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() Preliminary Specifications

(✓) Final Specifications

Module	24 Inch Color TFT-LCD
Model Name	G240UAN01.3

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

Approved by	Date
<u>Buffy Chen</u>	<u>2022/05/04</u>
Prepared by	Date
<u>Eugene Yu</u>	<u>2022/05/04</u>
General Display Business Division / AU Optronics corporation	

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Record of Revision

Version	Date (yyyy/m/d)	Page	Old description	New Description
1.0	2022/5/04		First Edition for Customer	

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

G240UAN01.3 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD panel, a driver and power supply circuit, and a LED backlight system. The screen format is intended to support the WUXGA (1920(H) x 1200(V)) screen and 1.07B colors. All input signals are 2-channel LVDS interface compatible.

2.1 Display Characteristics

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

Items	Unit	Specifications
Screen Diagonal	[inch]	24.07 (611.32mm)
Active Area	[mm]	518.4 (H) x 324.0 (V)
Resolution		1920(x3) x 1200
Pixel Pitch	[mm]	0.270 (per one triad) x 0.270
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		AHVA mode, Normally Black
Nominal Input Voltage VDD	[Volt]	+12
Power Consumption	[Watt]	29.16W (Max.) (LCD 10.8W+ BLU 18.36W)
Color gamut		Adobe 99%
Weight	[Grams]	2620 (Typ)
Physical Size	[mm]	546.4 (H) x 352.0 (V) x 13.35 (D) (Typ)
Electrical Interface		Dual channel LVDS ; w/o LED driver
Surface Treatment		Anti-Glare treatment
Support Color		16.7M colors, True 8 bit
Temperature Range		
Operating	[°C]	0 to +50
Storage (Non-Operating)	[°C]	-20 to +60
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.	Note
White Luminance	cd/m ²	ILED=90mA(center point)		328	410	-	1
Uniformity	%	9 points		75	-	-	2,3
Contrast Ratio	--			945	1350	-	4
Response Time	msec	Rising		-	-	-	5
		Falling		-	-	-	
		Rising + Falling		-	22	-	
Viewing Angle	degree	Horizontal CR >= 10	(Right)	-	85	89	6
			(Left)	-	85	89	
		Vertical CR >= 10	(Upper)	-	85	89	
			(Lower)	-	85	89	
Color / Chromaticity Coordinates (CIE 1931)	--	Red x		0.658	0.688	0.718	
		Red y		0.280	0.310	0.340	
		Green x		0.184	0.214	0.244	
		Green y		0.699	0.729	0.759	
		Blue x		0.119	0.149	0.179	
		Blue y		0.026	0.056	0.086	
		White x		0.276	0.306	0.336	
		White y		0.279	0.309	0.339	

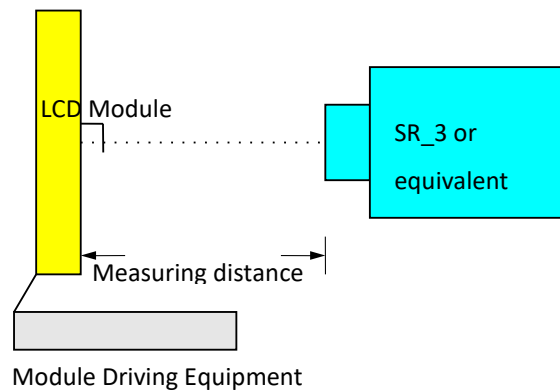
Note 1: Measurement method

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

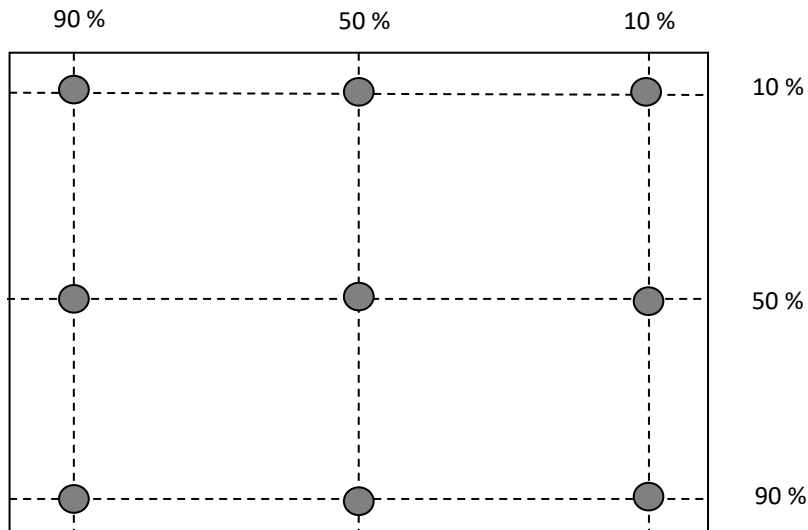
Aperture 1øwith 50cm viewing distance

Test Point Center

Environment < 1 lux



Note 2: Definition of 9 points position



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

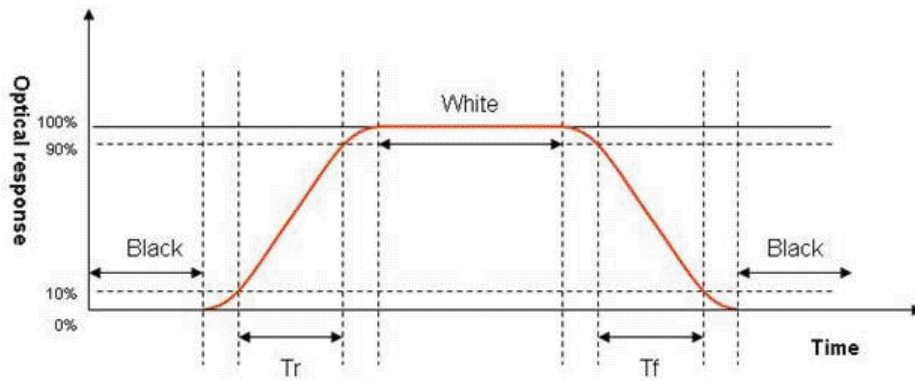
$$\delta w_9 = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

Note 4: Definition of contrast ratio (CR):

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

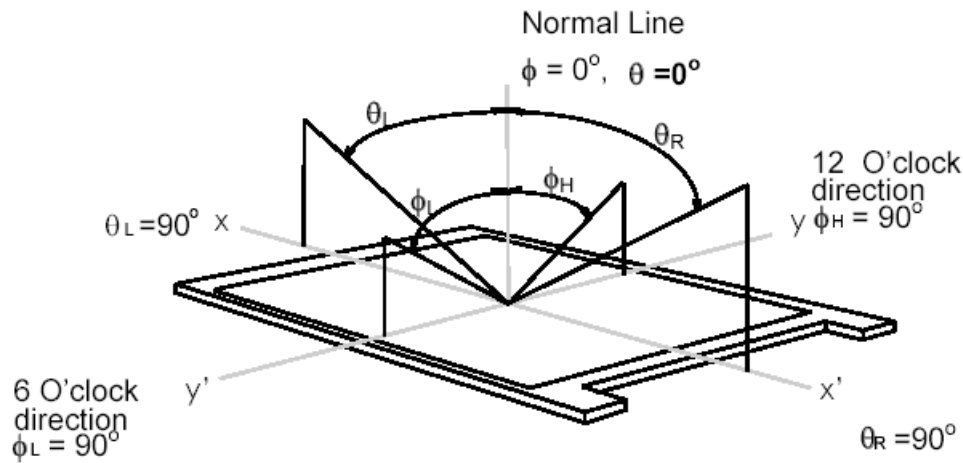
Note 5: Definition of response time:

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.



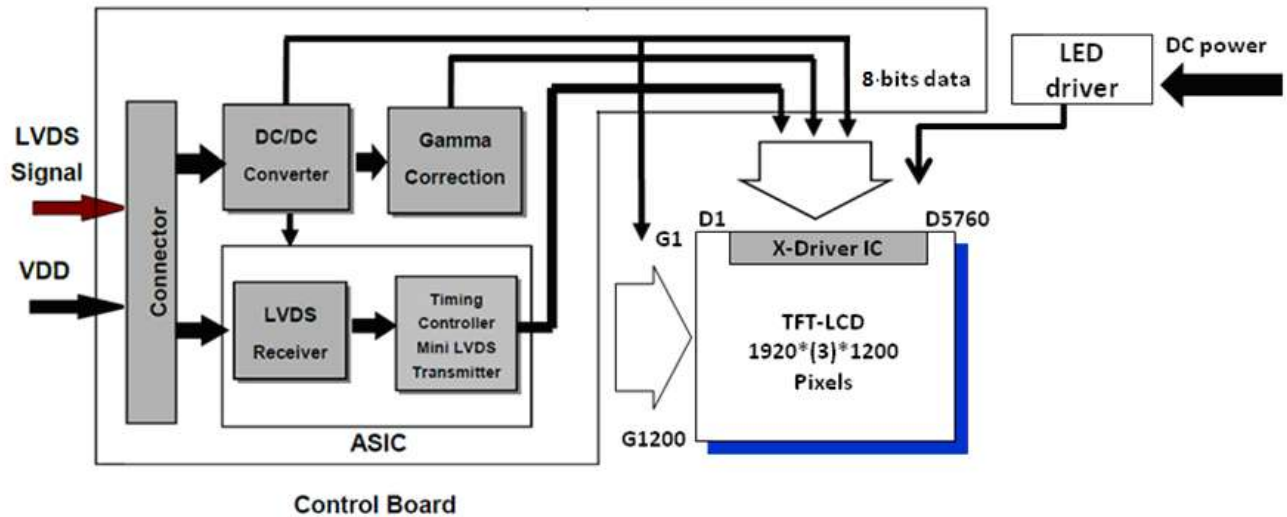
Note 6: Definition of viewing angle

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 24inch color TFT/LCD module:



4. Absolute Maximum Ratings

4.1 Absolute Ratings of TFT LCD Module

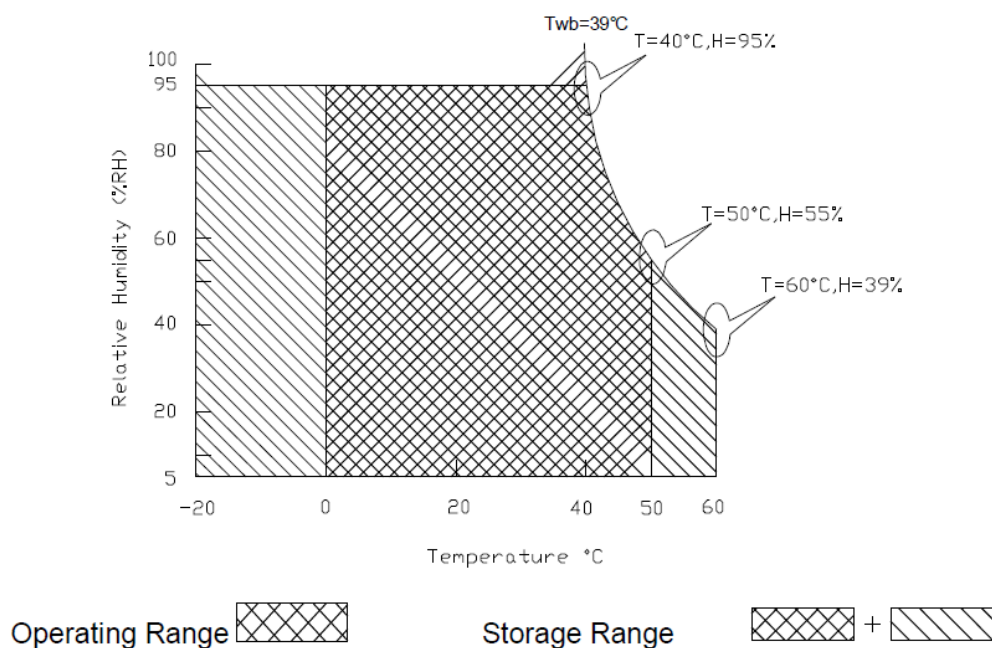
Item	Symbol	Min.	Max.	Unit	Conditions
Logic/LCD Drive Voltage	VDD	-0.3	+16.5	[Volt]	Note 1, 2

4.2 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	0	+50	[°C]	Note
Operation Humidity	HOP	5	90	[%RH]	
Storage Temperature	TST	-20	+60	[°C]	
Storage Humidity	HST	5	90	[%RH]	
Panel Surface	PST	-	+65	[°C]	

Note 1: Maximum Wet-Bulb should be 39°C and no condensation

Note 2: Surface temperature is measured at 50°C Dry condition



5. Electrical Characteristics

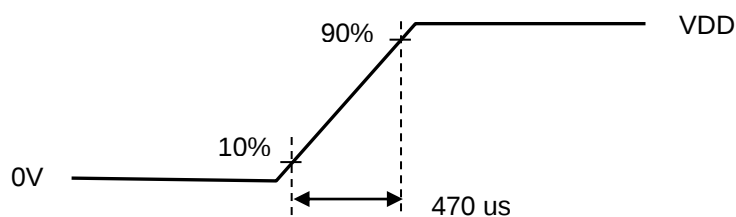
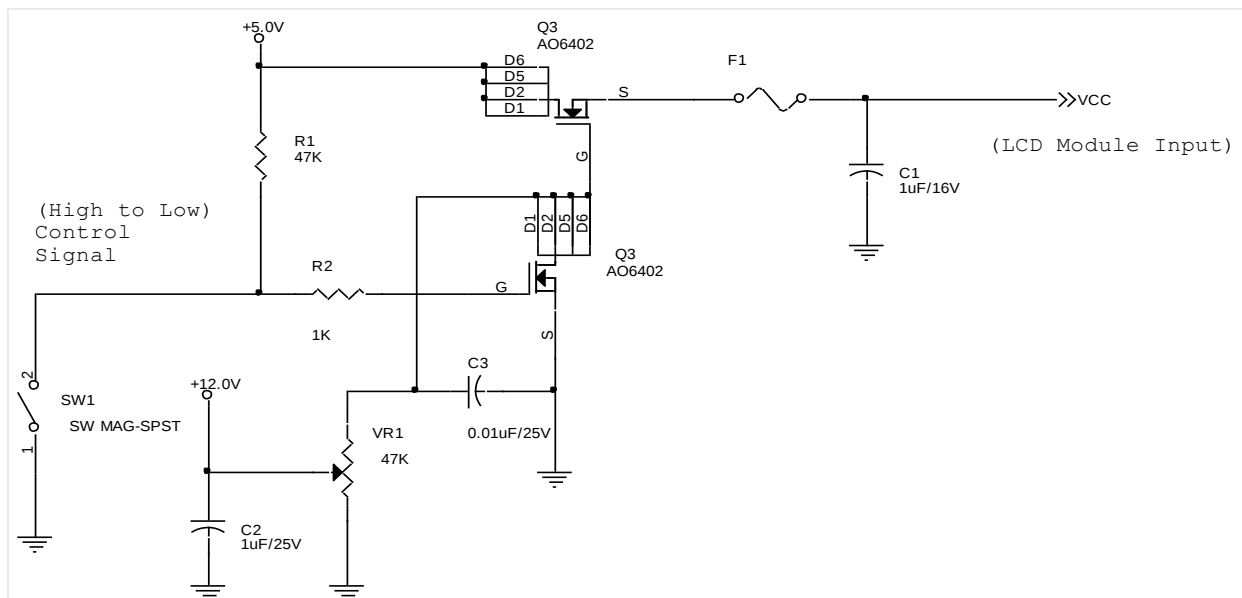
5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are shown as follows;

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	10.8	12.0	13.2	[Volt]	±10%
IDD	VDD Current	-	(0.7)	(0.9)	[A]	Vin=12V, White Pattern, at 60Hz
Irush	LCD Inrush Current	-	-	3	[A]	Note 1
PDD	VDD Power	-	8.4	10.8	[Watt]	Vin=12V, White Pattern, at 60Hz
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	300	[mV] p-p	With panel loading

Note 1: Measurement condition:



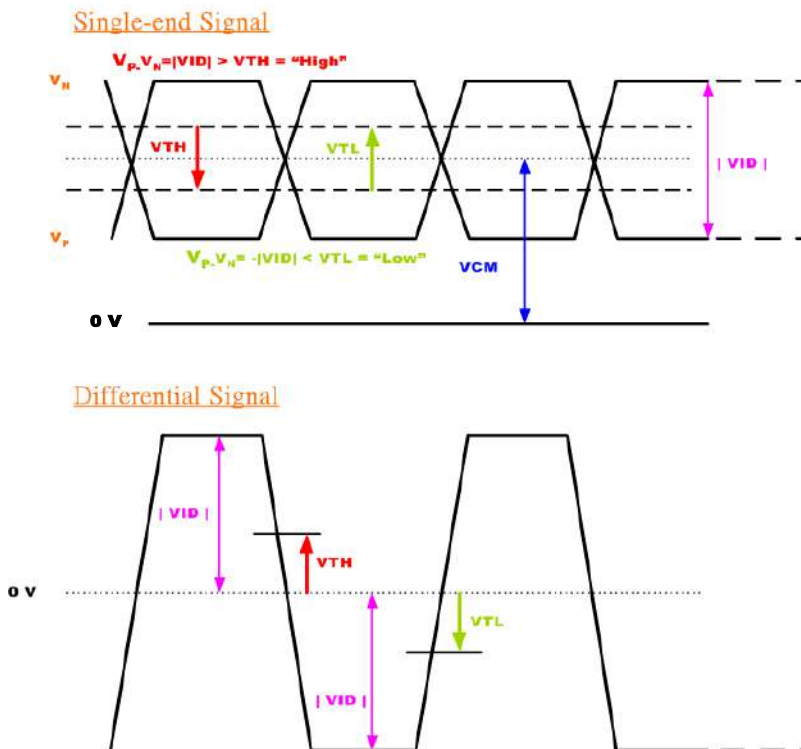
5.1.2 LVDS DC Signal Electrical Characteristics

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	-	600	[mV]	
VICM	Differential Input Common Mode Voltage	+1.0	+1.2	+1.5	[V]	VTH/VTL=+-200mV

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

Note: LVDS Signal Waveform.





Product Specification

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5.2 Backlight Unit

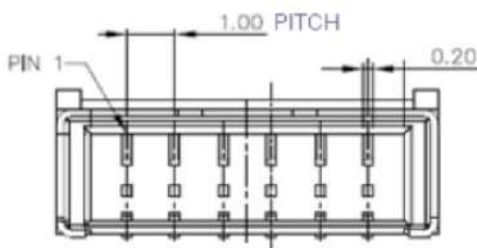
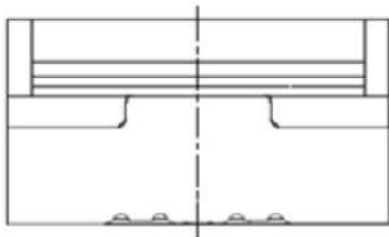
5.2.1 LED Backlight Unit: Light bar Connector

Connector Name / Designation	BLU Connector
Manufacturer	Cvilux
Backlight connector	CI1406M1HRN-NH1
Mating connector	Cvilux: CI1406S0000-NH (non-locking type) Cvilux: CI1406SL000-NH (locking type) ENTERY: H112K-P06N-00B (non-locking type) ENTERY: H112K-P06N-03B (locking type)

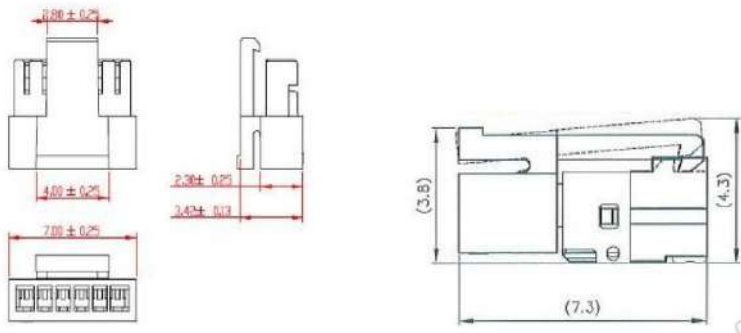
#Mating and Un-mating Force of the connector will be different if the operator or CN type is different, therefore please choose the compatible connector.

Backlight Connector dimension:

H x V x D = 7.9 x 3.00 x 4.25, Pitch = 1.0 (unit:mm)

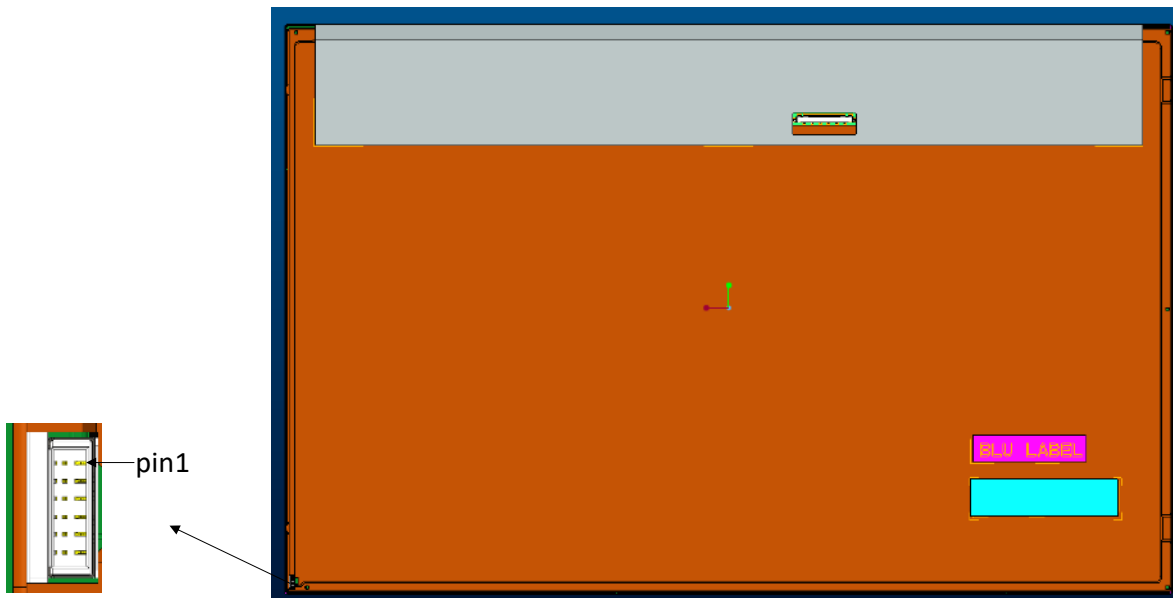


Mating Connector dimension:



5.2.2 Connector Pin Assignment

Pin #	Symbol	Description
1	Ch1	IRLED (current out)
2	Ch2	IRLED (current out)
3	V _{SLED}	VLED (voltage in))
4	V _{SLED}	VLED (voltage in)
5	Ch3	IRLED (current out)
6	Ch4	IRLED (current out)



5.2.3 Parameter guideline for LED

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
I _s	LED String Current	-	90	-	[mA]	Ta = 25°C, Note 2

V_s	LED String Voltage	42	45	51	[Volt]	$I_F = 90\text{mA}$, $T_a = 25^\circ\text{C}$ Note 2,3
P_{BLU}	LED Light Bar Power Consumption	-	16.2	18.36	[Watt]	$I_F = 90\text{mA}$, $T_a = 25^\circ\text{C}$ Note 3,4,5
LT_{LED}	LED Life Time	30,000	-	-	Hrs	$I_F = 90\text{mA}$, $T_a = 25^\circ\text{C}$, Note 6,7
OVP	Over Voltage Protection in system board	110% VFmax			Volt	Note 5

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

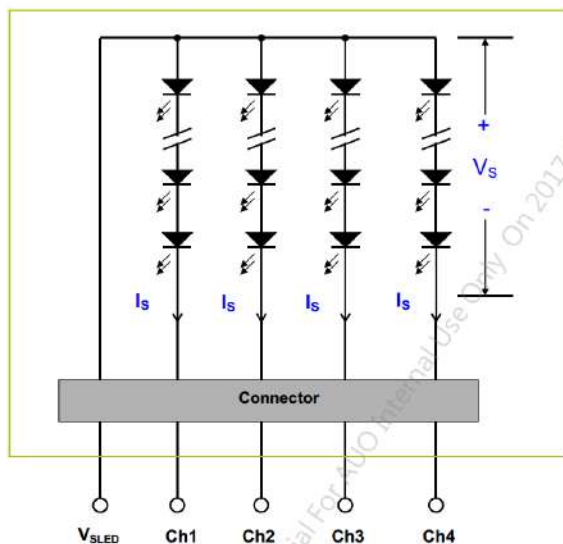
Note 2: I_s , V_s are defined for one channel LED. There are four LED channel in back light unit.

Note 3: LED backlight is 60 LEDs (4 strings, 15pcs for each string)

Note 4: The LED supply power is for 4 string of LED

Note 5: Recommendation for LED driver power design:

Due to there are electrical property deviation in LED & monitor set system component after long time operation. AUO strongly recommend the design value of LED driver board OVP (over voltage protection) should be 10% higher than max. value of LED string voltage (VF) at least.



Note 6: Definition of life time: Brightness becomes to 50% of its original value.

The minimum life time of LED unit is on the condition of $I_s = 90\text{ mA}$ and $25 \pm 2^\circ\text{C}$ (Room Temperature).

Note 7: If G240UAN01.3 model is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

6.3 Signal Description

LVDS is a differential signal technology for LCD interface and high speed data transfer device. The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

6.3.1 TFT LCD Module: LVDS Connector

LCD	manufacturer	JAE
	part number	FI-RE51S-HF-R1500
Mating	manufacturer	JAE or compatible
	part number	FE-RE51HL, FI-R51HL or compatible

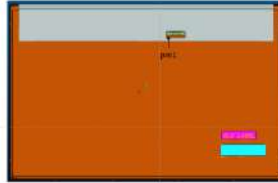
PIN #	Symbol	Description	Note
1	GND	Ground (0V)	(2)
2	IC	Internally connected& Keep open	
3	IC	Internally connected& Keep open	
4	IC	Internally connected& Keep open	
5	IC	Internally connected& Keep open	
6	IC	Internally connected& Keep open	
7	GND	Ground (0V)	
8	IC	Internally connected& Keep open	
9	NC	No Connection	
10	NC	No Connection	
11	GND	Ground (0V)	
12	RO0N	ODD Pixel Data	(3)
13	RO0P	ODD Pixel Data	(3)
14	RO1N	ODD Pixel Data	(3)
15	RO1P	ODD Pixel Data	(3)
16	RO2N	ODD Pixel Data	(3)
17	RO2P	ODD Pixel Data	(3)
18	GND	Ground (0V)	(2)
19	ROCLKN	ODD Pixel Clock	(3)
20	ROCLKP	ODD Pixel Clock	(3)

21	GND	Ground (0V)	(2)
22	RO3N	ODD Pixel Data	(3)
23	RO3P	ODD Pixel Data	(3)
24	NC	No Connection	
25	NC	No Connection	
26	GND	Ground (0V)	(2)
27	GND	Ground (0V)	(2)
28	RE0N	EVEN Pixel Data	(3)
29	RE0P	EVEN Pixel Data	(3)
30	RE1N	EVEN Pixel Data	(3)
31	RE1P	EVEN Pixel Data	(3)
32	RE2N	EVEN Pixel Data	(3)
33	RE2P	EVEN Pixel Data	(3)
34	GND	Ground (0V)	(2)
35	RECLKN	ODD Pixel Clock	(3)
36	RECLKP	ODD Pixel Clock	(3)
37	GND	Ground (0V)	(2)
38	RE3N	EVEN Pixel Data	(3)
39	RE3P	EVEN Pixel Data	(3)
40	NC	No Connection	
41	NC	No Connection	
42	GND	Ground (0V)	(2)
43	GND	Ground (0V)	(2)
44	GND	Ground (0V)	(2)
45	GND	Ground (0V)	(2)
46	GND	Ground (0V)	(2)
47	NC	No Connection	
48	VDD	Power Supply (typ.+12.0V)	(1)
49	VDD	Power Supply (typ.+12.0V)	(1)
50	VDD	Power Supply (typ.+12.0V)	(1)
51	VDD	Power Supply (typ.+12.0V)	(1)

Note-(1): All VDD pins shall be connected to +12.0V (Typ.)

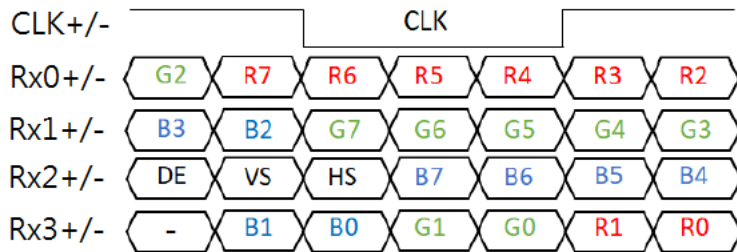
Note-(2): All GND pins shall be grounded. Metal bezel is internally connected to GND.

Note-(3): Rx n+ and Rx n- (n=0, 1, 2, 3) shall be wired by twist-pairs or side by side FPC patterns respectively



6.4 The Input Data Format

Data Mapping of JEIDA Format



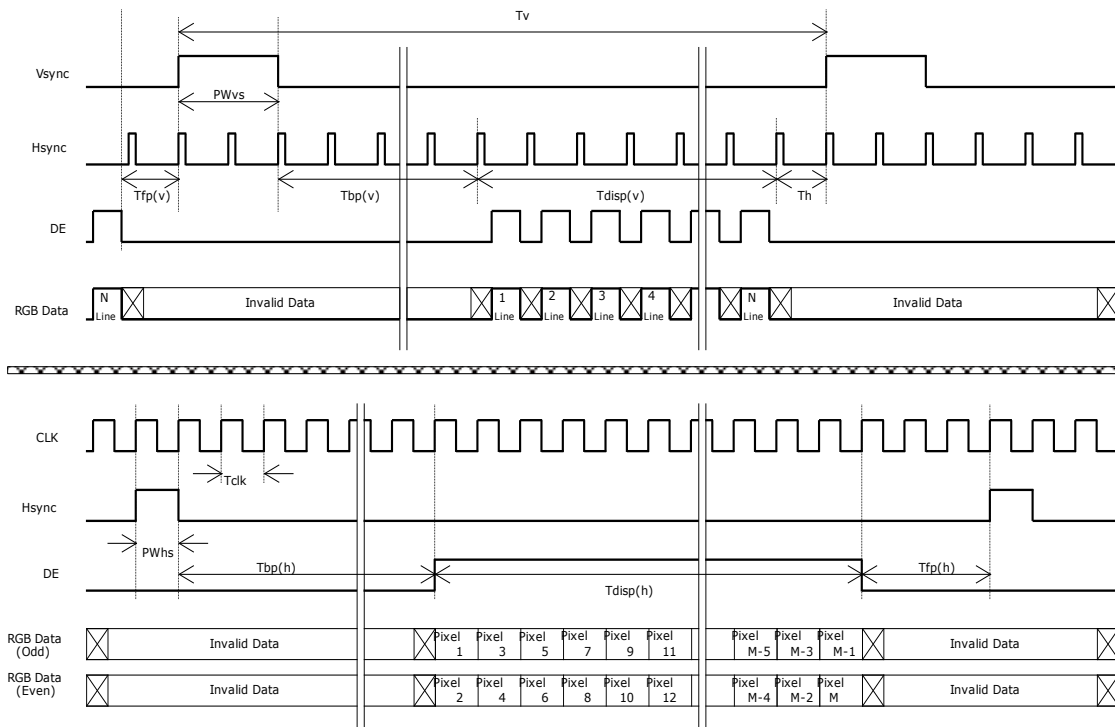
6.5 Interface Timing

6.5.1 Timing Characteristics

Signal		Symbol	Min.	Typ.	Max.	Unit
Clock Frequency		1/ T _{Clock}	59.5	77	85	MHz
Vertical Section	Period	T _V	1214	1235	1734	T _{Line}
	Active	T _{VD}	1200	1200	1200	
	Blanking	T _{VB}	14	35	534	
Horizontal Section	Period	T _H	1000	1040	1428	T _{Clock}
	Active	T _{HD}	960	960	960	
	Blanking	T _{HB}	40	80	468	
Frame Rate		F	49	60	66	Hz

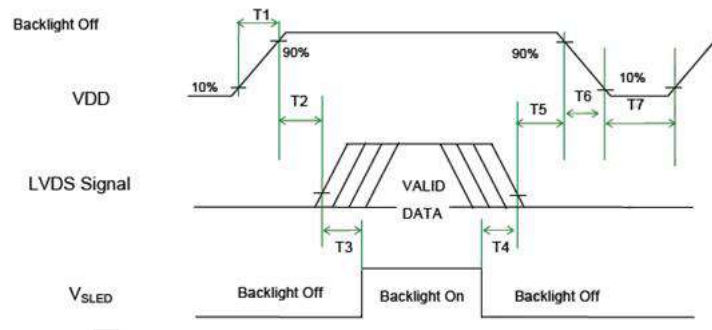
Note : DE mode only

6.5.2 Input Timing Diagram



6.6 Power ON/OFF Sequence

VDD power and lamp 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	200	-	--	[ms]
T4	110	-	-	[ms]
T5	0	16	50	[ms]
T6	0	-	10	[ms]
T7	1000	-	-	[ms]

Note 1: Recommend setting T5=0ms to avoid electronic noise when VDD is off.

Note 2: During T5 and T6 Period, Please keep the level of input LVDS signals with Hi-Z state.

Note 3: Voltage of VDD must decay smoothly after power-off.(customer system decide this value)

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

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50°C, 80%RH, 300hours	
High Temperature Operation (HTO)	Ta= 50°C, 300hours	
Low Temperature Operation (LTO)	Ta= 0°C, 300hours	
High Temperature Storage (HTS)	Ta= 60°C, 300hours	
Low Temperature Storage (LTS)	Ta= -20°C, 300hours	
Vibration Test (Non-operation)	Acceleration: 1.5 G Wave: Random PSD: 0.01185 G ² /Hz Frequency: 10 - 200 Hz 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)	
Drop Test	Height: 61 cm, package test	
Thermal Shock Test (TST)	-20 °C /30min, 60/ °C 30min, 100 cycles	1
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (Electrostatic Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 9 points, 25 times/ point.	2
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 9 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:

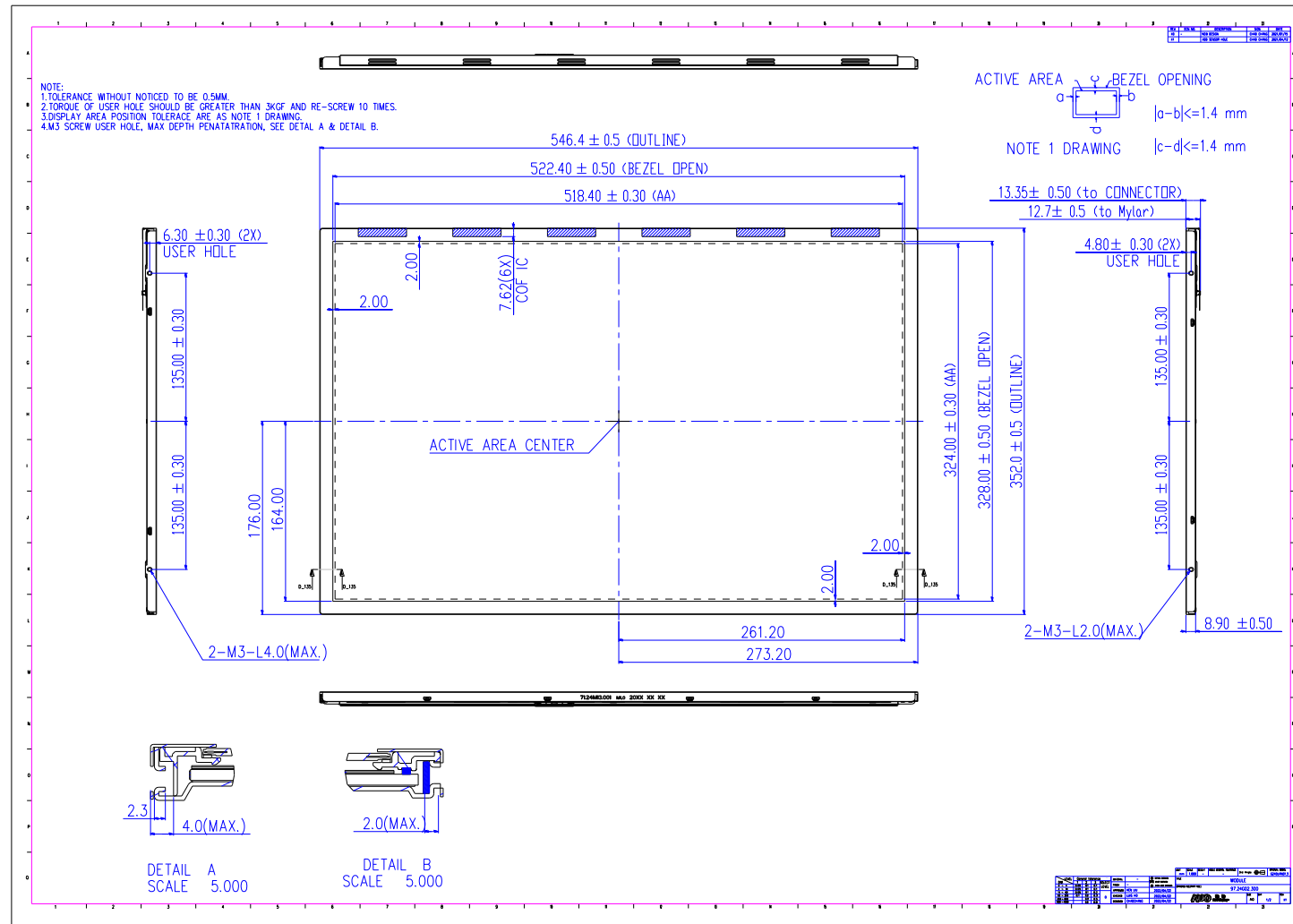
- Water condensation is not allowed for each test items.
- Each test is done by new TFT-LCD module. Don't use the same TFT-LCD module repeatedly for reliability test.
- The reliability test is performed only to examine the TFT-LCD module capability.
- To inspect TFT-LCD module after reliability test,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

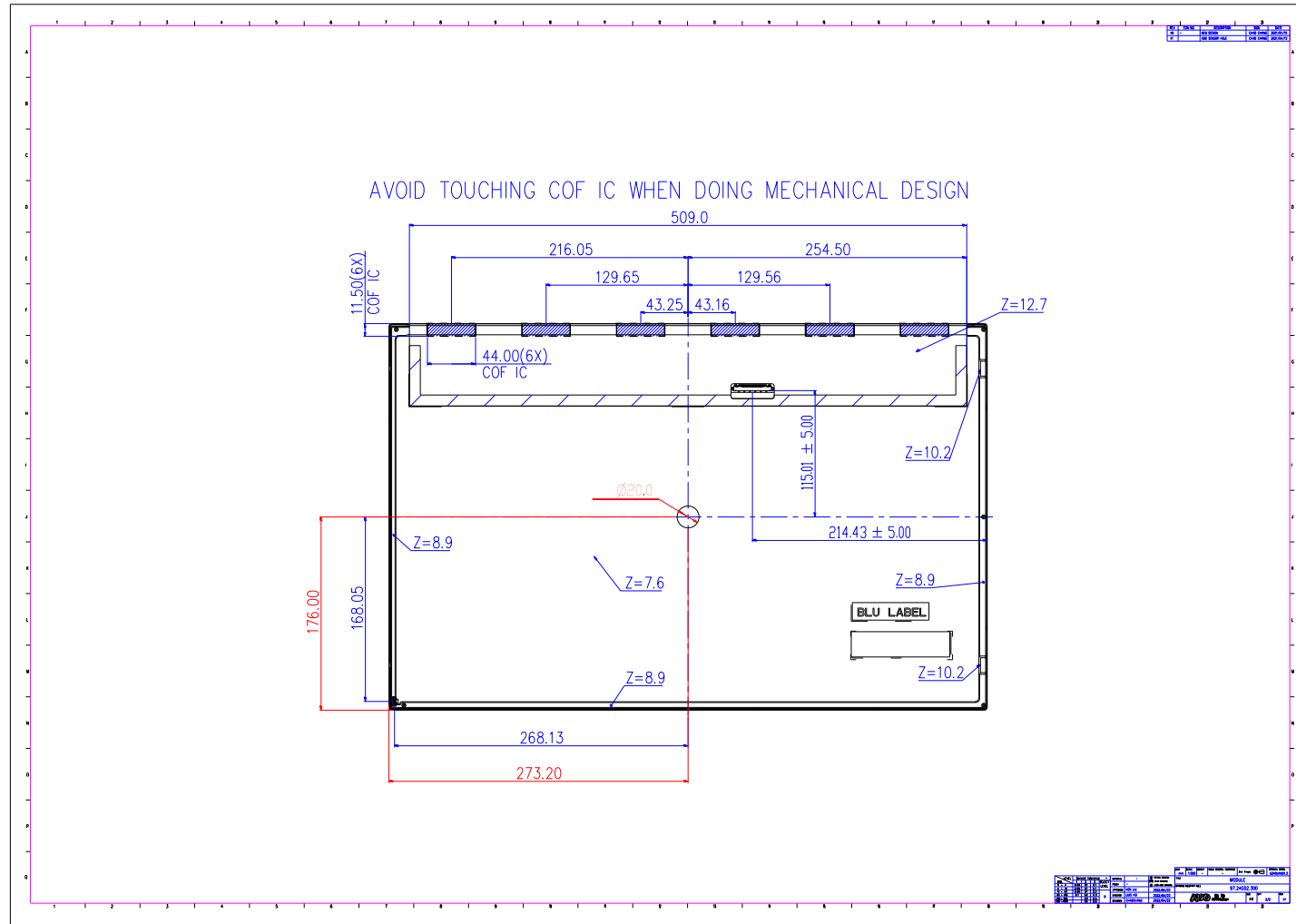
8. Mechanical Characteristics

8.1 LCM Outline Dimension

Product Specification

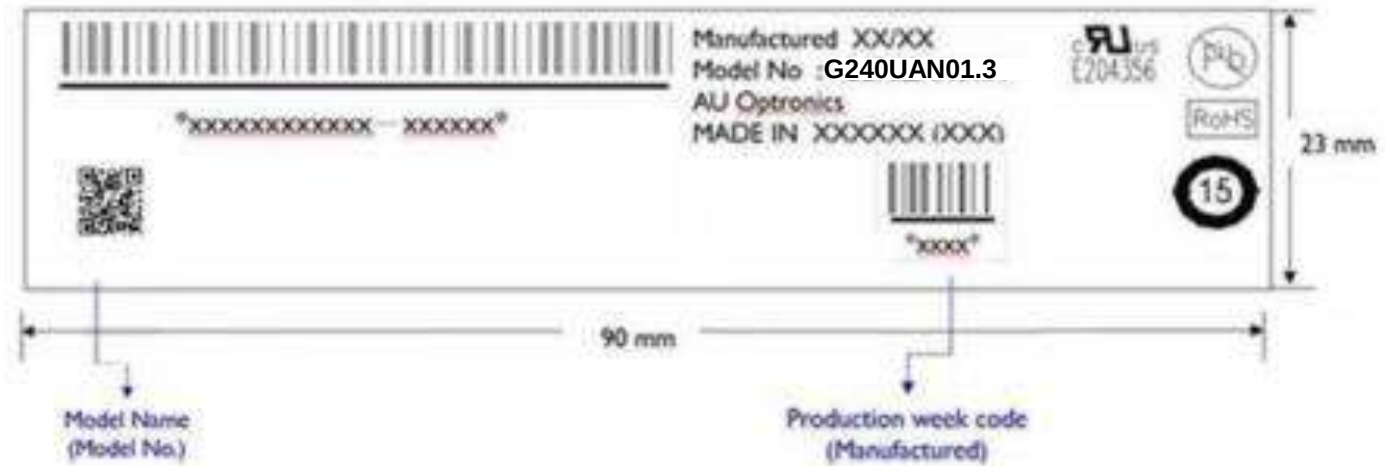
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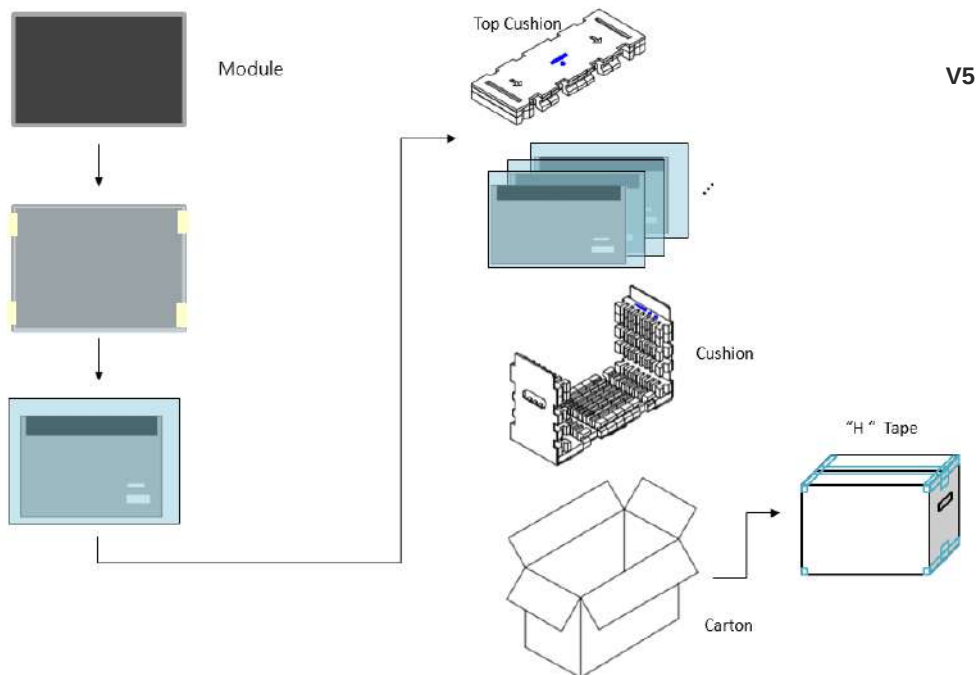


9. Label and Packaging

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



9.2 Carton Package



Max capacity : 7 PCS TFT-LCD module per carton

Max weight: 20.7 kg per carton

Outside dimension of carton: 650mm(L)* 265mm(W)*460mm(H)

Pallet size : 1070 mm * 740 mm * 132mm

Box stacked

Module by air_Max : (1 *4) *3 layers , one pallet put 12 boxes , total 84pcs module

Module by sea_Max : (1*4) *3 layers + (1 *4) *1 layers , two pallet put 16 boxes , total 112pcs module



Product Specification

AU OPTRONICS CORPORATION

Module by sea_HQ_Max : (1*4) *3 layers+(1*4) *1 layers, two pallet put 16 boxes, total 112pcs 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