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RFF700A4-AWH-DNN

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	2019/01/04		First issue

RAYSTAR OPTRONICS

Contents

1.Module Classification Information

2.Summary

3.General Specification

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.Other

1.Module Classification Information

R	F	F	70	0A4	-	A	W	H	-	D	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 : 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

TFT 7.0" is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel and a driving circuit.

This TFT LCD has a 7.0 (15:9) inch diagonally measured active display area with WVGA (800 horizontal by 480 vertical pixel) resolution.

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 6.5(D) mm
- Active area: 152.40 x 91.44 mm
- Dot pitch: 0.1905 x 0.1905 mm
- LCD type: TFT, Normally Black, Transmissive
- TFT Interface: 24-bit RGB
- TFT Driver IC: TBDNT51632T + NT52601TT
- View Direction: 85/85/85/85
- Aspect Ratio: 16:9
- Backlight Type: LED, Normally White
- With /Without TP: Without TP
- Surface: Glare,3H

*Color tone slight changed by temperature and driving voltage.

4.Interface

4.1. LCM PIN Definition

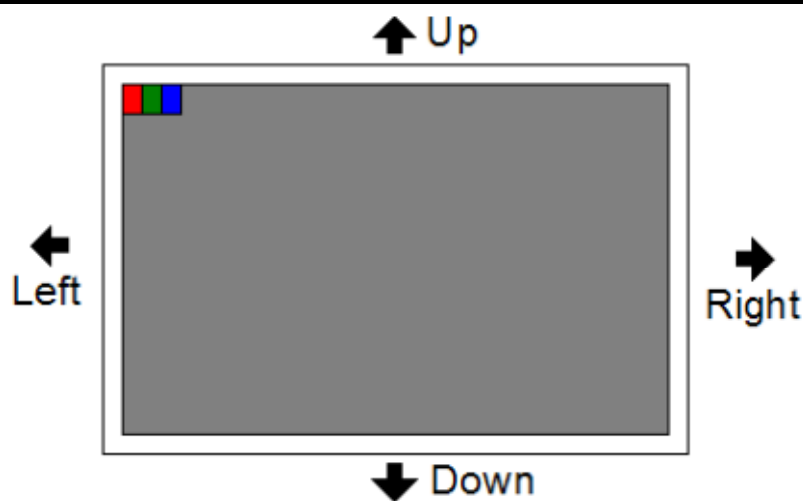
Pin	Symbol	Function	Remark
1	AGND	Analog Ground	
2	AVDD	Analog Power	
3	VCC	Digital Power	
4	R0	Red data(LSB)	
5	R1	Red data	
6	R2	Red data	
7	R3	Red data	
8	R4	Red data	
9	R5	Red data	
10	R6	Red data	
11	R7	Red data(MSB)	
12	G0	Green data(LSB)	
13	G1	Green data	
14	G2	Green data	
15	G3	Green data	
16	G4	Green data	
17	G5	Green data	
18	G6	Green data	
19	G7	Green data(MSB)	
20	B0	Blue data(LSB)	
21	B1	Blue data	
22	B2	Blue data	
23	B3	Blue data	
24	B4	Blue data	
25	B5	Blue data	
26	B6	Blue data	
27	B7	Blue data(MSB)	
28	DCLK	Clock input	
29	DE	Data enable signal	
30	HSD	Horizontal sync input. Negative polarity	

31	VSD	Vertical sync input. Negative polarity	
32	MODE	DE/SYNC mode select .normally pull low H: HV mode L: DE mode Suggest used DE mode, float HSD & VSD pin	
33	RSTB	Global reset pin. Normally pull high. H: normal operation. L: the controller is in reset state. Suggest to connecting with an RC (10KΩ, 0.1μF) reset circuit for stability.	
34	STBYB	Standby mode. Normally pull low. H: normal operation. L: the controller and source driver will turn off. Suggest to connecting with an RC (10KΩ, 0.47μF) reset circuit for stability.	
35	SHLR	Left or Right Display Control. Note1.	
36	VCC	Digital Power	
37	UPDN	Up / Down Display Control. Note1	
38	GND	Digital Ground	
39	AGND	Analog Ground	
40	AVDD	Analog Power	
41	VCOM	For external VCOM DC input	
42	N/C	Not connect	
43	N/C(BIST)	Not connect (Option Aging mode on/off control. Please float this pin)	
44	N/C	Not connect	
45	N/C	Not connect	
46	N/C	Not connect	
47	N/C	Not connect	
48	N/C(CSB)	Not connect (Option Serial communication chip selection. Please float this pin.)	
49	N/C(SCL)	Not connect (Option Serial communication clock pin. Please float this pin.)	
50	N/C(SDO)	Not connect (Option Serial communication data out pin. Please float this pin.)	
51	N/C(SDI)	Not connect (Option Serial communication data pin. Please float this pin.)	
52	N/C	Not connect	
53	N/C(VPP_T)	Not connect (Option Power supply for trim function. Please float this pin.)	

54	N/C	Not connect	
55	N/C	Not connect	
56	VGH	Positive Power for TFT	
57	VCC	Digital Power	
58	VGL	Negative Power for TFT	
59	GND	Digital Ground	
60	N/C	Not connect	

Note1 : SHLR and UPDN control function

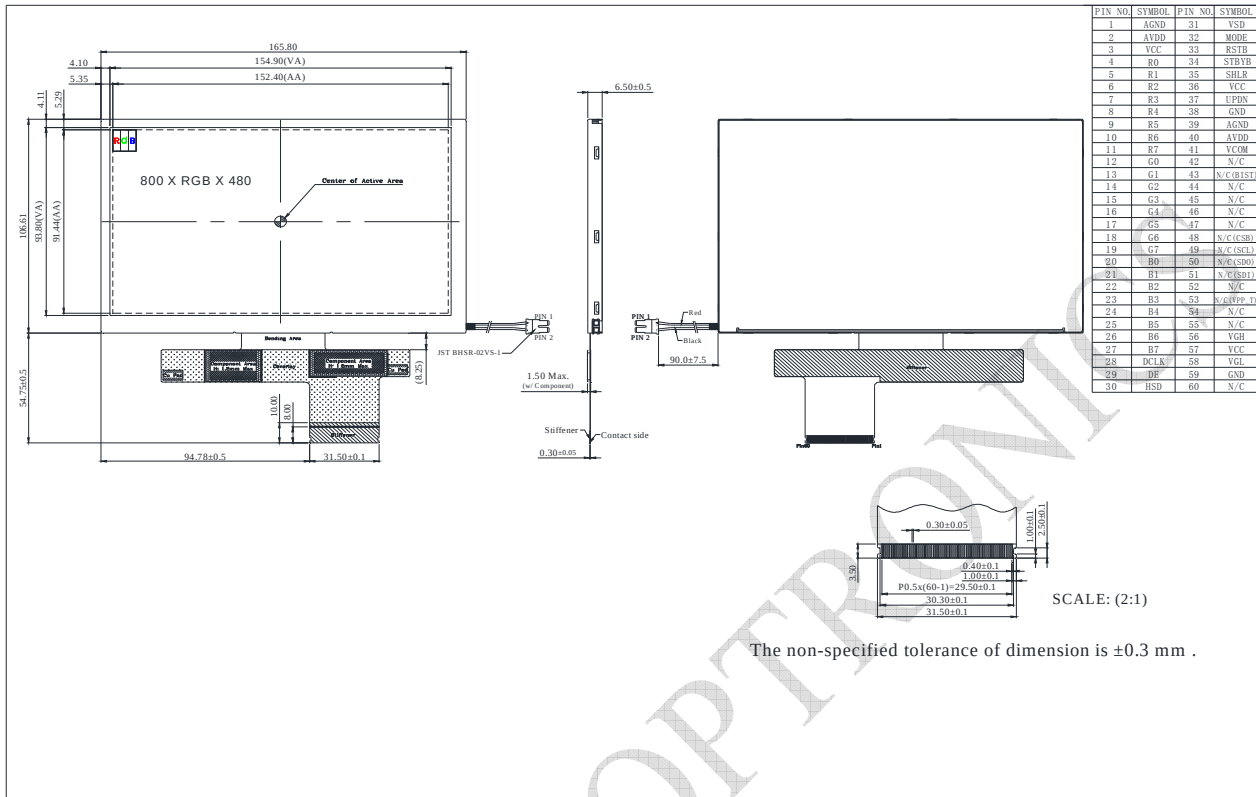
SHLR	UPDN	Data shifting
H	H	Left→Right, Up→Down
L	H	Right→Left, Up→Down
L	L	Right→Left, Down→Up
H	L	Left→Right, Down→Up



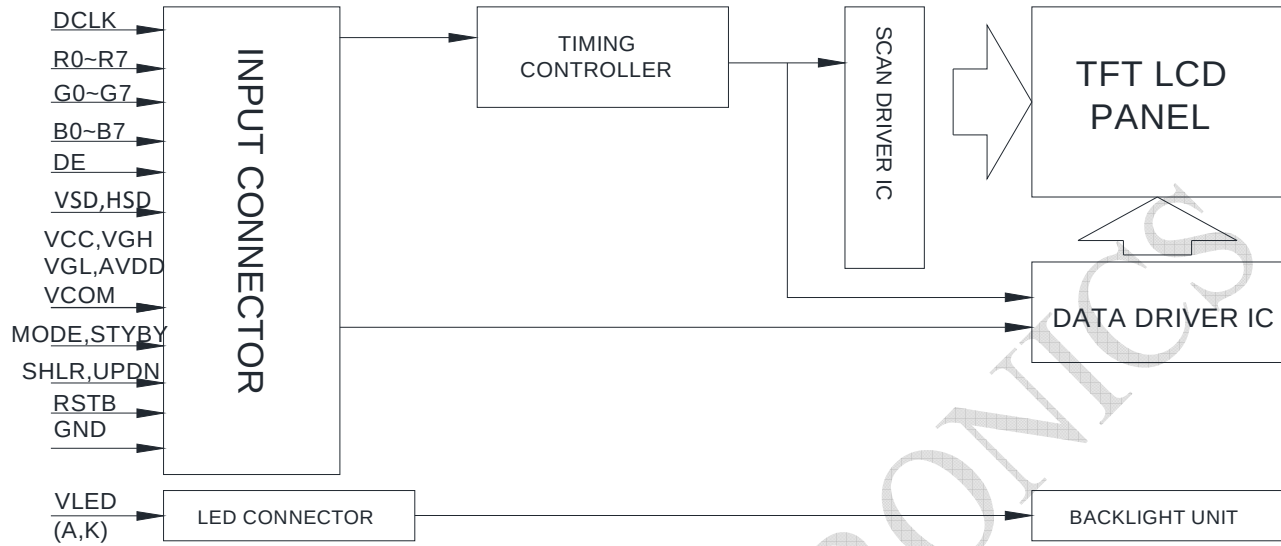
4.2. Backlight PIN Definition

Pin No.	Symbol	Description
1	A	Red, LED_ Anode
2	K	Black, LED_ Cathode

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	—	+90	°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	Vcc	3.0	3.3	3.6	V	
	VGH	—	19	—	V	
	VGL	—	-10	—	V	
	AVDD	—	12.4	—	V	
VCOM	VCOMin	—	5.5	—	V	
Input signal voltage	ViH	0.7*Vcc	—	Vcc	V	Note (1)
	ViL	0	—	0.3*Vcc	V	
Current of power supply	IDD	—	15	—	mA	Vcc =3.3V
	IADD	—	20	—	mA	AVDD=12.4V (Black)
	IGH	—	0.25	—	mA	VGH=19V
	IGL	—	0.50	—	mA	VGL=-10V

Note (1): HSYNC, VSYNC, DE, Digital Data

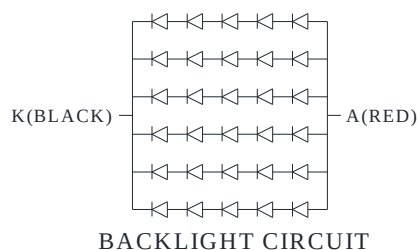
Note (2): Be sure to apply the power voltage as the power sequence spec.

Note (3): GND=AGND=0V

8.2. LED driving conditions

Parameter	Symbol	Min	Typ	Max	Unit	Remark
LED current	—	—	360	—	mA	
LED voltage	A~K	13.5	15.0	17.2	V	Note 1
LED Life Time	—	50000	—	—	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



Note 2 : Ta = 25 °C

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

Note 4 : The single LED lamp case

9.DC CHARATERISTICS

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	

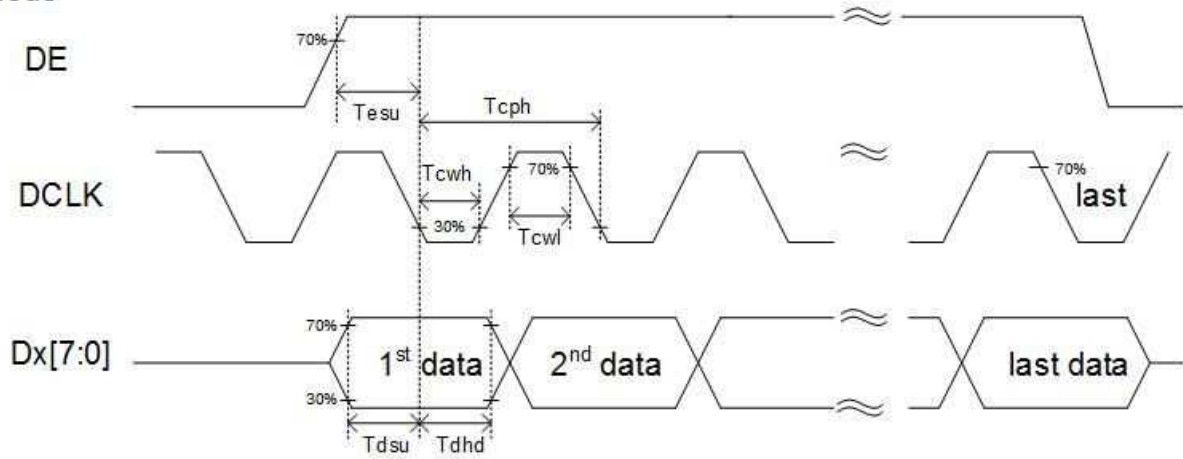
10.AC CHARATERISTICS

10.1. AC Characteristics

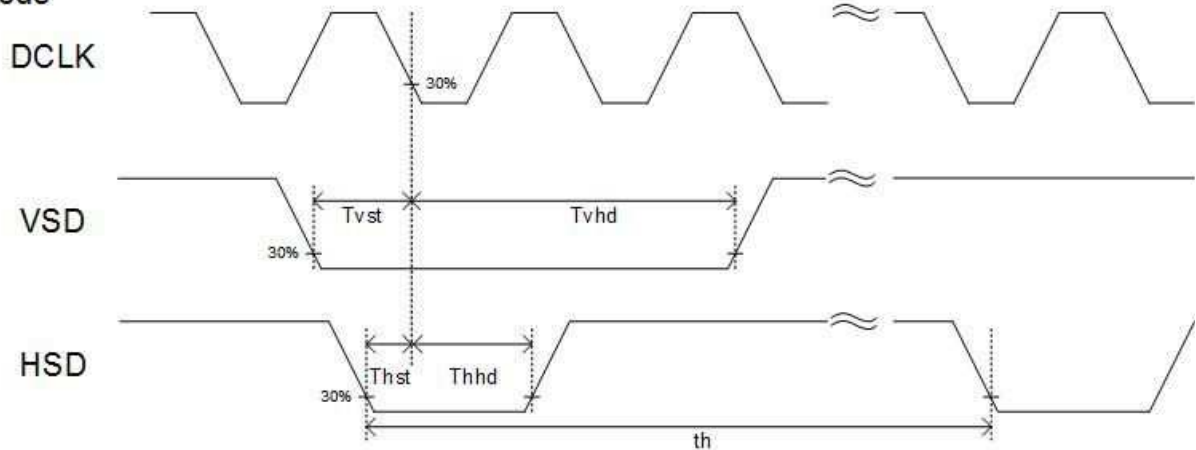
Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tcph	20		220	ns	
DCLK pulse duty	Tcwh	35	50	65	%	
VSD setup time	Tvst	8			ns	
VSD hold time	Tvhd	8			ns	
HSD setup time	Thst	8			ns	
HSD hold time	Thhd	8			ns	
Data setup time	Tdsu	8			ns	
Data hold time	Tdhd	8			ns	
DE setup time	Tesu	8			ns	
DE hold time	Tehd	8			ns	
DCLK frequency	fclk	28	30	32	MHz	
Horizontal display area	thd	800			Tcph	
HSD period time	th	899	902	915	Tcph	
HSD pulse width	thpw	5	10	15	Tcph	
HSD back porch	thb	32			Tcph	
HSD front porch	thfp	52	60	68	Tcph	
Vertical display area	tvd	480			th	
VSD period time	tv	546	555	564	th	
VSD pulse width	tvpw	6	10	14	th	
VSD back porch	tvb	5			th	
VSD front porch	tvfp	55	60	65	th	

10.2. Timing Diagram of Interface Signal

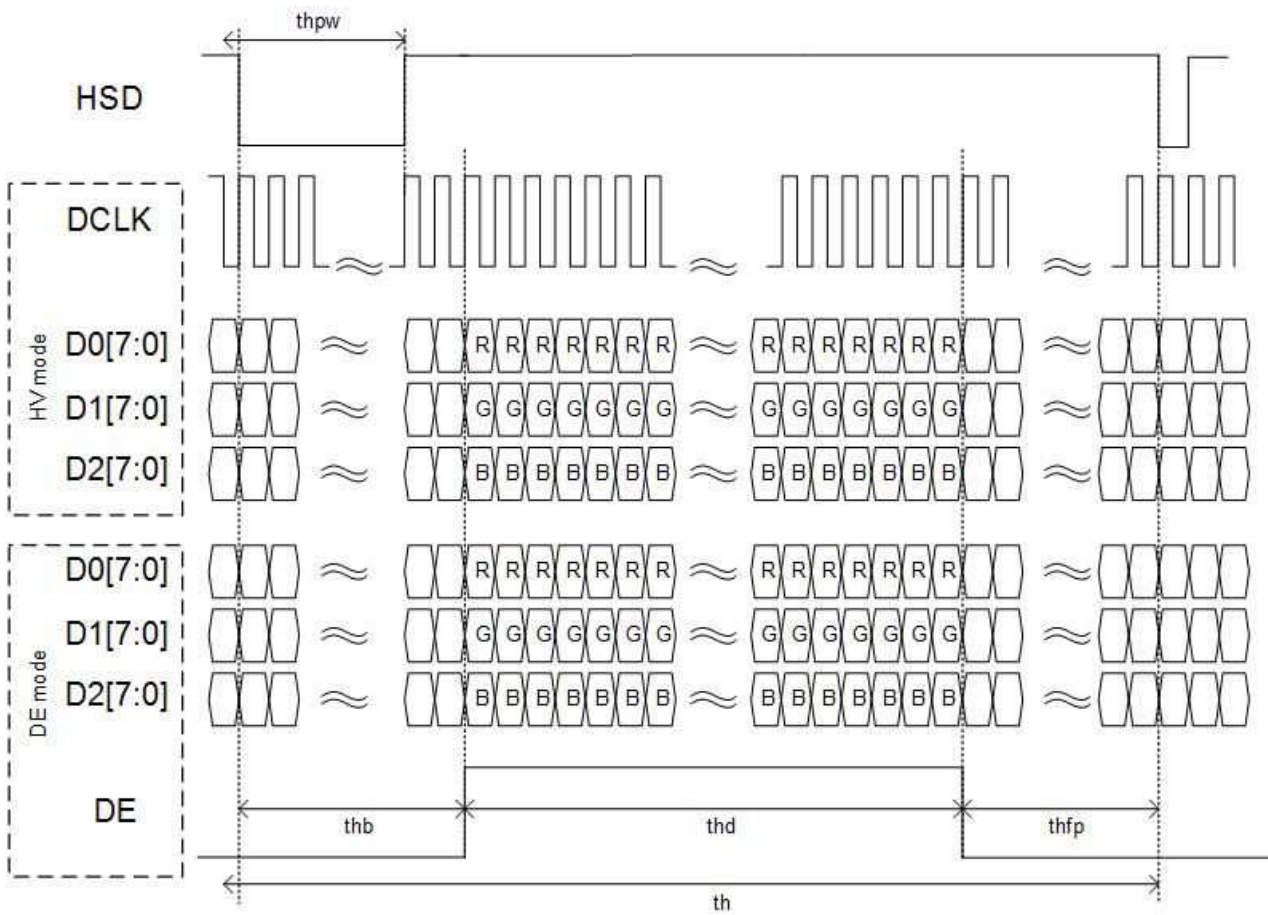
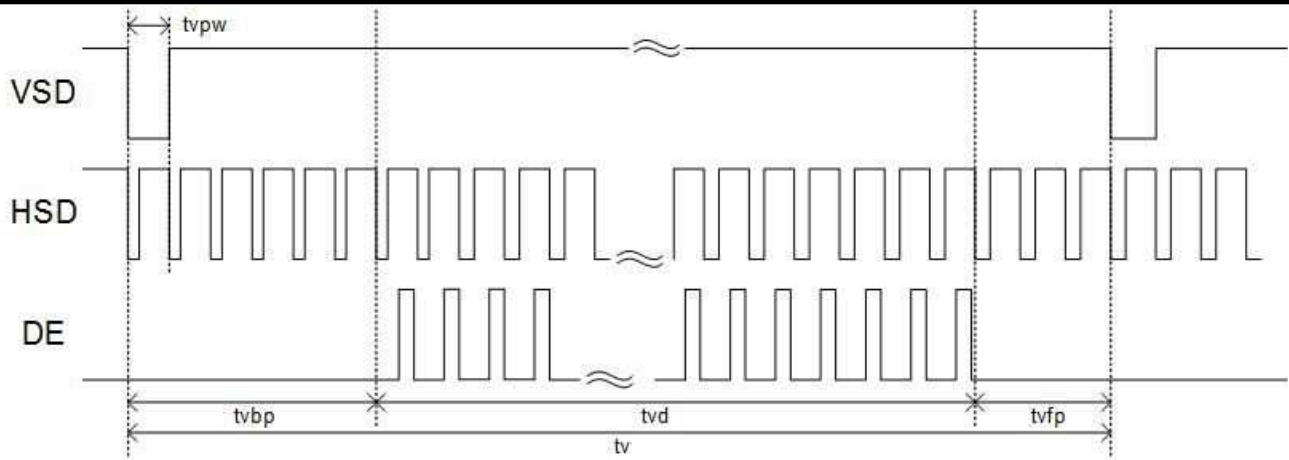
DE mode



HV mode

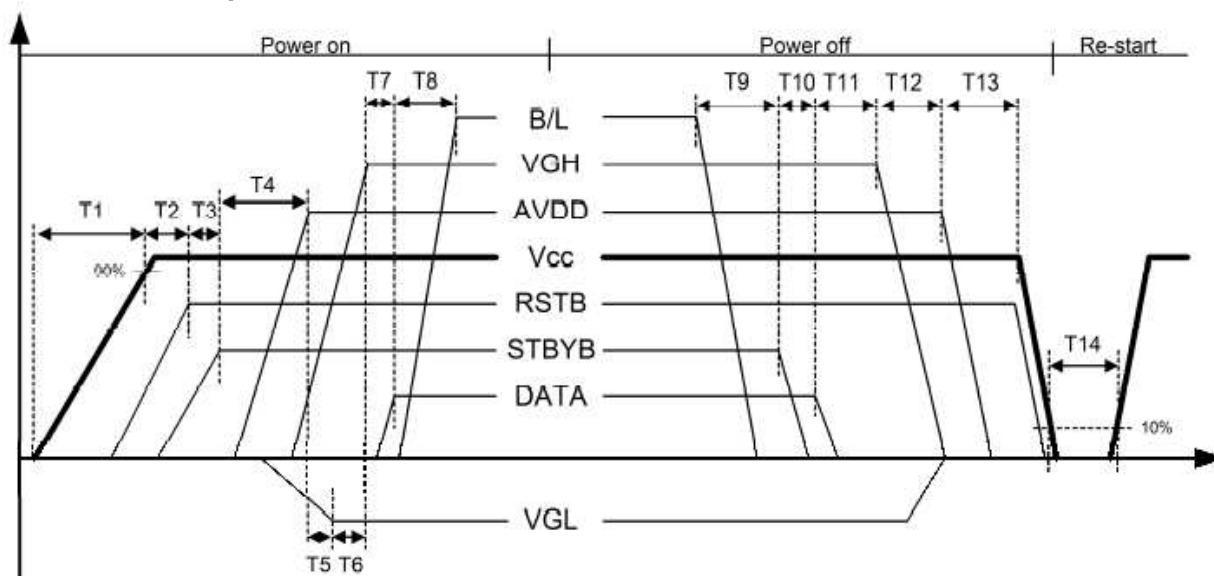


Input clock and data timing diagram.



DATA input format

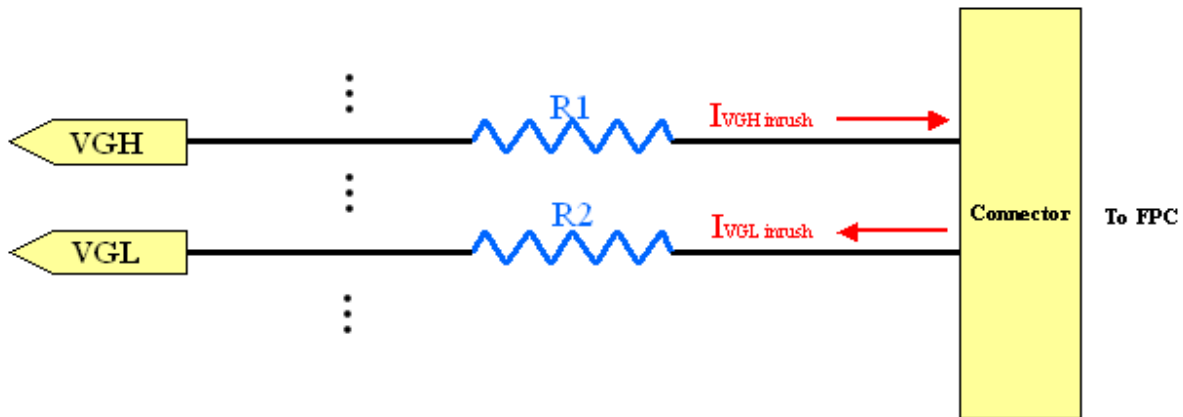
10.3. Power Sequence



Item	Min	Typ.	Max.	Unit
T1	—	—	20	ms
T2	1	—	—	ms
T3	1	—	—	ms
T4	50	—	—	ms
T5	32	—	—	ms
T6	16	—	—	ms
T7	16	—	—	ms
T8	32	—	—	ms
T9	32	—	—	ms
T10	32	—	—	ms
T11	50	—	—	ms
T12	16	—	—	ms
T13	32	—	—	ms
T14	1000	—	—	ms

The Data are included in the R0~R7, G0~G7, B0~B7, HSD, VSD, DCLK, DE, MODE, SHLR, and UPDN.

10.4. Reference circuit for inrush current limit resistor of VGH/VGL



Note: R1 = VGH inrush current limit resistor. Tune R1 resistor to make VGH inrush current less than 100mA.

R2 = VGL inrush current limit resistor. Tune R2 resistor to make VGL inrush current less than 100mA.

11. Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$	-	30	40	.ms	Note 3
		Tf						
Contrast ratio		CR	At optimized viewing angle	700	1000	-	-	Note 4
Color Chromaticity	White	Wx	$\theta=0^{\circ}$ 、 $\Phi=0$	0.253	0.303	0.353	-	Note 2,6,7
		Wy		0.273	0.323	0.373	-	
Viewing angle	Hor.	Θ R	$CR \geq 10$	80	85	-	Deg	Note 1
		Θ L		80	85	-		
	Ver.	Φ T		80	85	-		
		Φ B		80	85	-		
Brightness		-	-	800	1000	-	cd/m ²	Center of display
Uniformity		(U)	-	70	-	-	%	Note 5

Ta=25±2℃, IL=360mA

Note 1: Definition of viewing angle range

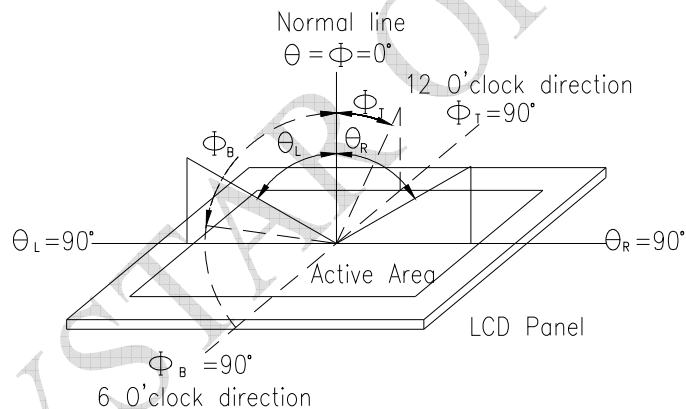


Fig. 11.1. Definition of viewing angle

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

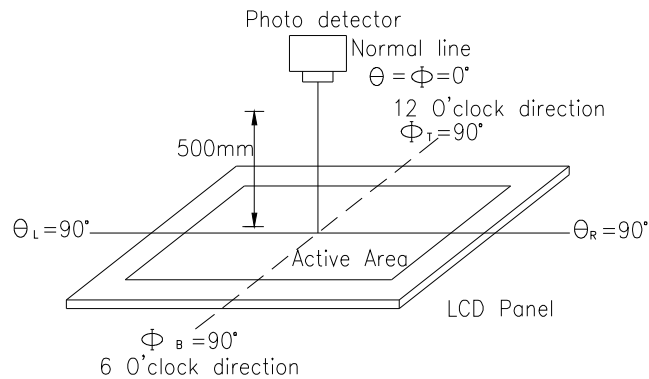
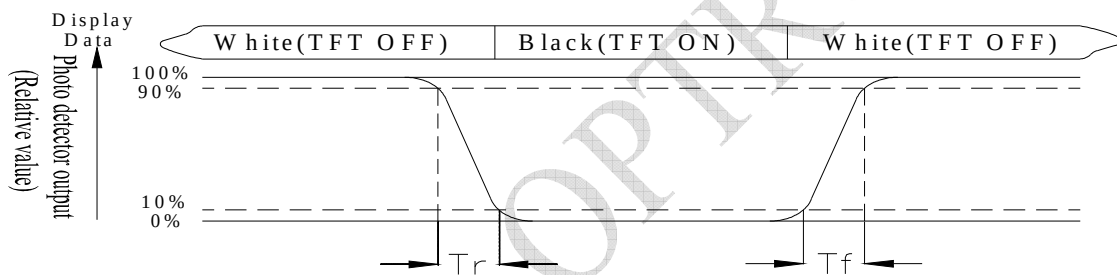


Fig. 11.2. Optical measurement system setup

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 (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

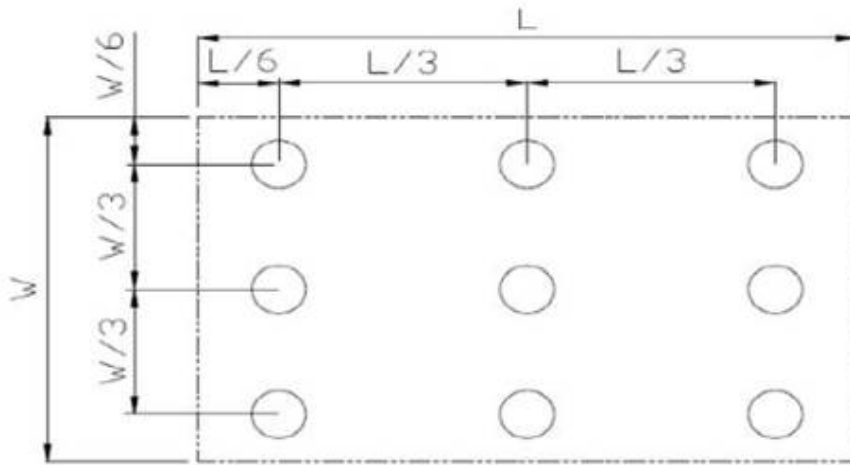


Fig 11.3. Definition of uniformity

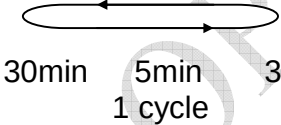
Note 6: Definition of color chromaticity (CIE 1931)

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.	90°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.

LCM Sample Estimate Feedback Sheet		
Module Number : _____		
1 、 <u>Panel Specification</u> :		
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 、 <u>Mechanical Specification</u> :		
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 、 <u>Relative Hole Size</u> :		
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 、 <u>Backlight Specification</u> :		
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 : / /