



AUO Display+

# Product Specification

G104VAN02.0

Preliminary Specification

Final Specification

<b>Module</b>	<b>10.4 Inch Color TFT-LCD</b>
<b>Model Name</b>	<b>G104VAN02.0</b>

<b>Company</b>	
_____	
<b>Checked &amp; Approved by</b>	<b>Date</b>
_____	_____

<b>Approved by</b>	<b>Date</b>
_____	_____
<b>Prepared by</b>	
<u>Danny Liao</u>	<u>2025/01/13</u>
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## Record of Revision

Version and Date	Page	Old description	New Description	Remark
0.0 2025/01/13	All	Draft version		

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## 1. Operating Precautions

- 1) Since front polarizer is easily damaged, please be cautious not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or soft cloth.
- 5) Since the panel is made of glass, it may be broken or cracked if dropped or bumped on hard surface.
- 6) To avoid ESD (Electro Static Discharge) damage, be sure to ground yourself before handling TFT-LCD Module.
- 7) Do not open nor modify the module assembly.
- 8) Do not press the reflector sheet at the back of the module to any direction.
- 9) In case if a module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED Reflector edge. Instead, press at the far ends of the LED Reflector edge softly. Otherwise the TFT Module may be damaged.
- 10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 11) After installation of the TFT Module into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
- 12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC 62368-1), or be applied exemption.
- 13) Severe temperature condition may result in different luminance, response time.
- 14) Continuous operating TFT-LCD Module under high temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.
- 15) The data on this specification sheet is applicable when LCD module is placed in landscape position.
- 16) Continuous displaying fixed pattern may induce image sticking. It is recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.

## 2. General Description

This specification applies to the Color Active Matrix Liquid Crystal Display G104VAN02.0 composed of a TFT-LCD display, a driver and power supply circuit, and a LED backlight system. The screen format is intended to support VGA (640(H) x 480(V)) screen.

G104VAN02.0 designed with wide viewing angle; wide temperature and long life LED backlight is well suited for industrial applications.

### 2.1 Display Characteristics

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

Items	Unit	Specifications
Screen Diagonal	[inch]	10.4
Active Area	[mm]	211.2 (H) x 158.4 (V)
Pixels H x V		640 x 3(RGB) x 480
Pixel Pitch	[mm]	0.33 x 0.33
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		AHVA, Normally Black
Nominal Input Voltage VDD	[Volt]	3.3V
Typical Power Consumption	[Watt]	0.51W (Power Consumption of CELL :White pattern)
Weight	[Grams]	564g (Max)
Physical Size	[mm]	243.0(H) x 185.1(V) x 10.5(D) (typ.)
Electrical Interface		RGB
Surface Treatment		Anti-glare, Hardness 3H
Support Color		262K colors
Temperature Range		
Operating	[°C]	-30 to +80
Storage (Non-Operating)	[°C]	-30 to +80
RoHS Compliance		RoHS Compliance

## 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 <sup>2</sup> ]	I <sub>F</sub> = 50mA (center point)	330	450	-	1
Uniformity		5 Points	75	-	-	1.2.3
Contrast Ratio			700	1000	-	4
	[msec]	Rising + Falling	-	25	35	5
Viewing Angle	[degree]	Horizontal (Right)	80	89	-	6
	[degree]	CR ≥ 10 (Left)	80	89	-	
	[degree]	Vertical (Upper)	80	89	-	
	[degree]	CR ≥ 10 (Lower)	80	89	-	
Color / Chromaticity Coordinates (CIE 1931)		Red x	TBD	TBD	TBD	1
		Red y	TBD	TBD	TBD	
		Green x	TBD	TBD	TBD	
		Green y	TBD	TBD	TBD	
		Blue x	TBD	TBD	TBD	
		Blue y	TBD	TBD	TBD	
		White x	TBD	0.313	TBD	
		White y	TBD	0.329	TBD	
Color Gamut	%		-	45	-	1

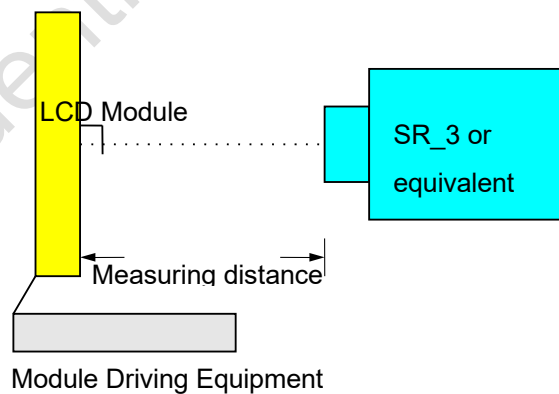
Note 1: Measurement method

Equipment : Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR\_3 or equivalent)

Aperture 1φwith 50cm viewing distance

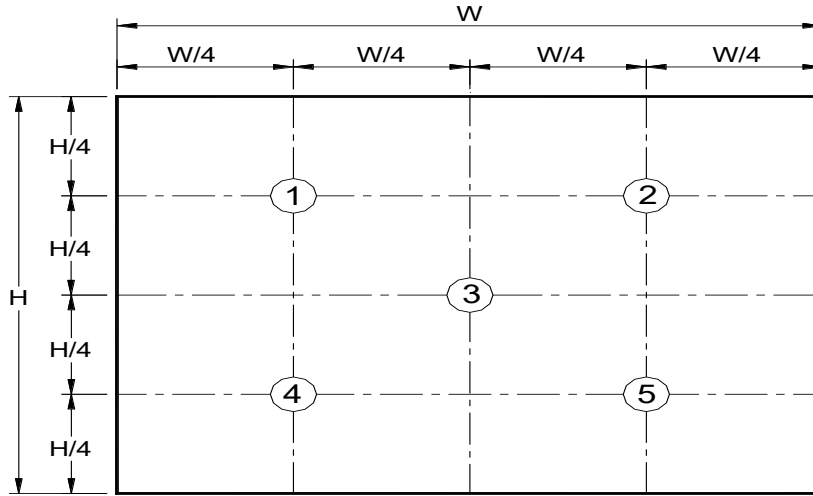
Test Point Center

Environment < 1 lux



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Note 2: Definition of 5 points position (Display active area: 152.40(H) x 91.44(V))



Note 3:

The luminance uniformity of 5 points is defined by dividing the minimum luminance value by the maximum luminance value at full white condition.

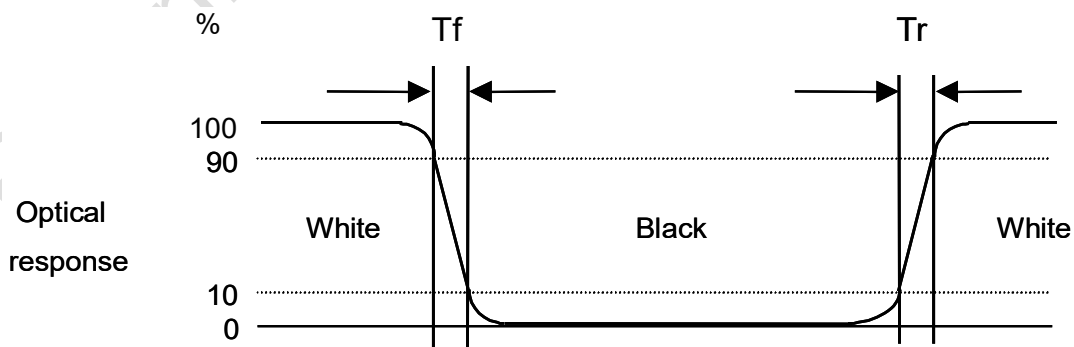
$$\delta_{w5} = \frac{\text{Minimum Brightness of five points}}{\text{Maximum Brightness of five points}}$$

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:

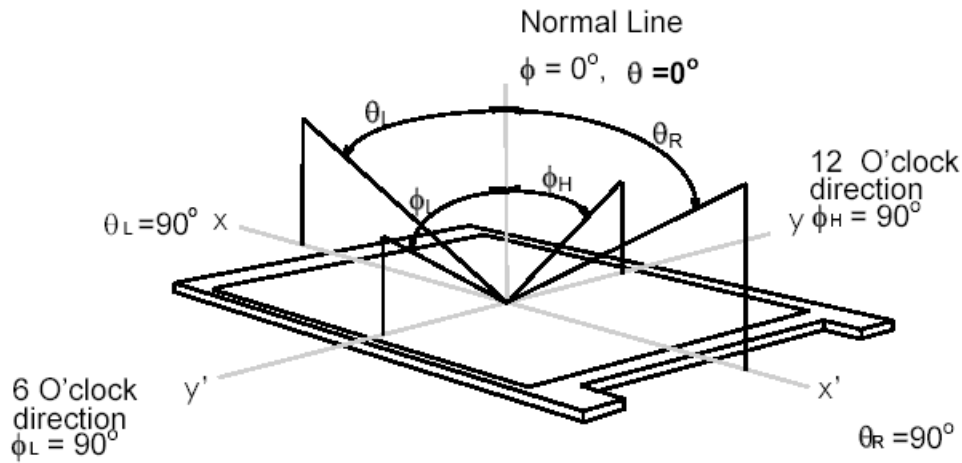
The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



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### Note 6: Definition of viewing angle

Viewing angle is the measurement of contrast ratio  $\geq 10$ , at the screen center, over a  $180^\circ$  horizontal and  $180^\circ$  vertical range (off-normal viewing angles). The  $180^\circ$  viewing angle range is broken down as below:  $90^\circ$  ( $\theta$ ) horizontal left and right, and  $90^\circ$  ( $\Phi$ ) 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.

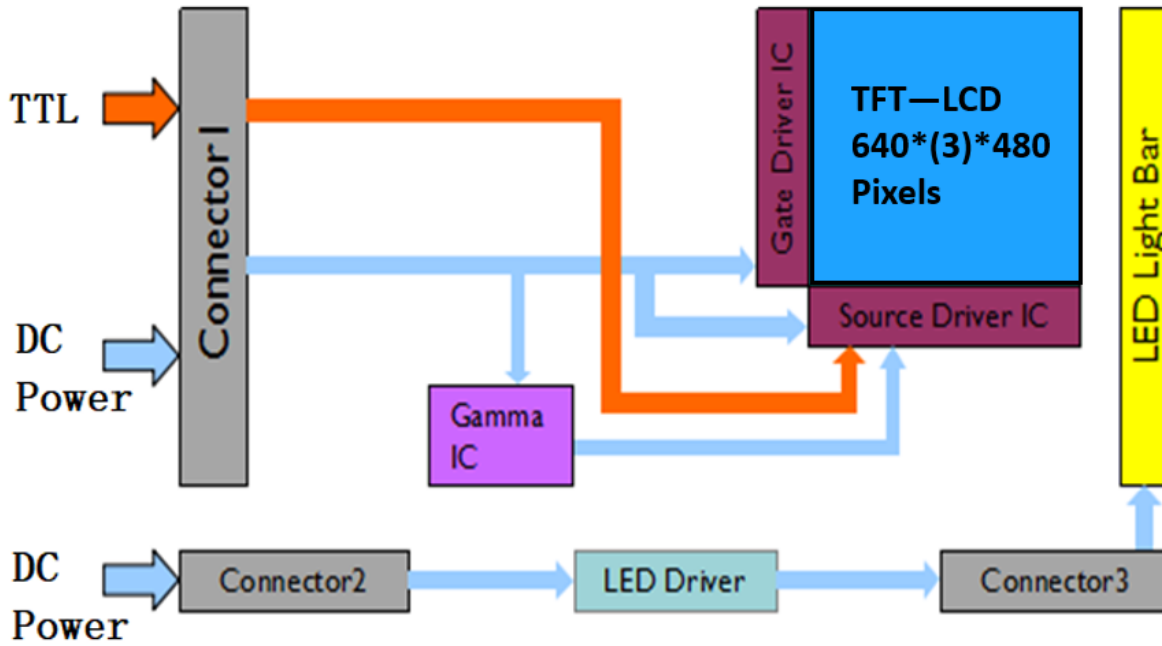


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## 3. Functional Block Diagram

The following diagram shows the functional block of the 10.4 inch color TFT/LCD module:



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## 4. Absolute Maximum Ratings

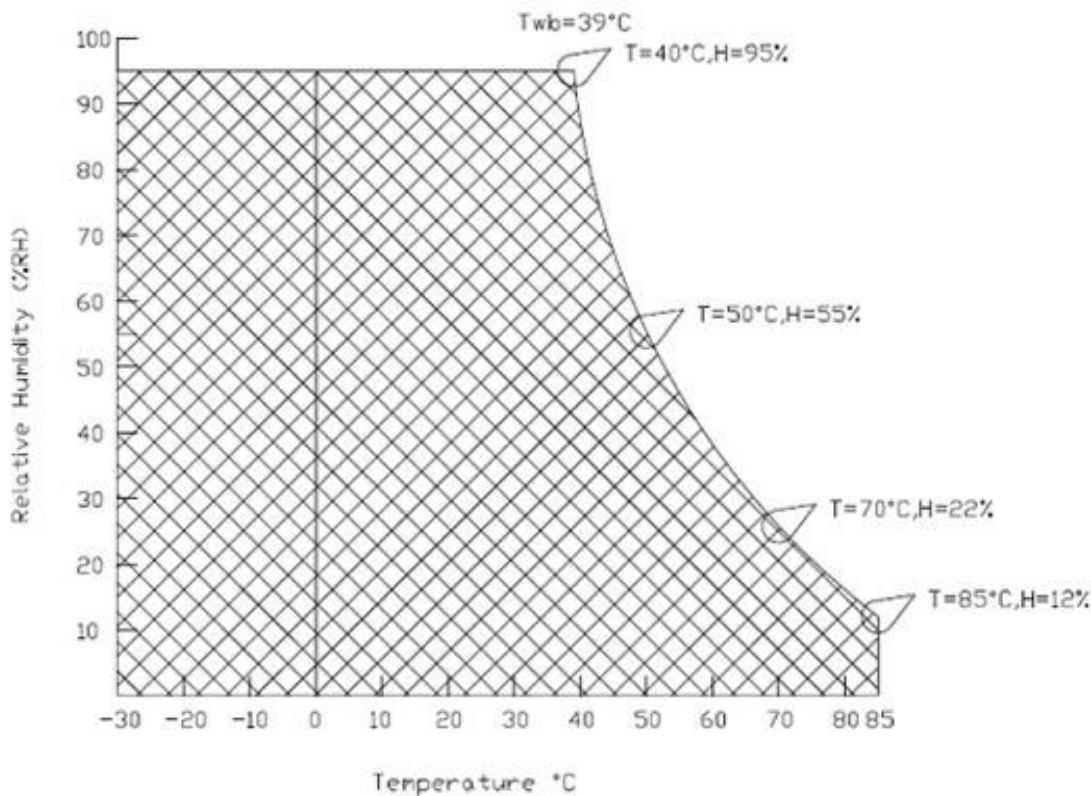
### 4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VDD	-0.3	+3.6	[Volt]	

### 4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	-30	+85	[°C]
Operation Humidity	HOP	5	90	[%RH]
Storage Temperature	TST	-30	+85	[°C]
Storage Humidity	HST	5	90	[%RH]

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

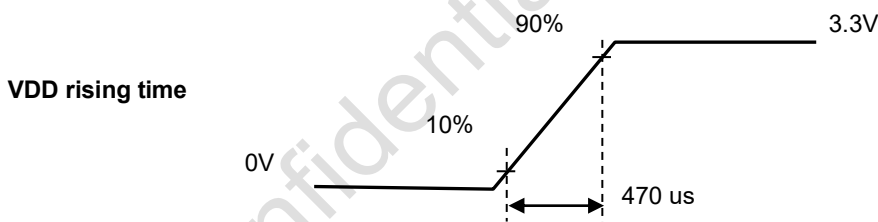
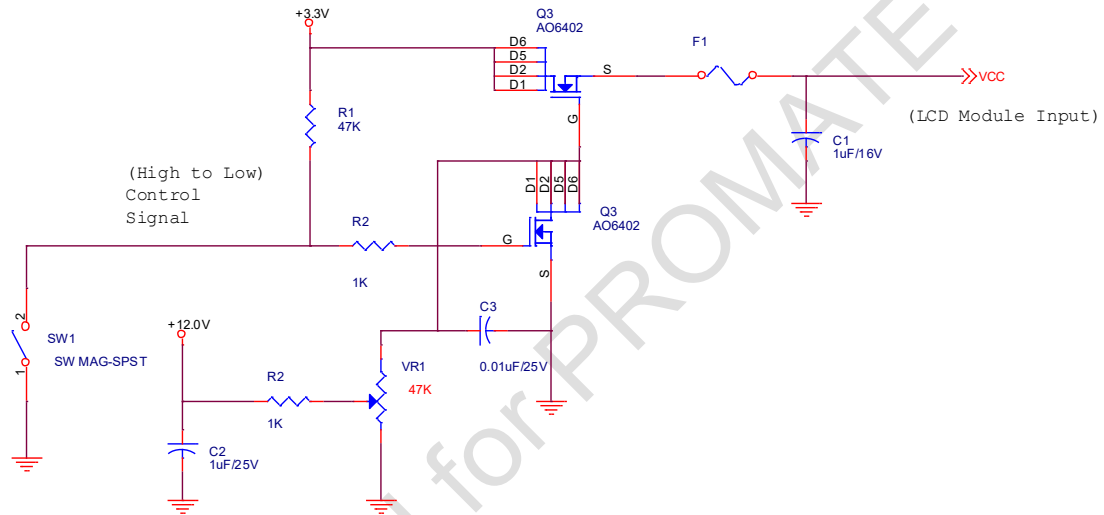


## 5. Electrical Characteristics

### 5.1 TFT LCD Module

#### 5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Input Voltage	3.0	3.3	3.6	[Volt]	
I <sub>VDD</sub>	LCD Input Current	-	155	-	[mA]	VDD=3.3V at 60 HZ, all White Pattern
P <sub>VDD</sub>	LCD Power consumption	-	0.51	-	[Watt]	VDD=3.3V at 60 HZ, all White Pattern
I <sub>rush LCD</sub>	LCD Inrush Current	-	-	1.5	[A]	Note 1; VDD=3.3V White Pattern, Rising time=470us



## 5.1.2 Signal Electrical Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remarks
Logic Input Voltage for Display Signals	High	V <sub>IH</sub>	2.8	-	V <sub>DD</sub>	Volt	
	Low	V <sub>IL</sub>	0	-	0.8	Volt	
Input Voltage for RL/UD	High	V <sub>IH</sub>	2.8	-	V <sub>DD</sub>	Volt	
	Low	V <sub>IL</sub>	0	-	0.8	Volt	

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

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## 5.2 Backlight Unit

### 5.2.1 Parameter guideline for LED

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
$I_F$	LED Forward Current		50		mA	One circuit
$V_F$	LED Forward Voltage		15		V	$I_F = 50\text{mA}$ , $T_a = 25^\circ\text{C}$
$P_{LED}$	LED Power Consumption		2.25		W	
LED life time			70,000	-	Hrs	$I_F = 50\text{mA}$ , $T_a = 25^\circ\text{C}$

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

Note 2:  $I_F$ ,  $V_F$  are defined for one channel LED. There are two LED channel in back light unit.

Note 3: If G104VAN02.0 module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note 4: Operating life means brightness goes down to 50% initial brightness. Minimum operating life time is estimated data.

Note 5: LED combination: 5 series 3 parallel.

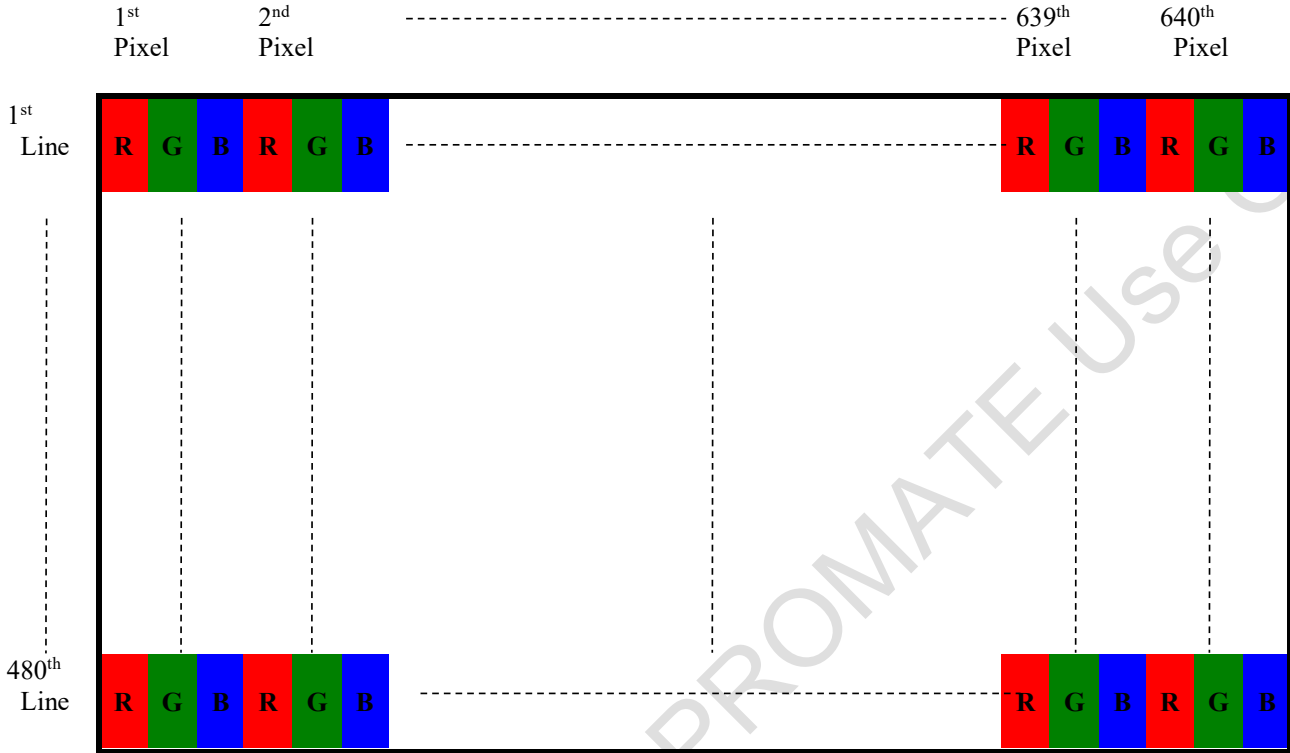
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## 6. Signal Characteristic

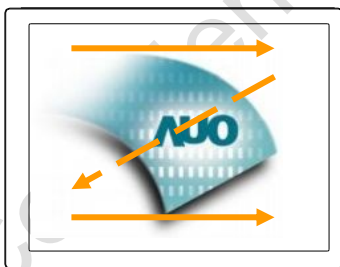
### 6.1 Pixel Format Image

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

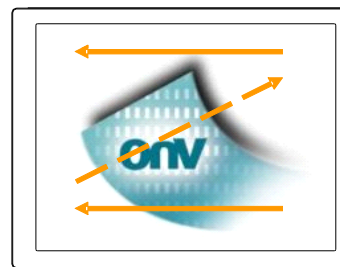


### 6.2 Scanning Direction

The following figures show the image seen from the front view. The arrow indicates the direction of scan.



DPS: L or NC (Normal Scan)



DPS: H (Reverse Scan)

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## 6.3 TFT-LCD Interface Signal Description

Input Signal Interface		
Pin No.	Symbol	Description
1	GND	Ground
2	CLK	Dot clock
3	HSYNC	Horizontal sync signal
4	VSNC	Vertical sync signal
5	GND	Ground
6	R0	Red data Signal
7	R1	Red data Signal
8	R2	Red data Signal
9	R3	Red data Signal
10	R4	Red data Signal
11	R5	Red data Signal
12	GND	Ground
13	G0	Green data Signal
14	G1	Green data Signal
15	G2	Green data Signal
16	G3	Green data Signal
17	G4	Green data Signal
18	G5	Green data Signal
19	GND	Ground
20	B0	Blue data Signal
21	B1	Blue data Signal
22	B2	Blue data Signal
23	B3	Blue data Signal
24	B4	Blue data Signal
25	B5	Blue data Signal
26	GND	Ground
27	DE	Data Enable Signal
28	VDD	Power Supply, 3.3V (typical)
29	VDD	Power Supply, 3.3V (typical)
30	NC	NC(Keep this pin Open)
31	DPS	High: Reverse scan L or NC: Normal scan

Note 1: Input Signals shall be in low status when VDD is off.

Note 2: High stands for "3.3V", Low stands for "0V", NC stands for "No Connection".

## 6.4 The Input Data Format

This product displays 262,144 colors in terms of the 64 grey levels on RGB respectively. The following table demonstrates the display of input data.

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0	Red-pixel Data  For 8Bits input MSB: R7 ; LSB: R0  For 6Bits input MSB: R5 ; LSB: R0
G7 G6 G5 G4 G3 G2 G1 G0	Green Data 7 Green Data 6 Green Data 5 Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0	Green-pixel Data  For 8Bits input MSB: G7 ; LSB: G0  For 6Bits input MSB: G5 ; LSB: G0
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0	Blue-pixel Data  For 8Bits input MSB: B7 ; LSB: B0  For 6Bits input MSB: B5 ; LSB: B0
CLK	Data Clock	Falling Latch
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.

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## 6.5 TFT-LCD Interface Timing

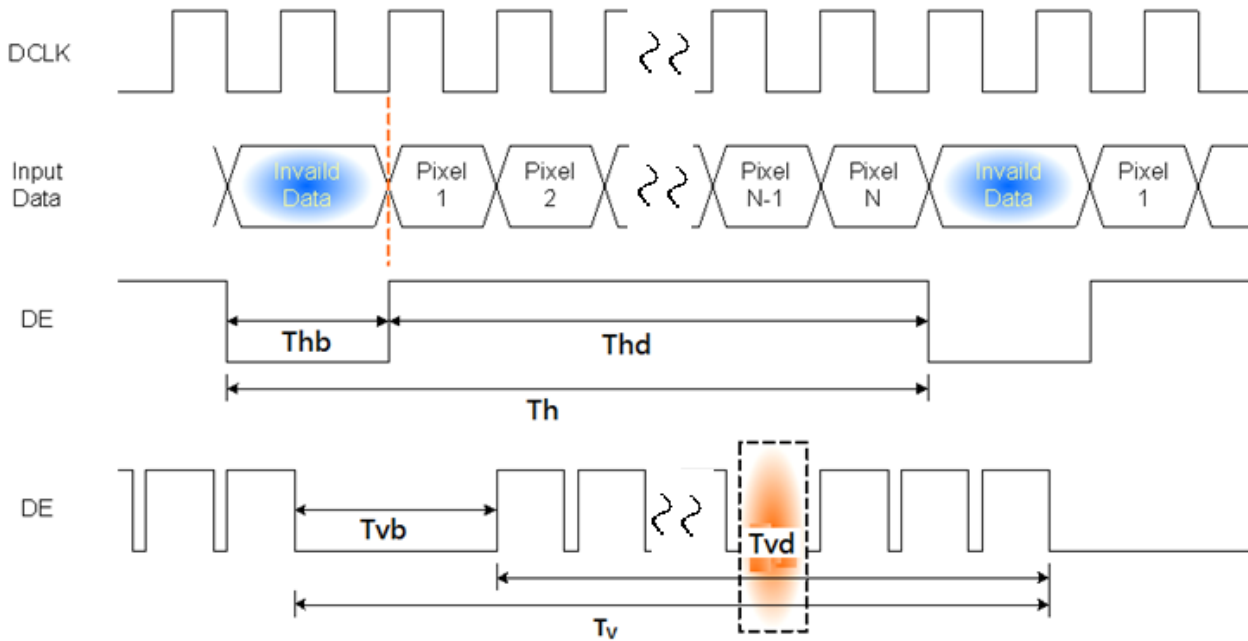
### 6.5.1 Timing Characteristics

Signal	Symbol	Min.	Typ.	Max.	Unit	
Clock Frequency	$1/T_{\text{Clock}}$	23.2	25.2	29	MHz	
Vertical Section	Period	$T_v$	517	525	560	$T_{\text{Line}}$
	Active	$T_{vd}$	--	480	--	
	Blanking	$T_{vb}$	37	45	80	
Horizontal Section	Period	$T_h$	748	800	860	$T_{\text{Clock}}$
	Active	$T_{hd}$	--	640	--	
	Blanking	$T_{hb}$	108	160	220	

Note 1: Frame rate is 60 Hz.

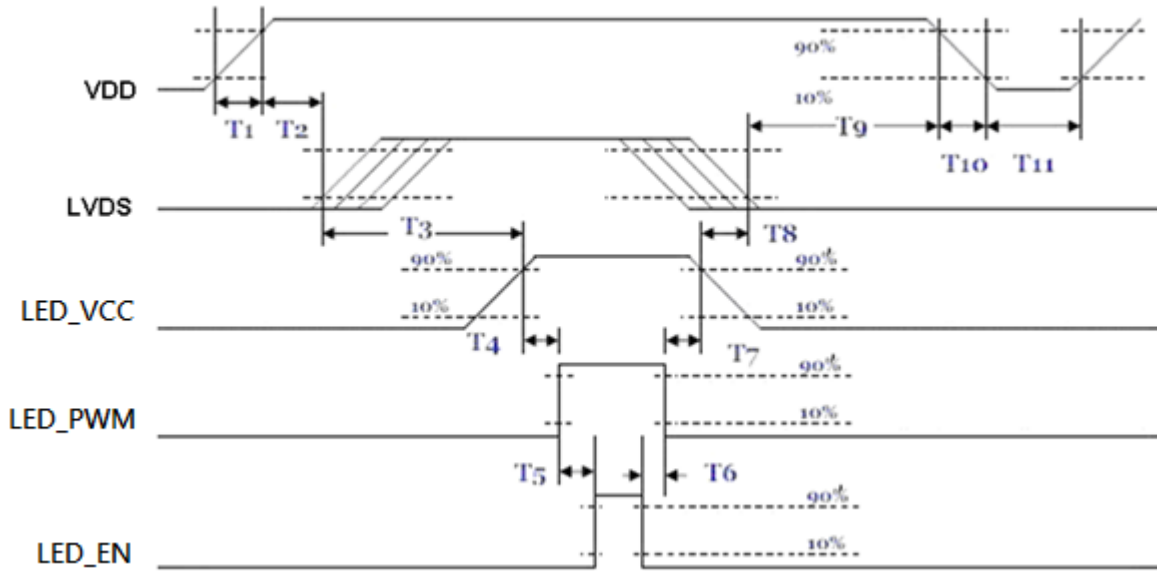
Note 2: DE mode.

### 6.5.2 Input Timing Diagram



## 6.6 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.



**Power ON/OFF sequence timing**

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	850	-	-	[ms]
T4	-	-	-	[ms]
T5	-	-	-	[ms]
T6	120	-	-	[ms]
T7	0	16	50	[ms]
T8	-	-	10	[ms]
T9	1000	-	-	[ms]

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.

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## 7. Connector & Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

### 7.1 TFT-LCD Signal (CN1): LCD Connector

Connector Name / Designation	Signal Connector
Manufacturer	Hirose or compatible
Connector Model Number	DF9B-31P-1V (2*) or compatible
Adaptable Plug	DF9-31S-1V (2*), DF9-31S-1V (3*) or compatible

Pin No.	Symbol	Pin No.	Symbol	Pin No.	Symbol	Pin No.	Symbol
1	GND	11	R5	21	B1	31	DPS
2	CLK	12	GND	22	B2		
3	HSYNC	13	G0	23	B3		
4	VSYNC	14	G1	24	B4		
5	GND	15	G2	25	B5		
6	R0	16	G3	26	GND		
7	R1	17	G4	27	DE		
8	R2	18	G5	28	VDD		
9	R3	19	GND	29	VDD		
10	R4	20	B0	30	NC		

### 7.2 LED Backlight Unit (CN2): Backlight Connector

Connector Name / Designation	Lamp Connector
Manufacturer	STM or compatible
Connector Model Number	SM08B-SRSS-TB or compatible
Mating Model Number	SHR-08V-S-B or compatible

Pin No.	symbol	description	Remarks
1	A1	Anode1	
2	K1	Cathode1	
3	A2	Anode2	
4	K2	Cathode2	
5	A3	Anode3	
6	K3	Cathode3	
7	NC	-	Keep this pin Open
8	NC	-	Keep this pin Open

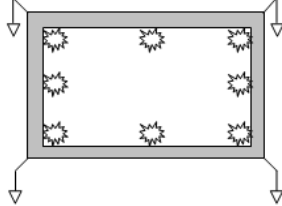
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## 8. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	60°C, 90%RH, 300 hours	
High Temperature Operation	80°C, 300 hours	
Low Temperature Operation	-30°C, 300 hours	
Hot Storage	80°C, 300 hours	
Cold Storage	-30°C, 300 hours	
Thermal Shock Test	-20°C/ 30 min, 60°C/ 30 min, 100cycles, 40°C minimum ramp rate	
Shock Test (Non-Operating)	50G, 20ms, Half-sine wave, ( ±X, ±Y, ±Z)	
Vibration Test (Non-Operating)	1.5G, (10~200Hz, Sine wave) 30 mins/axis, 3 direction (X, Y, Z)	
ESD	Contact Discharge: ± 8KV, 150pF(330Ω ) 1sec, 8 points, 25 times/point Air Discharge: ± 15KV, 150pF(330Ω ) 1sec, 8 points, 25 times/ point	Note 1

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

Self-recoverable. No hardware failures. Test points as below.

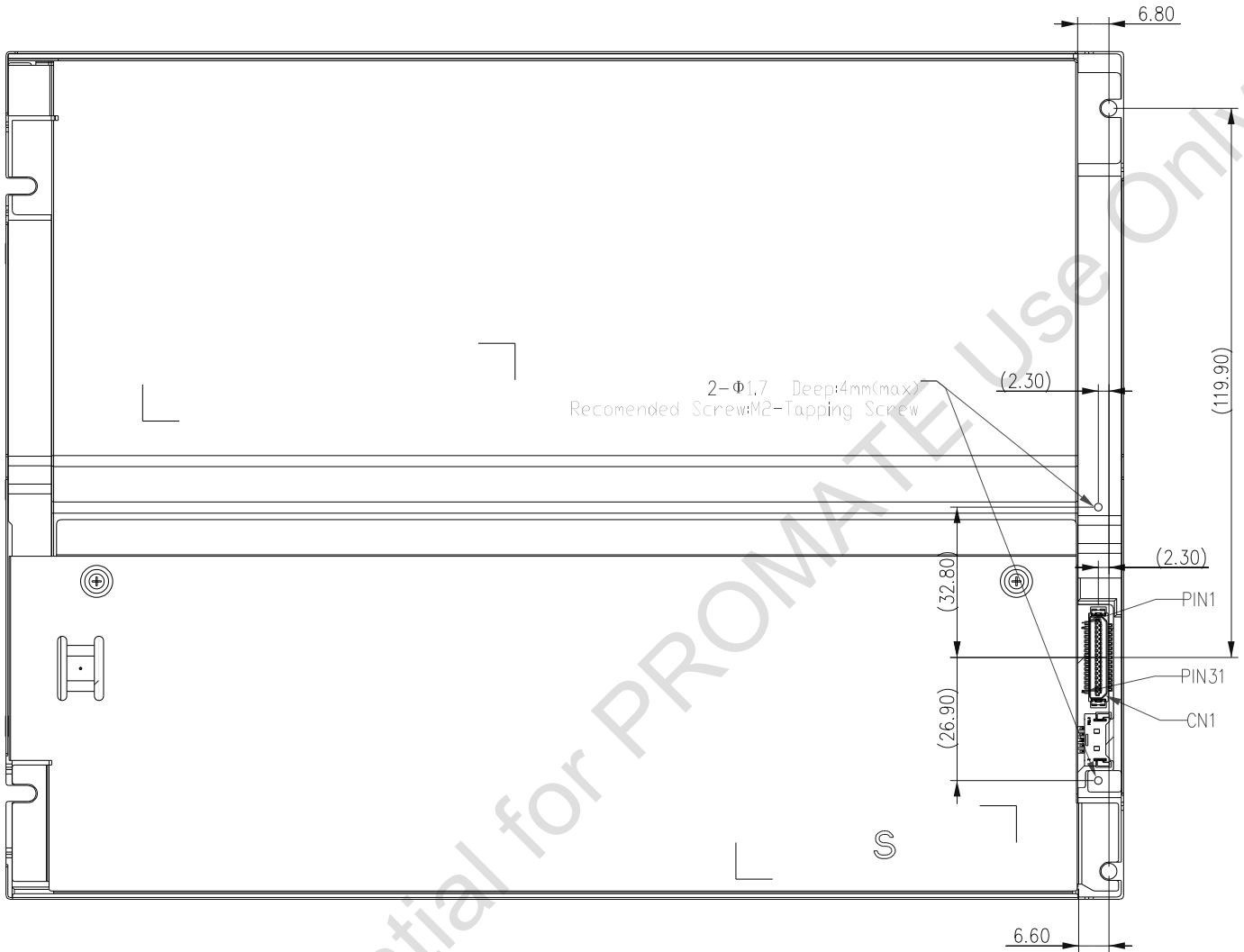


Note2:

- 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.



## 9.2 LCM Rear View

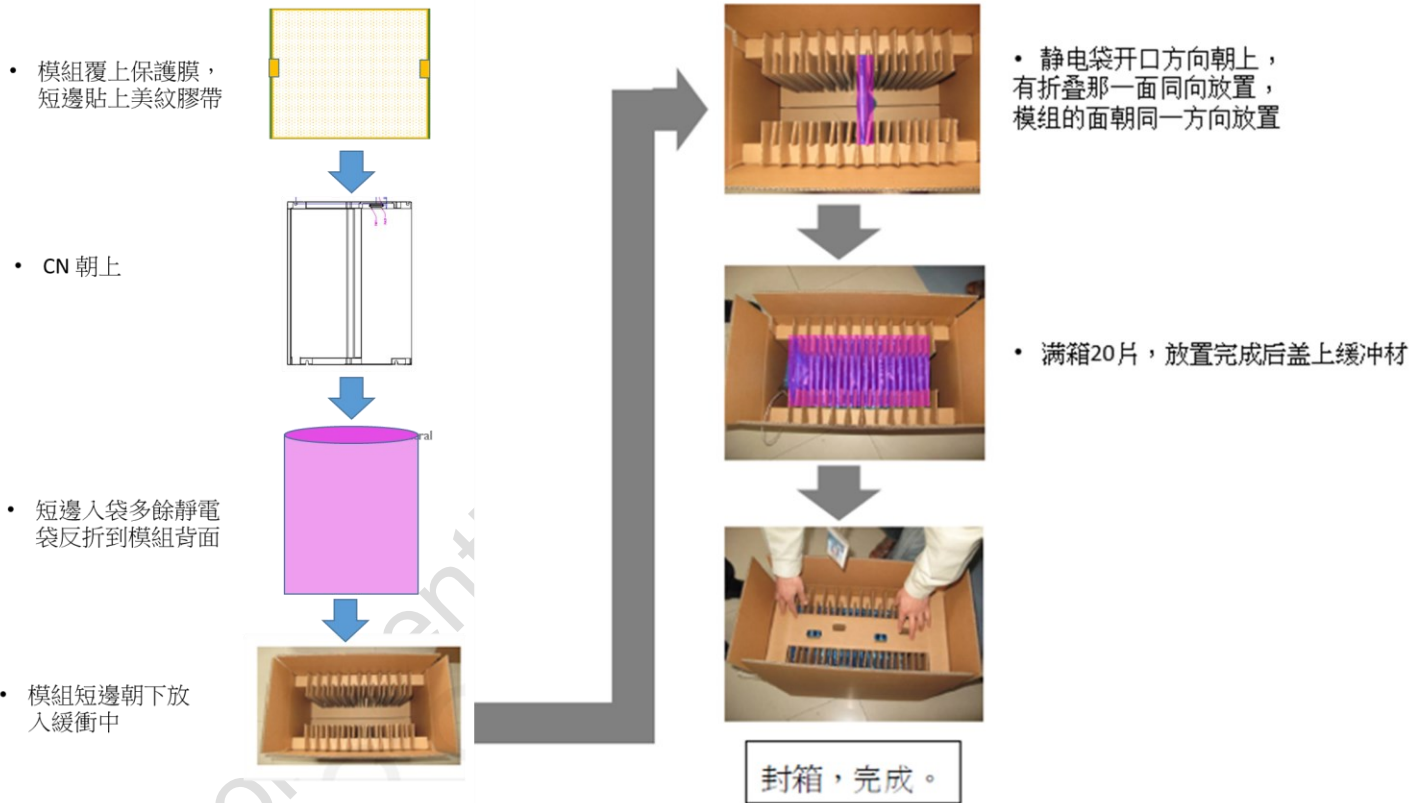


## 10. Label and Packaging

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



### 10.2 Carton Package



Total 20 pcs panel/carton  
 Max weight: 11.5 kg per carton  
 Carton size: 475mm \*288 mm \* 455mm

### 10.3 Packing of Pallet

4 cartons/layer, 3 layers/pallet  
 (20pcs \*4) \* 3 layers; Max 12 boxed/pallet. (240 pcs / Pallet)  
 Packing size (including pallet): 980 mm\* 740mm \*1497 mm  
 (Pallet size: 980 mm\* 740mm \*132 mm)

Note: Automatic storage height limit <=1580mm

## **11 Safety**

### **11.1 Keen Edge Requirements**

There will be no keen edges or corners on the display assembly that could cause injury.

### **11.2 Materials**

#### 11.2.1 Toxicity

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

#### 11.2.2 Flammability

The printed circuit board will be made from material rated 94 V-1 or better. The actual UL flammability rating will be printed on the printed circuit board.

### **11.3 Capacitors**

If any polarized capacitors are used in the TFT-LCD module, provisions will be made to keep them from being inserted backwards.

### **11.4 International Safety Standard Compliance**

The TFT-LCD Module will satisfy all requirements for compliance to IEC/UL 62368-1.

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