( ) Preliminary Specification
(V) Final Specification

Module	**27" Color TFT-LCD**
Model Name	**M270HAN02.2**

Customer	**Date**	**Approved by**	**Date**
		CH Lin	Jan 31, 2019
Approved by		**Prepared by**	**Date**
		Vincent Hsu	Jan 31, 2019
Note: This Specification is subject to change without notice.		AU Optronics corporation	

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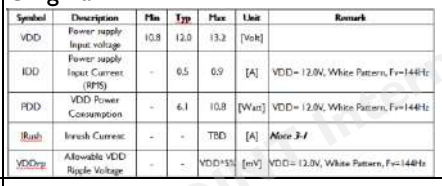
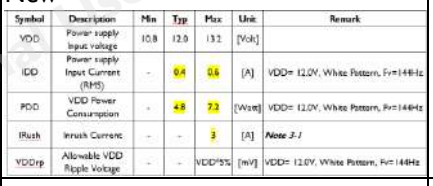
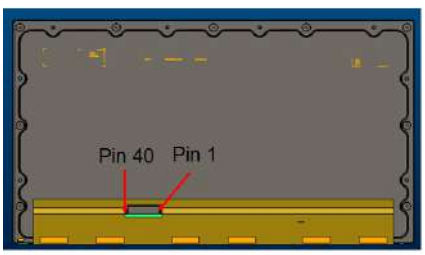
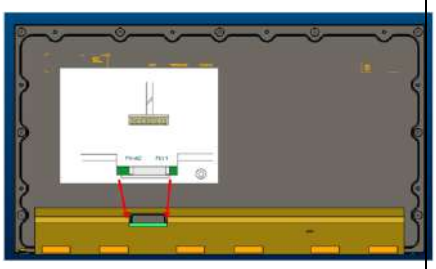
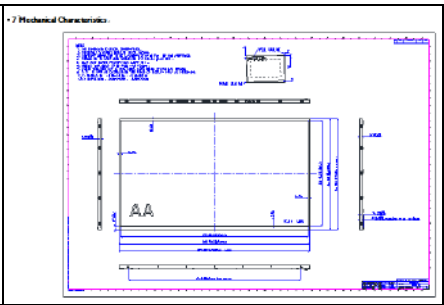
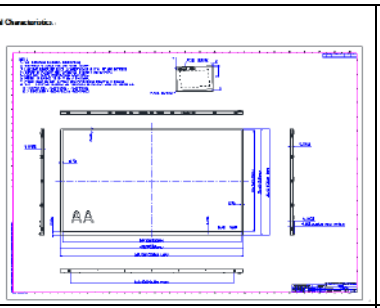
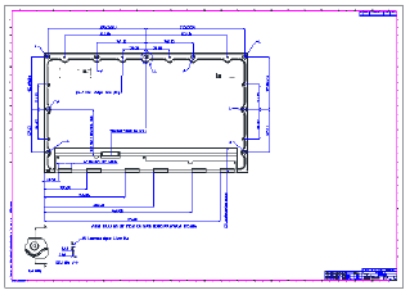
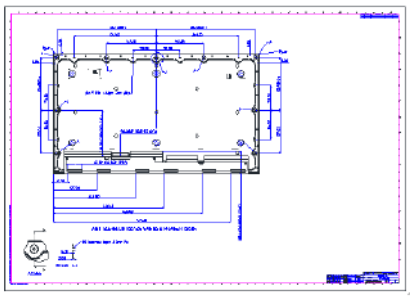
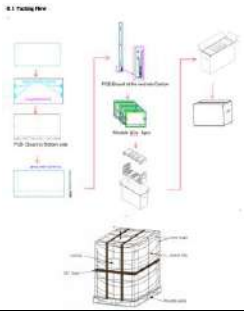
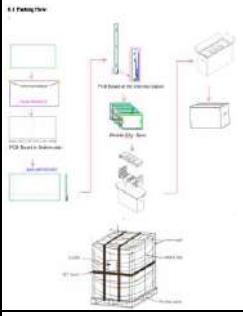
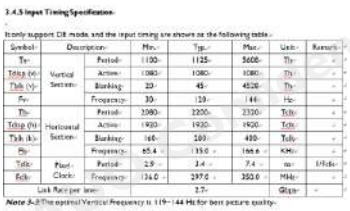
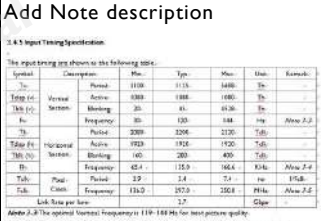
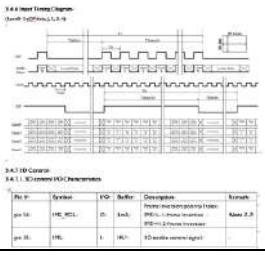
Record of Revision

Version	Date	Page	Old description	New Description	Remark
0.0	2018/5/23	All		New release	
0.1	2018/7/25	6	Power consumption is 23.4W	Power consumption is 22.1W	
		6/ 34/ 35/ 37	Outline Dimension: 609.1(H) x 354.96(V) x 11.64(D)	Outline Dimension: 609.1(H) x 355.0(V) x 11.6(D)	
		8	-	Update color coordinates	
		16	Original 	New 	
		22	Original 	New 	
		39	-	Add design guide for system	
0.2	2018/8/22	9	-	Update color coordinates of RGB	
		15	Orginal mating connector of interface is 15H40-0000TA-00-R (Locked Type)	New mating connector of interface is 115H40-0000TA-00-R	
		16	Orignal diagram of interface pin map 	New diagram of interface pin map 	

1.0	2018/10/25	34			
1.0	2018/10/25	35	 (1) Avoid touching COF position when doing mechanical design. (2) The user hole depth of the light bar side is different from the other side .	 (1) Avoid touching COF position when doing mechanical design (2) The user hole depth of the light bar side is different from the other side .	
1.0	2018/10/25	36			
1.1	2019/01/24	34	4. TORQUE OF M3 USER HOLE SHOULD BE WITHIN 4 kgf-cm MAX..	4. TORQUE OF M3 USER HOLE SHOULD BE WITHIN 6 kgf-cm MAX..	
1.1	2019/01/31	22		Add Note description 	
1.1	2019/01/31	23		Remove Input Timing Diagram	

1 Handling Precautions

1) Since polarizer is easily damaged, do not touch or press the surface of polorizer with hand.
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 a TFT-LCD Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of the LED lightbar edge. Otherwise the TFT-LCD Module may be damaged.
10) Insert or pull out the interface connector, be sure not to rotate nor tilt it of the TFT-LCD Module.
11) Do not twist nor bend the TFT -LCD Module even momentary. It should be taken into consideration that no bending/twisting forces are applied to the TFT-LCD Module from outside. Otherwise the TFT-LCD Module may be damaged.
12) Please avoid touching COF position while you are doing mechanical design.
13) When storing modules as spares for a long time, the following precaution is necessary: Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
14) Do not apply the same pattern for a long time, it will enhance relevant defect.
15) When this reverse-type model(PCBA on bottom side) is used as forward-type model(PCBA on top side) , AUO can not guarantee any defects of LCM .

2 General Description

This specification applies to the 27 inch wide Color a-Si TFT-LCD Module M270HAN02.2. The display supports the Full HD - 1920(H) x 1080(V) screen format and 16.7M colors (8bits RGB data input). The input interface is 4 lane eDP HBR1 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]	685.65 (27.0")
Active Area	[mm]	597.6 (H) x 336.15 (V)
Pixels H x V	-	1920(x3) x 1080
Pixel Pitch	[um]	311.25 (per one triad) ×311.25
Pixel Arrangement	-	R.G.B. Vertical Stripe, source board at bottom
Display Mode	-	AHVA, Normally Black
White Luminance (Center)	[cd/m^2]	400 (Typ.)
Contrast Ratio	-	1000 (Typ.)
Response Time	[msec]	14ms (Typ., GTG)
Power Consumption (LCD Module + Backligh unit)	[Watt]	22.1 W (Typ.) LCD module : PDD (Typ.)=4.8 W@ White pattern,Fv=144Hz Backlight unit : P_{BLU} (Typ.) =17.3W @ I_{RLED} =80mA
Weight	[Grams]	3220g
Outline Dimension	[mm]	609.1(H) x 355.0(V) x 11.6(D) Typ.
Electrical Interface	-	4 Lane eDP HBR1
Support Color	-	16.7M colors (RGB 8-bits)
Surface Treatment	-	Anti-Glare 25%, 3H
Temperature Range Operating Storage (Shipping)	 [°C] [°C]	 0 to +50 -20 to +60
RoHS Compliance	-	RoHS Compliance
TCO Compliance	-	NA

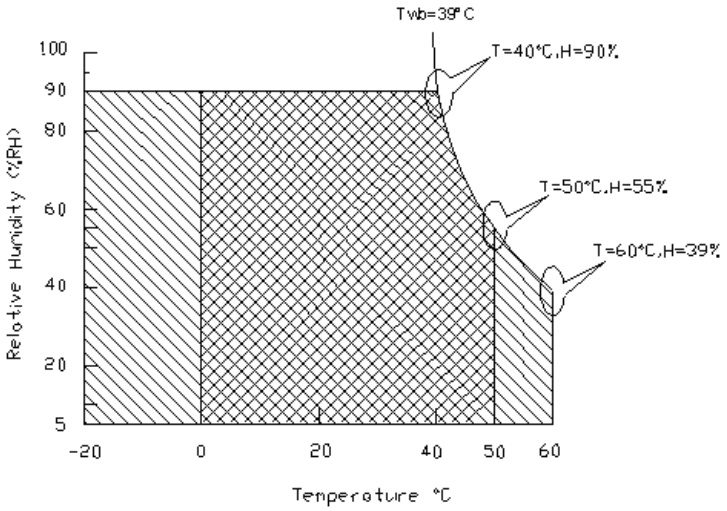
2.2 Absolute Maximum Rating of Environment

Permanent damage may occur if exceeding the following maximum rating.

Symbol	Description	Min.	Max.	Unit	Remark
TOP	Operating Temperature	0	+50	[°C]	***Note 2-1***
TGS	Glass surface temperature (operation)	0	+65	[°C]	***Note 2-1*** *Function judged only*
HOP	Operation Humidity	5	90	[%RH]	***Note 2-1***
TST	Storage Temperature	-20	+60	[°C]	
HST	Storage Humidity	5	90	[%RH]	

Note 2-1: Temperature and relative humidity range are shown as the below figure.

1. 90% RH Max (Ta ≦39℃)
2. Max wet-bulb temperature at 39℃ or less. (Ta ≦39℃)
3. No condensation



Operating Range Storage Range +

2.3 Optical Characteristics

The optical characteristics are measured on the following test condition.

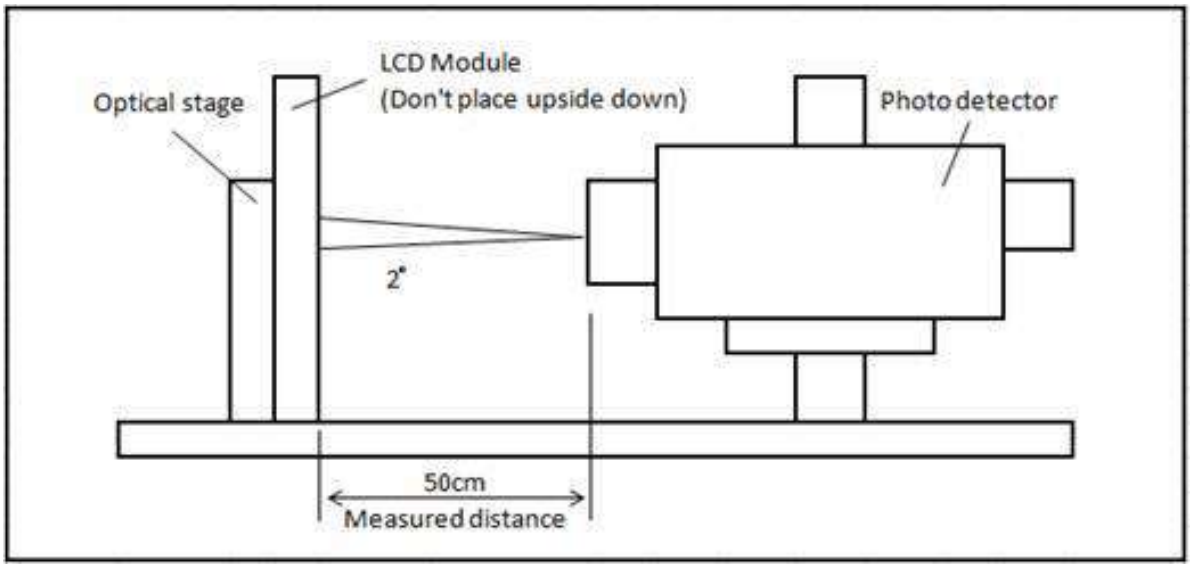
Test Condition:

1. Equipment setup: Please refer to ***Note 2-2***.
2. Panel Lighting time: 30 minutes
3. VDD=12.0V, Fv=120Hz,Is=80mA,Ta=25°C

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
L_w	White Luminance (Center of screen)		320	400	-	[cd/m2]	***Note 2-2*** *By SR-3*
L_{uni}	Luminance Uniformity (9 points)		75	80	-	[%]	***Note 2-3*** *By SR-3*
CR	Contrast Ratio (Center of screen)		600	1000	-	-	***Note 2-4*** *By SR-3*
θ_R	Horizontal Viewing Angle (CR=10)	Right	75	89	-	[degree]	***Note 2-5*** *By SR-3*
θ_L		Left	75	89	-		
Φ_H	Vertical Viewing Angle (CR=10)	Up	75	89	-		
Φ_L		Down	75	89	-		
θ_R	Horizontal Viewing Angle (CR=5)	Right	75	89	-		
θ_L		Left	75	89	-		
Φ_H	Vertical Viewing Angle (CR=5)	Up	75	89	-		
Φ_L		Down	75	89	-		
T_{GTG}	Response Time	Gray To Gray	-	14	-	[msec]	***Note 2-6*** *By TRD-100*
R_x	Color Coordinates (CIE 1931)	Red x	0.618	0.648	0.678	-	*By SR-3*
R_y		Red y	0.310	0.340	0.370		
G_x		Green x	0.275	0.305	0.335		
G_y		Green y	0.605	0.635	0.665		
B_x		Blue x	0.118	0.148	0.178		
B_y		Blue y	0.023	0.053	0.083		
W_x		White x	0.283	0.313	0.343		
W_y		White y	0.299	0.329	0.359		
Ru'	Color Coordinates (CIE 1976)	Red u'	-	0.448	-		*By SR-3*
Rv'		Red v'	-	0.529	-		
Gu'		Green u'	-	0.122	-		
Gv'		Green v'	-	0.571	-		
Bu'		Blue u'	-	0.177	-		
Bv'		Blue v'	-	0.143	-		

Wu'		White u'	-	0.198	-		
Wv'		White v'	-	0.468	-		
sRGB coverage ratio (CIE 1931)			-	99	-	[%]	*By SR-3*

Note 2-2: Equipment setup :

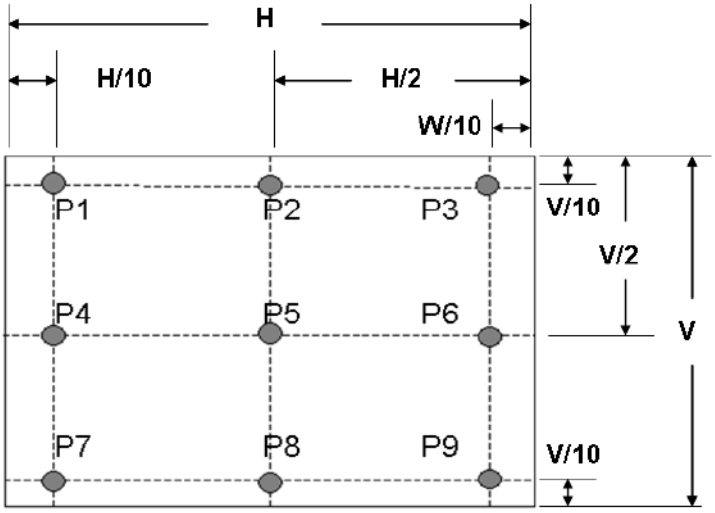


Note 2-3: Luminance Uniformity Measurement

Definition:

$$\text{Luminance Uniformit y} = \frac{\text{Minimum Luminance of 9 Points (P1 ~ P9)}}{\text{Maximum Luminance of 9 Points (P1 ~ P9)}}$$

a.Test pattern:White Pattern



Note 2-4: Contrast Ratio Measurement

Definition:

$$\text{Contrast Ratio} = \frac{\text{Luminance of White pattern}}{\text{Luminance of Black pattern}}$$

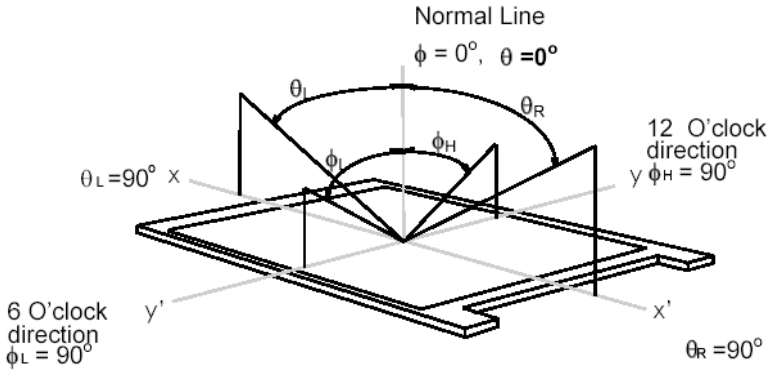
a. Measured position: Center of screen (P5) & perpendicular to the screen (θ=Φ=0°)

Note 2-5: Viewing angle measurement

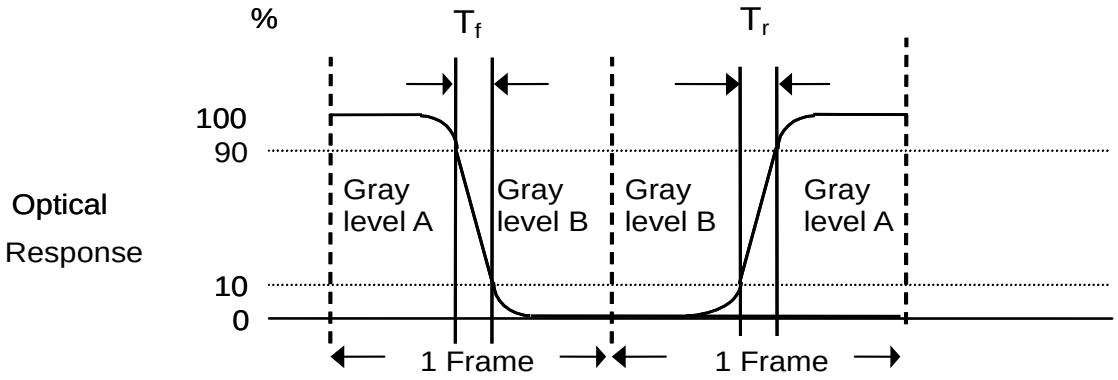
Definition: The angle at which the contrast ratio is greater than 10 & 5 .

a. Horizontal view angle: Divide to left & right (θ_L & θ_R)

Vertical view angle: Divide to up & down (Φ_H &Φ_L)



Note 2-6: Response time measurement



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.
The gray to gray response time is defined as the following table.

The gray to gray response time is defined as the following table.

Gray Level to Gray Level		Target gray level				
		L0	L63	L127	L191	L255
Start gray level	L0					
	L63					
	L127					
	L191					
	L255					

■ T_{GTG_typ} is the total average time at rising time and falling time of gray to gray.

2.4 Mechanical Characteristics

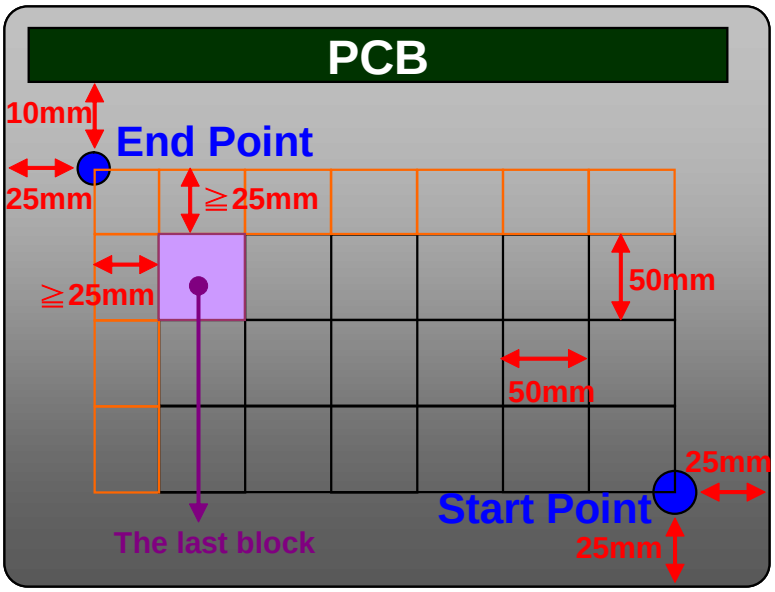
Symbol	Description	Min.	Max.	Unit	Remark
P_{bc}	Backside Compression	2.5	-	[Kgf]	***Note 2-9***

Note 2-9: Test Method:

The point is at a distance from right-downside 25mm x 25mm defined as the Start Point of Measure Points, and the point is at a distance 25mm from left-side & around 10mm from PCB defined as the End Point.

Align 50mm x 50mm block from Start Point on the Bezel Back, and the corners of each block are Measure Points.

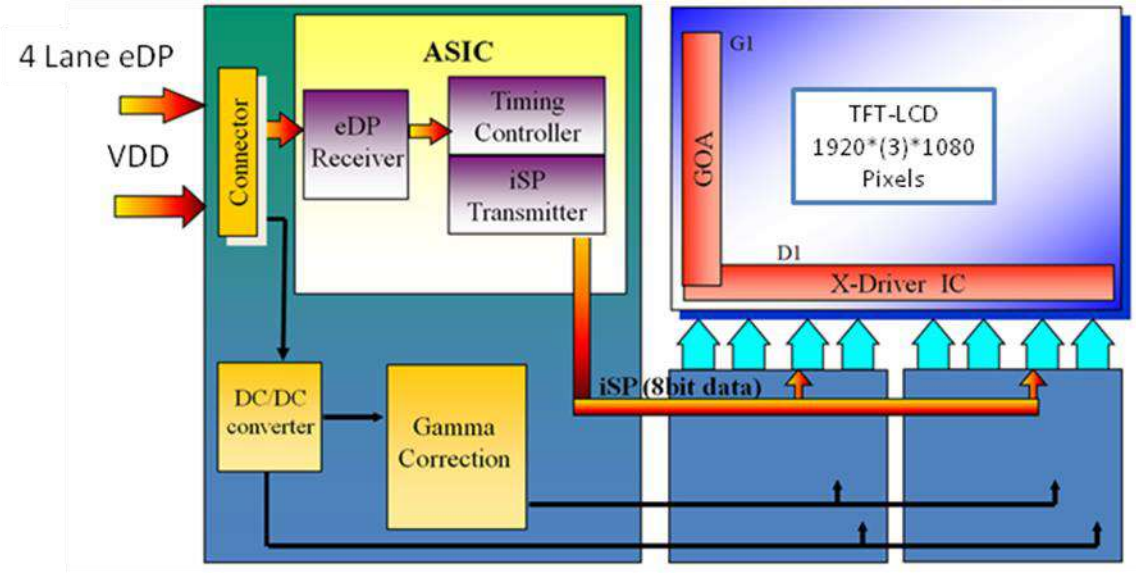
If the distance from the last block to each side of the End Point ≧ 25mm, add other blocks to make sure that most area of Bezel Back can be measured.



3 TFT-LCD Module

3.1 Block Diagram

The following shows the block diagram of the 27 inch Color TFT-LCD Module.



3.2 Interface Connection

3.2.1 Connector Type

TFT-LCD Connector	Manufacturer	STARCONN (CHIEF LAND)
	Part Number	115F40-R000RA-M3
Mating Connector	Manufacturer	STARCONN or Compatible
	Part Number	115H40-0000TA-00-R (Locked Type)

3.2.2 Connector Pin Assignment

PIN #	Symbol	Description	Remark
1	GND	Ground	
2	AUX1N	Negative AUX input(display port 1)	
3	AUX1P	Positive AUX input(display port 1)	
4	GND	Ground	
5	D1_0P	Positive lane 0 input(display port 1)	
6	D1_0N	Negative lane 0 input(display port 1)	
7	GND	Ground	
8	D1_1P	Positive lane 1 input(display port 1)	
9	D1_1N	Negative lane 1 input(display port 1)	
10	GND	Ground	
11	D1_2P	Positive lane 2 input(display port 1)	
12	D1_2N	Negative lane 2 input(display port 1)	
13	GND	Ground	
14	D1_3P	Positive lane 3 input(display port 1)	
15	D1_3N	Negative lane 3 input(display port 1)	
16	GND	Ground	
17	N.C	No connection (for AUO test only. Do not connect)	
18	N.C	No connection (for AUO test only. Do not connect)	
19	N.C	No connection (for AUO test only. Do not connect)	
20	N.C	No connection (for AUO test only. Do not connect)	
21	GND	Ground	
22	N.C	No connection (for AUO test only. Do not connect)	
23	N.C	No connection (for AUO test only. Do not connect)	
24	N.C	No connection (for AUO test only. Do not connect)	
25	N.C	No connection (for AUO test only. Do not connect)	
26	N.C	No connection (for AUO test only. Do not connect)	
27	GND	Ground	
28	N.C	No connection (for AUO test only. Do not connect)	

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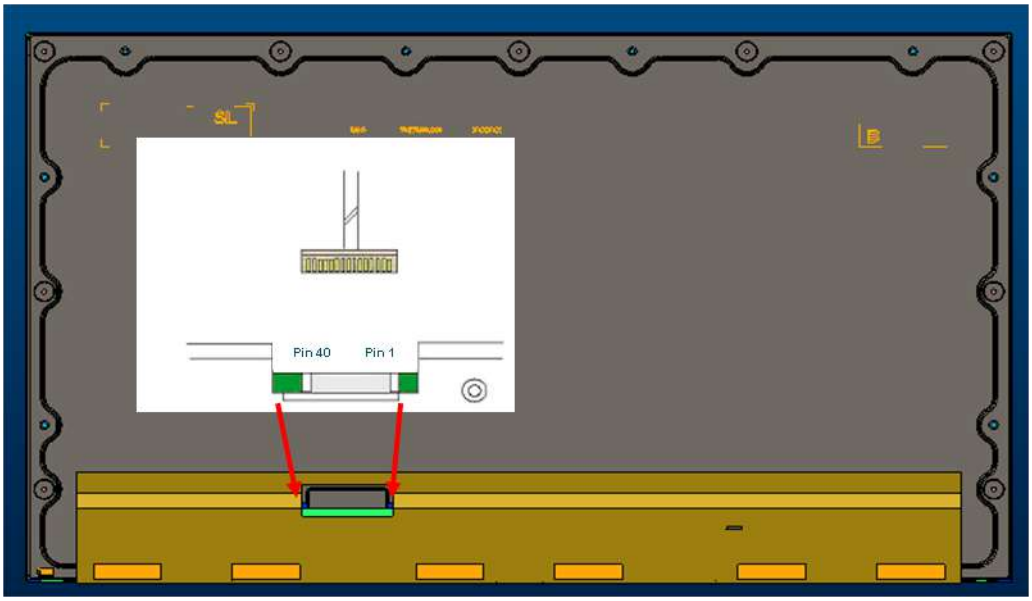
29	N.C	No connection (for AUO test only. Do not connect)	
30	N.C	No connection (for AUO test only. Do not connect)	
31	GND	Ground	
32	N.C	No connection (for AUO test only. Do not connect)	
33	HPD	Hot plug detection	
34	IMS_POL	Interlace Mode Selection Polarity	
35	IMS	Interlace Mode Selection	
36	VDD	Power +12V	
37	VDD	Power +12V	
38	VDD	Power +12V	
39	VDD	Power +12V	
40	VDD	Power +12V	



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3.3 Electrical Characteristics

3.3.1 Absolute Maximum Rating

Permanent damage may occur if exceeding the following maximum rating.

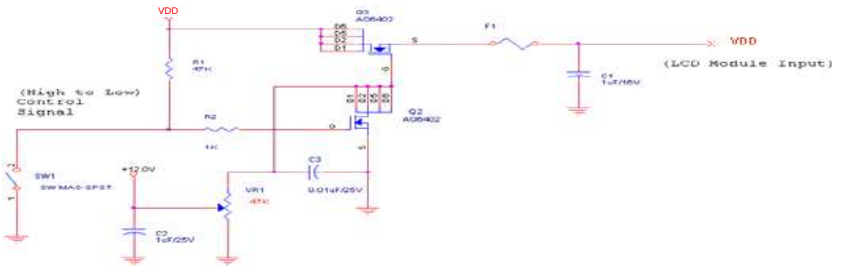
Symbol	Description	Min	Max	Unit	Remark
VDD	Power Supply Input Voltage	GND-0.3	14.0	[Volt]	Ta=25°C

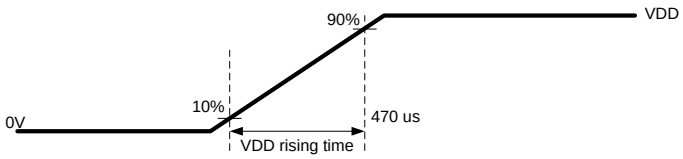
3.3.2 Recommended Operating Condition (Simulation result)

Symbol	Description	Min	Typ	Max	Unit	Remark
VDD	Power supply Input voltage	10.8	12.0	13.2	[Volt]	
IDD	Power supply Input Current (RMS)	-	0.4	0.6	[A]	VDD= 12.0V, White Pattern, Fv=144Hz
PDD	VDD Power Consumption	-	4.8	7.2	[Watt]	VDD= 12.0V, White Pattern, Fv=144Hz
IRush	Inrush Current	-	-	3	[A]	***Note 3-1***
VDDrp	Allowable VDD Ripple Voltage	-	-	VDD*5%	[mV]	VDD= 12.0V, White Pattern, Fv=144Hz

Note 3-1: Inrush Current measurement:

Test circuit:





The duration of VDD rising time: 470us.

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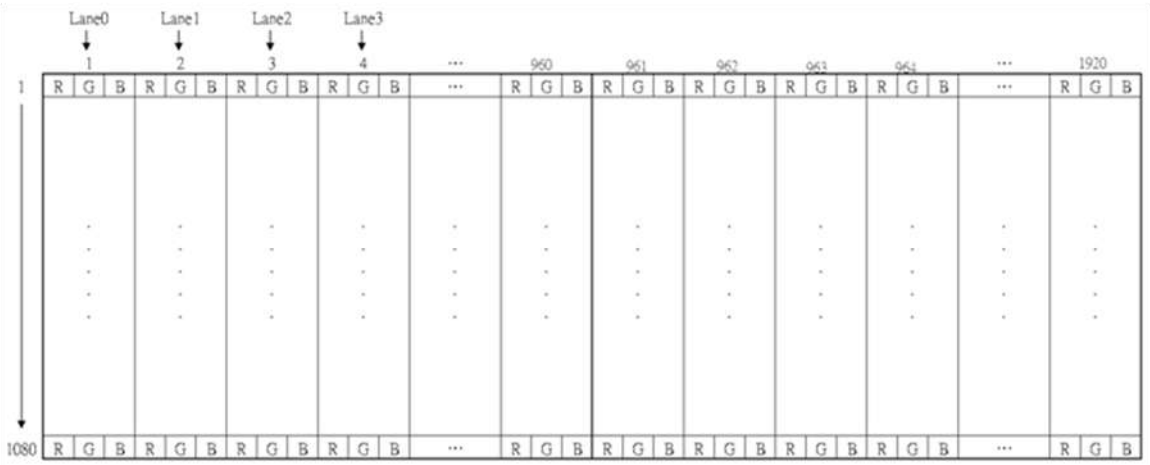
3.4 Signal Characteristics

3.4.1 LCD Pixel Format



Note 3-2: The module use 4 Lanes eDP interface.

Lane0：1+4n pixel
Lane1：2+4n pixel
Lane2：3+4n pixel
Lane3：4+4n pixel
n=0~479

3.4.2 eDP Data Format

1st Lane0	1st Lane1	1st Lane2	1st Lane3
R1-7:0	R2-7:0	R3-7:0	R4-7:0
G1-7:0	G2-7:0	G3-7:0	G4-7:0
B1-7:0	B2-7:0	B3-7:0	B4-7:0
R5-7:0	R6-7:0	R7-7:0	R8-7:0
G5-7:0	G6-7:0	G7-7:0	G8-7:0
B5-7:0	B6-7:0	B7-7:0	B8-7:0
R9-7:0	R10-7:0	R11-7:0	R12-7:0
G9-7:0	G10-7:0	G11-7:0	G12-7:0
B9-7:0	B10-7:0	B11-7:0	B12-7:0
. . .	. . .	. . .	. . .

3.4.3 Color versus Input Data

The following table is for color versus input data (8bit). The higher the gray level, the brighter the color.

Color	Gray Level	Color Input Data																								Remark
		RED data (MSB:R7, LSB:R0)								GREEN data (MSB:G7, LSB:G0)								BLUE data (MSB:B7, LSB:B0)								
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	
Black	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
White	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Gray 127	-	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	
Red	L0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Black
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	L255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Green	L0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Black
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	L255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
Blue	L0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Black
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	L255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	

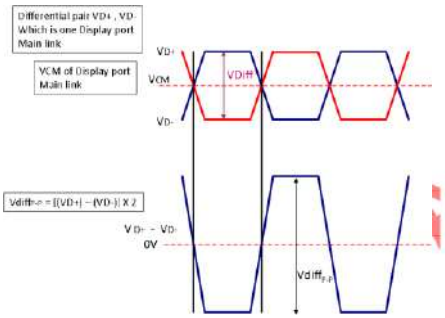
3.4.4 eDP Specification

a. DisplayPort main link signal:

DisplayPort main link					
		Min	Typ	Max	unit
Frequency	Main link Frequency	-	2.7	-	Gbps
UI	Unit Interval	-	370	-	ps
VCM	RX input DC Common Mode Voltage	-	0	-	[Volt]
$VDiff_{P-P}$	Peak-to-peak Voltage at a receiving Device	150	-	-	[mVolt]
Down_Spread_Freq	Link clock down spread frequency	30	-	33	KHz
Down_Spread_Amplitude	Link clock down spread amplitude	-	-	0.5	%

Point	Time (UI)	Voltage (V)
1	0.245	0
2	0.5	75mV
3	0.755	0
4	0.5	-75mV

Figure 5.55.3 Downstream Device EYE Mask at Receiver Connector for HBR



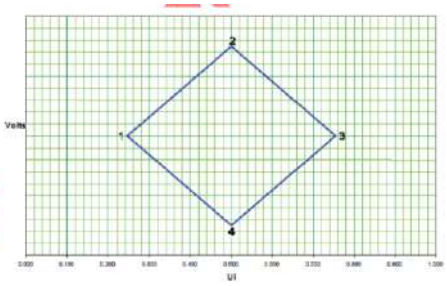
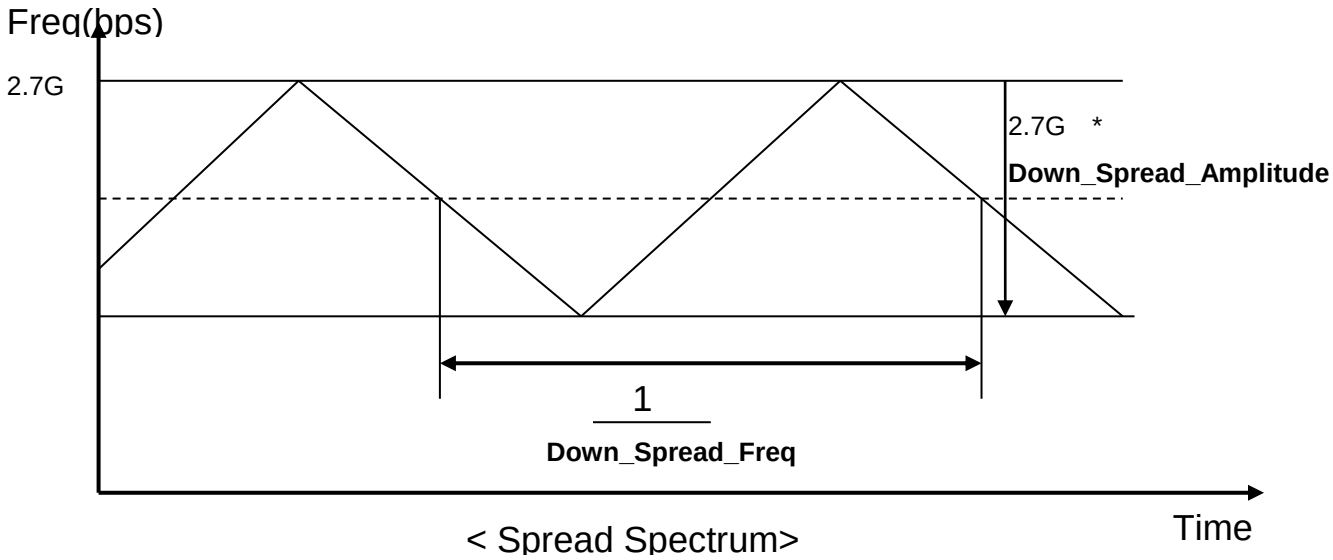


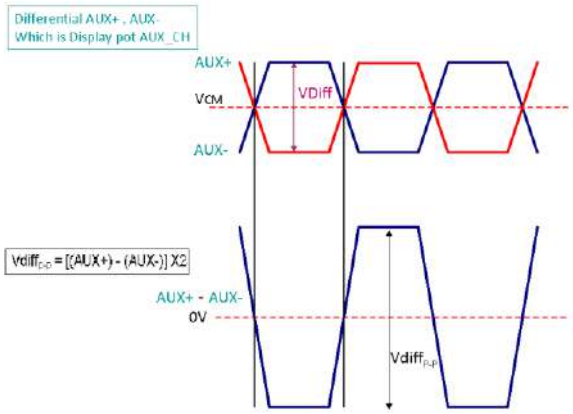
Figure 5.55.1 Downstream Device EYE Mask at Receiver Connector Pins



< Spread Spectrum>

b. DisplayPort AUX_CH signal:

DisplayPort AUX_CH					
		Min	Typ	Max	unit
VCM	AUX DC Common Mode Voltage	0	-	2.0	[Volt]
$VDiff_{P-P}$	AUX Peak-to-peak voltage at a receiving device	0.27	-	1.36	[Volt]



c. DisplayPort VHPD signal:

Display Port VHPD					
		Min	Typ	Max	unit
VHPD	HPD Voltage	2.25	-	3.6	[Volt]

d. Intra-Pair skew

LRX-SKEW-INTRA_PAIR					
		Min	Typ	Max	unit
LRX-SKEW-INTRA_PAIR	Lane Intra-pair Skew Tolerance	-	-	60	[ps]

e. Inter-Pair Skew

LRX-SKEW-INTER_PAIR					
		Min	Typ	Max	unit
LRX-SKEW-INTER_PAIR	Lane-to-Lane Skew at RX package pins	-	-	5200	[ps]

3.4.5 Input Timing Specification

The input timing are shown as the following table.

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
Tv	Vertical Section	Period	1100	1125	5608	Th	
Tdisp (v)		Active	1080	1080	1080	Th	
Tblk (v)		Blanking	20	45	4528	Th	
Fv		Frequency	30	120	144	Hz	*Note 3-3*
Th	Horizontal Section	Period	2080	2200	2320	Tclk	
Tdisp (h)		Active	1920	1920	1920	Tclk	
Tblk (h)		Blanking	160	280	400	Tclk	
Fh		Frequency	65.4	135.0	166.6	KHz	*Note 3-4*
Tclk	Pixel Clock	Period	2.9	3.4	7.4	ns	1/Fclk
Fclk		Frequency	136.0	297.0	350.0	MHz	*Note 3-5*
Link Rate per lane			2.7			Gbps	

Note 3-3: The optimal Vertical Frequency is 119~144 Hz for best picture quality

Note 3-4: The equation is listed as following. Please don't exceed the above recommended value.

Fh (Typ.) = Fclk (Typ.) / Th (Typ.)

Fh (Min.) $\leqq$ Fclk / Th $\leqq$ Fh (Max.)

Note 3-5: The equation is listed as following. Please don't exceed the above recommended value.

Fclk (Typ.) = Fv (Typ.) x Th (Typ.) x Tv (Typ.);

Fclk (Min.) < Fv x Th x Tv < Fclk (Max.)

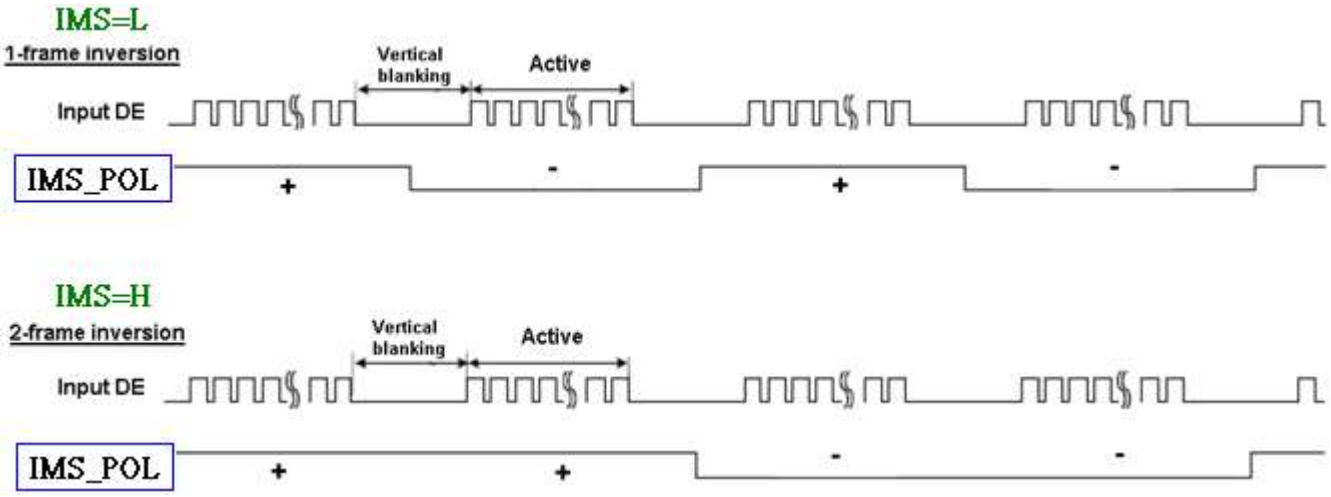
3.4.6 3D Control

3.4.6.1. 3D control I/O Characteristics

Pin #	Symbol	I/O	Buffer	Description	Remark
pin 34	IMS_POL	O	4mA	Frame Inversion polarity Index IMS=L :1-frame inversion IMS=H :2-frame inversion	***Note 3-7***
pin 35	IMS	I	IPL*	3D enable control signal	

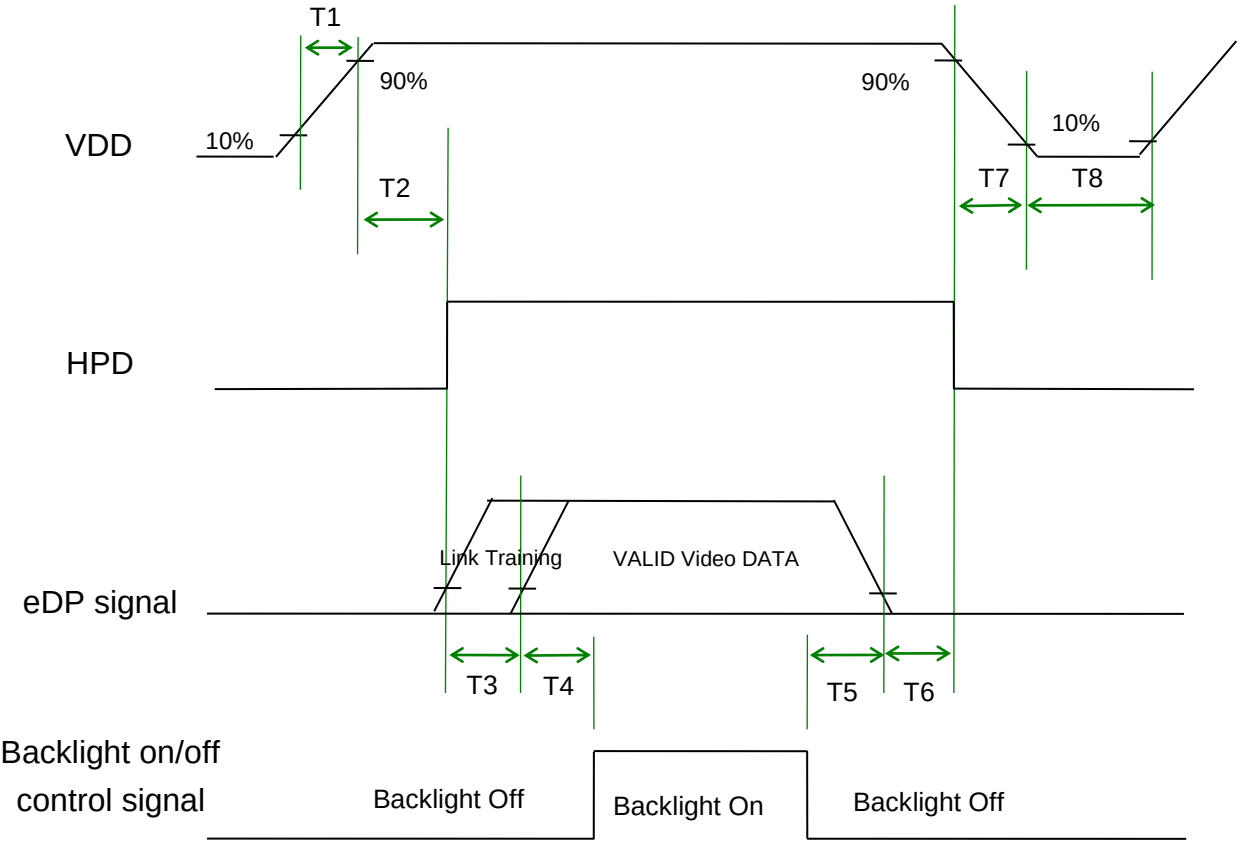
* IPL : internal pull low

Note 3-7



3.5 Power ON/OFF Sequence

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



Power Sequence Timing

Symbol	Value			Unit	Remark
	Min.	Typ.	Max.		
T1	0.5	-	10	[ms]	
T2	0	-	200	[ms]	
T3	0	-	-	[ms]	***Note 3-8***
T4	500	-	-	[ms]	
T5	100	-	-	[ms]	
T6	0		50	[ms]	***Note 3-9*** ***Note 3-10***
T7	0	-	200	[ms]	***Note 3-10*** ***Note 3-11***
T8	1000	-	-	[ms]	

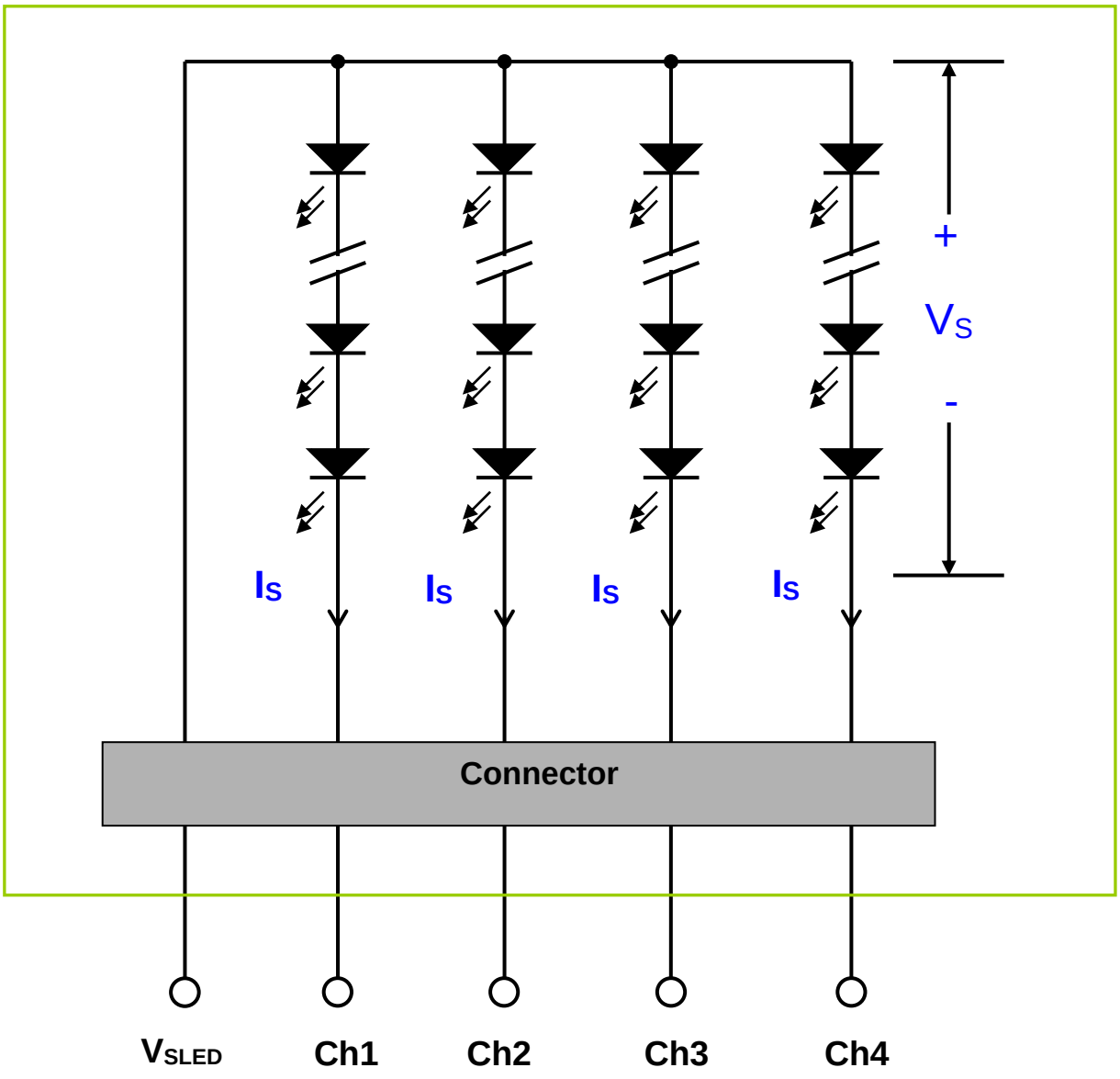
Note 3-8: During T3 period , eDP link training time by customer's system.

Note 3-9: Recommend setting T6 = 0ms to avoid electronic noise when VDD is off.
Note 3-10: During T6 and T7 period , please keep the level of input eDP signals with Hi-Z state.
Note 3-11: Voltage of VDD must decay smoothly after power-off.(customer system decide this value)

4 Backlight Unit

4.1 Block Diagram

The following shows the block diagram of the 27 inch Backlight Unit. And it includes 72 pcs LED in the LED light bar. (4 strings and 18 pcs LED of one string).



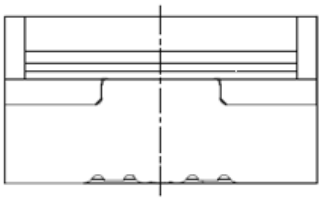
4.2 Interface Connection

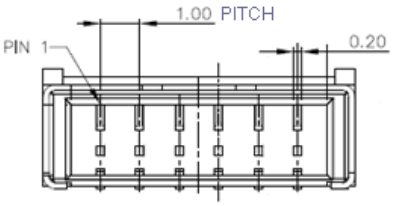
4.2.1 Connector Type

Backlight Connector	Manufacturer	CviLux
	Part Number	CI1406M1VLD-NH
Mating Connector	Manufacturer	CviLux
	Part Number	CI1406SL000-NH(Lock)

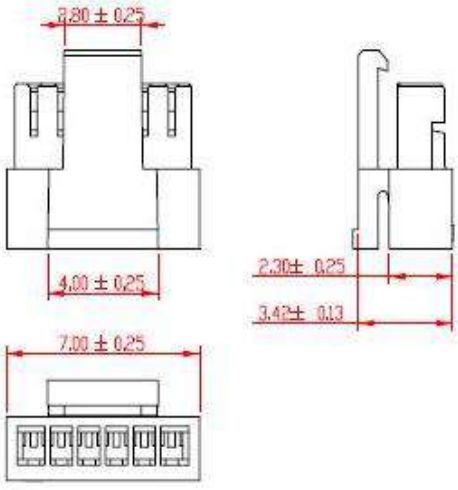
Backlight Connector dimension:

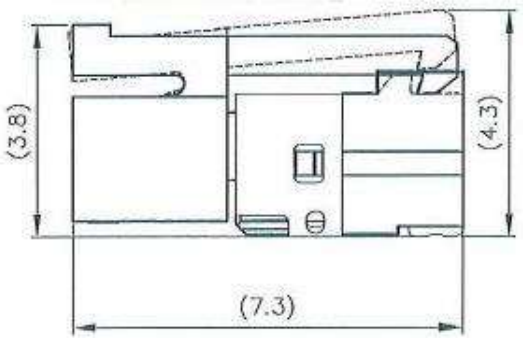
$H \times V \times D = 13.9 \times 3.00 \times 4.25, Pitch = 1.0(unit = mm)$





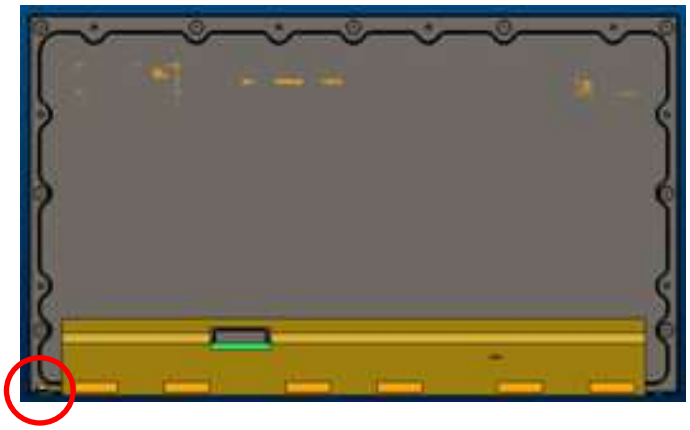
Mating Connector dimension:

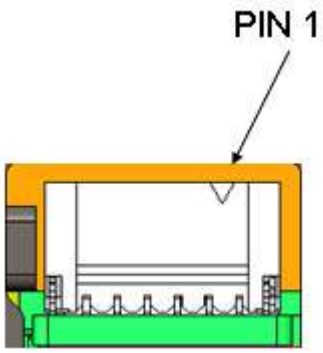




4.2.2 Connector Pin Assignment

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)	





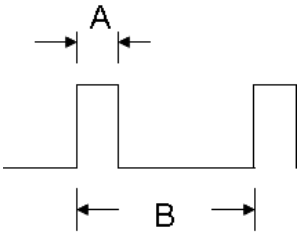
4.3 Electrical Characteristics

4.3.1 Absolute Maximum Rating

Permanent damage may occur if exceeding the following maximum rating.

(Ta=25°C)

Symbol	Description	Min	Max	Unit	Remark
Is	LED String Current	0	150	[mA]	100% duty ratio
			300	[mA]	*Duty ratio≦ 10%* *Pulse time=10 ms*



Duty ratio= (A / B) X 100% ; (A: Pulse time, B: Period)

4.3.2 Recommended Operating Condition

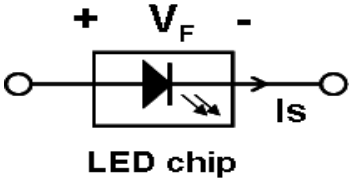
(Ta=25℃)

Symbol	Description	Min.	Typ.	Max.	Unit	Remark
Is	LED String Current	-	80	88	[mA]	100% duty ratio of LED chip, ***Note 4-6***
Vs	LED String Voltage	50.4	54	57.6	[Volt]	Is=80mA @ 100% duty ratio; ***Note 4-1, Note 4-5, Note 4-7***
ΔVs	Maximum Vs Voltage Deviation of light bar	-	-	3.6	[Volt]	Is=80mA @ 100% duty ratio; ***Note 4-2***
P_{BLU}	LED Light Bar Power Consumption	-	17.3	18.4	[Watt]	***Note 4-3***
LT_{LED}	LED Life Time	30,000	-	-	[Hour]	***Note 4-4***
OVP	Over Voltage Protection in system board	110% Vsmax	-	-	[Volt]	***Note 4-5***

Note 4-1: Vs (Typ.) = V_F (Typ.) X LED No. (one string);

a. V_F: LED chip forward voltage, V_F (Min.)=2.8V, V_F(Typ.)=3.0V, V_F(Max.)=3.2V

b. The same euqation to calculate Vs(Min.) & Vs (Max.) for respective V_F (Min.) & V_F(Max.);



Note 4-2: ΔVs (Max.) = ΔV_F X LED No. (one string);

a. ΔV_F: LED chip forward voltage deviation; (0.2 V , each Bin of LED V_F)

Note 4-3: P_{BLU} (Typ.) = Vs (Typ.) X Is (Typ.) X 4 ; (4 is total String No. of LED Light bar)

P_{BLU} (Max.) = Vs (Max.) X Is (Typ.) X 4 ;

Note 4-4: Definition of life time:

a. Brightness of LED becomes to 50% of its original value

b. Test condition: Is = 80mA and 25℃ (Room Temperature)

Note 4-5: 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 (Vs) at least.

Note 4-6: AUO strongly recommend "Analog Dimming" method for backlight brightness control for Wavy Noise Free. Otherwise, recommend that Dimming Control Signal (PWM Signal) should be synchronized with Frame Frequency.

Note 4-7: Ensure that the LED light bar is not subjected either forward or reverse voltage while monitor set is on standby mode or not in use.

5 Reliability Test

AUO reliability test items are listed as following table. (*Bare Panel only*)

Items	Condition	Remark
Temperature Humidity Bias (THB)	Ta= 50°C, 80%RH, 300hours	
High Temperature Operation (HTO)	Ta= 50°C, 50%RH, 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 Grms 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	***Note 5-1***
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: ± 15KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point.	***Note 5-2***
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 8 points, 25 times/ point.	
Altitude Test	Operation:18,000 ft Non-Operation:40,000 ft	

Note 5-1: a. 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.

b. After finish temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

Note 5-2: EN61000-4-2, ESD class B: Certain performance degradation allowed
No data lost
Self-recoverable
No hardware failures.

ESD discharged points should avoid display area and periphery front bezel of display area.

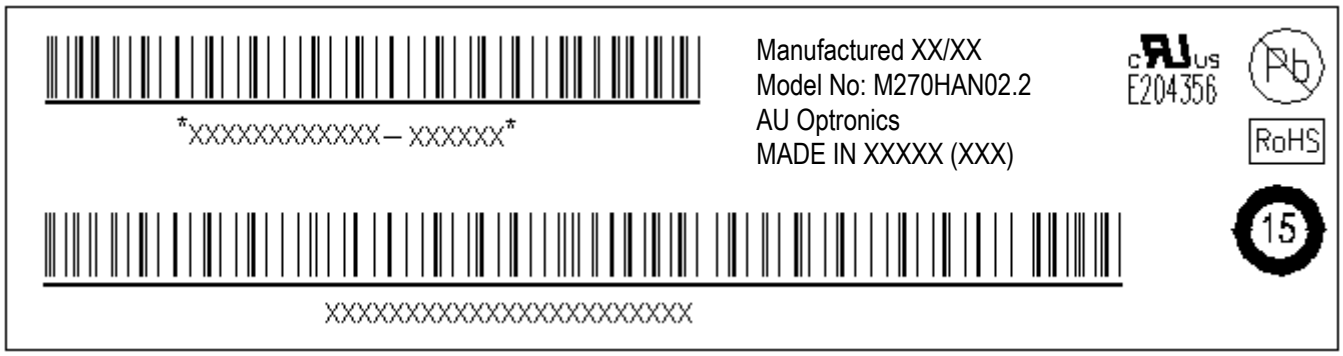
Suggest points were 4 side parallel edge of display area surface.

Metal front bezel must cover half area of BM (black matrix) and metal front bezel must connect with metal back bezel to protect source IC of panel by ESD damaged.

Note5-3 : Result Evaluation Criteria:
TFT-LCD panels test should take place after gradually cooling enough at room temperature
In the normal application, there should be no particular problems that may affect the display function.

6 Shipping Label

The label is on the panel as shown below:



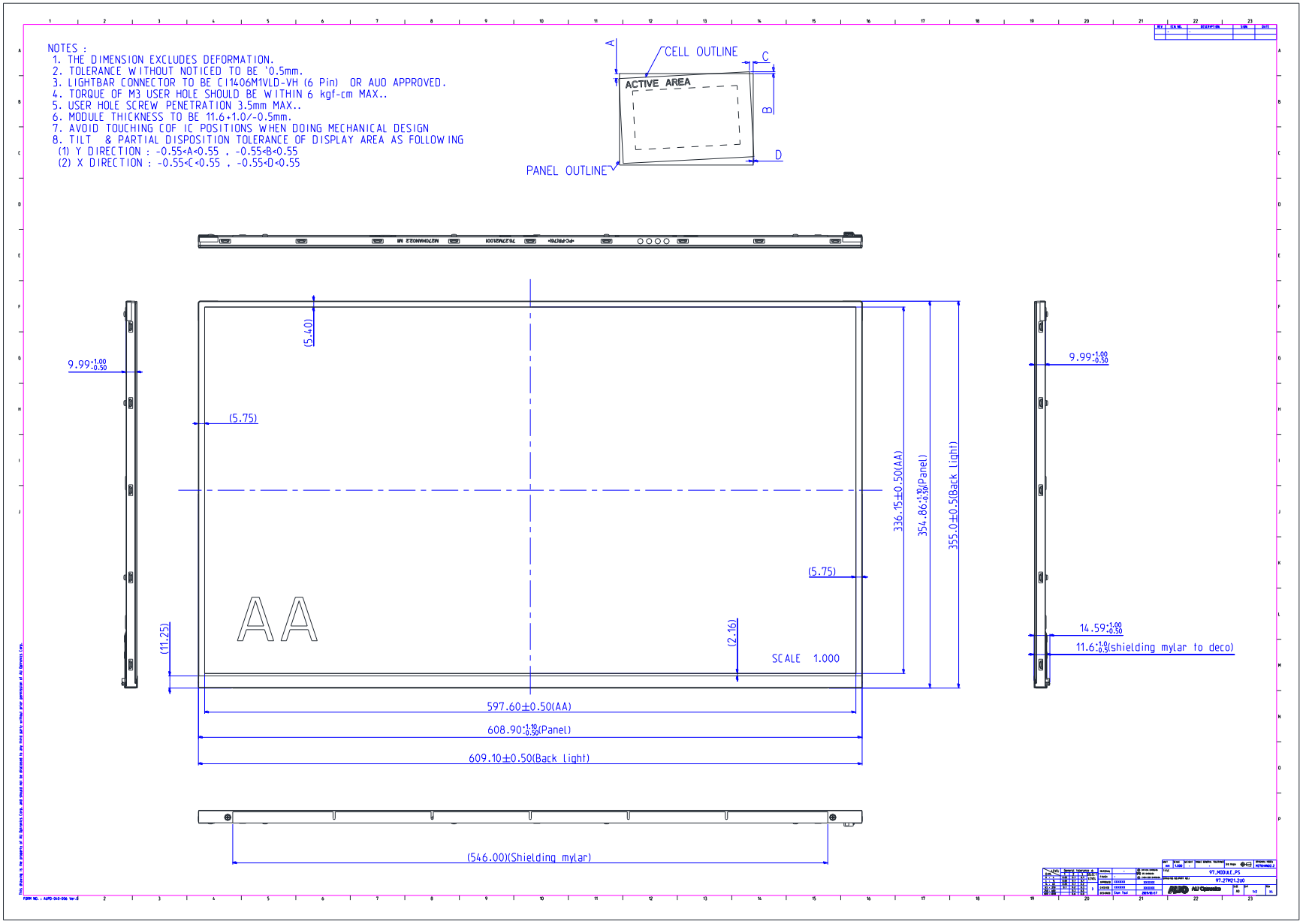
Note 6-1: For Pb Free products, AUO will add for identification.

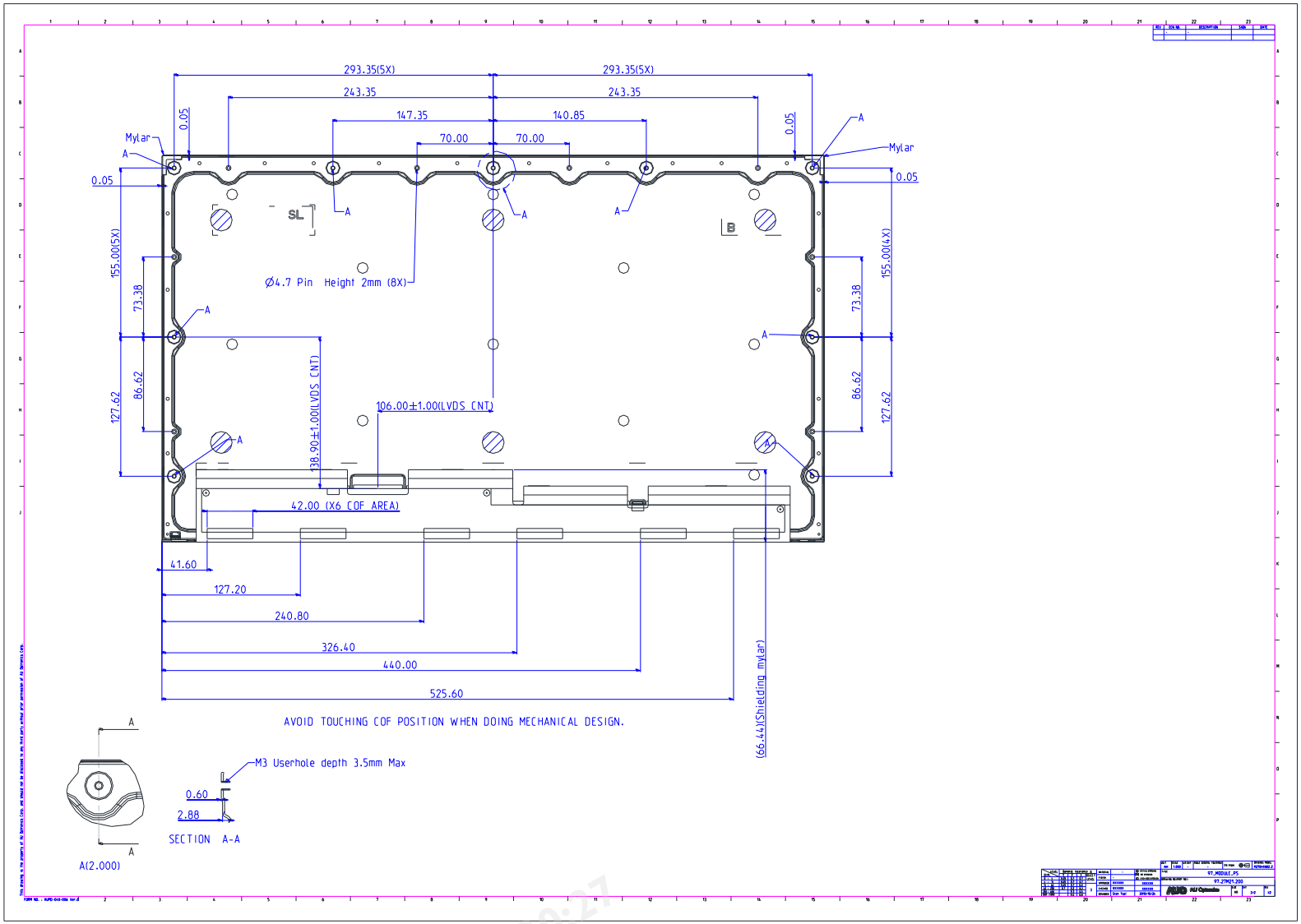
Note 6-2: For RoHS compatible products, AUO will add for identification.

Note 6-3: For China RoHS compatible products, AUO will add for identification.

Note 6-4: The Green Mark will be presented only when the green documents have been ready by AUO Internal Green Team.

7 Mechanical Characteristics



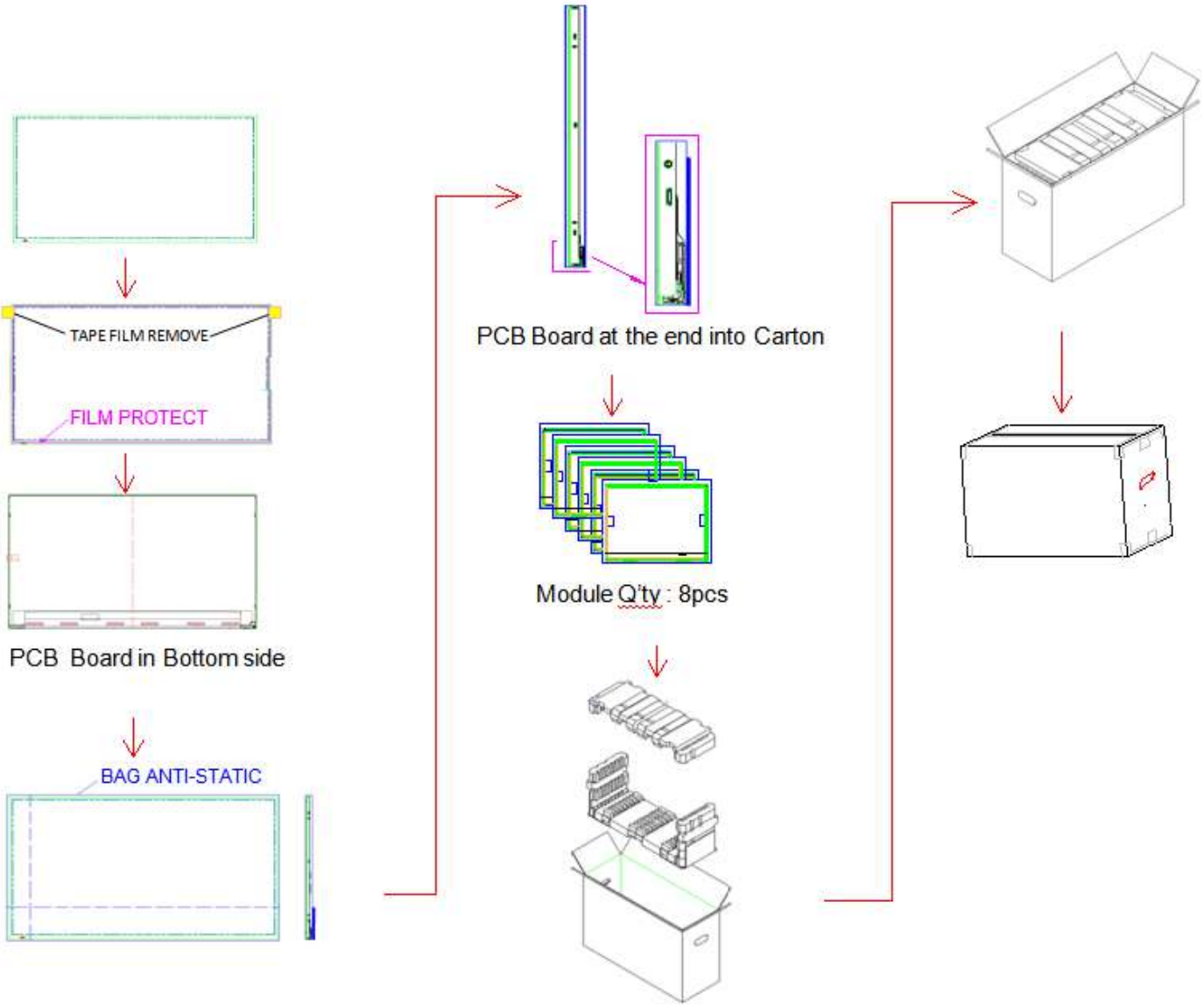


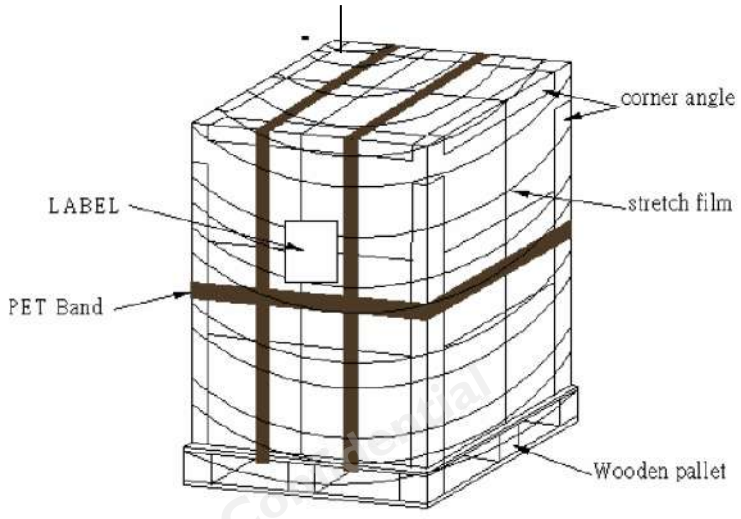
(1) Avoid touching COF position when doing mechanical design

(2) The user hole depth of the light bar side is different from the other side

8 Packing Specification

8.1 Packing Flow





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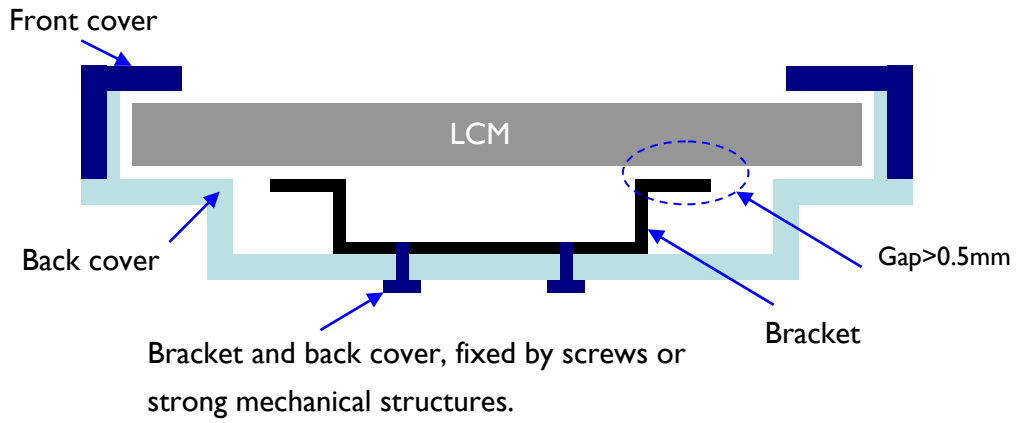
8.2 Pallet and shipment information

Item	Specification			Remark
	Q'ty	Dimension	Weight(kg)	
Panel	1	609.1(H) x 355.0(V) x 11.6(D)	3.22	
Cushion	1	-	0.9	
Box	1	702(L)mm x 264(W)mm x 456(H)mm	1.2	without Panel & cushion
Packing Box	8 pcs/Box	702(L)mm x 264(W)mm x 456(H)mm	27.86	with panel & cushion & Box
Pallet	1	1070(L)mm x 740(W)mm x 132(H)mm	14.8	
Pallet after Packing	8 boxes/pallet	1070(L)mm x 740(W)mm x 1086(H)mm	237.68	

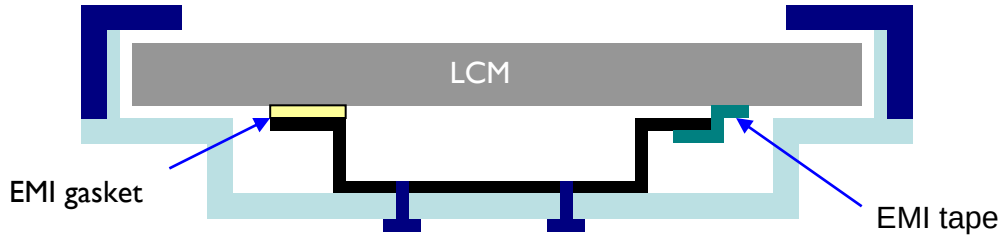
9 Design Guide for System

9.1 The gap between LCM and system rear bracket should be bigger than 0.5mm.

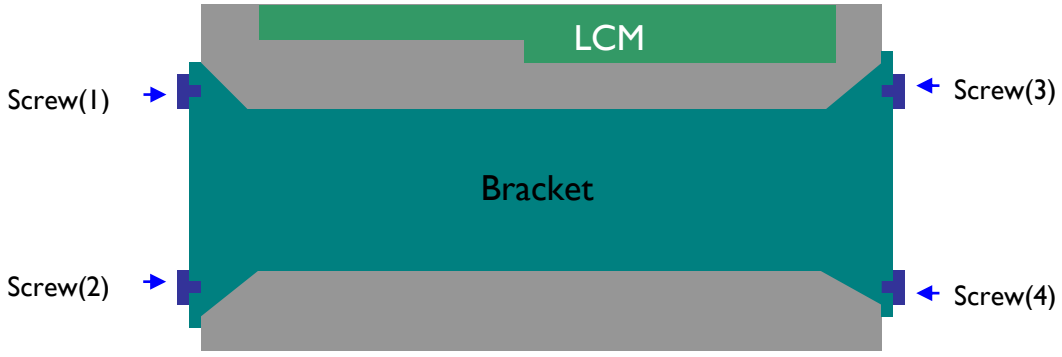
9.2 The system bracket should be fixed on back cover firmly.



9.3 The EMI gasket should be uniform and not push panel strongly.

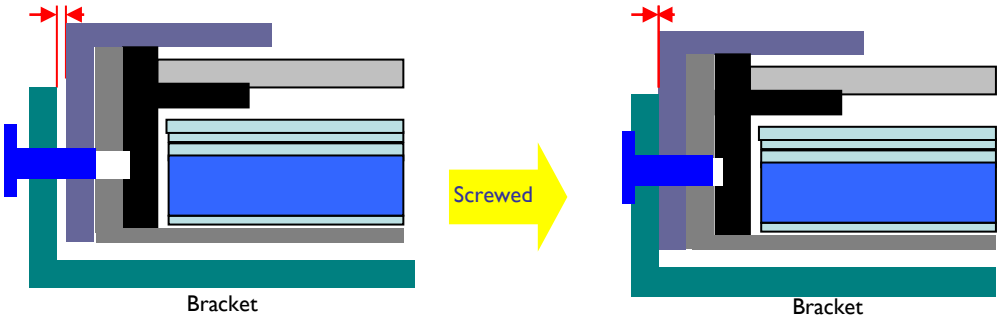
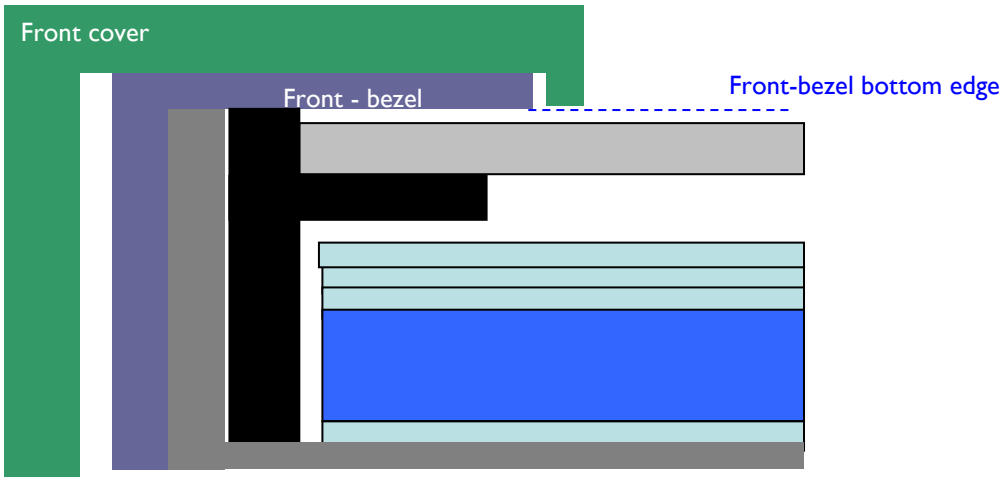


9.4 For stable assembly, the system bracket should use 4 screws to fix system and panel by dual sides.



9.5 The system bracket and panel should be in parallel with having no gap after inserting screws.

Proper and Parallel gap	0 gap and no mechanical damage



9.6 Avoid scratching LCM, the rib on system front-cover should not exceed the bottom edge of LCM's front-bezel.