( ) Preliminary Specification
(V) Final Specification

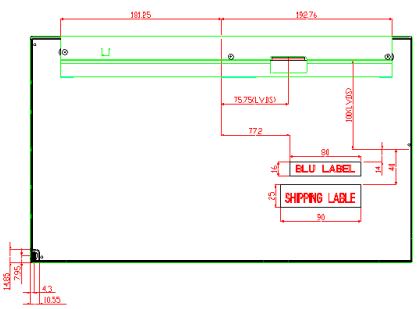
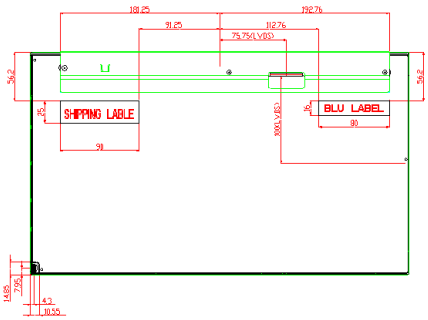
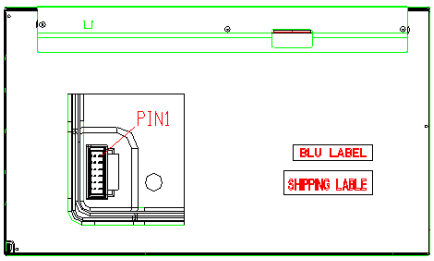
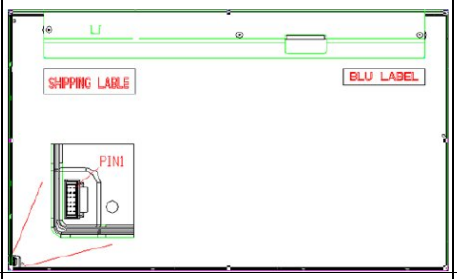
Module	18.5" Color TFT-LCD
Model Name	M185XTN01.2 (ES7.0 from 20C)

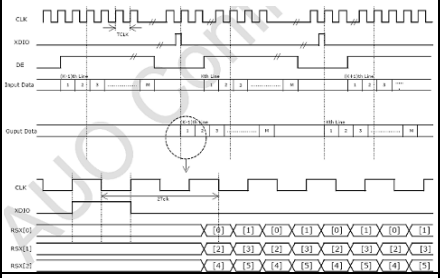
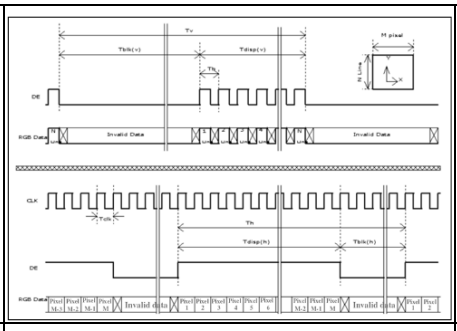
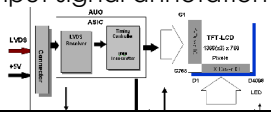
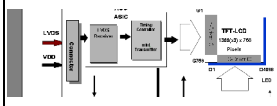
Customer	Date	Approved by	Date
		Howard Lee	Jan. 01, 2016
Approved by		Prepared by	Date
		Cherry Chiu	Jan. 01, 2016
Note: This Specification is subject to change without notice.		AU Optronics corporation	

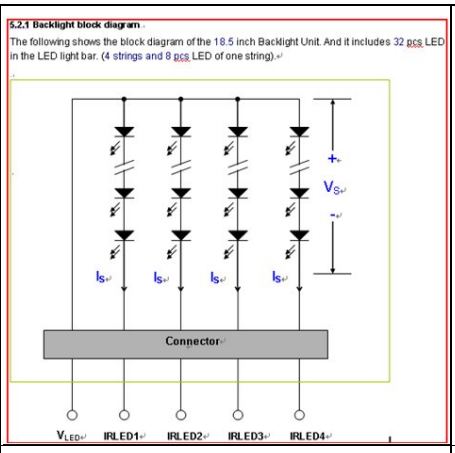
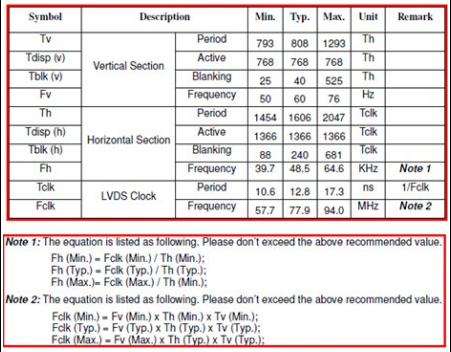
Contents

1 Handling Precautions 6
2 General Description 7
2.1 Display Characteristics 7
2.2 Absolute Maximum Rating of Environment 7
2.3 Optical Characteristics 9
2.4 Mechanical Characteristics 14
3 TFT-LCD Module 15
3.1 Block Diagram 15
3.2 Interface Connection 16
3.2.1 Connector Type 16
3.2.2 Connector Pin Assignment 16
3.3 Electrical Characteristics 18
3.3.1 Absolute Maximum Rating 18
3.3.2 Recommended Operating Condition 18
3.4 Signal Characteristics 18
3.4.1 LCD Pixel Format 19
3.4.2 LVDS Data Format 19
3.4.3 Color versus Input Data 20
3.4.4 LVDS Specification 21
3.4.5 Input Timing Specification 23
3.4.6 Input Timing Diagram 24
3.5 Power ON/OFF Sequence 25
4 Backlight Unit 26
4.1 Block Diagram 26
4.2 Interface Connection 27
4.2.1 Connector Type 27
4.2.2 Connector Pin Assignment 29
4.3 Electrical Characteristics 30
4.3.1 Absolute Maximum Rating 30
4.3.2 Recommended Operating Condition 30
5 Reliability Test 32
6 Shipping Label 33
7 Mechanical Characteristics 34
8 Packing Specification 37
8.1 Packing Flow 37
8.2 Pallet and shipment information 38
9 Design Guide for System 38

Record of Revision

Version Date	Page	Old description	New Description	Remark
0.1 2012/05/09		Preliminary Version		
0.2 2012/6/18	31	Update label positions. 		
	11	Logic/LCD Drive Voltage VDD: +5.5V	Logic/LCD Drive Voltage VDD: +6.0V	
	13	5.1.1 Power specification Irush Max. :2A	5.1.1 Power specification Irush Max. : TBD	
	26			
0.3 2012/7/4	6	"Energy Star 6.0 Compliance" : Yes	Remove "Energy Star 6.0 Compliance" because it'll be tested not with panel only but completed set.	
	28	Altitude test: Operation 15,000ft	Altitude test: Operation 18,000ft	
0.3 2012/7/9	6	Color / Chromaticity Coordinates (CIE) Color / Chromaticity Coordinates (CIE) Red x: TBD TBD TBD Red y: TBD TBD TBD Green x: TBD TBD TBD Green y: TBD TBD TBD Blue x: TBD TBD TBD Blue y: TBD TBD TBD	Color / Chromaticity Coordinates (CIE) Color / Chromaticity Coordinates (CIE) Red x: 0.616 0.646 0.676 Red y: 0.303 0.333 0.363 Green x: 0.287 0.317 0.347 Green y: 0.595 0.625 0.655 Blue x: 0.124 0.154 0.184 Blue y: 0.031 0.061 0.091	
0.4 2012/8/6	12	Revise "VDD min." 4.1 TFT LCD Module Item: Logic/LCD Drive Voltage; Symbol: VDD; Min: 0; Max: +6.0; Unit: [Volt]; Conditions: Note 1,2	Item: Logic/LCD Drive Voltage; Symbol: VDD; Min: -0.3; Max: +6.0; Unit: [Volt]; Conditions: Note 1,2	
	14	Revise "VDD max." •5.1.1 Power Specification Input power specifications are as following: Symbol: VDD; Parameter: Logic/LCD Drive Voltage; Min: 4.5; Typ: 5.0; Max: 6; Unit: [Volt]; Conditions: +/- 0%	•5.1.1 Power Specification Input power specifications are as following: Symbol: VDD; Parameter: Logic/LCD Drive Voltage; Min: 4.5; Typ: 5.0; Max: 5.5; Unit: [Volt]; Conditions: +/-10%	

	24	Revise "Timing Diagram" 	
0.5 2012/10/4	23	Revise "Timing Characteristics": Signal / Item / Symbol / Min / Typ / Max / Unit V-section: Period Tv 776 808 1023 Th; Active Tdisp(v) 768 768 768 Th; Blanking Tblk(v) 8 40 255 Th H-section: Period Th 1416 1606 2047 Tclk; Active Tdisp(h) 1366 1366 1366 Tclk; Blanking Tblk(h) 50 240 681 Tclk Clock: Period Tclk -- 12.8 -- ns; Frequency Freq 55 78 90 MHz Frame Rate: Frame Rate F 50 60 75 Hz	Signal / Item / Symbol / Min / Typ / Max / Unit V-section: Period Tv 788 808 1313 Th; Active Tdisp(v) 768 768 768 Th; Blanking Tblk(v) 20 40 545 Th H-section: Period Th 1432 1606 2047 Tclk; Active Tdisp(h) 1366 1366 1366 Tclk; Blanking Tblk(h) 66 240 681 Tclk Clock: Period Tclk 10.64 12.8 17.72 ns; Frequency Freq 55 78 90 MHz Frame Rate: Frame Rate F 50 60 76 Hz
	7	Revise "Color / Chromaticity Coordinates (CIE)" Green y 0.595 0.625 0.655	Green y 0.592 0.622 0.652
	31	Revise max outline thickness Original: 9.8 ± 0.5 mm	New: 9.9 ± 0.5 mm
	14	Revise Irush current: Max.TBD	IRush Inrush Current - - 2 [A] Note 1
	27	Revise 7.2 LED Connector on Backlight Unit Part number: 3707K-Q06N-01R	New part number: 3707K-S06N-21R
	12	Revise LED forward Voltage variation LED forward Voltage variation (per string variation) ΔVf - 3.4 [Volt] Note 1,2	LED forward Voltage variation (per string variation) ΔVf - 1.6 [Volt] Note 1,2
1.0 Final version		Version code 0.5	Version code 1.0
1.1 2012/12/25	7	Max. Response time: not specified	Response Time [msec] Raising Time (TR) - 3.6 5.5; Falling Time (TF) - 1.4 2.5; Raising + Falling - 5 8; 4
	11	Correct function block diagram input signal annotation 	
	11	Remove I/F PCB Interface in this page	
	22	Revise LVDS pin 1 annotation "RXOIN0-"	"NC"
	25	*Revise Power ON/OFF sequence T6* T6 5 - 100 [ms] Note 1,2	T6 5 - 150 [ms] Note 1,2
2013/1/17	19	Revise LED current Symbol / Description / Min. / Typ. / Max. / Unit / Note IRLED0 / IRLED1 / IRLED2 / IRLED3 LED Operation Current 67 70 73 [mA] Note 1	5.2 Backlight Unit Parameter guideline for LED driving is under stable conditions at 25℃ (Room Temperature): Symbol / Description / Min. / Typ. / Max. / Unit / Note RLED1 / RLED2 / RLED3 / RLED4 LED Operation Current / 70 / [mA] / Note 1
1.2 2013/09/09	18	5.2.1 Backlight block diagram	

		NA	
	19	5.2.2 Recommended Operating Condition	PBLU | BLU Power Consumption | 6.4 | 7.2 | 7.9 | [Watt] | Note 3
	19	Note **Note 1 : The specified current is 100% duty of LED chip input current, IRLED1,2,3,4 define as per strings LED current.** **Note 2 : The value showed in the table is one light bar's operation voltage.** **Note 3 : PBLU = VLED *(IRLED1+IRLED2+IRLED3+IRLED4)** **Note 4: Definition of life time: Brightness becomes to 50% of its original value. The minimum life time of LED unit is on the condition of IRLED = 70mA and 25±2°C (Room Temperature).**	***Note 1:*** The specified current is 100% duty of LED chip input current, Is define as per strings LED current. ***Note 2:*** The value showed is one string operation voltage. ***Note 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:*** Definition of life time: Brightness becomes to 50% of its original value. The minimum life time of LED unit is on the condition of IRLED = 70mA and 25±2°C (Room Temperature). ***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 (Vs) at least. ***Note 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.
	23	6.4 Timing Characteristics	
2.0 2015/12/23	all		ES 7.0 & Modify to follow new format
	7	2.1 Display Characteristics Power Consumption (VDD line + LED line) | [Watt] | VDD line: PDD (typ)= 1.75W, All black pattern at 60Hz LED line : PBLU (typ) = 7.2W Total : 8.95W TCO6.0 Compliance | | Yes	2.1 Display Characteristics Power Consumption (LCD Module + Backligh unit) | [Watt] | 7.85 (Typ.) LCD module : PDD (Typ.)=1.75 @ Black pattern,Fv=60Hz Backlight unit : P_{BLU} (Typ.) =6.1 @Is=70mA TCO Compliance | -- | TCO 7.0 Compliance
	26	5.2.1 Backlight block diagram The following shows the block diagram of the 18.5 inch Backlight Unit. And it includes 32 pcs LED in the LED light bar. (4 strings and 8 pcs LED of one string).	4.1 Block Diagram The following shows the block diagram of the 18.5 inch Backlight Unit. And it includes 28 pcs LED in the LED light bar. (4 strings and 7 pcs LED of one string).
	30	5.2.2 Recommended Operating Condition Symbol | Description | Min. | Typ. | Max. | Unit | Note IRLED1 / IRLED2 / IRLED3 / IRLED4 | LED Operation Current | - | 70 | 77 | [mA] | Note 1 VLED | Light Bar Operation Voltage | 24 | 25.6 | 27.2 | [Volt] | Note 2 PBLU | BLU Power Consumption | | 7.2 | 7.6 | [Watt] | Note 3	4.3.2 Recommended Operating Condition Symbol | Description | Min. | Typ. | Max. | Unit | Remark Is | LED String Current | -- | 70 | 77 | [mA] | 100% duty ratio of LED chip Vs | LED String Voltage | 19.6 | 21.7 | 23.8 | [Volt] | Is=70mA @ 100% duty ratio; Note 4-1, Note 4-5 ΔVs | Maximum Vs Voltage Deviation of light bar | -- | -- | 1.4 | [Volt] | Is=70mA @ 100% duty ratio; Note 4-2 P_{BLU} | LED Light Bar Power Consumption | -- | 6.1 | 6.7 | [Watt] | Note 4-3

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□ and 35□ at normal humidity.
14) Do not apply the same pattern for a long time, it will enhance relevant defect.

2 General Description

This specification applies to the 18.5 inch wide Color a-Si TFT-LCD Module M185XTN01.2. The display supports the WXGA - 1366(H) x 768(V) screen format and 16.7M colors (RGB 6-bits + Hi-FRC data). The input interface is one channel LVDS and this module doesn't contain an driver board for backlight.

2.1 Display Characteristics

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

ITEMS	Unit	SPECIFICATIONS
Screen Diagonal	[mm]	470.1(18.51")
Active Area	[mm]	409.8 (H) x 230.4 (V)
Pixels H x V	-	1366(x3) x 768
Pixel Pitch	[um]	300 (per one triad) × 300
Pixel Arrangement	-	R.G.B. Vertical Stripe
Display Mode	-	TN Mode, Normally White
White Luminance (Center)	[cd/m^2]	250 cd/m^2 (Typ.)
Contrast Ratio	-	1000 (Typ.)
Color Gamut	-	NTSC 72%
Response Time	[msec]	5 (Typ., on/off)
Power Consumption (LCD Module + Backligh unit)	[Watt]	7.85 (Typ.) LCD module : PDD (Typ.)=1.75 @ Black pattern,Fv=60Hz Backlight unit : P_{BLU} (Typ.) =6.1 @Is=70mA
Weight	[Grams]	1290
Outline Dimension	[mm]	430.4 (W) x 254.6 (H) Typ. x 9.9 (D) Typ
Electrical Interface	-	One channel LVDS
Support Color	-	16.7M colors (RGB 6-bit + Hi_FRC)
Surface Treatment	-	Anti-Glare, 3H
Temperature Range Operating Storage (Shipping)	 [°C] [°C]	 0 to +50 -20 to +60
RoHS Compliance	-	RoHS Compliance
TCO Compliance	-	TCO 7.0 Compliance

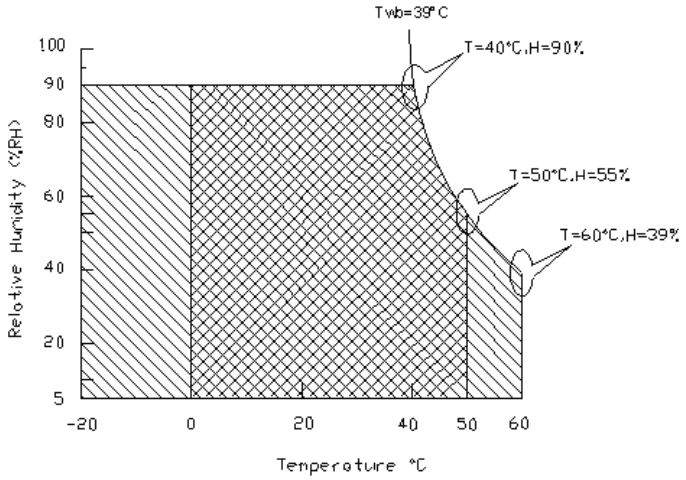
2.2 Absolute Maximum Rating of Environment

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°C)
2. Max wet-bulb temperature at 39°C or less. (Ta ≦39°C)
3. No condensation



Operating Range Storage Range +

2.3 Optical Characteristics

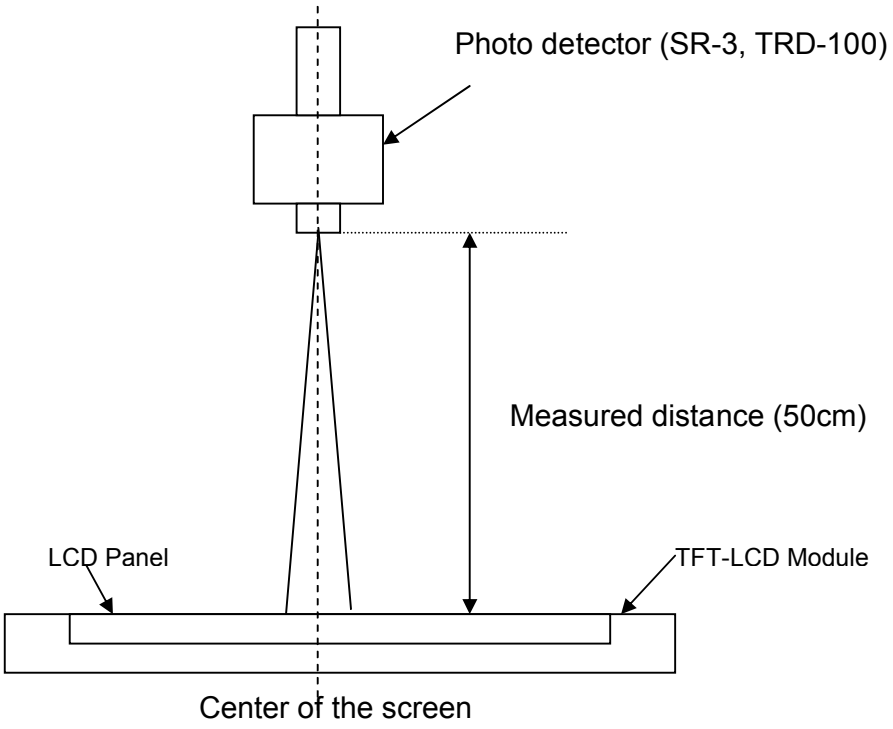
The optical characteristics are measured on the following test condition.

Test Condition:

1. Equipment setup: Please refer to *Note 2-2*.
2. Panel Lighting time: 30 minutes
3. VDD=5.0V, Fv=60Hz,Is=70mA,Ta=25□

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
L_w	White Luminance (Center of screen)		200	250	-	[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	85	-	[degree]	*Note 2-5 By SR-3*
θ_L		Left	75	85	-		
Φ_H	Vertical Viewing Angle (CR=10)	Up	70	80	-		
Φ_L		Down	70	80	-		
θ_R	Horizontal Viewing Angle (CR=5)	Right	75	88	-		
θ_L		Left	75	88	-		
Φ_H	Vertical Viewing Angle (CR=5)	Up	70	85	-		
Φ_L		Down	70	85	-		
T_R	Response Time	Rising Time	-	3.6	5.5	[msec]	*Note 2-6 By TRD-100*
T_F		Falling Time	-	1.4	2.5		
-		Rising + Falling	-	5	8		
R_x	Color Coordinates (CIE 1931)	Red x	0.616	0.646	0.676	-	*By SR-3*
R_y		Red y	0.303	0.333	0.363		
G_x		Green x	0.287	0.317	0.347		
G_y		Green y	0.592	0.622	0.652		
B_x		Blue x	0.124	0.154	0.184		
B_y		Blue y	0.031	0.061	0.091		
W_x		White x	0.283	0.313	0.343		
W_y		White y	0.299	0.329	0.359		
NTSC				72		[%]	*By SR-3*
CT	Crosstalk		-	-	1.5	[%]	*Note 2-7 By SR-3*
F_{dB}	Flicker (Center of screen)		-	-	-20	[dB]	*Note 2-8 By SR-3*

Note 2-2: Equipment setup :

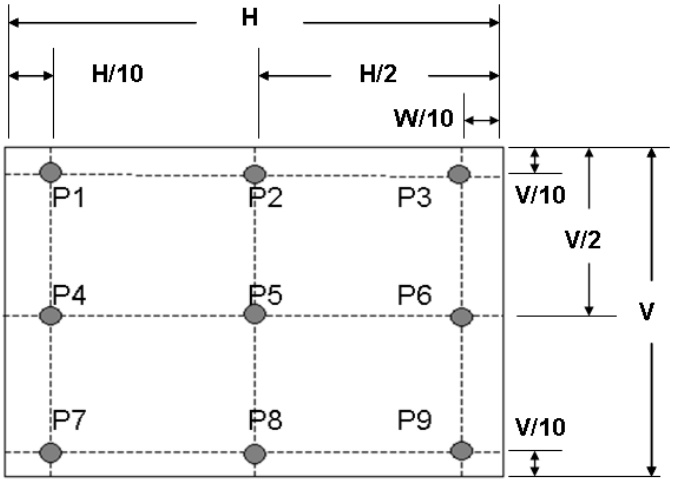


Note 2-3: Luminance Uniformity Measurement

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 2-4: Contrast Ratio Measurement

Definition:

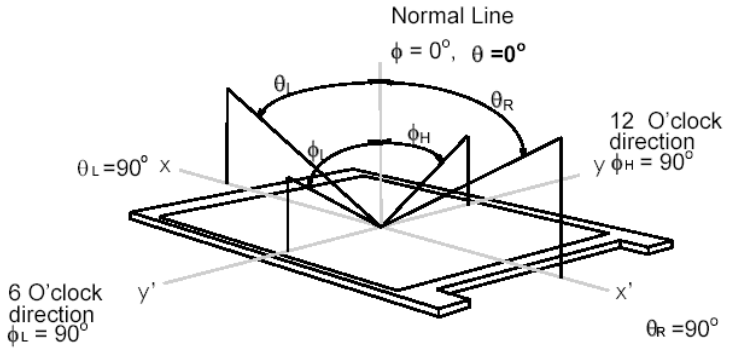
$$\text{Contrast Ratio} = \frac{\text{Luminance of White pattern}}{\text{Luminance of Black pattern}}$$

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

Note 2-5: Viewing angle measurement

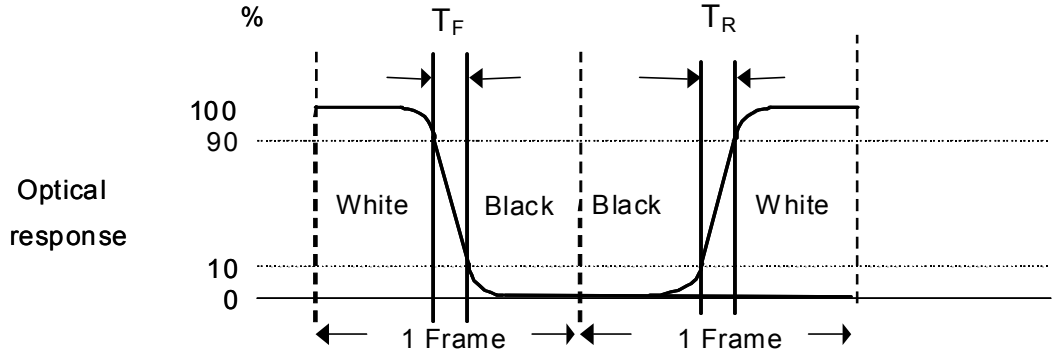
Definition: The angle at which the contrast ratio is greater than 10 & 5 .

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 "Black" to "White" (rising time, T_R), and from "White" to "Black" (falling time, T_F), respectively. The response time is interval between the 10% and 90% of optical response. (*Black & White color definition: Please refer section 3.4.3)*



Note 2-7: Crosstalk measurement

Definition:

$CT = Max. (CT_H, CT_V)$;

Where

a.Maximum Horizontal Crosstalk :

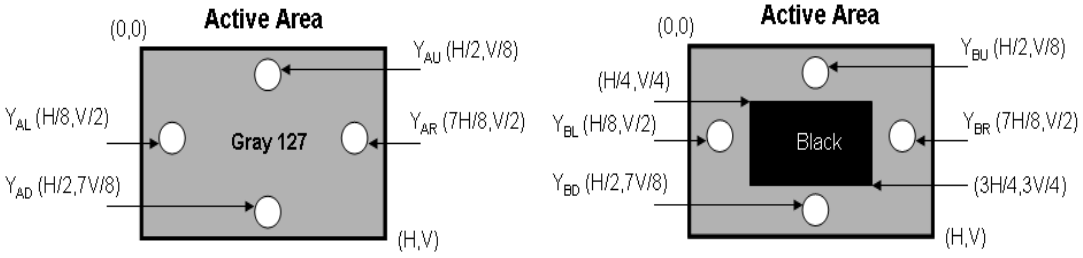
$CT_H = Max. (| Y_{BL} – Y_{AL} | / Y_{AL} \times 100\ \%, | Y_{BR} – Y_{AR} | / Y_{AR} \times 100\ \%)$;

Maximum Vertical Crosstalk:

$CT_V = Max. (| Y_{BU} – Y_{AU} | / Y_{AU} \times 100\ \%, | Y_{BD} – Y_{AD} | / Y_{AD} \times 100\ \%)$;

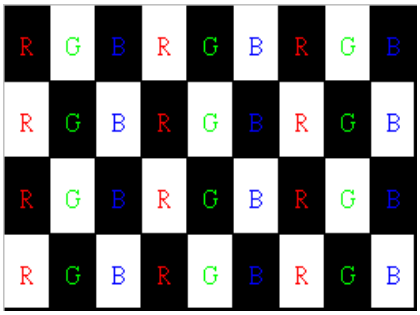
b. Y_{AU}, Y_{AD}, Y_{AL}, Y_{AR} = Luminance of measured location without Black pattern

Y_{BU}, Y_{BD}, Y_{BL}, Y_{BR} = Luminance of measured location with Black pattern



Note 2-8: Flicker measurement

a.Test pattern: It is listed as following.



Gray level = L0

Gray level = L127

R: Red, G: Green, B:Blue

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

2.4 Mechanical Characteristics

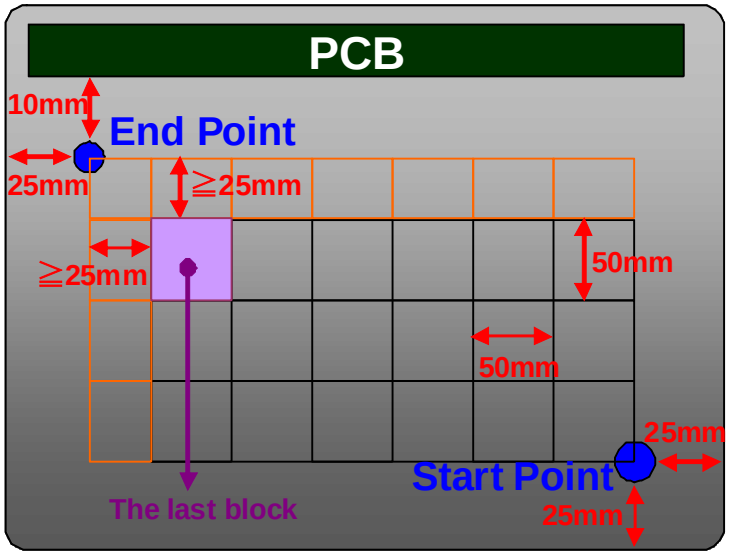
Symbol	Description	Min.	Max.	Unit	Remark
P_{bc}	Backside Compression	2.5	-	[Kgf]	*Note 2-9*

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.

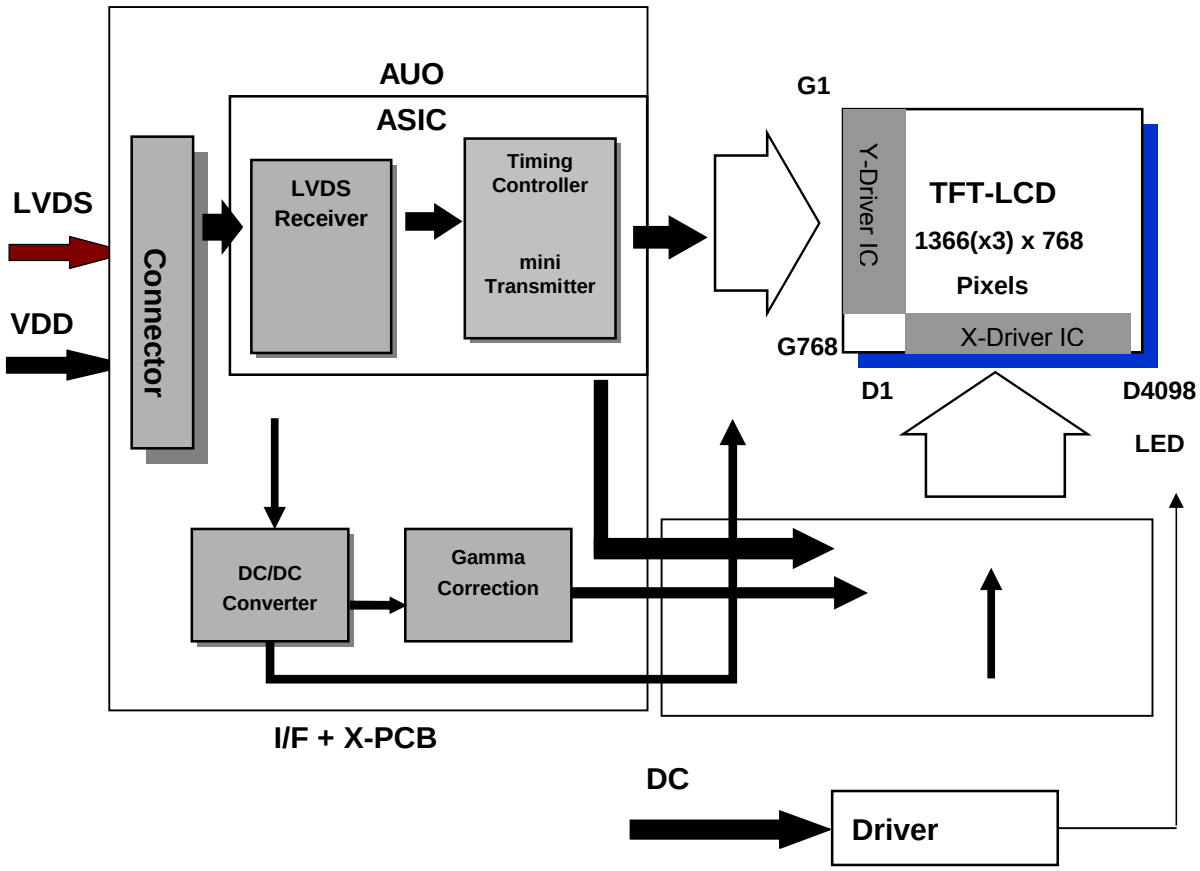
If the distance from the last block to each side of the End Point ≧ 25mm, add other blocks to make sure that most area of Bezel Back can be measured.



3 TFT-LCD Module

3.1 Block Diagram

The following shows the block diagram of the 18.5 inch Color TFT-LCD Module.



3.2 Interface Connection

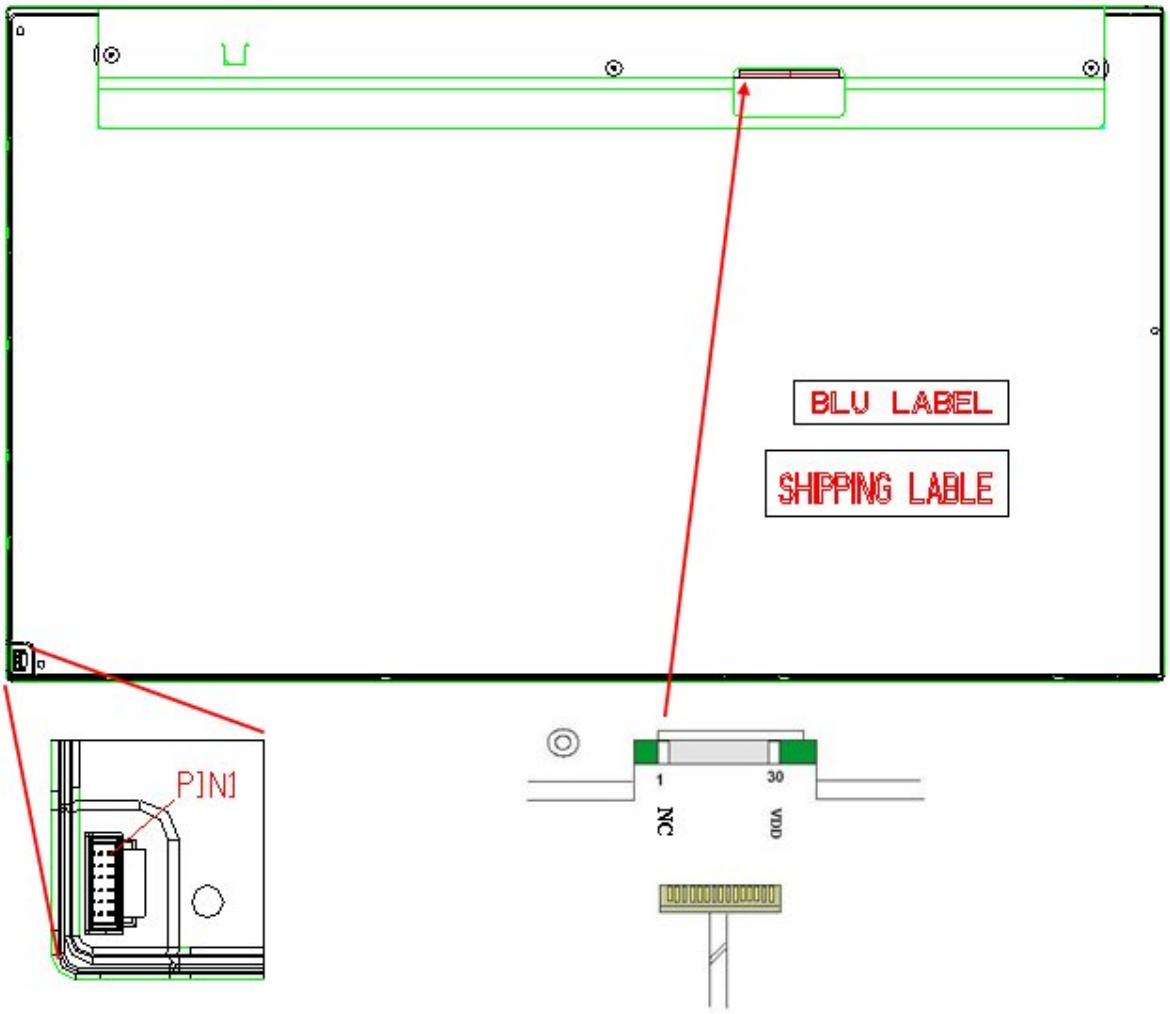
3.2.1 Connector Type

TFT-LCD Connector	Manufacturer	P-TWO	STM
	Part Number	AL230F-A0G1D-P	MSCKT2407P30HB
Mating Connector	Manufacturer	JAE	
	Part Number	FI-X30HL (Locked Type) FI-X30H (Unlocked Type)	

3.2.2 Connector Pin Assignment

PIN #	Symbol	Description	Remark
1	NC	No contact (For AUO internal use)	
2	NC	No contact (For AUO internal use)	
3	NC	No contact (For AUO internal use)	
4	GND	Power Ground	
5	RXIN0-	Negative LVDS differential data input (0)	
6	RXIN0+	Positive LVDS differential data input (0)	
7	GND	Power Ground	
8	RXIN1-	Negative LVDS differential data input (1)	
9	RXIN1+	Positive LVDS differential data input (1)	
10	GND	Power Ground	
11	RXIN2-	Negative LVDS differential data input (2)	
12	RXIN2+	Positive LVDS differential data input (2)	
13	GND	Power Ground	
14	RXCLKIN-	Negative LVDS differential clock input (clock)	
15	RXCLKIN+	Positive LVDS differential data input (clock)	
16	GND	Power Ground	
17	RXIN3-	Negative LVDS differential data input (3)	
18	RXIN3+	Positive LVDS differential data input (3)	
19	GND	Power Ground	
20	NC	No contact (For AUO internal use)	
21	NC	No contact (For AUO internal use)	
22	NC	No contact (For AUO internal use)	
23	GND	Power Ground	
24	GND	Power Ground	

25	GND	Power Ground	
26	VDD	+5V power supply	
27	VDD	+5V power supply	
28	VDD	+5V power supply	
29	VDD	+5V power supply	
30	VDD	+5V power supply	



3.3 Electrical Characteristics

3.3.1 Absolute Maximum Rating

Permanent damage may occur if exceeding the following maximum rating.

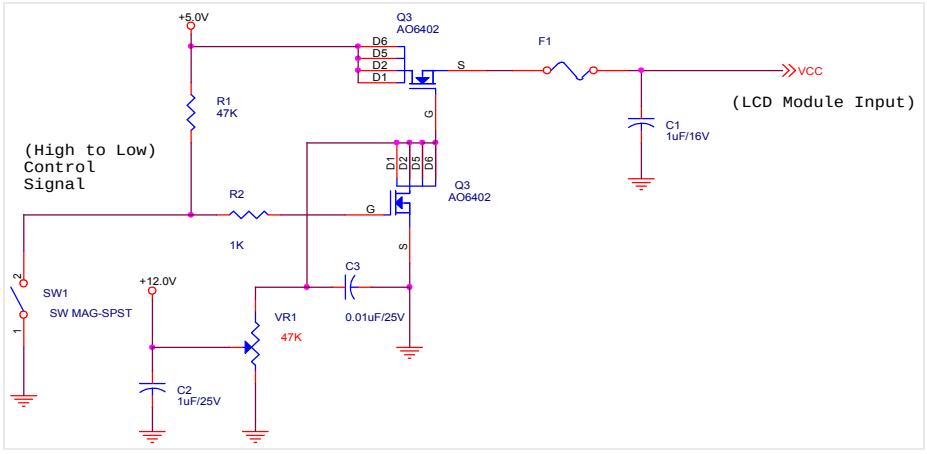
Symbol	Description	Min	Max	Unit	Remark
VDD	Power Supply Input Voltage	GND-0.3	6.0	[Volt]	Ta=25□

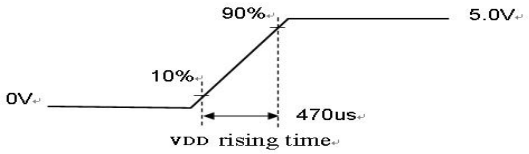
3.3.2 Recommended Operating Condition

Symbol	Description	Min	Typ	Max	Unit	Remark
VDD	Power supply Input voltage	4.5	5.0	5.5	[Volt]	
IDD	Power supply Input Current (RMS)	-	0.35	0.42	[A]	VDD= 5.0V, Black Pattern, Fv=60Hz
			0.42	0.5	[A]	VDD= 5.0V, Black Pattern, Fv=75Hz
PDD	VDD Power Consumption	-	1.75	2.1	[Watt]	VDD= 5.0V, Black Pattern, Fv=60Hz
			2.1	2.5	[Watt]	VDD= 5.0V, Black Pattern, Fv=75Hz
IRush	Inrush Current	-	-	2.0	[A]	*Note 3-1*
VDDrp	Allowable VDD Ripple Voltage	-	-	350	[mV]	VDD= 5.0V, Black Pattern, Fv=75Hz

Note 3-1: Inrush Current measurement:

Test circuit:

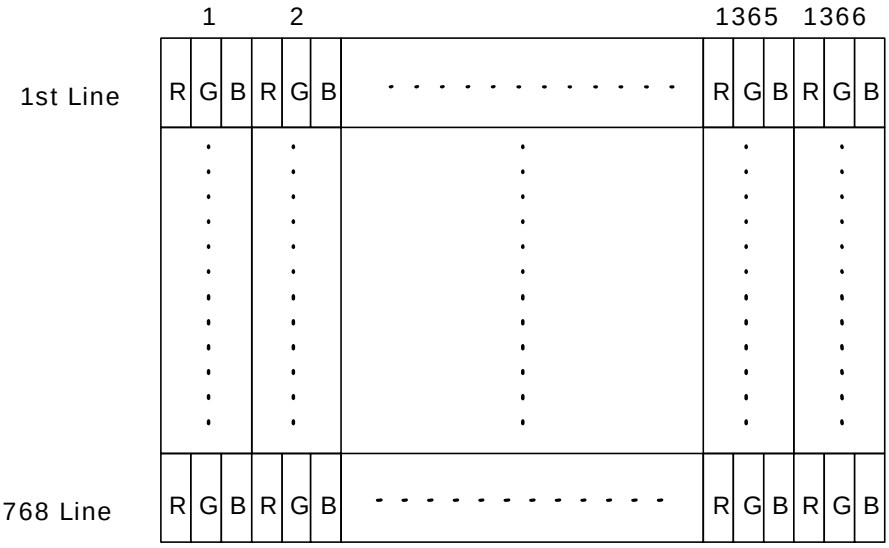




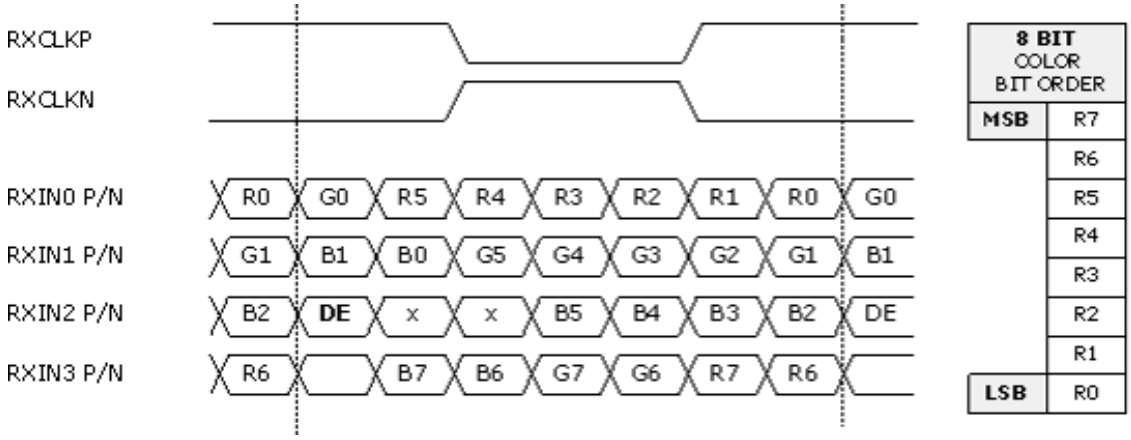
The duration of VDD rising time: 470us.

3.4 Signal Characteristics

3.4.1 LCD Pixel Format



3.4.2 LVDS Data Format



LVDS Data Mapping of NS Format

Note 3-2:

a. Normally, DE, VS, HS on EVEN channel are not used.

b. Refer to 3.4.1 LCD pixel format, the 1st data is 1, the 2nd data is 2 and the last data is 1366.

C. 8-bits signal input.

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.

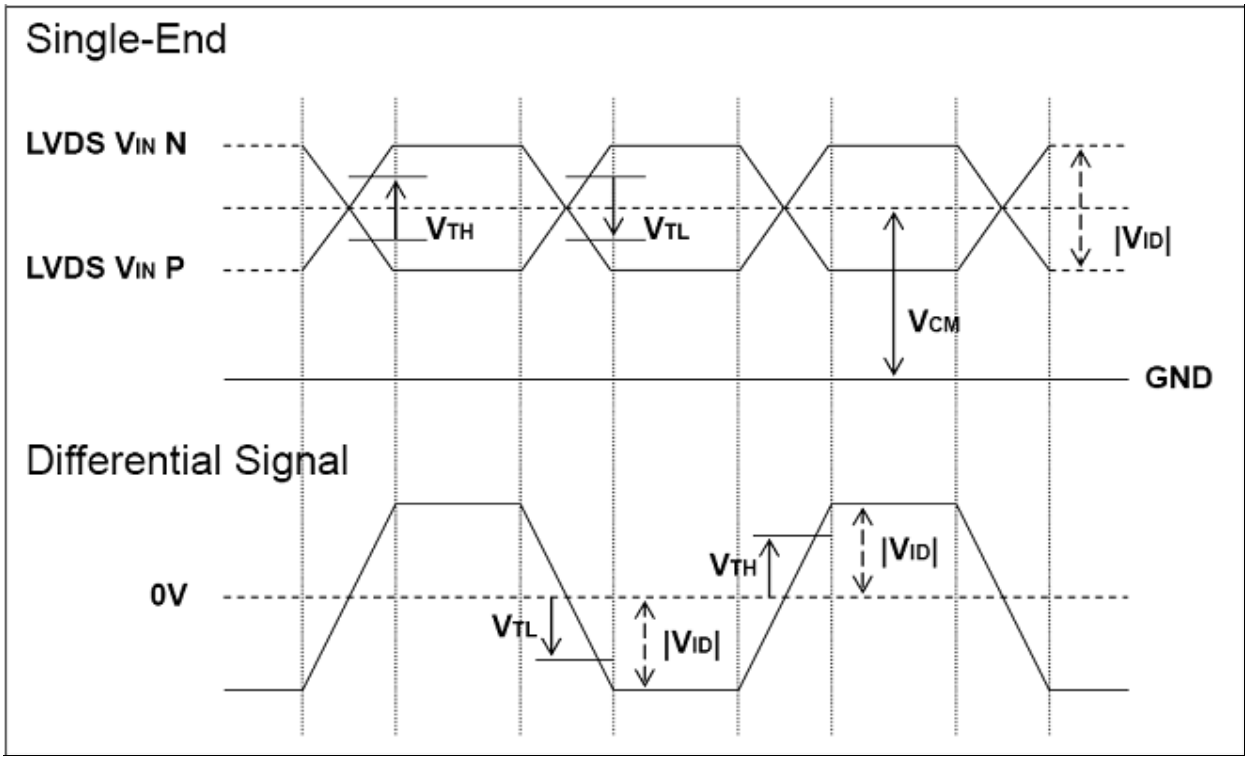
Color	Gray Level	Color Input Data																								Remark
		RED data (MSB:R7, LSB:R0)								GREEN data (MSB:G7, LSB:G0)								BLUE data (MSB:B7, LSB:B0)								
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	
Black	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

a. DC Characteristics:

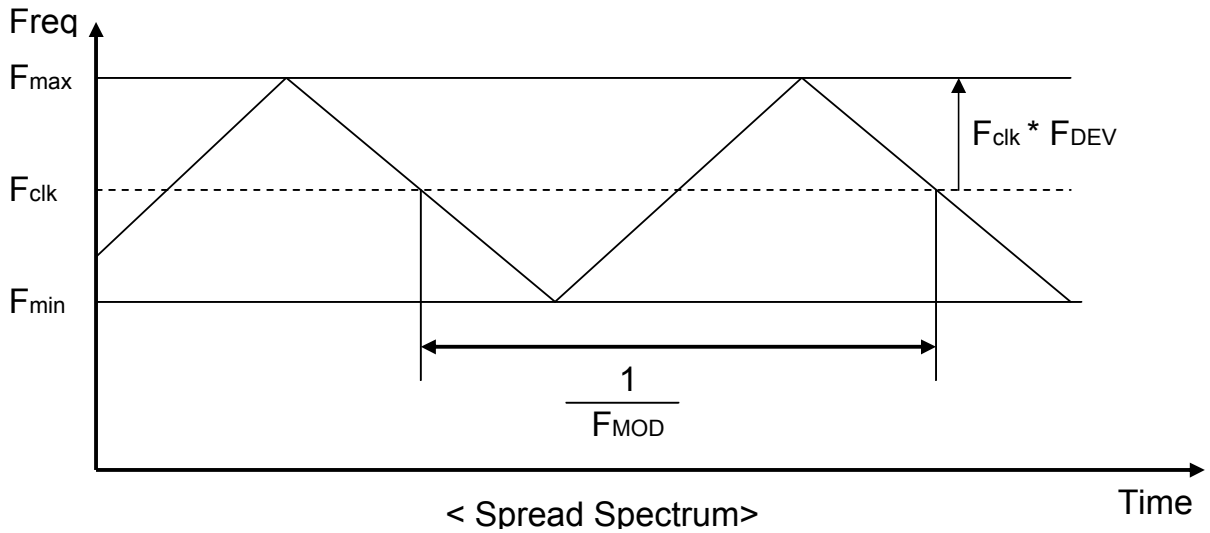
Symbol	Description	Min	Typ	Max	Units	Condition
V_{TH}	LVDS Differential Input High Threshold	-	-	+100	[mV]	V_{CM} = 1.2V
V_{TL}	LVDS Differential Input Low Threshold	-100	-	-	[mV]	V_{CM} = 1.2V
$\lvert V_{ID} \rvert$	LVDS Differential Input Voltage	100	-	600	[mV]	
V_{CM}	LVDS Common Mode Voltage	+1.0	+1.2	+1.5	[V]	V_{TH}-V_{TL} = 200mV

LVDS Signal Waveform:



b. AC Characteristics:

Symbol	Description	Min	Max	Unit	Remark
F_{DEV}	Maximum deviation of input clock frequency during Spread Spectrum	-	± 3	%	
F_{MOD}	Maximum modulation frequency of input clock during Spread Spectrum	-	200	KHz	



< Spread Spectrum>

Fclk: LVDS Clock Frequency

3.4.5 Input Timing Specification

It only support DE mode, and the input timing are shown as the following table.

Symbol	Description		Min.	Typ.	Max.	Unit	Remark
Tv	Vertical Section	Period	793	808	1293	Th	
Tdisp (v)		Active	768	768	768	Th	
Tblk (v)		Blanking	25	40	525	Th	
Fv		Frequency	50	60	76	Hz	
Th	Horizontal Section	Period	1454	1606	2047	Tclk	
Tdisp (h)		Active	1366	1366	1366	Tclk	
Tblk (h)		Blanking	88	240	681	Tclk	
Fh		Frequency	39.7	48.5	64.6	KHz	*Note 3-3*
Tclk	LVDS Clock	Period	10.6	12.8	17.3	ns	1/Fclk
Fclk		Frequency	57.7	77.9	94.0	MHz	*Note 3-4*

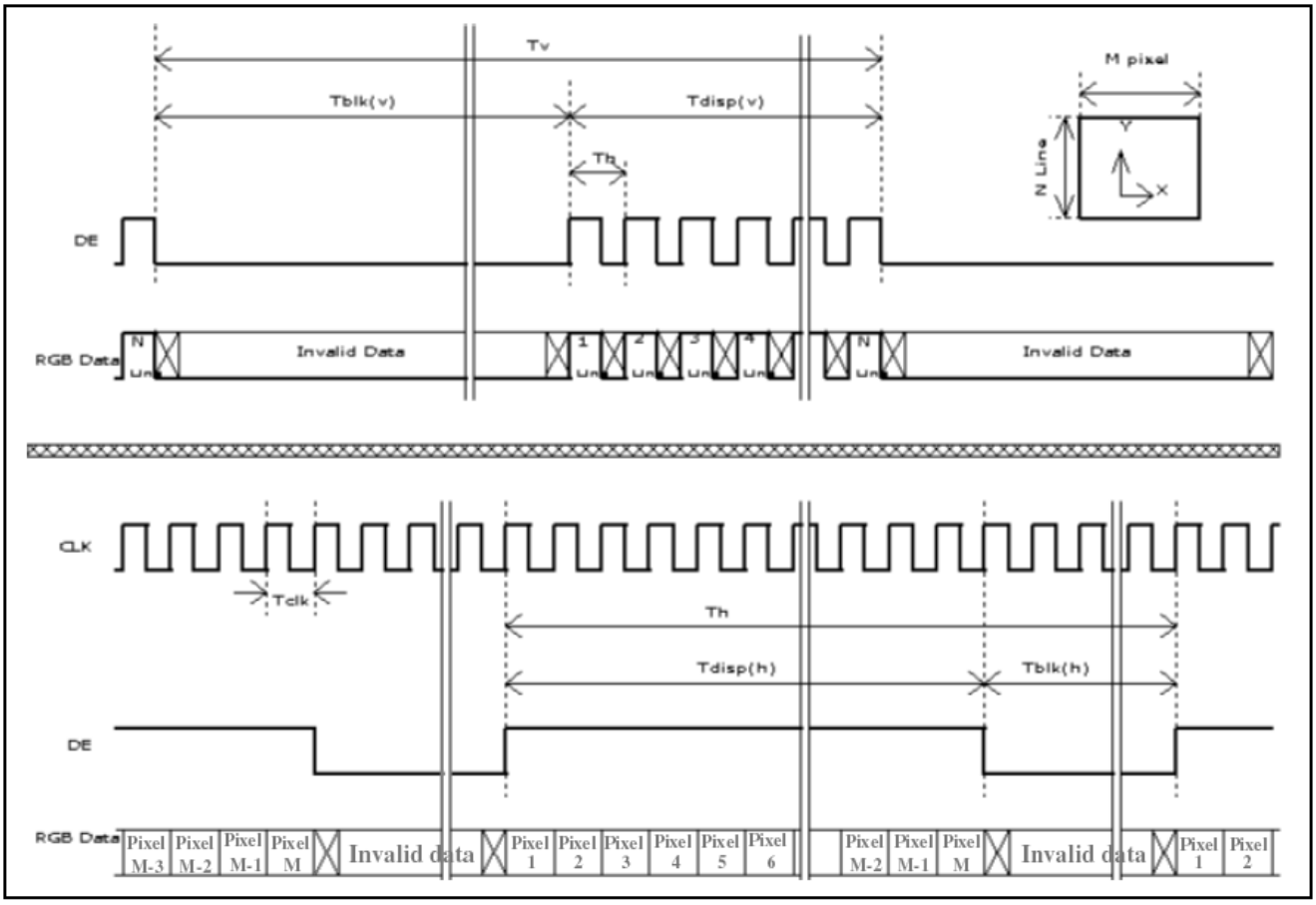
Note 3-3: The equation is listed as following. Please don't exceed the above recommended value.

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

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

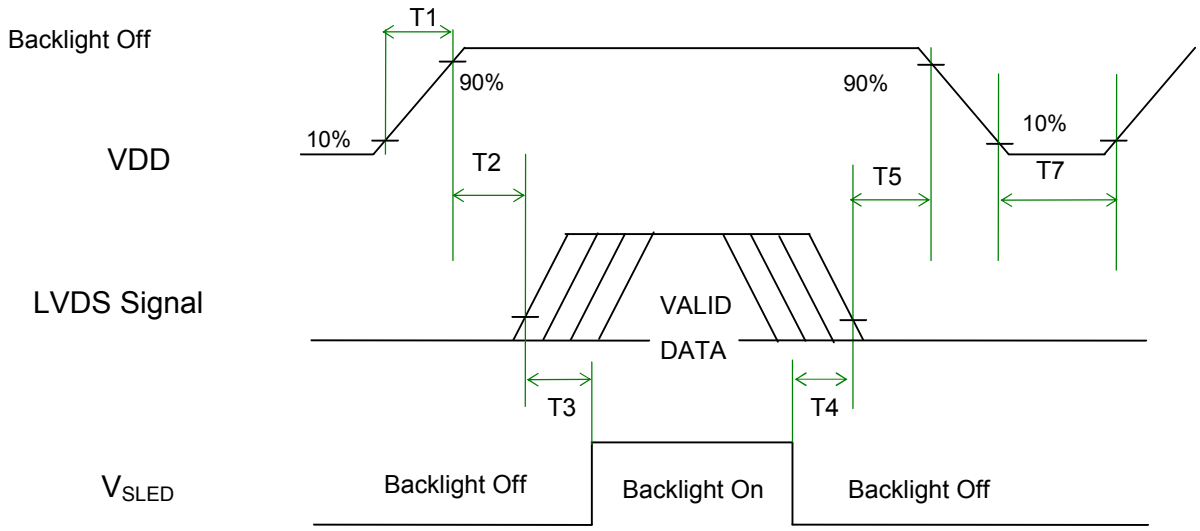
Fclk (Min.) = Fv (Min.) x Th (Min.) x Tv (Min.);
Fclk (Typ.) = Fv (Typ.) x Th (Typ.) x Tv (Typ.);
Fclk (Max.) = Fv (Max.) x Th (Typ.) x Tv (Typ.);

3.4.6 Input Timing Diagram



3.5 Power ON/OFF Sequence

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



Power Sequence Timing

Symbol	Value			Unit	Remark
	Min.	Typ.	Max.		
T1	0.5	-	10	[ms]	
T2	0	-	50	[ms]	
T3	500	-	-	[ms]	
T4	100	-	-	[ms]	
T5	0		50	[ms]	*Note 3-5* *Note 3-6*
T7	1000	-	-	[ms]	

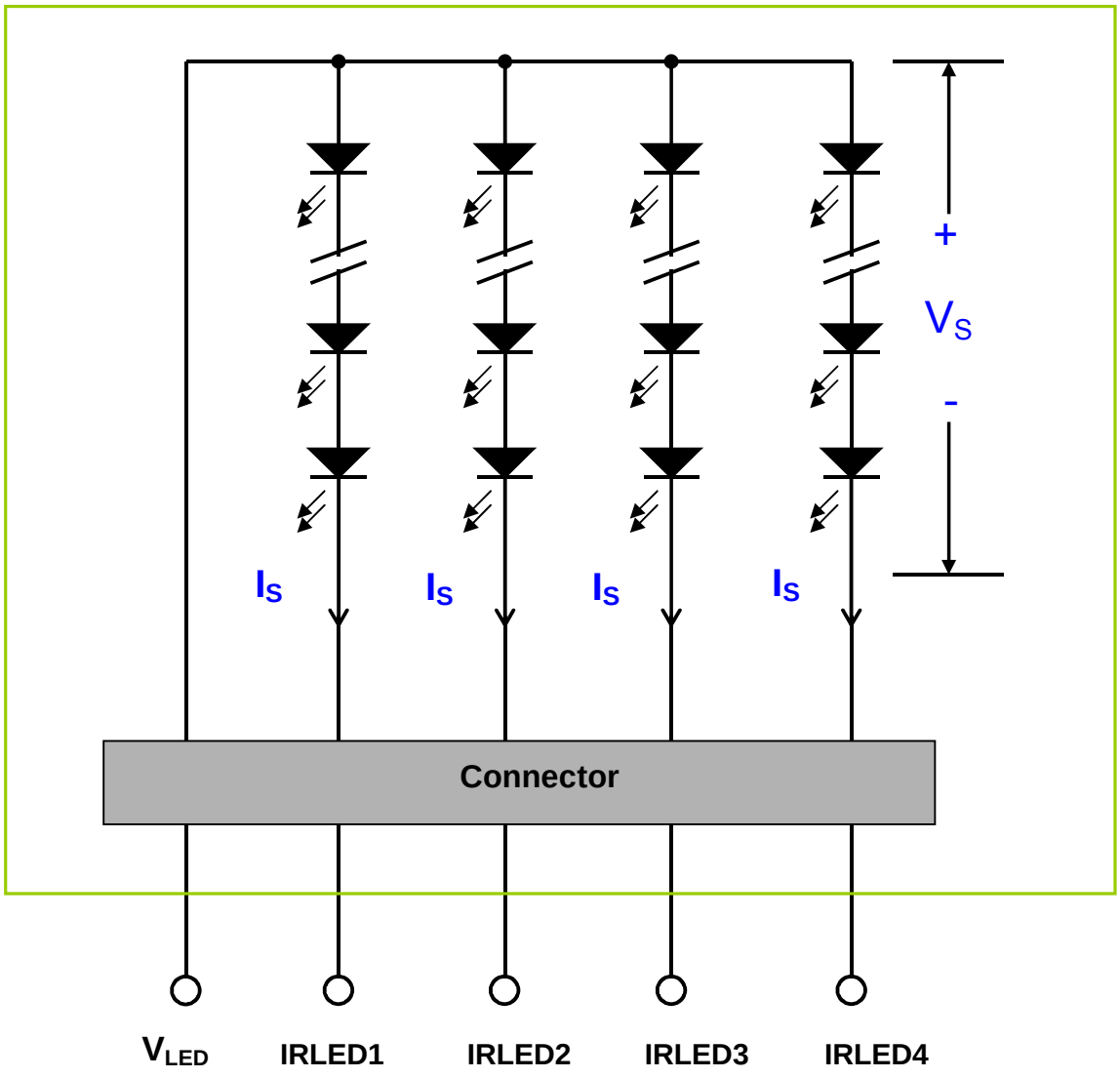
Note 3-5 : Recommend setting T5 = 0ms to avoid electronic noise when VDD is off.

Note 3-6 : During T5 period , please keep the level of input LVDS signals with Hi-Z state.

4 Backlight Unit

4.1 Block Diagram

The following shows the block diagram of the 18.5 inch Backlight Unit. And it includes 28 pcs LED in the LED light bar. (4 strings and 7 pcs LED of one string).



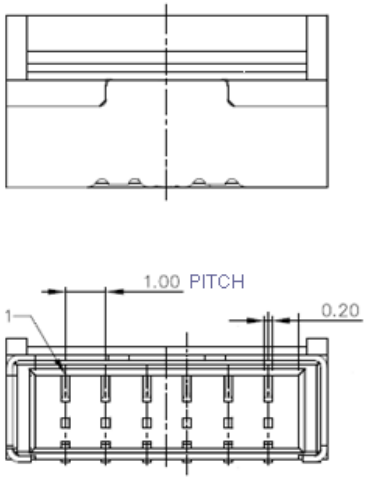
4.2 Interface Connection

4.2.1 Connector Type

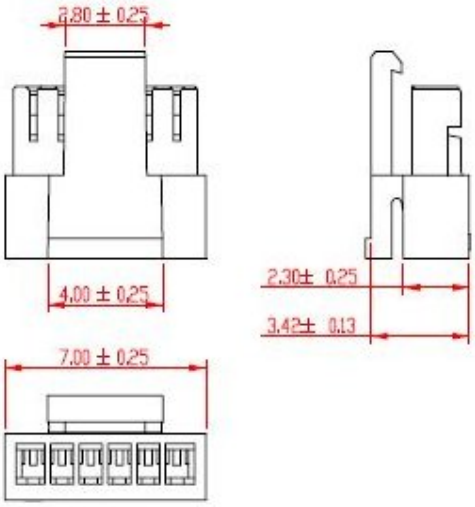
Backlight Connector	Manufacturer	ENTERY
	Part Number	3707K-S06N-21R
Mating Connector	Manufacturer	ENTERY
	Part Number	3707K-S06N-21R (Wire harness)

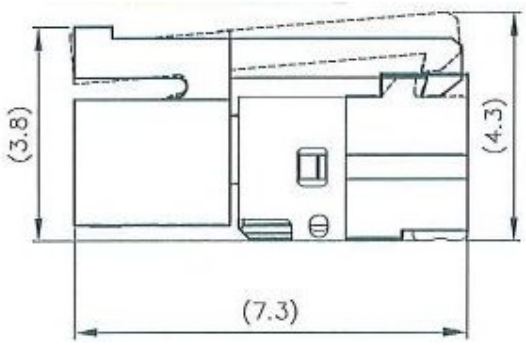
Backlight Connector dimension:

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



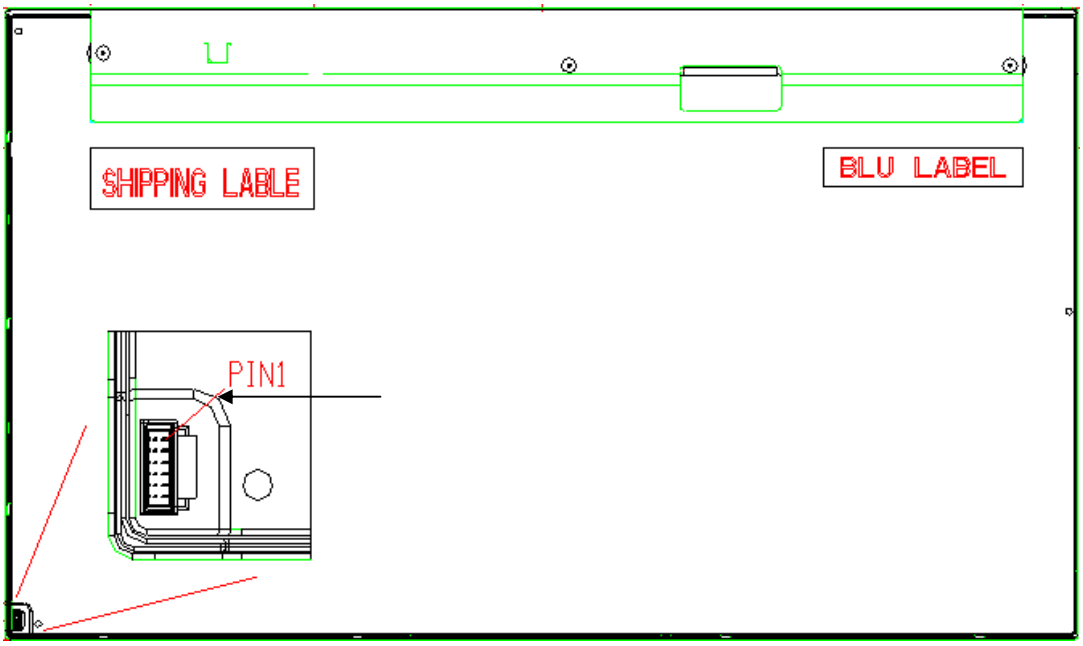
Mating Connector dimension:





4.2.2 Connector Pin Assignment

Pin#	Symbol	Description	Remark
1	IRLED1	LED Current Feedback Terminal (Channel 1)	
2	IRLED2	LED Current Feedback Terminal (Channel 2)	
3	V_{LED}	LED Power Supply Voltage Input Terminal	
4	V_{LED}	LED Power Supply Voltage Input Terminal	
5	IRLED3	LED Current Feedback Terminal (Channel 3)	
6	IRLED4	LED Current Feedback Terminal (Channel 4)	



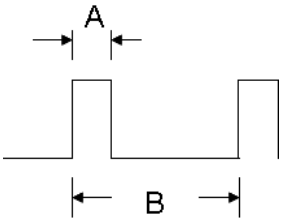
4.3 Electrical Characteristics

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	90	[mA]	100% duty ratio
			150	[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

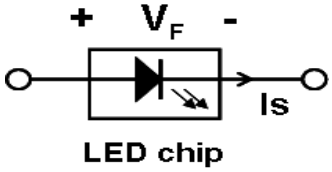
(Ta=25°C)

Symbol	Description	Min.	Typ.	Max.	Unit	Remark
Is	LED String Current	-	70	77	[mA]	100% duty ratio of LED chip
Vs	LED String Voltage	19.6	21.7	23.8	[Volt]	Is=70mA @ 100% duty ratio; *Note 4-1, Note 4-5*
ΔVs	Maximum Vs Voltage Deviation of light bar	-	-	1.4	[Volt]	Is=70mA @ 100% duty ratio; *Note 4-2*
P_{BLU}	LED Light Bar Power Consumption	-	6.1	6.7	[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.)=3.2V, V_F(Max.)=3.4V

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 = 70mA 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.

5 Reliability Test

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

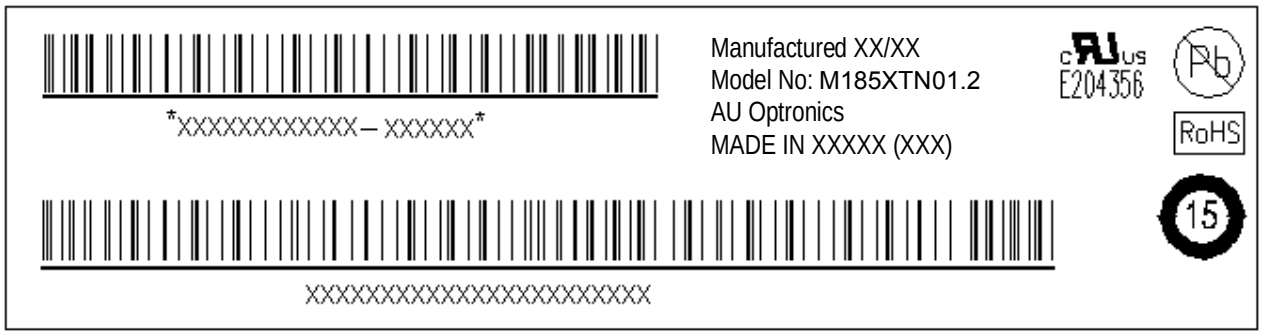
Items	Condition	Remark
Temperature Humidity Bias (THB)	Ta= 50□, 80%RH, 300hours	
High Temperature Operation (HTO)	Ta= 50□, 50%RH, 300hours	
Low Temperature Operation	Ta= 0□, 300hours	
High Temperature Storage (HTS)	Ta= 60□, 300hours	
Low Temperature Storage (LTS)	Ta= -20□, 300hours	
Vibration Test (Non-operation)	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□/30min, 60□/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□ to 60□, 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.

6 Shipping Label

The label is on the panel as shown below:



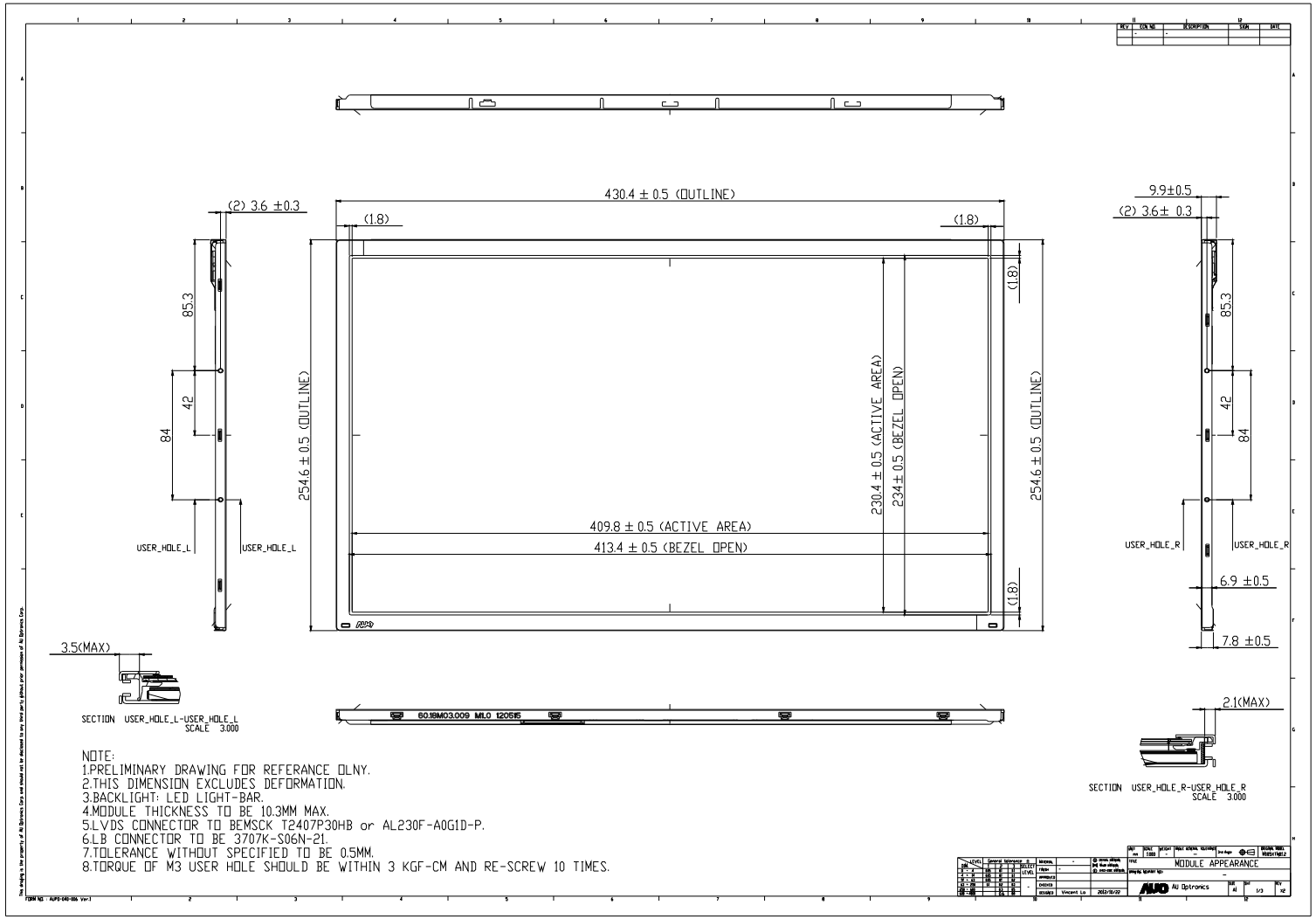
Note 6-1: For Pb Free products, AUO will add for identification.

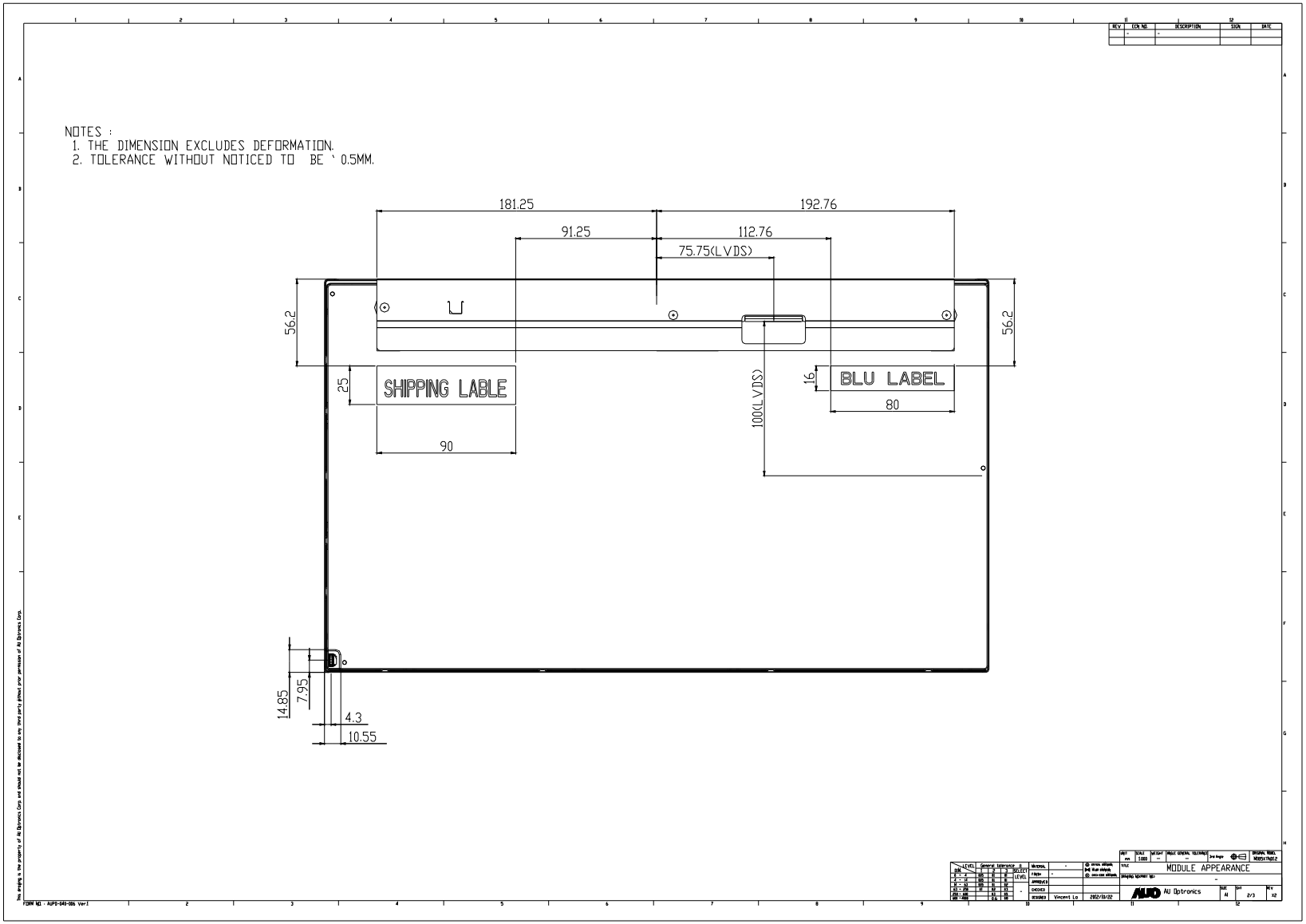
Note 6-2: For RoHS compatible products, AUO will add for identification.

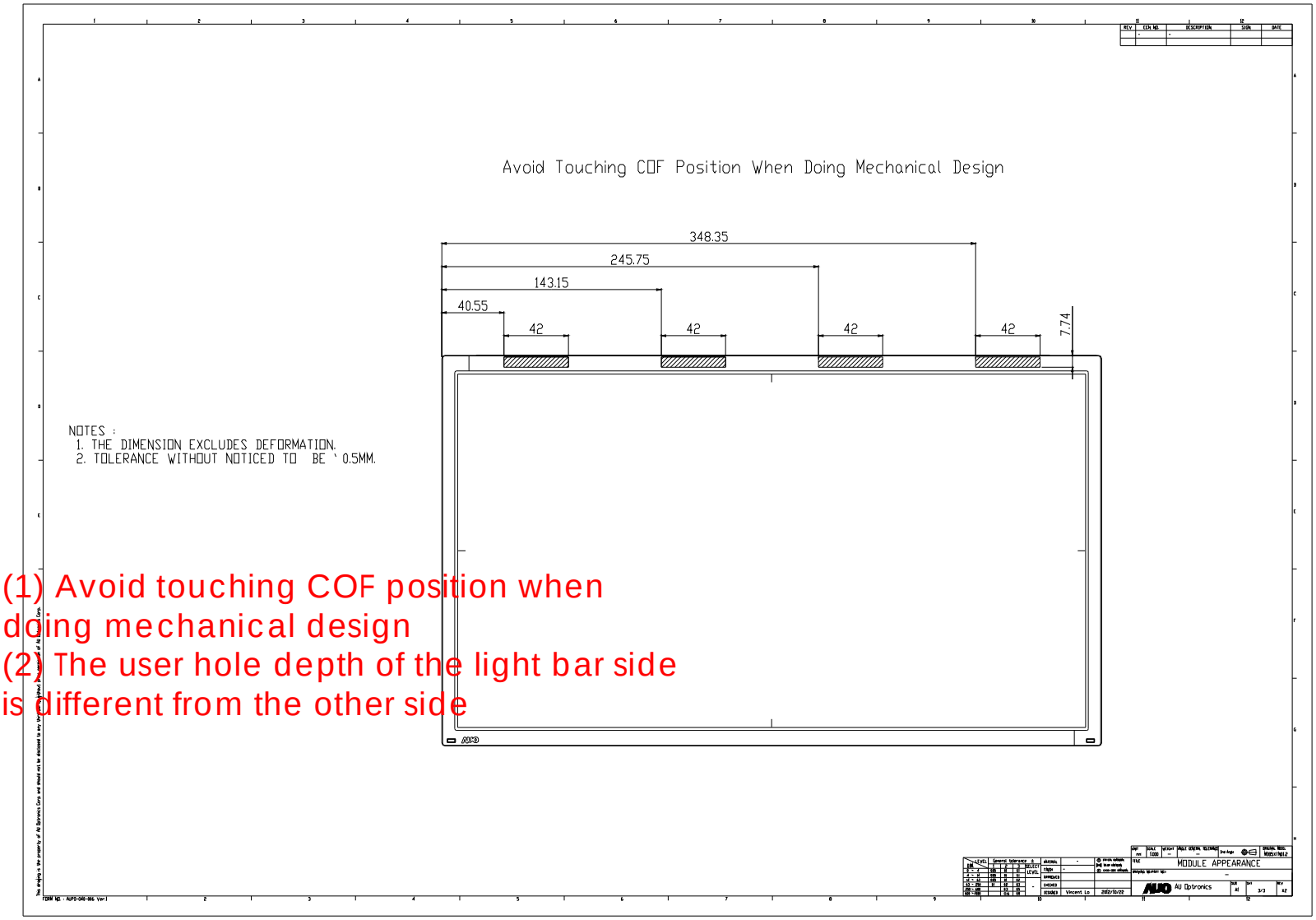
Note 6-3: For China RoHS compatible products, AUO will add for identification.

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




NOTES :
1. THE DIMENSION EXCLUDES DEFORMATION.
2. TOLERANCE WITHOUT NOTICED TO BE ` 0.5MM.
181.25
192.76
91.25
112.76
75.75(LVDS)
56.2
56.2
SHIPPING LABLE
25
90
100(LVDS)
BLU LABEL
16
80
14.85
7.95
4.3
10.55
MODULE APPEARANCE
AU Optronics


Avoid Touching COF Position When Doing Mechanical Design
348.35
245.75
143.15
40.55
42
42
42
42
7.74
NOTES :
1. THE DIMENSION EXCLUDES DEFORMATION.
2. TOLERANCE WITHOUT NOTICED TO BE ± 0.5MM.
(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
MODULE APPEARANCE
AU Optronics

8 Packing Specification

8.1 Packing Flow

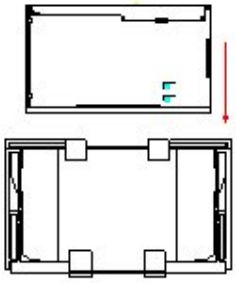
M185 14片裝:48.5*37.2*34.8cm

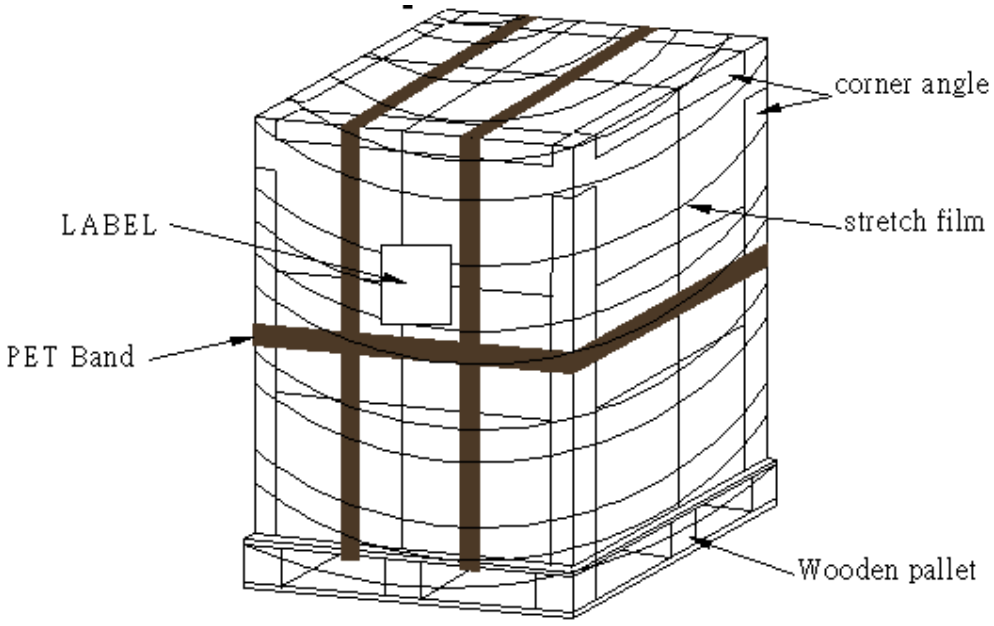
料號:

Carton:81.18M02.008 /Cushion:84.18M02.037

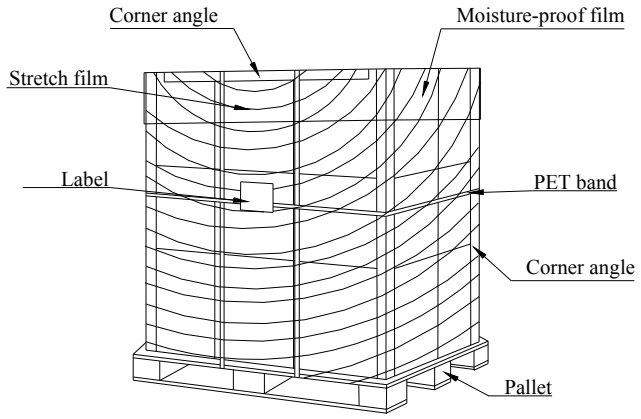
將M185模組置入靜電袋中並折疊後
依序放入包裝隔板中

放置14片，放入上蓋緩衝，封箱完成





單層 pallet 打棧示意圖



8.2 Pallet and shipment information

Item	Specification			Remark
	Q'ty	Dimension	Weight(kg)	
Panel	1	430.37(H)mm x 254.6(V)mm x 9.9(D)mm	1.330	
Cushion	1	-	1.125	
Box	1	485(L)mm x 372(W)mm x 348(H)mm	1.00	without Panel & cushion
Packing Box	14 pcs/Box	485(L)mm x 372(W)mm x 348(H)mm	20.745	with panel & cushion
Pallet	1	1150(L)mm x 980(W)mm x 138(H)mm	15	
Pallet after Packing	24 boxes/pallet	1150(L)mm x 980(W)mm x 138(H)mm	509	