



Winstar Display Co., LTD

華凌光電股份有限公司

WEB: <http://www.winstar.com.tw>

E-mail: sales@winstar.com.tw



SPECIFICATION

CUSTOMER : _____

MODULE NO.: **WF70NTZ AHLNNO#**

<p align="center">APPROVED BY:</p> <p align="center">(FOR CUSTOMER USE ONLY)</p>	<p>PCB VERSION: _____</p> <p>DATA: _____</p>
---	--

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2013/7/24		First issue



RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2013/7/24		First issue

Contents

1. Module Classification Information
2. GENERAL Specifications
3. Absolute Maximum Ratings
4. Electrical Characteristics
5. DC Electrical Characteristics
6. AC Electrical Characteristics
7. Optical Specifications
8. Interface
9. Reliability
10. Mechanical Drawing

2. GENERAL Specifications

Item	Dimension	Unit
Dot Matrix	1024 × 3(RGB) × 600	dots
Module dimension	165.75 (W) × 105.39(H) × 2.45(D)	mm
Active area	153.6(W) × 90.0(H)	mm
Dot pitch	0.05(W) × 0.15(H)	mm
LCD type	TFT, Transmissive	
View Direction	Wide Viewing Angle for O-FILM (12 o'clock)	
Gray Scale Inversion Direction	Wide Viewing Angle for O-FILM (6 o'clock)	
Backlight Type	LED, Normally White	
Surface treatment	Anti-Glare	
Interface	LVDS	

3. Absolute Maximum Ratings

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-VGL}	—	40.0	V	
Operation temperature	T _{OP}	-20	60	°C	
Storage temperature	T _{ST}	-30	70	°C	
LED Reverse Voltage	V _R	—	5	V	Each LED
LED Reverse Voltage	I _F	—	35	mA	Each LED

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.

4. Electrical Characteristics

4.1 Typical Operation Conditions

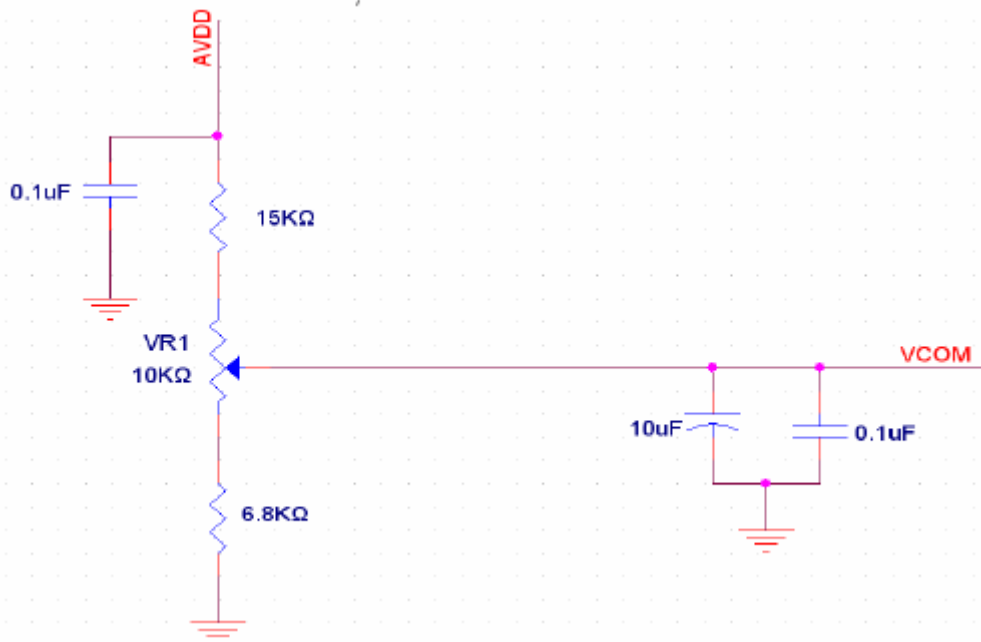
Item	Symbol	Values			Unit	Remark
		Min.	TYP.	MAX.		
Power voltage	DVDD	3.0	3.3	3.6	V	Note 2
	AVDD	10.8	11	11.2	V	
	VGH	19.7	20	20.3	V	
	VGL	-6.5	-6.8	-7.1	V	
Input signal voltage	VCOM	3.4	(3.7)	4.0	V	Note 4
Input logic high voltage	VIH	0.7 DVDD	-	DVDD	V	Note 3
Input logic low voltage	VIL	0	-	0.3 DVDD	V	

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

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

Note 3: LVDS, Reset.

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



4.2 Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	IGH	—	0.25	1.0	mA	VGH =20V
	IGL	—	0.25	1.0	mA	VGL = -6.8V
	IDVDD	—	38	60	mA	DVDD =3.3V
	IAVDD	—	20	30	mA	AVDD =11V

4.3. Backlight Driving Conditions

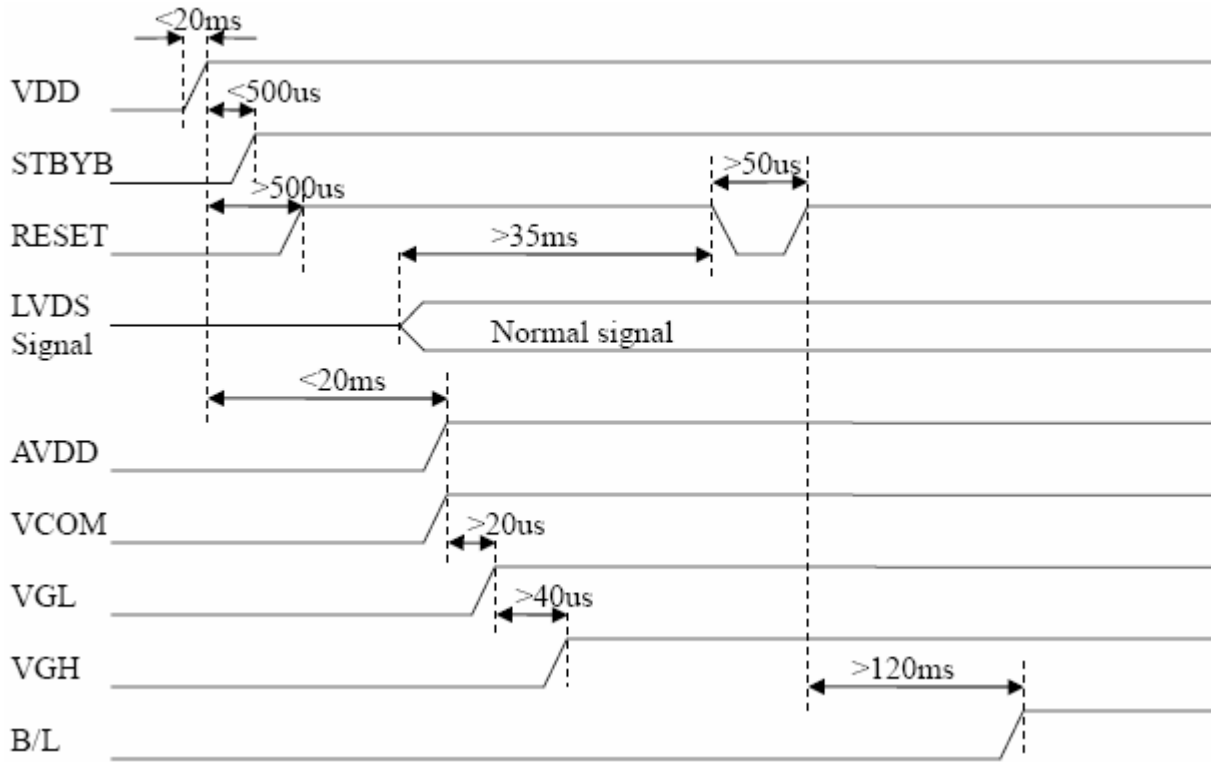
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	VL	—	9.3	10.2	V	Note 1
Current for LED backlight	IL	—	160	200	mA	
LED life time	—	—	20000	—	Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and IL=160mA.

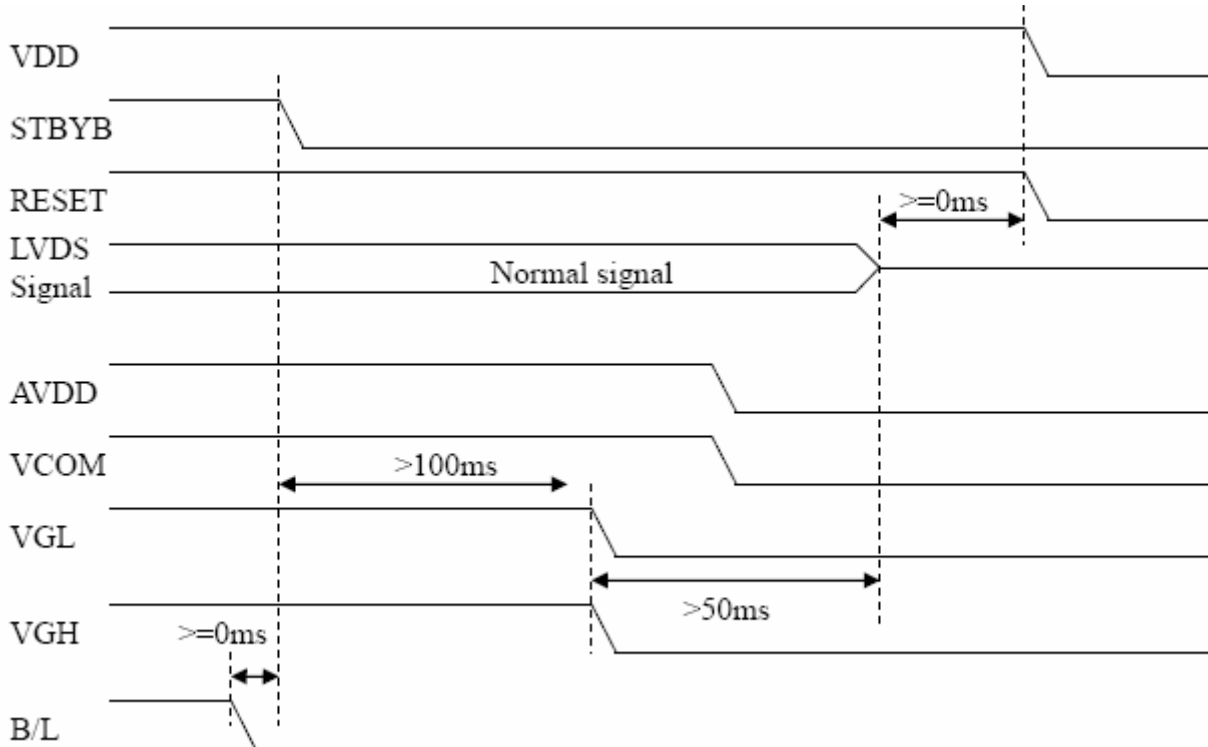
Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=160mA. The LED lifetime could be decreased if operating IL is larger than 160mA.

4.4 Power Sequence

a. Power on:

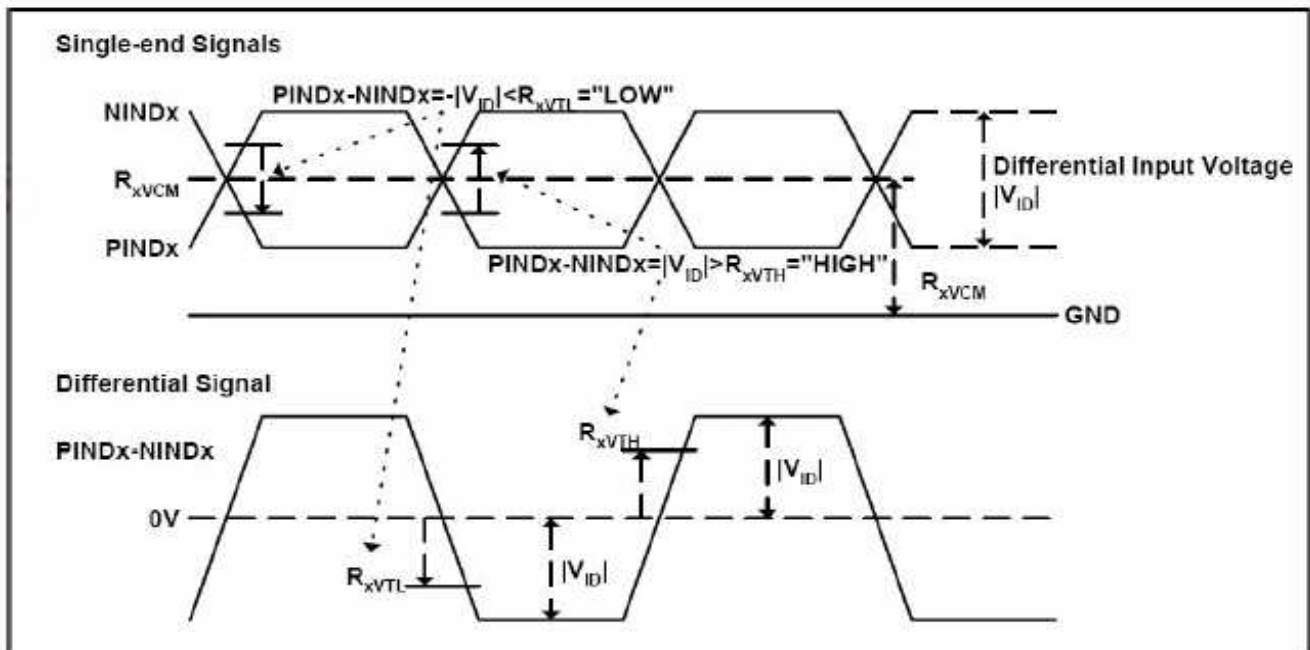


b. Power off:



5. 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	$R_{V_{xIz}}$	-10	-	+10	μA	

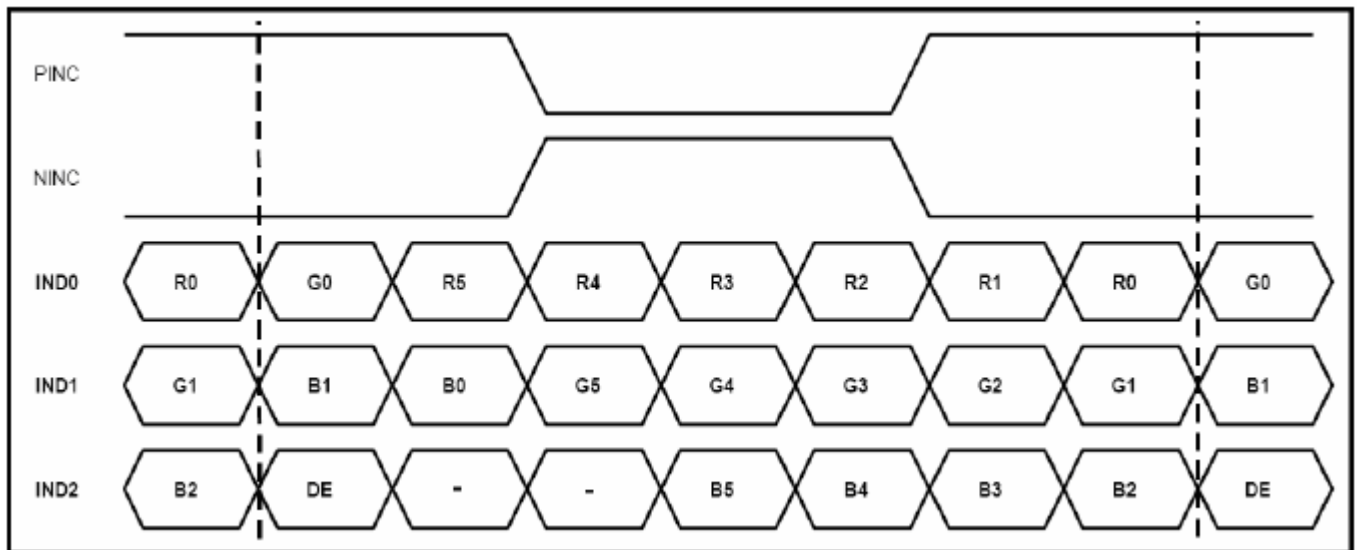


5.1 Timing

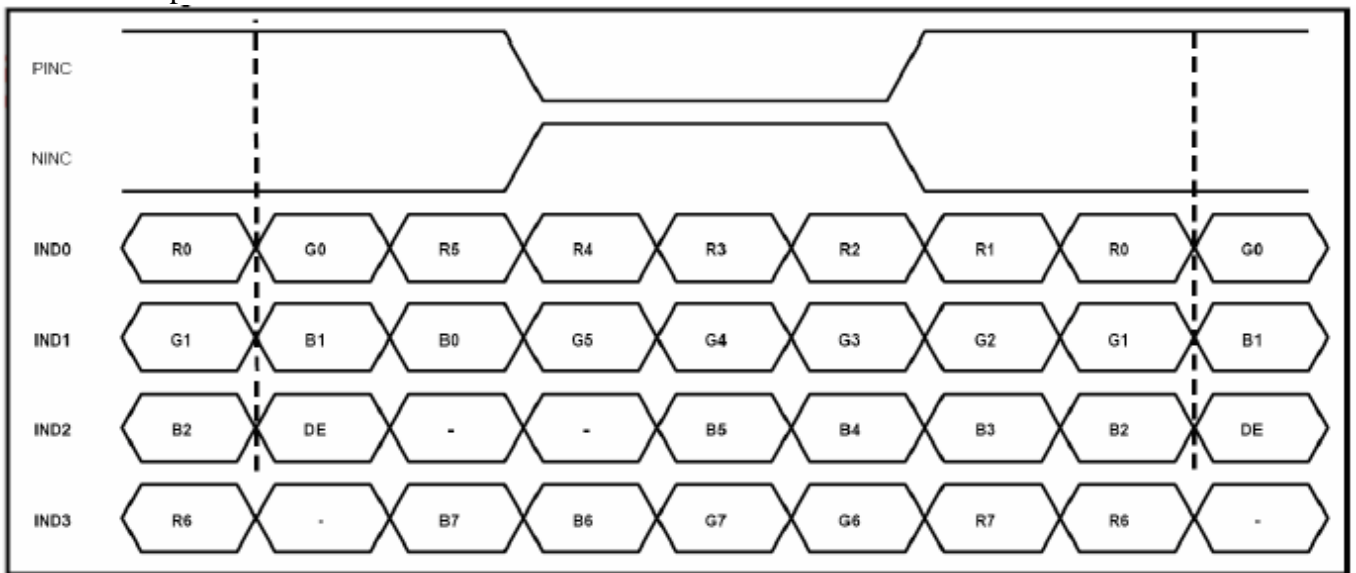
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	fclk	40.8	51.2	67.2	MHz	Frame rate =60Hz
Horizontal display area	thd	1024			DCLK	
HS period time	th	1114	1344	1400	DCLK	
HS Blanking	thb	90	320	376	DCLK	
Vertical display area	tvd	600			H	
VS period time	tv	610	634	800	H	
VS Blanking	thb	10	35	200	H	

5.2 Data Input Format

6bit LVDS input



8bit LVDS input

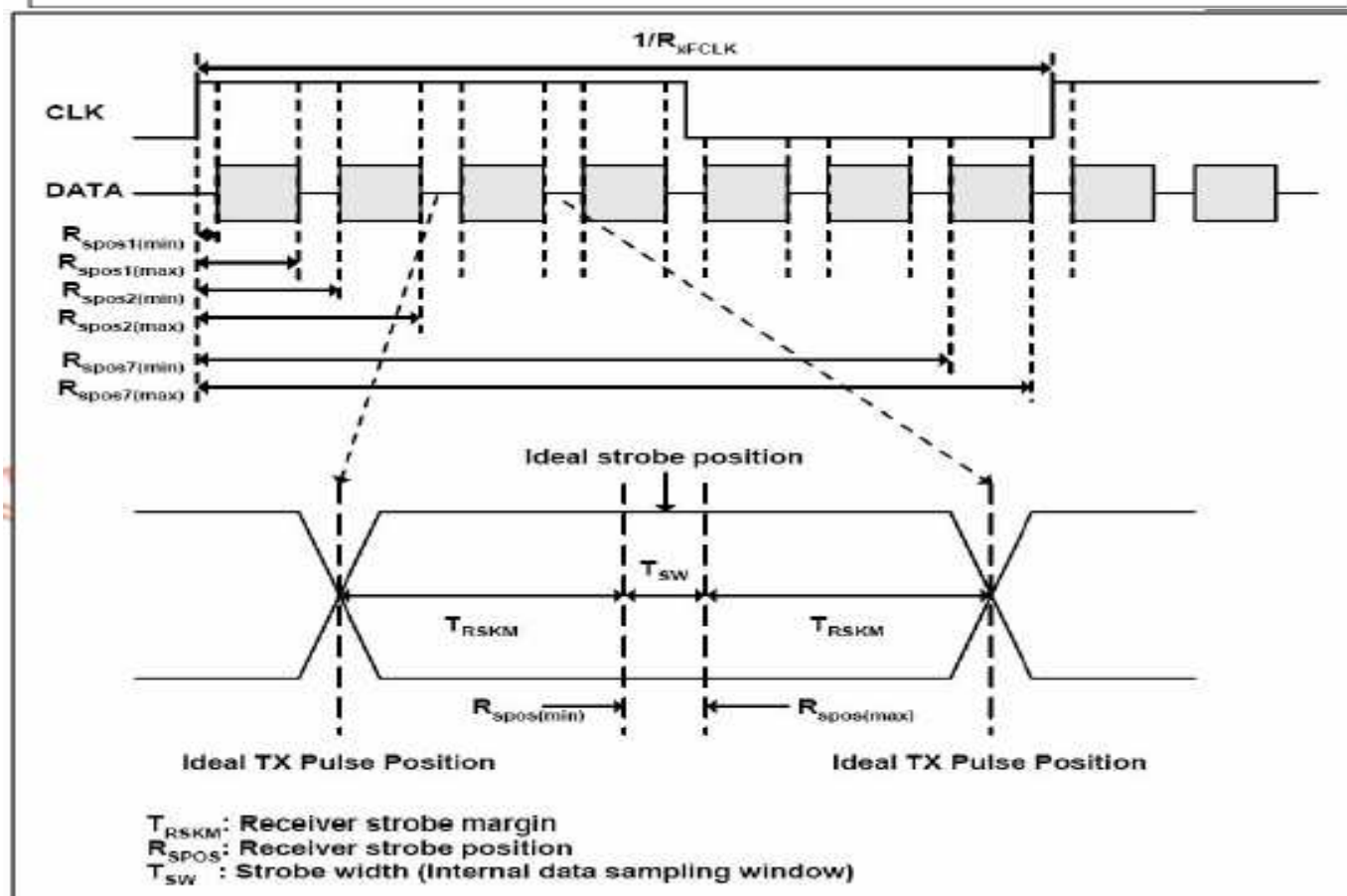
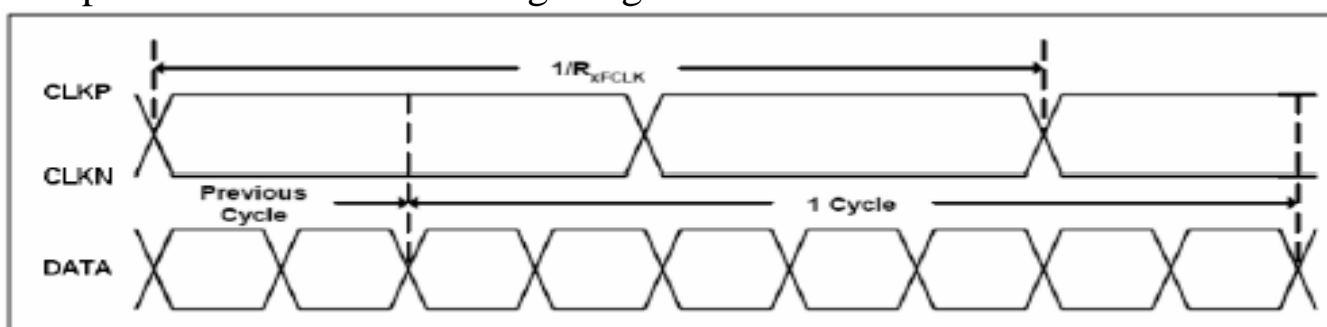


Note: Support DE timing mode only, SYNC mode not supported.

6. AC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ	Max.		
Clock frequency	R_{xFLK}	40.8	51.2	67.2	MHz	
Input data skew margin	T_{RSKM}	500			ps	
Clock high time	T_{LVCH}		$4/(7 * R_{xFLK})$		ns	
Clock low time	T_{LVCL}		$3/(7 * R_{xFLK})$		ns	

6.1 Input Clock and Data Timing Diagram



7. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle CR \geq 10)	θ L	$\Phi=180^\circ$ (9 o'clock)	75	85	-	degree	Note 1
	θ R	$\Phi=0^\circ$ (3 o'clock)	75	85	-		
	θ T	$\Phi=90^\circ$ (12 o'clock)	75	85	-		
	θ B	$\Phi=270^\circ$ (6 o'clock)	75	85	-		
Response time	TON	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3
	TOFF		-	15	30	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	WX		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	WY		0.28	0.33	0.38	-	
Luminance	L		250	300	-	cd/m ²	Note 6
Luminance uniformity	YU		70	75	-	%	Note 7

Test Conditions:

1. DVDD=3.3V, IL=160mA (Backlight current), the ambient temperature is 25°C.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle

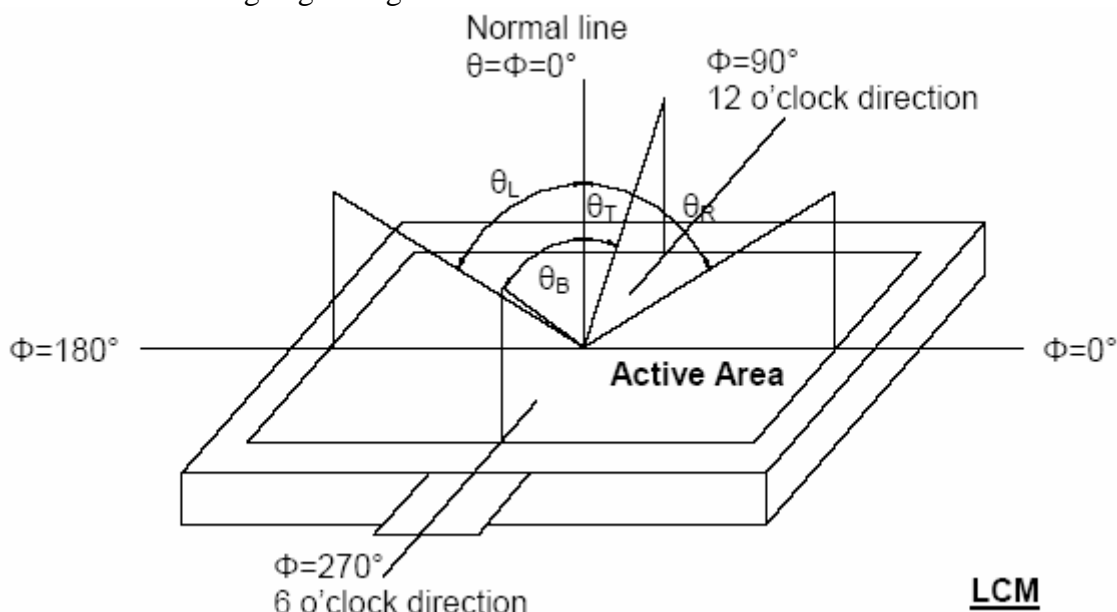


Fig. 5-1 Definition of viewing angle

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° /Height: 500mm.)

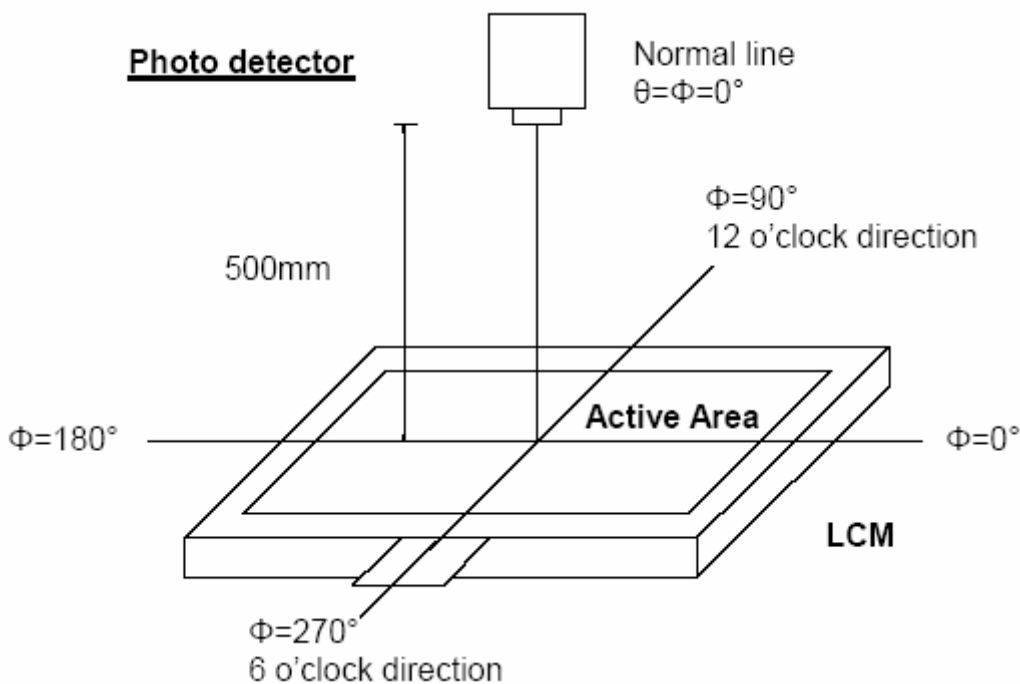


Fig. 5-2 Optical measurement system setup

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%.

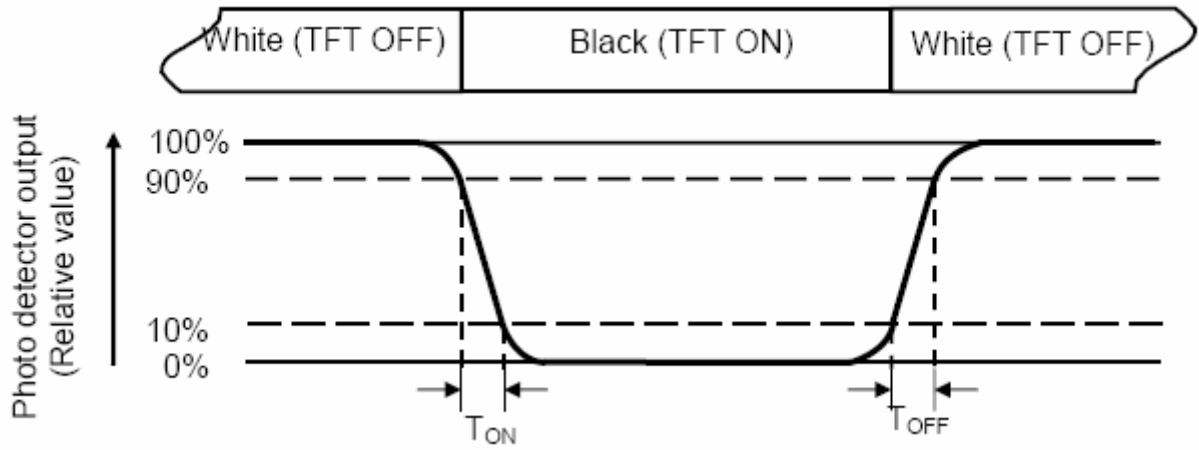


Fig. 5-3 Definition of response time

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: Definition of luminance:

Measured at the center area of the panel when LCD panel is driven at "white" state. The LED driving condition is $I_L=160\text{mA}$.

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

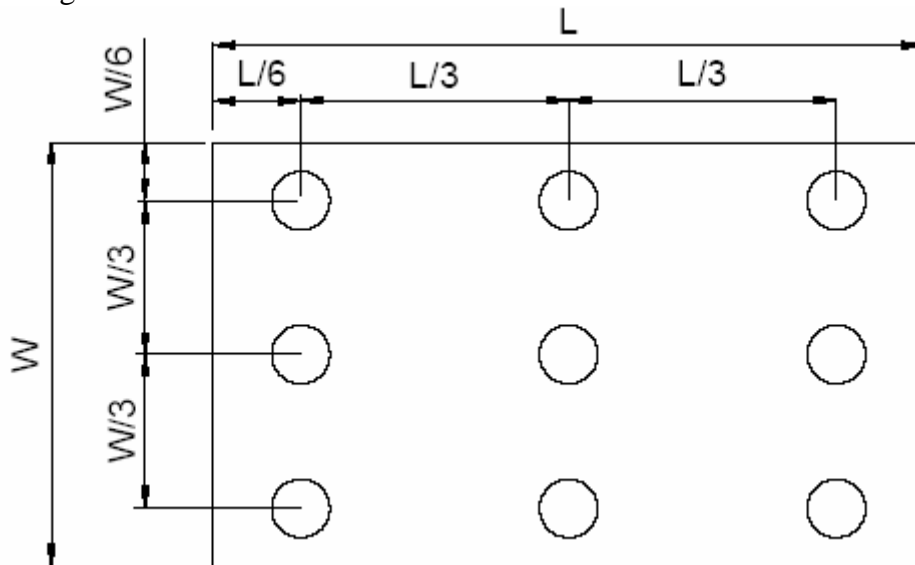


Fig. 5-4 Definition of measuring points

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

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

8. Interface

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

.	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	

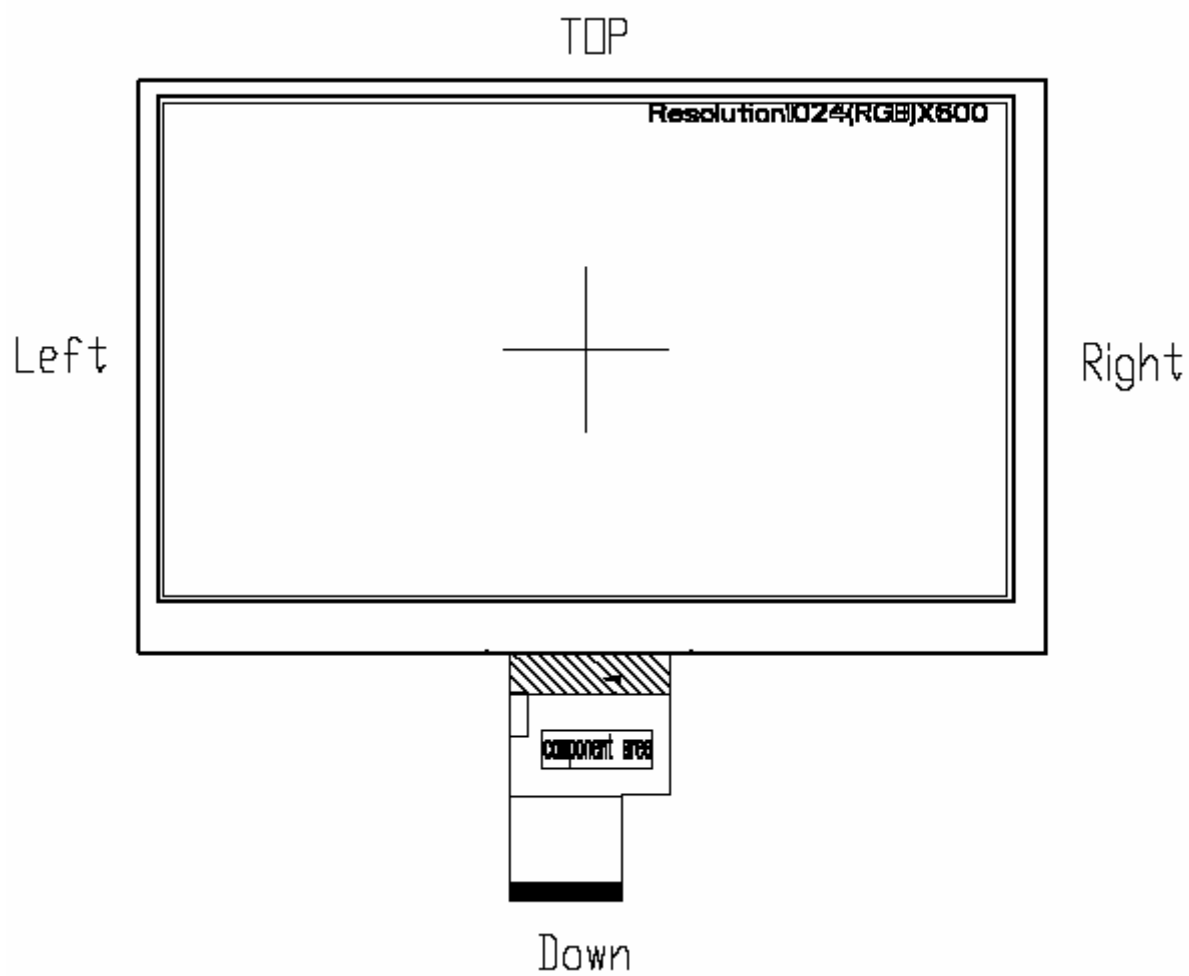
I: input, O: output, P: Power

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:



9. Reliability

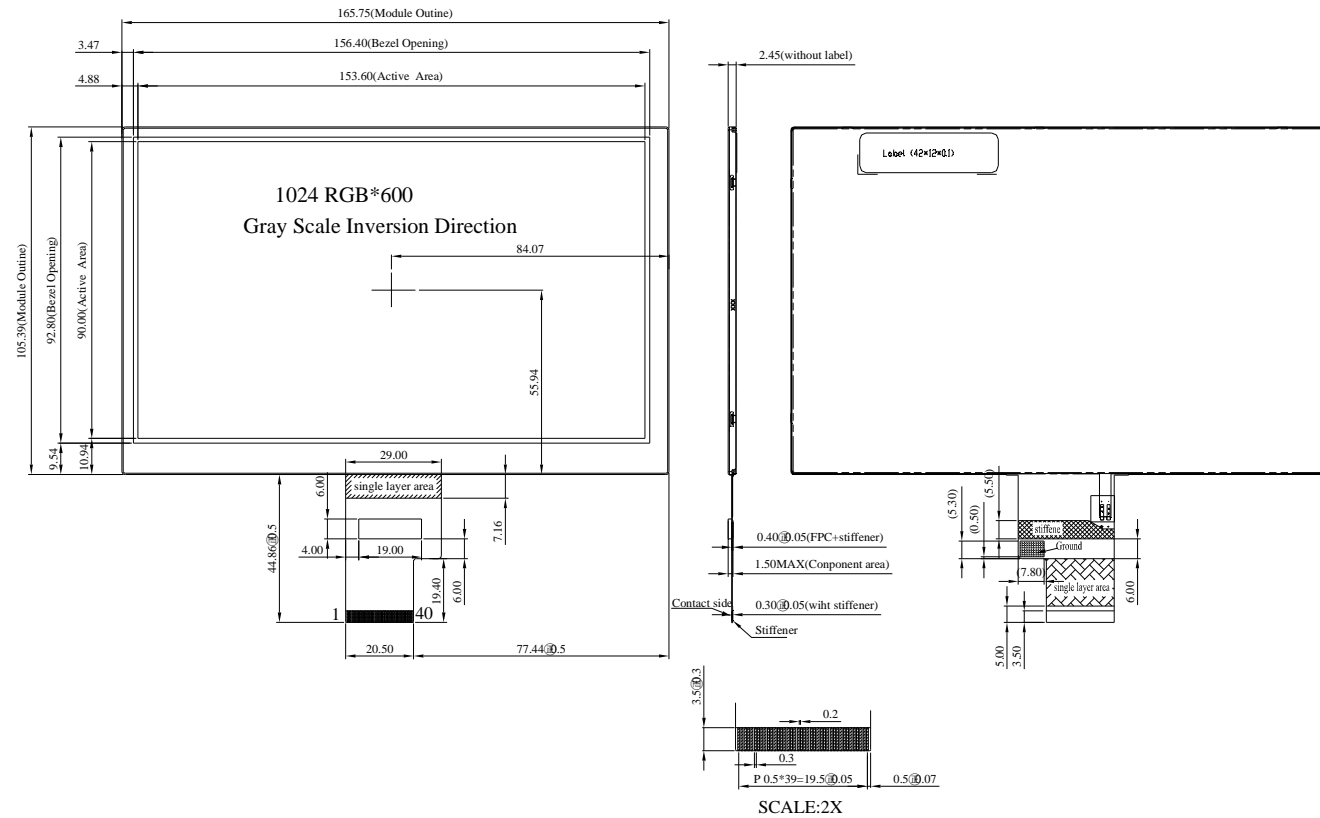
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	70°C 120hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30°C 120hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	60°C 120hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 120hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 40°C,90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	40°C,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation <div style="text-align: center;"> <p style="margin: 0;">-20°C 25°C 60°C</p> <p style="margin: 0;">30min 5min 30min</p> <p style="margin: 0;">1 cycle</p> </div>	-20°C/60°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 15mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ, CS=100pF 1 time	—

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

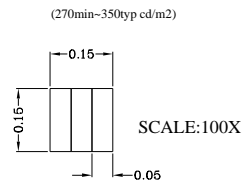
Note3: Vibration test will be conducted to the product itself without putting it in a container.

10. Mechanical Drawing



PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	VCOM	21	RXIN3+
2	VDD	22	GND
3	VDD	23	NC
4	NC	24	NC
5	RESET	25	GND
6	STBYB	26	NC
7	GND	27	DIMO
8	RXIN0-	28	SELB
9	RXIN0+	29	AVDD
10	GND	30	GND
11	RXIN1-	31	LED-
12	RXIN1+	32	LED-
13	GND	33	L/R
14	RXIN2-	34	U/D
15	RXIN2+	35	VGL
16	GND	36	CABCEIN1
17	RXCLKIN-	37	CABCEIN0
18	RXCLKIN+	38	VGH
19	GND	39	LED+
20	RXIN3-	40	LED+

The non-specified tolerance of dimension is $\pm 0.3\text{mm}$.





LCM Sample Estimate Feedback Sheet

Module Number : _____

Page: 1

1、Panel Specification :

1. Panel Type : Pass NG , _____
2. View Direction : Pass NG , _____
3. Numbers of Dots : Pass NG , _____
4. View Area : Pass NG , _____
5. Active Area : Pass NG , _____
6. Operating Temperature : Pass NG , _____
7. Storage Temperature : Pass NG , _____
8. Others : _____

2、Mechanical Specification :

1. PCB Size : Pass NG , _____
2. Frame Size : Pass NG , _____
3. Material of Frame : Pass NG , _____
4. Connector Position : Pass NG , _____
5. Fix Hole Position : Pass NG , _____
6. Backlight Position : Pass NG , _____
7. Thickness of PCB : Pass NG , _____
8. Height of Frame to PCB : Pass NG , _____
9. Height of Module : Pass NG , _____
10. Others : Pass NG , _____

3、Relative Hole Size :

1. Pitch of Connector : Pass NG , _____
2. Hole size of Connector : Pass NG , _____
3. Mounting Hole size : Pass NG , _____
4. Mounting Hole Type : Pass NG , _____
5. Others : Pass NG , _____

4、Backlight Specification :

1. B/L Type : Pass NG , _____
2. B/L Color : Pass NG , _____
3. B/L Driving Voltage (Reference for LED Type) : Pass NG , _____
4. B/L Driving Current : Pass NG , _____
5. Brightness of B/L : Pass NG , _____
6. B/L Solder Method : Pass NG , _____
7. Others : Pass NG , _____

>> Go to page 2 <<



5、Electronic Characteristics of Module :

- | | | |
|------------------------------|-------------------------------|-------------------------------------|
| 1. Input Voltage : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. Supply Current : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Driving Voltage for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. Contrast for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. B/L Driving Method : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. Negative Voltage Output : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Interface Function : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8. LCD Uniformity : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 9. ESD test : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 10. Others : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

6、Summary :

Sales signature : _____

Customer Signature : _____

Date : _____ / _____ / _____