TFT LCD Approval Specification

MODEL NO.:V315B1-P01

Customer: _____

Approved by: _____

Note:

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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 2.0	Mar. 01, 2007	All	All	Approval Specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V315B1- P01 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

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMO MODULE V315B1-L01)

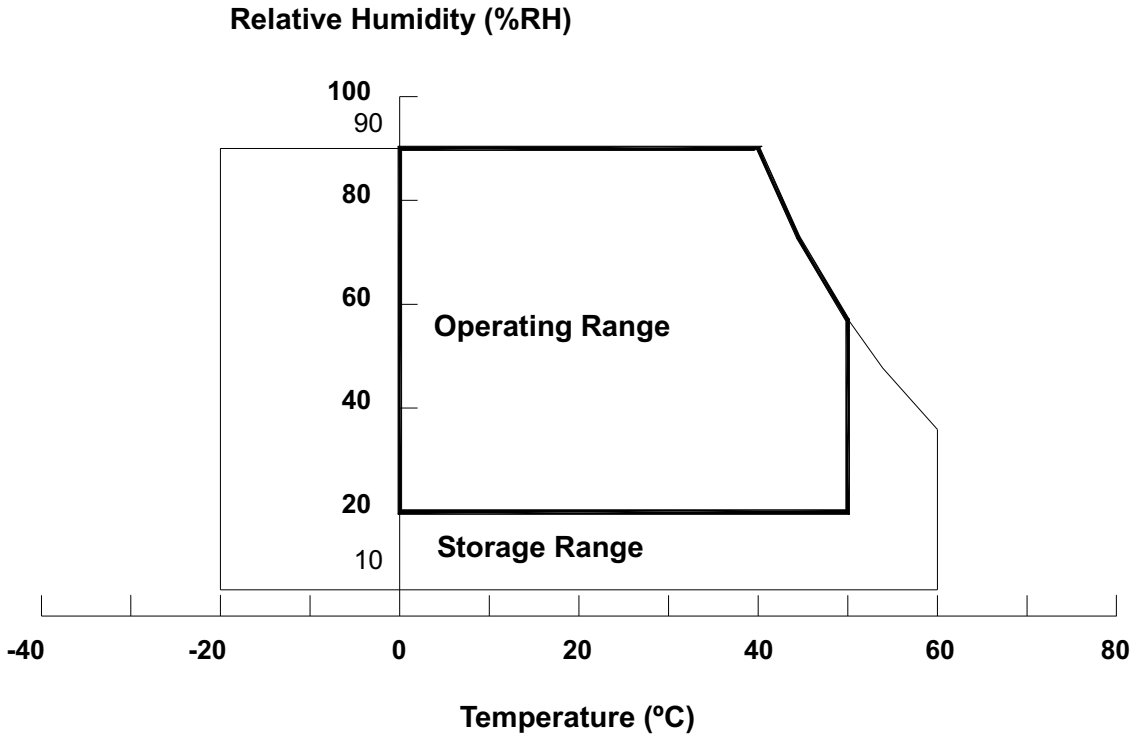
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1), (3)
Operating Ambient Temperature	T_{OP}	0	50	ºC	(1), (2), (3)
Altitude Operating	A_{OP}	0	5000	M	(3)
Altitude Storage	A_{ST}	0	12000	M	(3)

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	VAA	-0.3	+14.0	V	(1)
Power Supply Voltage	VGH	-0.3	+30.0	V	
Power Supply Voltage	VGL	-10.0	-0.3	V	
Logic Input Voltage	V_{IN}	-0.3	4.3	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	22	23	24	V	
		VGL	-6.0	-5.5	-5.0	V	
		VAA	13.45	13.75	14.0	V	
		V33V(3.3V)	3.1	3.3	3.5	V	
		VREF	12.9	13.05	13.2	V	
Power Supply Current		IGH	-	7.5	-	mA	
		IGL	-	2.5	-	mA	
		IAA	-	390	-	mA	
		I3.3V	-	180	-	mA	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	-	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.7	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)	VSSD+0.1	Note(3)	VDDD-1.2	V
RSDS Input leakage current	I_{DL}	$D_{xx}P$, $D_{xx}N$,CLKO ,CLPN	-10	-	10	μA

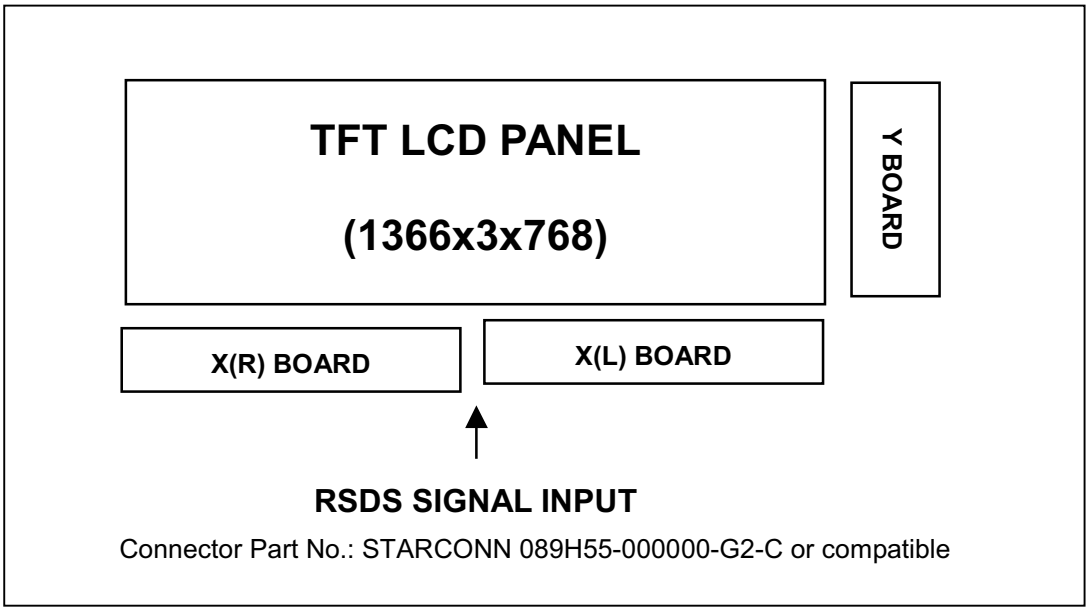
Note (1) V_{CMRSDS} = (VCLKP + VCLKN)/2 or V_{CMRSDS} = ($VD_{XX}P$ + $VD_{XX}N$)/2

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

Note (3) V_{CMRSDS} = 1.2V(VDDD = 3.3V)

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	VCM	VCM Power supply	29	ATP1	A-Path RSDS data latch
2	VCM	VCM Power supply	30	A_R1P	A-Path RSDS data signal (Red1)
3	GM14	Gamma Power supply	31	A_R1M	A-Path RSDS data signal (Red1)
4	CON2	Gamma Power supply	32	A_R0P	A-Path RSDS data signal (Red0)
5	GM13	Gamma Power supply	33	A_R0M	A-Path RSDS data signal (Red0)
6	GM12	Gamma Power supply	34	VAA	Driver Power supply
7	GM11	Gamma Power supply	35	VAA	Driver Power supply
8	GM10	Gamma Power supply	36	GM7	Gamma Power supply
9	GM9	Gamma Power supply	37	GM6	Gamma Power supply
10	GM8	Gamma Power supply	38	GM5	Gamma Power supply
11	GND	Ground	39	GM4	Gamma Power supply
12	A_B1P	A-Path RSDS data signal (Blue1)	40	GM3	Gamma Power supply
13	A_B1M	A-Path RSDS data signal (Blue1)	41	GM2	Gamma Power supply
14	A_B0P	A-Path RSDS data signal (Blue0)	42	CON1	Gamma Power supply
15	A_B0M	A-Path RSDS data signal (Blue0)	43	GM1	Gamma Power supply
16	A_G1P	A-Path RSDS data signal (Green1)	44	GND	Ground
17	A_G1M	A-Path RSDS data signal (Green1)	45	GND	Ground
18	A_G0P	A-Path RSDS data signal (Green0)	46	STV_R	Scan driver start pulse2
19	A_G0M	A-Path RSDS data signal (Green0)	47	OE	Scan driver output enable
20	DRL1	Control the direction of start pulse for data driver	48	GRL1	Control the direction of start pulse for scan driver
21	POL	Polarity invert	49	CKV	Scan driver clock
22	V33V	Logic Power supply	50	STV	Scan driver start pulse1
23	V33V	Logic Power supply	51	VGL	Driver Power supply
24	ASTH_R	A-Path source driver start pulse2	52	VGH	Driver Power supply
25	ASTH	A-Path source driver start pulse1	53	GND	Ground
26	GND	Ground	54	TR1	Trace1
27	A_CLKP	Data driver clock	55	TR2	Trace2
28	A_CLKM	Data driver clock			

CN2(XR) Connector Pin Assignment

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VCM	VCM Power supply	29	BTP1	B-Path RSDS data latch
2	VCM	VCM Power supply	30	B_R1P	B-Path RSDS data signal (Red1)
3	GM14	Gamma Power supply	31	B_R1M	B-Path RSDS data signal (Red1)
4	CON2	Gamma Power supply	32	B_R0P	B-Path RSDS data signal (Red0)
5	GM13	Gamma Power supply	33	B_R0M	B-Path RSDS data signal (Red0)
6	GM12	Gamma Power supply	34	VAA	Driver Power supply
7	GM11	Gamma Power supply	35	VAA	Driver Power supply
8	GM10	Gamma Power supply	36	GM7	Gamma Power supply
9	GM9	Gamma Power supply	37	GM6	Gamma Power supply
10	GM8	Gamma Power supply	38	GM5	Gamma Power supply
11	GND	Ground	39	GM4	Gamma Power supply
12	B_B1P	B-Path RSDS data signal (Blue1)	40	GM3	Gamma Power supply
13	B_B1M	B-Path RSDS data signal (Blue1)	41	GM2	Gamma Power supply
14	B_B0P	B-Path RSDS data signal (Blue0)	42	CON1	Gamma Power supply
15	B_B0M	B-Path RSDS data signal (Blue0)	43	GM1	Gamma Power supply
16	B_G1P	B-Path RSDS data signal (Green1)	44	GND	Ground
17	B_G1M	B-Path RSDS data signal (Green1)	45	GND	Ground
18	B_G0P	B-Path RSDS data signal (Green0)	46	NC	No connection
19	B_G0M	B-Path RSDS data signal (Green0)	47	VSCM	VSCM Power supply
20	DRL1	Control the direction of start pulse for data driver	48	VREF	Gamma Power supply
21	POL	Polarity invert	49	NC	No connection
22	V33V	Logic Power supply	50	NC	No connection
23	V33V	Logic Power supply	51	STV	Driver Power supply
24	BSTH_R	B-Path source driver start pulse2	52	VGL	Driver Power supply
25	BSTH	B-Path source driver start pulse1	53	GND	Ground
26	GND	Ground	54	TR3	Trace3
27	B_CLKP	Data driver clock	55	TR4	Trace4
28	B_CLKM	Data driver clock			

Note (1) CN1、2 Connector Part No.: STARCONN 089H55-000000-G2-C 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

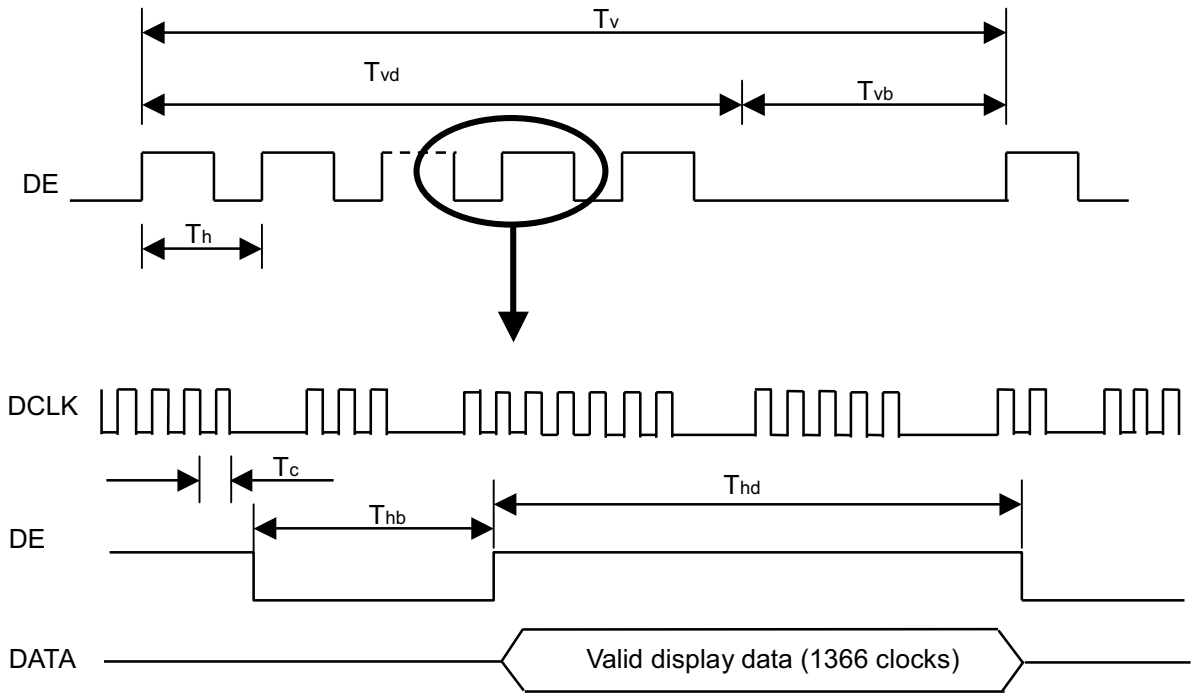
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

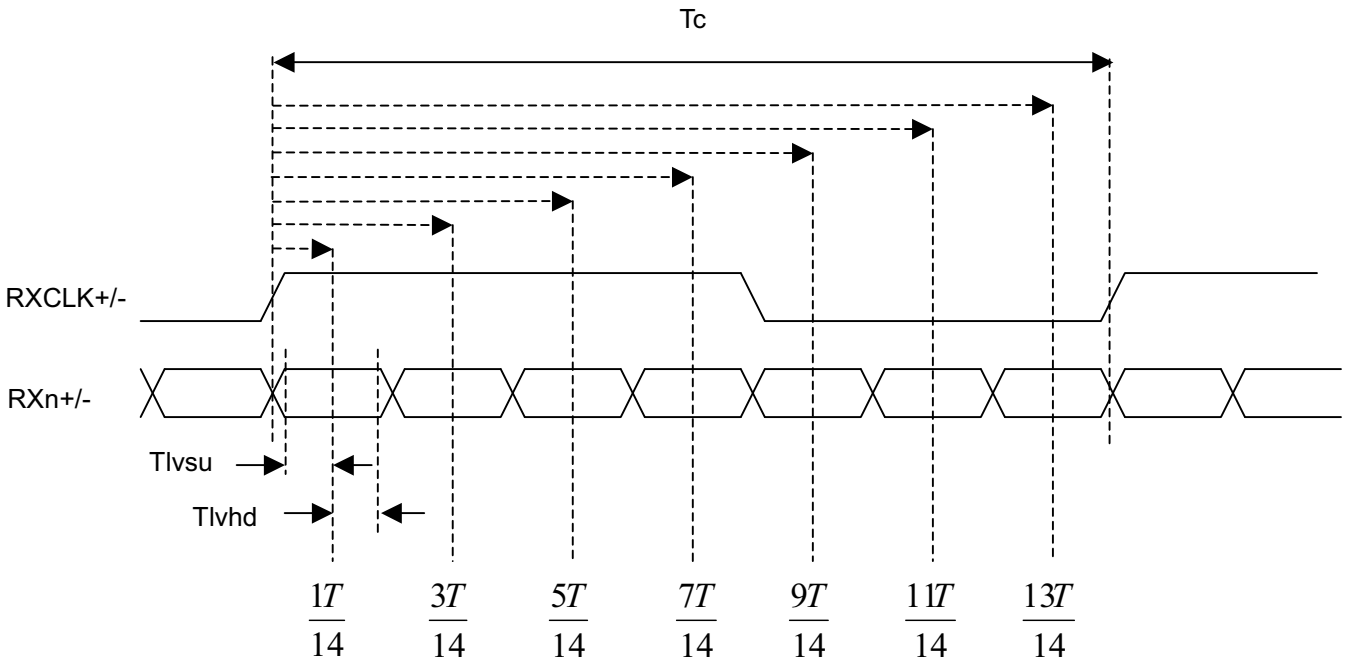
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Vertical Active Display Term	Frame Rate	Fr5	47	50	53	Hz	
		Fr6	57	60	63	Hz	
	Total	Tv	778	795	888	Th	Tv=Tvd+Tvb
	Display	Tvd	768	768	768	Th	-
	Blank	Tvb	10	27	120	Th	-
Horizontal Active Display Term	Total	Th	1442	1798	1936	Tc	Th=Thd+Thb
	Display	Thd	1366	1366	1366	Tc	-
	Blank	Thb	76	432	570	Tc	-

Note:Since this module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM

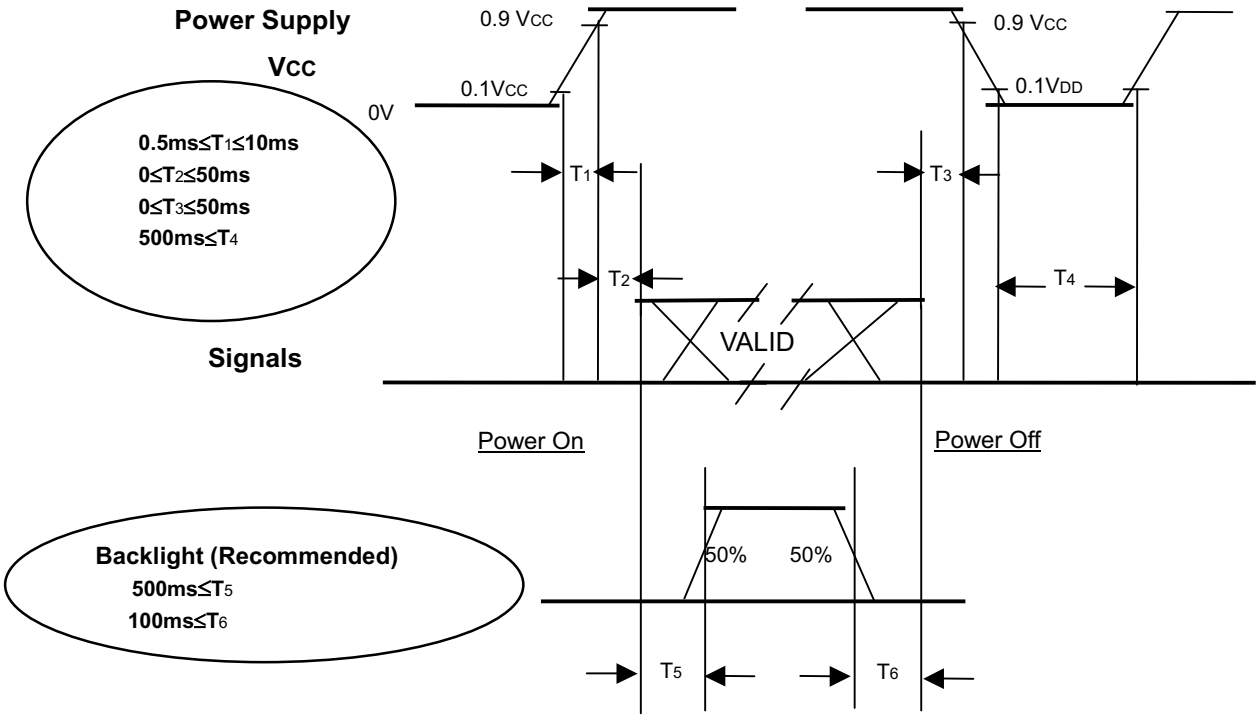


LVDS RECEIVER INTERFACE TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should follow the conditions shown in the following diagram.



Power ON/OFF Sequence

Note.

(1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

(2) Please apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation of the LCD turns off, the display may, instantly, function abnormally.

(3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

(4) T4 should be measured after the module has been fully discharged between power on/off periods.

(5) Interface signal shall not be kept at high impedance when the power is on.

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	5.2±0.5	mA
Inverter Driving Frequency	F_L	58±3	KHz

7.2 OPTICAL SPECIFICATIONS

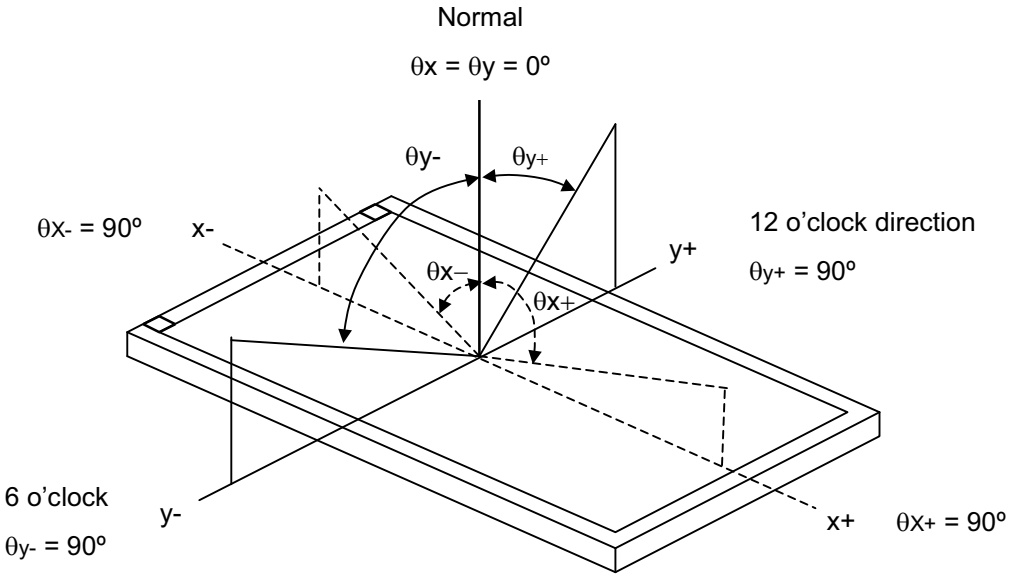
The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (5).

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	0.643	Typ+0.03	-	(1),(5)
		Ry			0.333		-	
	Green	Gx			0.272		-	
		Gy			0.595		-	
	Blue	Bx			0.144		-	
		By			0.069		-	
	White	Wx			0.280		-	
		Wy			0.285		-	
Center Transmittance		T%	θ_x=0°, θ_Y =0° With CMO Module	-	4.6		%	(1), (7)
Contrast Ratio		CR		1200	1500		-	(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 V315B1-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.

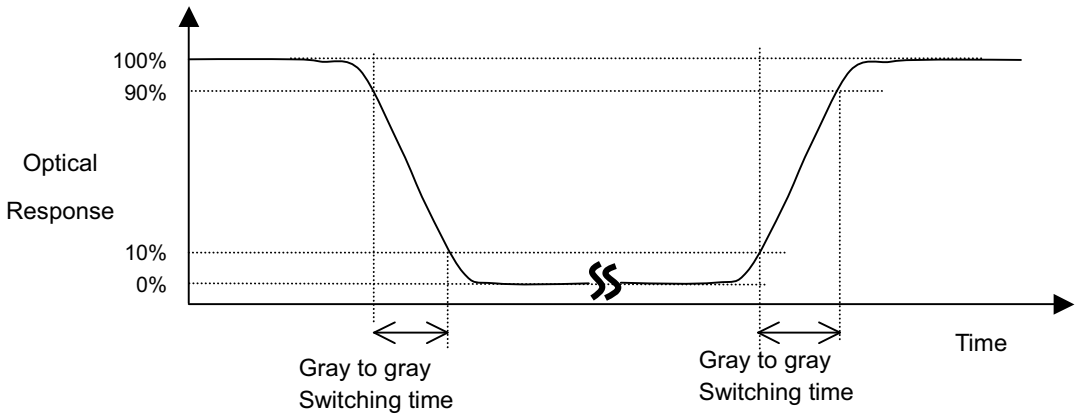
Contrast Ratio (CR) = L255 / L0

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:

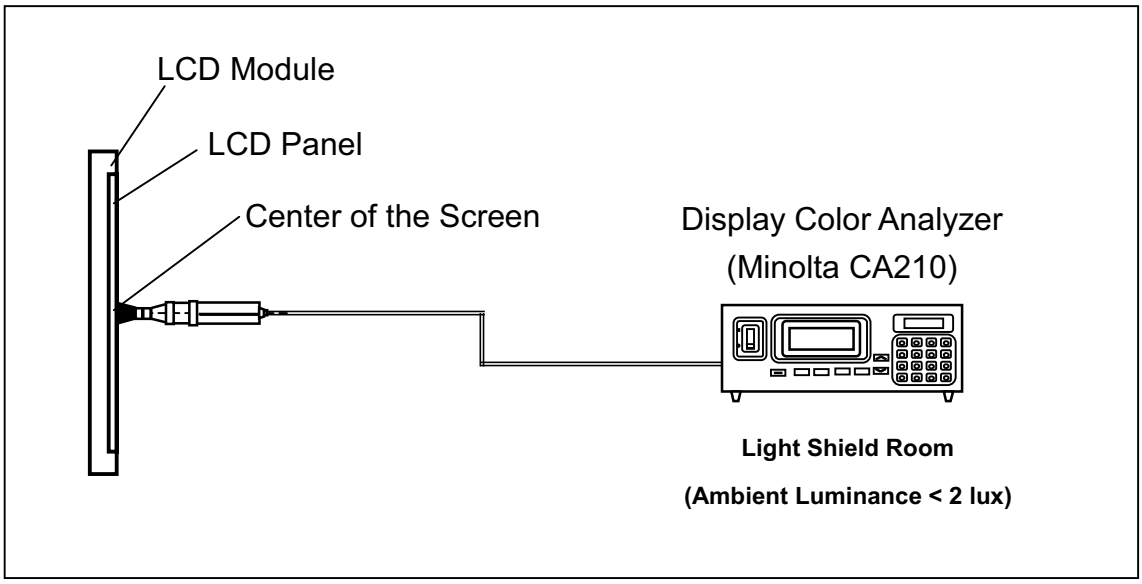


The driving signal means the signal of gray level 0, 63, 127,191, and 255.

Gray to gray average time means the average switching time of gray level 0, 63,127,191,255 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.

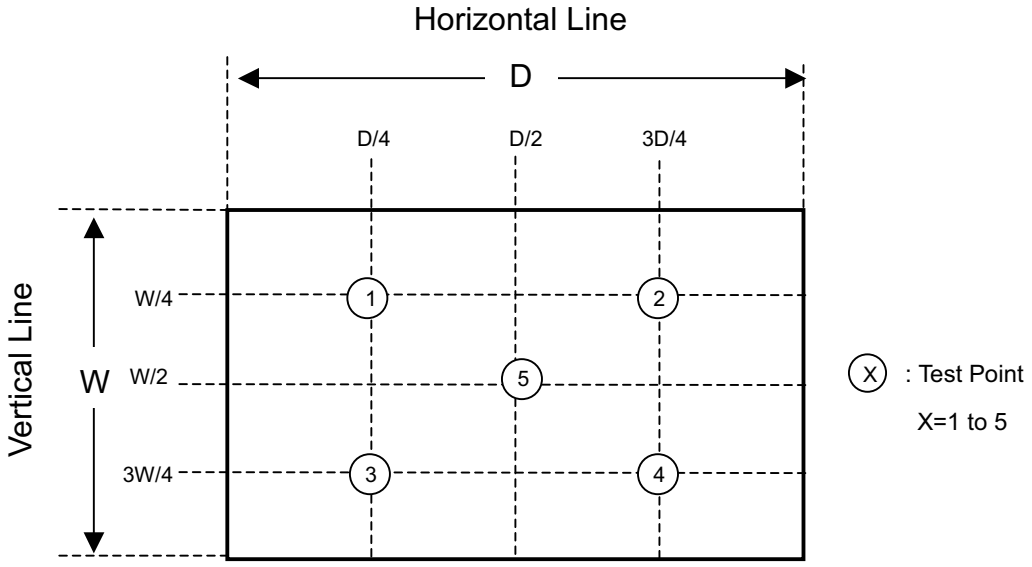


Note (6) Definition of White Variation (δW):

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

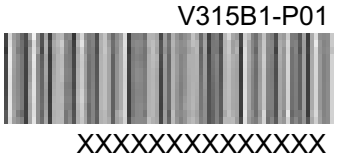
Module is without signal input.

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

8. DEFINITION OF LABELS

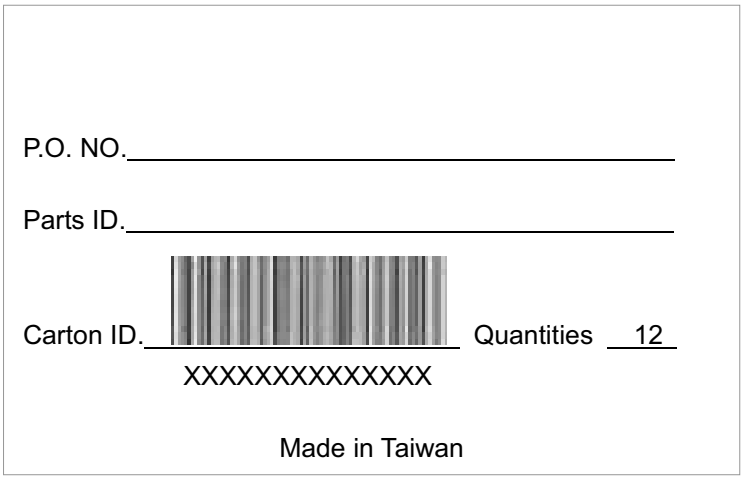
8.1 OPEN CELL LABEL

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



8.2 CARTON LABEL

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



(a) Model Name: V315B1– P01

(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 322 (H)

Weight : approximately 28Kg (12 panels per box)

9.2 PACKING METHOD

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

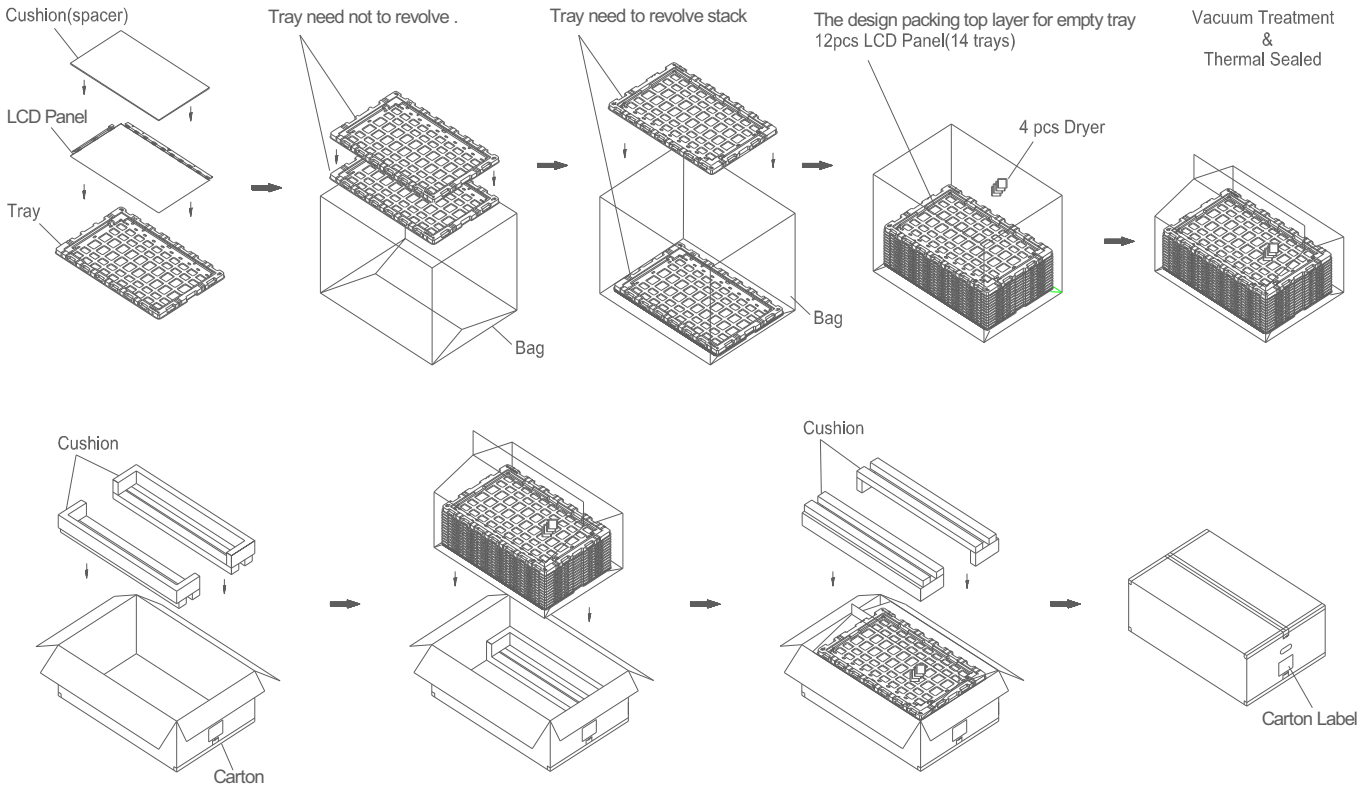
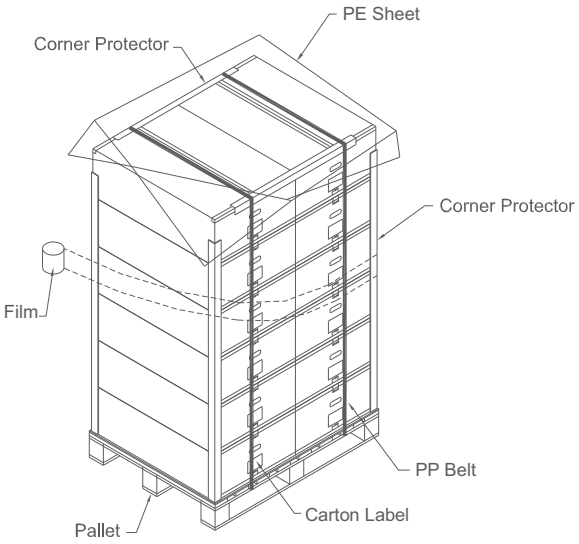


Figure.9-1 packing method

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

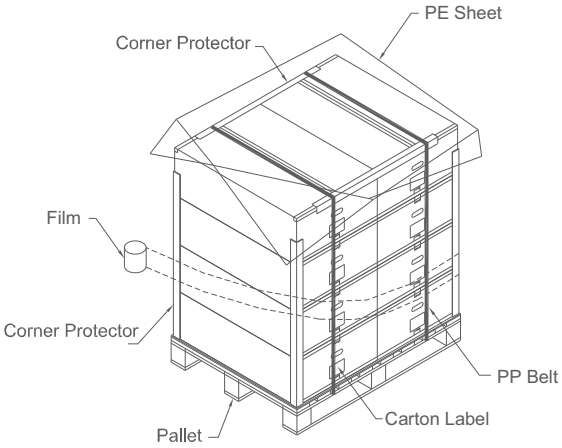


Figure.9-2 packing method

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