



**RAYSTAR**

# 曜凌光電股份有限公司

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## **RFK101XF-1YH-LHN**

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### **SPECIFICATION**

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

Release DATE:

## Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	2018/01/02		First issue

RAYSTAR OPTRONICS

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# 1. Module Classification Information

<b>R</b>	<b>F</b>	<b>K</b>	<b>101</b>	<b>XF</b>	<b>-</b>	<b>1</b>	<b>Y</b>	<b>H</b>	<b>-</b>	<b>L</b>	<b>H</b>	<b>N</b>
1	2	3	4	5	-	6	7	8	-	9	10	11

Item	Description	
1	R : Raystar Optronics Inc.	
2	Display Type : F→TFT Type, J→ Custom TFT	
3	Solution: A: 128x160    B:320x234    C:320x240    D:480x234    E:480x272 F:800x480    G:640x480    H:1024x600    I:320x480    J:240x320 K:1280x800    L:240x400    M:1024x768    N:128x128    O:480x800 P:640x320    Q:800x600    S:480x128    T:800x320	
4	Display Size : 10.1" TFT	
5	Version Code.	
6	Model Type: A : TFT LCD E : TFT+FR+CONTROL BOARD J : TFT+FR+A/D BOARD N : TFT+FR+A/D BOARD+CONTROL BOARD S : TFT+FR+POWER BOARD (DC TO DC) 1 : TFT+CONTROL BOARD	6 : TFT+FR H : TFT+D/V BOARD I : TFT+FR+D/V BOARD B : TFT+POWER BD
7	Polarizer Type, Temperature range, View direction	I→Transmissive, W. T, 6:00 ;    C→Transmissive, N. T, 6:00 L→Transmissive, W.T,12:00 ;    F→Transmissive, N.T,12:00 Y→Transmissive,W.T, IPS TFT ; A→Transmissive, N.T, IPS TFT Z→Transmissive, W.T, O-TFT R→Transmissive, Super W.T, O-TFT N→Transmissive, Super W.T, 6:00; Q→Transmissive, Super W.T, 12:00 V→Transmissive, Super W.T, VA TFT
8	Backlight	W : LED, White                      H : LED, High Light White F : CCFL, White
9	Driver Method	D: Digital    A: Analog    L : LVDS    M:MIPI
10	Interface	N : without control board    A : 8Bit    B : 16Bit S:SPI Interface    R: RS232    U:USB    I: I2C    H: HDMI
11	TS	N : Without TS    S : resistive touch panel C : capacitive touch panel capacitive touch panel (G-F-F) G : capacitive touch panel(G-G)

## 2.Summary

TFT 10.1” is a IPS transmissive type color active matrix TFT liquid crystal display . In-Plane Switching (IPS) was one of the first refinements to produce significant gains in the light-transmissive characteristics of TFT panels. It is a technology that addresses the two main issues of a standard twisted nematic (TN) TFT display: colour and viewing angle.

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### 3.General Specifications

- Screen Diagonal: 10.1 inch
- Number of Pixels: 1280 x 3(RGB) x 800 dots
- Module dimension: 230.56 x 155.01 x 25.1 mm
- Active area: 216.96 (H) x 135.6(V) mm
- Pixel pitch: 0.1695 × 0.1695 mm
- Display Mode: Normally Black
- Pixel Arrangement: R.G.B. Vertical Stripe
- Backlight Type: LED, Normally White
- Aspect Ratio: 16:9
- Electrical Interface (Logic): HDMI
- With /Without TP: Without TP
- Surface: Anti-Glare

\*Color tone slight changed by temperature and driving voltage.

## 4.Interface

### 4.1. CON4/CON5

Pin No.	Symbol	Function	Remark
1	3.3V	Raspberry Pi:Power 3.3V	
2	5V	Raspberry Pi:Power 5V	
3	SDA	CTP_SDA (For CTP type Reserved)	
4	5V	Raspberry Pi:Power 5V	
5	SCL	CTP_SCL (For CTP type Reserved)	
6	GND	Raspberry Pi:GND	
7	GPIO04	Raspberry Pi:GPIO04	
8	GPIO14	Raspberry Pi:GPIO14	
9	GND	Raspberry Pi:GND	
10	GPIO15	Raspberry Pi:GPIO15	
11	RST	CTP_RST (For CTP type Reserved)	
12	ACTIVE	GPIO	
13	WAKE	CTP_WAKE (For CTP type Reserved)	
14	GND	Raspberry Pi:GND	
15	INT	CTP_INT (For CTP type Reserved)	
16	GPIO23	Raspberry Pi:GPIO23	
17	3.3V	Power Supply	
18	GPIO24	Raspberry Pi:GPIO24	
19	GPIO10	Raspberry Pi:GPIO10	
20	GND	Raspberry Pi:GND	
21	GPIO09	Raspberry Pi:GPIO09	
22	GPIO25	Raspberry Pi:GPIO25	
23	GPIO11	Raspberry Pi:GPIO11	
24	GPIO08	Raspberry Pi:GPIO08	
25	GND	Raspberry Pi:GND	
26	GPIO07	Raspberry Pi:GPIO07	
27	ID_SD	Raspberry Pi:ID_SD	
28	ID_SC	Raspberry Pi:ID_SC	
29	GPIO05	Raspberry Pi:GPIO05	

30	GND	Raspberry Pi:GND	
31	GPIO06	Raspberry Pi:GPIO06	
32	GPIO12	Raspberry Pi:GPIO12	
33	GPIO13	Raspberry Pi:GPIO13	
34	GND	Raspberry Pi:GND	
35	GPIO19	Raspberry Pi:GPIO19	
36	GPIO16	Raspberry Pi:GPIO16	
37	GPIO26	Raspberry Pi:GPIO26	
38	GPIO20	Raspberry Pi:GPIO20	
39	GND	Raspberry Pi:GND	
40	GPIO21	Raspberry Pi:GPIO21	

#### 4.2. HDMI

Pin No.	Symbol	I/O	Function	Remark
1	Rx2+	I	+LVDS Differential Data Input	
2	GND	P	Ground	
3	Rx2-	I	-LVDS Differential Data Input	
4	Rx1+	I	+LVDS Differential Data Input	
5	GND	P	Ground	
6	Rx1-	I	-LVDS Differential Data Input	
7	Rx0+	I	+LVDS Differential Data Input	
8	GND	P	Ground	
9	Rx0-	I	-LVDS Differential Data Input	
10	RxC+	I	+LVDS Differential Clock Input	
11	GND	P	Ground	
12	RxC-	I	-LVDS Differential Clock Input	
13-14	NC	-	No connection	
15	SCL	I/O	DDC(Data Display Channel) Clock	
16	SDA	I/O	DDC(Data Display Channel) Data	
17	GND	P	Ground	
18	5V	P	Power Supply	
19	Detect	I/O	Hot plug detect	

I: input, O: output, P: Power



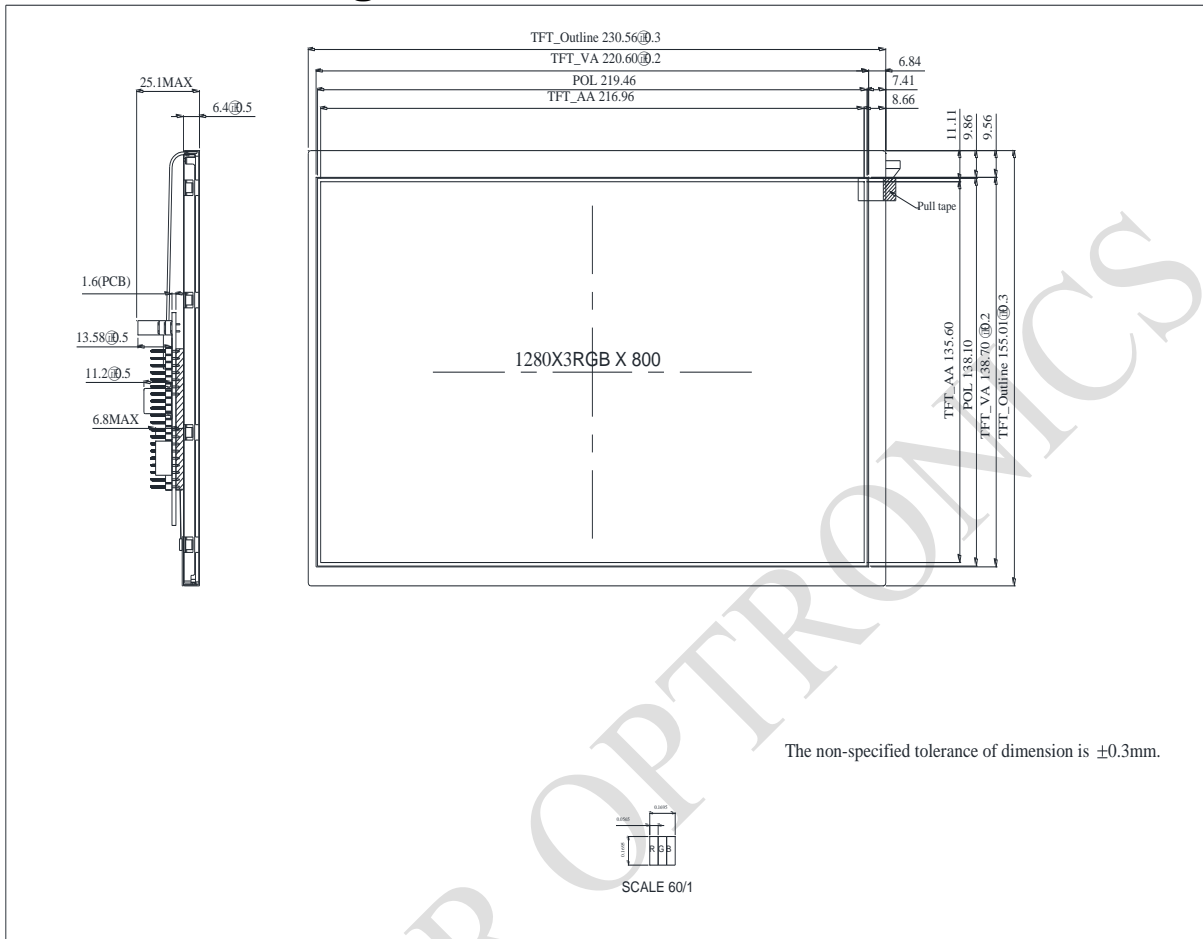
**4.3. USB**

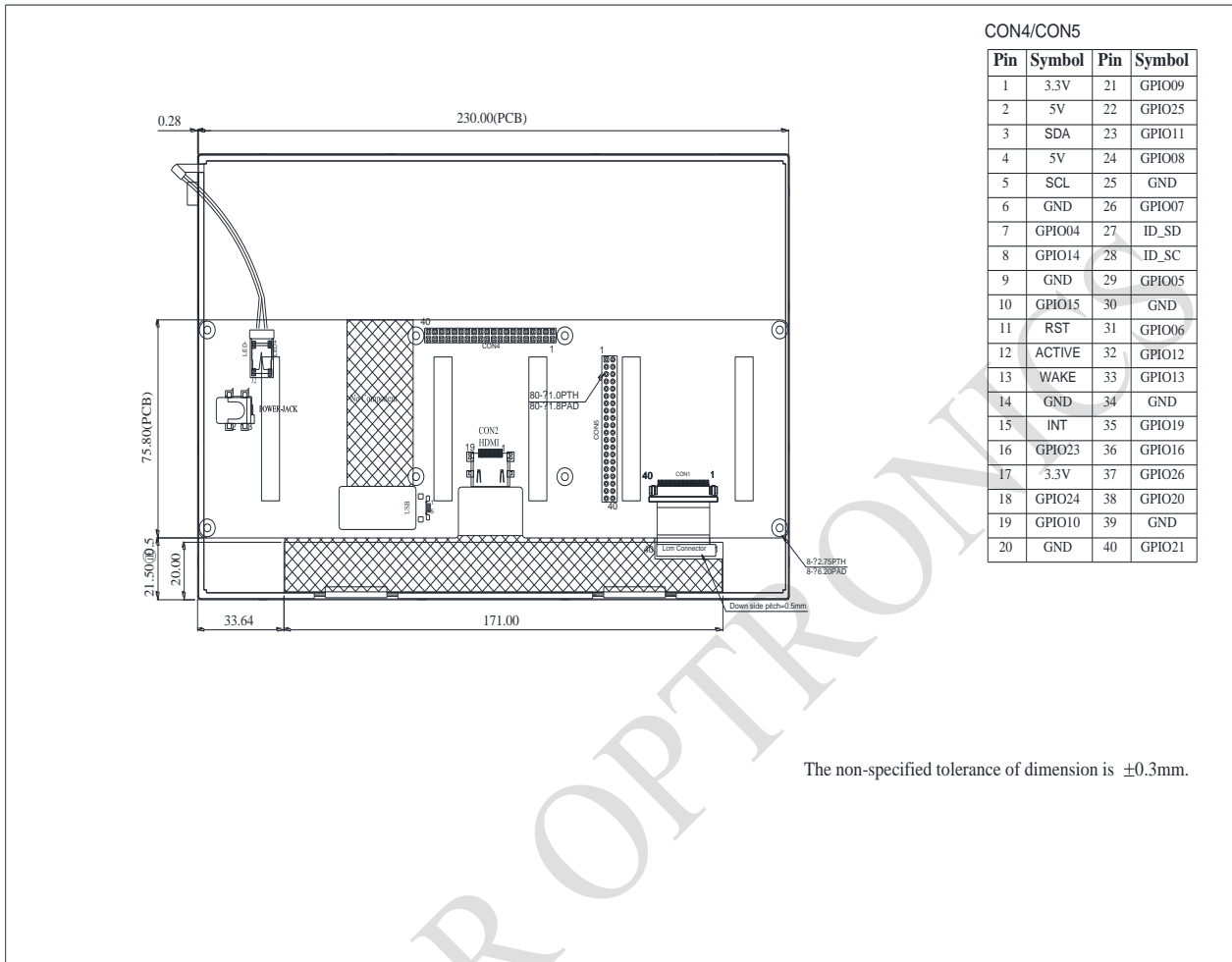
Pin No.	Symbol	I/O	Function	Remark
1	5V	P	Power Supply	
2	D-	I/O	USB Data -	
3	D+	I/O	USB Data +	
4	NC	-	No connection	
5	GND	P	Ground	

**4.4. J2**

Pin No.	Symbol	I/O	Function	Remark
1	VLED+	P	Power Supply	
2	VLED-	P	Ground	
3	NC		No connection	

# 5. Contour Drawing





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

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## 6. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	°C
Storage Temperature	TST	-20	—	+70	°C

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp.  $\leq 60^{\circ}\text{C}$ , 90% RH MAX. Temp.  $> 60^{\circ}\text{C}$ , Absolute humidity shall be less than 90% RH at  $60^{\circ}\text{C}$

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## 7. Electrical Characteristics

### 7.1. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	MAX.		
Power voltage	VDD	4.5	5.0	5.5	V	Note 2

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

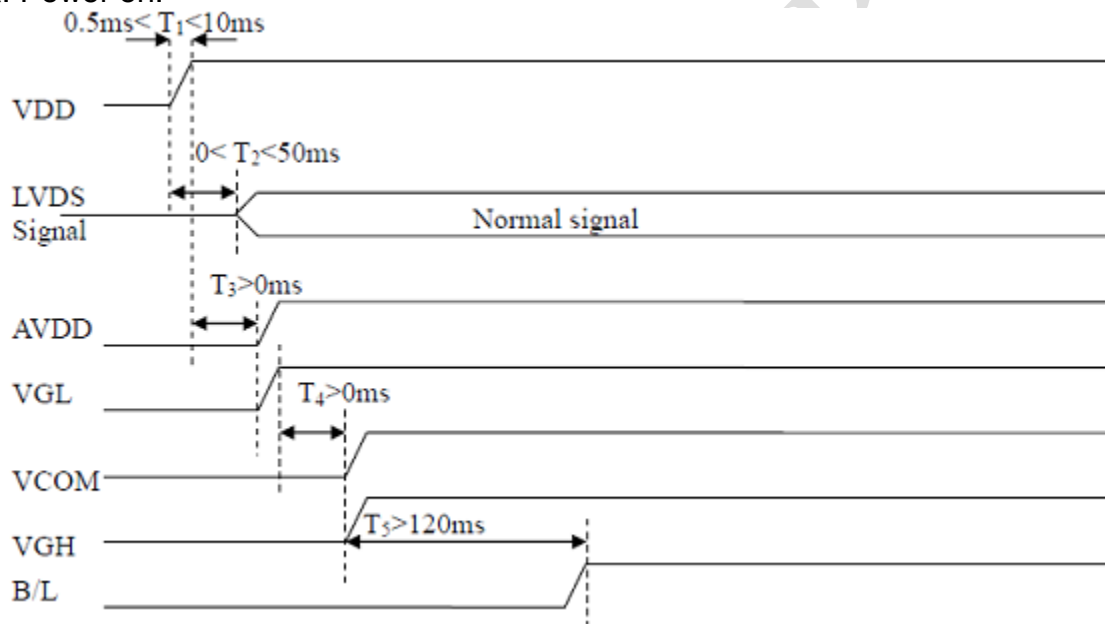
Note 2: VDD setting should match the signals output voltage

### 7.2. Current Consumption

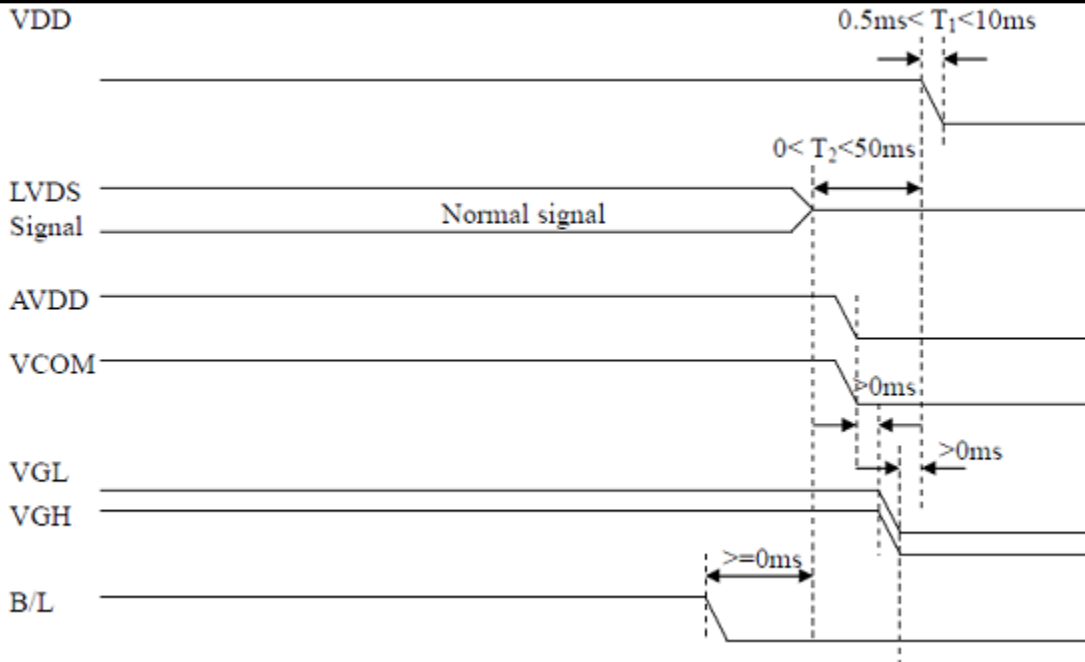
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	MAX.		
	IVDD	-	2153	-	mA	VDD =2.5V
	IVLED(5V)		3		A	VLED=5V

### 7.3. Power Sequence

a. Power on:



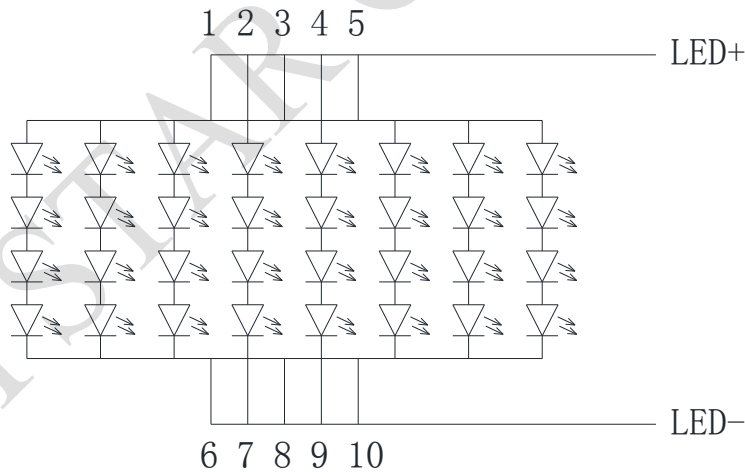
b. Power off:



#### 7.4. Backlight Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage of white LED backlight	VL	—	12.8	13.6	V	Note 1
Current for LED backlight	IL	—	480	—	mA	
LED life time	-	50000	-	-	Hr	Note 1

Note 1 : There are 1 Groups LED



Note 2 :  $T_a = 25\text{ }^\circ\text{C}$

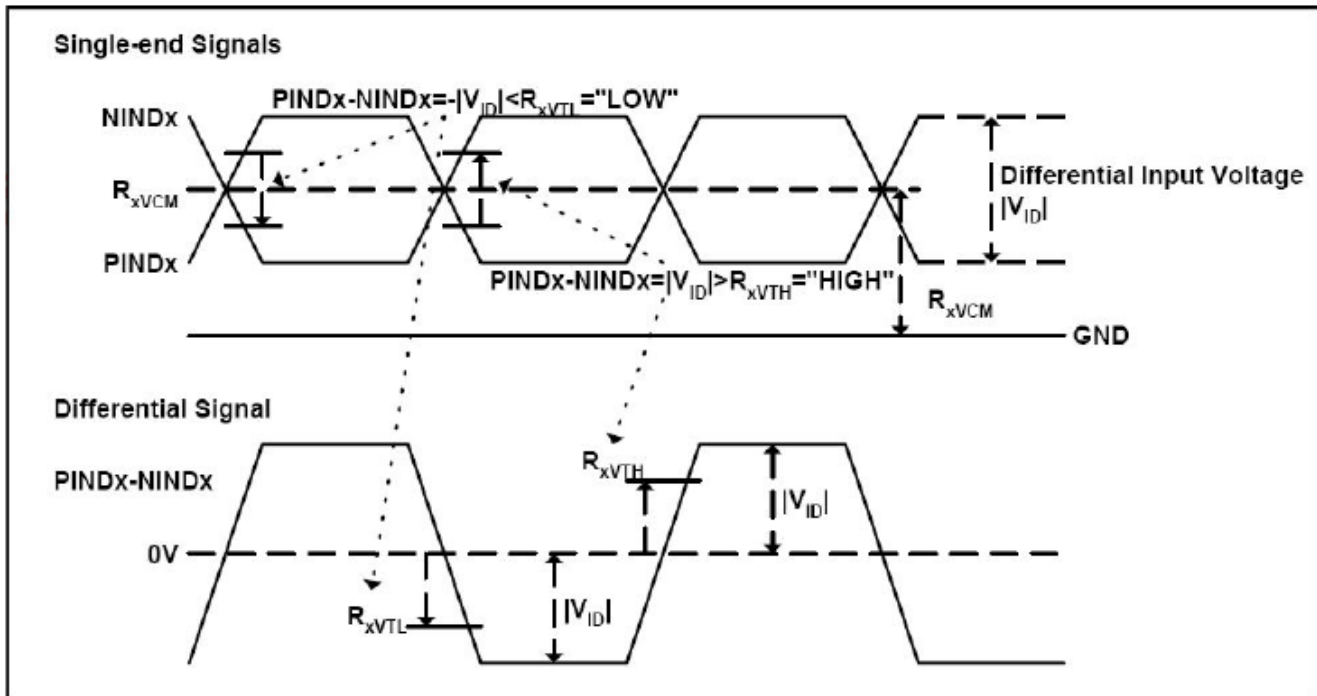
Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

# 8.LVDS Signal Timing Characteristics

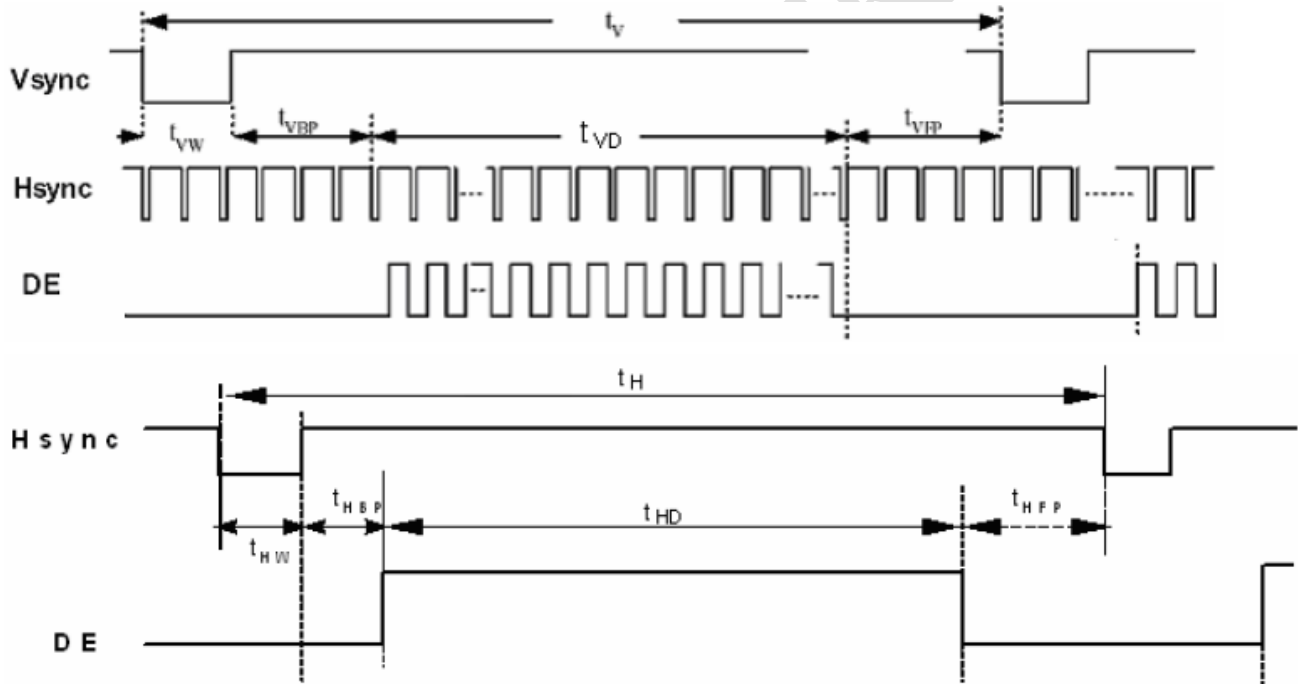
## 8.1. AC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	MAX.		
LVDS Differential input high Threshold voltage	RxVTH	-	-	+100	mV	RXVCM=1.2 V
LVDS Differential input low Threshold voltage	RxVTL	-100	-	-	mV	
LVDS Differential input common mode voltage	RxVCM	0.7	-	1.6	V	
LVDS Differential voltage	VID	200	-	600	mV	



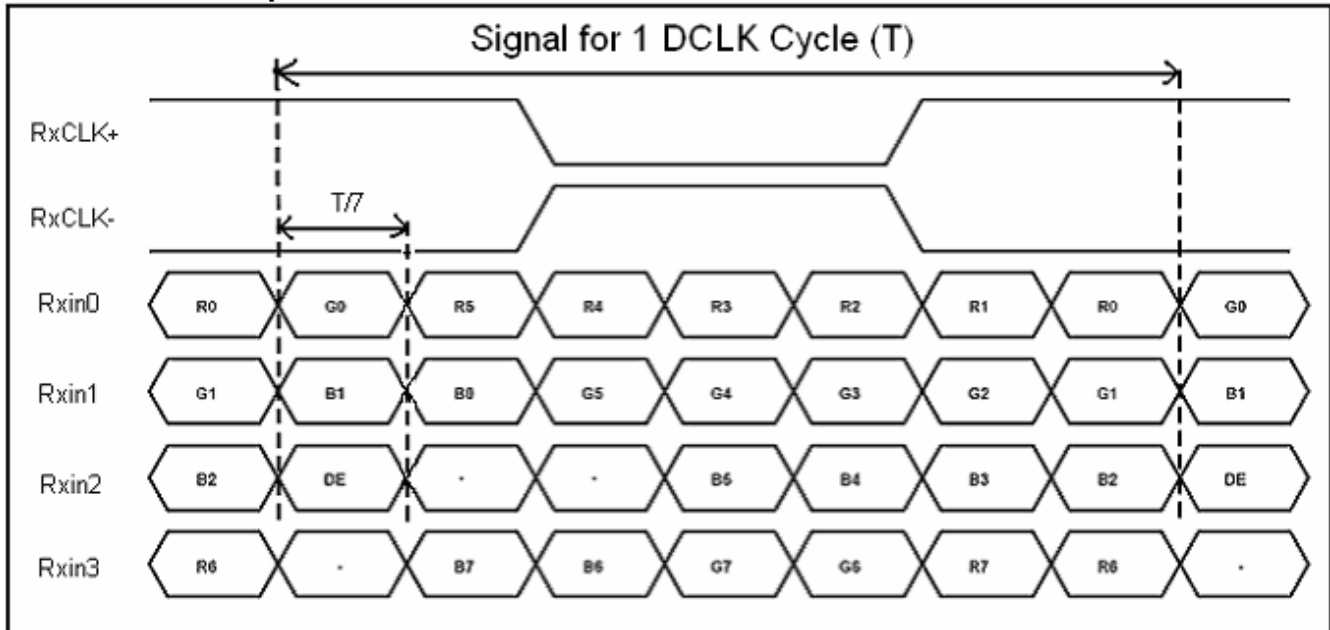
### 8.2. Timing Table

Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	1/Tc	68.9	71.1	73.4	Mhz	Frame rate =60Hz
Horizontal display area	thd	1280			Tc	
HS period time	th	1410	1440	1470	Tc	
HS Width +Back Porch +Front Porch	t <sub>HW</sub> + t <sub>HBP</sub> +t <sub>HFP</sub>	60	160	190	Tc	
Vertical display area	tvd	800			tH	
VS period time	tv	815	823	833	tH	
VS Width +Back Porch +Front Porch	t <sub>vW</sub> + t <sub>vBP</sub> +t <sub>vFP</sub>	15	23	33	tH	





### 8.3. LVDS Data Input Format



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## 9. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response time	$T_r$	$\theta=0^\circ, \phi=0^\circ$	-	10	20	.ms	Note 3	
	$T_f$		-	15	30			
Contrast ratio	CR	At optimized viewing angle	600	800	-	-	Note 4	
Color Chromaticity	White	$W_x$	$\theta=0^\circ, \phi=0^\circ$	0.26	0.31	0.36	-	Note 2,5
		$W_y$		0.28	0.33	0.38	-	
Viewing angle (Gray Scale Inversion Direction)	Hor.	$\theta_R$	$CR \geq 10$	75	85	-	Deg.	Note 1
		$\theta_L$		75	85	-		
	Ver.	$\phi_T$		75	85	-		
		$\phi_B$		75	85	-		
Brightness	-	-	1000	1100	-	cd/m <sup>2</sup>	Center of display	

Ta=25±2°C

Note 1: Definition of viewing angle range

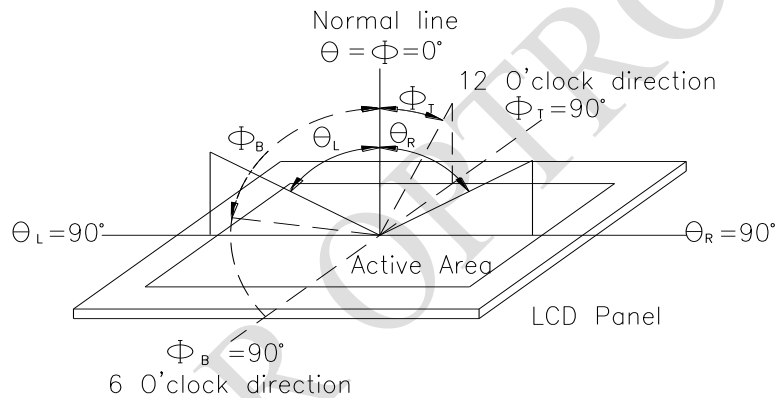


Fig. 9.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

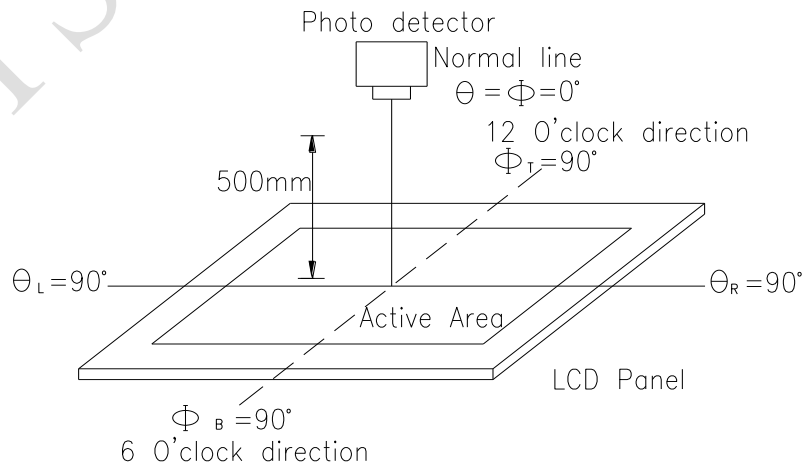
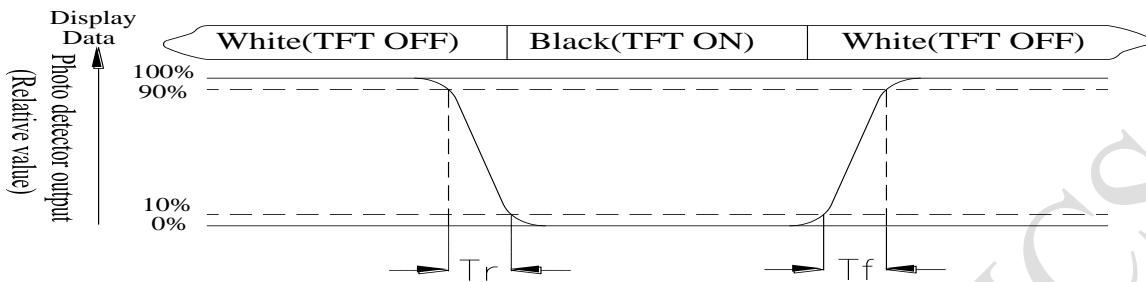


Fig. 9.2. Optical measurement system setup

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,  $T_r$ , is the time between photo detector output intensity changed from 90% to 10%. And fall time,  $T_f$ , is the time between photo detector output intensity changed from 10% to 90%



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

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

Note 5: White  $V_i = V_{i50} \pm 1.5V$

Black  $V_i = V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

“±” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

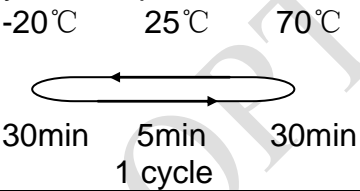
Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

## 10. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

<b>Environmental Test</b>			
<b>Test Item</b>	<b>Content of Test</b>	<b>Test Condition</b>	<b>Note</b>
High Temperature storage	Endurance test applying the high storage temperature for a long time.	70°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-20°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C, 90%RH max	60°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>-20°C    25°C    70°C</p> <p>30min    5min    30min</p> <p>1 cycle</p> </div>	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm 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=±600V(contact) , ±800v(air), RS=330Ω CS=150pF 10 times	—

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: The packing have to including into the vibration testing.

**LCM Sample Estimate Feedback Sheet**

**Module Number :** \_\_\_\_\_

**1 、 Panel Specification :**

1. Panel Type :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. View Direction :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Numbers of Dots :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. View Area :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Active Area :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6. Operating Temperature :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7. Storage Temperature :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8. Others :	_____	

**2 、 Mechanical Specification :**

1. PCB Size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. Frame Size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Material of Frame :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. Connector Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Fix Hole Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6. Backlight Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7. Thickness of PCB :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8. Height of Frame to PCB :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
9. Height of Module :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
10. Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

**3 、 Relative Hole Size :**

1. Pitch of Connector :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. Hole size of Connector :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Mounting Hole size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. Mounting Hole Type :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

**4 、 Backlight Specification :**

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

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<b>Module Number :</b> _____		
<b>5 · <u>Electronic Characteristics of Module</u> :</b>		
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 , _____
<b>6 · <u>Summary</u> :</b>		
<p style="text-align: right; margin-right: 50px;">Sales signature : _____</p> <p style="text-align: right; margin-right: 100px;">Customer Signature : _____      <u>Date</u> :   /   / _____</p>		