



Product Specification

G154EVN01.0

AU OPTRONICS CORPORATION

() Preliminary Specification

(V) Final Specification

Module	15.4 Inch Color TFT-LCD
Model Name	G154EVN01.0

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

Approved by	Date
<u>Sean Lin</u>	<u>2/25/2020</u>
Prepared by	Date
<u>Ryan Chen</u>	<u>2/25/2020</u>
General Display Business Division / AU Optronics corporation	

Contents

1. Operating Precautions	5
2. General Description	6
2.1 Display Characteristics	6
2.2 Optical Characteristics	7
3. Functional Block Diagram	10
4. Absolute Maximum Ratings.....	11
4.1 Absolute Ratings of TFT LCD Module	11
4.2 Absolute Ratings of Environment	11
5. Electrical characteristics	12
5.1 TFT LCD Module	12
5.1.1 Power Specification.....	12
5.1.2 LVDS DC Signal Electrical Characteristics	13
5.2 Backlight Unit.....	14
5.2.1 LED Backlight Unit : LED Driver Connector	14
5.2.2 Parameter guideline for LED	14
LED characteristics	14
Backlight input signal characteristics	14
6. Signal Characteristic.....	15
6.1 Pixel Format Image.....	15
6.2 Signal Description.....	15
6.2.1 TFT LCD Module: LVDS Connector	15
6.2.2 Pin Assignment	15
6.3 The Input Data Format	17
6.4 Interface Timing.....	18
6.4.1 Timing Characteristics.....	18
6.4.2 Input Timing Diagram	18
6.5 Power ON/OFF Sequence.....	19
7. Reliability Test Criteria	20
8. Mechanical Characteristics.....	21
8.1 LCM Outline Dimension (Front View).....	21
8.2 LCM Outline Dimension (Rear View)	22
9. Packaging Spec.....	23
9.1 Shipping Label (on the rear side of TFT-LCD display)	23
9.2 Carton & Pallet Package	23
10. Safety	24



10.1 Sharp Edge Requirements.....	24
10.2 Materials.....	24
10.2.1 Toxicity	24
10.2.2 Flammability	24
10.3 Capacitors	25
10.4 National Test Lab Requirement	25



Record of Revision

Version	Date	Page	Old description	New Description
0.1	2019/06/17	All	First Edition for Customer	
1.0	2020/02/25	All	Final Version	

1. Operating Precautions

- 1) Since front polarizer is easily damaged, please be cautious and 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 light bar edge. Instead, press at the far ends of the LED light bar 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) 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 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 (IEC60950 or UL1950), or be applied exemption.
- 13) Severe temperature condition may result in different luminance, response time and lamp ignition voltage.
- 14) Continuous operating TFT-LCD display under low temperature environment may accelerate lamp 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's 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 15.4 inch-wide Color a-Si TFT-LCD Module G154EVN01.0. The display supports the HD - 1280(H) x 800(V) screen format and 16.7M colors. All input signals are LVDS interface and this module contains with an LED driver for backlight.

2.1 Display Characteristics

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

ITEMS	Unit	SPECIFICATIONS			
Screen Diagonal	[inch]	15.4"			
Active Area	[mm]	331.2 (H) x 207 (V)			
Resolution		1280 x 800			
Pixel Pitch	[mm]	0.259 x 0.259			
Pixel Arrangement		R.G.B. Vertical Stripe			
Display Mode		MVA			
Nominal Input Voltage VDD	[Volt]	+3.3 (typ.)			
LCD Power Consumption	[Watt]	2.1W (Typ.), 2.6W (Max.)			
LED Power Consumption	[Watt]	6.4W (Typ.), 7.6W (Max.)			
Weight	[g]	900g (Typ.)			
Physical Size Include bracket	[mm]		Min.	Typ.	Max.
		Length	351.5	352.0	352.5
		Width	229.5	230.0	230.5
		Thickness		8.55	9.05
Electrical Interface		One channel LVDS			
Surface Treatment		Anti-Glare, 3H			
Support Color		16.7M			
RoHS Compliance		RoHS Compliance			
Temperature Range					
Operating	[°C]	-10 to 70			
Storage (Non-Operating)	[°C]	-20 to 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 (Center)	cd/m ²	(center point)		300	400		1
Luminance Uniformity	%	5 points		72	80		2,3
Contrast ratio	--			2500	3000	-	4
Response Time	msec	Rising (Tr)+ Falling (Tf)		-	30	-	5
Viewing Angle	[degree]	Horizontal CR >= 10	(Right)	79	89	-	6
			(Left)	79	89	-	
		Vertical CR >= 10	(Upper)	79	89	-	
			(Lower)	79	89	-	
Color / Chromaticity Coordinates (CIE 1931)	--	Red x		0.522	0.572	0.622	
		Red y		0.284	0.334	0.384	
		Green x		0.294	0.344	0.394	
		Green y		0.511	0.561	0.611	
		Blue x		0.117	0.167	0.217	
		Blue y		0.087	0.137	0.187	
		White x		0.263	0.313	0.363	
		White y		0.279	0.329	0.379	
Color Gamut	%	CIE 1931		-	45	-	

Note 1: Measurement method

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

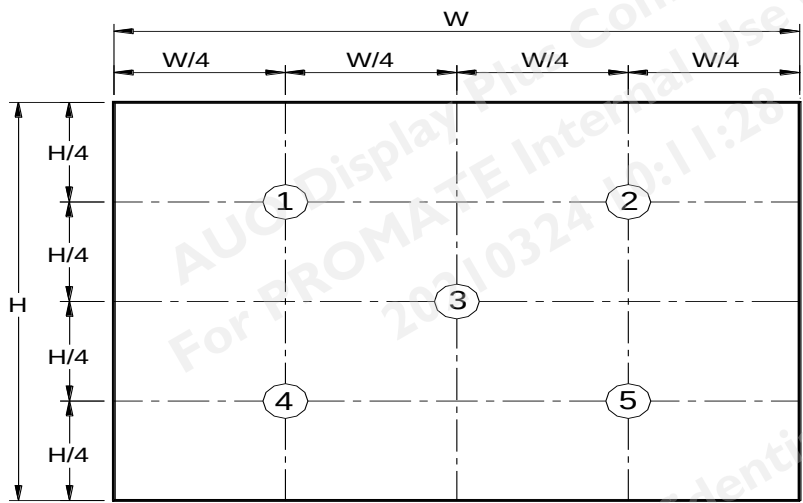
Aperture 1φ with 50cm viewing distance1

Test Point Center

Environment < 1 lux

Module Mounting Equipment SR_3 or
equivalent

Note 2: Definition of 5 points position



Note 3: The luminance uniformity of 5 points is defined by dividing the minimum luminance values by the maximum test point luminance

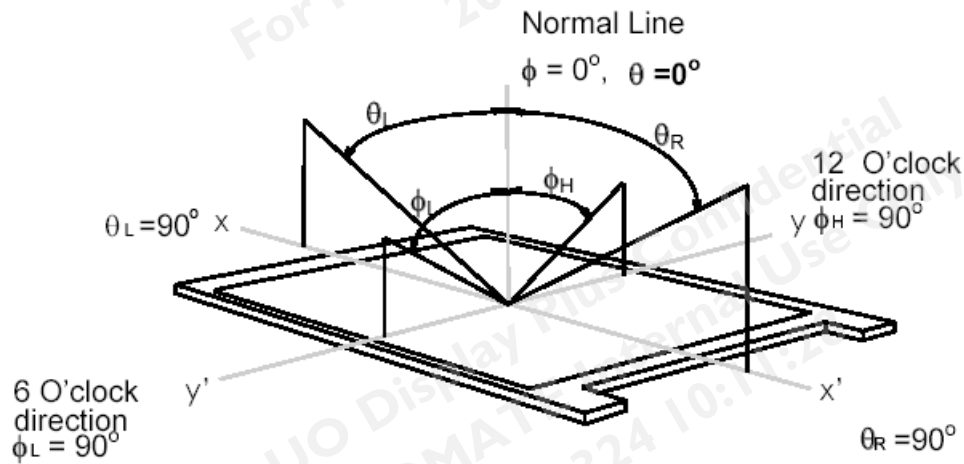
Note 4: Definition of contrast ratio (CR):

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.

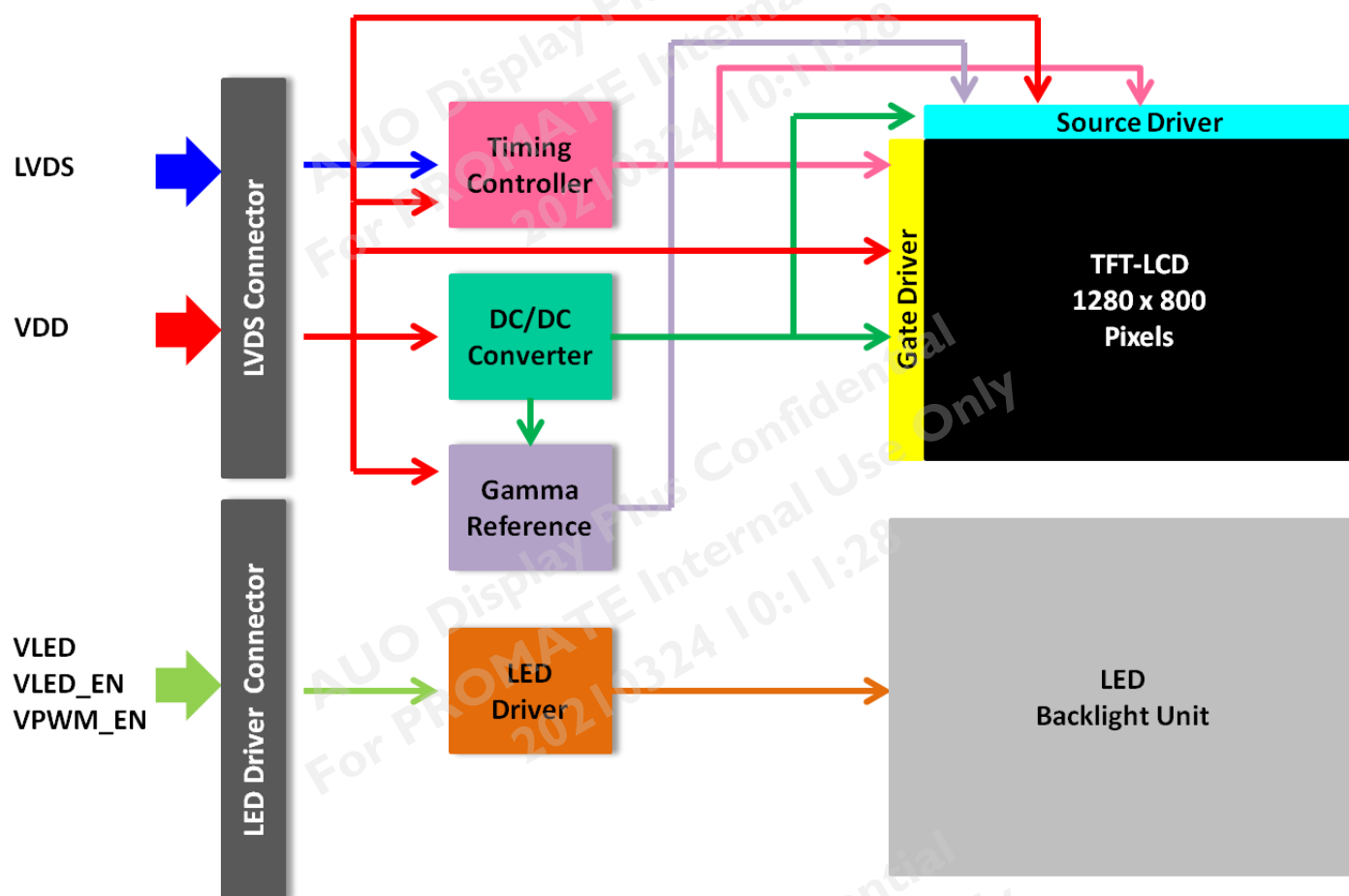
Note 6: Definition of viewing angle

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 15.4 inch Color TFT-LCD Module:



4. Absolute Maximum Ratings

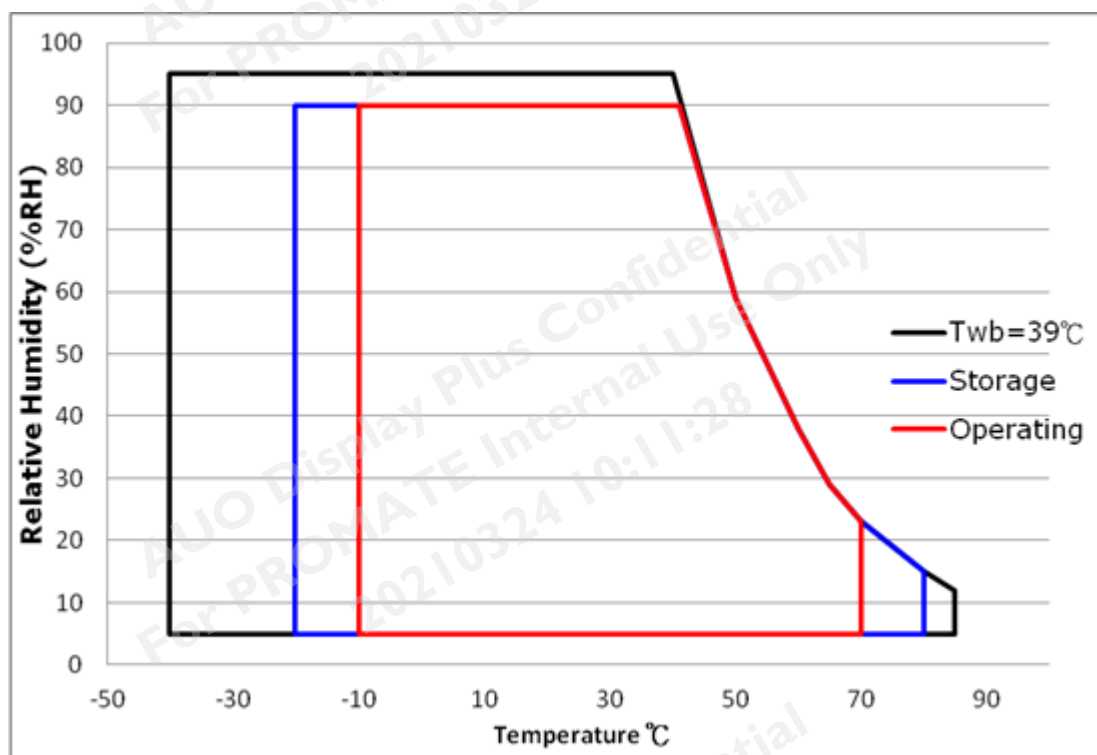
4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit
Logic/LCD Drive Voltage	VDD	0	4.0	[Volt]

4.2 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit
Operating Temperature	TOP (Ambient)	-10	+70	[°C]
Operation Humidity	HOP	5	90	[%RH]
Storage Temperature	TST (Ambient)	-20	+80	[°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

Input power specifications are as following:

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
VDD	Logic/LCD Drive Voltage	3.15	3.3	3.45	[Volt]	
IDD	VDD Current ,Input Current	-	0.636	0.787	[A]	VDD= 3.3V at 60Hz *Note 1, *Note 2
IRush	LCD Inrush Current	-	-	2.0	[A]	*Note 3
PDD	VDD Power	-	2.1	2.6	[Watt]	VDD= 3.3V at 60Hz *Note 1
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	-

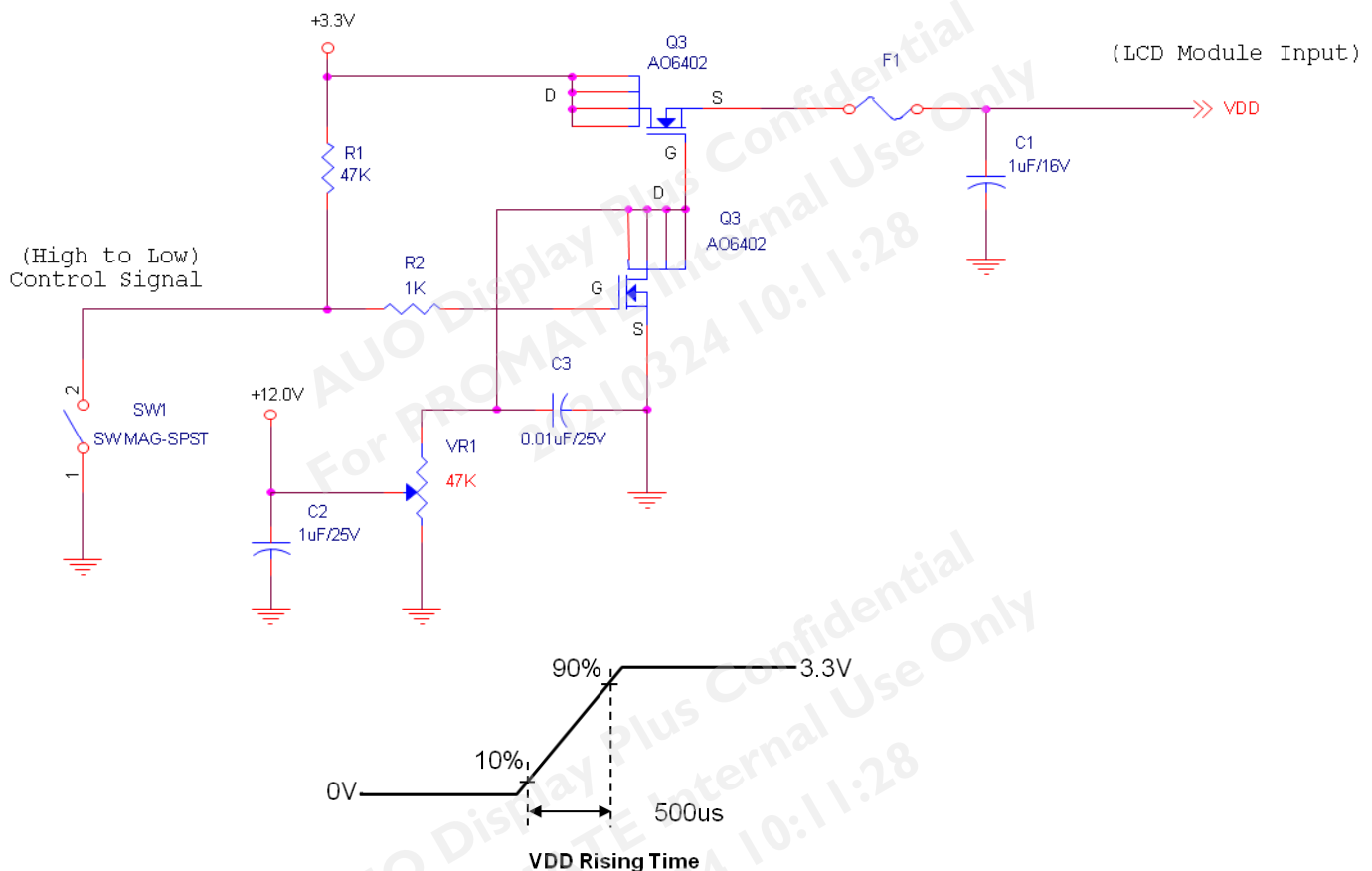
Note 1: Maximum Measurement Condition: White Pattern at 3.3V driving voltage. ($P_{max}=V_{3.3} \times I_{white}$)

Typical Measurement Condition: 5x5 Mosaic Pattern at 3.3V driving voltage. ($P_{typ}=V_{3.3} \times I_{mosaic}$)

Note 2: Current fuse is built in a module. Current capacity of power supply for VDD should be larger than 2A design value, so that the fuse can be opened at the trouble of electrical circuit of module.

Note 3: Measurement conditions:

The duration of rising time of power input is 500us.

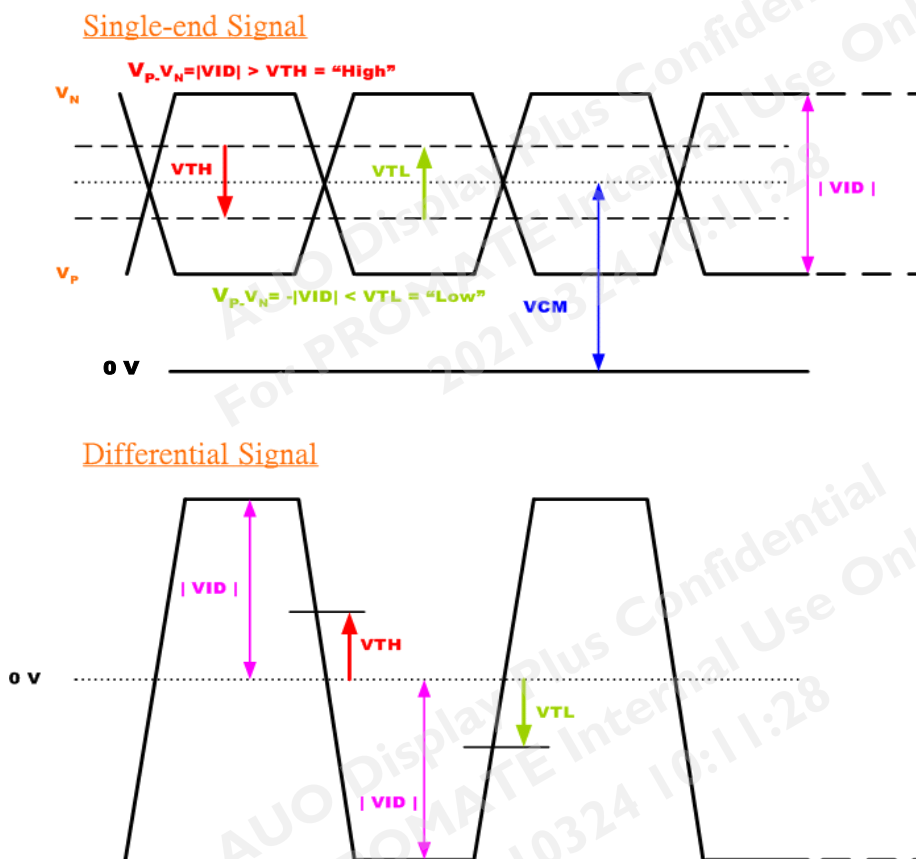


5.1.2 LVDS DC Signal Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Units	Condition
V_{TH}	Differential Input High Threshold	-	-	+100	[mV]	V _{CM} = 1.2V
V_{TL}	Differential Input Low Threshold	-100	-	-	[mV]	V _{CM} = 1.2V
 V_{ID} 	Input Differential Voltage	100	-	600	[mV]	
V_{CM}	Differential Input Common Mode Voltage	+1.0	+1.2	+1.5	[V]	

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 : LED Driver Connector

Connector Name / Designation	LED Connector
Manufacturer	E&T or compatible
Connector Model Number	3808K-F05N-12 or compatible
Mating Connector Model Number	H208K-D05N-22B or compatible

Pin No.	Symbol	Description
Pin1	VLED	LED Backlight Power Supply
Pin2	GND	Ground
Pin3	VLED_EN	LED Backlight Enable
Pin4	VPWM_EN	LED Backlight Dimming Adjust
Pin5	NA	NC

5.2.2 Parameter guideline for LED

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

LED characteristics

Symbol	Parameter	Min	Typ	Max	Units	Condition
PVLED	Backlight Power Consumption	-	6.4	7.6	[Watt]	(Ta=25°C), Note 1 VLED =12V
LTLED	LED Life-Time	50,000	70,000	-	Hour	No Backlight Unit

Note 1: Calculator value for reference $P_{LED} = V_F$ (Normal Distribution) * I_F (Normal Distribution) / Efficiency

Note 2: The LED life-time define as the estimated time to 50% degradation of initial luminous at Ta = 25°C.

Backlight input signal characteristics

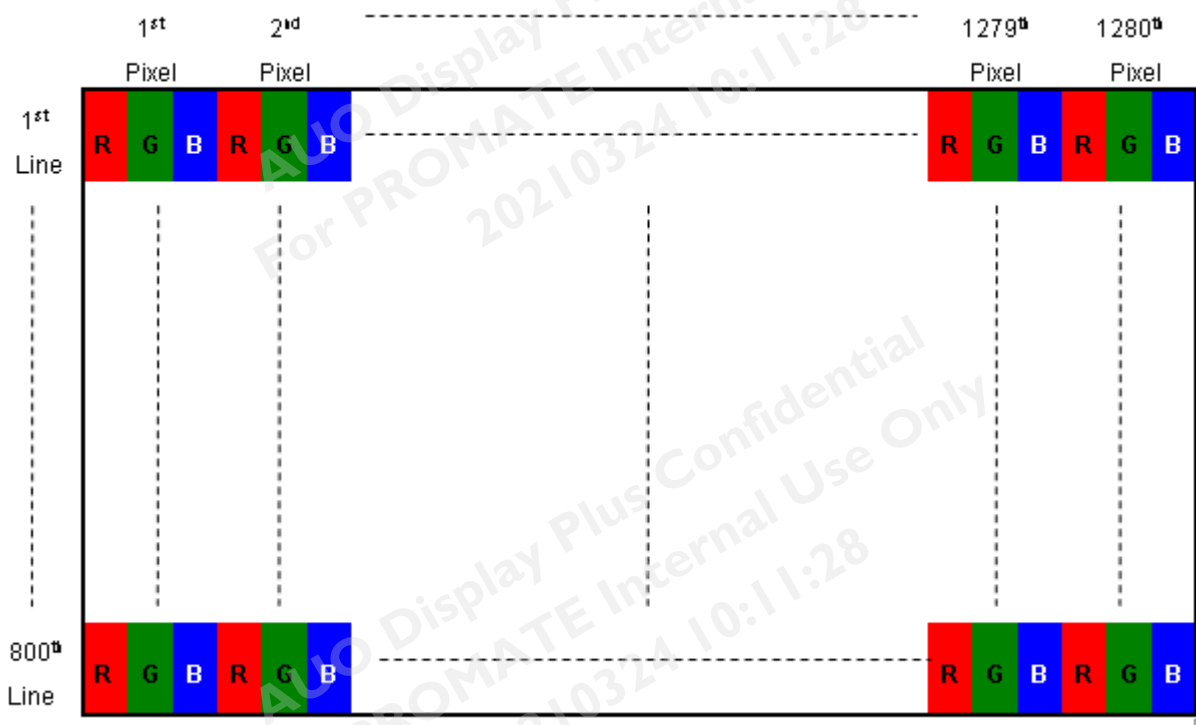
Symbol	Parameter	Min	Typ	Max	Units	Remark
VLED	LED Power Supply	10.8	12	13.2	[Volt]	Define as Connector Interface (Ta=25°C)
VLED_EN	LED Enable Input High Level	2.5	--	5.5	[Volt]	
	LED Enable Input Low Level	--	--	0.5	[Volt]	
VPWM_EN	PWM Logic Input High Level	2.5	--	5.5	[Volt]	
	PWM Logic Input Low Level	--	--	0.5	[Volt]	
FPWM	PWM Input Frequency *1	17.1K	--	20K	[Hz]	
Duty	PWM Duty Ratio	1	--	100	%	
ILED	Input Current	-	0.533	0.633	[A]	100% Dimming

Note1: The signals are measured on panel.

6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals 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	JAE / STM or compatible
Connector Model Number	FI-XB30SSL-HF15 / MSBKT2407P30HB or compatible
Adaptable Plug	FI-X30HL (Locked Type) or compatible

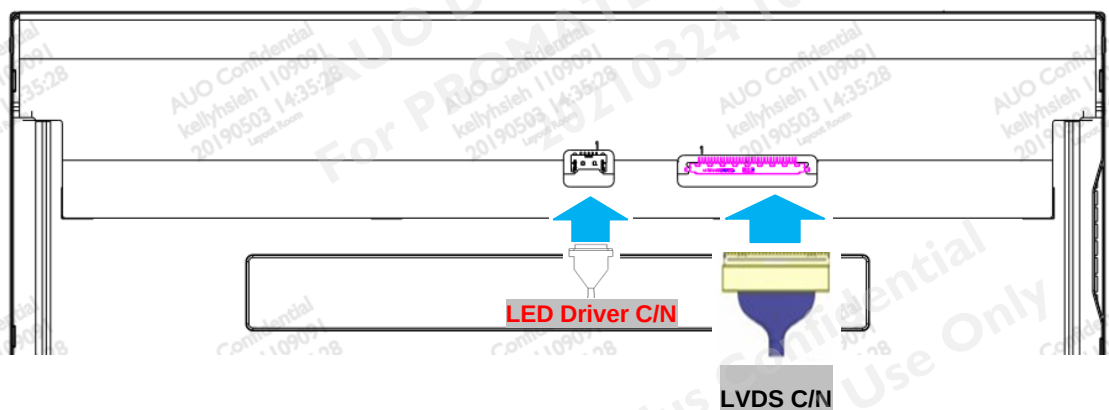
6.2.2 Pin Assignment

PIN no	Symbol	Function	Remark
1	NC	No Connection	
2	NC	No Connection	
3	NC	No Connection	
4	GND	Ground	
5	RXIN0N	Differential Data Input, CH0 (Negative)	

6	RXIN0P	Differential Data Input, CH0 (Positive)	
7	GND	Ground	
8	RXIN1N	Differential Data Input, CH1 (Negative)	
9	RXIN1P	Differential Data Input, CH1 (Positive)	
10	GND	Ground	
11	RXIN2N	Differential Data Input, CH2 (Negative)	
12	RXIN2P	Differential Data Input, CH2 (Positive)	
13	GND	Ground	
14	RXCLKN	Differential Clock Input, (Negative)	
15	RXCLKP	Differential Clock Input, (Positive)	
16	GND	Ground	
17	RXIN3N	Differential Data Input, CH3 (Negative)	
18	RXIN3P	Differential Data Input, CH3 (Positive)	
19	GND	Ground	
20	Reserved	Internal used (Recommend No connection)	
21	Reserved	Internal used (Recommend No connection)	
22	Reserved	Internal used (Recommend No connection)	
23	GND	Ground	
24	GND	Ground	
25	GND	Ground	
26	VDD	Power +3.3V, (typical)	
27	VDD	Power +3.3V, (typical)	
28	VDD	Power +3.3V, (typical)	
29	VDD	Power +3.3V, (typical)	
30	VDD	Power +3.3V, (typical)	

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 means “No Connection”.

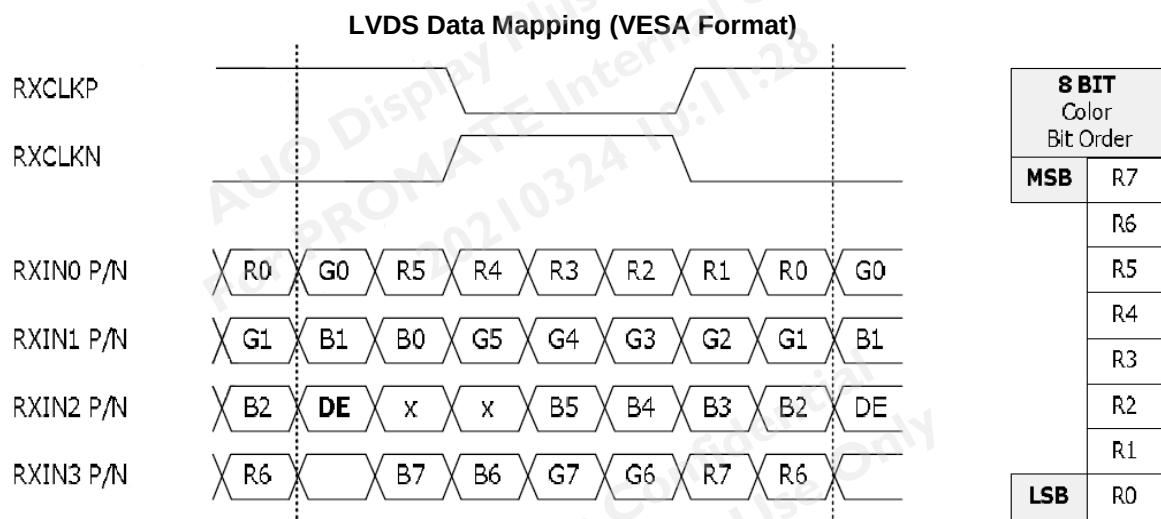


Note3: Please refer to the above figure for the insertion direction of connector.

Note4: Input signals shall be low or High-impedance state when VDD is off.

6.3 The Input Data Format

LVDS Input format



Note1: Please follow PSWG.

Note2: R/G/B data 7:MSB, R/G/B data 0:LSB

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 LVDS input MSB: R7 ; 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 LVDS input MSB: G7 ; 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 LVDS input MSB: B7 ; LSB: B0
RXCLKP/N	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.

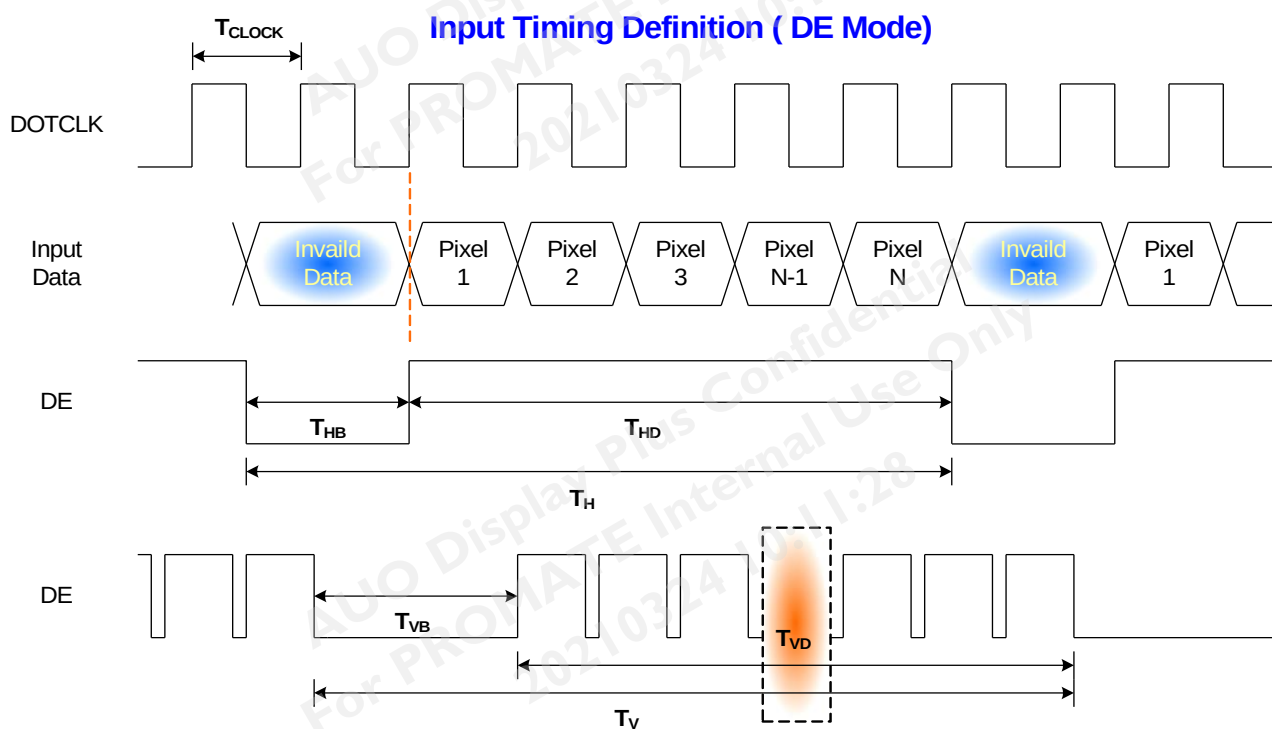
6.4 Interface Timing

6.4.1 Timing Characteristics

Signal		Symbol	Min	Typ	Max	Unit
Clock Frequency		$1/ T_{\text{Clock}}$	65.4	71.5	80	MHz
Vertical Section	Period	T_V	810	826	900	T_{Line}
	Active	T_{VD}	800			
	Blanking	T_{VB}	10	26	100	
Horizontal Section	Period	T_H	1344	1440	1480	T_{Clock}
	Active	T_{HD}	1280			
	Blanking	T_{HB}	64	160	200	
Frame Rate		F	-	60	-	Hz

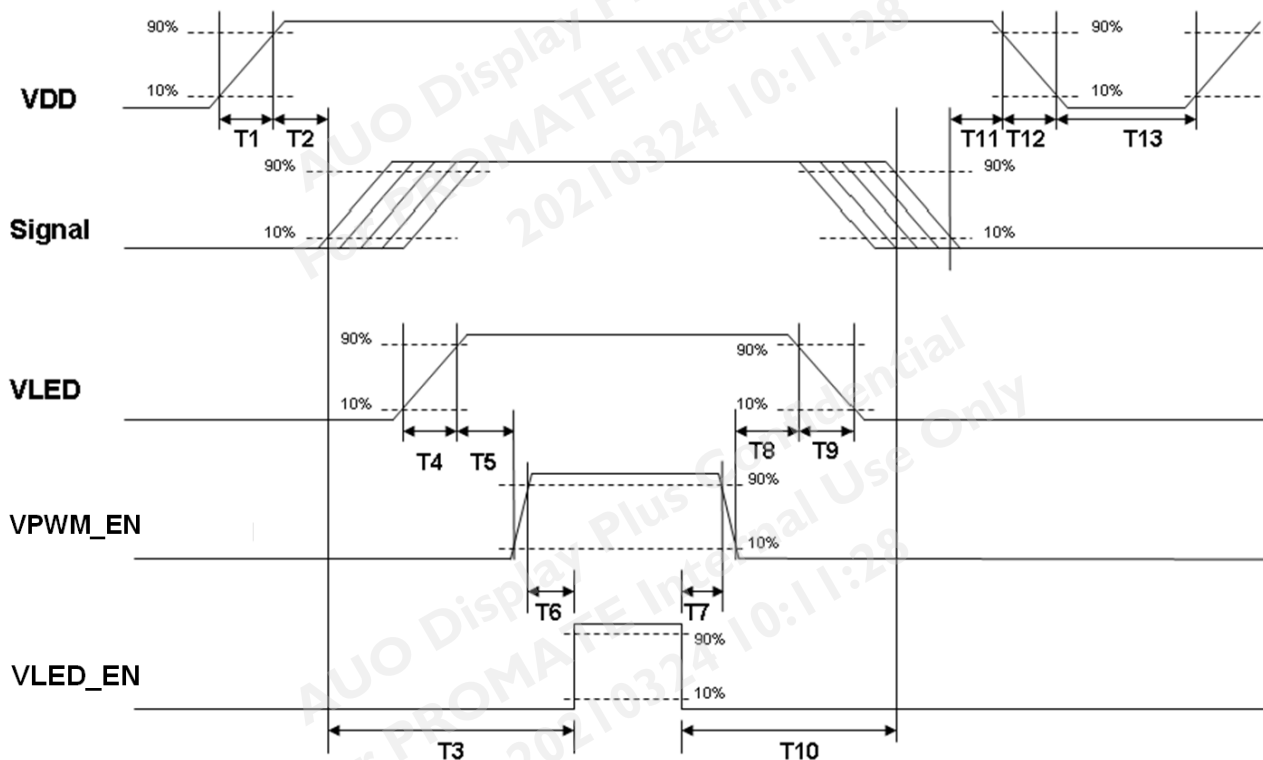
Note: 1. Support DE mode only.

6.4.2 Input Timing Diagram



6.5 Power ON/OFF Sequence

VDD power and LED on/off sequence are as follows. 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			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	40	-	50	[ms]
T3	200	-	-	[ms]
T4	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	0.5	-	10	[ms]
T10	110	-	-	[ms]
T11	0.5	16	50	[ms]
T12	-	-	10	[ms]
T13	1500	-	-	[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.

7. Reliability Test Criteria

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50 °C, 80%RH, 300hrs	Note 2
High Temperature Operation (HTO)	Ta= 70 °C, 300hrs	
Low Temperature Operation (LTO)	Ta= -10 °C, 300hrs	
High Temperature Storage (HTS)	Ta= 80 °C, 300hrs	
Low Temperature Storage (LTS)	Ta= -20 °C, 300hrs	
Thermal Shock Test (TST)	-20 °C /30min, 60 °C /30min, 100 cycles	
Shock Test (Non-operation)	Test method: Non-Operation Acceleration: 50 G; Wave: Half-sine Active time: 20 ms Direction: $\pm X, \pm Y, \pm Z$ (one time for each axis)	
Vibration Test (Non-operation)	Test method: Non-Operation Acceleration: 1.5 G Frequency: 10 - 200 -10Hz Sweep: Sine wave vibration; 30 minutes each axis (X, Y, Z)	
ESD	Contact : $\pm 8KV$ / operation, Class B Air : $\pm 15KV$ / operation, Class B	Note 1

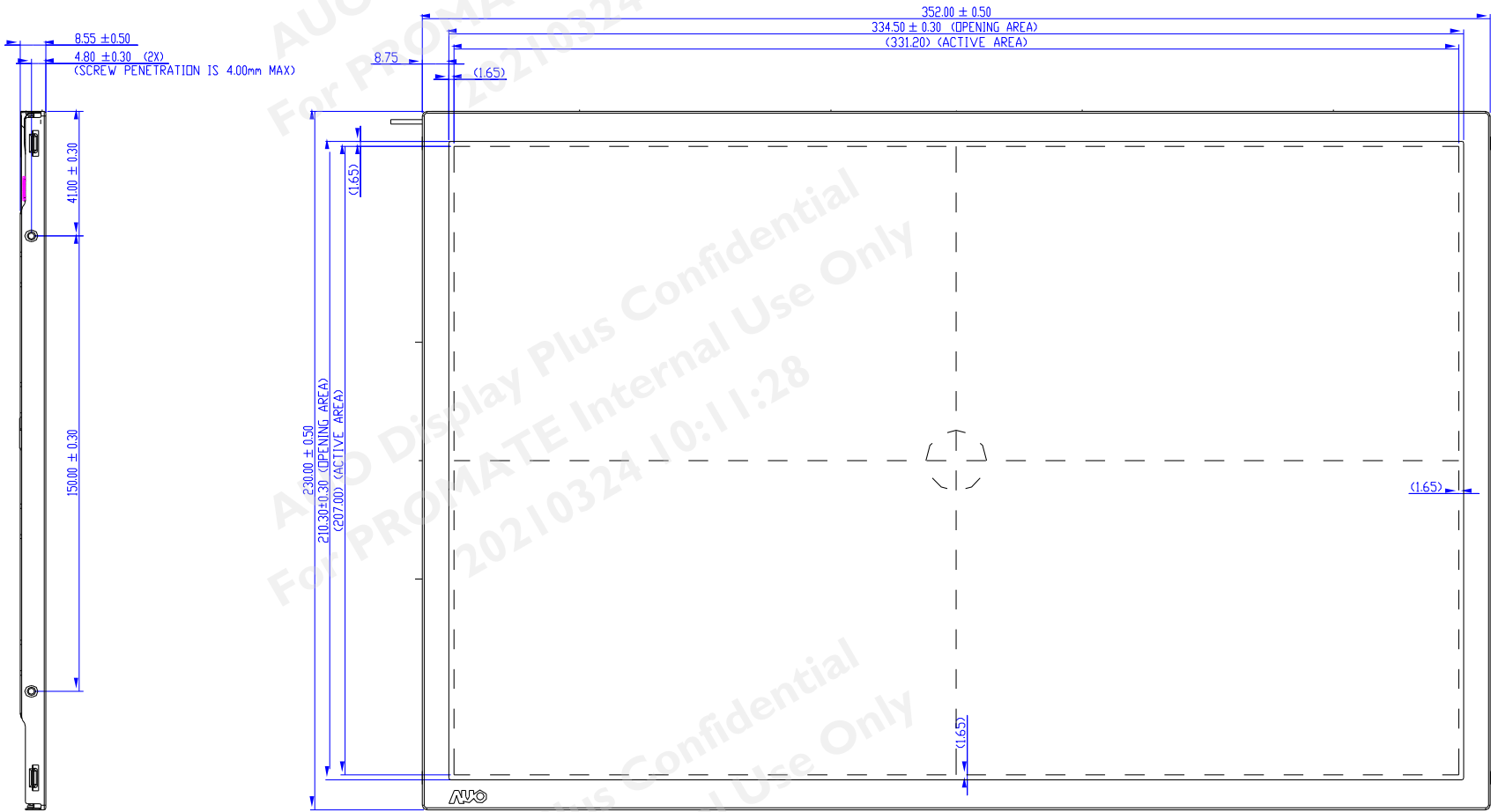
Note 1: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost
. Self-recoverable. No hardware failures.

Note 2:

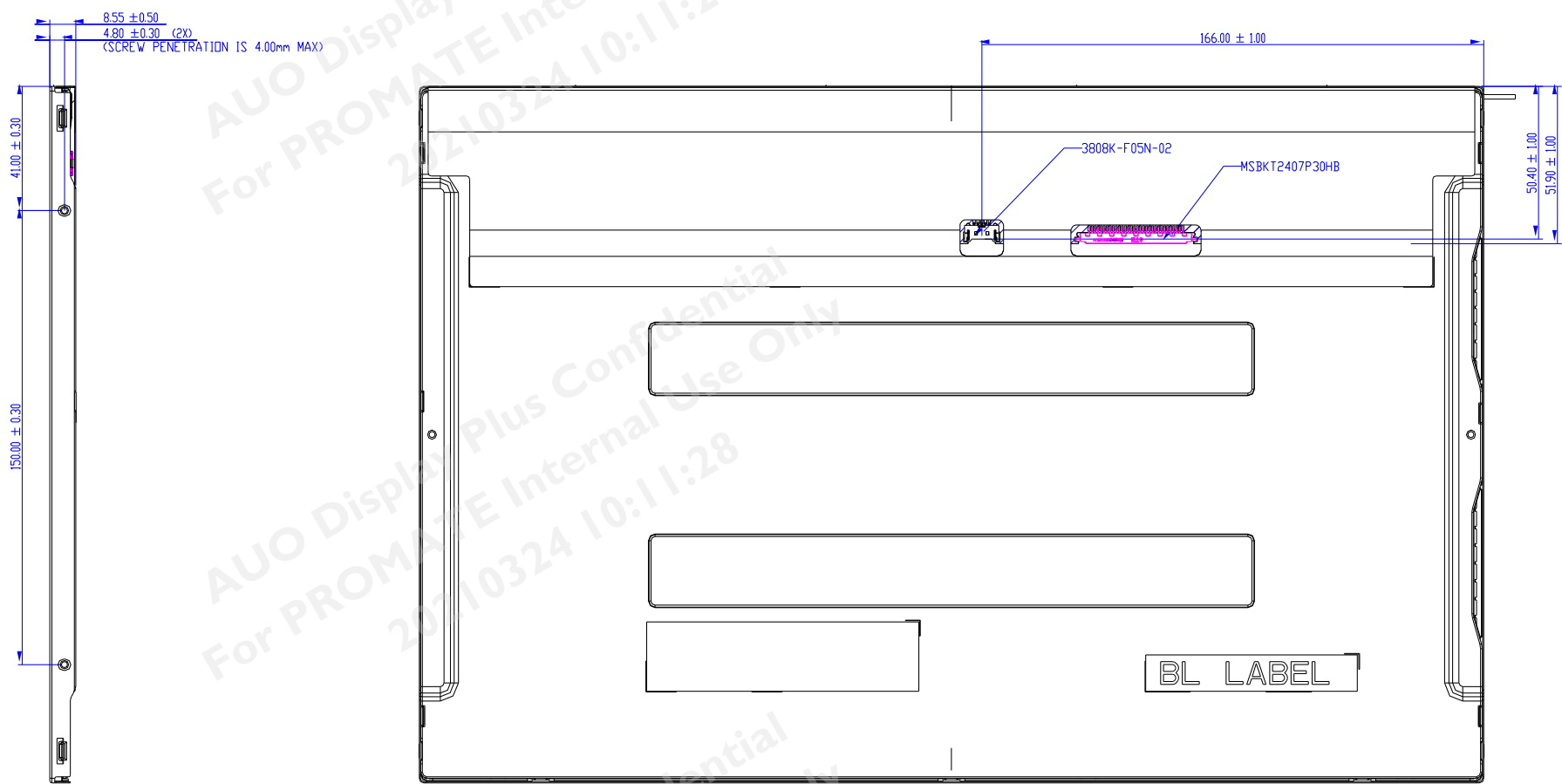
- Water condensation is not allowed for each test items.
- Each test is done by new TFT-LCD module. Don't use the same TFT-LCD module repeatedly for reliability test.
- The reliability test is performed only to examine the TFT-LCD module capability. No function failure occurs. Mura shall be ignored after high temperature reliability test.
- To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.

8. Mechanical Characteristics

8.1 LCM Outline Dimension (Front View)

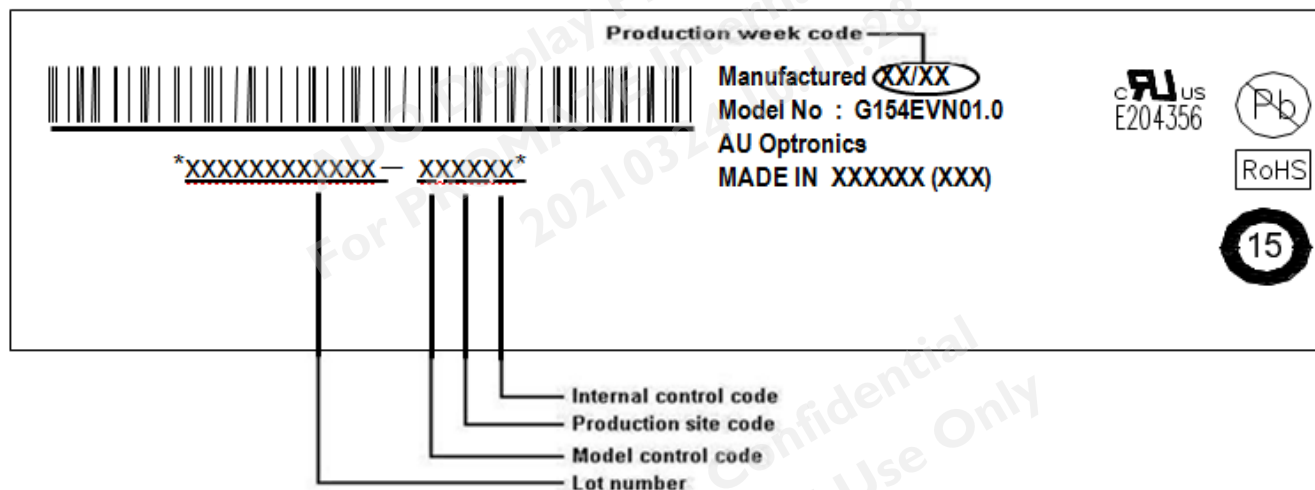


8.2 LCM Outline Dimension (Rear View)

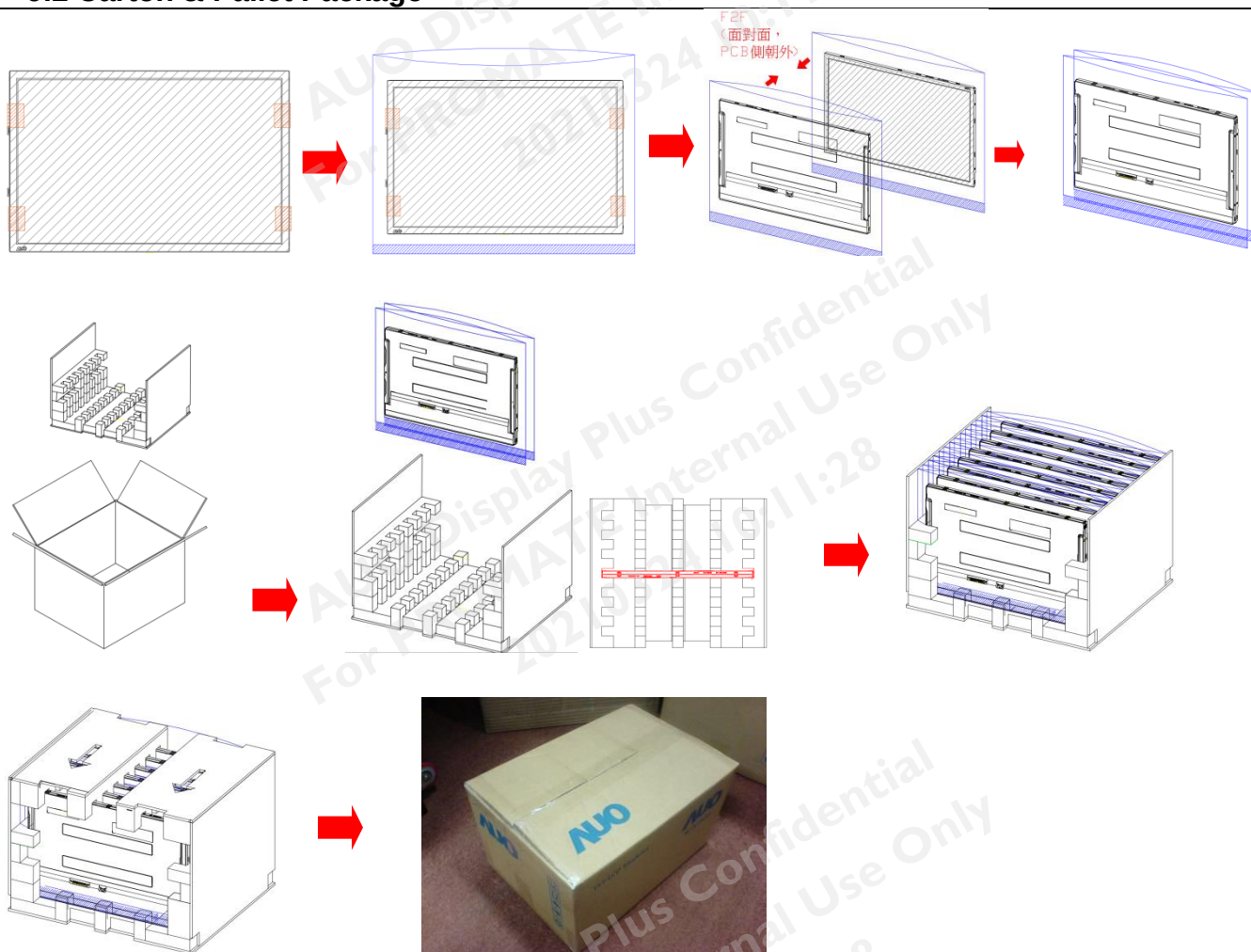


9. Packaging Spec

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



9.2 Carton & Pallet Package



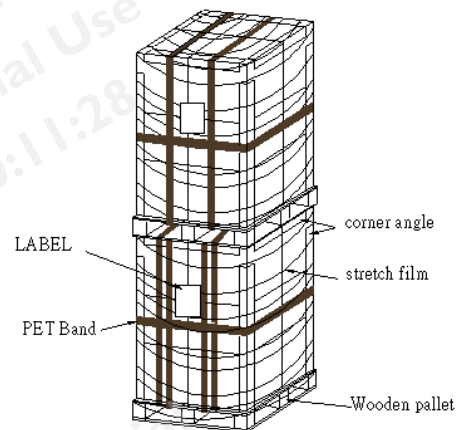
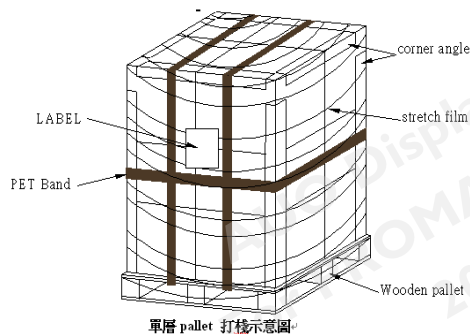
Max capacity : 14 TFT-LCD module per carton
Max weight: 15 kg per carton
Outside dimension of carton: 428mm(L)*365mm(W)*328mm(H)
Pallet size : 1150 mm* 910 mm*132mm

Box stacked

Module by air : (2 *3) *4 layers , one pallet put 24 boxes, total 336pcs module

Module by sea : (2 *3) *4 layers+(2 *3) *2 layers, two pallet put 36 boxes, total 504pcs module

Module by sea_HQ : (2 *3) *4 layers+(2 *3) *3 layers, two pallet put 42 boxes, total 588 pcs module



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