



AUO Display+

Preliminary Specification

Final Specification

<b>Module</b>	<b>8.4 Inch Color TFT-LCD</b>
<b>Model Name</b>	<b>G084XAN01.0 (97D08G08.000)</b>


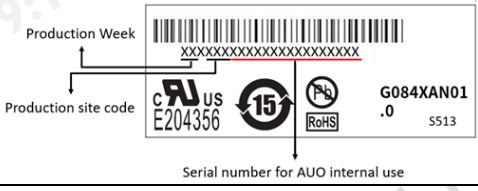
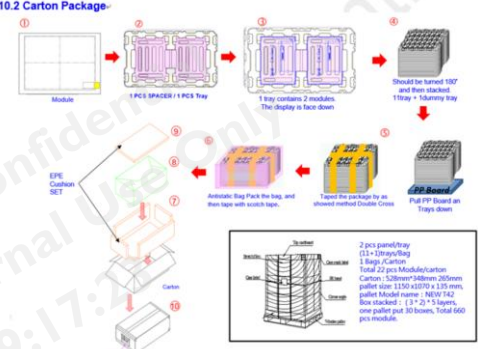
<b>Customer</b>	<b>Date</b>
_____	_____
<b>Checked &amp; Approved by</b>	
_____	_____

<b>Approved by</b>	<b>Date</b>
Castor Chan	2024/01/25
<b>Prepared by</b>	
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General Display Business Unit / AUO Display Plus Corporation	

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## Record of Revision

Version and Date	Page	Old description	New Description	Remark																																																																																																																																																																																																						
0.0 2022/01/29	All	First edition																																																																																																																																																																																																								
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		White y-	0.280	0.330	0.380																																																																																																																																																																																																					
		Red x-	0.593	0.643	0.693																																																																																																																																																																																																					
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## 1. Operating Precautions

- 1) Display area (Polarizer) of TFT-LCD Module is easily to be damaged, please be cautious and not to scratch it.
- 2) Be sure to power off your machine before connecting or disconnecting your signal cable to TFT-LCD Module.
- 3) Wipe off water drop on display area 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) Display area (Glass) of TFT-LCD Module may be broken or cracked if bump Module against hard object.
- 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 TFT-LCD module assembly.
- 8) Do not press the reflector sheet at the back of the module to any direction.
- 9) In case if TFT-LCD 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-LCD Module may be damaged.
- 10) When inserting or removing of your signal cable to TFT-LCD Module, be sure not to apply abnormal force (rotate, tilt...etc.) to the Connector of the TFT-LCD Module.
- 11) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.
- 12) Small amount of materials without flammability grade are used in the TFT-LCD module. The TFT-LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), 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 TFT-LCD module is placed in landscape position.
- 16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or moving content periodically if fixed pattern is displayed on the screen.

## 2. General Description

G084XAN01.0 is designed for industrial display applications with XGA(1024 x RGB x 768) resolution and 16.7M colors (RGB 8-bits). It is composed of a TFT-LCD panel, driver ICs, control and power supply circuits board and backlight unit including LED driver circuit.

### 2.1 Display Characteristics

The following items are characteristics summary under 25°C condition. (Room Temperature)

Items	Unit	Specifications
Screen Diagonal	inch	8.4
Active Area	mm	170.496(H) x 127.872(V)
Pixels H x V		1024 x 3(RGB) x 768
Pixel Pitch	mm	0.166 x 0.166
Pixel Arrangement		R.G.B. Stripe
Display Mode		AHVA, Normally Black
Nominal Input Voltage VDD	Volt	3.3 typ.
Typical Power Consumption	Watt	5.3 (typ.)
Weight	Grams	282 (typ.) , 310(max)
Physical Size	mm	199.5(H) x 149.0(V) x 9.05(D) (typ.)
Electrical Interface		LVDS
Surface Treatment		AG
Support Color		16.7M colors
Temperature Range Operating Storage (Non-Operating)	°C °C	-30 to +85 -30 to +85
RoHS Compliance		RoHS Compliance

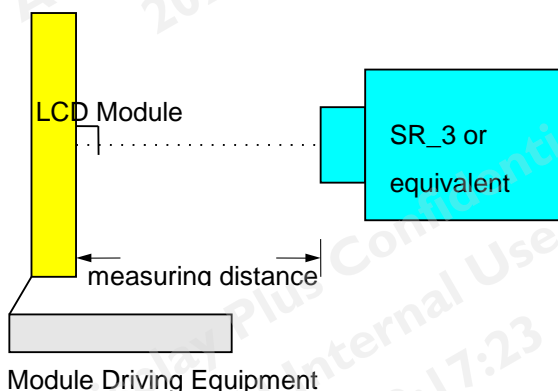
## 2.2 Optical Characteristics

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

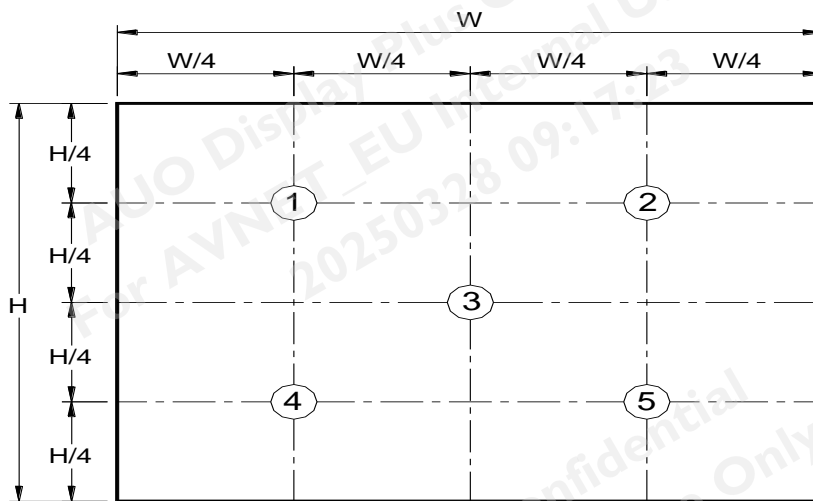
Item	Unit	Conditions	Min.	Typ.	Max.	Remark
White Luminance	cd/m <sup>2</sup>	V <sub>LED</sub> = 12V, D <sub>PWM</sub> = 100% (center point)	400	500	-	Note 1
Uniformity	%	5 Points	75	80	-	Note 1, 2, 3
Contrast Ratio			800	-	-	Note 4
Response Time	msec	Rising		15	20	Note 5
	msec	Falling		10	15	
	msec	Rising + Falling		25	35	
Viewing Angle	degree degree	Horizontal (Right) CR = 10 (Left)	85	89		Note 6
	degree degree	Vertical (Upper) CR = 10 (Lower)	85	89		
Color / Chromaticity Coordinates (CIE 1931)		White x	0.260	0.310	0.360	
		White y	0.280	0.330	0.380	
		Red x	0.593	0.643	0.693	
		Red y	0.285	0.335	0.385	
		Green x	0.254	0.304	0.354	
		Green y	0.567	0.617	0.667	
		Blue x	0.102	0.152	0.202	
		Blue y	0.005	0.055	0.105	
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



Note 2: Definition of 5 points position (Display active area: 115.2mm(W) x 86.4mm(H))



Note 3:

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

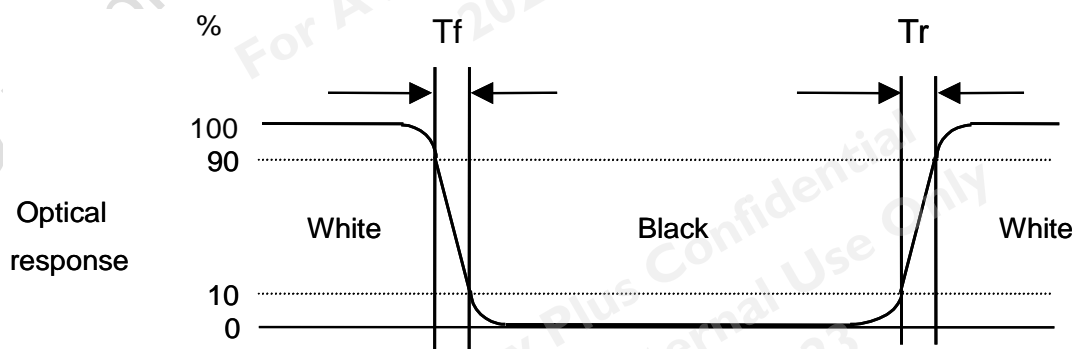
$$\delta_{w5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

Note 4: Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness @ "White" state}}{\text{Brightness @ "Black" state}}$$

Note 5: Definition of response time:

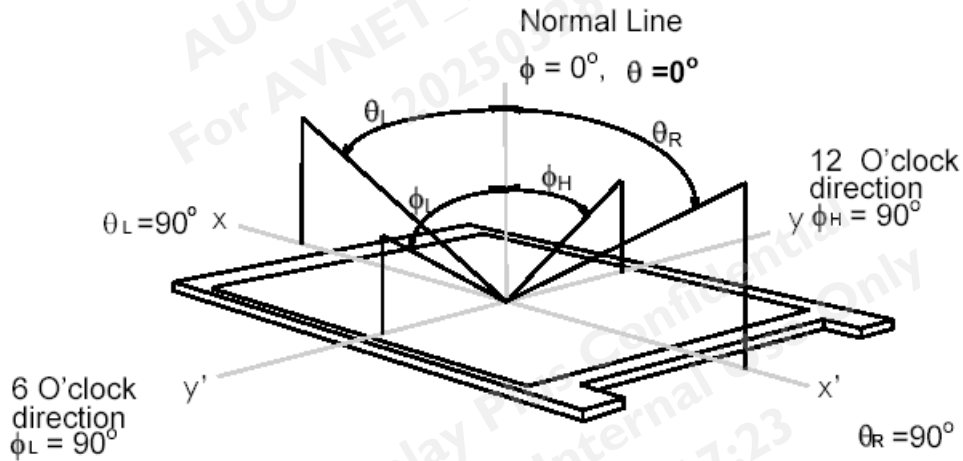
The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval definition is between 10% and 90% of amplitude. Please refer to the figure as below.





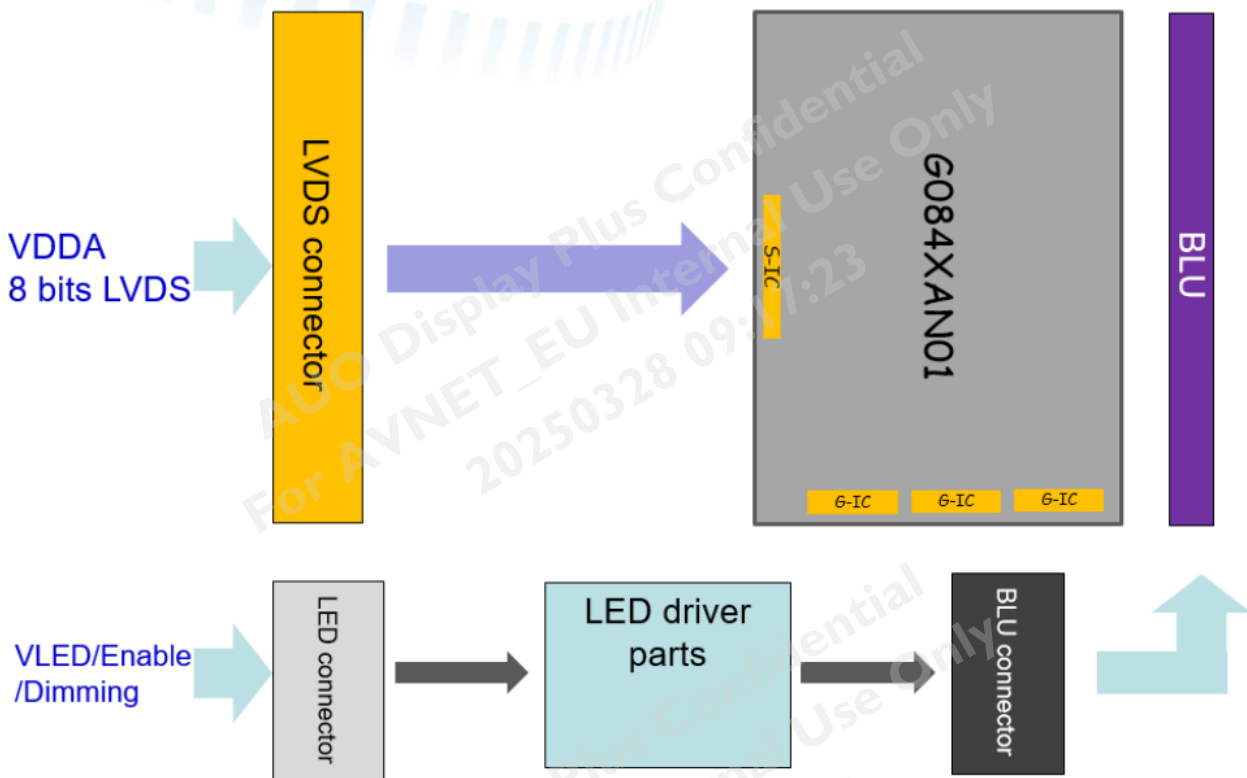
Note 6: Definition of viewing angle

Viewing angle is the measurement of contrast ratio  $\geq 10$ , at the screen center, over 180° horizontal and 180° vertical range. The 180° horizontal ( $\theta_L, \theta_R$ ) and 180° vertical ( $\phi_H, \phi_L$ ) range are illustrated as following figure.



### 3. Functional Block Diagram

The following diagram shows the functional block of the G084XAN01.0 color TFT/LCD module.



## 4. Absolute Maximum Ratings

### 4.1 Absolute Ratings

Item	Symbo	Min	Max	Unit	Remark
Logic/LCD Drive Voltage	VDDA	-0.3	4.0	Volt	Ta= 25°C

### 4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit	Remark
Operating Temperature	TOP	-30	+85	°C	Note 1, 2
Operation Humidity	HOP	5	90	%RH	Note 1, 2
Storage Temperature	TST	-30	+85	°C	Note 1
Storage Humidity	HST	5	90	%RH	Note 1

Note 1: Permanent damage to the device may occur if exceed maximum values.

Note 2: Maximum Wet-Bulb should be 39°C and no condensation.

Note 3: Only operation is guaranteed. Optical performance should be evaluated at 25°C only.

Note 4: Operating temperature means “ Front and rear surface” of panel

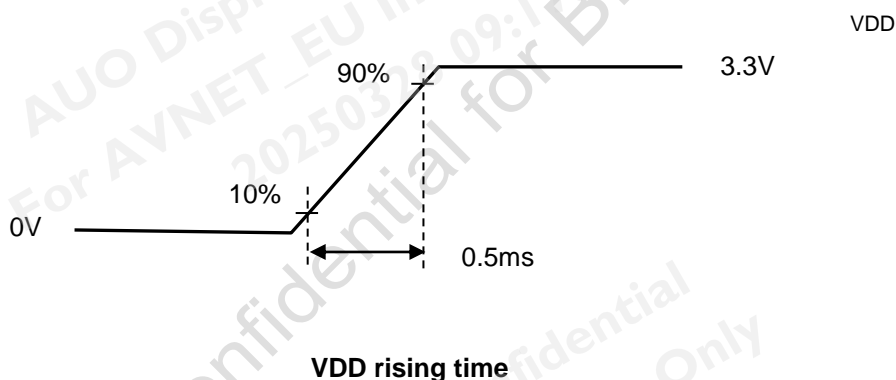
## 5. Electrical Characteristics

### 5.1 TFT-LCD Driving

#### 5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDDA	Logic/LCD Drive Voltage	3.0	3.3	3.6	Volt	
IDDA	VDD Current	-	150	220	mA	All Black Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current	-	-	571	mA	Note 1
PDD	VDD Power	-	0.5	0.73	Watt	All Black Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:

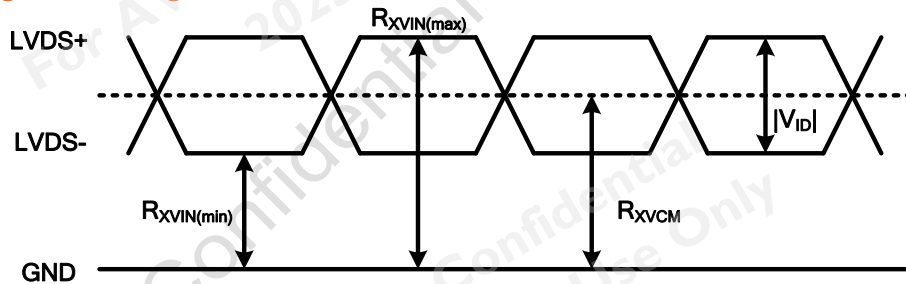


### 5.1.2 Signal Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Input high level voltage	V <sub>IH</sub>	0.7V <sub>DDA</sub>	-	V <sub>DDA</sub>	V	GRB LVBIT SHLR UPDN
Input low level voltage	V <sub>IL</sub>	GND	-	0.3V <sub>DDA</sub>	V	GRB LVBIT SHLR UPDN
Output high level voltage	V <sub>OH</sub>	0.8V <sub>DDA</sub>		V <sub>DDA</sub>		
Output low level voltage	V <sub>OL</sub>	GND		0.2V <sub>DDA</sub>		
Differential input high threshold	R <sub>XVTH</sub>	0.2	-	-	V	Note 1
Differential input low threshold	R <sub>XVTL</sub>	-	-	-0.2	V	Note 1
Input voltage range (singled-end)	R <sub>XVIN</sub>	0	-	V <sub>DDA</sub> - 1.2 +  V <sub>ID</sub>  /2	V	Note 1
Input differential voltage	V <sub>ID</sub>	0.2	-	0.6	V	Note 1
Differential Input Common Mode Voltage	R <sub>XVCM</sub>	V <sub>ID</sub>  /2	-	V <sub>DDA</sub> - 1.2	V	Note 1

Note 1: LVDS interface signal DC characteristic

#### Single-end Signal



#### Differential Signal

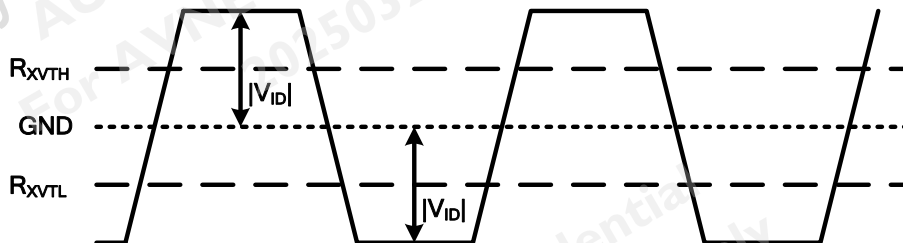
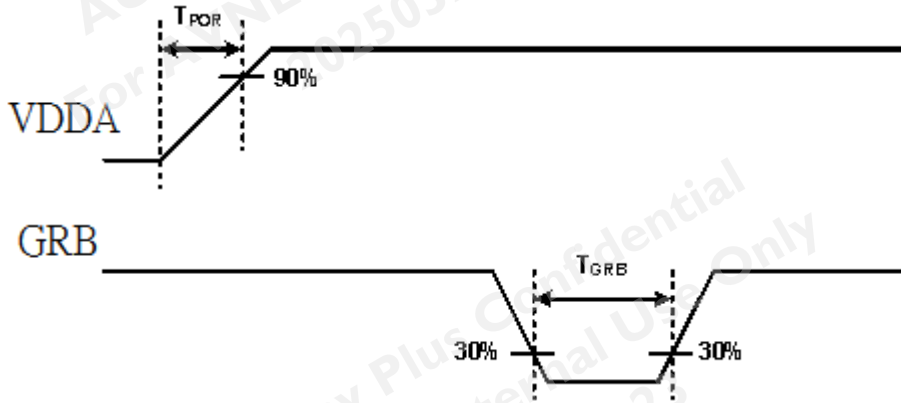


Fig. 5-1. LVDS DC characteristics diagram

### 5.1.3 Input AC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
VDDA power on slew time	$T_{POR}$	10	-	15	ms	From 0V to 90% VDDA <b>Note 1</b>
GRB active pulse width	$T_{GRB}$	1	-	20	ms	VDDA = 3.3 V

**Note 1:** the inrush current spec should follow VDDA power on slew time min value is 10ms and max value is 15ms. Inrush current maybe out of spec.(max:571mA)



### 5.1.4 Differential signal AC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency	$R_{XFCLK}$	25	-	72	MHz	$ VID =200mV$ $RXVCM=1.2V$
Input Data Skew Margin	$T_{RSKM}$			400	ps	

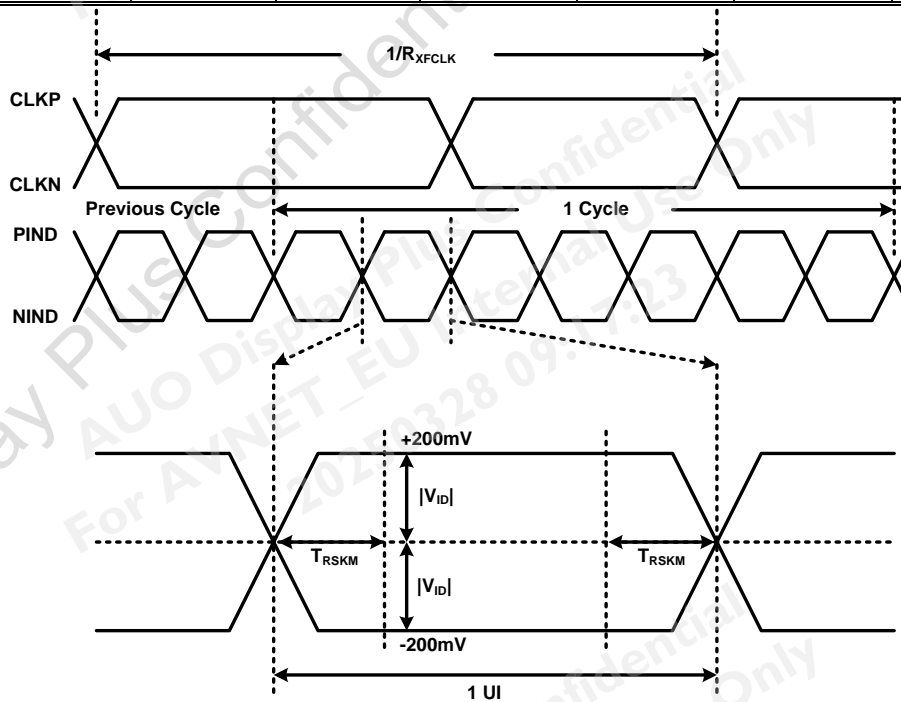


Fig. 5-3. LVDS AC characteristics diagram

## 5.2 Backlight Unit Driving

### 5.2.1 Parameter guideline for LED

Following characteristics are measured under stable condition at 25°C (Room Temperature).

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
VLED	Input Voltage	10.8	12	13.2	Volt	
ILED	Input Current	-	400	-	mA	VLED =12V,100% Dimming
Irush	Inrush Current	-	-	1.0	A	Note.7
PLED	Power Consumption	-	4.8	-	Watt	VLED =12V,100% Dimming
FPWM	PWM Dimming Frequency	200	-	20K	Hz	
Dimming	Swing Voltage High	3	4	5	Volt	Note 1,2
	Swing Voltage Low	0	0	0.6	Volt	
DPWM	Dimming Duty Cycle (FPWM200Hz~5KHz)	5	-	100	%	
	Dimming Duty Cycle (FPWM5KHz~20KHz)	15	-	100	%	
IF	LED Forward Current	-	51.8	-	mA	Ta = 25°C
Enable	On Control Voltage	3	4	5	Volt	Note 3, 4
	Off Control Voltage	0	0	0.6	Volt	
Operating Life		70,000	-	-	Hrs	Note 5, 6, 7

**Note 1:** PWM dimming function can be operated by PWM signal. PWM duty cycle can adjust white Luminance.

(PWM High: ON and PWM Low: OFF)

**Note 2:** PWM signal cannot be floating and pull-down to ground when waiting.

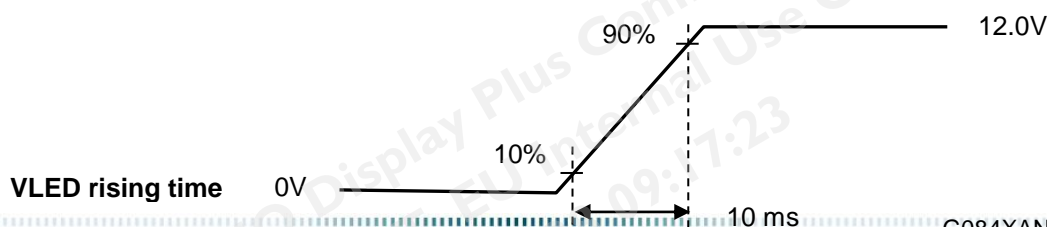
**Note 3:** EN must be turned on late than VLED and PWM Signal.

**Note 4:** EN must be turned off early than VLED and PWM Signal.

**Note 5:** If LCD is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

**Note 6:** Operating life means brightness goes down to 50% initial brightness. Minimum operating life time is estimated data.

**Note 7:** The test condition is 51.8mA in 25°C room temperature.



## 6. Signal Characteristic

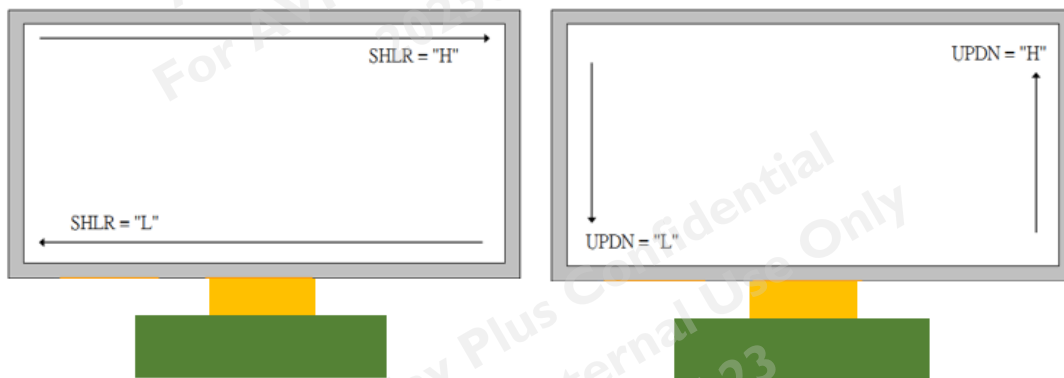
### 6.1 Pixel Format Image

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.



Note 1: TFT-LCD interface signal description is shown in section 6.3

### 6.3 TFT-LCD Interface Signal Description

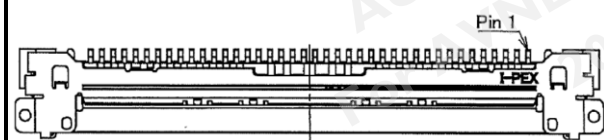
No.	Pin Name	I/O	Description	Remarks
1	GND	G	GND	
2	GND	G	GND	
3	GND	G	GND	
4	NC	-	For ADP internal use	
5	NC	-	For ADP internal use	
6	NC	-	For ADP internal use	
7	NC	-	For ADP internal use	
8	GND	G	GND	
9	NC	-	For ADP internal use	
10	GND	G	GND	
11	GRB	I	Global Reset, "L" in reset state ; "H" normal operation.	
12	GND	G	GND	
13	NIND3-	I	Negative LVDS differential data input (Odd data)	
14	PIND3+	I	Positive LVDS differential data input (Odd data)	
15	GND	G	GND	
16	NIND2-	I	Negative LVDS differential data input	
17	PIND2+	I	Positive LVDS differential data input	
18	GND	G	GND	
19	NIND1-	I	Negative LVDS differential data input	
20	PIND1+	I	Positive LVDS differential data input	
21	GND	G	GND	
22	NIND0	I	Negative LVDS differential data input	
23	PIND0	I	Positive LVDS differential data input	
24	GND	G	GND	
25	CLKN-	I	Negative LVDS differential clock input	
26	CLKP+	I	Positive LVDS differential clock input	
27	GND	G	GND	
28	NC	-	For ADP internal use, suggest to keep H level	
29	NC	-	For ADP internal use, suggest to keep H level	
30	GND	G	GND	
31	SHLR	I	Horizontal scan direction control. "H" Left to Right; "L" Right to Left.	
32	UPDN	I	Vertical scan direction control. "H" Down to Up; "L" Up to Down.	
33	GND	G	GND	
34	NC	-	For ADP internal use	
35	GND	G	GND	
36	LVBIT	I	6/8 bits select, "L" 6-bit. ; "H" 8-bit	



37	<b>NC</b>	-	For ADP internal use
38	<b>GND</b>	G	GND
39	<b>VDDA</b>	PI	Display power (3.3 V)
40	<b>VDDA</b>	PI	Display power (3.3 V)

I: Digital signal input, O: Digital signal output, G: GND, PI: Power input;

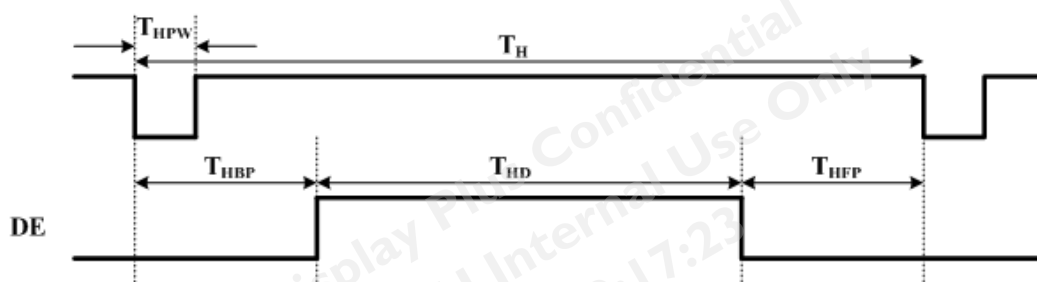
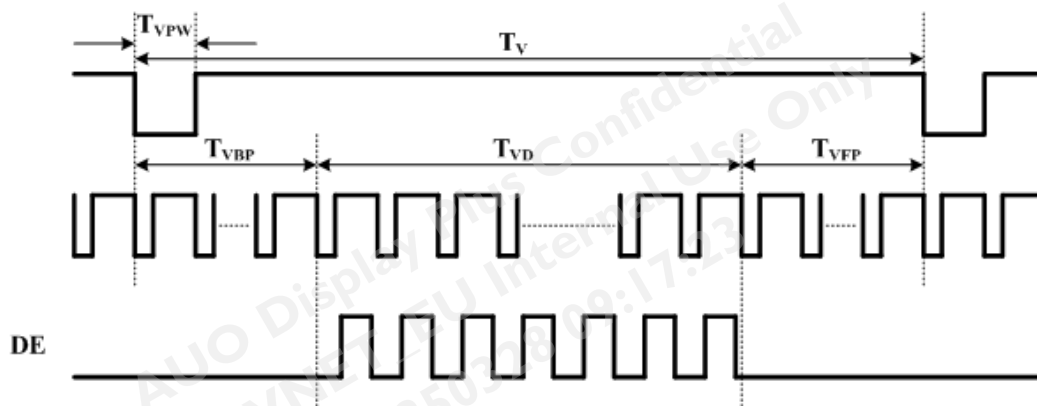
Connector Pin position:



## 6.4 Interface Timing

### 6.4.1 Timing Characteristics

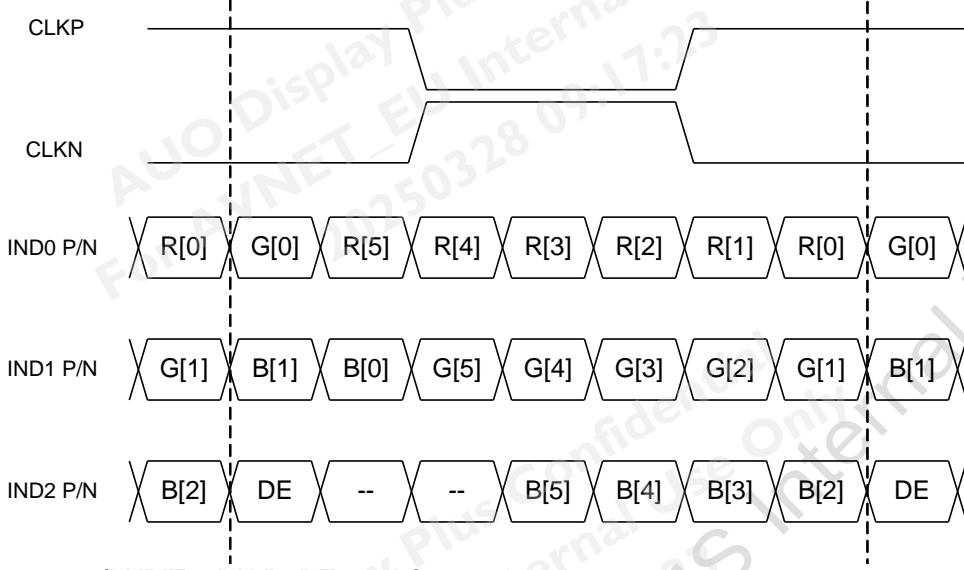
Parameter	Symbol	Min.	Typ.	Max.	Unit.
<b>CLK Frequency</b>	$F_{CLK}$	57.3	63	66	MHz
<b>Period</b>	$T_H$	1182	1284	1310	CLK
<b>Horizontal display area</b>	$T_{HD}$	1024			CLK
<b>Blanking</b>	$T_{HBP} + T_{HFP}$	158	260	286	CLK
<b>Period</b>	$T_V$	808	818	852	HS
<b>Vertical display area</b>	$T_{VD}$	768			HS
<b>Blanking</b>	$T_{VBP} + T_{VFP}$	40	50	84	HS



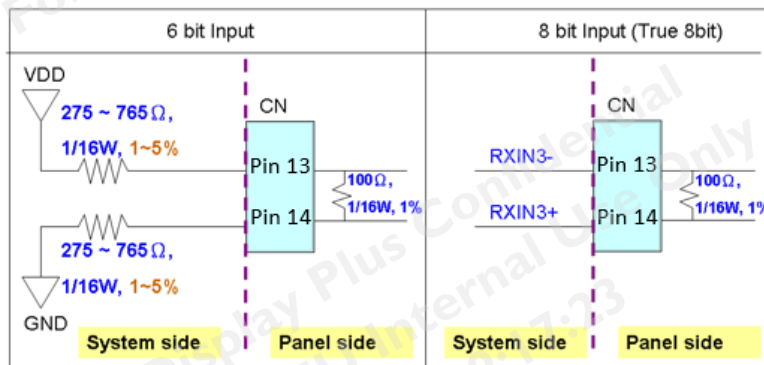
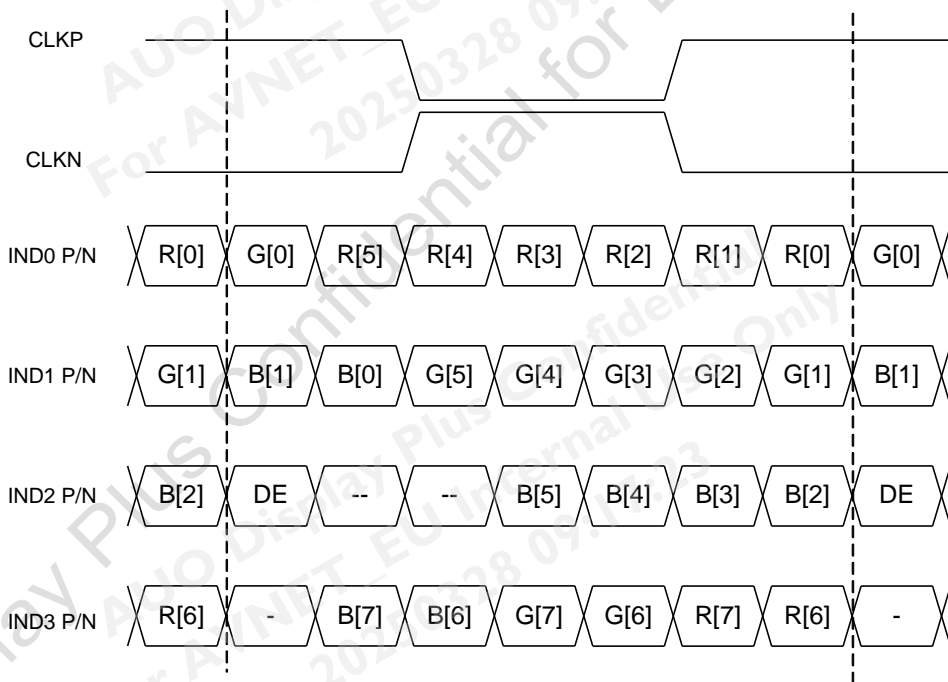
### 6.4.2 The Input Data Format

#### Differential Input Data Format

##### b. 6 bits format (LVBIT = " L " ; DE mode)

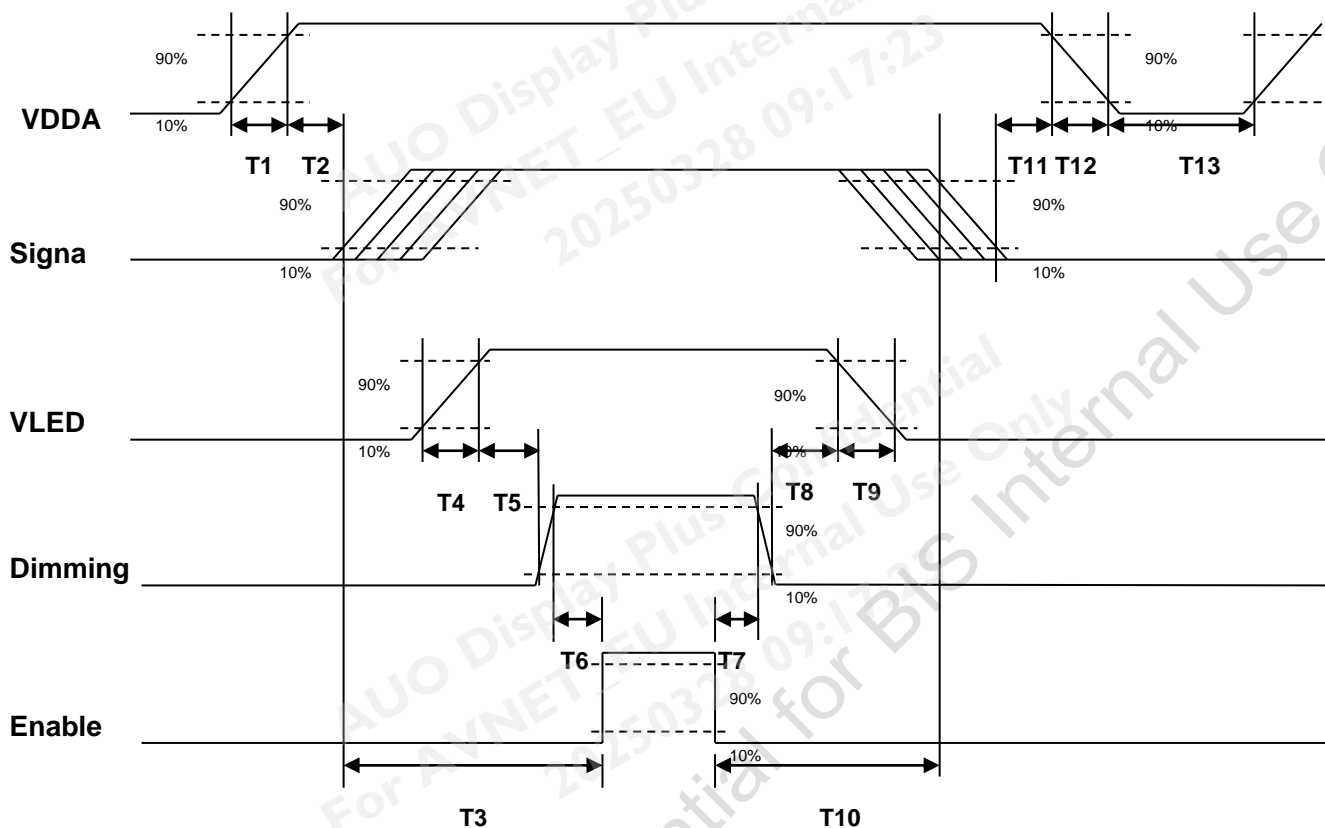


##### c. 8 bits format (LVBIT = " H " ; DE mode), note 1



### 6.5 Power ON/OFF Sequence

The LCD adopts high voltage driver IC, so it could be permanently damaged under a wrong power on/off sequence. The suggested LCD power sequence is below:



Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	10	-	15	[ms]
T2	1	-	10	[ms]
T3	250	-	-	[ms]
T4	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	-	-	10	[ms]
T10	110	-	-	[ms]
T11	1	-	-	[ms]
T12	-	-	10	[ms]
T13	1000	-	-	[ms]

## 7. Connector & Pin Assignment

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

<b>Manufacturer</b>	IPEX
<b>Connector Model Number</b>	IPEX-20765-040E-11A or compatible
<b>Adaptable Plug</b>	IPEX-20453-040T-01 or compatible

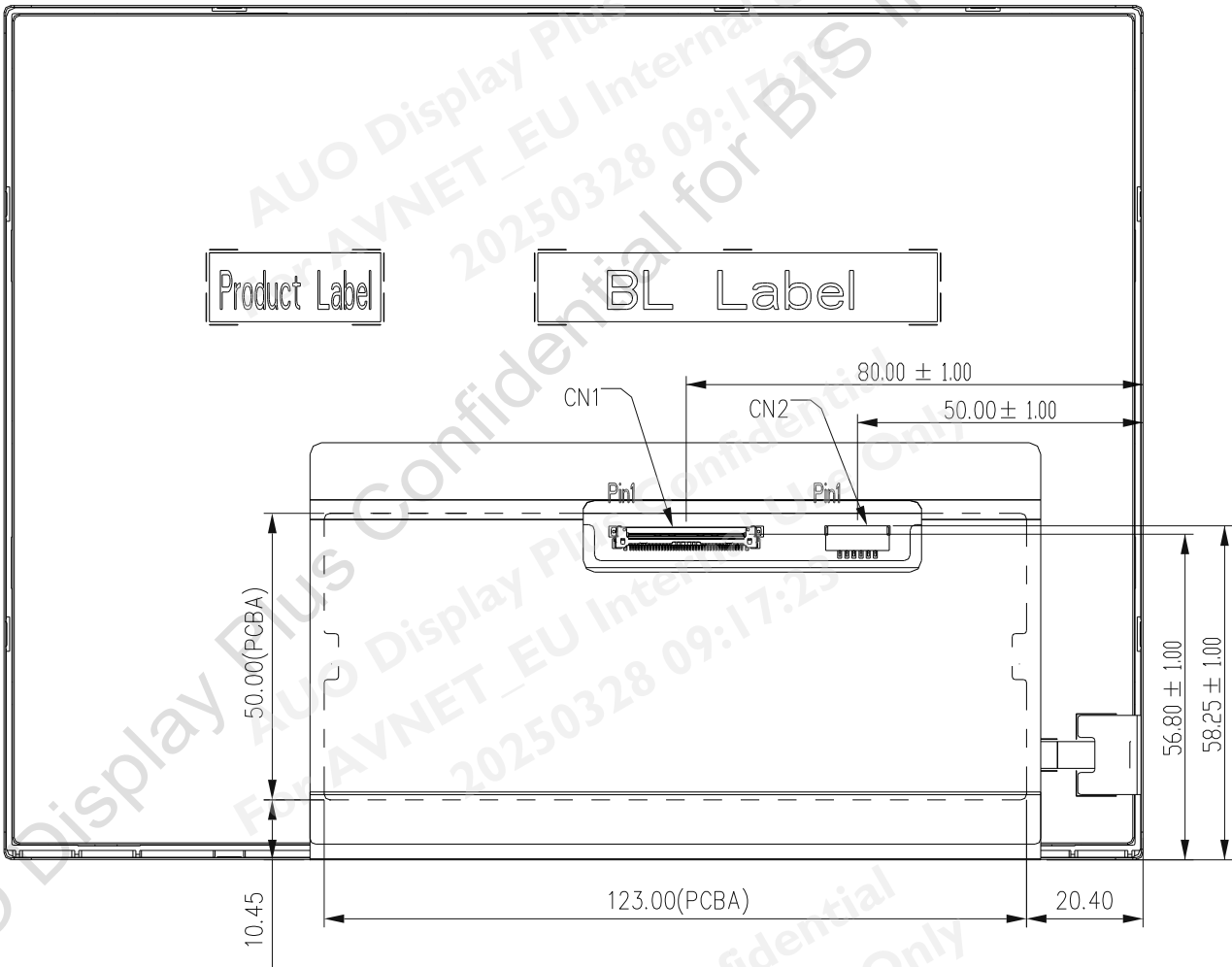
Pin#	Symbol	Pin#	Symbol
1	GND	21	GND
2	GND	22	NIND0
3	GND	23	PIND0
4	NC	24	GND
5	NC	25	CLKN
6	NC	26	CLKP
7	NC	27	GND
8	GND	28	NC
9	NC	29	NC
10	GND	30	GND
11	GRB	31	SHLR
12	GND	32	UPDN
13	NIND3	33	GND
14	PIND3	34	NC
15	GND	35	GND
16	NIND2	36	LVBIT
17	PIND2	37	NC
18	GND	38	GND
19	NIND1	39	VDD
20	PIND1	40	VDD

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

<b>Manufacturer</b>	JAE
<b>Connector Model Number</b>	FI-S6P-HFE or compatible
<b>Mating Connector Model Number</b>	FI-S6S or compatible

Pin #	Symbol	Pin #	Symbol
1	V <sub>LED</sub>	4	GND
2	V <sub>LED</sub>	5	Enable
3	GND	6	Dimming

### 7.3 PIN 1 definition of CN1 and CN2



## 8. Reliability Test Criteria (Preliminary)

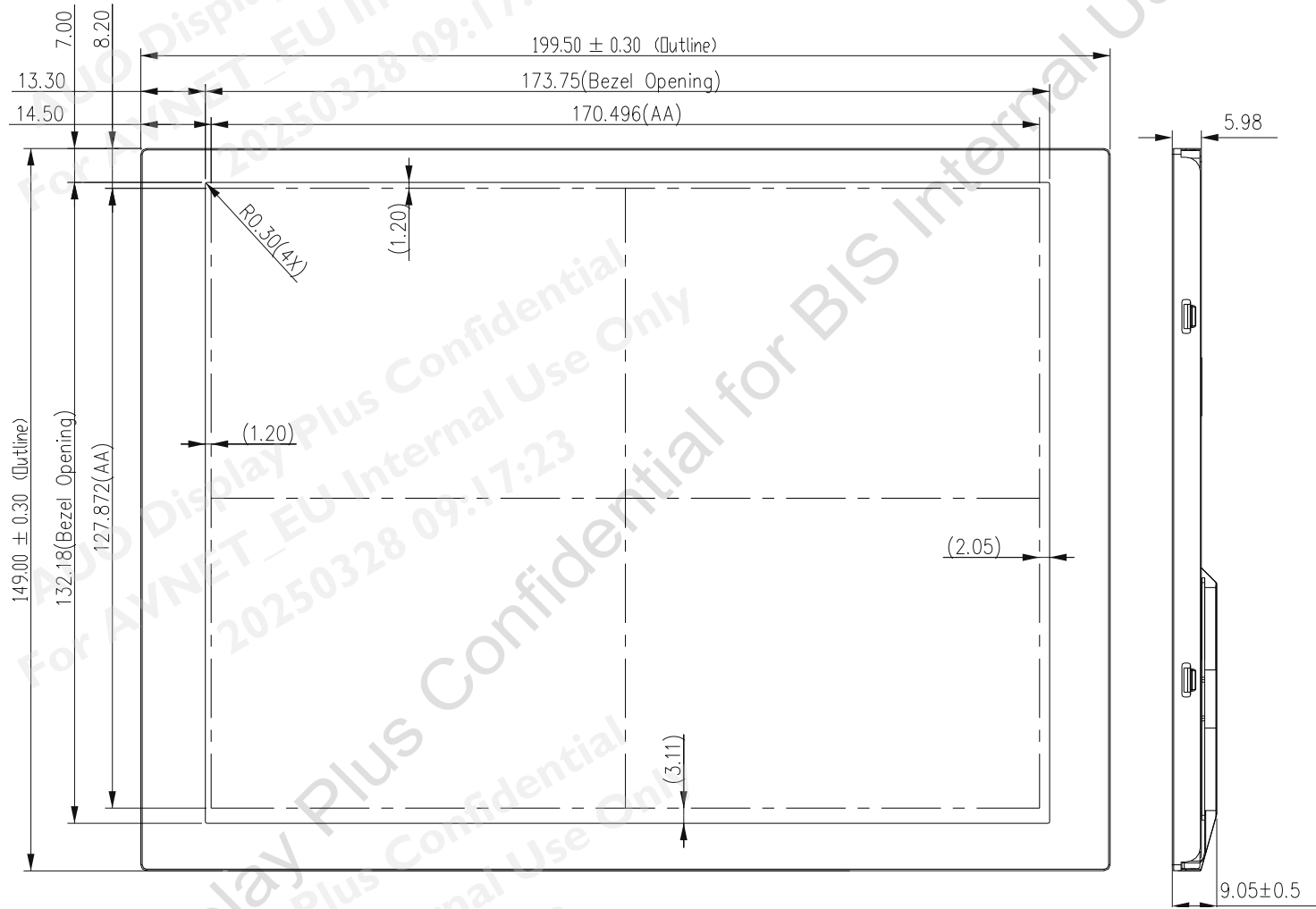
Items	Required Condition	Note
Temperature Humidity Bias	40°C, 90%RH, 300 hours	
High Temperature Operation	85°C, 300 hours	
Low Temperature Operation	-30°C, 300 hours	
Hot Storage	85°C, 300 hours	
Cold Storage	-30°C, 300 hours	
Thermal Shock Test	-20°C/ 30 min, 60°C/ 30 min, 100cycles, 40°C minimum ramp rate	
Hot Start Test	85°C / 1Hr min. power on/off per 5 minutes, 5 times	
Cold Start Test	-30°C / 1Hr min. power on/off per 5 minutes, 5 times	
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)	
On/off test	On/10 sec, Off/10 sec, 30,000 cycles	
ESD	Contact = ± 8 kV, 1sec, 8 point, 10 times/point class B (R = 330 Ω, C = 150 pF) Air = ± 15 kV, 1sec, 8 point, 10 times/point class B (R = 330 Ω, C = 150 pF)	Note 1
EMI	30-230 MHz, limit 40 dBu V/m, 230-1000 MHz, limit 47 dBu V/m	

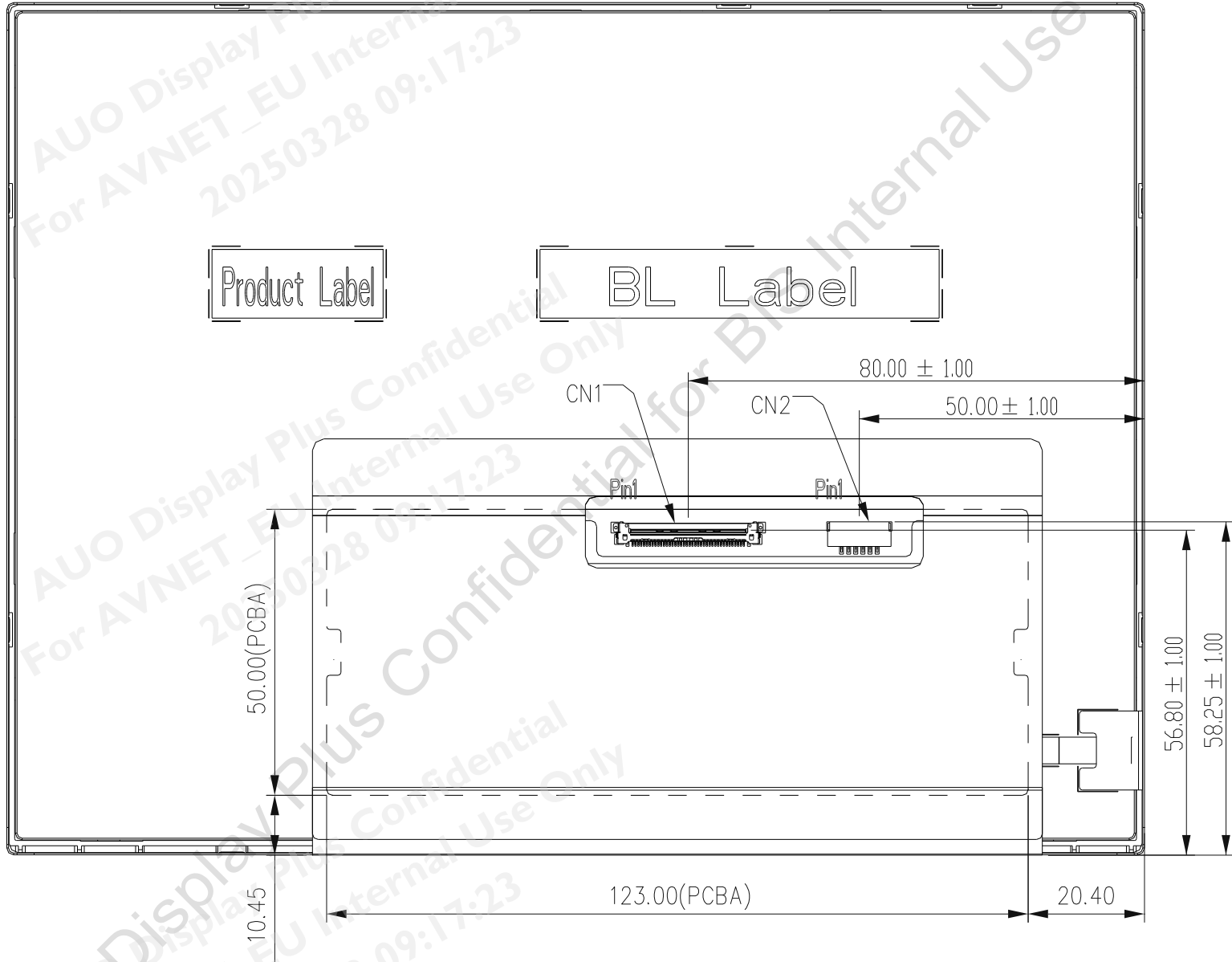
Note1: According to EN61000-4-2 ESD class B criteria, some performance degradation is allowed. TFT-LCD module is self-recoverable, no data lost and no hardware failures after test.

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. Mechanical Characteristics

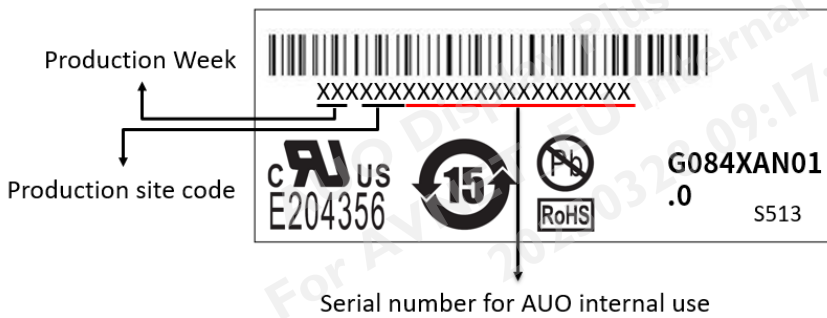




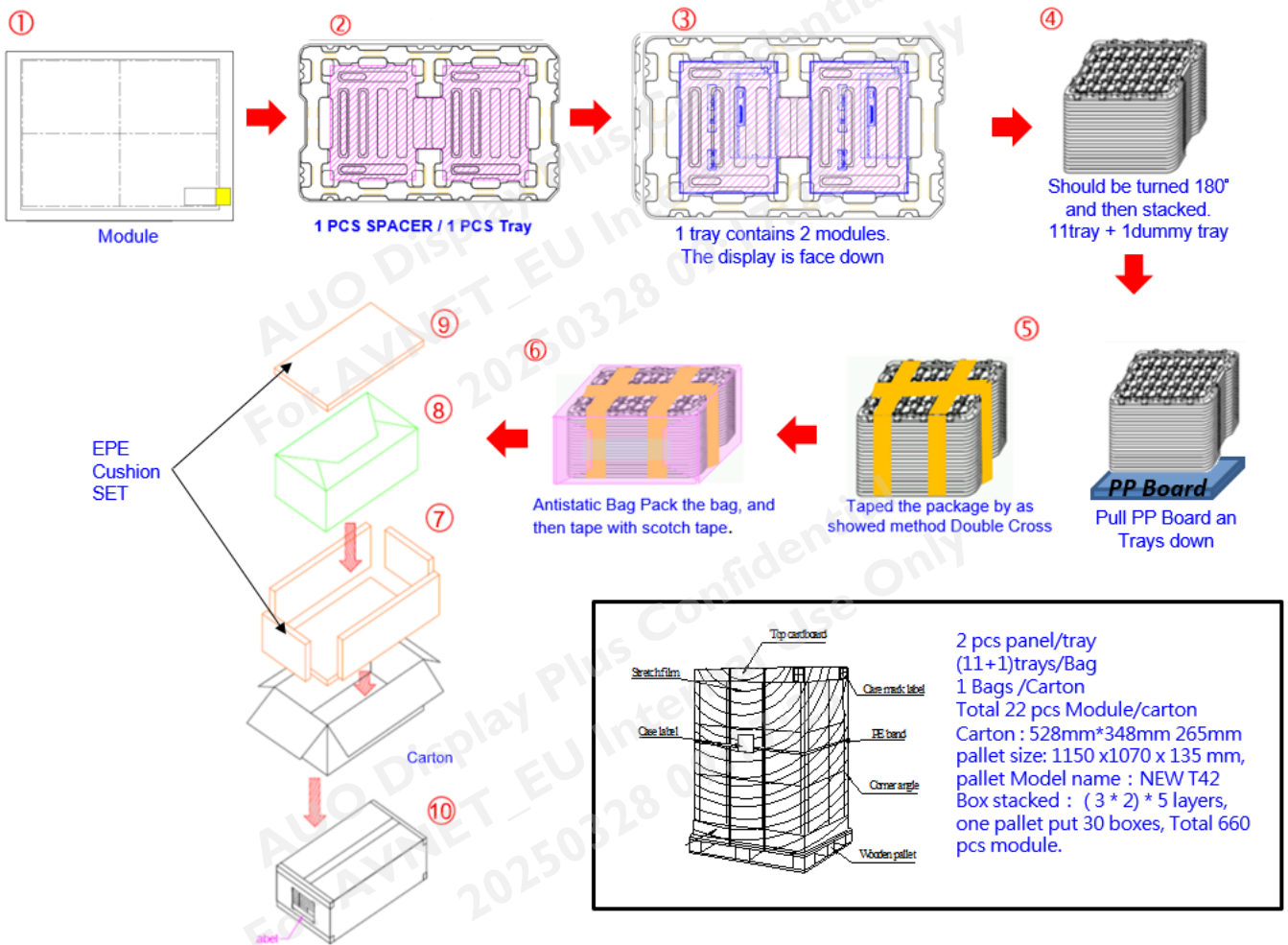


## 10. Label and Packaging

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



### 10.2 Carton Package



## 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

All components including electrical components that do not meet the flammability grade UL94-V1 in the TFT-LCD 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.

### 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 National Test Lab Requirement

The TFT-LCD Module will satisfy all requirements for compliance to UL 60950 (U.S.A. Information Technology Equipment).