DISPLAY Elektronik GmbH

TFT MODULE

DEM 1024600G TMH-PW-N

7,0” TFT

Product Specification **Version: 2**

08.10.2016

Revision History

VERSION	DATE	Note
0	01.06.2016	First Issue
1	11.08.2016	Modify Vibration Test
2	08.10.2016	Modify Summary

Contents

1. Summary

TFT 7.0”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.

2. General Specifications

- Size: 7.0 Inch
- Dot Matrix: 1024 x RGB x 600 dots
- Module Dimension: 164.80 x 99.80 x 5.65 mm
- Active Area: 154.2114 x 85.92 mm
- Dot Pitch: 0.1506 x 0.1432 mm
- LCD Type: TFT, Normally White, Transmissive
- View Direction: 12 o’clock
- Gray Scale Inversion Direction: 6 o’clock
- Backlight Type: LED, Normally White
- With / Without TP: Without TP
- Interface: LVDS
- Surface: Anti-Glare

*Color tone slight changed by temperature and driving voltage.

3. Interface

3.1. LCM PIN Definition

FPC Connector is used for the module electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

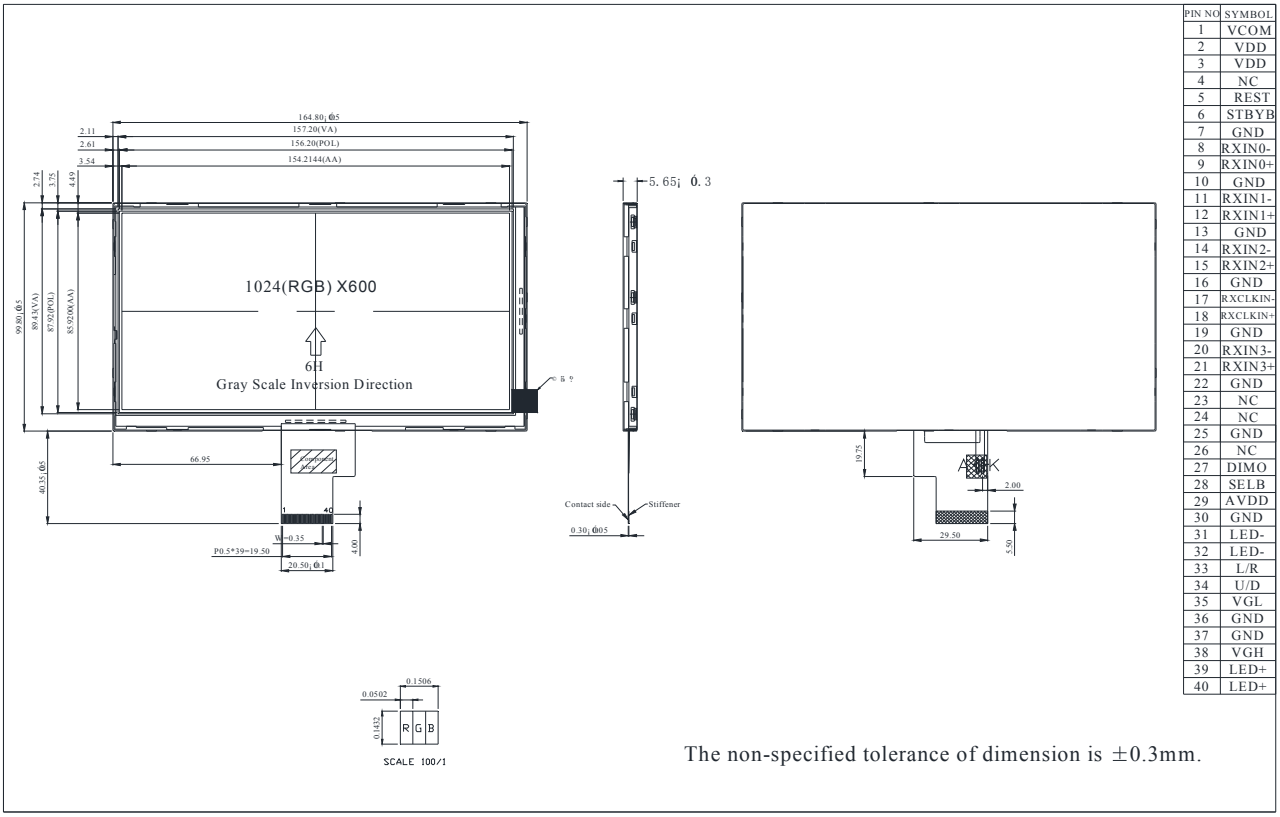
Pin No.	Symbol	I/O	Function	Remark
1	VCOM	P	Common Voltage	
2	VDD	P	Digital circuit	
3	VDD	P	Digital circuit	
4	NC	---	No connection	
5	Reset	I	Global reset pin	
6	STBYB	I	Standby mode, Normally pulled high STBYB = “1”, normal operation STBYB = “0”, timing controller, source driver will turn off, all output are High-Z	
7	GND	P	Ground	
8	RXIN0-	I	Negative LVDS differential data input	
9	RXIN0+	I	Positive LVDS differential data input	
10	GND	P	Ground	
11	RXIN1-	I	Negative LVDS differential data input	
12	RXIN1+	I	Positive LVDS differential data input	
13	GND	P	Ground	
14	RXIN2-	I	Negative LVDS differential data input	
15	RXIN2+	I	Positive LVDS differential data input	
16	GND	P	Ground	
17	RXCLKIN-	I	Negative LVDS differential clock input	
18	RXCLKIN+	I	Positive LVDS differential clock input	
19	GND	P	Ground	
20	RXIN3-	I	Negative LVDS differential data input	
21	RXIN3+	I	Positive LVDS differential data input	
22	GND	P	Ground	
23	NC	---	No connection	
24	NC	---	No connection	

25	GND	P	Ground	
26	NC	---	No connection	
27	DIMO	O	Backlight CABC controller signal output	
28	SELB	I	6bit/8bit mode select H:6bit / L:8bit	
29	AVDD	P	Power for Analog Circuit	
30	GND	P	Ground	
31	LED-	P	LED Cathode	
32	LED-	P	LED Cathode	
33	L/R	I	Horizontal inversion	
34	U/D	I	Vertical inversion	
35	VGL	P	Negative power for TFT	
36	GND	P	Ground	
37	GND	P	Ground	
38	VGH	P	Positive power for TFT	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

I:input ,O:output,P:power

Note
When L/R=”0”,set right to left scan direction.
When L/R=”1”,set left to right scan direction.
When U/D=”0”,set top to bottom scan direction.
When U/D=”1”,set bottom to top scan direction.

4. Counter Drawing



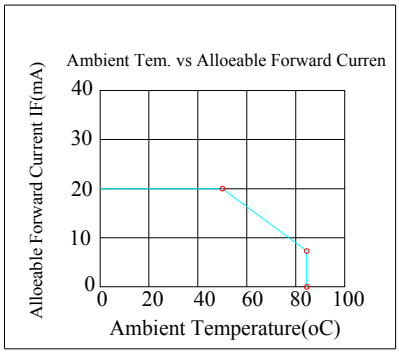
PIN NO	SYMBOL
1	VCOM
2	VDD
3	VDD
4	NC
5	REST
6	STBYB
7	GND
8	RXIN0-
9	RXIN0+
10	GND
11	RXIN1-
12	RXIN1+
13	GND
14	RXIN2-
15	RXIN2+
16	GND
17	RXCLKIN-
18	RXCLKIN+
19	GND
20	RXIN3-
21	RXIN3+
22	GND
23	NC
24	NC
25	GND
26	NC
27	DIMO
28	SELB
29	AVDD
30	GND
31	LED-
32	LED-
33	L/R
34	U/D
35	VGL
36	GND
37	GND
38	VGH
39	LED+
40	LED+

5. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T_{OP}	-20	—	+70	°C
Storage Temperature	T_{ST}	-30	—	+80	°C

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

1. Temp. ≦60℃, 90% RH MAX. Temp.＞60°C,
   Absolute humidity shall be less than 90% RH at 60°C



6. Electrical Characteristics

6.1. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	DVDD	3.0	3.3	3.6	V	Note 2
	AVDD	9.4	9.6	9.8	V	
	VGH	17	18	19	V	
	VGL	-6.6	-6.0	-5.4	V	
Input signal voltage	VCOM	3.1	3.3	3.6	V	
Input logic high voltage	VIH	0.7 DVDD	-	DVDD	V	Note 3
Input logic low voltage	VIL	0	-	0.3 DVDD	V	

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.
Note 2:.DVDD setting should match the signals output voltage (refer to Note 3) of customer's system board.
Note 3: DCLK,HS,VS,RESET,U/D,L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

6.2. Current Consumption

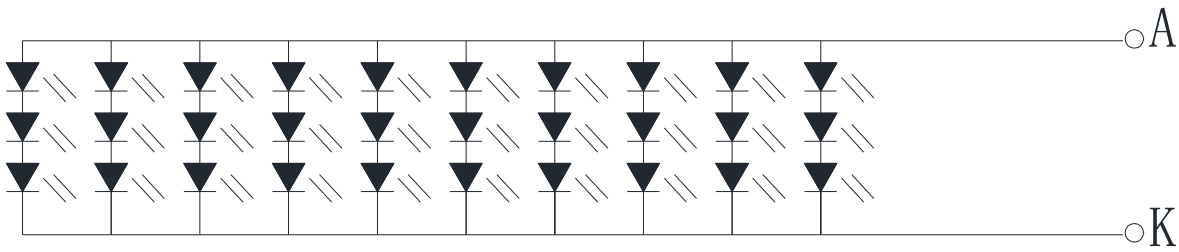
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	IGH	-	0.2	1.0	mA	VGH =18.0V
	IGL	-	0.2	1.0	mA	VGL = -6.0V
	IDVDD	-	4.0	10	mA	DVDD =3.3V
	IAVDD	-	20	50	mA	AVDD =9.6V

6.3. Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED Backlight	VL	8.4	9.8	10.8	V	Note 1
Current for LED Backlight	IL	--	300	--	mA	
LED Lifetime	-	-	50,000	-	Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and IL =300mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL =300mA. The LED lifetime could be decreased if operating IL is larger than 300mA.

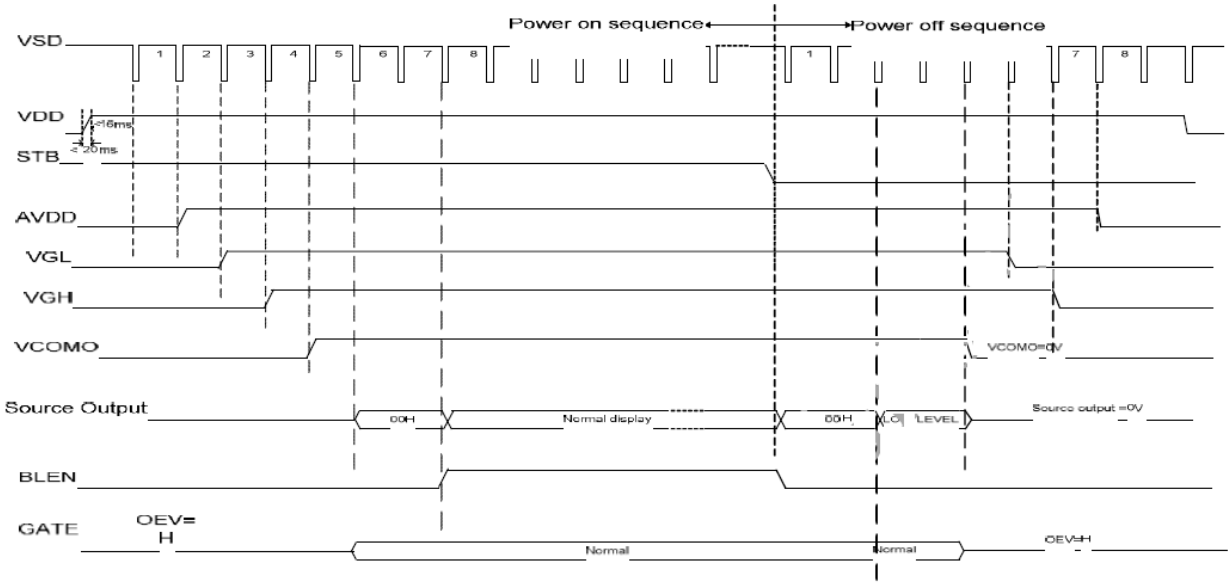


Backlight 30LED Circuit

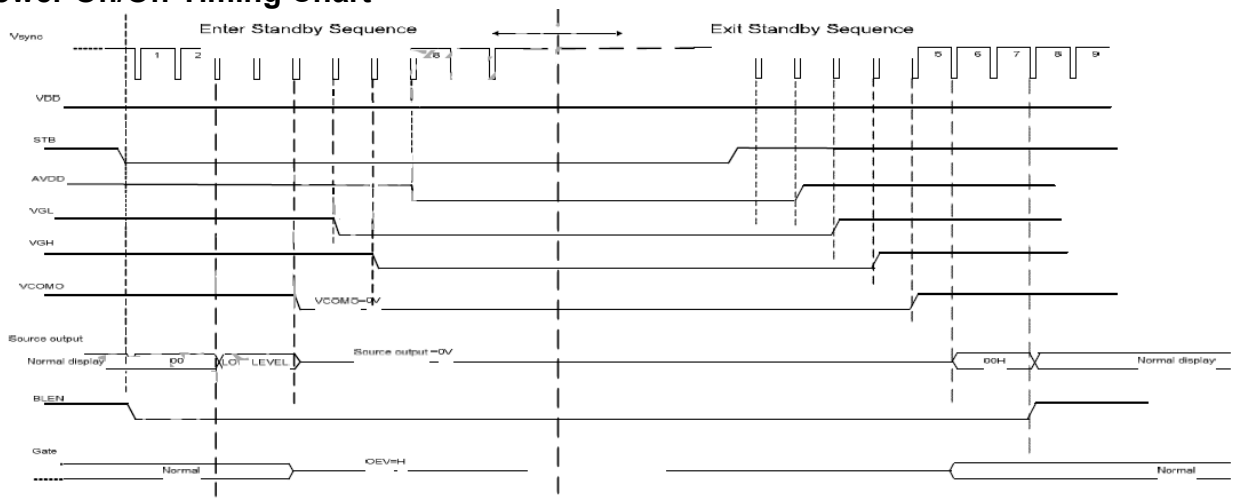
7. Operation Sequence

7.1. Power Sequence

In order to prevent IC from power on reset fail, the time (TPOR) of the digital power supply VDD should be maintained within the given specifications. Refer to “AC characteristics” for more detail on timing.



Power On/Off Timing Chart



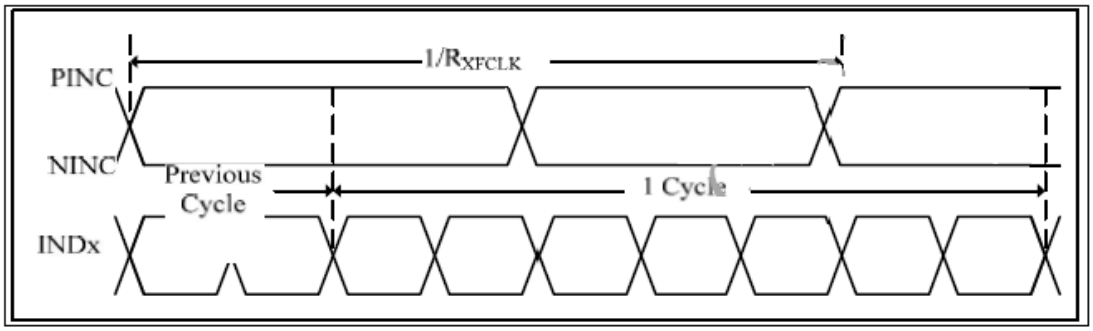
Enter and Exit standby Mode timing chart

Note : Low level=3Fh,when NBW=L (normally white)
Low level=00h,when NBW=H (normally black)

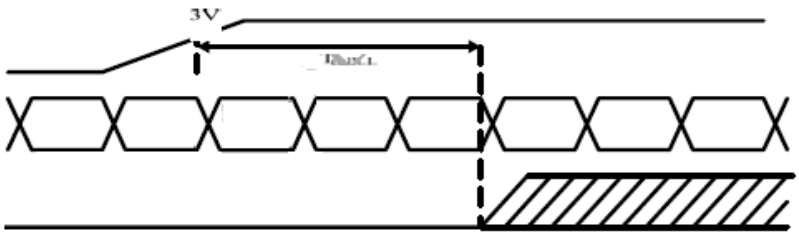
7.2. Timing Characteristics

AC Electrical Characteristics

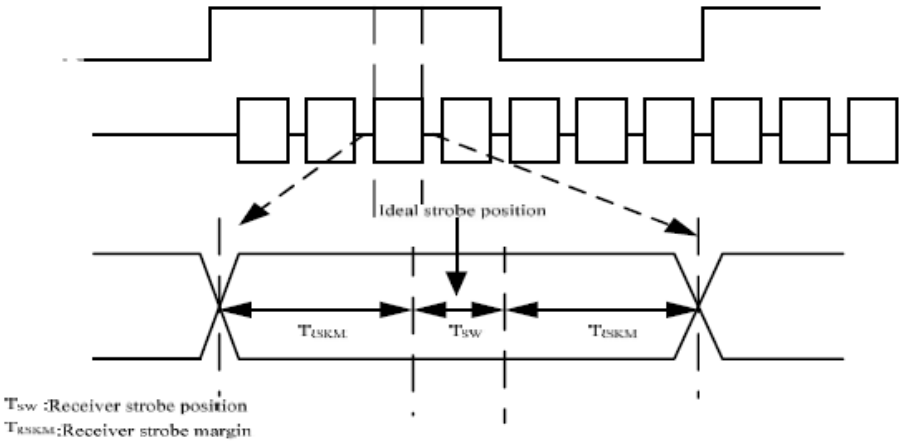
Parameter	Symbol	condition	Min.	Typ.	Max.	Unit
Clock Frequency	RxFCLK		20	-	71	MHz
Input Data Skew Margin	TRSKM	|VID|=400mV RxVCM=1.2V RxFCLK=71MHz	500	-	-	ps
Clock High Time	TLVCH		-	4/(7* RxFCLK)	-	ns
Clock Low Time	TLVCL		-	3/(7* RxFCLK)	-	ns
PLL Wake-Up-Time	TenPLL				150	us



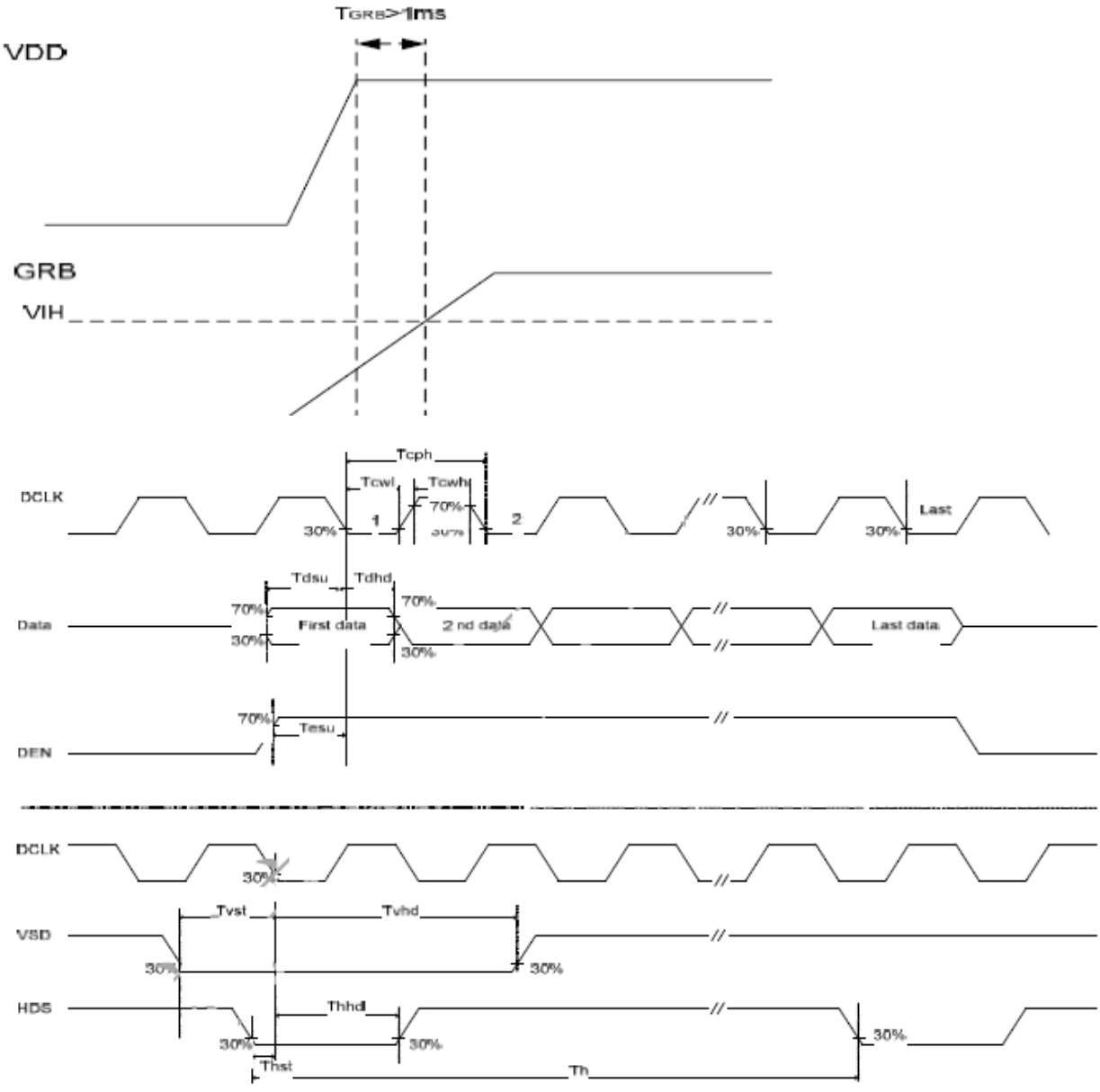
LVDS timing(1)



LVDS timing(2)



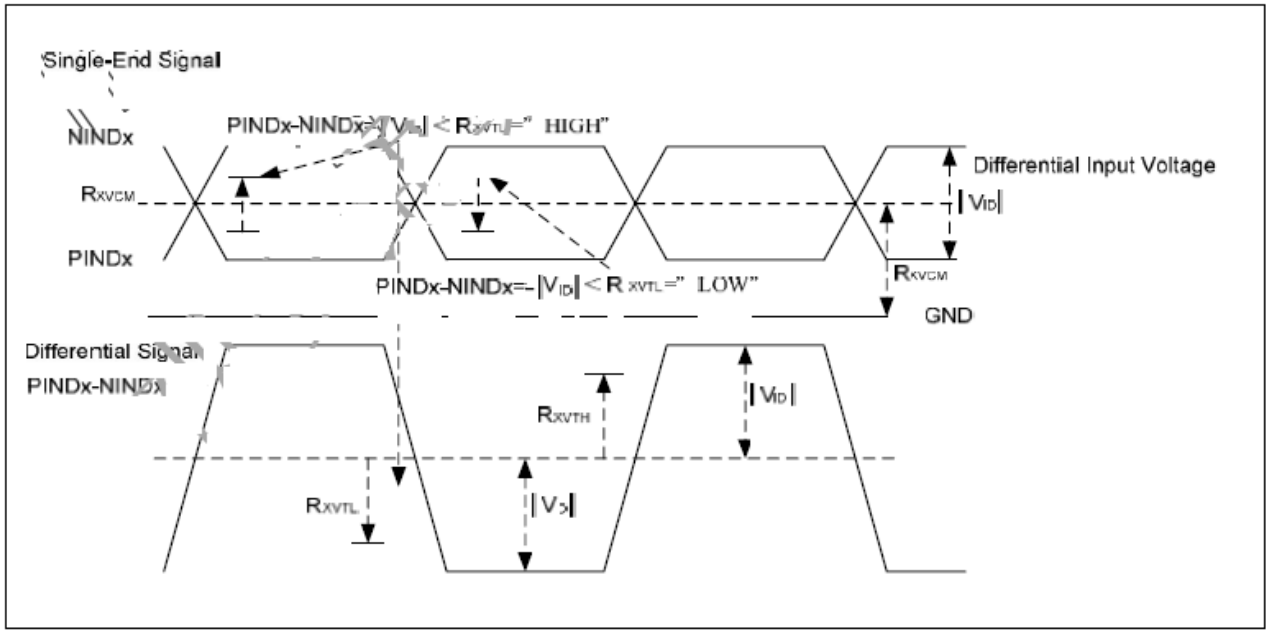
LVDS timing(3)



Parallel Input Clock and Data timing

7.3. LVDS DC Characteristics

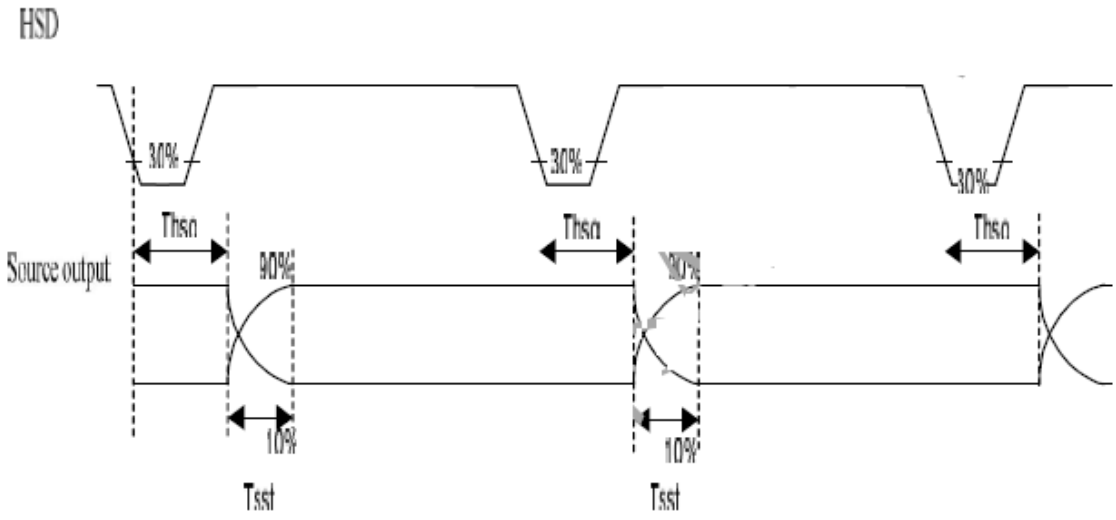
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Differential Input High Threshold Voltage	RxVTH	-	-	+0.1		
Differential Input Low Threshold Voltage	RxVTL	-0.1	-	-	V	
Input Voltage Range (Singled-End)	RxVIN	0	-	2.4	V	
Differential Input Common Mode Voltage	RxVCM	|VID|/2	-	2.4-|VID|/2	V	
Differential Input Voltage	|VID|	0.2	-	0.6	V	
Differential Input Leakage current	RVxliz	-10	-	+10	uA	
LVDS Digital Operating Current	Iddlvsd	-	40(TBD)	50	mA	Fclk=65Mhz VDD=3.3V
LVDS Digital Standby Current	Istlvds	--	10(TBD)	50	uA	Clock & all Functions are

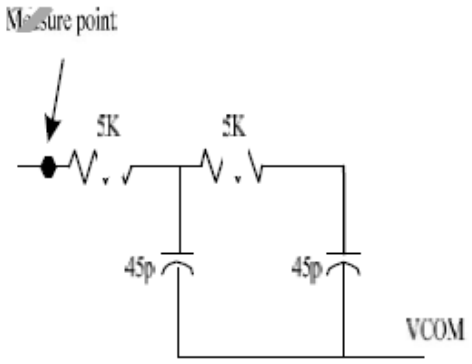


LVDS DC Characteristics

Output Timing table

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
DCLK frequency	Fclk	-	65	71	MHz	VDD =2.3~3.6V
DCLK cycle time	Tclk	14.1	15.4		ns	
DCLK pulse duty	Tcwh	40	50	60	%	Tclk
Time from HSD to Source Output	Thso	-	64	-	DCLK	
Time from HSD to LD	Thld	-	64	-	DCLK	
Time from HSD to STV	Thstv	-	2	-	DCLK	
Time from HSD to CKV	Thckv	-	20	-	DCLK	
Time from HSD to OEV	Thoev	-	4	-	DCLK	
LD pulse width	Twld	-	10	-	DCLK	
CKV pulse width	Twckv	-	66	-	DCLK	
OEV pulse width	Twoev	-	74	-	DCLK	

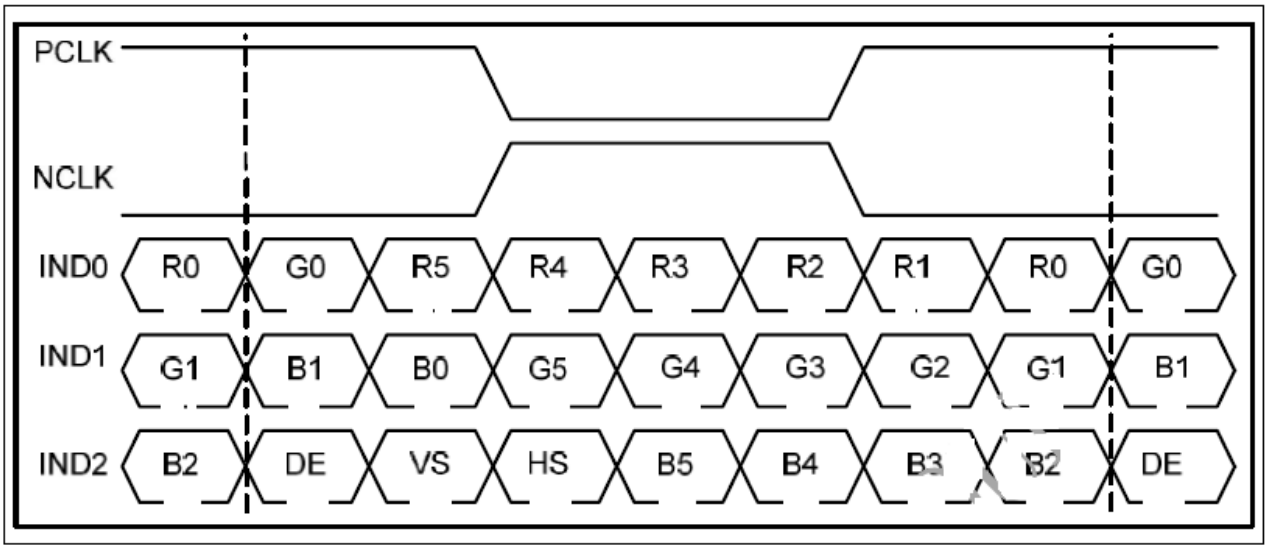




Source output timing (cascade)

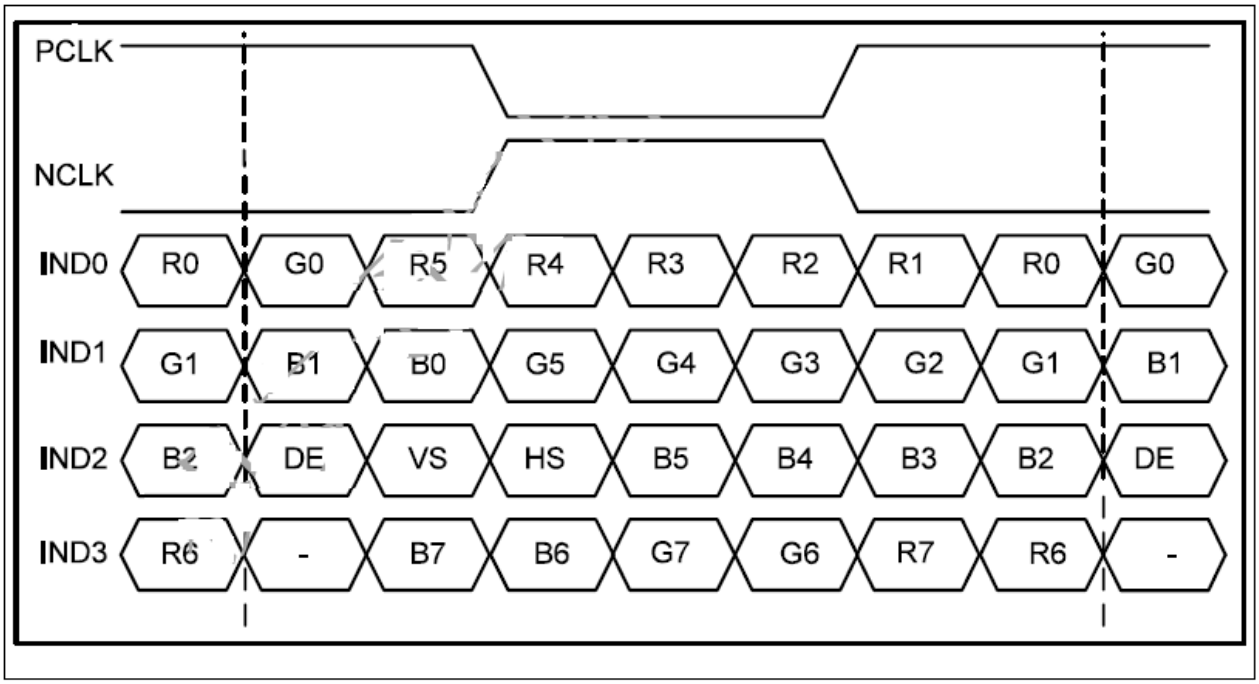
Data Input Format

6bit LVDS Input (HSD="H")



6-bit LVDS input timing chart

8bit LVDS Input (HSD="L")



8-bit LVDS input timing chart

8. Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response Time		Tr	θ=0°、Φ=0°	-	25	40	.ms	Note 3
		Tf						
Contrast Ratio		CR	At optimized viewing angle	600	800	-	-	Note 4
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.26	0.31	0.36	-	Note 2,5,6
		Wy		0.28	0.33	0.38	-	
Viewing Angle (Gray Scale Inversion Direction)	Hor.	ΘR	CR≧10	70	80	-	Deg.	Note 1
		ΘL		70	80	-		
	Ver.	ΦT		50	60	-		
		ΦB		60	70	-		
Brightness		-	-	500	600	-	cd/m^2	Center of display

Ta=25±2°C,

Note 1: Definition of viewing angle range

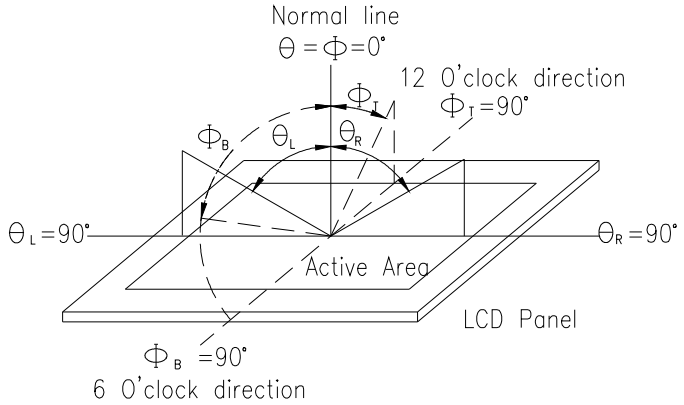


Fig. 9.1. Definition of viewing angle

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

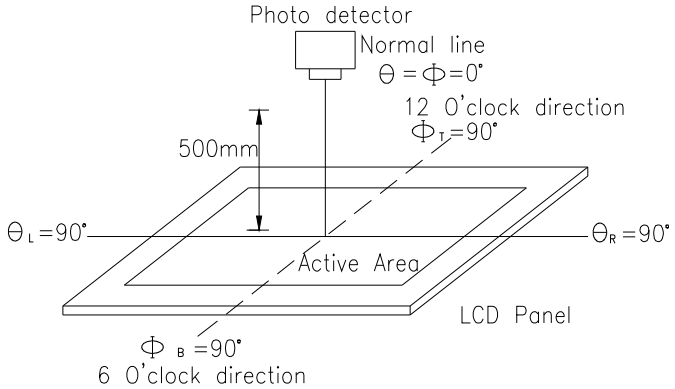
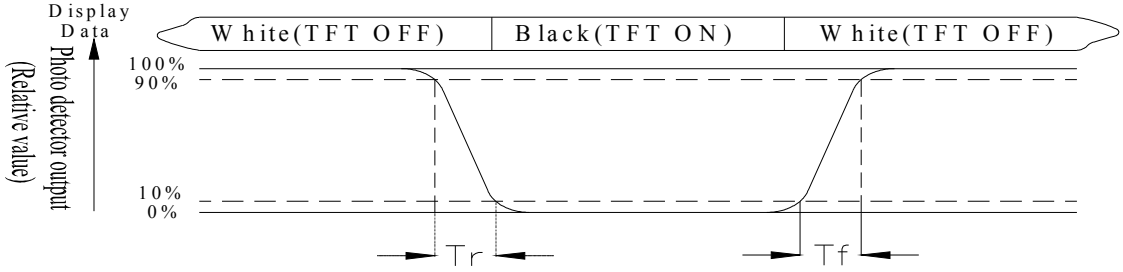


Fig. 9.2. Optical measurement system setup

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, Tr, is the time between photo detector output intensity changed from 90%to 10%. And fall time, Tf, 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 Vi = Vi50 ± 1.5V
Black Vi = Vi50 ± 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.

9. 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□,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 -20°C 25°C 70°C 30min 5min 30min 1 cycle	-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.