模组规格书
SPECIFICATION FOR LCD MODULE

(Customer P/N.)：322401L6ALZZ

目 录 Contents

# 1、 模组规格 Functions & Features

视角 Viewing direction	6:00　　　　　　工艺方式: 　SMT+COG
LCD 模式 LCD mode	FFSTN, B-W 黑白膜, Negative 负显, Transmissive 全透
驱动方式 Driving scheme	占空比(Duty)：1/240 偏压比(Bias)：1/16
背光颜色 Backlight color	白色 White, LEDX8，BLA:5V，120MA
LCM 驱动电压(VDD)	5.0V	LCD 电压(VLCD)	23.5V(Ref.)
工作温度 Operation temp	-20～70℃	储存温度 Storage temp	-30～80℃

注: 1, 此屏电压还有 3.3V 可选; 2, 5V 屏亦可与 3.3VMCU 数据匹配; 3 ,LCD 及背光也有多种选择.

2、机械尺寸 Mechanical specifications

项目 Item	尺寸 Dimension	单位 Unit
显示容量 Number of Characters	320x240	Dots
模组尺寸 Module size	142.6(L)* 92.6 (W)*8.0 (H)max	mm
可视区域 Viewing area	104.0 (L)*79.5(W)	mm
点间距 Dot pitch	0.30(L)*0.30(W)	mm
点大小 Dot size	0.27(L)*0.27(W)	mm

3、原理框图 Block diagram
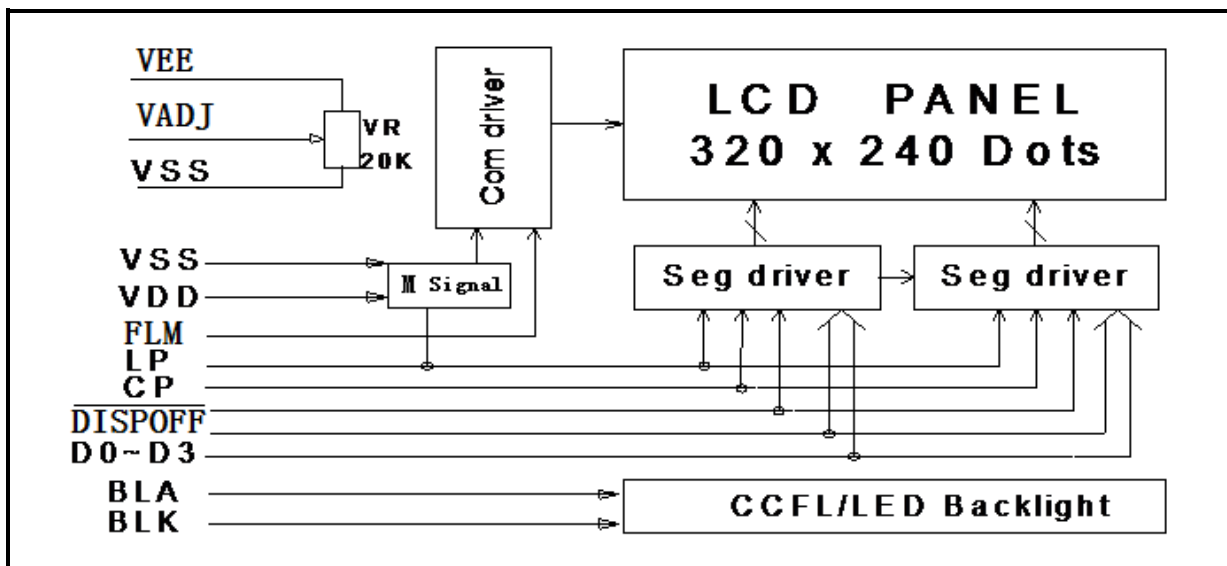
 * **Note:** when the temperature exceed 25℃, the approved current decrease rate for Backlight change as the temperature increase is: -0.36mA*12/℃ (below 25℃, the current refer to constant, which would not hange with temperature).

4、模组外形图 Dimensionaloutline
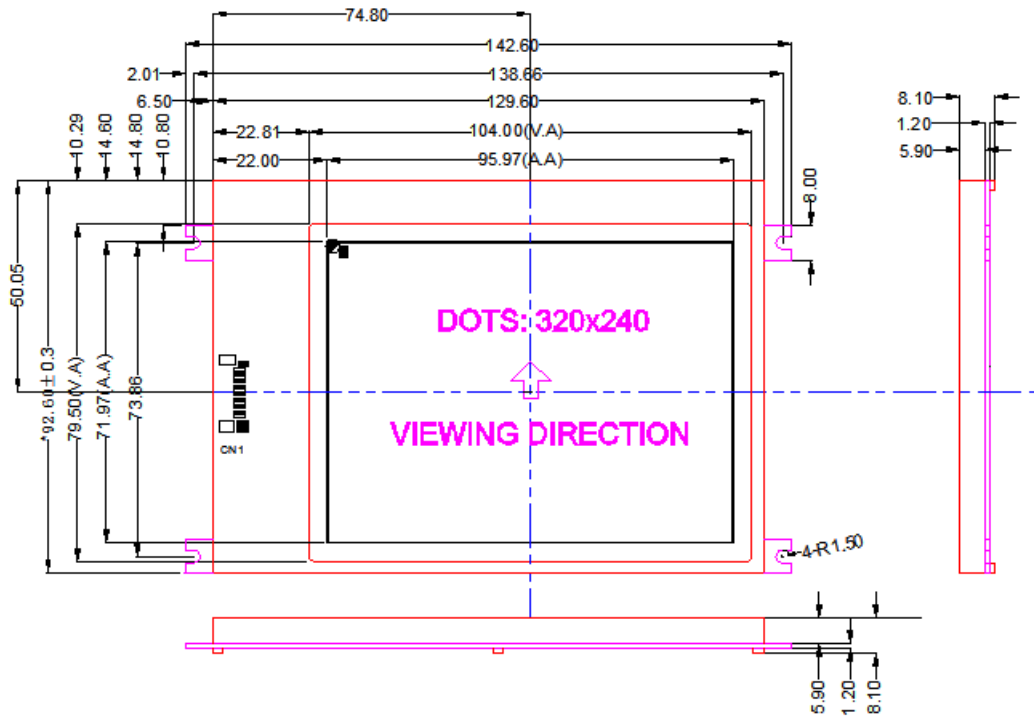
5、接口定义 Pin description

CN1:PH1.0　12PIN 接口定义:

项目 Item	标号 Symbol	描述 Function
1	FLM	Frame signal(每一帧的开始)
2	LP	Data Latch Pulse(数据锁存信号)
3	CP	Data shift Pulse(数据移位信号)
4	VDD(VCC)	Power supply for Logic 电源正(+5V)
5	VSS	Power Ground 电源地(0V),(背光地 BLK)
6	VADJ	Power supply for the LCD drive 对比度调节输入端（正压,屏显内容多少电压需调整在最佳位置上）（VO）
7~10	D0~D3	Data bus lines(数据线)
11	DISPOFF	Display ON/OFF (显示开关，高电平开 低电平关)
12	BLA	Anode of LED Backlight,+5.0V(背光电源)
	VOUT	Power supply for the LCD drive 液晶电源(内置正压 VEE)。

6、极限参数 Absolute Maximum limit

项目 Item	符号 Symbol	最小值 MIN	最大值 MAX	单位 Unit
驱动电压 Supply Voltage for Logic	VDD	-0.3	7.0	V
LCD 电压 Supply Voltage for LCD	VLCD	-0.3	23.5	V
输入电压 Input Voltage	Vin	-0.3	VDD+0.3	V
工作温度 Operating Temperature	Top	-20	70	°C
储存温度 Storage Temperature	Tstr	-30	80	°C

7、电性参数 Electrical characteristics

项目 Item	符号 Symbol	条件 Condition	最小值 MIN	典型值 Typ	最大值 MAX	单位 Unit
逻辑电压 Supply Voltage for Logic	VDD-VSS	Ta = 25°C	4.75	5.0	5.25	V
输入高电压 Input High Voltage	VIH	Ta = 25°C	0.7VDD	---	VDD	V
输入低电压 Input Low Voltage	VIL	Ta = 25°C	0	---	0.3VDD	V
输出高电压 Output High Voltage	VOH	Ta = 25°C	2.4	---	---	V
输出低电压 Output Low Voltage	VOL	Ta = 25°C	---	---	0.4	V
模块电流 Supply Current	IDD	Ta = 25°C	---	12		mA

8、光电特性 Electro-Optical characteristics

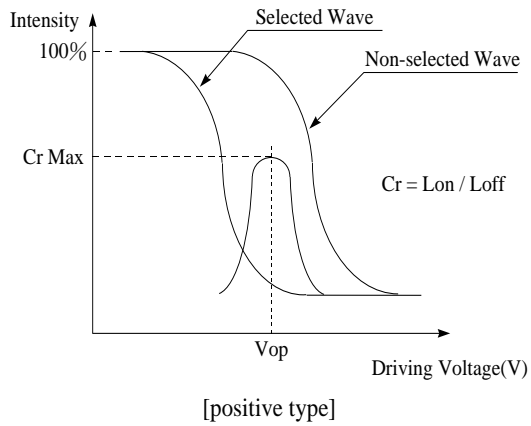调节对比度电位器接到接口上，一头接到 VSS，中心抽头接到 VADJ 上。VR=20K,液晶屏上也预留有电位器 VR1 供选择。

Example of Power Supply

It is recommended to apply a potentiometer for the contrast adjust due to the tolerance of the driving voltage and its temperature dependence.
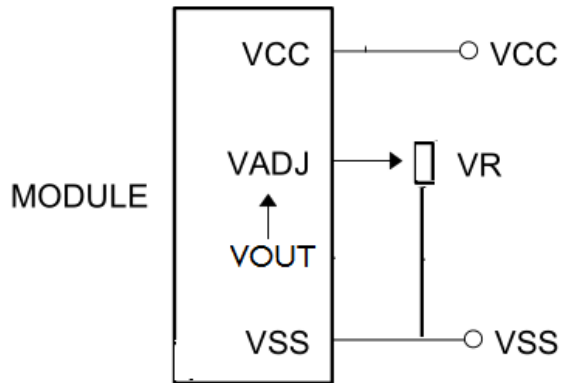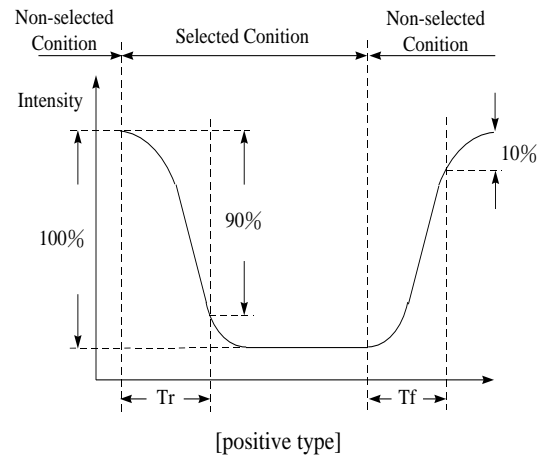

项目 Item	标号 Symbol	条件 Condition	最小 MIN	典型 Typ	最大 MAX	单位 Unit
工作电压(负压) Operating Voltage	VADJ	Ta = -20°C	---	---	---	--V
		Ta = +25°C	-18.0	-18.5	-19.3	
		Ta = +70°C	---	---	---	
响应时间 Response time	Tr	Ta = 25°C	---	180	---	ms
	Tf		---	320	---	ms
对比度 Contrast Ratio	Cr	Ta = 25°C	---	5	---	---
视角范围 Viewing angle range	θ	Cr≥2	-30	---	+40	deg
	Φ		-30	---	+30	deg

Definition of Operation Voltage (Vop)

Intensity

100%

Selected Wave

Non-selected Wave

Cr Max

$Cr = Lon / Loff$

Vop

Driving Voltage(V)

[positive type]

Definition of Response Time (Tr , Tf)

Non-selected Conition

Selected Conition

Non-selected Conition

Intensity

10%

100%

90%

Tr

Tf

[positive type]

Conditions :

Operating Voltage : Vop　　　Viewing Angle(θ，φ) : 0°，　0°

Frame Frequency : 64 HZ Driving Waveform : 1/N duty , 1/a bias

Definition of viewing angle(CR≧3)

θb

θf

$\varphi = 180°$

$\theta 1$

θr

$\varphi = 270°$

$\varphi = 90°$

$\varphi = 0°$
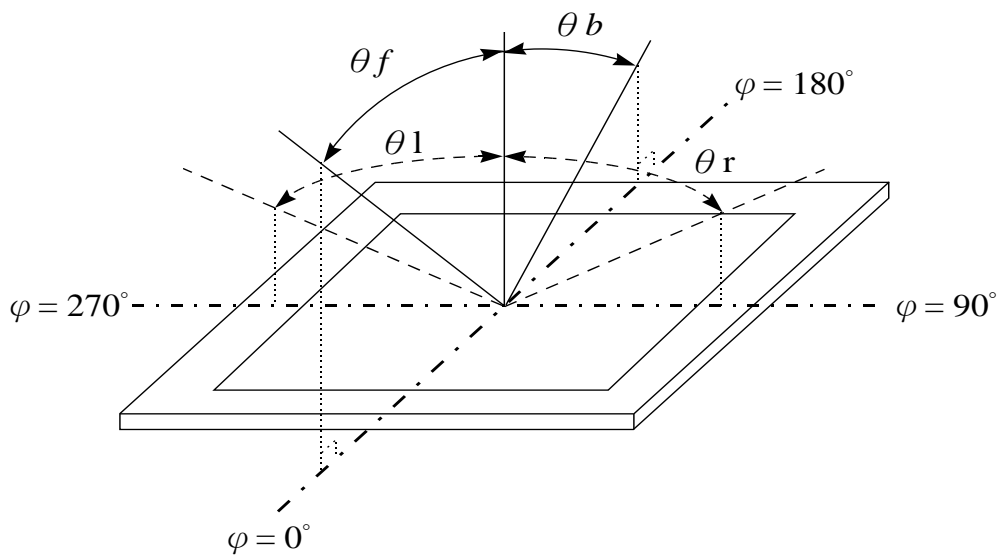
9、时序特性 Timing characteristics

AC Characteristics

Vcc=5.0V±10%

Parameter	Symbol	Min.	Max.	Units
CP Frequency	f_{CP}	—	6.0	MHz
Clock Pulse Width	t_{WC}	50	—	ns
Load Pulse Width	t_{WL}	63	—	ns
Data Setup Time	t_{SETUP}	30	—	ns
Data Hold Time	t_{HOLD}	30	—	ns
Clock Pulse Setup Time	t_{CL}	80	—	ns
Clock Pulse Hold Time	t_{LC}	110	—	ns
Rise/Fall Time	t_r, t_f	—	Note 1	ns
FLM Setup Time	t_{FDS}	100	—	ns
FLM Hold Time	t_{FDH}	100	—	ns

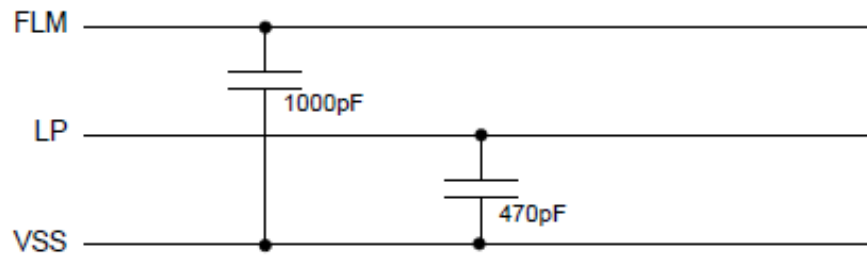Note 1: The rise and fall times (t_r, t_f) must satisfy the following relationships (① and ②).

① $t_r, t_f < \dfrac{1}{2f_{CP}} - t_{WC}$

② $t_r, t_f < 50$ ns
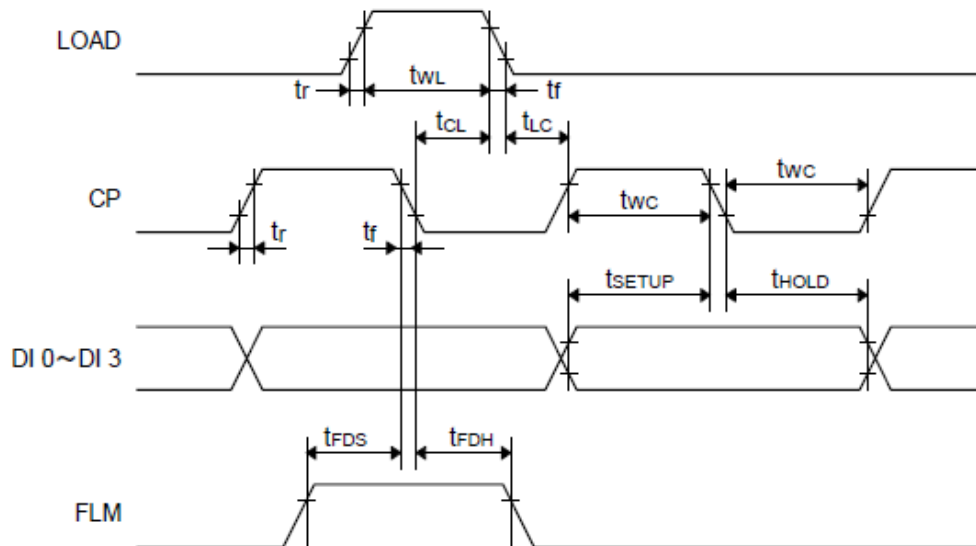
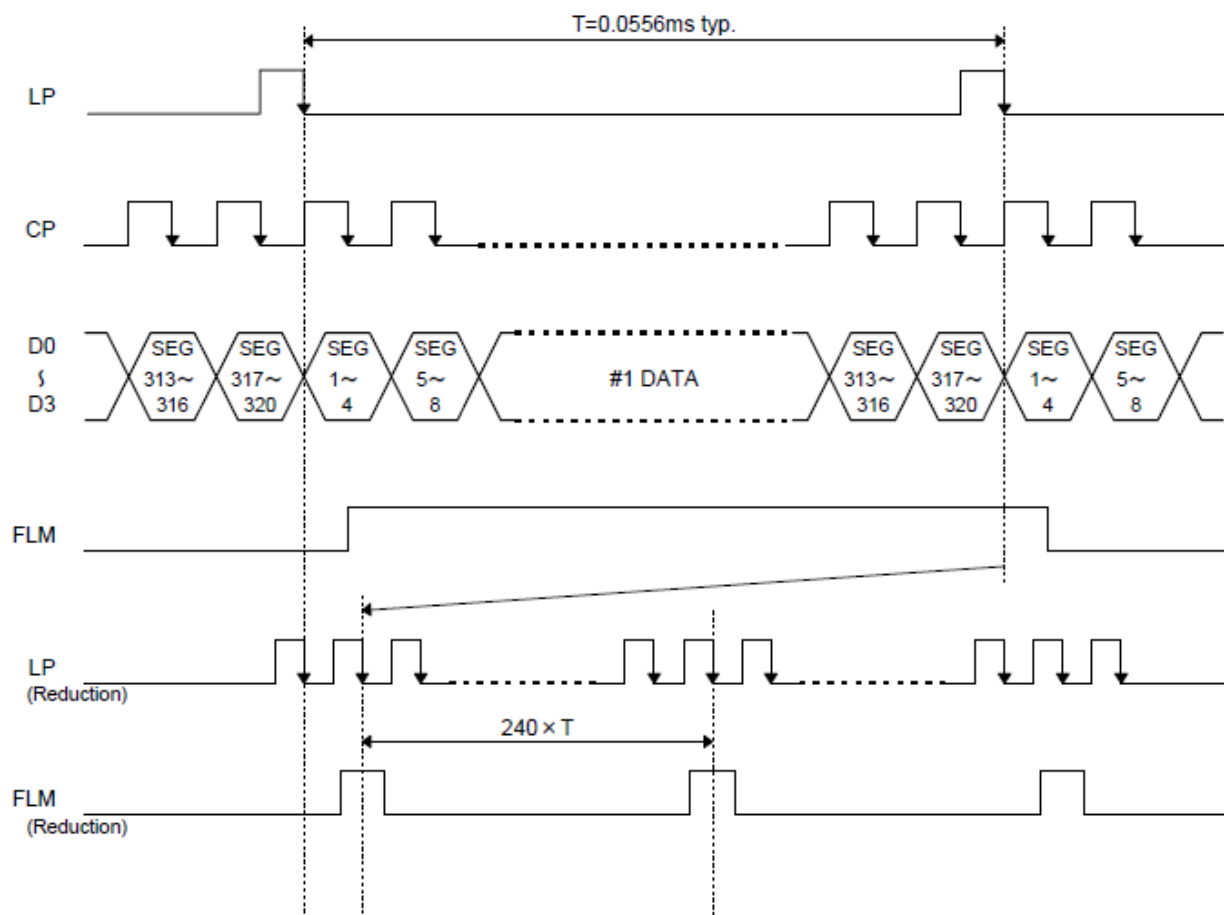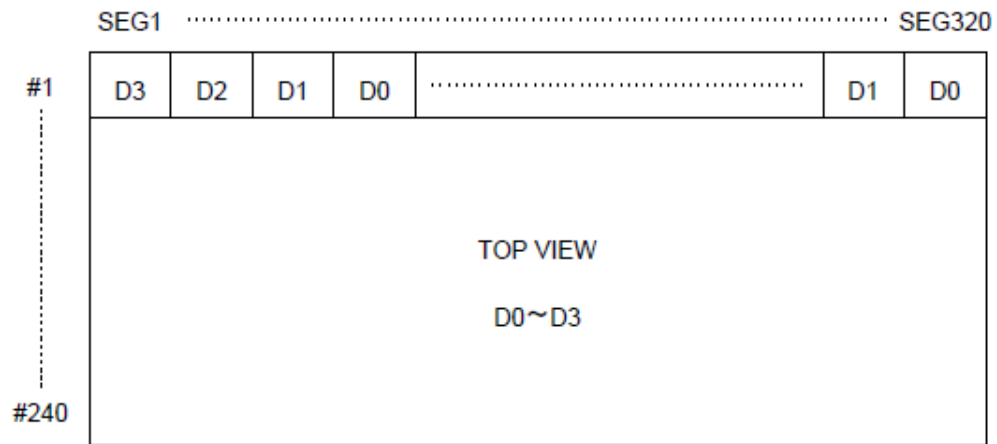This module contain these capacitors. Please be careful about timing characteristics.

FLM ———————●———————————————————————

｜｜ 1000pF

LP ———————————————●———————————————

｜｜ 470pF

VSS ———————●———————●———————————————

Timing Chart

T=0.0556ms typ.

LP

CP

D0
~
D3

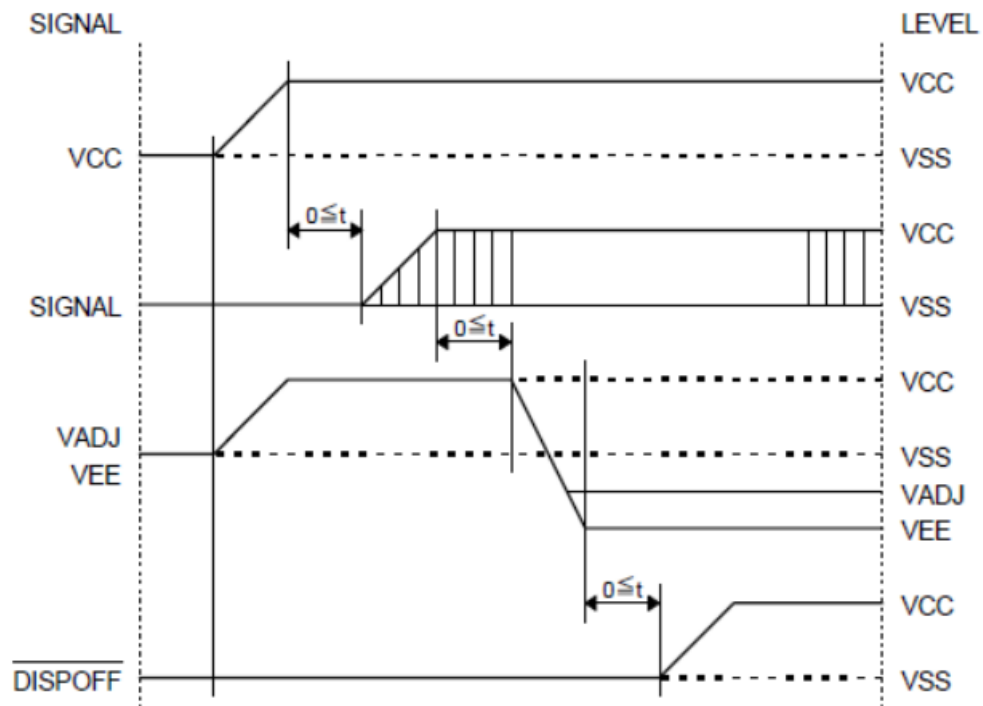| SEG 313~316 | SEG 317~320 | SEG 1~4 | SEG 5~8 | #1 DATA | SEG 313~316 | SEG 317~320 | SEG 1~4 | SEG 5~8 |

FLM

LP
(Reduction)

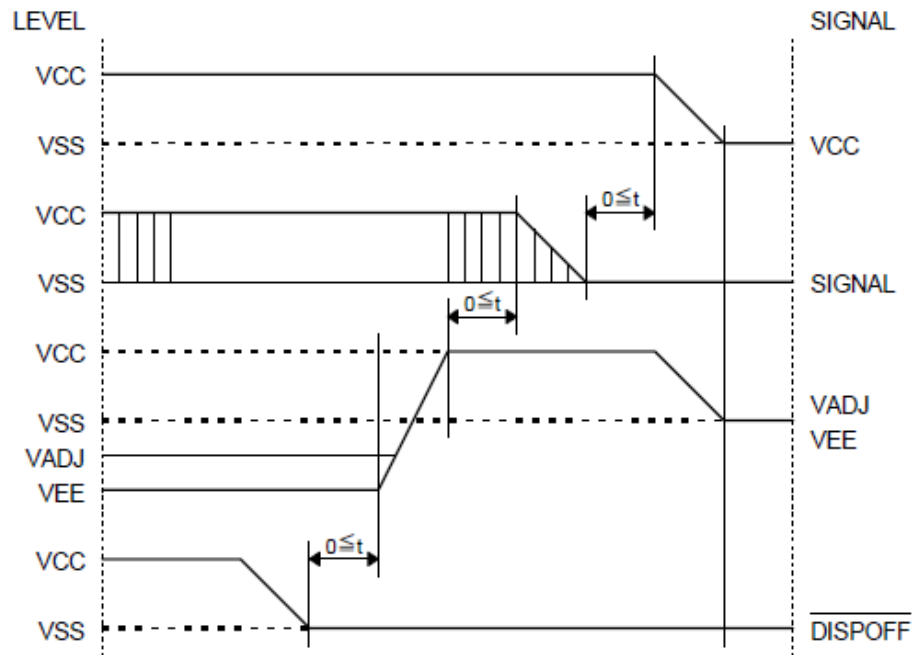240 × T

FLM
(Reduction)

Comparison of Display and Data

Power Supply ON/OFF Sequence

ON Sequence

OFF Sequence

Please maintain the above sequence when turning on and off the power supply of the module. If $\overline{\text{DISPOFF}}$ is supplied to the module while internal alternate signal for LCD driving (M) is unstable, DC component will be supplied to the LCD panel. This may cause damage the LCD module.

10. 品质保证 Quality Assurance

·Our company is qualified through ISO9001:2015. Our production plant has stringent quality control to guarantee absolute product quality. release and acceptance of finished LCM products in order to guarantee the quality required by the customer.

1Scope

The criteria are applicable to all the LCM products manufactured by factory

either supplied alone or embedded in or integrated with other components.

2·Inspection Apparatuses

Function testers, vernier calipers, microscopes, magnifiers, ESD wrist straps, finger cots, labels, ovens for high-low temperature tests, refrigerators, constant voltage power supply（DC），desk lamps, etc.

3·Reference Standards

3.1.1 GB/T 1619.96 Test Methods for TN LCD.

3.1.2 GB/T 12848.91 General Specifications for STN LCD.

3.1.3 GB2421-89 Basic Environmental Test Procedures for Electrical and Electronic Products

3.1.4 IPC-A-610C Acceptance Condition for Electrical Assemblies.

3.1.5 IEC-61000-4-2 Electrostatic Discharge immunity Tests

3.1.6 CISPR 22 Class B Conductive & Radiation limits

4·Inspection Conditions and Inspection Reference

4.1 Cosmetic inspection: shall be done normally at 25±5℃ of the ambient temperature and 45±20%RH of relative humidity, under the ambient luminance greater than 300cd/cm²and at the distance of 30cm apart between the inspector's eyes and the LCD panel and normally in reflected light. For back-lit LCMs, cosmetic inspection shall be done under the ambient luminance less than 100cd/cm² with the backlight on.

4.2   The LCM shall be tested at the angle of 45°, left and right, and 0-45°, top and bottom (for STN LCM, at 20-55°）.

4.3   Definition of VA

VA：Viewing area
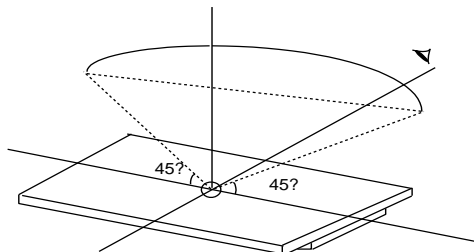
Non-VA：Non-viewing area
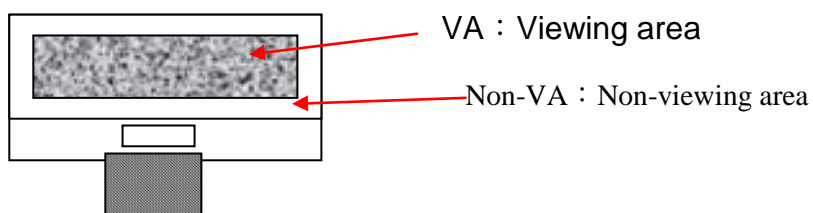
4.4   Inspection with naked eyes（exclusive of the inspection of the physical dimensions of defects carried out with magnifiers）.

4.5   Electrical properties
Inspection with the test jigs against the product specifications or drawings; display contents and parameters shall conform to those of the product specifications and the display effect to the sample.

4.5.1 Test voltage（V）：

4.5.1.1 (Determined) according to the operating instruction of test jigs assuming the external circuit can be adjusted unless the customer otherwise specifies driving voltage(s). (Display) effects are controlled within the specified range of voltage variation (If no specific requirements, display effects are controlled at Vop = 9V or Vop ±0.3V when Vop is below 9V; if Vop is above 9V, display effects are controlled at Vop ±0.3% at least).For display products with the customer-specified fixed Vop, display effects are controlled by adjusting the internal circuit; if necessary, acceptable limit samples shall be built.

4.5.2 Current Consumption（I）：refer to approved product specifications or drawings.
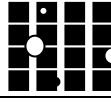
5．Defects and Acceptance Standards

5.1 Dimensions：the outline dimensions and the dimensions that could influence the assembly at the customer's side shall conform to those on the approved drawings.

5.2 Main Defects – Functionality Tests:

No.	Item	Description	MAJ	MIN	Acceptance Criteria
5.2.1	Missing Segments	Missing segments or dots caused by broken contact(s), loose connection or an internal open circuit.	√		Rejected
5.2.3	No display /Inaction	No segments, icons or graphics are displayed when the LCM is connected correctly.	√		Rejected
5.2.4	Mis-Display	Display pattern is deformed or jumbled-up under the normal scanning procedure.	√		Rejected

5.2.5	Wrong viewing angle	When powered up, the viewing angle at which the display is at its clearest is different from the required viewing angle or that of the approved samples.)	√		Rejected
5.2.6	Dim or Dark Display	Overall contrast is either too dark or too dim under normal operation.	√		If out of the voltage tolerance, Rejected
5.2.7	Slow response	Local response time varies when LCM is turned on or off.	√		Rejected
5.2.8	Extra segments, rows, or columns	Icons, traces, rows or columns that should not appear on the LCD screen and caused by LCD panel misalignment or insufficient corrosion.		√	Refer to dot/line standard
5.2.9	Dim segment	Under the normal voltage, the contrast of vertical and horizontal segments is uneven.		√	Reject or refer to samples
5.2.10	PI black/white spots	Partial black and white spots visible when changing display contents due to defective PI layer.		√	refer to the spot/line criteria for the visible spots when display image remains still; others OK.
5.2.11	pinhole/white spots	Deformed patterns appearing when LCD is turned on caused by missing ITO. d = (X+Y)/2		√	refer to spot/line standard
5.2.12	Pattern distortion	Segment is either wider , narrower or deformed than the specified, caused by panel misalignment, resulting in unwanted heave(s) or missing: |la-lb|≤1/4W(W is the normal width)		√	Acceptable |la-lb|>1/4 W, rejected
5.2.13	High current	LCM current is larger than the designed value.		√	Rejected

5.3   LCD Visual Defects

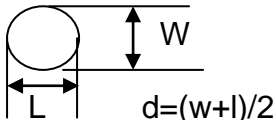5.3.1   Spot defect (defined within VA, spots out of VA do not count.)

Defect	Average diameter（d）	Acceptable quantity	MAJ	MIN
Spot defect （black spot, foreign matter, nick, scratches, including LC mis-orientation.）	d≤0.2	3		√
	0.2<d≤0.25	2		
	0.25<d≤0.30	1		

5.3.2   Line defects (defined within VA; those out of VA do not count.)

Defect	Length(L)	Width(W)	Acceptable quantity	MAJ	MIN
line defects (scratches, linear foreign matter)	≤5.0	≤0.02	3		√
	≤3.0	≤0.03	3		
	≤3.0	≤0.05	1		
note： 1.If the width is bigger than 0.1mm, it shall be treated as spot defect.					

5.3.3   Polarizer air bubble (defined within VA; those out of VA do not count.)

Defect	Average diameter（d）	Acceptable quantity	MAJ	MIN
Polarizer air bubble, Concave-Convex dot. W L d=(w+l)/2	d≤0.3	3		√
	0.3<d≤0.5	2		
	0.5<d≤0.8	1		

5.4   Backlight

No.	Item	Description	MAJ	MIN	Accept standard
5.4.1	Backlight not working, wrong color	/	√		Rejected
5.4.2	Color deviation	When powered on, the LCD color differs from that of the sample and is found after testing not conforming to the drawing.		√	Refer to sample and drawing
5.4.3	Brightness deviation	When powered on, the LCD brightness differs from that of the sample and is found after testing not conforming to the drawing; or if conforming to the drawing but over±30%.		√	Refer to sample and drawing
5.4.4	Uneven	When powered on, the LCD		√	Refer to

	brightness	brightness is uneven on the same LCD and out of the specification of the drawing.			sample and drawing
5.4.5	Spot/line scratch	Appearance of spot or line scratches on the LCD when turned on.		√	Refer to 6.3.1/6.3.2

5.5 Metal frame (Metal Bezel)

No.	Item	Description	MAJ	MIN	Accept standard
5.5.1	Material/surface treatment	Metal frame/surface treatment do not conform to the specifications.	√		Rejected
5.5.2	Tab twist inconformity/ Tab not twisted	Wrong twist method or direction and twist tabs are not twisted as required.	√		Rejected
5.5.3	Oxidization, chapped paint, discoloration, dents, and scratches	Oxidation on the surface of the metal bezel；the quantity of spot defect (chapped front surface paint and substrate-exposing scratches) ≤0.8mm exceeds 3; the quantity of linear defects with the length ≤5.0mm and width ≤0.05mm exceeds 2; the quantity of spot defect (front dent, bubble, side surface chapped paint and substrate-exposing scratches)≤1.0mm exceeds 3; the quantity of linear defects with the width ≤0.05mm exceeds 3.		√	Rejected
5.5.4	Burr	Burr(s) on metal bezel is so long as to get into viewing area.		√	Rejected

5.6 SMT (Refer to IPC-A-610C if not specified)

No.	Item	Description	MAJ	MIN	Accept standard
5.6.1	Soldering solder defects	Cold, false and missing soldering, solder crack and insufficient solder dissolution.		√	Rejected
5.6.2	Solder ball/splash	Solder ball/tin dross causing short at the solder point.		√	Rejected
5.6.3	DIP parts	Floated or tilted DIP parts，keypad，connectors.		√	Rejected
5.6.4	Solder shape	The welded spot should be concave and excessive or insufficient solder or solder burr on the welded spot must be rejected.		√	Rejected

5.6.5	Component pin exposure	For the DIP type components, 0.5~2mm component pin must be remained after cutting the soldered pin, and the solder surface should not be damaged nor should the component pin is fully covered with solder; otherwise rejected.		√	Reject
5.6.6	Poor Appearance	Caused by yellow-brown or black solder flux or resin or the white mist at the solder point caused by PCB cleaning.		√	reject

6．Reliability test

Test item	Condition	Time(hrs)	Acceptance standard
High Storage Temp.	80°C	120	
High Operating Temp.	70°C	120	
Low Storage Temp.	-20°C	120	Functions and appearance are qualified before and after test
Low Operating Temp.	-30°C	120	
Temp& Humidity Test	40°C/ 90%RH	120	
Thermal Shock	-20°C ← 25°C →+70°C (30 min ← 5 min → 30min)	10 cycles	

Notes：①Reliability tests shall be done as required by the customer if they inform factory of their special requirements when starting a project.

②Storage test at high-low temperature and functionality test shall be done with reference to the specified temperature range.

③Test conditions shall be controlled at the permissible tolerance of ±5℃.

7．Packing

Guarantee to offer ESD shield bag to protect the product from electrostatic or magnetic interference during delivery

8．Others

8.1 Items not specified in this document or released on compromise should be inspected with reference to the mutual agreement and limit samples.

11.注意事项Precaution for using LCD/LCM

After reliability test, recovery time should be 24 hours minimum. Moreover, functions, performance and appearance shall be free from remarkable deterioration within 50,000 hours（average） under ordinary operating and storage conditions room temperature (20±8°C), normal humidity (below 65% RH), and in the area not exposed to direct sun light. Using LCM beyond these conditions will shorten the life time.Precaution for using Lcd/Lcm

LCD/LCM is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification. The followings should be noted.

General Precautions:
1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isoproply alcohol, ethyl alcohol or trichlorotriflorothane, do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not make any modification on the PCB without consulting factory.
5. When mounting a LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.
7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

Static Electricity Precautions:
1. CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.
2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.
5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

Soldering Precautions:
1. Soldering should be performed only on the I/O terminals.

2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature: 350°C±10°C
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

Operation Precautions:

1. The viewing angle can be adjusted by varying the LCD driving voltage Vo.
2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature   and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage over 40°C is required, the relative humidity should be kept below 60%,and avoid direct sunlight.

Limited Warranty

LCDs and modules are not consumer products, but may be incorporated by factory customers into consumer products or components thereof, factory does not warrant that its LCDs and components are fit for any such particular purpose.

1. The liability of factory is limited to repair or replacement on the terms set forth below. Factory will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between factory and the customer, factory will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with factory general LCD inspection standard . (Copies available on request)
2. No warranty can be granted if any of the precautions state in handling liquid crystal display above has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.
3. In returning the LCD/LCM, they must be properly packaged; there should be detailed description of the failures or defect.