Display Elektronik GmbH

DATA SHEET

STANDARD OLED/PLED

DEP 096032B-W

Product Specification ***Version : 05***

06.09.2013

History of Version

Version	Contents	Date	Note
01	NEW VERSION	2009/03/02	SPEC.
02		2009/05/25	PAGE 6
03	Add contrast setting Modify Drawing	2011/12/14	PAGE5 PAGE15
04	UPDATE Quality Assurance、Reliability ADD Precautions for Handling、Precautions for Electrical、Precautions for Storage	2013/08/30	Page 14~21
05	Modify Electrical Characteristics	2013/09/06	Page 6

C O N T E N T S

1. Numbering System

2. General Specification

(1) Mechanical Dimension

Item	Standard Value	Unit
Number of dots	96x32	dots
Module dimension (L*W*H)	28.5*11.5*1.41(MAX)	mm
Active area	19.18*6.38	mm
Dot size	0.18(W)×0.18(H)	mm
Dot pitch	0.20(W)×0.20 (H)	mm
Color	White	

(2) Controller IC: SSD1307 Controller

(3) Temperature Range

Operating	-40 ~ +70℃
Storage	-40 ~ +85℃

3. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-40	—	+70	℃
Storage Temperature	TST	-40	—	+85	℃
Input Voltage (VDD)	VDD	-0.3	—	4.0	V
Supply Voltage (Vcc)	Vcc	7	—	16	V
Humidity	—	—	—	85	%
Operating lift time	—	—	21000(1)	—	Hrs
Operating lift time	—	—	25000(2)	—	Hrs
Operating lift time	—	—	30000(3)	—	Hrs

Note: (A) Under Vcc = 12V, Ta = 25°C, 50% RH.

(B) Life time is defined the amount of time when the luminance has decayed to less than 50% of the initial measured luminance.

(C) Note (1)、Note (2)、Note (3) contrast setting are under VDD = 2.8V

(1) Setting of 140 cd/m :

Contrast setting :0x40H Frame rate : 105Hz Duty setting : 1/32

(2) Setting of 120 cd/m :

Contrast setting :0x36H Frame rate : 105Hz Duty setting : 1/32

(3) Setting of 100 cd/m :

Contrast setting :0x2CH Frame rate : 105Hz Duty setting : 1/32

4. Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	–	1.65	2.8	3.3	V
Supply Voltage For Panel	Vcc-Vss	–	11.5	12	12.5	V
Input High Vol	V_{IH}	–	0.8V_{DD}	–	–	V
Input Low Vol	V_{IL}	–	–	–	0.2V_{DD}	V
Output High Vol	V_{OH}	–	0.9V_{DD}	–	–	V
Output Low Vol.	V_{OL}	–	–	–	0.1V_{DD}	V
Supply Current	I_{DD}	–	–	10	–	mA
Supply Current	I_{CC}	–	–	700	–	uA

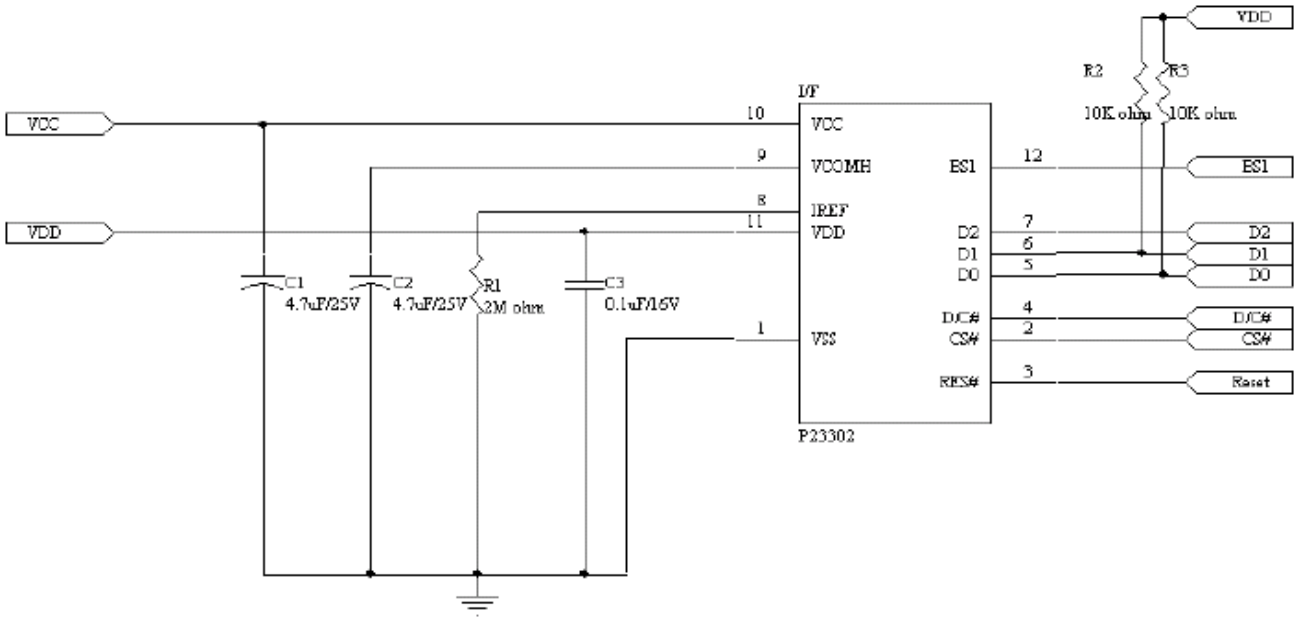
5. Optical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
View Angle	θ	160	–	–	deg
Dark Room contrast	CR	2000:1	–	–	–
Response Time	T	–	10	–	us

6. Interface Pin Function

Pin No.	Symbol	Description
1	VSS	This is a ground pin.
2	CS	This pin is the chip select input.
3	RES	Hardware reset signal
4	D/C	In 4-wire Serial mode, this is Data/Command control pin. In I2C mode, this pin acts as SA0 for slave address selection.
5	D0	4-wire SPI: SCLK I2C: SCL
6	D1	4-wire SPI: SDIN I2C: SDAIN
7	D2	4-wire SPI: NC I2C: SDAOUT
8	IREF	The current reference input pin, this pin should be connected to ground through a resistor
9	VCOMH	The COM voltage reference pin, this pin should be connected to ground through a capacitor.
10	VCC	Positive OLED high voltage power supply
11	VDD	Power supply for logic circuit
12	BS1	MCU Bus Interface Pin Selection 0: 4-wire Serial Interface 1: I2C Interface

7. Power Supply For LCD Module



Component :

C1、C2：4.7uF/16V(0805)

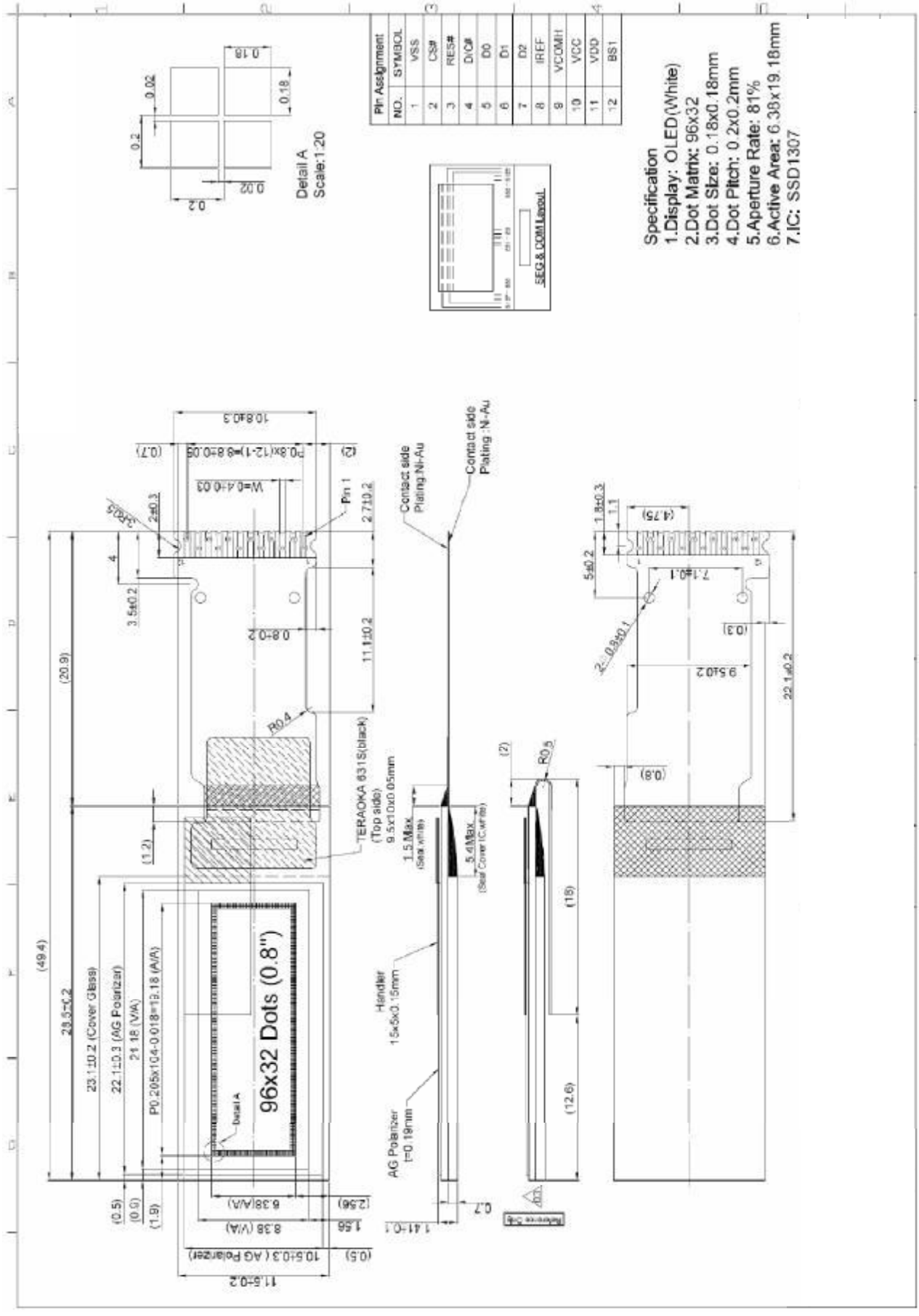
C3：0.1uF/16V(0603)

R1：2M ohm 1%(0603)

R2、R3：10K ohm (0603)

This circuit is for I^2C Interface

8. Drawing

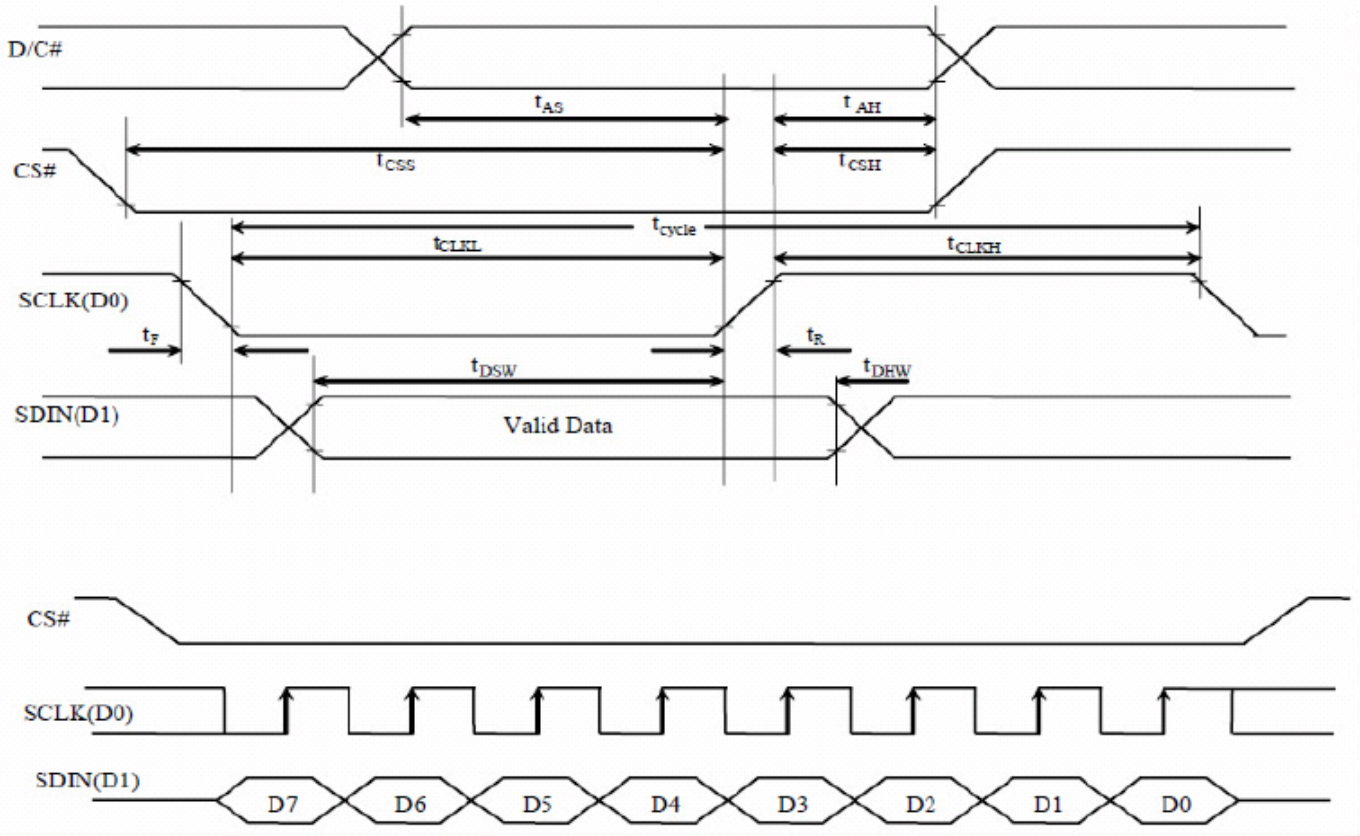


9. SSD1307controller data

9.1 Timing Characteristics

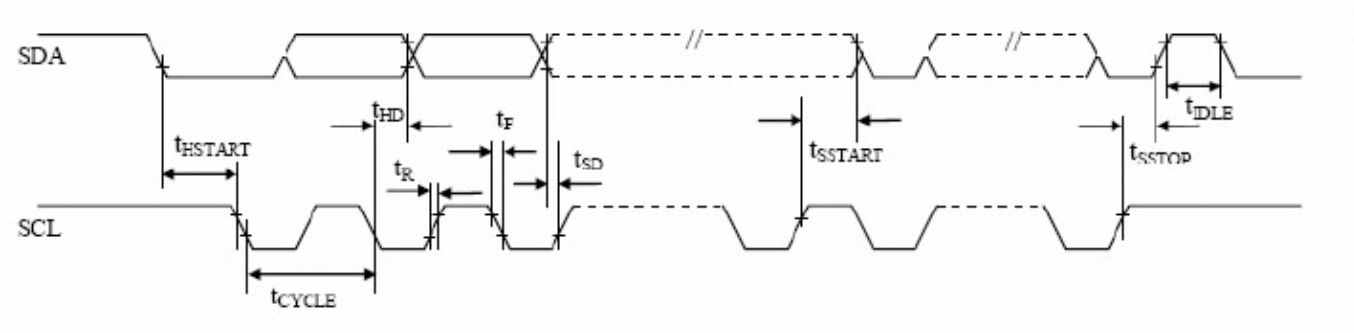
SPI Interface

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	100	-	-	ns
t_{AS}	Address Setup Time	15	-	-	ns
t_{AH}	Address Hold Time	15	-	-	ns
t_{CSS}	Chip Select Setup Time	20	-	-	ns
t_{CSH}	Chip Select Hold Time	10	-	-	ns
t_{DSW}	Write Data Setup Time	15	-	-	ns
t_{DHW}	Write Data Hold Time	15	-	-	ns
t_{CLKL}	Clock Low Time	20	-	-	ns
t_{CLKH}	Clock High Time	20	-	-	ns
t_R	Rise Time	-	-	40	ns
t_F	Fall Time	-	-	40	ns



I2C Interface

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	2.5	-	-	us
t_{HSTART}	Start condition Hold Time	0.6	-	-	us
t_{HD}	Data Hold Time (for "SDA_{OUT}" pin)	0	-	-	ns
	Data Hold Time (for "SDA_{IN}" pin)	300	-	-	ns
t_{SD}	Data Setup Time	100	-	-	ns
t_{SSTART}	Start condition Setup Time (Only relevant for a repeated Start condition)	0.6	-	-	us
t_{SSTOP}	Stop condition Setup Time	0.6	-	-	us
t_R	Rise Time for data and clock pin	-	-	300	ns
t_F	Fall Time for data and clock pin	-	-	300	ns
t_{IDLE}	Idle Time before a new transmission can start	1.3	-	-	us

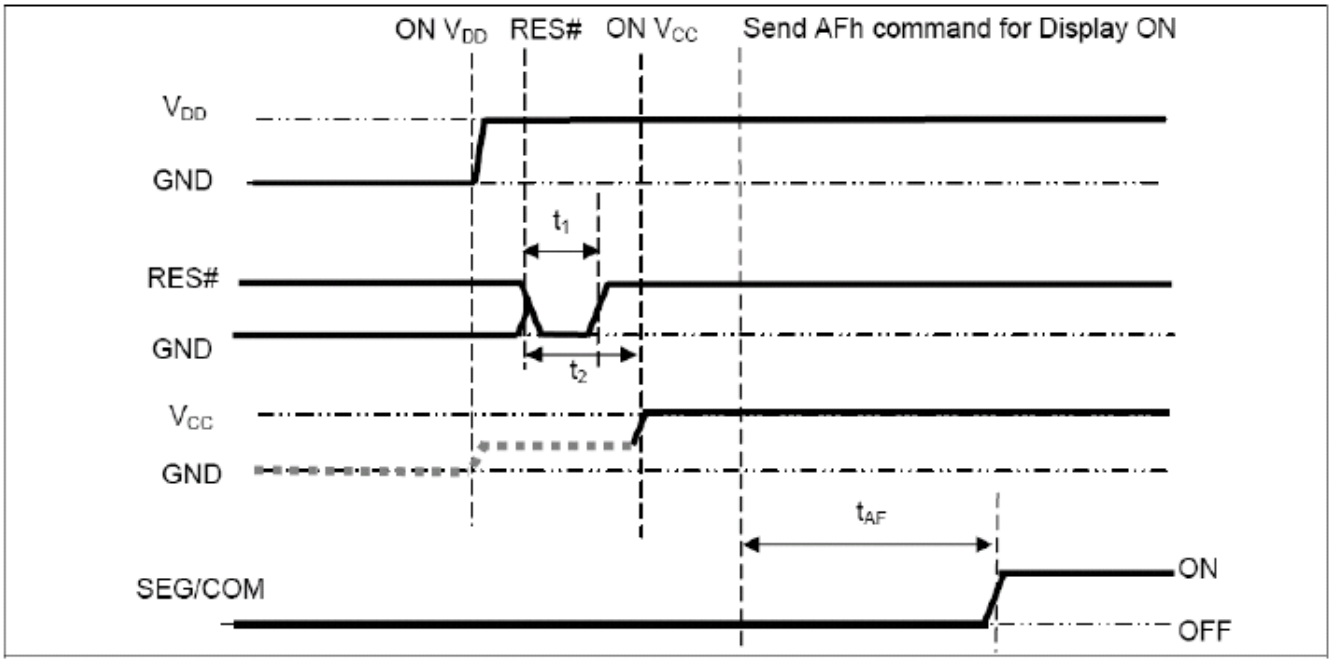


9.2 Power ON and OFF sequence& Application Circuit

9.2.1 POWER ON / OFF SEQUENCE

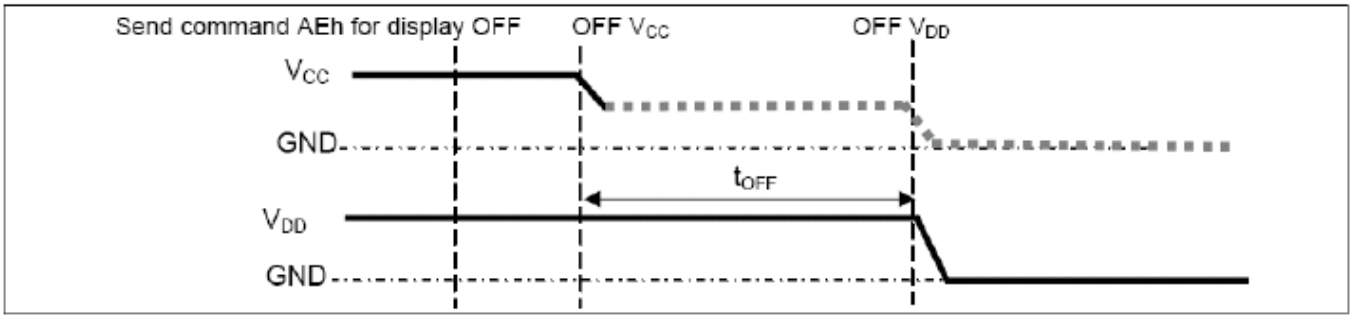
Power ON sequence:

1. Power ON V_{DD}.
2. After V_{DD} become stable, set RES# pin LOW (logic low) for at least 3us(t_1) and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 3us(t_2).Then Power ON V_{CC}.(1)
4. After V_{CC} become stable, send command AFh for display ON. SEG/COM wil be ON after 100ms(t_{AF}).



Power OFF sequence:

1. Send command AEh for display OFF.
2. Wait until panel discharges completely.
3. Power OFF V_{CC}. (1), (2)
4. Wait for t_{OFF}. Power OFF V_{DD}. (where Minimum t_{OFF}=80ms, Typical t_{OFF}=100ms)



Note:

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

(2)VCC should be disabled when it is OFF.

9.3 GRAPHIC DISPLAY DATA RAM ADDRESS MAP

The GDDRAM is a bit mapped static RAM holding the bit pattern to be displayed.

The size of the RAM is 128 x 39 bits and the RAM is divided into five pages, from PAGE0 to PAGE4, which are used for monochrome 128x39 dot matrix display, as shown in below figures.

When one data byte is written into GDDRAM, all the rows image data of the same page of the current column are filled (i.e. the whole column (8 bits) pointed by the column address pointer is filled.). Data bit D0 is written into the top row, while data bit D7 is written into bottom row. For PAGE4, bit D7 is treated as don't care bit.

For mechanical flexibility, re-mapping on both Segment and Common outputs can be selected by software. For vertical shifting of the display, an internal register storing the display start line can be set to control the portion of the RAM data to be mapped to the display (command D3h).

GDDRAM pages structure of SSD1307

Segment re-mapping (command A1h)		SEG127	SEG126	SEG125	SEG124	.....	SEG4	SEG3	SEG2	SEG1	SEG0		
Segment re-mapping (command A0h [RESET])		SEG0	SEG1	SEG2	SEG3	.....	SEG123	SEG124	SEG125	SEG126	SEG127		
Page	Data	COL0	COL1	COL2	COL3	.....	COL123	COL124	COL125	COL126	COL127	COM Output Scan Direction (command C0h [RESET])	COM Output Scan Direction (command C8h)
0	D0					.....						COM0	COM38
	D1											COM1	COM37
	D2											COM2	COM36
	D3											COM3	COM35
	D4											COM4	COM34
	D5											COM5	COM33
	D6											COM6	COM32
	D7											COM7	COM31
1	D0					.....						COM8	COM30
	D1											COM9	COM29
	D2											COM10	COM28
	D3											COM11	COM27
	D4											COM12	COM26
	D5											COM13	COM25
	D6											COM14	COM24
	D7											COM15	COM23
2	D0					.....						COM16	COM22
	D1											COM17	COM21
	D2											COM18	COM20
	D3											COM19	COM19
	D4											COM20	COM18
	D5											COM21	COM17
	D6											COM22	COM16
	D7											COM23	COM15
3	D0					.....						COM24	COM14
	D1											COM25	COM13
	D2											COM26	COM12
	D3											COM27	COM11
	D4											COM28	COM10
	D5											COM29	COM9
	D6											COM30	COM8
	D7											COM31	COM7
4	D0					.....						COM32	COM6
	D1											COM33	COM5
	D2											COM34	COM4
	D3											COM35	COM3
	D4											COM36	COM2
	D5											COM37	COM1
	D6											COM38	COM0
	D7	Don't care bit											

Each box represents one bit of image data

10. Quality Assurance

10.1 Inspection conditions

1. The inspection and meaurement are performed under the following conditions,
2. unless otherwise specified.
3. Temperature: 25±5°C
4. Humidity: 50±10%R.H.
5. Distance between the panel and eyes of the inspector≧30cm

10.2 Inspection Parameters

Severity	Inspection Item	Defect	Remark
Major Defect	1. Panel	(1) Non-displaying	
		(2) Line defects	
		(3) Malfunction	
		(4) Glass cracked	
	2. Film	(1) Film dimension out of specification	Can not be assembled
	3. Dimension	(1) Outline dimension out of specification	
Minor Defect	1. Panel	(1) Glass scratch	Appearance defect
		(2) Glass cutting NG	
		(3) Glass chip	
	2. Polarizer	(1) Polarizer scratch	
		(2) Stains on surface	
		(3) Polarizer bubbles	
	3. Displaying	(1) Dim spot、Bright spot、dust	
	4. Film	(1) Damage (2) Foreign material	

<table>
<tr><th>Description</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>1. Glass scratch</td><td>
<table>
<tr><th>Width (mm)
W</th><th>Length (mm)
L</th><th>number of pieces permitted</th></tr>
<tr><td>W≦0.03</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td>0.03＜ W≦0.05</td><td>L≦3</td><td>3</td></tr>
<tr><td>0.05＜ W</td><td>------</td><td>None</td></tr>
<tr><td>beyond A.A.</td><td>------</td><td>Ignore</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>2. Polarizer bubble</td><td>
<table>
<tr><th>Size</th><th>number of pieces permitted</th></tr>
<tr><td>Φ≦0.2</td><td>Ignore</td></tr>
<tr><td>0.2＜Φ≦0.5</td><td>2</td></tr>
<tr><td>0.5＜Φ</td><td>0</td></tr>
<tr><td>beyond A.A.</td><td>Ignore</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>3. Dimming spot、
Lighting spot、
Dust</td><td>
<table>
<tr><th>average</th><th>number of</th></tr>
<tr><td>D ≦0.1</td><td>Ignore</td></tr>
<tr><td>0.1＜ D ≦0.15</td><td>2</td></tr>
<tr><td>0.15＜ D ≦0.2</td><td>1</td></tr>
<tr><td>0.2 ＜ D</td><td>0</td></tr>
<tr><td>beyond A.A.</td><td>Ignore</td></tr>
</table>
D=(long diameter + short diameter)/2.
Pixel off is not allowed.
</td><td>Minor</td></tr>
</table>

10.3 WARRANTY POLICY

WE Will provide one-year warranty for the products only if under specification operating conditions.
If there are functional defects found during the period of warranty, the defective products would be replaced on a one-to-one basis.
We would not be responsible for any direct/indirect liabilities consequential to any parties.

10.4 MTBF

10.4.1 .MTBF based on specific test condition is 25K hours.

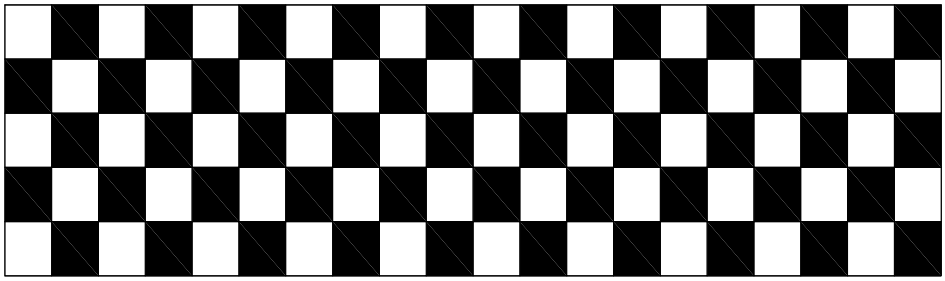
10.4.2 Test Condition:

10.4.2.1 Supply Voltage: Vcc=12V

10.4.2.2 Luminance: 120cd/m2

10.4.2.3 Operation temperature and humidity: 25 ℃ and 50%RH

10.4.2.4 Run-Patterns:



10.4.3 Test Criteria:

Luminace has decayed to less than 50% of the initial measured luminance.

11.Reliability

■Content of Reliability Test

NO.	Items.	Specification	Applicable Standard
1	High temp. (Non-operation)	85°C, 240hrs	——
2	High temp. (Operation)	70°C, 120hrs	——
3	Low temp. (Operation)	-40°C, 120hrs	——
4	High temp. / High. humidity (Operation)	65°C, 90%RH, 120hrs	——
5	Thermal shock(Non-operation)	-40°C ~85°C (-40°C /30min; transit /3min; 85°C /30min; transit /3min) 1cycle: 66min, 100 cycles.	——
6	Vibration	Frequency : 5~50HZ, 0.5G Scan rate : 1 oct/min Time : 2 hrs/axis Test axis : X, Y, Z	——

Test and measurement conditions

1. All measurements shall not be started until the specimens attain to temperature stability.
2. All-pixels-on is used as operation test pattern.
3. The degradation of Polarizer are ignored for item 1 & 4 & 5.

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.

Reliability Test

Only guarantees the reliability of the panel under the test conditions and durations listed in the specification, and is not responsible for any test results that are conducted using more stringent conditions and/or with lengthened durations. Also, when the testing the panel in a chamber or oven, make sure they won't produce any condensation on the panel, especially on the electrical leads, before lighting on the panel to see if it passes the test. Also the panel should rest for about an hour at room temperature and pressure before the measurement, as indicated in the specification. Be aware that one should use fresh panel for each of the reliability test items listed in the specification, in other words, don't use the panels that were tested for subsequent tests.