



# FORMIKE ELECTRONIC CO.,LTD

## PRODUCT SPECIFICATION

### TFT LCD MODULE

MODEL: KWH070KQ13-F02

Preliminary Specification

Finally Specification

CUSTOMER'S APPROVAL	
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- This specification is subject to change without notice. Please contact FORMIKE or its representative before designing your product based on this specification.



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## 2. GENERAL DESCRIPTION

### 2.1 Description

KWH070KQ13-F02 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 ICs, FPC, a backlight unit and touch screen. The following table described the features of FORMIKE KWH070KQ13-F02

### 2.2 Application

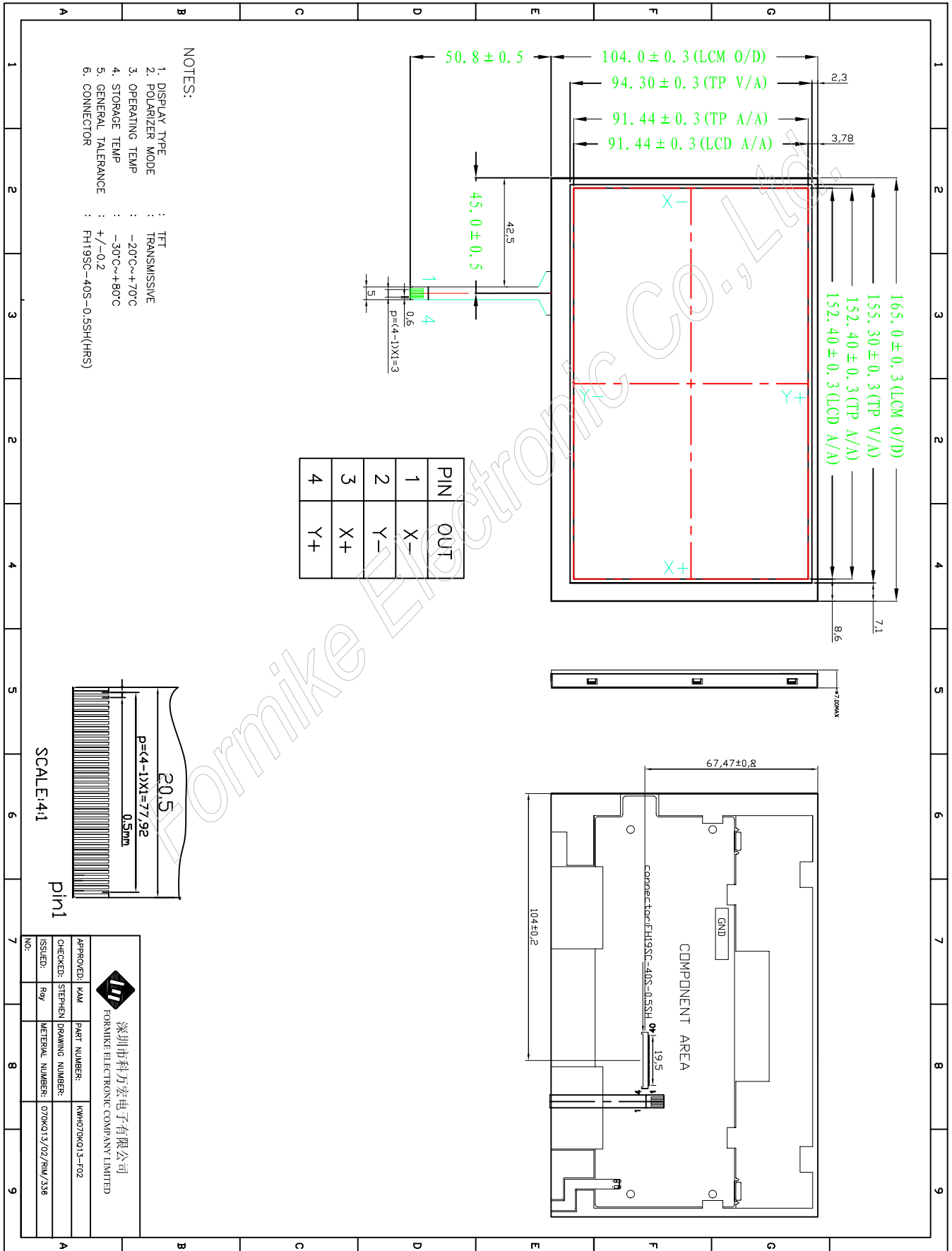
Armariium, Mobile Internet Device(MID), Multimedia products, GPS. Navigation device and other electronic Products  
Etc.

### 2.3 Features:

Feature	Description
Size	7.0 inchs (Diagonal)
Display Mode	Normally White, Transmissive
Surface Treatment	Unti-Glare
Resolution	800 (RGB) x 480
Display Format	R.G.B. Stripe
Backlight power consumption	2.5W (Typ.)
Inteface	Digital TTL
Panel Power consumption.	0.825W
Outline Dimension (W x H x D) (mm)	165 x 104 x 7.0
Active Area( W x H mm)	152.4 x 91.44
Dot pitch(mm)	0.0635 X 0.1905
With/Without TSP	With TSP
Weight (g)	165



### 3.0 Mechanical Drawing





## 4.0 Pin Definition

TTL Connector is used for the module electronics interface. The recommended model is FH19SC-40S-0.5SH manufactured by Hirose.

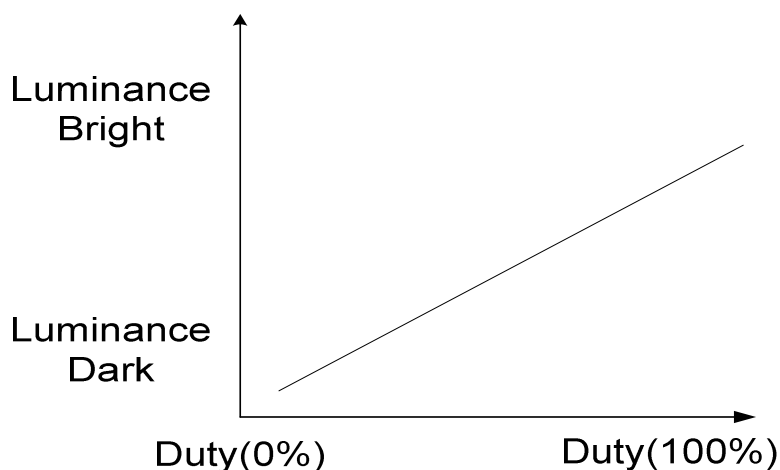
Pin No.	Symbol	I/O	Function	Remark
1	V <sub>LED</sub>	P	Power voltage for LED Driver	
2	V <sub>LED</sub>	P	Power voltage for LED Driver	
3	ADJ	I	Adjust the led brightness with PWM Pulse	Note 1,2
4	G <sub>LED</sub>	P	Ground for LED circuit	
5	G <sub>LED</sub>	P	Ground for LED circuit	
6	V <sub>CC</sub>	P	Power voltage for digital circuit	
7	V <sub>CC</sub>	P	Power voltage for digital circuit	
8	MODE	I	DE or HV mode control	Note 3
9	DE	I	Data enable	
10	VS	I	Vsync signal input	
11	HS	I	Hsync signal input	
12	GND	P	Power ground	
13	B5	I	Blue data input (MSB)	
14	B4	I	Blue data input	
15	B3	I	Blue data input	
16	GND	P	Power ground	
17	B2	I	Blue data input	
18	B1	I	Blue data input	



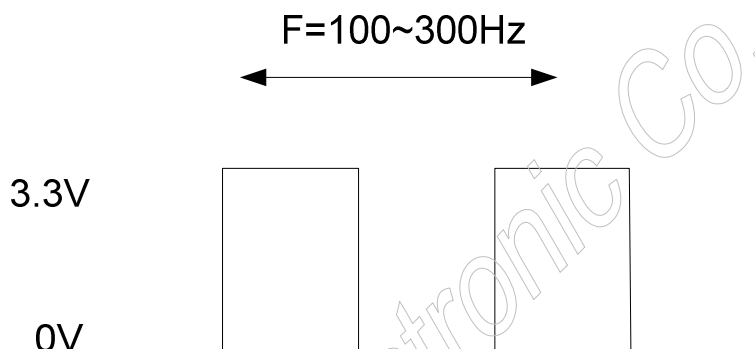
19	B0	I	Blue data input(LSB)	
20	GND	P	Power ground	
21	G5	I	Green data input(MSB)	
22	G4	I	Green data input	
23	G3	I	Green data input	
24	GND	P	Power ground	
25	G2	I	Green data input	
26	G1	I	Green data input	
27	G0	I	Green data input(LSB)	
28	GND	P	Power ground	
29	R5	I	Red data input(MSB)	
30	R4	I	Red data input	
31	R3	I	Red data input	
32	GND	P	Power ground	
33	R2	I	Red data input	
34	R1	I	Red data input	
35	R0	I	Red data input(LSB)	
36	GND	P	Power ground	
37	DCLK	I	Sample clock	
38	GND	P	Power ground	
39	L/R	I	Select left or right scanning direction	Note 4
40	U/D	I	Select up or down scanning direction	Note 4

I: input, O: output, P: power

Note1: ADJ adjust brightness to control Pin,Pulse duty the bigger the brighter.



Note 2: ADJ signal=0~3.3V;Operating frequency:100~25Hz.



Note 3: DE Mode: Mode="H", HS floating and VS floating.  
HV Mode: Mode="L" and DE floating.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	V <sub>CC</sub>	Up to down, left to right
V <sub>CC</sub>	GND	Down to up, right to left
GND	GND	Up to down, right to left
V <sub>CC</sub>	V <sub>CC</sub>	Down to up, left to right





## 5.0 Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	$V_{CC}$	-0.3	6.0	V	
	$V_{LED}$	-	5.5	V	
Input signal voltage	$V_I$	-0.3	6.3	V	
Operation Temperature	$T_{OP}$	-20	70	°C	
Storage Temperature	$T_{ST}$	-30	80	°C	

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



## 6. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	$V_{CC}$	3.1	3.3	3.5	V	Note 1
	$V_{LED}$	4.8	5.0	5.2	V	Note 2
Current consumption	$I_{CC}$	-	250	300	mA	
	$I_{LED}$	-	500	550	mA	Note 3
Input logic high voltage	$V_{IH}$	$0.7V_{CC}$	-	$V_{CC}$	V	Note 4
Input logic low voltage	$V_{IL}$	0	-	$0.3V_{CC}$	V	
LED life time	-	20,000	-	-	Hr	Note 5

Note 1:  $V_{CC}$  setting should match the signals output voltage (refer to Note 4) of customer's system board.

Note 2: LED driving voltage.

Note 3: LED driving current.

Note 4: DCLK, DE, HS, VS, R0~ R5,, G0~ G5, B0~ B5.

Note 5: The "LED life time" is defined as the module brightness decrease to 50% original brightness at  $T_a=25^{\circ}\text{C}$  and  $V_{LED}=5.0\text{V}$ . The LED lifetime could be decreased if operating  $V_{LED}$  is larger than 5.0V.



## 7. Timing Characteristics

### 7.1. Timing Conditions

SYNC mode Input signal characteristics ( 800 x 480 )

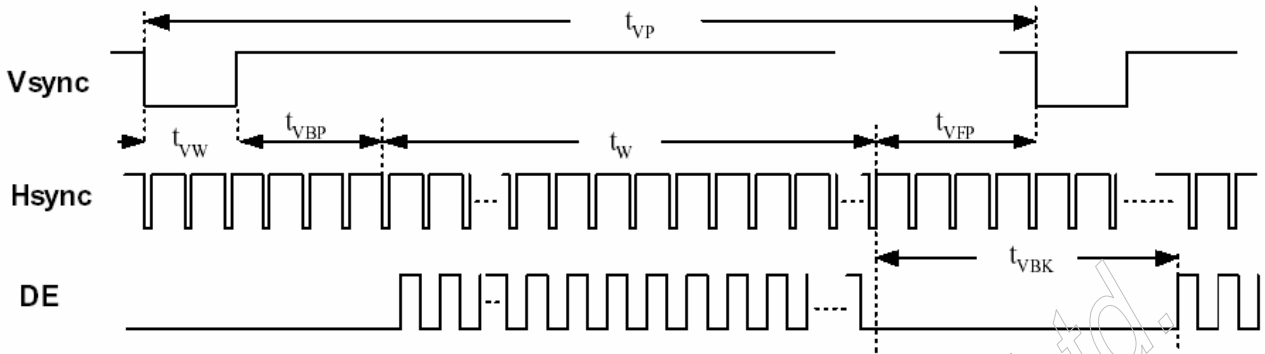
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Period	t <sub>CLK</sub>	23.2	25.0	30.7	ns	
Clock Frequency	f <sub>CLK</sub>	32.4	40.0	43	MHz	
Clock Low Level Width	t <sub>WCL</sub>	8	-	-	ns	
Clock High Level Width	t <sub>WCH</sub>	8	-	-		
Clock Rise/Fall Time	t <sub>CLKr</sub> , t <sub>CLKf</sub>	-	-	3		
HSYNC Period	t <sub>HP</sub>	862	1056	1100	t <sub>CLK</sub>	
HSYNC Pulse Width	t <sub>HW</sub>	-	1	-	t <sub>CLK</sub>	
HSYNC Back Porch	t <sub>HBP</sub>	-	45	-	t <sub>CLK</sub>	
HSYNC Width + Back Porch	t <sub>hw</sub> + t <sub>HBP</sub>	46			t <sub>CLK</sub>	
Horizontal valid data width	t <sub>HV</sub>	800			t <sub>CLK</sub>	
HSYNC Front Porch	t <sub>HFP</sub>	t <sub>HP</sub> - t <sub>HW</sub> - t <sub>HBP</sub> - t <sub>HV</sub>			t <sub>CLK</sub>	
Horizontal Blank	t <sub>HBK</sub>	t <sub>HP</sub> - t <sub>HV</sub>			t <sub>CLK</sub>	
VSYNC Period	t <sub>VP</sub>	628	635	650	t <sub>HP</sub>	
VSYNC Pulse Width	t <sub>VW</sub>	-	1	-	t <sub>HP</sub>	
VSYNC Back Porch	t <sub>VBP</sub>	22			t <sub>HP</sub>	
Vertical valid data width	t <sub>v</sub>	480			t <sub>HP</sub>	
Vertical Front Porch	t <sub>VFP</sub>	t <sub>VP</sub> - t <sub>VW</sub> - t <sub>VBP</sub> - t <sub>v</sub>			t <sub>HP</sub>	
Vertical Blank	t <sub>VBK</sub>	t <sub>VP</sub> - t <sub>v</sub>			t <sub>HP</sub>	
Data Setup Time	t <sub>DS</sub>	5	-	-	ns	
Data Hold Time	t <sub>DH</sub>	10	-	-	ns	



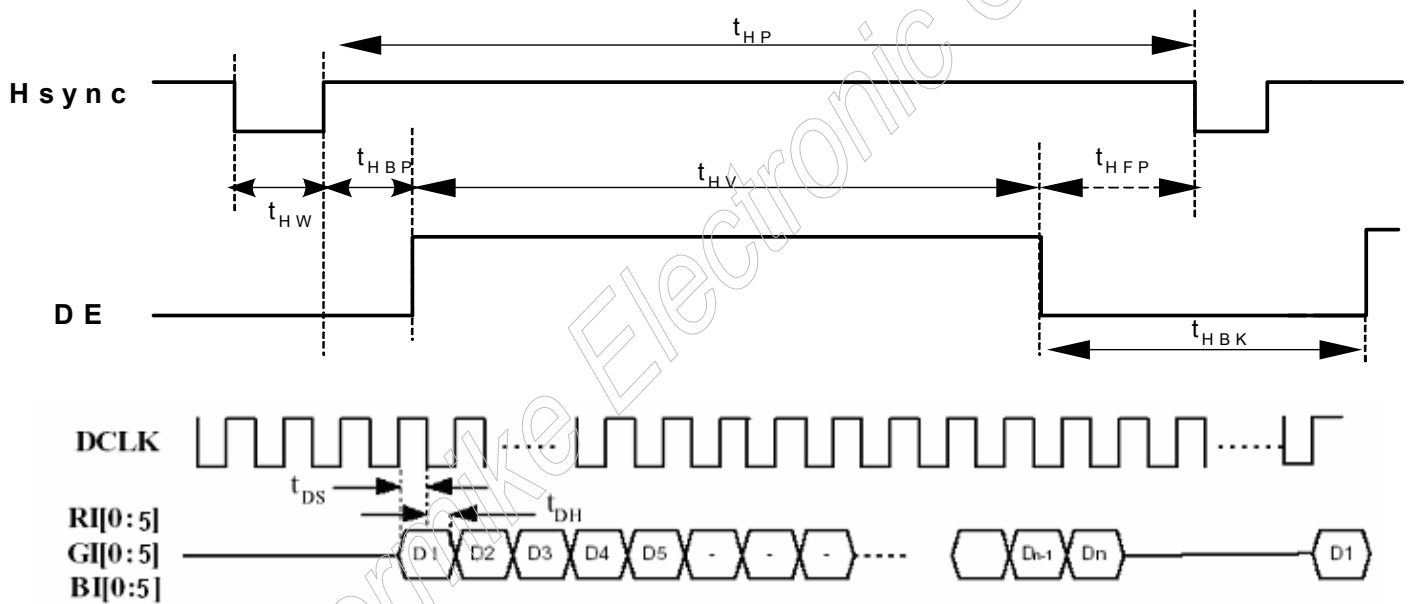
DE mode Input signal characteristics ( 800 x 480 )

Item	Symbol	Values			Unit	Remark	
		Min.	Typ.	Max.			
DCLK	Period	t <sub>CLK</sub>	23.2	25.0	30.7	ns	
	Frequency	f <sub>CLK</sub>	32.4	40.0	43.0	MHz	
	Low Level Width	t <sub>WCL</sub>	6	-	-	ns	
	High Level Width	t <sub>WCH</sub>	6	-	-		
	Rise/Fall Time	t <sub>CLKr</sub> , t <sub>CLKf</sub>	-	-	3		
	Duty	-	0.45	0.50	0.55	-	t <sub>CLKL</sub> / t <sub>CLK</sub>
DE	Setup Time	t <sub>DES</sub>	5	-	-	ns	
	Hold Time	t <sub>DEH</sub>	10	-	-		
	Rise/Fall Time	t <sub>DEr</sub> , t <sub>DEf</sub>	-	-	16		
	Horizontal Period	t <sub>HP</sub>	862	1056	1100	t <sub>CLK</sub>	
	Horizontal Valid	t <sub>HV</sub>	800				
	Horizontal Blank	t <sub>HBK</sub>	t <sub>HP</sub> - t <sub>HV</sub>				
	Vertical Period	t <sub>VP</sub>	628	635	650	t <sub>HP</sub>	
	Vertical Valid	t <sub>w</sub>	480				
	Vertical Blank	t <sub>VBK</sub>	t <sub>VP</sub> - t <sub>w</sub>				
DATA	Setup Time	t <sub>DS</sub>	5	-	-	ns	
	Hold Time	t <sub>DH</sub>	10	-	-		
	Rise/Fall Time	t <sub>Dr</sub> , t <sub>Df</sub>	-	-	3		

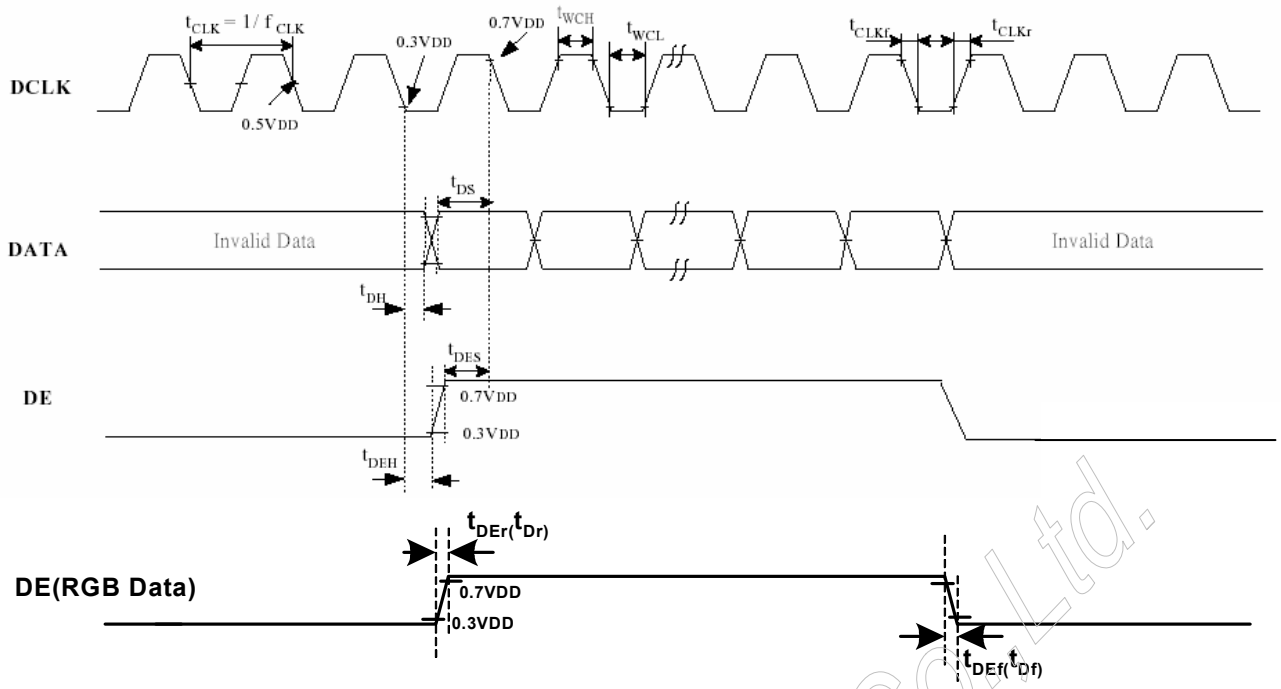
### 7.2. Timing Diagram



Input Vertical Timing

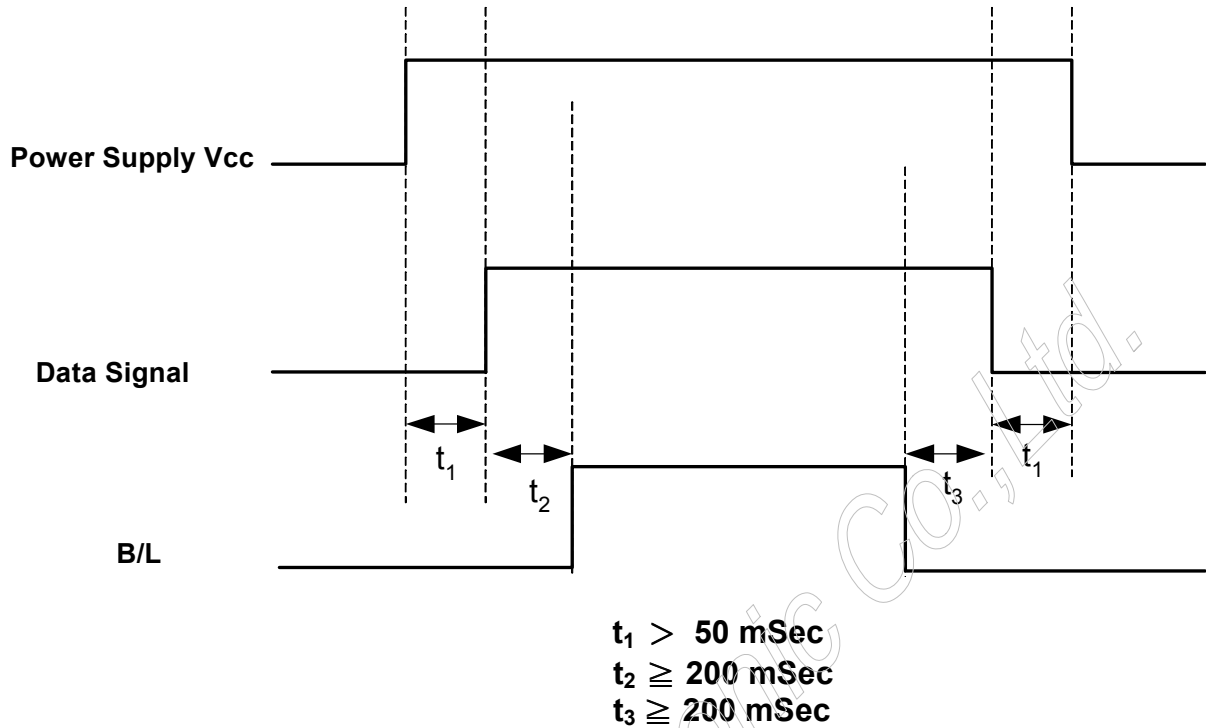


Input Horizontal Timing



DE and RGB Input Timing

### 7.3. Power Sequence



Note: Data Signal includes DCLK, DE, HS, VS, R0~ R5, G0~ G5, B0~ B5.



## 8. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	$\theta_L$	$\Phi=180^\circ$ (9 o'clock)	60	70	-	degree	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	L		250	300	-	Cd/m <sup>2</sup>	Note 6
Luminance uniformity	$Y_U$		70	75	-	%	Note 7

**Test Conditions:**

1.  $V_{CC}=3.3V$ ,  $V_{LED}=5.0V$ . The ambient temperature is 25°C.
2. The test systems refer to Note 2.



Note 1: Definition of viewing angle

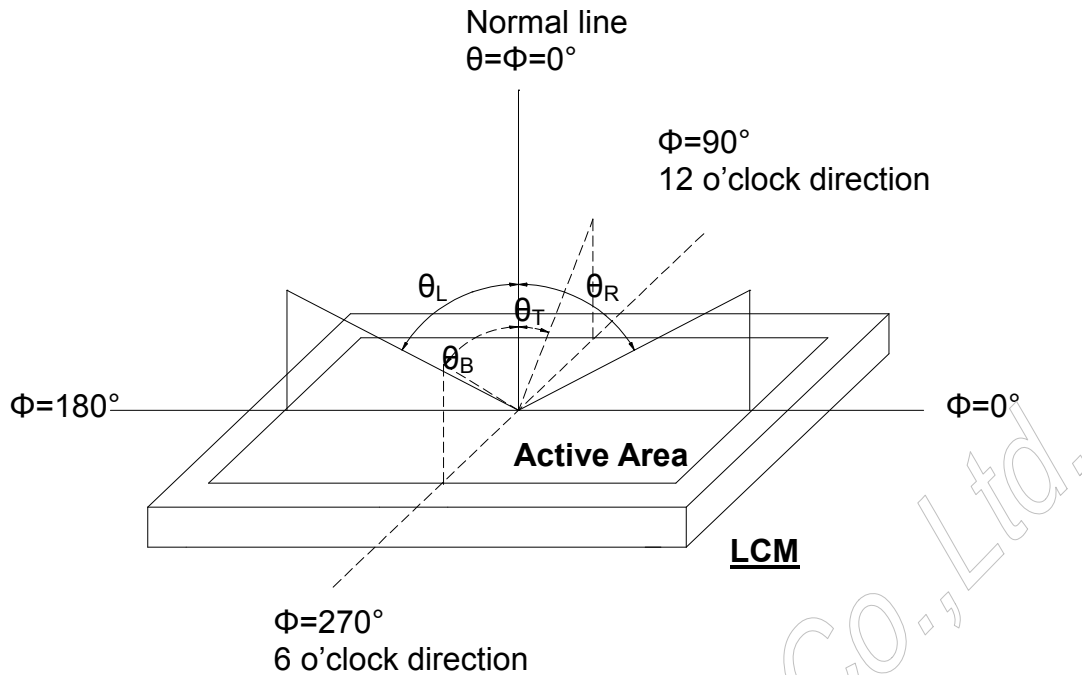


Fig. 4-1 Definition of viewing angle

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:  $1^\circ$  /Height: 500mm.)

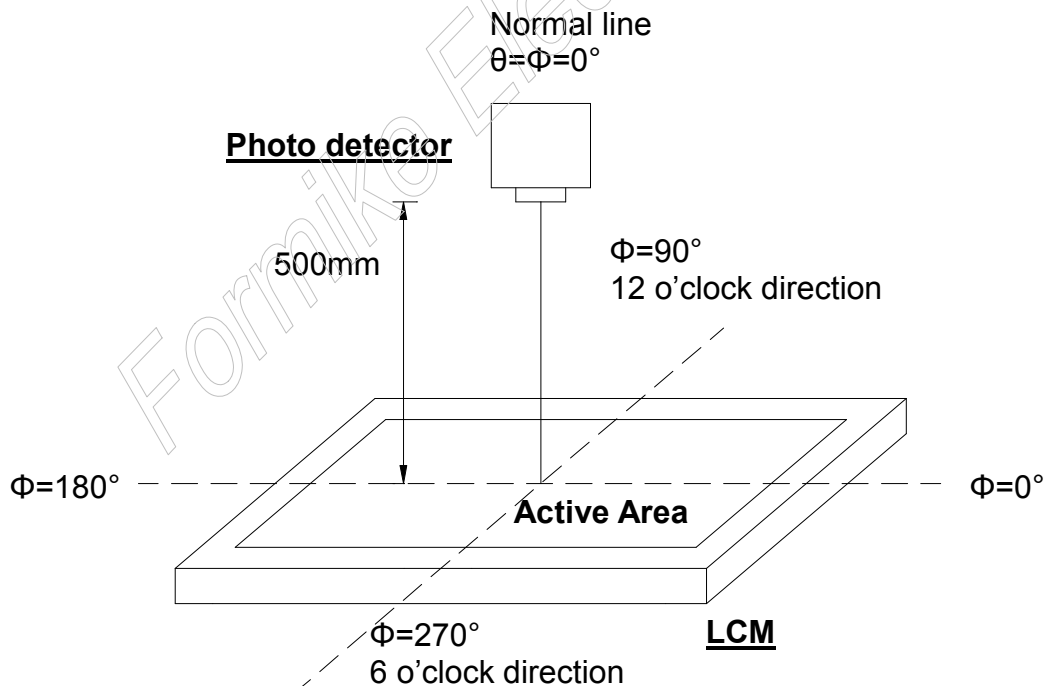


Fig. 4-2 Optical measurement system setup

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 ( $T_{ON}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.

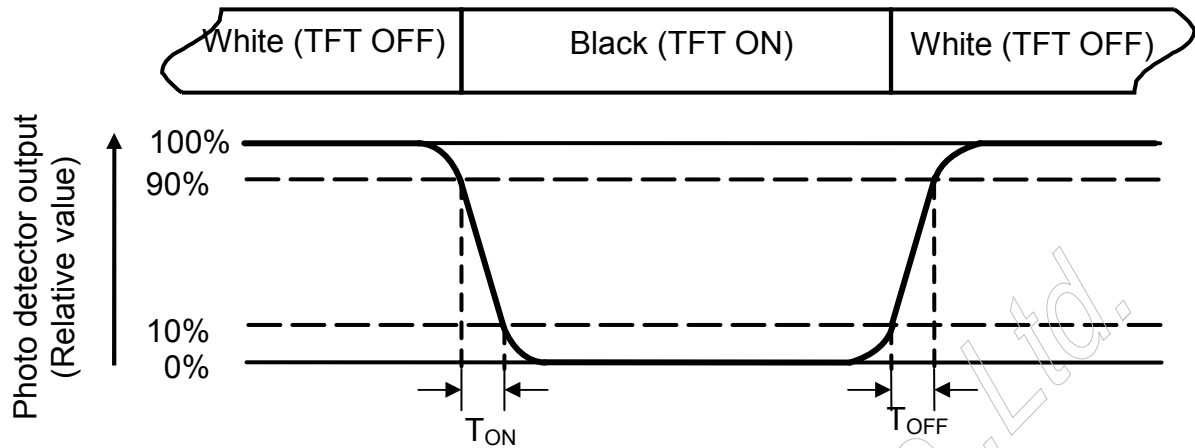


Fig. 4-3 Definition of response time

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  $V_{LED}=5.0V$ .

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4 ).Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

L-----Active area length      W----- Active area width

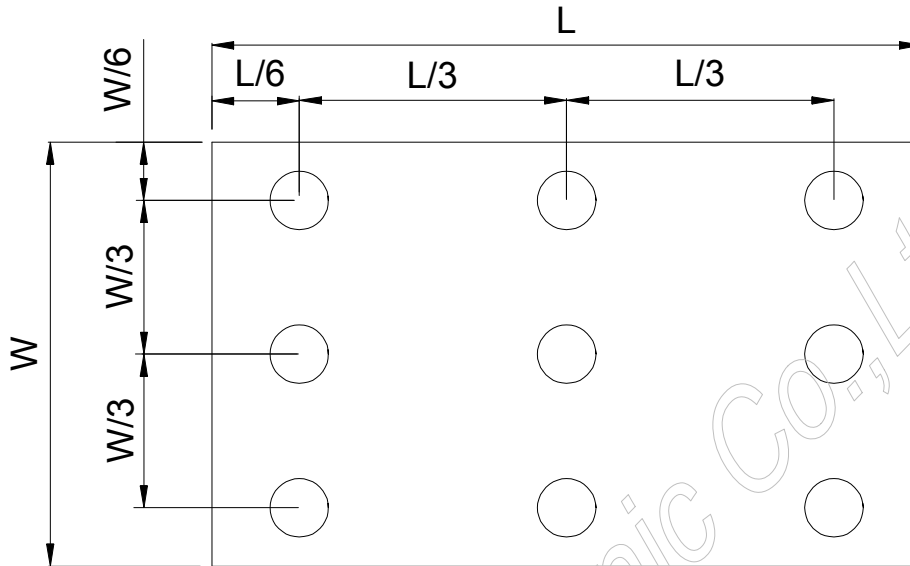


Fig. 4-4 Definition of measuring points

**B<sub>max</sub>**: The measured maximum luminance of all measurement position.  
**B<sub>min</sub>**: The measured minimum luminance of all measurement position.

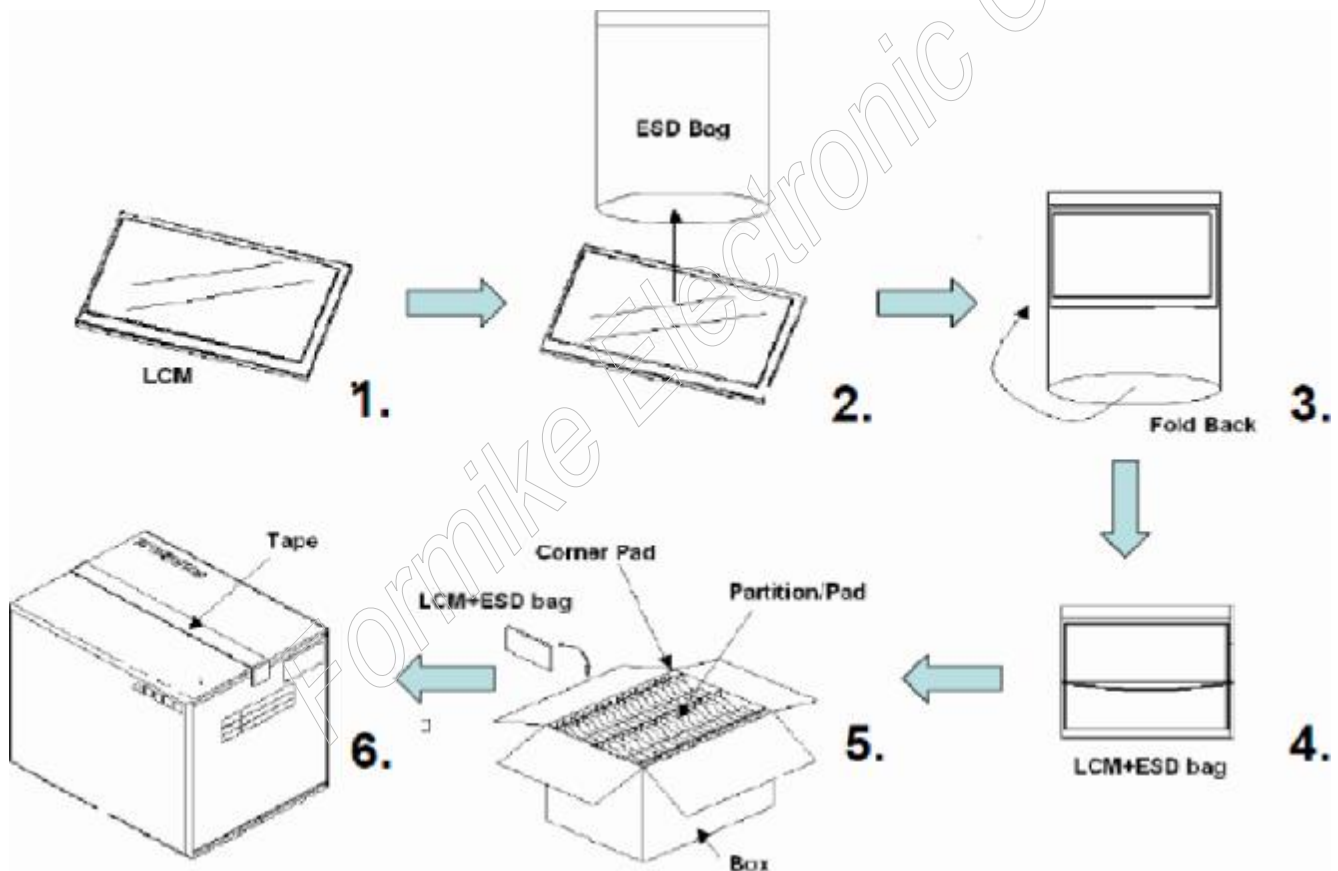


## 10.0 PACKAGE SPECIFICATION

### 10.1 Packing form

LCM Model	LCM Qty. in the carton	Carton Size	GW
KWH070KQ13-F02	50 pcs/carton	53 x 35.5 x 25.5 cm	12KG

### 10.2 Packing assembly drawings



1	Partition	BC Corrugated Paper	512 X 349 X 226	1.466	1 set	
2	Corrugated Bar	BC Corrugated Paper	512X162	0.046	4 set	
3	Corrugated Board	BC Corrugated Paper	510 X 343	0.130	1pcs	
4	Dust-Proof Bag	PE	700X530	0.048	1 pcs	
5	A/S Bag	PE	180 X 160 X 0.05	0.002	50 pcs	



## 11.PRECAUTIONS FOR USE

### 11.1.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.

### 11.2.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.

### 11.3.Installing LCD Module

Attend to the following items when installing the LCD Module.

- (1) Cover the surface with a transparent protective plate or touch panel to protect the polarizer and LC cell.
- (2) When assembling the LCD Module into other equipment, the spacer to the bit between the LCD Module 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  $\pm 0.1\text{mm}$ .

### 11.4.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.

### 11.5.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.

### 11.6.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.