US Micro Products
Electronic Products for the OEM

OLED PRODUCT SPECIFICATION

Manufactured by:

RITEK GROUP
RiTdisplay Corporation

PART NUMBER:	**USMP-P20603 V02**
DESCRIPTION:	0.7", 96x32, White, TAB, SSD1305

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	2009. 01. 21	
X02	■ Modify definition of panel thickness ■ Modify luminance specifications ■ Add the operating conditions for different luminance ■ Add the panel electrical specifications ■ Add the function block diagram ■ Add the application circuit	2009. 04. 13	Page 5, 6, 7, 8, 9 & 14

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 resolution : 96*32
- Driver IC : SSD1305
- Excellent Quick response time : 10μs
- Extremely thin thickness for best mechanism design : 1.21 mm
- High contrast : 2000:1
- Wide viewing angle : 160°
- Strong environmental resistance.
- 8-bit 6800-series Parallel Interface, 8-bit 8080-series Parallel Interface, Serial Peripheral Interface.
- Wide range of operating temperature : -40 to 70°C
- Anti-glare polarizer.

4. MECHANICAL DATA

NO	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	96 x 32	dot
2	Dot Size	0.15 (W) x 0.15 (H)	mm^2
3	Dot Pitch	0.17 (W) x 0.17 (H)	mm^2
4	Aperture Rate	78	%
5	Active Area	16.3 (W) x 5.42 (H)	mm^2
6	Panel Size	19.8 (W) x 12.8 (H)	mm^2
7*	Panel Thickness	1.02 ± 0.05	mm
8	Module Size	19.8 (W) x 19.8 (H) x 1.21 (T)	mm^3
9	Diagonal A/A size	0.68	inch
10	Module Weight	TBD	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 (Vcc)	8	16	V	Ta = 25°C	IC maximum rating
Operating Temp.	-40	70	°C		
Storage Temp	-40	85	°C		
Humidity		85	%	25°C ~40°C	
Life Time	21,000	-	Hrs	140 cd/m², 50% checkerboard	Note (1)
Life Time	25,000	-	Hrs	120 cd/m², 50% checkerboard	Note (2)
Life Time	30,000	-	Hrs	100 cd/m², 50% checkerboard	Note (3)

Note:

(A) Under Vcc = 13.5V, 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 140 cd/m² :

- Contrast setting : 0x45
- Frame rate : 105 Hz
- Duty setting : 1/32

(2) Setting of 120 cd/m² :

- Contrast setting : 0x3c
- Frame rate : 105 Hz
- Duty setting : 1/32

(3) Setting of 100 cd/m² :

- Contrast setting : 0x31
- Frame rate : 105 Hz
- 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)		13	13.5	14	V
V_{DD}	Digital power supply		2.4	2.8	3.5	V
V_{DDIO}	Power supply for I/O pins		1.6	-	V_{DD}	V
I_{DD}	Operating current for V_{DD} V_{DD} = 2.7V, V_{CC} = 12V, IREF = 10uA No loading, All Display ON	Contrast=FF	-	100	-	uA
I_{CC}	Operating current for V_{CC} V_{DD} = 2.7V, V_{CC} = 12V, IREF = 10uA, No loading, All Display ON	Contrast=FF	-	550	-	uA
V_{IH}	Hi logic input level		0.8* V_{DDIO}	-	V_{DDIO}	V
V_{IL}	Low logic input level		0	-	0.2* V_{DDIO}	V
V_{OH}	Hi logic output level		0.9* V_{DDIO}	-	V_{DDIO}	V
V_{OL}	Low logic output level		0	-	0.1* V_{DDIO}	V
I_{SEG}	Segment on output current V_{DD}=2.7V, V_{CC}=12V, IREF=10uA, Display on	Contrast=FF	294	320	346	uA
		Contrast=AF	-	220	-	uA
		Contrast=7F	-	159	-	uA
		Contrast=3F	-	79	-	uA
		Contrast=0F	-	19	-	uA

6.2 ELECTRO-OPTICAL CHARACTERISTICS

PANEL ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	TYP.	MAX	UNITS	COMMENTS
Normal mode current consumption	-	6	8	mA	All pixels on
Standby mode current consumption	-	1	3	mA	Standby mode 10% pixels on
Normal mode power consumption	-	81	108	mW	All pixels on
Standby mode power consumption	-	13.5	40.5	mW	Standby mode 10% pixels on
Pixel Luminance	100	120		cd/m^2	Display Average
Standby Luminance		20		cd/m^2	
CIEx (White)	0.27	0.31	0.35		CIE1931
CIEy (White)	0.29	0.33	0.37		CIE1931
Dark Room Contrast	2000:1				
Viewing Angle	160			degree	
Response Time		10		μs	

Normal mode condition :

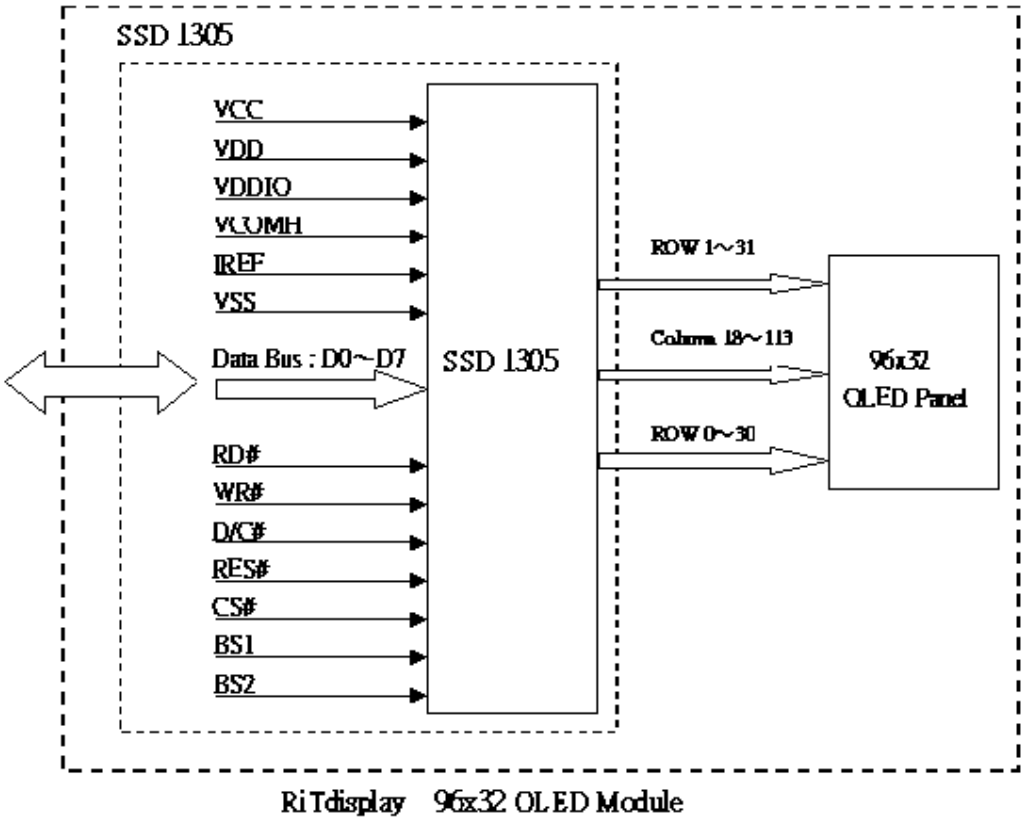
- Driving Voltage : 13.5V
- Contrast setting : 0x3c
- Frame rate : 105 Hz
- Duty setting : 1/32

Standby mode condition :

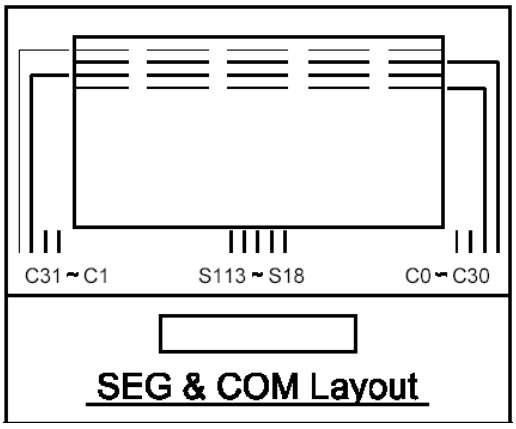
- Driving Voltage : 13.5V
- Contrast setting : 0x08
- Frame rate : 105 Hz
- Duty setting : 1/32

7. INTERFACE

7.1 FUNCTION BLOCK DIAGRAM



7.2 PANEL LAYOUT DIAGRAM



7.3 PIN ASSIGNMENTS

Pin No.	Pin Name	Description
1	NC	No connection
2	VSS	This is a ground pin
3	VCC	Positive OLED high voltage power supply
4	VCOMH	Com Voltage Output. A capacitor should be connected between this pin and VSS
5	IREF	A resistor should be connected between this pin and VSS
6	D7	This pin is bi-direction data signal
7	D6	This pin is bi-direction data signal
8	D5	This pin is bi-direction data signal
9	D4	This pin is bi-direction data signal
10	D3	This pin is bi-direction data signal
11	D2	This pin is bi-direction data signal
12	D1	This pin is bi-direction data signal
13	D0	This pin is bi-direction data signal
14	RD	This pin is used to receive the Read Data signal
15	WR	This pin is used to receive the Write Data signal
16	D/C	This is a Data/Command control pin
17	RES	Hardware reset signal
18	CS	This is a chip select control pin
19	BS2	MCU bus interface selection pins
20	BS1	
21	VDDIO	I/O voltage power supply
22	VDD	Voltage power supply for logic
23	VSS	This is a ground pin
24	VCC	Positive OLED high voltage power supply
25	NC	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 132x64= 8448bits.

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

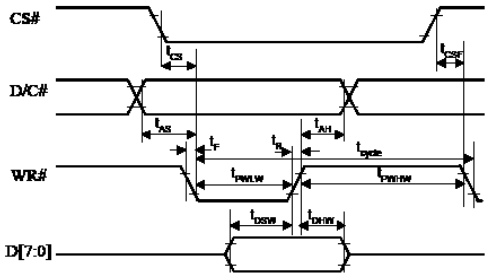
OUT	Row Address Direction='1'	Row Address Direction='0'			Column Address Remap='0'	Column Address Remap='1'	OUT								...				
					0x00h	0x83h	SEG0	SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7		SEG128	SEG129	SEG130	SEG131
					0x01h	0x82h													
					0x02h	0x81h													
					0x03h	0x80h													
					0x04h	0x7Fh													
					0x05h	0x7Eh													
					0x06h	0x7Dh													
					0x07h	0x7Ch													
					0x80h	0x03h													
					0x81h	0x02h													
					0x82h	0x01h													
					0x83h	0x00h													
COM0	0x3Fh	0x00h	PAGE 0	D0															
COM1	0x3Eh	0x01h		D1															
COM2	0x3Dh	0x02h		D2															
COM3	0x3Ch	0x03h		D3															
COM4	0x3Bh	0x04h		D4															
COM5	0x3Ah	0x05h		D5															
COM6	0x39h	0x06h		D6															
COM7	0x38h	0x07h		D7															
COM8	0x37h	0x08h	PAGE 1	D0															
COM9	0x36h	0x09h		D1															
COM10	0x35h	0x0Ah		D2															
COM11	0x34h	0x0Bh		D3															
COM12	0x33h	0x0Ch		D4															
COM13	0x32h	0x0Dh		D5															
COM14	0x31h	0x0Eh		D6															
COM15	0x30h	0x0Fh		D7															
COM16	0x2Fh	0x10h	PAGE 2	D0															
COM17	0x2Eh	0x11h		D1															
COM18	0x2Dh	0x12h		D2															
COM19	0x2Ch	0x13h		D3															
COM20	0x2Bh	0x14h		D4															
COM21	0x2Ah	0x15h		D5															
COM22	0x29h	0x16h		D6															
COM23	0x28h	0x17h		D7															
:																			
COM48	0x0Fh	0x30h	PAGE 6	D0															
COM49	0x0Eh	0x31h		D1															
COM50	0x0Dh	0x32h		D2															
COM51	0x0Ch	0x33h		D3															
COM52	0x0Bh	0x34h		D4															
COM53	0x0Ah	0x35h		D5															
COM54	0x09h	0x36h		D6															
COM55	0x08h	0x37h		D7															
COM56	0x07h	0x38h	PAGE 7	D0															
COM57	0x06h	0x39h		D1															
COM58	0x05h	0x3Ah		D2															
COM59	0x04h	0x3Bh		D3															
COM60	0x03h	0x3Ch		D4															
COM61	0x02h	0x3Dh		D5															
COM62	0x01h	0x3Eh		D6															
COM63	0x00h	0x3Fh		D7															

7.5 INTERFACE TIMING CHART

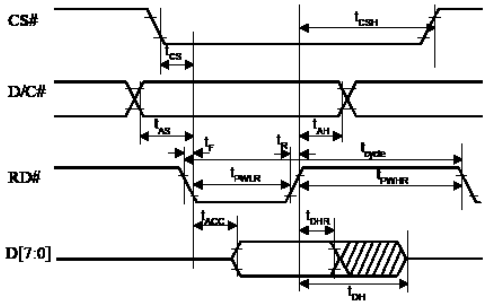
(V_{DD} - V_{SS} = 2.4V to 3.5V, V_{DDIO} = V_{DD}, T_A = 25°C)

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	-	-	40	ns
t_F	Fall Time	-	-	40	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

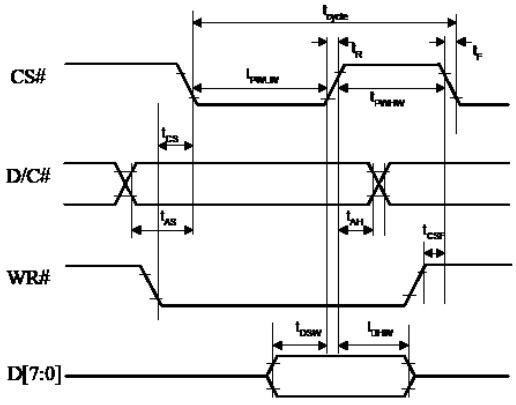
Write cycle (Form 1)



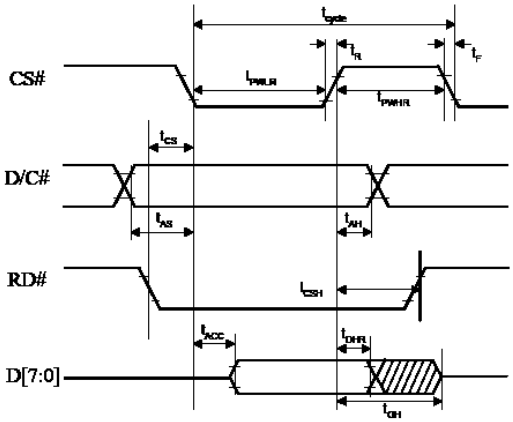
Read cycle (Form 1)



Write cycle (Form 2)



Read cycle (Form 2)

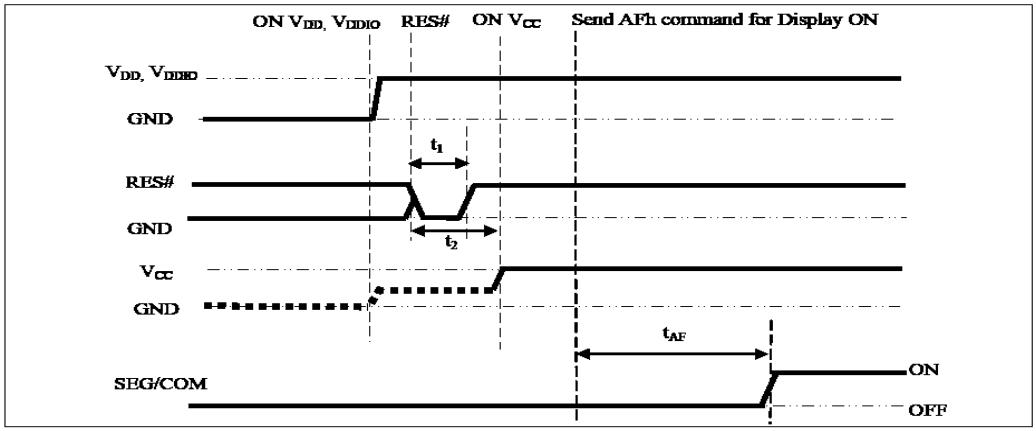


8. POWER ON / OFF SEQUENCE & APPLICATION CIRCUIT

8.1 POWER ON / OFF SEQUENCE

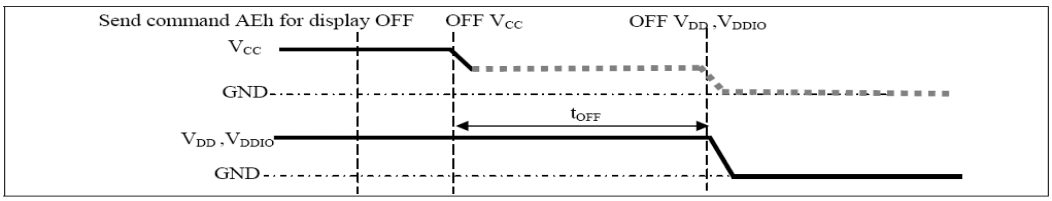
Power ON sequence:

1. Power ON V_{DD}, V_{DDIO}.
2. After V_{DD}, V_{DDIO} become stable, set RES# pin LOW (logic low) for at least 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 will be ON after 100ms(t_{AF}).



Power OFF sequence:

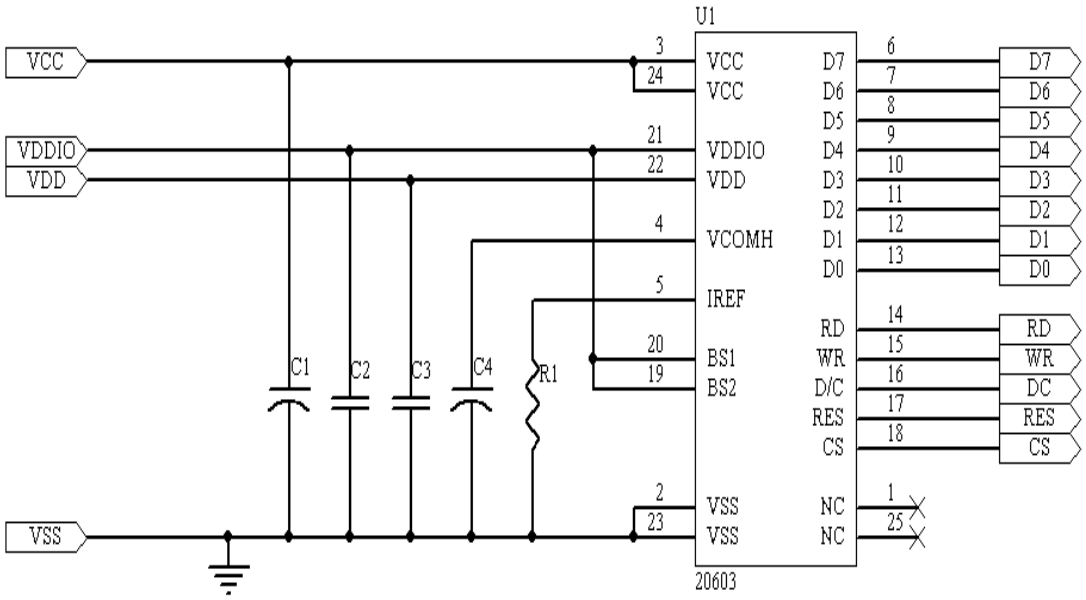
1. Send command AEh for display OFF.
2. Power OFF V_{CC}. (1), (2)
3. Wait for t_{OFF}. Power OFF V_{DD}, V_{DDIO}. (where Minimum t_{OFF}=80ms, Typical t_{OFF}=100ms)



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.
(3) Power Pins(VDD,VCC) can never be pulled to ground under any circumstance.
(4) The register values are reset after t1.
(5) VDD should not be Power OFF before VCC Power OFF.

8.3 APPLICATION CIRCUIT



Recommended components

C1, C4: 4.7uF/35V (Tantalum type), or VISHAY (572D475X0025A2T)

C2, C3: 0.1uF /25V (0603)

R1: 3M ohm /1% (0603)

Notes: This circuit is for 8080-series parallel interface

8.4 COMMAND TABLE

Refer to IC Spec.: SSD1305

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

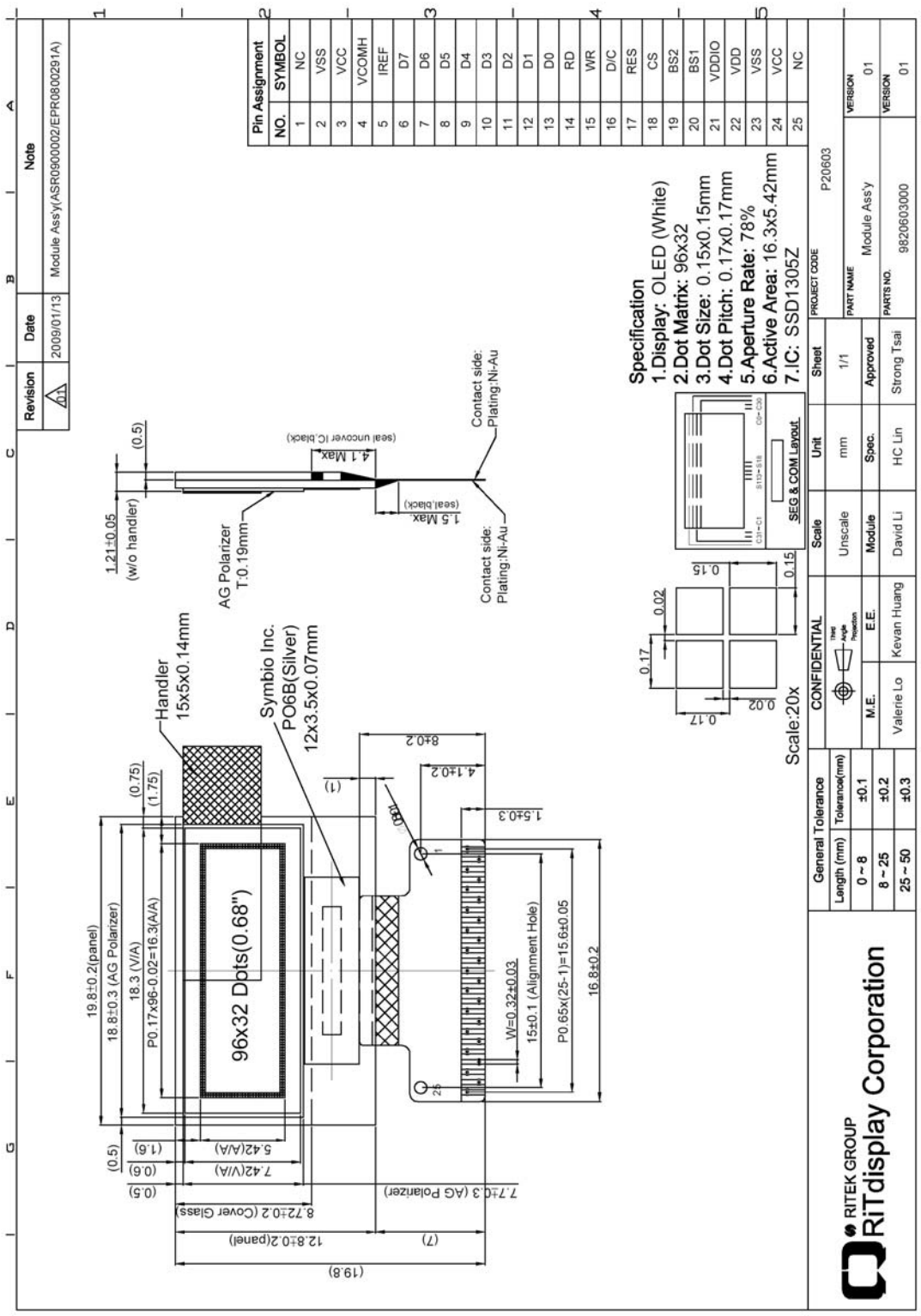
Test and measurement conditions

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

TBD

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.

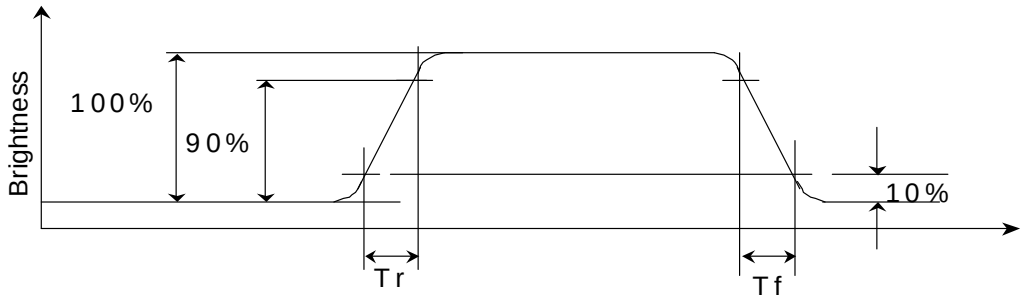


Figure 2 Response time

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.

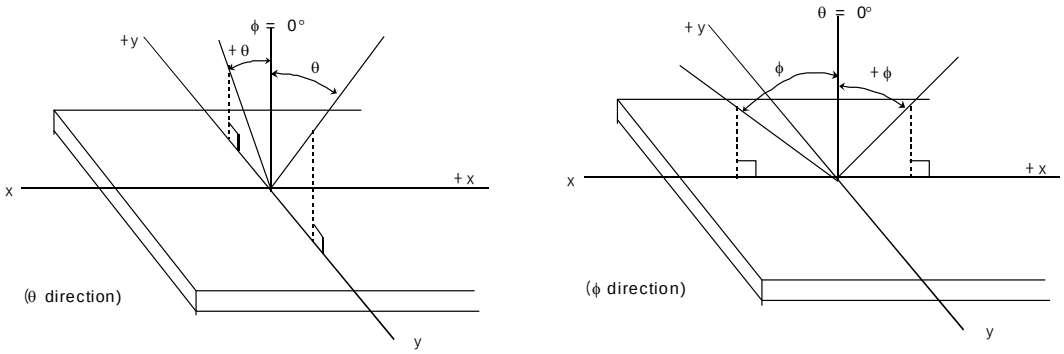
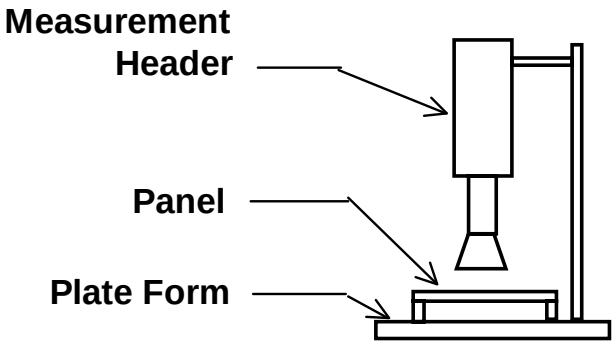


Figure 3 Viewing angle

APPENDIX 2: MEASUREMENT APPARATUS

A. LUMINANCE/COLOR COORDINATE

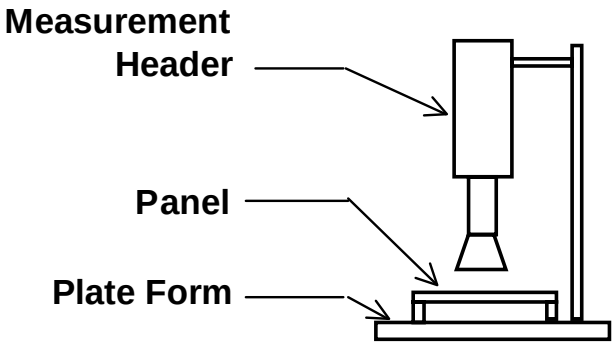
PHOTO RESEARCH PR-705, MINOLTA CS-100



PR-705 / MINOLTA CS-100 Color Analyzer

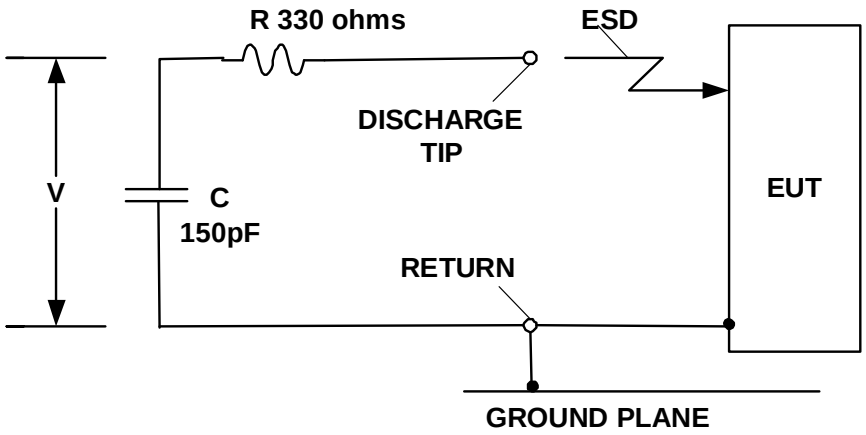
B. CONTRAST / RESPONSE TIME / VIEWING ANGLE

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