



RAYSTAR

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曜凌光電股份有限公司



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RFF700A9-AWH-DNG

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	2023/07/18		First issue

Contents

1.Module Classification Information

2.Summary

3.General Specifications

4.Interface

5.Contour Drawing

6.Block Diagram

7.Absolute Maximum Ratings

8.Electrical Characteristics

9.DC Characteristics

10.AC Characteristics

11.Optical Characteristics

12.Reliability

13.Touch Panel Information

14.Other

1.Module Classification Information

R	F	F	70	0A9	-	A	W	H	-	D	N	G
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 : 7.0" 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

The RF70 is a 7-inch LCD Cell with thin film transistors as active elements and contains 800 (H) X 480 (V) pixels. Each pixel is divided into red, green and blue dot, which are arranged in vertical stripe. The cell is normally black mode, and can be applied to the transmission type display. Backlight unit (BLU) and circuit board for the cell are not built in.

RAYSTAR OPTRONICS

3.General Specifications

- Size: 7.0 inch
- Dot Matrix: 800 x RGB x 480(TFT) dots
- Module dimension: 165.8 (W) x 106.61 (H) x 8.5(D) mm
- Active area: 152.40 x 91.44 mm
- Pixel pitch: 0.1905 x 0.1905 mm
- LCD type: TFT, Normally Black, Transmissive
- View Direction: 80/80/80/80
- TFT Interface: 24-bit RGB
- TFT Driver IC: HX8249-A + HX8678-C or Equivalent
- Aspect Ratio: 15:9
- Backlight Type: LED, Normally White
- CTP IC: ILI 2130 or equivalent
- CTP Interface: I2C
- CTP FW Version: 0x07.0x00. 0x00. 0x00. 0x00. 0x07. 0x68. 0xA1
- CTP Resolution: 16384*16384
- With /Without TP: With CTP
- Surface: Glare

*Color tone slight changed by temperature and driving voltage.

4.Interface

4.1. LCM PIN Definition

Pin	Symbol	Function			Remark
1-4	NC	No connection			
5	GND	Power Ground			
6	NC	No connection			
7	VCC	Power voltage			
8	MODE	Input timing mode selection.			
		MODE	Function	Note	
		0	DE only	-	
		1	HS+VS	Default	
9	DE	Data enable signal for TTL mode.			
10	VS	Vertical sync input			
11	HS	Horizontal sync input			
12	B7	Blue data(MSB)			
13	B6	Blue data			
14	B5	Blue data			
15	B4	Blue data			
16	B3	Blue data			
17	B2	Blue data			
18	B1	Blue data			
19	B0	Blue data(LSB)			
20	G7	Green data(MSB)			
21	G6	Green data			
22	G5	Green data			
23	G4	Green data			
24	G3	Green data			
25	G2	Green data			
26	G1	Green data			
27	G0	Green data(LSB)			
28	R7	Red data(MSB)			
29	R6	Red data			
30	R5	Red data			
31	R4	Red data			

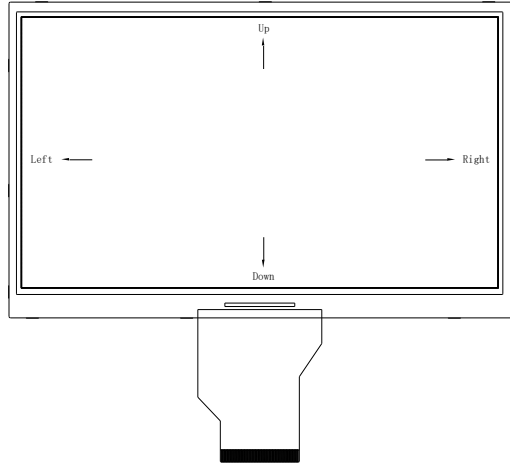
32	R3	Red data										
33	R2	Red data										
34	R1	Red data										
35	R0	Red data (LSB)										
36	GND	Power Ground										
37	DCLK	Sample clock										
38	GND	Power Ground										
39	L/R	Horizontal shift direction (source output) selection. <table><tr><th>L/R</th><th>Source output sequence and data order</th><th>Note</th></tr><tr><td>1</td><td>Left to right</td><td>Default</td></tr><tr><td>0</td><td>Right to left</td><td>-</td></tr></table>	L/R	Source output sequence and data order	Note	1	Left to right	Default	0	Right to left	-	Note1
L/R	Source output sequence and data order	Note										
1	Left to right	Default										
0	Right to left	-										
40	U/D	Vertical shift direction (gate output) selection. <table><tr><th>U/D</th><th>Function</th><th>Note</th></tr><tr><td>1</td><td>Top→bottom</td><td>Default</td></tr><tr><td>0</td><td>Bottom→top</td><td>-</td></tr></table>	U/D	Function	Note	1	Top→bottom	Default	0	Bottom→top	-	Note2
U/D	Function	Note										
1	Top→bottom	Default										
0	Bottom→top	-										
41	NC	No connection										
42	NC	No connection										
43	NC	No connection										
44	RESET	Reset pin. The chip is in reset state when RESETB=0.										
45	NC	No connection										
46	NC	No connection										
47	DITHB	STBYB Standby mode setting pin. The chip is in standby mode when STBYB=0.										
48	GND	Power Ground										
49	NC	No connection										
50	NC	No connection										

Note 1: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
1	1	Top to Bottom, left to right
1	0	Top to Bottom, right to left
0	0	Bottom to Top, right to left
0	1	Bottom to Top, left to right

Note 2: Definition of scanning direction.

Refer to the figure as below:



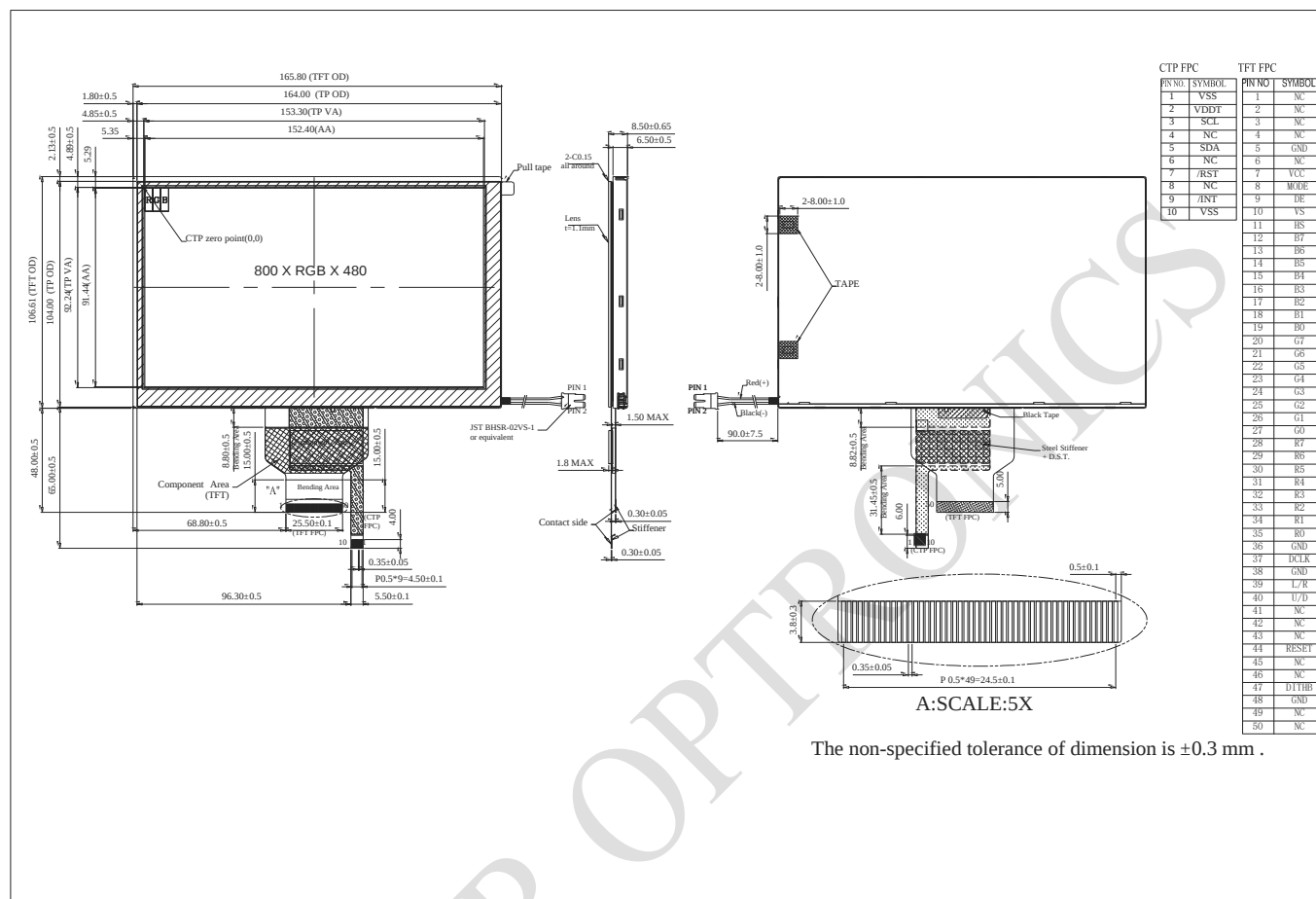
4.2. Backlight PIN Definition

Pin	Symbol	Description
1	VLED+	Red, LED_ Anode
2	VLED-	Black, LED_ Cathode

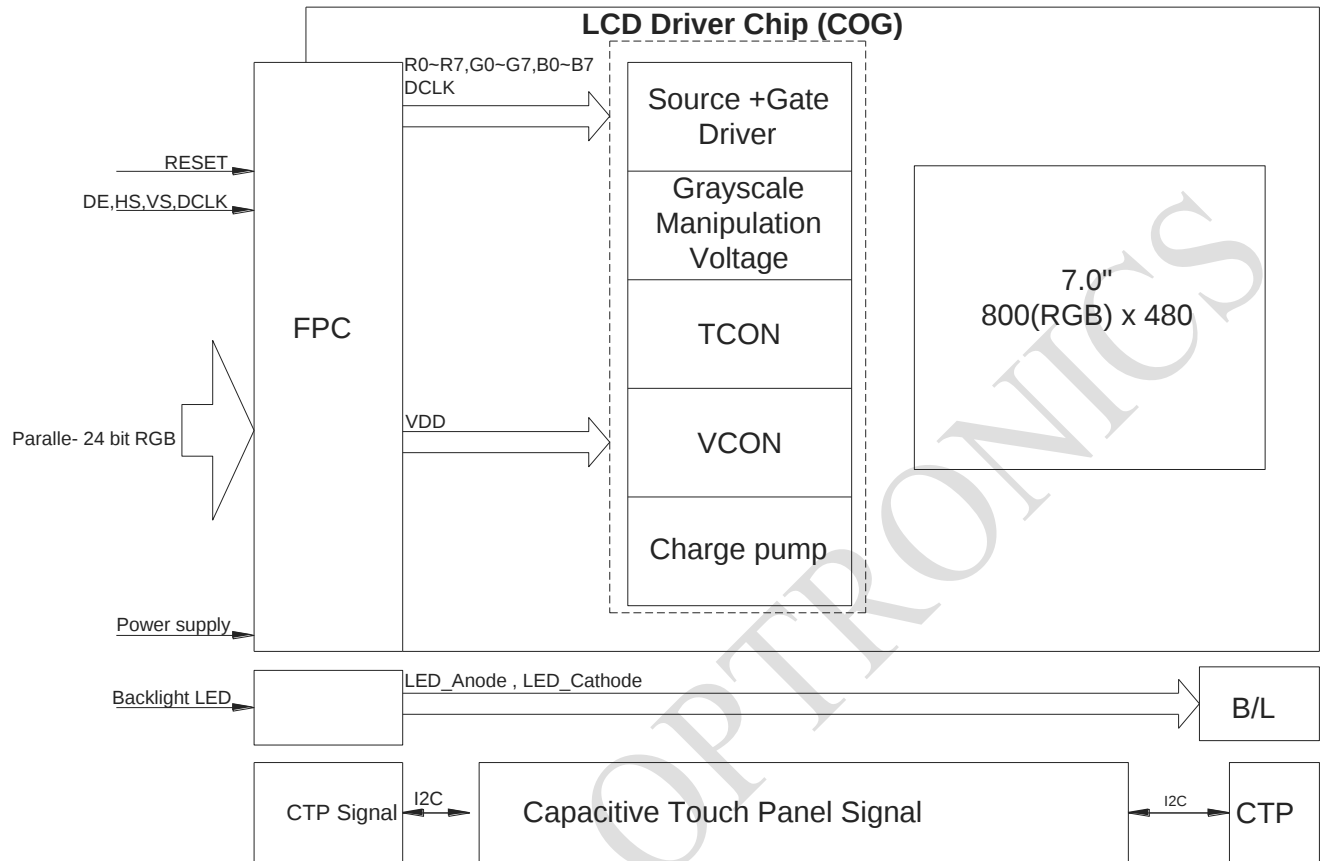
4.3. CTP PIN Definition

Pin	Symbol	Function	Remark
1	VSS	Ground for analog circuit	
2	VDDT	Power Supply : +3.3V	
3	SCL	I2C clock input	
4	NC	No connect	
5	SDA	I2C data input and output	
6	NC	No connect	
7	/RST	External Reset, Low is active	
8	NC	No connect	
9	/INT	External interrupt to the host	
10	VSS	Ground for analog circuit	

5. Contour Drawing



6. Block Diagram



7. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+80	°C
Storage Temperature	TST	-40	—	+85	°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°C

8. Electrical Characteristics

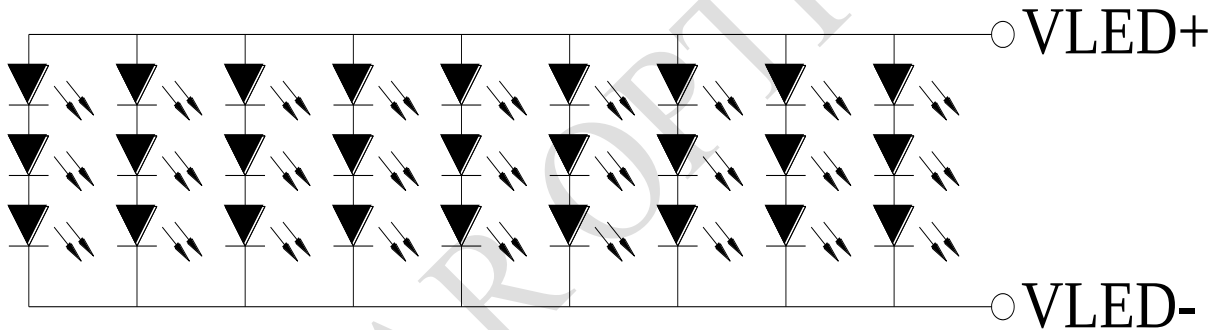
8.1. Operating conditions

Item	Symbol	Min	Typ	Max	Unit	Note
Supply Voltage	V _{CC}	2.7	3.3	3.6	V	
Current of power supply	I _{CC}	—	101	150	mA	V _{CC} = 3.3V
Supply CTP	V _{DDT}	3.1	3.3	3.5	V	
	I _{VDDT}	—	62	93	mA	

8.2. LED driving conditions

Parameter	Symbol	Min	Typ	Max	Unit	Remark
LED current	—	—	450	—	mA	
LED voltage	V _{LED+}	8.1	9.3	10.2	V	Note 1
LED Life Time	—	40000	—	—	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



CIRCUIT DIAGRAM

Note 2 : T_a = 25 °C

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

Note 4 : The single LED lamp case

9.DC Characteristics

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	V_{IL}	0	-	0.3VCC	V	
High level input voltage	V_{IH}	0.7VCC	-	VCC	V	

10.AC Characteristics

10.1. Parallel SYNC mode RGB input timing table

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
DCLK frequency	FDCLK	25.2	27.2	30.5	MHz	
Horizontal line	th	856	860	920	DCLK	
Horizontal valid data	thd	800			DCLK	
Hsync pulse width	thpw	1	2	100	DCLK	
Hsync back width	thbp	5	16	101	DCLK	
Hsync front width	thfp	19	44	115	DCLK	
Vertical valid data	tvd	480			H	
Vsync pulse width	tvpw	1	2	66	H	
Vsync back width	tvbp	5	5	67	H	
Vsync front width	tvfp	5	43	67	H	
Vertical field	tv	490	528	552	H	

10.2. Input Clock and Data Timing Diagram

• Horizontal

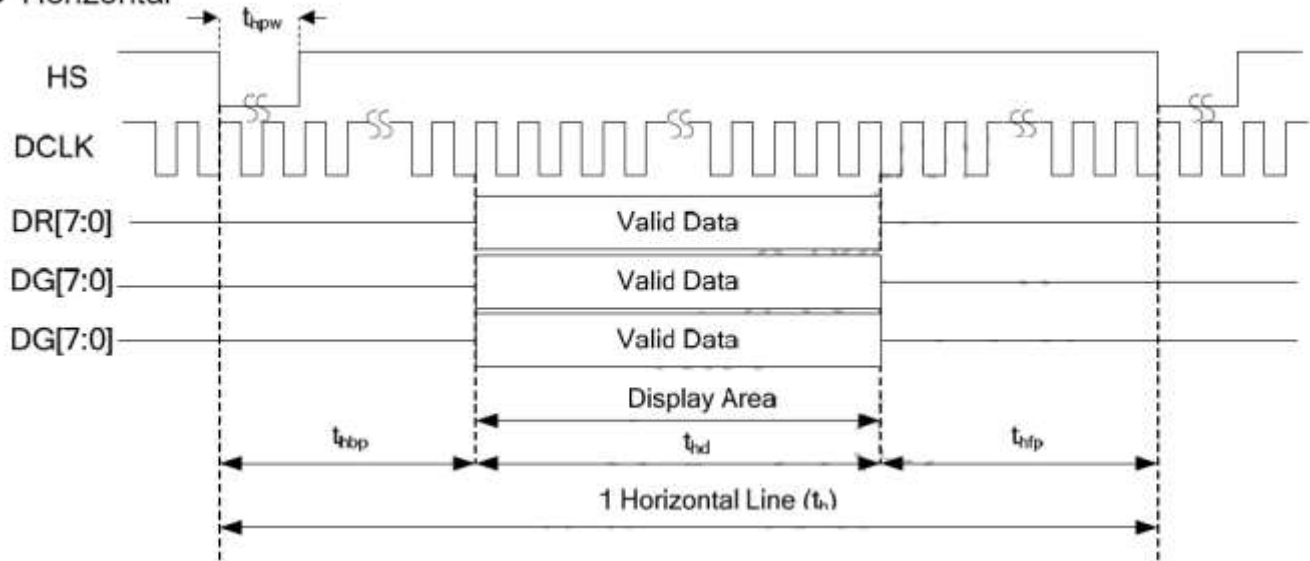


Fig1. Horizontal input Timing at Sync mode

• Vertical

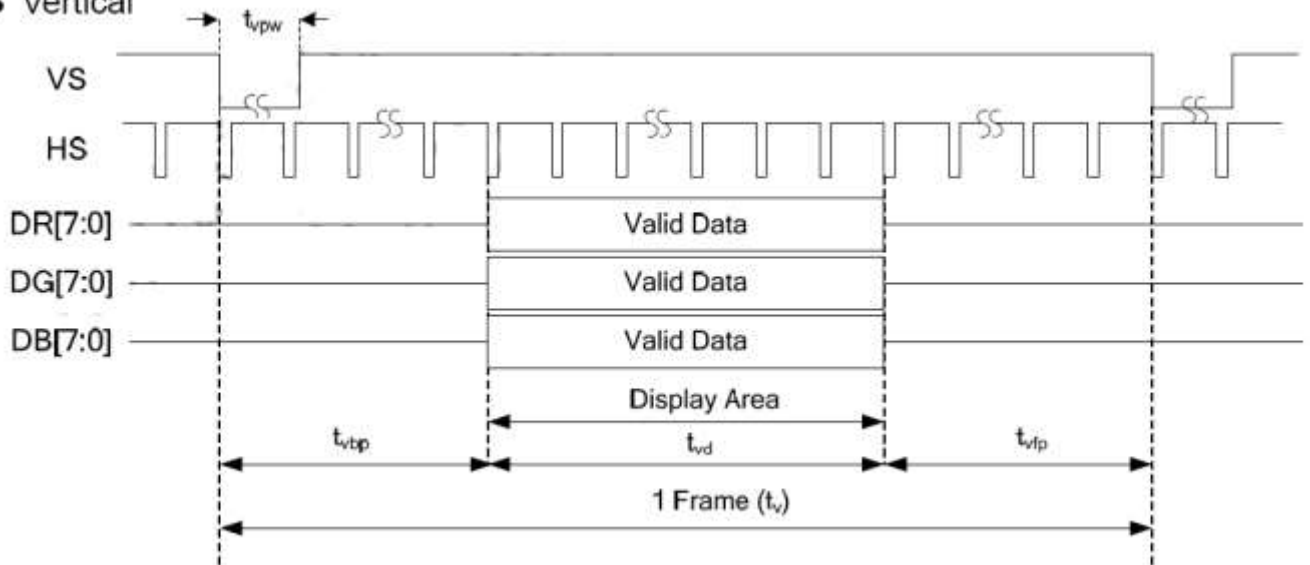


Fig.2. Vertical input Timing at Sync mode

11. 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 the center point of AA	800	1000	-	-	Note 4
Color Chromaticity	White	Wx	$\theta=0^{\circ}$ 、 $\Phi=0$	0.26	0.31	0.36	-	Note 2,6,7
		Wy		0.28	0.33	0.38	-	
Viewing angle	Hor.	ΘR	$CR \geq 10$	70	80	-	Deg.	Note 1
		ΘL		70	80	-		
	Ver.	ΦT		70	80	-		
		ΦB		70	80	-		
Brightness		-	-	700	800	-	cd/m ²	Center of display
Uniformity		(U)		75	-	-	%	Note5

Ta=25±2℃ , IL=450mA

Note 1: Definition of viewing angle range

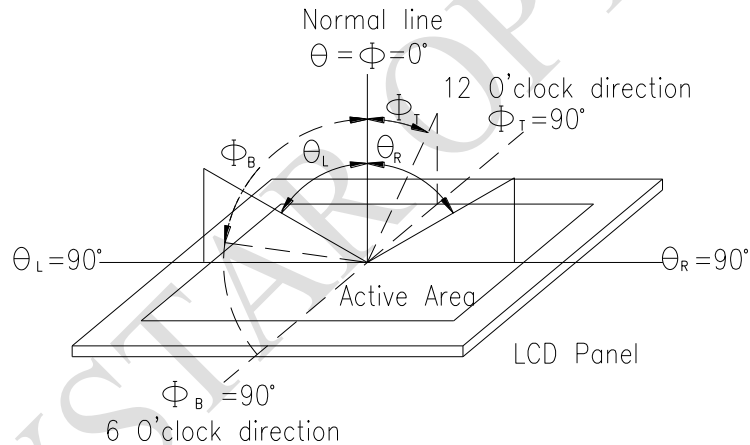


Fig 11.1. Definition of viewing angle

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-7or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

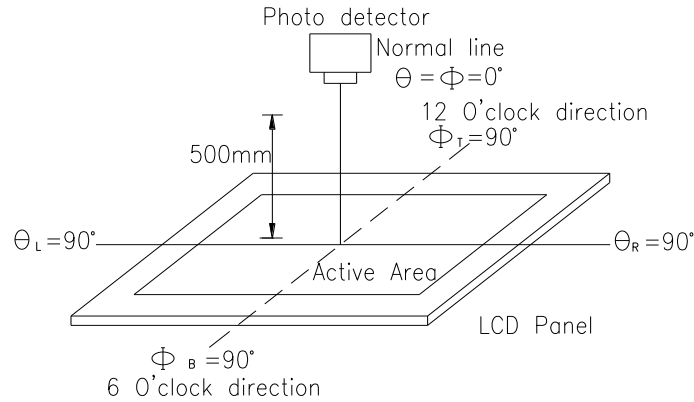
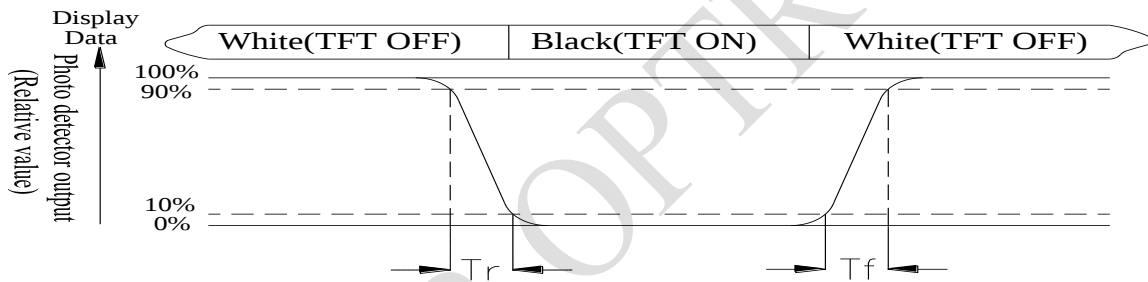


Fig 11.2. Optical measurement system setup

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 (Refer Fig. 8.3). 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

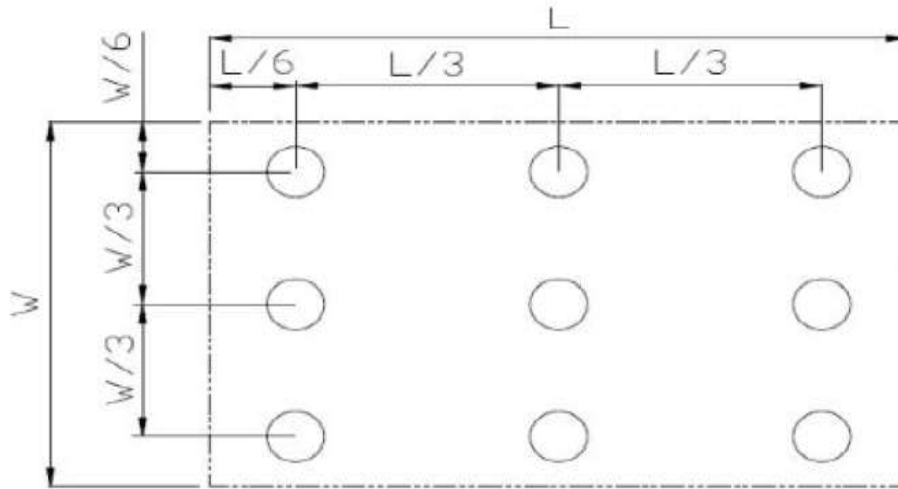


Fig 11.3. Definition of uniformity

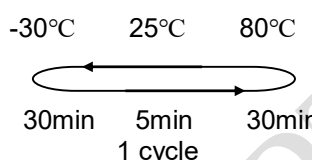
Note 6: Definition of color chromaticity (CIE 1931)

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.

12. Reliability

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

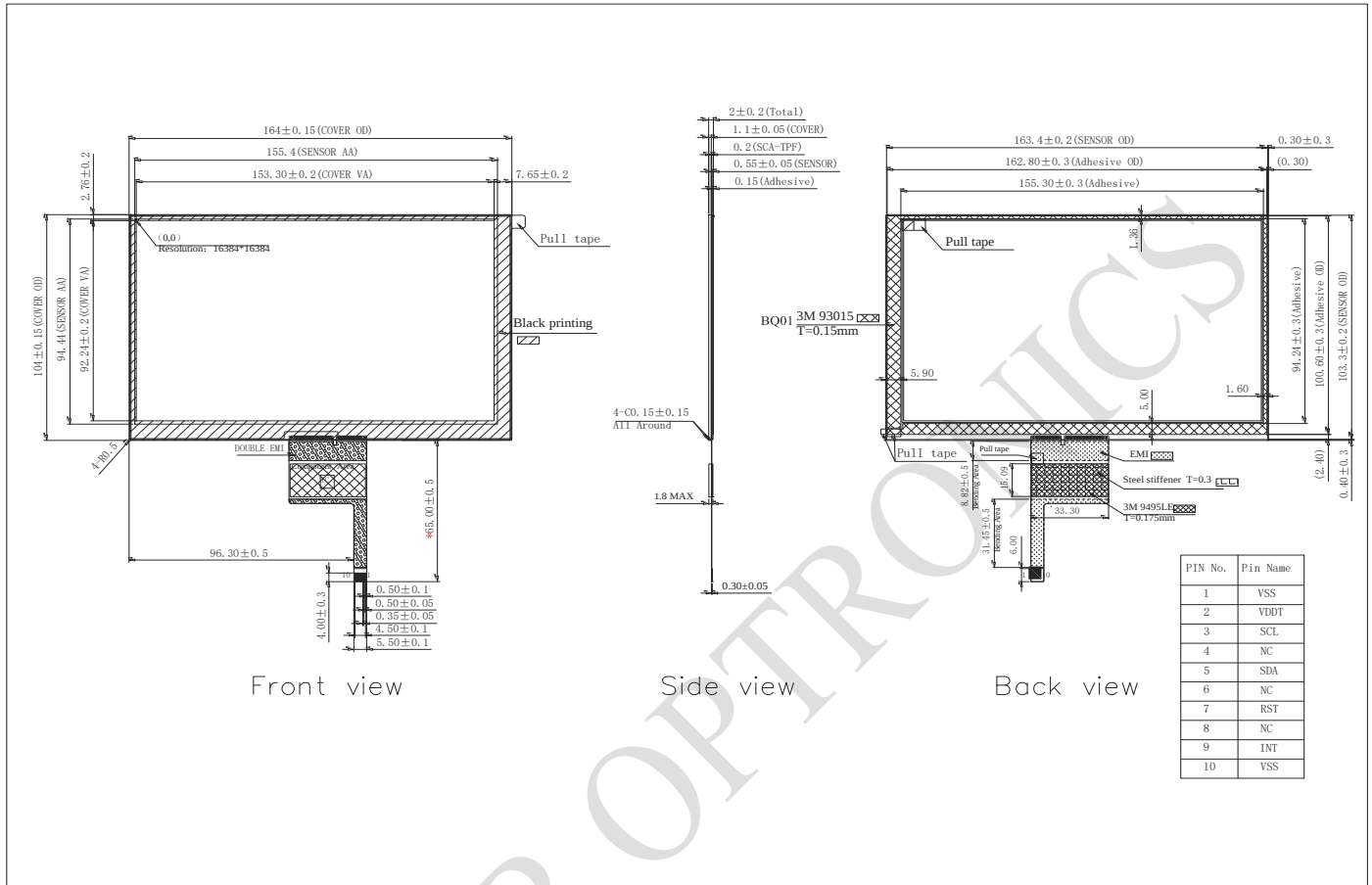
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	85°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-40°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	80°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30°C 200hrs	1
High Temperature/ Humidity storage	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 	-30°C/80°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.

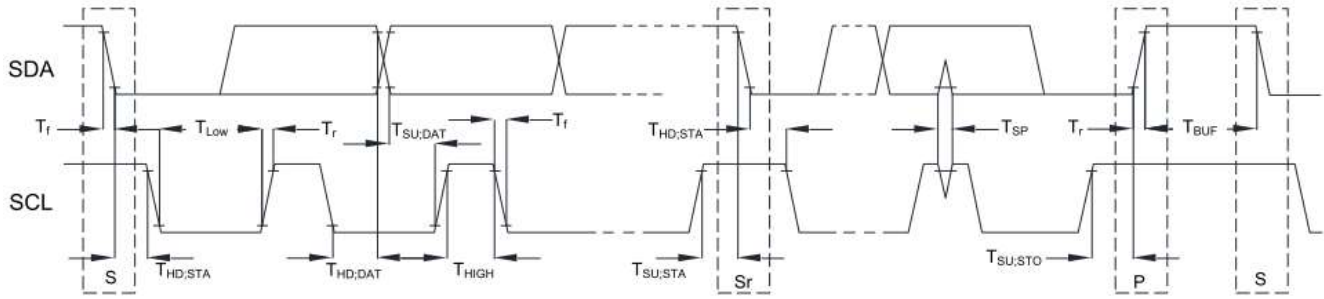
Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

13.Touch Panel Information

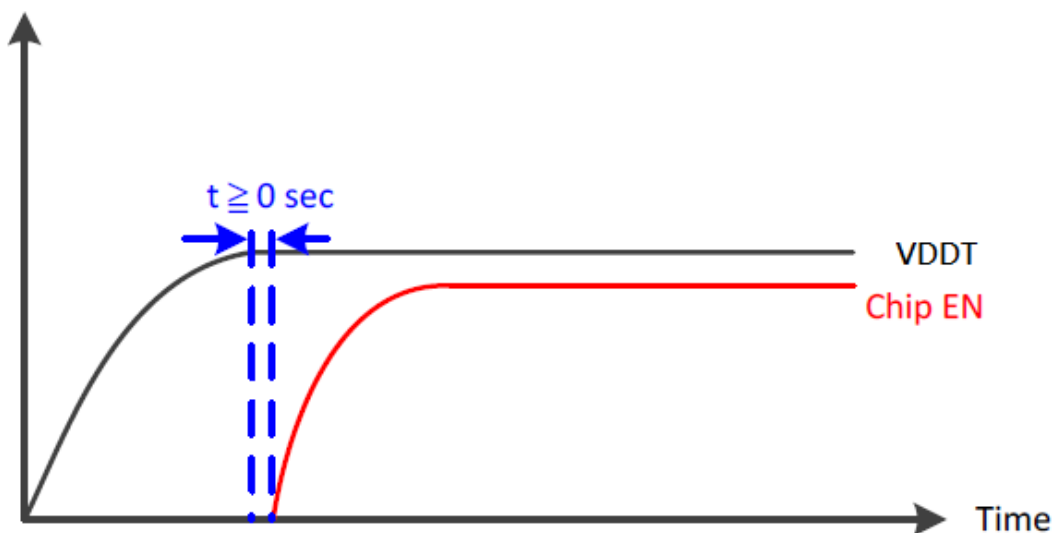


13.1. I2C AC Characteristics

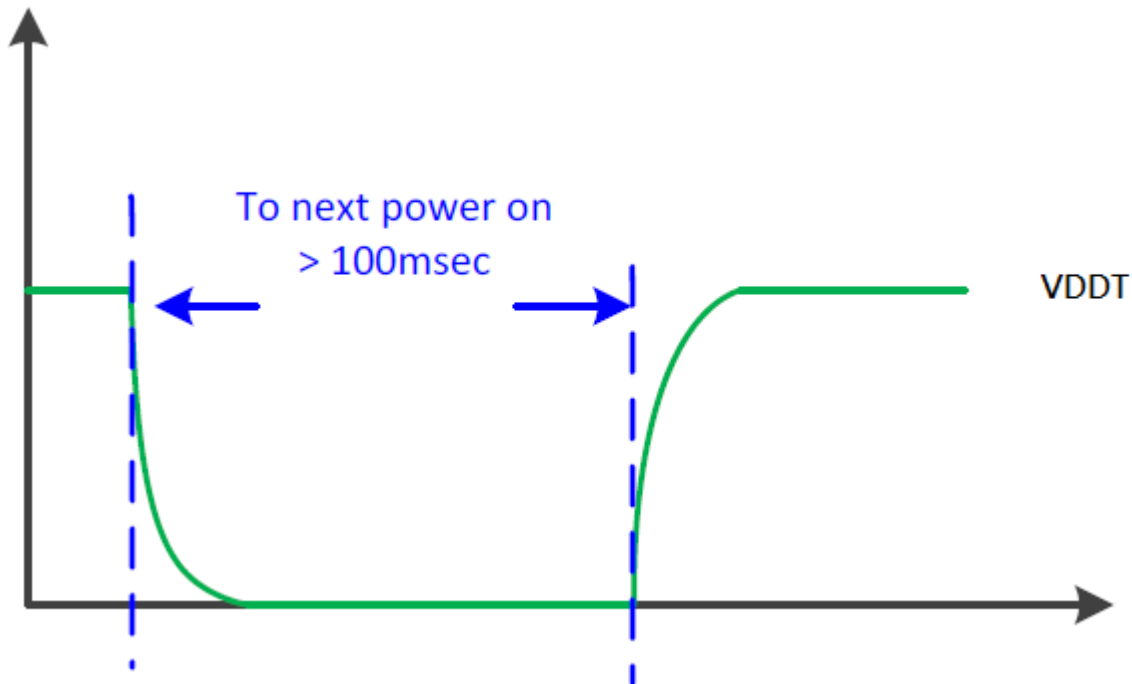


Item	Symbol	100kHz		400kHz		Unit
		Min.	Max.	Min.	Max.	
SCL standard mode clock frequency	FSCL	0	100	0	400	kHz
Hold time (repeated) START condition. After this period, the first clock is generated.	THD;STA	4	--	0.6	--	us
LOW period of the SCL clock	TLOW	4.7	--	1.3	--	us
HIGH period of the SCL clock	THIGH	4	--	0.6	--	us
Setup time for a repeat START condition.	TSU;STA	4.7	--	0.6	--	us
Data hold time	THD;DAT	0	3.45	0	0.9	us
Data setup time	TSU;DAT	250	--	100	--	ns
Rising time of both SDA and SCL signals	Tr	--	1000	--	300	ns
Falling time of both SDA and SCL signals	Tf	--	300	--	300	ns
Setup time for STOP condition.	TSU;STO	4	--	0.6	--	us
Free time between STOP and START condition	TBUF	4.7	--	1.3	--	us
Pulse width of spikes which must be suppressed by input filter	TSP	--	--	0	50	ns

13.2. Power On Sequence



13.3. Power Off to Power On Sequence



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 : / /