Shanghai CATIC OPTOELECTRONICS Co. Ltd

TFT COLOR LCD MODULE

（COMMON）

TMS185WX1-01TB

WXGA

LVDS Interface (1port)

DATA SHEET

(Version1.0)

Published by

Product Technology Department

Shanghai CATIC OPTOELECTRONICS Co. Ltd.

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INTRODUCTION

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1) Unauthorized or improper repair, maintenance or modification
2) Operation or use against specifications, instructions or warnings given by SCO
3) Any other causes attributable to customer

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The specifications of maintenance parts may be partially changed within equivalent quality or better. In this product, SCO will not accept to maintain for only mounting parts on circuit board (e.g. connector, fuse, capacitor, resistor, etc.) and only backlight conformation parts (e.g. reflector sheet, light guide plate, etc.).

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For the purpose of product improvement, this product design may be changed for specifications, appearance, parts, circuits and so on. In case a design change is affected on the product specifications, SCO shall inform it to customers in advance.

• HANDLING OF DOUBTFUL POINTS

Any question arising out of, or in connection with, this SPECIFICATION or any matter not stipulated herein will be settled each time upon consultation between both parties.

CONTENTS

Record of Revision

Rev	Issued Date	Description	Editor
1.0	2009-12-22	Preliminary Release	

1. OUTLINE

1.1 STRUCTURE AND PRINCIPLE

TMS185WX1-01TB module is composed of the amorphous silicon thin film transistor liquid crystal display (a-Si TFT LCD) panel structure with driver LSIs for driving the TFT (Thin Film Transistor) array and a backlight. The inverter is not built-in.

The a-Si TFT LCD panel structure is injected liquid crystal material into a narrow gap between the TFT array glass substrate and a color-filter glass substrate.

Color (Red, Green, Blue) data signals from a host system (e.g. PC, signal generator, etc.) are modulated into best form for active matrix system by a signal processing board, and sent to the driver LSIs which drive the individual TFT arrays.

The TFT array as an electro-optical switch regulates the amount of transmitted light from the backlight assembly, when it is controlled by data signals. Color images are created by regulating the amount of transmitted light through the TFT array of red, green and blue dots.

1.2 APPLICATIONS

• For Monitor / TV application

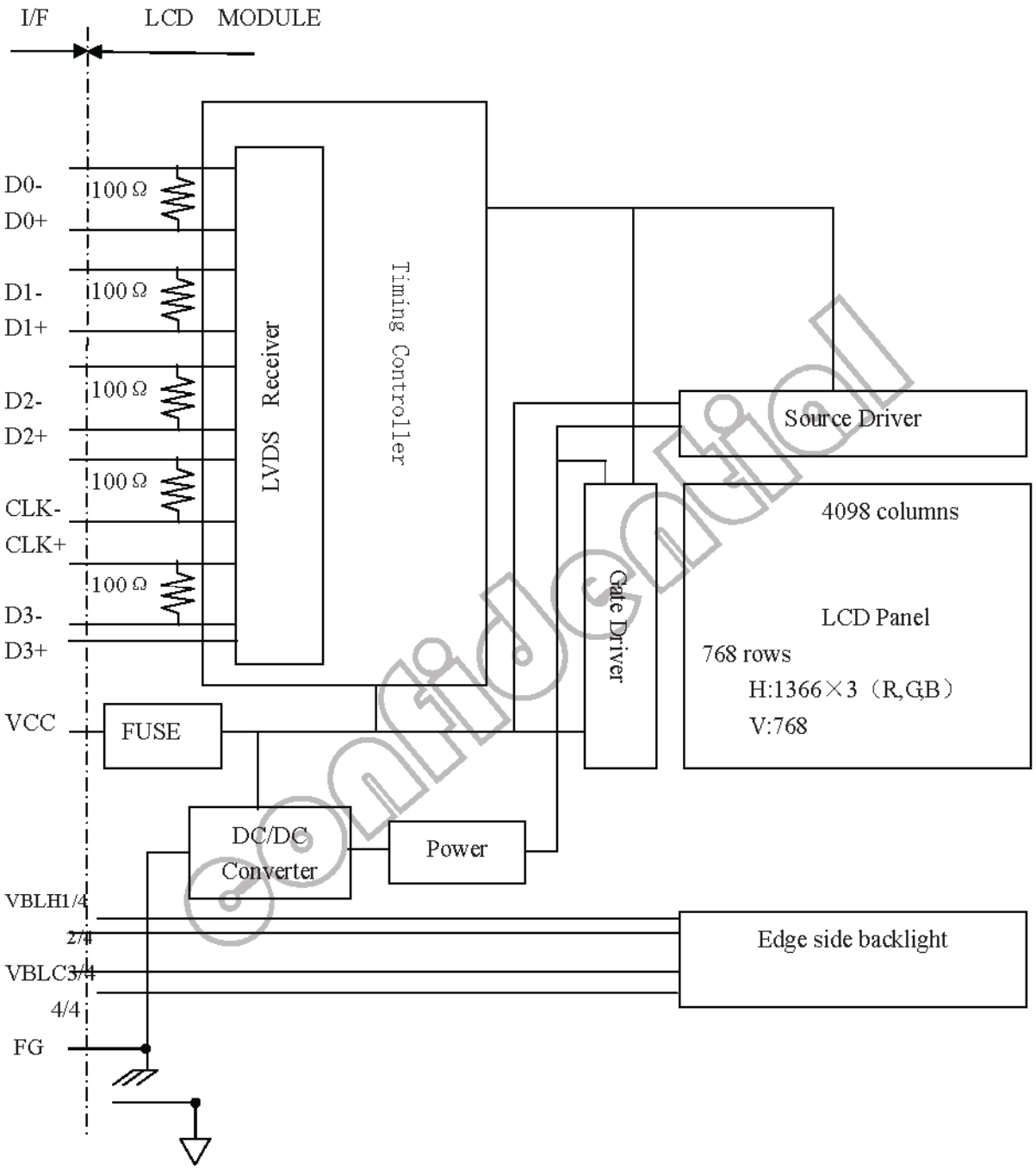
1.3 FEATURES

- a-Si TFT active matrix
- LVDS interface
- R.G.B input 8bit, 16.77 millions colors (6bit+Hi-FRC)
- Resolution: (1,366×768 pixels)
- High contrast ratio: 800:1
- High response time (Ton+Toff=5 ms）
- High gamut: (against NTSC 72%typ.)
- Edge light type backlight (4 CCFL lamps)
- RoHS compliance
- TCO'03 compliance

2. GENERAL INFORMATION

Display area	409.8 (W) x 230.4 (H) mm (typ.)
Drive system	a-Si TFT active matrix
Display color	16,777,216 colors (6bit+Hi-FRC)
Pixel	1,366 (H) x 768 (V) pixels
Pixel arrangement	RGB (Red dot、Green dot、 Blue dot) vertical stripe
Pixel pitch	0.3 (H) x 0.3 (V) mm
Module size	430.37 (W) x 254.6 (H) x 16.5 (D)(max.) mm
Weight	(1900)g (max.)
Contrast ratio	800:1 (typ.)
Viewing angle *(At the contrast ratio 10：1)*	• Horizontal: 85°/85°(L/R); • Vertical: 80°/80° (U/D)
Color gamut	At LCD panel center 72 % (typ.) [against NTSC color space]
Response time	*Ton (white 90%→black 10%) + Toff (black 10%→white 90%)* 5ms (typ.)
Luminance	*At IBL = (7.0)mArms / lamp* 300cd/m^2 (typ.)
Transmissive Mode	TN Mode,Normally White
Surface treatment	AG type,Hardness 3H
Signal system	LVDS 1port [RGB :8-bit, Dot clock (CLK), Data enable (DE)]
Power supply voltage	LCD panel signal processing board：5V
Backlight	Edge light type：4 cold cathode fluorescent lamps
Power consumption	*At IBL=(7.0)mArms / lamp and checkered flag pattern* (21.5)W (Typ.)

3. BLOCK DIAGRAM



Note: System ground(GND), FG (Frame ground) in the product should be connected together in customer equipment.

4. DETAILED SPECIFICATION

4.1 MECHANICAL SPECIFICATIONS

Parameter	Specification	Unit
Module size	430.37 (W) ×254.6 (H) ×16.5 （max）(D)	mm
Display area	409.8 (W) x 230.4 (H) (typ.)	mm
Display dot number	1366×3(H) ×768(V)	-
Pixel pitch	0.3(H)×0.3(V)	mm
Color arrangement	RGB (Red dot、Green dot、 Blue dot) vertical stripe	-
Display color	16,777,216(6bit+Hi- FRC)	color
Weight	(1900) (max.)	g

4.2 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Rating	Unit	Remarks
Power supply voltage	LCD panel signal board	VCC	-0.3 ~ +6.0	V	Ta = 25℃
Input voltage for signals	Display signals Note1	Vi	-0.3 ~ +2.63	V	Ta = 25℃
Storage temperature		Tst	-20 ~ +60	℃	-
Operating temperature		Top	0 ~ +50	℃	
Relative humidity Note2		RH	≤ 90	%	Ta ≤ 40℃
			≤ 85	%	40 < Ta ≤ 50℃
Operating altitude		-	≤ 4,850	m	0℃ ≤ Ta ≤ 55℃
Storage altitude		-	≤ 13,600	m	-20℃≤ Ta ≤ 60℃

Note1: Display signals are D0+/-, D1+/-, D2+/-, D3+/- and CK+/-.

Note2: No condensation

4.3 ELECTRICAL CHARACTERISTICS

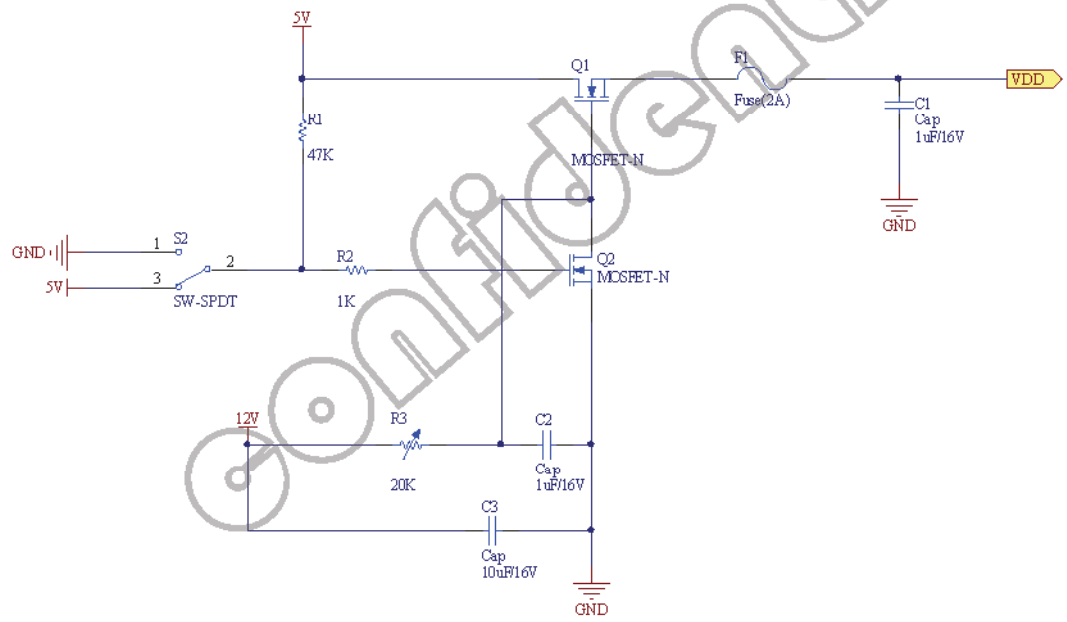
4.3.1 Driving for LCD panel signal processing board

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Power supply voltage		VCC	4.5	5.0	5.5	V	-
Power supply current		ICC	-	(350)※1	（450）※2	mA	at VCC = 5.0V
Permissible ripple voltage		VRP	-	-	150	mV	For VCC
Differential input threshold voltage for LVDS receiver	Low	VTL		-100		mV	at VCM = 1.25V ※3
	High	VTH	-	-	100	mV	
Input voltage width for LVDS receiver		Vi	0		2.62	V	-
Rush current		Irush	-	-	2	A	Note1.

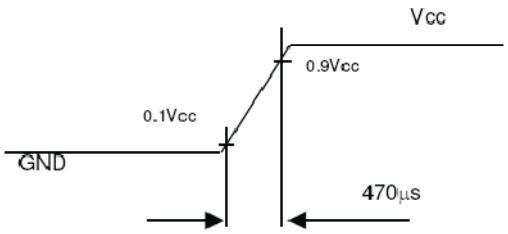
※1: Checkered flag pattern (EIAJ ED-2522)；　※2: 2H1V dot inverse pattern

※3: Common mode voltage for LVDS receiver

Note1.Measurement Conditions:



Vcc rising time is 470μs



4.3.2 Driving for backlight lamp

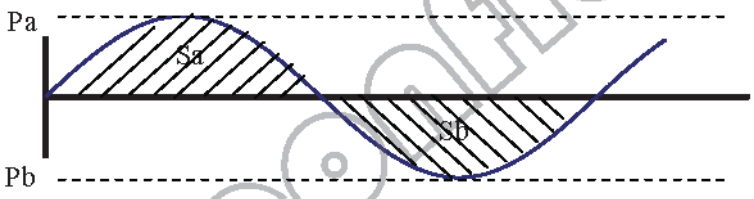
(Ta=25°C) Note1

Parameter	Symbol	min.	typ.	max.	Unit	Remarks
Lamp voltage	VBLH	(630)	(700)	(770)	Vrms	IBL=7.0MA Note2、Note3
Lamp current	IBL	(3.0)	7.0	(8.0)	mArms	Note3
Lamp starting voltage (discharge stabilization voltage)	Vs	(1314)	-	-	Vrms	Ta = 25℃ Note2、Note3
		(1512)	-	-	Vrms	Ta =0℃ Note2、3
Lamp oscillation frequency	FO	30	50	80	kHz	Note4

Note1: The backlight of this product is made up of 4-piece lamp. The specification above is only for each lamp.

Note2: The voltage timing cycle of each lamp should be set as the same phase. [Vs] and [VBLH] is the voltage between the high port and low port, the value is the characteristic of lamp. The starting voltage of inverter should be higher than the value. The possibility of not lighting exists by the lower voltage, so the suitable voltage should considered by the test.

Note3: The asymmetric ratio of working waveform for lamps (Lamp voltage peak ratio, Lamp current peak ratio and waveform area ratio) should be less than 5% (See the following figure). If the waveform is asymmetric, DC (Direct current) element applies into the lamp. In this case, a lamp lifetime may be shortened, because a distribution of a lamp enclosure substance inclines toward one side between low voltage terminal (Cold terminal) and high voltage terminal (Hot terminal).



$|Pa - Pb| / Pb \times 100 \leqslant 5\%$

$|Sa - Sb| / Sb \times 100 \leqslant 5\%$

Pa: Supply voltage/current peak for positive, Pb: Supply voltage/current peak for negative

Sa: Waveform space for positive part, Sb: Waveform space for negative part

Note4: In case "FO" is not the recommended value, beat noise may display on the screen, because of interference between "FO" and "1/th". Recommended value of "FO" is as following.

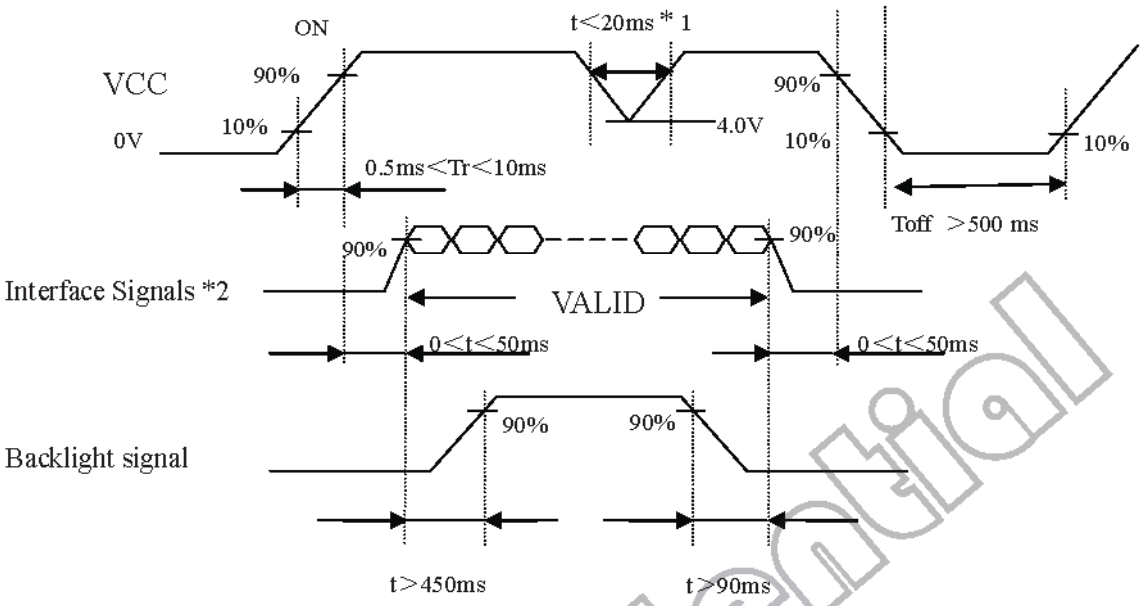
$FO = 1/4 \times 1/th \times (2n-1)$

Th: Horizontal signal period(See "4. 8.1 Timing characteristics".)

n: Natural number (1, 2, 3 ……)

4.4 POWER SUPPLY VOLTAGE SEQUENCE AND RIPPLE

4.4.1 Power supply voltage sequence



*1: VCC should be above 4.0 V while VCC ON period.

*2: The signal line is not connected with the module, at the end of cable the terminal resistor of 100Ω should be added.

Note1: In terms of voltage variation (voltage drop) while VCC rising edge is below 4.5 V, a protection circuit may work, and then this product may not work.

Note2: If some of interface signals of this product are cut while this product is working, even if the signal input to it once again, it might not work normally. If customer stops the interface signals, they should cut VCC.

Note3: The backlight power supply voltage should be inputted within the valid period of interface signals, in order to avoid unstable data display.

4.4.2 Power supply voltage ripple

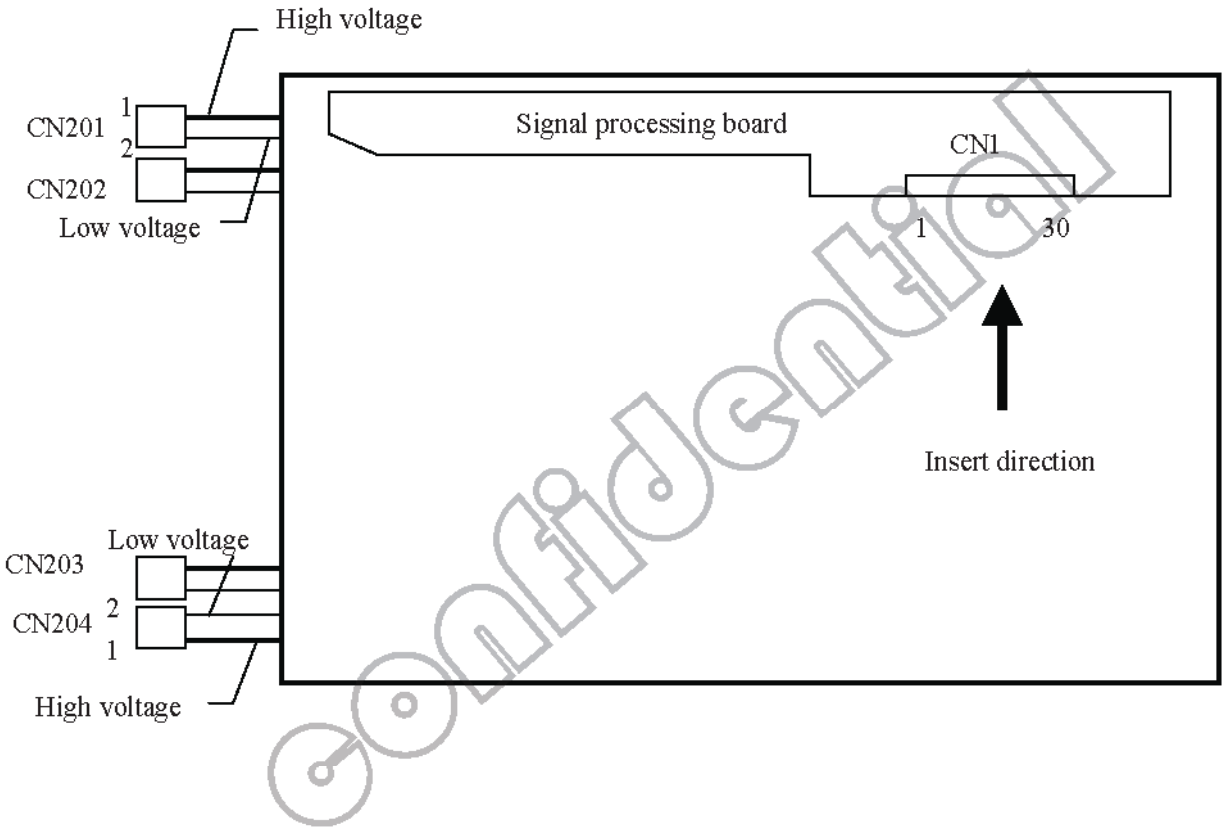
This product works, even if the ripple voltage levels are beyond the permissible values as the following table, but there might be noise on the display image.

	VCC(5V to drive the panel)
Ripple voltage	≤150mV（Including spike noise）

4.4.3 Fuse

Parameter	Fuse		Rating	Fusing current	Remarks
	Type	Supplier			
VCC	TF16SN2.50	KOA Corporation	1.5 A 32V	5.0 A	Note1

4.4.4 Connectors for power supply and signals

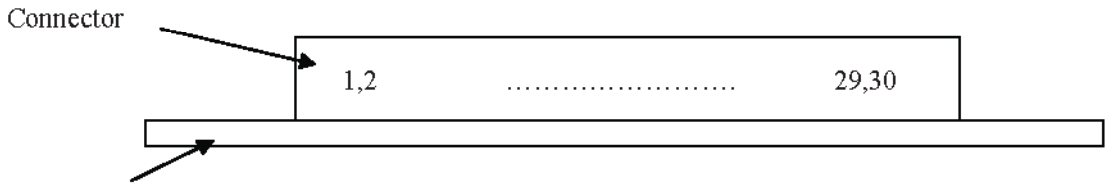


4.5 INTERFACE AND CONNECTOR PIN ASSIGNMENT

CN1: FI-X30SSL-HF or equivalent

Pin No.	Symbol	Description
1	NC	Not connection
2	NC	Not connection
3	NC	Not connection
4	GND	Ground
5	RX0-	Negative LVDS differential data input. Channel 0
6	RX0+	Positive LVDS differential data input. Channel 0
7	GND	Ground
8	RX1-	Negative LVDS differential data input. Channel 1
9	RX1+	Positive LVDS differential data input. Channel 1
10	GND	Ground
11	RX2-	Negative LVDS differential data input. Channel 2
12	RX2+	Positive LVDS differential data input. Channel 2
13	GND	Ground
14	RXCLK-	Negative LVDS differential clock input.
15	RXCLK+	Positive LVDS differential clock input.
16	GND	Ground
17	RX3-	Negative LVDS differential data input. Channel 3
18	RX3+	Positive LVDS differential data input. Channel 3
19	GND	Ground
20	NC	Not connection
21	NC	Not connection
22	NC	Not connection
23	GND	Ground
24	GND	Ground
25	GND	Ground
26	VCC	+5.0V power supply
27	VCC	+5.0V power supply
28	VCC	+5.0V power supply
29	VCC	+5.0V power supply
30	VCC	+5.0V power supply

CN1: The inserting side is as follows



CN201: (Yeonho) 3500011HS-02L/Locking Type or Equivalent

Adaptable Socket:

Pin No.	Signal name	Function
1	VH1	High voltage input terminal for upper lamp(Cable color: Pink)
2	VL1	Low voltage input terminal for upper lamp(Cable color: White)

CN202: :(Yeonho)3500011HS-02L/Locking Type or Equivalent

Adaptable Socket

Pin No.	Signal name	Function
1	VH2	High voltage input terminal for upper lamp(Cable color: Pink)
2	VL2	Low voltage input terminal for upper lamp(Cable color: White)

CN203: :(Yeonho)3500011HS-02L/Locking Type or Equivalent

Adaptable Socket

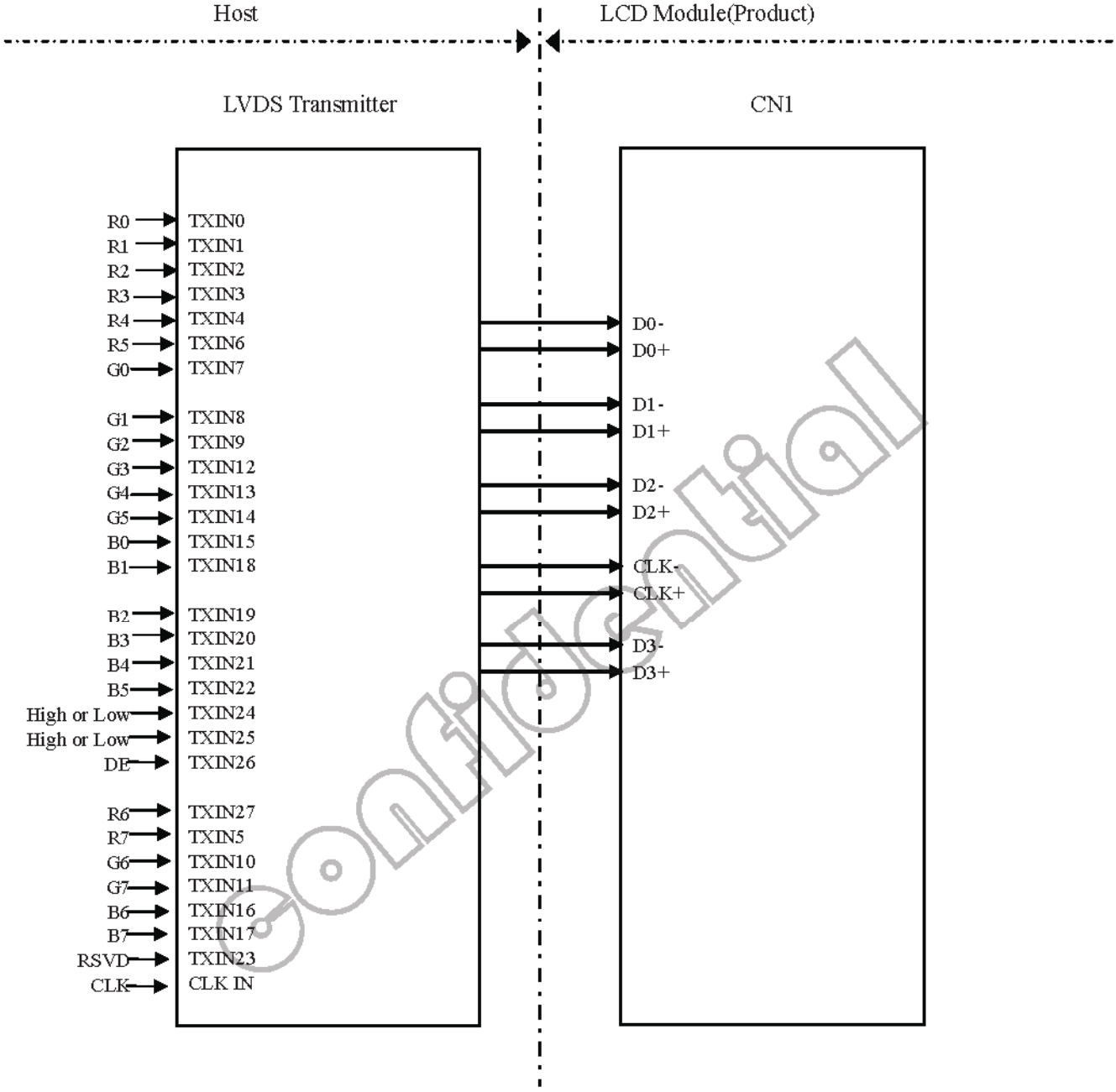
Pin No.	Signal name	Function
1	VH1	High voltage input terminal for upper lamp(Cable color: Pink)
2	VL1	Low voltage input terminal for upper lamp(Cable color: White)

CN204: :(Yeonho)3500011HS-02L/Locking Type or Equivalent

Adaptable Socket

Pin No.	Signal name	Function
1	VH2	High voltage input terminal for upper lamp(Cable color: Pink)
2	VL2	Low voltage input terminal for upper lamp(Cable color: White)

4.6 LVDS I/F DATA CHART



4.7 DISPLAY COLORS AND INPUT DATA SIGNALS

This product can display in equivalent to 16,777,216 colors in 256 scales. Also the relation between display colors and input data signals is as the following table.

Display colors		Data signal （0:Low level，1:High Level）																							
		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 Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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
	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
	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
	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
	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
	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
Red grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dark ↑	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:				:								:								:				
	↓				:								:								:				
	Bright	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		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	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 grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Dark ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:				:								:								:				
	↓				:								:								:				
	Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
		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	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 grayscale	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Dark ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:				:								:								:				
	↓				:								:								:				
	Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
		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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

4.8 INTERFACE TIMING

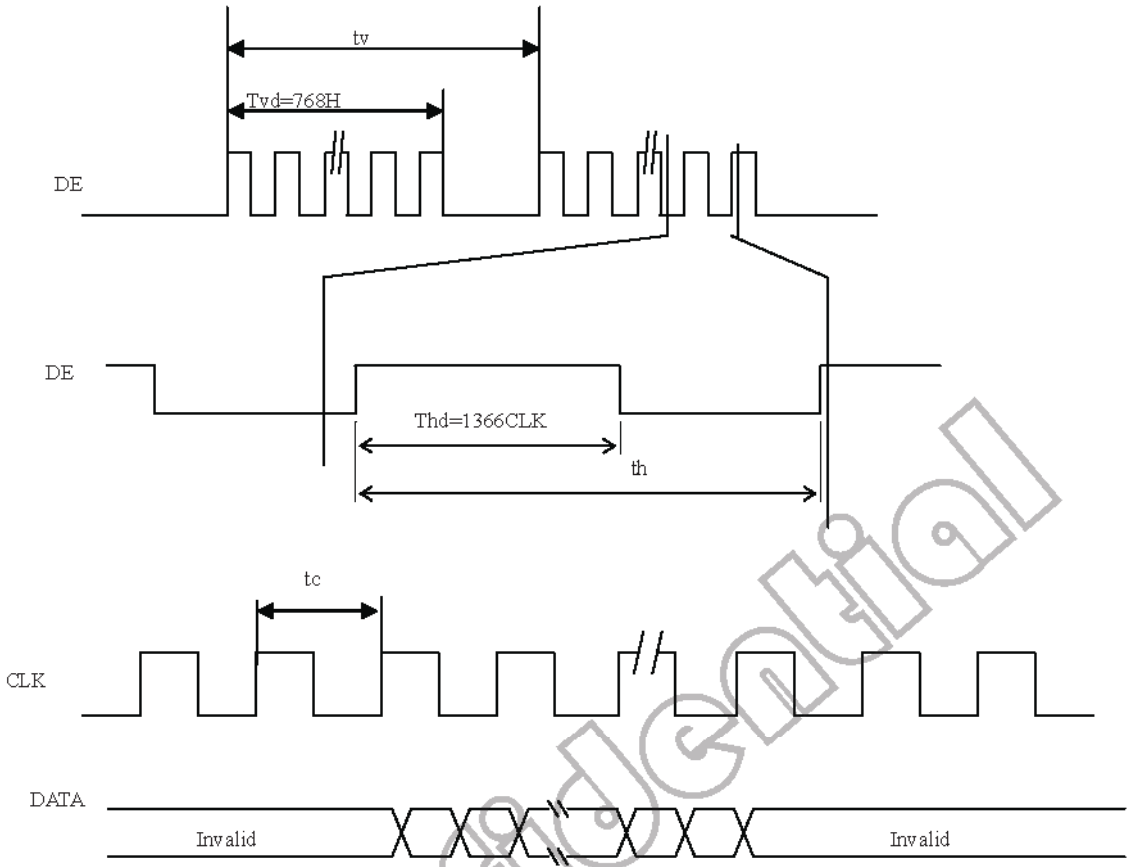
4.8.1 Timing specification

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Clock	Frequency	1/tc	60	76	93	MHz	
		tc	-	13	-	ns	
	Rise time, Fall time	-	Refer to the timing characteristics of LVDS transmitter			ns	Note 1
	Duty	-				-	
Horizontal signals	Cycle	th	-	20.67	-	μs	48.4kHz(typ.)
			(1446)	1560	(1936)	CLK	
	Display period	thd	1366			CLK	-
Vertical signals	Cycle	tv	-	16.67	-	ms	60.0Hz(typ.)
			(778)	806	(888)	H	
	Display period	tvd	768			H	-
DE/Data	Setup time	-	Refer to the timing characteristics of LVDS transmitter			ns	Note 1
	Hold time	-				ns	
	Rise time, Fall time	-				ns	

Note1: See the data sheet of LVDS transmitter.

Recommended transmitter: DS90CF383 (National Semiconducter)

4.8.2 Input signal timing chart



4.8.3 Pixel data alignment of display image

The following table is the coordinates per pixel

C (1, 1)

R	G	B

C (1, 1)	C (2, 1)	•••	C (X, 1)	•••	C (1365, 1)	C (1366, 1)
C (1, 2)	C (2, 2)	•••	C (X, Y)	•••	C (1365, 2)	C (1366, 2)
• • •	• • •	• ••• •	• • •	• ••• •	• • •	• • •
C (1, Y)	C (2, Y)	•••	C (X, Y)	•••	C (1365, Y)	C (1366, Y)
• • •	• • •	• ••• •	• • •	• ••• •	• • •	• • •
C (1, 767)	C (2, 767)	•••	C(X, 767)	•••	C(1365, 767)	C(1366, 767)
C (1, 768)	C (2, 768)	•••	C(X, 768)	•••	C(1365, 768)	C(1366, 768)

4.9 OPTICS

4.9.1 Optical characteristics

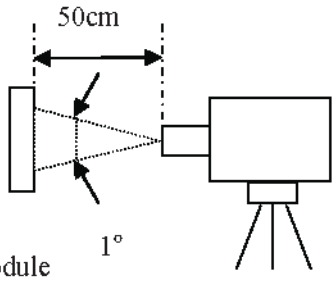
Note1 ,Note2

Parameter Note1		Condition	Symbol	min.	typ.	max.	Unit	Remarks
Luminance		White at center θR=0°, θL=0°, θU=0°, θD=0°	L	(200)	300	-	cd/ m^2	-
Contrast ratio		White/Black at center θR=0°, θL=0°, θU=0°, θD=0°	CR	(400)	800	-	-	Note3
Luminance uniformity		White θR=0°, θL=0°, θU=0°, θD=0	LU	-	-	(1.33)	-	Note4
Chromaticity	White	X coordinate	Wx	0.283	0.313	0.343	-	Note5
		Y coordinate	Wy	0.299	0.329	0.359	-	
	Red	X coordinate	Rx	typ- 0.03	0.648	typ+ 0.03	-	
		Y coordinate	Ry		0.339		-	
	Green	X coordinate	Gx		0.292		-	
		Y coordinate	Gy		0.603		-	
	Blue	X coordinate	Bx		0.143		-	
		Y coordinate	By		0.070		-	
Color gamut		θR=0°, θL=0°, θU=0°, θD=0 At center against NTSC	C	-	72	-	%	
Response time		White to black	Ton	-	1.4	-	ms	Note6 Note7
		Black to white	Toff	-	3.6	-	ms	
		Ton+ Toff	-	-	5	-	ms	
Viewing angle	Right	θU=0°, θD=0°,CR=10	θR	(80)	85	-	°	Note8
	Left	θU=0°, θD=0°,CR=10	θL	(80)	85	-	°	
	Up	θR=0°, θL=0°,CR=10	θU	(75)	80	-	°	
	Down	θR=0°, θL=0°,CR=10	θD	(75)	80	-	°	

Note1: The values in upper table are only initial characteristics.

Note2: Measurement conditions are as follows.

Ta=25°C, VCC=5.0V, IBL=(7.0)mArms/lamp, FO=50±5KHz, WXGA+, Vertical cycle=60.0Hz. Optical characteristics are measured at luminance saturation after 30minutes from working the product in the dark room. Also measurement method for luminance is as follows.



Luminance Meter (TOPCON BM-5A)
Spectroradiometer (TOPCON SR-3)

Note 3: See“4.9.2 Definition of contrast ratio”.
Note 4: See“4.9.3 Definition of luminance uniformity”.
Note 5: CIE 1931 Chromaticity Diagram Standard.
Note 6: See “4.9.4 Definition of response time”.
Note 7: See “4.9.5 Definition of viewing angle”.

4.9.2 Definition of contrast ratio

The contrast ratio is calculated by using the following formula.

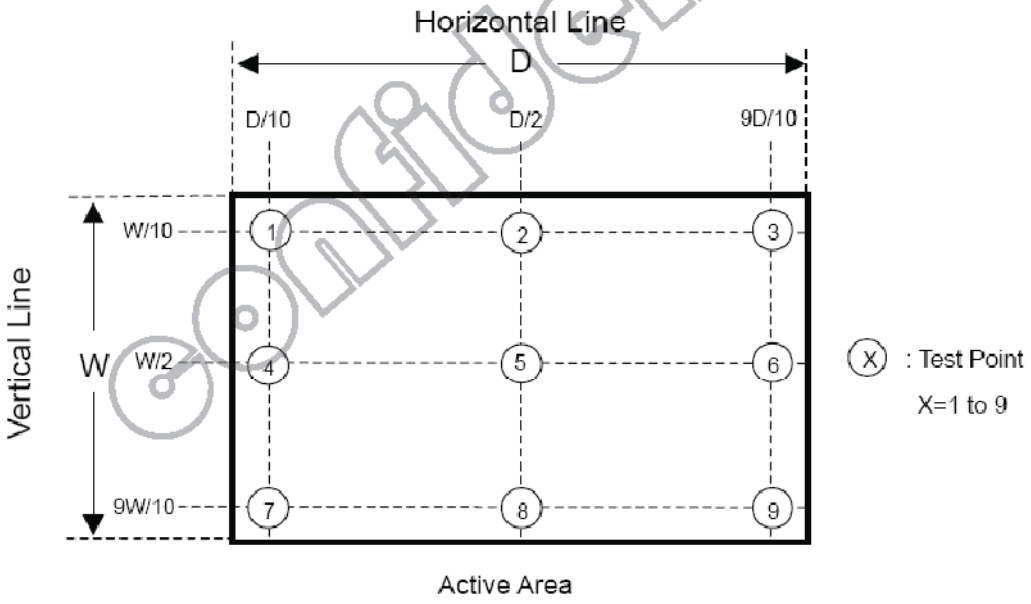
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance of white screen}}{\text{Luminance of black screen}}$$

4.9.3 Definition of luminance uniformity

The luminance uniformity is calculated by using the following formula.

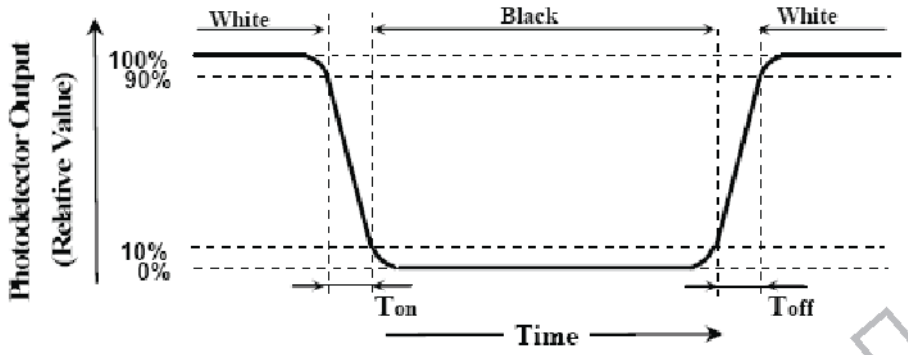
$$\text{Luminance uniformity (LU)} = \frac{\text{Maximum luminance from(1)to(9)}}{\text{Minimum luminance from(1)to(9)}}$$

The luminance is measured at near the 9points shown below.

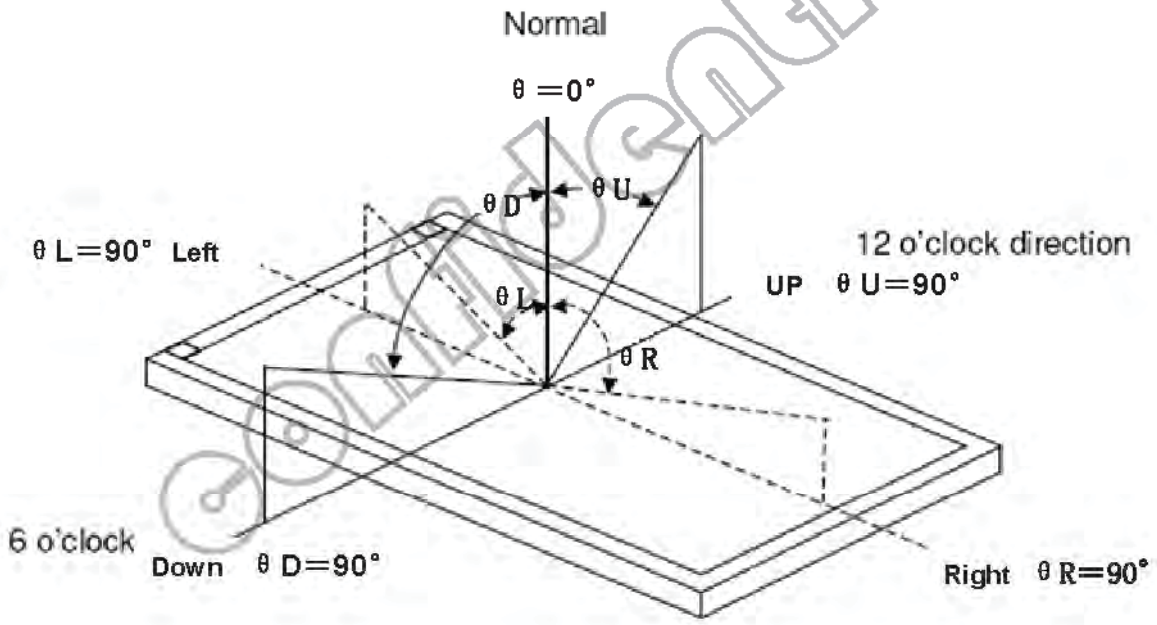


4.9.4 Definition of response time

Response time is measured, the luminance changes from "white" to "black", or "black" to "white" on the same screen point, by photo-detector. Ton is the time it takes the luminance change from 90% down to 10%. Also Toff is the time it takes the luminance change from 10% up to 90%. (See the following diagram.)



4.9.5 Definition of viewing angle

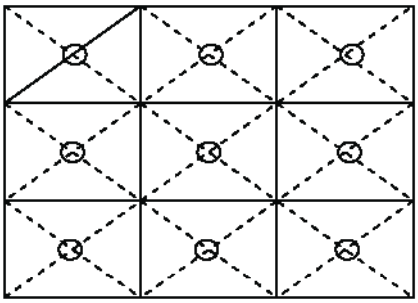


5. RELIABILITY TESTS

Test items		Condition
High temperature and humidity(Operation)		① 50±3℃,RH=80%,240hours ②Display data is black **Note1**
Low temperature (Operation)		① 0±3℃...240hours ② Display data is black
Thermal shock (Non operation)		① -20±3℃...30minutes 60±3℃ ...30minutes ② 100cycles,1hour/cycle ③ Temperature transition time is within 5 minutes.
ESD (operation)		① 150Pf,150Ω,±8kV（contact） ② 9 places on a panel surface(contact) ③10 times each place at 1 sec interval **Note2**
Vibration (Non operation)		① 10-200-10Hz， Sine wave， acceleration of 14.79m/s^2 ② 30 minutes/cycle ③ X,Y,Z direction ④ 1 time each direction
Mechanical shock (Non operation)		① 490 m/s^2， 11ms ② ±X， ±Y， ±Z direction ③ 2 times each direction
Low pressure	operation	①53.3kPa (Equivalent to altitude 4,850m） ② 0℃±3℃...24hours ③ 50℃±3℃...24hours
	non-operation	① 15kPa (Equivalent to altitude 13,600m） ② -20℃±3℃...24hours ③ 60℃±3℃... 24hours

Note1: Display and appearance are checked under environmental conditions equivalent to the inspection conditions of defect criteria.

Note2: See the following figure for discharge points.



6. ESTIMATED LUMINANCE LIFETIME

The luminance lifetime is the time from initial luminance to half-luminance.

This lifetime is the estimated value, and is not guarantee value.

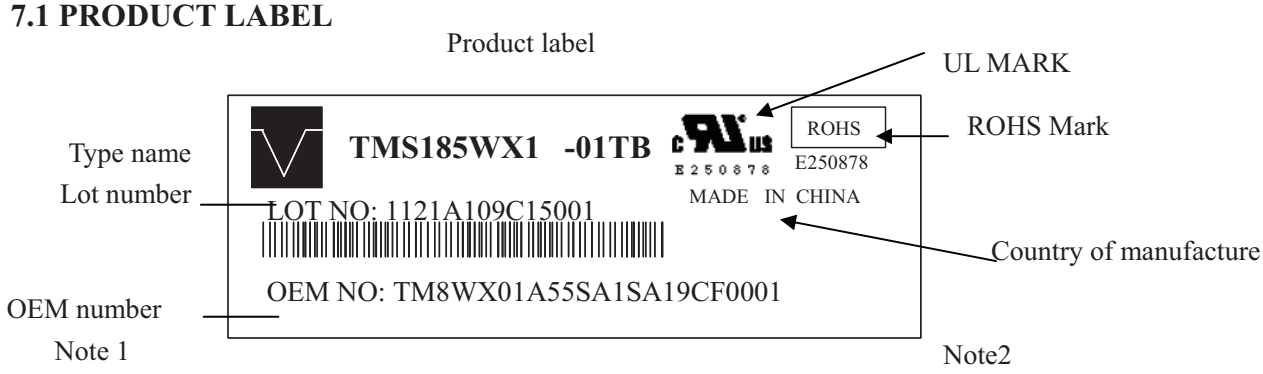
Condition	Luminance lifetime(MTTF) **Note1**	Unit
25℃(Ambient temperature of the product) Continuous operation and IBL=(7.0)mArms/lamp	40000(min)	Hour

Note1: MTTF is mean time to half-luminance. In case the product works under low temperature environment, the lifetime becomes short.

7. MARKINGS

The various markings are attached to this product. See "7.3 INDICATION LOCATIONS" for attachment positions.

7.1 PRODUCT LABEL



Note1: The meaning of OEM number

- Example: TM5XG10A55SA1SA19CF0001

TM5XG10A	55	SA1SA1	9CF	0001
Module Number	**Source & Gate Driver IC Code**	**Location Line#**	**Date code**	**Serial Number**

Date code:

1st Character Year Codes

Month	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	So on
Code	6	7	8	9	0	1	2	3	4	5	6	

2nd Character Month Codes

Month	January	February	March	April	May	June	July	August	September	October	November	December
Code	1	2	3	4	5	6	7	8	9	A	B	C

3rd Character Day Codes

Day	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11st	12nd
Code	1	2	3	4	5	6	7	8	9	A	B	C

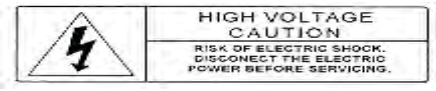
13rd	14th	15th	16th	17th	18th	19th	20th	21st	22nd	23rd	24th
D	E	F	G	H	J	K	L	M	N	P	Q

25th	26th	27th	28th	29th	30th	31st
R	S	T	U	V	W	X

Note2: **Do not attach anything such as label and so on, on the product label**! In case repair the product, SCO needs the contents of product label such as the lot number, inspection date and so on, to identify the warranty period with individual product. If SCO cannot decipher the contents of product label, such repair shall be entitled to charge. Also SCO may give a new lot number to reconditioned products.

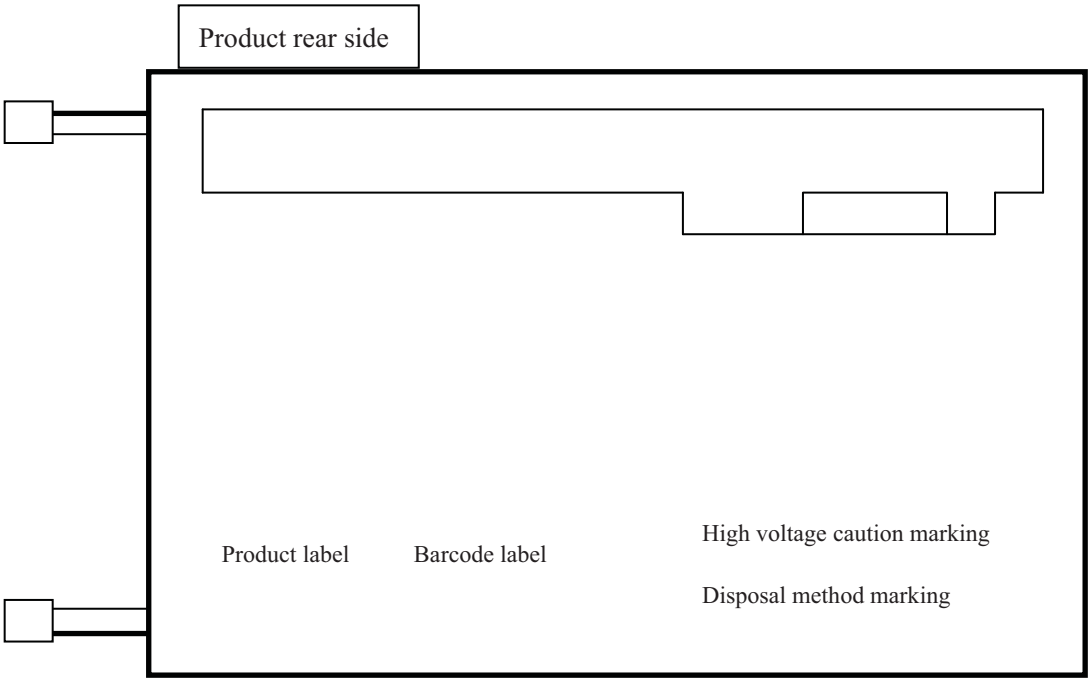
7.2 OTHER MARKINGS

High voltage caution marking



Disposal method marking for lamp

7.3 INDICATION LOCATIONS



8. PACKING, TRANSPORTATION AND DELIVERY

SCO will pack products to deliver to customer in accordance with SCO packing specifications, and will deliver products to customer in such a state that products will not suffer from a damage during transportation .The delivery conditions are as follows.

8.1 PACKING

(1) Packing box

8 products are packed up with the maximum in a packing box(See "**8.5 OUTLINE FIGURE FOR PACKING** ").

Products are put into a plastic bag for prevention of moisture with cushion, and then the bag is sealed up with heat sealing.

The type name and quality are shown on outside of the packing box, either labeling or printing.

(2)Pallet Packing (See" **8.5 OUTLINE FIGURE FOR PACKING** ")

① Packing boxes are tired on a cardboard pallet.(9 boxes×4 tiers maximum)

②Cardboard sleeve and top cap are attached to the packing boxes, then they are fixed by a band.

8.2 INSPECTION RECORD SHEET

Inspection record sheets are included in the packing box with delivery products to customer. It is summarized to a number of products for pass/fail assessment.

8.3 TRANSPORTATION

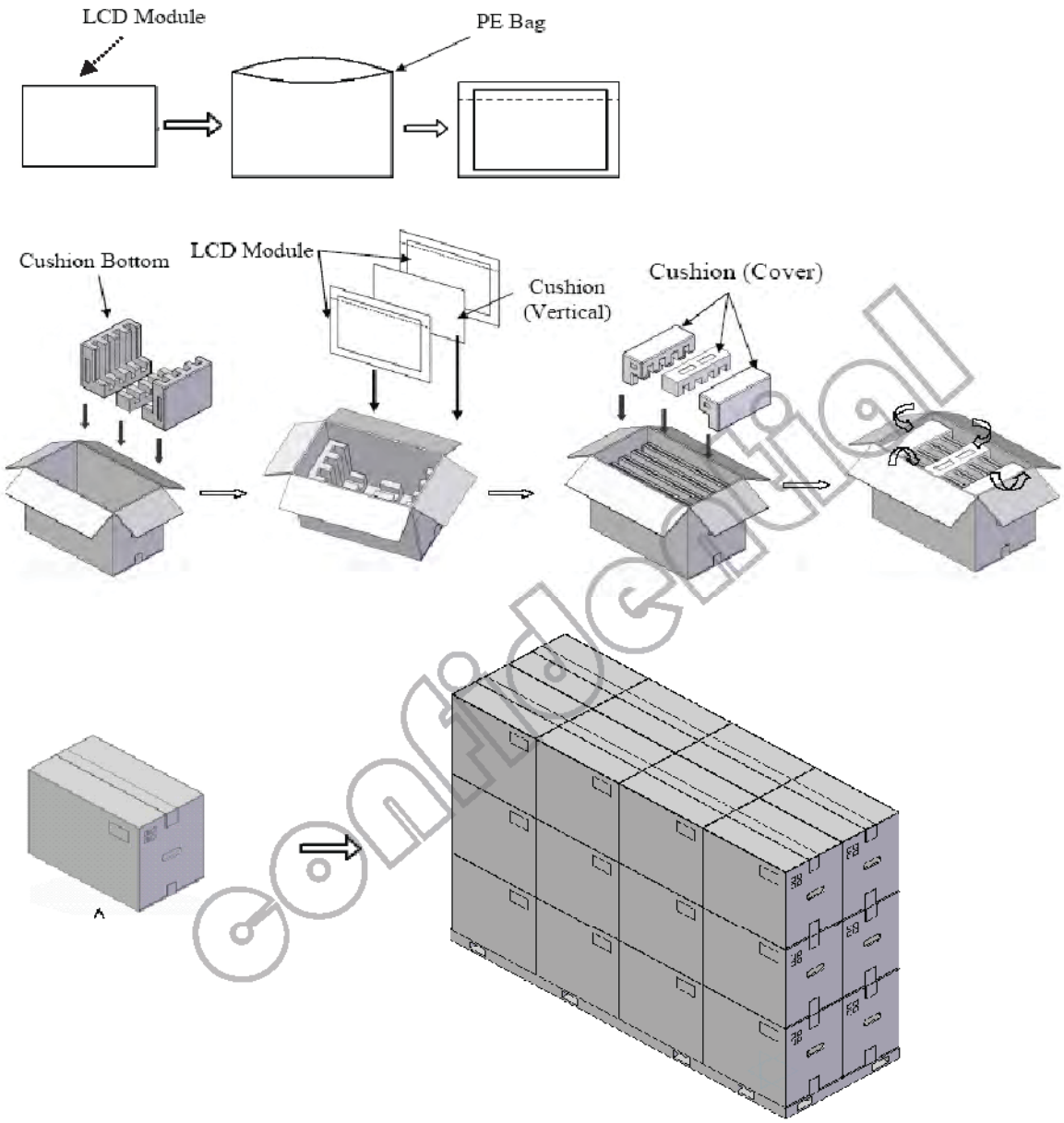
The product is transported by vehicle, aircraft or shipment in the state of pallet packing.

8.4 SIZE AND WEIGHT FOR PACKING BOX

Parameter	Packing box	Unit
Size	485（L）x280（W）x 315（H）)	mm
Weight	1.9（max）	kg
Total weight	17（typ.） (with 8 products)	kg

8.5 OUTLINE FIGURE FOR PACKING

8.5.1 Packing box



9. PRECAUTIONS

9.1 MEANING OF CUTION SIGNS

The following caution signs have very important meaning .**Be sure to read "9.2 CAUTIONS" and "9.3 ATTENTIONS", after understanding these contents!**

This sign have the meaning that customer will be injured by himself or the product will sustain a damage, if customer has wrong operations.

This sign has the meaning that customer will get an electrical shock, if customer has wrong operations.

This sign has the meaning that customer will be injured by himself, if customer has wrong operations.

9.2 CAUTIONS

*** Do not touch lamp cables while turn on .Customers will be in danger of an electric shock**

*** Do not touch the working backlight and IC. Customers will be in danger of burn injury.**

*** Do not shock and press the LCD panel and the backlight! There is a danger of breaking, because they are made of glass.(shock :To be not greater 294m/s^2 and to be not greater 11ms, Pressure: To be not greater 19.6N)**

9.3 ATTENTIONS

9.3.1 Handling of the product

① Take hold of both ends without touch the circuit board when customer pulls out products (LCD modules) from inner packing box. If customer touches it, products may be broken down or out of adjustment, because of stress to mounting parts.

② Do not hook cables nor pull connection cables such as flexible cable and so on , for fear of damage.

③ If customer puts down the product temporarily, the product puts on flat subsoil as a display side turns down.

④ Take the measures of electrostatic discharge such as earth band, ionic shower and so on, when customer deal with the product, because products may be damaged by electrostatic.

⑤The torque for mounting screws must never exceed 0.34N-m. Higher torque values might result in distortion of the bezel.

⑥The product must be installed using mounting holes without undue stress such as bends or twist (See outline drawings).And do not add undue stress to any portion (such as bezel flat area) except mounting hole portion. Bends or twist described above and undue stress to any portion except mounting hole portion may cause display

un-uniformity.

⑦Do not press or rub on the sensitive display surface .If customer clean on the panel surface, SCO recommends using the cloth with ethanolic liquid such as screen cleaner for LCD.

⑧ Do not push-pull the interface connectors while the product is working, because wrong power sequence may break down the product.

⑨ Do not bend or unbend the lamp cable at the near part of the lamp holding rubber, to avoid the damage for high voltage side of the lamp. This damage may cause a lamp breaking and abnormal operation of high voltage circuit.

9.3.2 Environment

① Do not operate or store in high temperature, high humidity, dewdrop atmosphere or corrosive gases. Keep the product in antistatic pouch in room temperature, because of avoidance for dusts and sunlight, if customer stores the product.

② In order to prevent dew condensation occurring by temperature difference, the product packing box must be opened after leave under the environment of an unpacking room temperature enough. Because a situation of dew condensation occurring is changed by the environment temperature and humidity, evaluate the leaving time sufficiently. (Recommendation leaving time: 6 hour or more with packing state)

③ Do not operate in a high magnetic field .Circuit boards may be broken down by it.

④ This product is not designed as radiation hardened.

⑤ Use an original protection sheet on the product surface (polarizer). Adhesive type protection sheet should be avoided, because it may change color or properties of the polarizer.

9.3.3 Characteristics

The following items are neither defects nor failures.

① Response time, luminance and color may be changed by ambient temperature.

②The LCD may be seemed luminance non-uniformity, flicker, vertical seam or small spot by display patterns.

③Optical characteristics (e.g. luminance, display uniformity, etc.) gradually is going to change depending on operating time ,and especially low temperature, because the LCD has cold cathode fluorescent lamps.

④Do not display the fixed pattern for a long time because it may cause image sticking .Use a screen saver, if the fixed pattern is displayed on the screen.

⑤The display color may be changed by viewing angle because of the use of condenser sheet in the backlight.

⑥Optical characteristics may be changed by input signal timings.

⑦The interference noise of input signal frequency for this product and luminance control frequency of customer's backlight inverter may appear on a display. Set up luminance control frequency of backlight inverter so that the interference noise doses not appear.

9.3.4 Other

①All GND and VCC terminals should be used without a non-connected line.

②Do not disassemble a product or adjust volume without permission of SCO.

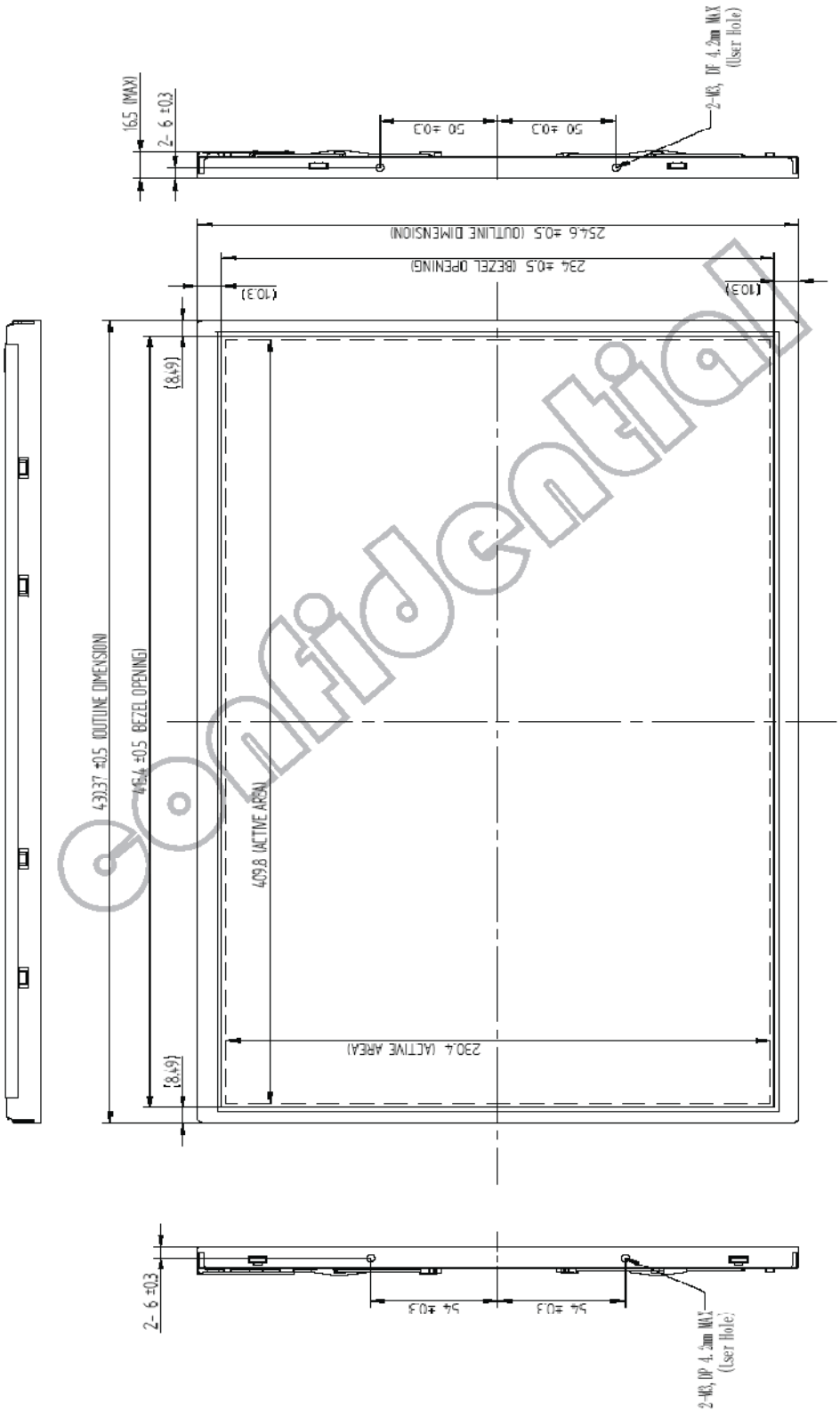
③Pay attention not to insert waste materials inside of products, if customer uses screw nails.

④Pack the product with original shipping package, because of avoidance of some damages during transportation, when customer returns it to SCO for repair and so on .

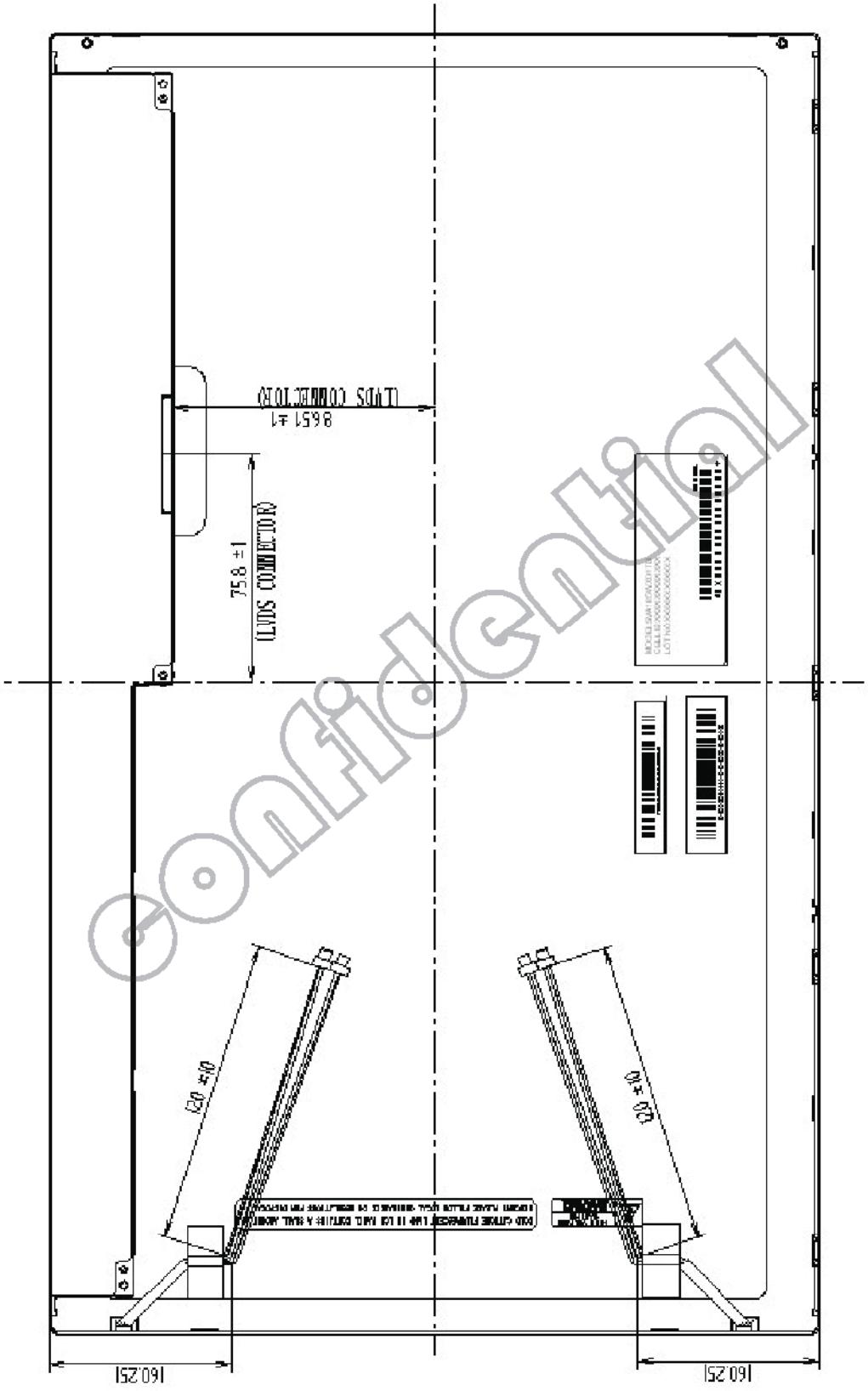
⑤Not only the module but also the equipment should be packed and transported as the module. becomes vertical .Otherwise, there is the fear that a display dignity decreases by an impact or vibrations.

10.OUTDRAWING

10.1 FRONT VIEW



10.2 REAR VIEW



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