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ER-OLED018-1 Series

OLED Display Datasheet

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CERTIFICATION

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QUALITY
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011

RoHS
COMPLIANT

EastRising Technology Co., Limited

Attention:

A. Some specifications of IC are not listed in this datasheet. Please refer to the IC datasheet for more details.

B. The related documents for interfacing, demo code, ic datasheet are all available, please download from www.buydisplay.com.

C. Please pay more attention to "Quality Control" in this Datasheet. We assume you already agree with these criterions when you place an order with us. No more recommendations.

REV	DESCRIPTION	RELEASE DATE
1.0	Preliminary Release	Jan-24-2011

ORDERING INFORMATION

Order Number

Part Number(Order Number)	Description
ER-OLED018-1B	1.8"OLED Display Module in Blue Color
ER-OLED018-1W	1.8"OLED Display Module in White Color
ER-DBO018-1	8051 Microcontroller Development Board&Kit for ER-OLED018-1

Image

↑ ER-OLED018-1B

↑ ER-OLED018-1W

CONTENT

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REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
A01	Initial release.	2011-11-26	

1   Overview

ER-OLED018-1 is an OLED grayscale display module with 256×32 dot matrix. The characteristics of this display module are high brightness, self-emission, high contrast ratio, slim/thin outline, wide viewing angle, wide temperature range, and low power consumption.
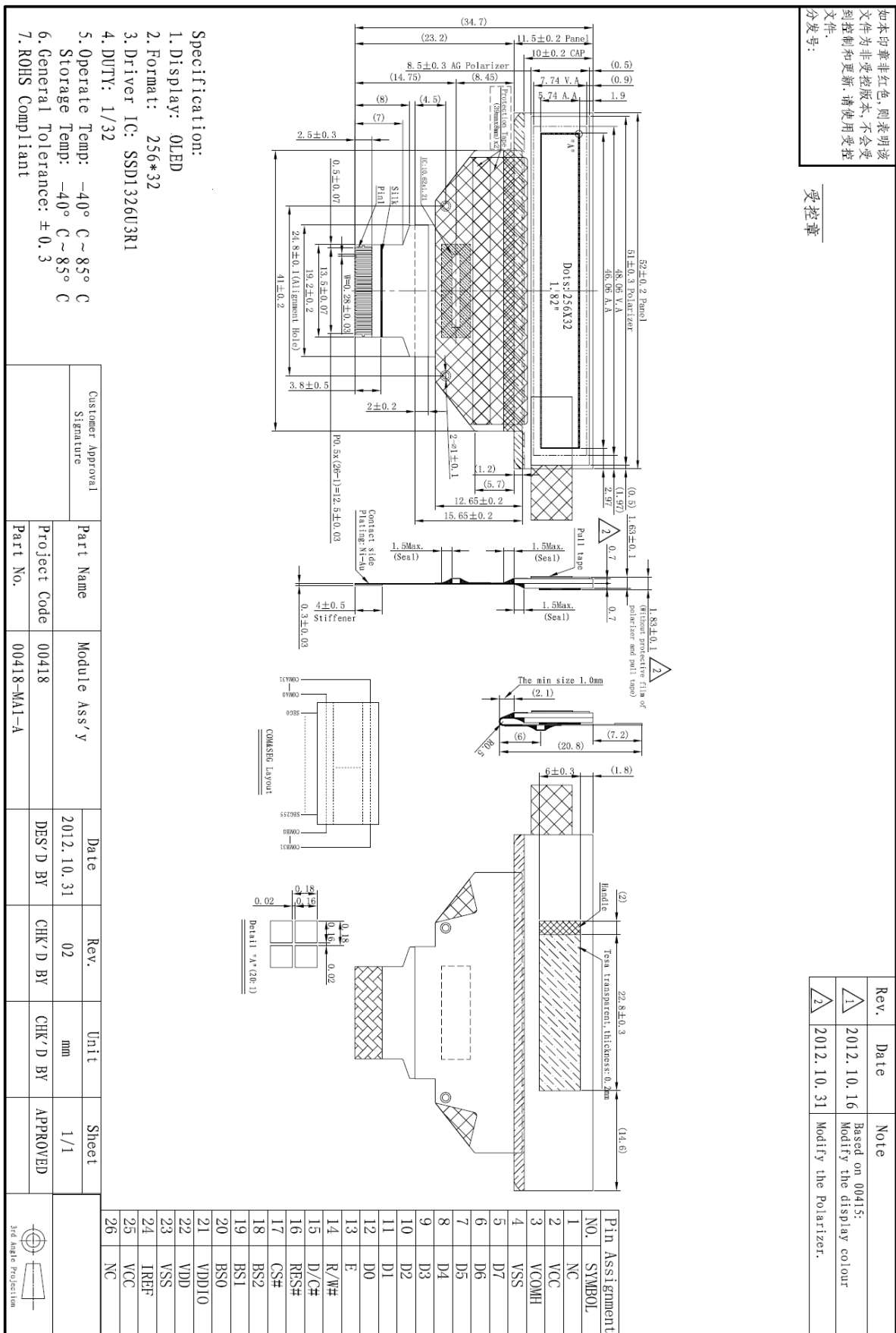
2   Features

➢   Display Color: Blue ,White

➢   Dot Matrix:256×32

➢   Driver IC: SSD1326U3R1

➢   Interface:8-bit 8080,8-bit 6800, SPI, I^2C

➢   Wide range of operating temperature: -40℃ to 85℃

3   Mechanical Data

NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	256(W)×32(H)	-
2	Dot Size	0.16(W)×0.16(H)	mm^2
3	Dot Pitch	0.18(W)×0.18(H)	mm^2
4	Aperture Rate	79	%
5	Active Area	46.06(W)×5.74(H)	mm^2
6	Panel Size	52(W)×11.5(H) ×1.4(T)	mm^3
7	Module Size	52(W)×34.7(H) ×1.83(T)	mm^3
8	Diagonal A/A Size	1.82	inch
9	Module Weight	2.20±10%	gram

4   Mechanical Drawing

Specification:
1. Display: OLED
2. Format: 256*32
3. Driver IC: SSD1326U3R1
4. DUTY: 1/32
5. Operate Temp: −40°C～85°C
   Storage Temp: −40°C～85°C
6. General Tolerance: ±0.3
7. ROHS Compliant

Rev.	Date	Note
1	2012.10.16	Based on 00415: Modify the display colour
2	2012.10.31	Modify the Polarizer.

Pin Assignment

NO.	SYMBOL
1	NC
2	VCC
3	VCOMH
4	VSS
5	D7
6	D6
7	D5
8	D4
9	D3
10	D2
11	D1
12	D0
13	E
14	R/W#
15	D/C#
16	RES#
17	CS#
18	BS2
19	BS1
20	BS0
21	VDD10
22	VDD
23	VSS
24	IREF
25	VCC
26	NC

Customer Approval Signature		
Part Name	Module Ass'y	
Project Code	00418	
Part No.	00418-MA1-A	

Date	2012.10.31	DES'D BY		
Rev.	02	CHK'D BY		
Unit	mm	CHK'D BY		
Sheet	1/1	APPROVED		

3rd Angle Projection

5   Module Interface

| PIN NO.	PIN NAME	DESCRIPTION
1	NC	No Connection.
2	VCC	OLED drive voltage, it should be supplied externally.
3	VCOMH	This is the most positive voltage supply pin of the chip. It is supplied either by external high voltage source.
4	VSS	Ground.
5~12	D7~D0	These is 8-bit-directional data bus. When serial interface mode is selected, D1 will be the serial data input,SDIN, and D0 will be serial clock input,SCLK. When I2C mode is selected, D2,D1 should be tied together and serve as SDAout,SDAin in application and D0 is the serial clock input, SCL.
13	E	This pin is MCU interface input. When interfacing to a 6800-series microprocessor, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this pin is pulled HIGH and the chip is selected. When connecting to an 8080-microprocessor, this pin receives the Read (E) signal. Data read operation is initiated when this pin is pulled LOW and the chip is selected.
14	R/W#	This pin is MCU interface input. When interfacing to a 6800-series microprocessor, this pin will be used as Read/Write (R/W#) selection input. Read mode will be carried out when this pin is pulled HIGH and write mode will be carried out when LOW. When 8080 interface mode is selected, this pin will be the Write (R/W#) input. Data write operation is initiated when this pin is pulled LOW and the chip is selected.
15	D/C#	This pin is Data/Command control pin. When the pin is pulled HIGH and serial interface mode is selected, the data at SDIN is treated as data. When the pin is pulled LOW, the data at SDIN will be transferred to the command register. In I^2C mode, this pin acts as SA0 for slave address selection.
16	RES#	This pin is reset signal input. When the pin is LOW, initialization of the chip is executed. Keep this pin HIGH during normal operation.
17	CS#	This pin is the chip select input. The chip is enabled for MCU communication only when CS# is pulled LOW.
18	BS2	Table 5.1
19	BS1	
20	BS0	
21	VDDIO	This pin is a power supply pin of I/O buffer.It should be connected to VDD or external source.
22	VDD	Power Supply pin. It must be connected to external source.
23	VSS	Ground.
24	IREF	This pin is the segment output current reference pin. ISEG is derived from IREF. A resistor should be connected between this pin and VSS to maintain the current around 10uA.
25	VCC	OLED drive voltage, it should be supplied externally.
26	NC	No Connection.

Table 5.1

Pin Name	I^2C	8-bit 6800	8-bit 8080	SPI
BS0	0	0	0	0
BS1	1	0	1	0
BS2	0	1	1	0

6 Function Block Diagram

6.1 Function Block Diagram

6.2 Panel Layout Diagram
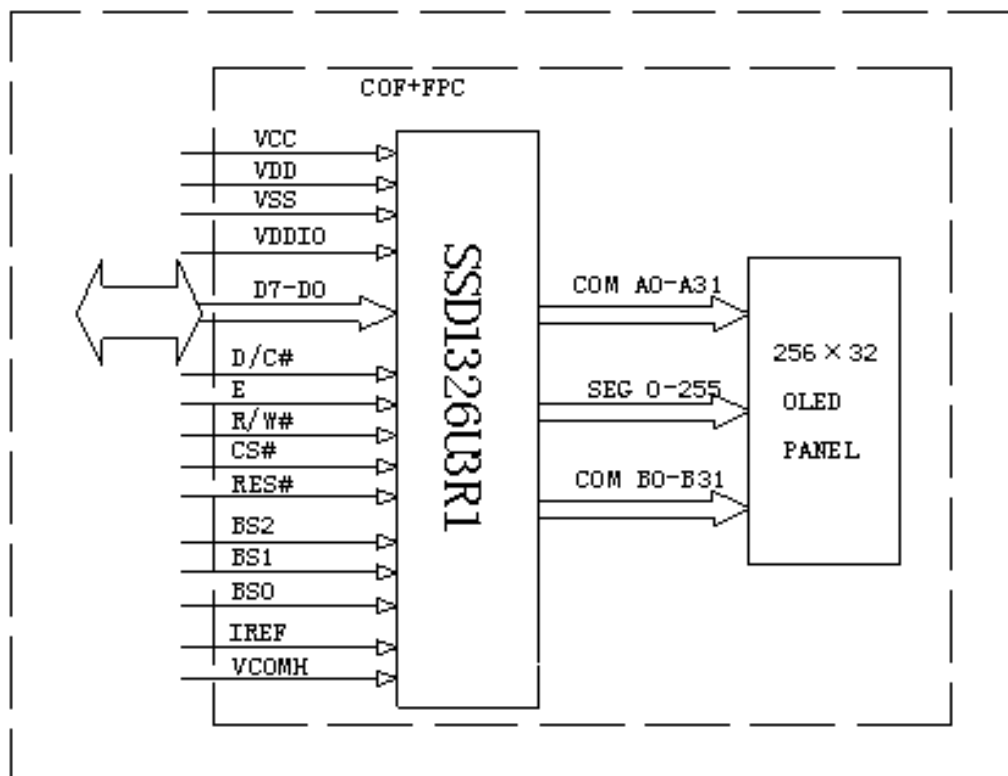
EastRising®
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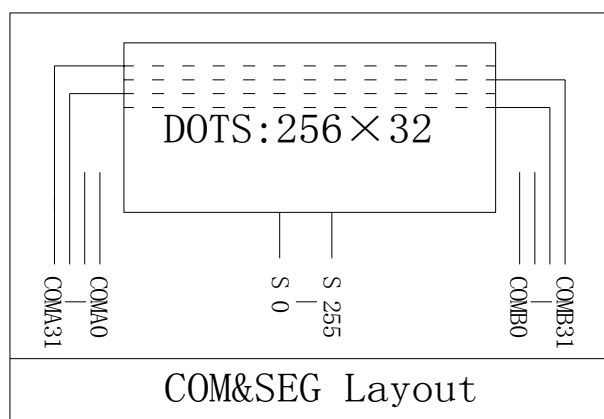
7　Absolute Maximum Ratings

ITEM	SYMBOL	MIN	MAX	UNIT	REMARK
Supply Voltage	VDD	-0.3	+4.0	V	IC maximum rating
	VDDIO	-0.3	VDD +0.5	V	
	VCC	0	+16	V	IC maximum rating
Operating Temp.	Top	-40	+85	℃	-
Storage Temp	Tstg	-40	+85	℃	-

Note (1): All of the voltages are on the basis of "VSS = 0V".

Note (2): Permanent breakage of module may occur if the module is used beyond the maximum rating. The module can be normal operated under the conditions according to Section 8 "Electrical Characteristics". Malfunctioning of the module may occur and the reliability of the module may deteriorate if the module is used beyond the conditions.

8 Electrical Characteristics

8.1 DC Electrical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Logic Supply Voltage	VDD	22±3°C, 55±15%R.H	2.4	3.0	3.5	V
Power Supply for I/O pins	VDDIO	22±3°C, 55±15%R.H	1.7	-	VDD	V
OLED Driver Supply Voltage	VCC	22±3°C, 55±15%R.H	11.5	12	12.5	V
High-level Input Voltage	V_{IH}	-	$0.8 \times VDDIO$	-	-	V
Low-level Input Voltage	V_{IL}	-	-	-	$0.2 \times VDDIO$	V
High-level Output Voltage	V_{OH}	-	$0.9 \times VDDIO$	-	-	V
Low-level Output Voltage	V_{OL}	-	-	-	$0.1 \times VDDIO$	V

Note : The VCC input must be kept in a stable value; ripple and noise are not allowed.

8.2 Electro-optical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Normal Mode Brightness	L_{br}	All pixels ON(1)	50	70	-	cd/m^2
Sleep mode Current	ICC,SLEEP	VDD=VDDIO=2.7V, display OFF, No panel attached	-	-	20	uA
	IDD,SLEEP		-	-	20	uA
	IDDIO,SLEEP		-	-	20	uA
Normal Mode Power Consumption	Pt	All pixels ON(1)	-	144	192	mW
C.I.E(Blue)	(x)	x,y(CIE1931)	0.12	0.16	0.20	-
	(y)		0.23	0.27	0.31	-
Dark Room Contrast	CR	-	≥2000:1	-	-	-
Response Time	-	-	---	10	-	μ s
View Angle	-	-	≥160	-	-	Degree

Note(1): Normal Mode test conditions are as follows:

- Driving voltage : 12V

- Contrast setting : 0x27

- Frame rate : 105HZ

- Duty setting : 1/32

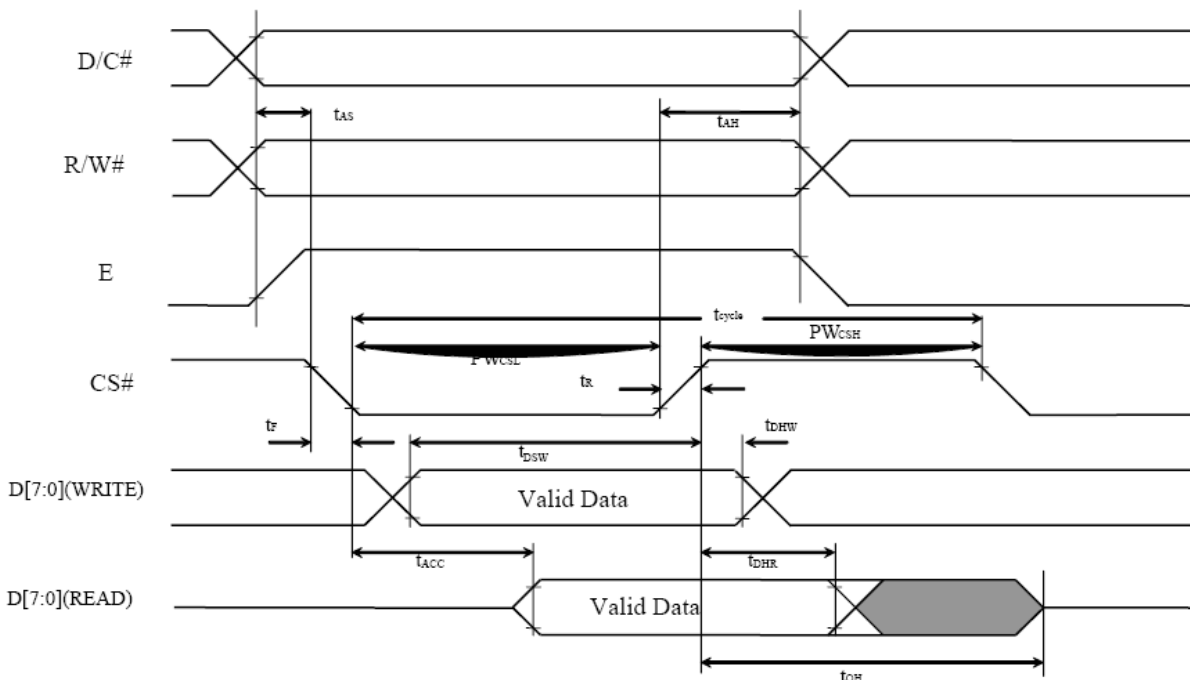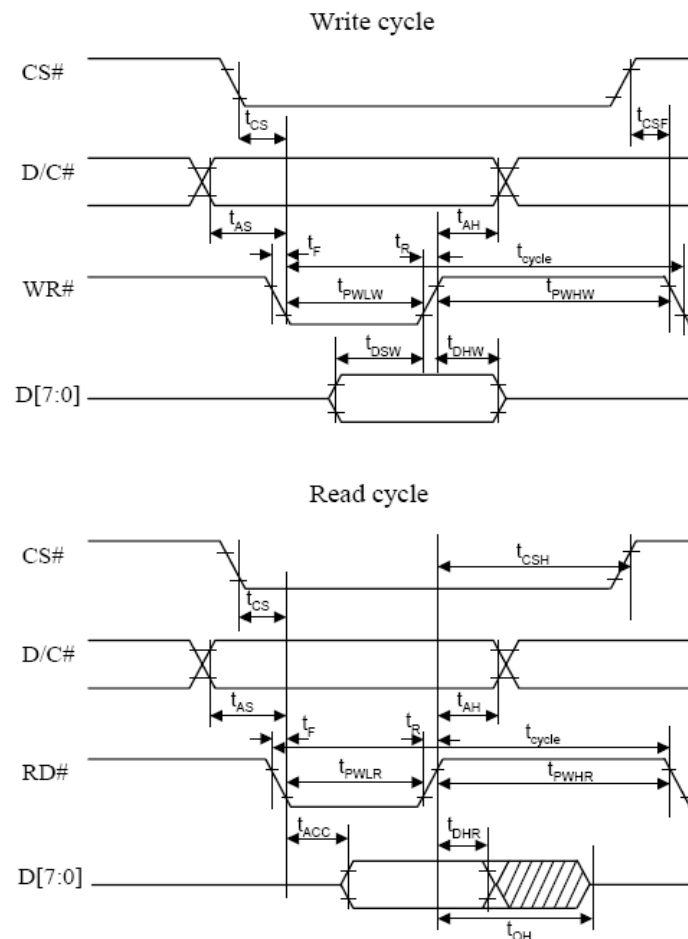### 8.3   AC Electrical Characteristics

(1)6800-Series MPU Parallel Interface Timing Characteristics

(VDD - VSS = 2.4V to 3.5V,VDDIO=VDD, TA = 25°C)

Table 13-4 : 6800-Series MCU Parallel Interface Timing Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	300	-	-	ns
t_{AS}	Address Setup Time	0	-	-	ns
t_{AH}	Address Hold Time	0	-	-	ns
t_{DSW}	Write Data Setup Time	40	-	-	ns
t_{DHW}	Write Data Hold Time	7	-	-	ns
t_{DHR}	Read Data Hold Time	20	-	-	ns
t_{OH}	Output Disable Time	-	-	70	ns
t_{ACC}	Access Time	-	-	140	ns
PW_{CSL}	Chip Select Low Pulse Width (read) Chip Select Low Pulse Width (write)	120 60	-	-	ns
PW_{CSH}	Chip Select High Pulse Width (read) Chip Select High Pulse Width (write)	60 60	-	-	ns
t_R	Rise Time	-	-	15	ns
t_F	Fall Time	-	-	15	ns

Figure 13-3 : 6800-series MCU parallel interface characteristics
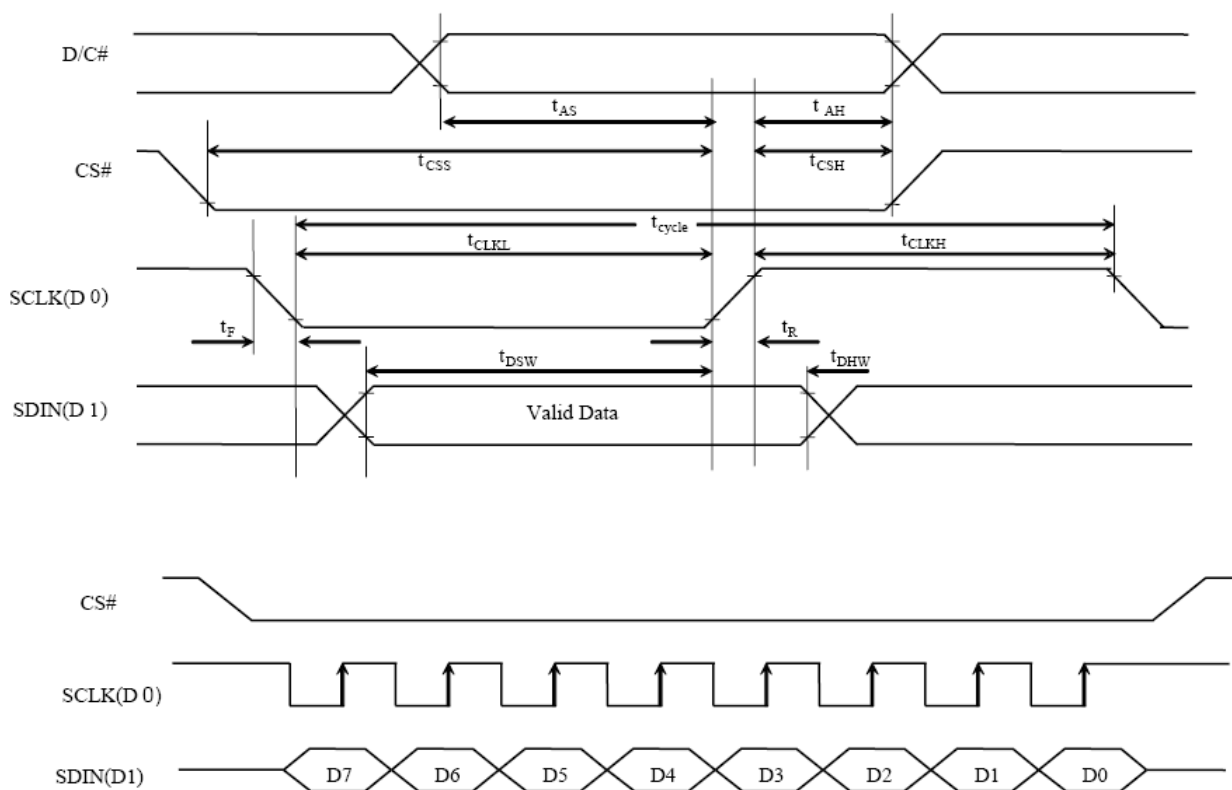

6800-series MCU parallel interface characteristics

(VDD - VSS = 2.4V to 3.5V,VDDIO=VDD, TA = 25°C)

Table 13-5 : 8080-Series MCU Parallel Interface Timing Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	300	-	-	ns
t_{AS}	Address Setup Time	10	-	-	ns
t_{AH}	Address Hold Time	0	-	-	ns
t_{DSW}	Write Data Setup Time	40	-	-	ns
t_{DHW}	Write Data Hold Time	7	-	-	ns
t_{DHR}	Read Data Hold Time	20	-	-	ns
t_{OH}	Output Disable Time	-	-	70	ns
t_{ACC}	Access Time	-	-	140	ns
t_{PWLR}	Read Low Time	120	-	-	ns
t_{PWLW}	Write Low Time	60	-	-	ns
t_{PWHR}	Read High Time	60	-	-	ns
t_{PWHW}	Write High Time	60	-	-	ns
t_R	Rise Time	-	-	15	ns
t_F	Fall Time	-	-	15	ns
t_{CS}	Chip select setup time	0	-	-	ns
t_{CSH}	Chip select hold time to read signal	0	-	-	ns
t_{CSF}	Chip select hold time	20	-	-	ns

Figure 13-4 : 8080-series MCU parallel interface characteristics

Write cycle

Read cycle

**8080-series MPU parallel interface characteristics**

(3)Serial Interface Timing Characteristics

(VDD - VSS = 2.4V to 3.5V,VDDIO=VDD, TA = 25°C)

Table 13-3 : Serial Interface Timing Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	250	-	-	ns
t_{AS}	Address Setup Time	150	-	-	ns
t_{AH}	Address Hold Time	150	-	-	ns
t_{CSS}	Chip Select Setup Time	120	-	-	ns
t_{CSH}	Chip Select Hold Time	60	-	-	ns
t_{DSW}	Write Data Setup Time	100	-	-	ns
t_{DHW}	Write Data Hold Time	100	-	-	ns
t_{CLKL}	Clock Low Time	100	-	-	ns
t_{CLKH}	Clock High Time	100	-	-	ns
t_R	Rise Time	-	-	15	ns
t_F	Fall Time	-	-	15	ns

Figure 13-2 : Serial interface characteristics

Serial interface characteristics

(4) I²C Interface Timing Characteristics

(VDD - VSS = 2.4V to 3.5V,VDDIO=VDD, TA = 25°C)

Table 13-2 : I²C Interface Timing Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	2.5	-	-	us
t_{HSTART}	Start condition Hold Time	0.6	-	-	us
t_{HD}	Data Hold Time	300	-	-	ns
t_{SD}	Data Setup Time	100	-	-	ns
t_{SSTART}	Start condition Setup Time (Only relevant for a repeated Start condition)	0.6	-	-	us
t_{SSTOP}	Stop condition Setup Time	0.6	-	-	us
t_R	Rise Time for data and clock pin	-	-	300	ns
t_F	Fall Time for data and clock pin	-	-	300	ns
t_{IDLE}	Idle Time before a new transmission can start	1.3	-	-	us

Figure 13-1 : I²C interface characteristics
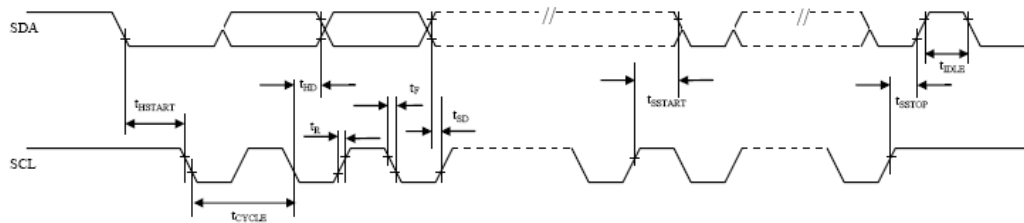
9   Functional Specification and Application Circuit

9.1   Power ON and Power OFF Sequence

Power ON Sequence:

1. Power ON VDD , VDDIO.

2. After VDD , VDDIO become stable, set RES# pin LOW (logic low) for at least 2us (t1) and then HIGH (logic high).

3. After set RES# pin LOW (logic low), wait for at least 2us (t2). Then Power ON VCC. (1)

4. After VCC become stable, send command AFh for display ON. SEG/COM will be ON after 100ms(t_{AF}).
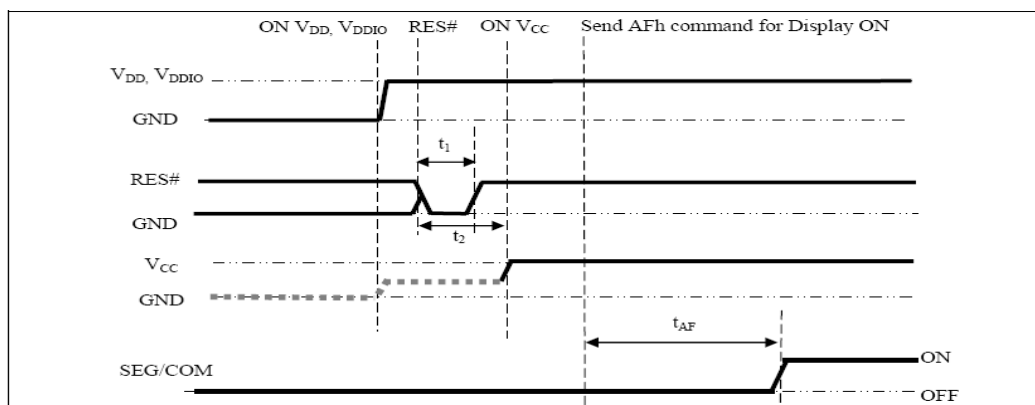
Power OFF Sequence:

1. Send command AEh for display OFF.

2. Power OFF VCC.(1), (2)

3. Wait for t_{OFF}. Power OFF VDD. (where Minimum t_{OFF}=0ms, Typical t_{OFF}=100ms)
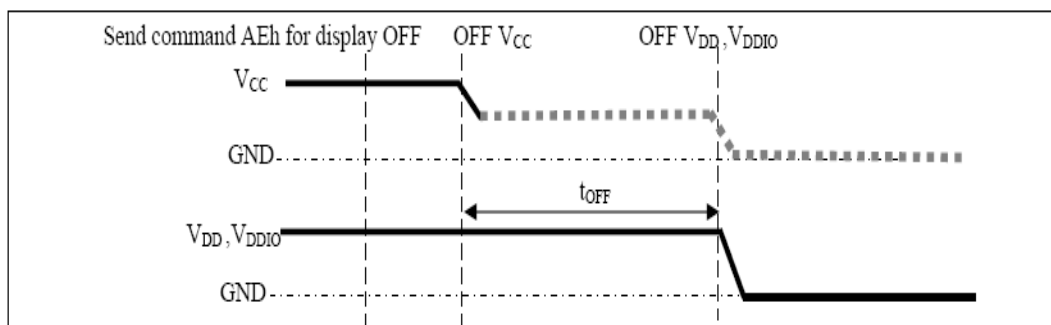
Note:

(1) Since an ESD protection circuit is connected between VDD and VCC, VCC becomes lower than VDD whenever VDD is ON and VCC is OFF as shown in the dotted line of VCC in above figures.

(2).VCC should be kept float (disable) when it is OFF.

(3).Power Pins (VDD,VCC)can never be pulled to ground under any circunstance.

(4).The register values are reset after t1.

(5).VDD should not be Power OFF before VCC Power OFF.

9.2 Application Circuit

(1). The configuration for 8080-parallel interface mode, external VCC is shown in the following diagram:
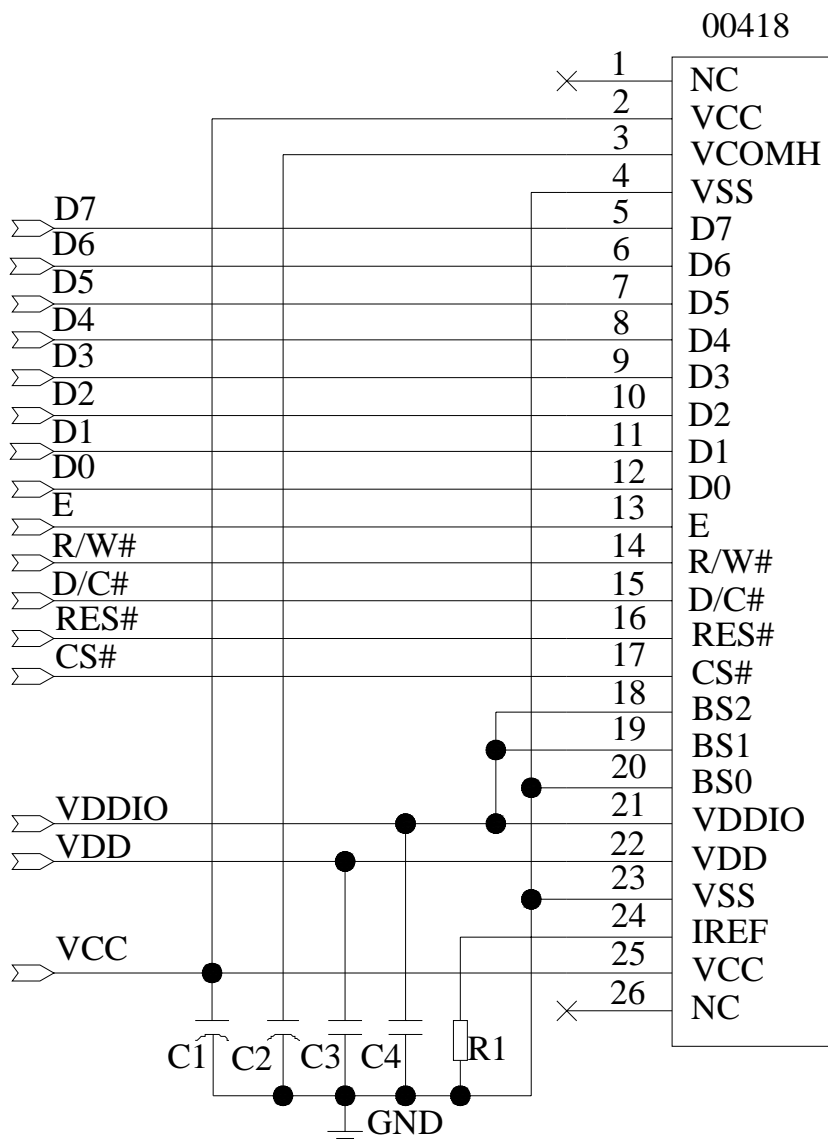
00418

Pin	Signal
1	NC
2	VCC
3	VCOMH
4	VSS
5	D7
6	D6
7	D5
8	D4
9	D3
10	D2
11	D1
12	D0
13	E
14	R/W#
15	D/C#
16	RES#
17	CS#
18	BS2
19	BS1
20	BS0
21	VDDIO
22	VDD
23	VSS
24	IREF
25	VCC
26	NC

D7, D6, D5, D4, D3, D2, D1, D0, E, R/W#, D/C#, RES#, CS#

VDDIO, VDD, VCC

C1 C2 C3 C4 R1

GND

Pin connected to MCU interface: D[7:0], E, R/W#, D/C#, CS#, RES#

Recommended components

C1,C2: 4.7μF/25V.ROHS (Tantalum Capacitors)

C3,C4: 0.1uF-0603-X7R±10%.ROHS

R1: 0603 1/10W +/-5% 680Kohm.ROHS

(2). The configuration for 6800-parallel interface mode, external VCC is shown in the following diagram:
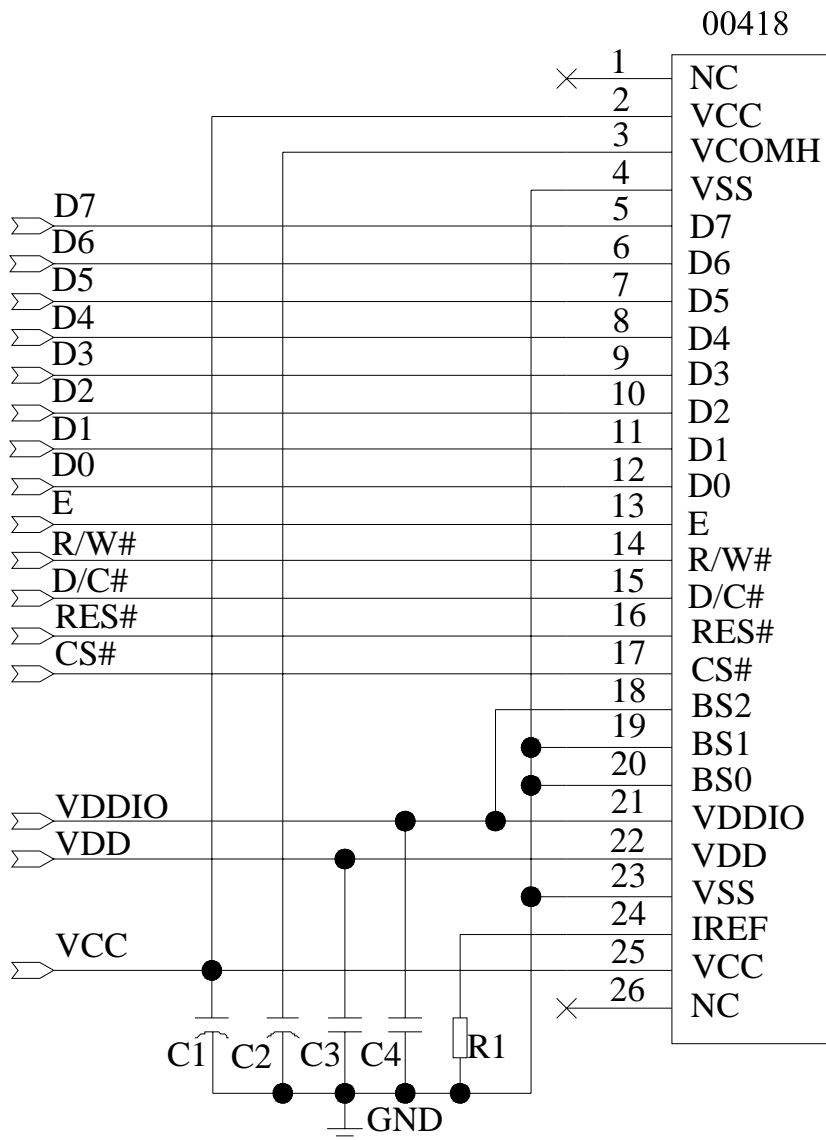
```
                                                        00418
                                              1   ┌─────────┐
                                        ──✕──     │ NC      │
                                              2   │         │
                                        ─────────│ VCC     │
                                              3   │         │
                                        ─────────│ VCOMH   │
                                              4   │         │
    D7  ▷───────────────────────────────────────│ VSS     │
                                              5   │         │
    D6  ▷─────────────────────────────────       │ D7      │
                                              6   │         │
    D5  ▷──────────────────────────────          │ D6      │
                                              7   │         │
    D4  ▷───────────────────────────            │ D5      │
                                              8   │         │
    D3  ▷────────────────────────              │ D4      │
                                              9   │         │
    D2  ▷─────────────────────               │ D3      │
                                             10   │         │
    D1  ▷──────────────────                 │ D2      │
                                             11   │         │
    D0  ▷───────────────                    │ D1      │
                                             12   │         │
    E   ▷────────────                       │ D0      │
                                             13   │         │
    R/W# ▷──────────                        │ E       │
                                             14   │         │
    D/C# ▷────────                          │ R/W#    │
                                             15   │         │
    RES# ▷──────                            │ D/C#    │
                                             16   │         │
    CS#  ▷────                              │ RES#    │
                                             17   │         │
                                                 │ CS#     │
                                             18   │         │
                                                 │ BS2     │
                                             19   │         │
                                                 │ BS1     │
                                             20   │         │
                                                 │ BS0     │
                                             21   │         │
  VDDIO ▷─────────────●───────●──────────────│ VDDIO   │
                                             22   │         │
  VDD   ▷──────────●──────────────────────────│ VDD     │
                                             23   │         │
                                                 │ VSS     │
                                             24   │         │
                                                 │ IREF    │
                                             25   │         │
  VCC   ▷──────●──────────────────────────────│ VCC     │
                                             26   │         │
                                        ──✕──     │ NC      │
                                                 └─────────┘
           C1  C2  C3  C4    R1
            │   │   │   │     │
            └───┴───┴───┴─────┘
                  GND
```

Pin connected to MCU interface: D[7:0], E, R/W#, D/C#, CS#, RES#

Recommended components

C1,C2: 4.7μF/25V.ROHS (Tantalum Capacitors)

C3,C4: 0.1uF-0603-X7R±10%.ROHS

R1: 0603 1/10W +/-5% 680Kohm.ROHS

(3). The configuration for SPI interface mode, external VCC is shown in the following diagram:
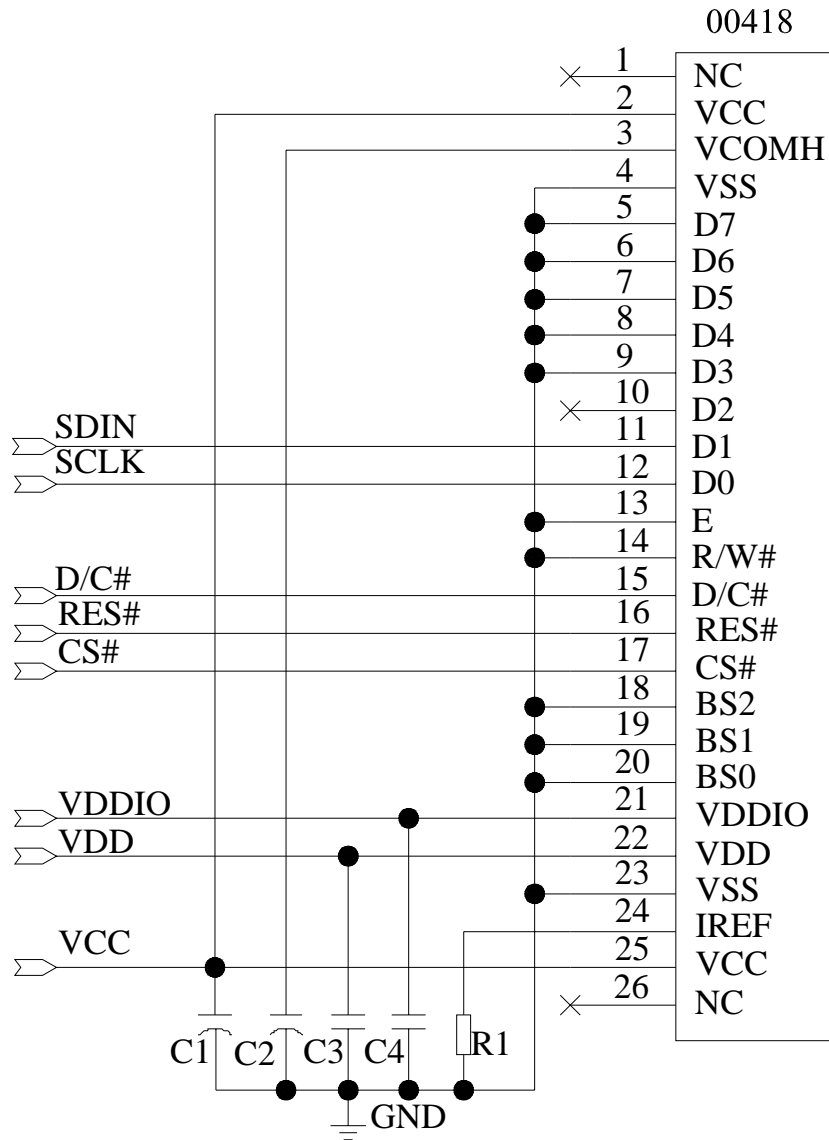
Pin connected to MCU interface:D/C#,SDIN,SCLK, CS#, RES#

Recommended components

C1,C2: 4.7μF/25V.ROHS (Tantalum Capacitors)

C3,C4: 0.1uF-0603-X7R±10%.ROHS

R1: 0603 1/10W +/-5% 680Kohm.ROHS

(4). The configuration for I² C interface mode, external VCC is shown in the following diagram:
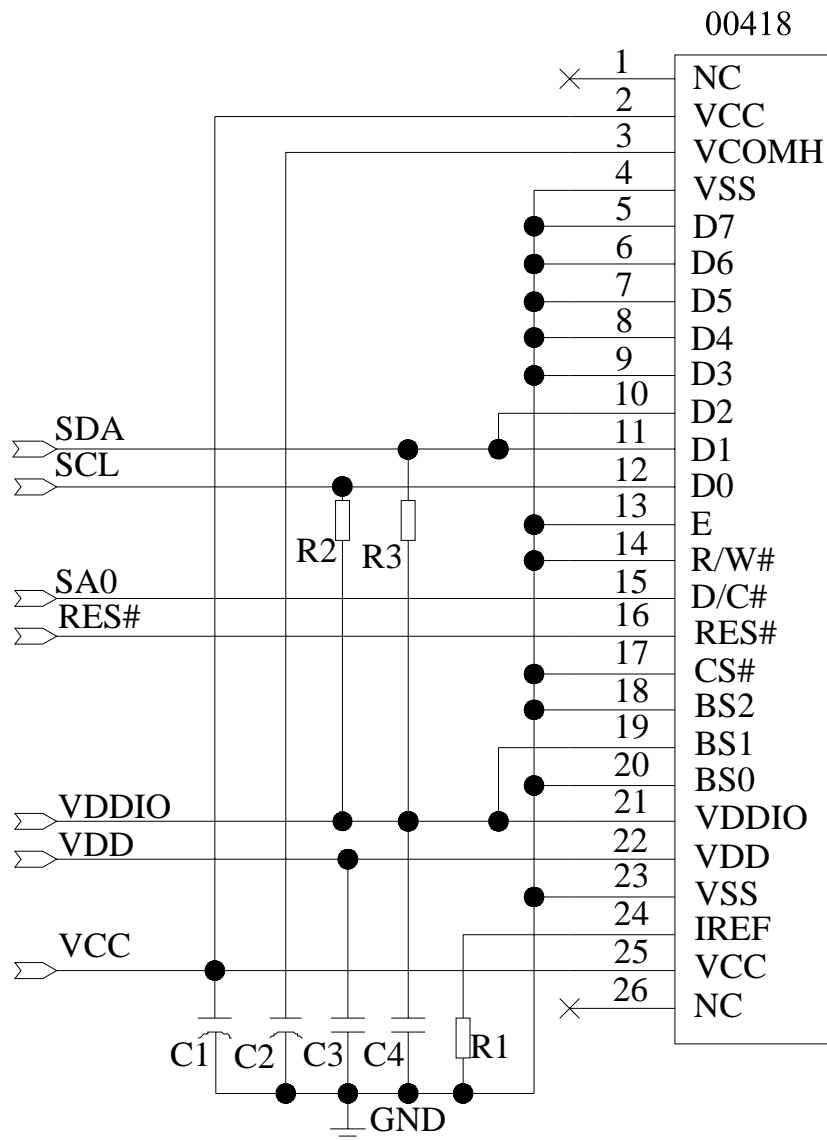
Pin connected to MCU interface:SDA,SA0,SCL, RES#

SA0	I² C Slave address
0	0X78
1	0X7A

Recommended components

C1,C2: 4.7μF/25V.ROHS (Tantalum Capacitors)

C3,C4: 0.1uF-0603-X7R±10%.ROHS

R1: 0603 1/10W +/-5% 680Kohm.ROHS

R2,R3: 0603 1/10W +/-5% 10Kohm.ROHS

9.3   External DC-DC application circuit
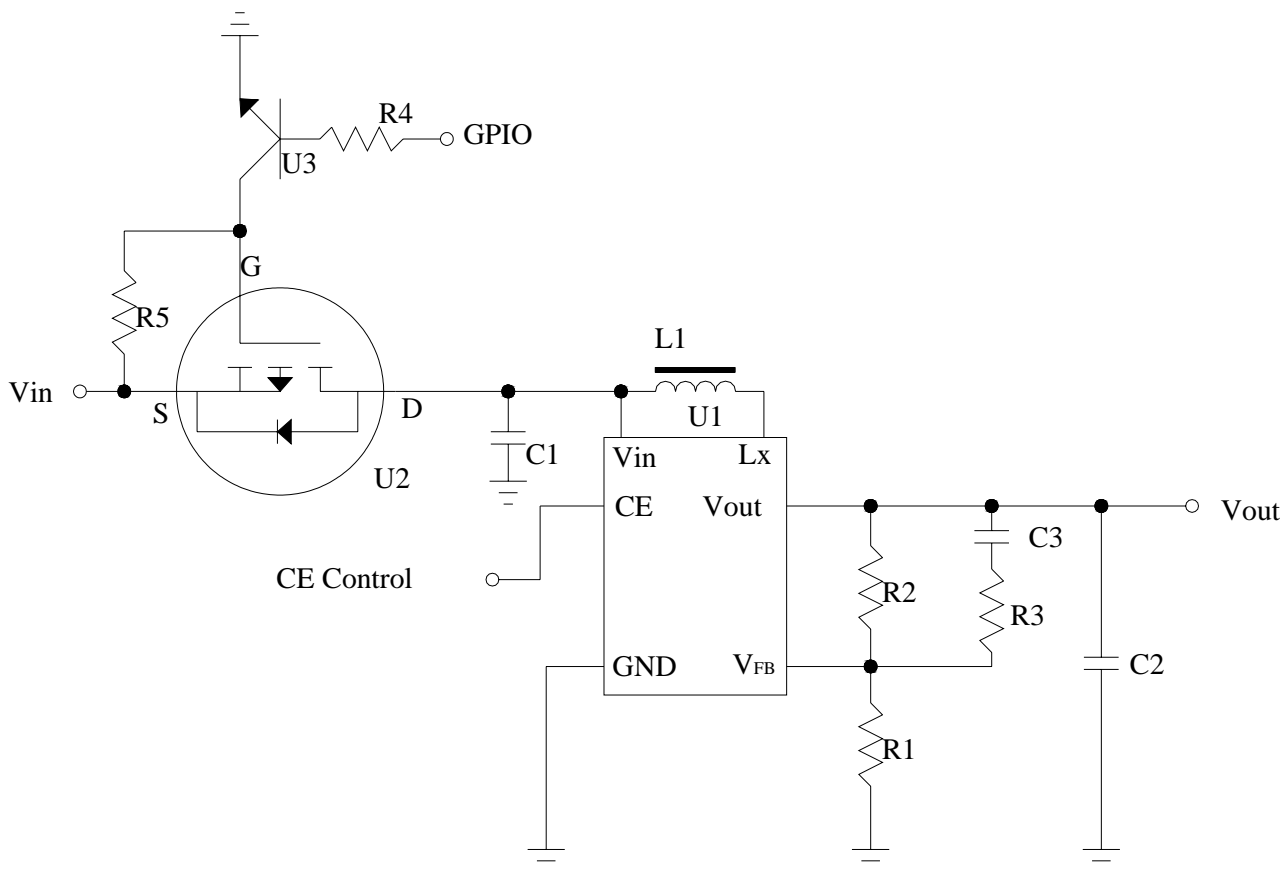
Recommend component

The C1	: 1 uF-0603-X7R±10%.ROHS
The C2	: 1 uF-0603-X7R±10%.ROHS
The C3	: 220pF-0603-X7R±10%.ROHS
The R1	: 0603 1/10W +/-5% 10Kohm.ROHS
The R2	: 0603 1/10W +/-1% 110Kohm.ROHS
The R3	: 0603 1/10W +/-5% 2Kohm.ROHS
The R4	: 0603 1/10W +/-5% 1Kohm.ROHS
The R5	: 0603 1/10W +/-5% 10Kohm.ROHS
The L1	: 22uH
The U1	: R1200
The U2	: FDN338P
The U3	: 8050

9.4 Display Control Instruction

Refer to SSD1326 IC Specification.

9.5 Recommended Software Initialization

void Write_Command(uchar command)

{

    CS=0;

    DC=0;

    WR=0;

    nop();_nop_();

    P0=command;

    WR=1;

    nop();_nop_();

    CS=1;

}
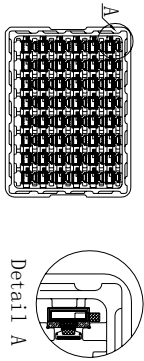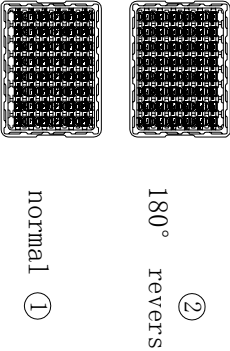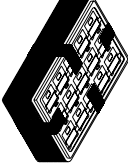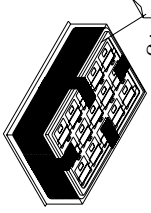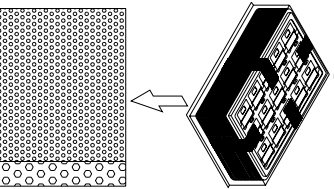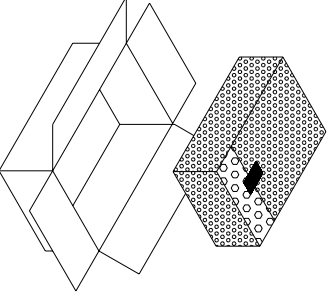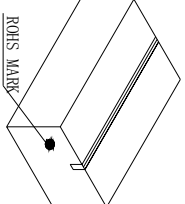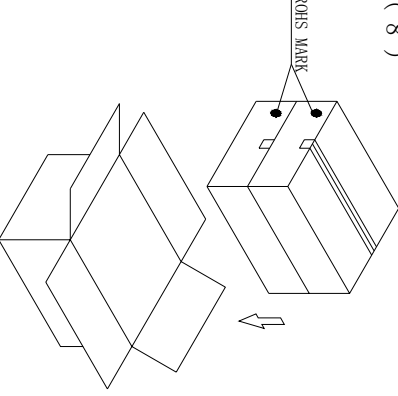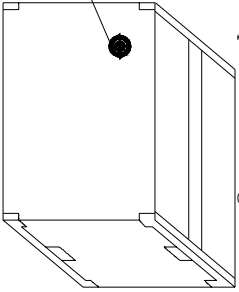
void Init_IC()

{

    Write_Command(0xFD);   //Set Command Lock

    Write_Command(0x12);

    Write_Command(0xAE);   //Set Display ON/OFF

    Write_Command(0x15);   //Set Column Address

    Write_Command(0x00);

    Write_Command(0x7F);

    Write_Command(0x75);   //Set Row Address

    Write_Command(0x00);

    Write_Command(0x1F)

    Write_Command(0x81);   //Set Contrast Current

    Write_Command(0x27);

    Write_Command(0x87);   //Set Current Range

    Write_Command(0xA0);   //Set Re-map and Gray Scale /Mono Mode

    Write_Command(0x07);

    Write_Command(0xA1);   //Set Display Start Line

    Write_Command(0x00);

    Write_Command(0xA2);   //Set Display Offset

    Write_Command(0x00)

    Write_Command(0xA8);   //Set MUX Ratio

    Write_Command(0x1F);

    Write_Command(0xB1);   //Set Phase Length

    Write_Command(0x71);

```
        Write_Command(0xB3);        //Set Front Clock Divider / Oscillator
        Write_Command(0xF0)
        Write_Command(0xB7);        //Select Default Linear Gray Scale table
        Write_Command(0xBB);        //Set Pre-charge Steup
        Write_Command(0x35);
        Write_Command(0xFF);
        Write_Command(0xBC);        //Set Pre-charge voltage
        Write_Command(0x1F);
        Write_Command(0xBE);        //Set VCOMH
        Write_Command(0x0F);
        Write_Command(0xAF);        //Set Display ON/OFF
    }
```

10 Package Specification

Controlled Seal

Packing Process (1)~(9)

(1) Tray Type:00410-MT1-B

Detail A

(2)

TRAY

180° revers ②

normal ①

(3) order① ② ① ②
500 pcs of 1 small carton
1 tray contain 24 pcs
21 contained trays, 1 empty tray

(4) Use vaccum bag to package the tray and add 5 bags of desiccant into the vacuum bag
*5

(5) After tray be packaged, wrap the package in a bubble bag and seal with scoth tape.

(6)

small carton package
L390*W290*L120 mm

(7)
ROHS MARK

(8)
ROHS MARK

2 small cartons in 1 big carton

(9)42 contained trays, 2 empty trays,
Package quantity products:
1000 pcs of 1 big carton

Package finished
L410*W310*L272 mm

ROHS MARK

NOTE:1、 The inner carton and master carton must be sealed with adhesive tape.

2、Fill up the gap with tray.

3、If the customer has special needs with the RoHS making, the inner carton and master carton need adhesive new RoHS marking at ◉.

11 Reliability

11.1 Reliability Test

NO.	ITEM	CONDITION	QUANTITY
1	High Temperature (Non-operation)	85℃,240hrs	5
2	Low Temperature (Non-operation)	-40℃,240hrs	5
3	High Temperature (Operation)	70℃,240hrs	5
4	Low Temperature (Operation)	-40℃,240hrs	5
5	High Temperature / High Humidity (Operation)	85℃,98%RH,120hrs	5
6	Thermal shock (Non-operation)	-40℃~85℃(-40℃/30min;transit/3min;85℃/30 min;transit/3min) 1cycle: 66min,100cycles	5
7	Vibration	Frequency: 5~50Hz,0.5G Scan rate: 1 oct/min Time: 2 hrs/axis Test axis: X,Y, Z	1 Carton
8	Drop	Height: 120 cm Sequence: 1 angle, 3 edges and 6 faces	1 Carton

Test and measurement conditions

1. All measurements shall not be started until the specimens attain to temperature stability, the stable

   time is at least 15 minutes.

2. The degradation of polarizer is ignored for item 1,4,&5.

3. The tolerance of temperature is ±3℃, and the tolerance of relative humidity is ±5%.

Evaluation criteria

1. The function test is OK.

2. No observable defects.

3. Luminance:≥50% of initial value.

4. Current consumption: within ± 50% of initial value.

11.2 Lifetime

End of lifetime is specified as 50% of initial brightness and the test pattern at operating condition is

50% alternating checkerboard.

ITEM	MIN	MAX	UNIT	CONDITION
Operation Life Time	16,000	-	hrs	70 cd/m^2, 50% alternating checkerboard, 22±3°C, 55±15% RH

11.3 Failure Check Standard

After the completion of the described reliability test, the samples were left at room temperature for 2

hrs prior to conducting the failure test at 22±3°C; 55±15% RH.

13 Outgoing Quality Control Specifications

13.1 Sampling Method

(1) GB/T 2828.1-2003/ISO2859-1：1999, inspection level Ⅱ, normal inspection, single sample inspection

(2) AQL: Major 0.65; Minor 1.0

13.2 Inspection Conditions

The environmental conditions for test and measurement are performed as follows.

Temperature: 22±3°C

Humidity: 55±15%R.H

Fluorescent Lamp: 30W

Distance between the Panel & Lamp: ≥50cm

Distance between the Panel & Eyes: ≥30cm

Viewing angle from the vertical in each direction: ≤45°

(See the sketch below)
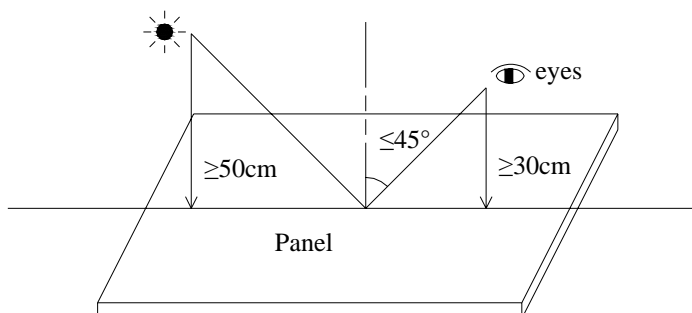
13.3 Quality Assurance Zones
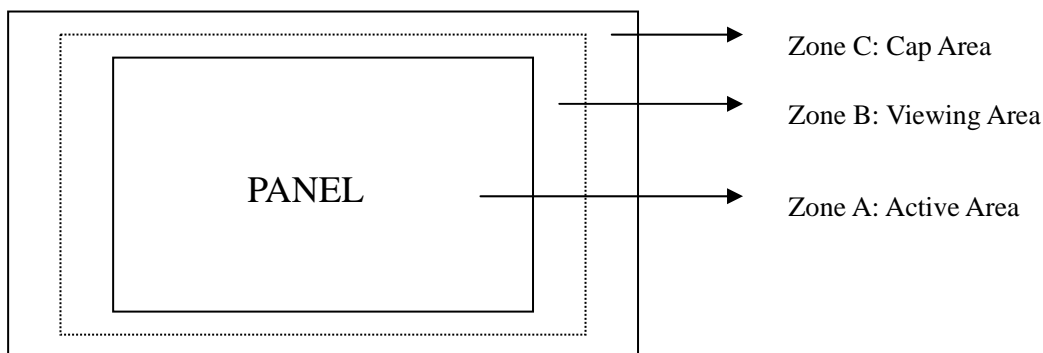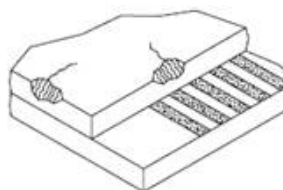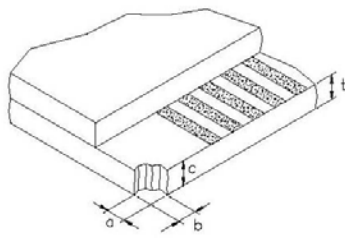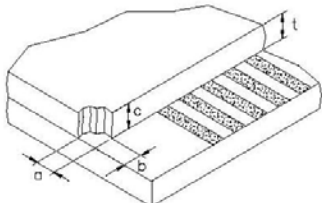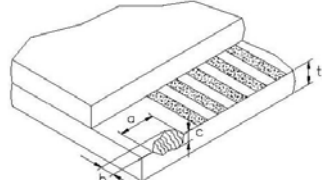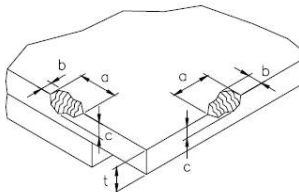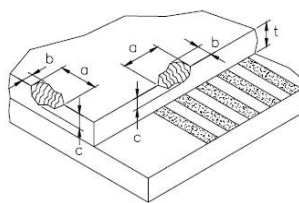
13.4 Inspection Standard

Definition of Φ&L&W (Unit: mm)

Φ=(a+b)/2
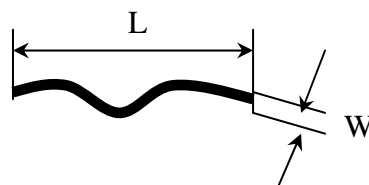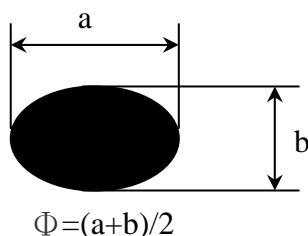
Ⅰ. Appearance Defects

NO.	ITEM	CRITERIA			CLASSIFICATION
1	Polarizer Black or White spot, Dirty spot, Foreign matter, Dent on the polarizer	**Average Diameter (mm)**	**Acceptable Number**		Minor
			Zone A,B	Zone C	
		Φ≤0.15	Ignore	Ignore	
		0.15＜Φ≤0.30	3		
		Φ＞0.30	0		
2	Scratch/line on the glass/Polarizer	**Width (mm)**	**Length (mm)**	**Acceptable Number** Zone A,B / Zone C	Minor
		W≤0.03	---	Ignore / Ignore	
		0.03＜W≤0.08	L≤5.0	3	
		W＞0.08	---	0	
3	Polarizer Bubble	**Average Diameter (mm)**	**Acceptable Number** Zone A,B / Zone C		Minor
		Φ>0.5	0	Ignore	
		0.2＜Φ≤0.5	3		
		Φ≤0.2	Ignore		
4	Any Dirt & Scratch on Polarizer's Protective Film	Ignore for not affect the polarizer.			Acceptable
5	Glass Crack	Propagation crack is not acceptable.			Major

6	Corner Chip	t= Glass thickness Accept a≤2.0mm or b≤2.0mm, c≤t	Minor
7	Corner Chip on Cap Glass	t= Glass thickness Accept a≤1.5mm or b≤1.5mm, c≤t	Minor
8	Chip on Contact Pad	t= Glass thickness Accept a≤3.0mm or b≤0.8mm, c≤t (on the contact pin) a≤3.0mm or b≤1.5mm, c≤t (outside of the contact pin)	Minor
9	Chip on Face of Display	t= Glass thickness Accept a≤1.5mm or b≤1.5mm, c≤t	Minor
10	Chip on Cap Glass	t= Glass thickness Accept a≤3.0mm or b≤3.0mm, c≤t/2 a≤1.5mm or b≤1.5mm, t/2≤c≤t	Minor
11	Stain on Surface	Stain removable by soft cloth or air blow is acceptable.	Minor
12	TCP/FPC Damage	(1) Crack, deep scratch, deep hole and deep pressure mark on the TCP/FPC are not acceptable. (2) Terminal lead twisted or broken is not allowable. (3) Copper exposed is not allowed by naked eye inspection.	Minor
13	Dimension Unconformity	Checking by mechanical drawing.	Major

Ⅱ. **Displaying Defects**

NO.	Items	Criteria			Classification
1	Black/White spot Dirty spot Foreign matter	Average Diameter (mm)	Pieces Permitted		Minor
			Zone A,B	Zone C	
		Φ≤0.10	Ignore	Ignore	
		0.10＜Φ≤0.20	3		
		Φ＞0.20	0		
2	No Display	Not allowable.			Major
3	Irregular Display	Not allowable.			Major
4	Missing Line (row or column)	Not allowable.			Major
5	Short	Not allowable.			Major
6	Flicker	Not allowable.			Major
7	Abnormal Color	Refer to the SPEC.			Major
8	Luminance NG	Refer to the SPEC.			Major
9	Over Current	Refer to the SPEC.			Major

13.5 Luminance Uniformity

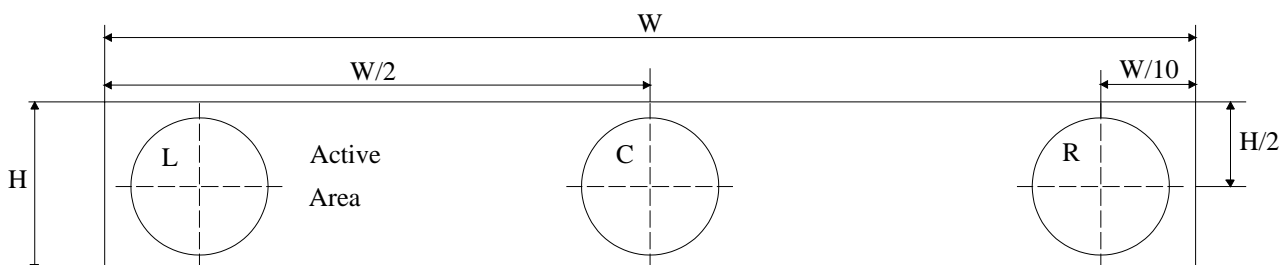| Parameter	Max	Unit
Luminance Uniformity	5	%

Luminance uniformity is measured as the relative deviation of brightness across the panel in 3 regions .

$Lu = (Lmax – Lmin)/Lmax \times 100\%$

Lu: Luminance uniformity

Lmax: indicates the maximum luminance of the 3 points

Lmax: indicates the minimum luminance of the 3 points

14 Precautions for operation and Storage

14.1 Precautions for Operation

(1) Since OLED panel is made of glass, do not apply any mechanical shock or impact or excessive force to it when installing the OLED module. Any strong mechanical impact due to falling dropping etc. may cause damage (breakage or cracking).

(2) The polarizer on the OLED surface is made of soft material and is easily scratched. Please take most care when handing. When the surface of the polarizer of OLED Module is contaminated, please wipe it off gently by using moisten soft cloth with isopropyl alcohol, do not use water, ketone or aromatics. If there is saliva or water on the OLED surface, please wipe it off immediately.

(3) When handling OLED module, please be sure that the body and the tools are properly grounded. And do not touch I/O pins with bare hands or contaminate I/O pins, it will cause disconnection or defective insulation of terminals.

(4) Do not attempt to disassemble or process the OLED module.

(5) OLED module should be used under recommended operating conditions shown in the specification. Since the higher voltage leads to the shorter lifetime, be sure to use the specified operating voltage.

(6) Foggy dew, moisture condensation or water droplets deposited on surface and contact terminals will cause polarizer stain or damage, the deteriorated display quality and electrochemical reaction then leads to shorter life time and permanent damage to the module probably. Please pay attention to the environmental temperature and humidity.

(7) An afterimage is created by the difference in brightness between unused dot and the fixed dot, according to the decrease of brightness of the emitting time. Therefore, to avoid having an afterimage, the full set should be thoroughly used instead of using a fixed dot. When the fixed dot emits, an afterimage can be created.

(8) Flicker could be come out at full on display. And it disappears when frame frequency increase, but brightness decreases too.

14.2 Soldering

(1) Soldering should be performed only on the I/O terminals.

(2) Use soldering irons with proper grounding and no leakage.

(3) Iron: no higher than 300℃ and 3~4 sec during soldering.

14.3 Precautions for Storage

(1) Please store OLED module in a dark place. Avoid exposure to sunlight, the light of fluorescent lamp or any ultraviolet ray.

(2) Keep the environment temperature between 10℃ and 35℃ and the relative humidity less than 60%. Avoid high temperature and high humidity.

(3) Keep the OLED modules stored in the container when shipped from supplier before using them is recommended.

(4) Do not leave any article on the OLED module surface for an extended period of time.

14.4 Warranty period

EastRising Technology Co., Ltd. warrants for a period of 12 months from the shipping date when stored or used under normal condition.