US Micro Products
Electronic Products for the OEM

OLED PRODUCT SPECIFICATION

Manufactured by:

RITEK GROUP
RiTdisplay Corporation

PART NUMBER:	**USMP-P19101**
DESCRIPTION:	**3.1", 256x32, Monochrome White, COF, SSD1326 IC**

ISSUE DATE	APPROVED BY (Customer Use Only)	CHECKED BY	PREPARED BY
PROPRIETARY NOTE:	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	2007. 10. 18	
X02	■ Add the operating conditions for different luminance ■ Add the panel electrical specifications ■ Modify power off sequence ■ Add the application circuit	2007. 12. 26	Page 6, 7, 8, 16 & 17
X03	■ Modify tape & polarizer dimension	2008. 02. 13	Page 19
A01	■ Transfer from X version ■ Add the information of module weight ■ Add the packing specification	2008. 04. 15	Page 5 & 20
A02	■ Add alignment line on FPC	2008. 06. 06	Page 19

CONTENTS

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.

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 : White
- Panel matrix : 256*32
- Driver IC : SSD1326
- Excellent quick response time.
- Extremely thin thickness for best mechanism design : 1.61mm
- High contrast : 2000:1
- Wide viewing angle : 160°
- 8-bit 6800-series Parallel Interface, 8-bit 8080-series Parallel Interface, Serial Peripheral Interface and I^2C Interface.
- Wide range of operating temperature : -40 to 70 °C
- Anti-glare polarizer.

4. MECHANICAL DATA

NO	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	256 (W) x 32 (H)	dot
2	Dot Size	0.289 (W) x 0.289 (H)	mm^2
3	Dot Pitch	0.309 (W) x 0.309 (H)	mm^2
4	Aperture Rate	87	%
5	Active Area	79.084 (W) x 9.868 (H)	mm^2
6	Panel Size	83.8 (W) x 18 (H)	mm^2
7	Panel Thickness	1.61 ± 0.1	mm
8	Module Size	83.8 (W) x 41.2 (H) x 1.61 (D)	mm^3
9	Diagonal A/A size	3.1	inch
10	Module Weight	5.28 ± 10%	gram

5. MAXIMUM RATINGS

ITEM	MIN	MAX	UNIT	Condition	Remark
Supply Voltage (V_{DD})	2.4	3.5	V	Ta = 25°C	IC maximum rating
Supply Voltage (Vcc)	9	15	V	Ta = 25°C	IC maximum rating
Operating Temp.	-40	70	°C		
Storage Temp	-40	85	°C		
Humidity	-	85	%		
Life Time	13,000	-	Hrs	120 cd/m^2, 50% checkerboard	Note (1)
Life Time	16,000	-	Hrs	100 cd/m^2, 50% checkerboard	Note (2)
Life Time	20,000	-	Hrs	80 cd/m^2, 50% checkerboard	Note (3)

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.

(1) Setting of 120cd/m^2 :

- Contrast setting : D0H
- Frame rate : 105HZ
- Duty setting : 1/32

(2) Setting of 100cd/m^2 :

- Contrast setting : B0H
- Frame rate : 105Hz
- Duty setting : 1/32

(3) Setting of 80cd/m^2 :

- Contrast setting : 90H
- Frame rate : 105Hz
- Duty setting : 1/32

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	11.5	12	12.5	V
V_{DD}	Logic operating voltage	Ta=-20°C to +70°C	2.4	2.7	3.5	V
V_{OH}	Hi logic output level	Iout=100 uA, 3.3MHz	0.9*V_{DD}		V_{DD}	V
V_{OL}	Low logic output level	Iout=100uA, 3.3MHZ	0		0.1*V_{DD}	V
V_{IH}	Hi logic input level	Iout=100uA, 3.3MHZ	0.8*V_{DD}		V_{DD}	V
V_{IL}	Low logic input level	Iout=100uA, 3.3MHZ	0		0.2*V_{DD}	V
I_{CC}	Operating current for V_{CC} (No panel attached)	Contrast=FF		550		uA
I_{DD}	Operating current for V_{DD} (No panel attached)	Contrast=FF		190		uA
I_{SEG}	Segment output current (No panel attached)	Contrast=FF		100		uA
		Contrast=AF		69		uA
		Contrast=3F		25		uA
		Contrast=0F		6		uA

Note : V_{DD}=2.7 Volts ; V_{CC}=12VDC ; Frame rate=105Hz ; No panel attached.

6.2 ELECTRO-OPTICAL CHARACTERISTICS

PANEL ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	TYP.	MAX	UNITS	COMMENTS
Normal mode current		24	26	mA	All pixels on (1)
Standby mode current		1	3	mA	Standby mode 10% pixels on (2)
Normal mode power consumption		288	312	mW	All pixels on (1)
Standby mode power consumption		12	36	mW	Standby mode 10% pixels on (2)
Normal Luminance	80	100		cd/m^2	Display Average
Standby Luminance		10		cd/m^2	Display Average
CIEx (White)	0.24	0.28	0.32		x, y (CIE 1931)
CIEy (White)	0.28	0.32	0.36		
Dark Room Contrast	2000:1				
Viewing Angle	160			degree	
Response Time		10		μs	

(1) Normal mode condition :

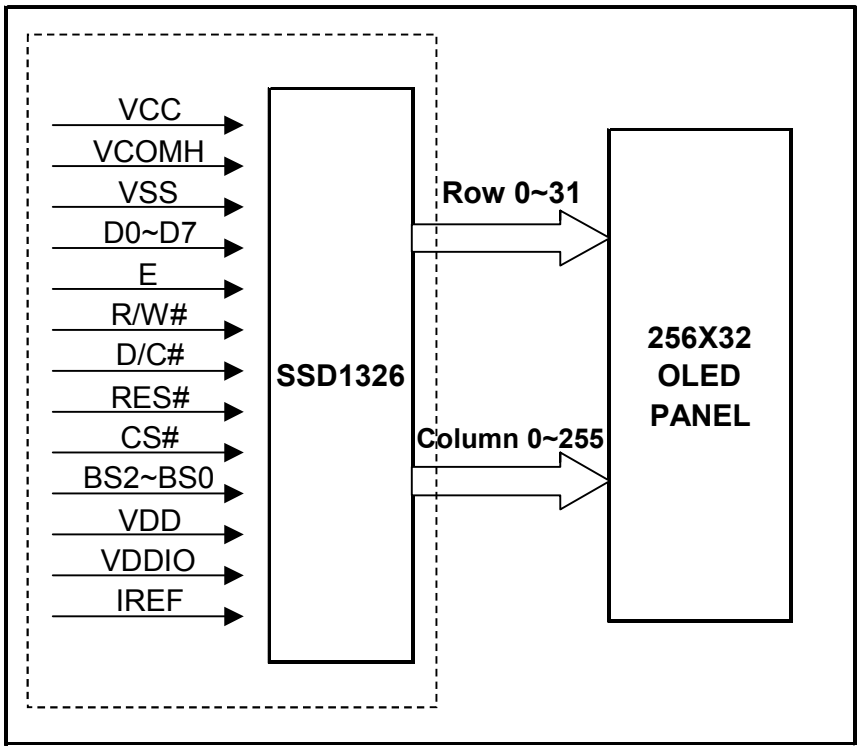
- Driving Voltage : 12V
- Contrast setting : 0xB0
- Frame rate : 105Hz
- Duty setting : 1/32

(2) Standby mode condition :

- Driving Voltage : 12V
- Contrast setting : 0x02
- Frame rate : 105Hz
- Duty setting : 1/32

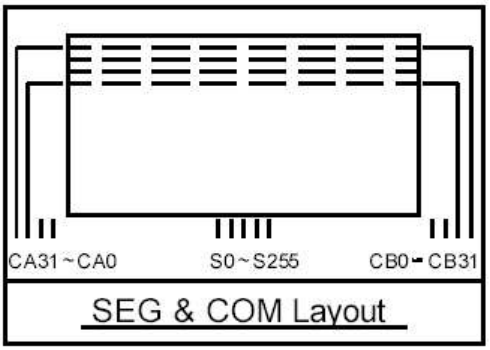
7. INTERFACE

7.1 FUNCTION BLOCK DIAGRAM



RiTdisplay 256x32

7.2 PANEL LAYOUT DIAGRAM



7.3 PIN ASSIGNMENTS

PIN NAME	PIN NO.	TYPE	DESCRIPTION
NC	1		No connection
VCC	2	P	Positive OLED high voltage power supply
VCOMH	3	O	A capacitor should be connected between this pin and VSS.
VSS	4	P	This is a ground pin.
D7	5	I/O	This pin is bi-direction data signal.
D6	6	I/O	This pin is bi-direction data signal.
D5	7	I/O	This pin is bi-direction data signal.
D4	8	I/O	This pin is bi-direction data signal.
D3	9	I/O	This pin is bi-direction data signal.
D2	10	I/O	This pin is bi-direction data signal.
D1	11	I/O	This pin is bi-direction data signal.
D0	12	I/O	This pin is bi-direction data signal.
E	13	I	Data read operation is initiated when it's pull low.
R/W#	14	I	Data write operation is initiated when it's pull low.
D/C#	15	I	Data/ Command control. Pull high for write/read display data. Pull low for write command or read status.
RES#	16	I	Reset signal input. When it's low, initialization of SSD1326 is executed.
CS#	17	I	Chip selection input.
BS2	18	I	MPU bus interface selection pins.
BS1	19	I	
BS0	20	I	
VDDIO	21	I	Power supply pin of I/O buffer. It should be connected to VDD or external source.
VDD	22	P	Voltage power supply for logic
VSS	23	P	This is a ground pin.
IREF	24	I	A resistor should be connected between this pin and VSS.
VCC	25	P	Positive OLED high voltage power supply
NC	26		No connection

7.4 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 256 x 32 bits.

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

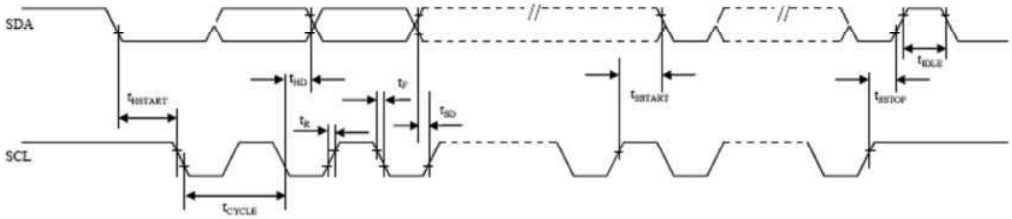
Display Data RAM Map

Colum	0~7								8~15								.....	248~255							
ROW	D7	D6	D5	D4	D3	D2	D1	D0	D7	D6	D5	D4	D3	D2	D1	D0		D7	D6	D5	D4	D3	D2	D1	D0
0																									
1																									
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12																									
13																									
14																									
15																									
16																									
17																									
18																									
19																									
20																									
21																									
22																									
23																									
24																									
25																									
26																									
27																									
28																									
29																									
30																									
31																									

7.5 INTERFACE TIMING CHART

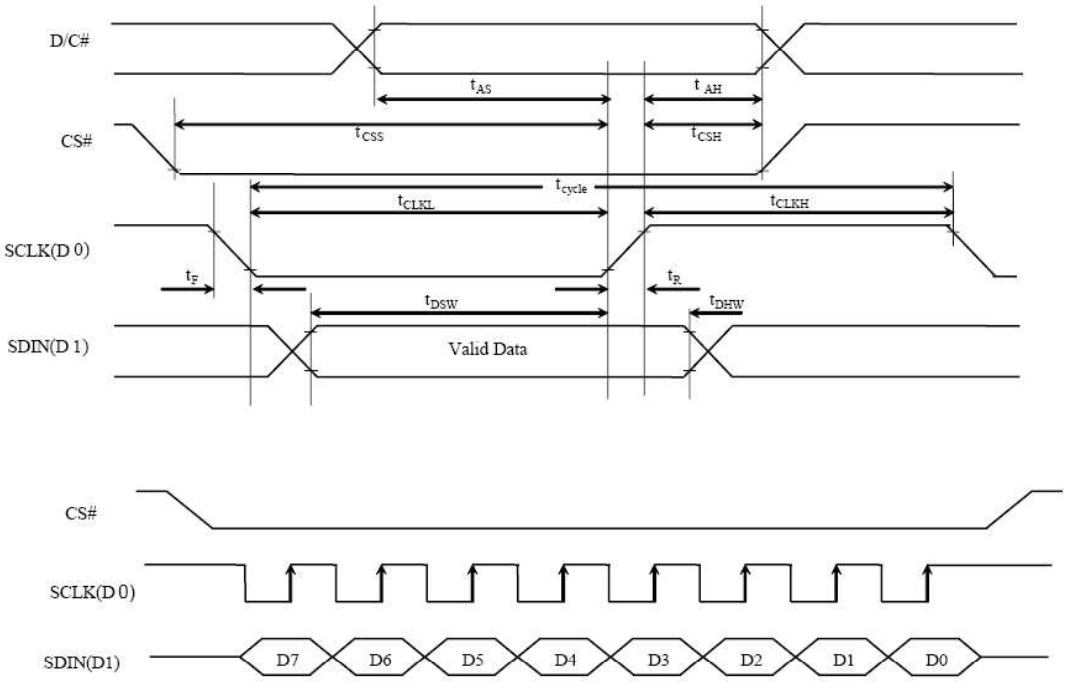
Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	2.5	-	-	us
t_{HSTART}	Start condition Hold Time	0.6	-	-	us
t_{HD}	Data Hold Time	300	-	-	ns
t_{SD}	Data Setup Time	100	-	-	ns
t_{SSTART}	Start condition Setup Time (Only relevant for a repeated Start condition)	0.6	-	-	us
t_{SSTOP}	Stop condition 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

I^2C interface characteristics



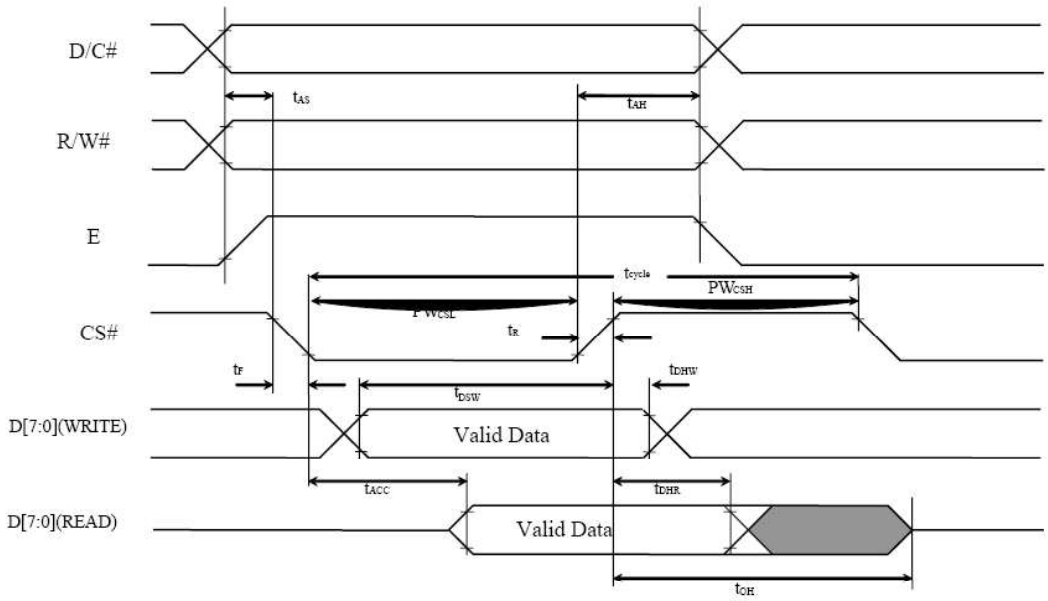
Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	250	-	-	ns
t_{AS}	Address Setup Time	150	-	-	ns
t_{AH}	Address Hold Time	150	-	-	ns
t_{CSS}	Chip Select Setup Time	120	-	-	ns
t_{CSH}	Chip Select Hold Time	60	-	-	ns
t_{DSW}	Write Data Setup Time	100	-	-	ns
t_{DHW}	Write Data Hold Time	100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

Serial interface characteristics



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

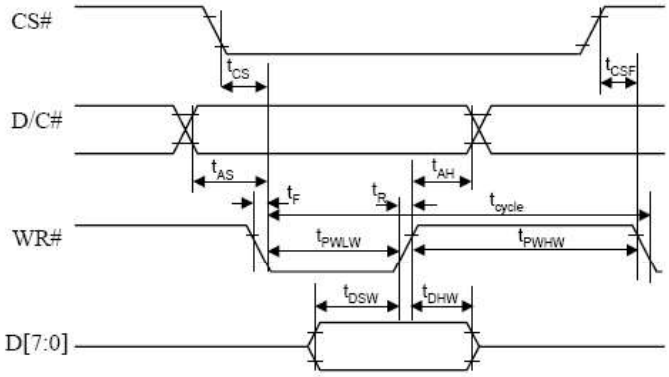
6800-series MCU parallel interface characteristics



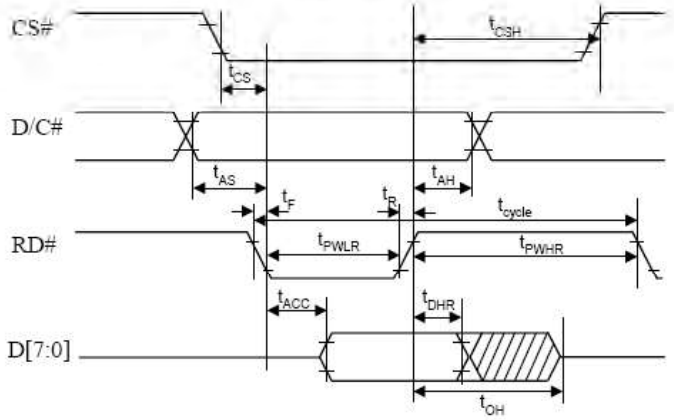
Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	300	-	-	ns
t_{AS}	Address Setup Time	10	-	-	ns
t_{AH}	Address Hold Time	0	-	-	ns
t_{DSW}	Write Data Setup Time	40	-	-	ns
t_{DHW}	Write Data Hold Time	7	-	-	ns
t_{DHR}	Read Data Hold Time	20	-	-	ns
t_{OH}	Output Disable Time	-	-	70	ns
t_{ACC}	Access Time	-	-	140	ns
t_{PWLR}	Read Low Time	120	-	-	ns
t_{PWLW}	Write Low Time	60	-	-	ns
t_{PWHR}	Read High Time	60	-	-	ns
t_{PWHW}	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 MCU parallel interface characteristics

Write cycle



Read cycle

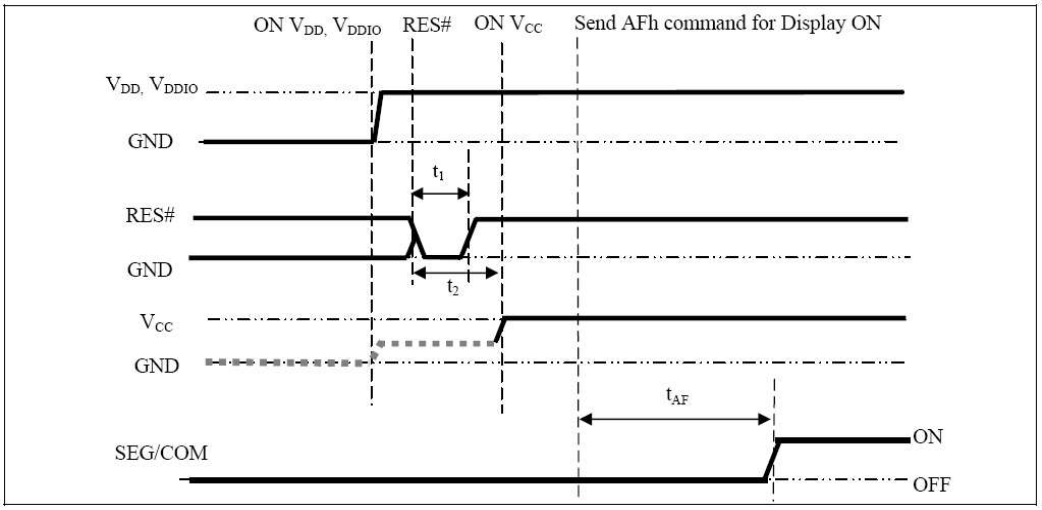


8. POWER ON / OFF SEQUENCE & APPLICATION CIRCUIT

8.1 POWER ON / OFF SEQUENCE

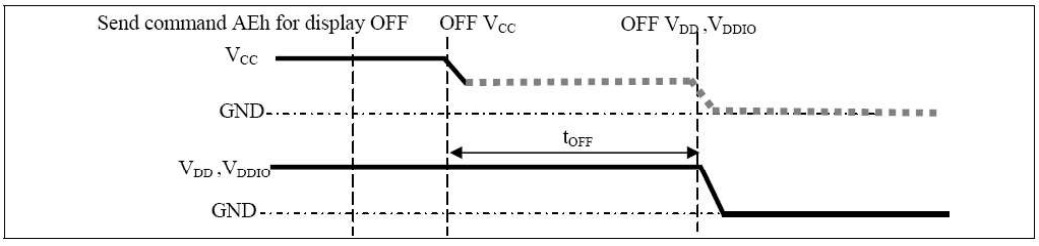
Power ON sequence:

1. Power ON V_{DD}, V_{DDIO}.
2. After V_{DD}, V_{DDIO} become stable, set RES# pin LOW (logic low) for at least 2us(t_1) and then HIGH (logic HIGH).
3. After set RES# pin LOW (logic LOW), wait for at least 2us(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. Wait for t_{OFF}. Power OFF V_{DD}, V_{DDIO}. (where Minimum t_{OFF}=80ms, Typical t_{OFF}=100ms)

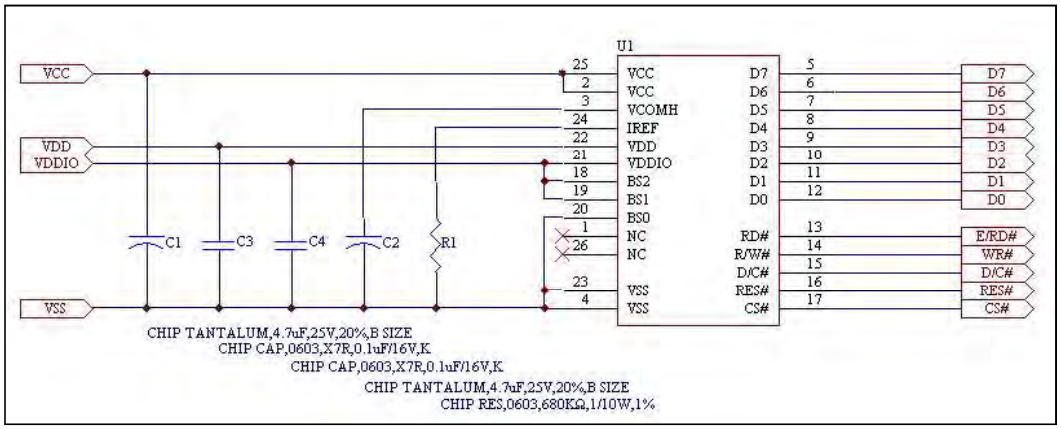


Note:

(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 disabled when it is OFF.

8.2 APPLICATION CIRCUIT



8.3 COMMAND TABLE

Refer to SSD1326 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

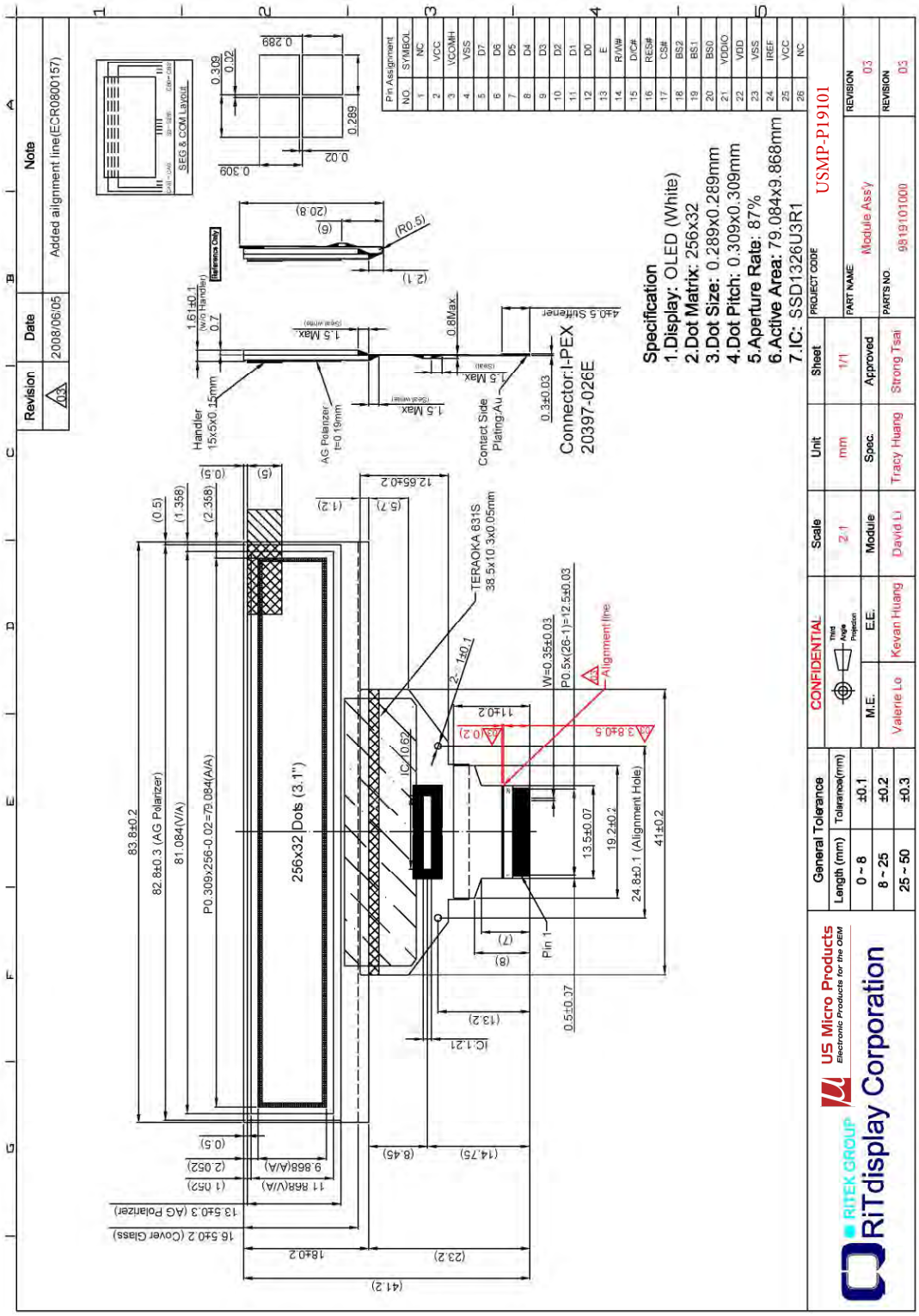
Test and measurement conditions

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.

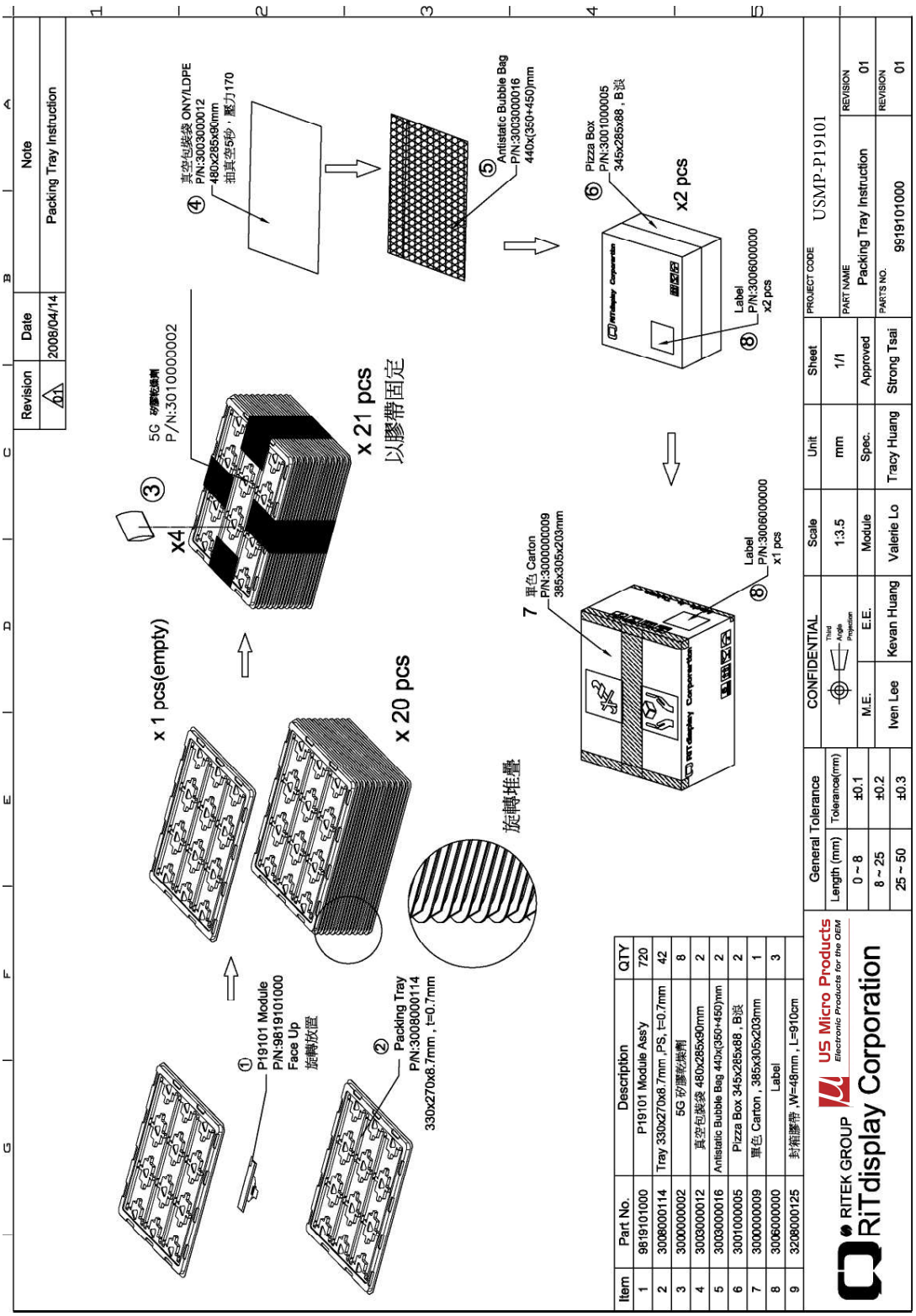
Evaluation criteria

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

10. EXTERNAL DIMENSION



11. PACKING SPECIFICATION



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 Tr 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 Tf 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.

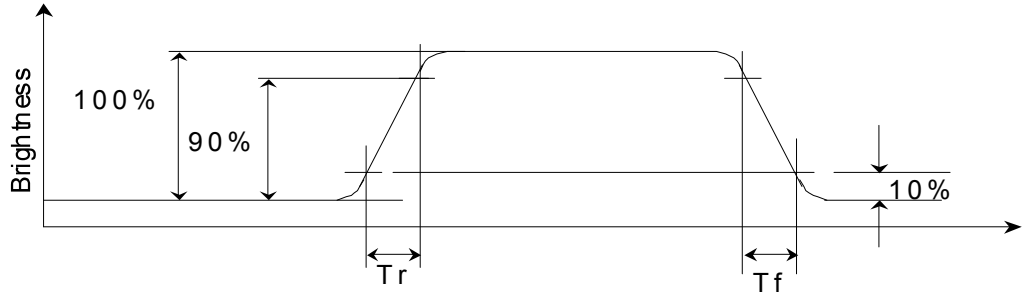


Figure 2: Response time

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.

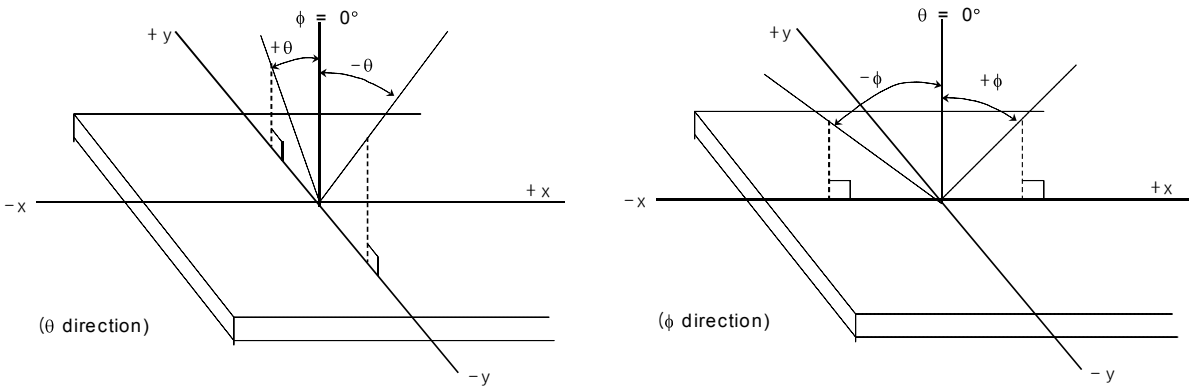
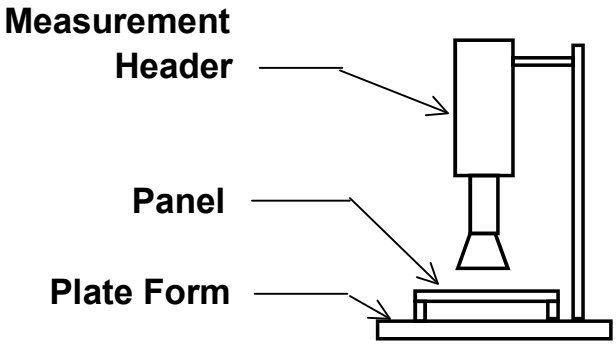


Figure 3: Viewing Angle

APPENDIX 2: MEASUREMENT APPARATUS

A. LUMINANCE/COLOR COORDINATE

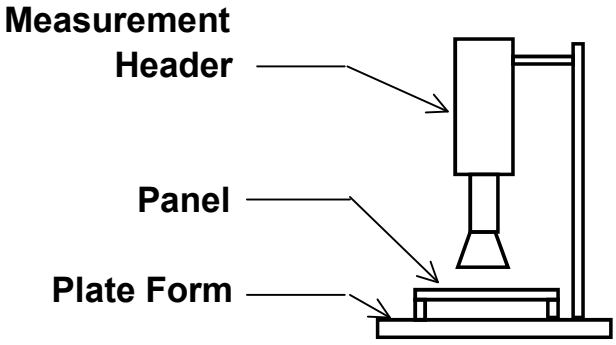
PHOTO RESEARCH PR-705, MINOLTA CS-100



PR-705 / MINOLTA CS-100 Color Analyzer

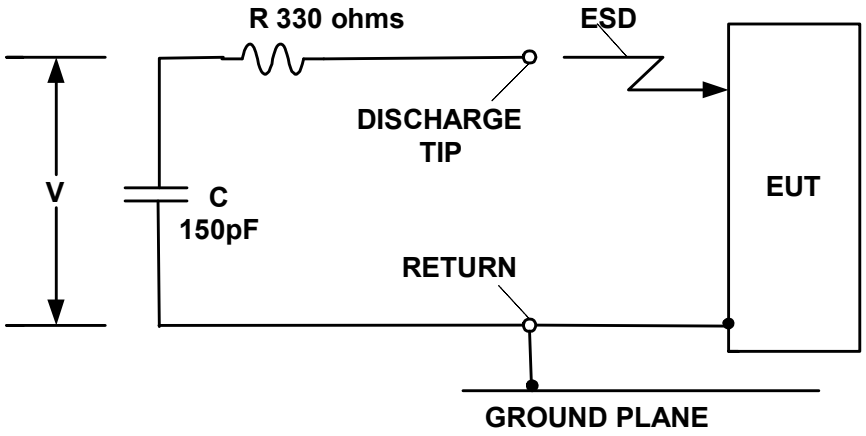
B. CONTRAST / RESPONSE TIME / VIEW ANGLE

WESTAR CORPORATION FPM-510



Westar FPM-510 Display Contrast / Response time / View angle Analyzer

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.

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

US Micro Products
Electronic Products for the OEM

6207 Bee Caves Rd., Suite 330, Austin, TX 78746
U.S.A. Tel. 800-741-7755 • International Tel. 01-512-385-9000 • Fax. 512-385-9002
www.usmicroproducts.com