15.0" High Bright TFT-LCD Module
Specification Sheet

GL150HB-600-XGA

Basic Model : SVA150XG10TB

Prepared Date : 06 / 4 / 2009

PRELIMINARY

Prepared by _____

Checked by _____

Approved by _____

CONTENTS

1. OUTLINE

1.1 STRUCTURE AND PRINCIPLE

SVA 150XG10TB module is composed of 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 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 indivisual TFT arrays.

The TFT arrays 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 amount of transmitted light through the TFT array of red, green, and blue dots.

1.2 APPLICATIONS

- Sun light readerble & Specialize setup systems

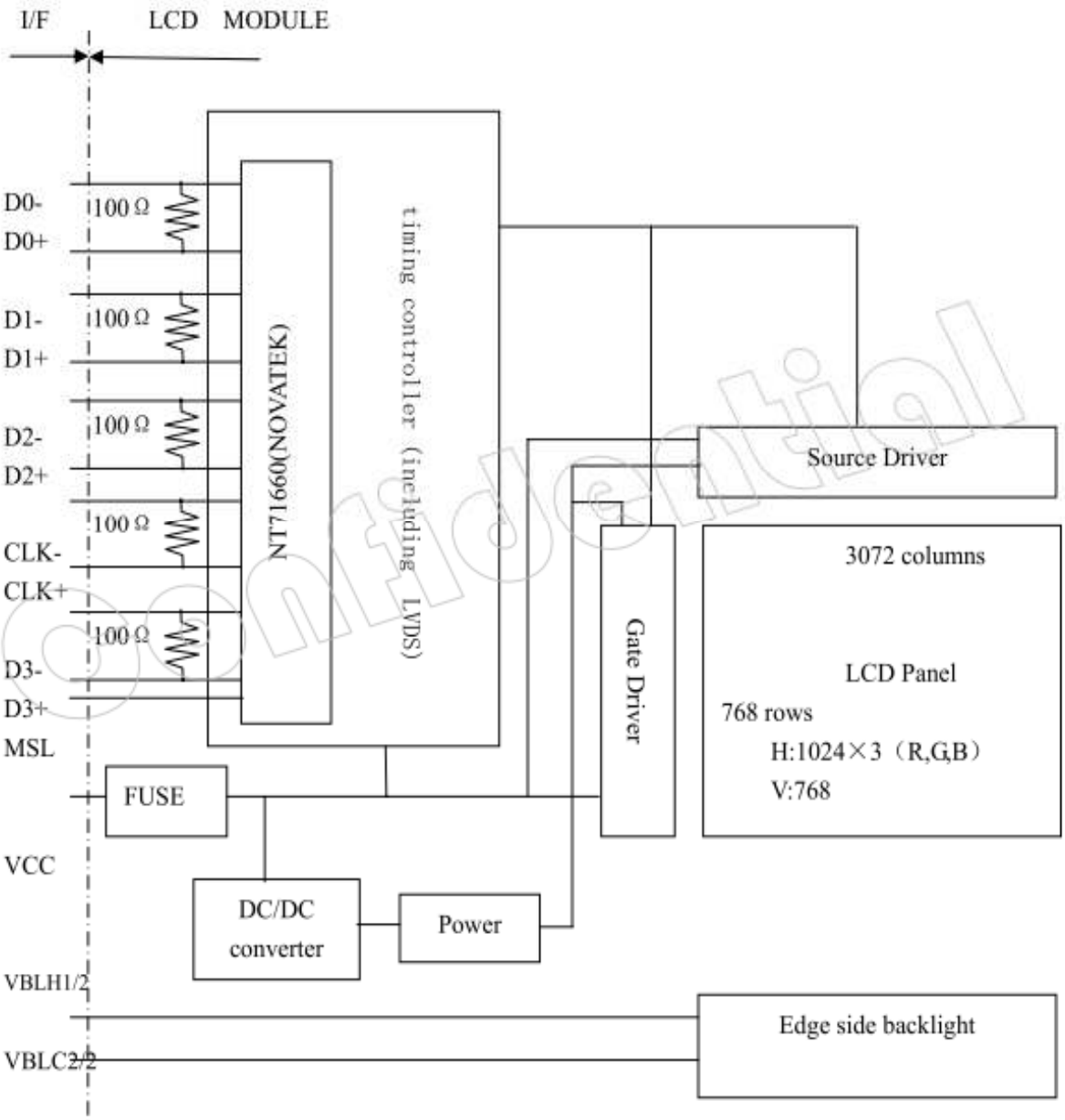
1.3 FEATURES

- a-Si TFT active matrix
- LVDS interface (6bit+FRC)
- Wide viewing angle
- high response time : 8ms (typ.)
- PSWG standard
- High contrast : 600:1 (typ.)
- Edge light type L.E.D backlight

2. GENERAL SPECIFICATIONS

Display area	304.128(W) X 228.096(H) mm (typ.)
Diagonal size of display	38.0Cm (15.0 inches)
Drive system	a- Si TFT active matrix
Display color	16,777,216 Colors (6bit +FRC)
Pixel	1,024(H) X 768(V) pixels
Pixel arrangement	RGB (Red dot, Green dot, Blue dot) vertical stripe
Dot pitch	0.099(W) X 0.297(H) mm
Pixel Pitch	0.297(W) X 0.297(H) mm
Module size	326.50±0.5(W) X253.5±0.5(H) X 11.13±0.5(D) mm (typ.)
Weight	1000g (typ.)
Contrast ratio	600 : 1 (typ.)
Viewing angle *(At the contrast ratio 10:1)*	- Horizontal : 160° (typ.) - Vertical : 160° (typ.)
Designed viewing direction	Viewing angle with optimum grayscale (√ =2.2) : nomal axis
Color gamut	At LCD panel center 60% (typ.) -against NTSC color space-
Response time	Ton (white 90% to black 10%) + Toff (black 10% to white 90%) 8ms (typ.)
Luminance	600cd/㎡ (typ.)
Signal system	LVDS 1port RGB : 8bit, Dot clock (CLK), Data enable (DE)
Power supply voltage	LCD panel signal processing board : 3.3V
Backlight	L.E.D Edge light type : 2 Strings
Power consumption	Excepted VCC, L.E.D Backlight only 15.72W (typ.)

3. BLOCK DIAGRAM



Note 1 - Connections between GND, FG (Frame ground) and VBLC (L.E.D Gnd terminal) in the product

GND - FG	Connected
GND - VBLC	Not connected
FG - VBLC	Not connected

Note 1 - These ground should be connected together in customer equipment

4. DETAIL SPECIFICATION

4.1 MECHENICAL SPECIFICATIONS

Parameter	Specification	Unit
Module size	326.5±0.5(W) X253.5±0.5(H) X 11.13±0.5(D) mm Note 1	mm
Display area	304.128 (W) X 228.096 (H) Note 1	mm
Weight	1,000 (typ.)	g

Note 1 : See " 10. OUTLINE DRAWINGS"

4.2 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Rating	Unit	Remarks
Power supply voltage	**LCD panel signal board**	VCC	-0.3 to +3.6	V	Ta = 25℃
Input voltage for signals	**Display signals Note 1**	Vi	-0.3 to +3.6 and Vi < VCC +0.3	V	Ta = 25℃
	Function signals Note 1				
Storage temperature		Tst	-20 to +60	℃	-
Operating temperature	**Front surface**	TopF	0 to +50	℃	Note3
	Rear surface	TopR	0 to +55	℃	Note4
Relative humidity Note 5		RH	≤ 95	%	Ta≤ 40℃
			≤ 85	%	40 < Ta≤ 50℃
Absolute humidity Note 6		AH	≤ 70	g/㎥	Ta > 50℃
			Note 6		

Note 1 - Display signals are DO+/-, D1+/-, D2+/-, D3+/- and CK+/-.

Note 2 - Function signal is MSL

Note 3 - Measured at center of LCD panel surface (including self-heat)

Note 4 - Measured at center of LCD module's rear shield surface (including self-heat)

Note 5 - No condensation

Note 6 - Ta = 50℃, RH = 85%

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	3.0	3.3	3.6	V	-
Power supply current		ICC	-	(500)※1	(700)※2	mA	at VCC=3.3V
Permisible ripple voltage		VRP	-	-	100	mV	For VCC
Differential input threshold voltage for LVDS receiver	**Low**	VTL	-100	-	-	mV	at VCM=1.2V
	High	VTH	-	-	100	mV	Note3
Input voltage width for LVDS receiver		Vi	0	-	2.4	V	-
Terminating resistor		RT	-	100	-	Ω	-
Input voltage for MSLsignal	**Low**	VFL	0	-	0.8	V	-
	High	VFH	2.0	-	VCC	V	

※ Check flag pattern (EIAJ ED-2522); ※ 2: 2HIV dot inverse pattern

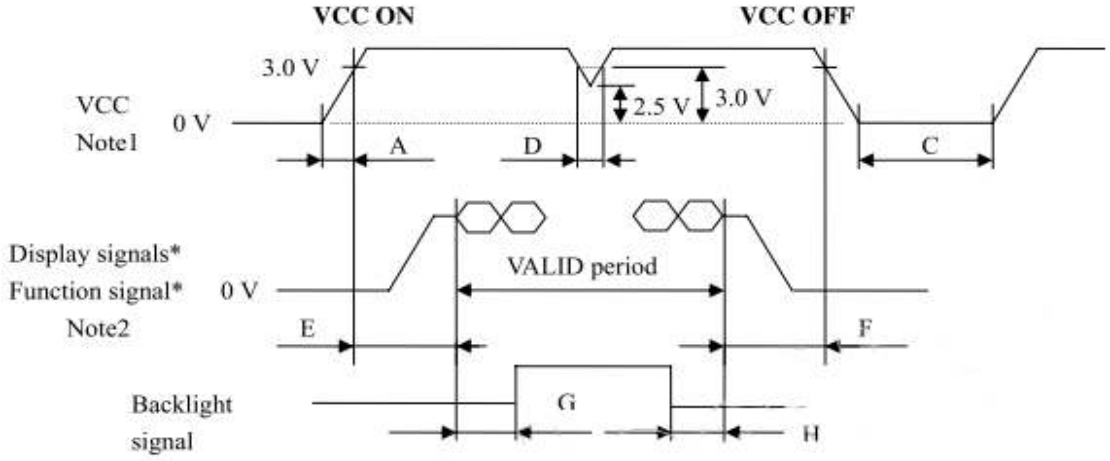
※ Common mode voltage for LVDS receiver

4.3.1 Driving for LCD panel signal processing board

Parameter	Symbol	min.	typ.	max.	Unit	Remarks
Operating current	I_{BL}	-	1.31	-	A	at L=600cd/㎡ (typ.)
Operating voltage	V_{BL}	5	12.0	-	V	For each LED Bar
Life time	-	30,000	40,000	-	Hrs	-

4.4 POWER SUPPLY VOLTAGE SEQUENCE

4.4.1 The sequence of backlight and power supply



※ These signals should be measured at the tetminal of 100Ω resistor.

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Input voltage sequence	ON	A	-	-	10	ms	-
	Moment	C	500	-	-	ms	-
	DIP	D	-	-	20	ms	※1
Power supply and signal sequence	ON	E	0.01	-	50	ms	-
	OFF	F	0.01	-	50	ms	-
B/L igniting	ON	G	200	-	-	ms	PSWG
B/L extinguising	OFF	H	200	-	-	ms	-

※ 1 : VCC should be 2.5V or more while VCC ON period.

※ NOTE ITEM ※

Note1 : In terms of voltage variation (voltage drop) while VCC rising edge is below 3.0V, a protection circuit may work, and then this product may not work.

Note2 : Display signals (D0+/-, D1+/-, D2+/-, D3+/-, and CK+/-) and function signal (MSL) must be "0" voltage, exclude the VALID period (See above sequence diagram). If these signals are higher than 0.3V, the internal circuit is damaged.

If some of display and function signals of this product are cut while this product is working, even if the signal input to it once agaon, ot might not work normally. If customer stops the display and function signals, they should be cut VCC.

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

Note4 : In order to prevent unstable data displaying, suggest that, during display and function signal's valid period, backlight power voltage should be input under the custom' condition as possible

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.

Parameter	Power supply voltage	ripple voltage Note1 (Measured at terminal of power supply)	Unit
VCC	3.3V	≤ 100	mVp-p

Note1 : The permissible ripple voltage includes spike noise.

4.4.3 Fuse

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

Note1 : The power supply capacity should be more than the fusing current. If the power supply capacity is less than the fusing current, the fuse may not blow for a short time, and then nasty smell, smoking and so on may occur.

4.5 CONNECTIONS AND FUNCTIONS FOR INTERFACE PINS

4.5.1 LCD panel signal processing board

CN1 socket (Module side) : DF-14H-20P-1.25H (Hirose Electric Co., Ltd.)

Adaptable plug : DF-14H-20S-1.25C (Hirose Electric Co., Ltd.)

Pin No.	Symbol	Signal	Remarks
1	VCC	Power supply	-
2	VCC		
3	GND	Ground	-
4	GND		
5	D0-	Pixel data	Note2
6	D0+		
7	GND	Ground	-
8	D1-	Pixel data	Note2
9	D1+		
10	GND	Ground	-
11	D2-	Pixel data	Note2
12	D2+		
13	GND	Ground	-
14	CLK-	Pixel clock	Note2
15	CLK+		
16	GND	Ground	-
17	D3-	Pixel data	Note2
18	D3+		
19	GND	Ground	-
20	MSL	Selection of LVDS input Map	Low or Open : Note1

Note1 : See **"4.5.4 Connection between receiver and transmitter For LVDS".**

Note2 : Twist pair wires with 100Ω (Chatacteristic impedance) should be connected between LCD panel signal processing board and LVDS transmitter

4.5.2 L.E.D Backlight

Attention : VBLH and VBLC must be connected correctly. IF customer connects wrongly, customer will be hurt and the product will be broken.

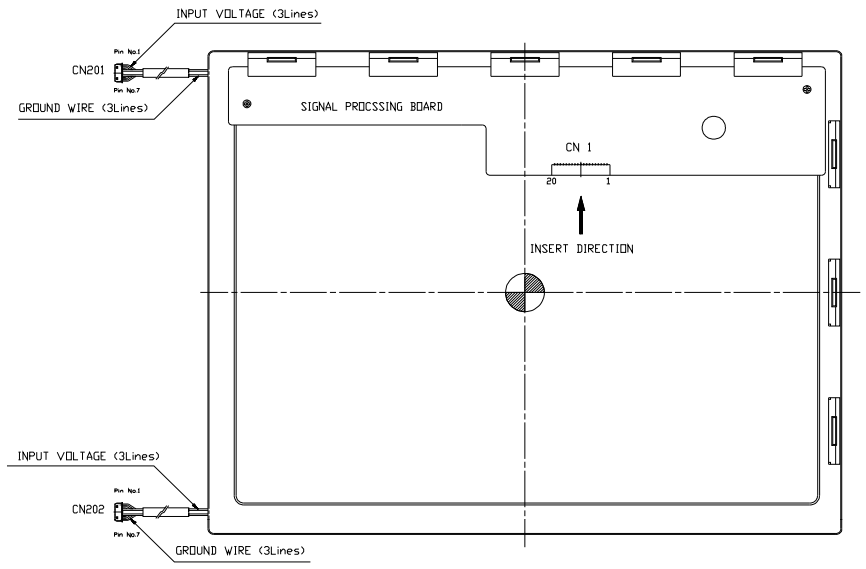
CN201 plug (LCD module side)

Pin No.	Symbol	Signal	Remarks
1	VBLH	High voltage terminal (Hot)	Cable color : White
2	VBLH	High voltage terminal (Hot)	Cable color : White
3	VBLH	High voltage terminal (Hot)	Cable color : White
4	N.C	Common	-
5	VBLC	Low voltage terminal (GND)	Cable color : Black
6	VBLC	Low voltage terminal (GND)	Cable color : Black
7	VBLC	Low voltage terminal (GND)	Cable color : Black

CN201 plug (LCD module side)

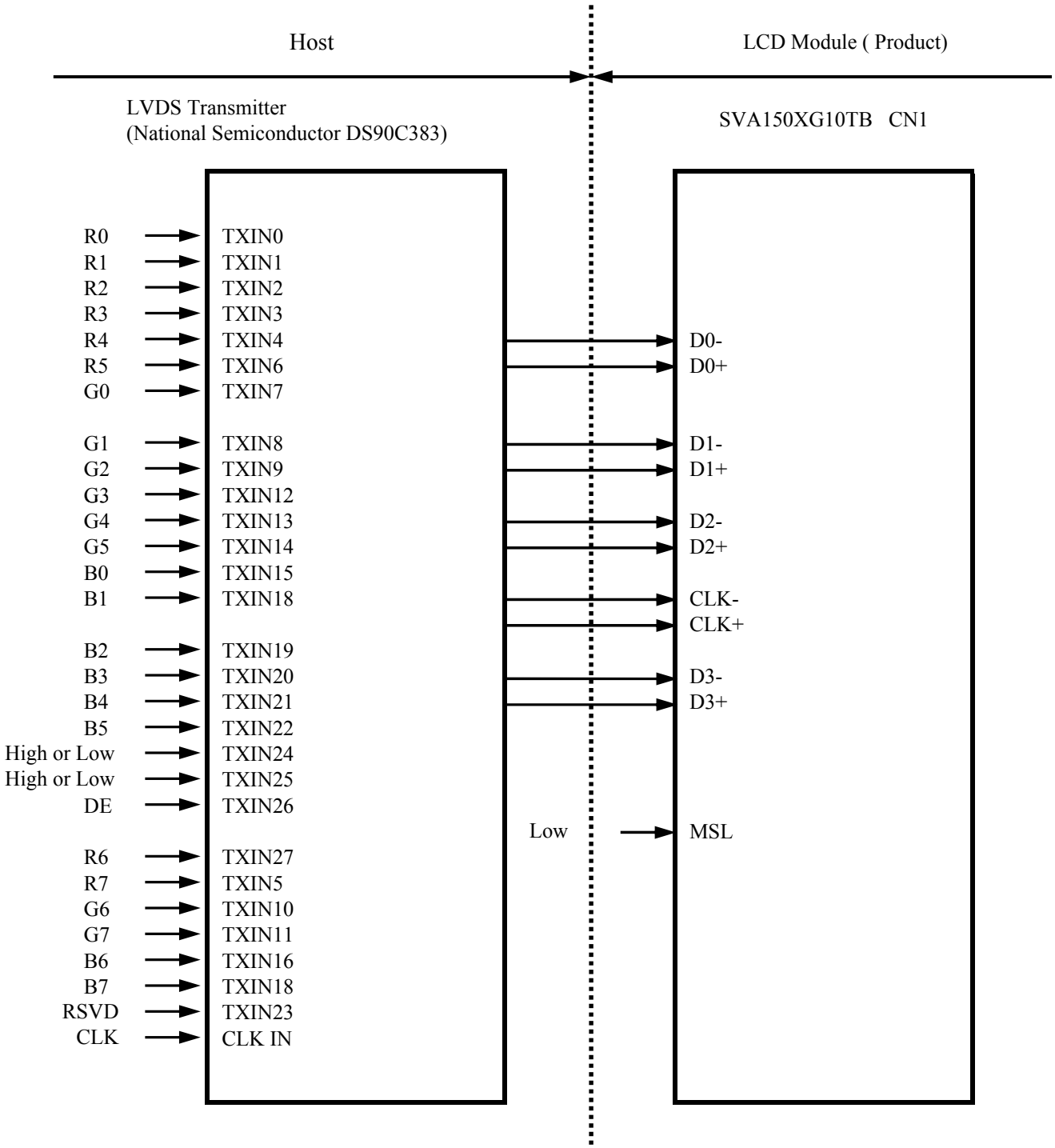
Pin No.	Symbol	Signal	Remarks
1	VBLH	High voltage terminal (Hot)	Cable color : White
2	VBLH	High voltage terminal (Hot)	Cable color : White
3	VBLH	High voltage terminal (Hot)	Cable color : White
4	N.C	Common	-
5	VBLC	Low voltage terminal (GND)	Cable color : Black
6	VBLC	Low voltage terminal (GND)	Cable color : Black
7	VBLC	Low voltage terminal (GND)	Cable color : Black

4.5.3 Position of plugs and a socket



4.5.4 Connection between receiver and transmitter for LVDS

Input LVDS map (MSL : "Low" or "Open")



Note1 : Recommended transmitter

See the data sheet for DS90C383 (National Semiconductor)

Note2 : LSB (Least Significant Bit) -R0, G0, B0 MSB (Most Significant Bit) -R7, G7, B7

4.6 DISPLAY COLORS AND INPUT DATA SIGNALS

This product can display in equivalent to 16,777,216 color in 256 scale. Also the relation between display colors and input data signals is 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

4.7 DISPLAY POSITIONS

The following table is coordinates per pixel

C (1, 1)

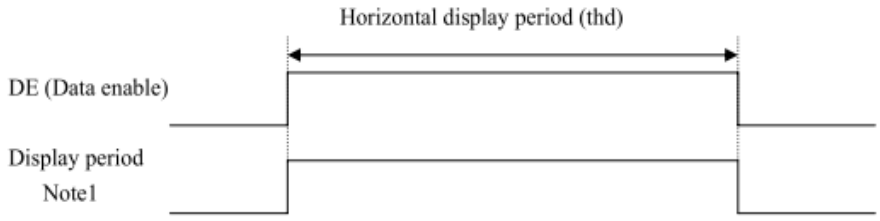
R	G	B

C (1, 1)	C (2, 1)	…	C (X, 1)	…	C (1023, 1)	C (1024, 1)
C (1, 2)	C (2, 2)	…	C (X, Y)	…	C (1023, 2)	C (1024, 2)
.	.	.	.	.	.	.
.	.	…	.	…	.	.
.	.	.	.	.	.	.
C (1, Y)	C (2, Y)	…	C (X, Y)	…	C (1023, Y)	C (1024, Y)
.	.	.	.	.	.	.
.	.	…	.	…	.	.
.	.	.	.	.	.	.
C (1, 767)	C (2, 767)	…	C (X, 767)	…	C (1023, 767)	C (1024, 767)
C (1, 768)	C (2, 768)	…	C (X, 768)	…	C (1023, 768)	C (1024, 768)

4.8 INPUT SIGNAL TIMINGS FOR LCD PANEL SIGNAL PROCESSING BOARD

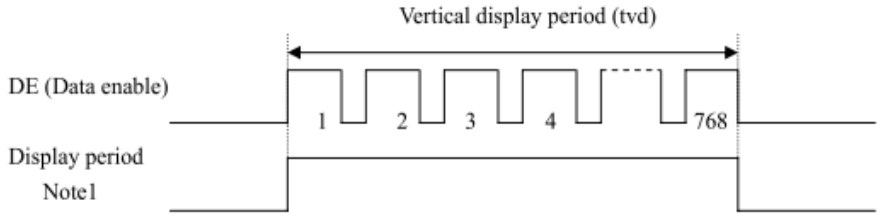
4.8.1 Outline of input signal timings

- Horizontal signal



Note1: This diagram indicates virtual signal for set up to timing.

• Vertical signal



Note1: This diagram indicates virtual signal for set up to timing.

4.8.2 Timing characteristics

(Note1)

Parameter			Symbol	min.	typ.	max.	Unit	Remarks
CLK	Frequency		1/tc	60	65	70	MHz	15.384 (typ.)
	Duty		-	-			-	Note2
	Rise time, Fall time		-				ns	
DATA	CLK-DATA	Setup time	-	-			ns	Note2
		Hold time	-				ns	
	Rise time, Fall time		-				ns	
DE	Horizontal	Cycle	th	12.3	20,676	30	μs	48.363KHz(typ.)
				1,050	1,344	1,800	CLK	Note3 Note4
		Display period	thd	1024			-	-
	Vertical (One frame)	Cycle	tv	13.1	16,666	20	ms	60.0Hz (typ.)
				770	806	1,334	H	
		Display period	tvd	768			H	
	CLK-DE	Setup time	-	-			ns	Note2
		Hold time	-				ns	
	Rise time, Fall time		-				ns	

Note1 : Definition of parameters is follows.

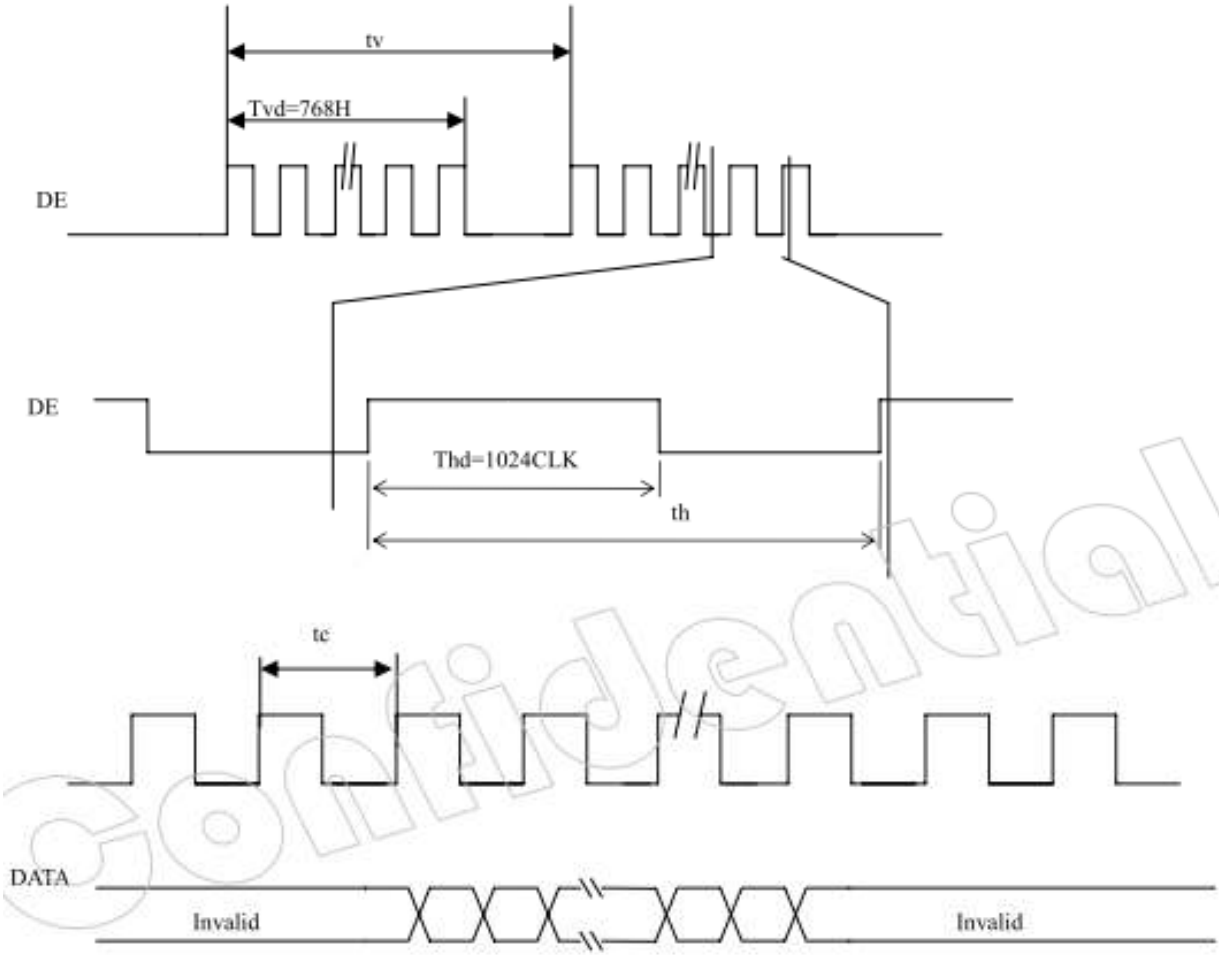
tc = 1CLK, Th = 1H

Note2 : See the data sheet of LVDS trans mitter.

Note3 : Both of "time" and "CLK number" of the "th" must keep the Minimum value of specifications.

Note4 : "th" must keep the fluctuation within ± 1CLK, because of avoidance of image sticking.

4.8.3 Input signal timing chart



4.9 OPTICS

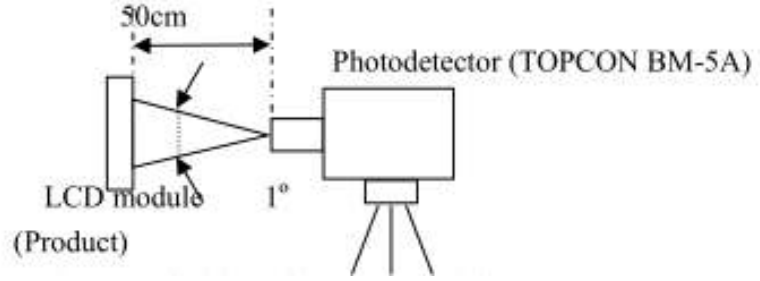
4.9.1 Optical characteristics

Parameter		Condition	Symbol	min.	typ.	max.	Unit
Luminance		White at center point R=0, L=0, U=0, D=0	L	500	600	-	cd/㎡
Contrast ratio		White/Black at center R=0, L=0, U=0, D=0	CR	400	600	-	-
Luminance uniformity		-	LU	-	1.2	1.3	-
Chromaticity	White	X coordinate	Wx	0.275	0.295	0.315	-
		Y coordinate	Wy	0.290	0.310	0.330	-
	Red	X coordinate	Rx	-	0.63	-	-
		Y coordinate	Ry	-	0.34	-	-
	Green	X coordinate	Gx	-	0.3	-	-
		Y coordinate	Gy	-	0.57	-	-
	Blue	X coordinate	Bx	-	0.14	-	-
		Y coordinate	By	-	0.1	-	-
Color gamut		R=0, L=0, U=0, D=0	C	50	60	-	%
Response time		White to Black	Ton	-	2	4	ms
		Black to White	Toff	-	6	8	ms
Viewing angle	Right	ΘU=0˚, ΘD=0˚, CR=10	ΘR	70	80	-	˚
	Left	ΘU=0˚, ΘD=0˚, CR=10	ΘL	70	80	-	˚
	Up	ΘR=0˚, ΘL=0˚, CR=10	ΘU	70	80	-	˚
	Down	ΘR=0˚, ΘL=0˚, CR=10	ΘD	70	80	-	˚

Note1 : Measurement conditions are follows.

Ta =25C, V_{BL}=12.0V, IBL=1.58A/L.E.D, Display mode : XGA, Horizontal cycle=48.363KHz, Vertical cycle=60.000Hz

Optical characteristics are measured at luminance saturation after 20minutes from working the product in the dark room. Also measurement method for luminance is as follows.



Note2 : See **" 4.10.2 Definition of contrast ratio."**

Note3 : See **" 4.10.3 Definition of luminance uniformity."**

Note4 : Product surface temperature : TopF=28.0 ℃

Note5 : See **" 4.10.4 Definition of response times."**

Note6 : See **" 4.10.5 Definition of viewing angles."**

4.9.2 Definition of contrast ratio

The contrast ratio is calcurated by using the following formula.

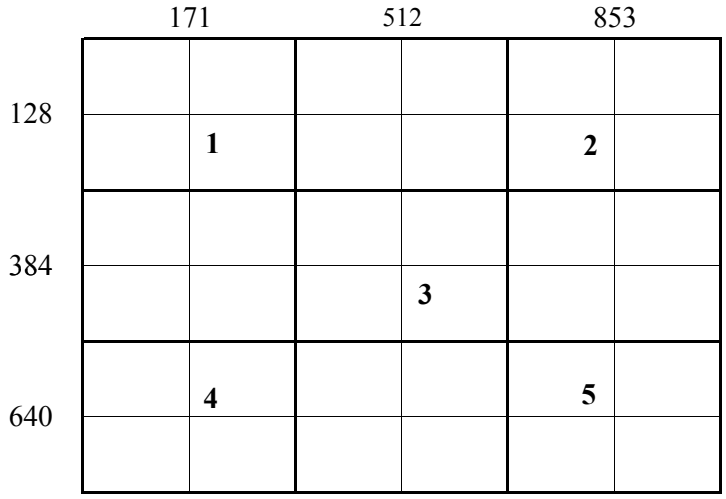
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance of white screen}}{\text{Luminance of black screen}}$$

4.9.3 Definition of luminance uniformity

The luminance uniformity is calculated by using the following formula.

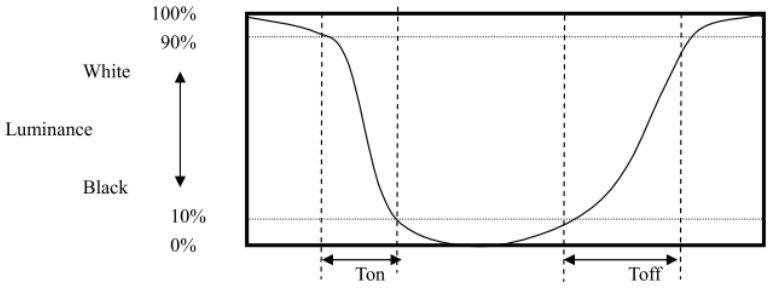
$$\text{Luminance uniformity (LU)} = \frac{\text{Manimum Luminance from 1 to 5}}{\text{Minimum Luminance from 1 to 5}}$$

The luminance is measured at near the 5 point shown below.

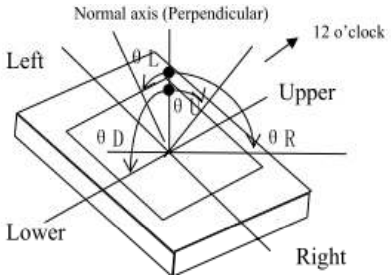


4.9.4 Definition of response times

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 it takesm the luminance change from 90% down to 10% Also Toff is the time it takes the luminance change from 10% up 90%. (See the following diagram.)



4.9.5 Definition of viewing angles

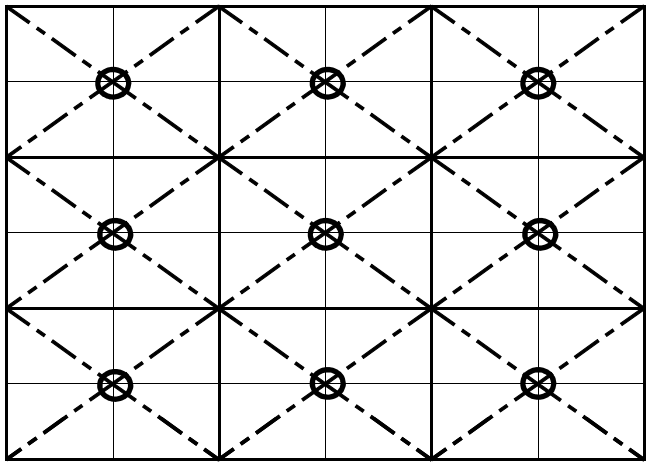


5. RELIABILITY TESTS (TO BE DEFINE)

Test item	Condition	Judgemene Note1
High temperature and humidity (Operation)	1. 60±2℃, 72hours 2. Display data is black	No display malfunctions
Heat cycle (Operation)	1. 0±3℃… 1 hour 55±3℃… 1 hour 2. 50cycles, 4hours/cycle 3. 50±2℃,RH=85, 245hours	
Thermal shock (Non Operation)	1. -25±3℃… 30minutes 60±3℃… 30minutes 2. 100cycles, 1hour/cycle 3. Temperature transition time is while 5minites	
Vibration (Non Operation)	1. 5-100Hz, sine wave, 11.76m/s² 2. 1minutes/cycle 3. X, Y, Z directions 4. 50 times each directions	No display malfunctions No physical damages
Mechanical shock (Non operation)	1. 294m/s², 11ms 2. ±X, ±Y, ±Z directions 3. 3 times each directions	

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 time from initial luminance to half - luminance.

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

Condition		Luminance lifetime(MTTF) Note1, Note2	Unit
Module	25℃ (Ambient temperature of the product) Continuous operation and IBL = 1.58A/L.E.D	40,000	h
	50℃ (Surface temperature at screen center) Continuous operation and IBL = 1.58A/L.E.D	35,000	h
L.E.D	25℃ (Ambient temperature of the product)	40,000	h

7. MARKINGS

The various markings are attached to this product. See "7.4 INDECATION LOCATIONS" for attachment positions.

7.1 PRODUCT LABEL

Note1

Note1

Product label

Jan. to Sep : Number of month
October : A
November : B
December : C

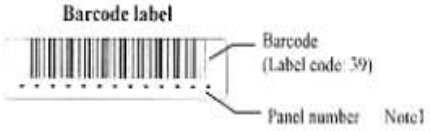
Note2

·Example : 1111A104201001

1111	A	1	04	9	01	001
Internal use	Revision 1 letter (Alphabet)	Internal use	Manufacturing year 2 figures of the A.D. end numbers (e.g: A.D2004 is 04.	Manufacturing month 1 letter	Manufacturing day	Production number Multi-letter (figure)

Note2 : **Do not attach anything such as label and so on, on the product label!** In case repair the product, SVA-NEC 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 SVA-NEC cannot decipher the contents of product label, such repair shall be entitled to charge. Also SVA-NEC may give a new lot number to reconditioned products.

7.2 BARCODE LABEL



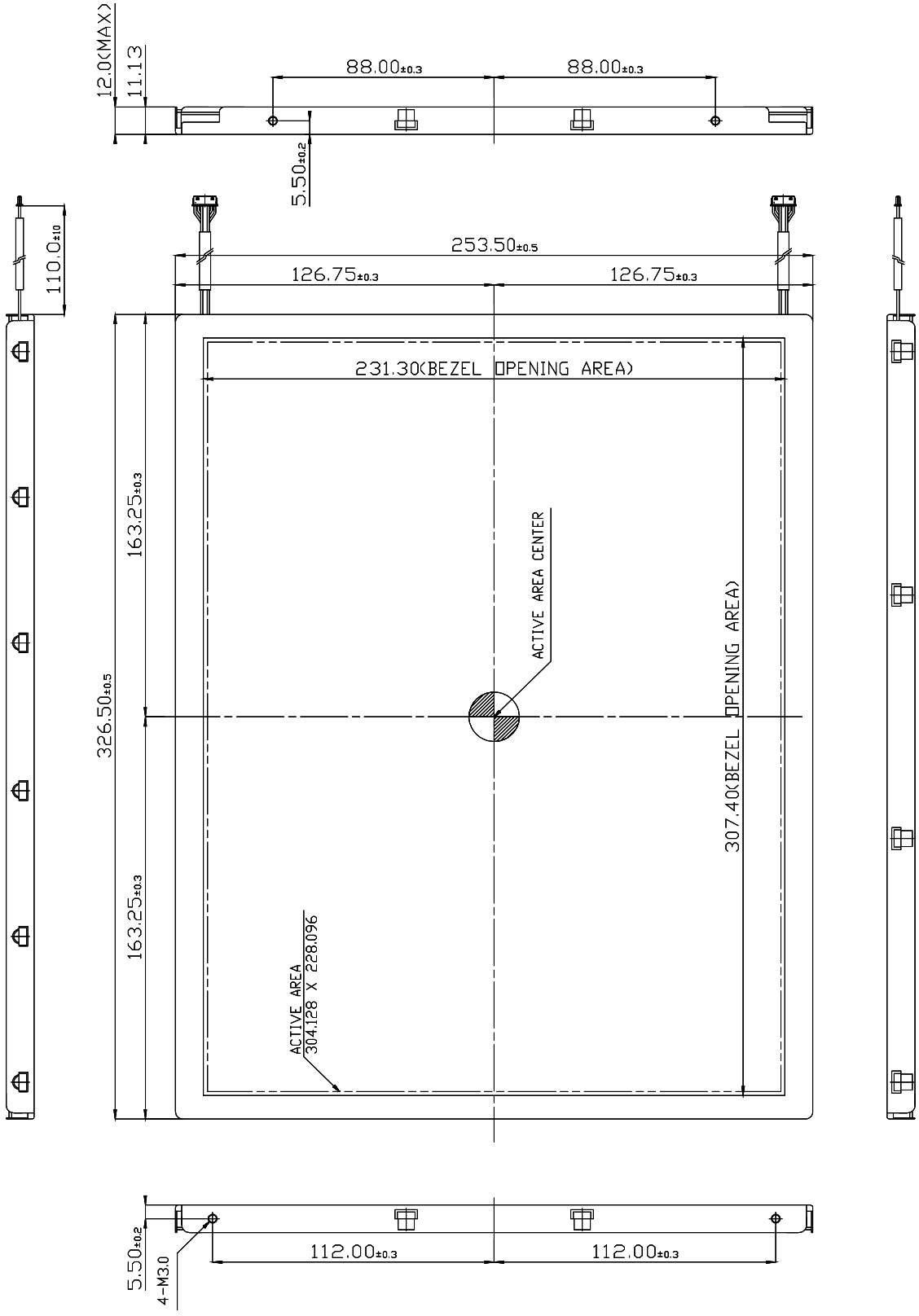
7.3 OTHER MARKINGS

High voltage caution marking

Disposal method marking for lamp

8. OUTDRAWING

8.1 Front side view



8.2 Back side view