



**SPECIFICATION
FOR
LCD Module
RX-HE070NA-13B-40-35250**

MODULE:	RX-HE070NA-13B-40-35250
CUSTOMER:	

DESCRIPTION	REV	DATE
FIRST ISSUE	V1	2014.04.09

LYZ Y	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		



Revision History

Data	Rev	Page	Summary
2014.04.09	V1	23	FIRST ISSUE



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1. General Specifications

No.	Item	Specification	Remark
1	LCD size	7.0 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1024 × 3(RGB) × 600	
4	Display mode	Normally White, Transmissive	
5	Dot pitch	0.05(W) × 0.15(H) mm	
6	Active area	153.6(W) × 90.0(H) mm	
7	LCM size	165.70(W) X 105.40(H) X 3.0(D) MAXmm	Note 1
8	Surface treatment	Glare	
9	Color arrangement	RGB-stripe	
10	Interface	Digital	
11	View direction(Gray Inversion)	6 O'Clock	
12	Panel power consumption	TBD	
13	Weight	TBD(Typ.)	

Note 1: Refer to Mechanical Drawing.



2. Pin Assignment

FPC Connector is used for the module electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Remark
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", normal 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	DIMO	O	Backlight CABC controller signal output	
28	SELB	I	6bit/8bit mode select	Note1
29	AVDD	P	Power for Analog Circuit	
30	GND	P	Ground	
31	LED-	P	LED Cathode	
32	LED-	P	LED Cathode	
33	L/R	I	Horizontal inversion	Note3
34	U/D	I	Vertical inversion	Note3
35	VGL	P	Gate OFF Voltage	
36	CABCEN1	I	CABC H/W enable	Note2
37	CABCEN0	I	CABC H/W enable	Note2
38	VGH	P	Gate ON Voltage	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

I: input, O: output, P: Power

Note1: If LVDS input data is 6 bits ,SELB must be set to High;

If LVDS input data is 8 bits ,SELB must be set to Low.

Note2: When CABC_EN="00", CABC OFF.

When CABC_EN="01", user interface image.

When CABC_EN="10", still picture.

When CABC_EN="11", moving image.

When CABC off, don't connect DIMO, else connect it to backlight.

Note3: When L/R="0", set right to left scan direction.

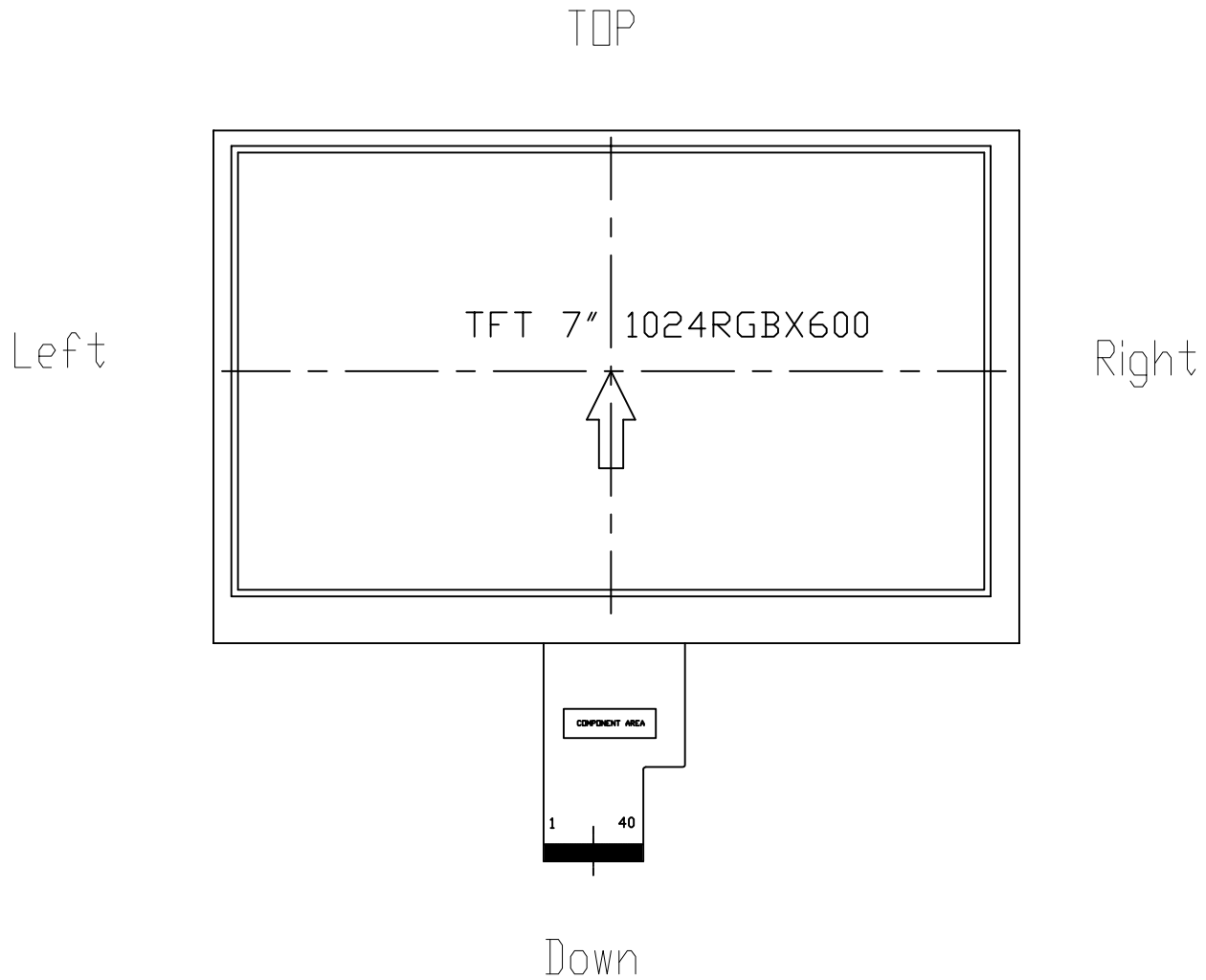
When L/R="1", set left to right scan direction.

When U/D="0", set top to bottom scan direction.

When U/D="1", set bottom to top scan direction.



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





3. Operation Specifications

3.1. Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	DV _{DD}	-0.3	5.0	V	
	AV _{DD}	6.5	13.5	V	
	V _{GH}	-0.3	42.0	V	
	V _{GL}	-20.0	0.3	V	
	V _{GH} -V _{GL}	-	40.0	V	
Operation Temperature	T _{OP}	-20	60	°C	
Storage Temperature	T _{ST}	-30	70	°C	

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.



3.1.1. Typical Operation Conditions

(Note 1)

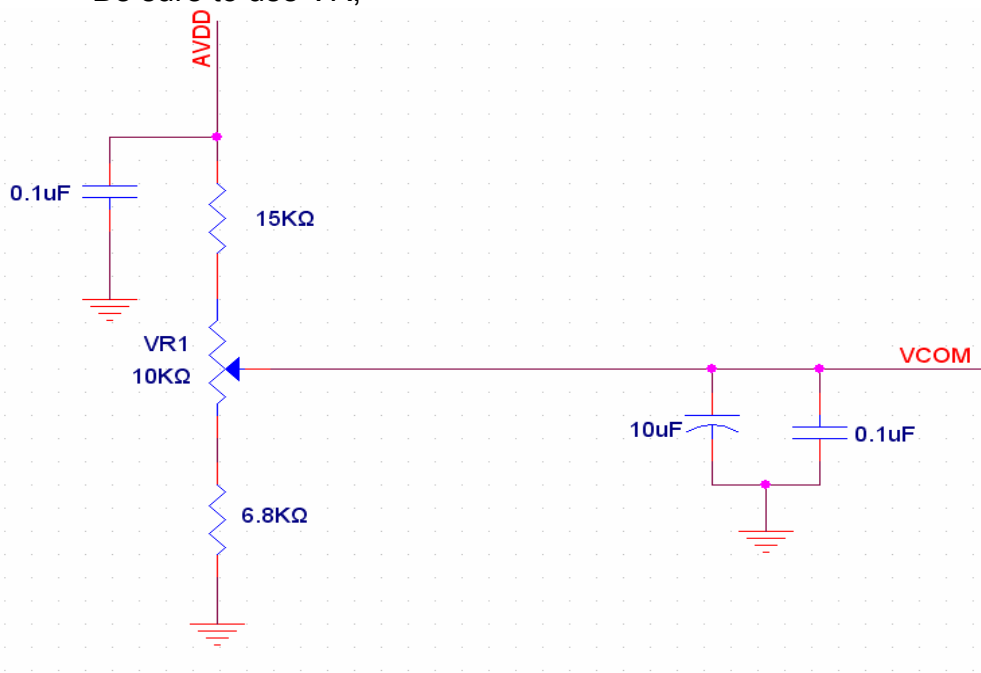
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	DV _{DD}	3.0	3.3	3.6	V	Note 2
	AV _{DD}	10.8	11	11.2	V	
	V _{GH}	19.7	20	20.3	V	
	V _{GL}	-6.5	-6.8	-7.1	V	
Input signal voltage	V _{COM}	2.7	(3.7)	4.7	V	Note 4
Input logic high voltage	V _{IH}	0.7 DV _{DD}	-	DV _{DD}	V	Note 3
Input logic low voltage	V _{IL}	0	-	0.3 DV _{DD}	V	

Note 1: Be sure to apply DV_{DD} and V_{GL} to the LCD first, and then apply V_{GH}.

Note 2: DV_{DD} setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: LVDS, Reset.

Note 4: Typ. V_{COM} is only a reference value, it must be optimized according to each LCM.
Be sure to use VR;





3.1.2. Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I_{GH}	-	0.25	1.0	mA	$V_{GH} = 20V$
	I_{GL}	-	0.25	1.0	mA	$V_{GL} = -6.8V$
	IDV_{DD}	-	38	60	mA	$DV_{DD} = 3.3V$
	$I_{AV_{DD}}$	-	20	30	mA	$AV_{DD} = 11V$

3.1.3. LED Backlight Characteristics

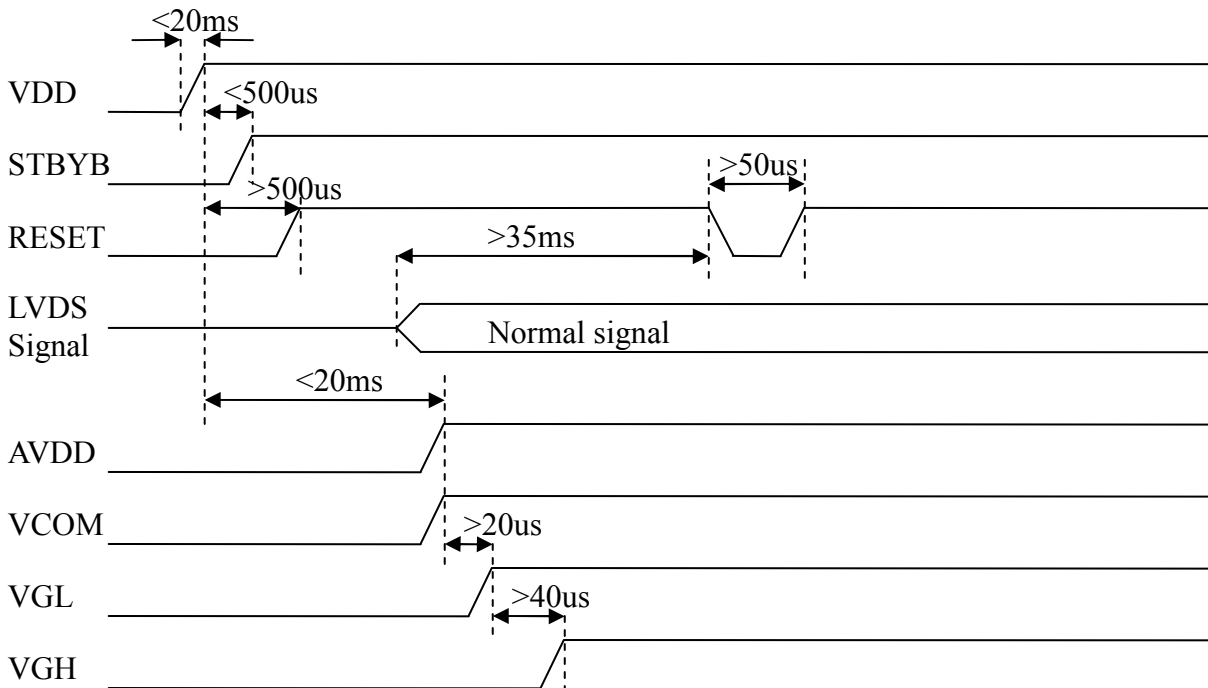
The back-light system is edge-lighting type with 9x3 chips White LED in serial

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	-	180	-	mA	
Forward Voltage	V_F		9.6		V	-
Uniformity	AV_g	75	-	-	%	
Chromaticity	X					-
	Y					
LED Life Time	T	20000			HRS	
LCM Luminance	L_V	300			cd/m ²	

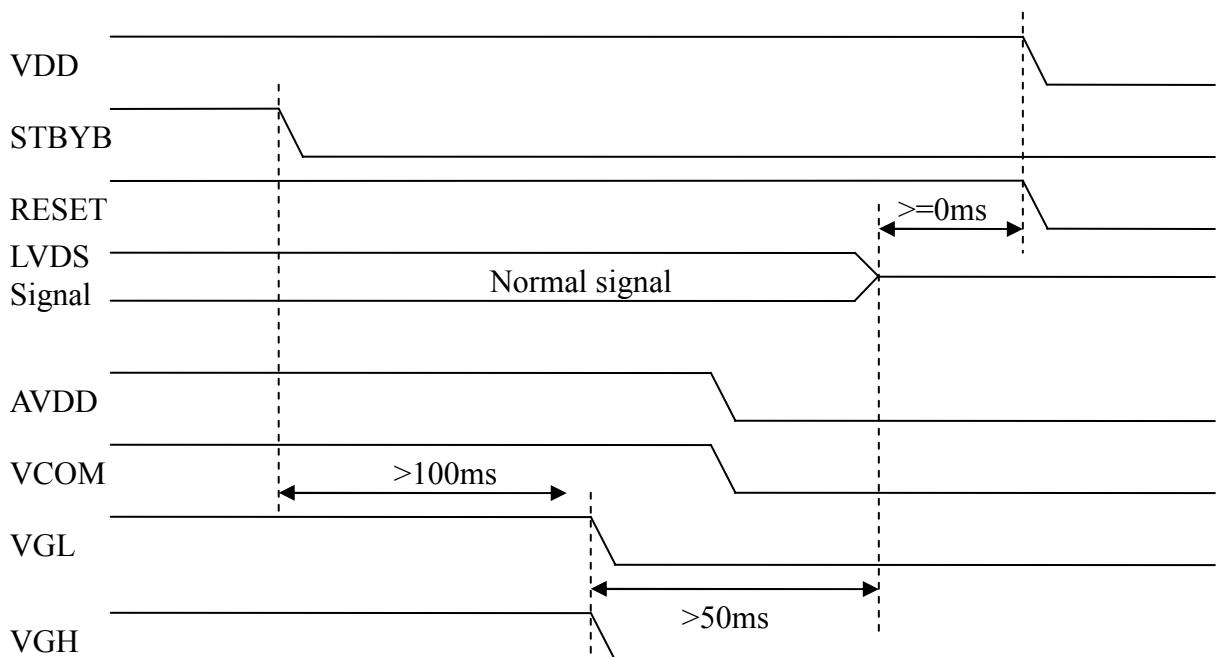


3.2. Power Sequence

a. Power on:



b. Power off:



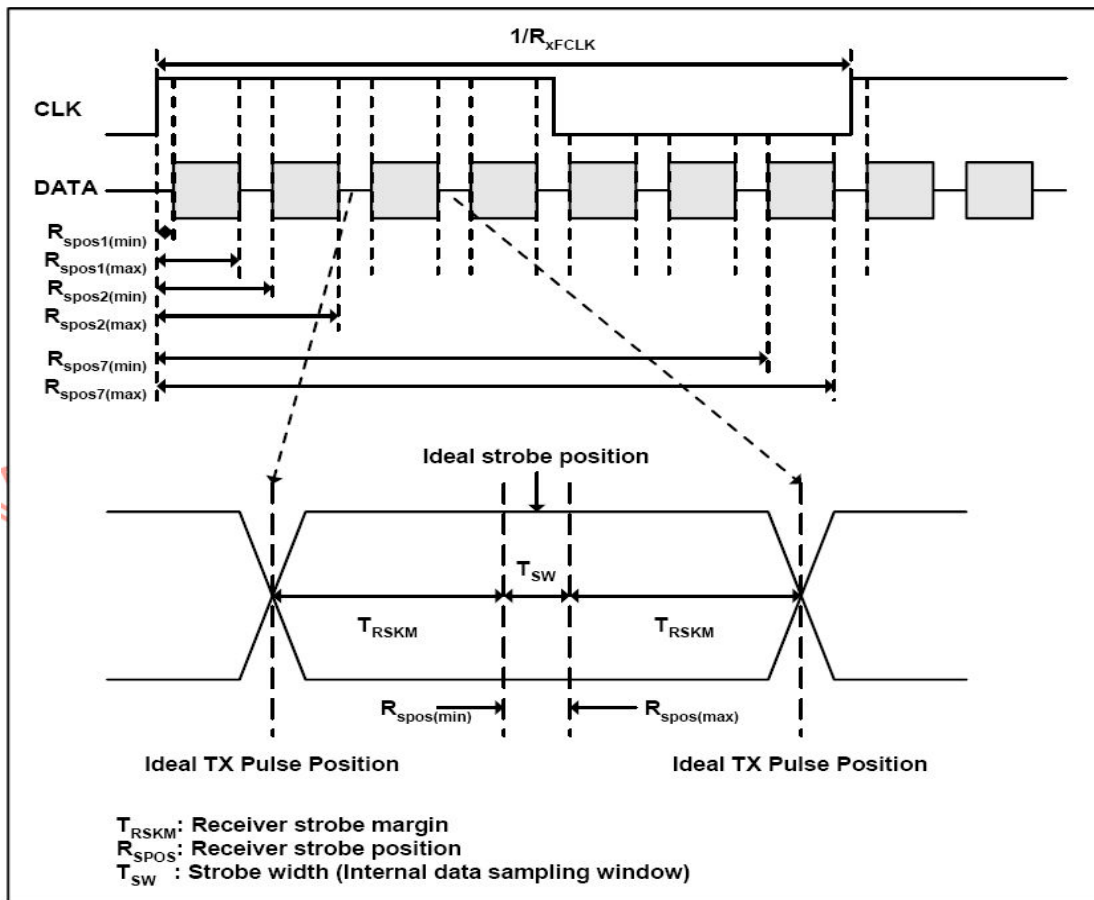
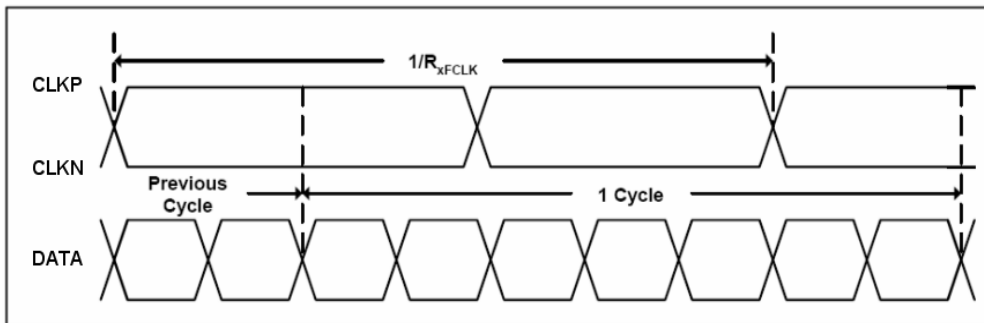


3.3. Timing Characteristics

3.3.1. AC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock frequency	R_{xFCLK}	40.8	51.2	67.2	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	

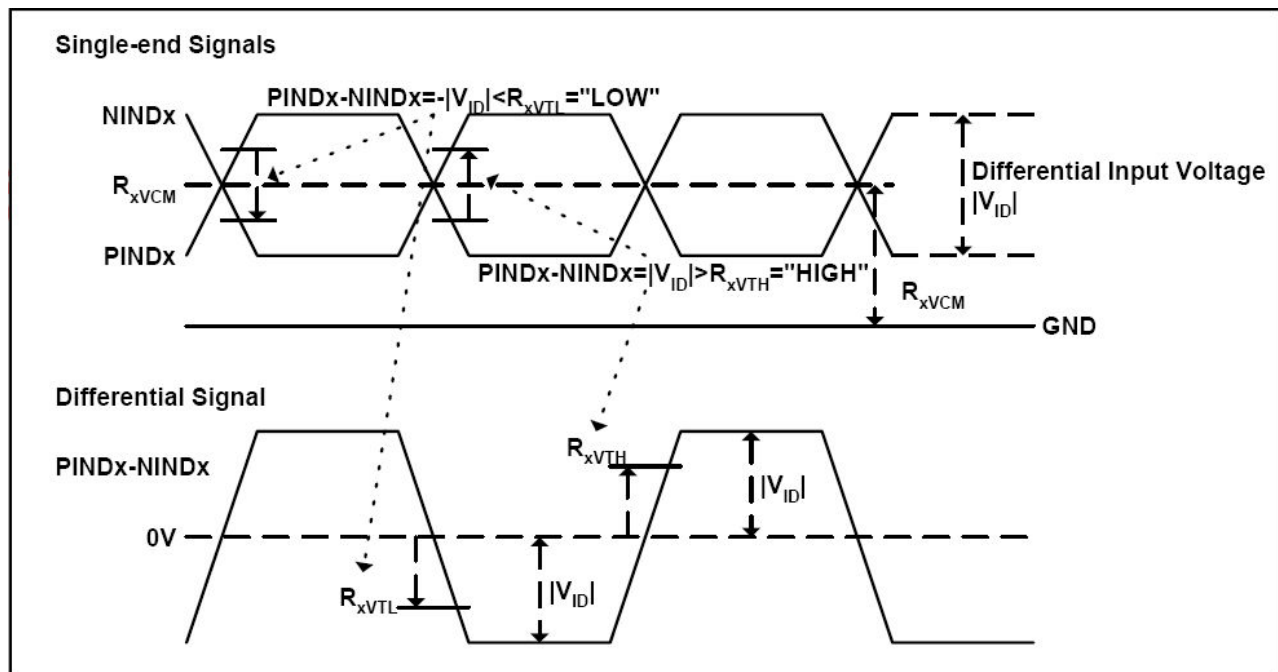
3.3.2. Input Clock and Data Timing Diagram





3.3.3. DC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Differential input high Threshold voltage	R_{xVTH}	-	-	+0.1	V	$R_{xVCM}=1.2V$
Differential input low Threshold voltage	R_{xVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{xVIN}	0	-	2.4	V	
Differential input common mode voltage	R_{xVCM}	$ V_{ID} /2$	-	$2.4- V_{ID} /2$	V	
Differential voltage	$ V_{ID} $	0.2	-	0.6	V	
Differential input leakage current	RV_{xliz}	-10	-	+10	μA	





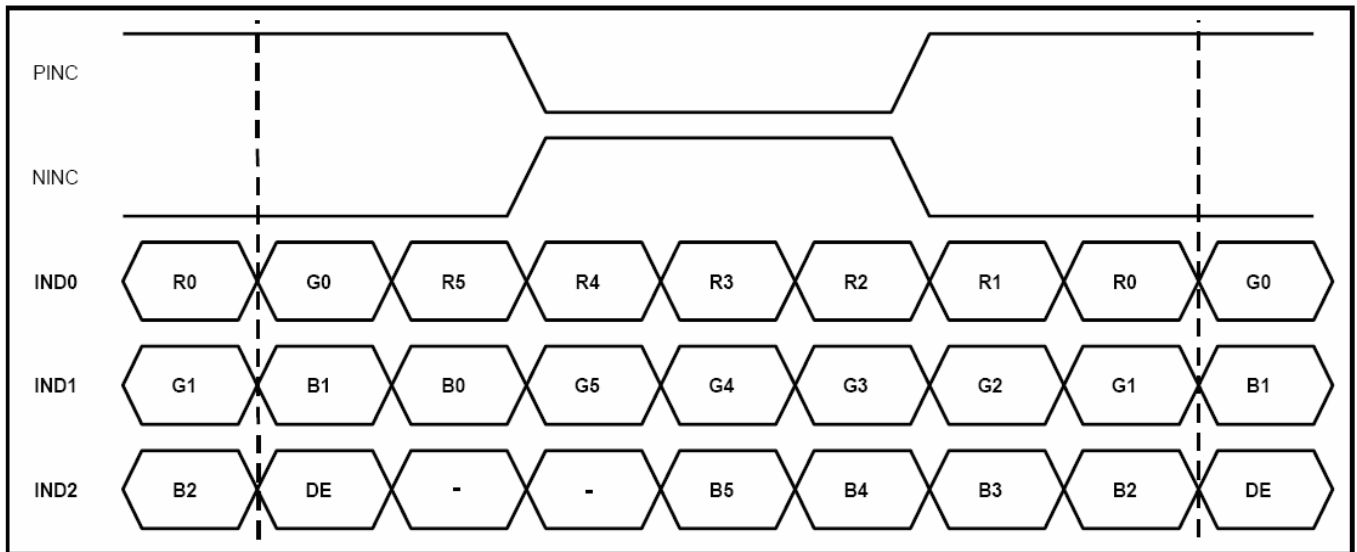
3.3.4. Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
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	thb	90	320	376	DCLK	
Vertical display area	tvd	600			H	
VS period time	tv	610	635	800	H	
VS Blanking	thb	10	35	200	H	

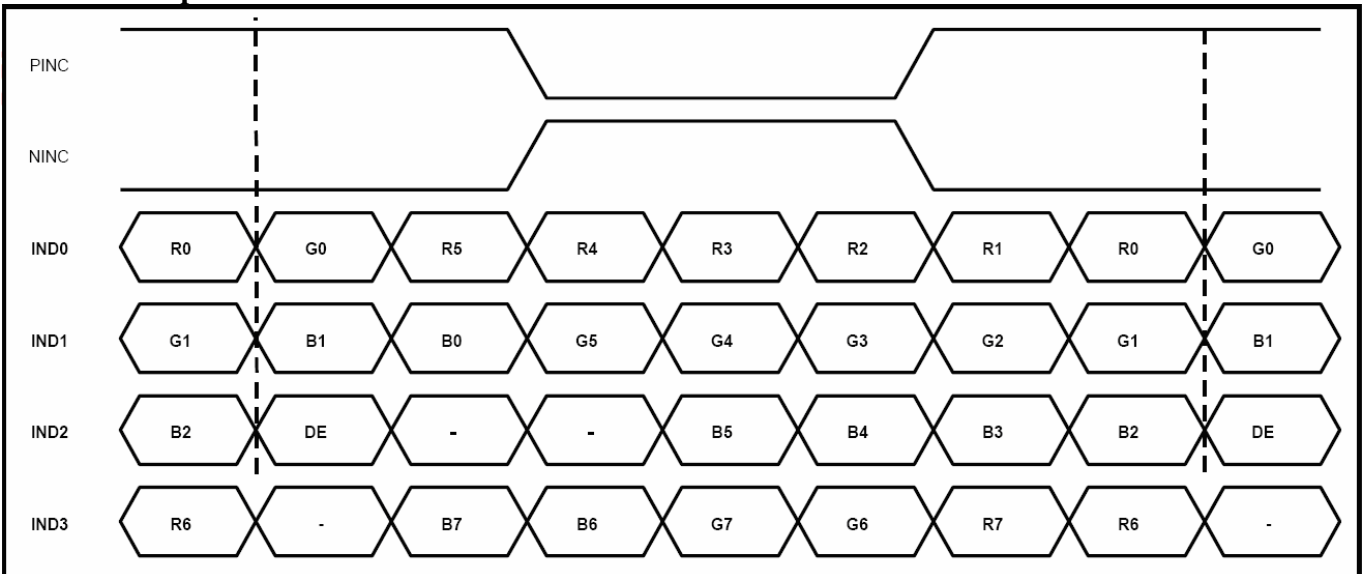


3.3.5. Data Input Format

6bit LVDS input



8bit LVDS input



Note: Support DE timing mode only, SYNC mode not supported.



4. Optical Specifications

Note: Base on CHIMEI-INNOLUX LCM

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR $\geq$ 10) B/L ON	θ_L	$\Phi=180^\circ$ (9 o'clock)	65	75	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	65	75	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	60	70	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	65	75	-		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note2
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		500	700	-	-	Note 4 Note 6
Color chromaticity	W_X		0.249	0.299	0.349	-	Note 2 Note 5
	W_Y		0.273	0.323	0.373	-	
Transmittance	Tr		-	3.5%	-		

Test Conditions:

1. $DV_{DD}=3.3V$, the ambient temperature is $25^\circ C$.
2. The test systems refer to Note 2.



Note 1: Definition of viewing angle range

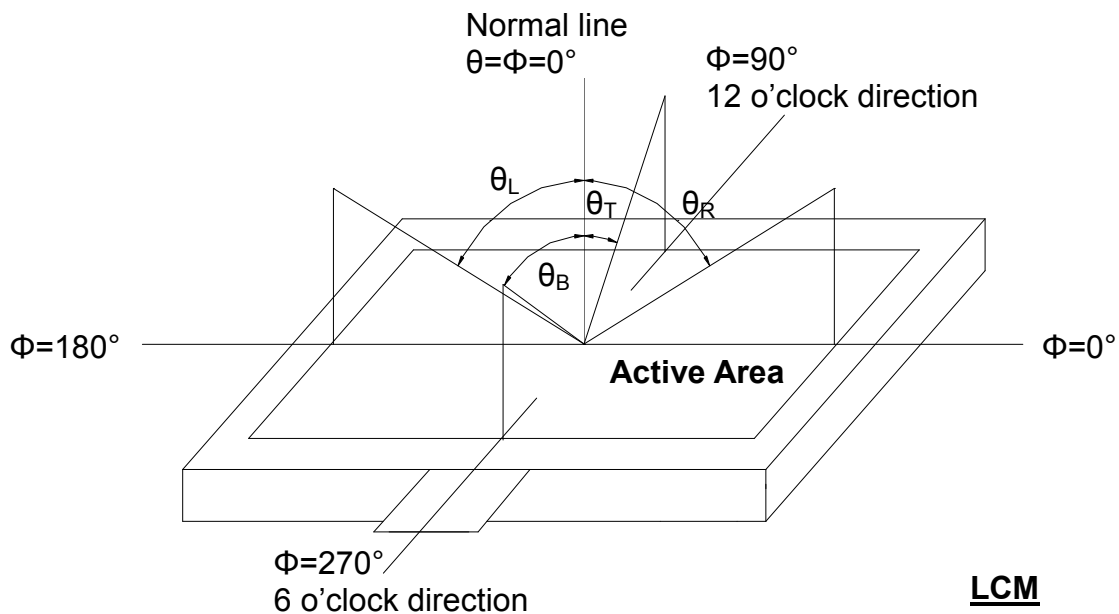


Fig. 4-1 Definition of viewing angle

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. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.)

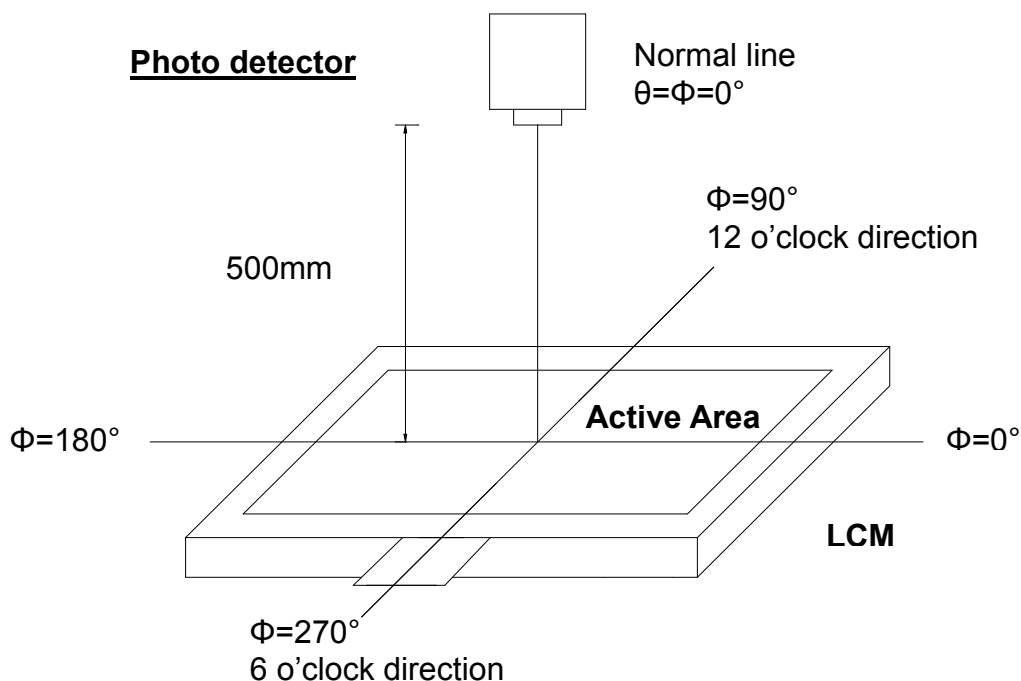


Fig. 4-2 Optical measurement system setup



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%.

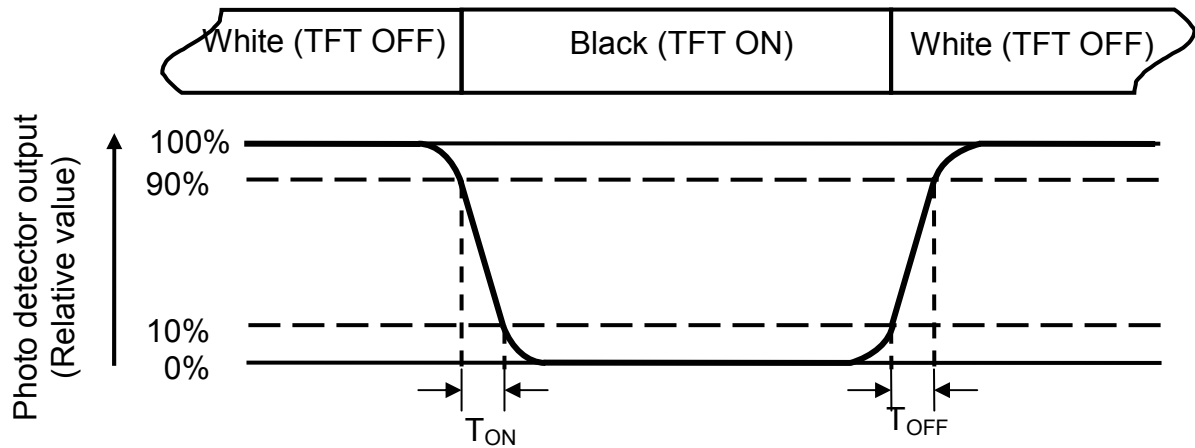


Fig. 4-3 Definition of response time

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 backlight

The backlight used C light.

Note 6: base on CMI standard backlight structure of LCM

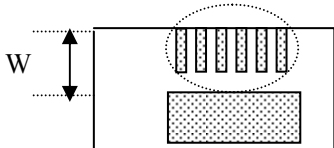
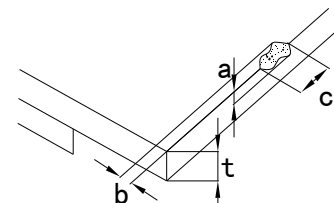
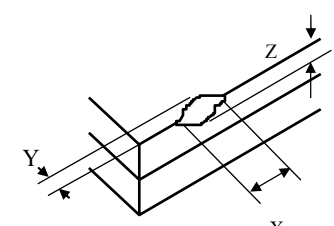
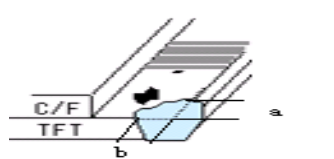


5.INSPECTION CRITERIA

Item NO.	Inspection Item	Inspection Standard			Classification of defects
1	Electrical function Testing	1) No display 2) Missing line 3) No backlight 4) shadow 5) black/blue display 6) Irregular operating 7) visual angle is wrong			Major
2	Outline dimension	All outline dimension beyond the drawing is not allowed			Major
3	White/Black spot (in LCD or Backlight)	Φ (mm)	acceptable		Minor (defect distance ≥ 20 mm)
		$\Phi \leq 0.15$	ignore		
		$0.15 < \Phi \leq 0.3$	3		
		$\Phi > 0.3$	0		
4	Dirt in POL	as same as White/Black spot			Minor
5	Dent at POL	Φ (mm)	acceptable		Minor
		$\Phi \leq 0.15$	ignore		
		$0.15 < \Phi \leq 0.3$	4		
		$0.3 \leq \Phi$	0		
6	Bubble in POL	Φ (mm)	acceptable		Minor (defect distance ≥ 20 mm)
		$\Phi \leq 0.15$	ignore		
		$0.15 < \Phi \leq 0.3$	2		
		$0.3 < \Phi$	0		
7	Color /bright /dark dot	as same as White/Black spot			Minor
8	Scratch / lines (in LCD)	Width	Length	acceptable	Minor (defect distance ≥ 20 mm)
		$W \leq 0.05$	ignore	ignore	
		$0.05 < W \leq 0.10$	$L \leq 10$	3	
		$W > 0.10$	ignore	0	
		ignore	$L > 10$	0	
9	Scratch / lines in POL	as same as scratch / line in LCD			Minor
10	Scratch / lines in BLU	as same as White/Black spot			Minor

If the acceptable number is ≥ 2 ,the interval between dots or lines must be ≥ 20 mm .



11	LCD defect	Crack	Unallowed	Major
		Pad break	$W > 0.5\text{mm}$, unallowed . 	Major
		Con-Pad break	When $a < 1/2T$ (T=the thickness of single LCD) : $b \geq 1/2 \text{ PAD NG}$ or $c \geq 5\text{mm NG}$ When $a \geq 1/2T$: as same as PAD break 	Minor
		Break not in PAD	$X \leq 1/8A$; Y into the inspect area is unallowed; $X \leq 1/8A$, if Y not into the frame,Z ignore; $X \leq 1/8A, Y \leq 1/2 \text{ Seal}, Z \leq 1/2T$ is allowed $X \leq 1/8A, Y > 1/2 \text{ Seal}, Z \leq 1/4T$ is allowed 	Minor
		Corner break	1)'a' > 1MM unallowed 2)'b' > 1/4E unallowed (E = PAD long of short side) 	Minor

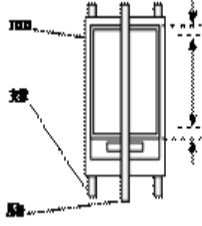
If the acceptable number is ≥ 2 , the interval between dots or lines must be $\geq 10\text{mm}$.



6. Reliability Test Items

Item NO.	TEST Item	Condition	Criterion
1	Humidity operating	60℃±2℃, 90%RH, 240 hrs	- Placed 2 hours in normal temperature, then inspect the function and cosmetic after test. - After testing, cosmetic defects should not happen. - Contrast ratio should not happen lower than 10% of initial value - Total current consumption should not be over 10% of initial value. - Polarizers may fail in humidity test, but only this failure is allowable.
2	Thermal shock test	25℃±2℃ (5min) → -40℃±2℃ (120min) → 25℃±2℃ (5min) → 70℃±2℃ (120min), 60cycle	
3	High temperature operating	70℃±2℃ 240 hrs	
4	Low temperature operating	-20℃±2℃ 240 hrs	
5	High temperature storage	80℃±2℃ 240 hrs	
6	Low temperature storage	-30℃±2℃ 240 hrs	
7	Packing drop test	1 corner 3 edges six faces, with carton packing, 1m height, concrete ground	- After testing, inspect the packing and product - Packing broken length<2cm, LCD visual and function check
8	LCM drop test	0.5m height, top and bottom sides, each side 5 times.	After testing, inspect the LCM, function and cosmetic defects should not happen
9	ESD	150 pF 330Ω ±8KV&±12KV air&contact 10 times air discharge(with Phone test).	- After testing ,cosmetic and electrical defects should not happen. - Total current consumption should be below double of initial value.
10	Solderability test	245±5℃ ,3-5s ,by magnifier	- last tin degree ≥95% ; - The pinhole or empty caves can't concentrate a place or don't exceed 5% of the total area.
11	Tin-adhesion test	non-Pb soldering ,360℃ ,5 cycles to solder and strip	copper is whole
12	LCD FPC bending test	Put 1mm diameter pole at fold line,fold the FPC cable as +/- 90degree or +/-180degree from PCB side to connector side; 100 times.	After testing, inspect the LCD, function and cosmetic defects should not happen



13	Hydrostatic test	Put the LCM on the plate , Use the 10mm diameter pole to press the center of the LCM with the velocity 10mm/min , when the LCM crush , register the pressure	·pressure > 300N is OK.
14	Vibration test	10~55~10Hz amplitude : 1.5mm 2hrs for each direction(X, Y, Z)	·Not allowed cosmetic and electrical defects. test will be performed at state of carton box,not each of the modules
15	LCD bending test 	Put the LCM on the plate like the picture , Use the 10mm diameter pole to press the center of the LCM with the velocity 10mm/min , until the force is 70N and keep 5s ,(X, Y direction both)	·After testing, inspect the LCD , Not allowed crush and transmutation.



7. General Precautions

7.1. 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 using soap and water.

7.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
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 damages.
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 sunlight to avoid malfunction of the ICs.

7.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

7.4. Storage

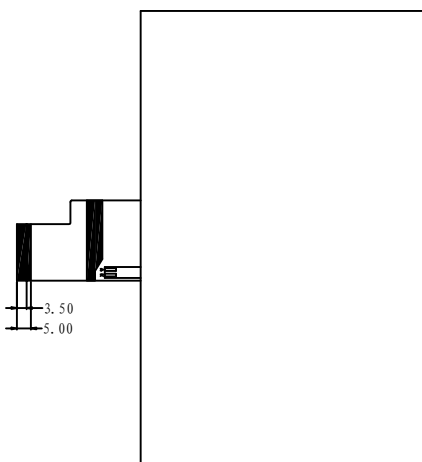
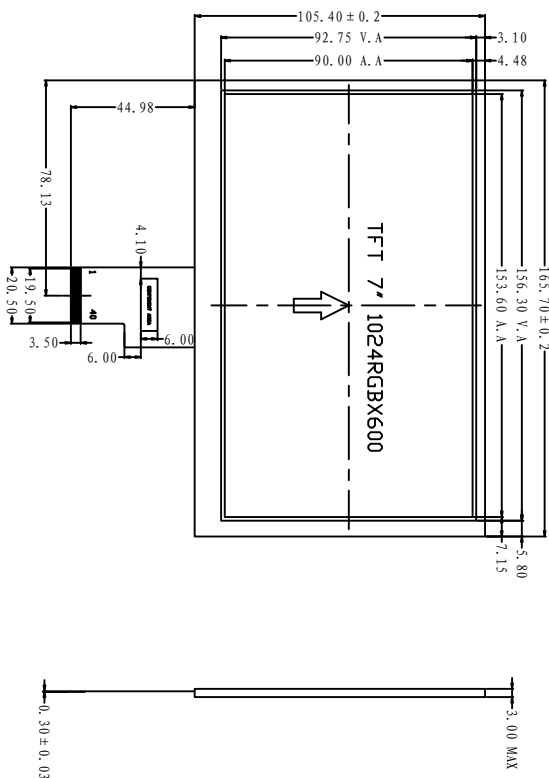
1. Store the module in a dark room where must keep at $25\pm 10^{\circ}\text{C}$ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

7.5. Cleaning

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

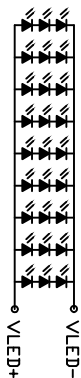
8. Mechanical Drawing

1	VCOM
2	VDD
3	VDD
4	NC
5	RST#
6	STB/B
7	GN
8	RXIN0-
9	RXIN0+
10	GN
11	RXIN1-
12	RXIN1+
13	GN
14	RXIN2-
15	RXIN2+
16	GN
17	RXCLIN-
18	RXCLIN+
19	GN
20	RXIN3-
21	RXIN3+
22	GN
23	NC
24	NC
25	GN
26	NC
27	DMO
28	SELB
29	AVDD
30	GN
31	LED-
32	LED-
33	L/R
34	U/D
35	VGL
36	CACEN
37	CACEN0
38	VGH
39	LED+
40	LED+



NOTES:

1. Display mode: Transmissive
2. Interface Type: System parallel
3. Viewing direction: 6:00
4. Input voltage: 3.0~3.6V
5. Backlight: White LED(3x9LED parallel)
If=180mA Vf=9.6(V_{TYPE})
6. LUMINANCE: 300 CD/M² MIN
7. Operating temperature: -20°C ~ +70°C
8. Storage temperature: -30°C ~ +80°C
9. Interface connector: FPC
10. Request ROHS



LED CIRCUIT DIAGRAM

A	2014.05.06

 深圳市龙祥卓越电子科技有限公司	SCALE	SHEET
	FIT	1/1
	 	
	DRAWING NAME	



9. Package Drawing

9.1. Packaging Material Table

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	Panel Assembly	HE070NA-13B	160.00 × 147.95 × 1.23	TBD	80	
2	Dust- Proof Bag	PE	700 × 530	0.050	1	
3	Tray	PET	505 × 338 × 16.5	0.22	21	Anti-static
4	Partition	Corrugated paper	512 × 350 × 225	0.29	1	
5	Carton	Corrugated paper	530 × 355 × 255	0.81	1	
8	Total weight	TBD± 5%Kg				

9.2. Packaging Quantity

Total LCM quantity in Carton:

no. of Trays(deduct a empty tray) (21-1) × quantity per Tray 4 = 80 PCS



9.3. Packaging Drawing

