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SPECIFICATION
FOR
LCM Module

MODULE No:	ET050HD01-A
CUSTOMER:	

YOURITECH	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Record of Revision

Data	Rev. No.	Page	Summary
2022.01.26	V1.0	ALL	FIRST ISSUE

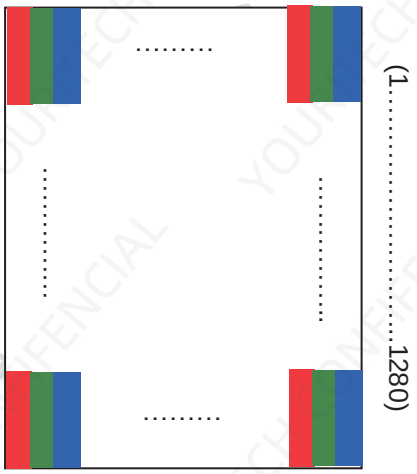
Contents

A. General Information

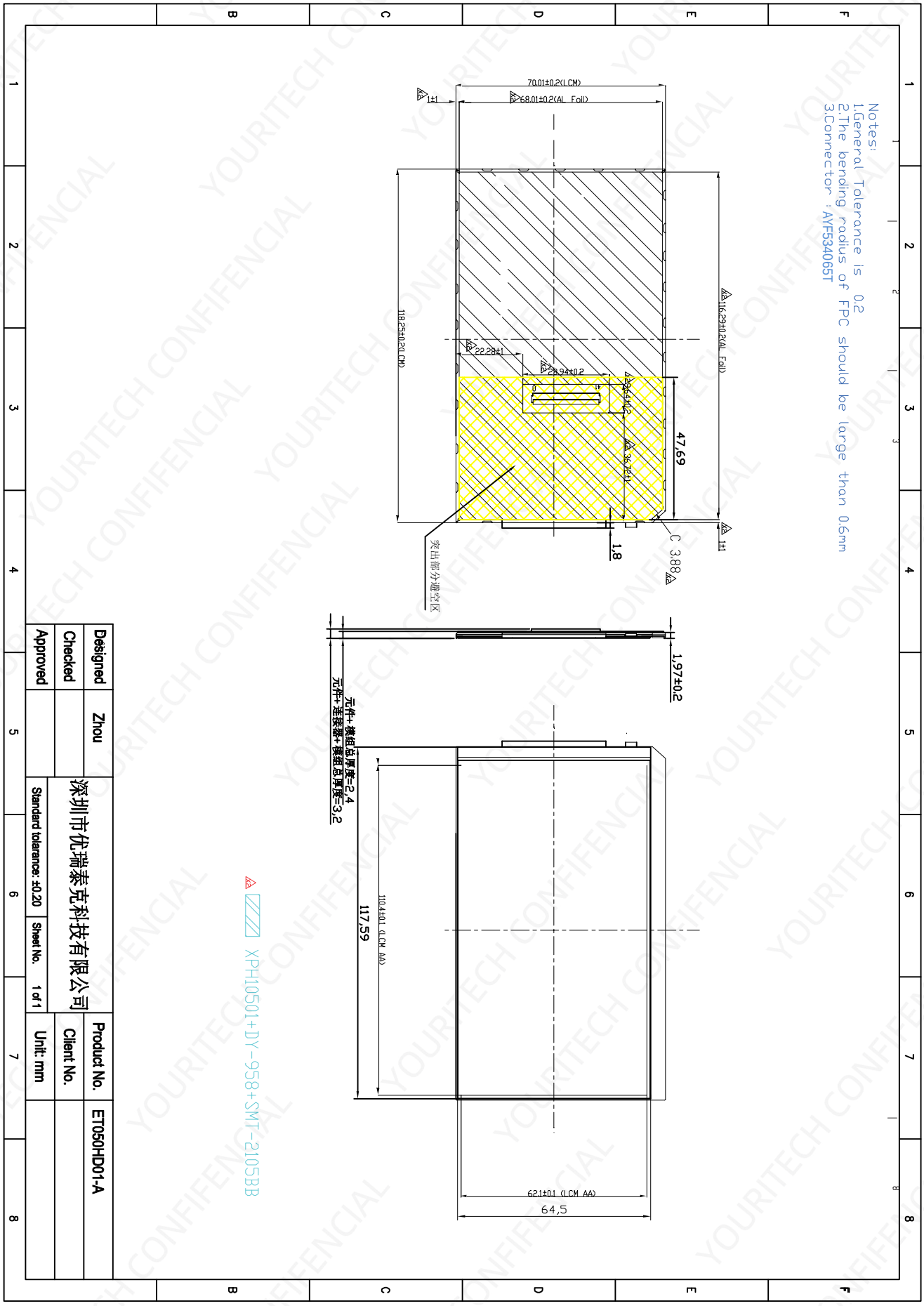
NO.	Item	Unit	Specification	Remark
1	Screen Size	inch	5.0(Diagonal)	
2	Display Mode	--	AHVA type	
3	Display Resolution	dot	720RGB(H)×1280(V)	
4	Overall Dimension	mm		Note 1
5	Active Area	mm	62.1(H)×110.4(V)	
6	Pixel Pitch	mm	0.08625(H)×0.08625(V)	
7	Color Configuration	--	R. G. B. Stripe	Note 2
8	Color Depth	--	16.7M Colors	
9	NTSC Ratio	%		
10	Weight	g		
11	Interface	--	MIPI 4-lane	
12	Power Consumption	W	1.48W (Typ.)	
13	Connector type	--	AYF534065T	ZIF

Note 1: Refer to B. outline dimension.

Note 2: Below figure shows dot stripe arrangement.



B. Outline Dimension


Notes:
1.General Tolerance is ±0.2
2.The bending radius of FPC should be large than 0.6mm
3.Connector : AYF534065T
70.01±0.2(LCM)
68.01±0.2(AL Foil)
118.25±0.2(LCM)
16.29±0.2(AL Foil)
22.28±1
28.94±0.2
4.34±0.2
3.62±1
47.69
1.8
C 3.88
突出部分避空区
1±1
1.97±0.2
元件+模组总厚度=2.4
元件+连接器+模组总厚度=3.2
117.59
110.4±0.1 (LCM AA)
62.1±0.1 (LCM AA)
64.5
XPH10501+DY-958+SMT-2105BB
Designed
Zhou
Checked
Approved
深圳市优瑞泰克科技有限公司
Standard tolerance: ±0.20
Sheet No. 1 of 1
Unit: mm
Client No.
Product No.
ET050HD01-A

C. Electrical Specifications

1. TFT LCD Panel Pin Assignment

NO.	PIN Name	I/O	Description	remark
0	GND	G	Ground Pin.	
1	NC	N	Not connect.	
2	GND	G	Ground Pin.	
3	LED_AN	P	Power for LED backlight anode	
4	LED_CA1	P	Power for LED backlight cathode	
5	LED_CA2	P	Power for LED backlight cathode	
6	LED_CA3	P	Power for LED backlight cathode	
7	GND	G	Ground Pin.	
8	VDDI	P	Power Supply for I/O.	
9	GND	G	Ground Pin.	
10	FTE1	O	The pulse output per scan line signal for noise sensing of TP. This pin is output low when it is not activated.	
11	FTE	O	Tearing effect output pin to synchronize MCU to frame writing, activated by S/W command. When this pin is not activated, this pin is output low.	
12	LEDPWM	O	It is a PWM signal for brightness control of the LED backlight. The width of LEDPWM signal is set from 256 values between 0% (Low) AND 100% (High)	
13	RESX	I	This signal will reset the device and must be applied to properly initialize the chip. Signal is active low.	
14	GND	G	Ground Pin.	
15	D2P	I	These are physical Lane-2's differential data input pins of MIPI interface.	
16	D2N			
17	GND	G	Ground Pin.	
18	D1P	I	These are physical Lane-1's differential data input pins of MIPI interface.	
19	D1N			
20	GND	G	Ground Pin.	
21	CLKP	I	These are differential clock input pins of MIPI interface.	
22	CLKN			
23	GND	G	Ground Pin.	
24	D0P	I	These are physical Lane-0's differential data input pins of MIPI interface.	
25	D0N			
26	GND	G	Ground Pin.	
27	D3P	I	These are physical Lane-3's differential data input pins of MIPI interface.	
28	D3N			

29	GND	G	Ground Pin.	
30	VCI	P	Power Supply for Analog.	
31	NC	N	Not connect.	
32	NC	N	Reserved for AUO test.	
33	NC	N	Not connect.	
34	GND	G	Ground Pin.	
35	TP_INT	/	Reserved for TP(NC)	
36	TP_SDA	/	Reserved for TP(NC)	
37	TP_SCL	/	Reserved for TP(NC)	
38	TP_RESET	/	Reserved for TP(NC)	
39	TP_VCC	/	Reserved for TP(Open)	
40	TP_GND	/	TReserved for TP(Open)	

O: Output pin; I: Input pin; P: Power pin; G: Ground pin; NC: Not connect;
TP: TP pin；RES: Reserved for TP, open for non-TP version

2. Absolute Maximum Ratings

Item	Symbol	Value	Unit
Power supply voltage	VCI	5	V
Power supply voltage	VDDI	3.6	V
Differential input voltage	CLKP/N	1.8	V
	D0P/N~D3P/N		
Digital input voltage	RESX	1.8	V
Operating temperature	Topr	-20~70	℃
Storage temperature	Tstg	-30~80	℃

Note 1: Digital Data.
Note 2: Functional operation should be restricted under ambient temperature. (25℃).
Note 3: Maximum ratings are those values beyond which damages to the device may occur. Functional operation should be restricted to the limits in the electrical characteristics chapter.

3. Electrical DC Characteristics

a. **Characteristics**

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VCI	3.0	3.3	3.6	V	Note2
		IVCI	-	27.5	30	mA	
		VDDI	1.65	1.8	3.3	V	Note2
		IVDDI	-	14.5	15	mA	
Input signal voltage	H Level	VIH	-	VDDI	VDDI	V	Note 1
	L Level	VIL	-	0.3*VDDI	0.3*VDDI	V	
Output signal voltage	H Level	VOH	-	VDDI	VDDI	V	Note 1
	L Level	VOL	-	0.2*VDDI	0.2*VDDI		
Power Consumption		P	-	120	-		Note 2

Note 1 : Digital Data

Note 2 : Typical current test pattern (white)

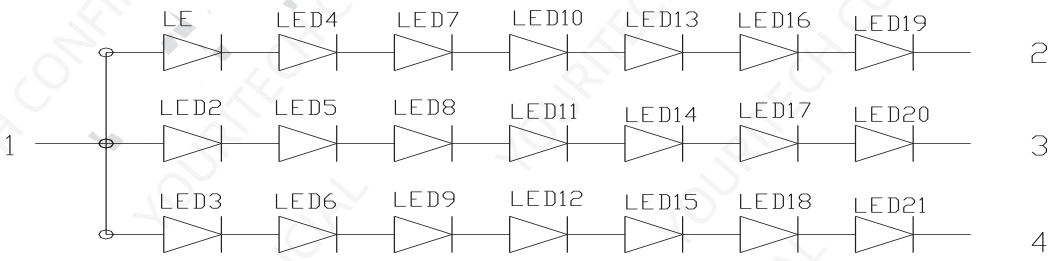
b. Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Lightbar current	I_L		21	23	mA	Note 1
Power consumption	P		1.36	1.5	W	

Note 1: LED backlight is LED lightbar type (21 pcs of LED).

Note 2: The value is only for reference.

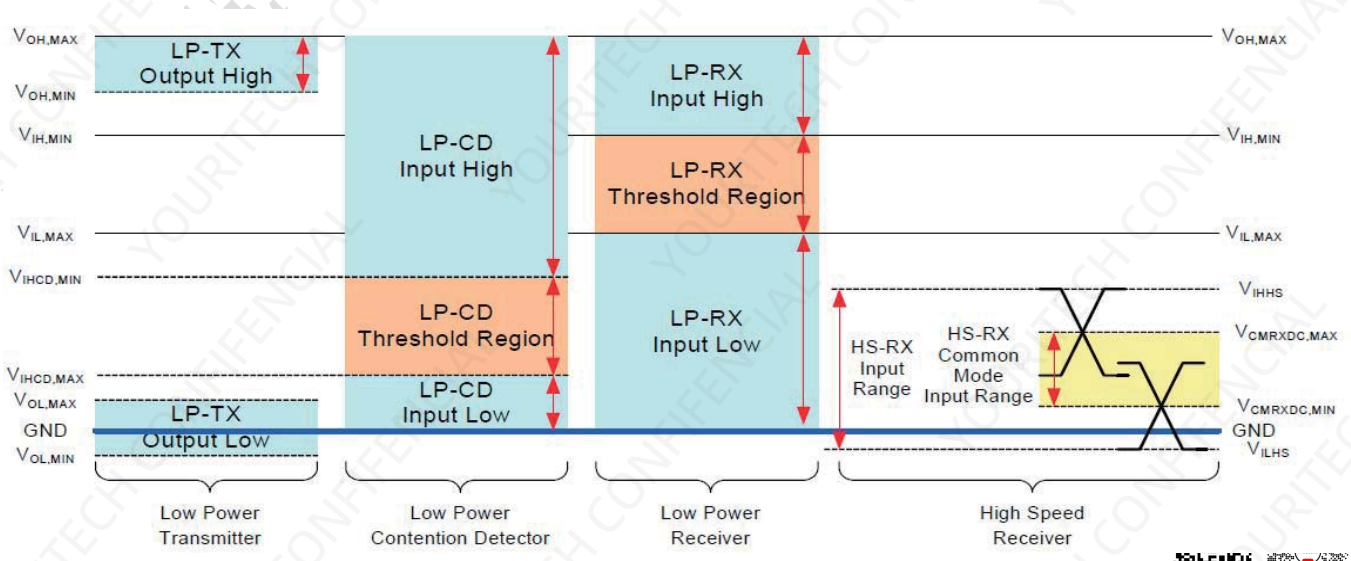
Note 3:LED for Everlight 99-616LM2C



c. MIPI DC characteristics

MIPI Characteristics for High Speed Receiver					
Symbol	**Parameter**	**Min**	**Typ**	**Max**	**Unit**
VCMRXDC	Common-mode voltage	70		330	mV
VIDTH	Differential input high threshold			70	mV
VIDTL	Different input low threshold	-70			mV
VIHHS	Single-ended input high voltage			460	mV
VILHS	Single-ended input low voltage	-40			mV
ZID	Differential input impedance	80	100	125	Ω

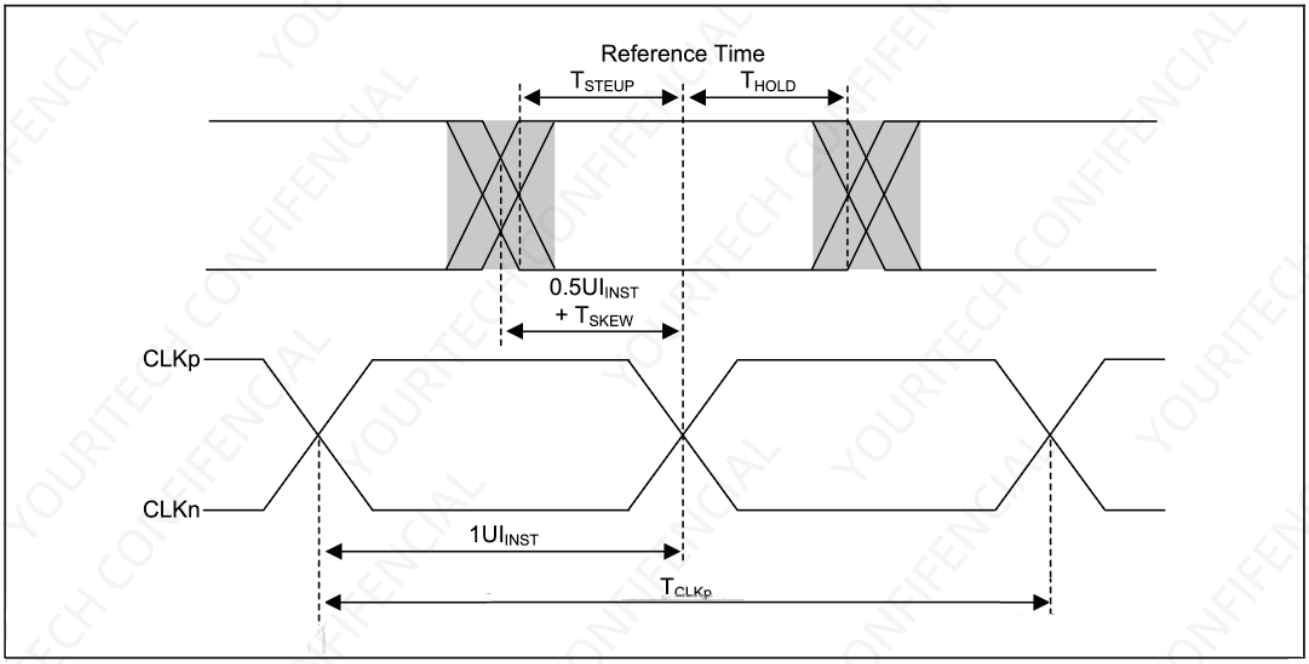
MIPI Characteristics for Low Power Mode					
Symbol	**Description**	**Min**	**Typ**	**Max**	**Unit**
VIHCD	Logic 1 contention threshold	450		1350	mV
VILCD	Logic 0 contention threshold	0		200	mV
VIH-LPRX	Logic 1 input voltage	880	-	1350	mV
VIL-LPRX	Logic 0 input voltage, not in ULP State	0		550	mV
VIL-ULPS	Logic 0 input voltage, ULP State	0		300	mV
VOH-LPTX	output high level	1.1	1.2	1.3	V
VOL-LPTX	input high level	-50	0	50	mV



4. Electrical AC Characteristics

4-1 MIPI AC characteristics

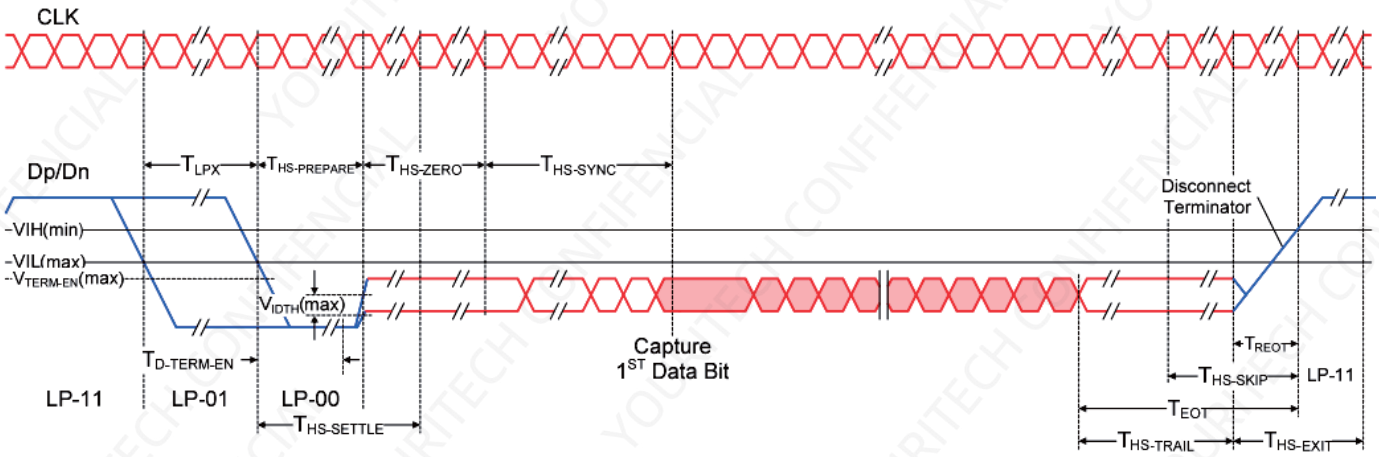
High-Speed transmission : Data-clock Timing



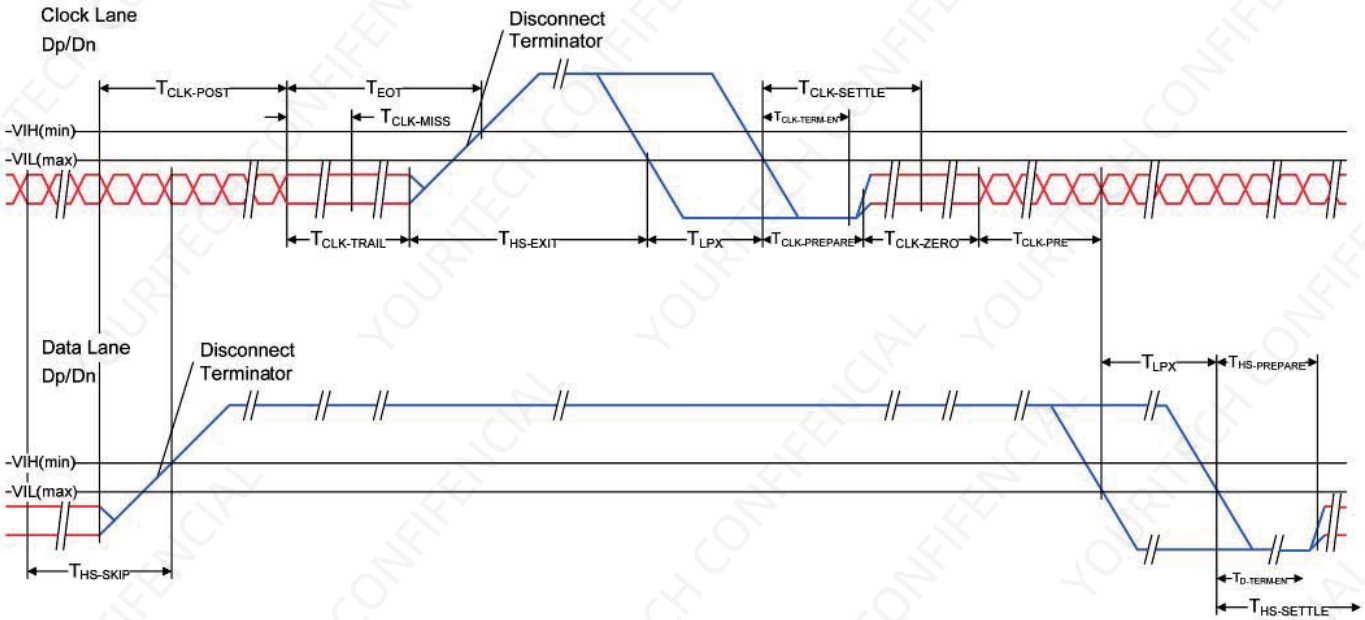
Symbol	Parameter	Min	Typ	Max	Unit	Notes
UI_{INST}	UI instantaneous	1		12.5	ns	1, 2
$T_{SKEW[TX]}$	Data to Clock Skew (mesured at transmitter)	-0.15		0.15	UI_{INST}	3
$T_{SETUP[RX]}$	Data to Clock Setup Time (receiver)	0.15		0.15	UI_{INST}	4
$T_{HOLD[RX]}$	Data to Clock Hold Time (receiver)	0.15		0.15	UI_{INST}	4

Note1: This value corresponds to a minimum 80 Mbps data rate.
Note2: The minimum UI shall not be violated for any single bit period, i.e.,any DDR half cycle within a data burst.
Note3: Total silicon and package delay budget of 0.3* UIINST when D-PHY is supporting maximum data rate = 1Gbps.
Note4: Total setup and hole window for receiver of 0.3* UIINST when D-PHY is supporting maximum data rate = 1Gbps.

High-Speed Data Transmission in Bursts



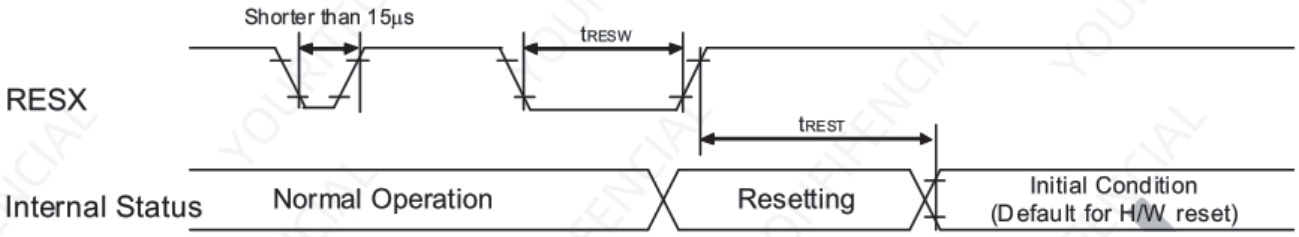
HS Clock Transmission :



Timing Parameters:

Symbol	Parameter	Min	Typ	Max	Unit
$T_{CLK-POST}$	Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	60 + 52UI			ns
$T_{CLK-TRAIL}$	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60			ns
$T_{HS-EXIT}$	Time that the transmitter drives the HS-0 stata after the last payload clock bit of a HS transmission burst.	300			ns
$T_{CLK-TERM-EN}$	Time to enable Clock Lane receiver line termination measured from when Dn cross VIL,MAX	Time for Dn to reach VTERM-EN		38	ns
$T_{CLK-PREPARE}$	Time to drive LP-00 to prepare for HS clock transmission	38		95	ns
$T_{CLK-PRE}$	Minimum time that the HS clock must be set prior to any associated date lane beginning the transmission from LP to HS mode	8			UI
$T_{CLK-PREPARE}$ + $T_{CLK-ZERO}$	$T_{CLK-PREPARE}$ + Time that the transmitter driver the HS-0 state prior to starting the Clock.	300			ns
$T_{HS-TERM-EN}$	Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses VIL,MAX	Time for Dn to reach VTERM-EN		35 + 4UI	ns
$T_{HS-PREPARE}$	Time that the transmitter driver the LP 00 Line state immediately before the HS e starting the HS transmission	40 + 4UI		85 + 6UI	ns
$T_{HS-PREPARE}$+ $T_{CLK-ZERO}$	T + Time that the transmitter driver the HS-0 state prior to transmitting the Sync sequence	145ns + 10UI			ns
$T_{HS-TRAIL}$	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60 + 4UI			ns

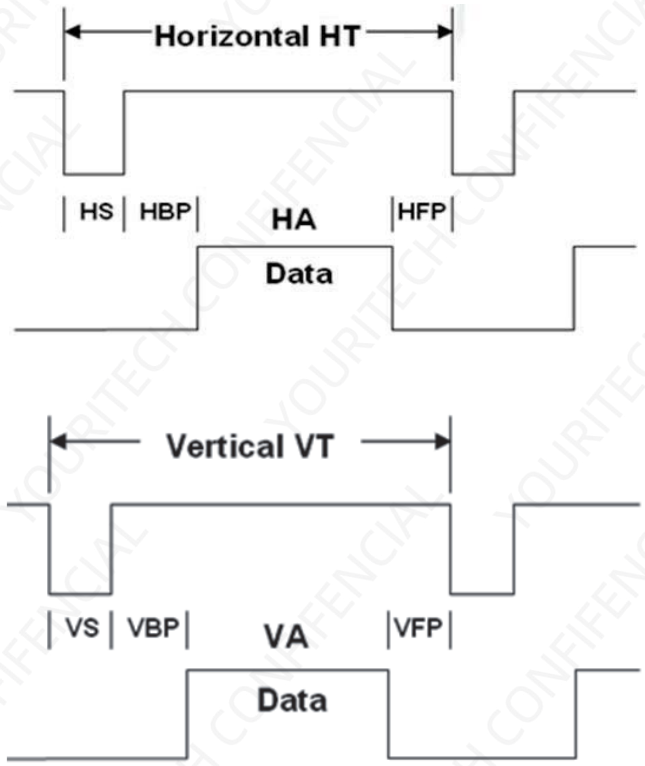
4.2 Reset Timing Characteristics



Symbol	Parameter	Relater Pins	Min.	TYP	Max.	Note	Unit
tRESW	Reset low pulse width	RESX	15	-	-		us
tREST	Reset complete time	-	-	-	5	applied during sleep-in mode	ms
		-	-	-	120	When reset applied during sleep-out mode	ms

RESX	Pulse Action
Shorter than 5us	Reset Rejected
Longer than 15us	Reset
Between 5us and 15us	Reset Starts

5. Interface Timing



Label	Setting	Value	Unit
1	MIPI Speed	400	Mbps
2	Lane	4	-
3	Frame Rate	60	Hz

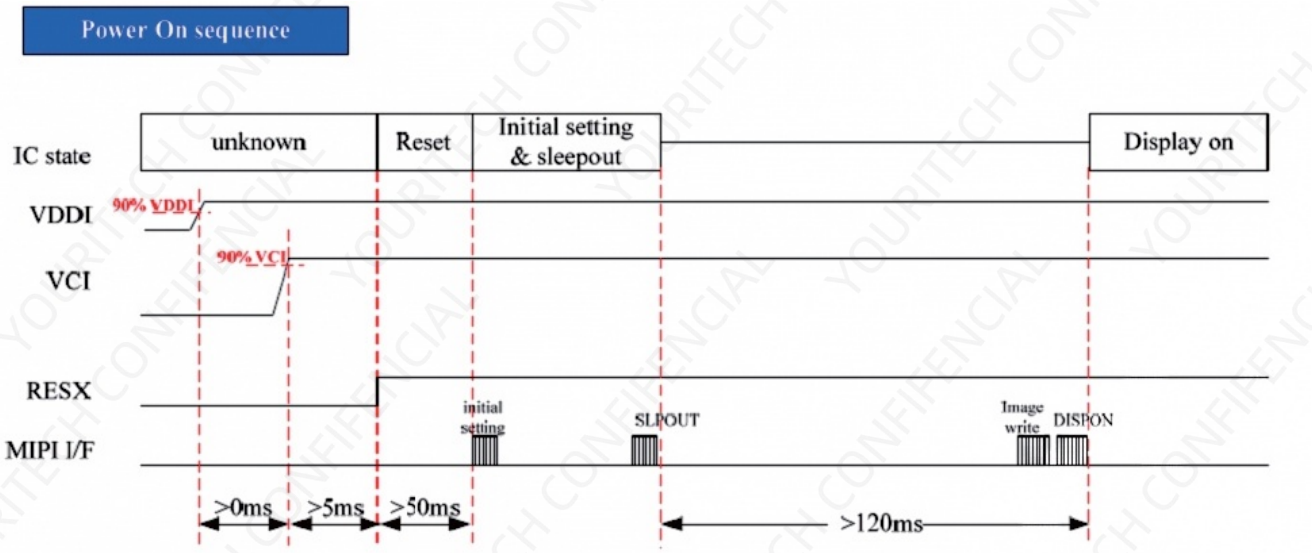
Label	Setting	Value	Unit
1	X-SIZE	720	-
2	Y-SIZE	1280	-
3	HS (Horizontal Sync Width)	10	CLK
4	HBP (Horizontal Back Porch)	52	CLK
5	HFP (Horizontal Front Porch)	52	CLK
6	VS (Vertical Sync Width)	2	LINE
7	VBP (Vertical Back Porch)	20	LINE
8	VFP (Vertical Front Porch)	20	LINE
9	CLK (Clock Frequency)	66	MHz

6. Power On/Off Characteristics

Power on/off sequence (2 Power mode with Power IC)

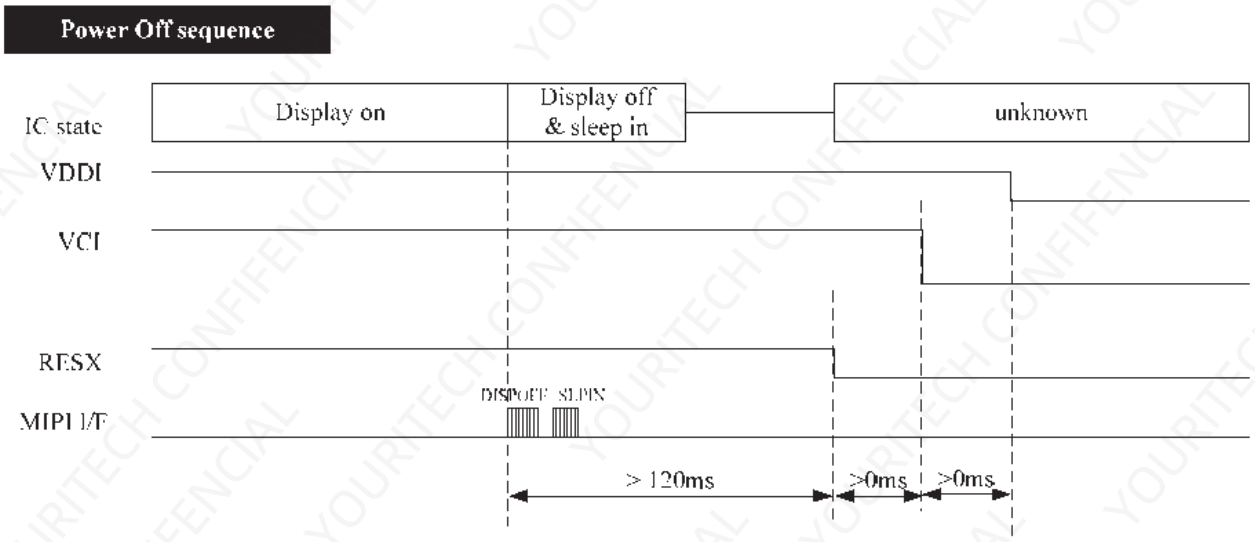
The power on/off sequence for 2-power mode, in which input powers are VCI and VDDI, is depicted in the following. Please follow the power input sequence to avoid triggering any abnormal state.

Power on sequence:



Step	Instruction/Parameters	R/W	MIPI	Reg. hex.	Data hex.	Description
1	Turn on VDDI					VDDI= 1.8V
2	Turn on VCI					VCI= 3.3V
3	REST pin low					
4	Delay 5ms (min.)					
5	REST pin high					
6	Delay 50ms (min.)					
7	Sleep out	W	0x05	1100		
8	Delay 120 ms (min.)					
9	Display on	W	0x05	2900		
10	Delay 100 ms (min.)					
11	B/L pwer on					

Power-off sequence:



Step	Instruction/Parameters	R/W	MIPI	Reg. hex.	Data hex.	Description
1	B/L pwer off					
2	Delay 120 ms (min.)					
3	Display off	W	0x05	2800		
4	Delay 40 ms (min.)					
5	Sleep in	W	0x05	1000		
6	Delay 120 ms (min.)					
7	REST pin low					
8	Turn off VDDI					
9	Turn off VCI					

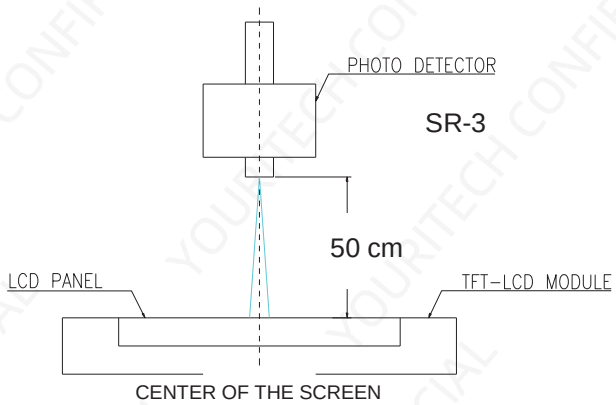
D. Optical Specification

All optical specification is measured under typical condition (Note 1, 2)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time Rise Fall		 Tr + Tf Tf	θ=0°	 -- --	 20 15	45 (Tr+Tf)	 ms ms	Note 3
Contrast ratio		CR	At optimized viewing angle	800	1000	--		Note 4
Viewing Angle	Top		CR≧10	70	80	--	deg.	Note 5
	Bottom			70	80			
	Left			70	80			
	Right			70	80			
Brightness		Y_L	θ=0°		950		cd/m^2	
Chromaticity	White	X	θ=0°	0.247	0.297	0.347		Note 6
		Y	θ=0°	0.276	0.326	0.376		Note 6
	Red	X	θ=0°	0.572	0.622	0.672		Note 6
		Y	θ=0°	0.284	0.334	0.384		Note 6
	Green	X	θ=0°	0.246	0.296	0.346		Note 6
		Y	θ=0°	0.539	0.589	0.639		Note 6
	Blue	X	θ=0°	0.100	0.150	0.200		Note 6
		Y	θ=0°	0.010	0.060	0.110		Note 6
Uniformity		ΔY_L	%	80	85		%	Note 7

Note 1: Ambient temperature =25 , and to be measured in the dark room.

Note 2: To be measured on the center area of panel by SR-3, after 15 minutes operation.

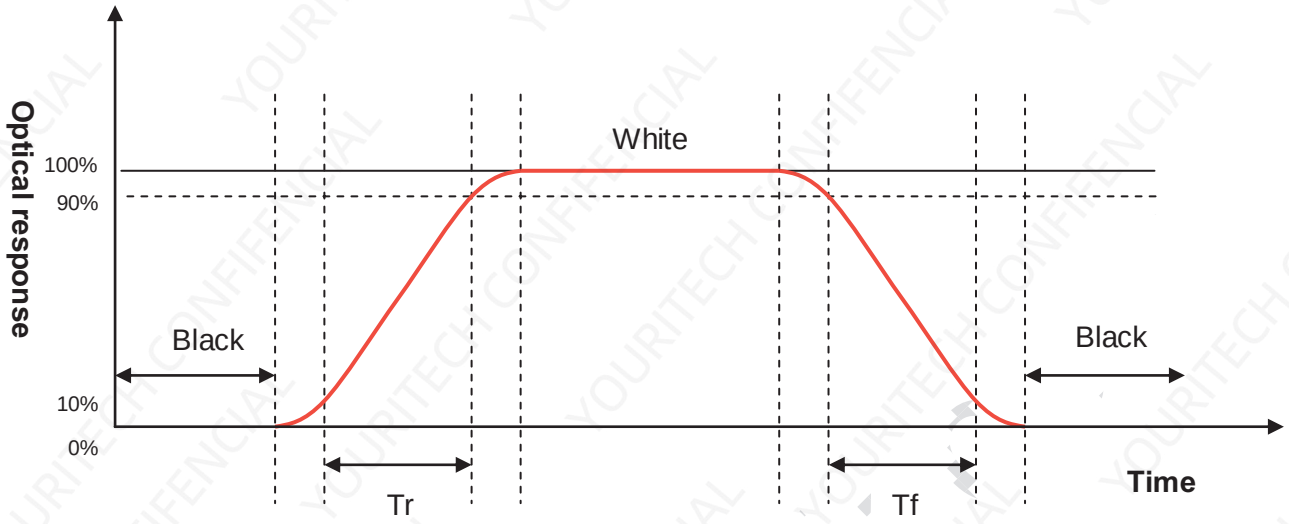


Note 3: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white" (rising time) and from "white" to "black" (falling time), respectively.

The response time is defined as the time interval between the 10% and 90% of amplitudes.

figure as below.

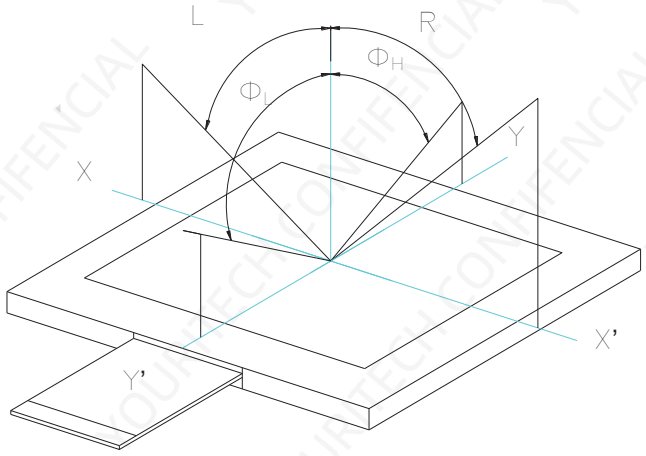


Note 4.Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

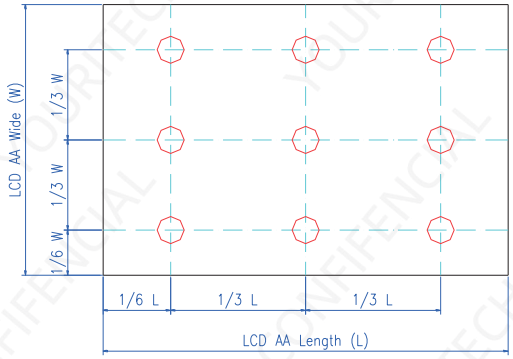
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" status}}{\text{Photo detector output when LCD is at "Black" status}}$$

Note 5. Definition of viewing angle, θ, Refer to the figure below.



Note 6. The chromaticity specification is under check, it will be firmed before mass production.

Note 7: Luminance Uniformity of these 9 points is defined as below:



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

E. Touch Screen Panel Specifications

F. Reliability Test Items

No.	Test items	Conditions		Remark
1	High Temperature Storage	Ta= 80˚C	240Hrs	Note 1,2,3
2	Low Temperature Storage	Ta= -30˚C	240Hrs	Note 1,2,3
3	High Ttemperature Operation	Tp= 70˚C	240Hrs	Note 1,2,3
4	Low Temperature Operation	Ta= -20˚C	240Hrs	Note 1,2,3
5	High Temperature & High	40℃/95%R.H	240Hrs	Operation
6	Thermal Shock	-30℃/30mins~+80℃/30 mins 27 cycles, slope 8℃/min		Non-operation
7	Electrostatic Discharge	Contact =± 4kV Air = ± 8 kV		Note 4
8	Mechanical Shock	100G . 6ms, ±X,±Y,±Z 3 times for each direction		Non-operation JIS C7021, A-7 condition C

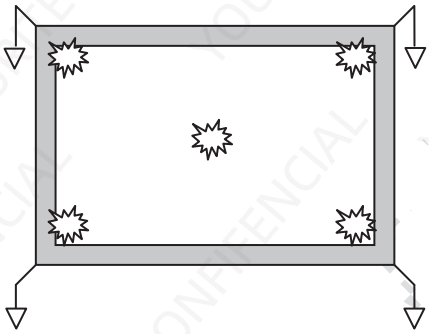
9	Vibration (With Carton)	Random vibration: 0.015G^2/Hz from 5~200Hz –6dB/Octave from 200~500Hz	IEC 68-34
10	Drop (With Carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	
11	Ball Drop Test (display only)	A ball bearing approximately 1 Ounce = 32.5 Grams Drop the ball bearing from the height of 50cm directly to the center of the LCD. Repeat this process 10 times.	The criteria is panel without broken in which exclude the function test and no dent.

Note 1: Ta: Ambient Temperature. Tp: Panel Surface Temperature

Note 2: In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

Note 3: There isn't display function NG issue occurred (ex.electrical …) after high and low temperature reliability testing. For material properties, the polarizers related defect caused not do judge.

Note4: All test techniques follow IEC6100-4-2 standard.

Test Condition		Note
Pattern		
Procedure And Set-up	Contact Discharge：330Ω, 150pF, 1sec, 5 point, 10 times/point Air Discharge：330Ω, 150pF, 1sec, 5 point, 10 times/point  Note : 1. The metal casing is connected to ground (0V) at four corners. 2. Judging the result after discharging.	
Criteria	B – Some performance degradation allowed. No data lost. Self-recoverable hardware failure.	
Others	Ambient: 22 , 50%±2%RH	

G. Packing and Marking

1. Packing Form

2. Module/Panel Label Information

H. Precautions

1. Do not twist or bend the module and prevent the unsuitable external force for display module during assembly.
2. Adopt measures for good heat radiation. Be sure to use the module with in the specified temperature.
3. Avoid dust or oil mist during assembly.
4. Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.
5. Less EMI: it will be more safety and less noise.
6. Please operate module in suitable temperature. The response time & brightness will drift by different temperature.
7. Avoid to display the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause image sticking.
8. Be sure to turn off the power when connecting or disconnecting the circuit.
9. Polarizer scratches easily, please handle it carefully.
10. Display surface never likes dirt or stains.
11. A dewdrop may lead to destruction. Please wipe off any moisture before using module.
12. Sudden temperature changes cause condensation, and it will cause polarizer damaged.
13. High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.
14. Acetic acid or chlorine compounds are not friends with TFT display module.
15. Static electricity will damage the module, please do not touch the module without any grounded device.
16. Do not disassemble and reassemble the module by self.
17. Be careful do not touch the rear side directly.
18. No strong vibration or shock. It will cause module broken.
19. Storage the modules in suitable environment with regular packing.
20. Be careful of injury from a broken display module.
21. Please avoid the pressure adding to the surface (front or rear side) of modules, because it will cause the display non-uniformity or other function issue.
22. It was forbidden to bend the FPC upward to the panel surface.