



Product Specification

G229HAF02.0

AU OPTRONICS CORPORATION

- (v) Preliminary Specifications
- () Final Specifications

Module	22.9 Inch All In One Monitor
Model Name	G229HAF02.0

<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">Customer</td> <td style="width: 50%; text-align: center;">Date</td> </tr> <tr> <td style="border-top: 1px solid black; height: 40px;"></td> <td style="border-top: 1px solid black; height: 40px;"></td> </tr> <tr> <td style="text-align: center; padding-top: 20px;">Checked & Approved by</td> <td style="text-align: center; padding-top: 20px;">Date</td> </tr> <tr> <td style="border-top: 1px solid black; height: 40px;"></td> <td style="border-top: 1px solid black; height: 40px;"></td> </tr> </table>	Customer	Date			Checked & Approved by	Date			<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">Approved by</td> <td style="width: 50%; text-align: center;">Date</td> </tr> <tr> <td style="border-top: 1px solid black; text-align: center; padding-top: 10px;"><i>Crystal Hsieh</i></td> <td style="border-top: 1px solid black; text-align: center; padding-top: 10px;">2019. 02. 19</td> </tr> <tr> <td style="text-align: center; padding-top: 20px;">Prepared by</td> <td style="text-align: center; padding-top: 20px;">Date</td> </tr> <tr> <td style="border-top: 1px solid black; text-align: center; padding-top: 10px;"><i>HsinYin Lee</i></td> <td style="border-top: 1px solid black; text-align: center; padding-top: 10px;">2019. 02. 19</td> </tr> </table>	Approved by	Date	<i>Crystal Hsieh</i>	2019. 02. 19	Prepared by	Date	<i>HsinYin Lee</i>	2019. 02. 19
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Customer's sign back page	General Display Business Division / AU Optronics corporation																



Contents

1 Operating Precautions4

2 General Description.....5

2.1 Display Characteristics 5

2.2 Optical Characteristics..... 7

3 Functional Block Diagram.....10

4 Absolute Maximum Ratings11

4.1 Absolute Ratings of Monitor11

4.2 Absolute Ratings of Environment11

5 Electrical Characteristics13

5.1 Set Module13

6 Signal Characteristic17

6.1 Pixel Format Image..... 17

6.2 Signal Description- USB pin define..... 18

6.3 LCM Timing Characteristics 19

6.4 LCM Timing diagram 20

6.5 Wireless LAN..... 20

7 Connector & Pin Assignment 21

7.1 Micro USB 21

7.2 Micro HDMI Connector 22

7.3 Type C Connector 23

7.4 Ethernet RJ45 24

8 Reliability Test Criteria 25

9 Mechanical Characteristics 26

9.1 Monitor Outline Dimension 26

10 Label and Packaging 27

10.1 Shipping Label 27

10.2 Carton Package 28

10.3 Shipping Package of Palletizing Sequence 29

11 Safety..... 30

11.1 Sharp Edge Requirements 30

11.2 Materials..... 30

11.3 Capacitors 30

11.4 National Test Lab Requirement 30



1 Operating Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the monitor surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the monitor 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 monitor Assembly.
- 8) In case if a monitor has to be put back into the packing container slot after it was taken out from the container, do not press the center of LED light bar edge. Instead, press at the far ends of the LED light bar edge softly. Otherwise the monitor may be damaged.
- 9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 10) After installation of the monitor into an enclosure, do not twist nor bend the monitor even momentarily. While designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the monitor from outside. Otherwise the monitor may be damaged.
- 11) Small amount of materials having no flammability grade is used in the monitor. The monitor should be supplied by power complied with requirements of Limited Power Source (IEC60950-1 or UL60950-1), or be applied exemption.
- 12) Micro USB only support read Image/Video files, don't connector 5V of USB from another host like PC ,mobile phone

2 General Description

This specification applies to the 22.9 inch wide color a-Si TFT-LCD All In One monitor G229HAF02.0. The screen format is intended to support the resolution 1920(H) x 165(V)) and 16.7M colors.

2.1 Display Characteristics

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

Panel	Model	G229HAF02.0
	LCD Size	22.9 inch
	Light Source	LED
	Active Area	578.88(H) x 49.7475(V) mm
	Resolution	1920 x 165
	Pixel Pitch	301.5 x 301.5
	Aspect Ratio	12:1
	Brightness (typ.)	700 cd/m ²
	Contrast Ratio (typ.)	1000:1
	Response Time	25ms (Tr+Tf)
	Viewing Angle	89 / 89 / 89 / 89 degree
	Light Life	50,000 hrs (min.)
	Panel Surface	Anti-Glare type, 3H, Haze 25%
	Color gamut	72% NTSC
	Display Color	8bit, 16.7M
Power	Power supply	AC 100V-240V, 50-60Hz, 1A (typ.)
	Power consumption (Watt@100V)	12W (typ.)
Display	I/O_Signal input	Micro USB x 1 (mouse or RJ45 dongle)
	I/O_Signal output	Micro HDMI x 1
	I/O_External Control	Debug USB port for repair
	Wireless	
	Dimension (Lx W x D)	587.08 x 62.05 x 16.5 mm
	Weight(Net)	700g (typ.)
	Border width (U/D/R/L)	3.4 / 8.9 / 4.1 / 4.1 mm
	Painting	Black
	Wall Mounting	M3 *4mm / Pitch 190mm
	Language	English /French/ German/ Spanish/ Traditional Chinese/ Simplified Chinese/ Japanese
	OS	Android 8.1



Product Specification

G229HAF02.0

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Environment	Operation Temp	0°C ~50°C
	Storage Temp	-20°C ~ 60°C
	Operating Humidity	5% ~ 80% RH
	Storage Humidity	5% ~ 80% RH
	Display Orientation	Landscape
Accessory	Power cable	3 in 1 (US/JPN/TW) x1
	Adaptor	12V, 3A x 1

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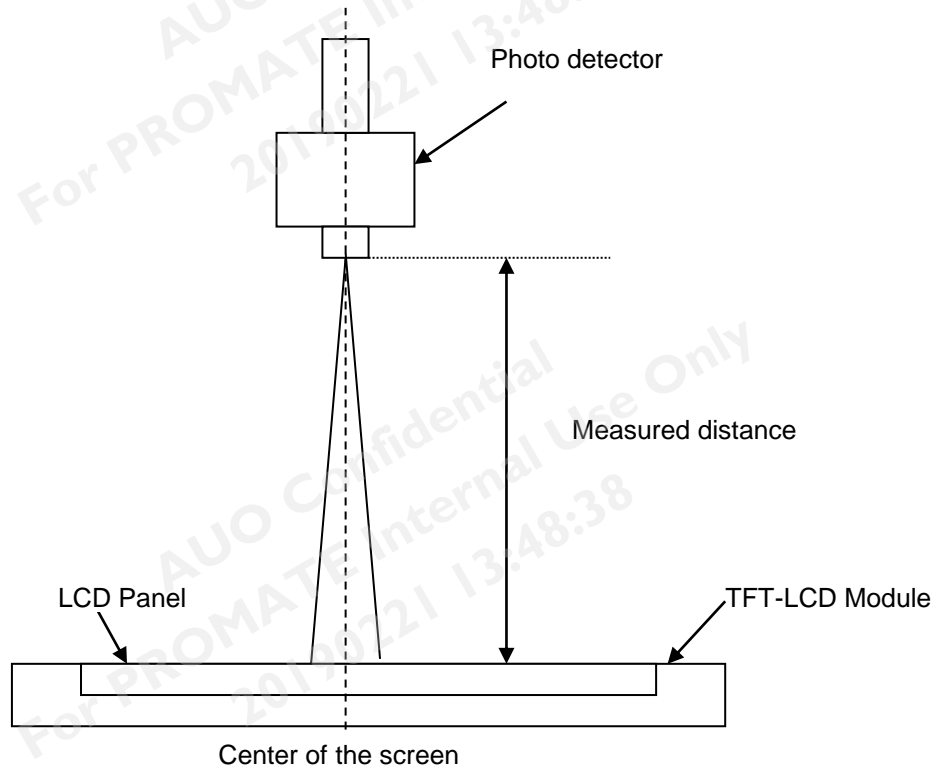
2.2 Optical Characteristics

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

Item	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing Angle	[degree]	Horizontal (Right) CR >10 (Left)	79 79	89 89	- -	2
		Vertical (Up) CR > 10 (Down)	79 79	89 89	- -	
		Contrast ratio		Normal Direction	800	
Response Time	[msec]	Raising Time (T _r)	-	13	-	4
		Falling Time (T _f)	-	12	-	
		Raising + Falling	-	25	30	
Color / Chromaticity Coordinates (CIE1931)	-	Red x	0.593	0.643	0.693	5
		Red y	0.287	0.337	0.387	
		Green x	0.257	0.307	0.357	
		Green y	0.550	0.600	0.650	
		Blue x	0.100	0.150	0.200	
		Blue y	0.014	0.064	0.114	
		White x	0.263	0.313	0.363	
		White y	0.279	0.329	0.379	
Central Luminance	[cd/m ²]		560	700	-	6
Luminance Uniformity	[%]		70	75	-	7
Color Gamut	%		-	72	-	

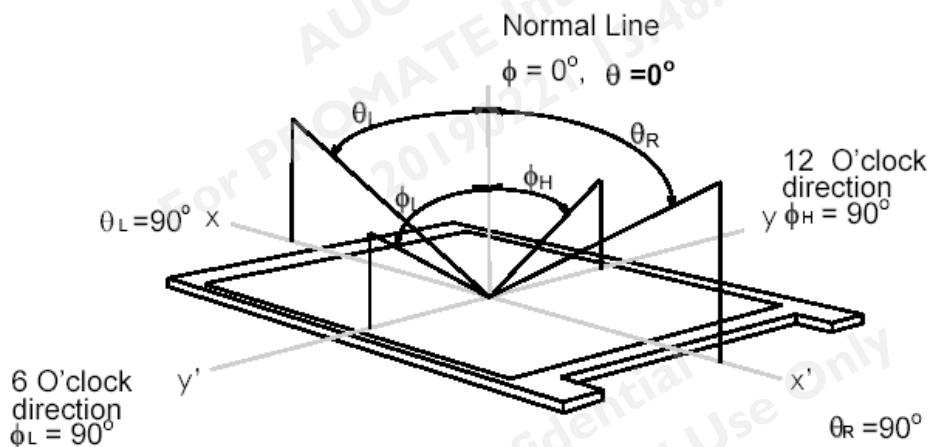
Note 1: Measurement method

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



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

Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90° (θ) horizontal left and right and 90° (ϕ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.

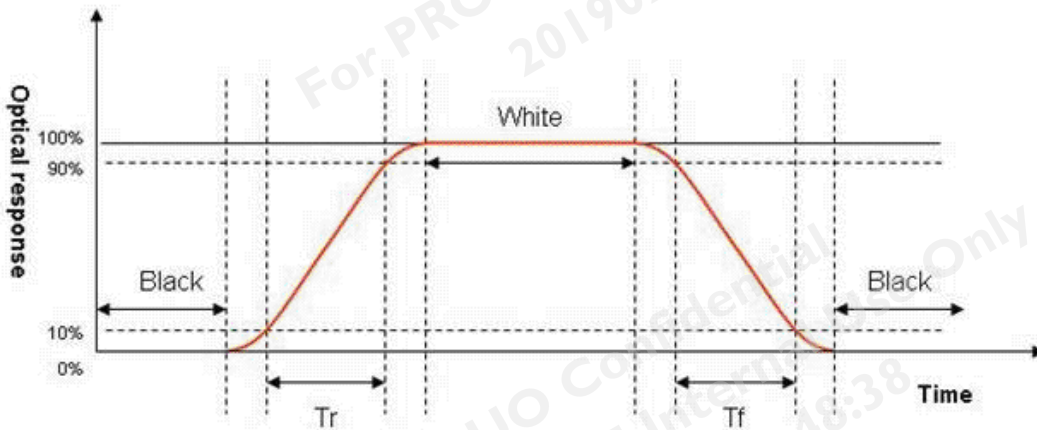


Note 3: Contrast ratio is measured by TOPCON SR-3

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

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

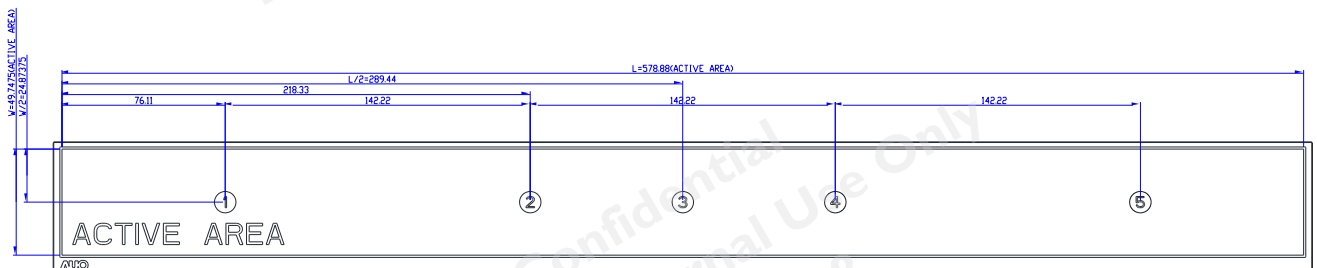
The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



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

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

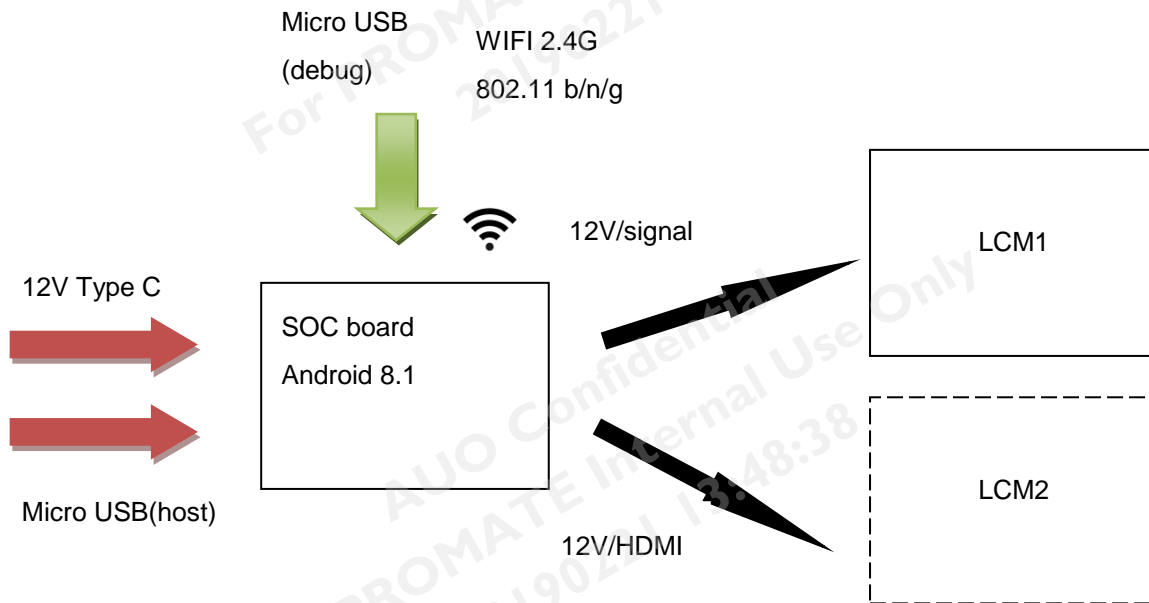
Note 7: Luminance uniformity of these 5 points is defined as below and measured by TOPCON SR-3



$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 points (1-5)}}{\text{Maximum Luminance in 9 Points (1-5)}}$$

3 Functional Block Diagram

The following diagram shows the functional block of the 22.9 inch wide color a-Si TFT-LCD All In One Monitor G229HAF02.0.



12V Type C Port Support :

- (1) System Power Supply : 12V
- (2) Accessory package have 36W adapter to dual panel application ,if using another device by not verification it's can't guarantee all of certification list as product specification of G229HAF02.0.

Micro USB Host Port Support :

- (1) Wired USB Mouse
- (2) Wireless USB Mouse (need android driver apk)
- (3) USB to RJ45 Dongle (need android driver apk) must use the ASIX AX88772B chip set for dongle function
- (4) Don't plug portable HDD directly without extend power supply.

Note for (1)~(3) : External USB OTG Cable is needed.

- (5) USB flash drive must be FAT32 format.

Micro USB Debug Port Support :

- (1) Software Download
- (2) Debugging



4 Absolute Maximum Ratings

4.1 Absolute Ratings of Monitor

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VDD	-0.3	+16	[Volt]	
Logic/LCD Drive Voltage	VHDMI	-0.3	7	[Volt]	
Micro USB	VBUS1	-0.3	7	[Volt]	
Micro USB(debug)	VBUS2	-0.3	7	[Volt]	Note1

Note1 :The micro USB for debug is using by engniring purpose, it's not release for normal user ,so the mechanical outline no relation hole for decoration.

4.2 Absolute Ratings of Environment

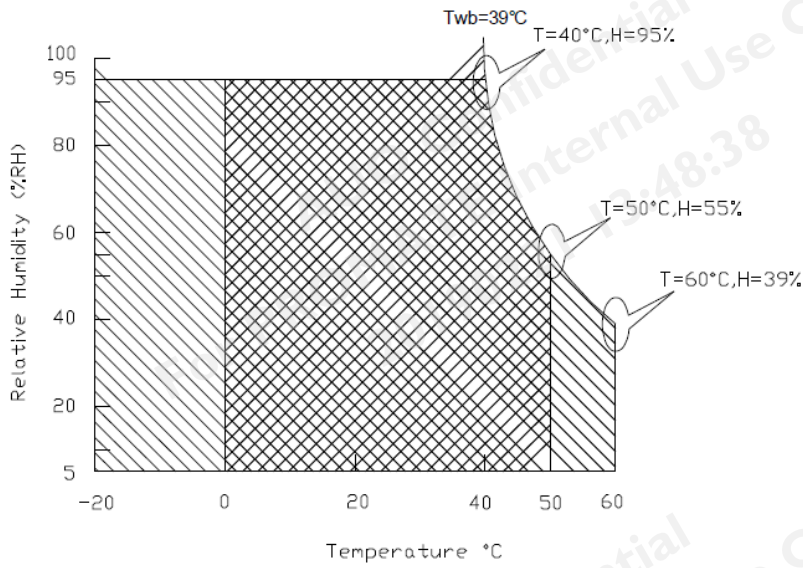
Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	0	50	[°C]	Note 3 & 4
Operation Humidity	HOP	5	80	[%RH]	
Storage Temperature	TST	-20	60	[°C]	
Storage Humidity	HST	5	80	[%RH]	

Note 1: With in Ta (25°C)

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

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

Note 4: Operation Temperature +60°C is defined as panel surface temperature.



Operating Range

Storage Range +

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5 Electrical Characteristics

5.1 Set Module

5.1.1 Power Specification

Input power specifications are as follows:

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
VDD	Logic/LCD Drive Voltage	10	12	13.2	[Volt]	+/-10%
IDD	Input Current	-	1.0	1.2	[A]	VDD= 12V, All White Pattern At 60Hz,
PDD	VDD Power	-	12	14.4	[Watt]	VDD=12V, All White Pattern At 60Hz
IRush	Inrush Current	-	-	TBD	[A]	Note 1
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	300	[mV] p-p	VDD= 12V, All White Pattern At 60Hz

Note : Turn On delay time less than 10 seconds at input voltage is 100-240Vac

HDMI Port +5V output power specifications are as follows:

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
VHDMI	Logic/Drive Voltage	4.75	5	5.25	[Volt]	+/-5%
IHDMI	Output Current	-	-	0.2	[A]	HDMI Mode, All White Pattern at 60Hz
PVHDMI	HDMI Power	-	-	1.05	[Watt]	HDMI Mode, All White Pattern at 60Hz
IRush	Inrush Current	-	-	0.6	[A]	
VHDMIRp	Allowable Logic/Drive Ripple Voltage	-	-	300	[mV] p-p	Data link with a HDMI Monitor



USB Host Port +5V output power specifications are as follows:

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
VBUS1	Logic/Drive Voltage	4.75	5	5.25	[Volt]	+/-5%
IBUS1	Output Current	-	1.0	1.2	[A]	Connected with a USB Device
PVBUS1	USB Power	-		6.3	[Watt]	Connected with a USB Device
IRush	Inrush Current	-	-	4	[A]	
VBUS1rp	Allowable Logic/Drive Ripple Voltage	-	-	300	[mV] p-p	Data link with a USB Device

USB Debug Port +5V Input power specifications are as follows:

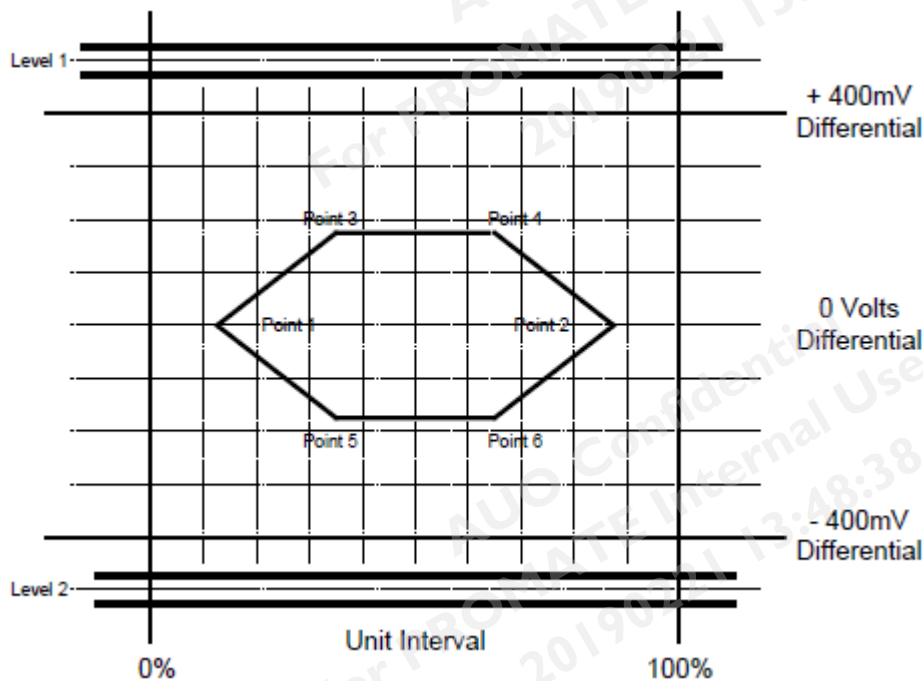
Symbol	Parameter	Min	Typ	Max	Unit	Conditions
VBUS2	Logic/Drive Voltage	4.75	5	5.25	[Volt]	+/-5%
IBUS2	Input Current	-	0.001	0.01	[A]	Connected with a x86 PC
PVBUS2	USB Power	-	-	0.0525	[Watt]	Connected with a x86 PC
IRush	Inrush Current	-	-	0.1	[A]	
VBUS2rp	Allowable Logic/Drive Ripple Voltage	-	-	300	[mV] p-p	Data link with a x86 PC

5.1.2 Signal Electrical Characteristics

Characteristics of USB HOST Port are as follows :

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
VTH	Differential Input High Threshold	-		+525	mV	VICM = 1.6V Note 1
VTL	Differential Input Low Threshold	-525		-	mV	VICM = 1.6V Note 1
VID	Input Differential Voltage	175	-	525	mV	Note 1
VICM	Differential Input Common Mode Voltage		1.6		V	VTH-VTL = 1.05V (max) Note 1

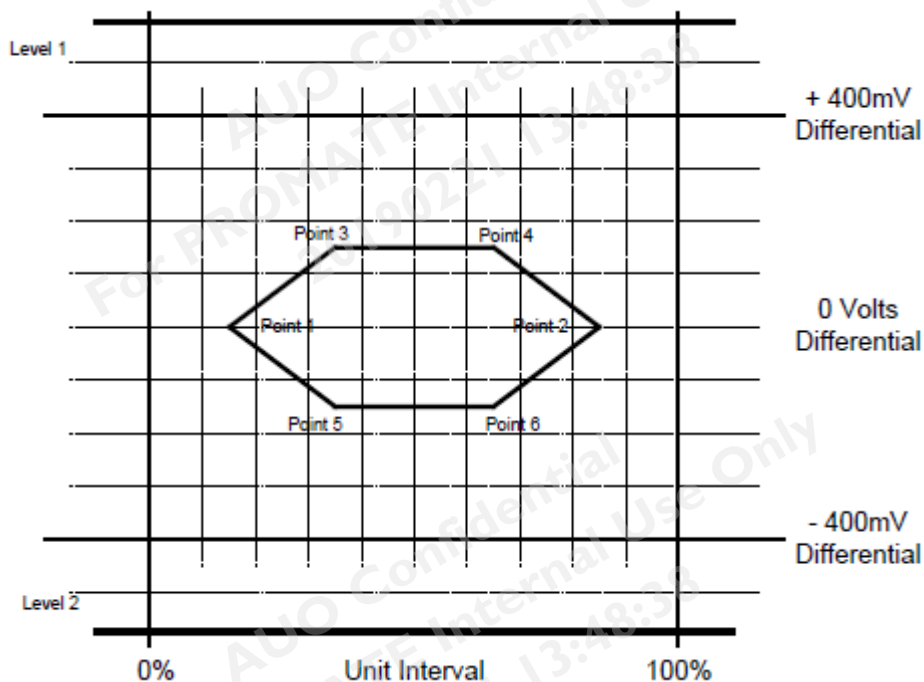
Note 1: USB Host Port, Transmit Waveform Requirement.



Characteristics of USB Debug Port are as follows:

Symbol	Parameter	Min	Typ	Max	Units	Condition
VTH	Differential Input High Threshold	-		+575	-mV	VICM = 1.6V Note 2
VTL	Differential Input Low Threshold	-575		-	mV	VICM = 1.6V Note 2
VID	Input Differential Voltage	150	-	575	mV	Note 2
VICM	Differential Input Common Mode Voltage		1.6		V	VTH-VTL = 1.15V (max) Note 2

Note 2: USB Debug Port, Receiver Sensitivity Requirements



6.2 Signal Description- USB pin define

The module using one USB Host Port and one USB Debug Port , The Host USB Port support both Micro A and Micro B Connector.

Pin definitions of USB HOST Port are as follows:

6.2.1 Signal Description- USB HOST Port

Pin definitions of USB HOST Port are as follows:

PIN #	SIGNAL NAME	I/O	DESCRIPTION
1	VBUS1	PO	+ 5V Power Output
2	DM	B	Data -
3	DP	B	Data +
4	ID	I	USB ID pin permit distinction of host connection from slave connection.
5	GND	G	Signal Ground

6.2.2 Signal Description- USB Debug Port

Pin definitions of USB Debug Port are as follows:

PIN #	SIGNAL NAME	I/O	DESCRIPTION
1	VBUS2	PI	+ 5V Power Input
2	DM	B	Data -
3	DP	B	Data +
4	-	-	None
5	GND	G	Signal Ground

Note1: Start from right side



Micro-A



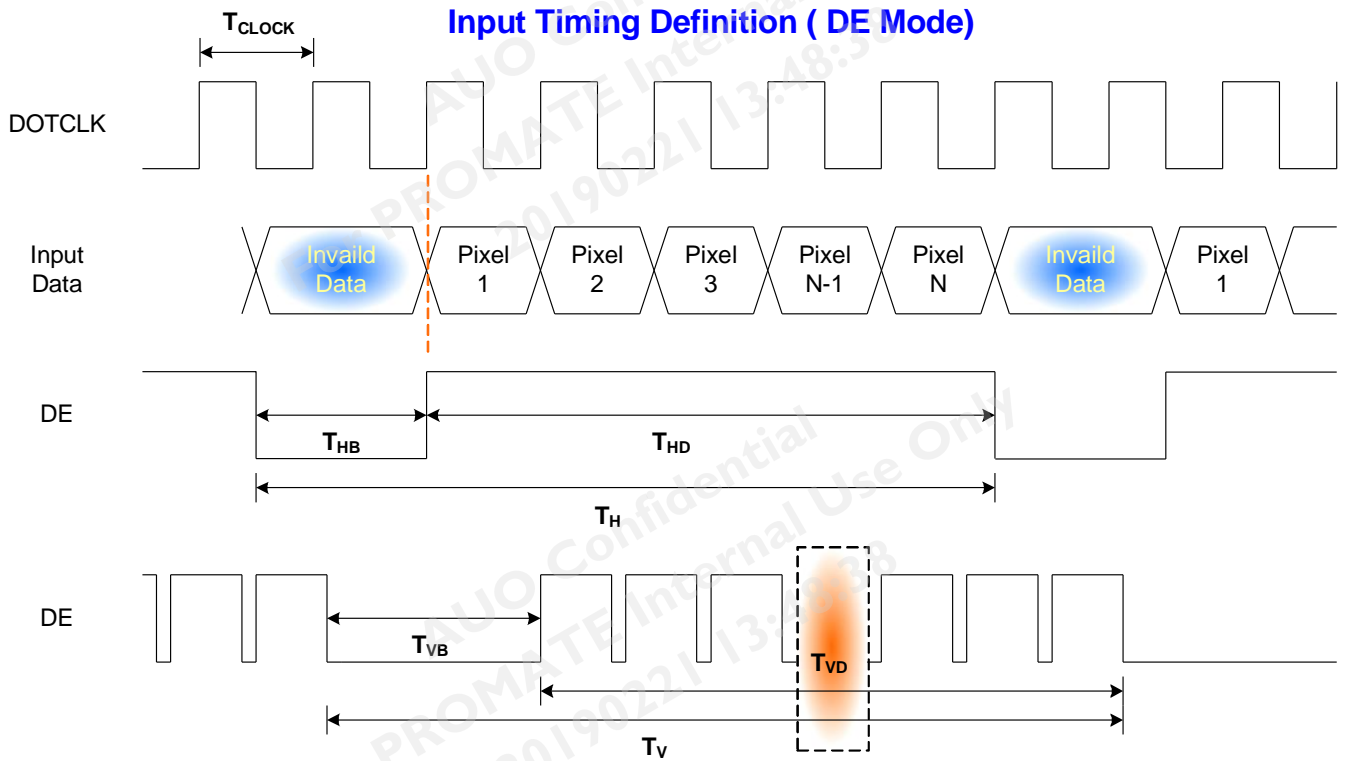
Micro-B

6.3 LCM Timing Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate		-	-	60	-	Hz
Clock frequency		$1/T_{\text{Clock}}$	-	40	-	MHz
Vertical Section	Period	T_V	-	195	-	T_{Line}
	Active	T_{VD}	165			
	Blanking	T_{VB}	-	30	-	
Horizontal Section	Period	T_H	-	3420	-	T_{Clock}
	Active	T_{HD}	1920			
	Blanking	T_{HB}	-	1500	-	

Note 1: Only DE mode operation.

6.4 LCM Timing diagram



6.5 Wireless LAN

IEEE 802.11 b/g/n compatible WLAN

Item	Condition	Min.	Type	Max	Unit
Operating frequency	802.11b/g/n	2400		2483.05	MHz



7 Connector & Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

7.1 Micro USB

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	Hirose Electric Co Ltd
Type Part Number	ZX62D-AB-5P8(30)

Pin Assignment

Pin#	Signal Name(USB Host)	Pin#	Signal Name (USB Debug)
1	+5V	1	+5V
2	Data-	2	Data-
3	Data+	3	Data+
4	ID	4	None
5	GND	5	GND

7.2 Micro HDMI Connector

Connector Name / Designation	Micro HDMI Connector
Manufacturer	JAE
Connector Model Number	DC3RX19JA2

Pin Assignment

Pin#	Symbol	Signal Name
1	GND	GND
2	GND	GND
3	GND	GND
4	Enable	5V-On / 0V-Off
5	Dimming	PWM Dimming
6	VCC	12V
7	VCC	12V
8	VCC	12V

7.3 Type C Connector

Power Input

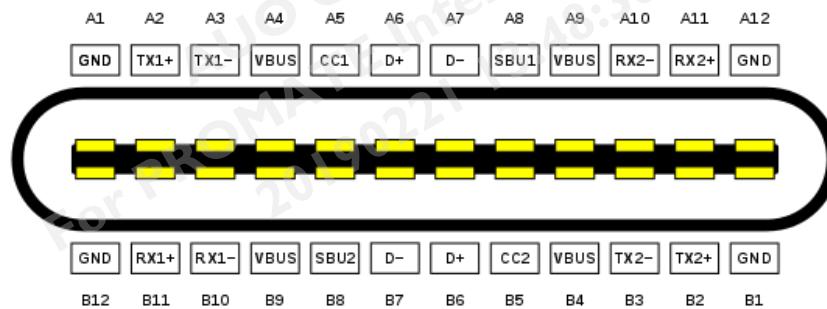
Connector Name / Designation	Connector
Manufacturer	Take Wing Technology CO. Ltd
Connector Model Number	UCF008-A2130000-AS

Power output

Connector Name / Designation	Connector
Manufacturer	Hirose
Connector Model Number	CX90B1-24P

Pin Assignment

Pin#	Symbol	Signal Name
A1	GND	Ground
A12	GND	Ground
B1	GND	Ground
B12	GND	Ground
Other	Other	None
Other	Other	None
A4	VBUS	12V
A9	VBUS	12V
B4	VBUS	12V
B9	VBUS	12V





7.4 Ethernet RJ45

The Ethernet function is provide by micro USB to RJ45 dongle device, may be need an APK driver to active RJ45 function.

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8 Reliability Test Criteria

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50°C, 80%RH, 300hours	
High Temperature Operation (HTO)	Ta= 50°C, 300hours	3
Low Temperature Operation (LTO)	Ta= 0°C, 300hours	
High Temperature Storage (HTS)	Ta= 60°C, 300hours	
Low Temperature Storage (LTS)	Ta= -20°C, 300hours	
Vibration Test (Non-operation)	Acceleration: 1.5 G Wave: Random 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)	
Drop Test	Height: 60 cm, package test	
Thermal Shock Test (TST)	-20°C /30min, 60°C /30min, 100 cycles	1
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 25 times/ point.	2
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 25 times/ point.	

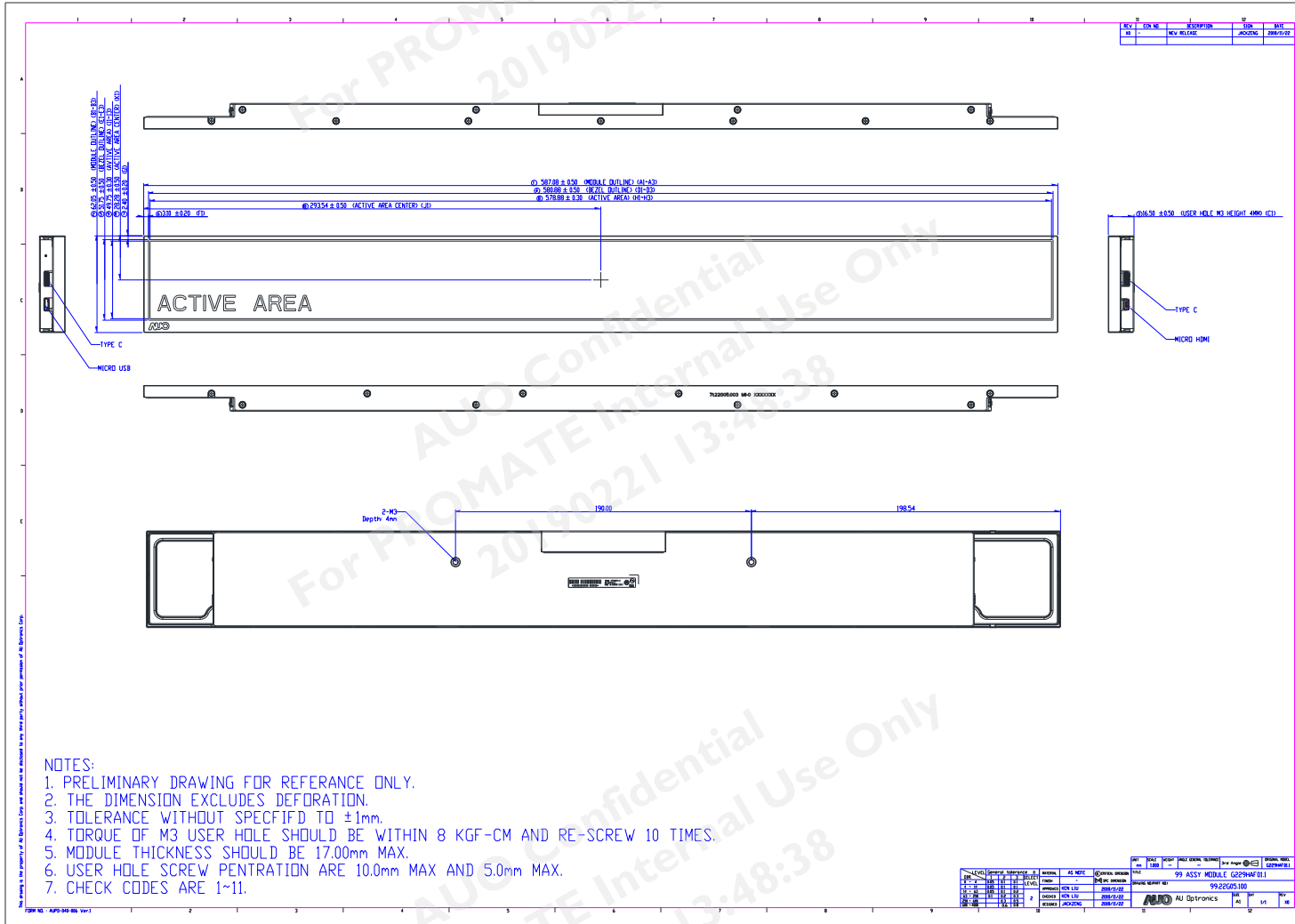
Note 1: The TFT-LCD module set will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20°C to 60°C, and back again. Power is not applied during the test. After temperature cycling, the unit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

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

Note 3: No function occurs Mura shall be ignored after high temperature reliability test.

9 Mechanical Characteristics

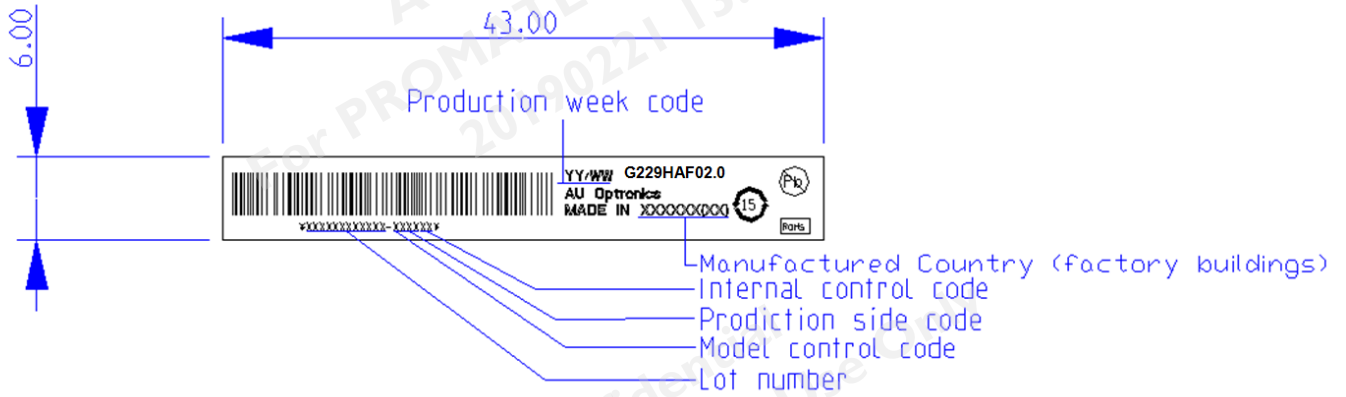
9.1 Monitor Outline Dimension



10 Label and Packaging

10.1 Shipping Label

Unit: mm



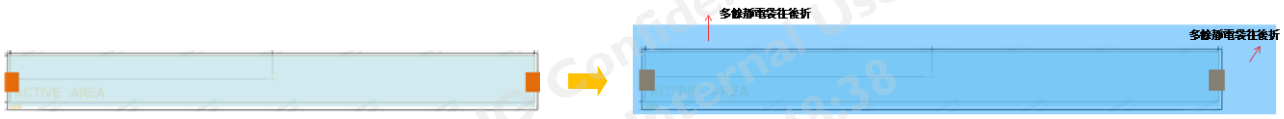
Note 1: For Pb Free products, AUO will add (Pb) for identification.

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

Note 3: For China RoHS compatible products, AUO will add (15) for identification.

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

10.2 Carton Package



1. Put a protective film on the panel and fix it with masking tape
2. Panel into the electrostatic bag and Fold the remaining electrostatic bag back



3. Put first layer of EPE



4. Put panel in the middle of EPE, Visible area facing up, and accessories put into the side groove.



4-1. Accessory placement method



5. Finish the first layer and put it in the second layer



6. Finish the second layer and put it in the third layer.



7. Cover with EPE cushion.



8. Sealing the carton with packing tape

Palletizing sequence

The operation of taking shape and related information of full carton:

Max capacity : 6 monitors per carton

Max weight: 9~10kg per carton (TBD)

Outside dimension of carton: 730mm(L)* 336mm(W)* 289mm(H)

Pallet size : 1060mm * 760 mm * 132mm

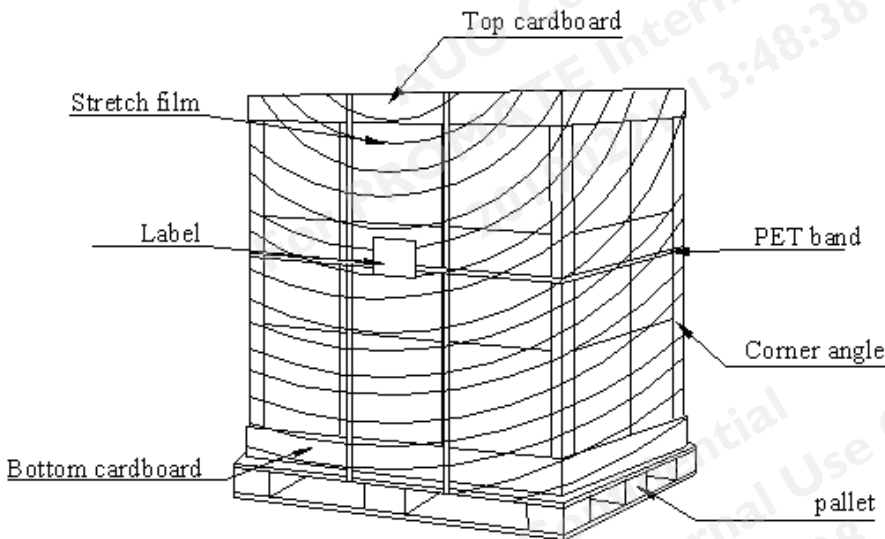
Box stacked

Module by air : (1 *3) *4 layers , one pallet put 12 boxes , total 72 pcs monitors

Module by sea : One pallet (1 *3) *4 layers + One pallet (1 *3) *2 layers , total 108 pcs monitors

Module by sea_ HQ :(1 *3) *4 layers + One pallet (1 *3) *3 layers Total 126 pcs monitors

10.3 Shipping Package of Palletizing Sequence



Item	Specification			
	Q'ty	Dimension	Weight (Kg)	
1	Packing Box	6 pcs/Box	73(L)cm x 33.6(W)cm x 28.9(H)cm	9~10(TBD)
2	Pallet	1	106(L)cm x 76 (W)cm x 13.2(H)cm	12.4
3	Pallet after Packing	12boxes/pallet	106(L)cm x 76(W) cm x 127.2(H) cm	108~120(TBD)

11 Safety

11.1 Sharp Edge Requirements

There will be no sharp edges or comers on the display assembly that could cause injury.

11.2 Materials

11.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

11.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

11.3 Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

11.4 National Test Lab Requirement

The display module will satisfy all requirements for compliance to:

UL 60950-1 second edition

U.S.A. Information Technology Equipment