



RAYSTAR



SPECIFICATION



RAYSTAR

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SPECIFICATION

RET009664AYPP3N00000

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

ISSUED DATE:

Contents

No.	Item	Page
1.	Revision History	4
2.	General Specification	4
3.	Module Coding System	5
4.	Interface Pin Function	6
5.	Outline Dimension	7
6.	Block Diagram	8
7.	Absolute Maximum Ratings	12
8.	Optics & Electrical Characteristics	13
9.	Reliability	16
10.	Inspection specification	17

1. Revision History

DATE	VERSION	REVISED PAGE NO.	Note
2011/10/20	1		First issue
2012/08/30	2	23	Modify picture
2013/04/24	3	16	Add Optics Characteristics
		17	Add Mechanical Test

2. General Specification

The Features is described as follow:

- Module dimension: 33.59 x 23.62 x 1.65 (max.) mm³
- Active area: 23.49 x 15.65 mm²
- Number of dots: 96 Dots x 64 Dots
- Pixel Pitch: 0.215 x 0.215 mm²
- Pixel Size: 0.245x 0.245mm²
- Display Mode: Passive Matrix
- Duty: 1/64
- Display Color: Monochrome (Yellow)

3. Module Coding System

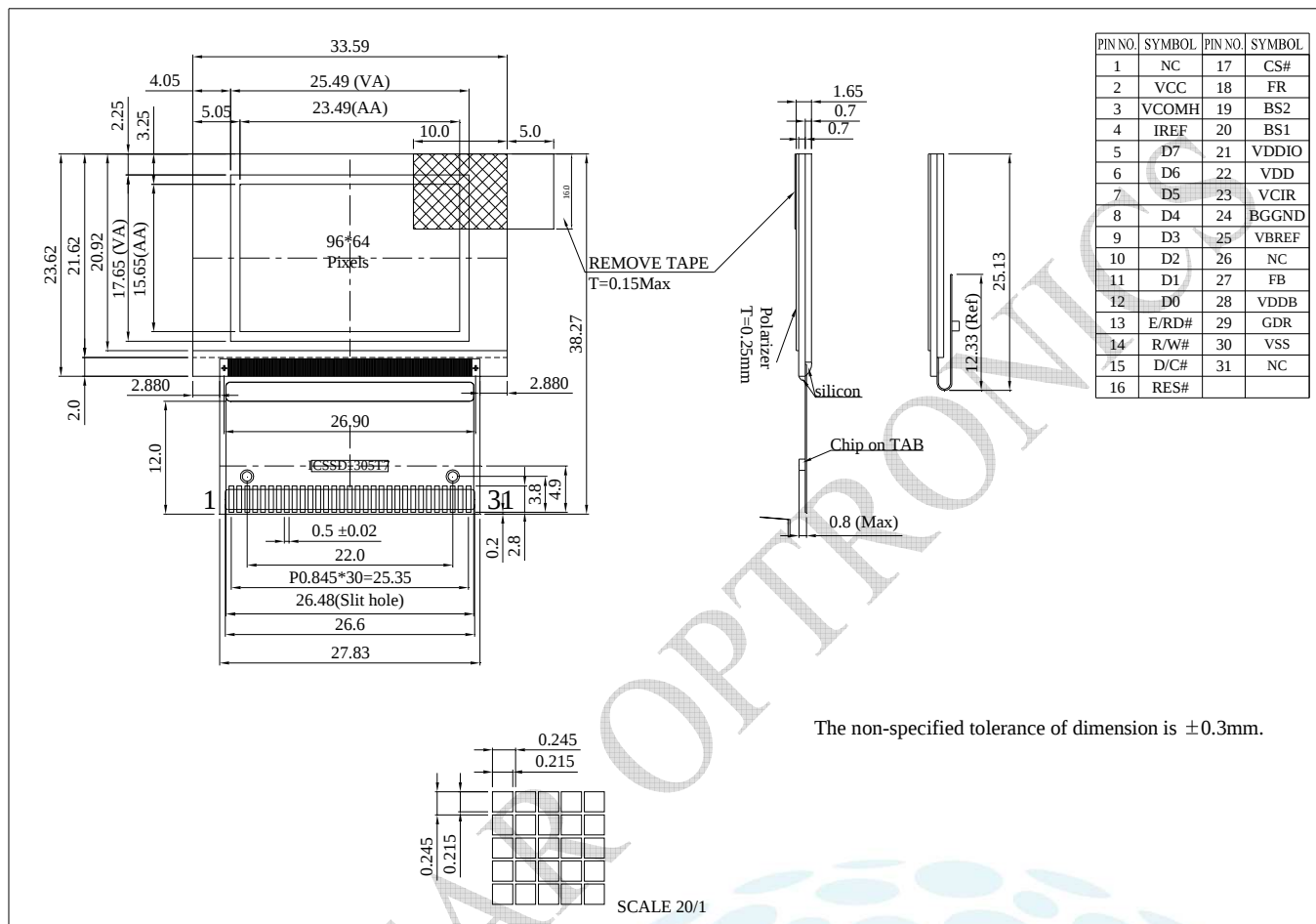
1	2	3	4	5	6	7	8	9	10	11	12	13
R	E	T	009664	A	Y	P	P	3	N	0	0	000

Item	Description		
1	R : Raystar Optronics Inc.		
2	E : OLED		
3	Display Type: C→Character Type, G→Graphic Type, T→TAB Type		
4	Number of dots : 96 Dots x 64 Dots		
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	NC	No connection												
2	VCC	Power supply for analog circuit.												
3	VCOMH	Com Voltage Output. A capacitor should be connected between this pin and VSS.												
4	IREF	Reference current input pin. A resistor should be connected between this pin and VSS.												
5~12	D7~D0	Data bus.												
13	E/RD#	Data read operation is initiated when it's pull low.												
14	R/W#	Data write operation is initiated when it's pull low.												
15	D/C#	Data/ Command control. Pull high for write/read display data. Pull low for write command or read status.												
16	RES#	Reset signal input. When it's low, initialization of SSD1305 is executed.												
17	CS#	Chip select input.												
18	FR	This pin outputs RAM write synchronization signal. Proper timing between MCU data writing and frame display timing can be achieved to prevent tearing effect. It should be kept NC if it is not used. Please refer to Section 8.4 for details usage.												
19	BS2	Communicating Protocol Select												
20	BS1	These pins are MCU interface selection input. See the following table: <table><tr><td></td><td>68XX-paralle l</td><td>80XX-paralle l</td><td>Serial</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 l	80XX-paralle l	Serial	BS1	0	1	0	BS2	1	1	0
	68XX-paralle l	80XX-paralle l	Serial											
BS1	0	1	0											
BS2	1	1	0											
21	VDDIO	Power supply for interface logic level. It should be match with MCU interface voltage level. VDDIO must always be equal or lower than VDD.												
22	VDD	Power supply for logic circuit.												
23	VCIR	This is a reserved pin. It should be kept NC												
24	BGGND	This pin must be connected to ground.												
25	VBREF	This is a reserved pin. It should be kept NC												
26	NC	No connection												
27	FB	This is a reserved pin. It should be kept NC												
28	Vddb	This is a reserved pin. It must be connected to VDD.												
29	GDR	This is a reserved pin. It should be kept NC												
30	VSS	Ground.												
31	NC	No connection												

5. Outline Dimension



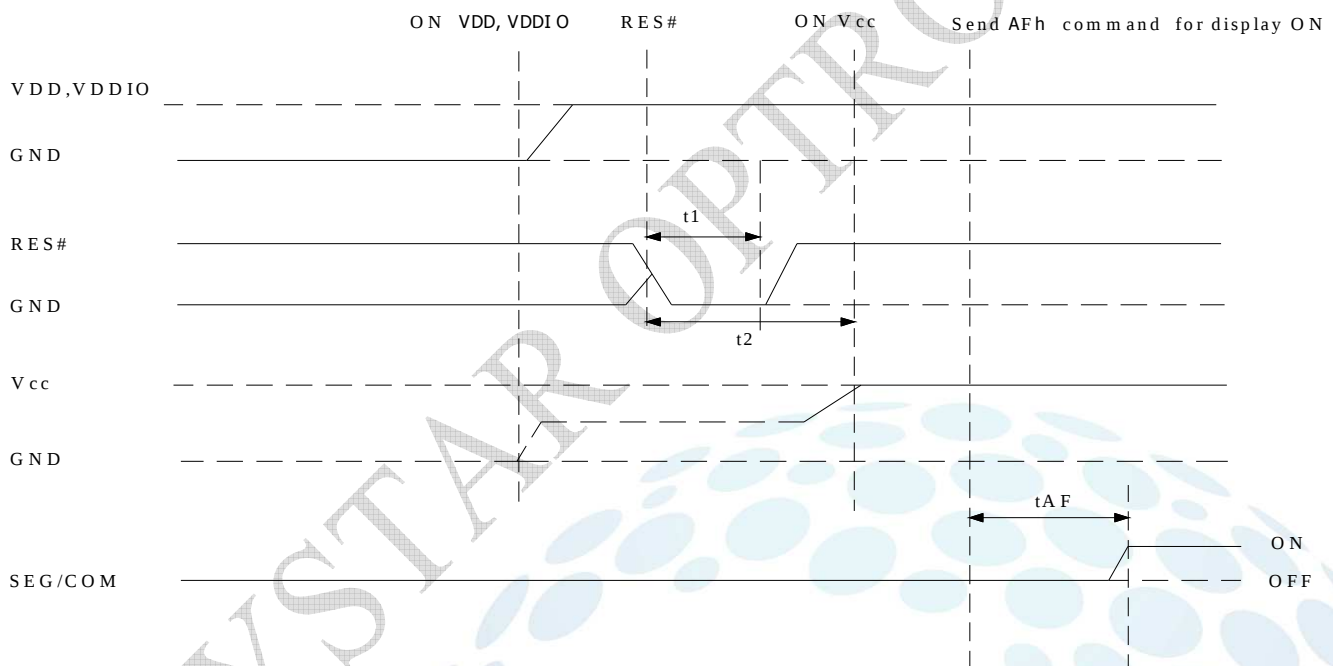
6. Block Diagram

6.1. POWER ON/OFF SEQUENCE & APPLICATION CIRCUIT

3.1.1 POWER ON/OFF SEQUENCE

Power ON sequence

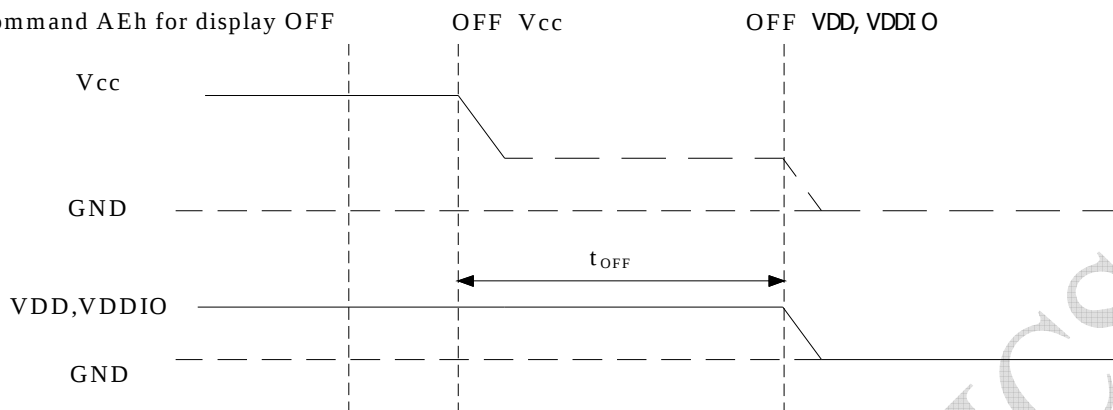
1. Power ON VDD ,VDDIO
2. After VDD ,VDDIO become stable , set RES# pin LOW (logic low) for at least $3\mu s(t_1)$ and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least $3\mu s(t_2)$. Then Power ON Vcc. (1)
4. After Vcc. become stable , send command AFh for display ON. DEG/COM will be ON after $100ms(t_{AF})$.



Power OFF sequence

1. Send command AEh for display OFF.
2. Power OFF Vcc.(1),(2)
3. Wait for t_{OFF} . Power OFF VDD ,VDDIO. (where Minimum $t_{OFF}=80ms$, Typical $t_{OFF}=100ms$)

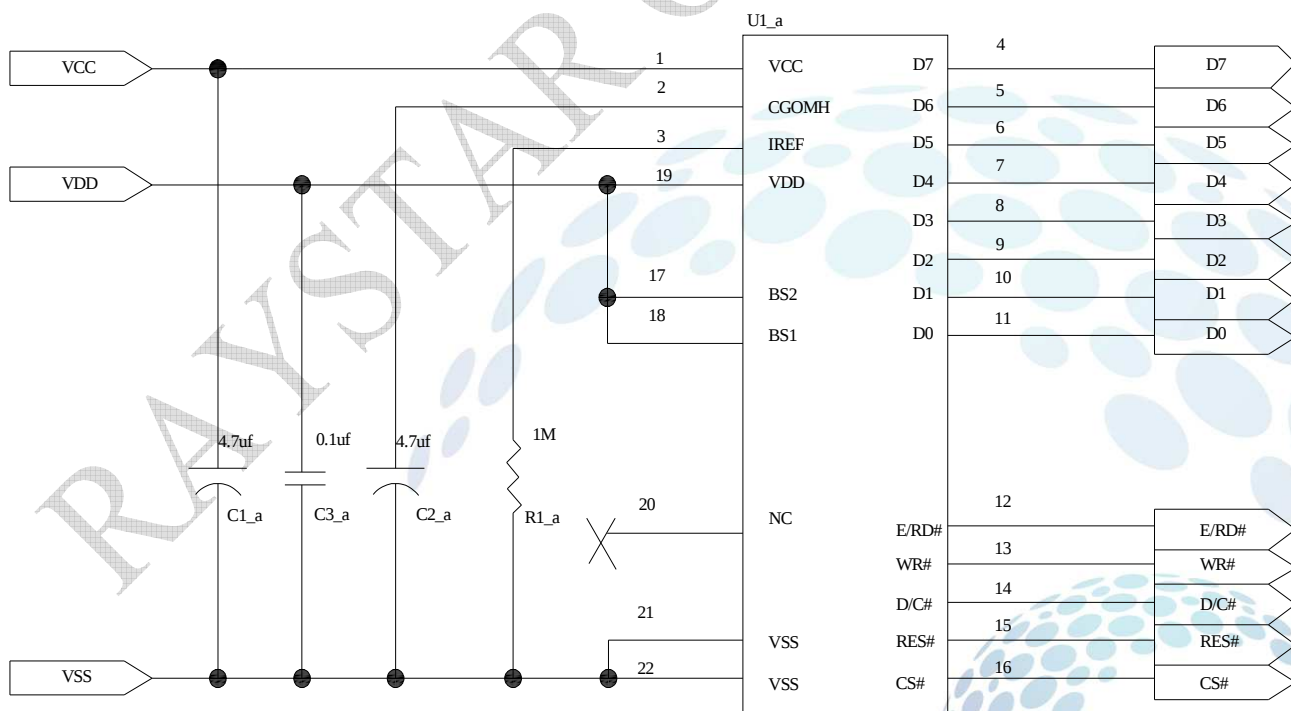
Send command AEh for display OFF



Note:

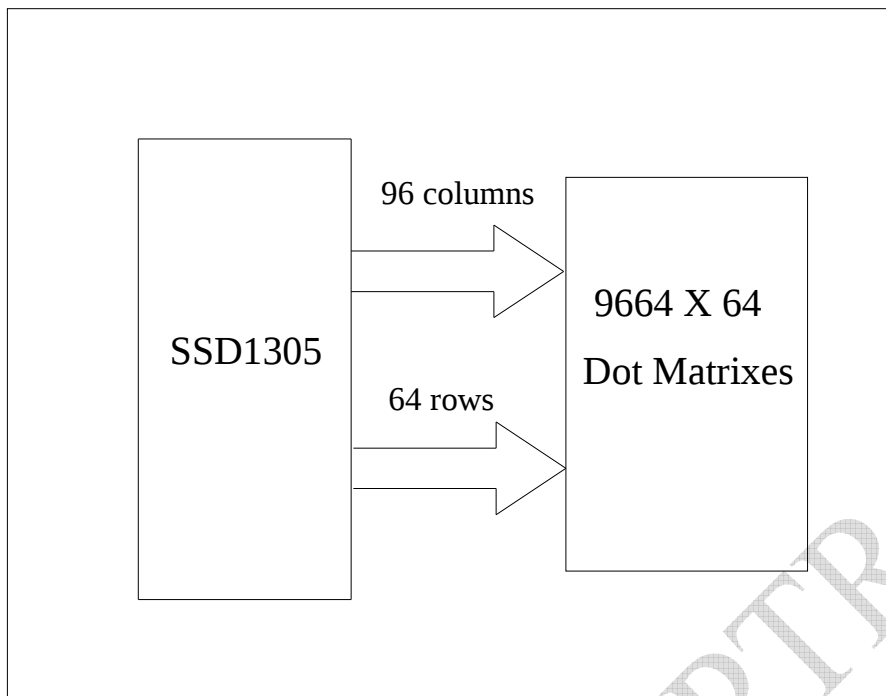
- (1) Since an ESD protection circuit is connected between VDD, VDDIO and Vcc, Vcc becomes lower than VDD and VDDIO is ON and Vcc is OFF as shown in the dotted line of Vcc in above figures.
- (2) Vcc should be disabled when it is OFF.

6.2 APPLICATION CIRCUIT

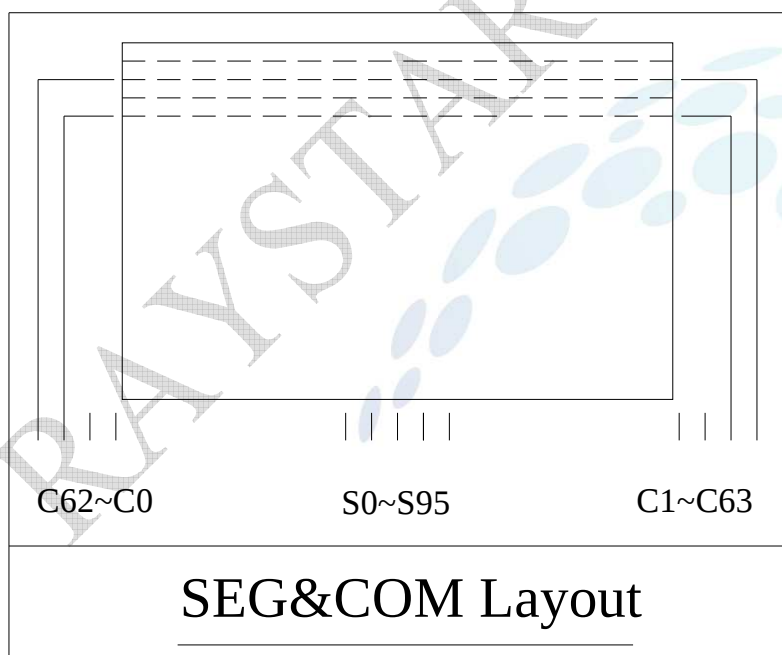


6.3 INTERFACE

6.3.1 FUNCTION BLOCK DIAGRAM



6.4 PANEL LAYOUT DIAGRAM



6.5 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.

7. 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.

8. Optics & Electrical Characteristics

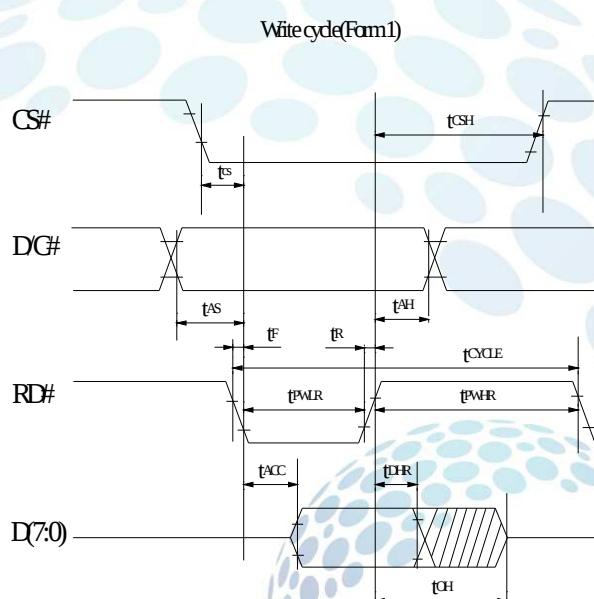
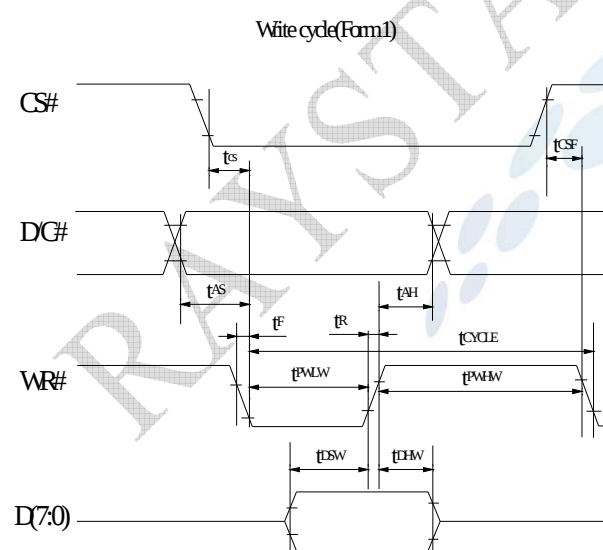
8.1 INTERFACE TIMING CHART

8080-Series MCU Parallel Interface Timing Characteristics

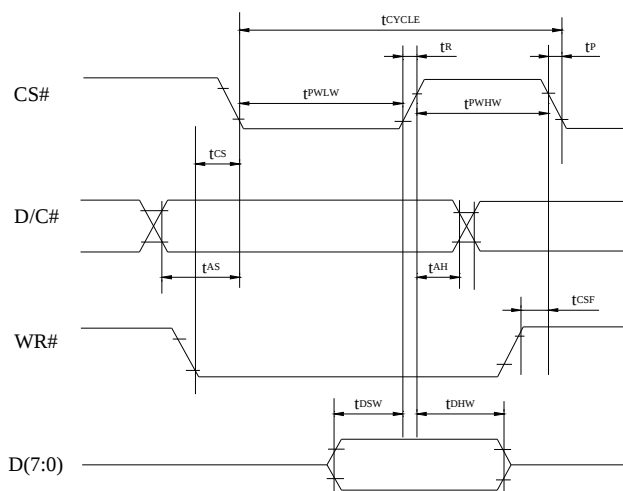
(VDD-VSS=2.4V to 3.5V, VDDIO=VDD, TA=25°C)

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

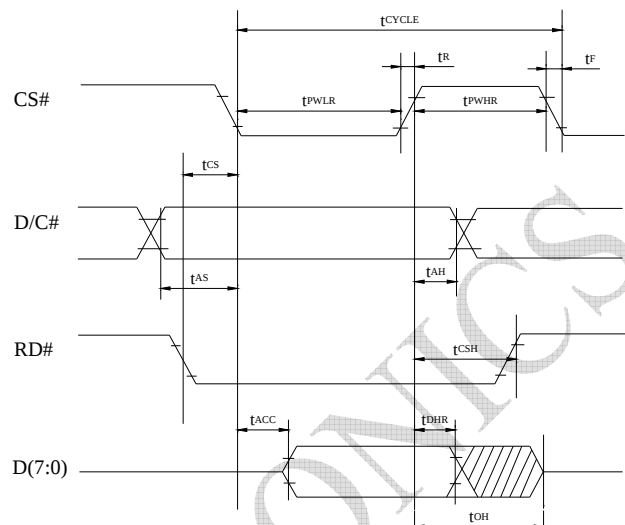
8080-seriesparallel interface characteristics (Form 1)



Write cycle(Form 2)



Write cycle(Form 2)



8.2 DC Characteristics

Characteristics	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	VDD	—	2.8	3	3.3	V
Supply Voltage for Display	VCC	—	11	13	15	V
High Level Input	VIH	I _{out} = 100μA, 3.3MHz	0.8×VDD	—	VDD	V
Low Level Input	VIL	I _{out} = 100μA, 3.3MHz	0	—	0.2×VDD	V
High Level Output	VOH	I _{out} = 100μA, 3.3MHz	0.9×VDD	—	VDD	V
Low Level Output	VOL	I _{out} = 100μA, 3.3MHz	0	—	0.1×VDD	V
Operating Current for VDD	IDD	Note 4 Note 5	—	250	400	μA
			—	250	400	μA
Operating Current for VCC	ICC	Note 4 Note 5	—	35	40	mA
			—	45	50	mA
Sleep Mode Current for VDD	IDD, SLEEP			—	10	μA
Sleep Mode Current for VCC	ICC, SLEEP		—	—	10	μA

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: V_{DD} = 3.0V, V_{CC} = 13V, 50% Display Area Turn on.

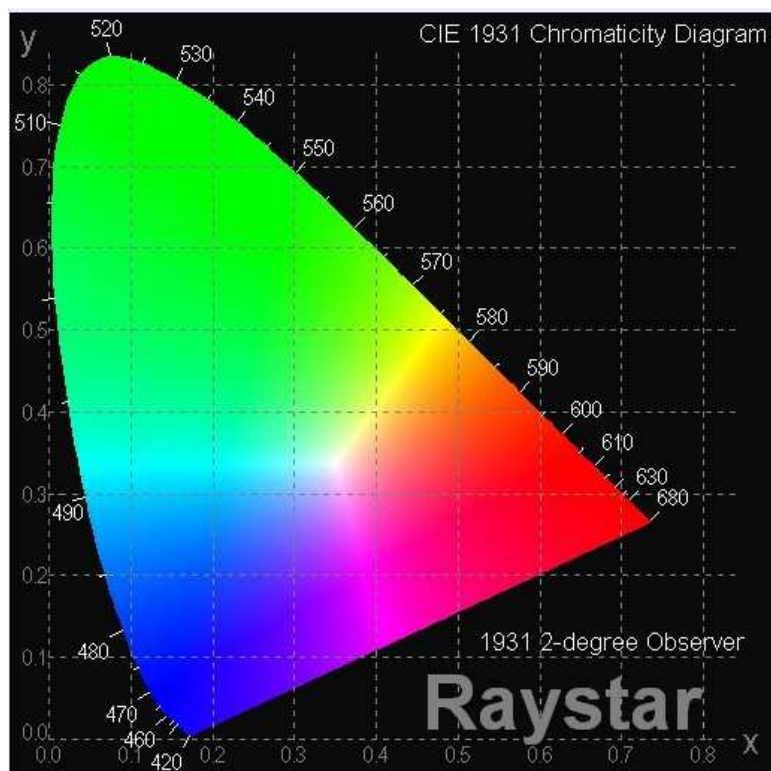
Note 5: V_{DD} = 3.0V, V_{CC} = 13V, 100% Display Area Turn on.

* Software configuration follows Section 4.4 Initialization.



8.3 Optics Characteristics

Characteristics	Symbol	Condition	Min	Typ	Max	Unit
C.I.E. (Yellow)	(x) (y)	Without Polarizer	0.43 0.46	0.47 0.50	0.51 0.54	
Dark Room Contrast	CR		—	>2000:1	—	—
View Angle			>160	—	—	
Brightness	Yellow	With Polarizer	80	100	—	cd/m ²



9. Reliability

9.1 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.

9.2 Lifetime

Parameter	Min	Typ	Max	Unit	Condition	Notes
Operating Life Time		50,000	—	Hrs	100 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.

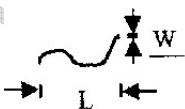
9.3 Failure Check Standard

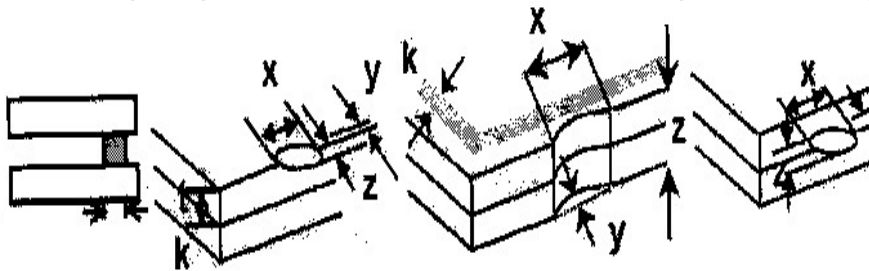
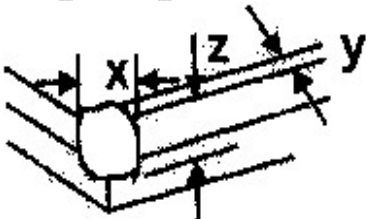
After the completion of the described reliability test, the samples were left at room temperature for 2 hrs prior to conducting the failure test at 23±5°C; 55±15% RH.

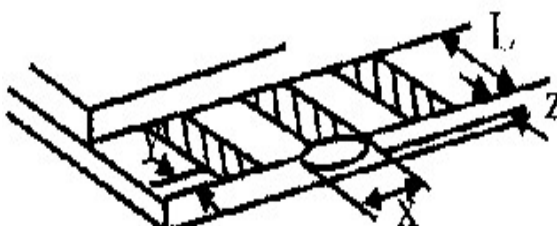
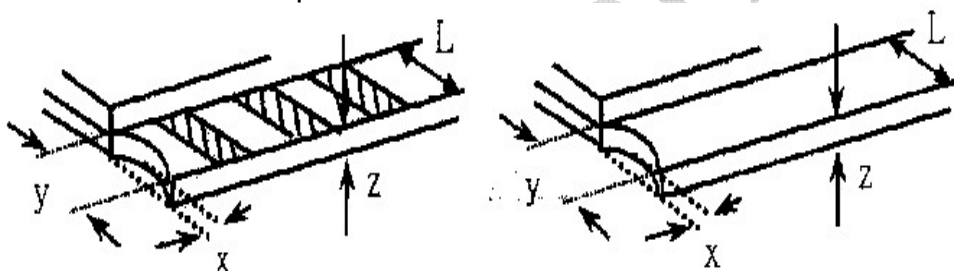
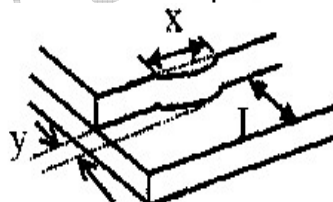
9.4 Mechanical Test

Mechanical Test			
Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	—
Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msdc 3 times of each direction	—
Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115mbar 40hrs	—

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 white spots (display only)	2.1 White and black spots on display $\leq 0.25\text{mm}$, no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm	2.5												
03	Black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing $\Phi = (x + y) / 2$	2.5												
		3.2 Line type : (As following drawing)  <table> <tr> <th>Length</th> <th>Width</th> <th>Acceptable QTY</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 QTY	---	$W \leq 0.02$	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 QTY													
---	$W \leq 0.02$	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 QTY</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 O TY</td> <td>3</td> </tr> </table>	Size Φ	Acceptable QTY	$\Phi \leq 0.20$	Accept no dense	$0.20 < \Phi \leq 0.50$	3	$0.50 < \Phi \leq 1.00$	2	$1.00 < \Phi$	0	Total O TY	3	2.5
Size Φ	Acceptable QTY														
$\Phi \leq 0.20$	Accept no dense														
$0.20 < \Phi \leq 0.50$	3														
$0.50 < \Phi \leq 1.00$	2														
$1.00 < \Phi$	0														
Total O TY	3														

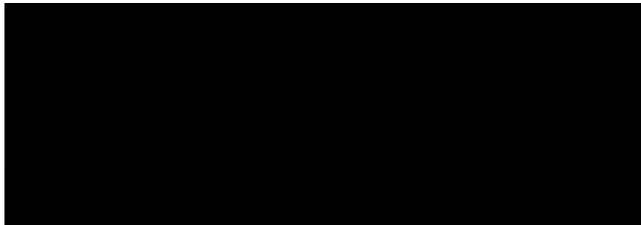
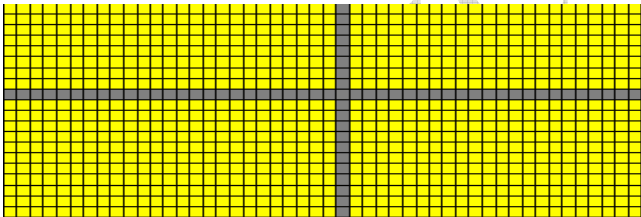
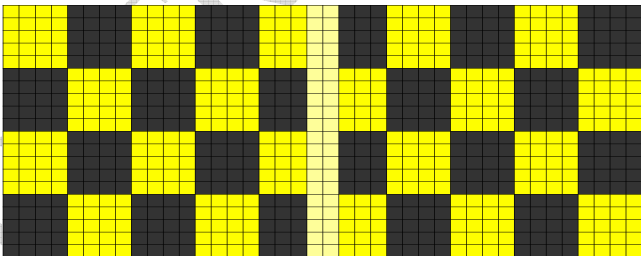
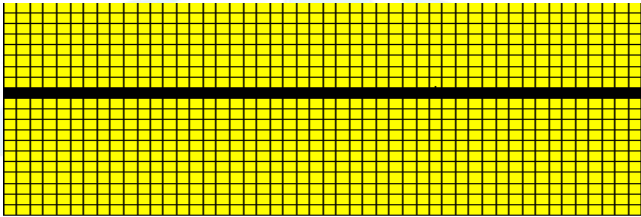
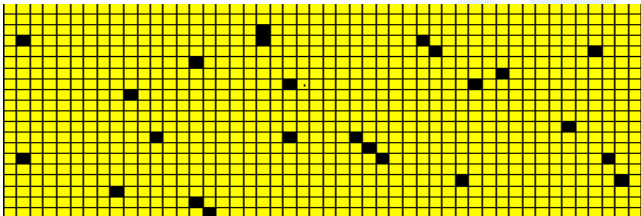
NO	Item	Criterion	AQL																		
05	Scratches	Follow NO.3 Black spots, white spots, contamination																			
06	Chipped glass	Symbols Define: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: Side length L: Electrode pad length: 6.1 General glass chip : 6.1.1 Chip on panel surface and crack between panels:  <table border="1"> <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 border="1"> <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	$x \leq 1/8a$																			

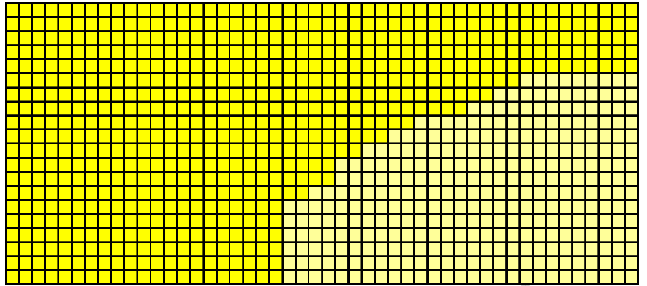
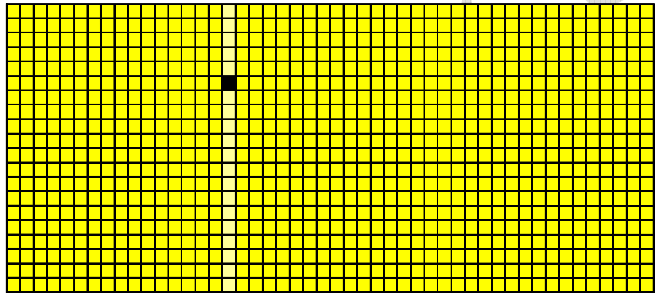
NO	Item	Criterion	AQL																
06	Glass crack	Symbols : x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: Side length L: Electrode pad length 6.2 Protrusion over terminal : 6.2.1 Chip on electrode pad :  <table border="1"> <tr> <td>y: Chip width</td> <td>x: Chip 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 border="1"> <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 border="1"> <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	With extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using Spot, lines and contamination standards. 8.3 Backlight doesn't light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
10	PCB 、 COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 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. 10.5 No oxidation or contamination PCB terminals. 10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts. 10.7 The jumper on the PCB should conform to the product characteristic chart. 10.8 If solder gets on bezel tab pads, LED pad, zebra pad or screw hold pad, make sure it is smoothed down.	2.5 2.5 0.65 2.5 2.5 0.65 0.65 2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP.	2.5
		12.2 No cracks on interface pin (OLB) of TCP.	0.65
		12.3 No contamination, solder residue or solder balls on product.	2.5
		12.4 The IC on the TCP may not be damaged, circuits.	2.5
		12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever.	2.5
		12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.	2.5
		12.7 Sealant on top of the ITO circuit has not hardened.	0.65
		12.8 Pin type must match type in specification sheet.	0.65
		12.9 Pin loose or missing pins.	0.65
		12.10 Product packaging must the same as specified on packaging specification sheet.	0.65
		12.11 Product dimension and structure must conform to product specification sheet.	0.65

Standard :

Defect item	Sorting	Defect judgment
No Display	Major	
Dark crisscross line	Major	
Short	Major	
Miss line	Major	
Wrong Display	Major	

Display Uneven	Major	
Dark dot and light line	Major	

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 , _____

>> **Go to page 2** <<

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 : / /