



RAYSTAR



SPECIFICATION

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SPECIFICATION

REG012864MYPP3N00000

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

ISSUED DATE:

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1. Revision History

DATE	VERSION	REVISED PAGE NO.	Note
2011/02/28	1		First issue
2011/06/17	2		Change version

2. General Specification

The Features is described as follow:

- Module dimension: $60.5 \times 37.0 \times 1.8$ (max.) mm³
- View area: 57.01×29.49 mm²
- Active area: 55.01×27.49 mm²
- Number of dots: 128 x 64
- Pixel size: 0.43×0.43 mm²
- Pixel pitch: 0.46×0.46 mm²
- Duty: 1/64
- Emitting Color: Yellow

3. Module Coding System

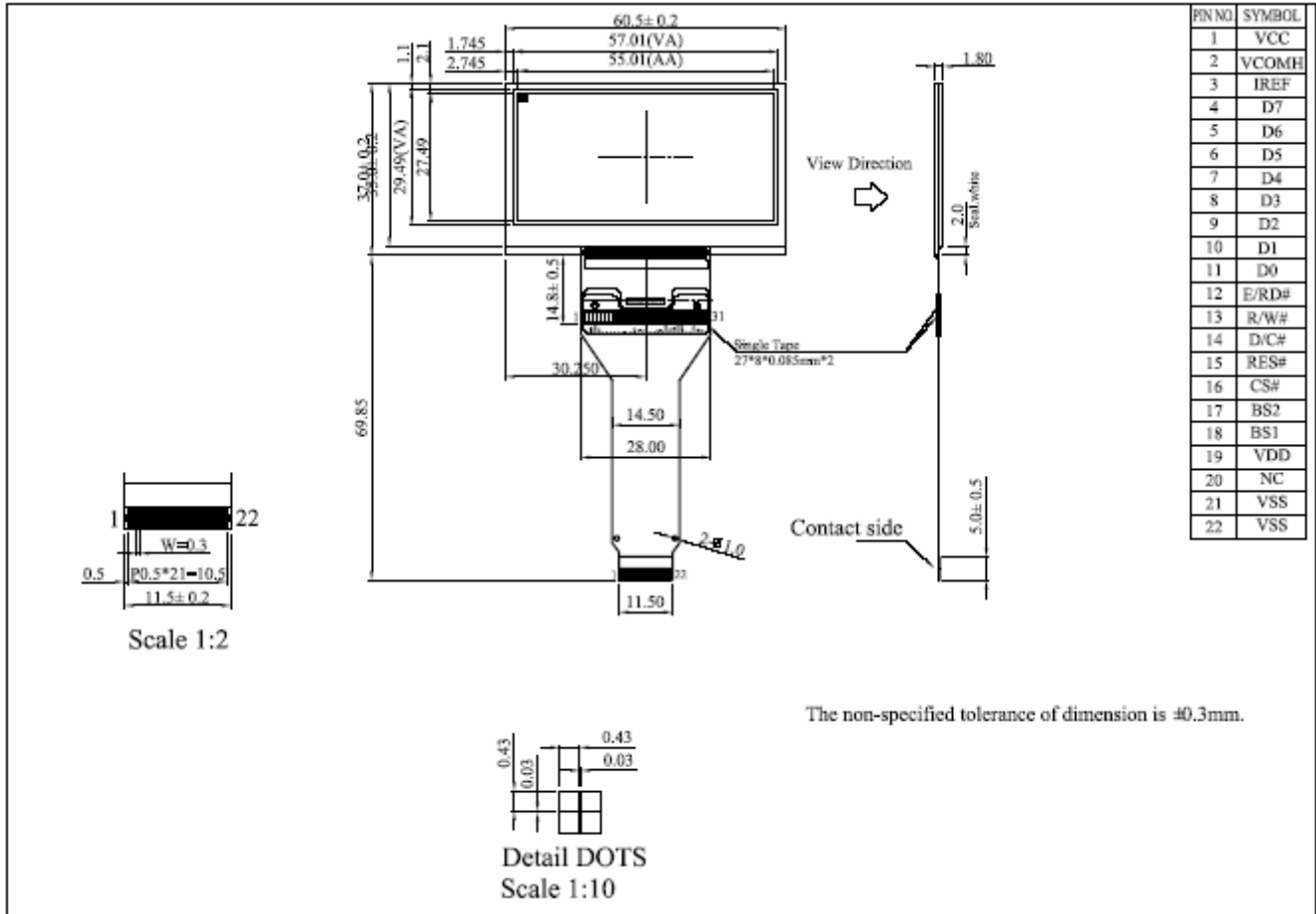
1	2	3	4	5	6	7	8	9	10	11	12	13
R	E	G	012864	M	Y	P	P	3	N	0	0	000

Item	Description		
1	R : Raystar Optronics Inc.		
2	E : OLED		
3	Display Type: C→Character Type, G→Graphic Type		
4	Number of dots : 128*64		
5	Serials code		
6	Emitting Color	A : Amber	R : RED
		B : Blue	Y : Yellow
		G : Green	W : White
7	Polarizer	P : With Polarizer ; N: Without Polarizer	
8	Display Mode	P : Passive Matrix ; A: Active Matrix	
9	Driver Voltage	3: 3.0 V ; 5: 5.0V	
10	Touch Panel	N : Without touch panel ; T: With touch panel	
11	Species	0:Normal , 1:Sunlight readable, 2:Transparent, 3:Flexible, 4:Lighting	
12	Grade code		
13	Serial No.	000: Sales code	

4. Interface Pin Function

No.	Symbol	Function																
1	VCC	Power supply for analog circuit.																
2	VCOMH	Com Voltage Output. A capacitor should be connected between this pin and VSS.																
3	IREF	Reference current input pin. A resistor should be connected between this pin and VSS.																
4~11	D7~D0	Data bus.																
12	E/RD#	Data read operation is initiated when it's pull low.																
13	R/W#	Data write operation is initiated when it's pull low.																
14	D/C#	Data/ Command control. Pull high for write/read display data. Pull low for write command or read status.																
15	RES#	Reset signal input. When it's low, initialization of SSD1305 is executed.																
16	CS#	Chip select input.																
17	BS2	Communicating Protocol Select These pins are MCU interface selection input. See the following table:																
18	BS1	<table><tr><td></td><td>68XX-paralle</td><td>80XX-paralle</td><td>Serial</td></tr><tr><td></td><td>l</td><td>l</td><td></td></tr><tr><td>BS1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>BS2</td><td>1</td><td>1</td><td>0</td></tr></table>		68XX-paralle	80XX-paralle	Serial		l	l		BS1	0	1	0	BS2	1	1	0
			68XX-paralle	80XX-paralle	Serial													
			l	l														
BS1	0	1	0															
BS2	1	1	0															
19	VDD	Power supply for logic circuit.																
20	NC	No connection.																
21	VSS	Ground.																
22	VSS	Ground.																

5. Outline Dimension



6. Electrical Characteristics

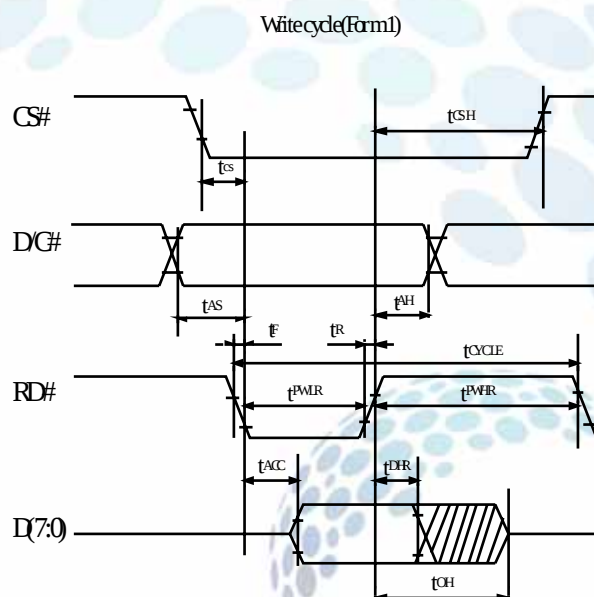
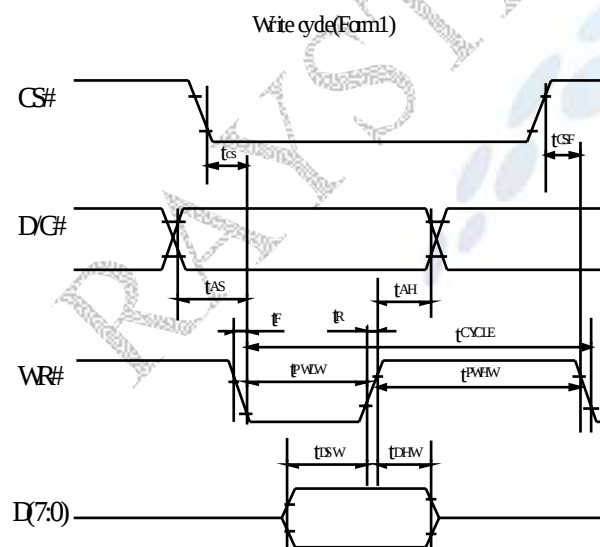
6.1 INTERFACE TIMING CHART

8080-Series MCU Parallel Interface Timing Characteristics

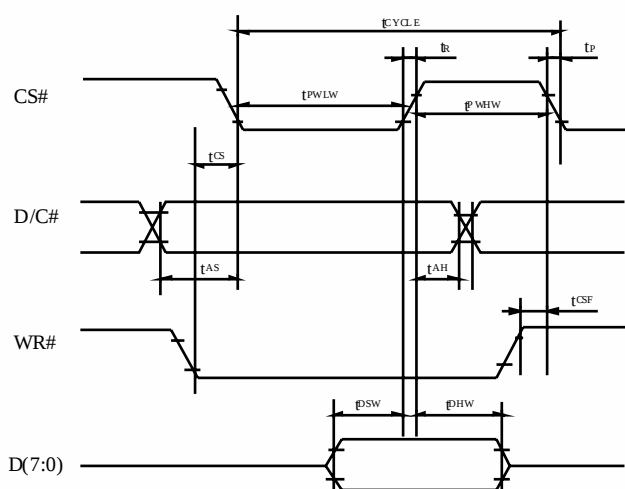
(VDD-VSS=2.4 V to 3.5V, VDDIO=VDD, TA=25°C)

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	-	-	15	ns
t _F	Fall Time	-	-	15	ns
t _{CS}	Chip select setup time	0	-	-	ns
t _{CSH}	Chip select setup hold time to read signal	0	-	-	ns
t _{CSF}	Chip select setup hold time	20	-	-	ns

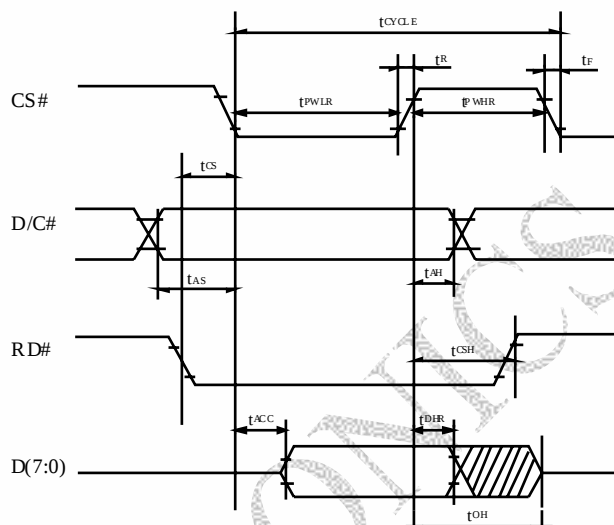
8080-seriesparallel interface characteristics (Form 1)



Write cycle(Form 2)



Write cycle(Form 2)



6.2 DC Characteristics

Characteristics	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	VDD	—	2.4	2.7	3.5	V
Supply Voltage for Display	VCC	—	11.0	13.0	15.0	V
High Level Input	VIH	I _{out} = 100μA, 3.3 MHz	0.8×VDD	—	VDD	V
Low Level Input	VIL	I _{out} = 100μA, 3.3 MHz	0	—	0.2×VDD	V
High Level Output	VOH	I _{out} = 100μA, 3.3 MHz	0.9×VDD	—	VDD	V
Low Level Output	VOL	I _{out} = 100μA, 3.3 MHz	0	—	0.1×VDD	V
Operating Current for VDD	IDD	Note 4	—	70	—	mA
Sleep Mode Current for VDD	IDD, SLEEP		—	—	1.5	mA

Note 3: Brightness (L_{br}) and Supply Voltage for Display (V_{cc}) are subject to the change of the panel characteristics and the customer's request.

Note 4: VDD = 2.7V, VCC = 13V, 50% Display Area Turn on.

* Software configuration follows Section 4.4 Initialization.

7. Block Diagram

7.1. POWER ON/OFF SEQUENCE & APPLICATION CIRCUIT

7.1.1 POWER ON/OFF SEQUENCE

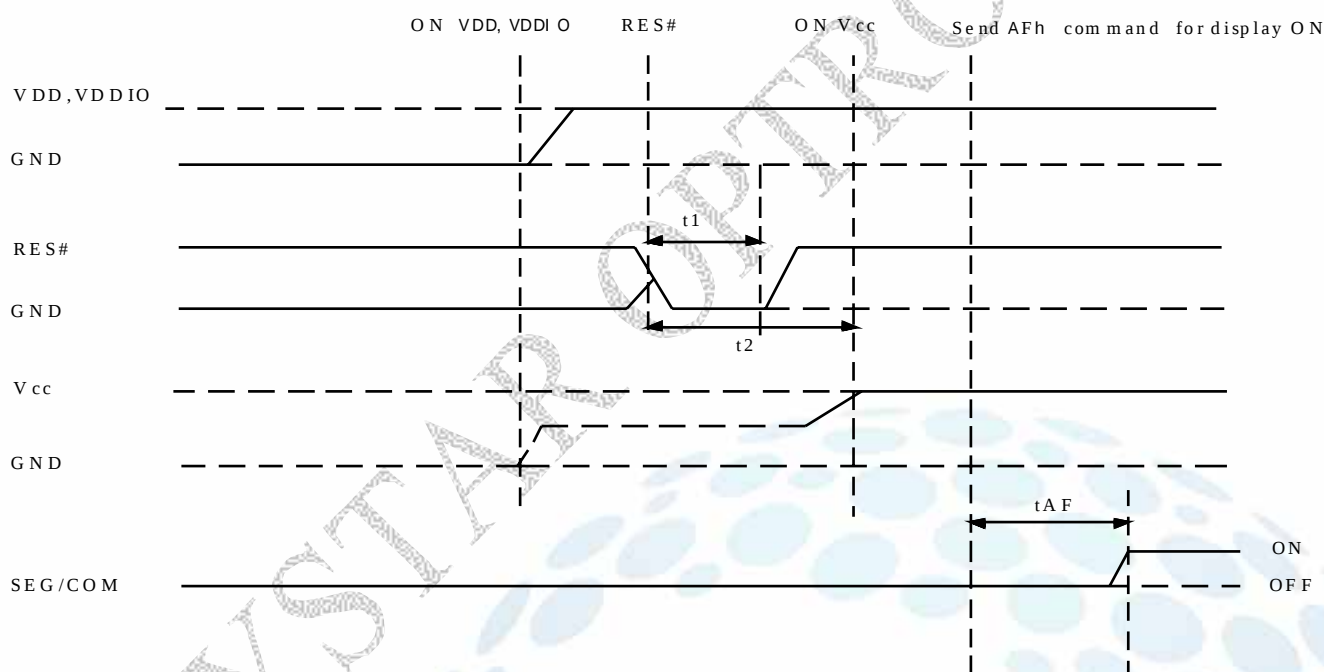
Power ON sequence

Power ON VDD, VDDIO

After VDD, VDDIO become stable, set RES# pin LOW (logic low) for at least 3 μ s (t_1) and then HIGH (logic high).

After set RES# pin LOW (logic low), wait for at least 3 μ s (t_2). Then Power ON Vcc. (1)

After Vcc. become stable, send command AFh for display ON. DEG/COM will be ON after 100ms (t_{AF}).

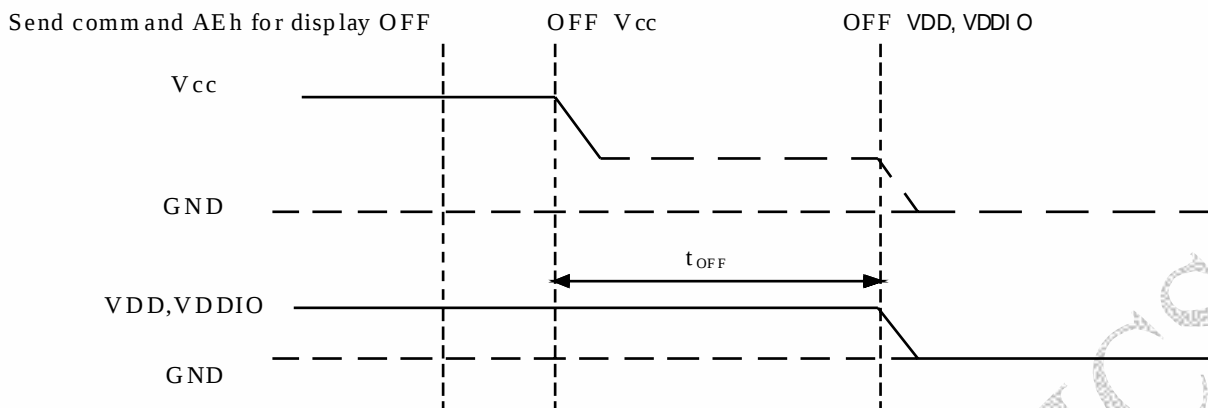


Power OFF sequence

Send command AEh for display OFF.

Power OFF Vcc.(1),(2)

Wait for t_{OFF} . Power OFF VDD, VDDIO. (where Minimum t_{OFF} =80ms, Typical t_{OFF} =100ms)

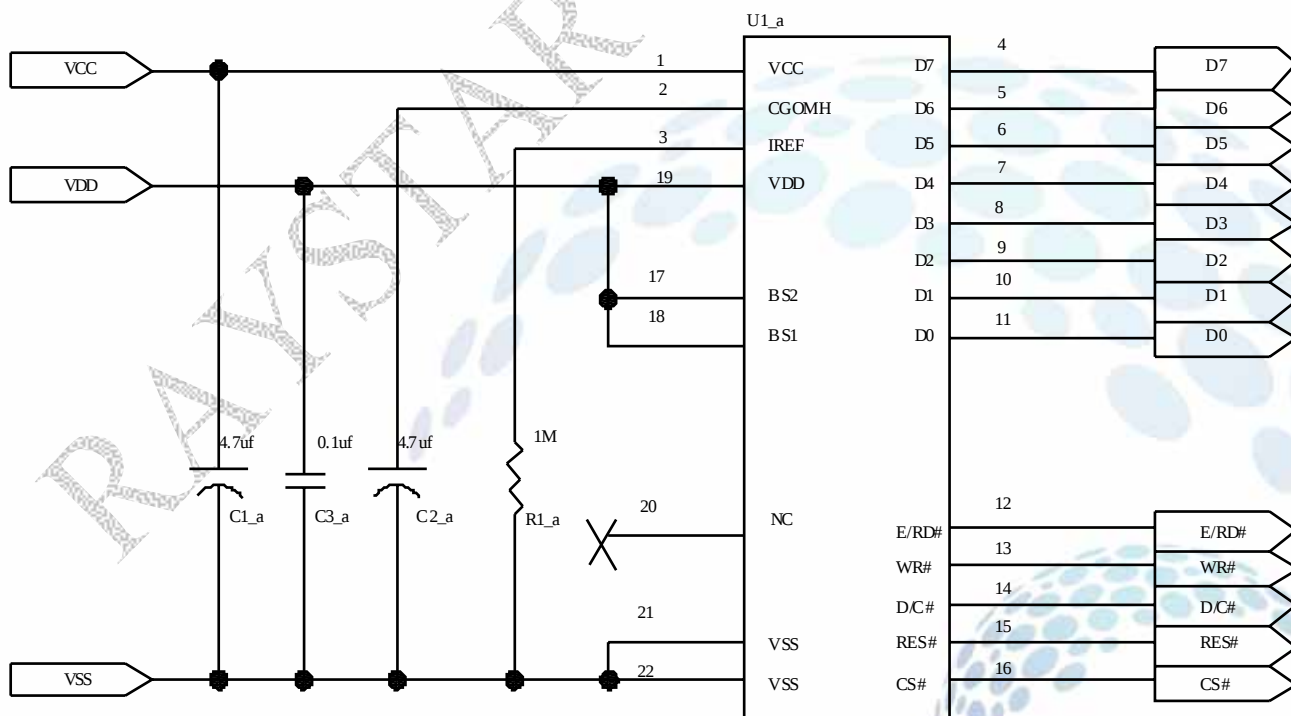


Note:

Since an ESD protection circuit is connected between VDD, VDDIO and V_{cc}, V_{cc} becomes lower than VDD and VDD, VDDIO is ON and V_{cc} is OFF as shown in the dotted line of V_{cc} in above figures.

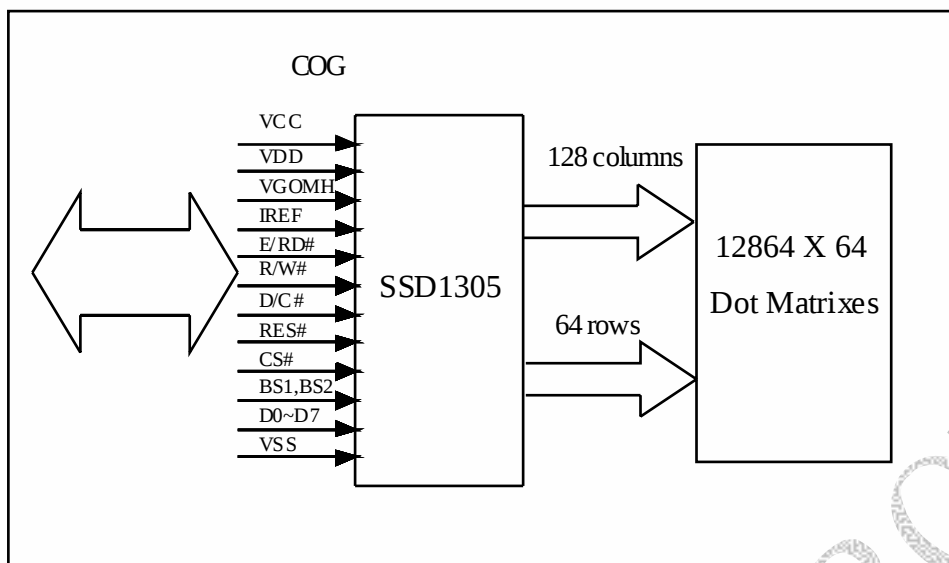
V_{cc} should be disabled when it is OFF.

7.2 APPLICATION CIRCUIT

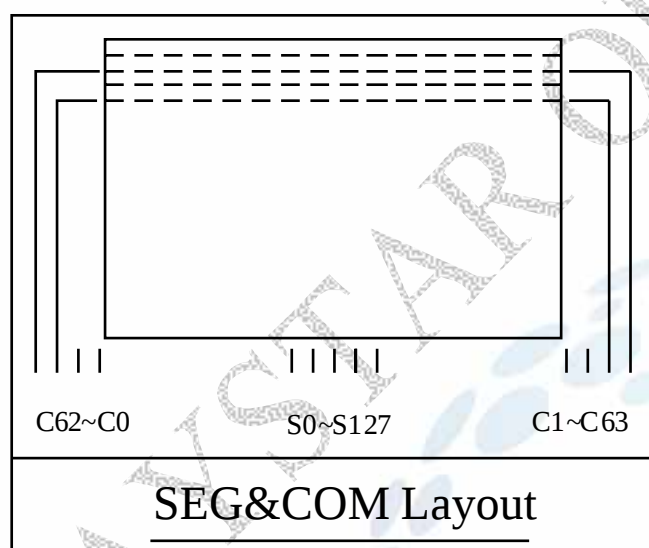


7.3 INTERFACE

7.3.1 FUNCTION BLOCK DIAGRAM



7.4 PANEL LAYOUT DIAGRAM



8. Reliability

8.1 Contents of Reliability Tests

Item	Conditions	Criteria
High Temperature Operation	80°C, 240hrs	The operational functions work.
Low Temperature Operation	-40°C, 240hrs	
High Temperature Storage	80°C, 240hrs	
Low Temperature Storage	-40°C, 240hrs	
High Temperature/Humidity Operation/ Thermal Shock	60°C, 90%RH, 120hrs , -40°C 80°C , 24cycles 1 hr dwell	

* The samples used for the above tests do not include polarizer.

* No moisture condensation is observed during tests.

8.2 Lifetime

Parameter	Min	Typ	Max	Unit	Condition	Notes
Operating Life Time		100,000	—	Hrs	80 cd/m ² , 50% Checkerboard	6

Note 6: The average operating lifetime at room temperature is estimated by the accelerated operation at high temperature conditions.

8.3 Failure Check Standard

After the completion of the described reliability test, the samples were left at room temperature for 2 hrs prior to conducting the failure test at 23±5°C; 55±15% RH.

9. Absolute Maximum Ratings

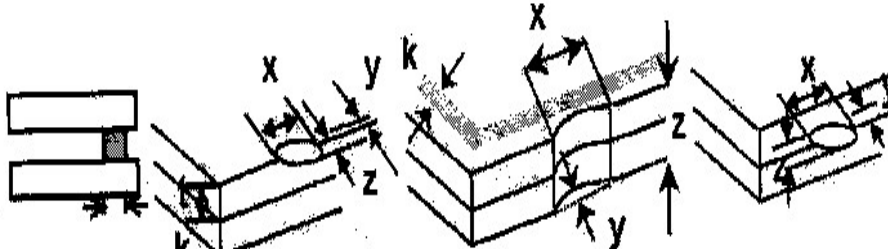
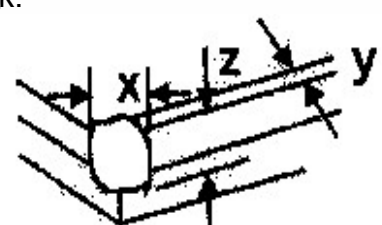
Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Logic	VDD	-0.3	3.5	V	1,2
Supply Voltage for Display	VCC	8	16	V	1,2
Operating Temperature	TOP	-40	80	°C	—
Storage Temperature	TSTG	-40	80	°C	—

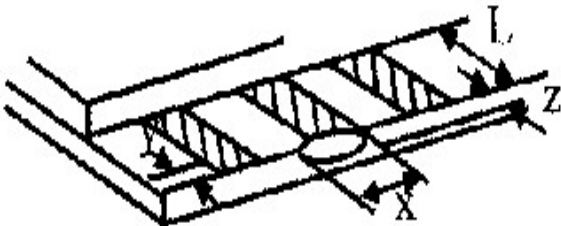
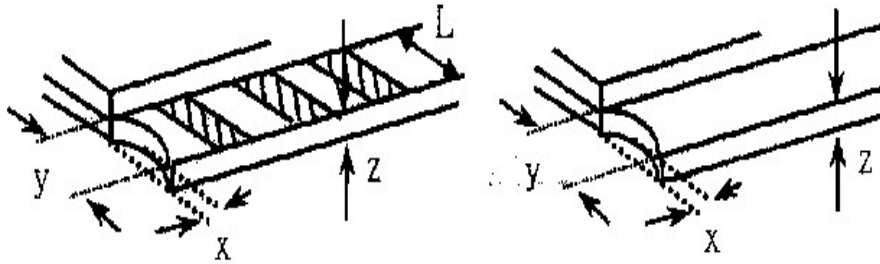
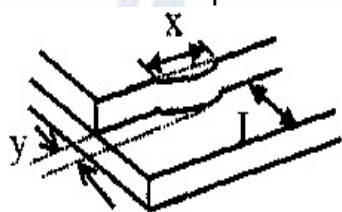
Note 1: All the above voltages are on the basis of “VSS = 0V”.

Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also, for normal operations, it is desirable to use this module under the conditions according to Section 3: “Optics & Electrical Characteristics”. If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

10. Inspection specification

NO	Item	Criterion	AQL												
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 Viewing angle defect. 1.7 Mixed product types. 1.8 Contrast defect.	0.65												
02	Black or bright spots on OLED (display only)	2.1 Bright and black spots on display $\leq 0.25\text{mm}$, no more than three Bright or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm	2.5												
03	Black spots, bright spots, contamination (non-display)	3.1 Round type :As follow ing drawing $\Phi=(x+y)/2$	2.5												
		3.2 Line type : (As follow ing drawing)  <table><tr><th>Length</th><th>Width</th><th>Acceptable Q TY</th></tr><tr><td>--</td><td>$W\leq 0.02$</td><td>Accept no dense</td></tr><tr><td>$L\leq 3.0$</td><td>$0.02 < W\leq 0.03$</td><td rowspan="2">2</td></tr><tr><td>$L\leq 2.5$</td><td>$0.03 < W\leq 0.05$</td></tr><tr><td>--</td><td>$0.05 < W$</td><td>As round type</td></tr></table>	Length	Width	Acceptable Q TY	--	$W\leq 0.02$	Accept no dense	$L\leq 3.0$	$0.02 < W\leq 0.03$	2	$L\leq 2.5$	$0.03 < W\leq 0.05$	--	$0.05 < W$
Length	Width	Acceptable Q TY													
--	$W\leq 0.02$	Accept no dense													
$L\leq 3.0$	$0.02 < W\leq 0.03$	2													
$L\leq 2.5$	$0.03 < W\leq 0.05$														
--	$0.05 < W$	As round type													
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction. <table><tr><th>Size Φ</th><th>Acceptable Q TY</th></tr><tr><td>$\Phi\leq 0.20$</td><td>Accept no dense</td></tr><tr><td>$0.20 < \Phi\leq 0.50$</td><td>3</td></tr><tr><td>$0.50 < \Phi\leq 1.00$</td><td>2</td></tr><tr><td>$1.00 < \Phi$</td><td>0</td></tr><tr><td>Total Q TY</td><td>3</td></tr></table>	Size Φ	Acceptable Q TY	$\Phi\leq 0.20$	Accept no dense	$0.20 < \Phi\leq 0.50$	3	$0.50 < \Phi\leq 1.00$	2	$1.00 < \Phi$	0	Total Q TY	3	2.5
Size Φ	Acceptable Q TY														
$\Phi\leq 0.20$	Accept no dense														
$0.20 < \Phi\leq 0.50$	3														
$0.50 < \Phi\leq 1.00$	2														
$1.00 < \Phi$	0														
Total Q TY	3														

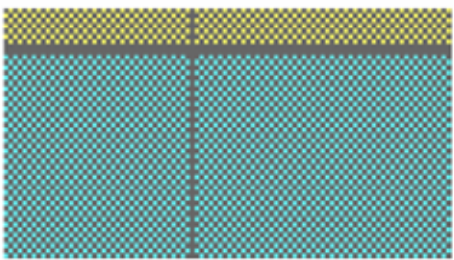
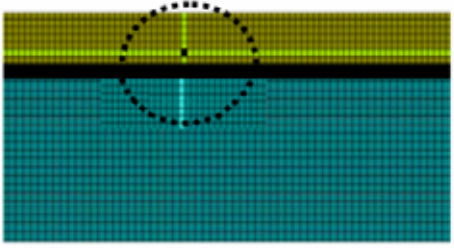
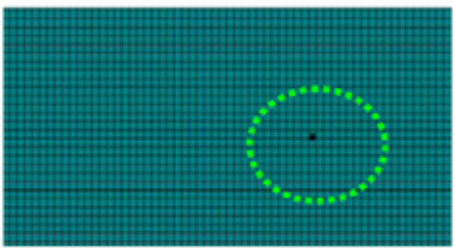
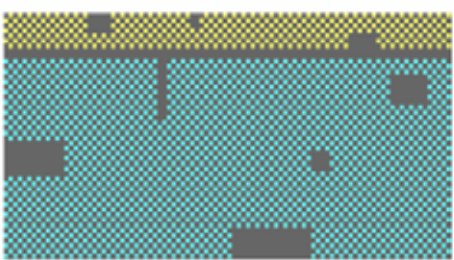
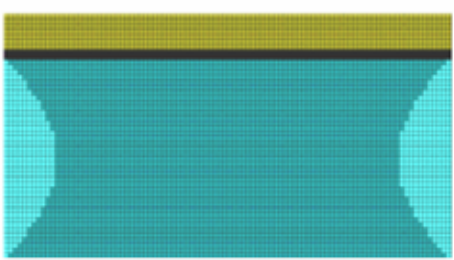
NO	Item	Criterion	AQL																		
05	Scratches	Follow NO.3 black spots, bright spots, contamination																			
06	Chipped glass	Symbols Define: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: OLED side length L: Electrode pad length: 6.1 General glass chip : 6.1.1 Chip on panel surface and crack between panels:  <table> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> <tr> <td>$Z \leq 1/2t$</td> <td>Not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> <tr> <td>$1/2t < z \leq 2t$</td> <td>Not exceed 1/3k</td> <td>$x \leq 1/8a$</td> </tr> </table> ⊙ If there are 2 or more chips, x is total length of each chip. 6.1.2 Corner crack:  <table> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> <tr> <td>$Z \leq 1/2t$</td> <td>Not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> <tr> <td>$1/2t < z \leq 2t$</td> <td>Not exceed 1/3k</td> <td>$x \leq 1/8a$</td> </tr> </table> ⊙ If there are 2 or more chips, x is the total length of each chip.	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	2.5
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$																			
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$																			

NO	Item	Criterion	AQL																
06	Glass crack	Symbols : x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: OLED side length L: Electrode pad length 6.2 Protrusion over terminal : 6.2.1 Chip on electrode pad :  <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td>$y \leq 0.5\text{mm}$</td><td>$x \leq 1/8a$</td><td>$0 < z \leq t$</td></tr></table> 6.2.2 Non-conductive portion:  <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td>$y \leq L$</td><td>$x \leq 1/8a$</td><td>$0 < z \leq t$</td></tr></table> ⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. ⊙ If the product will be heat sealed by the customer, the alignment mark not be damaged. 6.2.3 Substrate protuberance and internal crack.  <table><tr><td>y: width</td><td>x: length</td></tr><tr><td>$y \leq 1/3L$</td><td>$x \leq a$</td></tr></table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$	y: Chip width	x: Chip length	z: Chip thickness	$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$	y: width	x: length	$y \leq 1/3L$	$x \leq a$	2.5
		y: Chip width	x: Chip length	z: Chip thickness															
		$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$															
		y: Chip width	x: Chip length	z: Chip thickness															
$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$																	
y: width	x: length																		
$y \leq 1/3L$	$x \leq a$																		

NO	Item	Criterion	AQL
07	Cracked glass	The OLED with extensive crack is not acceptable.	2.5
08	Bezel	8.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 8.2 Bezel must comply with job specifications.	2.5 0.65
9	PCB、COB	9.1 COB seal may not have pinholes larger than 0.2mm or contamination. 9.2 COB seal surface may not have pinholes through to the IC. 9.3 The height of the COB should not exceed the height indicated in the assembly diagram. 9.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 9.5 No oxidation or contamination PCB terminals. 9.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts. 9.7 The jumper on the PCB should conform to the product characteristic chart. 9.8 If solder gets on bezel tab pads, zebra pad or screw hold pad, make sure it is smoothed down. 9.9 The Scraping testing standard for Copper Coating of PCB  $X * Y \leq 2\text{mm}^2$	2.5 2.5 0.65 2.5 0.65 0.65 2.5 2.5
10	Soldering	10.1 No un-melted solder paste may be present on the PCB. 10.2 No cold solder joints, missing solder connections, oxidation or icide. 10.3 No residue or solder balls on PCB. 10.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
11	General appearance	11.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP.	2.5
		11.2 No cracks on interface pin (OLB) of TCP.	0.65
		11.3 No contamination, solder residue or solder balls on product.	2.5
		11.4 The IC on the TCP may not be damaged, circuits.	2.5
		11.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it causes the interface pin to sever.	2.5
		11.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.	2.5
		11.7 Sealant on top of the ITO circuit has not hardened.	0.65
		11.8 Pin type must match type in specification sheet.	0.65
		11.9 OLED pin loose or missing pins.	0.65
		11.10 Product packaging must the same as specified on packaging specification sheet.	0.65
		11.11 Product dimension and structure must conform to productspecification sheet.	0.65

Pattern Check (Display On) in Active Area

Check Item	Classification	Criteria
No Display	Major	
Missing Line	Major	
Pixel Short	Major	
Darker Pixel	Major	
Wrong Display	Major	
Un-uniform	Major	

11. Precautions in use of Modules

1. Avoid applying excessive shocks to the module or making any alterations or modifications to it.
2. Don't make extra holes on the printed circuit board, modify its shape or change the components of OLED module.
3. Don't disassemble the OLED module.
4. Don't operate it above the absolute maximum rating.
5. Don't drop, bend or twist OLED module.
6. Soldering: only to the I/O terminals.
7. Storage: please storage in anti-static electricity container and clean environment.
8. Raystar have the right to change the passive components (Resistors, capacitors and other passive components will have different appearance and color caused by the different supplier.)
9. Raystar have the right to change the PCB Rev.

Module Sample Estimate Feedback Sheet

Module Number : _____

1 、 Panel Specification :

1. Panel Type :	☐ Pass	☐ NG , _____
2. Numbers of Pixel :	☐ Pass	☐ NG , _____
3. View Area :	☐ Pass	☐ NG , _____
4. Active Area :	☐ Pass	☐ NG , _____
5. Emitting Color :	☐ Pass	☐ NG , _____
6. Uniformity :	☐ Pass	☐ NG , _____
7. Operating Temperature :	☐ Pass	☐ NG , _____
8. Storage Temperature :	☐ Pass	☐ NG , _____
9. Others :	_____	

2 、 Mechanical Specification :

1. PCB Size :	☐ Pass	☐ NG , _____
2. Frame Size :	☐ Pass	☐ NG , _____
3. Material of Frame :	☐ Pass	☐ NG , _____
4. Connector Position :	☐ Pass	☐ NG , _____
5. Fix Hole Position :	☐ Pass	☐ NG , _____
6. Thickness of PCB :	☐ Pass	☐ NG , _____
7. Height of Frame to PCB :	☐ Pass	☐ NG , _____
8. Height of Module :	☐ Pass	☐ NG , _____
9. Others :	☐ Pass	☐ NG , _____

3 、 Relative Hole Size :

1. Pitch of Connector :	☐ Pass	☐ NG , _____
2. Hole size of Connector :	☐ Pass	☐ NG , _____
3. Mounting Hole size :	☐ Pass	☐ NG , _____
4. Mounting Hole Type :	☐ Pass	☐ NG , _____
5. Others :	☐ Pass	☐ NG , _____

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Module Number : _____

4、Electronic Characteristics of Module :

1.Input Voltage :	☐ Pass	☐ NG , _____
2.Supply Current :	☐ Pass	☐ NG , _____
3.Driving Voltage for OLED :	☐ Pass	☐ NG , _____
4.Contrast for OLED :	☐ Pass	☐ NG , _____
5.Negative Voltage Output :	☐ Pass	☐ NG , _____
6.Interface Function :	☐ Pass	☐ NG , _____
7.ESD test :	☐ Pass	☐ NG , _____
8.Others :	☐ Pass	☐ NG , _____

5、Summary :

Sales signature : _____

Customer Signature : _____

Date : / /