

No.	LD – 18263B
DATE	May 12, 2006

TECHNICAL LITERATURE

FOR

TFT - LCD module

These parts have corresponded with the RoHS directive.

MODEL No. LQ150X1LG51

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Engineering department
Mobile LCD design center
MOBILE LIQUID CRYSTAL DISPLY GROUP
SHARP CORPORATION

RECORDS OF REVISION

LQ150X1LG51

SPEC No.	DATE	REVISED No.	SUMMARY		NOTE
			PAGE		
LD-18262	Feb. 21, 2006		-	-	1st Issue
LD-18262A	Mar. 8, 2006	Δ 1	7,	pin No27 ,28	2nd Issue
			9	Changed: (NA) (High on Low)	
				Added terms: pin 31 CLK	
			8	Corrected wrong terms: <LVDS_SET=H> <LVDS_SET=L or open>	
				Corrected wrong term : BHSR-03VS-1 BHR-03VS-1	
			10	Added: outdrawing of backside	
				Absolute maximum ratings deleted terms: Lamp Input voltage	
			11	6-1. TFT-LCD panel driving deleted terms: Input current(High),(Low) added terms: Input voltage width for LVDS receiver added terms: Input voltage for LVDS set 【Note2】 Changed value:t2,t3,t4 Changed and added notices	
			12	6-2. Backlight • Lamp current range added remarks : “at L=250cd/m ² (typ.) ” • Lamp power consumption deleted • Kick-off voltage added remarks :Note4 【Note2】 added terms: recommend condition	
			13	Note5 Corrected wrong value: I _L =5.0 I _L = 7.5 Changed definition of Lamp life time: deleted	
			15	8-1 8bit input Corrected wrong term : X 1 Deleted wrong term: X: Don't care	
			17	Deleted terms: CR 5 deleted optical measurement instrument: EZ-CONTRAST	

Application

This technical literature applies to the color 15.0 XGA TFT-LCD module LQ150X1LG51. Δ2

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2. Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, control circuit, power supply circuit and a back light unit. Graphics and texts can be displayed on a 1024 × RGB × 768 dots panel with about 16 million colors by using LVDS (Low Voltage Differential Signaling) and supplying +3.3V DC supply voltages for TFT-LCD panel driving and supply voltage for backlight.

3. Mechanical Specifications

Parameter	Specifications	Unit
Display size	38 (Diagonal)	cm
	15.0 (Diagonal)	Inch
Active area	304.1 (H) × 228.1 (V)	mm
Pixel format	1024 (H) × 768 (V)	Pixel
	(1 pixel = R+G+B dots)	
Pixel pitch	0.297 (H) × 0.297 (V)	mm
Pixel configuration	R, G, B vertical stripe	
Display mode	Normally white	
Unit outline dimensions *1	326.5(W) × 253.5(H) × 11.2(D)	mm
Mass	1100 (Typ)	g
Surface treatment	Anti-glare and hard-coating	

*1.Note: excluding back light cables, cover and pet sheet.

The thickness of module (D) doesn't contain the projection.

PSWG Standard. Outline dimensions are shown in page24-25.

4. Input Terminals

4-1. TFT-LCD panel driving

CN1 (Interface signals and +3.3V DC power supply)

Using connectors : DF14H-20P-1.25H (Hirose Electric Co., Ltd.)

Corresponding connectors : DF14-20S-1.25C(Connector)
DF14-2628SCFA(Terminal)

Corresponding LVDS Transmitter : THC63LVDF83A(Thine) or compatible

Pin No.	Symbol	Function	Remark
1	Vcc	+3.3V Power supply	
2	Vcc	+3.3V Power supply	
3	GND		
4	GND		
5	RXIN0-	Receiver signal (-)	LVDS
6	RXIN0+	Receiver signal (+)	LVDS
7	GND		
8	RXIN1-	Receiver signal (-)	LVDS
9	RXIN1+	Receiver signal (+)	LVDS
10	GND		
11	RXIN2-	Receiver signal (-)	LVDS
12	RXIN2+	Receiver signal (+)	LVDS
13	GND		
14	RXCKIN-	Clock signal (-)	LVDS
15	RXCKIN+	Clock signal (+)	LVDS
16	GND		
17	RXIN3-	Receiver signal (-)	LVDS
18	RXIN3+	Receiver signal (+)	LVDS
19	GND		
20	LVDS_SET	LVDS_SET	【note1】

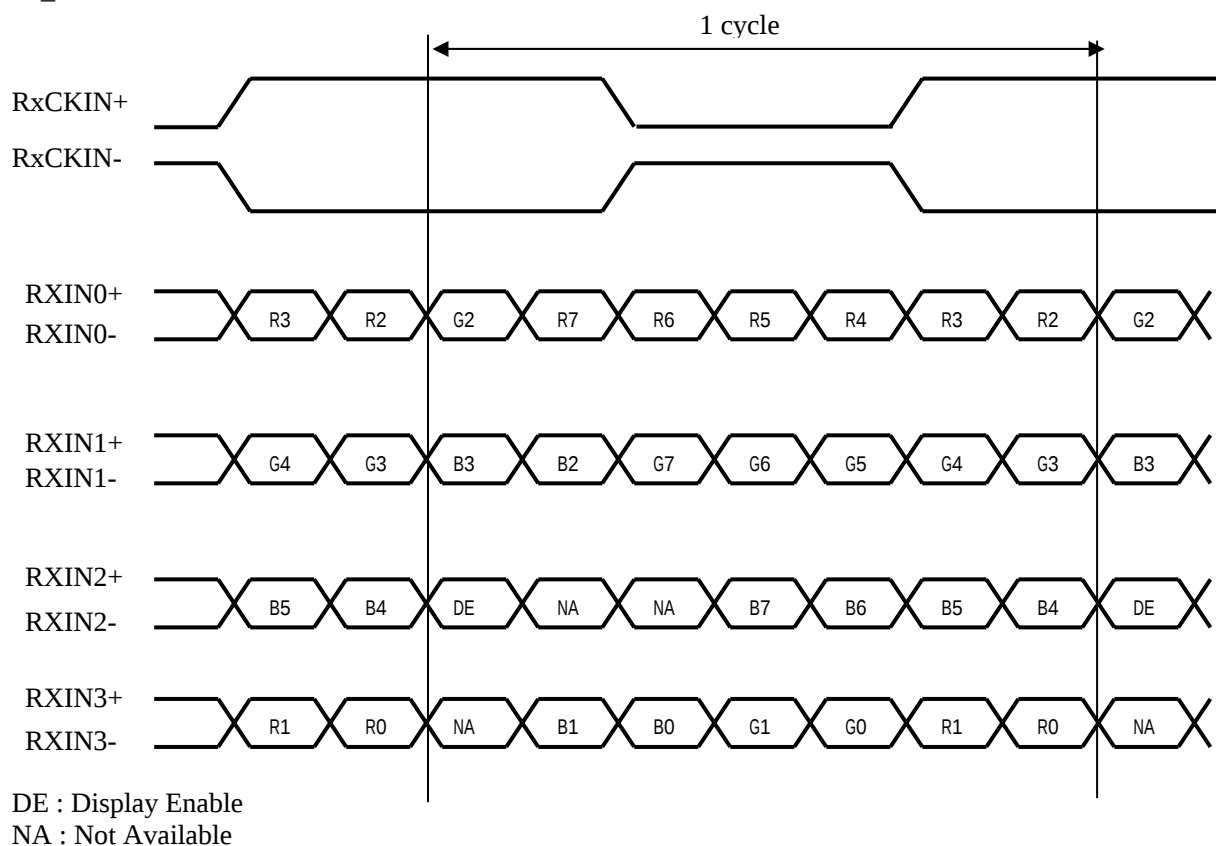
4-2 Data Mapping

1) 8 bit input

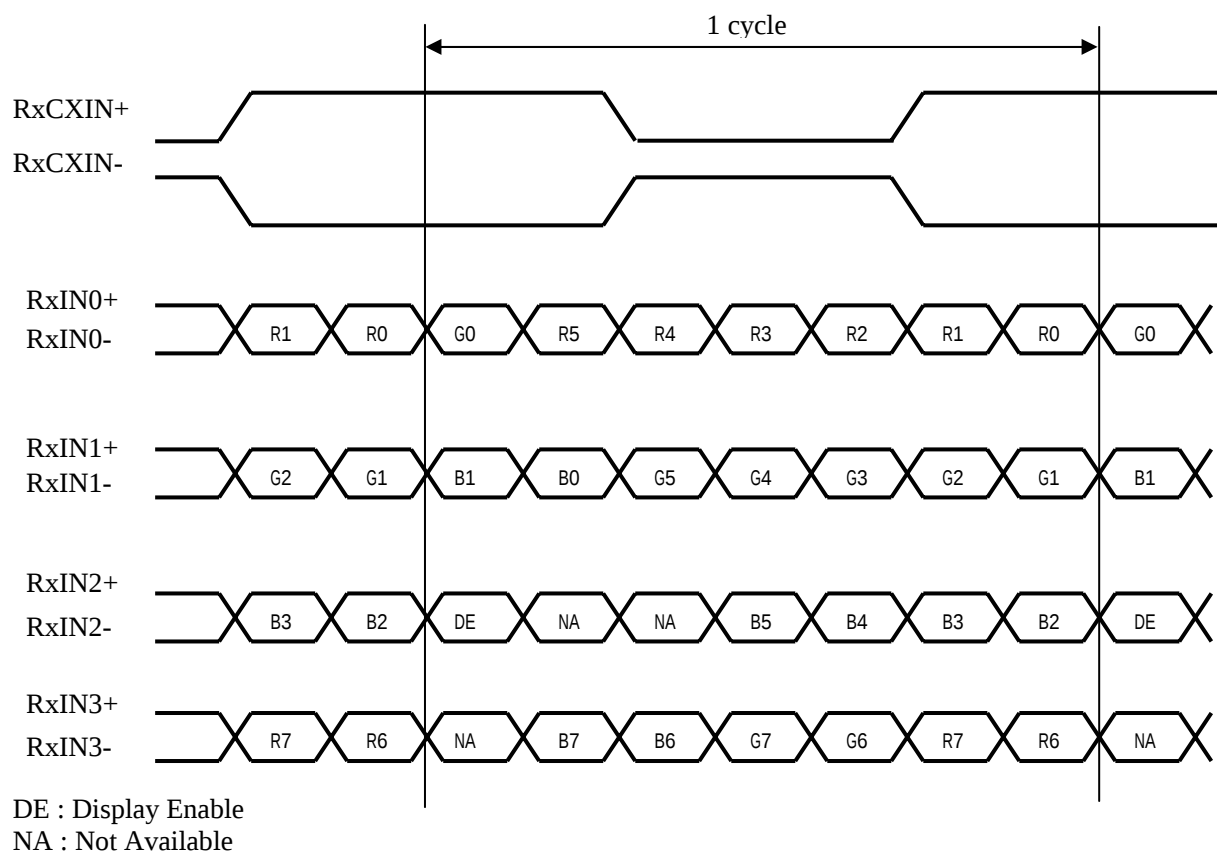
【note1】 pin assignment with LVDS_SET pin (Thine: THC63LVDF83A)

Transmitter		20pin LVDS_SET	
Pin No	Data	= H (3.3V)	= L (GND) or Open
51	TA0	R2	R0 (LSB)
52	TA1	R3	R1
54	TA2	R4	R2
55	TA3	R5	R3
56	TA4	R6	R4
3	TA5	R7 (MSB)	R5
4	TA6	G2	G0 (LSB)
6	TB0	G3	G1
7	TB1	G4	G2
11	TB2	G5	G3
12	TB3	G6	G4
14	TB4	G7 (MSB)	G5
15	TB5	B2	B0 (LSB)
19	TB6	B3	B1
20	TC0	B4	B2
22	TC1	B5	B3
23	TC2	B6	B4
24	TC3	B7 (MSB)	B5
27	TC4	High or low $\Delta 1$	High or low $\Delta 1$
28	TC5	High or low $\Delta 1$	High or low $\Delta 1$
30	TC6	DE	DE
50	TD0	R0 (LSB)	R6
2	TD1	R1	R7 (MSB)
8	TD2	G0 (LSB)	G6
10	TD3	G1	G7 (MSB)
16	TD4	B0 (LSB)	B6
18	TD5	B1	B7 (MSB)
25	TD6	(NA)	(NA)
31	CLK IN	CLK	CLK $\Delta 1$

<LVDS_SET=H>

 $\Delta 1$ 

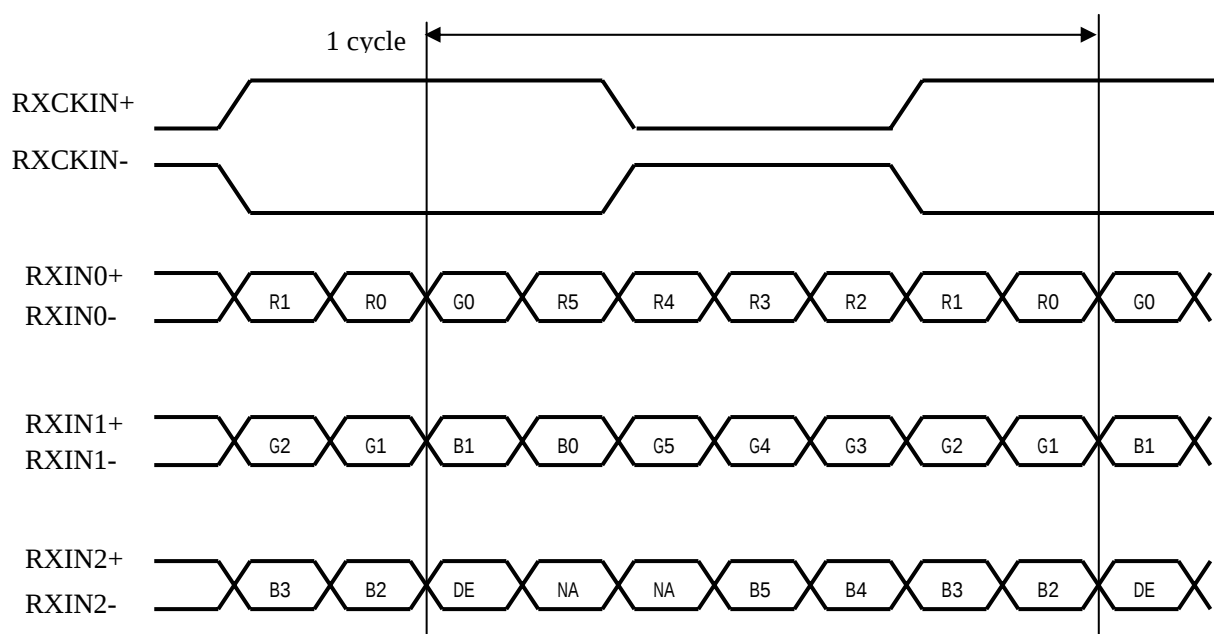
<LVDS_SET = L or Open>

 $\Delta 1$ 

2) 6 bit input

【note1】 pin assignment with LVDS_SET pin (Thine: THC63LVDF83A)

Transmitter		20pin LVDS_SET	
Pin No	Data	= H (3.3V)	= L (GND) or Open
51	TA0	R0 (LSB)	-
52	TA1	R1	-
54	TA2	R2	-
55	TA3	R3	-
56	TA4	R4	-
3	TA5	R5 (MSB)	-
4	TA6	G0 (LSB)	-
6	TB0	G1	-
7	TB1	G2	-
11	TB2	G3	-
12	TB3	G4	-
14	TB4	G5 (MSB)	-
15	TB5	B0 (LSB)	-
19	TB6	B1	-
20	TC0	B2	-
22	TC1	B3	-
23	TC2	B4	-
24	TC3	B5 (MSB)	-
27	TC4	High or low $\Delta 1$	-
28	TC5	High or low $\Delta 1$	-
30	TC6	DE	-
50	TD0	GND	-
2	TD1	GND	-
8	TD2	GND	-
10	TD3	GND	-
16	TD4	GND	-
18	TD5	GND	-
25	TD6	(NA)	-
31	CIKIN	CLK $\Delta 1$	



DE : Display Enable

NA : Not Available

In case of supplying 6 bit signal, it is recommended to connect
pin No.17(Rx3-) with VCC(3.3V), and No.18(Rx3+) with GND(0V).

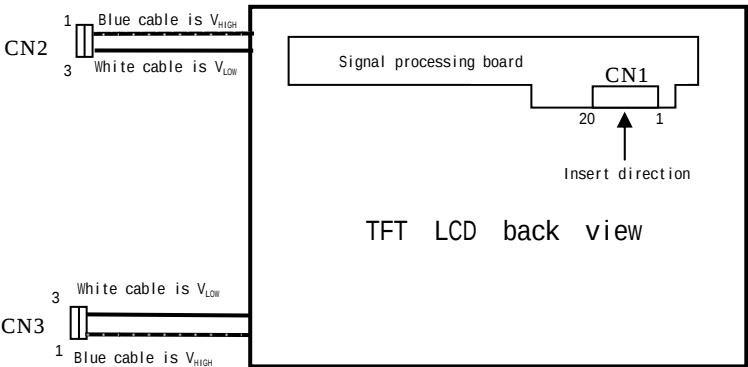
4-4 Backlight

CN 2, 3

The module-side connector : BHR-03VS-1 (JST) Δ1

The user-side connector : SM02(8.0)B-BHS-1-TB (JST)

Pin no.	symbol	I/O	Function
1	V_{HIGH}	I	Power supply for lamp (High voltage side)
2	N.C.	-	-
3	V_{LOW}	I	Power supply for lamp (Low voltage side)



Δ1

5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
Supply voltage	V_{CC}	$T_a=25$	-0.3 ~ +3.6	V	
Storage temperature	T_{STG}	-	- 20 ~ + 60		【Note1】
Operating temperature	T_{OPA}	Panel Surface	0 ~ + 50		

Δ1

【Note1】 Humidity : 95%RH Max. (T_a 40)

Maximum wet-bulb temperature at 39 or less. ($T_a>40$)

No condensation.

6. Electrical Characteristics

6-1. TFT-LCD panel driving

Ta = 25

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Vcc	Supply voltage	Vcc	+3.0	+3.3	+3.6	V	【Note2】
	Current dissipation	Icc	-	330	600	mA	【Note3】
Permissive input ripple voltage		V _{RF}	-	-	100	mVp-p	Vcc=+3.3V
Differential input Threshold voltage	High	V _{TH}	-	-	+100	mV	V _{CM} =+1.2V 【Note1】
	Low	V _{TL}	-100	-	-	mV	
Input voltage width for LVDS receiver		V _i	0	-	2.4	V	- Δ1
Input voltage for LVDS set	High	V _{FH}	0	-	0.8	V	- Δ1
	Low	V _{FL}	2.0	-	VCC	V	
Terminal resistor		R _T	-	100	-	Ω	Differential input

【Note1】 V_{CM} : Common mode voltage of LVDS driver.

【Note2】

1) On-off sequences of Vcc and data

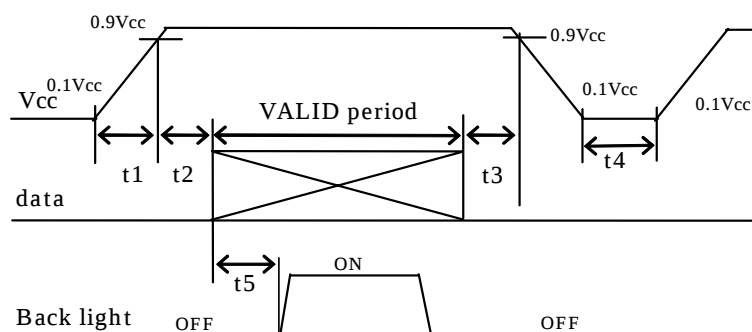
0 < t1 10ms

0.01 < t2 50ms

0.01 < t3 50ms

500ms t4 Δ1

200ms t5



Display signals and (D0+/-, D1+/-, D2+/-, D3+/-, and CK+/-) and function signal (LVDS set) must be "0" voltage, exclusive 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 again, it might not work normally. If customer stops the display and function signals, they should be cut Vcc.

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

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. Δ1

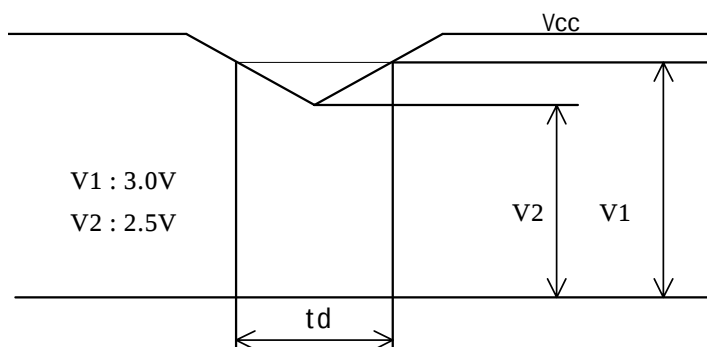
2) Dip conditions for supply voltage

1) V2 Vcc < V1

td 20ms

2) Vcc < V2

Vcc-dip conditions should also follow the on-off conditions.



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.. Δ1

【Note3】 Typical current situation : Checkered flag pattern(EIAJ-2522)

Vcc=+3.3V, CK=65MHz

Horizontal period = 20.7 us

Maximum current situation: 2H1V dot inverse pattern

6-2. Backlight

The back light system is an edge-lighting type with 2 CCFTs (Cold Cathode Fluorescent Tube).

The characteristics of the lamp are shown in the following table.

The value mentioned below is at the case of one CCFT.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp current range	I_L	3.5	7.5	8.0	mArms	【Note1】 at $L=350\text{cd/m}^2$ (typ.) $\Delta 1 \Delta 2$
Lamp voltage	V_L	-	560	-	Vrms	$I_L=7.5\text{ mArms}$ $T_a=25$ 60kHz
Lamp frequency	F_L	50	55	60	kHz	【Note2】
Kick-off voltage	V_s	-	-	1500	Vrms	$T_a=0$ 55kHz 【Note3,4】 $\Delta 1$
Lamp life time	T_L	50,000			hour	【Note5】

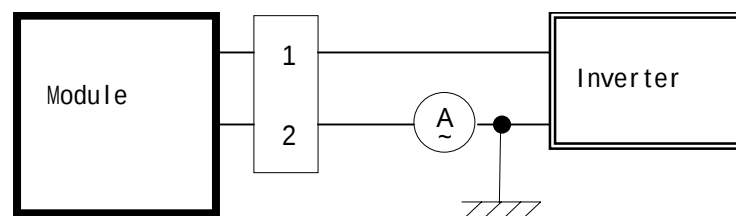
【Note1】 A lamp can be light in the range of lamp current shown above.

Maximum rating for current is measured by high frequency current measurement equipment connected to V_{LOW} at circuit showed below.

(Note : To keep enough kick-off voltage and necessary steady voltage for CCFT.)

Lamp frequency : 50 ~ 60kHz

Ambient temperature : 0 ~ 50



【Note2】 Lamp frequency of inverter may produce interference with horizontal synchronous frequency, and this may cause horizontal beat on the display. Therefore, adjust lamp frequency, and keep inverter as far as from module or use electronic shielding between inverter and module to avoid interference.

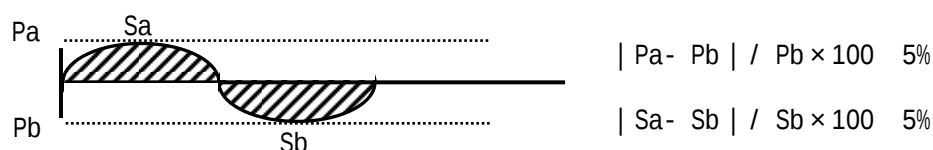
Recommended value of " F_L " is as following.

$$"F_L" = 1/4 \times 1/TH \times (2n-1) \quad n:\text{Numerical number (1,2,3,.....)} \quad \Delta 1$$

【Note3】 The kick-off voltage may rise up in the user set, please decide the open output voltage by checking not to occur lighting failure under operating state.

The open output voltage should be applied to the lamp for more than 1 second to startup. Otherwise the lamp may not be turned on.

【Note4】 The asymmetric ration of working waveform for lamps (Lamp voltage peak ration, Lamp current peak ration and waveform space ration) 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 toward one side between low voltage terminal (cold terminal) and high voltage terminal (Hot terminal).



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

【Note5】 Lamp life time is defined as the time when Brightness becomes 50% of the original value in the continuous operation under the condition of $T_a=25$ and $I_L = 7.5\text{mA}_{\text{rms}}/\text{lamp}$ $\Delta 1$

《Note》

The performance of the backlight, for example lifetime or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. When you design or order 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 you confirm it, the module should be operated in the same condition as it is installed in your instrument.

Use the lamp inverter power source incorporating such safeguard as over voltage / over current protective circuit or lamp voltage waveform detection circuit, which should have individual control of each lamp.

In case one circuit without such individual control is connected to more than two lamps, excessive current may flow into one lamp when the other one is not in operation.

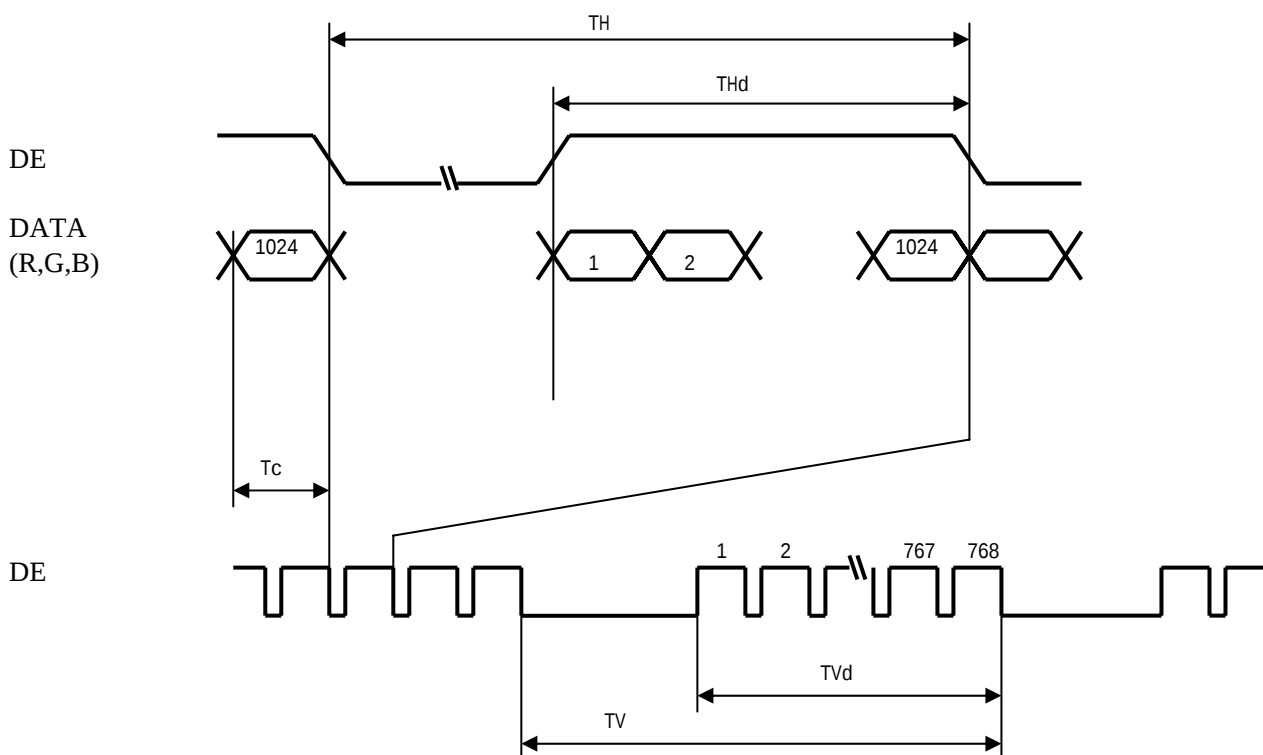
Under the environment of 10lx or less, miss-lighting or lighting delay may occur.

7. Timing characteristics of input signals

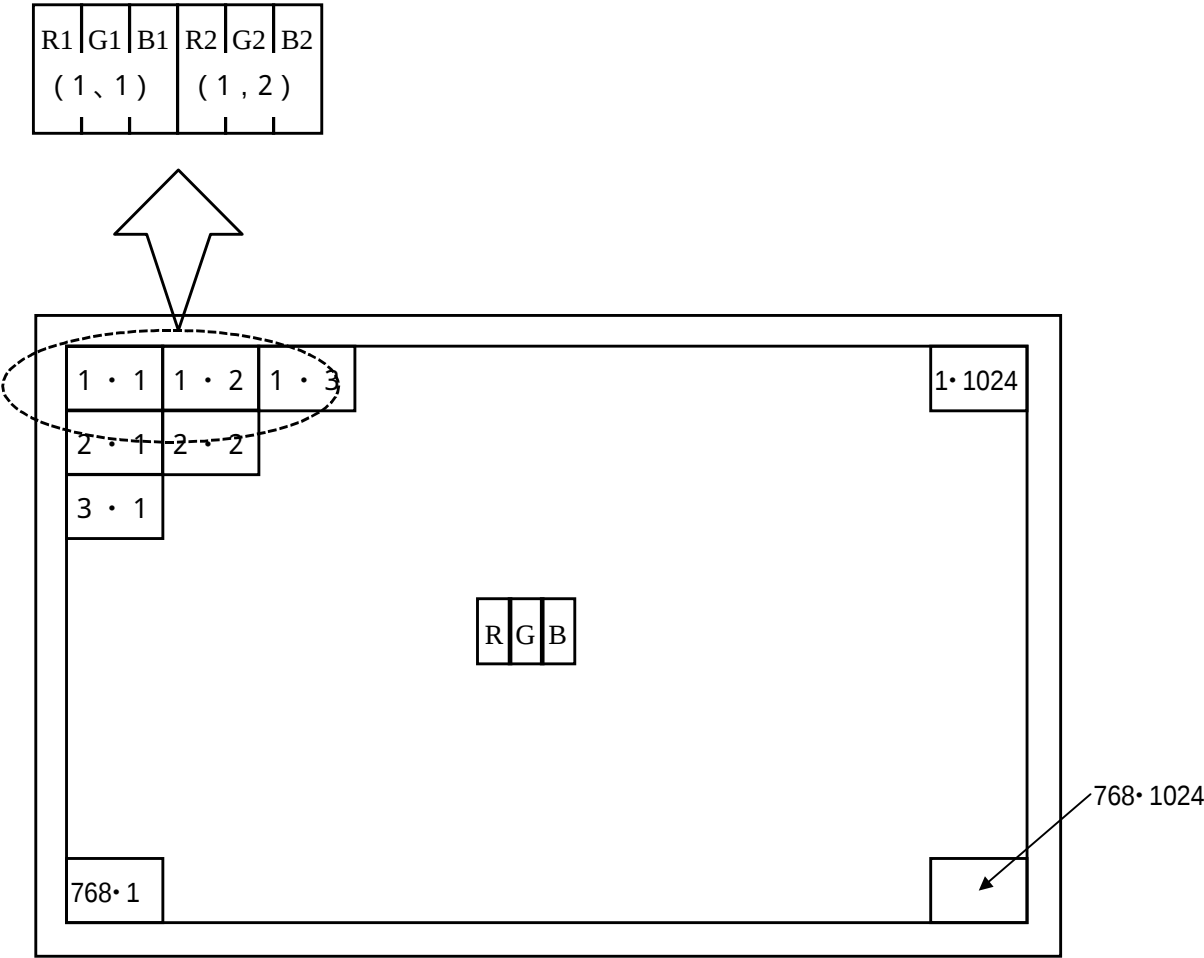
7-1. Timing characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock signal	Frequency	$1/T_c$	60.0	65.0	70.0	MHz
ENAB signal	Horizontal period	TH	1050	1344	-	clock
			12.3	20.7	-	μs
	Horizontal period (High)	THd	1024	1024	1024	clock
	Vertical period	TV	770	806	-	line
	Vertical period (High)	TVd	768	768	768	line

【Note】 In case of using the long vertical period, the deterioration of display quality, flicker etc. may occur.



7-2 Input Data Signals and Display Position on the screen



Display Position of Data (V,H)

8-2 6bit input

	Colors & Gray scale	Data signal																		
		Gray Scale	R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic Color	Black	-	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	1	1	1	1	1	1
	Green	-	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	-	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	-	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	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	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	↓	↓						↓						↓					
	↓	↓	↓						↓						↓					
	Brighter	GS61	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	↓	GS62	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS63	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	↑	↓	↓						↓						↓					
	↓	↓	↓						↓						↓					
	Brighter	GS61	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	↓	GS62	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	GS63	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	↑	GS1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	↑</																			

9. Optical Characteristics

Ta=25 , Vcc =+3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Vertical	θ_{11}	CR 10	30	40	-	Deg.	【Note1,4】
		θ_{12}		35	60	-	Deg.	
	Horizontal	θ_{21}, θ_{22}		50	60	-	Deg.	
Contrast ratio		C R	$\theta = 0^\circ$	350	450	-		【Note2,4】
Response Time	Rise	γ_r	$\theta = 0^\circ$	-	4	7	ms	【Note3,4】
	Fall	γ_d		-	12	18	ms	
Chromaticity of White		x		0.283	0.313	0.343		【Note4】
		y		0.299	0.329	0.359		
Chromaticity of Red		x		-	0.630	-		
		y		-	0.350	-		
Chromaticity of Green		x		-	0.300	-		
		y		-	0.590	-		
Chromaticity of Blue		x		-	0.140	-		
		y		-	0.090	-		
Luminance of white		Y_L		300	350	-	cd/m ²	IL=7.5mA rms f _L =55kHz 【Note4】
				$\Delta 1$	$\Delta 1$			
White Uniformity		δ_w		-	1.2	1.3		【Note5】

The measurement shall be executed 20 minutes after lighting at rating.

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.2 below.

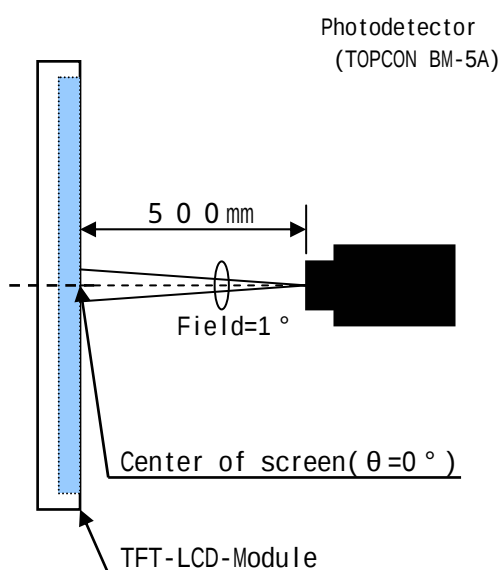
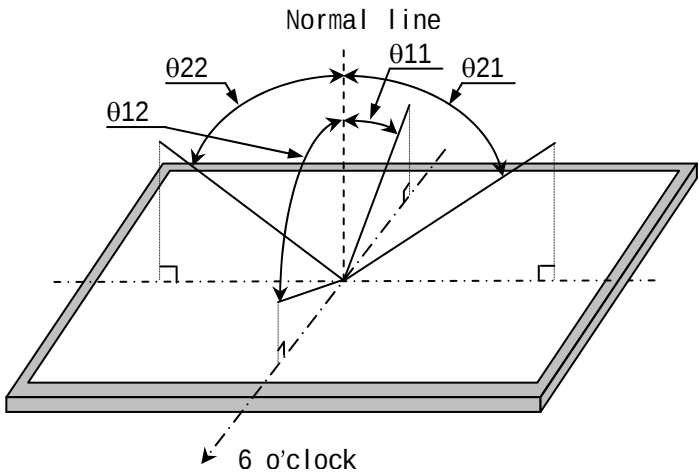
 $\Delta 1$ 

Fig2 Optical characteristics measurement method

【Note1】 Definitions of viewing angle range:



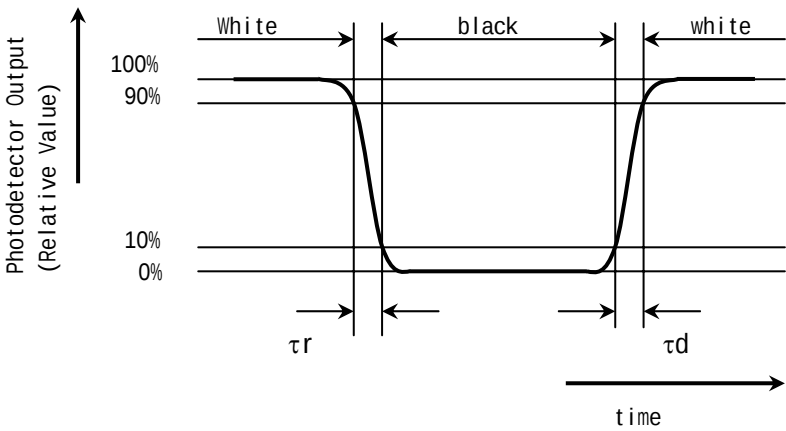
【Note2】 Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

【Note3】 Definition of response time:

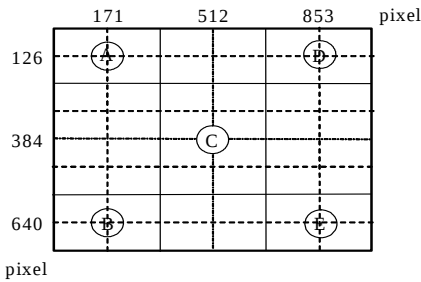
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



【Note4】 This shall be measured at center of the screen.

【Note5】 Definition of white uniformity:

White uniformity is defined as the following with five measurements (A ~ E).



$$\delta_w = \frac{\text{Maximum Luminance of five points (brightness)}}{\text{Minimum Luminance of five points (brightness)}}$$

Δ 1

10. Handling Precautions

- a) Be sure to turn off the power supply when inserting or disconnecting the cable.
- b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.
- c) Since the front polarizer is easily damaged, pay attention not to scratch it.
Blow away dust on the polarizer with antistatic N₂ blow. It is undesirable to wipe off because a polarizer is sensitive.
It is recommended to peel off softly using the adhesive tape when soil or finger oil is stuck to the polarizer. When unavoidable, wipe off carefully with a cloth for wiping lenses.
- d) Since long contact with water may cause discoloration or spots, wipe off water drop immediately.
- e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.
- g) Since CMOS LSI is used in this module, take care of static electricity and take the human earth into consideration when handling.
- h) Since there is a circuit board in the module back, stress is not added at the time of a design assembly. Please make it like. If stress is added, there is a possibility that circuit parts may be damaged.
- i) Protection film is attached to the module surface to prevent it from being scratched .
Peel the film off slowly , just before the use, with strict attention to electrostatic charges.
display quality.
- j) The polarizer surface on the panel is treated with Anti-Glare for low reflection. In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.
- k) Do not expose the LCD panel to direct sunlight. Lightproof shade etc. should be attached when LCD panel is used under such environment.
- l) Blow off 'dust' on the polarizer by using an ionized nitrogen.
- m) Make sure the four mounting holes of the module are grounded sufficiently. Take electro-magnetic interference (EMI) into consideration.
- n) The module has some printed circuit boards (PCBs) on the back side. Take care to keep them from any stress or pressure when handling or installing the module; otherwise some of electronic parts on the PCBs may be damaged.
- o) There are high voltage portions on the backlight and very dangerous. Careless touch may lead to electrical shock. When exchange lamps or service, turn off the power without fail.
- p) Observe all other precautionary requirements in handling components.
- q) When some pressure is added onto the module from rear side constantly, it causes display non-uniformity issue, functional defect, etc. So, please avoid such design.
- r) When handling LCD modules and assembling them into cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the LCD modules.
- s) Cold cathode fluorescent lamp in LCD panel contains a small amount of mercury, please follow local ordinances or regulations for disposal.
- t) Be careful of a back light lead not to pull by force at the time of the wiring to an inverter, or line processing.

- u) The torque for mounting screws must never exceed 0.34N-m. Higher torque values might result in distortion of the bezel. 1
- v) Be sure to confirm it in the same condition as it is installed in your instrument.
- w) Liquid crystal contained in the panel may leak if the LCD is broken. Rinse it as soon as possible if it gets inside your eye or mouth by mistake.
- x) Notice: Never dismantle the module, because it will cause failure.
- y) Be careful when using it for long time with fixed pattern display as it may cause afterimage.
- z) Adjusting volume have been set optimally before shipment, so do not change any adjusted value.
If adjusted value is changed, the specification may not be satisfied.
- aa) If a minute particle enters in the module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.

11. Packing form

- a) Production country : CHINA
- b) Piling number of cartons : T.B.D
- c) Packing quantity in one carton : T.B.D
- d) Carton size : T.B.D
- e) Total mass of one carton filled with full modules : T.B.D
- f) Packing form is shown : T.B.D

12 . Reliability test items

No	Test item		Conditions	Judgment $\Delta 1$
1	High temperature & high humidity operation test		Ta = 50 ± 2 ; 85%RH 240h Display data is Black	No display malfunctions
2	Heat cycle (Operation)		Ta=0 ± 3 1hour Ta=55 ± 3 1hour 50cycles, 4hours/cycle Display data is black	
3	Thermal shock test (Non operation)		Ta=-20 ± 3 30min Ta=60 ± 3 30min 100cycles, 1hour/cycle Temperature transition time is within 5 minutes.	
4	ESD (operation)		150pF,150 Ω , ± 10 kV 9 places on a panel surface 10 times each places at 1 sec interval	
5	Dust (operation)		Sample dust:No.15(by JIS-Z8901) 15 seconds stir 8 times repeat at 1hour interval	
6	Vibration (Non operating)		5~100Hz,sine wave,11.76 m/s ² 1minutes/cycle X,Y,Z direction 50 times each directions	No display malfunctions
7	Mechanical shock (non- operating)		294 m/s ² 11ms $\pm X$, $\pm Y$, $\pm Z$ direction 3 times each directions	No physical damages
8	Low pressure	operation	53.3kPa(Equivalent to altitude 4,850m) 0 ± 3 24h 50 ± 3 24h	No display malfunctions
		Non-operation	15kPa(Equivalent to altitude 13,600m) -20 ± 3 24h 60 ± 3 24h	

 $\Delta 1$

【Result Evaluation Criteria】

Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function. (normal operation state : Temperature:15 ~ 35 , Humidity:45 ~ 75%, Atmospheric pressure:86 ~ 106kpa)

13 . Others

1) Lot No. and indication Bar Code Label:

T.B.D

Δ 1

2) Packing Label

T.B.D

Δ 1

3) Adjusting volume have been set optimally before shipment, so do not change any adjusted value.

If adjusted value is changed, the specification may not be satisfied.

4) Disassembling the module can cause permanent damage and should be strictly avoided.

5) Please be careful since image retention may occur when a fixed pattern is displayed for a long time.

6) The chemical compound which causes the destruction of ozone layer is not being used.

7) Warning of mercury and material information of LPG (Light Pipe Guide) are stamped on the back of the module.

Δ 1

8) Cold cathode fluorescent lamp in LCD PANEL contains a small amount of mercury, Please follow local ordinances or regulations for disposal.

Δ 1

9) If any problem occurs in relation to the description of this technical literature, it shall be resolved through discussion with spirit of cooperation.

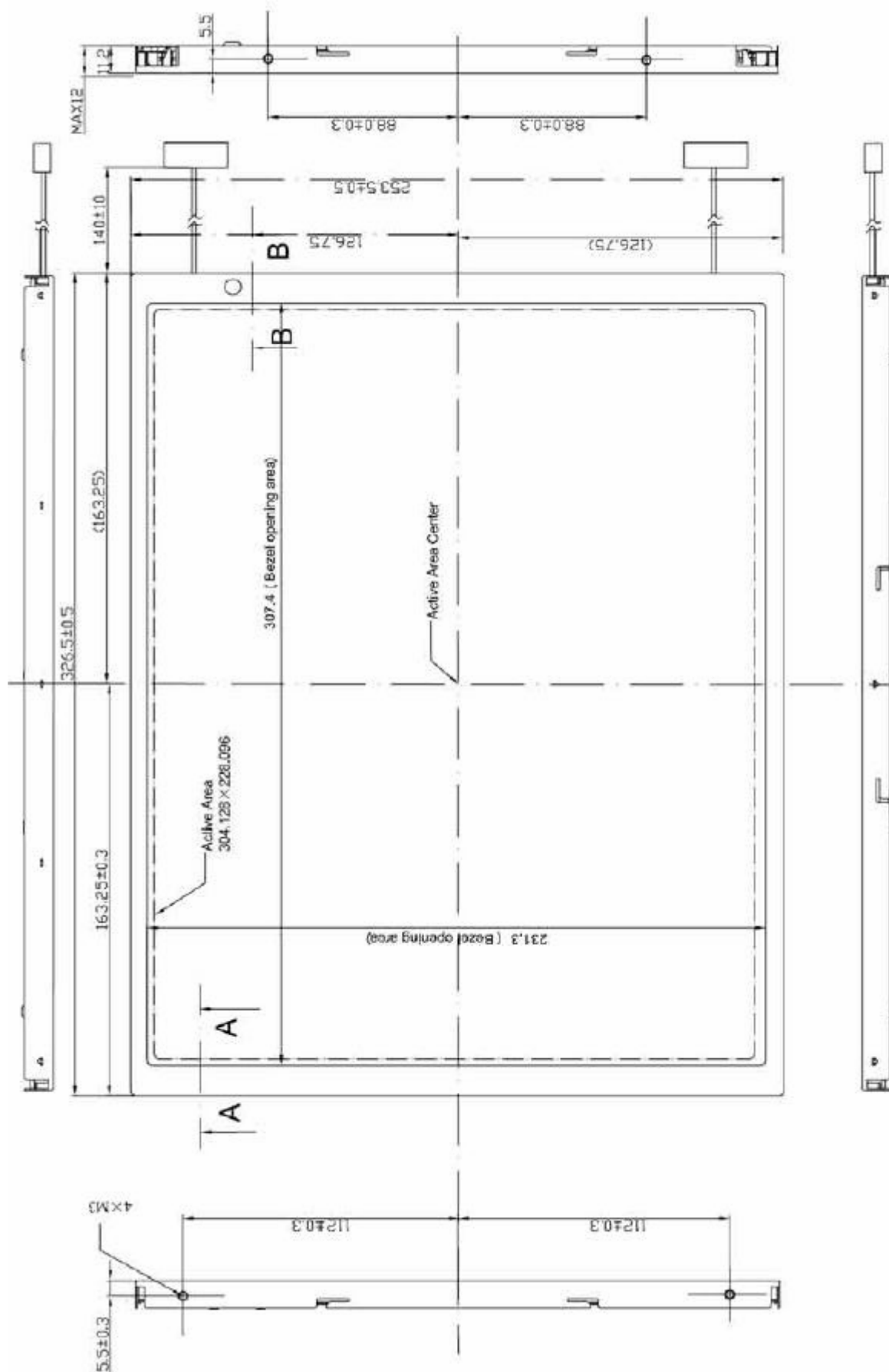
14. Carton storage condition

T.B.D

Δ 1

15. Outline dimensions

1) Front side



2) Rear side

