(v) Preliminary Specifications

(   ) Final Specifications

1/25

Module	7 Inch Color TFT-LCD
Model Name	G070VAN01.001

Customer	Date
Checked & Approved by	**Date**
Customer's sign back page	

Approved by	Date
Grace Hung	2018/12/10
Prepared by	**Date**
Ryan Chen	2018/12/10
General Display Business Division / AU Optronics corporation	

2. General Description

G070VAN01.0 is an a-Si & transmissive type thin film transistor liquid crystal display (TFT-LCD) with AHVA (Advanced Hyper View Angle) technology. This model is composed of a TFT-LCD, a driver, an FPCA (flexible printed circuit assembly), and a backlight unit.

2.1 Display Characteristics

The following items are characteristics summary on the table under 25 °C condition:

Items	Unit	Specifications
Screen Diagonal	[inch]	7.0
Active Area	[mm]	152.4(H)×91.44(V)
Resolution		800 (H)×480 RGB(V)
Pixel Pitch	[mm]	0.1905(H)x0.0635xRGB(V)
Pixel Arrangement		R. G. B. Horizontal Stripe
Display Mode		Normally Black
Nominal Input Voltage VDD	[Volt]	3.3 (typ,)
Power Consumption	[Watt]	2.978 (max.)
Weight	[Grams]	TBD±10%
Physical Size	[mm]	166.6(H) × 107(V) × 7(T)
Electrical Interface		LVDS
Surface Treatment		Anti-Glare,
Support Color		16.7M Colors

Temperature Range
    Operating
    Storage (Non-Operating)
	[ºC]
	[ºC]
		-20 ~ +70
		-30 ~ +80

RoHS Compliance		Yes

2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25 °C (Room Temperature):

| Item	Unit	Conditions		Min.	Typ.	Max.	Note
White Luminance	cd/m^2	I$_{LED}$=25mA(center point)			400		1
Uniformity	%	9 points			80		2,3
Contrast Ratio	--			1000	1300		4
Response Time	msec	Rising				11	5
		Falling				19	
		Rising + Falling				20	
Viewing Angle	degree	Horizontal CR >= 10	(Right)	70	89		6
			(Left)	70	89		
		Vertical CR >= 10	(Upper)	70	89		
			(Lower)	70	89		
Color / Chromaticity Coordinates (CIE 1931)	--	Red x		0.593	0.643	0.693	
		Red y		0.283	0.333	0.383	
		Green x		0.255	0.305	0.355	
		Green y		0.563	0.613	0.663	
		Blue x		0.105	0.155	0.205	
		Blue y		0.001	0.051	0.101	
		White x		0.257	0.307	0.357	
		White y		0.271	0.321	0.371	
Color Gamut	%				70		

Note 1: Measurement method

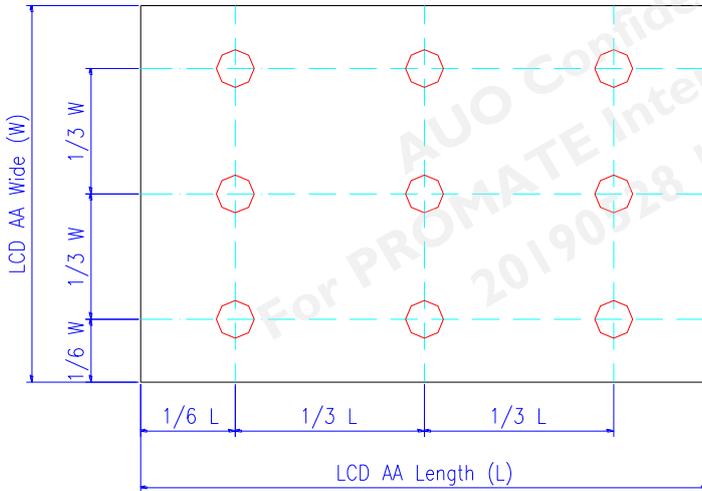Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

Aperture   1◦ with 50cm viewing distance

Test Point   Center

Environment   < *1 lux*

LCD Module

SR_3 or equivalent

Measuring distance

Module Driving Equipment
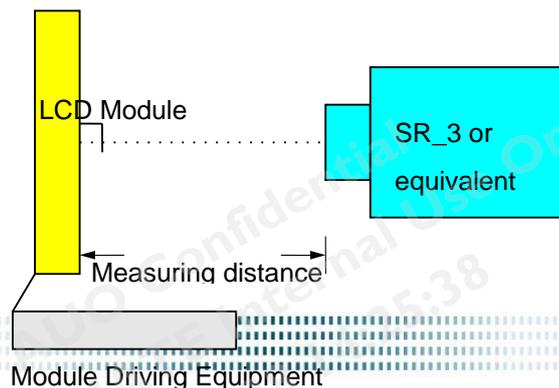
Note 2: Definition of 9 points position

Note 3: The luminance uniformity of 9 points is defined by dividing the minimum luminance values by the maximum test point luminance

$$\delta_{W9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$
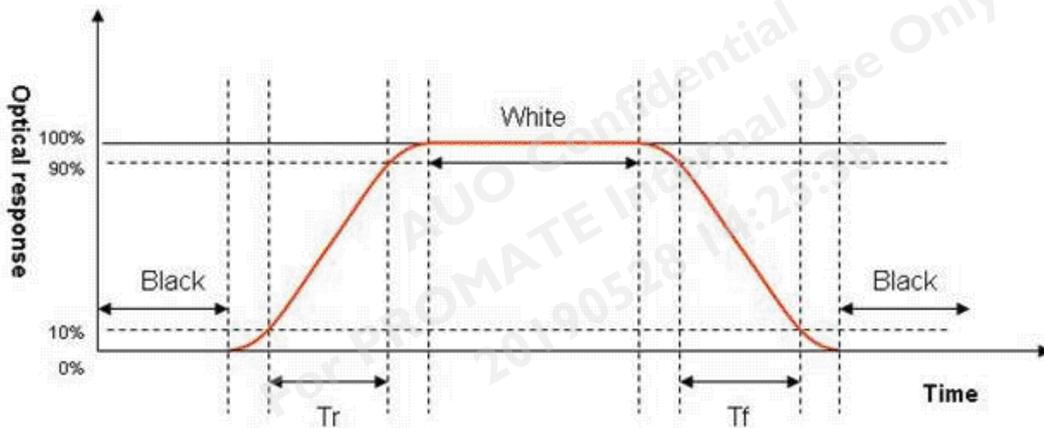
Note 4: Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$
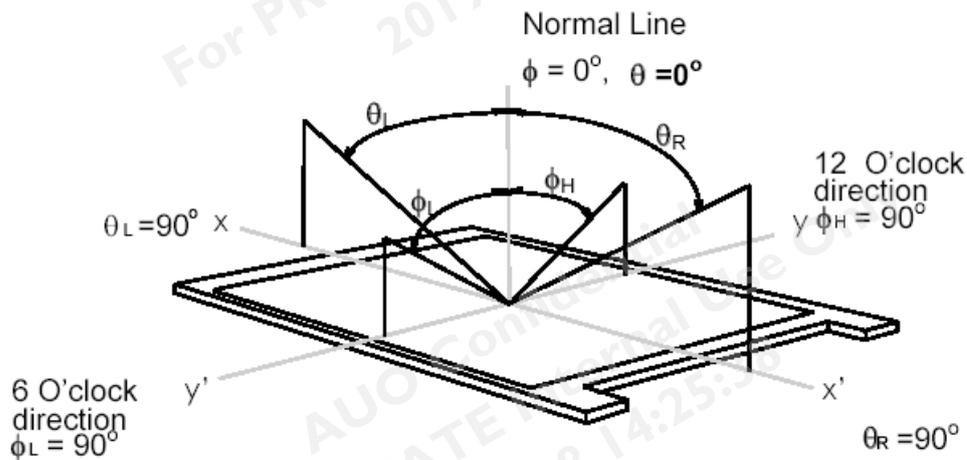
Note 5: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.
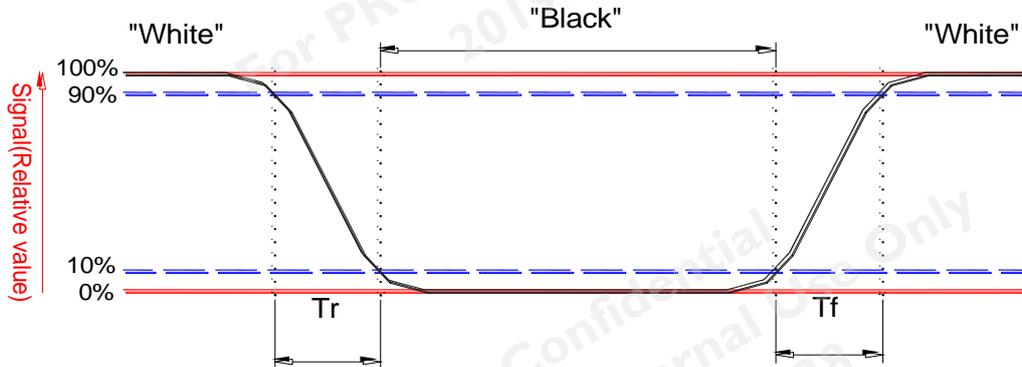
Note 6: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≧10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.

3. Functional Block Diagram

The following diagram shows the functional block of the 7 inch color TFT/LCD module:

4. Absolute Maximum Ratings

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit
Logic/LCD drive Voltage	Vin	-0.3	VDD+0.3	[Volt]

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating	TOP	-20	70	[ºC]
Operation Humidity	HOP	5	90	[%RH]
Storage Temperature	TST	-30	80	[ºC]
Storage Humidity	HST	5	90	[%RH]

Note: Maximum Wet-Bulb should be 39 ºC and no condensation.

5. Electrical Characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are shown as follows;

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	Note1
IVDD	Panel Current	-	140	200	[mA]	Note1,2,3
IVDD Inrush	Inrush Current	-	-	550	[mA]	Note 2
Digital input		-	-	50	[uA]	Note 2
Differential input	Leakage current	-	-	100	[uA]	Note 2
IVDD		-	-	300	[uA]	Note 2

All conditions should be set typical value.

The panel can operate normally in the recommended operating condition.

Note1:Test pattern is the following picture & typ. By VDD=3.3V & max by VDD=3.6V

Note2:Operating temperature from -20℃ to 70℃

Note3:panel loading of color bar pattern is close to typ spec., VBW pattern is close to max spec.

Color bar pattern

VBW pattern

5.1.2 LVDS DC Signal Electrical Characteristics

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
VTH	Differential Input High Threshold	100	-	-	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	-	-	-100	[mV]	VCM=1.2V
∣VID∣	Input Differential Voltage	200	-	600	[mV]	
VICM	Differential Input Common Mode Voltage	1.0	1.2	1.4	[V]	VTH/VTL=+-100mV

Input signals shall be low or Hi-Z state when VDD is off.

Note: LVDS Signal Waveform.
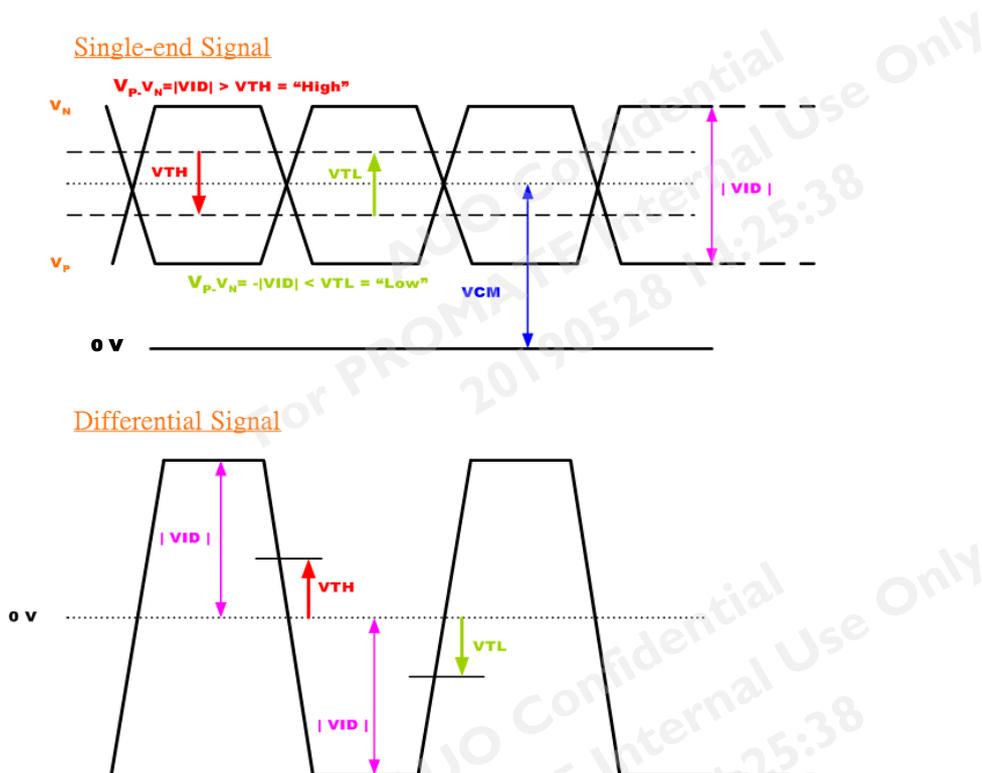
5.2 Backlight Unit

5.2.1 LED Backlight Unit (CN4): Light bar Connector

Connector Name / Designation	Lamp Connector
Manufacturer	Entery or compatible
Connector Model Number	Entery H203K-D04N-02Bor compatible
Mating Model Number	Entery 3800K-F04N-03Ror compatible

Pin #	Symbol	Cable color	Signal Name
1	AN	RED	LED anode
2	CA1	BLACK	LED Cathode 1
3	CA2	WHITE	LED Cathode 2
4	CA3	BLUE	LED Cathode 3

5.2.3 Parameter guideline for LED

Following characteristics are measured under a stable condition using an inverter at 25℃ (Room Temperature):

Backlight driving conditions

| Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
I_L	LED Supply Current	-	92		[mA]	Ta = 25°C, Note 2
V_L	LED Supply Voltage	-	22.4	25.2	[Volt]	Ta = 25°C Note 2/3
P_{LED}	LED Power Consumption		2.06		[Watt]	Ta = 25°C Note 3/4/5
L_L	LED Life Time	50000	70000		Hrs	Ta = 25°C, Note 6, Note 7

Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: I_L, V_L are defined for 2strings of LED

Note 3: LED backlight is 14 LEDs (2strings, 7pcs for each string)

Note 4: The LED supply power is for 2strings of LED

Note 5: The voltage capacity of LED driver IC must be over max. of LED Voltage.
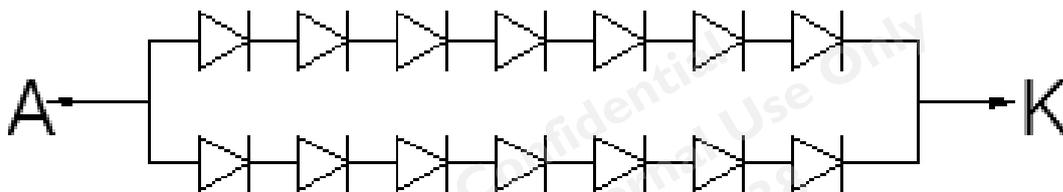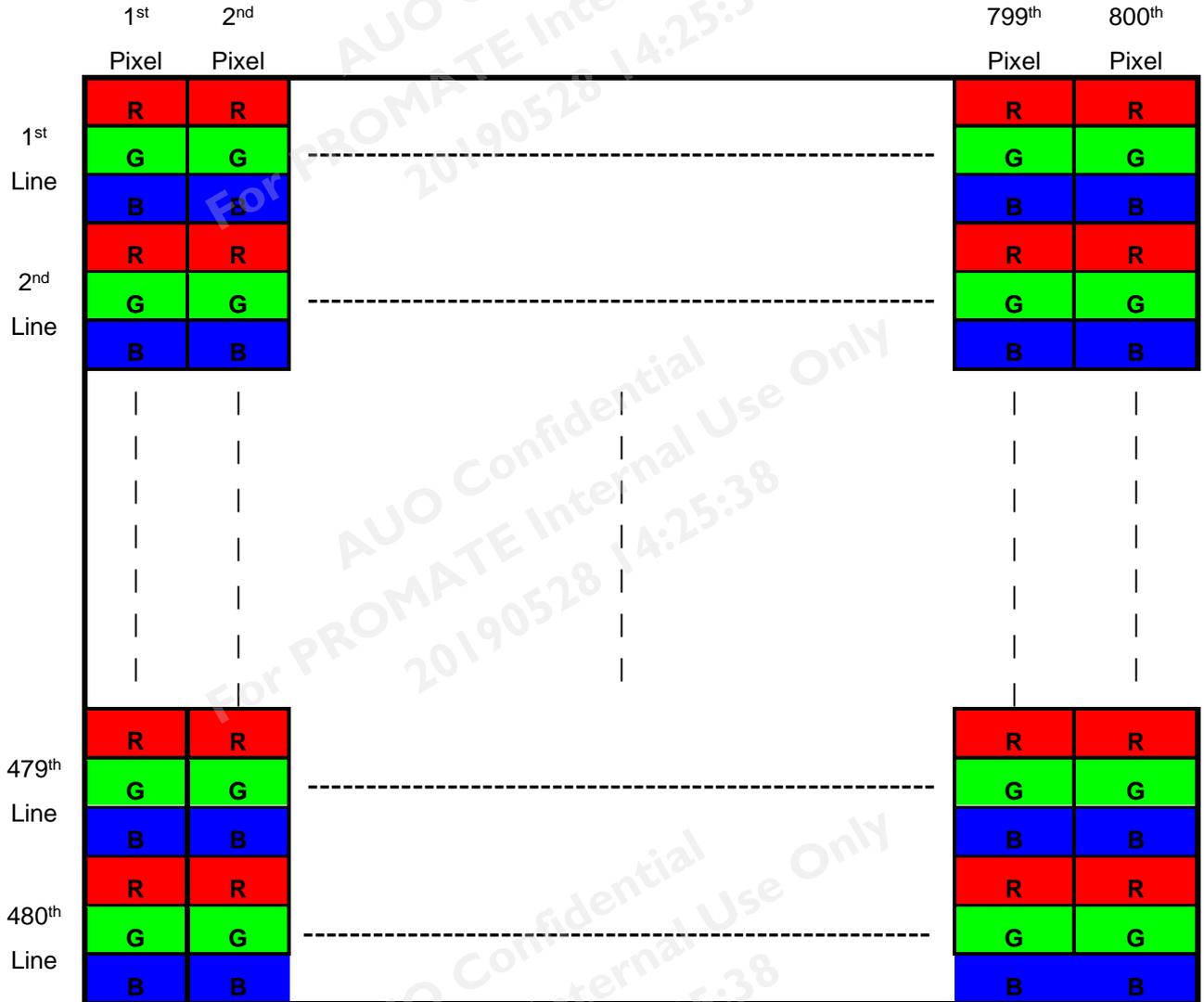

Note 6: Definition of life time: Brightness becomes to 50% of its original value.

Note 7: If G070VAN01.0 module is driven by high current or at high ambient temperature

& humidity condition. The operating life will be reduce.

6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.

6.2 Signal Description

The module uses a LVDS receiver embedded in AUO's ASIC. LVDS is a differential signal technology for LCD interface and a high-speed data transfer device.

6.2.1 TFT LCD Module: LVDS Connector

Connector Name / Designation	Signal Connector
Manufacturer	慶良電子股份有限公司 (CHIEF LAND ElectronicCo.,Ltd.)
Connector Model Number	093G30-00001A-M4

Pin no	Symbol	Function	Remark
1	NC	NOT CONNECT	Note 1
2	LED+	LED ANODE	
3	LED+	LED ANODE	
4	NC	NOT CONNECT	
5	NC	NOT CONNECT	
6	NC	NOT CONNECT	
7	LED-	LED KATHODE	
8	LED-	LED KATHODE	
9	VDD	Power supply +3.3V	
10	VDD	Power supply +3.3V	
11	GND	Ground	
12	GND	Ground	
13	RXIN0N	Negative LVDS differential input	
14	RXIN0P	Positive LVDS differential input	
15	GND	Ground	
16	RXIN1N	Negative LVDS differential input	
17	RXIN1P	Positive LVDS differential input	
18	GND	Ground	
19	RXIN2N	Negative LVDS differential input	
20	RXIN2P	Positive LVDS differential input	
21	GND	Ground	
22	RXCLKN	Negative LVDS differential clock input	
23	RXCLKP	Positive LVDS differential clock input	
24	GND	Ground	
25	RXIN3N	Negative LVDS differential input	
26	RXIN3P	Positive LVDS differential input	
27	GND	Ground	

28	SEL 6/8	Low or NC →6bit input mode High →8bit input mode	
29	NC	NOT CONNECT	Note 1
30	NC	NOT CONNECT	Note 1

Note 1: AUO internal engineering use
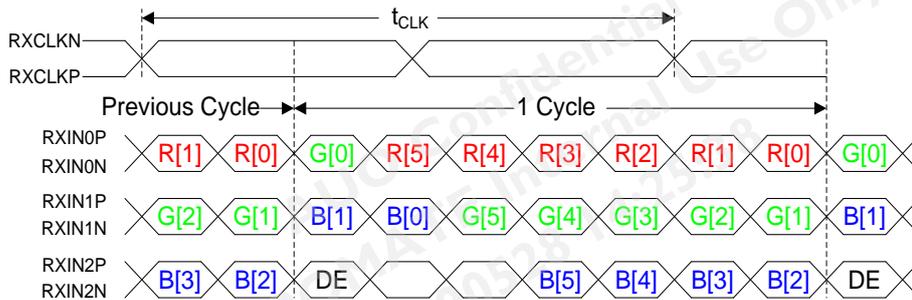

Pin 1　Pin 30

Connector
Insert Direction
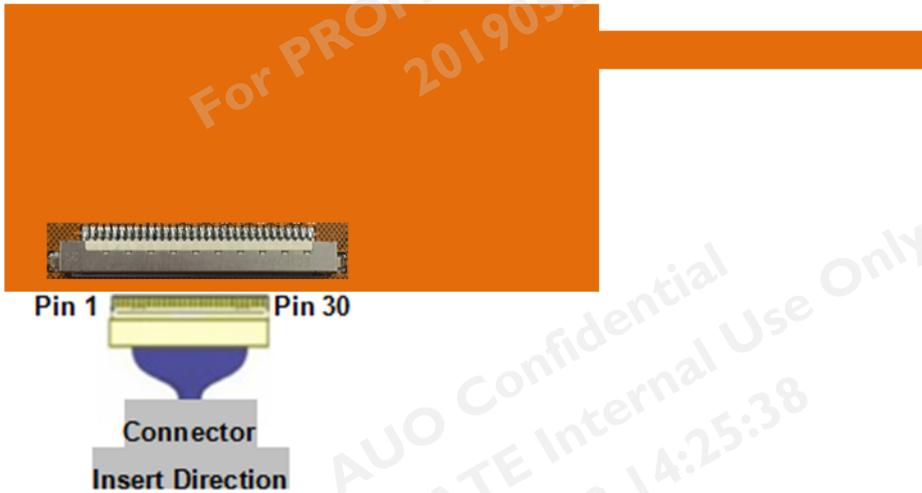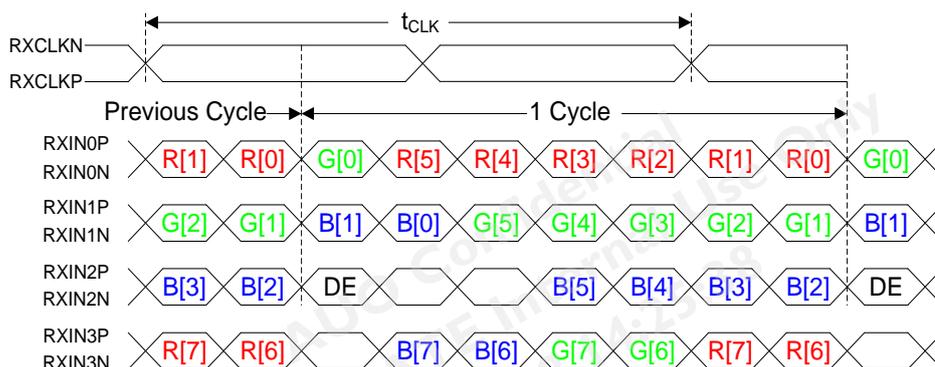
Note1: 30pin start from left side of connector.

Note2: Input signals shall be low or High-impedance state when VDD is off.

6.3 The Input Data Format

SEL68 ="Low" or "NC" for 6 bits LVDS Input

SEL68 = "High" for 8 bits LVDS Input(VESA Format)

Signal Name	Description	Remark
R7	Red Data 7	Red-pixel Data
R6	Red Data 6	
R5	Red Data 5	For 8Bits LVDS input
R4	Red Data 4	MSB: R7 ; LSB: R0
R3	Red Data 3	
R2	Red Data 2	For 6Bits LVDS input
R1	Red Data 1	MSB: R5 ; LSB: R0
R0	Red Data 0	
G7	Green Data 7	Green-pixel Data
G6	Green Data 6	
G5	Green Data 5	For 8Bits LVDS input
G4	Green Data 4	MSB: G7 ; LSB: G0
G3	Green Data 3	
G2	Green Data 2	For 6Bits LVDS input
G1	Green Data 1	MSB: G5 ; LSB: G0
G0	Green Data 0	
B7	Blue Data 7	Blue-pixel Data
B6	Blue Data 6	
B5	Blue Data 5	For 8Bits LVDS input
B4	Blue Data 4	MSB: B7 ; LSB: B0
B3	Blue Data 3	
B2	Blue Data 2	For 6Bits LVDS input
B1	Blue Data 1	MSB: B5 ; LSB: B0
B0	Blue Data 0	
RXCLKN RXCLKP	LVDS Data Clock	
DE	Data Enable Signal	When the signal is high, the pixel data shall be valid to be displayed.

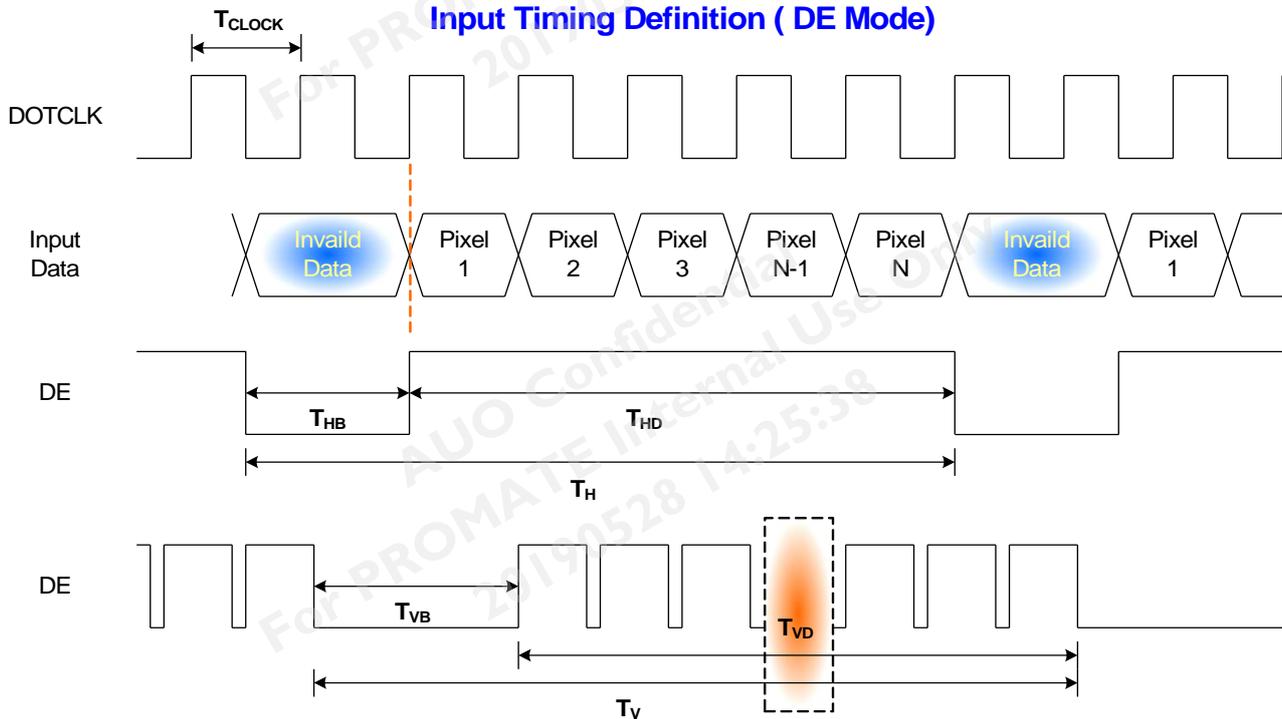Note: Output signals from any system shall be low or Hi-Z state when VDD is off.

6.4 Interface Timing

6.4.1 Timing Characteristics

Signal		Symbol	Min.	Typ.	Max.	Unit
Clock Frequency		$1/T_{Clock}$	33.2	37	45	MHz
Vertical Section	Period	T_V	525	525	580	T_{Line}
	Active	T_{VD}		480		
	Blanking	T_{VB}	45	45	100	
Horizontal Section	Period	T_H	1054	1175	1395	T_{Clock}
	Active	T_{HD}		800		
	Blanking	T_{HB}	254	375	595	
Frame Rate		F		60		Hz

Note : DE mode.

6.4.2 Input Timing Diagram

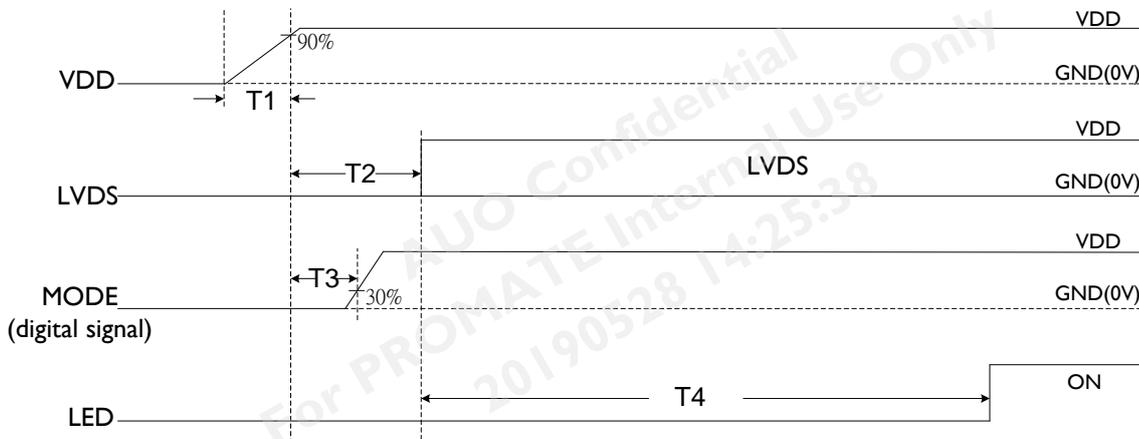**Input Timing Definition (DE Mode)**

6.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.
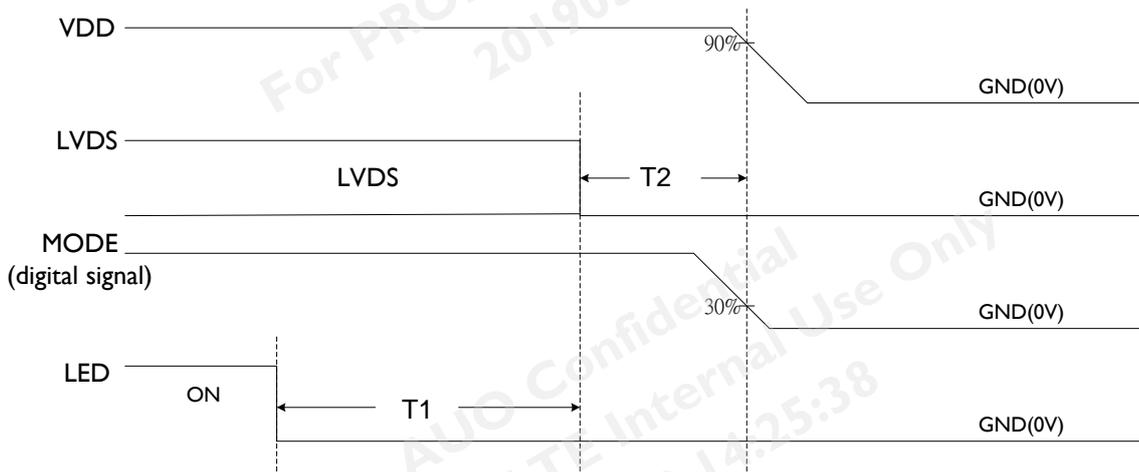
Panel Power on sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	1	-	-	ms
T2	7	-	-	ms
T3	0	-	-	ms
T4	300	-	-	ms

Panel Power off sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	350	-	-	ms
T2	0	-	-	ms

VDD ON/OFF:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	700	--	-	ms

Note : VDD restart voltage should be under VDD X 0.1
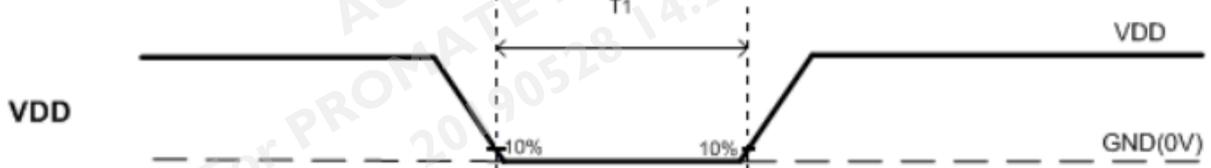
The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

7. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	60 °C /90%,240Hr	
High Temperature Operation	70 °C, 240Hr (center point of panel surface)	
Low Temperature Operation	-20 °C, 240Hr	
Hot Storage	80 °C, 240 hours	
Cold Storage	-30 °C, 240 hours	
Thermal Shock Test	-30 °C ~ 70 °C /50 cycles 1Hrs/cycle	
Shock Test (Non-Operating)	50G,20ms,Half-sine wave,(+-X,+-Y,+-Z)	
Vibration Test (Non-Operating)	Frequency：10~55 Hz Stoke： 1.5mm Sweep：10~55~10 Hz	
ESD	Contact : ± 8KV/ operation, Class B Air : ± 15KV / operation, Class B	Note 1
Drop (with carton)	Height: 61cm 1 corner, 3 edges, 6 surfaces	

Note1: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost

. Self-recoverable. No hardware failures.

Note2:

- Water condensation is not allowed for each test items.
- Each test is done by new TFT-LCD module. Don't use the same TFT-LCD module repeatedly for reliability test.
- The reliability test is performed only to examine the TFT-LCD module capability.
- To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.
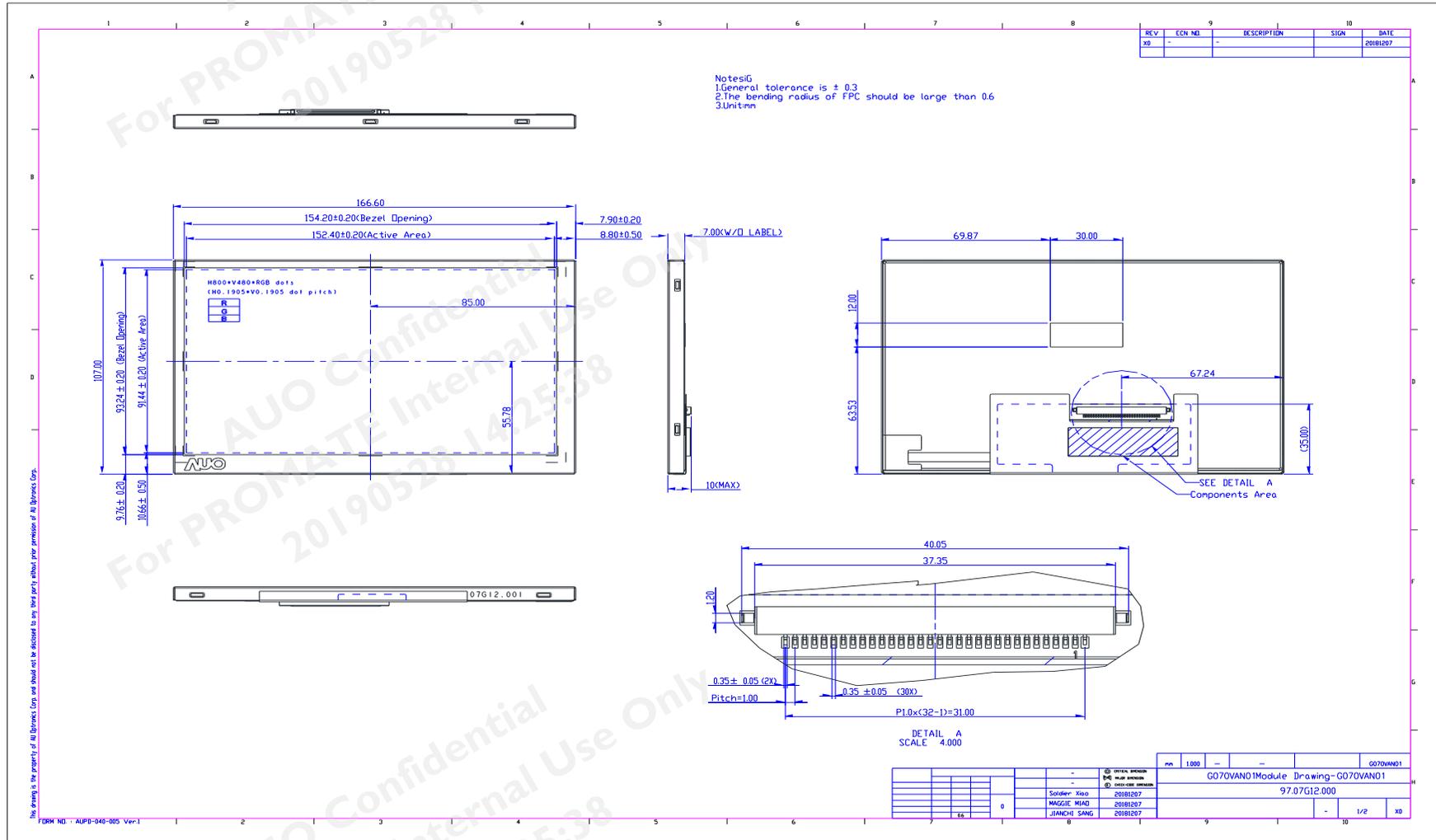
Product Specification

AU OPTRONICS CORPORATION

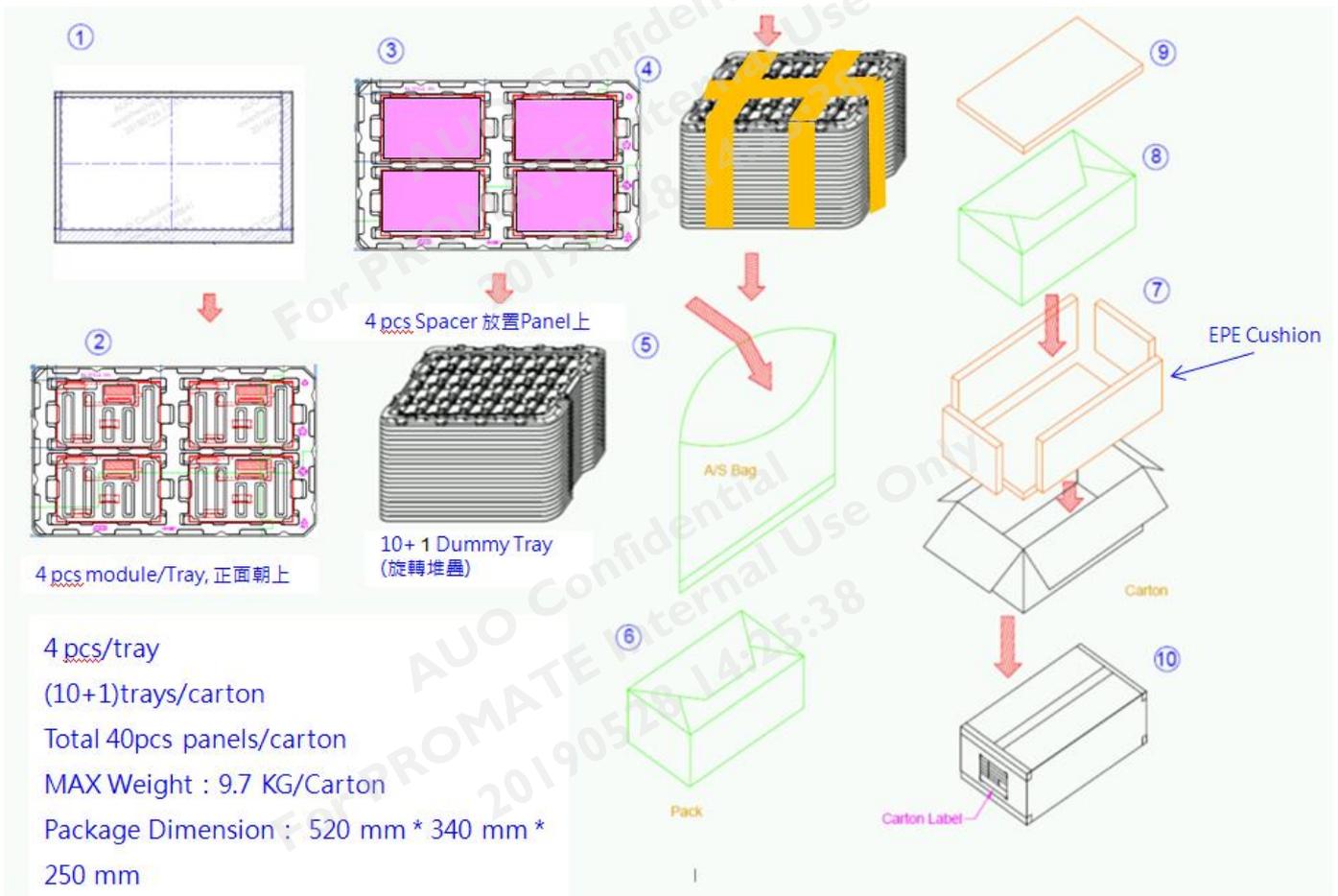## 8. Mechanical Characteristics

8.1 LCM Outline Dimension

9. Label and Packaging

9.1 Shipping Label (on the rear side of TFT-LCD display)

9.2 Carton Package

4 pcs Spacer 放置Panel上

10+ 1 Dummy Tray
(旋轉堆疊)

4 pcs module/Tray, 正面朝上

4 pcs/tray

(10+1)trays/carton

Total 40pcs panels/carton

MAX Weight : 9.7 KG/Carton

Package Dimension : 520 mm * 340 mm * 250 mm

EPE Cushion

A/S Bag

Carton

Pack

Carton Label

10 Safety

10.1 Sharp Edge Requirements

There will be no sharp edges or comers on the display assembly that could cause injury.

10.2 Materials

10.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

10.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

10.3 Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

10.4 National Test Lab Requirement

The display module will satisfy all requirements for compliance to:

UL 60950-1 second edition   U.S.A. Information Technology Equipment