

Specification for Approval

PRODUCT NO.:

CUSTOMER
APPROVED BY
DATE:

REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
X01	INITIAL RELEASE	2013. 09. 24	
A01	■ Transfer from X version ■ Add the information of module weight ■ Add the packing specification	2013. 11. 08	Page 5 & 17

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1. SCOPE

The purpose of this specification is to define the general provisions and quality requirements that apply to the supply of display cells manufactured by Forfuture . This document, together with the Module Ass'y Drawing, is the highest-level specification for this product. It describes the product, identifies supporting documents and contains specifications.

3. FEATURES

- Small molecular organic light emitting diode.
- Color : Blue
- Panel matrix : 128*32
- Driver IC : SSD1305
- Excellent quick response time.
- Extremely thin thickness for best mechanism design : 2.027 mm
- High contrast : 2000:1
- Wide viewing angle : 160°
- 8-bit 8080-series Parallel Interface, Serial Peripheral Interface, I²C Interface.
- Wide range of operating temperature : -40 to 70 °C
- Anti-glare polarizer.

4. MECHANICAL DATA

NO	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	128 (W) x 32 (H)	dot
2	Dot Size	0.41 (W) x 0.39 (H)	mm ²
3	Dot Pitch	0.43 (W) x 0.41 (H)	mm ²
4	Aperture Rate	90	%
5	Active Area	55.02 (W) x 13.1 (H)	mm ²
6	Panel Size	62 (W) x 24 (H)	mm ²
7*	Panel Thickness	1.82 ± 0.1	mm
8	Module Size	62 (W) x 60 (H) x 2.027 (D)	mm ³
9	Diagonal A/A size	2.23	inch
10	Module Weight	5.83 ± 10%	gram

* Panel thickness includes substrate glass, cover glass and UV glue thickness.

5. MAXIMUM RATINGS

ITEM	MIN	MAX	UNIT	Condition	Remark
Supply Voltage (V_{DD})	-0.3	3.5	V	Ta = 25 °C	IC maximum rating
Supply Voltage (V_{CC})	8	16	V	Ta = 25 °C	IC maximum rating
Operating Temp.	-40	70	°C		
Storage Temp	-40	85	°C		
Humidity	-	85	%		
Life Time	7,000	-	Hrs	130 cd/m ² , 50% checkerboard	Note (1)

Note:

- (A) Under $V_{CC} = 12.5V$, $T_a = 25\text{ °C}$, 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) More command setting (Initial code), please see the application note.
- (1) Setting of 130 cd/m² :
- Contrast setting : 0xbf
 - Frame rate : 120Hz
 - Duty setting : 1/32

6. ELECTRICAL CHARACTERISTICS

6.1 D.C ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETERS	TEST CONDITION	MIN	TYP	MAX	UNIT
V_{CC}	Analog power supply (for OLED panel)	-	12	12.5	13	V
V_{DD}	Digital power supply	-	2.4	-	3.5	V
I_{DD}	Operating current for V_{DD} $V_{DD} = 2.7V$, $V_{CC} = 12V$, $I_{REF} = 10\mu A$ No loading, All Display ON	Contrast=FF	-	100	300	μA
I_{CC}	Operating current for V_{CC} $V_{DD} = 2.7V$, $V_{CC} = 12V$, $I_{REF} = 10\mu A$, No loading, All Display ON	Contrast=FF	-	550	1000	μA
V_{IH}	Hi logic input level		0.8* V_{DDIO}	-	-	V
V_{IL}	Low logic input level		-	-	0.2* V_{DDIO}	V
V_{OH}	Hi logic output level		0.9* V_{DDIO}	-	-	V
V_{OL}	Low logic output level		-	-	0.1* V_{DDIO}	V
I_{SEG}	Segment on output current $V_{DD}=2.7V$, $V_{CC}=12V$, $I_{REF}=10\mu A$, Display on, Segment pin under test is connected with a 20K resistive load to V_{SS}	Contrast=FF	294	320	346	μA
		Contrast=AF	-	220	-	μA
		Contrast=7F	-	159	-	μA
		Contrast=3F	-	79	-	μA
		Contrast=0F	-	19	-	μA

6.2 ELECTRO-OPTICAL CHARACTERISTICS

PANEL ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	TYP.	MAX	UNITS	COMMENTS
Normal mode current	-	28.5	30.5	mA	All pixels on (1)
Standby mode current consumption	-	2	3	mA	Standby mode 10% pixels on(2)
Normal mode power consumption	-	356.25	381.25	mW	All pixels on (1)
Standby mode power consumption	-	25	37.5	mW	Standby mode 10% pixels on(2)
Normal Luminance	110	130		cd/m ²	Display Average
Standby Luminance	-	20			
CIE _x (Blue)	0.12	0.16	0.20		x, y (CIE 1931)
CIE _y (Blue)	0.22	0.26	0.30		
Dark Room Contrast	2000:1				
Viewing Angle	160			degree	
Response Time		10		μs	

(1) Normal mode condition :

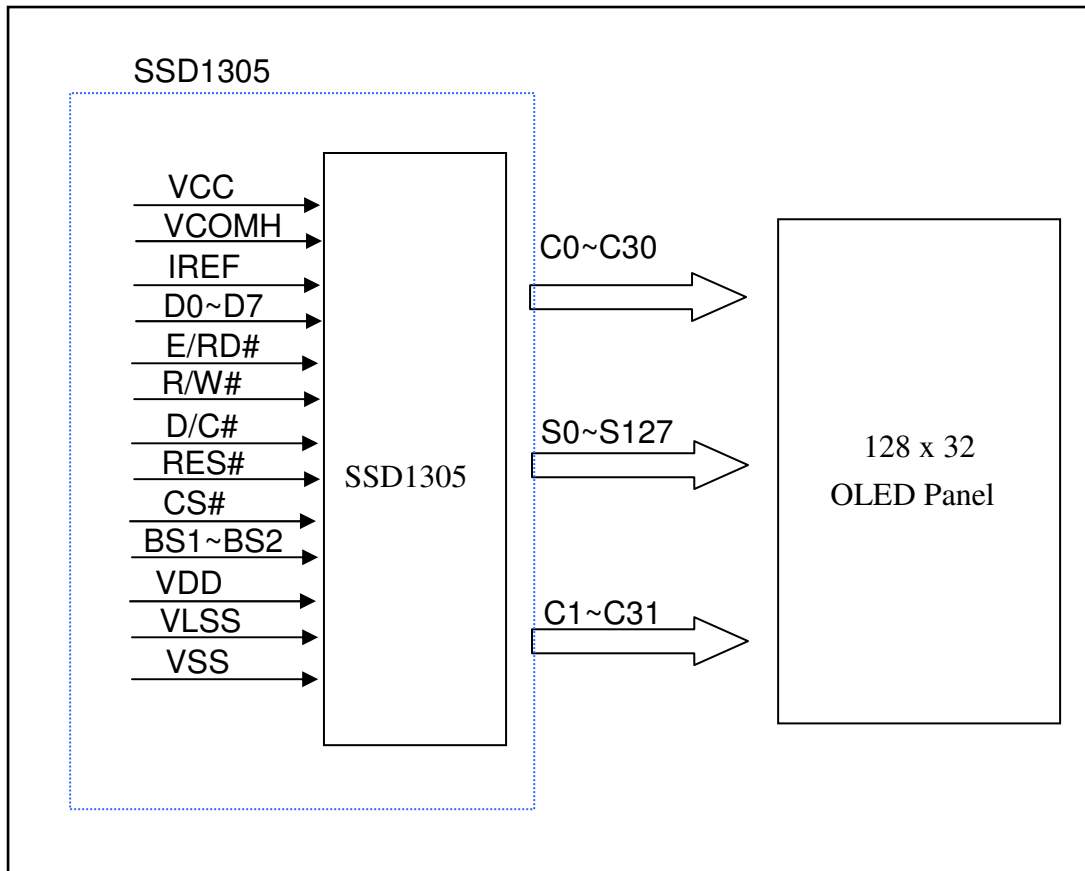
- Driving Voltage : 12.5V
- Contrast setting : 0xbf
- Frame rate : 120Hz
- Duty setting : 1/32

(2) Standby mode condition :

- Driving Voltage : 12.5V
- Contrast setting : 0x05
- Frame rate : 120Hz
- Duty setting : 1/32

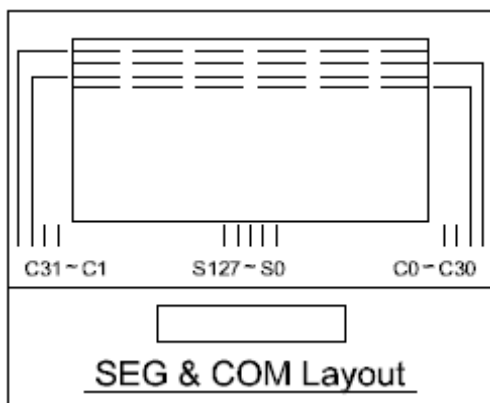
7. INTERFACE

7.1 FUNCTION BLOCK DIAGRAM



RiTdisplay 128x32 OLED Module

7.2 PANEL LAYOUT DIAGRAM



7.3 PIN ASSIGNMENTS

Pin No.	Pin Name	Description
1	NC	No connection.
2	VLSS	It should be connect to VSS externally.
3	VSS	This is ground pin.
4	NC	No connection.
5	VDD	Power supply pin for core logic operation.
6	BS1	Interface select pin.
7	BS2	Interface select pin.
8	CS#	Chip select input.
9	RES#	Reset signal input.
10	D/C#	Data/Command control pin. Pull high for write/read display data. Pull log for write command or read status.
11	R/W#	Data write operation is initiated when it's pull low.
12	E/RD#	Data read operation is initiated when it's pull low.
13	D0	These pins are bi-directional data bus connecting to the MCU data bus. When serial interface mode is selected, D0 will be the serial clock input: SCL; D1 will be the serial data input: SDA and D2 should be kept NC. When I2C mode is selected, D2, D1 should be tied together and serve as SDAout, SDAin in application and D0 is the serial clock input, SCL.
14	D1	
15	D2	
16	D3	
17	D4	
18	D5	
19	D6	
20	D7	
21	IREF	The current reference input pin. This pin should be connected to ground through a resistor.
22	VCOMH	The COM voltage reference pin, This pin should be connected to ground through a capacitor.
23	VCC	Power supply for panel driving voltage.
24	NC	No connection.

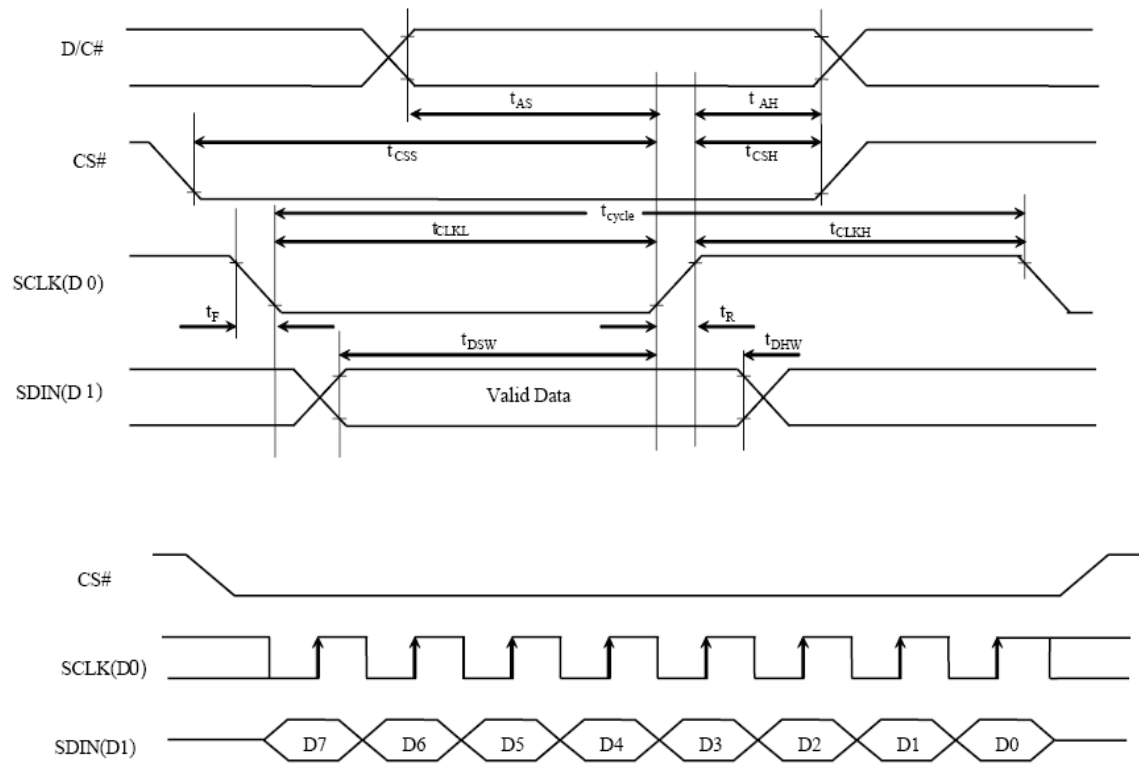
7.5 INTERFACE TIMING CHART

Serial Interface Timing Characteristics

($V_{DD} - V_{SS} = 2.4V$ to $3.5V$, $V_{DDIO} = V_{DD}$, $T_A = 25^\circ C$)

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	250	-	-	ns
t_{AS}	Address Setup Time	150	-	-	ns
t_{AH}	Address Hold Time	150	-	-	ns
t_{CSS}	Chip Select Setup Time	120	-	-	ns
t_{CSH}	Chip Select Hold Time	60	-	-	ns
t_{DSW}	Write Data Setup Time	50	-	-	ns
t_{DHW}	Write Data Hold Time	15	-	-	ns
t_{CLKL}	Clock Low Time	100	-	-	ns
t_{CLKH}	Clock High Time	100	-	-	ns
t_R	Rise Time	-	-	40	ns
t_F	Fall Time	-	-	40	ns

Serial Interface Characteristics



8. POWER ON / OFF SEQUENCE & APPLICATION CIRCUIT

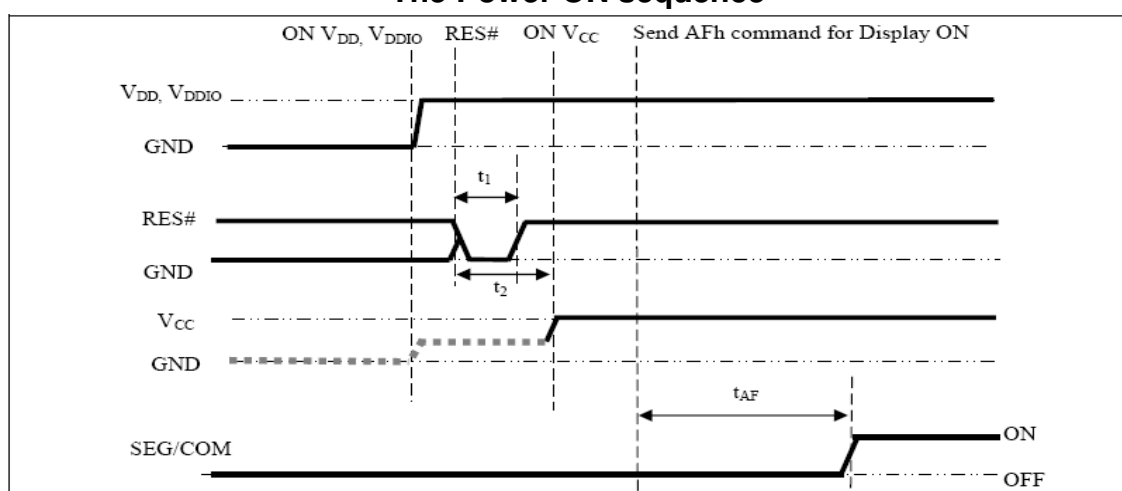
8.1 POWER ON / OFF SEQUENCE

The following figures illustrate the recommended power ON and power OFF sequence of SSD1305.

Power ON sequence :

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

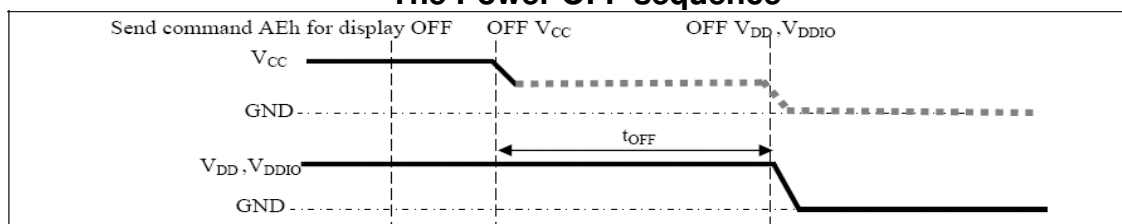
The Power ON sequence



Power OFF sequence:

1. Send command AEh for display OFF.
2. Power OFF $V_{CC}^{(1), (2), (3)}$
3. Wait for t_{OFF} . Power OFF V_{DD}, V_{DDIO} . (where Minimum $t_{OFF}=80ms^{(5)}$, Typical $t_{OFF}=100ms$)

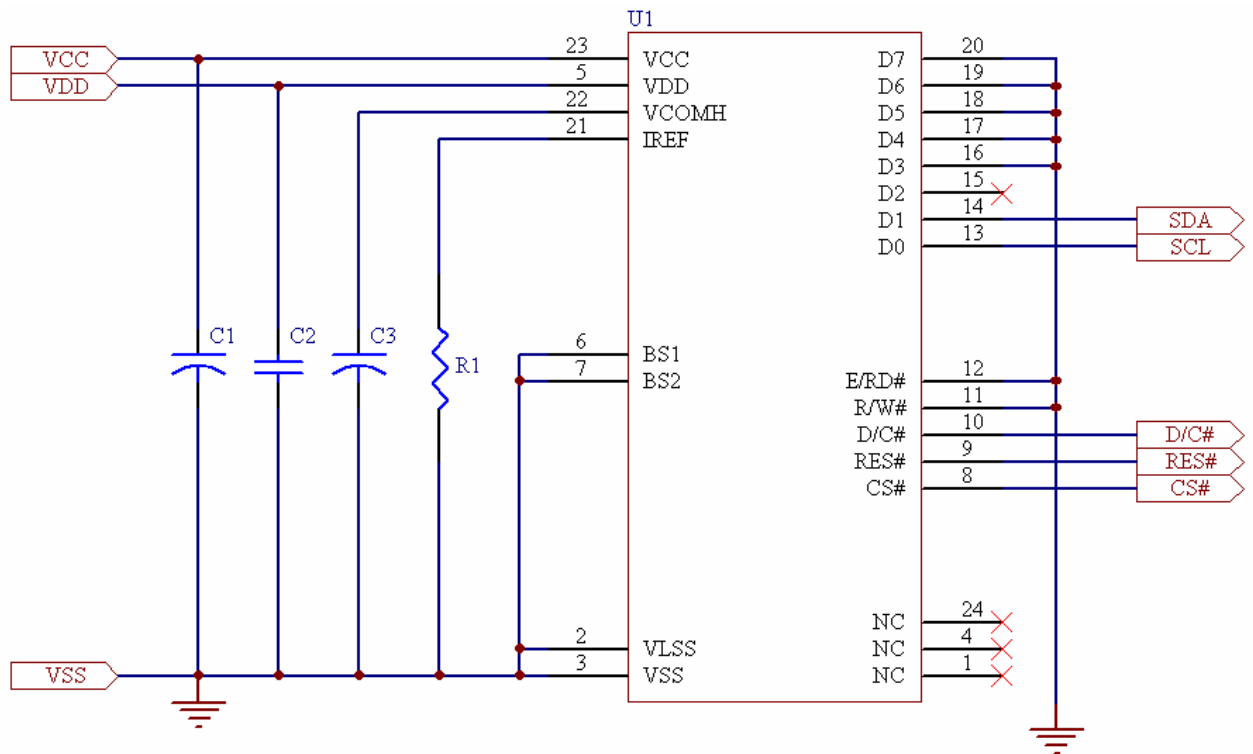
The Power OFF sequence



Note:

- (1) Since an ESD protection circuit is connected between V_{DD} , V_{DDIO} and V_{CC} , V_{CC} becomes lower than V_{DD} whenever V_{DD} , 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 kept disabled 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.

8.2 APPLICATION CIRCUIT



Recommend components :

C1 、 C3 : 4.7uF/25V Tantalum type or VISHAY(572D475X0025A2T)

C2 : 4.7uF/16V (0805)

R1 : 910K ohm 1% (0603)

This circuit is designed for SPI interface.

8.3 COMMAND TABLE

Refer to SSD1305 IC Spec.

9. RELIABILITY TEST CONDITIONS

No.	Items	Specification	Quantity
1	High temp. (Non-operation)	85 °C, 240hrs	5
2	High temp. (Operation)	70 °C, 120hrs	5
3	Low temp. (Operation)	-40 °C, 120hrs	5
4	High temp. / High humidity (Operation)	65 °C, 90%RH, 120hrs	5
5	Thermal shock (Non-operation)	-40 °C ~85 °C (-40 °C /30min; transit /3min; 85 °C /30min; transit /3min) 1cycle: 66min, 100 cycles	5
6	Vibration	Frequency : 5~50HZ, 0.5G Scan rate : 1 oct/min Time : 2 hrs/axis Test axis : X, Y, Z	1 Carton
7	Drop	Height: 120cm Sequence : 1 angle 、 3 edges and 6 faces Cycles: 1	1 Carton
8	ESD (Non-operation)	Air discharge model, ±8kV, 10 times	5

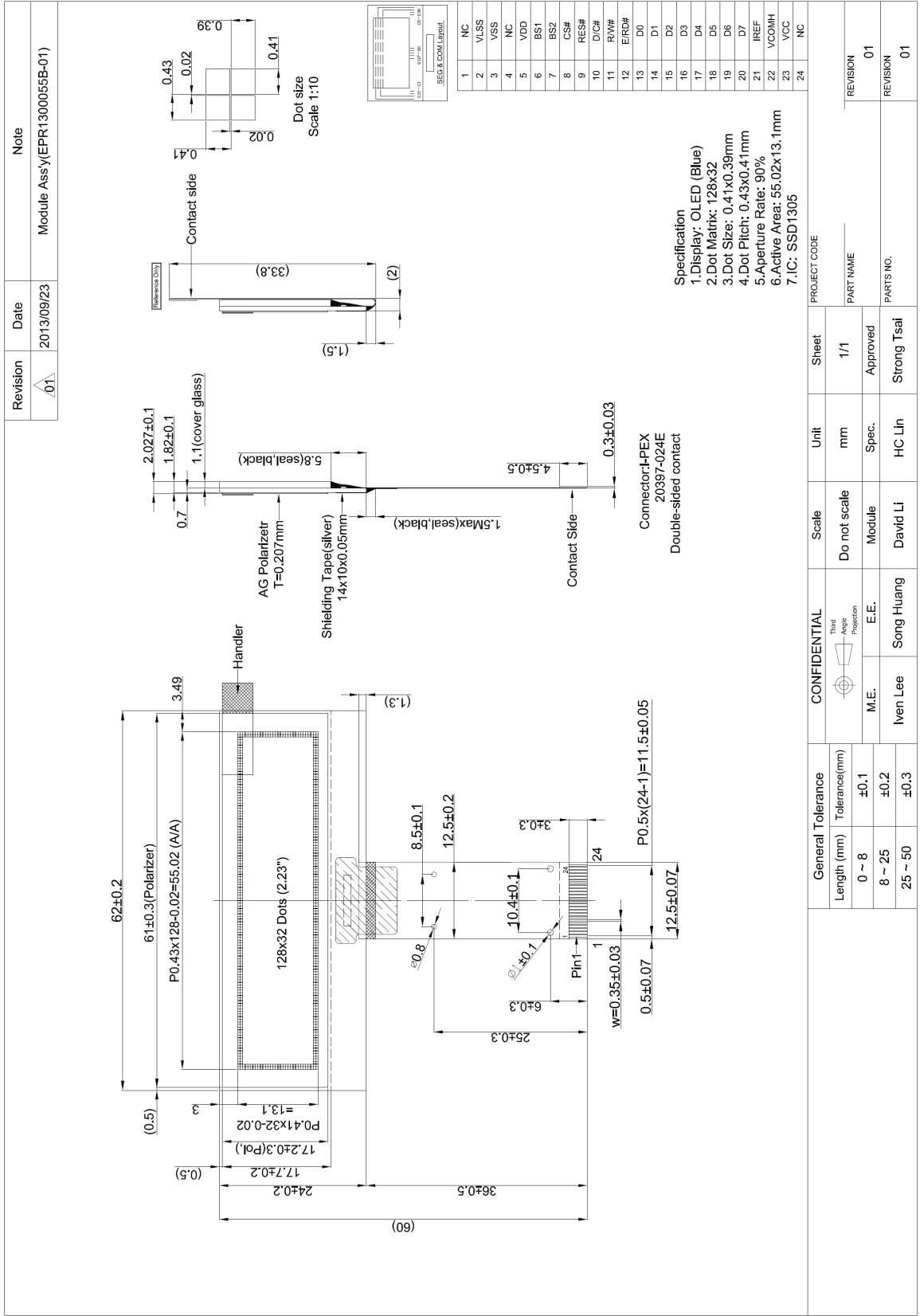
Test and measurement conditions

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.

Evaluation criteria

1. The function test is OK.
2. No observable defects.
3. Luminance: > 50% of initial value.
4. Current consumption: within \pm 50% of initial value.

10. EXTERNAL DIMENSION



11. PACKING SPECIFICATION

Revision	Date	Note
.01	2013/11/08	Packing Tray Instruction

80L9825705000
Module Assy For P25705 x16 pcs

1

700P257021002
Tray 330x270x8.7mm T=0.5mm, PET, P25702

2

3

4

5

6

7

8

9

RTD3010000003
5G 乾燥劑
5G Silica Gel Desiccants

3

4

5

6

7

8

9

RTD3010000005
Pizza Box 345x285x88,B corrugated

6

8

9

RTD3003000012
真空包裝袋
Vacuum Bag ONY/LDPE
480x285x90

4

RTD3003000016
Antistatic Bubble bag 440x(350+450)mm
抗靜電氣泡袋

5

RTD3006000000
Label x2 pcs

8

ITEM	PART No.	DESC	QTY
1	80L9825705000	Module Assy For P25705	1
2	700P257021002	Tray 330x270x8.7 T:0.5mm PET P25702	640
3	RTD3010000003	5G Silica Gel Desiccants	42
4	RTD3003000012	Vacuum Bag ONY/LDPE 480x285x90	8
5	RTD3003000016	Antistatic Bubble bag 440x(350+450)mm	2
6	RTD3001000005	Pizza Box 345x285x88 B corrugated	2
7	RTD3000000009	Carton 385x305x203mm	1
8	RTD3006000000	Label	3
9	RTD3208000125	Tape, W=48mm, L=910cm	3

General Tolerance		CONFIDENTIAL		PROJECT CODE	
Length (mm)	Tolerance(mm)		Scale	Unit	Sheet
0 ~ 8	±0.1	M.E.	1:15	mm	1/1
8 ~ 25	±0.2	Iven Lee	Module	Spec.	Approved
25 ~ 50	±0.3		Kelly Hsu	Irene Fan	Strong Tsai
					VERSION
					01
					VERSION
					01

12. APPENDIXES

APPENDIX 1: DEFINITIONS

A. DEFINITION OF CHROMATICITY COORDINATE

The chromaticity coordinate is defined as the coordinate value on the CIE 1931 color chart for R, G, B, W.

B. DEFINITION OF CONTRAST RATIO

The contrast ratio is defined as the following formula:

$$\text{Contrast Ratio} = \frac{\text{Luminance of all pixels on measurement}}{\text{Luminance of all pixels off measurement}}$$

C. DEFINITION OF RESPONSE TIME

The definition of turn-on response time T_r is the time interval between a pixel reaching 10% of steady state luminance and 90% of steady state luminance. The definition of turn-off response time T_f is the time interval between a pixel reaching 90% of steady state luminance and 10% of steady state luminance. It is shown in Figure 2.

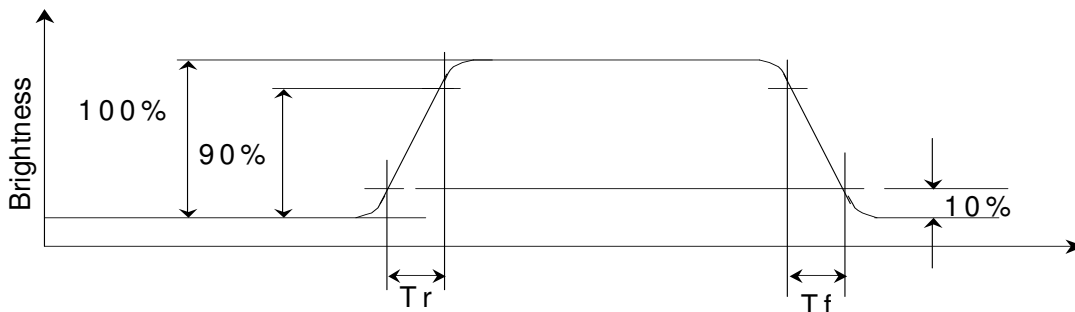


Figure 2: Response time

D. DEFINITION OF VIEWING ANGLE

The viewing angle is defined as Figure 3. Horizontal and vertical (H & V) angles are determined for viewing directions where luminance varies by 50% of the perpendicular value.

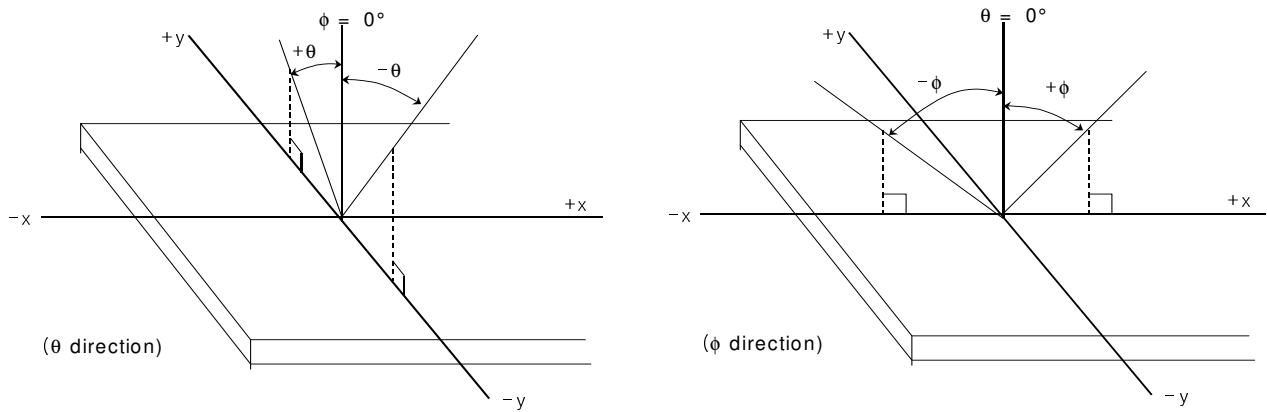
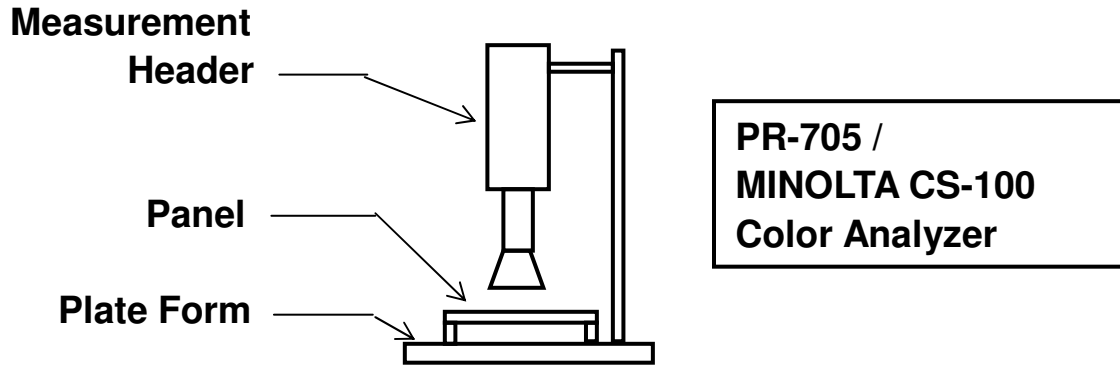


Figure 3: Viewing Angle

APPENDIX 2: MEASUREMENT APPARATUS

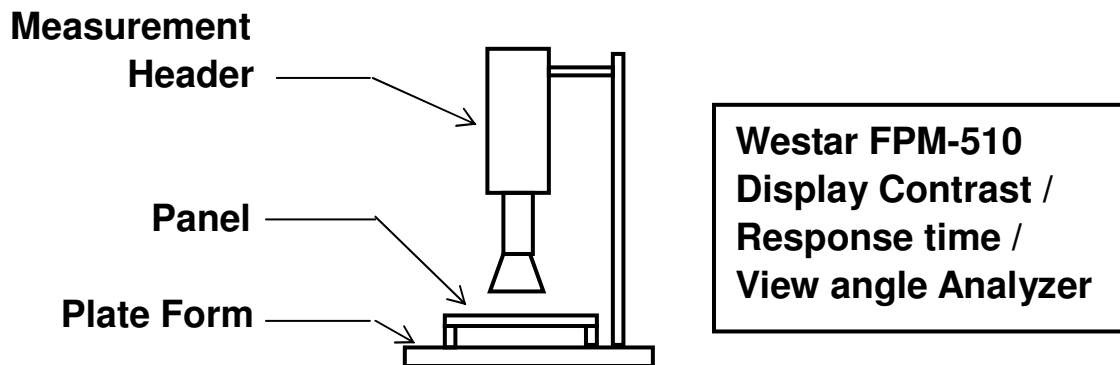
A. LUMINANCE/COLOR COORDINATE

PHOTO RESEARCH PR-705, MINOLTA CS-100

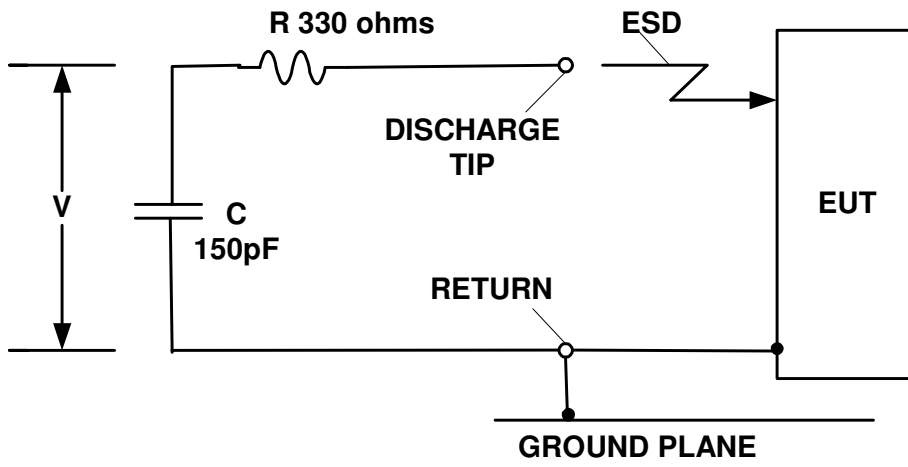


B. CONTRAST / RESPONSE TIME / VIEW ANGLE

WESTAR CORPORATION FPM-510



C. ESD ON AIR DISCHARGE MODE



APPENDIX 3: PRECAUTIONS

A. RESIDUE IMAGE

Because the pixels are lighted in different time, the luminance of active pixels may reduce or differ from inactive pixels. Therefore, the residue image will occur. To avoid the residue image, every pixel needs to be lighted up uniformly.