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TFT | CHARACTER | UWVD | FSC | SEGMENT | CUSTOM | REPLACEMENT

## TFT Display Module

Part Number

E101RB-HW660-C

### Overview:

- 10.1-inch TFT (229.06x148.7 mm)
- LVDS Interface
- 1280x800 pixels
- Wide Temp
- All View
- HDMI Board
- Capacitive Touch Panel
- 660 NITS
- CTP Controllers: FT5826QSL
- RoHS Compliant

## Description

This is a color active matrix TFT (Thin Film Transistor) LCD (Liquid Crystal Display) that uses amorphous silicon TFT as a switching device. This model is composed of a transmissive type TFT-LCD Panel, driver circuit, HDMI board and backlight unit. The resolution of the 10.1" TFT-LCD contains 1280x800 pixels and can display up to 16.7M colors.

## Features

Power Consumption: 3.5W (TYP)

Micro USB DC Power: 5V, 2A (TYP)

Plug & Play: DDC2B/VESA Standard

Recommended Resolution: 1280(RGB)\*800 @55-60Hz

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Display Area (AA)	216.96(H) x 135.6(V) (10.1 inch)	mm	-
Driver Element	TFT active matrix	-	-
Display Colors	16.7M	colors	-
Display Resolution	1280(RGB)x800	pixels	-
TFT Pixel Arrangement	RGB vertical stripe	-	-
Pixel Pitch	0.0565(H)*0.1695(V)	mm	-
Viewing Angle	FREE	o'clock	-
CTP Driver IC	FT5826QSL	-	-
LCM+CTP Luminance	660	nits	(TYP)
CTP Interface	Micro-USB	-	-
Touch Cover Thickness	1.1mm with chemical strengthening	-	-
Touch Point	10 points and gestures	-	-
Video Input	HDMI	-	-
Module Bonding	Optical Bonding	-	-
Operating Temperature	-20~+70	°C	-
Storage Temperature	-30~+80	°C	-

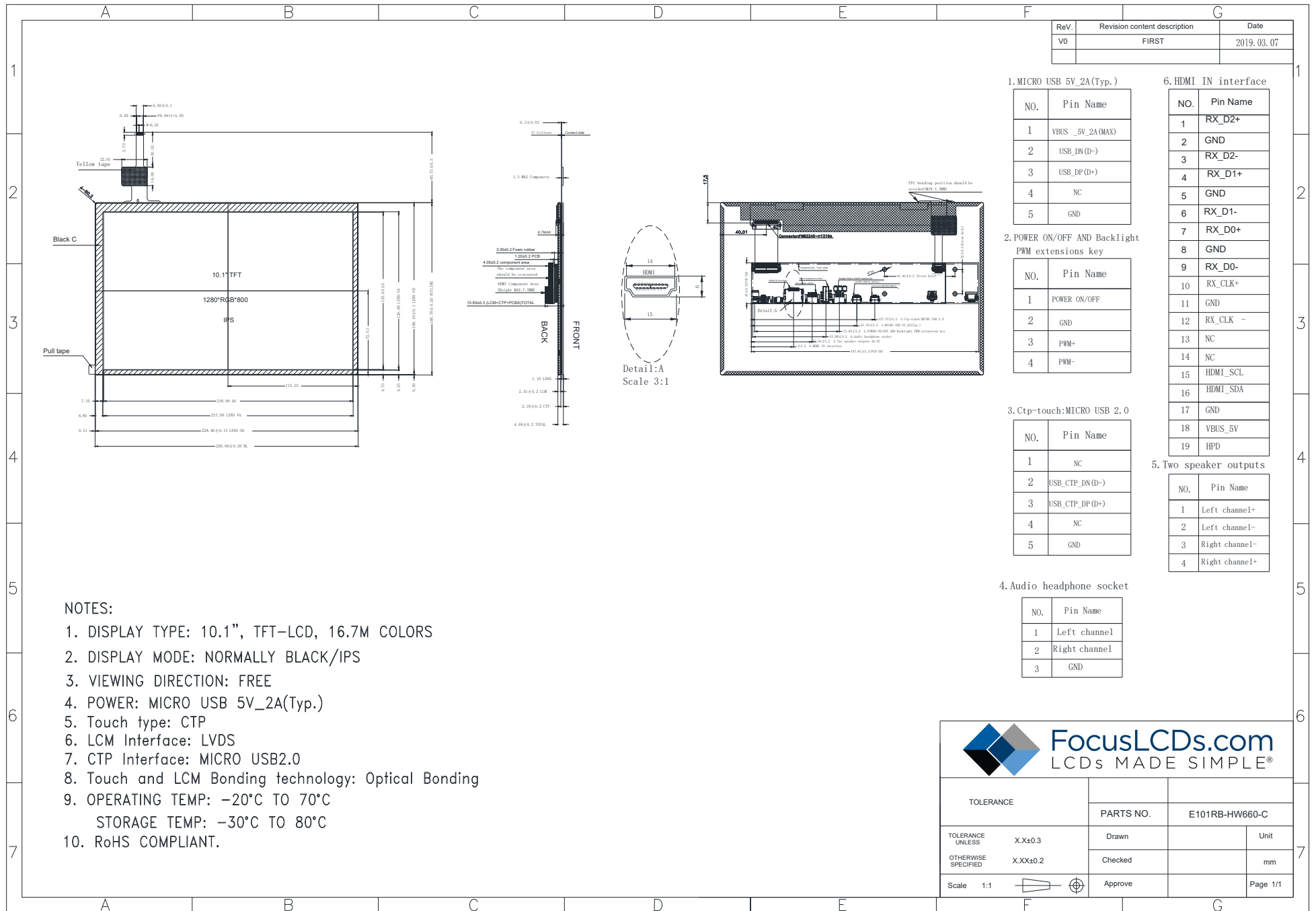
## Mechanical Information

Item		Min	Typ.	Max	Unit	Note
Module Size	Height (H)		229.06		mm	-
	Vertical (V)		148.7		mm	-
	Depth (D)		4.96		mm	Includes Bracket
Weight			TBD		g	-

## 1. Block Diagram



## 2. Outline Dimensions



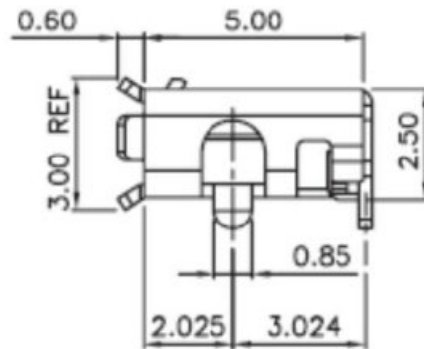
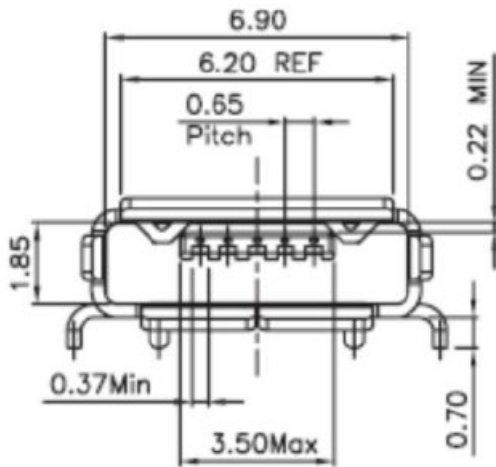
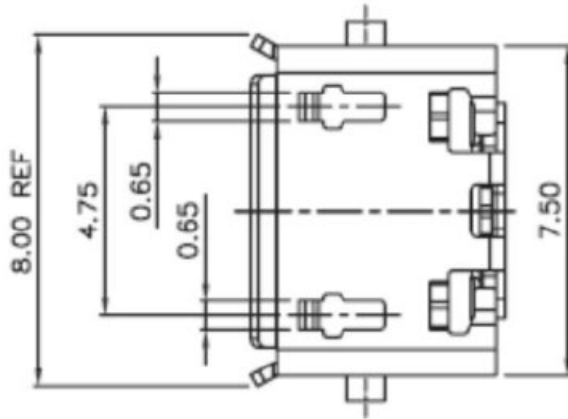
### 3. Input Terminal Pin Assignment

#### 3.1 Micro USB Pin Definition & Signal Connector

NO.	Symbol	Description	I/O
1	DC:5V, 2A (Typ.)	Supply voltage (5V, 2A Typ.)	P
2	NC	No connection	--
3	NC	No connection	--
4	NC	No connection	--
5	GND	Ground	P

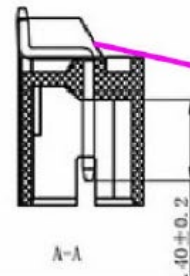
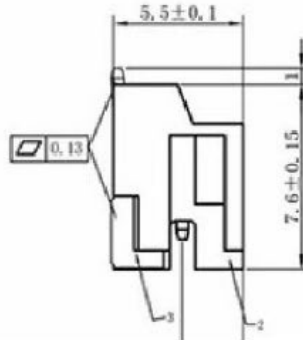
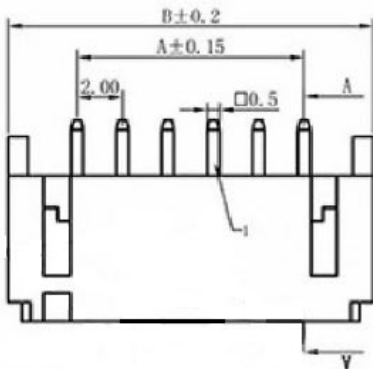
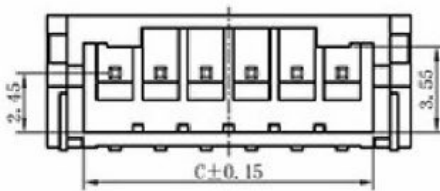
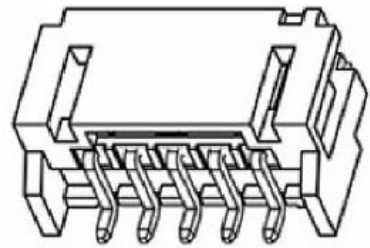
*I: Input, O: Output, P: Power*

*Micro-USB Connector Dimensions:*



### 3.2 Power ON/OFF and Backlight PWM Extension Key Pin Definition & Signal Connector

NO.	Symbol	Description	I/O
1	GND	Ground	P
2	Power ON/OFF	ON/OFF key	P
3	PWM+	The backlight brightness of each button is increased by one level until the maximum brightness reaches level 9	I
4	PWM-	The backlight brightness of each button is reduced by one level until the lowest brightness reaches level 9	I

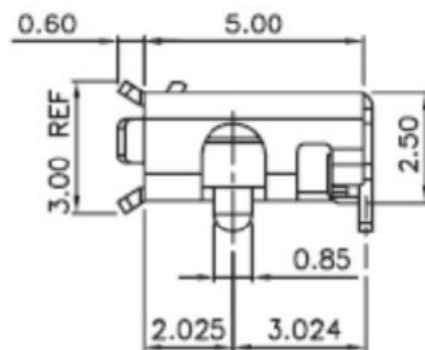
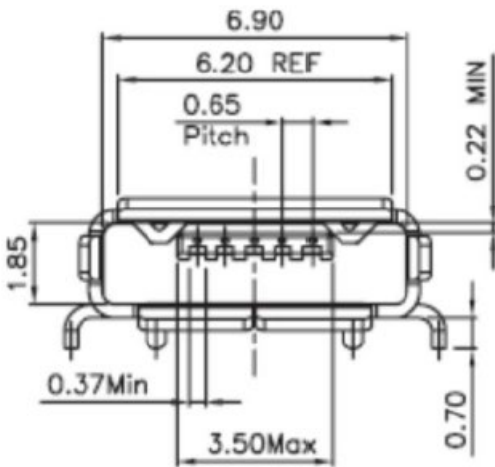
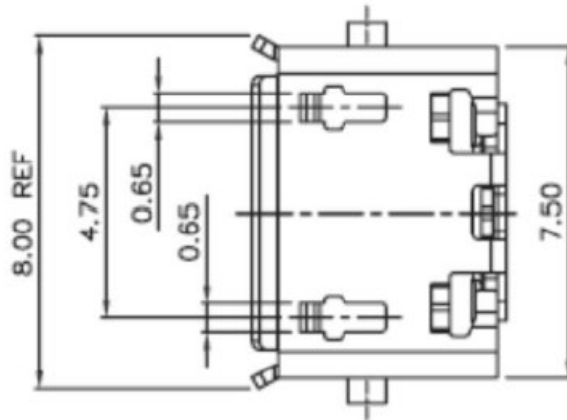


poles	A	B	C
2	2.00	8.00	4.75
3	4.00	10.00	6.75
4	6.00	12.00	8.75
5	8.00	14.00	10.75
6	10.00	16.00	12.75
7	12.00	18.00	14.75
8	14.00	20.00	16.75
9	16.00	22.00	18.75

### 3.3 CTP: Micro USB Pin Definition & Signal Connector

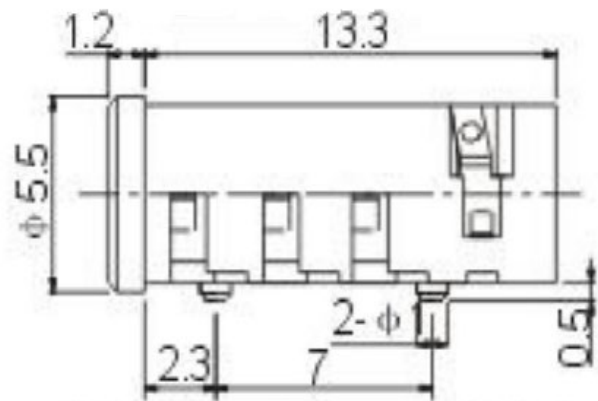
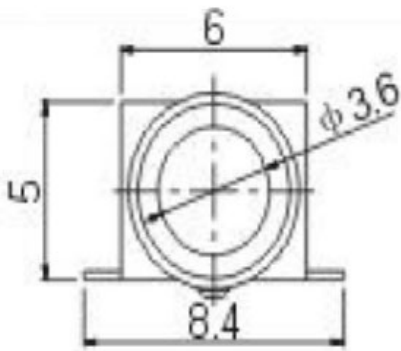
NO.	Symbol	Description	I/O
1	DC:5V,2A(Typ.)	Supply voltage (5V, 2A Typ.)	P
2	USB_CTP_DN(D-)	USB data negative analog input	I/O
3	USB_CTP_DP(D+)	USB data positive analog input	I/O
4	NC	No connection	I
5	GND	Ground	P

Micro USB Connector Dimensions:



### 3.4 Audio Headphone Socket Pin Definition & Input Signal Connector

NO.	Symbol	Description	I/O
1	Left channel	Audio output left channel	
2	Right channel	Audio output right channel	
3	GND	Ground	
4	GND	Ground	



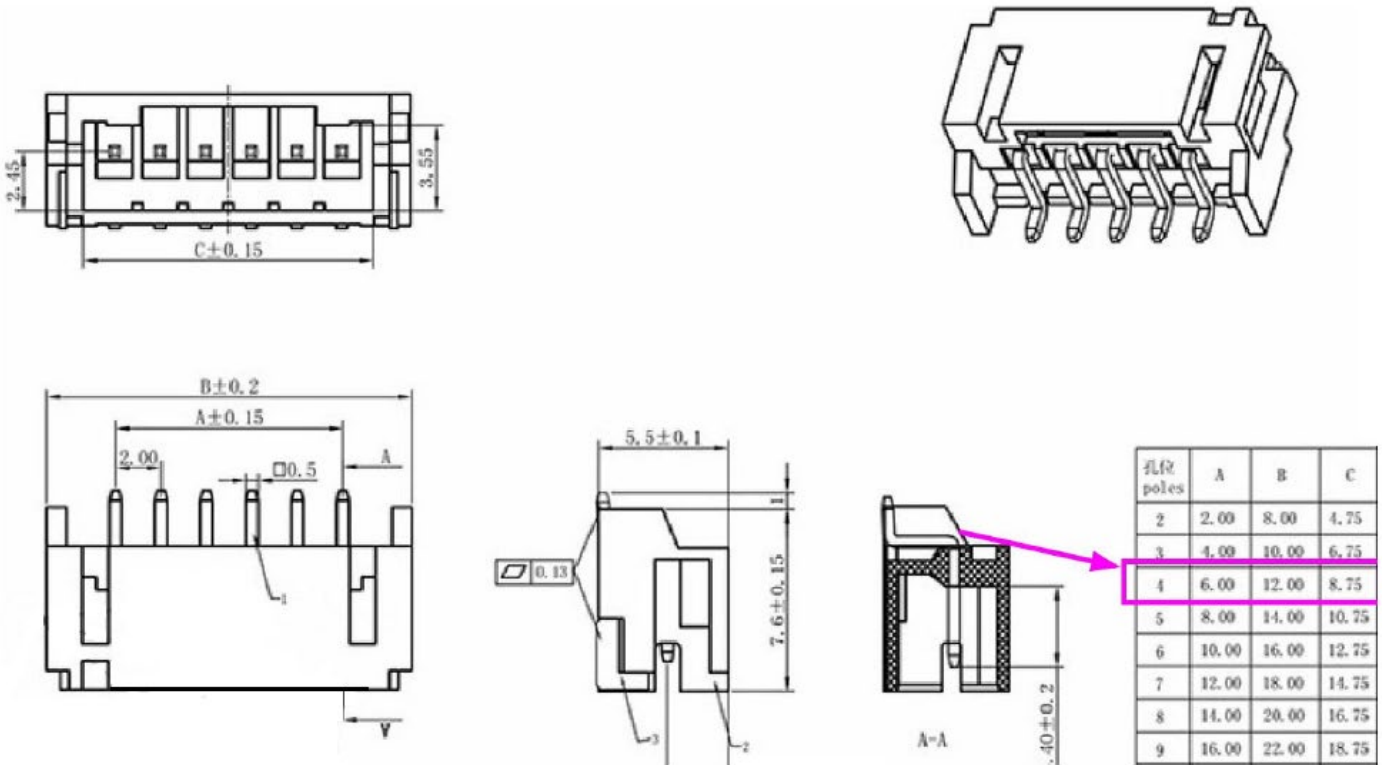
P.C.B Layout(copper-sided view)



### 3.5 Two Speaker Outputs Pin Definition & Input Signal Connector

NO.	Symbol	Description	I/O
1	Left channel+	Audio output left channel	
2	Left channel-		
3	Right channel-	Audio output right channel	
4	Right channel+		

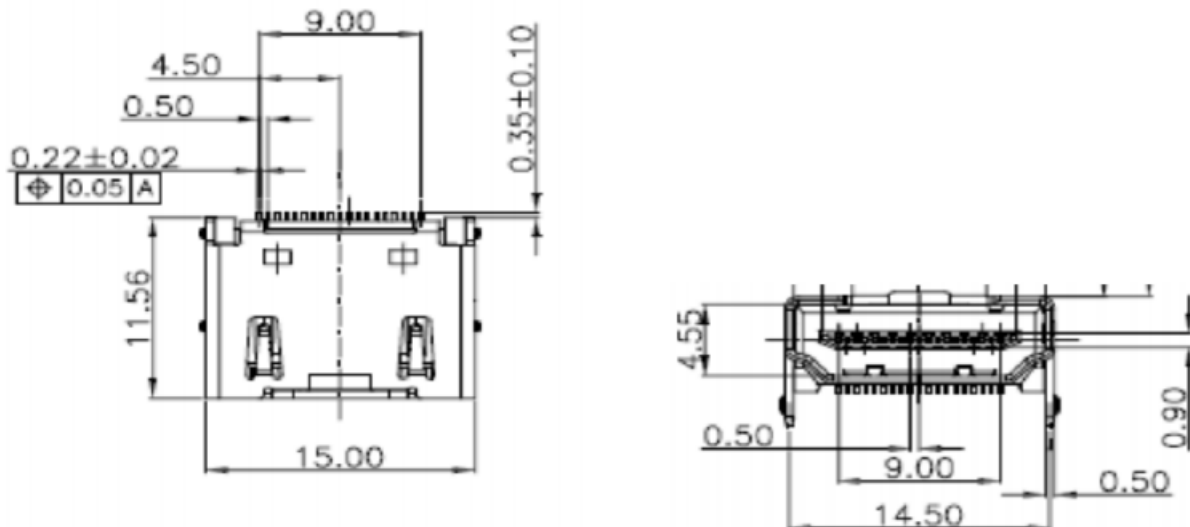
Note: SMT PH2.0mm spacing connector 4p



### 3.6 HDMI Pin Definition & Signal Connector

NO.	Symbol	Description	I/O
1	RX_D2+	HDMI receiver channel 2 positive analog input	I
2	GND	Ground	P
3	RX_D2-	HDMI receiver channel 2 negative analog input	I
4	RX_D1+	HDMI receiver channel 1 positive analog input	I
5	GND	Ground	P
6	RX_D1-	HDMI receiver channel 1 negative analog input	I
7	RX_D0+	HDMI receiver channel 0 positive analog input	I
8	GND	Ground	P
9	RX_D0-	HDMI receiver channel 0 negative analog input	I
10	RX_CLK+	HDMI receiver clock positive analog input	I
11	GND	Ground	P
12	RX_CLK-	HDMI receiver clock negative analog input	I
13	NC	Not connected	
14	NC	Not connected	
15	HDMI_SCL	HDMI receiver DDC data channel	I/O
16	HDMI_SDA	HDMI receiver DDC clock channel	I
17	GND	Ground	P
18	HDMI_5V	HDMI supply voltage (5V)	P
19	HPD	HDMI receiver hot plug detect output	O

HDMI Connector Dimensions:



## 4. LCD Optical Characteristics

### 4.1 Optical Specifications

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note	
Contrast Ratio	CR	Normal Viewing Angle $\theta=0$	600	800	--	--	(2)	
Response Time	Rising		TR	--	10	20	ms	(4)
	Falling		TF	--	15	30		
Color Filter Chromaticity	White		$W_x$	0.267	0.307	0.347	--	(5)(6)
			$W_y$	0.313	0.353	0.392		
	Red		$R_x$	0.534	0.574	0.614		
			$R_y$	0.310	0.350	0.390		
	Green		$G_x$	0.281	0.321	0.361		
			$G_y$	0.550	0.590	0.630		
	Blue		$B_x$	0.109	0.149	0.189		
		$B_y$	0.082	0.122	0.162			
Viewing Angle	Hor.	$\Theta_L$	--	85	--	degree	(1)(6)	
		$\Theta_R$	--	85	--			
	Ver.	$\Theta_T$	--	85	--			
		$\Theta_B$	--	85	--			
Option View Direction	FREE						(1)	

### 4.2 Operating Instructions

This product supports the following operating systems: Windows 7/8/10, Raspberry Pi, Ubuntu and Android.

Connect the HDMI cable to Windows 7/8/10, Raspberry Pi, Ubuntu or Android.

Connect the CTP to micro USB.

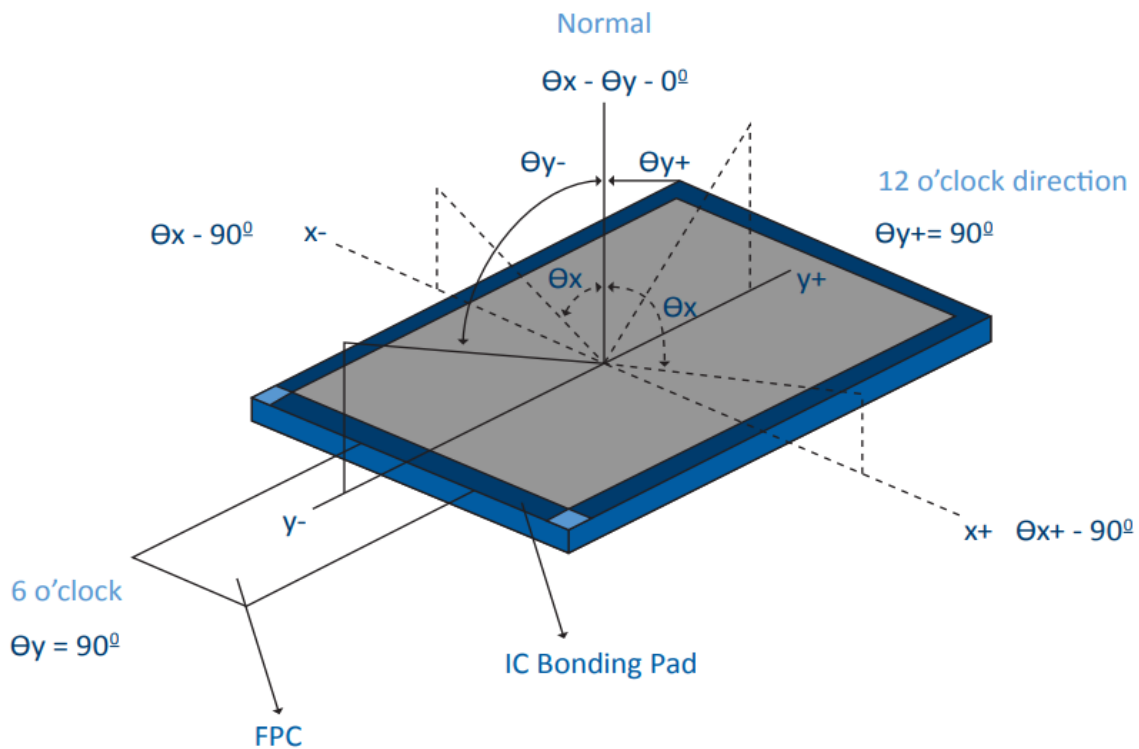
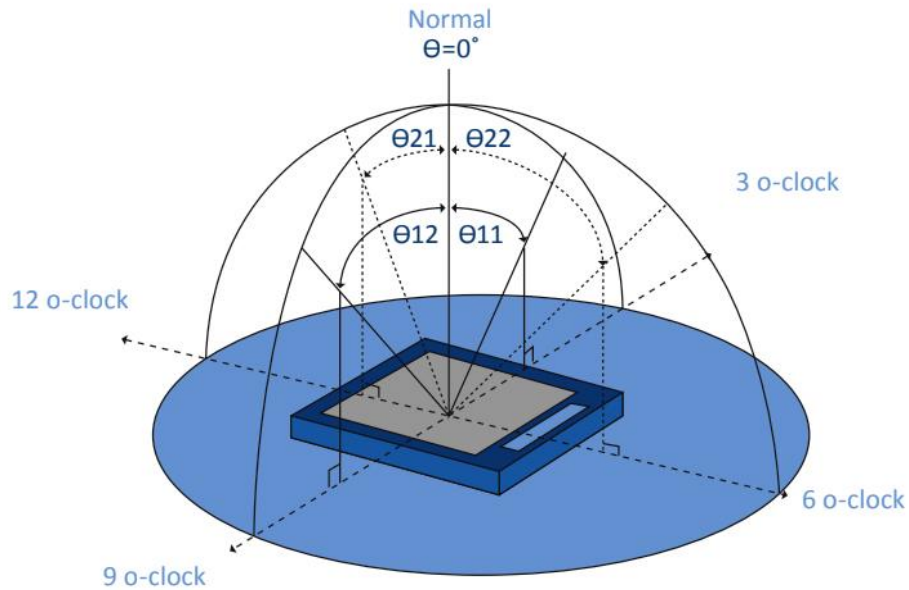
Connect the micro USB to DC power.

### 4.3 Test Conditions

VDD=3.3V, IL=300mA (Backlight current), the ambient temperature is 25°C

**Optical Specification Reference Notes:**

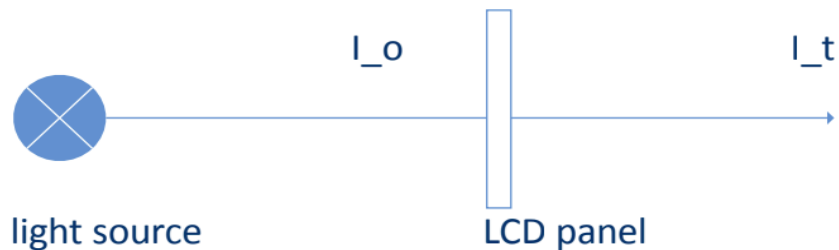
(1) Definition of Viewing Angle: The viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3,9 o'clock direction and the vertical or 6,12 o'clock direction with respect to the optical axis which is normal to the LCD surface.



(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

$$Cr = \frac{Lw}{Ld}$$

(3) Definition of transmittance (T%): The transmittance of the panel including the polarizers is measured with electrical driving.



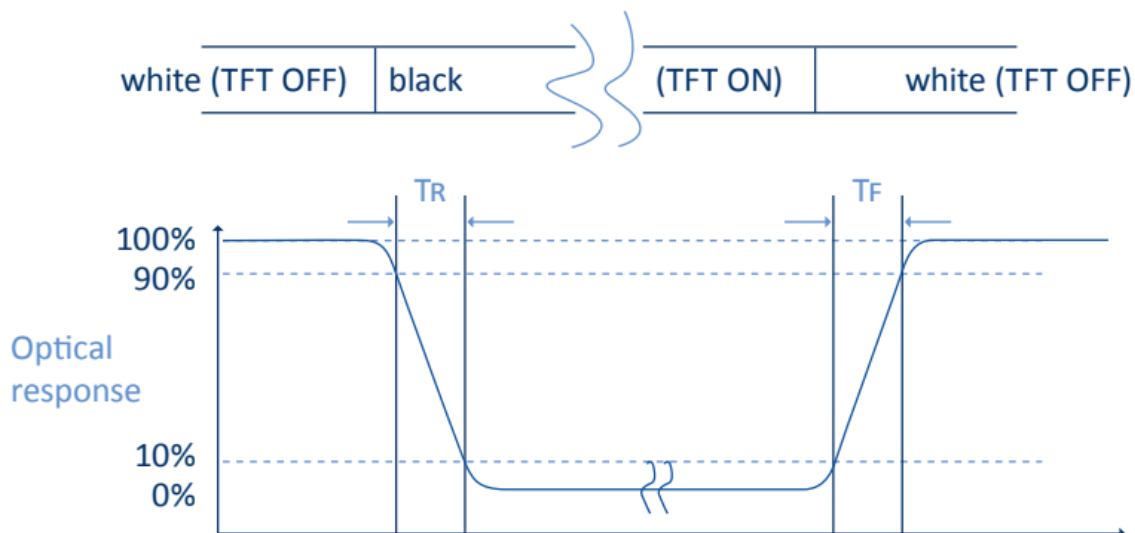
The transmittance is defined as:

$$Tr = \frac{I_t}{I_o} \times 100\%$$

I<sub>o</sub> = the brightness of the light source.

I<sub>t</sub> = the brightness after panel transmission

(4) Definition of Response Time (Tr, Tf): The rise time 'Tr' is defined as the time for luminance to change from 90% to 10% as a result of a change of the electrical condition. The fall time 'Tf' is defined as the time for luminance to change from 10% to 90% as a result of a change of the electrical condition.



(5) Definition of Color Gamut: Measuring machine CFT-01. NTSC's Primaries: R(x,y,Y),G(x,y,Y), B(x,y,Y). FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

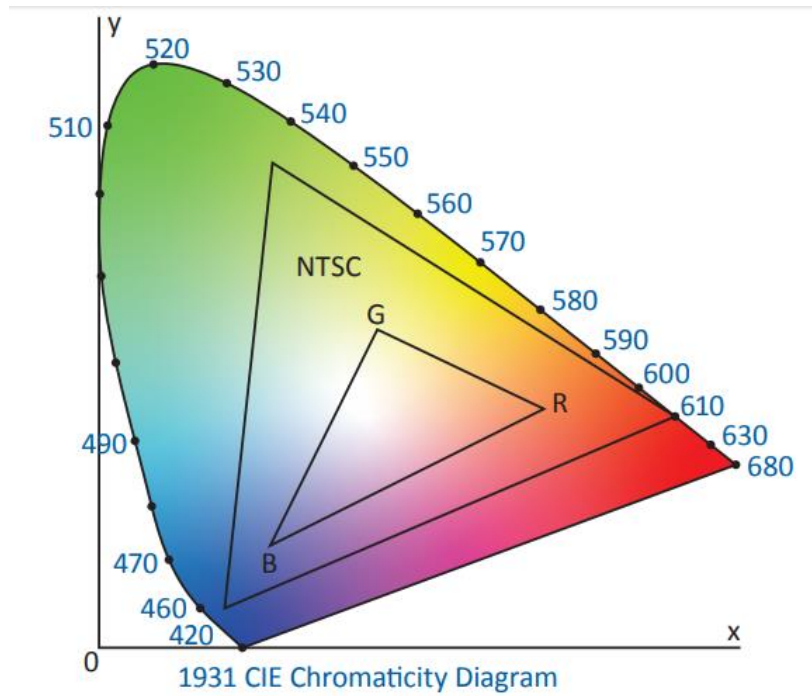
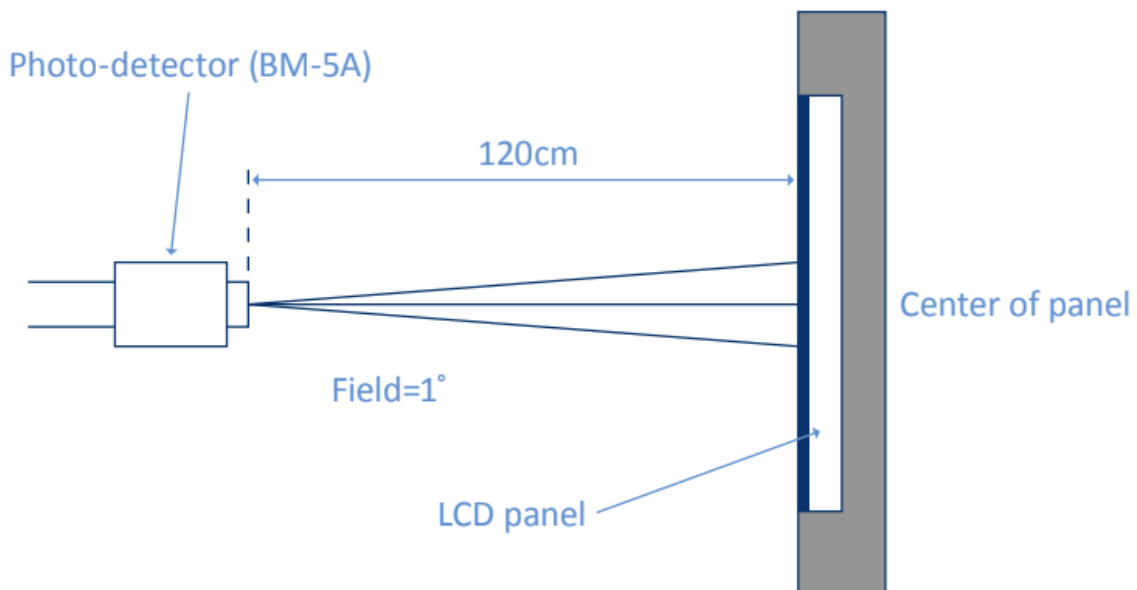


Fig. 1931 CIE chromacity diagram

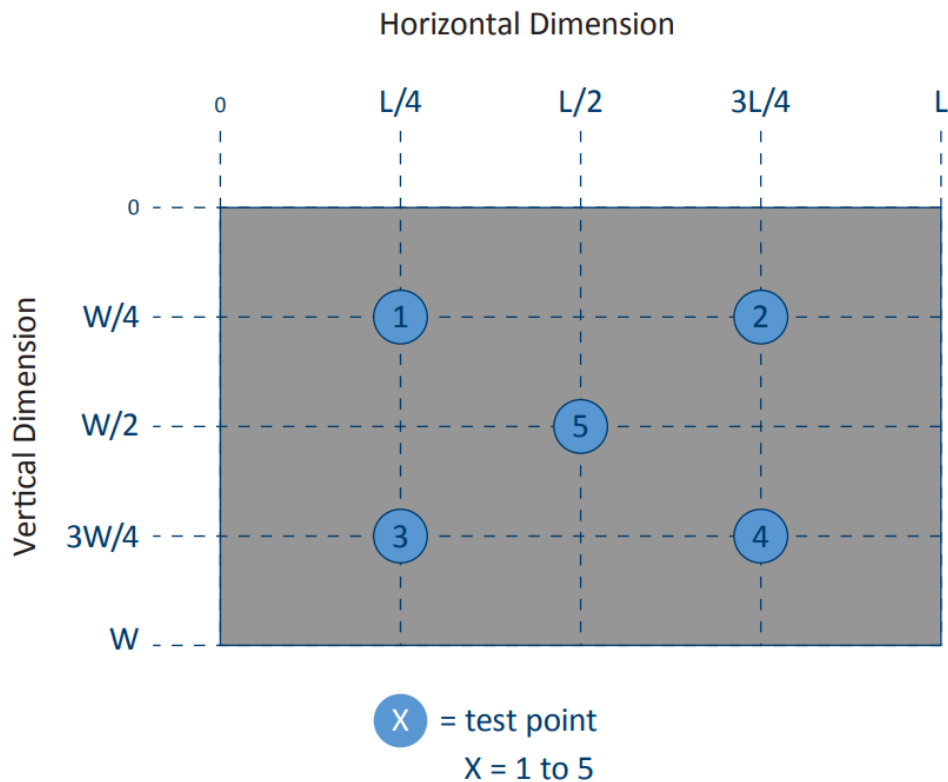
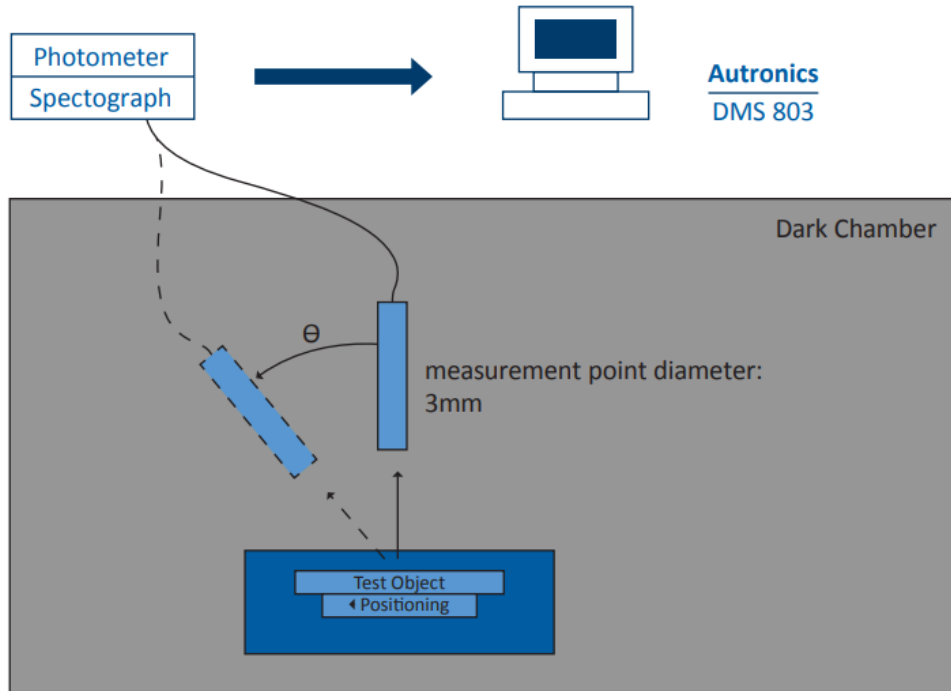
$$\text{Color gamut: } S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$

(6) Definition of Optical Measurement Setup:



(6) Optical Measurement Setup Continued:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 20 minutes.



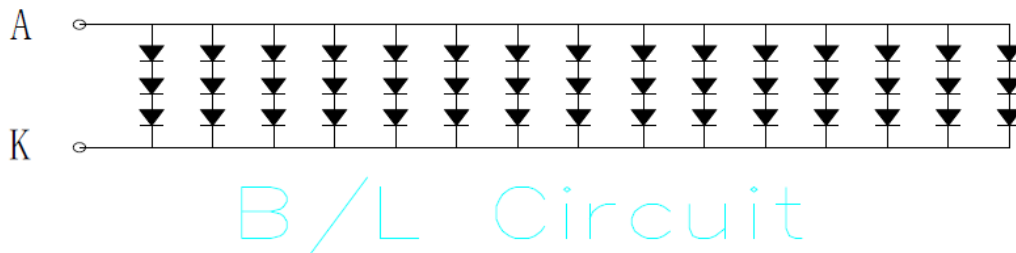
### 5.3 LED Backlight Characteristics

Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	IF	--	300	--	mA	
Forward Voltage	VF	--	9.6	--	V	
LCM Luminance	LV	600	660	--	cd/m <sup>2</sup>	Note 3
LED lifetime	Hr	--	50000	--	hour	Note1 & 2
Uniformity	AVg	80	--	--	%	Note 3

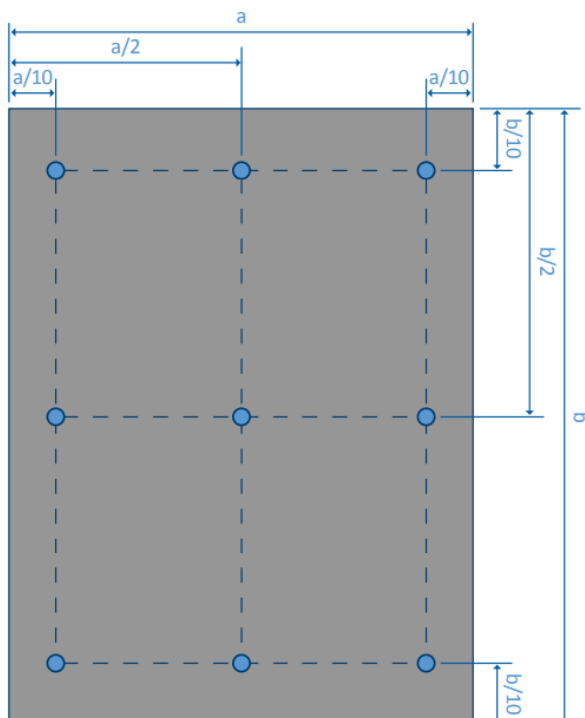
The back-light system is edge-lighting type with 45 chips White LED

Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25 ±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The "LED lifetime" 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. The constant current driving method is suggested.



Note 3: Luminance Uniformity of these 9 points is defined as below:



$$\text{Luminance} = \frac{\text{(Total Luminance of 9 points)}}{9}$$

$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points(1-9)}}{\text{maximum luminance in 9 points(1-9)}}$$



## 5. Electrical Characteristics

### 5.1 Absolute Maximum Rating (Ta=25 °C, VSS=0V)

Characteristics	Symbol	Min	Max	Unit	Note
Power Supply Voltage (Analog)	VDD-GND	-0.3	6.0	V	
	VDDp-GND	-0.3	6.0	V	
Input Signal Voltage (LED)	VLED	-0.3	6.0	V	LED_EN
Input Signal Voltage (PWR)	VPWR	-0.3	5.5	V	DCDC_EN
Operating Temperature	TOP	-30	+70	°C	
Storage Temperature	TST	-30	+80	°C	

**NOTE:** If the absolute maximum rating of the above parameters is exceeded, even momentarily, the quality of the product may be degraded. Absolute maximum ratings specify the values which the product may be physically damaged if exceeded. Be sure to use the product within the range of the absolute maximum ratings.

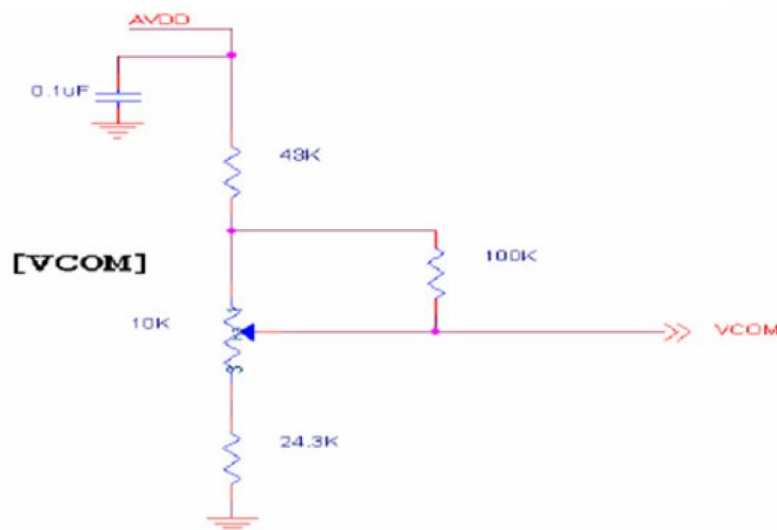
### 5.2 DC Electrical Characteristics

Characteristics	Symbol	Min	Typ.	Max	Unit	Note
Power Supply Voltage	VDD	2.3	3.3	3.6	V	Note 2
	AVDD	8.0	8.2	8.4	V	
	VGH	14.7	15.8	18.3	V	
	VGL	-7.3	-7	-6.7	V	
Input Signal Voltage	VCOM	3	3.3	3.6	V	Note 4
Input Logic High Voltage	VIH	0.8VDD	--	3.6	V	Note 3
Input Logic Low Voltage	VIL	0	--	0.2VDD	V	Note 3
Current for Driver	IGH	--	705	750	μA	VGH=22V
	IGL	--	705	750	μA	VGL=-7V
	IVDD	--	95	120	mA	VDD=2.5V
	IAVDD	--	45	70	mA	AVDD=8.2V

Note 1: Be sure to apply VDD and VGL to the LCD first, then apply VGH.

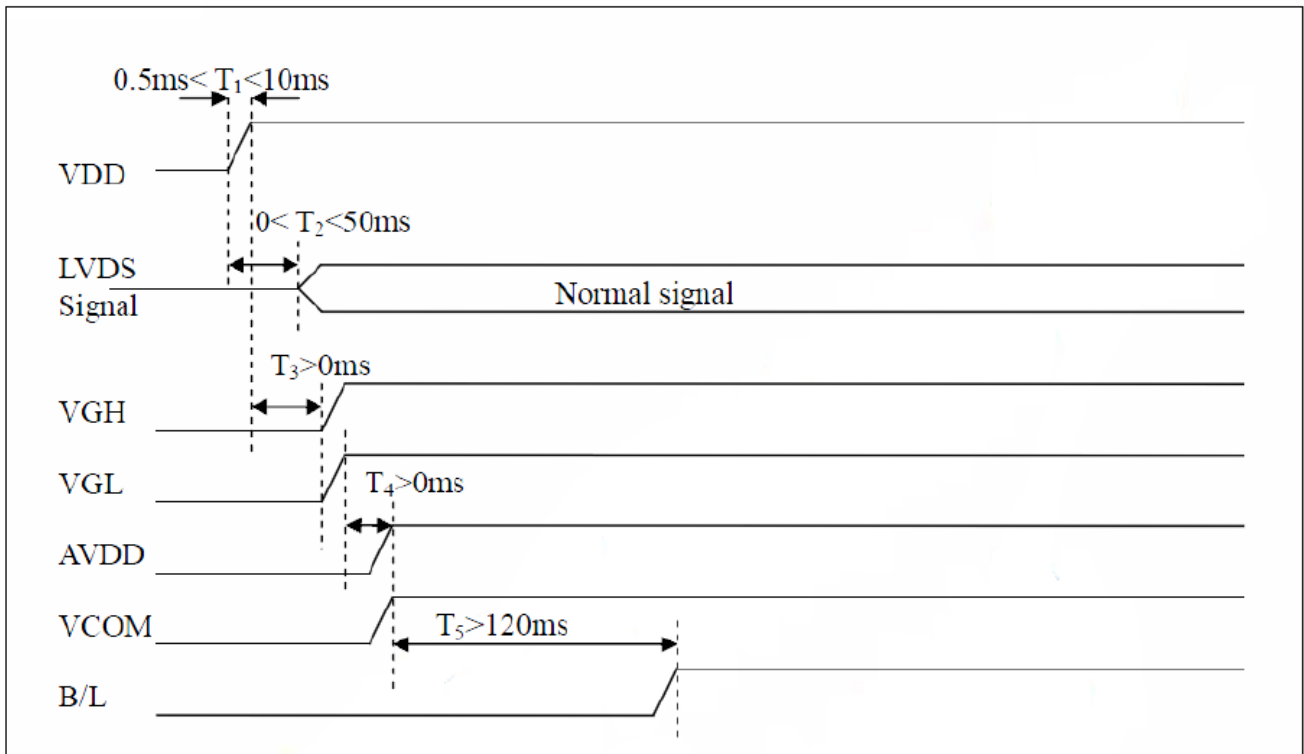
Note 2: VDD settings should match the signals output voltage (refer to Note 3) of board.

Note 3: Typical VCOM is reference value, must be optimized according to each LCM. Be sure to use VR.

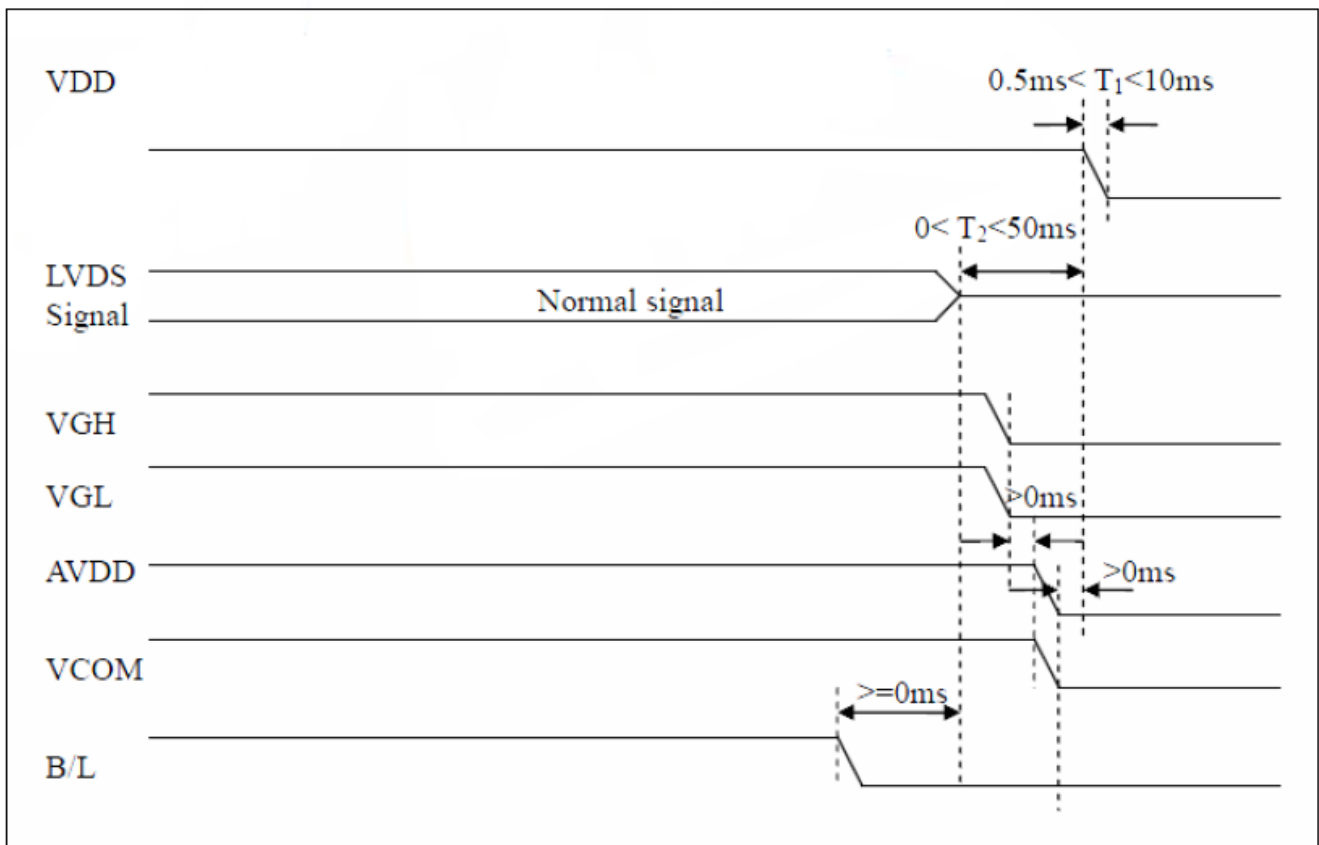


### 5.3 Power Sequence

Power On:



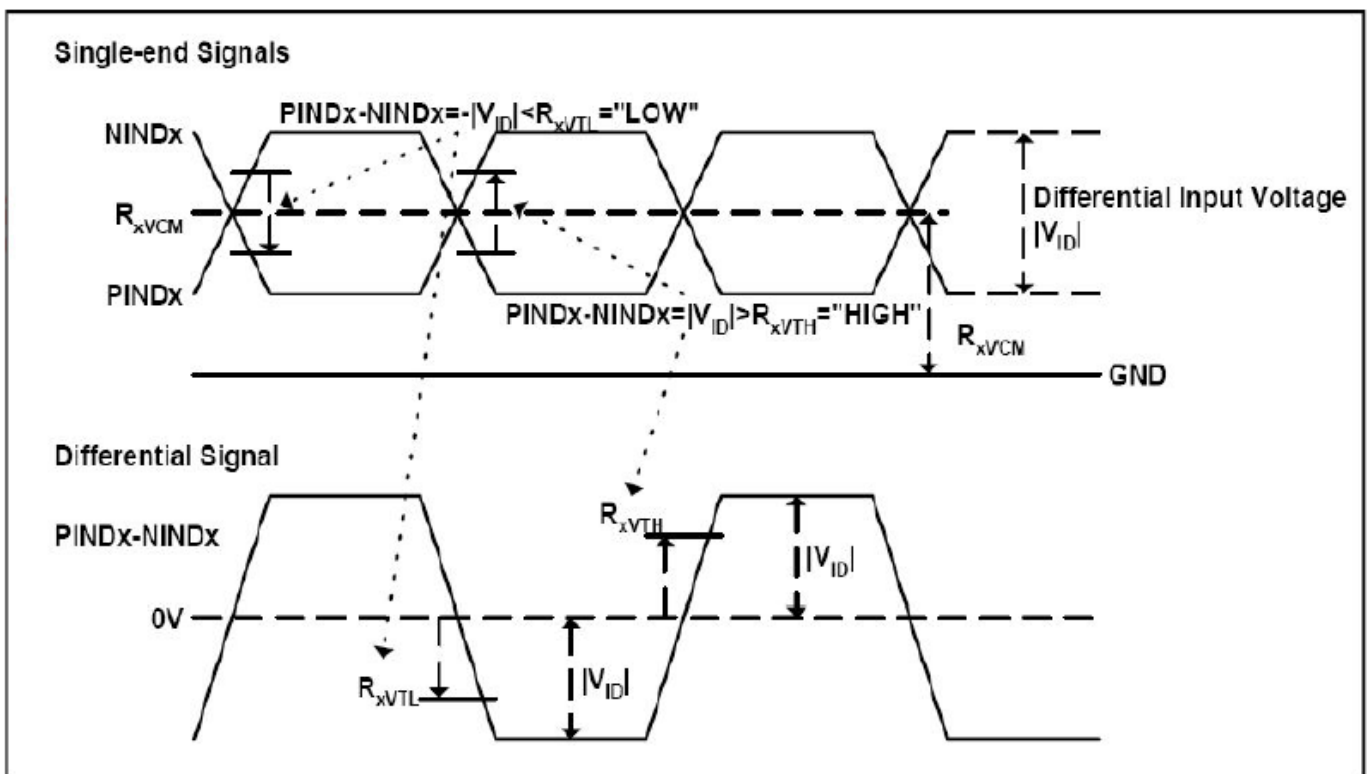
Power Off:



## 6. LVDS Signal Timing Characteristics

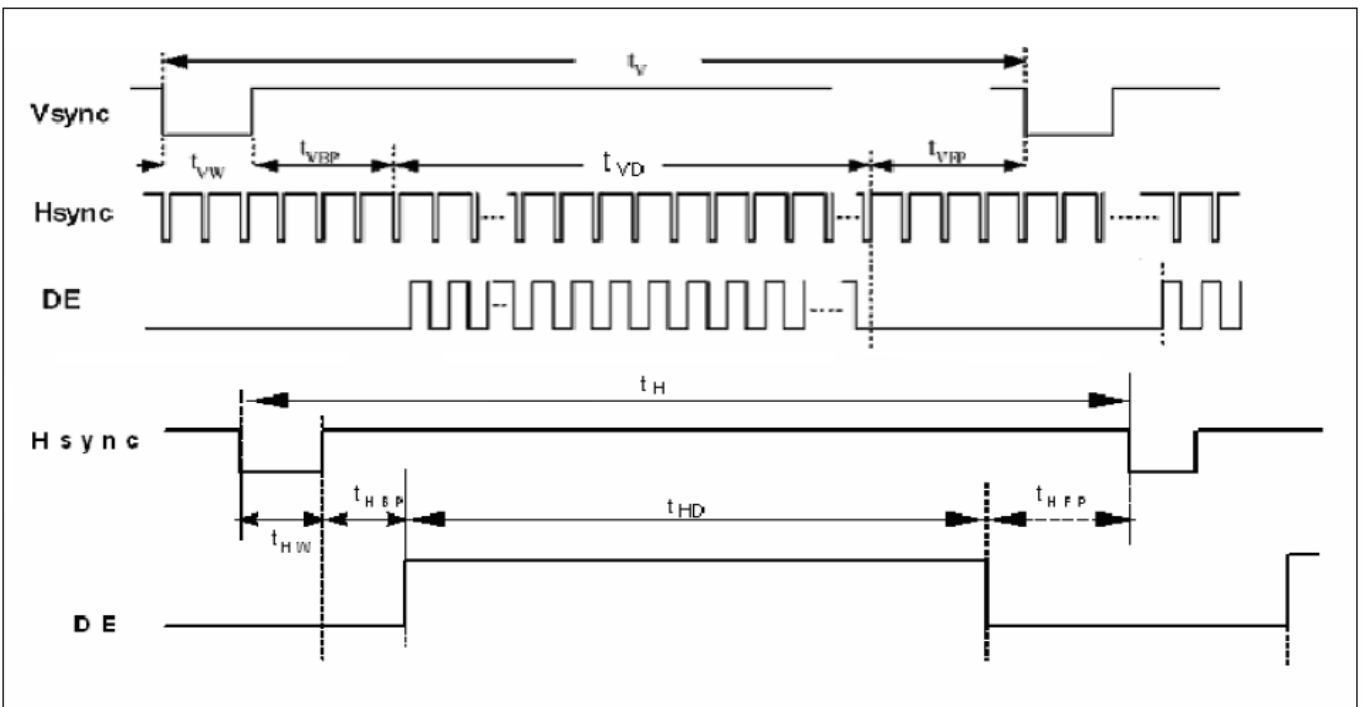
### 6.1 AC Electrical Characteristics

Characteristics	Symbol	Min	Typ.	Max	Unit	Note
LVDS Differential Input High Threshold Voltage	$R_{xVTH}$	--	--	+100	mV	$R_{xVCM}=1.2V$
LVDS Differential Input Low Threshold Voltage	$R_{xVTL}$	-100	--	--	mV	
LVDS Differential Input Common Voltage	$R_{xVCM}$	0.7	--	1.6	V	
LVDS Differential Voltage	$ V_{ID} $	100	--	600	mV	

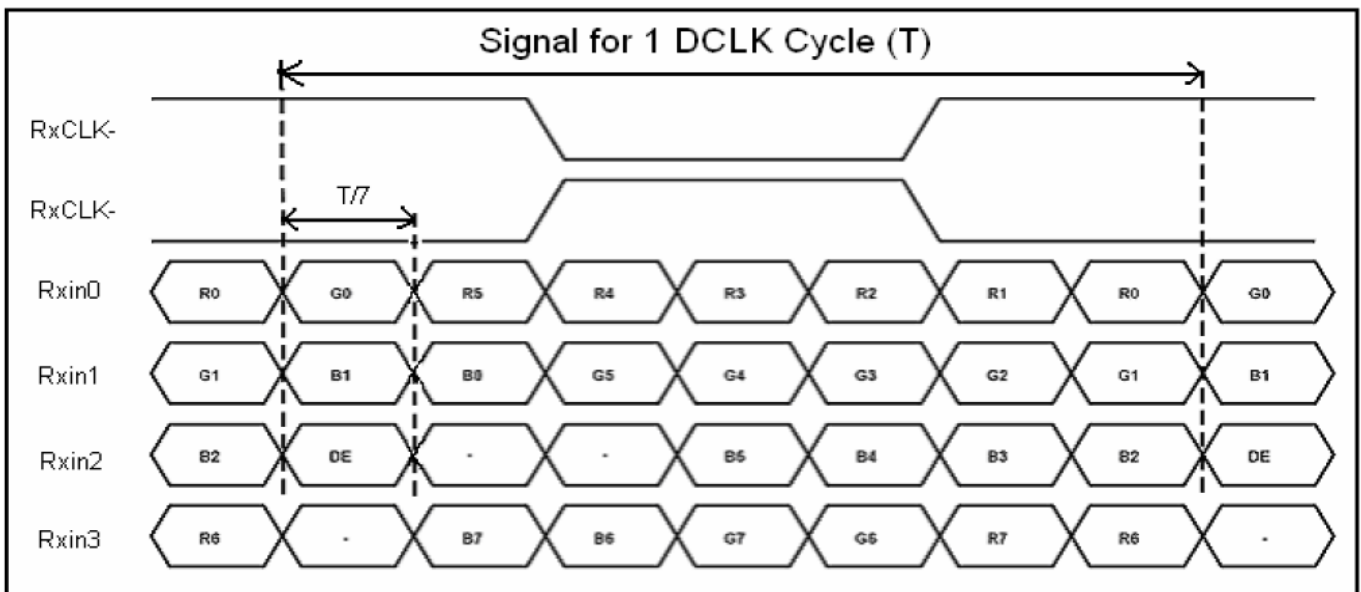


## 6.2 Timing Table

Characteristics	Symbol	Min	Typ.	Max	Unit	Note
Clock Frequency	1/Tc	68.9	71.1	73.4	MHz	Frame rate = 60Hz
Horizontal Display Area	t <sub>HD</sub>	1280			Tc	
HS Period	t <sub>H</sub>	1410	1440	1470	Tc	
HS Width+ BP + FP	t <sub>HW</sub> +t <sub>HBP</sub> +t <sub>HFP</sub>	60	160	190	Tc	
Vertical Display Area	t <sub>VD</sub>	800			t <sub>H</sub>	
VS Period Time	t <sub>V</sub>	815	823	833	t <sub>H</sub>	
VS Width + BP + FP	t <sub>VW</sub> +t <sub>VBP</sub> +t <sub>VFP</sub>	15	23	33	t <sub>H</sub>	



## 6.3 LVDS Data Input Format



## 7. CTP Electrical Characteristics

### 7.1 Absolute Maximum Rating

Characteristics	Symbol	Min	Max	Unit	Note
Power Supply Voltage	V <sub>BUS</sub>	-0.3	5.5	V	(1)(2)
Operating Temperature	T <sub>OP</sub>	-20	+70	°C	(1)
Storage Temperature	T <sub>ST</sub>	-30	+80	°C	(1)

**Notes:**

- 1.) If used beyond the absolute maximum ratings, FT5X26 may become permanently damaged. It is strongly recommended that the device be used within the electrical characteristic normal operations. If exposed to a condition not within the electrical characteristics, it may affect the reliability of the device.
- 2.) Make sure VDDA (high) ≥ VSSA (low)
- 3.) Make sure VDD (high) ≥ VSS (low)

### 7.2 Power Consumption

IC	Interface	Active (mA)	Monitor (mA)	Sleep (µA)
FT5C26	I2C	19.16	9.88	35.4
	I2C-HID	19.02	9.66	188.5
	USB-HID	20.73	10.27	187.5
FT5B26	I2C	17.20	8.63	35.4
	I2C-HID	17.21	8.67	188.5
	USB-HID	18.77	9.48	187.5
FT5926	I2C	15.12	7.77	35.4
	I2C-HID	15.01	7.58	188.5
	USB-HID	16.68	8.56	187.5
FT5826	I2C	12.97	6.85	35.4
	I2C-HID	12.91	6.78	188.5
	USB-HID	14.55	7.44	187.5

*Table 7.1 Power Consumption*

### 7.3 I/O Ports Circuits

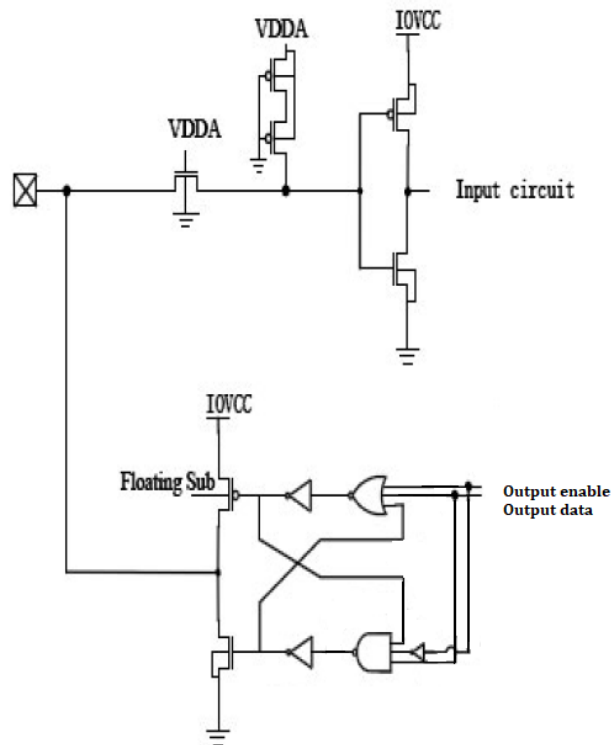


Figure 7.1: Digital Input/Output Port Circuit

NOTE: The input/output property can be configured via firmware settings. The firmware can also control its output behavior as push-pull or as open-drain that SDA of I2C interface is required.

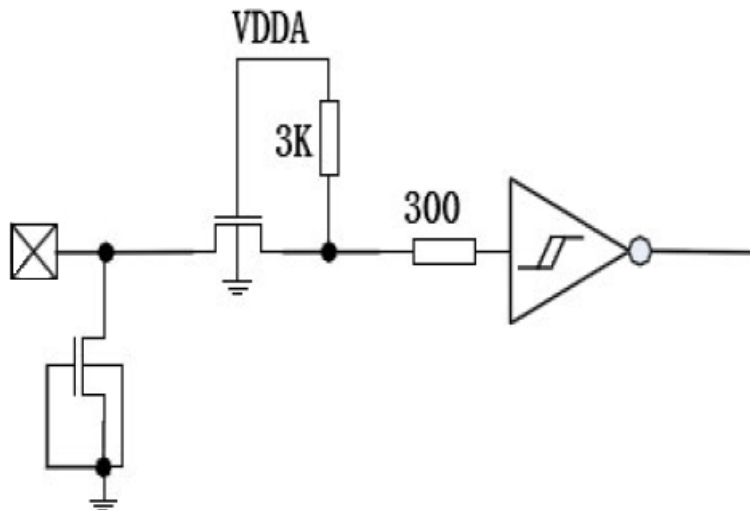


Figure 7.2: Reset Input Port Circuit

## 7.4 Power ON/Reset Sequence

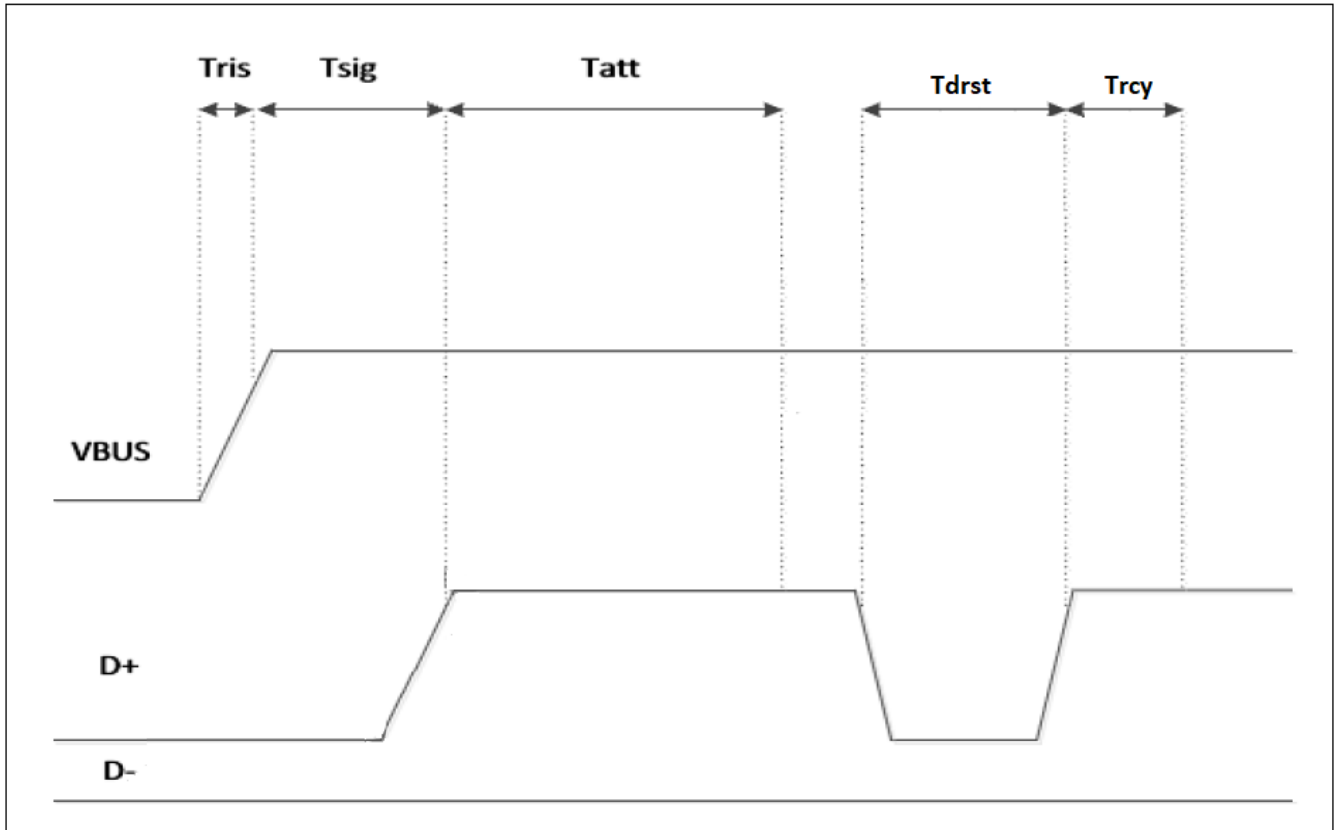


Figure 7.3 Power On/Down Sequence

Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Tsig	Time required for the device internal power rail to stabilize and for D+ or D- to reach VIH (min)	100	--	ms
Tatt	Time ensures that the electrical and mechanical connection is stable before software attempts to reset the attached device	100	--	ms
Tdrst	Time hubs drive reset to a device	10	--	ms
Trcy	The USB system software guarantees a minimum 10ms for reset recovery	10	--	ms

Table 7.2: MIPI Interface Low Power Mode Timing Characteristics

## 7.5 USB

USB is configured in device mode and full speed USB function is supported.  
The USB function controller is as follows:

- USB 2.01-compliant device, full speed (12Mbps)
- Require external crystal (12MHz)
- Support USB LPM L1
- Integrated transceiver
- Support USB-HID protocol for Win8
- Vendor ID:0x2808



## 8. Cautions and Handling Precautions

### 8.1 Handling and Operating the Module

1. When the module is assembled, it should be attached to the system firmly. Do not warp or twist the module during assembly work.
2. Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
3. Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
4. Do not allow drops of water or chemicals to remain on the display surface. If you have the droplets for a long time, staining and discoloration may occur.
5. If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
6. The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
7. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
8. Protect the module from static; it may cause damage to the CMOS ICs.
9. Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
10. Do not disassemble the module.
11. Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
12. Pins of I/F connector shall not be touched directly with bare hands.
13. Do not connect, disconnect the module in the "Power ON" condition.
14. Power supply should always be turned on/off by the item Power On Sequence & Power Off Sequence.

### 8.2 Storage and Transportation

1. Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%
2. Do not store the TFT-LCD module in direct sunlight.
3. The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
4. It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module. In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
5. This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.