



RAYSTAR

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RFG560B-AIW-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	2015/08/28		First issue
A	2016/01/21		Modify Static electricity test
B	2016/08/11		Modify Vibration test
C	2019/05/28		Add Uniformity Modify Summary Add Aspect Ratio

RAYSTAR OPTRONICS

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1. Module Classification Information
2. Summary
3. General Specification
4. Interface
5. Contour Drawing
6. Absolute Maximum Ratings
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10. Reliability
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RAYSTAR OPTRONICS

2.Summary

TFT 5.6" is a TN transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT_LCD module, It is usually designed for industrial application and this module follows RoHs

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3. General Specifications

- Size: 5.6 inch(Diagonal) inch
- Dot Matrix: 640 × (RGB) × 480 dots
- Module dimension: 126.5(W) × 100(H) × 5.7(D) mm
- Active area: 112.896 (W) × 84.672(H) mm
- Dot pitch: 0.0588(W) × 0.1764(H) mm
- LCD type: TFT, Normally White ,Transmissive
- View Direction: 12 o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Aspect Ratio: 4:3
- Backlight Type: LED, Normally White
- With /Without TP: Without TP
- Surface: Anti-Glare

*Color tone slight changed by temperature and driving voltage.

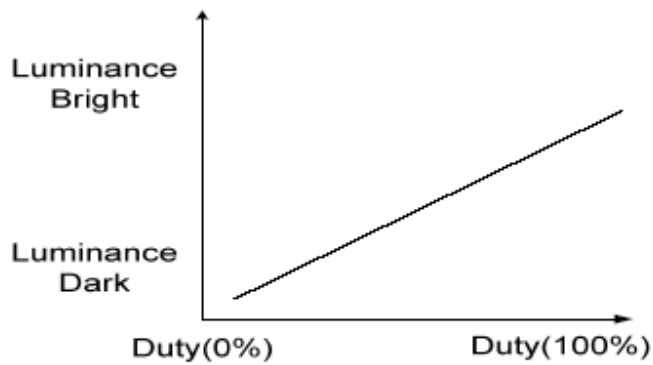
4.Interface

4.1. LCM PIN Definition

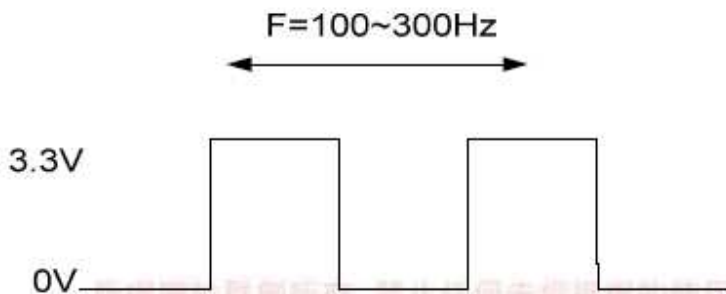
Pin No.	Symbol	I/O	Function	Remark
1	VLED	P	Power Voltage for LED circuit	
2	VLED	P	Power Voltage for LED circuit	
3	ADJ	I	Adjust the LED brightness with PWM Pulse	Note1,2
4	GLED	P	Ground for LED circuit	
5	GLED	P	Ground for LED circuit	
6	VCC	P	Power Voltage for digital circuit	
7	VCC	P	Power Voltage for digital circuit	
8	MODE	I	DE or HV mode control	Note 3
9	DE	I	Data enable	
10	VS	I	Vsync signal input	
11	HS	I	Hsync signal input	
12	GND	P	Power ground	
13	B5	I	Blue data input (MSB)	
14	B4	I	Blue data input	
15	B3	I	Blue data input	
16	GND	P	Power ground	
17	B2	I	Blue data input	
18	B1	I	Blue data input	
19	B0	I	Blue data input(LSB)	
20	GND	P	Power ground	
21	G5	I	Green data input(MSB)	
22	G4	I	Green data input	
23	G3	I	Green data input	
24	GND	P	Power ground	
25	G2	I	Green data input	
26	G1	I	Green data input	
27	G0	I	Green data input(LSB)	
28	GND	P	Power ground	
29	R5	I	Red data input(MSB)	
30	R4	I	Red data input	
31	R3	I	Red data input	
32	GND	P	Power ground	
33	R2	I	Red data input	

34	R1	I	Red data input	
35	R0	I	Red data input(LSB)	
36	GND	P	Power ground	
37	DCLK	I	Sample clock	
38	GND	P	Power ground	
39	L/R	I	Select left to right scanning direction	Note4,5
40	U/D	I	Select up or down scanning direction	Note4,5

Note: I: input, O: output t, P: Power
 Note1: Pin.3 is used to adjust brightness.



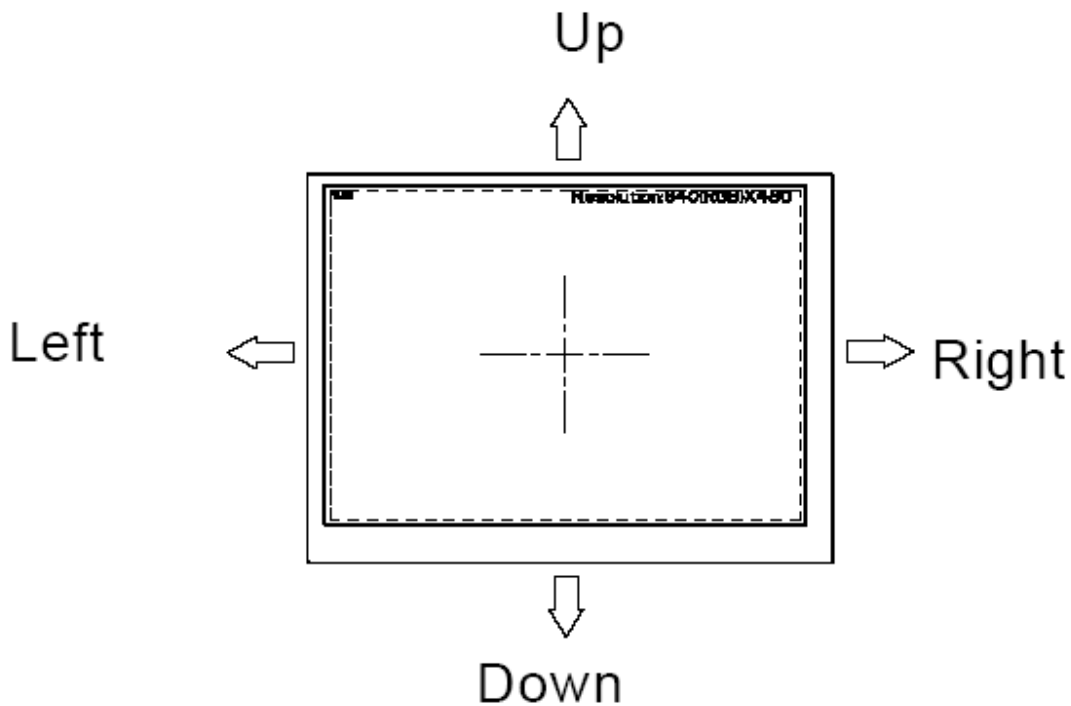
Note 2:ADJ signal=0~3.3V,operation frequency:100~300Hz



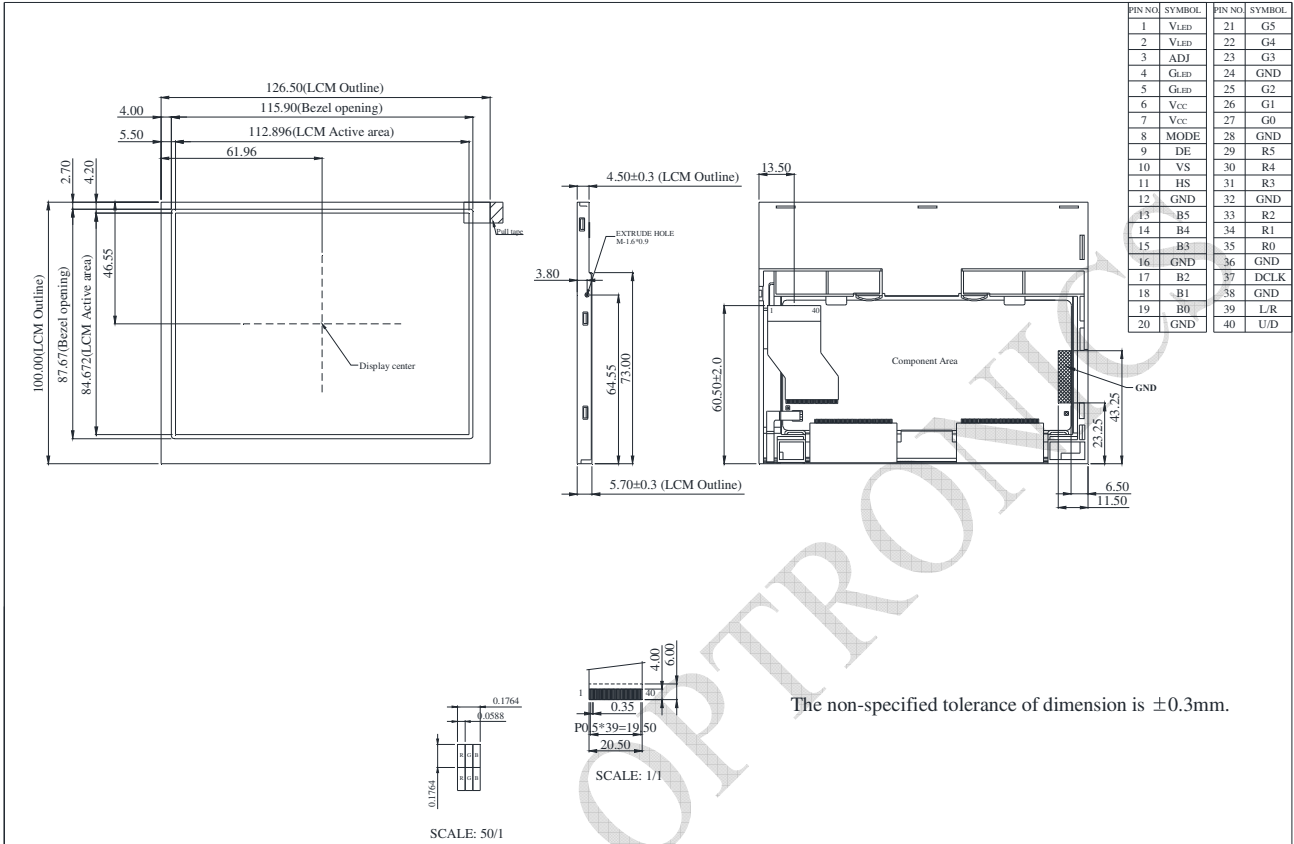
Note 3: DE Mode, Mode="H", HS floating and VS floating
 HV Mode, Mode="L" and DE floating
 Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	VCC	Up to down, left to right
VCC	GND	Down to up, right to left
GND	GND	Up to down, right to left
VCC	VCC	Down to up, left to right

Note 5: Definition of scanning direction.
 Refer to the figure as below:



5. Contour Drawing



6. Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min.	MAX.		
Power voltage	Vcc	-0.3	6.5	V	
	VLED	-0.3	6.5	V	
Operation temperature	TOP	-20	70	°C	
Storage temperature	TST	-30	80	°C	

Note 1: The absolute maximum rating values of the module should not be exceeded. Once exceeded absolute maximum rating values, the characteristics of the module may not be recovered. Even in an extreme condition, may result in module permanently destroyed.

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7. Electrical Characteristics

7.1. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VCC	3.1	3.3	3.5	V	Note1
	VLED	4.8	5.0	5.2	V	Note2
Current Consumption	ICC	-	200	250	mA	
	ILED	-	380	450	mA	Note3
Input logic high voltage	VIH	0.7VCC	-	1VCC	V	Note 4
Input logic low voltage	VIL	0	-	0.3VCC	V	
LED life time		20000	-	-	Hr	Note 5

Note 1: Vcc setting should match the signals output voltage (refer to Note 4) of customer's system board.

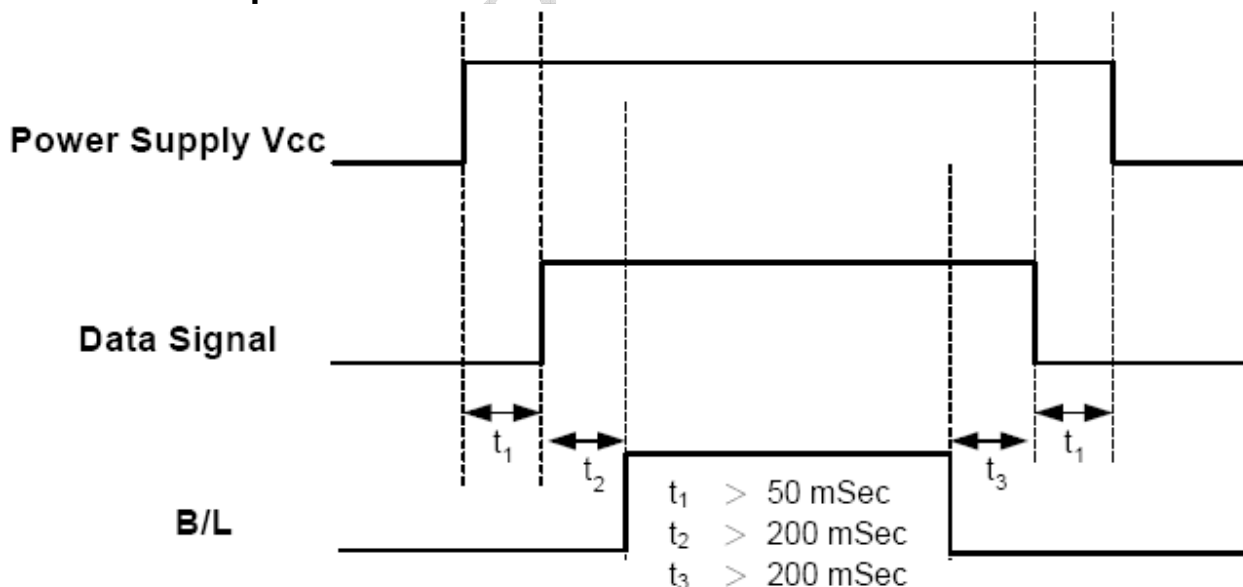
Note 2: LED driving voltage.

Note 3: LED driving current.

Note 4: DCLK, DE, HS, VS, R0~ R5,,G0~ G5,B0~ B5.

Note 5: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and VLED=5.0V. The LED lifetime could be decreased if operating VLED is larger than 5.0V.

7.2. Power Sequence



Note: Data includes DE, VS ,HS,B0~B5,G0~G5,R0~R5,DCLK.

8. Timing Characteristics

8.1. Timing Conditions

Input / Output Timing

Item	Symbol	Values			Unit.	Remark
		Min.	Typ.	Max.		
PXLCLK clock time	Tclk	33.3	39.7	-	ns	
PXLCLK pulse duty	Tcwh	40	50	60	%	Tclk
DATA set-up time	Tdsu	12	-	-	ns	DATA to PXLCLK
DATA hold time	Tdhd	12	-	-	ns	DATA to PXLCLK
DE setup time	Tesu	12	-	-	ns	DE to PXLCLK
VSYNC setup time	Tvst	12	-	-	ns	
VSYNC hold time	Tvhd	12	-	-	ns	
HSYNC setup time	Thst	12	-	-	ns	
HSYNC hold time	Thhd	12	-	-	ns	
HSYNC period time	Th	22.91	31.76	-	us	
HSYNC width	Thwh	1	-	-	Tclk	
VSYNC width	Tvwh	1	-	-	Th	
HSYNC to CLKIN	Thc	-	-	1	Tclk	

DE Mode input Timing Limitation

HV Mode	Values			Unit	Remark
	Min.	Typ.	Max.		
THC	48	160	765	tclk	
THD	640	640	640	tclk	
TH	688	800	1405	tclk	1TH=1line
TVC	6	45	255	line	
TVD	480	480	480	line	
TV	486	525	735	line	1TV=1field

HV Mode input Timing Limitation

HV Mode	Values			Unit	Remark
	Min.	Typ.	Max.		
Thwh	-	10	-	tclk	
Thbp	-	134	-	tclk	
Thfp	-	16	-	tclk	
THD	-	640	-	tclk	
TH	-	800	-	tclk	1TH=1 line
Tvwh	-	2	-	line	
Tvbp	-	11	-	line	
Tvfp	-	32	-	line	
TVD	-	480	-	line	
TV	-	525	-	line	1TV=1 field

8.2. Timing Diagram

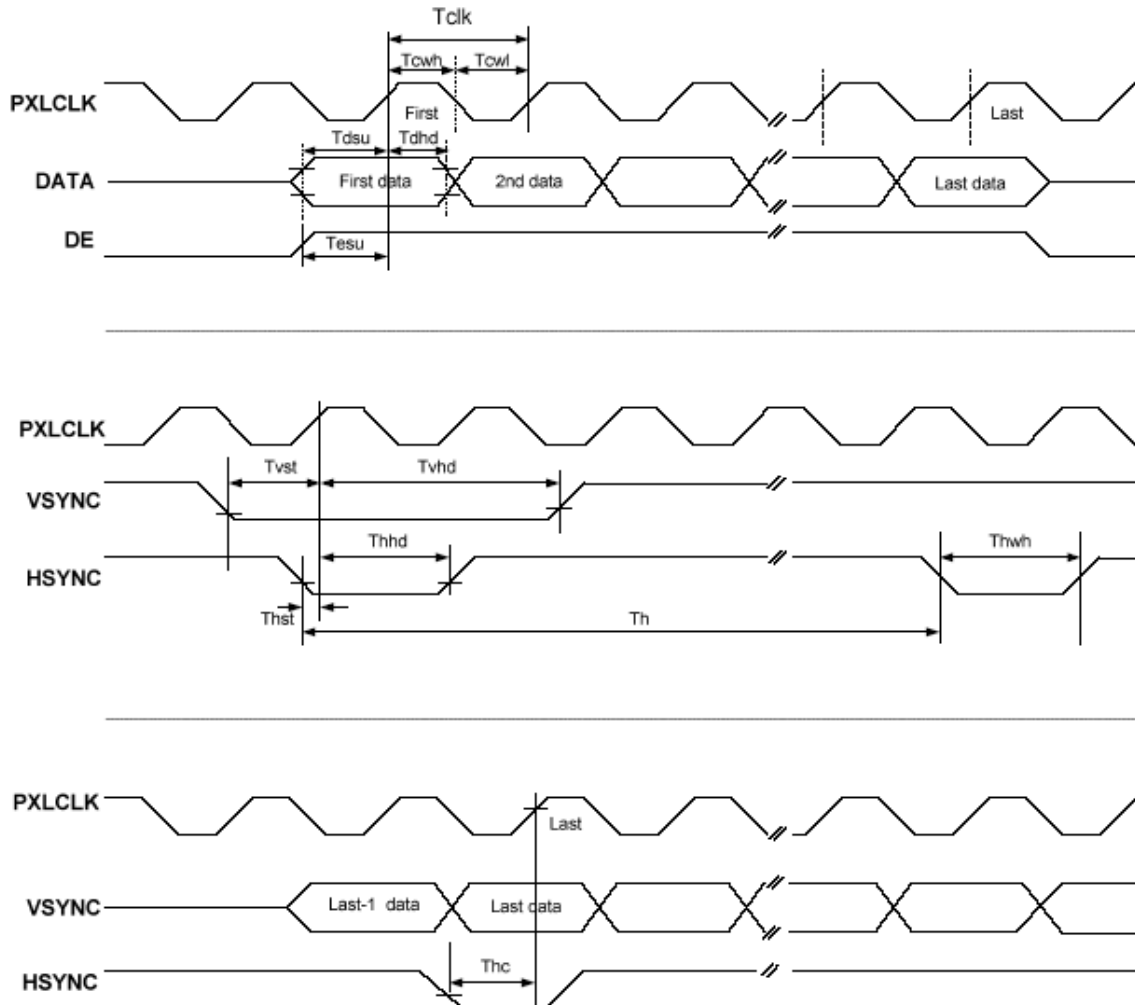


Fig. Clock and Data Input Timing Diagram

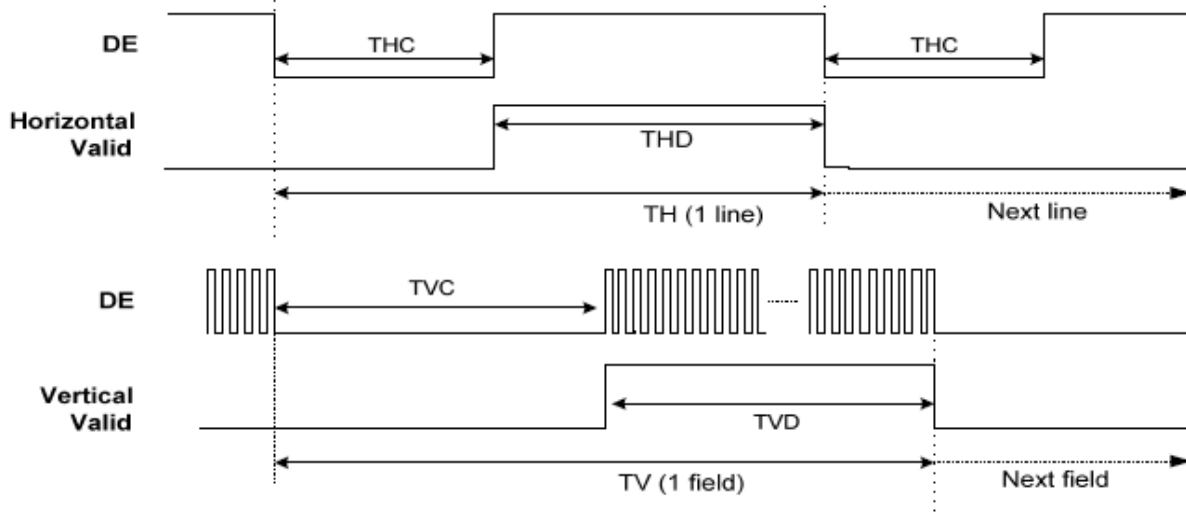


Fig. DE Mode Input Timing

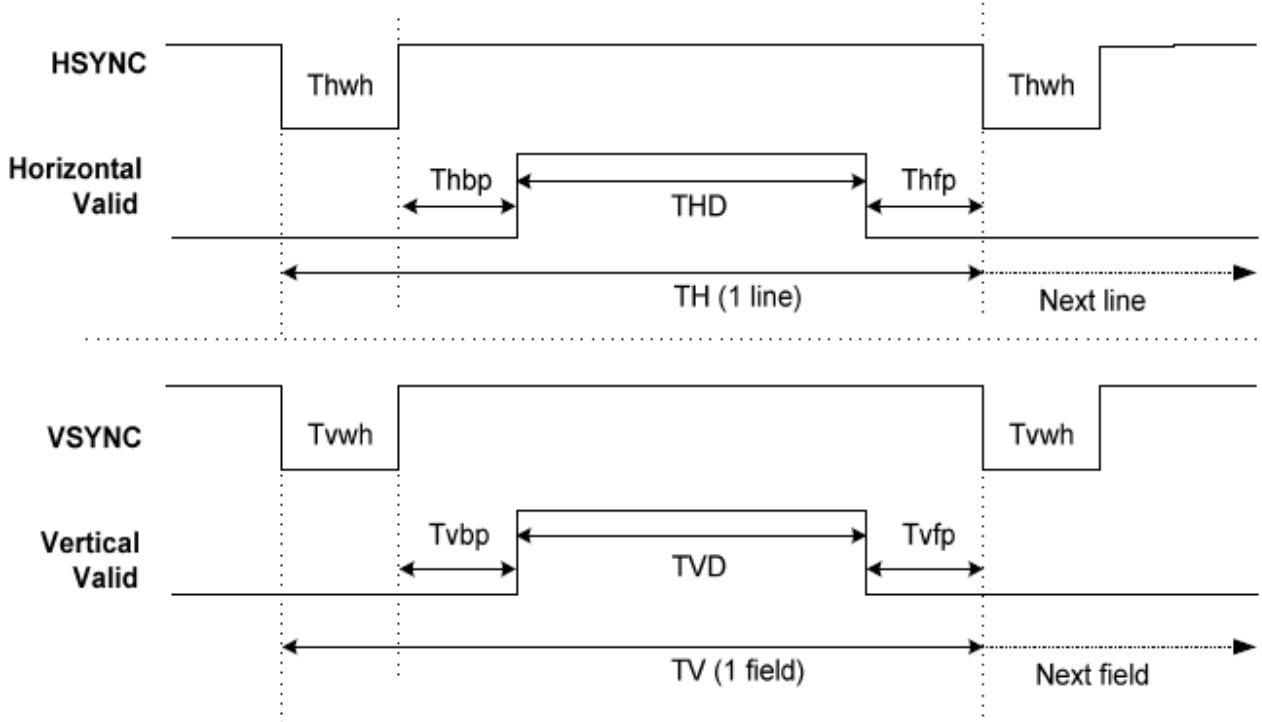


Fig HV Mode Input Timing

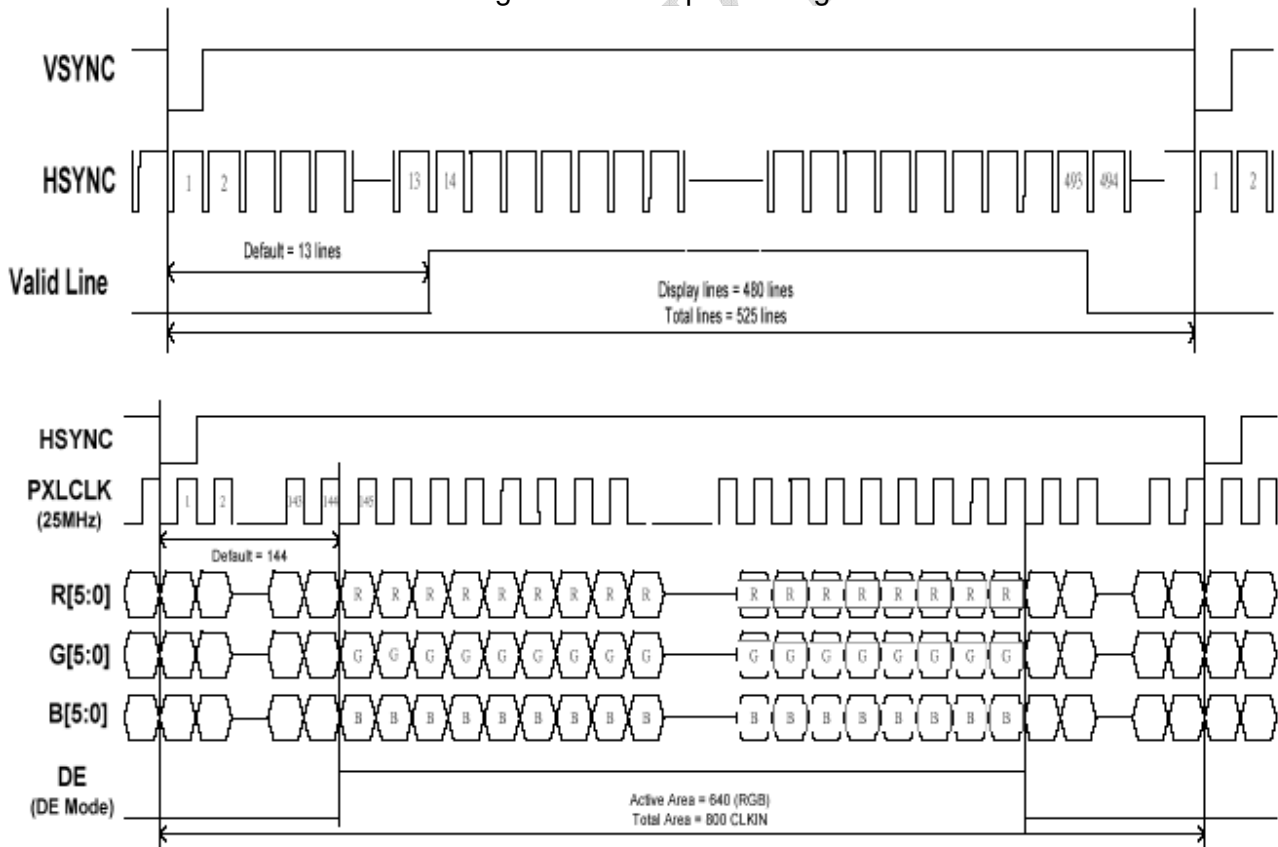


Fig. 18 bit RGB mode for 640 x (RGB) x 480

9. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response time	Tr	$\theta=0^\circ$ 、 $\Phi=0^\circ$	-	10	20	.ms	Note 3	
	Tf		-	15	30	.ms		
Contrast ratio	CR	At optimized viewing angle	400	500	-	-	Note 4	
Color Chromaticity	White	$\theta=0^\circ$ 、 $\Phi=0$	Wx	0.26	0.31	0.36	-	Note 2,5,6
			Wy	0.28	0.33	0.38	-	
Viewing angle	Hor.	$CR \geq 10$	ΘR	60	70	-	Deg.	Note 1
			ΘL	60	70	-		
	Ver.		ΦT	40	50	-		
			ΦB	60	70	-		
Brightness	-	-	280	350	-	cd/m ²	Center of display	
Uniformity	(U)	-	75	-	-	%	Note5	

Ta=25±2°C,

Note 1: Definition of viewing angle range

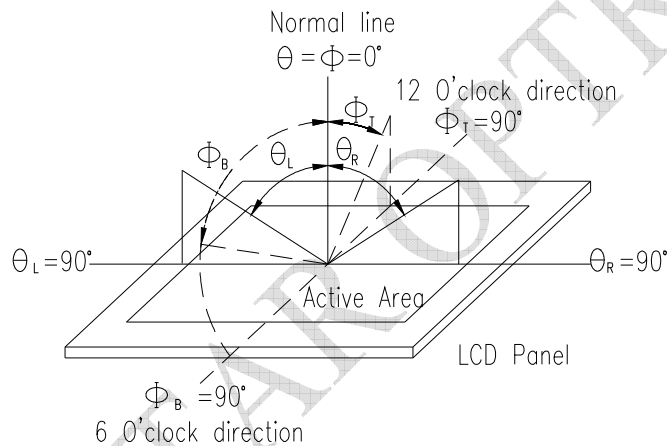


Fig. 9.1. Definition of viewing angle

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

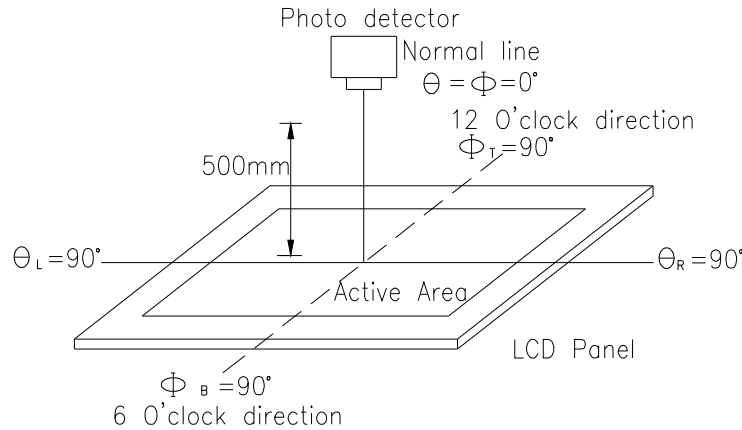
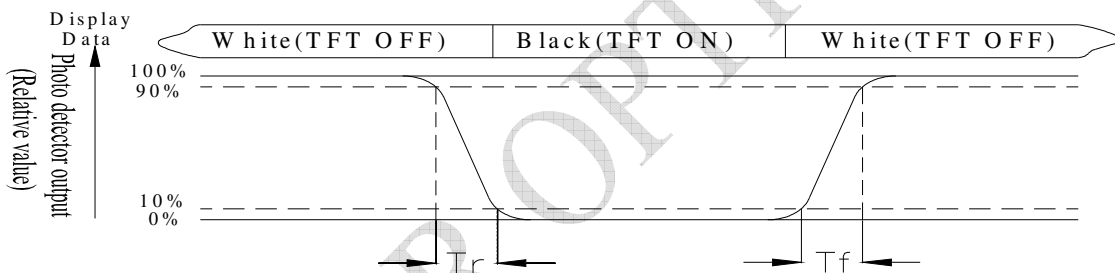


Fig. 9.2. Optical measurement system setup

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: 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.

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

L = Active area length

W = Active area width

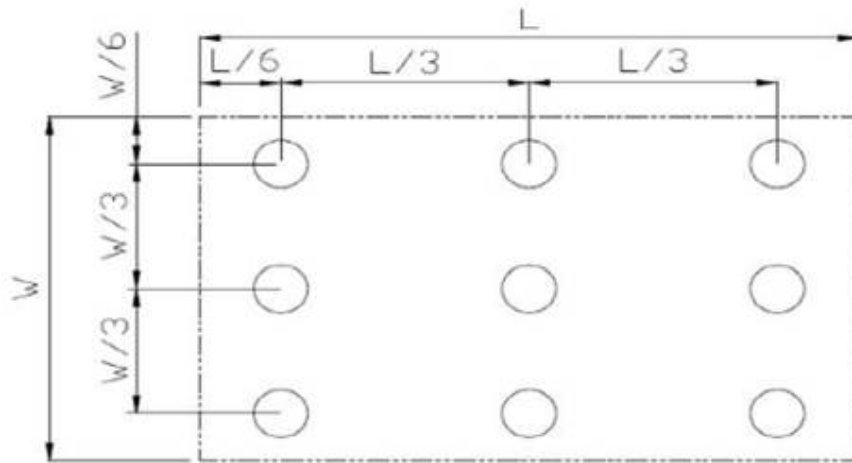


Fig9.3. . Definition of uniformity

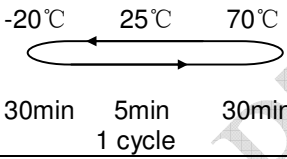
Note 6: Definition of color chromaticity (CIE 1931)

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.

10. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°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.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°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	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>-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 , _____

>> **Go to page 2** <<

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