Product Specification

（Common Application）

Product Name: VGM128128B6F03

Product Code: M80093

Customer
Approved by Customer
Approved Date:

Designed By	Checked By	Approved By	
		R&D	QA

CONTENT

REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
A01	Initial release.	2018-03-28	
A02	Add Serial Interface	2018-04-08	Page 14 Page 20
A03	Update Mechanical Drawing	2018-06-16	Page 5
A04	Update Mechanical Drawing Update Recommended Software Initialization Update Package Specification	2018-07-03	Page 5 Page 22 Page 23 Page 24
A05	Remove logo and change company name, website, email address Change appearance drawing and packing drawing	2021-07-30	All Page

1 Application filed

Common Application

2 Overview

VGM128128B6F03 is a full color OLED display module with 128×128 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.

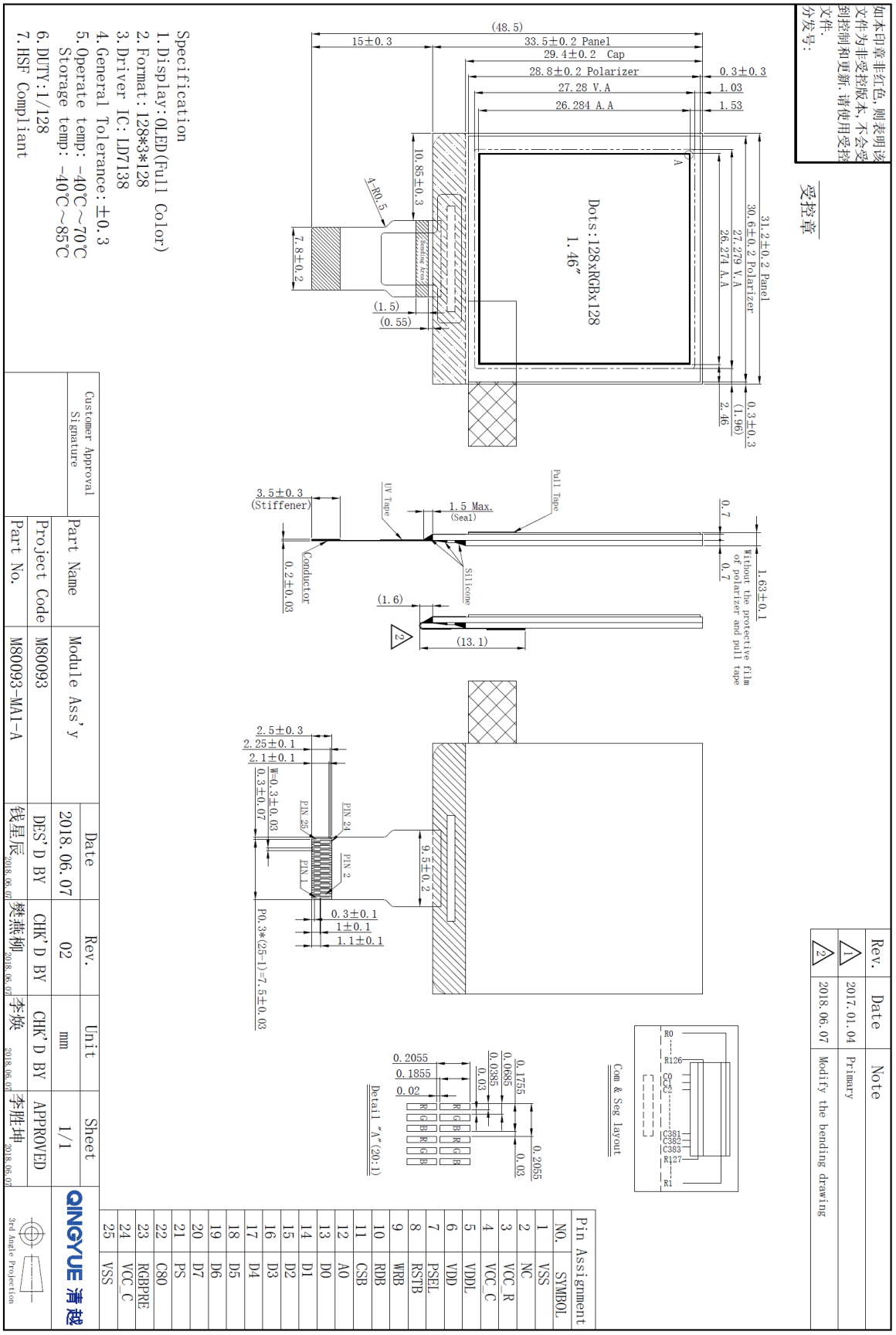
3 Features

- Display Color: Full Color
- Dot Matrix:128×128
- Driver IC: LD7138
- Interface: 8-bit 8080, 8-bit 6800, Serial
- Wide range of operating temperature: -40℃ to 70℃
- Wide range of Storage temperature: -40℃ to 85℃

4 Mechanical Data

NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	128(W)×128(H)	-
2	Dot Size	0.1755(W)×0.1855(H)	mm^2
3	Dot Pitch	0.2055(W)×0.2055(H)	mm^2
4	Aperture Rate	77.1	%
5	Active Area	26.274(W)×26.284(H)	mm^2
6	Panel Size	31.2(W)×33.5(H) ×1.4(T)	mm^3
7	Module Size	31.2(W)×48.5(H) ×1.63(T)	mm^3
8	Diagonal A/A Size	1.46	inch
9	Module Weight	3.15±10%	gram

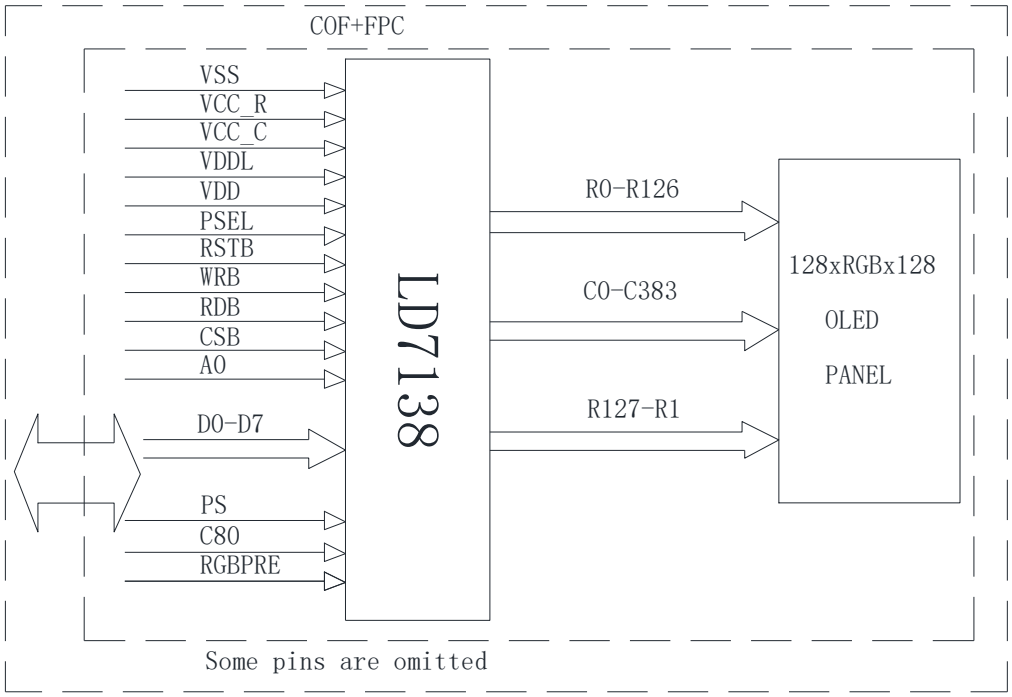
5 Mechanical Drawing



6 Module Interface

PIN NO.	PIN NAME	DESCRIPTION
1,25	VSS	Ground pin
2	NC	No Connection.
3	VCC_R	This pin is the power output pin of internal row power regulator. A 4.7uF capacitor is recommended to connect between VCC_R and GND.
4,24	VCC_C	Column Driver Power.
5	VDDL	Internal Logic Power. Refer to application guide. Capacitor is connected between VDDL and VSS.
6	VDD	Interface Power & Analog Power.
7	PSEL	This pin enable/disable internal logic power regulator. When this pin is tied with VDD pin, it is the internal logic power regulator enabled.
8	RSTB	Reset (Active Low).
9	WRB	Write (Active Low) for 8080 Series, H : Read, L : Write for 6800 Series.
10	RDB	Read (Active Low) for 8080 Series, Read or Write Enable for 6800 Series.
11	CSB	Chip Select (Active Low).
12	A0	Address (L: command, H: Parameter).
13~20	D0~D7	These are 8-bit bi-directional data bus to be connected to the microprocessor’s data bus.
21	PS	H: Parallel L: Serial.
22	C80	H: 6800CPU L: 8080CPU.
23	RGBPRE	Column Driver Pre-Charge Power for RGB.

7 Function Block Diagram



8 Absolute Maximum Ratings

ITEM	SYMBOL	MIN	MAX	UNIT	REMARK
Supply Voltage	VDD	-0.3	+3.6	V	IC maximum rating
	VDDL	-0.3	+2.4	V	IC maximum rating
	VCC_C	-0.3	+20.0	V	IC maximum rating
	RGBPRE	-0.3	+7.0	V	IC maximum rating
Operating Temp.	Top	-40	70	℃	-
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 9 "Electrical Characteristics". Malfunctioning of the module may occur and the reliability of the module may deteriorate if the module is used beyond the conditions.

9 Electrical Characteristics

9.1 DC Electrical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYPE	MAX	UNIT
Supply Voltage	VDD	22±3°C, 55±15%R.H	-	2.8	3.3	V
	VDDL	55±15%R.H 22±3°C,	-	1.8	2.0	V
	VCC_C	22±3°C, 55±15%R.H	12.5	13	13.5	V
High-level Input Voltage	V_{IH}	-	0.8× VDD	-	-	V
Low-level Input Voltage	V_{IL}	-	-	-	0.2× VDD	V
High-level Output Voltage	V_{OH}	IOUT = 100uA, 3.3MHz	0.9× VDD	-	-	V
Low-level Output Voltage	V_{OL}	IOUT = 100uA, 3.3MHz	-	-	0.1× VDD	V

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

9.2 Electro-optical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYPE	MAX	UNIT
Normal Mode Brightness	Lbr	All pixels ON(1) (VCC_C Supply by external)	60	75	-	cd/m2
Normal Mode Power Consumption	Pt	All pixels ON(1)	-	546	715	mW
ICC, Stand-By Current	ICC	VCC_C/VCC_R	-	-	10	uA
IDD, Stand-By Current	IDD	PSEL=VDD	-	-	60	uA
C.I.E(W)	(x)	x,y(CIE1931)	0.26	0.30	0.34	-
	(y)		0.29	0.33	0.37	
C.I.E(R)	(x)	x,y(CIE1931)	0.61	0.65	0.69	-
	(y)		0.30	0.34	0.38	
C.I.E(G)	(x)	x,y(CIE1931)	0.27	0.31	0.35	-
	(y)		0.57	0.61	0.65	-
C.I.E(B)	(x)	x,y(CIE1931)	0.10	0.14	0.18	-
	(y)		0.13	0.17	0.21	-
Dark Room Contrast	CR	-	≥10000:1	-	-	-
Response Time	-	-	-	10	-	μ s
View Angle	-	-	≥160	-	-	Degree

Note: Normal Mode test conditions are as follows:

- Driving voltage : VCC_C=13V.
- Contrast setting :0xff,0x70,0xcf
- Duty setting : 1/128

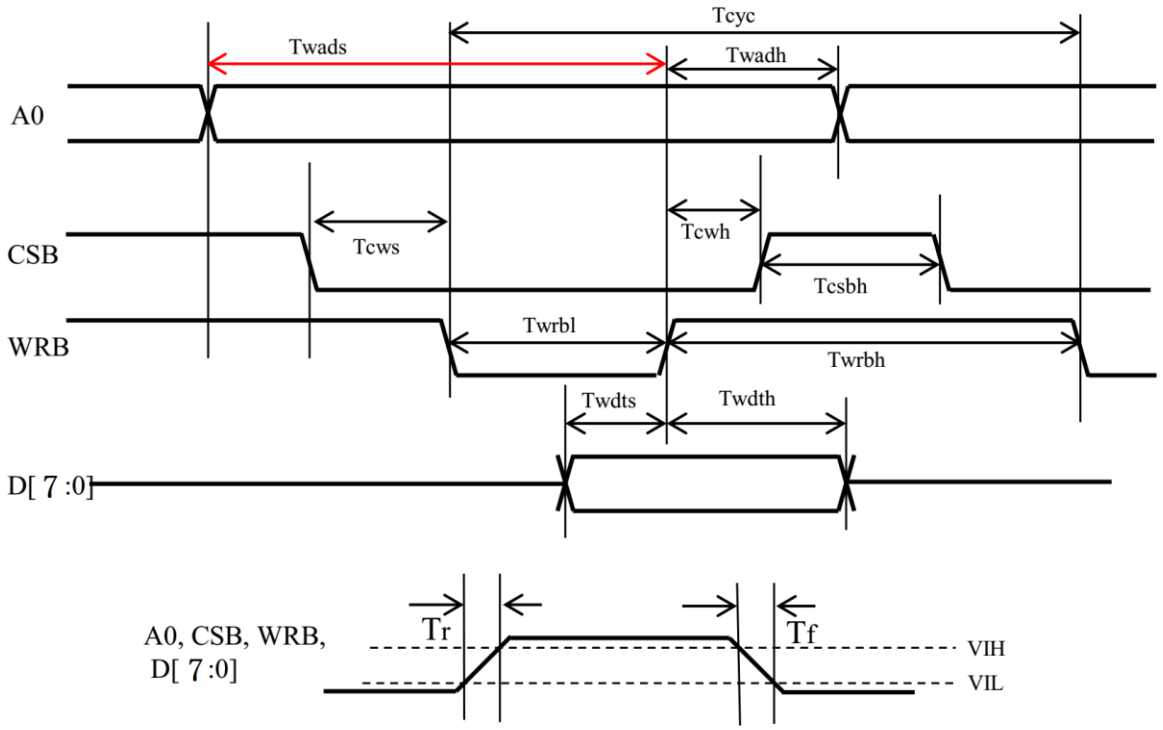
9.3 AC Electrical Characteristics

9.3.1 Parallel Interface (8080 Series CPU)

Writing Timing for 8080 Series CPU

(Ta = 25℃, VSS =0V, VDD=2.8V, VCC_C =18V, RGBPRE=0V, CL=100pF)

Parameter	Symbol	Related Pins	Specification		Unit
			MIN	MAX	
Write Cycle Time	Tcyc	WRB	100	-	ns
Address Setup Time	Twads	A0	50		ns
Address Hold Time	Twadh	A0	20		ns
Select Setup Time	Tcws	CSB	10		ns
Select Hold Time	Tcwh	CSB	20		ns
Write Low Pulse Width	Twrbl	WRB	30		ns
Write High Pulse Width	Twrbh	WRB	40		ns
Select High Pulse Width	Tcsbh	CSB	10		ns
Data Setup Time	Twdts	D7 ~ D0	10		ns
Data Hold Time	Twdth	D7 ~ D0	30		ns
Rising Time	Tr	A0, CSB, WRB, D7 ~ D0	-	30	ns
Falling Time	Tf	A0, CSB, WRB, D7 ~ D0	-	30	ns



Writing Timing for 80Series CPU

(Ta = 25℃, VSSA=VSSD=0V, VDD=1.65V~2.0V, VCC_C=VCC_R=18V, R/G/BPRE=0V, CL=100pF)

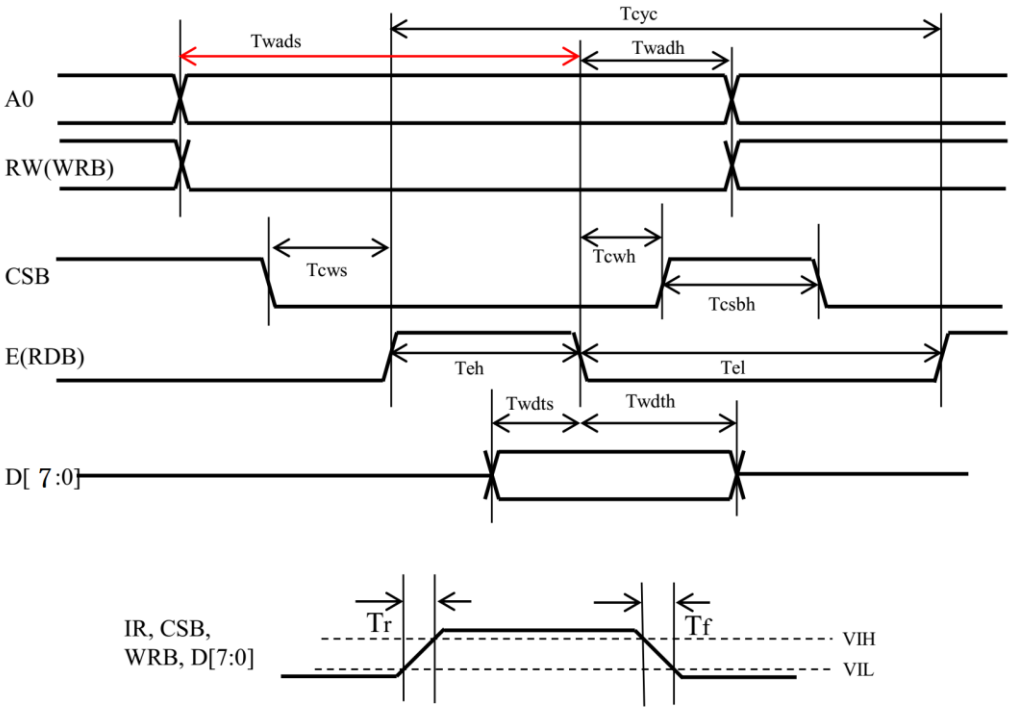
Parameter	Symbol	Related Pins	Specification		Unit
			MIN	MAX	
Write Cycle Time	Tcyc	WRB	300	-	ns
Address Setup Time	Twads	A0	60		ns
Address Hold Time	Twadh	A0	30		ns
Select Setup Time	Tcws	CSB	20		ns
Select Hold Time	Tcwh	CSB	30		ns
Write Low Pulse Width	Twrbl	WRB	120		ns
Write High Pulse Width	Twrbh	WRB	120		ns
Select High Pulse Width	Tcsbh	CSB	20		ns
Data Setup Time	Twdts	D15 ~ D0	60		ns
Data Hold Time	Twdth	D15 ~ D0	30		ns
Rising Time	Tr	A0, CSB, WRB, D15 ~ D0	-	30	ns
Falling Time	Tf	A0, CSB, WRB, D15 ~ D0	-	30	ns

9.3.2 Parallel Interface (6800 Series CPU)

Writing Timing for 6800 Series CPU

(Ta = 25℃, VSS =0V, VDD=2.8V, VCC_C=VCC_R=18V, RGBPRE=0V, CL=100pF)

Parameter	Symbol	Related Pins	Specification		Unit
			MIN	MAX	
Write Cycle Time	Tcyc	E	100	-	ns
Address Setup Time	Twads	A0, RW	50		ns
Address Hold Time	Twadh	A0, RW	20		ns
Select Setup Time	Tcws	CSB	10		ns
Select Hold Time	Tcwh	CSB	20		ns
Write Low Pulse Width	Tel	E	40		ns
Write High Pulse Width	Teh	E	30		ns
Select High Pulse Width	Tcsbh	CSB	10		ns
Data Setup Time	Twdts	D7 ~ D0	10		ns
Data Hold Time	Twdth	D7 ~ D0	30		ns
Rising Time	Tr	A0, CSB, RW, E, D7 ~ D0	-	30	ns
Falling Time	Tf	A0, CSB, RW, E, D7 ~ D0	-	30	ns

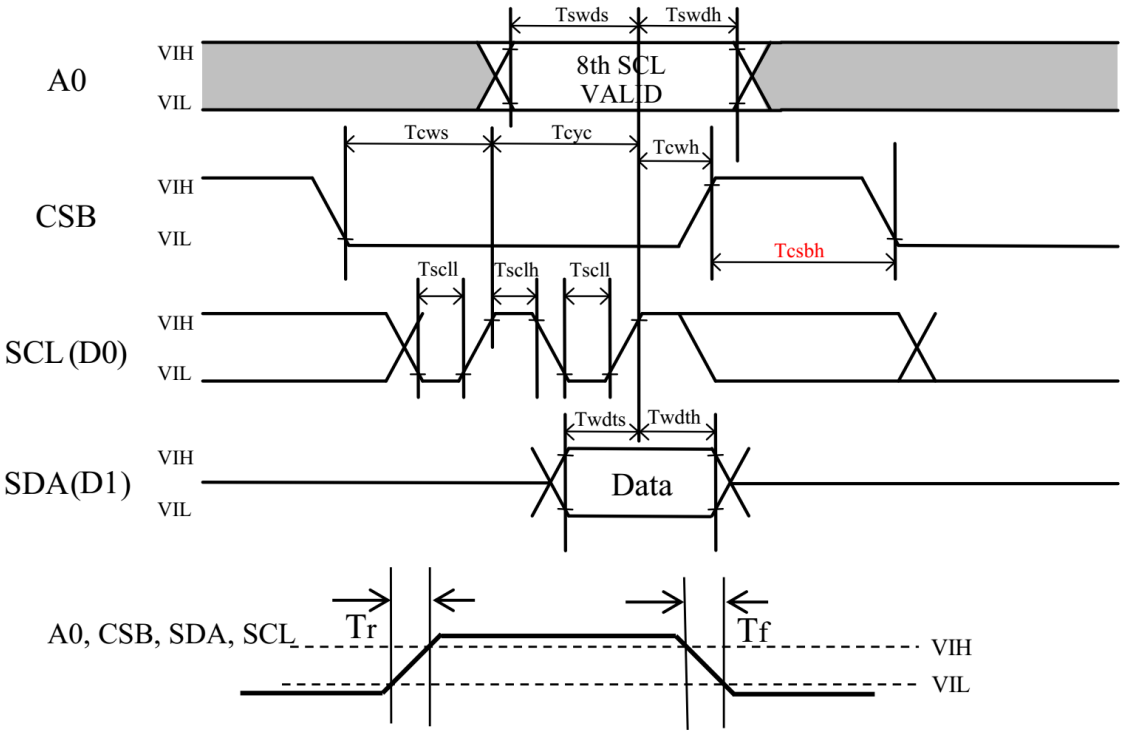


9.3.3 Serial Interface

Writing Timing

(Ta = 25℃, VSS =0V, VDD=2.8V, VCC_C=VCC_R=18V, RGBPRE=0V, CL=100pF)

Parameter	Symbol	Related Pins	Specification		Unit
			MIN	MAX	
Write Cycle Time	Tcyc	SCL(D0)	100	-	ns
Address Setup Time	Tswds	A0	65		ns
Address Hold Time	Tswdh	A0	35		ns
Select Setup Time	Tcws	CSB	65		ns
Select Hold Time	Tcwh	CSB	35		ns
SCL Low Pulse Width	Tscll	SCL(D0)	45		ns
Write High Pulse Width	Tsclh	SCL(D0)	45		ns
Select High Pulse Width	Tcsbh	CSB	30		ns
Data Setup Time	Twdts	SDA(D1)	20		ns
Data Hold Time	Twdth	SDA(D1)	30		ns
Rising Time	Tr	A0, CSB, SDA, SCL	-	30	ns
Falling Time	Tf	A0, CSB, SDA, SCL	-	30	ns



Writing Timing

(Ta = 25℃, VSSA=VSSD=0V, VDD=1.65V~2.0V, VCC_C=VCC_R=18V, R/G/BPRE=0V, CL=100pF)

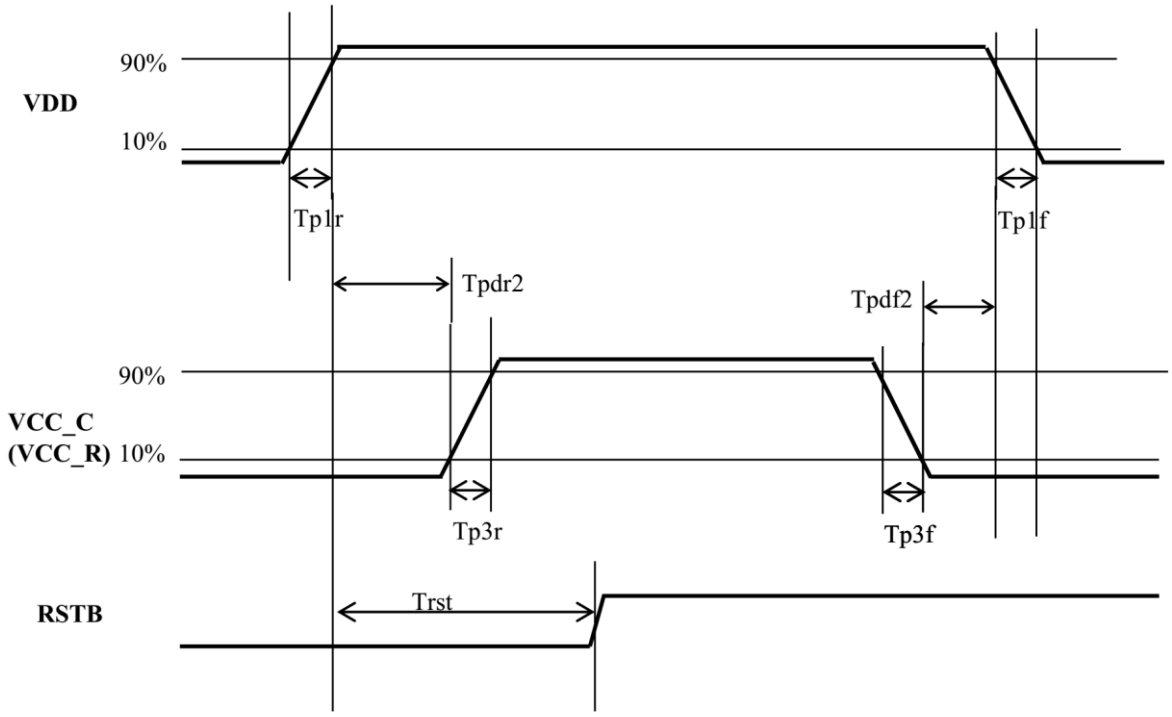
Parameter	Symbol	Related Pins	Specification		Unit
			MIN	MAX	
Write Cycle Time	Tcyc	SCL(D0)	150	-	ns
Address Setup Time	Tswds	A0	65		ns
Address Hold Time	Tswdh	A0	60		ns
Select Setup Time	Tcws	CSB	65		ns
Select Hold Time	Tcwh	CSB	60		ns
SCL Low Pulse Width	Tscll	SCL(D0)	60		ns
Write High Pulse Width	Tsclh	SCL(D0)	60		ns
Select High Pulse Width	Tcsbh	CSB	100		ns
Data Setup Time	Twdts	SDA(D1)	60		ns
Data Hold Time	Twdth	SDA(D1)	60		ns
Rising Time	Tr	A0, CSB, SDA, SCL	-	30	ns
Falling Time	Tf	A0, CSB, SDA, SCL	-	30	ns

10 Functional Specification and Application Circuit

10.1 Power ON and Power OFF Sequence

Power ON Sequence:

PSEL = VDD, C_{VDDL} = 2uF

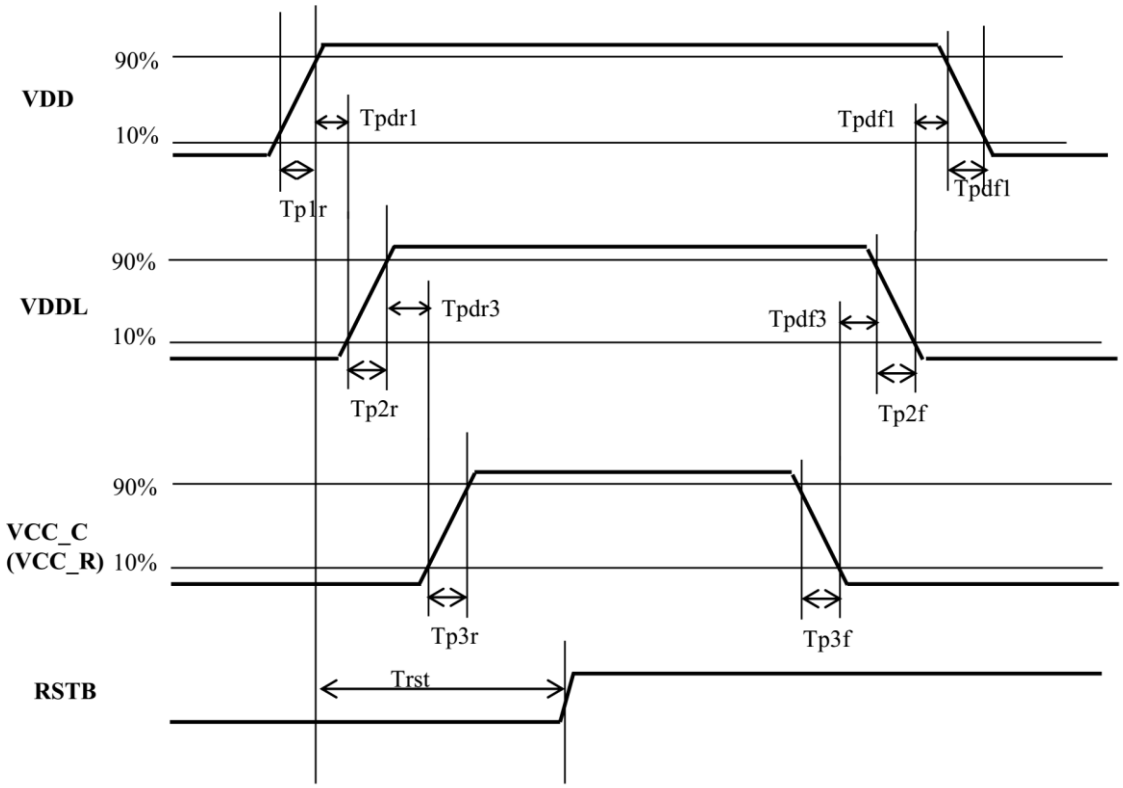


(Ta = 25℃, VSS =0V, VDD=2.8V, VCC_C=VCC_R=13V, RGBPRE=0V, CL=100pF)

Parameter	Symbol	Related Pins	Specification			Unit
			MIN	TYP	MAX	
VDD On Slope VDD Off Slope	Tp1r Tp1f	VDD	0.2	1	5	ms/V
VCC_C(VCC_R) On Slope VCC_C(VCC_R) Off Slope	Tp3r Tp3f	VCC_C(VCC_R)	0.2	1	5	ms/V
From VDD to VCC_C(VCC_R) Delay	Tpdr2	VDD, VCC_C(VCC_R)	2	-	-	ms
From VCC_C(VCC_R) to VDD Delay	Tpdf2	VDD, VCC_C(VCC_R)	2	-	-	ms
From VDD to H/W Reset Release	Trst	VDD, RSTB	30	-	-	ms

Power OFF sequence(‘CONT) :

PSEL = VSS

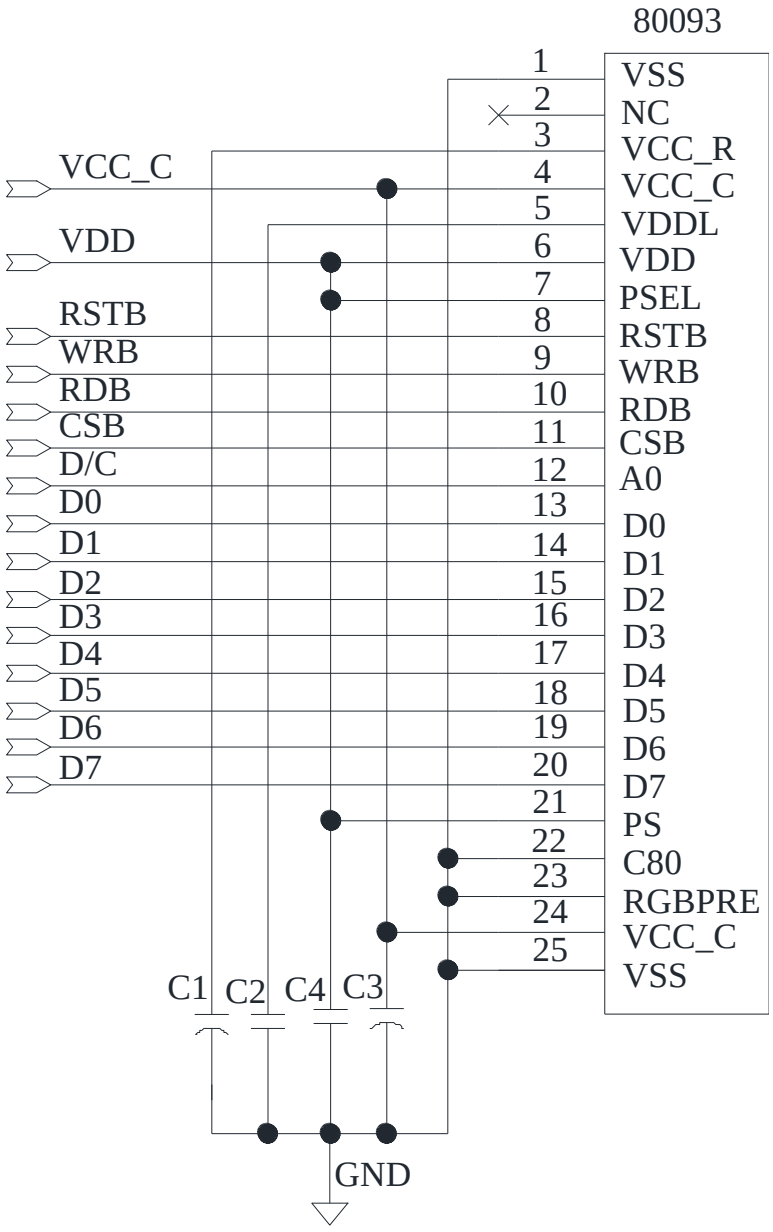


(Ta = 25℃, VSS =0V, VDD=2.8V, VCC_C=VCC_R=13V, RGBPRE=0V, CL=100pF)

Parameter	Symbol	Related Pins	Specification			Unit
			MIN	TYP	MAX	
VDDL On Slope VDDL Off Slope	Tp2r Tp2f	VDDL	0.2	1	5	ms/V
From VDD to VDDL Delay	Tpdr1	VDD, VDDL	1	-	-	ms
From VDDL to VDD Delay	Tpdf1	VDD, VDDL	1	-	-	ms
From VDDL to VCC_C(VCC_R) Delay	Tpdr3	VDDL, VCC_C(VCC_R)	1	-	-	ms
From VCC_C(VCC_R) to VDDL Delay	Tpdf3	VDDL, VCC_C(VCC_R)	1	-	-	ms
From VDD to H/W Reset Release	Trst	VDD, RSTB	30	-	-	ms

10.2 Application Circuit

10.2.1 The configuration (for 8080) VCC_C Supply by external is shown in the following diagram, VDDL and VCC_R is generated by internally. VDD=3.3V ~ 2V, VDD Reg. ON:



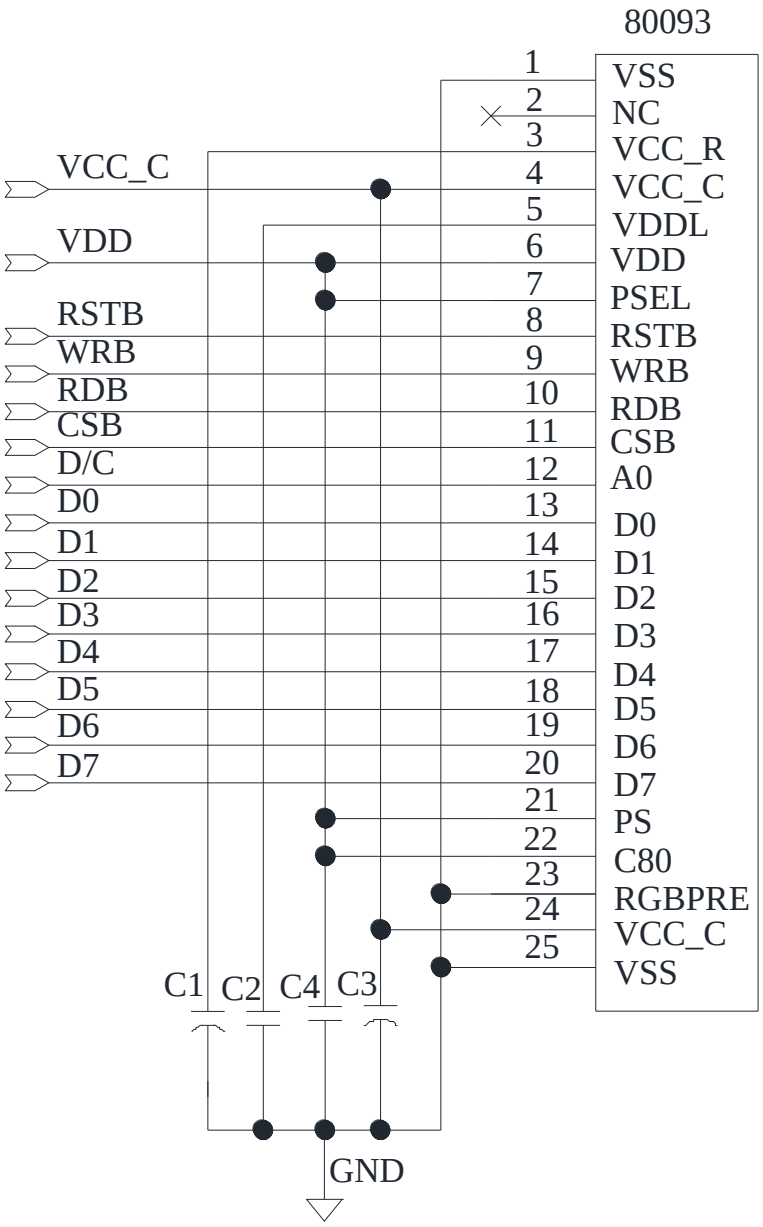
Pin connected to MCU interface: RSTB,WRB,RDB,CSB,D/C,D0~D7.

Recommended components

C1,C3 : 4.7μF/25V.RoHS (Tantalum Capacitors)

C2,C4 : 1.0uF-0603-X7R±10%.RoHS

10.2.2 The configuration (for 6800) VCC_C Supply by external is shown in the following diagram, VDDL and VCC_R is generated by internally. VDD=3.3V ~ 2V, VDD Reg. ON:



Pin connected to MCU interface: RSTB,WRB,RDB,CSB,D/C,D0~D7.

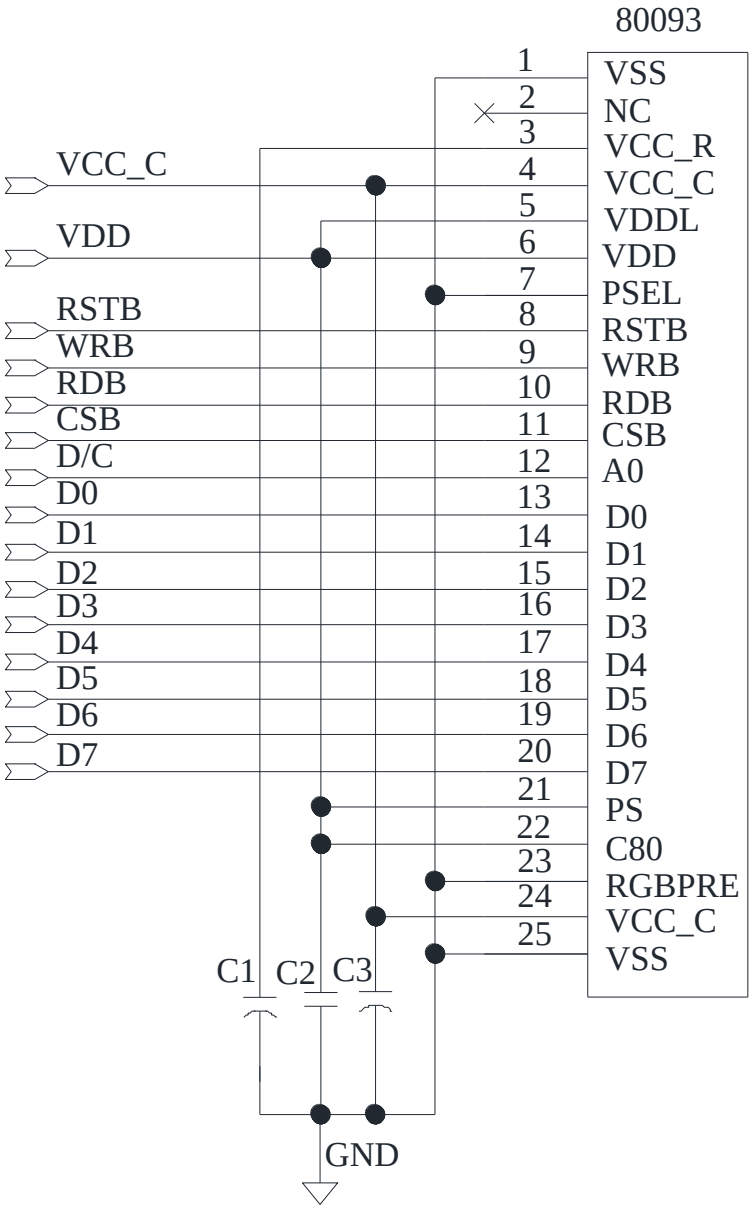
Recommended components

C1,C3 : 4.7μF/25V.RoHS (Tantalum Capacitors)

C2,C4 : 1.0uF-0603-X7R±10%.RoHS

The configuration (for 6800) VCC_C Supply by external is shown in the following diagram,

VDDL is Supply by external Circuit. VDD=1.9V ~ 1.65V, VDD Reg. OFF:



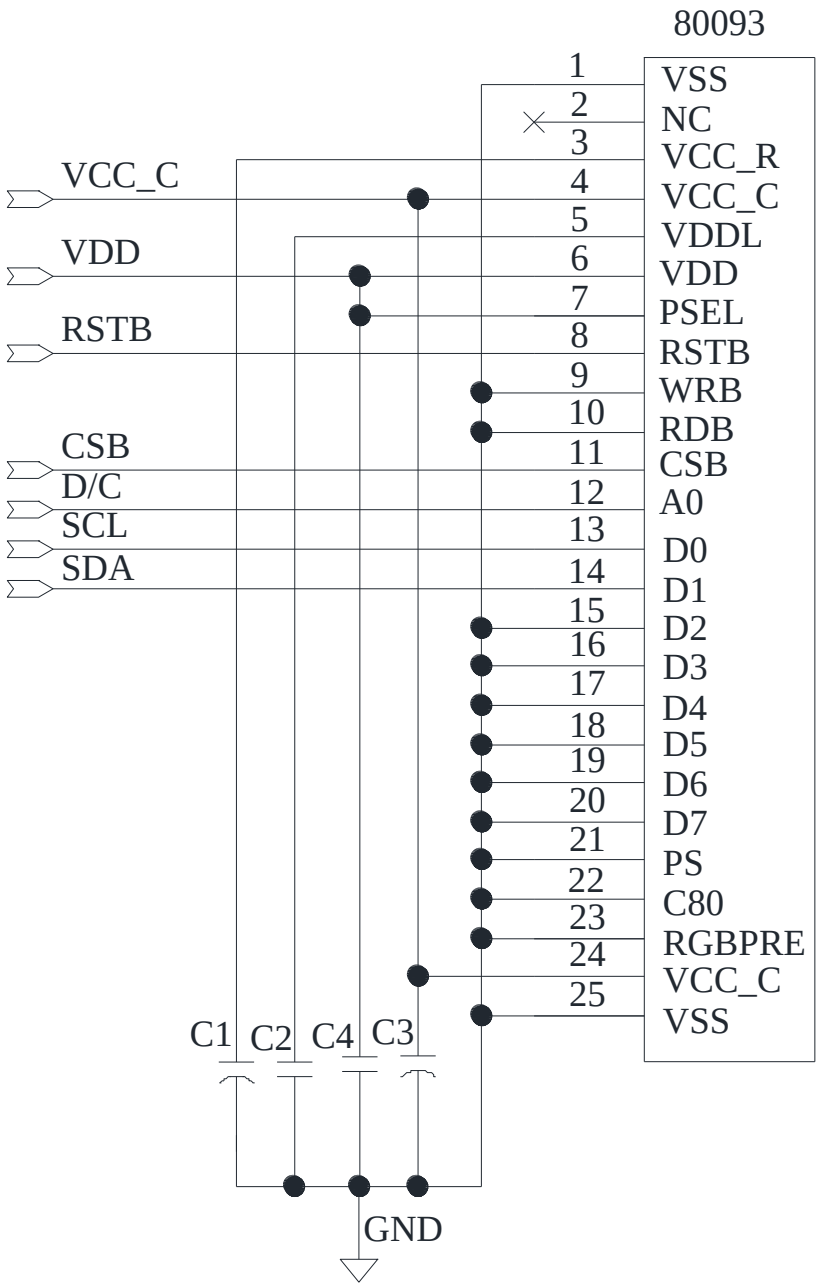
Pin connected to MCU interface: RSTB,WRB,RDB,CSB,D/C,D0~D7.

Recommended components

C1,C3 : 4.7μF/25V.RoHS (Tantalum Capacitors)

C2 : 1.0uF-0603-X7R±10%.RoHS

10.2.3 The configuration (Serial Interface) VCC_C Supply by external is shown in the following diagram, VDDL and VCC_R is generated by internally. VDD=3.3V ~ 2V, VDD Reg. ON:



Pin connected to MCU interface: RSTB,CSB,D/C,SCL,SDA.

Recommended components

C1,C3 : 4.7μF/25V.RoHS (Tantalum Capacitors)

C2,C4: 1.0uF-0603-X7R±10%.RoHS

10.3 Display Control Instruction

Refer to LD7138 IC Specification.

10.4 Recommended Software Initialization

In order to ensure the reliability and stability of the module, the module must initialized use the following code, Malfunctioning of the module may occur and the reliability of the module may deteriorate if the module is used beyond the initialize code.

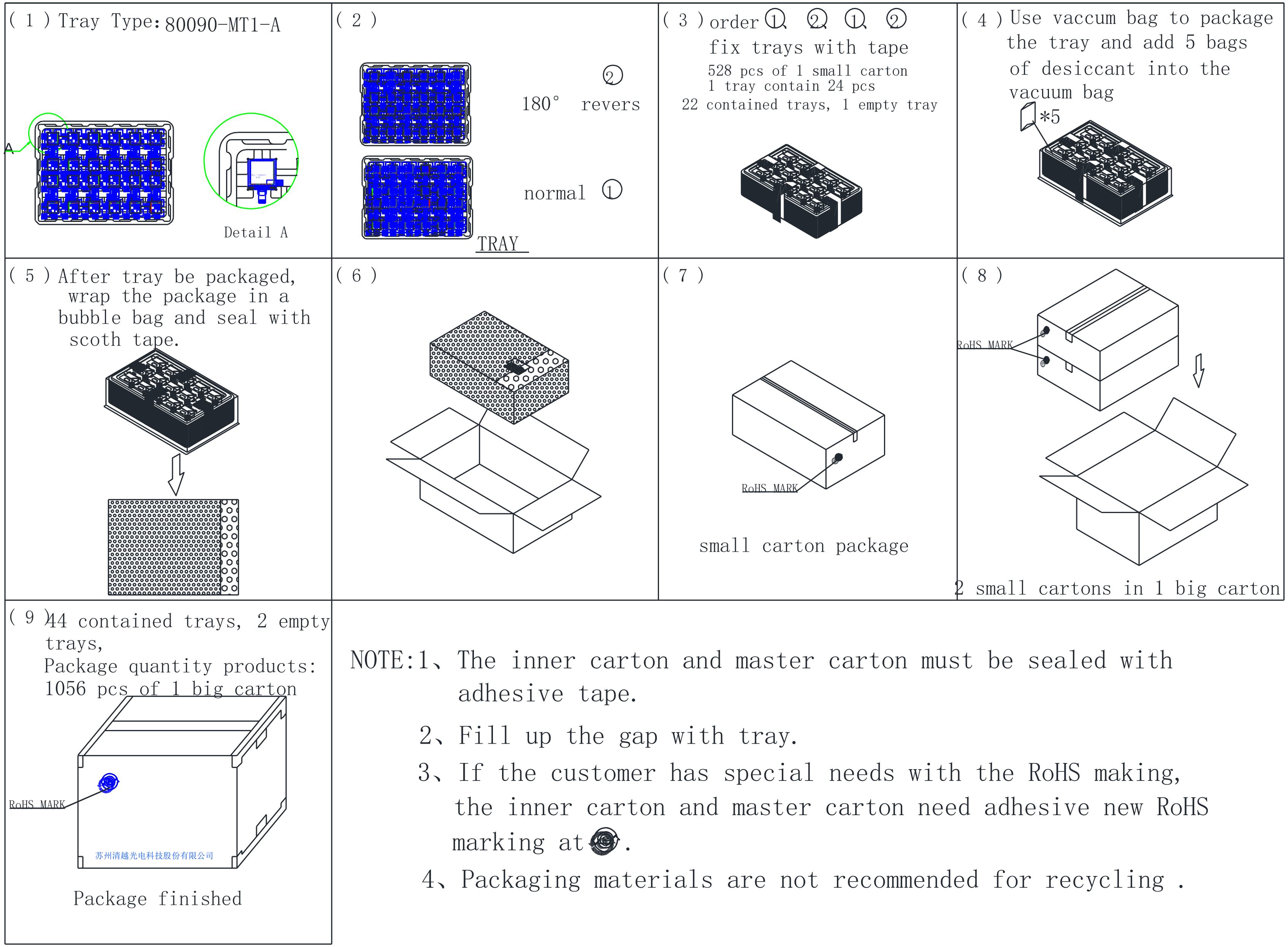
```
void Init_IC()
{  write_c(0x01);        //Software Reset
   write_c(0x02);        // Set Dot Matrix Display ON/OFF
   write_d(0x00);        //OFF
   write_c(0x03);        // Set Dot Matrix Display Stand-by ON/OFF
   write_d(0x00);        // Indicates the dot oscillator is starting.
   write_c(0x04);        // Set OSC Control
   write_d(0x04);
   write_c(0x05);        // Set Graphic RAM Writing Direction
   write_d(0x00);
   write_c(0x06);        // Set Row Scan Direction
   write_d(0x00);
   write_c(0x07);        //Set Display Size
   write_d(0x00);        //Xstart 1
   write_d(0x00);        //Xstart 2
   write_d(0x07);        //Xend 1
   write_d(0x0f);        //Xend 2
   write_d(0x00);        //Ystart 1
   write_d(0x00);        //Ystart 2
   write_d(0x07);        //Yend 1
   write_d(0x0f);        //Yend 2
   write_c(0x08);        //Set Interface Bus Type
   write_d(0x01);        //8Bit I/F Bus
   write_c(0x09);        //Set Masking Data
   write_d(0x07);        //Output Data
   write_c(0x0a);        // Set Read/Write Box Data
   write_d(0x00);        //Xstart 1
   write_d(0x00);        //Xstart 2
   write_d(0x07);        //Xend 1
   write_d(0x0f);        //Xend 2
   write_d(0x00);        //Ystart 1
```

```
write_d(0x00);          //Ystart 2
write_d(0x07);          //Yend 1
write_d(0x0f);          //Yend 2
write_c(0x0b);          //Set Display Start Address
write_d(0x00);          //1st Parameter
write_d(0x00);          //2nd Parameter
write_d(0x00);          //3rd Parameter
write_d(0x00);          //4th Parameter
write_c(0x0e);          //Set Dot Matrix Current Level
write_d(0x0f);          //1th Parameter          R   //C
write_d(0x0f);          //2th Parameter          R   //0
write_d(0x07);          //3rd Parameter          G   //1
write_d(0x00);          //4th Parameter          G   //8
write_d(0x0c);          //5st Parameter          B   //3
write_d(0x0f);          //6nd Parameter          B   //4
write_c(0x0f);          //Set Dot Matrix Peak Current Level
write_d(0x3f);          //1rd Parameter          R
write_d(0x3f);          //2nd Parameter          G
write_d(0x3f);          //3st Parameter          B
write_c(0x1c);          //Set Pre-Charge Width
write_d(0x03);
write_c(0x1d);          //Set Peak Pulse Width
write_d(0x01);          //R
write_d(0x01);          //G
write_d(0x01);          //B
write_c(0x1e);          //Set Peak Pulse Delay
write_d(0x03);
write_c(0x1f);          //Set Row Scan Operation
write_d(0x20);
write_c(0x30);          //Internal Regulator for Row Scan
write_d(0x11);
write_c(0x3c);          // Set VDD Selection
write_d(0x00);          //1.8V
Clear_screen();
 write_c(0x02);         // Set Dot Matrix Display ON/OFF
 write_d(0x01);         //ON
}
```

11 Package Specification

Controlled Seal

Packing Process (1)~(9)



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 ⊛.

4、Packaging materials are not recommended for recycling .

12 Reliability

12.1 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)	60℃,90%RH,240hrs	5
6	Thermal shock (Non-operation)	-40 ℃ ~85 ℃ (-40 ℃ /30min;transit/5min;85 ℃ /30min;transit/5min) 1cycle: 70min,30cycles	5
7	ESD Air discharge (Non-operation)	±8kV, Test 9 point; Each point discharge 10 times. Time interval is not less than 1 second.	5

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 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.

12.2 Lifetime

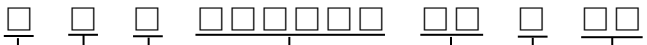
End of lifetime is specified as 50% of initial brightness and the test pattern at operating condition is 50% alternating checkerboard.

ITEM	MIN	MAX	UNIT	CONDITION
Operation Life Time	7,000	-	hrs	75 cd/m^2, 50% alternating checkerboard, 22±3°C, 55±15% RH

12.3 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 Illustration of OLED Product Name



Flow No. :

01~99

Display Color :

R—red

G—green

B—blue

Y—yellow

W—white

A—area color

F—full color

M—amber

Panel Flow No. :

A0~A9, B0~B9…Z0~Z9

Display Format :

Graphic—columns and rows

Character—characters and line number

Segment—segment number

Mixed—pixel number

Product Type :

P—panel

M—module

Display Type :

G—graphic

C—character

S—segment

I—Icon

M—mixed

Company :

V—QingYue

14 Outgoing Quality Control Specifications

14.1 Sampling Method

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

(2) AQL: Major 0.65; Minor 1.0

14.2 Inspection Conditions

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

Temperature: 22±3°C

Humidity: 55±15%R.H

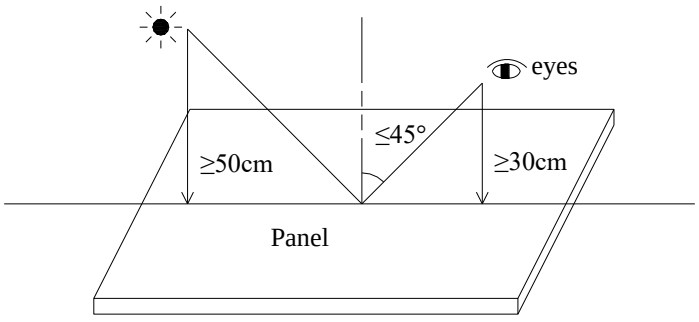
Fluorescent Lamp: 30W

Distance between the Panel & Lamp: ≥50cm

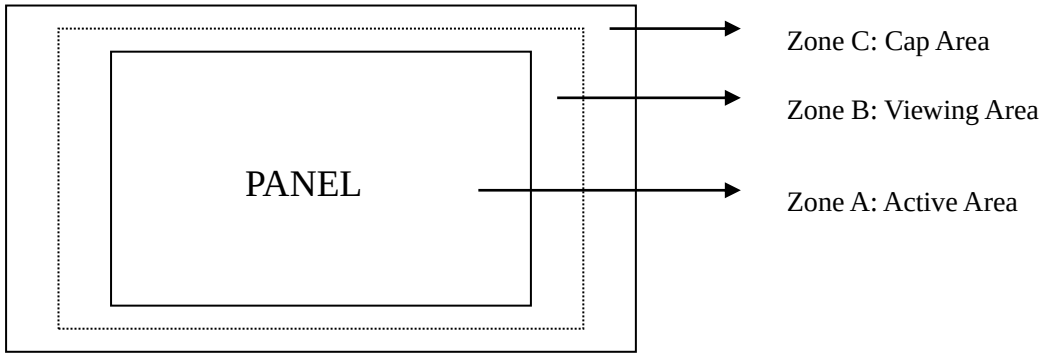
Distance between the Panel & Eyes: ≥30cm

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

(See the sketch below)

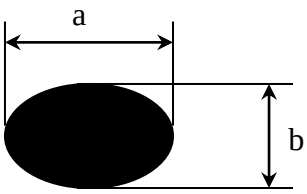


14.3 Quality Assurance Zones

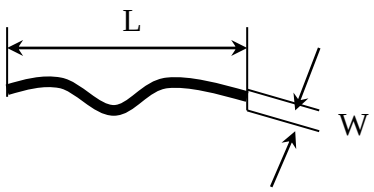


14.4 Inspection Standard

Definition of Φ&L&W (Unit: mm)

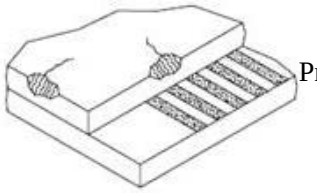
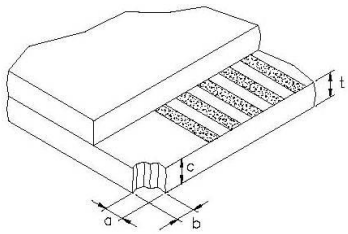
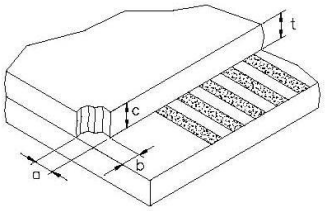
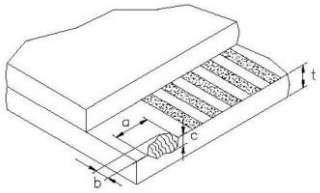
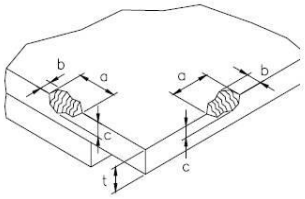
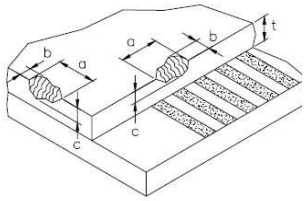


Φ=(a+b)/2



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: Zone A,B / Zone C Φ≤0.15: Ignore / Ignore 0.15<Φ≤0.30: 3 / Ignore Φ>0.30: 0 / Ignore	Minor
2	Scratch/line on the glass/Polarizer	Width (mm) / Length (mm) / Acceptable Number: Zone A,B / Zone C W≤0.05: --- / Ignore / Ignore 0.05<W≤0.1: L≤5.0 / 3 / Ignore W>0.1: --- / 0 / Ignore	Minor
3	Polarizer Bubble	Average Diameter (mm) / Acceptable Number: Zone A,B / Zone C Φ≤0.2: Ignore / Ignore 0.2<Φ≤0.5: 3 / Ignore Φ>0.5: 0 / Ignore	Minor
4	Any Dirt & Scratch on Polarizer's Protective Film	Ignore for not affect the polarizer.	Minor
5	Any Dirt on Cap Glass	Inside the Cap，Ignore the dirt without moving.	Minor

6	Glass Crack	 Propagation crack is not acceptable.	Major
7	Corner Chip	 t= Glass thickness Accept a≤2.0mm or b≤2.0mm, c≤t	Minor
8	Corner Chip on Cap Glass	 t= Glass thickness Accept a≤1.5mm or b≤1.5mm, c≤t	Minor
9	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≤2.0mm, c≤t (outside of the contact pin)	Minor
10	Chip on Face of Display	 t= Glass thickness Accept a≤1.5mm or b≤1.5mm, c≤t	Minor
11	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
12	Stain on Surface	Stain removable by soft cloth or air blow is acceptable.	Minor
13	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
14	Dimension Unconformity	Checking by mechanical drawing.	Major

Ⅱ. Displaying Defects

<table>
<tr><th>NO.</th><th>Items</th><th>Criteria</th><th>Classification</th></tr>
<tr><td>1</td><td>Black/White spot
Dirty spot
Foreign matter</td><td>
<table>
<tr><td rowspan="2">Average Diameter (mm)</td><td colspan="2">Pieces Permitted</td></tr>
<tr><td>Zone A,B</td><td>Zone C</td></tr>
<tr><td>Φ≤0.10</td><td>Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.10＜Φ≤0.20</td><td>3</td></tr>
<tr><td>Φ＞0.20</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>2</td><td>No Display</td><td>Not allowable.</td><td>Major</td></tr>
<tr><td>3</td><td>Irregular Display</td><td>Not allowable.</td><td>Major</td></tr>
<tr><td>4</td><td>Missing Line
(row or column)</td><td>Not allowable.</td><td>Major</td></tr>
<tr><td>5</td><td>Abnormal Color</td><td>Refer to the SPEC.</td><td>Major</td></tr>
<tr><td>6</td><td>Luminance NG</td><td>Refer to the SPEC.</td><td>Major</td></tr>
</table>

15 Precautions for operation and Storage

15.1 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.

15.2 Soldering

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

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

(3) Iron:The temperature setting of electric iron is 350℃, but we suggest that during soldering, the tem perature of iron tip should be no higher than 330℃ and soldering be finished within 3~4 seconds.

15.3 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 70%. 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.

15.4 Warranty period

QingYue warrants for a period of 12 months from the shipping date when stored or used under normal condition. In addition to the failure and quality problems caused by man-made damage and force majeure, we promise to provide maintenance and replacement free of charge during the warranty period.If the warranty period has been exceeded, we need to collect the staff's travel expenses, materials and other related costs.