Specification for Approval

PRODUCT NAME: RGS11128032BW000
PRODUCT NO.: 9913601000
Part Number: PMO13601

CUSTOMER
APPROVED BY
DATE:

RITDISPLAY CORP. APPROVED

REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
X01	INITIAL RELEASE	2005. 10. 03	
X02	■ Add the information of module weight ■ Add the operating conditions for different luminance ■ Add the panel electrical specification ■ Modify external dimension – add TAB bending view	2005. 10. 25	Page 5, 6, 7, 8 & 16
A01	■ Transfer from X version ■ Add the packing specification	2005. 11. 08	Page 17

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 Ass'y 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 Passive Organic Light Emission Diode.
- Color : Blue
- Panel matrix : 128x32
- Driver IC : SSD1303
- Excellent Quick response time : 10μs
- Extremely thin thickness for best mechanism design : 1.65mm
- High contrast : 500:1
- Wide viewing angle : 160°
- 8-bit 6800-series Parallel Interface, 8-bit 8080-series Parallel Interface, Serial Peripheral Interface.
- Wide range of operating temperature : -20 to 70 °C

4. MECHANICAL DATA

NO	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	128 (W) x 32 (H)	dot
2	Dot Size	0.195 (W) x 0.195 (H)	mm^2
3	Dot Pitch	0.215 (W) x 0.215 (H)	mm^2
4	Aperture Rate	82	%
5	Active Area	27.5 (W) x 6.86 (H)	mm^2
6	Panel Size	32.7 (W) x 14.5 (H)	mm^2
7	Panel Thickness	1.65	mm
8	Module Size	32.7 (W) x 29 (H) x 1.65 (T)	mm^3
9	Diagonal A/A size	1.1	inch
10	Module Weight	1.63 ± 10%	gram

5. MAXIMUM RATINGS

ITEM	MIN	MAX	UNIT	Condition	Remark
Supply Voltage (V_{DD})	-0.3	3.5	V	Ta = 25°C	
Supply Voltage(Vcc)	8	16	V	Ta = 25°C	
Operating Temp.	-20	70	°C		
Storage Temp	-40	85	°C		
Humidity		85	%		
Operating Life Time	2,200	-	Hrs	80 cd/m^2, 50% checkerboard	Note (1)
Operating Life Time	3,000		Hrs	60 cd/m^2, 50% checkerboard	Note (2)
Operating Life Time	7,000	-	Hrs	40 cd/m^2, 50% checkerboard	Note (3)
Storage Life Time	20,000	-	Hrs	Ta=25°C, 50% RH	

Note:

(A) Under Vcc = 10 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 80cd/m^2 :

- Contrast setting : 0x52
- Frame rate : 85Hz
- Duty setting : 1/32

(2) Setting of 60cd/m^2 :

- Contrast setting : 0x3A
- Frame rate : 85Hz
- Duty setting : 1/32

(3) Setting of 40cd/m^2 :

- Contrast setting : 0x22
- Frame rate : 85Hz
- 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)	Ta=-20 °C to +70°C	9.5	10	10.5	V
V_{DD}	Digital power supply	Ta=-20 °C to +70°C	2.4	2.7	3.5	V
I_{DD}	Operating current for V_{DD} V_{DD} = 2.7V, V_{CC} = 12V, IREF = 10uA No loading, All Display ON	Contrast=FF	-	190	-	uA
I_{CC}	Operating current for V_{CC} V_{DD} = 2.7V, V_{CC} = 12V, IREF = 10uA All Display ON	Contrast=FF	-	550	-	uA
V_{IH}	Hi logic input level		0.8* V_{DD}	-	V_{DD}	V
V_{IL}	Low logic input level		0	-	0.2* V_{DD}	V
V_{OH}	Hi logic output level		0.9* V_{DD}	-	V_{DD}	V
V_{OL}	Low logic output level		0	-	0.1* V_{DD}	V
I_{SEG}	Segment on output current V_{DD}=2.7V, V_{CC}=12V, IREF=10uA, Display on, Segment pin under test is connected with a 20K resistive load to V_{SS}	Contrast=FF	285	320	355	uA
		Contrast=AF	-	220	-	uA
		Contrast=5F	-	120	-	uA
		Contrast=0F	-	20	-	uA

6.2 ELECTRO-OPTICAL CHARACTERISTICS

PANEL ELECTRICAL SPECIFICATIONS

PARAMETER	MIN	TYP.	MAX	UNITS	COMMENTS
Normal mode current		6	8	mA	All pixels on (1)
Standby mode current		1	2	mA	Standby mode 10% pixels on (2)
Normal mode power consumption		60	80	mW	All pixels on (1)
Standby mode power consumption		10	20	mW	Standby mode 10% pixels on (2)
Normal mode Luminance	45	60		cd/m^2	Display Average
Standby mode Luminance		10		cd/m^2	Display Average
CIEx (Blue)	0.11	0.15	0.19		x, y (CIE 1931)
CIEy (Blue)	0.22	0.27	0.32		
Dark Room Contrast	500:1				
Viewing Angle	160			degree	
Response Time		10		μs	

(1) Normal mode condition :

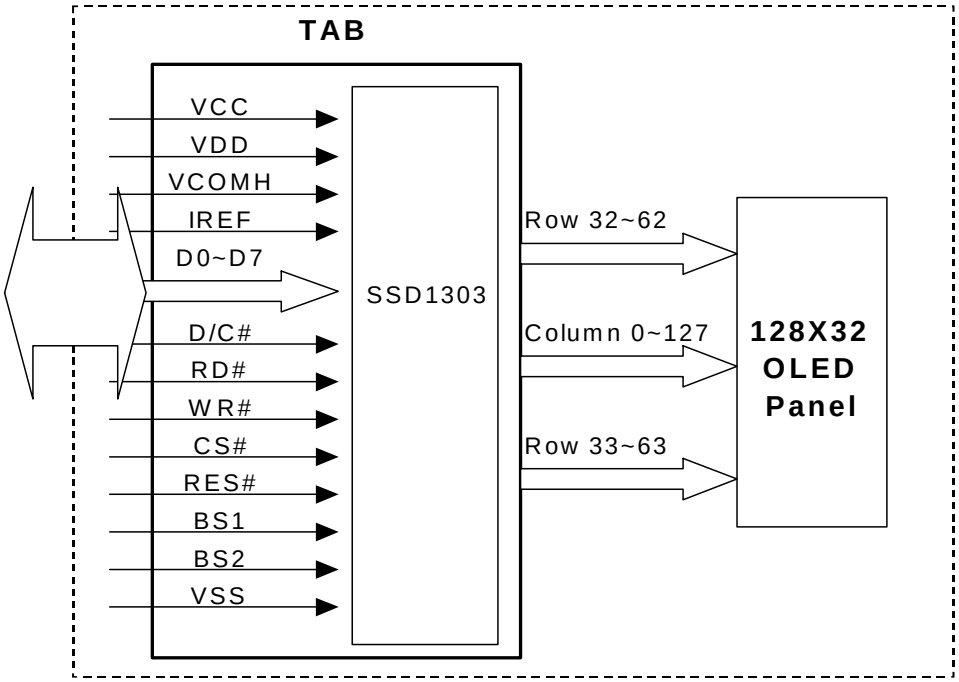
- Driving Voltage : 10V
- Contrast setting : 0x3F
- Frame rate : 85Hz
- Duty setting : 1/32

(2) Standby mode condition :

- Driving Voltage : 10V
- Contrast setting : 0x00
- Frame rate : 85Hz
- Duty setting : 1/32

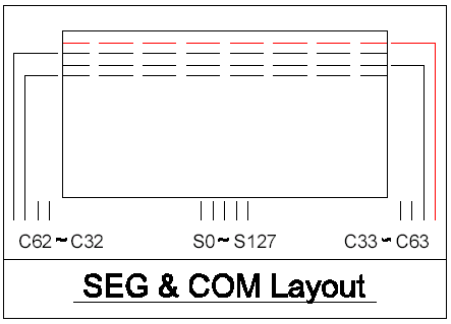
7. INTERFACE

7.1 FUNCTION BLOCK DIAGRAM



RiTdisplay 128X32 OLED module

7.2 PANEL LAYOUT DIAGRAM



7.3 PIN ASSIGNMENTS

PIN NAME	PIN NO.	TYPE	DESCRIPTION
NC	1	-	No connection
V_{SS}	2	I	This is a ground pin.
Test 0	3	-	Reserved pin; No connection and left float
Test 1	4	-	Reserved pin; No connection and left float
Test 2	5	-	Reserved pin; No connection and left float
Test 3	6	-	Reserved pin; No connection and left float
Test 4	7	-	Reserved pin; No connection and left float
NC	8	-	No connection
NC	9	-	No connection
NC	10	-	No connection
V_{DD}	11	I	Voltage power supply for logic
BS1	12	I	MCU interface selection input
BS2	13	I	MCU interface selection input
NC	14	-	No connection
CS#	15	I	This is a chip select control pin.
RES#	16	I	Hardware reset signal
D/C#	17	I	This is a Data/Command control pin.
WR#	18	I	This pin is used to receive the Write Data signal.
RD#	19	I	This pin is used to receive the Read Data signal.
D0	20	I/O	This pin is bi-direction data signal
D1	21	I/O	This pin is bi-direction data signal
D2	22	I/O	This pin is bi-direction data signal
D3	23	I/O	This pin is bi-direction data signal
D4	24	I/O	This pin is bi-direction data signal
D5	25	I/O	This pin is bi-direction data signal
D6	26	I/O	This pin is bi-direction data signal
D7	27	I/O	This pin is bi-direction data signal
I_{REF}	28	I	A resistor should be connected between this pin and V_{SS}
V_{COMH}	29	I	A capacitor should be connect between this pin and V_{SS}
V_{CC}	30	I	Positive high voltage power supply
NC	31	-	No connection

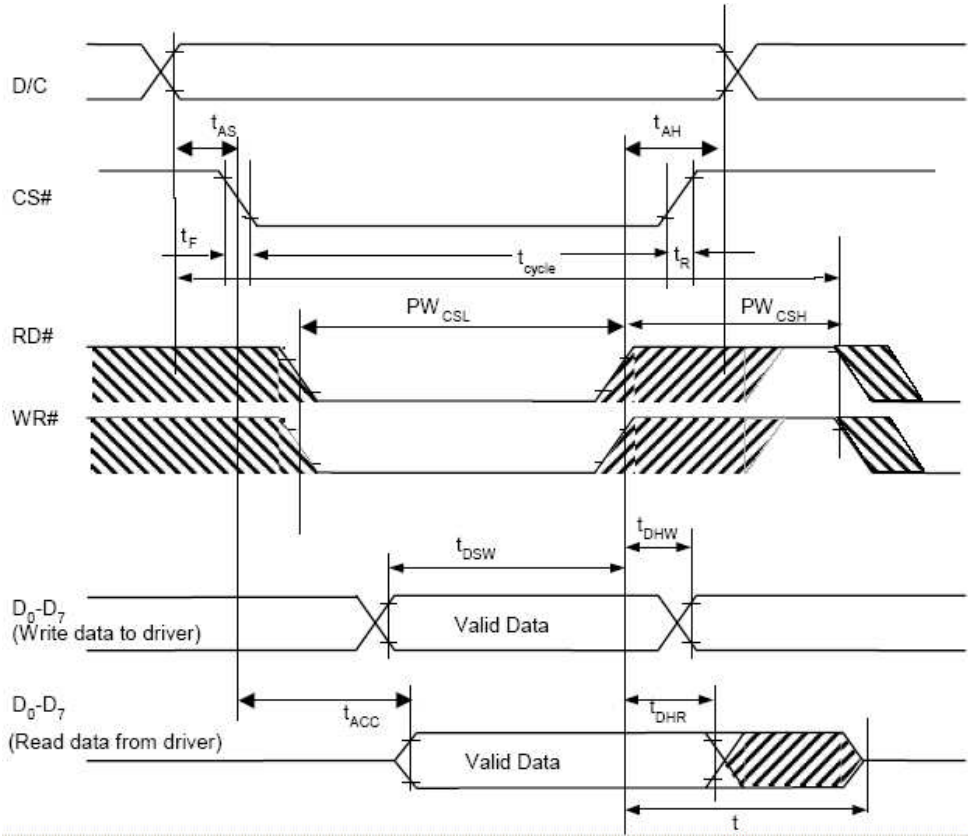
7.4 GRAPHIC DISPLAY DATA RAM ADDRESS MAP

OUT	Row Address Direction='1'	Row Address Direction='0'			OUT	SEG 0	SEG 1	SEG 2	SEG 3	SEG 4	SEG 5	SEG 6	SEG 7	.....	SEG128	SEG129	SEG130	SEG131
				Column Address Remap='1'		0x83h	0x82h	0x81h	0x80h	0x7Fh	0x7Eh	0x7Dh	0x7Ch		0x03h	0x02h	0x01h	0x00h
				Column Address Remap='0'		0x00h	0x01h	0x02h	0x03h	0x04h	0x05h	0x06h	0x07h		0x80h	0x81h	0x82h	0x83h
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

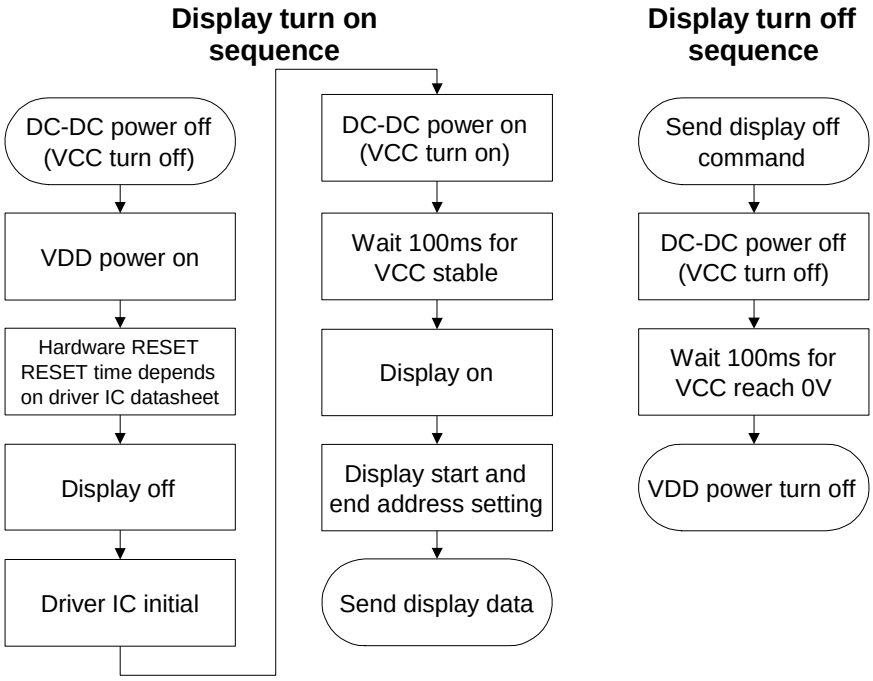
(V_{DD} - V_{SS} = 2.4 to 3.5V, T_A = 25°C)

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	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



8. POWER ON / OFF SEQUENCE & APPLICATION CIRCUIT

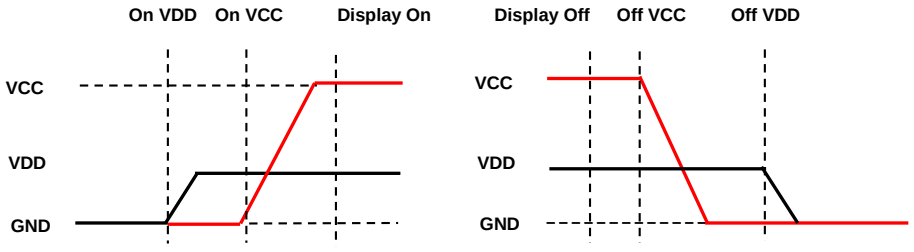
8.1 POWER ON / OFF SEQUENCE



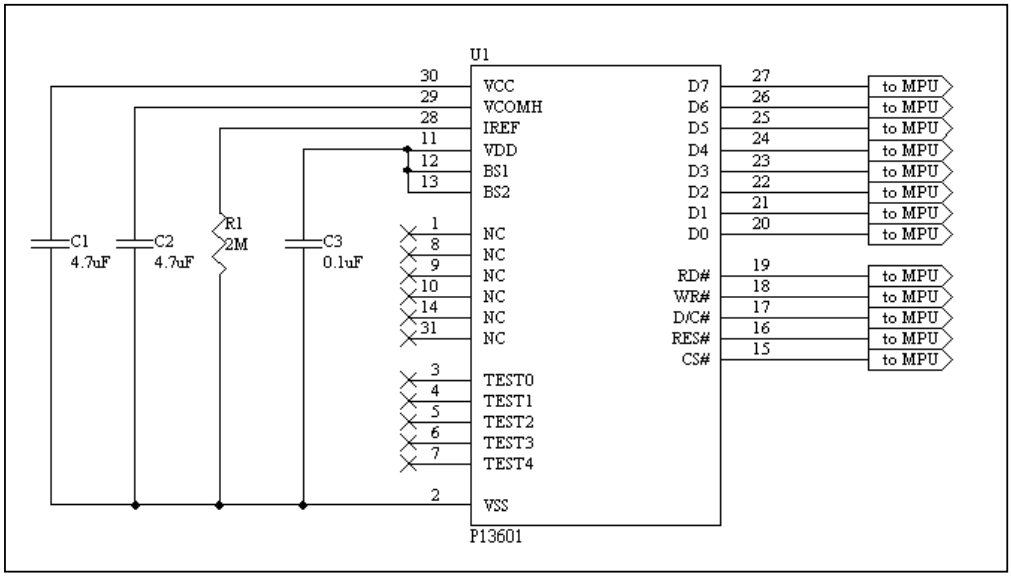
To protect OLED panel and extend the panel lifetime, the driver IC power up/down routine should include a delay period between high voltage and low voltage power sources turn on/off.

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



This circuit is designed for 8080 interface

8.3 COMMAND TABLE

Refer to SSD1303 IC Spec.

9. RELIABILITY TEST CONDITIONS

No.	Items	Specification	Quantity
1	High temp. (Non-operation)	85°C, 240hrs	3
2	Low temp. (Non-operation)	-40°C, 240hrs	2
3	High temp. (Operation)	70°C, 120hrs	3
4	Low temp. (Operation)	-20°C, 120hrs	2
5	High temp. / High humidity (Non-operation)	85°C, 85%RH, 120hrs	5
6	High temp. / High humidity (Operation)	65°C, 90%RH, 120hrs	5
7	Thermal shock (Non-operation)	-40°C ~85°C (-40°C /30min; transit /3min; 85°C /30min; transit /3min) 1cycle: 66min, 100 cycles	2
8	OLB Peel strength (Non-operation)	500g/cm (Speed~ 50mm/min)	5
9	Vibration	Frequency : 5~50HZ, 0.5G Scan rate : 1 oct/min Time : 2 hrs/axis Test axis : X, Y, Z	1 Carton
10	Drop	Height: 120cm Sequence : 1 angle 、3 edges and 6 faces Cycles: 1	1 Carton
11	ESD (Non-operation)	Air discharge model, ±8kV, 10 times	5

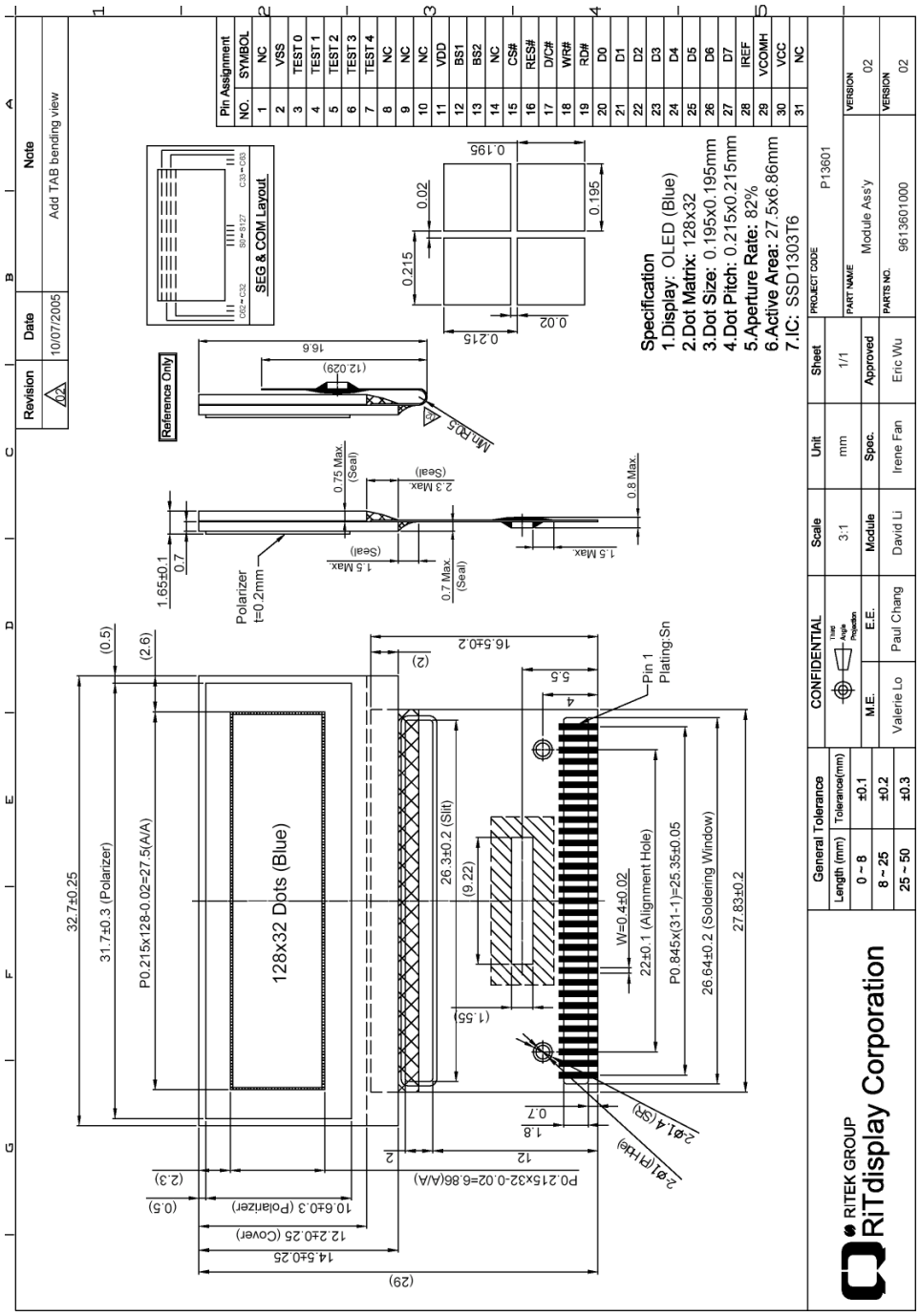
Test and measurement conditions

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, 5 & 6.

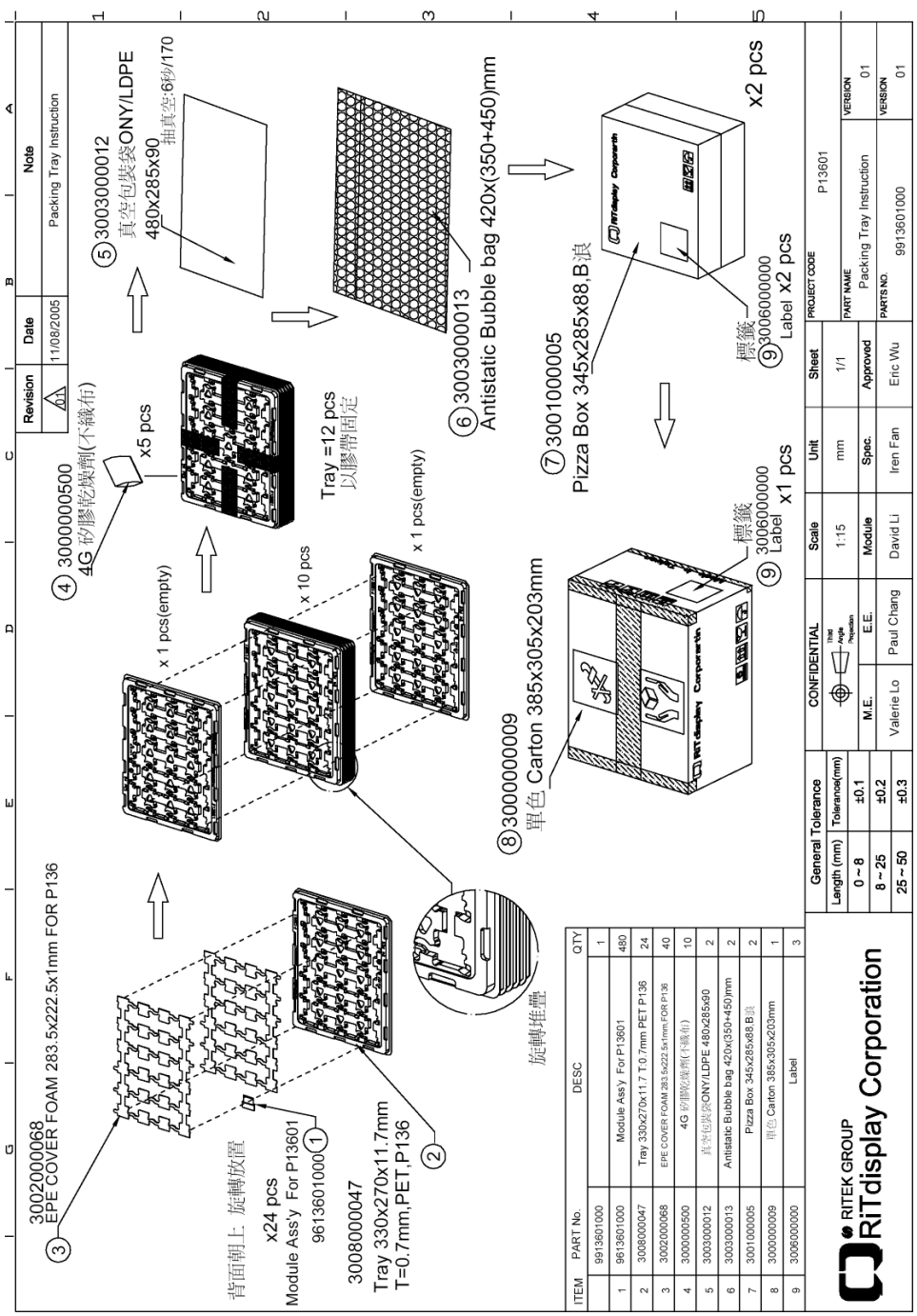
Evaluation criteria

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.

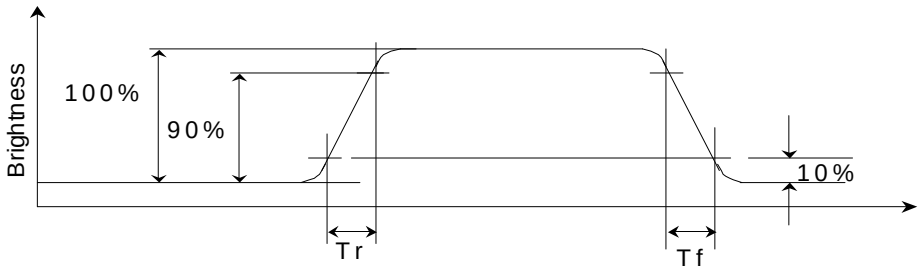


Figure 2 Response time

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.

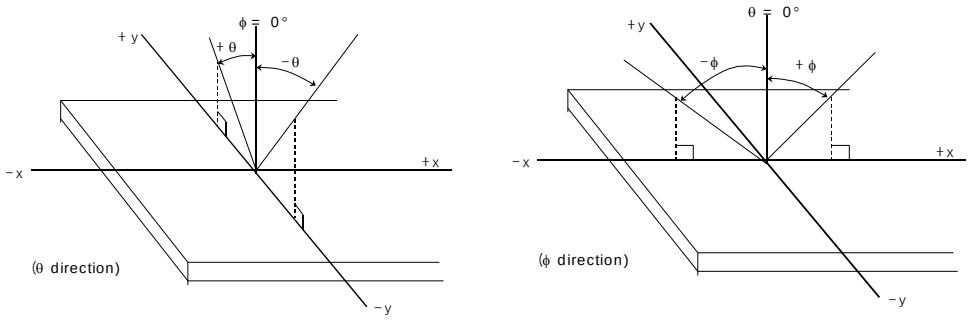
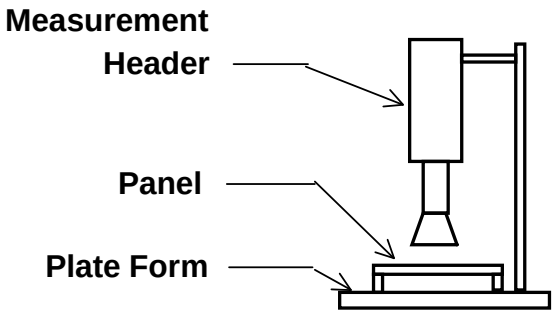


Figure 3 Viewing angle

APPENDIX 2: MEASUREMENT APPARATUS

A. LUMINANCE/COLOR COORDINATE

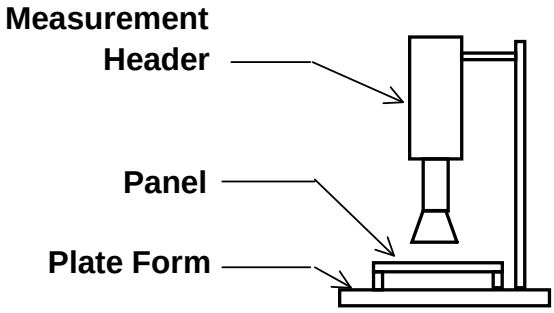
PHOTO RESEARCH PR-705, MINOLTA CS-100



**PR-705 /
MINOLTA CS-100
Color Analyzer**

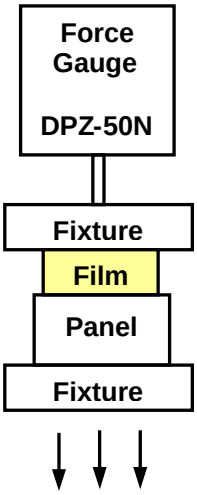
B. CONTRAST / RESPONSE TIME / VIEW ANGLE

WESTAR CORPORATION FPM-510

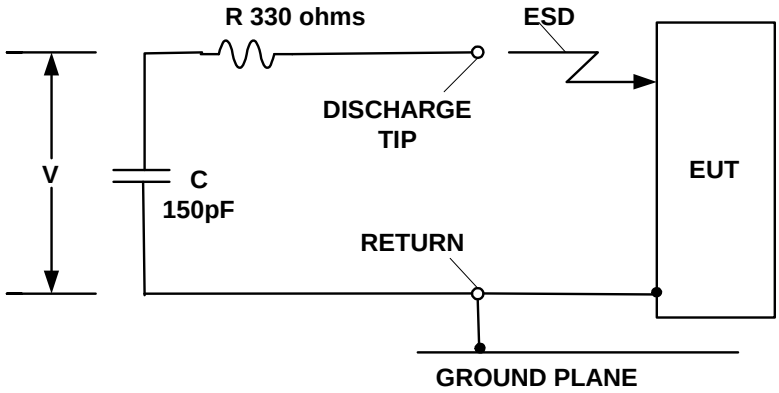


**Westar FPM-510
Display Contrast /
Response time /
View angle Analyzer**

C. PEEL STRENGTH



D. 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.