



**US Micro Products**  
*Electronic Products for the OEM*

# OLED PRODUCT SPECIFICATION

Manufactured by:



<b>PART NUMBER:</b>	<b>USMP-P19801 V01</b>
<b>DESCRIPTION:</b>	.95" OLED, 65K Full Color, 68/80series MPU 8-bit, SPI 4-wire interface, SEPS114A Driver IC

ISSUE DATE	APPROVED BY (Customer Use Only)	CHECKED BY	PREPARED BY
<b>PROPRIETARY NOTE:</b>	THIS SPECIFICATION IS THE PROPERTY OF US MICRO PRODUCTS AND SHALL NOT BE REPRODUCED OR COPIED WITHOUT THE WRITTEN PERMISSION OF US MICRO PRODUCTS AND MUST BE RETURNED TO US MICRO PRODUCTS UPON ITS REQUEST.		

## REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
X01	INITIAL RELEASE	2009. 09. 30	
X02	<ul style="list-style-type: none"> <li>■ Add lifetime specifications</li> <li>■ Add panel electrical specifications</li> <li>■ Modify power on/off sequence</li> <li>■ Add application circuit</li> </ul>	2009. 11. 20	Page 6, 7, 8, 15 & 17
A01	<ul style="list-style-type: none"> <li>■ Transfer from X version</li> <li>■ Add the information of module weight</li> <li>■ Modify seal color (white→black)</li> <li>■ Add the packing specification</li> </ul>	2009. 12. 10	Page 5, 19 & 20

CONFIDENTIAL

## CONTENTS

ITEM	PAGE
<b><u>1. SCOPE</u></b>	4
<b><u>2. WARRANTY</u></b>	4
<b><u>3. FEATURES</u></b>	4
<b><u>4. MECHANICAL DATA</u></b>	5
<b><u>5. MAXIMUM RATING</u></b>	6
<b><u>6. ELECTRICAL CHARACTERISTICS</u></b>	7
6.1 D.C ELECTRICAL CHARACTERISTICS	
6.2 ELECTRO-OPTICAL CHARACTERISTICS	
<b><u>7. INTERFACE</u></b>	9
7.1 FUNCTION BLOCK DIAGRAM	
7.2 PANEL LAYOUT DIAGRAM	
7.3 PIN ASSIGNMENTS	
7.4 GRAPHIC DISPLAY DATA RAM ADDRESS MAP	
7.5 INTERFACE TIMING CHART	
<b><u>8. POWER ON / OFF SEQUENCE &amp; APPLICATION CIRCUIT</u></b>	15
8.1 POWER ON / OFF SEQUENCE	
8.2 APPLICATION CIRCUIT	
8.3 COMMAND TABLE	
<b><u>9. RELIABILITY TEST CONDITIONS</u></b>	18
<b><u>10. EXTERNAL DIMENSION</u></b>	19
<b><u>11. PACKING SPECIFICATION</u></b>	20
<b><u>12. APPENDIXES</u></b>	21

CONFIDENTIAL

## **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 emitting diode.
- Color :65K colors
- Panel matrix : 96\*3\*64
- Driver IC : SEPS114A
- Excellent Quick response time : 10 $\mu$ s
- Extremely thin thickness for best mechanism design : 1.41 mm
- High contrast : 2000:1
- Wide viewing angle : 160°
- Strong environmental resistance.
- 68/80series MPU 8 bit, SPI 4 wire interface.
- Wide range of operating temperature : -40 to 70°C
- Anti-glare polarizer.

#### **4. MECHANICAL DATA**

NO	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	96 (W) x (RxGxB) x 64 (H)	dot
2	Dot Size	0.045 (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	58	%
5	Active Area	20.135 (W) x 13.42 (H)	mm <sup>2</sup>
6	Panel Size	24.2 (W) x 20.9 (H)	mm <sup>2</sup>
7*	Panel Thickness	1.22 ± 0.1	Mm
8	Module Size	24.2 (W) x 30.9 (H) x 1.41 (D)	mm <sup>3</sup>
9	Diagonal A/A size	0.95	inch
10	Module Weight	<b>1.44 ± 10%</b>	gram

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

CONFIDENTIAL

## 5. MAXIMUM RATING

ITEM	MIN	MAX	UNIT	Condition	Remark
Supply Voltage (V <sub>DD</sub> )	-0.3	4	V	Ta = 25°C	IC maximum rating
Supply Voltage (V <sub>CC</sub> )	8	18	V	Ta = 25°C	IC maximum rating
Operating Temp.	-40	70	°C		
Storage Temp	-40	85	°C		
Humidity		85	%		
Life Time	10,000	-	Hrs	120 cd/m <sup>2</sup> , 50% checkerboard	Note (1)
Life Time	12,000	-	Hrs	100 cd/m <sup>2</sup> , 50% checkerboard	Note (2)
Life Time	15,000	-	Hrs	80 cd/m <sup>2</sup> , 50% checkerboard	Note (3)

Note:

(A) Under V<sub>CC</sub> = 13V, 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 120 cd/m<sup>2</sup> :

- Blue contrast setting : 0x52
- Green contrast setting : 0x39
- Red contrast setting : 0x39
- Frame rate : 105Hz
- Duty setting : 1/64

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

- Blue contrast setting : 0x46
- Green contrast setting : 0x30
- Red contrast setting : 0x30
- Frame rate : 105Hz
- Duty setting : 1/64

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

- Blue contrast setting : 0x38
- Green contrast setting : 0x26
- Red contrast setting : 0x26
- Frame rate : 105Hz
- Duty setting : 1/64

## 6. ELECTRICAL CHARACTERISTICS

### 6.1 D.C ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETERS	CONDITIONS	MIN	TYP	MAX	UNIT
VCC	Driver Power Supply (For OLED Panel)	-	12.5	13	13.5	V
VDD	Logic Power Supply	-	2.4	-	3.3	V
VDDIO	Logic I/O Operating Voltage	-	1.65	-	3.3	V
VIH	High logic input voltage	-	0.8*VDDIO	-	VDDIO	V
VIL	Low logic input voltage	-	0	-	0.4	V
VOH	High logic output voltage	IOH = 0.1mA	VDDIO-0.4	-	-	V
VOL	Low logic output voltage	IOL = 0.1mA	-	-	0.4	V
ILI	Input leakage current	VI = VSS or VDDIO	-1	-	1	uA
ILO	Output leakage current	VI = VSS or VDDIO	-1	-	1	uA
FOSCE	Oscillator frequency By external resistor	RF = 27K $\Omega$	-	-	3	MHz

CONFIDENTIAL

## 6.2 ELECTRO-OPTICAL CHARACTERISTICS

### PANEL ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	TYP.	MAX	UNITS	COMMENTS
Normal mode current		11	13	mA	All pixels on (1)
Standby mode current		1	2	mA	Standby mode 10% pixels on (2)
Normal mode power consumption		143	169	mW	All pixels on (1)
Standby mode power consumption		13	26	mW	Standby mode 10% pixels on (2)
Normal mode Luminance	80	100		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)	0.62	0.66	0.70		
CIE <sub>y</sub> (Red)	0.29	0.33	0.37		
CIE <sub>x</sub> (Green)	0.26	0.30	0.34		
CIE <sub>y</sub> (Green)	0.59	0.63	0.67		
CIE <sub>x</sub> (Blue)	0.10	0.14	0.18		
CIE <sub>y</sub> (Blue)	0.14	0.18	0.22		
Dark Room Contrast	2000:1				
Viewing Angle	160			degree	
Response Time		10		μs	

(1) Normal mode condition :

- Driving Voltage : 13V
- Blue contrast setting : 0x46
- Green contrast setting : 0x30
- Red contrast setting : 0x30
- Frame rate : 105Hz
- Duty setting : 1/64

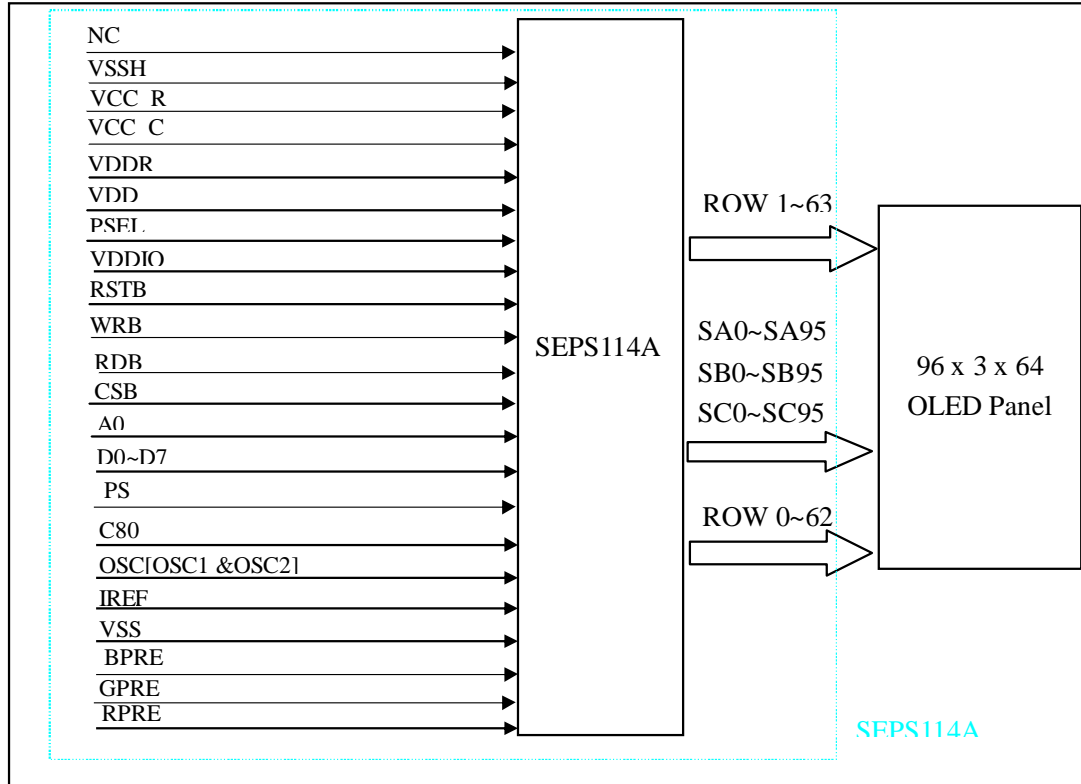
(2) Standby mode condition :

- Driving Voltage : 13V
- Blue contrast setting : 0x16
- Green contrast setting : 0x10
- Red contrast setting : 0x10
- Frame rate : 105Hz
- Duty setting : 1/64



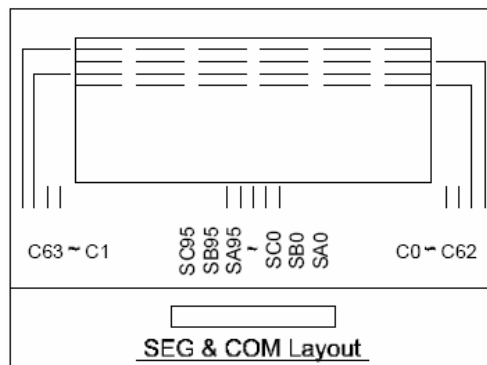
## 7. INTERFACE

### 7.1 FUNCTION BLOCK DIAGRAM



**RiT display 96x3x64 OLED Module**

### 7.2 PANEL LAYOUT DIAGRAM



### 7.3 PIN ASSIGNMENTS

PIN NO	PIN NAME	DESCRIPTION
1	NC	No connection.
2	VSSH	Ground for VCC_C/VCC_R
3	VCC_R	Power Supply for Scan Driver
4	VCC_C	Data Driver Power Supply
5	VDDR	Logic Power Supply2
6	VDD	Logic Power Supply
7	PSEL	Regulator Enable/Disable for Logic Power Supply2
8	VDDIO	MPU I/F PAD Power Supply VDDIO should be lower than VDD or the same as VDD.
9	RSTB	Reset Signal Input (active low)
10	WRB	For an 80 serise bus interface, write strobe signal (active low) For an 68 serise bus interface, read/write select Low: Write, High: Read When using SPI, fix it to VDDIO or VSS level
11	RDB	For an 80-serise bus interface, read strobe signal (active low) For an 68-serise bus interface, bus enable strobe (active high) When using SPI, fix it to VDDIO or VSS level
12	CSB	Selects the chip Low: chip is selected and can be accessed High: chip is not selected and cannot be accessed
13	A0	Selects the data / command Low: command, High: parameter / data
14	D0	bi directional data bus
15	D1	bi directional data bus
16	D2	bi directional data bus
17	D3	bi directional data bus
18	D4	bi directional data bus
19	D5	bi directional data bus
20	D6	bi directional data bus
21	D7	bi directional data bus
22	PS	Selects parallel/Serial interface type Low: serial, High: parallel
23	C80	Selects the MPU type Low: 80 Series Interface, High: 68 Series Interface
24	OSC1	Please connect external resister between OSC1 and OSC2.
25	OSC2	
26	IREF	Tie resister to VSS
27	VSS	Ground for VDD/VDDR
28	BPRE	Pre Charge Voltage for Blue

29	GPRE	Pre Charge Voltage for Green
30	RPRE	Pre Charge Voltage for Red
31	VCC_C	Data Driver Power Supply
32	VCC_R	Power Supply for Scan Driver
33	VSSH	Ground for VCC_C/VCC_R
34	NC	No connection.

CONFIDENTIAL

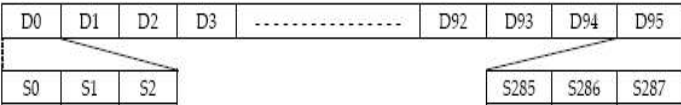
### 7.4 GRAPHIC DISPLAY DATA RAM ADDRESS MAP

The DDRAM stores pixel data for the display. It is composed of 96 row by 96 column x 16 bit addressable array. Address counter provides row and column address to DDRAM for access display pixel data from MPU.

#### Relationship between DDRAM Address and Display Position

G0	G95	00h					-----						
G1	G94	01h											
G2	G93	02h											
G3	G92	03h											
G4	G91	04h											
G5	G90	05h											
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
G90	G5	59h											
G91	G4	5Ah											
G92	G3	5Bh											
G93	G2	5Ch											
G94	G1	5Eh											
G95	G0	5Fh											
		Column Data	0	1	2	3	-----	92	93	94	95		

SCAND=0      SCAND=2



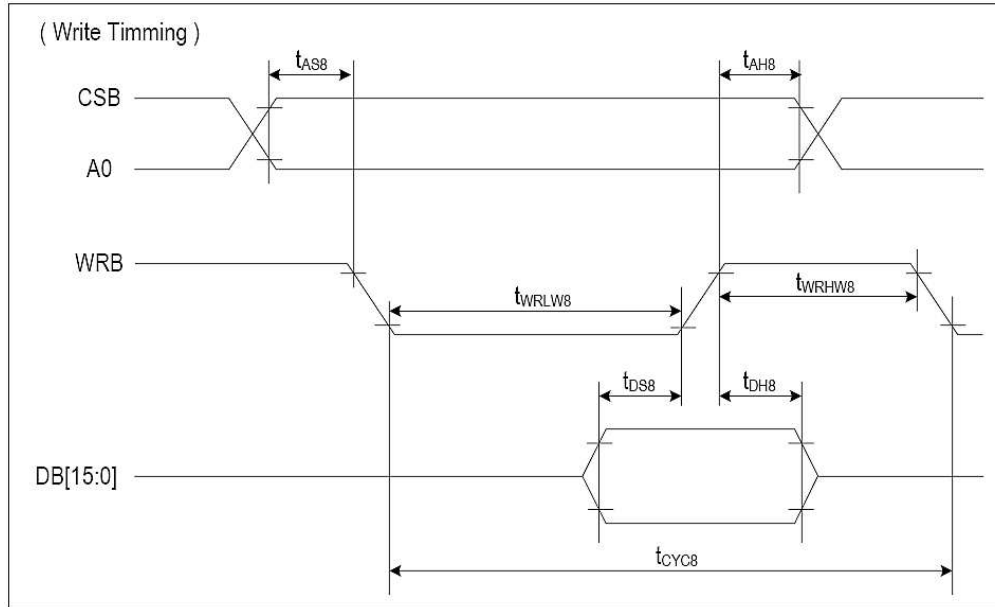
SCAND[1:0] : Row scan direction register(09h).

CONFIDENTIAL

**7.5 INTERFACE TIMING CHART**

System BUS Read/Write Timing (80 series CPU interface)

**Write Timing**



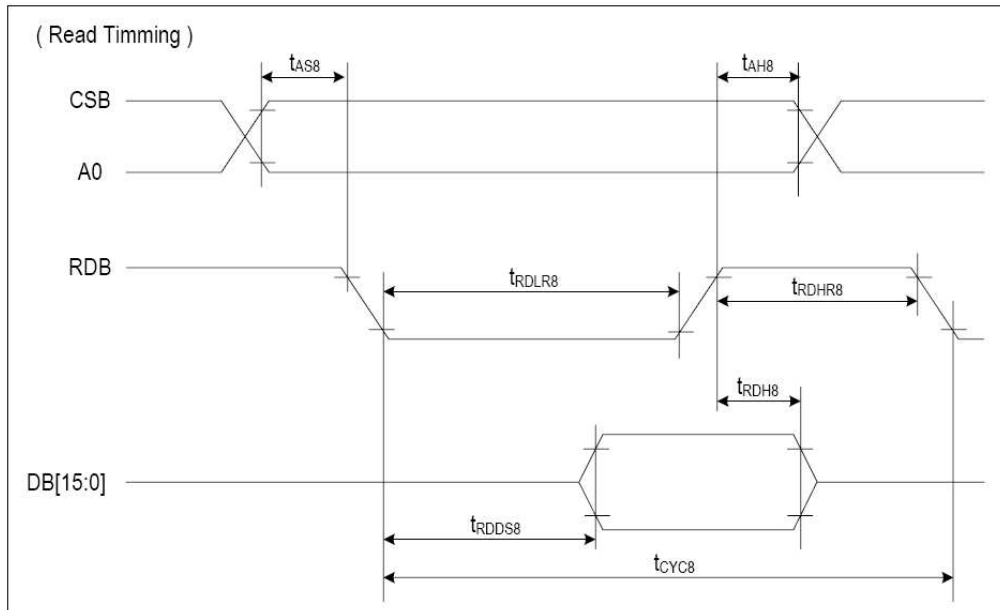
(VDD = 2.8V, Ta = 25°C)

ITEM	SYMBOL	CONDITION	MIN	MAX	UNIT	PORT
Address hold timing	t <sub>AH8</sub>	-	5	-	ns	CSB
Address setup timing	t <sub>AS8</sub>	-	5	-	ns	A0
System cycle timing	t <sub>CYC8</sub>	-	100	-	ns	
Write "L" pulse width	t <sub>WRLW8</sub>	-	45	-	ns	WRB
Write "H" pulse width	t <sub>WRHW8</sub>	-	45	-	ns	
Data setup timing	t <sub>DS8</sub>	-	30	-	ns	DB[15:0]
Data hold timing	t <sub>DH8</sub>	-	10	-	ns	

notice ) All the timing reference is 10% and 90% of VDDIO.

CONFIDENTIAL

**Read Timing**



(VDD = 2.8V, Ta = 25°C)

ITEM	SYMBOL	CONDITION	MIN	MAX	UNIT	PORT
Address hold timing	t <sub>AH8</sub>	-	5	-	ns	CSB
Address setup timing	t <sub>AS8</sub>	-	5	-	ns	A0
System cycle timing	t <sub>CYC8</sub>	-	200	-	ns	
Read "L" pulse width	t <sub>RDLR8</sub>	-	90	-	ns	RDB
Read "H" pulse width	t <sub>RDHR8</sub>	-	90	-	ns	RDB
Read data output delay time	t <sub>RDDS8</sub>	CL = 15 pF	-	60	ns	DB[15:0]
Data hold timing	t <sub>RDH8</sub>	CL = 15 pF	0	-	ns	DB[15:0]

Notice) All the timing reference is 10% and 90% of VDDIO.

CONFIDENTIAL

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

### 8.1 POWER ON / OFF SEQUENCE

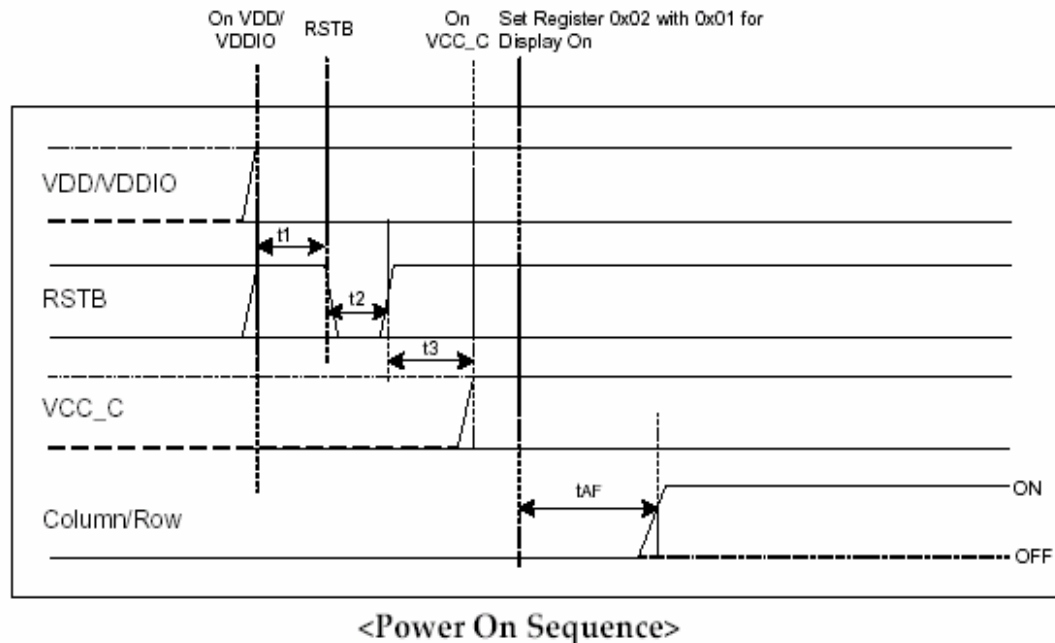
The following figures illustrate the recommended power ON and OFF sequence of SEPS114A.

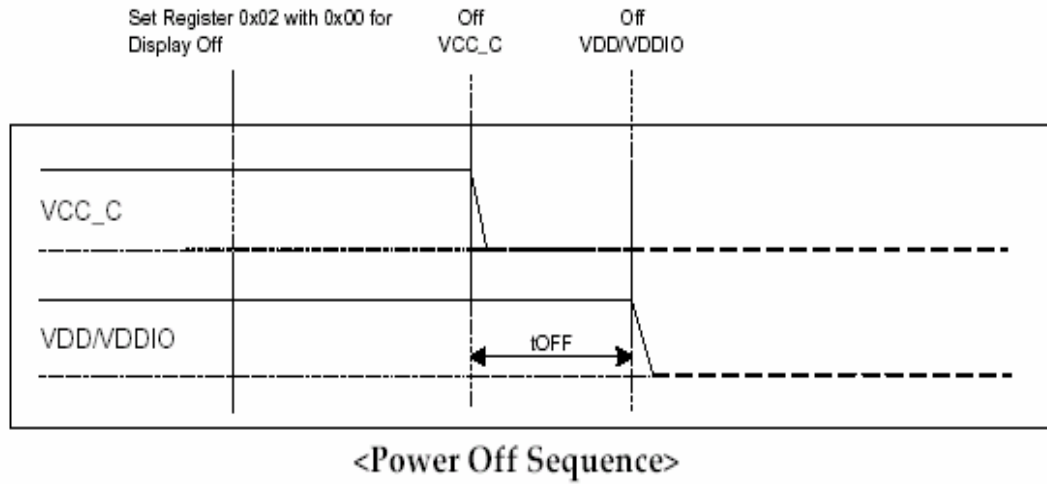
#### Power ON sequence

- (1) Power On VDD, VDDIO.
- (2) After VDD, VDDIO become stable and wait for 100ms( $t_1$ ), set RSTB pin LOW (logic low) for at least 1ms ( $t_2$ ) and then HIGH(logic high).
- (3) After set RSTB pin HIGH (logic high), wait for at least 50ms ( $t_3$ ). Then Power On VCC\_C
- (4) After VCC\_C become stable, set register 0x02 with value 0x01 for display On.Data/Scan will be On after 200ms ( $t_{AF}$ ).

#### Power OFF sequence

- (1) Set register 0x02 with value 0x00 for display OFF.
- (2) Power OFF VCC\_C.
- (3) Wait for  $t_{OFF}$ . Power OFF VDD, VDDIO (where Minimum  $t_{OFF}=80$ ms, Typical  $t_{OFF}=100$ ms)





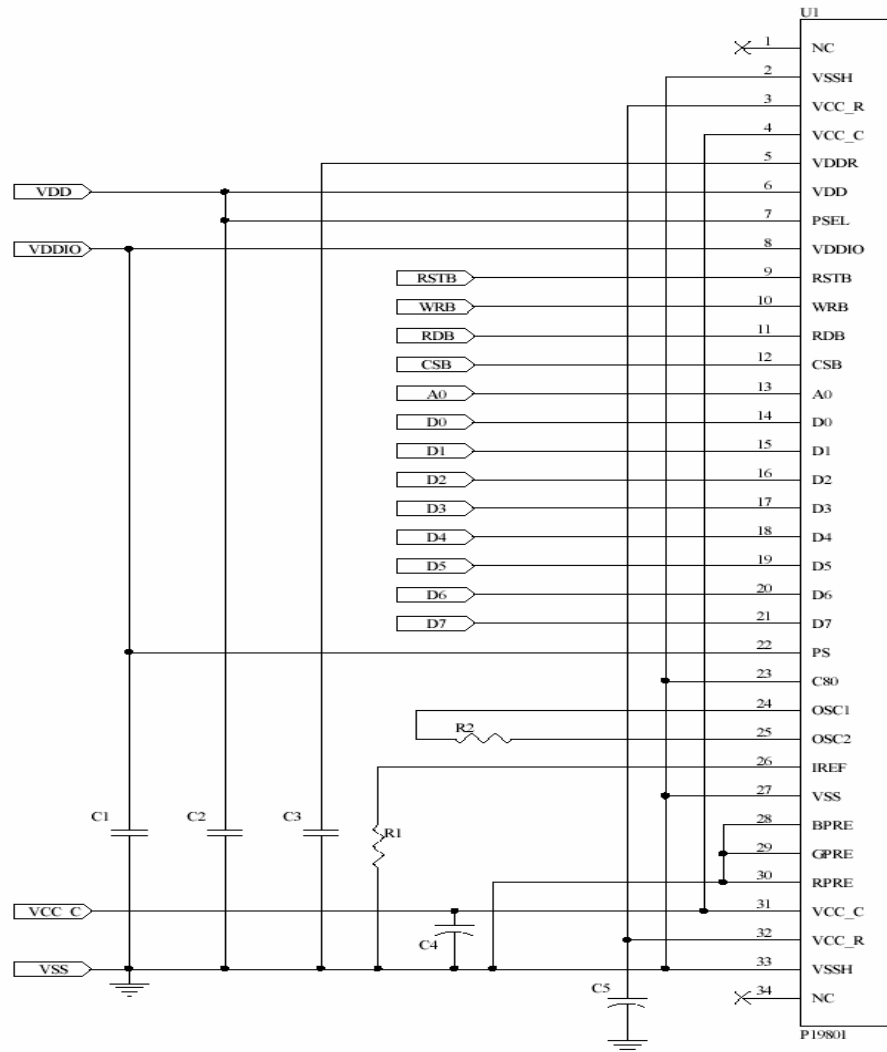
**Note:**

Since ESD protection circuit is connected between VDD, VDDIO and VCC\_C, VCC\_C becomes lower than VDD whenever VDD, VDDIO is On and VCC\_C is Off. VCC\_C should be kept disable when it is Off.

CONFIDENTIAL



## 8.2 APPLICATION CIRCUIT



### Recommend components:

C1, C2, C3 : 1uF/16V(0603)

C4, C5 : 2.2uF/25V(Tantalum type) or VISHAY (572D475X0025A2T)

R1 : 39k ohm(0603)

R2 : 27k ohm(0603)

**This circuit is for 8080 8bits interface.**

## 8.3 COMMAND TABLE

Refer to IC Spec.: SEPS114A

## **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

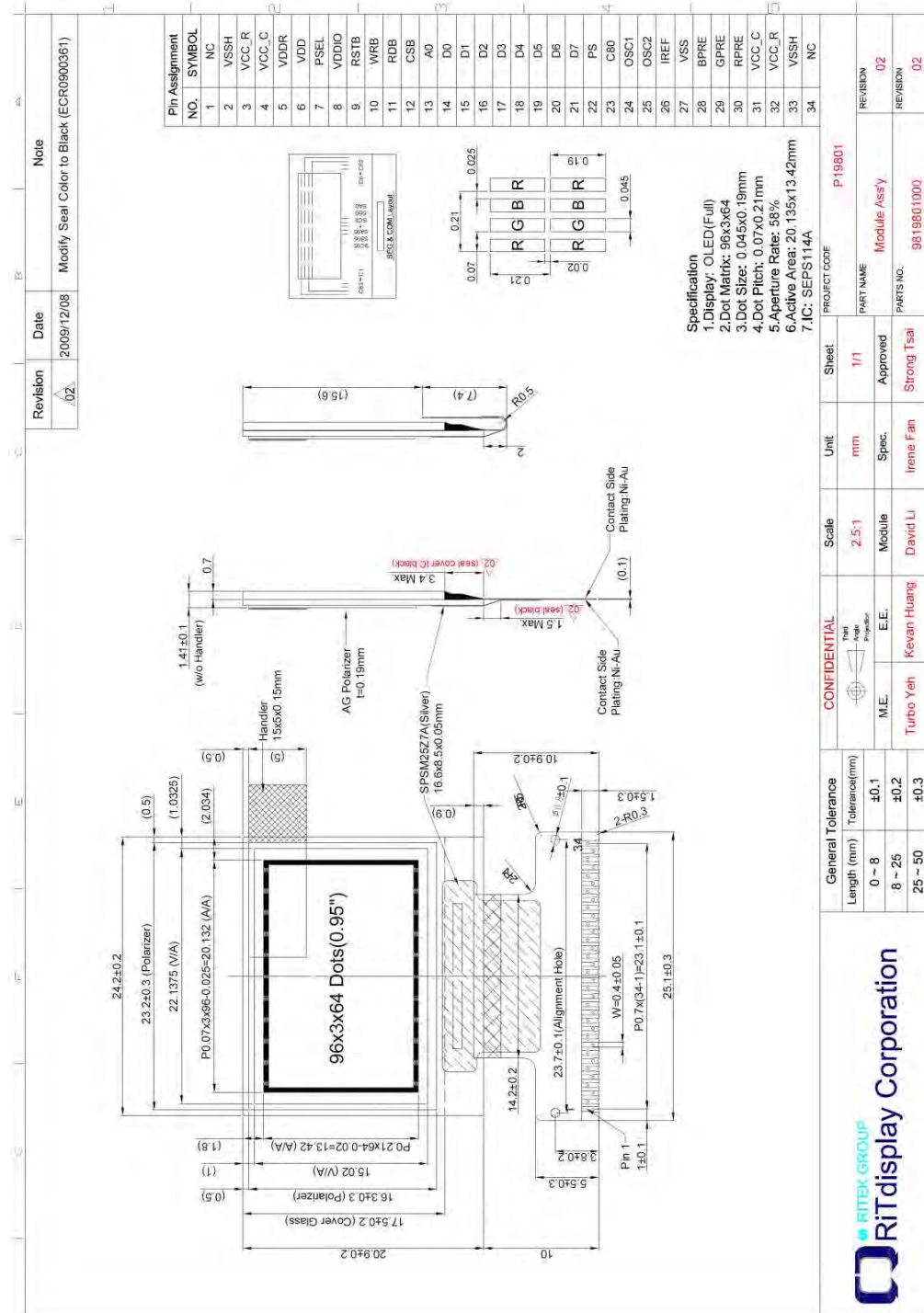
### **Test and measurement conditions**

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

<b>Revision</b>	A	<b>Date</b>	2009/12/01	<b>Note</b>	Packing Tray Instruction
-----------------	---	-------------	------------	-------------	--------------------------

**1** P19801 Module  
P/N: 9819801000  
面朝上, 勿摺压

**2** Packing Tray  
P/N: 3008000361  
330x270x7.8mm, L=0.7mm

**3** 5G Silica Gel Desiccants  
5G 矽膠乾燥劑  
P/N: 3010000002

**4** Vacuum Bag ONY/LDFE  
真空包裝袋 ONY/LDFE  
P/N: 300300012  
480x285x60mm  
Vacuum Packing  
抽真空袋

**5** Antistatic Bubble Bag  
抗靜電氣泡袋  
P/N: 300300016  
440x(350+450)mm

**6** Pizza Box  
P/N: 300100005  
345x285x88 B corrugated  
B 瓦

**7** 面盒 Carton  
P/N: 300000009  
380x294x175mm

**8** Label  
P/N: 300600000  
x2 pcs

**9** Tape  
P/N: 320800125

rotate stack  
旋轉堆疊

Item	Part No.	Description	QTY
1	9819801000	P19801 Module Assy	1920
2	3008000361	Trey 330x270x11mm, FS, L=0.7mm	42
3	3010000002	5G Silica Gel Desiccants	8
4	3003000012	Vacuum Bag 480x285x60mm	2
5	3003000016	Antistatic Bubble Bag 440x(350+450)mm	2
6	3001000005	Pizza Box, 345x285x88 B corrugated	2
7	3000000009	Carton, 385x305x203mm	1
8	3006000000	Label	3
9	3208000125	Tape, W=48mm, L=910cm	3

<b>General Tolerance</b>		<b>CONFIDENTIAL</b>	
Length (mm)	Tolerance(mm)	The Product	PROJECT CODE
0 - 8	±0.1	M.E.	P19801
8 - 25	±0.2	E.E.	Part Name
25 - 50	±0.3	Turbo Yeh	Packing Tray Instruction
		Kevan Huang	PARTS NO.
		David Li	9819801000
		Irene Fan	VERSION
		Strong Tsai	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.

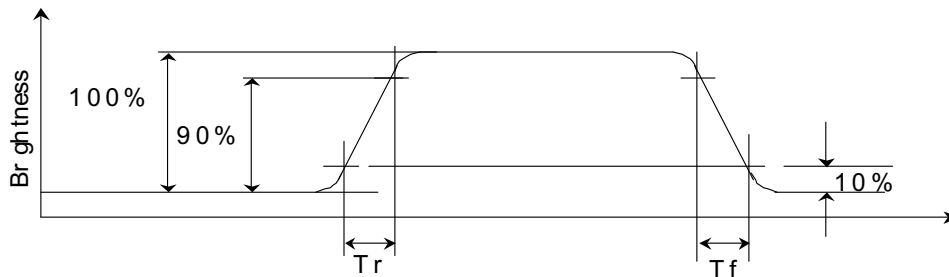
#### **B. DEFINITION OF CONTRAST RATIO**

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**

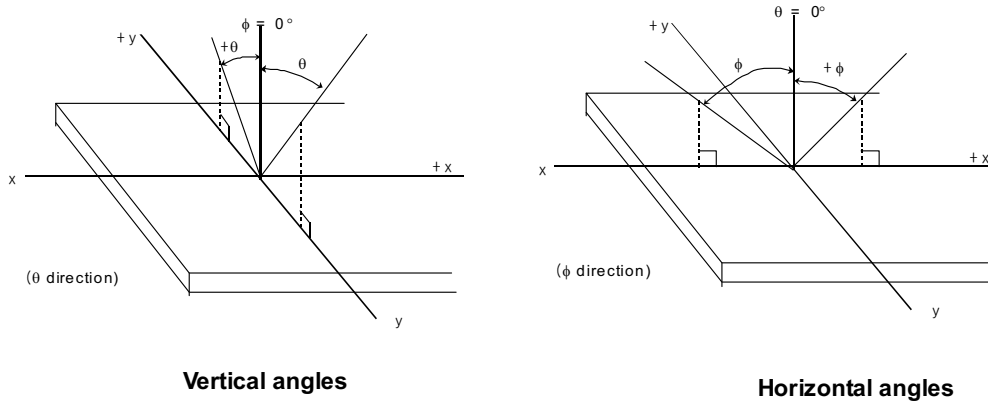
The definition of turn-on response time  $T_r$  is the time interval between a pixel reaching 10% of steady state luminance and 90% of steady state luminance. The definition of turn-off response time  $T_f$  is the time interval between a pixel reaching 90% of steady state luminance and 10% of steady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



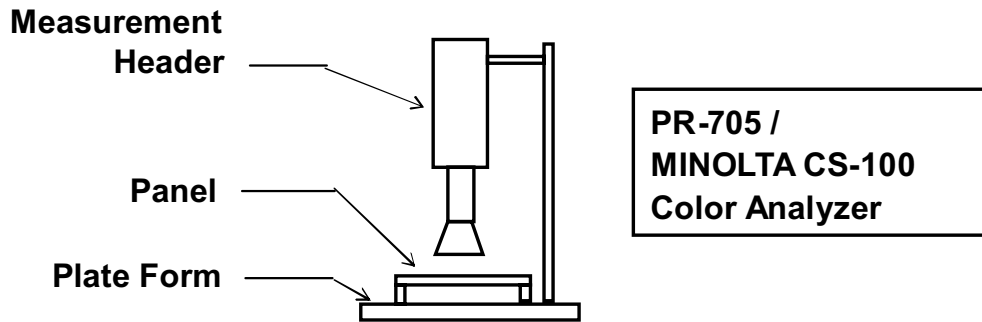
**Figure 3: Viewing Angle**

CONFIDENTIAL

## APPENDIX 2: MEASUREMENT APPARATUS

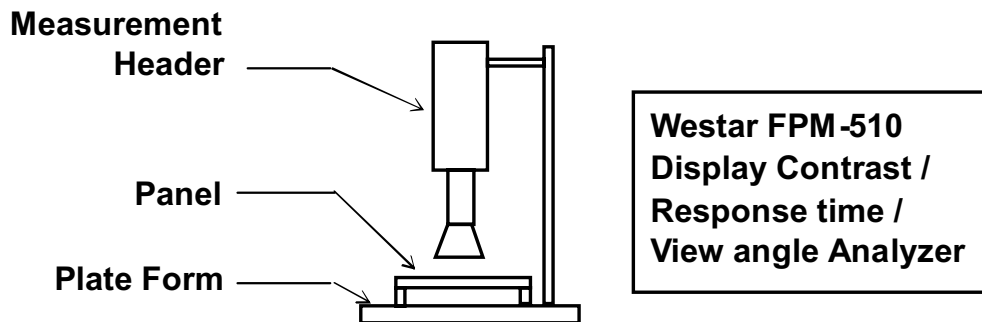
### A. LUMINANCE/COLOR COORDINATE

PHOTO RESEARCH PR-705, MINOLTA CS-100



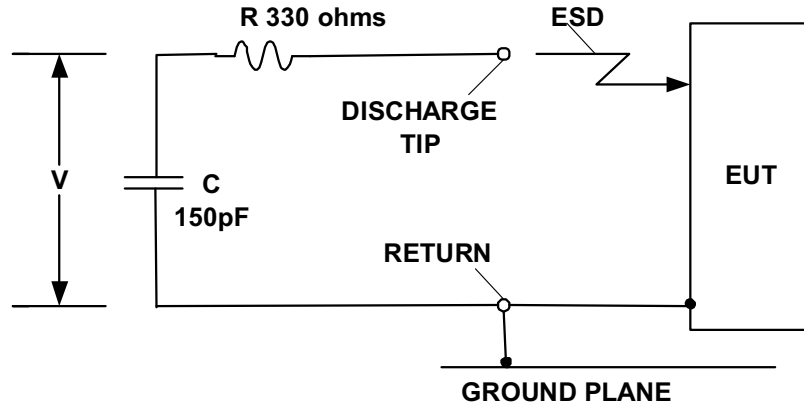
### B. CONTRAST / RESPONSE TIME / VIEW ANGLE

WESTAR CORPORATION FPM-510



CONFIDENTIAL

C. ESD ON AIR DISCHARGE MODE



CONFIDENTIAL



## 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.

CONFIDENTIAL



## Displays

US Micro Products is an industrial distributor specializing in engineered display solutions. We dedicate ourselves to providing the best in displays for the medical, industrial, gaming, automotive, aerospace, military and consumer markets.

**OLEDs**



**TFT Display**



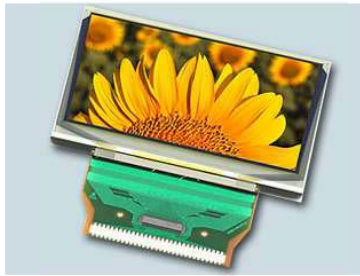
**Open Frame Monitors**



**Passive LCDs**



**Multitouch**



**Touch Screen**



As our customer, you receive expert knowledge, support and service. Our technical sales staff and experienced design engineers provide answers to your questions and engineered solutions to meet your display needs.

## Peripheral Devices

Our full line of peripheral devices includes keyboards, trackballs and printers. These rugged industrial products are designed to meet the rigorous demands of your equipment and are available in a variety of standard and custom options.

**Keyboards**



**Trackballs**



**Aerospace Trackballs**



**Printers**

