() **Preliminary Specifications**
(V) **Final Specifications**

Module	15 Inch Color TFT-LCD
Model Name	G150XTN03.5

Customer	Date
Checked & Approved by	

Approved by	Date
Sean Lin	2017/4/14
Prepared by	
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General Display Business Unit /
AU Optronics corporation

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Record of Revision

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0.1 2016/11/4	5	2.1 Display Characteristics Weight 1100g	2.1 Display Characteristics Weight 1022g
0.1 2016/11/4	11	Power specification VDD Current : 0.9A(Typ.), 1.5A(Max.) VDD Power : 3W(Typ.), 5W(Max.)	Power specification VDD Current : 450mA(Typ.), 750mA(Max.) 　=> Remark : 64 Gray Bar Pattern 　　(VDD=3.3V, at 60Hz.) VDD Power : 1.5W(Typ.), 2.5W(Max.) 　=> Remark : 64 Gray Bar Pattern 　　(VDD=3.3V, at 60Hz.)
	23		9.1 LCM Outline Dimension update
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	25		10.1 Shipping Label update
0.2 20170111	25	10.2 Carton Package : 19pcs/Caton	10.2 Carton Package : 14pcs/Caton
	26	10.3 Palletizing Module by air_Max: (2 *3) *4 layers，one pallet put 24 boxes，total 456pcs module Module by sea_Max: (2 *3) *4 layers + (2 *3) *1 layers , two pallet put 30 boxes，total570pcs module Module by sea_HQ_Max: (2 *3) *4 layers+(2 *3) *2 layers, two pallet put 36 boxes, total684pcs module	10.3 Palletizing Module by air_Max: (2 *3) *4 layers，one pallet put 24 boxes，total 336pcs module Module by sea_Max: (2 *3) *4 layers + (2 *3) *1 layers , two pallet put 30 boxes，total420pcs module Module by sea_HQ_Max: (2 *3) *4 layers+(2 *3) *2 layers, two pallet put 36 boxes, total504pcs module
1.0 20170116	All	Final spec	
1.1 2017/2/20	17	6.5.1 Timing Characteristics (table below)	6.5.1 Timing Characteristics (table below) Note: The maximum clock frequency = Frame Rate*(1024+B)*768+A) < 81MHz
	19	7.1 TFT LCD Module: LVDS Connector PIN5:Rin0-;　　PIN6:Rin0+;　　PIN8:Rin1-; PIN9:Rin1+;　PIN11:Rin2-;　　PIN12:Rin2+; PIN17:Rin3-; PIN18:Rin3+	7.1 TFT LCD Module: LVDS Connector PIN5:Rin1-; PIN6:Rin1+; PIN8:Rin2-; PIN9:Rin2+; PIN11:Rin3-; PIN12:Rin3+; PIN17:Rin4-; PIN18:Rin4+
1.2 20170411	23		Update LCM Outline Dimension(Front View)
	24		Update LCM Outline Dimension(Back View)

Old description table (Page 17, v1.1):

Signal	Parameter		Max.
Clock Timing	Clock frequency		81
Vsync Timing	Vertical Section	Period	968
		Active	768
		Blanking	200
Hsync Timing	Horizontal Section	Period	2024
		Active	1024
		Blanking	1000

New Description table (Page 17, v1.1):

Signal	Parameter		Max.
Clock Timing	Clock frequency		81
Vsync Timing	Vertical Section	Period	768+A
		Active	768
		Blanking	A
Hsync Timing	Horizontal Section	Period	1024+A
		Active	1024
		Blanking	B

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

G150XTN03.5 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display, a driver circuit, and a backlight system. The screen format is intended to support XGA (1024(H) x 768(V)) screen and 262K / 16.2M (RGB 6/8-bits) colors. All input signals are LVDS interface compatible.

G150XTN03.5 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		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	[Volt]	3.3 typ.
Typical Power Consumption	[Watt]	7.5 W (Typ.),(all black pattern)
Weight	[Grams]	1022g (max.)
Physical Size	[mm]	326.5(H) x 253.5(V) x 10 (D)
Electrical Interface		1 channel LVDS
Surface Treatment		Anti-glare, Hardness 3H
Support Color		16.2M / 262K colors
Temperature Range 　Operating 　Storage (Non-Operating)	[^{o}C] [^{o}C]	0 to +65 (+65 ^{o}C as panel surface temperature) -20 to +65
RoHS Compliance		RoHS Compliance
Light Bar Unit		LED, Non-Replaceable

2.2 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]		280	350	-	1
Uniformity	%	9 Points	75	80	-	1, 2, 3
Contrast Ratio			400	800	-	4
Cross talk	%		-	--	1.5	5
Response Time	[msec]	Rising	-	5.7		6
	[msec]	Falling	-	2.3		
	[msec]	Raising + Falling	-	8		
Viewing Angle	[degree] [degree]	Horizontal (Right) CR = 10 (Left)	70 70	80 80	- -	7
	[degree] [degree]	Vertical (Upper) CR = 10 (Lower)	60 70	70 80	- -	
Color / Chromaticity Coordinates (CIE 1931)		Red x	0.547	0.597	0.647	
		Red y	0.289	0.339	0.389	
		Green x	0.279	0.329	0.379	
		Green y	0.546	0.596	0.646	
		Blue x	0.104	0.154	0.204	
		Blue y	0.003	0.053	0.103	
		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*

LCD Module

SR_3 or equivalent

Measuring distance

Module Driving Equipment
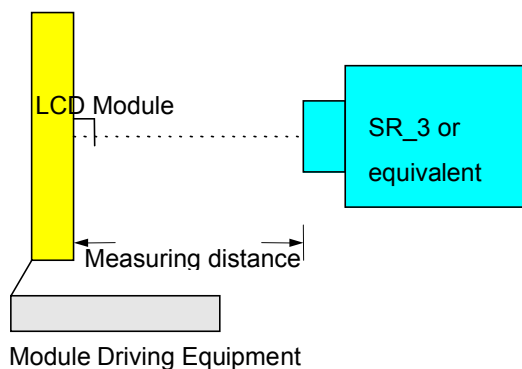
Note 2: Definition of 9 points position (Display active area: 304.128(H) x 228.096(V))

90 %　　　　　　　50 %　　　　　　　10 %

10 %

50 %

90 %
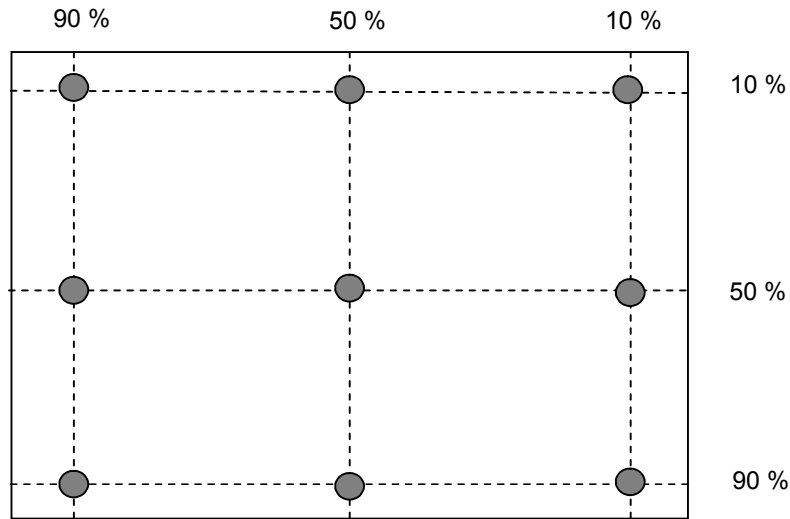
Note 3: The luminance uniformity of 9 points is defined by dividing the minimum luminance values by the maximum test point luminance

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

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 = | YB – YA | / YA × 100 (%)
Where
YA = Luminance of measured location without gray level 0 pattern (cd/m2)
YB = Luminance of measured location with gray level 0 pattern (cd/m2)

1/2　　　　1/6

1/6

A

1/2

B

184 gray level

2/3　1/2　1/3　1/6

A'

1/6

1/3

1/2

B'

2/3
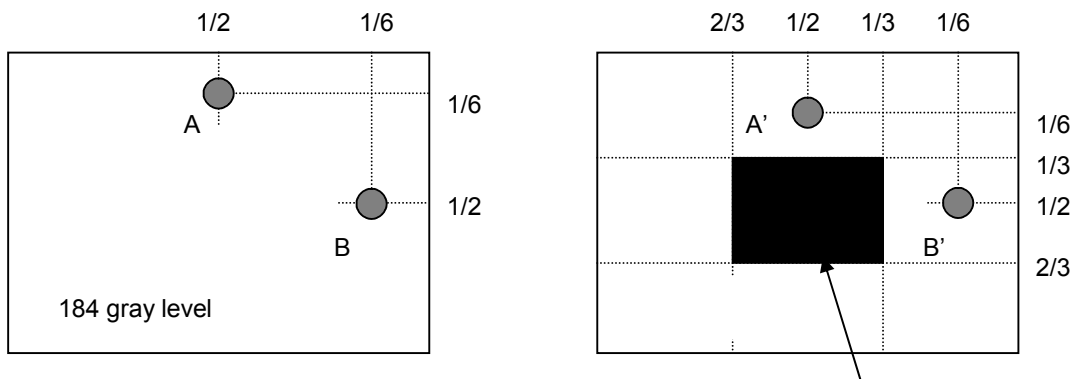
Note 6: Definition of response time:

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.
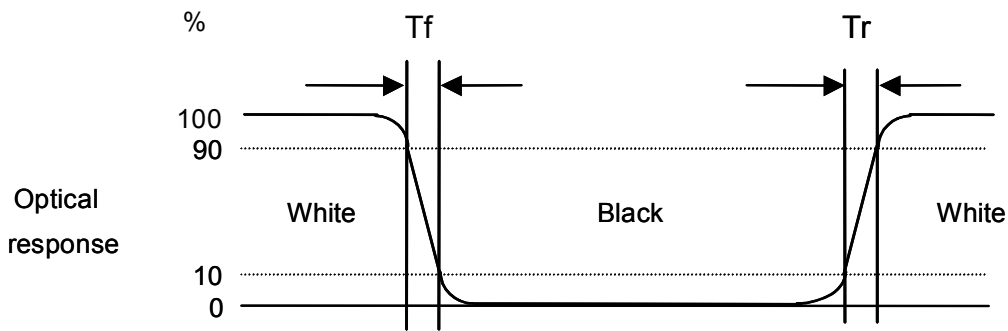
Note 7: Definition of viewing angle

Viewing angle is the measurement of contrast ratio $\geq$ 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.
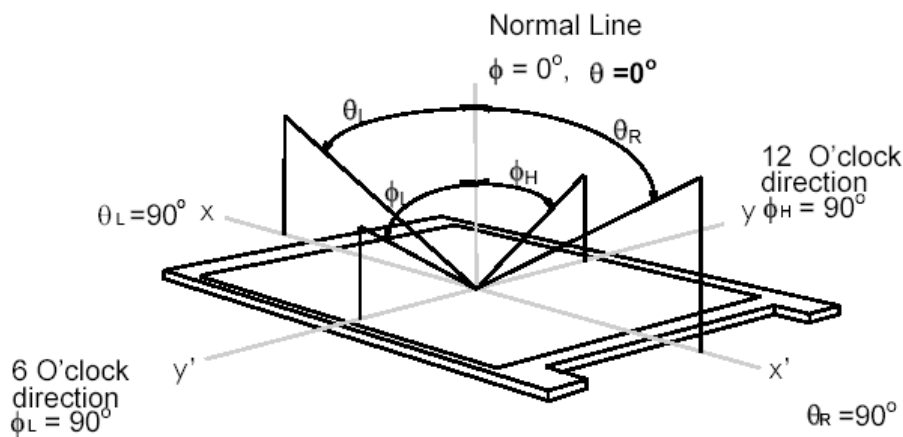
3. Functional Block Diagram

The following diagram shows the functional block of the 15 inch color TFT/LCD module:
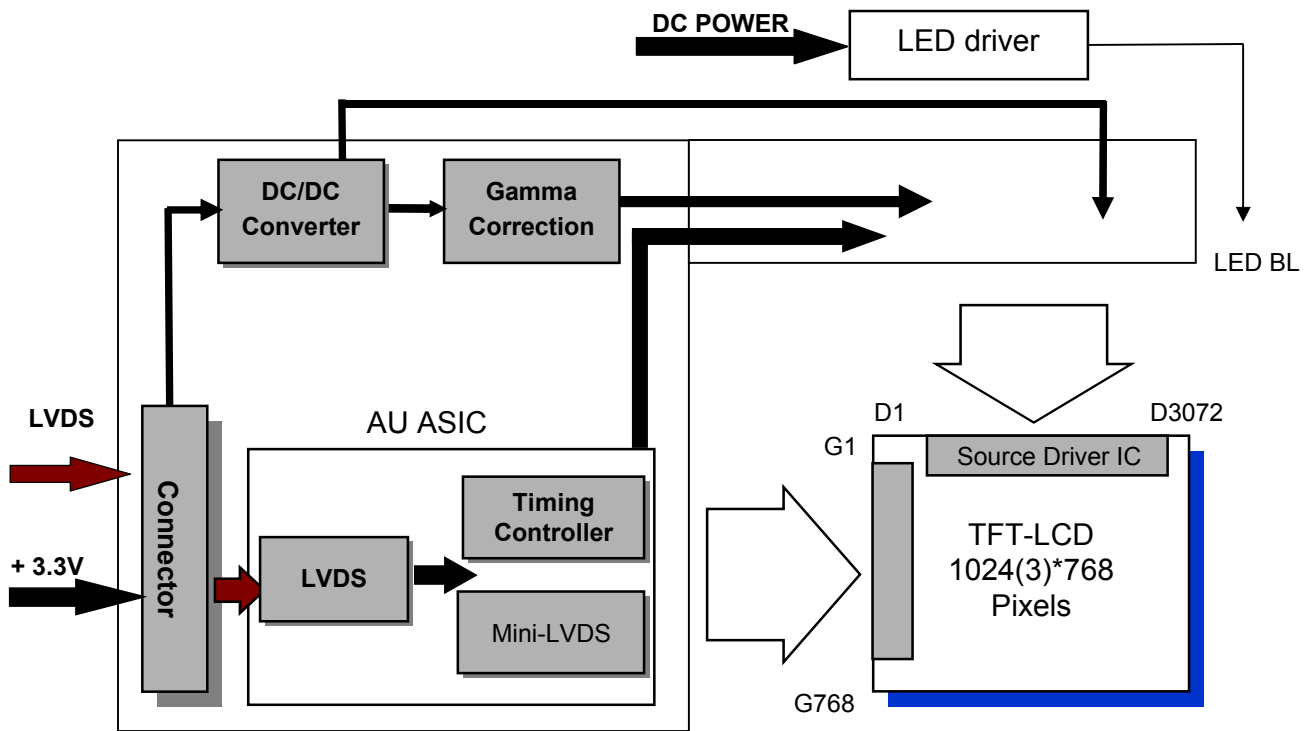
MSB240420HD

Mating Type: P240420

Entery 3808K-F05N-02

H208K-P05N-02B

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	0	+65*	[^{o}C]
Operation Humidity	HOP	8	90	[%RH]
Storage Temperature	TST	-20	+65	[^{o}C]
Storage Humidity	HST	8	90	[%RH]

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

　　　* 65 ^{o}C is panel surface temperature
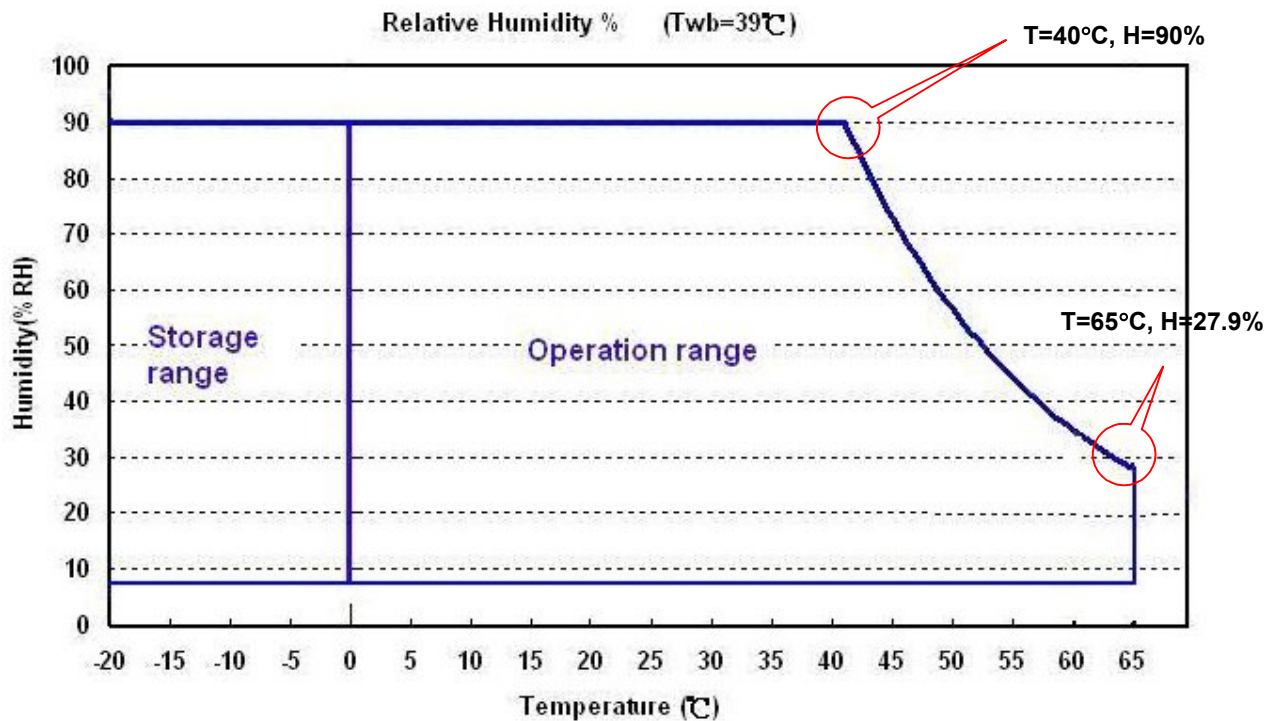
5. Electrical Characteristics

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	-	450	750	[mA]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current			2	[A]	Note 1
PDD	VDD Power	-	1.5	2.5	[Watt]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:
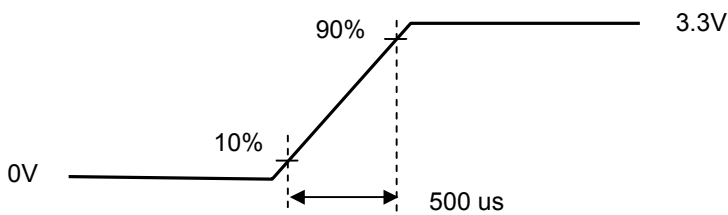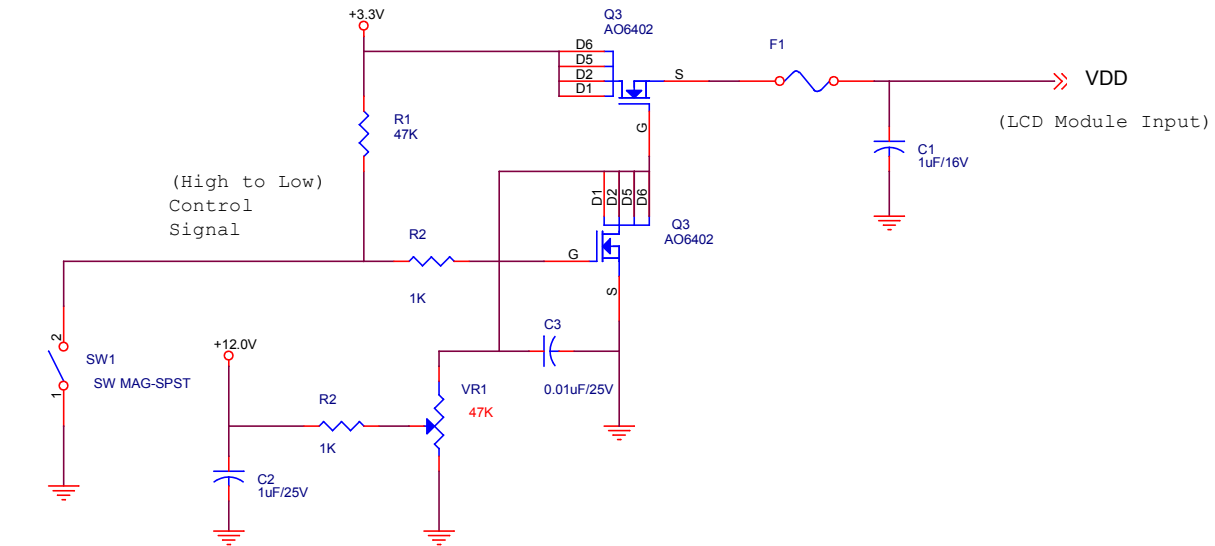
VDD rising time

64 Gray pattern

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	1.1		1.45	[V]	VTH/VTL=±100mV

Note: LVDS Signal Waveform.
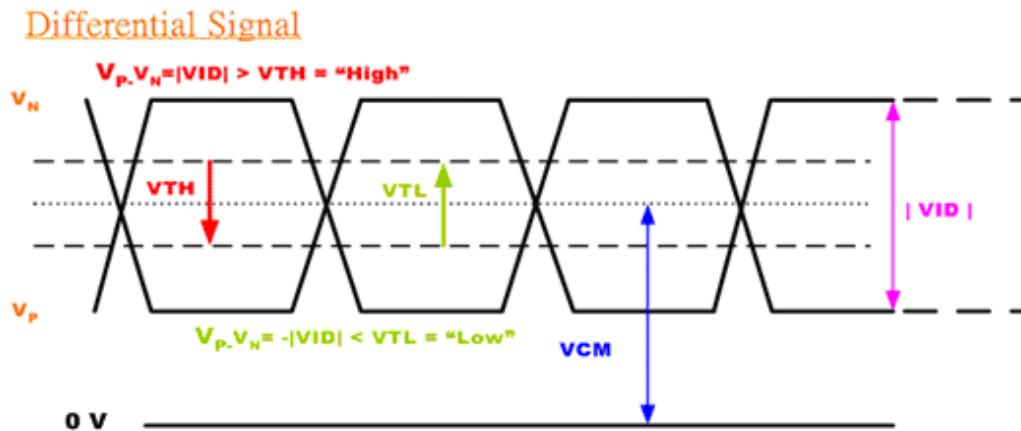
5.2 Backlight Unit

5.2.1 Parameter guideline for LED

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

Temperature).

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
Vcc	Input Voltage	10.8	12	13.2	Volt	
Ivcc	Input Current	-	0.375		A	100% Dimming
P_{LED}	Power Consumption	-	4.5	5	Watt	100% Dimming
Irush	Inrush Current			1	A	
$V_{LED\ on/off}$	On Control Voltage	2.5	3.3	5.5	Volt	
	Off Control Voltage			0.5	Volt	
F_{PWM}	PWM Dimming Frequency	200		10k	Hz	
	High Voltage	2.5	3.3	5.5	Volt	
	Low Voltage			0.5	Volt	
	Dimming Duty Cycle	5	-	100	%	
I_F	LED Forward Current		60		mA	Ta = 25°C
Operating Life		50,000			Hrs	Ta = 25°C

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

Note 2: If G150XTN03.5 module is driven at high ambient temperature & humidity condition. The operating life will be

reduced.

Note 3: Definition of life time: LED brightness becomes 50% of its original value. The minimum life time of LED unit is

defined at the condition of IR_{LED} = 60 mA and 25±2℃ (Room temperature).

6. Signal Characteristic

6.1 Pixel Format Image

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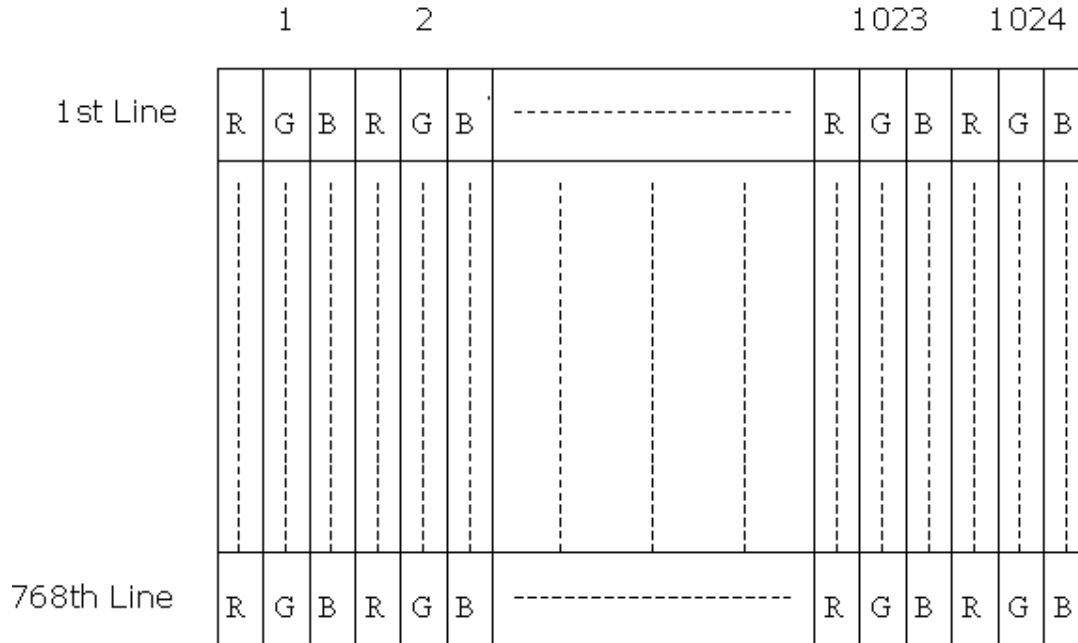
6.2 Scanning Direction

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

AUO

6.3 Signal Description

LVDS is a differential signal technology for LCD interface and high speed data transfer device.

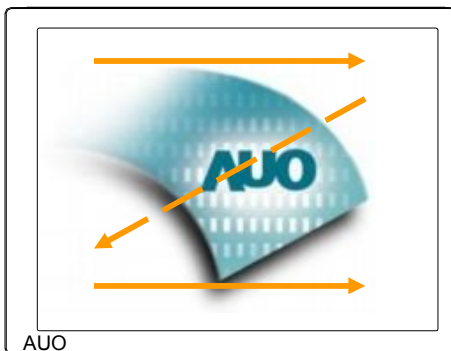| Pin No.	Symbol	Description
MSB240420E(STM)		
Pin No.	**Symbol**	**Description**
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	NC	No Connect
4	NC	No Connect
5	Rin1-	- LVDS differential data input (R0-R5, G0)
6	Rin1+	+ LVDS differential data input (R0-R5, G0)
7	VSS	Ground
8	Rin2-	- LVDS differential data input (G1-G5, B0-B1)
9	Rin2+	+ LVDS differential data input (G1-G5, B0-B1)
10	VSS	Ground
11	Rin3-	- LVDS differential data input (B2-B5, HS, VS, DE)
12	Rin3+	+ LVDS differential data input (B2-B5, HS, VS, DE)
13	VSS	Ground
14	ClkIN-	- LVDS differential clock input
15	ClkIN+	+ LVDS differential clock input
16	GND	Ground
17	Rin4-	- LVDS differential data input (R6-R7, G6-G7,B6-B7)
18	Rin4+	- LVDS differential data input (R6-R7, G6-G7,B6-B7)
19	VSS	Ground
20	SEL6/8	Select 6 or 8 Bits LVDS Input

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

Note 2: For 6 bits mode, please keep the Pin 17& Pin 18 NC or make sure that the voltage of Pin 18 is always higher than the voltage of Pin 17.
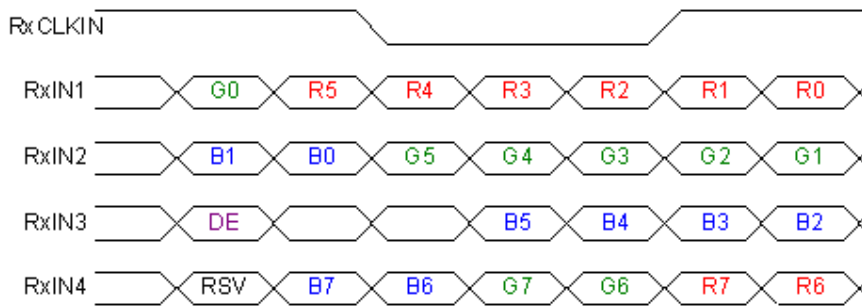
6.4 The Input Data Format

6.4.1 SEL68

SEL68 = "High" for 6 bits LVDS Input
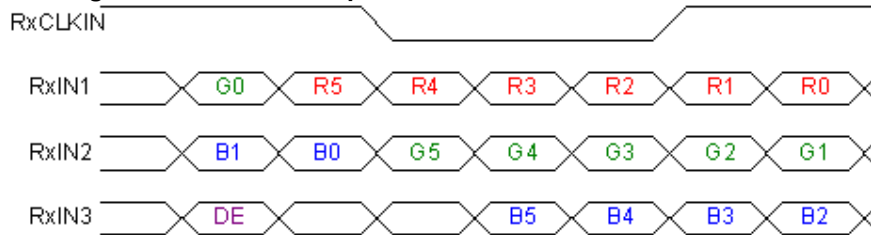
SEL68 = "Low" or "NC" for 8 bits LVDS Input

Note1: Please follow PSWG.
Note2: R/G/B data 7:MSB, R/G/B data 0:LSB

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	
RxCLKIN	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.

6.5 Interface Timing

6.5.1 Timing Characteristics

Signal	Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock Timing	Clock frequency		$1/ T_{Clock}$	50	65	81	MHz
Vsync Timing	Vertical	Period	T_V	783	806	768+A	
	Section	Active	T_{VD}	768	768	768	T_{Line}
		Blanking	T_{VB}	15	38	A	
Hsync Timing	Horizontal	Period	T_H	1224	1344	1024+B	
	Section	Active	T_{HD}	1024	1024	1024	T_{Clock}
		Blanking	T_{HB}	200	320	B	

Note: The maximum clock frequency = Frame Rate*(1024+B)*(768+A) < 81MHz
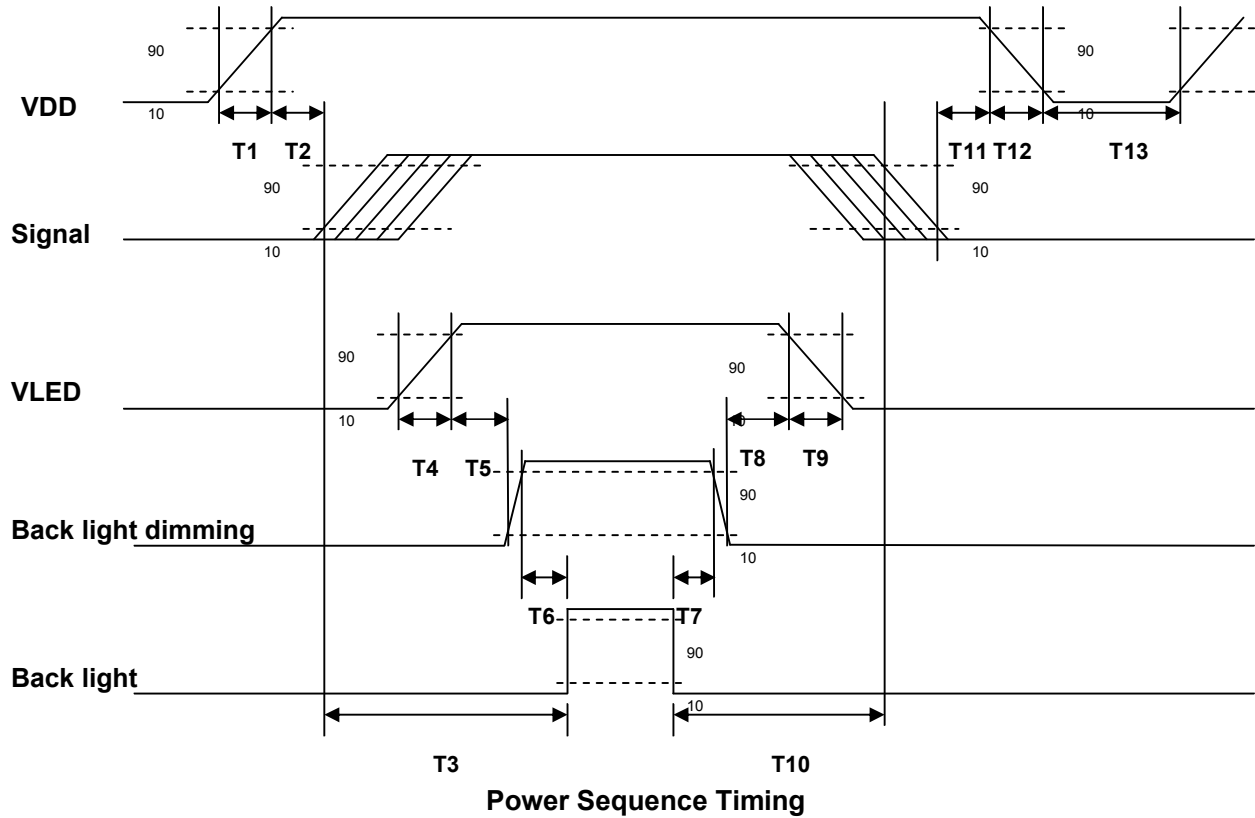Note: Support DE mode only.
Note : Typical value refer to VESA STANDARD

6.5.2 Input Timing Diagram
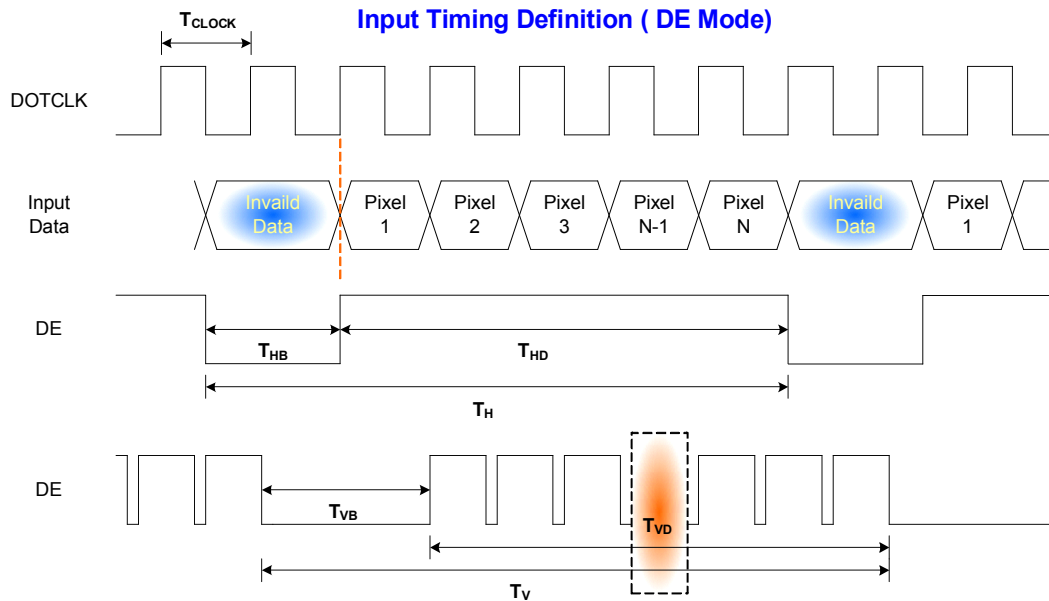
6.6 Power ON/OFF Sequence

VDD power and backlight 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 Sequence Timing

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	200	-	-	[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	0	16	50	[ms]
T12	-	-	10	[ms]
T13	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.

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

Connector Name / Designation	Signal Connector
Manufacturer	STM or compatible
Connector Model Number	MSB240420HD
Adaptable Plug	P240420

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	GND
17	Rin4-	18	Rin4+
19	VSS	20	SEL68

7.1.1 Connector Illustration
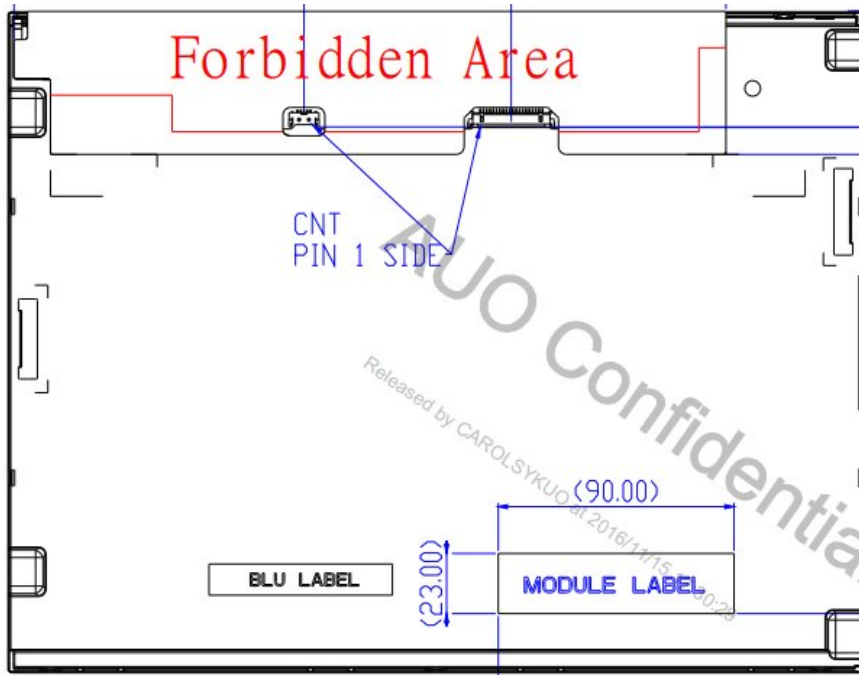
7.2 LED Backlight Unit: LED Driver Connector

Connector Name / Designation	LED Connector
Manufacturer	Entery or compatible
Connector Model Number	3808K-F05N-02 or compatible
Mating Model Number	H208K-P05N-02B or compatible

7.3 LED Driver Connector Pin Assignment

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

8. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	50℃/80%,300 hours	
High Temperature Operation	65℃,300 hours	
Low Temperature Operation	0℃,300 hours	
Hot Storage	65℃,300 hours	
Cold Storage	-20℃,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, (10~200~10Hz, 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.
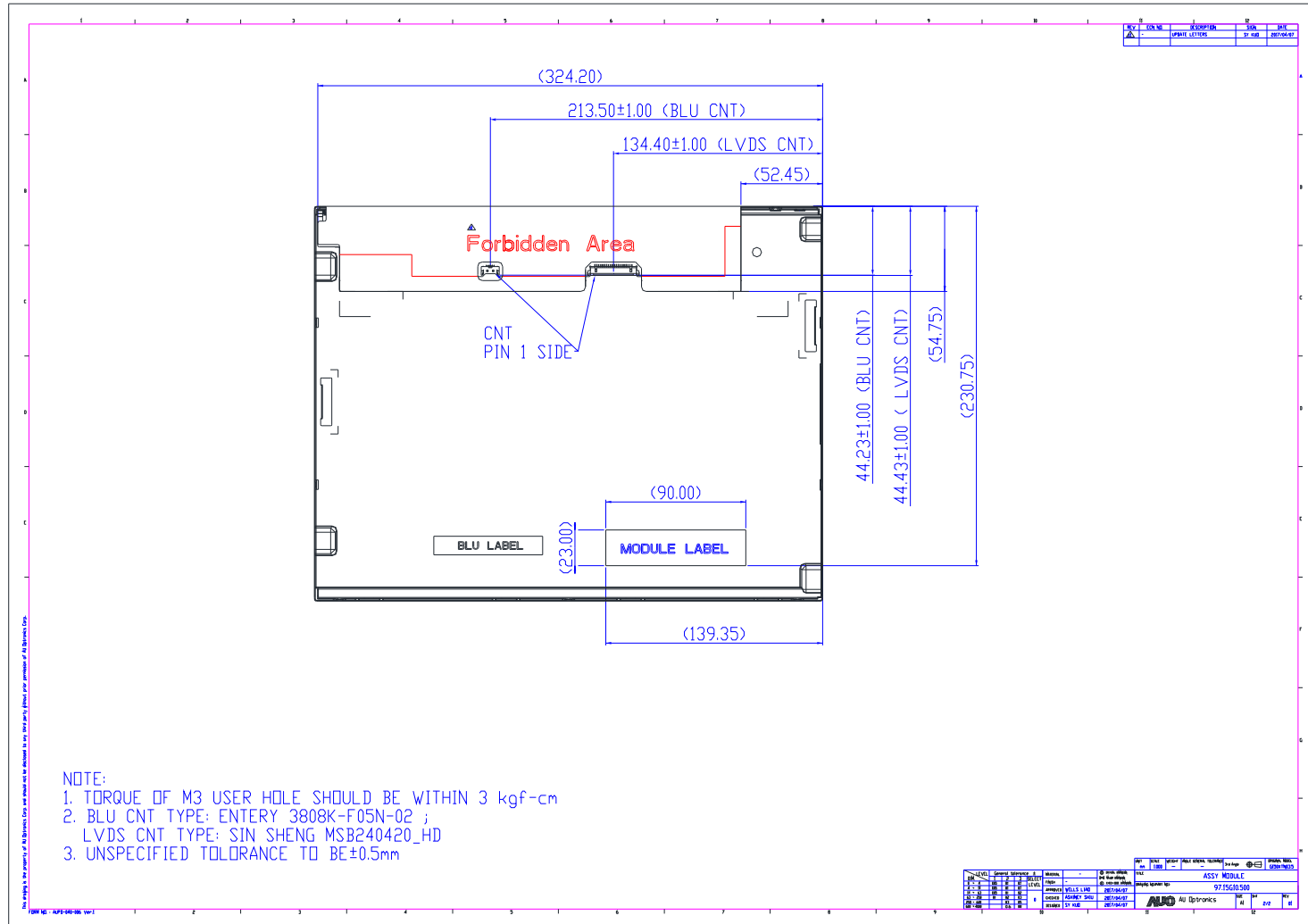
9. Mechanical Characteristics

9.1 LCM Outline Dimension (Front View)
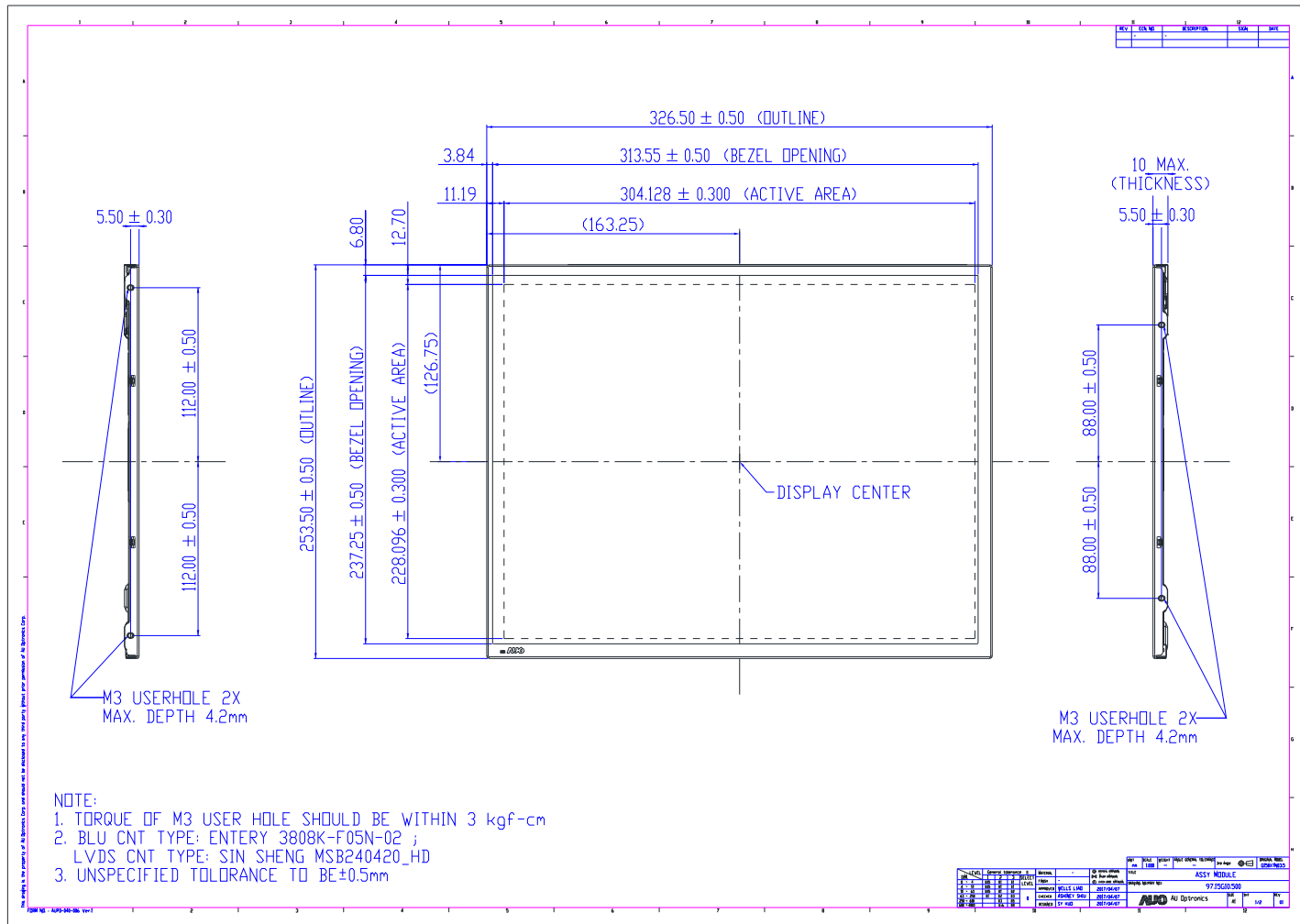
9.2 CM Outline Dimension (Rear View)

10. Label and Packaging

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

xxxxxxxxxxx— xxxxx

Manufactured XX/XX
Model No : G150XTN03.5
AU Optronics
MADE IN XXXXXX (XXX)

E204356

RoHS

15

10.2 Carton Package

Max capacity：14TFT-LCD module per carton
Max weight: 16.5 kg per carton
Outside dimension of carton: 430mm(L)* 370mm(W)*350mm(H)
Pallet size： 1140 mm * 890 mm * 132mm
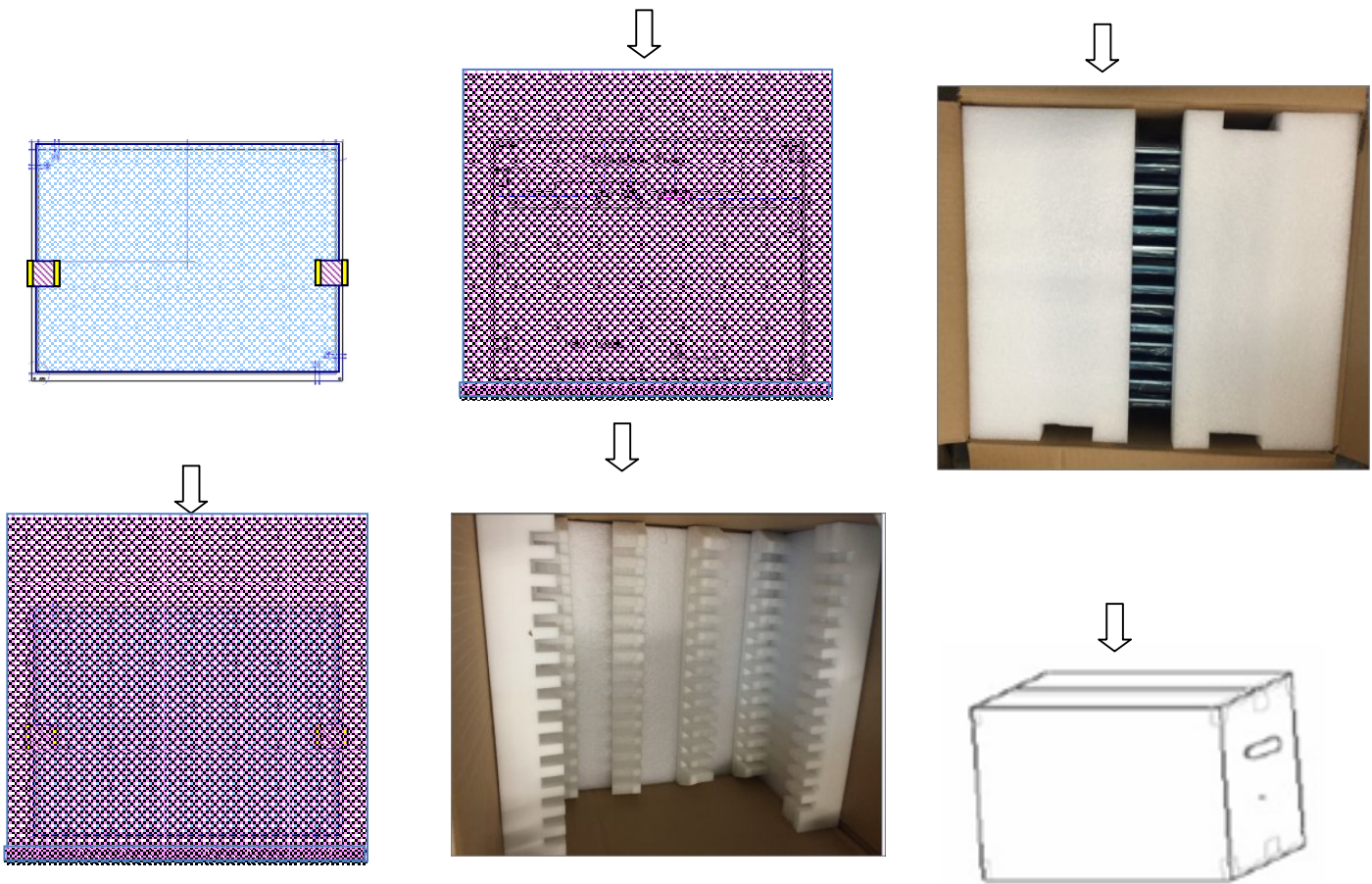
静电袋开口朝上，装箱后反

折至模组背面

14pcs/Carton

10.3 Palletizing

Module by air_Max: (2 *3) *4 layers，one pallet put 24 boxes，total 336pcs module
Module by sea_Max: (2 *3) *4 layers + (2 *3) *1 layers , two pallet put 30 boxes，total420pcs module
Module by sea_HQ_Max: (2 *3) *4 layers+(2 *3) *2 layers, two pallet put 36 boxes, total504pcs module

	SHIPPING BY AIR	SHIPPING BY SEA	SHIPPING BY SEA_HQ
MODULE/CARTON	14	14	14
CARTON/LAYER	6	6	6
LAYER/PALLET	4	4+1	4+2
MODULE/PALLET	336	420	504
CARTON SIZE(MM)	430(L)*370(W)*350(H)	430(L)*370(W)*350(H)	430(L)*370(W)*350(H)
PALLET SIZE(MM)	1140(L)*890(W)*132(H)	1140(L)*890(W)*132(H)	1140(L)*890(W)*132(H)
TOTAL PALLET HEIGHT(MM)	1535	2020	2370
TOTAL PALLET WEIGHT(KG)	336	420	504

ONE PALLET SHIPMENT EXAMPLE
SHIPPING BY AIR USED

TWO PALLETS SHIPMENT EXAMPLE
SHIPPING BY SEA USED

TWO PALLETS SHIPMENT EXAMPLE
SHIPPING BY SEA_HQ USED

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