

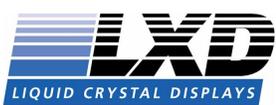
# Specification for Approval

**PRODUCT NAME:** RGS13128096FH000  
**PRODUCT NO.:** 9910901000

<b>CUSTOMER</b>
<b>APPROVED BY</b>
<b>DATE:</b>

<b>RITDISPLAY CORP. APPROVED</b>

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## REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
X01	INITIAL RELEASE	2005. 01. 25	
X02	<ul style="list-style-type: none"> <li>■ Modify electrical characteristics</li> <li>■ Modify CIE specification</li> <li>■ Modify reliability test conditions</li> <li>■ Add protective film</li> <li>■ Remove the outgoing inspection provision (Refer to "OQC SPEC - STD - Full Color, CF type")</li> </ul>	2005. 05. 05	Page 6, 7, 8, 15 & 16
X03	<ul style="list-style-type: none"> <li>■ Modify product name - RGC13128096FH000→RGS13128096FH000</li> <li>■ Add warranty</li> <li>■ Change COF from SSD1338U2 to SSD1338U3</li> <li>■ Modify lifetime definition</li> <li>■ Add packing specification</li> </ul>	2005. 11. 28	Page 1, 4, 6, 16 & 17
A01	<ul style="list-style-type: none"> <li>■ Modify wide range of operating temperature</li> <li>■ Add the information of module weight</li> <li>■ Modify lifetime specification</li> <li>■ Modify the operating conditions for different luminance</li> <li>■ Modify the panel electrical specification</li> <li>■ Modify typical luminance</li> <li>■ Modify CIE specification</li> <li>■ Modify reliability test conditions</li> </ul>	2006. 03. 16	Page 4, 5, 6, 8, 15 & 21

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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 RiTdisplay. This document, together with the Module Assembly Drawing, is the highest-level specification for this product. It describes the product, identifies supporting documents and contains specifications, which are either not addressed, or are exceptions to the supporting documents.

## **2. WARRANTY**

RiTdisplay warrants that the products delivered pursuant to this specification (or order) will conform to the agreed specifications for twelve (12) months from the shipping date ("Warranty Period"). RiTdisplay is obligated to repair or replace the products which are found to be defective or inconsistent with the specifications during the Warranty Period without charge, on condition that the products are stored or used as the conditions specified in the specifications. Nevertheless, RiTdisplay is not obligated to repair or replace the products without charge if the defects or inconsistency are caused by the force majeure or the reckless behaviors of the customer.

After the Warranty Period, all repairs or replacements of the products are subject to charge.

## **3. FEATURES**

- Small Molecular Organic Light Emission Diode.
- Color : 262K Full color
- Panel matrix :128\*3\*96
- Driver IC : SSD1338U3
- Excellent Quick response time : 10 $\mu$ s
- Extremely thin thickness for best mechanism design : 1.85 mm
- High contrast : 500:1
- Wide viewing angle : 160°
- Strong environmental resistance.
- 16/8-bits 6800-series Parallel Interface, 16/8-bits 8080-series Parallel Interface, Serial Peripheral Interface.
- Wide range of operating temperature : -40 to 70 °C

#### 4. MECHANICAL DATA

NO	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	128 (W) x (RxGxB) x 96 (H)	dot
2	Dot Size	0.057 (W) x 0.19 (H)	mm <sup>2</sup>
3	Dot Pitch	0.07 (W) x 0.21 (H)	mm <sup>2</sup>
4	Aperture Rate	74	%
5	Active Area	26.867 (W) x 20.14 (H)	mm <sup>2</sup>
6	Panel Size	36 (W) x 30 (H)	mm <sup>2</sup>
7	Panel Thickness	1.85 ± 0.1	mm
8	Module Size	36.0 (W) x 52.5 (H) x 1.85 (D)	mm <sup>3</sup>
9	Diagonal A/A size	1.3	inch
10	Module Weight	4.4 ± 10%	gram

## 5. MAXIMUM RATING

ITEM	MIN	MAX	UNIT	Condition	Remark
Supply Voltage ( $V_{DD}$ )		3.5	V	Ta = 25°C	
Supply Voltage ( $V_{DDIO}$ )		3.5	V		
Supply Voltage ( $V_{CC}$ )		15.5	V	Ta = 25°C	
Operating Temp.	-40	70	°C		
Storage Temp	-40	85	°C		
Humidity	-	85	%		
Operating Life Time	6,400	-	Hrs	100 cd/m <sup>2</sup> , 50% checkerboard	Note (1)
Operating Life Time	8,000	-	Hrs	80 cd/m <sup>2</sup> , 50% checkerboard	Note (2)
Operating Life Time	10,000	-	Hrs	60 cd/m <sup>2</sup> , 50% checkerboard	Note (3)

Note:

(A) Under  $V_{CC} = 15$  Volts, 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.

(1) Setting of 100 cd/m<sup>2</sup> :

- Master contrast setting : 0x0BH
- Frame rate : 85 Hz
- Duty setting : 1/96

(2) Setting of 80 cd/m<sup>2</sup> :

- Master contrast setting : 0x09H
- Frame rate : 85 Hz
- Duty setting : 1/96

(3) Setting of 60 cd/m<sup>2</sup> :

- Master contrast setting : 0x06H
- Frame rate : 85 Hz
- Duty setting : 1/96

## 6. ELECTRICAL CHARACTERISTICS

### 6.1 D.C ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETERS	TEST CONDITION	MIN	TYP	MAX	UNIT
$V_{CC}$	Driver power supply (for OLED panel)	Ta=-20°C to +70°C	14.5	15	15.5	V
$V_{DD}$	Logic operating voltage	Ta=-20°C to +70°C	2.4	2.7	3.5	V
$V_{DDIO}$	Logic I/O operating voltage	Ta=-20°C to +70°C	1.5	2.7	3.5	V
$V_{OH}$	Hi logic output level	I <sub>out</sub> =100 uA, 3.3MHz	0.9*V <sub>DDIO</sub>		V <sub>DDIO</sub>	V
$V_{OL}$	Low logic output level	I <sub>out</sub> =100uA, 3.3MHZ	0		0.1*V <sub>DDIO</sub>	V
$V_{IH}$	Hi logic input level	I <sub>out</sub> =100uA, 3.3MHZ	0.8*V <sub>DDIO</sub>		V <sub>DDIO</sub>	V
$V_{IL}$	Low logic output level	I <sub>out</sub> =100uA, 3.3MHZ	0		0.2*V <sub>DDIO</sub>	V
$I_{CC}$	Operating current for V <sub>CC</sub> (No panel attached)	Contrast=FF		1.3		mA
$I_{DD}$	Operating current for V <sub>DD</sub> (No panel attached)	Contrast=FF		0.4		mA
$I_{SEG}$	Segment output current (No panel attached)	Contrast=FF		160		uA
		Contrast=AF		110		uA
		Contrast=5F		60		uA
		Contrast=00		0		uA

Note : V<sub>DD</sub>=2.7 Volts ; V<sub>CC</sub>=15 Volts ; Frame rate= 85 Hz ; No panel attached.

## 6.2 ELECTRO-OPTICAL CHARACTERISTICS

### PANEL ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	TYP.	MAX	UNITS	COMMENTS
Normal mode current		30	32	mA	All pixels on (1)
Standby mode current		3	4	mA	Standby mode 10% pixels on (2)
Normal mode power consumption		450	480	mW	All pixels on (1)
Standby mode power consumption		45	60	mW	Standby mode 10% pixels on (2)
Normal mode Luminance	70	80		cd/m <sup>2</sup>	Display Average
Standby mode Luminance		20		cd/m <sup>2</sup>	
CIE <sub>x</sub> (White)	0.24	0.28	0.32		x, y (CIE 1931)
CIE <sub>y</sub> (White)	0.28	0.32	0.36		
CIE <sub>x</sub> (Red)	0.61	0.65	0.69		
CIE <sub>y</sub> (Red)	0.30	0.34	0.38		
CIE <sub>x</sub> (Green)	0.22	0.26	0.30		
CIE <sub>y</sub> (Green)	0.52	0.56	0.60		
CIE <sub>x</sub> (Blue)	0.07	0.11	0.15		
CIE <sub>y</sub> (Blue)	0.13	0.17	0.21		
Dark Room Contrast	500:1				
Viewing Angle	160			degree	
Response Time		10		μs	

(1) Normal mode condition :

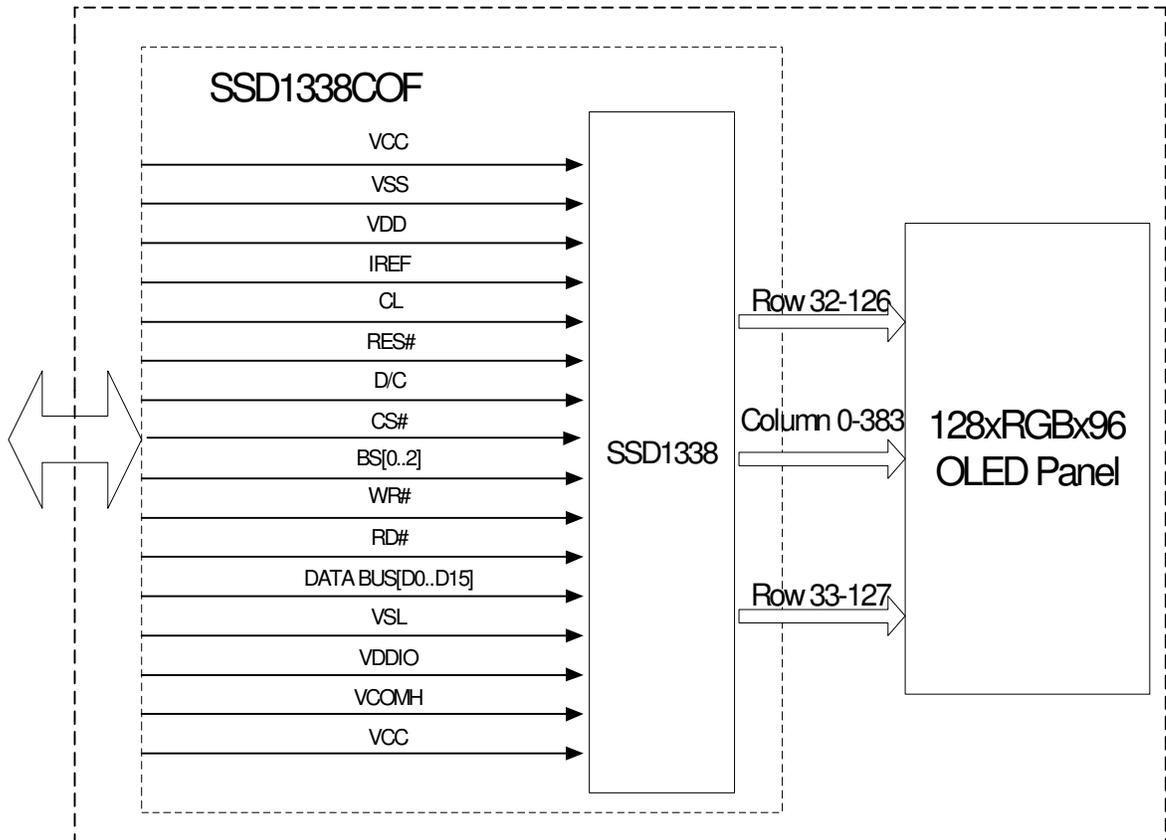
- Driving Voltage : 15V
- Contrast setting : 0x09H
- Frame rate : 85 Hz
- Duty setting : 1/96

(2) Standby mode condition :

- Driving Voltage : 15V
- Contrast setting : 0x02H
- Frame rate : 85 Hz
- Duty setting : 1/96

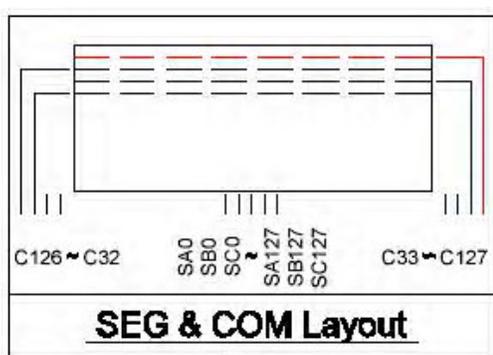
## 7. INTERFACE

### 7.1 FUNCTION BLOCK DIAGRAM



**RiTdisplay 128xRGBx96 OLED Module**

### 7.2 PANEL LAYOUT DIAGRAM



### 7.3 PIN ASSIGNMENTS

PIN NAME	PIN NO	DESCRIPTION
NC	1	No connection.
VCC	2	Analog voltage power supply.
VSS	3	Ground.
TEST	4	No connection.
TEST	5	No connection.
VDD	6	Digital voltage power supply.
TEST	7	No connection.
TEST	8	No connection.
TEST	9	No connection.
IREF	10	A resistor should be connected between this pin and VSS.
CL	11	No connection.
RES#	12	Hardware Reset pin (Low active).
D/C	13	H: Data; L: Command.
CS#	14	Chip select pin.
BS2	15	Interface select pin.
BS1	16	Interface select pin.
BS0	17	Interface select pin.
R/W#	18	8080: data write enable pin; 6800: Read/Write select pin.
E/RD#	19	8080: data read enable pin; 6800: Read/Write enable pin.
D0	20	16 bits data bus.
D1	21	
D2	22	
D3	23	
D4	24	
D5	25	
D6	26	
D7	27	
D8	28	
D9	29	
D10	30	
D11	31	
D12	32	
D13	33	
D14	34	
D15	35	
VSS	36	Ground.
VSL	37	This is segment voltage reference pin.
VDDIO	38	I/O voltage power supply.
VCOMH	39	A capacitor should be connected between this pin and VSS.
VCC	40	Analog power supply.
NC	41	No connection

### 7.4 GRAPHIC DISPLAY DATA RAM ADDRESS MAP

#### Graphic Display Data RAM (GDDRAM)

The GDDRAM is a bit mapped static RAM holding the bit pattern to be displayed. The size of the RAM is 132 x 133 x 16bits.

For mechanical flexibility, re-mapping on both Segment and Common outputs can be selected by software.

For vertical scrolling of the display, an internal register storing display start line can be set to control the portion of the RAM data to be mapped to the display. Each pixel has 16-bit data. The arrangement of data pixel in graphic display data RAM is shown below.

Column Address	Normal	0	1	2	:	129	130	131												
Address	Remap	131	130	129	:	2	1	0												
Data Format		A5	B5	C5	A5	B5	C5	A5	B5	C5	:	A5	B5	C5	A5	B5	C5	A5	B5	C5
		A4	B4	C4	A4	B4	C4	A4	B4	C4	:	A4	B4	C4	A4	B4	C4	A4	B4	C4
		A3	B3	C3	A3	B3	C3	A3	B3	C3	:	A3	B3	C3	A3	B3	C3	A3	B3	C3
		A2	B2	C2	A2	B2	C2	A2	B2	C2	:	A2	B2	C2	A2	B2	C2	A2	B2	C2
		A1	B1	C1	A1	B1	C1	A1	B1	C1	:	A1	B1	C1	A1	B1	C1	A1	B1	C1
Row Address		A0	B0	C0	A0	B0	C0	A0	B0	C0	:	A0	B0	C0	A0	B0	C0	A0	B0	C0
Normal	Remap																			
0	132	6	6	6	6	6	6	6	6	6	:	6	6	6	6	6	6	6	6	6
1	131										:									
2	130										:									
:	:	no. of bits of data in this cell																		
130	2										:									
131	1										:									
132	0										:									

SEG OUTPUT

SA0	SB0	SC0	SA1	SB1	SC1	SA2	SB2	SC2	:	SA129	SB129	SC129	SA130	SB130	SC130	SA131	SB131	SC131
-----	-----	-----	-----	-----	-----	-----	-----	-----	---	-------	-------	-------	-------	-------	-------	-------	-------	-------

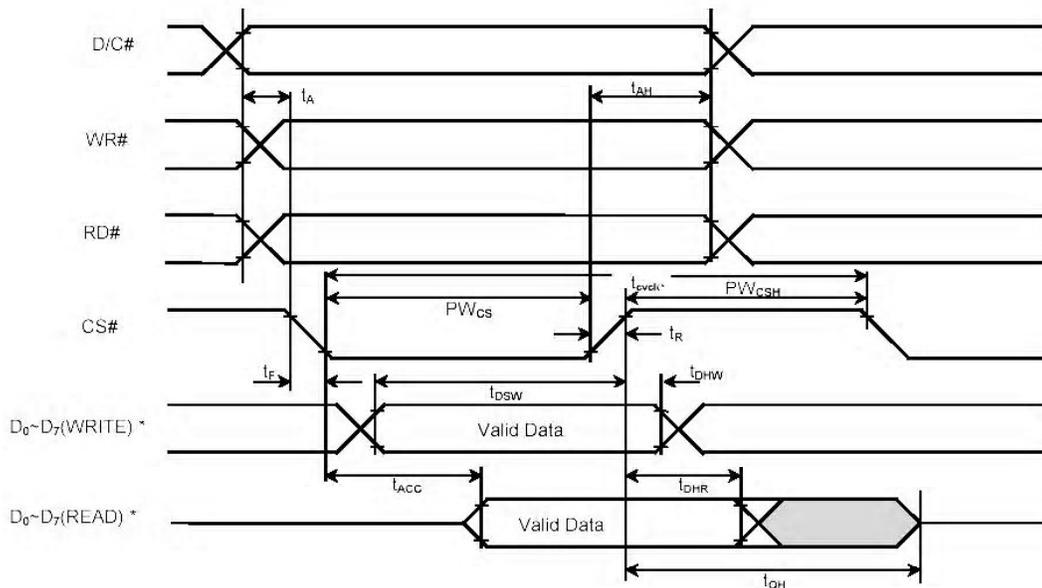
COM OUTPUT

COM0
COM1
COM2
:
COM130
COM131
COM132

## 7.5 INTERFACE TIMING CHART

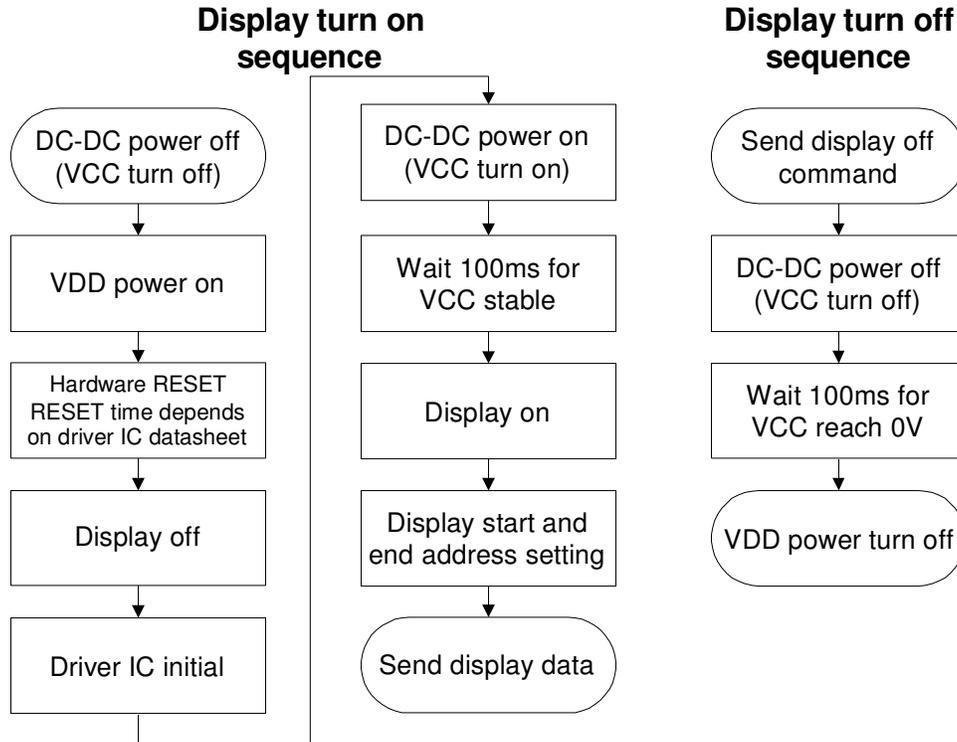
( $V_{DD} - V_{SS} = 2.4$  to  $3.5V$ ,  $T_A = 25^\circ C$ )

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	15	-	-	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)	120	-	-	ns
	Chip Select Low Pulse Width (write)	60	-	-	ns
$PW_{CSH}$	Chip Select High Pulse Width (read)	60	-	-	ns
	Chip Select High Pulse Width (write)	60	-	-	ns
$t_R$	Rise Time	-	-	15	ns
$t_F$	Fall Time	-	-	15	ns



## 8. POWER ON / OFF SEQUENCE & APPLICATION CIRCUIT

### 8.1 POWER ON / OFF SEQUENCE



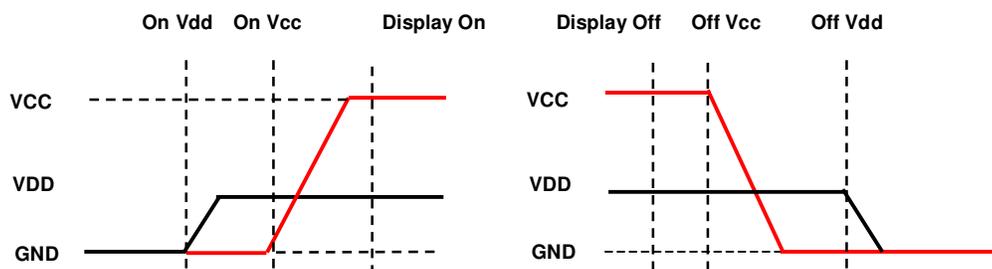
To protect OLED panel and extend the panel lifetime, the driver IC power up/down routine should include a delay period between high voltage and low voltage power sources turn on/off.

#### Power up Sequence:

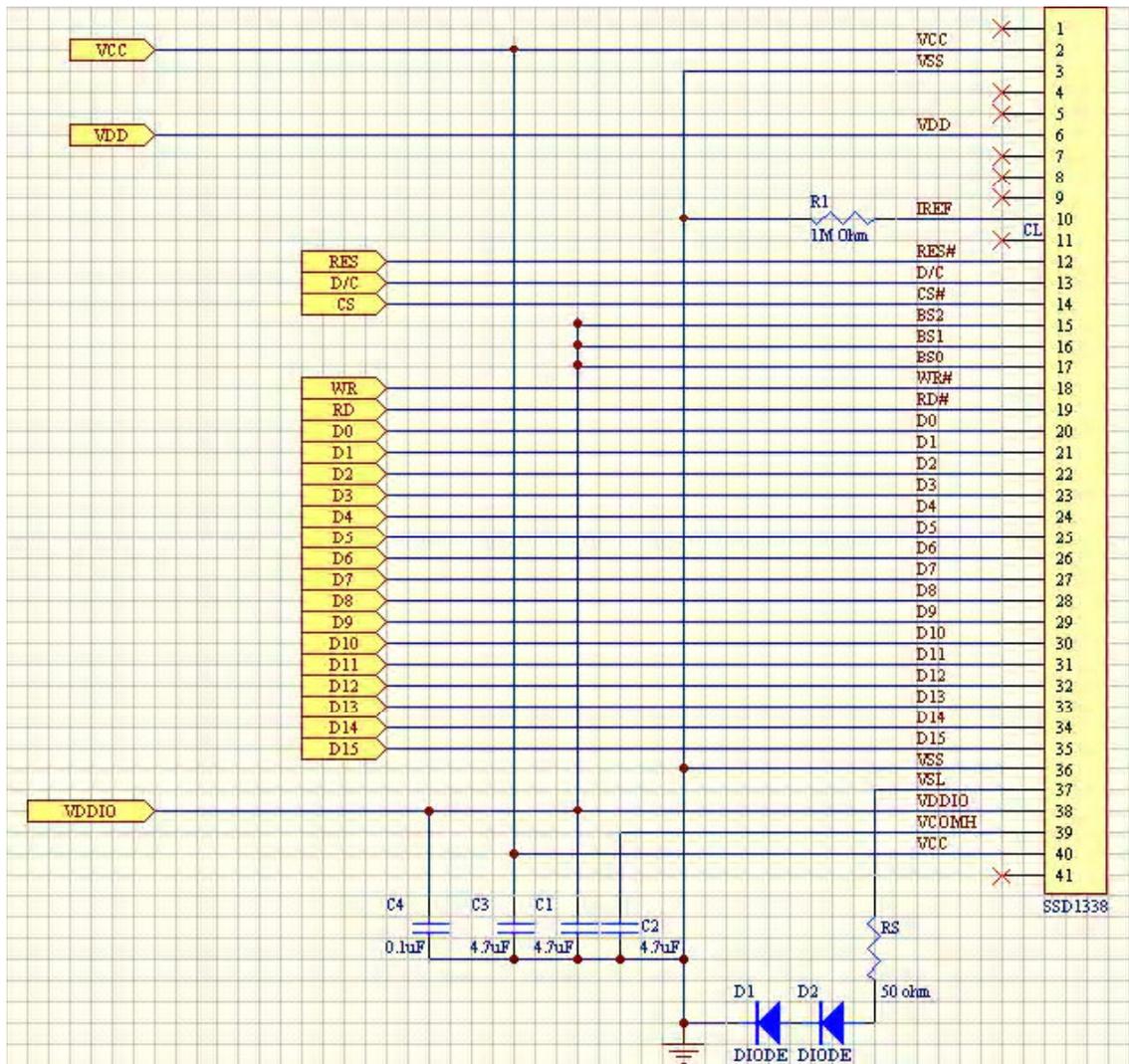
1. Power up Vdd
2. Hardware RESET
3. Send display off command
4. Power up Vcc
5. Delay 100ms (when Vcc is stable)
6. Send Display on command

#### Power down Sequence:

1. Send Display off command
2. Power down Vcc
3. Delay 100ms (When Vcc is reach 0 and panel is completely discharges)
4. Power down Vdd



## 8.2 APPLICATION CIRCUIT



### Notes:

Component:

R1: 1M ohm 1%

C1, C2, C3: 4.7 uF / 25V, C4 : 0.1 uF

Rs: 50ohm 1/4W

D1 and D2: RB480K (ROHM)

This circuit is for 8080 16 bits interface.

## 8.3 COMMAND TABLE

Refer to IC Spec.: SSD1338

## 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, 96hrs	5
5	Thermal shock (Non-operation)	-40 °C ~85 °C (-40 °C /30min; transit /3min; 85 °C /30min; transit /3min) 1cycle: 66min, 20 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

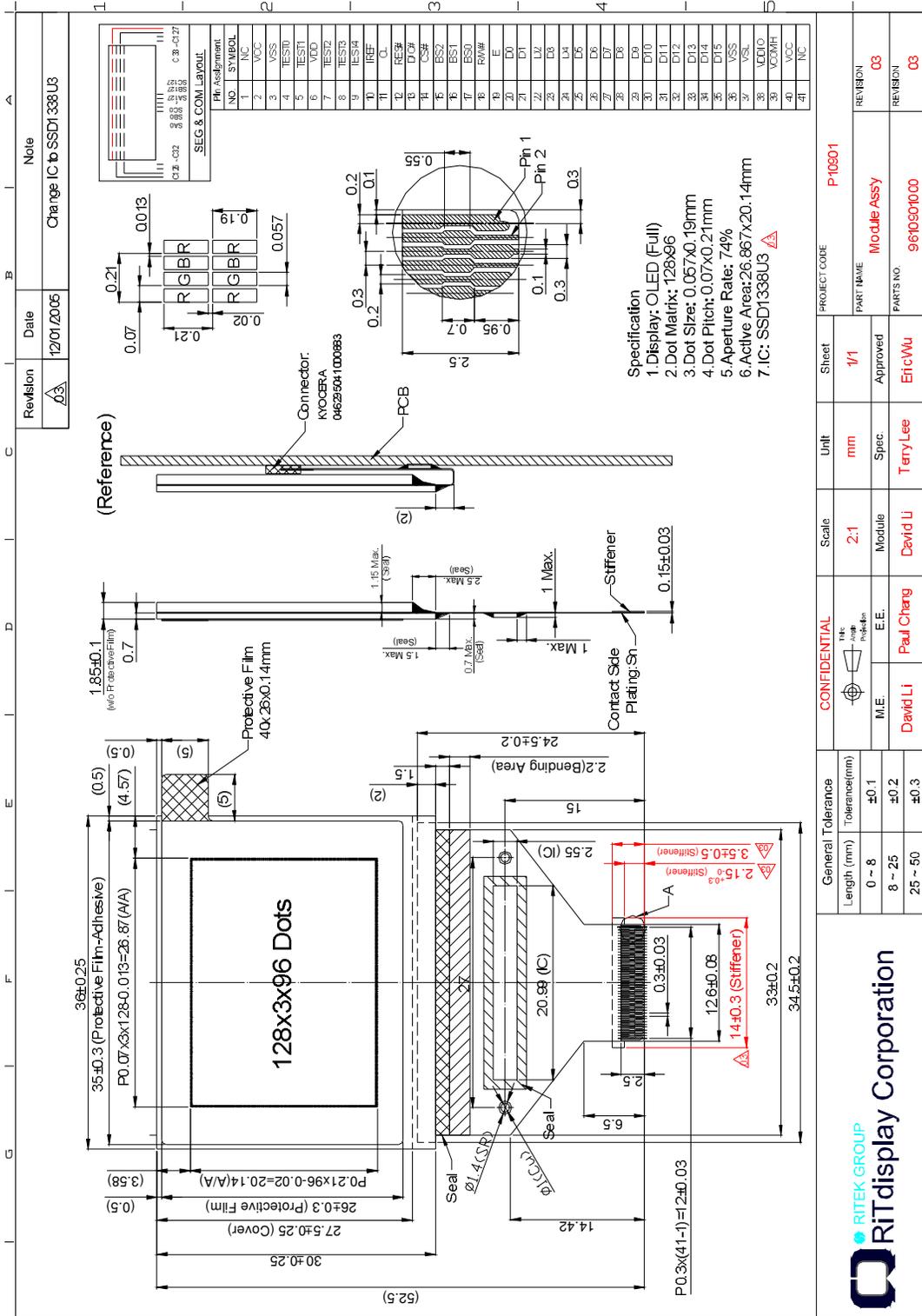
### Test and measurement conditions

1. All measurements shall not be started until the specimens attain to temperature stability.
2. All-pixels-on is used as operation test pattern.

### 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
A0	09/01/2006	Modify Packign From EPS To Tray

① Packing Tray 330x270x117mm P/N:30080000036

② EPE Cover Foam 278x224x2mm P/N:30020000056

③ P10901 Module Face Down 旋轉放置 P/N:30109010000

④ 4G 防静电气泡袋(不織布) P/N:30000000500 x5 pcs

⑤ 真空防静电 ONYALDPE 480x285x80mm P/N:30030000012 控真空袋 · 壓力1.0

⑥ Anti static Bubble Bag 420x(390+490)mm P/N:30030000013

⑦ Pizza Box, 比派 345x285x80mm P/N:30010000005

⑧ Label P/N:30060000000 x2 pcs

⑨ Carton 380x234x175mm P/N:30000000009

旋轉堆疊

Item	Part No.	Description	QTY
1	300800086	P119 Tray 330x270x117mm FETD	20
2	300200056	P119 EPE 278.6x224.4x2mm	32
3	301090100	P10901 Module Assy	26
4	300000500	4G 防静电气泡袋(不織布)	10
5	300300012	真空防静电袋 480x285x80mm	2
6	300300013	AntiStatic Bubble Bag 420x(390+490)mm	2
7	300100005	Pizza Box 345x285x80mm	2
8	300600000	Label	3
9	300000009	單色 Carton 380x234x175mm	1

General Tolerances		PROJECT CODE	
Length (mm)	Tolerance(mm)	Sheet	P10301
0 ~ 8	±0.1	Unit	mm
8 ~ 25	±0.2	Scale	1:12
25 ~ 50	±0.3	Module	Module
M.I.E.		Spec.	Approved
M.E.		Drawn	Terry Lee
M.A.S.		Checked	Eric Wu
M.P.C.		Part Name	Packing Tray Instruction
M.Q.C.		Part No.	3910301000
M.R.E.		Revision	C2
M.S.E.		Revision	C2



## **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.

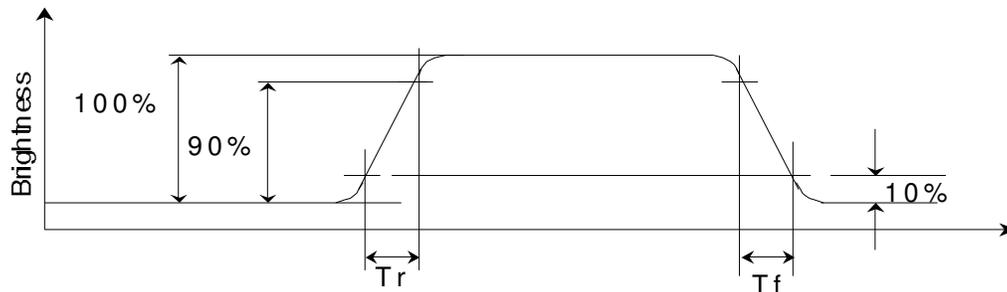
#### **B. DEFINITION OF CONTRAST RATIO**

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**

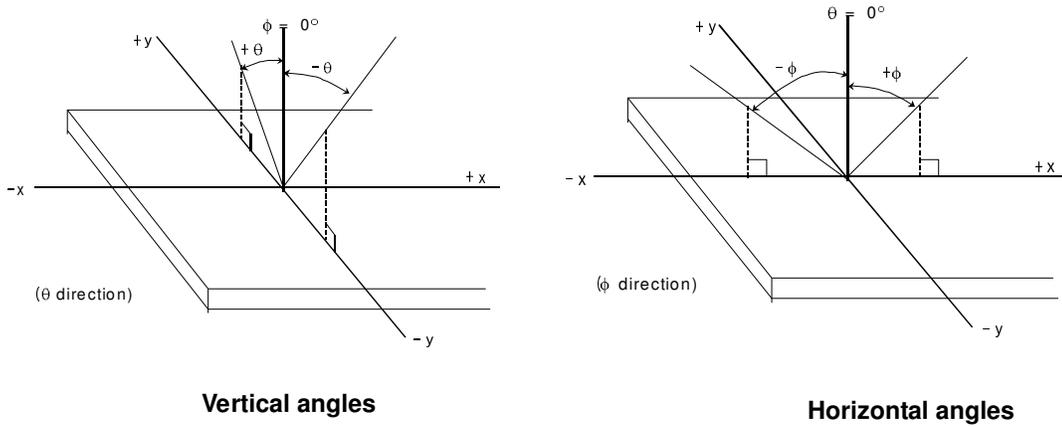
The definition of turn-on response time  $T_r$  is the time interval between a pixel reaching 10% of steady state luminance and 90% of steady state luminance. The definition of turn-off response time  $T_f$  is the time interval between a pixel reaching 90% of steady state luminance and 10% of steady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

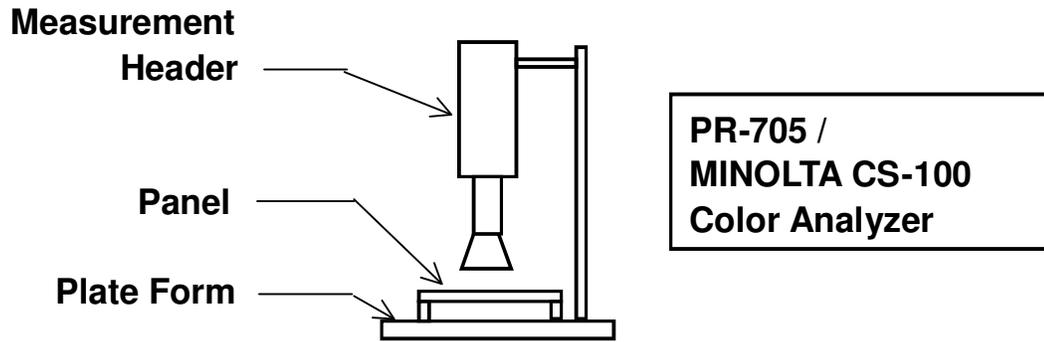


**Figure 3: Viewing Angle**

**APPENDIX 2: MEASUREMENT APPARATUS**

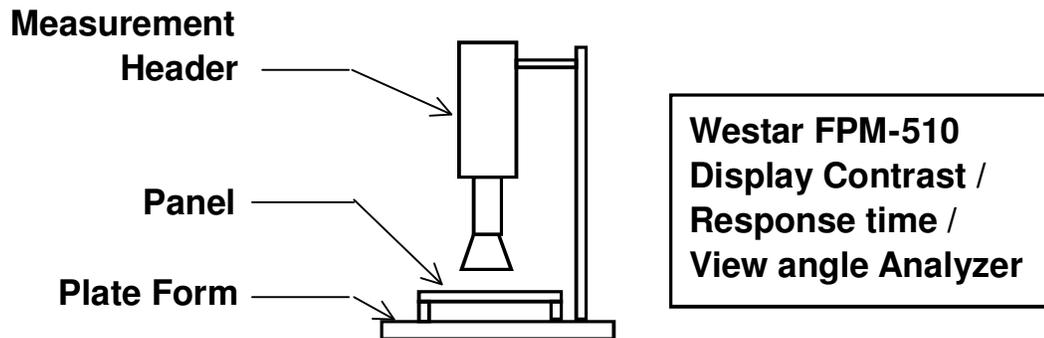
**A. LUMINANCE/COLOR COORDINATE**

PHOTO RESEARCH PR-705, MINOLTA CS-100

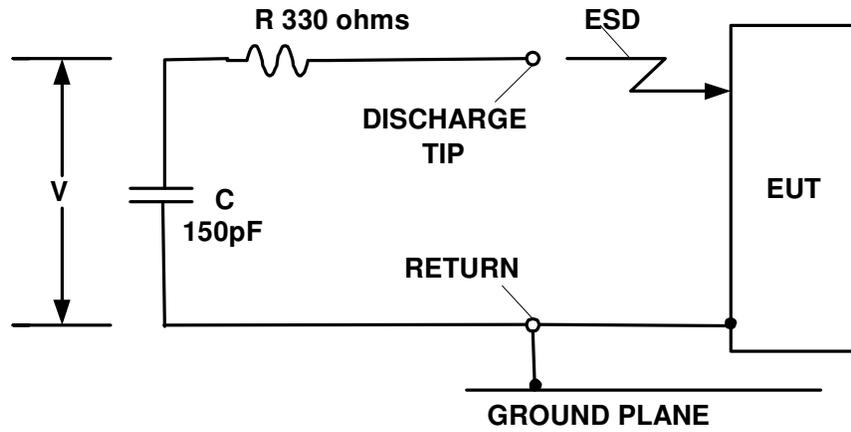


**B. CONTRAST / RESPONSE TIME / VIEW ANGLE**

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.