



MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

OLED MODULE SPECIFICATION

Model : MI9664FO-6

For Customer's Acceptance:

Customer	
Approved	
Comment	

Revision	1.0
Engineering	
Date	2016-06-03
Our Reference	

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**■ PHYSICAL DATA**

No.	Items	Specification	Unit
1	Display Mode	Passive Matrix OLED	-
2	Display Color	65K Full Color	-
3	Duty	1/64	-
4	Resolution	96 (H) x 64 (V)	Pixel
5	Active Area	20.135 (W) x 13.42 (H)	mm
6	Outline Dimension	24.80 (W) x 22.42 (H) x 1.33 (D)	mm
7	Dot Pitch	0.07 (W) x 0.21 (H)	mm
8	Dot Size	0.045 (W) x 0.19 (H)	mm
9	Driver IC	SSD1331Z	-
11	Interface	8-bit parallel,SPI	-
12	Aperture rate	58	%
13	Weight	1.46	g

■ ABSOLUTE MAXIMUM RATINGS

Items	Symbol	Min	Typ.	Max	Unit	Notes
Supply voltage for logic	V _{DD}	-0.3	-	4	V	1
Supply voltage for display	V _{CC}	0	-	18.0	V	1
Operating temperature	T _{OP}	-30	-	70	°C	2
Storage temperature	T _{ST}	-30	-	80	°C	2

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 “Electrical Characteristics”.

Malfunctioning of the module may occur and the reliability of the module may deteriorate if the module is used beyond the conditions.

■ ELECTRICAL CHARACTERISTICS

◆ DC Characteristics

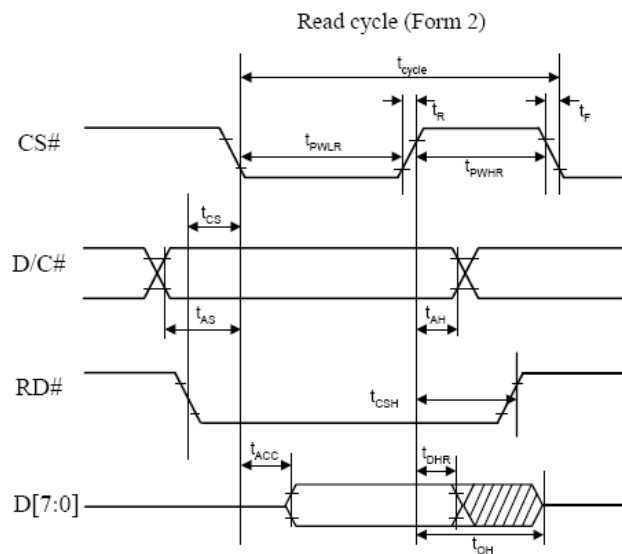
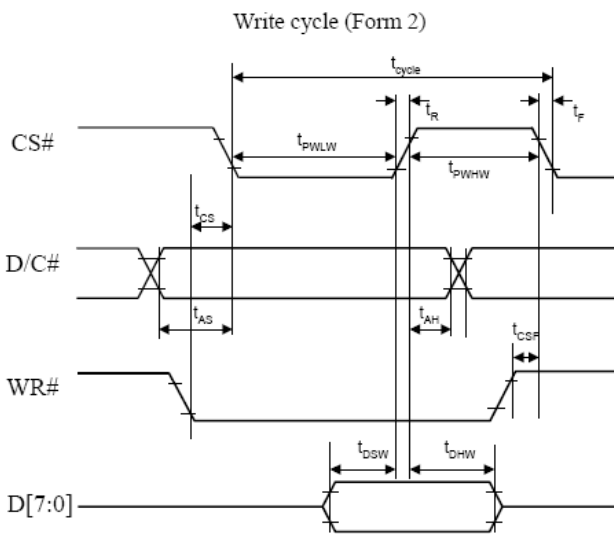
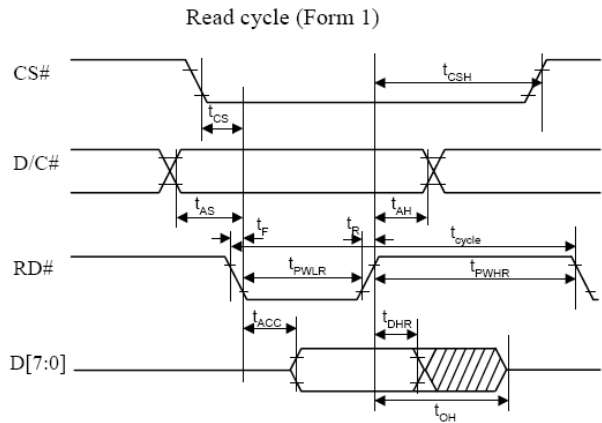
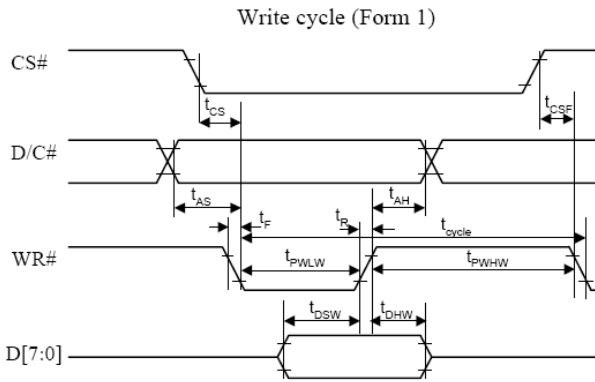
Items	Symbol	Conditions	Min	Typ.	Max	Unit
Supply voltage for logic	V _{DD}	22±3°C, 55±15%R.H	2.4	3.0	3.5	V
OLED Driver supply voltage	V _{CC}	22±3°C, 55±15%R.H	9.5	10	10.5	V
High level input	V _{IH}		0.8 x V _{DD}	-	V _{DD}	V
Low level input	V _{IL}		-	-	0.2 x V _{DD}	V
High level output	V _{OH}		0.9 x V _{DD}	-	V _{DD}	V
Low level output	V _{OL}		-	-	0.1x V _{DD}	V

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

◆ AC Characteristics

1. 80XX-Series MPU Parallel Interface Timing Characteristics: (VDD - VSS = 2.4V to 3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	130	-	-	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	10	-	-	ns
t_{DHR}	Read Data Hold Time	20	-	-	ns
t_{OH}	Output Disable Time	-	-	70	ns
t_{ACC}	Access Time	-	-	140	ns
$t_{PWL R}$	Read Low Time	150	-	-	ns
$t_{PWL W}$	Write Low Time	60	-	-	ns
$t_{PWH R}$	Read High Time	60	-	-	ns
$t_{PWH W}$	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

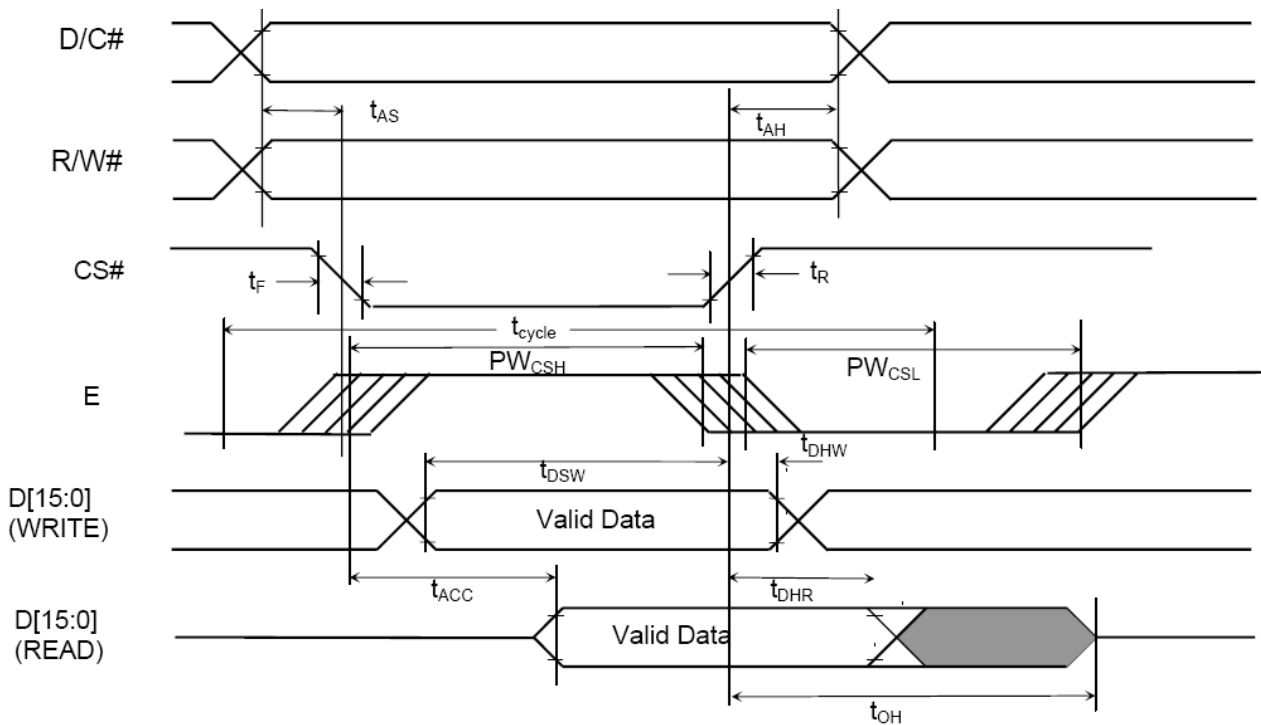


8080-series parallel interface characteristics

2. 68XX-Series MPU Parallel Interface Timing Characteristics:

(VDD - VSS = 2.4V to 3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time (write cycle)	130	-	-	ns
PW_{CSL}	Control Pulse Low Width (write cycle)	60	-	-	ns
PW_{CSH}	Control Pulse High Width (write cycle)	60	-	-	ns
t_{cycle}	Clock Cycle Time (read cycle)	200	-	-	ns
PW_{CSL}	Control Pulse Low Width (read cycle)	100	-	-	ns
PW_{CSH}	Control Pulse High Width (read cycle)	100	-	-	ns
t_{AS}	Address Setup Time	0	-	-	ns
t_{AH}	Address Hold Time	10	-	-	ns
t_{DSW}	Data Setup Time	40	-	-	ns
t_{DHW}	Data Hold Time	10	-	-	ns
t_{ACC}	Data Access Time	-	-	140	ns
t_{OH}	Output Hold time	-	-	70	ns
t_{R}	Rise Time	-	-	15	ns
t_{F}	Fall Time	-	-	15	ns

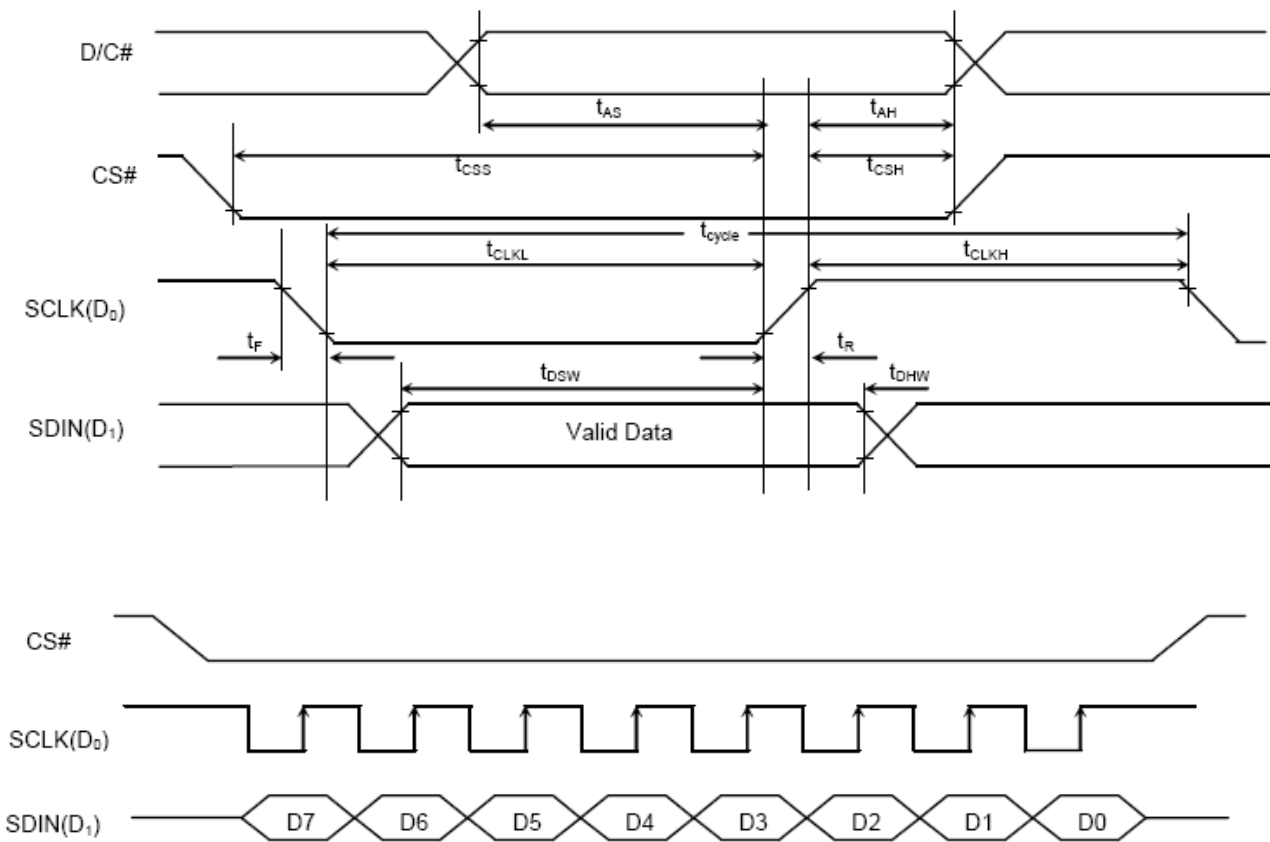


6800-series parallel interface characteristics

3. Serial Interface Timing Characteristics:

(VDD - VSS = 2.4V to 3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	150	-	-	ns
t_{AS}	Address Setup Time	40	-	-	ns
t_{AH}	Address Hold Time	40	-	-	ns
t_{CSS}	Chip Select Setup Time	75	-	-	ns
t_{CSH}	Chip Select Hold Time	60	-	-	ns
t_{DSW}	Write Data Setup Time	40	-	-	ns
t_{DHW}	Write Data Hold Time	40	-	-	ns
t_{CLKL}	Clock Low Time	75	-	-	ns
t_{CLKH}	Clock High Time	75	-	-	ns
t_R	Rise Time	-	-	15	ns
t_F	Fall Time	-	-	15	ns



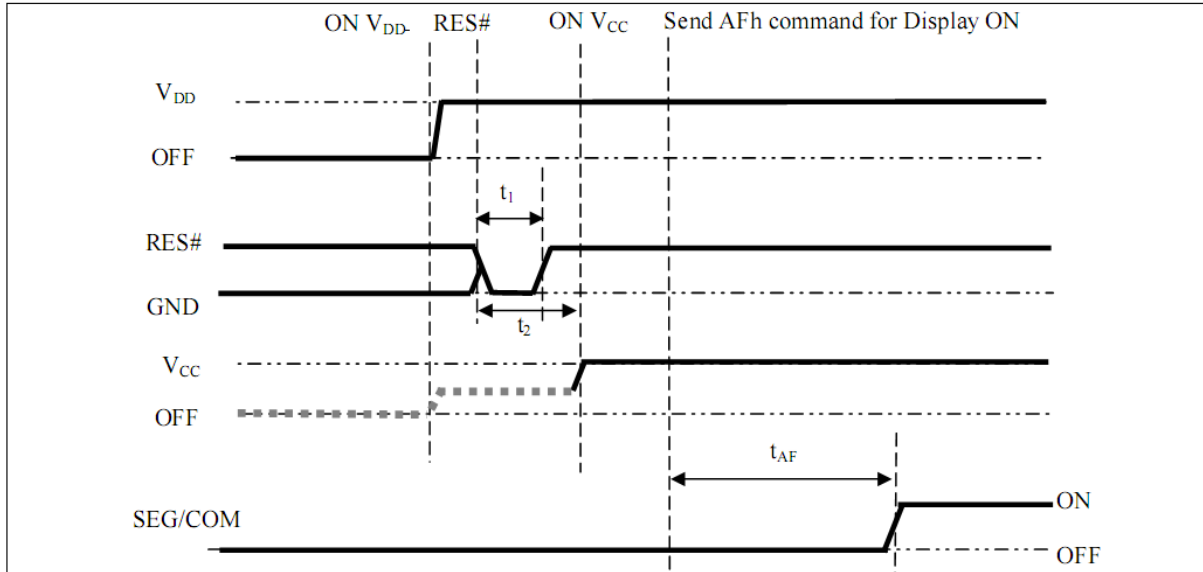
Serial interface characteristics

■ TIMING OF POWER SUPPLY

1. Power ON and Power OFF Sequence

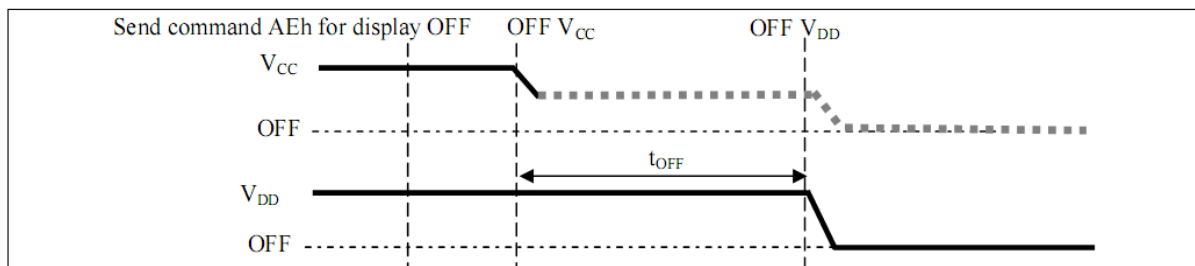
Power ON Sequence:

1. Power ON V_{DD} .
2. After V_{DD} become stable, set RES pin LOW (logic low) for at least 3 μ s (t_1)⁽⁴⁾ and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 3 μ s (t_2). Then Power ON V_{CC} ⁽¹⁾.
4. After V_{CC} 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 V_{CC} ^{(1),(2),(3)}.
3. Power OFF V_{DD} after t_{OFF} ⁽⁵⁾. (Typical t_{OFF} =100ms)

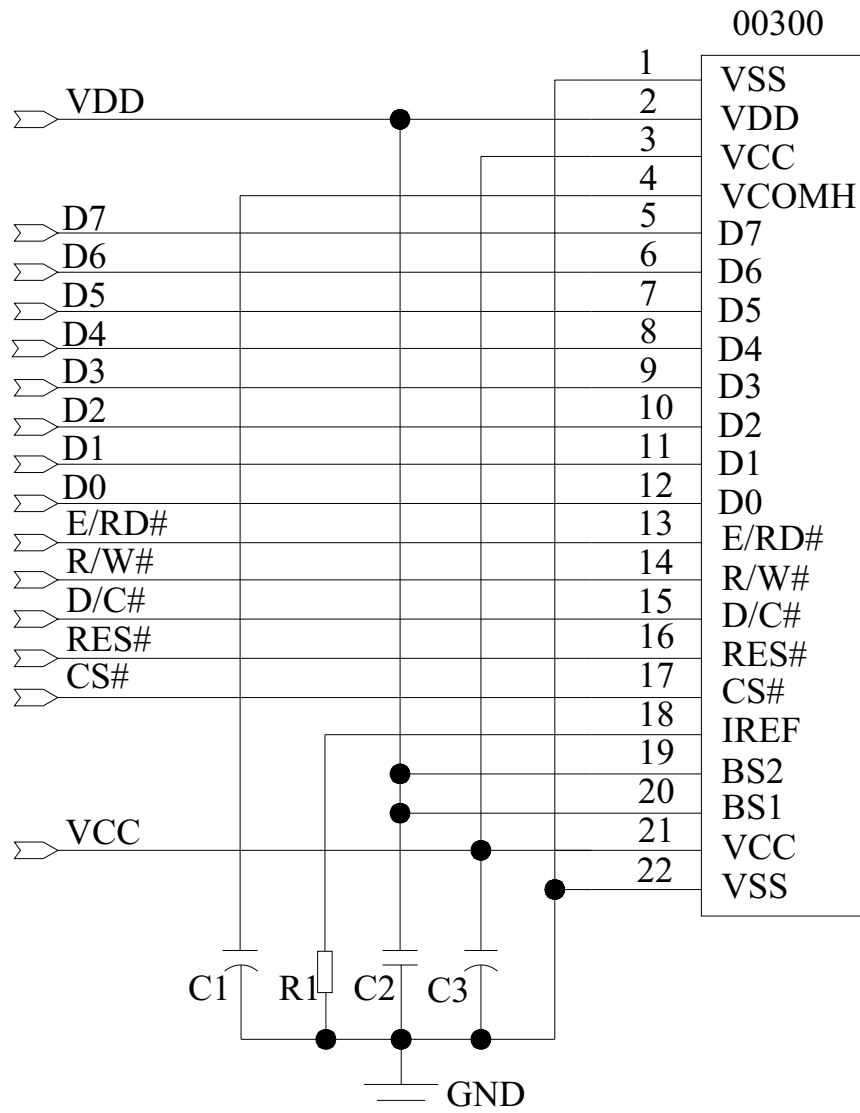


Note:

- ⁽¹⁾ Since an ESD protection circuit is connected between V_{DD} and V_{CC} , V_{CC} becomes lower than V_{DD} whenever V_{DD} is ON and V_{CC} is OFF as shown in the dotted line of V_{CC} in above figures.
- ⁽²⁾ V_{CC} should be kept float (disable) when it is OFF.
- ⁽³⁾ Power Pins (V_{DD} , V_{CC}) can never be pulled to ground under any circumstance.
- ⁽⁴⁾ The register values are reset after t_1 .
- ⁽⁵⁾ V_{DD} should not be Power OFF before V_{CC} Power OFF.

2. Application Circuit

(1).The configuration for 8-bit 8080 mode, external VCC is shown in the following diagram:



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

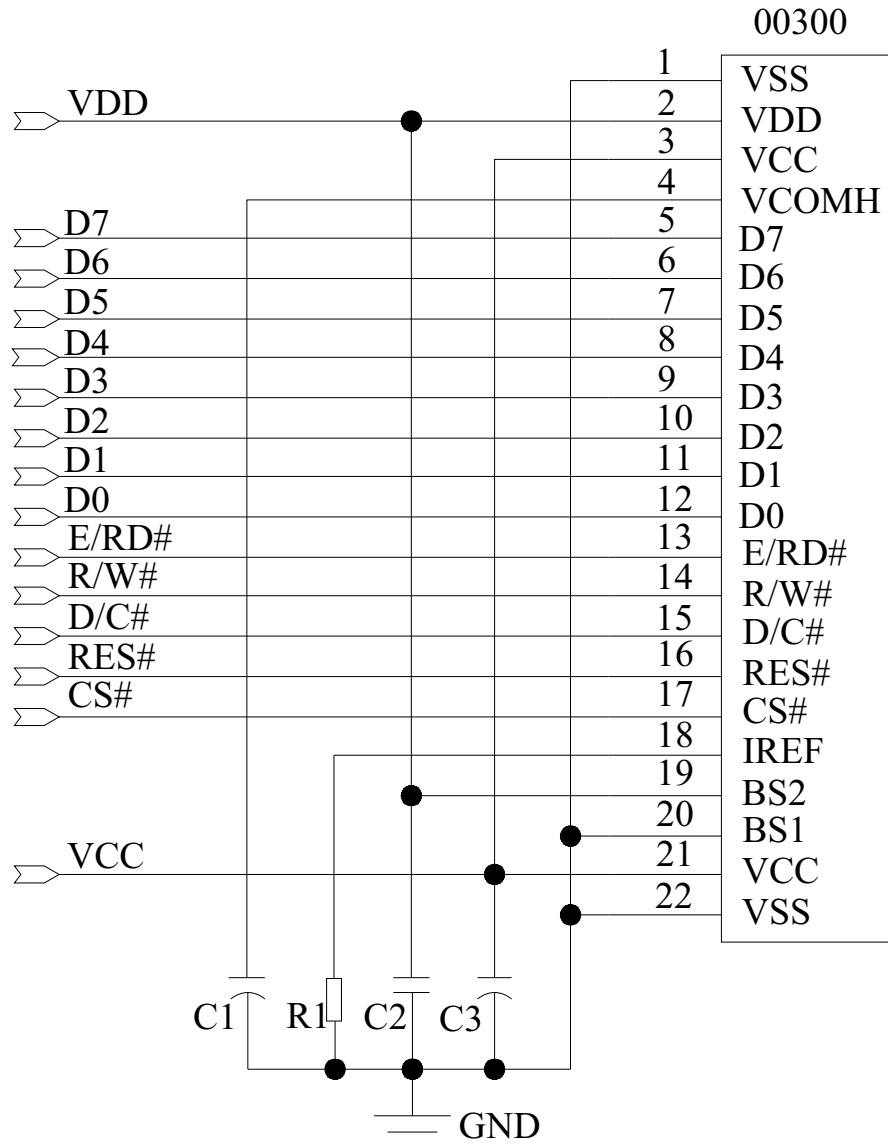
Recommended components

C1, C3: 4.7 μ F/25V.ROHS (Tantalum Capacitors)

C2: 0.1 μ F-0603-X7R \pm 10%.ROHS

R1: 0603 1/10W \pm 5% 910Kohm.ROHS

(2).The configuration for 8-bit 6800 mode, external VCC is shown in the following diagram:



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

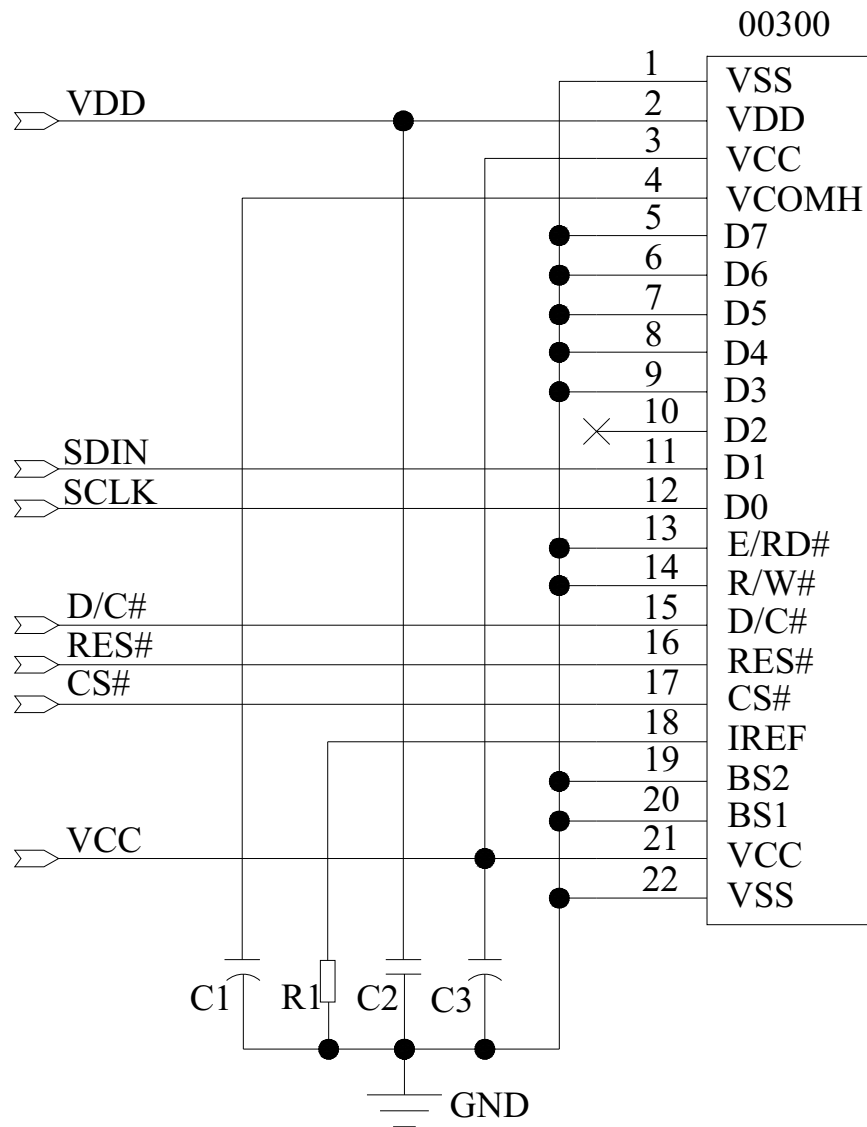
Recommended components

C1, C3: 4.7 μ F/25V.ROHS (Tantalum Capacitors)

C2: 0.1 μ F-0603-X7R \pm 10%.ROHS

R1: 0603 1/10W +/-5% 910Kohm.ROHS

(3).The configuration for SPI mode, external VCC is shown in the following diagram:



Pin connected to MCU interface: SCLK, SDIN, D/C#, RES#, CS#

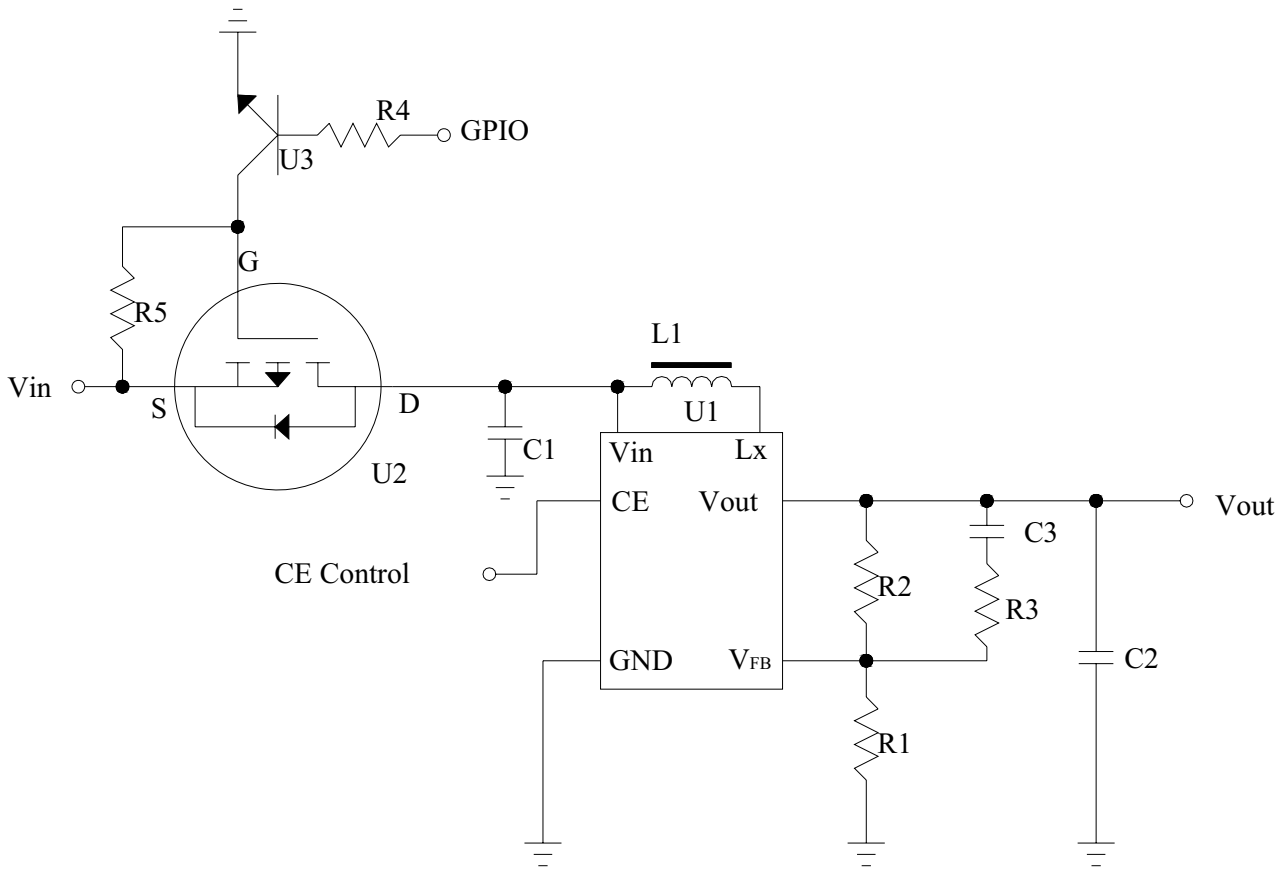
Recommended components

C1, C3 4.7 μ F/25V.ROHS (Tantalum Capacitors)

C2: 0.1 μ F-0603-X7R \pm 10%.ROHS

R1: 0603 1/10W \pm 5% 910Kohm.ROHS

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% 120Kohm.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

4. Display Control Instruction

Refer to SSD1331 IC Specification.

5. Recommended Software Initialization

```
void init_SSD1331()
{
    int pwm, delta;
    write_com(0xfd);    // command lock
    write_com(0x12);
    write_com(0xae);    // display off
    write_com(0xa4);    // Normal Display mode
    write_com(0x15);    //set column address
    write_com(0x00);    //column address start 00
    write_com(0x5f);    //column address end 95
    write_com(0x75);    //set row address
    write_com(0x00);    //row address start 00
    write_com(0x3f);    //row address end 63
    write_com(0x87);    //master current control
    write_com(0x06);    //9/16(160uA)
    write_com(0x83);    //Set Contrast for Color R
    write_com(0xc0);
    write_com(0x82);    //Set Contrast for Color G
    write_com(0x65);
    write_com(0x81);    //Set Contrast for Color B
    write_com(0x95);
    write_com(0x8a);
    write_com(0x61);
    write_com(0x8b);
    write_com(0x62);
    write_com(0x8c);
    write_com(0x63);
    write_com(0xa0);    //set re-map & data format
    write_com(0x72);    //Horizontal address increment
    write_com(0xa1);    //set display start line
    write_com(0x00);    //start 00 line
    write_com(0xa2);    //set display offset
    write_com(0x00);
    write_com(0xa8);    //set multiplex ratio
    write_com(0x3f);    //64MUX
}
```

```
write_com(0xad);
write_com(0x8f);
write_com(0xb0); //set power save
write_com(0x1a); //
write_com(0xb1);
write_com(0xf1); // Phase 2 period Phase 1 period
write_com(0xb3); // Set Display Clock Divide Ratio/ Oscillator Frequency
write_com(0xd0); // 0.97MHZ
write_com(0xbb); // set pre-charge
write_com(0x3e); //
write_com(0xbe); //set Vcomh
write_com(0x3e); //0.83Vref
write_com(0xB9);
write_com(0xB8); //SET Gray Scale Table
pwm = 1;
delta=1;
pwm=pwm; write_com(pwm); //pw1
pwm=pwm+delta; write_com(pwm); //pw3
pwm=pwm+delta; write_com(pwm); //pw5
pwm=pwm+delta; write_com(pwm); //pw7
delta=2;
pwm=pwm+delta; write_com(pwm); //pw9
pwm=pwm+delta; write_com(pwm); //pw11
pwm=pwm+delta; write_com(pwm); //pw13
pwm=pwm+delta; write_com(pwm); //pw15
delta=2;
pwm=pwm+delta; write_com(pwm); //pw17
pwm=pwm+delta; write_com(pwm); //pw19
pwm=pwm+delta; write_com(pwm); //pw21
pwm=pwm+delta; write_com(pwm); //pw23
delta=3;
pwm=pwm+delta; write_com(pwm); //pw25
pwm=pwm+delta; write_com(pwm); //pw27
pwm=pwm+delta; write_com(pwm); //pw29
pwm=pwm+delta; write_com(pwm); //pw31
delta=4;
pwm=pwm+delta; write_com(pwm); //pw33
pwm=pwm+delta; write_com(pwm); //pw35
```



```
pwm=pwm+delta; write_com(pwm);//pw37
pwm=pwm+delta; write_com(pwm);//pw39
delta=5;
pwm=pwm+delta; write_com(pwm);//pw41
pwm=pwm+delta; write_com(pwm);//pw43
pwm=pwm+delta; write_com(pwm);//pw45
pwm=pwm+delta; write_com(pwm);//pw47
delta=6;
pwm=pwm+delta; write_com(pwm);//pw49
pwm=pwm+delta; write_com(pwm);//pw51
pwm=pwm+delta; write_com(pwm);//pw53
pwm=pwm+delta; write_com(pwm);//pw55
delta=7;
pwm=pwm+delta; write_com(pwm);//pw57
pwm=pwm+delta; write_com(pwm);//pw59
pwm=pwm+delta; write_com(pwm);//pw61
pwm=pwm+delta; write_com(pwm);//pw63
TMOD=0X01;
TH0=0x3c;
TL0=0xb0;
EA=1;
ET0=1;
TR0=1;
write_com(0xad); //Select external VCC supply at Display ON
write_com(0x8e); //Select External VP voltage supply
write_com(0xaf); //display on
}
```

■ ELECTRO-OPTICAL CHARACTERISTICS (Ta=25°C)

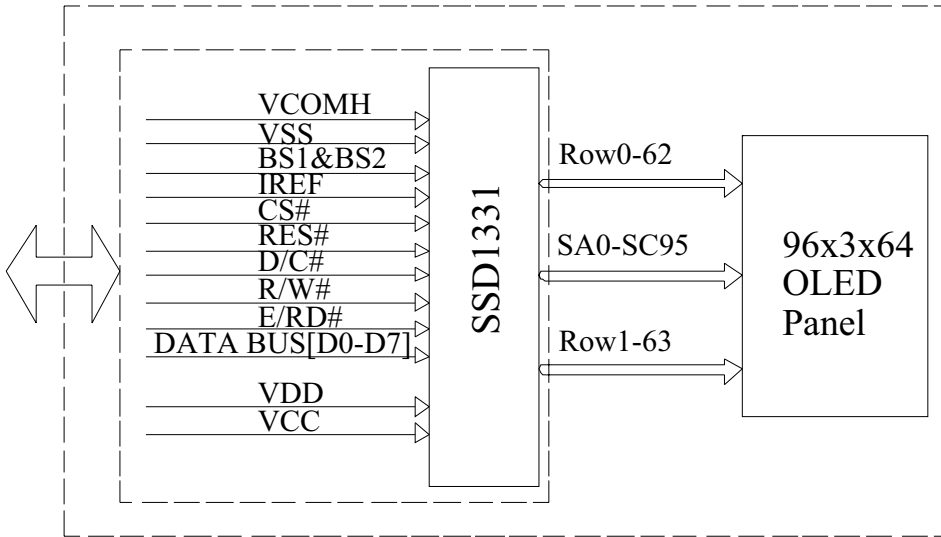
ITEM	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Normal Mode Brightness	L _{br}	All pixels ON(1)	80	100	-	cd/m ²
Normal Mode Power Consumption	Pt	All pixels ON(1)	-	170	210	mW
C.I.E(White)	(x)	x,y(CIE1931)	0.26	0.30	0.34	-
	(y)		0.28	0.32	0.36	-
C.I.E(Red)	(x)	x,y(CIE1931)	0.61	0.65	0.69	-
	(y)		0.30	0.34	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)		0.12	0.16	0.20	-
Dark Room Contrast	CR	-	≥2000:1	-	-	-
Response Time	-	-	---	10	-	μ s
View Angle	-	-	≥160	-	-	Degree

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

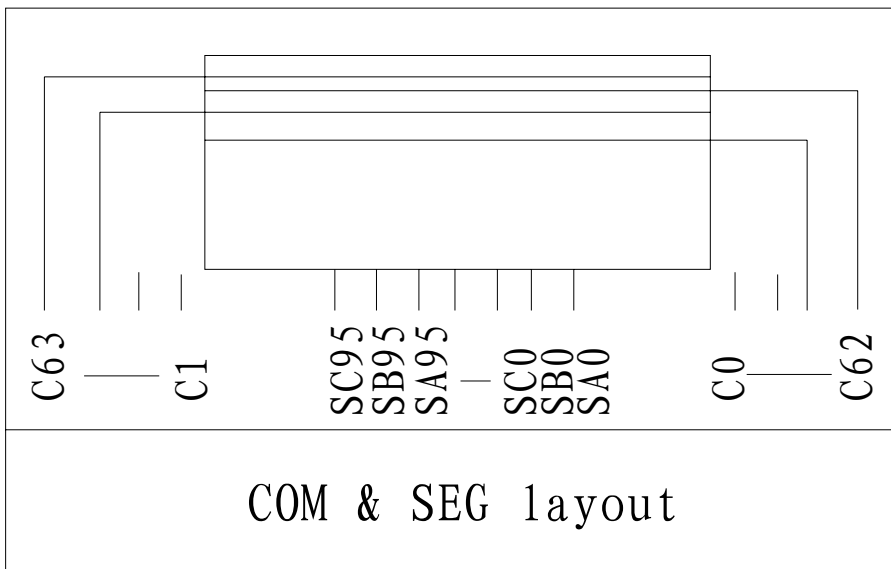
- Driving voltage :13V
- Contrast setting : R:0xc0 G:0x65 B:0x95
- Frame rate : 105Hz
- Duty setting : 1/64

■ INTERFACE PIN CONNECTIONS

1.1 Function Block Diagram



1.2 Panel Layout Diagram



2 Module Interface

PIN NO.	PIN NAME	DESCRIPTION													
1	VSS	Ground.													
2	VDD	Power Supply pin for logic operation of the driver.													
3	VCC	This is the most positive voltage supply pin of the chip.													
4	VCOMH	A capacitor should be connected between this pin and VSS.													
5~12	D7~D0	These are 8-bit bi-directional data bus to be connected to the microprocessor's data bus. When serial interface mode is selected, D0 will be the serial clock input, SCLK; D1 will be the serial data input: SDIN and D2 should be left opened.													
13	E/RD#	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.													
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 when low.													
15	D/C#	This pin is Data/Command control pin. When the pin is pulled high, the data at D7-D0 is treated as display data. When the pin is pulled low, the data at D7-D0 will be transferred to the command register.													
16	RES#	Reset pin, active low.													
17	CS#	Chip select pin, active low.													
18	IREF	A resistor should be connected between this pin and VSS.													
19	BS2	These are MCU interface input selection pins. See the following table for selecting different interfaces:													
20	BS1		<table border="1"> <thead> <tr> <th>Pin Name</th> <th>6800-parallel Interface</th> <th>8080-parallel interface</th> <th>Serial Interface</th> </tr> </thead> <tbody> <tr> <td>BS1</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>BS2</td> <td>1</td> <td>1</td> <td>0</td> </tr> </tbody> </table>	Pin Name	6800-parallel Interface	8080-parallel interface	Serial Interface	BS1	0	1	0	BS2	1	1	0
Pin Name	6800-parallel Interface		8080-parallel interface	Serial Interface											
BS1	0	1	0												
BS2	1	1	0												
21	VCC	This is the most positive voltage supply pin of the chip.													
22	VSS	Ground.													

■ RELIABILITY TESTS

Item		Condition	Criterion
High Temperature Storage (HTS)		80±2°C, 240 hours	1. After testing, the function test is ok. 2. After testing, no addition to the defect. 3. After testing, the change of luminance should be within +/- 50% of initial value. 4. After testing, the change for the mono and area color must be within (+/-0.02, +/- 0.02) and for the full color it must be within (+/-0.04, +/-0.04) of initial value based on 1931 CIE coordinates. 5. After testing, the change of total current consumption should be within +/- 50% of initial value.
High Temperature Operating (HTO)		70±2°C, 240 hours	
Low Temperature Storage (LTS)		-30±2°C, 240 hours	
Low Temperature Operating (LTO)		-30±2°C, 240 hours	
High Temperature / High Humidity Storage (HTHHS)		60±3°C, 90%±3%RH, 240 hours	
Thermal Shock (Non-operation) (TS)		-30±2°C ~ 25°C ~ 80±2°C (30min) (5min) (30min) 10cycles	
Vibration (Packing)	10~55~10Hz, amplitude 1.5mm, 1 hour for each direction x, y, z	1. One box for each test. 2. No addition to the cosmetic and the electrical defects.	
Drop (Packing)	Height : 1 m, each time for 6 sides, 3 edges, 1 angle		

Note: 1) For each reliability test, the sample quantity is 3, and only for one test item.
 2) The HTHHS test is requested the Pure Water(Resistance > 10MΩ).

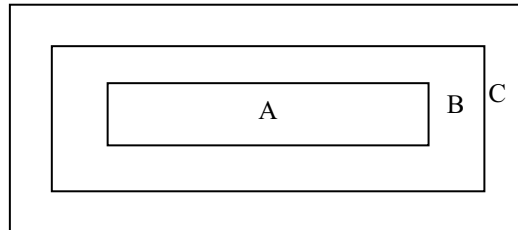
■ OUTGOING QUALITY CONTROL SPECIFICATION

◆ Standard

According to GB/T2828.1-2003/ISO 2859-1: 1999 and ANSI/ASQC Z1.4-1993, General Inspection Level II.

◆ Definition

- 1 Major defect : The defect that greatly affect the usability of product.
- 2 Minor defect : The other defects, such as cosmetic defects, etc.
- 3 Definition of inspection zone:



Zone A: Active Area

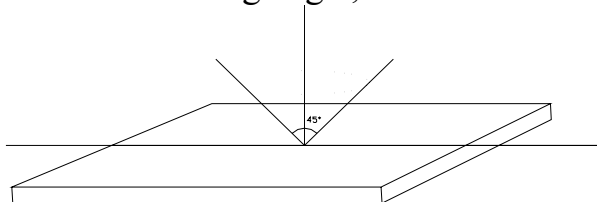
Zone B: Viewing Area except Zone A

Zone C: Outside Viewing Area

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble of quality and assembly to customer`s product.

◆ Inspection Methods

- 1 The general inspection : under 20W x 2 or 40W fluorescent light, about 30cm viewing distance, within 45° viewing angle, under 25±5°C.



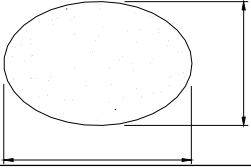
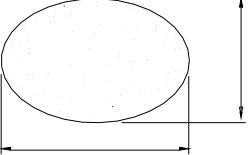
- 2 The luminance and color coordinate inspection : By PR705 or BM-7 or the equal equipments, in the dark room, under 25±5°C.

◆ Inspection Criteria

- 1 Major defect : AQL= 0.65

Item	Criterion
Function Defect	1. No display or abnormal display is not accepted
	2. Open or short is not accepted.
	3. Power consumption exceeding the spec is not accepted.
Outline Dimension	Outline dimension exceeding the spec is not accepted.
Glass Crack	Glass crack tends to enlarge is not accepted.

- 2 Minor Defect : AQL= 1.5

Item	Criterion			
Spot Defect (dimming and lighting spot)	Size (mm)		Accepted Qty	
			Area A + Area B	Area C
		$\Phi \leq 0.15$	Ignored	
		$0.15 < \Phi \leq 0.30$	3	Ignored
		$0.30 < \Phi$	0	
Note : $\Phi = (x + y) / 2$				
Line Defect (dimming and lighting line)	L (Length) : mm	W (Width) : mm	Area A + Area B	Area C
	/	$W \leq 0.03$	Ignored	
	$L \leq 5.0$	$0.03 < W \leq 0.08$	3	Ignored
	/	$0.08 < W$	As spot defect	
Remarks: The total of spot defect and line defect shall not exceed 4 pcs.				
Polarizer Stain	Stain which can be wiped off lightly with a soft cloth or similar cleaning is accepted, otherwise, according to the Spot Defect and the Line Defect.			
Polarizer Scratch	1. If scratch can be seen during operation, according to the criterions of the Spot Defect and the Line Defect.			
	2. If scratch can be seen only under non-operation or some special angle, the criterion is as below :			
	L (Length) : mm	W (Width) : mm	Area A + Area B	Area C
	/	$W \leq 0.03$	Ignore	
	$L \leq 5.0$	$0.03 < W \leq 0.08$	3	Ignore
/	$0.08 < W$	0		
Polarizer Air Bubble	Size		Area A + Area B	Area C
		$\Phi \leq 0.20$	Ignored	
		$0.20 < \Phi \leq 0.50$	3	Ignored
		$0.80 < \Phi$	0	

Glass Defect (Glass Chipped)	1. On the corner	(mm)	<table border="1"> <tr> <td>x</td> <td>≤ 2.0</td> </tr> <tr> <td>y</td> <td>$\leq S$</td> </tr> <tr> <td>z</td> <td>$\leq t$</td> </tr> </table>	x	≤ 2.0	y	$\leq S$	z	$\leq t$
	x	≤ 2.0							
	y	$\leq S$							
	z	$\leq t$							
2. On the bonding edge	(mm)	<table border="1"> <tr> <td>x</td> <td>$\leq a / 2$</td> </tr> <tr> <td>y</td> <td>$\leq s / 3$</td> </tr> <tr> <td>z</td> <td>$\leq t$</td> </tr> </table>	x	$\leq a / 2$	y	$\leq s / 3$	z	$\leq t$	
x	$\leq a / 2$								
y	$\leq s / 3$								
z	$\leq t$								
	3. On the other edges	(mm)	<table border="1"> <tr> <td>x</td> <td>$\leq a / 5$</td> </tr> <tr> <td>y</td> <td>≤ 1.0</td> </tr> <tr> <td>z</td> <td>$\leq t$</td> </tr> </table>	x	$\leq a / 5$	y	≤ 1.0	z	$\leq t$
x	$\leq a / 5$								
y	≤ 1.0								
z	$\leq t$								
	Note: t: glass thickness ; s: pad width ; a: the length of the edge								
TCP Defect	Crack, deep fold and deep pressure mark on the TCP are not accepted								
Pixel Size	The tolerance of display pixel dimension should be within $\pm 20\%$ of the spec								
Luminance	Refer to the spec or the reference sample								
Color	Refer to the spec or the reference sample								

■ CAUTIONS IN USING OLED MODULE

◆ Precautions For Handling OLED Module:

1. OLED module consists of glass and polarizer. Pay attention to the following items when handling:
 - i. Avoid drop from high, avoid excessive impact and pressure.
 - ii. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead.
 - iii. If the surface becomes dirty, breathe on the surface and gently wipe it off with a soft dry cloth. If it is terrible dirty, moisten the soft cloth with Isopropyl alcohol or Ethyl alcohol. Other solvents may damage the polarizer. Especially water, Ketone and Aromatic solvents.
 - iv. Wipe off saliva or water drops immediately, contact the polarizer with water over a long period of time may cause deformation.
 - v. Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peeling-off may occur with high temperature and high humidity.
 - vi. Condensation on the surface and the terminals due to cold or anything will damage, stain or dirty the polarizer, so make it clean as the way of iii.
2. Do not attempt to disassemble or process the OLED Module.
3. Make sure the TCP or the FPC of the Module is free of twisting, warping and distortion, do not pull or bend them forcefully, especially the soldering pins. On the other side, the SLIT part of the TCP is made to bend in the necessary case.
4. When assembling the module into other equipment, give the glass enough space to avoid excessive pressure on the glass, especially the glass cover which is much more fragile.
5. Be sure to keep the air pressure under 120 kPa, otherwise the glass cover is to be cracked.
6. Be careful to prevent damage by static electricity:
 - i. Be sure to ground the body when handling the OLED Modules.
 - ii. All machines and tools required for assembling, such as soldering irons, must be properly grounded.
 - iii. Do not assemble and do no other work under dry conditions to reduce the amount of static electricity generated. A relative humidity of 50%-60% is recommended.
 - iv. Peel off the protective film slowly to avoid the amount of static electricity generated.
 - v. Avoid to touch the circuit, the soldering pins and the IC on the Module by the body.
 - vi. Be sure to use anti-static package.
7. Contamination on terminals can cause an electrochemical reaction and corrode the terminal circuit, so make it clean anytime.
8. All terminals should be open, do not attach any conductor or semiconductor on the terminals.
9. When the logic circuit power is off, do not apply the input signals.
10. Power on sequence: $V_{DD} \rightarrow V_{PP}$, and power off sequence: $V_{PP} \rightarrow V_{DD}$.
11. Be sure to keep temperature, humidity and voltage within the ranges of the spec, otherwise shorten Module's life time, even make it damaged.
12. Be sure to drive the OLED Module following the Specification and Datasheet of IC controller, otherwise something wrong may be seen.

13. When displaying images, keep them rolling, and avoid one fixed image displaying more than 30 seconds, otherwise the residue image is to be seen. This is the speciality of OLED.

◆ **Precautions For Soldering OLED Module:**

1. Soldering temperature : $260^{\circ}\text{C} \pm 10^{\circ}\text{C}$.
2. Soldering time : 3-4 sec.
3. Repeating time : no more than 3 times.
4. If soldering flux is used, be sure to remove any remaining flux after finishing soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended to protect the surface with a cover during soldering to prevent any damage due to flux spatters.

◆ **Precautions For Storing OLED Module:**

1. Be sure to store the OLED Module in the vacuum bag with dessicant.
2. If the Module can not be used up in 1 month after the bag being opened, make sure to seal the Module in the vacuum bag with dessicant again.
3. Store the Module in a dark place, do not expose to sunlight or fluorescent light.
4. The polarizer surface should not touch any other objects. It is recommended to store the Module in the shipping container.
5. It is recommended to keep the temperature between 0°C and 30°C , the relative humidity not over 60%.

◆ **Limited Warranty**

Unless relevant quality agreements signed with customer and law enforcement, for a period of 12 months from date of production, all products (except automotive products) Multi-Inno will replace or repair any of its OLED modules which are found to be functional defect when inspected in accordance with Multi-Inno OLED acceptance standards (copies available upon request). Cosmetic/visual defects must be returned to Multi-Inno within 90 days of shipment. Confirmation of such date should be based on freight documents. The warranty liability of Multi-Inno is limited to repair and/or replacement on the terms above. Multi-Inno will not be responsible for any subsequent or consequential events.

◆ **Return OLED Module Under Warranty:**

1. No warranty in the case that the precautions are disregarded.
2. Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects.