

# Product Specification

## (Preliminary)

Part Name: OEL Display Module  
Part ID: UG-9663GMACF02  
Doc No.: SAS1-3002-A

Customer:
Approved by

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From: Univision Technology Inc.
Approved by

### Univision Technology Inc.

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***Revised History***

Part Number	Revision	Revision Content	Revised on
UG-9663GMACF02	A	New	Jan 16, 2004

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## 1. Basic Specifications

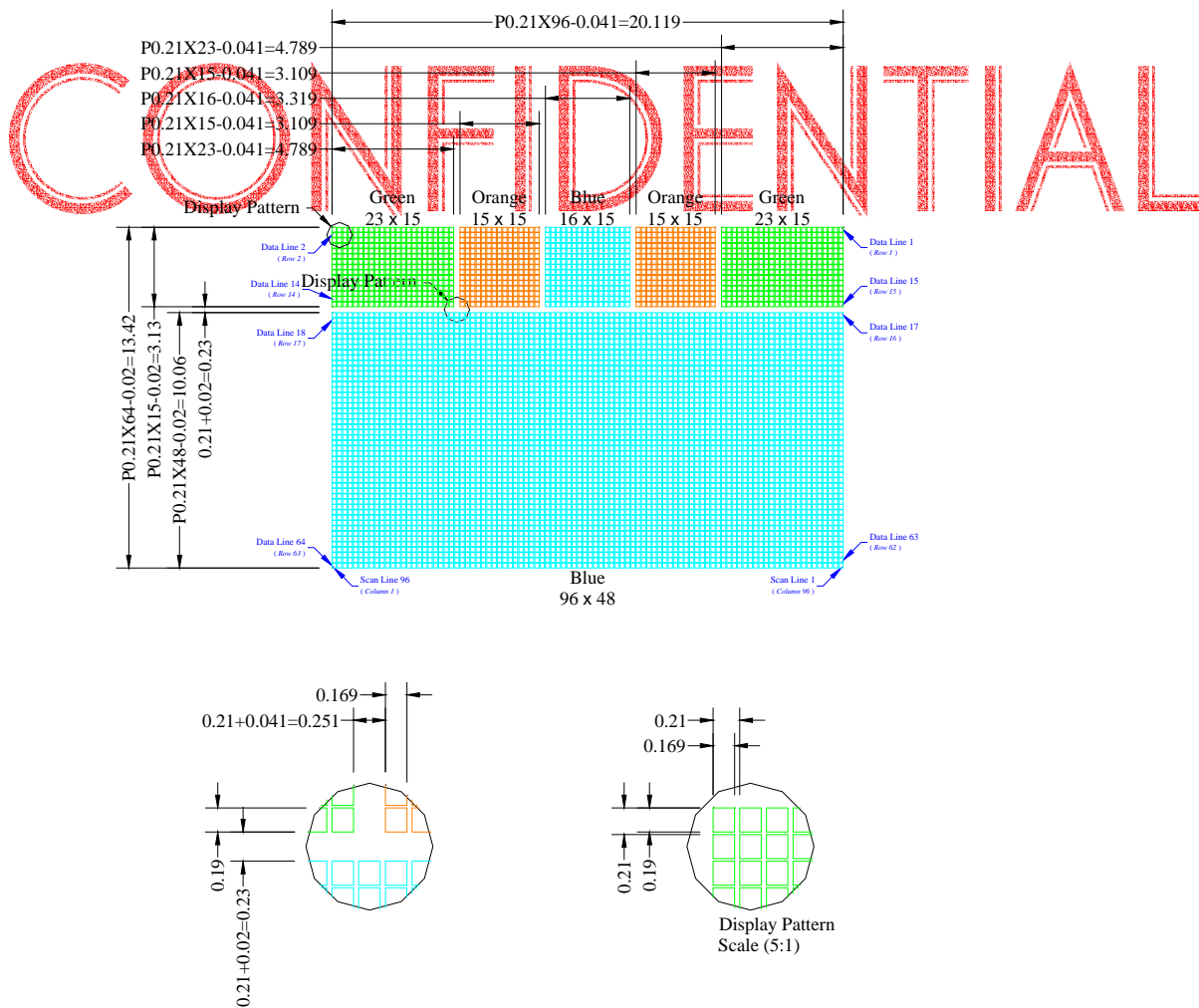
### 1.1 Display Specifications

- 1) Display Mode: Passive Matrix
- 2) Display Color: Area Color (Blue, Green, Orange)
- 3) Drive Duty: 1/96 Duty

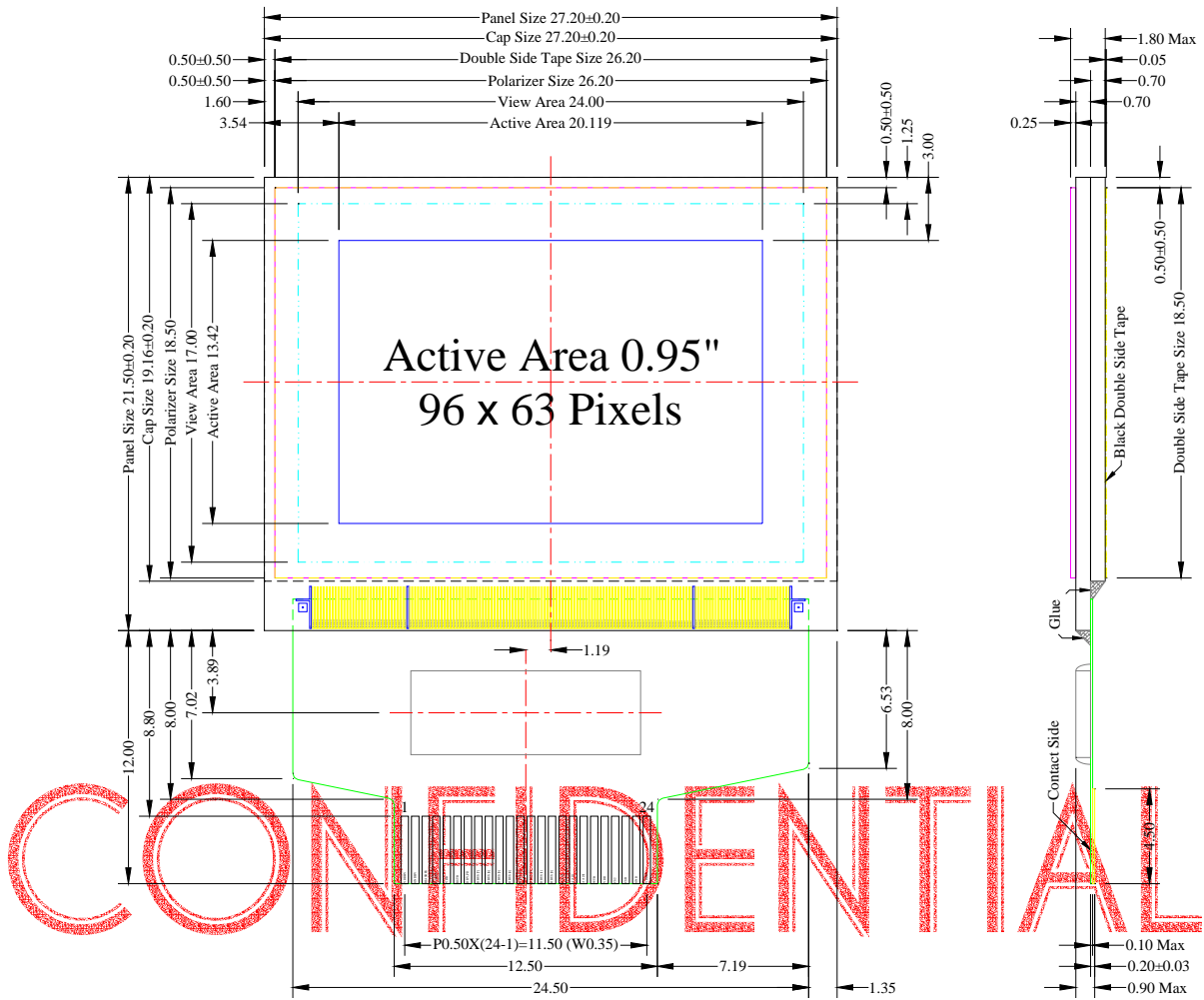
### 1.2 Mechanical Specifications

- 1) Outline Drawing: According to the annexed outline drawing number
- 2) Number of Pixels:  $96 \times 63$
- 3) Panel Size:  $27.20 \times 21.50 \times 1.80$  (mm)
- 4) Active Area:  $20.119 \times 13.42$  (mm)
- 5) Pixel Pitch:  $0.21 \times 0.21$  (mm)
- 6) Pixel Size:  $0.169 \times 0.19$  (mm)
- 7) Weight: 2.0 (g)

### 1.3 Active Area & Pixel Construction



1.4 Mechanical Drawing



General Tolerance: ±0.30

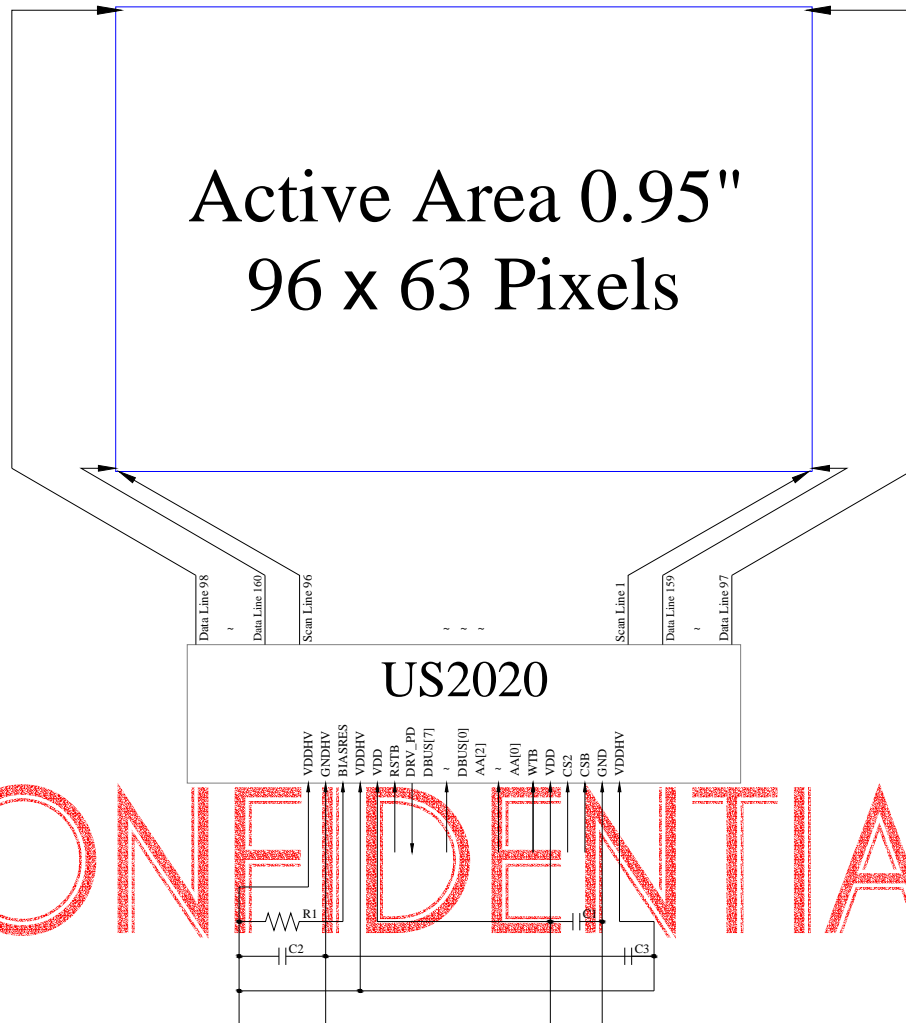
Unit: mm

**1.5 Pin Definition**

Pin Number	Symbol	I/O	Function
5 20	VDD	I	<b>Power Supply for Logic Circuit</b> It must be connected to external source.
23	GND	I	<b>Ground of Logic Circuit</b> A reference for the logic pins. It must be connected to external ground.
1 4 24	VDDHV	I	<b>Power Supply for OEL Panel</b> This is the most positive voltage supply pin of the chip. It must be connected to external source.
2	GNDHV	I	<b>Ground of OEL Panel</b> This is a ground pin for analog circuits. It must be connected to external ground.
3	BIASRES	I	<b>Current Mirror Bias Resistor</b> This pin is current reference pin. A resistor should be connected between this pin and VDDHV.
7	DRV_PD	O	<b>Driver Power Down</b> This pin will send out a signal that could be used to set external DC/DC converter circuit enable/disable or other applications.
6	RSTB	I	<b>Power Reset for Controller and Driver</b> This pin is reset signal input. When the pin is low, initialization of the chip is executed.
21	CS2	I	<b>Chip Select (Host Enable Select)</b> Chip select is used to access registers; this is driven from the microprocessor's I/O enable signal ANDed with the address selection logic. When this pin is pull-high, then the functions become active.
22	CSB	I	<b>Chip Select (Read/Write Enable Strobe)</b> Chip select is used to access registers; this is driven from the microprocessor's I/O enable signal ANDed with the address selection logic. When this pin is pull low, then the functions become active.
19	WTB	I	<b>Read/Write Enable</b> This pin is used with CSB to access registers. The interface is places in a read mode when a high pulse is entered and placed in a write mode when a low pulse is entered.
16-18	AA [2:0]	I	<b>Host Register Address Bus</b> These pins are 3 bits internal registers selecting bus to be connected to the microprocessor's address bus.
8-15	DBUS [7:0]	I/O	<b>Host Data Input/Output Bus</b> These pins are 8 bits data bus to be connected to the microprocessor's data bus.

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1.6 Block Diagram



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Pins connected to MCU interface:

RSTB, DBUS[7]~DBUS[0], AA[2]~AA[0], WTB, CS2, and CSB

C1: 4.7μF

C2, C3: 10μF

R1: 150kΩ

## 2. Absolute Maximum Ratings

### 2.1 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage	V <sub>DD</sub>	-0.5	4.0	V	1, 2
Driver Supply Voltage	V <sub>DDHV</sub>	0	TBD	V	1, 2
Operating Temperature	T <sub>OP</sub>	-20	70	°C	-
Storage Temperature	T <sub>STG</sub>	-30	80	°C	-

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

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

### 2.2 Regarding the Gradation

Although this module possesses the gradation function, respective gradation levels will vary depending on the production conditions etc. The temperature range where the gradation function can be guaranteed is -10°C~60°C.

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### 3. Electrical Characteristics

#### 3.1 DC Characteristics

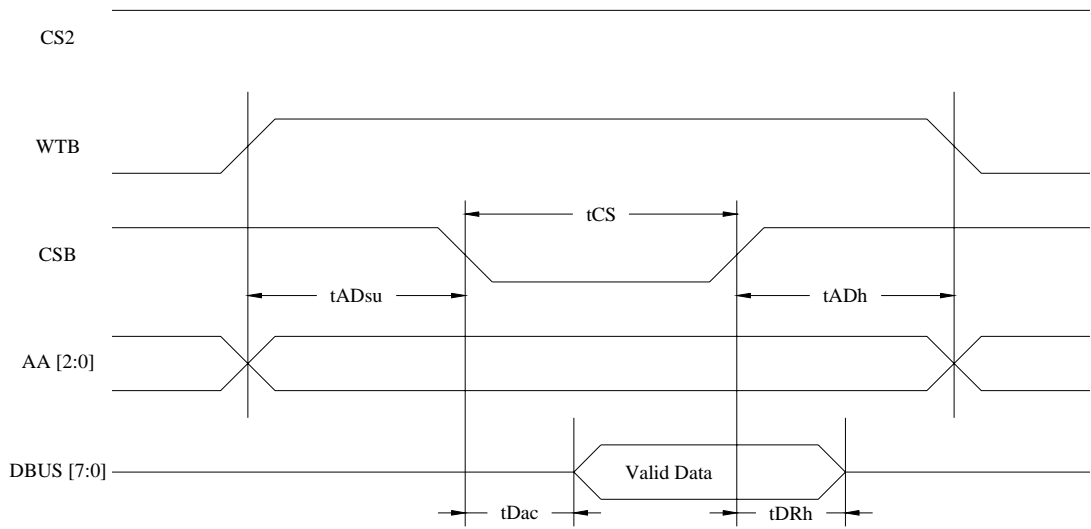
Characteristics	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	$V_{DD}$		2.4	2.8	3.8	V
Driver Supply Voltage	$V_{DDHV}$		TBD	11.5	TBD	V
High Level Input	$V_{IH}$	TTL inputs	2.0	-	$V_{DD}$	V
Low Level Input	$V_{IL}$	TTL inputs	$V_{SS}$	-	0.8	V
High Level Output	$V_{OH}$	$I_{OH} = 4\text{mA DC}$	2.4	-	$V_{DD}$	V
Low Level Output	$V_{OL}$	$I_{OL} = 4\text{mA DC}$	$V_{SS}$	-	0.45	V
Input Leakage	$I_{IN}$	$V_I = V_{OL}$ or GND	-10	-	10	$\mu\text{A}$
3-state Leakage	$I_{OZ}$	$V_O = V_{DD}$ or GND	-10	-	10	$\mu\text{A}$
$V_{DD}$ Supply Current	$I_{DD}$		-	-	25	mA
Output Short Circuit	$I_{OS}$	$V_O = 0\text{V}$	-	-	-100	mA

#### 3.2 AC Characteristics

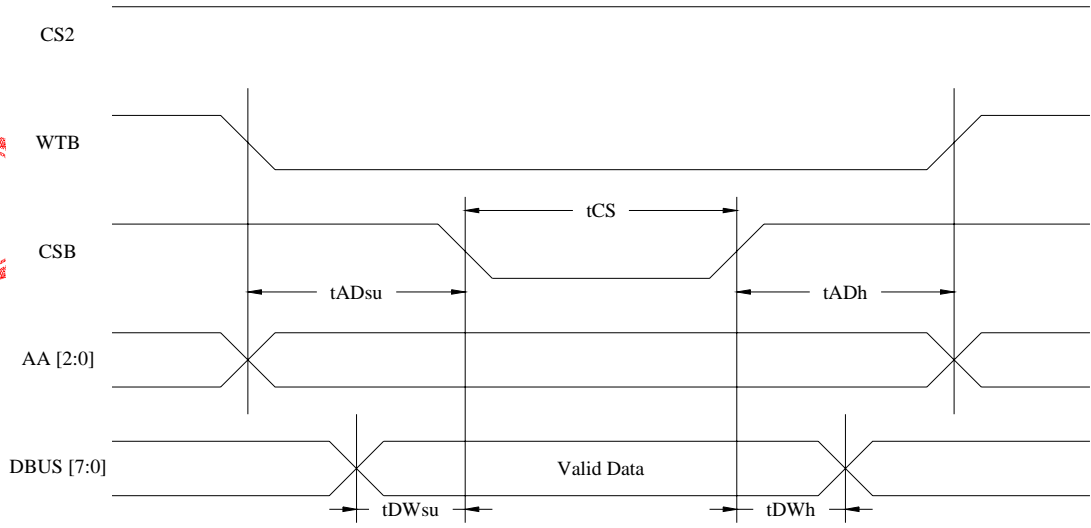
Symbol	Description	Min	Max	Unit
tCS	Host cycle chip select pulse width	75	-	ns
tDac	Host read data access time	-	50	ns
tADsu	Host Address setup time	20	-	ns
tADh	Host cycle Address hold time	20	-	ns
tDRh	Host read cycle disable time	20	-	ns
tDWsu	Host write cycle data setup time	20	-	ns
tDWh	Host write cycle data hold time	20	-	ns

\* All the timings should be based on 30% and 70% of  $V_{DD}$ -GND.

\* tCS should be the overlapping period when the CSB is on the "L" level and the WTB is on the "L" level.



Host Read Cycle Timing



Host Write Cycle Timing

### 3.3 Optics & Electrical Characteristics

Characteristics	Symbol	Conditions	Min	Typ	Max	Unit
Brightness	L <sub>br</sub>	Display Average	35	40	-	nits
C.I.E. (Blue)		(x)	0.12	0.16	0.20	
		(y)	0.24	0.28	0.32	
C.I.E. (Green)		(x)	0.26	0.30	0.34	
		(y)	0.59	0.63	0.67	
C.I.E. (Orange)		(x)	0.47	0.51	0.55	
		(y)	0.40	0.44	0.48	

Notes 3: Optical measurement taken at 1/96 duty, 100Hz Frame Rate.

## 4. Functional Specification

### 4.1 Commands

Refer to Technical Manual for the US2020.

### 4.2 Power down and Power up Sequence

To protect OEL panel and to 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 while turning on/off. It gives the OEL panel enough time to complete the action of charge and discharge before/after the operation.

#### 4.2.1 Power up Sequence:

1. Power up VDD
2. Send Display off command
3. Power up  $V_{DDHV}$
4. Delay 100ms (when VDD is stable)
5. Send Display on command

#### 4.2.2 Power down Sequence:

1. Send Display off command
2. Power down  $V_{DDHV}$
3. Delay 100ms (when  $V_{DDHV}$  is reach 0 and panel is completely discharges)
4. Power down VDD

### 4.3 Actual Application Example

Command usage and explanation of an actual example.

#### 4.3.1 Command Entry Procedures When Turning on the Power Supply

Turn on the power supply ( $V_{DD}$ ,  $V_{DDHV}$ )

Be sure to execute power on resetting (RSTB)

<Initialization Setting 1>

Set Initial Control

Set Chip Select Signal (CS2)

Set Chip Enable (CSB)

Set Read/Write Control (WTB)

Set Oscillator On

Set Internal Oscillator Frequency (CNTL[4])

\* This is not necessary when using external oscillator.

Set Oscillator Frequency Factor (SETUP[5:4])

Set Panel Size  
Set HPANEL (127)  
Set VPANEL (95)  
Control Panel Size (CNTL[7] = 1)

Set Origin Head-section (SETUP[7]=0, SETUP[6]=1)

Set Frame Rate (CNTL[3])

Set Contrast Control (SETUP[3:0])

<Power Setting>

Set Display On (CNTL[0])

< Initialization Setting 2 >

Set Brightness Control (CNTL[2:1])

#### 4.3.2 Command Entry Procedures When Turning off the Power Supply

Set Display Off (CNTL[0])

The power ( $V_{DDHV}$ ,  $VDD$ ) will be shut down.

\* In order to discharge the electric charge remaining both at the display panel and at the capacitor connected to the OEL drive power circuit, the sleep-in command has to be executed to bring the IC into the sleep state and to wait until the occurrence of voltage drop at the output of the OEL drive power circuit before shutting down the  $V_{DDHV}$  and  $VDD$ .

#### 4.3.3 Regarding the Sleep-in/Sleep-out Sequence

<Sleep-in Sequence>

Set Display Off (CNTL[0])

<Sleep-out Sequence>

Set Display On (CNTL[0])

#### 4.3.4 Refresh Sequence

For recovering from miss-operation of IC, it is suggested to send commands, parameter and display data periodically for refreshing data. Following commands and parameters should be reset periodically.

Set Chip Select Signal (CS2)  
Set Chip Enable (CSB)  
Set Read/Write Control (WTB)  
Set Internal Oscillator Frequency (CNTL[4])  
Set Oscillator Frequency Factor (SETUP[5:4])  
Set HPANEL (127)

Set VPANEL (95)  
Control Panel Size (CNTL[7] = 1)  
Set Origin Head-section (SETUP[7]=0, SETUP[6]=1)  
Set Frame Rate (CNTL[3])  
Set Contrast Control (SETUP[3:0])  
Set Display On (CNTL[0])  
Set Brightness Control (CNTL[2:1])

If the noise is accidentally occurred at the displaying window during the operation,  
Please reset the display in order to recover the display function.

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## 5. Reliability

### 5.1 Contents of Reliability Tests

Item	Conditions	Criteria
High Temperature Operation	70 °C, 240 hrs	The operational functions work.
Low Temperature Operation	-20 °C, 240 hrs	
High Temperature Storage	80 °C, 240 hrs	
Low Temperature Storage	-30 °C, 240 hrs	
High Temperature/Humidity Storage	60 °C, 90 %RH, 240 hrs	
Thermal Shock	-30°C ↔ 80°C, 10 cycles 30 mins dwell	

- \* The samples used for the above tests do not include polarizer.
- \* No moisture condensation is observed during tests.

### 5.2 Failure Check Standard

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

### 5.3 Mean time to failure (MTTF)

MTTF is over 10,000 hrs at a typical operating voltage and at room temperature. It's criteria of acceptance is the same as item 5.1.

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## 6. Outgoing Quality Control Specifications

### 6.1 Inspection Method:

#### 6.1.1 Applicable Standard

MIL-STD-105E, Level II, Normal Inspection, Single Sampling

#### 6.1.2 AQL

Partition	AQL	Definition
Major	0.65	Defects may lead to the failure of display function or the failure of passing the reliability criteria.
Minor	1.0	Defects do not affect all of the display functions, and have no impact to the reliability.

#### 6.1.3 Inspection Condition

Test and measurement were conducted under the following conditions:

Temperature:  $23 \pm 5$  °C

Humidity:  $55 \pm 15$  %RH

Distance between the panel and eyes of the inspector:  $\geq 30$  cm

### 6.2 Inspection Criterion

Display check in active area

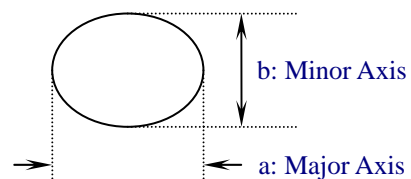
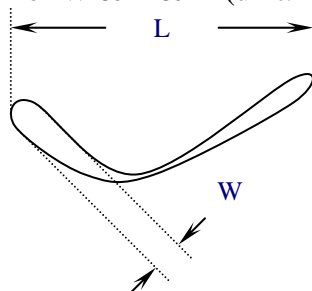
Check Item	Classification	Criteria
Non operation/display Flicker	major	Not Allowable
Miss line or pixel		
Wrong display		
Cross talk *		
Scratches, fiber **	minor	$W \leq 0.05$ Ignore $W \leq 0.1, L \leq 2$ $n \leq 3$ $2 < L$ $n = 0$
Dirt, Black spot, white spot, Greasy dirt, Foreign material, Dent, Bubbles ***	minor	$\Phi \leq 0.1$ , Ignore $0.1 < \Phi \leq 0.2$ $n \leq 3$ $0.2 < \Phi \leq 0.25$ $n \leq 1$ $0.25 < \Phi$ $n = 0$
Fingerprint, Flow mark	minor	Not allowable

\* In displays which manifests itself has the other shadowing, ghosting or streaking.

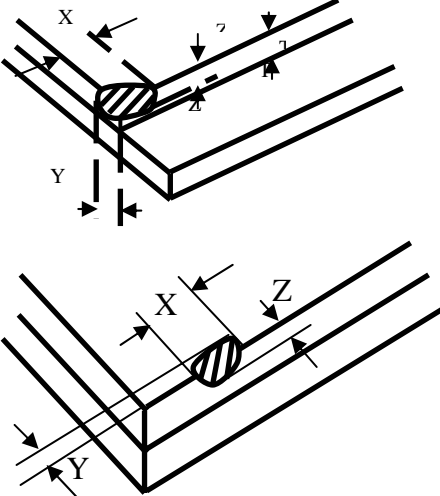
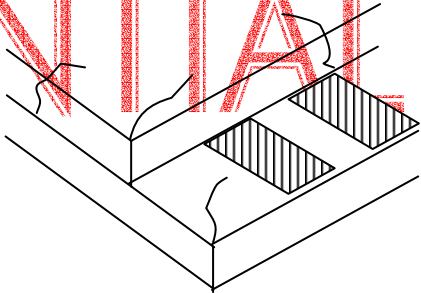
\*\* Distance between any 2 defects should over 10mm

\*\*\* Definition of W & L &  $\Phi$  (unit: mm):

$$\Phi = (a + b) / 2$$



Visual check in non-active area

Check Item	Classification	Criteria
Panel General Chipping	Major	$X \leq 1/6$ Panel Length $Y \leq 1$ $Z \leq T$ 
Panel crack	minor	Any crack is not allowable 
Terminal cable: twist, Scar, Split, Scratch	Minor	Not Allowable

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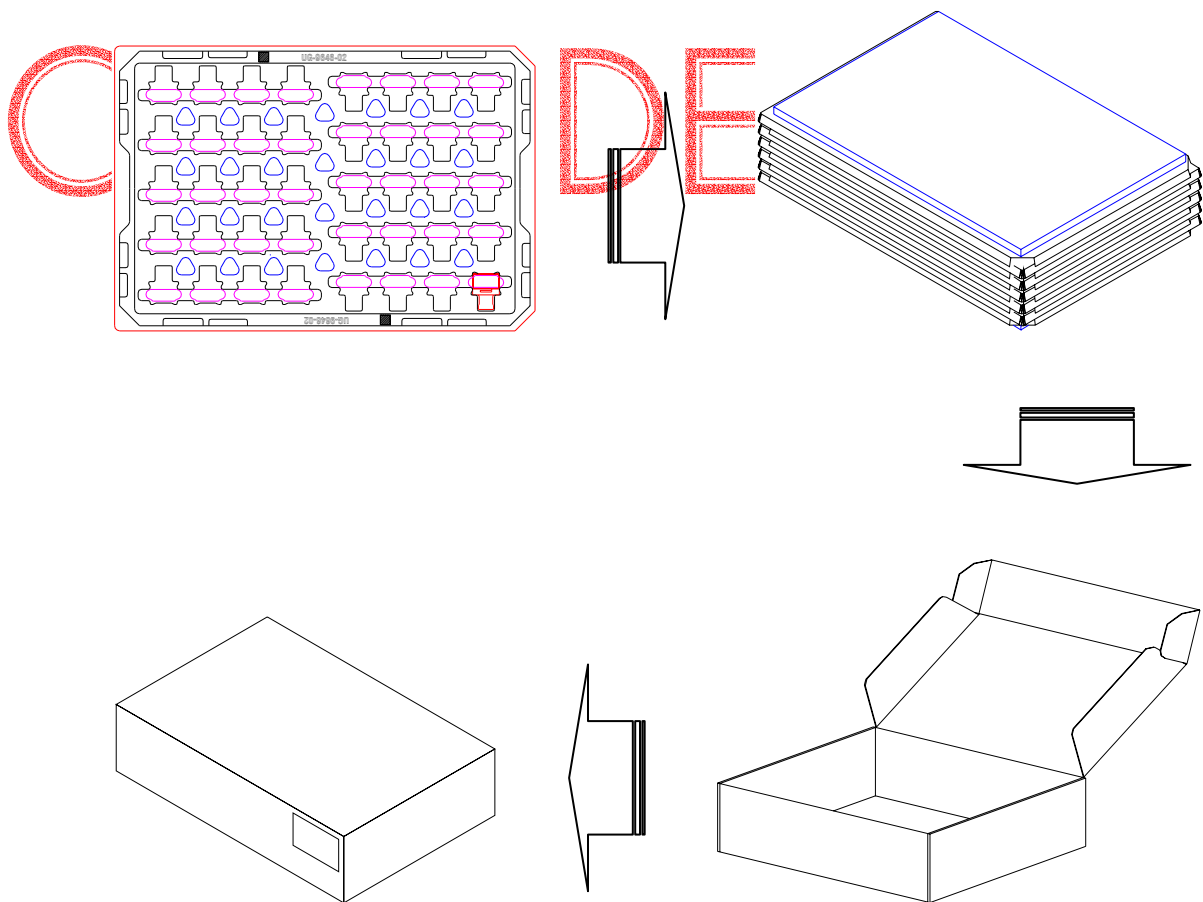
## 7. Package Specifications

### 7.1 Inner Carton Box

Each OEL display module will be placed on the antistatic tray and up to XXX units at the maximum will be packaged into the inner carton box. A label indicating the flowing contents will be applied to the surface of the inner carton box.

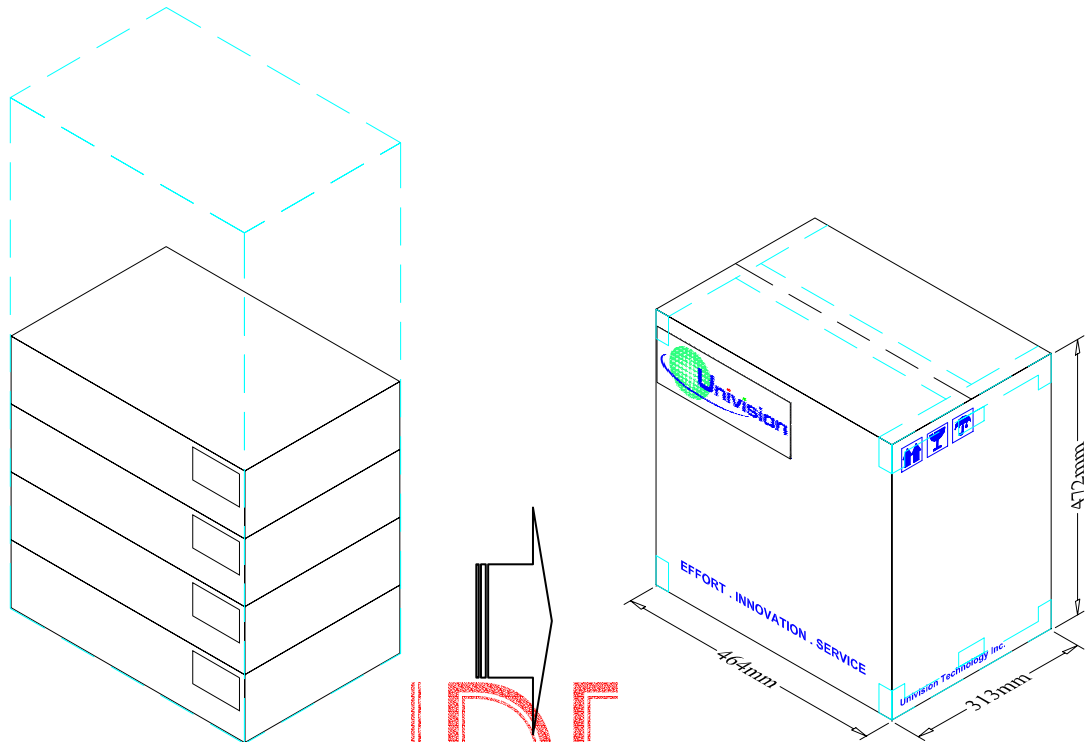
<b>Univision Technology Inc.</b>	
Product Number: UG-9663GMACF02	
Quantity XXX pieces	Lot XXXXXXXXXX
Customer Product Number: XXXXXXXXXXXX	
QC Check :	Date: 2004.1.1

Contents of the label indication



### 7.2 Master Carton Box

The Master Carton Box is the unit package to deliver to each customer. The Master Carton Box contains 4 inner carton boxes.



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## 8. Precautions When Using These OEL Display Modules

### 8.1 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 OEL display module, the cell structure may be damaged and be careful not to apply pressure to these sections.
- 4) The polarizer covering the surface of the OEL display module is soft and easily scratched. Please be careful when handling the OEL display module.
- 5) When the surface of the polarizer of the OEL display module has soil, clean the surface. It takes advantage of by using following adhesion tape.
  - \* Scotch Mending Tape No. 810 or an equivalentNever 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) When installing the OEL display module, be careful not to apply twisting stress or deflection stress to the OEL display module. These stresses will influence the display performance. Also, secure sufficient rigidity for the outer cases.
- 7) Do not apply stress to the LSI chips and the surrounding molded sections.
- 8) Do not disassemble nor modify the OEL display module.
- 9) Do not apply input signals while the logic power is off.
- 10) Pay sufficient attention to the working environments when handling OEL display modules to prevent occurrence of element breakage accidents by static electricity.
  - \* Be sure to make human body grounding when handling OEL 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 OEL display module. Be careful since static electricity may be generated when exfoliating the protective film.
- 11) 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 OEL 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).
- 12) If electric current is applied when the OEL display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful to avoid the above.

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## 8.2 Storage Precautions

- 1) When storing OEL display modules, put them in static electricity preventive bags avoiding exposure to direct sun light nor to lights of fluorescent lamps. and, also, avoiding high temperature and high humidity environment or low temperature (less than 0°C) environments. (We recommend you to store these modules in the packaged state when they were shipped from Univision Technology Inc.)

At that time, be careful not to let water drops adhere to the packages or bags nor let dewing occur with them.

- 2) If electric current is applied when water drops are adhering to the surface of the OEL display module, when the OEL display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful about the above.

## 8.3 Designing Precautions

- 1) The absolute maximum ratings are the ratings which cannot be exceeded for OEL display module, and if these values are exceeded, panel damage may be happen.
- 2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specifications and, at the same time, 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). (Recommend value: 0.5A)
- 4) Pay sufficient attention to avoid occurrence of mutual noise interference with the neighboring devices.
- 5) As for EMI, take necessary measures on the equipment side basically.
- 6) When fastening the OEL display module, fasten the external plastic housing section.
- 7) If power supply to the OEL display module is forcibly shut down by such errors as taking out the main battery while the OEL display panel is in operation, we cannot guarantee the quality of this OEL display module.
- 8) The electric potential to be connected to the rear face of the IC chip should be as follows: US2020  
\* Connection (contact) to any other potential than the above may lead to rupture of the IC.

## 8.4 Precautions when disposing of the OEL display modules

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

## 8.5 Other Precautions

- 1) When an OEL display module is operated for a long of time with fixed pattern may remain as an after image or slight contrast deviation may occur. Nonetheless, if the operation is interrupted and left unused for a while, normal

state can be restored. Also, there will be no problem in the reliability of the module.

- 2) To protect OEL display modules from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the OEL display modules.
  - \* Pins and electrodes
  - \* Pattern layouts such as the COF
- 3) With this OEL display module, the OEL driver is being exposed. Generally speaking, semiconductor elements change their characteristics when light is radiated according to the principle of the solar battery. Consequently, if this OEL driver is exposed to light, malfunctioning may occur.
  - \* Design the product and installation method so that the OEL driver may be shielded from light in actual usage.
  - \* Design the product and installation method so that the OEL driver may be shielded from light during the inspection processes.
- 4) Although this OEL display module stores the operation state data by the commands and the indication data, when excessive external noise, etc. enters into the module, the internal status may be changed. It therefore is necessary to take appropriate measures to suppress noise generation or to protect from influences of noise on the system design.
- 5) We recommend you to construct its software 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.

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