31.5” WXGA Color TFT-LCD SKD Panel

Model Name: T320XW03 V3

Issue Date : 2009/12/25

( ) Preliminary Specifications

(∗) Final Specifications

Customer Signature	Date	AUO	Date
Approved By		Approval By PM Director *Frank Hsu* Frank Hsu.	
Note		Reviewed By RD Director *Eugene CC Chen* Eugene Chen 12/30.'09 Reviewed By Project Leader *Vincent MC Cheng* Vincent MC. Cheng 12/25	
		Prepared By PM *Marcus Lai* Marcus Lai 12/25'09	

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Record of Revision

Version	Date	Page	Description
0.1	2009/10/01		First release
1.0	2009/12/15	4	Update Cell Outline Dimension : 716.18(H) x 413.97(V)
		17	Update Mechanical Characteristic
		20	Update Shipping Label
		19	Drop Test (with carton) Height: 45.7 cm , 1 corner, 3 edges, 6 surfaces (ASTM-D5276)
1.1	2010/01/13	19	Vibration test (With carton) Q'ty : 4 pcs , Drop test (With carton) Q'ty: 4 pcs
1.2	2010/01/19	13	Update power on t2 Max value：50ms
		14	Update Cell Transparency 4.95 %
1.3	2010/03/25	15	Add Note: 1. The optical data are measured from AUO T320XW03 V3 module and it is only for reference. It depends on customer's backlight design
1.4	2010/04/20	21	Update Packing Process

1. General Description

This specification applies to the 31.5 inch Color TFT-LCD SKD panel of T315XW03. This LCD open cell has a TFT active matrix type liquid crystal panel 1,366 x 768 pixels, and diagonal size of 31.5 inch. This module supports 1,366 x 768 mode. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in horizontal stripes. Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot.

The T315XW03 has been designed to apply the 8-bit 1 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.

*** General Information**

Items	Specification	Unit	Note
Active Screen Size	31.5	inch	
Display Area	697.685 (H) x 392.256(V)	mm	
Cell Outline Dimension	716.18(H) x 413.97(V)	mm	
Driver Element	a-Si TFT active matrix		
Display Colors	8 bit, 16.7M	Colors	
Number of Pixels	1,366 x 768	Pixel	
Pixel Pitch	0.51075	mm	
Pixel Arrangement	RGB horizontal stripe		
Display Operation Mode	Normally Black		
Surface Treatment	Anti-Glare, 3H		Haze=11%

2. Absolute Maximum Ratings

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

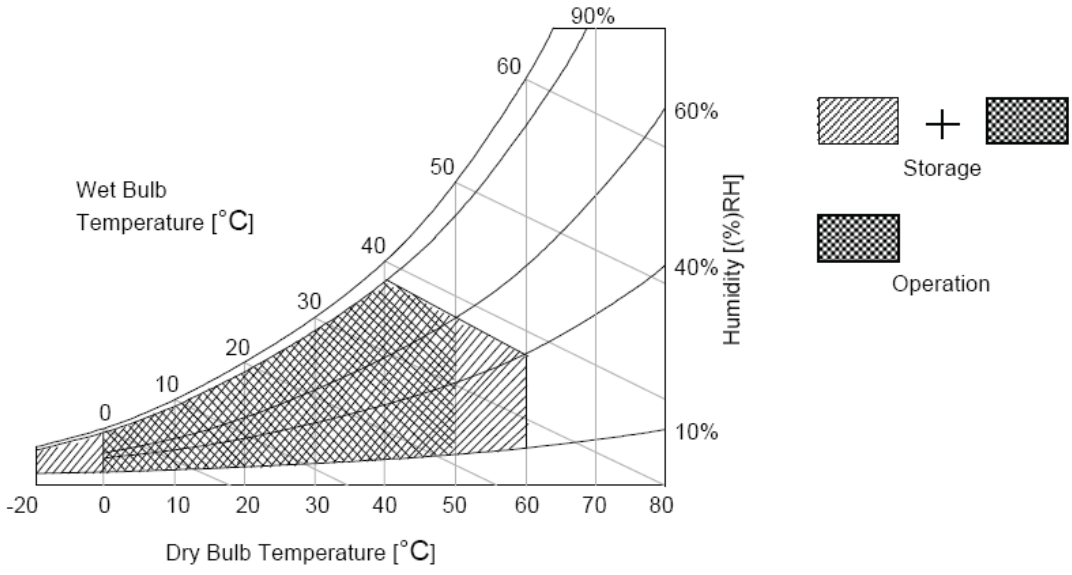
Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	Vcc	-0.3	14	[Volt]	Note 1
Input Voltage of Signal	Vin	-0.3	4	[Volt]	Note 1
Operating Temperature	TOP	0	+50	[°C]	Note 2
Operating Humidity	HOP	10	90	[%RH]	Note 2
Storage Temperature	TST	-20	+60	[°C]	Note 2
Storage Humidity	HST	10	90	[%RH]	Note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

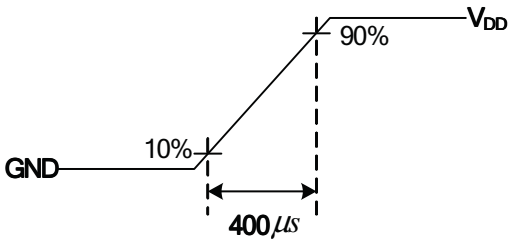
The T315XW03 require power input drive the TFT array and liquid crystal.

3-1 Electrical Characteristics

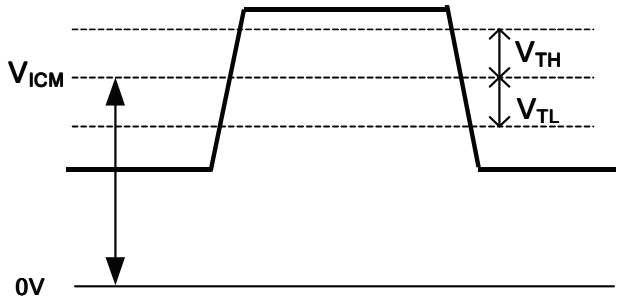
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max		
LCD							
Power Supply Input Voltage		V_{DD}	10.8	12	13.2	V_{DC}	1
Power Supply Input Current		I_{DD}	--	0.3	0.4	A	2
Power Consumption		P_C	--	3.6	4.32	Watt	2
Inrush Current		I_{RUSH}	--	2	3	A	3
LVDS Interface	Differential Input High Threshold Voltage	V_{TH}	--	--	+100	mV_{DC}	4
	Differential Input Low Threshold Voltage	V_{TL}	-100	--	--	mV_{DC}	4
	Input Common Mode Voltage	V_{ICM}	1.1	1.25	1.4	V_{DC}	4
CMOS Interface	Input High Threshold Voltage	V_{IH} (High)	2.7	--	3.3	V_{DC}	--
	Input Low Threshold Voltage	V_{IL} (Low)	0	--	0.6	V_{DC}	--

Note :

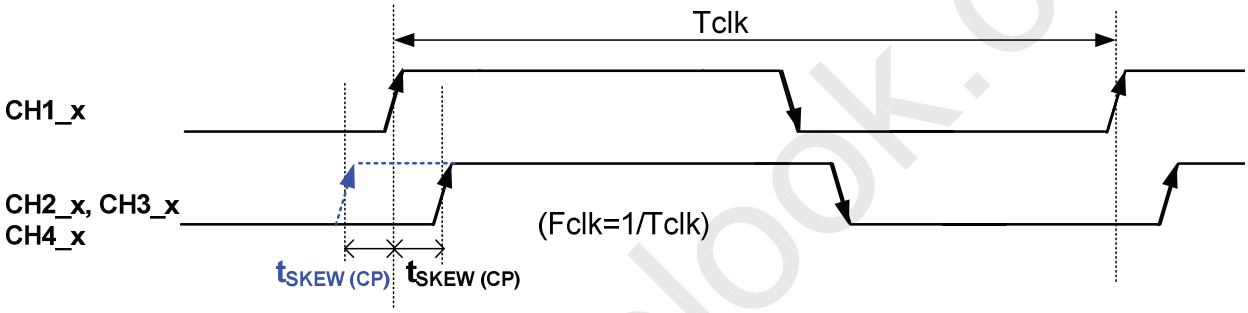
1. The ripple voltage should be controlled under 10% of V_{CC}
2. Test Condition:
   (1) V_{DD} = 12.0V
   (2) Fv = 60Hz
   (3) F_{CLK} = 81.5 Mhz (typ.)
   (4) Temperature = 25 ℃
   (5) Test Pattern : White Pattern
3. Measurement condition : Rising time = 470us



4. V_{ICM} = 1.25V



5. Input Channel Pair Skew Margin

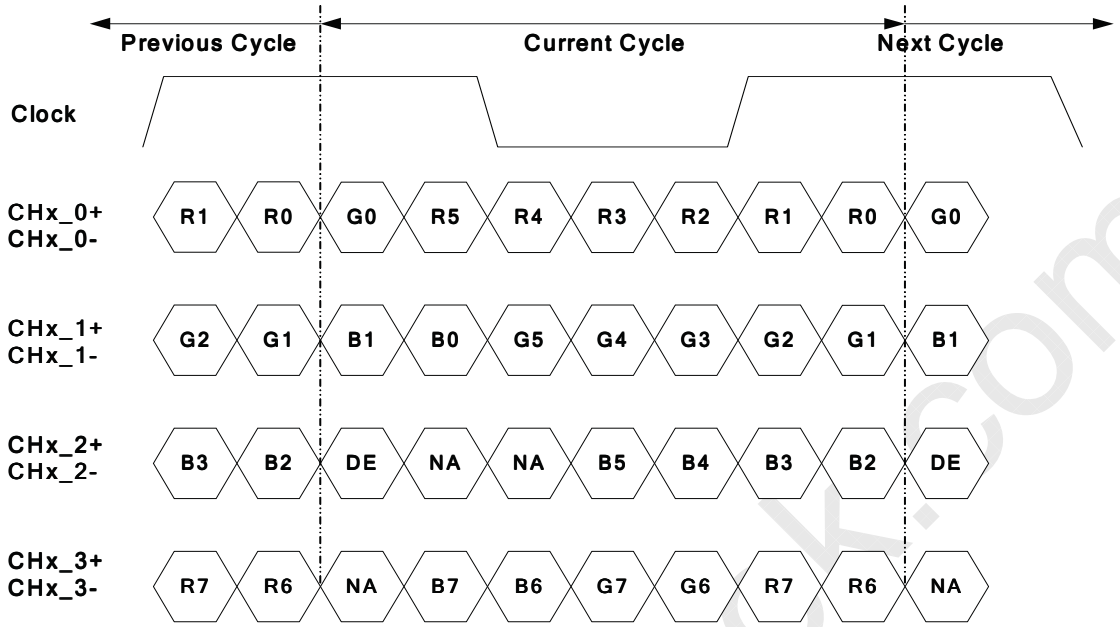


3-2 Interface Connections

- **LCD Connector - FFC connector on source board : P-two 196282-30041**

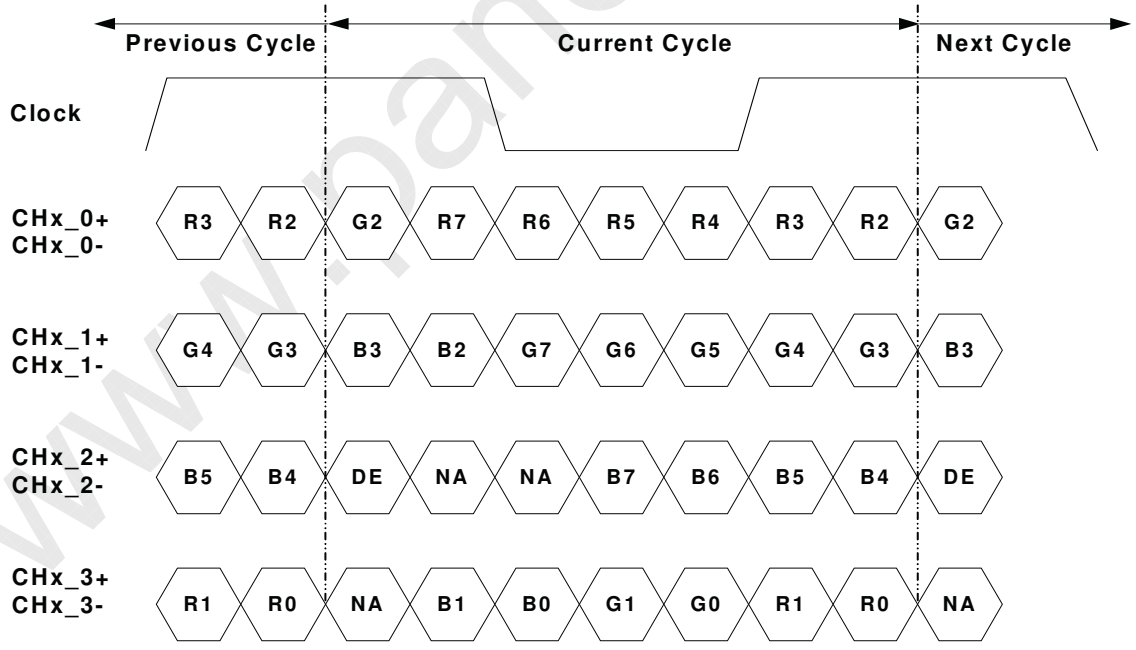
Pin No	P-two 196282-30041	
1	Reserved	No Connect (AUO Internal Use)
2	Reserved	No Connect (AUO Internal Use)
3	Reserved	No Connect (AUO Internal Use)
4	GND	Ground
5	R_0-	LVDS Channel, Signal 0-
6	R_0+	LVDS Channel, Signal 0+
7	GND	Ground
8	R_1-	LVDS Channel, Signal 1-
9	R_1+	LVDS Channel, Signal 1+
10	GND	Ground
11	R_2-	LVDS Channel, Signal 2-
12	R_2+	LVDS Channel, Signal 2+
13	GND	Ground
14	R_CLK-	LVDS Channel, Clock -
15	R_CLK+	LVDS Channel, Clock +
16	GND	Ground
17	R_3-	LVDS Channel, Signal 3-
18	R_3+	LVDS Channel, Signal 3+
19	GND	Ground
20	Reserved	No connect (AUO Internal Use)
21	LVDS_SEL	Open/High(3.3V) for NS, Low(GND) for JEIDA
22	Reserved	No Connect (AUO Internal Use)
23	GND	Ground
24	GND	Ground
25	GND	Ground
26	V_{DD}	Operating Voltage Supply, +12V DC Regulated
27	V_{DD}	Operating Voltage Supply, +12V DC Regulated
28	V_{DD}	Operating Voltage Supply, +12V DC Regulated
29	V_{DD}	Operating Voltage Supply, +12V DC Regulated
30	V_{DD}	Operating Voltage Supply, +12V DC Regulated

- **LVDS Option = High/Open → NS**



Note: x = 1, 2, 3, 4…

- **LVDS Option = Low → JEIDA**



Note: x = 1, 2, 3, 4…

3-3 Signal Timing Specification

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 its proper operation.

Signal	Item	Symbol	Min.	Typ.	Max	Unit
Vertical Section	Period	Tv	776	810	1015	Th
	Active	Tdisp (v)		768		Th
	Blanking	Tblk (v)	8	42	247	Th
Horizontal Section	Period	Th	1414	1648	2000	Tclk
	Active	Tdisp (h)		1366		Tclk
	Blanking	Tblk (h)	48	282	634	Tclk
Clock	Frequency	Fclk=1/Tclk	50	80	86	MHz
Vertical Frequency	Frequency	Fv	47	60	63	Hz
Horizontal Frequency	Frequency	Fh	43	48	53	KHz

Notes:

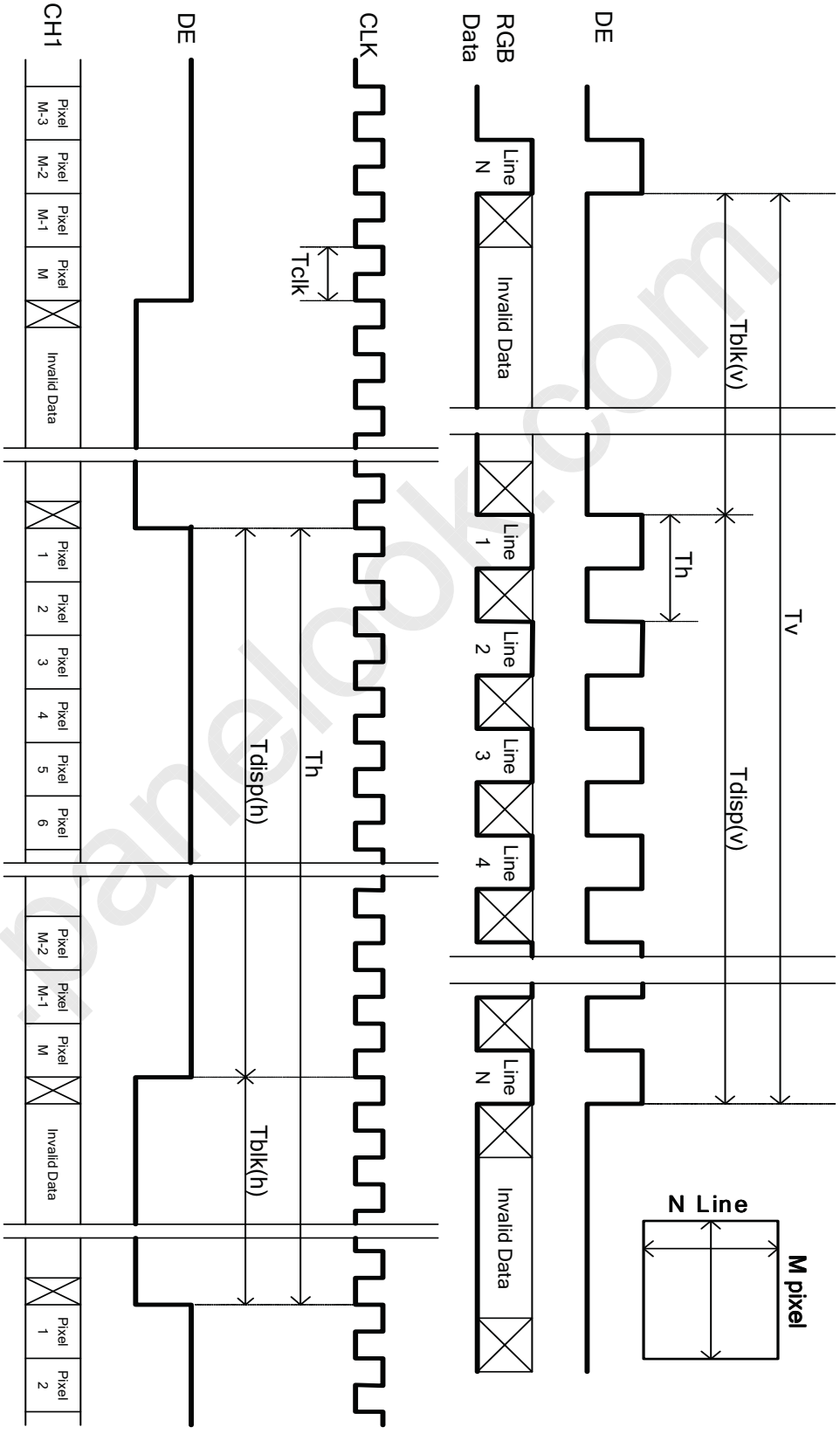
(1) Display position is specific by the rise of DE signal only.
Horizontal display position is specified by the rising edge of 1st DCLK after the rise of 1st DE, is displayed on the left edge of the screen.

(2) 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 of 1st DE is displayed at the top line of screen.

(3) If a period of DE “High” is less than 1,366 DCLK or less than 768 lines, the rest of the screen displays black.

(4) 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 8 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**

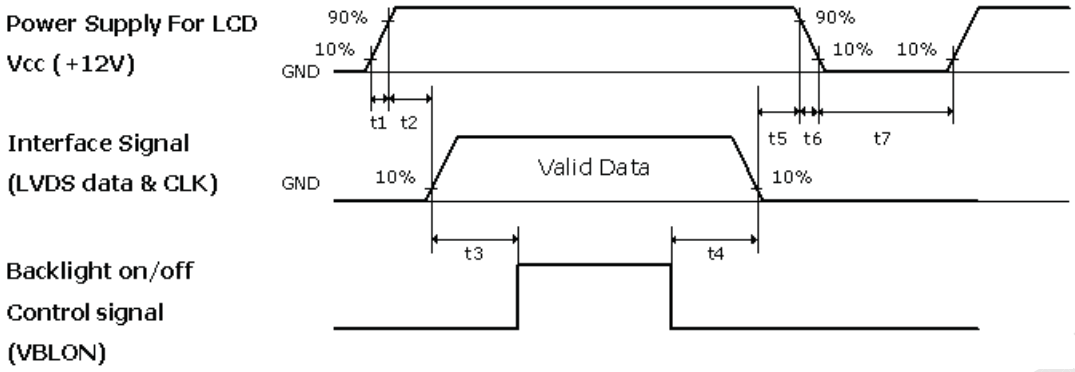
Color		Input Color Data																							
		RED								GREEN								BLUE							
		MSB							LSB	MSB							LSB	MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	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(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	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	0	0	0	0	0	0	0	0	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	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
R	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
	RED(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	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
	GREEN(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
B	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
	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	1

	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

3-6 Power Sequence for LCD



Parameter	Values			Units	Note
	Min.	Typ.	Max.		
t1	0.4	-	30	ms	
t2	0.1	-	50	ms	
t3	200	-	-	ms	
t4	0	-	-	ms	1
t5	0	-	-	ms	
t6	-	-	-	ms	2
t7	500	-	-	ms	

Note:

(1) T4=0 : concern for residual pattern before BLU turn off.

(2) T6 : voltage of Vcc must decay smoothly after power-off.

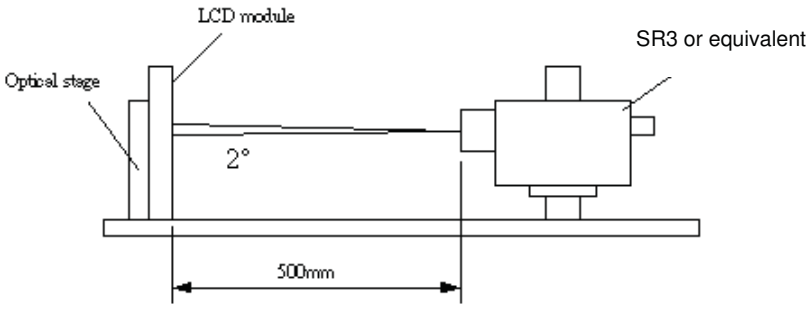
The timing controller will not be damaged in case of TV set AC input power suddenly shut down.

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

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 θ equal to 0°.

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



Parameter		Symbol	Values			Unit	Notes
			Min.	Typ.	Max		
Contrast Ratio		CR	2,400	3,000	--		1, 2
Surface Luminance (White)		L_{WH}	350	420	--	cd/m^2	1, 3
Luminance Variation		$\delta_{WHITE(9P)}$	--	--	1.3		1, 4
Response Time (G to G)		Tγ	--	6.5	--	ms	1, 5
Cell Transparency		Tr	--	4.95	--	%	1, 6
Color Gamut		NTSC	--	72	--	%	1
Color Coordinates	Red	R_X	Typ.-0.03	0.64	Typ.+0.03	--	1
		R_Y		0.33		--	1
	Green	G_X		0.29		--	1
		G_Y		0.60		--	1
	Blue	B_X		0.15		--	1
		B_Y		0.06		--	1
	White	W_X		0.280		--	1
		W_Y		0.290		--	1
Viewing Angle	x axis, right(φ=0°)	θ_r	--	89	--	degree	1, 7
	x axis, left(φ=180°)	θ_l	--	89	--	degree	1, 7
	y axis, up(φ=90°)	θ_u	--	89	--	degree	1, 7
	y axis, down (φ=270°)	θ_d	--	89	--	degree	1, 7

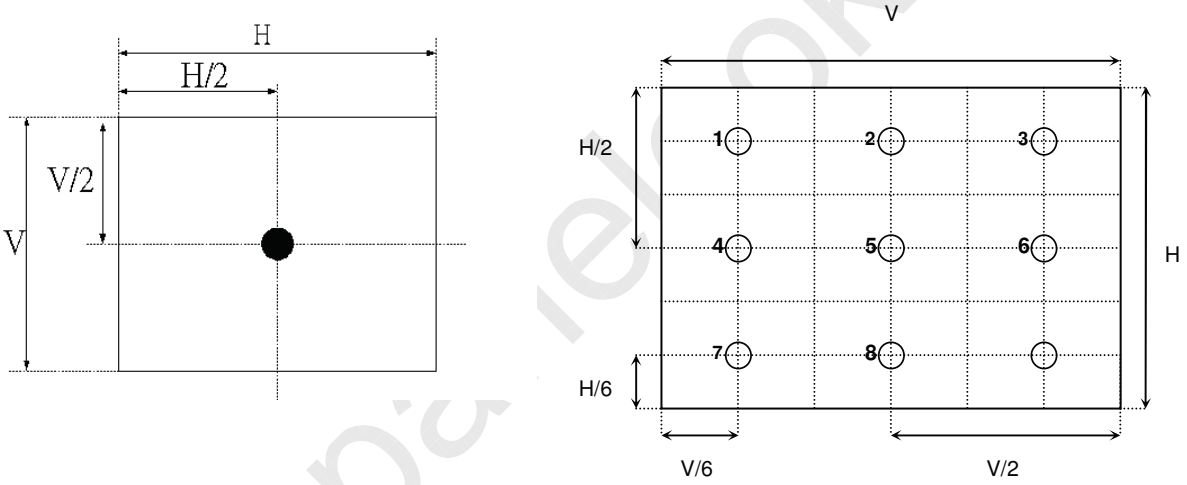
Note:

1. The optical data are measured from AUO T320XW03 V3 module and it is only for reference. It depends on customer's backlight design
2. Contrast Ratio (CR) is defined mathematically as:

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

1. 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.L_{WH}=Lon5 where Lon5 is the luminance with all pixels displaying white at center 5 location.

Fig 2 Luminance



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

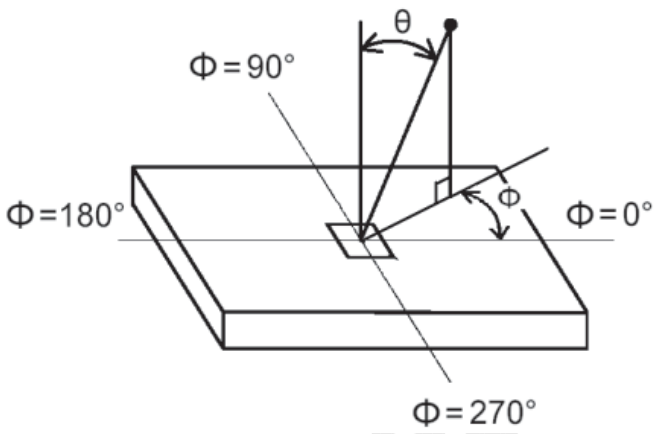
   $\delta_{WHITE(9P)}$= Maximum(L_{on1}, L_{on2},…,L_{on9})/ Minimum(L_{on1}, L_{on2},…L_{on9})

3. Response time T_γ 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.

Measured Response Time		Target				
		0%	25%	50%	75%	100%
Start	0%		0% to 25%	0% to 50%	0% to 75%	0% to 100%
	25%	25% to 0%		25% to 50%	25% to 75%	25% to 100%
	50%	50% to 0%	50% to 25%		50% to 75%	50% to 100%
	75%	75% to 0%	75% to 25%	75% to 50%		75% to 100%
	100%	100% to 0%	100% to 25%	100% to 50%	100% to 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 Fig 3.

Fig 3 Viewing Angle



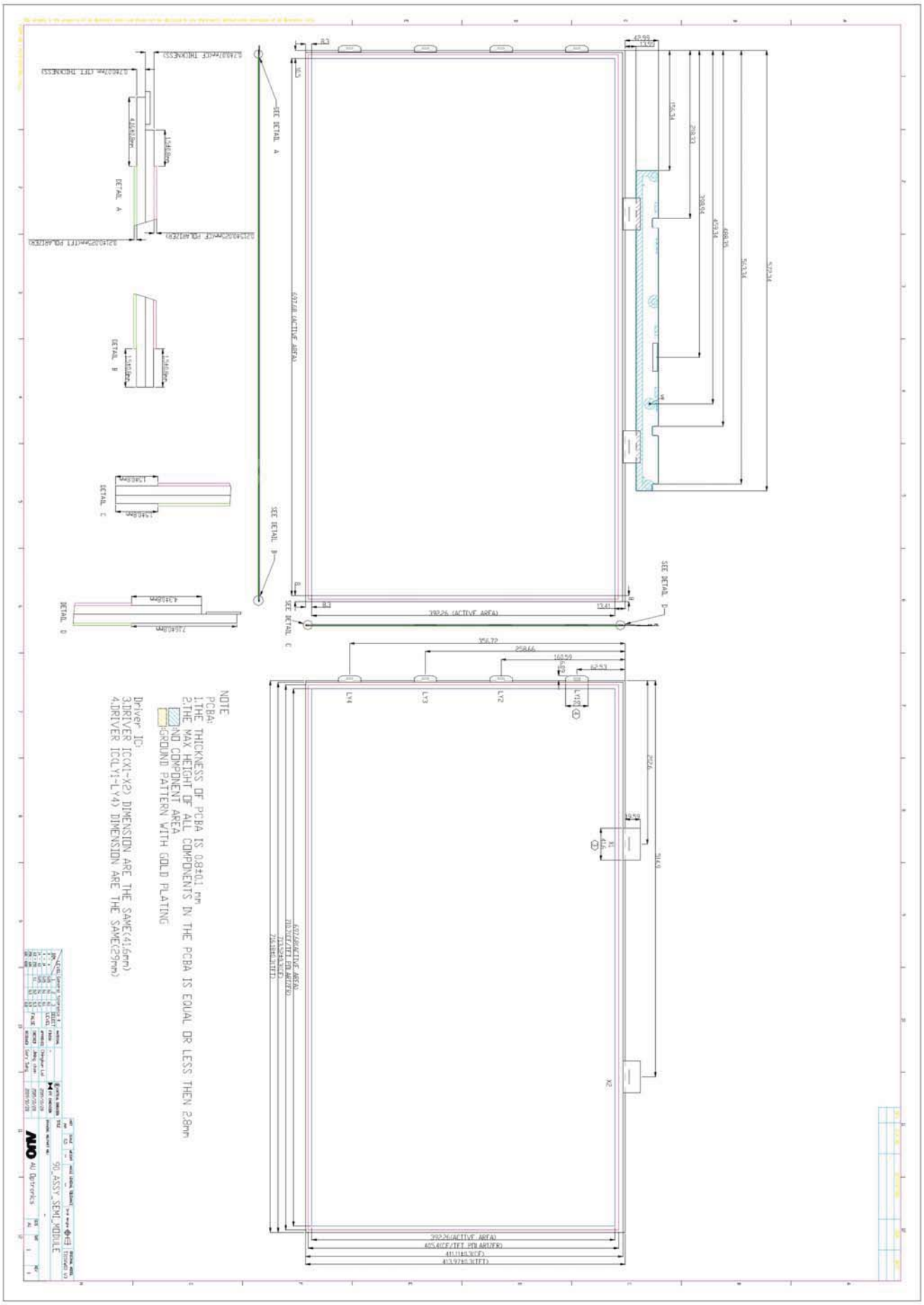
5. Cell Transparency (Tr) is the ratio of module luminance at center point of active area to backlight luminance at center point. Tr is defined as, Tr (%) = (Module luminance / Backlight luminance) x 100. Where the film structure of backlight should not include any reflective type of prism such as DBEFD, and Measurement of module or backlight luminance should be under the same condition of BLU power and no any lamp mura is found.

5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model T320XW03 V3. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	716.18 mm
	Vertical	413.97 mm
	Depth	2.8mm (with PCBA)
Active Display Area	Horizontal	697.685 mm
	Vertical	392.256 mm
Surface Treatment	AG, Haze=11%, 3H	

- **Open Cell 2D Drawing**



6. Reliability Test Items

No.	Test Item	Q'ty	Condition
1	High temperature storage test	3	60℃, 300hrs
2	Low temperature storage test	3	-20℃, 300hrs
3	High temperature operation test	3	50℃, 300hrs
4	Low temperature operation test	3	-5℃, 300hrs
5	Vibration test (non-operation)	3	Wave form : random Vibration level : 1.5G RMS Bandwidth: 10-300Hz Duration: X, Y, Z 30min One time for each direction
6	Shock test (non-operation)	3	Shock level: 50G Waveform: half since wave, 11ms Direction: ±X, ±Y, ±Z, One time each direction
7	Vibration test (With carton)	4	Random wave (1.5G RMS, 10-200Hz) 30mins/ Per each X,Y,Z axes
8	Drop test (With carton)	4	Height: 45.7 cm 1 corner, 3 edges, 6 surfaces (ASTM-D5276)

Note: Test RA items above tests are done on AUO T320XW03 V3 module.

7. Packing

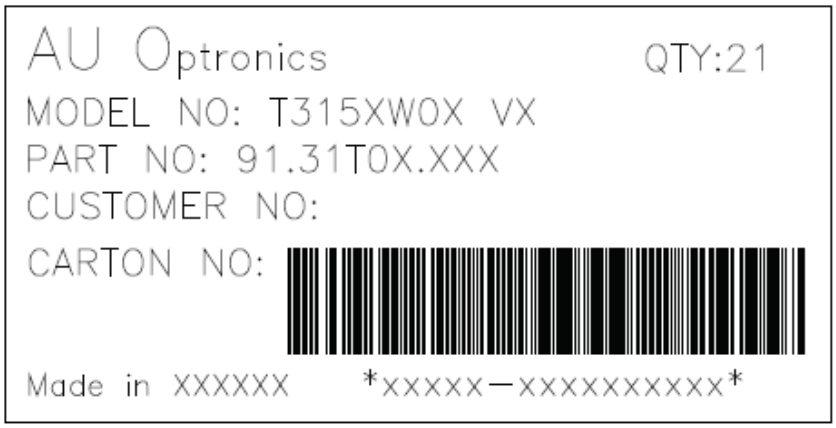
7-1 Shipping Label

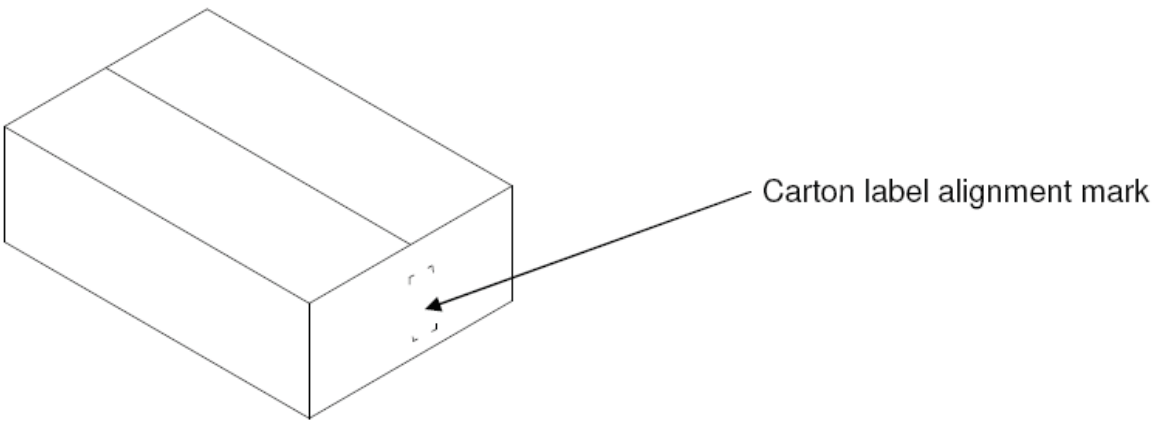
Dimension: 35mm X 7mm

* 1 : S/N Number
* 2,3,4 : AUO Internal code
* 5: Manufactured Date
* 6: Model Name

7-2 Carton Label

Dimension: 80mm X 40mm



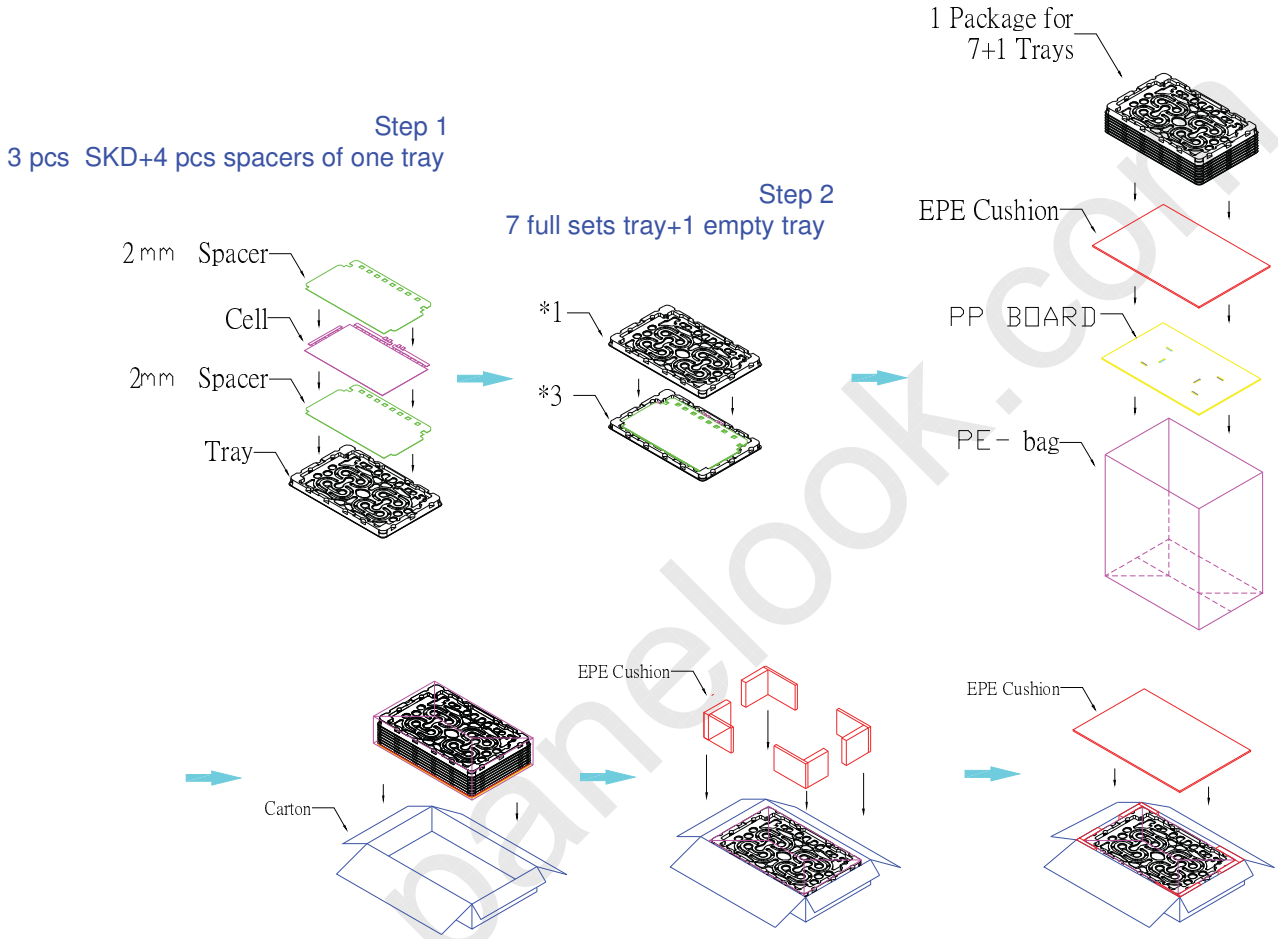


7-3 Packing Process

Carton outline：955*585*280 mm

Package weight：9.05 kg

Total weight：35 kg



8. PRECAUTIONS

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

8-1 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 cause circuit broken by electro-chemical reaction.

(6) Do not touch, push or rub the exposed polarizer 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 polarizer. 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.

8-2 Operation 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 of CCFL 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.

8-3 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 wristband etc. And don't touch interface pin directly.

8-4 Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

8-5 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.

8-6 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 glue 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.

