

Product Specification

Product Name: VGM096096A2F01

Product Code: M00790

Customer
Approved by Customer
Approved Date:

Designed By	Checked By	Approved By	
		R&D	QA
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1 Overview

VGM096096A2F01 is a full color OLED display module with 96(RGB)×96 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: 65K full colors
- Dot Matrix:96(RGB)×96
- Driver IC: LD7134
- Interface: SPI
- Wide range of operating temperature: -40°C to 70°C

3 Mechanical Data

NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	96(W)(RGB)×96(H)	-
2	Dot Size	0.045(W)×0.19(H)	mm ²
3	Dot Pitch	0.07(W)×0.21(H)	mm ²
4	Aperture Rate	58	%
5	Active Area	20.135(W)×20.14 (H)	mm ²
6	Panel Size	27(W)×30.1 (H) ×1.05(T)	mm ³
7	Module Size	27.5(W)×50.95(H) ×1.28(T)	mm ³
8	Diagonal A/A Size	1.12	inch
9	Module Weight	1.94 ± 10%	gram

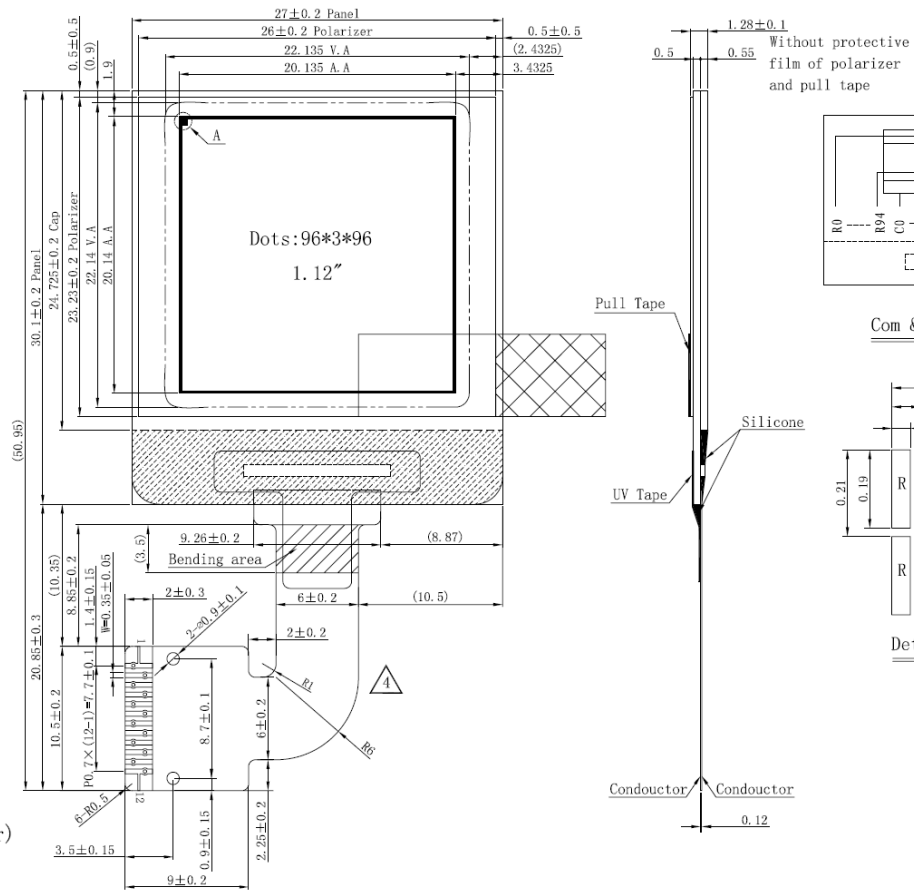
4 Mechanical Drawing

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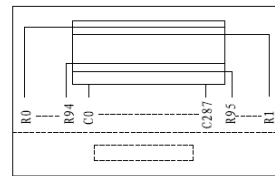
受控章

Specification

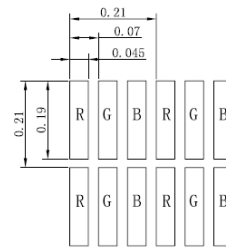
1. Display: OLED(Full Color)
2. Format: 96*3*96
3. Driver IC: LD7134
4. General Torlecrece: ± 0.3
5. Operate temp: $-40^{\circ}\text{C} \sim 70^{\circ}\text{C}$
Storage temp: $-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$
6. DUTY: 1/96
7. RoHS Compliant



Rev.	Date	Note
①	2010.11.08	Primary
②	2010.11.15	Change the third PIN "NC" to "ID_VSS"
③	2010.11.18	Modify The size of FPC
④	2010.12.25	Modify The size of FPC
⑤	2011.01.26	Modify the definition of PIN 12



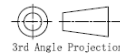
Com & Seg layout



Detail A (30:1)

Pin Assignment

NO.	SYMBOL
1	VCC_R
2	VCC_C
3	VDD_L
4	VDD
5	RSTB
6	CSB
7	A0
8	SCLK
9	SDIN
10	PRERGB
11	GND
12	NC



3rd Angle Projection

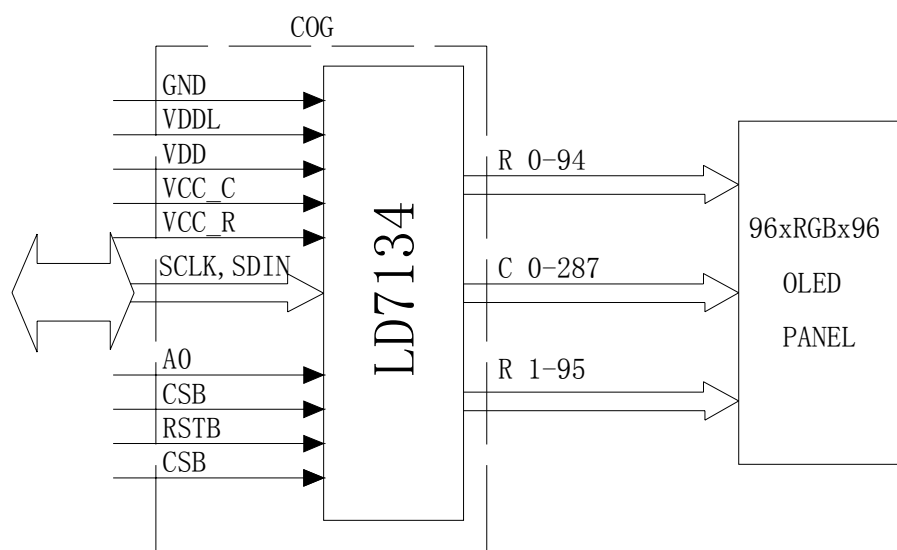
Customer Approval Signature	Part Name	Module ass'y	Date	Rev.	Unit	Sheet
	Project Code	00790	2011.01.26	05	mm	1/1
	Part No.	00790-MA1-C	DES'D BY	CHK'D BY	CHK'D BY	APPROVED

5 Module Interface

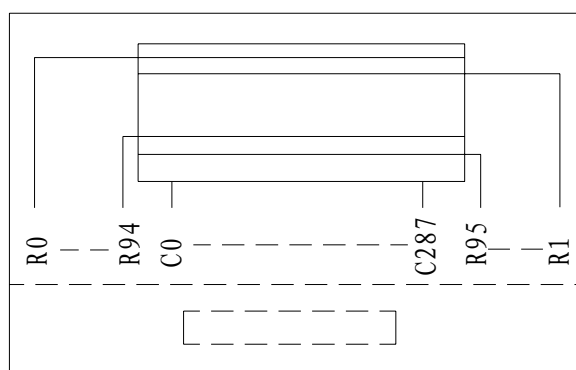
PIN NO.	PIN NAME	DESCRIPTION
1	VCC_R	This pin is the power output pin of internal row power regulator. A 4.7uF capacitor is recommended to connect between VCC_R and GND. If internal row power regulator is disabled, It must be connected to the external high voltage source
2	VCC_C	Column Driver Power
3	VDDL	Internal Logic Power.Refer to application guide.Capacitor is connected between VDDL and GND
4	VDD	Interface Power & Analog Power
5	RSTB	Reset(Active Low)
6	CSB	Chip Select(Active Low)
7	A0	Address(L:command,H:Parameter)
8	SCLK	Data Bus or Clock Input for Serial Interface
9	SDIN	Data Bus or Data Input for Serial Interface
10	PRERGB	Column Driver Pre-Charge Power for Red/Green/Blue
11	GND	Ground
12	NC(ID_GND)	No connection

6 Function Block Diagram

6.1 Function Block Diagram



6.2 Panel Layout Diagram



Com & Seg layout

7 Absolute Maximum Ratings

ITEM	SYMBOL	MIN	MAX	UNIT	REMARK
Internal Logic Power	VDDL	-0.3	+2.4	V	IC maximum rating
Interface Power & Analog Power	VDD	-0.3	+3.6	V	IC maximum rating
OLED Operating voltage	VCC_C	-0.3	+18.3	V	IC maximum rating
Operating Temp.	Top	-40	+70	°C	-
Storage Temp	Tstg	-40	+85	°C	-

Note (1): All of the voltages are on the basis of “GND = 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
Supply voltage	VCC_C	-	13	13.5	14	V
	VDDL	-	1.65	1.9	2.1	V
	VDD	-	1.65	3.0	3.3	V
High-level Input Voltage	V _{IH}	-	0.8 × VDD	-	VDD	V
Low-level Input Voltage	V _{IL}	-	GND	-	0.2 × VDD	V
High-level Output Voltage	V _{OH}	IOH= -0.1mA	0.9 × VDD	-	VDD	V
Low-level Output Voltage	V _{OL}	IOL= -0.1mA	GND	-	0.1 × VDD	V

Note : The VCC_C 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
Normal Mode Power Consumption	Pt	All pixels ON(1)	-	230	285	mW
Stand-By Current	IDD1	(2)	-	-	30	uA
	ICC1		-	-	5.0	uA
VDD and VCC_C off	IDD1	-	-	-	0	uA
	ICC1	-	-	-	0	uA
C.I.E(White)	(x)	x,y(CIE1931)	0.26	0.30	0.34	-
	(y)		0.29	0.33	0.37	-
C.I.E(Red)	(x)	x,y(CIE1931)	0.61	0.65	0.69	-
	(y)		0.30	0.34	0.38	-
C.I.E(Green)	(x)	x,y(CIE1931)	0.25	0.29	0.33	-
	(y)		0.54	0.58	0.62	-
C.I.E(Blue)	(x)	x,y(CIE1931)	0.10	0.14	0.18	-
	(y)		0.13	0.17	0.21	-
Dark Room Contrast	CR	-	≥2000:1	-	-	-
Response Time	-	-	-	10	-	μs
View Angle	-	-	≥160	-	-	Degree

Note(1):

Normal Mode test conditions are as follows:

- Driving voltage : 13.5V
- Red contrast setting : 0X3F
- Green contrast setting : 0X24
- Blue contrast setting : 0X38
- Frame rate : 105Hz
- Duty setting : 1/96

Note(2):

Standby Mode test conditions are as follows:

Indicates the dot oscillator stopped and the dot matrix display off.

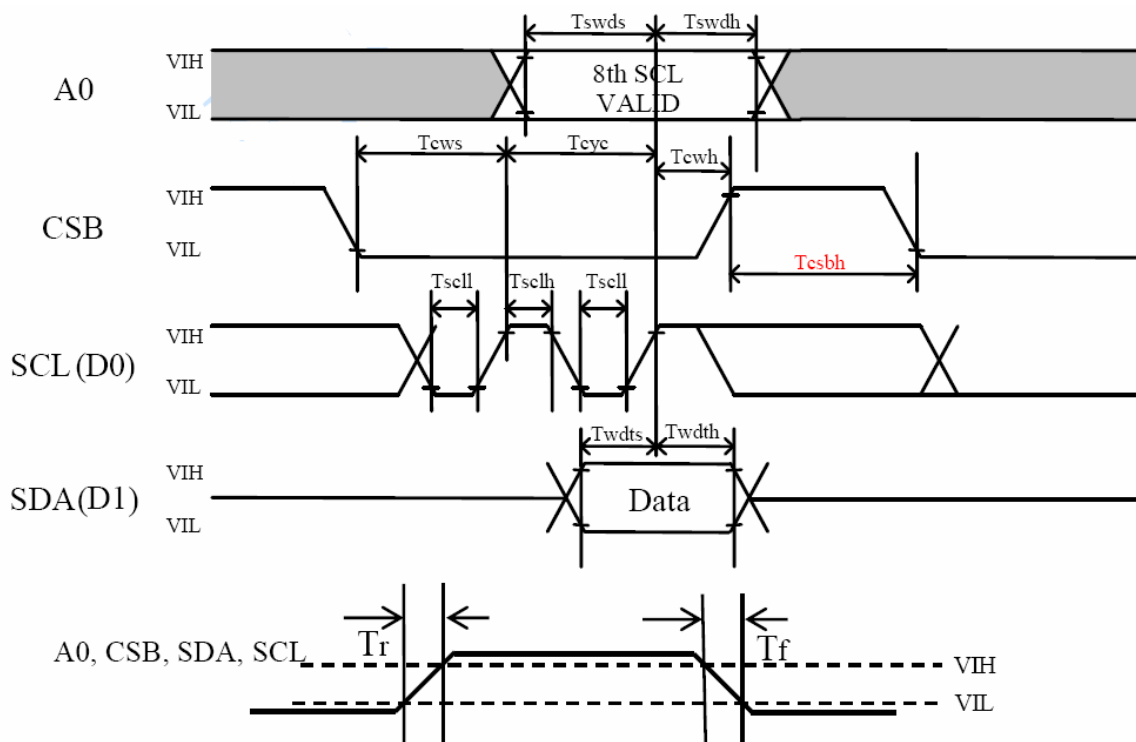
- Set Dot Matrix Display Stand-by ON(0x03): 0x01

8.3 AC Electrical Characteristics

1) Writing Timing for 80Series CPU

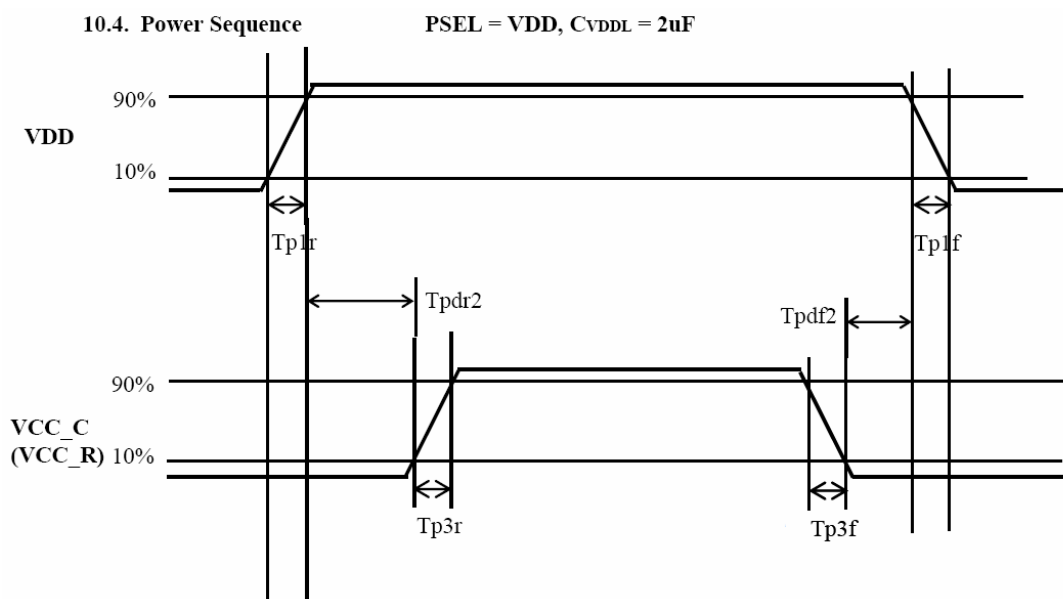
($T_a = -40 \sim 85^\circ\text{C}$, $GND = 0V$, $VDD = 2.8V$, $VCC_C = VCC_R = 18V$, $R/G/BPRE = 0V$, $CL = 100pF$)

Parameter	Symbol	Related Pins	Specification		Unit
			MIN	MAX	
Write Cycle Time	T_{cyc}	SCL(D0)	100	-	ns
Address Setup Time	T_{swds}	A0	65		ns
Address Hold Time	T_{swdh}	A0	35		ns
Select Setup Time	T_{cws}	CSB	65		ns
Select Hold Time	T_{cwh}	CSB	35		ns
SCL Low Pulse Width	T_{scll}	SCL(D0)	45		ns
Write High Pulse Width	T_{sclh}	SCL(D0)	45		ns
Select High Pulse Width	T_{csbh}	CSB	30		ns
Data Setup Time	T_{wdts}	SDA(D1)	20		ns
Data Hold Time	T_{wdth}	SDA(D1)	30		ns
Rising Time	T_r	A0, CSB, SDA, SCL	-	30	ns
Falling Time	T_f	A0, CSB, SDA, SCL	-	30	ns



9 Functional Specification and Application Circuit

9.1 Power Sequence

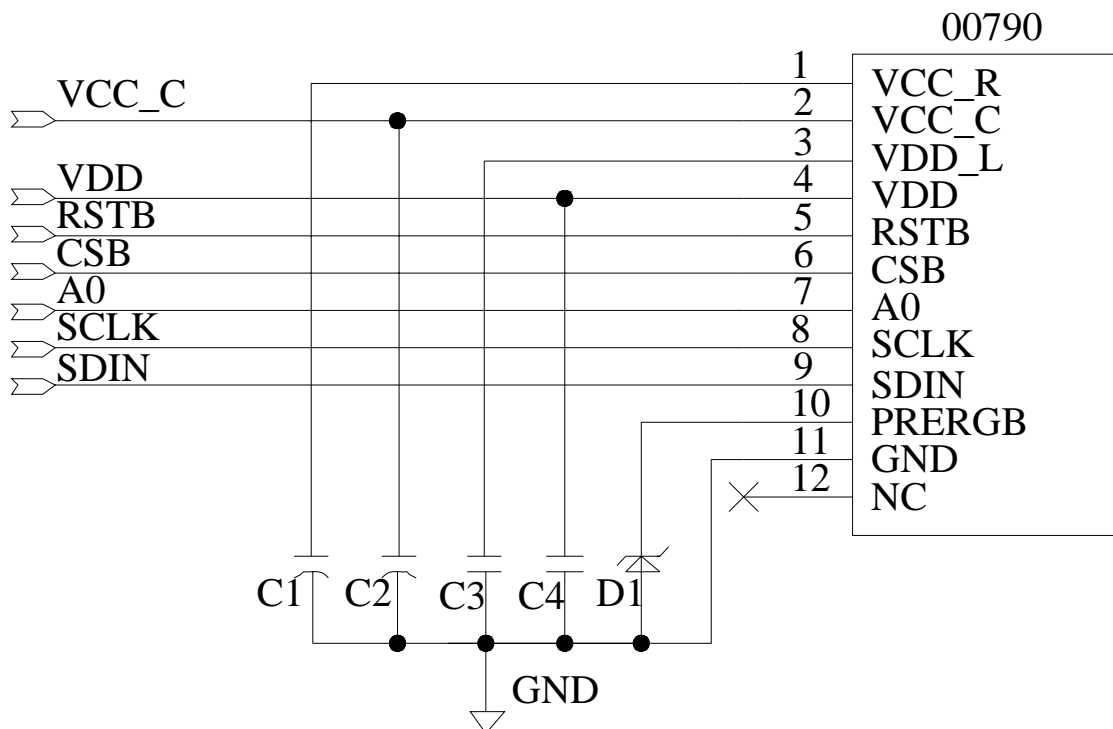


(Ta=-40~85°C, GND=0V, VDD=2.8V, VCC_C=VCC_R=18V, R/G/BPRE=0V, CL=100pF)

Parameter	Symbol	Related Pins	Specification			Unit
			MIN	TYP	MAX	
VDD On Slope Vdd Off Slope	Tplr Tplf	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

9.2 Application Circuit

The configuration for 8080-parallel interface mode, external VCC_C is shown in the following diagram:



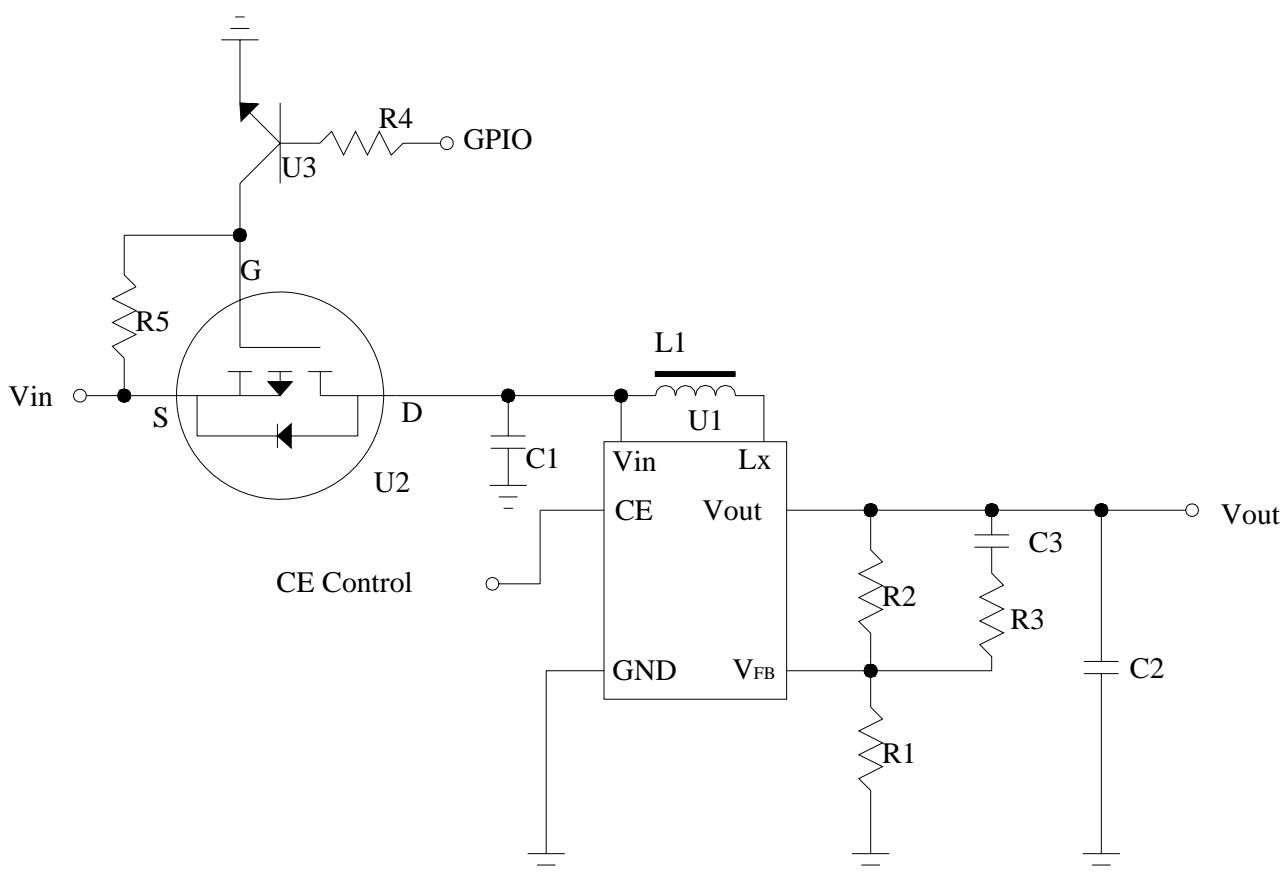
Recommended components

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

C3,C4: 0.1 μ F-0603-X7R \pm 10%.ROHS

D1: UDZSTE-172.7B(zener diode)

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% 140Kohm.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	: FDN338N
The U3	: SS8050

9.4 Display Control Instruction

Refer to LD7134 IC Specification.

9.5 Recommended Software Initialization

```
void write_com(uchar com)
```

```
{  
    CS=0;  
    DC=0;  
    WR=0;  
    P0=com;  
    WR=1;  
    CS=1;  
}
```

```
void write_dat(uchar dat)
```

```
{  
    CS=0;  
    DC=1;  
    WR=0;  
    P0=dat;  
    WR=1;  
    CS=1;  
}
```

```
void write_dat1(uchar dat)
```

```
{  
    uchar a,b;  
    a=dat;  
    b=dat;  
    write_dat((a>>4)&0x07);  
    write_dat(b&0x0f);  
}
```

```
void init_LD7134()
```

```
{  
    CS=0;  
    RES=0;  
    delay_ms(50);  
    RES=1;  
    write_com(0x02);  
    write_dat(0x00);    //turn OFF  
    write_com(0x01);    //software reset The OSC.is stopped.
```

```

write_com(0x03);
write_dat(0x00); //Ste Dot Matrix Display Stand-by OFF
write_com(0x04); //Set OSC Control
write_dat(0x03); //105Hz
write_com(0x05); //Set Graphic RAM Writing Direction
write_dat(0x01); //RGB 0x08 BGR
write_com(0x06); //Set Row Scan Direction
write_dat(0x01);
write_com(0x07); //Set Diplay Size
write_dat(0x00); //X start 1
write_dat(0x00); //X start 2
write_dat(0x04); //X end 1
write_dat(0x1f); //X end 2
write_dat(0x00); //Y start 1
write_dat(0x00); //Y start 2
write_dat(0x05); //Y end 1
write_dat(0x0f); //Y end 2
write_com(0x08); //Set Interface Bus Type
write_dat(0x01); //8Bit I/F Bus
write_com(0x09); //Set Masking Data
write_dat(0x07); //Data AND Pallet(R,G,B)-->Output Data
write_com(0x0a); //Set Read/Write Box Data
write_dat(0x00); //X start 1
write_dat(0x00); //X start 2
write_dat(0x05); //X end 1
write_dat(0x0f); //X end 2
write_dat(0x00); //Y start 1
write_dat(0x00); //Y start 2
write_dat(0x05); //Y end 1
write_dat(0x0f); //Y end 2
write_com(0x0b); //Set Diplay Start Address
write_dat(0x00); //1st Parameter
write_dat(0x00); //2st Parameter
write_dat(0x00); //3st Parameter
write_dat(0x00); //4st Parameter
write_com(0x0e); //Set Dot Matrix Current Level
write_dat(0x03); //1st Paramenter R[7:4]
write_dat(0x0f); //2st Paramenter R[3:0]

```

```

write_dat(0x02); //3st Paramenter G[7:4]
write_dat(0x04); //4st Paramenter G[3:0]
write_dat(0x03); //5st Paramenter B[7:4]
write_dat(0x08); //6st Paramenter B[3:0]
write_com(0x0f); //Set Dot Matrix Peak Current Level
write_dat(0x0a); //PR[5:0] 16uA Step
write_dat(0x0a); //PG[5:0] 16uA Step
write_dat(0x0a); //PB[5:0] 16uA Step
write_com(0x1c); //Set Pre-Charge Width
write_dat(0x08); //0x08 //Parameter Range :01h-3fh
write_com(0x1d); //Set Peak Pulse Width;Parameter Range :01h-3fh
write_dat(0x00); //for Red
write_dat(0x00); //for Green
write_dat(0x00); //for Blue
write_com(0x1e); //Set Peak Pulse Delay
write_dat(0x05); //01h-0fh
write_com(0x1f); //Set Row Scan Operation
write_dat(0x00);
write_com(0x30); //Set Internal Regulator for Row Scan
write_dat(0x10); //VCC_R =0.85 VCC_C
//write_com(0x3b); //Set Gamma Correction Table Initialize
write_com(0x3c); //Set VDD Selection
write_dat(0x00); //VDD=2.8V; 0x01:VDD=1.8V
write_com(0x3d); //Set DMODE Selection
write_dat(0x00); //Resolution=96*96,65k Color
write_com(0x3a); //Set Gamma Correction Table
//R
write_dat1(0);
write_dat1(5);
write_dat1(10);
write_dat1(15);
write_dat1(20);
write_dat1(25);
write_dat1(30);
write_dat1(35);
write_dat1(39);
write_dat1(43);
write_dat1(47);

```



```
write_dat1(51);  
write_dat1(55);  
write_dat1(59);  
write_dat1(63);  
write_dat1(67);  
write_dat1(71);  
write_dat1(75);  
write_dat1(79);  
write_dat1(83);  
write_dat1(87);  
write_dat1(91);  
write_dat1(95);  
write_dat1(99);  
write_dat1(103);  
write_dat1(105);  
write_dat1(109);  
write_dat1(113);  
write_dat1(117);  
write_dat1(121);  
write_dat1(123);  
write_dat1(127);  
//G  
write_dat1(0);  
write_dat1(2);  
write_dat1(4);  
write_dat1(6);  
write_dat1(8);  
write_dat1(10);  
write_dat1(12);  
write_dat1(16);  
write_dat1(18);  
write_dat1(24);  
write_dat1(26);  
write_dat1(28);  
write_dat1(30);  
write_dat1(32);  
write_dat1(34);  
write_dat1(36);
```

write_dat1(38);
write_dat1(40);
write_dat1(42);
write_dat1(44);
write_dat1(46);
write_dat1(48);
write_dat1(50);
write_dat1(52);
write_dat1(54);
write_dat1(56);
write_dat1(58);
write_dat1(60);
write_dat1(62);
write_dat1(64);
write_dat1(66);
write_dat1(68);
write_dat1(70);
write_dat1(72);
write_dat1(76);
write_dat1(78);
write_dat1(80);
write_dat1(82);
write_dat1(84);
write_dat1(86);
write_dat1(88);
write_dat1(90);
write_dat1(92);
write_dat1(94);
write_dat1(96);
write_dat1(98);
write_dat1(100);
write_dat1(102);
write_dat1(104);
write_dat1(106);
write_dat1(108);
write_dat1(110);
write_dat1(112);
write_dat1(114);

write_dat1(116);
write_dat1(118);
write_dat1(120);
write_dat1(121);
write_dat1(122);
write_dat1(123);
write_dat1(124);
write_dat1(125);
write_dat1(126);
write_dat1(127);
//B
write_dat1(0);
write_dat1(5);
write_dat1(10);
write_dat1(15);
write_dat1(20);
write_dat1(25);
write_dat1(30);
write_dat1(35);
write_dat1(39);
write_dat1(43);
write_dat1(47);
write_dat1(51);
write_dat1(55);
write_dat1(59);
write_dat1(63);
write_dat1(67);
write_dat1(71);
write_dat1(75);
write_dat1(79);
write_dat1(83);
write_dat1(87);
write_dat1(91);
write_dat1(93);
write_dat1(97);
write_dat1(101);
write_dat1(105);
write_dat1(109);

```
write_dat1(113);  
write_dat1(117);  
write_dat1(121);  
write_dat1(124);  
write_dat1(127);  
write_com(0x02);  
write_dat(0x01);//turn ON  
}
```

Controlled Seal

Packing Process(1)~(9)

KPS-0293-A04

PRODUCT SPECIFICATION

<p>(1) TRAY Type:00790-MT1-A Add EPE in every contained tray</p>	<p>(2)</p> <p>TRAY</p>	<p>(3) order ①、 ② ①、 ② fix trays with tape 540 pcs of 1 small carton 1 tray contain 36 pcs 15 contained trays, 1 empty tray</p>	<p>(4) package with pl add five desicca create a power vacuum</p>
<p>(5)</p>	<p>(6)</p>	<p>(7)</p> <p>small carton package</p>	<p>(8)</p> <p>2 small cartons in 1 big carton</p>

(9) 30 contained trays, 2 empty trays,
Package quantity products:
1080 pcs of 1 big carton

Package finished

- NOTE:1、 The inner carton and master carton must be sealed with adhesive tape.
2、 Fill up the gap with EPE.
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	4
2	Low Temperature (Non-operation)	-40°C,240hrs	4
3	High Temperature (Operation)	70°C,240hrs	4
4	Low Temperature (Operation)	-40°C,240hrs	4
5	High Temperature / High Humidity (Operation)	60°C,95%RH,240hrs	4
7	Thermal shock (Non-operation)	-40°C~85°C(-40°C/30min;transit/3min;85°C/30min;transit/3min) 1cycle: 66min,30cycles	4
8	Vibration	Frequency: 5~50Hz,0.5G Scan rate: 1 oct/min Time: 2 hrs/axis Test axis: X,Y,Z	1 Carton
9	Drop	Height: 100 cm Sequence: 1 angle, 3 edges and 6 faces	1 Carton

Test and measurement conditions

- All measurements shall not be started until the specimens attain to temperature stability, the stable time is at least 15 minutes.
- The degradation of polarizer is ignored for item 5.
- The tolerance of temperature is $\pm 3^{\circ}\text{C}$, and the tolerance of relative humidity is $\pm 5\%$.

Evaluation criteria

- The function test is OK.
- No observable defects.
- Luminance: $\geq 50\%$ of initial value.
- Current consumption: within $\pm 50\%$ of initial value.

11.2 Lifetime

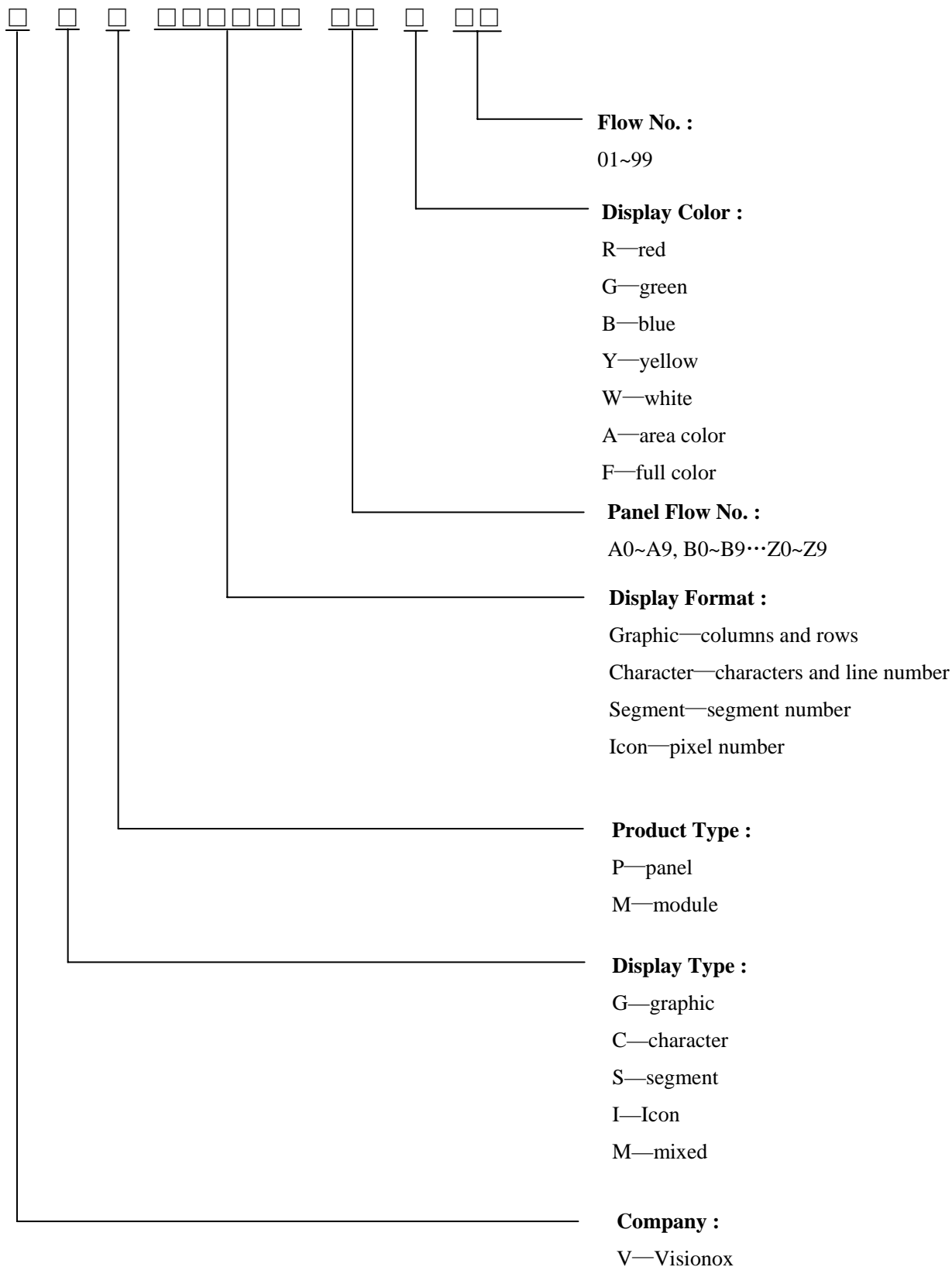
End of lifetime is specified as 50% of initial brightness and the test pattern at operating condition is 50% alternating checkerboard.

ITEM	MIN	MAX	UNIT	CONDITION
Operation Life Time	20,000	-	hrs	70 cd/m ² ,50% Checkerboard

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 $22\pm 3^{\circ}\text{C}$; $55\pm 15\%$ RH.

12 Illustration of OLED Product Name



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: $22 \pm 3^{\circ}\text{C}$

Humidity: $55 \pm 15\% \text{R.H}$

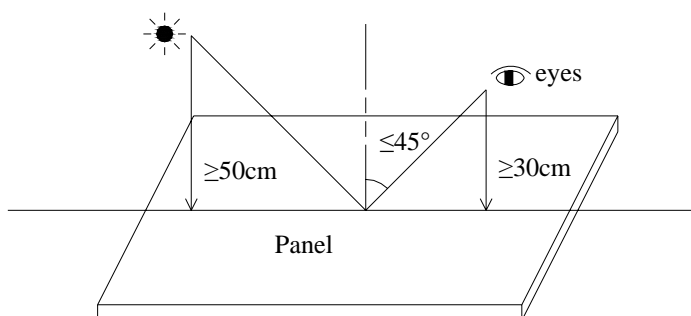
Fluorescent Lamp: 30W

Distance between the Panel & Lamp: $\geq 50\text{cm}$

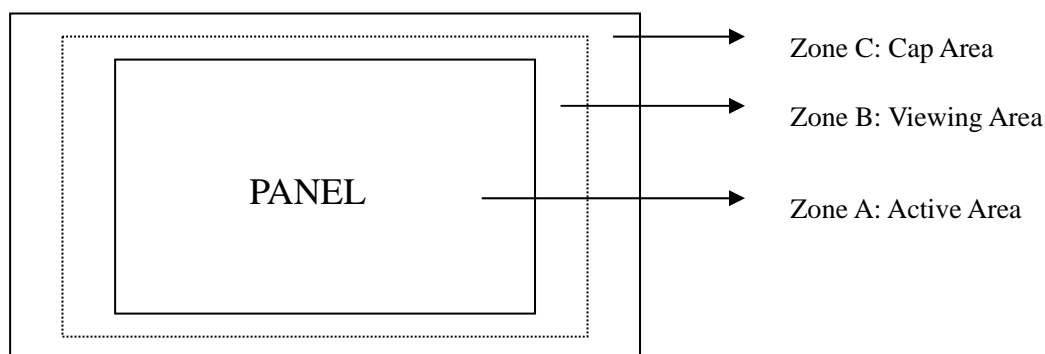
Distance between the Panel & Eyes: $\geq 30\text{cm}$

Viewing angle from the vertical in each direction: $\leq 45^{\circ}$

(See the sketch below)



13.3 Quality Assurance Zones

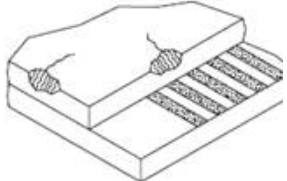


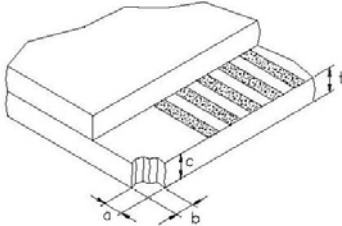
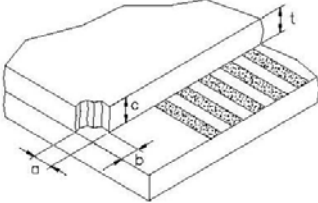
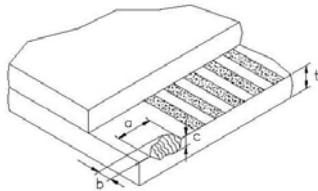
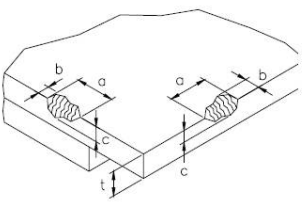
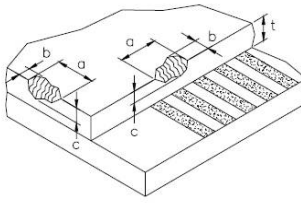
13.4 Inspection Standard

Definition of Φ &L&W (Unit: mm)



I . Appearance Defects

NO.	ITEM	CRITERIA	CLASSIFICATION																		
1	Polarizer Black or White spot, Dirty spot, Foreign matter, Dent on the polarizer	<table border="1"> <thead> <tr> <th rowspan="2">Average Diameter (mm)</th> <th colspan="2">Acceptable Number</th> </tr> <tr> <th>Zone A,B</th> <th>Zone C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.15$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.30$</td> <td colspan="2">3</td> </tr> <tr> <td>$\Phi > 0.30$</td> <td colspan="2">0</td> </tr> </tbody> </table>	Average Diameter (mm)	Acceptable Number		Zone A,B	Zone C	$\Phi \leq 0.15$	Ignore		$0.15 < \Phi \leq 0.30$	3		$\Phi > 0.30$	0		Minor				
Average Diameter (mm)	Acceptable Number																				
	Zone A,B	Zone C																			
$\Phi \leq 0.15$	Ignore																				
$0.15 < \Phi \leq 0.30$	3																				
$\Phi > 0.30$	0																				
2	Scratch/line on the glass/Polarizer	<table border="1"> <thead> <tr> <th rowspan="2">Width (mm)</th> <th rowspan="2">Length (mm)</th> <th colspan="2">Acceptable Number</th> </tr> <tr> <th>Zone A,B</th> <th>Zone C</th> </tr> </thead> <tbody> <tr> <td>$W \leq 0.03$</td> <td>---</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.08$</td> <td>$L \leq 5.0$</td> <td colspan="2">3</td> </tr> <tr> <td>$W > 0.08$</td> <td>---</td> <td colspan="2">0</td> </tr> </tbody> </table>	Width (mm)	Length (mm)	Acceptable Number		Zone A,B	Zone C	$W \leq 0.03$	---	Ignore		$0.03 < W \leq 0.08$	$L \leq 5.0$	3		$W > 0.08$	---	0		Minor
Width (mm)	Length (mm)	Acceptable Number																			
		Zone A,B	Zone C																		
$W \leq 0.03$	---	Ignore																			
$0.03 < W \leq 0.08$	$L \leq 5.0$	3																			
$W > 0.08$	---	0																			
3	Polarizer Bubble	<table border="1"> <thead> <tr> <th rowspan="2">Average Diameter (mm)</th> <th colspan="2">Acceptable Number</th> </tr> <tr> <th>Zone A,B</th> <th>Zone C</th> </tr> </thead> <tbody> <tr> <td>$\Phi > 0.5$</td> <td colspan="2">0</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td colspan="2">3</td> </tr> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="2">Ignore</td> </tr> </tbody> </table>	Average Diameter (mm)	Acceptable Number		Zone A,B	Zone C	$\Phi > 0.5$	0		$0.2 < \Phi \leq 0.5$	3		$\Phi \leq 0.2$	Ignore		Minor				
Average Diameter (mm)	Acceptable Number																				
	Zone A,B	Zone C																			
$\Phi > 0.5$	0																				
$0.2 < \Phi \leq 0.5$	3																				
$\Phi \leq 0.2$	Ignore																				
4	Any Dirt & Scratch on Polarizer's Protective Film	Ignore for not affect the polarizer.	Acceptable																		
5	Glass Crack	 <p>Propagation crack is not acceptable.</p>	Major																		

6	Corner Chip	 <p>t= Glass thickness Accept $a \leq 2.0\text{mm}$ or $b \leq 2.0\text{mm}$, $c \leq t$</p>	Minor
7	Corner Chip on Cap Glass	 <p>t= Glass thickness Accept $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$</p>	Minor
8	Chip on Contact Pad	 <p>t= Glass thickness Accept $a \leq 3.0\text{mm}$ or $b \leq 0.8\text{mm}$, $c \leq t$ (on the contact pin) $a \leq 3.0\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$ (outside of the contact pin)</p>	Minor
9	Chip on Face of Display	 <p>t= Glass thickness Accept $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$</p>	Minor
10	Chip on Cap Glass	 <p>t= Glass thickness Accept $a \leq 3.0\text{mm}$ or $b \leq 3.0\text{mm}$, $c \leq t/2$ $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $t/2 \leq c \leq t$</p>	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	<table border="1"> <thead> <tr> <th>Average Diameter (mm)</th> <th colspan="2">Pieces Permitted</th> </tr> <tr> <th></th> <th>Zone A,B</th> <th>Zone C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.20$</td> <td>3</td> <td rowspan="2">Ignore</td> </tr> <tr> <td>$\Phi > 0.20$</td> <td>0</td> </tr> </tbody> </table>	Average Diameter (mm)	Pieces Permitted			Zone A,B	Zone C	$\Phi \leq 0.10$	Ignore		$0.10 < \Phi \leq 0.20$	3	Ignore	$\Phi > 0.20$	0	Minor
		Average Diameter (mm)	Pieces Permitted														
			Zone A,B	Zone C													
		$\Phi \leq 0.10$	Ignore														
$0.10 < \Phi \leq 0.20$	3	Ignore															
$\Phi > 0.20$	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°C 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°C and 35°C 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.