Model Name: T460HW03 VG

Issue Date : 2010/02/08

( )Preliminary Specifications
(∗)Final Specifications

Customer Signature	Date	AUO	Date
Approved By _____		Approval By PM Director *Frank Hsu* _____	
Note		Reviewed By RD Director *Eugene Chen* _____ Reviewed By Project Leader *Evan Chen* _____	
		Prepared By PM *Ryan Chung* _____	

Contents

Record of Revision

Version	Date	Page	Description
1.0	2010/2/8		First release

1. General Description

This specification applies to the 46 inch Color TFT-LCD Module T460HW03 VG. This LCD module has a TFT active matrix type liquid crystal panel 1920 x 1080 pixels, and diagonal size of 46 inch. This module supports 1920 x 1080 mode with 120Hz frame rate. 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 T460HW03 VG 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 T460HW03 VG backlight unit is using inverter.

*** General Information**

Items	Specification	Unit	Note
Active Screen Size	46	inch	
Display Area	1018.08(H) x 572.67(V)	mm	
Outline Dimension	1083.0(H) x 627.0(V) x 59.0(D)	mm	With Inverter
Driver Element	a-Si TFT active matrix		
Display Colors	10 bit, 1.07B	Colors	
Number of Pixels	1920 x 1080	Pixel	
Pixel Pitch	0.53025	mm	
Pixel Arrangement	RGB vertical 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

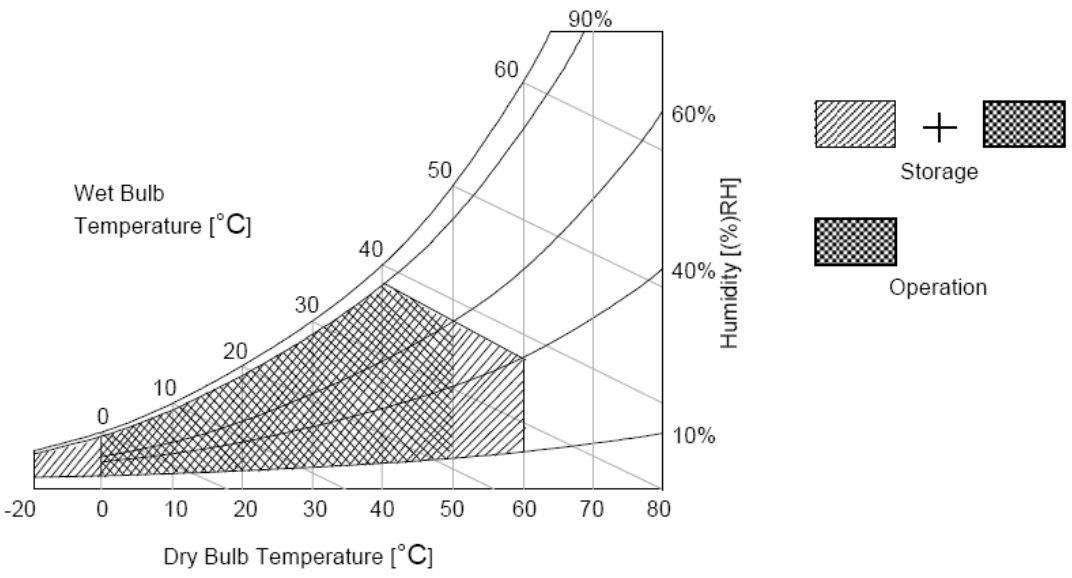
Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	Vcc	-0.3	14	[Volt]	Note 1
Input Voltage of Signal	Vin	-0.3	4	[Volt]	Note 1
Operating Temperature	TOP	0	+50	[°C]	Note 2
Operating Humidity	HOP	10	90	[%RH]	Note 2
Storage Temperature	TST	-20	+60	[°C]	Note 2
Storage Humidity	HST	10	90	[%RH]	Note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

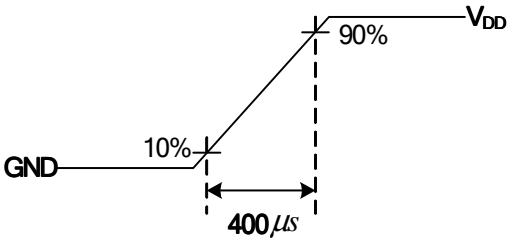
The T460HW03 VG requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input for BLU is to power inverter.

3.1 Electrical Characteristics

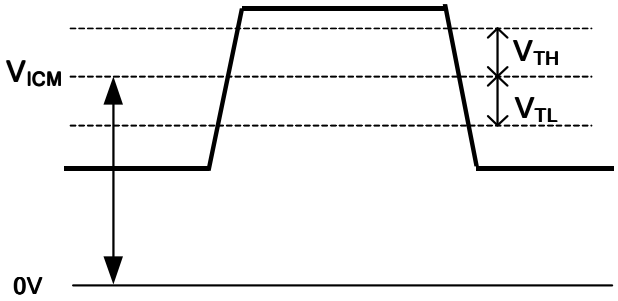
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max		
LCD							
Power Supply Input Voltage		V_{DD}	10.8	12	13.2	V_{DC}	1
Power Supply Input Current		I_{DD}	--	1.2	1.7	A	2
Power Consumption		P_C	--	14.4	20.4	Watt	2
Inrush Current		I_{RUSH}	--	--	4	A	3
LVDS Interface	Differential Input High Threshold Voltage	V_{TH}	--	--	+100	4	4
	Differential Input Low Threshold Voltage	V_{TL}	-100	--	--	4	4
	Input Common Mode Voltage	V_{ICM}	1.10	1.25	1.40	V_{DC}	4
	Input Channel Pair Skew Margin	$t_{SKEW\ (CP)}$	-500	--	+500	ps	5
CMOS Interface	Input High Threshold Voltage	V_{IH} (High)	2.4	--	3.3	V_{DC}	--
	Input Low Threshold Voltage	V_{IL} (Low)	0	--	0.6	V_{DC}	--
Backlight Power Consumption		P_{BL}	159.6	168	176.4	Watt	--
Life Time			50,000		--	Hours	8

Note :

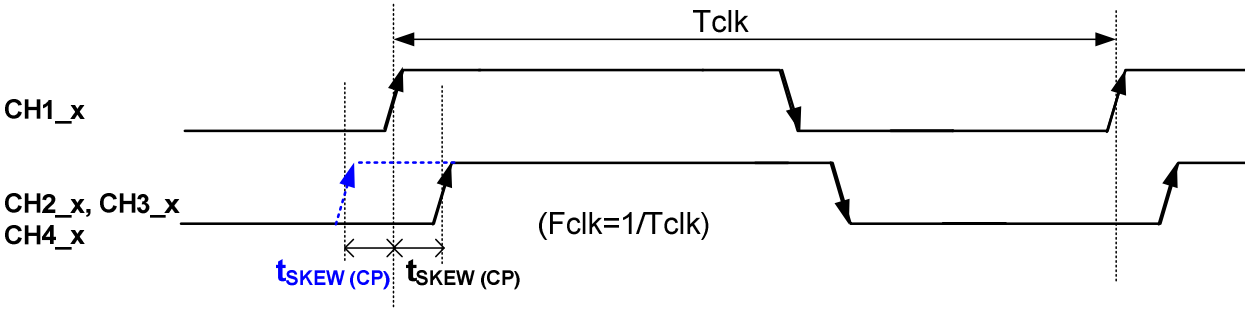
1. The ripple voltage should be controlled under 10% of V_{CC}
2. V_{DD} = 12.0V, Fv = 120Hz, F_{CLK} = Max freq. , 25 ℃, Test Pattern : White Pattern
   >> refer to “Section:3.3 Signal Timing Specification, Typical timing”
3. Measurement condition : Rising time = 400us



4. V_{ICM} = 1.25V



5. Input Channel Pair Skew Margin



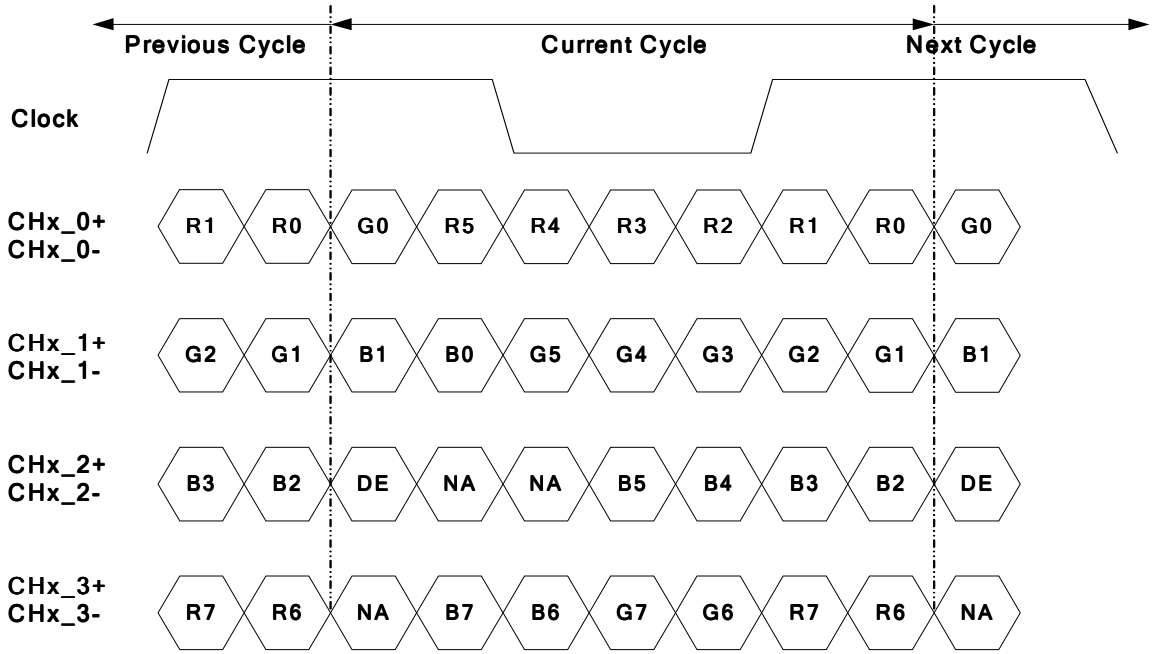
3.2 Interface Connections

- LCD connector: 187059-51221 (P-TWO, LVDS connector)

LVDS Option for 10bit

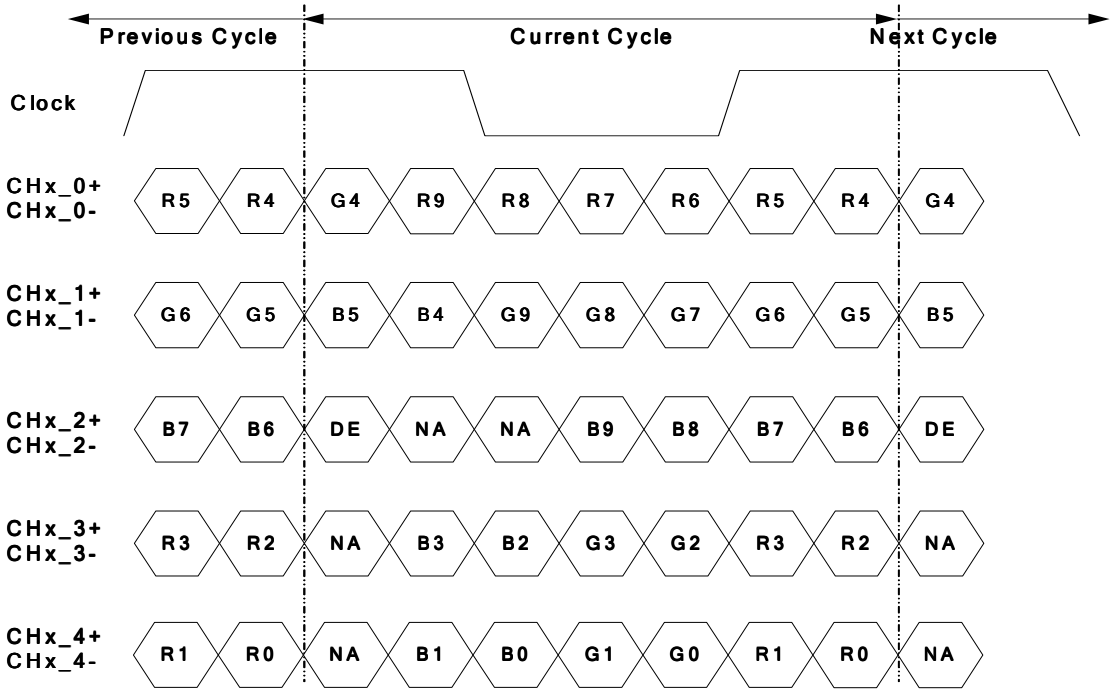
PIN	Symbol	Description	PIN	Symbol	Description
1	V_{DD}	Power Supply, +12V DC Regulated	26	CH2_0+	LVDS Channel 2, Signal 0+
2	V_{DD}	Power Supply, +12V DC Regulated	27	CH2_1-	LVDS Channel 2, Signal 1-
3	V_{DD}	Power Supply, +12V DC Regulated	28	CH2_1+	LVDS Channel 2, Signal 1+
4	V_{DD}	Power Supply, +12V DC Regulated	29	CH2_2-	LVDS Channel 2, Signal 2-
5	V_{DD}	Power Supply, +12V DC Regulated	30	CH2_2+	LVDS Channel 2, Signal 2+
6	Reserved	AUO Internal Use Only	31	GND	Ground
7	GND	Ground	32	CH2_CLK-	LVDS Channel 2, Clock -
8	GND	Ground	33	CH2_CLK+	LVDS Channel 2, Clock +
9	GND	Ground	34	GND	Ground
10	CH1_0-	LVDS Channel 1, Signal 0-	35	CH2_3-	LVDS Channel 2, Signal 3-
11	CH1_0+	LVDS Channel 1, Signal 0+	36	CH2_3+	LVDS Channel 2, Signal 3+
12	CH1_1-	LVDS Channel 1, Signal 1-	37	CH2_4-	LVDS Channel 2, Signal 4-
13	CH1_1+	LVDS Channel 1, Signal 1+	38	CH2_4+	LVDS Channel 2, Signal 4+
14	CH1_2-	LVDS Channel 1, Signal 2-	39	GND	Ground
15	CH1_2+	LVDS Channel 1, Signal 2+	40	SCL	I2C Serial Clock Bus
16	GND	Ground	41	SDA	I2C Serial Data Bus
17	CH1_CLK-	LVDS Channel 1, Clock -	42	LVDS_SEL	Open/High(3.3V) for NS 8bits Low(GND) for JEIDA 10bits
18	CH1_CLK+	LVDS Channel 1, Clock +	43	NC	No connection
19	GND	Ground	44	NC	No connection
20	CH1_3-	LVDS Channel 1, Signal 3-	45	NC	No connection
21	CH1_3+	LVDS Channel 1, Signal 3+	46	Reserved	AUO Internal Use Only
22	CH1_4-	LVDS Channel 1, Signal 4-	47	Reserved	AUO Internal Use Only
23	CH1_4+	LVDS Channel 1, Signal 4+	48	Reserved	AUO Internal Use Only
24	GND	Ground	49	Reserved	AUO Internal Use Only
25	CH2_0-	LVDS Channel 2, Signal 0-	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

LVDS Option = High/Open➔NS



Note: x = 1, 2, 3, 4…

LVDS Option = Low/GND➔JEIDA



Note: x = 1, 2, 3, 4…

MEMC Function Description

Setting By Hardware

Pin name	Content	Note	Default
FR_SEL	Input Frame Rate Selection 0: 60Hz 1: 50Hz		1'b0
MEMC_SEL *1	MEMC level selection 00: MEMC OFF 01: Weak level performance 10: Middle level performance 11: Strong level performance	MEME OFF: 1 frame latency (~16.7ms) MEMC ON (Weak & Middle & Strong): 10 frames latency (~170ms) for film FJC, MBR + video MBR	2'd2
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	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).

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 Right side, and MEMC disable at Left 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: Weak 1 MEMC level (GPIO setting) 0x01: Middle MEMC level (GPIO setting) 0x02: Strong MEMC level (GPIO setting) 0x03: Weak 2 MEMC level 0x04: Weak 3 MEMC level	Usable in MEMC ON status. (The data of address 0x79 must be 0x00.)	0x01

F0	0	3:0	Enable or disable 2D function 0x00: Disable 2D dimming 0x01: Enable 2D dimming	Enable/Disable 2D local dimming function	0x01
10	0	7:0	0x00: 60Hz 0x01: 50Hz	Select input format	0x00

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.

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

Notes:

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

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

(2) Display position is specific by the rise of DE signal only.

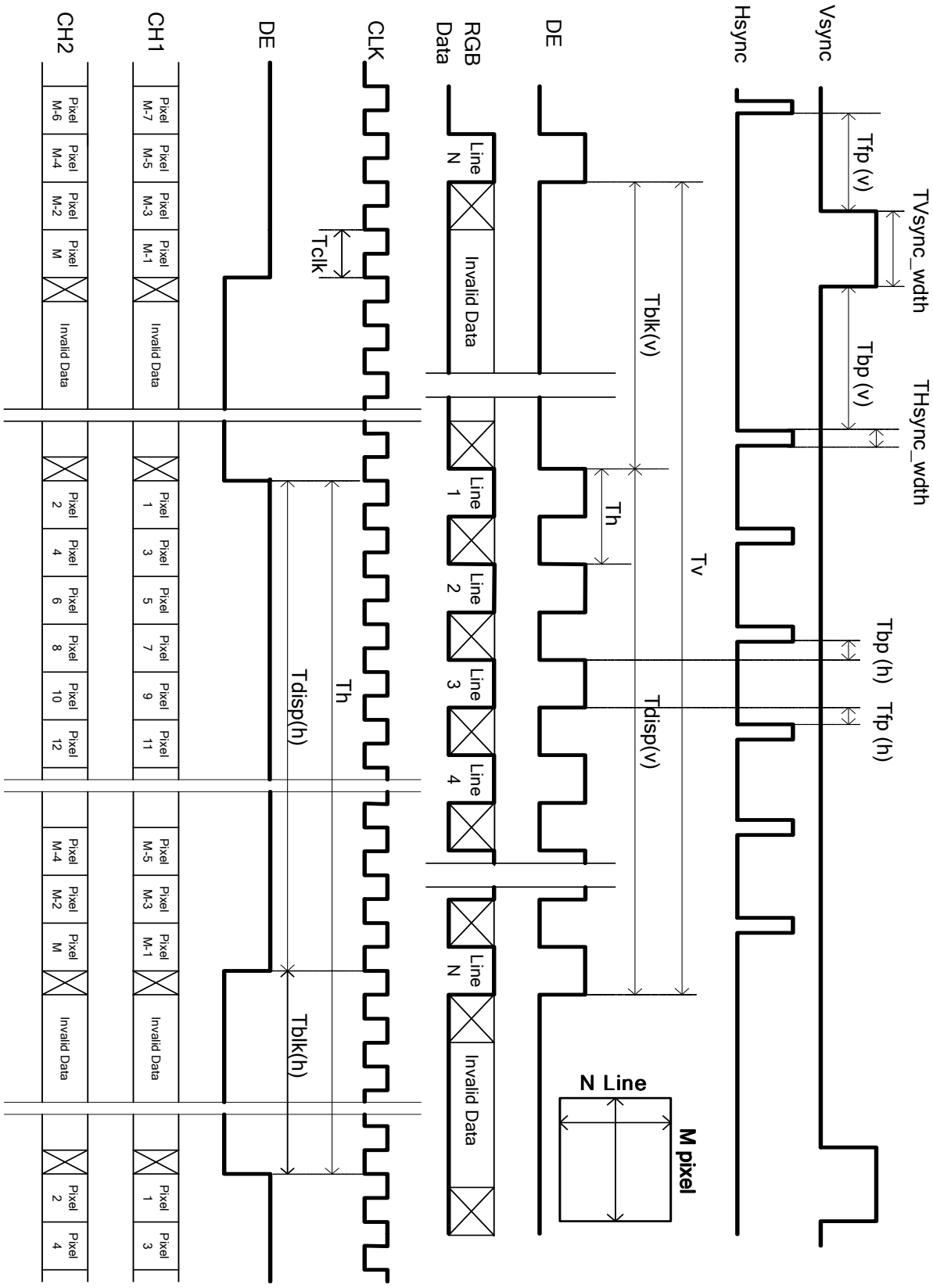
Horizontal display position is specified by the rising edge of 1st DCLK after the rise of 1st DE, is displayed on the left edge of the screen.

(3) 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.

(4) If a period of DE “High” is less than 1920 DCLK or less than 1080 lines, the rest of the screen displays black.

(5) 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 optional 8 bit or 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.

8 Bit 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

10 Bit Color Data Reference

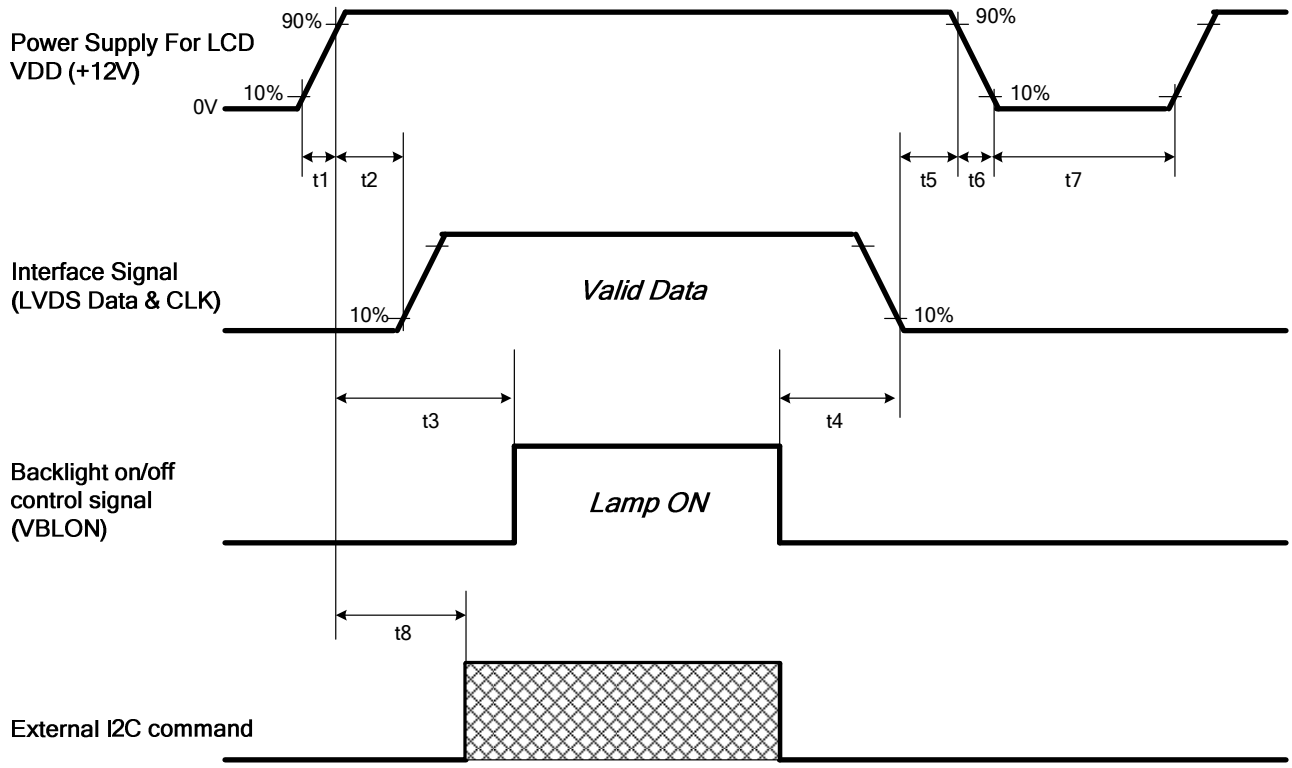
Color		Input Color Data																													
		RED										GREEN										BLUE									
		MSB									LSB	MSB									LSB	MSB									LSB
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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
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	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
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	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
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	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



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.

3.7 Backlight Specification

The backlight unit contains 12 CCFLs (Cold Cathode Fluorescent Lamp)

3.7.1: Electrical specification

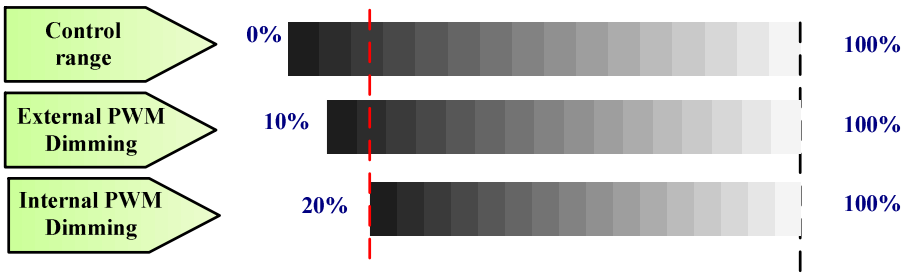
Item	Symbol		Condition	Spec			Unit	Note
				Min	Typ	Max		
Input Voltage	VDDB		-	21.6	24	26.4	VDC	-
Input Current	I_{DDB}		VDDB=24V	6.65	7	7.35	ADC	1
Input Power	P_{DDB}		VDDB=24V	159.6	168	176.4	W	1
Inrush Current	I_{RUSH}		VDDB=24V	-	-	11.025	A	2
On/Off control voltage	V_{BLON}	ON	VDDB=24V	2	-	5.5	VDC	-
		OFF		0	-	0.8		-
On/Off control current	I_{BLON}		VDDB=24V	-	-	1.5	mA	-
Dimming Control Voltage	V_DIM	MAX	VDDB=24V	3.0	-	3.3	VDC	-
		MIN		-	0	-	VDC	-
Dimming Control Current	I_DIM		VDDB=24V	-	-	2	mADC	-
Internal Dimming Ratio	DIM_R		VDDB=24V	10	-	100	%	3
External 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	140	180	240	Hz	-

Note 1 : Dimming ratio= 100% (MAX)（Ta=25±5℃, Turn on for 45minutes）
Note 2: Measurement condition Rising time = 20ms (VDDB : 10%~90%);
Note 3: Less than10% dimming control is functional well and no backlight shutdown happened.

3.7.2: Input Pin Assignment

■ CN2: CI0114M1HRL-NH (Cvilux)

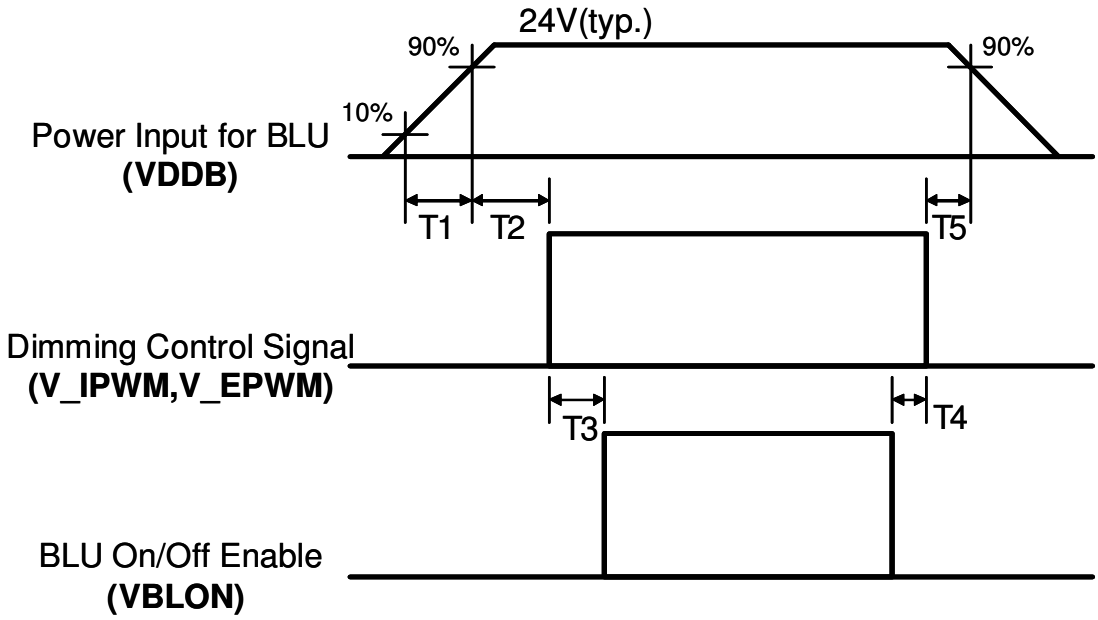
Pin	Symbol	Description
1	VDDB	Operating Voltage Supply, +24V DC regulated
2	VDDB	Operating Voltage Supply, +24V DC regulated
3	VDDB	Operating Voltage Supply, +24V DC regulated
4	VDDB	Operating Voltage Supply, +24V DC regulated
5	VDDB	Operating Voltage Supply, +24V DC regulated
6	BLGND	Ground and Current 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	BLU On-Off control: High/Open (2.0V~5.5V) : BL On ; Low (0~0.8V/GND) : BL off
13	VDIM(**)	Internal PWM (0~3.1V for 20~100% Duty) < NC ; When External PWM mode>
14	PDIM(*)	External PWM (10%~100% Duty, open for 100%) < NC ; When Internal PWM mode>



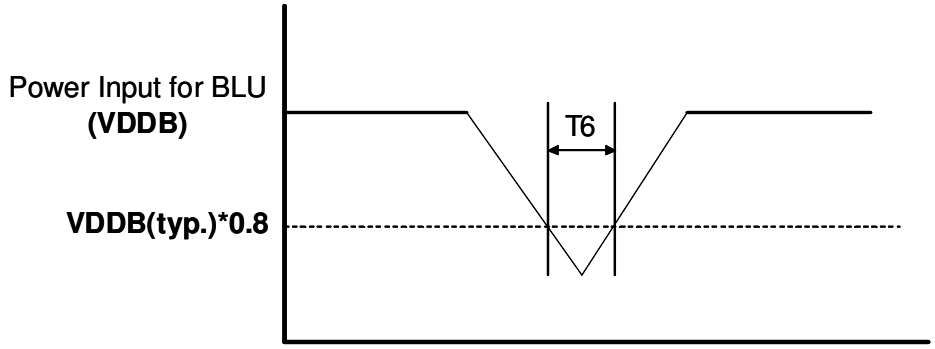
PWM Dimming : include Internal and External PWM Dimming

(Note*) IF External PWM function includes 10% dimming ratio. Judge condition as below:
1.) Backlight module must be lighted ON normally.
2.) All protection function must work normally.
3.) Uniformity and flicker could NOT be guaranteed!

3.7.3 Power Sequence for Inverter



Dip condition for Inverter

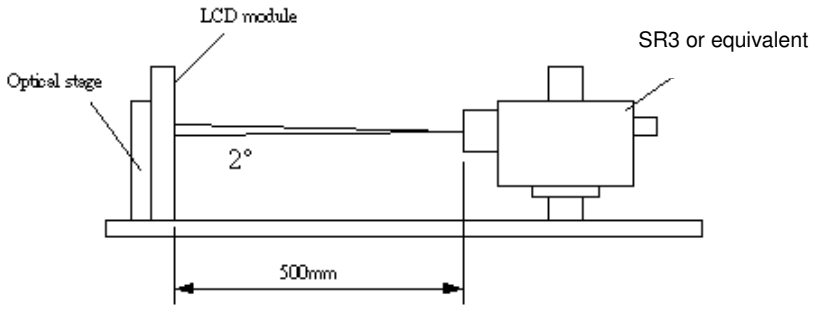


Parameter	Value			Units
	Min	Typ	Max	
T1	20	-	-	ms
T2	500	-	-	ms
T3	250	-	-	ms
T4	0	-	-	ms
T5	1	-	-	ms
T6	-	-	10	ms

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	4,000	5,000	--		1
Surface Luminance (White)		L_{WH}	360	450	--	cd/m^2	2
Luminance Variation		$\delta_{WHITE(9P)}$	--	--	1.3		3
Response Time (G to G)		Tγ	--	5.5	--	Ms	4
Color Gamut		NTSC		72		%	
Color Coordinates							
	Red	R_X	Typ.-0.03	0.645	Typ.+0.03		
		R_Y		0.330			
	Green	G_X		0.290			
		G_Y		0.615			
	Blue	B_X		0.145			
		B_Y		0.055			
	White	W_X		0.280			
		W_Y		0.290			
Viewing Angle							5
	x axis, right(φ=0°)	θ_r	--	89	--	degree	
	x axis, left(φ=180°)	θ_l	--	89	--	degree	
	y axis, up(φ=90°)	θ_u	--	89	--	degree	
	y axis, down (φ=270°)	θ_d	--	89	--	degree	

Note:

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

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

2. Surface luminance is luminance value at point 5 across the LCD surface 50cm from the surface with all pixels displaying white. From more information see FIG 2. When lamp current I_H = 15.5mA. L_{WH}=Lon5 where Lon5 is the luminance with all pixels displaying white at center 5 location.
3. 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})
4. 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 FIG3.

FIG.2 Luminance

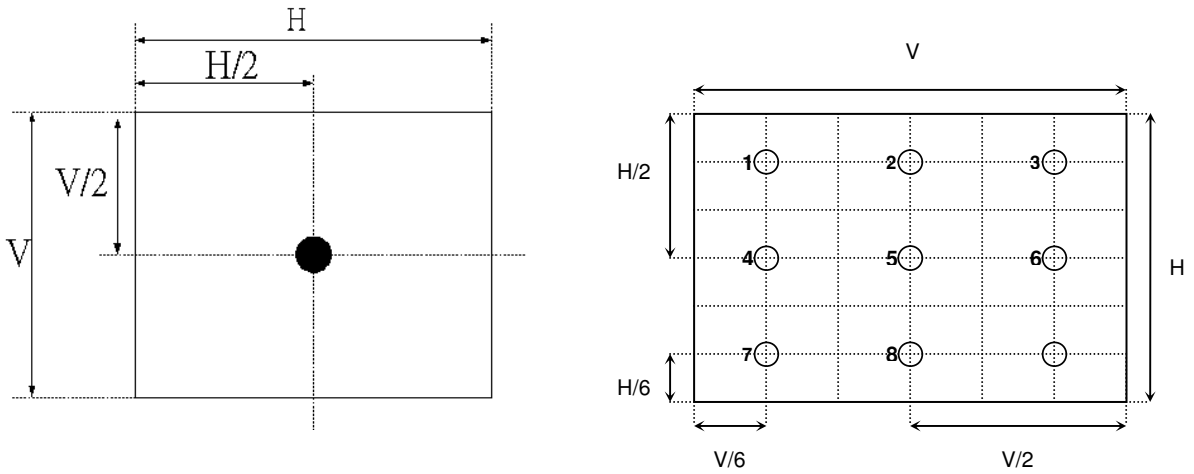
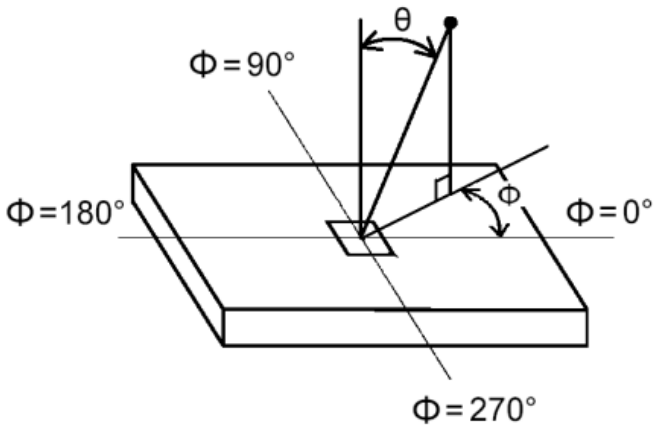


FIG.3 Viewing Angle

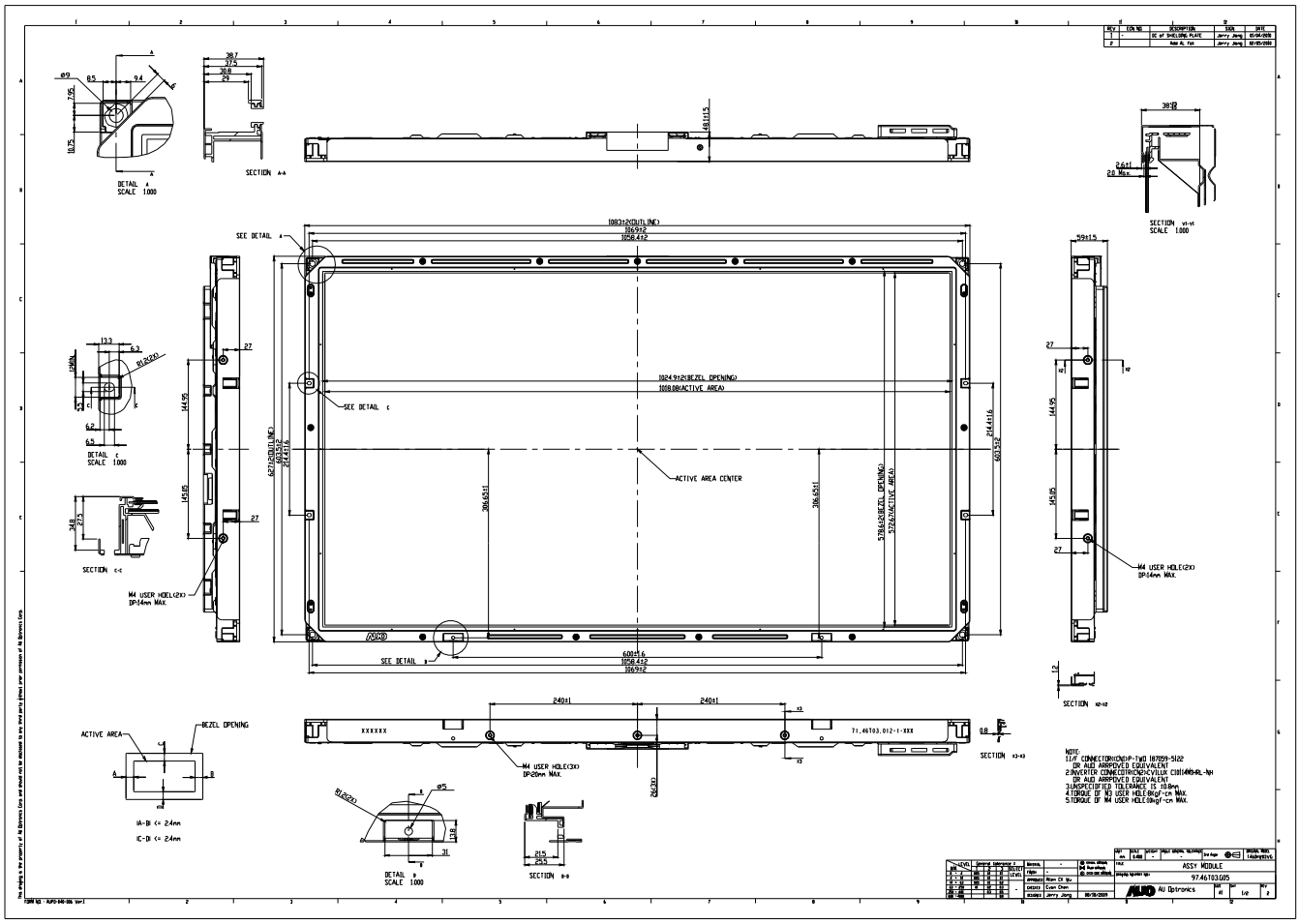


5. Mechanical Characteristics

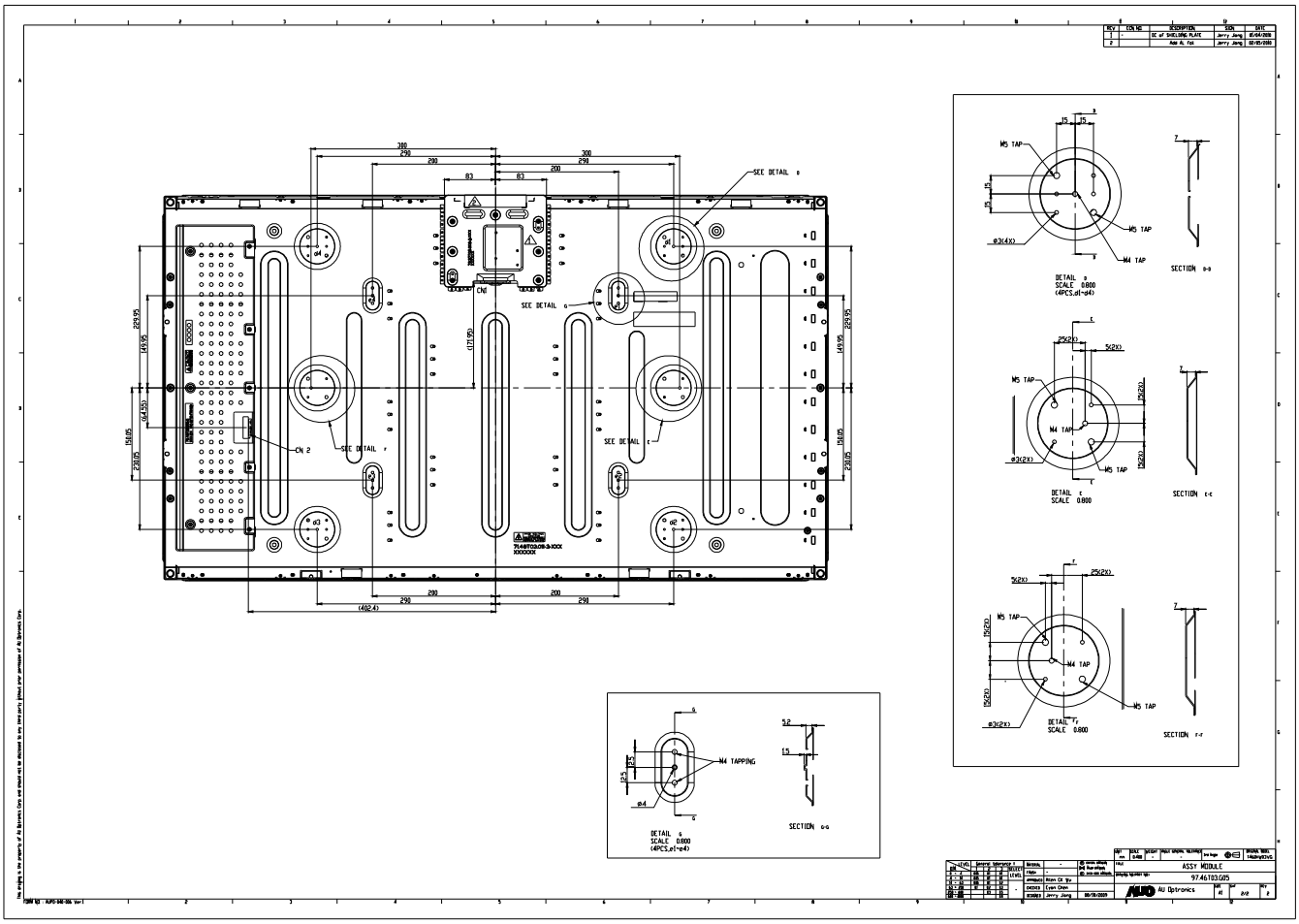
The contents provide general mechanical characteristics for the model T460HW03 VG. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	1083.0mm
	Vertical	627.0mm
	Depth	59.0mm (w/ inverter & shielding)
Bezel Opening	Horizontal	1024.9 mm
	Vertical	578.6 mm
Active Display Area	Horizontal	1018.08 mm
	Vertical	572.67 mm
Weight	13000 g(Typ.)	
Surface Treatment	AG, Haze=11%, 3H	

Front View



Back View



6. Reliability Test Items

	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)	1(PCK)	Random wave (1.5G RMS, 10-200Hz) 30mins/ Per each X,Y,Z axes
8	Drop test (With carton)	1(PCK)	Drop Height: 25.4 cm, 6 Flats (ASTMD4169-I)

7. International Standard

7.1 Safety

(1) UL 60950-1, UL 60065; Standard for Safety of Information Technology Equipment Including electrical Business Equipment.

(2) IEC 60950-1 : 2001, IEC 60065:2001 ; Standard for Safety of International Electrotechnical Commission

(3) EN 60950 : 2001+A11, EN 60065:2002+A1:2006; European Committee for Electrotechnical Standardization (CENELEC), EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

7.2 EMC

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

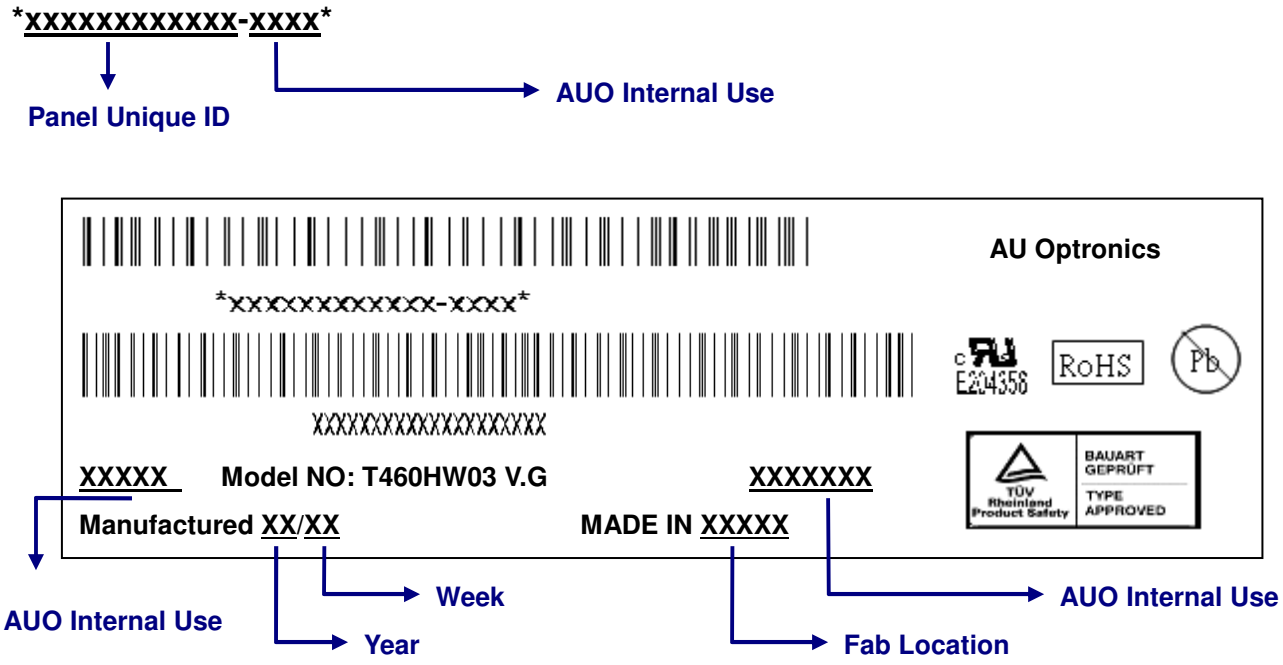
(2) C.I.S.P.R “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.” International Special committee on Radio Interference.

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

8. Packing

8-1 DEFINITION OF LABEL:

A. Panel Label:



Green mark description

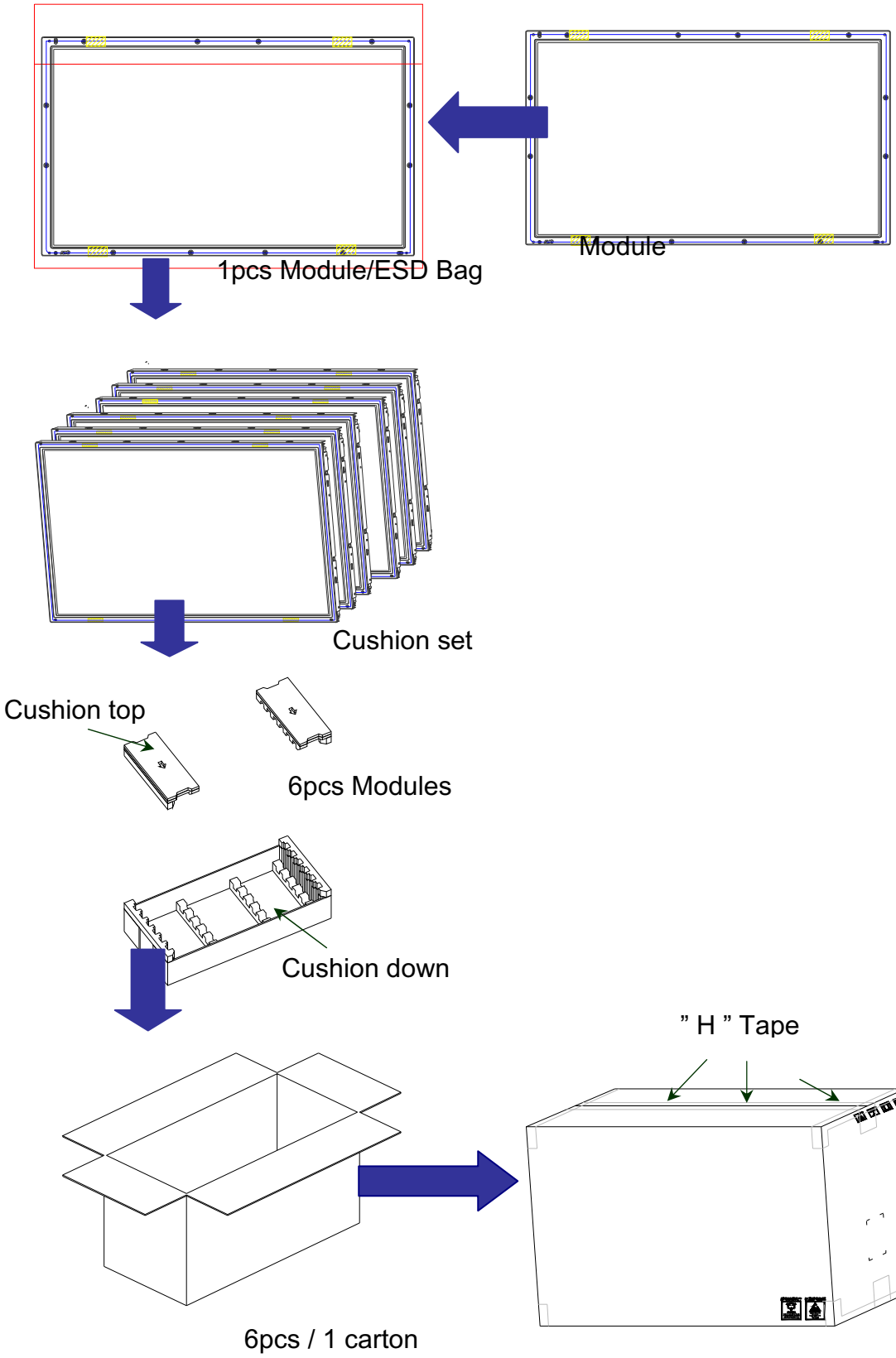
(1) For Pb Free Product, AUO will add Pb for identification.

(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. (definition of green design follows the AUO green design checklist.)

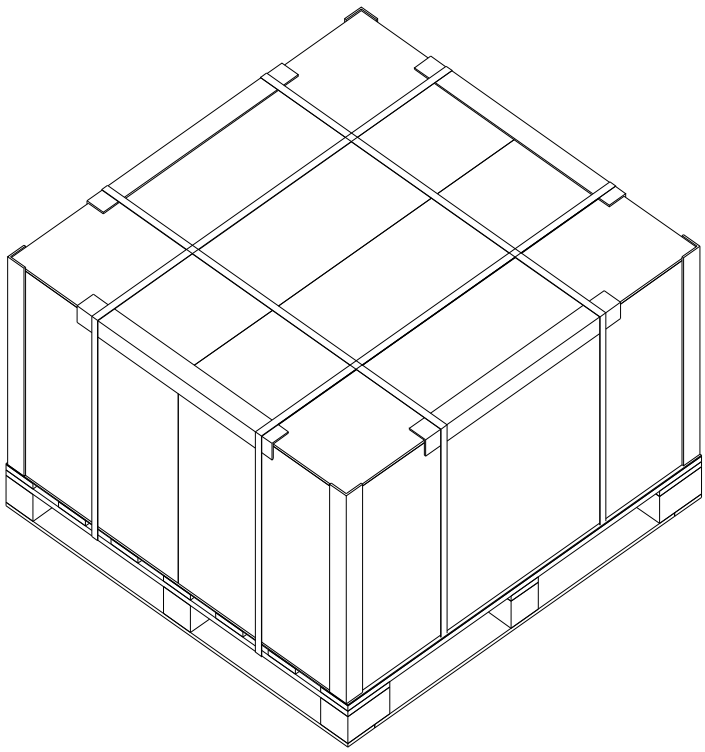
B. Carton Label:

8-2 Packing Methods:



8-3 Pallet and Shipment Information:

	Item	Specification			Packing Remark
		Qty.	Dimension	Weight (kg)	
1	Packing Box	6 pcs/box	1160(L)mm*547(W)mm*680(H)mm	97	
2	Pallet	1	1180(L)mm*1150(W)mm*132(H)mm	18	
3	Boxes per Pallet	2 boxes/Pallet (By Air) ; 2 Boxes/Pallet (By Sea)			
4	Panels per Pallet	12pcs/pallet(By Air) ; 12 pcs/Pallet (By Sea)			
5	Pallet after packing	12(by Air)	1180(L)mm*1150(W)mm*812(H)mm (by Air)	212 (by Air)	
		36(by Sea)	1180(L)mm*1150(W)mm*2436(H)mm (by Sea)	636 (by Sea)	40ft HQ



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 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.

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 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.

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 wristband 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 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.