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WINSTAR Display

OLED SPECIFICATION

Model No:

WEA012832ELAP3N00000

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SPECIFICATION Version: 0

CUSTOMER :	
MODULE NO. :	**WEA012832ELAP3N00000**

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

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MODEL NO：

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2025/02/26		First release

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1.Module Classification Information

W	E	A	012832	E	L	A	P	3	N	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：COF	
		A：COG + PCB	N：COF + FR + PCB	
4	Dot Matrix： 128 * 32			
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: With touch panel		
11	Product type	0：Standard		
12	Inspection Grade	0：Standard		
13	Option	0：Default		
14	Serial No.	Serial number(00~99)		

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2.General Specification

Item	Dimension	Unit
Dot Matrix	128 x 32 Dots	—
Module dimension	35.4 × 23.5 × 1.8	mm
Active Area	25.58 × 6.38	mm
Pixel Size	0.176 × 0.176	mm
Pixel Pitch	0.200× 0.200	mm
Display Mode	Passive Matrix	
Display Color	Yellow	
Drive Duty	1/32 Duty	
IC	SSD1306	
Font IC	GT21L16T1W	
Interface	SPI	
Size	1.04 inch	

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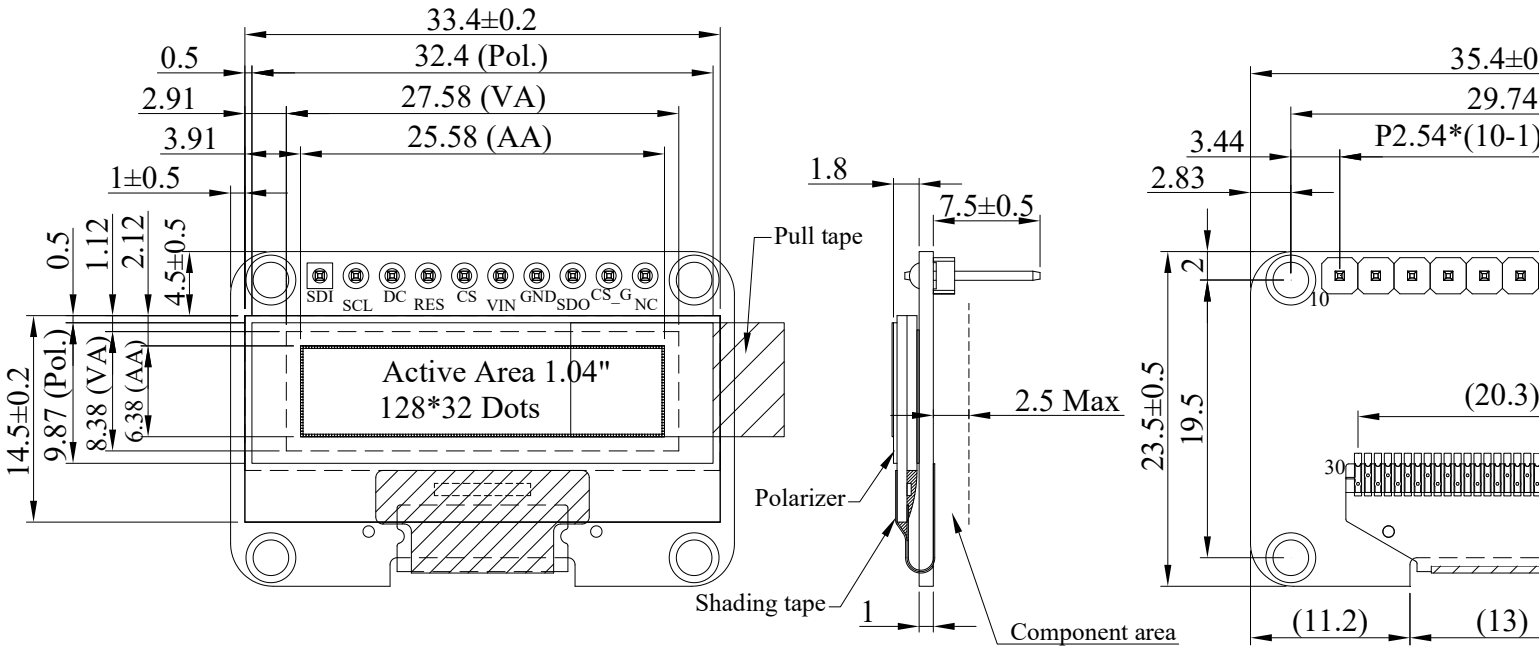
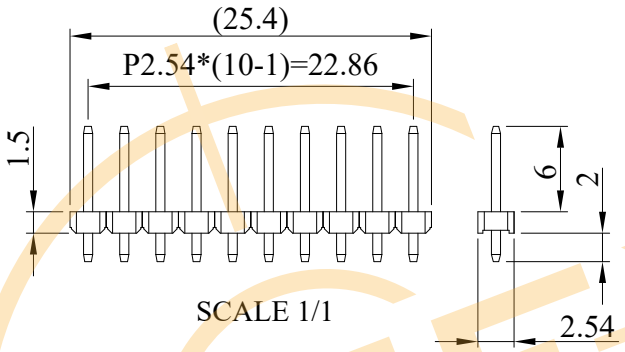
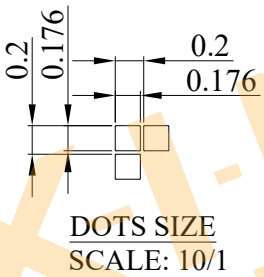
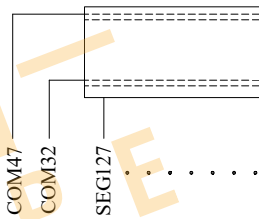
3. Contour Drawing & Block Diagram









The non-specified tolera

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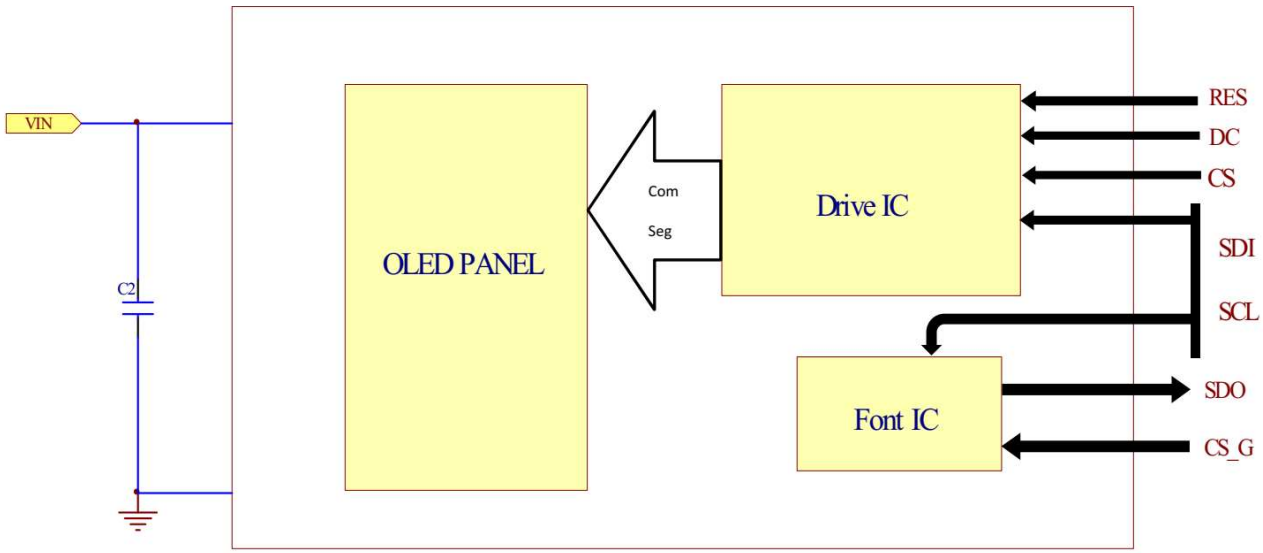
3.1 Application recommendations



C2: 1.0uF (1)

Note
(1) The capacitor value is recommended value. Select appropriate value against module application.

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4. Interface Pin Function

No.	Symbol	Function
1	SDI	Serial data input This pin connects font IC of SDI and OLED drive IC of SDI.
2	SCL	Serial clock input This pin connects font IC of SCL and OLED drive IC of SCL.
3	DC	This is Data/Command control pin.
4	RES	This pin is reset signal input. When the pin is pulled LOW, initialization of the chip is executed.
5	CS	This pin is the chip select input. (active LOW).
6	VIN	Input voltage for 2.8 ~ 5.2V power supply.
7	GND	This is a ground pin.
8	SDO	Serial Data Output for font IC. Data is shifted out on the falling edge of the serial clock.
9	CS_G	Chip Select input for font IC. This pin is the chip select input. (active LOW).
10	NC	Not connection

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5.Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for input	VIN	2	7	V	1,2
Operating Temperature	TOP	-40	+80	°C	—
Storage Temperature	TSTG	-40	+85	°C	—

Note ：

1. All the above voltages are on the basis of “VSS = 0V”.
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.
3. The absolute limit temperature was verified according to the test conditions of reliability test (See section 9. Reliability) , and module was met all criteria.
4. The defined temperature ranges do not include the polarizer. The maximum withstood temperature of the polarizer should be 80 °C.

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6.Electrical Characteristics

6.1 DC Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Input	VIN	–	2.8	3.0	5.2	V
Input High Volt.	VIH	–	0.8×VIN	–	VIN	V
Input Low Volt.	VIL	–	0	–	0.2×VIN	V
Output High Volt.	VOH	–	0.9×VIN	–	VIN	V
Output Low Volt.	VOL	–	0	–	0.1×VIN	V
Display 50% Pixel on	I_{IN}	VIN=3V	–	15	22.5	mA

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6.2 Initial code

```
void Initial_SSD1306(){

        Write_command(0xAE);    // Display Off

        Write_command(0xD5);    //SET DISPLAY CLOCK
        Write_command(0x81);

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

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

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

        Write_command(0x8D);    //Set Charge Pump
        Write_command(0x14);    //Enable Charge Pump

        Write_command(0xAD);    //Internal IREF Setting
        Write_command(0x30);    //Enable Internal IREF

        Write_command(0xA1);     //0xA1 => Column Address is 127 Mapped to SEG0
                                 //0xA0 => Column Address is 0 Mapped to SEG127

         Write_command(0xC8);     //0xC8 => Scan from COM[N-1] to 0
                                  //0xC0 => Scan from 0 to COM[N-1]

        Write_command(0xDA);    //Set COM Hardware Configuration
        Write_command(0x12);    //Alternative COM Pin

        Write_command(0x81);    //Set Contrast Control
        Write_command(0x1F);

        Write_command(0xD9);    //Set Pre-Charge period
        Write_command(0x22);

        Write_command(0xDB);    //Set Deselect Vcomh level
        Write_command(0x30);

        Write_command(0xA4);    //Entire Display ON

        Write_command(0xA6);    //Set Normal Display

        Write_command(0xAF);    //Display ON

}
```

Note1: Initial code is for reference only. Please make the best adjustment with the OLED module.
Note2: Command: Set Contrast Control (0x81) , This command sets the Contrast Setting of the display. The chip has 255 contrast steps from 01h to FFh. The segment output current increases as the contrast step value increases. The segment current increases, the OLED brightness increases.

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6.3 Font Chip Content

GT21L16T1W is a 15X16 dots fonts chip, it supports Chinese standard GB12345 traditional Chinese character set (with official license from NIT), BIG5 traditional Chinese character basic set, Japanese standard JIS0208 Japanese character set(compatible with Unicode), and a total of 150 countries' character.

The data is arrayed byte horizontally and string horizontally.

Type	Content	Character set	Characters
Chinese Font	15X16 dots GB12345 font	GB12345	6866+846
	15X16 dots BIG5 basic font	BIG5	5401+408
Japanese	15X16 dots JIS0208 basic font	JIS0208	6398+1644
ASCII font	5X7 dots ASCII font	ASCII	96
	7X8 dots ASCII font	ASCII	96
	6X12 dots ASCII font	ASCII	96
	8X16 dots ASCII font	ASCII	96
	8X16 dots bold ASCII font	ASCII	96
	12 dots Arial font	ASCII	96
	16 dots Arial font	ASCII	96
Unicode font	8X16 dots Latin font	Unicode	376
	8X16 dots Greek font	Unicode	96
	8X16 dots Cyril font	Unicode	250
	12 dots Unicode font (Latin, Greek, Cyril)	Unicode	555
	16 dots Unicode font (Latin, Greek, Cyril)	Unicode	555
	12 dots Arabia font	Unicode	250
	12 dots Arabia extendable font	Customize	498
	16 dots Arabia font	Unicode	250
	16 dots Arabia extendable font	Customize	498
Character set index table	BIG5 index table	BIG5	
	JIS0208 index table	JIS0208	
	Unicode index table	Unicode	

Character Checklist

Language serial	language	country	Latin countries	countries
Latin	English	UK,USA etc.	39	112
	French	France, Niger etc.	22	
	Spanish	Mexico, Spain etc.	22	
	Portuguese	Portugal, Brazil etc.	7	
	German	Germany, Austria etc.	5	
	Italian	Italy, San Marino etc.	3	
	Malay	Malaysia, Brunei etc.	2	
	Swahili	Tanzania, Kenya etc.	2	
	other	Netherlands, Sweden etc.	10	
Arabian	Arabian	Egypt, Jordan etc.		21
Cyril	12 languages	Russia, Kazakhstan etc.		15
Greek	Greek	Greece, Cyprus etc.		2
				Sum 150

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Instruction parameter

Instruction Set

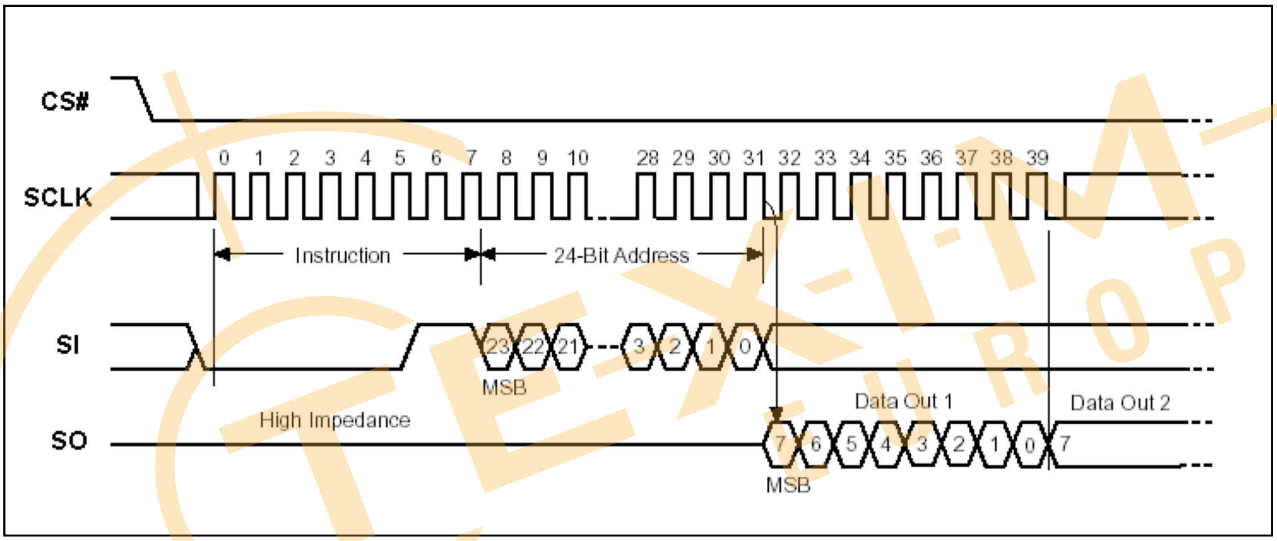
Instruction	Description	Instruction Code(One-Byte)		Address Bytes	Dummy Bytes	Data Bytes
READ	Read Data Bytes	0000 0011	03 h	3	—	1 to ∞
FAST_READ	Read Data Bytes at Higher Speed	0000 1011	0B h	3	1	1 to ∞

6.3.1 Read Data Bytes.

The Read instruction supports up to 20 MHz, It outputs the data starting from the specified address location. The data output stream is continuous through all addresses until terminated by a low to high transition on CS#. The internal address pointer will automatically increment.

The Read instruction is initiated by executing an 8-bit command,03H, followed by address bits[A23-A0]. CS# must remain active low for the duration of the Read cycle.

Figure：Read Data Bytes (READ) Instruction Sequence and Data-out sequence:



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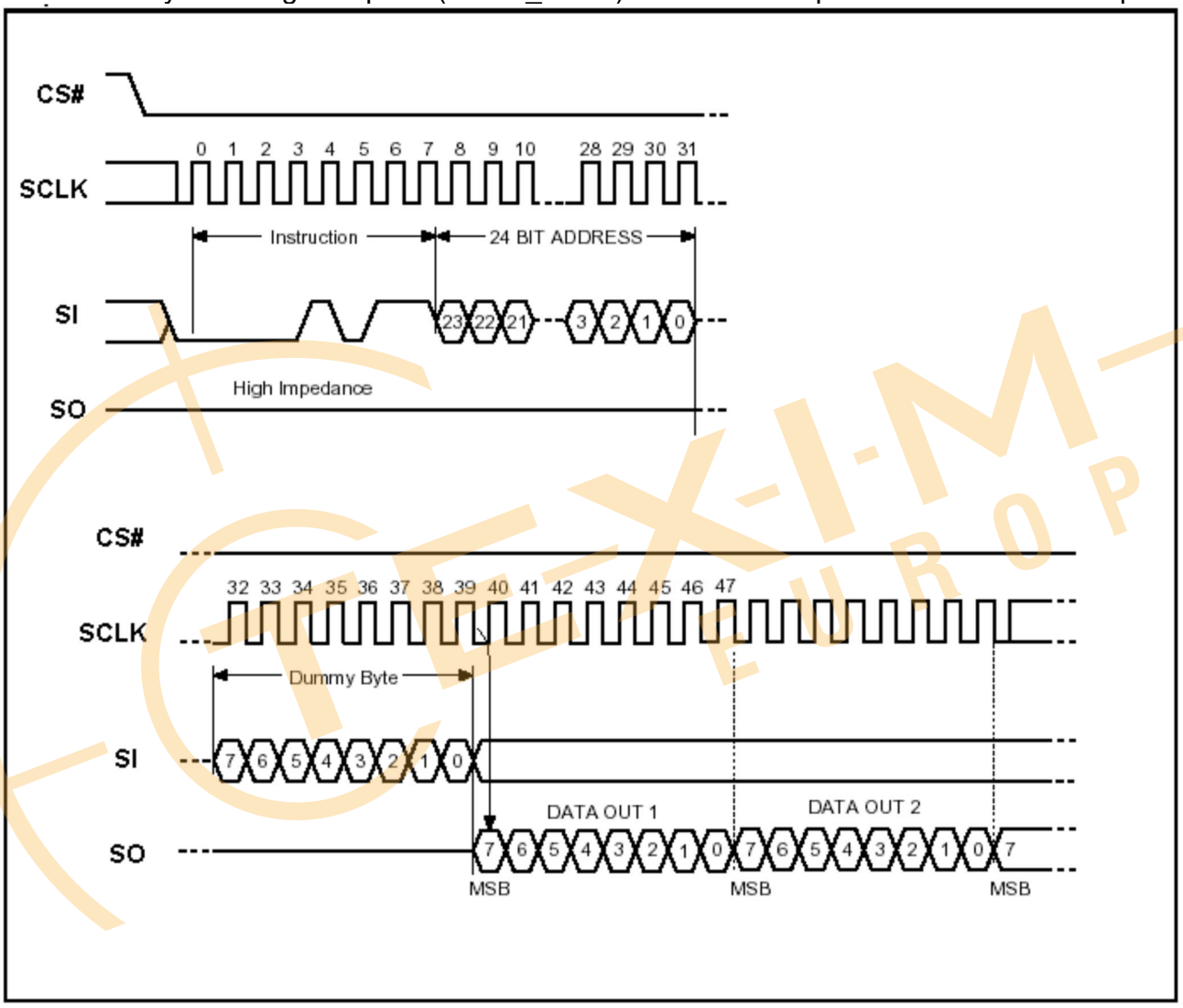
6.3.2 Read Data Bytes at Higher Speed

The High-Speed-Read instruction supporting up to 30 MHz is initiated by executing an 8-bit command, 0BH, followed by address bits [A23-A0] and a dummy byte. CS# must remain active low for the duration of the High-Speed-Read cycle.
Following a dummy byte (8 clocks input dummy cycle), the High-Speed-Read instruction outputs the data starting from the specified address location. The data output stream is continuous through all addresses until terminated by a low to high transition on CS#. The internal address pointer will automatically increment.
Read Data Bytes at Higher Speed (READ_FAST) Instruction Sequence and Data-out sequence:



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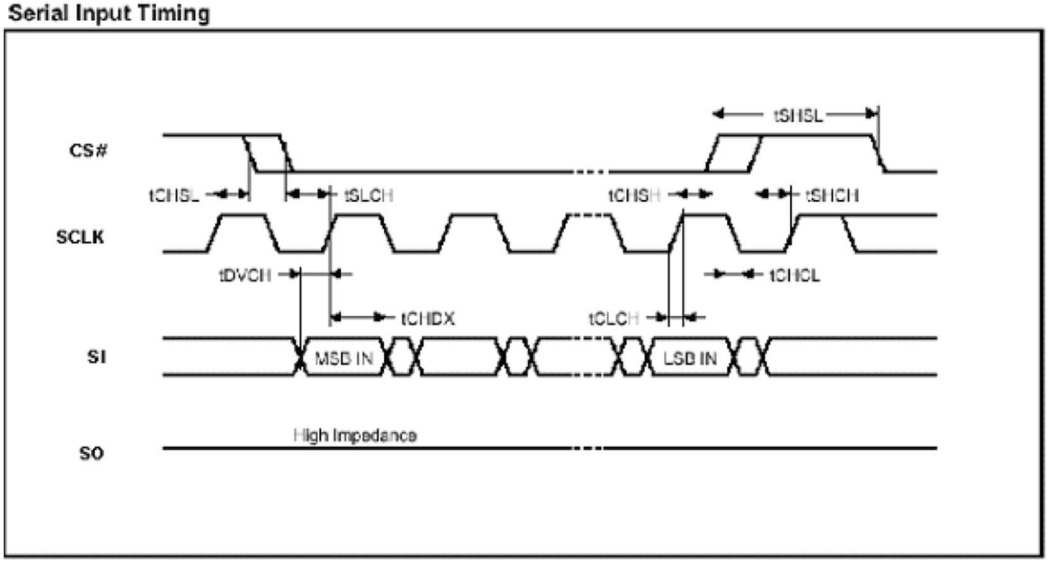
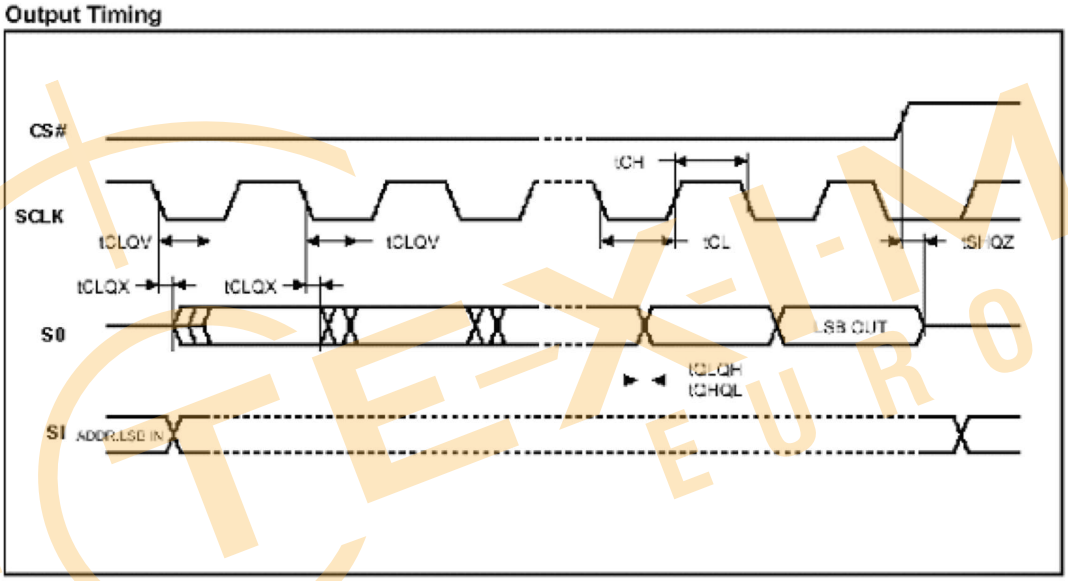
6.3.3 AC characteristic

Serial Input Timing



Output Timing



Symbol	Alt.	Parameter	Min.	Max.	Unit
Fc	Fc	Clock Frequency	D.C.	30	MHz
tCH	tCLH	Clock High Time	15		ns
tCL	tCLL	Clock Low Time	15		ns
tCLCH		Clock Rise Time(peak to peak)	0.1		V/ns
tCHCL		Clock Fall Time (peak to peak)	0.1		V/ns
tSLCH	tCSS	CS# Active Setup Time (relative to SCLK)	5		ns
tCHSL		CS# Not Active Hold Time (relative to SCLK)	5		ns
tDVCH	tDSU	Data In Setup Time	2		ns
tCHDX	tDH	Data In Hold Time	5		ns
t CHSH		CS# Active Hold Time (relative to SCLK)	5		ns
t SHCH		CS# Not Active Setup Time (relative to SCLK)	5		ns
t SHSL	tCSH	CS# Deselect Time	100		ns
t SHQZ	tDIS	Output Disable Time		9	ns
t CLQV	tV	Clock Low to Output Valid		9	ns
t CLQX	tHO	Output Hold Time	0		ns
t HLCH		HOLD# Setup Time (relative to SCLK)	5		ns
t CHHH		HOLD# Hold Time (relative to SCLK)	5		ns
t HHCH		HOLD Setup Time (relative to SCLK)	5		ns
t CHHL		HOLD Hold Time (relative to SCLK)	5		ns
t HHQX	tLZ	HOLD to Output Low-Z		9	ns
t HLQZ	tHZ	HOLD# to Output High-Z		9	ns

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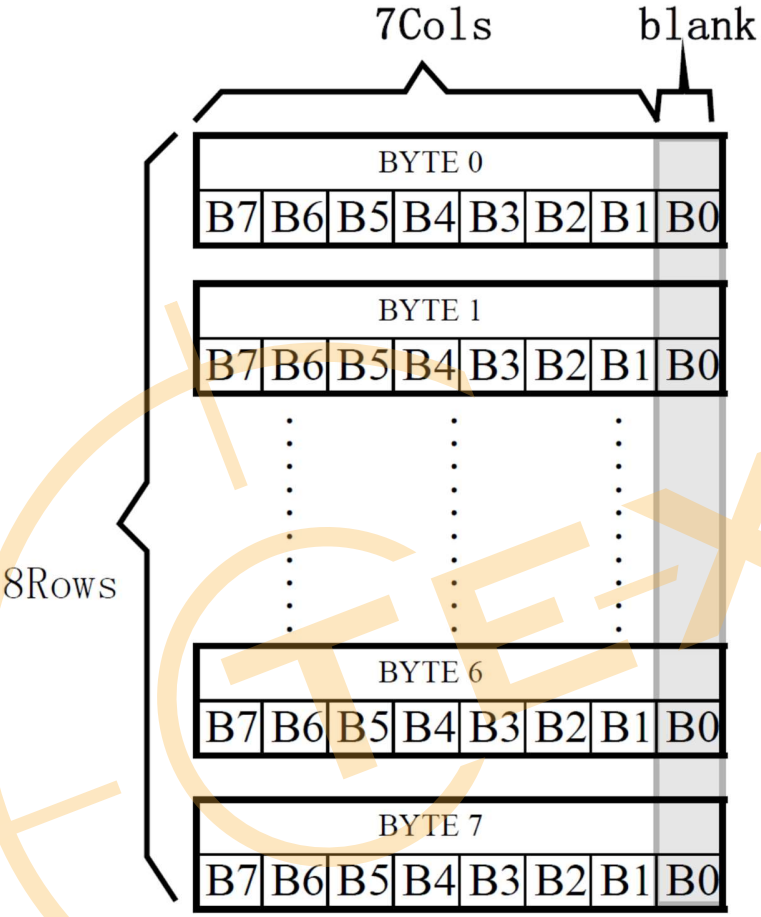
6.3.4 Font Read Method

Character dots arrangement

The data arrangement is byte horizontal, string horizontal. The highest Bit of BYTE represent left point, the lowest Bit of BYTE represent right point.

6.3.4.1 7X8 dots ASCII font

7X8 dots ASCII font has 8 bytes（BYTE 0 – BYTE7）data.



Calculation of character address for 7X8 dots ASCII

7X8 dots ASCII font Parameters:
ASCIICode: ASCII code(8 bits)
BaseAdd: the base address of the font in chip
Address: address of character data in chip.
Calculation of character address:
BaseAdd=0x51C80
if (ASCIICode >= 0x20) and (ASCIICode <= 0x7E) then
Address = (ASCIICode –0x20) * 8+BaseAdd

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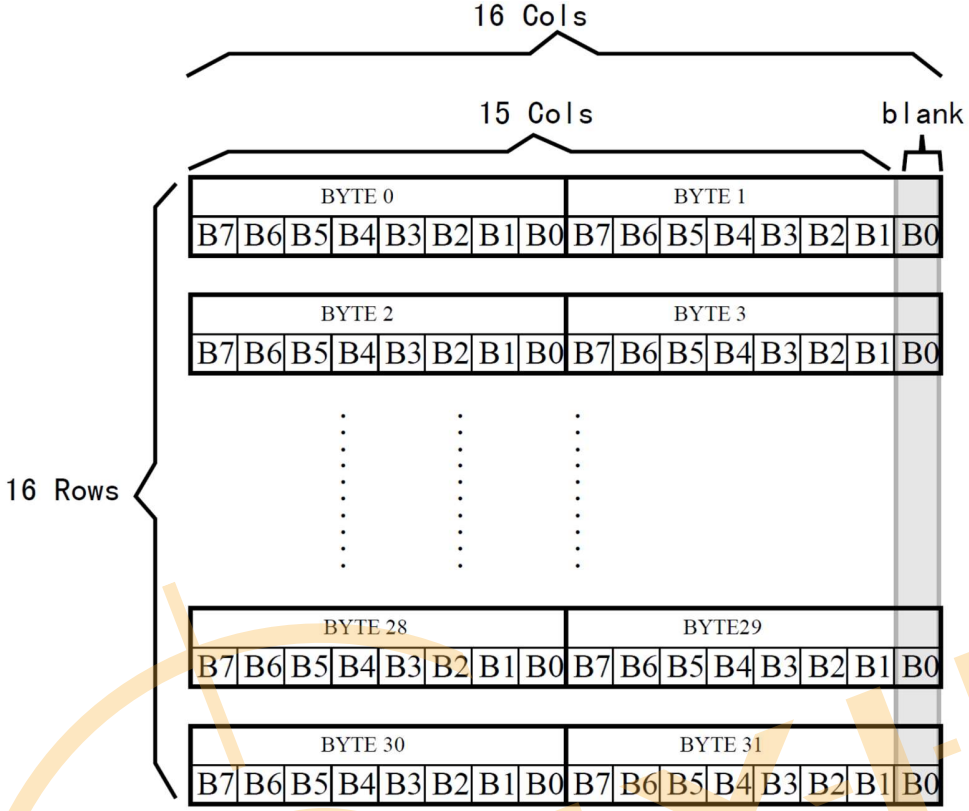
6.3.4.2 15X16 dots GB12345 font

15X16 dots font has 32 bytes (BYTE 0 – BYTE 31)data。



Calculation of character address for 15X16 dots GB12345

15X16 dots GB12345 font Parameters:
GBCode: character code.
MSB: high byte of GBCode.
LSB: low byte of GBCode.
Address: address of character data in chip.
BaseAdd: the base address of the font in chip
Calculation of character address:
BaseAdd=0x00;
if(MSB >=0xA1 && MSB <= 0Xa9 && LSB >=0xA1)
Address =((MSB - 0xA1) * 94 + (LSB - 0xA1))*32+ BaseAdd;
else if(MSB >=0xB0 && MSB <= 0Xf9 && LSB >=0xA1)
Address = ((MSB - 0xB0) * 94 + (LSB - 0xA1)+ 1038)*32+ BaseAdd;

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6.3.4.3 Example: The Read Data Bytes from Font Chip Content

- Set the ASCII Code is 41H, then use “Calculation of character address”, and can get Address of data bits [A23-A0].
- The Read instruction is initiated by executing an 8-bit command, 0BH or B3H, followed by address bits [A23-A0]. As shown in Figure 1.
- The data output stream is continuous through all addresses until terminated by a low to high transition on CS#. The internal address pointer will automatically increment as shown in Figure 1.
- The data output (1~8) can be written into OLED RAM as shown in Figure 2.

Figure 1

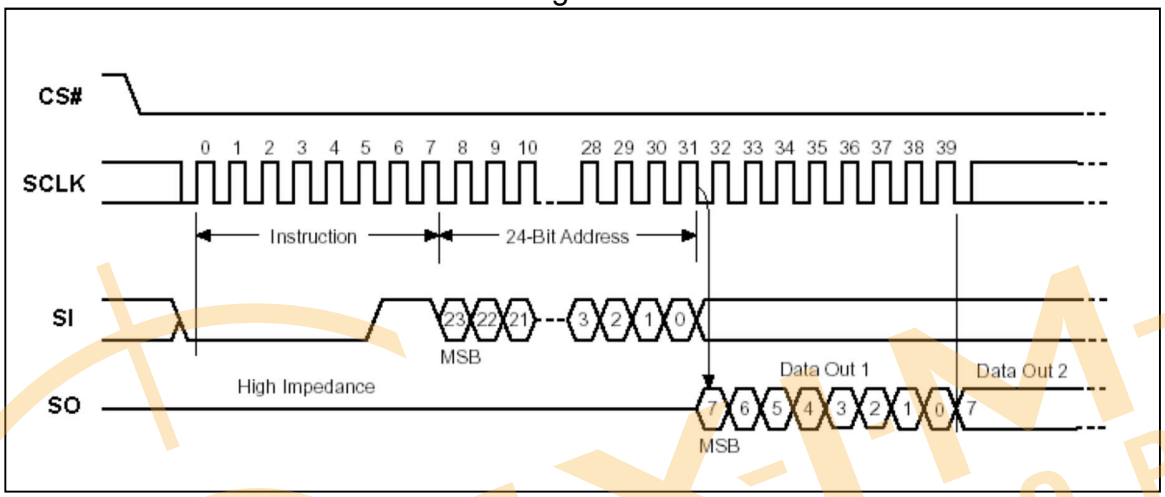
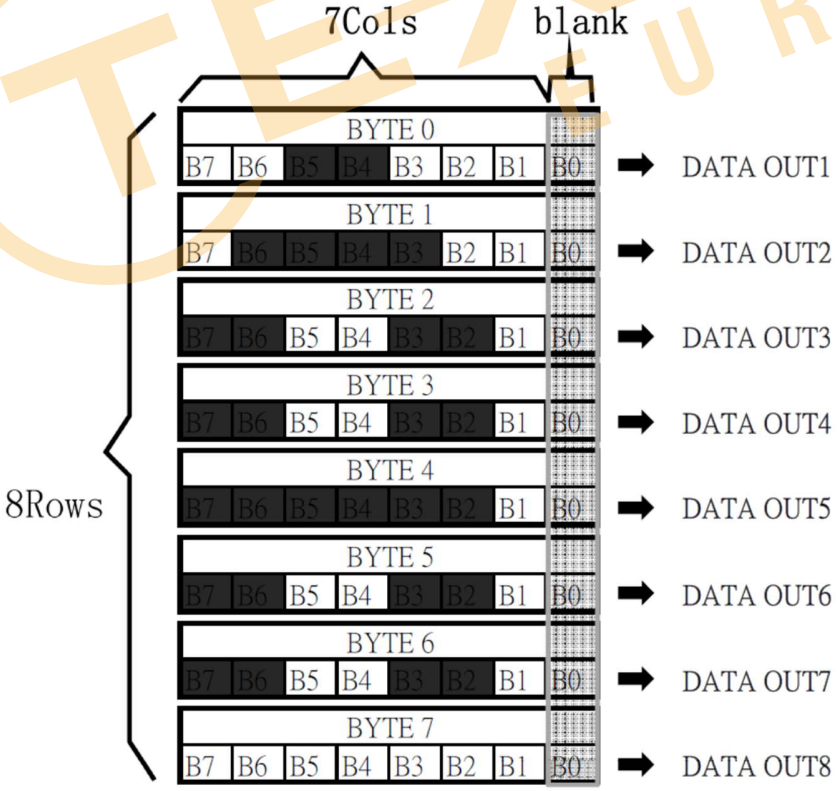


Figure 2



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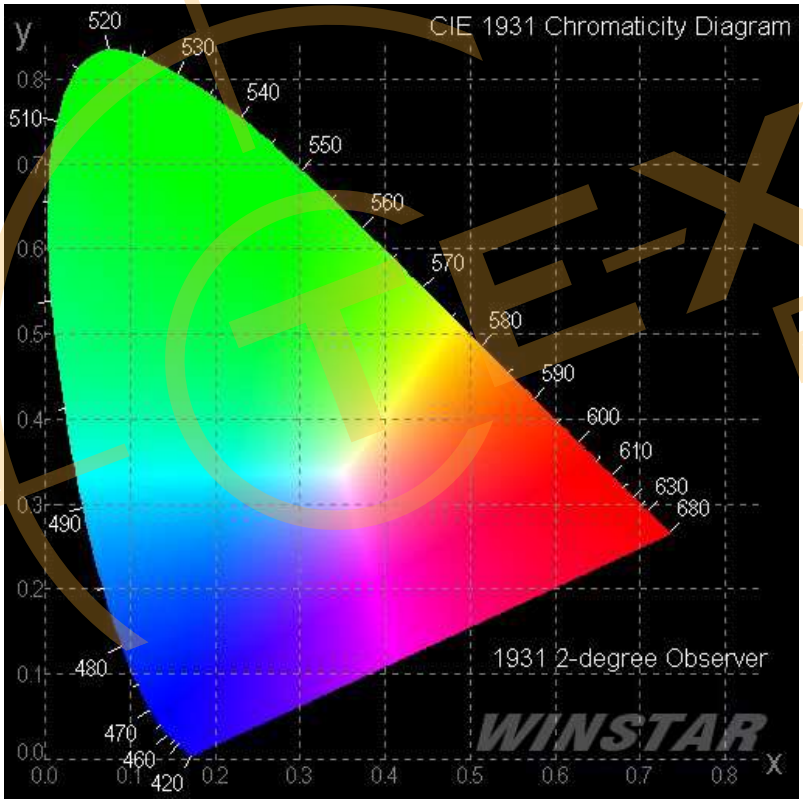
7.Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ	—	160	—	—	deg
	(H)φ	—	160	—	—	deg
Contrast Ratio	CR	Dark	10,000:1	—	—	—
Response Time	T rise	—	—	10	—	μs
	T fall	—	—	10	—	μs
Display with 100% checkerboard Brightness			100	120	—	cd/m²
CIEx(Yellow)		(CIE1931)	0.45	0.47	0.49	—
CIEy(Yellow)		(CIE1931)	0.48	0.50	0.52	—



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8.OLED Lifetime

ITEM	Conditions	Min	Typ	Remark
Operating Life Time	Ta=25°C / Initial 50% checkerboard brightness 100cd/m^2	50,000 Hrs	—	Note

Note:

1. Lifetime is defined the amount of time when the luminance has decayed to <50% of the minimal brightness.
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.
4. Lifetime is not guaranteed one but expected lifetime in normal condition.

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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.	85°C 240hrs	___
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-40°C 240hrs	___
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	80°C 240hrs	___
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-40°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. -40°C 25°C 80°C 30min 5min 30min 1 cycle	-40°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°C

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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 functional test at 23±5°C; 55±15% RH.
2. All-pixels on/off exchange is used as operation test pattern.
3. The degradation of Polarizer are ignored for High Temperature storage, High Temperature/ Humidity Storage, Temperature Cycle.
4. No Condensation.

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.

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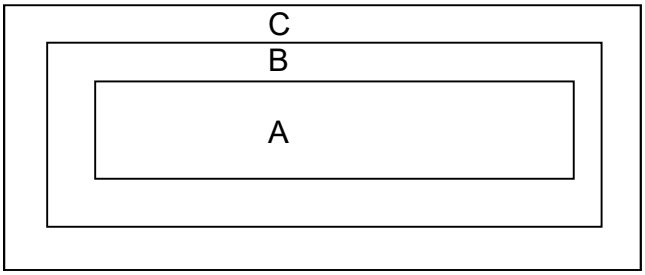
10.Inspection specification

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

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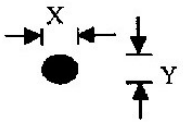
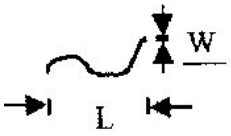
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td rowspan="2">03</td><td>OLED black spots, white spots, contamination (non-display)</td><td>3.1 Round type : As following drawing
Φ=(x + y) / 2
 
<table>
<tr><th>SIZE</th><th>Acceptable QTY</th><th>Zone</th></tr>
<tr><td>Φ≦0.10</td><td>ignore</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>ignore</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 /Dent</td><td>4.1 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>ignore</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>
4.2 The polarizer dent follows this specification.</td><td>2.5</td></tr>
<tr><td>05</td><td>Scratches</td><td>Follow NO.3 OLED black spots, white spots, contamination.</td><td></td></tr>
</table>

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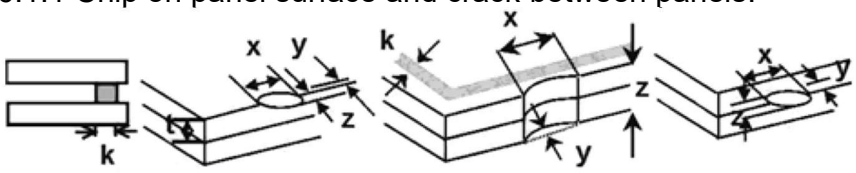
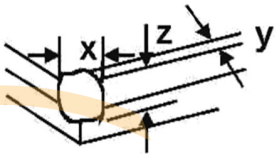
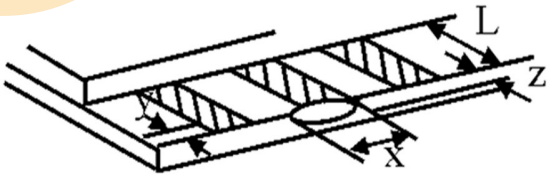
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>06</td><td>Chipped glass</td><td>
Symbols Define:
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Glass thickness a: OLED side length
L: Electrode pad length:
6.1 General glass chip :
6.1.1 Chip on panel surface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


<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></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><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></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><th>y: Chip width</th><th>x: Chip length</th><th>z: Chip thickness</th></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>

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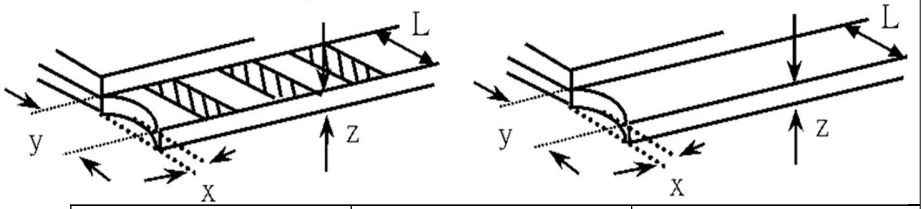
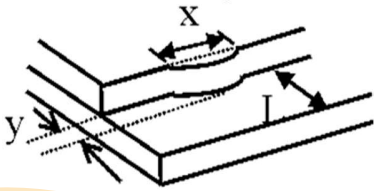
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>06</td><td>Glass crack</td><td>6.2.2 Non-conductive portion:
 

<table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></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><td>y: width</td><td>x: length</td></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>

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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 2.5 0.65 0.65 0.65 0.65

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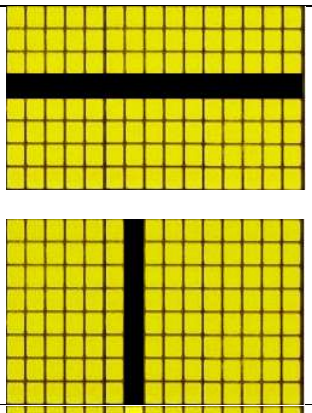
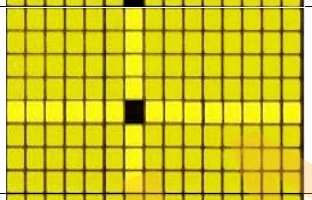
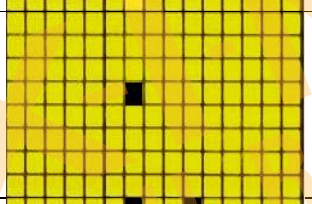
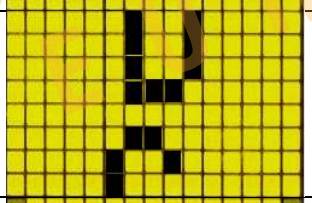
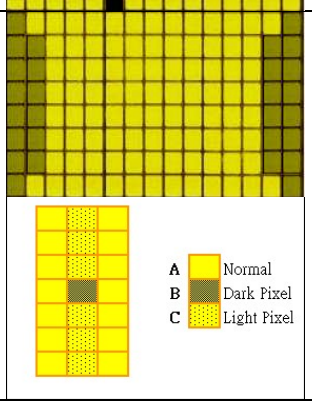
Check Item	Classification	Criteria
No Display	Major	
Missing Line	Major	
Pixel Short	Major	
Dark Pixel	Major	
Wrong Display	Major	
Un-uniform B/A x 100% < 70% A/C x 100% < 70%	Major	

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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) For COG & COF structure OLED products, customers should reserve VCC (VPP) adjustment function or software update function when designing OLED supporting circuit. (The progress of OLED light-emitting materials will increase the conversion efficiency and the brightness. The brightness can be adjusted if necessary).

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

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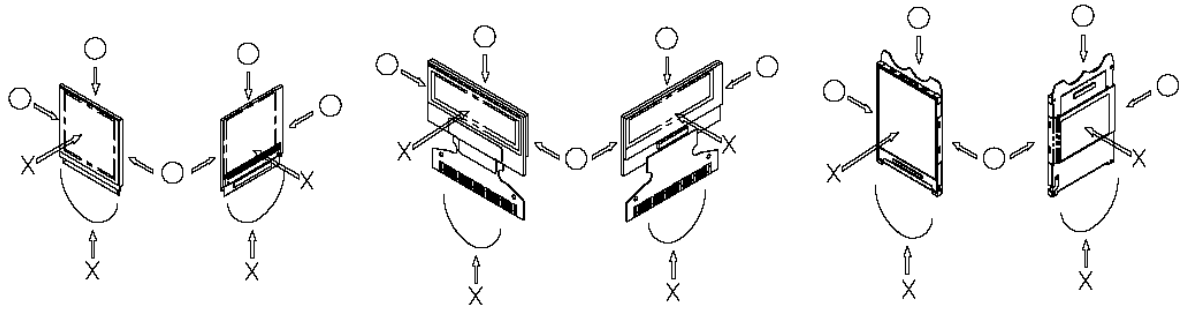
(8) Hold OLED display module very carefully when placing OLED display module into the System housing. Do not apply excessive stress or pressure to OLED display module. And, do not over bend the film with electrode pattern layouts. These stresses will influence the display performance. Also, secure sufficient 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. And, also, place in the temperature 25±5°C and Humidity below 65% RH.(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.

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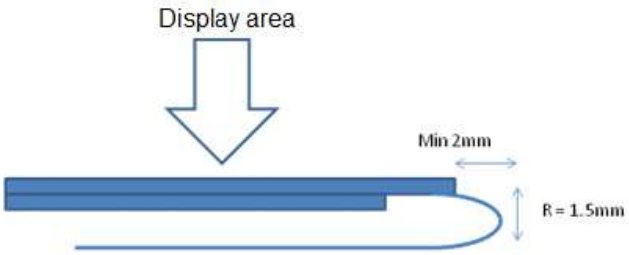
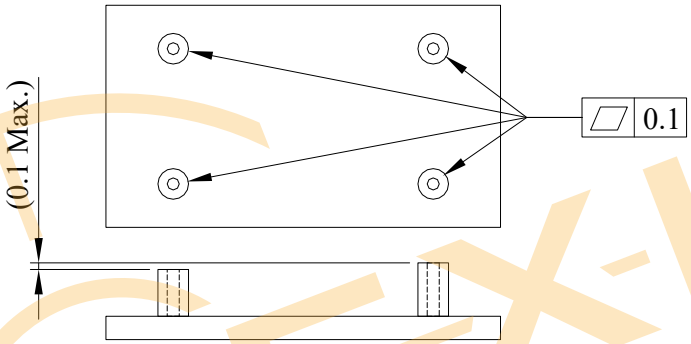
(8) The internal status may be changed, if excessive external noise enters into the module. Therefore, it is necessary to take appropriate measures to suppress noise generation or to protect module from influences of noise on the system design.
(9) We recommend you to make periodical refreshment of the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



(13) Please heat up a little the tape sticking on the components when removing it; otherwise the components might be damaged.

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.

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Please contact us if you have any questions about the contents of the datasheet.

This may not be the latest version of the datasheet. Please check with us if a later version is available.

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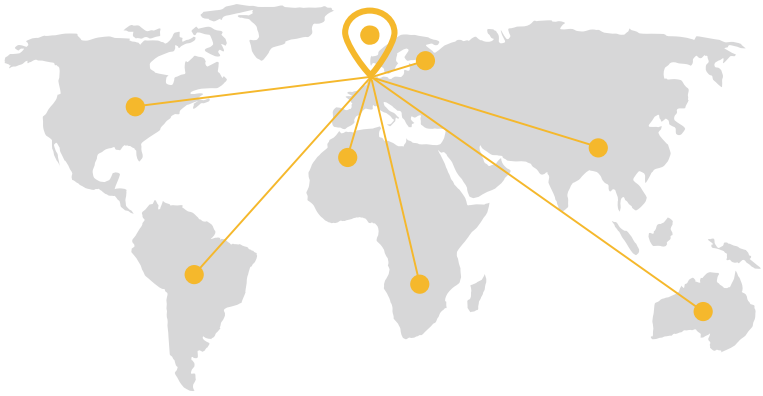

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