



Product Specification

Part Name: TFT LCD Display Module

Customer Part ID:

Zhong JingYuan ID: ZJY144S0800TG02

Ver: A

Customer:

Approved by

From: Zhong JingYuan technology Co.,Ltd.

Approved by

Notes:

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2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by Zhong JingYuan technology Co.,Ltd. for any intellectual property claims or other problems that may result from application based on the module described herein.



ZHONGJINGYUAN

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1.General Description

ZJY144S0800TG02 is a 128RGB*128 dots matrix TFT LCD module. It has a TFT panel composed of 384sources and 128gates. The LCM can be easily accessed by micro-controller.

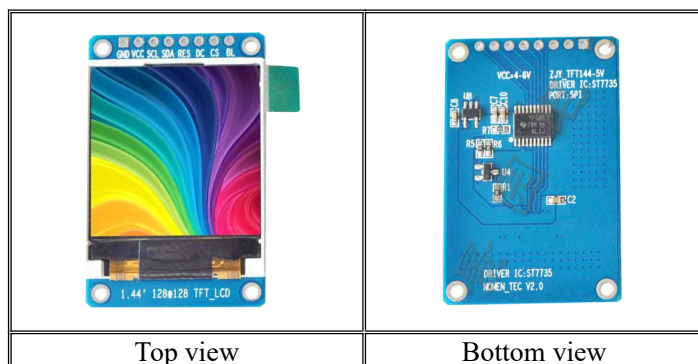
2. Features

Display Mode	Transmissive
	a-TFT
Display Format	Graphic 128RGB*160 Dot-matrix
Input Data	SPI-4wire interface
Viewing Direction	12 o'clock
Drive	ST7735S

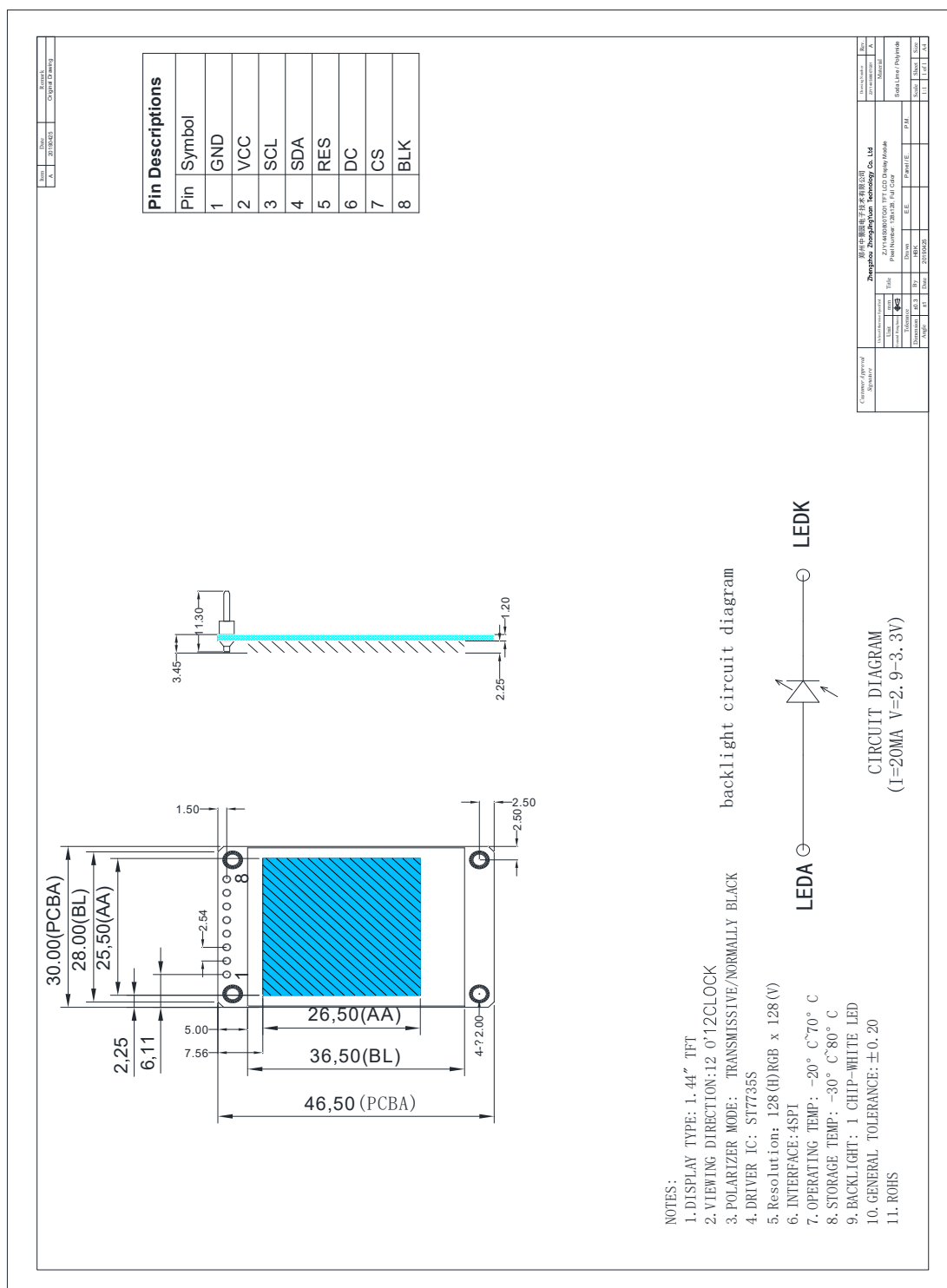
3. Mechanical Specification

Item	Specifications	Unit
Dimensional outline	30(W)*46.5(H)*3.50MAX	mm
Resolution	128RGB*128	dots
LCD Active area	25.5 (W)*26.5 (H)	mm
Pixel size	0.20(W)*0.20(H)	mm

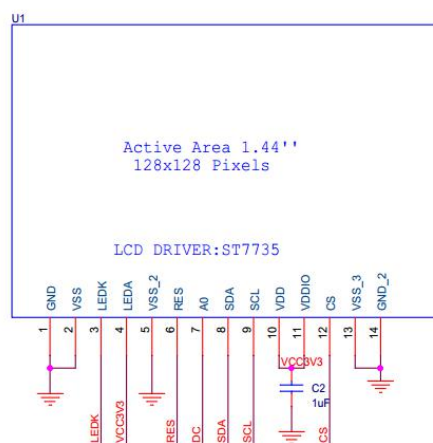
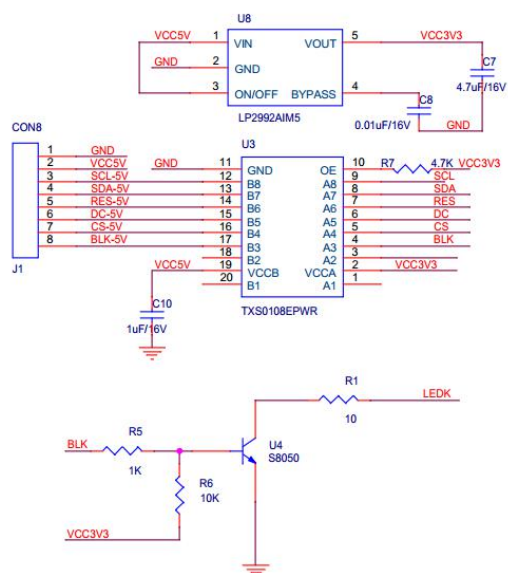
4. Product picture



5. Mechanical Dimension



6. Schematic diagram



7. Maximum Ratings

Item	Symbol	Min	Max	Unit	Note
Supply voltage	VCC	3.0	3.3	V	
Operating temperature	T _{OPR}	-20	70	°C	
Storage temperature	T _{STR}	-30	80	°C	



8. Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	Logic	V _{CC}	2.7	2.8	3.3	V
Input Voltage	H level	T _{IH}	0.8*IOVCC		IOVCC	V
	L level	T _{IL}	-0.3		0.2* IOVCC	
Storage temperature	I _{DD}	With internal voltage generation V _{CC} =2.8V; T _{emp} =25℃			TBD	mA

9. Backlight Characteristic

Item	Symbol	Min	Typical	Max	Unit
LED module Forward voltage	V _{LED}	3.0	3.2	3.4	V
LED module current	V _{LED}		30		mA
L/G Surface Luminance ★1	L _S	1800			Cd/m ³
LCM Surface brightness uniform ★2	L _D	80			%

★ 1Test condition is:

(a) Center point on active area.

(b)Best Contrast.

★2Uniform measure condition:

(1)Measure 9 point. Measure location show below;

(2)Uniform=(Min. brightness /Max. brightness)*100%

(3)Best Contrast.



10. Module Function Description

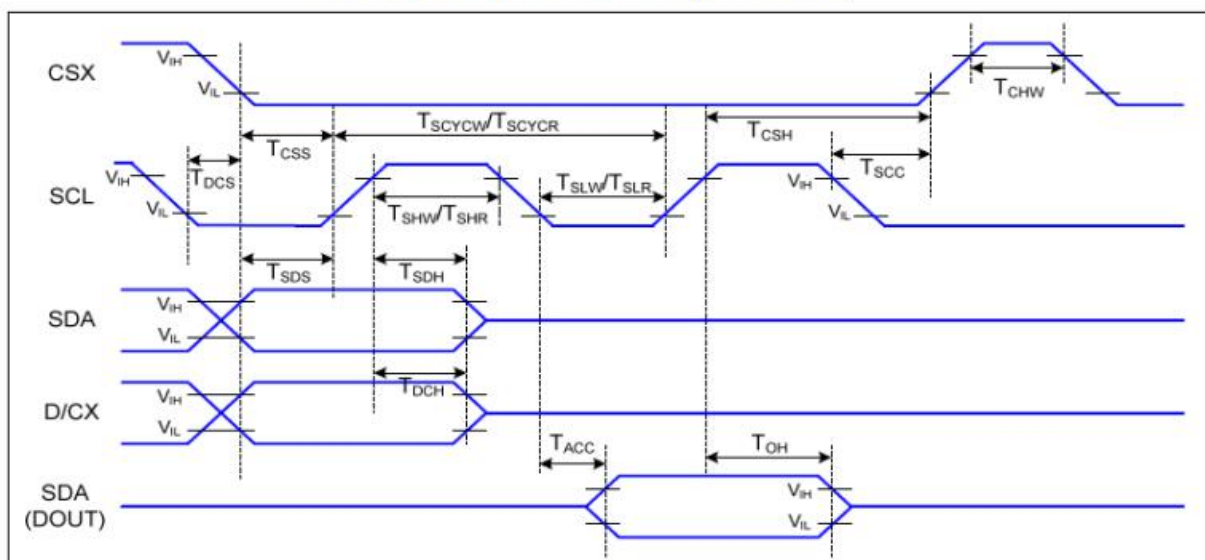
10.1 Pin Descriptions

PIN No.	Symbol	Description
1	GND	Ground of Logic Circuit This is a ground pin. It acts as a reference for the logic pins. It must be connected to external ground
2	VCC	Power Supply for Logic This is a voltage supply pin. It must be connected to external source
3	SCL	The serial clock input
4	SDA	The serial data input
5	RES	Power Reset for Controller and Driver This pin is reset signal input. When the pin is low, initialization of the chip is executed. Keep this pin pull high during normal operation
6	DC	Data/Command Control This pin is Data/Command control pin. When the pin is pulled high, the input at SDA is treated as display data. When the pin is pulled low, the input at SDA will be transferred to the command register.
7	CS	Chip Select This pin is the chip select input. The chip is enabled for MCU communication only when CS# is pulled low.
8	BL	Backlight control pin When the pin is pulled high turn on backlight, When the pin is pulled low turn off backlight



10.2 Timing characteristics.

Serial Interface Characteristics (4-line Serial)



4-line Serial Interface Timing

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

4-line Serial Interface Characteristics



10.3 Commands

Refer to the Technical Manual for the ST7735S

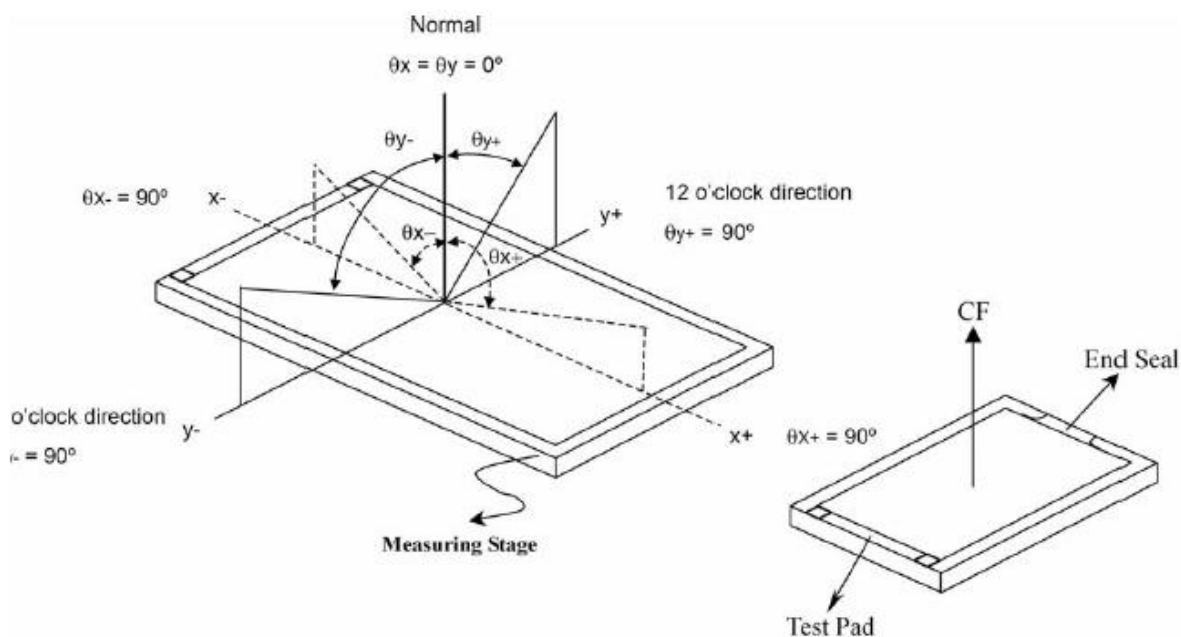
11.Electro-optical Characteristics

Item	Symbol	Conditions	Temp	Min.	Typ.	Max.	Unit	Note
Response Time	T_R	$\theta = \phi = 0$	25°C		TBD	TBD	msec	NOTE2
	T_F				TBD	TBD		
Viewing Angle Range	$\phi = 0^\circ (6'')$	$\phi = 90^\circ (3'')$		$\phi = 180^\circ (12'')$		$\phi = 270^\circ (9'')$		NOTE3
$\theta (25^\circ\text{C}) \text{ CR} \geq 10$	TBD	TBD		TBD		TBD		NOTE3

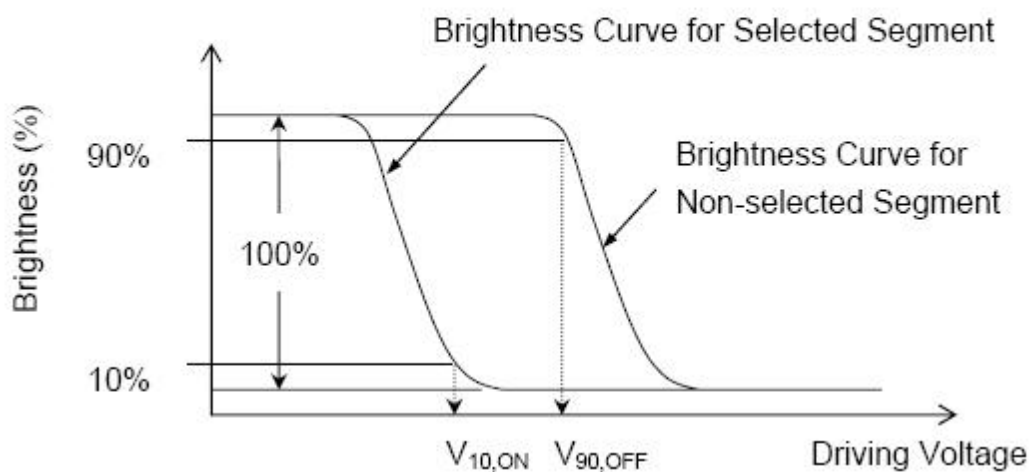
The above “viewing angle” is the measuring position with the largest contrast ratio. Not for good image quality. Viewing direction for good image quality is 12 O'clock.

●For panel only

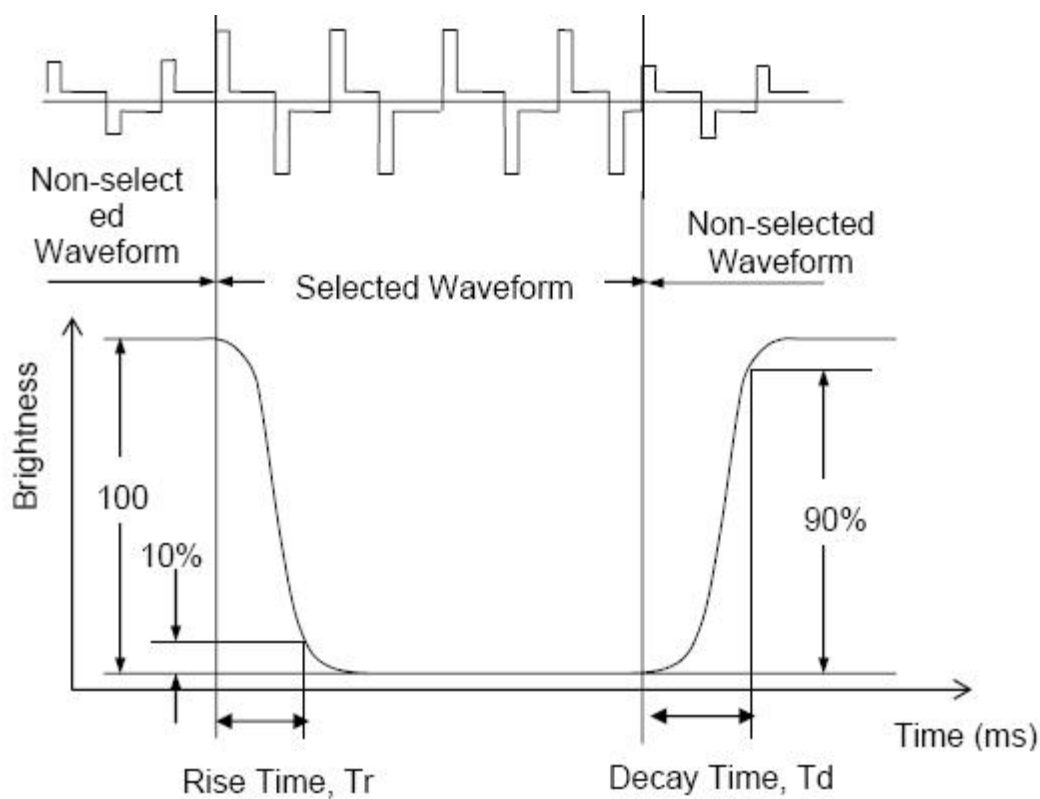
●Electro-Optical Characteristics Test Method



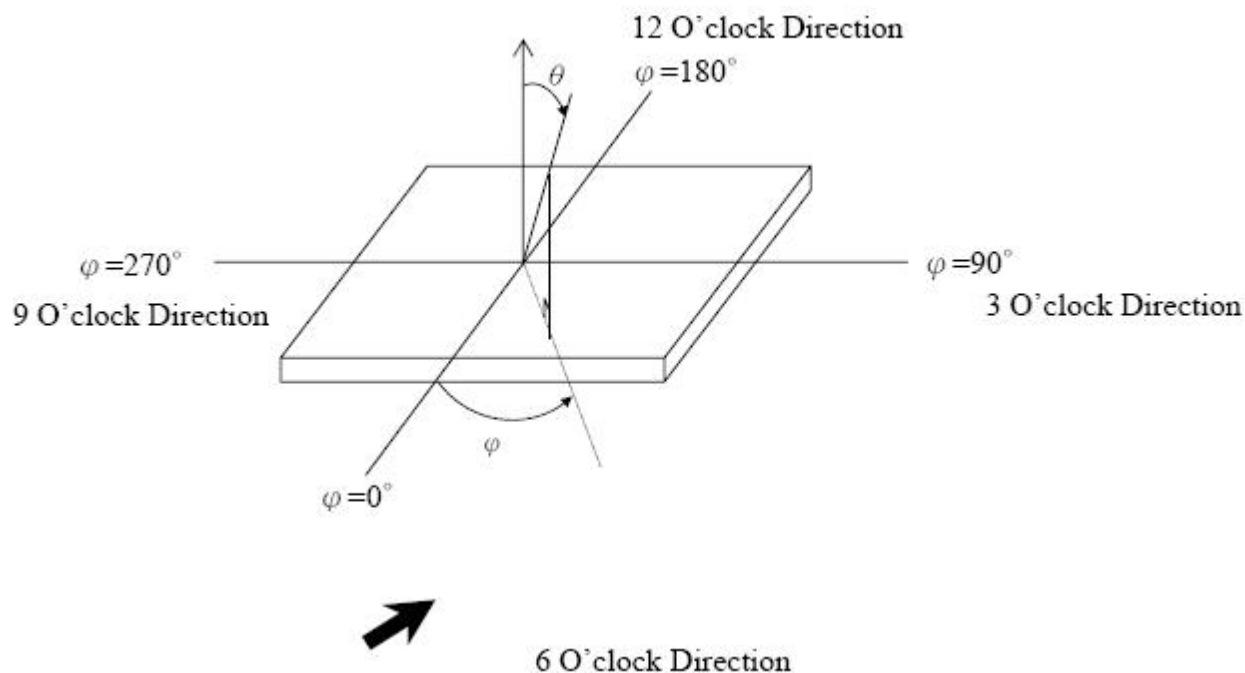
$$V_{op} = (V_{10, ON} + V_{90, OFF})/2$$



.Note2.Definition of Optical Response Time:



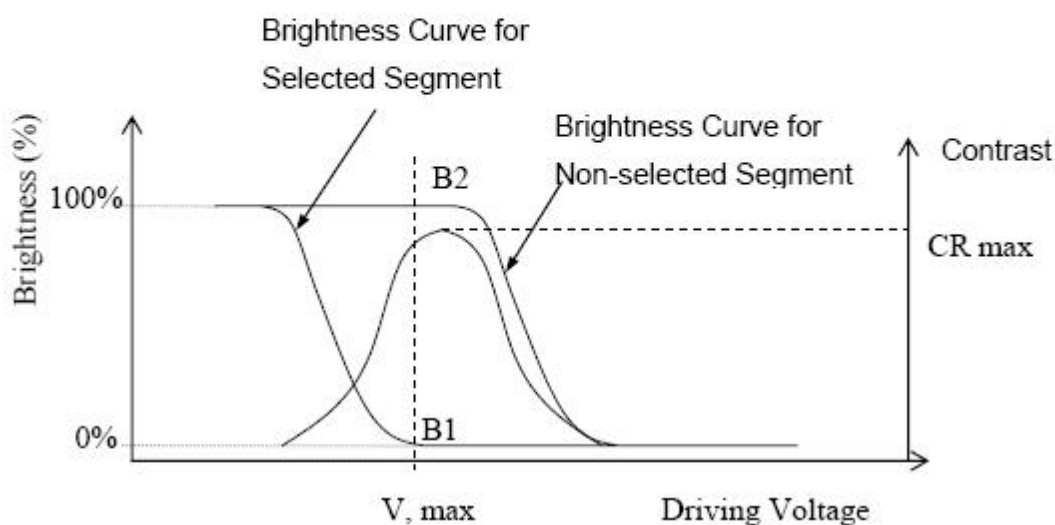
.Note3.Definition of Viewing Angle θ and ϕ :





Note4.Definition of Contrast ratio (CR):

$$CR = \frac{\text{Brightness of Non-selected Segment (B2)}}{\text{Brightness of Selected Segment (B1)}}$$



12. Reliability

12.1 Mtbf

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal

12.2 Test condition

NO.	ITEM	CONDITION	CRITERION
1	High Temperature Non-Operating Test	80℃*240Hrs	◦ No Defect Of Operational Function In Room Temperature Are Allowable ◦ IDD of LCM in Pre-and Post-Test Should Follow Specification
2	Low Temperature Non-Operating Test	-30℃*240Hrs	
3	High Temperature/Humidity Non Operating Test	60℃*90%RH*240Hrs	
4	High Temperature Operating Test	70℃*240Hrs	
5	Low Temperature Operating Test	-20℃*240Hrs	
6	Thermal Shock Test	-20℃ (30Min) ↔ 70℃ (30Min) *10CYCLES	

Notes:

1. Judgments should be made after exposure in room temperature for two hours.
2. The distill water is used for the high temperature/humidity test.
3. The sample above is individually for every reliability tests condition.



13. Inspection standards

1. AQL (Acceptable Quality Level)

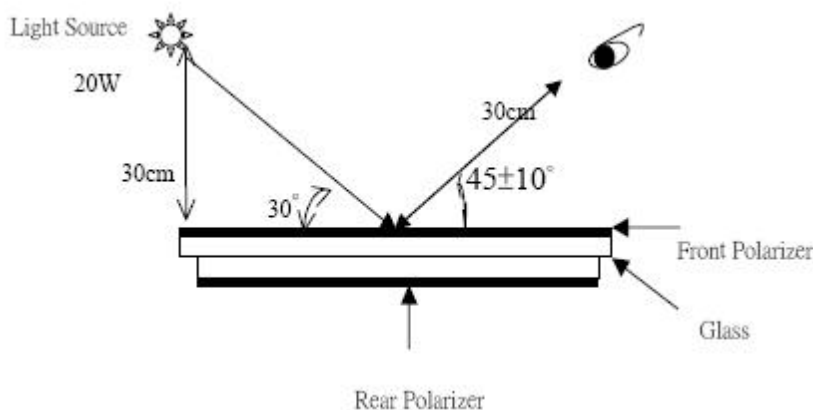
AQL of major and minor defect.

	MAJOR DEFECT	MINOR DEFECT
AQL	0.65	1.5

2. Basic conditions for inspection

The LCM face to us, in normal environment, the lux is 1000 ± 200 . (Darkroom's lux: 100 ± 50), About an angle of incidence 30° , a distance of 30 cm with an angle of $45 \pm 10^\circ$ to check the products without uncovering the film!

(As shown below)



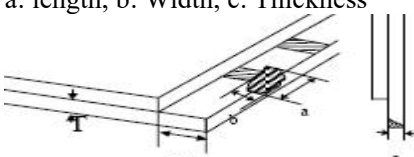
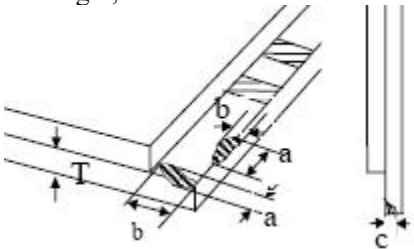
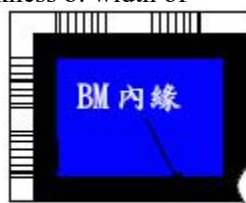
3. Inspection item and criteria

3.1 Visual inspection criterion in immobility

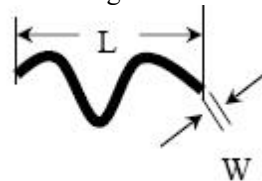
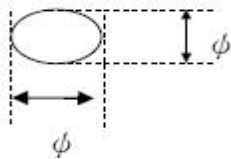
3.1.1 Glass defect

NO	Defect item	Criteria	Remark
1	Dimension Unconformity (Major defect)	By Engineering Drawing	
2	Cracks (Major defect)	1. Linear cracks panel 2. Nonlinear crack contrast by limited sample 【Reject】	
3	Glass extrude the conductive area (minor defect)	a: disregards and no influence assemblage. 1) $b \leq 1/3$ Pin width (non bonding area) 2) bonding area ≤ 0.5 mm 【Accept】	A: Length, b: Width



		【Accept】	
4	Pin-side ,conductive area damaged (minor defect)	(a c: disregards) $b \leq 1/3$ of effective length for bonding electrode 【Accept】	a: length, b: Width, c: Thickness 
5	Pin-side,non-conductive area damaged (minor defect)	1)Damage area don't touch the ITO (Including contraposition mark, except scribing mark) 【Accept】 2) $C < T$ $b \leq BM/3$ of width 【Accept】 3) $c = T$ b not touch the seal glue 【Accept】 4)a disregards	a: Length, b: Width c: Thickness 
6	Non-pin-side damage (minor defect)	$c < T$ 1)b exceeds $1/3 B_m$ 【Reject】 $c = T$ b not touch the seal glue 【Reject】	c: Thickness b: width of  damage


3.1.2LCD appearance defect(View area)

NO	Defect item	Criteria		Remark
1	Fiber、glass cratch、polarizer scratch/folded (minor defect)	Specification	Allowable	note1:L: Length, W: Width note2: disregard if out of AA 
		$W \leq 0.03\text{mm}$	disregard	
		$0.03\text{mm} < W \leq 0.05\text{mm};$ $L \leq 3.0\text{mm}$	2	
		$0.05\text{mm} < W \leq 0.1\text{mm};$ $L \leq 3.0\text{mm}$	1	
		$W > 0.1\text{mm}; L > 3.0\text{mm}$	0	
2	Polarizer bubble、concave and convex (minor defect)	$\phi \leq 0.2\text{mm}$	disregard	note1: $\phi = (L+W)/2$, L:Length, W :Width note2:disregard if out of AA
		$0.2\text{mm} < \phi \leq 0.3\text{mm}$	2	
		$0.3\text{mm} < \phi \leq 0.5\text{mm}$	1	
		$0.5\text{mm} < \phi$	0	
3	Black dots、dirty dots、impurities、eye winker (minor defect)	$\phi \leq 0.15\text{mm}$	disregard	note2:disregard if out of AA 
		$0.15\text{mm} < \phi \leq 0.25\text{mm}$	2	
		$0.25\text{mm} < \phi \leq 0.3\text{mm}$	1	
		$0.3\text{mm} < \phi$	0	
4	Polarizer prick	$\phi \leq 0.1\text{mm}$	disregard	note1: $\phi = (L+W)/2$, L=Length,

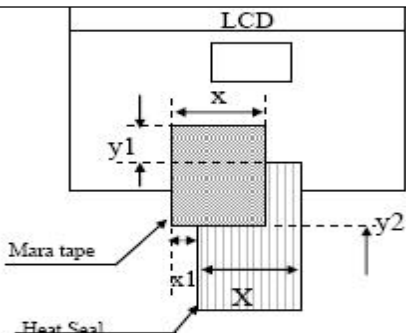


	(minor defect)	$0.1\text{mm} < \phi \leq 0.25\text{mm}$	3	W=Width note2:the distance between two dots>5mm
		$\phi > 0.25\text{mm}$	0	

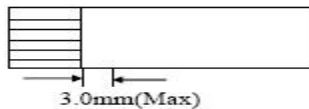
3.1.3FPC

NO	Defect item	Criteria		Remark
1	Copper screen peel (minor defect)	Copper screen peel 【Reject】		
2	No release tape or peel	No release tape or peel 【Reject】		
3	Dirty dot and impurity of FPC for customer using side (minor defect)	Specification	Allowable	Note1: Cannot have stride ITO impurities
		$\phi \leq 0.25\text{mm}$	2	
		$\phi > 0.25$	0	

3.1.4Black tape & Mara tape

NO	Defect item	Criteria	Remark
1	FPC or H/S black tape (minor defect)	1. shift spec: 1) glue to the polarize 【Reject】 2) IC bare 【Reject】 2. left-and-right spec: 1) exceed of FPC edge or H-S edge 【Reject】 2) IC bare 【Reject】	
2	No black tape (major defect)	No black tape 【Reject】	
3	Tape position mistake (minor defect)	Not by engineering drawing	
4	Mara tape defect (minor defect)	Peel before pulling the protecting film 【Reject】	

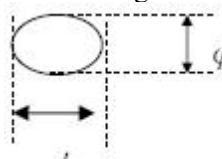
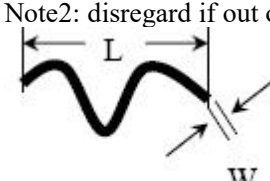
3.1.5Silicon and Taffy glue

NO	Defect item	Criteria	Remark
1	Quantity of silicon (major defect)	Uncover the ITO and circuit area 【Reject】	note: compared by engineering
2	Taffy glue (major defect)	1.Uncover the reveal copper area【Reject】 2.Cover layer 0.3mm(Min)~3.0mm(Max) 【Reject】	note: if customer has special requirement, refer to the technical document 
3	Depth of glue covering (major defect)	Depth of glue covering overtop front Polarizer 【Reject】	Except of the special requirement

3.2Electrical criteria

NO	Defect item	Criteria	Remark
----	-------------	----------	--------



1	No display (major defect)	No display 【Rej ect】		
2	Missing line (major defect)	Missing line 【Rej ect】		
3	Seg-com light and dark (major defect)	Seg-com light and dark 【Rej ect】	ND filter 2% test	
4	No display in immobility (major defect)	No display in immobility 【Rej ect】		
5	Flicker of Pattern (major defect)	Flicker of Pattern 【Rej ect】		
6	Mura (major defect)	ND filter 2%test		
7	Over current (major defect)	Over current 【Rej ect】		
8	Voltage out of specification (major defect)	Voltage out of specification 【Rej ect】		
9	Pattern blur, error code (major defect)	Pattern blur, error code 【Rej ect】		
10	Dark light, Flicker (major defect)	Dark light, Flicker 【Rej ect】		
11	Black/white dots、 Dirty dots、 eye winker (major defect)	Specification	Allowable	Note1:disregard if out of AA 
		$\phi \leq 0.15\text{mm}$	disregard	
		$0.15\text{mm}< \phi \leq 0.25\text{mm}$	2	
		$0.25\text{mm}< \phi \leq 0.3\text{mm}$	1	
		$0.3\text{mm}< \phi$	0	
12	Fiber、glass crutch、Polarizer scratch/folded (major defect)	$W \leq 0.03\text{mm}$	disregard	Note1:L: Length, W: Width Note2: disregard if out of AA 
		$0.03\text{mm}<W \leq 0.05\text{mm}$ $L \leq 3.0\text{mm}$	2	
		$0.05\text{mm}<W \leq 0.1\text{mm}$ $L \leq 3.0\text{mm}$	1	
		$W>0.1\text{mm};L>3.0\text{mm}$	0	

14.Precautions for using LCD modules.

14.1 Safety

- (1)Do not swallow any liquid crystal ,even if there is no proof that liquid crystal is poisonous.
- (2)If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3)If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.



14.2 Srorang Conditions

- (4)Store the panel or module in a dark place where the temperature is $23 \pm 5^{\circ}\text{C}$ and the humidity is below $45 \pm 20\%\text{RH}$.
- (5)Store in anti-static electricity container.
- (6)Store in clean environment, free from dust, active gas, and solvent.
- (7)Do not place the module near organics solvents or corrosive gases.
- (8))Do not crush, shake, or jolt the module.

14.3 Handling Precautions

- (9)Avoid static electricity, which can damage the CMOS LSI.
- (10)The polarizing plate of the display is very fragile, please handle if very carefully.
- (11)Do not give external shock.
- (12)DO mot apply excessive force on the surface.
- (13)Bo not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (14)Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (15)Do not operate it above the absolute maximum rating.
- (16)Do not remove the panel or frame from the module.

14.4Warranty

The period is within twelve months since the date of shipping out under normal using and storage conditions.

15.Revision history

Version	Revise record	Date
v0.0	Original version	2020-06-06



16. The appendix

ST7735S_initial

```
void LCD_Init(void)
{
    LCD_RES_Clr(); //复位
    delay_ms(100);
    LCD_RES_Set();
    delay_ms(100);

    LCD_BLK_Set(); //打开背光
    delay_ms(100);

    LCD_WR_REG(0x11); //Sleep out
    delay_ms(120); //Delay 120ms
    //-----ST7735S Frame
rate-----//
    LCD_WR_REG(0xB1); //Frame rate 80Hz
    LCD_WR_DATA8(0x02);
    LCD_WR_DATA8(0x35);
    LCD_WR_DATA8(0x36);
    LCD_WR_REG(0xB2); //Frame rate 80Hz
    LCD_WR_DATA8(0x02);
    LCD_WR_DATA8(0x35);
    LCD_WR_DATA8(0x36);
    LCD_WR_REG(0xB3); //Frame rate 80Hz
    LCD_WR_DATA8(0x02);
    LCD_WR_DATA8(0x35);
    LCD_WR_DATA8(0x36);
    LCD_WR_DATA8(0x02);
    LCD_WR_DATA8(0x35);
    LCD_WR_DATA8(0x36);
    //-----End ST7735S Frame
rate-----//
    LCD_WR_REG(0xB4); //Dot inversion
    LCD_WR_DATA8(0x03);
    //-----ST7735S Power
Sequence-----//
    LCD_WR_REG(0xC0);
    LCD_WR_DATA8(0xA2);
    LCD_WR_DATA8(0x02);
    LCD_WR_DATA8(0x84);
    LCD_WR_REG(0xC1);
    LCD_WR_DATA8(0xC5);
```



```
LCD_WR_REG(0xC2);
LCD_WR_DATA8(0x0D);
LCD_WR_DATA8(0x00);
LCD_WR_REG(0xC3);
LCD_WR_DATA8(0x8D);
LCD_WR_DATA8(0x2A);
LCD_WR_REG(0xC4);
LCD_WR_DATA8(0x8D);
LCD_WR_DATA8(0xEE);
//-----End ST7735S Power
Sequence-----//
LCD_WR_REG(0xC5); //VCOM
LCD_WR_DATA8(0x0a);
LCD_WR_REG(0x36);
LCD_WR_DATA8(0x08);
//-----ST7735S Gamma
Sequence-----//
LCD_WR_REG(0xE0);
LCD_WR_DATA8(0x12);
LCD_WR_DATA8(0x1C);
LCD_WR_DATA8(0x10);
LCD_WR_DATA8(0x18);
LCD_WR_DATA8(0x33);
LCD_WR_DATA8(0x2C);
LCD_WR_DATA8(0x25);
LCD_WR_DATA8(0x28);
LCD_WR_DATA8(0x28);
LCD_WR_DATA8(0x27);
LCD_WR_DATA8(0x2F);
LCD_WR_DATA8(0x3C);
LCD_WR_DATA8(0x00);
LCD_WR_DATA8(0x03);
LCD_WR_DATA8(0x03);
LCD_WR_DATA8(0x10);
LCD_WR_REG(0xE1);
LCD_WR_DATA8(0x12);
LCD_WR_DATA8(0x1C);
LCD_WR_DATA8(0x10);
LCD_WR_DATA8(0x18);
LCD_WR_DATA8(0x2D);
LCD_WR_DATA8(0x28);
LCD_WR_DATA8(0x23);
LCD_WR_DATA8(0x28);
LCD_WR_DATA8(0x28);
LCD_WR_DATA8(0x26);
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ZHENG ZHOU ZHONG JING YUAN TECHNOLOGY CO.,LTD

ZHONGJINGYUAN

TEL: 18601955397

```
LCD_WR_DATA8(0x2F);
LCD_WR_DATA8(0x3B);
LCD_WR_DATA8(0x00);
LCD_WR_DATA8(0x03);
LCD_WR_DATA8(0x03);
LCD_WR_DATA8(0x10);
//-----End ST7735S Gamma
Sequence-----//
LCD_WR_REG(0x3A); //65k mode
LCD_WR_DATA8(0x05);
LCD_WR_REG(0x29); //Display on
}
```