Product Description: T315HW02 TFT-LCD PANEL with RoHS guarantee			
AUO Model Name: T315HW02 V3			
Customer Part No/Project Name:			
Customer Signature	**Date**	AUO	**2008/12/08**
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		Reviewed By: RD Director / Eugene CC Chen CP Wang Reviewed By: Project Leader / Ming Ku Ming Wang	
		Prepared By: PM / Hanson Wang Hanson Wang	

Document Version : 0.1
Date : 2008/12/08

Product Specifications

31.5” FHD Color TFT-LCD Module
Model Name: T315HW02 V3

() Preliminary Specifications
(*) Final Specifications

Contents

Record of Revision

Version	Date	No	Old Description	New Description	Remark
0.0	2008/10/11		First issue		
0.1	2008/11/27	6	Drop test condition: 46mm	Drop test condition: 38mm	
					Final spec

1. General Description

This specification applies to the 31.5 inch Color TFT-LCD Module T315HW02 V3. This LCD module has a TFT active matrix type liquid crystal panel 1920x1080 pixels, and diagonal size of 31.5 inch. This module supports 1920x1080 HDTV 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 **10-bit** gray scale signal for each dot.
The T315HW02 V3 has been designed to apply the 10-bit 2 channel LVDS interface method. It is intended to support displays where high brightness, wide viewing angle, high color saturation, and high color depth are very important.
The T315HW02 V3 model is RoHS verified which can be distinguished on panel label.

* General Information

Items	Specification	Unit	Note
Active Screen Size	31.51 inches		
Display Area	698.4 (H) x 392.85 (V)	mm	
Outline Dimension	760.0(H) x 450.0(V) x 45(D)	mm	w/o Inverter
Driver Element	a-Si TFT active matrix		
Display Colors	16.7M	Colors	
Number of Pixels	1920x1080	Pixel	
Pixel Pitch	0.36375	mm	
Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally Black		
Surface Treatment	SC, 3H		

2. Absolute Maximum Ratings

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

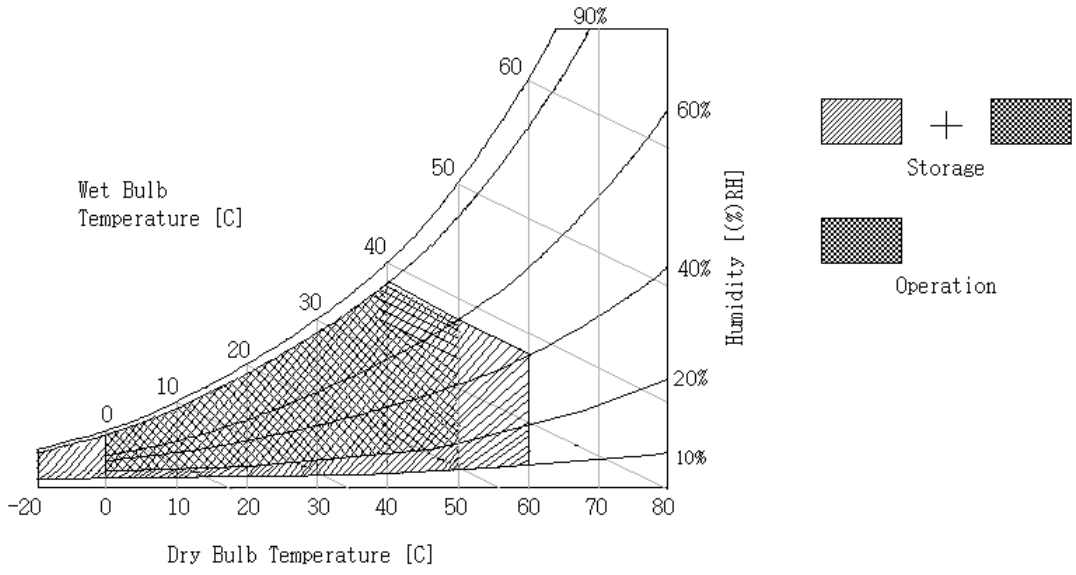
Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	Vcc	-0.3	14	[Volt]	Note 1
Input Voltage of Signal	Vin	-0.3	4	[Volt]	Note 1
Operating Temperature	TOP	0	+50	[°C]	Note 2
Operating Humidity	HOP	10	90	[%RH]	Note 2
Storage Temperature	TST	-20	+60	[°C]	Note 2
Storage Humidity	HST	10	90	[%RH]	Note 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

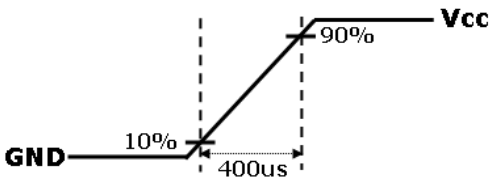
The T315HW02 V3 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input, which powers the CCFL, is typically generated by an integrated power (I/P) system.

3-1 Electrical Characteristics

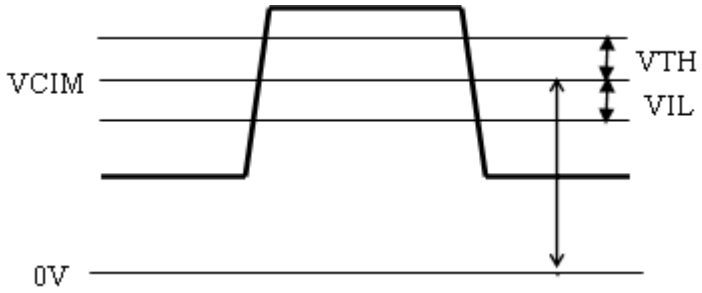
Parameter		Values				Unit	Notes
			Min	Typ	Max		
CD:							
Power Supply Input Voltage		Vcc	10.8	12	13.2	Vdc	1
Power Supply Input Current		Icc	-	1.2		A	2
Power Consumption		Pc	-	14.4		Watt	2
Inrush Current		I_{RUSH}	-	-	4.5	Apeak	3
LVDS Interface	Differential Input High Threshold Voltage	VTH	100			mV	4
	Differential Input Low Threshold Voltage	VTL	100			mV	4
	Common Input Voltage	VCIM	1.10	1.25	1.40	V	4
CMOS Interface	Input High Threshold Voltage	VIH (High)	2.4		3.3	Vdc	
	Input Low Threshold Voltage	VIL (Low)	0		0.7	Vdc	
Life Time			50,000			Hours	6

Note :

1. The ripple voltage should be controlled under 10% of V_{CC}
2. Vcc=12.0V, f_v =60Hz, fCLK=74.25 Mhz , 25℃, Test Pattern : White Pattern
3. Measurement condition :



4. VCIM = 1.2V



5. The performance of the Lamp in LCD panel, for example life time or brightness, is extremely influenced by the characteristics of balanced board and I/P board. All the parameters should be carefully designed as not to produce too much leakage current from high-voltage output. While you design or order the balance board, please make sure unwanted lighting caused by the mismatch of the lamp and the balanced board (no lighting, flicker, etc) never occurs. After confirmation, the LCD panel should be operated in the same condition as installed in your instrument.

6. Do not attach a conducting tape to lamp connecting wire. If the lamp wire attach to conducting tape, TFT-LCD Module have a low luminance and the inverter has abnormal action because leakage current occurs between lamp wire and conducting tape.

7. 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 CCFL will drop and the life time of CCFL will be reduced.

3-2 Interface Connections

- Connector on Panel: JAE FI-RE51S-HF (Manufactured by JAE)
-

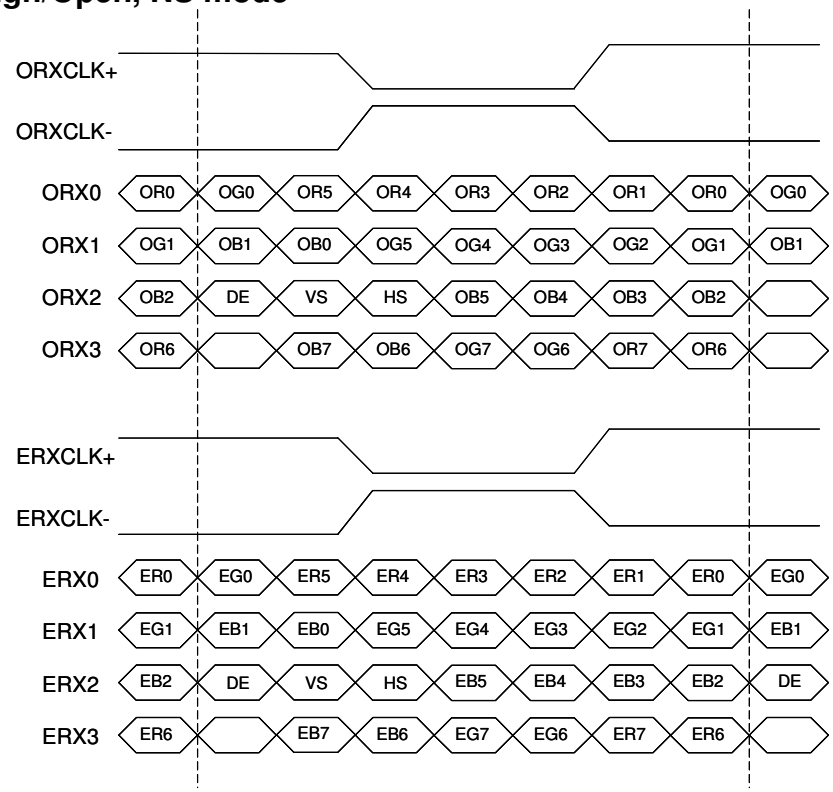
PIN No	Signal Name	Description
1	V_{DD}	Operating Voltage Supply, +12V DC Regulated
2	V_{DD}	Operating Voltage Supply, +12V DC Regulated
3	V_{DD}	Operating Voltage Supply, +12V DC Regulated
4	V_{DD}	Operating Voltage Supply, +12V DC Regulated
5	V_{DD}	Operating Voltage Supply, +12V DC Regulated
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	GND	Ground
10	ORX_0-	LVDS Channel Odd, Signal 0-
11	ORX _0+	LVDS Channel Odd, Signal 0+
12	ORX _1-	LVDS Channel Odd, Signal 1-
13	ORX _1+	LVDS Channel Odd, Signal 1+
14	ORX _2-	LVDS Channel Odd, Signal 2-
15	ORX _2+	LVDS Channel Odd, Signal 2+
16	GND	Ground
17	ORX _CLK-	LVDS Channel Odd, Clock -
18	ORX _CLK+	LVDS Channel Odd, Clock +
19	GND	Ground
20	ORX _3-	LVDS Channel Odd, Signal 3-
21	ORX _3+	LVDS Channel Odd, Signal 3+
22	ORX _4-	LVDS Channel Odd, Signal 4-
23	ORX _4+	LVDS Channel Odd, Signal 4+
24	GND	Ground
25	ERX_0-	LVDS Channel Even, Signal 0-
26	ERX_0+	LVDS Channel Even, Signal 0+
27	ERX_1-	LVDS Channel Even, Signal 1-
28	ERX_1+	LVDS Channel Even, Signal 1+
29	ERX_2-	LVDS Channel Even, Signal 2-
30	ERX_2+	LVDS Channel Even, Signal 2+
31	GND	Ground
32	ERX_CLK-	LVDS Channel Even, Clock -
33	ERX_CLK+	LVDS Channel Even, Clock +

34	GND	Ground
35	ERX_3-	LVDS Channel Even, Signal 3-
36	ERX_3+	LVDS Channel Even, Signal 3+
37	ERX_4-	LVDS Channel Even, Signal 4-
38	ERX_4+	LVDS Channel Even, Signal 4+
39	GND	Ground
40	NC	No Connection
41	NC	No Connection
42	NC	No Connection
43	NC	No Connection
44	HSYNC	Customer use only
45	LVDS_SEL	Open/High(3.3V) for NS, Low(GND) for JEIDA
46	LVDS_SCL	I2C SCL data from LVDS
47	FRC_NRESET	Customer use only
48	LVDS_SDA	I2C SDA data from LVDS
49	SW_PVCC	Customer use only
50	MAIN_CHECK	Customer use only
51	NC (reserved)	No Connection (AUO internal use)

Note:

1. All GND (ground) pins should be connected together and should also be connected to the LCD's metal frame. All Vcc (power input) pins should be connected together.
2. For Pin 10, 27 and 28, panel will not damage if negligently connect these pins to high or low

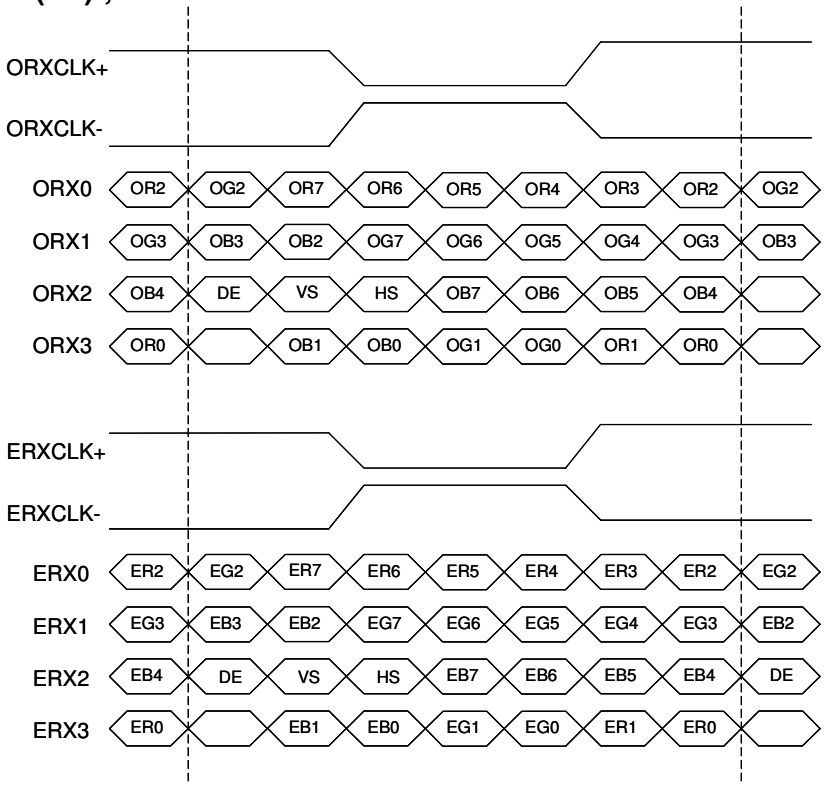
LVDS_SEL = High/Open, NS mode



Note:

- Odd data is the first priority.
- First data is odd.

LVDS_SEL = Low (0V) , JEIDA mode



3-3 Signal Timing Specifications

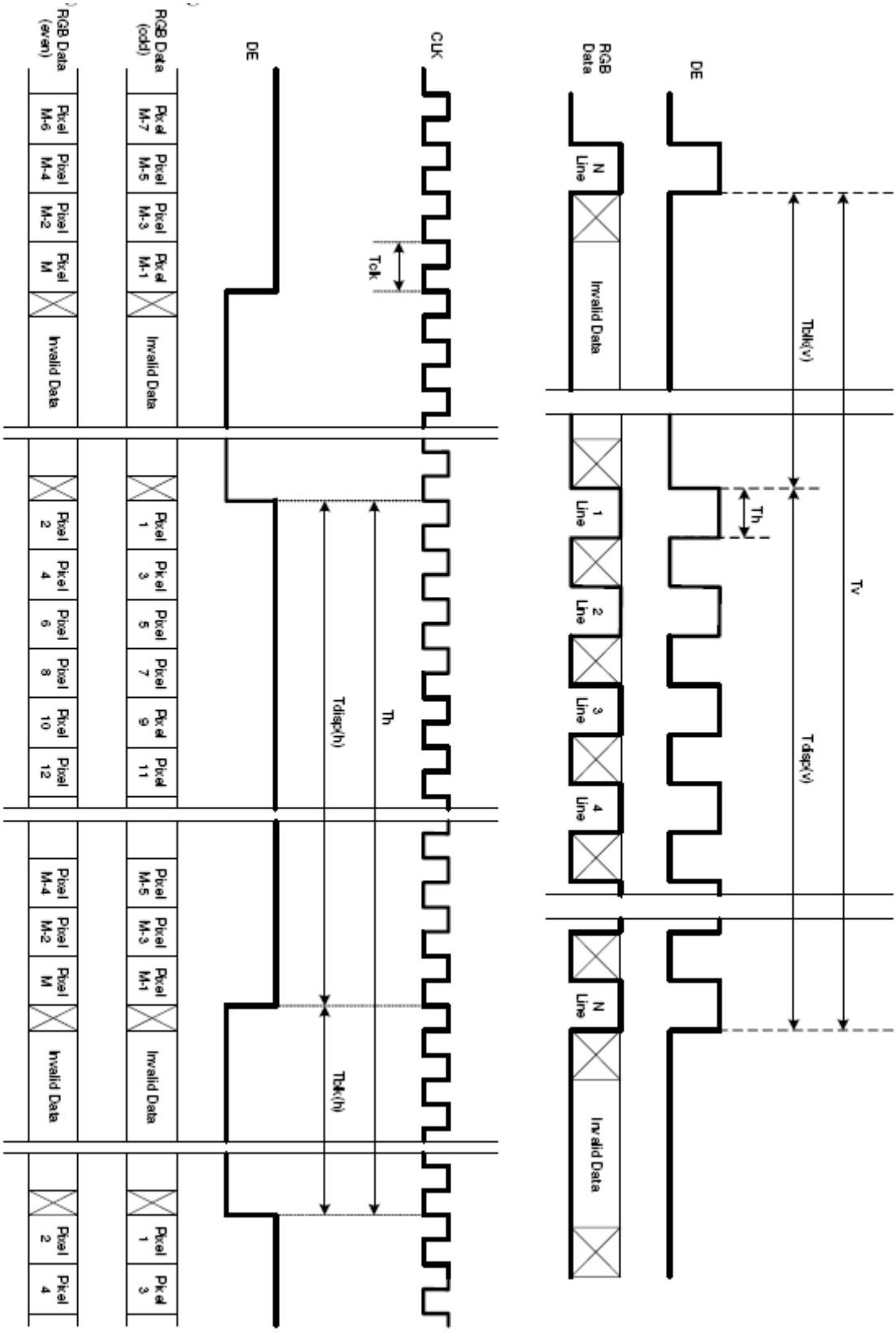
This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications for it's proper operation.

*** Timing Table**
DE only Mode
Vertical Frequency:

Signal	Item	Symbol	Min.	Typ.	Max	Unit
Vertical Section	Period	T_V		1125		T_H
	Active	T_{DISP} (V)		1080		T_H
	Blanking	T_{BLK} (V)		45		T_H
	Front porch	Tfp(V)	5	5	5	T_H
	Back porch	Tbp(V)	31	31	31	T_H
	V_sync	TVsync_wdth	9	9	9	T_H
Horizontal Section	Period	T_H	2200	2200	2200	T_{CLK}
	Active	T_{DISP} (H)		1920		T_{CLK}
	Blanking	T_{BLK} (H)		144		T_{CLK}
	Front porch	Tfp(H)	49	49	49	T_{CLK}
	Back porch	T(H)	147	147	147	T_{CLK}
	V_sync	TVsync_wdth	84	84	84	T_{CLK}
Clock	Period	T_{CLK}		13.47		ns
	Frequency	F_{CLK}		74.25		MHz
Vertical Frequency	Frequency	F_V		60		Hz
Horizontal Frequency	Frequency	F_H		67.5		KHz

Notes:
1.) Display position is specific by the rise of DE signal only.
Horizontal display position is specified by the falling edge of 1st DCLK right after the rise of ENAB, is displayed on the left edge of the screen.
Vertical display position is specified by the rise of DE after a "Low" level period equivalent to eight times of horizontal period. The 1st data corresponding to one horizontal line after the rise the of ENAB is displayed at the top line of screen.
2.) The display position does not fit to the screen if a period of DE "High" and the effective data period do not synchronize with each other.

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 DATA REFERENCE

Color		Input Color Data																													
		RED										GREEN										BLUE									
		MSB									LSB	MSB									LSB	MSB									LSB
		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

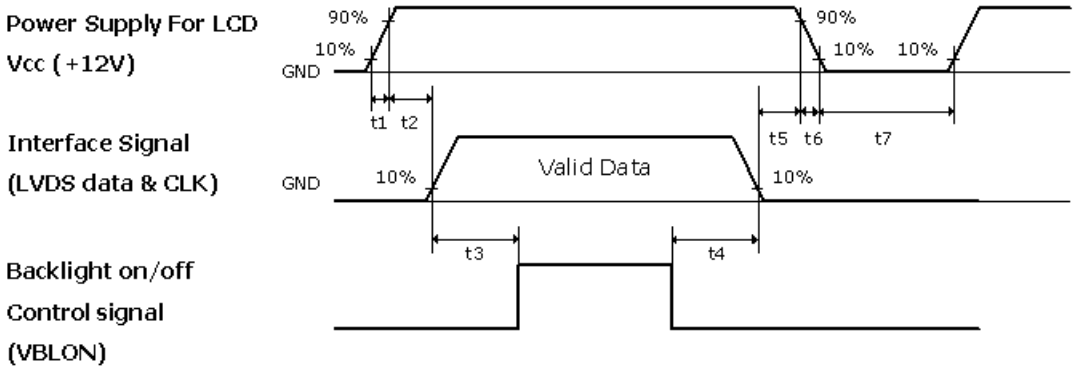
	RED(1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

	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 for LCD Module

3.6.1 Power Sequence for LCD



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**	**---**	**---**	s

Note:

The timing controller will not be damaged in case of TV set AC input power suddenly shut down.

Once power reset, it should follow power sequence as spec. definition.

(1) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become abnormal screen.

3-7 Backlight Power Specification for LCD Module

3.7.1 Electrical specification

	Description			Min	Typ	Max	Unit	Condition/Note
1	Operating Voltage		Vo	1242	1380	1518	Vrms	1. Dimming range is set 100% 2. Base on lamp specification, for each lamp need to be applied at least minimum operating voltage to ensure each lamp can be normally worked!
2	Operating Current		Io	12	12.5	13	mArms	1. Dimming range is set 100% 2. Base on lamp specification, for each lamp need to be applied at least minimum operating current to ensure each lamp can be normally worked!
3	BL Total Power Dissipation		PBL	73	**78**	83	Watt	1. Dimming range is set 100%. 2. In order to get typical light out, the backlight need to be applied typical power. 3. Input power of JIG BD is about 90 W (typ) by AUO measure!
4	Striking Voltage	At 0℃	Vstrike	2750	2900	-	Vrms	1. Base on lamp specification, to ensure each lamp can be normally ignited, need to apply at least minimum striking voltage to each lamp
		At 25℃		2290	2440	-		
5	Striking Time		Ts	1000	-	1500	msec	1. To ensure each lamp can be normally ignited, each lamp need to be applied at least minimum striking voltage during minimum striking time.
6	Lamp Type			Straight type				
7	Number of Lamps			4U			pcs	

（Ta=25±5℃, Turn on for 45minutes）

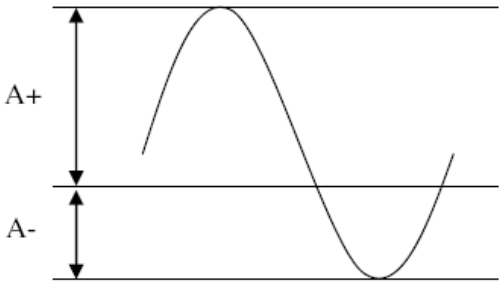
(*) The operating frequency of lamp may produce interference with horizontal frequency from display, and may cause line noise on the display. In order to avoid interference, the operating frequency should be separated from horizontal frequency.

Lamp specification

	Description		Min	Typ	Max	Unit	Note
1	Lamp voltage	Vlamp	1242	1380	1518	Vrms	At Ilamp=12.5mA
2	Lamp current	Ilamp	12	12.5	13	mArms	
3	Lamp frequency	flamp	35	-	80	kHz	
4	Striking voltage	At 25℃	-	-	2290	Vrms	
		At 0℃	-	-	2750	Vrms	
5	Delayed discharge time	Tdelay	-	-	1000	msec	
6	Life time		50K	50K	-	-	
7	Unsymmetrical ratio		-	-	-	10%	Note 1.
8	Crest factor (C.F)		$\sqrt{2}-10\%$	$\sqrt{2}-10\%$	$\sqrt{2}$	$\sqrt{2}+10\%$	

The above characteristics are measured under the conditions:
Ambient temperature: 25±2℃,
Relative Humidity: 65±20%RH.

Note 1:
Please light on the lamp with symmetrical voltage and current waveform (unsymmetrical ratio is less than 10%, crest factor within $\sqrt{2}\pm10\%$). The inverter output waveform should be better similar to the ideal sine wave.

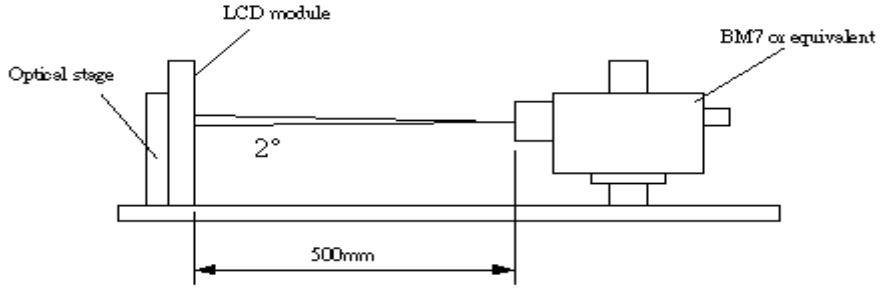


Unsymmetrical ratio = |(A+)-(A-)|/Arms*100%
Crest factor= (A+) / Arms or (A-) / Arms
A+：Plus of peak value
A-：Minus of peak value
Arms：Root mean square value

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 45 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 θequal to 0°.

Fig.1 1 presents additional information concerning the measurement equipment and method.



Parameter		Symbol	Values			Units	Notes
			Min.	Typ.	Max.		
Contrast Ratio		CR	4000	5000			1
Surface Luminance, white		LWH	400	500		cd/㎡	2
Luminance Variation		δ_{WHITE} 9 p			1.30		3
Response time	G to G	Tγ		6.5		ms	4
Color Gamut		NTSC		72		%	
Color Coordinates							
	RED	R_X	Typ.-0.03	0.64	Typ.+0.03		
		R_Y		0.33			
	GREEN	G_X		0.29			
		G_Y		0.60			
	BLUE	B_X		0.15			
		B_Y		0.06			
	WHITE	W_X		0.28			
		W_Y		0.29			
Viewing Angle							
x axis, right(φ=0°)		θ_r		89		degree	5
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:

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

$$\textbf{Contrast Ratio} = \frac{\textbf{Surface Luminance of } L_{on5}}{\textbf{Surface Luminance of } L_{off5}}$$

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 2. When lamp current IH=11mA, LWH=Lon5, where Lon5 is the luminance with all pixels displaying white at center 1 location.

2. The variation in surface luminance, δWHITE is defined (center of Screen) as:

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

3. Response time Tγ is the average time required for display transition by switching the input signal for five luminance ratio (0%,25%,50%,75%,100% brightness matrix) and is based on f_v=60Hz to optimize.

	0%	25%	50%	75%	100%
0%		t:0%-25%	t:0%-50%	t:0%-75%	t:0%-100%
25%	t:25%-0%		t:25%-50%	t:25%-75%	t:25%-100%
50%	t:50%-0%	t:50%-25%		t:50%-75%	t:50%-100%
75%	t:75%-0%	t:75%-25%	t:75%-50%		t:50%-100%
100%	t:100%-0%	t:100%-25%	t:100%-50%	t:100%-75%	

4. 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 FIG4.

FIG. 2 Luminance

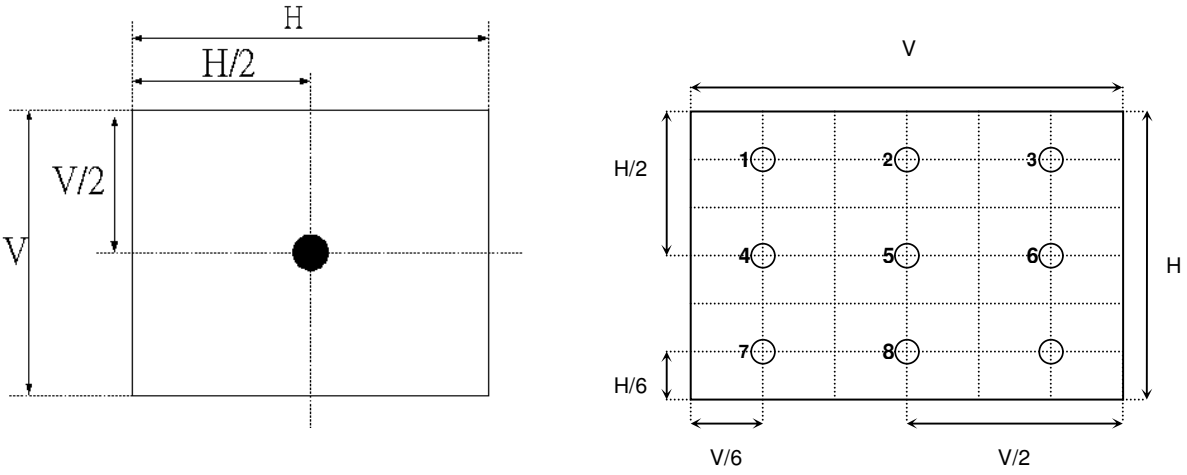


FIG.3 Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for “any level of gray(bright) “ and “any level of gray(dark)”.

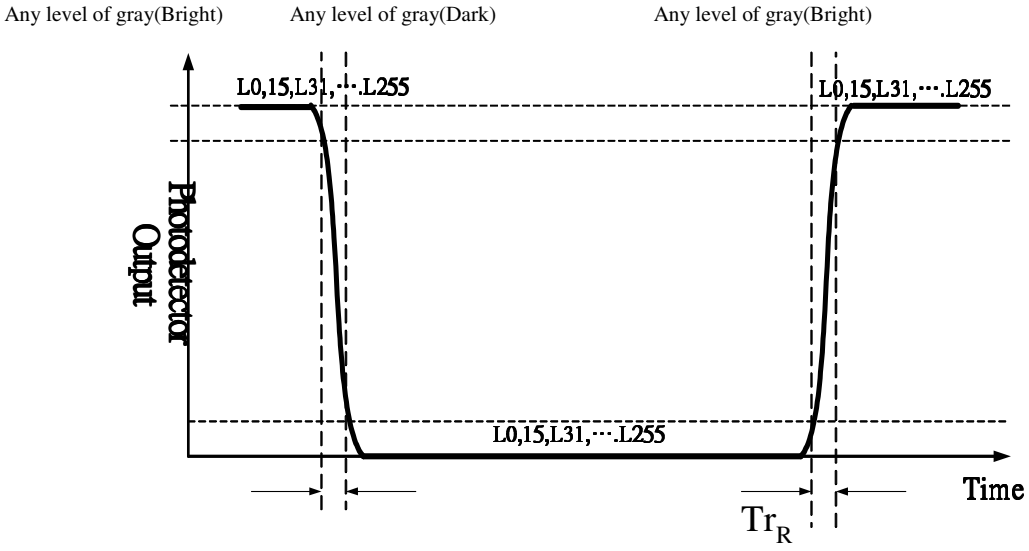
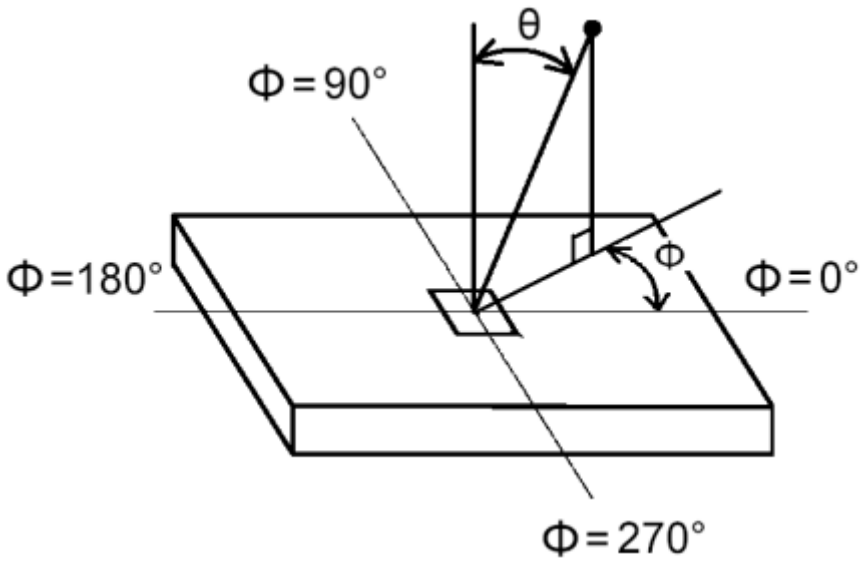


FIG.4 Viewing angle

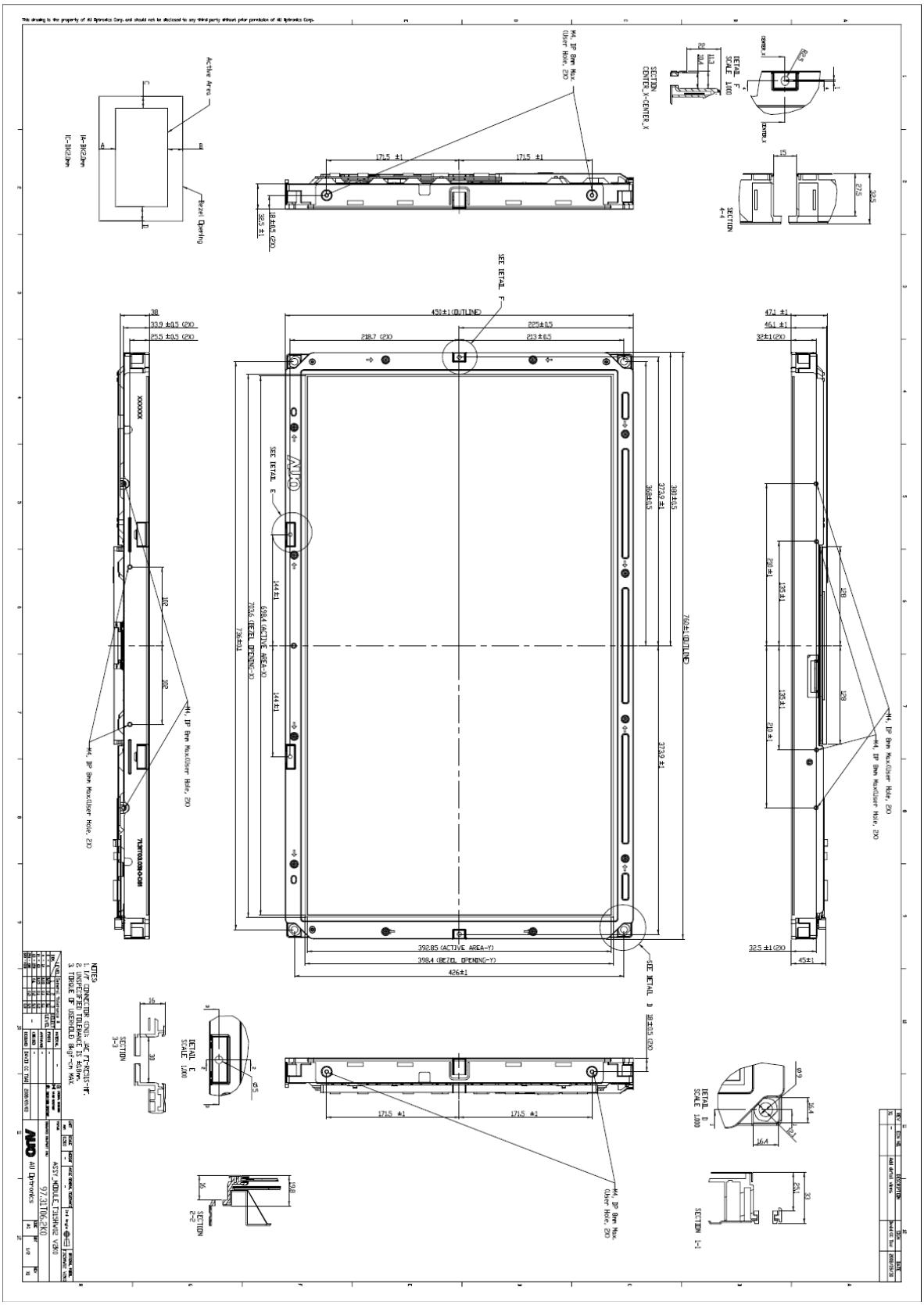


5. Mechanical Characteristics

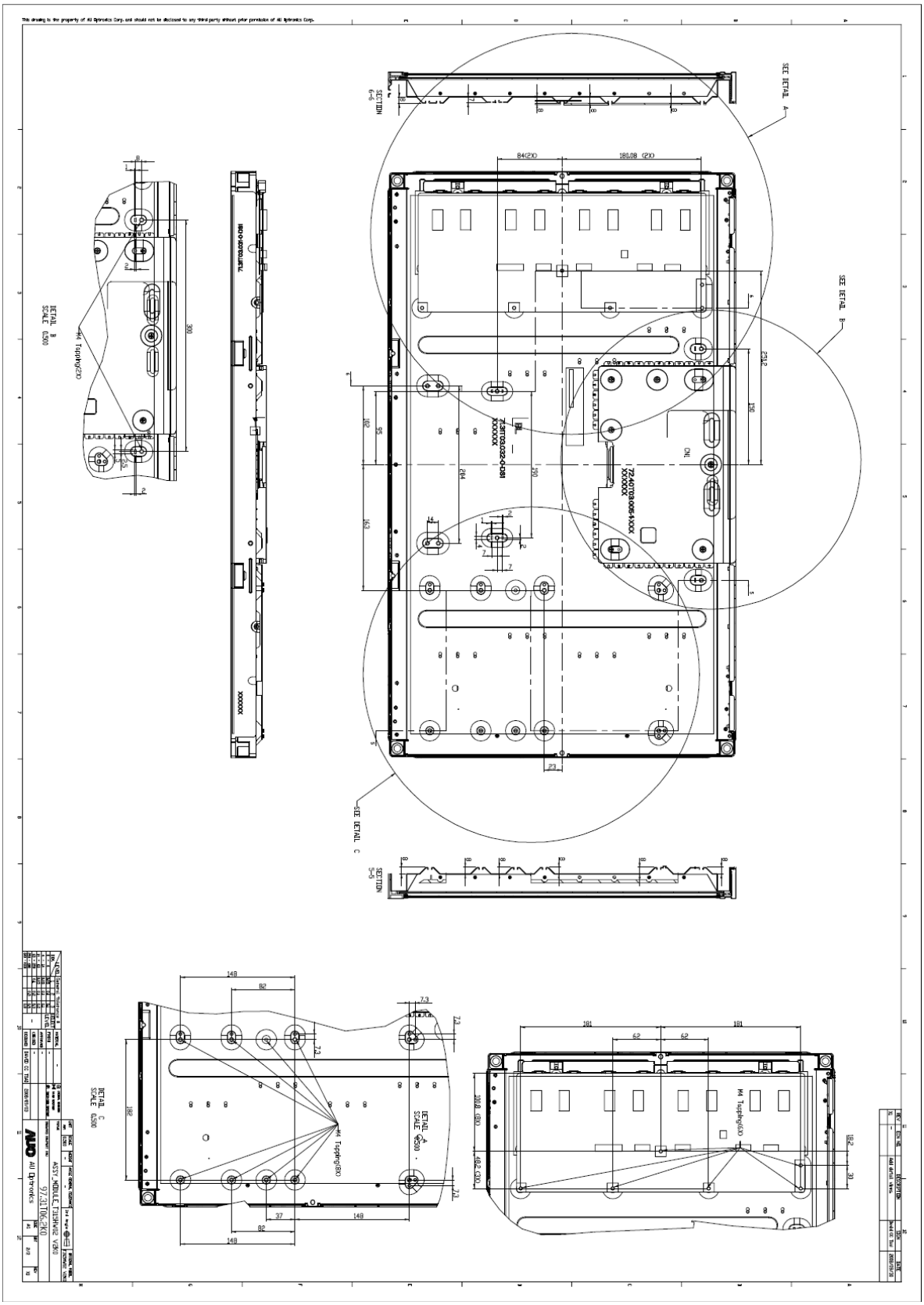
The contents provide general mechanical characteristics for the model T315HW02 V3. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	760.0mm
	Vertical	450.0mm
	Depth	45mm
Bezel Opening	Horizontal	703.6mm
	Vertical	398.4mm
Active Display Area	Horizontal	698.4mm
	Vertical	392.85mm
Weight	6500g (typ.)	
Surface Treatment	SC, 3H	

Front:



Back:



6. Reliability:

Environment test condition

	Test Items	Q'ty	Conditions
1	High Temperature Stroage	3	60℃ 300 hrs
2	Low Temperature Stroage	3	-20℃, 300 hrs
3	High Temperature Operation	3	50℃, 300 hrs
4	Low Temperature Operation	3	-5℃, 300 hrs
5	Vibration (non-operation)	3	(10 ~ 300Hz/1.5G/11min SR, XYZ 30min/axis) Vibration level : 1.5G RMS, Bandwidth : 10-300Hz Duration: X, Y, Z 30min,
6	Shock (non-operation)	3	Shock level: 50G Waveform: have sine wave, 11ms Direction: ±X,±Y, ±Z One time each direction
7	Vibration (With carton)	3	Random wave (1.5 Grms 5~500Hz) 30mins / Per each X.Y.Z axes
8	Drop (With carton)	3	Height: 38cm 1 corner, 3 edges, 6 surfaces (ASTMD4169-I)

7. International Standard

7-1. Safety

i. UL1950 Third Edition, Underwriters Laboratories, Inc. Jan. 28, 1995

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

ii. CAN/CSA C22.2 No. 950-95/60950 Third Edition, Canadian Standards Association,

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

iii. EN60950 : 1992+A2: 1993+A2: 1993+C3: 1995+A4: 1997+A11: 1997

IEC 950: 1991+A1: 1992+A2: 1993+C3: 1995+A4:1996

European Committee for Electrotechnical Standardization (CENELEC)

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

7-2. EMC

a) 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

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

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

8. Packing

TW7A00400044-ZM0200

TW7A004: T: Taiwan, A/B: China

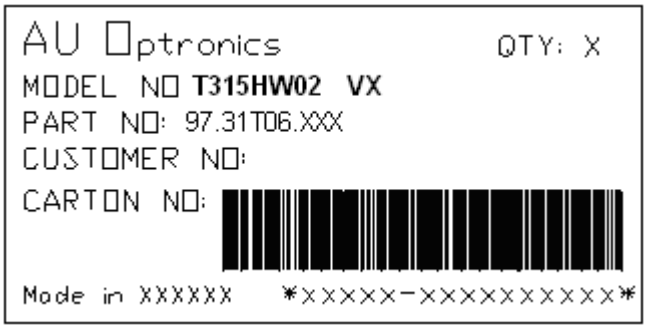
00044: Panel Serial Number

ZM0: AUO internal code

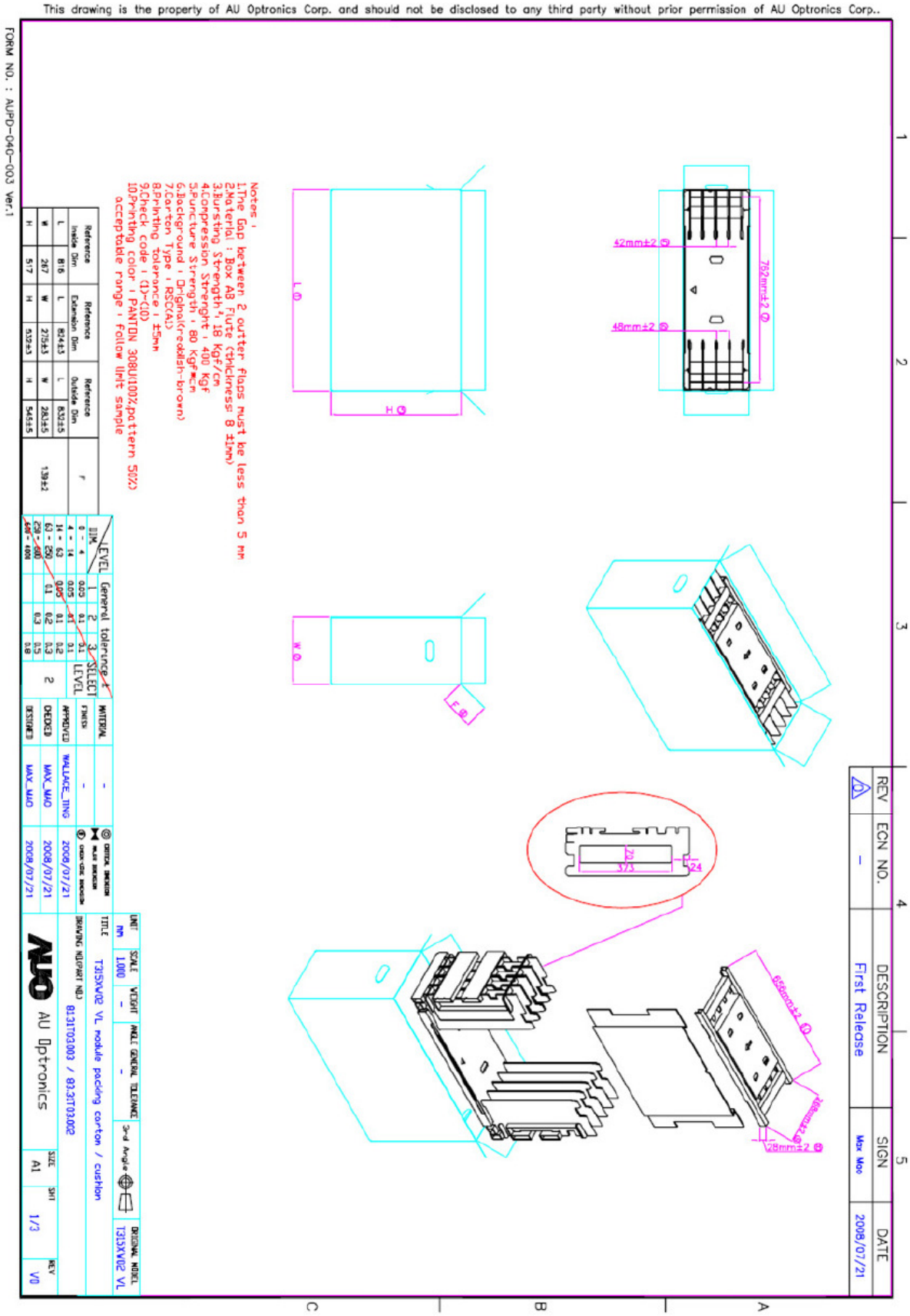
Manufactured 07/43: 2007 week 43

Made In Taiwan: Taiwan made

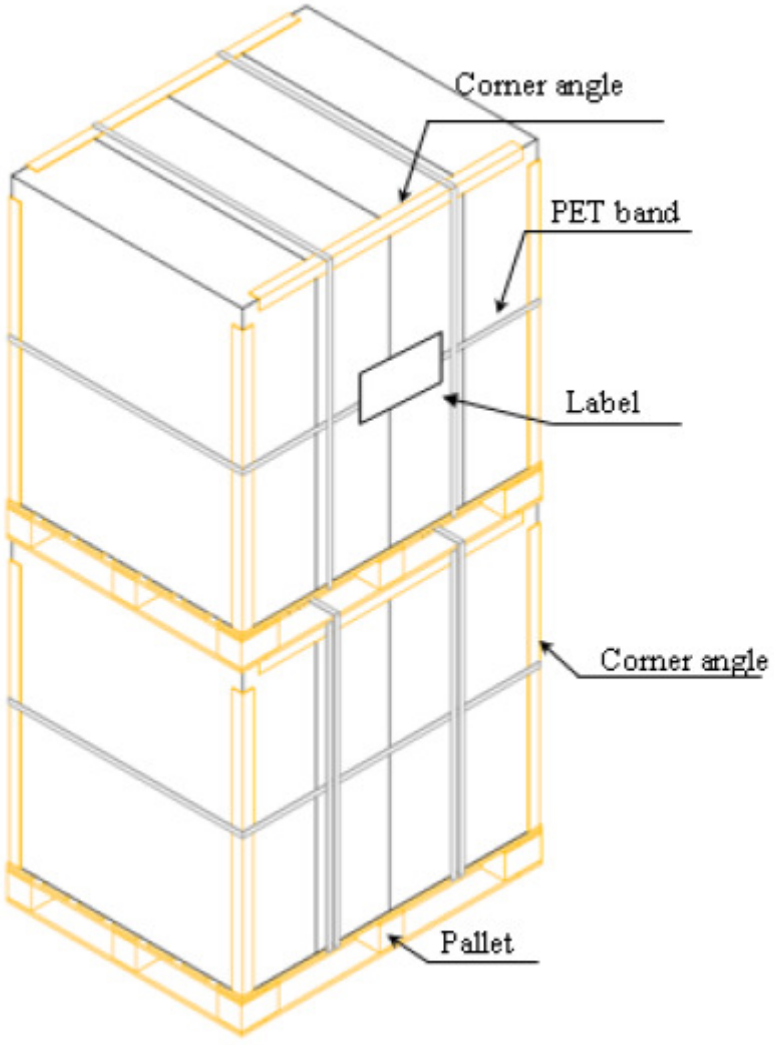
Carton Label:



Carton:



	Item	Specification			Packing Remark
		Qty.	Dimension	Weight (kg)	
1	Packing BOX	4pcs/box	832(L)mm*283(W)mm*545(H)mm	30.5	
2	Pallet	1	1150(L)mm*840(W)mm*138(H)mm	13	
3	Boxes per Pallet	8 boxes/Pallet			
4	Panels per Pallet	32pcs/pallet			
	Pallet after packing	32	1150(L)mm*840(W)mm*2460(H)mm	256	



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 in four corners or four sides.
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) 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.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) 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.
(6) 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).
(7) 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.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

9-2 OPERATING PRECAUTIONS

(1) The device listed in the product specification sheets was designed and manufactured for TV application
(2) The spike noise causes the mis-operation of circuits. It should be lower than following voltage: V=±200mV(Over and under shoot voltage)
(3) Response time depends on the temperature. (In lower temperature, it becomes longer..)
(4) 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.
(5) 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.
(6) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(7) 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.