HITACHI

Hitachi Displays,Ltd.

Date; Mar.26,2004

TECHNICAL DATA

TX38D88VC1GAB

CONTENTS

RECORD OF REVISION

Date	Old Sheet No. New Sheet No.	Summary

APPLICATIONS

This specification is applied to the following TFT Liquid Crystal Display Module with Back-light unit.

Note : Inverter device for Back-light is not built in and so it needs to be prepared on yourside.

・Type name	: TX38D88VC1GAB
・Display Area	: H304.1×V228.1 [mm]
・Display Pixels (Display Dots)	: H1024×V768 pixels (H(1024×3)×V768 [dots])
・Voltage of V_{DD}	: 3.3V
・Pixel Pitch	: H0.297×V0.297
・Color Pixel Arrangement	: R･G･B Vertical Stripe
・Display Mode	: Transmissive & Normally White Mode
・Color Number	: 262k Colors
・Direction with Wider Viewing Angle	: Lower side of 6 o'clock (Azomuth ϕ=270°)
・Dimensions Outlines	: 315.8(W)×241.5(H)×9.7MAX(T) [mm]
・Weight	: 800 TYP. [g]
・Interface	: 1ch-LVDS
・Surface Polarizing Film	: Glare Polarizing Film with Antireflection Coating
・Back-light	: Two Cold Cathode Fluorescent Lamp (Lower side) Back-light inverter is not contained in Module.

1. ABSOLUTE MAXIMUM RATINGS

1.1 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

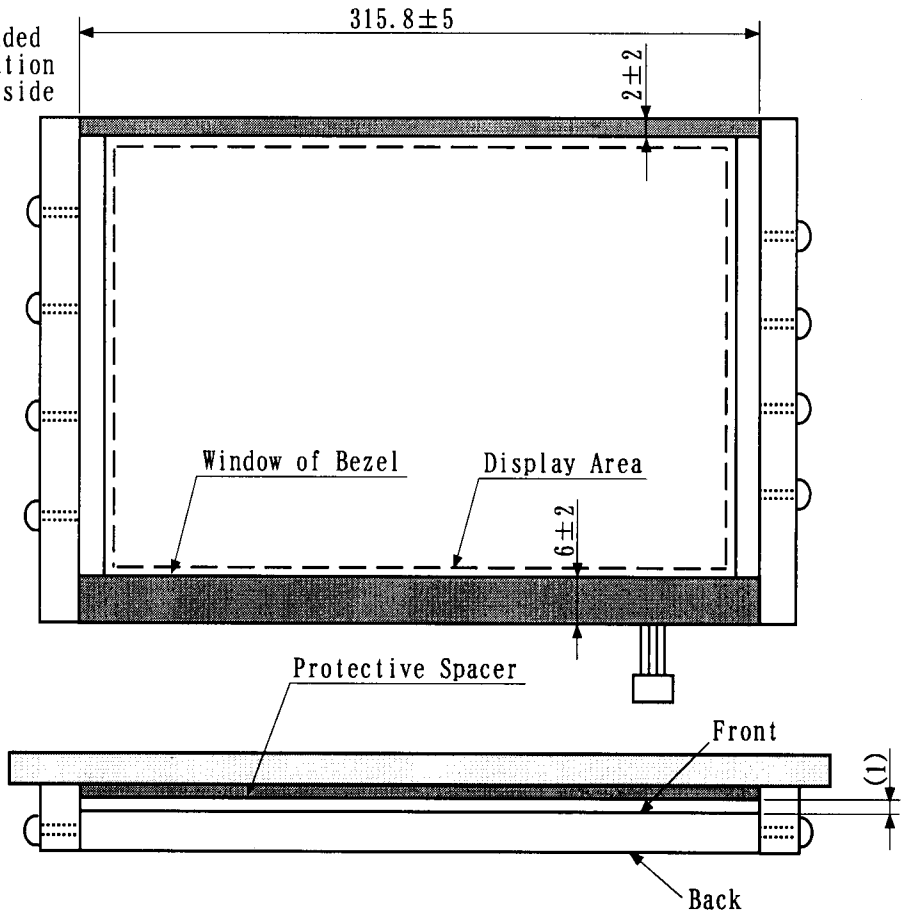
ITEM	OPERATING		STORAGE		UNIT	NOTE
	MIN.	MAX.	MIN.	MAX.		
Ambient Temperature	0	50	−20	60	℃	1)
Humidity	2)		2)		%RH	1)
Vibration	—	14.7(1.5G)	—	29.4(3G)	m/s^2	3),5)
Shock	—	29.4(3G)	—	980(100G)	m/s^2	4),5)
Corrosive Gas	NOT ACCEPTABLE		NOT ACCEPTABLE		—	
Illuminance at LCD surface	—	50,000	—	50,000	lx	

Note 1) Environmental temperature and humidity of this unit, not of system installed with this unit.
At low temperature the brightness of CFL drop and the life time of CFL become to be short.
2) Ambient temp. Ta≦40℃ : 85%RH MAX. without condensation.
Ta＞40℃ : Absolute humidity must be lower than the humidity of 85%RH at 40℃. without condensation.
3) 10～500Hz, (Except resonance frequency), 20minutes/cycle, 1cycle, X·Y·Z
4) 3ms, X·Y·Z·Z'
5) With mounting protective spacer (ref. page 4-2/3)

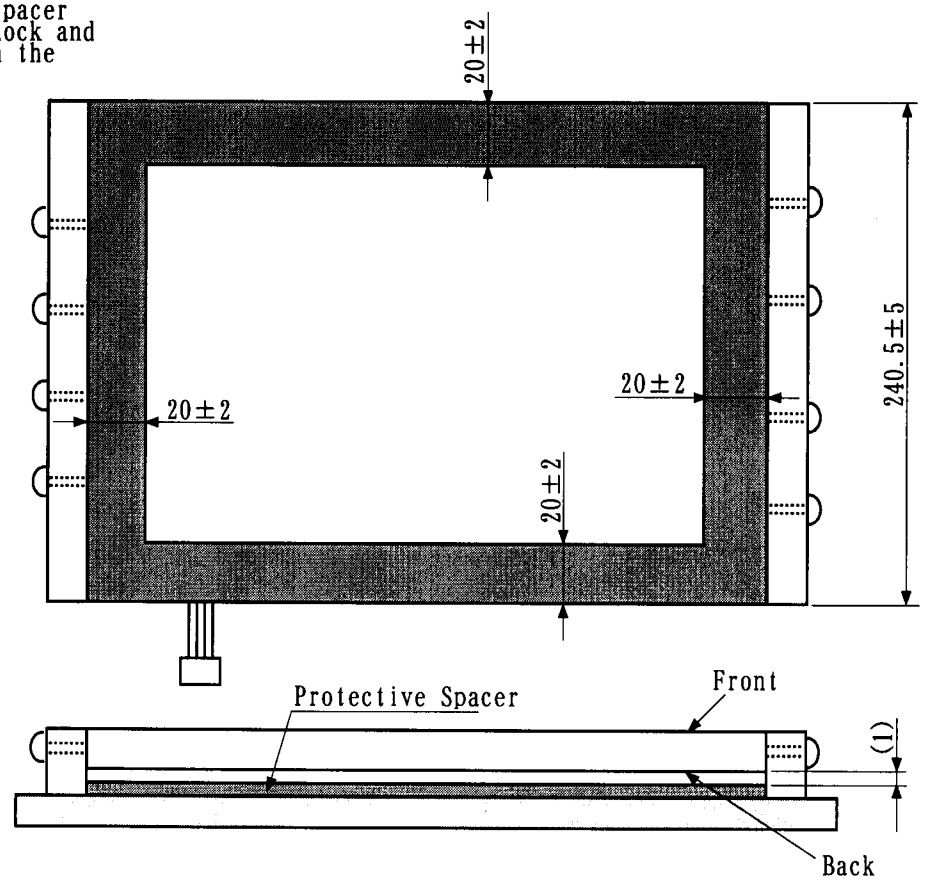
Adding protective spacer at shock & vibration test

Shaded area is to be supported with additional spacer.

(1) This protective spacer is to be added at shock and vibration test on the front side



(2) This protective spacer is to be added shock and vibration test on the other side



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1.2 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

(1) TFT LIQUID CRYSTAL DISPLAY MODULE

VSS=0V

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	VDD	0	4.0	V	
Electrostatic Durability	VESD0	±250		V	1)
	VESD1	± 15		kV	2), 3)

Note 1) Electric discharge constant 200pF-0Ω, 25℃-70%RH.
I/F Connector pins are subjected.
2) Electric discharge constant 200pF-250Ω, 25℃-70%RH.
3) The Surface of Metal bezel and LCD are subjected.

(2) BACK-LIGHT UNIT

GND=0V

ITEM	SYMBOL	MIN.	MAX.	UNIT
Lamp Current	I_L	0	7	mArms
Lamp Voltage	V_L	0	2000	Vrms

1.3 Connection between PC Ground and Metal frame.
Metal frame of the module shold be grounded with PC's ground in case that protection film is being peeled off while operating the module.
Unless you couned between metal frame and PC's Ground.
PC's system happen to shut down due to the influence of electrostatic discharge coused by pealing off the protection film.

2. OPTICAL CHARACTERISTICS

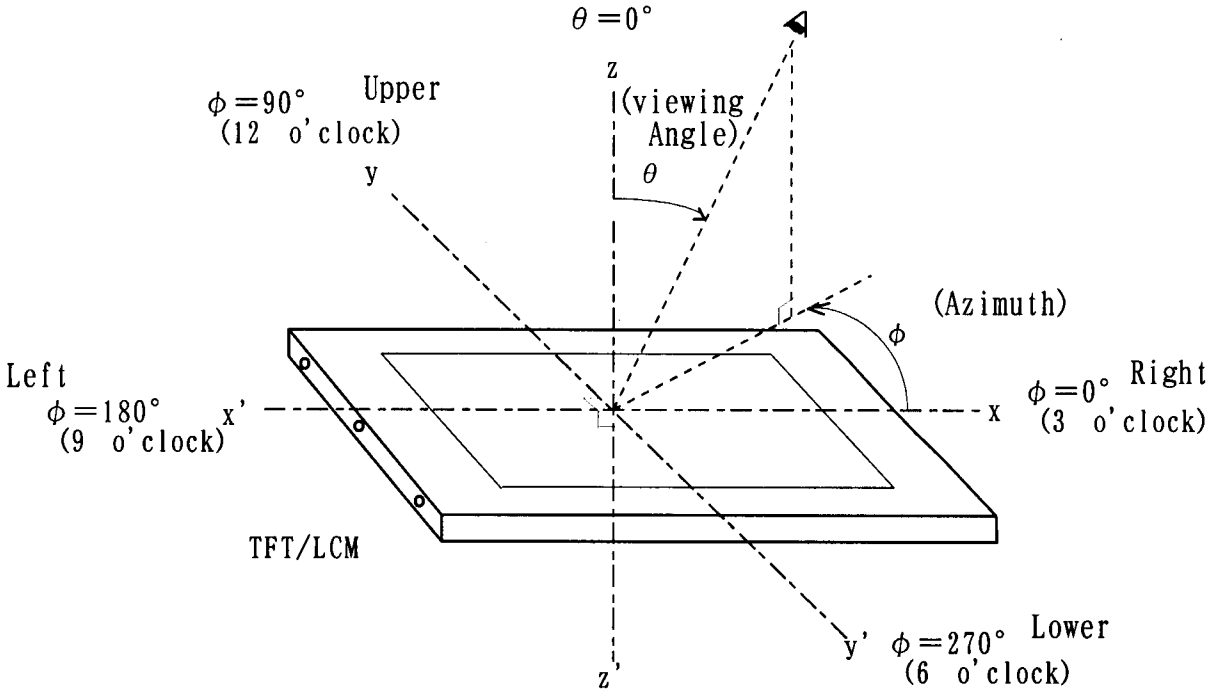
The following items are measured on the conditions that this unit operation (TFT panel and Back-light) and measuring systems are stable. (more than 30minites' operation)
The ambient light excluding The Back-light unit is nothing.

- Measuring equipment : TOPCON BM-7, Prichard 1980A, or equivalent
- Measuring point : Active area center

Temperature of LCD=25℃, V_{DD}=3.3V, fv=60Hz, f_L=50kHz, I_L=6mA

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast Ratio		CR	θ=0° Note 1)	300	600	—	—	2)
Response Time	RISE	tr		—	30	—	ms	3)
	FALL	tf		—	20	—		
Brightness(White)		Bwh		350	430	—	cd/m²	
Color of CIE	Red	x		0.58	0.61	0.64	—	
		y		0.30	0.33	0.36		
	Green	x		0.29	0.32	0.35		
		y		0.52	0.55	0.58		
	Blue	x		0.12	0.15	0.18		
		y		0.09	0.12	0.15		
	White	x		0.29	0.32	0.35		
		y		0.30	0.33	0.36		
Viewing Angle (CR≧10)	x-x	θx	ϕ=0°	60	80	—	deg	1)
		θx'	ϕ=180°	60	80	—		
	y-y	θy	ϕ=90°	30	50	—		
		θy'	ϕ=270°	40	50	—		

Note 1) Definition of Viewing Angle

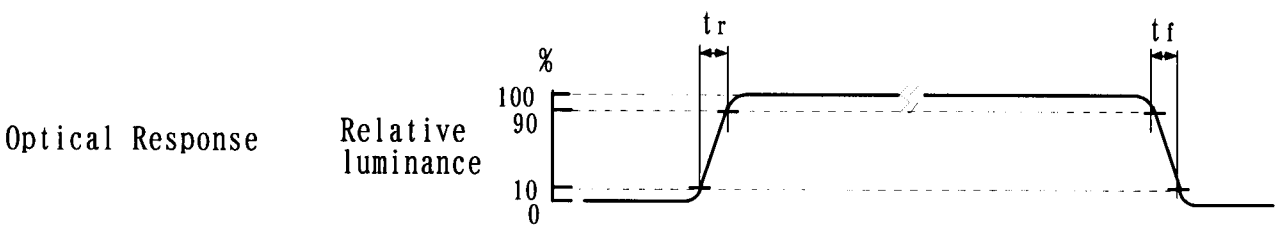


Note 2) Definition of Contrast Ratio (CR)

$$CR = \frac{\text{Brightness when displaying White raster}}{\text{Brightness when displaying Black raster}}$$

These Brightness is measured on the center of screen.
* Measurement in the darkroom.

Note 3) Definition of Response Time



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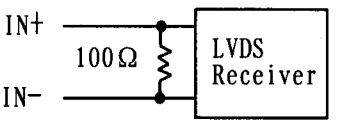
3. ELECTRICAL CHARACTERISTICS

(1) TFT LIQUID CRYSTAL DISPLAY MODULE

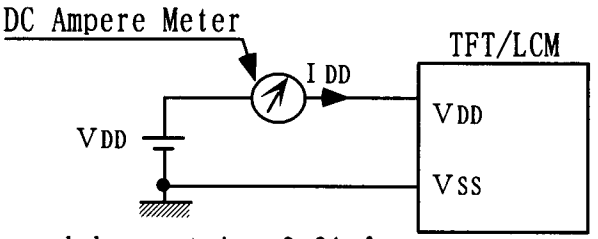
Ta=25℃, Vss=0V

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Power Supply Voltage		VDD	3.0	3.3	3.6	V	
Differential Input Voltage for LVDS Receiver Threshold	Hi	VIH	—	—	+100	mV	1)
	Lo	VIL	-100	—	—		
Power Supply Current		IDD	—	350	500	mA	2), 3)
Vsync Frequency		fv	—	60	65	Hz	4), 5)
Hsync Frequency		fH	—	48.5	52.4	kHz	4)
DCLK Frequency		fCLK	—	65	68	MHz	4)

Note 1) VCM=+1.25V ~ +1.375V
VCM is common mode voltage of LVDS transmitter/receiver.
The input terminal of LVDS transmitter is terminated with 100Ω.



2) fv=60Hz, fCLK=65MHz, VDD=3.3V, DC Current.
Typical value is measured when displaying vertical 64 gray scale.
Maximum is measured when displaying Vertical-stripe (Black-Gray 7).



3) As this module contains 0.8A fuse, prepare current source that is enough for cutting current fuse when a truble happens. (larger than 2A.)
4) For LVDS Transmitter Input
5) Vsync Frequency (fH) (Recommendation) : 60Hz
Flicker level will be worse by shift of V-Sync Frequency

(2) BACK-LIGHT UNIT

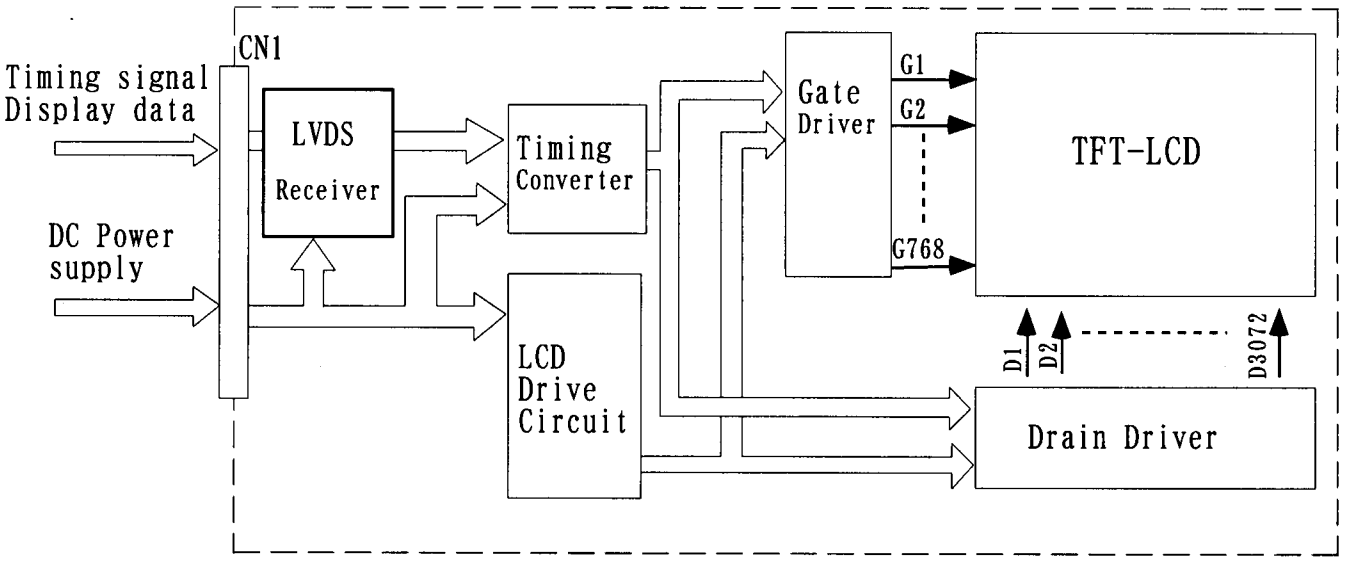
Ta=25℃, GND=0V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Lamp Current	IL	2.8	6.0	7.0	mArms	1), 2)
		—	—	10	mA0-peak	
Lamp Voltage	VL	—	710	—	Vrms	7)
Frequency	fL	40	—	70	kHz	3)
Starting Lamp Voltage	Vs	1085	—		Vrms	4)
		1310	—			4), 5)
Life Time of CFL		10000	—	—	h	4)

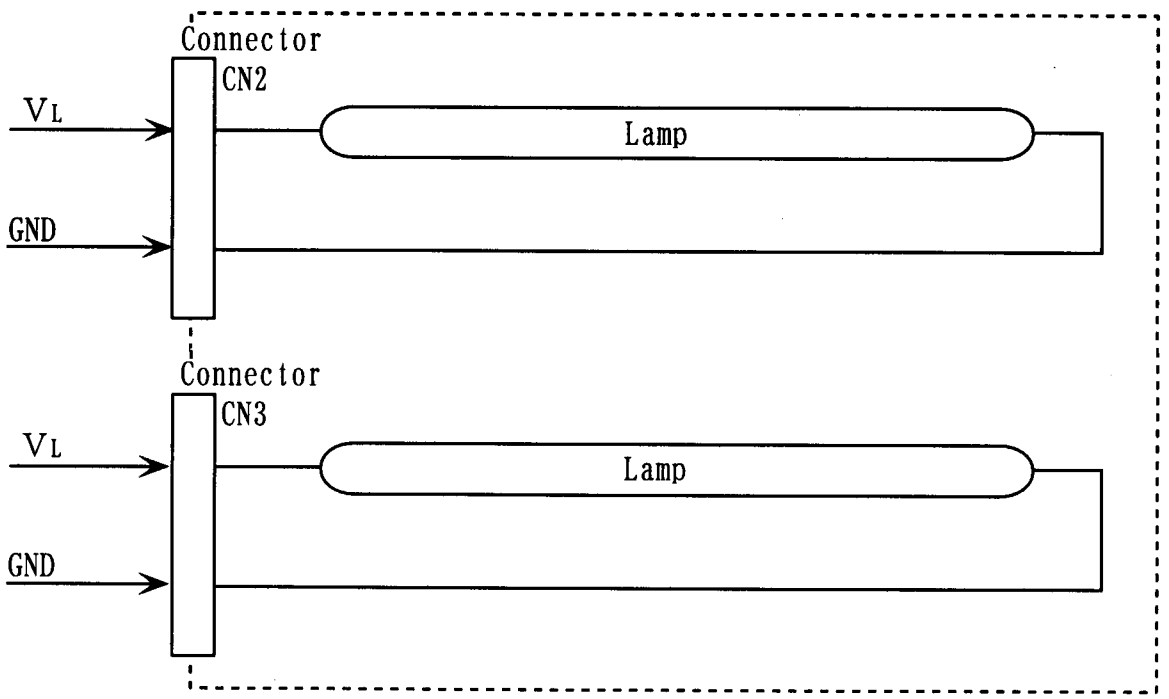
Note 1) IL is Current of GND side.
2) Higher IL cause the short life time of CFL.
3) Lamp frequency may produce interference with Hsync frequency, causing beat or flicker on the display.
4) Starting Lamp Voltage is specified to the output of inverter with ballast capacitance > 22pF.
5) Ta=0℃
6) CFL Life Time is the peried that the brightness is half as much as the initial.
7) IL=6.0mA

4. BLOCK DIAGRAM

(1) TFT LIQUID CRYSTAL DISPLAY MODULE



(2) BACK-LIGHT UNIT



5. INTERFACE PIN CONNECTION

(1) TFT LIQUID CRYSTAL DISPLAY MODULE

CN1 《JAE FI-XB30SL-HF10》

Pin No	SYMBOL	FUNCTION
–	VSS	Ground
1		
2	VDD	Power Suply 3.3V (typical)
3		
4	VSS	Ground
5	VSS	Ground
6	VSS	Ground
7	VSS	Ground
8	ROin0–	LVDS Receiver Signal(–)
9	ROin0+	LVDS Receiver Signal(+)
10	VSS	Ground
11	ROin1–	LVDS Receiver Signal(–)
12	ROin1+	LVDS Receiver Signal(+)
13	VSS	Ground
14	ROin2–	LVDS Receiver Signal(–)
15	ROin2+	LVDS Receiver Signal(+)
16	VSS	Ground
17	CLKO–	LVDS Clock Signal(–)
18	CLKO+	LVDS Clock Signal(+)
19	VSS	Ground
20	REin0–	NC
21	REin0+	NC
22	VSS	Ground
23	REin1–	NC
24	REin1+	NC
25	VSS	Ground
26	REin2–	NC
27	REin2+	NC
28	VSS	Ground
29	CLKE–	NC
30	CLKE+	NC
–	VSS	Ground

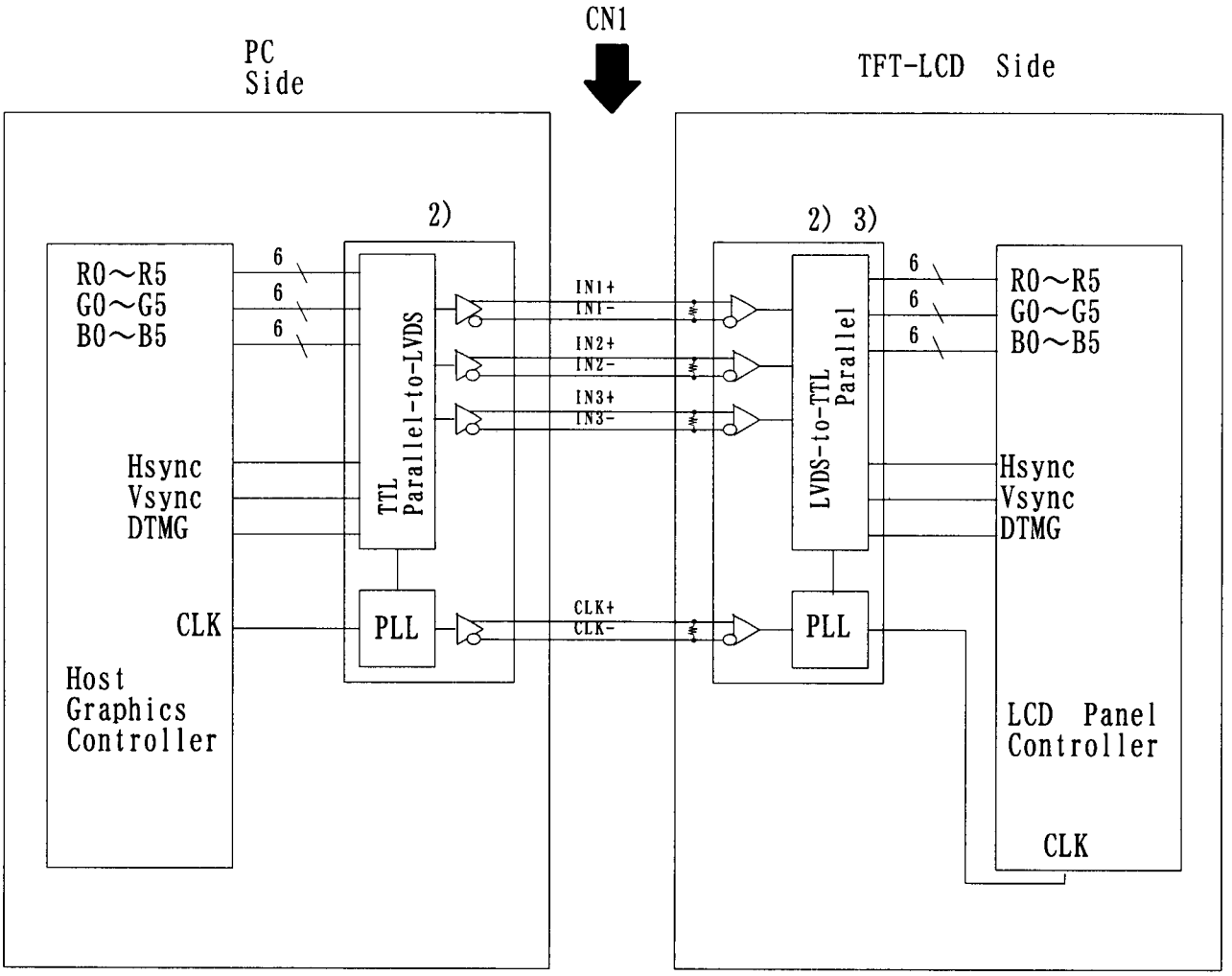
Note 1) All VSS pins should be connected to GND(0V).
Metal bezel is connected internaly to VSS.
2) All VDD pins should be connected to +3.3V.
3) Keep Open. Hitachi test use only.

(2) BACK-LIGHT UNIT

CN2, CN3 《JST BHSR-02VS-1(N)》

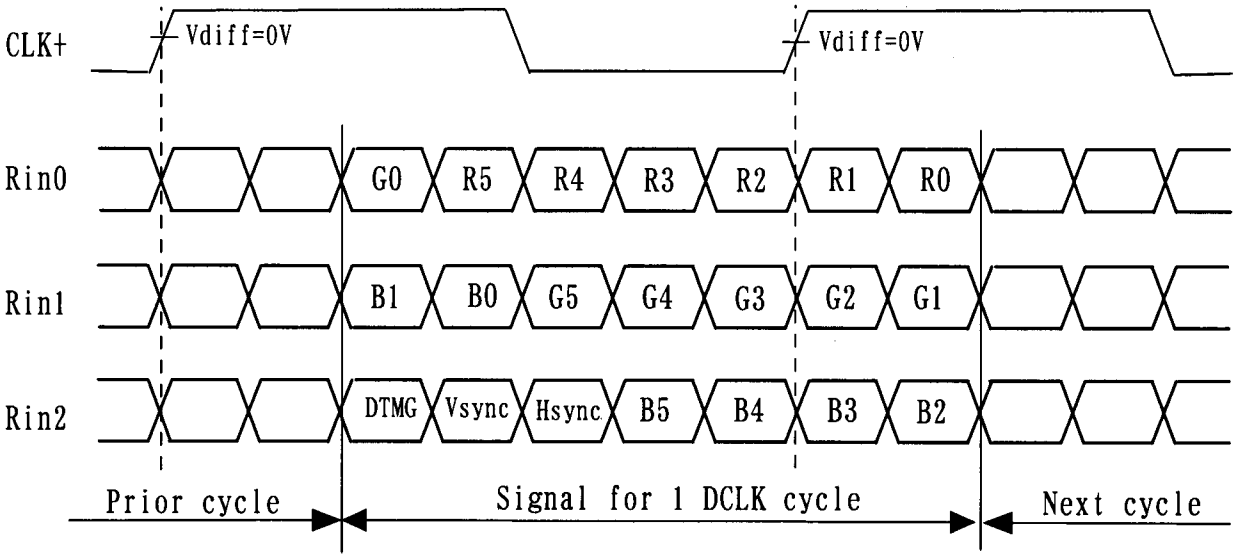
Pin No	SYMBOL	DESCRIPTION	Refelence
1	VL	Power Supply	
2	GND	GND (0V)	

LVDS INTERFACE



NOTE: 1) LVDS cable impedance should be 100 ohms per signal line when each 2-lines(+,-) is used in differential mode.
2) LVDS transmitter is using LVDS input signal (page 8-3/3).
3) LVDS receiver is THine THC63LVDM63A or compatible.

LVDS Input Signal



CLK=(CLK+)-(CLK-)
RinX=(RinX+)-(RinX-) (X=0, 1, 2)

Pin connection in case of using
Thine THC63LVDM63A

	INPUT SIGNAL	Transmitter	Interface connector(CN1) PC	Interface connector(CN1) TFT module
LVDS	R0 R1 R2 R3 R4 R5 G0 G1 G2 G3 G4 G5 B0 B1 B2 B3 B4 B5 HSYNC VSYNC DTMG	IN0(44) IN1(45) IN2(47) IN3(48) IN4(1) IN5(3) IN6(4) IN7(6) IN8(7) IN9(9) IN10(10) IN11(12) IN12(13) IN13(15) IN14(16) IN15(18) IN16(19) IN17(20) IN18(22) IN19(23) IN20(25)	OUT0+ OUT0- OUT1+ OUT1- OUT2+ OUT2-	IN0+ IN0- IN1+ IN1- IN2+ IN2-
	DCLK	CLK IN(26)	CLK OUT+ CLK OUT-	CLK IN+ CLK IN-

1) ( ) indicate pin NO (IC).

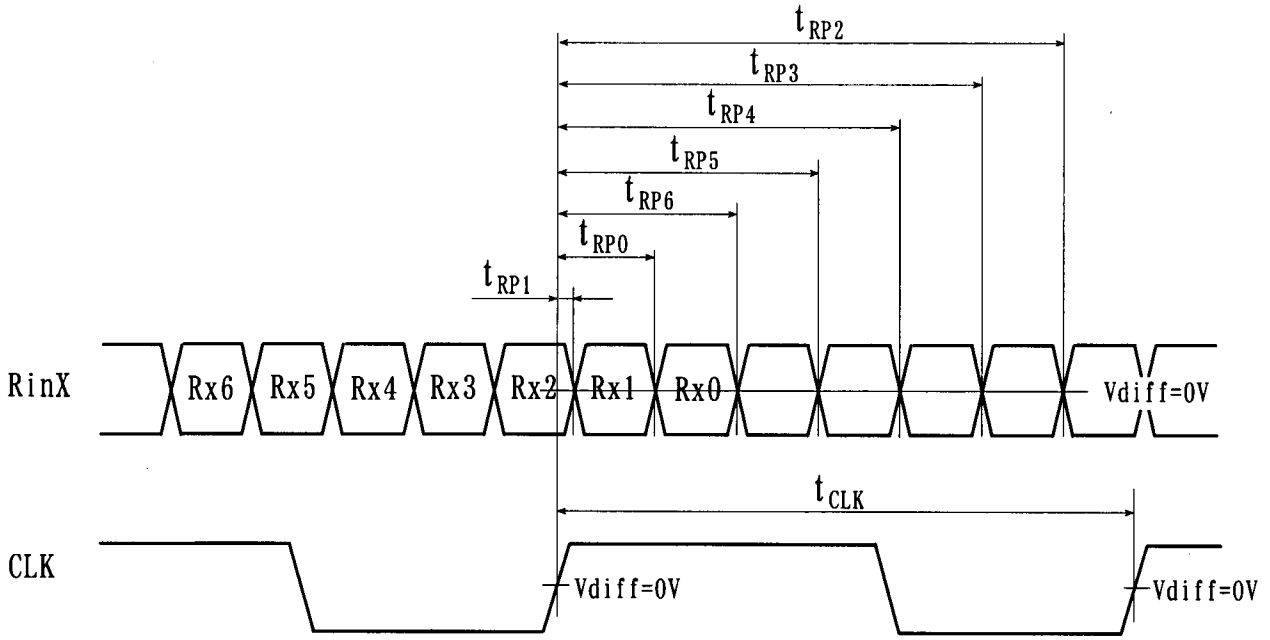
RELATIONSHIP BETWEEN DISPLAYED COLOR AND INPUT DATA

COLOR \ INPUT DATA		R DATA						G DATA						B DATA					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
BASIC COLOR	BLACK	0	0	0	0	0	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
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	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
	YELLO	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
RED	BLACK	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
GREEN	BLACK	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
BLUE	BLACK	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) Definition of gray scale :
Color(n) --- number in parenthesis indicates gray scale level.
Larger number corresponds to brighter level.
2) Data Signal : 1:High, 0:Low

6. Interface timing

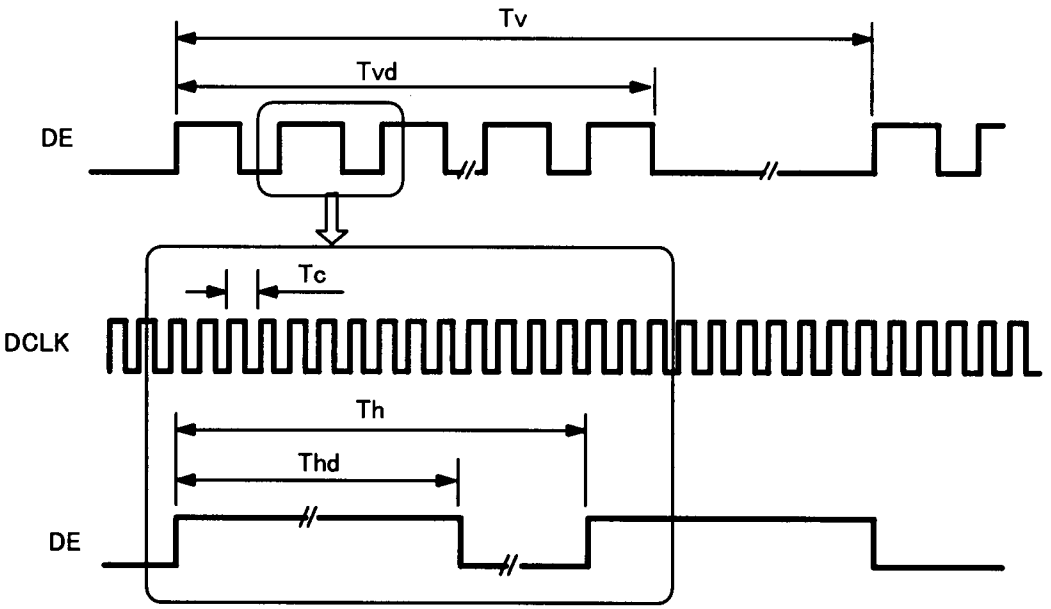
(1) LVDS receiver timing
(Interface of TFT module)



RinX=(RinX+)-(RinX-) (X=0, 1, 2)
CLK=(CLK+)-(CLK-)

ITEM		SIMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
DCLK	FREQUENCY	$1/t_{CLK}$	60	65	68	MHz	
RinX (X=0, 1, 2)	0 data position	t_{RP0}	$\frac{1}{7}t_{CLK}-0.49$	$\frac{1}{7}t_{CLK}$	$\frac{1}{7}t_{CLK}+0.49$	ns	
	1st data position	t_{RP1}	-0.49	0	+0.49		
	2nd data position	t_{RP2}	$\frac{6}{7}t_{CLK}-0.49$	$\frac{6}{7}t_{CLK}$	$\frac{6}{7}t_{CLK}+0.49$		
	3rd data position	t_{RP3}	$\frac{5}{7}t_{CLK}-0.49$	$\frac{5}{7}t_{CLK}$	$\frac{5}{7}t_{CLK}+0.49$		
	4th data position	t_{RP4}	$\frac{4}{7}t_{CLK}-0.49$	$\frac{4}{7}t_{CLK}$	$\frac{4}{7}t_{CLK}+0.49$		
	5th data position	t_{RP5}	$\frac{3}{7}t_{CLK}-0.49$	$\frac{3}{7}t_{CLK}$	$\frac{3}{7}t_{CLK}+0.49$		
	6th data position	t_{RP6}	$\frac{2}{7}t_{CLK}-0.49$	$\frac{2}{7}t_{CLK}$	$\frac{2}{7}t_{CLK}+0.49$		

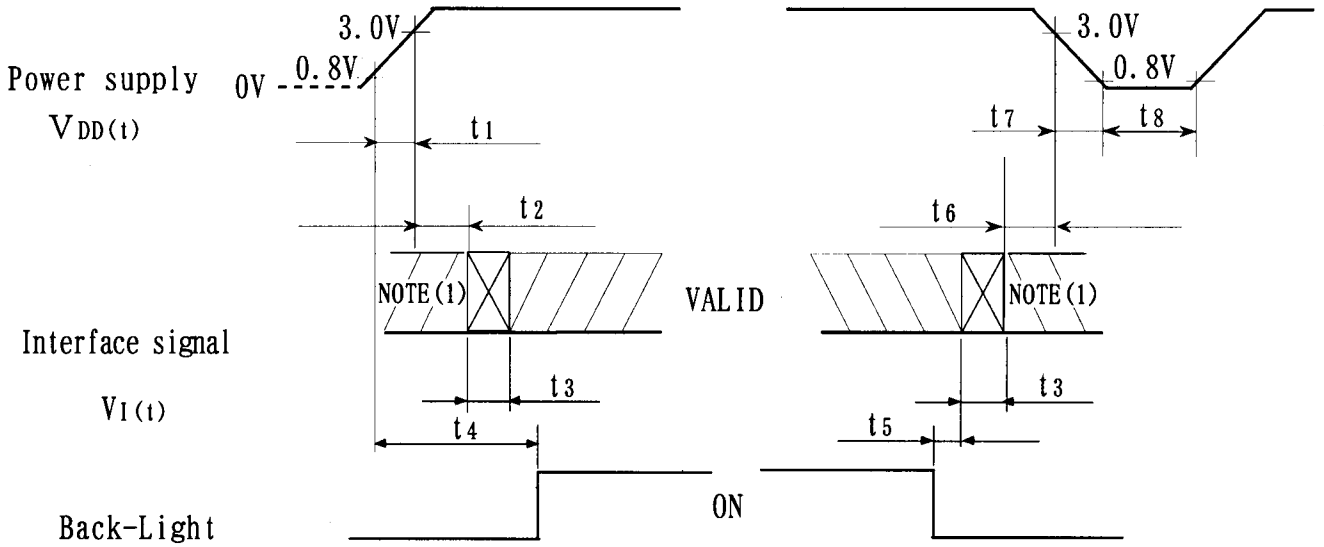
(2) timing converter timing
(Input timing for transmitter)



The timings except mentiond above are referd to the specifications of your transmitter.

Symbol	Item	Min.	Typ.	Max.	Unit
1/Tc	Clock Frequency	35	65	68	MHz
Tv	Frame Period	771	806	856	Th
Tvd	Frame Display Term	768	768	768	Th
Th	Horizontal Period	1160	1344	1644	Tc
Thd	Horizontal Display Term	1024	1024	1024	Tc

(3) TIMING BETWEEN INTERFACE SIGNAL AND POWER SUPPLY



POWER ON

$t_1 \leqq 15ms$

$0 < t_2 \leqq 45ms$

$0 \leqq t_3 \leqq 5ms$

$0.1s \leqq t_4$ NOTE(3)

POWER OFF

$5ms \leqq t_5$

$0 \leqq t_6 \leqq 45ms$

$0 \leqq t_7 \leqq 20ms$

$0.4s \leqq t_8$

NOTE(1) t2:Hi-Z(Hi-impedance)state

(2) t3:Signal transition time from Hi-Z state to Valid state specified by 3(1), 6(1)and(2).

(3) Recommended value

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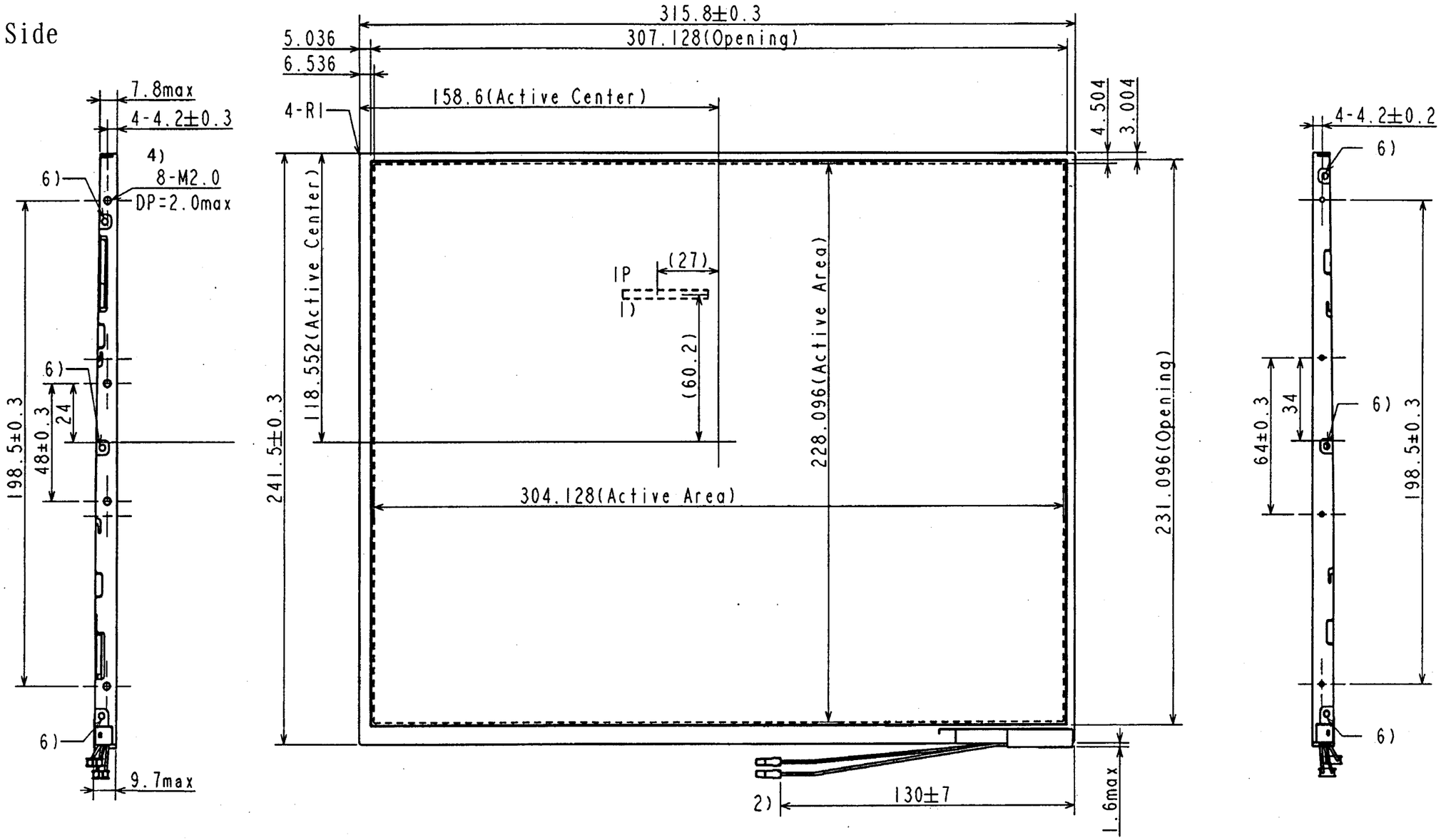
7. DIMENSIONAL OUTLINE

Front Side



1) Interface connector
   JAE : FI-XB30SL-HF10
2) CFL cable connector
   JST : BHSR-02VS-1
   Panel side connector pin : Hot cable (Pink)
   Back side connector pin : Hot cable (Blue)
3) The unspecified tolerance : ±0.5mm
4) Hole in mounting panel : 8 holes
5) Maximum torgue for the screw in mounting panel : 0.196N·m (2.0kgf·cm)
6) Attachment screw : Total 6 pcs

UNIT : mm
SCALE : NTS

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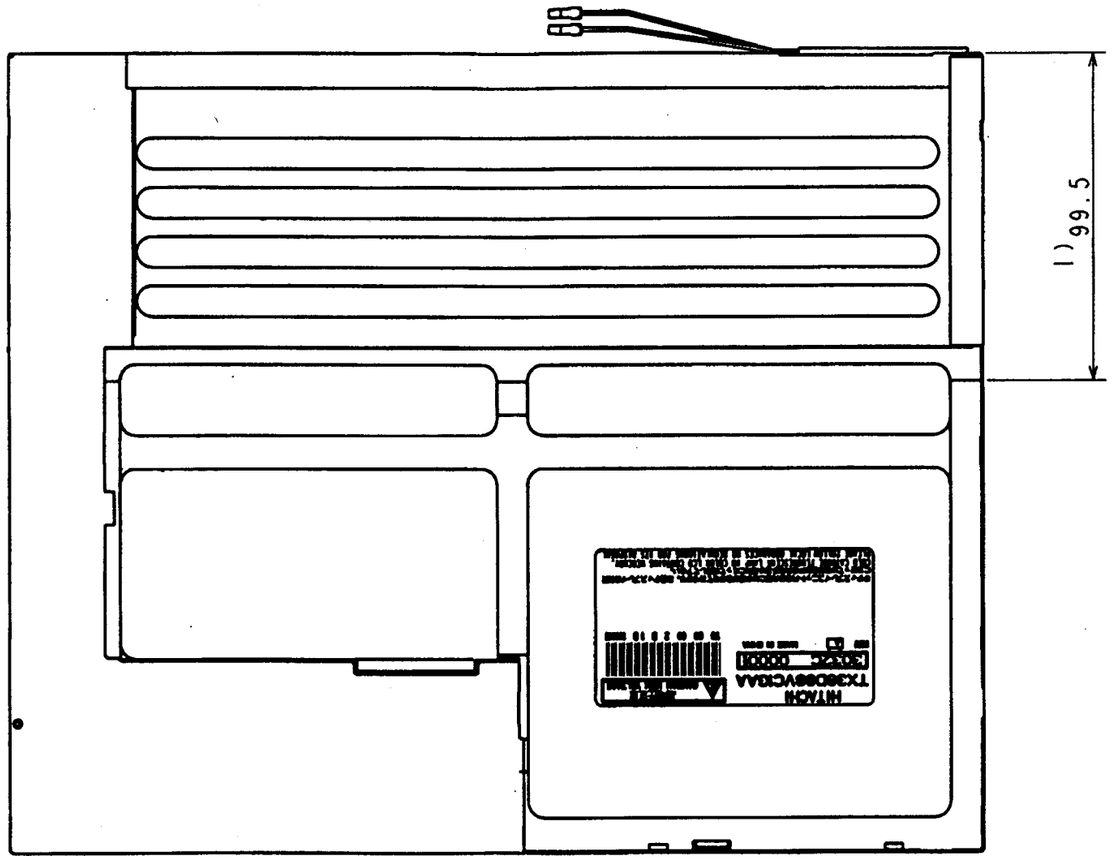
Back Side



1) Starting point of the slant on the module back side.

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8. PRECAUTIONS

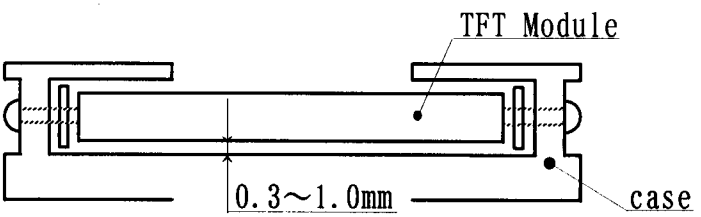
Please pay attention to the followings when you use this TFT/LCD module with Back-light unit.

8.1 MOUNTING PRECAUTION

(1) You must mount Module using mounting holes arranged in 8 corners tightly.

(2) You should consider the mounting structure so that uneven force (ex. twisted stress) is not applied to Module.
And the case which Module is mounted should have sufficient strength so that external force is not transmitted directly to Module.

(3) To improve the strength of module against the mechanical shock the space between module and the case should be 0.3～1.0mm.



(4) Acetic acid type and chloline type materials for the cover case are not desiable because the former generate corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.

(5) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub by dustclothes with chemical treatment.
Do not touch the surface of polarizer with bare hand or greasy close. (Some cosmetics are detrimental to the polarizer.)

(6) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials chamois soaked petrolium benzin.
Don't use acceton, toluen, hexane and ethanol because they caus chemical damage to the polarizer.
Recommendation chemical ; Isopropyl Alcohol

(7) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

(8) Do not open the case because inside circuits have not sufficient strength.

(9) Use fingerstalls of soft gloves in order to keep clean display quality, when you handle the device for incoming inspection and assembly.

(10) Do not pull or do not fold the CFL cable.

(11) You must mount Module on the plain case.

(12) Do not connect I/F Connector with excessive forces.

8.2 OPERATING PRECAUTION

(1) Response time depends on the temperature. (In lower temperature, it becomes longer).
And also Transmittance and Color depend on the temperature.

(2) Brightness depends on the temperature. (In lower temperature, it becomes lower).
And in lower temperature, response time (required time that brightness is stable after turn on) becomes longer.

(3) Be careful for condensation at sudden temperature change.
Condensation make damage to polarizer or electrical contact part.
And after fading condensation, smear or spot will occur.

(4) When fixed patterns are displayed at long times, afterimage is likely to occur.

(5) The Module have high frequency circuit. If you need to shield the electromagnetic noise, please do in yours.

(6) When Back-light unit is operating, it sounds.
If you need to shield the noise, please do in yours.

(7) Please connect the Back-light connector to the inverter circuit directly.
The long cable between CFL and the inverter may cause the brightness drop of CFL and may cause the rise of starting lamp Voltage(Vs).

(8) Do not connect or remove the module from main system with power applied.

8.3 ELECTROSTATIC DISCHARGE CONTROL

(1) Since Module is composed with electronic circuit, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through list band etc.. Anc don't touch I/F pin directly.

(2) Protection film for a polarizer on a module should be slowly peeled off so that the electrostatic change can be minimized.

8.4 PRECAUTION FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

8.5 STORAGE

When storing Module as spares for long time, the following precautions are necessary.

(1) Store them in a dark place ; do not expose then to sunlight or fluorescent light.
Keep the temperature between 5℃ and 35℃ at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

8.6 Wiping for Polarizer's surface

Polarizer with low reflection layer is lowered of reflection on LCD surface by AR coat on anti glare layer.
However charging for surface friction will be added more than normal coat by chemical composition on AR layer.
As a result, it is characteristic that are easier to absorption.
And hardness on AR layer is soft more than normal Polarizer.
Please be careful about handling.

8.7 SAFETY

(1) If Module is broken, be careful to handle not to injure. (TFT/LCD and Lamp are made of glass.)
Please wash hands sufficiently when you touch the liquid crystal coming out from broken LCDs.

(2) As Back-light unit has high voltage circuit internal, do not open the case and do not insert foreign materials in the case.

(3) The CFL inverter should be designed to include the function of output shutdown in case the output overcurrent happer due to any backlight trouble. The shutdown function should be assured to work in abnormal condition at t he actual system.

8.8 Environmental protection

(1) The TFT module contains cold cathode fluorescent lamps. Please follow local ordinance or regulations for its disposal.

(2) Flexible circuits board and printed circuits board used in a module contain of lead. Please follow local ordinance or regulations for its disposal.