MODEL NO : TM043YVHG35

MODEL VERSION: 00

SPEC VERSION : Ver 1.0

ISSUED DATE: 2017-01-20

■Preliminary Specification
□Final Product Specification

Customer :

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by
Junwen Du	Longping Deng	KimMin Hong

This technical specification is subjected to change without notice

Table of Contents

Record of Revision

Rev	Issued Date	Description	Editor
1.0	2017.01.20	First Release	Junwen Du

1. General Specifications

Feature		Spec
Display Spec.	Size	4.3 inch
	Resolution	480(RGB)x800
	Technology Type	a-Si
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.117X0.117
	Display Mode	SFT Normally Black
	Surface Treatment	AG
	Viewing Direction	ALL
	Gray Scale Inversion Direction	ALL
Mechanical Characteristics	LCM (W x H x D) (mm)	LCM:61.96x104.50x1.90
		CTP+LCM: 67.50x117.70x4.775
	Active Area(mm)	TFT LCD: 56.16X93.6
		CTP:57.96x95.40
	CTP Touch Method	Finger
	Number of simultaneous touches	5
	Minimum Touch Area	Φ6
	CTP Structure	G+G
	With /Without TSP	With TSP
	Matching FPC Connection Type	CN1:FH26-45S-0.3SHW CN2:UJU PF050-B06B-C09-A
	LED Numbers	8 LEDS
	Weight (g)	TBD
Electrical Characteristics	Interface	RGB 24 bit+SPI
	Color Depth	16.7M
	Driver IC	CTP: ST1633I
		TFT: ILI9806E

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 FPC

Matching connector type:CN1:FH26-45S-0.3SHW

No	Symbol	I/O	Description	Comment
1	GND	P	Ground	
2	LEDA	P	Power Supply for LED	
3	LEDK	P	Power Supply for LED	
4	VCC	P	Power Supply Type2.8V	
5	IOVCC	P	Power Supply Type1.8V or 2.8V	
6	SDO	O	Serial data output pin for SPI interface	
7	SDI	I	Serial data input pin for SPI interface	
8	GND	P	Ground	
9	SCL_WR	I	Serial clock input	
10	CS	I	Chip select input. Low: select and accessible High: not select and not accessible	
11	IM3	-	NC	
12	RESET	I	Reset pin. Initializes the LSI when low. Must be reset after power-on	
13	R0	I	Data bus pin	
14	R1	I	Data bus pin	
15	R2	I	Data bus pin	
16	R3	I	Data bus pin	
17	R4	I	Data bus pin	
18	R5	I	Data bus pin	
19	R6	I	Data bus pin	
20	R7	I	Data bus pin	
21	G0	I	Data bus pin	
22	G1	I	Data bus pin	
23	G2	I	Data bus pin	
24	G3	I	Data bus pin	
25	G4	I	Data bus pin	
26	G5	I	Data bus pin	
27	G6	I	Data bus pin	
28	G7	I	Data bus pin	
29	B0	I	Data bus pin	

30	B1	I	Data bus pin	
31	B2	I	Data bus pin	
32	B3	I	Data bus pin	
33	B4	I	Data bus pin	
34	B5	I	Data bus pin	
35	B6	I	Data bus pin	
36	B7	I	Data bus pin	
37	DE	I	Data Enable signal Low: access enabled High: access inhibited	
38	GND	P	Ground	
39	PCLK	I	Pixel clock signal	
40	GND	P	Ground	
41	HS	I	Line synchronizing signal	
42	VS	I	Frame synchronizing signal	
43	IC_ID	-	No connect (Test pin)	
44	LED_PWM	O	LED PWM frequency output for LED driver control Leave it open when not in use	
45	GND	P	Ground	

Table 2.1 input terminal pin assignment

2.2 CTP FPC

Matching connector type: CN2:UJU PF050-B06B-C09-A

No	Symbol	I/O	Description	Comment
1	SCL	I/O	I2C Serial Clock	
2	SDA	I/O	I2C Serial data	
3	INT	I/O	Indicate coordinate data ready	
4	RST	I	System reset signal input, active low	
5	VDD	P	Power supply	
6	GND	P	Power Ground	

Note 1: I/O-----Input/Output
I-------Input
O-------Output
P------Power/Ground

3. Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Analog Supply Voltage	VCC	-0.3	4.6	V	Note1
Logic Supply Voltage	IOVCC	-0.3	4.6		
Input voltage	V_{IN}			V	
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40℃
		--	≤85	%	40℃<Ta≤50℃
		--	≤55	%	50℃<Ta≤60℃
		--	≤36	%	60℃<Ta≤70℃
		--	≤24	%	70℃<Ta≤80℃
Absolute Humidity	AH	--	≤70	g/m^3	Ta>70℃

Table 3 Absolute Maximum Ratings

Note1: Input voltage include R0~R7, G0~G7, B0~B7, Hsync, Vsync, DE, PCLK,SDI, SCL_WR,CS, RESET..
Note2: Ta means the ambient temperature.
It is necessary to limit the relative humidity to the specified temperature range.
Condensation on the module is not allowed.

4. Electrical Characteristics

4.1 Driving LCD Panel

GND=0V, Ta = 25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Logic operation Voltage		IOVCC	1.65	3.15	3.3	V	
Analog operation Voltage		VCC	2.6	3.15	3.3	V	
Input Signal Voltage	High Level	VIH	0.7* IOVCC	-	IOVCC	V	
	Low Level	VIL	-0.3	-	0.3*IOVCC	V	
Output Signal Voltage	High Level	VOH	0.8*IOVCC	-	IOVCC	V	IOH=-1mA
	Low Level	VOL	0	-	0.2*IOVCC	V	IOH=1mA
(Panel+LSI) Power Consumption		White Mode	-	99	150	m W	2.8V

Table 4.1 LCD module electrical characteristics

4.2 Driving Backlight

GND=0V, Ta = 25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	20	-	mA	Per 1 LEDs string
Forward Voltage	V_F	-	25.6	-	V	Per 1 LEDs string
Backlight Power Consumption	W_{BL}	-	512	-	mW	8 LEDs
Life Time	-	10,000	(20,000)		Hrs	

Table 4.2 backlight unit electrical characteristics

Note 1: The figure below shows the connection of backlight LED.

Figure 4.2.1 LED backlight circuit

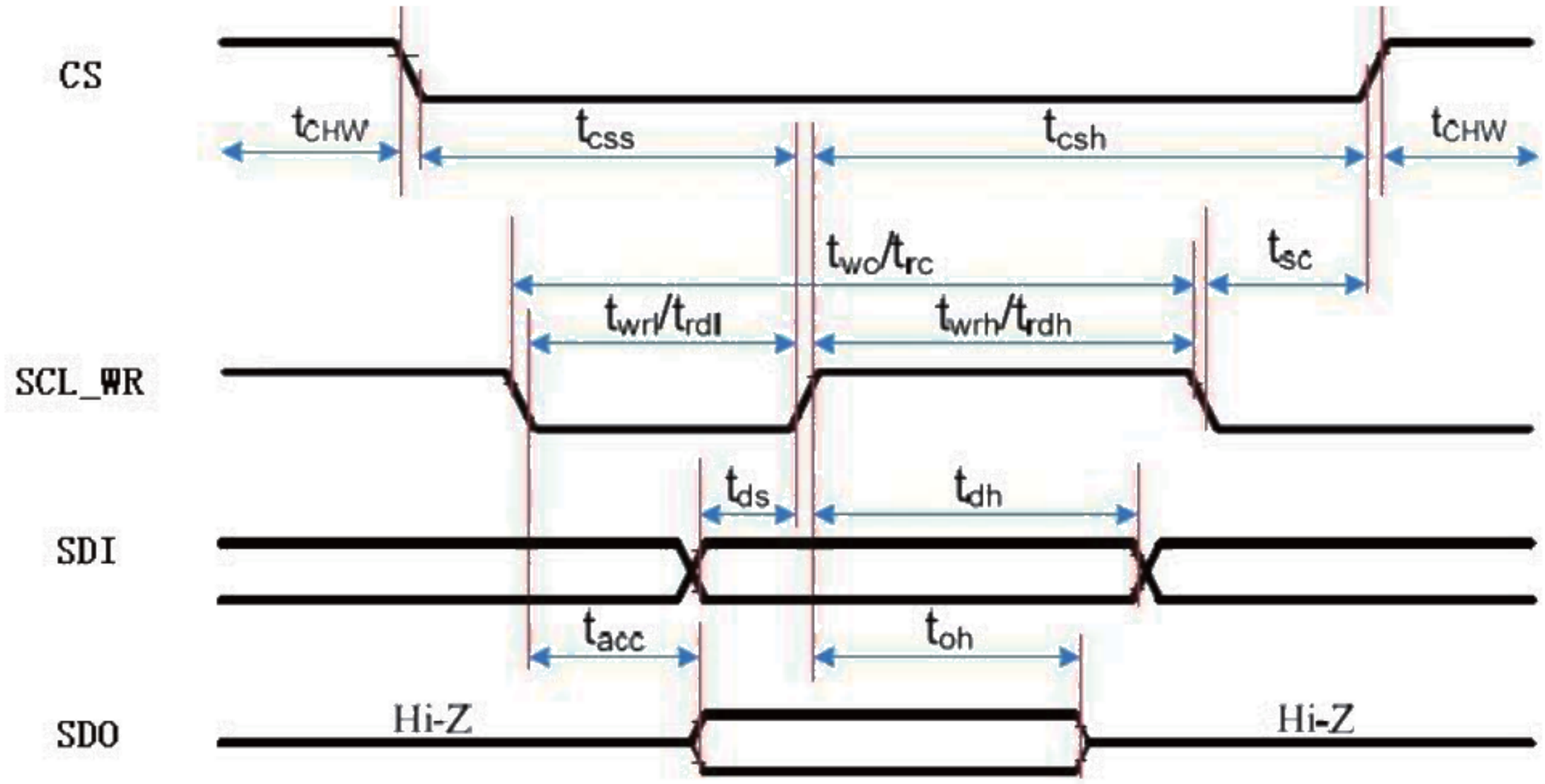
Note 2: One LED : I_F =20 mA, V_F =3.2V

Note 3: I_F is defined for one channel LED.
Optical performance should be evaluated at Ta=25℃ only.
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.

5 Timing Chart

5.1 Serial Interface Characteristics

5.1.1 Serial Interface Timing



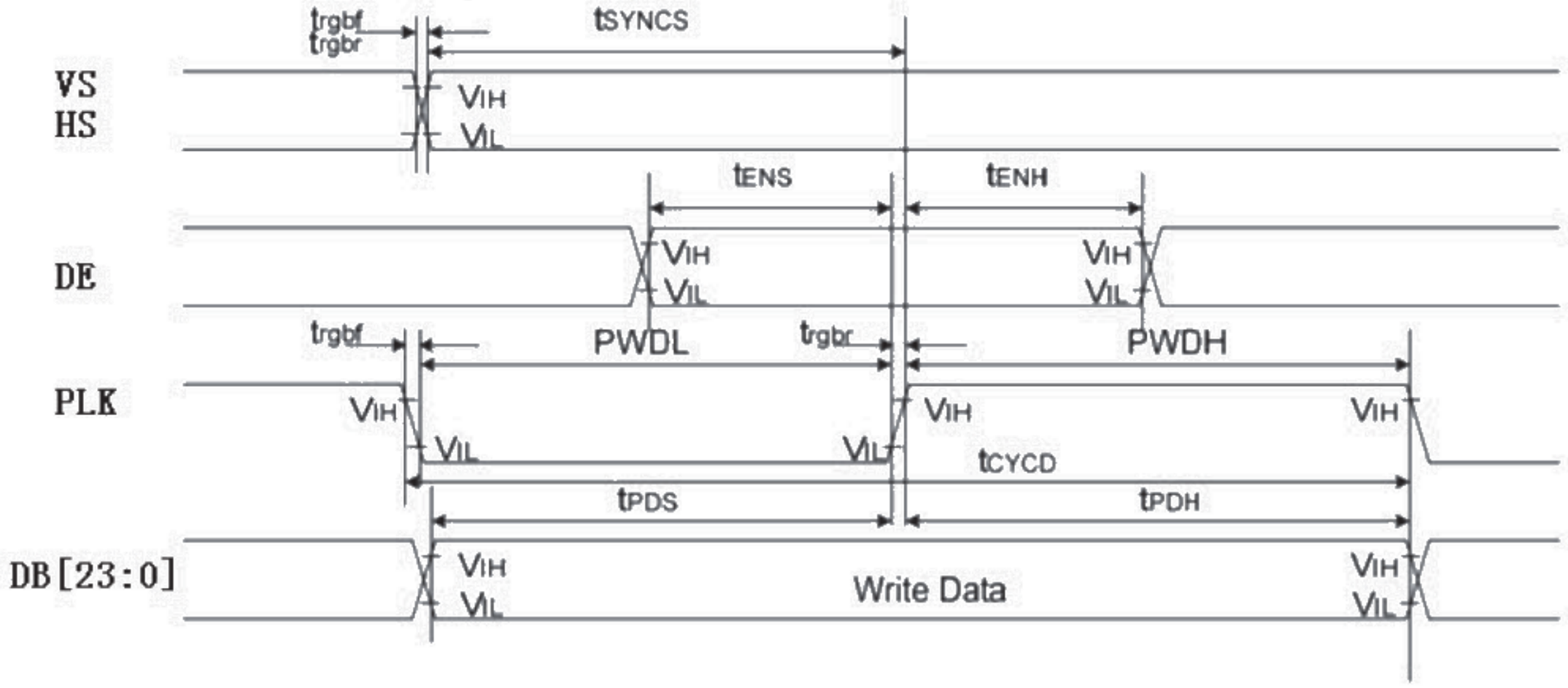
GND=0V, Ta = 25℃

Signal	Symbol	Parameter	min	max	Unit	Description
CS	tcss	Chip select time(Write)	15	-	ns	
	tcsh	Chip select hold time(Read)	15	-	ns	
	tcHw	CS“H”pulse width	40	-	ns	
SCL_WR	twc	Serial clock cycle(Write)	30	-	ns	
	twrh	SCL“H”pulse width(Write)	10	-	ns	
	twrl	SCL“L”pulse width(Write)	10	-	ns	
	trc	Serial clock cycle(Read)	150	-	ns	
	trdh	SCL“H”pulse width(Read)	60	-	ns	
	trdl	SCL“L”pulse width(Read)	60	-	ns	
SDO	tacc	Access time(Read)	10	50	ns	For maximum CL=30pF
	toh	Output disable time(Read)	15	50	ns	For minimum CL=8pF
SDI	tds	Data setup time(Write)	10	-	ns	
	tdh	Data hold time(Write)	10	-	ns	

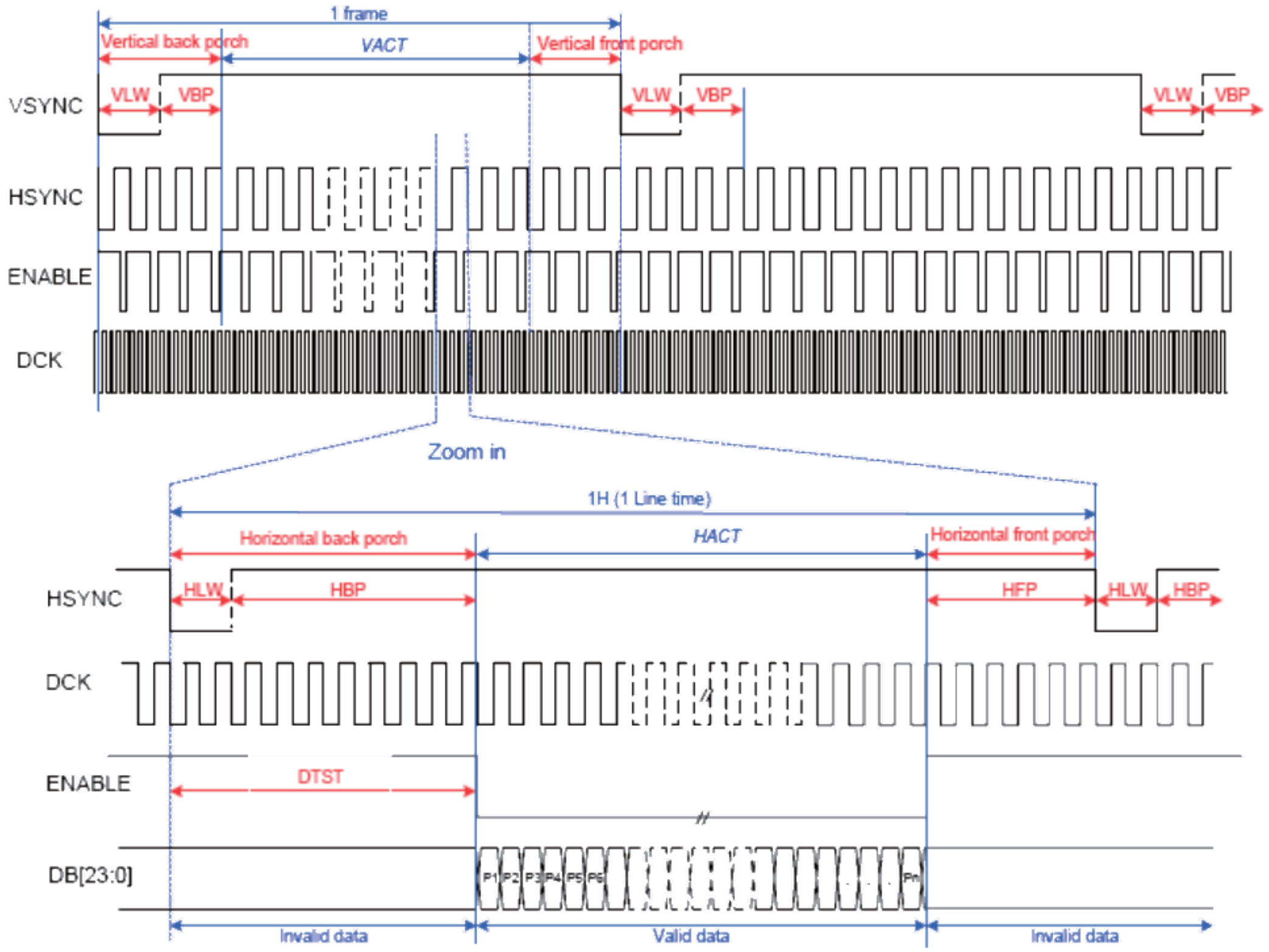
Note: Does not include signal rise and fall times.

5.2 RGB Interface Characteristics

5.2.1 RGB Interface Timing



Signal	Symbol	Parameter	min	max	Unit	Description
VS/HS	tSYNCS	VS/HS setup time	5	-	ns	24/18/16-bit bus RGB interface mode
	tSYNCH	VS/HS hold time	5	-	ns	
DE	tENS	DE setup time	5	-	ns	
	tENH	DE hold time	5	-	ns	
DB[23:0]	tPOS	Data setup time	5	-	ns	
	tPDH	Data hold time	5	-	ns	
PLK	PWDH	PLK high-level period	13	-	ns	
	PWDL	PLK low-level period	13	-	ns	
	tCYCD	PLK cycle time	28	-	ns	
	trgbr,trgbf	PLK,HS,VS rise/fall time	-	15	ns	



VLW : VSYNC Low pulse Width
HLW : HSYNC Low pulse Width
DTST : Data Transfer Startup Time
Pn : pixel 1, pixel 2···, pixel n.

Parameters	Symbols	Condition	Min.	Typ.	Max.	Units
Frame Rate	FR		50	-	70	fps
Horizontal Low Pulse Width	HLW		5	-	80	DOTCLK
Horizontal Back Porch	HBP		10	-	85	DOTCLK
Horizontal Address	HACT		-	480	-	DOTCLK
Horizontal Front Porch	HFP		5	-	80	DOTCLK
Horizontal Blanking Period	HBP + HFP		60		90	DOTCLK
Vertical Low Pulse Width	VLW		2	-	4	Line
Vertical Back Porch*	VBP		4	-		Line
Vertical Address	VACT		-	800	-	Line
Vertical Front Porch	VFP		2	-		Line
Vertical Blanking Period	VBP + VFP		6			Line
Data Clock	DCLK		23.5	-	34.9	MHz

5.3 Reset Input Timing

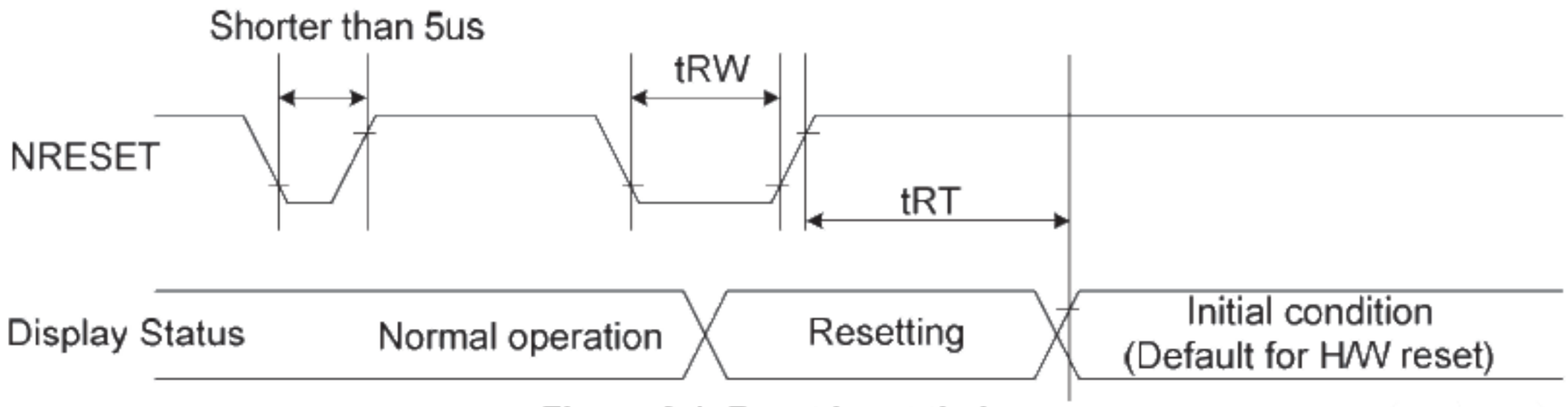


Figure 6.4: Reset input timing

GND=0V, Ta = 25°C

Signal	Symbol	Parameter	min	max	Unit
RESET	tRW	Reset pulse duration	10		us
	tRT	Reset cancel		5(note 1,5)	ms
				120(note 1,6,7)	ms

Note:

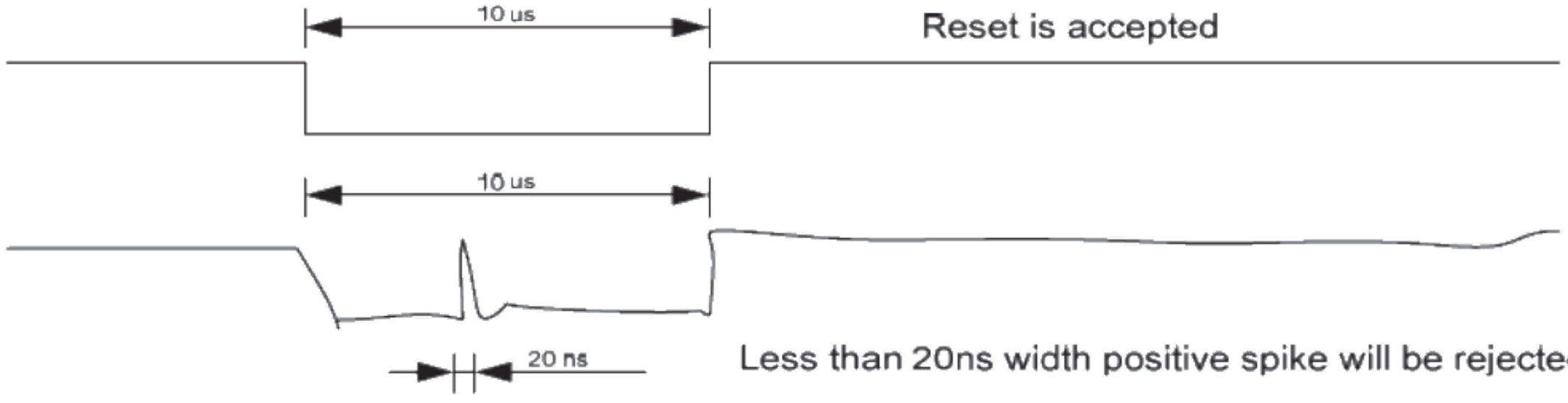
1.The reset cancel includes also required time for loading ID bytes,VCOM setting and other settings from OTP to registers.This loading is done every time when there is H/W reset cancel time (tRT) within 5 ms after a rising edge of RESET.

2.Spike due to an electrostatic discharge on RESET line does not cause irregular system reset according to following table.

RESET Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset stars

3.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 Hardware Reset.

4.Spike Rejection also applies during a valid reset pulse as shown below:

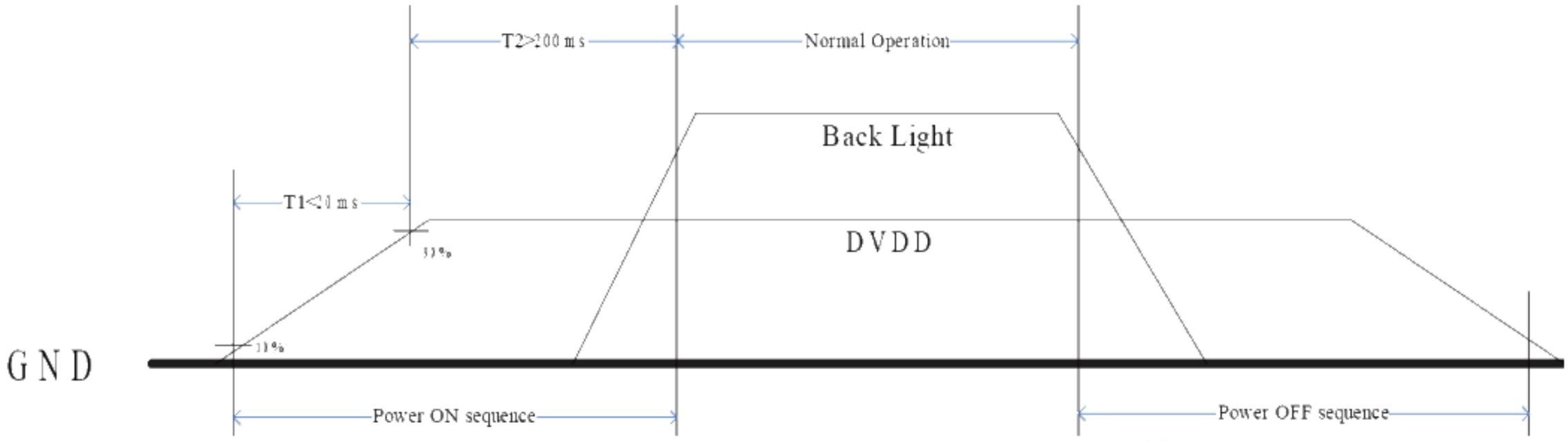


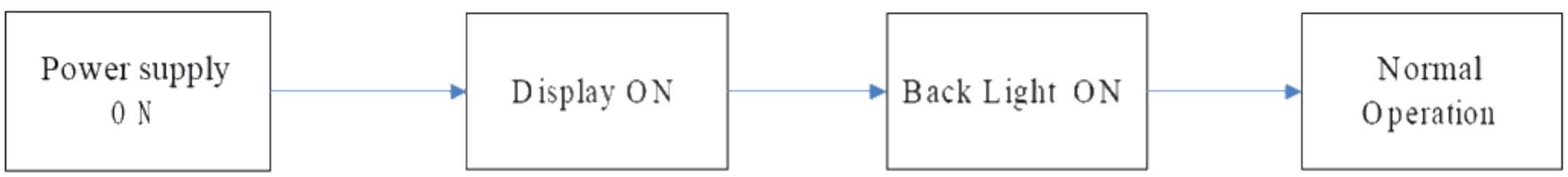
5.When Reset applied during Sleep In Mode.

6.When Reset applied during Sleep Out Mode.

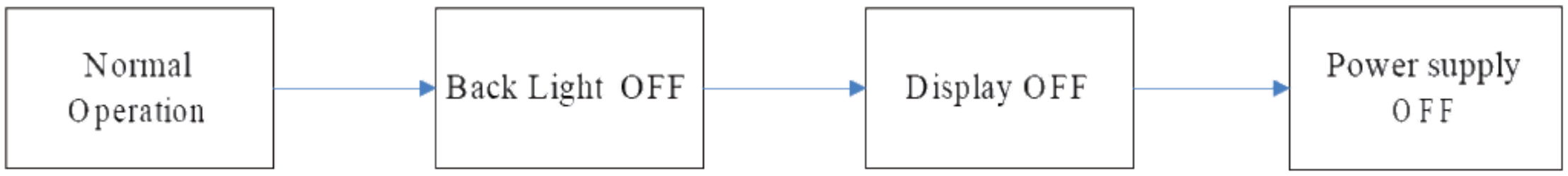
7.It is necessary to wait 5msec after releasing RESET before sending commands.Also Sleep Out command cannot be sent for 120msec.

5.4 Power ON/OFF Timing





Power ON Squence



Power OFF Squence

6 Capacitive Touch Panel

6.1 Touch Panel Module Characteristics

Item	Description	Note
Driver IC	ST1633I	
Multi Touch Suppor	5 fingers	Add Gesture
Interface	I2C	
Surface hardness	⩾7H	
Slave Address	0X70	
Host SCL,SDA Pull-Up Resistance	On customer's board	

6.2 Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit	Remark
Operating Temperature	TOP	-20	--	+70	℃	
Storage Temperature	TST	-30		+80	℃	
Input voltage range	VDDTP	-0.3	--	+6.0	V	
Static Electricity	Be sure that you are grounded when handing TP					

Note1: If the module exceeds the absolute maximum ratings, it may be damaged permanently .Also, if the module operated with the absolute maximum ratings for a long time, its reliability may drop.

6.3 DC Electrical Characteristics

Condition: VDD=IOVDD=3.3V,TA=25℃,unless be specified individually.

Item		Symbol	Test Condition	MIN	TYP	MAX	Unit	Remark
Power Supply		VDDTP		2.7	3.3	3.6	V	
I/O Power Supply		IOVCC		1.6	3.3	3.6	V	
Input Signal Voltage	High Level	VIH		0.85*IOVCC	--	--	V	
	Low Level	VIL		--	--	0.15*IOVCC	V	
Operating Current		INML	21TX,12RX	--	16.1	24	mA	
Idle Current		IIDLE	21TX,12RX,scan rate=20Hz	--	8.1	12.2	mA	
Power Down Current		IPD		--	--	20	uA	
Input Pull Up Resistor		Rpu		50	--	60	Kohm	
Output Driving Current		IDRV	VOH=IOVDDx0.8	6	--	--	mA	
Output Sinking Current		ISINK	VOL=IOVDDx0.2	10	--	--	mA	
Low Voltage Reset		VLVR		--	--	2.3	V	

6.4 AC Electrical Characteristics

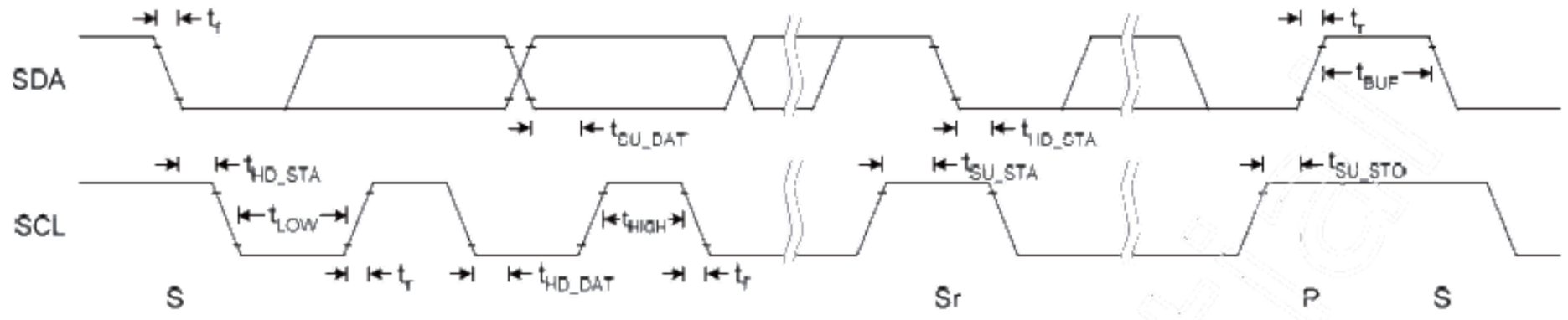


Figure 5-1 I2C Fast Mode Timing

Table 5-3 I2C Fast Mode Timing Characteristic

Conditions: VDD = 3.3V, GND = 0V, T_A = 25°C

Symbol	Parameter	Rating			Unit
		Min.	Typ	Max.	
f_{SCL}	SCL clock frequency	0	-	400	kHz
t_{LOW}	Low period of the SCL clock	1.3	-	-	us
t_{HIGH}	High period of the SCL clock	0.6	-	-	us
t_f	Signal falling time	-	-	300	ns
t_r	Signal rising time	-	-	300	ns
t_{SU_STA}	Set up time for a repeated START condition	0.6	-	-	us
t_{HD_STA}	Hold time (repeated) START condition. After this period, the first clock pulse is generated	0.6	-	-	us
t_{SU_DAT}	Data set up time	100	-	-	ns
t_{HD_DAT}	Data hold time	0	-	0.9	us
t_{SU_STO}	Set up time for STOP condition	0.6	-	-	us
t_{BUF}	Bus free time between a STOP and START condition	1.3	-	-	us
C_b	Capacitive load for each bus line	-	-	400	pF

6.5 System management

6.5.1 Reset

Master can reset ST1633i through RESET pin. RESET pin is low active and needs hold low for 1us to take effect.

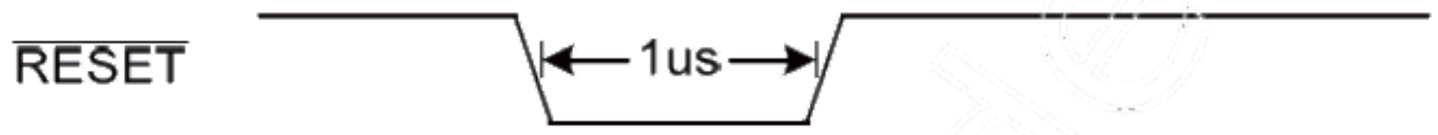


Figure 3-1 $\overline{\text{RESET}}$ Pin Low Pulse Width

6.5.2 Power On/Off Sequence

RESET pin should be held low before power on and power off. During power on, after both VDD and IOVDD reach normal voltage, RESET pin needs to be held low for 5ms to ensure internal block stable.

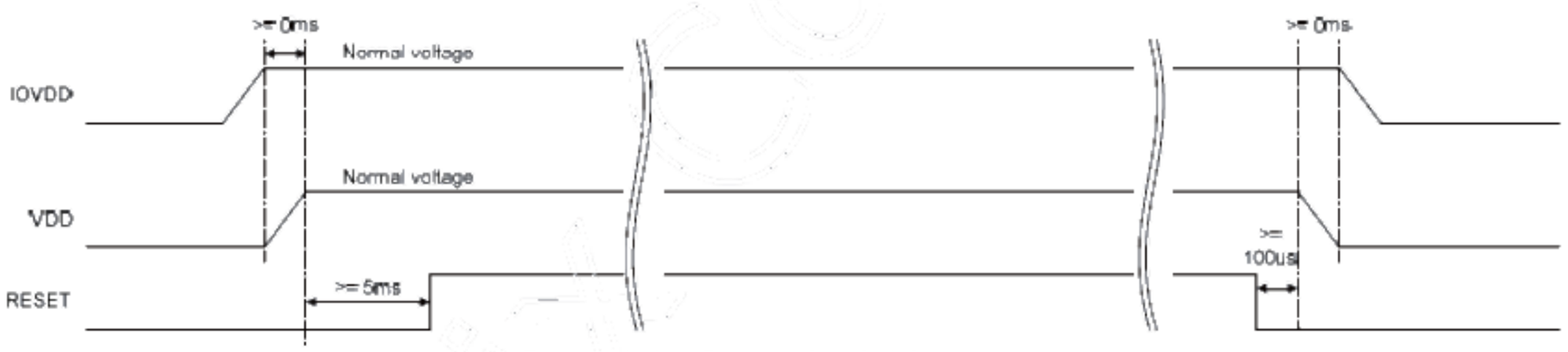


Figure 3-2 Power On/Off Sequence

7 Optical Characteristics

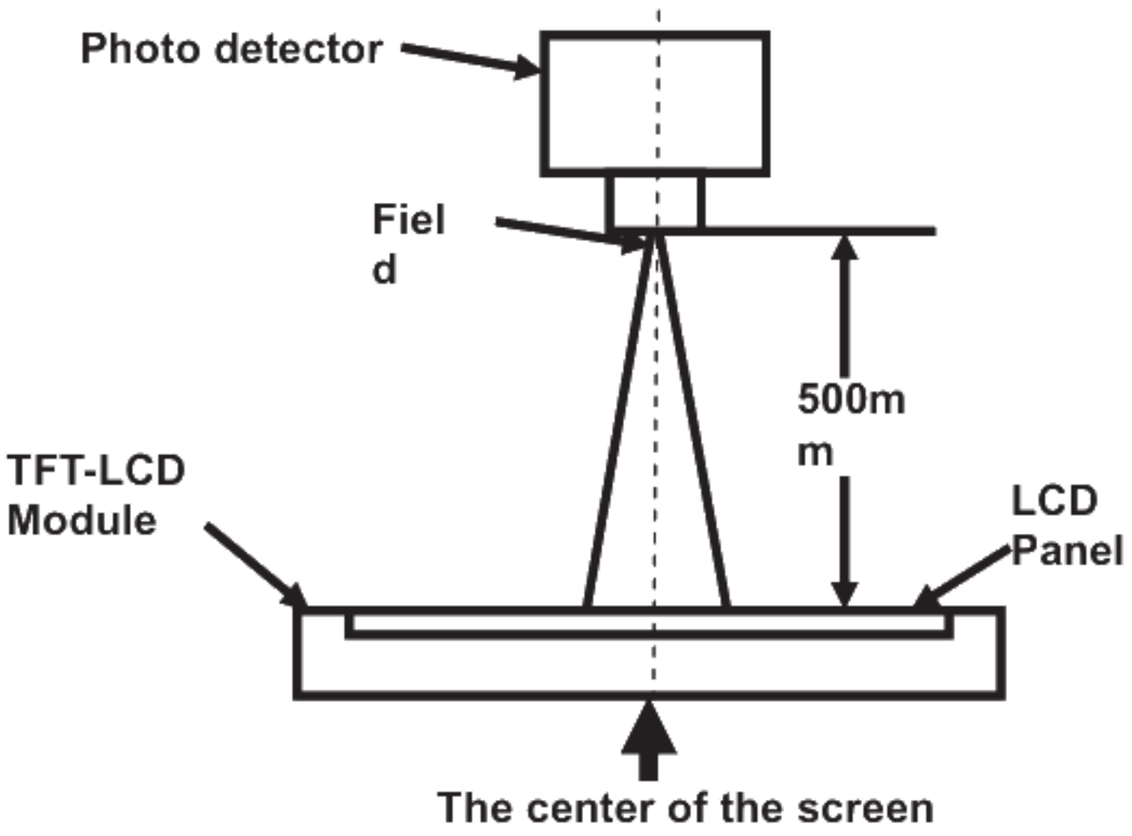
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	75	85	-	Degree	Note 2
		θB		75	85	-		
		θL		75	85	-		
		θR		75	85	-		
Contrast Ratio		CR	θ=0°	600	800	-	-	Note1 Note3
Response Time		T_{ON}	25℃	-	35	50	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on		0.292		-	Note5 Note1
		y			0.317			
	Red	x			0.625			
		y			0.325			
	Green	x			0.321			
		y			0.594			
	Blue	x			0.154			
		y			0.173			
Uniformity		U	-	75	80		%	Note1 Note6
NTSC		-	-	60	65		%	Note 5
Luminance		L		250	300		cd/m^2	Note1 Note7

Test Conditions:

1. I_F= 20 mA (For each LED), 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.

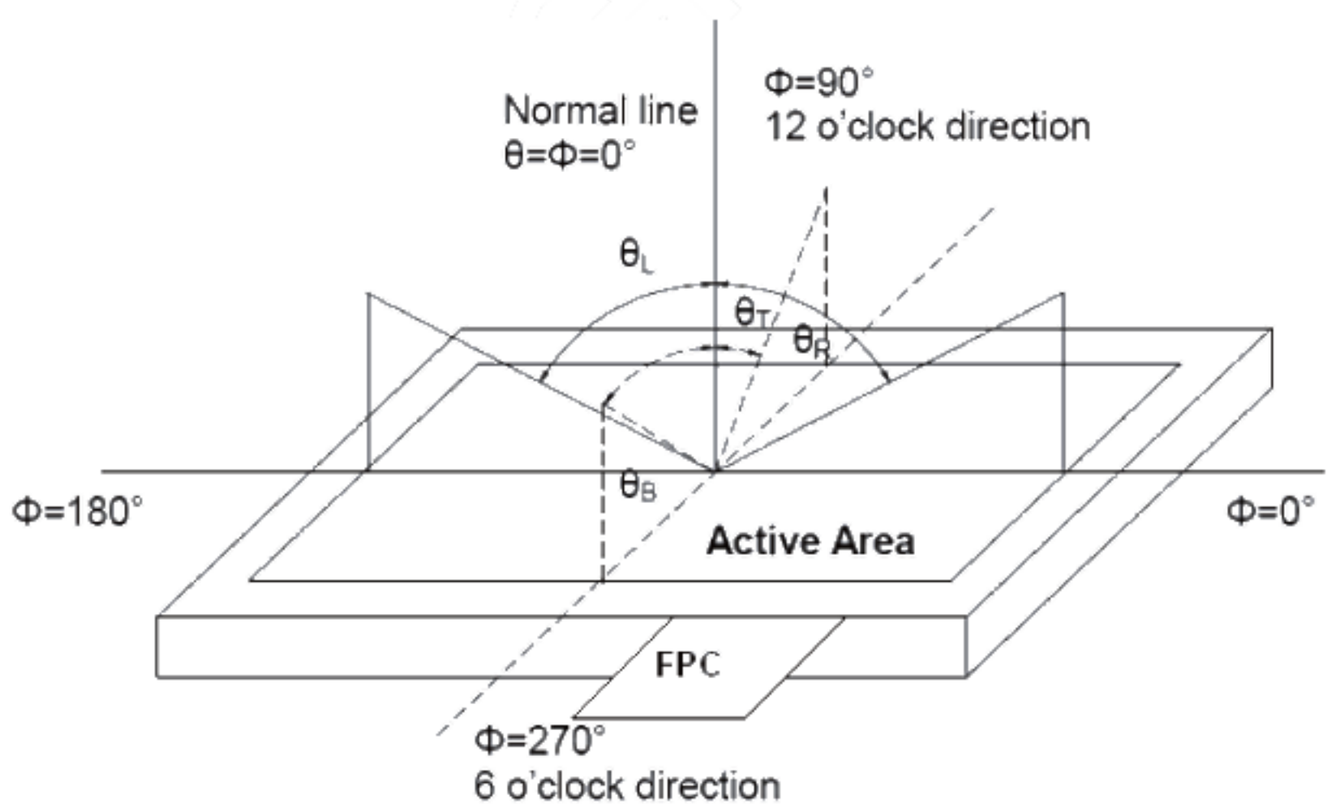


Fig.7.1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

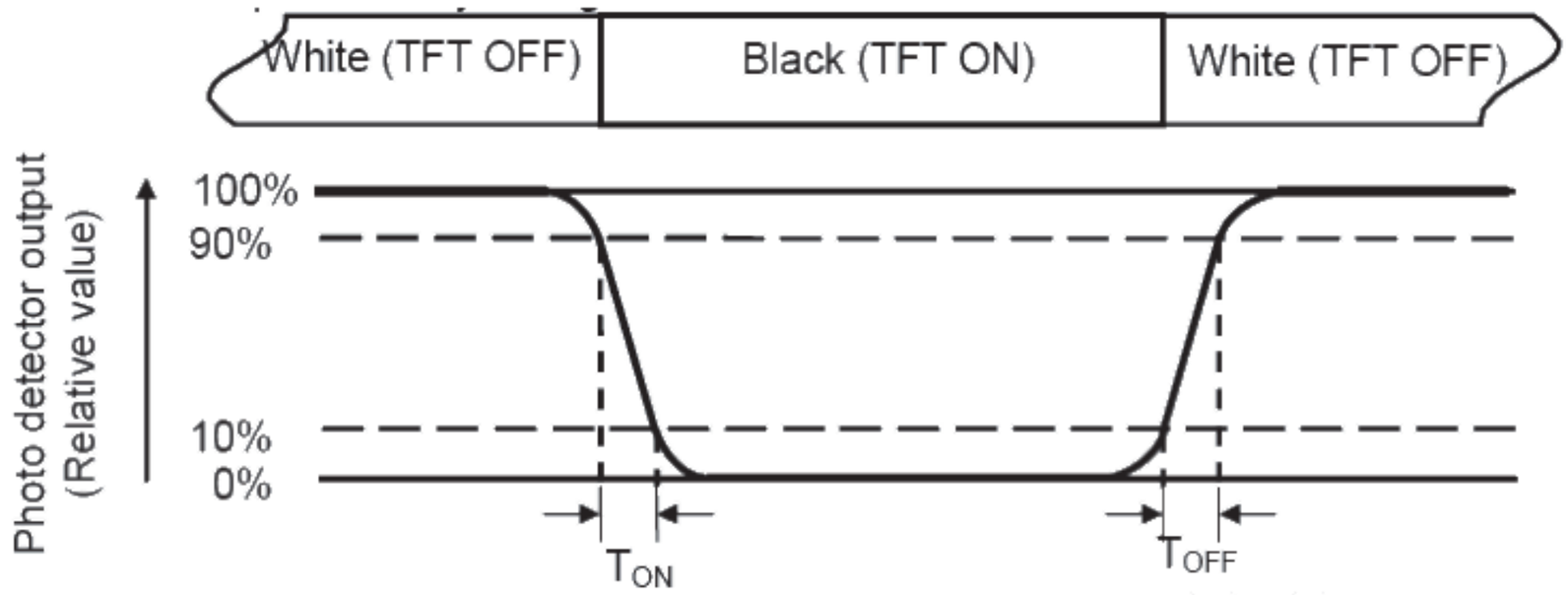
“White state “:The state is that the LCD should driven by Vwhite.

“Black state”: The state is that the LCD should driven 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 (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) 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

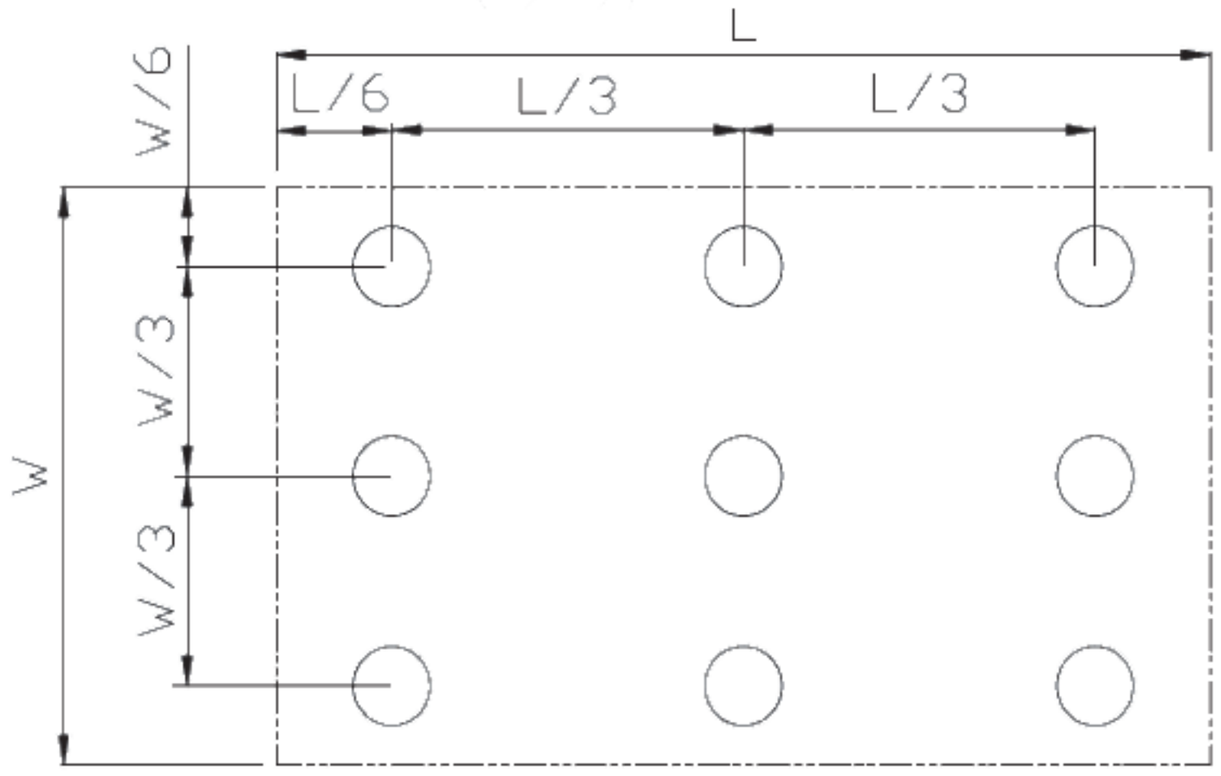


Fig.7.2 Definition of uniformity

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.

8 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max,240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+70℃ 30 min, Change time:5min, 20 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
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)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non Op)	Half Sine Wave 60G 6ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:60cm, 1corner,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

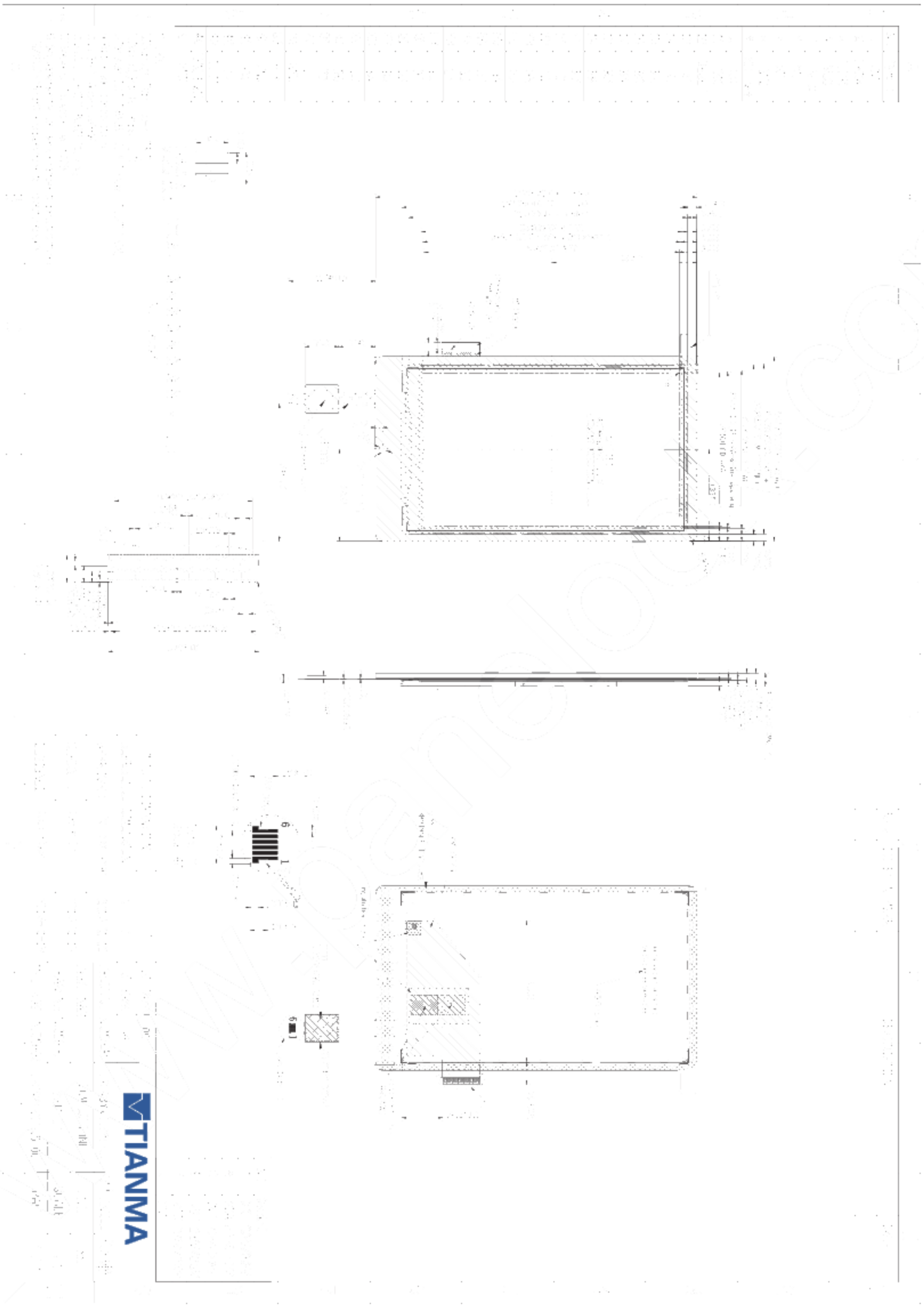
Note1: Ts is the temperature of panel's surface.

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.

9 Mechanical Drawing



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, pro mptly 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.

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:

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