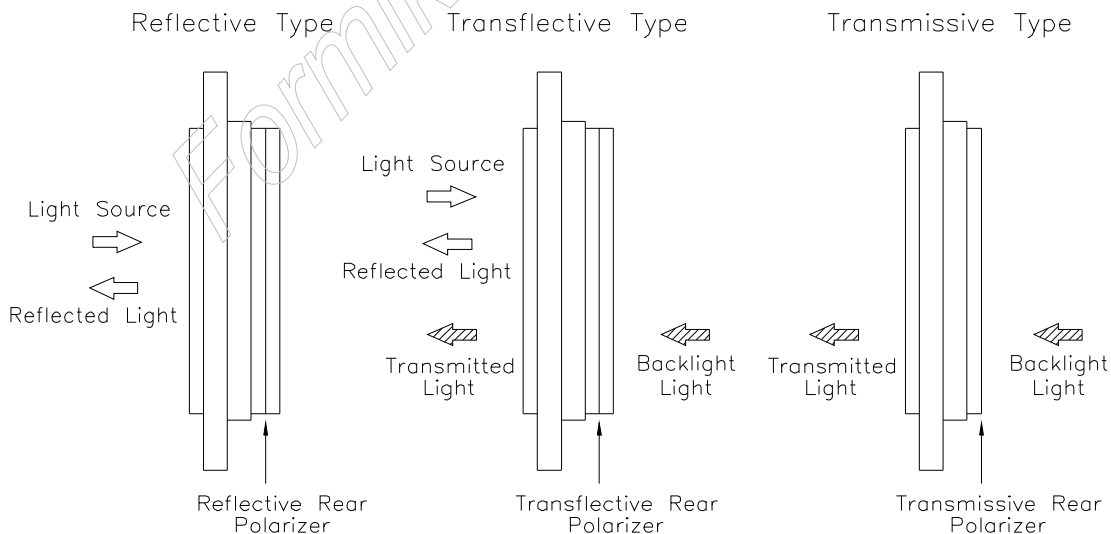
Note:

1. 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 black to white (Rise Time, Tr) and from white to black(Decay Time, Tf). For additional information see FIG 3.
- Viewing angle is the angle at which the contrast ratio is greater than 5. 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.
- Optimum contrast is obtained by adjusting the LCD Threshold voltage (Vth& Vsat)

## 7. Viewing Modes





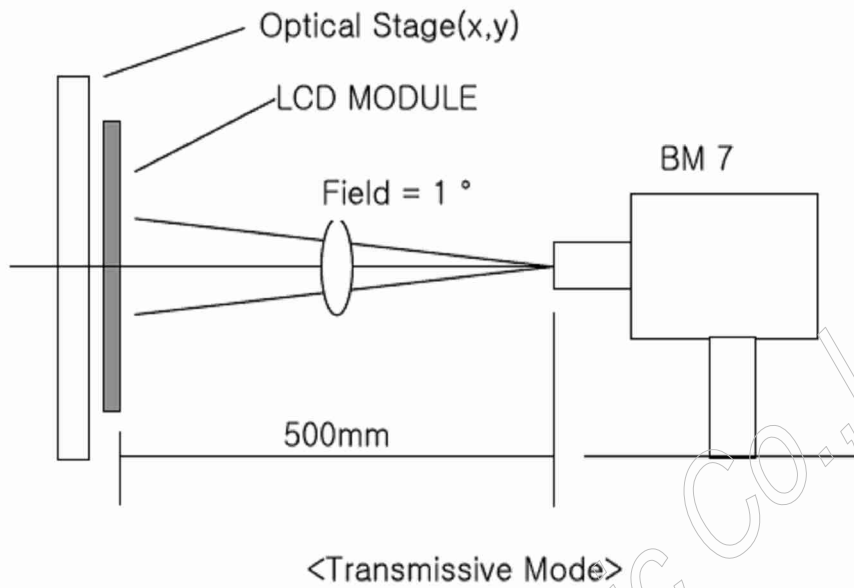
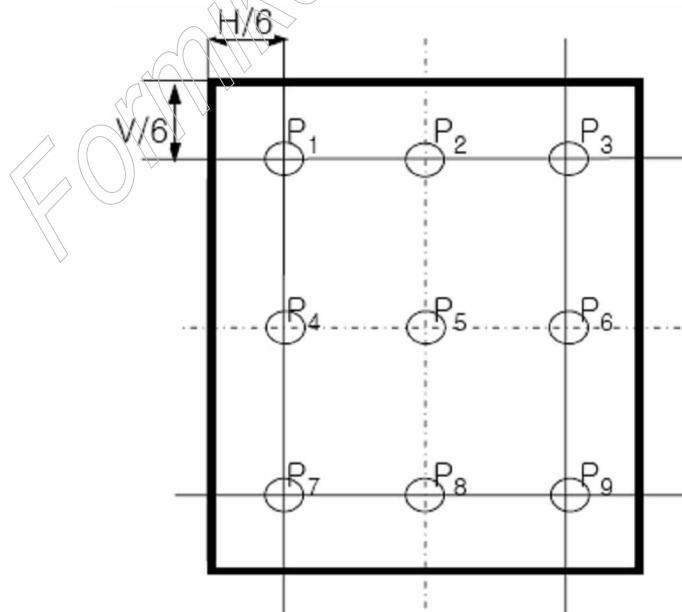


FIG. 1 Optical Characteristic Measurement Equipment and Method



**P1-P9:** Main Measuring point

Fig. 2 Measuring Points

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.

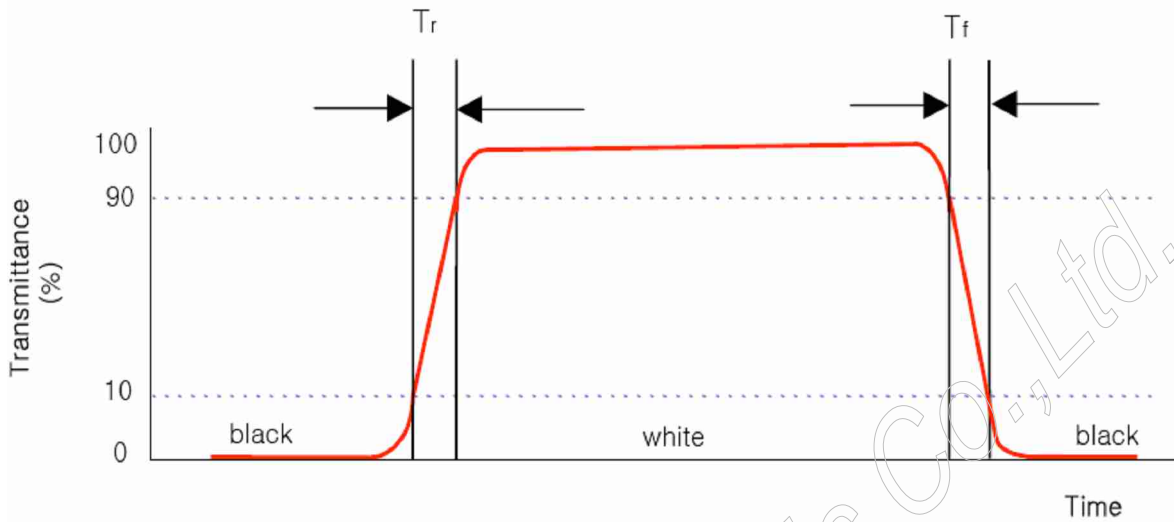


FIG.3 The definition of Response Time

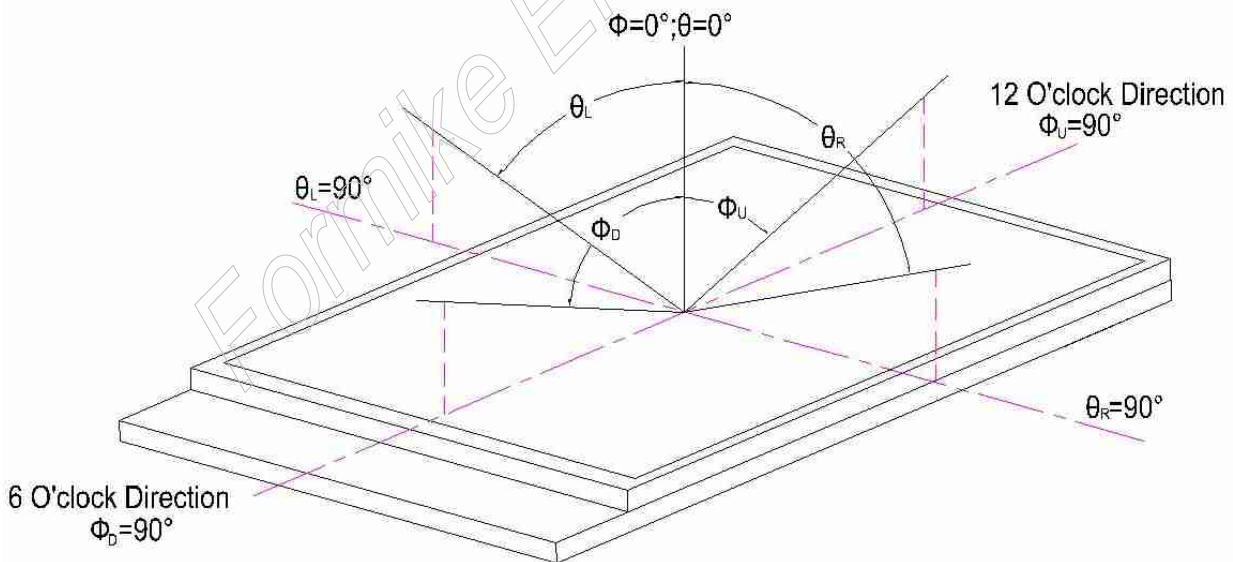
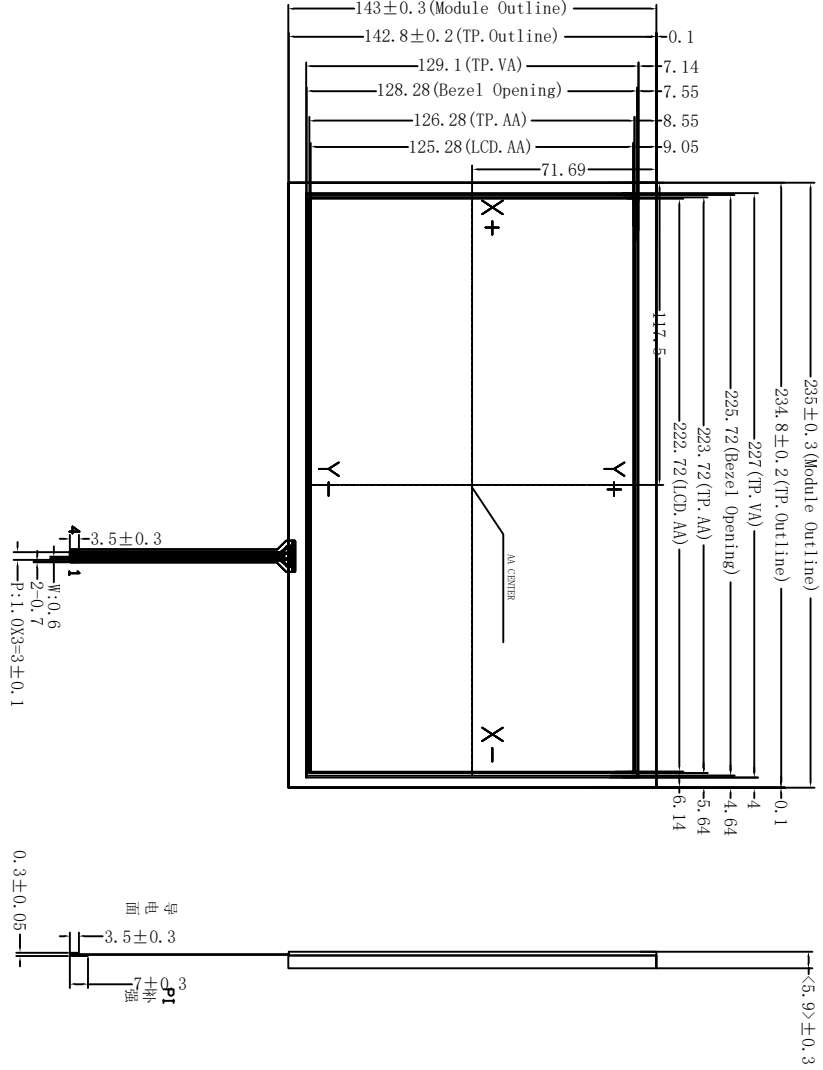


FIG.4 The definition of Viewing Angle

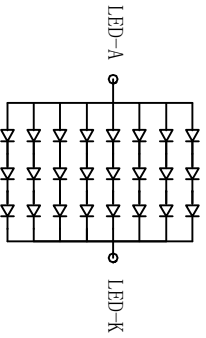
Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the

VERTION	DESCRIPTION	DATE
A	First Issue	2013-12-09



IF=180MA VF=9.1V



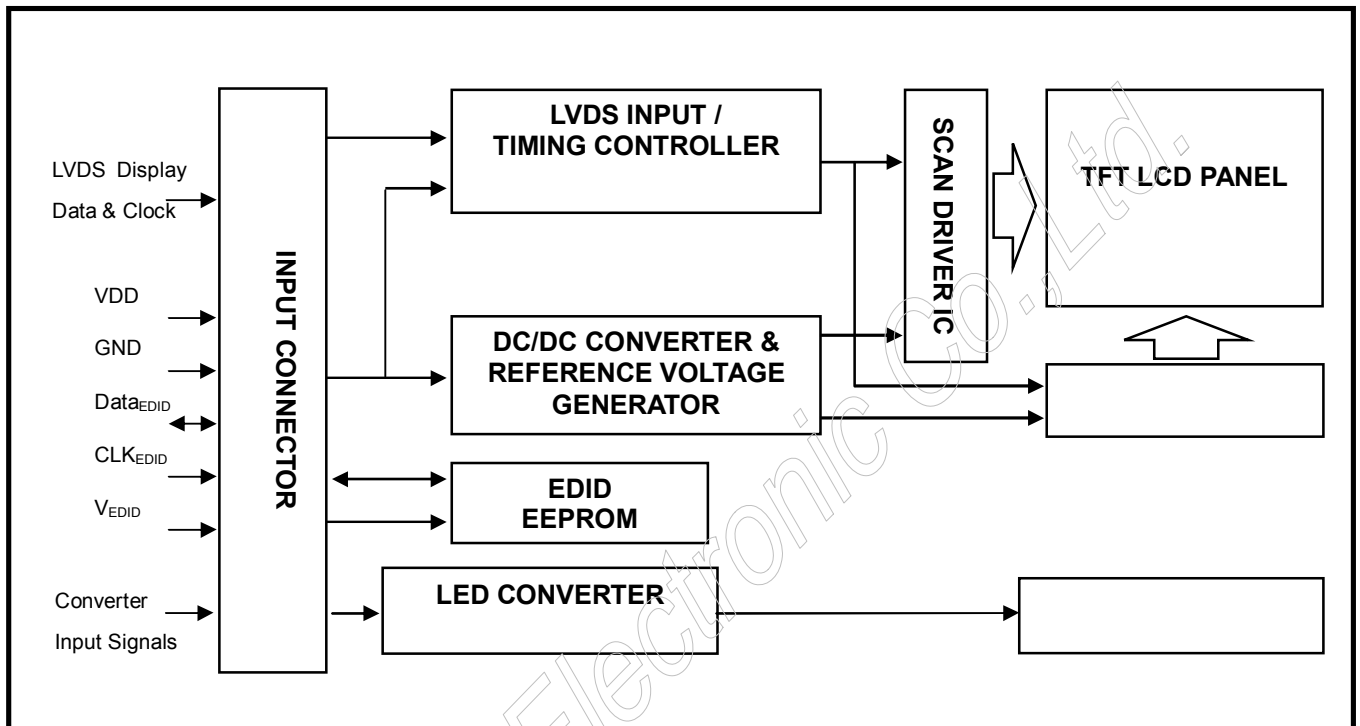
Pin No.	Symbol
1	Y+
2	X-
3	Y-
4	X+

NOTES:

1. DISPLAY TYPE: TFT
2. MODULE SIZE: 10.1INCH
3. OPERATING TEMPERATURE: -20° C~70° C
4. STORAGE TEMPERATURE: -30° C~80° C
5. RSH COMPLIANT
6. Unspecified tolerance is ±0.20mm

CUSTOMER APPROVE		FORMIKE ELECTRONIC CO.,LTD 深圳市科方宏电子有限公司 www.wandisplay.com	
MODULE NO.	KWH101FL06-F02	VERTION:	A
MATERIAL NO.		SHEET:	1 OF 1
ISSUED	CHECKED	APPROVED	UNIT:
DENG	ZENG	LIU	MM
		DATE:	Dec-09-2013

## 9. Block diagram



## 10. Interface

### 10.1 LCM PIN Definition

Pin No.	Symbol	Description	Remark
1	NC	No Connection (Reserve)	
2	VDD	Power Supply (3.3V typ.)	
3	VDD	Power Supply (3.3V typ.)	
4	VEDID	DDC 3.3V power	
5	NC	No Connection (Reserve for CMO test)	BIST
6	CLKEDID	DDC clock	
7	DATAEDID	DDC data	
8	Rxin0-	LVDS differential data input	R0-R5, G0
9	Rxin0+	LVDS differential data input	

10	GND	Ground	
11	Rxin1-	LVDS differential data input	G1~G5, B0, B1
12	Rxin1+	LVDS differential data input	
13	GND	Ground	
14	Rxin2-	LVDS Differential Data Input	B2~B5, HS, VS , DE
15	Rxin2+	LVDS Differential Data Input	
16	GND	Ground	
17	RxCLK-	LVDS differential clock input	
18	RxCLK+	LVDS differential clock input	
19	GND	Ground	
20	NC	No Connection (Reserve)	
21	NC	No Connection (Reserve)	
22	GND	Ground	
23	NC	No Connection (Reserve)	
24	NC	No Connection (Reserve)	
25	GND	Ground	
26	NC	No Connection (Reserve)	
27	NC	No Connection (Reserve)	
28	GND	Ground	
29	NC	No Connection (Reserve)	
30	NC	No Connection (Reserve)	
31	LED_GND	LED Ground	
32	LED_GND	LED Ground	
33	LED_GND	LED Ground	
34	NC	Non connection	
35	LED_PWM	PWM Control Signal of LED Converter	
36	LED_EN	Enable Control Signal of LED Converter	
37	NC	Non connection	
38	LED_VDD	LED Power	
39	LED_VDD	LED Power	
40	LED_VDD	LED Power	

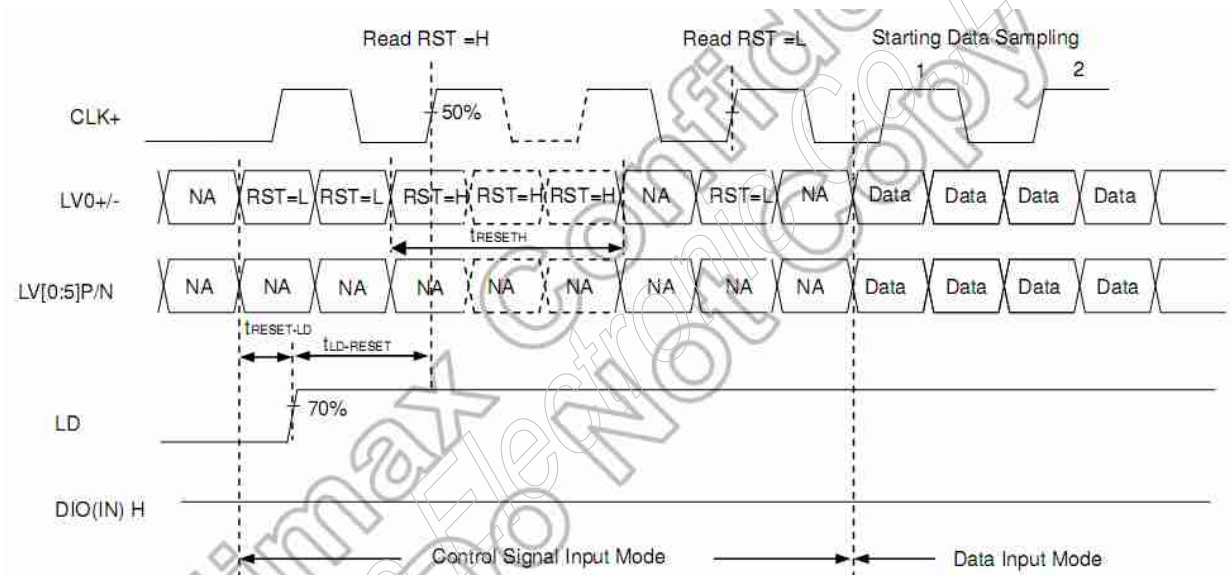
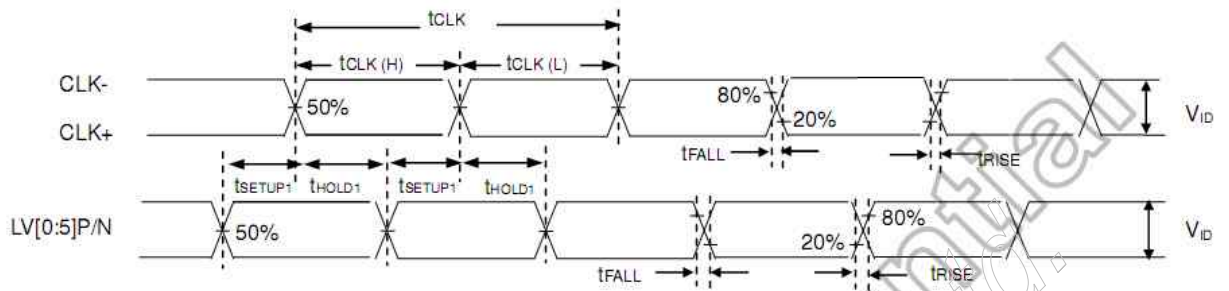
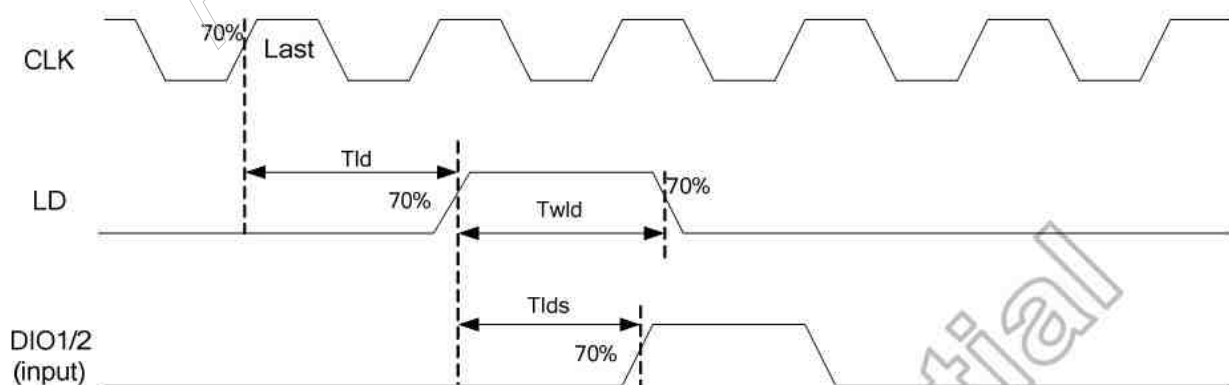
Note

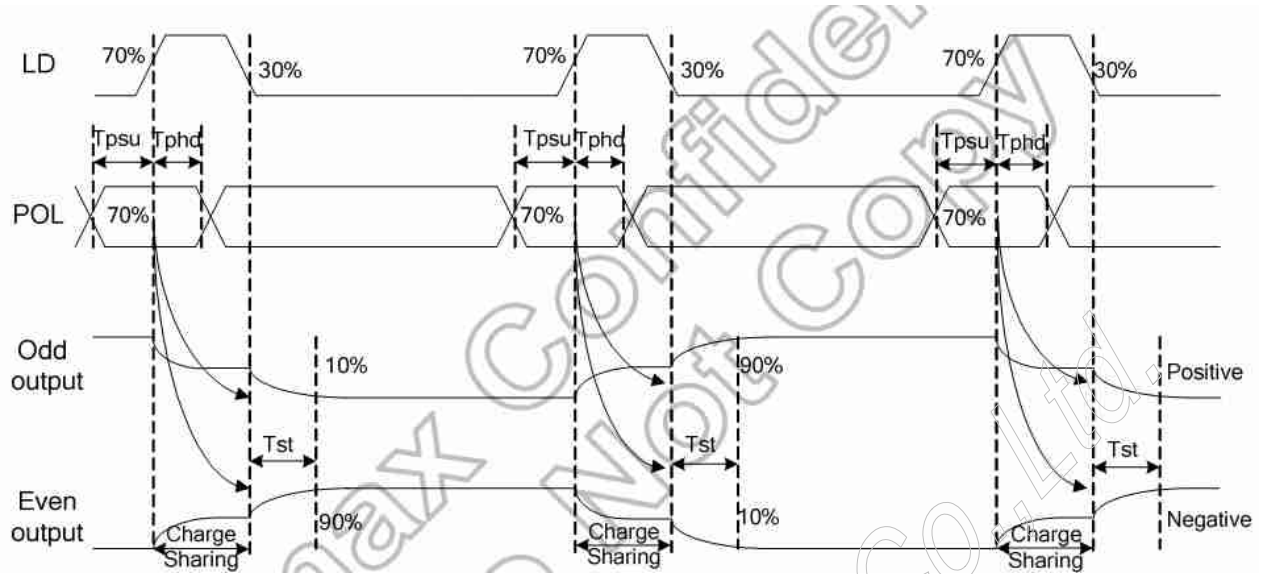
Note1: Connector Part No.: IPEX-20455-040E-12 or equivalent

Note2: User's connector Part No.: IPEX-20453-040T-01 or equivalent

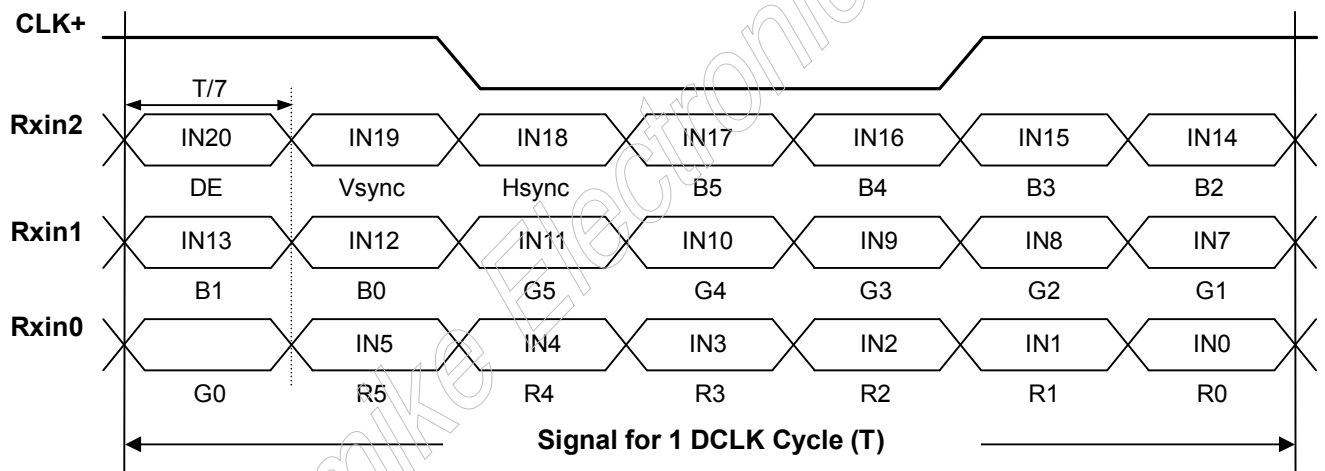
**11. Command/AC Timing**
**11.1 AC Electrical CHARACTERISTICS**

Parameter	Symbol	Condition	Spec			Unit
			Min.	Typ.	Max.	
Clock period	$t_{CLK}$	VDDD=2.3V to 2.7V	5.4	-	-	ns
		VDDD=2.7V to 3.6V	4 <sup>(1)</sup>	-	-	ns
Clock low pulse width	$t_{CLK(L)}$	VDDD=2.3V to 2.7V	2.2	-	-	ns
		VDDD=2.7V to 3.6V	1.6	-	-	ns
Clock high pulse width	$t_{CLK(H)}$	VDDD=2.3V to 2.7V	2.2	-	-	ns
		VDDD=2.7V to 3.6V	1.6	-	-	ns
Data setup time	$t_{SETUP1}$	VDDD=2.3V to 2.7V	1.1	-	-	ns
		VDDD=2.7V to 3.6V	0.7	-	-	ns
Data hold time	$t_{HOLD1}$	VDDD=2.3V to 2.7V	1.1	-	-	ns
		VDDD=2.7V to 3.6V	0.7	-	-	ns
CLK,LV[5:0] rising time	$t_{RISE}$	VDDD=2.3V to 2.7V	-	-	0.5	ns
		VDDD=2.7V to 3.6V	-	-	0.4	ns
CLK,LV[5:0] falling time	$t_{FALL}$	VDDD=2.3V to 2.7V	-	-	0.5	ns
		VDDD=2.7V to 3.6V	-	-	0.4	ns
Start pulse setup time	$t_{SETUP2}$	VDDD=2.3V to 2.7V	1	-	-	ns
		VDDD=2.7V to 3.6V	1	-	-	ns
Start pulse delay time	$t_{PLH1}$	VDDD=2.3V to 2.7V Loading=15pF	-	-	13	ns
		VDDD=2.7V to 3.6V Loading=15pF	-	-	13	ns
	$t_{PHL1}$	VDDD=2.3V to 2.7V Loading=15pF	-	-	13	ns
		VDDD=2.7V to 3.6V Loading=15pF	-	-	13	ns
Reset(RST) high period	$t_{RESETH}$	-	50ns over 3 CLK	-	-	
LD high period	$t_{LD(H)}$	-	200	-	-	ns
POL to LD setup time	$t_{POL-LD}$	POL toggle to LD rising	-5	-	-	ns
LD to POL hold time	$t_{LD-POL}$	LD falling to POL toggle	6	-	-	ns
Receiver off to LD timing	$t_{REG-OFF}$	-	5	-	-	CLK
LD to reset input time	$t_{LD-RESET}$	-	200	-	-	ns
Reset low to LD rising time	$t_{RESET-LD}$	-	0	-	-	ns

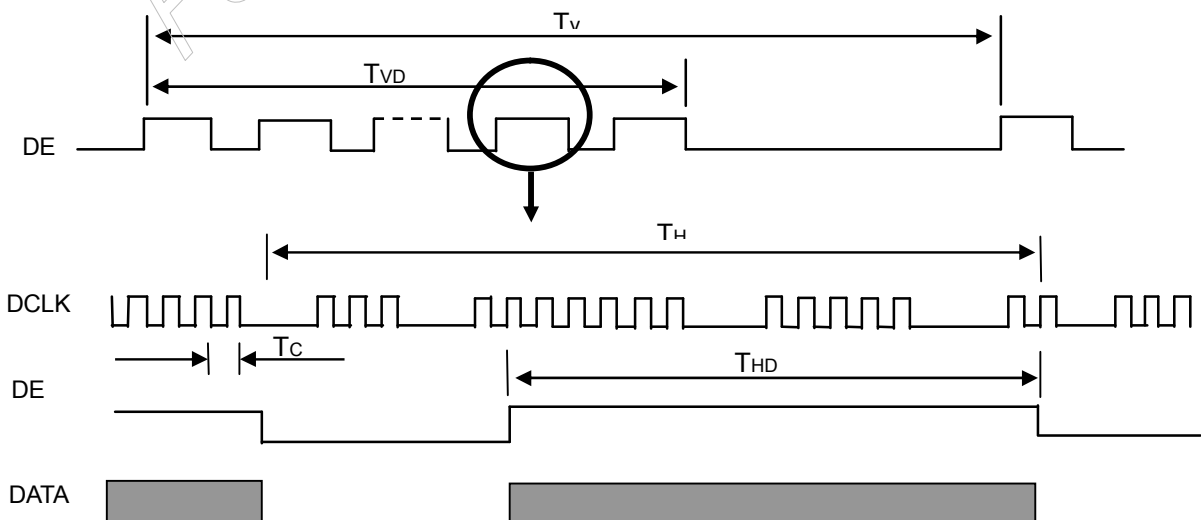
**11.2 Timing diagram 1 (CHNSL=H, default)**

**11.3 Timing diagram 2**




11.4 Timing diagram 3



11.4 Timing diagram 4





## 12.PRECAUTIONS FOR USE

### 12.1.Safety

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

### 12.2.Storage Conditions

- (1) Store the panel or module in a dark place where the temperature is  $23\pm 5^{\circ}\text{C}$  and the humidity is below  $50\pm 20\% \text{RH}$ .
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.
- (6) Do not exposed to direct sun light of fluorescent lamps.

### 12.3.Installing LCD Module

Attend to the following items when installing the LCM.

- (1) Cover the surface with a transparent protective plate or touch panel 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  $\pm 0.1 \text{mm}$ .

### 12.4.Precautions For Operation

- (1) Viewing angle varies with the change of liquid crystal driving voltage ( $V_0$ ). Adjust  $V_0$  to show the best contrast.
- (2) Driving the LCD in the voltage above the limit will shorten its lifetime.
- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (4) When turning the power on, input each signal after the positive/negative voltage becomes stable.
- (5) Do not apply water or any liquid on product which composed of T/P.

## 12.5.Handling Precautions

- (1) Avoid static electricity which can damage the CMOS LSI; please wear the wrist strap when handling.
- (2) The polarizing plate of the display is very fragile. so, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface; it may cause display abnormal .
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.
- (9) Do not apply water or any liquid on product, which composed of T/P.

## 12.6.Warranty

- (1) The period is within 12 months since the date of shipping out under normal using and storage conditions.
- (2) The warranty will be avoided in case of defect induced by customer.