MODEL NO. : TM043NVHG01-00

ISSUED DATE: 2013-07-30

VERSION : Ver 1.0

■Preliminary Specification
□Final Product Specification

Customer :_____

Approved by	Notes

SHANGHAI TIANMA Confirmed :

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2013-07-30	Preliminary release.	Wallace.Jiang

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1. General Specifications

Feature		Spec
Display Spec.	Size	4.3 inch
	Resolution	480(RGB) x 272
	Interface	RGB 24 bits
		CTP:I2C
	Color Depth	16M
	Technology Type	a-Si
	Pixel Pitch (mm)	0.198x0.198
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment	CTP:6H
		Up Polarizer:Anti-Glare(3H)
	Viewing Direction	6 o'clock
	Gray Scale Inversion Direction	12 o'clock
	Active Area(mm)	LCD:95.04x53.86
		CTP:97.44(W) x 56.26(H)
	LCM (W x H x D) (mm)	113.44x71.46x4.55
	CTP Structure	Glass Lens－Glass Sensor
	CTP Touch Method	Bare finger
	Number of simultaneous touches	5 points
	Minimum Touch Area(mm)	Φ6
	Finger Touch Pitch(mm)	13
	Control IC	CTP: FT5306
		TFT LCD:HX8257A
	LED Numbers	10 LEDs

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%

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2. Input/Output Terminals

2.1 TFT LCD Pin Assignment

No	Symbol	I/O	Description	Remark
1	VLED-	P	Back light cathode	
2	VLED+	P	Back light anode	
3	GND	P	Ground	
4	VDD	P	Power supply	
5	R0	I	Data input	
6	R1	I	Data input	
7	R2	I	Data input	
8	R3	I	Data input	
9	R4	I	Data input	
10	R5	I	Data input	
11	R6	I	Data input	
12	R7	I	Data input	
13	G0	I	Data input	
14	G1	I	Data input	
15	G2	I	Data input	
16	G3	I	Data input	
17	G4	I	Data input	
18	G5	I	Data input	
19	G6	I	Data input	
20	G7	I	Data input	
21	B0	I	Data input	
22	B1	I	Data input	
23	B2	I	Data input	
24	B3	I	Data input	
25	B4	I	Data input	
26	B5	I	Data input	
27	B6	I	Data input	
28	B7	I	Data input	
29	GND	P	Ground	
30	DCLK	I	Clock for input data. Data latched at rising edge of this signal.	
31	DISP	I	Standby mode. DISP =“1”: Normally operation. DISP =“0”: Standby mode.	
32	HSYNC	I	Horizontal sync input with negative polarity. If unused, please pull high level.	
33	VSYNC	I	Vertical sync input with negative polarity. If unused, please pull high level.	
34	DE	I	Data input enable. If unused, please pull low level.	
35	NC	--	No connection	
36	GND	P	Ground.	
37	X_R	--	No connection	
38	Y_B	--	No connection	
39	X_L	--	No connection	
40	Y_T	--	No connection	

Note：I--Input，O--Output，P--Power/Ground

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Table 2.1 Input Terminal Pin Assignment

2.2 CTP Pin Assignment

Pin No.	Symbol	I/O	Description	Remark
1~5	GND	P	Groud	
6	VCC	I/O	CTP power supply	
7	INT	P	External interrupt to the host	
8	WAKEUP	I/O	External interrupt from the host	
9	SCL	O	I2C clock input	
10	SDA	P	I2C data input and output	

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V,Ta=25℃

Item	Symbol	Min	Max	Unit	Remark
Supply Voltage	VDD	-0.3	4.0	V	
Back Light Forward Current	I_{LED}		25	mA	For each LED
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

Note1: The parameter is for driver IC (gate driver, source driver) only.
Note2: Signals include R0~R5, G0~G5, B0~B5, DCLK, DISP, HSYNC, VSYNC, DE

Table 3.1 absolute maximum rating

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25℃

Item		Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage		VDD	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	V_{IL}	0	--	0.3xVDD	V	R0~R5, G0~G5, B0~B5, DCLK, DISP, HSYNC, VSYNC, DE
	High Level	V_{IH}	0.7xVDD	--	VDD	V	
Output Signal Voltage	Low Level	V_{OL}	--	--	0.2xVDD	V	
	High Level	V_{OH}	0.8xVDD	--	VDD	V	

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(Panel+LSI) Power Consumption	Black Mode (60Hz)		74.0		mW	
	Standby Mode		50		uW	Note1

Note1: To test the current dissipation, use “all Black Pattern”.

Table 4.1 LCD module electrical characteristics

4.2 Driving CTP

(T_A= 25℃,VDD=3.3V)

Item	Min	Typ	Max	Unit	Note
power supply voltage	--	3.3	--	V	DC(noise should be under 100mV)
Power supply current	--	20	--	mA	One finger on sensor
Sleep mode	--	2	--	mA	
Respond time	--	--	200	ms	

Note1: All current measurement is average current.

4.3 Driving Backlight

Item	Symbol	Min	Typ	Max	Unit	Remark
Channel	$I_{channel}$	--	20.0	25.0	mA	Note 1
Forward Voltage	V_{BL}	--	16	--	V	
Backlight Power Consumption	W_{BL}	--	640	--	mW	
Life Time	--	10,000	(20,000)	--	Hrs	Note 3

Note 1: I_F is defined for one channel LED. There are total two LED channels in back light unit
Note 2: Optical performance should be evaluated at Ta=25℃ only.
Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

Table 4.2 LED backlight characteristics

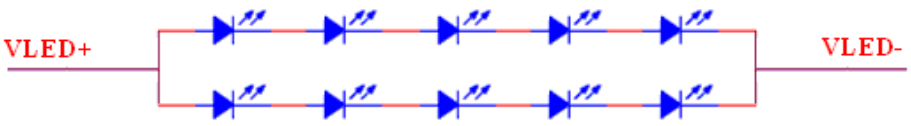


Figure 4.2 LED connection of backlight

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4.4 Block Diagram

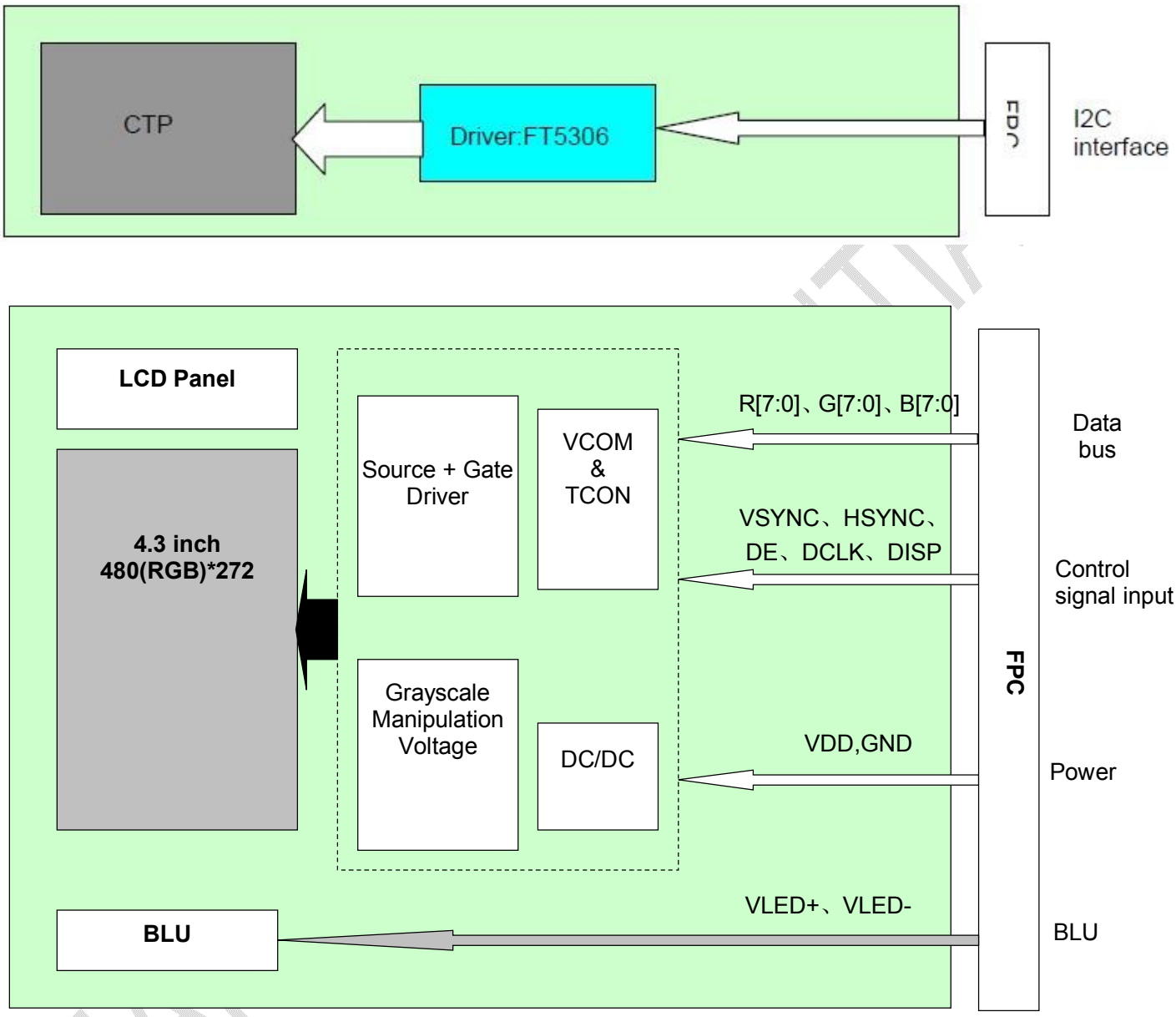


Figure 4.3 LCD Module Diagram

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5. Interface timing

5.1 Input Setup Timing Setting

5.1.1 Input Setup Timing Parameter Setting

VDD=3.3V Ta=25℃

Normal Write Mode

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK Cycle Time	T_{pw}	66.7	-	-	ns	
DCLK Pulse High Width	T_{pwh}	26.7	-	-	ns	
DCLK Pulse Low Width	T_{pwl}	26.7	-	-	ns	
DE Setup Time	T_{des}	10	-	-	ns	
DE Hold Time	T_{deh}	10	-	-	ns	
HSYNC Setup Time	T_{hs}	10	-	-	ns	
HSYNC Hold Time	T_{hh}	10	-	-	ns	
VSYNC Setup Time	T_{vhs}	10	-	-	ns	
VSYNC Hold Time	T_{vhh}	10	-	-	ns	
Data Setup Time	T_{ds}	10	-	-	ns	
Data Hold Time	T_{dh}	10	-	-	ns	
DISP Setup Time	T_{diss}	10	-	-	us	
DISP Hold Time	T_{dish}	10	-	-	ms	

Note 1：t_r=t_f=2ns.t_r, t_f is defined 10% to 90% of signal amplitude.

Note 2：For parallel interface, maximum clock frequency is 15MHz.

Table 5.1 Input Setup Timing Parameters Requirement

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5.1.2 Input Setup Timing Diagram

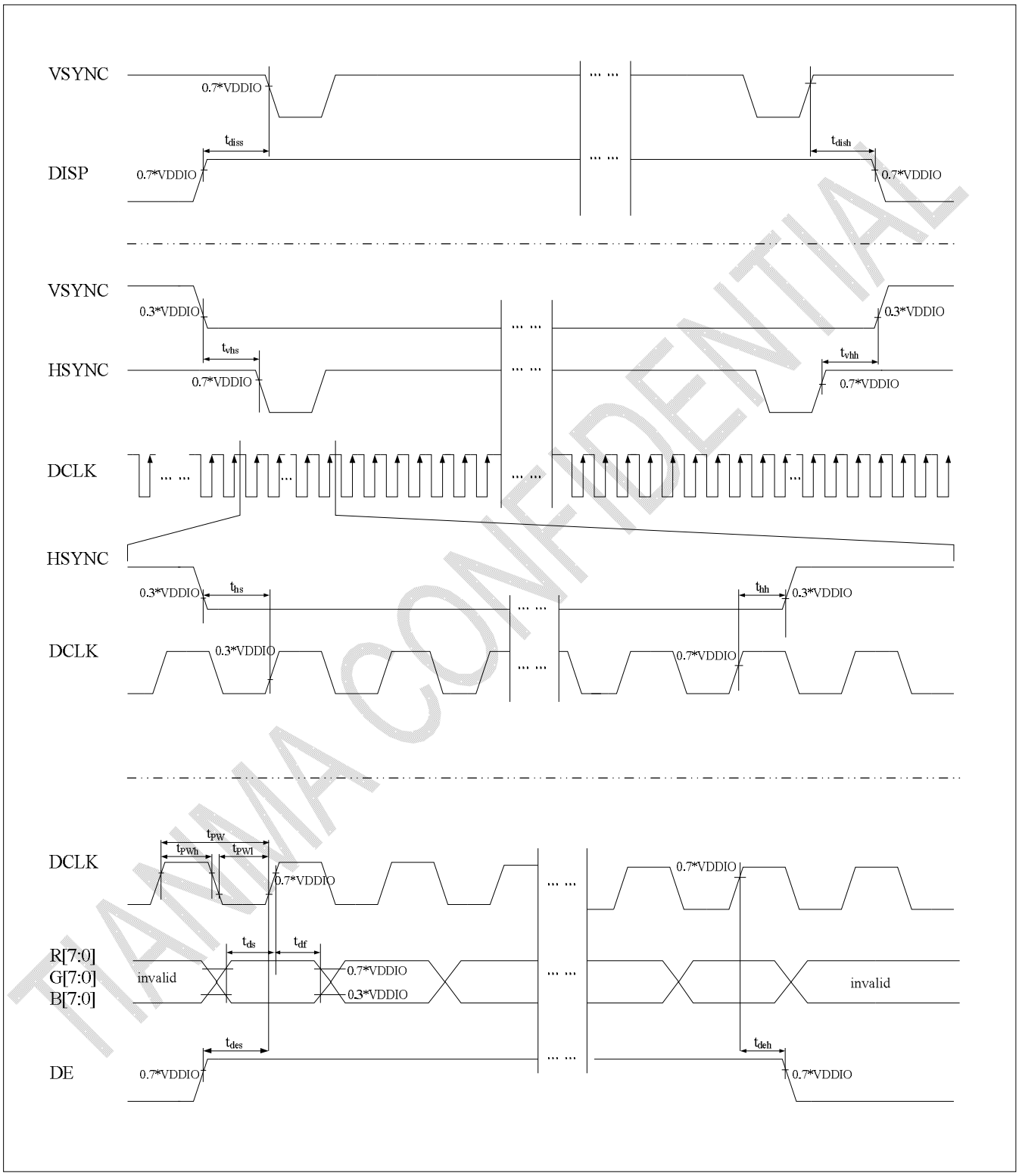


Figure 5.1.2 Input Setup Timing Diagram

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5.2 Data Input Format

5.2.1 Data Input Timing Parameter Setting

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK frequency	f_{clk}	--	9	15	MHZ	
HSYNC frequency	$1/t_h$	--	17.14	--	KHz	
VSYNC frequency	$1/t_v$	--	59.94	--	Hz	
Horizontal cycle	t_h	525	525	605	DCLK	
Horizontal display period	t_{hd}		480		DCLK	
Horizontal pulse width	t_{hp}	2	41	41	DCLK	
Horizontal back porch	t_{hb}	2	2	41	DCLK	
Horizontal front porch	t_{hf}	2	2	82	DCLK	
Vertical cycle	t_v	285	286	399	HSYNC	
Vertical display period	t_{vd}		272		HSYNC	
Vertical pulse width	t_{vp}	1	10	11	HSYNC	
Vertical back porch	t_{vb}	1	2	11	HSYNC	
Vertical front porch	t_{vf}	1	2	227	HSYNC	

Note 1：Unit: CLK=1/ f_{CLK} , H= t_h,

Note 2：It is necessary to keep $t_{vp}+t_{vb}=12$ and $t_{hp}+t_{hb}= 43$ in sync mode. DE mode is unnecessary to keep it.

Table 5.2.2 Data Input Timing Parameters Requirement

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5.2.2 Data Input Timing Diagram

5.2.2.1 Data Input Timing Diagram under SYNC Mode

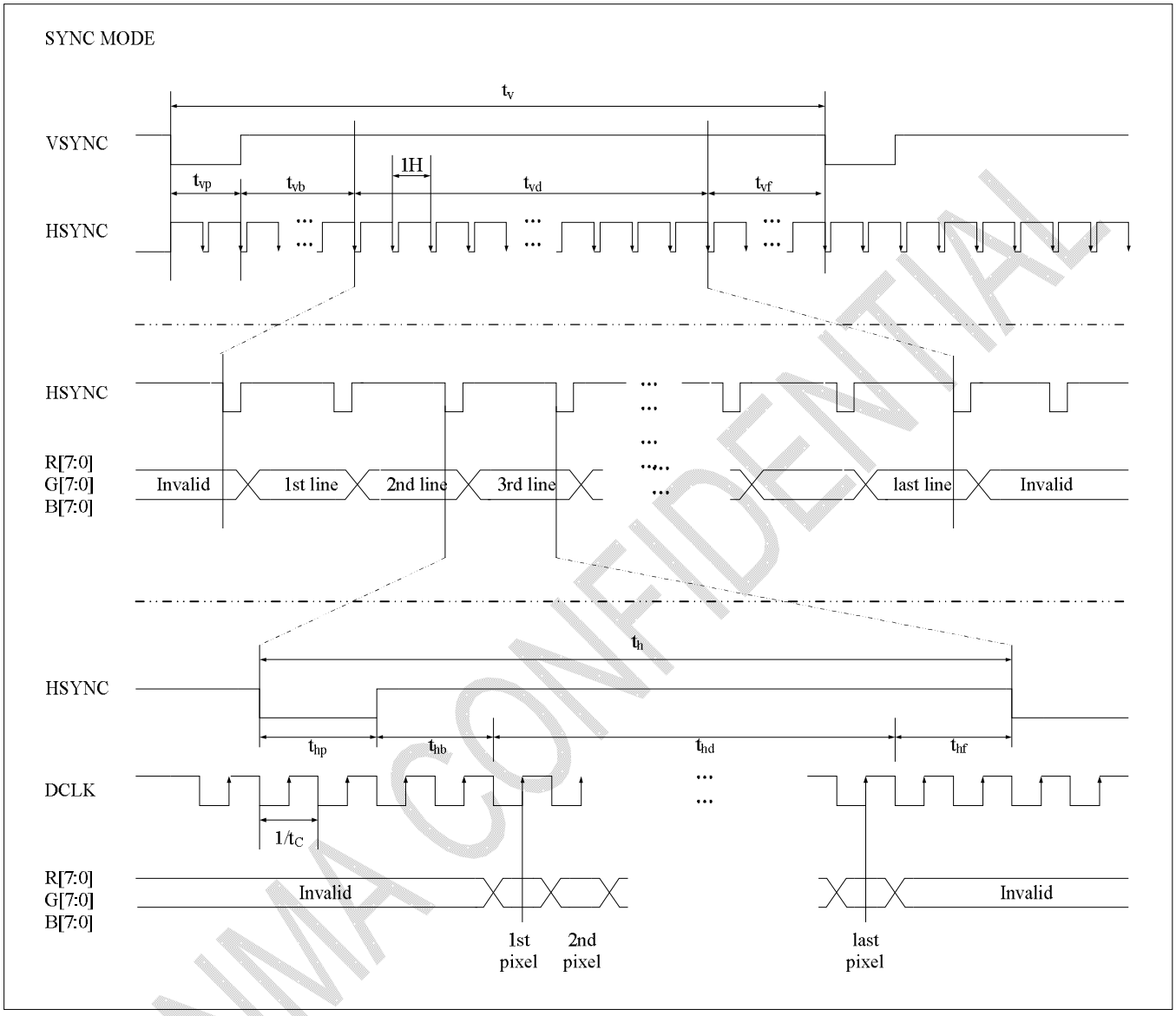


Figure 5.2.1 Data Input Timing Diagram Under SYNC Mode(DE="L")

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5.2.2.2 Data Input Timing Diagram under DE Mode

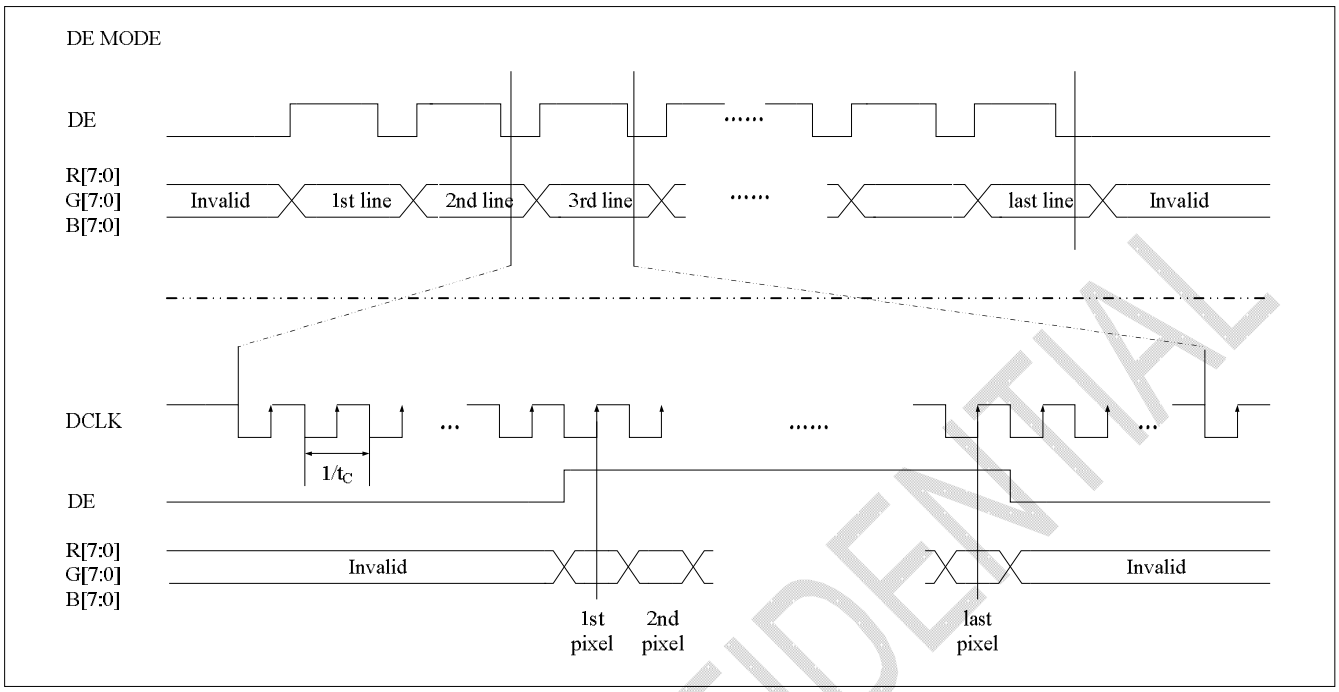


Figure 5.2.2 Data Input Timing Diagram Under DE Mode(VSYNC/HSYNC="H")

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5.3 Power ON/OFF Sequence

5.3.1 Power ON Sequence

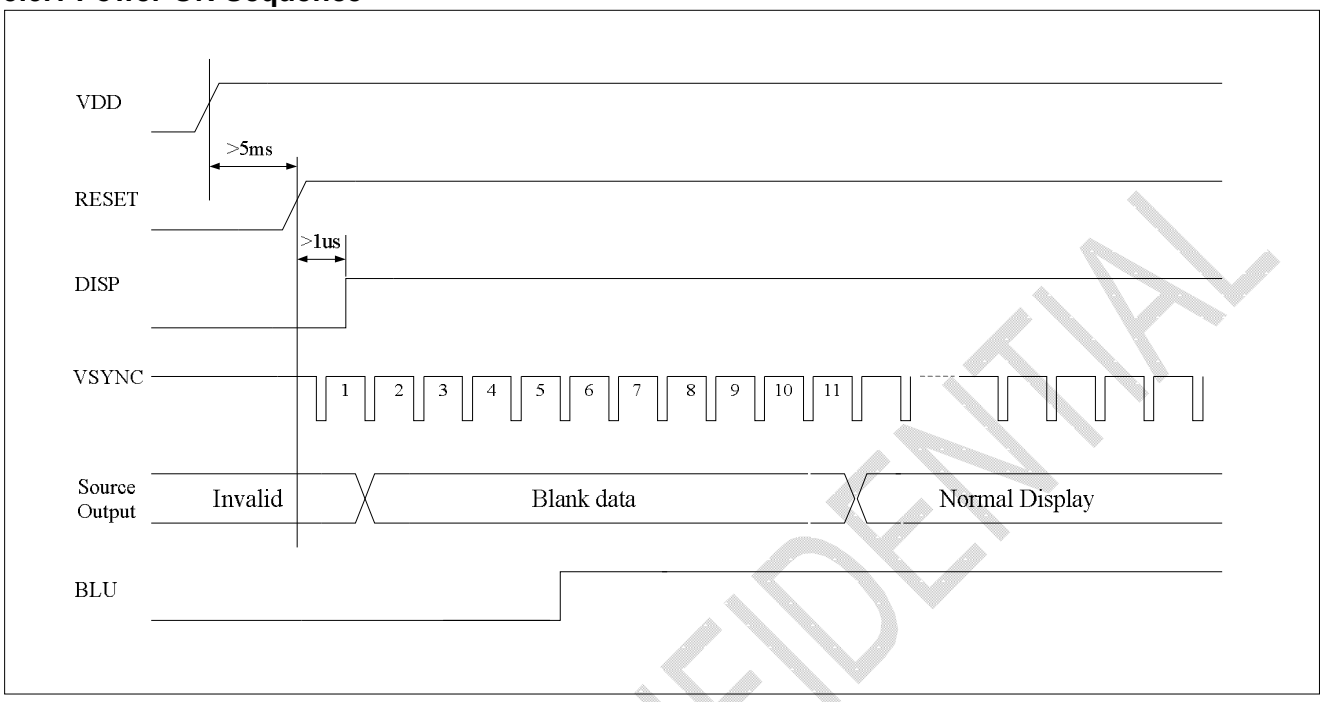


Figure 5.3.1 Power on sequence

5.3.2 Power OFF Sequence

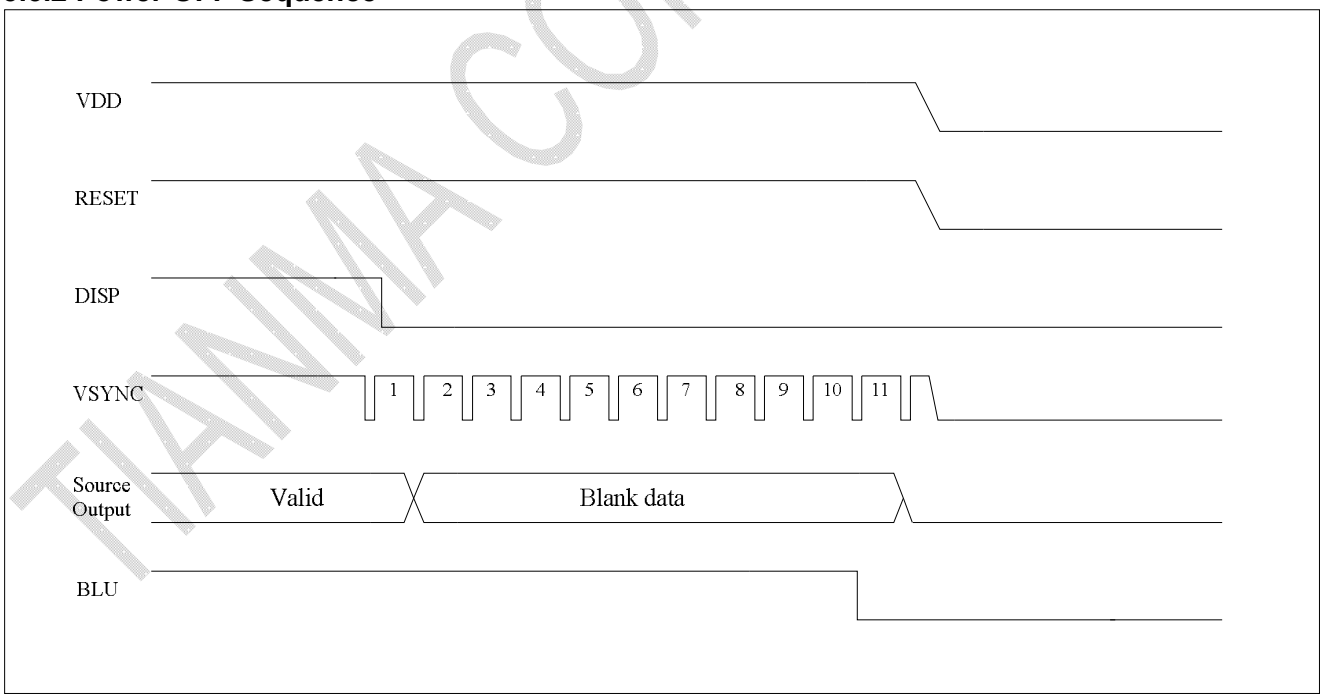


Figure 5.3.2 Power off sequence

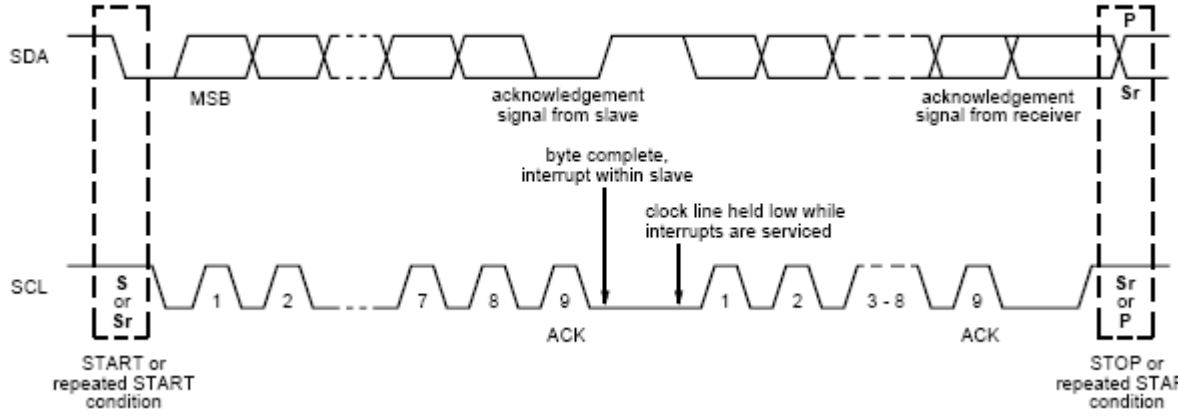
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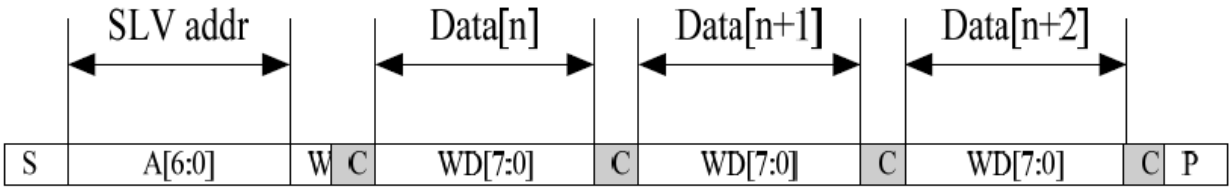
5.4 CTP Timing

5.4.1 I2C interface

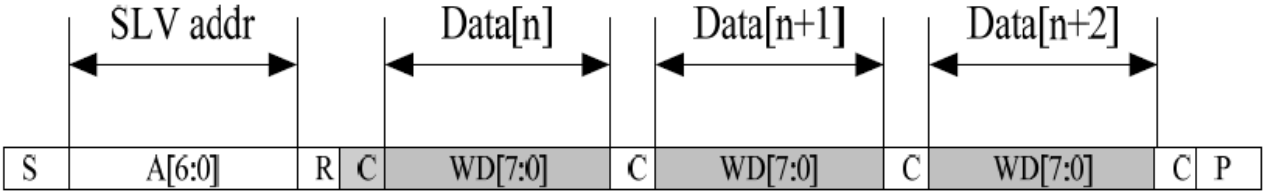
FT5306 supports the I2C or SPI interfaces, which can be used by a host processor or other devices. The I2C is always configured in the Slave mode. The data transfer format is shown as below



I2C serial data transfer format



I2C master write, slave read



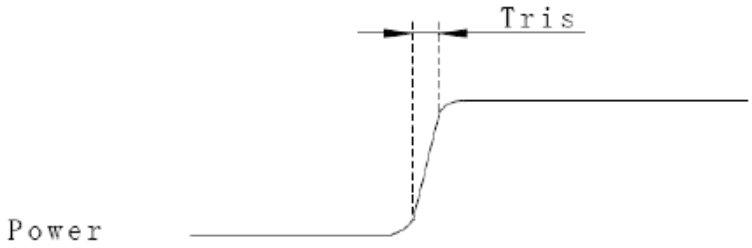
I2C master read, slave write

Parameter	Unit	Min	Max
SCL frequency	KHz	0	400
Bus free time between a STOP and START condition	us	4.7	\
Hold time (repeated) START condition	us	4.0	\
Data setup time	ns	250	\
Setup time for a repeated START condition	us	4.7	\
Setup Time for STOP condition	us	4.0	\

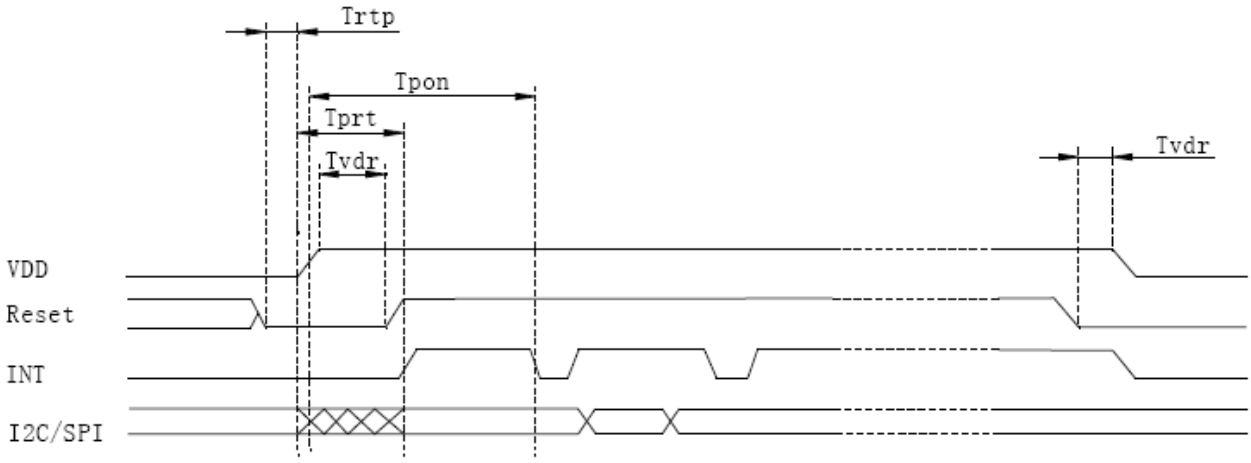
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5.4.2 Power ON/RESET Sequence

Reset should be pulled down to be low before powering on and powering down. I2C shouldn't be used by other devices during Reset time after IOVCC powering on (Tprt). INT signal will be sent to the host after initializing all parameters and then start to report points to the host.

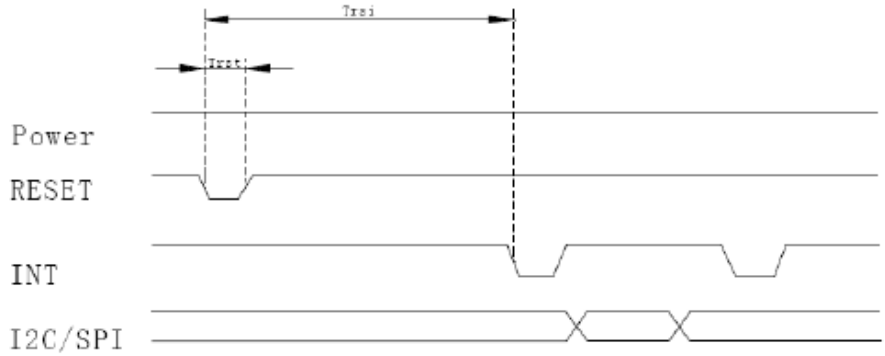


Power on Time



Power on sequence

Reset time must be enough to guarantee reliable reset, the time of starting to report point after resetting approach to the time of starting to report point after powering on.



Reset sequence

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Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Trtp	Time of resetting to be low before powering on	100	--	μs
Tpon	Time of starting to report point after powering on	300	--	ms
Tvdr	Reset time after VDD powering on	1	--	ms
Tprt	Reset time after IOVCC powering on	2Tris +Tvdr	--	ms
Trsi	Time of starting to report point after resetting	300	--	ms
Trst	Reset time	5	--	ms

5.4.3 CTP INSTRUCTION DESCRIPTION(More information refer to FT5306 datasheet)

Address	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Host Access
Op,00h	DEVIDE_MODE		Device Mode[2:0]							RW
Op,01h	GEST_ID	Gesture ID[7:0]								R
Op,02h	TD_STATUS					Number of touch points[3:0]				R
Op,03h	TOUCH1_XH	1st Event Flag				1st Touch X Position[11:8]				R
Op,04h	TOUCH1_XL	1st Touch X Position[7:0]								R
Op,05h	TOUCH1_YH	1st Touch ID[3:0]				1st Touch Y Position[11:8]				R
Op,06h	TOUCH1_YL	1st Touch Y Position[7:0]								R
Op,07h	Reserved									
Op,08h	Reserved									
Op,09h	TOUCH2_XH	2nd Event Flag				2nd touch X Position[11:8]				R
Op,0Ah	TOUCH2_XL	2nd touch X Position[7:0]								R
Op,0Bh	TOUCH2_YH	2nd Touch ID[3:0]				2nd Touch Y Position[11:8]				R
Op,0Ch	TOUCH2_YL	2nd Touch Y Position[7:0]								R
Op,0Dh	Reserved									
Op,0Eh	Reserved									R
Op,0Fh	TOUCH3_XH	3st Event Flag				3st Touch X Position[11:8]				R
Op,10h	TOUCH3_XL	3st Touch X Position[7:0]								R
Op,11h	TOUCH3_YH	3st Touch ID[3:0]				3st Touch Y Position[11:8]				R
Op,12h	TOUCH3_YL	3st Touch Y Position[7:0]								R

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Op,13h	Reserved				
Op,14h	Reserved				
Op,15h	TOUCH4_XH	4st Event Flag		4st Touch X Position[11:8]	R
Op,16h	TOUCH4_XL	4st Touch X Position[7:0]			R
Op,17h	TOUCH4_YH	4st Touch ID[3:0]		4st Touch Y Position[11:8]	R
Op,18h	TOUCH4_YL	4st Touch Y Position[7:0]			R
Op,19h	Reserved				
Op,1Ah	Reserved				
Op,1Bh	TOUCH5_XH	5st Event Flag		5st Touch X Position[11:8]	R
Op,1Ch	TOUCH5_XL	5st Touch X Position[7:0]			R
Op,1Dh	TOUCH5_YH	5st Touch ID[3:0]		5st Touch Y Position[11:8]	R
Op,1Eh	TOUCH5_YL	5st Touch Y Position[7:0]			R
Op,1Fh	Reserved				
Op,20h	Reserved				
Op,21h	TOUCH6_XH	6st Event Flag		6st Touch X Position[11:8]	R
Op,22h	TOUCH6_XL	6st Touch X Position[7:0]			R
Op,23h	TOUCH6_YH	6st Touch ID[3:0]		6st Touch Y Position[11:8]	R
Op,24h	TOUCH6_YL	6st Touch Y Position[7:0]			R
Op,25h	Reserved				
Op,26h	Reserved				
Op,27h	TOUCH7_XH	7st Event Flag		7st Touch X Position[11:8]	R
Op,28h	TOUCH7_XL	7st Touch X Position[7:0]			R
Op,29h	TOUCH7_YH	7st Touch ID[3:0]		7st Touch Y Position[11:8]	R
Op,2Ah	TOUCH7_YL	7st Touch Y Position[7:0]			R
Op,2Bh	Reserved				
Op,2Ch	Reserved				
Op,2Dh	TOUCH8_XH	8st Event Flag		8st Touch X Position[11:8]	R
Op,2Eh	TOUCH8_XL	8st Touch X Position[7:0]			R
Op,2Fh	TOUCH8_YH	8st Touch ID[3:0]		8st Touch Y Position[11:8]	R
Op,30h	TOUCH8_YL	8st Touch Y Position[7:0]			R

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Op,31h	Reserved			
Op,32h	Reserved			
Op,33h	TOUCH9_XH	9st Event Flag	9st Touch X Position[11:8]	R
Op,34h	TOUCH9_XL	9st Touch X Position[7:0]		R
Op,35h	TOUCH9_YH	9st Touch ID[3:0]	9st Touch Y Position[11:8]	R
Op,36h	TOUCH9_YL	9st Touch Y Position[7:0]		R
Op,37h	Reserved			
Op,38h	Reserved			
Op,39h	TOUCH10_XH	10st Event Flag	10st Touch X Position[11:8]	R
Op,3Ah	TOUCH10_XL	10st Touch X Position[7:0]		R
Op,3Bh	TOUCH10_YH	10st Touch ID[3:0]	10st Touch Y Position[11:8]	R
Op,3Ch	TOUCH10_YL	10st Touch Y Position[7:0]		R
Op,3Dh	Reserved			
Op,3Eh	Reserved			
…	…	…		…
Op,FEh	LOG_MSG_CNT	The log MSG count		R
Op,FFh	LOG_CUR_CHA	Current character of log message, will point to the next character when one character is read.		R

6. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	60	70	--	Degree	Note 2
		θB		40	50	--		
		θL		60	70	--		
		θR		60	70	--		
Contrast Ratio		CR	θ=0°	400	500	--		Note1、Note3
Response Time		T_{ON}	25℃	--	20	30	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.265	0.315	0.365		Note5 Note1
		y		0.285	0.335	0.385		
	Red	x		0.531	0.581	0.631		
		y		0.295	0.345	0.395		
	Green	x		0.298	0.348	0.395		
		y		0.531	0.581	0.631		
	Blue	x		0.103	0.153	0.203		
		y		0.045	0.095	0.145		
Uniformity		U		75	80	--	%	Note1、Note6
NTSC				--	50	--	%	Note 5
Luminance		L		210	260	--	cd/m^2	Note1、Note7

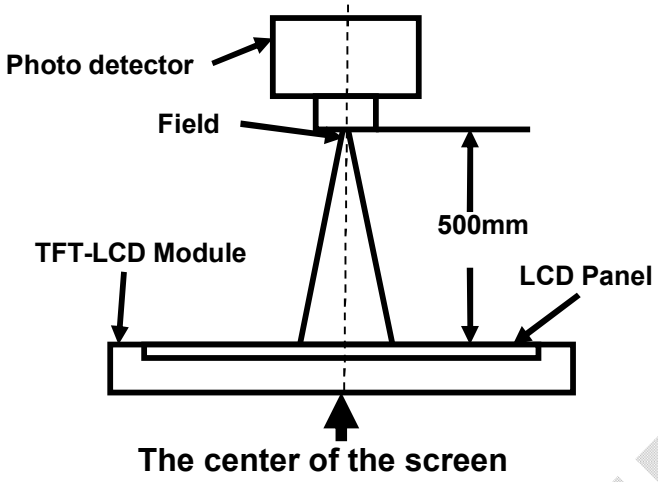
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Test Conditions:

1. I_F= 20mA(one channel),the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

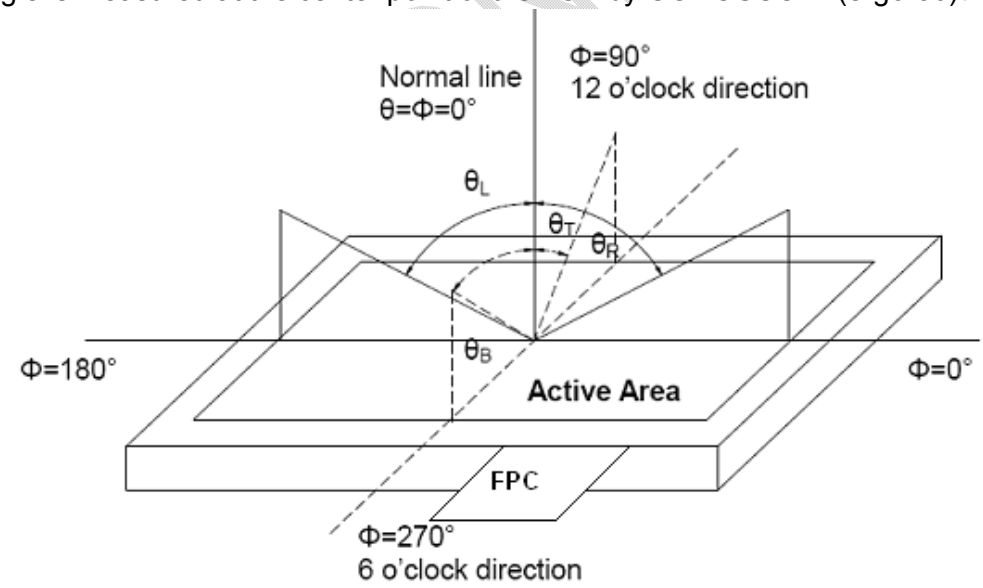
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。



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.

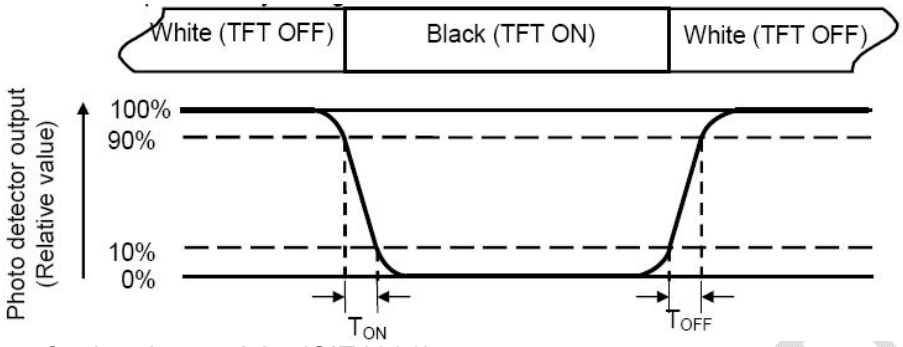
Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and

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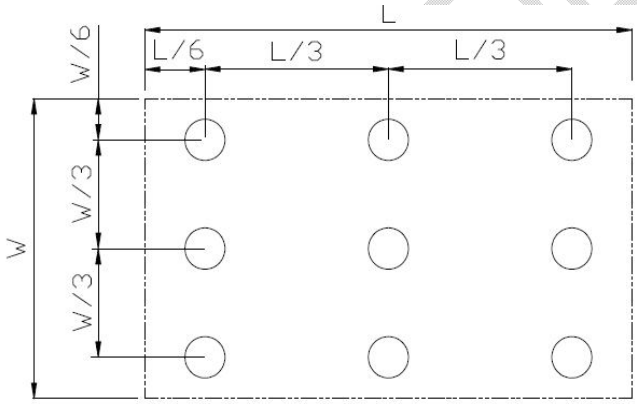
"Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



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.

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7. Environmental / Reliability Test

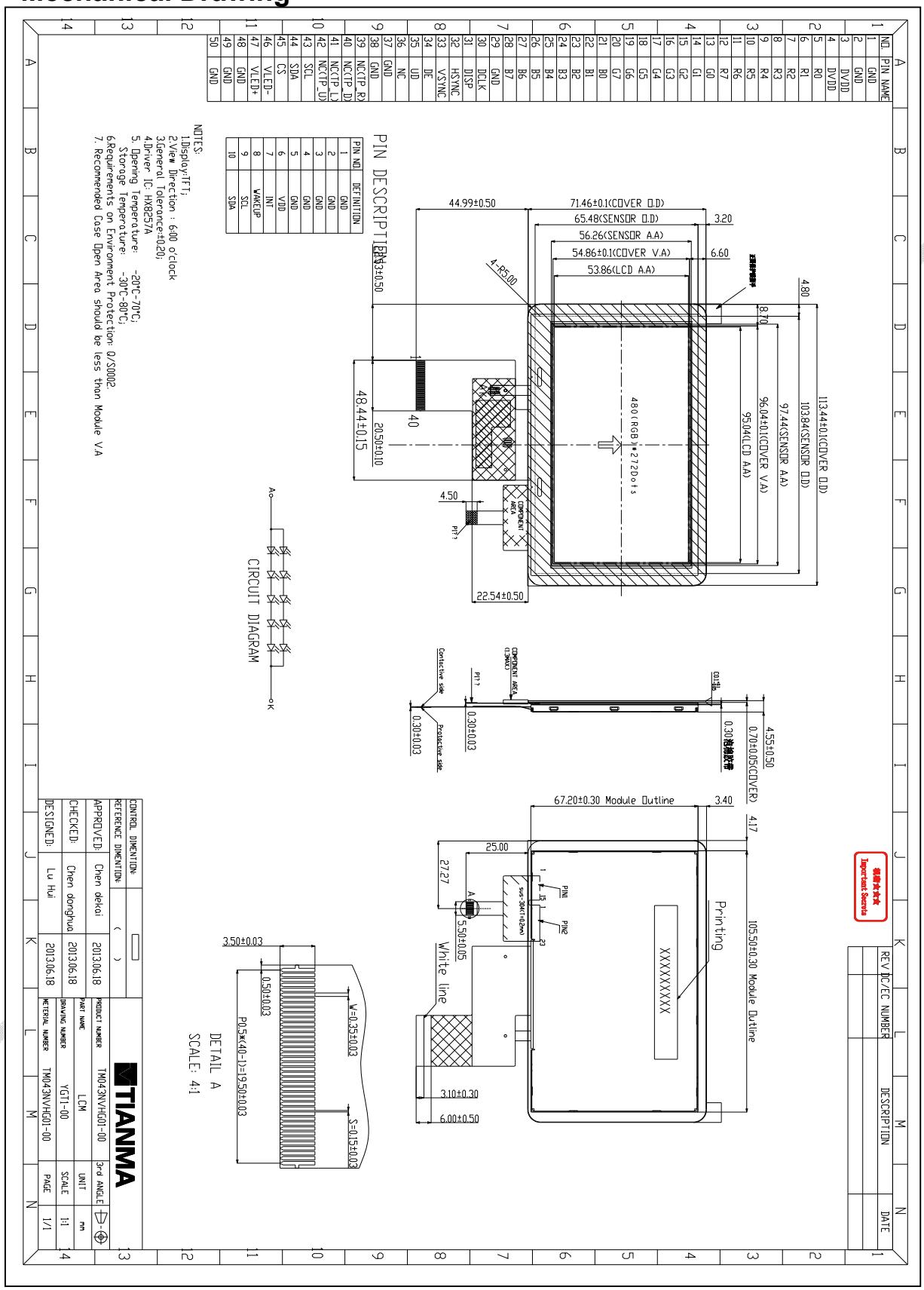
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours	Note1 IEC60068-2-1,GB2423.2
2	Low Temperature Operation	Ta = -20℃, 240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1 GB2423.1
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max,240hours	Note2 IEC60068-2-78 GB/T2423.3
6	Thermal Shock (non-operation)	-20℃ 30 min~+80℃ 30 min, Change time:5min, 100 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22
7	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
8	Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)	IEC60068-2-6 GB/T2423.10
9	Mechanical Shock (Non Op)	Half Sine Wave 60G 6ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27 GB/T2423.5
10	Package Drop Test	Height:60cm, 1corner,3edges,6surfaces	IEC60068-2-32 GB/T2423.8
11	Package Vibration Test	Random Vibration: 0.015G*G/Hz for 5-200Hz, -6dB/Octave from 200-500Hz 2 hours for each direction of X,Y,Z (6 hours for total)	IEC60068-2-34 GB/T2423.11

Note1: Ts is the temperature of panel's surface.
Note2: Ta is the ambient temperature of samples.

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8. Mechanical Drawing



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9. Packing Drawing

9.1 Packaging Material

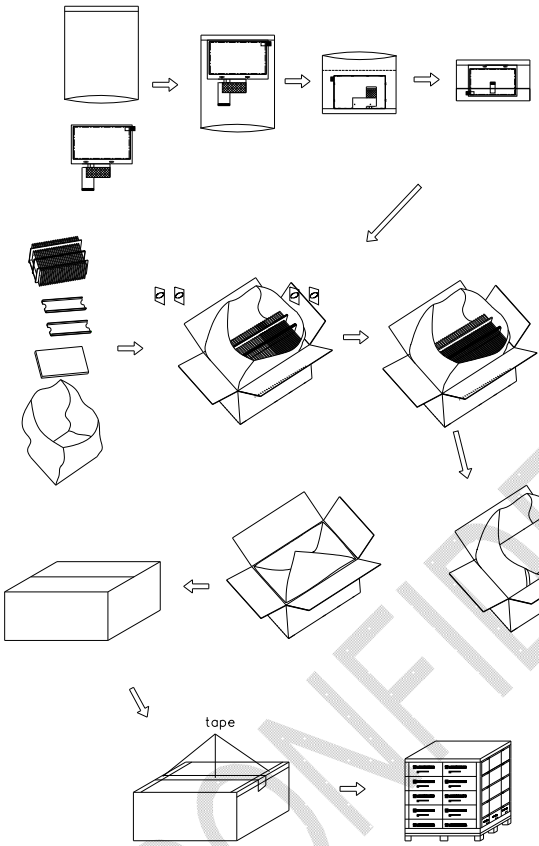
No	Item	Model(Material)	Dimensions (mm)	Unit Weigt (Kg)	Quantity	Remark
1	LCM module	TM043NDH02	105.5x67.2x2.9	0.044	112	
2	Partition_1	Corrugated Paper	513x333x106	0.7	2	
3.	Anti-Static Bag	PE	175.8x125x0.05	0.0007	112	Anti-static
4	Dust-Proof Bag	PE	700x530	0.0600	1	
5	Partition_2	Corrugated Paper	505x332x4.00	0.09	3	
6	Corrugated Bar	Corrugated Paper	513x117x3	0.04	8	
7	Carton	Corrugated Paper	530x350x250	1.1000	1	
8	Total weight	TBD Kg				

Note: Packaging Specification and Quantity
Module quantity in a carton：28pcs(per row)x2(per column)x2= 112pcs

9.2 Packing Instruaction

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10. Precautions for Use of LCD Modules

10.1 Handling Precautions

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

10.1.2 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.

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

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

10.1.5 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

10.1.6 Do not attempt to disassemble the LCD Module.

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

10.1.8 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.

10.2 Storage precautions

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

10.2.2 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%

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

10.3 Transportation Precautions

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

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