CHI MEI OPTOELECTRONICS CORP.

Issued Date: Feb. 23, 2009
Model No.: V315B3-P05
Approval

TFT LCD Approval Specification

MODEL NO.:V315B3-P05

Customer: _____

Approved by: _____

Note:

Approved By	TVHD
	LY Chen

Reviewed By	QRA Dept.	Product Development Div.
	Kc Ko	WT Lin

Prepared By	LCD TV Marketing and Product Management Div.	
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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 2.0	Feb.23, 2009	All	All	Approval Specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V315B3- P05 is a 31.5" TFT Liquid Crystal Display module. This module supports 1366 x 768 WXGA format and can display true 16.7M colors (8-bit colors).

1.2 CHARACTERISTICS

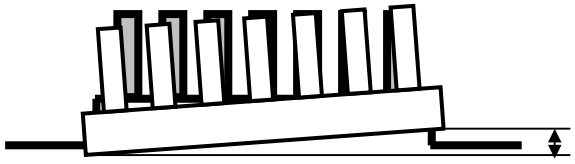
CHARACTERISTICS ITEMS	SPECIFICATIONS
Screen Diagonal [in]	31.51
Pixels [lines]	1366×768
Active Area [mm]	697.6845 (H) x 392.256 (V) (31.51" diagonal)
Sub -Pixel Pitch [mm]	0.17025 (H) x 0.51075 (V)
Pixel Arrangement	RGB vertical stripe
Weight [g]	TYP. 1200
Physical Size [mm]	716(W) x 410.8(H) x 2(D) Typ.
Display Mode	Transmissive mode / Normally black
Contrast Ratio	2500:1 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=(0.641, 0.331) G=(0.272, 0.597) B=(0.144, 0.070) W=(0.280, 0.290) (Typical value measured at CMO's module)
Cell Transparency [%]	4.5%Typ. (Typical value measured at CMO's module)
Polarizer (CF side)	Super Wide View Anti-glare coating (Haze 17%), 710.8(H) x 406.6(w).. Hardness: 2H
Polarizer (TFT side)	Super Wide View, 710.8(H) x 406.6(w).

1.3 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight		1200		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



2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMO MODULE V315B1-L04)

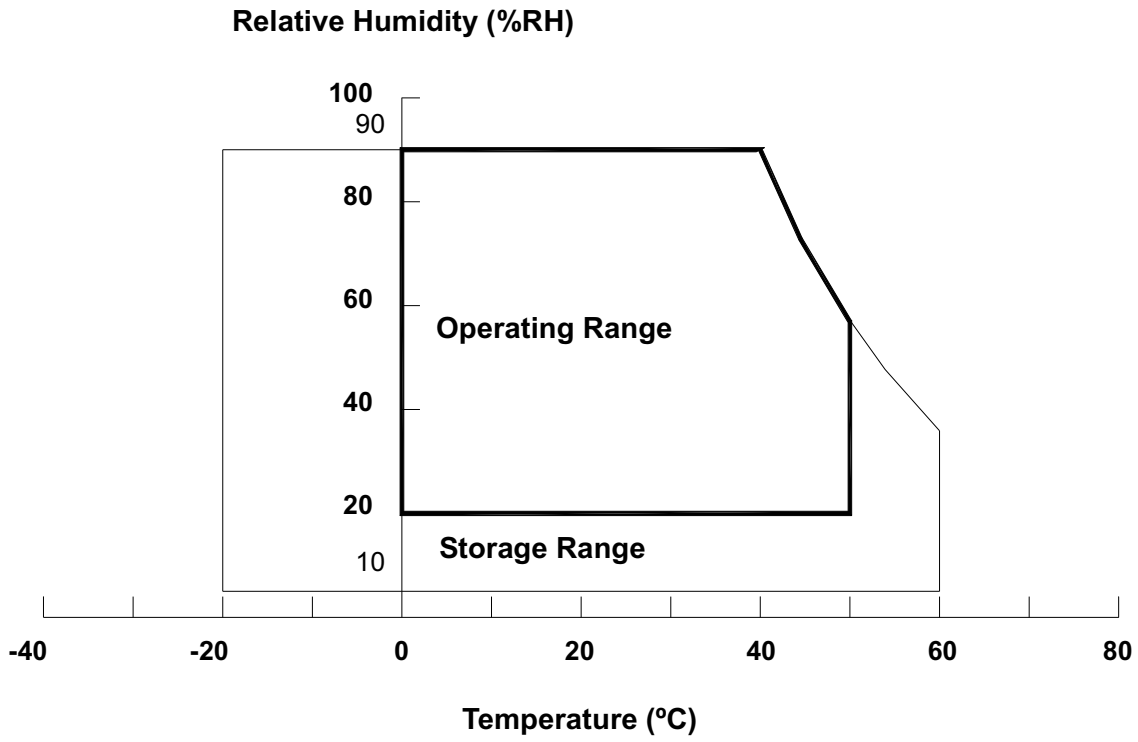
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1), (3)
Operating Ambient Temperature	T_{OP}	0	50	ºC	(1), (2), (3)
Altitude Operating	A_{OP}	0	5000	M	(3)
Altitude Storage	A_{ST}	0	12000	M	(3)

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)

Item	Symbol	Value		Unit	Note
		Min	Max		
Power Supply Voltage	VDA	-0.5	+14.0	V	(1)
Power Supply Voltage	VGHP	-0.3	+30.0	V	
Power Supply Voltage	VGL	-10.0	-0.3	V	
Logic Input Voltage	VDD	-0.3	+3.1	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		VGHP	22	23	24	V	
		VGL	-6.0	-5.5	-5.0	V	
		VDA	13.20	13.50	13.80	V	
		VDD	2.4	2.5	2.6	V	
		VREF	12.65	12.8	12.95	V	
Power Supply Current		IGH	-	10	-	mA	
		IGL	-	3	-	mA	
		IDA	-	260	-	mA	
		IDD	-	225	-	mA	
CMOS interface	Input High Threshold Voltage	V_{IH}	0.8VDD	-	VDD	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.2VDD	V	

3.2 RSDS CHARACTERISTICS

Ta = -10~+85 ºC

Item	Symbol	Condition	Value			Unit
			Min	Typ	Max	
RSDS high input Voltage	$V_{DIFFRSDS}$	V_{CMRSDS} = +1.2 V (1)	100	200	-	mV
RSDS low input Voltage	$V_{DIFFRSDS}$	V_{CMRSDS} = +1.2 V (1)	-	-200	-100	mV
RSDS common mode input voltage range	V_{CMRSDS}	$V_{DIFFRSDS}$ = 200 mV (2)	VSS+0.1	Note(3)	VDD-1.2	V
RSDS Input leakage current	I_{DL}	$D_{xx}P$, $D_{xx}N$,CLKO ,CLPN	-10	-	10	μA

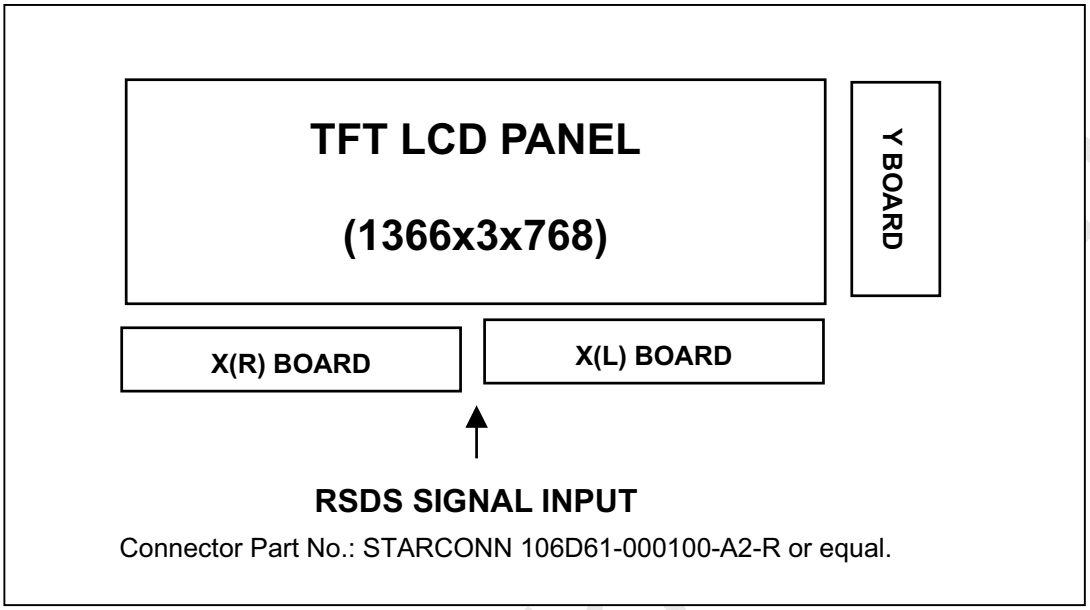
Note (1) V_{CMRSDS} = (VCLKP + VCLKN)/2 or V_{CMRSDS} = ($VD_{XX}P$ + $VD_{XX}N$)/2

Note (2) $V_{DIFFRSDS}$ = VCLKP - VCLKN or $V_{DIFFRSDS}$ = $VD_{XX}P$ - $VD_{XX}N$

Note (3) V_{CMRSDS} = 0.8V(VDD = 2.5V)

4. BLOCK DIAGRAM

4.1 TFT LCD OPEN CELL



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin assignment

CN1(XL) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	TR2	trace2 (3)	32	B1P	RSDS data signal (Blue 1)
2	TR1	trace1 (2)	33	B1N	RSDS data signal (Blue 1)
3	GND	Ground	34	B0P	RSDS data signal (Blue 0)
4	GM14	Gamma Power supply	35	B0N	RSDS data signal (Blue 0)
5	GM13	Gamma Power supply	36	CLKP	Data driver clock
6	GM12	Gamma Power supply	37	CLKN	Data driver clock
7	GM11	Gamma Power supply	38	G3P	RSDS data signal (Green 3)
8	GM10	Gamma Power supply	39	G3N	RSDS data signal (Green 3)
9	GM9	Gamma Power supply	40	G2P	RSDS data signal (Green 2)
10	GM8	Gamma Power supply	41	G2N	RSDS data signal (Green 2)
11	GM7	Gamma Power supply	42	G1P	RSDS data signal (Green 1)
12	GM6	Gamma Power supply	43	G1N	RSDS data signal (Green 1)
13	GM5	Gamma Power supply	44	G0P	RSDS data signal (Green 0)
14	GM4	Gamma Power supply	45	G0N	RSDS data signal (Green 0)
15	GM3	Gamma Power supply	46	R3P	RSDS data signal (Red 3)
16	GM2	Gamma Power supply	47	R3N	RSDS data signal (Red 3)
17	GM1	Gamma Power supply	48	R2P	RSDS data signal (Red 2)
18	VCM	VCM Power supply	49	R2N	RSDS data signal (Red 2)
19	VDA	Driver Power supply	50	R1P	RSDS data signal (Red 1)
20	VDA	Driver Power supply	51	R1N	RSDS data signal (Red 1)
21	DRL	Control the direction of start pulse	52	R0P	RSDS data signal (Red 0)
22	VDD	Logic Power supply	53	R0N	RSDS data signal (Red 0)
23	EIO4	The fourth source driver start pulse	54	GND	Ground
24	STH	The first source driver start pulse	55	STV_R	Scan driver start pulse 2
25	TP1	RSDS data latch	56	STV	Scan driver start pulse 1
26	POL	polarity invert	57	CKV	Scan driver clock
27	GND	Ground	58	OE	Scan driver output enable
28	B3P	RSDS data signal (Blue 3)	59	VGL	Driver Power supply
29	B3N	RSDS data signal (Blue 3)	60	VGH	Driver Power supply
30	B2P	RSDS data signal (Blue 2)	61	GND	Ground
31	B2N	RSDS data signal (Blue 2)			

CN2(XR) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	32	R3N	RSDS data signal (Red 3)
2	GM14	Gamma Power supply	33	R3P	RSDS data signal (Red 3)
3	GM13	Gamma Power supply	34	G0N	RSDS data signal (Green 0)
4	GM12	Gamma Power supply	35	G0P	RSDS data signal (Green 0)
5	GM11	Gamma Power supply	36	G1N	RSDS data signal (Green 1)
6	GM10	Gamma Power supply	37	G1P	RSDS data signal (Green 1)
7	GM9	Gamma Power supply	38	G2N	RSDS data signal (Green 2)
8	GM8	Gamma Power supply	39	G2P	RSDS data signal (Green 2)
9	GM7	Gamma Power supply	40	G3N	RSDS data signal (Green 3)
10	GM6	Gamma Power supply	41	G3P	RSDS data signal (Green 3)
11	GM5	Gamma Power supply	42	CLKN	Data driver clock
12	GM4	Gamma Power supply	43	CLKP	Data driver clock
13	GM3	Gamma Power supply	44	B0N	RSDS data signal (Blue 0)
14	GM2	Gamma Power supply	45	B0P	RSDS data signal (Blue 0)
15	GM1	Gamma Power supply	46	B1N	RSDS data signal (Blue 1)
16	VCM	VCM Power supply	47	B1P	RSDS data signal (Blue 1)
17	VDA	Driver Power supply	48	B2N	RSDS data signal (Blue 2)
18	VDA	Driver Power supply	49	B2P	RSDS data signal (Blue 2)
19	VREF	Gamma Power supply	50	B3N	RSDS data signal (Blue 3)
20	VDD	Logic Power supply	51	B3P	RSDS data signal (Blue 3)
21	STH_R	source driver start pulse reverse	52	GND	Ground
22	EIO4	The fourth source driver start pulse	53	DRL	Control the direction of start pulse
23	TP1	RSDS data latch	54	STV	Scan driver start pulse 1
24	POL	polarity invert	55	VSCM	VSCM Power supply
25	GND	Ground	56	NC	No connection
26	R0N	RSDS data signal (Red 0)	57	VGL	Driver Power supply
27	R0P	RSDS data signal (Red 0)	58	NC	No connection
28	R1N	RSDS data signal (Red 1)	59	GND	Ground
29	R1P	RSDS data signal (Red 1)	60	TR4	trace4 (2)
30	R2N	RSDS data signal (Red 2)	61	TR3	trace3 (3)
31	R2P	RSDS data signal (Red 2)			

Note (1) CN1、CN2 Connector Part No.: STARCONN 106D61-000100-A2-R or equal.
Note (2) The TR1 must be connected to the TR4.
Note (3) The TR2 must be connected to the TR3.

5.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		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 Colors	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	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	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	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
Gray Scale Of Red	Red(0) / Dark	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(1)	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(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(253)	1	1	1	1	1	1	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
Gray Scale Of Green	Green(0) / Dark	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(1)	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(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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
Gray Scale Of Blue	Blue(0) / Dark	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(1)	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(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

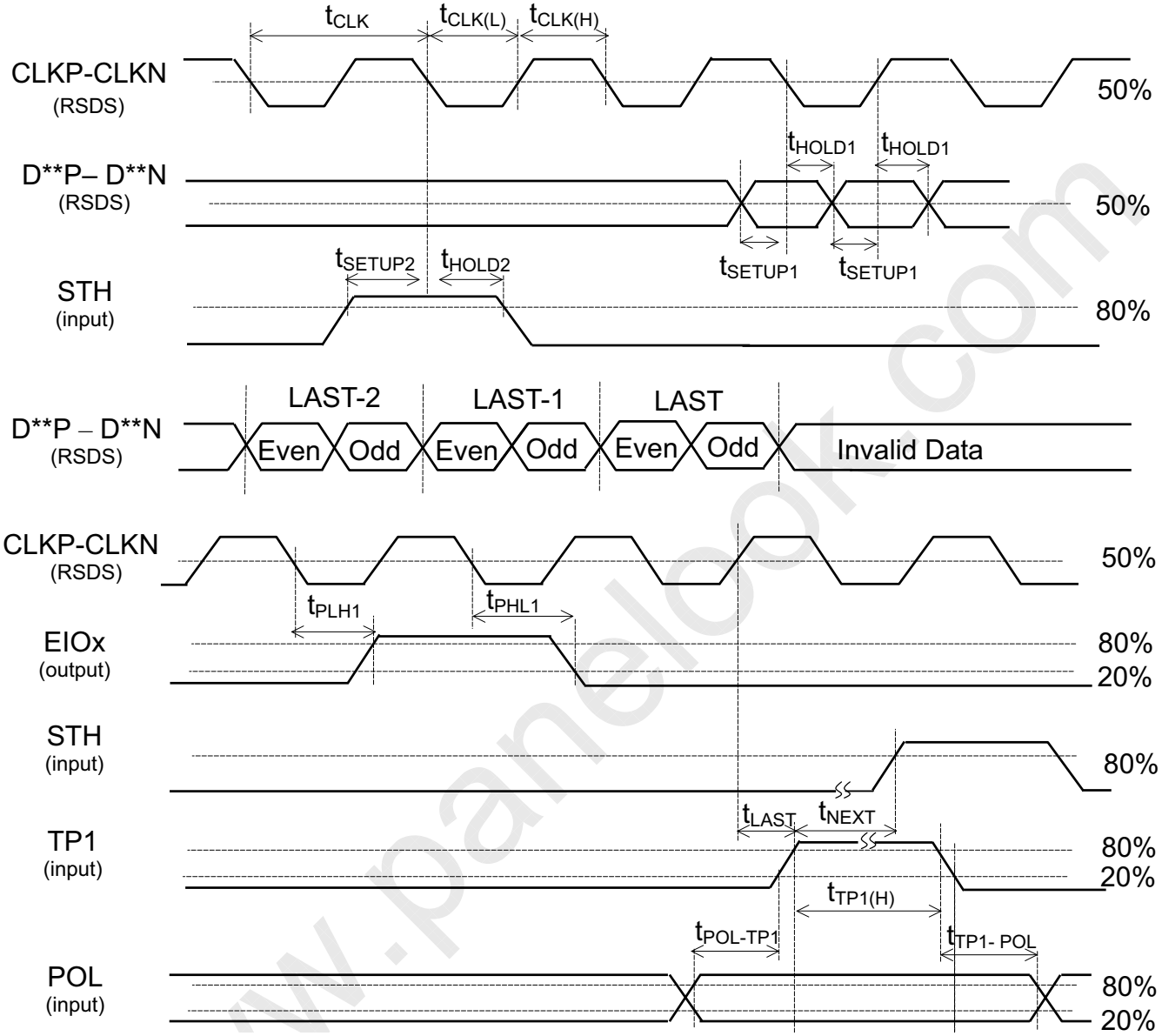
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

(a) Timing Spec

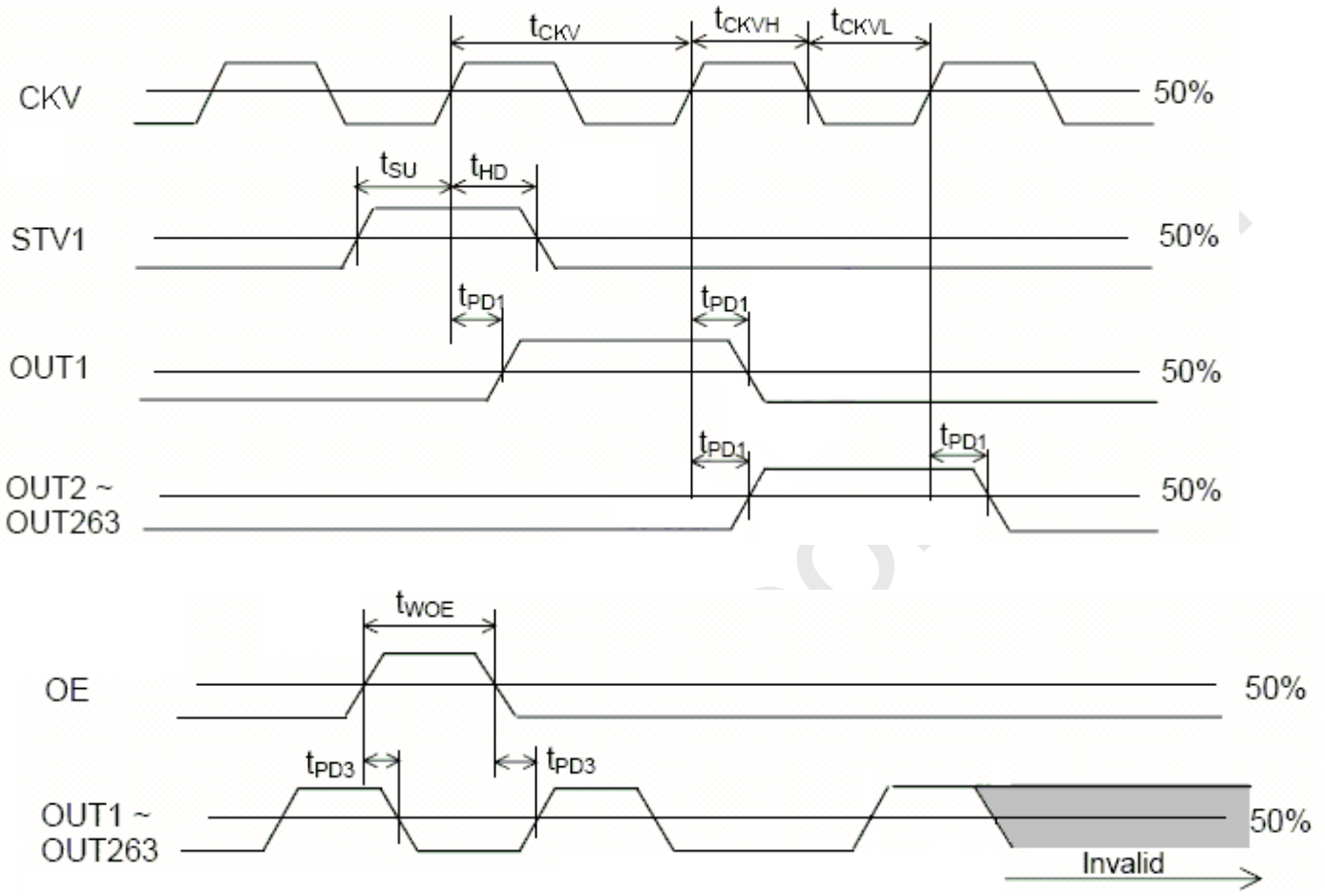
	Parameter	Symbol	Condition	Spec			Unit
				Min.	Typ.	Max.	
HD	Clock pulse width	t_{CLK}	-	11.8(1)	-	-	ns
	Clock pulse low period	$t_{CLK(L)}$	-	5	-	-	ns
	Clock pulse high period	$t_{CLK(H)}$	-	5	-	-	ns
	Data setup time	t_{SETUP1}	-	2.9	-	-	ns
	Data hold time	t_{HOLD1}	-	2.2	-	-	ns
	Start pulse setup time	t_{SETUP2}	-	1.3	-	-	ns
	Start pulse hold time	t_{HOLD2}	-	2.2	-	-	ns
	TP1 high period	$t_{TP1(H)}$	-	15	-	-	CLKP
	Last data CLK to TP1 high	t_{LAST}	-	1	-	-	CLKP
	TP1 high to STH high	t_{NEXT}	-	6	-	-	CLKP
	POL to TP1 setup time	$t_{POL-TP1}$	POL toggle to TP1 rising	3	-	-	ns
	TP1 to POL hold time	$t_{TP1-POL}$	TP1 falling to POL toggle	2	-	-	ns
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
	OE to output delay time	t_{PD3}	CL=300pF	-	-	0.8	μs

Note (1) : When operation frequency=85MHz

(b) Horizontal Timing Chart



(c)Vertical Timing Chart

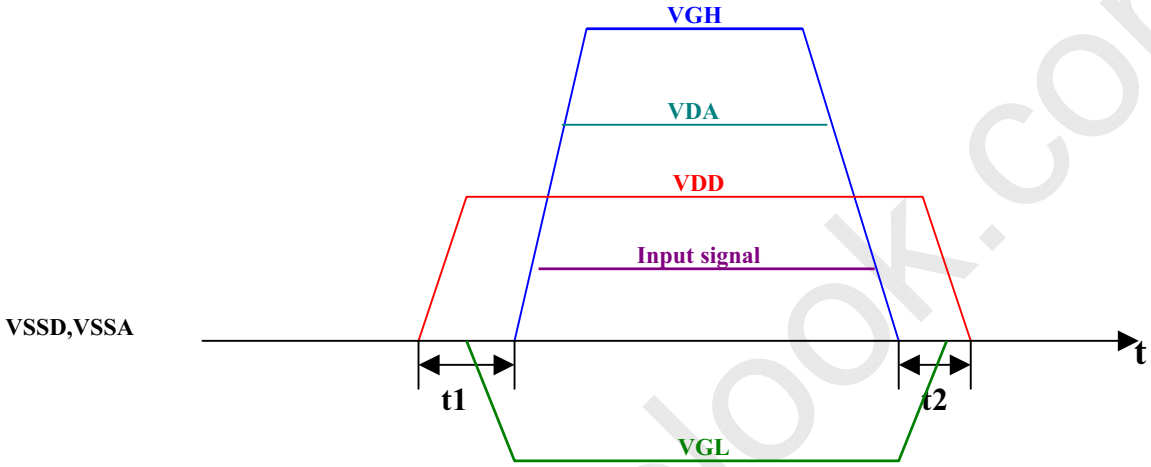


6.2 POWER ON/OFF SEQUENCE

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 , Input signal (t1＞0)

When power off : Input signal , 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}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	**9.5±0.7**	mA
Inverter Driving Frequency	F_L	**66±3**	KHz

7.2 OPTICAL SPECIFICATIONS

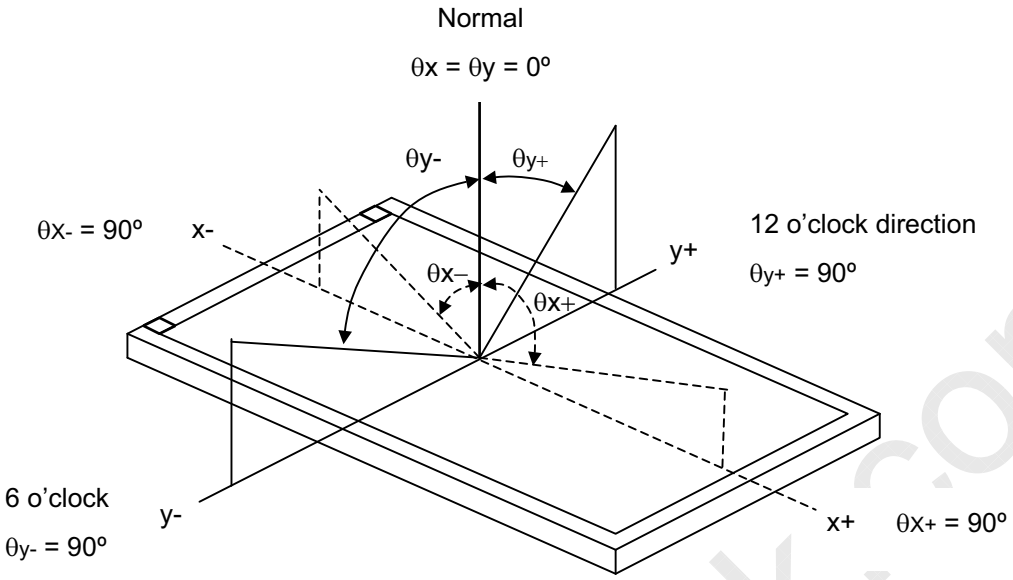
The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y =0° Viewing angle at normal direction With CMO module	Typ.-0.03	0.641	Typ+0.03	-	(1),(5)
		Ry			0.331		-	
	Green	Gx			0.272		-	
		Gy			0.597		-	
	Blue	Bx			0.144		-	
		By			0.070		-	
	White	Wx			0.280		-	
		Wy			0.290		-	
Center Transmittance		T%	θ_x=0°, θ_Y =0° With CMO Module	-	4.5		%	(1), (7)
Contrast Ratio		CR		1500	2500		-	(1), (3)
Response Time		Gray to gray average	θ_x=0°, θ_Y =0° With CMO Module@60Hz	-	6.5	12	ms	(4)
White Variation		δW	θ_x=0°, θ_Y =0° With CMO Module			1.3	-	(1), (6)
Viewing Angle	Horizontal	θ_x+	CR≥20 With CMO Module	80	88	-	Deg.	(1), (2)
		θ_x-		80	88	-		
	Vertical	θ_Y+		80	88	-		
		θ_Y-		80	88	-		

Note (1) Light source is CMO's V315B3-L01 BLU and driving voltages are based on suitable gamma voltages.

Note (2) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by EZ-Contrast 160R (Eldim)



Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

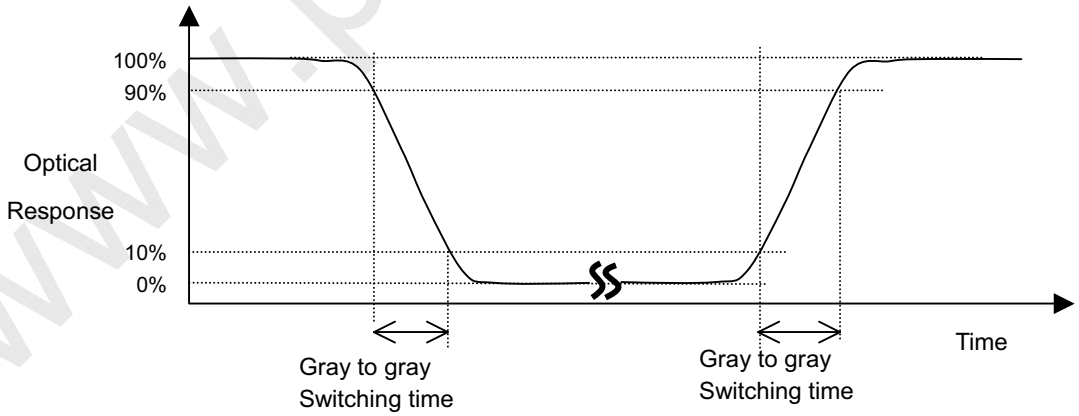
Contrast Ratio (CR) = L255 / L0

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 (6).

Note (4) Definition of Gray-to-Gray Switching Time:



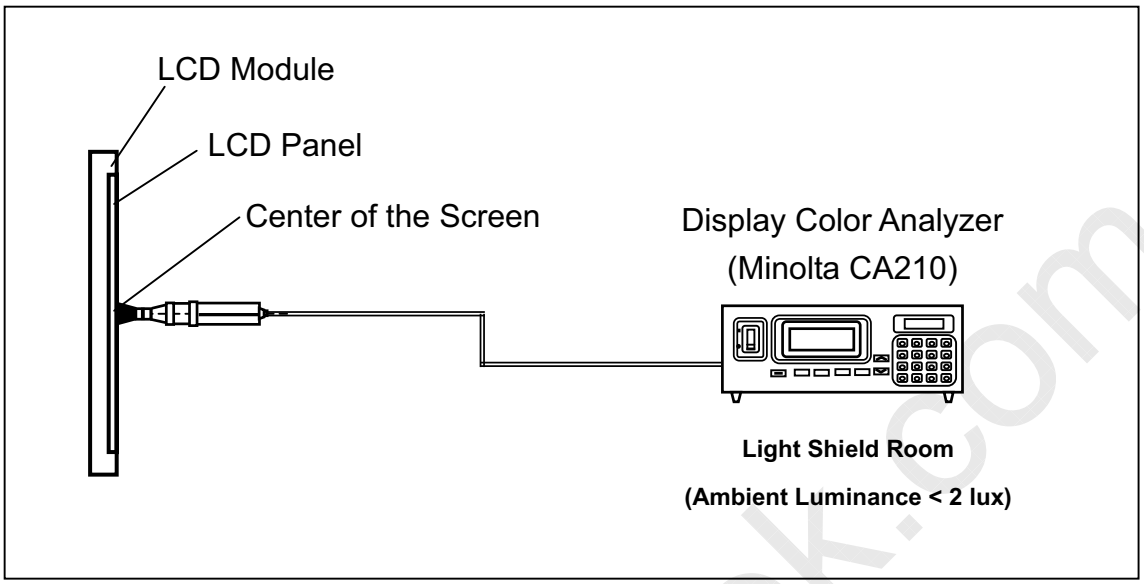
The driving signal means the signal of luminance 0%, 20%, 40%, 60%, 80%, 100%.

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

Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 60 minutes to avoid abrupt temperature

change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 60 minutes in a windless room.

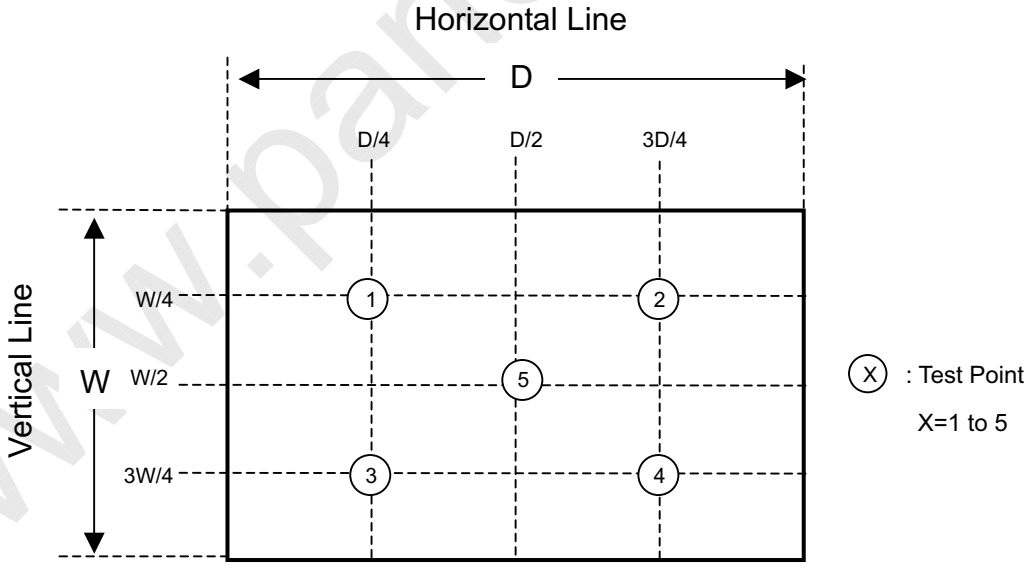


Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 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)]

where L (X) is corresponding to the luminance of the point X at the figure below.



Note (7) Definition of Transmittance (T%): Active Area

Module is without signal input.

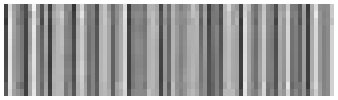
$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$

8. DEFINITION OF LABELS

8.1 OPEN CELL LABEL

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

V315B3-P05



XXXXXXXXXXXXX

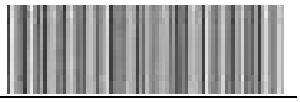
8.2 CARTON LABEL

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 12



XXXXXXXXXXXXX

Made in Taiwan

(a) Model Name: V315B3– P05

(b) Carton ID: CMO internal control

(c) Quantities: 12

9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 12 LCD TV Panels / 1 Box

(2) Box dimensions : 970 (L) X 640 (W) X 319 (H)

Weight : approximately 28Kg (12 panels per box)

9.2 PACKING METHOD

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

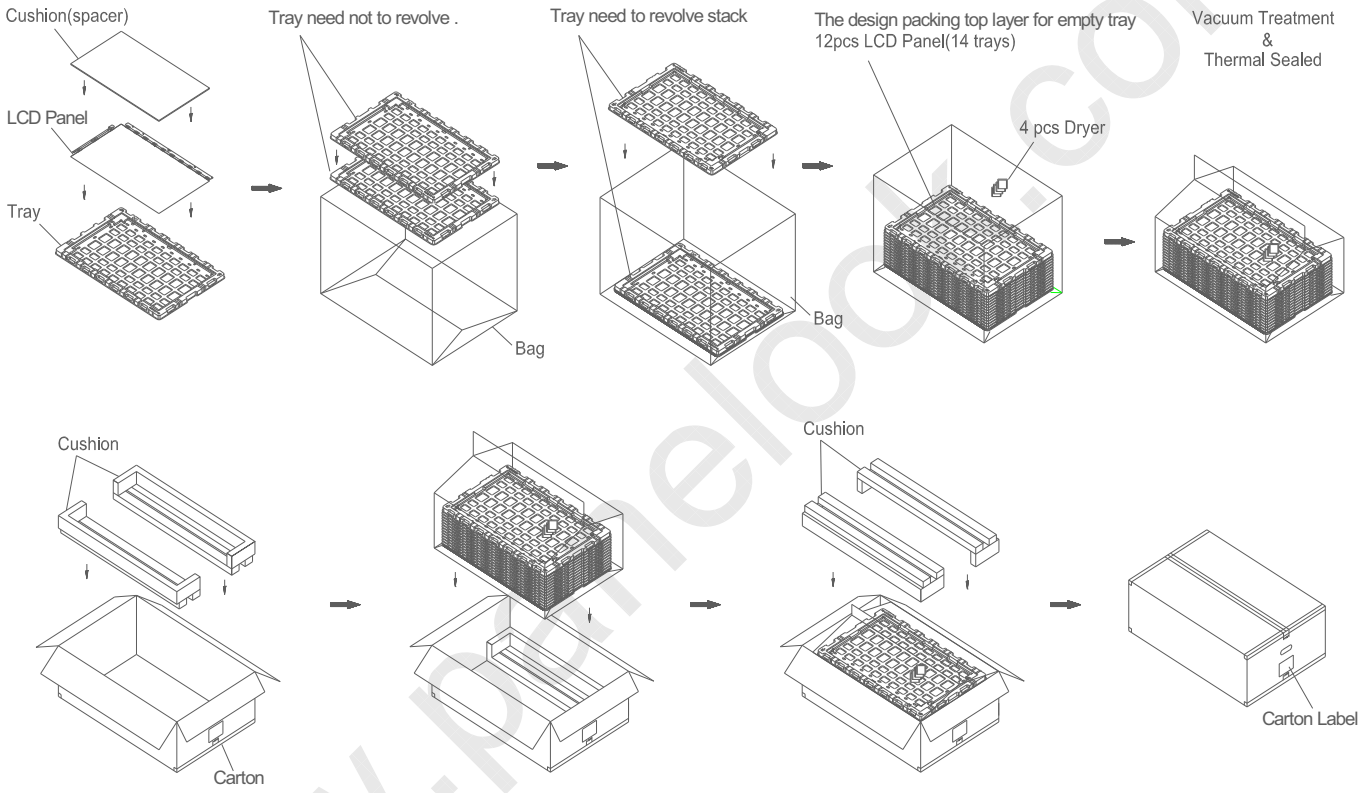
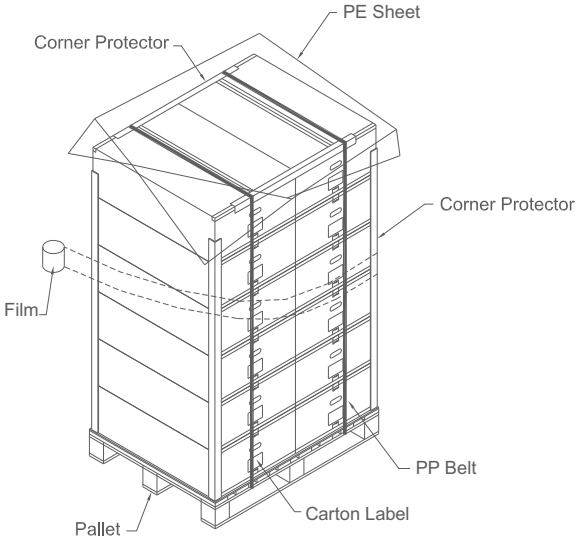


Figure.9-1 packing method

Sea Transportation

Corner Protector:L1850*50*50mm
L1130*50*50mm
Pallet:L1300*W1000*H140mm
Pallet Stack:L1300*W1000*H2054mm
Gross: 352kg



Air Transportation

Corner Protector:L1250*50*50mm
L1130*50*50mm
Pallet:L1300*W1000*H140mm
Pallet Stack:L1300*W1000*H1416mm
Gross:240kg

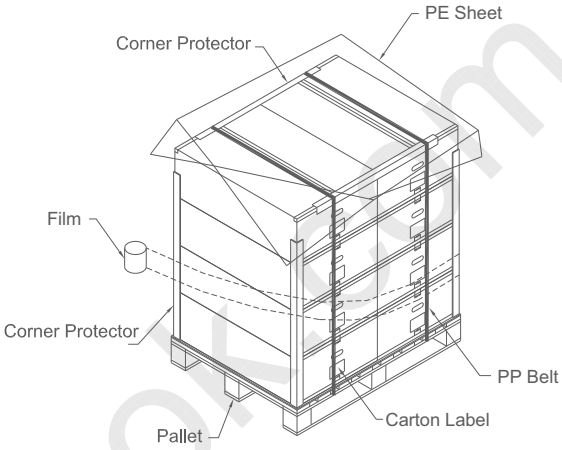


Figure.9-2 packing method

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.

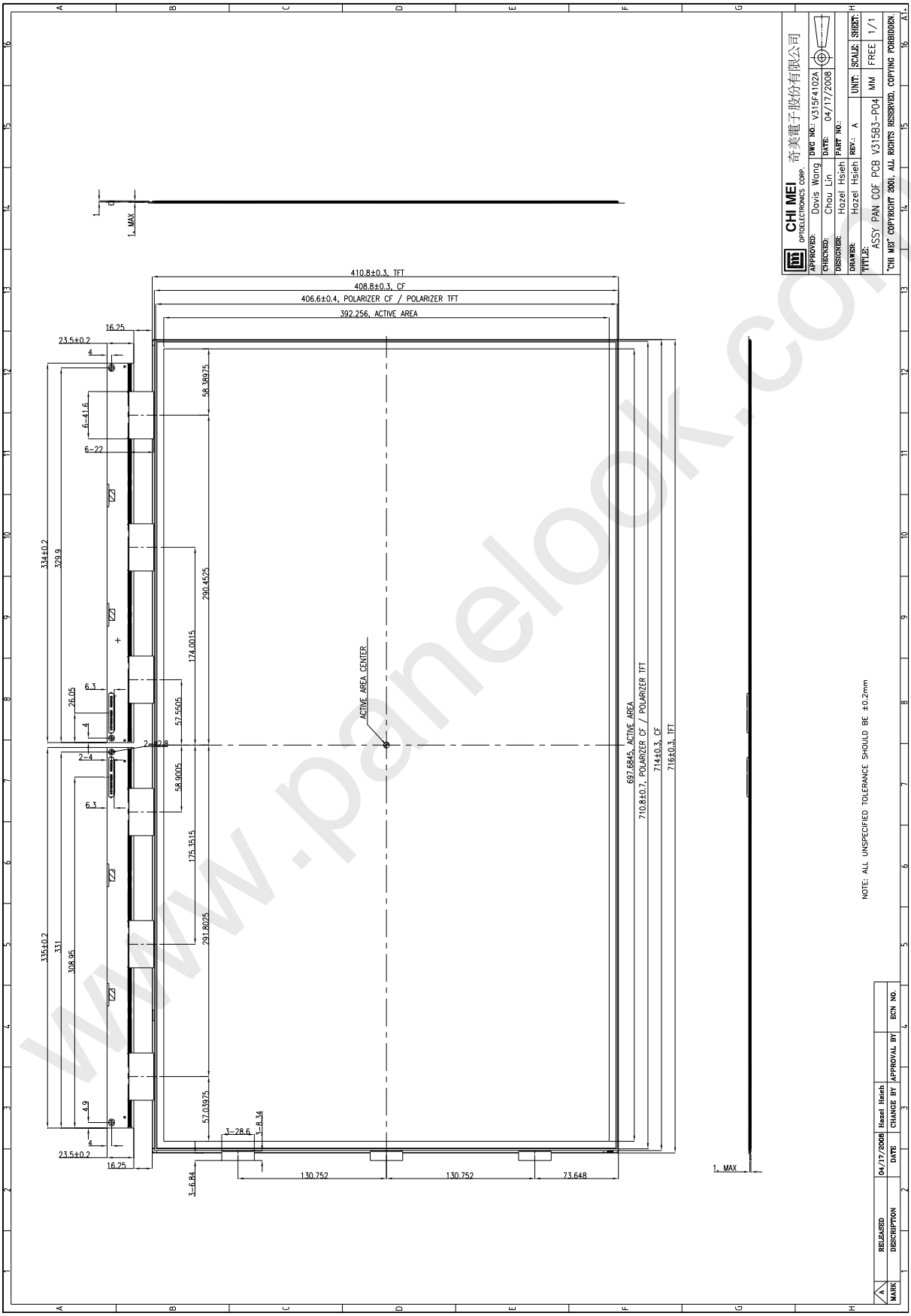
(9) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly.

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



CHI MEI OPTOELECTRONICS CORP.

Issued Date: Feb. 23, 2009
Model No.: V315B3-P05
Approval

TFT LCD Approval Specification

MODEL NO.:V315B3-P05

Customer: _____

Approved by: _____

Note:

Approved By	TVHD
	LY Chen

Reviewed By	QRA Dept.	Product Development Div.
	Kc Ko	WT Lin

Prepared By	LCD TV Marketing and Product Management Div.	
	Ken Wu	Peter Liu

CHI MEI OPTOELECTRONICS CORP.

Issued Date: Feb. 23, 2009
Model No.: V315B3-P05
Approval

- CONTENTS -

REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 2.0	Feb.23, 2009	All	All	Approval Specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V315B3- P05 is a 31.5" TFT Liquid Crystal Display module. This module supports 1366 x 768 WXGA format and can display true 16.7M colors (8-bit colors).

1.2 CHARACTERISTICS

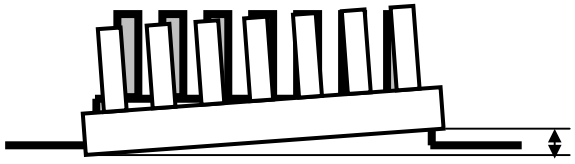
CHARACTERISTICS ITEMS	SPECIFICATIONS
Screen Diagonal [in]	31.51
Pixels [lines]	1366×768
Active Area [mm]	697.6845 (H) x 392.256 (V) (31.51" diagonal)
Sub -Pixel Pitch [mm]	0.17025 (H) x 0.51075 (V)
Pixel Arrangement	RGB vertical stripe
Weight [g]	TYP. 1200
Physical Size [mm]	716(W) x 410.8(H) x 2(D) Typ.
Display Mode	Transmissive mode / Normally black
Contrast Ratio	2500:1 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=(0.641, 0.331) G=(0.272, 0.597) B=(0.144, 0.070) W=(0.280, 0.290) (Typical value measured at CMO's module)
Cell Transparency [%]	4.5%Typ. (Typical value measured at CMO's module)
Polarizer (CF side)	Super Wide View Anti-glare coating (Haze 17%), 710.8(H) x 406.6(w).. Hardness: 2H
Polarizer (TFT side)	Super Wide View, 710.8(H) x 406.6(w).

1.3 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight		1200		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



2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMO MODULE V315B1-L04)

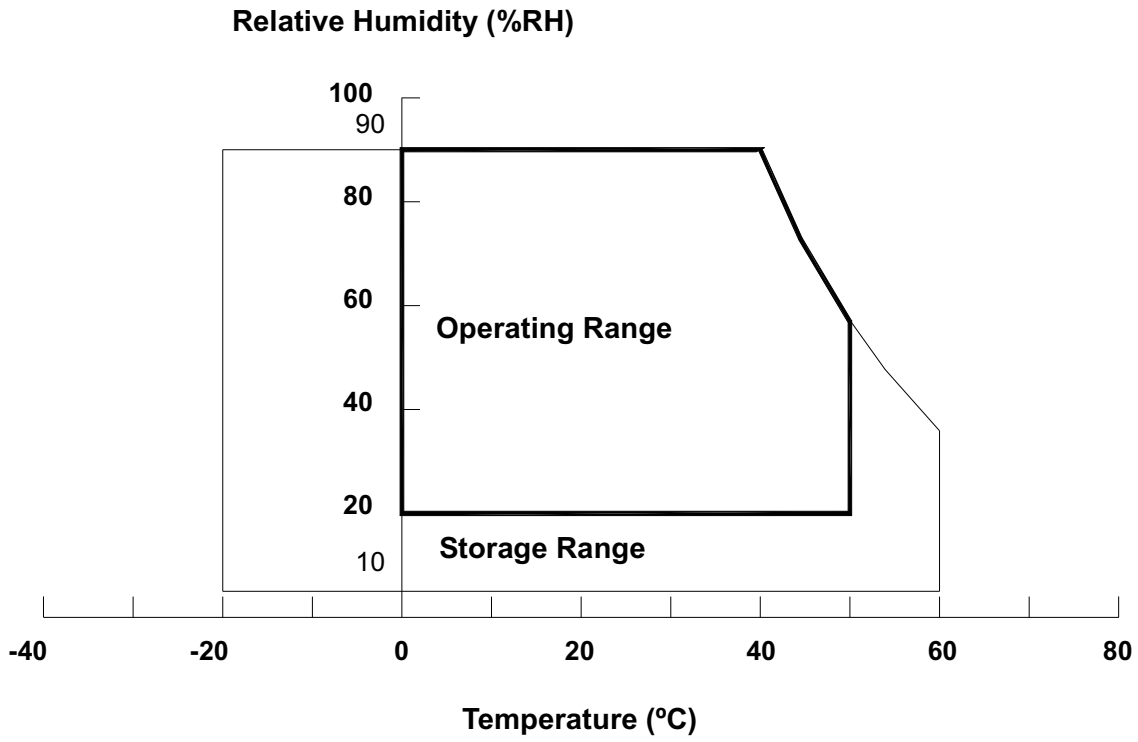
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1), (3)
Operating Ambient Temperature	T_{OP}	0	50	ºC	(1), (2), (3)
Altitude Operating	A_{OP}	0	5000	M	(3)
Altitude Storage	A_{ST}	0	12000	M	(3)

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)

Item	Symbol	Value		Unit	Note
		Min	Max		
Power Supply Voltage	VDA	-0.5	+14.0	V	(1)
Power Supply Voltage	VGHP	-0.3	+30.0	V	
Power Supply Voltage	VGL	-10.0	-0.3	V	
Logic Input Voltage	VDD	-0.3	+3.1	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		VGHP	22	23	24	V	
		VGL	-6.0	-5.5	-5.0	V	
		VDA	13.20	13.50	13.80	V	
		VDD	2.4	2.5	2.6	V	
		VREF	12.65	12.8	12.95	V	
Power Supply Current		IGH	-	10	-	mA	
		IGL	-	3	-	mA	
		IDA	-	260	-	mA	
		IDD	-	225	-	mA	
CMOS interface	Input High Threshold Voltage	V_{IH}	0.8VDD	-	VDD	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.2VDD	V	

3.2 RSDS CHARACTERISTICS

Ta = -10~+85 ºC

Item	Symbol	Condition	Value			Unit
			Min	Typ	Max	
RSDS high input Voltage	$V_{DIFFRSDS}$	V_{CMRSDS} = +1.2 V (1)	100	200	-	mV
RSDS low input Voltage	$V_{DIFFRSDS}$	V_{CMRSDS} = +1.2 V (1)	-	-200	-100	mV
RSDS common mode input voltage range	V_{CMRSDS}	$V_{DIFFRSDS}$ = 200 mV (2)	VSS+0.1	Note(3)	VDD-1.2	V
RSDS Input leakage current	I_{DL}	$D_{xx}P$, $D_{xx}N$,CLKO ,CLPN	-10	-	10	μA

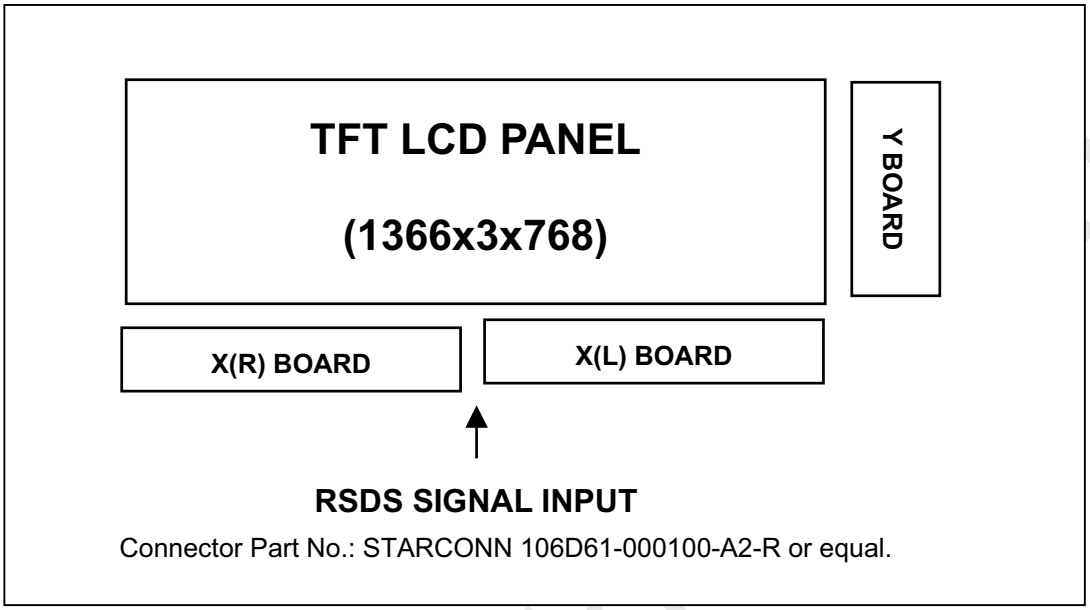
Note (1) V_{CMRSDS} = (VCLKP + VCLKN)/2 or V_{CMRSDS} = ($VD_{XX}P$ + $VD_{XX}N$)/2

Note (2) $V_{DIFFRSDS}$ = VCLKP - VCLKN or $V_{DIFFRSDS}$ = $VD_{XX}P$ - $VD_{XX}N$

Note (3) V_{CMRSDS} = 0.8V(VDD = 2.5V)

4. BLOCK DIAGRAM

4.1 TFT LCD OPEN CELL



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin assignment

CN1(XL) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	TR2	trace2 (3)	32	B1P	RSDS data signal (Blue 1)
2	TR1	trace1 (2)	33	B1N	RSDS data signal (Blue 1)
3	GND	Ground	34	B0P	RSDS data signal (Blue 0)
4	GM14	Gamma Power supply	35	B0N	RSDS data signal (Blue 0)
5	GM13	Gamma Power supply	36	CLKP	Data driver clock
6	GM12	Gamma Power supply	37	CLKN	Data driver clock
7	GM11	Gamma Power supply	38	G3P	RSDS data signal (Green 3)
8	GM10	Gamma Power supply	39	G3N	RSDS data signal (Green 3)
9	GM9	Gamma Power supply	40	G2P	RSDS data signal (Green 2)
10	GM8	Gamma Power supply	41	G2N	RSDS data signal (Green 2)
11	GM7	Gamma Power supply	42	G1P	RSDS data signal (Green 1)
12	GM6	Gamma Power supply	43	G1N	RSDS data signal (Green 1)
13	GM5	Gamma Power supply	44	G0P	RSDS data signal (Green 0)
14	GM4	Gamma Power supply	45	G0N	RSDS data signal (Green 0)
15	GM3	Gamma Power supply	46	R3P	RSDS data signal (Red 3)
16	GM2	Gamma Power supply	47	R3N	RSDS data signal (Red 3)
17	GM1	Gamma Power supply	48	R2P	RSDS data signal (Red 2)
18	VCM	VCM Power supply	49	R2N	RSDS data signal (Red 2)
19	VDA	Driver Power supply	50	R1P	RSDS data signal (Red 1)
20	VDA	Driver Power supply	51	R1N	RSDS data signal (Red 1)
21	DRL	Control the direction of start pulse	52	R0P	RSDS data signal (Red 0)
22	VDD	Logic Power supply	53	R0N	RSDS data signal (Red 0)
23	EIO4	The fourth source driver start pulse	54	GND	Ground
24	STH	The first source driver start pulse	55	STV_R	Scan driver start pulse 2
25	TP1	RSDS data latch	56	STV	Scan driver start pulse 1
26	POL	polarity invert	57	CKV	Scan driver clock
27	GND	Ground	58	OE	Scan driver output enable
28	B3P	RSDS data signal (Blue 3)	59	VGL	Driver Power supply
29	B3N	RSDS data signal (Blue 3)	60	VGH	Driver Power supply
30	B2P	RSDS data signal (Blue 2)	61	GND	Ground
31	B2N	RSDS data signal (Blue 2)			

CN2(XR) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	32	R3N	RSDS data signal (Red 3)
2	GM14	Gamma Power supply	33	R3P	RSDS data signal (Red 3)
3	GM13	Gamma Power supply	34	G0N	RSDS data signal (Green 0)
4	GM12	Gamma Power supply	35	G0P	RSDS data signal (Green 0)
5	GM11	Gamma Power supply	36	G1N	RSDS data signal (Green 1)
6	GM10	Gamma Power supply	37	G1P	RSDS data signal (Green 1)
7	GM9	Gamma Power supply	38	G2N	RSDS data signal (Green 2)
8	GM8	Gamma Power supply	39	G2P	RSDS data signal (Green 2)
9	GM7	Gamma Power supply	40	G3N	RSDS data signal (Green 3)
10	GM6	Gamma Power supply	41	G3P	RSDS data signal (Green 3)
11	GM5	Gamma Power supply	42	CLKN	Data driver clock
12	GM4	Gamma Power supply	43	CLKP	Data driver clock
13	GM3	Gamma Power supply	44	B0N	RSDS data signal (Blue 0)
14	GM2	Gamma Power supply	45	B0P	RSDS data signal (Blue 0)
15	GM1	Gamma Power supply	46	B1N	RSDS data signal (Blue 1)
16	VCM	VCM Power supply	47	B1P	RSDS data signal (Blue 1)
17	VDA	Driver Power supply	48	B2N	RSDS data signal (Blue 2)
18	VDA	Driver Power supply	49	B2P	RSDS data signal (Blue 2)
19	VREF	Gamma Power supply	50	B3N	RSDS data signal (Blue 3)
20	VDD	Logic Power supply	51	B3P	RSDS data signal (Blue 3)
21	STH_R	source driver start pulse reverse	52	GND	Ground
22	EIO4	The fourth source driver start pulse	53	DRL	Control the direction of start pulse
23	TP1	RSDS data latch	54	STV	Scan driver start pulse 1
24	POL	polarity invert	55	VSCM	VSCM Power supply
25	GND	Ground	56	NC	No connection
26	R0N	RSDS data signal (Red 0)	57	VGL	Driver Power supply
27	R0P	RSDS data signal (Red 0)	58	NC	No connection
28	R1N	RSDS data signal (Red 1)	59	GND	Ground
29	R1P	RSDS data signal (Red 1)	60	TR4	trace4 (2)
30	R2N	RSDS data signal (Red 2)	61	TR3	trace3 (3)
31	R2P	RSDS data signal (Red 2)			

Note (1) CN1、CN2 Connector Part No.: STARCONN 106D61-000100-A2-R or equal.
Note (2) The TR1 must be connected to the TR4.
Note (3) The TR2 must be connected to the TR3.

5.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		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 Colors	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	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	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	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
Gray Scale Of Red	Red(0) / Dark	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(1)	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(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	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
Gray Scale Of Green	Green(0) / Dark	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(1)	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(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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
Gray Scale Of Blue	Blue(0) / Dark	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(1)	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(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

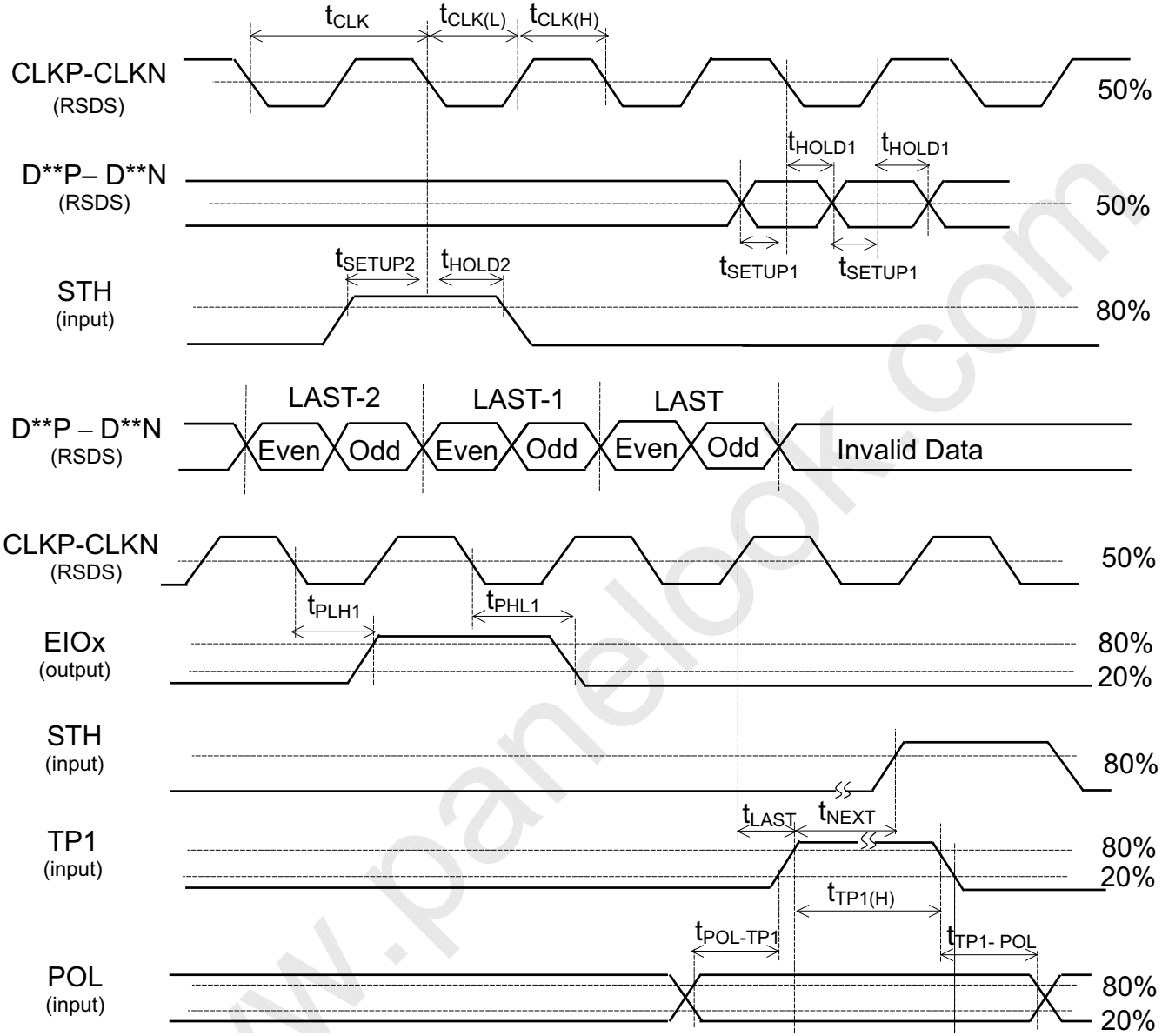
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

(a) Timing Spec

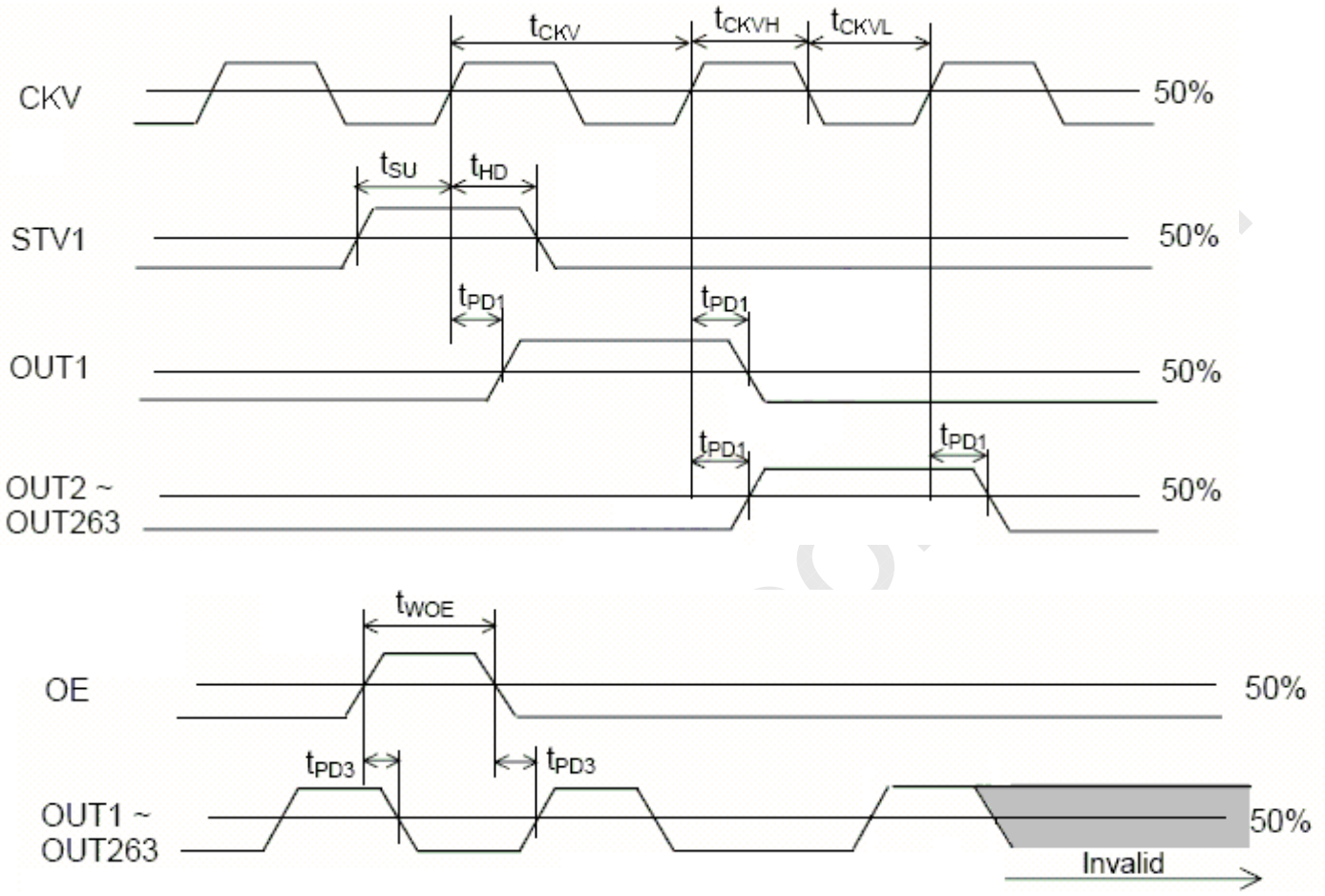
	Parameter	Symbol	Condition	Spec			Unit
				Min.	Typ.	Max.	
HD	Clock pulse width	t_{CLK}	-	11.8(1)	-	-	ns
	Clock pulse low period	$t_{CLK(L)}$	-	5	-	-	ns
	Clock pulse high period	$t_{CLK(H)}$	-	5	-	-	ns
	Data setup time	t_{SETUP1}	-	2.9	-	-	ns
	Data hold time	t_{HOLD1}	-	2.2	-	-	ns
	Start pulse setup time	t_{SETUP2}	-	1.3	-	-	ns
	Start pulse hold time	t_{HOLD2}	-	2.2	-	-	ns
	TP1 high period	$t_{TP1(H)}$	-	15	-	-	CLKP
	Last data CLK to TP1 high	t_{LAST}	-	1	-	-	CLKP
	TP1 high to STH high	t_{NEXT}	-	6	-	-	CLKP
	POL to TP1 setup time	$t_{POL-TP1}$	POL toggle to TP1 rising	3	-	-	ns
	TP1 to POL hold time	$t_{TP1-POL}$	TP1 falling to POL toggle	2	-	-	ns
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
	OE to output delay time	t_{PD3}	CL=300pF	-	-	0.8	μs

Note (1) : When operation frequency=85MHz

(b) Horizontal Timing Chart



(c)Vertical Timing Chart

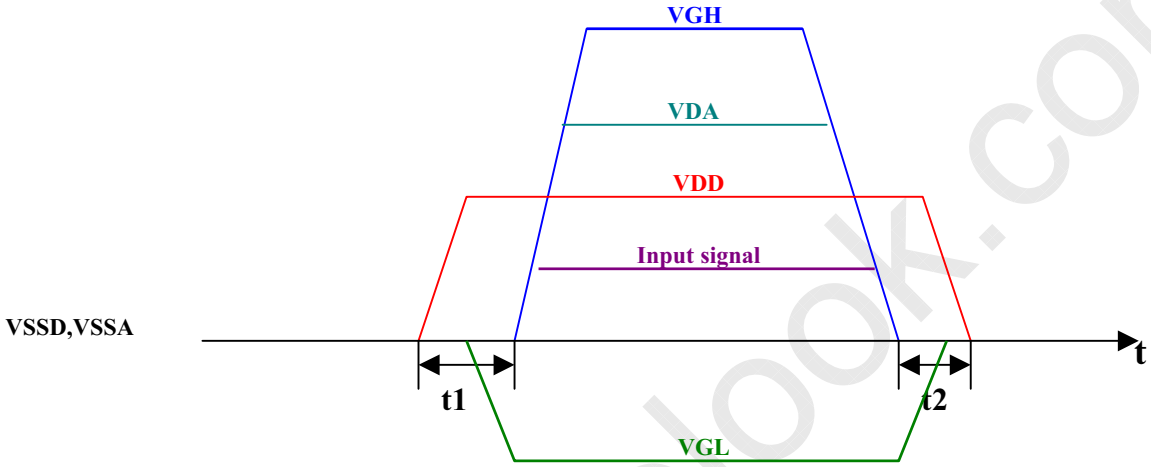


6.2 POWER ON/OFF SEQUENCE

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 , Input signal (t1＞0)

When power off : Input signal , 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}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	**9.5±0.7**	mA
Inverter Driving Frequency	F_L	**66±3**	KHz

7.2 OPTICAL SPECIFICATIONS

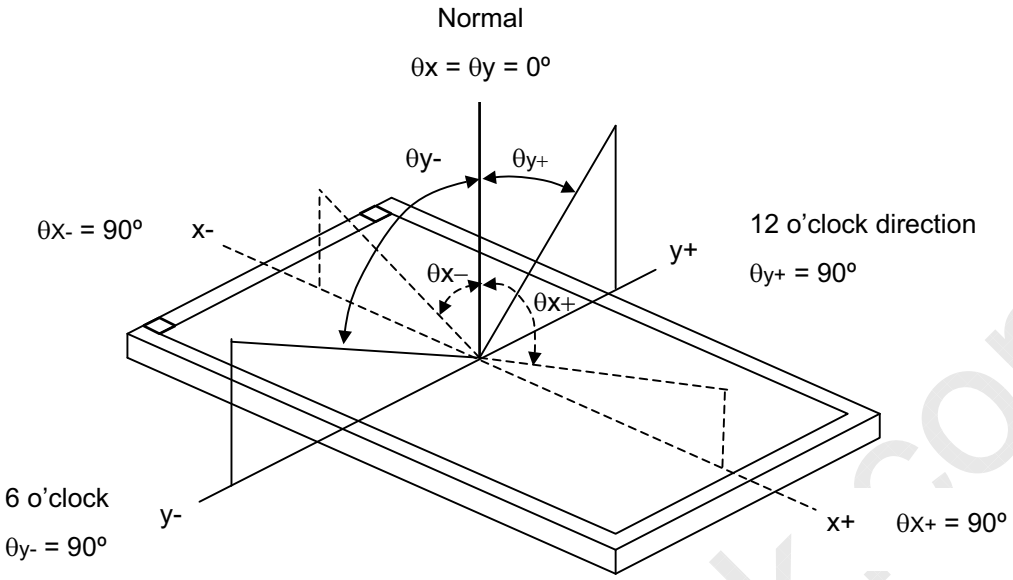
The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y =0° Viewing angle at normal direction With CMO module	Typ.-0.03	0.641	Typ+0.03	-	(1),(5)
		Ry			0.331		-	
	Green	Gx			0.272		-	
		Gy			0.597		-	
	Blue	Bx			0.144		-	
		By			0.070		-	
	White	Wx			0.280		-	
		Wy			0.290		-	
Center Transmittance		T%	θ_x=0°, θ_Y =0° With CMO Module	-	4.5		%	(1), (7)
Contrast Ratio		CR		1500	2500		-	(1), (3)
Response Time		Gray to gray average	θ_x=0°, θ_Y =0° With CMO Module@60Hz	-	6.5	12	ms	(4)
White Variation		δW	θ_x=0°, θ_Y =0° With CMO Module			1.3	-	(1), (6)
Viewing Angle	Horizontal	θ_x+	CR≥20 With CMO Module	80	88	-	Deg.	(1), (2)
		θ_x-		80	88	-		
	Vertical	θ_Y+		80	88	-		
		θ_Y-		80	88	-		

Note (1) Light source is CMO's V315B3-L01 BLU and driving voltages are based on suitable gamma voltages.

Note (2) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by EZ-Contrast 160R (Eldim)



Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

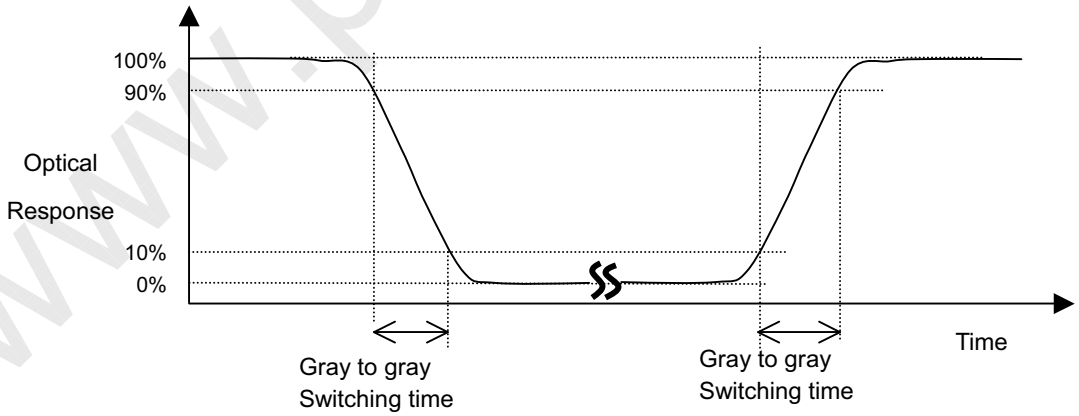
Contrast Ratio (CR) = L255 / L0

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 (6).

Note (4) Definition of Gray-to-Gray Switching Time:



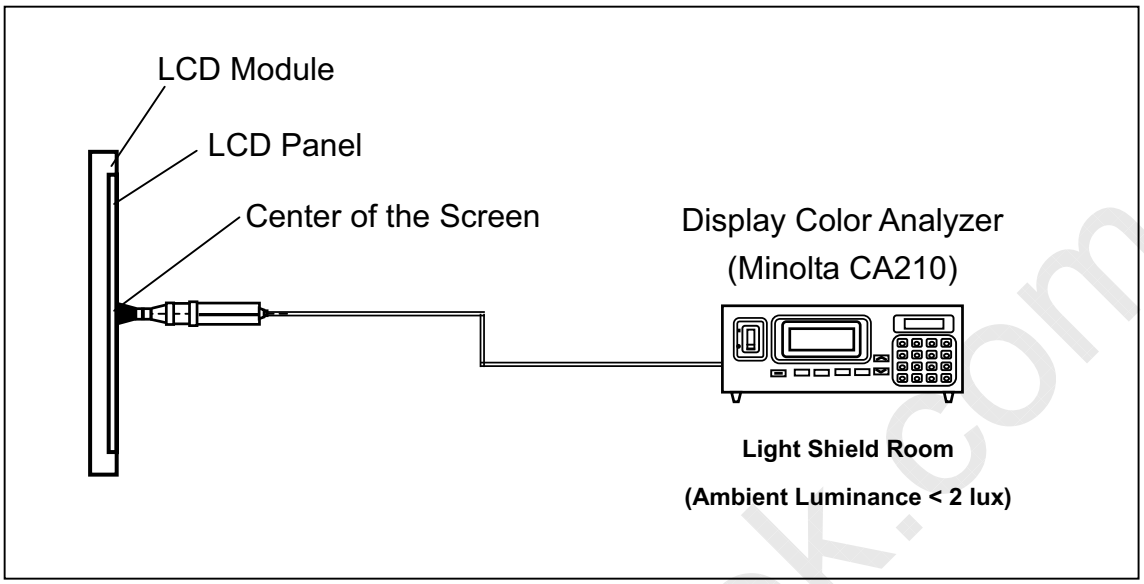
The driving signal means the signal of luminance 0%, 20%, 40%, 60%, 80%, 100%.

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

Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 60 minutes to avoid abrupt temperature

change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 60 minutes in a windless room.

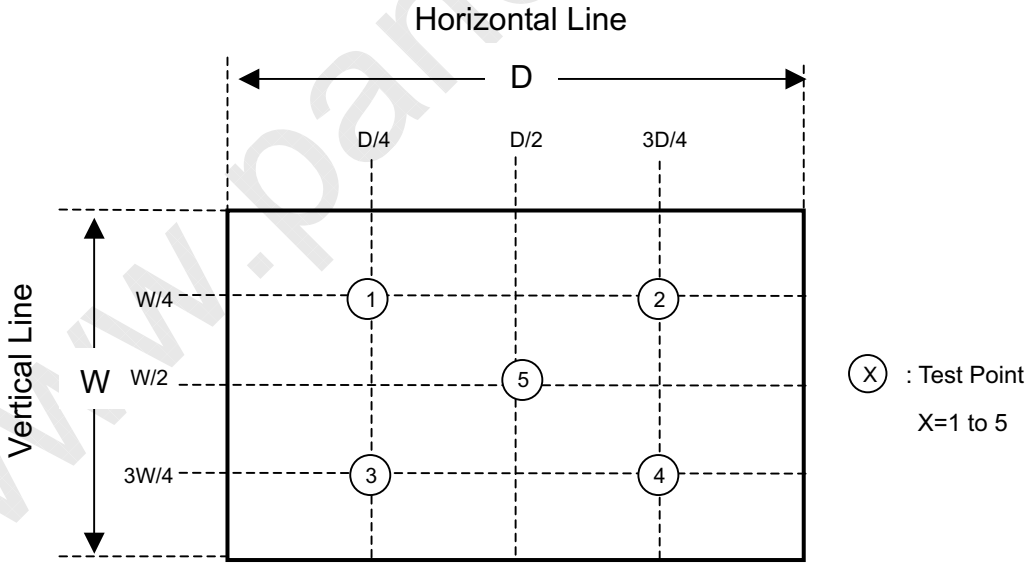


Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 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)]

where L (X) is corresponding to the luminance of the point X at the figure below.



Note (7) Definition of Transmittance (T%): Active Area

Module is without signal input.

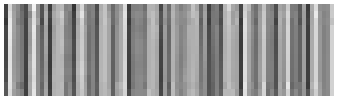
$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$

8. DEFINITION OF LABELS

8.1 OPEN CELL LABEL

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

V315B3-P05



XXXXXXXXXXXXX

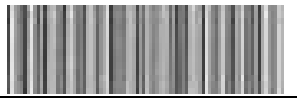
8.2 CARTON LABEL

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 12



XXXXXXXXXXXXX

Made in Taiwan

(a) Model Name: V315B3– P05

(b) Carton ID: CMO internal control

(c) Quantities: 12

9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 12 LCD TV Panels / 1 Box

(2) Box dimensions : 970 (L) X 640 (W) X 319 (H)

Weight : approximately 28Kg (12 panels per box)

9.2 PACKING METHOD

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

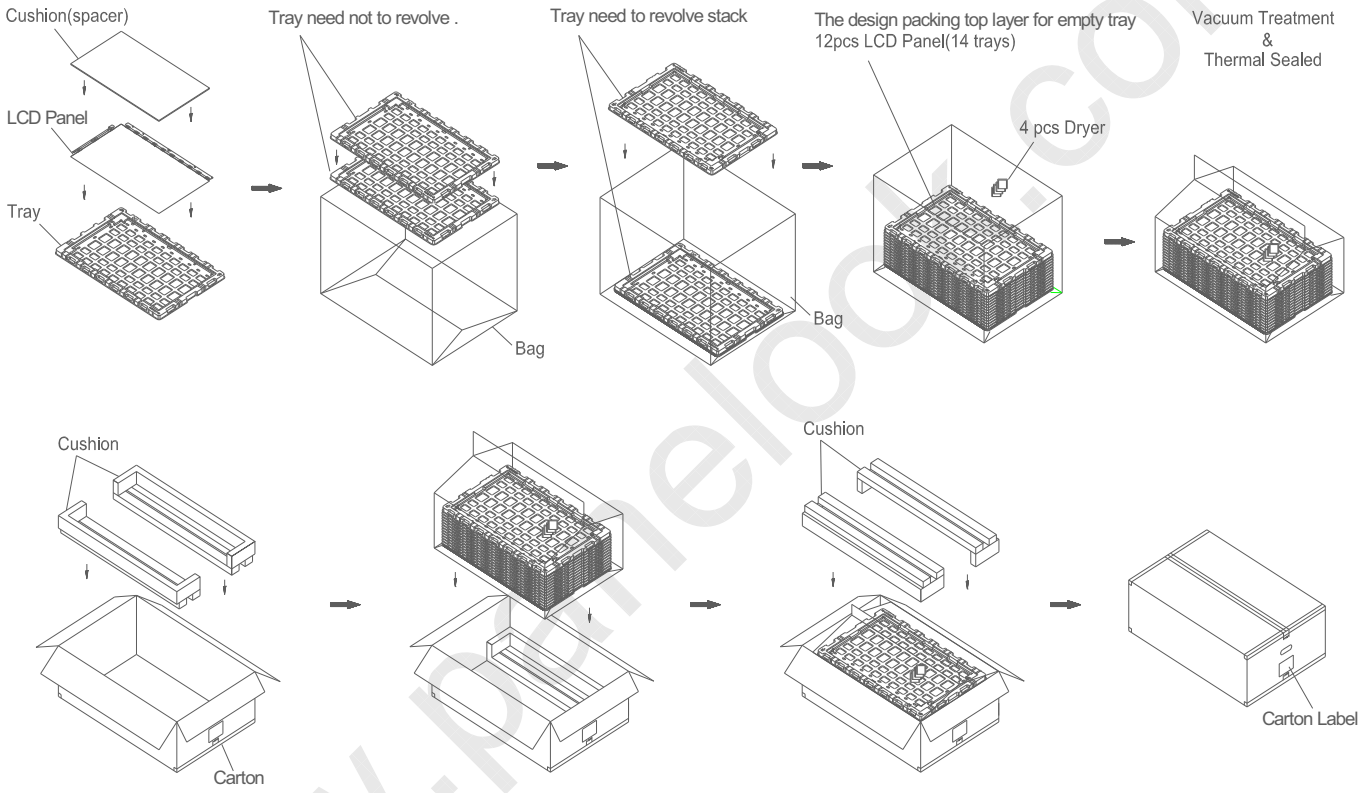
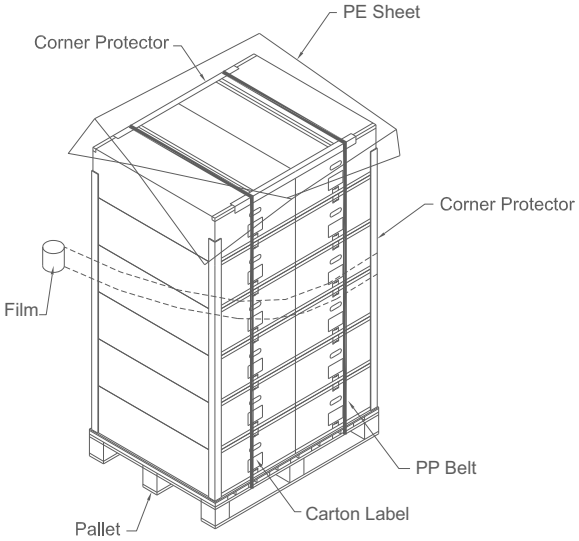


Figure.9-1 packing method

Sea Transportation

Corner Protector:L1850*50*50mm
L1130*50*50mm
Pallet:L1300*W1000*H140mm
Pallet Stack:L1300*W1000*H2054mm
Gross: 352kg



Air Transportation

Corner Protector:L1250*50*50mm
L1130*50*50mm
Pallet:L1300*W1000*H140mm
Pallet Stack:L1300*W1000*H1416mm
Gross:240kg

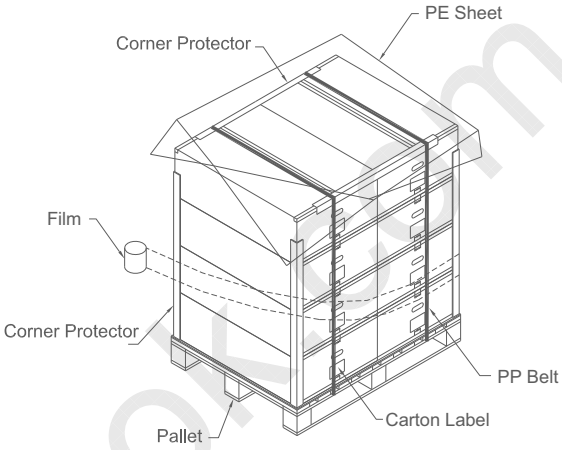


Figure.9-2 packing method

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