■ **Preliminary Specifications**
☐ **Final Specifications**

Module	15 Inch Color TFT-LCD
Model Name	G150XTK01.0
Note	oTP display

Customer	Date
Checked & **Approved by**	
_____ _____	

Customer's sign back page

Approved by	Date
Sean Lin	2017/8/7
Prepared by	
Albert Jian	2017/8/7

General Display Business Unit /
AU Optronics corporation

Contents

Record of Revision

Version and Date	Page	Old description	New Description
0.0 2016/04	All	First Edition	
0.1 2016/09	5	Physical Size: 326.5(H)x253.5(V)x 12.0(D) (max.)	Physical Size: 326.5(H)x 253.5(V) x 10.0(D) (max.)
	6	Luminance typ.300/ min.240	Luminance typ.390/ min.310.
0.2 2017/8/4	6	**2.1 Display Characteristics** Typical Power Consumption: 6.9 (typ. @ black pattern)	**2.1 Display Characteristics** Typical Power Consumption: 8.26 (max.)
	7	**2.2 Touch Characteristics** a. The smallest distance between 2 points: 22mm	**2.2 Touch Characteristics** a. The smallest distance between 2 points: 26mm b. OS support: add win10
	13	**5.1.1 Power Specification**	**5.1.1 Power Specification** Update IDD & PDD number
	14	**5.1.2 Signal Electrical Characteristics**	**5.1.2 Signal Electrical Characteristics** Change note: LVDS signal waveform
	16	**5.3.1 Power Specification**	**5.3.1 Power Specification** TP current update
	22		**6.6 Power ON/OFF Sequence** Add touch power ON/OFF sequence timing
	27		**9. Mechanical Characteristics**

9. Mechanical Characteristics

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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) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
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) 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 (IEC60950-1 or UL60950-1), 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 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

G150XTK01.0 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display, a driver circuit, and a LED backlight system. The screen format is intended to support 4:3 XGA (1024(H) x 768(V)) screen and 16.2M or 262K colors. All input signals are LVDS interface compatible.

G150XTK01.0 is designed for industrial display applications.

2.1 Display Characteristics

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

Items	Unit	Specifications
Screen Diagonal	[inch]	15
Active Area	[mm]	304.128(H) x 228.096(V)
Pixels H x V		1024x3(RGB) x 768
Pixel Pitch	[mm]	0.297 x 0.297
Pixel Arrangement		RGB Strip
Display Mode		TN, Normally White
Nominal Input Voltage VDD	[Volt]	3.3 typ.
Typical Power Consumption	[Watt]	8.26 (max)
Weight	[Grams]	1150g (Max.)
Physical Size	[mm]	326.5(H)x 253.5(V) x 10.0(D) (max.)
Electrical Interface		LVDS
Surface Treatment		Anti-glare
Support Color		16.2M/262K

Temperature Range
    Operating
    Storage (Non-Operating)
	[℃]
	[℃]
		-30 to +85
		-30 to +85

RoHS Compliance		RoHS Compliance
Light Bar Unit		LED, Non-replaceable

2.2 Touch Characteristics

The following items are characteristics summary on the table under 25 ^{o}C condition:

Item		Unit	Specifications
Type of Touch Sensor			Projective Capacity Touch (on-cell touch)
Cover Lens	Outline Dimension	[mm]	NA
	Material		
	Thickness	[mm]	
	Visual Area	[mm]	
Touch Sensor	Outline Dimension		on cell touch
	Thickness		on cell touch
	Active Area		306.130 (W) x 230.092 (H)
Touch Controller			ILITEK 2312
Channel (X * Y)		[ch]	55 * 41
Interface			USB 2.0 full speed
Surface Hardness		[H]	3
Multi-Touch Point		Points	5
Single/Multi-points Accuracy		[mm]	Center : +/- 1.5mm Edge : +/- 2.5mm
Linearity		[mm]	Center : +/- 1.5mm Edge : +/- 2.5mm
The smallest distance between 2 points		[mm]	26mm
Report Rate			>100 Hz
OS support			Win 7, Win 8, win10

2.3 Optical Characteristics
The optical characteristics are measured under stable conditions at 25℃ (Room Temperature):

Item	Unit	Conditions		Min.	Typ.	Max.	Note
White Luminance	[cd/m2]			310	390	-	1
Uniformity	%	9 Points		75	80	-	2, 3
Contrast Ratio				400	700	-	4
Cross talk	%			-	1.2	1.5	5
Response Time	[msec]	Rising		-	5.7		6
	[msec]	Falling		-	2.3		
	[msec]	Raising + Falling		-	8		
Viewing Angle	[degree]	Horizontal CR> = 10	(Right)	70	80	-	7
			(Left)	70	80	-	

	[degree]	Vertical CR> = 10	(Upper)	60	70	-	
			(Lower)	70	80	-	
Color / Chromaticity Coordinates (CIE 1931)		Red x		0.567	0.617	0.667	
		Red y		0.296	0.346	0.396	
		Green x		0.286	0.336	0.386	
		Green y		0.562	0.612	0.662	
		Blue x		0.109	0.159	0.209	
		Blue y		0.015	0.065	0.115	
		White x		0.263	0.313	0.363	
		White y		0.279	0.329	0.379	
Color Gamut	%				60	-	

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*

Module Driving Equipment
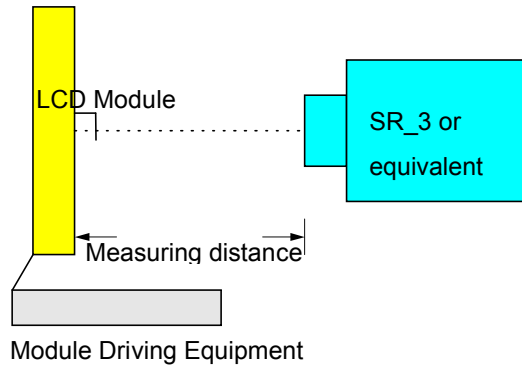
Note 2: Definition of 9 points position (Display active area : 304.128(H) x 228.096(V))
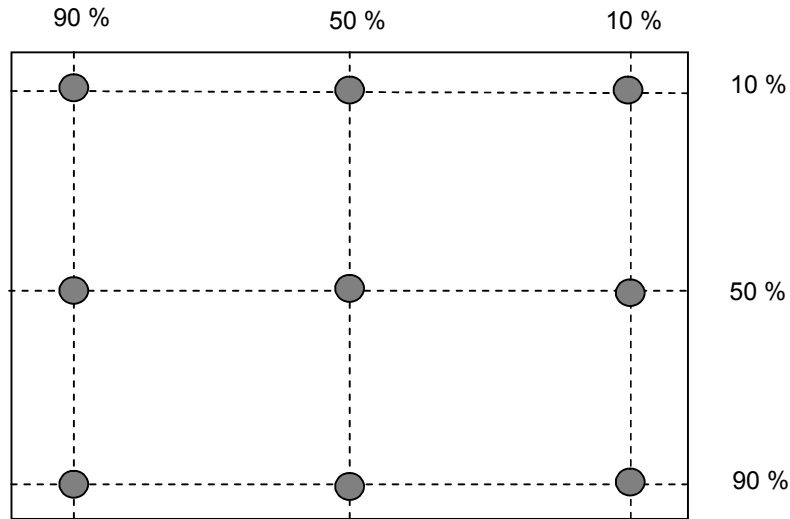
Note 3: The luminance uniformity of 9 points is defined by dividing the minimum luminance values by the maximum test point luminance

$$\delta_{W9} \ = \ \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

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 cross talk (CT)

CT = max(| Y' – Y | / Y × 100 (%)), Y = U/D/L/R
Where
Y = Luminance of measured location without gray level 0 pattern (cd/m2)
Y' = Luminance of measured location with gray level 0 pattern (cd/m2)
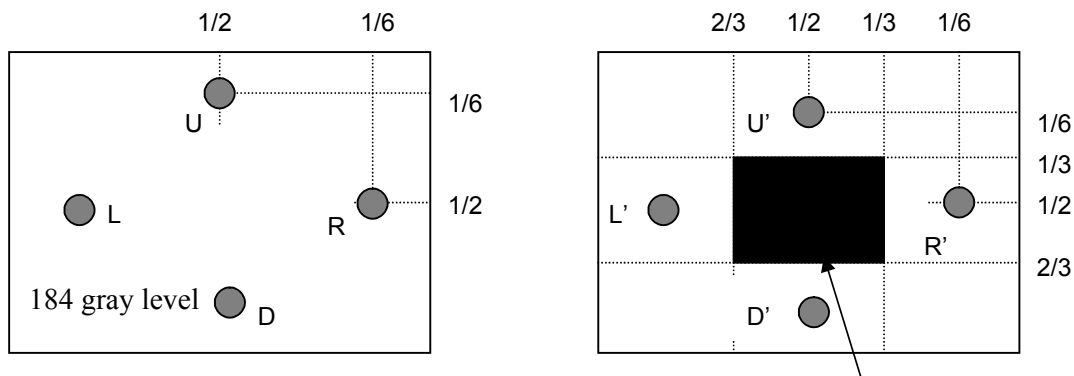
Note 6: Definition of response time:

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.
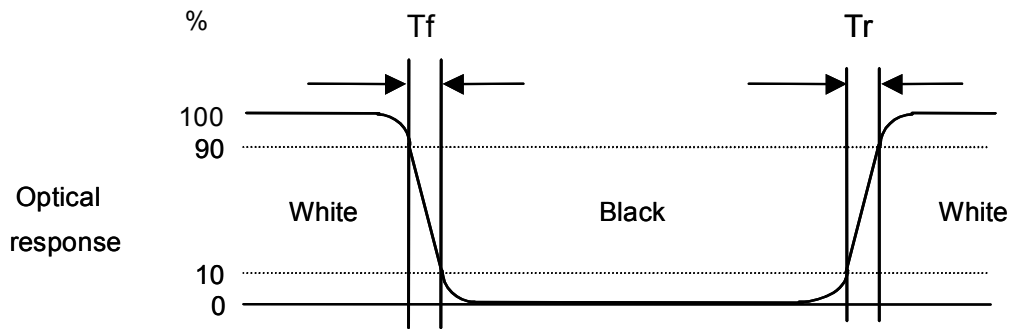
Note 7: Definition of viewing angle

Viewing angle is the measurement of contrast ratio $\geqq 10$, 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.
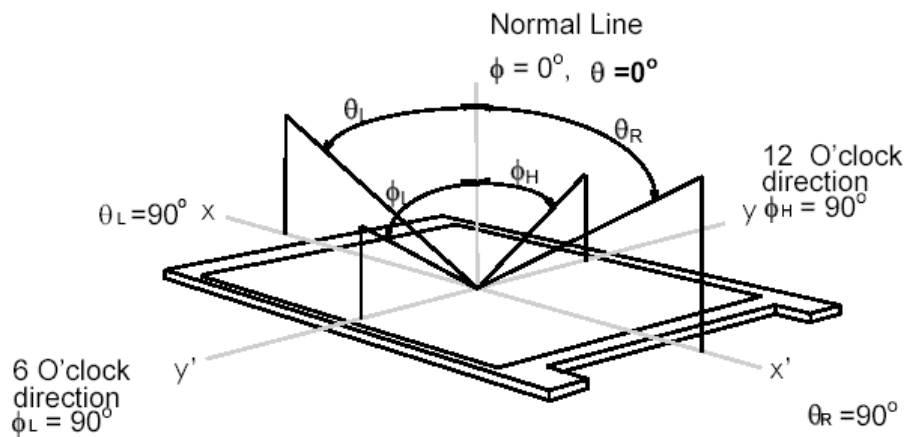
3. Functional Block Diagram

The following diagram shows the functional block of the 15 inch color TFT/LCD module:
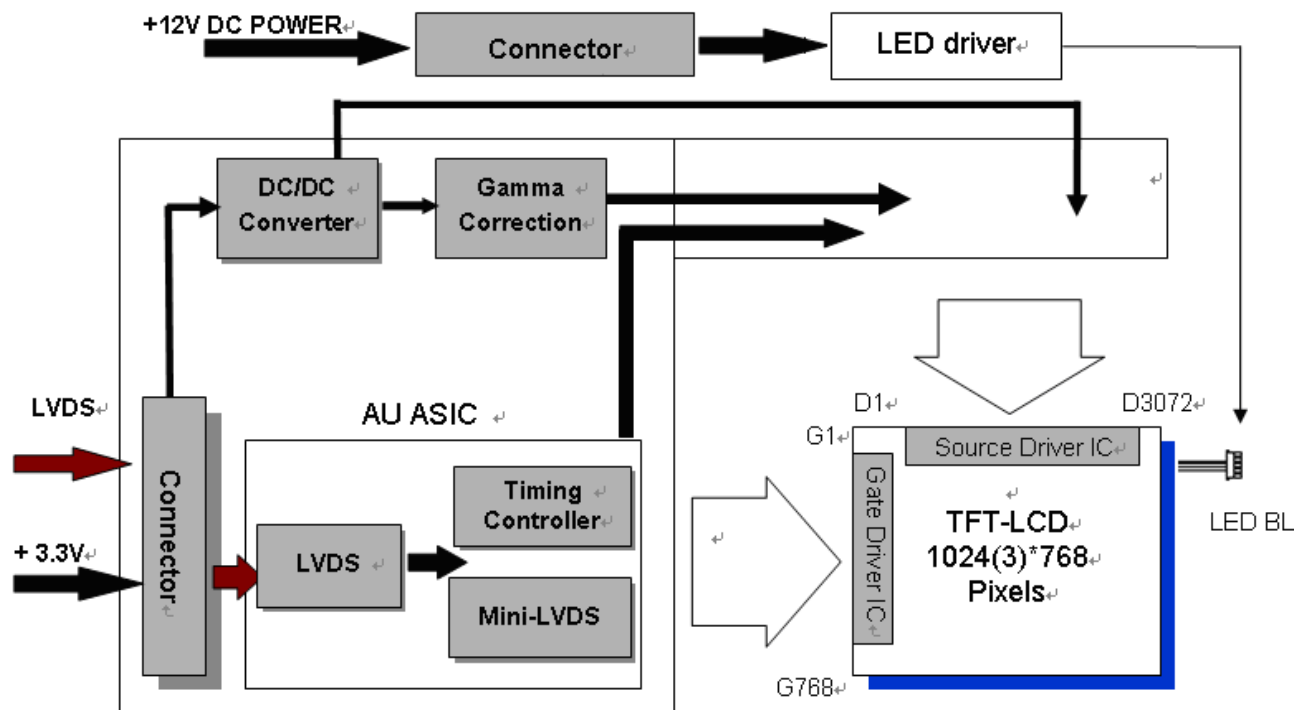
4. Absolute Maximum Ratings

4.1 Absolute Ratings of TFT LCD Module

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

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	-30	+85	[^{o}C]
Operation Humidity	HOP	8	90	[%RH]
Storage Temperature	TST	-30	+85	[^{o}C]
Storage Humidity	HST	8	90	[%RH]

Note: Maximum Wet-Bulb should be 39℃ and no condensation.
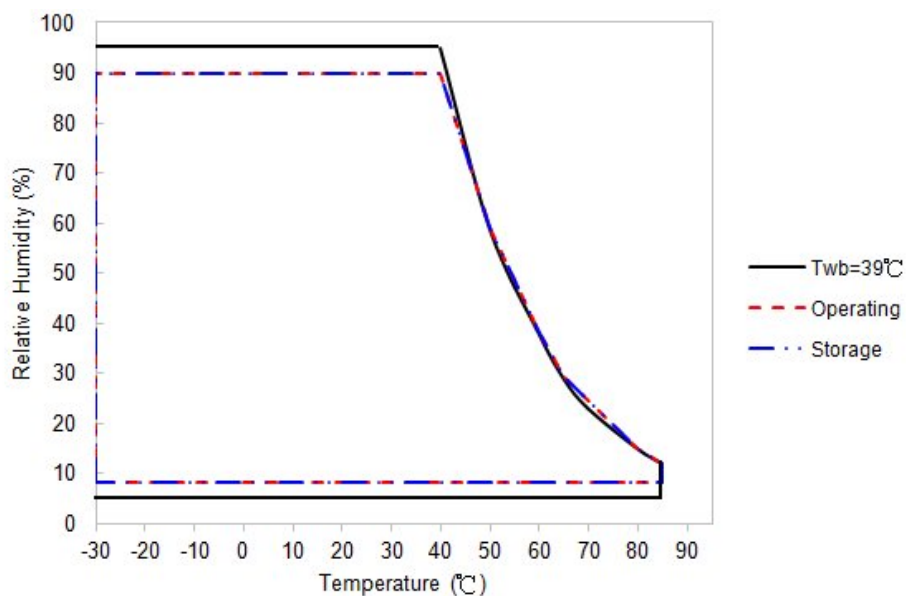
5. Electrical Characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	±10%
IDD	VDD Current	-	0.45	0.54	[A]	All Black Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current	-	-	2	[A]	Note 1
PDD	VDD Power	-	1.49	1.78	[Watt]	All Black Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:
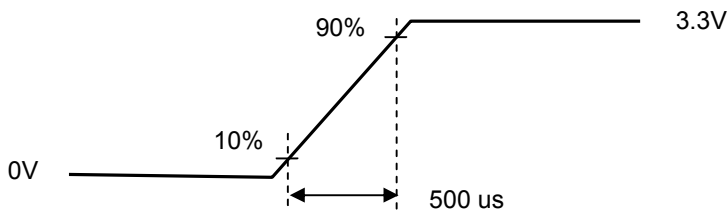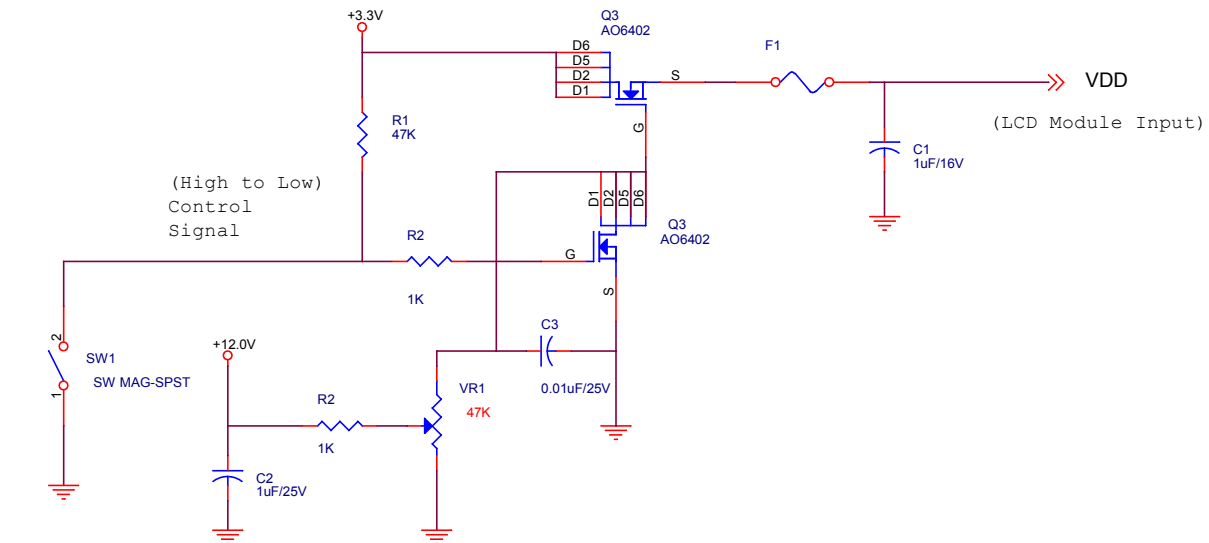
VDD rising time

5.1.2 Signal Electrical Characteristics

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

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	100	400	600	[mV]	
VICM	Differential Input Common Mode Voltage	1.15	1.2	1.45	[V]	VTH/VTL=±100mV

Note: LVDS Signal Waveform.
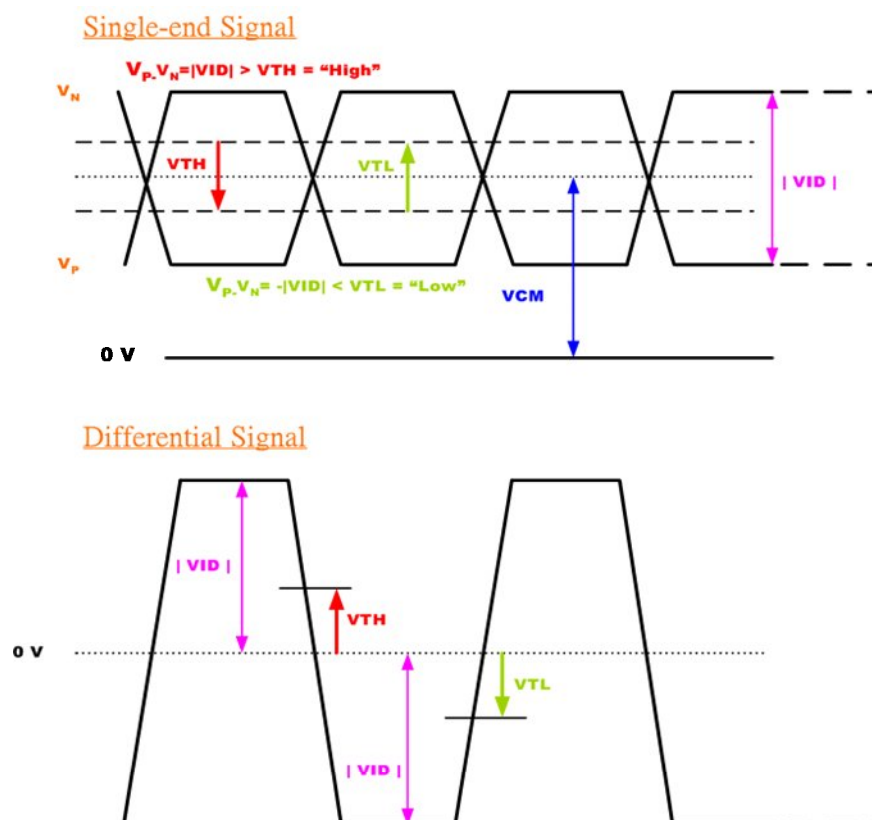
5.2 Backlight Unit

5.2.1 Parameter guideline for LED

Following characteristics are measured under stable condition using a LED driving board at 25℃ (Room

Temperature).

LED characteristics

Symbol	Parameter	Min	Typ	Max	Units	Condition
PLED	Backlight Power Consumption	--	5.4	--	[Watt]	
LTLED	LED Life-Time	50000	70000	--	Hour	

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.

Backlight input signal characteristics

Symbol	Parameter	Min	Typ	Max	Units	Remark
VLED (Note 1)	LED Power Supply	10.8	12.0	13.2	[Volt]	Define as Connector Interface (Ta=25℃)
VLED_EN	LED Enable Input High Level	3.0	--	5.5	[Volt]	
	LED Enable Input Low Level	--	--	0.8	[Volt]	
VPWM_EN	PWM Logic Input High Level	3.0	--	5.5	[Volt]	
	PWM Logic Input Low Level	--	--	0.8	[Volt]	
FPWM	PWM Input Frequency *1	200		20K	Hz	
Duty	PWM Duty Ratio	5	--	100	%	

Note1: Measured on panel VLED

5.3 Touch Sensor Module

5.3.1 Power Specification

Items	Symbol	Specifications			Unit	Notes
		Min.	Typ.	Max.		
Touch Panel Power Supply	VTSP	4.5	5	5.5	V	Ripple <100mV
Input Voltage	VIH	$0.65V_{DD}$	-	$V_{DD}+0.5$	V	$V_{DD}=3.3$
	VIL	-0.5	-	$0.3V_{DD}$	V	
Normal mode Current consumption @ Report rate 100Hz		126	140	154	mA	
Idle mode Current consumption		76.5	85	93.5	mA	

6. Signal Characteristic

6.1 Pixel Format Image

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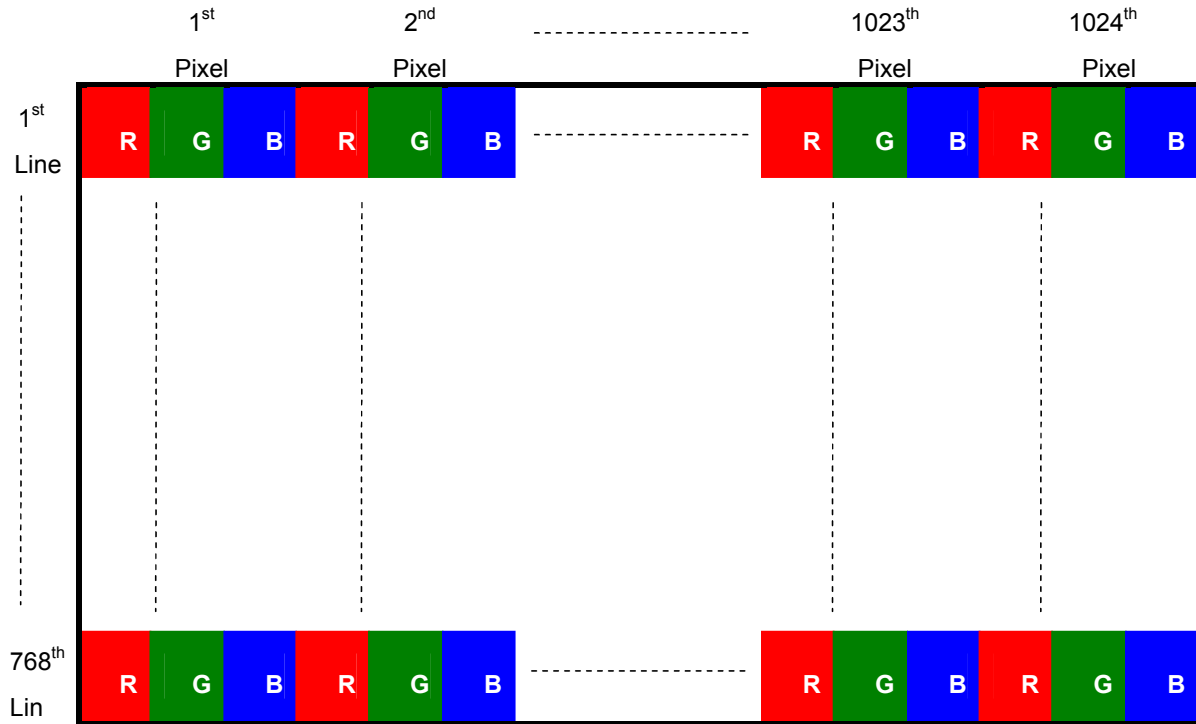
6.2 Scanning Direction

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

6.3 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.

Pin No.	Symbol	Description
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	NC	No Connect
4	NC	No Connect
5	Rin1-	- LVDS differential data input
6	Rin1+	+ LVDS differential data input
7	VSS	Ground
8	Rin2-	- LVDS differential data input
9	Rin2+	+ LVDS differential data input
10	VSS	Ground
11	Rin3-	- LVDS differential data input
12	Rin3+	+ LVDS differential data input
13	VSS	Ground
14	ClkIN-	- LVDS differential clock input
15	ClkIN+	+ LVDS differential clock input
16	VSS	Ground
17	Rin4-	- LVDS differential data input
18	Rin4+	- LVDS differential data input
19	VSS	Ground
20	SEL LVDS	H or NC: 6bit/L: 8bit

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".

6.4 The Input Data Format

SEL LVDS = "H" or NC for 6 bits LVDS Input
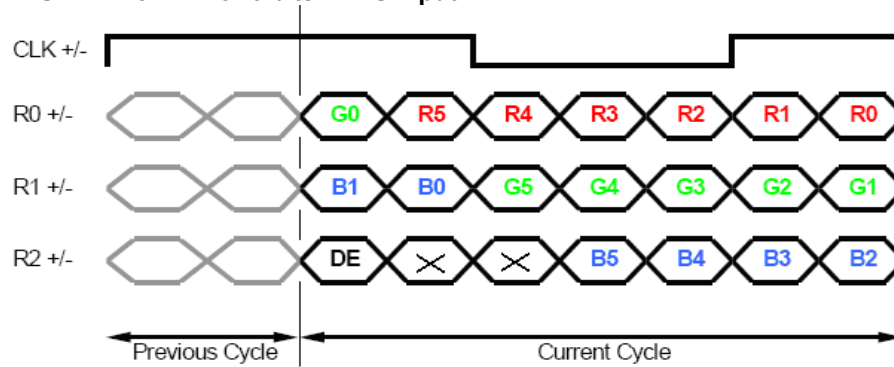
SEL LVDS ="L" for 8 bits LVDS Input
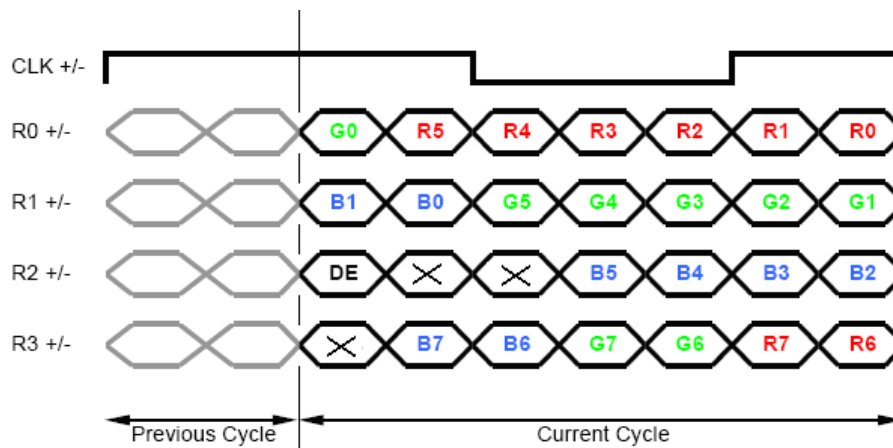
Note1: Please follow PSWG.
Note2: R/G/B data 7:MSB,　R/G/B data 0:LSB

6.5 Interface Timing

6.5.1 Timing Characteristics

Signal	Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock Timing	Clock frequency		1/ T$_{Clock}$	50	65	80	MHz
Vsync Timing	Vertical Section	Period	T$_V$	776	806	990	Vsync Timing
		Active	T$_{VD}$	-	768	-	
		Blanking	T$_{VB}$	8	38	222	
Hsync Timing	Horizontal Section	Period	T$_H$	1094	1344	1720	Hsync Timing
		Active	T$_{HD}$	-	1024	-	
		Blanking	T$_{HB}$	70	320	696	
Frame Rate			F	50	60	75	Hz

Note: DE mode only.
Note : Typical value refer to VESA STANDARD

6.5.2 Input Timing Diagram
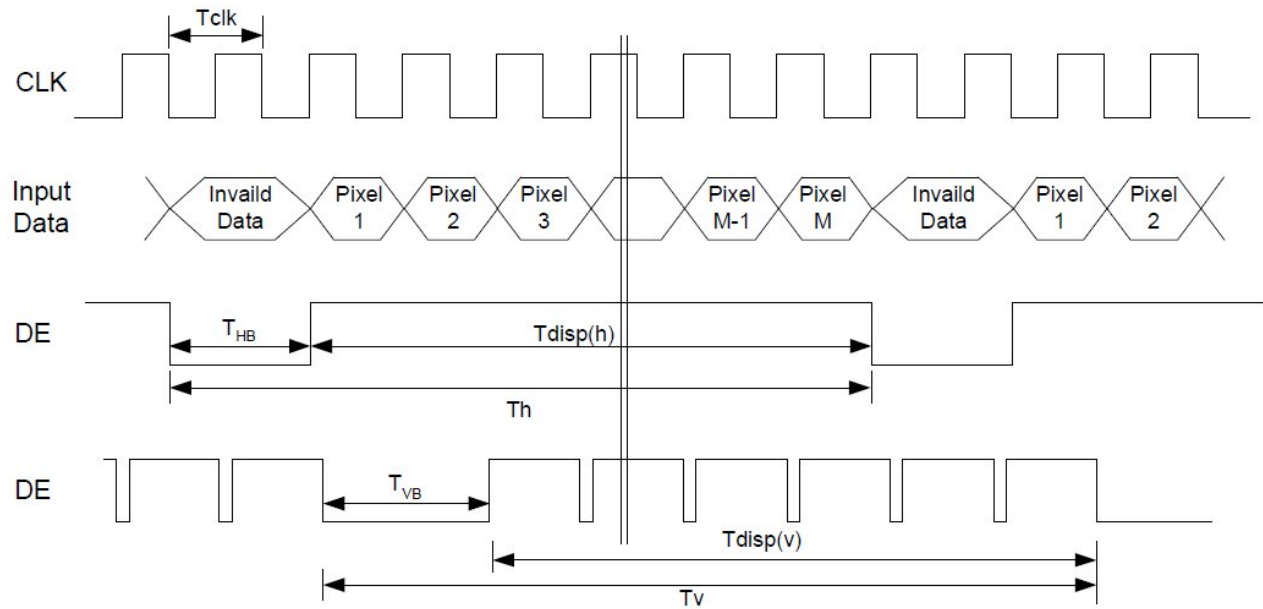
6.6 Power ON/OFF Sequence

VDD power and LED 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.
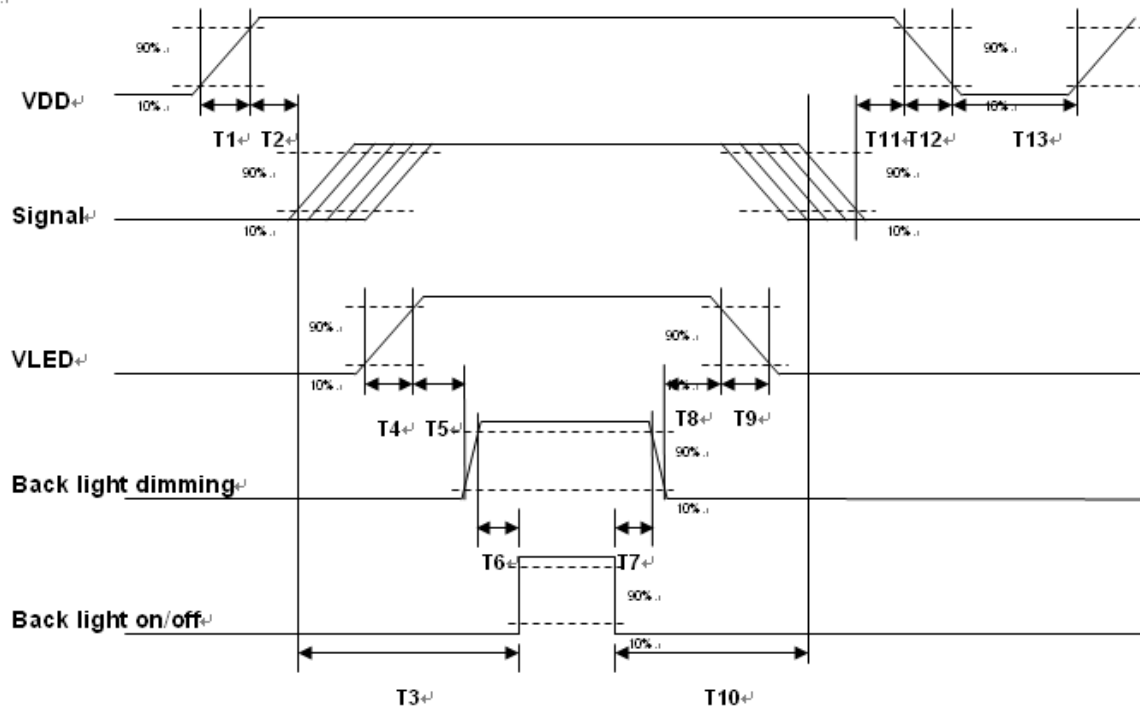
Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	220	-	-	[ms]
T4	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	100	-	-	[ms]
T10	110	-	-	[ms]
T11	0	16	50	[ms]
T12	-	-	10	[ms]
T13	1000	-	-	[ms]

.
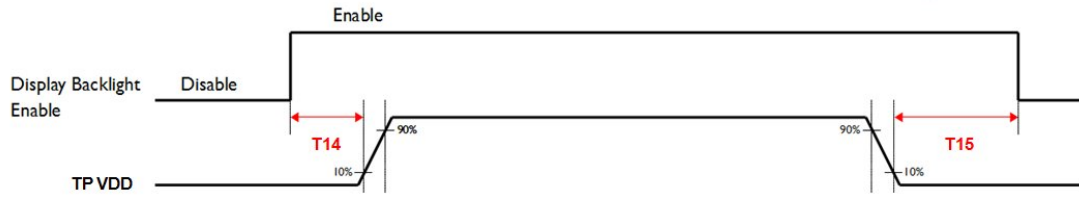
TP Power ON/OFF sequence timing

parameter	Value		Units
	Min	Max	
T14	10	-	[ms]
T15	100	-	[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. 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 Module: LVDS Connector & Pin Assignment

Connector Name / Designation	Signal Connector
Manufacturer	STM or compatible
Connector Model Number	MSB240420_HD or compatible
Mating Model Number	P240420 or compatible

Pin#	Signal Name	Pin#	Signal Name
1	VDD	2	VDD
3	NC	4	NC
5	Rin1-	6	Rin1+
7	VSS	8	Rin2-
9	Rin2+	10	VSS
11	Rin3-	12	Rin3+
13	VSS	14	ClkIN-
15	ClkIN+	16	VSS
17	Rin4-	18	Rin4+
19	VSS	20	SEL68

7.2 Backlight Unit: LED Driver Connector & Pin Assignment

| Connector Name / Designation	LED Driver Connector
Manufacturer	ENTERY or compatible
Connector Model Number	3808K-F05N-12R or compatible
Mating Model Number	H208K-P05N-02B or compatible

Pin#	Symbol	Signal Name
1	Vcc	12V
2	GND	GND
3	Enable	V_{LED} On/Off
4	Dimming	PWM Dimming
5	NC	NC

7.3 Touch Unit: Touch Driver Connector & Pin Assignment

Connector Name / Designation	Touch Driver Connector
Manufacturer	ENTERY or compatible
Connector Model Number	3806K-F06N-03L or compatible
Mating Model Number	H208K-D06N-22B or compatible

Pin#	Symbol	Signal Name
1	VDD	5V
2	D-	USB D-
3	D+	USB D+
4	GND	GND
5	GND	GND
6	GND	GND

7.4 Connector Illustration
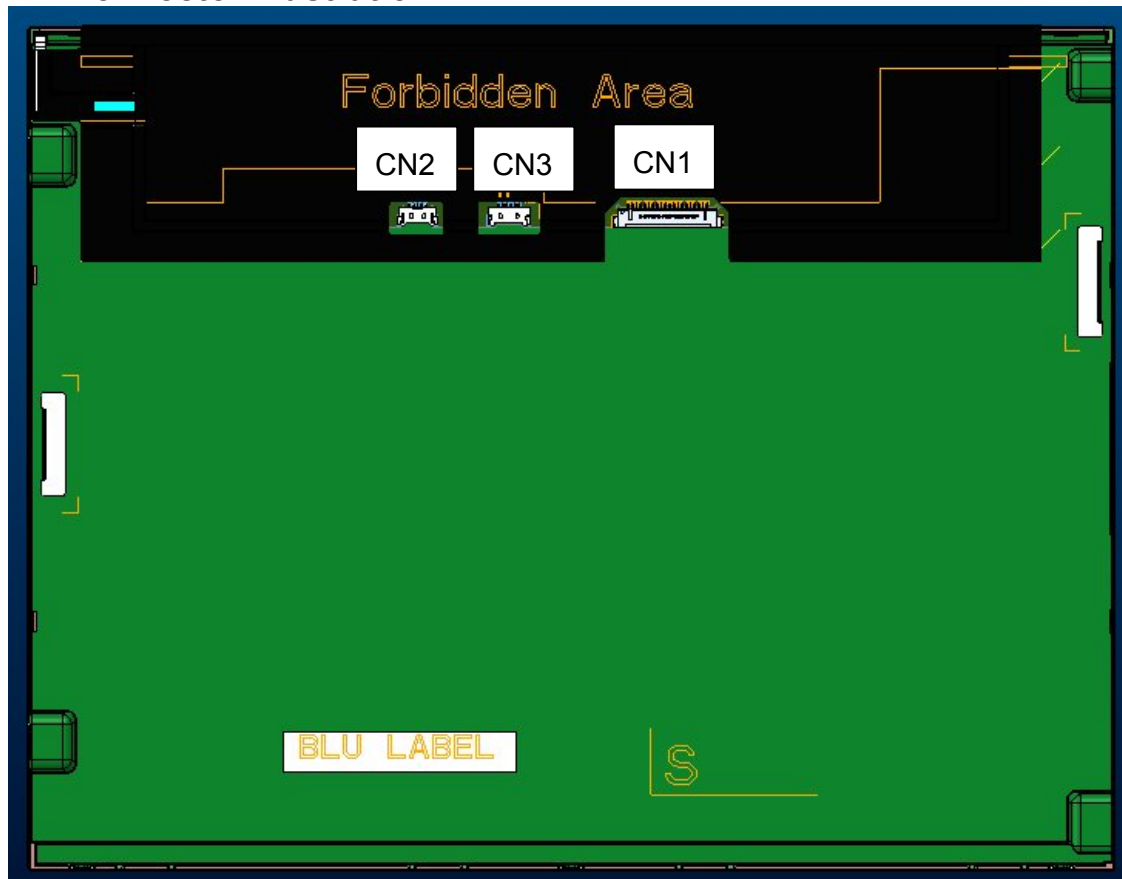
LVDS (CN1):
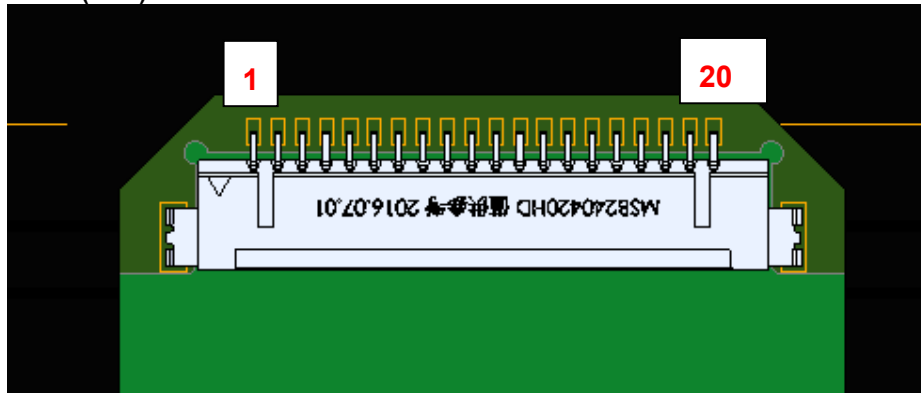
BLU Power in (CN2):

Touch Connector (CN3):
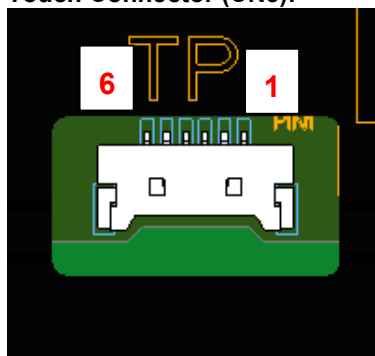
8. Reliability Test Criteria

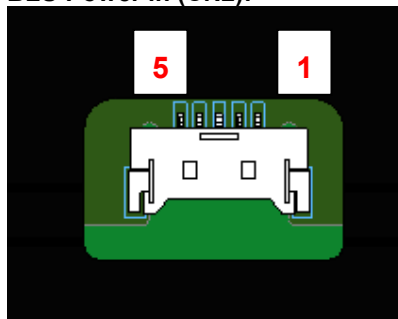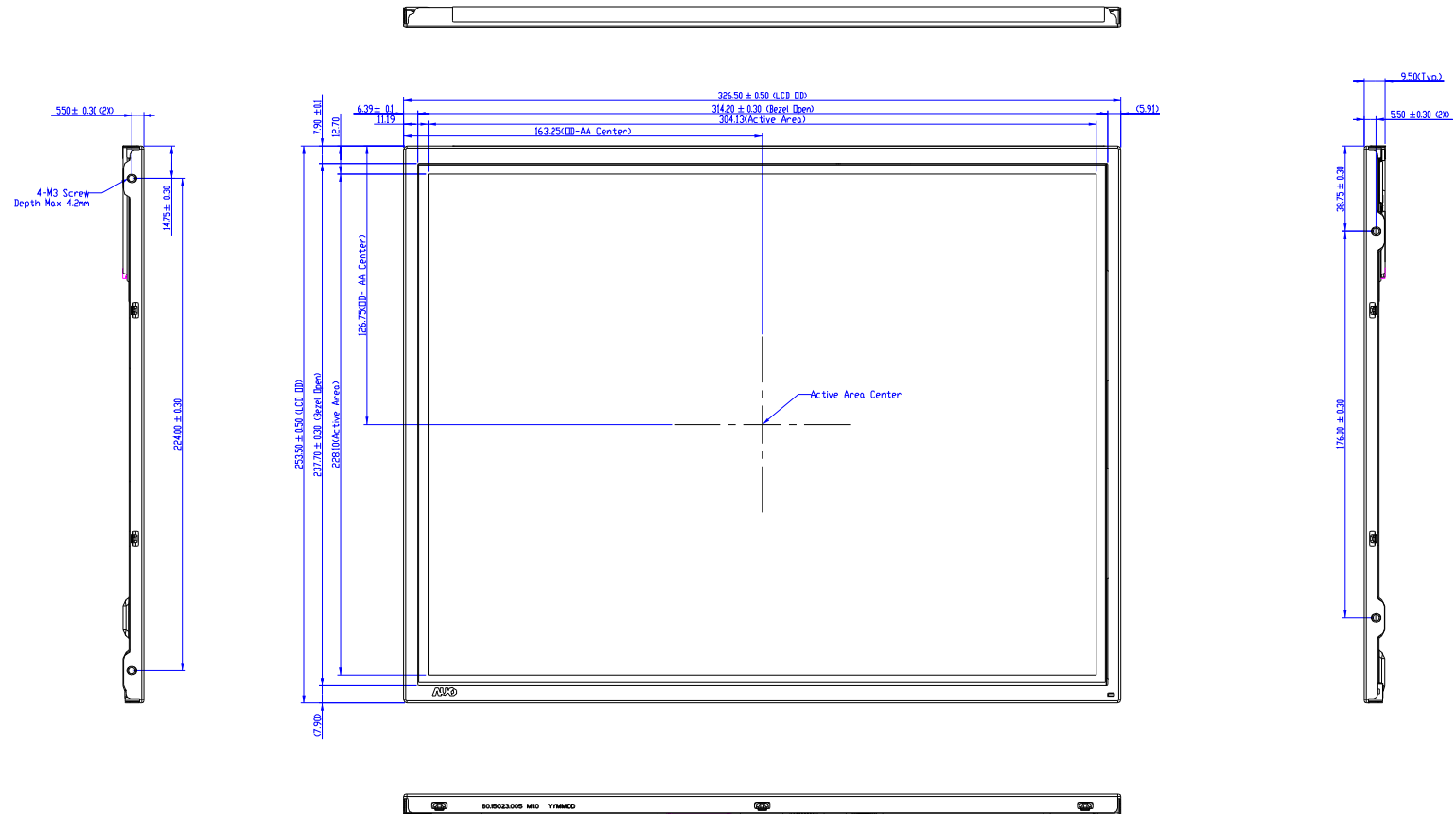| Items	Required Condition	Note
Temperature Humidity Bias	50℃/80%,300 hours	
High Temperature Operation	85℃,300 hours	
Low Temperature Operation	-30℃,300 hours	
Hot Storage	85℃,300 hours	
Cold Storage	-30℃,300 hours	
Thermal Shock Test	-20℃/30 min ,60℃/30 min ,100cycles	
Shock Test (Non-Operating)	50G,20ms,Half-sine wave,(±X, ±Y, ±Z)	
Vibration Test (Non-Operating)	1.5G, (10~200Hz, P-P) 30 mins/axis (X, Y, Z)	
On/off test	On/10 sec, Off/10 sec, 30,000 cycles	
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
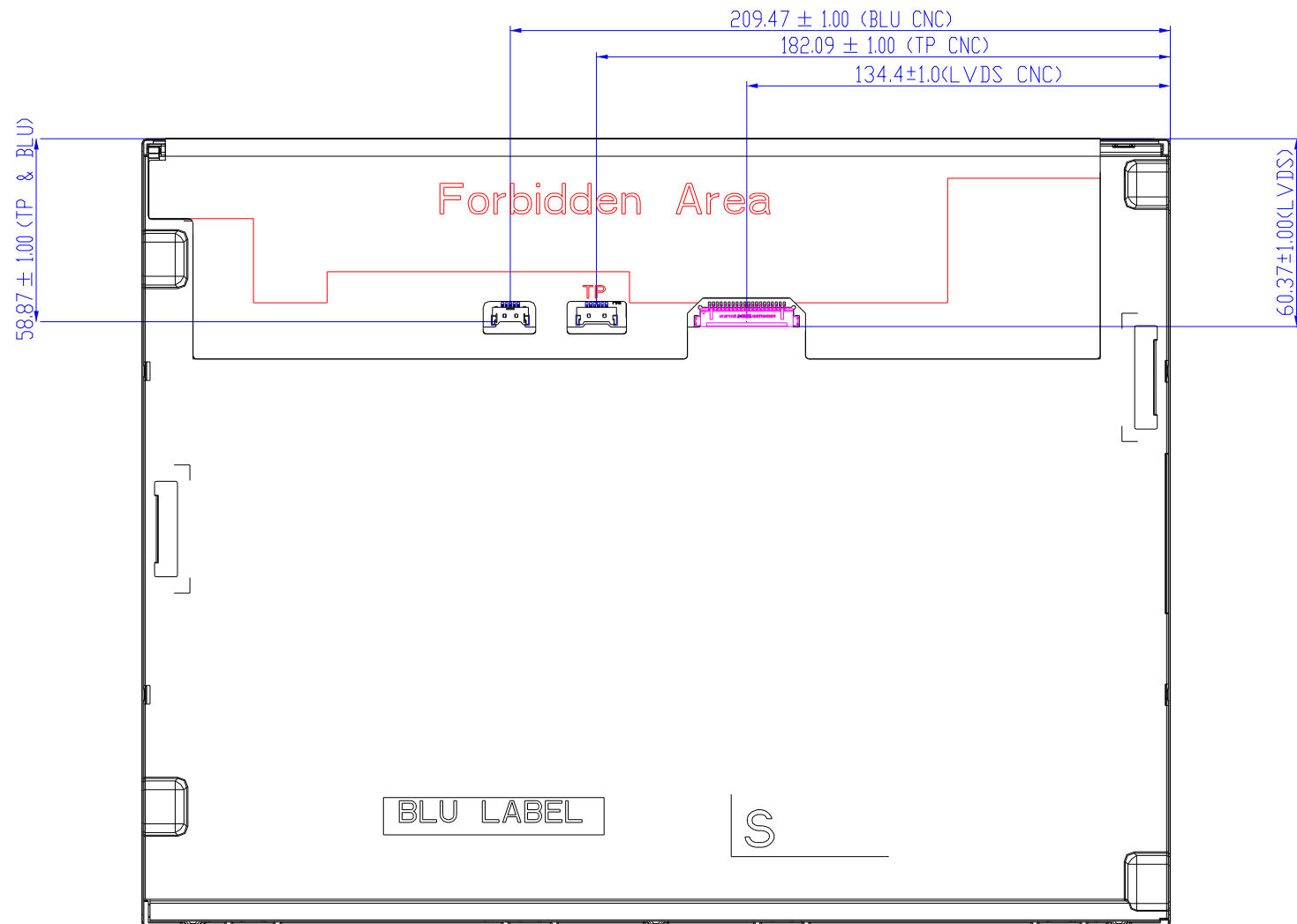
.　Self-recoverable. No hardware failures.

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.

● To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.

● No function failure occurs. Mura shall be ignored after high temperature reliability test

9. Mechanical Characteristics

9.1 LCM Outline Dimension (Front View and back view)

Note:
1. USER HOLE MAXIMUN INSERTION DEPTH IS 4.2mm.
2. TORQUE OF M3 USER HOLE SHOULD BE WITHIN 4 kgf-cm AND RE-SCREW 10 TIMES.
3. UNSPECIFIED TOLORANCE TO BE 0.5mm .

209.47 ± 1.00 (BLU CNC)
182.09 ± 1.00 (TP CNC)
134.4±1.0(LVDS CNC)

58.87 ± 1.00 (TP & BLU)

60.37±1.00(LVDS)

Forbidden Area

TP

BLU LABEL

S

10. Label and Packaging

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

```
*xxxxxxxxxxxx－xxxxx*
```

Manufactured XX/XX
Model No: **G150XTK01.0**
AU Optronics
MADE IN XXXXX(XXX)

cᴿUus
E204356

(Pb)

RoHS

(15)

10.2 Carton Package
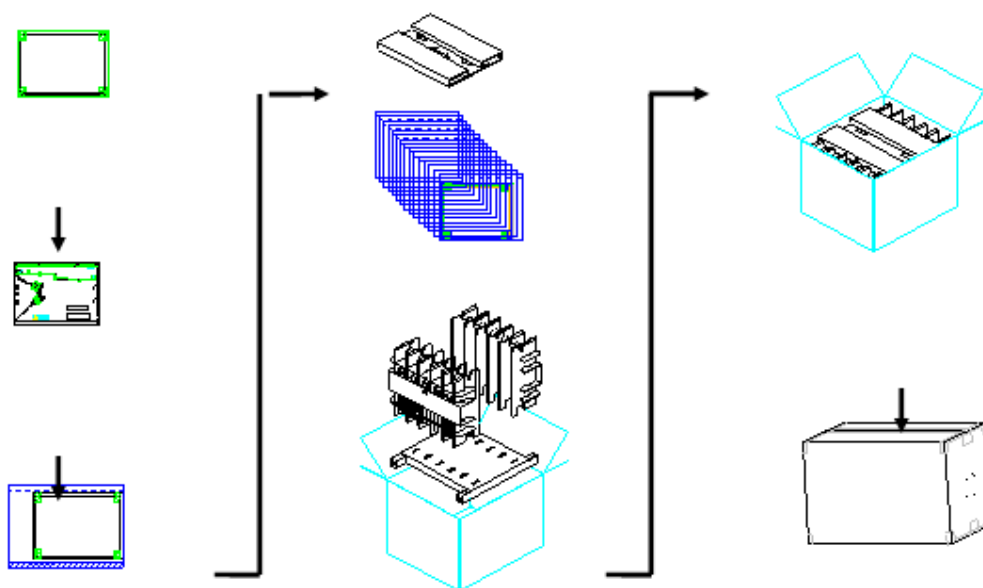
Max capacity：15 TFT-LCD module per carton

Max weight: 20.0 kg per carton

Outside dimension of carton: 434(L) mm x 380(W) mm x 353(H) mm

Pallet size：1140mm*890mm*132mm

11. Safety

11.1 Sharp Edge Requirements

There will be no sharp edges or comers 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 display 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 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 display assembly, provisions will be made to keep them from being inserted backwards.

11.4 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