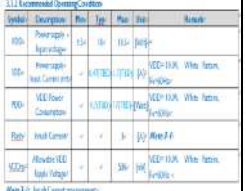
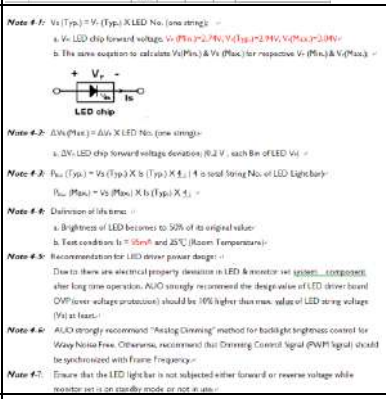
() Preliminary Specification
(V) Final Specification

Module	27" Color TFT-LCD
Model Name	M270QAN06.0

Customer	Date	Approved by	Date
_____	_____	*PY Cheng*	Aug 11, 2022
Approved by		Prepared by	Date
_____	_____	*Chiyinwu*	Aug 11, 2022
		AU Optronics corporation	

Contents

Record of Revision

Version	Date	Page	Old description	New Description	Remark
0.0	2020/7/20	All		First editing _Preliminary	
	20210708	18		3.3.2 Recommended Operating Condition Symbol / Item / Min. / Typ. / Max. / Unit / Note VDD — Power Supply Input Range — 9.5 — 10 — 10.5 — [Volt] — IDD — Current of Power Supply@60Hz — White — → — 0.44 — 0.53 — [A] — Note3-1 IDD — Current of Power Supply@60Hz — Black — → — 0.39 — 0.47 — [A] — Note3-1 IDD — Current of Power Supply@60Hz — H-stripe — → — 1.17 — 1.41 — [A] — Note3-1 IDD — Current of Power Supply@62Hz — White — → — 0.45 — 0.54 — [A] — Note3-1 IDD — Current of Power Supply@62Hz — Black — → — 0.4 — 0.48 — [A] — Note3-1 IDD — Current of Power Supply@62Hz — H-stripe — → — 1.2 — 1.44 — [A] — Note3-1 PDD — VDD Power Consumption@60Hz — → — 4.4 — 5.3 — [Watt] — White PDD — VDD Power Consumption@62Hz — → — 12 — 14.4 — [Watt] — H-stripe IRUSH — Inrush current — → — - — 3 — [A] — Note3-2 VDDrp — Allowable VDD Ripple Voltage — — — 500 — [mV] — VDD=10.0V, White Pattern @Maxi Frame rate *Note 3-1:* Inrush Current measurement:	
	20210708	5		Power Consumption (LCD Module + Backligh unit) — [Watt] — TBD(Typ.) LCD module : PDD (Typ.)= 4.4 @ White pattern,Fv=60Hz Backlight unit : P_{BLU} (Typ.) =16.7 (TBD) @Is=80 mA	
	20210709	5		Power Consumption (LCD Module + Backligh unit) — [Watt] — TBD(Typ.) LCD module : PDD (Typ.)= 4.4 @ White pattern,Fv=60Hz Backlight unit : P_{BLU} (Typ.) =20.1 W(TBD) @Is=95 mA (TBD)	
	20210709	7			
	20210709	32			
	20210709	33		*Note 4-1:* Vs (Typ.) = V- (Typ.) X LED No. (one string) a. V-: LED chip forward voltage. b. The same equation to calculate Vs(Min.) & Vs (Max.) for respective V- (Min.) & V-(Max.). LED chip *Note 4-2:* ΔVs(Max.) = ΔV- X LED No. (one string) a. ΔV-: LED chip forward voltage deviation; 0.2 V , each Bin of LED V- *Note 4-3:* P_{BLU} (Typ.) = Vs (Typ.) X Is (Typ.) X # (# = total String No. of LED Lightbar) P_{BLU} (Max.) = Vs (Max.) X Is (Typ.) X # *Note 4-4:* Definition of life time: a. Brightness of LED becomes to 50% of its original value. b. Test conditions: Is = 95mA and 25°C (Room Temperature). *Note 4-5:* Recommendation for LED driver power design: Due to there are electrical property deviation in LED & inverter 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 lightbar is not subjected either forward or reverse voltage while monitor set is on standby mode or not in use.	
	20210721	14		TFT-LCD Connector — Manufacturer: JAE / STM TFT-LCD Connector — Part Number: HD2S030HA2 / MSAK24025P30M Mating Connector — Manufacturer: IPEX or Compatible Mating Connector — Part Number: IPEX 20453-030T	

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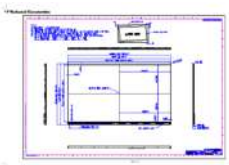
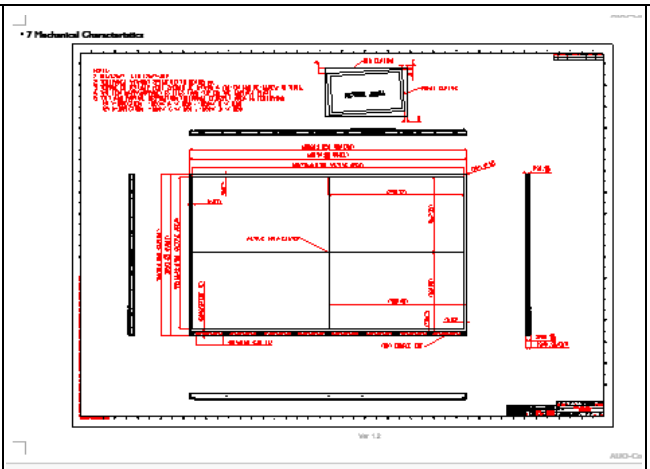
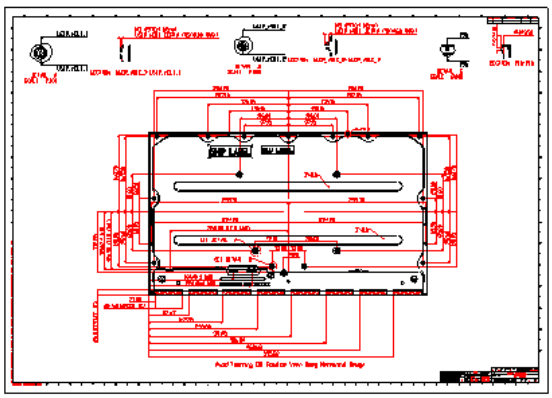
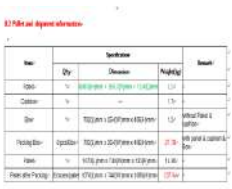
<tr><td></td><td></td><td>36/37</td><td> 
  </td><td> 
  </td><td></td></tr>
<tr><td>1.0</td><td>22020811</td><td>All</td><td></td><td>Final 1.0</td><td></td></tr>
<tr><td></td><td></td><td>38</td><td>  </td><td>8.2 Pallet and shipment information
<table>
<tr><th rowspan="2">Item</th><th colspan="3">Specification</th><th rowspan="2">Remark</th></tr>
<tr><th>Q'ty</th><th>Dimension</th><th>Weight(kg)</th></tr>
<tr><td>Panel</td><td>1</td><td>608.8(H)mm × 355.3(V)mm × 13.4(D)mm</td><td>3.2</td><td></td></tr>
<tr><td>Cushion</td><td>1</td><td>--</td><td>0.75</td><td></td></tr>
<tr><td>Box</td><td>1</td><td>702(L)mm x 264(W)mm x 456(H)mm</td><td>1.2</td><td>without Panel & cushion</td></tr>
<tr><td>Packing Box</td><td>8 pcs/Box</td><td>702(L)mm x 264(W)mm x 456(H)mm</td><td>27.55</td><td>with panel & cushion & Box</td></tr>
<tr><td>Pallet</td><td>1</td><td>1070(L)mm x 740(W)mm x 132(H)mm</td><td>14.80</td><td></td></tr>
<tr><td>Pallet after Packing</td><td>8 boxes/pallet</td><td>1070(L)mm x 740(W)mm x 1086(H)mm</td><td>235.2</td><td></td></tr>
</table></td><td></td></tr>
<tr><td></td><td></td><td>7</td><td>  </td><td><table>
<tr><th>ITEMS</th><th>Unit</th><th>SPECIFICATIONS</th></tr>
<tr><td>Screen Diagonal</td><td>[mm]</td><td>27"(26.96")</td></tr>
<tr><td>Active Area</td><td>[mm]</td><td>596.736 (H) x 335.664 (V)</td></tr>
<tr><td>Pixels H x V</td><td>--</td><td>3840(x3) x 2160</td></tr>
<tr><td>Pixel Pitch</td><td>[um]</td><td>155.4 (per one triad) ×155.4</td></tr>
<tr><td>Pixel Arrangement</td><td>--</td><td>R.G.B. Vertical Stripe. Source board at bottom Note 2-1</td></tr>
<tr><td>Display Mode</td><td>--</td><td>AHVA Mode(Advanced Hyper-Viewing Angle), Normally Black</td></tr>
<tr><td>White Luminance (Center)</td><td>[cd/m²]</td><td>350 (Typ.)</td></tr>
<tr><td>Contrast Ratio</td><td>--</td><td>1000 (Typ.)</td></tr>
<tr><td>Response Time</td><td>[msec]</td><td>14 (Typ., GTG)</td></tr>
<tr><td>Power Consumption (LCD Module + Backligh unit)</td><td>[Watt]</td><td>22.15(Typ.)
LCD module : PDD (Typ.)= 4.4 @ White pattern,Fv=60Hz
Backlight unit : P_{BLU} (Typ.) =17.75 W @Is=85 mA</td></tr>
<tr><td>Weight</td><td>[Grams]</td><td>3200</td></tr>
<tr><td>Outline Dimension</td><td>[mm]</td><td>608.8(H) × 355.3(V) × 13.4(D) Typ.</td></tr>
<tr><td>Electrical Interface</td><td>--</td><td>4 lane HBR2</td></tr>
<tr><td>Support Color</td><td>--</td><td>1.07M colors (RGB 8-bits + Hi_FRC)</td></tr>
<tr><td>Surface Treatment</td><td>--</td><td>SAG25% , 3H</td></tr>
<tr><td>Temperature Range
Operating
Storage (Shipping)</td><td>
[°C]
[°C]</td><td>
0 to +50
-20 to +60</td></tr>
<tr><td>RoHS Compliance</td><td>--</td><td>RoHS Compliance</td></tr>
<tr><td>TCO Compliance</td><td>--</td><td>TCO 8.0 Compliance</td></tr>
</table></td><td></td></tr>
</table>

9

2.3 Optical Characteristics

The optical characteristics are measured on the following test condition.

Test Condition:

1. Equipment setup: Please refer to **Note 2-3**.
2. Panel Lighting time: 30 minutes
3. VDD=10.0V, Fv=60Hz, Is=85 mA, Ta=25℃

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
L_w	White Luminance (Center of screen)		300	350	-	[cd/m2]	Note 2-3 By SR-3 Max=Peak
L_{uni}	Luminance Uniformity (9 points)		75	80	-	[%]	Note 2-4 By SR-3
CR	Contrast Ratio (Center of screen)		600	1000	-	-	Note 2-5 By SR-3
θ_R	Horizontal Viewing Angle (CR=10)	Right	75	89	-	[degree]	Note 2-6 By SR-3
θ_L		Left	75	89	-		
Φ_U	Vertical Viewing Angle (CR=10)	Up	75	89	-		
Φ_D		Down	75	89	-		
θ_R	Horizontal Viewing Angle (CR=5)	Right	75	89	-		
θ_L		Left	75	89	-		
Φ_U	Vertical Viewing Angle (CR=5)	Up	75	89	-		
Φ_D		Down	75	89	-		
T_{RT}		Falling Time	75	89	-		
		Rising + Falling	75	89	-		
T_{GTG}	Response Time	Gray To Gray	-	14	-	[msec]	Note 2-7 By TRD / 00
R_x	Color Coordinates (CIE 1931 / 1976)	Red x	0.620	0.650	0.680	-	By SR-3
R_y		Red y	0.310	0.340	0.370		
G_x		Green x	0.276	0.306	0.336		
G_y		Green y	0.607	0.637	0.667		
B_x		Blue x	0.117	0.147	0.177		
B_y		Blue y	0.029	0.059	0.089		
W_x		White x	0.283	0.313	0.343		
W_y		White y	0.299	0.329	0.359		
sRGB			-	99	-	[%]	By SR-3

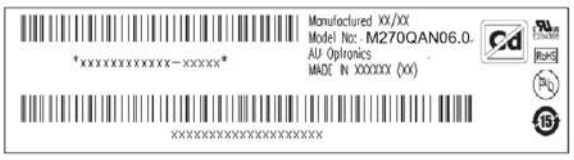
33

4.3.2 Recommended Operating Condition

(Ta=25℃)

Symb	Description	Min.	Typ.	Max.	Unit	Remark
Is	LED String Current	-	85	93.5	[mA]	100% duty ratio of LED chip, Note 4-6.
Vs	LED String Voltage	48.6	52.2	54.0	[Volt]	Is=85mA @ 100% duty ratio; Note 4-1, Note 4-5, Note 4-7.
ΔVs	Maximum Vs Voltage Deviation of light bar	-	-*	3.6	[Volt]	Is=85mA @ 100% duty ratio; Note 4-2.
P_{LB}	LED Light Bar Power Consumption	-	17.75	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.

36



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

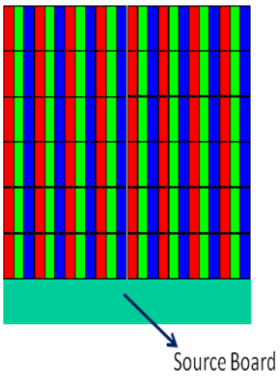
This specification applies to the 27 inch wide Color a-Si TFT-LCD Module M270QAN06.0. The display supports the UHD - 3840(H) x 2160(V) screen format and 1.07B colors (RGB 8-bits+Hi_FRC). The input interface is 4 lane HBR2 and this module doesn't contain an driver board for backlight.

2.1 Display Characteristics

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

ITEMS	Unit	SPECIFICATIONS
Screen Diagonal	[mm]	27"(26.96")
Active Area	[mm]	596.736 (H) x 335.664 (V)
Pixels H x V	-	3840(x3) x 2160
Pixel Pitch	[um]	155.4 (per one triad) ×155.4
Pixel Arrangement	-	R.G.B. Vertical Stripe. Source board at bottom ***Note 2-1***
Display Mode	-	AHVA Mode(Advanced Hyper-Viewing Angle) , Normally Black
White Luminance (Center)	[cd/m²]	350 (Typ.)
Contrast Ratio	-	1000 (Typ.)
Response Time	[msec]	14 (Typ., GTG)
Power Consumption (LCD Module + Backligh unit)	[Watt]	22.15(Typ.) LCD module : PDD (Typ.)= 4.4 @ White pattern,Fv=60Hz Backlight unit : P_{BLU} (Typ.) =17.75 W @Is=85 mA
Weight	[Grams]	3200
Outline Dimension	[mm]	608.8(H) × 355.3(V) × 13.4(D) Typ.
Electrical Interface	-	4 lane HBR2
Support Color	-	1.07M colors (RGB 8-bits + Hi_FRC)
Surface Treatment	-	SAG25% , 3H
Temperature Range Operating Storage (Shipping)	 [°C] [°C]	 0 to +50 -20 to +60
RoHS Compliance	-	RoHS Compliance
TCO Compliance	-	TCO 8.0 Compliance

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



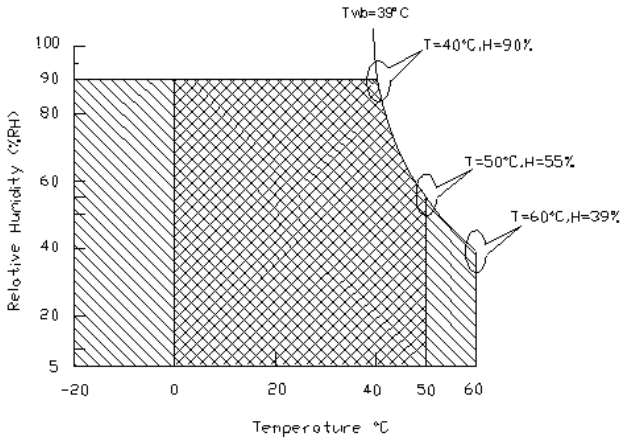
2.2 Absolute Maximum Rating of Environment

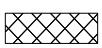
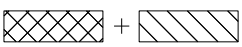
Permanent damage may occur if exceeding the following maximum rating.

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

Note 2-2: 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

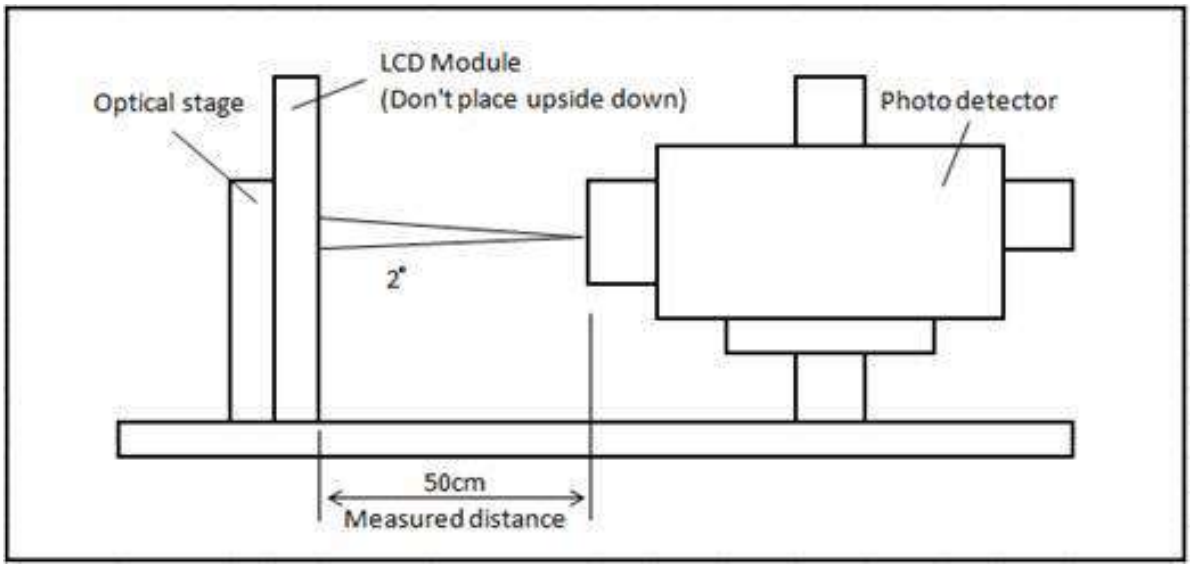
The optical characteristics are measured on the following test condition.

Test Condition:

1. Equipment setup: Please refer to ***Note 2-3***.
2. Panel Lighting time: 30 minutes
3. VDD=10.0V, Fv=60Hz,Is=85 mA,Ta=25°C

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
L_w	White Luminance (Center of screen)		300	350		[cd/m2]	***Note 2-3*** *By SR-3* **Max=Peak**
L_{uni}	Luminance Uniformity (9 points)		75	80	-	[%]	***Note 2-4*** *By SR-3*
CR	Contrast Ratio (Center of screen)		600	1000	-	-	***Note 2-5*** *By SR-3*
θ_R	Horizontal Viewing Angle (CR=10)	Right	75	89		[degree]	***Note 2-6*** *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_F		Falling Time	75	89			
-		Rising + Falling	75	89			
T_{GTG}	Response Time	Gray To Gray	-	14	-	[msec]	***Note 2-7*** *By TRD-100*
R_x	Color Coordinates (CIE 1931 / 1976)	Red x	0.620	0.650	0.680	-	*By SR-3*
R_y		Red y	0.310	0.340	0.370		
G_x		Green x	0.276	0.306	0.336		
G_y		Green y	0.607	0.637	0.667		
B_x		Blue x	0.117	0.147	0.177		
B_y		Blue y	0.029	0.059	0.089		
W_x		White x	0.283	0.313	0.343		
W_y		White y	0.299	0.329	0.359		
sRGB				99		[%]	*By SR-3*

Note 2-3: Equipment setup :

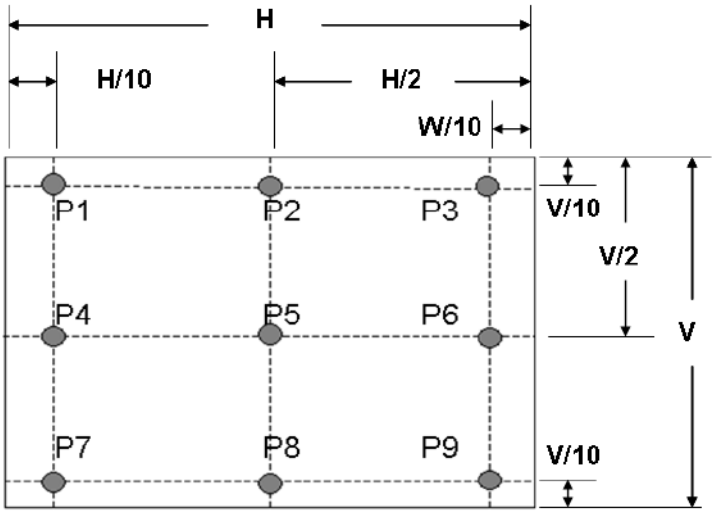


Note 2-4: Luminance Uniformity Measurement

Definition:

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

a. Test pattern: White Pattern



Note 2-5: Contrast Ratio Measurement

Definition:

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

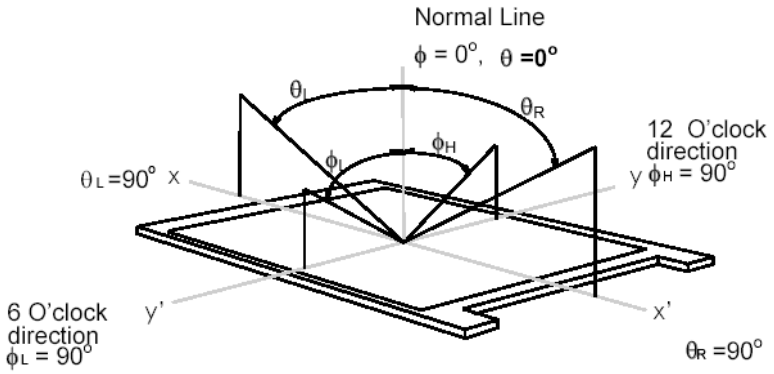
a. Measured position: Center of screen (P5) & perpendicular to the screen (θ=Φ=0°)

Note 2-6: Viewing angle measurement

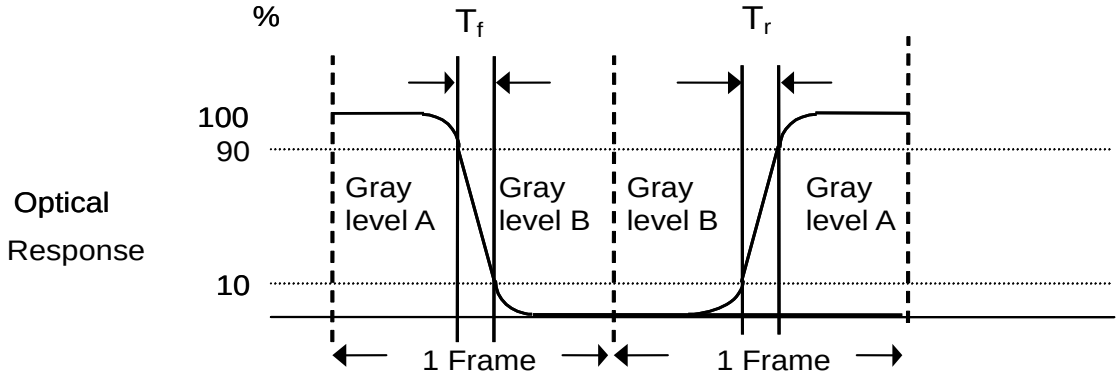
Definition: The angle at which the contrast ratio is greater than 10 & 5 .

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

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



Note 2-7: 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.

Gray Level to Gray	Target gray level

Level		L0	L255	L511	L767	L1023
Start gray level	L0					
	L255					
	L511					
	L767					
	L1023					

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

2.4 Mechanical Characteristics

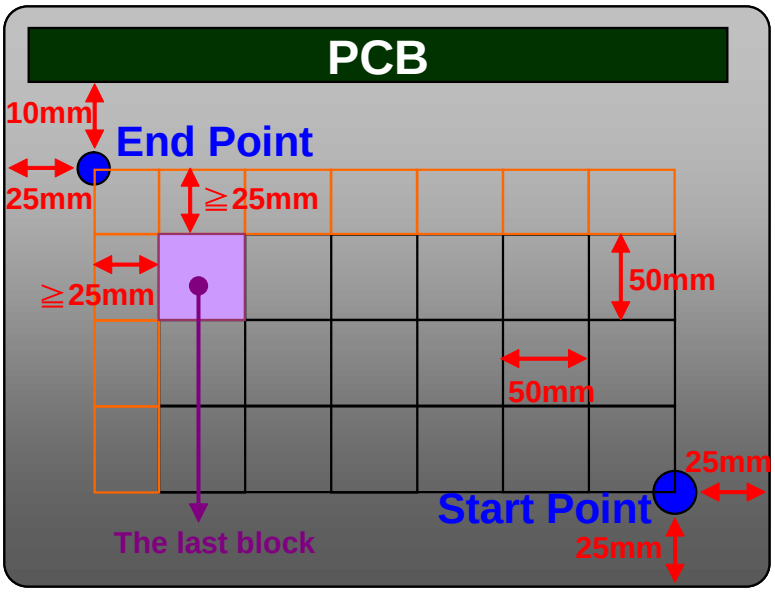
Symbol	Description	Min.	Max.	Unit	Remark
P_{bc}	Backside Compression	2.5	-	[Kgf]	*Note 2-10*

Note 2-10: 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.

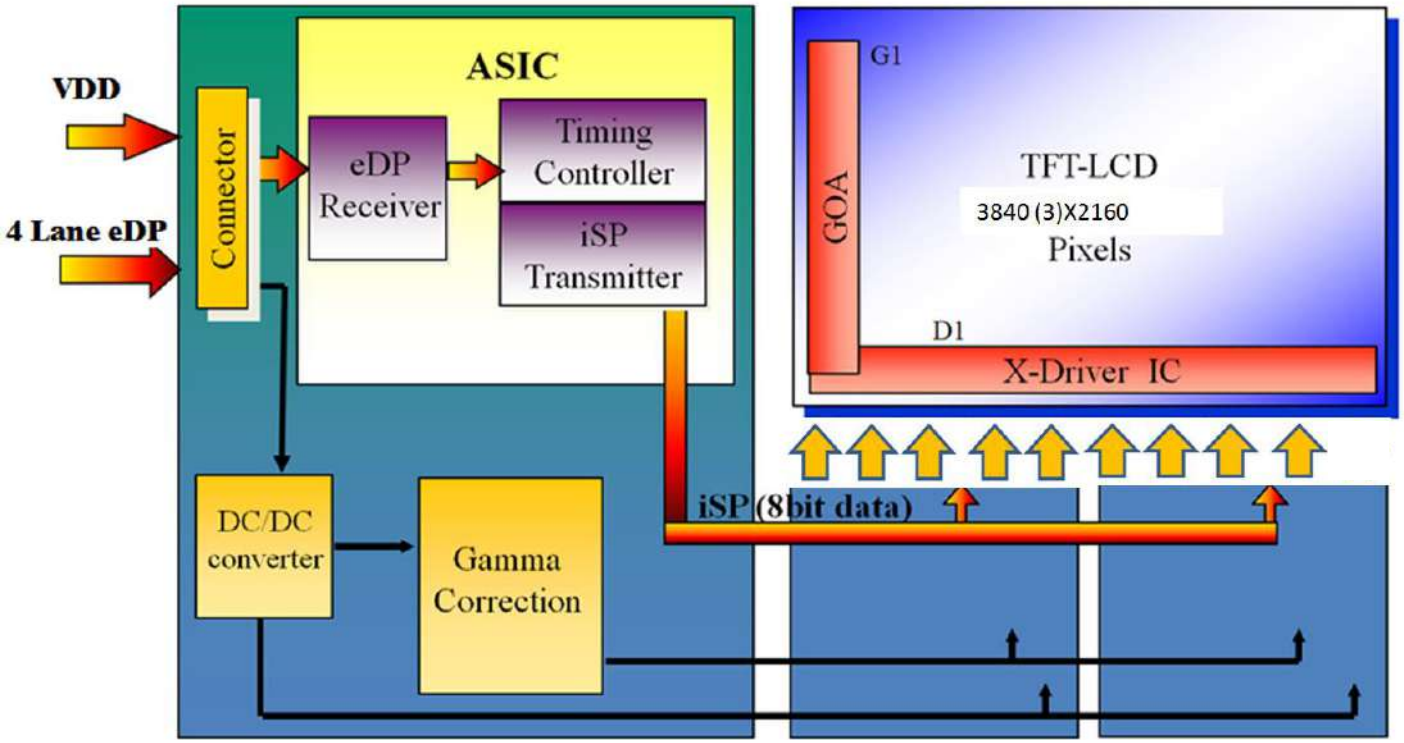
If the distance from the last block to each side of the End Point ≧ 25mm, add other blocks to make sure that most area of Bezel Back can be measured.



3 TFT-LCD Module

3.1 Block Diagram

The following shows the block diagram of the27inch Color TFT-LCD Module.



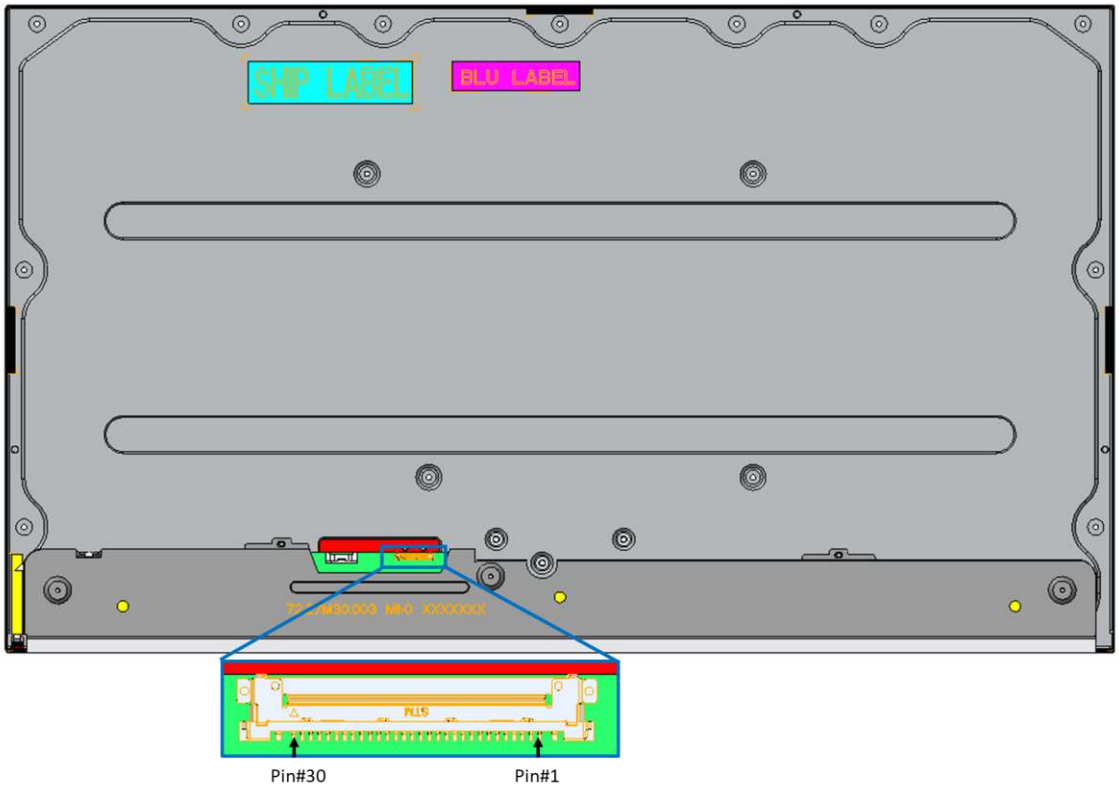
3.2 Interface Connection

3.2.1 Connector Type

TFT-LCD Connector	Manufacturer	JAE	STM
	Part Number	HD2S030HA2	MSAK24025P30M
Mating Connector	Manufacturer	IPEX or Compatible	
	Part Number	IPEX 20453-030T	

3.2.2 Connector Pin Assignment

PIN #	Symbol	Description	Remark
1	VDD	Power +10V	
2	VDD	Power +10V	
3	VDD	Power +10V	
4	VDD	Power +10V	
5	VDD	Power +10V	
6	N.C.	No connection	
7	N.C.	No connection (for AUO test only. Do not connect)	
8	N.C.	No connection (for AUO test only. Do not connect)	
9	N.C.	No connection (for AUO test only. Do not connect)	
10	GND	Ground	
11	HPD	Hot plug detection	
12	GND	Ground	
13	1st AUX_CH_N	Negative AUX Channel differential data input	
14	1st AUX_CH_P	Positive AUX Channel differential data input	
15	GND	Ground	
16	1st Lane0_P	Positive eDP differential data input	
17	1st Lane0_N	Negative eDP differential data input	
18	GND	Ground	
19	1st Lane1_P	Positive eDP differential data input	
20	1st Lane1_N	Negative eDP differential data input	
21	GND	Ground	
22	1st Lane2_P	Positive eDP differential data input	
23	1st Lane2_N	Negative eDP differential data input	
24	GND	Ground	
25	1st Lane3_P	Positive eDP differential data input	
26	1st Lane3_N	Negative eDP differential data input	
27	GND	Ground	
28	N.C.	No connection (for AUO test only. Do not connect)	
29	N.C.	No connection (for AUO test only. Do not connect)	
30	NC/GND	No connection (for AUO test only. Do not connect)	


SHIP LABEL
BLU LABEL
Pin#30
Pin#1

3.3 Electrical Characteristics

3.3.1 Absolute Maximum Rating

Permanent damage may occur if exceeding the following maximum rating.

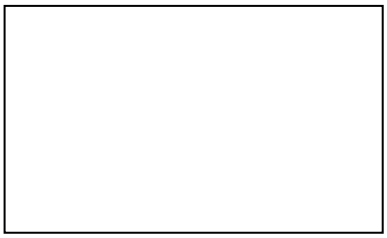
Symbol	Description	Min	Max	Unit	Remark
VDD	Power Supply Input Voltage	GND-0.3	12	[Volt]	Ta=25°C

3.3.2 Recommended Operating Condition

Symbol	Item		Min.	Typ.	Max.	Unit	Note
VDD	Power Supply Input Range		9.5	10	10.5	[Volt]	
IDD	Current of Power Supply@60Hz	White	-	0.44	0.53	[A]	Note3-1
		Black	-	0.39	0.47	[A]	
		H-stripe	-	1.17	1.41	[A]	
	Current of Power Supply@62Hz	White	-	0.45	0.54	[A]	
		Black	-	0.4	0.48	[A]	
		H-stripe	-	1.2	1.44	[A]	
PDD	VDD Power Consumption@60Hz		-	4.4	5.3	[Watt]	White
	VDD Power Consumption@62Hz		-	12	14.4	[Watt]	H-stripe
IRUSH	Inrush current		-	-	3	[A]	Note3-2
VDDrp	Allowable VDD Ripple Voltage				500	[mV]	VDD=10.0V, White Pattern @Maxi Frame rate

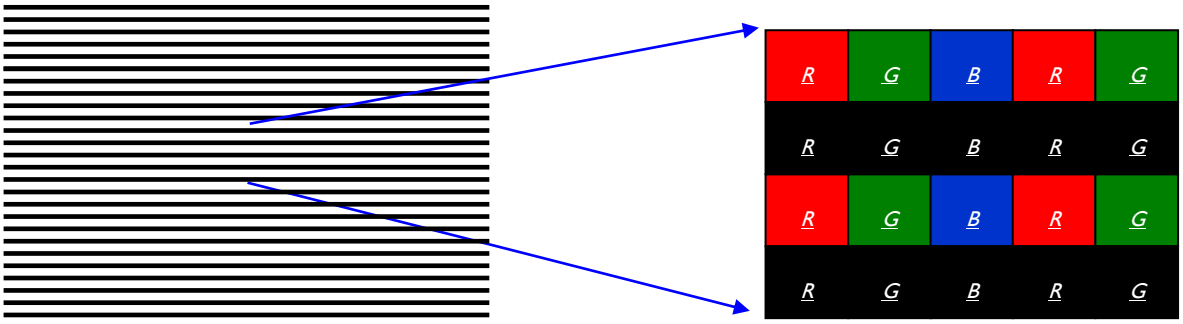
Note 3-1: Inrush Current measurement:
Test circuit:

A. White



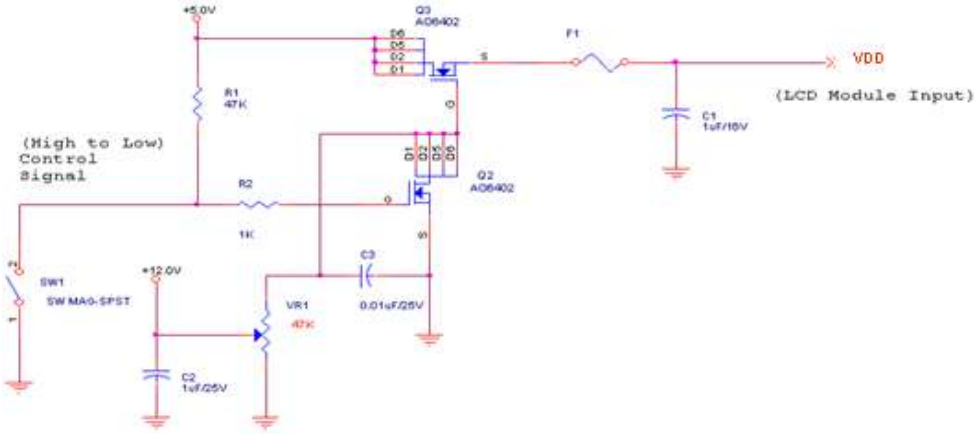
B. Black

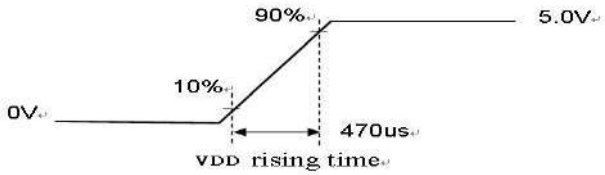
C. H-Stripe



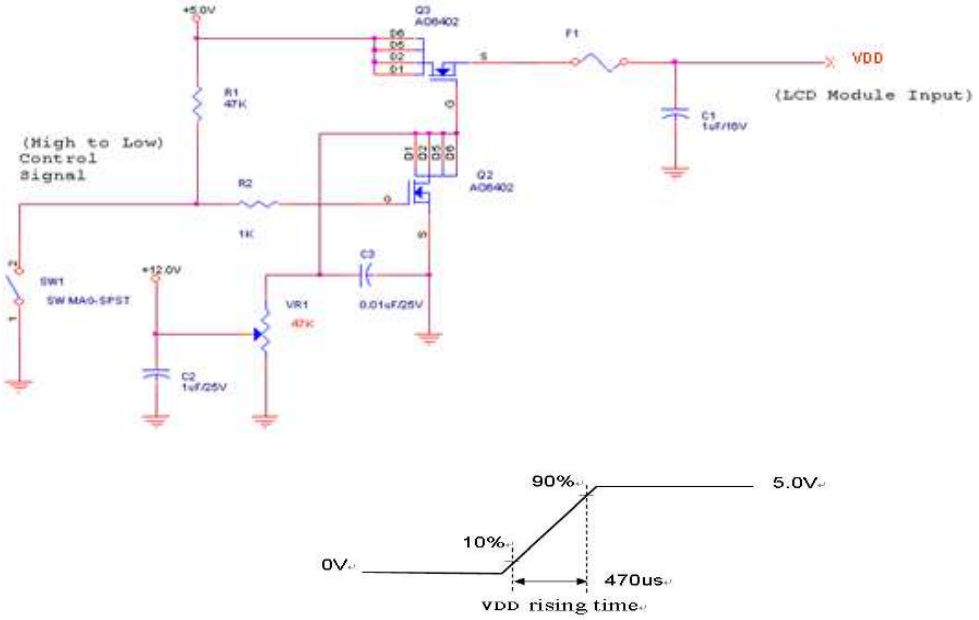
Note 3-2: Inrush Current measurement:

Test circuit:





The duration of VDD rising time: 470us.

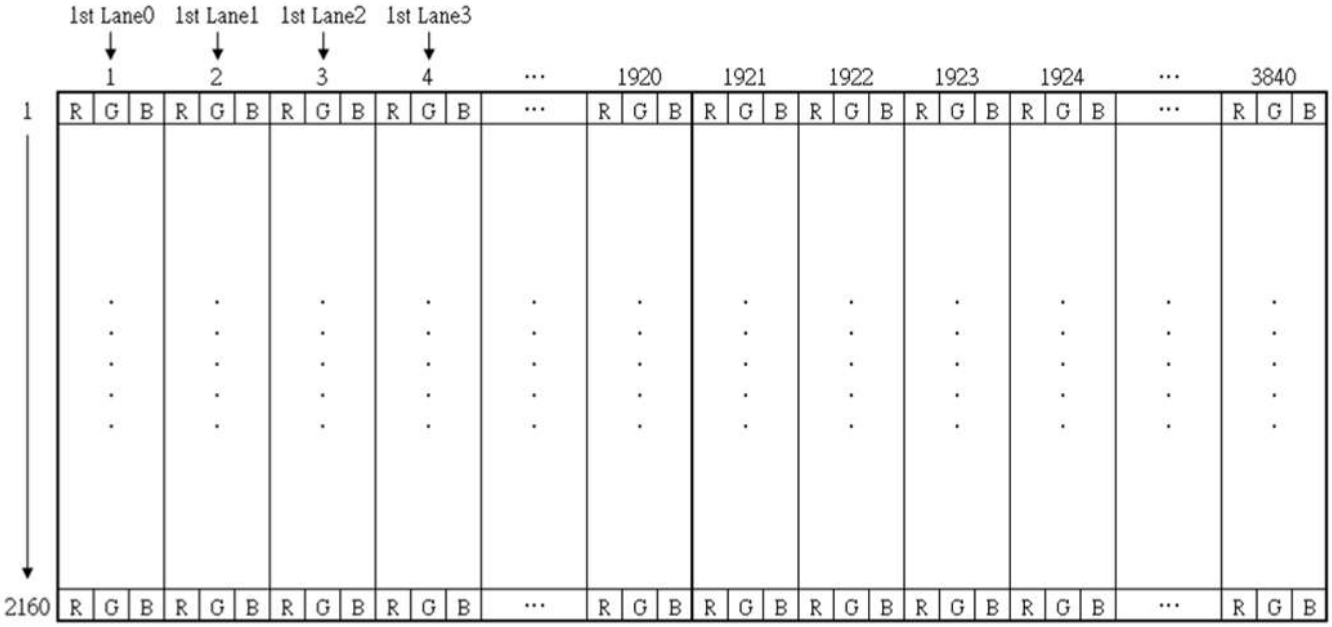


The duration of VDD rising time: 470us.

3.4 Signal Characteristics

3.4.1 LCD Pixel Format

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



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

1st port:

1st Lane0：1+4n pixel
1st Lane1：2+4n pixel
1st Lane2：3+4n pixel
1st Lane3：4+4n pixel

3.4.2 eDP Data Format

1st Lane0	1st Lane1	1st Lane2	1st Lane3
R1-9:0	R2-9:0	R3-9:0	R4-9:0
G1-9:0	G2-9:0	G3-9:0	G4-9:0
B1-9:0	B2-9:0	B3-9:0	B4-9:0
R5-9:0	R6-9:0	R7-9:0	R8-9:0
G5-9:0	G6-9:0	G7-9:0	G8-9:0
B5-9:0	B6-9:0	B7-9:0	B8-9:0
R9-9:0	R10-9:0	R11-9:0	R12-9:0
G9-9:0	G10-9:0	G11-9:0	G12-9:0
B9-9:0	B10-9:0	B11-9:0	B12-9:0
…..	…..	……..	…….
R3837-9:0	R3838-9:0	R3839-9:0	R3840-9:0
G3837-9:0	G3838-9:0	G3839-9:0	G3840-9:0
B3837-9:0	B3838-9:0	B3839-9:0	B3840-9:0

3.4.3 Color versus Input Data

The following table is for color versus input data (10bits). The higher the gray level, the brighter the color.

Color	Gary Level	Color Input Data																													Remark
		RED data (MSB:R9,LSB:R0)										GREEN data (MSB:G9,LSB:G0)										BLUE data (MSB:B9,LSB:B0)									
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	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	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	1	1	1	1	1	1	
L511	-	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	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	0	0	0	0	0	0	Black
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	L1023	1	1	1	1	1	1	1	1	1	1	0	0	0	0	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	0	0	0	0	0	0	Black
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	L1023	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	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	0	0	0	0	0	0	Black
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	L1023	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	

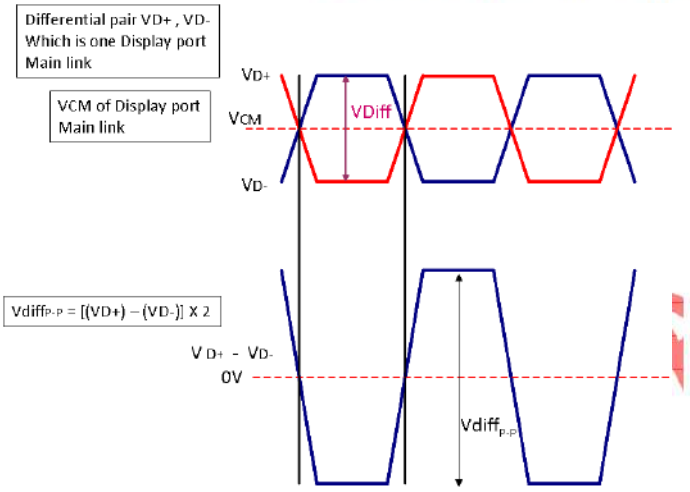
3.4.4 eDP Specification (Follow as VESA Display Port Standard Version 1.1)

a. DisplayPort main link signal:

DisplayPort main link					
		Min	Typ	Max	unit
Frequency	Main link Frequency	-	5.4	-	Gbps
UI	Unit Interval	-	185	-	ps
VCM	RX input DC Common Mode Voltage	-	0	-	[Volt]
$VDiff_{P-P}$	Peak-to-peak Voltage at a receiving Device	70(HBR2)	-	-	[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	0.310	0
2	0.375~0.625	35mV
3	0.690	0
4	0.375~0.625	-35mV

Figure 5.55.2 Downstream Device EYE Mask at Receiver Connector for HBR2



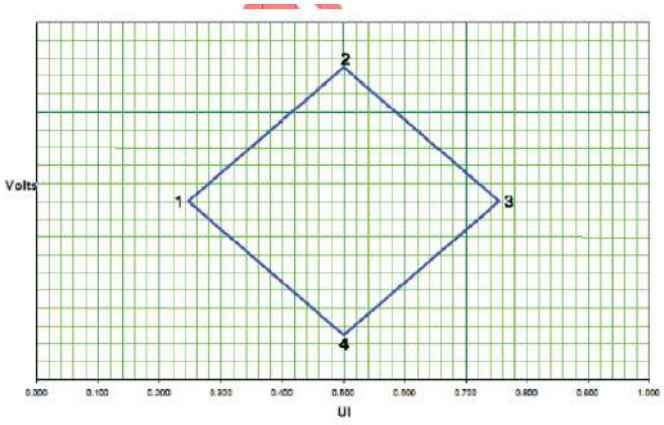
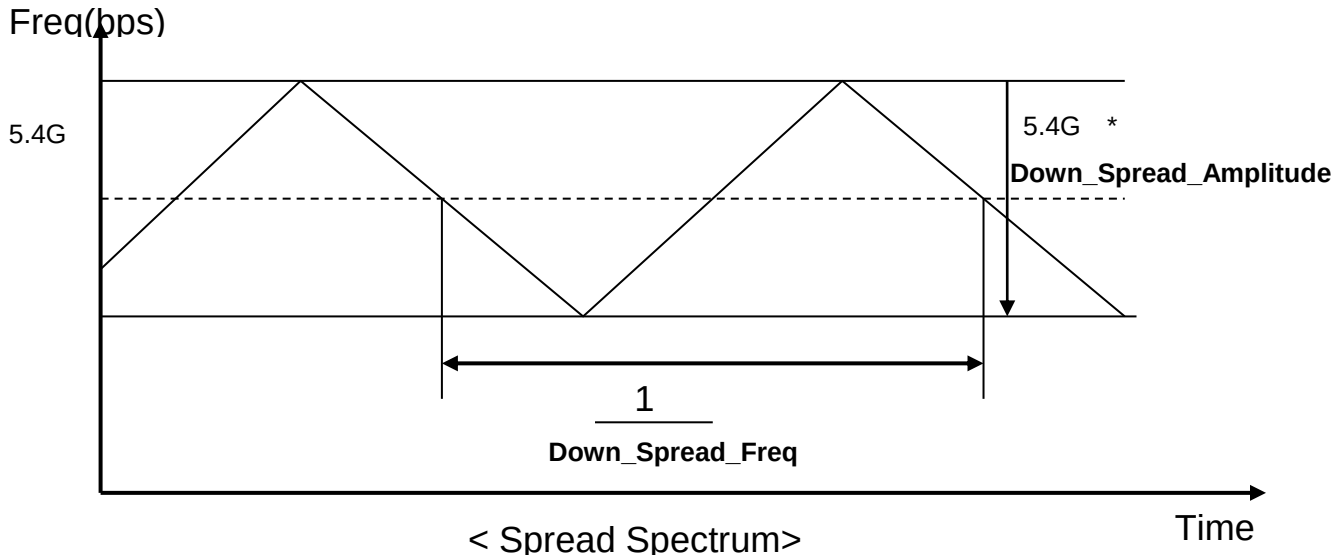


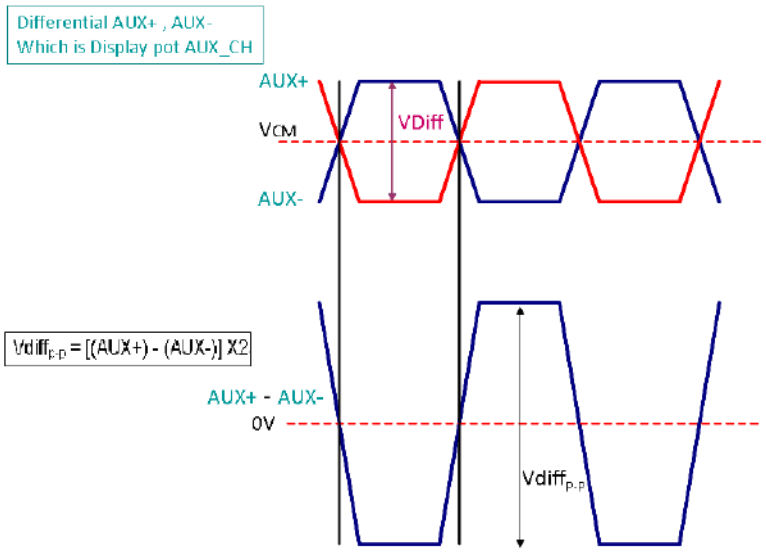
Figure 5.55.1 Downstream Device EYE Mask at Receiver Connector Pins



< 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	-	-	50	[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 is shown as the following table.

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
Tv	Vertical Section	Period	2220	2222	2268	Th	
Tdisp (v)		Active	2160	2160	2160	Th	
Tblk (v)		Blanking	60	62	108	Th	
Fv		Frequency	50	60	62	Hz	Note 3-6 Note 3-7
Th	Horizontal Section	Period	3968	4000	4032	Tclk	
Tdisp (h)		Active	3840	3840	3840	Tclk	
Tblk (h)		Blanking	128	160	192	Tclk	
Fh		Frequency	111.0	133.3	138.9	KHz	***Note 3-4***
Tclk	LVDS Clock	Period	1.81	1.88	2.27	ns	1/Fclk
Fclk		Frequency	440.4	533.3	551.1	MHz	***Note 3-5***
Link Rate per Lane			5.4			Gbps	

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

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

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.)

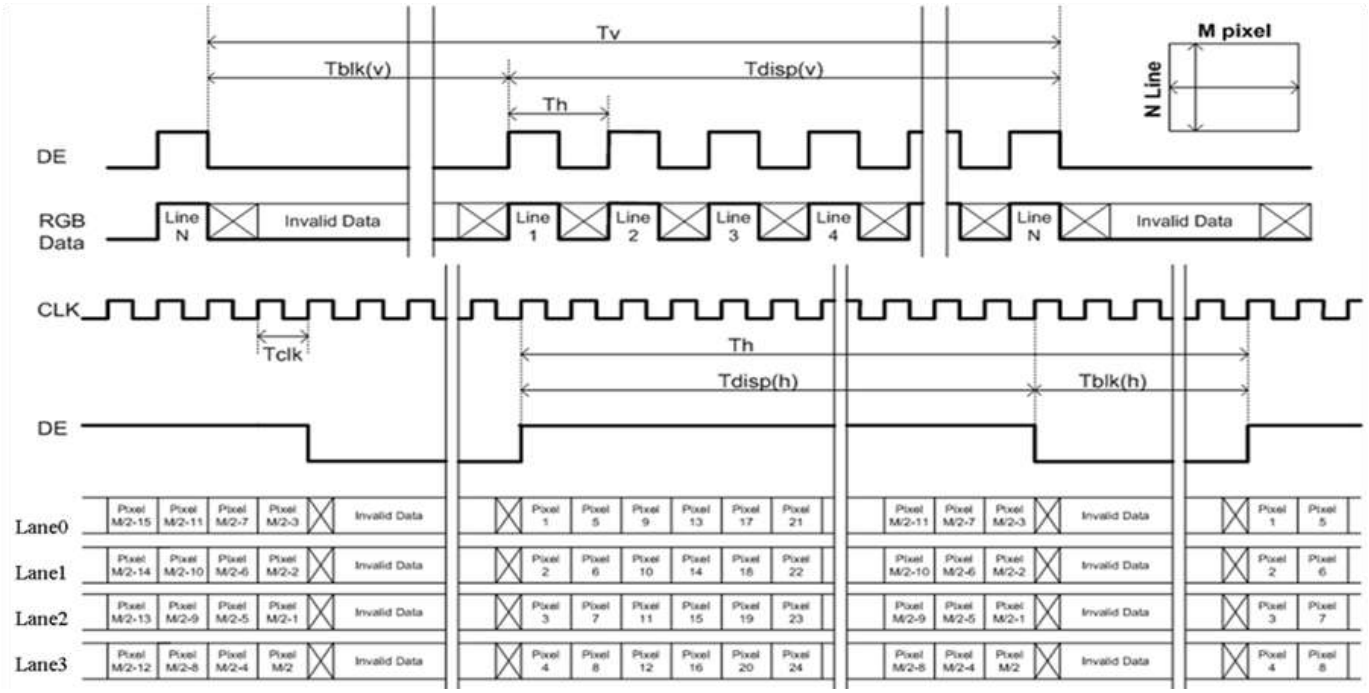
Fclk (Min.)≦ Fv x Th x Tv ≦ Fclk (Max.)

Note 3-6: The equation is listed as following. Please don't exceed the above recommended value.

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

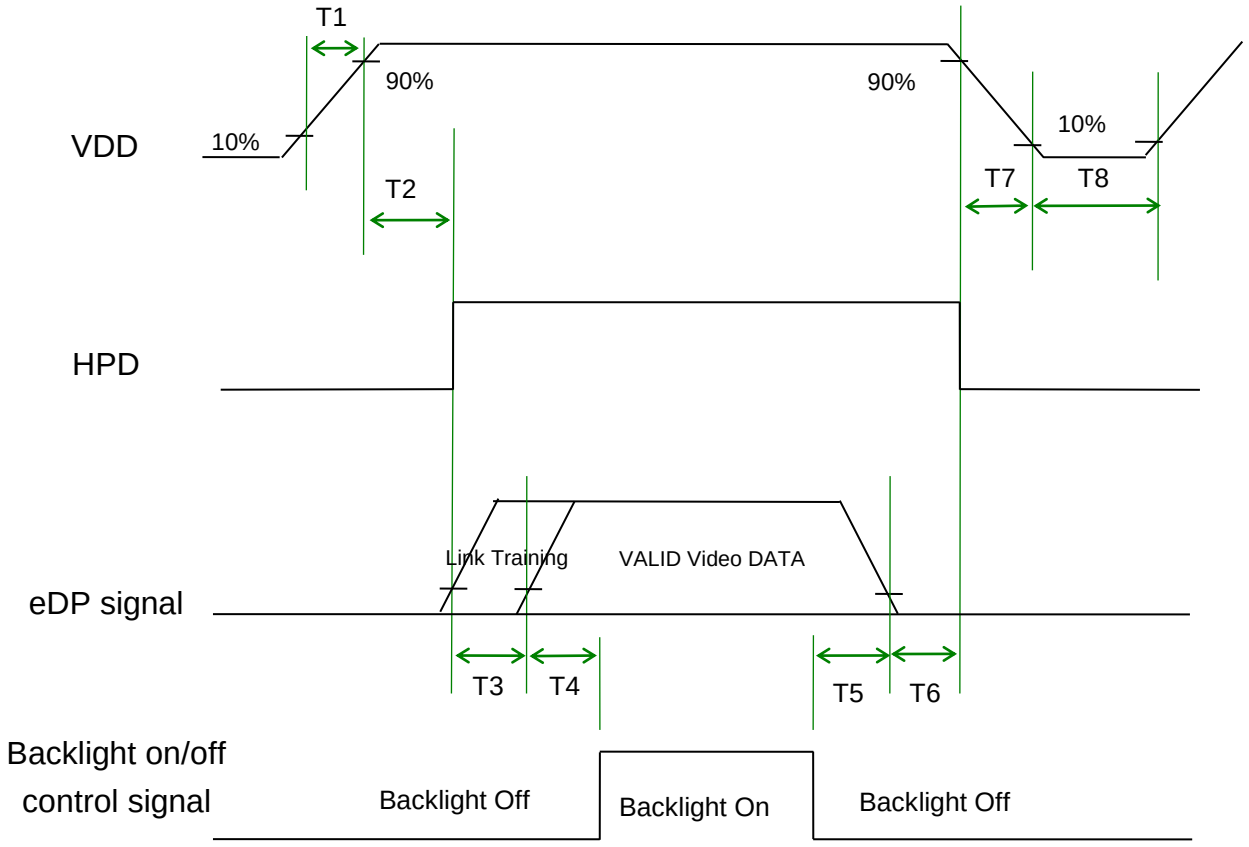
3.4.6 Input Timing Diagram

(Lane0~4 eDP data:1, 2, 3, 4)



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]	

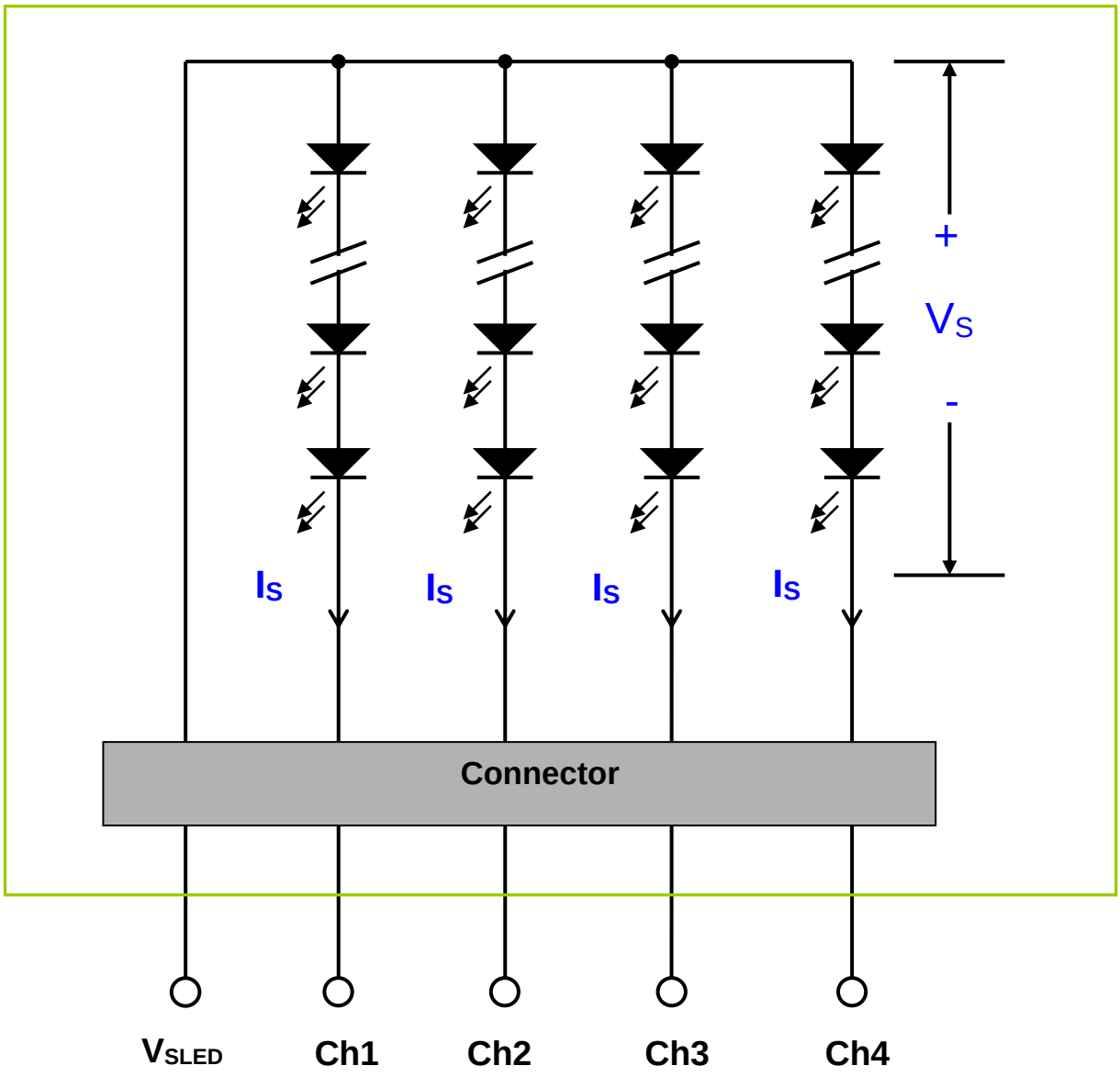
T5	100	-	-	[ms]	
T6	0		50	[ms]	*Note 3-9* *Note 3-10*
T7	0	-	200	[ms]	*Note 3-10* *Note 3-11*
T8	1000	-	-	[ms]	

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).



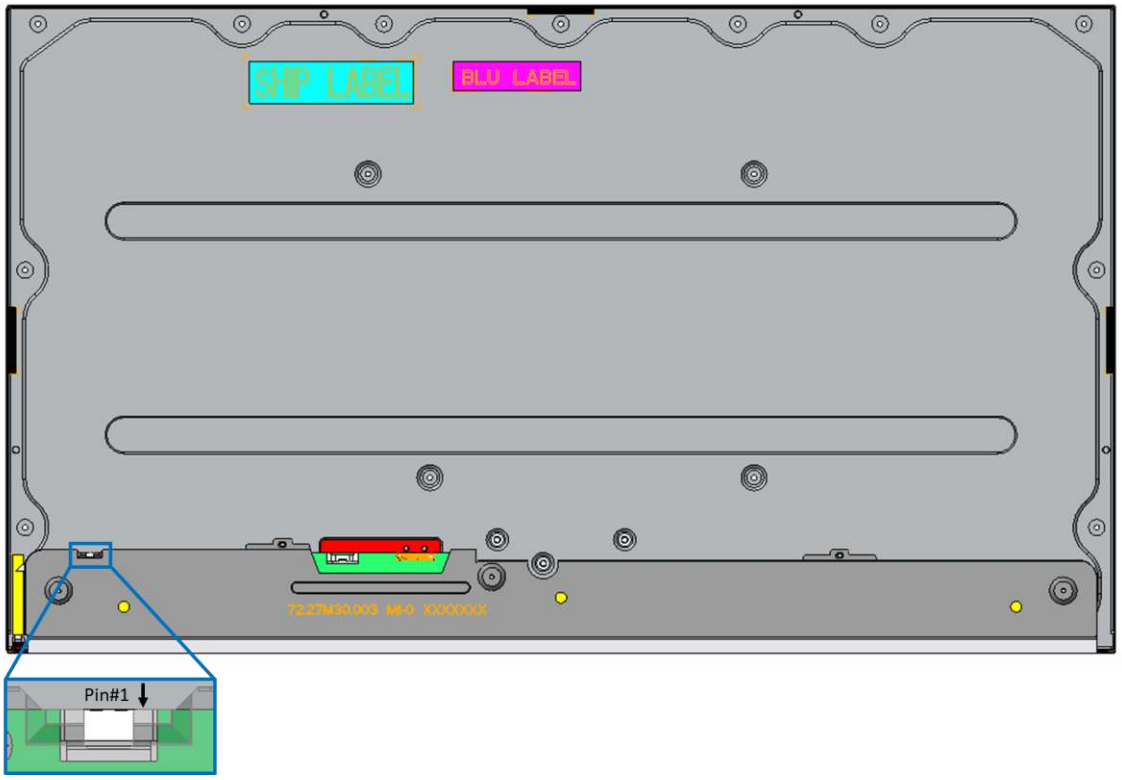
4.2 Interface Connection

4.2.1 Connector Type

Backlight Connector	Manufacturer	ENTERY	CVILUX
	Part Number	3709K-Q06C-04L	CI1406M1VLD-NH
Mating Connector	Manufacturer	CVILUX or Compatible	
	Part Number	CI1406SL000-NH (Lock)	

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℃)

Symbol	Description	Min	Max	Unit	Remark
Is	LED String Current	0	120	[mA]	100% duty ratio

4.3.2 Recommended Operating Condition

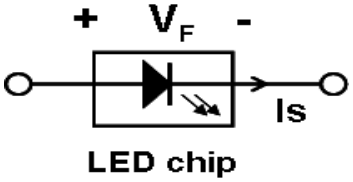
(Ta=25℃)

Symbol	Description	Min.	Typ.	Max.	Unit	Remark
Is	LED String Current	-	85	93.5	[mA]	100% duty ratio of LED chip, ***Note 4-6***
Vs	LED String Voltage	48.6	52.2	54.0	[Volt]	Is=85mA @ 100% duty ratio; ***Note 4-1, Note 4-5, Note 4-7***
ΔVs	Maximum Vs Voltage Deviation of light bar	-	-	3.6	[Volt]	Is=85mA @ 100% duty ratio; ***Note 4-2***
P_{BLU}	LED Light Bar Power Consumption	-	17.75	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.)=2.7V, V_F(Typ.)=2.9V, V_F(Max.)=3.0V

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 = 85mA and 25°C (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.

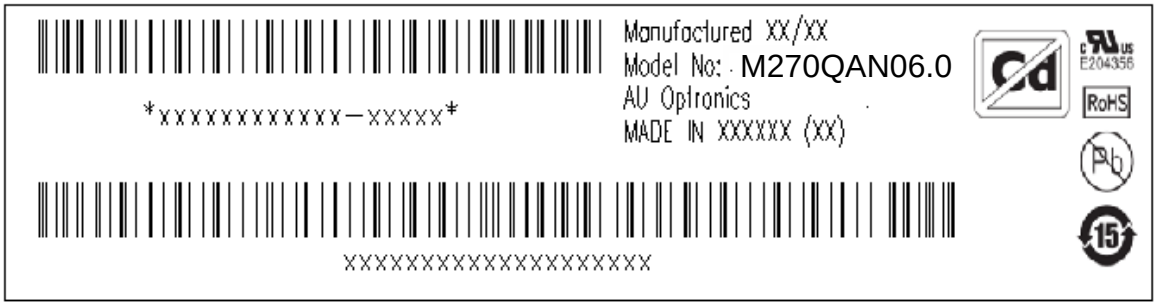
Metal front bezel must cover half area of BM (black matrix), and metal front bezel must connect with metal back bezel to protect source IC of panel by ESD damaged.

Note 5-3 : 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.

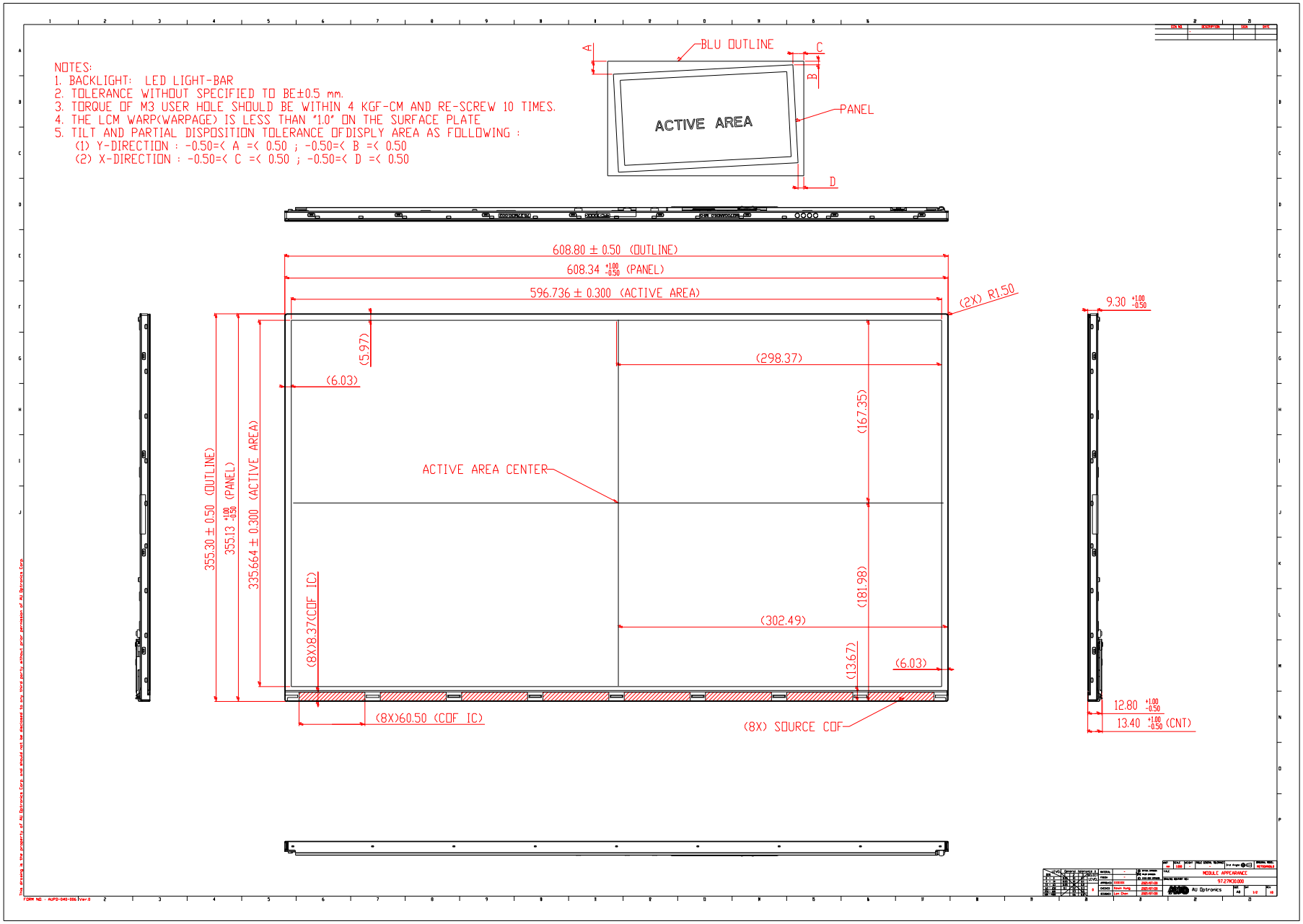
Note 6-2: For RoHS compatible products, AUO will add for identification.

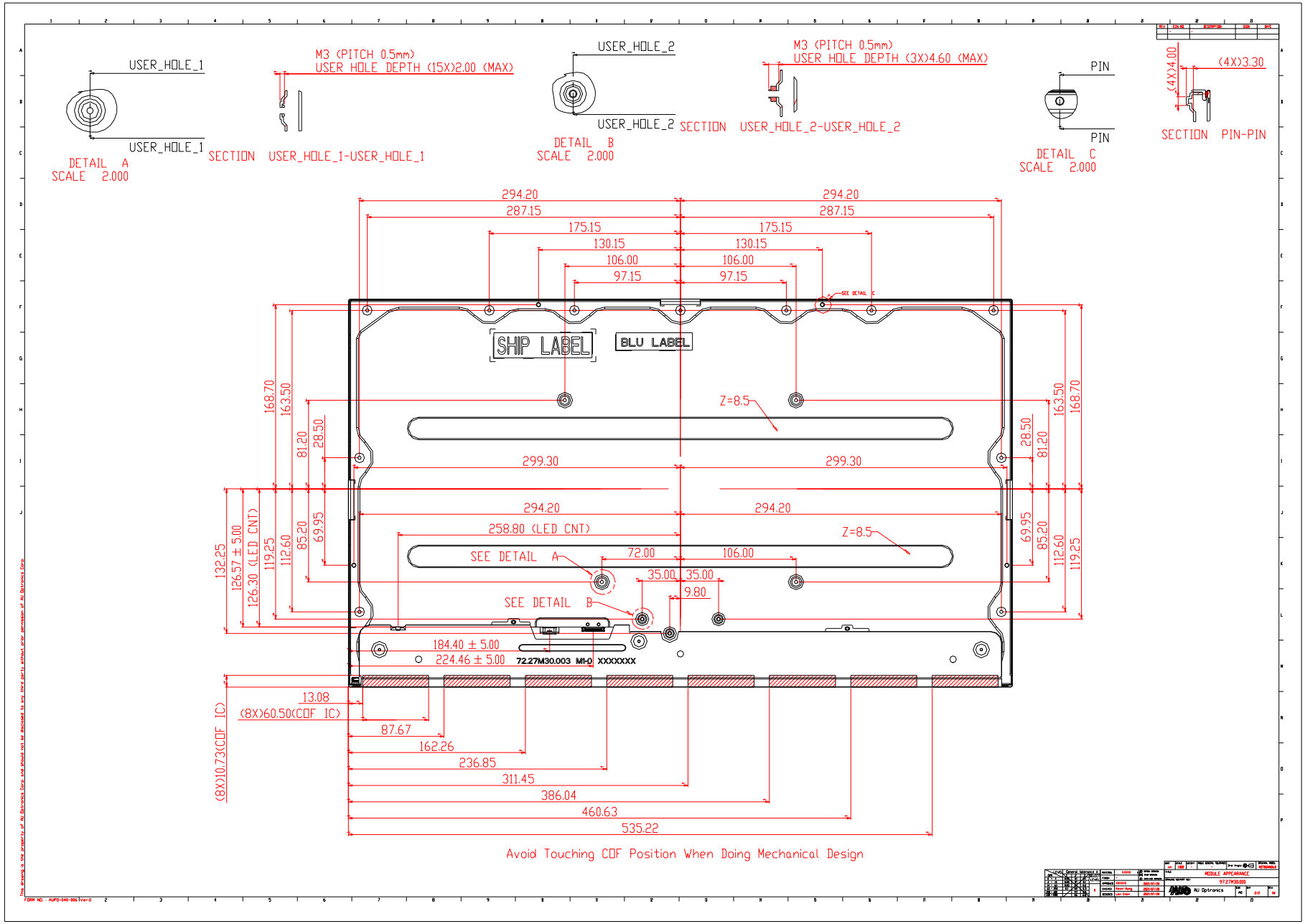
Note 6-3: For China RoHS compatible products, AUO will add for identification.

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

Note 6-5: To response ErP Lot5 regulation about "Cadmium (Cd) logo", display panel shall be labeled with additional new "Cd logo"

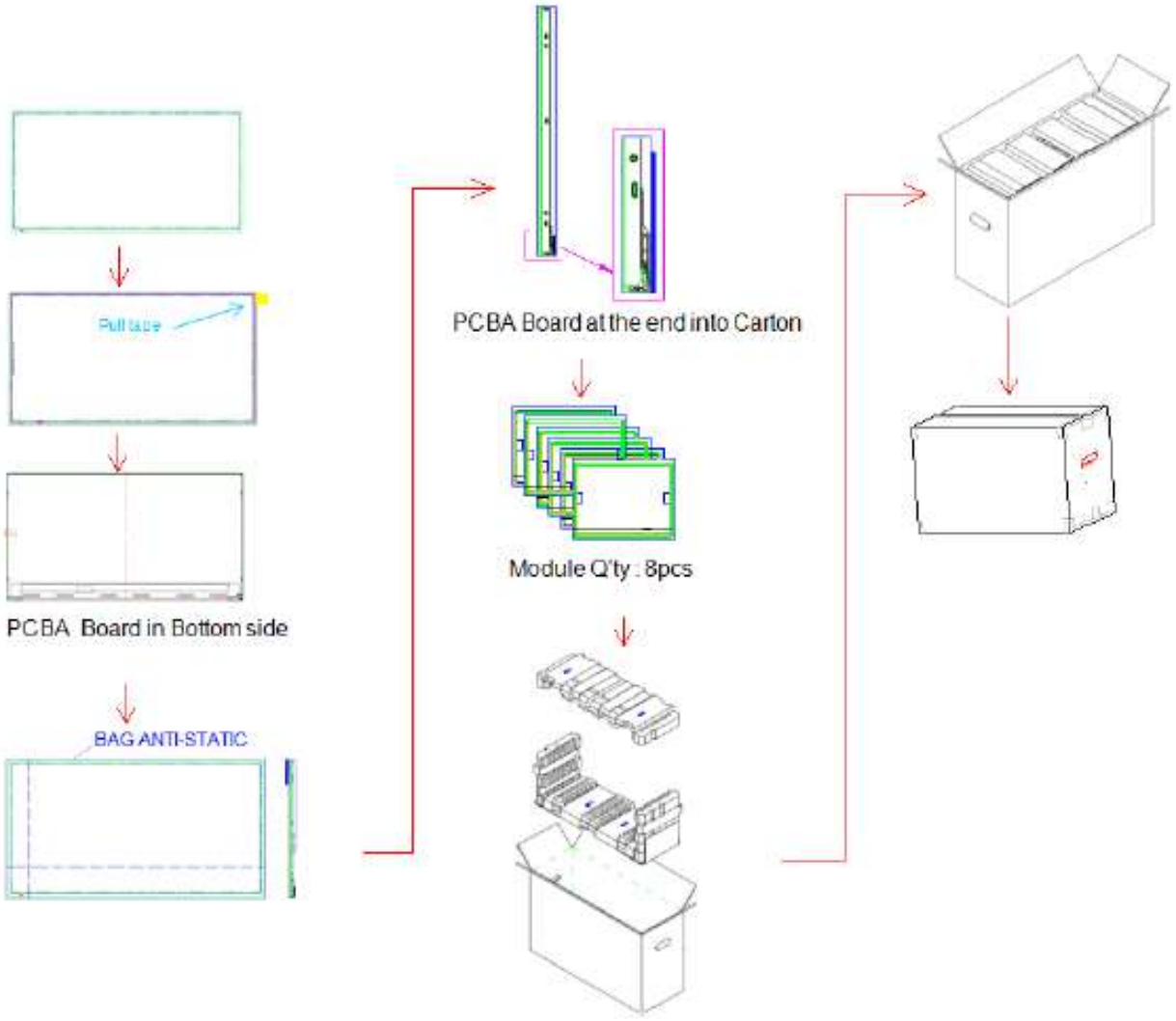
7 Mechanical Characteristics

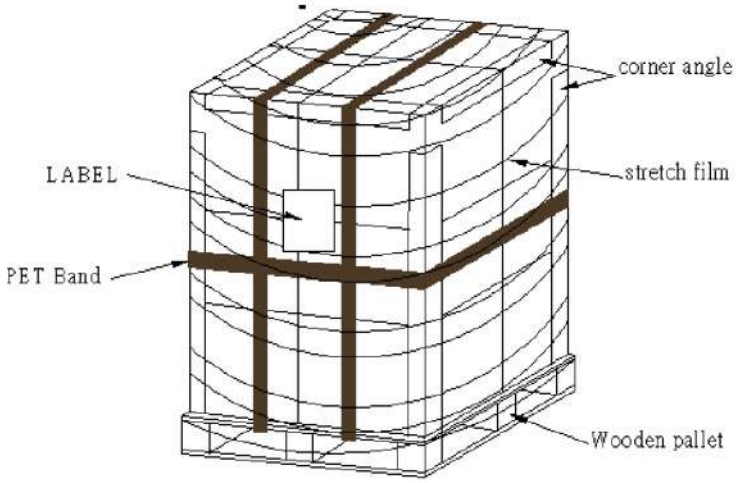



USER_HOLE_1
USER_HOLE_1
DETAIL A
SCALE 2.000
M3 (PITCH 0.5mm)
USER HOLE DEPTH (15X)2.00 (MAX)
SECTION USER_HOLE_1-USER_HOLE_1
USER_HOLE_2
USER_HOLE_2
DETAIL B
SCALE 2.000
M3 (PITCH 0.5mm)
USER HOLE DEPTH (3X)4.60 (MAX)
SECTION USER_HOLE_2-USER_HOLE_2
PIN
PIN
DETAIL C
SCALE 2.000
(4X)4.00
(4X)3.30
SECTION PIN-PIN
294.20
287.15
175.15
130.15
106.00
97.15
SHIP LABEL
BLU LABEL
SEE DETAIL C
Z=8.5
168.70
163.50
81.20
28.50
299.30
294.20
258.80 (LED CNT)
SEE DETAIL A
72.00
106.00
35.00
35.00
9.80
SEE DETAIL B
132.25
126.57 ± 5.00
126.30 (LED CNT)
119.25
112.60
85.20
69.95
184.40 ± 5.00
224.46 ± 5.00
72.27M30.003 M1-0 XXXXXXX
13.08
(8X)60.50(COF IC)
87.67
162.26
236.85
311.45
386.04
460.63
535.22
(8X)10.73(COF IC)
Avoid Touching COF Position When Doing Mechanical Design
MODULE APPEARANCE
97.27M30.000
AU Optronics

8 Packing Specification

8.1 Packing Flow





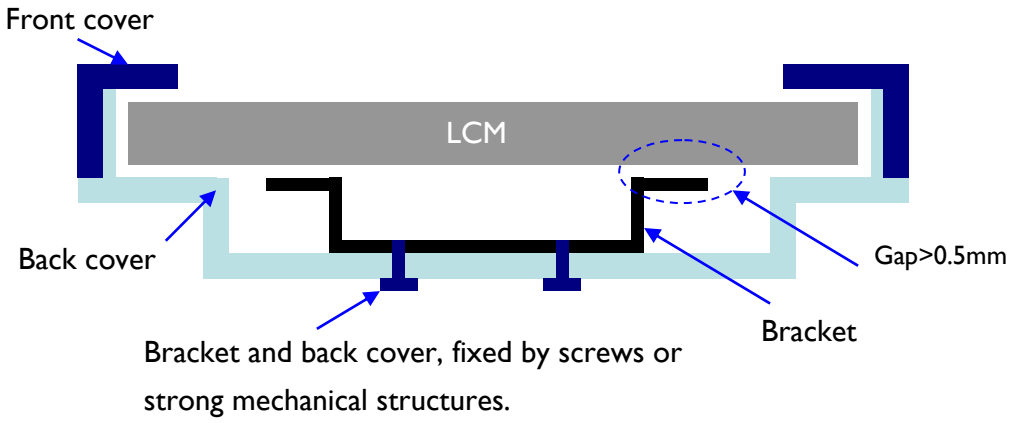
8.2 Pallet and shipment information

Item	Specification			Remark
	Q'ty	Dimension	Weight(kg)	
Panel	1	608.8(H)mm × 355.3(V)mm × 13.4(D)mm	3.2	
Cushion	1	-	0.75	
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	27.55	with panel & cushion & Box
Pallet	1	1070(L)mm x 740(W)mm x 132(H)mm	14.80	
Pallet after Packing	8 boxes/pallet	1070(L)mm x 740(W)mm x 1086(H)mm	235.2	

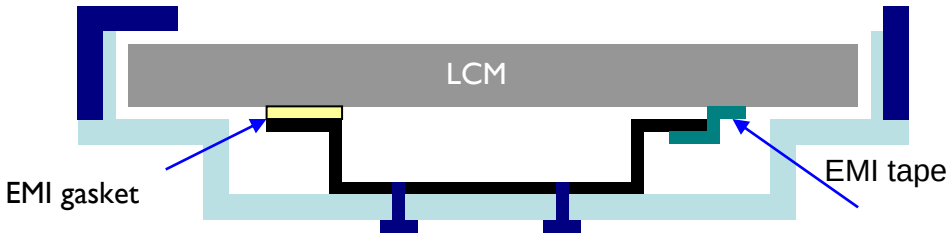
9 Design Guide for System

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

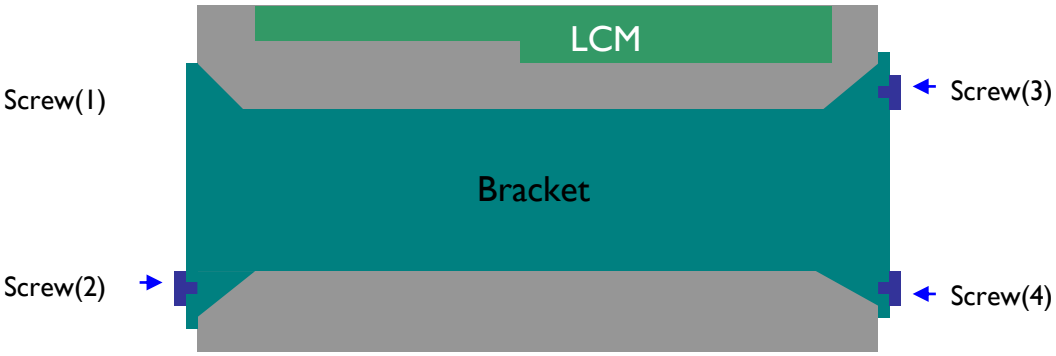
9.2 The system bracket should be fixed on back cover firmly.



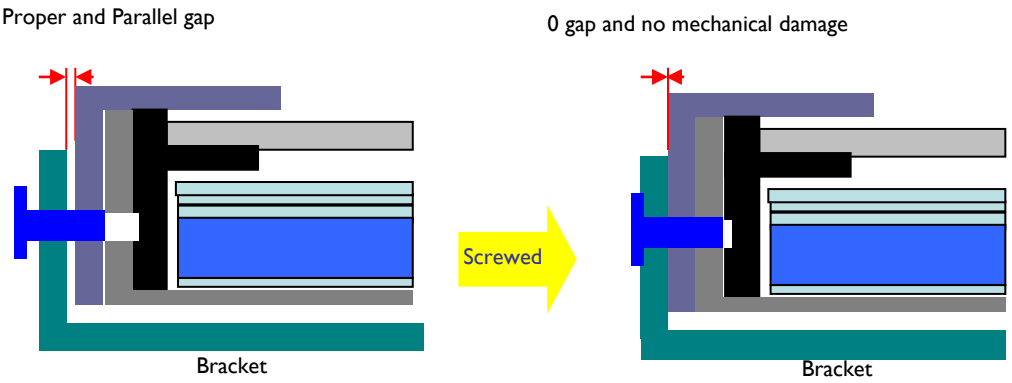
9.3 The EMI gasket should be uniform and not push panel strongly.



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.



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