HannStar Product Information

Model : **HSD150PK14**

-A00

(A00: sub-model code)

Note:1.The information contained herein is tentative and may be changed without prior notices.
2.Please contact HannStar Display Corp. before designing your product based on this module specification.
3.The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by HannStar for any intellectual property claims or other problems that may result from application based on the module described herein.

Record of Revisions

Rev.	Date	Description of change
1.0		● HSD150PK14-A00 Product Information was first issued.

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1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD150PK14-AXX is a color active matrix thin film transistor (TFT) liquid crystal display(LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 15.0 inch diagonally measured active display area with SXGA$^+$ resolution (1050 vertical by 1400 horizontal pixel array) and can display up to 262,144 colors.

1.2 Features

- 15.0 SXGA$^+$ for Notebook PC
- 2-ch LVDS interface system
- Compatible with SPWG style-B standard
- Input timing: DE only mode

1.3 Applications

- Notebook PC
- Moniputers
- Display terminals for AV applications
- Monitors for industrial applications

1.4 General information

Item	Specification	Unit
Outline Dimension	317.3 x 242.0 x 6.3 (Typ.)	
Display area	304.5(H) x 228.375(V)(15.0” diagonal)	mm
Number of Pixel	1400(H) x1050(V)	pixels
Pixel pitch	0.2175(H) x 0.2175(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display color	6 bits / 262,144	colors
Display mode	Normally white	
Surface treatment	Antiglare, Hard-Coating(3H)	
Weight	590 (Typ.)	g
Back-light	Single CCFL (Side-Light type)	
Input signal	2-ch LVDS with EDID(following SPWG)	
Optimum viewing direction	6 o’clock	
Power Consumption(with B/L)	6.8 (typ.)	W

1.5 Mechanical Information

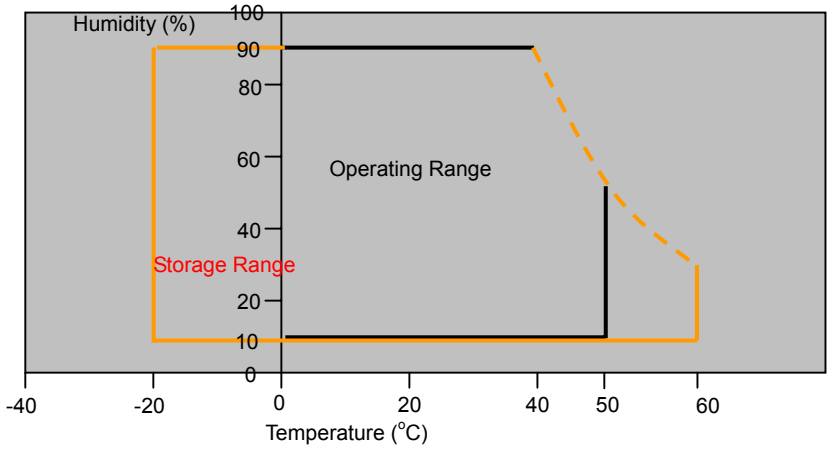
Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	316.8	317.3	317.8	mm
	Vertical(V)	241.5	242.0	242.6	mm
	Depth(D)	—	—	6.2	mm
Weight (Without inverter)		—	590	605	g
Torque of customer screw hole		—	—	3.2	Kgf•Cm

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Absolute Rating of Environment

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-20	60	°C	
Operating temperature	T_{OPR}	0	50	°C	(1)
Vibration(non-operating)	V_{NOP}	—	1.5	G	(2)
Shock(non-operating)	S_{NOP}	180	--	G	(3)
Storage humidity	H_{STG}	10	90	%RH	(3)
Operating humidity	H_{OP}	10	80	%RH	(4)
Low pressure(operating)	P_{LOP}	697	—	hPa	(5)
Low pressure(non-operating)	P_{LNOP}	116	—	hPa	(6)

Note (1) Storage / Operating temperature



(2) 5-500-5Hz sine wave, X,Y,Z each directions, 30min/cycle.

(3) 2ms, ±X, ±Y, ±Z direction, one time each. For this shock test, it is necessary to fill the silicon rubber between the shock jig as buffer.

(4) Max wet bulb temp.=39°C

(5) 2hrs. (10000 feet)

(6) 24hrs. (50000 feet)

2.2 Electrical Absolute Rating

2.2.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	V_{DD}	-0.3	4.0	V	(1) (2)
Logic input voltage	V_{IN}	-0.3	VDD+0.3	V	(1) (2)

2.2.2 Back-Light Unit

Item	Symbol	Min.	Max.	Unit	Note
Lamp voltage	V_{FL}	0	2000	$V_{(rms)}$	(1) (2)
Lamp current	I_L	—	7.0	mA	(1) (2)
Lamp frequency	f_L	0	100	kHz	(1) (2)

Note (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normally operating conditions.

(2) Within Ta =25±2℃

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	Θ=0 Φ=0 Normal viewing angle	150	250	—		(1)(2)
Response time	Rising	TR		—	7	13	msec	(1)(3)
	Falling	TF		—	15	20		
White luminance (Center)		YL		—	180	—	cd/m2	(1)(4)(5) (IL=6.0mA)
Color chromaticity (CIE1931)	Red	Rx		0.576	0.606	0.636		(1)(4)
		Ry		0.313	0.343	0.373		
	Green	Gx		0.273	0.303	0.333		
		Gy		0.514	0.544	0.574		
	Blue	Bx		0.121	0.151	0.181		
		By		0.105	0.135	0.165		
	White	Wx		0.280	0.310	0.340		
		Wy		0.300	0.330	0.360		
Viewing angle	Hor.	ΘL	CR>10	35	40	—		
		ΘR		35	40	—		
	Ver.	ΘU		15	20	—		
		ΘD		35	40	—		
Brightness uniformity		BUNI	Θ=0 Φ=0	65	—	—	%	(6)
Crosstalk		CT(n)		—	—	1.3	%	(7)

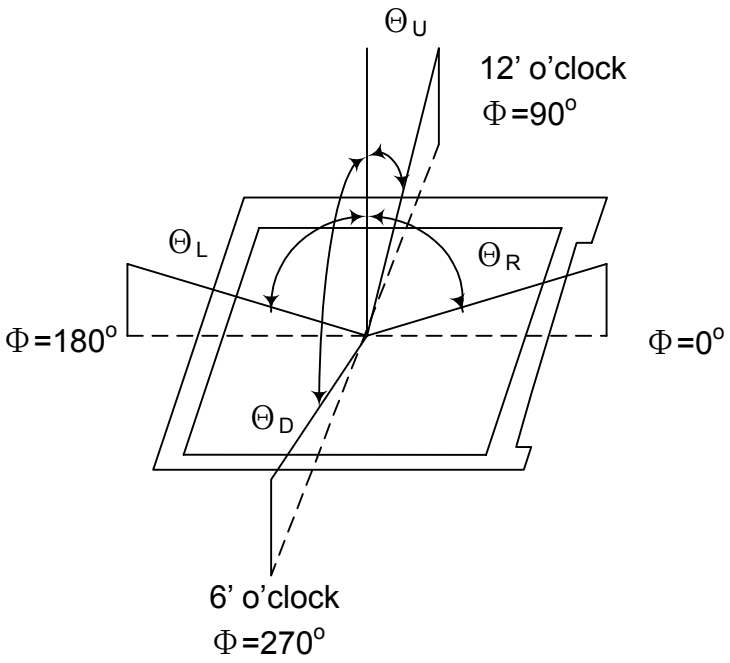
Measuring Condition

- Measuring surrounding : dark room
- Lamp current I_{FL} : 6.0±0.1mA(rms), Lamp freq. F_L=50KHz, Inverter : **HIU-757-22pF**
- V_{DD}=3.3V±0.05V
- Surrounding temperature : 25±2°C
- 30min. warm-up time.

3.2 Measuring Equipment

- Otsuka Electrics Corp., which utilized MCPD-7000 for Chromaticity and BM-5 for other optical characteristics.
- Measuring spot size : 10 ~ 12 mm

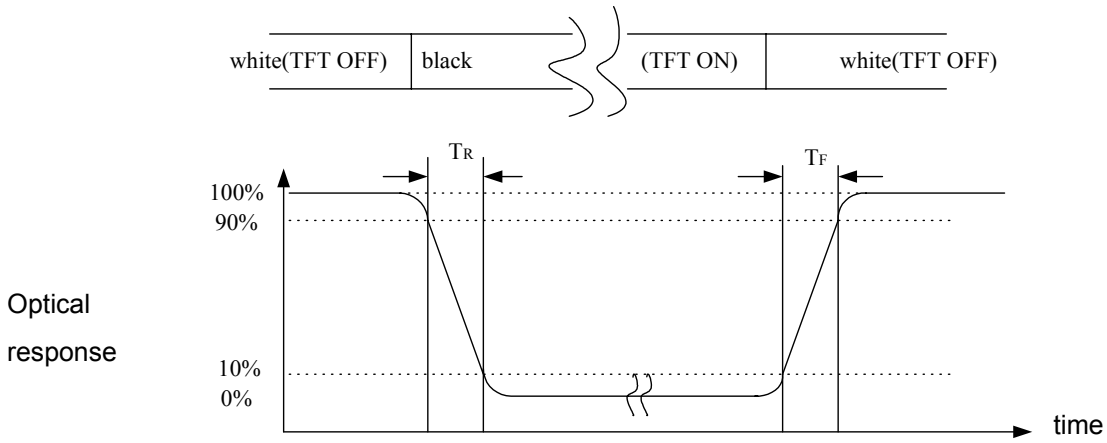
Note (1) Definition of Viewing Angle :



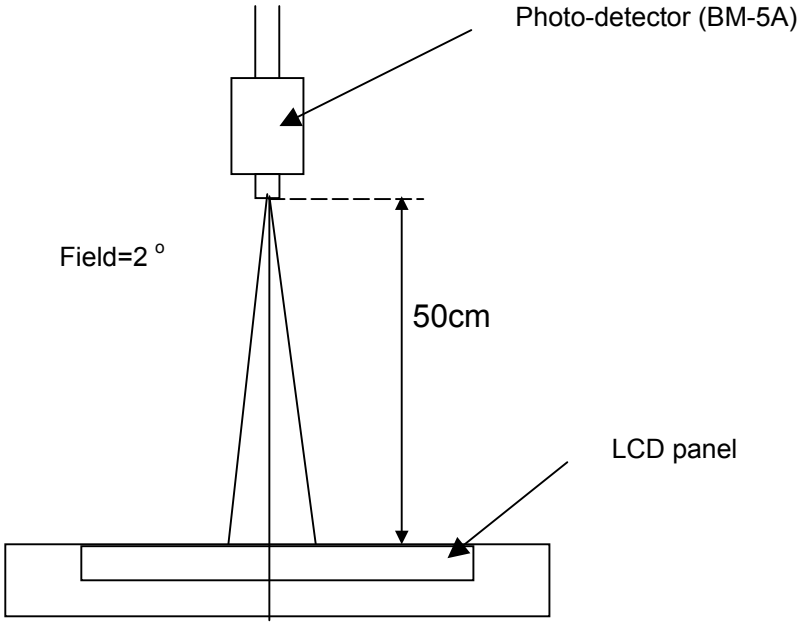
Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white (L63)}}{\text{Luminance with all pixels black (L0)}}$$

Note (3) Definition of Response Time : Sum of T_R and T_F

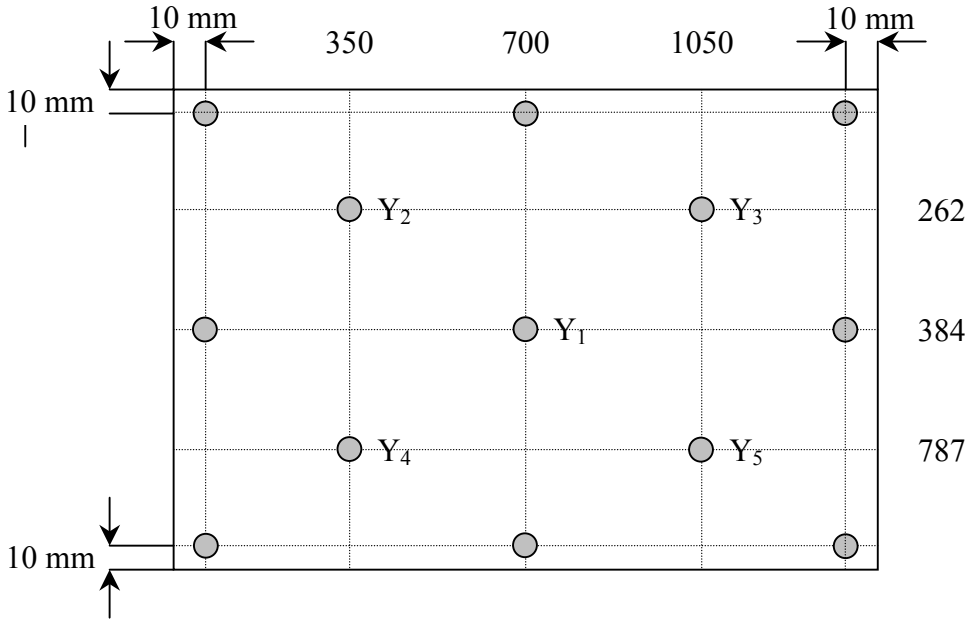


Note (4) Definition of brightness uniformity



Note (5) Definition of Average Luminance of White (5 Point)

$$\text{Average Luminance} = \frac{Y_1+Y_2+Y_3+Y_4+Y_5}{5}$$



Note (6) Definition of brightness uniformity

$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 13 points)}}{\text{(Max Luminance of 13 points)}} \times 100\%$$

Note (7) Definition of crosstalk CT(1) ~ CT(4)

$$CT(n) = \frac{\left| L(n) - LB(n) \right|}{L(n)} \times 100\% \text{ , } n = 1 \sim 4$$

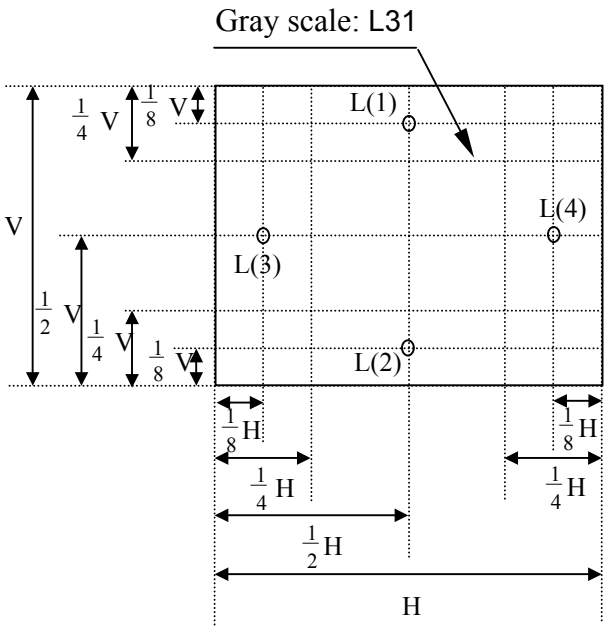
Where L(n) = Luminance of point "n" at pattern A (cd/m^2) , n=1 4

LB(n) = Luminance of point "n" at pattern B (cd/m^2) , n=1 4

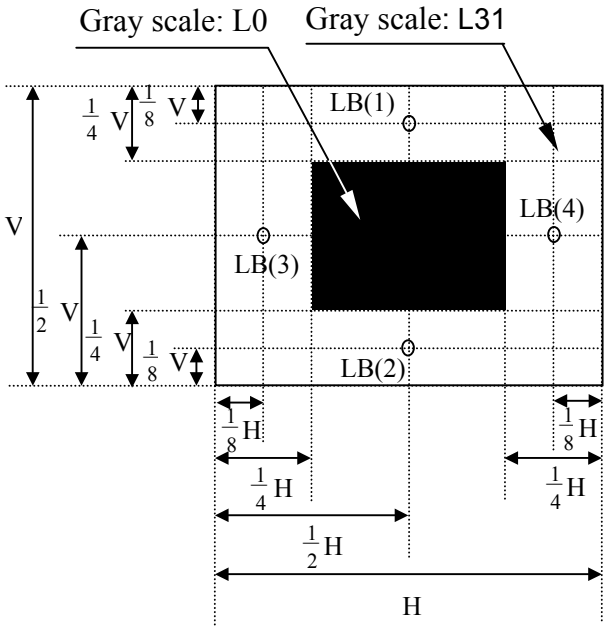
The location measured will be exactly the same in both patterns.

L0 : Luminance with all pixels black

L63 : Luminance with all pixels white



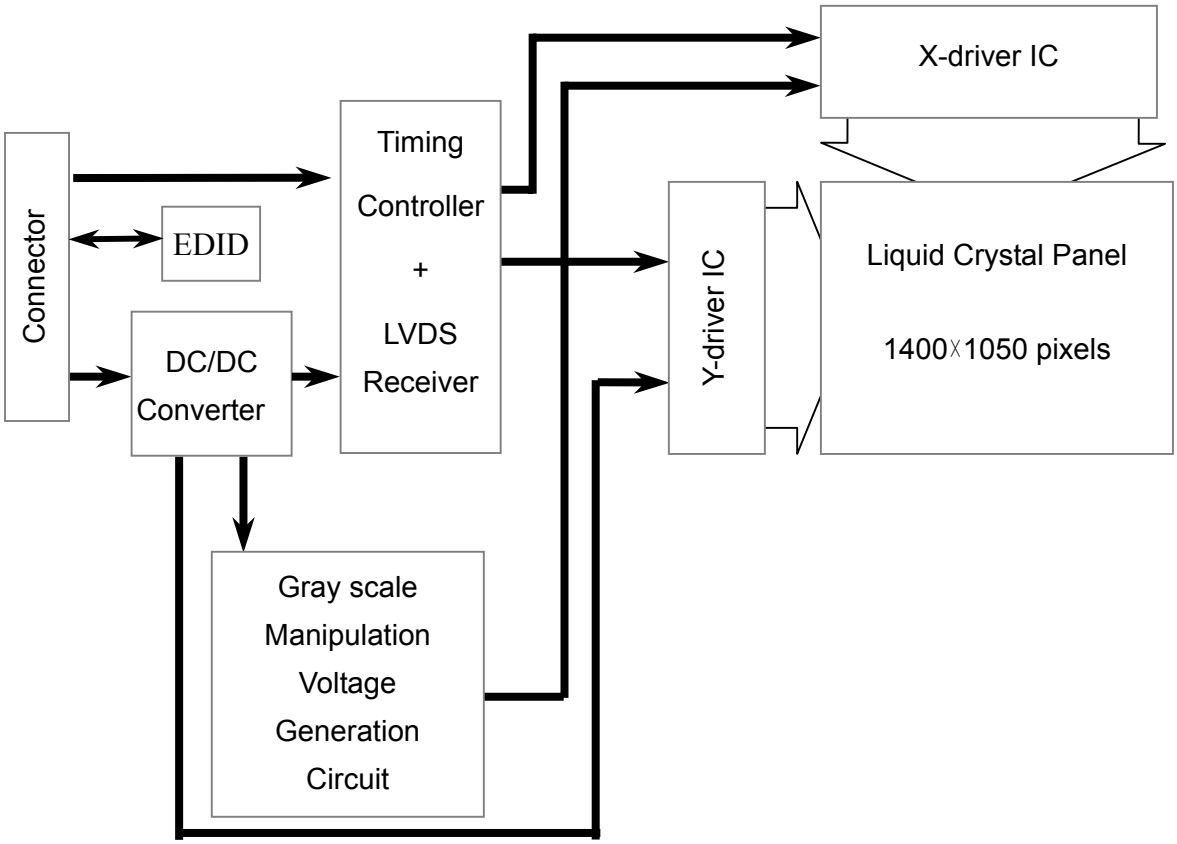
Pattern A



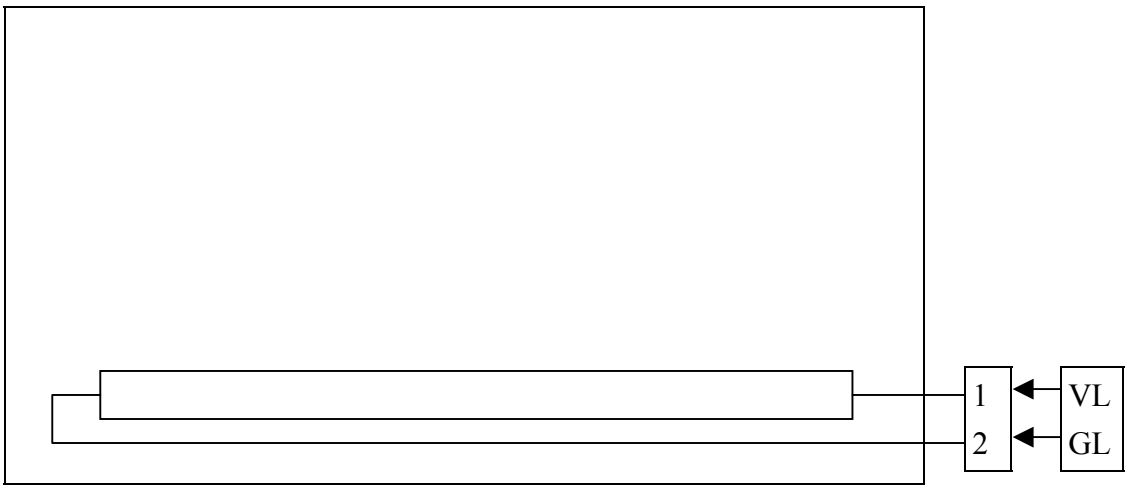
Pattern B

4.0 BLOCK DIAGRAM

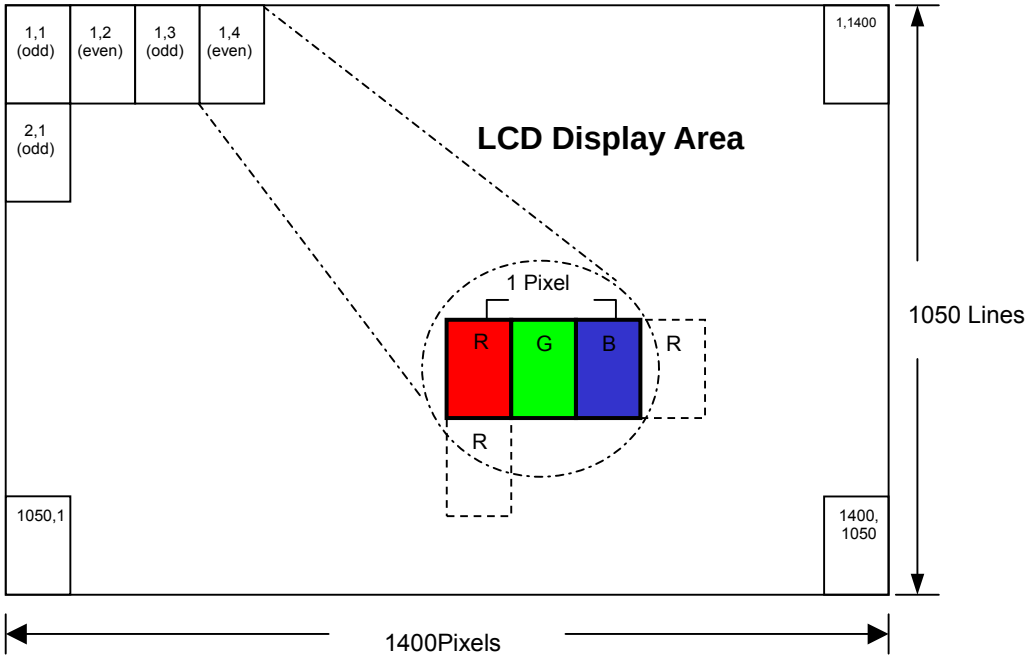
4.1 TFT LCD Module



4.2 Back Light Unit



4.3 Pixel Format



4.4 Relationship Between Displayed Color and Input

		MSB					LSB	MSB					LSB	MSB					LSB	Gray scale
	Display	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0	level
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	L	L	L	L	L	L	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3…L60
		H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L61
		H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L62
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	Red L63
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3…L60
		L	L	L	L	L	L	H	H	H	H	L	H	L	L	L	L	L	L	L61
		L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L62
	Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	Green L63
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3…L60
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	H	L61
		L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L62
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	Blue L63
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑ ↓ Light	L	L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L1
		L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3…L60
		H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L61
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	L62
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L63

5.0 INTERFACE PIN CONNECTION

5.1 TFT LCD Module

CN1 (INPUT SIGNAL): FI-XB30S-HF10 (JAE)

MATING CONNECTOR: FI-X30M,FI-X30MR

Terminal no.	Symbol	Function	Note
1	GND	Ground	
2	VDD	Power Supply : +3.3V	
3	VDD	Power Supply : +3.3V	
4	VEDID	DDC 3.3V power	
5	NC	Reserved for supplier test point	
6	ClkEDID	DDC clock	
7	DataEDID	DDC data	
8	Odd_Rin0-	- LVDS differential data input (R0-R5, G0)	(2)
9	Odd_Rin0+	+ LVDS differential data input (R0-R5, G0)	(2)
10	GND	Ground	
11	Odd_Rin1-	- LVDS differential data input (G1-G5, B0-B1)	(2)
12	Odd_Rin1+	+ LVDS differential data input (G1-G5, B0-B1)	(2)
13	GND	Ground	
14	Odd_Rin2-	- LVDS differential data input (B2-B5,NC,NC,DE)	(2)
15	Odd_Rin2+	+ LVDS differential data input (B2-B5,NC,NC,DE)	(2)
16	GND	Ground	
17	Odd_ClkIN-	- LVDS differential clock input	(2)
18	Odd_ClkIN+	+ LVDS differential clock input	(2)
19	GND	Ground	
20	Even_Rin0-	- LVDS differential data input (R0-R5, G0)	
21	Even_Rin0+	+ LVDS differential data input (R0-R5, G0)	
22	GND	Ground	
23	Even_Rin1-	- LVDS differential data input (G1-G5, B0-B1)	
24	Even_Rin1+	+ LVDS differential data input (G1-G5, B0-B1)	
25	GND	Ground	
26	Even_Rin2-	- LVDS differential data input (B2-B5,NC,NC,DE)	
27	Even_Rin2+	+ LVDS differential data input (B2-B5, NC, NC, DE)	
28	GND	Ground	
29	Even_ClkIN-	- LVDS differential clock input	
30	Even_ClkIN+	+ LVDS differential clock input	

Note (1) Please connects NC pin to nothing. Don't connect it to ground nor to other signal input. (NC pin should be open.)

Note (2) The module used a 100ohm resistor between positive and negative data lines of each receiver input.

5.2 Back-Light Unit

CN2 CCFL Power Source (**BHSR-02VS-1**) / JAPAN SOLDERLESS TERMINAL MFG CO., LTD.

Mating Connector: (**SBHT-002T-P0.5**) / JAPAN SOLDERLESS TERMINAL MFG CO., LTD.

Terminal no.	Symbol	Function
1	VL	CCFL power supply (high voltage)
2	GL	CCFL power supply (low voltage)

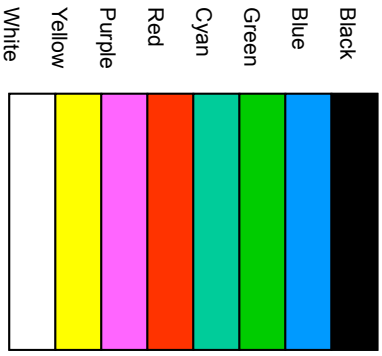
6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

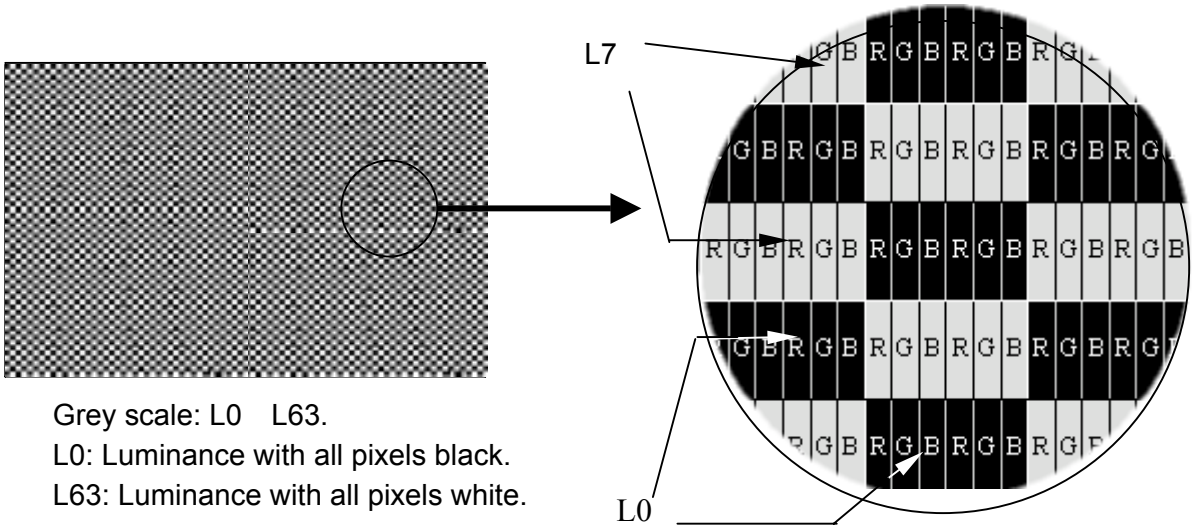
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of power supply		V_{DD}	3.0	3.3	3.6	V	
Current of power supply	V-Color	I_{DD1}	485	550	615	mA	(1)
	Mosaic	I_{DD2}	535	600	665	mA	(1)
Vsync frequency		f_V	—	60	—	Hz	ref 6.7 t1
Hsync frequency		f_H	—	64	—	KHz	ref 6.7 t2
Frequency		f_{DCLK}	—	54	—	MHz	ref 6.7 t4
Input rush current		I_{Rush}	—	—	1.5	A	(2)

Note (1)

1). V-Color :



2). Mosaic : Dot checker image

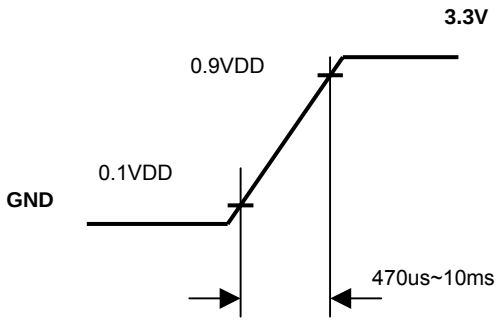


Grey scale: L0 L63.

L0: Luminance with all pixels black.

L63: Luminance with all pixels white.

Note (2) **Input Rush Current measurement condition**

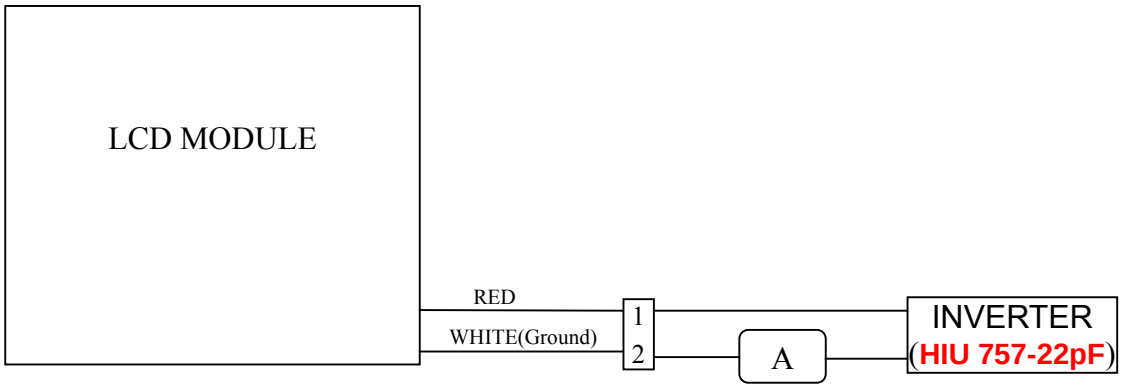


6.2 Back-Light Unit

The back-light system is an edge-lighting type with 1 CCFL(Cold Cathode Fluorescent Lamp). The characteristics of the lamp is shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp current	IL	3.0	6.0	7.0	mA(rms)	(1)
Lamp voltage	VL	TBD	660	860	V(rms)	IL=6.0mA
Frequency	fL	20	50	100	KHz	(2)
Operating lamp life time	Hr	10,000	TBD	—	Hour	(3)
Startup voltage	Vs	1350	—	—	V(rms)	at 25oC
		TBD				at 0oC

Note (1) Lamp current is measured with current meter for high frequency as shown below. Specified valued are for a lamp.

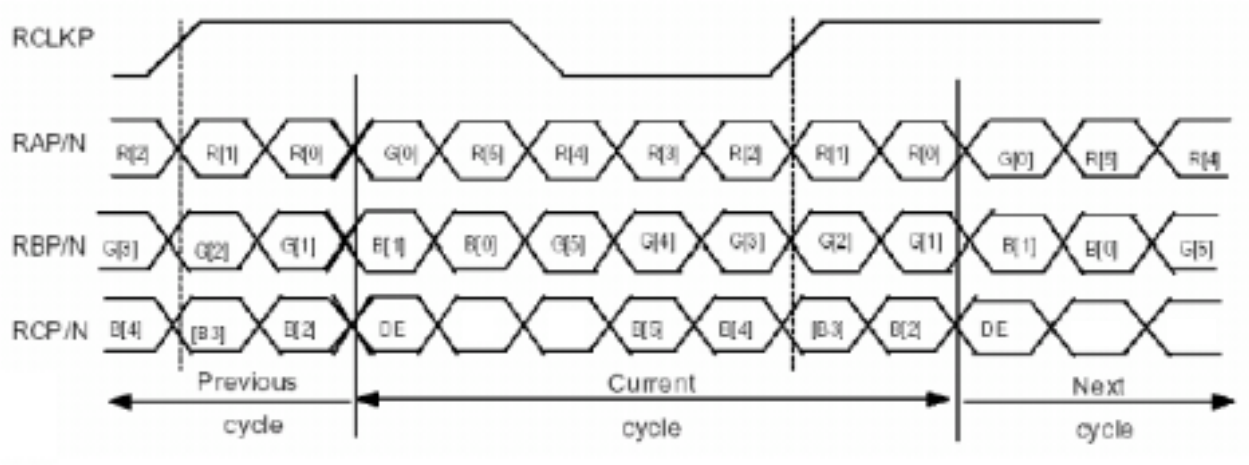


Note (2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

Note (3) Lamp life time (Hr) can be defined as the time in which it continues to operate under the condition : Ta=25±3°C, I_L=6.0mA(rms) and f_L=50kHz until one of the following event occurs :

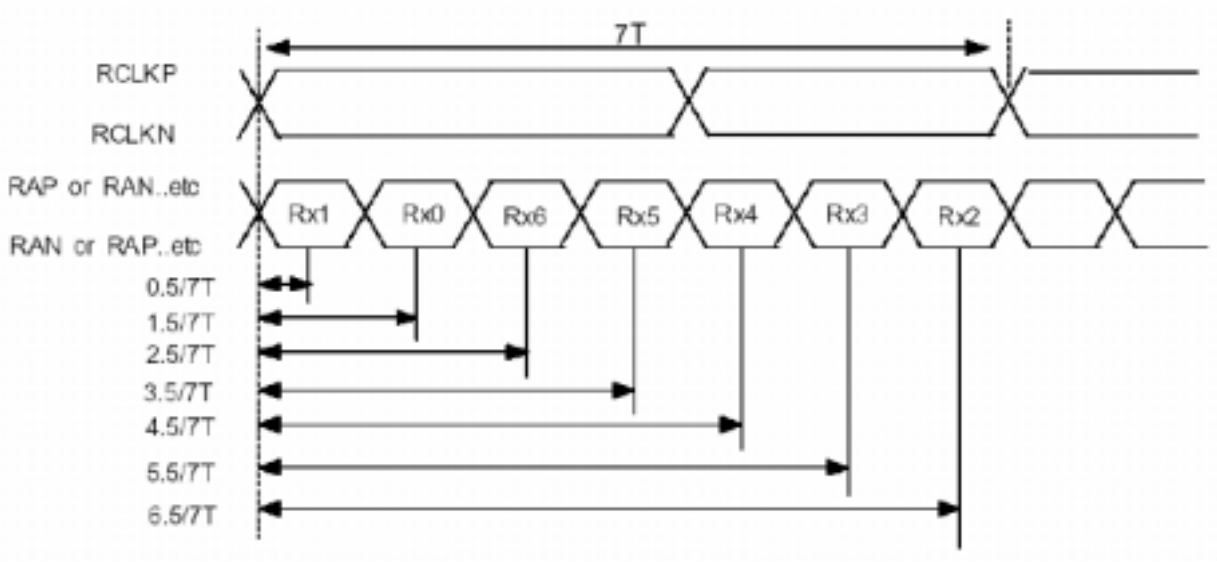
1. When the brightness becomes 50%
2. When the startup voltage(Vs) at 0°C becomes higher than the minimal Value of Vs specified above.

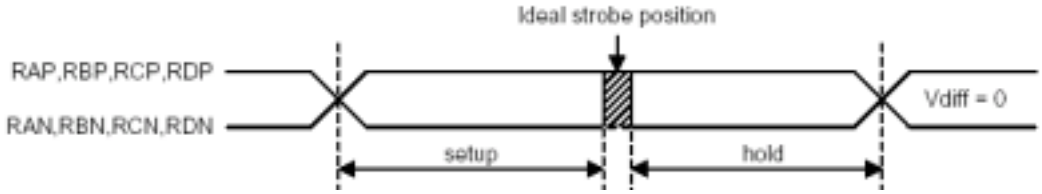
6.3 Data mapping



6.4 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Clock Frequence	fc	—	54	—	MHz	
Data Setup Time	Setup		—	—	ps	
Data Hold Time	Hold		—	—	ps	
Differential Input High Threshold	Vth	—	—	100	mV	
Differential Input Low Threshold	Vtl	-100	—	—	mV	



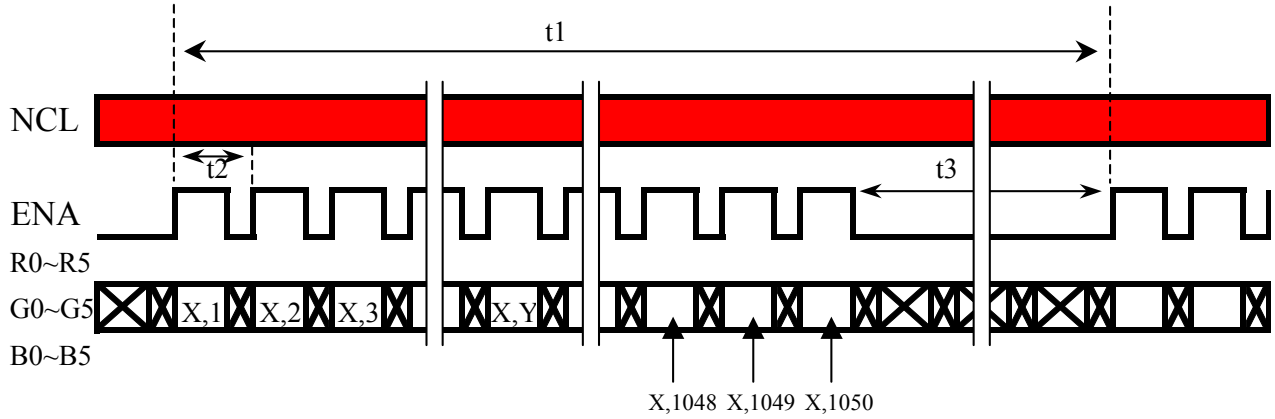


6.5 Interface Timing (DE mode) 1)2)3)4)

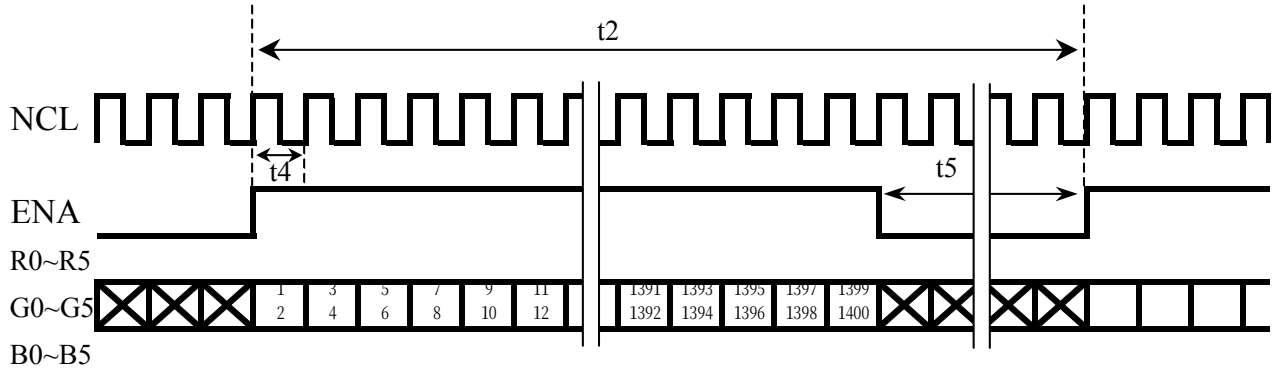
Graphic mode	DE Mode		Number of Total Horizontal lines in a frame	Number of Total Pixel clocks in a Horizontal line
	Horizontal Timing (t5)	Vertical Timing (t4)		
	Horizontal Blank (t5)	Vertical Blank (t4)		
	Min	Min	Typ	Typ
SXGA+	120	2	1066	844

6.7 Timing Diagram of Interface Signal (DE Only mode)

(1)Vertical



(2)Horizontal



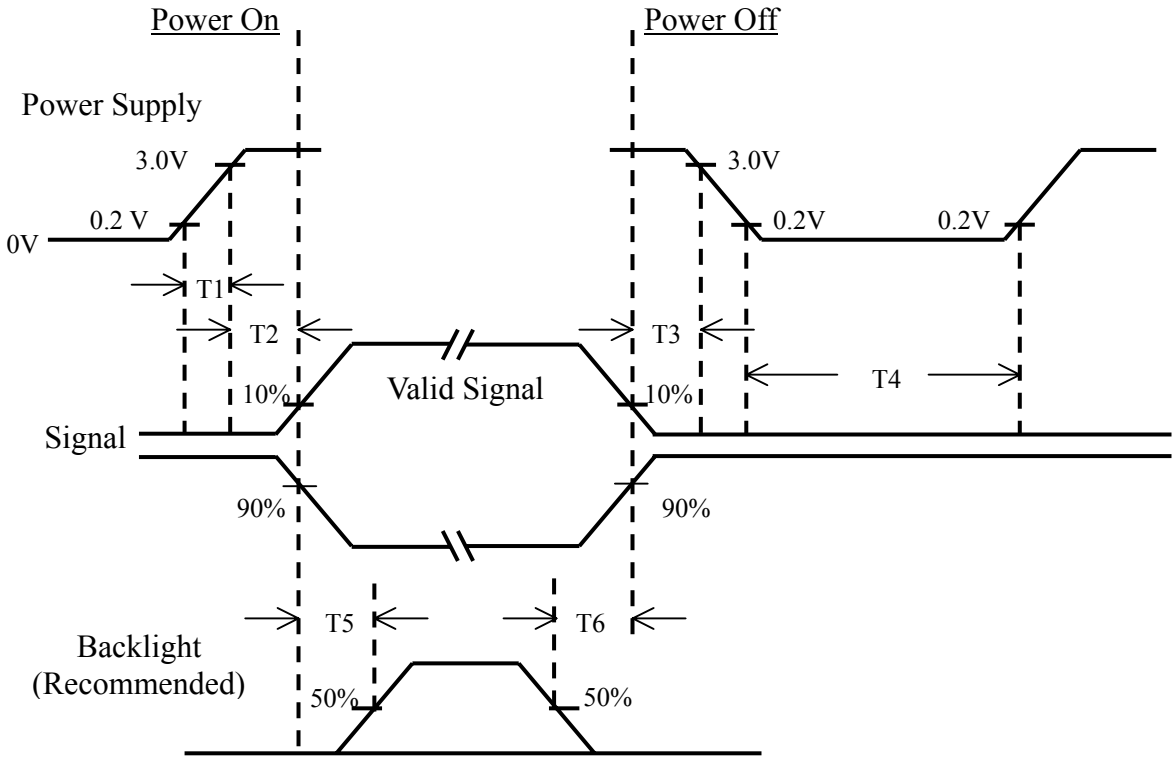
Note 1) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note 2) When ENAB is fixed to “L” level after NCLK input, the panel is displayed as black. However, a flicker may be occurred on the display. When ENAB is fixed to “H” level after NCLK input, the panel will be damaged.

Note 3) Do not fix NCLK to “H” or “L” level while the V_{DD} (+3.3V) is supplied. If NCLK is fixed to “H” level or “L” level for certain period while the V_{DD} (+3.3V) is supplied, the panel may be damaged.

Note 4) Please adjust LCD operating signal timing and FL driving frequency, to optimize the display quality. There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition (especially driving frequency).

6.8 Power ON/OFF Sequence



Power ON/OFF Sequence

470 usec < T1 ≤ 10 msec
0 < T2 ≤ 50 msec
0 < T3 ≤ 50 msec:
1sec < T4

Back-ligh:
200 ms ≤ T5
200 msec < T6

Note (1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD}.

(2) Apply the lamp volatge within the LCD operation range. When the back-light turns on before the LCD operation or the LCD truns off before the back-light turns off, the display may momentarily become white.

(3) In case of V_{DD} = off level, please keep the level of input signal on the low or keep a high impedance.

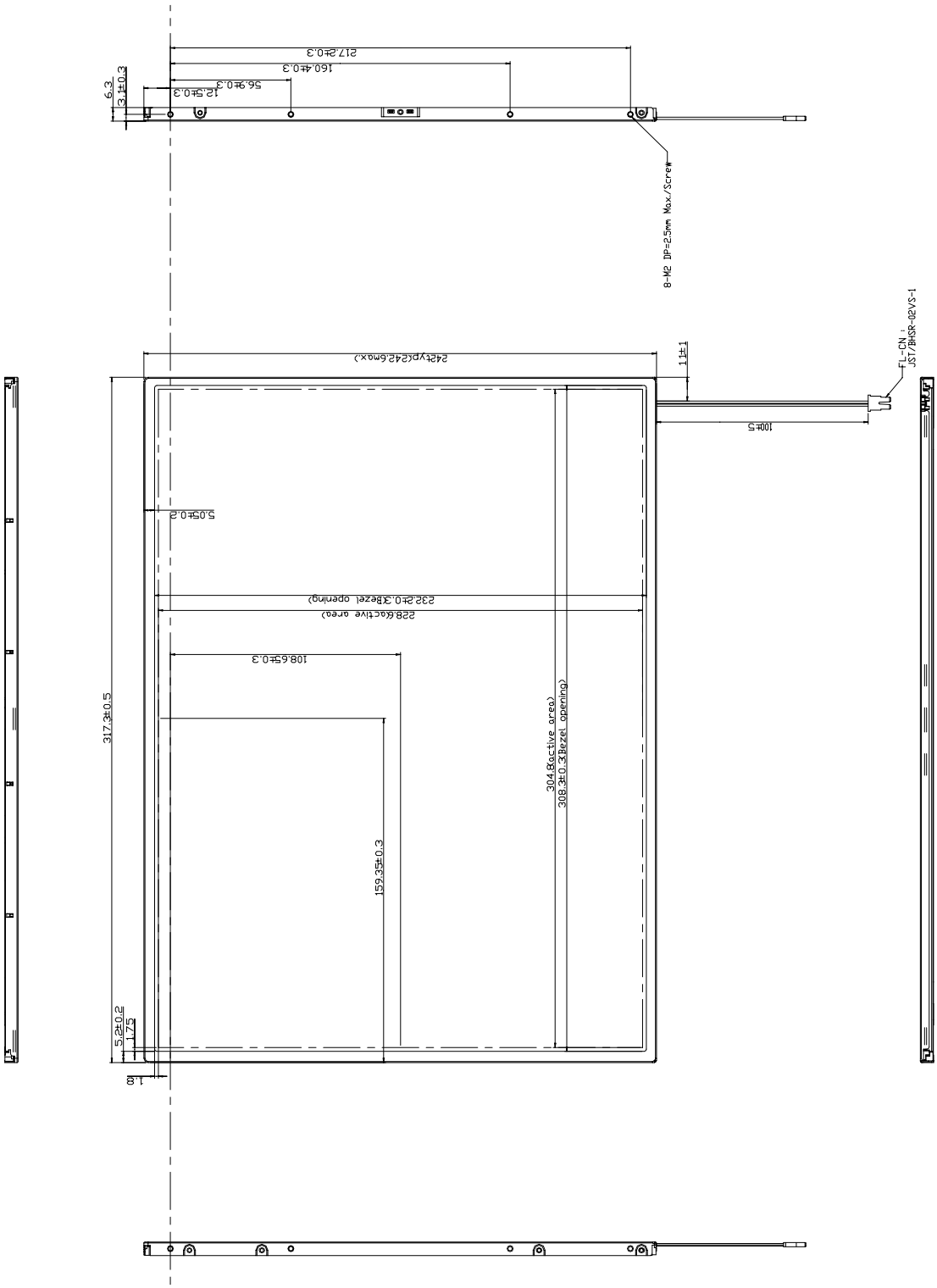
(4) T4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

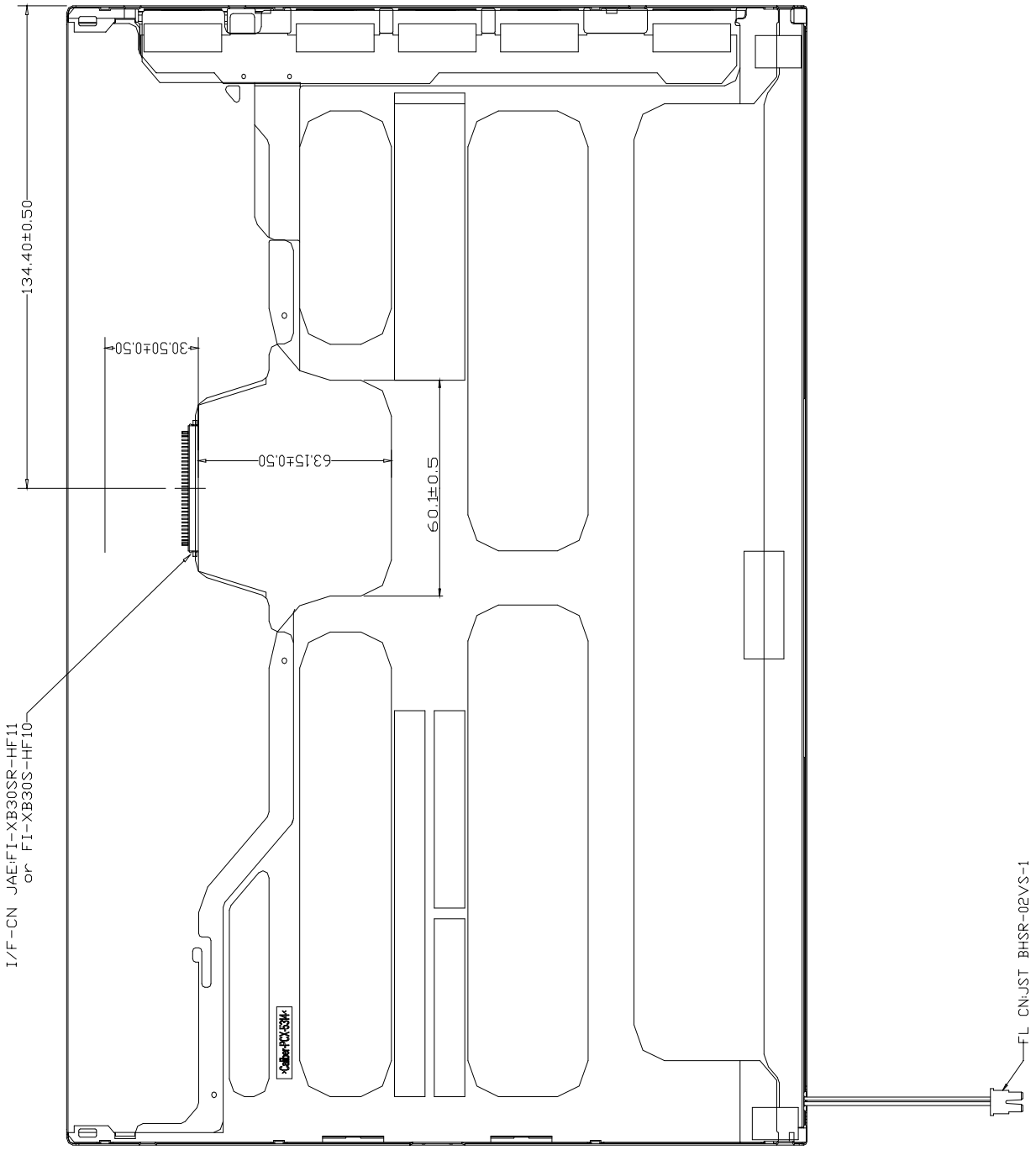
7.0 OUTLINE DIMENSION

Unit : mm

7.1 Front View Outline Dimension



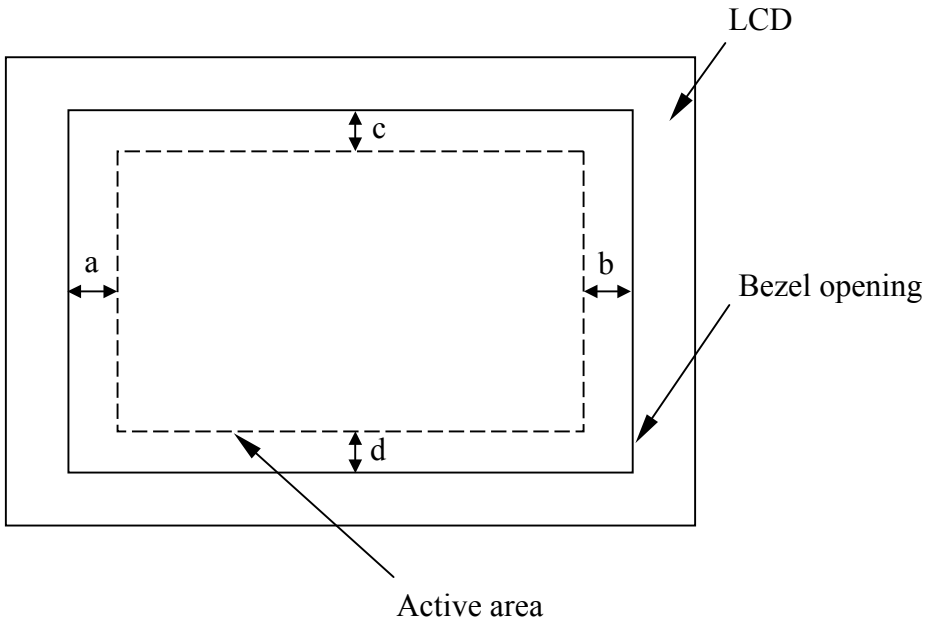
7.2 Back View Outline Dimension



7.3 Tolerance of distance between active area and bezel opening

$|a-b| \leqq$ **0.9** mm

$|c-d| \leqq$ **0.9** mm



8.0 LOT MARK

8.1 Lot Mark

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

code 1,2,3,4,5,6: HannStar internal flow control code.
code 7: production location.
code 8: production year.
code 9: production month.
code 10,11,12,13,14,15: serial number.

Note (1) Production Year

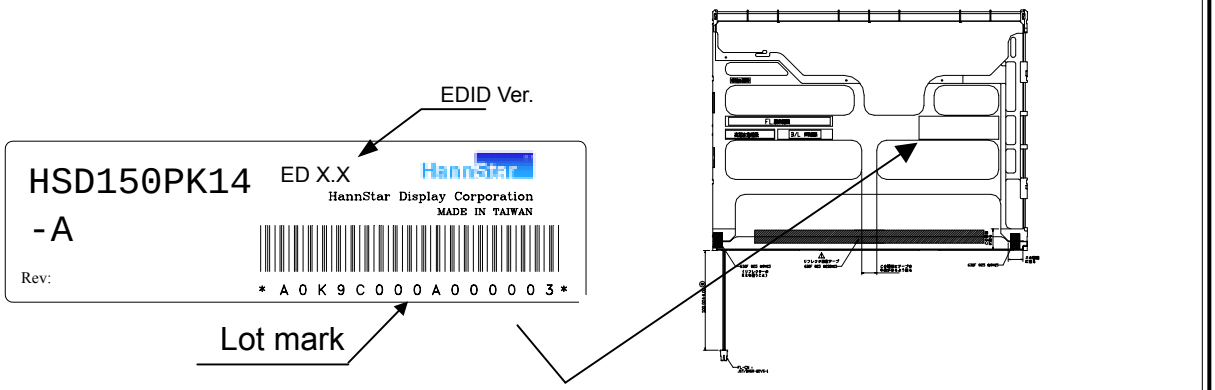
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mark	9	0	1	2	3	4	5	6	7	8

Note (2) Production Month

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

8.2 Location of Lot Mark

(1) The label is attached to the backside of the LCD module.
(2) This is subject to change without prior notice.



9.0 PACKAGE SPECIFICATION

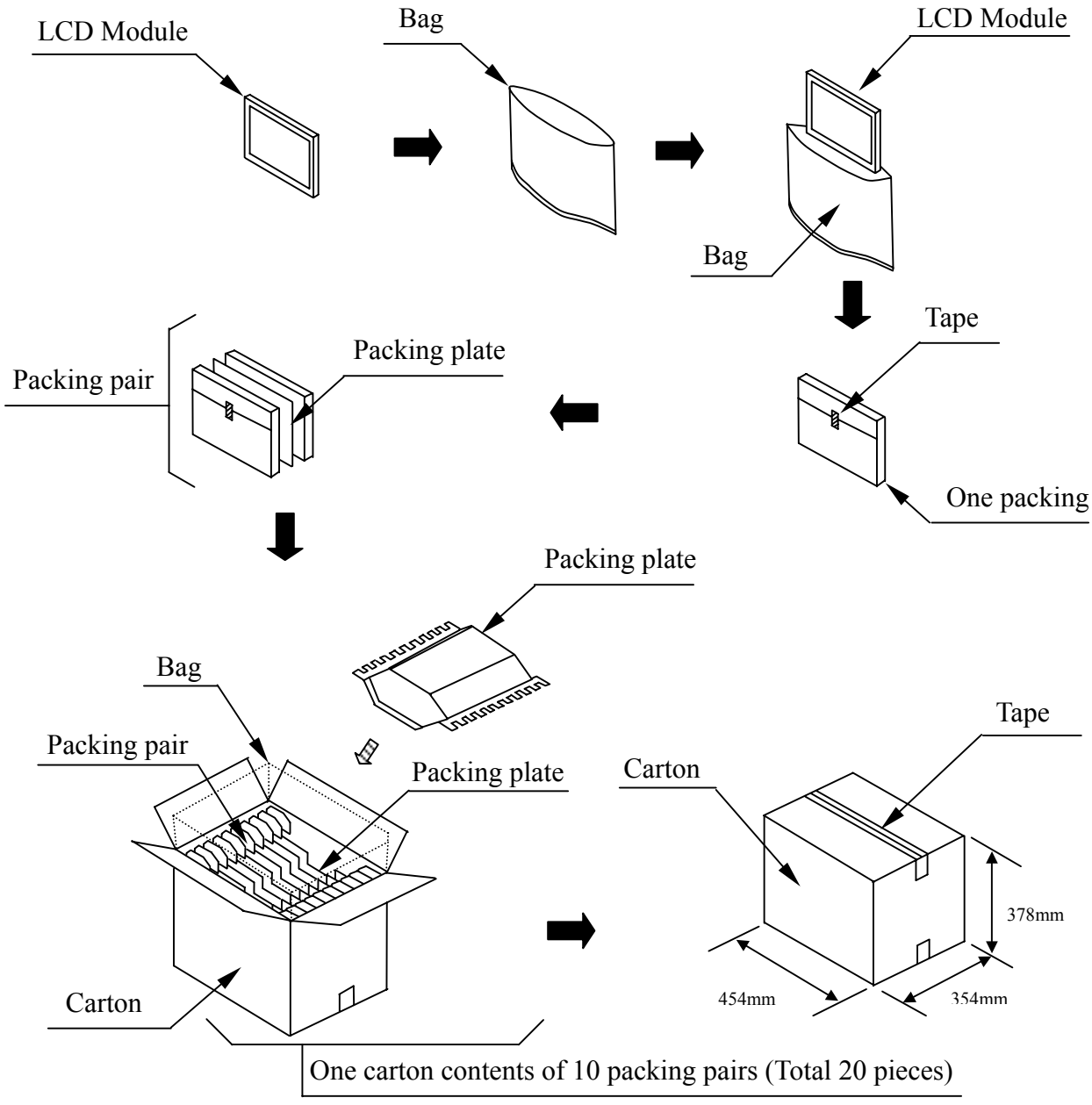
9.1 packing form

(1) package quantity in one carton: 20 pieces.

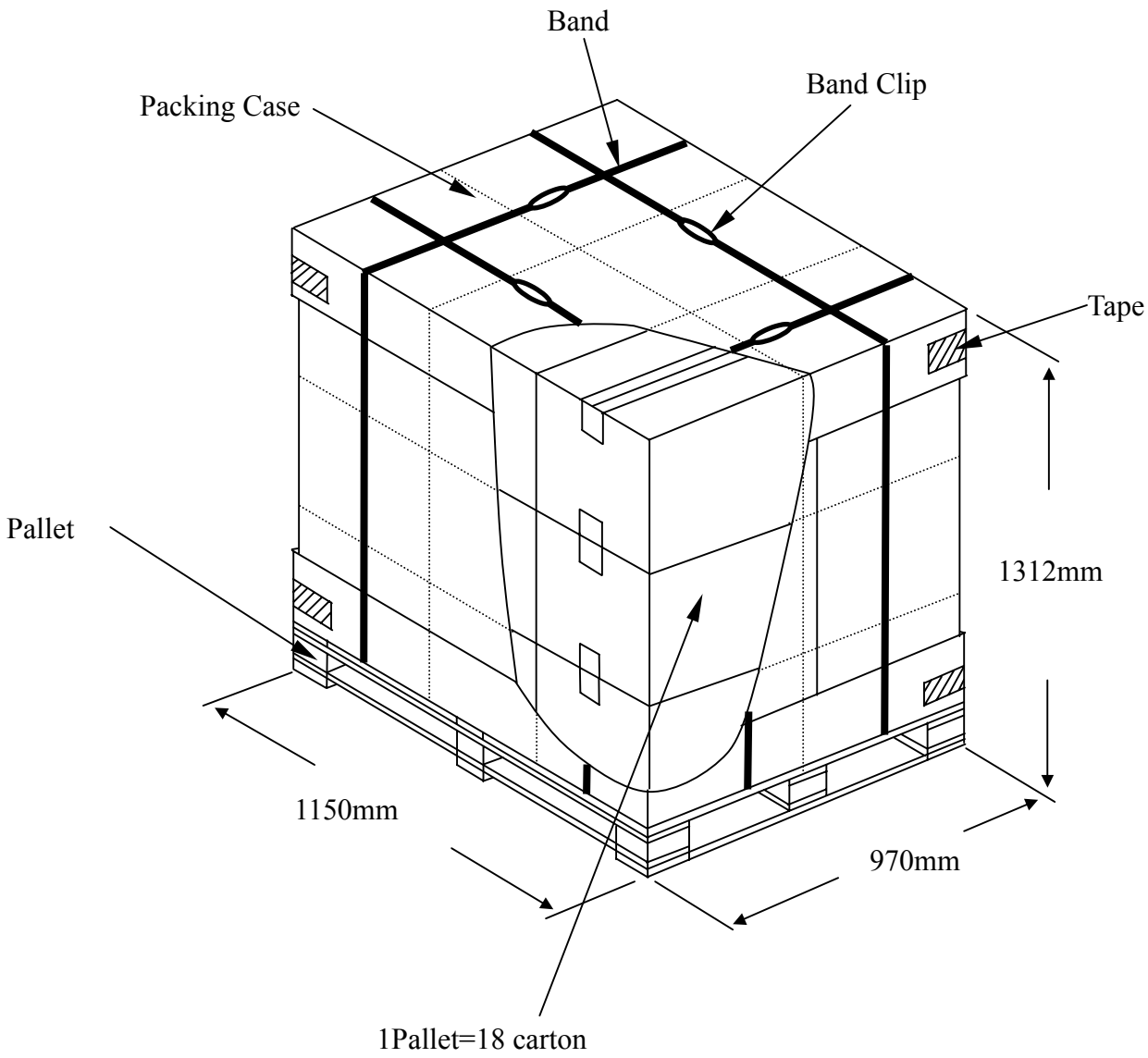
(2) carton size: 454±3 mmX354±3 mmX378±3 mm.

(3) for domestic transportation only.

9.2 packing assembly drawings



9.3 Pallet transportation specification



10.0 GENERAL PRECAUTION

10.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

10.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

10.3 Breakage of LCD Panel

2.2.1 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

2.2.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.

2.2.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

2.2.4 Handle carefully with chips of glass that may cause injury, when the glass is broken.

10.4 Electric Shock

10.4.1 Disconnect power supply before handling LCD module.

10.4.2 Do not pull or fold the CCFL cable.

10.4.3 Do not touch the parts inside LCD modules and the fluorescent lamp's connector or cables in order to prevent electric shock.

10.5 Absolute Maximum Ratings and Power Protection Circuit

10.5.1 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

10.5.2 Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

10.5.3 It's recommended to employ protection circuit for power supply.

10.6 Operation

10.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

10.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

10.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

10.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

10.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

10.7 Mechanism

Please mount LCD module by using mounting holes arranged in four corners tightly.

10.8 Static Electricity

10.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

10.8.2 Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

10.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

10.10 Disposal

When disposing LCD module, obey the local environmental regulations.