



深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, LTD.

TFT-LCD Module Specification

Module NO.: TST09603A

Version: V1.1

☐ APPROVAL FOR SPECIFICATION

☐ APPROVAL FOR SAMPLE

For Customer' s Acceptance:	
Approved by	Comment

Team Source Display:		
Presented by	Reviewed by	Approved by
Hcr	Aron	Aron

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1 General Characteristics

ITEM	Specification	Unit
LCD Type	a-Si TFT,Transmissive,Normally Black	-
LCD Size	0.96	inch
Resolution (W x H)	80x (RGB) × 160	pixel
LCM (W × H × D)	14.04(W) x 27.95(H) x 1.71(D)	mm
Active Area (W × H)	10.8(W) x 21.7 (H)	mm
Dot Pitch (W × H)	0.135 x 0.1356	mm
Viewing Direction	All o'clock	-
Color Depth	65K/262K	-
Pixel Arrangement	RGB Vertical stripe	-
Backlight Type	1 LED,20mA, 3.2V	-
Surface Luminance	400 ± 50	cd/m2
Surface Treatment	Clear	-
Driver IC	ST7735S	-
Interface Type	4 wire SPI	-
Input Voltage	2.8 (Typ)	V
With/Without TP	without	-
Weight	TBD.	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

The drawing includes three main views: a top view (A-A), a side view (B-B), and a detail view of the LED chip (C-C). Dimensions are provided in millimeters (mm) and inches (in). Key dimensions include overall width (140.4±0.2), height (1.71±0.1), and various internal offsets. The detail view shows the LED chip, solder mask, and wire bonds.

Pin Assignment	
NO	SYMBOL
1	TP0
2	TP1
3	SDA
4	SCL
5	RS
6	RES
7	CS
8	GND
9	NC
10	VCC
11	LEDK
12	LEDA
13	GND

图 1 显示模块外形尺寸图 (单位: mm)

图 2 显示模块侧视图 (单位: mm)

图 3 显示模块 LED 芯片尺寸图 (单位: mm)

图 4 显示模块 LED 芯片尺寸图 (单位: mm)

图 5 显示模块 LED 芯片尺寸图 (单位: mm)

图 6 显示模块 LED 芯片尺寸图 (单位: mm)

图 7 显示模块 LED 芯片尺寸图 (单位: mm)

图 8 显示模块 LED 芯片尺寸图 (单位: mm)

图 9 显示模块 LED 芯片尺寸图 (单位: mm)

图 10 显示模块 LED 芯片尺寸图 (单位: mm)

图 11 显示模块 LED 芯片尺寸图 (单位: mm)

图 12 显示模块 LED 芯片尺寸图 (单位: mm)

图 13 显示模块 LED 芯片尺寸图 (单位: mm)

图 14 显示模块 LED 芯片尺寸图 (单位: mm)

图 15 显示模块 LED 芯片尺寸图 (单位: mm)

图 16 显示模块 LED 芯片尺寸图 (单位: mm)

图 17 显示模块 LED 芯片尺寸图 (单位: mm)

图 18 显示模块 LED 芯片尺寸图 (单位: mm)

图 19 显示模块 LED 芯片尺寸图 (单位: mm)

图 20 显示模块 LED 芯片尺寸图 (单位: mm)

图 21 显示模块 LED 芯片尺寸图 (单位: mm)

图 22 显示模块 LED 芯片尺寸图 (单位: mm)

图 23 显示模块 LED 芯片尺寸图 (单位: mm)

图 24 显示模块 LED 芯片尺寸图 (单位: mm)

图 25 显示模块 LED 芯片尺寸图 (单位: mm)

图 26 显示模块 LED 芯片尺寸图 (单位: mm)

图 27 显示模块 LED 芯片尺寸图 (单位: mm)

图 28 显示模块 LED 芯片尺寸图 (单位: mm)

图 29 显示模块 LED 芯片尺寸图 (单位: mm)

图 30 显示模块 LED 芯片尺寸图 (单位: mm)

图 31 显示模块 LED 芯片尺寸图 (单位: mm)

图 32 显示模块 LED 芯片尺寸图 (单位: mm)

图 33 显示模块 LED 芯片尺寸图 (单位: mm)

图 34 显示模块 LED 芯片尺寸图 (单位: mm)

图 35 显示模块 LED 芯片尺寸图 (单位: mm)

图 36 显示模块 LED 芯片尺寸图 (单位: mm)

图 37 显示模块 LED 芯片尺寸图 (单位: mm)

图 38 显示模块 LED 芯片尺寸图 (单位: mm)

图 39 显示模块 LED 芯片尺寸图 (单位: mm)

图 40 显示模块 LED 芯片尺寸图 (单位: mm)

图 41 显示模块 LED 芯片尺寸图 (单位: mm)

图 42 显示模块 LED 芯片尺寸图 (单位: mm)

图 43 显示模块 LED 芯片尺寸图 (单位: mm)

图 44 显示模块 LED 芯片尺寸图 (单位: mm)

图 45 显示模块 LED 芯片尺寸图 (单位: mm)

图 46 显示模块 LED 芯片尺寸图 (单位: mm)

图 47 显示模块 LED 芯片尺寸图 (单位: mm)

图 48 显示模块 LED 芯片尺寸图 (单位: mm)

图 49 显示模块 LED 芯片尺寸图 (单位: mm)

图 50 显示模块 LED 芯片尺寸图 (单位: mm)

图 51 显示模块 LED 芯片尺寸图 (单位: mm)

图 52 显示模块 LED 芯片尺寸图 (单位: mm)

图 53 显示模块 LED 芯片尺寸图 (单位: mm)

图 54 显示模块 LED 芯片尺寸图 (单位: mm)

图 55 显示模块 LED 芯片尺寸图 (单位: mm)

图 56 显示模块 LED 芯片尺寸图 (单位: mm)

图 57 显示模块 LED 芯片尺寸图 (单位: mm)

图 58 显示模块 LED 芯片尺寸图 (单位: mm)

图 59 显示模块 LED 芯片尺寸图 (单位: mm)

图 60 显示模块 LED 芯片尺寸图 (单位: mm)

图 61 显示模块 LED 芯片尺寸图 (单位: mm)

图 62 显示模块 LED 芯片尺寸图 (单位: mm)

图 63 显示模块 LED 芯片尺寸图 (单位: mm)

图 64 显示模块 LED 芯片尺寸图 (单位: mm)

图 65 显示模块 LED 芯片尺寸图 (单位: mm)

图 66 显示模块 LED 芯片尺寸图 (单位: mm)

图 67 显示模块 LED 芯片尺寸图 (单位: mm)

图 68 显示模块 LED 芯片尺寸图 (单位: mm)

图 69 显示模块 LED 芯片尺寸图 (单位: mm)

图 70 显示模块 LED 芯片尺寸图 (单位: mm)

图 71 显示模块 LED 芯片尺寸图 (单位: mm)

图 72 显示模块 LED 芯片尺寸图 (单位: mm)

图 73 显示模块 LED 芯片尺寸图 (单位: mm)

图 74 显示模块 LED 芯片尺寸图 (单位: mm)

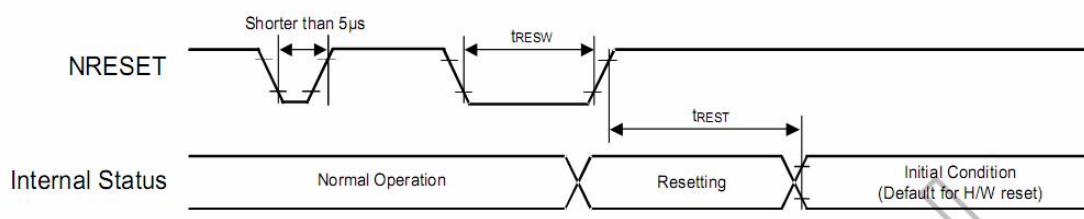
图 75 显示模块 LED 芯片尺寸图 (单位: mm)

3 Interface description

PIN NO.	Symbol	description
1	TP0	No connect
2	TP1	No connect
3	SDA	the serial data input/output signal
4	SCL	the serial clock input signal
5	RS	Data/Command Selection pin
6	RES	Reset input signal,active low
7	CS	Chip select signal.Low Enable
8	GND	System Ground. (0V)
9	NC	
10	VCC	Power supply +2.8V
11	LEDK	Backlight K Cathode input pin.
12	LEDA	Backlight A Aothod input pin.
13	GND	System Ground. (0V)

4 LCM Interface Timing

4.1 Reset Timing

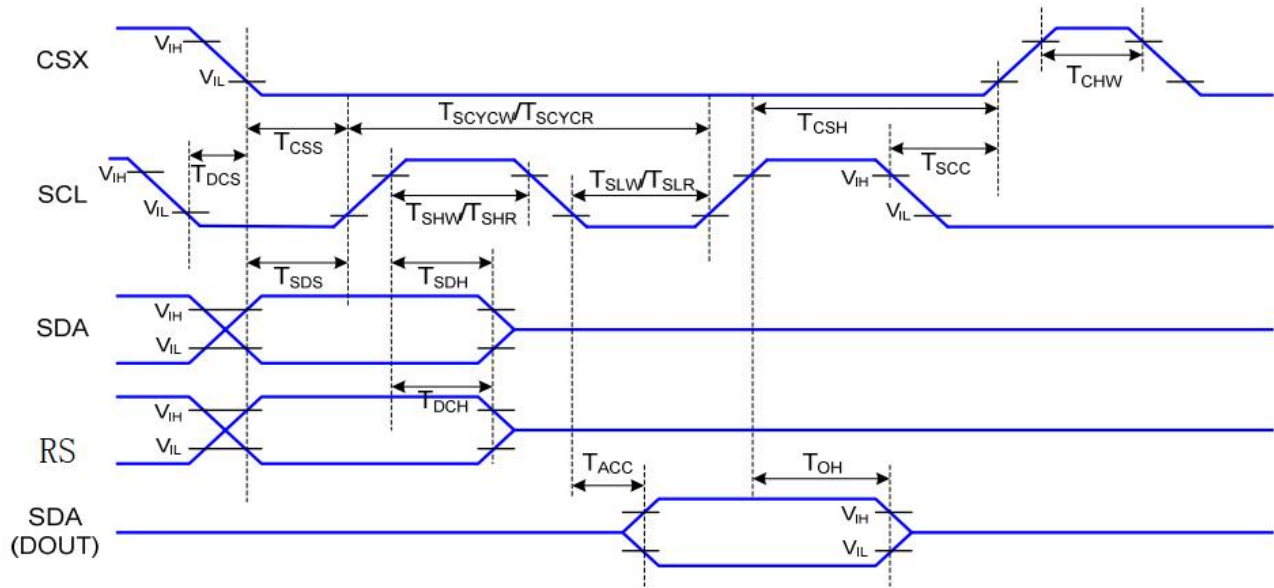


Signal	Symbol	Parameter	Min	Max	Unit
NRESET	tRESW	Reset low pulse width	10	-	us
	tREST	Reset complete time	5 (note 1)	-	ms
			120(note 2)	-	ms

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

(2) When reset applied during SLPOUT mode.

4.2 4-line SPI Read/Write Timing



Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	TCSS	Chip Select Setup Time (Write)	45		ns	
	TCSH	Chip Select Hold Time (Write)	45		ns	
	TCSS	Chip Select Setup Time (Read)	60		ns	
	TSCC	Chip Select Hold Time (Read)	65		ns	
	TCHW	Chip Select "H" Pulse Width	40		ns	
SCL	TSCYCW	Serial Clock Cycle (Write)	66		ns	-Write Command & Data Ram
	TSHW	SCL "H" Pulse Width (Write)	15		ns	
	TSLW	SCL "L" Pulse Width (Write)	15		ns	
	TSCYCR	Serial Clock Cycle (Read)	150		ns	-Read Command & Data Ram
	TSHR	SCL "H" Pulse Width (Read)	60		ns	
	TS LR	SCL "L" Pulse Width (Read)	60		ns	
D/CX	TDCS	D/CX Setup Time	10		ns	
	TDCH	D/CX Hold Time	10		ns	
SDA (DIN) (DOUT)	TSDS	Data Setup Time	10		ns	For Maximum CL=30pF For Minimum CL=8pF
	TSDH	Data Hold Time	10		ns	
	TACC	Access Time	10	50	ns	
	TOH	Output Disable Time	15	50	ns	

Note : The rising time and falling time (Tr, Tf) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage (Analog)	VCC~GND	-0.3	4.0	V
Logic signal voltage(I/O)	IOVCC~GND	-0.3	4.0	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	2.8	VCC	V
Input Current	IDD	7.5	10	-	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	3.3	V
Current for LED backlight	I _f	-	20	25	mA
Power consumption	W _{bl}	-	64	82.5	mW
Uniformity	Avg	70	-	-	%
LED Life Time	-	20000	30000	-	Hrs

Note:

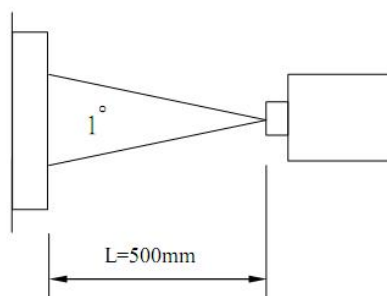
- 1.The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C, 60%RH ±5 %.
2. The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions.
3. Typical operating life time is an estimated data.
4. Permanent 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	$\theta = 0^\circ$	-	30	35	ms	Note 4
Contrast ratio	CR	$\theta = 0^\circ$	600	800	-		Note 3
Viewing angle	Top	$CR \geq 10$	-	80	-	Deg.	Note 5
	Bottom	$CR \geq 10$	-	80	-		
	Left	$CR \geq 10$	-	80	-		
	Right	$CR \geq 10$	-	80	-		
Color chromaticity (CF only with ITO, light source is C light, CIE 1931)	Wx	$\theta = 0^\circ$	-0.02	0.267	+0.02		Note 6
	Wy			0.273			
	Rx			0.621			
	Ry			0.329			
	Gx			0.333			
	Gy			0.561			
	Bx			0.141			
	By			0.060			

Note 1.Ambient condition: $25^\circ\text{C} \pm 2^\circ\text{C}$, $60 \pm 10\%\text{RH}$, under 10 Lunx in the darkroom。

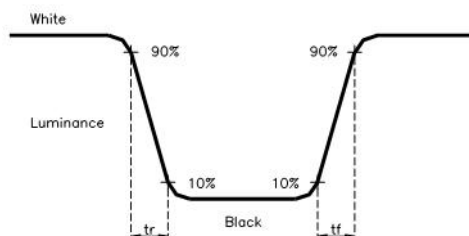
Note 2.Measure device: BM-7 (TOPCON), viewing cone= 1° , IL=20mA。



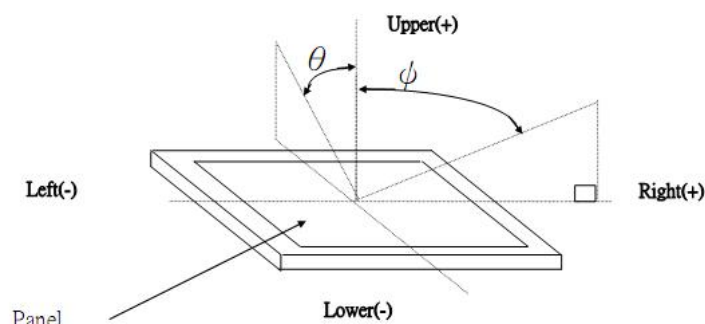
Note 3. Definition of Contrast Ratio:

$CR = \text{White Luminance (ON)} / \text{Black Luminance (OFF)}$

Note 4. Definition of response time: The response time is defined as the time interval between the 10% and 90% amplitudes.



Note 5. Definition of view angle(θ , ϕ):



Note 6. Light source: C light.

9 RELIABILITY TEST

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~ 80± 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	

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.