Product Specification

Product Name: VGM160128A2F02

Product Code: M00361

Customer
Approved by Customer
Approved   Date:

Designed By	Checked by	Approved By	
		R&D	**QA**
曹朝平 09.10.2	陈捷诗 09.0.20	王龙 2009.10.20	2009.10.20

CONTENT

REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
A01	Initial release.	2009-10-19	

1   Overview

VGM160128A2F02 is an OLED full color 160(RGB)×128dot matrix display module. 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: Full Color
- Dot Matrix:160(RGB)×128
- Driver IC: SSD1353U4
- Interface:8/16-bit 8080, 8/16-bit 6800
- Wide range of operating temperature: -40℃-70℃

3   Mechanical Data

NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	160(W)(RGB)×128(H)	-
2	Dot Size	0.048(W)×0.199(H)	mm^2
3	Dot Pitch	0.073(W)×0.219(H)	mm^2
4	Aperture Rate	60	%
5	Active Area	35.015(W)×28.012 (H)	mm^2
6	Panel Size	42.7(W)×33.4(H)	mm^2
7	Module Size	According to the annexed mechanical drawing	mm^3
8	Diagonal A/A Size	1.77	inch
9	Module Weight	6.32±10%	gram

4 Mechanical Drawing
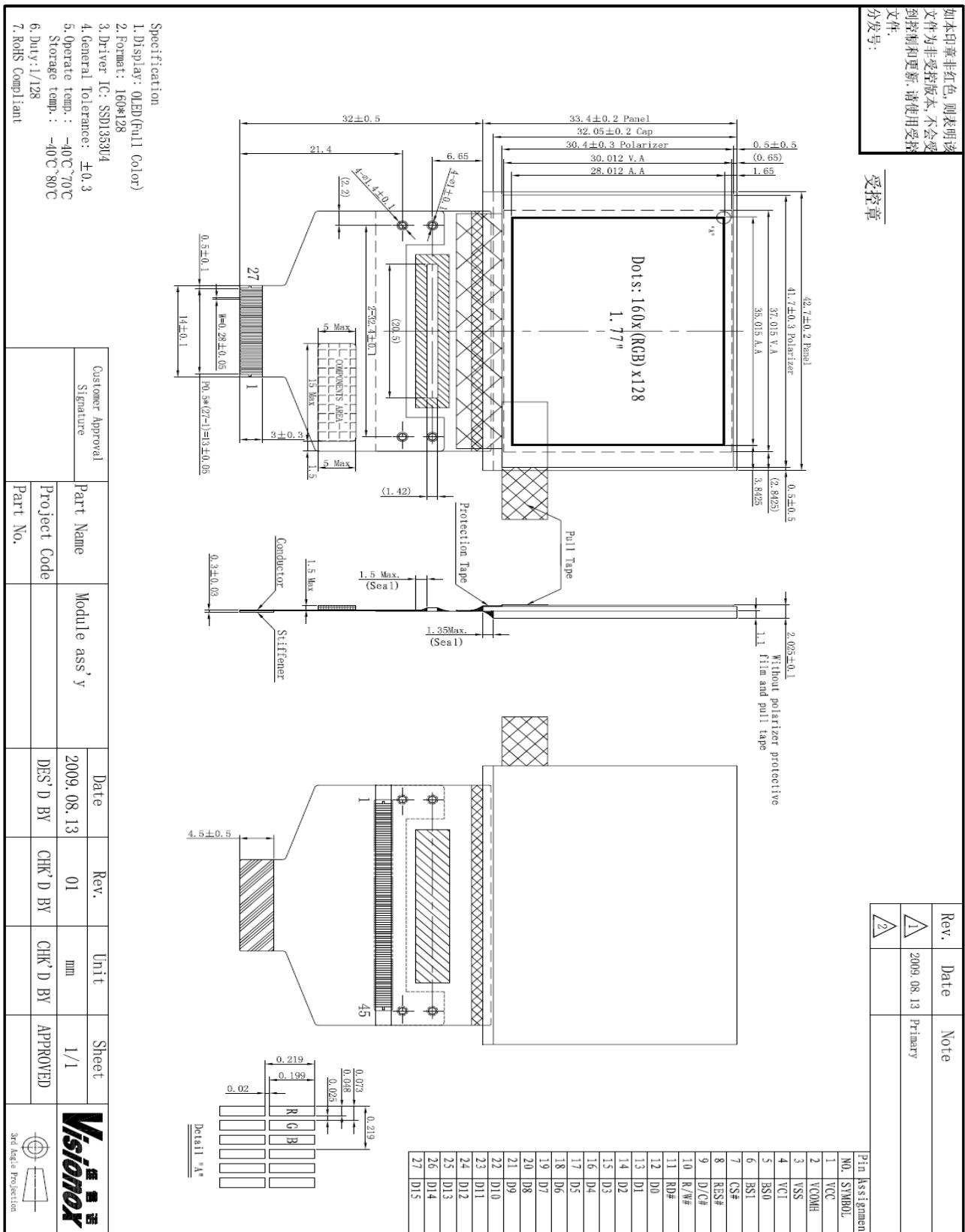
5 Module Interface

| PIN NO.	PIN NAME	DESCRIPTION
1	VCC	Power supply for panel driving voltage.
2	VCOMH	A capacitor should be connected between this pin and VSS.
3	VSS	Analog system ground pin.
4	VCI	Low voltage power supply.
5	BS0	Connect to ground with a capacitor.
6	BS1	This is segment voltage reference pin.
7	CS#	Chip select input. LOW active.
8	RES#	Reset signal input. LOW active.
9	D/C#	Data / Command control pin.
10	R/W#	This pin is read/write control input pin connecting to the MCU interface.
11	RD#	This pin is MCU interface input.
12~27	D0~D15	Data bus.

Table:5-1

BS[1:0]	Bus Interface Selection
00	8-bit 6800 parallel
01	16-bit 6800 parallel
10	8-bit 8080 parallel
11	16-bit 8080 parallel

6 Function Block Diagram

6.1 Function Block Diagram
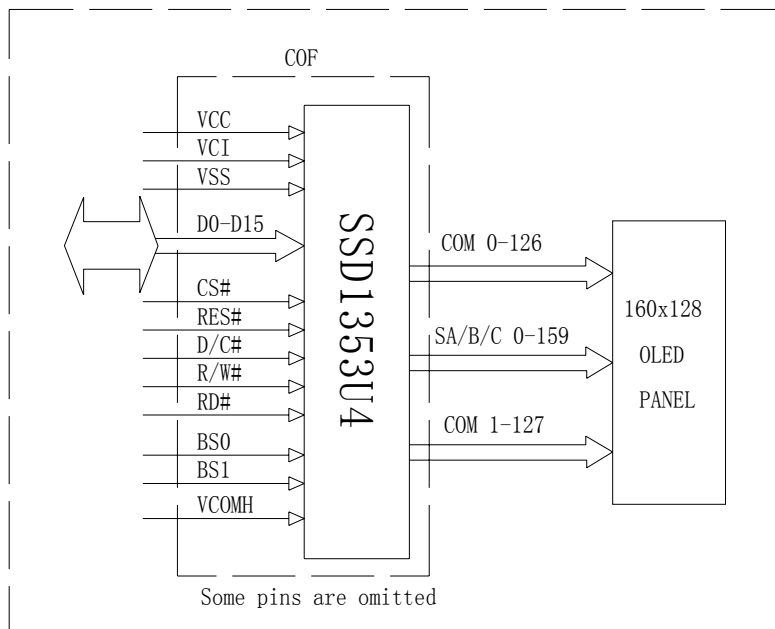
6.2 Panel Layout Diagram
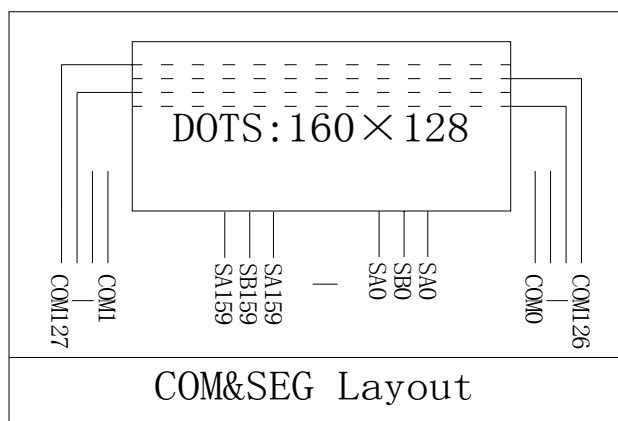
7   Absolute Maximum Ratings

ITEM	SYMBOL	MIN	MAX	UNIT	REMARK
Logic supply voltage	V_{DD}	-0.5	2.75	V	IC maximum rating
LOW voltage power supply	V_{CI}	-0.3	4.0	V	
Logic I/O operating voltage	V_{DDIO}	-0.5	V_{CI}	V	
OLED Operating voltage	V_{CC}	-0.5	22	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 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	TYPE	MAX	UNIT
OLED Driver Supply Voltage	V_{CC}	22±3°C, 55±15%R.H	16.5	17	17.5	V
Low voltage power supply	V_{CI}	22±3°C, 55±15%R.H	2.4	2.8	3.5	V
High-level Input Voltage	V_{IH}	-	$0.8 \times V_{DD}$	-	V_{DD}	V
Low-level Input Voltage	V_{IL}	-	0	-	$0.2 \times V_{DD}$	V
High-level Output Voltage	V_{OH}	-	$0.9 \times V_{DD}$	-	V_{DD}	V
Low-level Output Voltage	V_{OL}	-	0	-	$0.1 \times V_{DD}$	V

Note : The V_{CC} input must be kept in a stable value; ripple and noise are not allowed.

8.2   Electro-optical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYPE	MAX	UNIT
Normal Mode Brightness	L_{br}	All pixels ON(1)	75	90	-	cd/m^2
Standby Mode Brightness		Standby Mode 10% pixels ON(2)	-	12	-	cd/m^2
Normal Mode Power Consumption	Pt	All pixels ON(1)	-	646	680	mW
Standby Mode Power Consumption		Standby Mode 10% pixels ON(2)	-	60	-	mW
C.I.E(White)	(x)	x,y(CIE1931)	0.24	0.28	0.32	-
	(y)		0.28	0.32	0.36	-
C.I.E(Red)	(x)	x,y(CIE1931)	0.64	0.68	0.72	-
	(y)		0.28	0.32	0.36	-
C.I.E(Green)	(x)	x,y(CIE1931)	0.24	0.28	0.32	-
	(y)		0.58	0.62	0.66	-
C.I.E(Blue)	(x)	x,y(CIE1931)	0.10	0.14	0.18	-
	(y)		0.10	0.14	0.18	-
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 : 17V

- Master contrast setting : 0x0F

- Frame rate : 110HZ

- Duty setting : 1/128

Note(2): Standby Mode test conditions are as follows:

- Driving voltage : 17V

- Master contrast setting : 0x0F

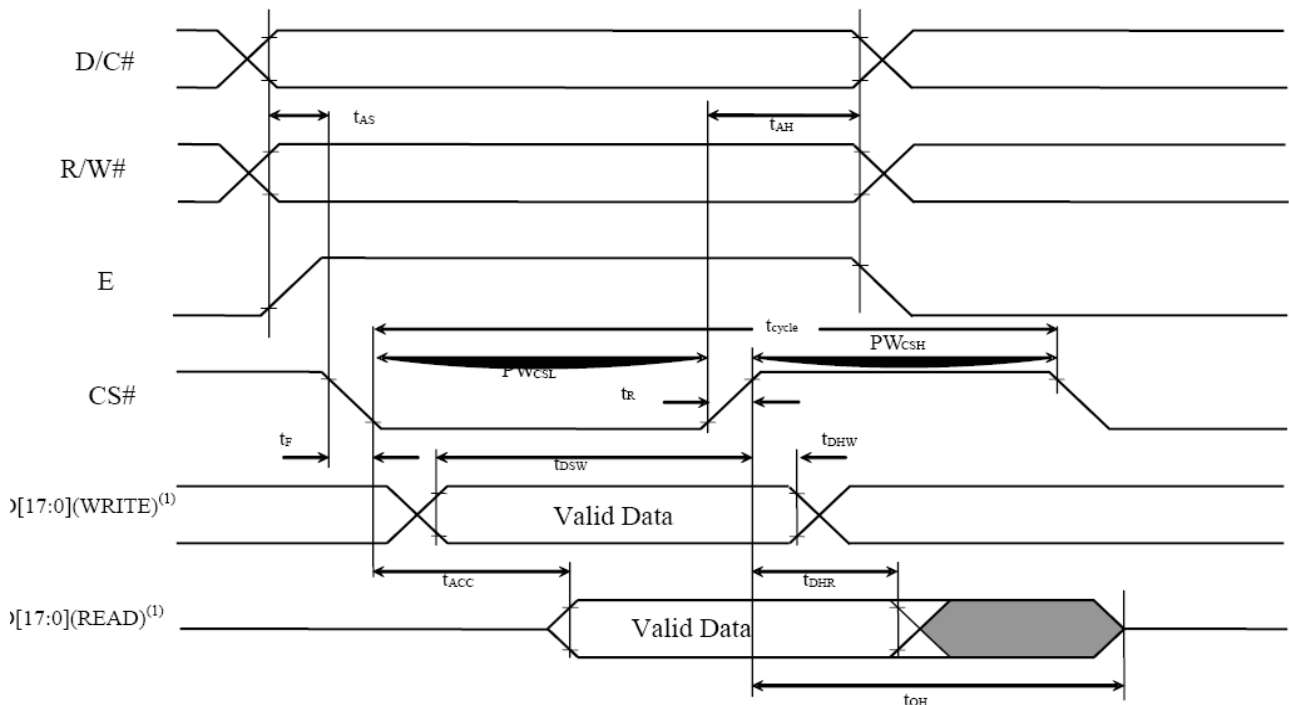- Frame rate : 110HZ

- Duty setting : 1/128

8.3 AC Electrical Characteristics

(1)6800-Series MPU Parallel InterfaceTiming Characteristics

$(V_{DD} - V_{SS} = 2.4$ to $2.6V$, $V_{DDIO}=1.6V$, $V_{CI} = 3.3V$, $T_A = 25°C)$

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 13-1 : 6800-series MCU parallel interface characteristics

Note
[1] when 8 bit used: D[7:0] instead; when 9 bit used: D[8:0] instead; when 16 bit used: [15:0] instead; when 18 bit used: D[17:0] instead.

(2)8080-Series MPU Parallel Interface Timing Characteristics

$(V_{DD} - V_{SS} = 2.4$ to $2.6V$, $V_{DDIO}=1.6V$, $V_{CI} = 3.3V$, $T_A = 25°C)$

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	150	-	-	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

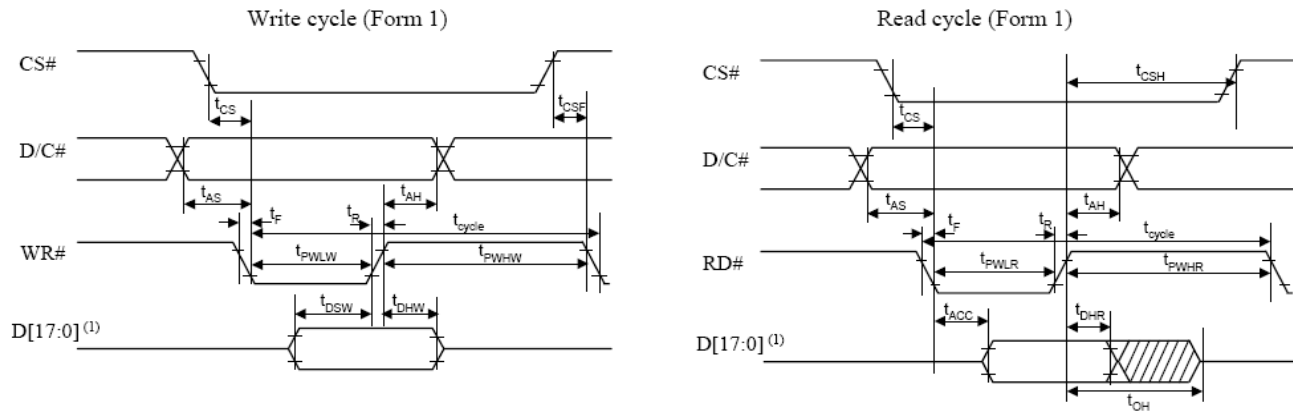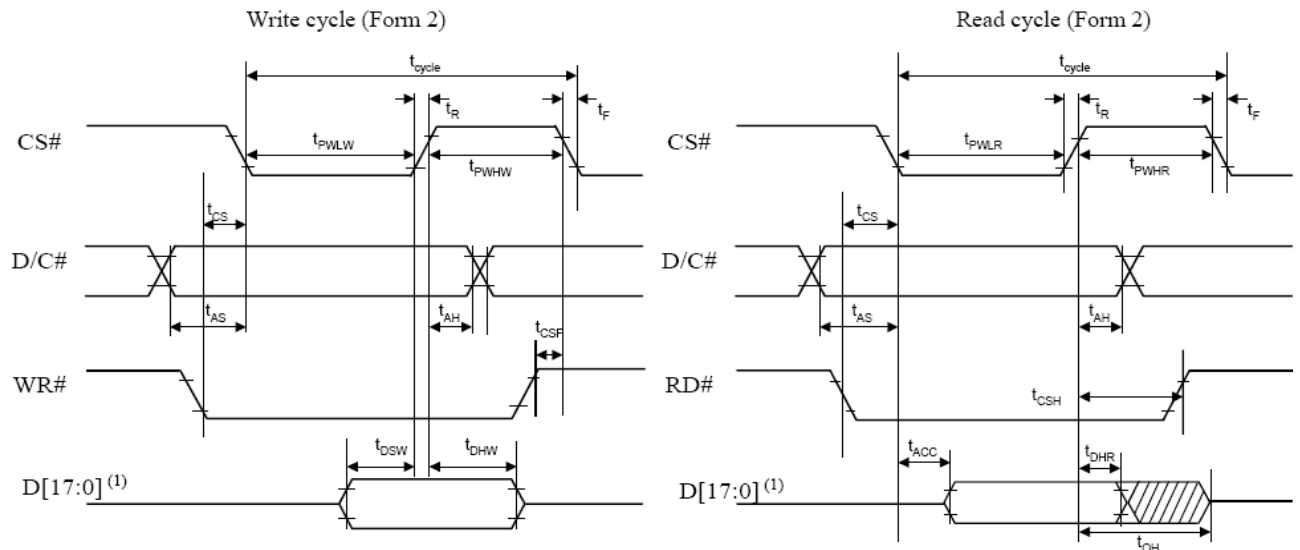**Figure 13-2 : 8080-series MCU parallel interface characteristics (Form 1)**

Figure 13-3 : 8080-series MCU parallel interface characteristics (Form 2)

Note

[1] when 8 bit used: D[7:0] instead; when 9 bit used: D[8:0] instead; when 16 bit used: [15:0] instead; when 18 bit used: D[17:0] instead.

9   Functional Specification and Application Circuit

9.1   Power ON and Power OFF Sequence

Power ON Sequence:

1. Power ON V_{CI}, V_{DDIO}.

2. After V_{CI}, V_{DDIO} become stable, set RES# pin LOW (logic low) for at least 100us (t_1) and then HIGH (logic high).

3. After set RES# pin LOW (logic low), wait for at least 100us (t_2). Then Power ON V_{CC}. (1)

4. After V_{CC} become stable, send command AFh for Sleep for display ON. SEG/COM will be ON after 200ms(t_{AF}).
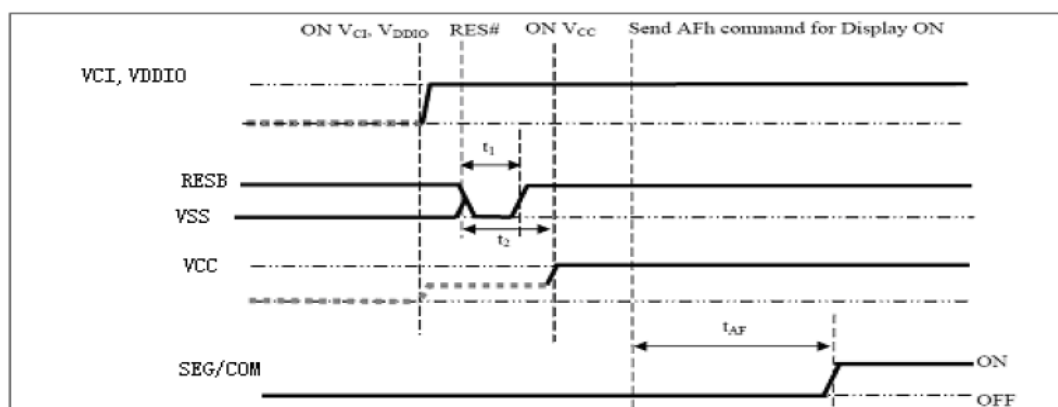
Power OFF Sequence:

1. Send command AE for display OFF.

2. Power OFF V_{cc}.(1), (2)

4. Wait for t_{OFF}. Power OFF V_{CI}, V_{DDIO}(where Minimum t_{OFF}=0ms, Typical t_{OFF}=100ms)
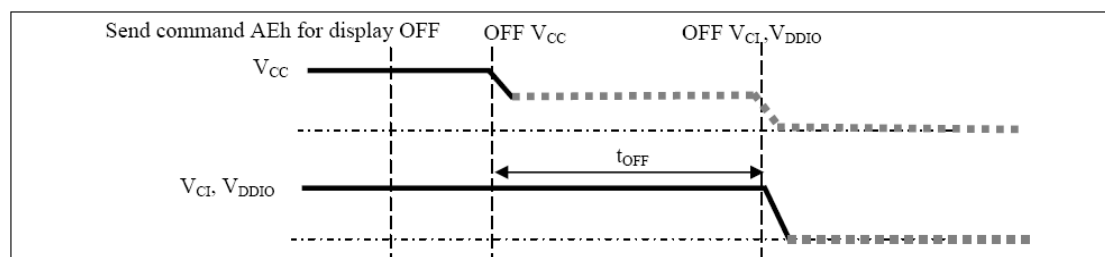
Note:

(1) Since an ESD protection circuit is connected between V_{CI}, V_{DDIO} and V_{cc}, V_{cc} becomes lower than V_{CI}, whenever V_{CI}, V_{DDIO} is ON and V_{cc} is OFF as shown in the dotted line of V_{cc} in above figures.

(2)V_{cc} should be disabled when it is OFF.

9.2   Application Circuit

The configuration for 8-bit 8080-parallel interface mode, external V_{CC} is shown in the following diagram:

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

Recommended components

C1,C3,C4: 4.7μF/25V.ROHS (Tantalum Capacitors)

C2,C5: 0.1uF-0603-X7R±10%.ROHS

9.3   Display Control Instruction

Refer to SSD1353 IC Specification.

9.4   Recommended Software Initialization

```
/****************************************************************
//*****M00361
//*****160*128(Full Color)
//*****CS:CS#.RES:RES#,DC:DC#,WR:R/W#
//*****初始化SSD1353
//*****Edit:Caocg
*****************************************************************/
/***************************************
//*****写命令
***************************************/
void Write_Command(uchar command)
{
    CS=0;
    DC=0;
    WR=0;
    P0=command;
    WR=1;
    CS=1;
}
/***************************************
//*****写数据
***************************************/
void Write_Data(uchar date)
{
    CS=0;
    DC=1;
    WR=0;
    P0=date;
    WR=1;
    CS=1;
}
```

```
/*********************************
//*****初始化SSD1353
*********************************/
void Init_SSD1353( )
{
    Write_Command(0xFD) ;            //Command lock
     Write_Data(0x12);
    Write_Command(0xE2) ;           //Soft Reset
     Write_Command(0xAE) ;          //Set Display OFF
    Write_Command(0x15) ;           //Set Coluum Address
     Write_Data(0x00);
     Write_Data(0x9F);
    Write_Command(0x75) ;           //Set Row Address
    Write_Data(0x00);
     Write_Data(0x7F);
    Write_Command(0x81) ;           // Set Contrast of Red
     Write_Data(0x60);
    Write_Command(0x82) ;           // Set Contrast of Green
     Write_Data(0xA5);
    Write_Command(0x83) ;           // Set Contrast of Blue
     Write_Data(0xB5);
    Write_Command(0x87) ;           // Master Current Control
    Write_Data(0x0F);
    Write_Command(0x8A) ;            // Set Second Pre-charge speed
    Write_Data(0x00);
    Write_Command(0xA0) ;            // Remap & Color Depth setting
    Write_Data(0x64);
    Write_Command(0xA1) ;            // Set Start Line
    Write_Data(0x00);
    Write_Command(0xA2) ;            // Set Display offset
    Write_Data(0x00);
    Write_Command(0xA4) ;            //Set Normal Display
    Write_Command(0xA8) ;            // Set Multiplex 128
    Write_Data(0x7F);
    Write_Command(0xB1) ;            // Phase 1 and 2 Period adjustment 0x38
    Write_Data(0x38);
    Write_Command(0xB3) ;            // Display Clock Driver /oscillator Frequency
    Write_Data(0xB0);
```
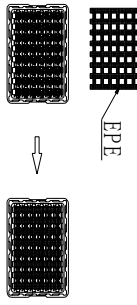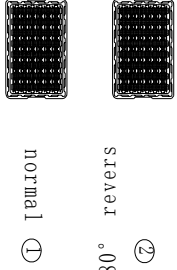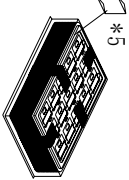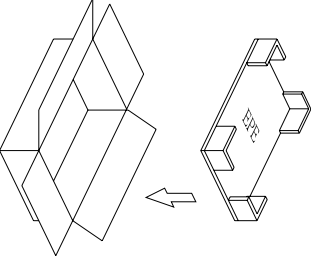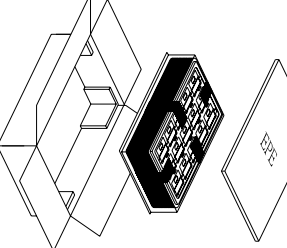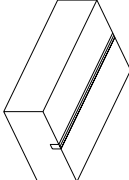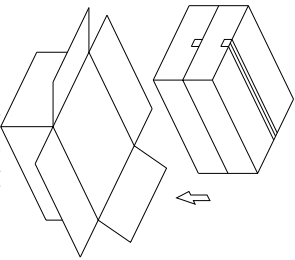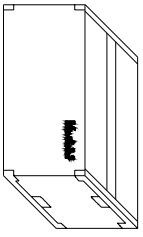
```
    Write_Command(0xB4) ;          // Set Second Precharge period
    Write_Data(0x03);
    Write_Command(0xB9) ;          // Enable Linear Gray Scale Table
    Write_Command(0xBB) ;           // Set Pre-charge level
    Write_Data(0x3E);
    Write_Command(0xBE) ;          // Set VCOMH
    Write_Data(0x3C);
    Write_Command(0xAF) ;          //Set Display ON
}
```

10 Package Specification

Package order(1)~(9)

(1) Tray: 370*273 t=0.8mm
Add EPE in every contained tray
EPE

(2)
normal ①   reverse ②   180°
TRAY

(3) order ① ② ① ②
fix trays with tape
Package quantity products:
224 pcs of 1 small carton
1 tray contain 16 pcs
14 contained trays, 1 empty tray

(4) package with plastic bags
add five desiccants
create a power vacuum
*5

(5)

(6)

(7) small carton package
L425*W330*L175 mm

(8) 2 small cartons in 1 big carton

(9) 28 contained trays, 2 empty trays,
Package quantity products:
448 pcs of 1 big carton
Package finished
L450*W350*L360 mm

11 Reliability

11.1 Reliability Test

NO.	ITEM	CONDITION	QUANTITY
1	High Temperature (Non-operation)	85℃,240hrs	4
2	Low Temperature (Non-operation)	-40℃,240hrs	4
3	High Temperature (Operation)	70℃,240hrs	4
4	Low Temperature (Operation)	-40℃,240hrs	4
5	High Temperature / High Humidity (Operation)	60℃,90%RH,240hrs	4
6	Thermal shock (Non-operation)	-30℃~80℃(-30℃/30min;transit/3min;80℃/30min;transit/3min) 1cycle: 66min,30cycles	4
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: 100 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 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	12200	-	hrs	90cd/m^2,50% Checkerboard

An average operating lifetime of more than 10,000 hrs (50% checkerboard) at room temperature is approached by 120 hrs @ 80°C operating.

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.

12 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

Panel Flow No. :

A0~A9, B0~B9···Z0~Z9

Display Format :

Graphic—columns and rows

Character—characters and line number

Segment—segment number

Icon—pixel number

Product Type :

P—panel

M—module

Display Type :

G—graphic

C—character

S—segment

I—Icon

M—mixed

Company :

V—Visionox
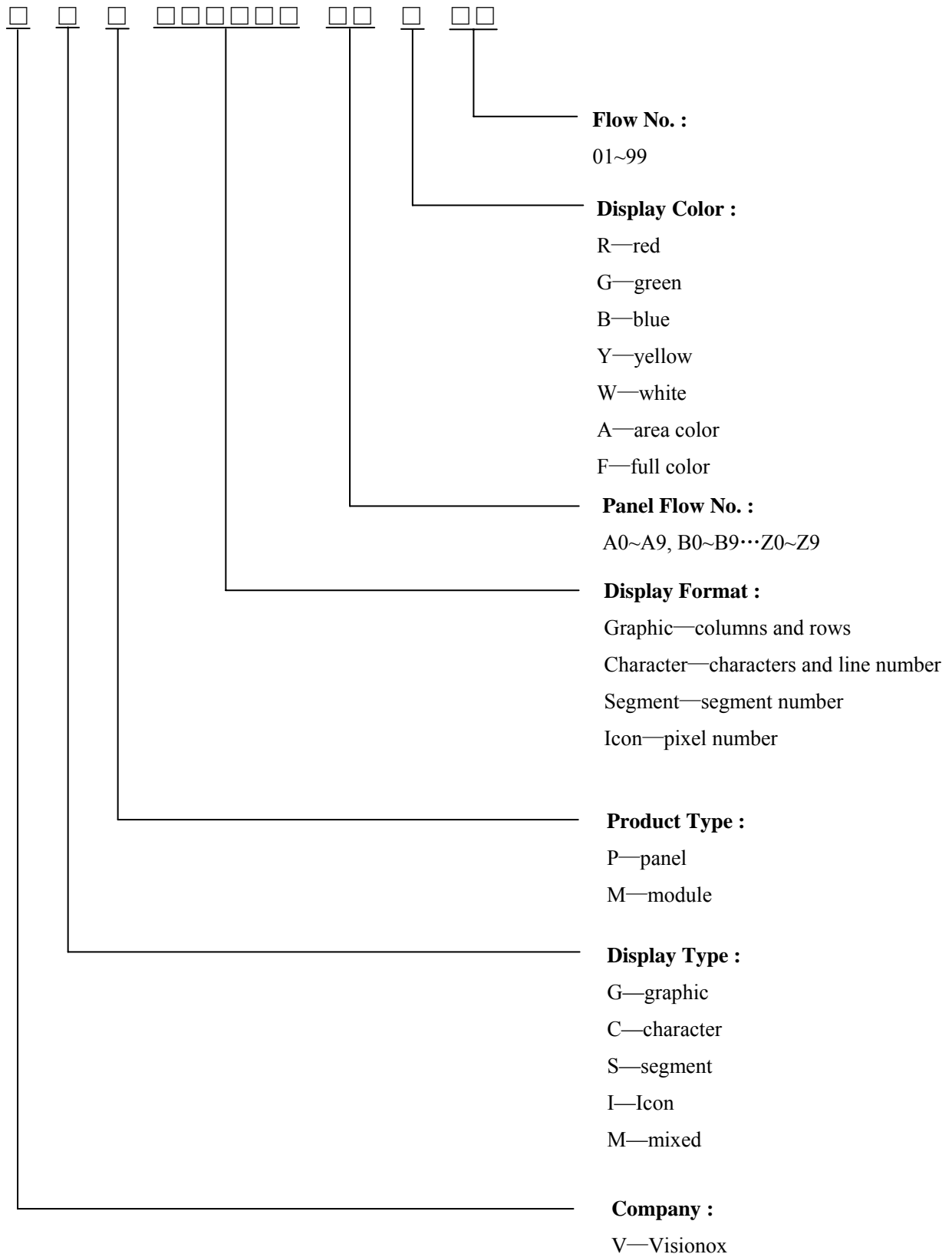
13 Outgoing Quality Control Specifications

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)
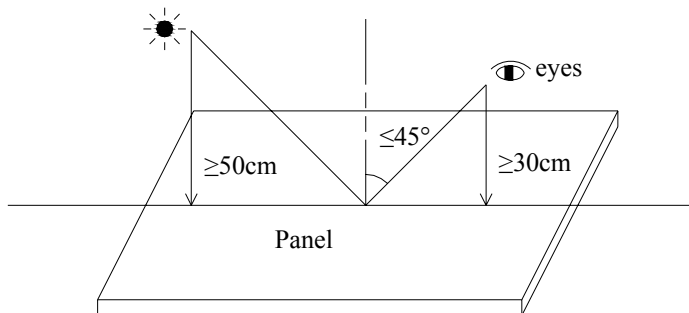
13.3 Quality Assurance Zones

PANEL

Zone C: Cap Area

Zone B: Viewing Area

Zone A: Active Area
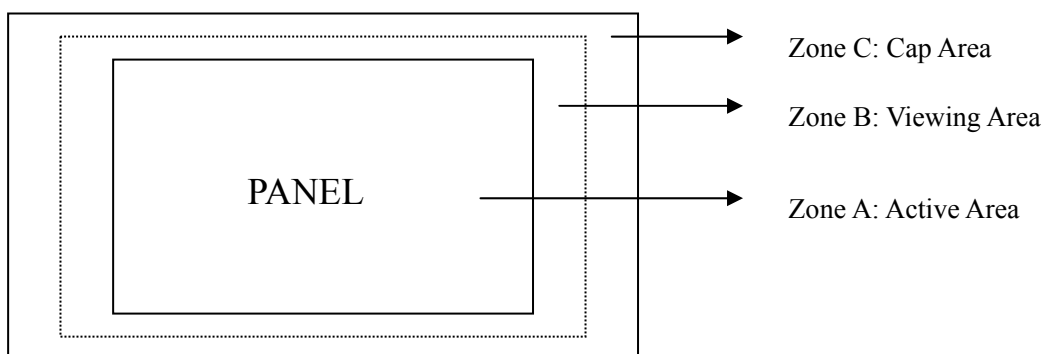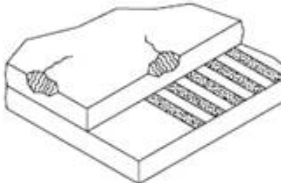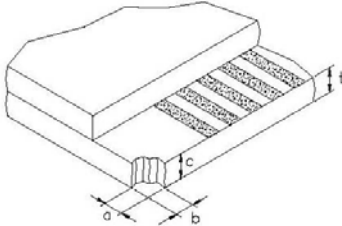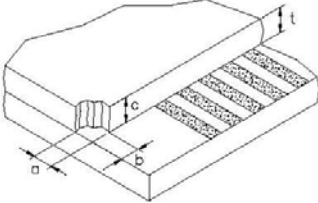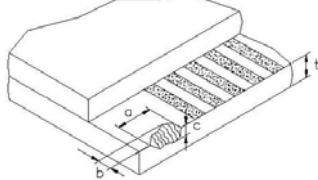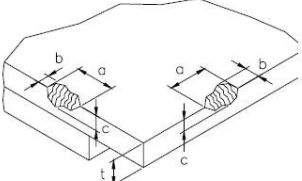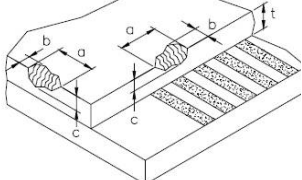
13.4 Inspection Standard

Definition of Φ&L&W (Unit: mm)

$$\Phi=(a+b)/2$$
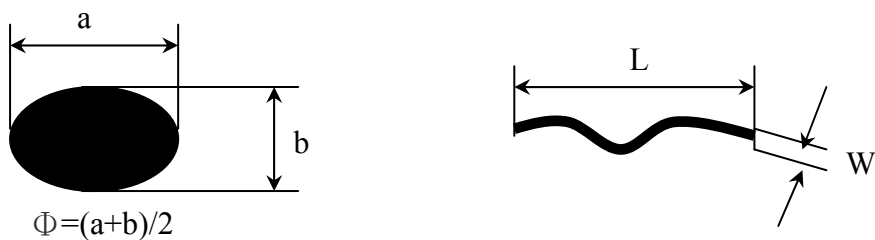
Ⅰ. Appearance Defects

NO.	ITEM	CRITERIA	CLASSIFICATION
1	Polarizer Black or White spot, Dirty spot, Foreign matter, Dent on the polarizer	<table><tr><td rowspan="2">Average Diameter (mm)</td><td colspan="2">Acceptable Number</td></tr><tr><td>Zone A,B</td><td>Zone C</td></tr><tr><td>Φ≤0.15</td><td>Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>0.15<Φ≤0.30</td><td>3</td></tr><tr><td>Φ>0.30</td><td>0</td></tr></table>	Minor
2	Scratch/line on the glass/Polarizer	<table><tr><td rowspan="2">Width (mm)</td><td rowspan="2">Length (mm)</td><td colspan="2">Acceptable Number</td></tr><tr><td>Zone A,B</td><td>Zone C</td></tr><tr><td>W≤0.03</td><td>---</td><td>Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>0.03<W≤0.08</td><td>L≤5.0</td><td>3</td></tr><tr><td>W>0.08</td><td>---</td><td>0</td></tr></table>	Minor
3	Polarizer Bubble	<table><tr><td rowspan="2">Average Diameter (mm)</td><td colspan="2">Acceptable Number</td></tr><tr><td>Zone A,B</td><td>Zone C</td></tr><tr><td>Φ>0.5</td><td>0</td><td rowspan="3">Ignore</td></tr><tr><td>0.2<Φ≤0.5</td><td>3</td></tr><tr><td>Φ≤0.2</td><td>Ignore</td></tr></table>	Minor
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.	ITEM	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

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

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