艾斯迪科技
LCD TECHNOLOGY

LCD MODULE
SPECIFICATION

Customer: _____

Model Name: LCDT1548922AL

Date: 2020-03-022

Version: 1.0

Approved by	Reviewed by	Prepared by

For Customer's Acceptance

Approved by	Comment

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Contents

1. General Specifications

No.	Item	Specification	Unit	Remark
1	LCD Size	1.54"	inch	-
2	Panel Type	a-si TFT	-	-
3	Resolution	240x(RGB)x240	pixel	-
4	Display Mode	Normally Black,Transmissive	-	-
5	Display Number of Colors	262K	-	-
6	Viewing Direction	ALL o'clock	-	Note 1
7	Contrast Ratio	300	-	-
8	Luminance	180	cd/m^2	
9	Module Size	31.52(W)x35.1(L)x1.72(T)	mm	Note 1
12	Weight	TBD	g	-
13	Driver IC	ST7789V	-	-
14	Driver IC RAM Size	240x16x240	bit	-
15	Light Source	3 White LED in Parallel	-	-
16	Interface	8 Bit MCU/4L SPI Interface	-	-
17	Operating Temperature	-20~70	℃	-
18	Storage Temperature	-30~80	℃	-

Note 1: Please refer to the mechanical drawing.

Pin Assignments

Pin No.	Symbol	I/O	Function	Remark
1	LEDA	P	LED+	-
2	LEDK	P	LED-	-
3	IM2	I		-
4	IM1	I		-
5	IM0	I		-
6	VCI(2.8V)	P	Power Supply(2.8V)	-
7	DB7	I/O	DATA BUS	-
8	DB6			-
9	DB5			-
10	DB4			-
11	DB3			-
12	DB2			
13	DB1			-
14	DB0			-
15	RD	I		-
16	WR	I		-
17	RS	I		
18	CS	I	-Chip Selection Pin -Low Enable.	
19	TE	O	Tearing effect output pin to synchronies MCU to frame rate, activated by S/W command.	
20	RESET	I	This signal will reset the device and it must be applied to properly initialize the chip.	
21	SDA	I/O	serial input/output signal in serial interface mode.	
22	GND	P	Ground	

2.   Electrical Specifications

2.1.   Absolute Maximum Rating

$(T_a=+25℃)$

Item		Symbol	Values		Unit	Remark
			Min.	Max.		
TFT Module	I/O Circuit Supply Voltage	VDD	-0.3	4.6	V	Note 1
	Analog/Logic Supply Voltage	VCI	-0.3	4.6	V	Note 1
Backlight Unit	Current	I_B	-	20	mA	Note 2
	Power Consumption	P_{BL}	-	60	mW	Note 2

Note1: Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is applied.

Note2: Without LED driver IC, please refer to 1.54.

2.2.   Typical Operation Conditions

3.2.1   DC Characteristics

$(T_a=+25℃, VCI=+2.8V)$

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Logic Supply Voltage	VDD	1.65	2.8	3.3	V	
Analog Supply Voltage	VCI	2.6	2.8	3.3	V	
Input High Voltage	V_{IH}	0.7VDD	-	VDD	V	
Input Low Voltage	V_{IL}	0		0.3VDD	V	Ta=25℃
Output High Voltage	V_{OH}	0.8VDD	-	VDD	V	
Output Low Voltage	V_{OL}	0	-	0.2VDD	V	
Frame Frequency	f_{FRAME}	-	65	-	Hz	

Note: To prevent IC latch up or DC operation in LCD panel, the power on/off sequence should follow the driver IC specification.

3.2.2   Current Consumption

Item	Symbol	Values		Unit	Remark
		Typ.	Max.		
MCU Interfsce (8080 16-bit parallel Interface)					
Still Mode	VDD	-	TBD	uA	Note1
	VCI	-	TBD	mA	
Sleep Mode	VDD	-	TBD	uA	Note1, Note3
	VCI	-	TBD	uA	

Note1: Test Condition

Typ: VDD=2.8V   Max: VDD=3.0V

VCI=2.8V   VCI=3.3V

Display Pattern: 8 Color Bar   Display: Pattern:All Pixel Black

Frame Rate=80Hz at Line Inversion   Frame Rate=80Hz at Line Inversion

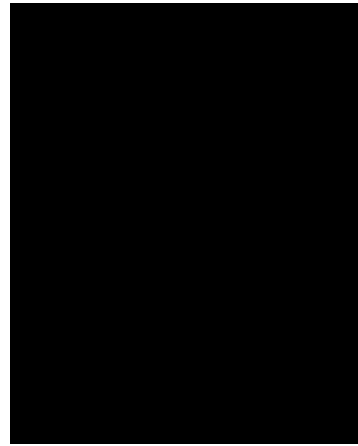Operating Temperature: 25℃   Operating Temperature: 25℃

Typ. current check pattern: **Max. current check pattern:**
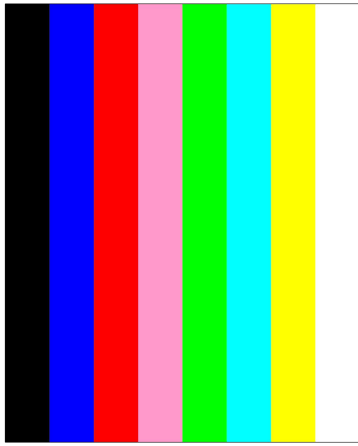
8-Color Bar

Black

Note2: In the standby mode, all the internal display operations are suspended including the internal R-C oscillator.

Note3: In the sleep mode, all the internal display operations are suspended except the internal R-C oscillator.

Backlight Unit

The backlight system is an edge lighting type with 3white LED.

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current	I_B	-	45	-	mA	Note 1
Power Consumption	P_{BL}	-	135	-	mW	Note 2

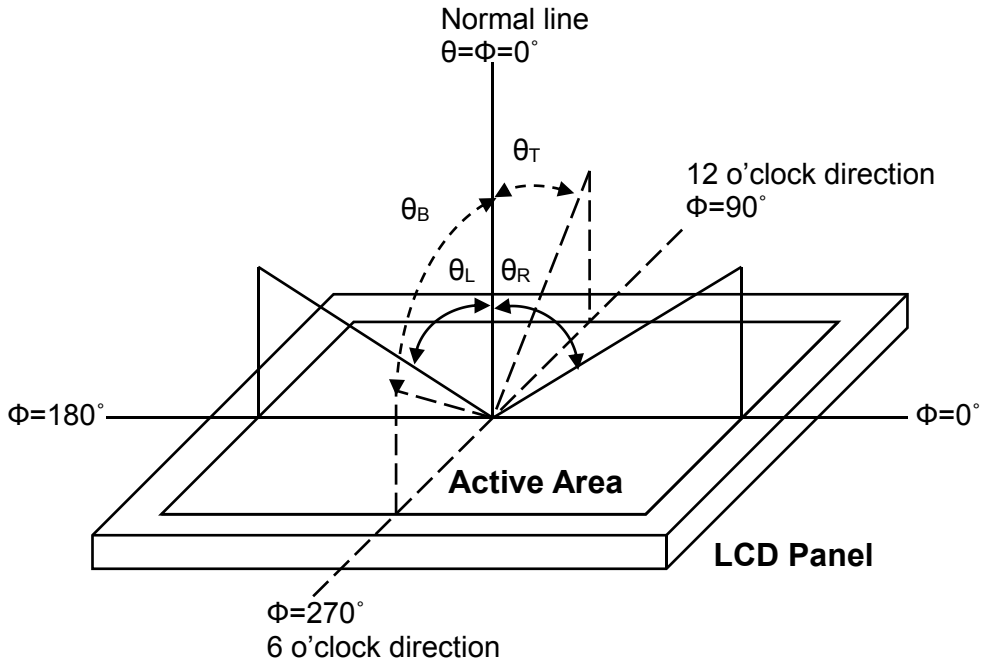Note1: 3 LEDs are connected in parallel; each LED's current consumption is 20mA.

Note2: Where I_B= 45mA, $P_{BL} = I_B$ x $V_{BL,}$ V_{BL} is backlight forward voltage

3. Optical Specifications

(T$_a$=+25℃, VCI=2.8V, VDD=1.8V, I_B=46mA)

Item		Symbol	Condition	Values			Unit	Remark
				Min.	Typ.	Max.		
Viewing Angle Range	Left	θ_L	CR$\geqq$10	—	45	-	degree	Note 1,2
	Right	θ_R		—	45	-		
	Top	θ_T		—	50	-		
	Bottom	θ_B		—	20	-		
Response Time		$T_{on} + T_{off}$	Normal θ=Φ=0°	-	30	50	ms	Note 2,3
Contrast Ratio		CR	Normal θ=Φ=0°	200	300	-	-	Note 2,4
Luminance		L	Normal θ=Φ=0°	160	200	-	cd/m^2	Note 2,5
Flicker		-	-	No Visible			-	Note 8
Crosstalk		-	-	No Visible			-	Note 9
Color Chromaticity (CIE1931)	White	W_x	Normal θ=Φ=0°	—	0.30	—	-	Note 2,6
		W_y		—	0.31	—		
	Red	R_x			0.59	—		
		R_y		—	0.32	—		
	Green	G_x		—	0.31	—		
		G_y		—	0.56	—		
	Blue	B_x		—	0.15	—		
		B_y		—	0.08	—		
Color Gamut		NTSC	CIE1931	-	58	-	%	-
Luminance Uniformity		U_L	Normal θ=Φ=0°	—	80	-	%	Note 2,7

Note 1: Definition of viewing angle

Normal line
θ=Φ=0°

θ_T

θ_B

12 o'clock direction
Φ=90°

θ_L | θ_R

Φ=180°

Φ=0°

Active Area

LCD Panel

Φ=270°
6 o'clock direction

range

Fig. 1 Definition of viewing angle

Top

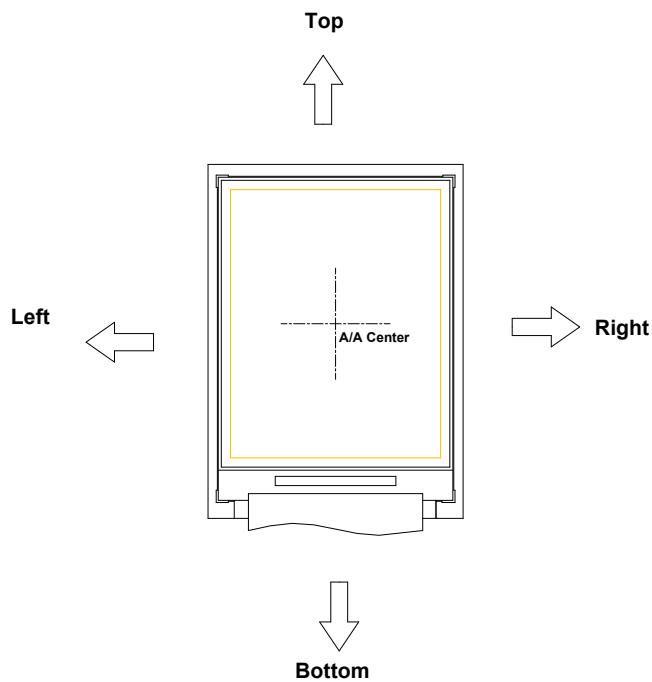**Left**

A/A Center

Right

Bottom

Fig. 2 Definition of viewing angle for display

Note 2: Definition of optical measurement system

      The optical characteristics should be measured in a dark room with ambient temperature $T_a=+25$. The optical properties are measured at the center point of the LCD screen after 5 minutes operation. (Equipment: Photo detector TOPCON BM-5A or BM-7 /Field of view: 1° /Height: 500mm.)
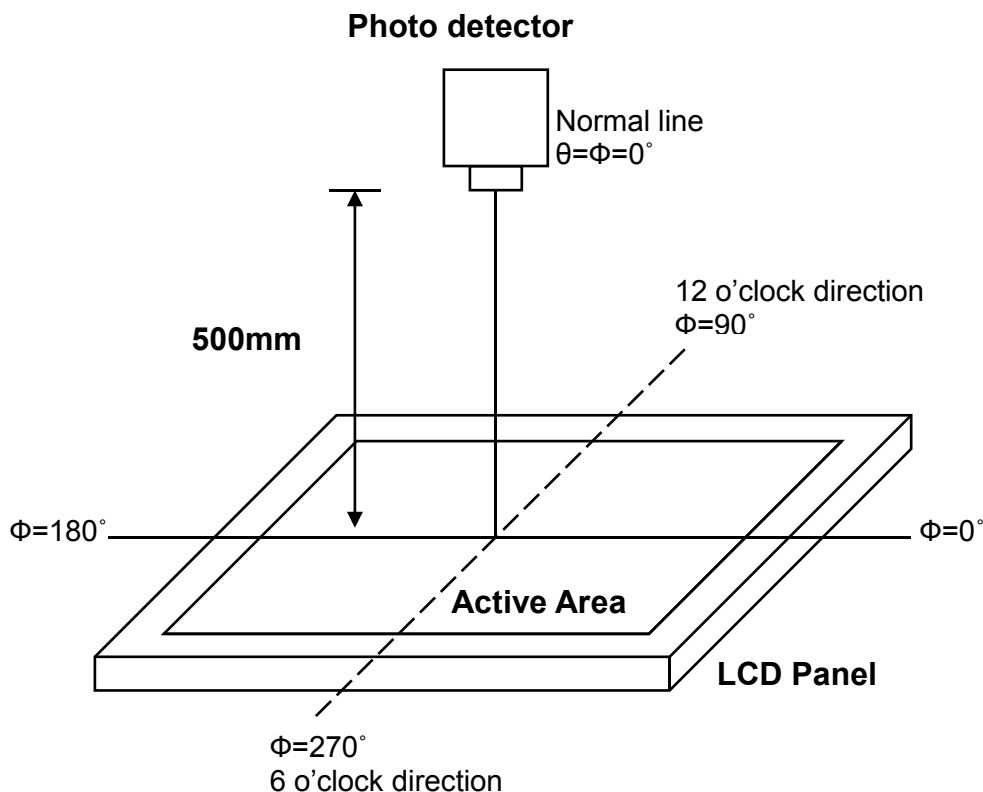
Photo detector

Normal line
θ=Φ=0°

500mm

12 o'clock direction
Φ=90°

Φ=180°

Φ=0°

Active Area

LCD Panel

Φ=270°
6 o'clock direction

Fig. 3 Optical measurement system setup

Note 3: 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%.

| **White (TFT OFF)** | **Black (TFT ON)** | **White (TFT OFF)** |

Photo detector output
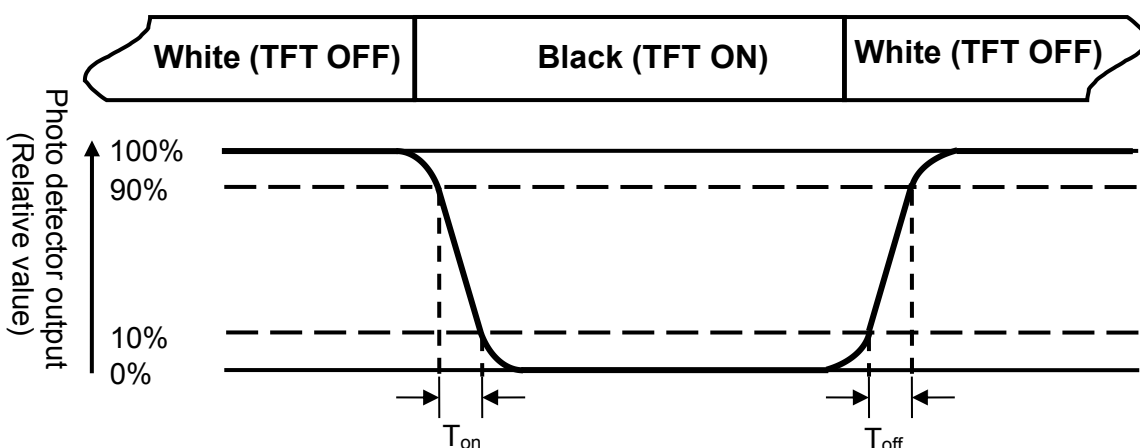(Relative value)

100%
90%

10%
0%

T_{on}

T_{off}

Fig. 4 Definition of response time

Note 4: Definition of contrast ratio

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

Note 5: Definition of luminance

Measured at the center area of the panel when LCD panel is driven at "white" state.

Note 6: Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD when panel is driven at "White", "Red", "Green" and "Blue" state respectively.

Note 7: Definition of luminance uniformity

To test for uniformity, the tested area is divided into 3 rows and 3 columns. The measurement spot is placed at the center of each circle as below.

$$\text{Luminance Uniformity } (U_L) = \frac{L_{min}}{L_{max}}$$

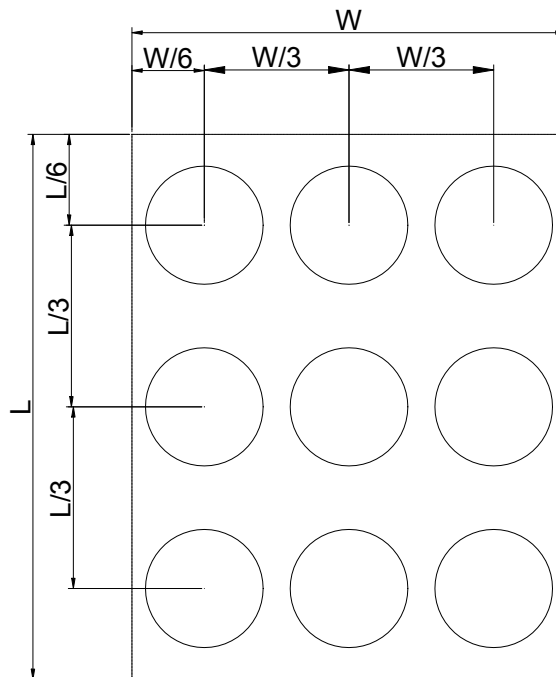L-------Active area length   W----- Active area width

Fig. 5 Definition of luminance uniformity

L_{max} : The measured maximum luminance of all measurement position.

L_{min} : The measured minimum luminance of all measurement position.

Note 8: Definition of Flicker

　　　Flicker is the pattern usually used to describe the visual sensation produced by a rapidly varying light intensity. There should be no visible flicker in normal direction of the display when the following figure are loaded.
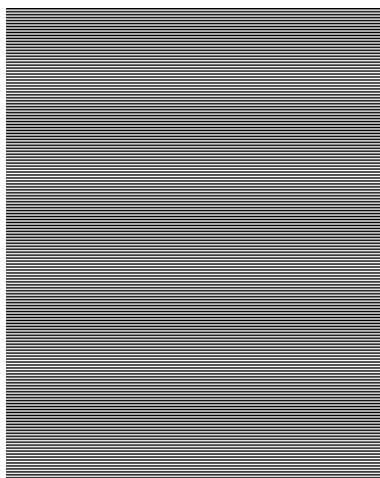
Fig.6 Flicker checker pattern

Note9: Definition of crosstalk

　　　There should be no visible in normal direction of the display when the following figures are loaded.
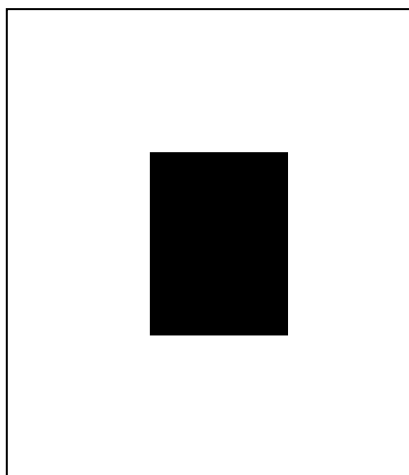
Fig.7 Crosstalk checker pattern

4.　　Reliability Test Items

Test Items	Test Conditions	Remark
High Temperature Storage	+80℃±3℃ for 240 hours	-
Low Temperature Storage	-30℃±3℃ for 240 hours	-
High Temperature Operation	+70℃±3℃ for 240 hours	-
Low Temperature Operation	-20℃±3℃ for 240 hours	-
High Temperature and Humidity Operation	+60℃±3℃, 90%±3%RH max. for 240 hours	-

Thermal Shock	-30℃/0.5h ~ +80℃/0.5h for a total 100 cycles, Start with cold temp and end with high temp	-
Vibration Test	Frequency range:10~55Hz Stoke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	-
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	-
Package Vibration Test	Random Vibration : 0.015G^2/Hz from 5-200Hz, -6dB/Octave from 200-500Hz 1 hour for each direction of X. Y. Z. (3 hours for total)	-
Package Drop Test	Height :76cm(Weight≦10kg); 60cm(Weight>10kg) 1 corner, 3 edges, 6 surfaces	-
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	-

Note1: During the display practical test under normal operation condition, there shall be no change, which may affect display function.

Note2: Before functional check, the test sample requires a 2 hours storage time at room temperature.

5. Handling Precautions

5.1. Safety

5.1.1. **The liquid crystal in the LCD is poisonous.** DO NOT **put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.**

5.2. Handling

5.2.1. **The LCD and touch panel is made of plate glass.** DO NOT **subject the panel to mechanical shock or to excessive force on its surface.**

5.2.2. Do not **handle the product by holding the flexible pattern portion in order to assure the reliability**

5.2.3. **Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.**

5.2.4. **Provide a space so that the panel does not come into contact with other components.**

5.2.5. **To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.**

5.2.6. **Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.**

5.2.7. **Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.**

5.2.8. **To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.**

5.3. Static Electricity

5.3.1. **Ground soldering iron tips, tools and testers when they are in operation.**

5.3.2. **Ground your body when handling the products.**

5.3.3. **Power on the LCD module** BEFORE **applying the voltage to the input terminals.**

5.3.4. DO NOT **apply voltage which exceeds the absolute maximum rating.**

5.3.5. **Store the products in an anti-electrostatic bag or container.**
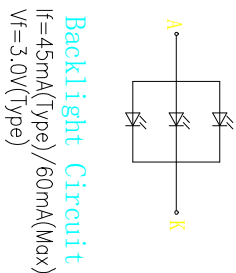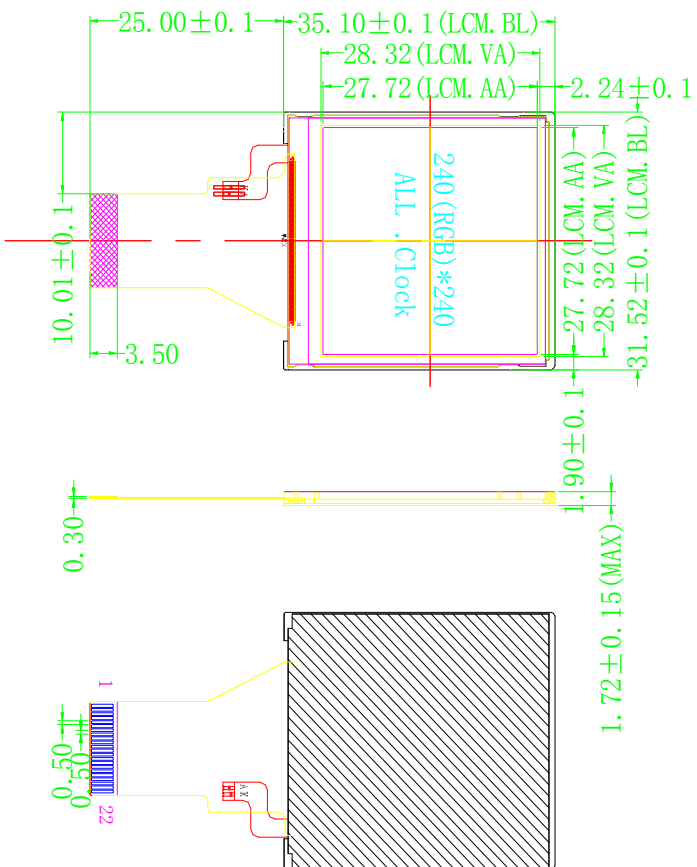
5.4. Storage

5.4.1. **Store the products in a dark place at +25℃±10℃ with low humidity (65%RH or less).**

5.4.2. DO NOT **store the products in an atmosphere containing organic solvents or corrosive gas.**

5.5. Cleaning

5.5.1. DO NOT **wipe the touch panel with dry cloth, as it may cause scratch.**

5.5.2. **Wipe off the stain on the product by using soft cloth moistened with ethanol.** DO Not **allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation.** Do not **use any organic solvent or detergent other than ethanol.**

6. Mechanical Drawing

NOTES

1. Drive IC: ST7789v OR COMPATIBLE
2. Display Type: TFT/Transmissive
3. Viewing Direction: ALL O'CLOCK
4. Backlight: 2 Chip White LED
5. Operating Temperature: -20°C to 70°C
   Storage Temperature: -30°C to 80°C
6. General Tolerance: ±0.2

Backlight Circuit
If=45mA(Type)/60mA(Max)
Vf=3.0V(Type)

25.00±0.1 35.10±0.1(LCM.BL)
28.32(LCM.VA)
27.72(LCM.AA) 2.24±0.1

240(RGB)*240
ALL.Clock

3.50

0.30

深圳市艾斯迪科技有限公司

MODULE NO. : LCDT1548922AL

SCALE:1:1 | UNIT:mm | PAGE:1/1 | APPROVED | CHECKER | DRAWN

VER.	REVISED RECORD	DATA
V0	New Issue	

PIN ASSIGNMENT

原接口

PIN	ASS
1	LEDA
2	LEDK
3	GND
4	IM1
5	IM0
6	VDD2.8
7	DB7
8	DB6
9	DB5
10	DB4
11	DB3
12	DB2
13	DB1
14	DB0
15	RD
16	WR
17	RS
18	CS
19	TE
20	RESET
21	SDA
22	GND

八位并口接法

PIN	ASS
1	LEDA
2	LEDK
3	GND
4	GND
5	GND
6	VDD2.8
7	DB7
8	DB6
9	DB5
10	DB4
11	DB3
12	DB2
13	DB1
14	DB0
15	RD
16	WR
17	RS
18	CS
19	TE
20	RESET
21	GND
22	GND

SPI4线串口接法

PIN	ASS
1	LEDA
2	LEDK
3	VDD2.8
4	VDD2.8
5	GND
6	VDD2.8
7	GND
8	GND
9	GND
10	GND
11	GND
12	GND
13	GND
14	GND
15	GND
16	A0
17	SCLK
18	CS
19	TE
20	RESET
21	SDA
22	GND