Tailorpixels

A Professional Manufacturer of Display

Manufacturer Certificated

9001 CERT. No.: 282Q19070712006

14001 CERT. No.: 282E19070712007

Product Specification

Model: TTC040XST-03

3.95″TFT Display Module(720*720）

This module uses RoHS material

Tailor Pixels Technology Co., Ltd.
www.tailorpixels.com
tailor@tailorpixels.com
Ph: 86-755-8821 2653

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1.Record of Revision

Rev.	Issued Date	Description	Editor
1.0	2023-06-05	First release	chen

2.General Specifications

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

Note 2: RoHs compliant.

Item	Specification	Unit
LCD size	3.95	inch
Display Mode	Normally Black	--
Resolution	720(RGB)x720	Pixel
Pixel pitch	0.1095*RGB*0.1095	mm
Pixel Arrangement	RGB Vertical Stripe	
Viewing direction	ALL	-
Module outline dimension	74.83(H)*78.98(V)*2.07(D)	mm
LCD AA	71.93x71.93	mm
TP VA	-	mm
Colors	262K	-
Driver IC	NV3052CGRB	-
Driver IC RAM Size	-	-
Interface	18RGB	--
Backlight	White LED	--
Touch IC	-	--
Surface hardness	-	--
Touch structure	-	--
Cover lens	-	--
Color	-	--
Operating Temperature	-20℃~ +70℃	--
Storage Temperature	-30℃~ +80℃	--

3.Pin Assignment

PIN	Symbol	Description	Remark
1	LEDA	LED ANODE	
2	LEDK	LED CATHODE	
3	LEDK	LED CATHODE	
4	GND	Ground	
5	VCI	LCD analog power supply (3.3V)	
6	RESET	Reset Signal	
7	IM1/NC	Not connect	
8	IM0/NC	Not connect	
9	SDA	SPI Data signal	
10	SCK	SPI Clock signal	
11	CS	SPI Chip select signal	
12	PCLK	RGB dot clock signal	
13	DE	RGB data enable signal	
14	VSYNC	RGB frame synchronizing signal	
15	HSYNC	RGB line synchronizing signal	
16-33	DB0-DB17	RGB data(B2-B7,G2-G7,R2-R7)	
34	GND	Ground	
35	TP_INT	Touch Interrupt	
36	TP_SDA	Touch IIC Data signal	
37	TP_SCL	Touch IIC Clock signal	
38	TP_RESET	Touch Reset Signal	
39	TP_VCI	Touch Power supply	
40	TP_GND	Touch Ground	

4.Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
Power Voltage	VCI	-0.30	+3.3	V	
	IOVCC	-0.30	3.3	V	
	TP_VCI	/	/	V	
	TP_IOVCC	/	/	V	
Operating Temperature	Top	-20.0	70.0	℃	
Storage Temperature	T_{st}	-30.0	80.0	℃	
Operating and Storage Humidity	H_{stg}	10%	90%	%(RH)	

5.Electrical Characteristics

5.1Recommended Operating Condition

VCI=3.3V， GND=0V， Ta = 25℃

Item		Symbol	Min.	TYP.	Max.	Unit	Remark
Digital supply Voltage		IOVCC	1.65	1.8	3.3	V	
Analog supply Voltage		VCI	2.5	2.8	3.3	V	
TP Power		TP_VCI	/	/	/	V	
TP Power		TP_IOVCC	/	/	/	V	NOTES
Input Signal Voltage	Low Level	V_{IL}	0	-	0.3 x IOVCC	V	
	High Level	V_{IH}	0.7 x IOVCC	-	IOVCC	V	
Current of digital supply voltage		I_{IOVCC}	-	/	/	Ma	VCI=3.3V, color bar pattern
Current of analog supply voltage		I_{VCI}	-	/	/	Ma	

5.2 Backlight Unit Driving Condition

Item	Symbol	Min.	TYP.	Max.	Unit	Remark
Forward Current	I_F	-	40	-	Ma	
Forward Current Voltage	V_F	10.8	12	13.2	V	
Backlight Power Consumption	W_{BL}	-	512	-	mW	
Operating Life Time	--	20000	--	--	hrs	Note 2, Note 3

Note1: The LED driving condition is defined for each module.

Note2: When LCM is operated, the stable forward current should be inputted. And forward voltage is for reference only.

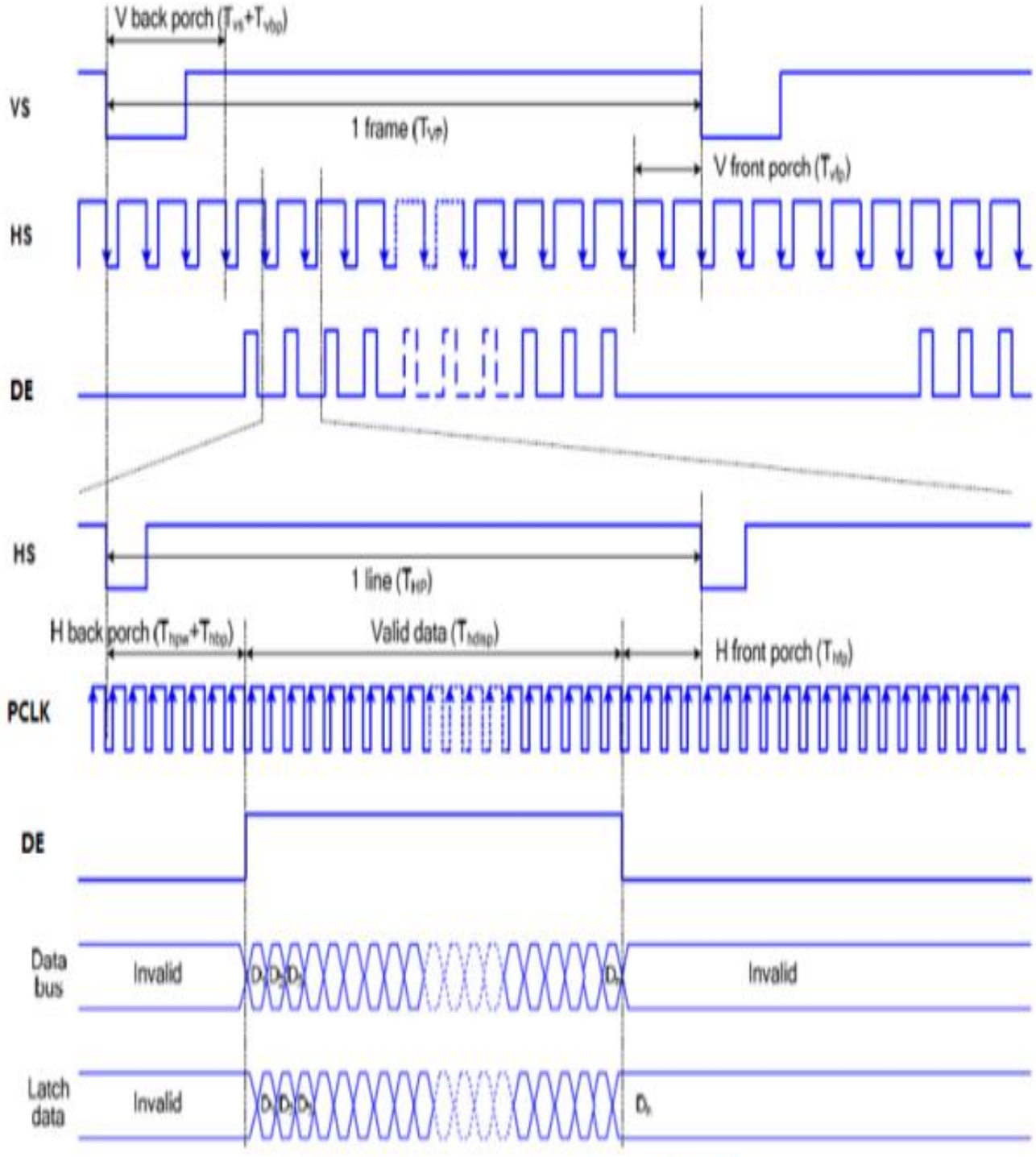
Note3: Optical performance should be evaluated at Ta=25℃ When LED is driven at high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

Note4: The LED driving condition is defined for each LED module.

6.Timing Characteristics

6.1 RGB Interface Characteristics :

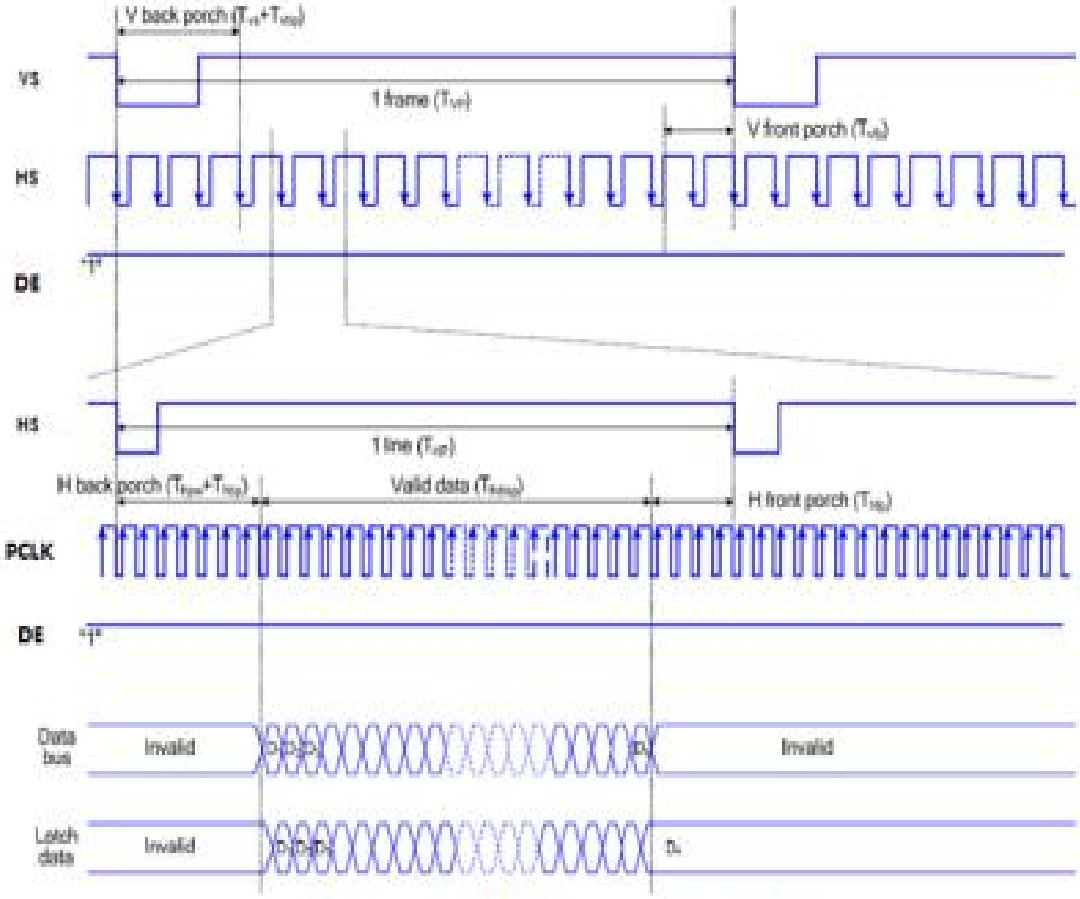
The timing chart of RGB interface DE mode is shown as follows.



Timing Chart of Signals in RGB Interface DE Mode

Note: The setting of front porch and back porch in host must match that in IC as this mode.

The timing chart of RGB interface SYNC mode is shown as follows.



Timing chart of RGB interface SYNC mode

Below Table provide the timing parameter by external Vertical-cycle

(Resolution for 720/640 horizontal x 1280 vertical display with Frame-Rate of 60Hz)

Parameters	Symbols	Min.	Typ	Max.	Unit
Horizontal Synchronization	hpw	-	2	-	PCLK
Horizontal Back Porch	hbp	-	42	-	PCLK
Horizontal Front Porch	hfp	-	44	-	PCLK
Hsync+ HBP+ HFP	-	-	88*Note1	-	PCLK
Horizontal Address (Display area)	hdisp	-	720	-	PCLK
Horizontal cycle	-	-	12.703	-	us
Vertical Synchronization	VS	-	2	-	Line
Vertical Back Porch	vbp	-	14	-	Line
Vertical Front Porch	vfp	-	16	-	Line
Vsync+ VBP+ VFP	-	-	32	-	Line
Vertical Address (Display area)	vdisp	-	1280	-	Line
Vertical cycle	-	-	16.66	16.181	ms
Frame-Rate	-	-	60	61.8	Hz

6.2 Power On /OFF Timing

IOVCC and VCI can be applied in any order. IOVCC and VCI can be powered down in any order.

During power off, if LCD is in the Sleep Out mode, VCI and IOVCC must be powered down minimum 120msec after RESX has been released.

During power off, if LCD is in the Sleep In mode, IOVCC or VCI can be powered down minimum 0msec after RESX has been released.

CSX can be applied at any timing or can be permanently grounded. RESX has priority over CSX.

Note 1: There will be no damage to the display module if the power sequences are not met.

Note 2: There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.

Note 3: There will be no abnormal visible effects on the display between end of Power On Sequence and before receiving Sleep Out command.

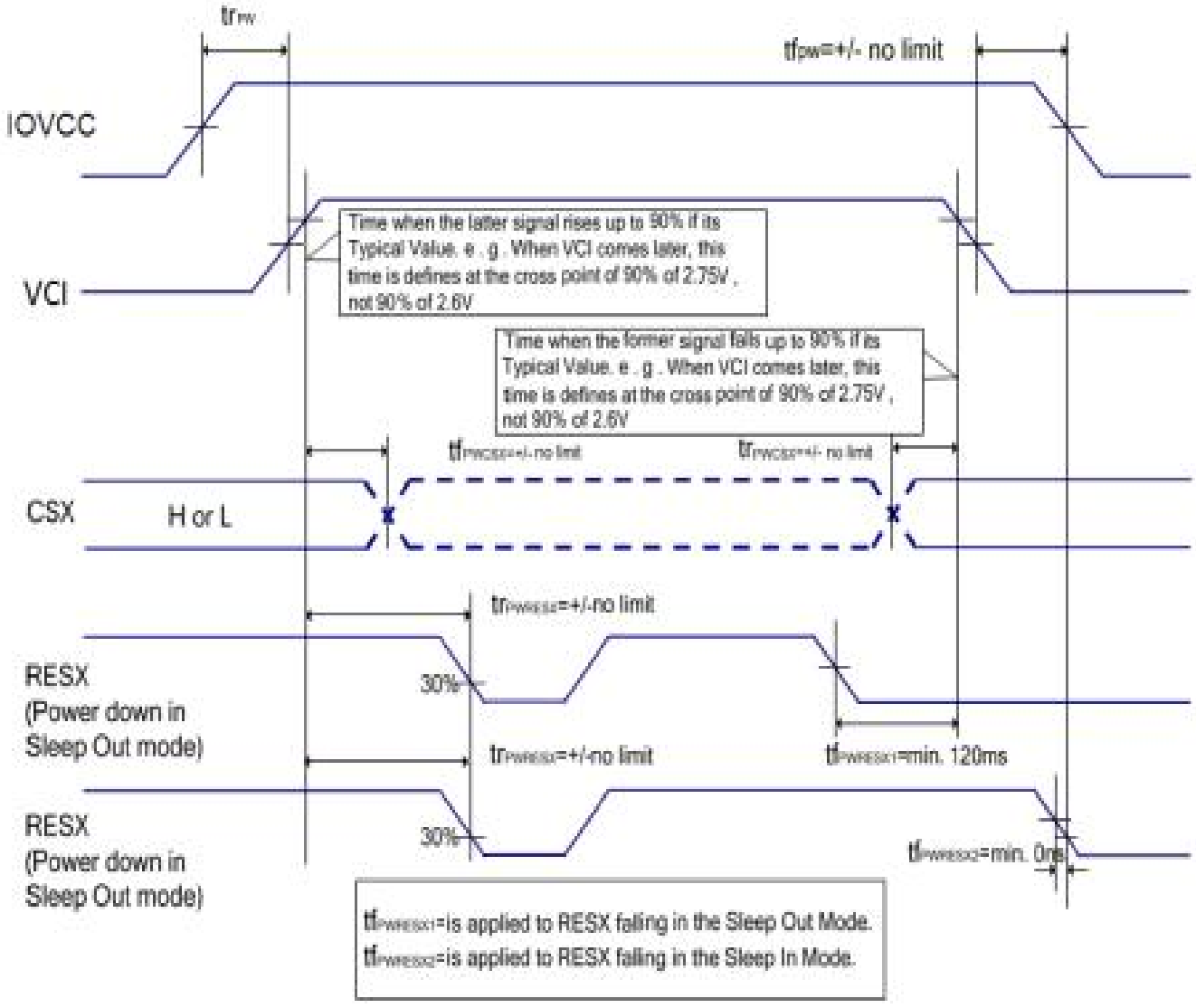
Also between receiving Sleep In command and Power Off Sequence.

If RESX line is not held stable by host during Power On Sequence, then it will be necessary to apply a Hardware Reset (RESX) after Host Power On Sequence is complete to ensure correct operation. Otherwise function is not guaranteed.

The power on/off sequence is illustrated below:

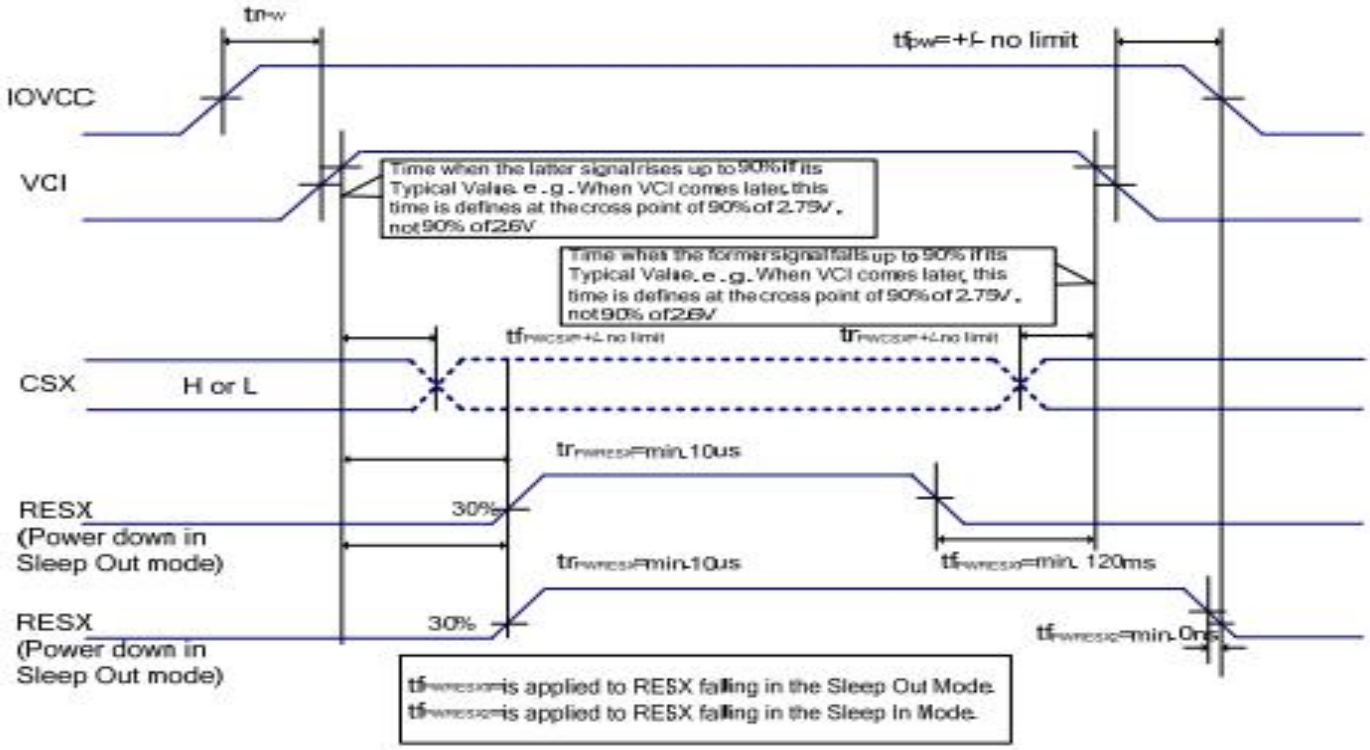
6.4.1. Case 1 – RESX line is held high or unstable by host at power on

If RESX line is held High or unstable by the host during Power On, then a Hardware Reset must be applied after both VCI and IOVCC have been applied – otherwise correct functionality is not guaranteed. There is no timing restriction upon this hardware reset.



6.4.2. Case 2 – RESX line is held low or unstable by host at power on

If RESX line is held Low (and stable) by the host during Power On, then the RESX must be held low for minimum 10sec after both VCI and IOVCC have been applied.

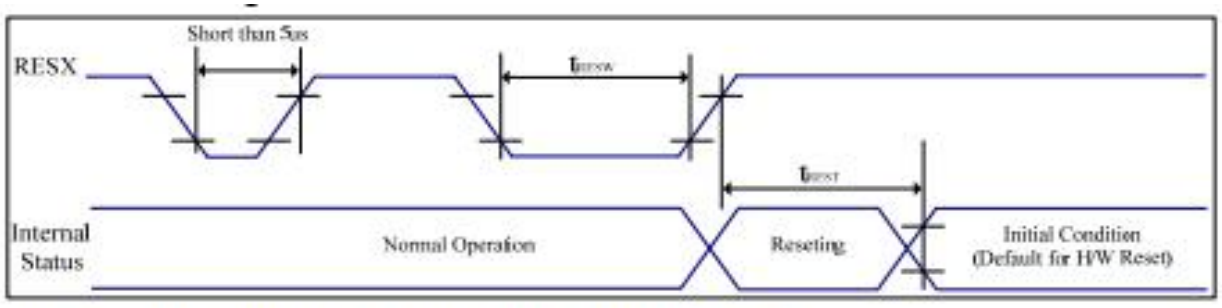


6.4.3. Uncontrolled power off

The uncontrolled power off means a situation when e.g. there is removed a battery without the controlled power off sequence. There will not be any damages for the display module or the display module will not cause any damages for the host or lines of the interface.

At an uncontrolled power off the display will go blank and there will not be any visible effects within (TBD) second on the display (blank display) and remains blank until "Power On Sequence" powers it up.

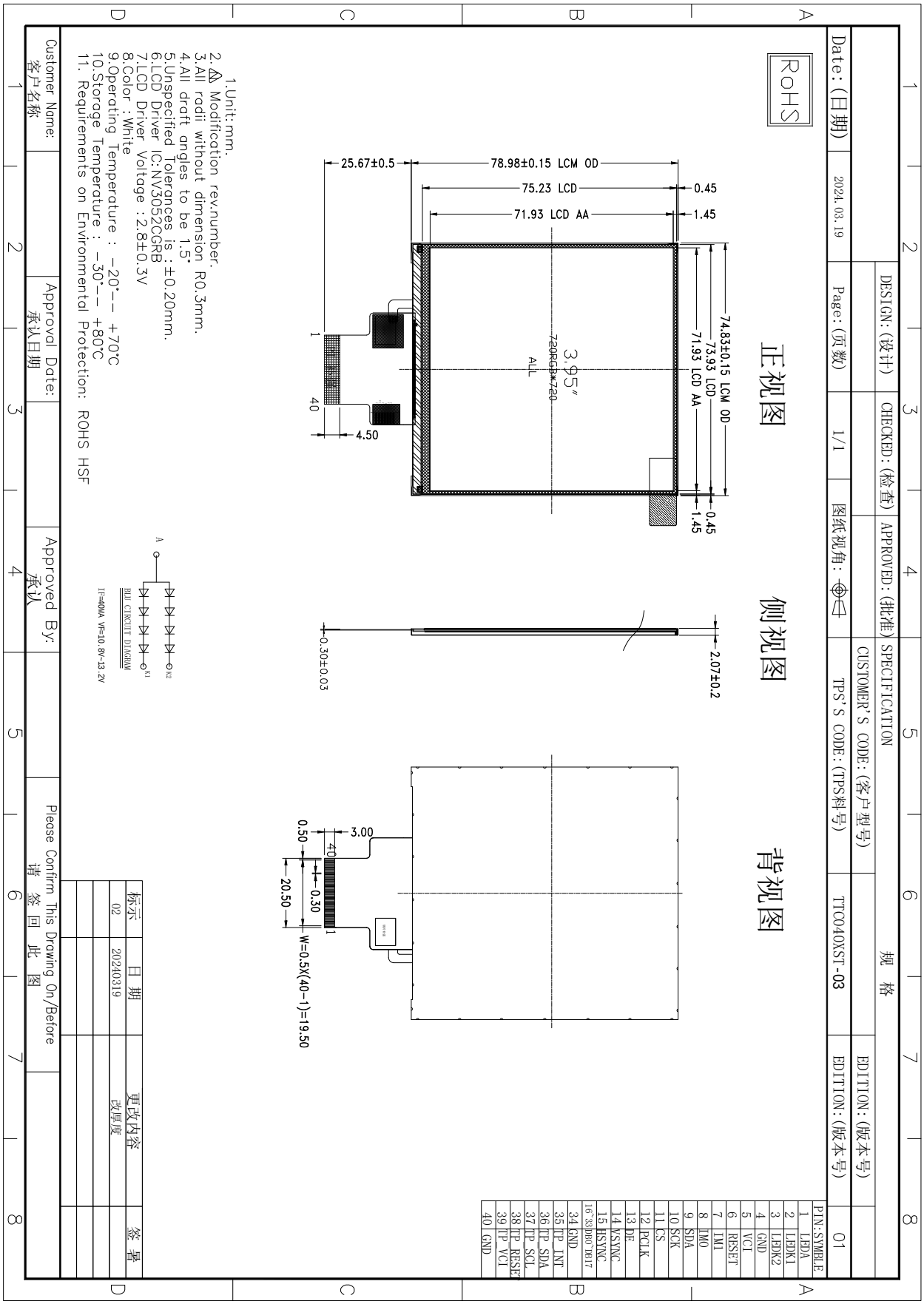
6.3 Reset Timing



VSS=0V, IOVCC=1.65V to 3.6V, VCI=2.5V to 6.0V, Ta = -30℃ to 85℃

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	10	-	-	-	us
t_{REST}	*2) Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-	-	-	120	When reset applied during Sleep out mode	ms

7.Mechanical Drawing



8.Optical Characteristics

Item		Symbol	Condition	Min.	TYP.	Max.	Unit	Remark
View Angles		θT	CR≧10	-	85	-	Degree	Note 2
		θB		-	85	-		
		θL		-	85	-		
		θR		-	85	-		
Contrast Ratio		CR	θ=0°	700	900	-		Note1 Note3
Response Time		T_{ON}	25℃		25	35	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	-	-	-		Note1 Note5
		y		-	-	-		
Uniformity		U		70	80	-	%	Note1 Note6
NTSC					68	-	%	Note 5
Luminance		L		-	300	-	CD/m^2	Note1 Note7

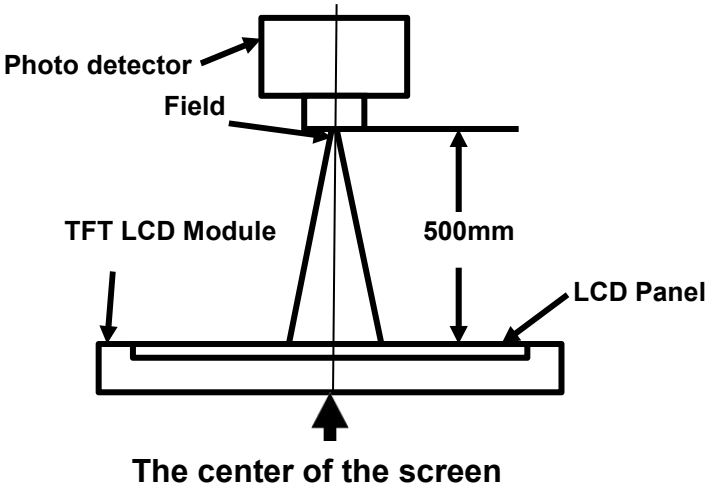
Test Conditions:

1.IF= 40 Ma, VF=12.8 V and the ambient temperature is 25±2℃.humidity is 65±7%

2.The test systems refer to Note 1 and Note 2.

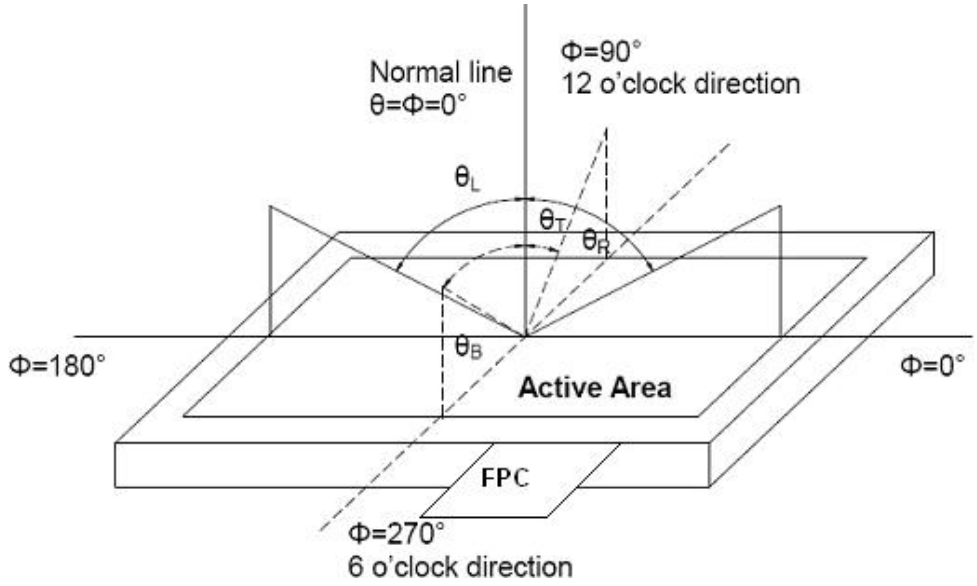
Note 1: Definition of optical measurement system.

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 by CONOSCOPE(ergo-80)。

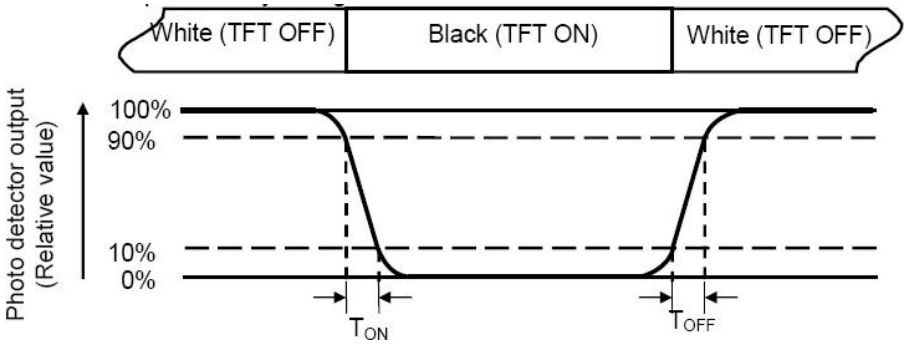


Note 3: Definition of contrast ratio

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

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)

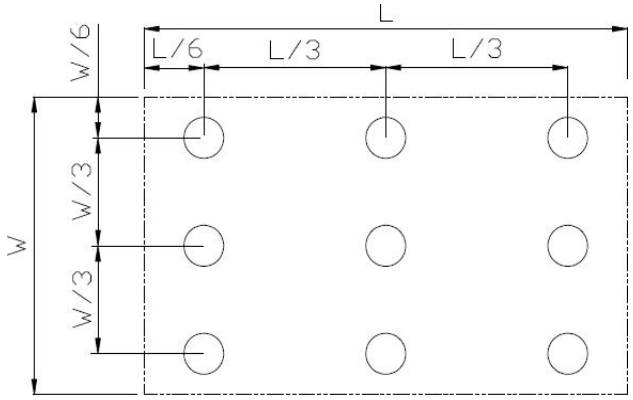
Color coordinates measured at center point ofLCD.

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) = Luminance min / Luminance max

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



Luminance max: The measured Maximum luminance of all measurement position. Luminance min: The measured Minimum luminance of all measurement position.

Note 7: Definition of luminance:

Measure the luminance of white state at center point

9.Environmental / Reliability Test

No.	Items	Condition	Inspection after test
1	High Temperature Storage	T = 80℃ for 96 hr	Inspection after 4 hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD 2.Seal leak; 3.Non-display; 4.missing segments; 5.Glass crack; 6.Current IDD is twice higher than initial value.
2	Low Temperature Storage	T = -30℃ for 96 hr	
3	High Temperature Operating	T = 70℃ for 96 hr	
4	Low Temperature Operating	T = -20℃ for 96 hr (But no condensation of dew)	
5	High Temp. and High Humidity Operating	T = 60℃/90% for 96 hr (But no condensation dew)	
6	Thermal Shock	-20±2℃~25~70±2℃×10cycles (30min.) (5min.) (30min.)	
7	ESD	Voltage:±2KV R: 330Ω C: 150pF Air discharge, 10time	

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

Note2: Ta is the ambient temperature of samples

10.Precautions for Use of LCD Modules Handling Precautions

10.1Handling 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.

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

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

10.1.8.3 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

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

10.2.2The 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%

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

10.3Transportation Precautions

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