



FORMIKE ELECTRONIC CO.,LTD

PRODUCT SPECIFICATION

TFT LCD MODULE

MODEL : KWH070TG24-F01 Version: 1.0

【 ◆ 】 Preliminary Specification

【 】 Finally Specification

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

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1. Record of Revision

Version	Issued Date	Page	Content	Created or Modified by
1.0	2010.12.15	All	New Creation	Stephen



2. GENERAL DESCRIPTION

2.1 Description

KWH070TG24-F01 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, backlight unit and touch screen. The following table described the features of FORMIKE KWH070TG24-F01

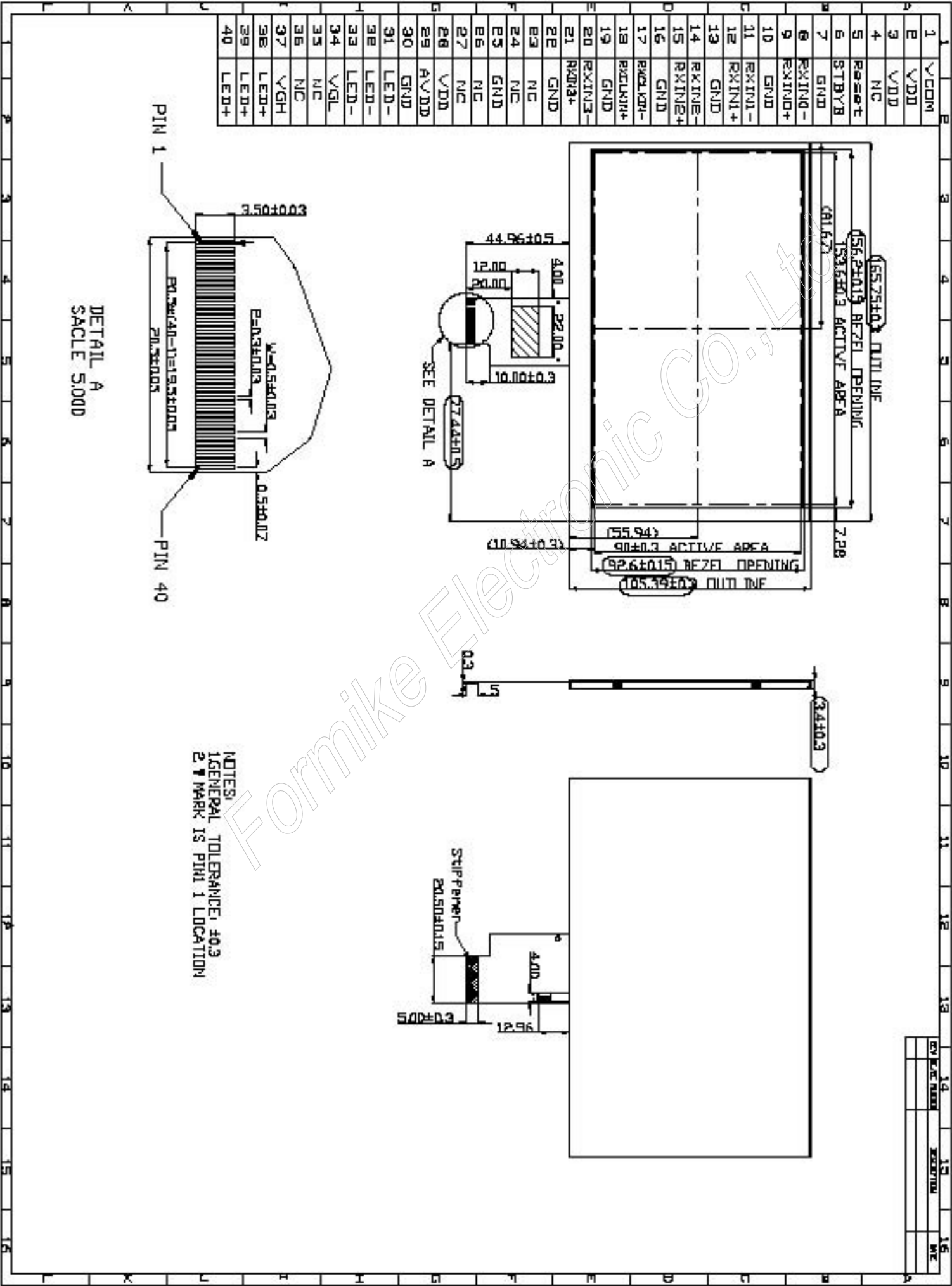
2.2 Application

Tablet PC, Netbook, PDA, Multimedia products, instrument Device
and other electronic Products
Etc.

2.3 Features

Feature	Description
Size	7.0 inches (Diagonal)
Display Mode	Normally White, Transmissive
Resolution	1024 (RGB) x 600
Display Format	R.G.B. stripe
Surface Treatment	Anti-Glare
Color Depth	16.7M
Interface	LVDS 40 PIN
Viewing Direction	12 O' clock
Technology Type	a-si TFT
Outline Dimension (W x H x D) (mm)	165.75 x105.39 x 3.4
Active Area(W x H mm)	153.6 x 90.0
Pixel pitch(mm)	0.150 x 0.150
With/Without TSP	Without TSP
Weight (g)	TBD

3. Mechanical Drawing





4. Pin Assignment

4.2 FPC pinouts

Pin No.	Symbol	I/O	Function	Remarks
1	VCOM	P	Common Voltage	
2	VDD	P	Power Voltage for digital circuit	
3	VDD	P	Power Voltage for digital circuit	
4	NC	---	No connection	
5	Reset	I	Global reset pin	
6	STBYB	I	Standby mode, Normally pulled high STBYB="1", Normally operation STBYB="0", Timing controller, source driver will turn off, all output are High-Z	
7	GND	P	Ground	
8	RXIN0-	I	- LVDS differential data input	
9	RXIN0+	I	+LVDS differential data input	
10	GND	P	Ground	
11	RXIN1-	I	-LVDS differential data input	
12	RXIN1+	I	+LVDS differential data input	
13	GND	P	Ground	
14	RXIN2-	I	-LVDS differential data input	
15	RXIN2+	I	+LVDS differential data input	
16	GND	P	Ground	
17	RXCLKIN-	I	-LVDS differential clock input	
18	RXCLKIN+	I	+LVDS differential clock input	
19	GND	P	Ground	
20	RXIN3-	I	-LVDS differential data input	
21	RXIN3+	I	+LVDS differential data input	
22	GND	P	Ground	
23	NC	---	No connection	
24	NC	---	No connection	
25	GND	P	Ground	
26	NC	---	No connection	
27	NC	---	No connection	
28	VDD	I	VDD	
29	AVDD	P	Power for Analog Circuit	
30	GND	P	Ground	
31	LED-	P	LED Cathode	
32	LED-	P	LED Cathode	
33	LED-	P	LED Cathode	
34	VGL	P	Gate OFF Voltage	
35	NC	---	No connection	
36	NC	---	No connection	
37	VGH	P	Gate ON Voltage	
38	LED+	P	LED Anode	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

Note: I/O definition.

I---Input pin, O---Output pin, P--- Power/Ground, N--- No Connection



4.2 U/D R/L Function Description

Scan Control Input		Scanning Direction
UPDN	SHLR	
GND	VDD	Up to Down, Left to Right
VDD	GND	Down to Up, Right to Left
GND	GND	Up to Down, Right to Left
VDD	VDD	Down to Up, Left to Right



5. Absolute Maximum Ratings

AGND= GND=0V, Ta = 25°C

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD	-0.3	5.0	V	
	AVDD	6.5	13.5	V	
	VGH	-0.3	20.0	V	
	VGL	-20.0	0.3	V	
Backlight Forward Current	I _{LED}	-	20	mA	For each LED
Operating Temperature	T _{OPR}	-20	60	°C	
Storage Temperature	T _{STG}	-30	70	°C	



6. Electrical Characteristics

6.1 Recommended Operating Condition

AGND=GND=0V, Ta = 25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
Analog Supply Voltage	AVDD	10.8	11	11.2	V	
Gate On Voltage	VGH	19.7	20	20.3	V	
Gate Off Voltage	VGL	-6.5	-6.8	-7.1	V	
Common Electrode Driving Signal	VCOM	(3.6)	(3.8)	(4.0)	V	

Note: The value is for design stage only.



6.2 Recommended Driving Condition for Backlight

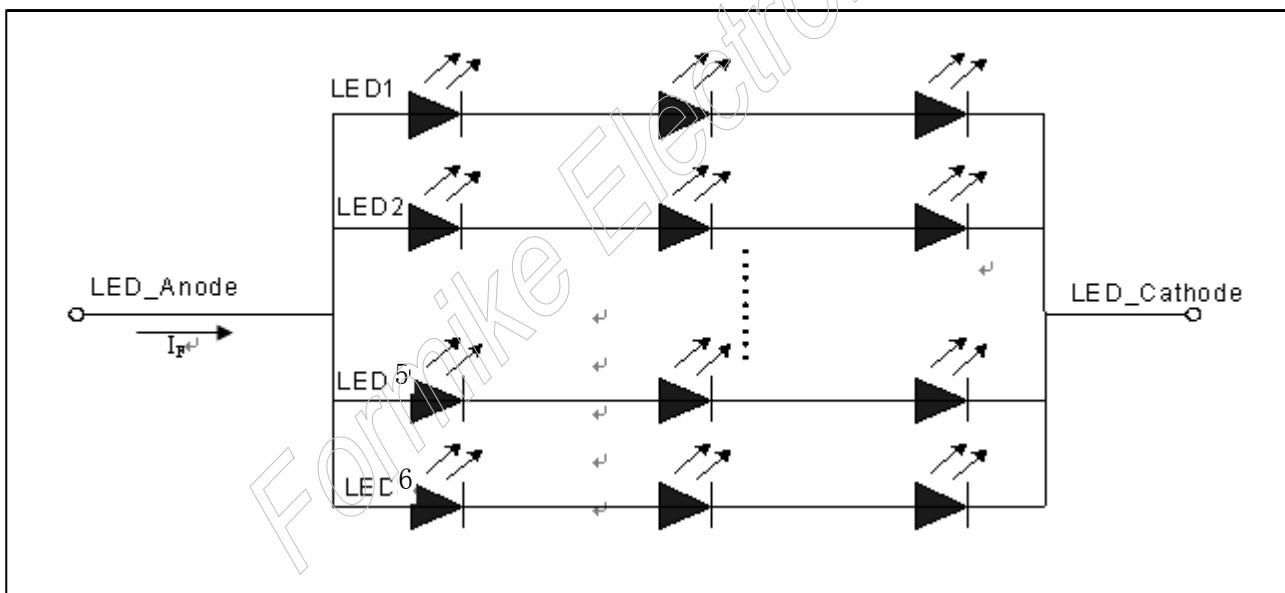
 $T_a=25^{\circ}\text{C}$

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	20	-	mA	18 LEDs (3 LED Serial, 6 LED Parallel)
Forward Voltage	V_F	-	9.9	-	V	
Operating Life Time	-	20,000	-	-	Hrs	

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 6 LED Parallel). For each LED: $I_F (1/6) = 20\text{mA}$, $V_F (1/3) = 3.3\text{V}$.

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: I_F is defined for one channel LED. Optical performance should be evaluated at $T_a=25^{\circ}\text{C}$ only. 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.



Note4: The LED driving condition is defined for each LED module.

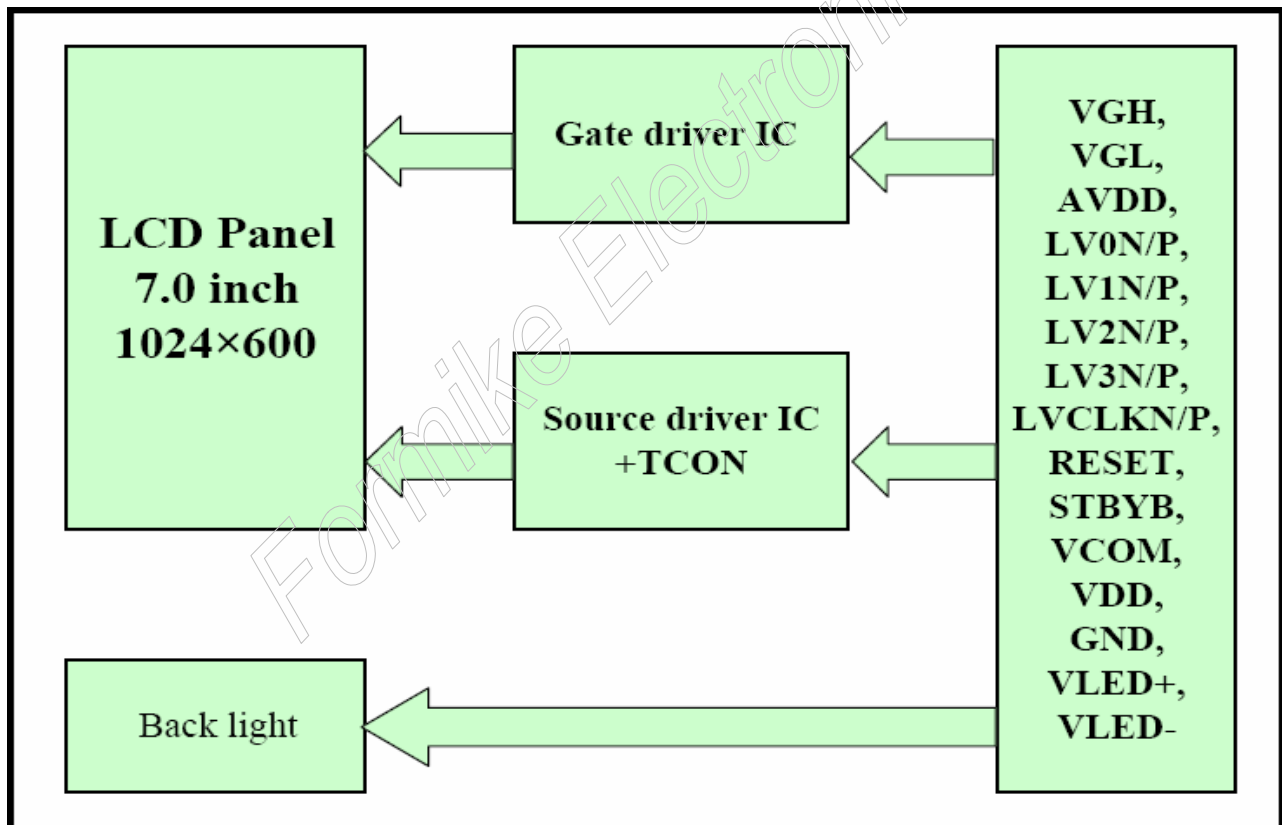


6.3 Power Consumption

AGND=GND=0V, Ta = 25°C

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Digital Supply Current	I_{VDD}	VCC=3.3 V	-	-	60	mA	
Analog Supply Current	I_{AVDD}	AVDD=11 V	-	--	30	mA	
Gate On Current	I_{VGH}	VGH=20 V	-	--	1.0	mA	
Gate Off Current	I_{VGL}	VGL=-6.8 V	-	--	1.0	mA	
Power Consumption	Panel&Gamma		-	TBD	TBD	mW	
	Backlight		-	1.2	-	W	
	Total		-	TBD	TBD	W	

6.4 Block Diagram





7.Optical Characteristics

Ta=25℃

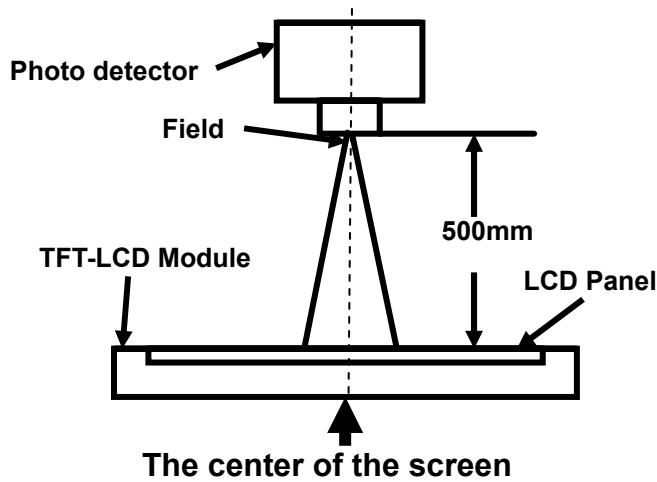
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	-	70	-	Degree	Note 2
		θB		-	75	-		
		θL		-	75	-		
		θR		-	75	-		
Contrast Ratio		CR	θ=0°	TBD	(500)	-		Note1 Note3
Response Time		T _{ON}	25℃	-	20	TBD	ms	Note1 Note4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	-	0.31			Note1 Note5
		y		-	0.33			
	Red	x		-	TBD			
		y		-	TBD			
	Green	x		-	TBD			
		y		-	TBD			
	Blue	x		-	TBD			
		y		-	TBD			
Uniformity		U		-	75	-	%	Note1 Note6
NTSC				-	50	-	%	Note 5
Luminance		L		TBD	250	-	cd/m ²	Note1 Note7

Test Conditions:

1. $I_F = 20 \text{ mA}$, $V_F = 9.9 \text{ V}$ and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

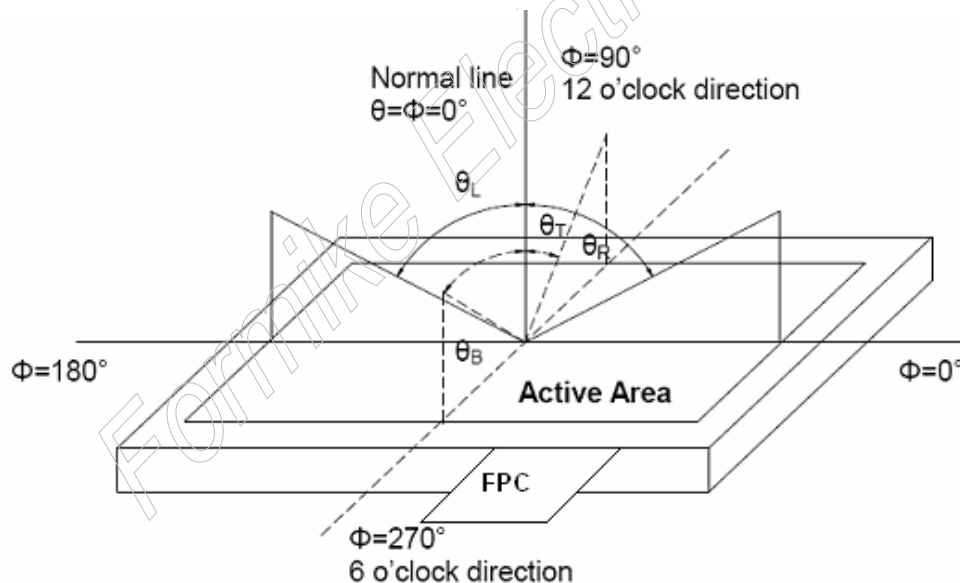
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	BM-5A	1°
Luminance		
Lum Uniformity		
Chromaticity	SR-3A	-
Response Time	TRD100	

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).



Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

“White state “: The state is that the LCD should drive by V_{white}.

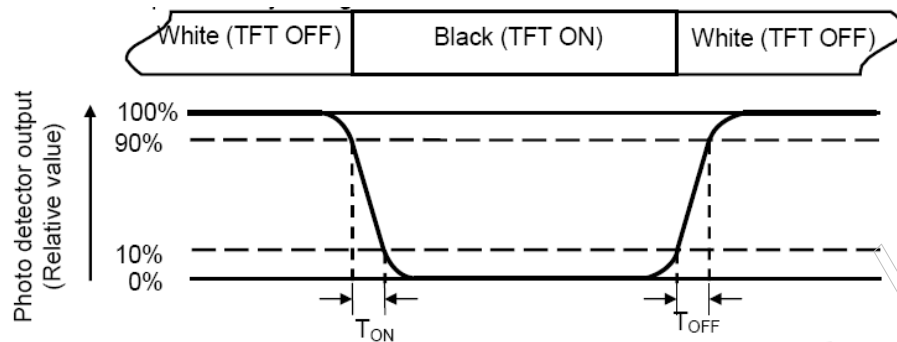
“Black state”: The state is that the LCD should drive by V_{black}.

V_{white}: To be determined V_{black}: To be determined.

Note 4: 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%.



Note 5: Definition of color chromaticity (CIE1931)

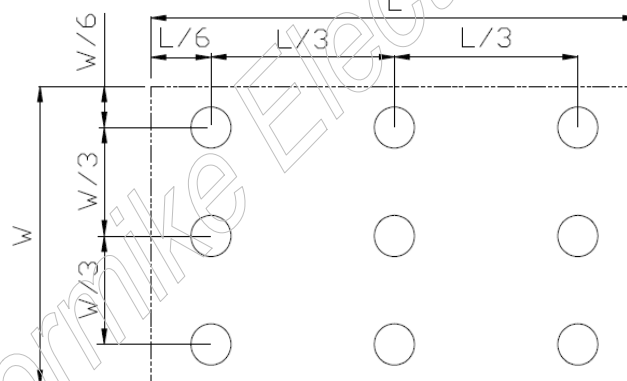
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

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



$L_{\max}$: The measured Maximum luminance of all measurement position.

$L_{\min}$: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

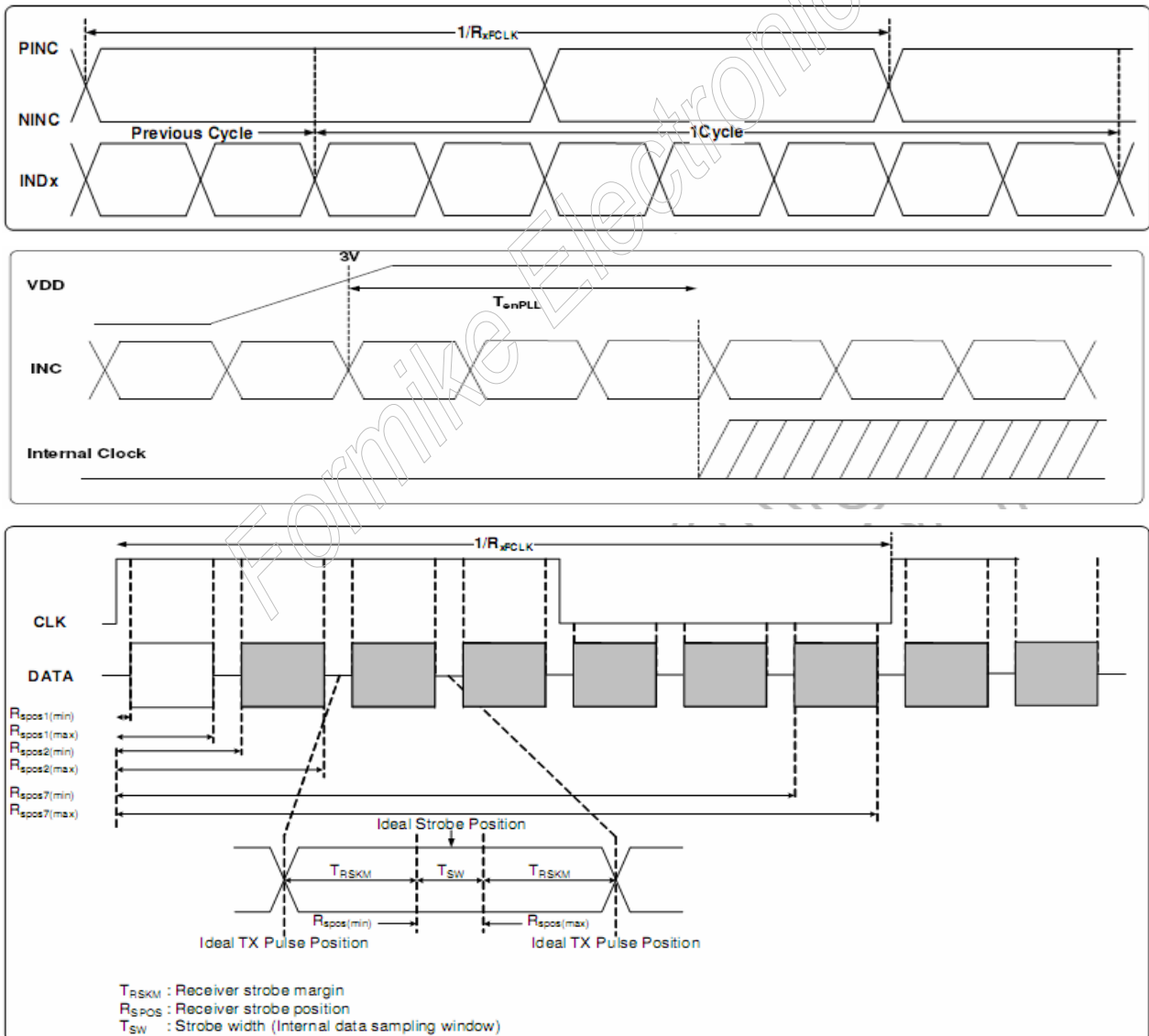


8. Timing Chart

8.1 AC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Clock Frequency	R_{xFCLK}	40.8	51.2	71	MHz	
Input data skew margin	T_{RSKM}	500	-	-	ps	
Clock high time	T_{LVCH}	-	$4/(7 * R_{xFCLK})$	-	ns	
Clock low time	T_{LVCL}	-	$3/(7 * R_{xFCLK})$	-	ns	
PLL wake-up time	T_{enPLL}	-	-	150	us	

8.2 Input Clock and Data Timing Diagram:

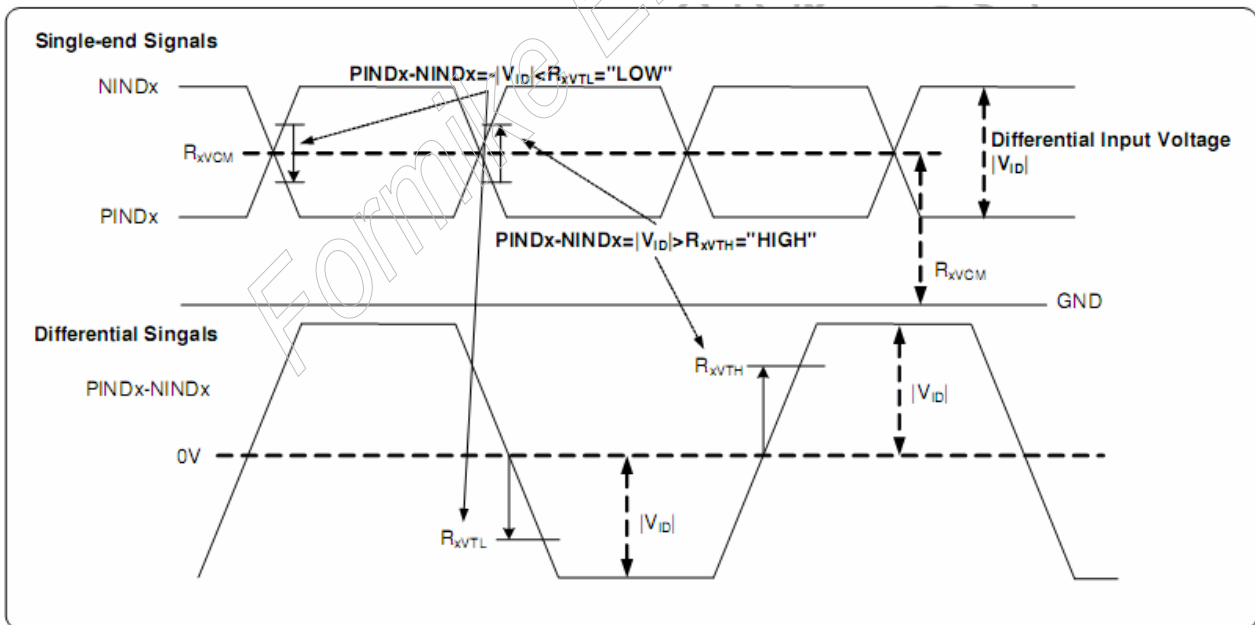




8.3 DC Electrical Characteristics

VDD=3.3V, AVDD=11V, AGND=GND=0V, Ta=25°C

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Differential input high Threshold voltage	R_{XVTH}	–	–	+0.1	V	
Differential input Low Threshold voltage	R_{XVTL}	-0.1	–	–	V	
Input voltage range	R_{XVIN}	0	–	$VDD-1.2+ V_{ID} /2$	V	
Differential input common Mode voltage	R_{XVCM}	$ V_{ID} /2$	–	$VDD-1.2$	V	
Differential input voltage	$ V_{ID} $	0.2	v	0.6	V	
Differential input leakage Current	RV_{Xliz}	-10	v	+10	uA	
LVDS Digital Operating Current	Iddlvds	–	15(TBD)	30(TBD)	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	Istlvds	–	10(TBD)	50(TBD)	uA	Clock & all functions are stopped

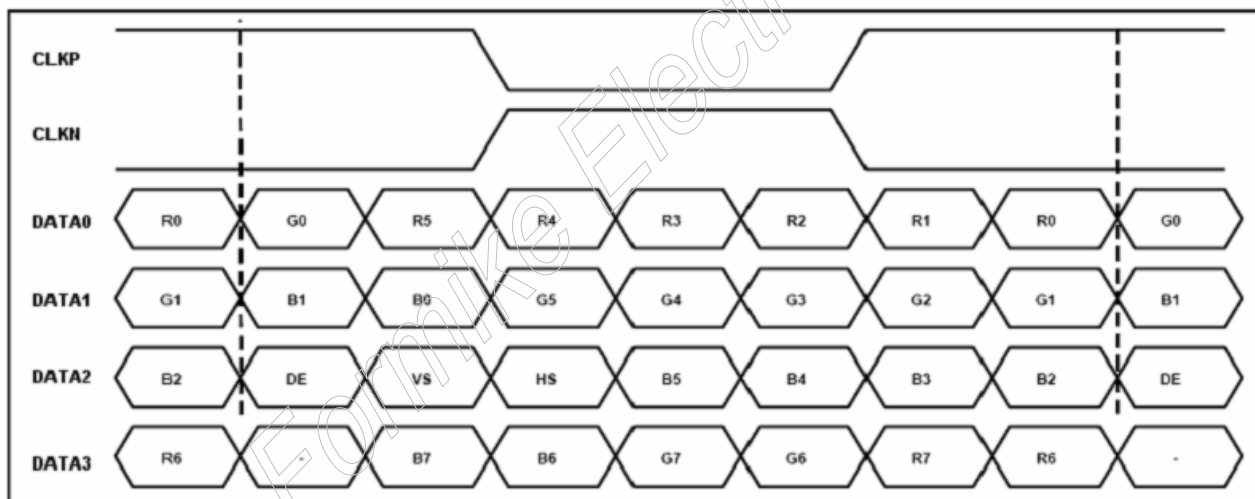




8.4 Timing

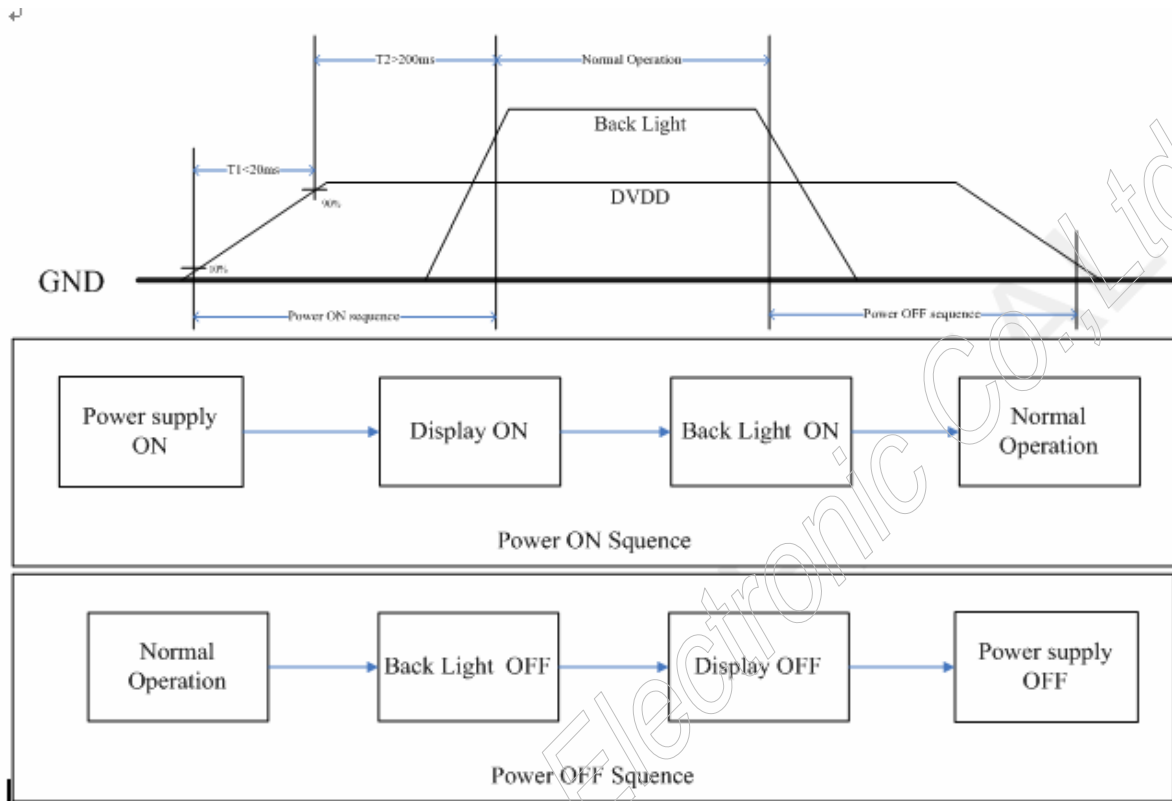
Parameter	Symbol	Min	Typ	Max	Unit	Remark
Clock frequency	fclk	40.8	51.2	67.2	MHz	Frame rate=60Hz
Horizontal display area	thd	1024			DCLK	
HS period time	th	1114	1344	1400	DCLK	
HS Blanking	thbp+thfp	90	320	376	DCLK	
Vertical display area	tvd	600			H	
VS period time	tv	610	635	800	H	
VS Blanking	tvbp+tvfp	10	35	200	H	

8.5 Data Input Format





8.6 POWER ON/OFF SEQUENCE





9. RELIABILITY TEST ITEMS

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours	
2	Low Temperature Operation	Ta = -20℃, 240 hours	
3	High Temperature Storage	Ta = +80℃, 240 hours	
4	Low Temperature Storage	Ta = -30℃, 240 hours	
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max, 240 hours	
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time: 5min, 20 Cycle	
7	ESD	C=150pF, R=330Ω, 5point/panel Air: ±8Kv, 5times; Contact: ±4Kv, 5times (Environment: 15℃~35℃, 30%~60% RH, 86Kpa~106Kpa)	
8	Vibration Test	Frequency range: 10~55Hz Stroke: 1.5mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)	
9	Mechanical Shock (Non Op)	Half Sine Wave 60G 6ms, ±X, ±Y, ±Z 3times for each direction	
10	Package Drop Test	Height: 80cm, 1corner, 3edges, 6surfaces	

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of samples.



10. Packing Information

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	KWH070KQTG24	165.75x 105.39 x 3.4	TBD	50	
2	Partition_1	Corrugated paper	513X333X215	1.571	1	
3	Anti-static Bag	PE	180X160X0.05	0.001	50	Anti-static
4	Dust-Proof Bag	PE	700X530	0.06	1	
5	Partition_2	Corrugated Paper	505X332X4.0	0.098	2	
6	Corrugated Bar	Corrugated paper	513X146×19.5	0.057	4	
7	Carton	Corrugated paper	530X350X250	1.12	1	
8	Model Label		35 X 15	0.001	1	
9	Total weight	TBD±5%				



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 $23\pm5^{\circ}\text{C}$ and the humidity is below $50\pm20\%\text{RH}$.
- (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_o). Adjust V_o 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.