Document Version : 0.4
Date : 2008/5/12

Product Specifications

31.5” FHD Color TFT-LCD Module
Model Name: T315HW02 V6

() Preliminary Specifications
(*) Final Specifications

Contents

Record of Revision

<table>
<tr><th>Version</th><th>Date</th><th>No</th><th>Old Description</th><th>New Description</th><th>Remark</th></tr>
<tr><td>0</td><td>2009/3/23</td><td></td><td>First issue</td><td></td><td></td></tr>
<tr><td>0.1</td><td>2009/4/10</td><td>3.6.1</td><td>Power Sequence for LCD
T2 min = 0.1</td><td>Power Sequence for LCD
T2 min = 2000, max = 2050</td><td></td></tr>
<tr><td>0.2</td><td>2009/4/14</td><td></td><td>Update TBD items</td><td></td><td></td></tr>
<tr><td>0.3</td><td>2009/4/27</td><td>3-1</td><td>Electrical Characteristics
Update Max Value</td><td>Icc Max = 1.4A
Pc Max = 16.6W</td><td></td></tr>
<tr><td></td><td></td><td>3-3</td><td>Signal Timing Specifications
Update Timing Table</td><td></td><td></td></tr>
<tr><td></td><td></td><td>3.6.1</td><td>Power Sequence for LCD
<table>
<tr><th rowspan="2">Parameter</th><th colspan="3">Value</th><th rowspan="2">Units</th></tr>
<tr><th>Min.</th><th>Typ.</th><th>Max.</th></tr>
<tr><td>T1</td><td>0.4</td><td>---</td><td>30</td><td>ms</td></tr>
<tr><td>T2</td><td>2000</td><td>---</td><td>2050</td><td>ms</td></tr>
<tr><td>T3</td><td>300</td><td>---</td><td>---</td><td>ms</td></tr>
<tr><td>T4</td><td>10</td><td>---</td><td>---</td><td>ms</td></tr>
<tr><td>T5</td><td>0.1</td><td>---</td><td>50</td><td>ms</td></tr>
<tr><td>T6</td><td>---</td><td>---</td><td>300</td><td>ms</td></tr>
<tr><td>T7</td><td>500</td><td>---</td><td>---</td><td>ms</td></tr>
</table></td><td>Power Sequence for LCD
<table>
<tr><th rowspan="2">Parameter</th><th colspan="3">Values</th><th rowspan="2">Unit</th></tr>
<tr><th>Min.</th><th>Typ.</th><th>Max.</th></tr>
<tr><td>t1</td><td>0.4</td><td>--</td><td>30</td><td>ms</td></tr>
<tr><td>t2</td><td>2480</td><td>--</td><td>2980</td><td>ms</td></tr>
<tr><td>t3</td><td>1300</td><td>--</td><td>--</td><td>ms</td></tr>
<tr><td>t4</td><td>10</td><td>--</td><td>--</td><td>ms</td></tr>
<tr><td>t5</td><td>0.1</td><td>--</td><td>50</td><td>ms</td></tr>
<tr><td>t6</td><td>--</td><td>--</td><td>300</td><td>ms</td></tr>
<tr><td>t7</td><td>500</td><td>--</td><td>--</td><td>ms</td></tr>
<tr><td>t8</td><td>2500</td><td>--</td><td>--</td><td>ms</td></tr>
<tr><td>t9</td><td>100</td><td>--</td><td>--</td><td>ms</td></tr>
</table></td><td></td></tr>
<tr><td>0.4</td><td>2009/5/12</td><td>5</td><td>Mechanical Characteristics:
Old 2D drawing</td><td>Mechanical Characteristics
Updated 2D drawing</td><td></td></tr>
<tr><td></td><td></td><td></td><td>Final Spec</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

1. General Description

This specification applies to the 31.5 inch Color TFT-LCD Module T315HW02 V6. 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 an 8-bit gray scale signal for each dot.
The T315HW02 V6 has been designed to apply the 8-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 V6 model is RoHS verified which can be distinguished on panel label.

* General Information

Items	Specification	Unit	Note
Active Screen Size	31.55 inches		
Display Area	698.4 (H) x 392.85 (V)	mm	
Outline Dimension	760.0(H) x 450.0(V) x 45(D)	mm	With 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	AG, 3H		Haze = 11%

2. Absolute Maximum Ratings

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

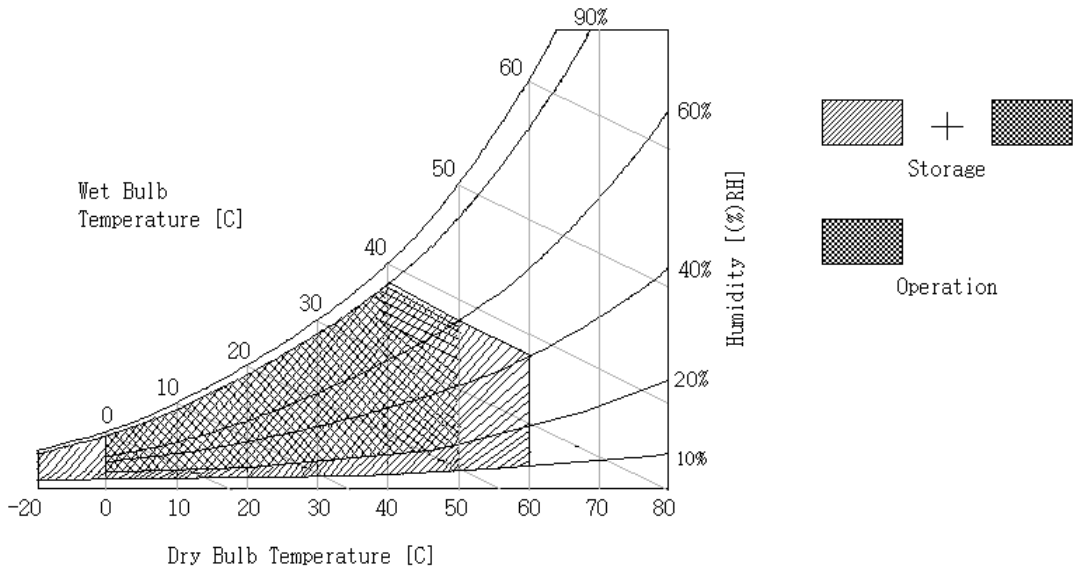
Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	Vcc	-0.3	14	[Volt]	Note 1
Input Voltage of Signal	Vin	-0.3	3.6	[Volt]	Note 1
BLU Input Voltage	VDDB	-0.3	28	[Volt]	Note 1
BLU Brightness Control Voltage	Vdim	-0.3	7.0	[Volt]	Note 1
Operating Temperature	TOP	0	+50	[°C]	Note 2
Operating Humidity	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

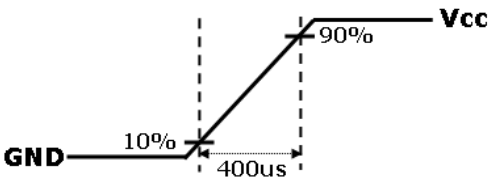
The T315HW02 V5 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input power for the BLU, is to power inverter..

3-1 Electrical Characteristics

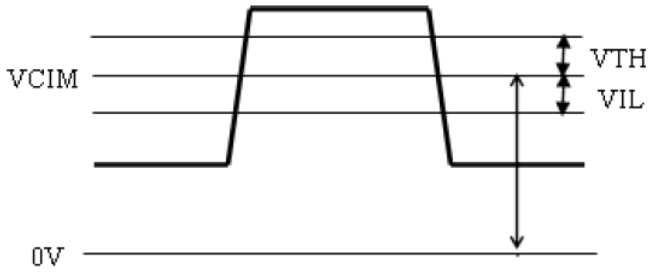
Parameter		Values				Unit	Notes
			Min	Typ	Max		
LCD:							
Power Supply Input Voltage		Vcc	10.8	12	13.2	Vdc	1
Power Supply Input Current		Icc	-	1.1	1.4	A	2
Power Consumption		Pc	-	13.2	16.8	Watt	2
Inrush Current		I_{RUSH}	-	-	6	Apeak	3
LVDS Interface	Differential Input High Threshold Voltage	VTH			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	
Backlight Power Consumption		PDDB	63.5	67	70.5	Watt	
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=81.5Mhz , 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 the DC-AC Inverter. So all the parameters of an inverter should be carefully designed as not to produce too much leakage current from high-voltage output of the inverter. When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter (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.

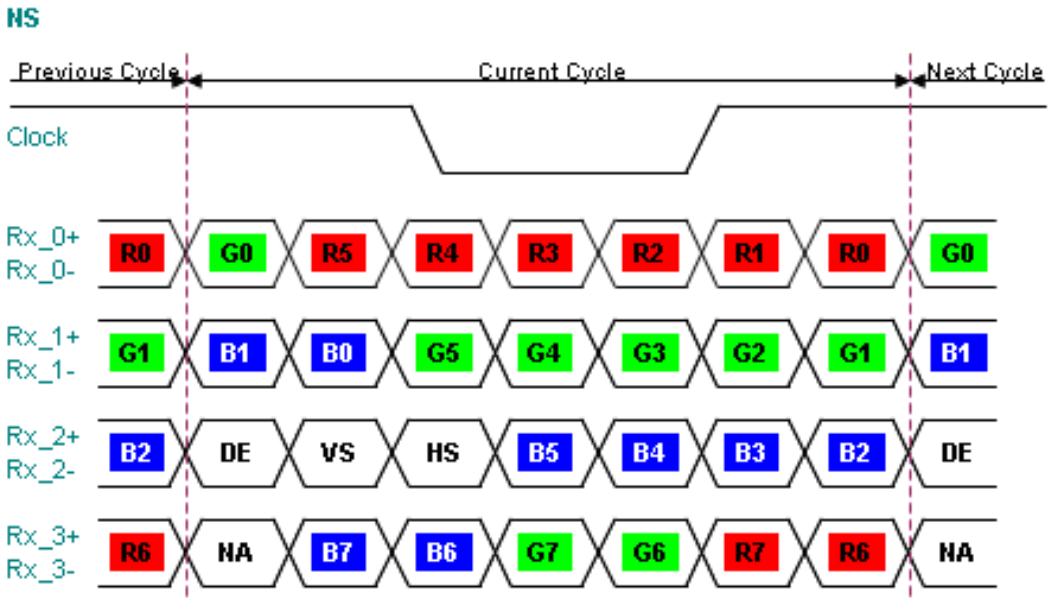
3-2 Interface Connections

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

PIN #	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	RO_0-	LVDS Channel 1, pair 0, negative
11	RO_0+	LVDS Channel 1, pair 0, positive
12	RO_1-	LVDS Channel 1, pair 1, negative
13	RO_1+	LVDS Channel 1, pair 1, positive
14	RO_2-	LVDS Channel 1, pair 2, negative
15	RO_2+	LVDS Channel 1, pair 2, positive
16	GND	Ground
17	RO_CLK-	LVDS Clock, Channel 1, negative
18	RO_CLK+	LVDS Clock, Channel 1, positive
19	GND	Ground
20	RO_3-	LVDS Channel 1, pair 3, negative
21	RO_3+	LVDS Channel 1, pair 3, positive
22	RO_4-	LVDS Channel 1, pair 4, negative
23	RO_4+	LVDS Channel 1, pair 4, positive
24	GND	Ground
25	RE_0-	LVDS Channel 2, pair 0, negative
26	RE_0+	LVDS Channel 2, pair 0, positive
27	RE_1-	LVDS Channel 2, pair 1, negative
28	RE_1+	LVDS Channel 2, pair 1, positive
29	RE_2-	LVDS Channel 2, pair 2, negative
30	RE_2+	LVDS Channel 2, pair 2, positive
31	GND	Ground

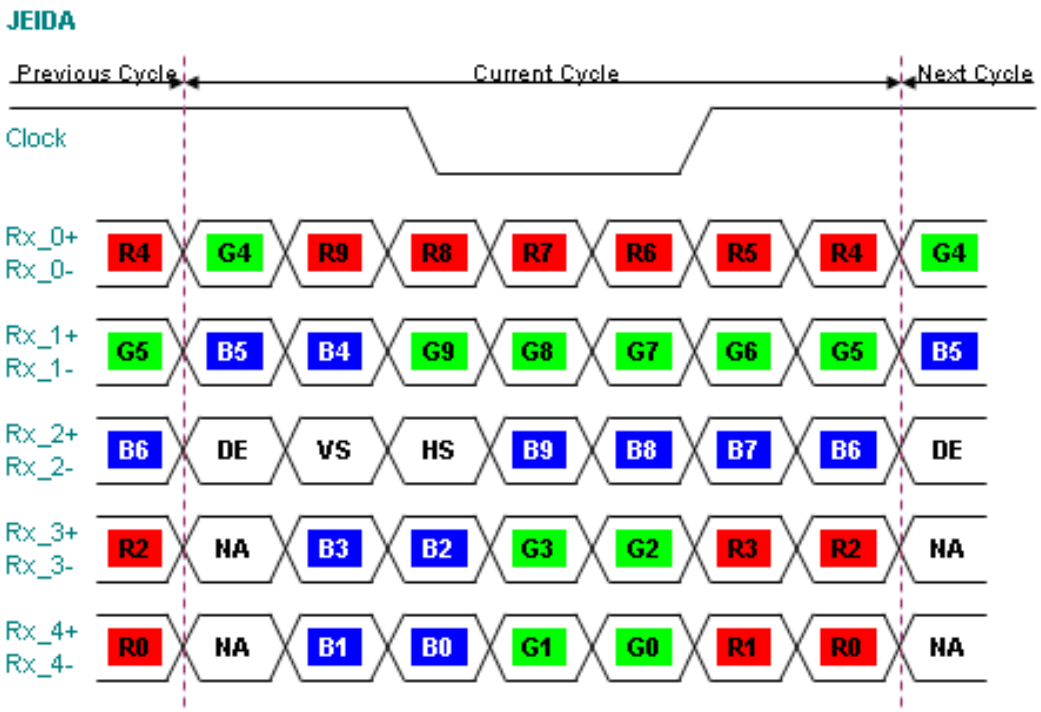
32	RE_CLK-	LVDS Clock, Channel 2, negative
33	RE_CLK+	LVDS Clock, Channel 2, positive
34	GND	Ground
35	RE_3-	LVDS Channel 2, pair 3, negative
36	RE_3+	LVDS Channel 2, pair 3, positive
37	RE_4-	LVDS Channel 2, pair 4, negative
38	RE_4+	LVDS Channel 2, pair 4, positive
39	GND	Ground
40	NC (reserved)	No Connection (AUO internal use)
41	NC (reserved)	No Connection (AUO internal use)
42	NC (reserved)	No Connection (AUO internal use)
43	NC (reserved)	No Connection (AUO internal use)
44	MEMC_ON	MEMC ON/OFF Selection Low: MEMC OFF High/Open: MEMC ON
45	LVDS_FORMAT	LVDS Format Selection Low: Support JEIDA Mode 10/8bits High/Open: Support NS Mode 8bits
46	SCL_E	External I2C from customer's comment
47	NC (reserved)	No Connection (AUO internal use)
48	SDA_E	External I2C from customer's comment
49	NC (reserved)	No Connection (AUO internal use)
50	NC (reserved)	No Connection (AUO internal use)
51	NC (reserved)	No Connection (AUO internal use)

LVDS_SEL = High/Open, NS mode



(X = O E)

LVDS_SEL = Low (0V) , JEIDA mode



(X = O E)

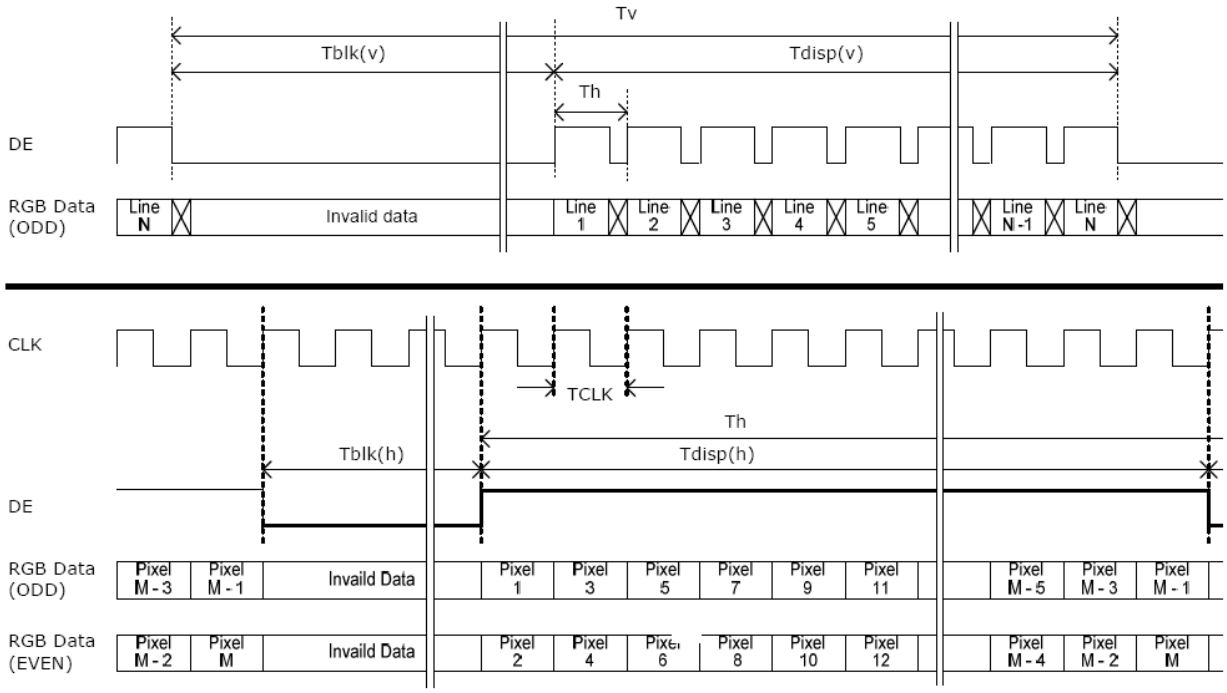
3-3 Signal Timing Specifications

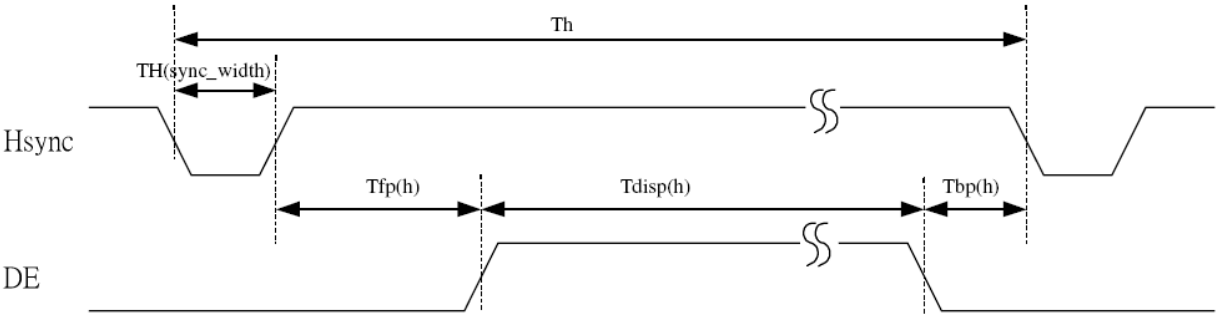
This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications for it's proper operation.

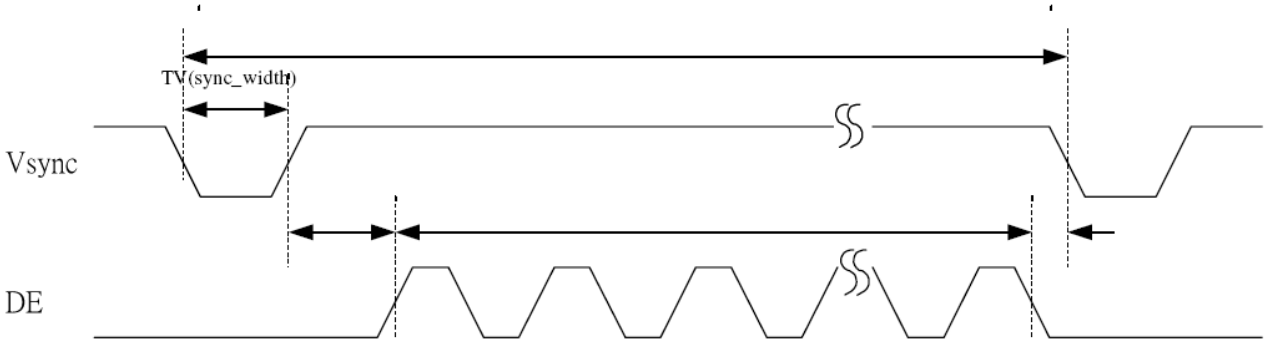
*** Timing Table**
Vertical Frequency:

Signal	Item	Symbol	Min.	Typ.	Max	Unit
Vertical Section	Period	T_V	1100	1125	1200	T_H
	Active	T_{DISP} (V)		1080		T_H
	Blanking	T_{BLK} (V)	20	45	120	T_H
	Front porch	Tfp(V)	1	4	110	T_H
	Back porch	Tbp(V)	1	36	110	T_H
	V_sync	TVsync_wdth	2	5	110	T_H
Horizontal Section	Period	T_H	1050	1100	1150	T_{CLK}
	Active	T_{DISP} (H)		960		T_{CLK}
	Blanking	T_{BLK} (H)	90	140	190	T_{CLK}
	Front porch	Tfp(H)	5	44	180	T_{CLK}
	Back porch	T(H)	5	74	180	T_{CLK}
	H_sync	THsync_wdth	5	22	180	T_{CLK}
LVDS Clock	Period	T_{CLK}		13.47		ns
	Frequency	F_{CLK}	70.875	74.25	76	MHz
Vertical Frequency	Frequency	F_V	59.5	60	60.5	Hz
Horizontal Frequency	Frequency	F_H	66	67.5	72	KHz

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
		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

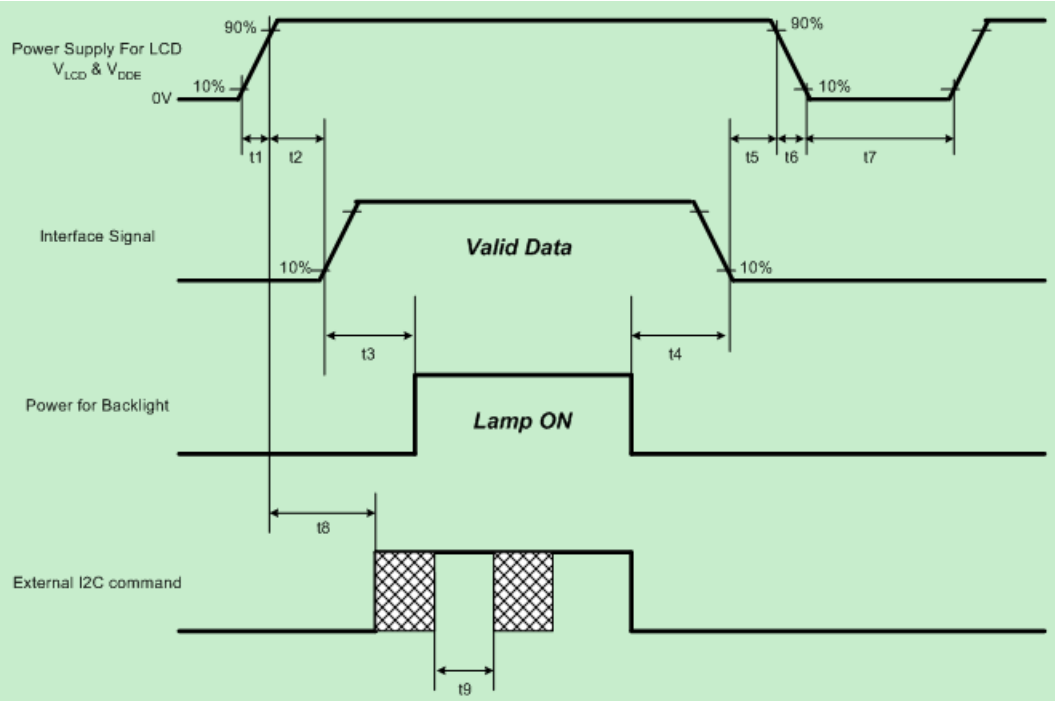
	RED(1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

	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			Unit
	Min.	Typ.	Max.	
t1	0.4	--	30	ms
t2	2480	--	2980	ms
t3	1300	--	--	ms
t4	10	--	--	ms
t5	0.1	--	50	ms
t6	--	--	300	ms
t7	500	--	--	ms
t8	2500	--	--	ms
t9	100	--	--	ms

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

Item	Symbol		Condition	Spec			Unit	Note
				Min	Typical	Max		
Input Voltage	V_{DDB}			21.6	24	26.4	VDC	
Input Current	I_{DDB}		VDDB=24V	-	2.79		ADC	1
Input Power	P_{DDB}		VDDB=24V	-	67		W	1
Inrush current	I_{RUSH}		VDDB=24V	-	-	6	ADC	2
Output Frequency	F_{BL}		VDDB=24V	53.5	55	56.5	KHz	
On/Off control voltage	V_{BLON}	ON	VDDB=24V	2	-	5.25	VDC	
		OFF		0	-	0.8		
Dimming Control Voltage	V_{DIM}	MAX	VDDB=24V	0	-	3.3	VDC	
Internal Dimming Ratio	DIM_R			10		100	%	
PWM control Voltage	V_EPWM	MAX	VDDB=24V	2		3.3	VDC	
		MIN	VDDB=24V	0		0.8		
External PWM control Current	I_EPWM		VDDB=24V			2	mADC	
External PWM Duty ratio	D_EPWM		VDDB=24V	10		100	%	3
External PWM Frequency	F_EPWM		VDDB=24V	120	180	240	Hz	

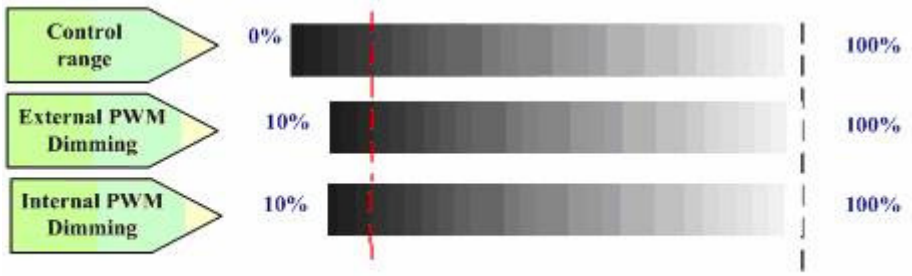
Note1 : VDIM= 3.3V (MAX) （Ta=25±5℃, Turn on for 45minutes）

Note 2 : Measurement condition Rising time = 20 ms (VDDB : 10%~90%);
Note 3 : (a) Uniformity and flicker do not guarantee below 20% dimming control.
(b) 10% dimming control is function okay and no backlight shut down

Input Pin Assignment

CN1: CI0114M1HRL-NH (Civilux)

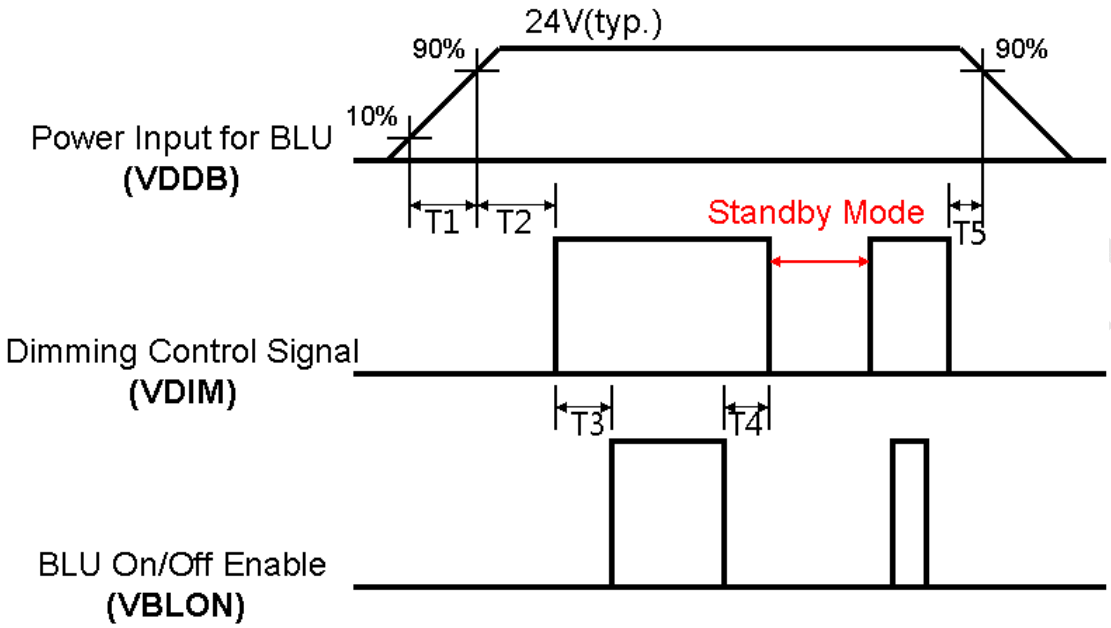
Pin	Symbol	Description
1	VDDB	Operating Voltage Supply, +24V DC regulated
2	VDDB	Operating Voltage Supply, +24V DC regulated
3	VDDB	Operating Voltage Supply, +24V DC regulated
4	VDDB	Operating Voltage Supply, +24V DC regulated
5	VDDB	Operating Voltage Supply, +24V DC regulated
6	BLGND	Ground and Current Return
7	BLGND	Ground and Current Return
8	BLGND	Ground and Current Return
9	BLGND	Ground and Current Return
10	BLGND	Ground and Current Return
11	**DET**	**BLU status detection:** **Normal : 0~0.8V ; Abnormal : Open collector**
12	VBLON	BL On-Off control: High/Open **(2.0V~5.5V)** : BL **On ;** Low (GND) : BL **off**
13	**VDIM**	**Internal PWM (0~3.1V for 10~100% Duty)** **< NC ; at External PWM mode>**
14	**PDIM**	**External PWM (10%~100% Duty Ratio)** **< NC ; at Internal PWM mode>**



PWM Dimming : include Internal and External PWM Dimming

(note*) IF External PWM function includes 10% dimming function. Judge condition is shown below:
1.) Backlight module must be lighted ON normally.
2.) All protection function must operate normally.
3.) Uniformity and flicker could NOT be guaranteed!
When External or Internal PWM working Duty ratio is above 20%, all function condition MUST be in SPEC.
(note**) In Product SPEC Description, Inverter will NOT guarantee optical performance when Dimming ratio under 20%; and NOT guarantee Protection function when Dimming ratio under 10%.

3.7.2 Power Sequence for Inverter



Parameter	Values			Units
	Min.	Typ.	Max.	
T1	20	-	-	Ms
T2	50	-	-	Ms
T3	0	-	-	Ms
T4	0	-	-	Ms
T5	0	-	-	Ms

3.8 MEMC Function Specification

3.8.1 Setting by hardware

Pin name	Input/ ouptut	Content	Note	Default
MEMC_ON *1	I	MEMC ON/OFF Selection 0: MEMC OFF 1: MEMC ON	MEMC ON: 10 frames latency (~170ms) for film FLC, MBR + video MBR MEME OFF: 1 frame latency (~16.7ms)	1
LVDS_FORMAT	I	LVDS Format Selection 0: JEIDA Mode 10/8bits 1: NS Mode 8bits		1
SDA_MCU	I/O	Internal I2C to control MEMC		1
SCL_MCU	I/O	Internal I2C to control MEMC		
SDA_E *2	I/O	External I2C from customer's comment	When MCU gets external I2C signals from customer's comment, MCU will download register setting for MEMC chip by MCU_SDA and MCU_SCL. The sheet of register map shows detail register setting.	1
SCL_E *2	I/O	External I2C from customer's comment		

Note 1.
MEMC ON/OFF can also control by external I2C. If users want to change the setting, only need to change hardware setting or provide external I2C command. Ex: When MEMC_ON of the hardware is L for MEMC OFF, external I2C can set address=0x79 and data=0x00 for MEMC ON.

Note 2.
The below figure shows the I2C format of customer's single-byte commend. Ex. Address : 0x65.

START	0XE4 (*1)	ACK (*2)	Address	ACK	Data	ACK	STOP

The next figure shows the I2C format of customer's multi-byte commend. Ex. Address : 0x23.

START	0XE4	ACK	Add ress	ACK	Data (Byte 0)	ACK	Data (Byte 1)	ACK	Data (Byte 2)	ACK	Data (Byte 3)	ACK	STOP

Note (1)
Slave address of MEMC chip is 0x72 plus the least significant bit indicating a write (0xE4).
Note (2)
Shaded items are issued by the slave (MEMC chip).

3.8.2 Setting by External I2C

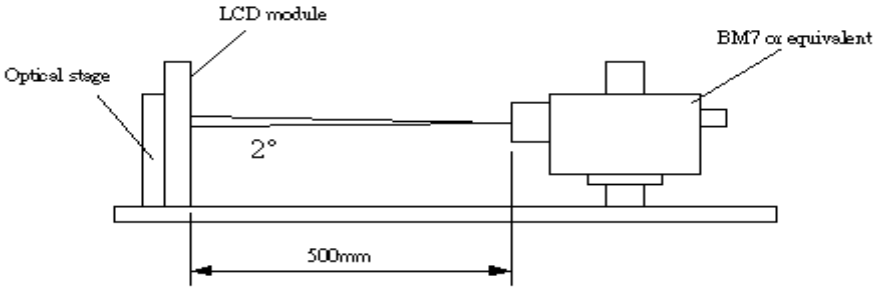
Address (Hex)	Byte	Bit	Description	Note	Default
1B	0	7:0	Output black data 0x00: unblank (normal display) 0x01: blank (output black data)	Initial state is unblanked.	0x00
79	0	7:0	MEMC ON/OFF Selection 0x00: MEMC ON 0x02: MEMC OFF	MEMC ON: 10 frames latency (~170ms) for film FLC, MBR + video MBR MEME OFF: 1 frame latency (~16.7ms)	0x00
65	0:1	15:0	Control the demo option 0x0000: Demo OFF. 0x0004: Demo ON.	Demo OFF : Normal display; Demo ON : MEMC enable at Left side, and MEMC disable at right side.	0x0000
59	0	7:0	OSD ON/OFF control 0x00: OSD OFF 0x04: OSD ON	OSD On/Off Control	0x00
23	0:1	15:0	OSD width define (Unit: pixel ; range 0~1920)	1. OSD Protection Size Define (Width, height, x, y) 2. Usable in OSD ON status. (The data of address 0x59 must be 0x04.)	0x0000
	2:3	15:0	OSD height define (Unit: pixel ; range 0~1080)		0x0000
	4:5	15:0	The amount of H pixels that the left upper corner of the OSD is from the left top corner of the output window (Unit: pixel ; range 0~1920)		0x0000
	6:7	15:0	The amount of V pixels that the left upper corner of the OSD is from the left top corner of the output window (Unit: pixel ; range 0~1080)		0x0000
25	0	6:0	Thickness of the OSD left and right border (Unit: pixel ; range 0~127)	1. OSD border width and color decision 2. Usable in OSD ON status. (The data of address 0x59 must be 0x04.)	0x00
	1	6:0	Thickness of the OSD top and bottom border (Unit: pixel ; range 0~127)		0x00
	2:4	7:0	Red component of the OSD border color		0x00
		7:0	Green component of the OSD border color		0x00
		7:0	Blue component of the OSD border color (Unit: 8 bit level ; range 0~255)		0x00

6E	0	7:0	Different MEMC level selection 0x00: Normal MEMC level 0x01: Strong MEMC level 0x03: Weak MEMC level	Usable in MEMC ON status. (The data of address 0x79 must be 0x00.)	0x00

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	3200	4000			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 VDDB = 24V, IDDB = 5A, LWH=Lon5, where Lon5 is the luminance with all pixels displaying white at center 5 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

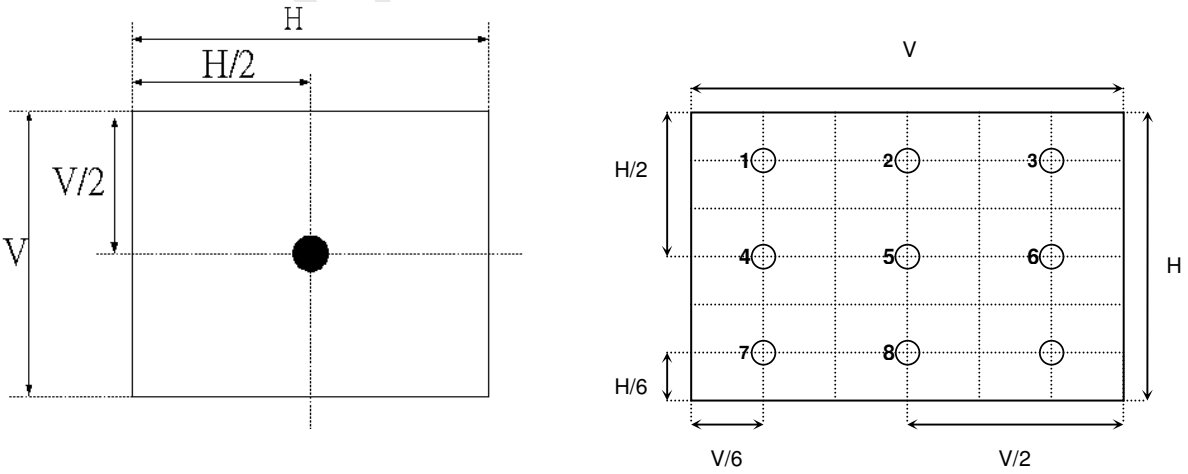
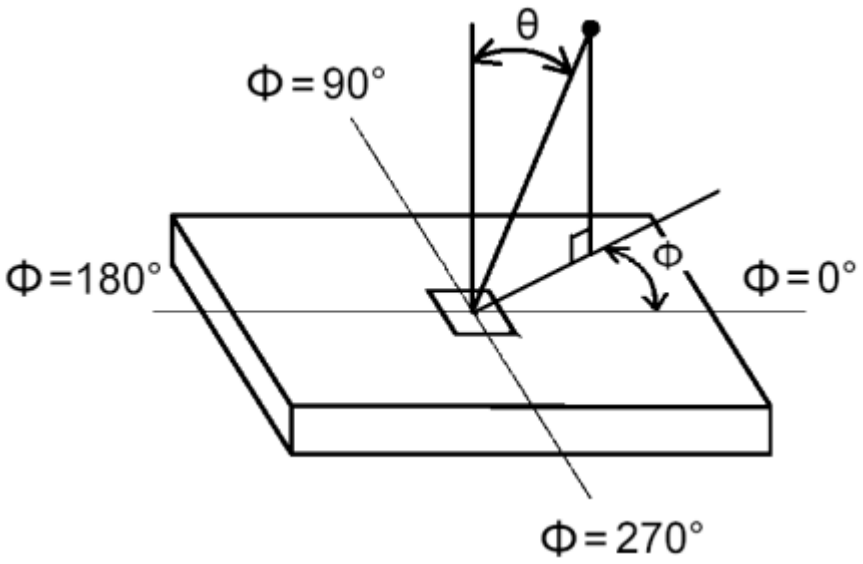


FIG. 3 Viewing angle

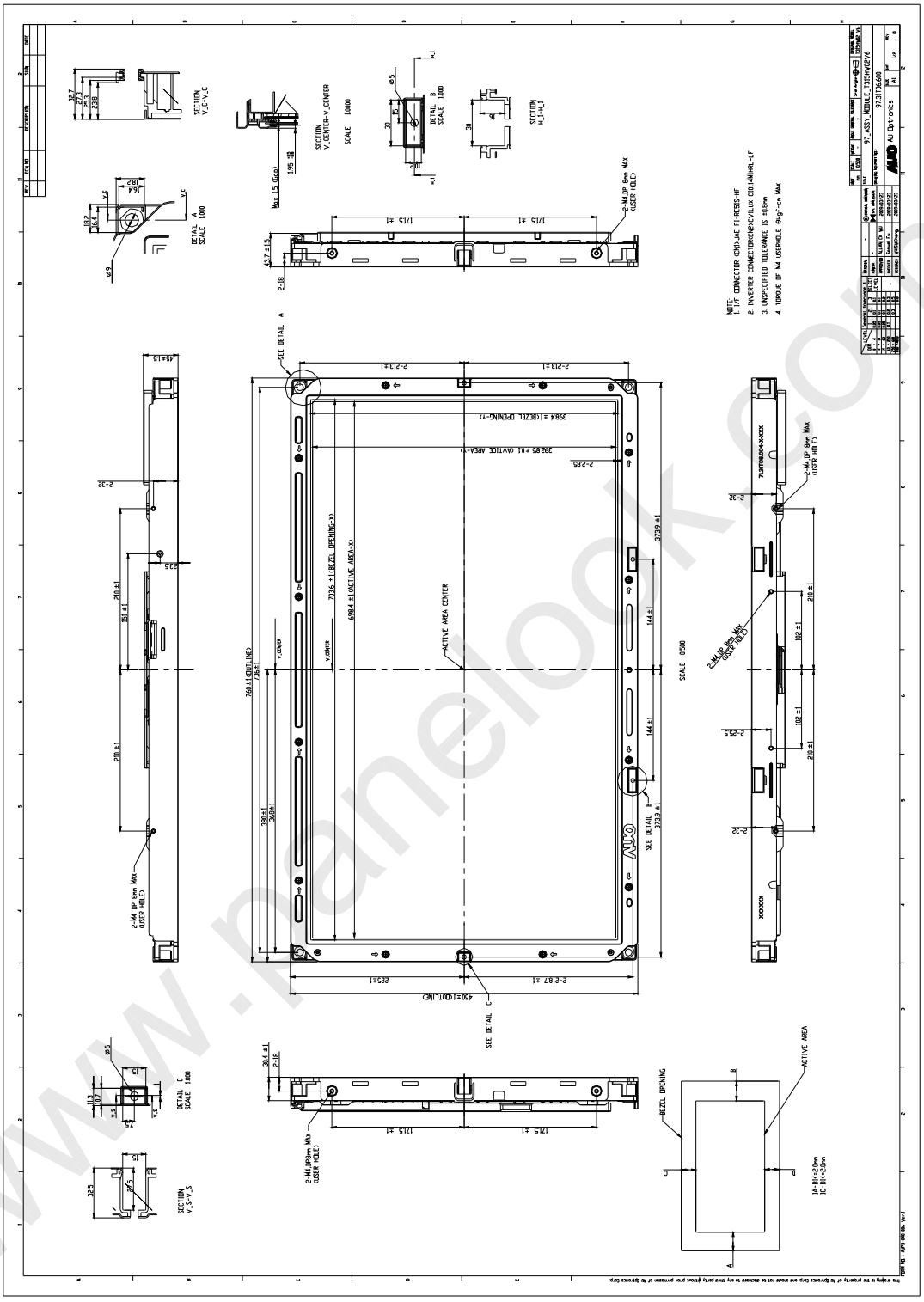


5. Mechanical Characteristics

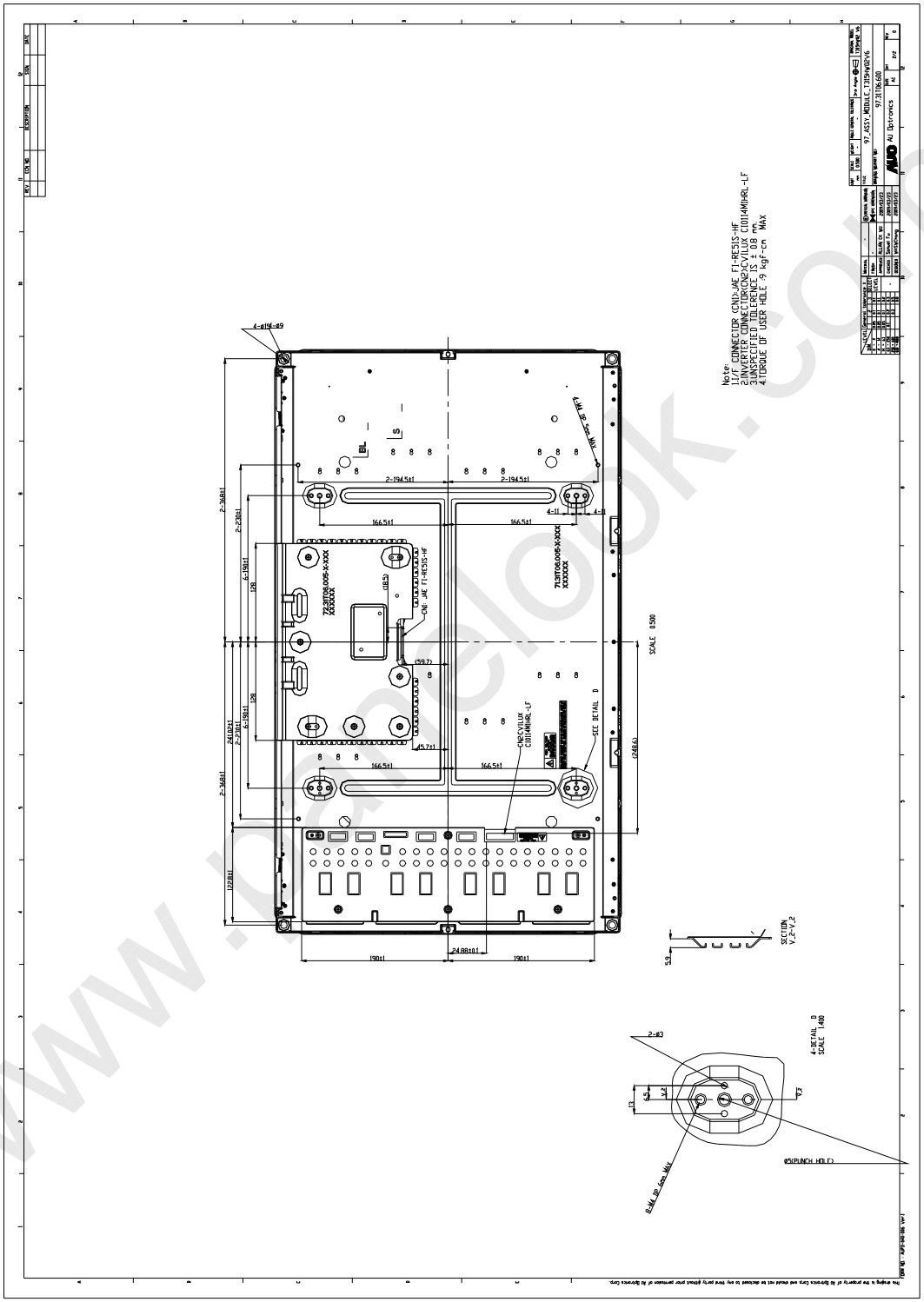
The contents provide general mechanical characteristics for the model T315HW02 V6. In addition the figures in the next page are detailed mechanical drawing of the LCD.

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	AG, 3H, Haze=11%	

Front:



Back:



6. Reliability:

Environment test condition

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
5	Vibration test (non-operating)	"(10 ~ 300Hz/1.5G/11min SR, XYZ 30min/axis) Vibration level : 1.5G RMS, Bandwidth : 10-300Hz Duration: X, Y, Z 30min, "
6	Shock test (non-operating)	Shock level: 50G Waveform: half since wave, 11ms Direction: ±X, ±Y, ±Z, one time each direction
7	Vibration test (with carton)	Random wave (1.5 Grms 10~200Hz) 30mins / Per each X.Y.Z axes "
8	Drop test (with carton)	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

Panel label:

838A0584AHZ – ZS0200

838A0584AHZZ: Panel Unique ID

ZS0200: AUO internal use

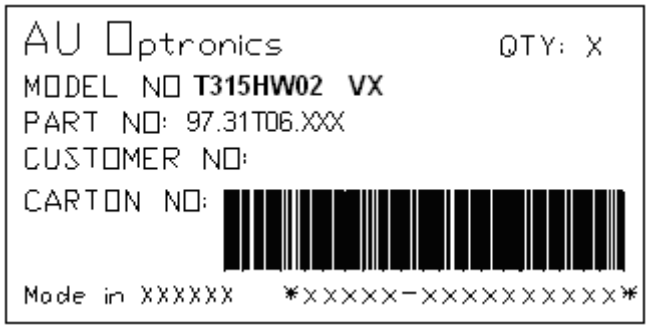
Manufactured 09/02

2009 week 02

AM89018

AUO internal use

Carton Label:



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.