CHI MEI
OPTOELECTRONICS CORP.

TFT LCD Approval Specification

MODEL NO.: N150X2-L01
G33C0000M110

Customer : Toshiba

Approved by :

Note :

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Liquid Crystal Display Division		
QRA Dept.	TDD I Dept.	PDD I Dept.
Approval	Approval	Approval
陳 水一 92.1.24	李注淙 92.1.24	楊桔祥 92.1.22代

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REVISION HISTORY

| Version	Date	Page (New)	Section	Description
Ver 3.0	Dec. 30,'02			Final approval sheet is released.
Ver 3.1	Jan. 21, '03	9	2.2	Revise connector PN to be Note (1) Connector PN.: **BHTR-02VS-1** or equivalent Note (2) User's connector Part No.: SM02B-BHTS-B-TB or equivalent Remove Page 28~ Outgoing inspection Criteria

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GENERAL DESCRIPTION

OVERVIEW

This product is a 15" TFT Liquid Crystal Display Module with a Backlight unit and 30 pins LVDS (Low Voltage Differential Signal) interface. This module supports 1024 x 768 XGA mode and can display 262,144 colors. The inverter module for Backlight is not built in.

BLOCK DIAGRAM

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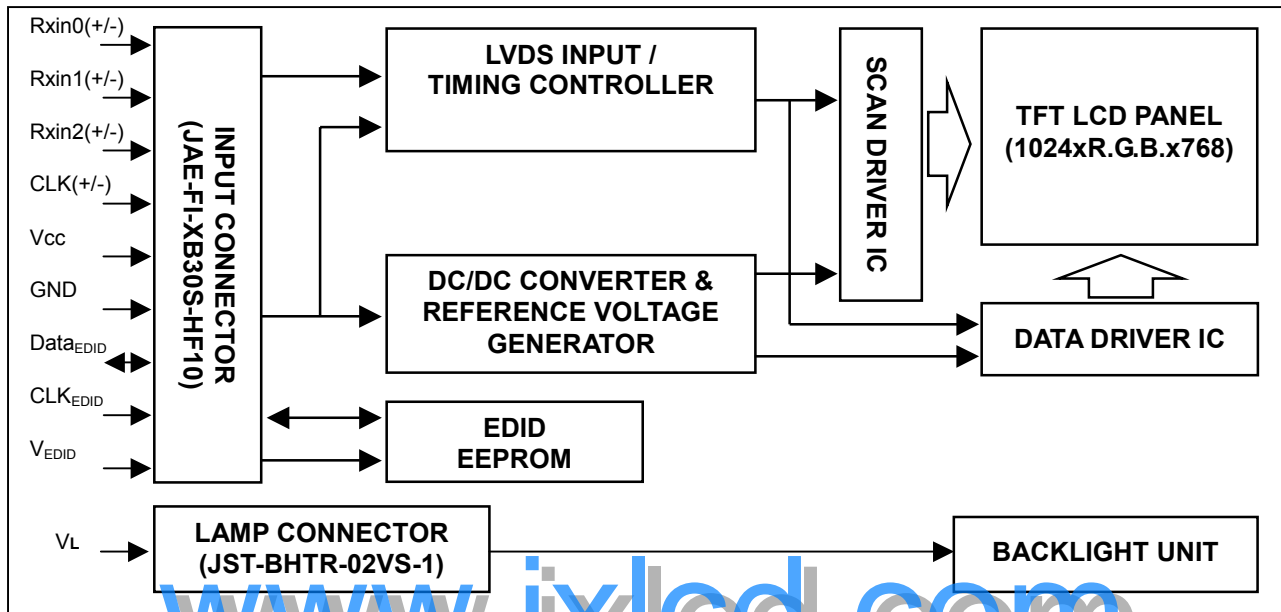
APPLICATION
-Note Book PC

GENERAL SPECIFICATI0NS

Item	Specifications	Unit
Screen Size	15.0 Diagonal	inch
Bezel opening area	307.6(W)x231.6(H)	mm
Effective display area	304.1(W)x228.1(H)	mm
Pixel number	1024 x R.G.B x768	pixel
Pixel pitch	0.297(H) x 0.297(V)	mm
Pixel Arrangement	R.G.B Vertical Stripe	-
Display Color	6 bits, 262,144	color
Transmissive mode	Normally white	-
Surface treatments	Hard coating (3H) and Anti-glare (Haze 25%)	-

MECHANICAL SPECIFICATIONS

ITEM		MIN.	TYP.	MAX.	Unit	Note
Module Size	Horizontal	315.5	315.8	316.1	mm	-
	Vertical	240.2	240.5	240.8	mm	-
	Depth	-	5.7	6.0	mm	(1)
Weight		480	490	500	g	-

Note 1: The maximum thickness of I/O connector area is 6.0mm.

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1. ABSOLUTE MAXIMUM RATINGS

1.1 ABSOLUTE RATING OF ENVIRONMENT

Item	Symbol	Min.	Max.	Unit	Note
Operating Ambient Temperature	T_{OP}	0	+50	°C	-
Operating Temperature for Panel	-	0	+60	°C	(2)
Storage Temperature	T_{STG}	-20	+60	°C	-
Operating Ambient Humidity	H_{OP}	20	90	%RH	(1)
Storage Humidity	H_{STG}	10	90	%RH	(1)
Air Pressure	-	70.0	-	kPa	Operation
Air Pressure	-	12.0	-	kPa	Non-Operation
Altitude	-	-	4572	m	Operation
Altitude	-	-	15240	m	Non-Operation

Note. (1) Wet bulb temperature should be 39°C Max, and no condensation of water.

(2) The surface temperature caused by self-heat radiation of cell itself is specified on this item.

1.2 ELECTRICAL ABSOLUTE RATINGS

(1) TFT LCD Module

Parameter	Symbol	Values		Unit	Remarks
		Min.	Max.		
Power supply voltage	V_{CC}	-0.3	+4.0	V	
Logic input voltage	V_{IN}	-0.3	$V_{CC}+0.3$	V	Ta=0~50°C

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(2) Backlight Unit

Parameter	Symbol	Values		Unit	Remarks
		Min.	Max.		
Lamp voltage	V_L	-	2.5K	V_{RMS}	Note (1)
Lamp current	I_L	1.8	7.0	mA_{RMS}	-
Lamp frequency	f_L	-	80	KHz	-

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.

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1.3 MECHANICAL RATINGS

LCD shall have no failure in the following reliability items.

Item	Test Conditions			Note
Mechanical Vibration	Frequency Range 5 – 500 Hz, 14.7m/s^2 (1.5G) constant, 0.5Hrs each axis (X, Y, Z direction)			Non Operation
	Frequency Range 5 – 500 Hz, 4.9m/s^2 (0.5G) constant, 0.5Hrs each axis (X, Y, Z direction)			Operation
Mechanical Shock	686m/s^2(70G), Pulse width 11 ms, Half-Sine Wave, $\pm$X, $\pm$Y, $\pm$Z direction, each 3 times.			Operation and Non Operation
	2548m/s^2(260G), Pulse width 2mS, Half-Sine Wave, $\pm$X, $\pm$Y, $\pm$Z direction, each 1 time			
Pressure Resistance	No Destruction with the force 196 N (20 kgf, 16 mm in diameter) to the display surface at the vertical direction			Non Operation Fig 1-3-1
	No Destruction with the force 294.2 N (30 kgf, 30 mm in diameter) to the back of the display surface at the vertical direction			Fig 1-3-2 Fig 1-3-3
Strength of FL Cable	Strength of rotation force	Cable: No disconnection of cable to the 5 trial of 360 degree rotation. See a bent state of cable.		Non Operation
		Connector: No disconnection of cable to 10 trial of 180 degree rotation. See a bent state of cable.		
	Lead pull test	Soldering portion: 14.7N (1.5kgf), 1min Connector: 14.7N (1.5kgf), 1 sec		
Connector tension test	Input connector: With 50 times of connector trial there must be no damage to the shape and functional.			Non Operation
	Back light connector: With 50 times of connector trial there must be no damage to the shape and functional.			
Assured torque value at side-mount part	245 mN·m (2.5 kgf·cm)			Non Operation
Rescrewed test	10 times under 245.0 mN·m (2.5 kgf·cm)			Non Operation
Tapping test	Test " Ripple " Phenomenon.			Operation
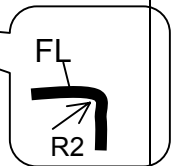
Definitions of failure for judgment shall be as follows:

1) Function of the module should be maintained.

2) Current consumption should be smaller than the specified value.

3) Appearance and display quality should not have distinguished degradation.

4) Luminance should be larger than the minimum value specified in optical specification.

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NOTE

(1) The compression condition of front side

   (a) Compression point: 12 points (refer to Fig 1-3-1)

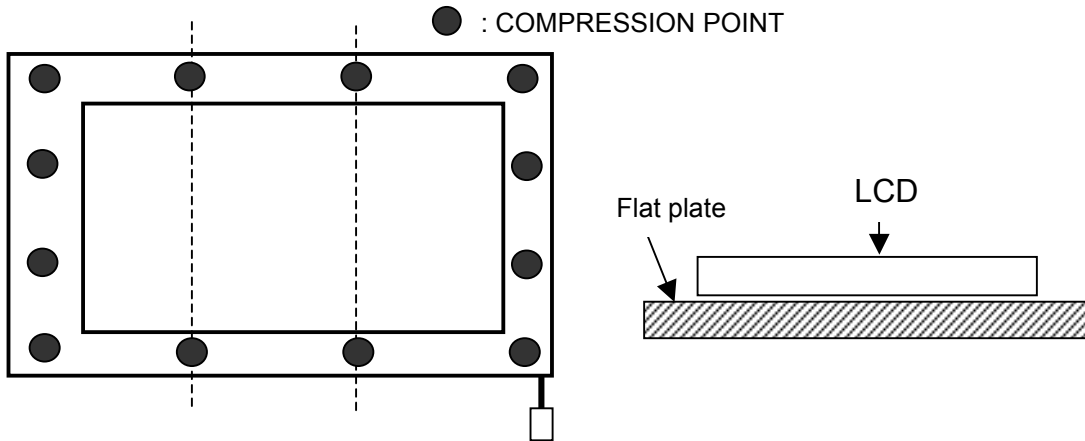   (b) Compression condition: Time 3 sec, Tool diameter: 16 mm in diameter (refer to Fig 1-3-3)

● : COMPRESSION POINT

Flat plate   LCD

Fig 1-3-1

(2) The compression condition of rear side

   (a) Compression point: 21 points (refer to Fig 1-3-2)

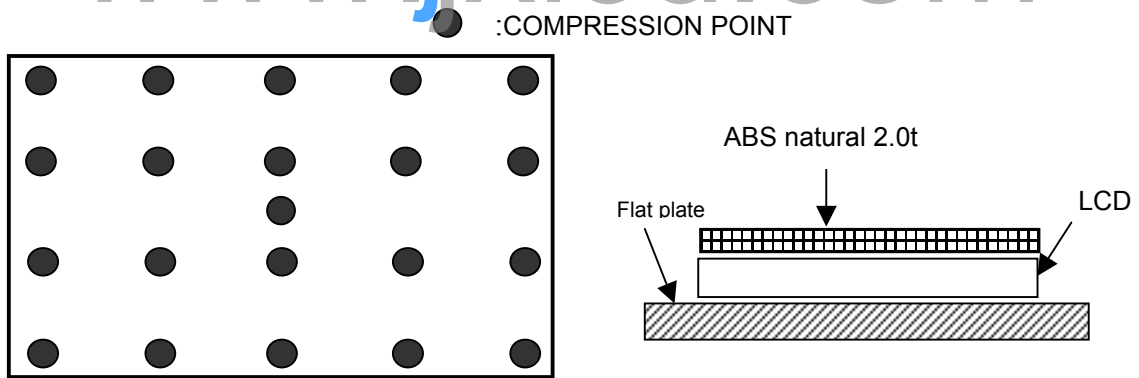   (b) Compression condition: Time 3 sec, Tool radius: 30 mm in diameter (refer to Fig 1-3-3)

●:COMPRESSION POINT

ABS natural 2.0t

Flat plate   LCD

Fig 1-3-2

(3) Dimension of the compression jig

(a) compression jig for front side A = 16 mm in diameter

                          B = 16 mm in diameter

(b) compression jig for rear side A = 30 mm in diameter

                          B = 28 mm in diameter
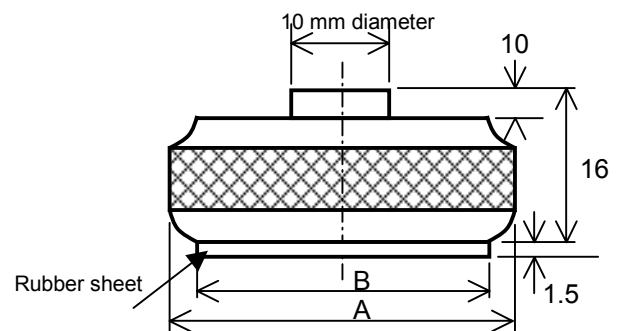
(4) Recommend Torque is 1.3 – 1.5 kgf

10 mm diameter

10

16

1.5

Rubber sheet   B   A

Fig 1-3-3

1.4 THE OTHERS

(1) Static electricity pressure resistance

Items	Testing conditions	Operation	Non Operation
Contact discharge	150pF, 330 ohm	±10 kV	±10 kV
Air discharge	150pF, 330 ohm	±20 kV	±20 kV

ESD Acceptance Definition:

Temporary performance degradation. Recovery by operator is acceptable. No hardware failure.

(2) Sound noise

There should be no uncomfortable noise.

Being used under whatever surrounds, when power on/off, the panel should not generate uncomfortable noise.

(3) Open / Short

No smoke, no firery at any open/ short test

(4) MTBF : 50000 Hr (except for backlight lamp)

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2. ELECTRICAL SPECIFICATIONS

2.1 TFT LCD MODULE

MODULE						
Parameter	Symbol	Value			Unit	Notes
		Min.	Typ.	Max.		
Power Supply Voltage	V_{CC}	3.0	3.3	3.6	V	
"H" level LVDS signal input	V_{IH}	-	-	+100	mV	(1)
"L" level LVDS signal input	V_{IL}	-100	-	-	mV	
Power Supply Current White	I_{CC}	270	300	330	mA	(9)
Power Supply Current Black		310	360	420	mA	
Power Supply Current Maximum		470	540	600	mA	
Rush Current	I_{RUSH}	-	1.0	1.5	A	(2)
Ripple voltage	V_{RP}	-	50	100	mV	(1)
Terminating resistor	Rt	-	100	-	Ohm	

LCD Fuse name: Kamaya(FCC16-162ABTP)

2.2 BACKLIGHT UNIT

LAMP : Harison, MBVK2JB45YX309.5NCLFH/CS2

BACKLIGHT (1 Lamp)						
Parameter	Symbol	Value			Unit	Notes
		Min.	Typ.	Max.		
Lamp Voltage	V_L	617	685	754	V_{RMS}	I_L=6.0mA
Lamp Current	I_L	2.0	6.0	6.5	mA	(3)
Startup Voltage	V_S	-	-	1150 (25°C)	V_{RMS}	(4)
				1500 (0°C)	V_{RMS}	(4)
Operating Frequency	F_L	40	60	80	KHz	(5)
Power Consumption	P_L	-	4.11	-	W	(6), I_L=6.0mA
Lamp Life time	L_{BL}	10000	15000	-	Hrs	(7)

The connector information of Black light unit.

Pin	Symbol	Description	Remark
1	HV	Lamp power input	Pink
2	LV	Ground	White

Note (1) Connector PN.: **BHTR-02VS-1** or equivalent

Note (2) User's connector Part No.: SM02B-BHTS-B-TB or equivalent

2.3 MATERIAL LIST CONCERNING EMI REGULATIONS

(1) EMI Regulations:

"N150X2-L01" which is assembled inside Toshiba's Satellite model should be met to the regulations as below:

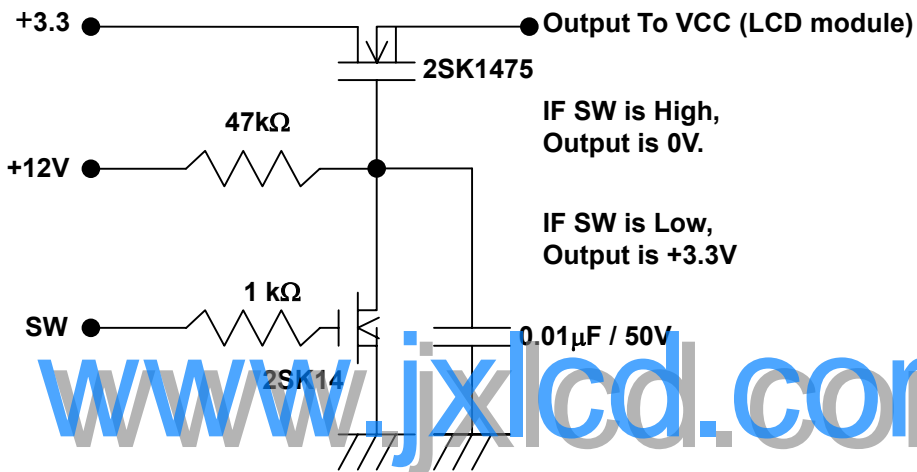CISPR: Pub.22 Class B

FCC : Part 15 Class B

VCCI : Class B

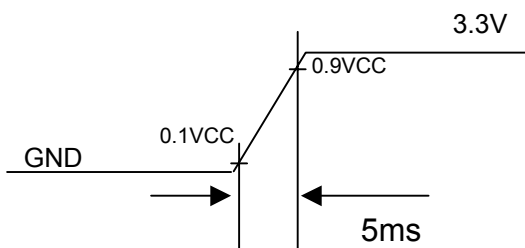(2) Safety regulation (CMO TFT-LCD module only): UL 1950

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1. EMI Filter	Silk	Product Code	Rating	Maker
Bead	R407	BK1608LL241	240 Ohm/100MHz	TAIYO YU DEN Co.,JPN
Bead	LA1~LA10	BK32164M121	120 Ohm/100MHz	TAIYO YU DEN Co.,JPN
Bead	R406,424	BK1608LL121	120 Ohm / 100MHz	TAIYO YO DEN Co.,JPN
2. DC/DC Converter	Silk	Osc. Freq.		Maker
PWM IC	U9	Typ 1.2 MHz.		Linear Technology

Note (1) Operating Temp. range is 0 ~ 50 ºC

Note (2) Measurement Conditions is as below. Them maximum Vcc drop voltage that caused by rush
current when switching-on should not be more than 0.5V.

+3.3 ● ──────────────── ● **Output To VCC (LCD module)**

2SK1475

**IF SW is High,
Output is 0V.**

47kΩ

+12V ●

**IF SW is Low,
Output is +3.3V**

1 kΩ

SW ●

0.01μF / 50V

2SK14

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VCC rising time is 5ms

3.3V
0.9VCC

GND
0.1VCC

5ms

Note (3) Lamp current is measured by utilizing a current meter for high frequency as shown below:

| LCD Module | Hot(Pink) | 1 | | Inverter |

GND(White) 2 (A) Current meter
(Yokogawa 2016)
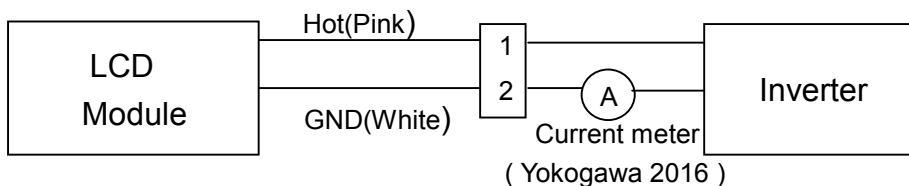
Note (4) The voltage shown above should be applied to the lamp for more than 1 second after startup.

Otherwise the lamp may not be turned on.

Note (5) The lamp frequency may produce interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (6) $P_L = I_L \times V_L$.

Note (7) The lifetime (Hr) of a lamp can be defined as the time in which it continues to operate under the condition Ta = 25$\pm$2°C and I_L = 2.0 ~ 6.5 mArms until one of the following event occurs :
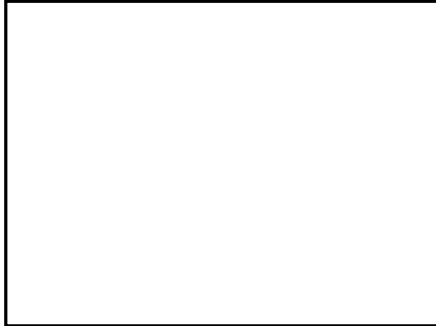 (1) When the brightness becomes 50% or lower than its original,
  (2) When the effective ignition length becomes 80% or lower than its original value.
  (Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)

Note (8) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be designed with care so as not to produce too much current leakage from high-voltage output of the inverter. When designing or ordering the inverter, please make sure that a poor lighting caused by the mismatch of the backlight and the inverter (miss-lighting, flicker, etc.) never occurs. When the above situation is confirmed, the module should be operated in the same manners as it is installed in your instrument.
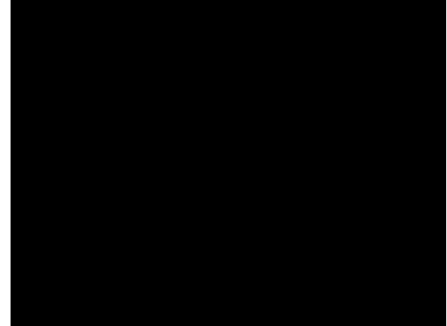
Note (9) The specified power supply current is under the conditions , Ta = 25 $\pm$ 2 $^\circ$C, fv = 60 Hz, whereas a power dissipation check pattern below is displayed. In case of white patten and black pattern, the maximum value is measured when VCC=3.0V, the typical value is measured when VCC=3.3V and the minimum value is measured when VCC=3.6V. In case of maximum pattern, the maximum value is measured when VCC=3.6V, the typical value is measured when VCC=3.3V and the minimum value is measured when VCC=3.0V.

a. White Pattern

b. Black Pattern

Active Area

c. Maximum pattern (Zoom in)

R	G	B	R	G	B	B	R
R	G	B	R	G	B	B	R
R	G	B	R	G	B	B	R
R	G	B	R	G	B	B	R

gray level = 0

• • •

expend to whole

active area

gray level = 7

• • • expend to whole active area
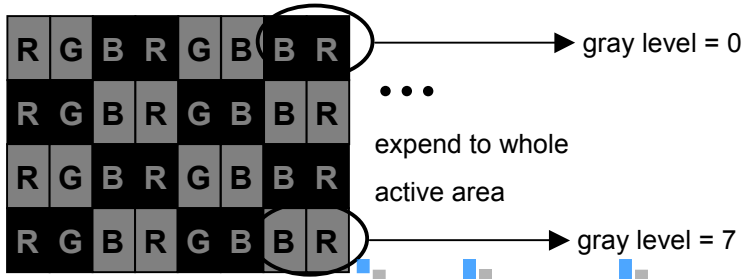
3. INTERFACE SPECIFICATIONS

3.1 THE PIN ASSIGNMENT OF LVDS INTERFACE CONNECTOR.

Pin	Symbol	Description	Polarity	Remark
1	Vss	Ground		
2	Vcc	Power Supply +3.3 V (typical)		
3	Vcc	Power Supply +3.3 V (typical)		
4	NC	Non-Connection		DDC 3.3V Power (reserved)
5	NC	Non-Connection		
6	NC	Non-Connection		DDC Clock (reserved)
7	NC	Non-Connection		DDC Data (reserved)
8	Rxin0-	LVDS Differential Data Input	Negative	R0~R5,G0
9	Rxin0+	LVDS Differential Data Input	Positive	-
10	Vss	Ground		
11	Rxin1-	LVDS Differential Data Input	Negative	G1~G5,B0,B1
12	Rxin1+	LVDS Differential Data Input	Positive	-
13	Vss	Ground		
14	Rxin2-	LVDS Differential Data Input	Negative	B2~B5,DE,Hsync,Vsync
15	Rxin2+	LVDS Differential Data Input	Positive	
16	Vss	Ground		
17	CLK-	LVDS Clock Data Input	Negative	LVDS Level Clock
18	CLK+	LVDS Clock Data Input	Positive	
19	Vss	Ground		
20	NC	Non-Connection		
21	NC	Non-Connection		
22	Vss	Ground		
23	NC	Non-Connection		
24	NC	Non-Connection		
25	Vss	Ground		
26	NC	Non-Connection		
27	NC	Non-Connection		
28	Vss	Ground		
29	NC	Non-Connection		
30	NC	Non-Connection		

Note (1) Connector Part No.: JAE-FI-XB30S-HF10 or equivalent.

Note (2) User's connector Part No: JAE-FI-X30M or equivalent.

Note (3) The first pixel is even.

3.2 INPUT SIGNAL TIMING SPECIFICATIONS

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

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Clock	Frequency	1/Tc	50	65	68	MHz	-
Frame Frequency	Cycle	TV	771	806	850	TH	-
Vertical Active Display Term	Display Period	TVD	768	768	768	TH	-
One Line Scanning Time	Cycle	TH	1200	1344	1500	Tc	-
Horizontal Active Display Term	Display Period	THD	1024	1024	1024	Tc	-

Note (1) The duration of DE signal must be longer than 1 clock period at every horizontal sync. period.

INPUT SIGNAL TIMING DIAGRAM

Valid display data (1024 pixels)

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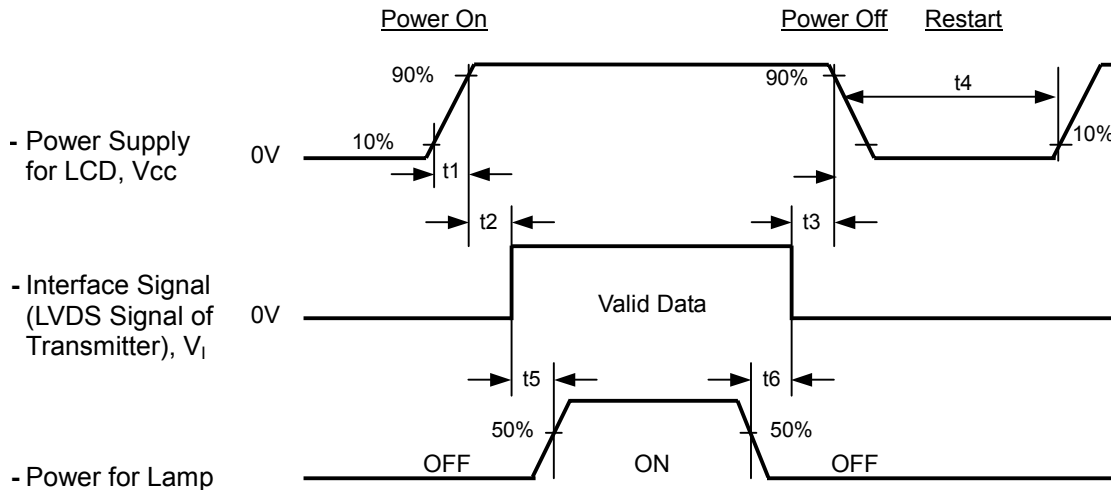OPTOELECTRONICS CORP.
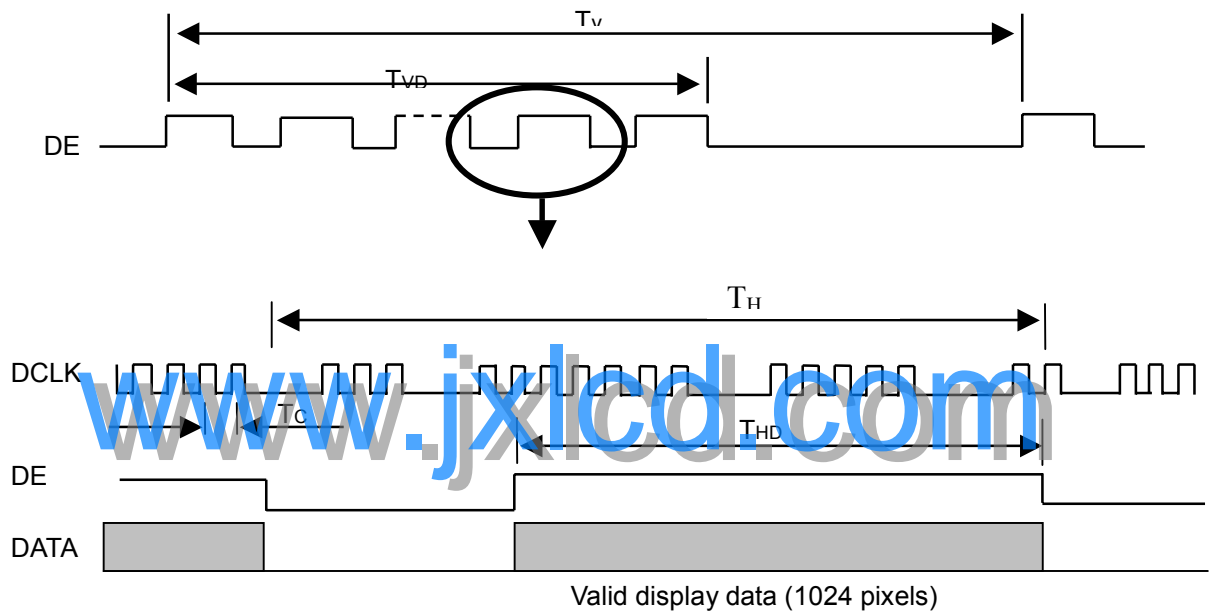
3.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-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					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
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
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	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
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	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
	Blue(1)	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	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

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

3.4 POWER UP/DOWN SEQUENCE & VCC DIP CONDITIONS
### 3.4.1 POWER UP/DOWN SEQUENCE

Power On   Power Off   Restart

- Power Supply for LCD, Vcc

- Interface Signal (LVDS Signal of Transmitter), V_I

    Valid Data

- Power for Lamp

    OFF   ON   OFF

Timing Specifications:

$0 < t1 \leqq 10$ msec

$0 < t2 \leqq 50$ msec

$0 < t3 \leqq 50$ msec

$t4 \geqq 300$ msec

$t5 \geqq 100$ msec

$t6 \geqq 100$ msec

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD Vcc to 0 V.

Note (3) The Backlight inverter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight inverter power must be turned off before the power supply for the logic and the interface signal is invalid.

3.4.2 VCC DIP CONDITIONS
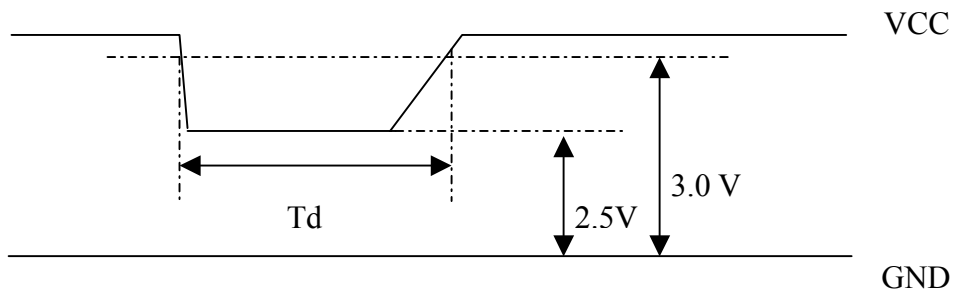
(1) $2.5V \leqq VCC < 3.0V$

$Td \leqq 20$ ms

(2) $VCC < 2.5V$

Vcc-Dip conditions also follow the power up/down conditions for supply voltage.

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4. OPTICAL SPECIFICATIONS

4.1 TEST CONDITIONS

Ambient Temperature : T_a = 25±2°C
Ambient Humidity : H_a 50±10%RH
Supply Voltage : Vcc = 3.3V
Input Signal : According to typical value in "Electrical Characteristics"
FL Input Current : I_{FL} =6.0mArms
FL Driving Frequency : f_{FL} = 50 kHz
FL Inverter : HBL-0237 (Tamura)

The measuring method is shown in 4.2. The following items are measured under stable conditions. The optical characteristics should be measured in a dark room (Screen luminance < 2-lx) or equivalent state with the methods shown in Note (6).

4.2 OPTICAL SPECIFICATIONS

Item		Symbol	Conditions	Specifications Min.	Specifications Typ.	Specifications Max.	Unit	Note
Contrast Ratio		CR_{AVE}		200	250	-	-	(2),(6)
Response Time		T_R		-	6	10	ms	(3)
		T_F		-	17	25	ms	
Average luminance of white (5 points)		$Y_{L,AVE}$		140	170	-	cd/m^2	I_{FL}=6.0mArms * Gray Scale Level=L63 (White) (4)
Cross Modulation		D_{SHA}	$\theta_X = \theta_Y =0°$	-	-	1.0	%	(5)
Luminance Uniformity Chromaticity	Red	Rx	Viewing normal angle	0.569	0.599	0.629	-	
		Ry		0.316	0.346	0.376	-	
	Green	Gx		0.299	0.329	0.359		
		Gy		0.495	0.525	0.555		
	Blue	Bx		0.121	0.151	0.181		
		By		0.097	0.127	0.157		
	White	Wx		0.306	0.336	0.366	-	(1), (6)
		Wy		0.314	0.344	0.374	-	
Viewing Angle	Hor.	θ_{X+}	Center CR>=10	40	45	-	deg.	
		θ_{X-}		40	45	-		
	Ver.	θ_{Y+}		15	20	-		
		θ_{Y-}		35	40	-		
	Hor.	θ_{X+}	Center CR>=5	50	55	-		
		θ_{X-}		50	55	-		
	Ver.	θ_{Y+}		25	30	-		
		θ_{Y-}		40	45	-		
13 Points White Variation		δW	$\theta_X = \theta_Y =0°$ Viewing normal angle	1.0	1.3	1.6	-	(7)
13 Points CR Variation		δC_R		-	2.0	2.5	-	(7)
White Variation		dL		-	-	1.5	%/mm	(8)

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Item	Symbol	Conditions	Specifications			Unit	Note
			Min.	Typ.	Max.		
Gamma	63	θ$_X$ = θ$_Y$ =0° Viewing normal angle	-	0.0%	-	%	(1) (6) at center of Viewing area center only
	60		-	0.2%	-		
	56		-	1.1%	-		
	52		-	2.6%	-		
	48		-	4.9%	-		
	44		-	8.0%	-		
	40		-	12.0%	-		
	36		-	16.8%	-		
	32		-	16.8%	-		
	28		-	29.2%	-		
	24		-	36.8%	-		
	20		-	45.4%	-		
	16		-	55.0%	-		
	12		-	65.6%	-		
	8		-	77.2%	-		
	4		-	89.8%	-		
	0		-	100.0%	-		

PS. Because of the color measurement discrepancy between TSB &CMO is (△Wx,△Wy)=>(0.01,0.009),

CMO internal spec of White is (Wx,Wy)Typ =>(0.326,0.335)

(Wx,Wy)Max=>(0.356,0.365)

(Wx,Wy)Min=>(0.296,0.305)

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

Normal
$\theta x = \theta y = 0°$

$\theta y-$ $\theta y+$

$\theta X- = 90°$ x-

12 o'clock direction
$\theta y+ = 90°$

$\theta x-$

y+

$\theta x+$

6 o'clock
$\theta y- = 90°$ y-

x+ $\theta X+ = 90°$
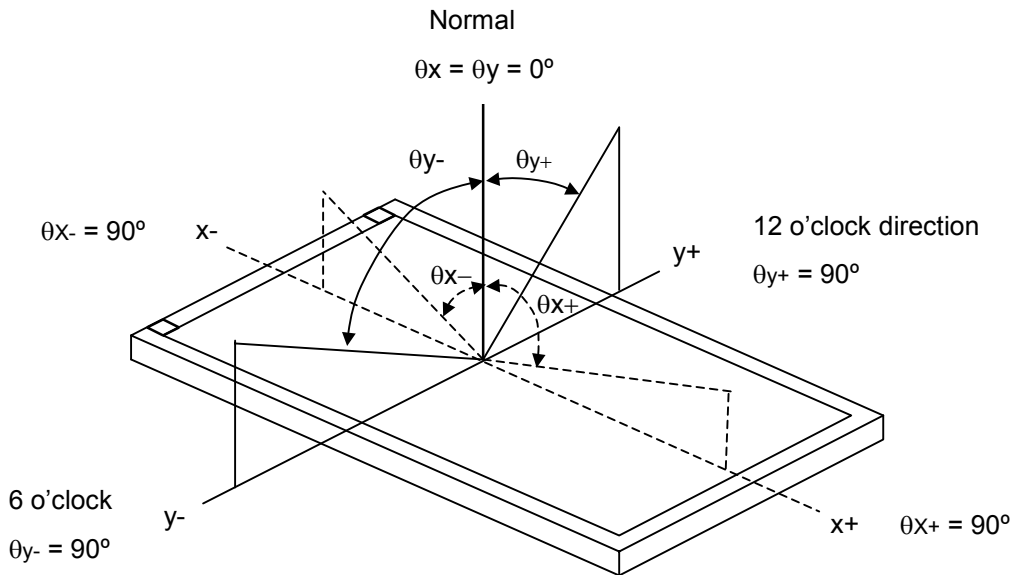
Note (2) Definition of Contrast Ratio :
The contrast ratio can be calculated by the following expression.
Contrast Ratio (CR) = L 63 / L0
L63 : Luminance on the white raster (gray scale level L63)
L 0 : Luminance on the black raster (gray scale level L0)

CR_{AVE} = (CR(4)+CR(5)+CR(7)+CR(9)+CR(10))/ 5

CR(X) is correspond to the Contrast Ratio of a point of X at Figure of Note (7).

Note (3) Definition of Response time :

White L63

White L63

100%
90%

Optical

Response

Black L0

10%
0%

time

T_R T_F

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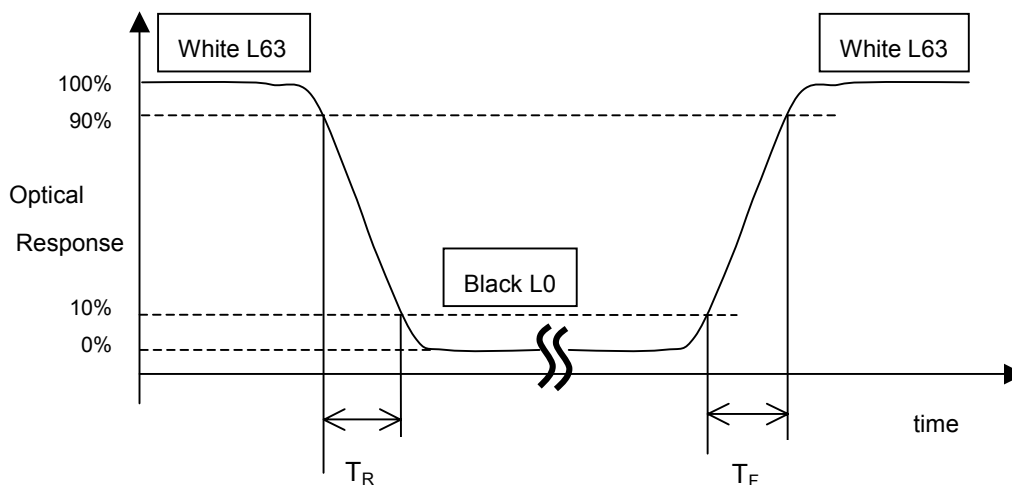
Note (4) Definition of Average Luminance of White :
measure the luminance of white at 5 points.
Average Luminance of White $Y_{L,AVE}$

$$Y_{L,AVE} = (Y_{L4} + Y_{L5} + Y_{L7} + Y_{L9} + Y_{L10}) / 5$$

Y_{LX} is correspond to the Luminance of a point of X at Figure of Note (7).

Note (5) Definition of Cross Modulation (D_{SHA})

$$D_{SHA} = | Y_B - Y_A | / Y_A \times 100\ (\%)$$

Where :

Y_A = Luminance of measured location without darkest gray pattern (cd/m^2)
Y_B = Luminance of measured location with darkest gray pattern (cd/m^2)
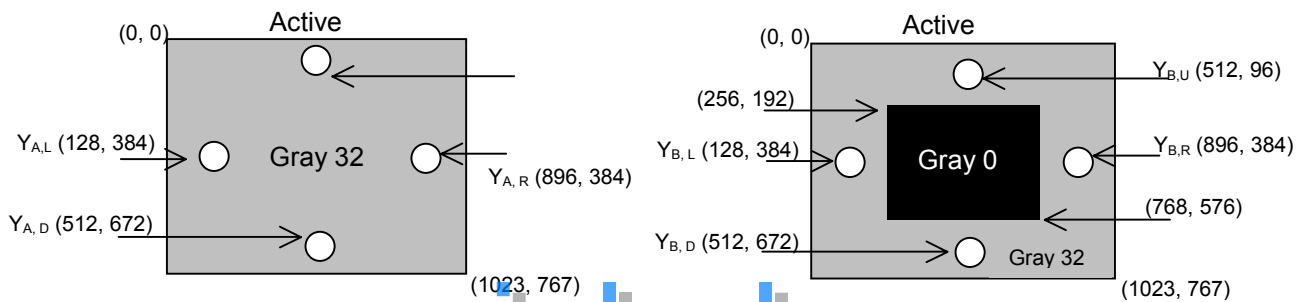
Note (6) Measuring setup :
The measurement suppose to be executed after stabilized the panel at given temperature during 30min. in the case of abrupt temperature change. The measurement shall be executed 30 minutes after lighting at rating. The luminance of white should be typical luminance (Typical Condition IL=6.0mA). In order to stable the luminance, LCD shall not be gotten winds.

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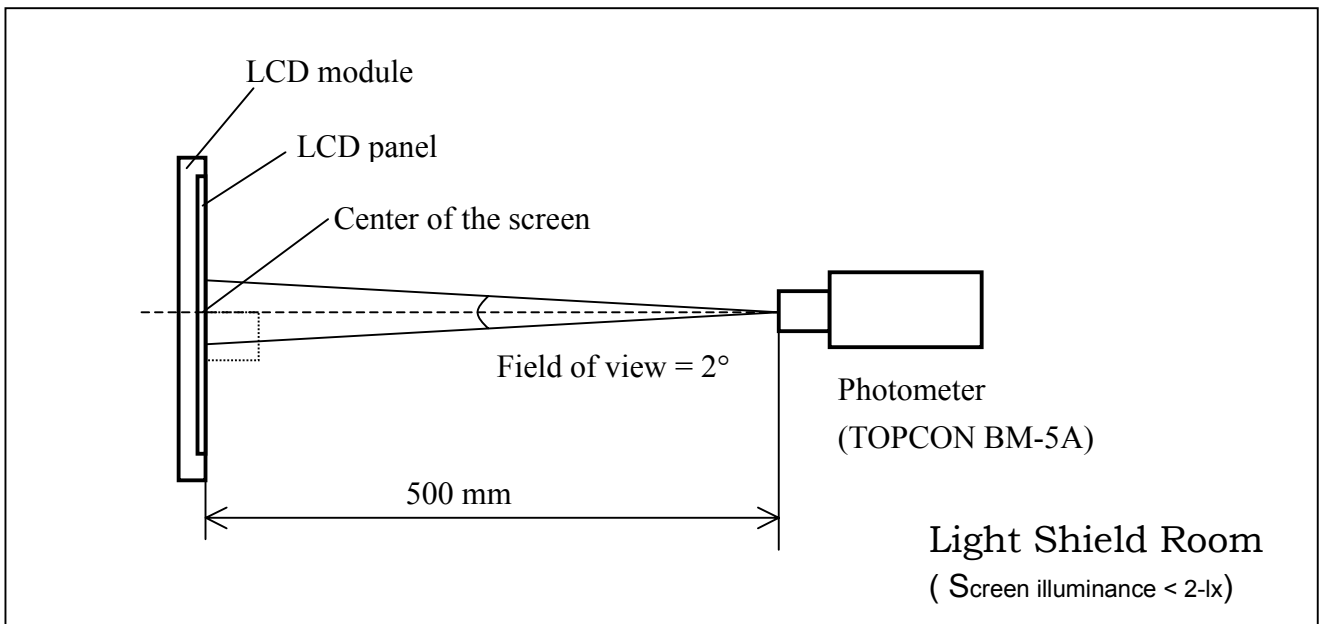
Note (7) Definition of 13 points white variation δW, CR variation δC_R

δW = Maximum luminance of 13 points / Minimum luminance of 13 points

δC_R = Maximum CR 13 points / Minimum CR of 13 points
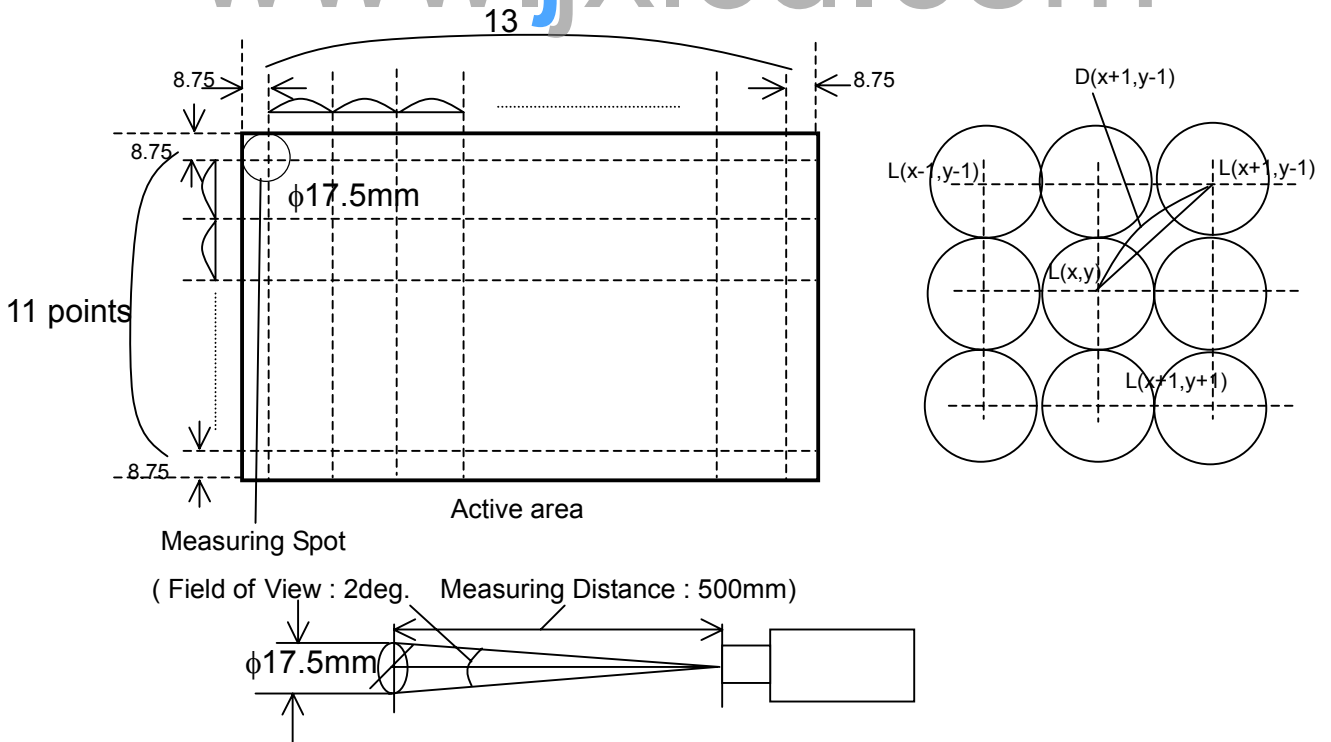
Horizontal Line number

Active area
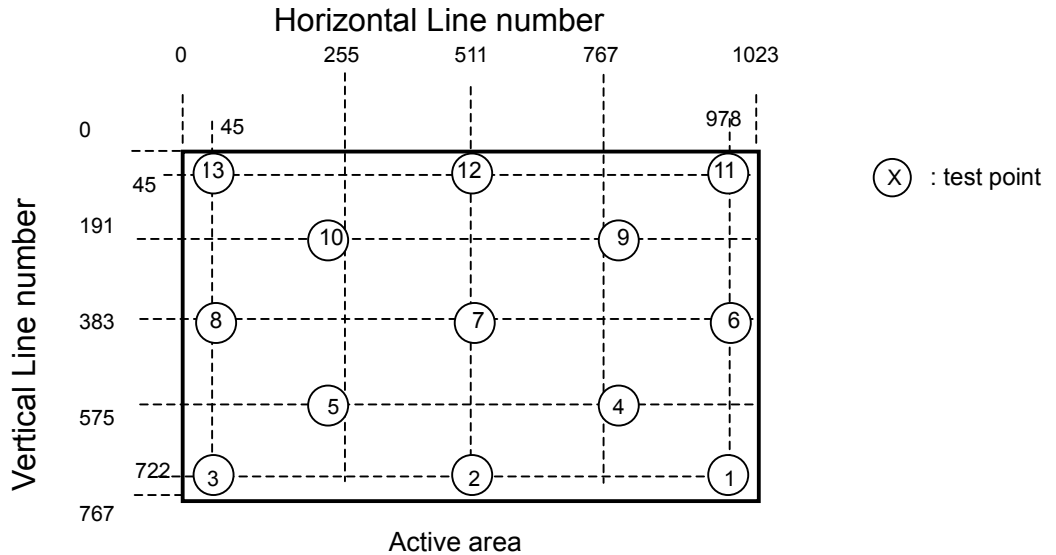
Note (8) Definition of White Variation dL : measure the luminance of white at 13×11 points.

$$dL = | L(x,y) - L(x+I, y+j)| / (L(x,y) \times D(x+I, y+j)) \times 100 \qquad (\%/mm)$$

where $\qquad 2 \leq x \leq 12, \qquad 2 \leq y \leq 10, \ I = \pm 1, \qquad j = \pm 1$

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Measuring Spot

(Field of View : 2deg.　Measuring Distance : 500mm)

ϕ17.5mm

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5. MECHNICAL DRAWING

Please refer to the attached drawings.

6. PRECAUTION

6. 1 ASSEMBLY AND HANDLING PRECAUTION

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

(2) To assemble 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 and backlight will be damaged.

(4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latchup.

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

(6) Do not disassemble the module.

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

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

(9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(10) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly, and the starting voltage of CCFL will be higher than room temperature.

6.2 SAFTY PRECAUTION

(1) The startup voltage of backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the backlight unit.

(2) 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.

7. PACKAGING

7.1 PACKING SPECIFICATIONS

(1) 10 LCD modules / 1 Box

(2) Box dimensions : 422(L) X 337(W) X 345(H) mm

(3) Weight : approximately 6.5Kg (10 modules per box)

7.2 PACKING METHOD

(1)Carton Packing should have no failure in the following reliability test items.

Test Item	Test Conditions	Note
Vibration	Frequency Range: 5 – 50 Hz, Degree of acceleration 9.8 m/s^2(1G). Sweep rate 3 minutes Top & Bottom 60 minutes, Right & Left 15 minutes, Back & Forth 15 minutes	Non Operation
Dropping Test	1 Angle, 3 Edge, 6 Face, 60cm	Non Operation
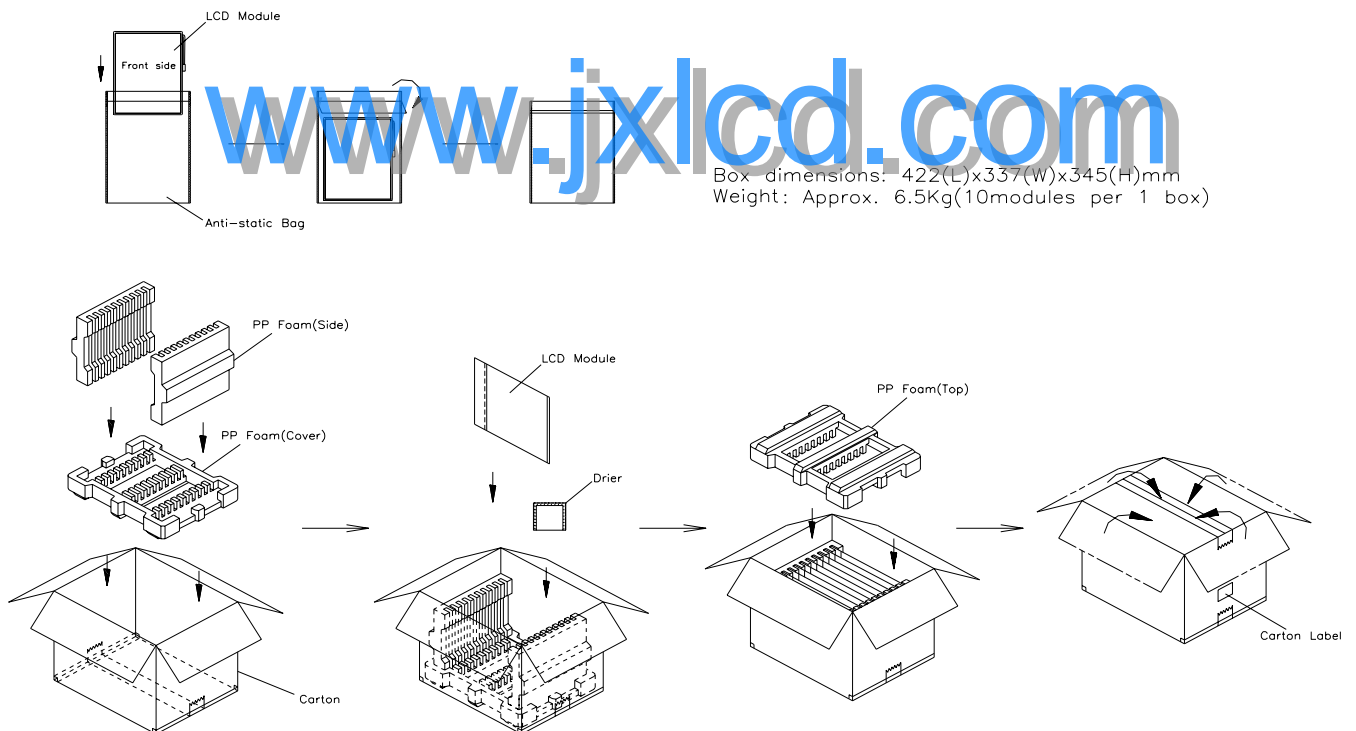
Figure. 7-1 Packing method

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Corner Protector:L1350 50mm*50mm
Pallet:L1050*W890*H135mm
Bottom Cap:L1050*W890*H120mm

Pallet Stock Dim:L1050*W890*H1525mm

PE Sheet

Corner Protector

PP Belt

Bottom Cap

Pallet

Film

Carton Label

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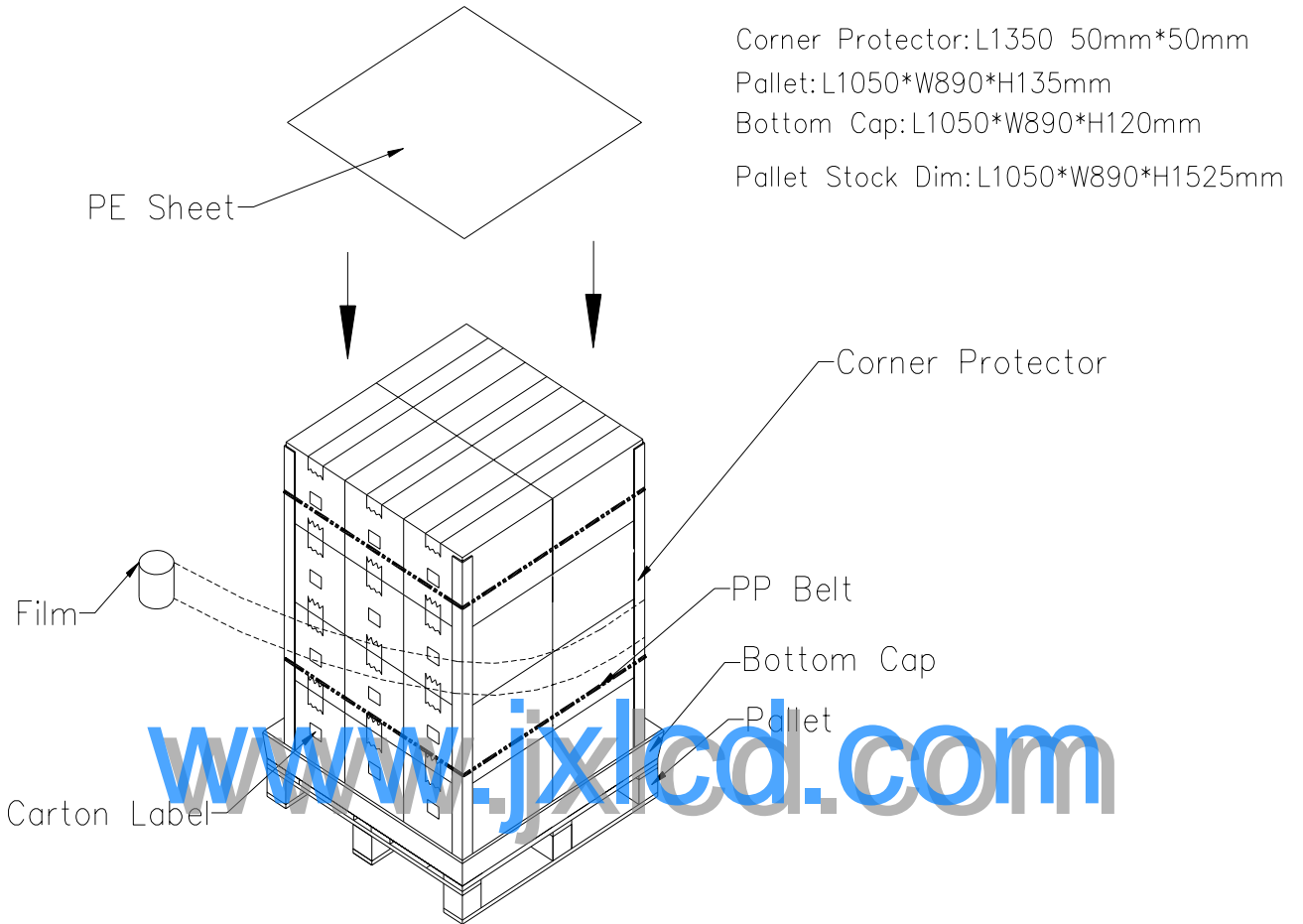
Figure. 7-2 Packing method

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8. DEFINITION OF SHIPPING LABEL ON MODULE

(1) CMO Label

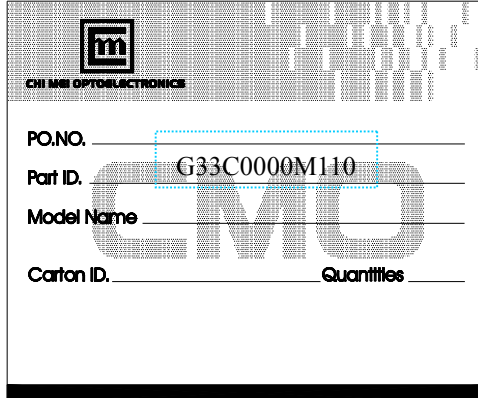The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

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G33C0000M110

N150X2-L01   Rev.XX

E207943

MADE IN TAIWAN
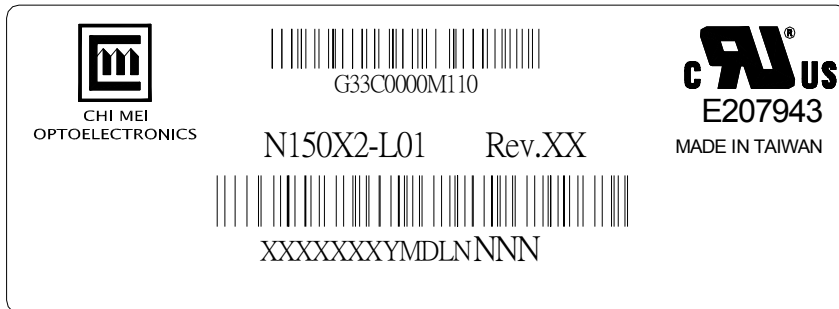
XXXXXXXYMDLNNNN

70mm X 24mm

(a) Model Name : N150X2-L01

(b) Revision : Rev.XX, for example : C1, C2 …etc.

(c) Serial ID: X X X X X X X Y M D L N N N N

- Serial No.
- Product Line
- Year, Month, Date
- CMO Internal Use
- Revision
- CMO Internal Use
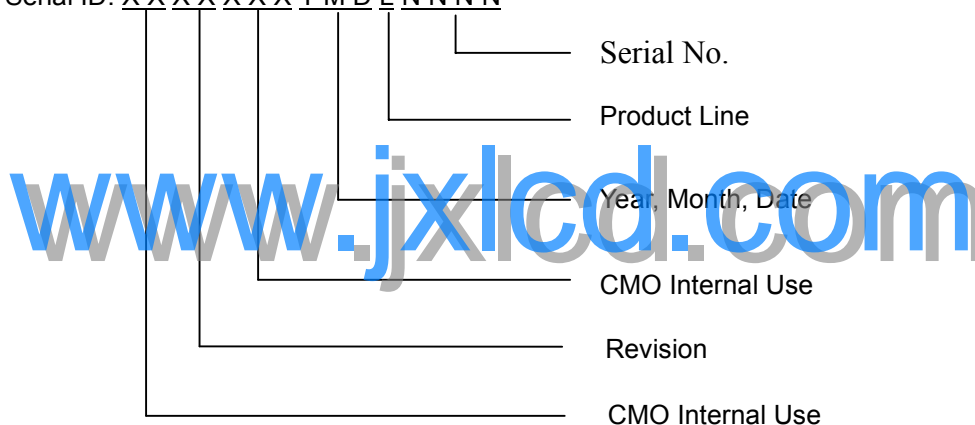
Serial ID include the information as list.

(a)Manufactured Date: Year: 1~9, for 2001~2009

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

(b)Revision Code: cover all the change

(c)Serial No.: Manufacturing sequence of product

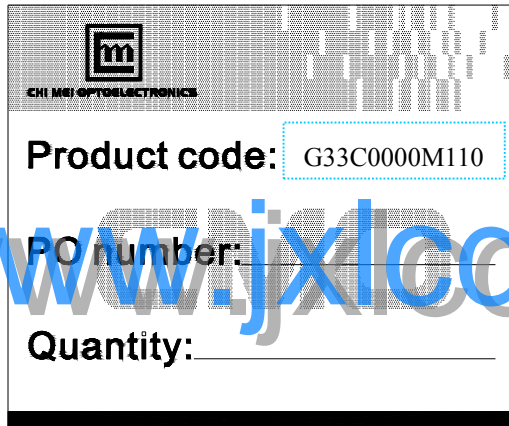(d)Product Line: 1 -> Line1, 2 -> Line 2, …etc.

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(2) Carton Label

PO.NO.

Part ID.　　G33C0000M110

Model Name

Carton ID.　　　　　　Quantities

(3) Pallet Label

Product code:　G33C0000M110

PO number:

Quantity:

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5.70±0.3
4-3.3±0.2
4.8±0.1
6.536±0.3

315.8±0.3
◁158.6▷

4.5±0.1
6.252±0.3

99.25±0.2
198.5±0.2

304.128(ACTIVE AREA)
307.6±0.2(BEZEL OPENING)

ACTIVE AREA CENTER

◁20.3▷
240.5±0.3

POL
BEZEL
M2

0.4⁺⁰·³₋₀·₀

228.096(ACTIVE AREA)
231.6±0.2(BEZEL OPENING)

3.4±0.1
5.136±0.3

4.4±0.1
6.152±0.3

2.6±0.3
SECTION A-A
SCALE 4.000

2.3MAX
A
A

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4-M2.0mm USER HOLES
Depth=2.3mmMAX

45±5
50±3

BHTR-02VS-1(JST)
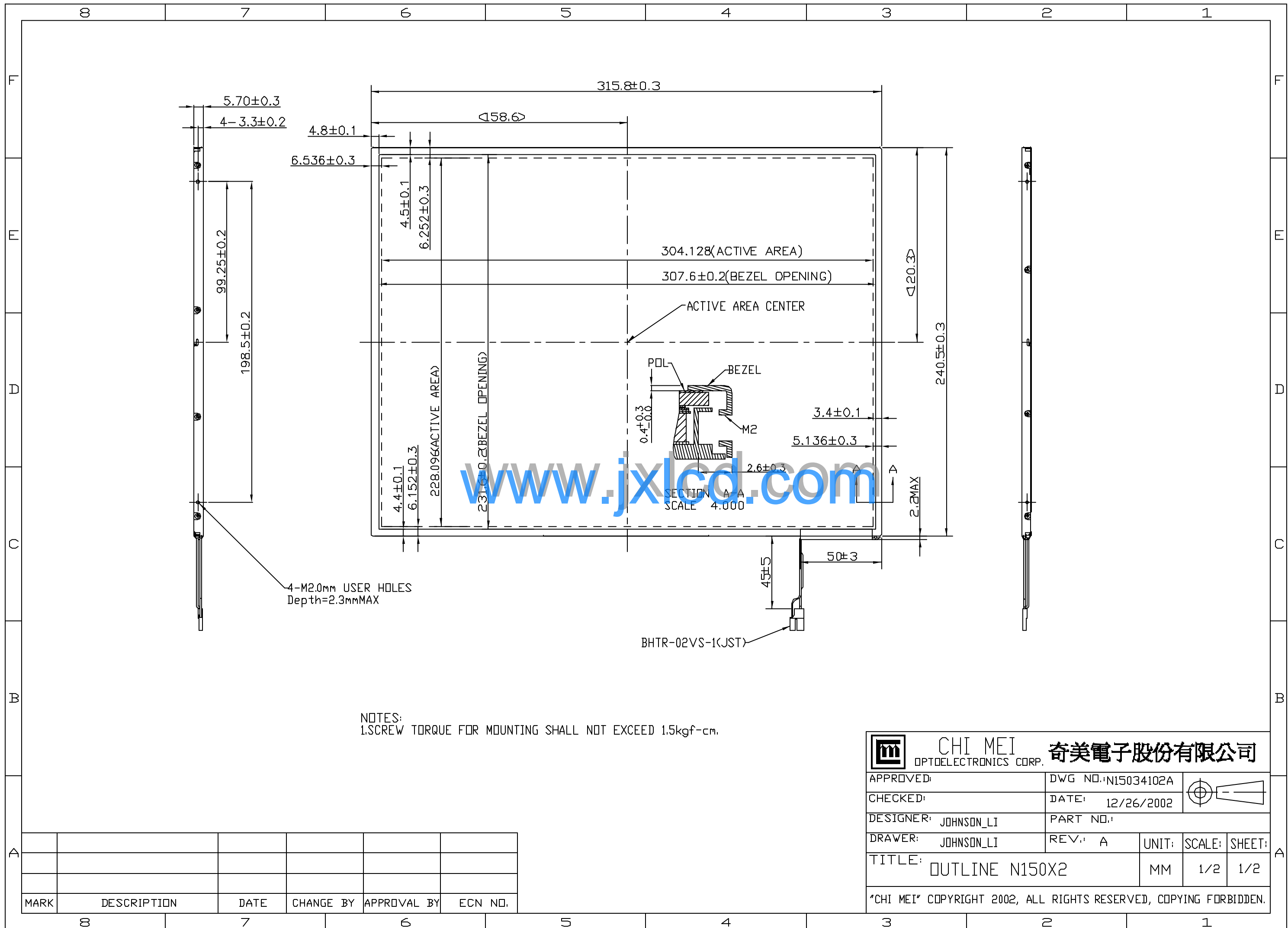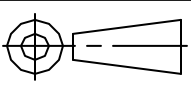
NOTES:
1.SCREW TORQUE FOR MOUNTING SHALL NOT EXCEED 1.5kgf-cm.

MARK | DESCRIPTION | DATE | CHANGE BY | APPROVAL BY | ECN NO.

8	7	6	5	4	3	2	1

27.0±1

61.1±1

FI-XB30S-HF10(JAE)

N150X2-L01 Rev.XX

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APPROVED:		DWG NO.: N15034102A	
CHECKED:		DATE: 12/26/2002	
DESIGNER: JOHNSON_LI		PART NO.:	
DRAWER: JOHNSON_LI		REV: A	UNIT:	SCALE:	SHEET:
TITLE: OUTLINE N150X2			MM	1/2	2/2

MARK	DESCRIPTION	DATE	CHANGE BY	APPROVAL BY	ECN NO.

8	7	6	5	4	3	2	1