TFT LCD Preliminary Specification

MODEL NO.:V460H1-P06

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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 1.0	Jun.17, 2009	All	All	Preliminary Specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V460H1- P06 is a 46" TFT Liquid Crystal Display module. This module supports 1920 x 1080 HDTV format and can display true 16.7M colors (8bit/color).

1.2 CHARACTERISTICS

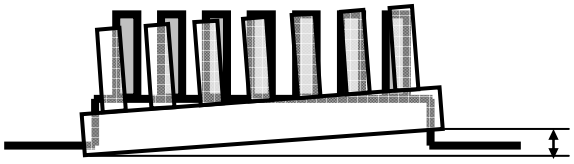
CHARACTERISTICS ITEMS	SPECIFICATIONS
Screen Diagonal [in]	46
Pixels [lines]	1920 x 1080
Active Area [mm]	1018.08(H) x 572.67(V) (46" diagonal)
Sub -Pixel Pitch [mm]	0.17675(H) x 0.53025(V)
Pixel Arrangement	RGB vertical stripe
Weight [g]	TYP. 2490
Physical Size [mm]	1056.38(W) x 628.52(H) x 2(D) Typ.
Display Mode	Transmissive mode / Normally black
Contrast Ratio	5000:1 Typ. (Typical value measured at CMO's module)
Glass thickness (Array/CF) [mm]	0.7 / 0.7
Viewing Angle (CR>20)	+88/-88(H),+88/-88(V) Typ. (Typical value measured at CMO's module)
Color Chromaticity	R=(0.643, 0.323) G=(0.287, 0.602) B=(0.148, 0.056) W=(0.280, 0.290) (Typical value measured at CMO's module)
Cell Transparency [%]	4.4%Typ. (Typical value measured at CMO's module)
Polarizer (CF side)	Super Wide View, Anti-Glare coating, 1030.18 (H) x 586.37(w).. Hardness: 3H
Polarizer (TFT side)	Super Wide View, 1030.18(H) x 586.37(w).

1.3 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	-	2490	-	g	-
I/F connector mounting position	The mounting inclination of the connector makes the screen center within ±0.5mm as the horizontal.				(2)

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

(2) Connector mounting position



+/- 0.5mm

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMO MODULE V460H1-PH1)

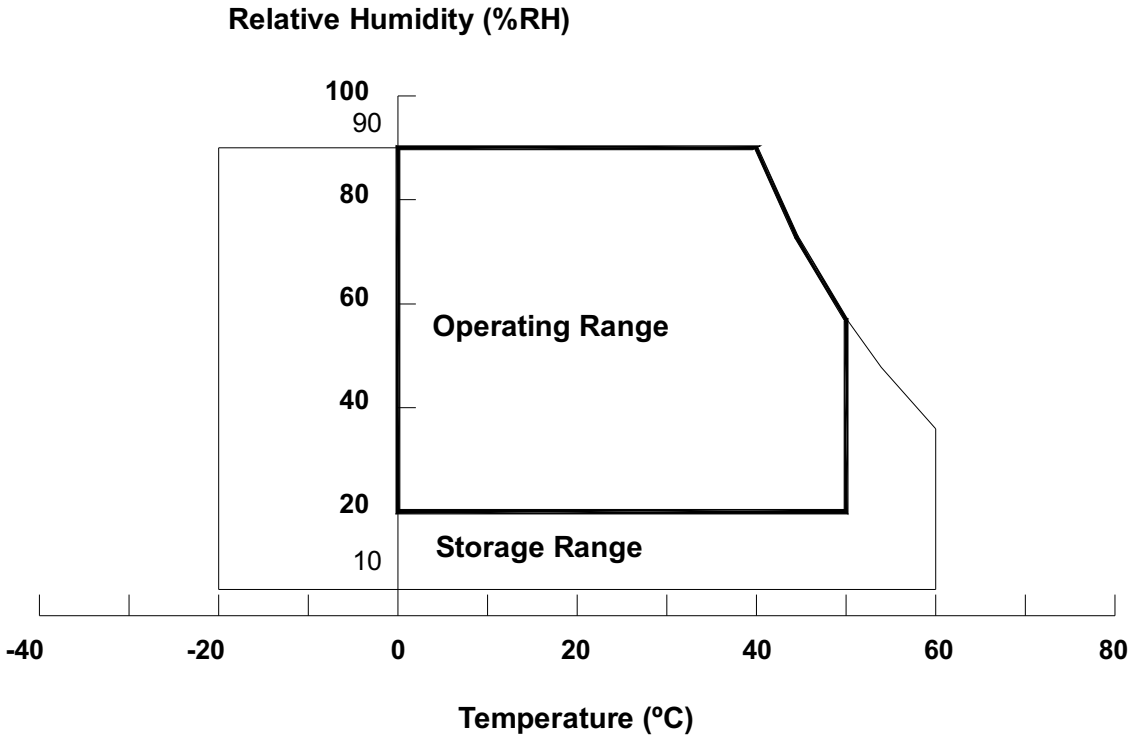
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1), (3)
Operating Ambient Temperature	T_{OP}	0	50	ºC	(1), (2), (3)
Altitude Operating	A_{OP}	0	5000	M	(3)
Altitude Storage	A_{ST}	0	12000	M	(3)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation..



Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in your product design to prevent the surface temperature of display area from being over 65 ºC. The range of operating temperature may degrade in case of improper thermal management in your product design.

Note (3) The rating of environment is base on LCD module. Leave LCD cell alone, this environment condition can't be guaranteed. Except LCD cell, the customer has to consider the ability of other parts of LCD module and LCD module process.

2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

Storage Condition : With shipping package.

Storage temperature range : 25±5 ℃

Storage humidity range : 50±10%RH

Shelf life : a month

2.3 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

VSSD=VSSA=0V

Item	Symbol	Value		Unit	Note
		Min	Max		
Power Supply Voltage	V_{DA}	-0.5	+18.5	V	(1)
	V_{GH}	-0.3	+43.0	V	
	V_{GL}	-43.0	+0.3	V	
	V_{GH} -V_{GL}	-0.3	+43.0	V	
Logic Input Voltage	V_{DD}	-0.3	+5.0	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

(Ta = 25 ± 2 ºC)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VGH	31.5	32	32.5	V	
		VGL	-6.0	-5.5	-5.0	V	
		VDA	17.4	17.7	18.0	V	
		VDD	3.2	3.3	3.4	V	
Power Supply Current		IGH	-	-	30	mA	
		IGL	-	-	50	mA	
		IAA	-	-	630	mA	
		IDD	-	-	925	mA	
CMOS interface	Input High Threshold Voltage	VIH	2.7	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.7	V	

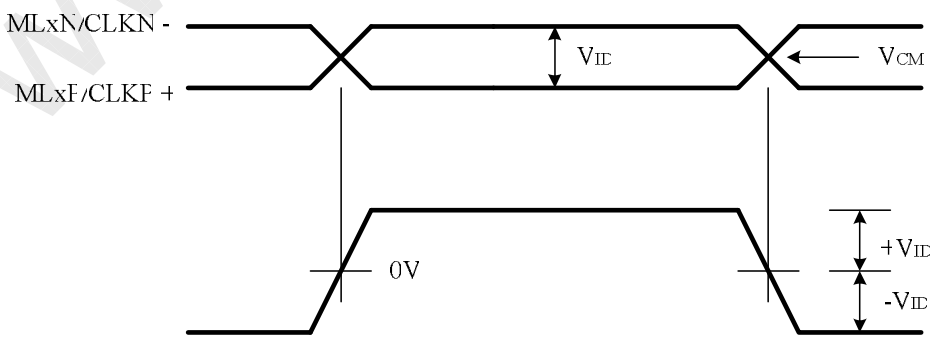
Note (1) The module should be always operated within the above ranges.

3.2 Mini-LVDS CHARACTERISTICS

(Ta = -10~+85 ºC)

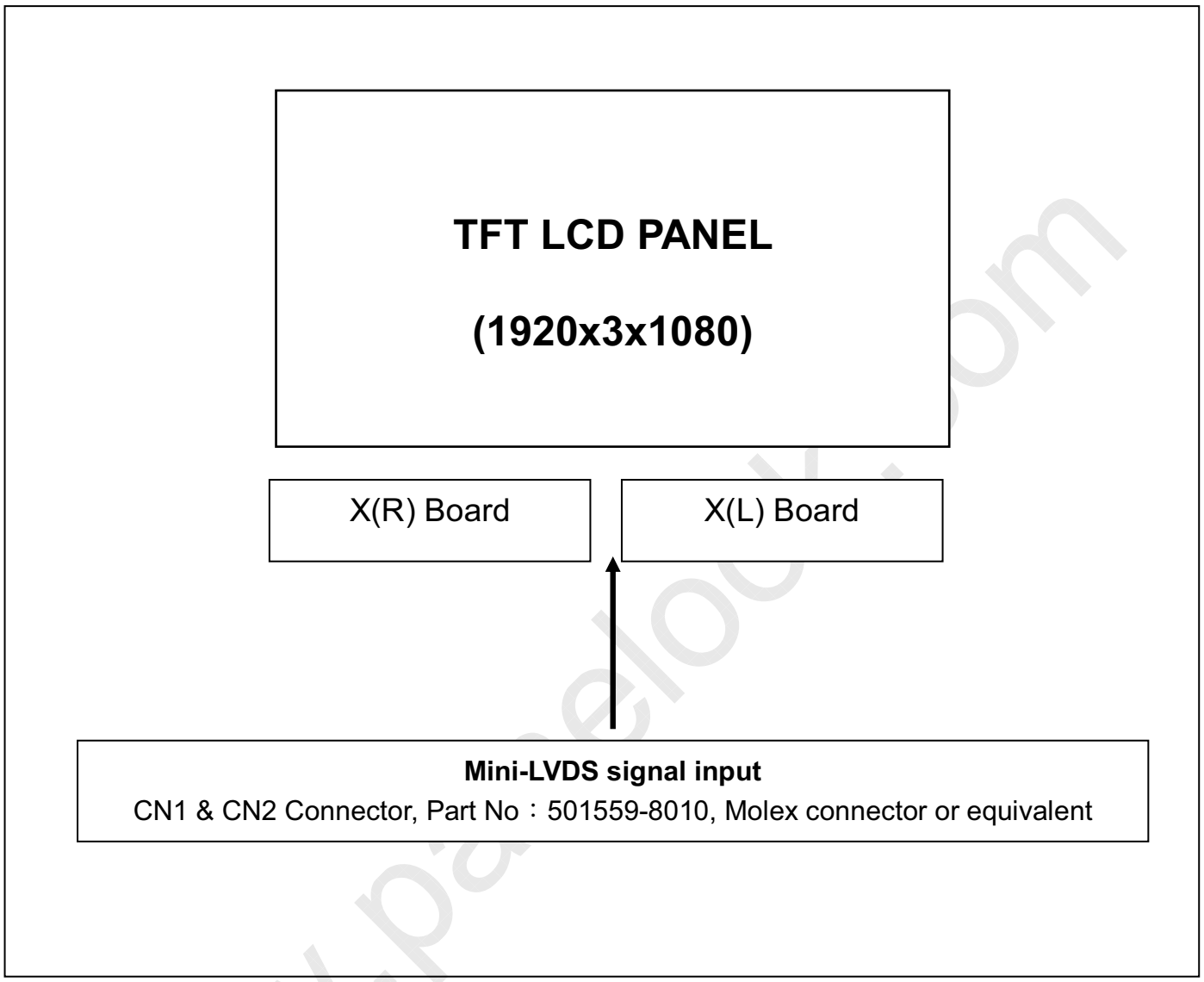
Item	Symbol	Condition	Value			Unit
			Min	Typ	Max	
Mini-LVDS Differential High Input Voltage	$+V_{ID}$	-	100	-	600	mV
Mini-LVDS Differential Low Input Voltage	$-V_{ID}$	-	-600	-	-100	mV
Mini-LVDS common mode input voltage range	V_{CM}	-	VSSD+0.5	Note(1)	VDD-1.2	V

Note (1) V_{CM}= 1.2V (VDD = 3.3V)



4. BLOCK DIAGRAM OF INTERFACE

4.1 TFT LCD OPEN CELL



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD Module Input Pin Assignment

CN1(XL) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	41	GM6	Gamma power supply
2	N.C.	No Connection	42	GM5	Gamma power supply
3	N.C.	No Connection	43	GM4	Gamma power supply
4	GND	Ground	44	GM3	Gamma power supply
5	N.C.	No Connection	45	GM2	Gamma power supply
6	N.C.	No Connection	46	GM1	Gamma power supply
7	N.C.	No Connection	47	GND	Ground
8	N.C.	No Connection	48	N.C.	No Connection
9	N.C.	No Connection	49	POL	Polarity Control
10	N.C.	No Connection	50	A_TP1	mini-LVDS data latch
11	GND	Ground	51	GND	Ground
12	ML5N_F	mini-LVDS data signal -	52	VDA	Data driver analog power supply
13	ML5P_F	mini-LVDS data signal +	53	VDA	Data driver analog power supply
14	ML4N_F	mini-LVDS data signal -	54	GND	Ground
15	ML4P_F	mini-LVDS data signal +	55	VDD	Driver logic power supply
16	ML3N_F	mini-LVDS data signal -	56	VDD	Driver logic power supply
17	ML3P_F	mini-LVDS data signal +	57	GND	Ground
18	GND	Ground	58	VGH	Power supply for Gate on output
19	CLKN_F	mini-LVDS clock -	59	VGH	Power supply for Gate on output
20	CLKP_F	mini-LVDS clock +	60	GND	Ground
21	GND	Ground	61	N.C.	No Connection
22	ML2N_F	mini-LVDS data signal -	62	VCM	VCM power supply
23	ML2P_F	mini-LVDS data signal +	63	VCM	VCM power supply
24	ML1N_F	mini-LVDS data signal -	64	GND	Ground
25	ML1P_F	mini-LVDS data signal +	65	VGL	Power supply for Gate off output
26	ML0N_F	mini-LVDS data signal -	66	OE1	Scan driver output enable 1
27	ML0P_F	mini-LVDS data signal +	67	CKV	Scan driver clock
28	GND	Ground	68	STV	Scan driver start pulse
29	GM18	Gamma power supply	69	GND	Ground
30	GM17	Gamma power supply	70	OE2	Scan driver output enable 2
31	GM16	Gamma power supply	71	N.C.	No Connection
32	GM15	Gamma power supply	72	N.C.	No Connection
33	GM14	Gamma power supply	73	N.C.	No Connection
34	GM13	Gamma power supply	74	N.C.	No Connection
35	GM12	Gamma power supply	75	N.C.	No Connection
36	GM11	Gamma power supply	76	N.C.	No Connection
37	GM10	Gamma power supply	77	N.C.	No Connection
38	GM9	Gamma power supply	78	N.C.	No Connection
39	GM8	Gamma power supply	79	N.C.	No Connection
40	GM7	Gamma power supply	80	GND	Ground

CN2(XR) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	41	GM12	Gamma power supply
2	VSCM	VSCM power supply	42	GM11	Gamma power supply
3	N.C.	No Connection	43	GM10	Gamma power supply
4	N.C.	No Connection	44	GM9	Gamma power supply
5	N.C.	No Connection	45	GM8	Gamma power supply
6	N.C.	No Connection	46	GM7	Gamma power supply
7	N.C.	No Connection	47	GM6	Gamma power supply
8	N.C.	No Connection	48	GM5	Gamma power supply
9	N.C.	No Connection	49	GM4	Gamma power supply
10	N.C.	No Connection	50	GM3	Gamma power supply
11	OE2	Scan driver output enable 2	51	GM2	Gamma power supply
12	GND	Ground	52	GM1	Gamma power supply
13	OE1	Scan driver output enable 1	53	GND	Ground
14	CKV	Scan driver clock	54	ML5N_B	mini-LVDS data signal -
15	STV	Scan driver start pulse	55	ML5P_B	mini-LVDS data signal +
16	VGL	Power supply for Gate off output	56	ML4N_B	mini-LVDS data signal -
17	GND	Ground	57	ML4P_B	mini-LVDS data signal +
18	VCM	VCM power supply	58	ML3N_B	mini-LVDS data signal -
19	VCM	VCM power supply	59	ML3P_B	mini-LVDS data signal +
20	N.C.	No Connection	60	GND	Ground
21	GND	Ground	61	CLKN_B	mini-LVDS clock -
22	VGH	Power supply for Gate on output	62	CLKP_B	mini-LVDS clock +
23	VGH	Power supply for Gate on output	63	GND	Ground
24	GND	Ground	64	ML2N_B	mini-LVDS data signal -
25	VDD	Driver logic power supply	65	ML2P_B	mini-LVDS data signal +
26	VDD	Driver logic power supply	66	ML1N_B	mini-LVDS data signal -
27	GND	Ground	67	ML1P_B	mini-LVDS data signal +
28	VDA	Data driver analog power supply	68	ML0N_B	mini-LVDS data signal -
29	VDA	Data driver analog power supply	69	ML0P_B	mini-LVDS data signal +
30	GND	Ground	70	GND	Ground
31	POL	Polarity Control	71	N.C.	No Connection
32	B_TP1	mini-LVDS data latch	72	N.C.	No Connection
33	N.C.	No Connection	73	N.C.	No Connection
34	GND	Ground	74	N.C.	No Connection
35	GM18	Gamma power supply	75	N.C.	No Connection
36	GM17	Gamma power supply	76	N.C.	No Connection
37	GM16	Gamma power supply	77	GND	Ground
38	GM15	Gamma power supply	78	N.C.	No Connection
39	GM14	Gamma power supply	79	N.C.	No Connection
40	GM13	Gamma power supply	80	GND	Ground

Note (1) CN1 & CN2 Connector, Part No：501559-8010, Molex connector or equivalent.

Note (2) The OE1 and OE2 must be connected to the the same OE.

6. INTERFACE TIMING

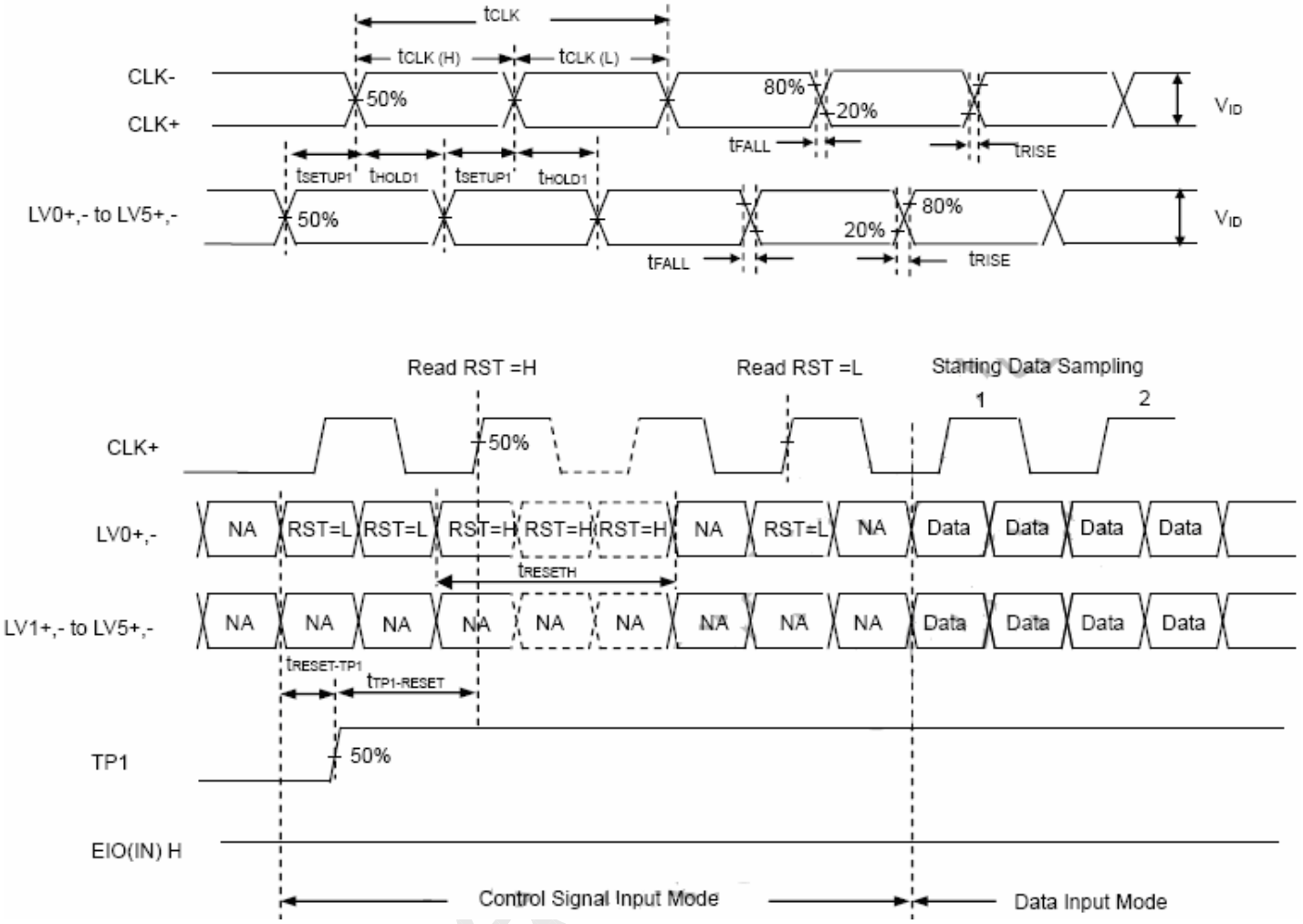
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

(a) Timing SPEC

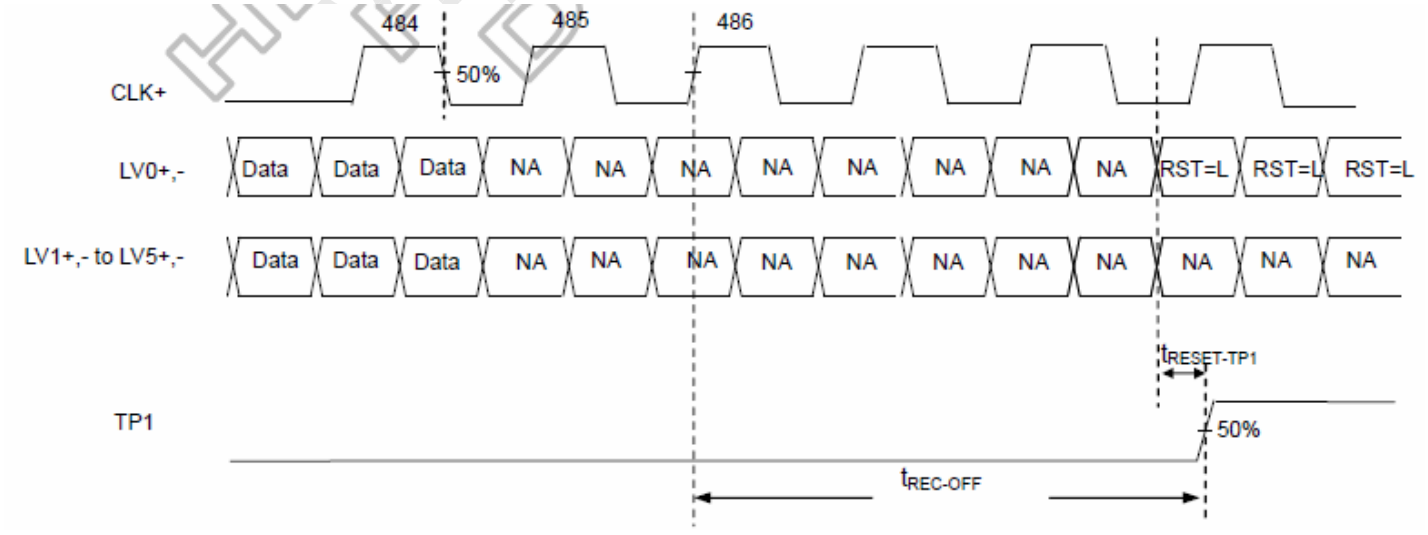
	Parameter	Symbol	Condition	Spec			Unit
				Min.	Typ.	Max.	
HD	Clock period	t_{CLK}	-	4(1)	-	-	ns
	Clock low pulse width	$t_{CLK(L)}$	-	1.7	-	-	ns
	Clock high pulse width	$t_{CLK(H)}$	-	1.7	-	-	ns
	Data setup time	t_{SETUP1}	-	0.8	-	-	ns
	Data hold time	t_{HOLD1}	-	0.8	-	-	ns
	CLK,LV [5:0] rising time	t_{RISE}		-	-	0.8	ns
	CLK,LV [5:0] falling time	t_{FALL}		-	-	0.8	ns
	Start pulse setup time	t_{SETUP2}		0	-	-	ns
	Start pulse delay time	t_{PLH1}	Loading=15pF	-	-	13	ns
		t_{PHL1}	Loading=15pF	-	-	13	ns
	Reset(RST) high time	t_{RESETH}		50ns over 3 CLK	-	-	-
	TP1 high period	$t_{TP1(H)}$		200	-	-	ns
	POL to TP1 setup time	$t_{POL-TP1}$	POL toggle to TP1 rising	5	-	-	ns
	TP1 to POL hold time	$t_{TP1-POL}$	TP1 falling to POL toggle	6	-	-	ns
	Receiver off to TP1 timing	$t_{REC-OFF}$		5	-	-	CLK
	TP1 to reset input time	$t_{TP-RESET}$		200	-	-	ns
	Reset low to TP1 rising time	$t_{RESET-TP1}$		0			ns
	Output delay time1	t_{PD1}	CL=100pF	-	-	5	μs
	Output delay time2	t_{PD2}	CL=100pF	-	-	10	μs
	Output delay time3	t_{PD3}	CL=100Pf	-	-	5	μs
	Output delay time4	t_{PD4}	CL=100pF	-	-	10	μs
VD	CKV period	t_{CKV}	-	5	-	-	μs
	CKV pulse width	t_{CKVH}, t_{CKVL}	50% duty cycle	2.5	-	-	μs
	OE pulse width	t_{WOE}	-	1	-	-	μs
	Data setup time	t_{SU}		0.5	-	-	μs
	Data hold time	t_{HD}		0.5	-	-	μs
	CKV to output delay time	t_{PD1}	CL=300pF	-	-	1	μs
	Start pulse output delay time	t_{PD2}	- CL=300pF	-	-	0.8	μs
	OE to output delay time	t_{PD3}	CL=300pF	-	-	0.8	μs

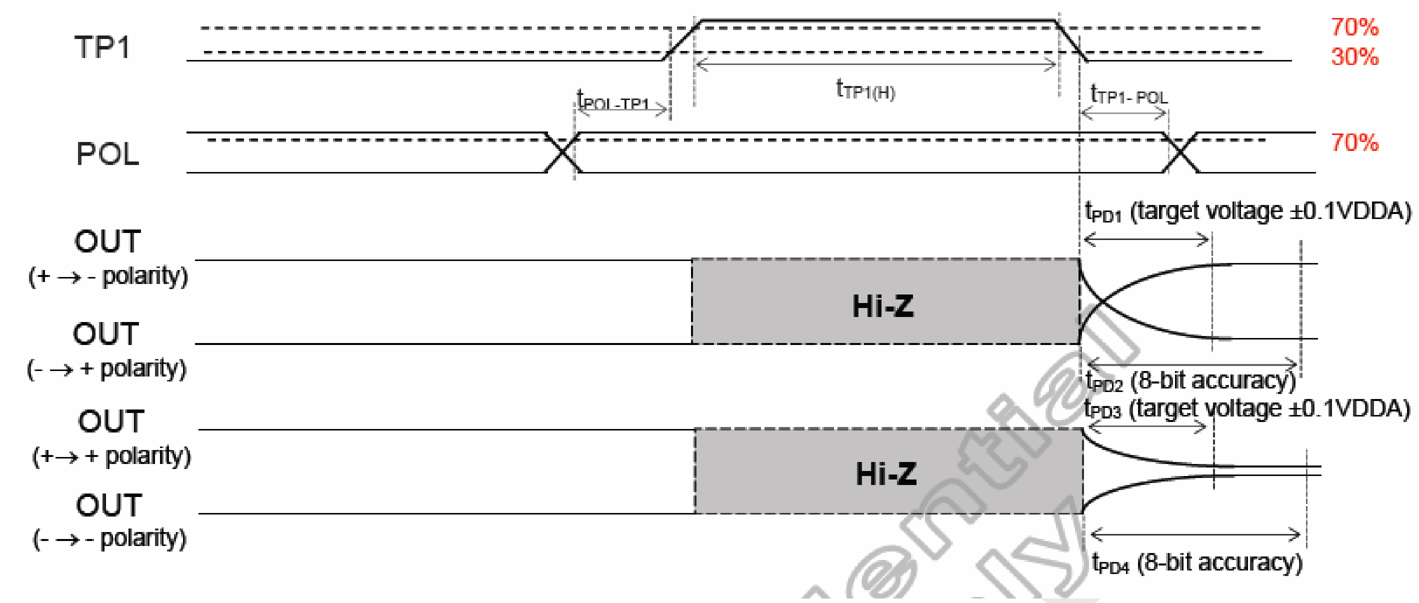
Note (1) : When operation frequency=250MHz

(b) Horizontal Timing Chart

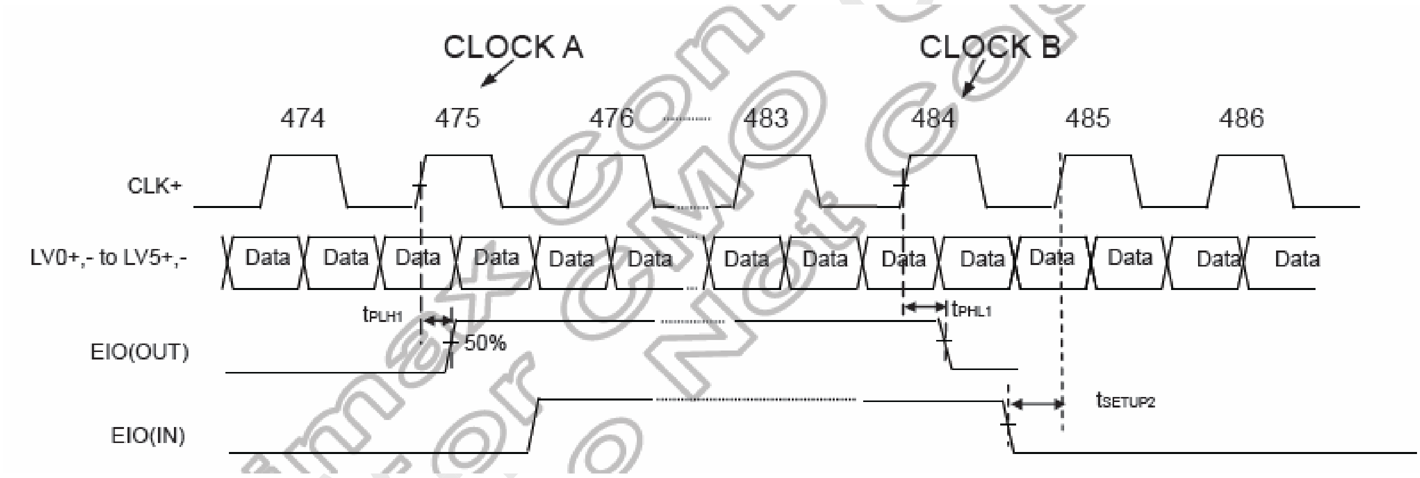


Last data sampling to TP1 timing for 726 channel case：

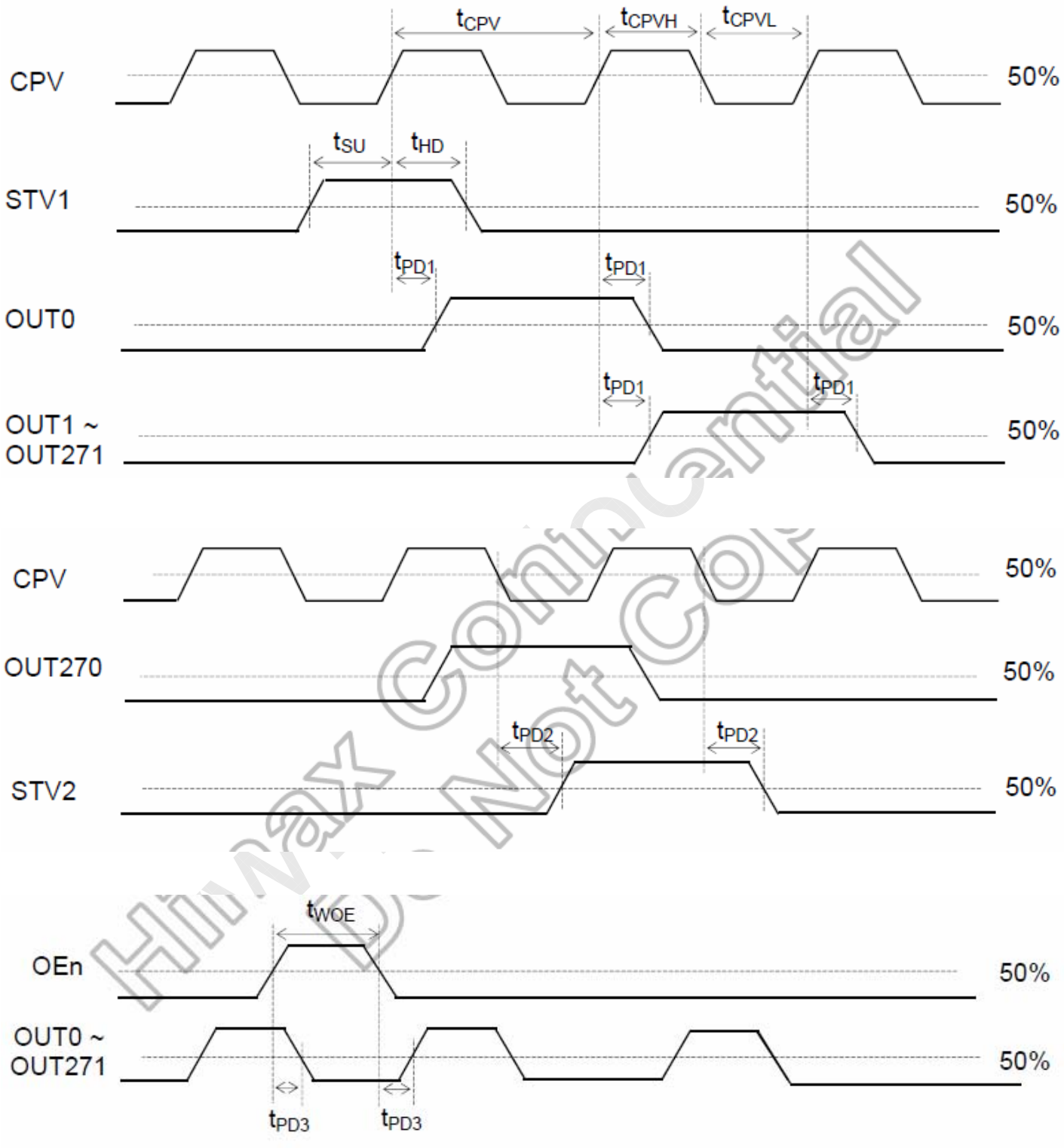




Relationship between EIO (OUT) and EIO (IN) timing for 726 channel case：



(C) Vertical Timing Chart

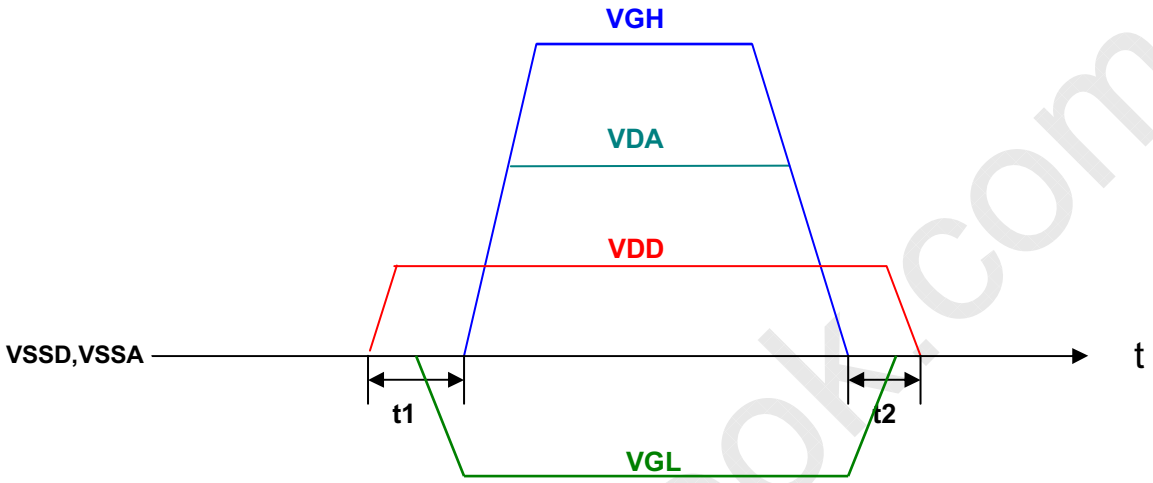


6.2 POWER ON/OFF SEQUENCE

To prevent the device from damage due to latch up , the power ON/OFF sequence shown below must be followed.

When power on：VDD → VGL → VDA → VGH (t1＞0)

When power off：VGH → VDA → VGL → VDD (t2≧0)



7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	12V	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I_L	10.5±0.3	mA
Oscillating Frequency (Inverter)	F_W	46±3	KHz
Vertical Frame Rate	Fr	60	Hz

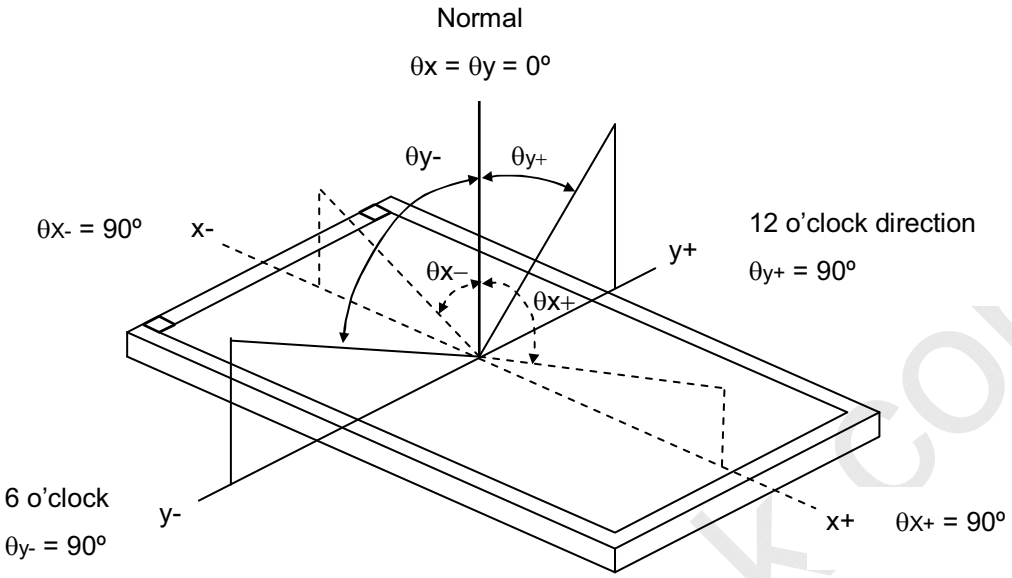
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing angle at normal direction	3800	5000	-	-	Note (2)
Response Time		Gray to gray		-	6.5	12	ms	Note (3)
Center Luminance of White		L_C		450	500	-	cd/m^2	Note (4)
White Variation		δW		-	-	1.3	-	Note (7)
Cross Talk		CT		-	-	4	%	Note (5)
Color Chromaticity	Red	Rx		Typ.-0.03	0.634	Typ.+0.03	-	Note (6)
		Ry			0.323		-	
	Green	Gx			0.287		-	
		Gy			0.602		-	
	Blue	Bx			0.148		-	
		By			0.056		-	
	White	Wx			0.280		-	
		Wy			0.290		-	
	Color Gamut				72	-	%	NTSC
Viewing Angle	Horizontal	θ_x+	CR≥20	80	88	-	Deg.	Note (1)
		θ_x-		80	88	-		
	Vertical	θ_Y+		80	88	-		
		θ_Y-		80	88	-		

Note (1) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by Eldim EZ-Contrast 160R



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

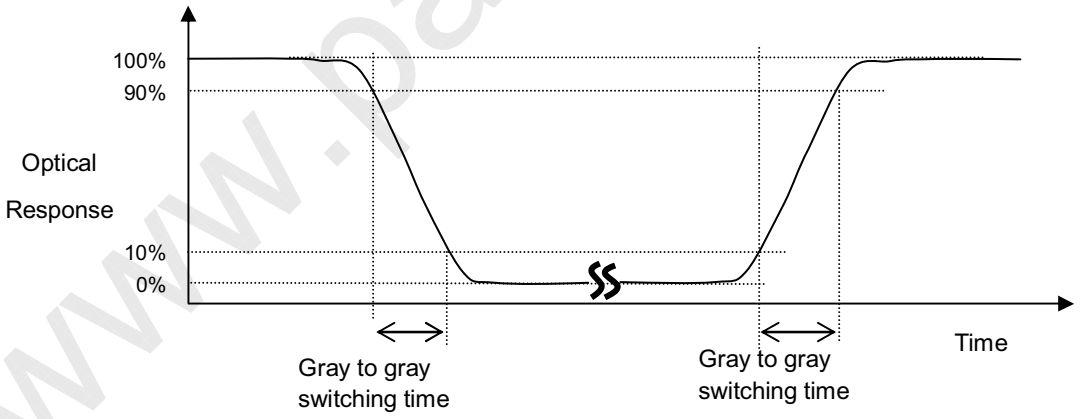
Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7)

Note (3) Definition of Gray to Gray Switching Time :



The driving signal means the signal of luminance 0%, 20%, 40%, 60%, 80%, 100%.

Gray to gray average time means the average switching time of luminance 0%,20%, 40%, 60%, 80%, 100% to each other.

Note (4) Definition of Luminance of White (L_C):

Measure the luminance of gray level 255 at center point.

L_C = L (5), where L (x) is corresponding to the luminance of the point X at the figure in Note (7).

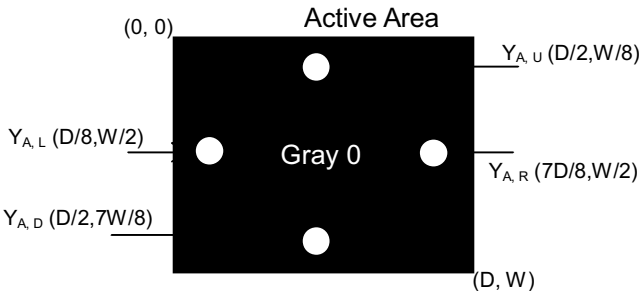
Note (5) Definition of Cross Talk (CT):

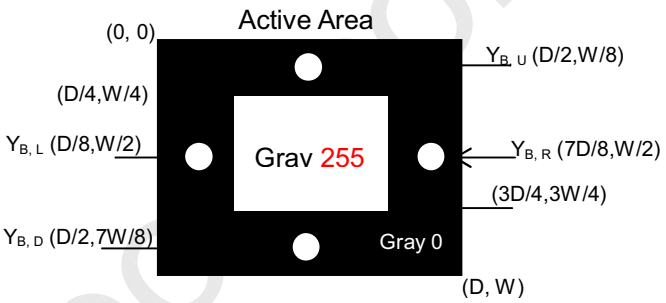
$$CT = | Y_B - Y_A | / Y_A \times 100 (\%)$$

Where:

Y_A = Luminance of measured location without gray level 51 pattern (cd/m^2)

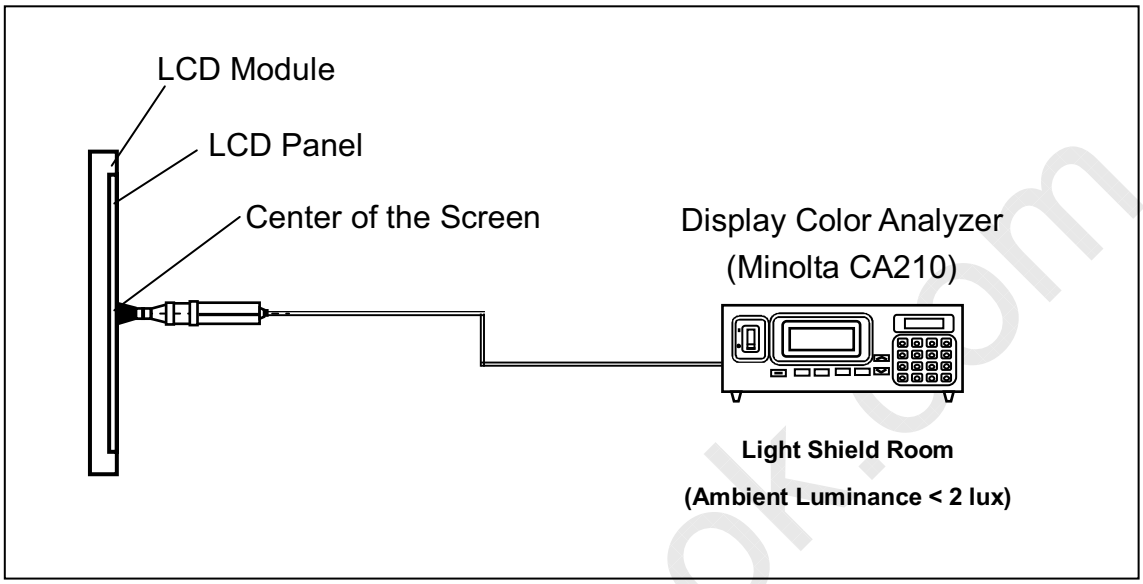
Y_B = Luminance of measured location with gray level 255 pattern (cd/m^2)





Note (6) Measurement Setup:

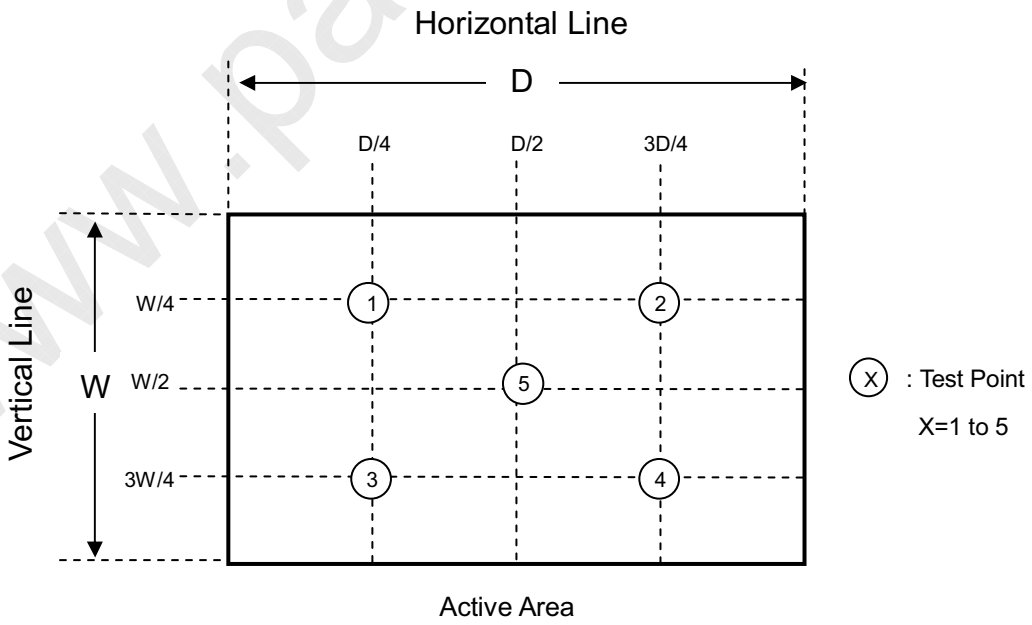
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 1 hour in a windless room.



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 1023 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

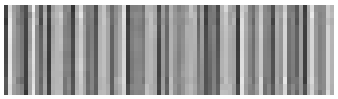


8. DEFINITION OF LABELS

8.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for CMO internal control.

V460H1-P06



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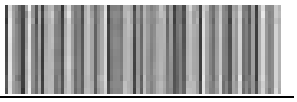
8.2 CARTON LABEL

The barcode nameplate is pasted on each box as illustration, and its definitions are as following explanation

P.O. NO._____

Parts ID._____

Carton ID._____ Quantities 8



XXXXXXXXXXXXX

Made in Taiwan

(a) Model Name: V460H1– P06

(b) Carton ID: CMO internal control

(c) Quantities: 8

9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 8 LCD TV Panels / 1 Box

(2) Box dimensions :1238 (L) X 842 (W) X 240(H)

(3) Weight : approximately 38Kg (8 panels per box)

9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

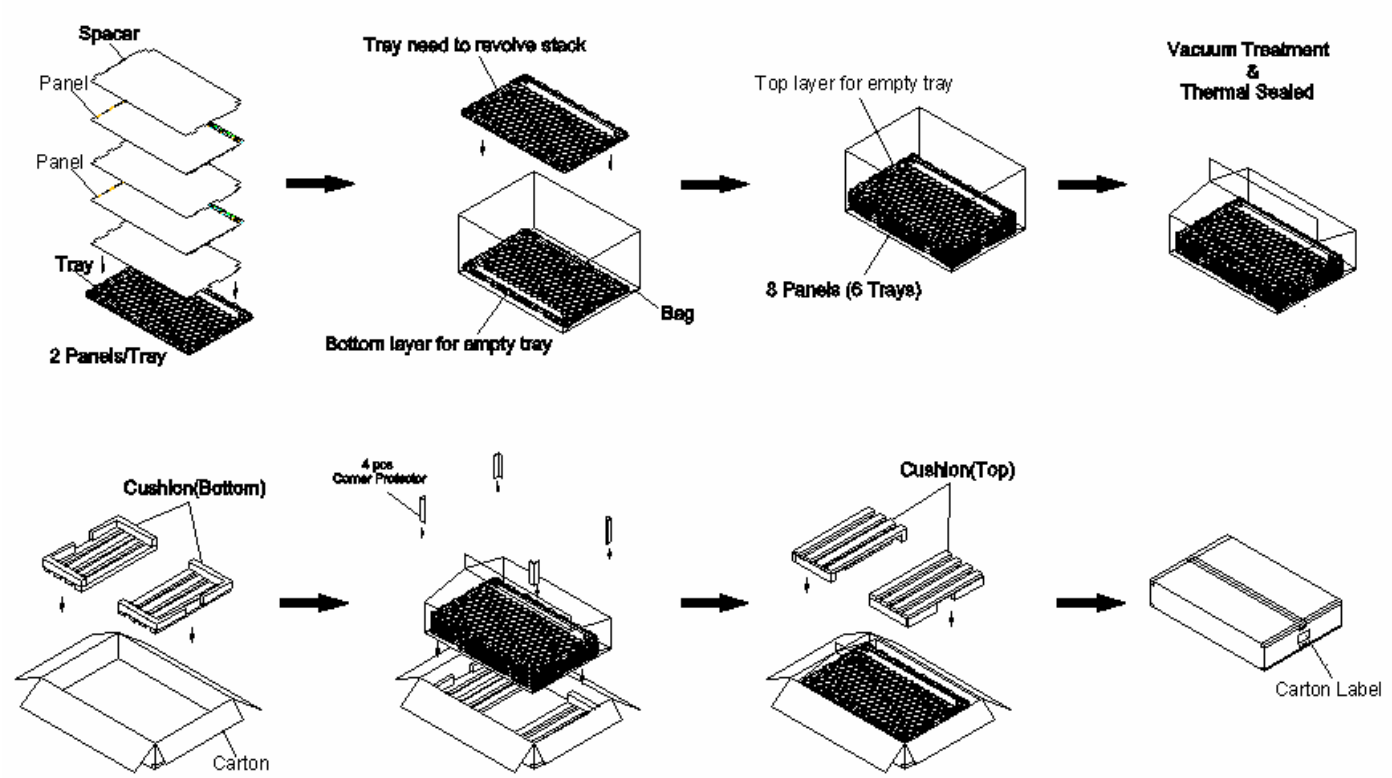
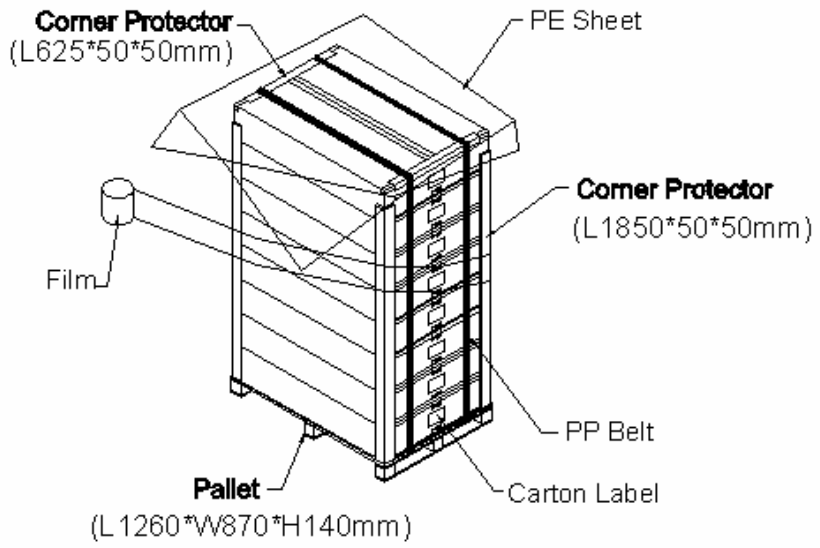


Figure.9-1 packing method

Sea & Land Transportation
Gross: 319kg



Air Transportation
Gross: 243kg

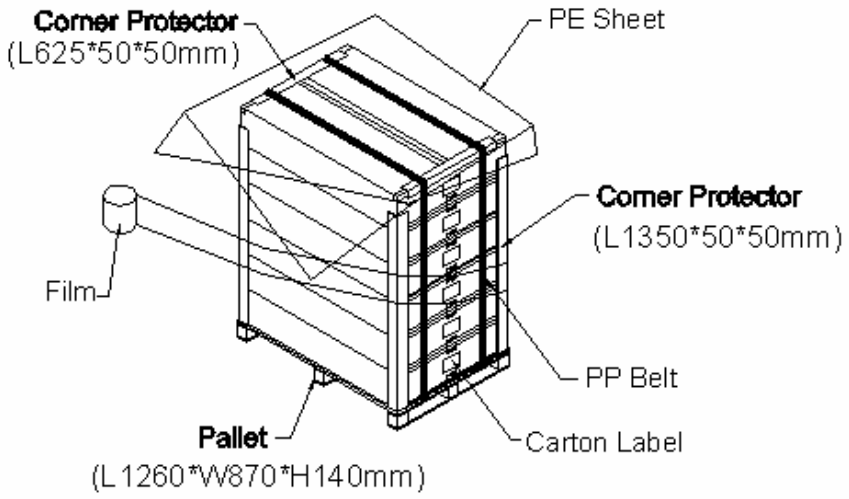


Figure.9-2 packing method

10. PRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the product during assembly.

(2) To assemble backlight or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel will be damaged.

(4) Always follow the correct power sequence when the product is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(7) It is dangerous that moisture come into or contacted the product, because moisture may damage the product when it is operating.

(8) High temperature or humidity may reduce the performance of module. Please store this product within the specified storage conditions.

(9) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly.

10.2 SAFETY PRECAUTIONS

(1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(2) After the product's end of life, it is not harmful in case of normal operation and storage.

11. Mechanical Drawing