WINSTAR Display

OLED SPECIFICATION

Model No:

WEO012864GLPP3D00000

SPECIFICATION Version: C

CUSTOMER :

MODULE NO. : WEO012864GLPP3D00000

APPROVED BY: (FOR CUSTOMER USE ONLY)	

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
RELEASE DATE:			

■APPROVAL FOR SPECIFICATIONS ONLY

□APPROVAL FOR SPECIFICATIONS AND SAMPLE

MODEL NO：

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2018/07/02		First release
A	2018/11/09		Add 6.3.3 Register Map
B	2018/12/03		Modify Static electricity test Content of Test
C	2019/09/02		Modify Precautions in use of OLED Modules

Contents

1.Module Classification Information

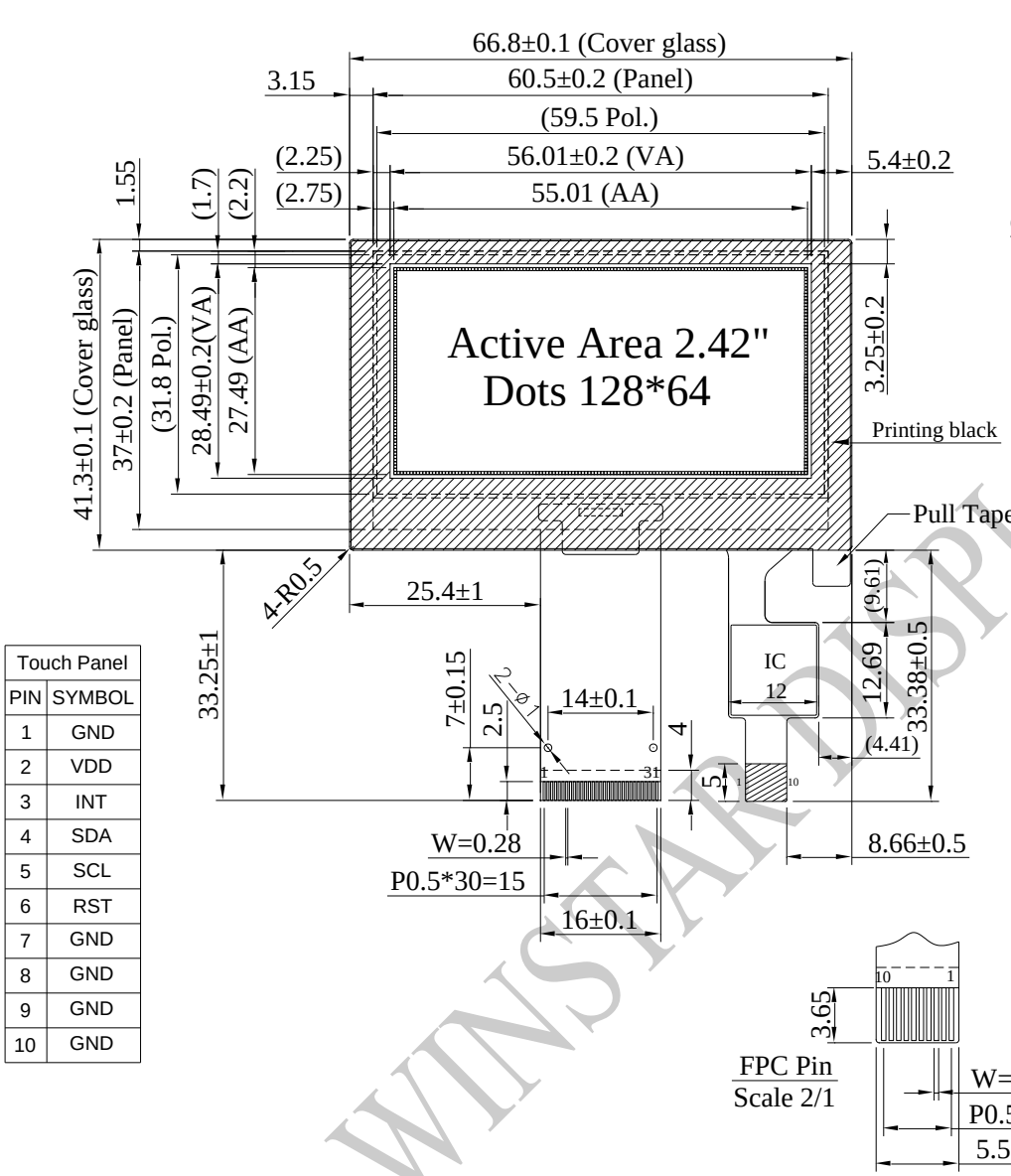
W	E	O	012864	G	L	P	P	3	D	0	0	0	00
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭

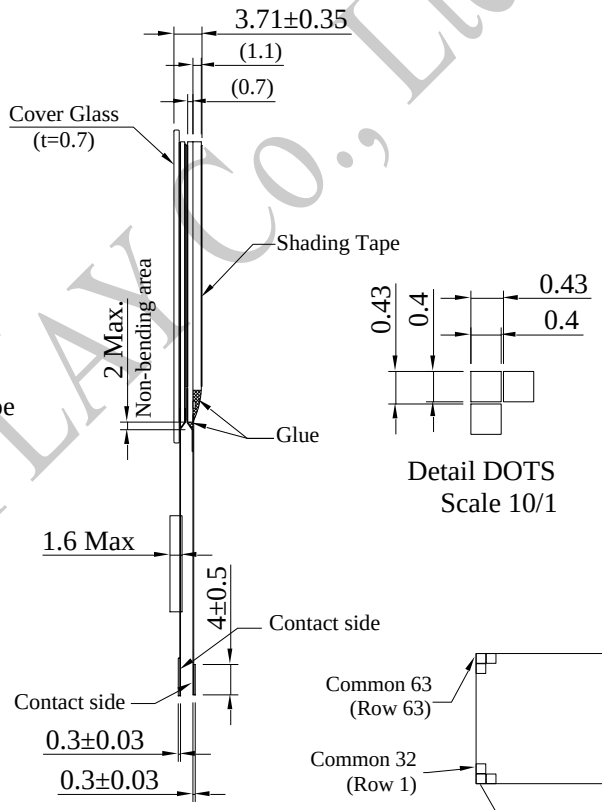
1	Brand：WINSTAR DISPLAY CORPORATION			
2	E：OLED			
3	Display Type	H：COB Character	G：COB Graphic	
		O：COG	F：COG + FR	
		P：COG + FR + PCB	X：TAB	
		A：COG + PCB		
4	Dot Matrix： 128 * 64			
5	Serials code			
6	Emitting Color	A：Amber	R：Red	C：Full Color
		B：Blue	W：White	
		G：Green	L：Yellow	
		S：Sky Blue	X：Dual Color	
7	Polarizer	P：With Polarizer; N: Without Polarizer A：Anti-glare Polarizer		
8	Display Mode	P：Passive Matrix ; N：Active Matrix		
9	Driver Voltage	3：3.0~3.3V ； 5：5.0V		
10	Touch Panel	N：Without touch panel; T：Resistive TP; D：DCT Attached CTP; R：OCR Attached CTP; A：OCA Attached CTP		
11	Product type	0：Standard 1：Daylight Readable 2：Transparent OLED (TOLED) 3：Flexible OLED (FOLED) 4：OLED Lighting		
12	Inspection Grade	0：Standard 2：Special grade C：Automotive grade Y：Consumer grade		
13	Option	0：Default ; F：ZIF FPC ; H：Hot bar FPC; D：Demo Kit		
14	Serial No.	Serial number(00~ZZ)		

2.General Specification

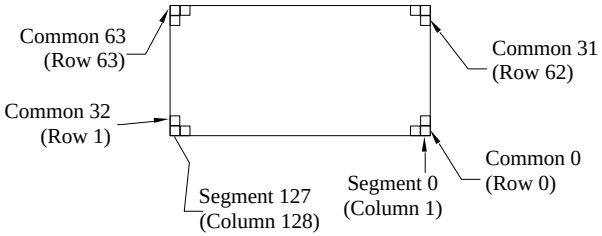
Item	Dimension	Unit
Dot Matrix	128 x 64	—
Module dimension	66.8 × 41.3 × 3.71	mm
Active Area	55.01 × 27.49	mm
Pixel Size	0.40 × 0.40	mm
Pixel Pitch	0.43 × 0.43	mm
Display Mode	Passive Matrix	
Display Color	Monochrome (Yellow)	
Interface	8Bits 68xx 80xx/ SPI/ I2C	
Drive Duty	1/64 Duty	
OLED IC	SSD1309	
Size	2.42inch	
CTP IC	GT911	
Detect Point	1	
CTP Interface	I2C	
CTP FW Version:	VER95	
Surface	Normal Glare	

3. Contour Drawing & Block Diagram





Detail DOTS
Scale 10/1



SEG & COM Layout

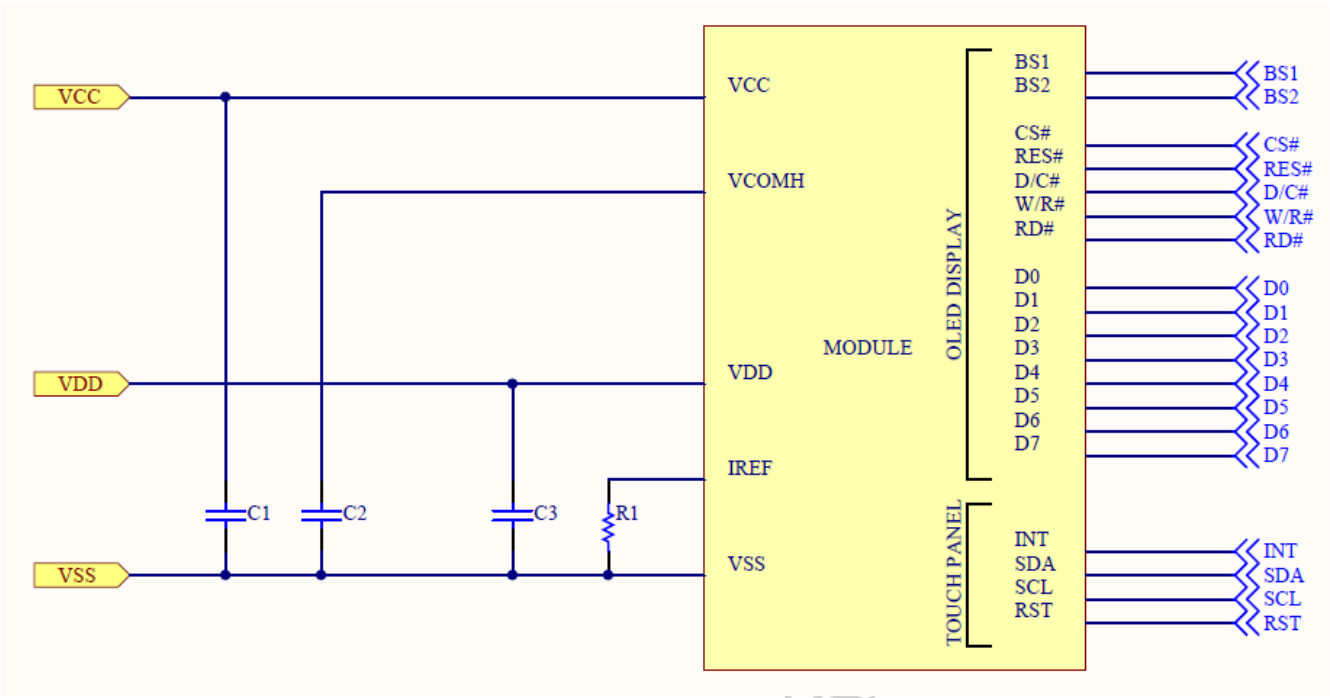
FPC Pin
Scale 2/1

Touch Panel	
PIN	SYMBOL
1	GND
2	VDD
3	INT
4	SDA
5	SCL
6	RST
7	GND
8	GND
9	GND
10	GND

PIN	SYMBOL	PIN	SYMBOL
1	NC(GND)	17	D/C#
2	VSS	18	R/W#
3	NC	19	E/RD#
4	NC	20	D0
5	NC	21	D1
6	NC	22	D2
7	NC	23	D3
8	NC	24	D4
9	NC	25	D5
10	NC	26	D6
11	VDD	27	D7
12	BS1	28	IREF
13	BS2	29	VCOMH
14	NC	30	VCC
15	CS#	31	NC(GND)
16	RES#		

The non-specified tolerance of dimension is ± 0.3mm.

3.1 Application recommendations



Recommended components:
C1, C2：4.7uF/25V/0805
C3：1.0uF/16V/0603

OLED DISPLAY's Bus Interface selection: (Must be set the BS[2:1], refer to item 4)
8-bits 6800 and 8080 parallel, SPI, I2C

TOUCH PANEL'S INTERFACE : ONLY I2C INTERFACE.

Voltage at IREF ≈ VCC – 3V. For VCC = 13V, IREF = 10uA:
R1 = (Voltage at IREF - VSS) / IREF
≈ (13 - 3)V / 10uA = 1MΩ

*For more information, please refer to Application Note provided by Winstar.

4. Interface Pin Function

<table>
<tr><th>No.</th><th>Symbol</th><th>Function</th></tr>
<tr><td>1</td><td>NC(GND)</td><td>No connection</td></tr>
<tr><td>2</td><td>VSS</td><td>Ground.</td></tr>
<tr><td>3-10</td><td>NC</td><td>No connection</td></tr>
<tr><td>11</td><td>VDD</td><td>Power supply pin for core logic operation</td></tr>
<tr><td>12</td><td>BS1</td><td rowspan="2">MCU bus interface selection pins. Select appropriate logic setting as described in the following table. BS2, BS1 and BS0 are pin select
<table>
<tr><td></td><td>BS1</td><td>BS2</td></tr>
<tr><td>I2C</td><td>1</td><td>0</td></tr>
<tr><td>4-wire Serial</td><td>0</td><td>0</td></tr>
<tr><td>8-bit 68XX Parallel</td><td>0</td><td>1</td></tr>
<tr><td>8-bit 80XX Parallel</td><td>1</td><td>1</td></tr>
</table>
Note
(1) 0 is connected to VSS
(2) 1 is connected to VDD</td></tr>
<tr><td>13</td><td>BS2</td></tr>
<tr><td>14</td><td>NC</td><td>No connection</td></tr>
<tr><td>15</td><td>CS#</td><td>This pin is the chip select input connecting to the MCU.
The chip is enabled for MCU communication only when CS# is pulled LOW (active LOW).</td></tr>
<tr><td>16</td><td>RES#</td><td>This pin is reset signal input.
When the pin is pulled LOW, initialization of the chip is executed.
Keep this pin pull HIGH during normal operation.</td></tr>
<tr><td>17</td><td>D/C#</td><td>This pin is Data/Command control pin connecting to the MCU.
When the pin is pulled HIGH, the data at D[7:0] will be interpreted as data.
When the pin is pulled LOW, the data at D[7:0] will be transferred to a command register.
In I2C mode, this pin acts as SA0 for slave address selection.
When 3-wire serial interface is selected, this pin must be connected to VSS.</td></tr>
<tr><td>18</td><td>R/W#</td><td>This pin is read / write control input pin connecting to the MCU interface.
When 6800 interface mode is selected, this pin will be used as Read/Write (R/W#) selection input. Read mode will be carried out when this pin is pulled HIGH and write mode when LOW.
When 8080 interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled LOW and the chip is selected.
When serial or I2C interface is selected, this pin must be connected to VSS.</td></tr>
</table>

19	E/RD#	This pin is MCU interface input. When 6800 interface mode is selected, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this pin is pulled HIGH and the chip is selected. When 8080 interface mode is selected, this pin receives the Read (RD#) signal. Read operation is initiated when this pin is pulled LOW and the chip is selected. When serial or I2C interface is selected, this pin must be connected to VSS.
20~27	D0~D7	These pins are bi-directional data bus connecting to the MCU data bus. Unused pins are recommended to tie LOW. When serial interface mode is selected, D0 will be the serial clock input: SCLK; D1 will be the serial data input: SDIN and D2 should be kept NC. When I2C mode is selected, D2, D1 should be tied together and serve as SDAout, SDAin in application and D0 is the serial clock input, SCL.
28	IREF	This pin is the segment output current reference pin. IREF is supplied externally.
29	VCOMH	COM signal deselected voltage level. A capacitor should be connected between this pin and VSS.
30	VCC	Power supply for panel driving voltage. This is also the most positive power voltage supply pin.
31	NC(GND)	No connection

CTP PIN Definition

No.	Symbol	Function
1	GND	Power ground
2	VDD	Power supply
3	INT	Interrupt signal, active low, asserted to request Host start a new transaction
4	SDA	I2C data signal
5	SCL	I2C clock signal
6	RST	External reset signal, active low
7	GND	Power ground
8	GND	Power ground
9	GND	Power ground
10	GND	Power ground

5.Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Logic	VDD	-0.3	3.47	V	1, 2
Supply Voltage for Display	VCC	0	15	V	1, 2
Operating Temperature	TOP	-20	+70	°C	-
Storage Temperature	TSTG	-30	+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 6 ‘’Electrical Characteristics’’. If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate

6.Electrical Characteristics

6.1 DC Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	VDD	–	2.8	3.0	3.3	V
Supply Voltage for Display	VCC	–	12.5	13	13.5	V
High Level Input	VIH	–	0.8×VDD	–	–	V
Low Level Input	VIL	–	–	–	0.2×VDD	V
High Level Output	VOH	–	0.9×VDD	–	–	V
Low Level Output	VOL	–	–	–	0.1×VDD	V
50% Check Board operating Current		VCC =13.0V	-	22	33	mA

6.2 OLED DISPLAY's Initial code

```
void Initial_SSD1309ZC(){

        Write_command(0xAE);        // Display Off

        Write_command(0xAD);        // Master Configuration
        Write_command(0x8e);        // Select external VCC supply

        Write_command(0xA8);        // Select Multiplex Ratio
        Write_command(0x3F);  // Default => 0x3F (1/64 Duty)      0x1F(1/32 Duty)

        Write_command(0xD3);  //Setting Display Offset
        Write_command(0x00);        //00H Reset

        Write_command(0x00);  //Set Column Address LSB

        Write_command(0x10);  //Set Column Address MSB

        Write_command(0x40);        //Set Display Start Line

        Write_command(0x00);        //;Set Memory Addressing Mode Default => 0x02
                                    //0x00 => Horizontal Addressing Mode
        Write_command(0xA6);        //Set Normal Display

        Write_command(0xDB);  //Set Deselect Vcomh level
        Write_command(0x3c);  //~0.83xVCC

        Write_command(0xA4);        //Entire Display ON

        Write_command(0x81);        //Set Contrast Control for Bank 0
        Write_command(0xFF);

        Write_command(0xD5);        //SET DISPLAY CLOCK
        Write_command(0xF0);        //105HZ

        Write_command(0xD8);  //Select Area color ON/OFF
        Write_command(0x05);  //MONO Mode and Low Power display Mode

        Write_command(0xA1);  //Set Segment Re-Map Default => 0xA0
                              //0xA1 (0x01) => Column Address 0 Mapped to SEG131
        Write_command(0xC8);  //Set COM Output Scan Direction Default => 0xC0
                              //0xC8 (0x08) => Scan from COM63 to 0
        Write_command(0xDA);        //Set COM Hardware Configuration
        Write_command(0x12);  //Alternative COM Pin

        Write_command(0xD9);  //Set Pre-Charge period
        Write_command(0xF1);  //Refer to SPEC 34PAGE
        Write_command(0xFF);

        Write_command(0xAF);  // Display ON
```

```
}
```

6.3 TOUCH PANEL's application code.

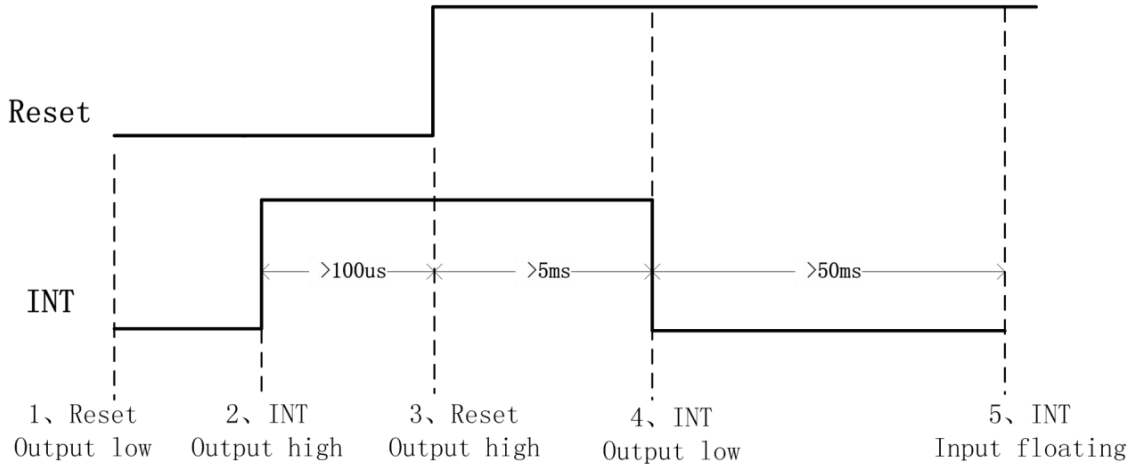
6.3.1

7-btis address	8-bits write address	8bits read address
0x5D	0xBA	0xBB
0x14	0x28	0x29

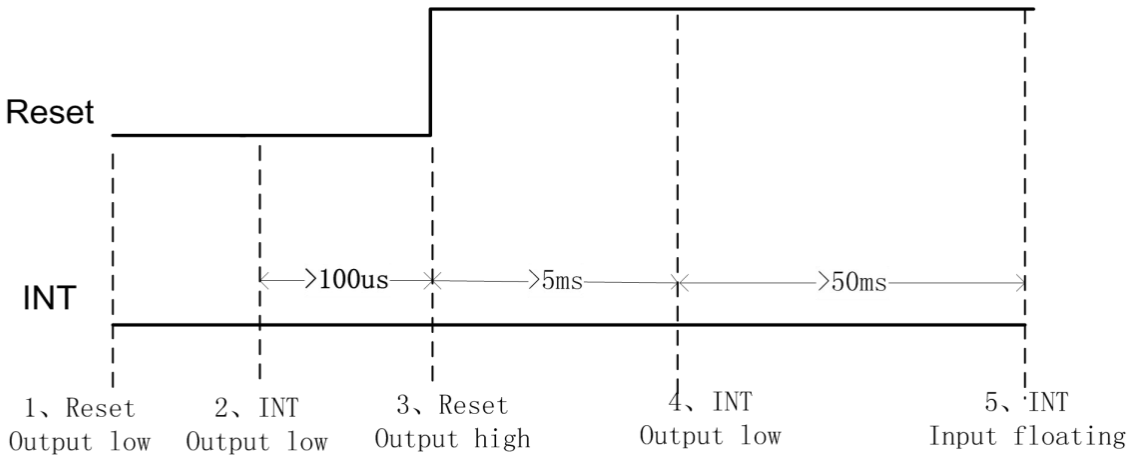
6.3.2 Power on for I2C address select

GT911 supports two I2C slave addresses: 0xBA/0xBB and 0x28/0x29. The host can select the address by changing the status of Reset and INT pins during the power-on initialization phase. See the diagram below for configuration methods and timings:

Timing for setting slave address to 0x28/0x29:



Timing for setting slave address to 0xBA/0xBB:



6.3.3 Register Map

6.3.3.1 Real-time command (Write only)

Addr	Name	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0x8040	Command	0: Read coordinates status; 1: Read diff data or raw data; 2: Read diff data or raw data; 3: Reference capacitance update (Internal test); 4: Reference capacitance calibration (Internal test); 5: Screen off; 6: Enter Charge mode; 7: Exit Charge mode 8 : Gesture mode. 0x20: Enter HotKnot Slave Approach mode 0x21：Enter HotKnot Master Approach mode 0x22：Enter Receive mode 0x28：Exit Slave Approach mode 0x29：Exit Master Approach mode 0x2A：Exit Receive mode 0xAA: ESD protection mechanism enabled; driver writes 0xAA to 0x8040 and reads and checks the value of 0x8040 regularly; other values are invalid.							
0x8041	ESD_Check	ESD protection mechanism enabled; reset to 0 upon initialization; after that, driver writes 0xAA to 0x8040 and reads and checks the value of 0x8040 regularly.							
0x8046	Command_Check	For commands greater than 0x07, it is required to write the command to 0x8046 before writing to 0x8040, to improve anti-ESD capability.							

6.3.3.2 Configuration information (R/W)

Register	Config Data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0x8047	Config_ Version	The version number of configuration documents (configuration parameters will be updated only when the version number of the new release is later than that of the previous one, or equal to that of the previous one but there are changes in contents; documents are numbered sequentially from 'A' to 'Z'; Send 0x00 and the version number is reset to 'A')							
0x8048	X Output Max (Low Byte)	Resolution of X axis							
0x8049	X Output Max (High Byte)								
0x804A	Y Output Max (Low Byte)	Resolution of Y axis							
0x804B	Y Output Max (High Byte)								
0x804C	Touch Number	Reserved				Touch points supported: 1 to 5			
0x804D	Module_ Switch1	Driver_ Resersal (Y2Y)	Sensor_ Resersal (X2X)	Stretch_rank		X2Y (X,Y axis switch-over)	Sito (Software noise reduction)	INT triggering mechanism 00: rising edge 01: falling edge 02: Low level 03: High level	
0x804E	Module_ switch2	Reserved		FirstFilter_Dis	Reserved		Approch_ En	HotKnot _En	Touch_ Key
0x804F	Shake_Count	De-jitter frequency when touch is being released				De-jitter frequency when touch is pressing down			
0x8050	Filter	First_Filter		Normal_Filter (Filter threshold for original coordinates, coefficient is 4)					
0x8051	Large_Touch	Number of large-area touch points							
0x8052	Noise_ Reduction	Reserved				Noise reduction value (0-15 valid, coefficient is 1)			
0x8053	Screen_ Touch_Level	Threshold for touch to be detected							
0x8054	Screen_ Leave_Level	Threshold for touch to be released							
0x8055	Low_Power_ Control	Reserved				Interval to enter lower power consumption mode (0s to 15s)			
0x8056	Refresh_Rate	Pulse width setting for gesture wakeup				Coordinates report rate (period: 5+N ms)			
0x8057	x_threshold	X coordinate output threshold: 0-255 (Based on the last reported coordinates; If configured to 0, GT911 will keep outputting coordinates continuously)							
0x8058	y_threshold	Y coordinate output threshold: 0-255 (Based on the last reported coordinates. If configured to 0, GT911 will keep outputting coordinates continuously)							
0x8059	X_Speed_Limit	Reserved							
0x805A	Y_Speed_Limit								

0x805B	Space	Space of border top (coefficient: 32)			Space of border bottom (coefficient: 32)
0x805C		Space of border left (coefficient: 32)			Space of border right (coefficient: 32)
0x805D	Mini_Filter	Reserved			Mini filter configuration during line drawing process, configured as 0 indicates 4
0x805E	Stretch_R0	coefficient of Stretch space 1			
0x805F	Stretch_R1	coefficient of Stretch space 2			
0x8060	Stretch_R2	coefficient of Stretch space 3			
0x8061	Stretch_RM	The base of multiple stretch spaces			
0x8062	Drv_GroupA_ Num	All_Driving	Reserved		Driver_Group_A_number
0x8063	Drv_GroupB_ Num	Reserved		Dual_Freq	Driver_Group_B_number
0x8064	Sensor_Num	Sensor_Group_B_Number			Sensor_Group_A_Number
0x8065	FreqA_factor	Clock Multiplier Factor of drive frequency of Driver Group A GroupA_Frequence = Clock Multiplier Factor * Fundamental Frequency			
0x8066	FreqB_factor	Clock Multiplier Factor of drive frequency of Driver Group B GroupB_Frequence = Clock Multiplier Factor * Fundamental Frequency			
0x8067	Pannel_ BitFreqL	Fundamental Frequency of Driver Groups A and B (1526HZ< Fundamental Frequency <14600Hz)			
0x8068	Pannel_ BitFreqH				
0x8069	Pannel_Sensor_ TimeL	Output Interval between two adjacent drive signals (unit: us); Reserved (used in beta version; invalid in a Release)			
0x806A	Pannel_Sensor_ TimeH				
0x806B	Pannel_Tx_ Gain	Reserved		Pannel_Drv_output_R 4 gain values, configurable	Pannel_DAC_Gain 0: Gain max. 7: Gain min.
0x806C	Pannel_Rx_ Gain	Pannel_PGA_C	Pannel_PGA_R	Pannel_Rx_Vcmi (4 gain values, configurable)	Pannel_PGA_Gain (8 gain values, configurable)
0x806D	Pannel_Dump_ Shift	Amplification factor of raw data in Gesture Mode (2^N)			Amplification factor of raw data on the touch panel (2^N)
0x806E	Drv_Frame_ Control	Reserved	SubFrame_DrvNum (maximum setting is 17)		Repeat_Num (Accumulated sampling count)
0x806F	Charging_Level_Up	After the host issues Charge command, IC enters Charge mode and raises the Touch_Level and Leave_Level. The level applicable to Charge mode= original level+configuration level. When configuration level is 0, the charging level equals to the original level.			

0x8070	Module_ Switch3	Reserved	Gesture_ Hop_ Dis	Strong_S mooth	Reserved				Shape_En
0x8071	GESTURE_DIS	Valid distance for slide-up/down wakeup			Valid distance for slide-left/right wakeup				
0x8072	Gesture_Long_ Press_Time	The gesture recognizing processing aborting time period when long touching							
0x8073	X/Y_Slope_Adjust	The adjustment parameter of X direction slope when using “four point trigonometric approximation algorithm” to calculate the coordinates (0: algorithm disabled)			The adjustment parameter of Y direction slope when using “four point trigonometric approximation algorithm” to calculate the coordinates (0: algorithm disabled)				
0x8074	Gesture_Control	Invalid time for double-tap wakeup (unit:100 ms, defaults to 1.5s when configured as 0)			GestureDrv_PGA_Gain (8 gain values, configurable)				
0x8075	Gesture_Switch1	Swipe left	Swipe up	Swipe right	w	o	m	e	c
0x8076	Gesture_Switch2	Swipe is valid only at the bottom of the TP	z	s	^	>	V	Double-tap	Swipe down
0x8077	Gesture_Refresh_Rate	Report rate in Gesture mode (period is 5+ms)							
0x8078	Gesture_Touch_ Level	Touch threshold in Gesture mode							
0x8079	NewGreenWake UpLevel	Threshold for NewGreen wakeup of Gesture wakeup function							
0x807A	Freq_Hopping_Start	Start frequency for frequency hopping(when Range_Ext=0，the unit is 2KHz，for example, 50 indicates100KHz； When Range_Ext=1，the unit is BitFreq)							
0x807B	Freq_Hopping_End	End frequency for frequency hopping(when Range_Ext=0，the unit is 2KHz，for example, 150 indicates 300KHz； when Range_Ext=1，the unit is BitFreq)							
0x807C	Noise_Detect_Times	Detect_Stay_Times (Number of tests taken on each frequency point in each noise test; 2 is recommended)		Detect_Confirm_Times (Confirmed noise level after repeated noise tests, 1-63 valid; 20 is recommended)					
0x807D	Hopping_Flag	Hopping_En	Range_ Ext	Dis_Force_Ref	Delay_Hopping		Detect_Time_Out (timeout for noise detection, unit: second), Reserved		
0x807E	Hopping_ Threshold	Fast_Hopping_Limit: fast hopping is enabled only when the interference value of current frequency is greater than Fast_Hopping_Limit*4. The minimum setting of this limit is 5.				Hopping_Hit_Threshold (Conditions for selecting optimal frequency: Current operating frequency interference- Minimum interference>Set			

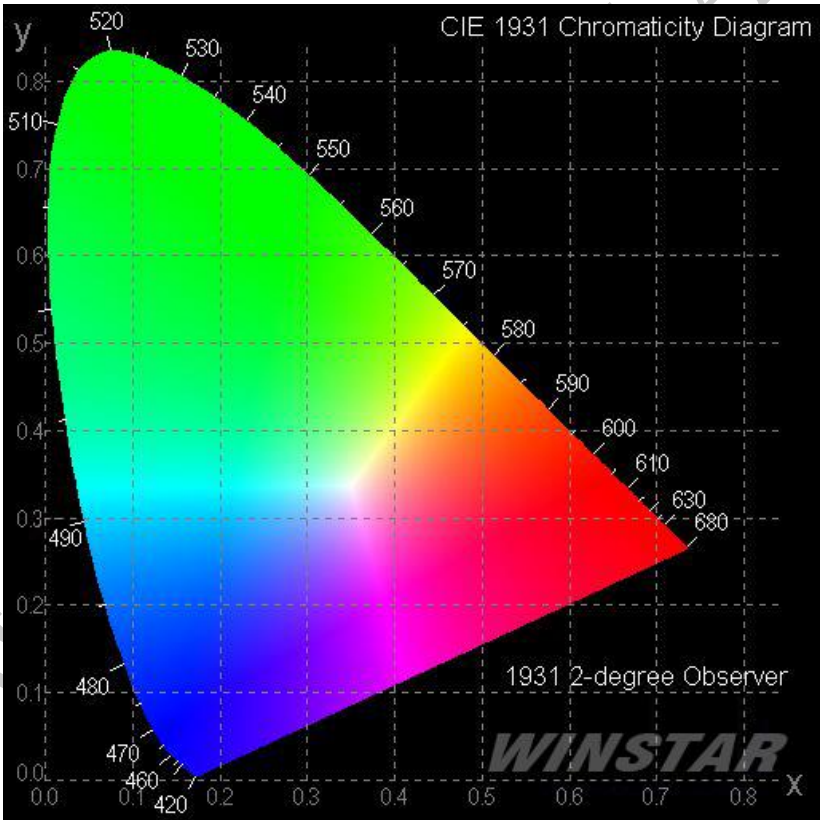
			valuex4, then optimal frequency is selected and frequency hopping is enabled)
0x807F	Noise_ Threshold	Threshold to distinguish if there is interference (if the interference on all frequency point is less than this threshold, it is regarded as no interference), Reserved	
0x8080	Noise_Min_Threshold	When ESD causes the minimum interference point to be greater than the threshold value, it will initiate fast reduction treatment. Configured to 0 means this function is disabled and configured to high value (such as 200 or higher) has the equivalent effect. To enable this function, it is recommended to set the value 5 to 20 higher than the minimum frequency point (LCD interference and common-mode interference, whichever is greater) in normal interference.	
0x8081	NC	Reserved	
0x8082	Hopping_Sensor_Group	Sections for Hopping Frequency Noise Detection (4 sections recommended)	
0x8083	Hopping_seg1_Normalize	Seg1 Normalize coefficient (sampling value *N / 128= Raw data)	
0x8084	Hopping_seg1_Factor	Seg1 Central point Factor	
0x8085	Main_Clock_Ajdust	Fine adjustment of IC main clock Frequency, within the range of -7 to +8	
0x8086	Hopping_seg2_Normalize	Seg2 Normalize coefficient (sampling value *N / 128= Raw data)	
0x8087	Hopping_seg2_Factor	Seg2 Central point Factor	
0x8088	NC	Reserved	
0x8089	Hopping_seg3_Normalize	Seg3 Normalize coefficient (sampling value *N / 128= Raw data)	
0x808A	Hopping_seg3_Factor	Seg3 Central point Factor	
0x808B	NC	Reserved	
0x808C	Hopping_seg4_Normalize	Seg4 Normalize coefficient (sampling value *N / 128= Raw data)	
0x808D	Hopping_seg4_Factor	Seg4 Central point Factor	
0x808E	NC	Reserved	
0x808F	Hopping_seg5_Normalize	Seg5 Normalize coefficient (sampling value *N / 128= Raw data)	
0x8090	Hopping_seg5_Factor	Seg5 Central point Factor	
0x8091	NC	Reserved	
0x8092	Hopping_seg6_Normalize	Seg6 Normalize coefficient (sampling value *N / 128= Raw data)	
0x8093	Key 1	Key 1 address: 0-255 valid	

		(0 indicates no key is available. When the addresses of all four keys are the multiples of 8, it means independent key design manner.)						
0x8094	Key 2	Key 2 address: 0-255 valid (0 indicates no key is available. When the address of all four keys is the multiples of 8, it means independent key design manner)						
0x8095	Key 3	Key 3 address: 0-255 valid (0 indicates no key is available. When the address of all four keys is the multiples of 8, it means independent key design manner)						
0x8096	Key 4	Key 4 address: 0-255 valid (0 indicates no key is available. When the address of all four keys is the multiples of 8, it means independent key design manner)						
0x8097	Key_Area	Time limit for long-press update (1s to 15s). Long-press update is disabled when configured to 0.			Key active area configuration (single side): 0-15 valid			
0x8098	Key_Touch_Level	Touch key touch threshold						
0x8099	Key_Leave_Level	Touch key release threshold						
0x809A	Key_Sens	KeySens_1(sensitivity coefficient of Key 1)			KeySens_2 (sensitivity coefficient of Key 2)			
0x809B	Key_Sens	KeySens_3(sensitivity coefficient of Key 3)			KeySens_4 (sensitivity coefficient of Key 4)			
0x809C	Key_Restrain	The key restrain interval after finger leaves screen (unit: 100ms), 0 means the key suppression interval is 600ms.			Independent adjacent key restrain parameter			
0x809D	Key_Restrain_ Time	Reserved			Adjacent key restrain time internal after the finger slides to leave at the bottom of the TP (unit: 100 ms). Timing starts from the moment that finger leaves the TP. If there is touch key event within this time interval, the touch key will be restrained until the touch key is released and touched down again. (configured as 0, this function is disabled)			
0x809E	GESTURE_ LARGE_TOUCH	Large-area touch processing in Gesture mode (the size of the touch rectangle). Configured as 0, this function is disabled.						
0x809F	NC	Reserved						
0x80A0	NC	Reserved						
0x80A1	Hotknot_Noise_ Map	Reserved	200K	250K	300K	350K	400K	450K
0x80A2	Link_Threshold	Link_NoiseThreshold						
0x80A3	Pxy_Threshold	Pxy_NoiseThreshold						
0x80A4	GHot_Dump_ Shift	Reserved		Rx_Self	Amplification factor of raw Data (2^N)			
0x80A5	GHot_Rx_Gain	PGA_C	PGA_R	Reserved	PGA_Gain (8 levels to be configured）			
0x80A6	Freq_Gain0	400K signal gain calibration, calibration volume is N/16. Invalid when N=0.			450K signal gain calibration, calibration volume is N/16. Invalid when N=0.			

0x80A7	Freq_Gain1	300K signal gain calibration, calibration volume is N/16. Invalid when N=0.	350K signal gain calibration, calibration volume is N/16. Invalid when N=0.
0x80A8	Freq_Gain2	200K signal gain calibration, calibration volume is N/16. Invalid when N=0.	250K signal gain calibration, calibration volume is N/16. Invalid when N=0.
0x80A9	Freq_Gain3	Reserved	150K signal gain calibration, calibration volume is N/16. Invalid when N=0.
0x80AA	NC	Reserved	
0x80AB	NC	Reserved	
0x80AC	NC	Reserved	
0x80AD	NC	Reserved	
0x80AE	NC	Reserved	
0x80AF	NC	Reserved	
0x80B0	NC	Reserved	
0x80B1	NC	Reserved	
0x80B2	NC	Reserved	
0x80B3	Combine_Dis	Distance for adjacent rectangles to be combined in Gesture mode	Distance for adjacent rectangles to be combined
0x80B4	Split_Set	Distance for a large-area rectangle to be split	Distance for a normal-size rectangle to be split
0x80B5	NC	Reserved	
0x80B6	NC	Reserved	
0x80B7 to 0x80C4	Sensor_CH0 to Sensor_CH13	Channel number on chip corresponding to ITO Sensor	
0x80C5 to 0x80D4	NC	Reserved	
0x80D5 to 0x80EE	Driver_CH0 to Driver_CH25	Channel number on chip corresponding to ITO Driver	
0x80EF to 0x80FE	NC	Reserved	
0x80FF	Config_Chksum	Configuration verification (checksum value of the bytes from 0x8047 to 0x80FE)	
0x8100	Config_Fresh	Configuration updated flag (the flag is written by the host)	

7.Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ	–	160	–	–	deg
	(H)φ	–	160	–	–	deg
Contrast Ratio	CR	Dark	2000:1	–	–	–
Response Time	T rise	–	–	10	–	μs
	T fall	–	–	10	–	μs
Display with 50% check Board Brightness			60	80	–	cd/m2
CIEx(Yellow)		(CIE1931)	0.45	0.47	0.49	–
CIEy(Yellow)		(CIE1931)	0.48	0.50	0.52	–



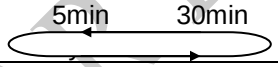
8.OLED Lifetime

ITEM	Conditions	Min	Typ	Remark
Operating Life Time	Ta=25℃ / Initial 50% check board brightness Typical Value	50,000 Hrs	—	Note

Notes:
1. Life time is defined the amount of time when the luminance has decayed to <50% of the initial value.
2. This analysis method uses life data obtained under accelerated conditions to extrapolate an estimated probability density function (*pdf*) for the product under normal use conditions.
3. Screen saving mode will extend OLED lifetime.

9.Reliability

Content of Reliability Test

Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Applicable Standard**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 240hrs	___
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 240hrs	___
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 240hrs	___
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 240hrs	___
High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60°C,90%RH 240hrs	___
High Temperature/ Humidity Operation	Endurance test applying the high temperature and high humidity Operation for a long time.	60°C,90%RH 120hrs	___
Temperature Cycle	Endurance test applying the low and high temperature cycle. -30°C 25°C 80°C 30min 5min 30min 	-30°C /80°C 30 cycles	___
Mechanical Test			
Vibration test	Endurance test applying the vibration during transportation and using.	Frequency:10~55Hz amplitude:1.5mm Time:0.5hrs/axis Test axis:X,Y,Z	___
Others			
Static electricity test	Endurance test applying the electric stress to the finished product housing.	Air Discharge model ±4kv,10 times	___

*** Supply voltage for OLED system =Operating voltage at 25℃

Test and measurement conditions

1. All measurements shall not be started until the specimens attain to temperature stability. 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.
2. All-pixels-on is used as operation test pattern.
3. The degradation of Polarizer are ignored for High Temperature storage, High Temperature/ Humidity Storage, Temperature Cycle

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.

APPENDIX:

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.

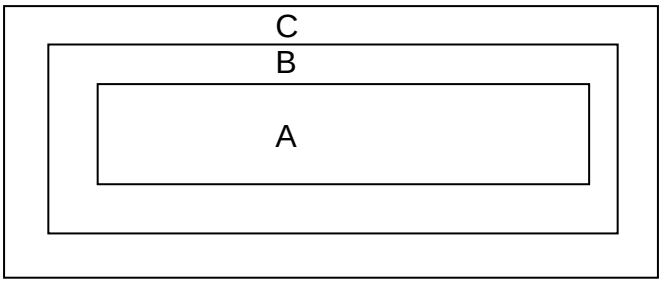
10.Inspection specification

Inspection Standard:

MIL-STD-105E table normal inspection single sample level II.

Definition

1 Major defect : The defect that greatly affect the usability of product.
2 Minor defect : The other defects, such as cosmetic defects, etc.
Definition of inspection zone:

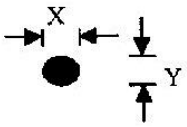


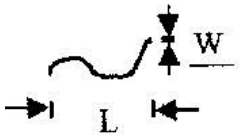
Zone A: Active Area
Zone B: Viewing Area except Zone A
Zone C: Outside Viewing Area
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble of quality and assembly to customer`s product.

Inspection Methods

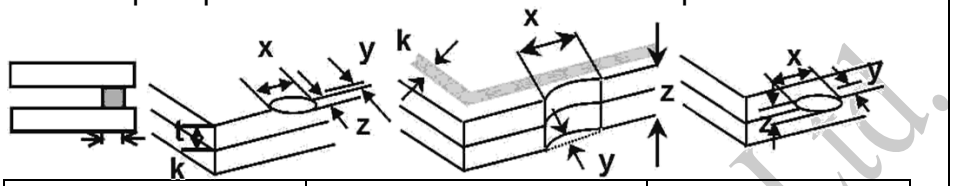
1 The general inspection : Under fluorescent light illumination: 750~1500 Lux, about 30cm viewing distance, within 45º viewing angle, under 25±5°C.
2 The luminance and color coordinate inspection : By SR-3 or BM-7 or the equal equipments, in the dark room, under 25±5°C.

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 OLED viewing angle defect. 1.7 Mixed product types. 1.8 Contrast defect.	0.65
02	Black or white spots on OLED (display only)	2.1 White and black spots on display ≦ 0.25mm, no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm.	2.5

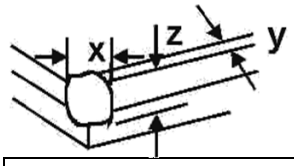
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td rowspan="2">03</td><td>OLED black spots, white spots, contamination (non-display)</td><td>3.1 Round type :
As following drawing
Φ=(x + y) / 2
 

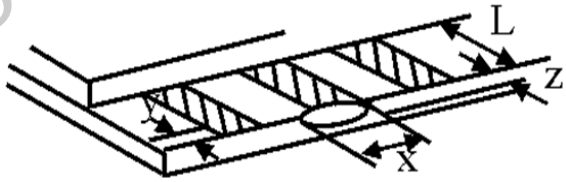
<table>
<tr><th>SIZE</th><th>Acceptable QTY</th><th>Zone</th></tr>
<tr><td>Φ≦0.10</td><td>Accept no dense</td><td>A+ B,</td></tr>
<tr><td>0.10＜Φ≦0.20</td><td>2</td><td>A+ B</td></tr>
<tr><td>0.20＜Φ≦0.25</td><td>1</td><td>A+ B</td></tr>
<tr><td>0.25＜Φ</td><td>0</td><td>A+ B</td></tr>
</table></td><td>2.5</td></tr>
<tr><td>3.2 Line type : (As following drawing)
 

<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Q TY</th><th>Zone</th></tr>
<tr><td>---</td><td>W≦0.02</td><td>Accept no dense</td><td>A+B</td></tr>
<tr><td>L≦3.0</td><td>0.02＜W≦0.03</td><td rowspan="2">2</td><td>A+B</td></tr>
<tr><td>L≦2.5</td><td>0.03＜W≦0.05</td><td>A+B</td></tr>
<tr><td>---</td><td>0.05＜W</td><td>As round type</td><td></td></tr>
</table></td><td>2.5</td></tr>
<tr><td>04</td><td>Polarizer bubbles</td><td>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><th>Zone</th></tr>
<tr><td>Φ≦0.20</td><td>Accept no dense</td><td>A+B</td></tr>
<tr><td>0.20＜Φ≦0.50</td><td>3</td><td>A+B</td></tr>
<tr><td>0.50＜Φ≦1.00</td><td>2</td><td>A+B</td></tr>
<tr><td>1.00＜Φ</td><td>0</td><td>A+B</td></tr>
<tr><td>Total Q TY</td><td>3</td><td></td></tr>
</table></td><td>2.5</td></tr>
<tr><td>05</td><td>Scratches</td><td colspan="2">Follow NO.3 OLED black spots, white spots, contamination.</td></tr>
</table>

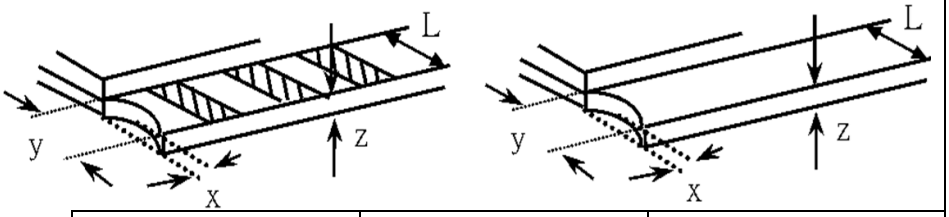
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>06</td><td>Chipped glass</td><td>
Symbols Define:
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Glass thickness a: OLED side length
L: Electrode pad length:
6.1 General glass chip :
6.1.1 Chip on panel surface and crack between panels:


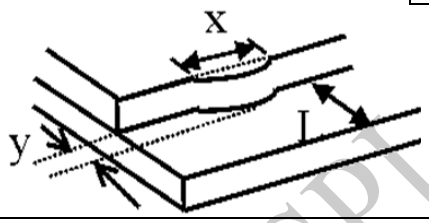
<table>
<tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙If there are 2 or more chips, x is total length of each chip.

6.1.2 Corner crack:


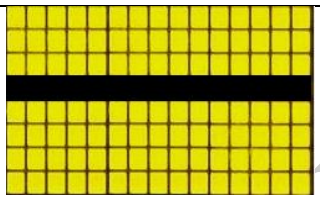
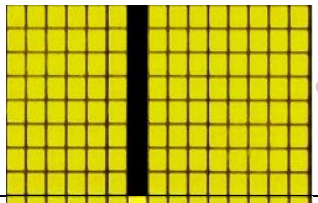
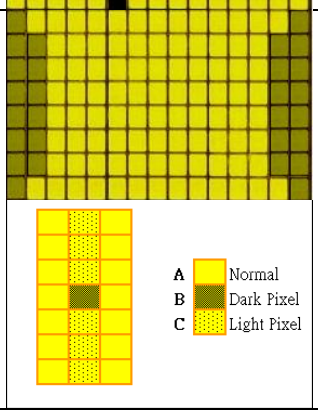
<table>
<tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙If there are 2 or more chips, x is the total length of each chip.
</td><td>2.5</td></tr>
<tr><td>06</td><td>Glass crack</td><td>
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≦0.5mm</td><td>x≦1/8a</td><td>0 ＜ z ≦ t</td></tr>
</table>
</td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>06</td><td>Glass crack</td><td>6.2.2 Non-conductive portion:
 

<table>
<tr><th>y: Chip width</th><th>x: Chip length</th><th>z: Chip thickness</th></tr>
<tr><td>y≦ L</td><td>x≦1/8a</td><td>0 ＜ z ≦ 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><th>y: width</th><th>x: length</th></tr>
<tr><td>y≦1/3L</td><td>x ≦ a</td></tr>
</table>

</td><td>2.5</td></tr>
<tr><td>07</td><td>Cracked glass</td><td>The OLED with extensive crack is not acceptable.</td><td>2.5</td></tr>
<tr><td>08</td><td>Backlight elements</td><td>8.1 Illumination source flickers when lit.
8.2 Spots or scratched that appear when lit must be judged. Using OLED spot, lines and contamination standards.
8.3 Backlight doesn’t light or color wrong.</td><td>0.65
2.5
0.65</td></tr>
<tr><td>09</td><td>Bezel</td><td>9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination.
9.2 Bezel must comply with job specifications.</td><td>2.5
0.65</td></tr>
<tr><td>10</td><td>PCB , COB</td><td>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, OLED pad, zebra pad or screw hold pad, make sure it is smoothed down.</td><td>2.5
2.5
0.65
2.5
2.5
0.65
0.65
2.5</td></tr>
</table>

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

Check Item	Classification	Criteria
No Display	Major	
Missing Line	Major	 
Pixel Short	Major	
Darker Short	Major	
Wrong Display	Major	
Un-uniform B/A x 100% < 70% A/C x 100% < 70%	Major	

11.Precautions in use of OLED Modules

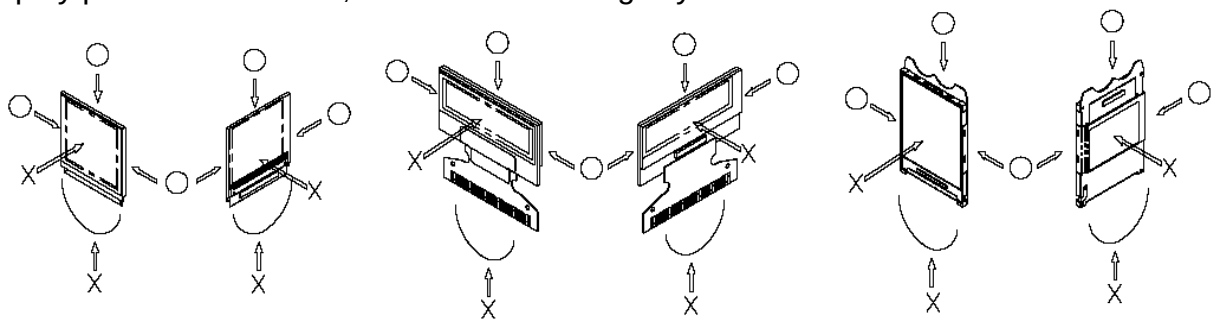
Modules

(1) Avoid applying excessive shocks to module or making any alterations or modifications to it.
(2) Don't make extra holes on the printed circuit board, change the components or modify its shape of OLED display module.
(3) Don't disassemble the OLED display module.
(4) Do not apply input signals while the logic power is off.
(5) Don't operate it above the absolute maximum rating.
(6) Don't drop, bend or twist OLED display module.
(7) Soldering: only to the I/O terminals.
(8) Hot-Bar FPC soldering condition: 280~350C, less than 5 seconds.
(9) Winstar has the right to change the passive components (Resistors, capacitors and other passive components will have different appearance and color caused by the different supplier.) and change the PCB Rev. (In order to satisfy the supplying stability, management optimization and the best product performance...etc, under the premise of not affecting the electrical characteristics and external dimensions, Winstar have the right to modify the version.)
(10) Winstar has the right to upgrade or modify the product function.

11.1. Handling Precautions

(1) Since the display panel is being made of glass, do not apply mechanical impacts such as dropping from a high position.
(2) If the display panel is broken by some accident and the internal organic substance leaks out, be careful not to inhale nor lick the organic substance.
(3) If pressure is applied to the display surface or its neighborhood of the OLED display module, the cell structure may be damaged. So, be careful not to apply pressure to these sections.
(4) The polarizer covering the surface of the OLED display module is soft and easily scratched.
(5) When the surface of the polarizer of the OLED display module has soil, clean the surface. It takes advantage by using following adhesion tape.
* Scotch Mending Tape No. 810 or an equivalent
Never try to breathe upon the soiled surface nor wipe the surface using cloth containing solvent such as ethyl alcohol, since the surface of the polarizer will become cloudy.
Also, pay attention that the following liquid and solvent may spoil the polarizer:
* Water
* Ketone
* Aromatic Solvents
(6) Protection film is being applied to the surface of the display panel and removes the protection film before assembling it. At this time, if the OLED display module has been stored for a long period of time, residue adhesive material of the protection film may remain on the surface of the display panel after removed of the film. In such case, remove the residue material by the method introduced in the above Section 5.
(7) Do not touch the following sections whenever possible while handling the OLED display modules.
* Pins and electrodes
* Pattern layouts such as the TCP & FPC
(8) Hold OLED display module very carefully when placing OLED display module into the System housing. Do not apply excessive stress or pressure to OLED display module. And, do not over bend the film with electrode pattern layouts. These stresses will influence the

display performance. Also, secure sufficient rigidity for the outer cases.



(9) Do not apply stress to the LSI chips and the surrounding molded sections.

(10) Pay sufficient attention to the working environments when handing OLED display modules to prevent occurrence of element breakage accidents by static electricity.
* Be sure to make human body grounding when handling OLED display modules.
* Be sure to ground tools to use or assembly such as soldering irons.
* To suppress generation of static electricity, avoid carrying out assembly work under dry environments.
* Protective film is being applied to the surface of the display panel of the OLED display module. Be careful since static electricity may be generated when exfoliating the protective film.

11.2. Storage Precautions

(1) When storing OLED display modules, put them in static electricity preventive bags to avoid be directly exposed to sun or lights of fluorescent lamps. (We recommend you to store these modules in the packaged state when they were shipped from Winstar. At that time, be careful not to let water drops adhere to the packages or bags.)

(2) When the OLED display module is being dewed or when it is placed under high temperature or high humidity environments, the electrodes may be corroded if electric current is applied. Please store it in clean environment.

11.3. Designing Precautions

(1) The absolute maximum ratings are the ratings which cannot be exceeded for OLED display module, and if these values are exceeded, OLED display module may be damaged.

(2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specification and to make the signal line cable as short as possible.

(3) We recommend you to install excess current preventive unit (fuses, etc.) to the power circuit (VDD / VCC). (Recommend value: 0.5A)

(4) Pay sufficient attention to avoid occurrence of mutual noise interference with the nearby devices.

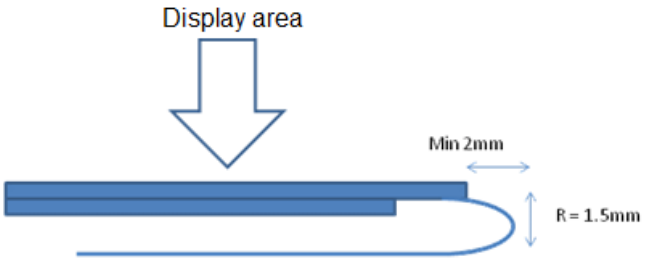
(5) As for EMI, take necessary measures on the equipment side basically.

(6) If the power supplied to the OLED display module is forcibly shut down by such errors as taking out the main battery while the OLED display panel is in operation, we cannot guarantee the quality of this OLED display module.
* Connection (contact) to any other potential than the above may lead to rupture of the IC.

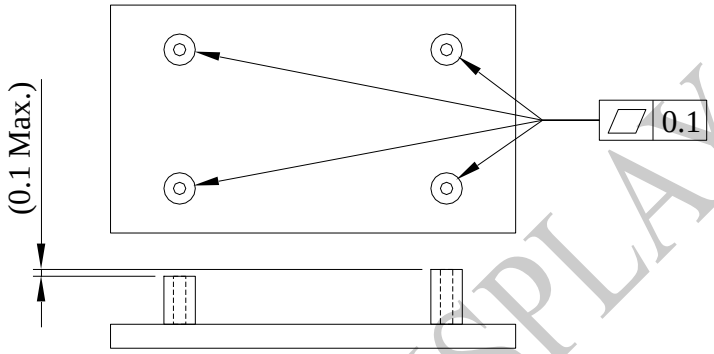
(7) If this OLED driver is exposed to light, malfunctioning may occur and semiconductor elements may change their characteristics.

(8) The internal status may be changed, if excessive external noise enters into the module. Therefore, it is necessary to take appropriate measures to suppress noise generation or to protect module from influences of noise on the system design.

(9) We recommend you to make periodical refreshment of the operation statuses (re-setting of the commands and re-transference of the display data) to cope with catastrophic noise.
(10) It's pretty common to use "Screen Saver" to extend the lifetime and Don't use the same image for long time in real application. When an OLED display module is operated for a long of time with fixed pattern, an afterimage or slight contrast deviation may occur.
(11) The limitation of FPC and Film bending.



(12) The module should be fixed balanced into the housing, or the module may be twisted.



11.4. Precautions when disposing of the OLED display modules

(1) Request the qualified companies to handle industrial wastes when disposing of the OLED display modules. Or, when burning them, be sure to observe the environmental and hygienic laws and regulations.