






DOCUMENT NUMBER AND REVISION  
**VL-PS-OLM-O095CNC-02 REV. A**  
**(OLM-O095CNC)**

DOCUMENT TITLE:  
**PRELIMINARY SPECIFICATION**  
**OF**  
**OLED MODULE TYPE**  
**MODEL NUMBER: OLM-O095CNC-02**

DEPARTMENT	NAME	SIGNATURE	DATE
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**VARITRONIX LIMITED**

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**Preliminary Specification  
 of  
 OLED Module Type  
 Module No.: OLM-O095CNC-02**

**1. General Description**

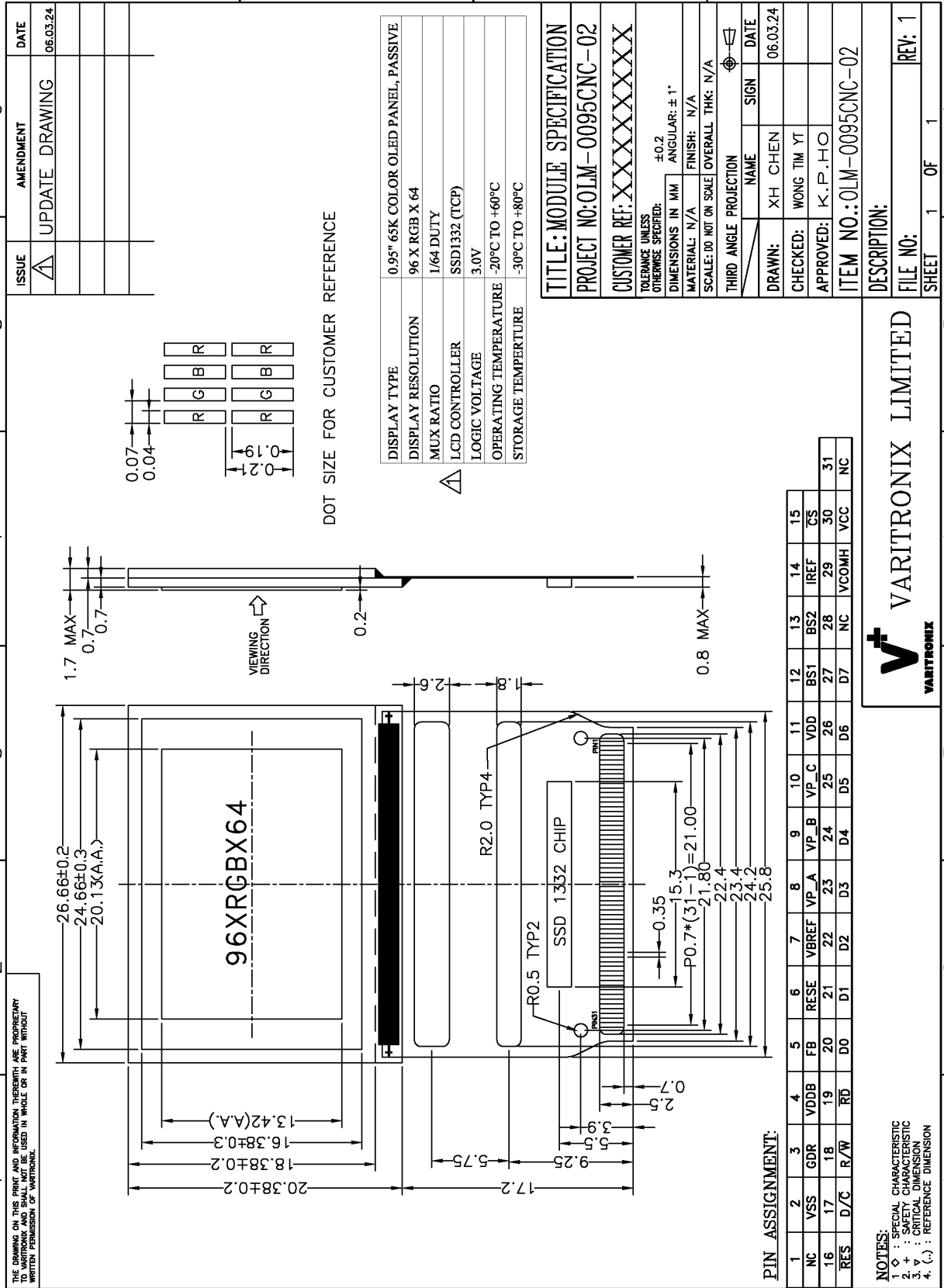
- 96 x RGB x 64 dots, 0.95”(diagonal), 65K color OLED panel, passive, graphic module.
- Driving scheme: 1/64 duty.
- Driving IC: SSD1332 (TCP).
- Logic voltage: 3.0V.
- 8-bit 6800-series parallel interface, 8-bit 8080-series parallel interface or serial peripheral interface.

**2. Mechanical Specifications**

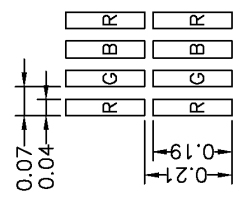
The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameter	Specifications	Unit
Outline dimensions	26.66(W) x 20.38(H) x 1.70 MAX.(D) (Excluded IC & TCP)	mm
Polarizer size	24.66(W) x 16.38(H)	mm
Active area	20.13(W) x 13.42(H)	mm
Display format	96 x RGB x 64	dots
Dot size	0.18(RGB)(W) x 0.19(H)	mm
Dot spacing	0.03(W) x 0.02(H)	mm
Dot pitch	0.21(RGB)(W) x 0.21(H)	mm
Weight	Approx < 3	grams



DOT SIZE FOR CUSTOMER REFERENCE



DISPLAY TYPE	0.95" 65K COLOR OLED PANEL, PASSIVE
DISPLAY RESOLUTION	96 X RGB X 64
MUX RATIO	1/64 DUTY
LCD CONTROLLER	SSD1332 (TCP)
LOGIC VOLTAGE	3.0V
OPERATING TEMPERATURE	-20°C TO +60°C
STORAGE TEMPERATURE	-30°C TO +80°C

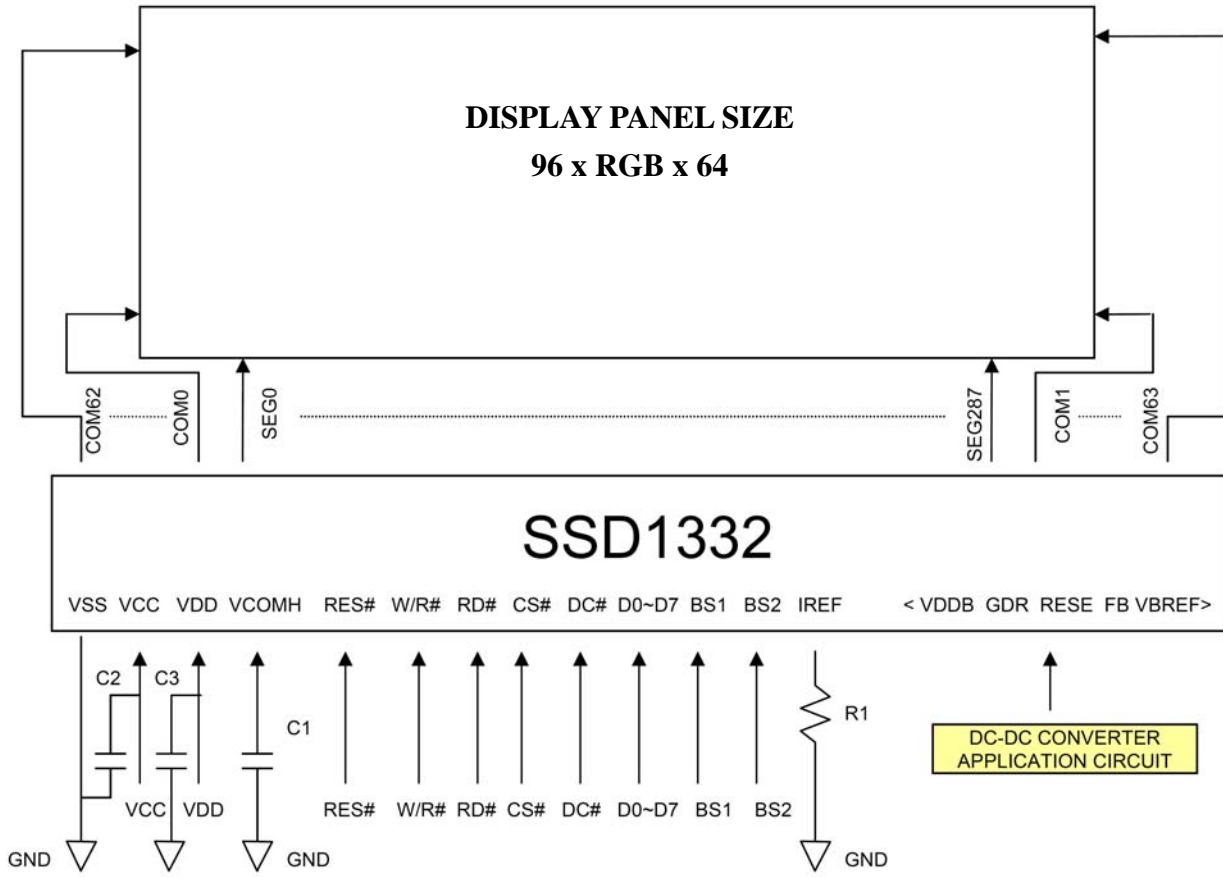
TITLE: MODULE SPECIFICATION  
 PROJECT NO: OLM-0095CNC-02  
 CUSTOMER REF: XXXXXXXXXXXXX

TOLERANCE UNLESS OTHERWISE SPECIFIED:	±0.2
DIMENSIONS IN MM	ANGULAR: ± 1°
MATERIAL:	N/A
FINISH:	N/A
SCALE:	DO NOT ON SCALE OVERALL THK: N/A

THIRD ANGLE PROJECTION		NAME	SIGN	DATE
DRAWN:	XH CHEN			06.03.24
CHECKED:	WONG TIM YI			
APPROVED:	K.P.HO			
ITEM NO.: OLM-0095CNC-02				
DESCRIPTION:				
FILE NO:		REV:	1	
SHEET	1	OF	1	



Figure 1: Outline Drawing



C1,C2 : 4.7uF, 25V

C3 : 4.7uF, 10V

R1 = 910K ohm, 1%

BS1,BS2 connected to VDD to set 8bit 8080 series interface

Pin connected to MCU interface : D7~D0, RD#, D/C#, RES#, CS#, R/W#

Pin floated : RESE, FB, VBREF, GDR

Figure 2: Block Diagram

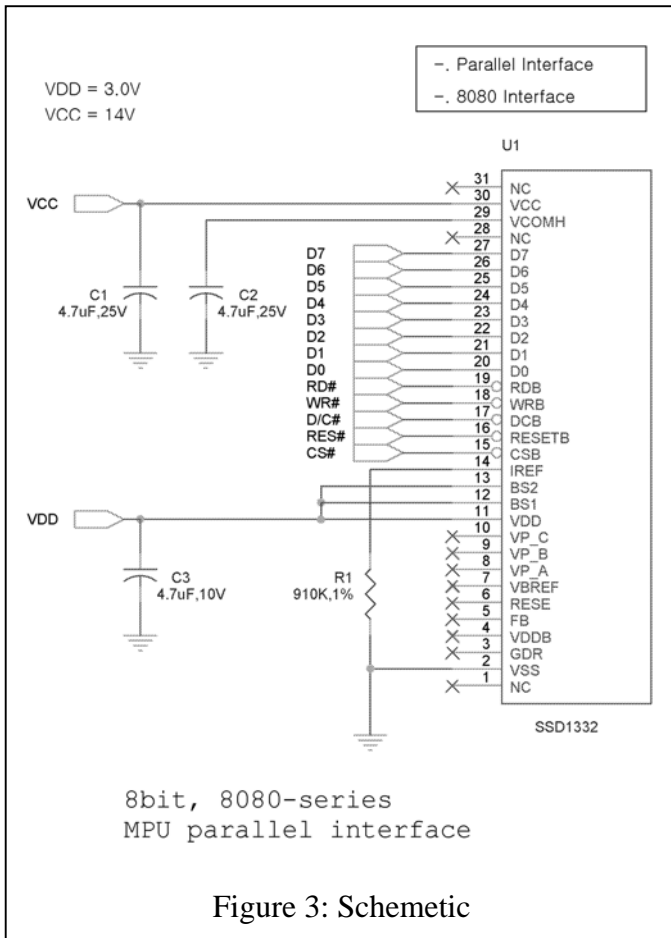


Figure 3: Schematic

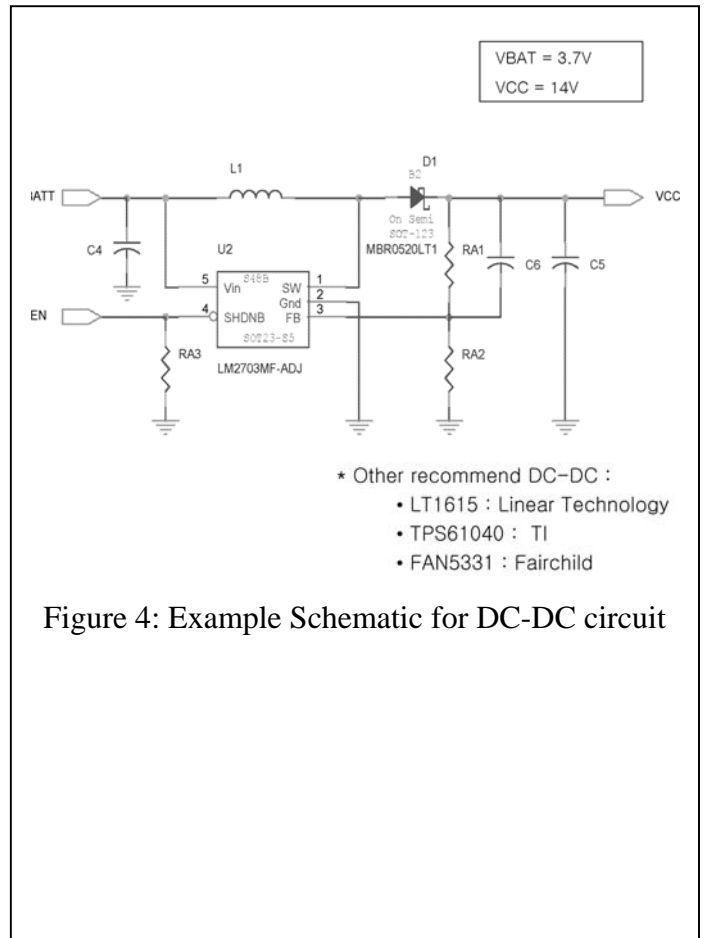


Figure 4: Example Schematic for DC-DC circuit

Table 2: Part List

No.	Item	Spec	Maker	#	Ref. No.	Remark
1	Resistor	910K, 1%	-	1	R1	
2	Resistor	51K, 1%	-	1	RA1	VCC=14V
3	Resistor	4.7K, 1%	-	1	RA2	VCC=14V
4	Resistor	10K, 5%	-	1	RA3	Pull-down
5	Capacitor	4.7uF, 25V	-	1	C1	
6	Capacitor	4.7uF, 25V	-	1	C2	Tantal
7	Capacitor	4.7uF, 10V	-	1	C3	
8	Capacitor	4.7uF, 10V	-	1	C4	
9	Capacitor	4.7uF, 25V	-	1	C5	
10	Capacitor	22pF, 25V	-	1	C6	
11	Inductor	LQH32CN100K53	Murata	1	L1	10uH, Low DCR
12	Schottky Diode	MBR0520LT	ONSEMI	1	DA1	20V, 0.5A
13	DC-DC IC	LM2703MF-ADJ	National	1	UA1	Step Up
14	DRIVER IC	SSD1332	Solomon	1	U1	FP095A03

### 3. Interface signals

Table 3

No.	Symbol	Description
1	NC	No connection.
2	VSS	Analog (Driver) GND
3	GDR	Refer to the DC-DC voltage converter section for connection detail
4	Vddb	Refer to the DC-DC voltage converter section for connection detail
5	FB	Refer to the DC-DC voltage converter section for connection detail
6	RESE	Refer to the DC-DC voltage converter section for connection detail
7	VBREF	Refer to the DC-DC voltage converter section for connection detail
8	VP_A	Pre-charge voltage, Not Connected
9	VP_B	Pre-charge voltage, Not Connected
10	VP_C	Pre-charge voltage, Not Connected
11	VDD	Power supply pin for Logic operation of the driver
12	BS1	Configure MCU interface selection pin
13	BS2	Configure MCU interface selection pin
14	IREF	Segment output current reference pin
15	$\overline{CS}$	$\overline{CS}$ (or CS#). Chip select Input
16	$\overline{RES}$	$\overline{RES}$ (RES#). Reset signal Input
17	$D/\overline{C}$	$D/\overline{C}$ (DC#). Data / Command control Pin
18	$R/\overline{W}$	$R/\overline{W}$ (WR#). MCU Interface Input
19	$\overline{RD}$	$\overline{RD}$ (RD#). MCU Interface Input
20	D0	Data Bus
21	D1	Data Bus
22	D2	Data Bus
23	D3	Data Bus
24	D4	Data Bus
25	D5	Data Bus
26	D6	Data Bus
27	D7	Data Bus
28	NC	No connection.
29	VCOMH	Voltage output high level for COM signals
30	VCC	OLED Dot Matrix Power Supply
31	NC	No Connection



#### 4. Absolute Maximum Ratings

##### 4.1 Electrical Maximum Ratings – For IC

Table 4

Parameter	Symbol	Min	Typ.	Max	Unit	
Supply Voltage	Logic	VDD	-0.3	-	4.0	V
	Driving	VCC	0	-	18	V
	Driving	VREF	0	-	18	V
Supply voltage	VCOMH	0	-	16	V	
SEG/COM output voltage	-	0	-	16	V	
Input voltage	VIN	VSS-0.3	-	VDD+0.3	V	

Note 1: Ta = 25°C Unless otherwise specified, Vss = 0V.

Note 2: Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the limits in the electrical characteristics tables or pin description.

##### 4.2 Environmental Condition

Table 5

Item	Operating Temperature (Topr)		Storage Temperature (Tstg) (Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient Temperature	-20°C	+60°C	-30°C	+80°C	Dry

Note 1: Product cannot sustain at extreme storage conditions for long time.

## 5. Electrical Specifications

### 5.1 DC Characteristics

At  $T_a = 25\text{ }^\circ\text{C}$ ,  $V_{DD} = 2.4\text{V to }3.5\text{V}$ ,  $V_{SS} = 0\text{V}$ .

Table 6

Characteristics		Symbol	Min	Typ	Max	Unit
Supply voltage	Logic	$V_{DD}$	2.4	3.0	3.5	V
	Operating	$V_{CC}$	13	14	15	V
Input voltage	High voltage	$V_{IH}$	$0.8 \times V_{DD}$	-	$V_{DD}$	V
	Low voltage	$V_{IL}$	0	-	$0.2 \times V_{DD}$	V
Output voltage	High voltage	$V_{OH}$	$0.9 \times V_{DD}$	-	$V_{DD}$	V
	Low voltage	$V_{OL}$	0	-	$0.1 \times V_{DD}$	V
Current consumption	Logic	$I_{DD}$	-	0.15	0.21	mA
	Driving	$I_{CC}$	-	7.3	9.5	mA
Sleep mode current		$I_{sleep}$	-	-	100	$\mu\text{A}$

### 5.2 AC Characteristics

Table 7

Items		Symbol	Min	Typ.	Max	Unit
Oscillation frequency	Internal oscillator	$F_{osc}$	-	0.97	-	MHz
Frame frequency	Internal oscillator	$F_{frm}$	-	$F_{osc} \times \frac{1}{(D \times K \times 64)}$	-	Hz

Note:

D : divide ratio (default value = 1)

K : number of display clocks (default value = 136)

Refer to command table for detail description

### 5.2.1 8080-Series MPU Parallel Interface Timing Characteristics

VDD-VSS = 2.4 to 3.5V, TA = -20 to 60°C

Symbol	Parameter	Min	Typ	Max	Unit
$t_{cycle}$	Clock Cycle Time	300	-	-	ns
$t_{AS}$	Address Setup Time	0	-	-	ns
$t_{AH}$	Address Hold Time	0	-	-	ns
$t_{DSW}$	Write Data Setup Time	40	-	-	ns
$t_{DHW}$	Write Data Hold Time	15	-	-	ns
$t_{DHR}$	Read Data Hold Time	20	-	-	ns
$t_{OH}$	Output Disable Time	-	-	70	ns
$t_{ACC}$	Access Time	-	-	140	ns
$PW_{CSL}$	Chip Select Low Pulse Width (read)	120	-	-	ns
	Chip Select Low Pulse Width (write)	60	-	-	ns
$PW_{CSH}$	Chip Select High Pulse Width (read)	60	-	-	ns
	Chip Select High Pulse Width (write)	60	-	-	ns
$t_R$	Rise Time	-	-	15	ns
$t_F$	Fall Time	-	-	15	ns

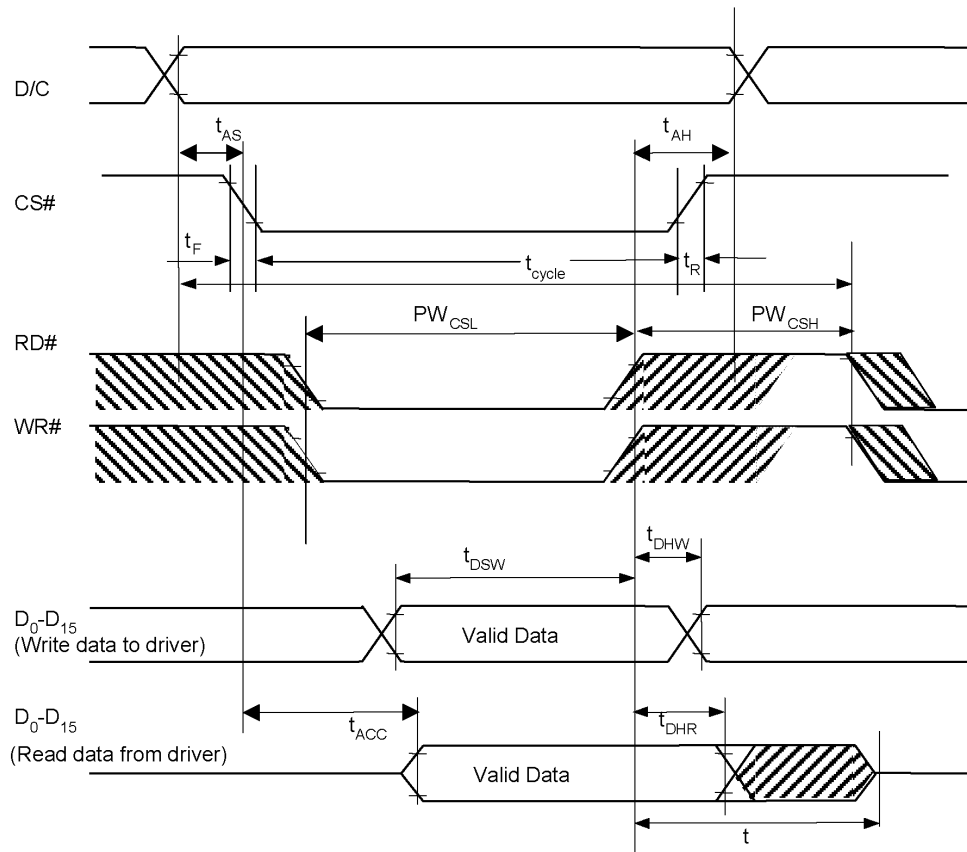


Figure 5: 8080-Series MPU Parallel Interface Timing Characteristics

### 5.2.2 6800-Series MPU Parallel Interface Timing Characteristics

VDD-VSS = 2.4 to 3.5V, TA = -20 to 60°C

Symbol	Parameter	Min	Typ	Max	Unit
$t_{cycle}$	Clock Cycle Time	300	-	-	ns
$t_{AS}$	Address Setup Time	0	-	-	ns
$t_{AH}$	Address Hold Time	0	-	-	ns
$t_{DSW}$	Write Data Setup Time	40	-	-	ns
$t_{DHW}$	Write Data Hold Time	15	-	-	ns
$t_{DHR}$	Read Data Hold Time	20	-	-	ns
$t_{OH}$	Output Disable Time	-	-	70	ns
$t_{ACC}$	Access Time	-	-	140	ns
$PW_{CSL}$	Chip Select Low Pulse Width (read)	120	-	-	ns
	Chip Select Low Pulse Width (write)	60	-	-	ns
$PW_{CSH}$	Chip Select High Pulse Width (read)	60	-	-	ns
	Chip Select High Pulse Width (write)	60	-	-	ns
$t_R$	Rise Time	-	-	15	ns
$t_F$	Fall Time	-	-	15	ns

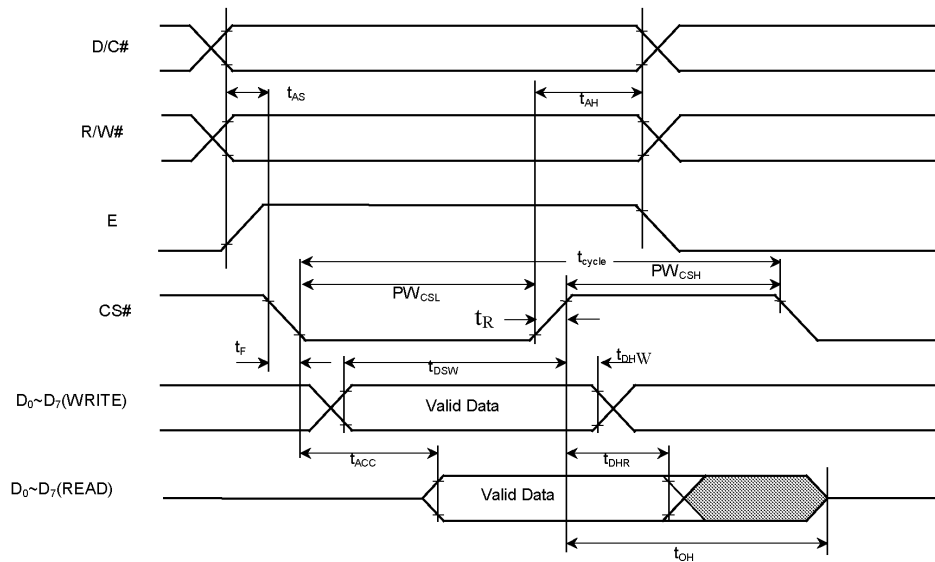


Figure 6: 6800-Series MPU Parallel Interface Timing Characteristics

**5.2.3 Serial Interface Timing Characteristics**  
**VDD-VSS = 2.4 to 3.5V, TA = -20 to 60°C**

Symbol	Parameter	Min	Typ	Max	Unit
$t_{cycle}$	Clock Cycle Time	250	-	-	ns
$t_{AS}$	Address Setup Time	150	-	-	ns
$t_{AH}$	Address Hold Time	150	-	-	ns
$t_{CSS}$	Chip Select Setup Time	120	-	-	ns
$t_{CSH}$	Chip Select Hold Time	60	-	-	ns
$t_{DSW}$	Write Data Setup Time	100	-	-	ns
$t_{DHW}$	Write Data Hold Time	100	-	-	ns
$t_{CLKL}$	Clock Low Time	100	-	-	ns
$t_{CLKH}$	Clock High Time	100	-	-	ns
$t_R$	Rise Time	-	-	15	ns
$t_F$	Fall Time	-	-	15	ns

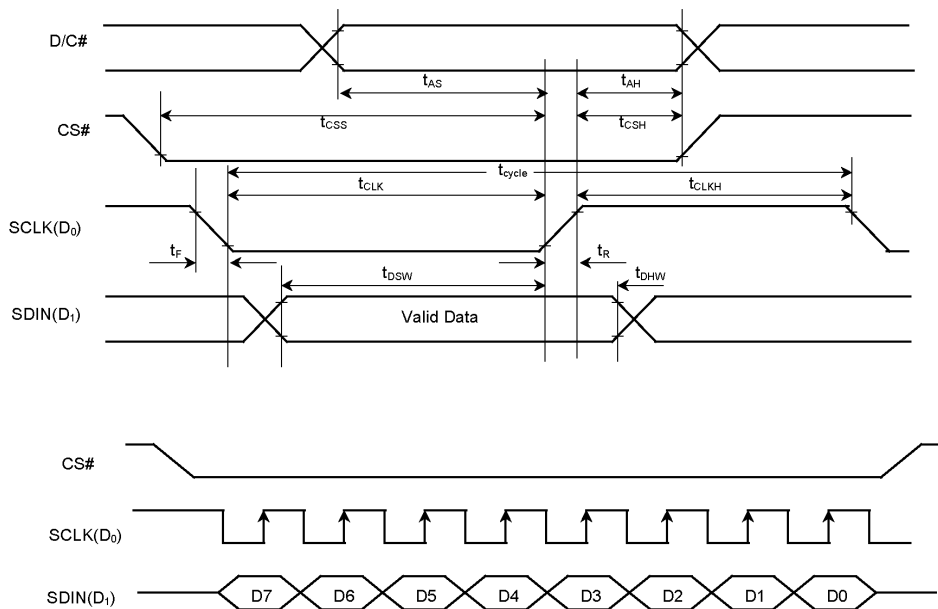


Figure7: Serial Interface Timing Characteristics

## 6. OLED Driving Waveform

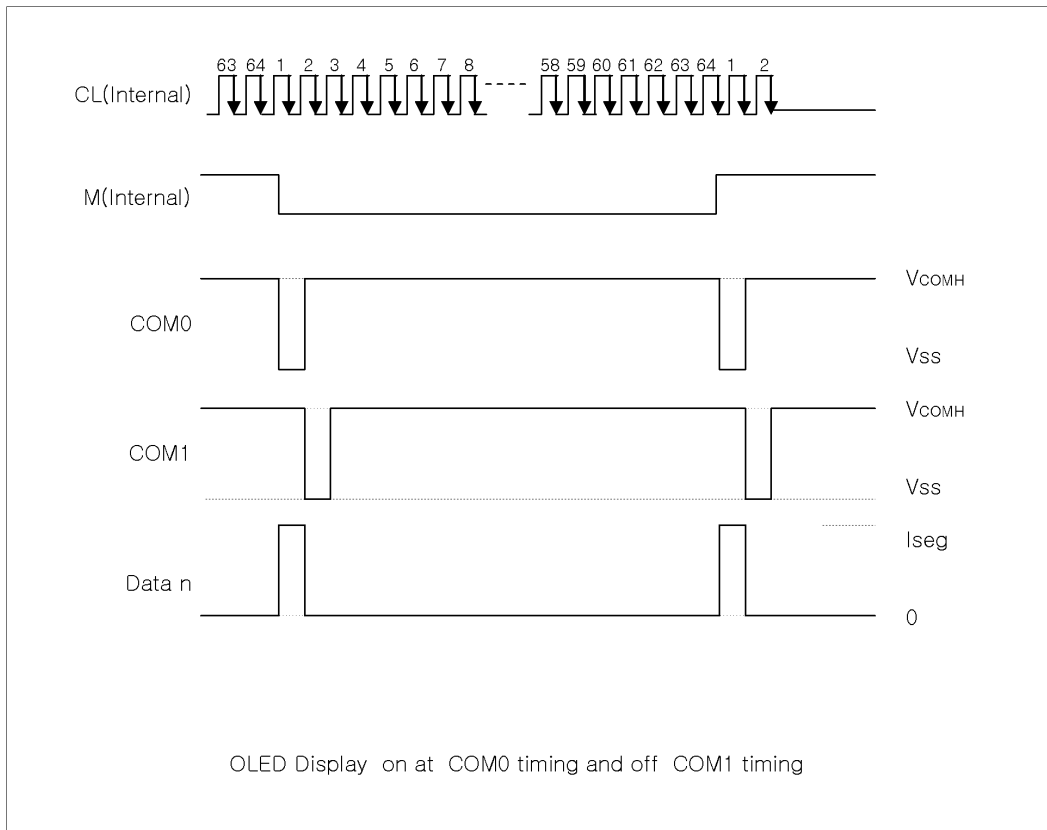


Figure 8: OLED Driving Waveform (Duty Ratio = 1/64)

## 7. Power Up / Down Sequence

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

### Power Up Sequence

1. Turn On VDD
2. Delay 100ms
3. Turn On VCC (High Voltage)
4. Delay 100ms
5. Send Display On Command

### Power Down Sequence

1. Send Display Off Command
2. Turn Off VCC (High Voltage)
3. Delay 100ms
4. Turn Off VDD

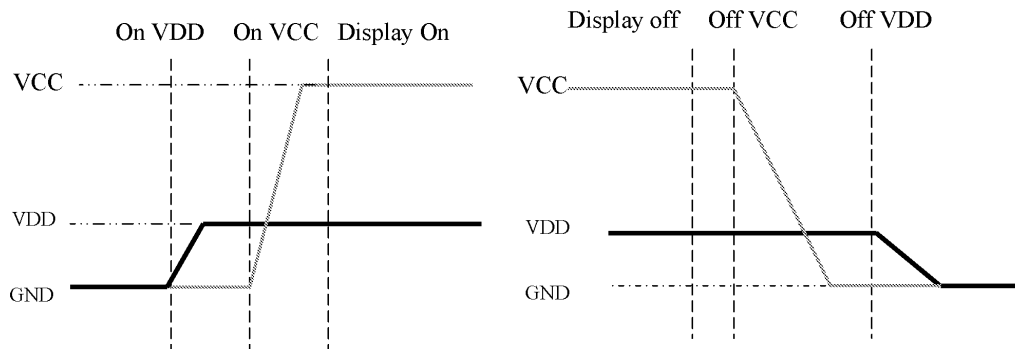


Figure 9

## 8. Driver IC Command Table

Hardware setup : VDD/VDDIO = 3 V, VCC = 14 V

D/C#	Hex Code	Command Description
0	0xAE	Display Off
0	0x15	Set Column Address
0	0x00	- Column Start Address
0	0x5F	- Column End Address
0	0x75	Set Row Address
0	0x00	- Row Start Address
0	0x3F	- Row End Address
0	0x87	Master Current Control
0	0x0F	-
0	0x81	Contrast Current For Color A
0	0x29	- Contrast Color A (RED)
0	0x82	Contrast Current For Color B
0	0x19	- Contrast Color B (GREEN)
0	0x83	Contrast Current For Color B
0	0x22	- Contrast Color C (BLUE)
0	0xA0	Set Re-map & Data Format
0	0x70	-
0	0xA1	Set Display Start Line
0	0x00	- Vertical Scroll by RAM from 0-63
0	0xA2	Set Display Offset
0	0x00	- Vertical Scroll by Row from 0-63
0	0xA4	Display Mode [Normal Display]

D/C#	Hex Code	Command Description
1		
0	0xA8	Set Mux Ratio
0	0x3F	- 3Fh = 64
0	0xAD	Master Configuration
0	0x8E	- Internal. pre-charge Vp, External. VCC
0	0xB0	Power Saving Mode
0	0x00	- 00h
0	0xB1	Set Reset(Phase 1)/Pre-charge (phase 2) period
0	0x12	- phase 2= 1, Phase 1 = 2
0	0xB3	Display Clock Divider (Divset) / Osc. freq.
0	0xC0	- 105 Hz
0	0xBB	Set Pre-charge voltage of Color A
0	0x18	- pre-charge color A (RED)
0	0xBC	Set Pre-charge voltage of Color B
0	0x18	- pre-charge color B (GREEN)
0	0xBD	Set Pre-charge voltage of Color C
0	0x18	- pre-charge color C (BLUE)
0	0xBE	Set VCOMH
0	0x3F	- VCOMH = 0.83 * Vref
1		Send Display Data (96xRGBx64) to Driver IC
0	0xAF	Sleep mode Off / Display On



## 9. Electro-optical Characteristics

Ta = 25 °C

Items	Symbol	Min	Typ.	Max	Unit	Remark
Operating Luminance	L	50	60	90	cd/m <sup>2</sup>	White
Power Consumption		–	103	133	mW	White 100% w/o DC/DC
Stand-by Luminance	L	15	25	40	cd/m <sup>2</sup>	White
Power Consumption		–	42	62	mW	White 100% w/o DC/DC
Off Status Power Consumption		–	1	–	mW	
Frame Frequency		–	105	–	Hz	
Color Coordinate	CIE X CIE Y	0.240 0.310	0.290 0.360	0.340 0.410	CIE1931	White
	CIE X CIE Y	0.590 0.300	0.640 0.350	0.690 0.400	CIE1931	Red
	CIE X CIE Y	0.240 0.590	0.290 0.640	0.340 0.690	CIE1931	Green
	CIE X CIE Y	0.083 0.140	0.133 0.190	0.183 0.240	CIE1931	Blue
Color Gamet		–	64.2	–	%	
Peak Emission Wavelength		–	608	–	nm	Red
		–	520	–	nm	Green
		–	467	–	nm	Blue
Response Time	Rise	tr	–	–	0.020	ms
	Decay	td	–	–	0.020	ms
Darkroom Contrast Ratio	CR	200:1	–	–		
Viewing Angle	△θ	–	170	–	Degree	
Operating Life Time	top	6,000	–	–	hours	40% Pixel-on
Storage Life Time	tst	20,000	–	–	hours	
Brightness Uniformity	Unif.	–	–	15	%	100% Pixel-on

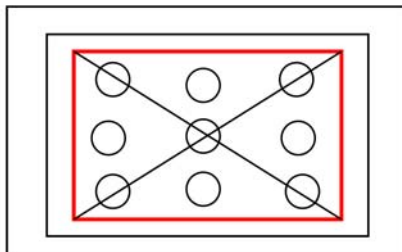
– Contrast ratio is defined as follows:

$$\text{Contrast ratio} = \frac{\text{Luminance with OLED being "white"}}{\text{Luminance with OLED being "black"}}$$

– Response characteristics of photo-detector output are measured, assuming that input signals are applied so as to select and deselect the dot to be measured.

– Operating life time means the half decay time of initial luminance at continuous on state of 40% pixel on. In case of phone application, real operating life time may be longer than suggested value.

– Brightness Uniformity is defined as (Max – Min)/Max of brightness in active area. 9 points are measured as 100% Pixel-on(white) and Measurement area is over Φ1.1mm



**10. Inspection Standards**

This standards applies to the inspection for OLED module device which manufactured by NESS DISPLAY.

10.1 Inspection Conditions

10.1.1 Environmental Condition

Room temperature  $25 \pm 3^{\circ}\text{C}$

Humidity  $50 \pm 5\%RH$

10.1.2 Display Condition

Unless otherwise specified, Supply voltage shall be a standard value described in the specification

Display ON inspection shall be conducted on All White & All Black status with optimum contrast.

10.1.3 External visual inspection

The inspection shall be performed by using a 20W fluorescent lamp for illumination and distance between OLED panel and eyes of inspector should be at least 30cm. Viewing angle for inspection should be within range of  $\pm 30^{\circ}$  for top/bottom and right/left direction from perpendicular.

10.2 Defect classification

Defects are classified into major and minor defects according to degree of defect defined herein.

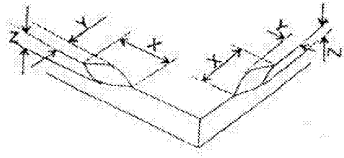
( MIL-STD-105E, Inspection Level II , Normal Inspection, Single sample inspection )

Items	AQL(%)	Remark
Major Defect	0.4	Defect that may degrade usability for product application.
Minor Defect	0.65	Defect that deviates from existing standards almost unrelated to the effective use of the product or its operation.


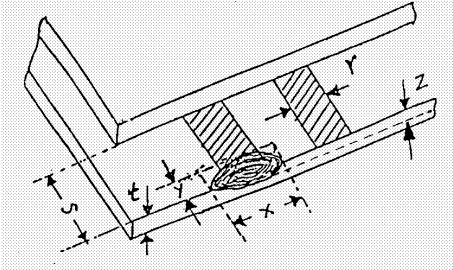
### 10.3 Inspection standards

Items	Criterion for defects	Defect type															
Display on inspection	1) Non display in a specific area 2) Vertical line defects 3) Horizontal line defects 4) Cross line defects 5) Malfunction	Major															
Black/White spot, Particle(circular), Pattern missing, Pin-hole	<table border="1"> <thead> <tr> <th>Size <math>\Phi</math> (m/m)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.1</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.1 &lt; \Phi \leq 0.15</math></td> <td>2</td> </tr> <tr> <td><math>0.15 &lt; \Phi \leq 0.2</math></td> <td>1</td> </tr> <tr> <td><math>0.2 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table> <p>* Not allowable if four more spot crowd together * Acceptable distance between allowable defects is less than 5mm * <math>\Phi = (\text{Long diameter} + \text{Short diameter})/2</math> * Gray pixel : Not less than 70% of the average on the same panel is acceptable</p>	Size $\Phi$ (m/m)	Acceptable number	$\Phi \leq 0.1$	Ignore	$0.1 < \Phi \leq 0.15$	2	$0.15 < \Phi \leq 0.2$	1	$0.2 < \Phi$	0	Minor					
Size $\Phi$ (m/m)	Acceptable number																
$\Phi \leq 0.1$	Ignore																
$0.1 < \Phi \leq 0.15$	2																
$0.15 < \Phi \leq 0.2$	1																
$0.2 < \Phi$	0																
Black/White line, Particle(linear)	<table border="1"> <thead> <tr> <th>Length (m/m)</th> <th>Width (m/m)</th> <th>Acceptable number</th> </tr> </thead> <tbody> <tr> <td>-</td> <td><math>W \leq 0.02</math></td> <td>Ignore</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.02 &lt; W \leq 0.04</math></td> <td>2</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.04 &lt; W \leq 0.08</math></td> <td>1</td> </tr> <tr> <td>-</td> <td><math>0.08 &lt; W</math></td> <td>0</td> </tr> </tbody> </table> <p>* Apply the spot criteria when a width of defect is over 0.08mm * Gray line : Not less than 70% of the average on the same panel is acceptable</p>	Length (m/m)	Width (m/m)	Acceptable number	-	$W \leq 0.02$	Ignore	$L \leq 3.0$	$0.02 < W \leq 0.04$	2	$L \leq 3.0$	$0.04 < W \leq 0.08$	1	-	$0.08 < W$	0	Minor
Length (m/m)	Width (m/m)	Acceptable number															
-	$W \leq 0.02$	Ignore															
$L \leq 3.0$	$0.02 < W \leq 0.04$	2															
$L \leq 3.0$	$0.04 < W \leq 0.08$	1															
-	$0.08 < W$	0															
Maximum ratings	Values that don't meet the ratings noted in the specification	Major															
Display pixel size	The tolerance of Display pixel dimension should be within $\pm 20\%$ of Pixel size of specification	Minor															

10.3 Inspection standards (Continued)

Items	Criterion for defects	Defect type																					
Polarizer scratch	In accordance with “Black/White spot” and “Black/White line”	Minor																					
Stains on the surface of polarizer	Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning	Minor																					
Polarizer bubble (circular)	<table border="1"> <thead> <tr> <th data-bbox="600 719 879 763">Size <math>\Phi</math> (m/m)</th> <th data-bbox="879 719 1222 763">Acceptable number</th> </tr> </thead> <tbody> <tr> <td data-bbox="600 763 879 808"><math>\Phi \leq 0.2</math></td> <td data-bbox="879 763 1222 808">Ignore</td> </tr> <tr> <td data-bbox="600 808 879 853"><math>0.2 &lt; \Phi \leq 0.5</math></td> <td data-bbox="879 808 1222 853">3</td> </tr> <tr> <td data-bbox="600 853 879 898"><math>0.5 &lt; \Phi \leq 0.8</math></td> <td data-bbox="879 853 1222 898">2</td> </tr> <tr> <td data-bbox="600 898 879 943"><math>0.8 &lt; \Phi</math></td> <td data-bbox="879 898 1222 943">0</td> </tr> </tbody> </table>	Size $\Phi$ (m/m)	Acceptable number	$\Phi \leq 0.2$	Ignore	$0.2 < \Phi \leq 0.5$	3	$0.5 < \Phi \leq 0.8$	2	$0.8 < \Phi$	0	Minor											
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Polarizer bubble (linear)	<table border="1"> <thead> <tr> <th data-bbox="600 981 799 1070">Length (m/m)</th> <th data-bbox="799 981 1046 1070">Width (m/m)</th> <th data-bbox="1046 981 1222 1070">Acceptable number</th> </tr> </thead> <tbody> <tr> <td data-bbox="600 1070 799 1115"><math>L \leq 5.0</math></td> <td data-bbox="799 1070 1046 1115"><math>W \leq 0.03</math></td> <td data-bbox="1046 1070 1222 1115">Ignore</td> </tr> <tr> <td data-bbox="600 1115 799 1160"><math>L \leq 2.0</math></td> <td data-bbox="799 1115 1046 1160"><math>0.03 &lt; W \leq 0.05</math></td> <td data-bbox="1046 1115 1222 1160">Ignore</td> </tr> <tr> <td data-bbox="600 1160 799 1205"><math>2.0 &lt; L</math></td> <td data-bbox="799 1160 1046 1205"><math>0.03 &lt; W \leq 0.05</math></td> <td data-bbox="1046 1160 1222 1205">1</td> </tr> <tr> <td data-bbox="600 1205 799 1249"><math>L \leq 1.0</math></td> <td data-bbox="799 1205 1046 1249"><math>0.05 &lt; W \leq 0.08</math></td> <td data-bbox="1046 1205 1222 1249">Ignore</td> </tr> <tr> <td data-bbox="600 1249 799 1294"><math>1.0 &lt; L</math></td> <td data-bbox="799 1249 1046 1294"><math>0.05 &lt; W \leq 0.08</math></td> <td data-bbox="1046 1249 1222 1294">1</td> </tr> <tr> <td data-bbox="600 1294 799 1339">-</td> <td data-bbox="799 1294 1046 1339"><math>0.08 &lt; W</math></td> <td data-bbox="1046 1294 1222 1339">0</td> </tr> </tbody> </table>	Length (m/m)	Width (m/m)	Acceptable number	$L \leq 5.0$	$W \leq 0.03$	Ignore	$L \leq 2.0$	$0.03 < W \leq 0.05$	Ignore	$2.0 < L$	$0.03 < W \leq 0.05$	1	$L \leq 1.0$	$0.05 < W \leq 0.08$	Ignore	$1.0 < L$	$0.05 < W \leq 0.08$	1	-	$0.08 < W$	0	Minor
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-	$0.08 < W$	0																					
Chip on side (EL Glass)	 <p data-bbox="683 1585 1139 1697"> <math>X \leq 1/6a</math> &amp; <math>Y \leq 1.0</math> &amp; <math>Z &lt; t</math>            ( t : glass thickness,            a=dimension of glass outline length )         </p>	Minor																					

10.3 Inspection standards (Continued)

Items	Criterion for defects	Defect type
Chip on corner (EL Glass)	 <p><math>X \leq 1.5\text{mm} \ \&amp; \ Y \leq 2\text{mm}</math> Chips on corner of ITO contact surface shall not be allowed to extend into the ITO contact</p>	Minor
Chip on contact pad (EL Glass)	 <p><math>X \leq 3\text{mm} \ \&amp; \ Y \leq 0.5\text{mm} \ (Z \text{ acceptable})</math></p>	Minor
Chipping	Chipping with progress is not allowed	Minor
Part mounting	<ol style="list-style-type: none"> <li>1) Failure to mount part</li> <li>2) Parts not in the specifications are mounted</li> <li>3) For example : Polarity is reversed, TCP falls off</li> </ol>	Major
Part alignment	1) More than 50% of Driver IC, Component leads are off the pad outline	Minor

10.3 Inspection standards (Continued)

Items	Criterion for defects	Defect type
TCP Pattern damage (Follow IPC Standard)	1) Deep Damage is found on a copper foil and the pattern is nearly broken. ( Deep damage is include electrode peeling, pin-hole, scratch, crack etc.) 2) Damage on copper foil other than (1)	Major  Minor
Conductive foreign material (Follow IPC Standard)	Conductive foreign material of length, which exceeds 0.3mm, must not adhere on the module. Even if the length of foreign material is less than 0.3mm adhering on leads of Driver IC and other components are unacceptable.	Minor
Current consumption	Do not exceed the standard value of Specifications.	Major
Outline dimension	Within $\pm 0.2\text{m/m}$ tolerance in the specifications	Major
Label	Failure to stamp or label error, or not legible (all acceptable if possible)	Minor

#### 10.4 Reliability Test

##### 10.4.1 Test Conditions

All item tested should be judged in 1 hour recovery time at room temperature.

Driving Condition : NESSDISPLY Application guide, Pattern : White/Black 1sec transition

No.	Items	Specification
1	High Temp Storage	80°C, 240hr
2	Low Temp Storage	-30°C, 240hr
3	High Temp Operation	60°C, 120hr
4	Low Temp Operation	-20°C, 240hr
5	High Temperature & High Humidity Storage	60°C, 90%, 240hr
6	High Temperature & High Humidity Operating	60°C, 90%RH, 120hr
7	Thermal Shock	-40°C ~ 85 °C, 1hr 32cycle
8	Peel Strength	600g/cm <
9	Vibration (Phone Housing)	10 ~55Hz, 1.5mm. X,Y,Z 2hr
10	Drop (Phone Housing)	TBD (TEST中)
11	ESD(Air discharge)	Human body >10kV, 300Ω, 150pF

##### 10.4.2 Evaluation criteria

- No damage to glass or encapsulation
- No drastic change to the display
  - Pixel/Line defects : No increased
  - Color : Within ( $\pm 0.05$ ,  $\pm 0.05$ ) of initial value 1931 CIE coordinates base
  - Luminance : Within  $\pm 50\%$  of initial value
  - Uniformity : (Max-Min) / Max < 15%
  - Current consumption : Within  $\pm 50\%$  of initial value
- The module functions are not adversely affected

## 11. General Precautions

### 11.1 Handling precautions

- 1) Do not scratch the surface of the polarizer film as it is easily damaged.
- 2) When cleaning the display surface, use soft cloth with solvent and wipe gently (solvent : Isopropyl alcohol, Ethyl alcohol, Trichlorotrifluoroethane)
- 3) Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.
- 4) Handle the OLED panel with care at all time, as it is made of glass and it is fragile and may cause cracks or fragmentation.
- 5) Do not disassemble the OLED module as it may cause permanent damage.
- 6) Hold OLED very carefully when placing OLED module into the system housing.  
Do not over exert stress or pressure to OLED module.

### 11.2 Against electrostatic discharge

The OLED module use CMOS LSI drivers. So we recommend you :

- 1) Connect any unused input terminal to Vdd or Vss. Do not input any signals before power is turn on; and ensure proper grounding to the body, work assemble area, assembly equipment to protect against static electricity.
- 2) When carrying the OLED module. Place it on the tray to protect from mechanical damage. It is recommended to use the conductive trays to protect the CMOS components from electrostatic discharge.
- 3) Protective film is placed onto the surface of OLED module when it is shipped from factory. Make sure to peel it off before assembling the OLED module into the system. Be very careful not to damage OLED module by electrostatic discharge when peeling off this protective film at approx. 30degree from panel surface. Do not peel it off with vertical from panel surface.

### 11.3 Caution for operation

- 1) It is not recommended to drive OLED module outside the specified voltage limits as it may shorten the life of OLED module.
- 2) An electrochemical reaction due to DC may cause undesirable deterioration of the OLED module, so the use of DC drive should be avoided.

### 11.4 Packing



#### 11.4 Packing

- 1) Avoid intense shock and falls from height.
- 2) To prevent modules from degradation, do not operate or store them direct to sunlight or high temperature/humidity

#### 11.5 Storage

In case of storage for long period of time, the following are recommended :

- 1) Storage in polyethylene bag with opened seal to prevent exposure to moisture at the event if no desiccant.
- 2) Storage in dark area to prevent direct exposure to sunlight or light.
- 3) Storing in controlled temperature environment to avoid in contact with heat.
- 4) Keep polarizer surface free from contact with other parts.

#### 11.6 Precaution for use

Both parties should provide a limit sample on an occasion when both parties agree its necessary. The judgment by reference sample shall take effect after the reference sample has been established and confirmed by both parties.

On the following occasions, the handling of problem should be decided through discussion and agreement between responsible of both parties.

- When any question arise in this manual
- When new problem arise which is not specified in this document
- Some problem arise due to the change of inspection and operating conditions by users
- When a new problem arise at the customer's operating set for sample evaluation at the customer site.

“Varitronix Limited reserves the right to change this specification.”

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- END -