



RAYSTAR

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曜凌光電股份有限公司



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RFM08400A-AWW-LNN

SPECIFICATION

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

Release DATE:

TFT Display Inspection Specification: <https://www.raystar-optronics.com/download/products.htm>

Precaution in use of TFT module: <https://www.raystar-optronics.com/download/declaration.htm>

Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	2022/01/28		First issue
A	2022/03/14		Correct Pixel pitch

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1.Module Classification Information

R	F	M	0840	A	-	A	W	W	-	L	N	N
1	2	3	4	5	-	6	7	8	-	9	10	11

Item	Description	
1	R : Raystar Optonics 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 : 084.0" 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 ; W→Transmissive, Super 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
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 8.4" is color TFT-LCD (Thin Film Transistor Liquid Crystal Display) ODF cell. The 8.4" screen produces a high-resolution image that is composed of 1024*BGR*768 pixel elements in a stripe arrangement.

RAYSTAR OPTRONICS

3.General Specifications

- Screen Diagonal: 8.4 inch
- Number of Pixels: 1024 x 3(BGR) x 768 dots
- Module dimension: 199.5 x 149.0 x 11.5 mm
- Active area: 170.8032 (H) x 128.1024(V) mm
- Pixel pitch: 0.1668 ×0.1668 mm
- Display Mode: Normally Black , Transmissive
- Viewing Angle: 80/80/80/80
- TFT Drive IC: ST5821AH+ST5084AA or Equivalent
- TFT Interface: LVDS
- Backlight Type: LED, Normally White
- Aspect Ratio: 4:3
- Side screw torque : Typ:0.9 Max:1.3 (Unit,Kgf-cm)
- With /Without TP: Without TP
- Surface: Anti-Glare

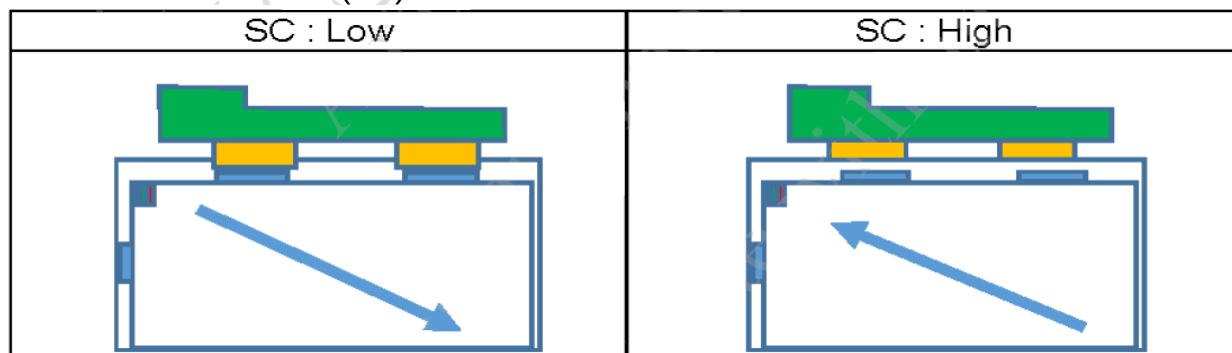
*Color tone slight changed by temperature and driving voltage.

4.Interface

LCM PIN Definition

Pin No.	Symbol	Function	Remark
1	VDD	Power supply	
2	VDD	Power supply	
3	GND	Ground	
4	GND	Ground	
5	Link0-	0- LVDS differential data input (D0N)	
6	Link0+	0+ LVDS differential data input (D0P)	
7	GND	Ground	
8	Link1-	1- LVDS differential data input (D1N)	
9	Link1+	1+ LVDS differential data input (D1P)	
10	GND	Ground	
11	Link2-	2- LVDS differential data input (D2N)	
12	Link2+	2+ LVDS differential data input (D2P)	
13	GND	Ground	
14	CLKIN-	- LVDS differential clock input (CLKN)	
15	CLKIN+	+ LVDS differential clock input (CLKP)	
16	GND	Ground	
17	Link3-	3- LVDS differential data input (D3N)	
18	Link3+	3+ LVDS differential data input (D3P)	
19	MODE	Bit 6/8:Low(6 Bit);High(8 Bit)	
20	SC	Scan direction selector (Low: Normal ;High: Reverse)	

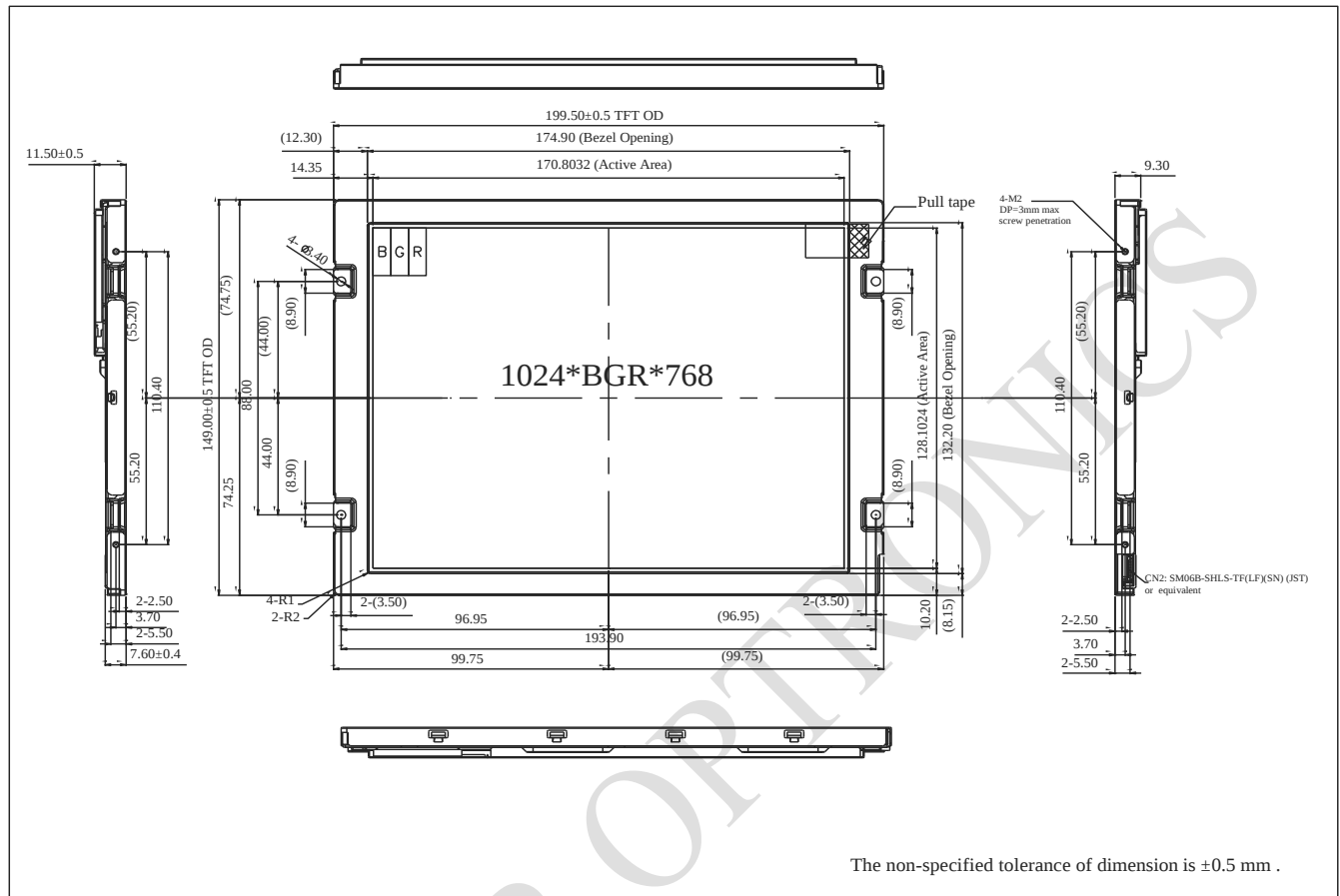
*Scan direction selector(SC):

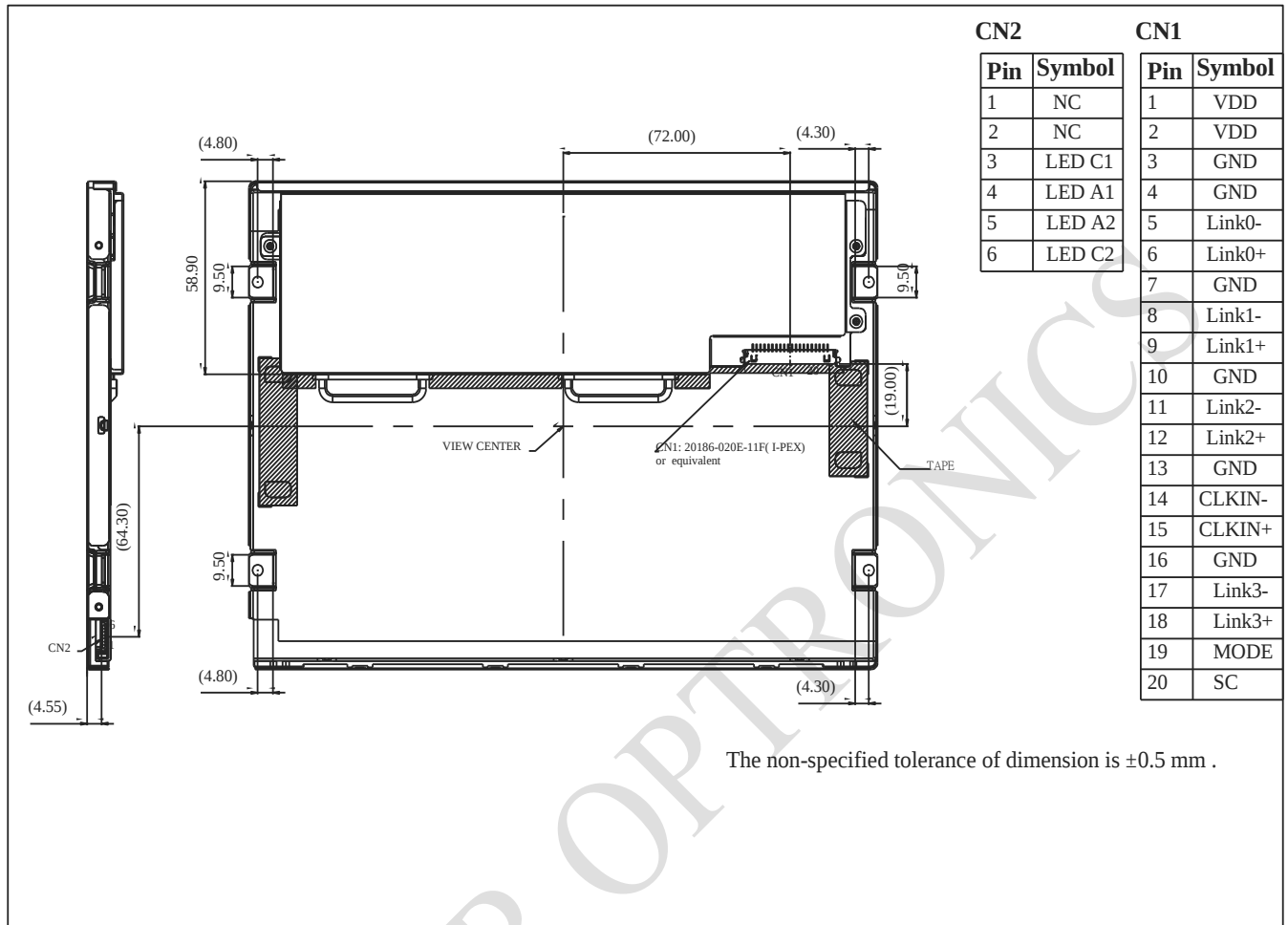


CN2

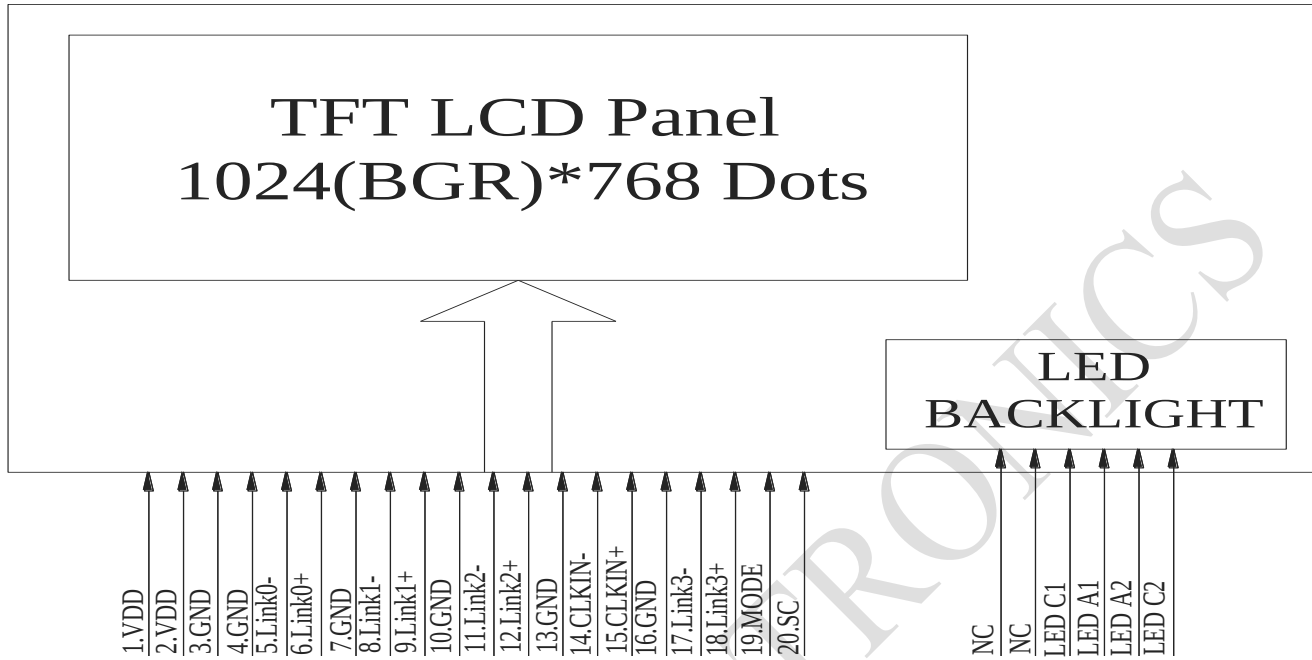
Pin No.	Symbol	Function	Remark
1	NC	No connection	
2	NC	No connection	
3	LED C1	LED_ Cathode 1	
4	LED A1	LED_ Anode 1	
5	LED A2	LED_ Anode 2	
6	LED C2	LED_ Cathode 2	

5. Contour Drawing





6. Block Diagram



7. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+80	□
Storage Temperature	TST	-30	—	+80	□

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

- Temp. □60□, 90% RH MAX. Temp. > 60□, Absolute humidity shall be less than 90% RH at 60□

8. Electrical Characteristics

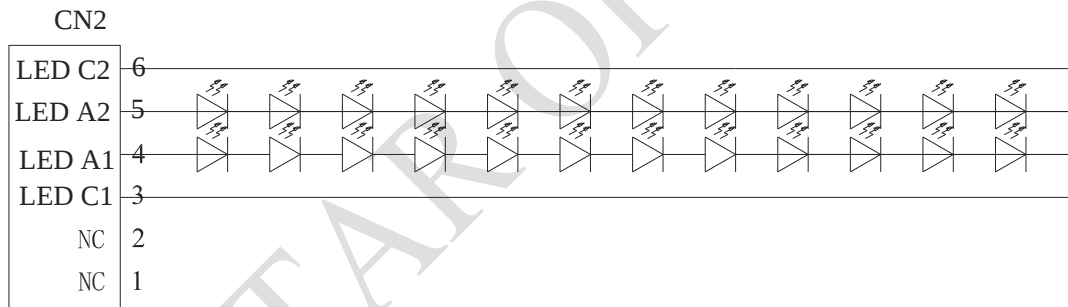
8.1. Operating conditions:

Item	Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage For Logic	V_{DD}	3.0	3.3	3.6	V	—
Power Supply For Current	$V_{DD}=3.3V$	—	330	495	mA	—
Input Voltage	H level	V_{IH}	$0.7V_{DD}$	—	V_{DD}	SC.MODE
	L Level	V_{IL}	GND	—	$0.3V_{DD}$	

8.2. Backlight Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage of white LED backlight	VLED	32.4	36	40.8	V	Note 1
Current for LED backlight	ILED	—	70*2	—	mA	
LED life time	-	—	100,000	—	Hr	Note 3

Note 1 : There are 1 Groups LED



CIRCUIT DIAGRAM (12X 2=24 DICES)

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

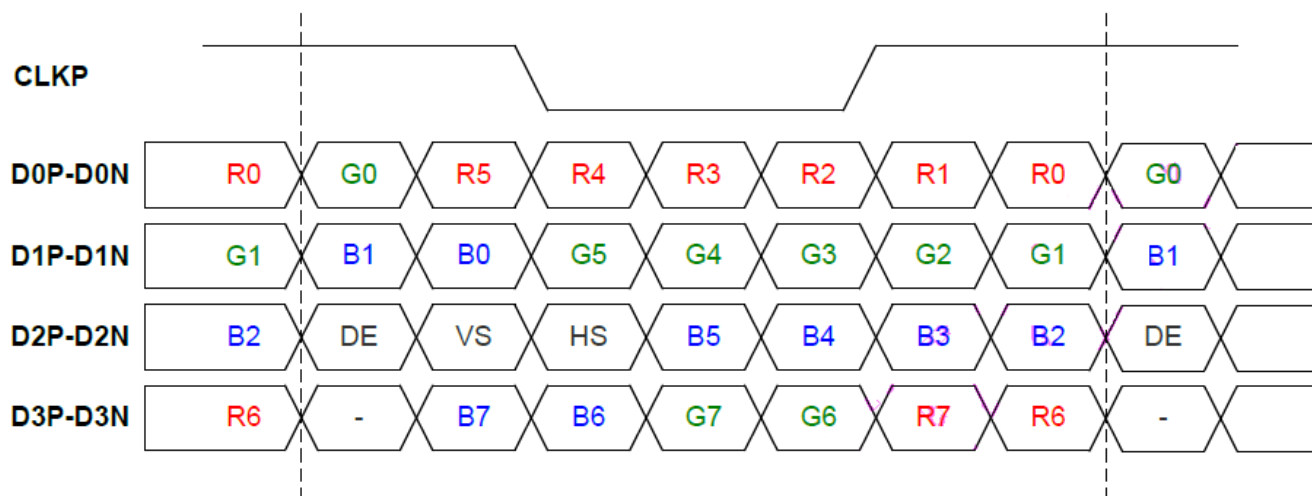
9. Timing characteristics

9.1. LVDS Video timing

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
CLK frequency	t _{CLK}	48.4	52.4	61.5	Mhz	
Horizontal blanking time	t _{HBT}	20	56	180	t _{CLK}	t _{HBP} + t _{HFP}
Horizontal back porch	t _{HBP}	5	5	180- t _{HFP}	t _{CLK}	
Horizontal display area	t _{HD}	1024	1024	1024	t _{CLK}	
Horizontal front porch	t _{HFP}	15	51	175	t _{CLK}	
Horizontal period	t _H	1044	1080	1204	t _{CLK}	
Horizontal pulse width	t _{HPW}	1	1	256	t _{CLK}	
Vertical blanking time	t _{VB}	5	40	83	t _H	t _{VB} + t _{VFP}
Vertical back porch	t _{VBP}	2	2	83- t _{VFP}	t _H	
Vertical display area	t _{VD}	768	768	768	t _H	
Vertical front porch	t _{VFP}	3	38	81	t _H	
Vertical period	t _V	773	808	851	t _H	
Vertical pulse width	t _{VPW}	1	1	128	t _H	

9.2. TCON mode LVDS interface data mapping

VESA data mapping



Note 1 : for 6 bit mode, MSB are R/G/B[5] and R/G/B[0] are LSB

Note 2 : for 8 bit mode, MSB are R/G/B[7] and R/G/B[0] are LSB

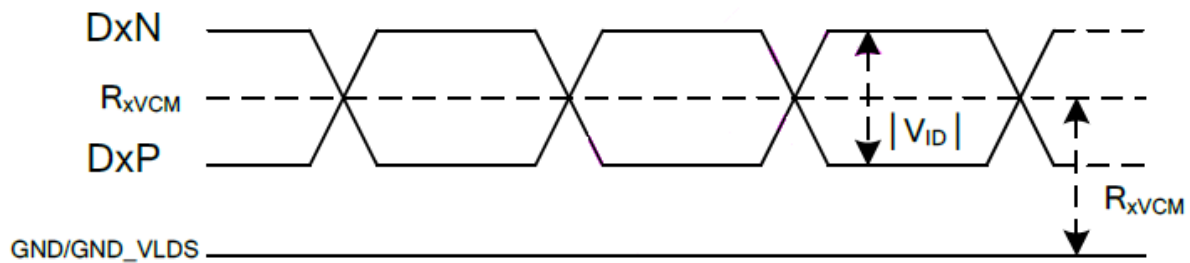
9.3. LVDS receiver characteristic

(Receiver Differential Input : D0P~D3P, D0N~D3N, CLKP, CLKN)

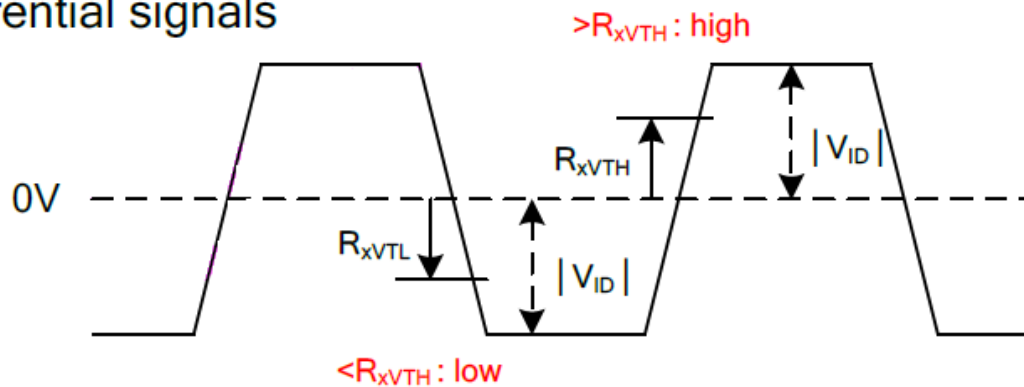
(VDD=VDD_LVDS=3.0~3.6V, GND=GND_LVDS=0V, TA=-40~95°C)

Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
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		$VDD-1.0$	V	
Differential input common mode voltage	R_{xVCM}	0.6	1.2	$2.4 - V_{ID} / 2$	V	
Differential input voltage	$ V_{ID} $	0.2	0.4	0.6	V	
Differential input leakage current	R_{VxIIZ}	-10		10	uA	
LVDS Digital Operating Current	I_{VDD_LVDS}	-	25	35	mA	$F_{CLK}=65\text{ MHz}$, $VDD_LVDS=3.3V$ Data pattern=55/H → AA/H (loop)
LVDS Digital Stand-by Current	I_{STBD_LVDS}	-	10	50	uA	$RSTB=0$ or $STBYB=0$ All functions are stopped CLKx & D0x connect to GND

Single end signals



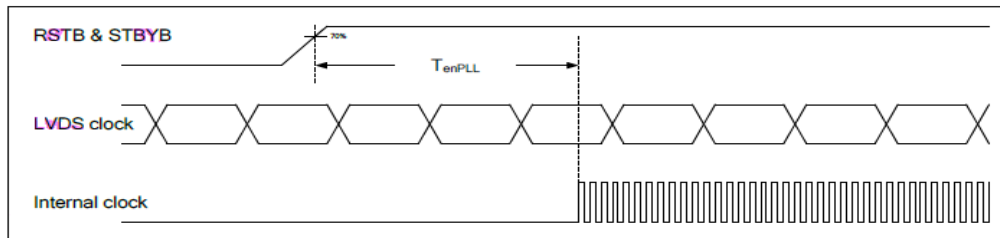
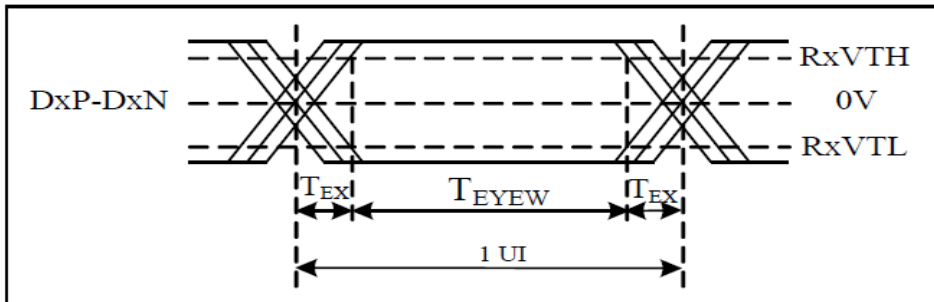
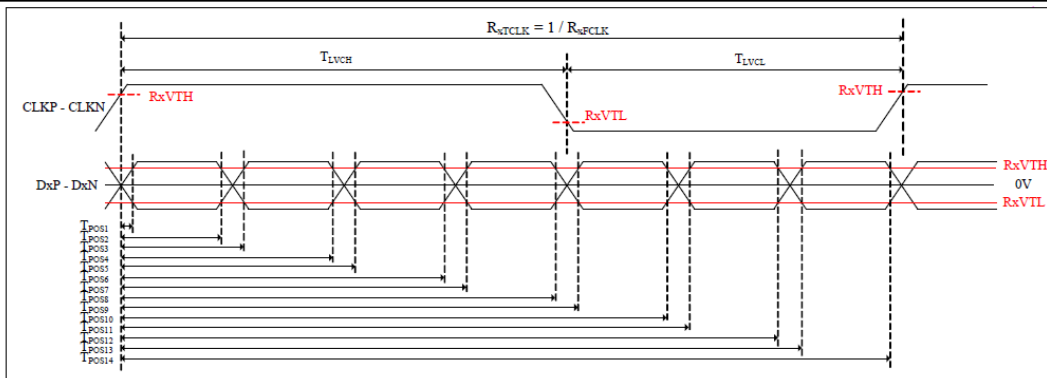
Differential signals



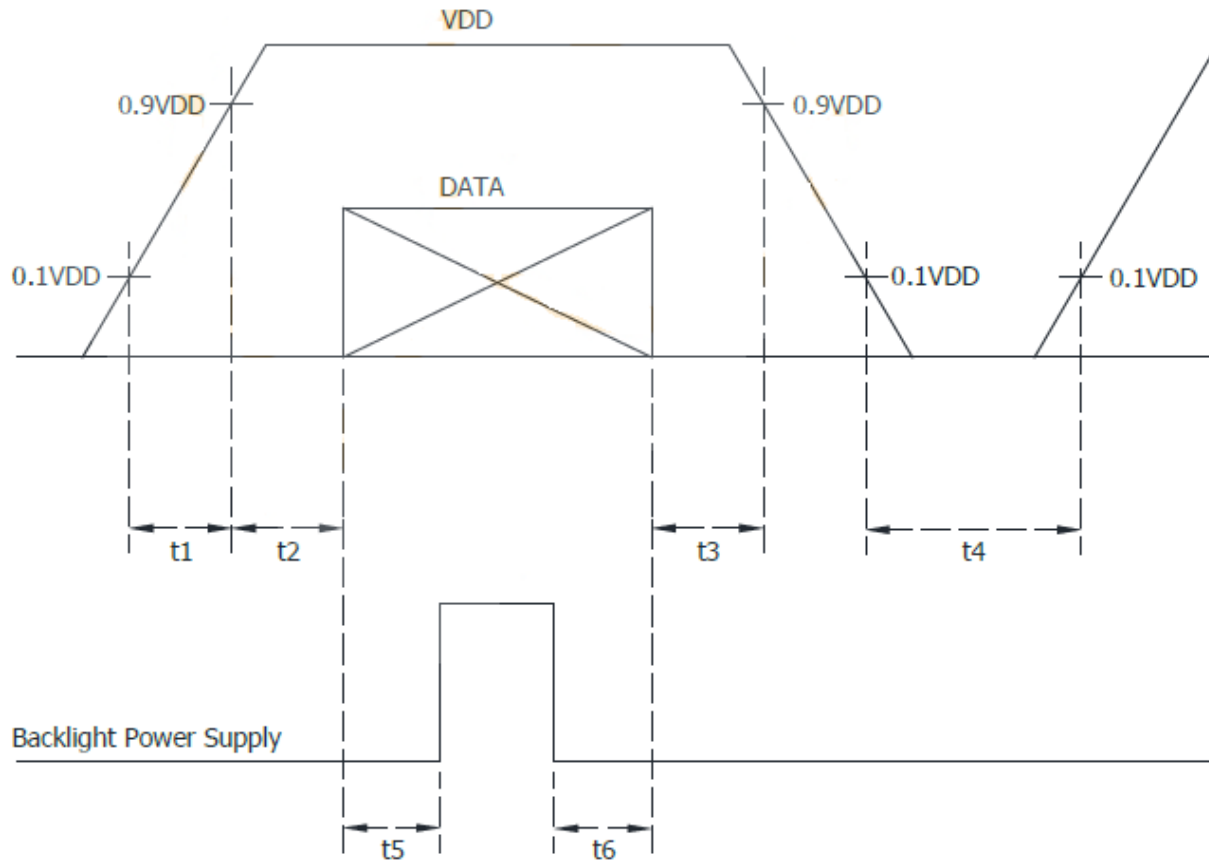
LVDS AC characteristic

(VDD=VDD_LVDS=3.0~3.6V, GND=GND_LVDS=0V, TA=-40~95°C)

Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
Clock Frequency	R_{xCLK}	20		80	MHz	
Clock Period	R_{xCLK}	12.5		50	ns	
1 data bit time	UI	-	1/7	-	R_{xCLK}	
Clock high time	T_{LVCH}		4		UI	
Clock low time	T_{LVCL}		3		UI	
Position 1	T_{POS1}	-0.25	0	0.25	UI	
Position 2	T_{POS2}	0.75	-	1.25	UI	
Position 3	T_{POS3}	0.75	1	1.25	UI	
Position 4	T_{POS4}	1.75	-	2.25	UI	
Position 5	T_{POS5}	1.75	2	2.25	UI	
Position 6	T_{POS6}	2.75	-	3.25	UI	
Position 7	T_{POS7}	2.75	3	3.25	UI	
Position 8	T_{POS8}	3.75	-	4.25	UI	
Position 9	T_{POS9}	3.75	4	4.25	UI	
Position 10	T_{POS10}	4.75	-	5.25	UI	
Position 11	T_{POS11}	4.75	5	5.25	UI	
Position 12	T_{POS12}	5.75	-	6.25	UI	
Position 13	T_{POS13}	5.75	6	6.25	UI	
Position 14	T_{POS14}	6.75	-	7.25	UI	
Input eye width	T_{EYEW}	0.5	-	-	UI	
Input eye border	T_{EX}	-	-	0.25	UI	
PLL wake-up time	T_{enPLL}			150	us	



9.4. Power Sequence



$1.5\text{ms} < t_1 < 3\text{ms}$; $t_2 > 100\text{ms}$

$t_3 > 100\text{ms}$; $t_4 > 200\text{ms}$

$t_5 > 500\text{ms}$; $t_6 > 500\text{ms}$

DATA : LVDS, MODE ,SC

10. Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr+ Tf	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$	-	25	35	.ms	Note 3
Contrast ratio		CR	At optimized viewing angle	800	1000	-	-	Note 4
Color Chromaticity	White	Wx	$\theta=0^{\circ}$ 、 $\Phi=0$	0.244	0.294	0.344	-	Note 2,6,7
		Wy		0.257	0.307	0.357	-	
Viewing angle	Hor.	ΘR	$CR\geq 10$	-	80	-	Deg.	Note 1
		ΘL		-	80	-		
	Ver.	ΦT		-	80	-		
		ΦB		-	80	-		
Brightness		-	-	400	500	-	cd/m ²	Center of display
Uniformity		(U)	-	70	-	-	%	Note 5

Ta=25±2°C

Note 1: Definition of viewing angle range

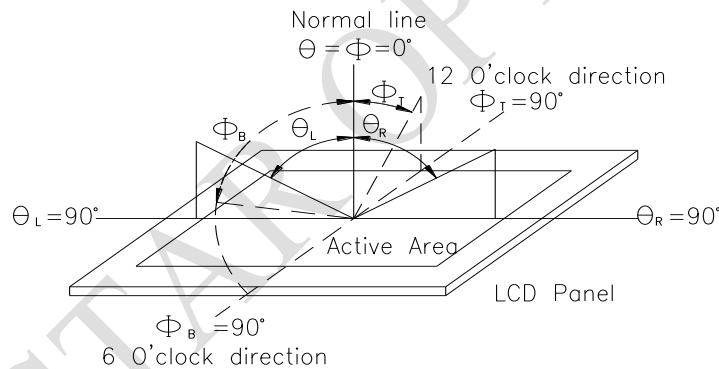


Fig. 10.1. Definition of viewing angle

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.

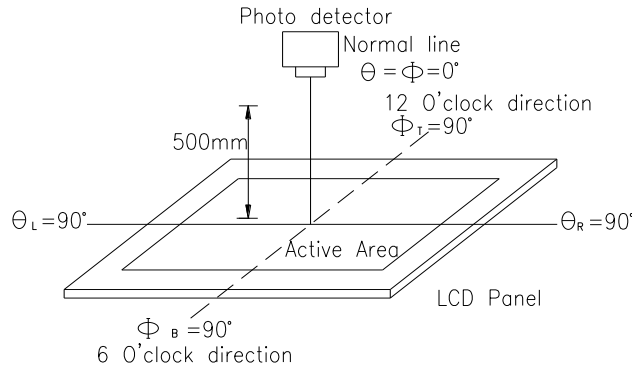
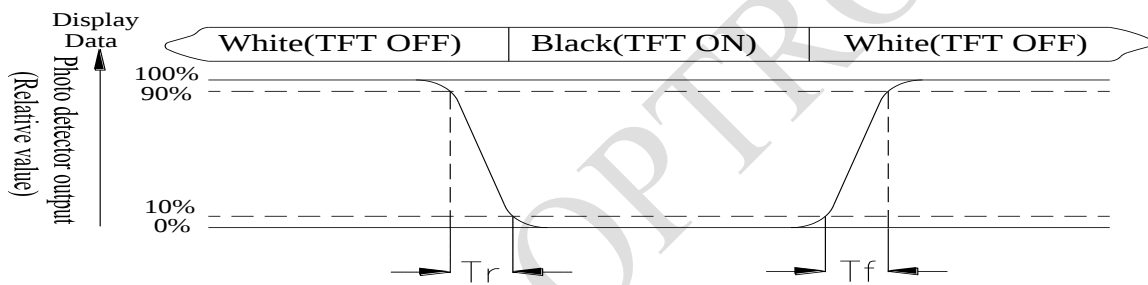


Fig. 10.2. Optical measurement system setup

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: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = $L_{min}/L_{max} \times 100\%$

L = Active area length

W = Active area width

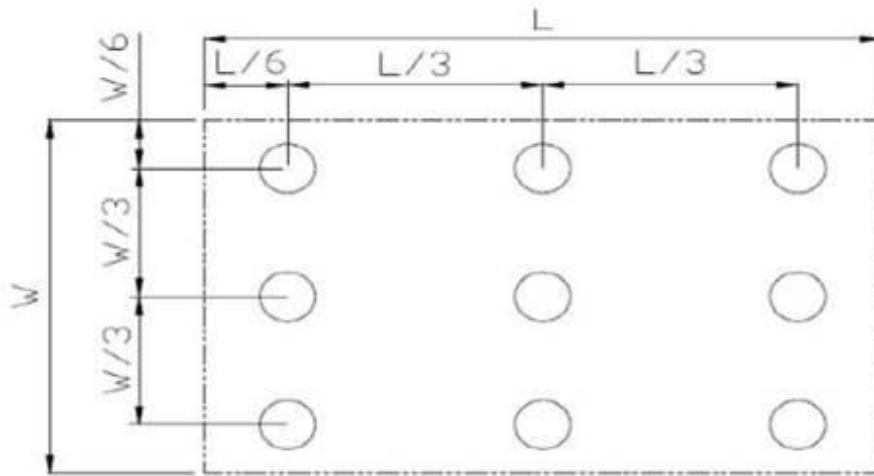


Fig10.3. Definition of uniformity

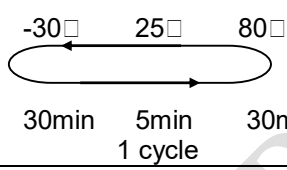
Note 6: Definition of color chromaticity (CIE 1931)

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.

11. Reliability

Content of Reliability Test (Super Wide temperature, -30℃~80℃)

Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30℃ 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.	80℃ 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30℃ 200hrs	1
High Temperature/Humidity storage	The module should be allowed to stand at 60℃,90%RH max	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation 	-30℃/80℃ 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 :	☐ 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 <<

Module Number : _____

5 、 Electronic Characteristics of Module :

1.Input Voltage :	☐ Pass	☐ NG , _____
2.Supply Current :	☐ Pass	☐ NG , _____
3.Driving Voltage for LCD :	☐ Pass	☐ NG , _____
4.Contrast for LCD :	☐ Pass	☐ NG , _____
5.B/L Driving Method :	☐ Pass	☐ NG , _____
6.Negative Voltage Output :	☐ Pass	☐ NG , _____
7.Interface Function :	☐ Pass	☐ NG , _____
8.LCD Uniformity :	☐ Pass	☐ NG , _____
9.ESD test :	☐ Pass	☐ NG , _____
10.Others :	☐ Pass	☐ NG , _____

6 、 Summary :
Sales signature : _____

Customer Signature : _____

Date : / /