一众显示科技有限公司

TEAM SOURCE DISPLAY TECH. CO, TD.

TFT-LCD Module Specification

Module NO.： TST020QVHS-06B

Version： V1.0

☐ APPROVAL FOR SPECIFICATION ☐ APPROVAL FOR SAMPLE

For Customer’s Acceptance：	
Approved by	**Comment**

Team Source Display：		
Presented by	**Reviewed by**	**Approved by**
Zahi	**Aron**	**Aron**

Version No.	Date	Content	Remark
V1.0	2022-10-17	Initial Release	

CONTENTS

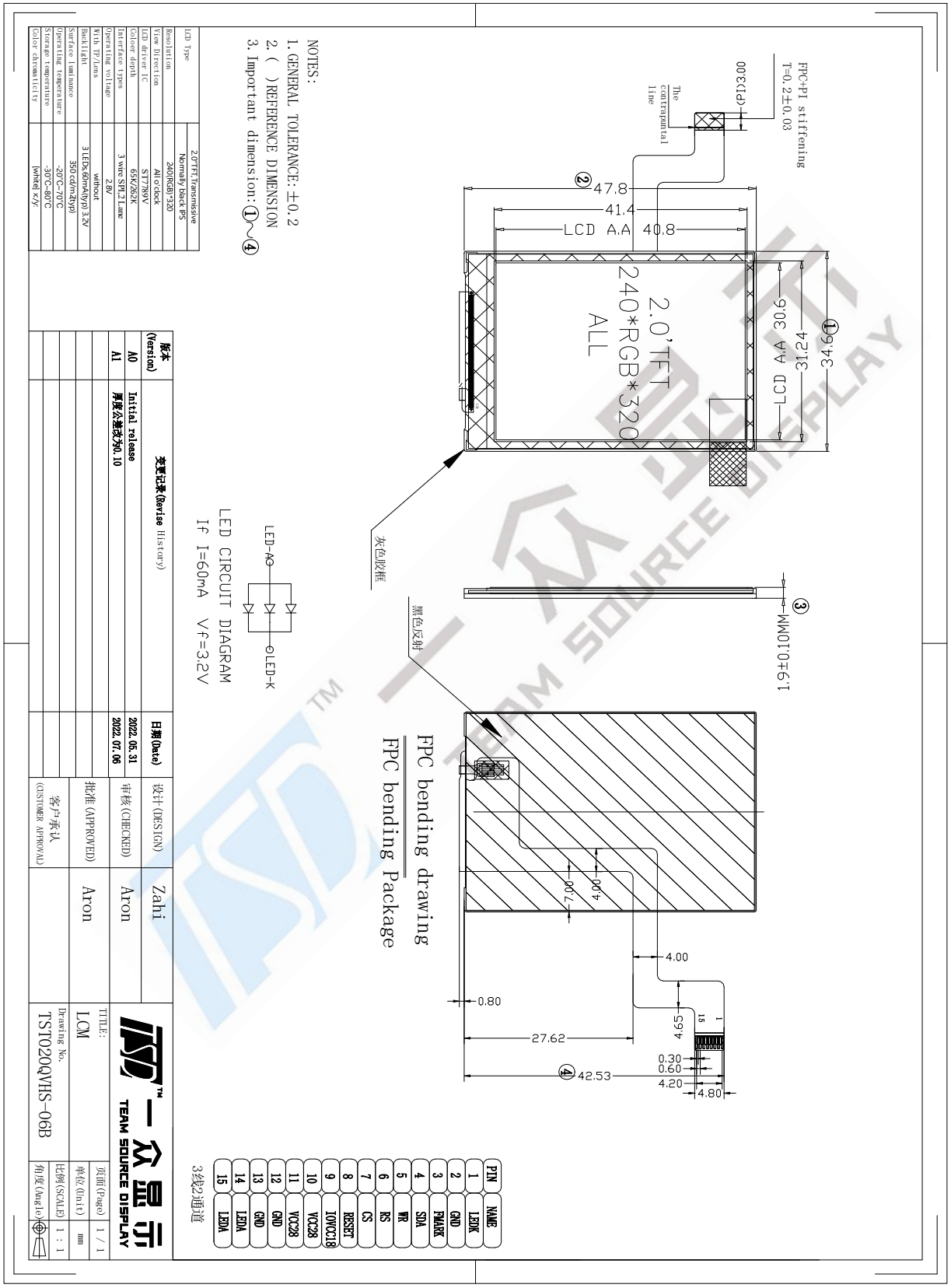
1 General Characteristics

ITEM	Specification	Unit
LCD Type	a-Si TFT,Transmissive,Normally black,IPS	-
LCD Size	2.0	inch
Resolution (W x H)	240 x (RGB) × 320	pixel
LCM (W × H × D)	34.6 (W)*47.8(H)*1.9(T)	mm
Active Area (W × H)	30.6 (W) x 40.8 (H)	mm
Dot Pitch (W × H)	0.1275 (W) x 0.1275 (H)	mm
Viewing Direction	Free	-
Color Depth	65K/262K	-
Pixel Arrangement	RGB Vertical stripe	-
Backlight Type	3LEDs, 60mA	-
Surface Luminance	350(Typ)	cd/m2
Surface Treatment	Anti-glare	-
Driver IC	ST7789V	-
Interface Type	3 wire SPI, support 2 lane	-
Input Voltage	2.8~3.3	V
TP/Lens	Without	-
Weight	TBD.	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

2 Product drawings



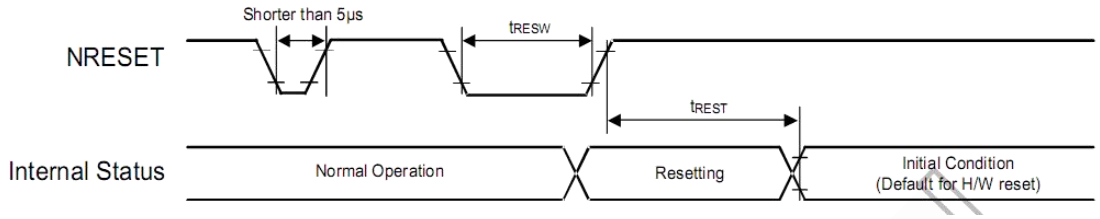
3 Interface description

3.1 LCD interface

PIN NO.	Symbol	description
1	LEDK	Backlight K Cathode input pin.
2	GND	System Ground. (0V)
3	FMARK	Tearing Effect output signal
4	SDA	serial interfacedata input pin.
5	WR	Second Data lane in 2 data lane serial interface. If not used, please fix this pin at IOVCC or GND.
6	RS/SCL	serial interface clock input pin
7	CS	Chip select signal.
8	RESET	Reset input signal
9	IOVCC	Power supply 1.8~3.3V
10	VCC28	Power supply 2.5~3.3V
11	VCC28	Power supply 2.5~3.3V
12	GND	System Ground. (0V)
13	GND	System Ground. (0V)
14	LEDA	Backlight A Aothod input pin.
15	LEDA	Backlight A Aothod input pin.

4 LCM Interface Timing

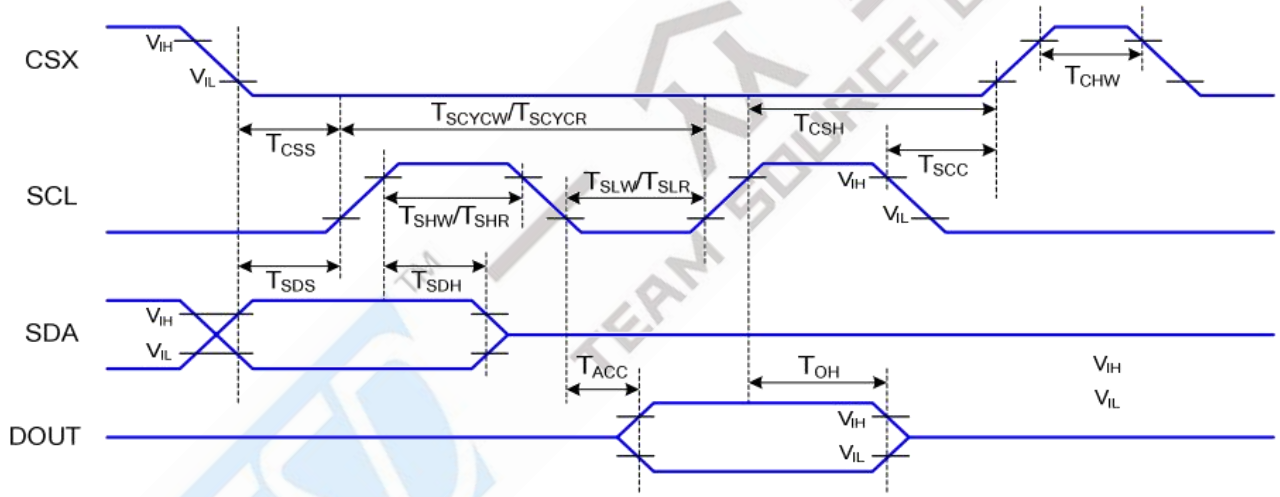
4.1 Reset Timing



Signal	Symbol	Parameter	Min	Max	Unit
NRESET	tRESW	Reset low pulse width	10	-	us
	tREST	Reset complete time	5 (note 1)	-	ms
			120(note 2)	-	ms

Note: (1) When reset applied during SLPIN mode;
(2) When reset applied during SLPOUT mode.

4.2 SPI Read/Write Timing



Website: www.tslcd.com/www.lcdlcm.com Email: tslcd@tslcd.com

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select “H” pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	
	T_{SHW}	SCL “H” pulse width (Write)	15		ns	
	T_{SLW}	SCL “L” pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL “H” pulse width (Read)	60		ns	
	T_{SLR}	SCL “L” pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T_{OH}	Output disable time	15	50	ns	For minimum CL=8pF

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage (Analog)	VCC~GND	-0.3	3.3	V
Logic signal voltage(I/O)	IOVCC~GND	-0.3	3.3	V
Operating Temperature	TOP	-20	70	° C
Storage Temperature	TST	-30	80	° C
Humidity	RH	-	90%(Max 60° C)	RH

6 Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Analog operating voltage	VCC	2.5	2.8	3.3	V
Logic operating voltage	IOVCC	1.65	1.8	3.3	V
Input Current	Icc	-	6	7.5	mA
Input Voltage ' H ' level	VIH	0.7IOVCC	-	IOVCC	V
Input Voltage ' L ' level	VIL	GND	-	0.3IOVCC	
Output Voltage ' H ' level	VOH	0.8IOVCC	-	IOVCC	
Output Voltage ' L ' level	VOL	GND	-	0.2IOVCC	

7 Backlight Characteristics

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V_f	-	3.2	-	V
Current for LED backlight	I_f	-	60	-	mA
Power consumption	Wbl	-	192	-	mW
Uniformity	Avg	80	-	-	%
LED Life Time	-	20000	30000	-	Hrs

Note:

1.The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C, 60%RH ±5 %.

2. The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions.

3. Typical operating life time is an estimated data.

4. Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded .Functional operation should be restricted to the conditions described under normal operating conditions.

8 LCD Optical specifications

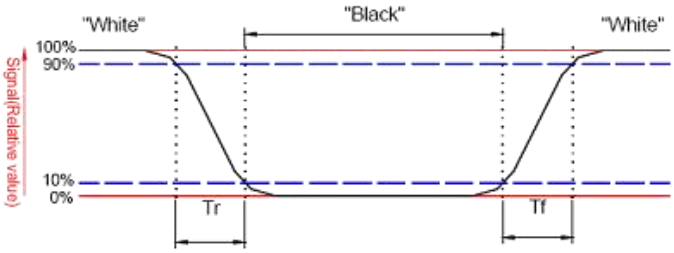
Item	Symbol	Condition	Specification			Unit	Remark
			Min.	Typ.	Max.		
Response time (By Quick)	Tr+Tf	θ = 0°	-	30	40	ms	
Luminance	L	θ = 0°	300	350	-	cd/m^2	
Contrast ratio	CR	θ = 0°	640	800	-		
Viewing angle	Top	CR≧10	-	80	-	Deg.	
	Bottom	CR≧10	-	80	-		
	Left	CR≧10	-	80	-		
	Right	CR≧10	-	80	-		
Color chromaticity (CF only with ITO, light source is C light, CIE 1931)	Wx	θ = 0°	-0.02	0.28	+0.02		
	Wy			0.30			

Note 1: Ambient temperature = 25°C.

Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-7.

Note 3: LCD status is cell without polarizer. Transmittance of Specification is cell with polarizer.
The tolerance of Transmittance is ±10%.

Note 4: Definition of response time:
The output signals of TRD-100 are measured when the input signals are changed to “White” (falling time) and from “White” to “Black” (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.

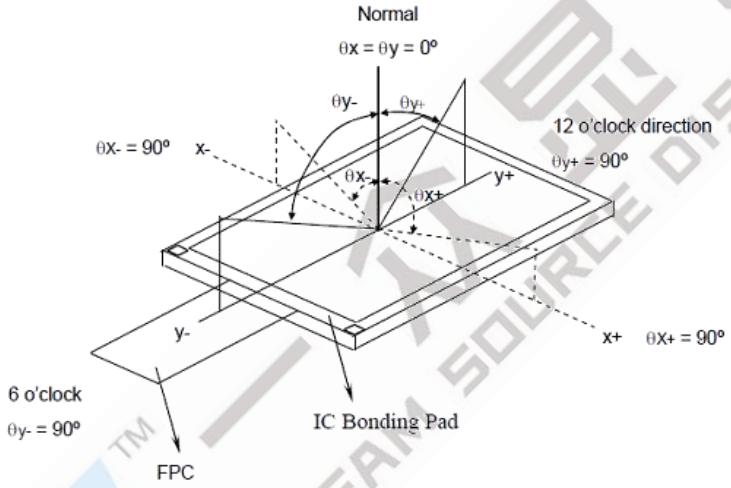


Note 5: Definition of contrast ratio:

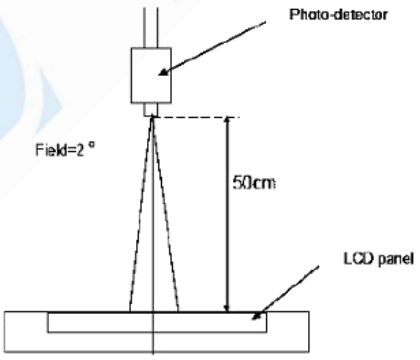
Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

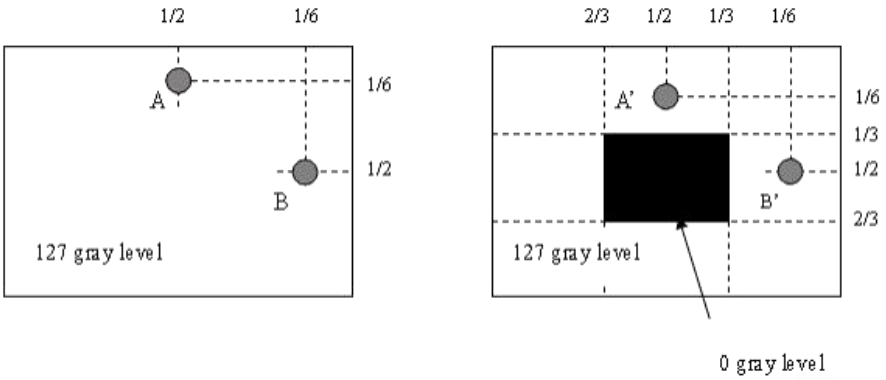
Note 6: Definition of viewing angle



Note 7: Optical characteristic measurement setup.



Note 8:



l LA-LA' l / LA x 100%= 2% max., LA and LA' are brightness at location A and A'.

l LB-LB' l / LB x 100%= 2% max., LB and LB' are brightness at location B and B'.

9 RELIABILITY TEST

9.1 Test condition

NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	80±2°C/96 hours	Inspection after 2~4 hours storage at room temperature and humidity. The condensation is not accepted. 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
2	Low Temperature Storage	-30±2°C/96 hours	
3	High Temperature Operating	70±2°C/96 hours	
4	Low Temperature Operating	-20±2°C/96 hours	
5	Temperature Cycle	-30±2°C ~ 25~ 70± 2°C × 10 cycles (30 min.) (5min.) (30min.)	
6	Damp Proof Test	60°C ±5°C × 90%RH/96 hours	
7	Vibration Test	Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~150 Hz~10Hz 2 hours For each direction of X, Y, Z	
8	Packing Drop Test	Height: 60 cm 1 corner, concrete floor	
9	Electrostatic Discharge Test	C=150pF, R=330 Ω Air: ±8KV 150pF/330Ω 30 times Contact: ±4KV,20 times	

9.2 Others

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)

2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)

10 Suggestions for using LCD modules

10.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.
2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.
3. Don't apply excessive force on the surface of the LCM.
4. If the surface is contaminated, clean it with soft cloth. If the LCM is severely contaminated, use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer. The following solvents is especially prohibited: water , ketone Aromatic solvents etc.
5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
7. Don’t disassemble the LCM.
8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
- Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

9. Do not alter, modify or change the the shape of the tab on the metal frame.
10. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
11. Do not damage or modify the pattern writing on the printed circuit board.
12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector
13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
14. Do not drop, bend or twist LCM.

10.2 Storage

1. Store in an ambient temperature of 5 to 45 C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.
2. Storage in a clean environment, free from dust, active gas, and solvent.
3. Store in antistatic container.