Model Name: P550QVN01.0
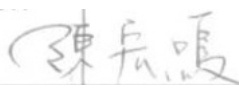
Issue Date : 2014/07/30

(∗)Preliminary Specifications
(   )Final Specifications

Customer Signature	Date	AUO	Date
Approved By _____		Approval By PM Director Kelly Kao _____	
Note		Reviewed By RD Director Eugene CC Chen _____ Reviewed By Project Leader Alex HM Chen _____	
		Prepared By PM Rafael Lu _____	

Record of Revision

Version	Date	Page	Description
0.0	2014/4/29		First preliminary spec release
0.1	2014/5/9	28	Update drop spec
0.2	2014/7/30	4	Update Rotate Function & Display Orientation
		6	3.1.1 Electrical Characteristics(Ta = 25 ± 2 ℃)
		6	Update Life time (MTTF) (min 50000hr--> 35000hr)
		6	Update power supply Input Current (typ. 0.51-->0.62; max. 2.05-->2.16)
		6	Update power Consumption value(typ. 6.12-->7.41; 29.55-->31.1)
		7	3.1.2 AC Characteristics(Ta = 25 ± 2 ℃)
		13	Add Open / High(3.3V) / Low(GND) description
		20	3.7.1 Electrical specification(Ta = 25 ± 2 ℃)
		20	Update input current(typ 4.02-->5.03; max 4.40-->5.42)
		20	Update input power value(typ. 96.5-->120.8; max 105.6-->136.7)
		35	Add 9-3 Operating Condition for Public Information Display

1. General Description

This specification applies to the 55 inch Color TFT-LCD Module P550QVN01.0. This LCD module has a TFT active matrix type liquid crystal panel 3,840x2,160 pixels, and diagonal size of 55 inch. This module supports 3,840x2,160 mode. 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 P550QVN01.0 has been designed to apply the 8 lane V by one interface method. It is intended to support displays where high brightness, wide viewing angle, high color saturation, and high color depth.

* General Information

Items	Specification	Unit	Note
Active Screen Size	55	Inch	
Display Area	1209.6(H) x 680.4(V)	mm	
Outline Dimension	1235.6(H) x 706.4(V) x 25.5(D)	mm	1
Driver Element	a-Si TFT active matrix		
Display Colors	10bit(8bit+FRC)	Colors	
Number of Pixels	3,840x2,160	Pixel	
Pixel Pitch	0.315 (H) x 0.315(W)	mm	
Pixel Arrangement	RGB vertical stripe		
Display Operation Mode	Normally Black		
Display Orientation	Landscape/Portrait Enable		
Surface Treatment	AG		Haze = 11%
Rotate Function	Unachievable		Note 2
Display Orientation	Portrait/Landscape Enabled		Note 3

Note 1: Dmax: 21.05mm (Front bezel to Source board); Dmin: 9.9mm (Front bezel to Bezel back)

Note 2: Rotate Function refers to LCD display could be able to rotate. This function does not work in this model.

Note 3: Please refer to 5.1 Placement Suggestions.

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	[^{o}C]	Note 2
Operating Humidity	HOP	10	90	[%RH]	Note 2
Storage Temperature	TST	-20	+60	[^{o}C]	Note 2
Storage Humidity	HST	10	90	[%RH]	Note 2
Panel Surface Temperature	PST		65	[^{o}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
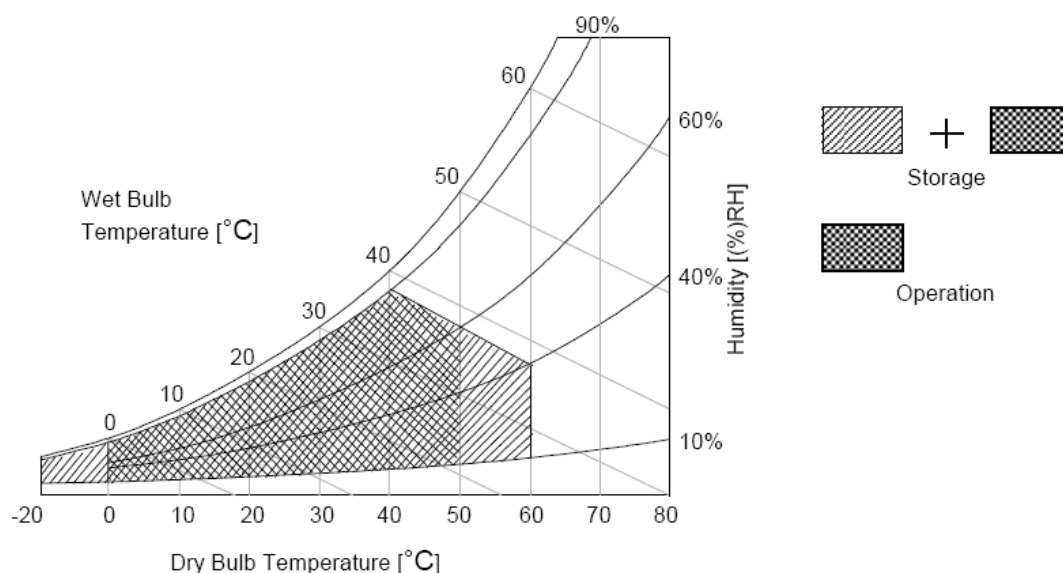
3. Electrical Specification

The P550QVN01.0 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second is employed for LED driver.

3.1   Electrical Characteristics

3.1.2   Electrical Characteristics(Ta = 25 ± 2 ℃)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max		
LCD							
Power Supply Input Voltage		V_{DD}	10.8	12	13.2	V_{DC}	
Power Supply Input Current		I_{DD}	--	0.62	2.16	A	1
Power Consumption		P_C	--	7.44	31.1	Watt	1
Inrush Current		I_{RUSH}	-	-	5	A	2
Permissible Ripple of Power Supply Input Voltage (for input power=12V)		V_{RP}	--	--	$V_{DD} * 5\%$	$mV_{pk\text{-}pk}$	3
CMOS Interface	Input High Threshold Voltage	V_{IH} (High)	2.7	--	3.3	V_{DC}	4
	Input Low Threshold Voltage	V_{IL} (Low)	0	--	0.6	V_{DC}	4
V-by-one Interface	CML Differential Input High Threshold	V_{RTH}	+50	--	--	mV_{DC}	
	CML Differential Input Low Threshold	V_{RTL}	--	--	-50	mV_{DC}	
	CML Common mode Bias Voltage	V_{RCT}	0.8	0.9	1.0	V_{DC}	
Backlight Power Consumption		P_{BL}		114.8	123.7	Watt	P_{BL}
Life time (MTTF)			35000			Hour	

3.1.2 AC Characteristics(Ta = 25 ± 2 ℃)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max		
V-by-one Interface	VRXINP/N input each bit Period	T_{RRIP} (UI)	413	--	505	ps	8bit 6
			310	--	379	ps	10bit 6
	CDR lock time(CDR training)	T_{RLCK0}	--	--	1.0	ms	6
	Receiver Clock : Spread Spectrum Modulation range	Fclk_ss	Fclk -0.5%	--	Fclk +0.5%	MHz	5
	Receiver Clock : Spread Spectrum Modulation frequency	Fss		30		KHz	5
	ALN Training	T_{RALN}	--	30720	--	UI	8bit 6
			--	40960	--	UI	10bit 6
	PDX active to hot plug enable	T_{RHPD0}	--	--	1.0	us	6
	Intra-pair skew	T_{INTRA}	--	--	0.3	UI	7
	Inter-pair skew	T_{INTER}	--	--	5	UI	8
	Eye diagram at receiver	A_X	--	0.25	--	UI	9
		A_Y	--	0	--	mV	
		B_X	--	0.3	--	UI	
		B_Y	--	50	--	mV	
		C_X	--	0.7	--	UI	
		C_Y	--	50	--	mV	
		D_X	--	0.75	--	UI	
		D_Y	--	0	--	mV	
		E_X	--	0.7	--	UI	
		E_Y	--	-50	--	mV	
		F_X	--	0.3	--	UI	
		F_Y	--	-50	--	mV	
I2C Interface1	**AUO 12411**						
	SCL clock frequency	fSCL	-	-	400	kHz	10
	Clock Pulse Width Low	tLOW	1.3	-	-	us	
	Clock Pulse Width High	tHIGH	0.6	-	-	us	
	Clock Low to Data Output Valid	tAA	1.1	-	-	us	
	Start Setup Time	tSTASU	0.6	-	-	us	
	Start Hold Time	tSTAHD	0.6	-	-	us	
	Stop Setup Time	tSTOSU	0.6	-	-	us	
	Data In Setup Time	tDSU	0.2	-	-	us	
	Data In Hold Time	tDHD	0	-	-	us	
	SCL/SDA Rise Time	tR	-	-	0.3	us	
	SCL/SDA Fall Time	tF	-	-	0.3	us	
	SCL clock frequency						

3.1.3 Driver Characteristics

Item	Symbol	Min	Max	Unit	condition
Driver Surface Temperature	DST		100	[℃]	Note

Note : Any point on the driver surface must be less than 100℃ under any conditions.
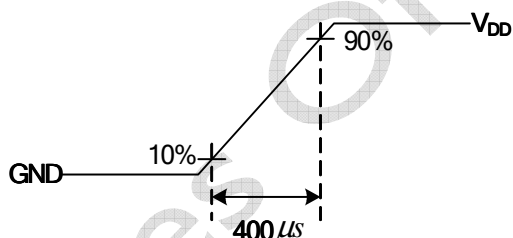
3.1.4 TCON Characteristics

Item	Symbol	Min	Max	Unit	condition
TCON Surface Temperature	TST		85	[℃]	Note

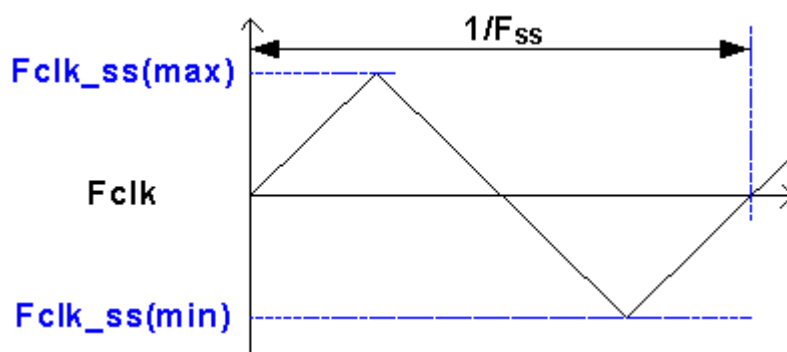**Note: Any point on the TCON surface must be less than 85℃ under any conditions.**

Note :

1. Test Condition:
    (1) V_{DD} = 12.0V
    (2) Fv = Type Timing, 60Hz, 120Hz or Other
    (3) F_{CLK} = Max freq.
    (4) Temperature = 25 ℃
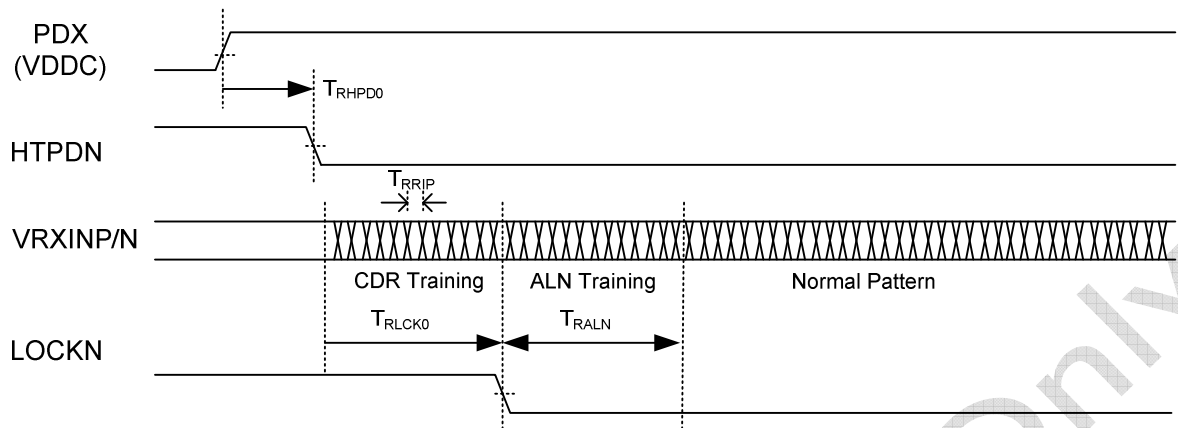   (5) Test Pattern : White Pattern

2. Measurement condition : Rising time = 400us

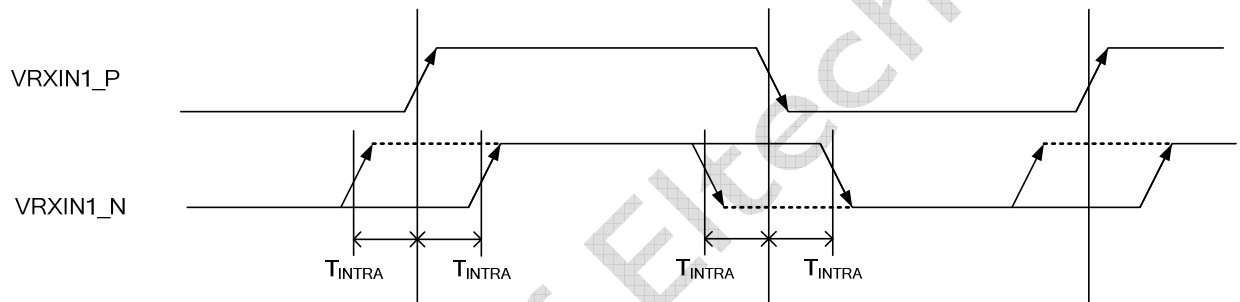3. Test Condition:
    (1) The measure point of V_{RP} is in LCM side after connecting the System Board and LCM.
    (2) Under Max. Input current spec. condition.

4. The measure points of VIH and VIL are in LCM side after connecting the System Board and LCM

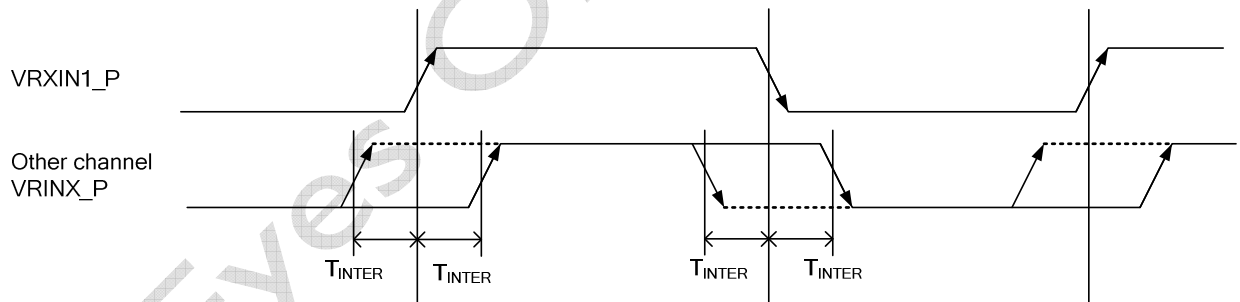5. LVDS Receiver Clock SSCG (Spread spectrum clock generator) is defined as below figures

6. V-by-one Receiver start up timing waveform

PDX (VDDC)

T_{RHPD0}

HTPDN

T_{RRIP}

VRXINP/N

CDR Training | ALN Training | Normal Pattern

T_{RLCK0} | T_{RALN}

LOCKN

7. V-by-one Intra-pair Skew

VRXIN1_P

VRXIN1_N

T_{INTRA} | T_{INTRA} | T_{INTRA} | T_{INTRA}

8. V-by-one Inter-pair Skew

VRXIN1_P

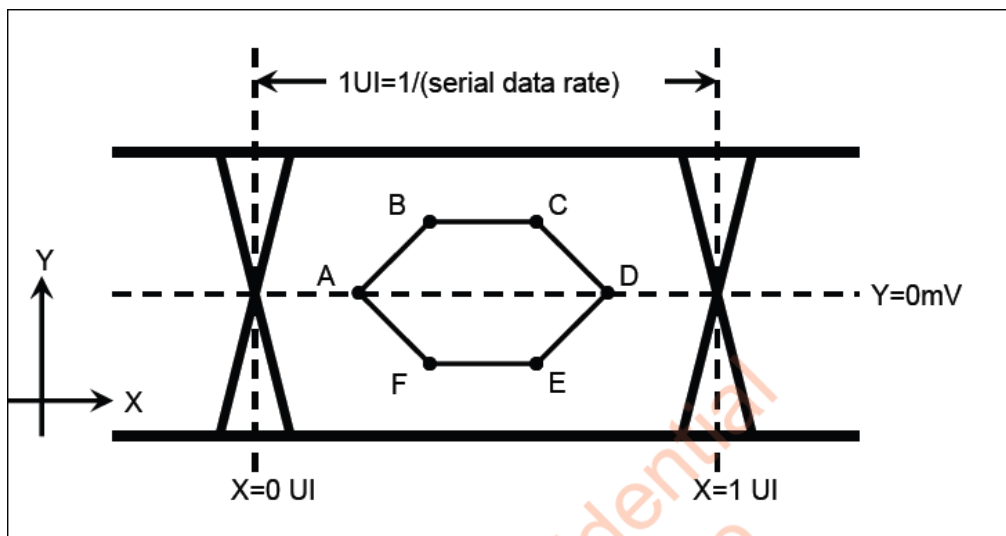Other channel VRINX_P

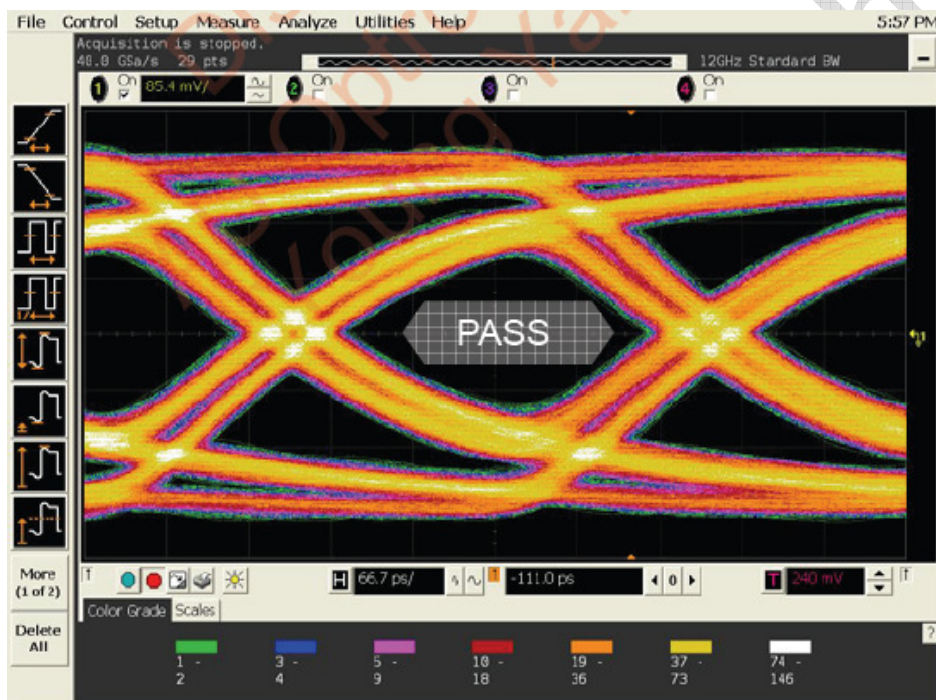T_{INTER} | T_{INTER} | T_{INTER} | T_{INTER}
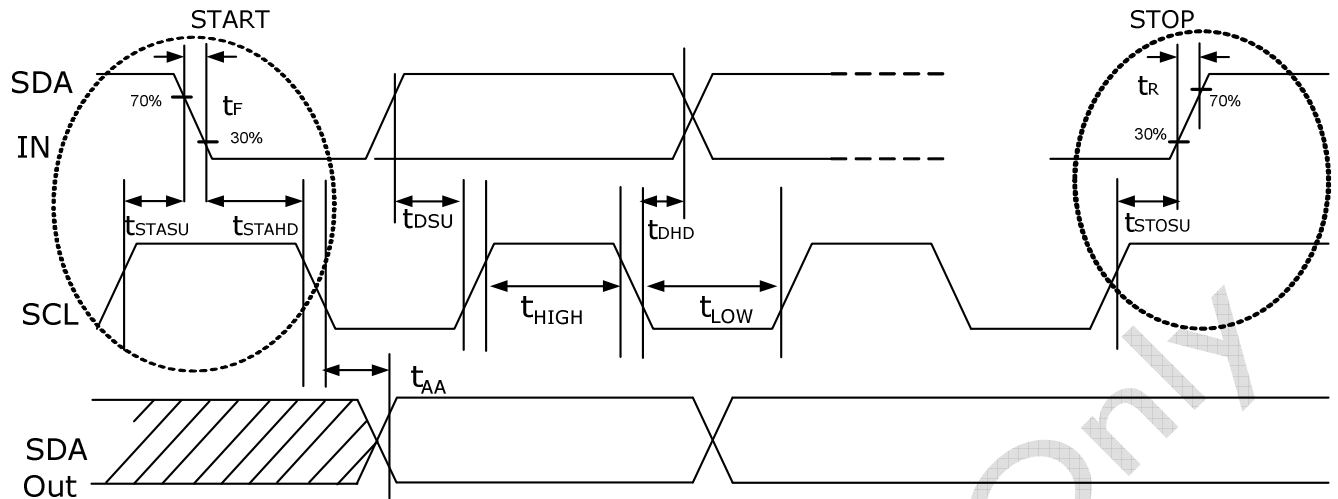
9. Eye diagram at receiver

Eye Mask

Example of Eye diagram

10. I2C Read/Write Timing

3.2 Interface Connections

● **LCD connector : P-TWO 187059-5122 (51pin)**

1	VIN	12V	26	LOCKN	Vx1 LOCK
2	VIN	12V	27	GND	Ground
3	VIN	12V	28	RX0N	Vx1 lane 0
4	VIN	12V	29	RX0P	Vx1 lane 0
5	VIN	12V	30	GND	Ground
6	VIN	12V	31	RX1N	Vx1 lane 1
7	VIN	12V	32	Rx1P	Vx1 lane 1
8	VIN	12V	33	GND	Ground
9	N.C.	No connection (for AUO test only. Do not connect)	34	RX2N	Vx1 lane 2
10	GND	Ground	35	RX2P	Vx1 lane2
11	GND	Ground	36	GND	Ground
12	GND	Ground	37	RX3N	Vx1 lane 3
13	GND	Ground	38	RX3P	Vx1 lane 3
14	GND	Ground	39	GND	Ground
15	N.C.	No connection (for AUO test only. Do not connect)	40	RX4N	Vx1 lane 4
16	N.C.	No connection (for AUO test only. Do not connect)	41	RX4P	Vx1 lane 4
17	N.C.	No connection (for AUO test only. Do not connect)	42	GND	Ground
18	N.C.	No connection (for AUO test only. Do not connect)	43	RX5N	Vx1 lane 5
19	N.C.	No connection (for AUO test only. Do not connect)	44	RX5P	Vx1 lane 5
20	WP	AUO Internal Use Only (EEPROM Write Protection High(3.3V) for Writable, Low(GND) for Protection)	45	GND	Ground
21	N.C.	No connection (for AUO test only. Do not connect)	46	RX6N	Vx1 lane 6
22	N.C.	No connection (for AUO test only. Do not connect)	47	RX6P	Vx1 lane 6
23	N.C.	No connection (for AUO test only. Do not connect)	48	GND	Ground
24	GND	Ground	49	RX7N	Vx1 lane 7
25	HTPDN	Vx1 HTPDN	50	RX7P	Vx1 lane 7

| 51 | GND | Ground |

Note: N.C. : please leave this pin unoccupied. It can not be connected by any signal (Low/GND/High).

Note: Open / High(3.3V) / Low(GND)/ WP / SDA / SCL described as below

Note * : Open/High(3.3V)	**Note ** : Open/Low(GND)**
3.3V 3.3kΩ 100Ω 20kΩ	100Ω 2.833kΩ
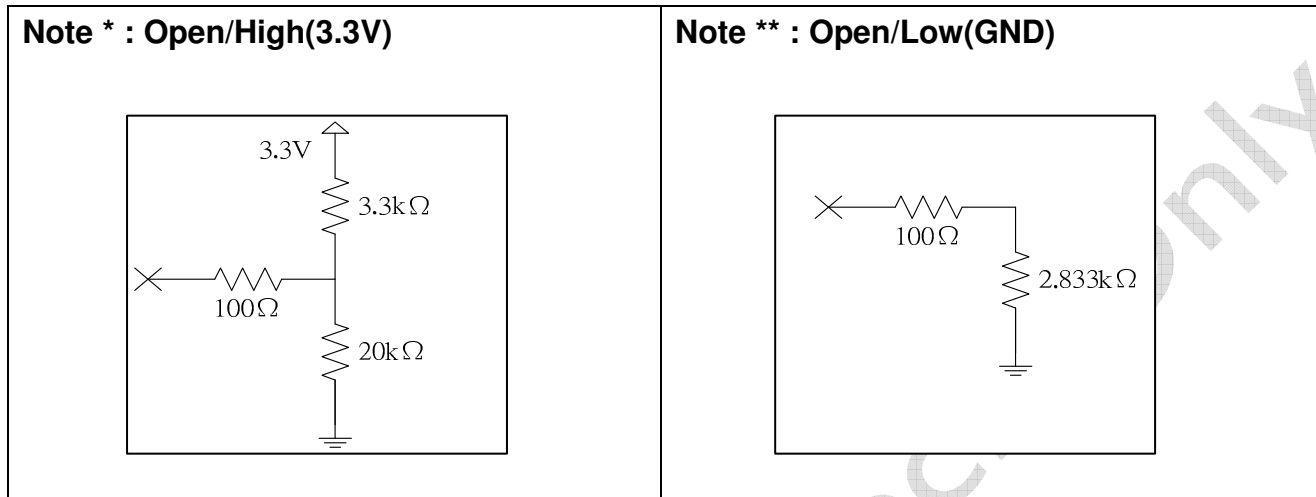
3.2.1 V by one color data mapping

Mode			Packer input & Unpacker output	30bpp RGB /YCbCr444(10bit)	24bpp RGB /YCbCr444(8bit)
4byte mode	3byte mode	Byte0	D[0]	R/Cr[2]	R/Cr[0]
			D[1]	R/Cr[3]	R/Cr[1]
			D[2]	R/Cr[4]	R/Cr[2]
			D[3]	R/Cr[5]	R/Cr[3]
			D[4]	R/Cr[6]	R/Cr[4]
			D[5]	R/Cr[7]	R/Cr[5]
			D[6]	R/Cr[8]	R/Cr[6]
			D[7]	R/Cr[9]	R/Cr[7]
		Byte1	D[8]	G/Y[2]	G/Y[0]
			D[9]	G/Y[3]	G/Y[1]
			D[10]	G/Y[4]	G/Y[2]
			D[11]	G/Y[5]	G/Y[3]
			D[12]	G/Y[6]	G/Y[4]
			D[13]	G/Y[7]	G/Y[5]
			D[14]	G/Y[8]	G/Y[6]
			D[15]	G/Y[9]	G/Y[7]
		Byte2	D[16]	B/Cb[2]	B/Cb[0]
			D[17]	B/Cb[3]	B/Cb[1]
			D[18]	B/Cb[4]	B/Cb[2]
			D[19]	B/Cb[5]	B/Cb[3]
			D[20]	B/Cb[6]	B/Cb[4]
			D[21]	B/Cb[7]	B/Cb[5]
			D[22]	B/Cb[8]	B/Cb[6]
			D[23]	B/Cb[9]	B/Cb[7]
		Byte3	D[24]	--	
			D[25]	--	
			D[26]	B/Cb[0]	
			D[27]	B/Cb[1]	
			D[28]	G/Y[0]	
			D[29]	G/Y[1]	
			D[30]	R/Cr[0]	
			D[31]	R/Cr[1]	

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)

Signal	Item	Symbol	Min.	Typ.	Max	Unit
Vertical Section	Period	Tv	2180	2250	2715	Th
	Active	Tdisp (v)		2160		
	Blanking	Tblk (v)	20	90	555	Th
Horizontal Section	Period	Th	530	550	600	Tclk
	Active	Tdisp (h)		480		
	Blanking	Tblk (h)	50	70	120	Tclk
Clock	Frequency	Fclk=1/Tclk	66	74.25	77	MHz
Vertical Frequency	Frequency	Fv	47	60	63	Hz
Horizontal Frequency	Frequency	Fh	120	135	139.2	KHz

Notes:

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

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

(2) Vertical display position is specified by the rise of DE after a "Low" level period equivalent to eight times of horizontal period. The 1st data corresponding to one horizontal line after the rise of 1st DE is displayed at the top line of screen.

(3) If a period of DE "High" is less than 3840 DCLK or less than 2160 lines, the rest of the screen displays black.

(4) The display position does not fit to the screen if a period of DE "High" and the effective data period do not synchronize with each other.

3.4 Signal Timing Waveforms
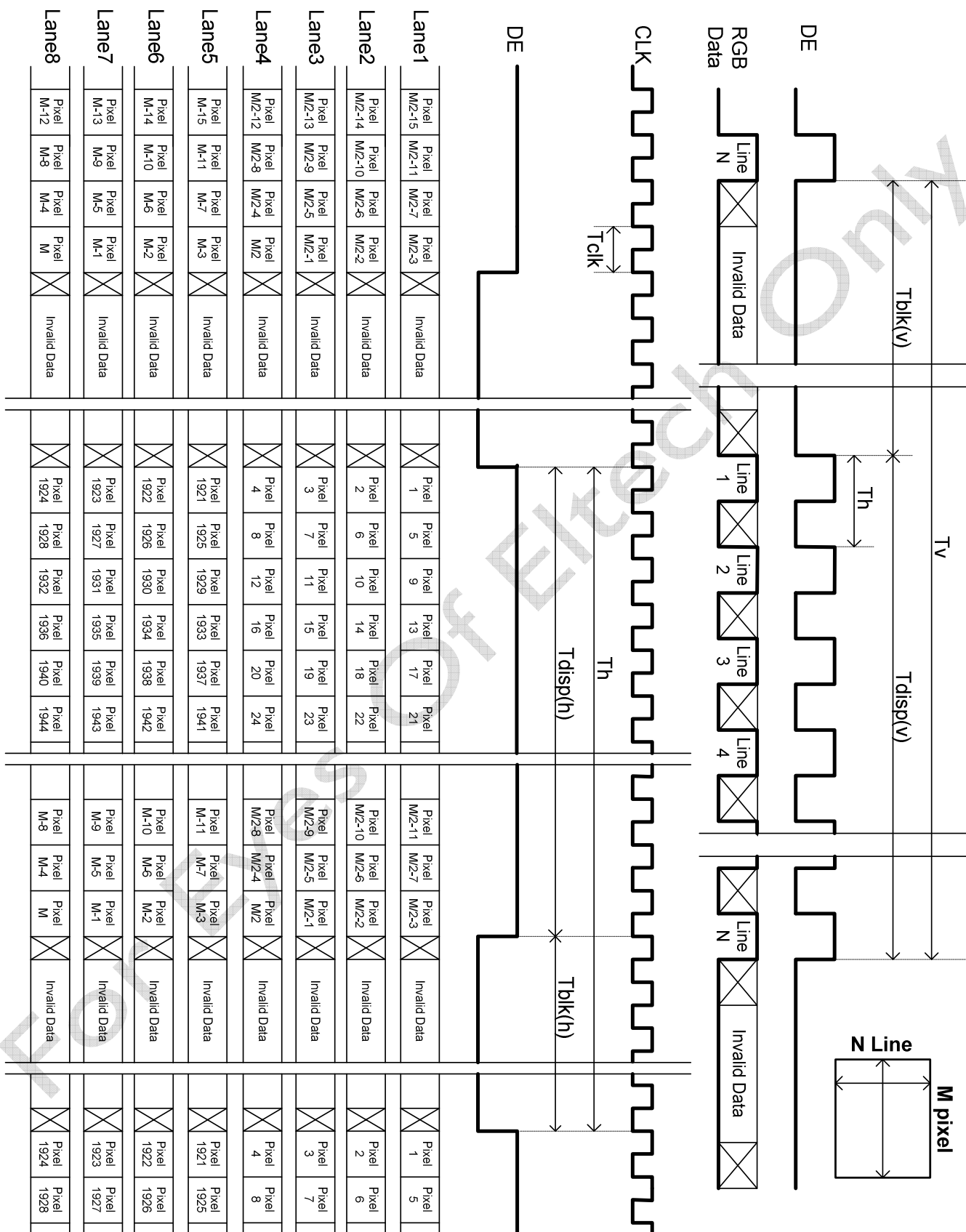
3.5 Color Input Data Reference

The brightness of each primary color (red, green and blue) is based on the 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										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

◆ **Power Sequence of LCD**
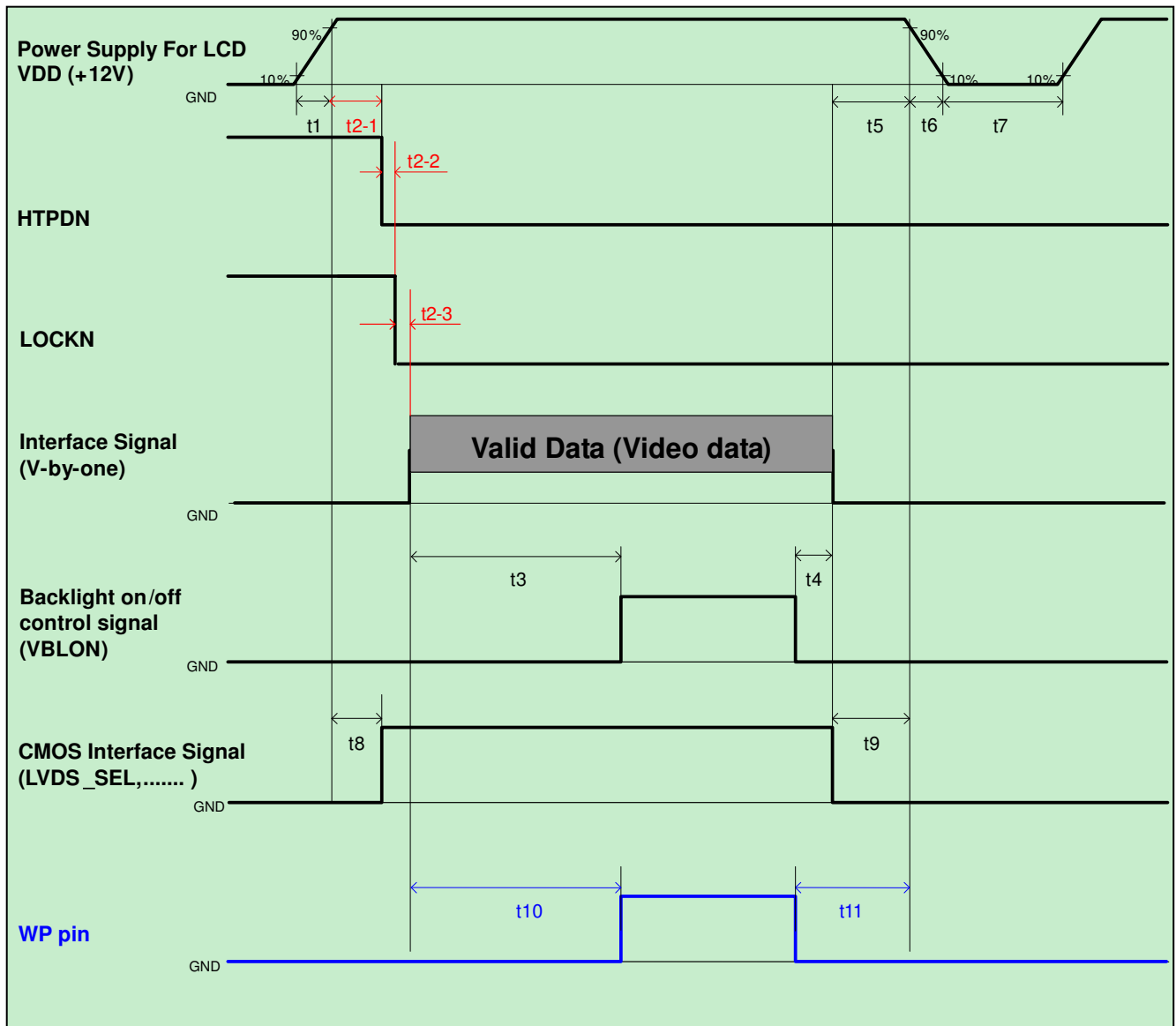
Parameter	Values			Unit
	Min.	Type.	Max.	
t1	0.4	---	30	ms
t2-1	10	---	---*1	ms
t2-2	---	---	---*2	ms
t2-3	---	---	1	ms
t3	640	---	---	ms
t4	0*3	---	---	ms
t5	0	---	---	ms
t6	---	---	---*4	ms
t7	500	---	---	ms
t8	10*5	---	50	ms
t9	0	---	---	ms
t10	640	---	---	ms
t11	150	---	---	ms

Note:

(1) t2-1 : The maximum timing of VDD rising(90%) to HTPDN falling edge decided by customer

system.

(2) t2-2 : V by One training time after power-on. The timing of HTPDN falling edge to LOCKN

falling edge decided by customer system.

(3) t4=0 : concern for residual pattern before BLU turn off.

(4) t6 : voltage of VDD must decay smoothly after power-off. (customer system decide this value)

(5) When CMOS Interface signal is N.C. (no connection), opened in Transmitted end, t8 timing

spec can be negligible.

(6) t2-1: VDD rising(90%) to HTPDN falling edge

t2-2: CDR lock time (CDR training)

t2-3: ALN training

3.7 Backlight Specification

The backlight unit contains 144pcs LED.

3.7.1 Electrical specification(Ta = 25 ± 2 ℃)

	Item	Symbol		Condition	Spec			Unit	Note
					Min	Typ	Max		
1	Input Voltage	VDDB		-	22.8	24	25.2	VDC	-
2	Input Current	I_{DDB}		VDDB=24V		5.03	5.42	ADC	1
3	Input Power	P_{DDB}		VDDB=24V		120.8	136.7	W	1
4	Inrush Current	I_{RUSH}		VDDB=24V			10	Apeak	2
5	Control signal voltage	V_{Signal}	Hi	VDDB=24V	2	-	5.5	VDC	-
			Low		0	-	0.8		3
6	Control signal current	I_{Signal}		VDDB=24V	-	-	1.5	mA	-
7	External PWM Duty ratio (input duty ratio)	D_EPWM		VDDB=24V	0	-	100	%	4
8	External PWM Frequency	F_EPWM		VDDB=24V	90	180	240	Hz	4
9	DET status signal	DET	HI	VDDB=24V	Open Collector			VDC	5
			Lo		0	-	0.8	VDC	5
10	Input Impedance	Rin		VDDB=24V	300			Kohm	-

Note 1: Dimming ratio= 100%, （Ta=25±5℃, Turn on for 45minutes）

Note 2: MAX input current at all operating mode, measurement condition Rising time = 20ms (VDDB: 10%~90%)

Note 3: When BLU off（VDDB = 24V , VBLON = 0V）, IDDB (max) = 0.1A

Note 4: Less than 5% dimming control is functional well and no backlight shutdown happened

Note 5: Normal: 0~0.8V ; Abnormal : Open collector

3.7.2 Input Pin Assignment

LED driver board connector:

Cl0114M1HRL-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: BL On : High/Open (2V~3.3V); BL off : Low (0~0.8V/GND)
13	NC	NC
14	PDIM	External PWM (10%~100% Duty, open for 100%) < NC ; at Internal PWM mode>

Performance guaranteed dimming range
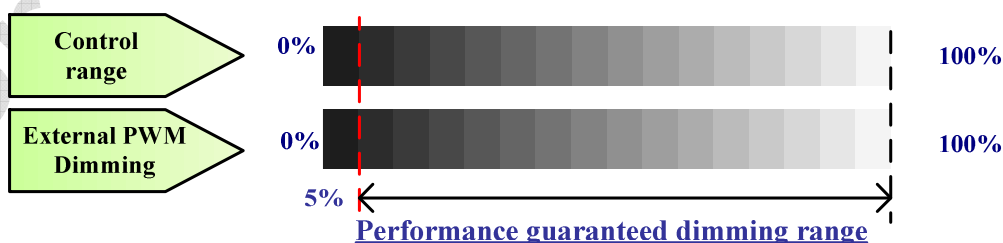
IF External PWM function less than 5% dimming ratio, Judge condition as below:
(1)Backlight module must be lighted ON normally.
(2)All protection function must work normally.
(3)Uniformity and flicker could not be guaranteed

3.7.3   Power Sequence for Backlight (LED)
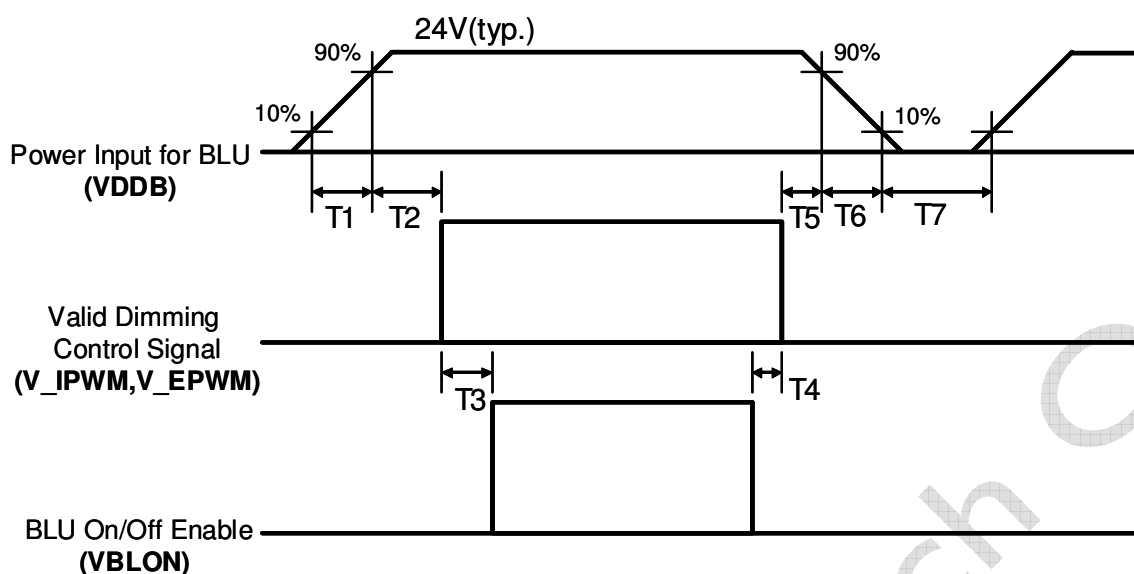
Dip condition
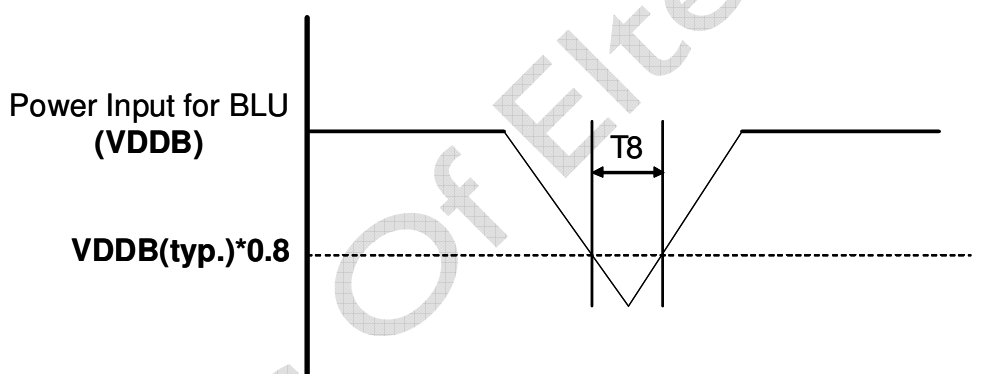
Parameter	Value			Units
	Min	Typ	Max	
T1	20	-	-	ms [*1]
T2 (Normal)	500	-	-	ms
T3 (Normal)	250	-	-	ms
T4	0	-	-	ms
T5	1	-	-	ms
T6	0	-	-	ms
T7	500			ms
T8	-	-	10	ms

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℃ while panel is placed in the default position. The default position is T-con side as the up side of panel. The value specified is 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.
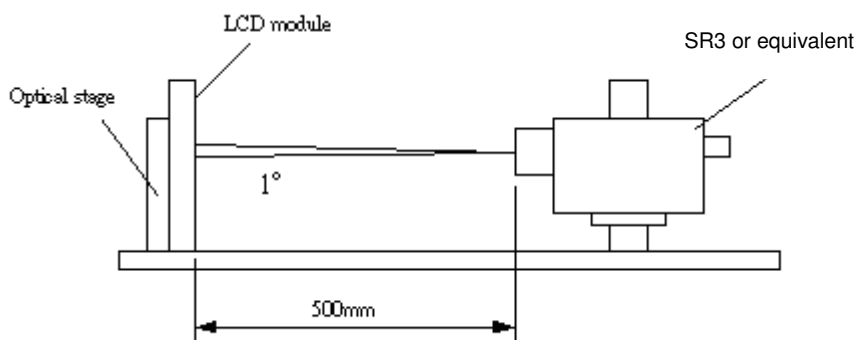
Parameter		Symbol	Values			Unit	Notes
			Min.	Typ.	Max		
Contrast Ratio		CR	3200	4000	--		1
Surface Luminance (White)		L_{WH}	360	450	--	cd/m^2	2
Luminance Variation		$\delta_{WHITE(9P)}$	--	--	1.33		3
Response Time (G to G)		Tγ	--	6.5	10	Ms	4
Color Gamut		NTSC		72		%	
Color Coordinates							
	Red	R_X		0.640			
		R_Y		0.330			
	Green	G_X		0.300			
		G_Y	Typ.-0.03	0.600	Typ.+0.03		
	Blue	B_X		0.150			
		B_Y		0.050			
	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:

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

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. $L_{WH}=L_{on5}$ where L_{on5} 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:

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

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		Target				
Response Time		**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 FIG4.

FIG. 2 Luminance
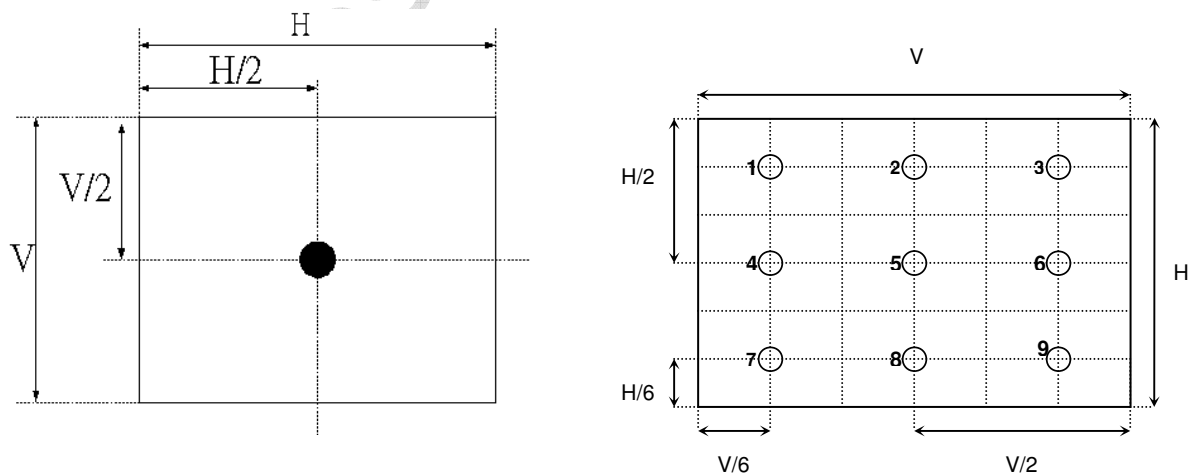
FIG.3 Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for "any level of gray(bright) " and "any level of gray(dark)".
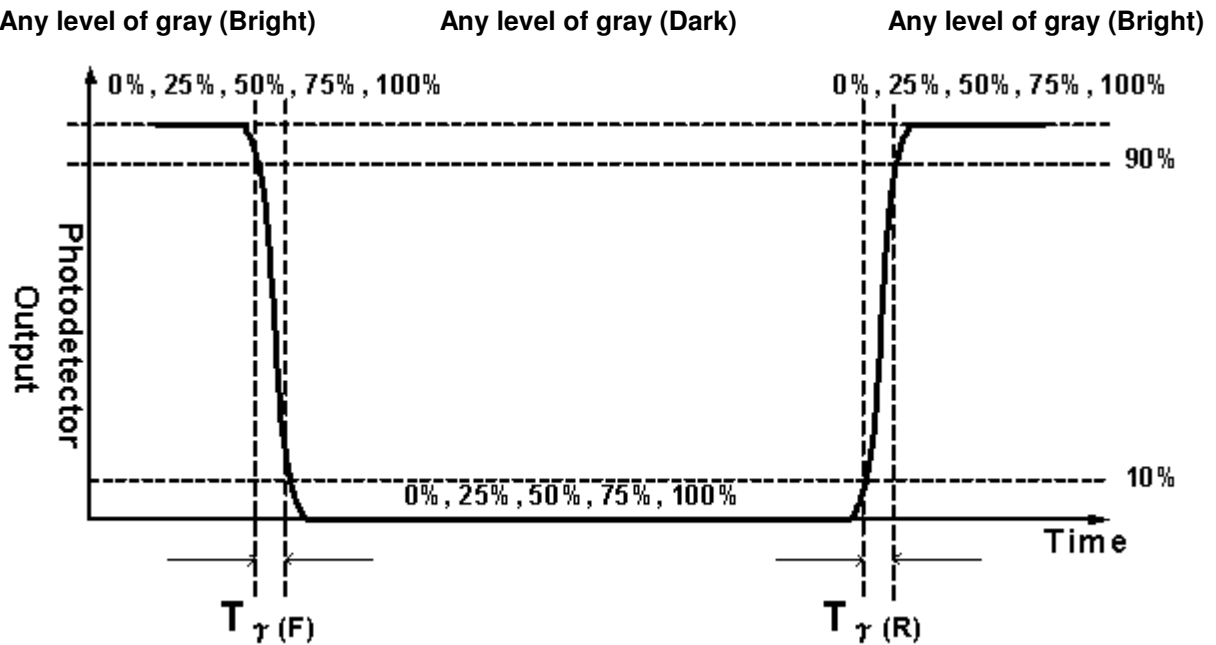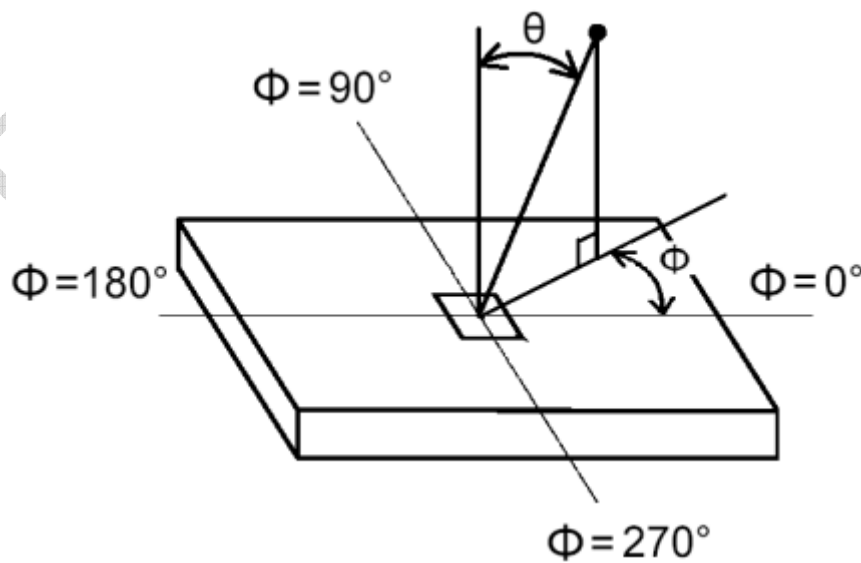

FIG.4 Viewing Angle

5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model P550QVN01.0. In addition the figures in the next page are detailed mechanical drawing of the LCD.
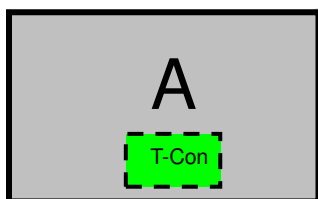
Outline Dimension	Horizontal (typ.)	1235.6 mm
	Vertical (typ.)	706.4 mm
	Depth (typ.)	25.5 mm
Bezel Opening Area	Horizontal (typ.)	1216 mm
	Vertical (typ.)	686.8 mm
Active Display Area	Horizontal	1209.6 mm
	Vertical	680.4 mm
Weight	Typ 14.85kg	

Placement suggestions:

The Suggestion placement is as following:

1. Landscape Mode: The default placement is T-Con Side on the bottom side and the image is shown upright via viewing from the front.

2. Portrait Mode: The default placement is that T-Con side has to be placed on the left side via viewing from the front.

Landscape mode(Front view)   Portrait mode(Front view)
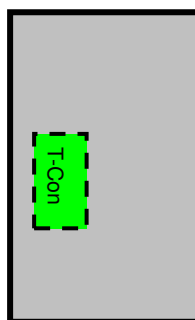
Front View
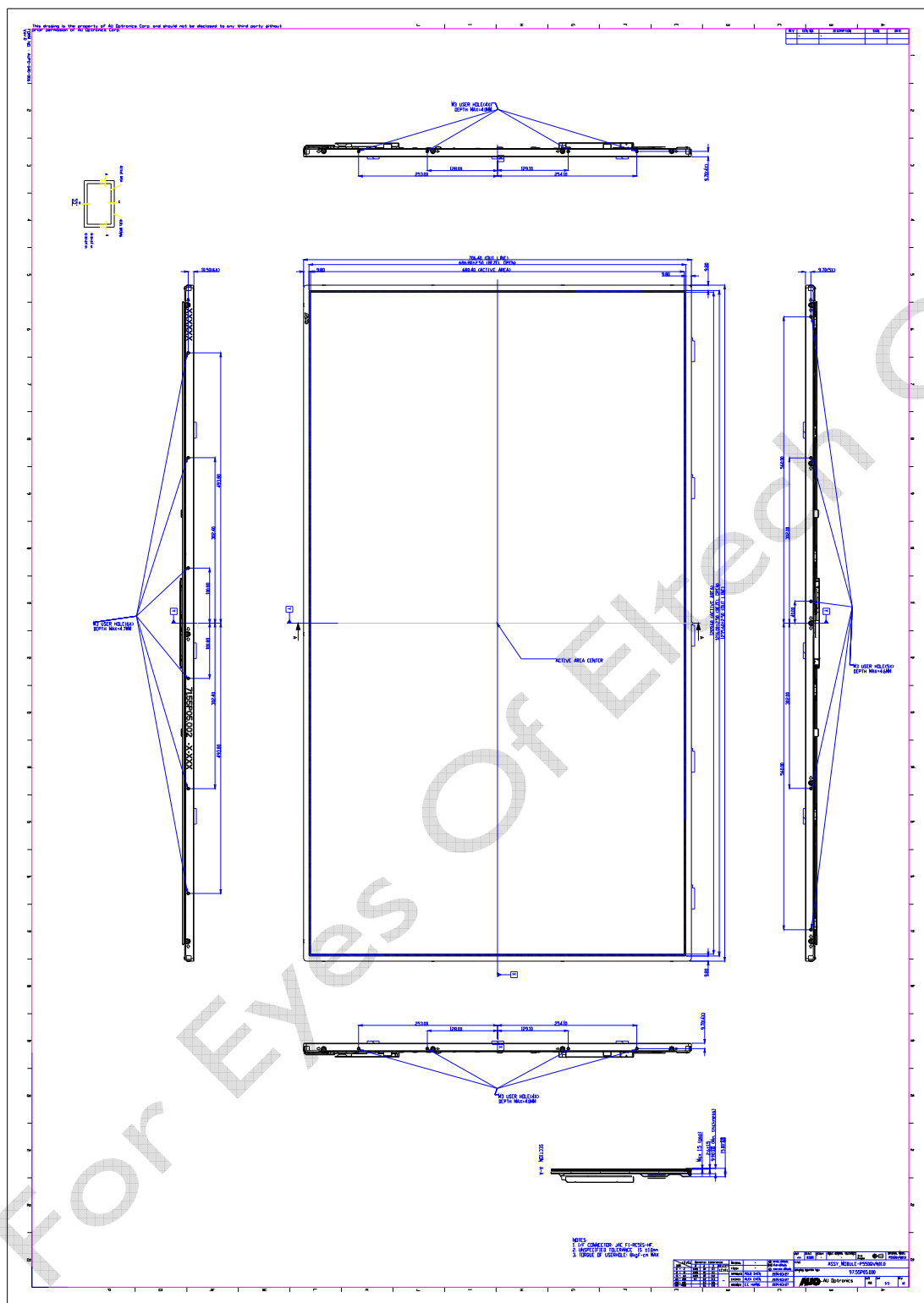
Back View
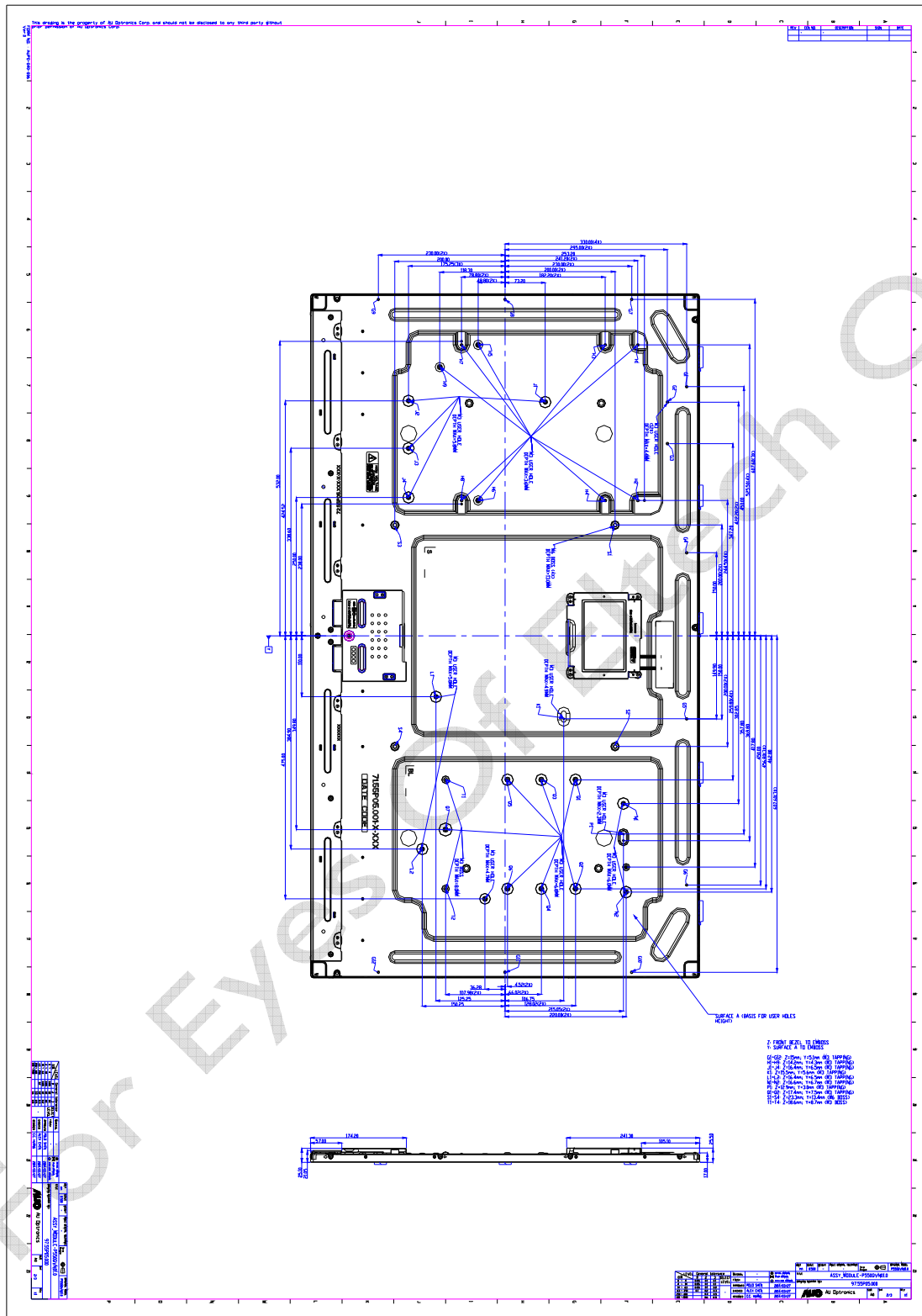
6. Reliability Test Items

	Test Item	Q'ty	Condition
1	High temperature storage test	3	60℃, 500hrs
2	Low temperature storage test	3	-20℃, 500hrs
3	High temperature operation test	3	50℃, 500hrs
4	Low temperature operation test	3	-5℃, 500hrs
5	Vibration test (non-operation)	3	Wave form: random Vibration level: 1.0G RMS Bandwidth: 10-300Hz, Duration: X, Y, Z 10min per axes X,Y,Z : Horizontal, face up
6	Shock test (non-operation)	3	Shock level: 30G Waveform: half since wave, 11ms Direction: ±X, ±Y, ±Z, One time each direction
7	Vibration test (With carton)	1 (PKG)	Random wave (1.04G RMS, 2-200Hz) 20mins per each X,Y,Z axes
8	Drop test (With carton)	1 (PKG)	Drop Height : 25.4cm Surround four flats & bottom flat twice (ASTMD4169)

7. International Standard

7.1 Safety

    (1) UL 60950-1, 2007, Standard for Safety of Information Technology Equipment Including electrical Business Equipment.

    (2) IEC 60950-1 : 2005, Standard for Safety of International Electrotechnical Commission

    (3) EN 60950 : 2006+A11, European Committee for Electrotechnical Standardization (CENELEC), EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.
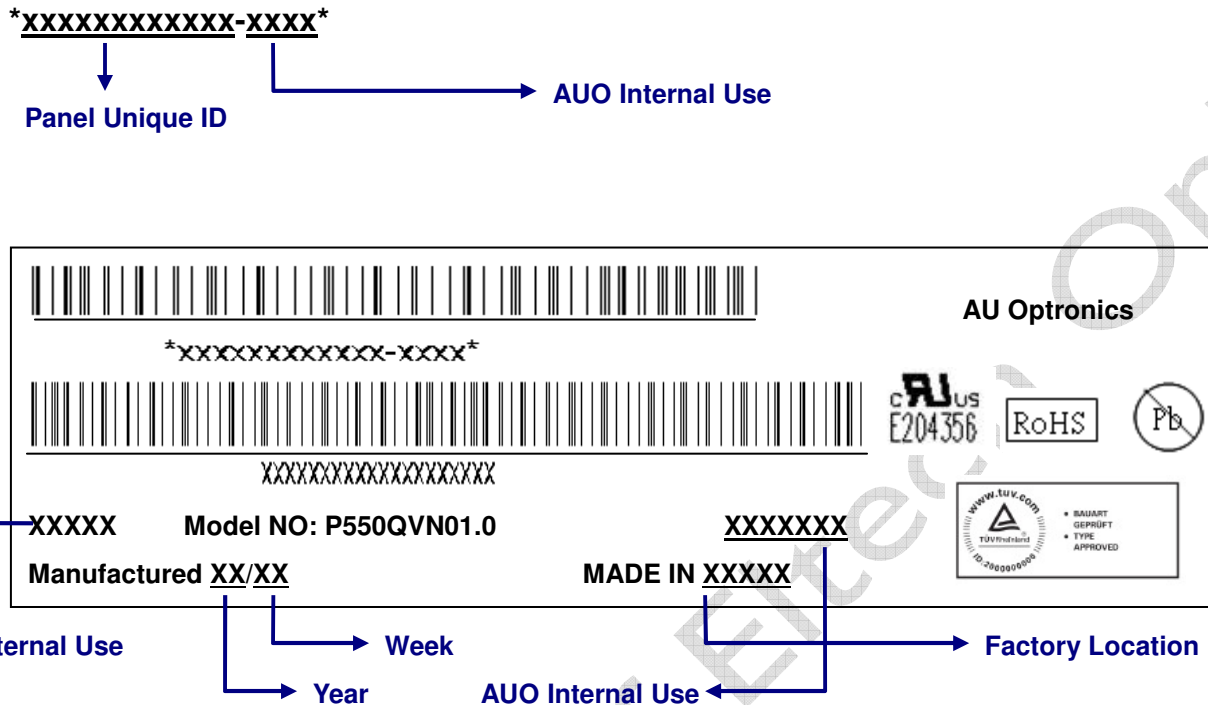
7.2 EMC

    (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:

xxxxxxxxxxxx-xxxx

→ **AUO Internal Use**

Panel Unique ID

xxxxxxxxxxxx-xxxx

AU Optronics

cRUus
E204356 RoHS (Pb)

XXXXXXXXXXXXXXXXXX

XXXXX   **Model NO: P550QVN01.0**   **XXXXXXX**

Manufactured XX/XX   **MADE IN XXXXX**

AUO Internal Use   **Week**   **Factory Location**
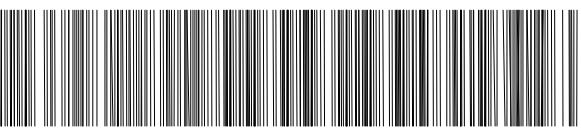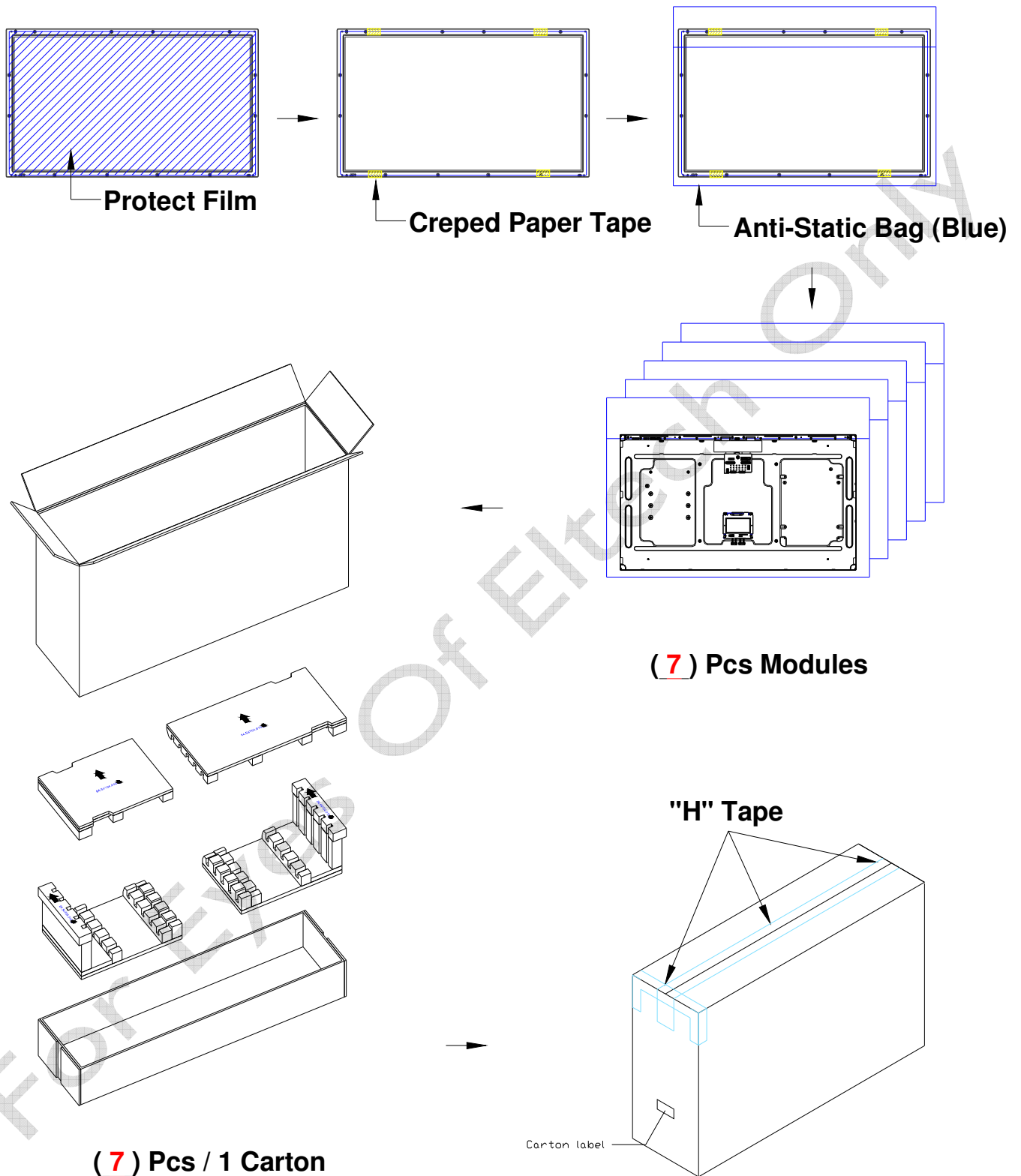
Year   **AUO Internal Use**

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:

AU Optronics   **QTY : 7**   RoHS (Pb)

MODEL NO: P550QVN01.0

PART NO: 97.55P05.000

CUSTOMER NO:

CARTON NO:

Made in XXXXXX   *xxxxx－xxxxxxxxxx*

8-2 PACKING METHODS:

Protect Film

Creped Paper Tape

Anti-Static Bag (Blue)

(7) Pcs Modules

"H" Tape

Carton label

(7) Pcs / 1 Carton

8-3 Pallet and Shipment Information

Item	Specification			Packing Remark
	Qty.	Dimension	Total Weight (kg)	
Packing BOX	7pcs/box	1305(L)*383(W)*800(H)	110.06kg	Box = 4.11kg Cushion = 2.05kg (Includes bottom cardboard)
Pallet	1	1315(L)*1150(W)*138(H)	20kg	
Boxes per Pallet	3 boxes/pallet			
Panels per Pallet	21pcs/pallet			
Pallet after packing (40' container)	36	1315(L)*1150(W)*938(H)	350.18kg	
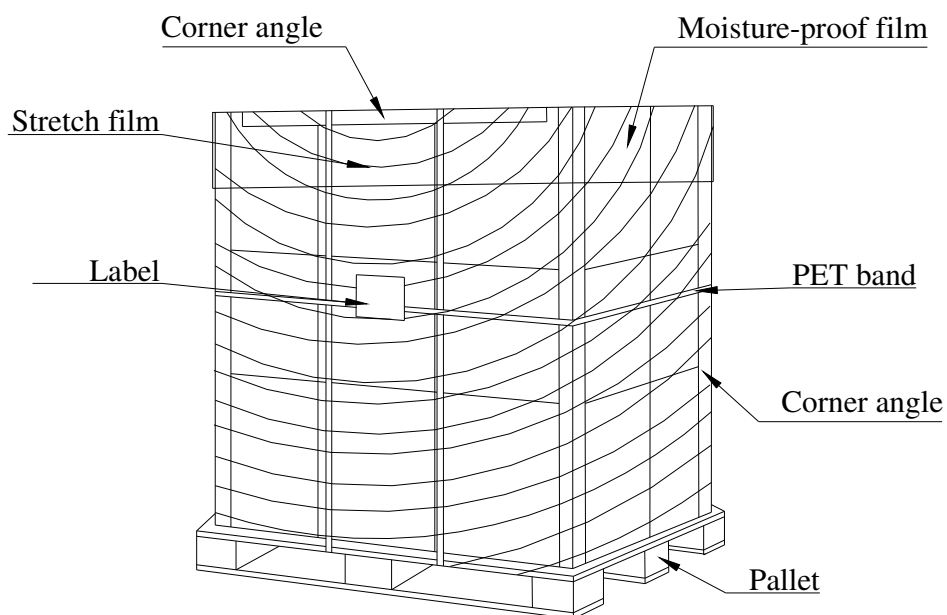
9. PRECAUTIONS

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 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 of LED 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 Operating Condition for Public Information Display

The device listed in the product specification is designed and manufactured for PID (Public Information Display) application. To optimize module's lifetime and function, below operating usages are required.

(1) Normal operating condition

    1. Operating temperature: 5~40℃

    2. Operating humidity: 10~90%

    3. Display pattern: dynamic pattern (Real display).

    Note) Long-term static display would cause image sticking.

(2) Operation usage to protect against abnormal display due to long-term static display.

    1. Suitable operating time: under **14** hours a day.

    2. Liquid Crystal refresh time is required. Cycling display between 5 minutes' information (static) display and 10 seconds' moving image.

    3. Periodically change background and character (image) color.

    4. Avoid combination of background and character with large different luminance.

(3) Periodically adopt one of the following actions after long time display.

    1. Running the screen saver (motion picture or black pattern)

    2. Power off the system for a while

(4) LCD system is required to place in well-ventilated environment. Adapting active cooling system is highly recommended.

(5) Product reliability and functions are only guaranteed when the product is used under right operation usages. If product will be used in extreme conditions, such as high temperature/ humidity, display stationary patterns, or long operation time etc…, it is strongly recommended to contact AUO for filed application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock market and controlling systems

9-4 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.

9-5 Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

9-6 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.

(3) Storage condition is guaranteed under packing conditions.

(4) The phase transition of Liquid Crystal in the condition of the low or high storage temperature will be recovered when the LCD module returns to the normal condition.

9-7 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.