Document Version: 1.2

Date:2009/09/30

Product Functional Specification

32” Full-HD Color TFT-LCD Module
Model Name: T315HW03 V0

() Preliminary Specification
(*) Final Specification

Note : This specification is subject to change without notice.

Contents

Record of Revision

Version	Date	Page	Old Description	New Description	Remark
1.0	2009/06/15		Fianl spec first release		
1.1	2009/08/14	p35~p38	Application Note		
		p31	Update Cell Protect sheet information		
		P20	24V(typ)	28V(typ)	
		P30	Update shipping label		
		P30	Update carton label		
1.2	2009/09/30	P30	Update shipping label		
	2009/09/30	P30~38	Update application note		

1. General Description

This specification applies to the 32 inch Color TFT-LCD Module T315HW03 V0. This LCD module has a TFT active matrix type liquid crystal panel 1920x1080 pixels, and diagonal size of 32 inch. This module supports 1920x1080 Full-HD mode (Non-interlace).

Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 8-bit+FRC gray scale signal for each dot.

The T315HW03 V0 has been designed to apply the 10-bit 4 channel LVDS interface method. It is intended to support displays where high brightness, wide viewing angle, high color saturation, and high color depth.

* General Information

Items	Specification	Unit	Note
Active Screen Size	31.5	inches	
Display Area	698.4 (H) x 392.85 (V)	mm	
Outline Dimension	772.4(H) x 496.1(V) x 7.8(D)	mm	Without driver board & boss
Driver Element	a-Si TFT active matrix		
Display Colors	8bit+FRC	Colors	
Number of Pixels	1920 x 1080	Pixel	
Pixel Pitch	0.36375	mm	
Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally Black		
Lamp quantity, type	LED	228 pcs	
Surface Treatment	AG, 3H		

2. Absolute Maximum Ratings

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

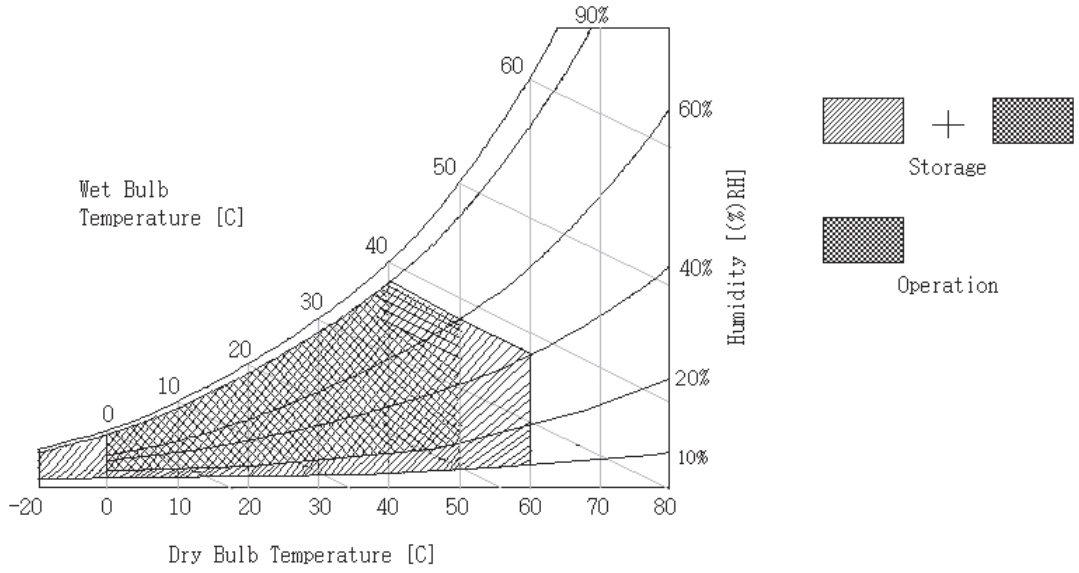
Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	Vcc	-0.3	14	[Volt]	Note 1
Input Voltage of Signal	Vin	-0.3	3.6	[Volt]	Note 1
BLU Input Voltage	VDDB	-0.3	32	[Volt]	Note 1
BLU Brightness Control Voltage	Vdim	-0.3	7.0	[Volt]	Note 1
Operating Temperature	TOP	0	+50	[°C]	Note 2
Operating Humidity	HOP	10	90	[%RH]	Note 2
Storage Temperature	TST	-20	+60	[°C]	Note 2
Storage Humidity	HST	10	90	[%RH]	Note 2
Panel Surface Temperature	PST		65	[°C]	Note 3

Note 1: Duration:50 msec.

Note 2 : Maximum Wet-Bulb should be 39℃ and No condensation.

The relative humidity must not exceed 90% non-condensing at temperatures of 40℃ or less. At temperatures greater than 40℃, the wet bulb temperature must not exceed 39℃.

Note 3: Surface temperature is measured at 50℃ Dry condition



3. Electrical Specification

The T315HW03 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input, which powers the LED, is typically generated by an driver board.

3-1 Electrical Characteristics

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
LCD:							
Power Supply Input Voltage		Vdd	10.8	12	13.2	Vdc	
Power Supply Input Current		Idd	-	0.6	0.66	A	1
Power Consumption		Pc	-	7.2		Watt	1
Inrush Current		I_{RUSH}	-	-	4.5	A	5
LVDS Interface	Differential Input High Threshold Voltage	V_{TH}			+100	mV	4
	Differential Input Low Threshold Voltage	V_{TL}	-100			mV	4
	Common Input Voltage	V_{CIM}	0.6	1.2	1.8	V	
CMOS Interface	Input High Threshold Voltage	V_{IH} (High)	2.0		3.3	Vdc	
	Input Low Threshold Voltage	V_{IL} (Low)	0		0.8	Vdc	
Backlight Power Consumption				100		Watt	2
Life Time			30000			Hours	3

The relative humidity must not exceed 80% non-condensing at temperatures of 40℃ or less. At temperatures greater than 40℃, the wet bulb temperature must not exceed 39℃. When operate at low temperatures, the brightness of LED will drop and the lifetime of LED will be reduced.

Note :

1. Vdd=12.0V, fv=120 Hz, f_{CLK}=80 Mhz , 25℃, Vdd Duration time= 470 μs , Test pattern : white pattern

2. The Backlight power consumption shown above does include loss of external converter at 25 ℃. The used LED current is the LED typical current, Operating condition : ILED=120 mA, Duty=100%
3. The life is determined as the time at which luminance of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25±2℃.
4. VCIM = 1.2V

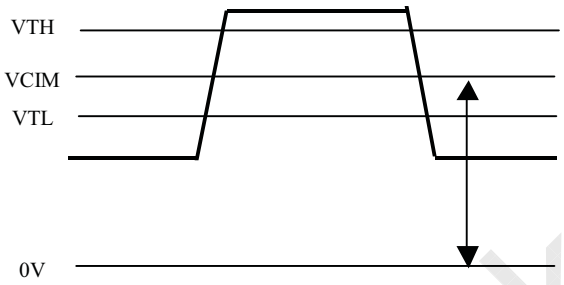
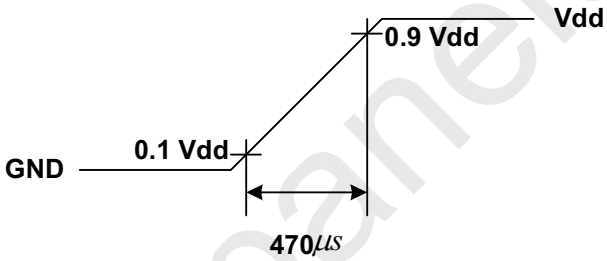


Figure : LVDS Differential Voltage

5. Measurement Condition: Rising time = 470 μs



3-2 Interface Connections

LCD connector 1 : 187059-5122 (P-TWO INDUSTRIES INC.)

Pin No	Symbol	Description	Note
1	NC	No Connect (AUO internal use)	
2	NC	No Connect (AUO internal use)	
3	NC	No Connect (AUO internal use)	
4	NC	No Connect (AUO internal use)	
5	NC	No Connect (AUO internal use)	
6	NC	No Connect (AUO internal use)	
7	LVDS Option	Low/Open for Normal (NS), High for JEIDA	Default : NS mode
8	NC	No Connect (AUO internal use)	
9	NC	No Connect (AUO internal use)	
10	NC	No Connect (AUO internal use)	
11	GND	Ground	Channel 2
12	R2_0-	LVDS Channel 2, Signal 0-	
13	R2_0+	LVDS Channel 2, Signal 0+	
14	R2_1-	LVDS Channel 2, Signal 1-	
15	R2_1+	LVDS Channel 2, Signal 1+	
16	R2_2-	LVDS Channel 2, Signal 2-	
17	R2_2+	LVDS Channel 2, Signal 2+	
18	GND	Ground	
19	R2_CLK-	LVDS Channel 2, Clock -	
20	R2_CLK+	LVDS Channel 2, Clock +	
21	GND	Ground	
22	R2_3-	LVDS Channel 2, Signal 3-	
23	R2_3+	LVDS Channel 2, Signal 3+	
24	R2_4-	LVDS Channel 2, Signal 4-	
25	R2_4+	LVDS Channel 2, Signal 4+	
26	NC or GND	No Connect or Ground	

Pin No	Symbol	Description	Note
27	NC or GND	No Connect or Ground	Channel 1
28	R1_0-	LVDS Channel 1, Signal 0-	
29	R1_0+	LVDS Channel 1, Signal 0+	
30	R1_1-	LVDS Channel 1, Signal 1-	
31	R1_1+	LVDS Channel 1, Signal 1+	
32	R1_2-	LVDS Channel 1, Signal 2-	
33	R1_2+	LVDS Channel 1, Signal 2+	
34	GND	Ground	
35	R1_CLK-	LVDS Channel 1, Clock -	
36	R1_CLK+	LVDS Channel 1, Clock +	
37	GND	Ground	
38	R1_3-	LVDS Channel 1, Signal 3-	
39	R1_3+	LVDS Channel 1, Signal 3+	
40	R1_4-	LVDS Channel1, Signal 4-	
41	R1_4+	LVDS Channel 1, Signal 4+	
42	NC or GND	No Connect or Ground	
43	NC or GND	No Connect or Ground	
44	GND	Ground	Power
45	GND	Ground	
46	GND	Ground	
47	V_{DD}	Operating Voltage supply, +12V DC regulated	
48	V_{DD}	Operating Voltage supply, +12V DC regulated	
49	V_{DD}	Operating Voltage supply, +12V DC regulated	
50	V_{DD}	Operating Voltage supply, +12V DC regulated	
51	V_{DD}	Operating Voltage supply, +12V DC regulated	

LCD connector 2 : 187060-4122 (P-TWO INDUSTRIES INC.)

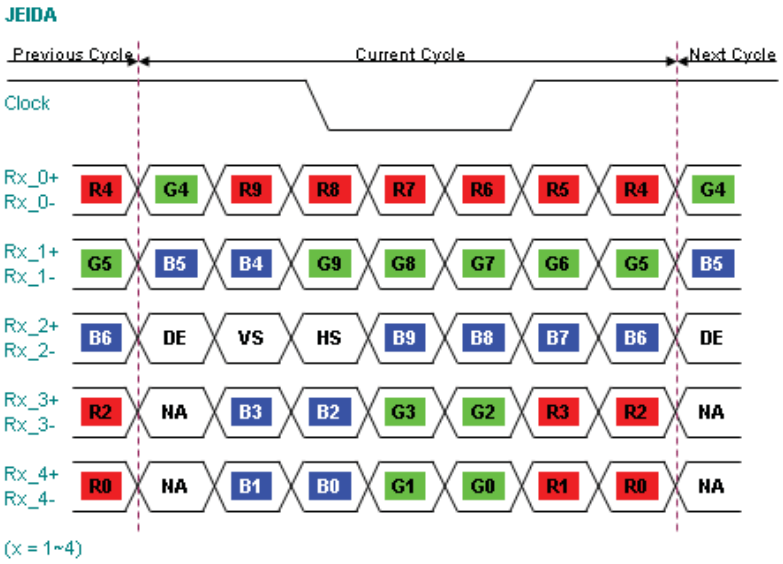
Pin No	Symbol	Description	Note
1	NC	No Connect (AUO internal use)	
2	NC	No Connect (AUO internal use)	
3	NC	No Connect (AUO internal use)	
4	NC	No Connect (AUO internal use)	
5	NC	No Connect (AUO internal use)	
6	NC	No Connect (AUO internal use)	
7	NC	No Connect (AUO internal use)	
8	NC	No Connect (AUO internal use)	
9	GND	Ground	Channel 4
10	R4_0-	LVDS Channel 4, Signal 0-	
11	R4_0+	LVDS Channel 4, Signal 0+	
12	R4_1-	LVDS Channel 4, Signal 1-	
13	R4_1+	LVDS Channel 4, Signal 1+	
14	R4_2-	LVDS Channel 4, Signal 2-	
15	R4_2+	LVDS Channel4, Signal 2+	
16	GND	Ground	
17	R4_CLK-	LVDS Channel 4, Clock -	
18	R4_CLK+	LVDS Channel 4, Clock +	
19	GND	Ground	
20	R4_3-	LVDS Channel 4, Signal 3-	
21	R4_3+	LVDS Channel 4, Signal 3+	
22	R4_4-	LVDS Channel4, Signal 4-	
23	R4_4+	LVDS Channel 4, Signal 4+	
24	NC or GND	No Connect or Ground	

Pin No	Symbol	Description	Note
25	NC or GND	No Connect or Ground	Channel 3
26	R3_0-	LVDS Channel 3, Signal 0-	
27	R3_0+	LVDS Channel 3, Signal 0+	
28	R3_1-	LVDS Channel 3, Signal 1-	
29	R3_1+	LVDS Channel 3, Signal 1+	
30	R3_2-	LVDS Channel 3, Signal 2-	
31	R3_2+	LVDS Channel 3, Signal 2+	
32	GND	Ground	
33	R3_CLK-	LVDS Channel 3, Clock -	
34	R3_CLK+	LVDS Channel 3, Clock +	
35	GND	Ground	
36	R3_3-	LVDS Channel 3, Signal 3-	
37	R3_3+	LVDS Channel 3, Signal 3+	
38	R3_4-	LVDS Channel 3, Signal 4-	
39	R3_4+	LVDS Channel 3, Signal 4+	
40	NC or GND	No Connect or Ground	
41	NC or GND	No Connect or Ground	

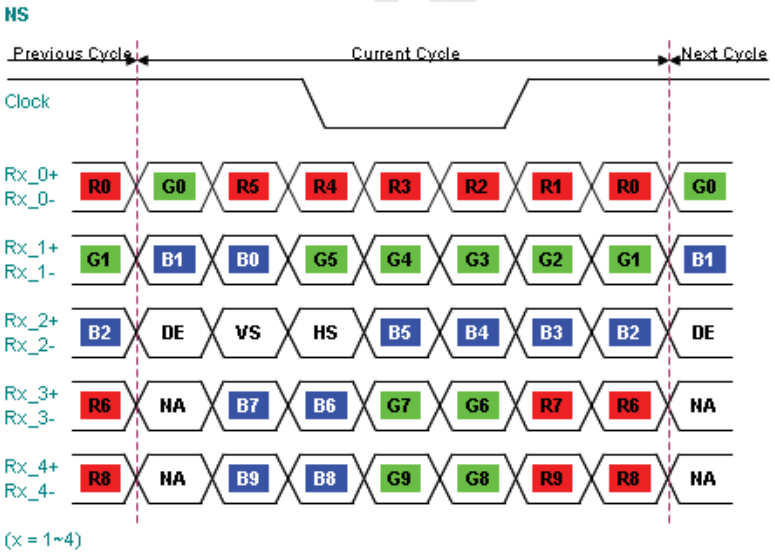
Note: 1. All GND (ground) pin should be connected together to the LCD module's metal frame.

2. All V_{LCD} (power input) pins should be connected.

LVDS Option = High➔JEIDA



LVDS Option = Low/Open➔NS



Backlight Connector Pin Configuration

1. Electrical specification

No	ITEM	SYMBOL		CONDITION	MIN	TYP	MAX	UNIT	Note
1	Input Voltage	V_{DDB}		---	25.2	28.0	30.8	V_{DC}	
2	Input Current	I_{DDB}		V_{DDB}=24V 100% Brightness	3.4	3.57	3.75	A_{DC}	
3	Input Power	P_{DDB}		V_{DDB}=24V 100% Brightness	95	100	105	W	
4	Input inrush current	I_{RUSH}		V_{DDB}=24V 100% Brightness	---	---	6	A_{DC}	
5	ON/OFF Control Voltage	V_{BLON}	ON	V_{DDB}=24V	2.0	---	3.3	V_{DC}	
			OFF	V_{DDB}=24V	0.0	---	0.8	V_{DC}	
6	ON/OFF Control Current	I_{BLON}		V_{DDB}=24V	0	---	2	mA_{DC}	
7	External PWM Control Voltage	EV_{PWM}	MAX	---	2.0	---	3.3	V_{DC}	
			MIN	---	0	---	0.8	V_{DC}	
8	External PWM Control Current	EI_{PWM}	MAX	PWM=100%	0	---	2	mA_{DC}	
			MIN	PWM=30%	0	---	2	mA_{DC}	
9	External PWM Duty Ratio	ED_{PWM}		---	5*	---	100	%	
10	External PWM Frequency	EF_{PWM}		---	140	180	240	Hz	
11	Internal PWM Control Voltage	IV_{PWM}		V_{DDB}=24V	0	---	3.3	V_{DC}	

（Ta=25±5℃, Turn on for 45minutes）

*** Note : At < 20% dimming ratio, AUO would not guarantee display performance & start at High and Low Temperature condition.**

2. Input specification

Connector 2: JST_PA type connector (side entry type) or equivalent

Pin No	Symbol	Description
1	VDDB	Operating Voltage Supply, +28V DC regulated
2	VDDB	Operating Voltage Supply, +28V DC regulated
3	GND	Ground and Current Return
4	GND	Ground and Current Return
5	ON/OFF	BL On/Off control signal High: On, Low/open: Off Low=0~ 0.8V, High=2.0~5.0V)
6	Dimming	External PWM (AC 0~3.3V, Duty: 5%~100%)

3-3 Signal Timing Specifications

This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications for it's proper operation.

Timing Table (DE only Mode)

Vertical Frequency Range A (120Hz)

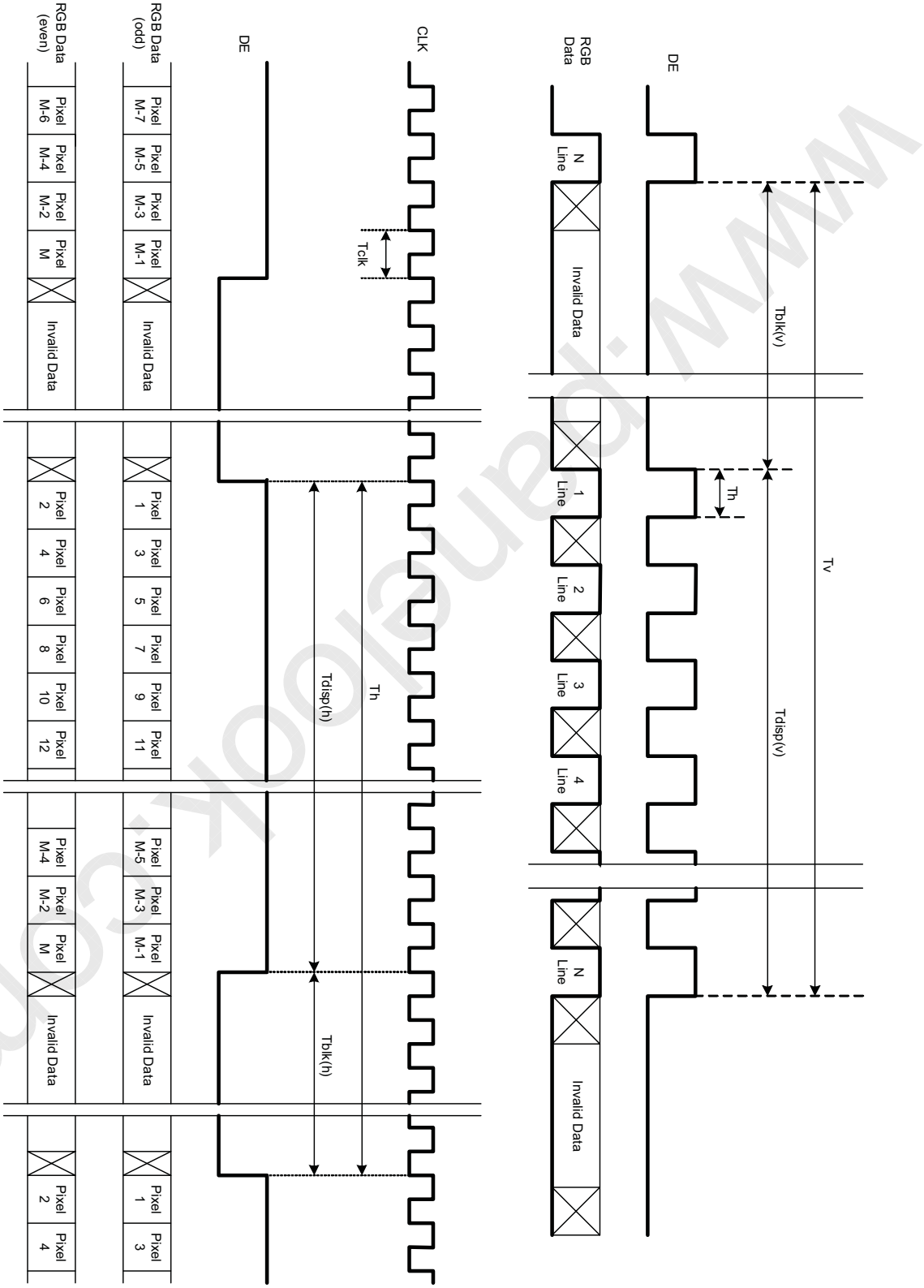
Signal	Item	Symbol	Min	Type	Max	Unit
Vertical Section	Period	Tv	1096	1130	1160	Th
	Active	Tdisp (v)		1080		Th
	Blanking	Tblk (v)	16	50	80	Th
Horizontal Section	Period	Th	560	570	580	Tclk
	Active	Tdisp (h)		480		Tclk
	Blanking	Tblk (h)	80	90	100	Tclk
Clock	Period	CLK		12.94		ns
	Frequency	Freq	73.65	77.29	80.74	MHz
Vertical Frequency	Frequency	Vs	118	120	122	Hz
Horizontal Frequency	Frequency	Hs	131.52	135.6	139.2	KHz

Vertical Frequency Range B (100Hz)

Signal	Item	Symbol	Min	Type	Max	Unit
Vertical Section	Period	Tv	1200	1280	1392	Th
	Active	Tdisp (v)		1080		Th
	Blanking	Tblk (v)	120	200	312	Th
Horizontal Section	Period	Th	560	570	580	Tclk
	Active	Tdisp (h)		480		Tclk
	Blanking	Tblk (h)	80	90	100	Tclk
Clock	Period	CLK		13.71		ns
	Frequency	Freq	67.2	72.96	80.74	MHz
Vertical Frequency	Frequency	Vs	96	100	102	Hz
Horizontal Frequency	Frequency	Hs	120	128	139.2	KHz

Note :
1. Vertical Frequency Range A : Vs Max = 124 is accepted
2. Vertical Frequency Range B : Vs Max = 104 is accepted
3. Vertical Frequency Range B : Vs Min = 94 is accepted

3-4 Signal Timing Waveforms



3-5 Color Input Data Reference

The brightness of each primary color (red, green and blue) is based on the 10 bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Color		Input Color Data																													
		RED										GREEN										BLUE									
		MSB										MSB										MSB									
		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
Basic Color	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
	Red(1023)	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(1023)	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(1023)	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
	Cyan	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	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
RED	RED(000)	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
	RED(001)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

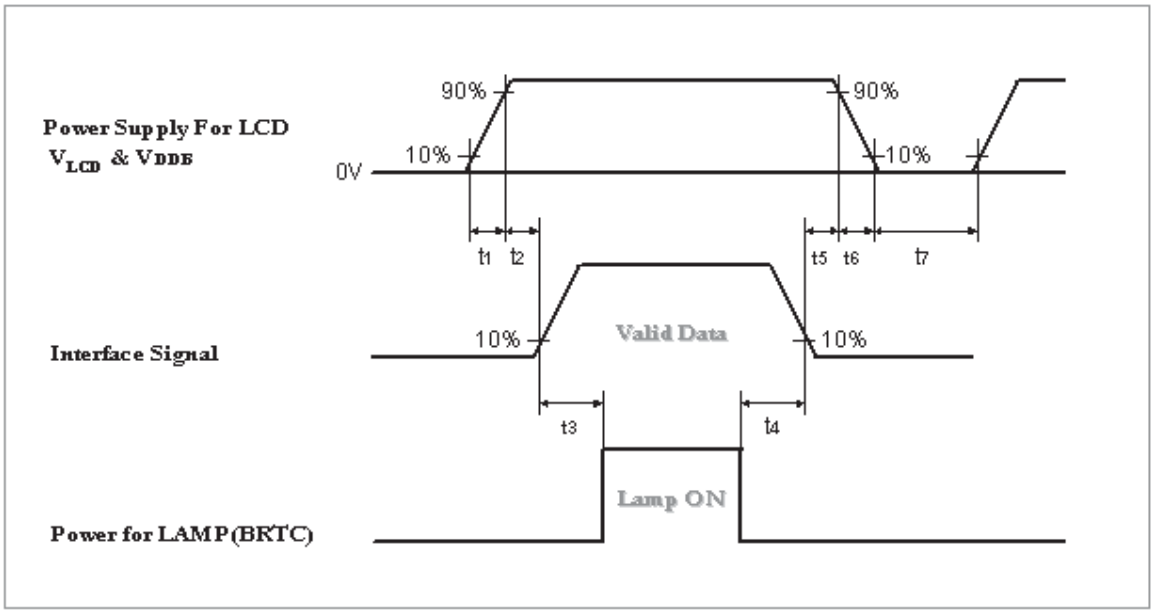
	RED(1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

	GREEN(1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1023)	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	BLUE(000)	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
	BLUE(001)	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	1

	BLUE(1022)	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	0
	BLUE(1023)	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

3-6 Power Sequence

1. Power sequence of panel

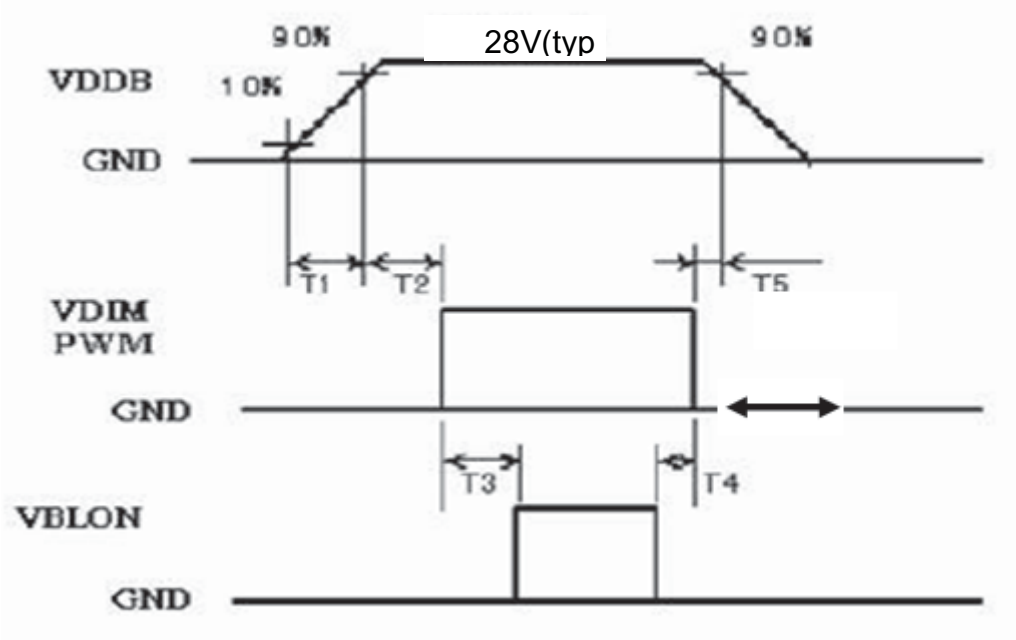


Parameter	Values			Units
	Min.	Typ.	Max.	
t1	0.4	-	30	ms
t2	0.1	-	50	ms
t3	300	-	-	ms
t4	10	-	-	ms
t5	0.1	-	50	ms
t6	-	-	300	ms
t7	500	-	-	ms

Apply the lamp voltage within the LCD operating range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal.

Caution : The above on/off sequence should be applied to avoid abnormal function in the display. In case of handling, make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

2. Power sequence of driver board



Parameter	Values			Units
	Min.	Typ.	Max.	
T1	20	-	-	ms
T2	10	-	-	ms
T3	10	-	-	ms
T4	0	-	-	ms
T5	1	-	-	ms
T6	-	-	-	ms

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 60 minutes in a dark environment at 25℃. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

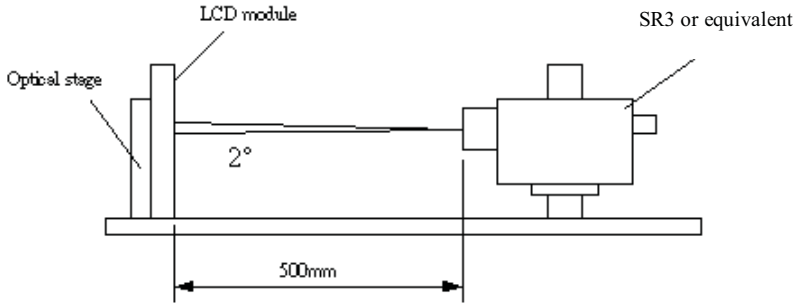


Fig.4-1 Optical measurement equipment and method

Parameter		Symbol	Values			Units	Notes
			Min.	Typ.	Max.		
Contrast Ratio		CR		4000			1
Surface Luminance, white		LWH	280	450		cd/㎡	2
Luminance Variation		δ_{WHITE} 5p			1.3		3
Response Time (G to G)		T γ		(6.5)		ms	4
Color Coordinates							
	RED	R_X	Typ.-0.05	0.653	Typ.+0.05		
		R_Y		0.327			
	GREEN	G_X		0.267			
		G_Y		0.625			
	BLUE	B_X		0.147			
		B_Y		0.061			
	WHITE	W_X		0.280			
		W_Y		0.290			
Viewing Angle							Contrast Ratio>10
	x axis, right(φ=0°)	θ_r		89		Degree	6
	x axis, left(φ=180°)	θ_l		89			
	y axis, up(φ=90°)	θ_u		89			
	y axis, down (φ=0°)	θ_d		89			

Note for Optics Spec :

JVC consider that min surface luminance is 360nits, min color coordinates is typ. – 0.04, and max color coordinates is typ. + 0.04. AUO and JVC will keep monitor LED performance.

Note:

1. Contrast Ratio (CR) is defined mathematically as:

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

2. Surface luminance is luminance value at point 5 across the LCD surface 50cm from the surface with all pixels displaying white. From more information see Fig. 4-2. When V_{DDB} = 28V, I_{DDB} = 3.57A. $L_{WH}=L_{on5}$, Where L_{on1} is the luminance with all pixels displaying white at center 5 location.

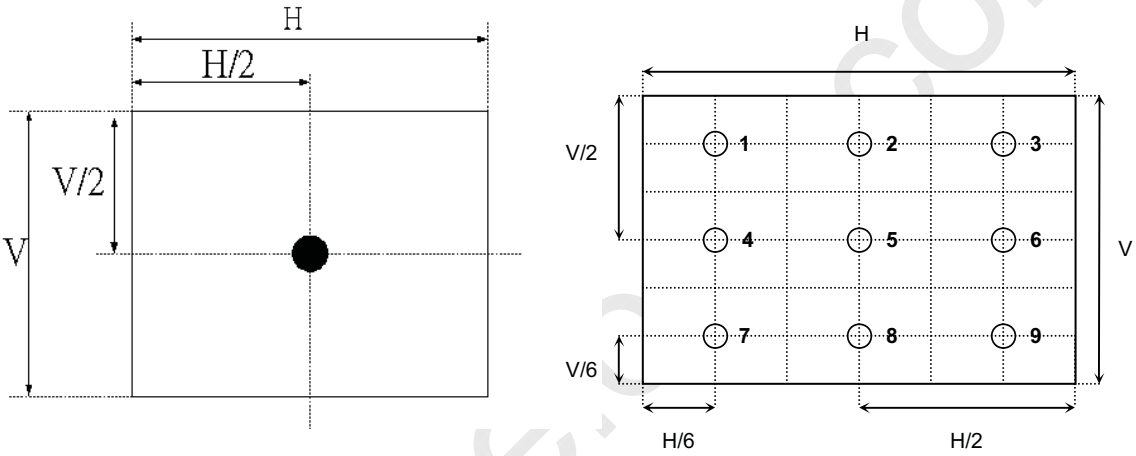


Fig.4-2 Optical measurement point

3. The variation in surface luminance, δ_{WHITE} is defined under 100% brightness as:

$$\delta_{WHITE(9P)} = \text{Maximum}(L_{on1}, L_{on2},\ldots,L_{on9})/\text{Minimum}(L_{on1}, L_{on2},\ldots L_{on9})$$

4. Response Time:

(a) G-to-G: average response time among brightness of 0%, 25%, 50%, 75% &100%.

	0%	25%	50%	75%	100%
0%		tr: 0%→25%	tr: 0%→50%	tr: 0%→75%	tr: 0%→100%
25%	tf: 25%→0%		tr: 25%→50%	tr: 25%→75%	tr: 25%→100%
50%	tf: 50%→0%	tf: 50%→25%		tr: 50%→75%	tr: 50%→100%
75%	tf: 75%→0%	tf: 75%→25%	tf: 75%→50%		tr: 75%→100%
100%	tf: 100%→0%	tf: 100%→25%	tf: 100%→50%	tf: 100%→75%	

5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see Fig. 4-3. (Optical measurement by SR3)

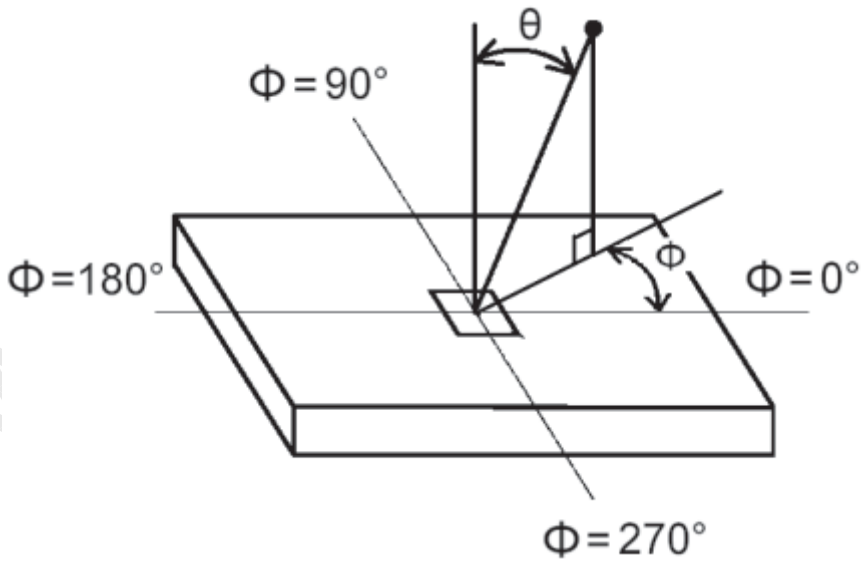


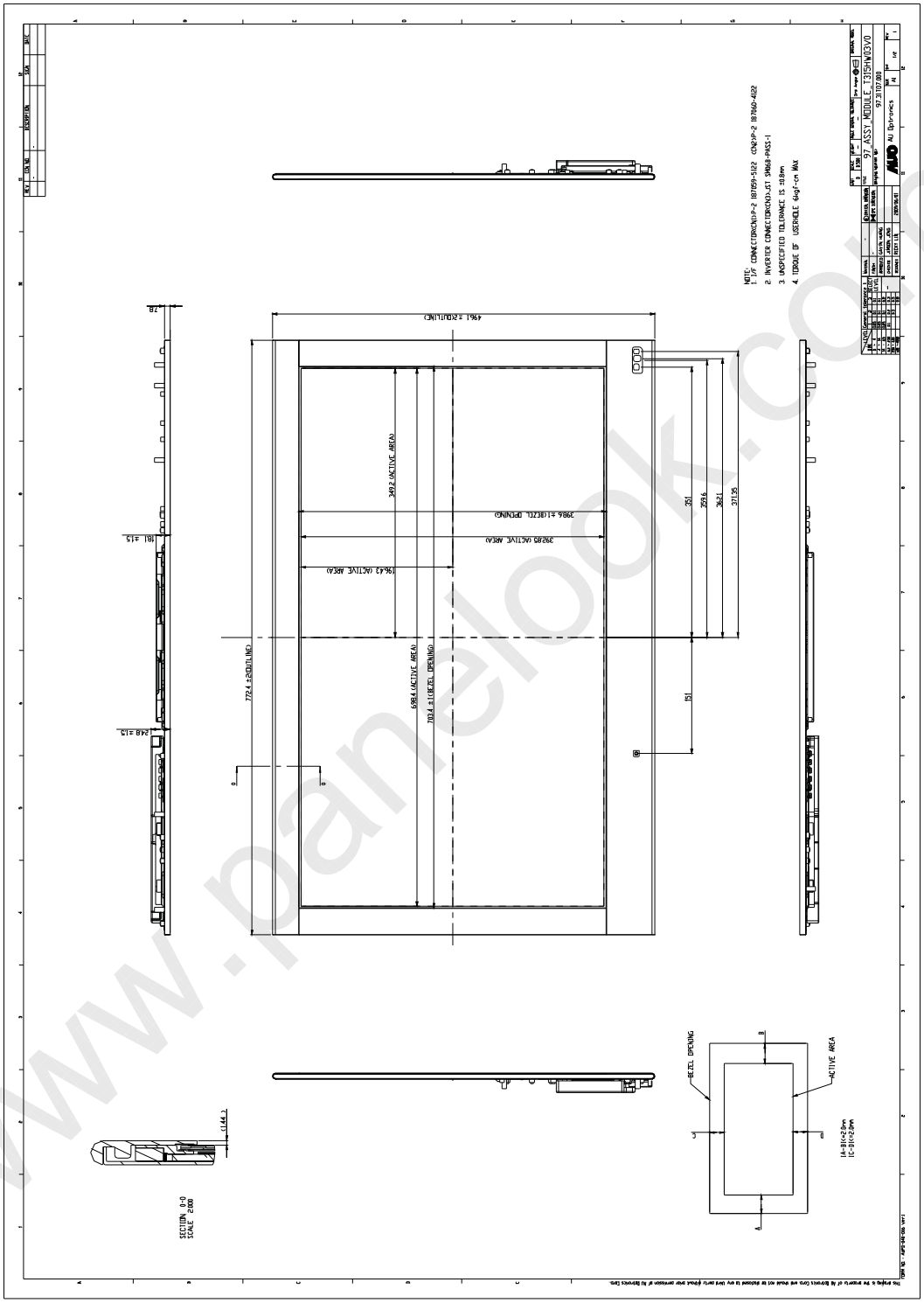
Fig.4-3 Viewing Angle Definition

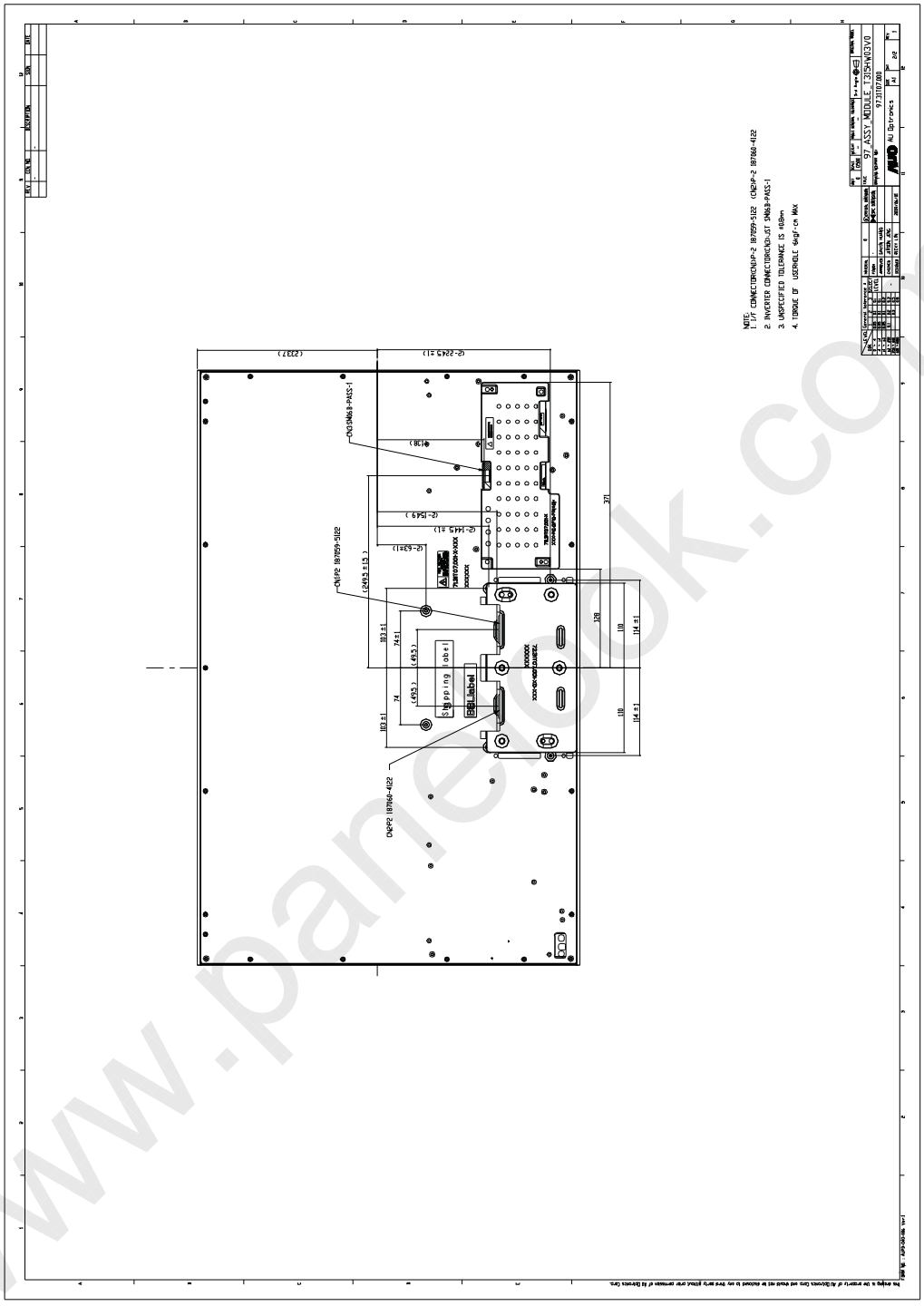
5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model T315HW03 V0. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal (typ.)	772.4mm
	Vertical (typ.)	496.1mm
	Depth (typ.)	7.8mm (without driver board & boss)
Bezel Area	Horizontal (typ.)	703.4mm
	Vertical (typ.)	398.6mm
Active Display Area	Horizontal	698.4mm
	Vertical	392.85mm
Weight	4595g (typ)(without T-con cover & driver board cover)	
Surface Treatment	Anti-Glare coating (Haze 11%) Hard coating (3H)	

2D drawing





6. Reliability

Panel condition in RA test

Brightness: 450nits

No	Test Item	Condition
1	High temperature storage test	Ta=60℃ 300h
2	Low temperature storage test	Ta= -20℃ 300h
3	High temperature operation test	Ta=50℃ 300h
4	Low temperature operation test	Ta=-5℃ 300h
7	Vibration test (with carton)	Wave form: random Vibration level: 1.5G RMS Bandwidth: 10-200Hz, Duration: X, Y, Z 30min One time each direction
8	Drop test (TBD) (with carton) (refer to below table)	Height: 38.1cm 1 corner, 3 edges, 6 surfaces (ASTMD4169-I)

Step	TEST ITEM	Height (cm)
		JVC and AUO Spec. combination
①	Drop **Bottom** face	**38.1**
②	Drop **Front-Bottom** edge line	**38.1**
③	Drop **Rear-Bottom** edge line	**38.1**
④	Drop **Right-Bottom** edge line	**38.1**
⑤	Drop **Left-Bottom** edge line	**38.1**
⑥	Drop **Front-Bottom** edge line	**38.1**
⑦	Over Turning Front	N/A
⑧	Over Turning Back	N/A
⑨	Over Turning Front	N/A
⑩	Over Turning Back	N/A
⑪	Drop **Bottom** face	**30**
⑫	Drop **Bottom** face	**30**

Result Evaluation Criteria

There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.

7. International Standard

7-1. Safety

(1) UL 60950-1, UL 60065

Standard for Safety of Information Technology Equipment Including electrical Business Equipment.

(2) IEC 60950-1 : 2001, IEC 60065:2001

Standard for Safety of International Electrotechnical Commission

(3) EN 60950 : 2001+A11, EN 60065:2002+A1:2006

European Committee for Electrotechnical Standardization (CENELEC)

EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

7-2. EMC

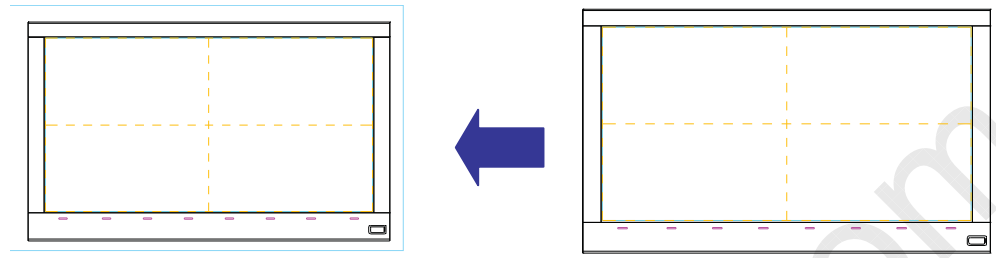
(1) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHz to 40GHz. “American National standards Institute(ANSI), 1992

(2) C.I.S.P.R “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.” International Special committee on Radio Interference.

(3) EN 55022 “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.” European Committee for Electrotechnical Standardization. (CENELEC), 1998

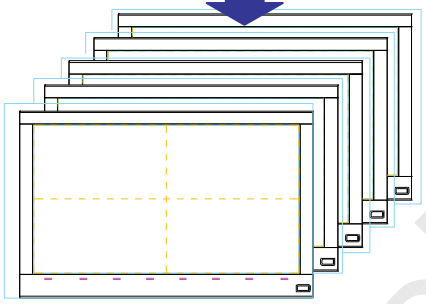
8.Packing

Packing Instruction

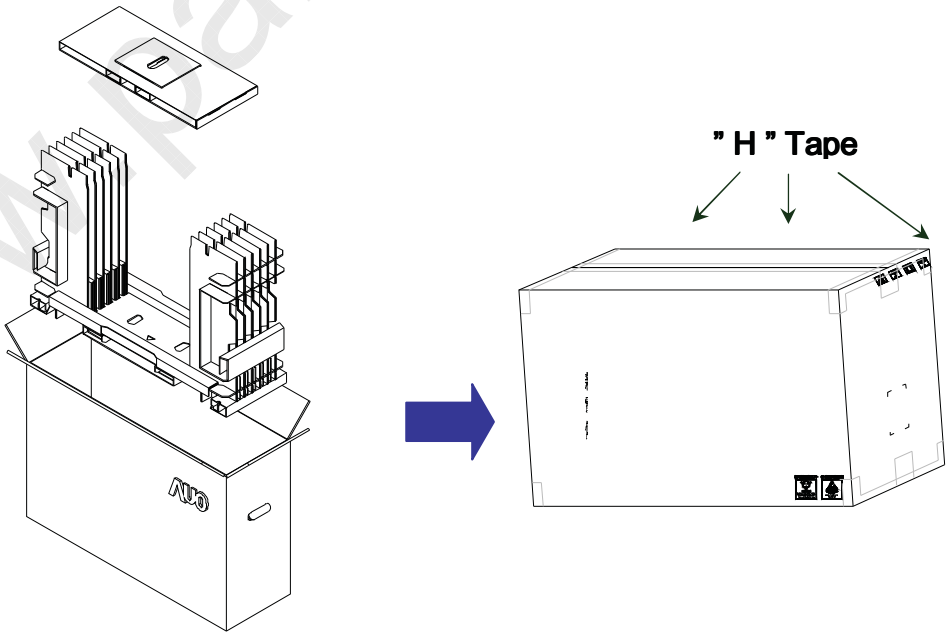


1pcs Module with Anti-ESD Bag

Module



5cs Modules



Cushion set

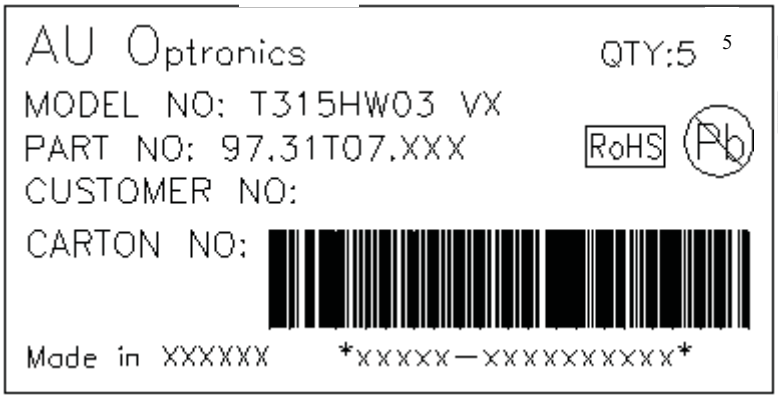
Package information:

Carton outside dimension : 870x283x598mm

Carton/Package weight : 4.5kg

Shipping label

Carton label



Green Mark Description:

For Pb Free products, AUO will add for identification.

For RoHS compatible products, AUO will add for identification.

Note: The Green Mark will be present only when the green documents have been ready by AUO Internal Green Team. (The definition of green design follows the AUO green design checklist.)

Pallet information

By air cargo : : (4x1) x2 layers, one pallet put 8 boxes, total 24 pcs module.

By sea : (4x1) x2 layers, one pallet put 24 boxes, total 24 pcs module

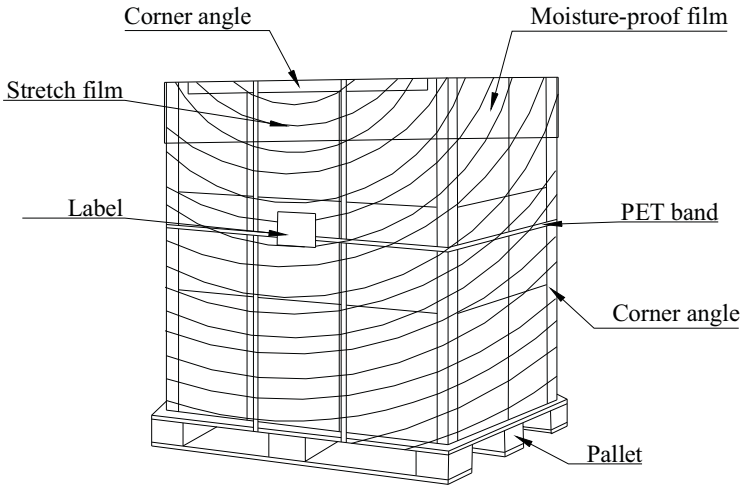
Pallet dimension : 1150x910x132mm

Made in XXXX

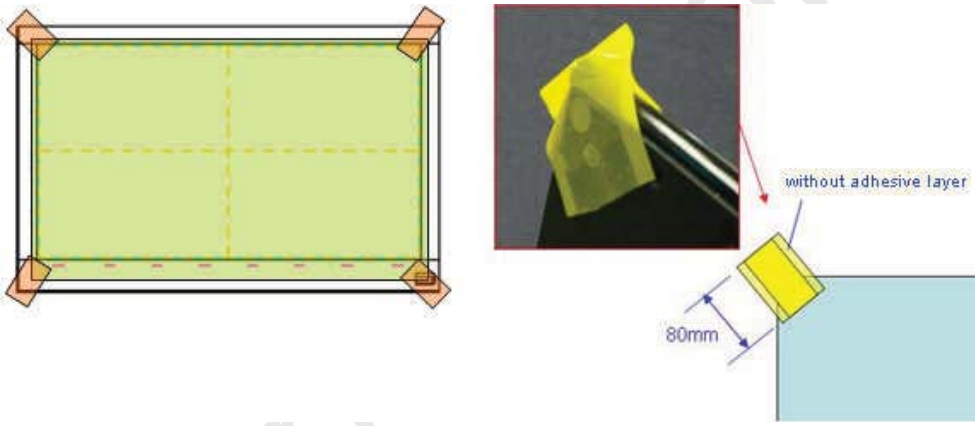
Pallet weight : 12kg

By air total weight : 31.5 kg/box X 8 boxes=252 kg (with pallet weight 264kg)

By sea total weight : 31.5 kg/box X 8 boxes=252 kg (with pallet weight 264kg)



Cell protection sheet and corner tape



TAPE FILM PROTECT (PET TAPE)

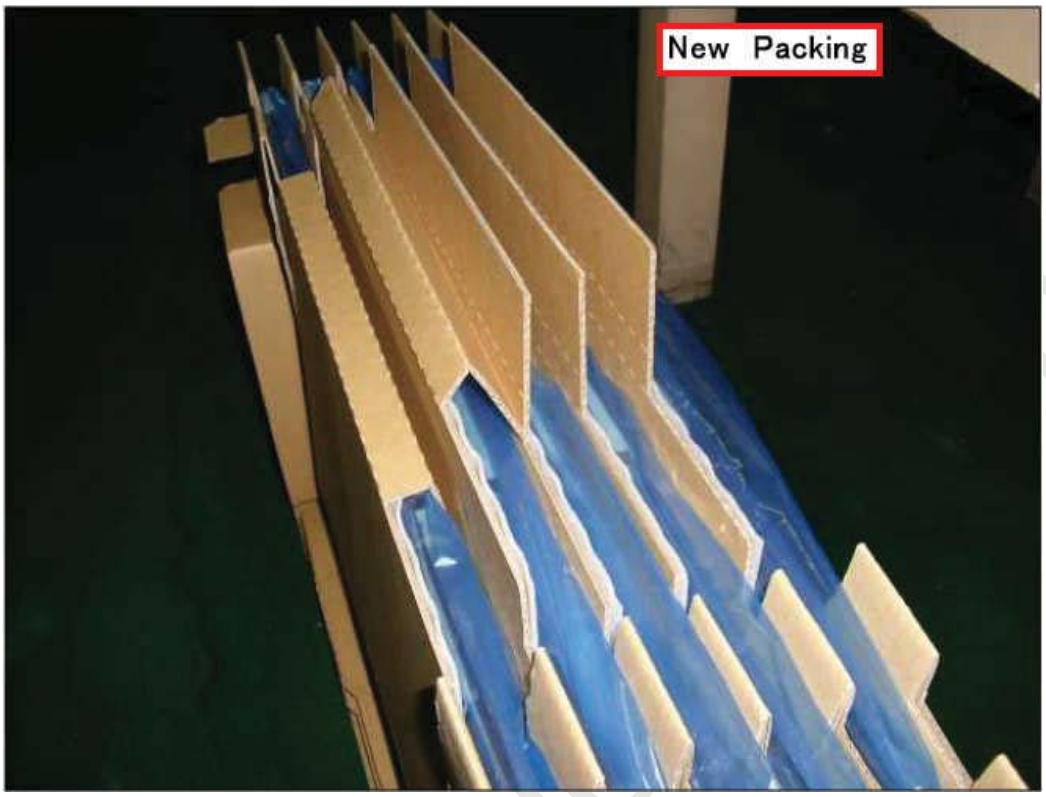
Qty: 0.08m*4

Taping SOP (reference the above figure)

1. 0.08m*4 preparation
2. Rotating tape to 45 degree sticking o the corner.

Note :

AUO keep studying optimized packing design, so far, the panel packing solution as below



9.PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD module.

9-1 MOUNTING PRECAUTIONS

(1) You must mount a module using holes arranged on back side of panel.

(2) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.

(3) You should adopt radiation structure to satisfy the temperature specification.

(4) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.

(5) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)

(6) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front/ rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.

(7) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

(8) Do not open the case because inside circuits do not have sufficient strength.

9-2 OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage: V=±200mV(Over and under shoot voltage)

(2) Response time depends on the temperature. (In lower temperature, it becomes longer..)

(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.

(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.

(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference

shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interface.

9-3 ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

9-4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

9-5 STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

(1) 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.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

9-6 HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) The protection film is attached to the bezel with a small masking tape. When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.

(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of flue still on the Bezel after the protection film is peeled off.

(3) You can remove the glue easily. When the glue remains on the Bezel or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

Application Note :

■ Prevent ”Image Sticking” Problem

In using a TFT LCD for a commercial machine (such as POS or PID) or an industrial automation application, it is often that the application software requires a fixed screen pattern, icons or buttons (see example as below) to be presented on the screen for a long period of time.

Figure 1. Example image of POS screen

When the LCD panels run under such condition, a phenomenon called “image sticking” or “ghost image” will sometime be seen when switched from the fixed image to a different image. A vaguely visible “residual image” can still be seen at the place where it was.

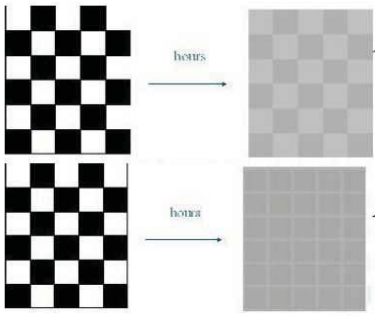


Figure 2. Image sticking phenomenon

The “stuck on” image can be “prevented” or “”recovered” by adopting the following guidelines in designing the system.

Pls don’t run the LCD with “fixed” image more than 8hrs of period, Especially, it is running in the elevated temperature environment.

While running the LCD more than 12hrs continually, LCD should turn-off for a while(≧1 hour), in addition, all operation condition should meet product specification.

In defining the icons, button or windows in the screen, “Block Pattern” is preferred than “Line Boarder Pattern”. Avoid using lines in dividing different display area.

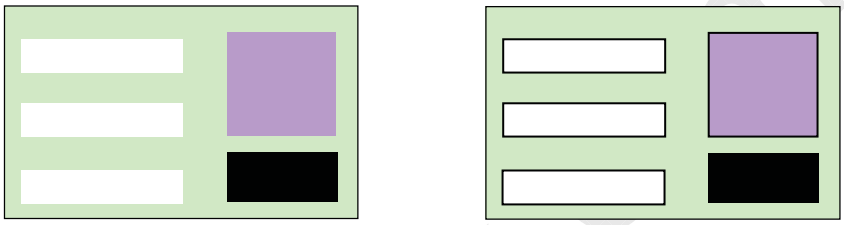


Figure 4. “Block Pattern” v.s. “Line Boarder Pattern”

If a static image is necessary, at the boundary of two different colors, try to use colors that are symmetric to the middle grey level, and slightly shift the boarder line once in a while.

It is better to set those areas with longer displaying time in medium gray colors.

■ Prevent thermal problem

In using a TFT LCD for a commercial applications (such as PID), it is often that LCD panel is set up in one system cover (see example as below) to present information or advertisement on the screen for a long period of time.

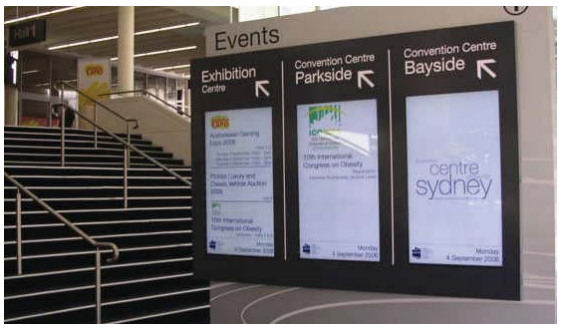


Figure 1. Public information display (PID)

When PID system runs for a long time, LCD panel and other key parts would be hotter and hotter. Finally, it is possible to over their thermal specifications. In this case, PID system may be malfunction.

However, the “thermal problem” can be “prevented” by adopting the following guidelines in designing the system.

Procedure & Subject Matter：

In order to prevent thermal problems, we hope customer may follow up below flows when they use AUO panel to design their PID system.

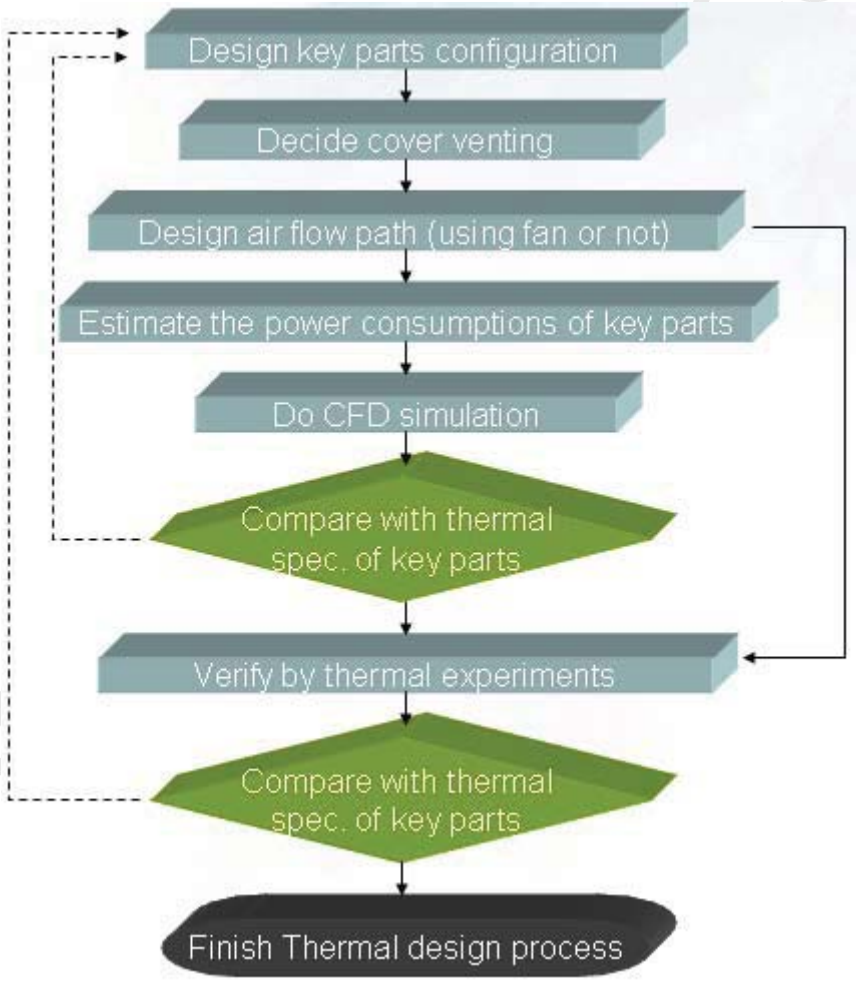


Figure 2. Thermal design process

2.1 Try not to run the LCD in a closed environment. Suitable venting on the system cover or TV wall would be helpful for cooling.

2.2 It is recommended to perform computational fluid dynamics (CFD) simulations and real experiments to find out potentially thermal problem of PID system before mass production.

2.3 If a thermal sensor (such as thermistor) is available, suggest to build it in PID system to monitor the temperature of key part or internal environment temperature.

Figure 3. Thermistor for temperature monitoring

2.4 When the temperature of specified component over its thermal specification, it may be malfunction and be damaged because of high temperature. We should make sure that the temperatures of all key parts are below their specifications.

2.5 It is better to adapt active cooling with fans for long time displaying, especially for high luminance LCD model. But we should consider noise side effect in the same time.

■ Apply LCD for outdoor application.

If utilize this panel in outdoor field, all operation condition should meet product specification.

■ Don't move this product while turn on this product