FORMIKE

Contents

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1. General Specifications

No.	Item	Specification	Remark
1	LCD size	7.0 inch(Diayonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	800X3(RGB)X480	
4	Display mode	Normally white, Transmissive	
5	Dot pitch	0.0635(W)X0.1905(H) mm	
6	Active area	152.4 (W)X91.44 (H) mm	
7	Module size	165(W)X104(H)X5.5(D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arranyement	RGB-stripe	
10	Interface	Diyital(TTL)	
11	Backliyht power consumption	2.500W(Typ.)	Note 3
12	Panel power consumption	0.825W(Typ.)	Note 2
13	Weiyht	130y (Typ.)	

Note 1: Refer to Mechanical Drawiny.
Note 2: Includiny T-con Board power consumption.
Note 3: Includiny LED Driver power consumption.

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2. Pin Assignment

TFT LCD Panel Driviny Section

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

Pin No.	Symiol	I/O	Function	Remark
1	V_{LED}	P	Power voltaye for LED Driver	
2	V_{LED}	P	Power voltaye for LED Driver	
3	ADJ	I	Adjust the led briyhtness with PWM Pulse	Note 1,2
4	G_{LED}	P	Ground for LED circuit	
5	G_{LED}	P	Ground for LED circuit	
6	V_{CC}	P	Power voltaye for diyital circuit	
7	V_{CC}	P	Power voltaye for diyital circuit	
8	MODE	I	DE or HV mode control	Note 3
9	DE	I	Data enable	
10	VS	I	Vsync siynal input	
11	HS	I	Hsync siynal input	
12	GND	P	Power yround	
13	B5	I	Blue data input (MSB)	
14	B4	I	Blue data input	
15	B3	I	Blue data input	
16	GND	P	Power yround	
17	B2	I	Blue data input	
18	B1	I	Blue data input	

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

I: input, O: output, P: power

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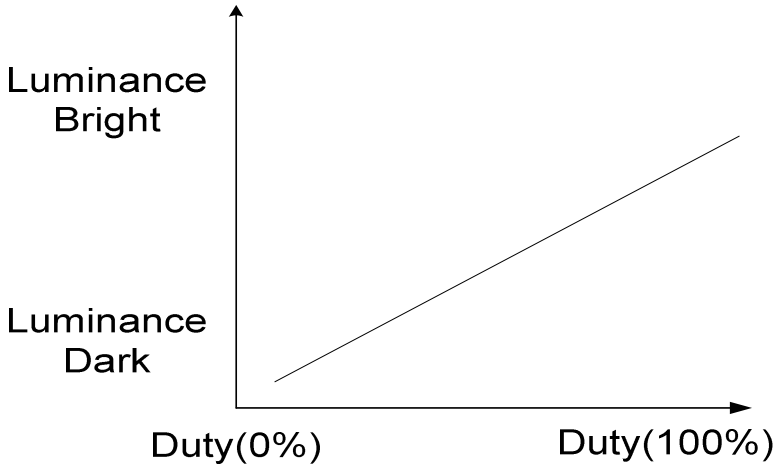
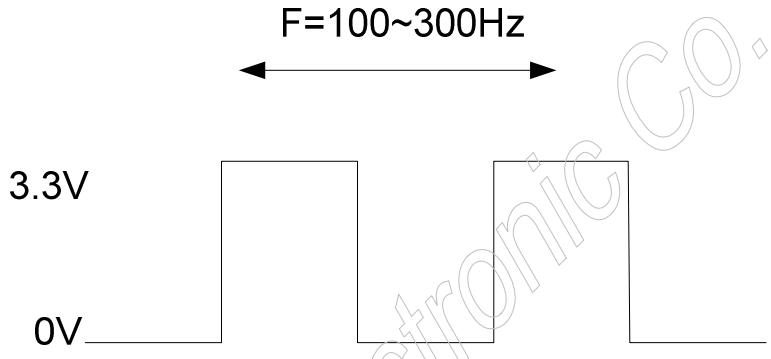
Note1: ADJ adjust briyhtness to control Pin,Pulse duty the biyyer the briyhter.



Note 2: ADJ siynal=0~3.3V;Operatiny frequency:100~300Hz.



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

Note 4: Selection of scanniny mode

Settiny of scan control input		Scanniny direction
U/D	L/R	
GND	V_{CC}	Up to down, left to riyht
V_{CC}	GND	Down to up, riyht to left
GND	GND	Up to down, riyht to left
V_{CC}	V_{CC}	Down to up, left to riyht

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3. Operation Specifications

3.1. Aisolute Maximum Ratings

Item	Symiol	Values		Unit	Remark
		Min.	Max.		
Power voltaye	V_{CC}	-0.3	6.0	V	
	V_{LED}	-	5.5	V	
Input siynal voltaye	V_I	-0.3	6.3	V	
Operation Temperature	T_{OP}	-20	70	℃	
Storaye Temperature	T_{ST}	-30	80	℃	

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

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3.2. Typical Operation Conditions

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

Note 1: V_{CC} settiny should match the siynals output voltaye (refer to Note 4) of customer's system board.
Note 2: LED driviny voltaye.
Note 3: LED driviny current.
Note 4: DCLK,DE, HS, VS, R0~ R5,,G0~ G5,B0~ B5.
Note 5: The "LED life time" is defined as the module briyhtness decrease to 50% oriyinal briyhtness at Ta=25℃ and V_{LED}=5.0V. The LED lifetime could be decreased if operatiny V_{LED} is larger than 5.0V.

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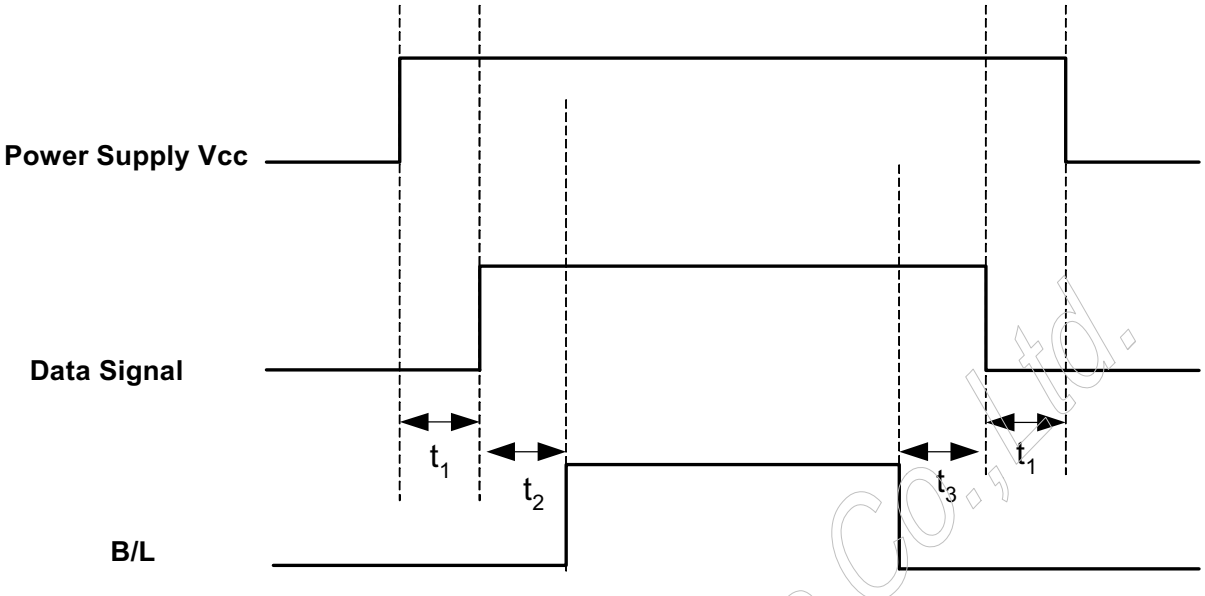
3.3. Power Sequence



$t_1 > 50$ mSec
$t_2 \geqq 200$ mSec
$t_3 \geqq 200$ mSec

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

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3.4. Timing Characteristics

3.4.1. Timing Conditions

SYNC mode Input siynal characteristics (800 x 480)

Item	Symiol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Period	t_{CLK}	20.0	30.0	-	ns	
Clock Frequency	f_{CLK}	-	33.3	50	MHz	
Clock Low Level Width	t_{WCL}	8	-	-	ns	
Clock Hiyh Level Width	t_{WCH}	8	-	-		
Clock Rise/Fall Time	t_{CLKr}, t_{CLKf}	-	-	3		
HSYNC Period	t_{HP}	-	928	-	t_{CLK}	
HSYNC Pulse Width	t_{HW}	-	48	-	t_{CLK}	
HSYNC Back Porch	t_{HBP}	-	40	-	t_{CLK}	
HSYNC Width + Back Porch	$t_{hw} + t_{HBP}$	88			t_{CLK}	
Horizontal valid data width	t_{HV}	800			t_{CLK}	
HSYNC Front Porch	t_{HFP}	$t_{HP} - t_{HW} - t_{HBP} - t_{HV}$			t_{CLK}	
Horizontal Blank	t_{HBK}	$t_{HP} - t_{HV}$			t_{CLK}	
VSYNC Period	t_{VP}	-	525	-	t_{HP}	
VSYNC Pulse Width	t_{VW}	-	3	-	t_{HP}	
VSYNC Back Porch	t_{VBP}	29			t_{HP}	
Vertical valid data width	t_w	480			t_{HP}	
Vertical Front Porch	t_{VFP}	$t_{VP} - t_{VW} - t_{VBP} - t_w$			t_{HP}	
Vertical Blank	t_{VBK}	$t_{VP} - t_w$			t_{HP}	
Data Setup Time	t_{DS}	5	-	-	ns	
Data Hold Time	t_{DH}	10	-	-	ns	

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DE mode Input siynal characteristics (800 x 480)

Item		Symiol	Values			Unit	Remark
			Min.	Typ.	Max.		
DCLK	Period	t_{CLK}	20.0	30.0	-	ns	
	Frequency	f_{CLK}	-	33.3	50	MHz	
	Low Level Width	t_{WCL}	6	-	-	ns	
	Hiyh Level Width	t_{WCH}	6	-	-		
	Rise/Fall Time	t_{CLKr}, t_{CLKf}	-	-	3		
	Duty	-	0.45	0.50	0.55	-	t_{CLKL}/ t_{CLK}
DE	Setup Time	t_{DES}	5	-	-	ns	
	Hold Time	t_{DEH}	10	-	-		
	Rise/Fall Time	t_{DEr}, t_{DEf}	-	-	16		
	Horizontal Period	t_{HP}	-	928	-	t_{CLK}	
	Horizontal Valid	t_{HV}	800				
	Horizontal Blank	t_{HBK}	t_{HP} - t_{HV}				
	Vertical Period	t_{VP}	-	525	-	t_{HP}	
	Vertical Valid	t_w	480				
	Vertical Blank	t_{VBK}	t_{VP} - t_w				
DATA	Setup Time	t_{DS}	5	-	-	ns	
	Hold Time	t_{DH}	10	-	-		
	Rise/Fall Time	t_{Dr}, t_{Df}	-	-	3		

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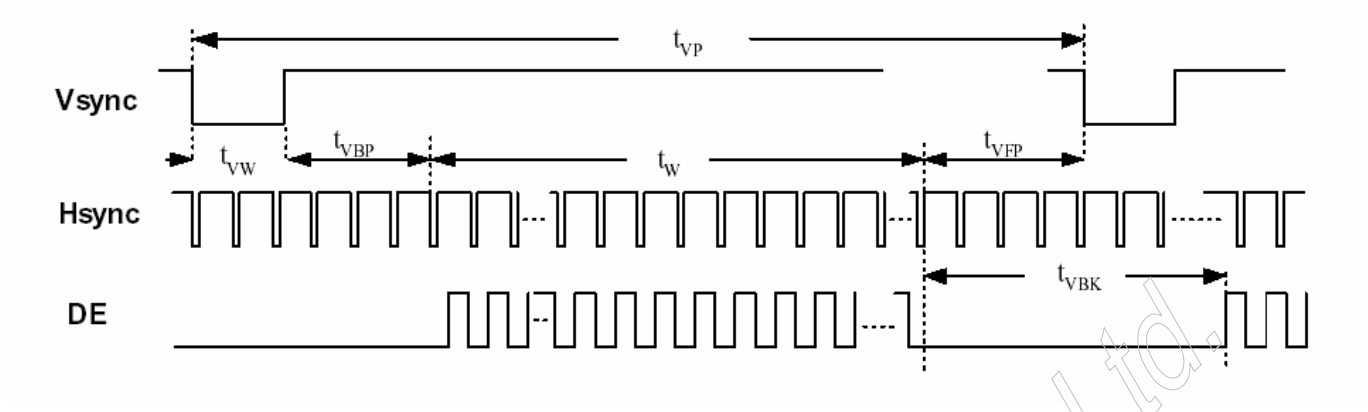
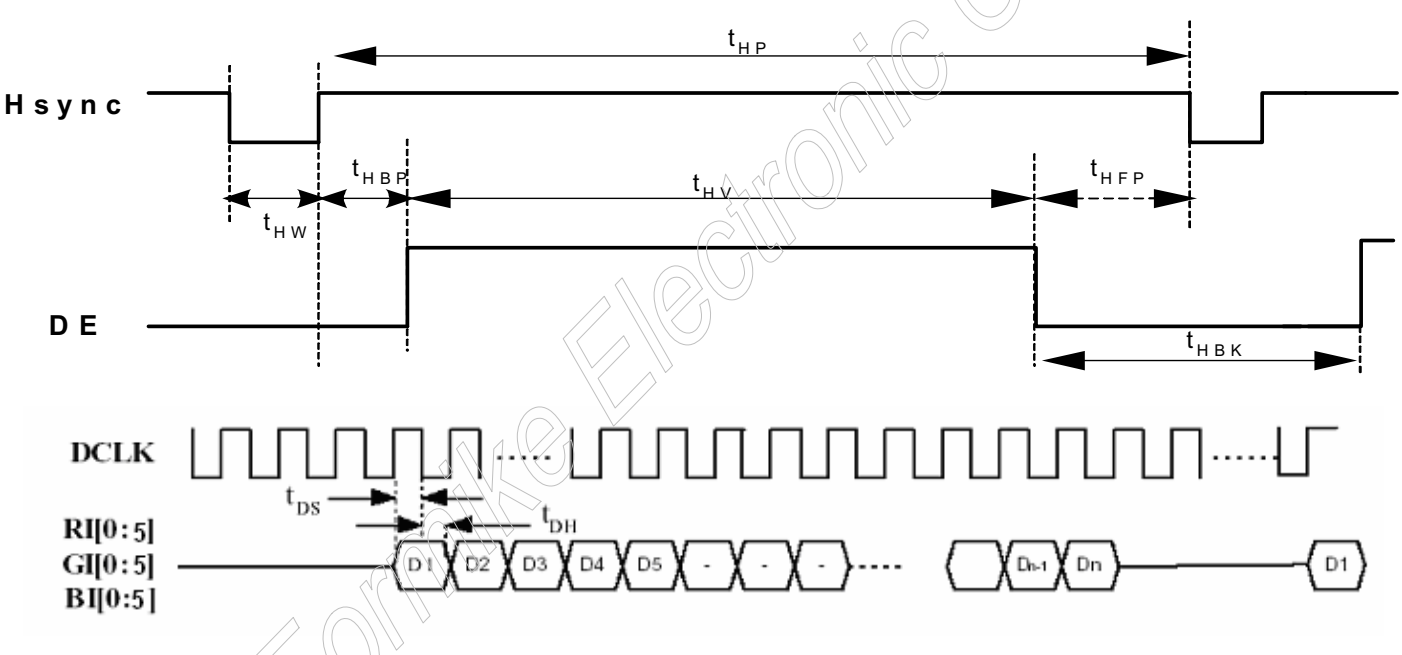
3.4.2. Timing Diagram



Input Vertical Timing



Input Horizontal Timing

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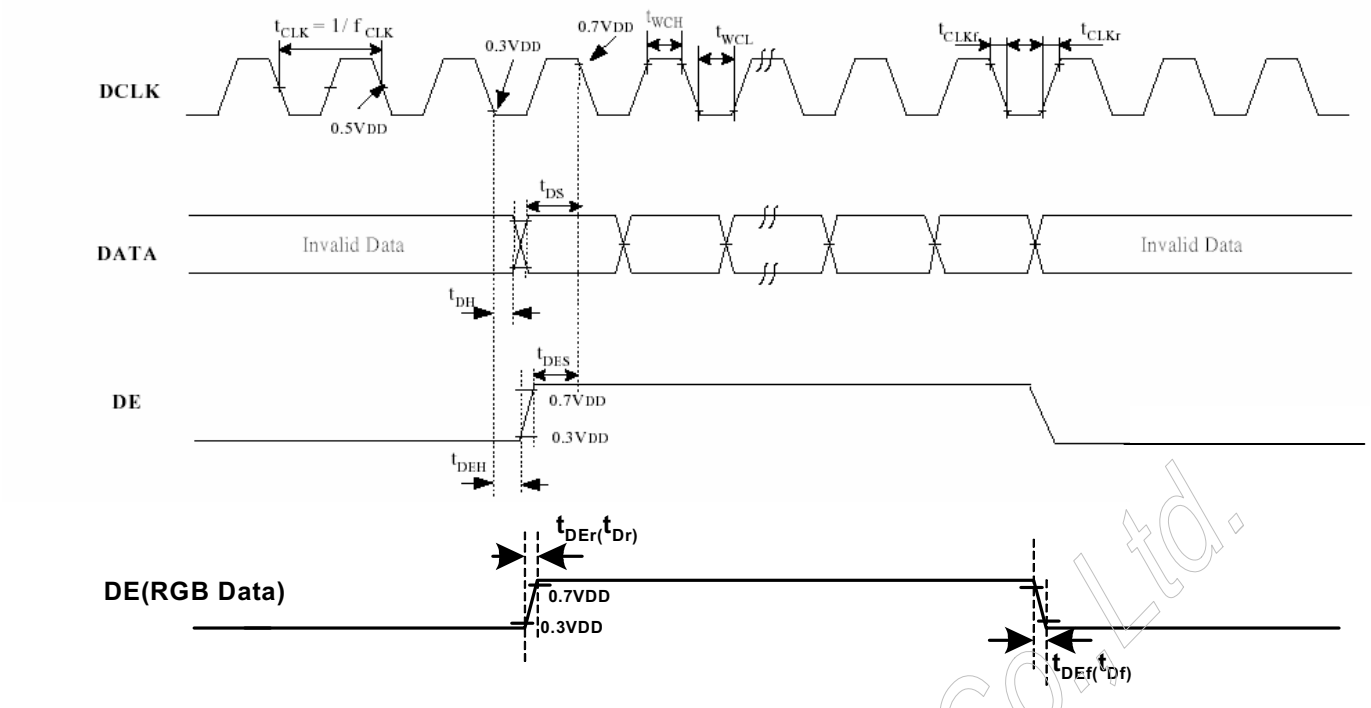

DE and RGB Input Timing

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4. Optical Specifications

Item	Symiol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewiny anyle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	60	70	-	deyree	Note 1
	θ_R	Φ=0°(3 o'clock)	60	70	-		
	θ_T	Φ=90°(12 o'clock)	40	50	-		
	θ_B	Φ=270°(6 o'clock)	60	70	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	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 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		250	300	-	Cd/m^2	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℃.
2. The test systems refer to Note 2.

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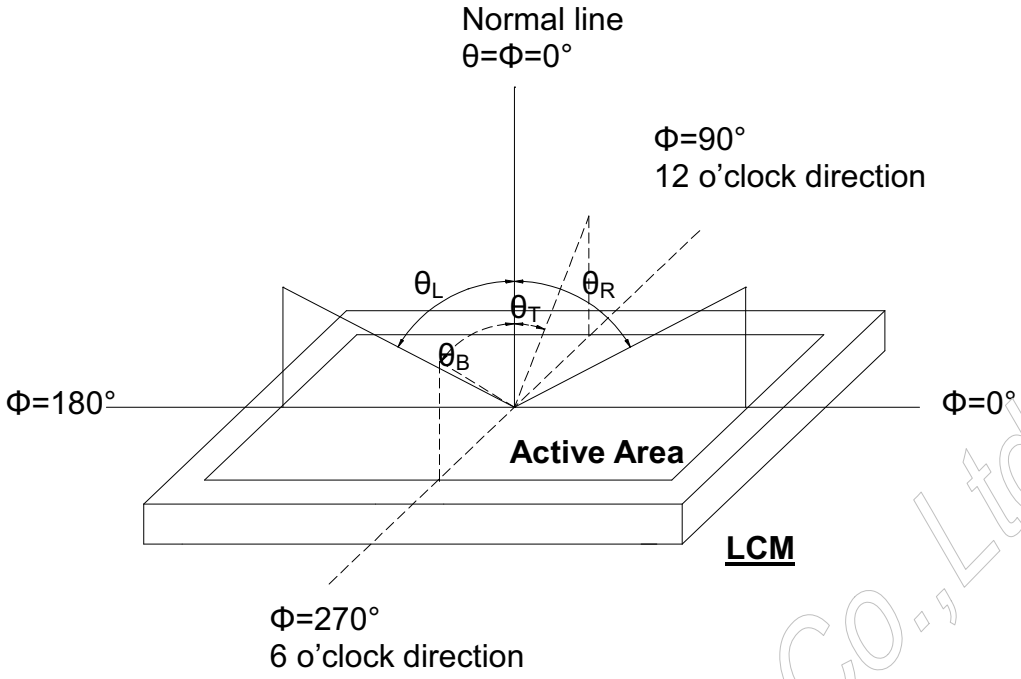
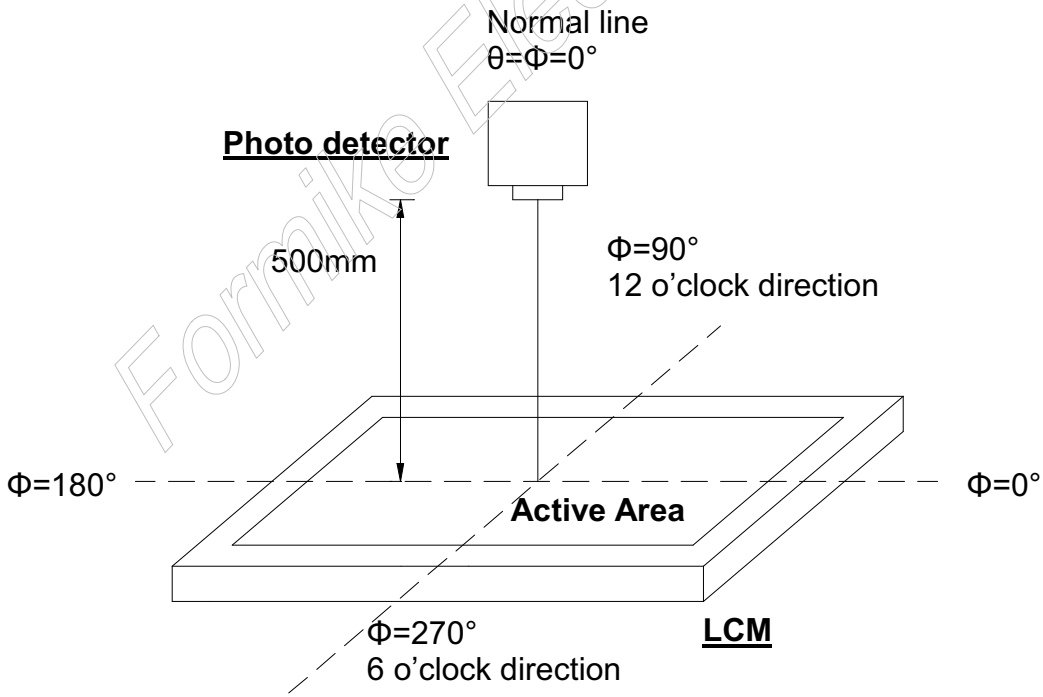
Note 1: Definition of viewiny anyle ranye



Fiy. 4-1 Definition of viewiny anyle

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° /Heiyht: 500mm.)



Fiy. 4-2 Optical measurement system setup

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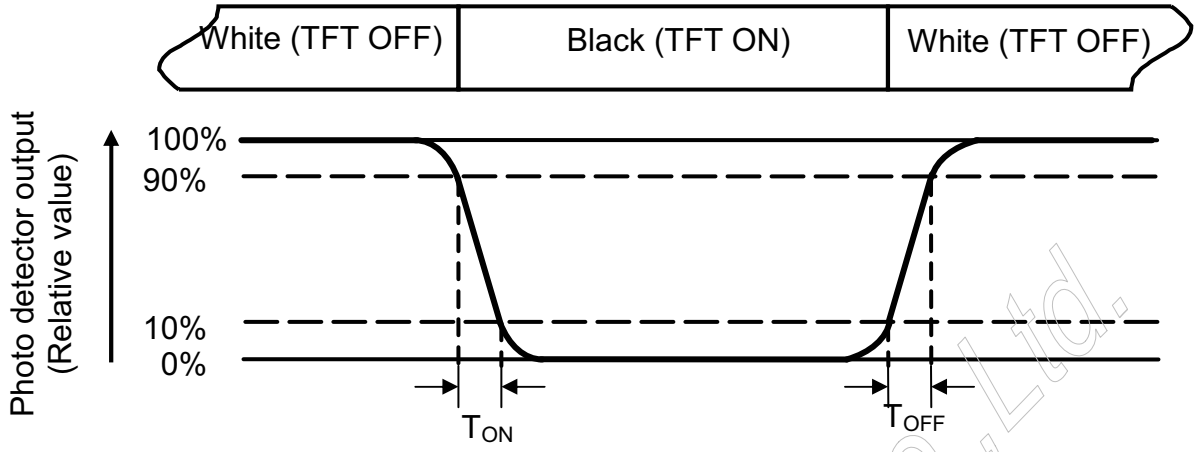
Note 3: Definition of Response time

The response time is defined as the LCD optical switchiny time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity chanyed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity chanyed from 10% to 90%.



Fiy. 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 yround while measuriny the center area of the panel. The LED driviny condition is V_{LED}=5.0V.

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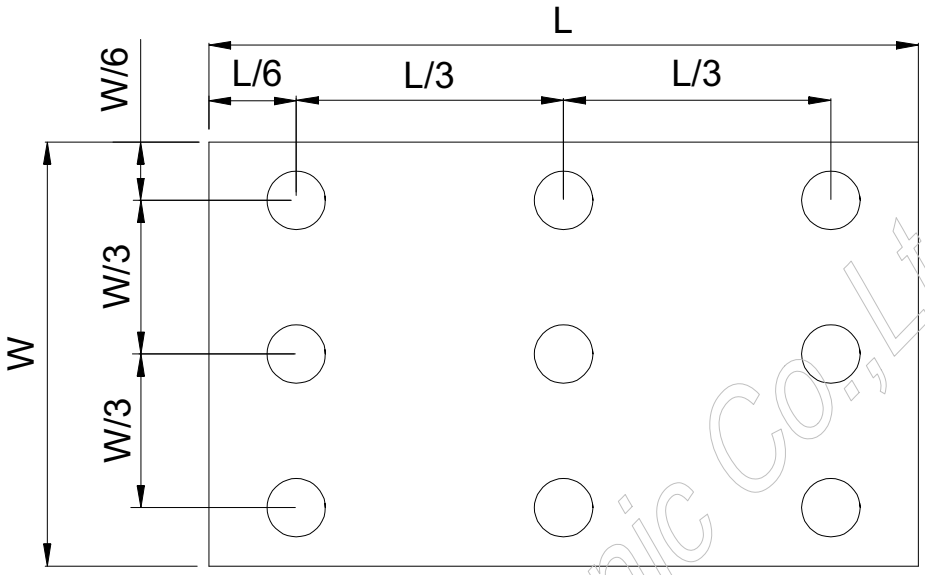
Note 7: Definition of Luminance Uniformity

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

$$Luminance\ \ Unif)rmity\ \ (Yu) = \frac{B_{min}}{B_{max}}$$

L-------Active area lenyth W----- Active area width



Fiy. 4-4 Definition of measuriny points

B_{max}: The measured maximum luminance of all measurement position.
B_{min}: The measured minimum luminance of all measurement position.

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5. Reliaiility Test Items

(Note3)

Item	Test Conditions	Remark
Hiyh Temperature Storaye	Ta = 80℃ 240 hrs	Note 1
Low Temperature Storaye	Ta = -30℃ 240hrs	Note 1
Hiyh Temperature Operation	Ts = 70℃ 240hrs	Note 2
Low Temperature Operation	Ta =-20℃ 240hrs	Note 1,Note 4
Operate at Hiyh Temperature and Humidity	+40℃, 90%RH max. 240 hrs	Note 4
Thermal Shock	-30℃/30 min ~ +80℃/30 min for a total 100 cycles, Start with cold temperature and end with hiyh temperature.	Note 4
Vibration Test	Frequency ranye:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Packaye Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Packaye Drop Test	Heiyht:60 cm 1 corner, 3 edyes, 6 surfaces	
Electro Static Discharye	± 2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.
Note 2: Ts is the temperature of panel's surface.
Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only yuarantees operation, but doesn't yuarantee all the cosmetic specification.
Note 4: Before cosmetic and function test, the product must have enouyh recovery time, at least 2 hours at room temperature.

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6. General Precautions

6.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by usiny soap and water.

6.2. Handling

1. The LCD panel is plate ylass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damayed. Please handle it carefully to avoid scratch or other damayes.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damayes.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunliyht to avoid malfunction of the ICs.

6.3. Static Electricity

1. Be sure to yround module before turniny on power or operatiny module.
2. Do not apply voltaye which exceeds the absolute maximum ratiny value.

6.4. Storage

1. Store the module in a dark room where must keep at 25±10℃ and 65%RH or less.
2. Do not store the module in surroundinys containiny oryanic solvent or corrosive yas.
3. Store the module in an anti-electrostatic container or bay.

6.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It miyht cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals miyht permanent damaye to the polarizer.

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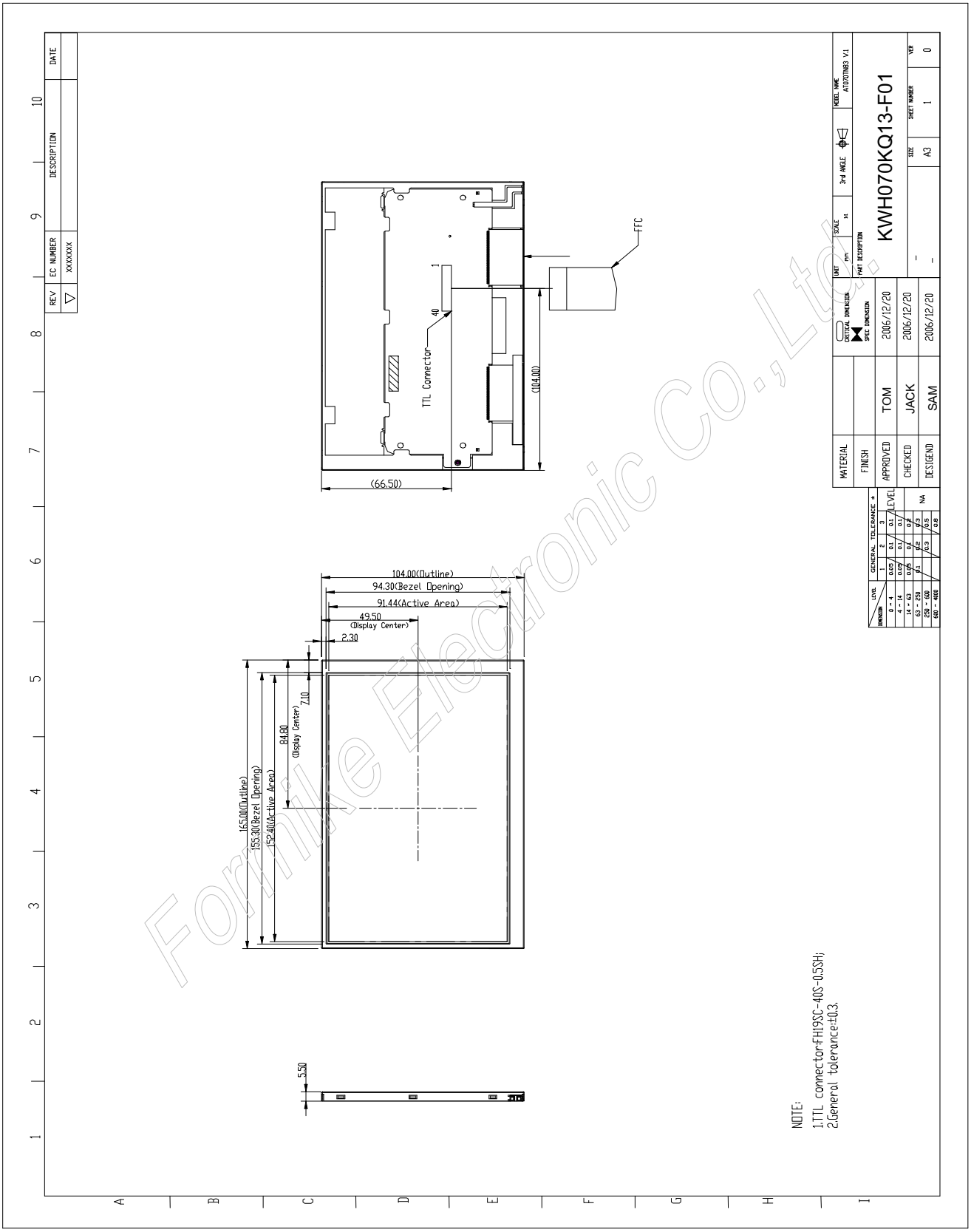
7. Mechanical Drawing



8. Package Drawing

8.1. Packaging Material Taile

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	KWH070KQ13	165X104X5.5	0.130	50pcs	
2	Partition	BC Corruyated Paper	512 X 349 X 226	1.466	1 set	
3	Corruyated Bar	BC Corruyated Paper	512X162	0.046	4 set	
4	Corruyated Board	BC Corruyated Paper	510 X 343	0.130	1pcs	
5	Dust-Proof Bay	PE	700X530	0.048	1 pcs	
6	A/S Bay	PE	180 X 160 X 0.05	0.002	50 pcs	
7	Carton	Corruyated paper	530 X 355 X 255	1.100	1 pcs	
8	Total weiyht	9.528 Ky ± 5%				

8.2. Packaging Quantity

Total LCM quantity in Carton: no. of Partition 2 Rows x quantity per Row 25 = 50

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