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MODEL NO : ET041HD03-OT

MODEL VERSION:

SPEC VERSION : 3.0

ISSUED DATE: 2019-05-30

■**Preliminary Specification**

□**Final Product Specification**

Customer :

Approved by	Notes

Table of Contents

Record of Revision

Rev	Issued Date	Description	Editor
1.0	2018-03-05	Preliminary Specification Release	Xunqiang Ji
2.0	2018-12-21	Update parameters details	Xunqiang Ji
3.0	2019-05-30	Update parameters details	Faris Mao

1 General Specifications

Feature		Spec
Display Spec.	Size	4.13 inch
	Resolution	1200(RGB) X 720
	Technology Type	a-Si
	Pixel Configuration	RGB Vertical Stripe
	Pixel pitch(mm)	0.025(W) X 0.075(H)
	Display Mode	Normally Black, Transmissive
	Viewing Direction	ALL
Mechanical Characteristics	MODEL (W x H x D) (mm)	91.4 (W) × 59.2 (H) × 1.1(T)
	LCD Active Area(mm)	90.0 (W) × 54.0 (H)
	With /Without TSP	INCELL
	LCD Driver IC	ILI7810
	Touch controller	ILI2120CB
	Surface Treatment	HC-Polarizer
Electrical Characteristics	LCD Interface	MIPI 3 lane
	Color Depth	16.7M
	Weight	11g

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance: ± 5%

2 Input/Output Terminals

2.1 LCM Interface

Pin NO	Symbol	I/O	Description
1	GND	P	Ground
2	GND	P	Ground
3	GND	P	Ground
4	TP-SCL	I	TP_SCL PIN
5	GND	P	Ground
6	TP-SDA	I	TP_SDA PIN
7	D3N<GND>	I	For 3Lane, It isn't processed to GND.<MIPI DSI 3 lane(-)>
8	VDDH	P	Operation Voltage
9	D3P<GND>	I	For 3Lane, It isn't processed to GND.<MIPI DSI 3 lane(+)>
10	TP-RSTB	I	TP_RESET PIN
11	GND	P	Ground
12	TP-ATTN	I	TP_INT PIN
13	D0N	I	MIPI DSI 0 lane(-)
14	VDDI	P	I/O supply voltage
15	D0P	I	MIPI DSI 0 lane(+)
16	GND	P	Ground
17	GND	P	Ground
18	LEDPWM	O	LEDPWM control
19	CKN	I	MIPI DSI CN lane
20	TE	I	TE TEST
21	CKP	I	MIPI DSI CP lane
22	GND	P	Ground
23	GND	P	Ground
24	AVEE	P	Negative voltage
25	D1N	I	MIPI DSI 1 lane(-)
26	GND	P	Ground

27	D1P	I	MIPI DSI 1 lane(+)
28	AVDD	P	Positive voltage
29	GND	P	Ground
30	GND	P	Ground
31	D2N	I	MIPI DSI 2 lane(-)
32	NC	-	NC
33	D2P	I	MIPI DSI 2 lane(+)
34	LED-2	P	LED Cathode2
35	GND	P	Ground
36	LED-1	P	LED Cathode1
37	RESX	I	RESET PIN
38	NC	-	NC
39	GND	P	Ground
40	LED+	P	LED Anode

3 Absolute Maximum Ratings

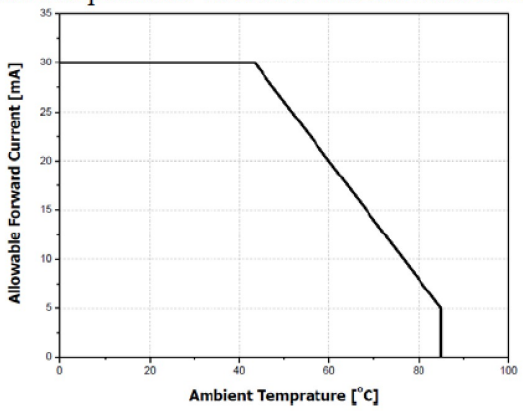
4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS OF LCD GND=0V,Ta=25°C

Item	Symbol	Min	Max	Unit	Note
Power Supply for I/O Interface	VDDI	-0.3	2.0	V	(1)
Power Supply for Analog	VDDH	-0.3	4.0	V	(1)
	AVDD	-0.3	6.5	V	(1)
	AVEE	-6.5	0.3	V	(1)
Input Voltage	Vi	-0.3	VDDI+0.3	V	(2)
LED Reverse Voltage	V_R	-	5	V	
LED Forward Current	I_{LED}	-	Note (3)	mA	per LED

Notes (1) Make sure (High)VDDI>GND(Low) , (High)VDDH>GND(Low) , (High)AVDD<GND(Low)
(Low)AVEE<GND(High)

(2) Applies to the RESX.

(3) Ambient Temperatures vs. Allow able Forward Current.



4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

Item	Operating		Non-Operating (Note4)		Remarks
	Min	Max	Min	Max	
Ambient Temperature	-20°C	60°C	-30°C	70°C	Note (2)
Humidity	Note (1)		Note (1)		No condensation
Corrosive Gas	Not Acceptable		Not Acceptable		

Notes (1) Ta ≤ 40°C 85%RH max.
Ta > 40°C Absolute humidity must be lower than the humidity of 85%RH at 40°C.

(2) Background color slightly changes depending on ambient temperature and viewing angle.
The speed of response is slower at 0°C. The temperature for operating
in the table above apply to operation only. Visual qualities, such as contrast and speed of response,
to be evaluated at Ta = 25°C Operating.

(3) Degradation of the polarizer's optical characteristics can be ignored if it appears after
the reliability test.

(4) This is not for storing condition. When storing LCM for long term, please follow the condition
mentioned in "11.5 STORAGE".

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND = 0V, Ta = 25°C

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Power Supply Voltage for I/O Interface	VDDI	-	1.71	1.8	1.89	V	-
Power Supply Voltage for LCD	VDDH	-	3.0	3.1	3.2	V	-
Power Supply Voltage for LCD	AVDD	-	5.4	5.5	5.6	V	-
Power Supply Voltage for LCD	AVEE	-	-5.6	-5.5	-5.4	V	-
Input Voltage for Logic Circuits	VIH1	"H" level	0.70×VDDI	-	VDDI	V	(1),(2)
	VIL1	"L" level	0	-	0.30×VDDI		
Output Voltage for Logic Circuits	VOH1	"H" level	0.80×VDDI	-	VDDI	V	(1),(3)
	VOL1	"L" level	0	-	0.20×VDDI		
Power Supply Current	I_{VDDI}	All White	-	6.3	17.4	mA	(4),(5)
	I_{VDDH}	All White	-	10.4	14.2	mA	(4),(5)
	I_{AVDD}	All White	-	6.5	9.4	mA	(4),(5)
	I_{AVEE}	All White	-7.4	-5.4	-	mA	(4),(5)
LED Forward Voltage	VLED	-	2.7	-	3.1	V	(6),(7),(9)
LED Forward Current	ILED	-	-	12	-	mA	(6),(7)
LED Reverse Current	IR	-	-	-	50	μA	(7)
Frame Frequency	fFLM	-	57	60	63	Hz	(8)
TP Frame Frequency	TPfFLM	-		(120)		Hz	

Notes (1) VDDI = 1.71V to 1.89V

(2) Input : RESX

(3) Output : TE, LEDPWM

(4) VDDI=1.8V, AVDD+=5.5V, AVEE=-5.5V, VDDH=3.1V, fFLM=60Hz, Column inversion mode, MIPI Command mode.

(5) TP active mode. (No fingers)

(6) Each value is the characteristics of one LED.

(7) The operating current of LED should be determined within the maximum rating of the temperature environmental condition.

(8) The value is a frame frequency when the data of Item (8.8.2) is set to the register. When changing setting data, please contact us.

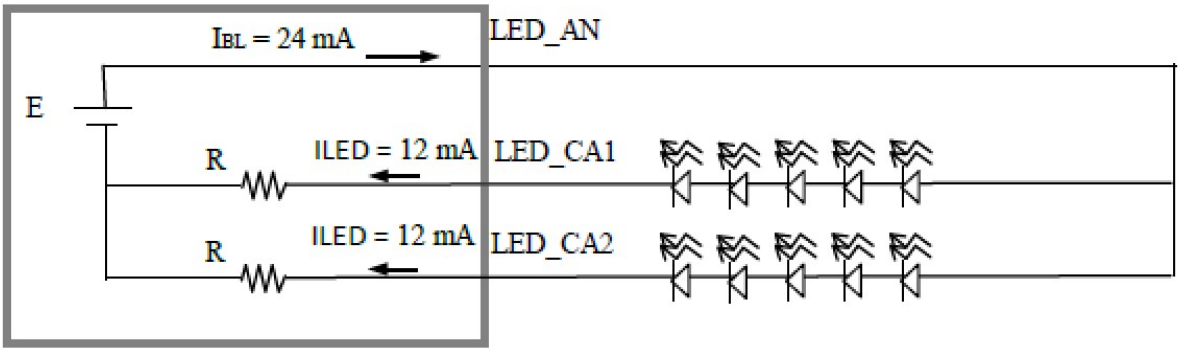
(9) LED color rank:JD2D/JE2D, VF rank Z27/Z29, Luminous Flux:W750/W775/W800

4.2 Backlight Unit

The backlight system is an edge-lighting type with 10 LED. The characteristics of the LED are shown in the following tables.

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Backlight forward voltage	V_F	-	15	-	V	10 LEDs
Backlight forward current	I_F	--	12	--	mA	
LED life time	--	20000	--	--	Hrs	

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



5 Timing Chart

5.1 AC CHARACTERISTICS

8.5.1 MIPI-DSI HS-TX CLOCK AND DATA-CLOCK SPECIFICATIONS

Symbol	Item	Min	Typ	Max	Unit
fDSICLK	DSICLK Frequency			250	MHz
tCLKP	DSICLK Cycle time	2			ns
tDSIR	DSI Data Transfer Rate			500	Mbps
tSETUP	Data to Clock Setup Time	0.15			UI
tHOLD	Data to Clock Hold Time	0.15			UI

8.5.2 MIPI-DSI LP-RX/TX CLOCK AND DATA-CLOCK SPECIFICATIONS

Parameter	Description	Min	Typ	Max	Unit
$T_{HS-PREPARE}$	Time to drive LP-00 to prepare for HS transmission	40+4UI		85+6UI	ns
$T_{HS-TRAIL}$	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60+4UI			ns
$T_{HS-EXIT}$	Time to drive LP-11 after HS burst	100			ns
T_{TA-GO}	Time to drive LP-00 after Tumaround Request	$4T_{LPX}$			ns
$T_{TA-SURE}$	Time-out before new TX side starts driving	T_{LPX}		$2T_{LPX}$	ns
T_{TA-GET}	Time to drive LP-00 by new TX	$5T_{LPX}$			ns
T_{LPX}	Length of any Low-Power state period	50		75	ns
$T_{CLK-POST}$	Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	60+52UI			ns
$T_{CLK-PREPARE}$	TCLK-PREPARE + Time for lead HS-0 drive period before starting Clock	300			ns
$T_{CLK-PRE}$	Time that the HS clock shall be driven prior to any associated Data Lane beginning the transition from LP to HS mode	8xUI			ns
$T_{CLK-PREPARE}$	Time to drive LP-00 to prepare for HS clock transmission	38		95	ns
$T_{CLK-TRAIL}$	Time to drive HS differential state after last payload clock bit of an HS transmission burst	60			ns
T_{LPTX}	Length of Low-Power TX period in case of using DSI clock	50			ns

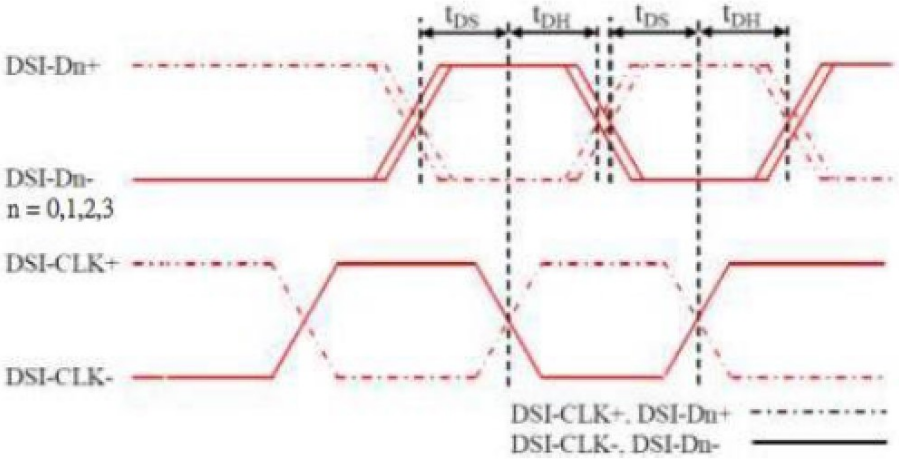


Figure 8.5.1 Data to Clock Timing Definitions

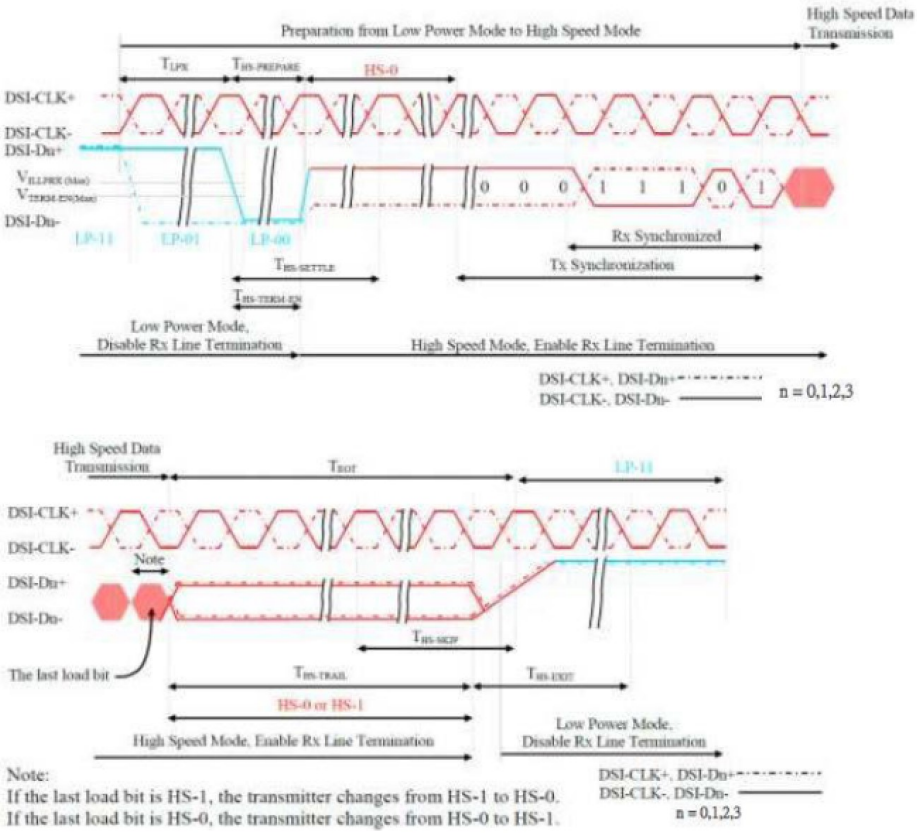


Figure 8.5.2 HS Data Transmission in Bursts

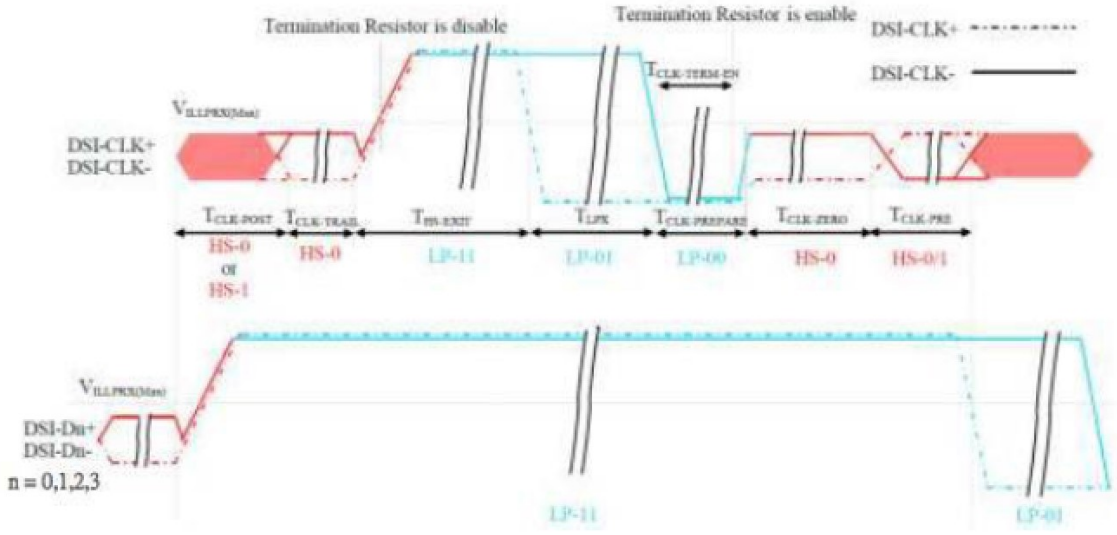


Figure 8.5.3 Switching the Clock Lane between Clock Transmission and LP mode

5.2 Touch panel I/F

8.7.1 Touch I2C parameters

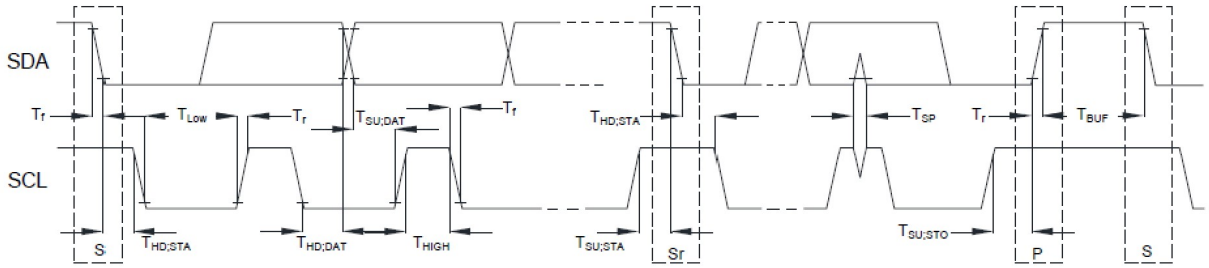


Figure 8.7.1 I2C timing

Symbol	Parameter	100KHz			400KHz		
		Min	Max	Unit	Min	Max	Unit
F_{SCL}	SCL clock frequency	0	100	kHz	0	400	KHz
$T_{HD;STA}$	Hold time (repeated) START condition. After this period, the first clock pulse is generated	4.0	–	μs	0.6	–	μs
T_{LOW}	LOW period of the SCL clock	4.7	–	μs	1.3	–	μs
T_{HIGH}	HIGH period of the SCL clock	4.0	–	μs	0.6	–	μs
$T_{SU;STA}$	Set-up time for a repeated START condition	4.7	–	μs	0.6	–	μs
$T_{HD;DAT}$	Data hold time	0	3.45	μs	0	0.9	μs
$T_{SU;DAT}$	Data set-up time	250	–	ns	100	–	ns
T_r	Rise time of both SDA and SCL signals	–	1000	ns	–	300	ns
T_f	Fall time of both SDA and SCL signals	–	300	ns	–	300	ns
$T_{SU;STO}$	Set-up time for STOP condition	4.0	–	μs	0.6	–	μs
T_{BUF}	Bus free time between a STOP and START condition	4.7	–	μs	1.3	–	μs
T_{SP}	Pulse width of spikes which must be suppressed by the input filter	–	–	–	0	50	ns

Note
-Communication speed up to 400 kHz.
-Support variableness of I2C Slave Adress. (This project is default:0x20)
On the other hand, 0x41 is used for FW upgrading.
-MSB first transfer.
-External pull-up resistors is necessary for I2C fast mode.
It is 2.0 KΩ for the fastest speed FSCL,max= 400KHz, the maximum loading CL,max< 150pF and the IO power supply VDDIO

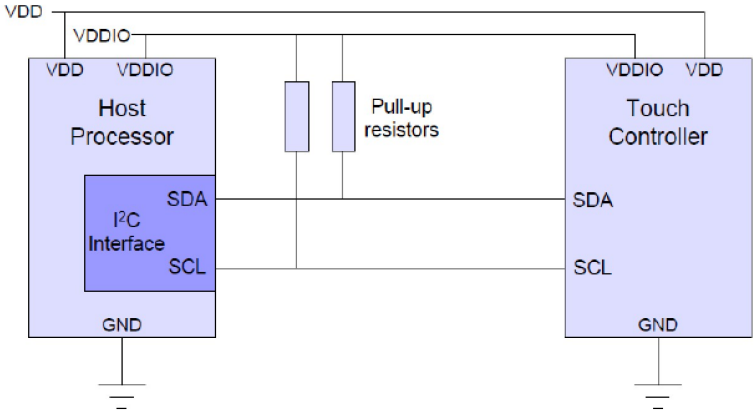
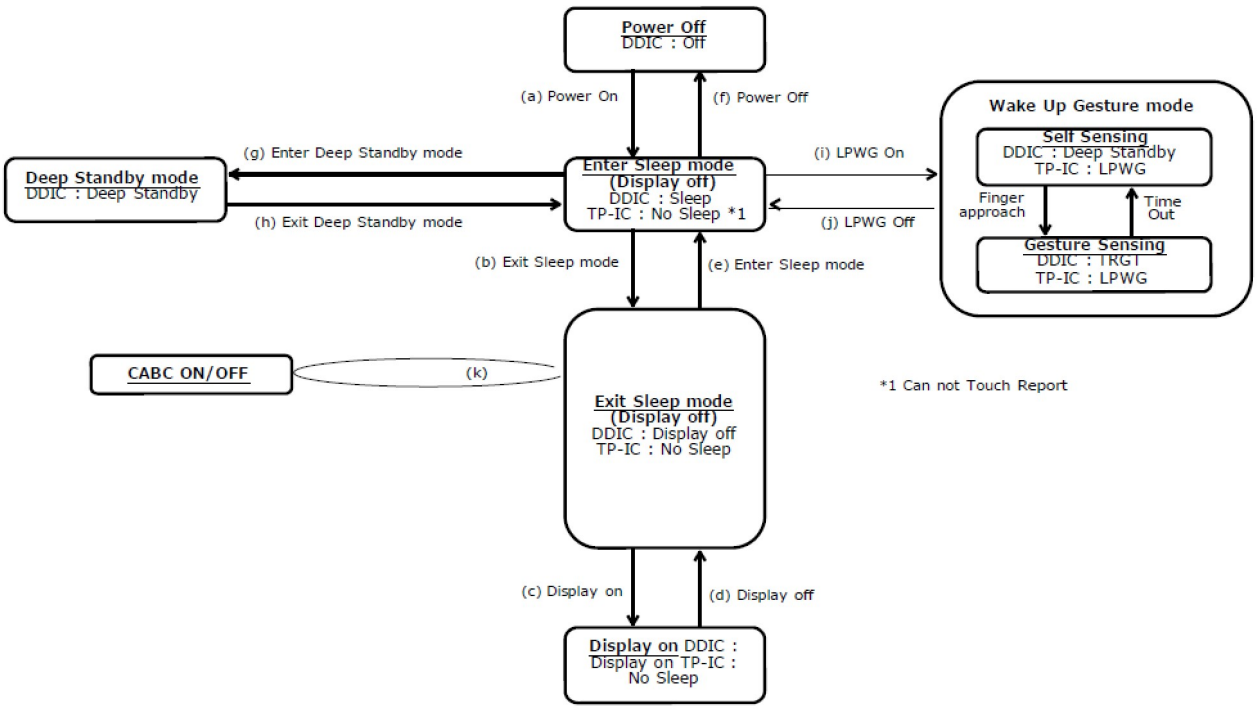


Figure 8.7.2 Typical connection of the Touch Controller to host (I2C)

5.3 LCD & TP POWER-ON / POWER-OFF SEQUENCE

State machine



*For Power supply on/off sequence, please refer to 8.3 POWER SEQUENCE.

(a) Power On Sequence

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1	RESX = L								
2	Power Supply VDDH ON								
3	- Wait Min. 0us								Wait to VDDH=90% (depends on Power Supply Circuit)
4	Power Supply IOVCC ON								
5	- Wait Min. 5ms								Wait to IOVCC=90% (depends on Power Supply Circuit)
6	Power Supply VSP+ ON								
7	- Wait Min. 1ms								Wait for VSP->VSN ordering (depends on Power Supply Circuit)
8	Power Supply VSN- ON								
9	- Wait Min. 0ms								
10	RESX = L								
11	- Wait Min. 10ms								Wait to VSP/VSN=±90% and RESX=Low period (depends on Power Supply Circuit)
12	RESX = H								
13	- Wait 10ms								Wait Min. 10ms

(b) Exit Sleep mode Sequence (Initial setting & Exit Sleep mode)

For mipi command mode

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1	Tearing Effect Line On	DCS 0x15	0x35	0x00					
2	Memory access control	DCS 0x15	0x36	0x00					
3	Column Adress Set	DCS 0x39	0x2A	0x00					
				0x00					
				0x04					
				0xAF					
4	Page Address Set	DCS 0x39	0x2B	0x00					
				0x00					
				0x02					
				0xCF					
5	Sleep Out	DCS 0x05	0x11	-					
6	- Wait Min. 120ms								
7	EXTC Command	Generic	0xFF	0x78					
				0x10					
				0x03					
8		Generic	0x83	0x20					
9		Generic	0x84	0x00					PWM=7.81kHz(Typ.)
10		Generic	0xFF	0x78					
				0x10					
				0x00					
11	Memory Write	DCS 0x39	0x2C	0x**					

(c) Display on Sequence

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1	Display On	DCS 0x05	0x29	-					

(d)Display off Sequence

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1	Display Off	DCS 0x05	0x28	-					
2	- Wait Min. 20ms								

(e) Enter Sleep mode Sequence

For mipi command mode

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1	Sleep In	DCS 0x05	0x10	-					
2	- Wait Min. 120ms								

(f) Power Off Sequence

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1	RESX=L								
2	- Wait Min. 10ms								
3	Power Supply VSN- OFF								
4	- Wait Min. 5ms								Wait for VSN->VSP ordering (depends on Power Supply Circuit)
5	Power Supply VSP+ OFF								
6	- Wait Min. 5ms								Wait to VSP=10%, VSN=10% (depends on Power Supply Circuit)
7	Power Supply IOVCC OFF								
8	- Wait Min. 0us								Wait to IOVCC=10% (depends on Power Supply Circuit)
9	Power Supply VDDH OFF								

(g) Enter Deep Standby mode Sequence

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1	RESX = L								
2	- Wait 10ms								

(h) Exit Deep Standby mode Sequence(1)

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1	RESX = H								
2	- Wait 10ms								

(i) LPWG On Sequence

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1					0x20	0x0A	0x01		
2									

(j) LPWG Off Sequence

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1					0x20	0x0A	0x00		
2									

(k) CABC ON/OFF

Step	Action/Command	DSI Data Type	Address	Data	I2C Address (TP)	Param 1	Param 2	Param 3	Note
1	Display Brightness Value	DCS 0x39	0x51	0x0F 0xFF					D[15:14] = b00 D[13:0] = DBV[13:0] = b11_1111_1111_1111 = h3FFF (LED 100% Duty)
2	Write CTRL Display Value	DCS 0x15	0x53	0x24					D[7:6] = b00 D[5] = BCTRL = b1 (Brightness Control Block ON) D[4] = b0 D[3] = DD = b1 (Display Dimming ON) D[2] = BL = b1 (Backlight Control ON) D[1:0] = b00
3	Write Power Save	DCS 0x15	0x55	0x01					D[7] = b0 = IE OFF D[6] = b0 = SRE_OFF D[5:4] = b00 (IE/SRE Low) D[3:2] = b00 D[1:0] = b00 =Power Save Off (CABC OFF) b01=Conservative Setting
4	Write CABC Minimun Brightness	DCS 0x15	0x5E	0x00 0x00					D[15:14] = b00 D[13:0] = CMB[13:0] = b00_0000_0000_0000 = h0000

5.4 Touch Prerformance

Item	Spec.
Multi-touch	10 fingers
Report rate	120 Hz/60Hz
Active latency	Nominal 10ms, Maximum 16ms
First touch latency	< 35 ms
IC FW upgradability	Support
Touch accuracy (mm, D9)	Center/edge: refer to below tab.
Multi-finger separation (mm,D9)	11mm: H/V direction, finger center to center. (Target value). 13mm : Diagonal direction, finger center to center (target value) To be fixed after
Palm/LO rejection	15 mm * 30 mm reject
Jitter	Max. +/- 0.3mm
Unlock with draw letters	Wake up with draw letters is not supported.
Double tap wake up	Not Support
Glove	Not support
Water proof	No permanent ghost fingers after swiping with a cloth. No ghost fingers with water droplet.
Charger noise immunity	Support

* The above specification is specified the state the LCD module is laminated with 0.4mmt sapphire CG.

5.5 DC CHARACTERISTICS

8.2.1 MIPI Characteristics for High Speed receiver Ta=-20~70degree C

Symbol	Parameter	Min	Typ	Max	Unit
VILHS	Single-ended input low voltage	-40			mV
VIHHS	Single-ended input high voltage			460	mV
VCMRXDC	Common-mode voltage	70		330	mV
ZID	Differential input impedance	80	100	125	ohm
|VOD|	HS transmit differential voltage (VOD=VDP-VDN)	140	200	250	mV

8.2.2 MIPI Characteristics for Low Power Mode

Symbol	Parameter	Min	Typ	Max	Unit
VIL	Logic 0 input threshold	0		550	mV
VIH	Logic 1 input threshold	880		1350	mV
VOL	Output low level	-50		50	mV
VOH	Output high level	1.1	1.2	1.3	V
VIHCD,MAX	Logic 0 contention threshold	0		200	mV
VILCD,MIN	Logic 1 contention threshold	450		1350	mV

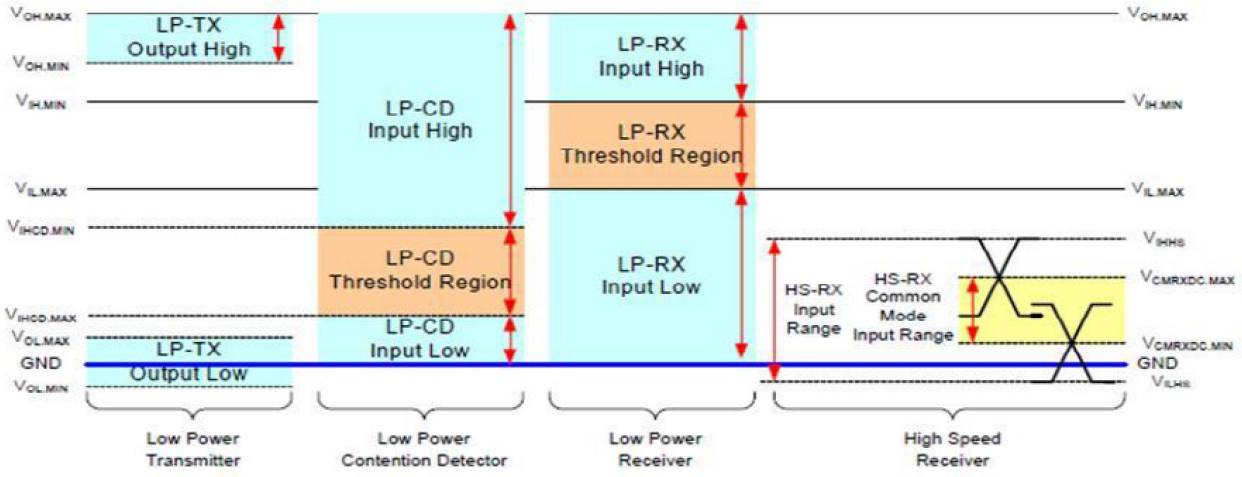


Figure 8.2.1 Signaling Levels

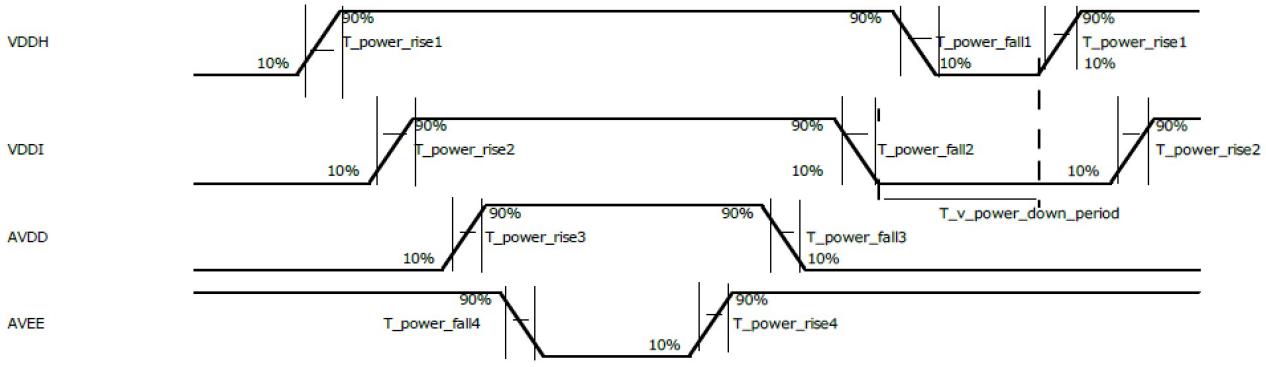
5.6 POWER SEQUENCE

1. Supply Power Voltage

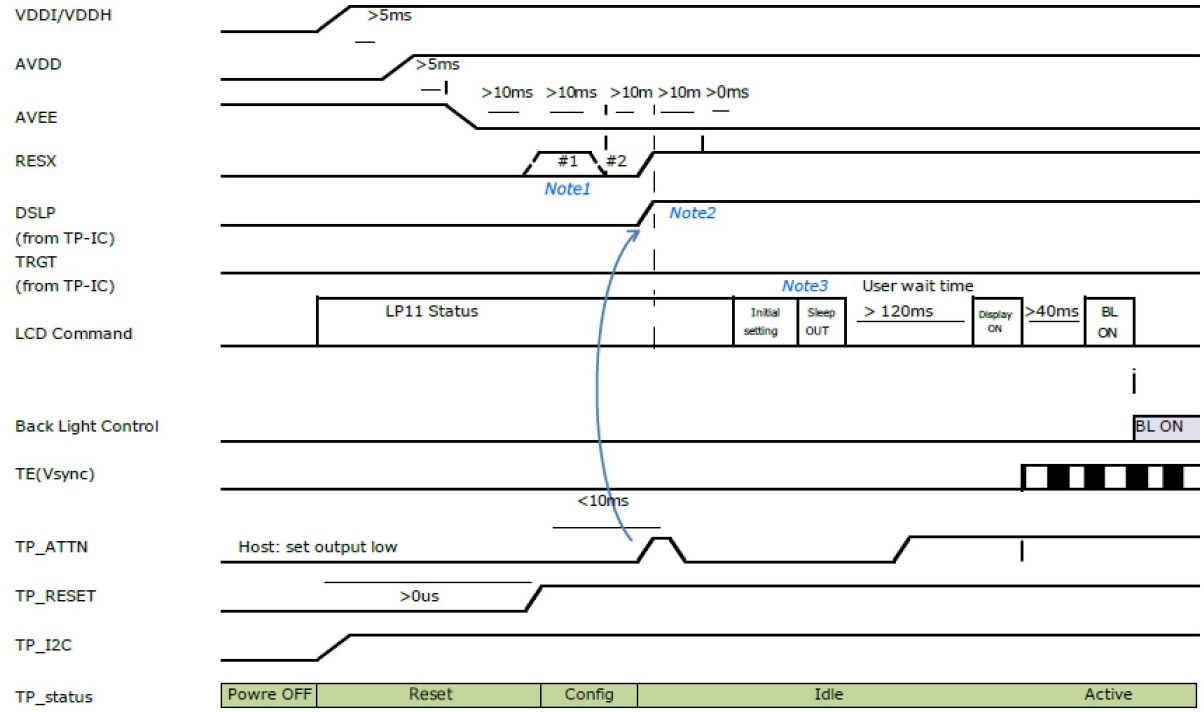
	Min	Typ	Max	Description
AVDD	+5.4	+5.5	+5.6	Analog power supply for LCD.
AVEE	-5.6	-5.5	-5.4	Analog power supply for LCD.
VDDI	+1.71	+1.8	+1.89	Digital power supply for LCD and TP.
VDDH	+3.0	+3.1	+3.2	Analog power supply for TP.

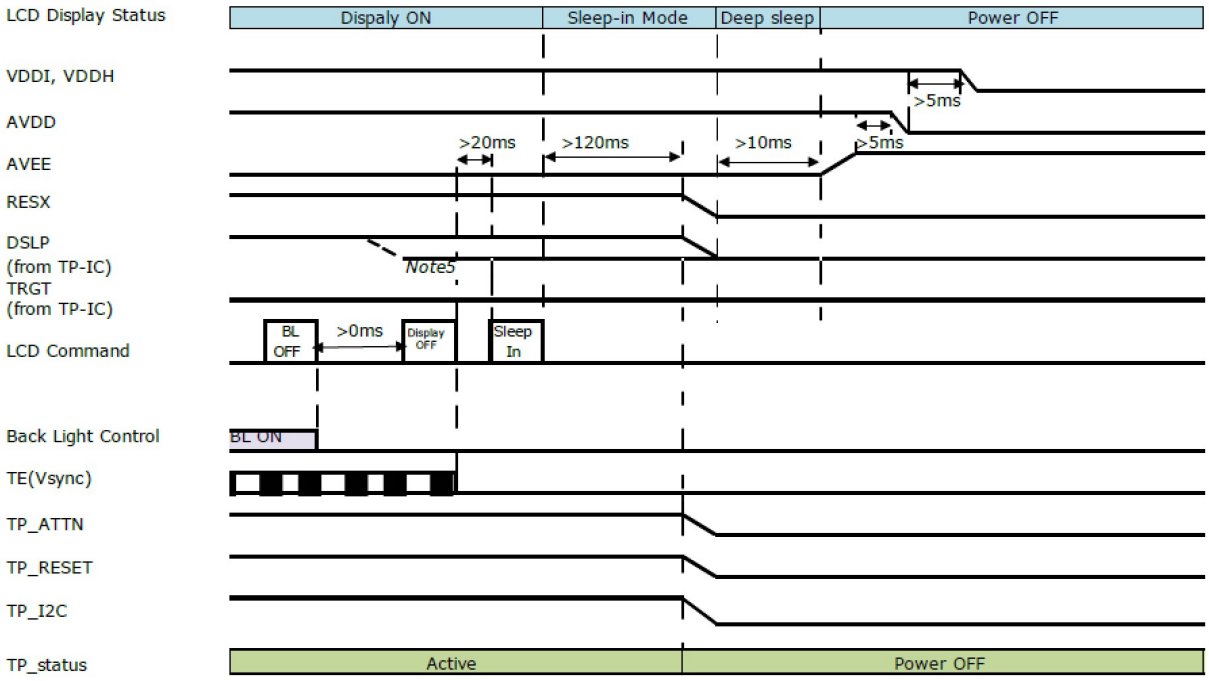
2. Supply Power Slew rate

	Min	Typ	Max	Description
T_power_rise1	5.5us	-	2ms	VDDH from 10% to 90% target voltage
T_power_fall1	-	-	2ms	VDDH from 90% to 10% target voltage
T_power_rise2	0.2ms	-	20ms	VDDI from 10% to 90% target voltage
T_power_fall2	0.2ms	-	20ms	VDDI from 90% to 10% target voltage
T_power_rise3	0.2ms	-	20ms	AVDD from 10% to 90% target voltage
T_power_fall3	0.2ms	-	20ms	AVDD from 90% to 10% target voltage
T_power_rise4	0.2ms	-	20ms	AVEE from 10% to 90% target voltage
T_power_fall4	0.2ms	-	20ms	AVEE from 90% to 10% target voltage



LCD Display Status	Power ON	Deep sleep	Sleep-in Mode	Sleep out sequence	Display ON





5.7 RESET TIMING CHARACTERISTICS

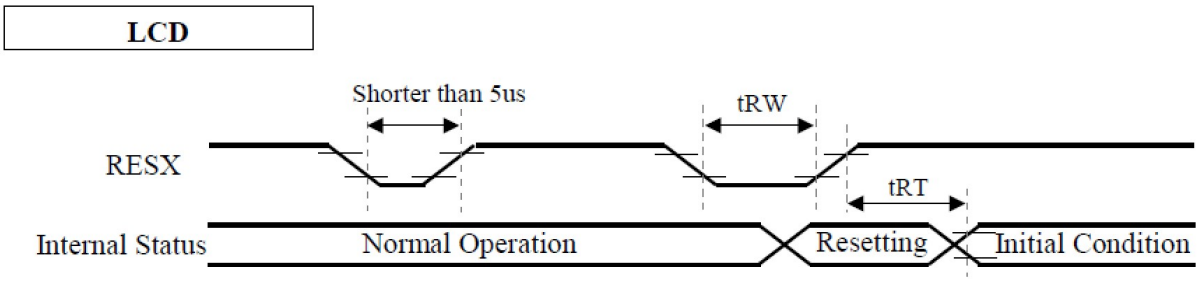


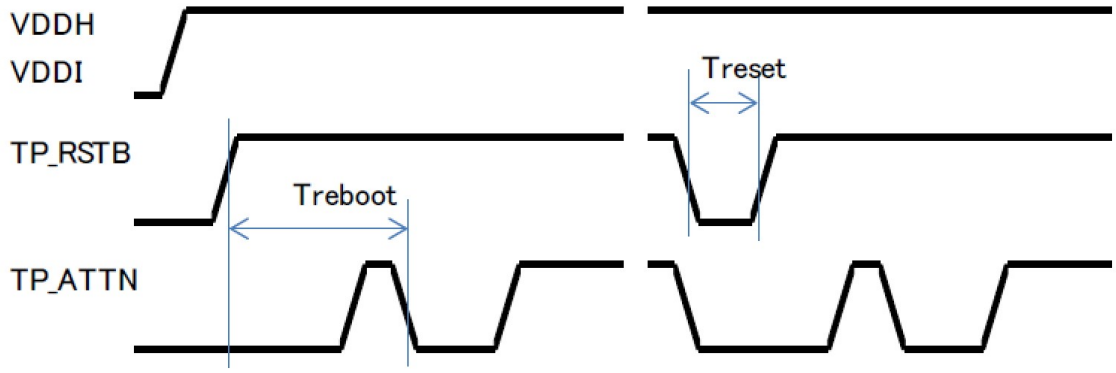
Fig.8.4.1 RESX Operation

Symbol	Parameter	Min	Max	Unit
tRW	Reset low pulse duration	10		ms
tRT	Reset cancel		5	ms
			120	ms

RESX Pulse	Action
Shorter than 5us	Reset Rejected

Note 1. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table above.
Note 2. During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120
ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition
for H/W reset.

TP



Item	min	max
Treset (TP_RSTB Pin)	1us	-
Treset (VDDH/VDDI Pins)	0.5ms	-
Treboot	-	10ms

6 Optical Characteristics

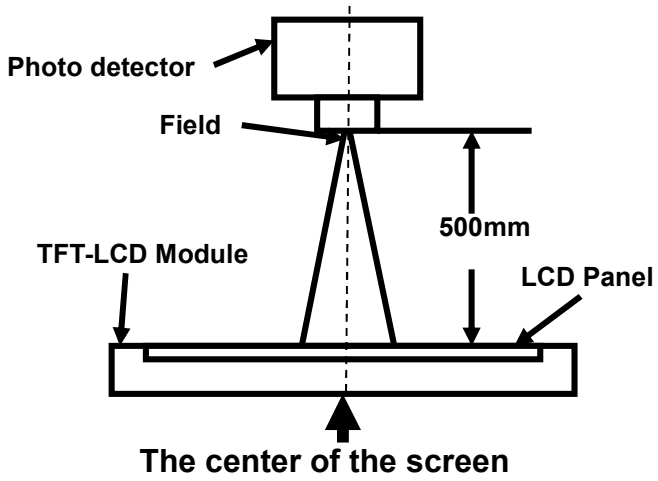
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	-	85	-	Degree	Note2,3
		θB		-	85	-		
		θL		-	85	-		
		θR		-	85	-		
Contrast Ratio		CR	θ=0°	-	1500	-		Note 3
Response Time		T_{ON}	25℃	-	35	-	ms	Note 4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.265	0.30	0.335		Note 1,5
		y		0.285	0.32	0.355		
	Red	x						Note 1,5
		y						
	Green	x						Note 1,5
		y						
	Blue	x						Note 1,5
		y						
Uniformity		U		75	80	--	%	Note 6
Luminance		L		350	450	-	cd/m^2	Note 7

Test Conditions:

1. I_F= 24 mA, and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

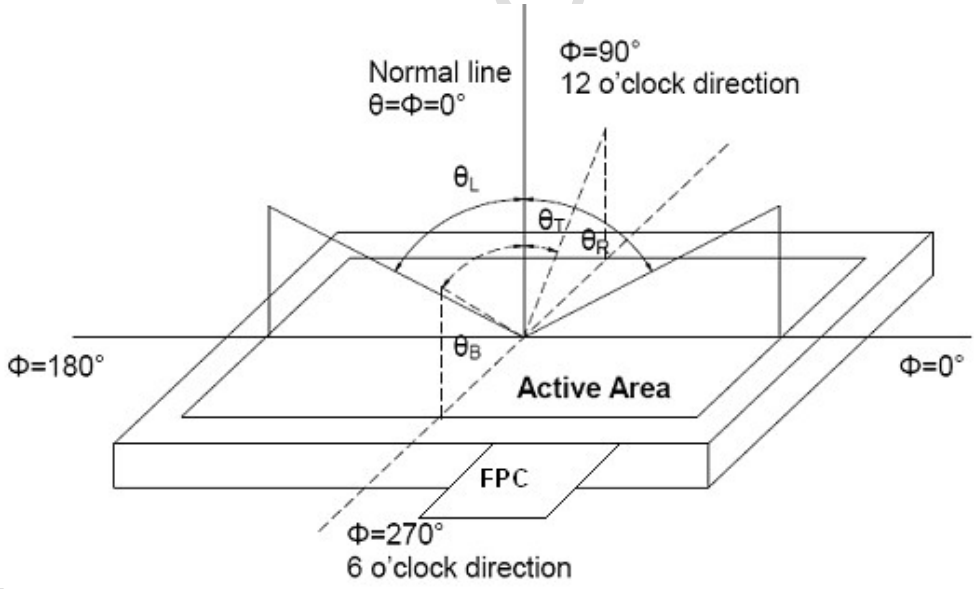
Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD.



Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

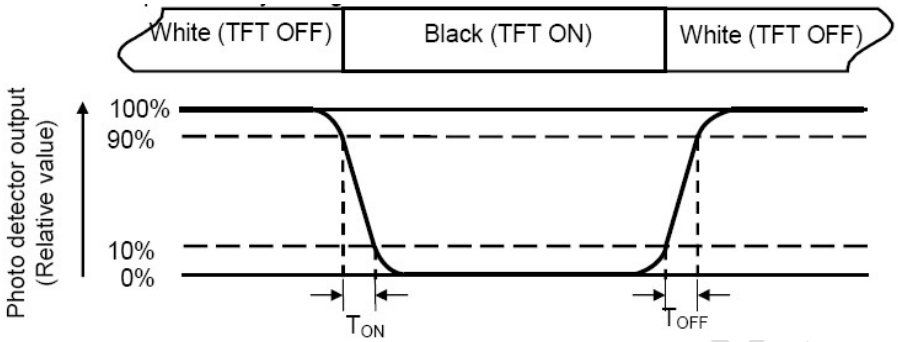
"White state ": The state is that the LCD should drive by Vwhite.

"Black state": The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: 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_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

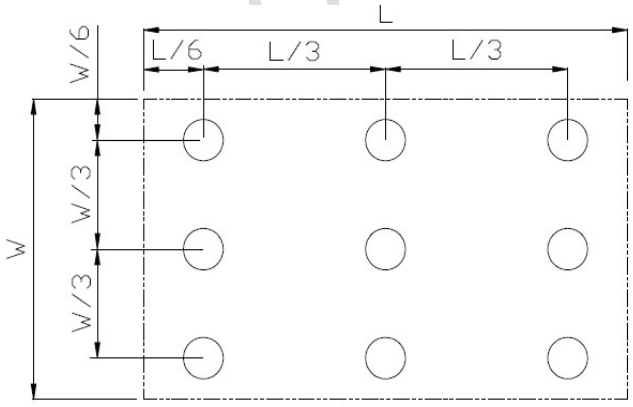
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

L-------Active area length W----- Active area width



Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	70℃, 120Hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃, 120Hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	80℃, 120Hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30℃, 120Hours	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	60℃, 90%RH, 120Hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-20℃ ↔ 70℃, ON/OFF, 20CYC	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	Voltage:±8KV R:330 ohm,C:150pF Air discharge,10 times	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	10 => 55 =>10 => 55 => 10 Hz, within 1 minute;Amplitude:1.5mm. 15 minutes for each Direction (X,Y,Z)	IEC60068-2-6:1982 GB/T2423.10—1995
10	Package Drop Test	Packed, 66CM free fall 6 sides, 1 corner, 3edges	IEC60068-2-32:1990 GB/T2423.8—1995

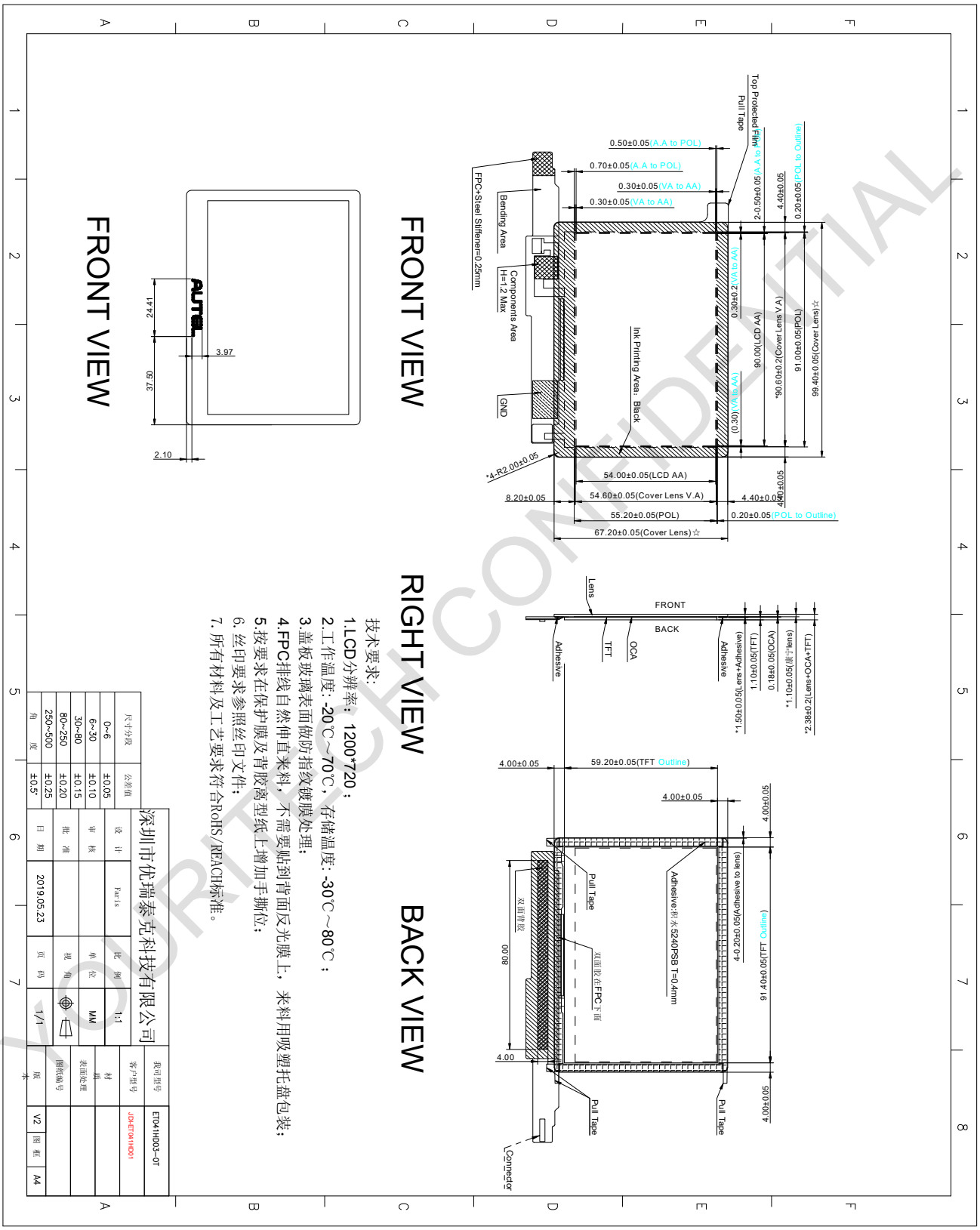
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

8. Outline Dimension



9 Packing Drawing

TBD

10 Precautions for Use of LCD Modules

a) Handling Precautions

i. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

ii. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

iii. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

iv. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

v. If the display surface is contaMinated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

vi. Do not attempt to disassemble the LCD Module.

vii. If the logic circuit power is off, do not apply the input signals.

viii. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

b) Storage precautions

i. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

ii. The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

iii. The LCD modules should be stored in the room without acid, alkali and harmful gas.

c) Transportation Precautions

i. The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.