



AUO Display+

Product Specification

G215HAN01.7

☐ Preliminary Specification

☒ Final Specification

Module	21.5 Inch Color TFT-LCD
Model Name	G215HAN01.7(00)

Company	
Checked & Approved by	Date

Approved by	Date
Elsie Kuo	2023/12/13
Prepared by	
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General Display Business Unit / AUO Display Plus Corporation	

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Record of Revision

Version & Date	Page	Old description	New Description																																																																								
0.1 / 2023.4.14			Preliminary Specification																																																																								
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	25	Max capacity : 7 TFT-LCD module per carton Max weight: TBD kg per carton Outside dimension of carton : TBD mm* TBD mm*TBDmm Pallet size : TBDmm * TBDmm * TBDmm Box stacked By air_max : TBD layers , one pallet put TBD boxes , total TBD pcs module By sea_max : TBD layers + TBD layers ,total TBD pcs module By sea_HQ_max : TBD layers+ TBD layers, total TBD pcs module	Update packing information Max capacity : 12PCS/CTN Max weight: 23.2 kg per carton Outside dimension of carton : L565*W345*H375mm Pallet size : L1150*W1070*H132mm 6 cartons/layer, 3 layers/pallet (12pcs *6) * 3 layers; Max 18 boxed/pallet. (216 pcs / Pallet) Note: Automatic storage height limit <=1580mm																																																																								



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1.0 Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention 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 other soft cloth.
- 5) Since the panel is made of glass, it may break or crack 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 or modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 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 LED lightbar 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) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentarily. While designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
- 12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950-1 or UL60950-1), or be applied exemption.

2.0 General Description

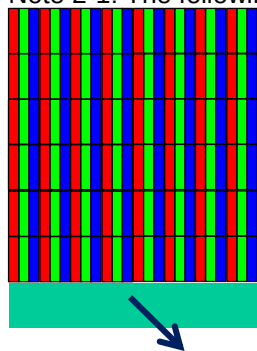
This specification applies to the 21.5 inch-wide Color AHVA (IPS-like) TFT-LCD Module G215HAN01.7. The display supports the FHD [1920(H) x 1080(V)] screen format and 16.7M colors(RGB 6-bits+Hi-FRC). The input interface is Dual channel LVDS and this module doesn't contain an driver board for backlight.

2.1 Display Characteristics

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

ITEMS	Unit	SPECIFICATIONS
Screen Diagonal	[mm]	546.865 (21.5")
Active Area	[mm]	476.064 (H) x 267.786 (V)
Pixels H x V		1920(x3) x 1080
Pixel Pitch	[um]	247.95 (per one triad) ×247.95
Pixel Arrangement		R.G.B. Vertical Stripe. R.G.B. Vertical Stripe. Source board at bottom Note 2-1
Display Mode		AHVA Mode, Normally Black
White Luminance (Center)	[cd/m ²]	350 cd/m ² (Typ.)
Contrast Ratio		1000 (Typ.)
Optical Response Time	[msec]	22 (Typ.)
Nominal Input Voltage VDD	[Volt]	5 V (Typ)
Power Consumption (VDD line + LED line)	[Watt]	11.83 watt LCD module : PDD (Typ.)= 1.8W @ White pattern,Fv=60Hz Backlight unit: PBLU (typ) = 10.03 W(@Is=55mA)
Weight	[Grams]	1760 (Typ)
Physical Size	[mm]	484.46(H) × 284.49(V) × 11.1(D) Typ.
Electrical Interface		Dual LVDS
Support Color		16.7M colors (RGB 6-bits+Hi-FRC)
Surface Treatment		Anti-Glare, 3H
RoHS Compliance		RoHS Compliance
Temperature Range Operating Storage (Shipping)	[°C] [°C]	0 to +50 -20 to +60
TCO Compliance	-	Meet TCO 8.0 Compliance

Note 2-1: The following shows the figure of pixel arrangement



Source Board

2.2 Optical Characteristics

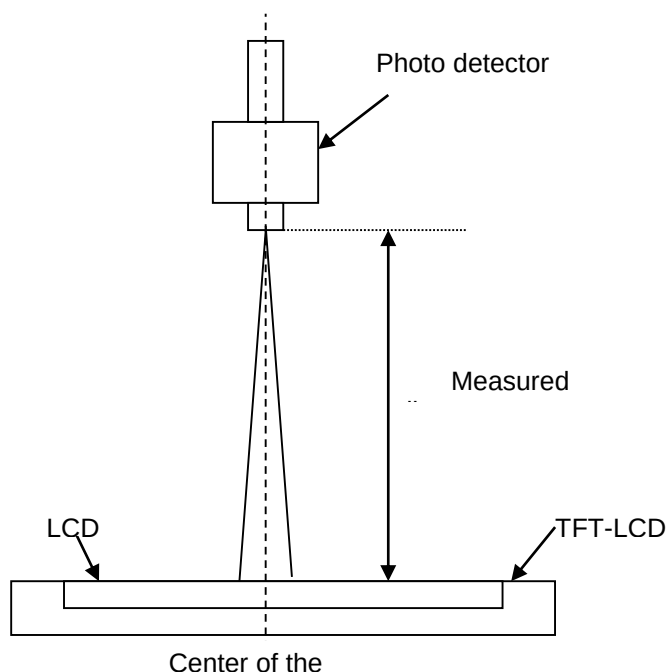
The optical characteristics are measured under stable conditions at 25 °C:

Item	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing Angle	[degree]	Horizontal (Right) CR >10 (Left)		89 89	- -	2
		Vertical (Up) CR > 10 (Down)		89 89	- -	
Contrast ratio		Normal Direction	600	1000	-	3
Response Time	[msec]	Tr+Tf		22	-	4
Color / Chromaticity Coordinates (CIE)		Red x	0.626	0.656	0.686	5
		Red y	0.298	0.328	0.358	
		Green x	0.263	0.293	0.323	
		Green y	0.584	0.614	0.644	
		Blue x	0.117	0.147	0.177	
		Blue y	0.037	0.067	0.097	
Color Coordinates (CIE) White		White x	0.283	0.313	0.343	
		White y	0.299	0.329	0.359	
Central Luminance	[cd/m ²]		280	350		6
Luminance Uniformity	[%]		75	80		7
Color Gamut	[%]	sRGB	95%	99%		

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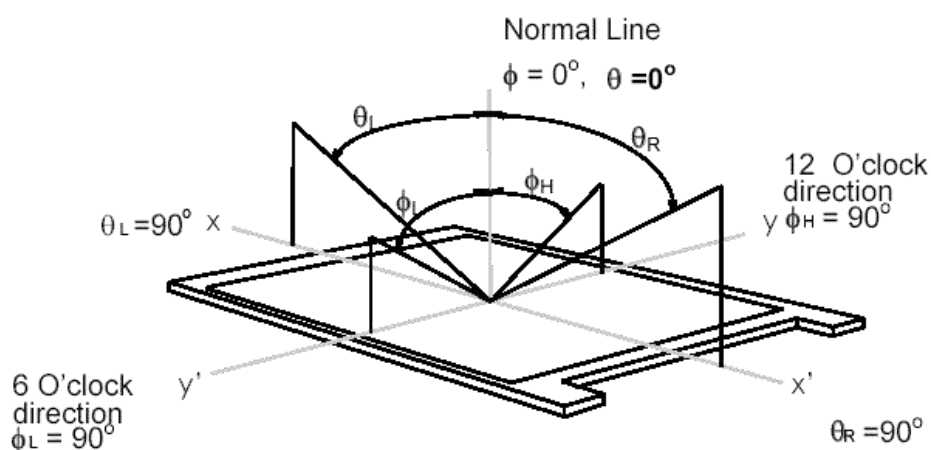
Note 1: Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring (at surface 35°C). In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.



Note 2: Definition of viewing angle measured by ELDIM (EZContrast 88)

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 follows; 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 about its center to develop the desired measurement viewing angle.

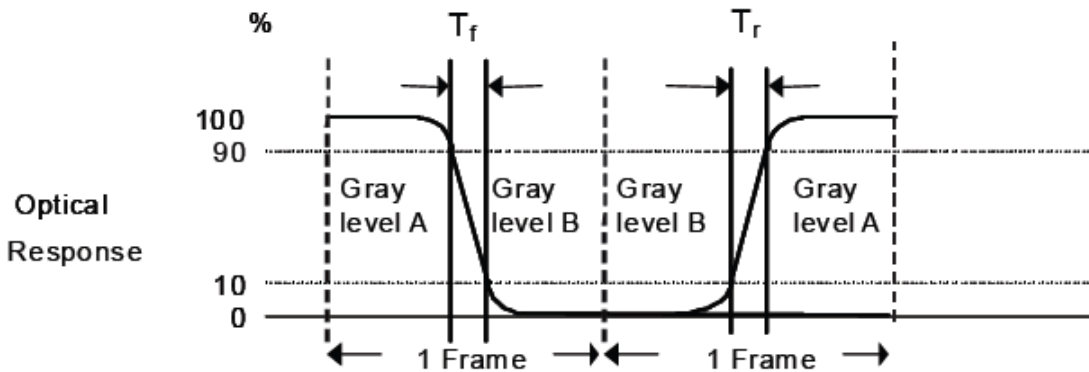


Note 3: Contrast ratio is measured by TOPCON SR-3

Note 4: Definition of Response time measured by Westar TRD-100A

The output signals of photo detector are measured when the input signals are changed from "Gray level A" to "Gray level

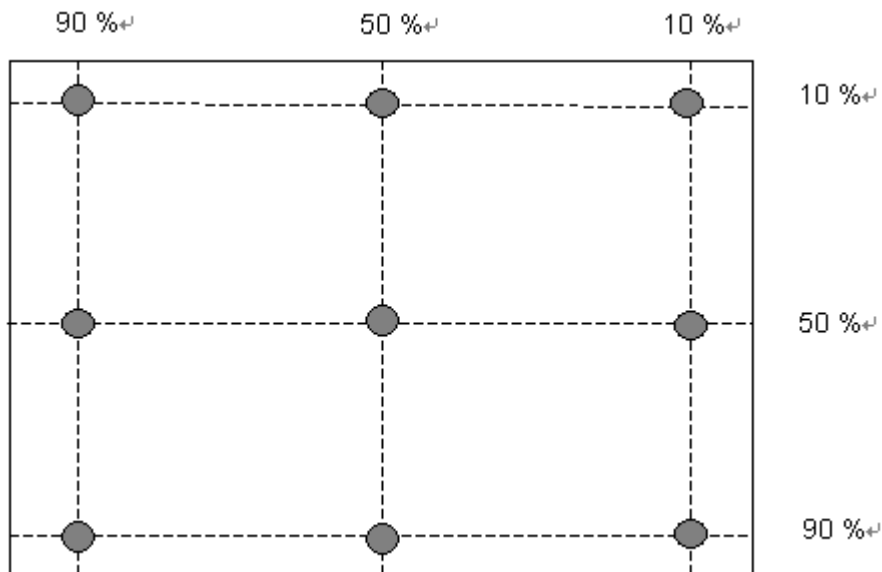
B" (falling time, TF), and from "Gray level B" to "Gray level A" (rising time, TR), respectively. The response time is interval between the 10% and 90% of optical response.



Note 5: Color chromaticity and coordinates (CIE) is measured by TOPCON SR-3

Note 6: Central luminance is measured by TOPCON SR-3

Note 7: Luminance uniformity of these 9 points is defined as below and measured by TOPCON SR-3



$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 points (1 - 9)}}{\text{Maximum Luminance in 9 Points (1 - 9)}}$$

3.0 Functional Block Diagram

The following diagram shows the functional block of the 21.5 inch Color TFT-LCD Module:



I/F PCB Interface:

Connector: FI-XB30SSRLA-HF16-R3500(JAE 30pin)

Mating Type:

FI-X30HL or FI-X30C2L-NPB

4.0 Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

4.1 TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VDD	-0.3	+5.5	[Volt]	Note 1,2

4.2 Absolute Ratings of Environment

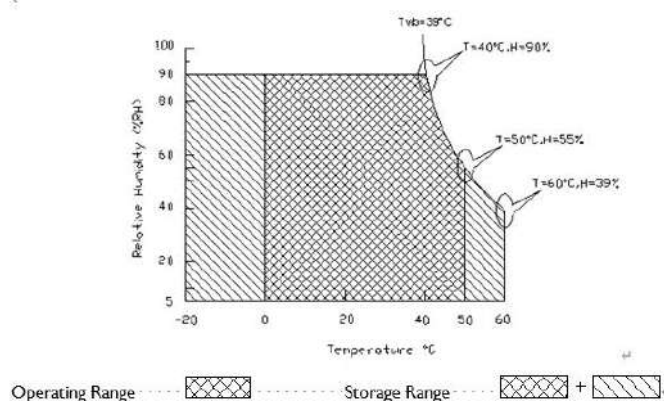
Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	0	50	[°C]	Note 3 & 4
Operation Humidity	HOP	5	90	[%RH]	
Storage Temperature	TST	-20	60	[°C]	
Storage Humidity	HST	5	90	[%RH]	

Note 1: With in Ta (25 °C)

Note 2: Permanent damage to the device may occur if exceeding maximum values

Note 3: For quality performance, please refer to AUO IIS(Incoming Inspection Standard).

Note 4: Operation Temperature +50°C is defined as panel surface temperature.



5.0 Electrical characteristics

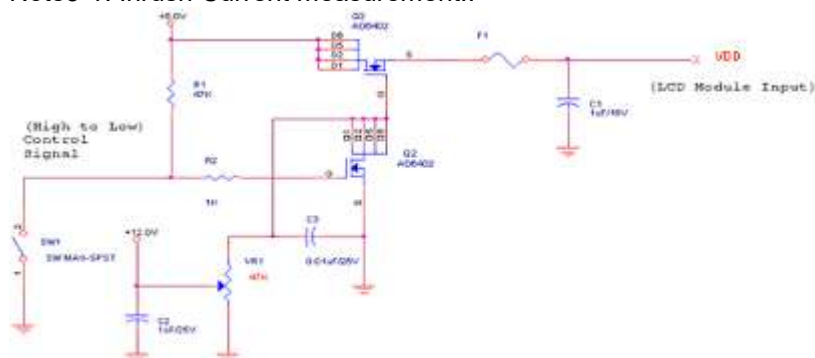
5.1 TFT LCD Module

5.1.1 Power Specification

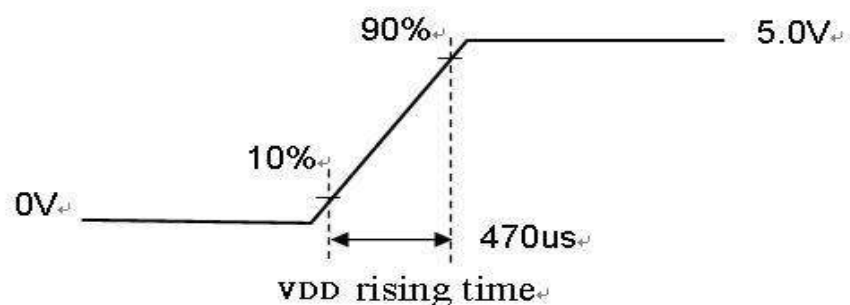
Input power specifications are as follows:

Symbol	Description	Min	Typ	Max	Unit	Remark
VDD	Power supply Input voltage	4.5	5.0	5.5	[Volt]	
IDD	Power supply Input Current (RMS)	-	0.36	0.95	[A]	VDD= 5.0V, White Pattern, Fv=60Hz
			0.4	1.13	[A]	VDD= 5.0V, White Pattern, Fv=75Hz
PDD	VDD Power Consumption	-	1.80	4.75	[Watt]	VDD= 5.0V, White Pattern, Fv=60Hz
			2.00	5.65	[Watt]	VDD= 5.0V, White Pattern, Fv=75Hz
IRush	Inrush Current	-	-	3.0	[A]	Note 5-1
VDDrp	Allowable VDD Ripple Voltage	-	-	500	[mV]	VDD= 5.0V, White Pattern, Fv=75Hz

Note5-1: Inrush Current measurement::



The duration of rising time of power input is 470us.



5.1.2 Signal Electrical Characteristics

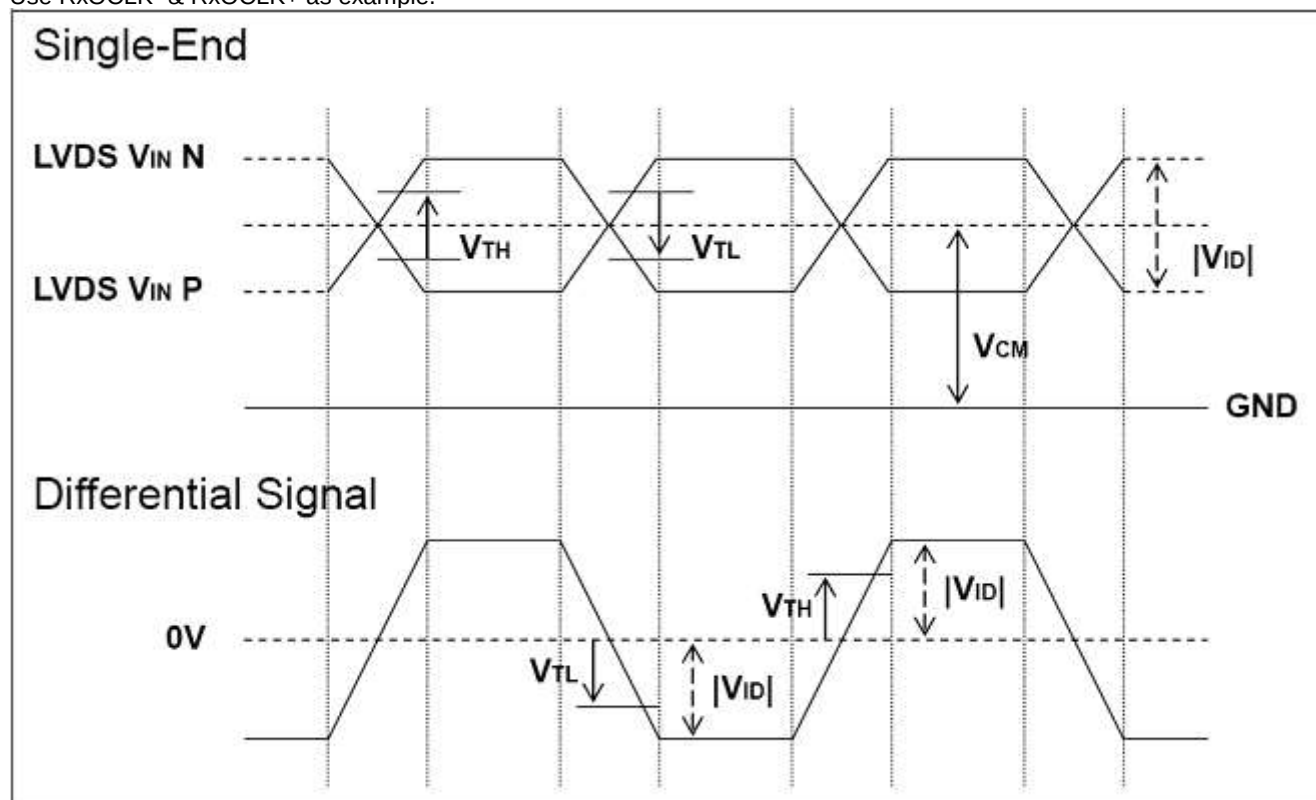
Input signals shall be low or Hi-Z state when VDD is off. Please refer to specifications of SN75LVDS82DGG (Texas Instruments) in detail.

Characteristics of each signal are as follows:

Symbol	Parameter	Min	Typ	Max	Units	Condition
V_{TH}	Differential Input High Threshold	-		100	[mV]	$V_{ICM} = 1.2V$ Note 1
V_{TL}	Differential Input Low Threshold	-100		-	[mV]	$V_{ICM} = 1.2V$ Note 1
$ V_{ID} $	Input Differential Voltage	100	400	600	[mV]	Note 1
V_{ICM}	Differential Input Common Mode Voltage	1.125	-	1.375	[V]	$V_{TH}-V_{TL} = 200mV$ (max) Note 1

Note 1: LVDS Signal Waveform

Use RxOCLK- & RxOCLK+ as example.



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5.2 Backlight Unit

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

I_F	LED Forward Current		55		mA	$T_a = 25^\circ\text{C}$
V_F	LED Forward Voltage	-	2.85	3.3	Volt	$I_F = 55\text{mA}, T_a = 25^\circ\text{C}$
P_{LED}	LED Power Consumption	-	10.03	11.62	Watt	$I_F = 55\text{mA}, T_a = 25^\circ\text{C}$
LED Life Time		30,000			Hrs	$I_F = 55\text{mA}, T_a = 25^\circ\text{C}$

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

Note 3: I_F , V_F , P_{LED} are defined for single LED.

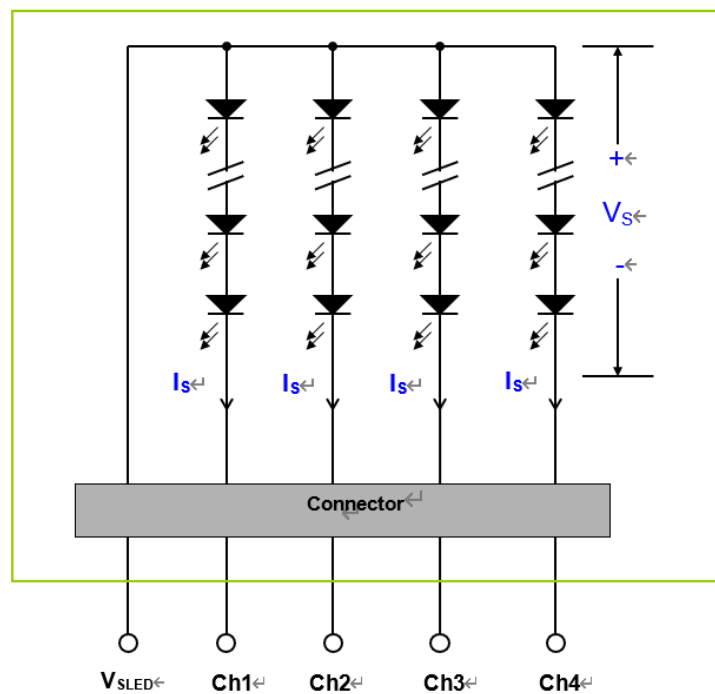
Note 4: If G215HAN01.7 module is driven by high current or at high ambient temperature & humidity condition. The LED life will be reduced.

Note 5: 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 $I_F = 55\text{mA}$, $T_a = 25^\circ\text{C}$ (Room temperature)

Note 6: Each LED light bar consists of 64 pcs LED package (4 strings x 16 pcs / string)

5.2.1 Block Diagram

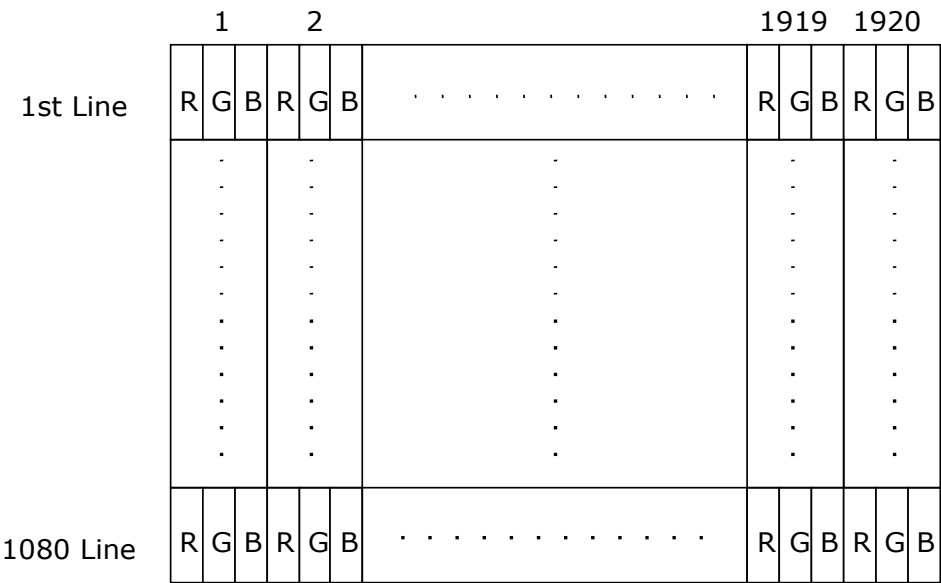
The following shows the block diagram of the 21.5 inch Backlight Unit. And it includes 64 pcs LED in the LED light bar. (4 strings and 16 pcs LED of one string).



6.0 Signal Characteristic

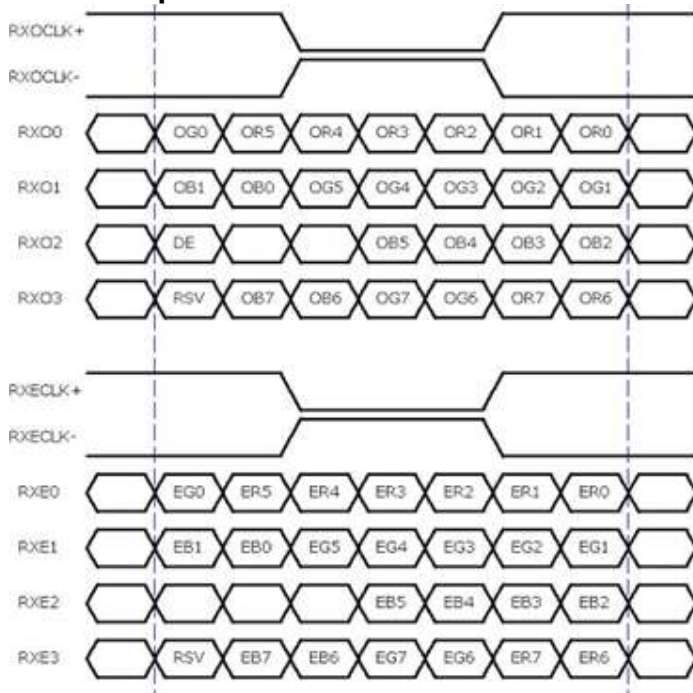
6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



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6.2 The input data format



8 Bit Color Bit Order			
MSB	R7	G7	B7
	R6	G6	B6
	R5	G5	B5
	R4	G4	B4
	R3	G3	B3
	R2	G2	B2
	R1	G1	B1
LSB	R0	G0	B0

Note1: Normally DE mode only. VS and HS on EVEN channel are not used.

Note2: Please follow VESA.

Note3: 8-bits signal input.

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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.

6.4 Timing Characteristics

Signal	Item	Symbol	Min	Typ	Max	Unit
V-section	Period	T_v	1094	1130	1836	Th
	Active	$T_{disp(v)}$	1080	1080	1080	Th
	Blanking	$T_{bp(v)}+T_{fp(v)}+PW_{vs}$	14	50	756	Th
H-section	Period	T_h	1000	1050	1678	Tclk
	Active	$T_{disp(h)}$	960	960	960	Tclk
	Blanking	$T_{bp(h)}+T_{fp(h)}+PW_{hs}$	40	90	718	Tclk
Clock	Period	T_{clk}	11.2	14.0	19.4	ns
	Frequency	Freq.	51.5	71.2	90.0	MHz
Frame Rate	Frame Rate	$1/T_v$	50	60	75	Hz

Note 1: Only DE mode operation.

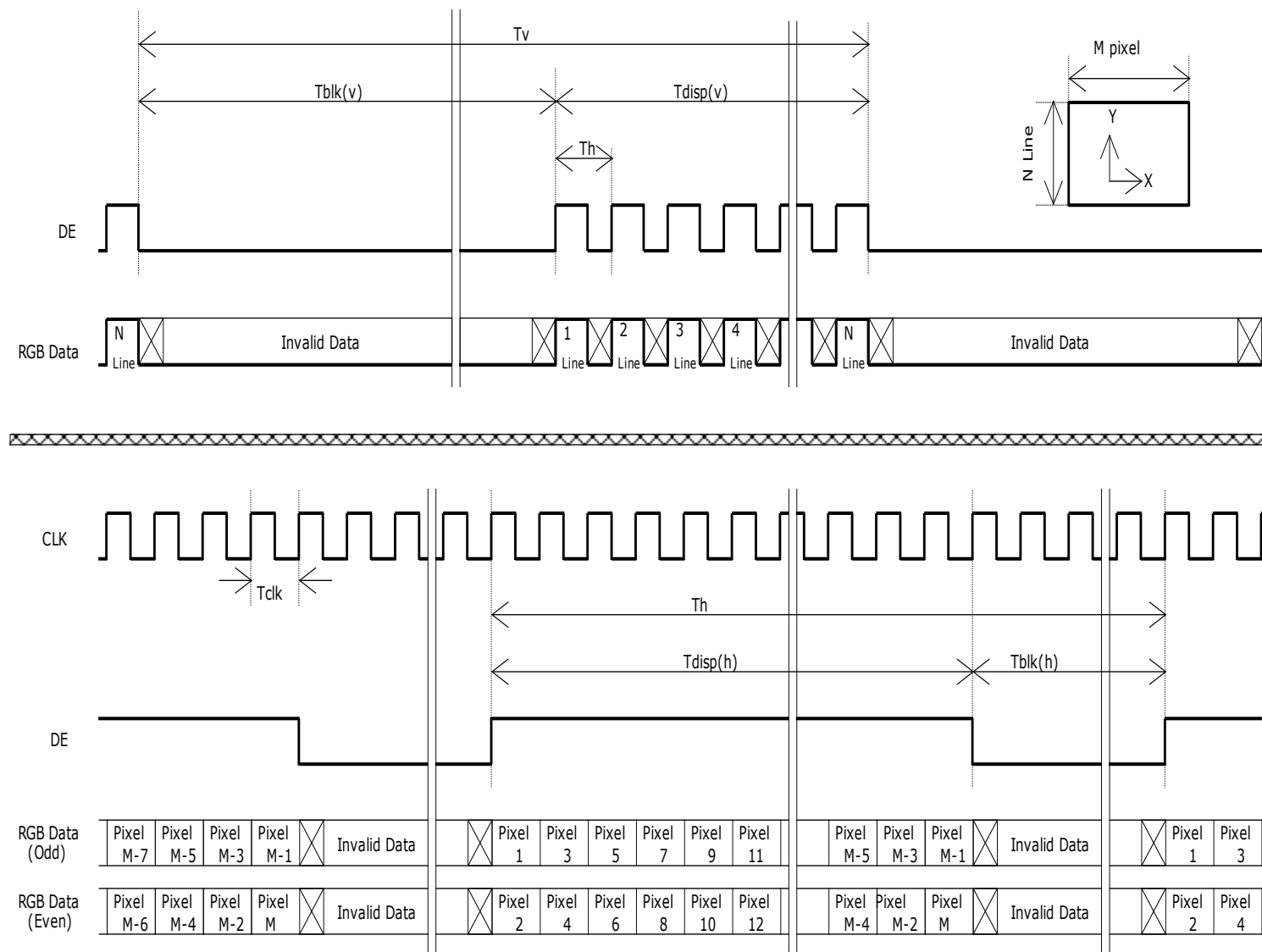
The input of Hsync & Vsync signal does not have an effect upon the LCD normal operation.

Note 2: The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rates.

Note 3: Horizontal period should be even.

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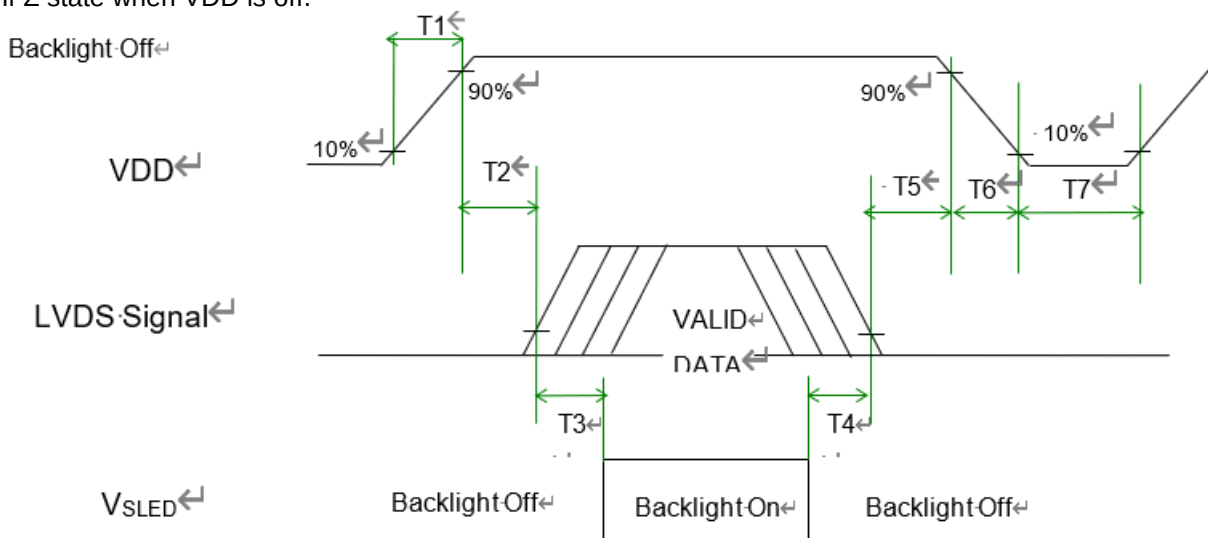
6.5 Timing diagram



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6.6 Power ON/OFF Sequence

VDD power, LVDS signal and backlight on/off sequence are as following. LVDS signals from any system shall be Hi-Z state when VDD is off.



Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	0	-	50	[ms]
T3	500	-	-	[ms]
T4	100	-	-	[ms]
T5	0	-	50	[ms]
T6	0	-	200	[ms]
T7	1000	-	-	[ms]

7.0 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

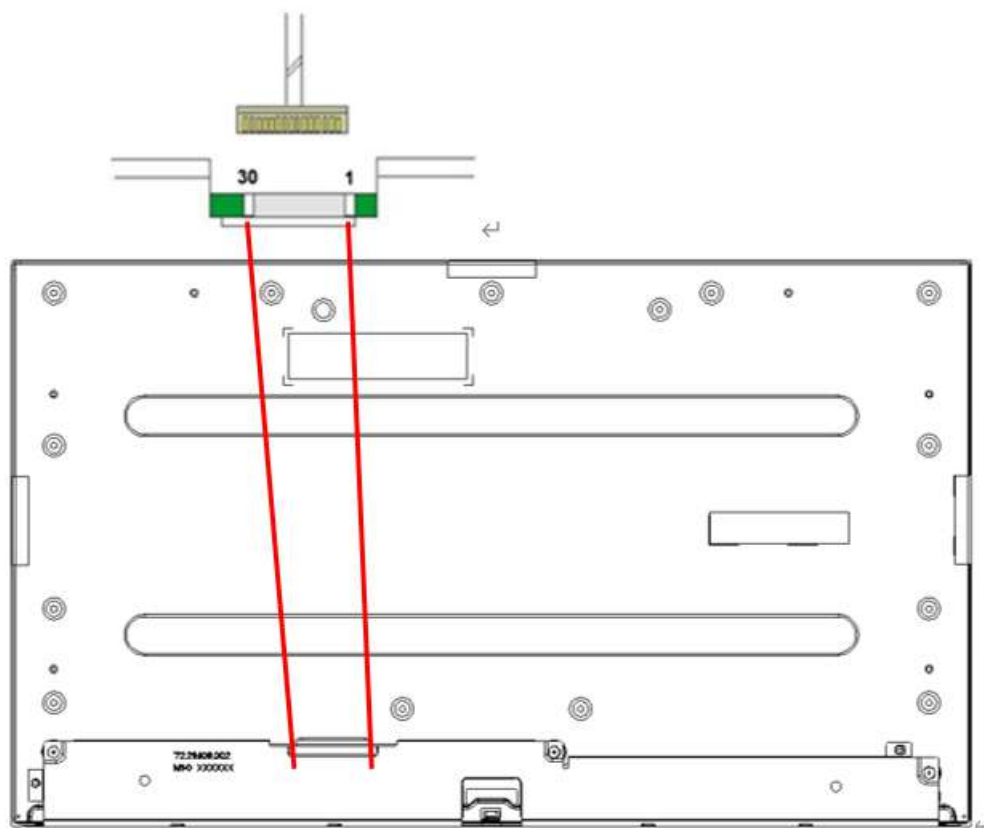
TFT-LCD Connector	Manufacturer	P-TWO	STM
	Part Number	187034-3009	MSBKT2407P30HB
Mating Connector	Manufacturer	JAE or Compatible	
	Part Number	FI-X30HL (Locked Type)	

7.1.1 Pin Assignment

PIN #	Symbol	Description	Remark
1	RxO0-	Negative LVDS differential data input (Odd data)	
2	RxO0+	Positive LVDS differential data input (Odd data)	
3	RxO1-	Negative LVDS differential data input (Odd data)	
4	RxO1+	Positive LVDS differential data input (Odd data)	
5	RxO2-	Negative LVDS differential data input (Odd data)	
6	RxO2+	Positive LVDS differential data input (Odd data)	
7	GND	Ground	
8	RxOCLK-	Negative LVDS differential clock input (Odd clock)	
9	RxOCLK+	Positive LVDS differential clock input (Odd clock)	
10	RxO3-	Negative LVDS differential data input (Odd data)	
11	RxO3+	Positive LVDS differential data input (Odd data)	
12	RxE0-	Negative LVDS differential data input (Even data)	
13	RxE0+	Positive LVDS differential data input (Even data)	
14	GND	Ground	
15	RxE1-	Negative LVDS differential data input (Even data)	
16	RxE1+	Positive LVDS differential data input (Even data)	
17	GND	Ground	
18	RxE2-	Negative LVDS differential data input (Even data)	
19	RxE2+	Positive LVDS differential data input (Even data)	
20	RxECLK-	Negative LVDS differential clock input (Even clock)	
21	RxECLK+	Positive LVDS differential clock input (Even clock)	
22	RxE3-	Negative LVDS differential data input (Even data)	
23	RxE3+	Positive LVDS differential data input (Even data)	
24	NC	No connection (for internal use only. Do not connect)	
25	NC	No connection (for internal use only. Do not connect)	
26	NC	No connection (for internal use only. Do not connect)	

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27	NC	No connection (for internal use only. Do not connect)	
28	VDD	Power Supply Input +5.0 Voltage	
29	VDD	Power Supply Input +5.0 Voltage	
30	VDD	Power Supply Input +5.0 Voltage	



7.2 Interface Connection

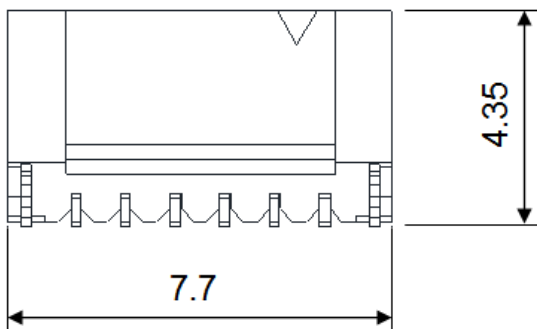
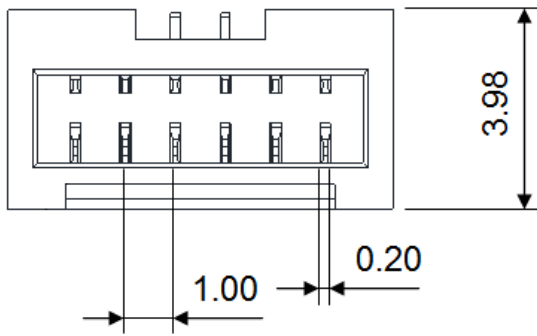
7.2.1 Connector Type

Backlight Connector	Manufacturer	CVILUX
	Part Number	CI1406M1VLD-NH
Mating Connector	Manufacturer	CVILUX
	Part Number	CI1406S0000-NH (Non-Locking type) CI1406SL000-NH (Locking type)

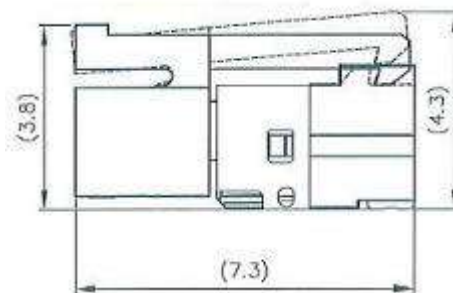
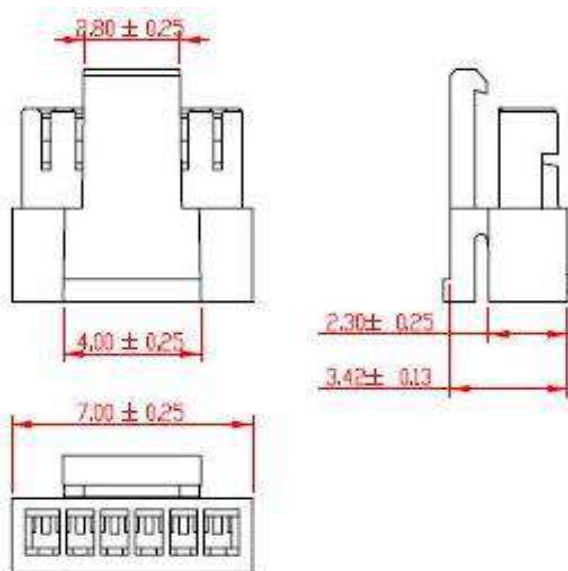
Backlight Connector dimension:

$H \times V \times D = 7.7 \times 3.98 \times 4.35$, Pitch = 1.0 (unit = mm)

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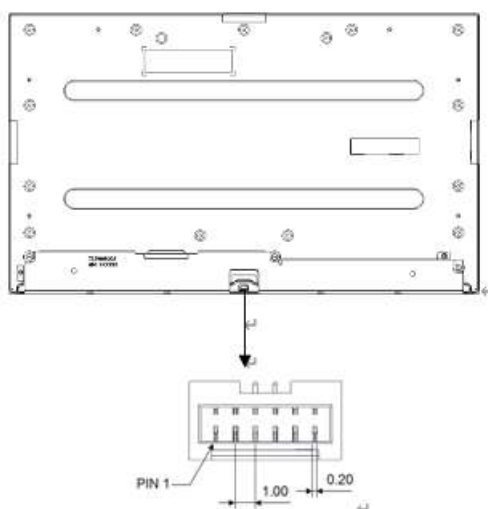


Mating Connector dimension:



7.2.2 Pin Assignment

Pin#	Symbol	Description	Remark
1	Ch1	LED Current Feedback Terminal (Channel 1)	
2	Ch2	LED Current Feedback Terminal (Channel 2)	
3	V _{SLED}	LED Power Supply Voltage Input Terminal	
4	V _{SLED}	LED Power Supply Voltage Input Terminal	
5	Ch3	LED Current Feedback Terminal (Channel 3)	
6	Ch4	LED Current Feedback Terminal (Channel 4)	



8.0 Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50°C, 80%RH, 300hours	3 ,4
High Temperature Operation (HTO)	Ta= 50°C, 300hours	3 ,4
Low Temperature Operation (LTO)	Ta= 0°C, 300hours	3 ,4
High Temperature Storage (HTS)	Ta= 60°C, 300hours	3 ,4
Low Temperature Storage (LTS)	Ta= -20°C, 300hours	
Vibration Test (Non-operation)	Acceleration: 1.5 G Wave: Random Frequency: 10 - 200 Hz Sweep: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction: ±X, ±Y, ±Z (one time for each Axis)	
Thermal Shock Test (TST)	-20°C /30min, 60°C /30min, 100 cycles	1
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point.	2
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 8 points, 25 times/ point.	

Note 1: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20°C to 60°C, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

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

Note 3: To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.

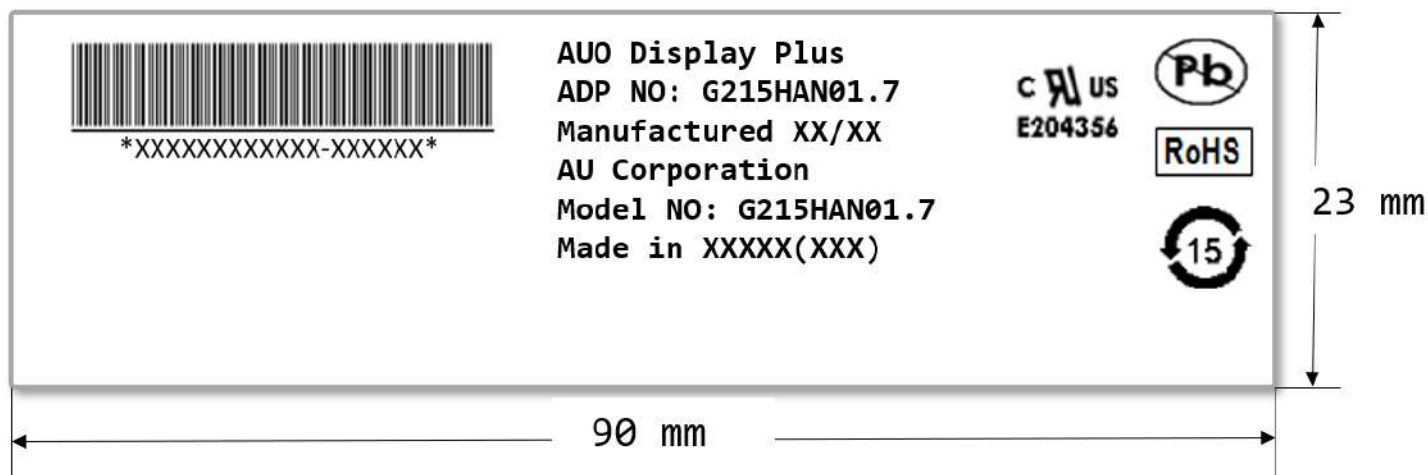
Note 4: The high temperature test item: THB & HTO & HTS & Thermal Shock, Mura shall be ignored.

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9.0 Shipping Label & Packaging

9.1 Shipping Label

The label is on the panel as shown below:



Note 1: For Pb Free products, AUO will add  for identification.

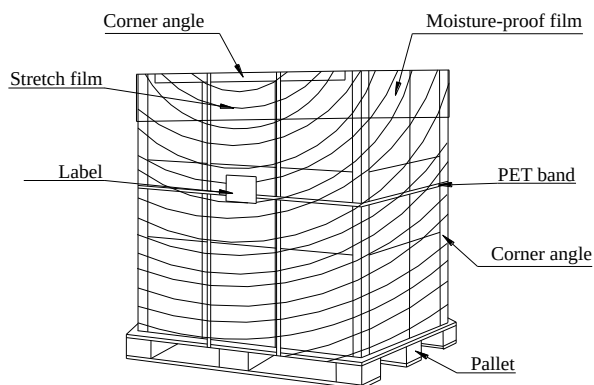
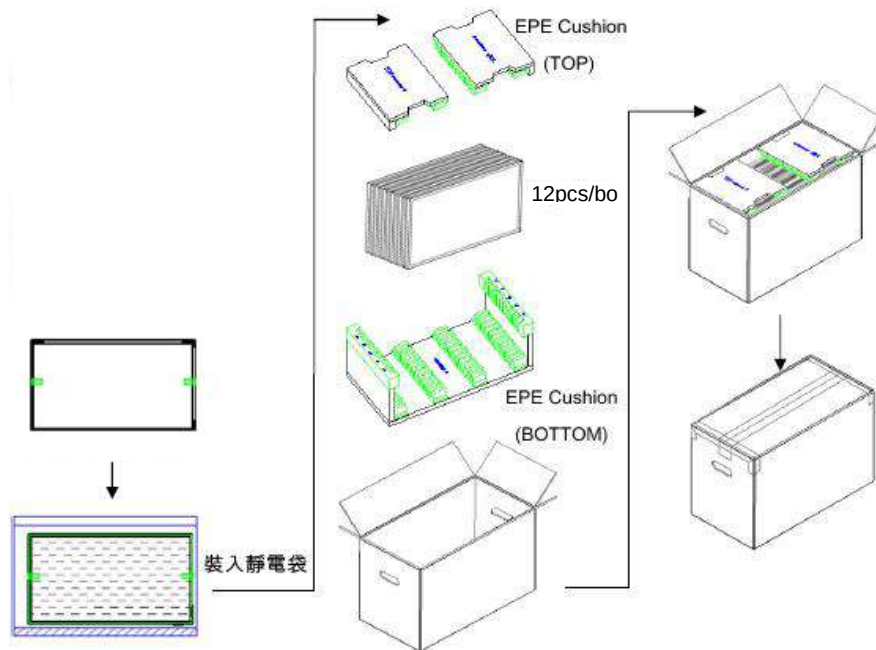
Note 2: For RoHS compatible products, AUO will add  for identification.

Note 3: For China RoHS compatible products, AUO will add  for identification.

Note 4: The Green Mark will be presented only when the green documents have been ready by AUO Internal Green Team.

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9.2 Packaging



Max capacity : 12PCS/CTN

Max weight: 23.2 kg per carton

Outside dimension of carton: : L565*W345*H375mm

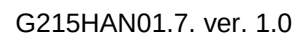
Pallet size : L1150*W1070*H132mm

6 cartons/layer, 3 layers/pallet

(12pcs *6) * 3 layers; Max 18 boxed/pallet. (216 pcs / Pallet)

Note: Automatic storage height limit <=1580mm

10.0 Mechanical Characteristics



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11 Safety

11.1 Keen 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

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 International Safety Standard Compliance

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