Model Name: T546HW01 V4

Issue Date : 2010/04/28

(   )Preliminary Specifications
(＊)Final Specifications

Customer Signature	Date	AUO	Date
Approved By _____		Approval By PM Director _____	
Note		Reviewed By RD Director _____	
		Reviewed By Project Leader _____	
		Prepared By PM _____	

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Contents

Record of Revision

Version	Data	Page.	Old Description	New Description	Remark
0.0	2009/12/28		First release	N/A	N/A
0.1	2010/1/25	20		Add brightness min value	
		24		Updated 3D drawing (Front).	
		25		Updated 3D drawing (rear).	
0.2	2010/3/1	5	Updated display colors		
0.3	2010/4/28	24		Updated 3D drawing (Front).	
		25		Updated 3D drawing (rear).	

1. General Description

This specification applies to the 55 inch Color TFT-LCD Module T546HW01 V4. This LCD module has a TFT active matrix type liquid crystal panel 1920x1080 pixels, and diagonal size of 55 inch. This module supports Full HD mode (Non-interlace) with MEMC.

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 T546HW01 V4 has been designed to apply the 10-bit 2 channel LVDS interface method. It is intended to support displays where high brightness, EBU Gamut (72% NTSC), wide viewing angle, and high color depth are very important.

The T546HW01 V4 backlight unit is using inverter-less solution (inductor type balance board), and need to be powered by integrated power system by customers.

* General Information

Items	Specification	Unit	Note
Active Screen Size	55	inches	Diagonal
Display Area	1209.6(H) x 680.4(V)	mm	
Outline Dimension	1267.6 (H) x 738.4(V) x 58(D)	mm	With Balance Board cover
Driver Element	a-Si TFT active matrix		
Display Colors	1.07B (8bit + FRC)	Colors	
Color Gamut	72	%	NTSC
Number of Pixels	1920 x 1080	Pixel	
Pixel Arrangement	RGB vertical stripe		
Pixel Pitch	0.63	mm	
Display Mode	Normally Black		
Surface Treatment	AG Haze 11%		
RoHS	RoHS compliance		

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	Note
Logic/LCD Drive Voltage	V_{DD}	-0.3	14.0	V_{DC}	1
Input Voltage of Signal	V_{IN}	-0.3	4	V_{DC}	1
Operating Temperature	T_{OP}	0	+50	℃	2
Operating Humidity	H_{OP}	10	90	%RH	2
Storage Temperature	T_{ST}	-20	+60	℃	2
Storage Humidity	H_{ST}	10	90	%RH	2
Panel Surface Temperature	T_{SUR}	--	+65	℃	2
Shock (non-operation)	±x, ±y	--	40	G	3
Shock (non-operation)	±z	--	50	G	3
Vibration (non-operation)		--	1.5	G	4

Note 1: Duration = 50ms

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: Sine wave, 11ms, direction: ±x, ±y, ±z (one time each direction)

Note 4: Wave form: random, vibration level: 1.5G RMS, Bandwidth: 10--300Hz
        Duration: X, Y, Z 30min (one time each direction)

Note 5: Surface temperature is measured at 50℃ Dry condition.
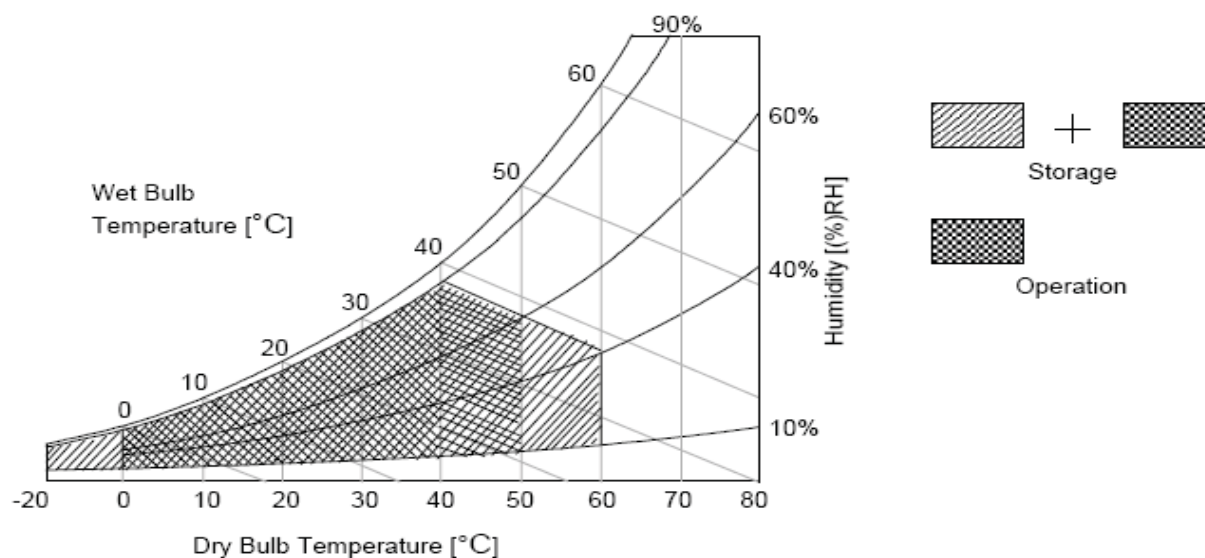
3. Electrical Specification

The T546HW01 V4 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 integrate power (I/P) system.

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}	--	1.43	2.26	A	2
Power Consumption		P_C	--	17.2	27.1	Watt	2
Inrush Current		I_{RUSH}	--	--	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}	
Backlight Power Consumption		P_{BL}		175		Watt	
Life Time			50000	--	--	Hours	8

Note :

　Note:

1.　　The ripple voltage should be controlled under 10% of V_{CC}

2.　Test Condition:

　　　● V_{DD} = 12.0V

　　　● Fv = Type Timing, 60Hz, 120Hz or Other

　　　● F_{CLK} = Max freq.

　　　● Temperature = 25 ℃

　　　● Test Pattern : White Pattern

3.　Measurement condition : Rising time = 400us
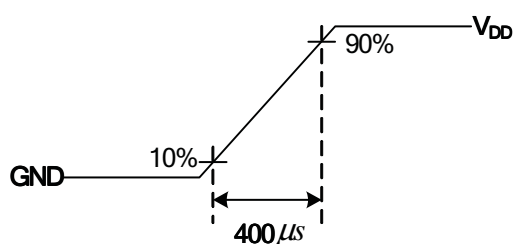
4. V_{ICM} = 1.25V
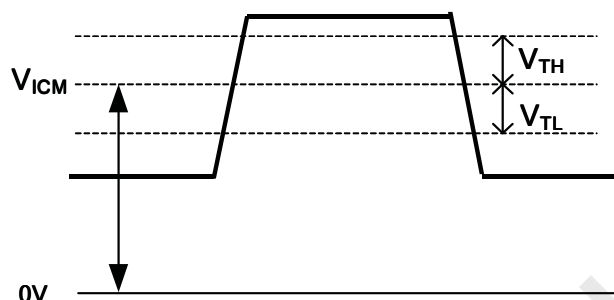
5. Input Channel Pair Skew Margin
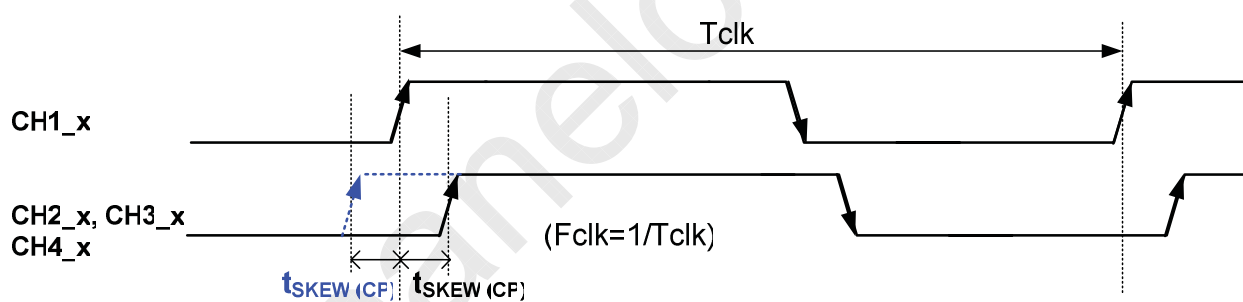
6. Do not attach a conducting tape to lamp connecting wire. If the lamp wire attach to conducting tape, TFT-LCD Module have a low luminance and the inverter has abnormal action because leakage current occurs between lamp wire and conducting tape.

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.

8. Specified values are for a single lamp only which is aligned horizontally. The lifetime is defined as the time which luminance of the lamp is 50% compared to its original value.

[Operating condition: Continuous operating at Ta = 25±2℃]

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3.2 Interface Connections

- LCD connector: FI-RE51S-HF (Manufactured by JAE)

- Mating connector: FI-RE51S-HL (Manufactured by JAE)

PIN #	Signal Name	Description
1	V_{DD}	Power Supply, +12V DC Regulated
2	V_{DD}	Power Supply, +12V DC Regulated
3	V_{DD}	Power Supply, +12V DC Regulated
4	V_{DD}	Power Supply, +12V DC Regulated
5	V_{DD}	Power Supply, +12V DC Regulated
6	Reserved	AUO Internal Use Only
7	GND	Ground
8	GND	Ground
9	GND	Ground
10	CH1_0-	LVDS Channel 1, Signal 0-
11	CH1_0+	LVDS Channel 1, Signal 0+
12	CH1_1-	LVDS Channel 1, Signal 1-
13	CH1_1+	LVDS Channel 1, Signal 1+
14	CH1_2-	LVDS Channel 1, Signal 2-
15	CH1_2+	LVDS Channel 1, Signal 2+
16	GND	Ground
17	CH1_CLK-	LVDS Channel 1, Clock -
18	CH1_CLK+	LVDS Channel 1, Clock +
19	GND	Ground
20	CH1_3-	LVDS Channel 1, Signal 3-
21	CH1_3+	LVDS Channel 1, Signal 3+
22	CH1_4-	LVDS Channel 1, Signal 4-
23	CH1_4+	LVDS Channel 1, Signal 4+
24	GND	Ground
25	CH2_0-	LVDS Channel 2, Signal 0-
26	CH2_0+	LVDS Channel 2, Signal 0+
27	CH2_1-	LVDS Channel 2, Signal 1-
28	CH2_1+	LVDS Channel 2, Signal 1+
29	CH2_2-	LVDS Channel 2, Signal 2-
30	CH2_2+	LVDS Channel 2, Signal 2+
31	GND	Ground

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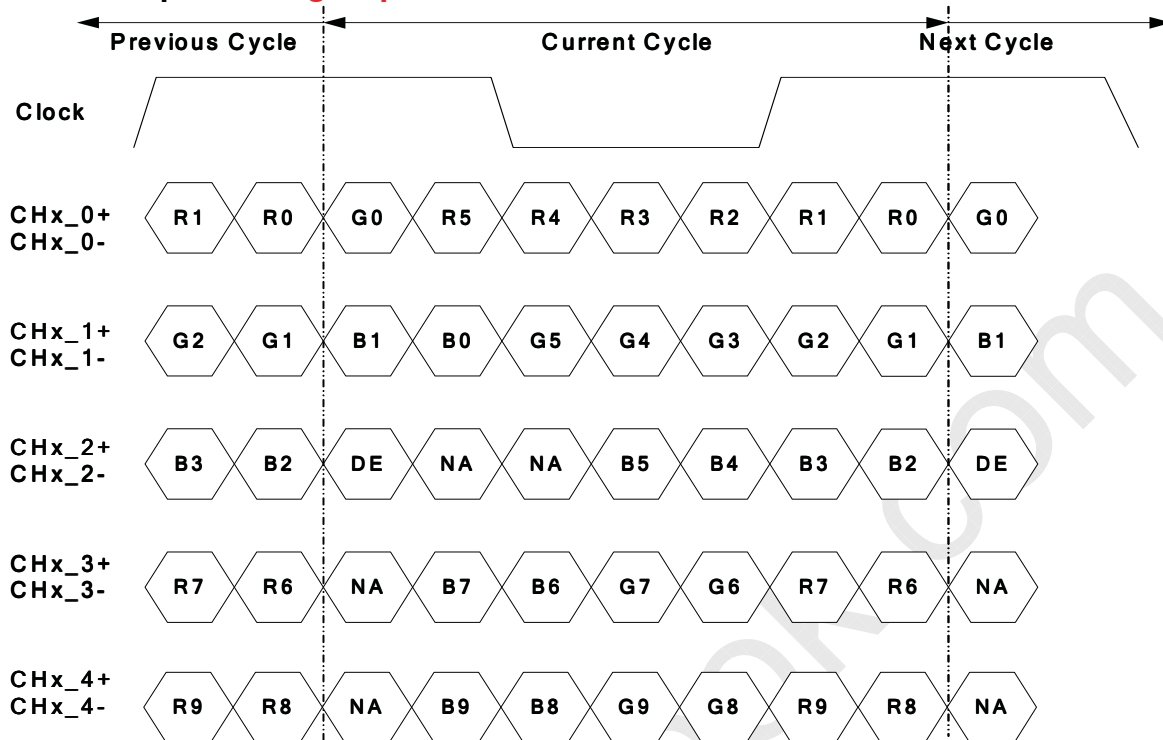| 32	CH2_CLK-	LVDS Channel 2, Clock -
33	CH2_CLK+	LVDS Channel 2, Clock +
34	GND	Ground
35	CH2_3-	LVDS Channel 2, Signal 3-
36	CH2_3+	LVDS Channel 2, Signal 3+
37	CH2_4-	LVDS Channel 2, Signal 4-
38	CH2_4+	LVDS Channel 2, Signal 4+
39	GND	Ground
40	SCL	I2C Serial Clock Bus
41	SDA	I2C Serial Data Bus
42	LVDS_SEL	Open/High(3.3V) for NS 8bits Low(GND) for JEIDA 10bits
43	NC	No connection
44	NC	No connection
45	Reserved	AUO Internal Use Only
46	Reserved	AUO Internal Use Only
47	MEMC_ SELECT_0	MEMC_SELECT_0 High(3.3V) for 1 ; Low/Open(GND) for 0
48	Reserved	AUO Internal Use Only
49	Reserved	AUO Internal Use Only
50	Reserved	AUO Internal Use Only
51	FR_SELECT	Input Frame Rate Selection. High(3.3V) for 1 : 50Hz Low/Open(GND) for 0 : 60Hz

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

Note 2: All V_{DD} (power input) pins should be connected together.

Note 3: All NC (no connection) pins should be open without voltage input.
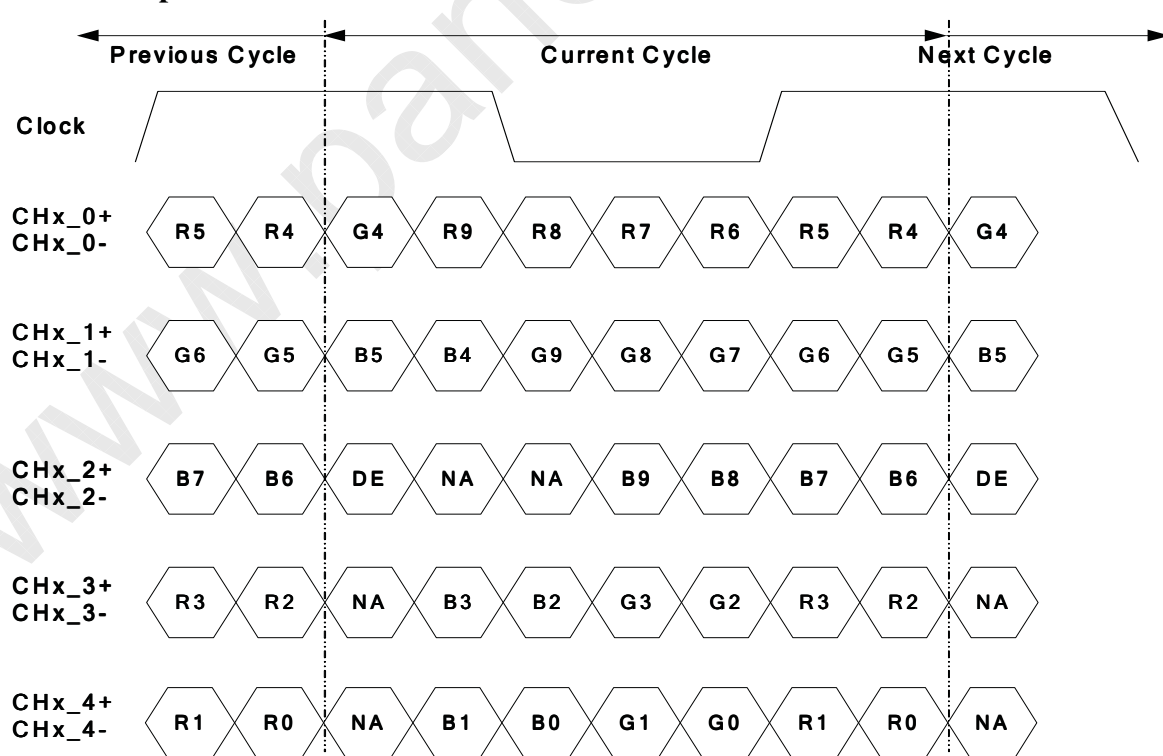
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■ **LVDS Option = High/Open➜NS**

	Previous Cycle		Current Cycle						Next Cycle

Clock

CHx_0+ CHx_0-	R1	R0	G0	R5	R4	R3	R2	R1	R0	G0
CHx_1+ CHx_1-	G2	G1	B1	B0	G5	G4	G3	G2	G1	B1
CHx_2+ CHx_2-	B3	B2	DE	NA	NA	B5	B4	B3	B2	DE
CHx_3+ CHx_3-	R7	R6	NA	B7	B6	G7	G6	R7	R6	NA
CHx_4+ CHx_4-	R9	R8	NA	B9	B8	G9	G8	R9	R8	NA

Note: x = 1, 2, 3, 4…

■ **LVDS Option = Low➜JEIDA**

	Previous Cycle		Current Cycle						Next Cycle

Clock

CHx_0+ CHx_0-	R5	R4	G4	R9	R8	R7	R6	R5	R4	G4
CHx_1+ CHx_1-	G6	G5	B5	B4	G9	G8	G7	G6	G5	B5
CHx_2+ CHx_2-	B7	B6	DE	NA	NA	B9	B8	B7	B6	DE
CHx_3+ CHx_3-	R3	R2	NA	B3	B2	G3	G2	R3	R2	NA
CHx_4+ CHx_4-	R1	R0	NA	B1	B0	G1	G0	R1	R0	NA

Note: x = 1, 2, 3, 4…

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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.

Timing Table (DE only Mode)

Vertical Frequency Range (60Hz)

Signal	Item	Symbol	Min.	Typ.	Max	Unit
Vertical Section	Period	Tv	1100	1125	1200	Th
	Active	Tdisp (v)		1080		Th
	Blanking	Tblk (v)	20	45	120	Th
	Front porch	Tfp (v)	1	4	110	Th
	Back porch	Tbp (v)	1	36	110	Th
	V_sync	TVsync_wdth	2	5	110	Th
	Polarity	POL (v)		**+**		
Horizontal Section	Period	Th	1050	1100	1150	Tclk
	Active	Tdisp (h)		960		Tclk
	Blanking	Tblk (h)	90	140	190	Tclk
	Front porch	Tfp (h)	5	44	180	Tclk
	Back porch	Tbp (h)	5	74	180	Tclk
	H_sync	THsync_wdth	5	22	180	Tclk
	Polarity	POL (h)		**+**		
Clock	Frequency	Fclk=1/Tclk	70.875	74.25	76	MHz
Vertical Frequency	Frequency	Fv	59.5	60	60.5	Hz
Horizontal Frequency	Frequency	Fh	66	67.5	72	KHz

Note 1: Tblk (v) = Tfp(v) + TVsync_wdth + Tbp(v)

Tblk (h) = Tfp(h) + THsync_wdth + Tbp(h)

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3.4 Signal Timing Waveforms

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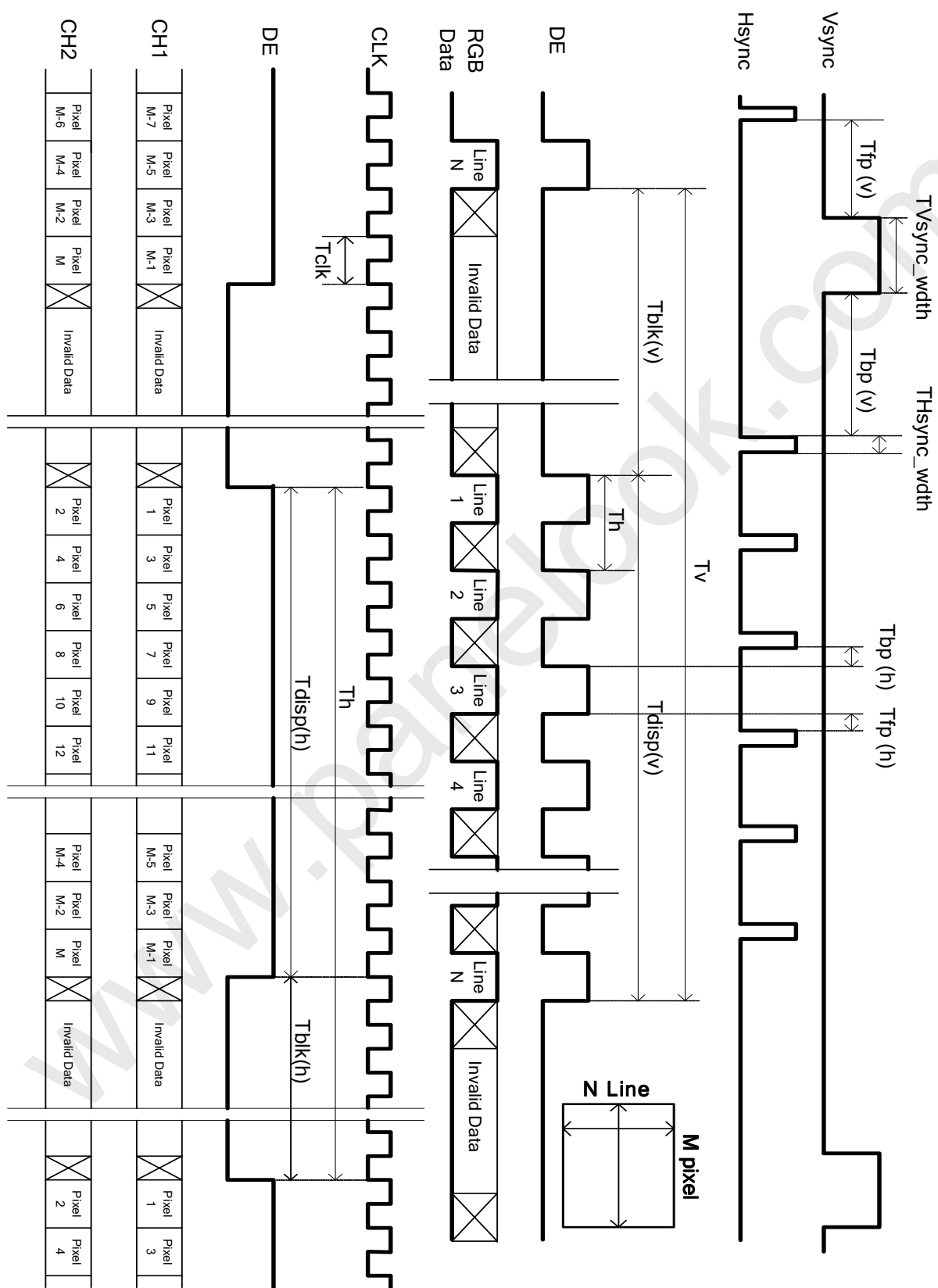
3.5 Color Input Data Reference

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 MSB ... LSB										GREEN MSB ... LSB										BLUE 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

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3.6 Power Sequence
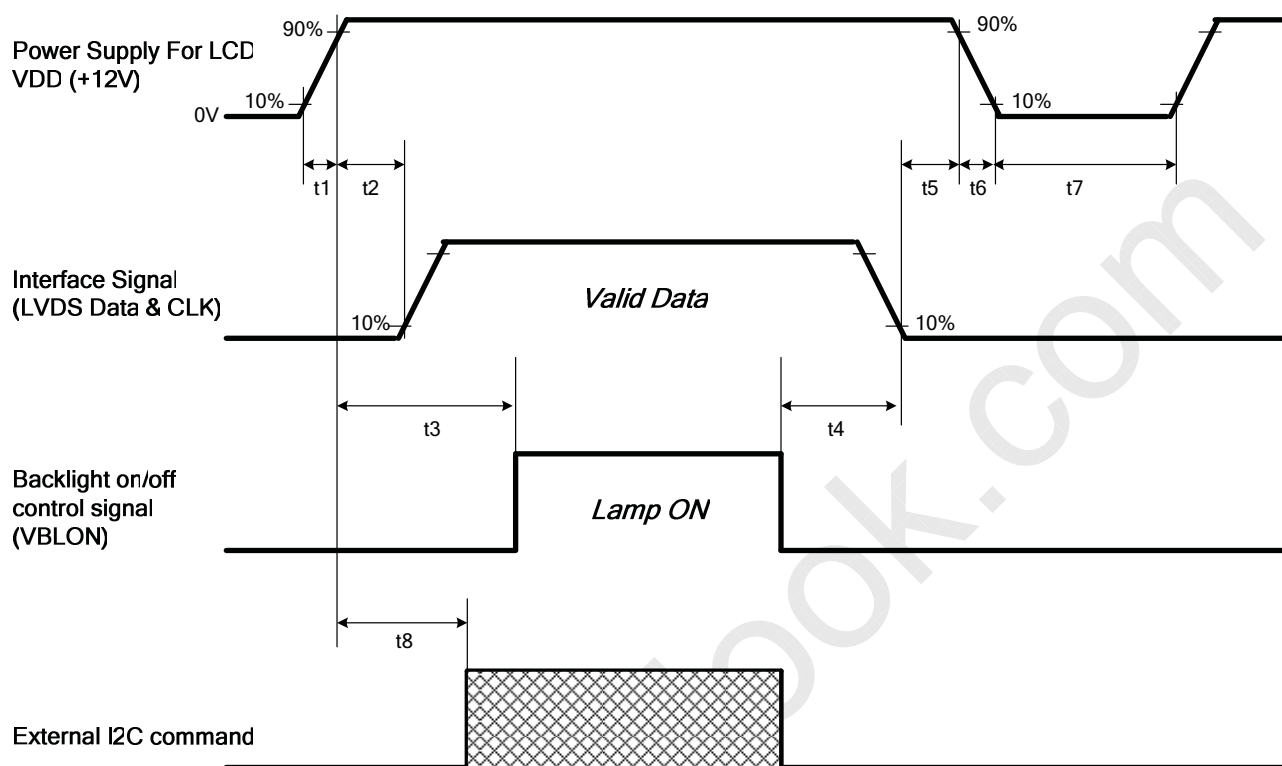
Parameter	Values			Unit
	Min.	Type.	Max.	
t1	0.4	---	30	ms
t2	0.1	---	2000	ms
t3	3400	---	---	ms
t4	0^{*1}	---	---	ms
t5	0	---	---	ms
t6	---	---	---^{*2}	ms
t7	500	---	---	ms
t8	2500	---	---	ms

Note:

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

(2) T6 : voltage of VDD must decay smoothly after power-off. (customer system decide this value)

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.

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3.7 Backlight Power Specification

Item	Symbol	Condition	Spec			Unit	Note
			Min	Typ	Max		
Operating Voltage	Vo	-		680		Vrms	
Operating Current	Io	-	6.1	6.6	7.1	mArms	
BL Total Power Dissipation	PBL	-	-	175	-	Watt	
Striking Voltage	Vstk	At 0℃	1830	-	-	Vrms	
		At 25℃	1685	-	-		
Striking Time	Ts	-		-	500	msec	
Operating Frequency	fo	-	46	48	50	kHz	
PWM Operating Frequency	F_PWM	-		150		Hz	
PWM Dimming Duty Ratio	D_PWM	-	10	-	100	%	Note 1&2
Lamp Type			Straight type				
Number of Lamps			18			pcs	
Type of current balance			L-balance				

（Ta=25±5℃, Turn on for 45minutes）

Note 1: Dimming range

PWM Dimming : include Internal and External PWM Dimming

Note 2: Low dimming ratio operation

When PWM dimming duty ratio is operated lower than recommended value, feedback signal and all protection functions should be confirmed by LIPS design. Display performance should also be confirmed by customer's implement.

Protection circuit specification

Item	Symbol	Spec			Unit	Note
		Min	Typ	Max		
Supply voltage	Vcc	10	12	15	VDC	
Supply current	Icc	-	20	40	mADC	
Current feedback signal	IFB				Vrms	Non feedback signal
Lamp Detection (OLP)	VLD(H)	10	-	12	VDC	Lamp normal status
	VLD(L)	0	-	0.8	VDC	Lamp protection status

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Connector Pin Assignmen

Master CN2:130001WR-02E (YeonHo)

Pin	Symbol	Description
1	HV1+	I/P board high voltage supply
2	HV1+	I/P board high voltage supply

Slave CN2:130001WR-02E (YeonHo)

Pin	Symbol	Description
1	HV2-	I/P board high voltage supply
2	HV2-	I/P board high voltage supply

CN3:KN30-7P-1.25H (Hirose Elec.)

Pin	Symbol	Description
1	Vcc	Power Supply for Protection Circuit
2	N/A	NC(Must include feedback circuit design in IPB)
3	N/A	NC(Must include feedback circuit design in IPB)
4	GND	Signal Ground
5	GND	Signal Ground
6	VLD	CCFL connector Open & Non-lighting Signal
7	VLD	CCFL connector Open & Non-lighting Signal

Lamp specification

Item	Symbol	Condition	Spec Min	Spec Typ	Spec Max	Unit	Note
Lamp voltage	VL			1360		Vrms	
Lamp current	IL			6.6		mArms	
Lamp frequency	fL		46	48	50	kHz	
Starting voltage	Vs	At 0℃		1830		Vrms	
		At 25℃		1685		Vrms	
Life time	TL			TBD		hr	
Unsymmetrical ratio	UR		-	-	10%	-	Note 1.
Crest factor	C.F.		$\sqrt{2}-10\%$	$\sqrt{2}$	$\sqrt{2}+10\%$	-	

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

Note 1: Waveform definition

Please light on the lamp with symmetrical voltage and current waveform (unsymmetrical ratio is less than 10%, crest factor within $\sqrt{2}\pm10\%$).

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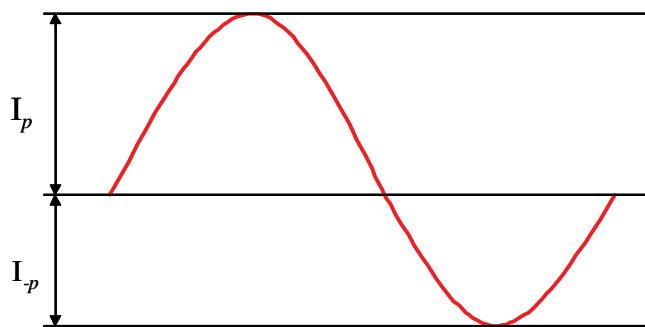
Unsymmetrical Ratio = $|I_p - I_{-p}| / I_{rms} * 100\%$

Crest Factor = I_p (or I_{-p}) / I_{rms}

I_p : High side peak value

I_{-p} : Low side peak value

I_{rms} : Root mean square value

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3.8 MEMC Function Specification

3.8.1 Setting by hardware

Pin name	Content	Note	Default
LVDS_SEL	LVDS Format Selection 0: JEIDA Mode 10bits 1: NS Mode 8bits		1'b1
I2C_SDA [*2]	External I2C from customer's comment		
I2C_SCL [*2]	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_SEL of the hardware is 00 for MEMC OFF, external I2C can set address=0x79 and data=0x02 for MEMC OFF.

Note 2.
The next figure shows the I2C format of customer's single-byte command. 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 command. Ex. Address : 0x23.

START	0XE4	ACK	Address	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).

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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 0x04: TRUE MOVIE (5:5 pull down for 120Hz)	**MEMC ON:** 10 frames latency (~170ms) for film FLC, MBR + video MBR **MEME OFF:** 1 frame latency (~16.7ms) **TRUE MOVIE:** latency (~80ms) for film a frame repeat.	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 0x01: Middle MEMC level 0x02: Strong MEMC level 0x03: Weak MEMC level	Usable in MEMC ON status. (The data of address 0x79 must be 0x00.)	0x01

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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°.
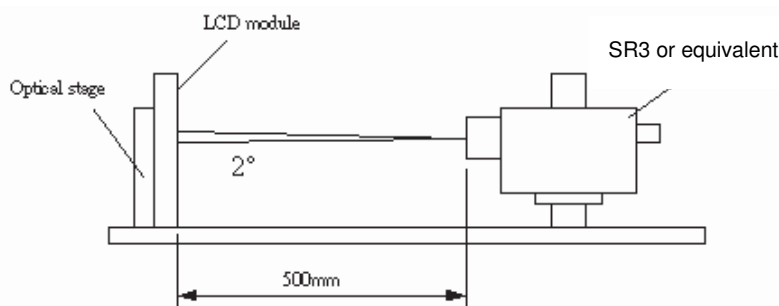
Parameter	Symbol	Values			Unit	Notes
		Min.	Typ.	Max		
Contrast Ratio	CR	3200	4000	--		1
Surface Luminance (White)	L_{WH}	360	450	--	cd/m^2	2
Luminance Variation	$\delta_{WHITE(9P)}$	--	--	1.3		3
Response Time (Average)	Tγ	--	5.5	--	ms	4 (Gray to Gray)
Color Coordinates						
Red	R_X		0.640			
	R_Y		0.330			
Green	G_X		0.290			
	G_Y	Typ.-0.03	0.600	Typ.+0.03		
Blue	B_X		0.150			
	B_Y		0.060			
White	W_X		0.280			
	W_Y		0.290			
Viewing Angle						(Contrast Ratio>10)
x axis, right(φ=0°)	θ_r	--	89	--	degree	5
x axis, left(φ=180°)	θ_l	--	89	--	degree	5
y axis, up(φ=90°)	θ_u	--	89	--	degree	5
y axis, down (φ=270°)	θ_d	--	89	--	degree	5

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Note:

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

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

2. Surface Luminance is luminance value at point 5 with 100% dimming across the LCD surface 50cm from the surface with all pixels displaying white. For more information see Fig. 4-2. When lamp current I_L=7.6mA, L_{WH}=L_{on5}, where L_{on5} is the luminance with all pixels displaying white at center 5 location.
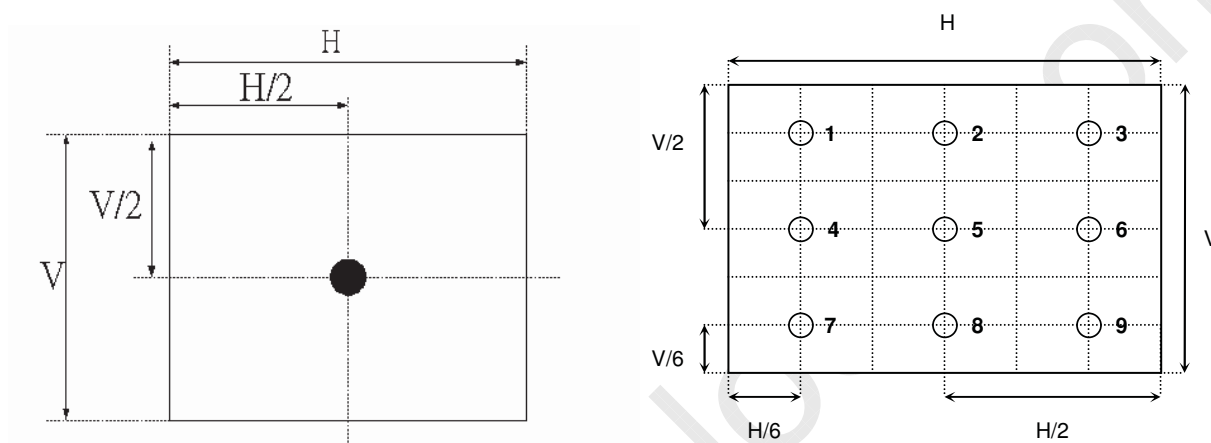
Fig.4-2 Optical measurement point

3. The variation in surface luminance, $\delta_{WHITE(9P)}$ is defined under brightness of I_L=7.6mA 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 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%	

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. 4-4.
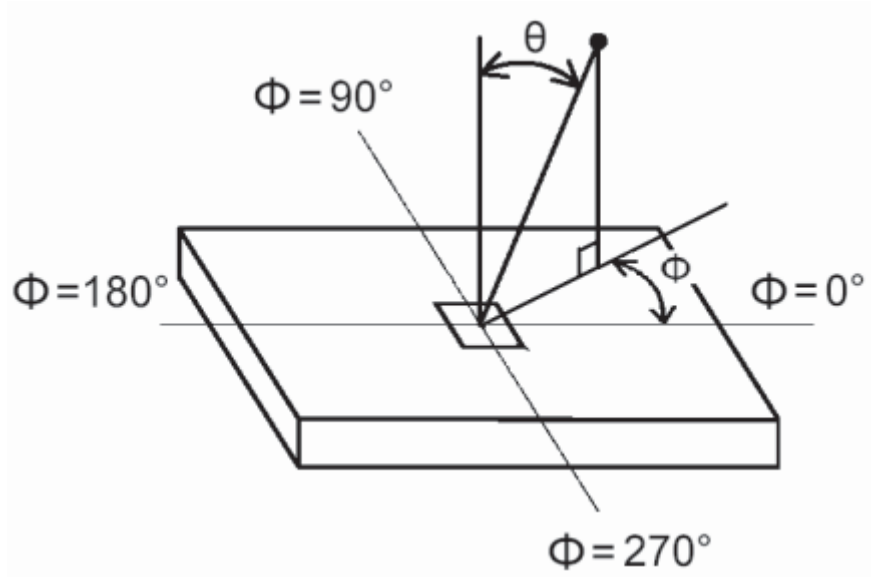
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Fig.4-4 Viewing angle definition

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5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model T546HW01. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal (typ.)	1267.6 mm
	Vertical (typ.)	738.4 mm
	Depth (typ.)	58 mm (with balance board cover)
Bezel Area	Horizontal (typ.)	mm
	Vertical (typ.)	mm
Active Display Area	Horizontal	1209.6 mm
	Vertical	680.4 mm
Weight	20500g (Max)	

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2D Drawing (Front)
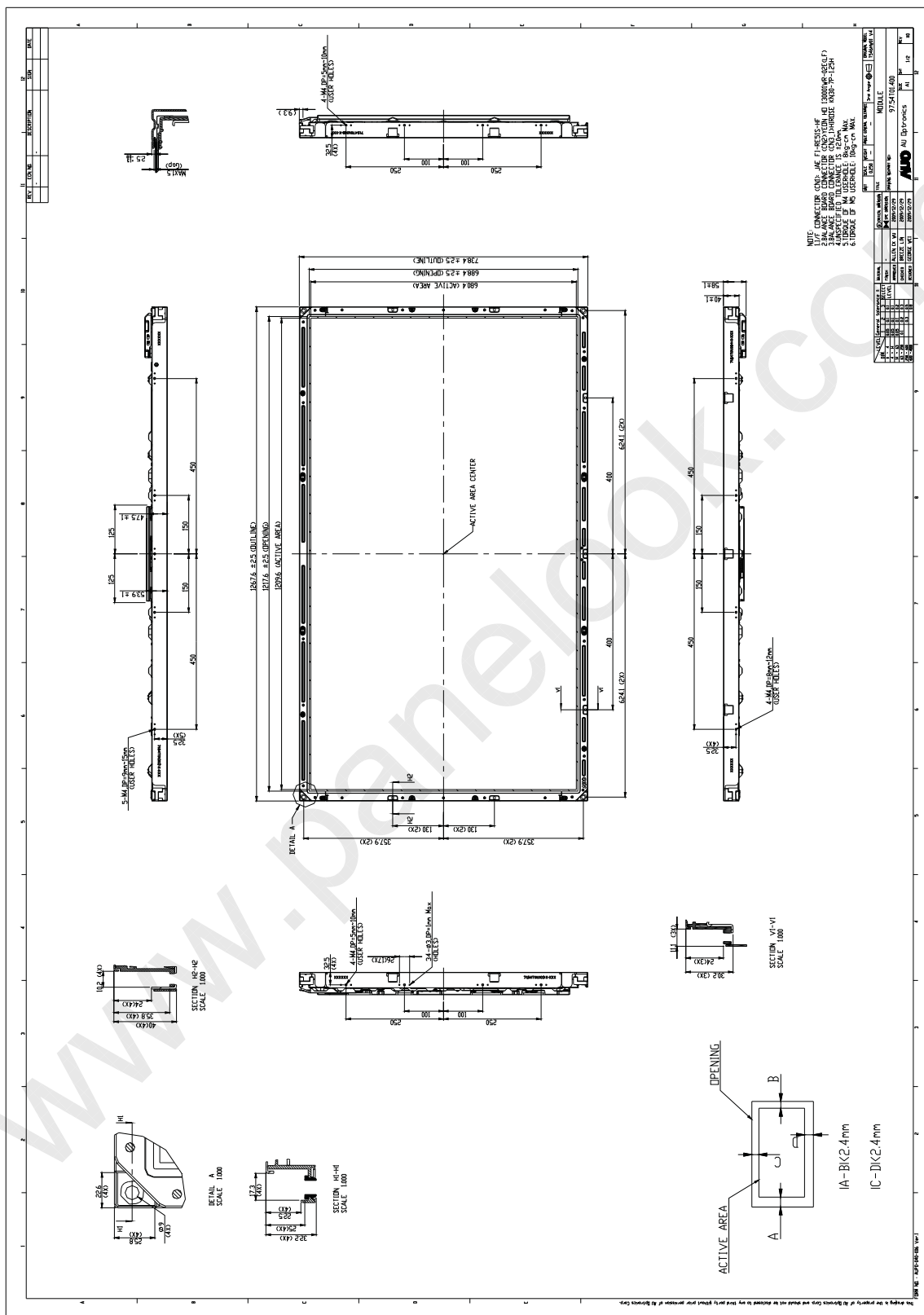
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2D Drawing (Rear)

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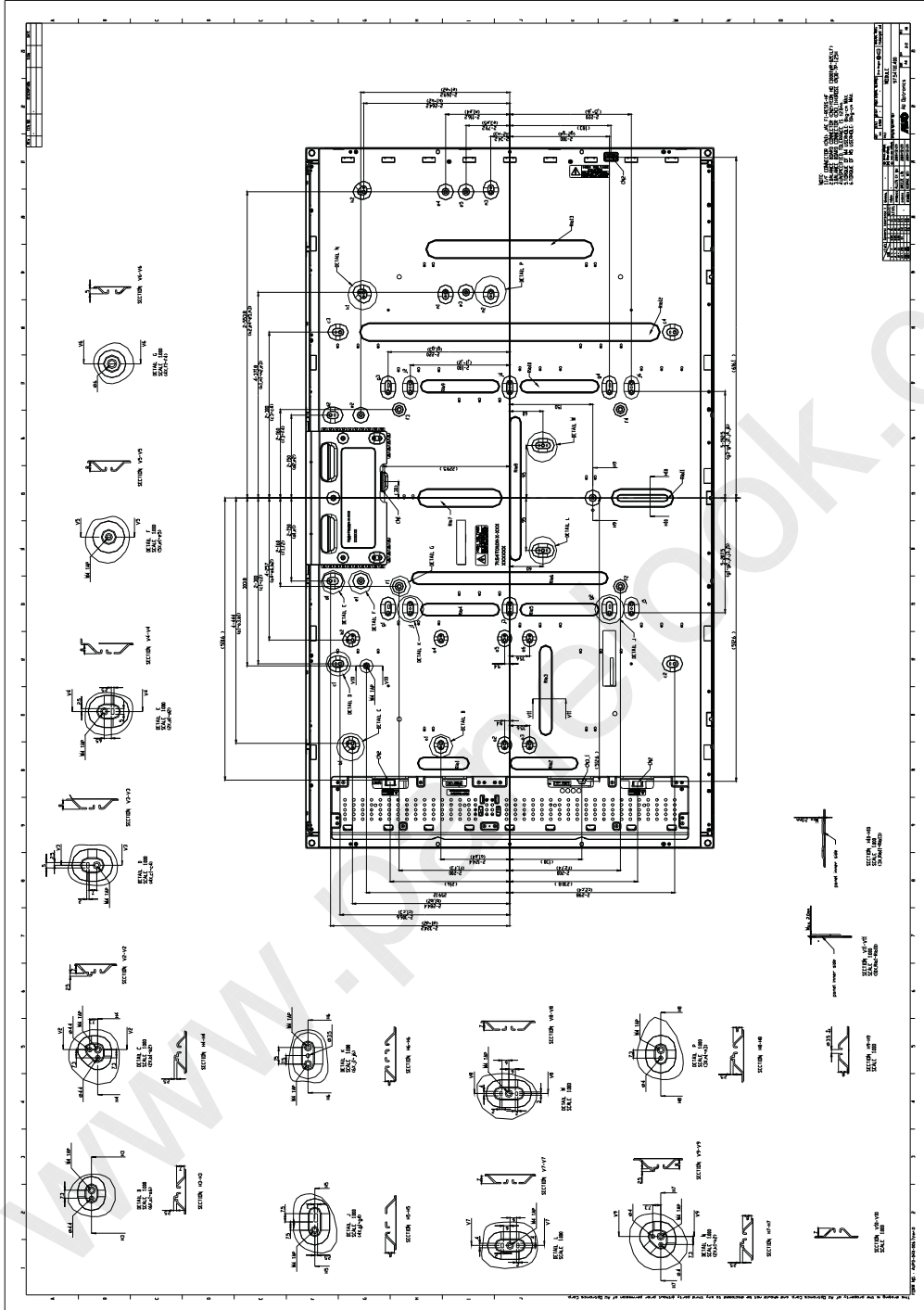
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6. Reliability

	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 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)	3	Random wave (1.5G RMS, 10-200Hz) 30mins/ Per each X,Y,Z axes
8	Drop test (With carton)	3	Height: 25.4cm(ASTMD4169-I) 1 corner, 3 edges, 6 surfaces (refer ASTM D 5276)

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7. International Standard

7-1. Safety

(1) UL6500, UL 60065 Underwriters Laboratories, Inc. (AUO file number: E204356)

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

(2) CAN/CSA C22.2 No. 950-95 Third Edition, Canadian Standards Association, Jan. 28, 1995

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

(3) EN60950: 1992+A2: 1993+A2: 1993+C3: 1995+A4: 1997+A11: 1997

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

IEC 60065: version 7th

European Committee for Electro technical 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

7-3. Green Mark Description

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

(2) For RoHS compatible products, AUO will add RoHS for identification.

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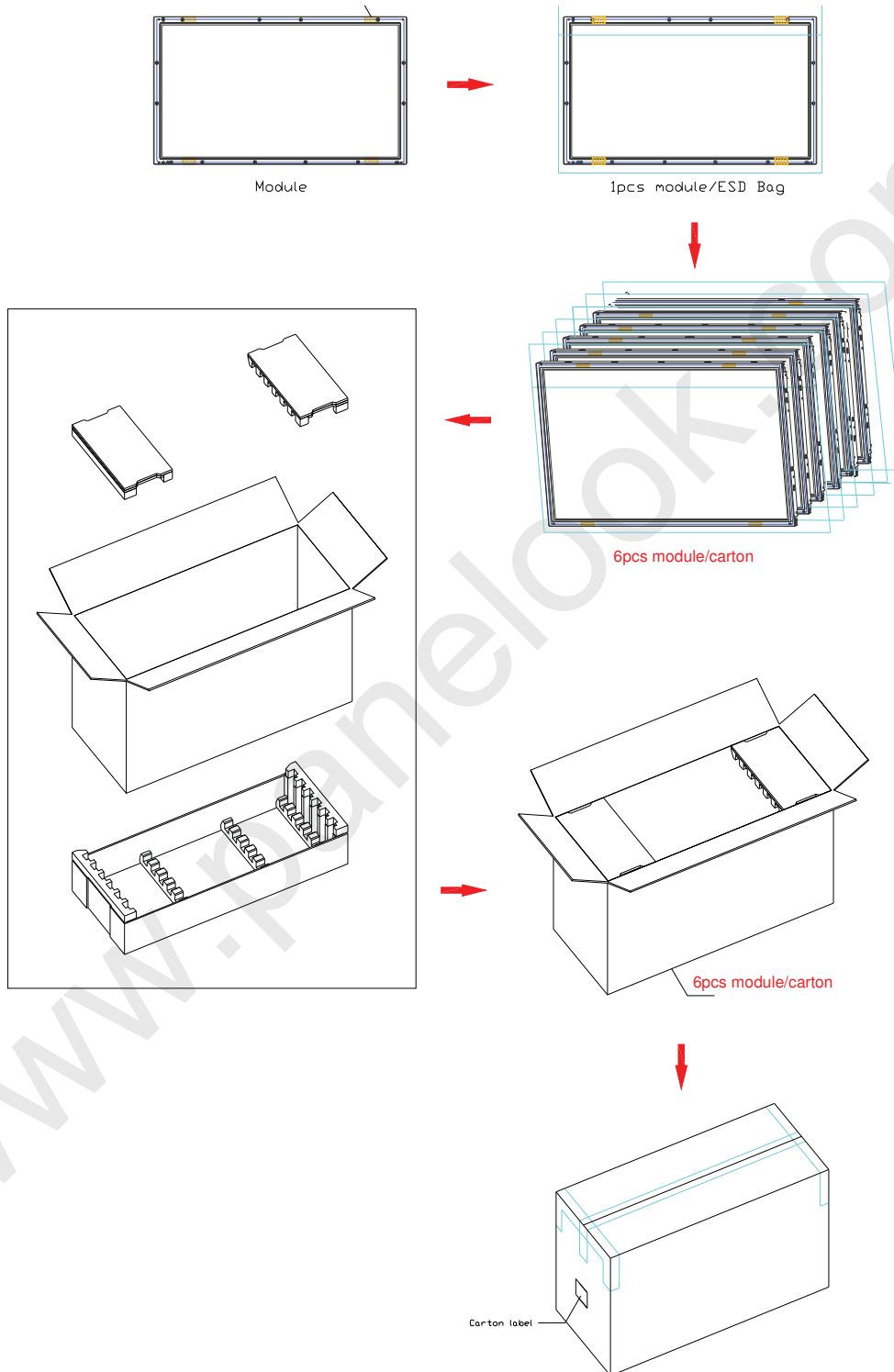Team. (The definition of green design follows the AUO green design checklist.)

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8. Packing

Packing Instruction

Carton dimension= **1355**mm***560**mm***830**mm

Module

1pcs module/ESD Bag

6pcs module/carton

6pcs module/carton

Carton label

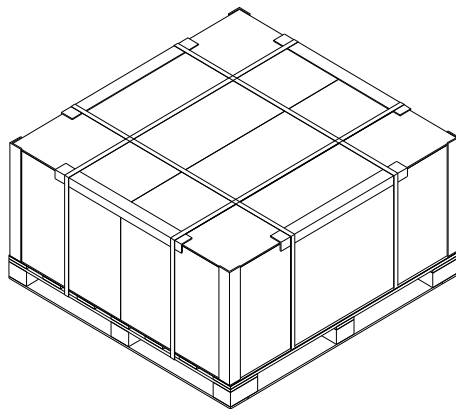© **Copyright AUO Optronics Corp. 2009 All Rights Reserved.**   28

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Pallet information

By air cargo: (2 x 1) x 1 layers, one pallet put 2 boxes, total 12 pcs module.

Dimension: **1390**mm***1150**mm***962**mm

By sea: (2 x 1) x 2 layers, one pallet put 2 boxes, stack 2 layers, total 24 pcs module.

Dimension: **1390** x **1150** x **1924**mm
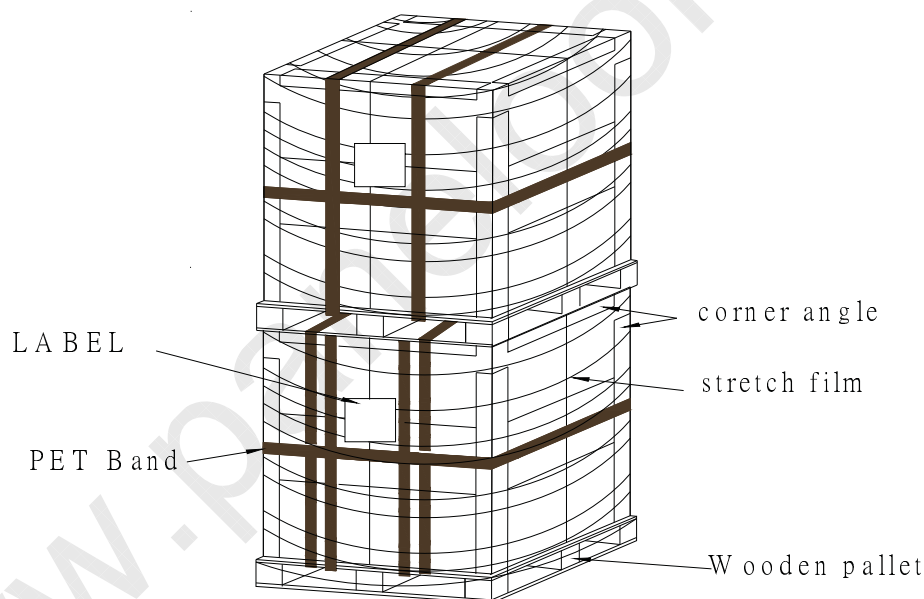
Pallet dimension: **1390**mm***1150**mm***132**mm (**T55**)

Item	Specification			Packing Remark
	Qty.	Dimension	Weight (kg)	
1 Packing BOX	6pcs/box	1355(L)mm*560(W)mm*830(H)mm	133	
2 Pallet	1	1390(L)mm*1150(W)mm*132(H)mm	20	
3 Boxes per Pallet	2 boxes/Pallet			
4 Panels per Pallet	12pcs/pallet			
Pallet after packing	1	1390(L)mm*1150(W)mm*962(H)mm	286	

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Panel Label

xxxxxxxxxxxxx-xxxx

→ AUO Internal Use

Panel Unique ID

AU Optronics

XXXXX   Model NO: T546HW01 V.4   XXXXXXX

Manufactured XX/XX   MADE IN XXXXX

AUO Internal Use   Week   Factory Location

Year   AUO Internal Use
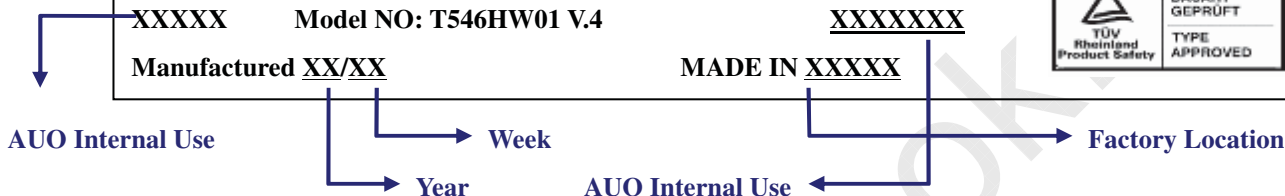
Green mark description

Carton Label

AU Optronics
MODEL NO: T546HW01 V4   QTY: 6
PART NO: 97.54T01.XXX
CUSTOMER NO:
CARTON NO:
Made in XXXXXX   * X X X X X X - X X X X X X X X X *

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9. 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 on back side of panel

(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.

8-2 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.

(7) The device listed in the product specification sheets was designed and manufactured for TV application.

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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 wrist band 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 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-hex.