

深圳市金逸晨电子有限公司

ShenZhen GoldenMorning Electronic Co.,Ltd

PRODUCT SPECIFICATION

Model No	E223XB-W-C24-01
Product Name	2.23 OLED Module
Version	V1.0
Date	2024-11-25

- ☐ Preliminary Specification
☒ Final Specification

PREPARED BY	CHECKED BY	APPROVED BY

Revision History

Version	Date	Page	Revise record	Remarks
1.0	2024-11-25	-	First issued	-

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1. General Parameter

NO.	Features	Details	Unit
1	Display Size(Diagonal)	2.23"	Inch
2	LCD type	OLED	-
3	View Direction	ALL	-
4	Drive Duty	1/32	-
5	Resolution	128 x 32	Pixels
6	Module size	62.00(W) x 24.00(H) x 2.00(T)	mm
7	Active Area	29.42(W) x 14.70(H)	mm
8	Pixel Pitch	0.43(W) x 0.41(H)	mm
9	Pixel Size	0.41(W) x 0.39(H)	mm
10	Interface	I ² C, 3/4 Wire SPI, 8080	-
11	Display Colors	White	-
12	Driver IC	CH1116	-
13	IC package type	COG	-
14	Operating Temperature	-20℃~70℃	℃
15	Storage Temperature	-30℃~80℃	℃
16	Weight	5.94	g

Note 1 : Please refer to the mechanical drawing.

2. Physical drawing

								8	7	6	5	4	3	2	1
D															A
D															A
C															B
C															B
D															A
D															A
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4. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
DC Supply Voltage	VDD1	-0.3	3.6	V
DC Supply Voltage	VDD2	-0.3	4.8	V
DC Supply Voltage	VPP	-0.3	14.5	V
Operating temperature	Top	-20	70	°C
Storage temperature	Tst	-30	80	°C

Note 1 : All the above voltages are on the basis of “VSS = 0V” .

Note 2 : When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also, for normal operations, it is desirable to use this module under the conditions according “Optics & Electrical Characteristics” . If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

Note 3 : The defined temperature ranges do not include the polarizer. The maximum withstood temperature of the polarizer should be 80°C.

Note 4 : 50% Checkerboard.End of lifetime is specified as 50% of initial brightness reached. The average operating lifetime at room temperature is estimated by the accelerated operation at high temperature conditions.

5. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Digital Supply Voltage	VDD1	1.65	-	3.5	V	
Analog Supply Voltage	VDD2	2.2	-	4.7	V	
Operating Voltage	VPP	6.4	-	14	V	
Input high voltage	V _{IN}	0.8*VDD	-	-	V	
Input low voltage	V _{IL}	-	-	0.2*VDD	V	
Output high voltage	V _{OH}	0.8*VDD	-	-	V	
Output low voltage	V _{OL}	-	-	0.2*VDD	V	
Dynamic current consumption 1	IDD1	-	-	600	uA	VDD1 = 3V, VDD2 = 3.7V, IREF = -18.75A, Contrast = 256, Internal charge pump OFF, Display ON, isplay data = All ON, No panel attached.
Dynamic current consumption 2	IDD2	-	-	3.5	mA	VDD1 = 3V, VDD2 = 3.7V, IREF = -18.75A, Contrast = 256, internal charge pump ON, Display ON, Display data = All ON, No panel attached.
OLED dynamic current consumption	IPP	-	-	1.5	mA	VDD1 = 3V, VDD2 = 3.7V, VPP =9V(external), IREF = -18.75A, Contrast = 256, Display ON, display data = All ON, No panel attached. Connect charge pump capacitor.

Note 1 : Brightness (Lbr) and Supply Voltage for Display (VCC) are subject to the change of the panel characteristics and the customer’ s request.

Note 2 : The above refers to the DC characteristics of the LCD screen.

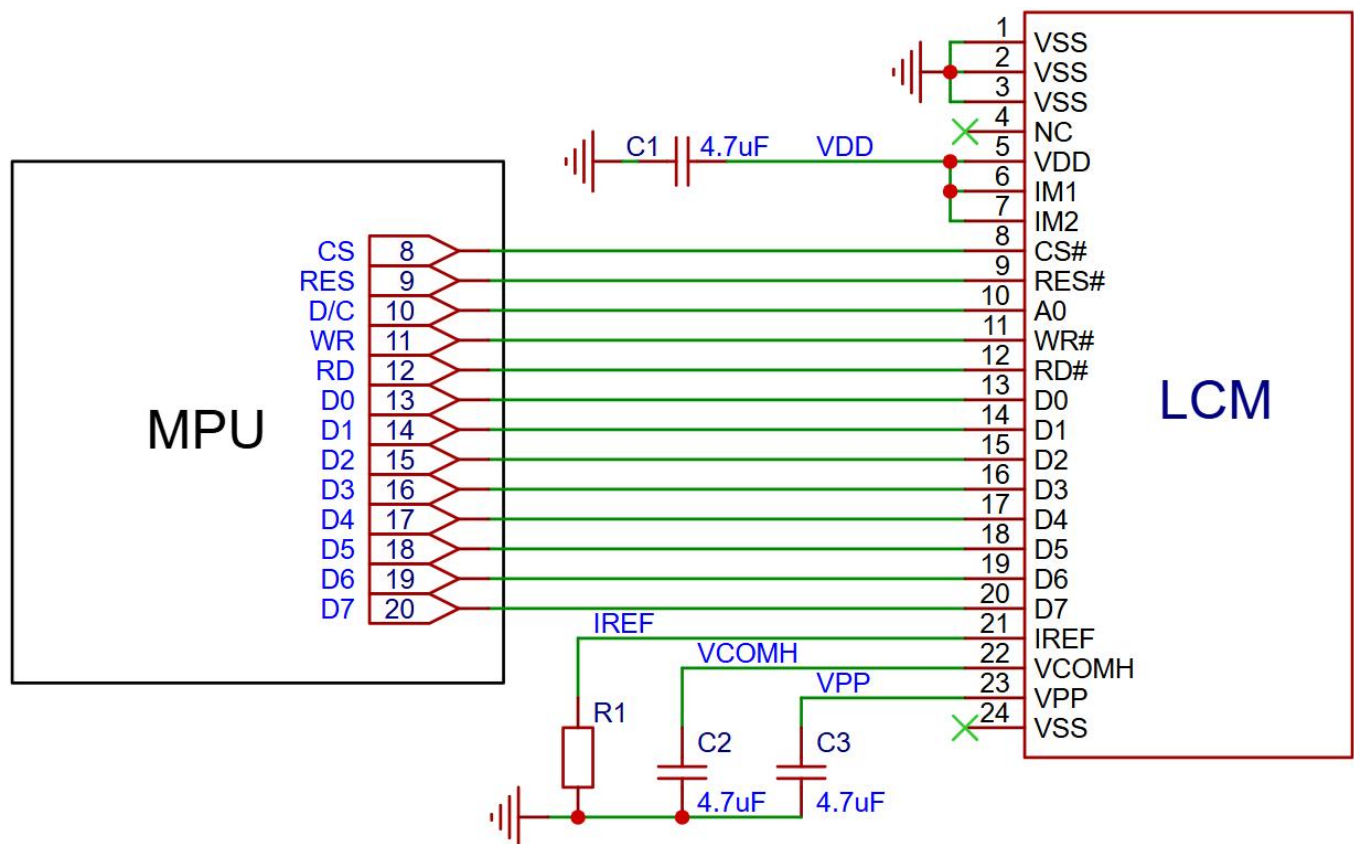
6. Pins Definitions.

Pin. No	Symbol	Description																			
1-3	VSS	Ground pin. It must be connected to external ground.																			
4	NC	No Connect.																			
5	VDD	Power supply input: 2.2 – 3.5V																			
6	IM1	<table><tr><th colspan="4">Communicating Protocol Select</th></tr><tr><th>Name</th><th>8080</th><th>I²C</th><th>4-wire SPI</th></tr><tr><td>IM1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>IM2</td><td>1</td><td>0</td><td>0</td></tr></table>				Communicating Protocol Select				Name	8080	I ² C	4-wire SPI	IM1	1	1	0	IM2	1	0	0
Communicating Protocol Select																					
Name	8080					I ² C	4-wire SPI														
IM1	1					1	0														
IM2	1	0	0																		
7	IM2																				
8	CS#	This pad is the chip select input. When CS = “L”, then the chip select becomes active, and data/command I/O is enabled.																			
9	RES#	This is a reset signal input pad. When RES is set to “L”, the settings are initialized. The reset operation is performed by the RES signal level.																			
10	A0	This is the Data/Command control pad that determines whether the data bits are data or a command. A0 = “H” : the inputs at D0 to D7 are treated as display data. A0 = “L” : the inputs at D0 to D7 are transferred to the command registers. In I ² C interface, this pad serves as SA0 to distinguish the different address of OLED driver.																			
11	WR#	This is a MPU interface input pad. When connected to an 8080 MPU, this is active LOW. This pad connects to the 8080 MPU WR signal. The signals on the data bus are latched at the rising edge of the WR signal. When WR = “H” : Read. When WR = “L” : Write.																			
12	RD#	This is a MPU interface input pad. When connected to an 8080 series MPU, it is active LOW. This pad is connected to the RD signal of the 8080 series MPU, and the data bus is in an output status when this signal is “L”. When RD = “H” : Enable. When RD = “L” : Disable.																			
13-20	D0-D7	This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus. When the serial interface is selected, then D0 serves as the serial clock input pad (SCL) and D1 serves as the serial data input pad (SI). At this time, D2 to D7 are set to high impedance. When the I ² C interface is selected, then D0 serves as the serial clock input pad (SCL) and D1 serves as the serial data input pad (SDAI). At this time, D2 to D7 are set to high impedance																			
21	IREF	This is a segment current reference pad. A resistor should be connected between this pad and VSS.																			
22	VCOMH	This is a pad for the voltage output high level for common signals. A capacitor should be connected between this pad and VSS.																			
23	VPP	OLED panel power supply. Generated by internal charge pump. Connect to capacitor. It could be supplied externally.																			
24	VSS	Ground pin. It must be connected to external ground.																			

Note 1 : See the IC Specification manual for details.

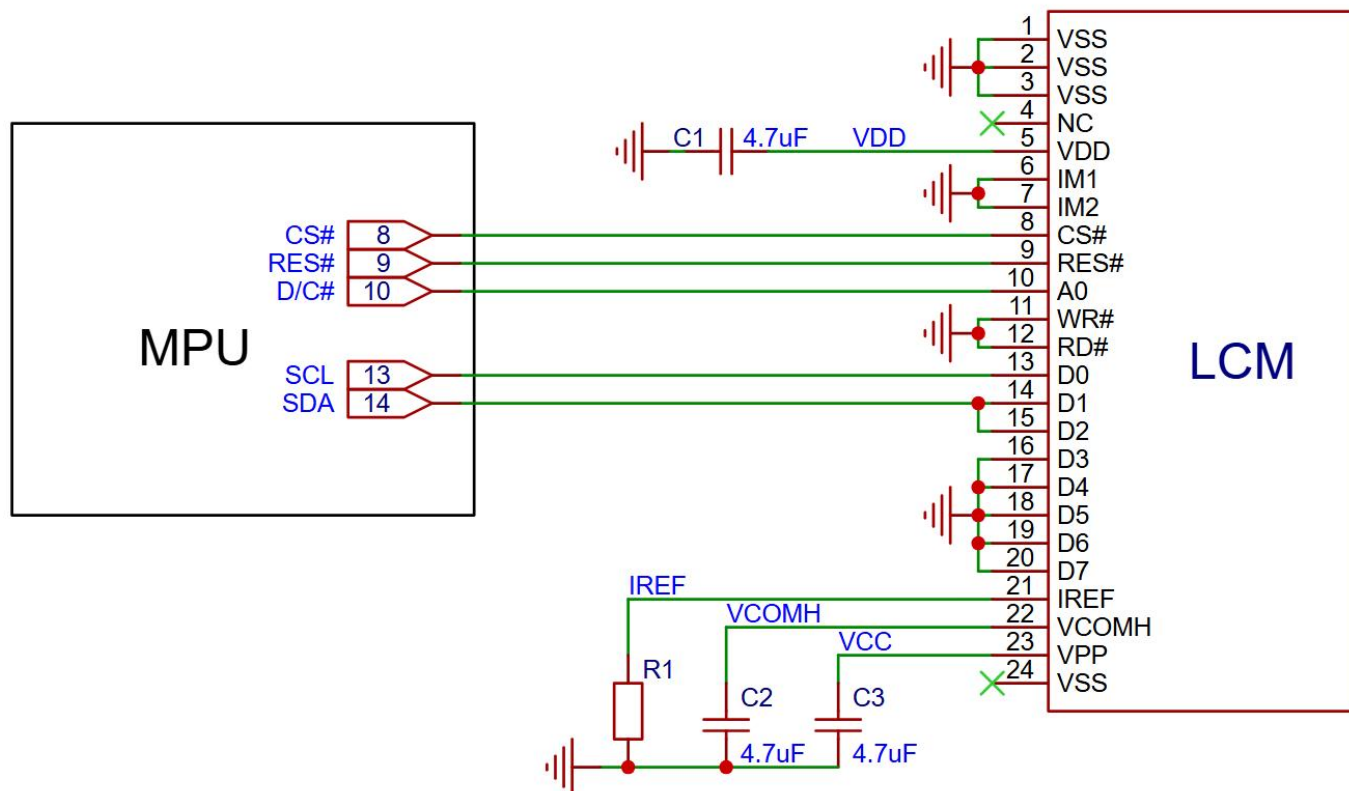
7. Schematic Diagram.

MCU 8080 8 位 参考原理图



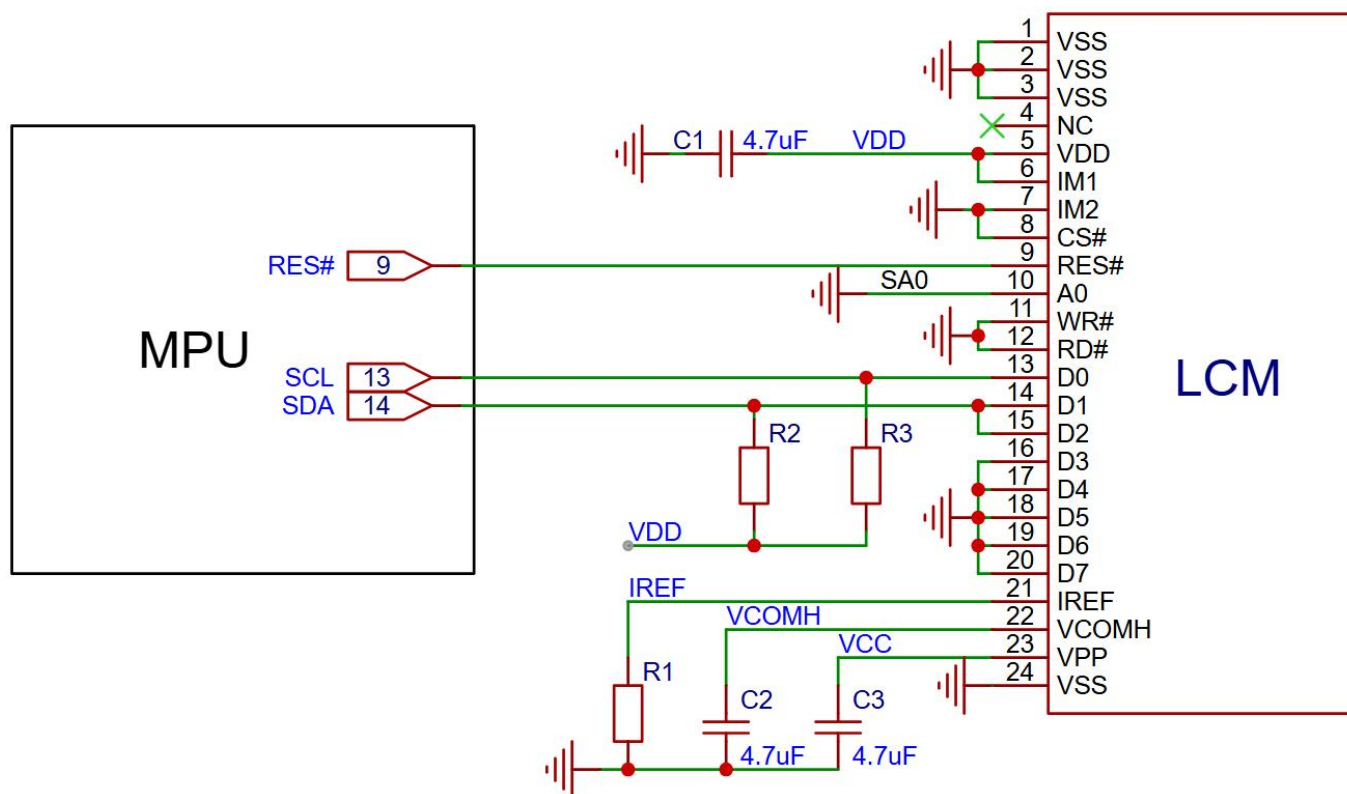
R1: about 310k Ω (ISEG=300uA) , $R1 = (\text{Voltage at IREF} - \text{VSS})/\text{IREF}$

4 线 SPI 参考原理图



R1: about 310k Ω (ISEG=300uA) , $R1 = (\text{Voltage at IREF} - \text{VSS})/\text{IREF}$

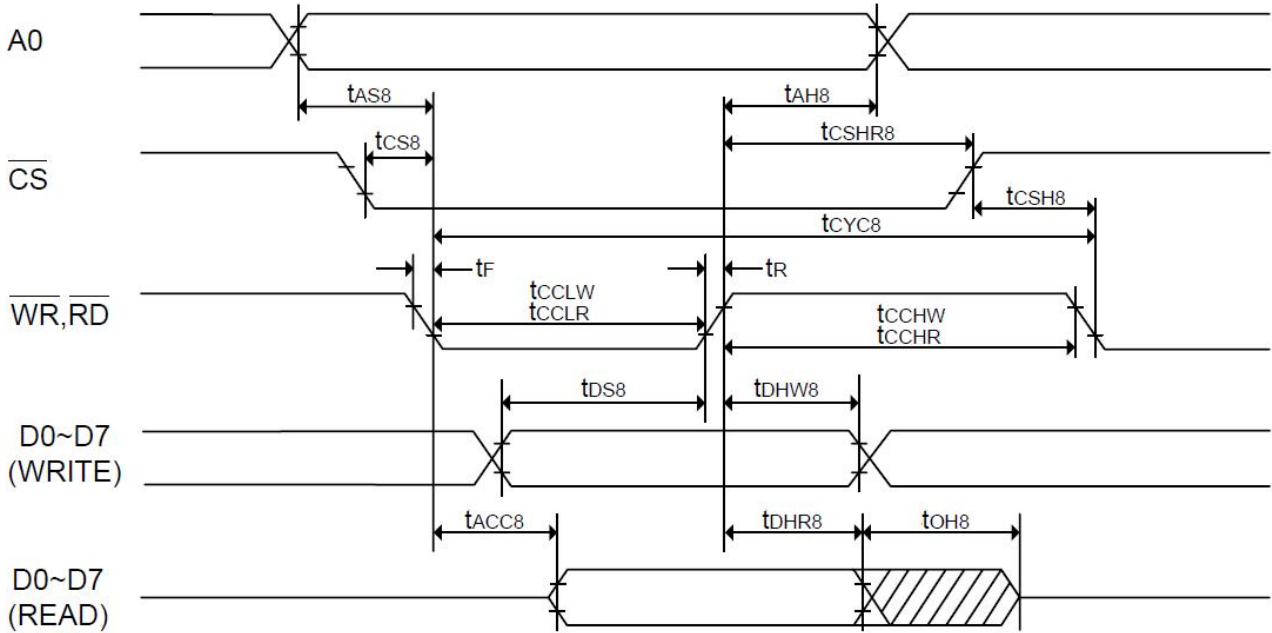
I2C 参考原理图



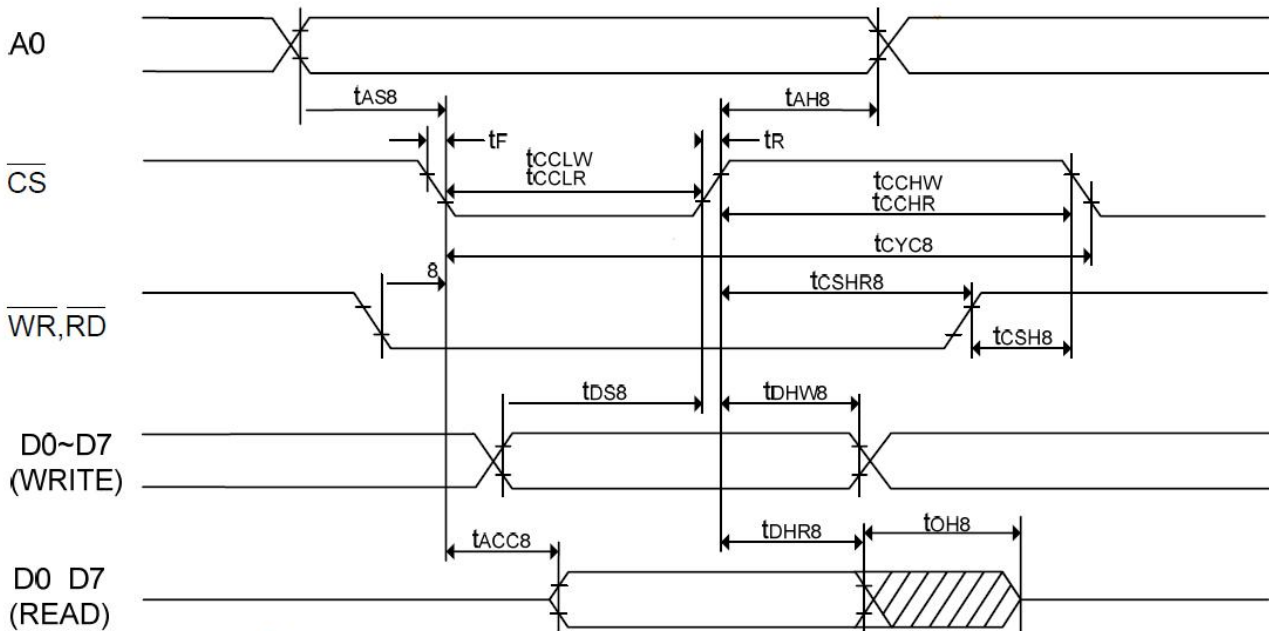
R1: about 310k Ω (ISEG=300uA) , R1 = (Voltage at IREF - VSS)/IREF

8. Timing Characteristics.

System buses Read/Write characteristics (For the 8080 Series Interface MPU)



8080-series parallel interface cycle (Form1)



8080-series parallel interface cycle (Form2)

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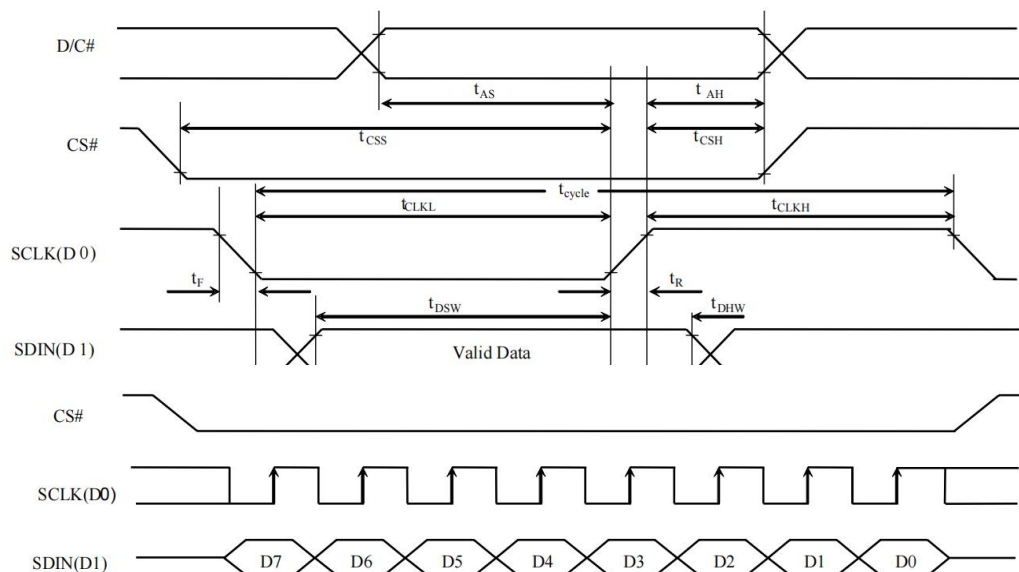
(VDD - VSS = 1.65V~3.5V, TA = 25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
tCYC8	System cycle time	600	-	-	ns	
tAS8	Address setup time	0	-	-	ns	
tAH8	Address hold time	0	-	-	ns	
tDS8	Data setup time	80	-	-	ns	
tDHW8	Write Data hold time	20	-	-	ns	
tDHR8	Read Data hold time	20	-	-	ns	
TOH8	Output disable time	-	-	140	ns	CL = 100pF
tACC8	RD access time	-	-	280	ns	CL = 100pF
tCCLW	Control L pulse width (WR)	300	-	-	ns	
tCCLR	Control L pulse width (RD)	300	-	-	ns	
tCCHW	Control H pulse width (WR)	300	-	-	ns	
tCCHR	Control H pulse width (RD)	300	-	-	ns	
tR	Rise time	-	-	30	ns	
tF	Fall time	-	-	30	ns	
tCS8	Chip select setup time	0	-	-	ns	
tCSH8	Chip select hold time	40	-	-	ns	
tCSHR8	Chip select hold time to read signal	40	-	-	ns	

(VDD - VSS = 2.4V~3.5V, TA = 25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
tCYC8	System cycle time	300	-	-	ns	
tAS8	Address setup time	0	-	-	ns	
tAH8	Address hold time	0	-	-	ns	
tDS8	Data setup time	40	-	-	ns	
tDHW8	Write Data hold time	10	-	-	ns	
tDHR8	Read Data hold time	10	-	-	ns	
TOH8	Output disable time	-	-	70	ns	CL = 100pF
tACC8	RD access time	-	-	140	ns	CL = 100pF
tCCLW	Control L pulse width (WR)	150	-	-	ns	
tCCLR	Control L pulse width (RD)	150	-	-	ns	
tCCHW	Control H pulse width (WR)	150	-	-	ns	
tCCHR	Control H pulse width (RD)	150	-	-	ns	
tR	Rise time	-	-	15	ns	
tF	Fall time	-	-	15	ns	
tCS8	Chip select setup time	0	-	-	ns	
tCSH8	Chip select hold time	20	-	-	ns	
tCSHR8	Chip select hold time to read signal	20	-	-	ns	

Serial interface characteristics (4 Wire SPI)



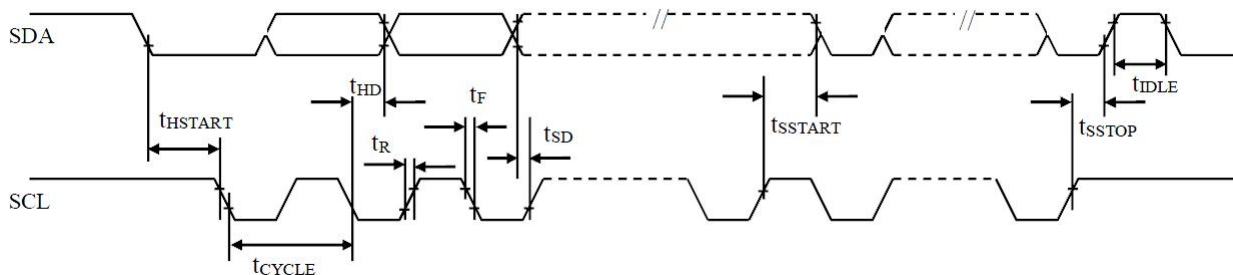
(VDD - VSS = 1.65V~3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t _{cycle}	Clock Cycle Time	100	-	-	ns
t _{AS}	Address Setup Time	60	-	-	ns
t _{AH}	Address Hold Time	60	-	-	ns
t _{CSS}	Chip Select Setup Time	90	-	-	ns
t _{CSH}	Chip Select Hold Time	24	-	-	ns
t _{DSW}	Write Data Setup Time	40	-	-	ns
t _{DHW}	Write Data Hold Time	40	-	-	ns
t _{CLKL}	Clock Low Time	40	-	-	ns
t _{CLKH}	Clock High Time	40	-	-	ns
t _R	Rise Time	-	-	6	ns
t _F	Fall Time	-	-	6	ns

(VDD - VSS = 2.4V~3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t _{cycle}	Clock Cycle Time	50	-	-	ns
t _{AS}	Address Setup Time	30	-	-	ns
t _{AH}	Address Hold Time	30	-	-	ns
t _{CSS}	Chip Select Setup Time	45	-	-	ns
t _{CSH}	Chip Select Hold Time	12	-	-	ns
t _{DSW}	Write Data Setup Time	20	-	-	ns
t _{DHW}	Write Data Hold Time	20	-	-	ns
t _{CLKL}	Clock Low Time	20	-	-	ns
t _{CLKH}	Clock High Time	20	-	-	ns
t _R	Rise Time	-	-	3	ns
t _F	Fall Time	-	-	3	ns

Serial interface characteristics (I²C)



(VDD - VSS = 1.65V~3.5V, TA = 25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit
fSCL	SCL clock frequency	DC	-	400	kHz
TLOW	SCL clock Low pulse width	1.3	-	-	uS
THIGH	SCL clock High pulse width	0.6	-	-	uS
TSU:DATA	data setup time	100	-	-	nS
THD:DATA	data hold time	0	-	0.9	uS
TR	SCL, SDA rise time	20+0.1Cb	-	300	nS
TF	SCL, SDA fall time	20+0.1Cb	-	300	nS
Cb	Capacity load on each bus line	-	-	400	pF
TSU:START	Setup time for re-START	0.6	-	-	uS
THD:START	START Hold time	0.6	-	-	uS
TSU:STOP	Setup time for STOP	0.6	-	-	uS
TBUF	Bus free times between STOP and START condition	1.3	-	-	uS

9. Optical Characteristics.

All data in below based the condition (Ta = 22±3℃,60±10%RH).
以下参数均基于 Ta = 22±3℃,60±10%RH 的条件。

Items 项目		Symbol 符号	Min. 最小值	Typ. 典型值	Max. 最大值	Unit 单位	Remark 备注
Operating Luminance 工作亮度		L	100	120*	-	cd/m ²	-
Color Coordinate 色坐标	White	CIE x	0.25	0.29	0.33	CIE1931	Darkroom
		CIE y	0.27	0.31	0.35		
Operating Life Time* 工作寿命		Top	15,000	-	-	Hours	L= 120 cd/m2

Note(注意事项):

1. L=120cd/m² is based on VDD=2.8V, VPP=12.0V, Contrast command setting 0xFF.
L=120 cd/m² 基于 VDD=2.8V,VPP=12.0V，对比度设置为 0xFF。
2. Life Time is defined when the Luminance has decayed to less than 50% of the initial Luminance specification.
(Odd and even chess board alternately displayed).
(The initial value should be closed to the typical value after adjusting.)
寿命的定义为当亮度衰减到初始亮度 50%时所消耗的时间。
(奇数和偶数棋盘交替显示)。
(初始亮度值应调试到接近典型值的大小)。

The above data are the data of OLED MODULE with polarizer, for reference only.
以上数据为带偏光片的 OLED 模块数据，仅供参考。

10. Reliability

10.1. MTBF

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

10.2. Test Condition

No	Item	Condition	Criteria
1	High Temperature Operating	70℃*24Hrs	1. No Defect Of Operational Function In Room Temperature Are Allowable. 2. IDD of LCM in Pre-and Post-Test Should Follow Specification.
2	Low Temperature Operating	-20℃*24Hrs	
3	High Humidity Storage	50℃*90%RH*24Hrs	
4	High Temperature Storage	80℃*24Hrs	
5	Low Temperature Storage	-30℃*24Hrs	
6	Thermal Cycling Test Storage	-	
7	Packing vibration	-	
8	Electrical Static Discharge	-	
		-	
9	Drop Test (Packaged)	-	

Note 1 : The test samples should be applied to only one test item.

Note 2 : Sample size for each test item is 2pcs.

Note 3 : No defective function allowable.

11. Precautions

11.1. Storage Conditions

- 11.1.1. Store the panel or module in a dark place where the temperature is $23\pm5^{\circ}\text{C}$ and the humidity is below $45\pm 20\%\text{RH}$.
- 11.1.2. Store in anti-static electricity container.
- 11.1.3. Store in clean environment, free from dust, active gas, and solvent.
- 11.1.4. Do not place the module near organics solvents or corrosive gases.
- 11.1.5. Do not crush, shake, or jolt the module.
- 11.1.6. Strong light exposure causes degradation of polarizer and color filter.

11.2. Handling Precautions

- 11.2.1. Avoid static electricity, which can damage the CMOS LSI.
- 11.2.2. The polarizing plate of the display is very fragile, please handle it very carefully.
- 11.2.3. Do not give external shock.
- 11.2.4. Do not apply excessive force on the surface.
- 11.2.5. Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.
- 11.2.6. Reverse and use within ratings in order to keep performance and prevent damage
- 11.2.7. Do not remove the panel or frame from the module.
- 11.2.8. Except for soldering the interface, do not make any alterations or modifications with a soldering iron; Ensure welding temperature at 320°C to 350°C , the welding time control within the 10 s, welding note don't stay too long in the same place to avoid scald FPC.

11.3. Limited Warranty

- 11.3.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss. (我们的保证责任仅限于修理和/或更换。我们将不负任何相应的损失。)
- 11.3.2. If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used. (如果可能，我们建议客户在 6 个月内用完所有模块。如果模块存放时间超过 12 个月，我们建议在使用模块前重新检查。)
- 11.3.3. The warranty period is twelve months from the date of delivery. Buyer shall complete the assembly of all processes within twelve months of validity. During the warranty period, if the product quality problems, our company will be responsible for repair and replacement. All products must be stored and handled in accordance with regulations. Under warranty. When the goods do not comply with the above terms, we do not provide warranty services. (保修期为交货之日起十二个月。买方应在 12 个月内完成所有流程的组装。在保修期内，如果产品出现质量问题，我公司将负责维修和更换。所有产品必须按照规定储存和处理。在保修期内。当货物不符合上述条款时，我们不提供保修服务。)