Document Version: 1.4
Date:2008/7/22

Product Functional Specification

42” Full-HD Color TFT-LCD Module
Model Name: T420HW02 V1

() Preliminary Specification

(*) Final Specification

Note : This specification is subject to change without notice.

Contents

Record of Revision

Version	Date	No	Old Description	New Description	Remark
0.0	2007/10/24		Draft specification first release		
1.0	2008/2/15		Preliminary specification first release		
1.1	2008/6/4			Update LVDS Timing Table	
1.2	2008/6/9			Update LVDS Timing Table	
1.3	2008/7/2			Update power on/off sequence	
1.4	2008/7/22		Carton sixe 1087*285*716 mm	Carton size 1057*283*673 mm	

1. General Description

This specification applies to the 42 inch Color TFT-LCD Module T420HW02 V1. This LCD module has a TFT active matrix type liquid crystal panel 1920x1080 pixels, and diagonal size of 42 inch. This module supports 1920x1080 Full-HD mode (Non-interlace).

Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 10-bit gray scale signal for each dot.

The T420HW02 V1 has been designed to apply the 10-bit 4 channel LVDS interface method. It is intended to support displays where high brightness, wide viewing angle, high color saturation, and high color depth are very important.

* General Information

Items	Specification	Unit	Note
Active Screen Size	42.02	inches	
Display Area	930.24(H) x 523.26(V)	mm	
Outline Dimension	967.0(H) x 559.3(V) x 49.2(D)	mm	With Converter
Driver Element	a-Si TFT active matrix		
Display Colors	1073.7M	Colors	
Color Gamut	85	%	NTSC
Number of Pixels	1920 x 1080	Pixel	
Pixel Pitch	0.4845	mm	
Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally Black		
Light source	LED		
Surface Treatment	AG, 3H		

Absolute Maximum Ratings

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

Item	Symbol	Min	Max	Unit	Note
Power Supply Input Voltage	VDD	-0.3	13.5	[Volt]	1
Logic Input Voltage	Vin	-0.3	3.6	[Volt]	1
BLU Input Voltage	VDDB	-0.3	26.4	[Volt]	1
BLU Brightness Control Voltage	BLON	-0.3	5.0	[Volt]	1
Ambient Operating Temperature	TOP	0	+50	[°C]	2
Ambient Operating Humidity	HOP	10	80	[%RH]	2
Storage Temperature	TST	-20	+60	[°C]	2
Storage Humidity	HST	10	80	[%RH]	2
Shock (non-operation)		-	50	G	3
Vibration (non-operation)		-	1.5	G	4
Thermal shock		-20	60	C	5

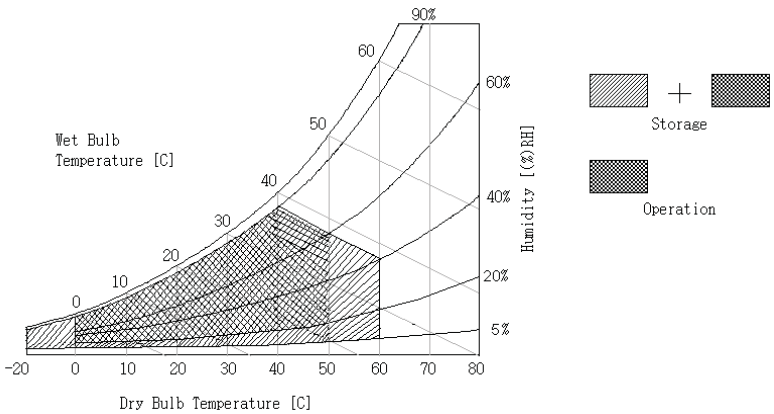
Note 1 : Duration = 50msec

Note 2 : Maximum Wet-Bulb should be 50℃ and No condensation.

Note 3 : Half sine wave, shock level : 50G(11ms), direction : ±x, ±y, ±z (one time each direction)

Note 4 : Wave form : Random, vibration level : 1.5G RMS, Bandwidth : 10~500Hz
Duration : X,Y,Z 30min (one time each direction)

Note 5 : -20C/1hr ~ 60C/1hr, 100 cycles



2. Electrical Specification

The T420HW02 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 LED, is typically generated by an converter.

3-1 Electrical Characteristics

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
LCD:							
Power Supply Input Voltage		Vdd	10.8	12	13.2	Vdc	
Power Supply Input Current		Idd	-	1.12	1.7	A	1
Power Consumption		Pc	-	13.44	22.44	Watt	1
Inrush Current		I_{RUSH}	-	-	**8**	A	5
LVDS Interface	Differential Input High Threshold Voltage	V_{TH}			+100	mV	4
	Differential Input Low Threshold Voltage	V_{TL}	-100			mV	4
	Common Input Voltage	V_{CIM}	0.9	1.2	1.5	V	
CMOS Interface	Input High Threshold Voltage	V_{IH} (High)	2.0		3.3	Vdc	
	Input Low Threshold Voltage	V_{IL} (Low)	0		0.8	Vdc	
Backlight Power Consumption			-	210	231	Watt	2
Life Time				30000		Hours	3

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 LED will drop and the lifetime of LED will be reduced.

Note :

1. Vdd=12.0V, fv=120 Hz, f_{CLK}=80 Mhz , 25℃, Vdd Duration time= 470μs , Test pattern : white pattern

2. The Backlight power consumption shown above does include loss of external converter at 25 ℃. The used lamp current is the lamp typical current
3. The life is determined as the time at which luminance of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25±2℃.
4. VCIM = 1.2V

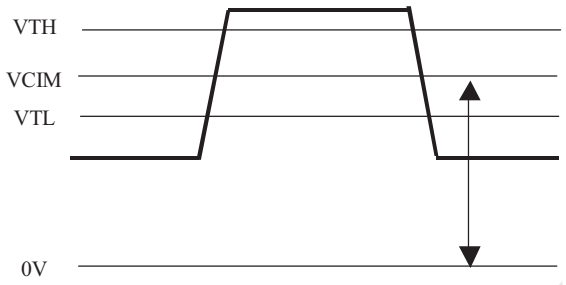
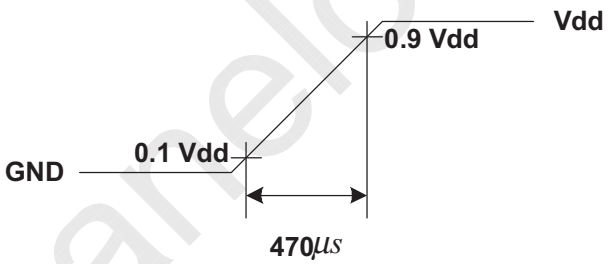


Figure : LVDS Differential Voltage

5. Measurement Condition: Rising time = 470μs



3-2 Interface Connections

- LCD connector 1 : FI-RE51S-HF (JAE) or equivalent

Pin No	Symbol	Description	Note
1	GND	Ground	
2	SDA_TS	SDA for T-sensor	
3	SCL_TS	SCL for T-sensor	
4	NC	No Connect (AUO internal use)	
5	NC	No Connect (AUO internal use)	
6	NC	No Connect (AUO internal use)	
7	LVDS Option	Low/Open for Normal (NS), High for JEIDA	Default : NS mode
8	NC	No Connect (AUO internal use)	
9	NC	No Connect (AUO internal use)	
10	NC	No Connect (AUO internal use)	
11	GND	Ground	
12	R1_0-	LVDS Channel 1, Signal 0-	Channel 1
13	R1_0+	LVDS Channel 1, Signal 0+	
14	R1_1-	LVDS Channel 1, Signal 1-	
15	R1_1+	LVDS Channel 1, Signal 1+	
16	R1_2-	LVDS Channel 1, Signal 2-	
17	R1_2+	LVDS Channel 1, Signal 2+	
18	GND	Ground	
19	R1_CLK-	LVDS Channel 1, Clock -	
20	R1_CLK+	LVDS Channel 1, Clock +	
21	GND	Ground	
22	R1_3-	LVDS Channel 1, Signal 3-	
23	R1_3+	LVDS Channel 1, Signal 3+	
24	R1_4-	LVDS Channel 1, Signal 4-	
25	R1_4+	LVDS Channel 1, Signal 4+	
26	GND	Ground	
27	GND	Ground	
28	R2_0-	LVDS Channel 2, Signal 0-	Channel 2
29	R2_0+	LVDS Channel 2, Signal 0+	
30	R2_1-	LVDS Channel 2, Signal 1-	
31	R2_1+	LVDS Channel 2, Signal 1+	

32	R2_2-	LVDS Channel 2, Signal 2-	
33	R2_2+	LVDS Channel 2, Signal 2+	
34	GND	Ground	
35	R2_CLK-	LVDS Channel 2, Clock -	
36	R2_CLK+	LVDS Channel 2, Clock +	
37	GND	Ground	
38	R2_3-	LVDS Channel 2, Signal 3-	
39	R2_3+	LVDS Channel 2, Signal 3+	
40	R2_4-	LVDS Channel 2, Signal 4-	
41	R2_4+	LVDS Channel 2, Signal 4+	
42	GND	Ground	
43	GND	Ground	
44	GND	Ground	Power
45	GND	Ground	
46	GND	Ground	
47	V_{DD}	Operating Voltage supply, +12V DC regulated	
48	V_{DD}	Operating Voltage supply, +12V DC regulated	
49	V_{DD}	Operating Voltage supply, +12V DC regulated	
50	V_{DD}	Operating Voltage supply, +12V DC regulated	
51	V_{DD}	Operating Voltage supply, +12V DC regulated	

- LCD connector 2 : FI-RE41S-HF (JAE) or equivalent

Pin No	Symbol	Description	Note
1	BL_BIST_EN	High/Open for Normal (HDR), Low for BIST	BL full on enable
2	LVDS_1-	LVDS channel data-	B-con use
3	LVDS_1+	LVDS channel data+	B-con use
4	GND	Ground	B-con use
5	LVDS_0-	LVDS channel CLK-	B-con use
6	LVDS_0+	LVDS channel CLK+	B-con use
7	NC	No Connect (AUO internal use)	
8	NC	No Connect (AUO internal use)	
9	GND	Ground	
10	R3_0-	LVDS Channel 3, Signal 0-	Channel 3

11	R3_0+	LVDS Channel 3, Signal 0+	
12	R3_1-	LVDS Channel 3, Signal 1-	
13	R3_1+	LVDS Channel 3, Signal 1+	
14	R3_2-	LVDS Channel 3, Signal 2-	
15	R3_2+	LVDS Channel 3, Signal 2+	
16	GND	Ground	
17	R3_CLK-	LVDS Channel 3, Clock -	
18	R3_CLK+	LVDS Channel 3, Clock +	
19	GND	Ground	
20	R3_3-	LVDS Channel 3, Signal 3-	
21	R3_3+	LVDS Channel 3, Signal 3+	
22	R3_4-	LVDS Channel 3, Signal 4-	
23	R3_4+	LVDS Channel 3, Signal 4+	
24	GND	Ground	
25	GND	Ground	
26	R4_0-	LVDS Channel 4, Signal 0-	Channel 4
27	R4_0+	LVDS Channel 4, Signal 0+	
28	R4_1-	LVDS Channel 4, Signal 1-	
29	R4_1+	LVDS Channel 4, Signal 1+	
30	R4_2-	LVDS Channel 4, Signal 2-	
31	R4_2+	LVDS Channel 4, Signal 2+	
32	GND	Ground	
33	R4_CLK-	LVDS Channel 4, Clock -	
34	R4_CLK+	LVDS Channel 4, Clock +	
35	GND	Ground	
36	R4_3-	LVDS Channel 4, Signal 3-	
37	R4_3+	LVDS Channel 4, Signal 3+	
38	R4_4-	LVDS Channel 4, Signal 4-	
39	R4_4+	LVDS Channel 4, Signal 4+	
40	GND	Ground	
41	GND	Ground	

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

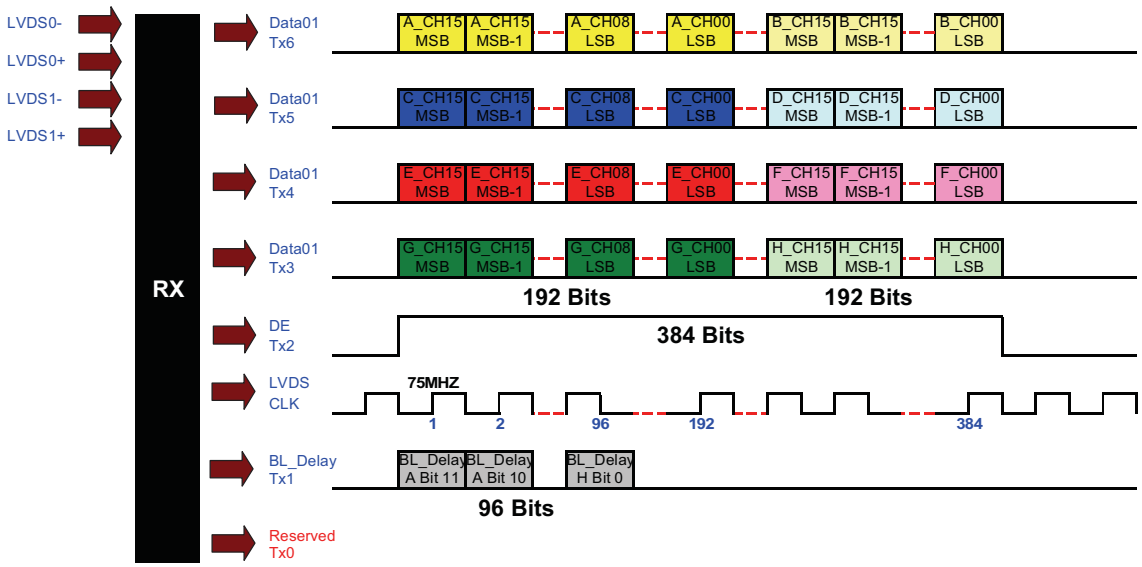
2. All V_{LCD} (power input) pins should be connected.

BCON LVDS data mapping

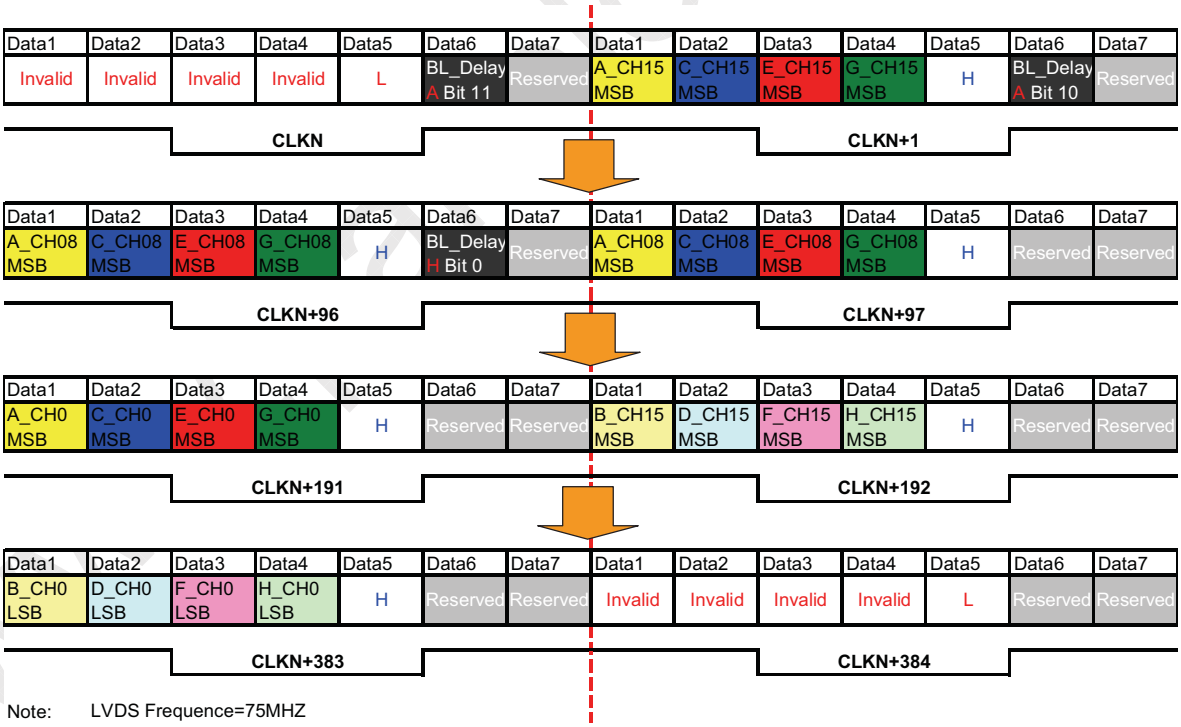
Start Pulses of Gate Drive
Direction of LCDScanning

OFF SET	BL_Delay Value	A~H BL Value	CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0
135	+BL_Delay	ROWA BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
270	+BL_Delay	ROWB BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
405	+BL_Delay	ROWC BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
540	+BL_Delay	ROWD BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
675	+BL_Delay	ROWE BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
810	+BL_Delay	ROWF BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
945	+BL_Delay	ROWG BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
1080	+BL_Delay	ROWH BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits

Note01: BL_Delay Value=1~1080 yclks
Note02: Every Channel BL Value=0~4095 (12Bits)

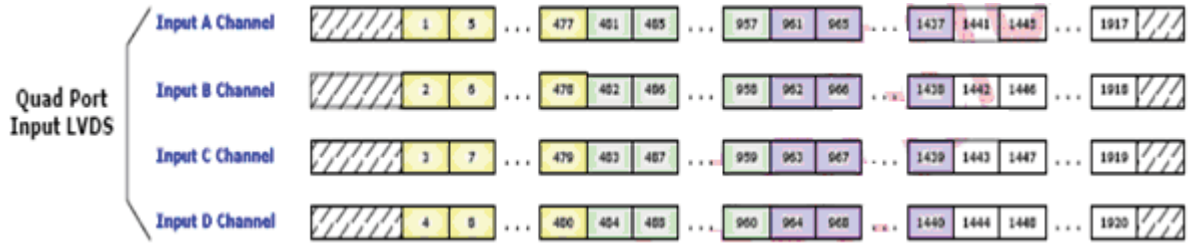


Note: LVDS Frequence=75MH

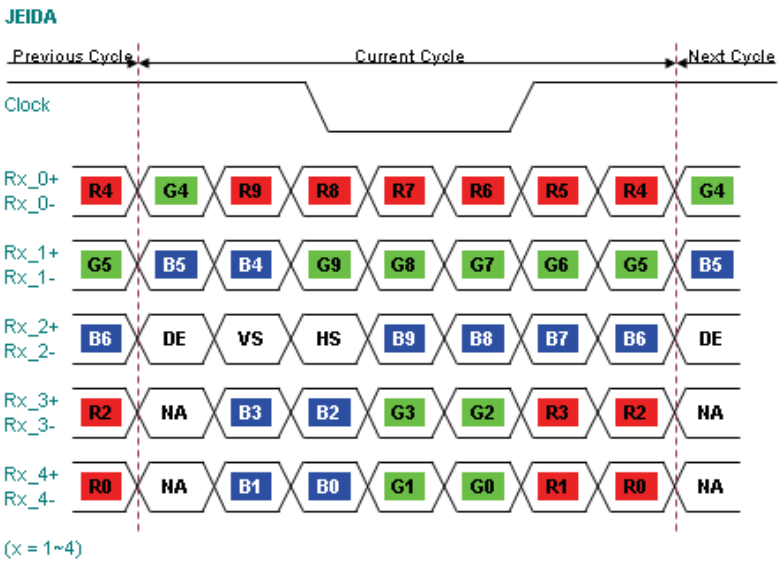


Note: LVDS Frequence=75MHZ

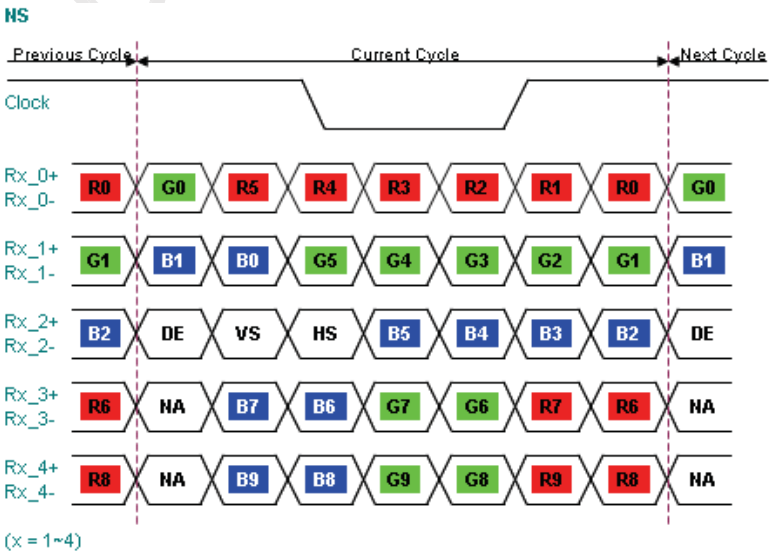
4 CH LVDS data mapping



LVDS Option = High➔JEIDA



LVDS Option = Low/Open➔NS



Thermal Sensor

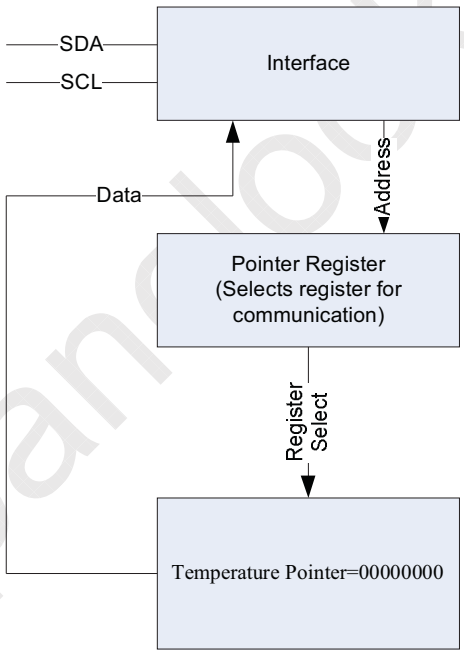
1. DEFINITION OF THE DEVICE ADDRESS

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
1	0	0	1	A2	A1	A0	R/W

Thermal Sensor U1 Address: 94 H

MSB							LSB
1	0	0	1	0	1	0	R/W

2. DEFINITION OF THE REGISTER ADDRESS



INTERNAL REGISTER STRUCTURE

POINTER REGISTER

Register Description	Register Address							
	P7	P6	P5	P4	P3	P2	P1	P0
Temperature Register (Read Only)	0	0	0	0	0	0	0	0

TEMPERATURE REGISTER(Register Address:00000000 B 0 H)

D15	D14	D13	D12	D11	D10	D9	D8
MSB	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1

D7	D6	D5	D4	D3	D2	D1	D0
LSB	×	×	×	×	×	×	×

D0–D6: Undefined

D7–D15: Temperature Data. Two's complement format.

One LSB = 0.5°C.

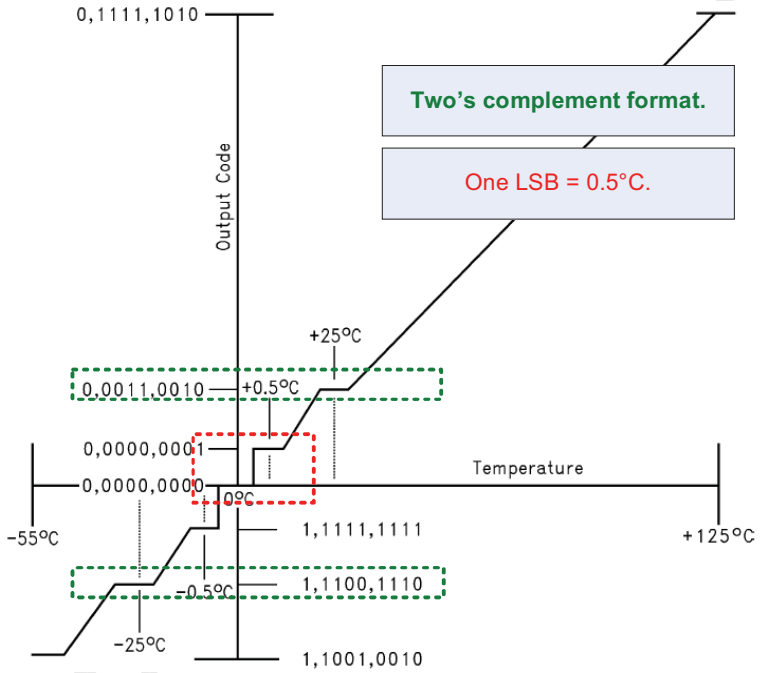
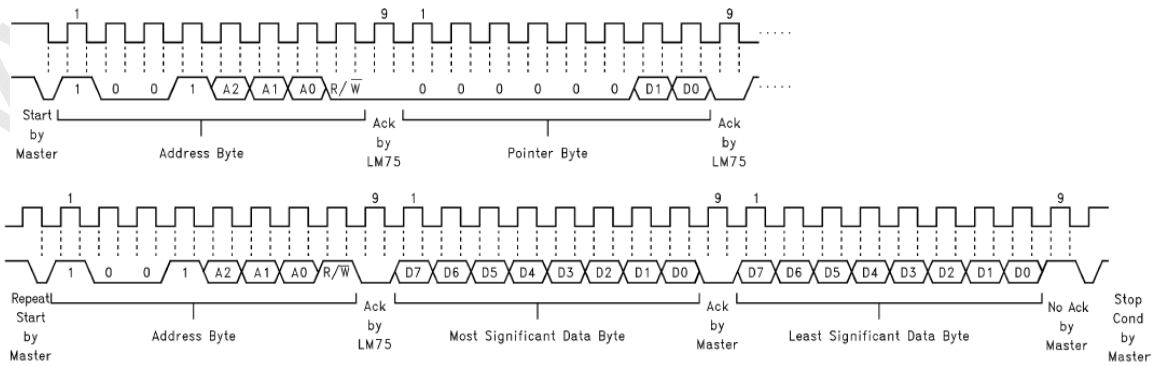


FIGURE Temperature-to-Digital Transfer Function



Backlight Connector Pin Configuration

1. Electrical specification

No	ITEM	SYMBOL		CONDITION	MIN	TYP	MAX	UNIT	Note
1	Input Voltage	V_{DDB}		---	21.6	24.0	26.4	V_{DC}	
2	Input Current	I_{DDB}		V_{DDB}=24V 100% Brightness		7.1	8.5	A_{DC}	
3	Input Power	P_{DDB}		V_{DDB}=24V 100% Brightness	---	170.4	224.4	W	
4	Input inrush current	I_{RUSH}		V_{DDB}=24V 100% Brightness	---	---	TBD	A_{DC}	
5	Output Frequency	F_{BL}		V_{DDB}=24V	---	120	---	Hz	
6	ON/OFF Control Voltage	V_{BLON}	ON	V_{DDB}=24V	2.8	3.3	5.0	V_{DC}	
			OFF	V_{DDB}=24V	0.0	---	0.8	V_{DC}	
7	ON/OFF Control Current	I_{BLON}		V_{DDB}=24V	0	---	2	mA_{DC}	

（Ta=25±5℃, Turn on for 45minutes）

2. Input specification

Master Board:

Connector 1: S14B-PH-SM3-TB(JST) or equivalent

Pin No	Symbol	Description
1	VBL	DC 24V
2	VBL	DC 24V
3	VBL	DC 24V
4	VBL	DC 24V
5	VBL	DC 24V
6	GND_VBL_RETURN	DC 24V return ground
7	GND_VBL_RETURN	DC 24V return ground
8	GND_VBL_RETURN	DC 24V return ground
9	GND_VBL_RETURN	DC 24V return ground
10	GND_VBL_RETURN	DC 24V return ground
11	NA	Not Available
12	V_{BLON}	BLU ON/OFF
13	NA	Not Available
14	NA	Not Available

Slave Board:

Connector 2: S12B-PH-SM3-TB(JST) or equivalent

Pin No	Symbol	Description
1	VBL	DC 24V
2	VBL	DC 24V
3	VBL	DC 24V
4	VBL	DC 24V
5	VBL	DC 24V
6	GND_VBL_RETURN	DC 24V return ground
7	GND_VBL_RETURN	DC 24V return ground
8	GND_VBL_RETURN	DC 24V return ground
9	GND_VBL_RETURN	DC 24V return ground
10	GND_VBL_RETURN	DC 24V return ground
11	NA	Not Available
12	NA	Not Available

3-3 Signal Timing Specifications

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

Timing Table (DE only Mode)

Vertical Frequency Range (120Hz)

Signal	Item	Symbol	Min	Type	Max	Unit
Vertical Section	Period	Tv	1096	1130	1160	Th
	Active	Tdisp (v)		1080		Th
	Blanking	Tblk (v)	16	50	80	Th
Horizontal Section	Period	Th	528	560	580	Tclk
	Active	Tdisp (h)		480		Tclk
	Blanking	Tblk (h)	48	80	100	Tclk
Clock	Frequency	Freq	69.4425	75.936	80.74	MHz
Vertical Frequency	Frequency	Vs	--	120	--	Hz
Horizontal Frequency	Frequency	Hs	131.52	135.6	139.2	KHz

Vertical Frequency Range (100Hz)

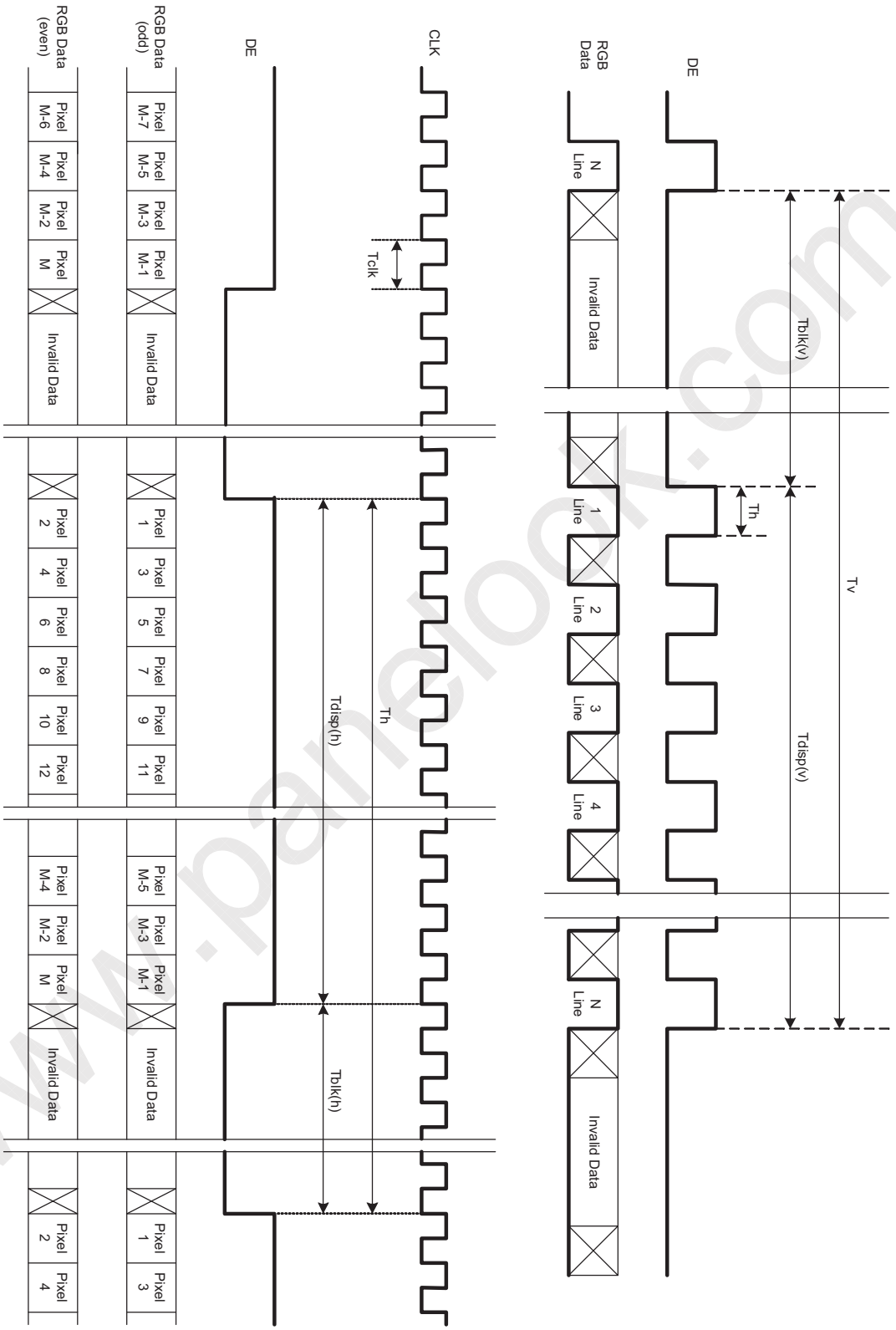
Signal	Item	Symbol	Min	Type	Max	Unit
Vertical Section	Period	Tv	1200	1280	1392	Th
	Active	Tdisp (v)		1080		Th
	Blanking	Tblk (v)	120	200	312	Th
Horizontal Section	Period	Th	550	560	580	Tclk
	Active	Tdisp (h)		480		Tclk
	Blanking	Tblk (h)	70	80	100	Tclk
Clock	Frequency	Freq	66	71.68	80.736	MHz
Vertical Frequency	Frequency	Vs	--	100	--	Hz
Horizontal Frequency	Frequency	Hs	120	128	139.2	KHz

BCON

LVDS Frequency Range (75MHz)

Signal	Item	Symbol	Min	Type	Max	Unit
LVDS Clock	Frequency	Freq	67.5	75	82.5	MHz
LVDS Data	Frequency	Freq	67.5	75	82.5	MHz

3-4 Signal Timing Waveforms



3-5 Color/B-CON Input Data Reference

COLOR 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		Input Color Data																											
		RED										GREEN										BLUE									
		MSB										MSB										MSB									
		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

B-CON data reference

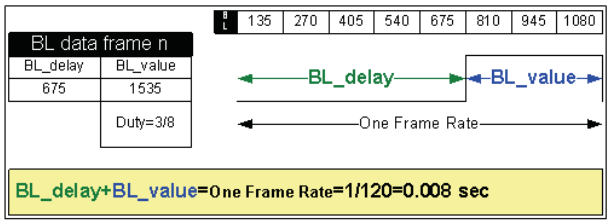
The brightness of each channel is based on the 12 bit gray scale data input.

The brightness of each channel turn on timing is based on yclk.

A~H BL Value		CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0
ROWA	BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
ROWB	BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
ROWC	BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
ROWD	BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
ROWE	BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
ROWF	BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
ROWG	BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits
ROWH	BL Value	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits	12 Bits

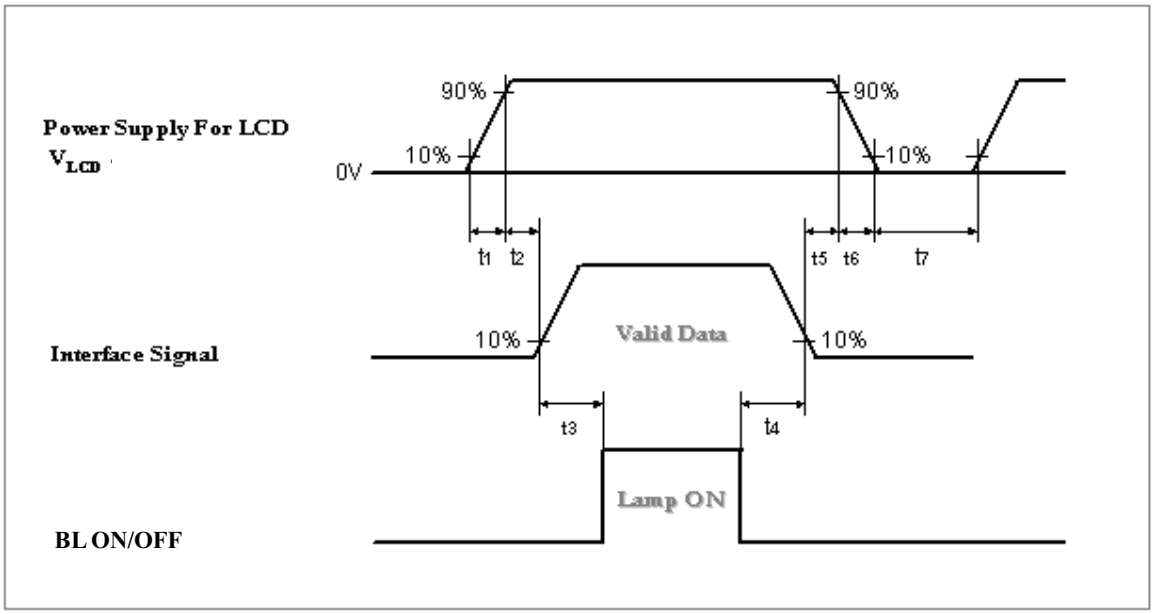
A~H DL Value		Value
ROWA	BL Delay Value	1~1080 yclks
ROWB	BL Delay Value	1~1080 yclks
ROWC	BL Delay Value	1~1080 yclks
ROWD	BL Delay Value	1~1080 yclks
ROWE	BL Delay Value	1~1080 yclks
ROWF	BL Delay Value	1~1080 yclks
ROWG	BL Delay Value	1~1080 yclks
ROWH	BL Delay Value	1~1080 yclks

Note: BL Delay Value+BL Value=1Frame



3-6 Power Sequence

1. Power sequence of panel

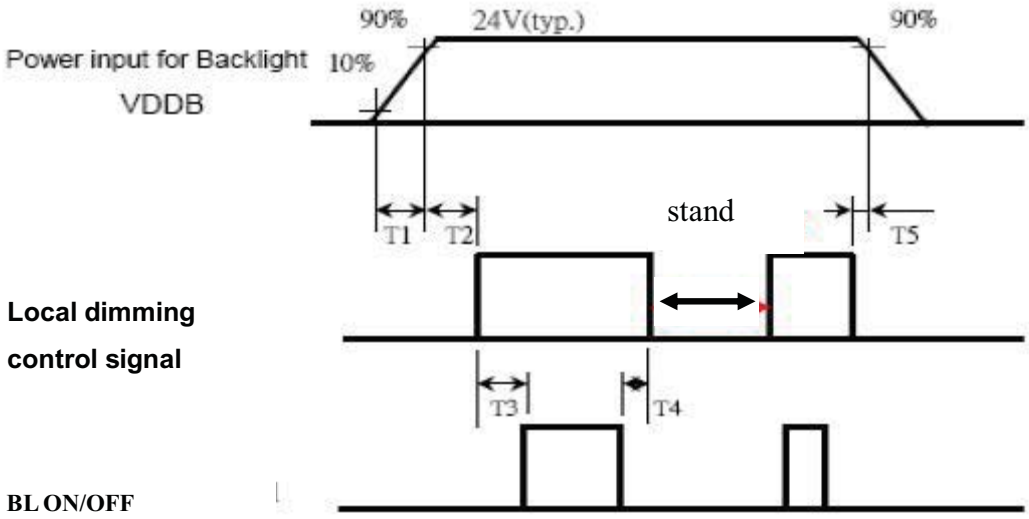


Parameter	Values			Units
	Min.	Typ.	Max.	
t1	470	-	5000	us
t2	20	-	50	ms
t3	500	-	-	ms
t4	200	-	-	ms
t5	50	-	-	ms
t6	0.47	-	30	ms
t7	1	-	-	s

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.

2. Power sequence of IP converter



Parameter	Values			Units
	Min.	Typ.	Max.	
T1	20	-	-	ms
T2	200	-	-	ms
T3	20	-	300-	ms
T4	5	-	-	ms
T5	5	-	-	ms

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°.

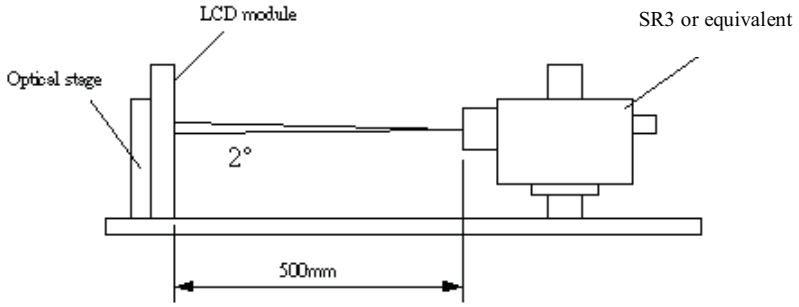


Fig.4-1 Optical measurement equipment and method

Parameter		Symbol	Values			Units	Notes
			Min.	Typ.	Max.		
Contrast Ratio		CR	2000	2500			1
Surface Luminance, white		LWH	420	490		cd/m²	2
Luminance Variation		δ_{WHITE} 5p			1.3		3
Response Time (Average)		T_γ		(4)		ms	4,5 (Gray to Gray)
	Rise Time	Tr		15		ms	4
	Decay Time	Tf		5		ms	4
Color Coordinates							
	RED	R_X	Typ.-0.03	0.663	Typ.+0.03		
		R_Y		0.327			
	GREEN	G_X		0.271			
		G_Y		0.634			
	BLUE	B_X		0.15			
		B_Y		0.052			
	WHITE	W_X		0.271			
		W_Y		0.286			
Viewing Angle							Contrast Ratio>10
	x axis, right(φ=0°)	θ_r		89		Degree	6
	x axis, left(φ=180°)	θ_l		89			
	y axis, up(φ=90°)	θ_u		89			
	y axis, down (φ=0°)	θ_d		89			
Gamma				2.3			

Note:

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

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

2. Surface luminance is luminance value at point 1 across the LCD surface 50cm from the surface with all pixels displaying white. From more information see Fig. 4-2. When V_{DDB} = 24V, I_{DDB} = 6.4A. $L_{WH}=L_{on1}$, Where L_{on1} is the luminance with all pixels displaying white at center 1 location.

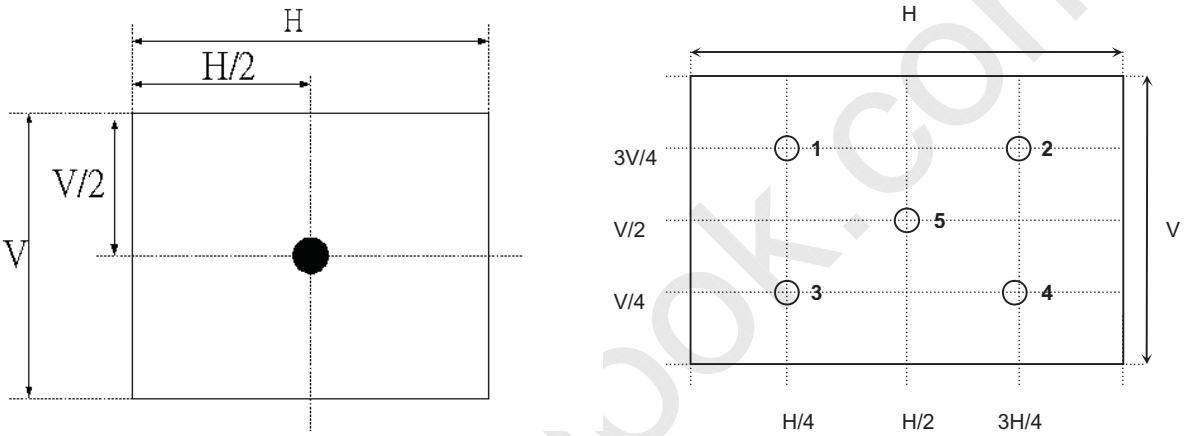


Fig.4-2 Optical measurement point

3. The variation in surface luminance, δ_{WHITE} is defined under 100% brightness as:

$$\delta_{WHITE(5P)} = \text{Maximum}(L_{on1}, L_{on2},\ldots,L_{on5}) / \text{Minimum}(L_{on1}, L_{on2},\ldots L_{on5})$$

4. Response Time:

(a) Tr = full black to full white, 10%~90%

(b) Tf = full white to full black, 90%~10%

(c) G-to-G: average response time among brightness of 0%, 25%, 50%, 75% &100%.

	0%	25%	50%	75%	100%
0%		tr: 0%→25%	tr: 0%→50%	tr: 0%→75%	tr: 0%→100%
25%	tf: 25%→0%		tr: 25%→50%	tr: 25%→75%	tr: 25%→100%
50%	tf: 50%→0%	tf: 50%→25%		tr: 50%→75%	tr: 50%→100%
75%	tf: 75%→0%	tf: 75%→25%	tf: 75%→50%		tr: 75%→100%
100%	tf: 100%→0%	tf: 100%→25%	tf: 100%→50%	tf: 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. 4-3. (Optical measurement by SR3)

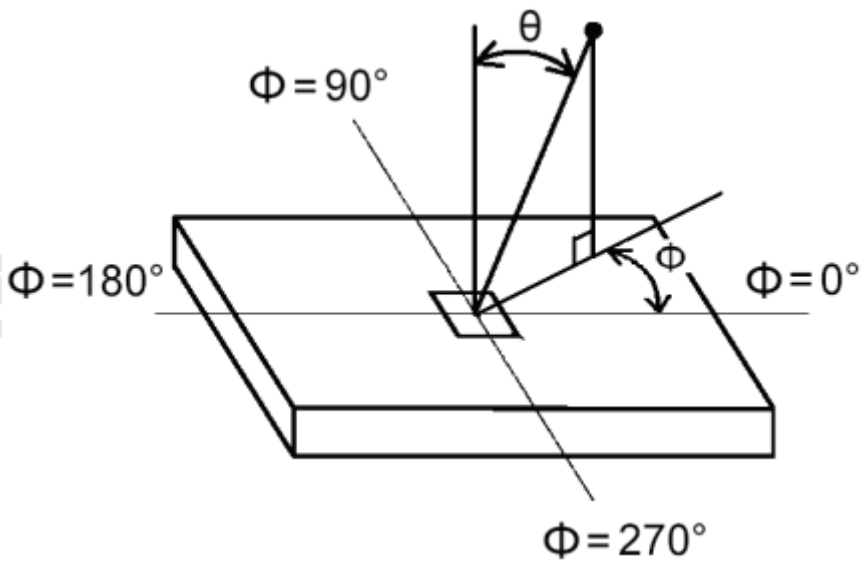


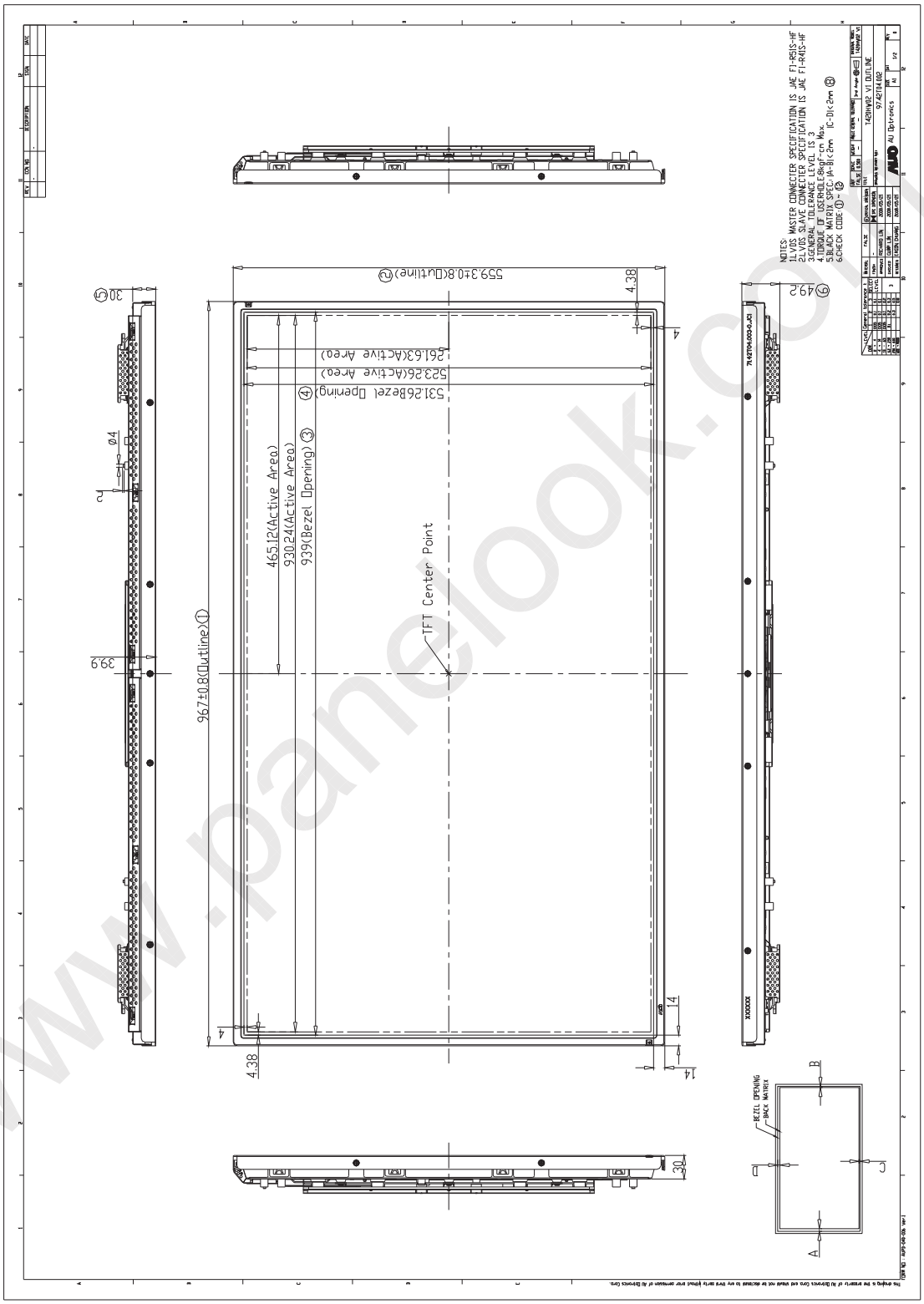
Fig.4-3 Viewing Angle Definition

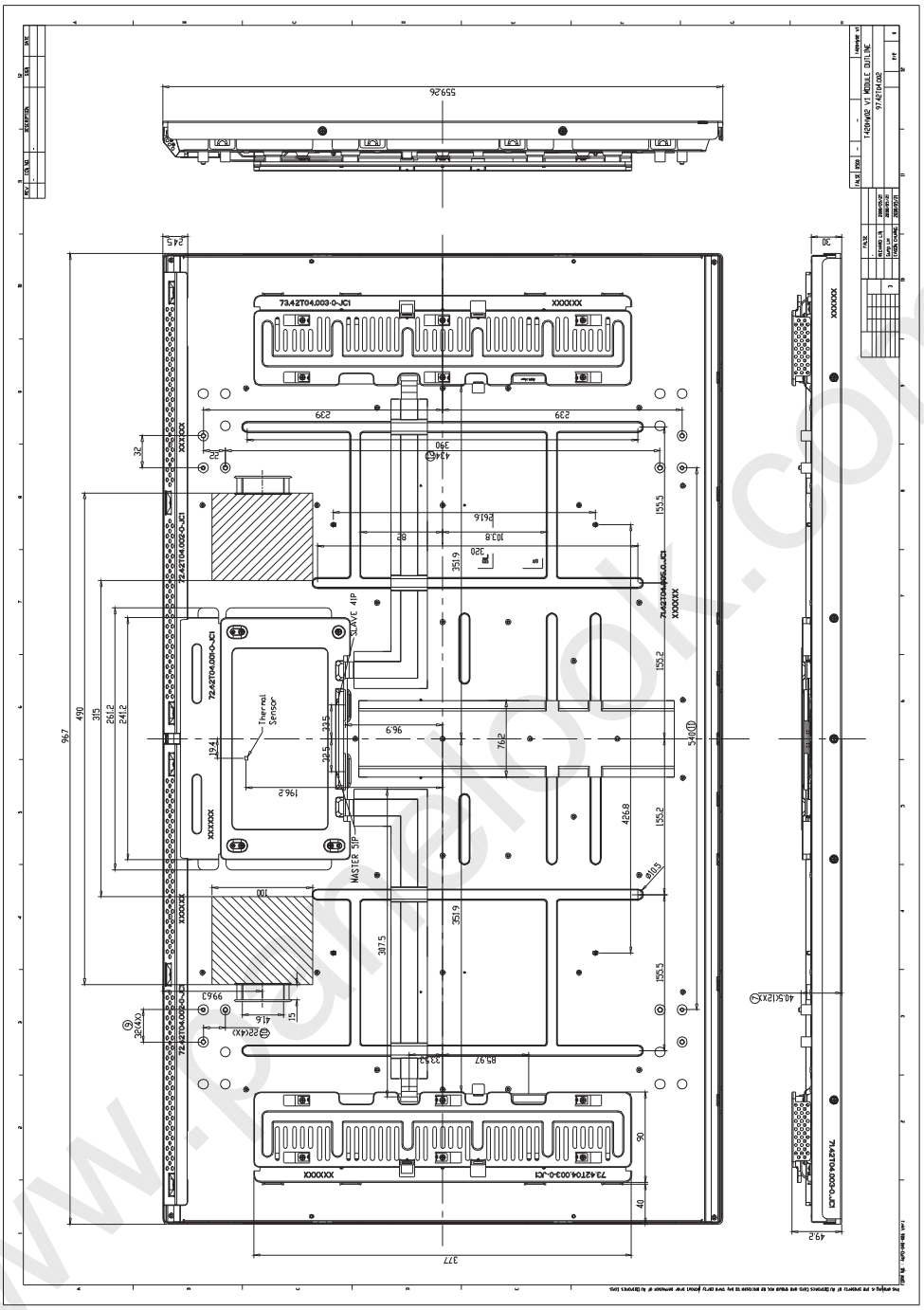
5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model T420HW01. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal (typ.)	967.0mm
	Vertical (typ.)	559.3mm
	Depth (typ.)	49.2mm (with converter)
Bezel Area	Horizontal (typ.)	939.0mm
	Vertical (typ.)	531.26mm
Active Display Area	Horizontal	930.24mm
	Vertical	523.26mm
Weight	13000g (Max.)	
Surface Treatment	AG, 3H	

2D drawing





6. Reliability

Environment test condition

No	Test Item	Condition
1	**High temperature storage test**	Ta=60℃, 300hr judge
2	**Low temperature storage test**	Ta=-20℃, 300hr judge
3	**High temperature/High humidity test**	Ta=50℃, 80%RH, 300hr judge
4	**High temperature operation test**	Ta=50℃, 300hr judge
5	**Low temperature operation test**	Ta=0℃, 300hr judge
6	**Vibration test (non-operating)**	Wave form: random Vibration level : 1.5G RMS Bandwidth : 10-500Hz Duration: X, Y, Z 30min one time each direction
7	**Shock test (non-operating)**	Shock level: 50G Waveform: half sine wave, 11ms Direction: ±X, ±Y, ±Z One time each direction Time cycle no.: once for each time
8	**Vibration test (with carton)**	Random wave (1.5Grms 10~200Hz) 30mins / Per each X.Y.Z axes
9	**Drop test (with carton)**	Height: 31 cm 1 corner, 3 edges, 6 surfaces (ASTMD4169-I)

7. International Standard

7-1. Safety

(1) UL60065, Underwriters Laboratories, Inc. (AUO file number : E204356)
Standard for Safety of Information Technology Equipment Including electrical Business Equipment.

(2) CSA E60065, Canadian Standards Association
Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.

(3) IEC 60065 ver. 7th,European Committee for Electro technical Standardization (CENELEC)
EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

7-2. EMC

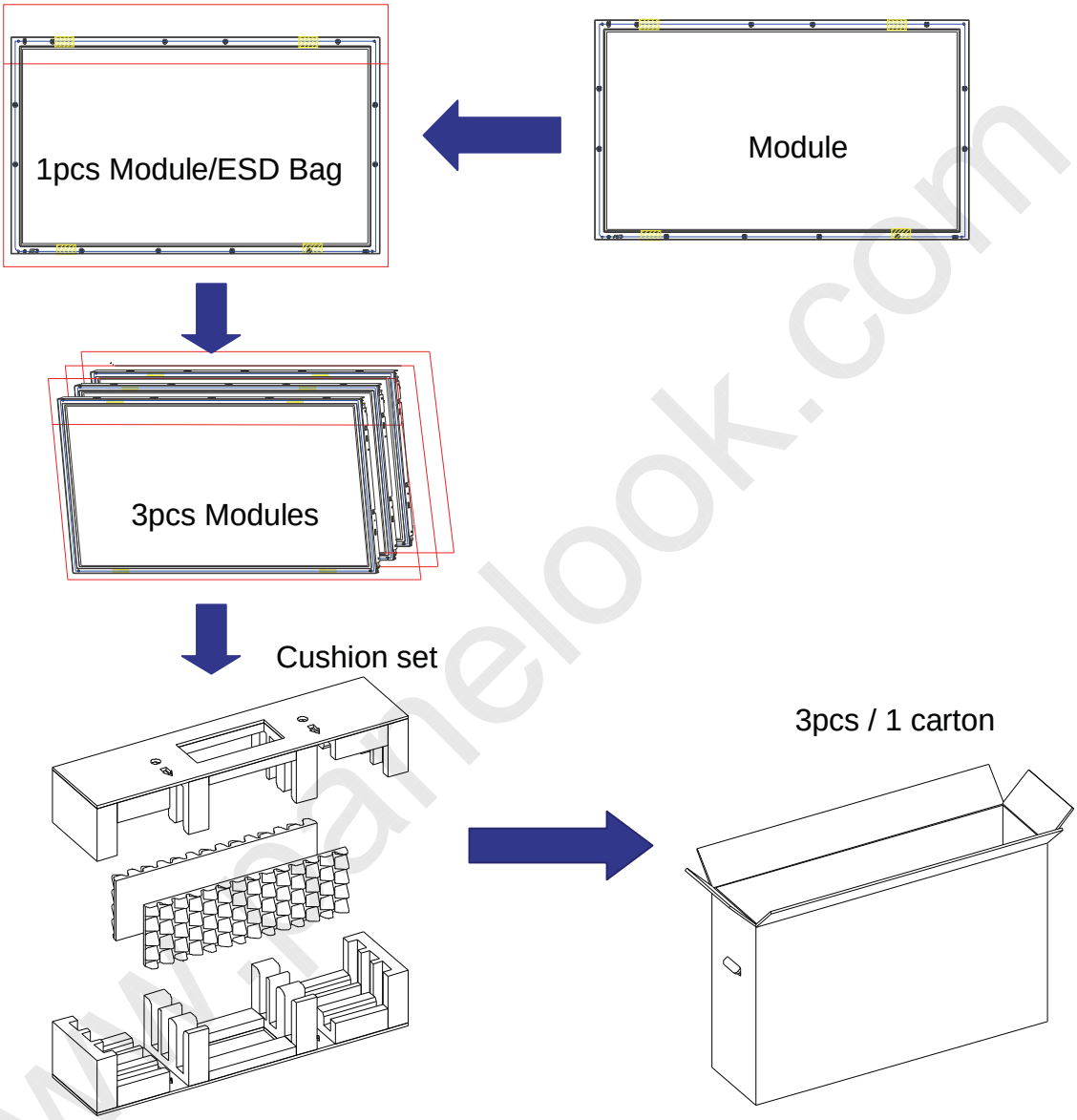
(1) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHz to 40GHz. “American National standards Institute(ANSI), 1992

(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

(2) Packing

Packing Instruction



Package information:

Carton outside dimension : 1057*283*673mm

Carton/Package weight : 3kg

Shipping label

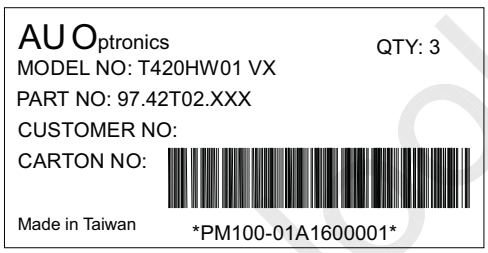
Green Mark Description:

For Pb Free products, AUO will add for identification.

For RoHS compatible products, AUO will add 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.)

Carton label



Pallet information

By air cargo : : (4x1) x2 layers, one pallet put 8 boxes, total 24 pcs module.

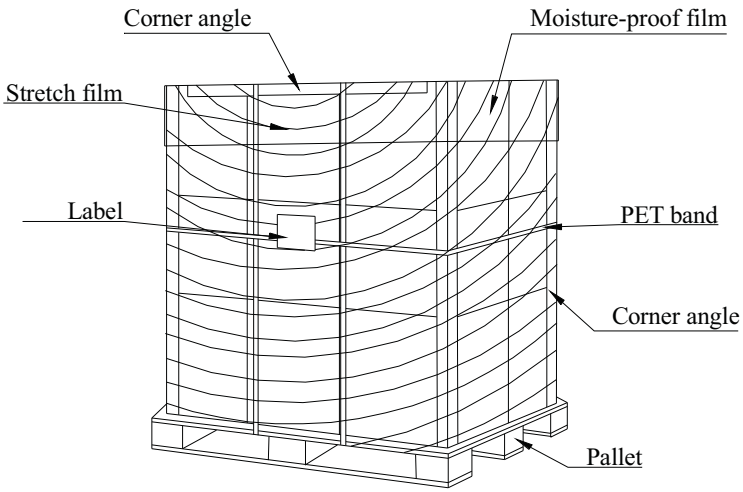
By sea : (4x1) x3 layers, one pallet put 12 boxes, total 36 pcs module.

Pallet dimension : 1150x1100x120mm

Pallet weight : 10kg

By air total weight : 40.8 kg/box X 8 boxes=326.4 kg (with pallet weight 336.4kg)

By sea total weight : 40.8 kg/box X 12 boxes=489.6 kg (with pallet weight 499.6kg)



(3) 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 on back side of panel.

(2) 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.

(3) You should adopt radiation structure to satisfy the temperature specification.

(4) 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.

(5) 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.)

(6) 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.

(7) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

(8) Do not open the case because inside circuits do not have sufficient strength.

9-2 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.

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.