To :

Date : March.30, 2004

Product Information

Model : HSD150SX84 - G

Note: 1. Please contact HannStar Display Corp. before designing your product based on this module specification.
2. 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.	Updated No.	Date	Description of change
01	—	Jan. 06, 2004	Product Information for HSD150SX84-G was first issued.
02	---	Jan.08,2004	Modify table 3.1 in page 7.
03	---	Mar.30 ,2004	1.Modify module block diagram in page 12. 2.Modify Backlight unit note in page 18.

Contents

1.0 GENERAL DESCRIPTIONS

1.1 Introduction

HannStar Display model **HSD150SX84-G** 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, the voltage reference, common voltage, DC-DC converter, column, and row driver circuit. This TFT LCD has a 15-inch diagonally measured active display area with XGA resolution (768 vertical by 1024 horizontal pixel array).

1.2 Features

- 15” XGA TFT LCD panel
- 2 CCFLs Backlight system
- Supported XGA (V:768 lines, H:1024 pixels) resolution
- Supported to 75Hz refresh rate
- Without LCD Timing Controller

1.3 General information

Item	Specification	Unit
Outline dimension	321.0×249.0×10.5 (typ.)	Mm
Display area	304.1(H) x 228.1(V) (15.0” diagonal)	Mm
Number of Pixel	1024(H) x 768(V)	Pixels
Pixel pitch	0.297(H) x 0.297(V)	Mm
Pixel arrangement	RGB Vertical stripe	
Display color	262,144 (6-bits)	
Display mode	Normally white	
Surface treatment	Antiglare, Hard-Coating(3H)	
Weight	900(typ.)	G
Back-light	2-CCFLs, Top & bottom edge side	
Input signal	Source and Gate Driver control signals	
Power consumption (with B/L)	12 W(typ.), with back light	W
Optimum viewing direction	6 o’clock	

1.4 Applications

- Desktop monitors
- Display terminals for AV applications
- Monitors for industrial applications

1.5 Mechanical Information

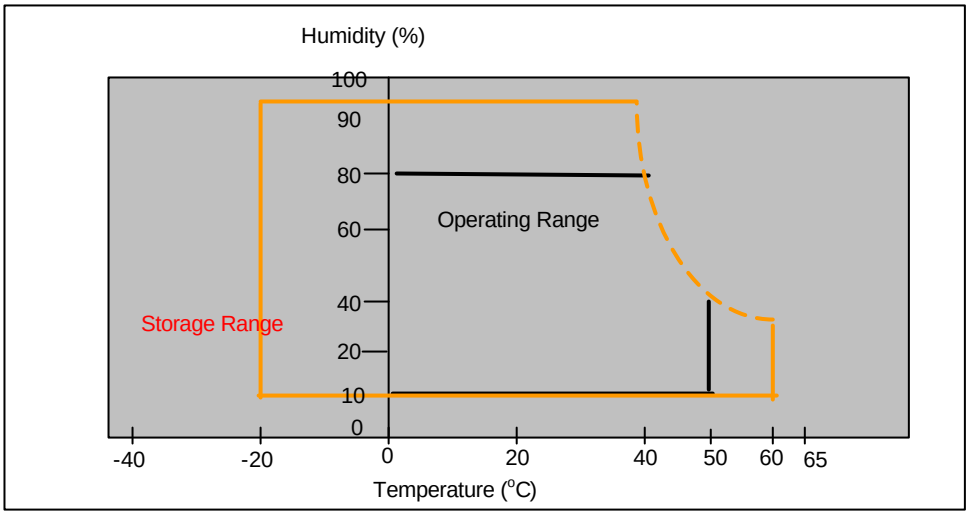
Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	320.5	321.0	321.5	mm
	Vertical(V)	248.5	249.0	249.5	mm
	Depth(D)	--	10.5	10.8	mm
Weight (without inverter)		--	900	950	g
Torque of customer screw hole				3.0	Kgf*Cm

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}	--	70	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) **5-500-5**Hz sine wave, X,Y,Z each directions, 30 min/cycle.
(3) 11ms, ±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) **2** hrs. (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}	+3.0	+3.8	V(DC)	(1)(2)
Logic input voltage	V_{SIG}	-0.3	V_{DD} +0.3	V	(1)(2)

2.2.2 Back Light Unit:

Item	Symbol	Min.	Max.	Unit	Note
Lamp voltage	V_L	0	2000	V(rms)	(1)(2)
Lamp current	I_L	—	9.0	mA	(1)(2)
Lamp frequency	f_L	0	80	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 Normal Operating Conditions.
(2) Within Ta=25±2°C

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\Theta=0^o$ $\phi=0^o$ Normal viewing angle	--	450	--		(1)(2)
Response time	Rising	TR +TF		--	25	--	msec	(1)(3)
	Falling							
White luminance (center of screen)		Y_L		--	250		cd/m^2	(1)(4)(5) (IL=8.0mA)
Color chromaticity (CIE1931)	Red	Rx		0.604	0.634	0.664		(1)(4)
		Ry		0.309	0.339	0.369		
	Green	Gx		0.255	0.285	0.315		
		Gy		0.557	0.587	0.617		
	Blue	Bx		0.114	0.144	0.174		
		By		0.045	0.075	0.105		
	White	Wx		0.280	0.310	0.340		
		Wy		0.300	0.330	0.360		
Viewing angle	Hor.	Θ_L	CR>10	--	60	--		
		Θ_R		--	60	--		
	Ver.	Θ_H		--	45	--		
		Θ_L		--	55	--		
Viewing angle	Hor.	Θ_L	CR>5	--	75	--		
		Θ_R		--	75	--		
	Ver.	Θ_H		--	50	--		
		Θ_L		--	65	--		
Brightness uniformity		B_{UNI}	$\Theta=0^o$ $\phi=0^o$	--	80	--	%	(6)
Crosstalk		CT(n)		--	--	1.3	%	(7)

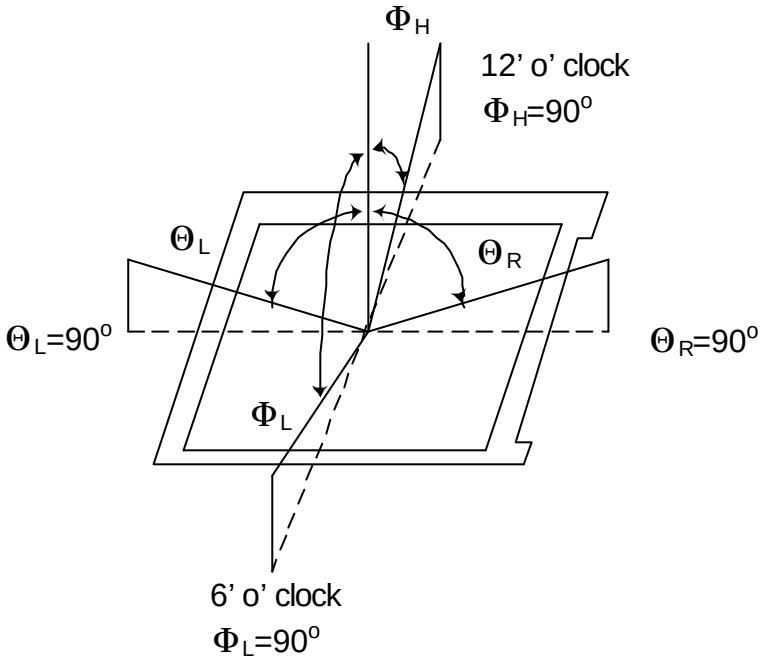
3.2 Measuring Condition

- Measuring surrounding : dark room
- Lamp current I_{BL} : (8.0)±0.1mA, lamp freq. F_L=55 KHz,Inverter :HIU-766(11pf)
- V_{DD1}=3.3V, f_V=60Hz, f_{DCLK}=32.5MHz
- Surrounding temperature : 25±2°C
- 30min. Warm-up time.

3.3 Measuring Equipment

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

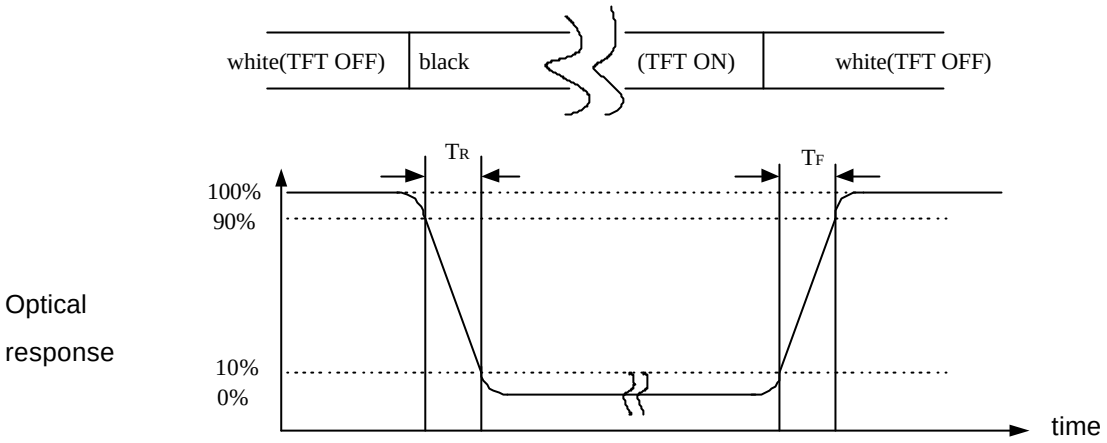
Note (1) Definition of Viewing Angle:



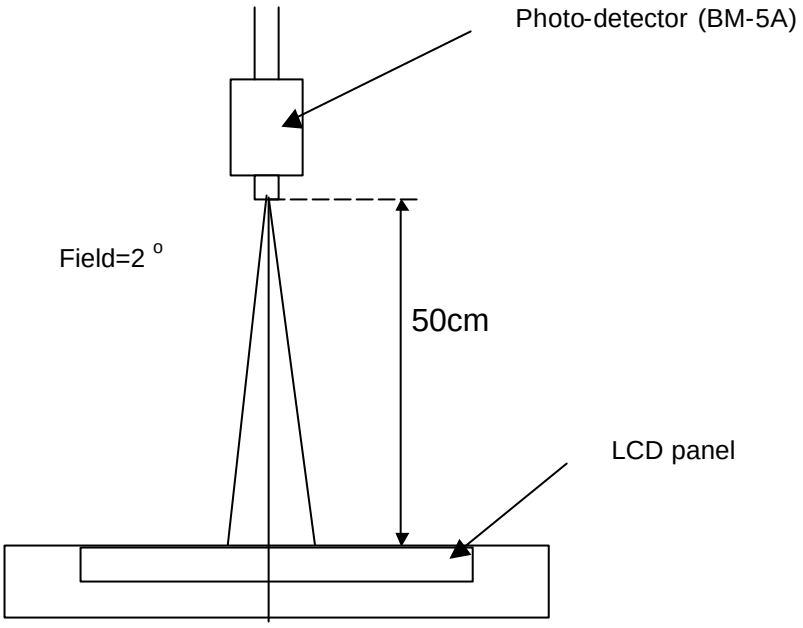
Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

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

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

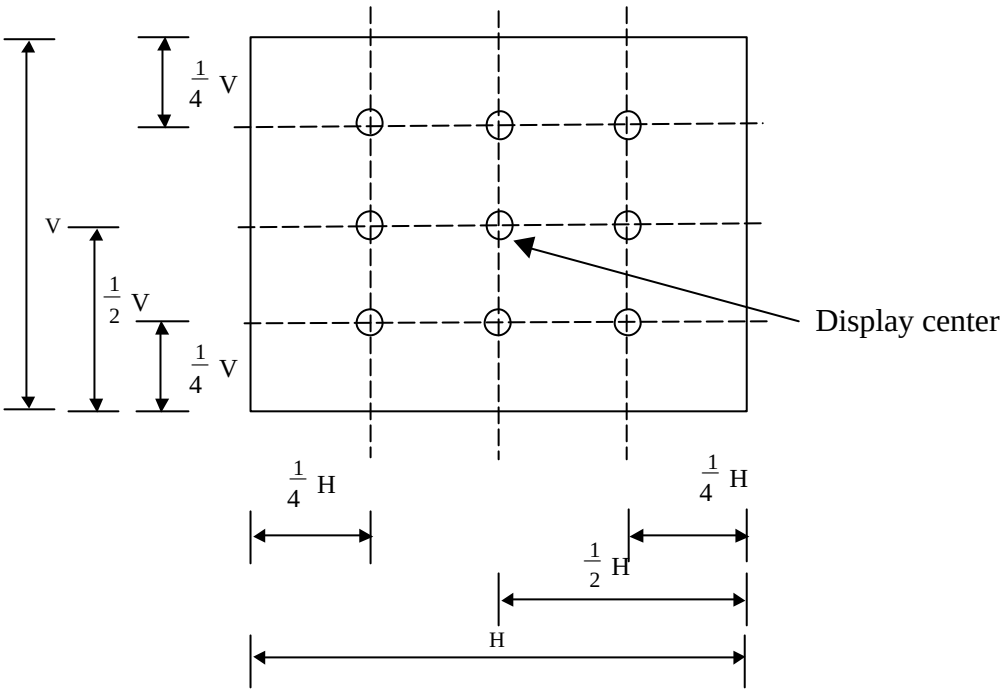


Note (4) Optical characteristic measurement setup



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

$$\text{Average Luminance} = \frac{Y1+Y2+Y3+Y4+Y5}{5}$$



Note (6) Definition of brightness uniformity

$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

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

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

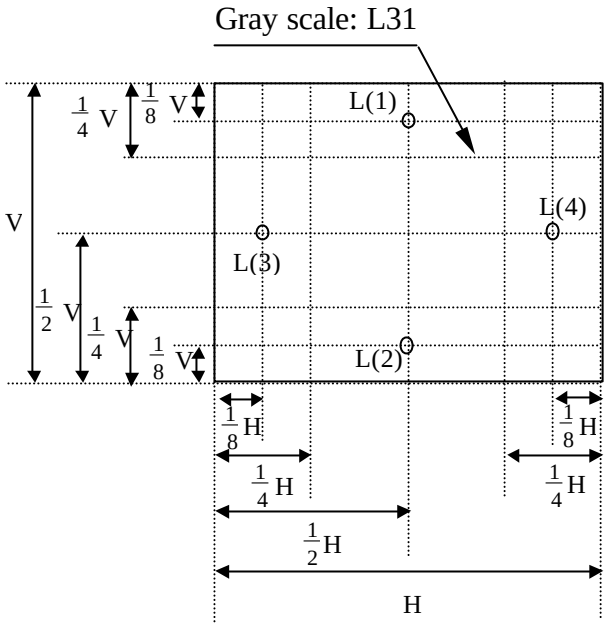
Where L(n) = Luminance of point "n" at pattern A (cd/m^2) , n=1 4

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

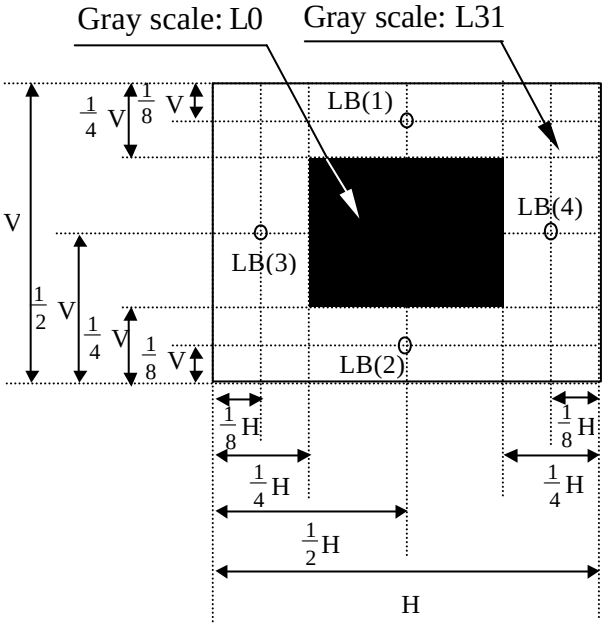
The location measured will be exactly the same in both patterns.

L0: Luminance with all pixels black

L63: Luminance with all pixels white



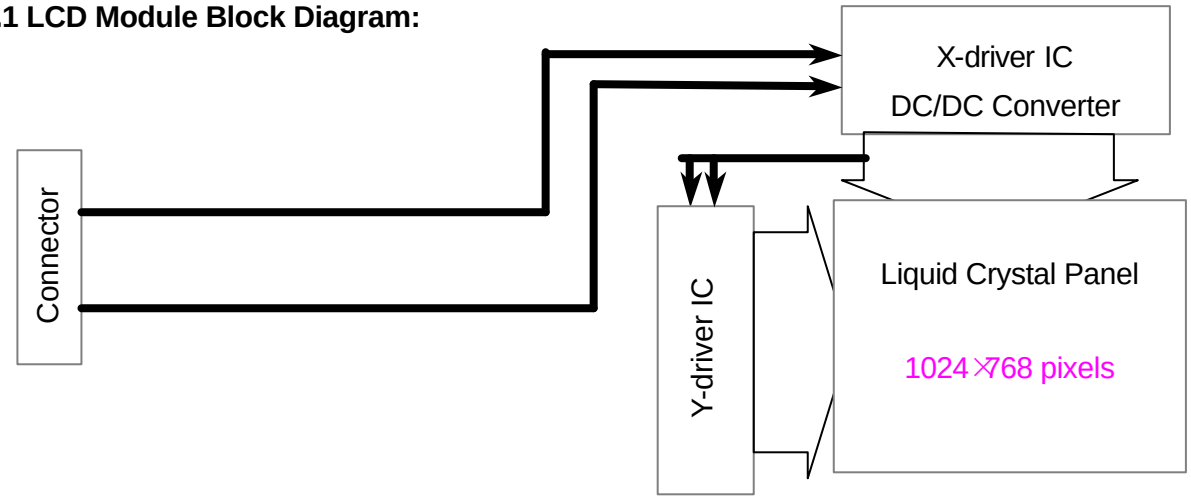
Pattern A



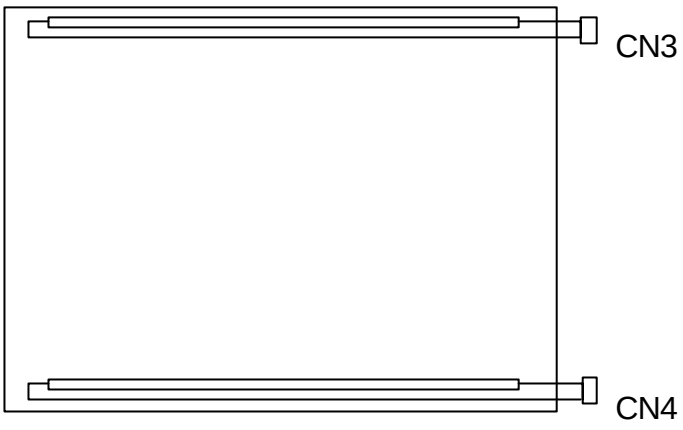
Pattern B

4.0 BLOCK DIAGRAM

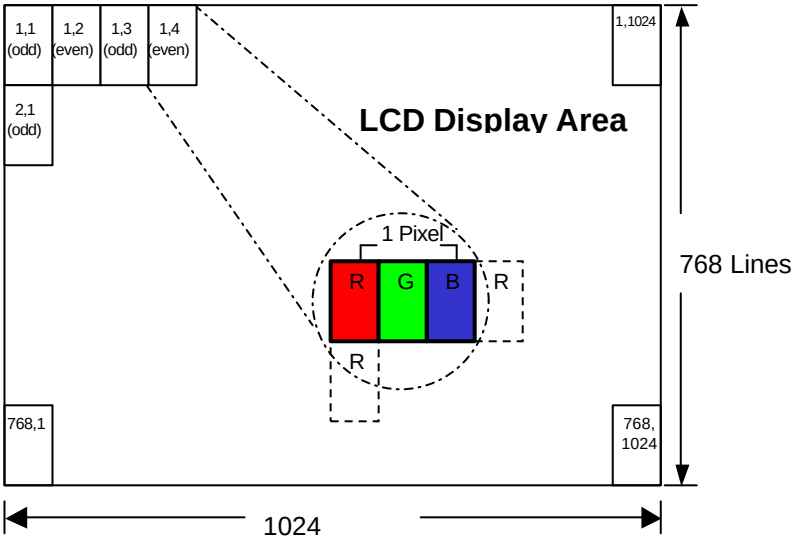
4.1 LCD Module Block Diagram:



4.2 Back Light Unit



4.3 Pixel Format



4.4 Relationship between Displayed Color and Input Data

	Display	MSB R5	R4	R3	R2	R1	LSB R0	MSB G5	G4	G3	G2	G1	LSB G0	MSB B5	B4	B3	B2	B1	LSB B0	Gray scale 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 and 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 I/O CONNECTION PIN ASSIGNMENT

5.1 Interface FPC Connector (40-pins x 2) (Hirose: FH12-40S-0.5SH)

I/F FRC Connector (J1)			I/F FRC Connector (J2)		
Pin No.	**Symbol**	**Description**	**Pin No.**	**Symbol**	**Description**
1	**NC**	**No Connecting**	1	VDD	Digital Power Input (DC +3.3V)
2	**NC**	**No Connecting**	2	VDD	Digital Power Input (DC +3.3V)
3	GND	Ground	3	GND	Ground
4	GND	Ground	4	GND	Ground
5	EB5	Even-dot Blue Data bit 5 (MSB)	5	OB5	Odd-dot Blue Data bit 5 (MSB)
6	EB4	Even-dot Blue Data bit 4	6	OB4	Odd-dot Blue Data bit 4
7	EB3	Even-dot Blue Data bit 3	7	OB3	Odd-dot Blue Data bit 3
8	EB2	Even-dot Blue Data bit 2	8	OB2	Odd-dot Blue Data bit 2
9	EB1	Even-dot Blue Data bit 1	9	OB1	Odd-dot Blue Data bit 1
10	EB0	Even-dot Blue Data bit 0 (LSB)	10	OB0	Odd-dot Blue Data bit 0 (LSB)
11	GND	Ground	11	GND	Ground
12	EG5	Even-dot Green Data bit 5 (MSB)	12	OG5	Odd-dot Green Data bit 5 (MSB)
13	EG4	Even-dot Green Data bit 4	13	OG4	Odd-dot Green Data bit 4
14	EG3	Even-dot Green Data bit 3	14	OG3	Odd-dot Green Data bit 3
15	EG2	Even-dot Green Data bit 2	15	OG2	Odd-dot Green Data bit 2
16	EG1	Even-dot Green Data bit 1	16	OG1	Odd-dot Green Data bit 1
17	EG0	Even-dot Green Data bit 0 (LSB)	17	OG0	Odd-dot Green Data bit 0 (LSB)
18	GND	Ground	18	GND	Ground
19	ER5	Even-dot Red Data bit 5 (MSB)	19	OR5	Odd-dot Red Data bit 5 (MSB)
20	ER4	Even-dot Red Data bit 4	20	OR4	Odd-dot Red Data bit 4
21	ER3	Even-dot Red Data bit 3	21	OR3	Odd-dot Red Data bit 3
22	ER2	Even-dot Red Data bit 2	22	OR2	Odd-dot Red Data bit 2
23	ER1	Even-dot Red Data bit 1	23	OR1	Odd-dot Red Data bit 1
24	ER0	Even-dot Red Data bit 0 (LSB)	24	OR0	Odd-dot Red Data bit 0 (LSB)
25	GND	Ground	25	GND	Ground
26	CPH1	Pixel Clock Input	26	CPH2	Pixel Clock Input
27	GND	Ground	27	GND	Ground
28	GND	Ground	28	GND	Ground
29	STH	Horizontal Start Pulse	29	NC	No Connecting
30	LOAD	Source Driver Latch Pulse	30	NC	No Connecting
31	POL	Source Driver Output Polarity control	31	NC	No Connecting
32	REV	Data Reverse Control Signal	32	NC	No Connecting
33	GND	Ground	33	NC	No Connecting
34	GND	Ground	34	NC	No Connecting
35	STV	Vertical Start Pulse	35	NC	No Connecting
36	STV2	Vertical Start Pulse 2	36	NC	No Connecting
37	CPV	Vertical Clock Input	37	NC	No Connecting
38	OE	Gate Driver Output Enable Signal	38	NC	No Connecting
39	GND	Ground	39	GND	Ground
40	GND	Ground	40	GND	Ground

5.2 Back Light Unit (CCFL) Connectors:

CN3, 4: CCFL Power Source (BHR-03VS-1/Japan Solderless Terminal MFG Co., LTD)

Mating connector: SM02 (8.0)B-BHS-1/ Japan Solderless Terminal MFG Co., LTD

Terminal No.	Symbol	Function
1	VL	CCFL power supply (high voltage)
2	NC	No connection
3	GL	CCFL power supply (low voltage)

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

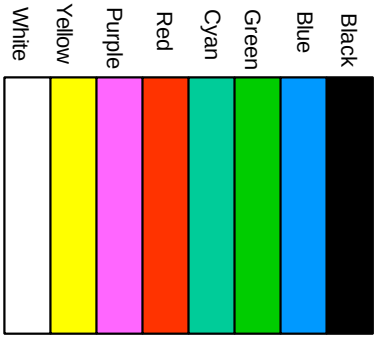
6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module:

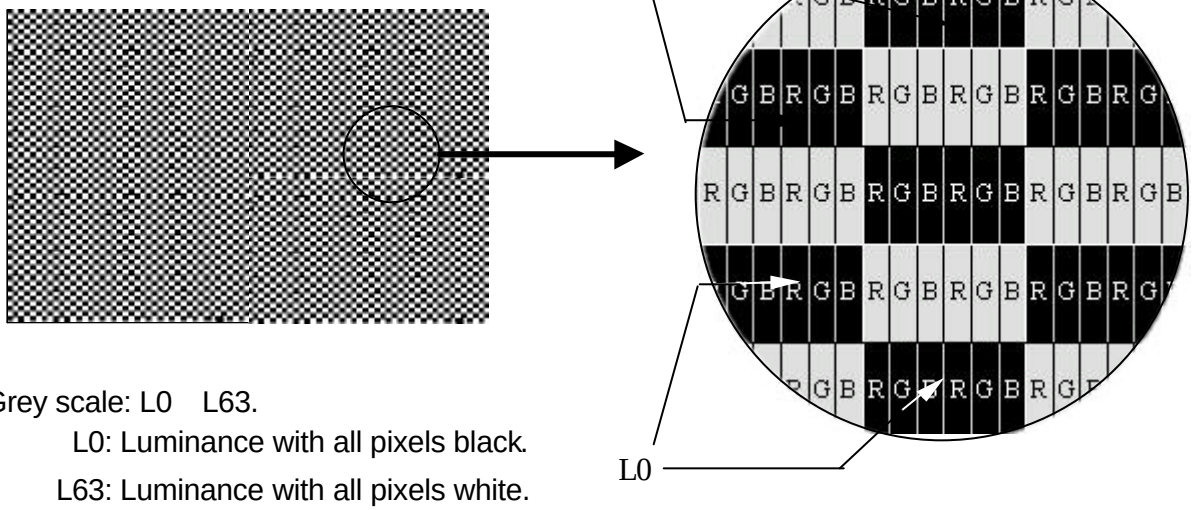
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of power supply		V_{DD}	3.0	3.3	3.6	V	
Current of power supply	V-Color	I_{DD1}	182	282	382	mA	(1)(3)
	Mosaic	I_{DD2}	276	376	476	mA	(1)(3)
Vsync frequency		f_V	-	60	75	Hz	(2)(3)
Hsync frequency		f_H	-	48.36	75	KHz	
Frequency		f_{DCLK}	-	65.00	80	MHz	
Input rush current		I_{RUSH}	---	---	1.5	A	(3)(4)

Note (1)

1). V-Color :



2). Mosaic : Dot checker image



Grey scale: L0 L63.

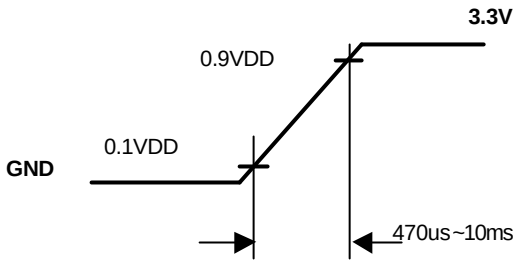
L0: Luminance with all pixels black.

L63: Luminance with all pixels white.

Note (2) When fv is too low, a flicker may be occurred on the display.

Note (3) Measured with HannStar Timing Control Board SX87

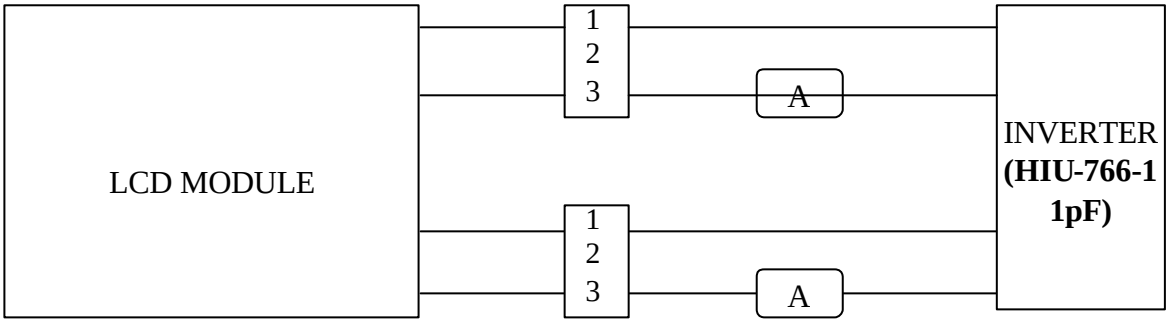
Note (4) Input Rush Current condition



6.2 **Back-Light Unit**

The back-light system is an edge-lighting type with 2 CCFL(Cold Cathode Fluorescent Lamp). The characteristics of the lamp are shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp current	IL	3.0	8.0	9.0	mA(rms)	(1)
Lamp voltage	VL	513	570	627	V(rms)	I_L=8.0mA
Frequency	fL	50	55	80	KHz	(2)
Operating lamp life time	Hr	30,000	--	--	Hour	(3)
Startup voltage	Vs	--	--	1040	V(rms)	at 25°C
				1350		at 0°C



Note (1)

Lamp current is measured with current meter for high frequency as shown below. Specified values are for a single lamp. To exceed 8.0mA, life time accelerate drop down and if to exceed 9.0mA has safety problem. If current lower than 3.0mA, CCFL would be unstable or damaged.

Note (2)

Lamp frequency may produce interference with horizontal synchronous frequency and this may cause ripple noise on the display. Therefore lamp frequency shall be kept away 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, Typical IL value indicated in the above table and fL=50kHz until the brightness becomes less than 50%

Note (4)

CCFL inverter should be able to provide a voltage over specified value (Vs) in the above table. Lamp units need at least Vs value shown above to ignition.

Note (5)

The voltage over specified value (Vs) should be applied to the lamp more than 1 second after startup. Otherwise, the lamp may not be turned on. The used lamp current is the lamp typical current.

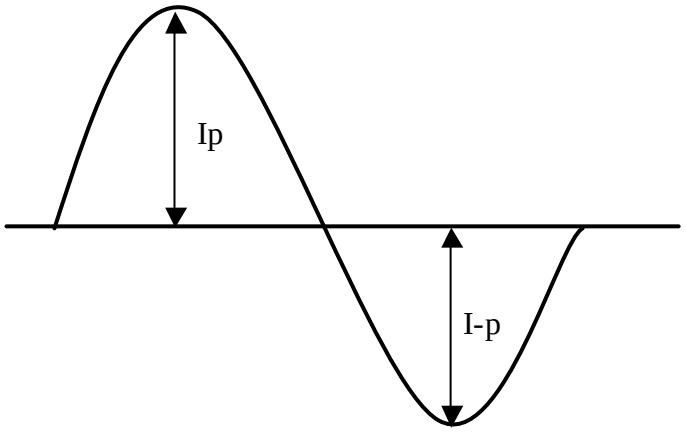
Note (6)

The output voltage waveform and current waveform of the inverter must be symmetrical (Unsymmetrical ratio is less than 10%). Please do not use the inverter which has unsymmetrical voltage and current waveform, and spike waveform. The inverter design which can provide the best optical performance, power efficiency, and lamp life should under the following conditions.

a. The asymmetry rate of the inverter waveform should be less than 10%.

b. The distortion tae of the waveform should be within √2±10%.

c. The inverter output waveform should be better similar to the ideal sine wave.



Asymmetry rate = $|I_p - I_{-p}| / I_{rms} \times 100\%$

Distortion rate = I_p (or I_{-p}) / I_{rms}

6.3 AC Electrical Characteristics:

6.3.1 AC Timing: (VDD1=3.0V~3.6V, TOPR=25 oC) 5)

Item		Symbol	Min.	Typ.	Max.	Unit	Signals	Note
Reference Signal (Pixel Clock)	Periodic	F1 T1=CLK T2=T1*2	50 12.5 25	65 15.384 30.769	80 20 40	MHz n-Sec n-Sec		
Reference Signal (DENB)	Line Periodic	T3=Line	526	672	900	T2		1), 2), 4)
	Line Active	T4	512	512	512	T2		
	Line Blank	T5	14	160	388	T2		
	Frame Periodic	T6	773	806	950	Lines		
	Frame Active	T7	768	768	768	Lines		
	Frame Blank	T8	5	---	---	Lines		
Vertical Periodic	Periodic	T6	773	806	950	Lines	STV	2)
	Pulse Width	T9 T10	1 ---	1 3	--- ---	Lines		
	Set-up Time	T13	700	800	---	n-Sec		
	Hold Time	T14	700	800	---	n-Sec		
Horizontal Periodic	Period	T15	---	1	---	Lines	OE CPV LOAD STH	
	Pulse Width	T16A T16B T16C T16D	1 1 2 25	 64 30.769	 100 40	u-Sec u-Sec T2 n-Sec		
	Rising Time	T17A T17B T17C T17D	 2 2	40 40 4 4	60 60	n-Sec		
	Falling Time	T12 T18A T18B T18C T18D	 2 2	 40 40 4 4	50 60 60	n-Sec		
	Set-up Time	T19A T19B	7 7	10 10	---	n-Sec	LOAD STH	
	Hold Time	T20A T20B	7 7	10 10	---	n-Sec		

Item		Symbol	Min.	Typ.	Max.	Unit	Signals	Note
6Horizontal Periodic	Period	T21	---	2	---	Lines	POL	
	Pulse Width	T22	---	1	---	Lines		
	Rising Time	T23	---	---	8	n-Sec		
	Falling Time	T24	---	---	8	n-Sec		
	Set-up Time	T25	6	---	---	n-Sec		
	Hold Time	T26	2	---	---	n-Sec		
Clock	Period	T2	25.00	30.769	40	n-Sec	CPH1 CPH2	3)
	Rising Time	T27	---	---	8	n-Sec		
	Falling Time	T28	---	---	8	n-Sec		
Image Data And Data Reverse Control Pin	Setup time	T29	6	---	---	n-Sec	ER(5:0) EG(5:0) EB(5:0) OR(5:0) OG(5:0) OB(5:0) REV	
	Hold time	T30	2	---	---	n-Sec		
Relative Signals	LOAD rising-STH rising	T31	6	---	---	T2		
	CPV rising-LOAD rising	T32	3.5	3.7	4.5	u-Sec		

Note 1) Refer to VESA standard.

Note 2) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

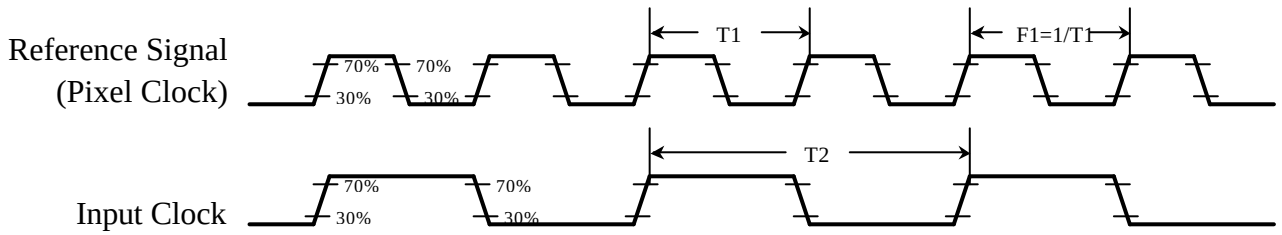
Note 3) Do not fix CPH1 and CPH2 to “H” or “L” level while the V_{DD} (+3.3V) is supplied. If CPH1 and CPH2 is fixed to “H” level or “L” level for certain period while the V_{DD} (+3.3V) is supplied, the panel may be damaged.

Note 4) Do not change t3 and t6 values in the operation. When t1 or t4 is changed, the panel is displayed as black.

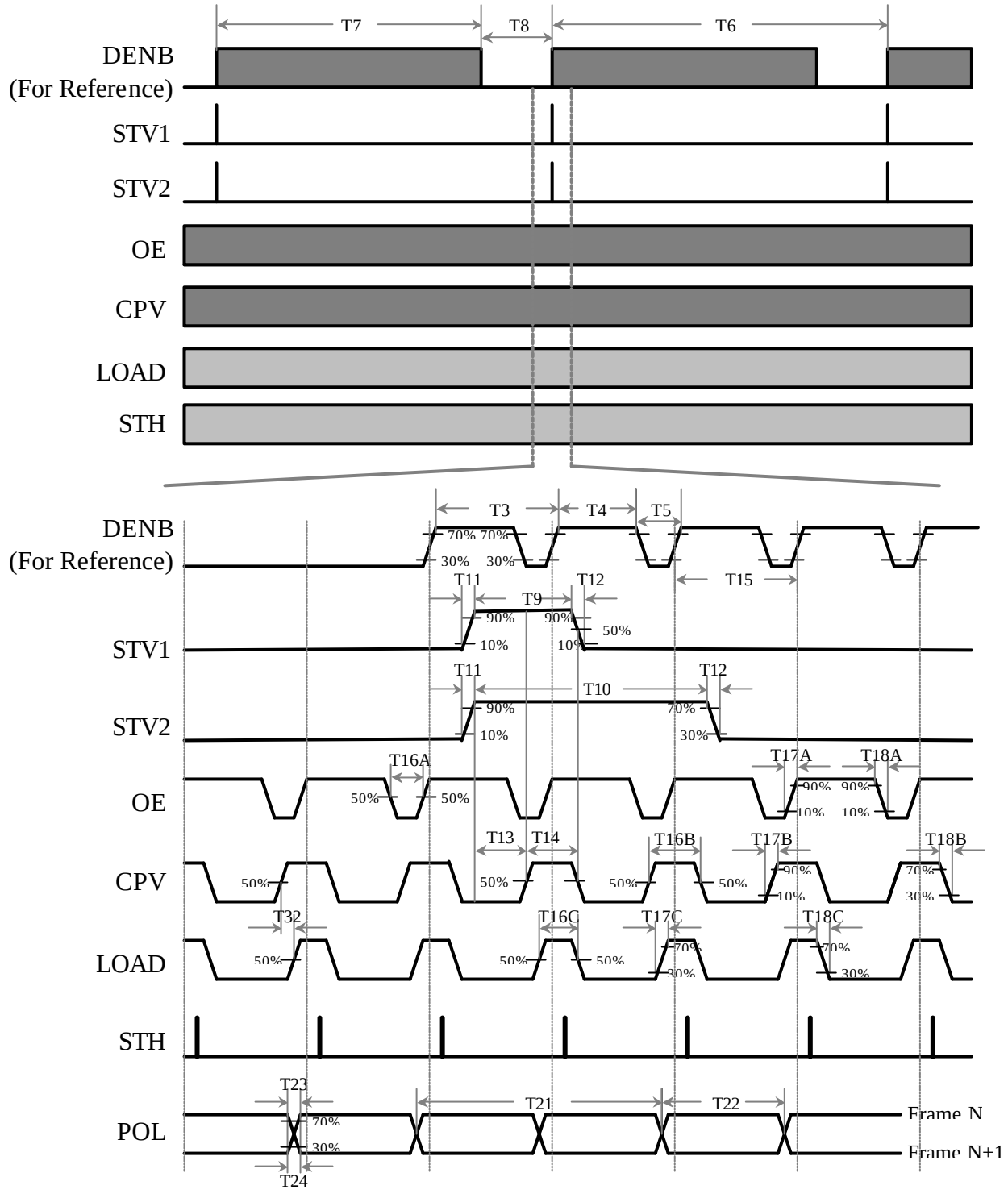
Note 5) Please adjust LCD operating signal timing and FL driving frequency, to optimize the display quality. There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition (especially driving frequency).

6.3.2 AC Timing Charts:

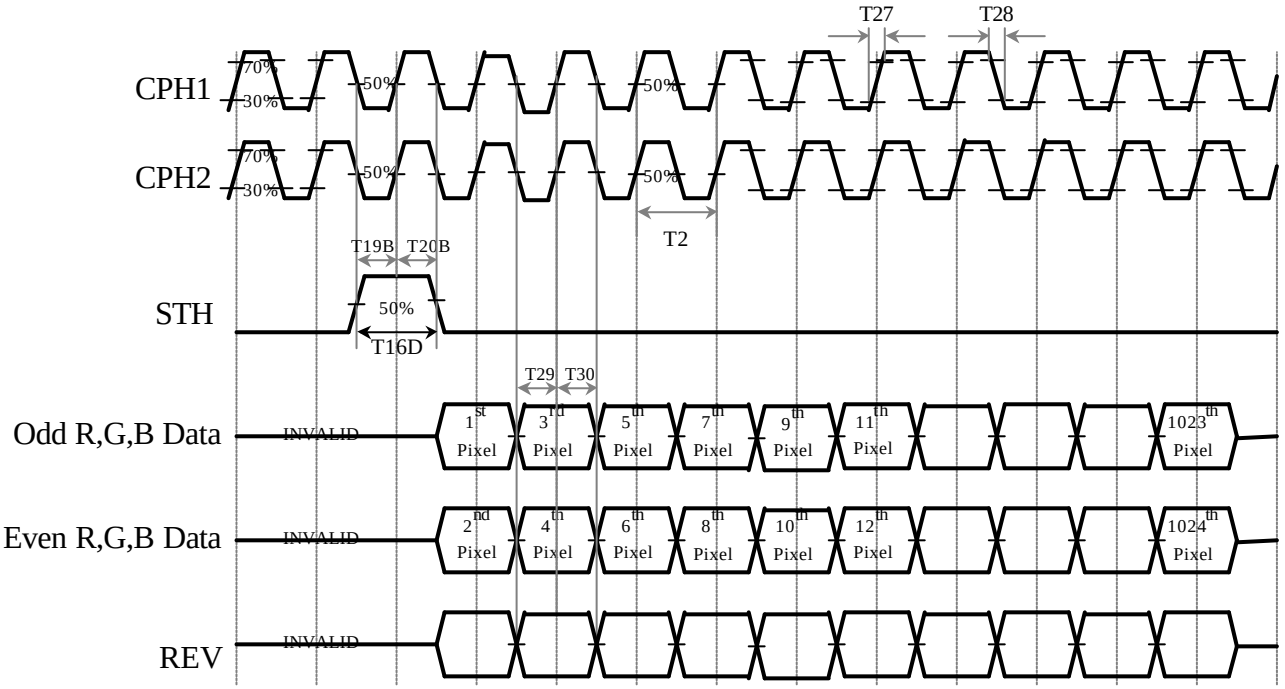
(1). Reference Signal (pixel clock):



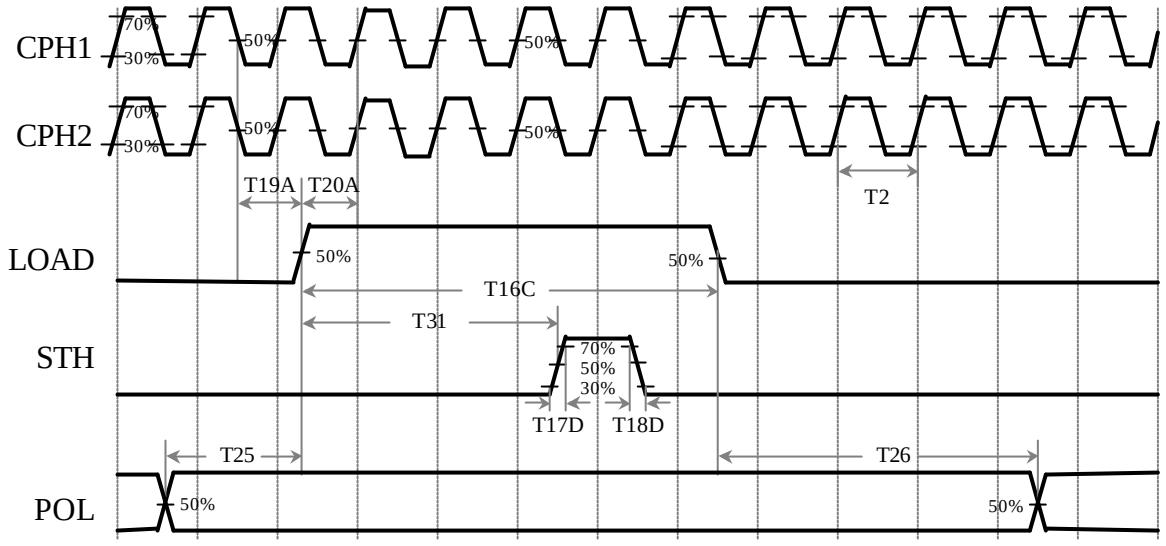
(2). Vertical Periodic (STV1, STV2, OE, CPV):



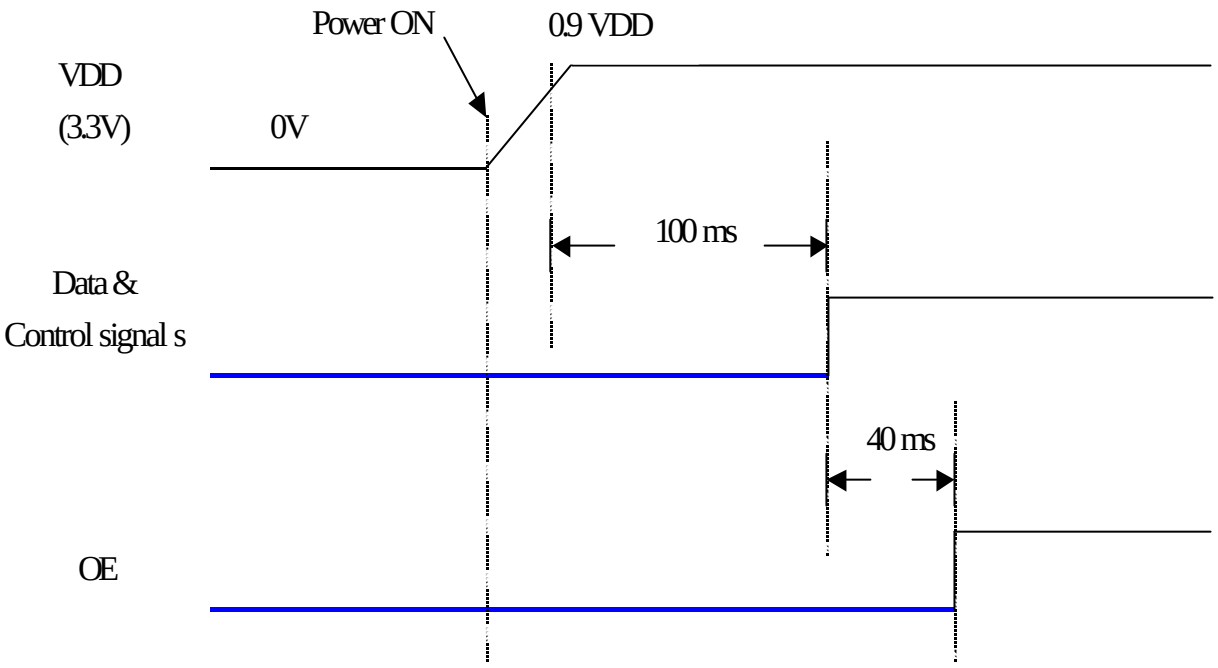
(3). Horizontal Periodic 1 (STH, CPH, DATA):



(4). Horizontal Periodic 2 (CPH, LOAD, STH, POL):

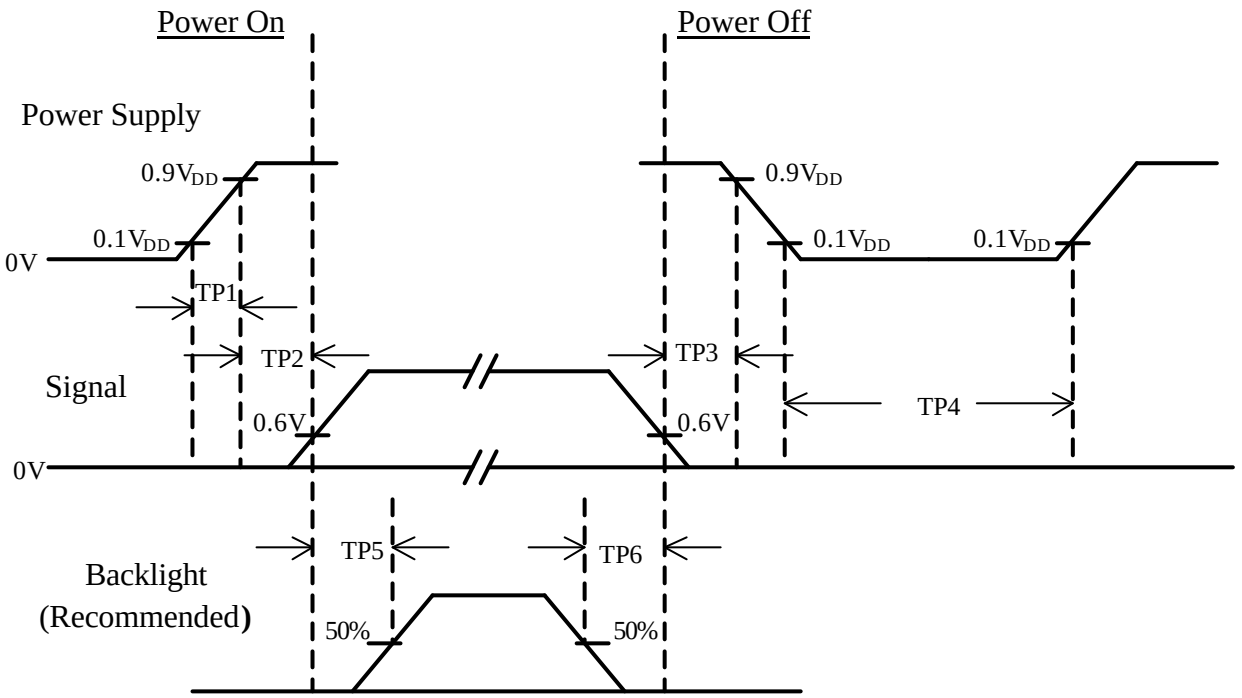


(5). Initial Condition:



* Input Power (VDD) should be 0V(GND) before Power-ON.
* All signals (including control signals and data) should be kept **low** before it is active.

6.4 Power On / Off Sequence：



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.4	—	10	msec	
TP2	100	—	200	msec	
TP3	0	—	50	msec	
TP4	1	—	—	sec	
TP5	200	—	—	msec	
TP6	200	—	—	msec	

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

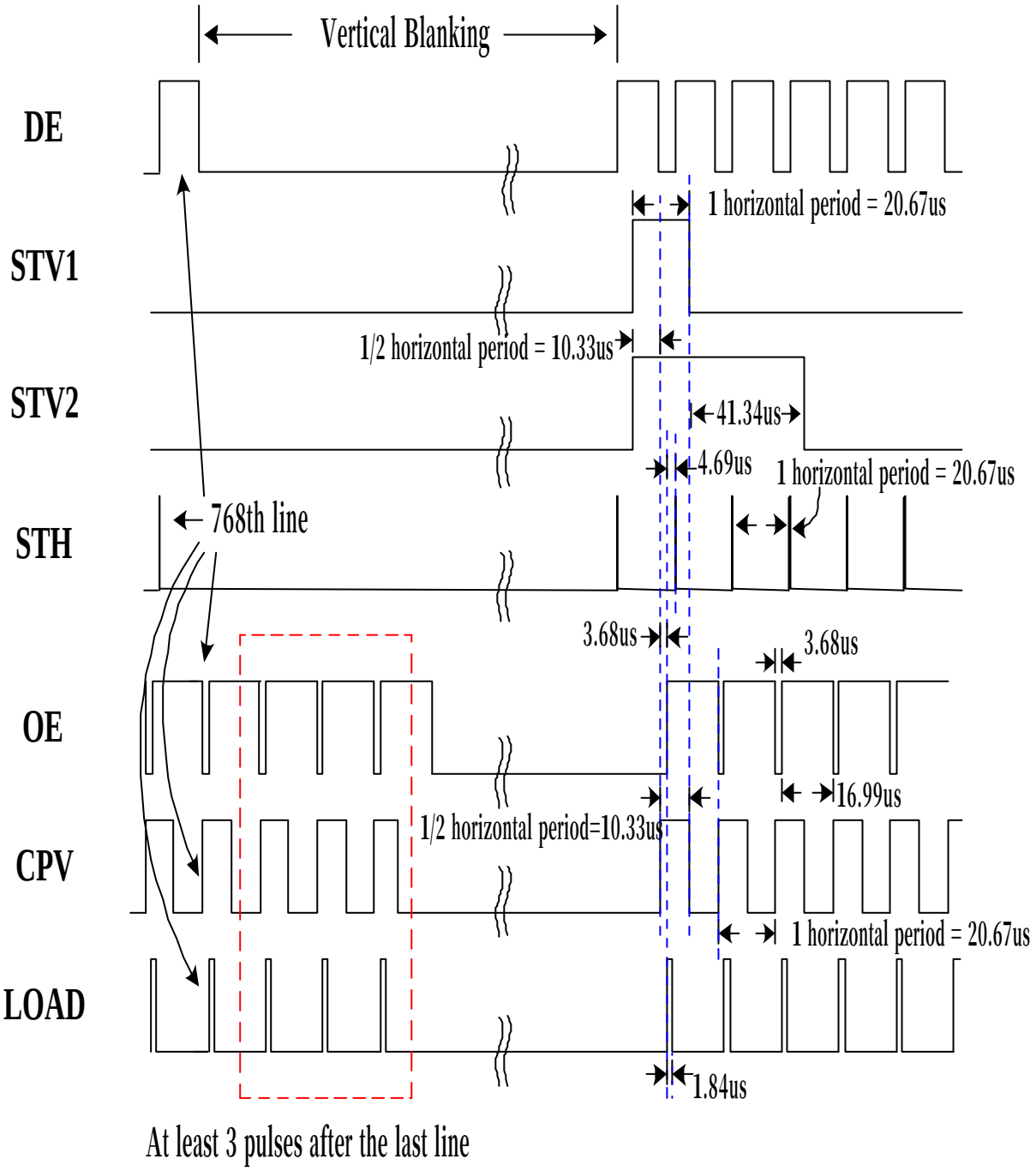
(2) Apply the lamp volatge within the LCD operation range. When the back-light turns on before the LCD operation or the LCD truns off before the back-light turns off, the display may momentarily become white.

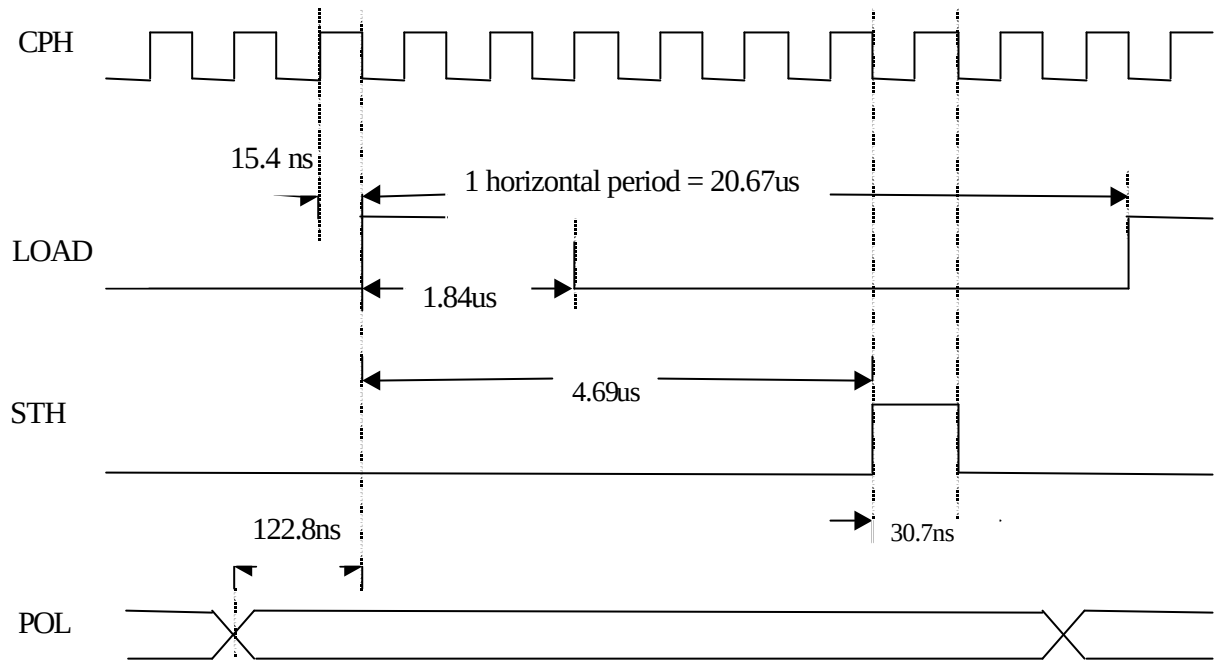
(3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.

(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 Suggested Timing (VESA – 1024x768/60Hz) :

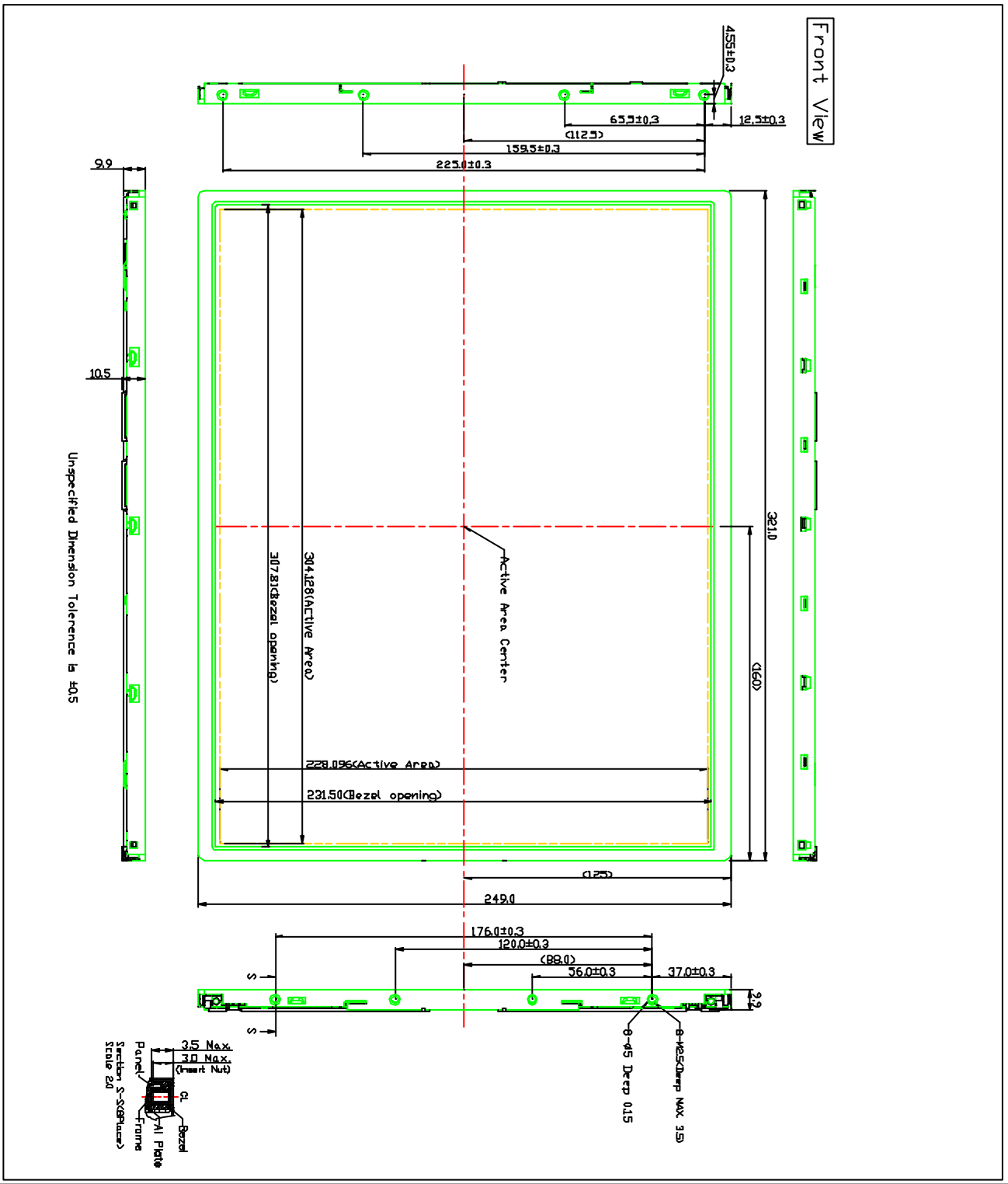




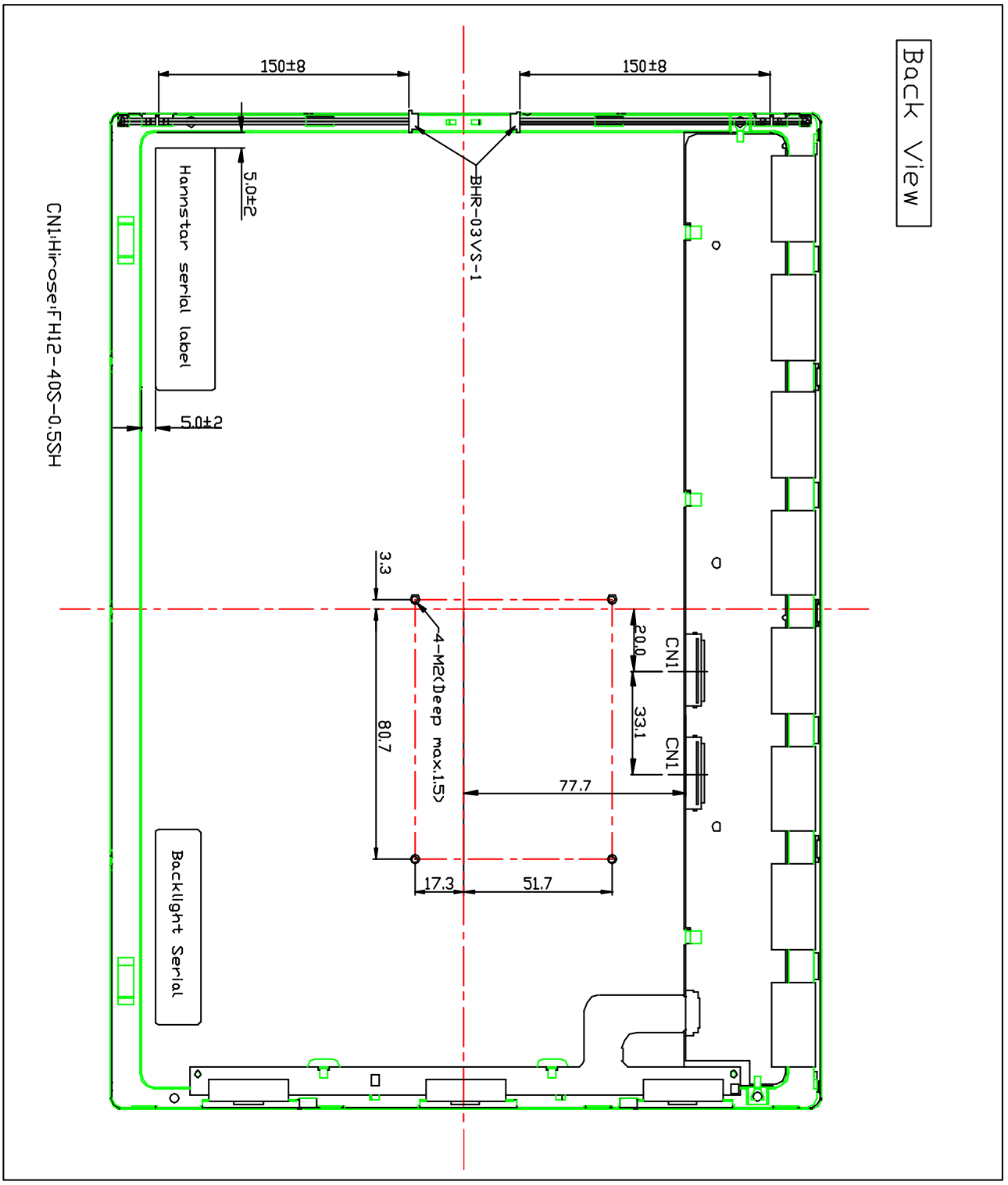
8.0 OUTLINE DIMENSION

8.1 Front View:

Date: 2003.10.08



8.2 Back View: **Date: 2003.10.08**



9.0 LOT MARK

9.1 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

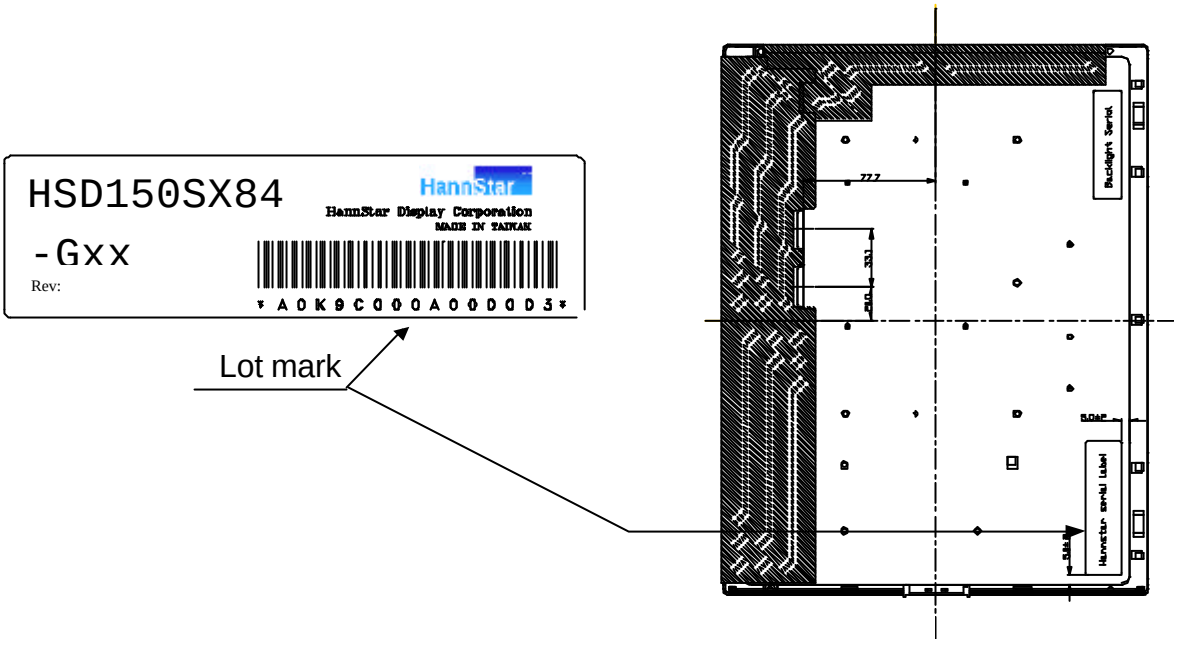
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mark	9	0	1	2	3	4	5	6	7	8

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

9.2 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.



10.0 PACKAGE SPECIFICATION

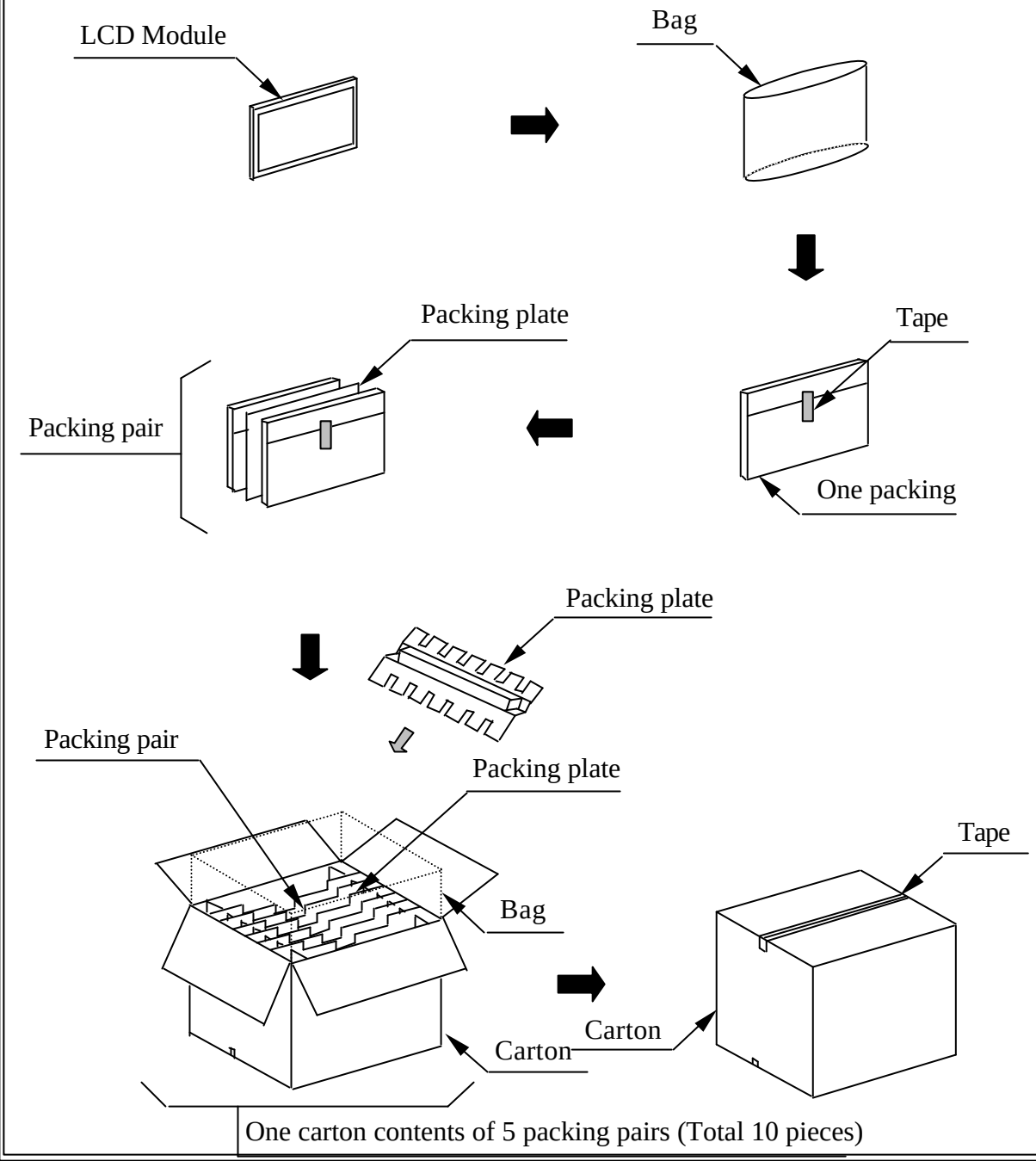
10.1 packing form

(1) package quantity in one carton: 10 pieces.

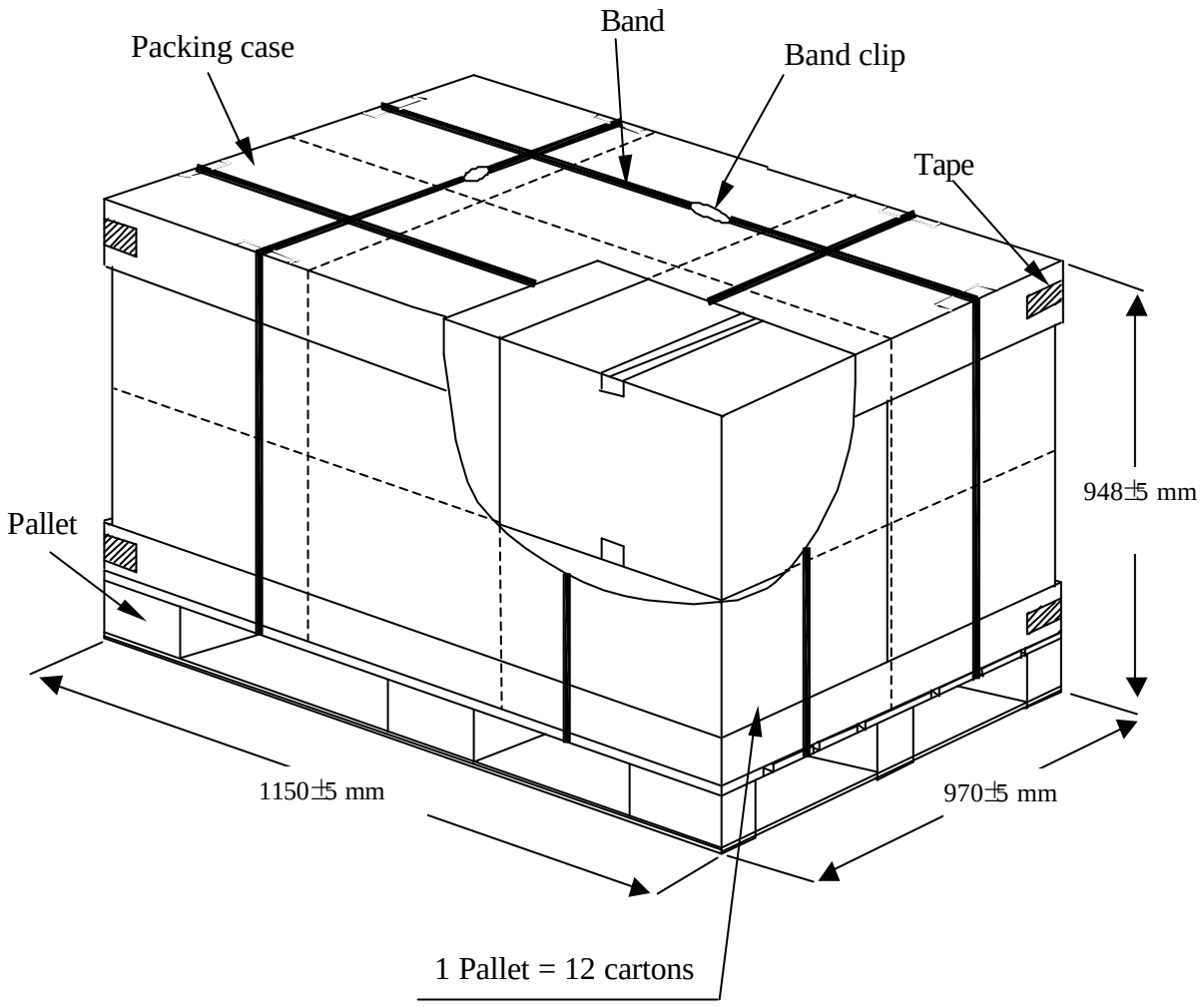
(2) carton size: 453±3 mm×360±3 mm×403±3 mm.

(3) for domestic transportation only.

10.2 packing assembly drawings



10.3 Pallet transportation specification



11.0 GENERAL PRECAUTION

11.1 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.

11.2 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.

11.3 Breakage of LCD Panel

11.31 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.

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

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

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

11.4 Electric Shock

11.4.1 Disconnect power supply before handling LCD module.

11.4.2 Do not pull or fold the CCFL cable.

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

11.5 Absolute Maximum Ratings and Power Protection Circuit

11.5.1 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.

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

11.5.3 It' s recommended employing protection circuit for power supply.

11.6 Operation

11.6.1Do not touch, push or rub the polarizer with anything harder than HB pencil lead. Use fingerstalls of soft gloves in order to keep clean display quality, when persons

11.6.2 handle the LCD module for incoming inspection or assembly.

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

11.6.4 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.

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

11.7 Mechanism

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

11.8 Static Electricity

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

11.8.2 Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.

11.8.3 Persons who handle the module should be grounded through adequate methods.

11.9 Strong Light Exposure

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

11.10 Disposal

When disposing LCD module, obey the local environmental regulations.