



HannStar Display Corp.

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Hannstar Product Information

Model: **HSD170ME13**
- B00

- 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.

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Record of Revisions

Rev.	Updated No.	Date	Description of change
1.0	—		HSD170ME13-B product information was first issued..

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1.0 GENERAL DESCRIPTIONS

1.1 Introduction

HannStar Display model HSD170ME13-B 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 17.0 inch diagonally measured active display area with SXGA resolution (1024 vertical by 1280 horizontal pixel array) and can display up to 16 million colors.

1.2 Features

- 17" SXGA TFT LCD panel
- 4 CCFLs Backlight system
- Supported SXGA (V:1024 lines, H:1280 pixels) resolution
- Supported to 75Hz refresh rate
- With LCD Timing Controller
- Side Mount Compatible

1.3 Applications

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

1.4 General information

Item	Specification	Unit	
Outline dimension	358.5×296.5× 15.6 (typ.)	mm	
Display area	337.92 (H) x 270.336 (V) (17.0" diagonal)	mm	
Number of Pixel	1280(H) x 1024(V)	Pixels	
Pixel pitch	0.264(H) x 0.264(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display color	16 million (6 bit + FRC)	colors	
Display mode	Normally white		
Surface treatment	Antiglare, Hard-Coating(3H)		
Weight	1680(typ.)	g	
Back-light	4-CCFLs, Top & bottom edge side		
Input signal	2-ch LVDS		
Power consumption	Logic system	2.15 (typ.)	W
	B/L system	20.5 (typ.)	W



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1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	358.0	358.5	359.0	mm
	Vertical(V)	296.0	296.5	297.0	mm
	Depth(D)	--	15.6	--	mm
Weight (without inverter)		--	1680	1848	g
Torque of customer screw hole		--	--	3.0	Kgf*Cm

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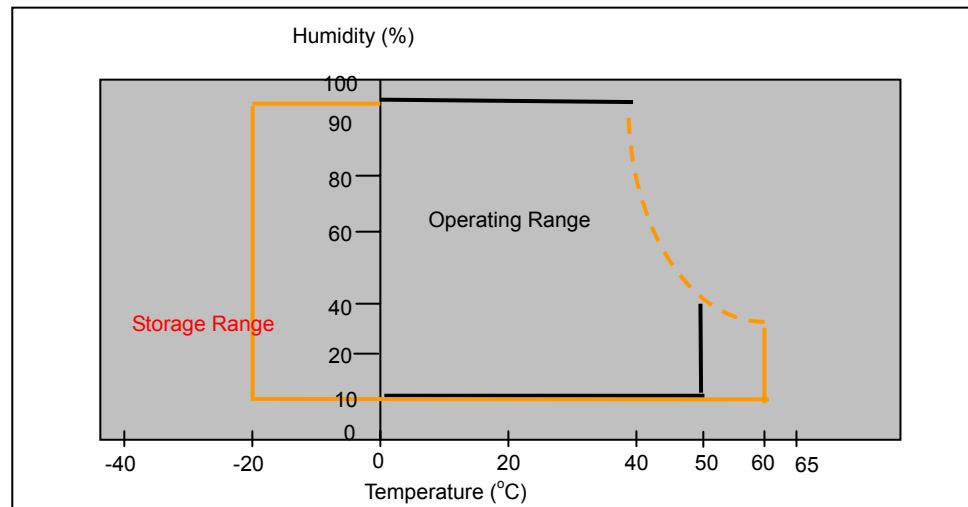
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2.0 ABSOLUTE MAXIMUM RATINGS

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	(4)
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, 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)



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2.2 Electrical Absolute Rating:

2.2.1 TFT LCD Module:

Item	Symbol	Min.	Max.	Unit.	Note
Power supply Voltage	V_{DD}	-0.3	5.5	V	(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 current	I_L	3.0	9.0	mA	(1)(2)
Lamp frequency	f_L	35	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 $T_a = 25 \pm 2^\circ\text{C}$



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3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast		CR	Normal viewing angle $\Theta=0^\circ$ $\phi=0^\circ$	400	500	--		(1)(2)	
Response time		Tr		--	4	6	msec	(1)(3) black to white + white to black	
		Tf		--	8	12			
White luminance (center of screen)		Y_L			220	270		cd/m ²	(1)(4)(5) (IL=8.0mA)
Color chromatically (CIE1931)		Red		Rx	0.617	0.647	0.677	(1)(4)	
				Ry	0.297	0.327	0.357		
		Green		Gx	0.262	0.292	0.322		
				Gy	0.584	0.614	0.644		
		Blue		Bx	0.112	0.142	0.172		
				By	0.049	0.079	0.109		
		White	Wx	0.281	0.311	0.341			
			Wy	0.307	0.337	0.367			
Viewing angle		Hor.	Θ_L	60	70	--	CR>10		
			Θ_R	60	70	--			
		Ver.	Θ_H	60	70	--			
			Θ_L	50	60	--			
Brightness uniformity		B_{UNI}	$\Theta=0^\circ$	75	--	--	%	(6)	
Crosstalk		CT(n)	$\phi=0^\circ$	--	--	1.3	%	(7)	

3.2 Measuring Condition

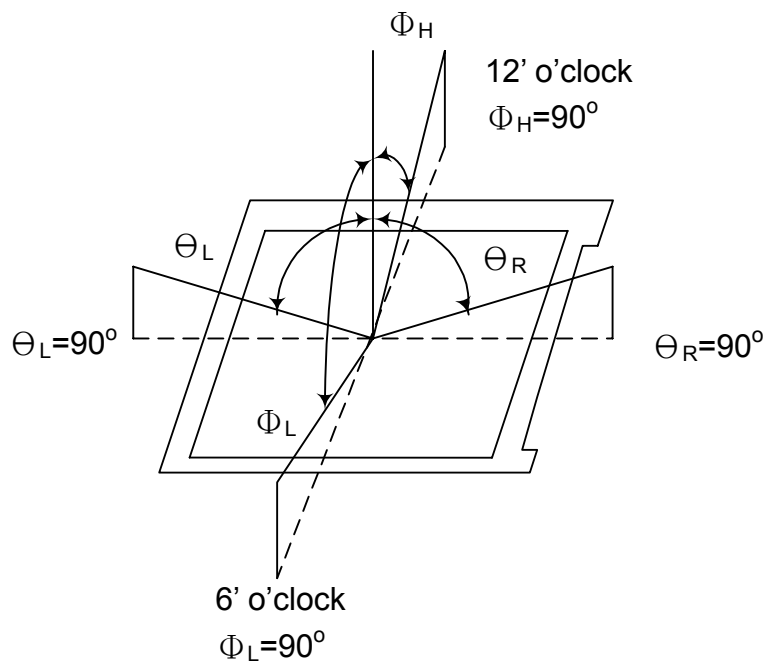
- Measuring surrounding : dark room
- Lamp current I_{BL} : 8.0 ± 0.1 mA, lamp freq. $F_L=48$ kHz , Inverter :EMAX19402E(22pF)
- $V_{DD1}=5.0$ V, $f_V=60$ Hz, $f_{DCLK}=54$ MHz
- Surrounding temperature : $25 \pm 2^\circ$ C
- 30min. Warm-up time.

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3.3 Measuring Equipment

- Otsuka Electrics Corp., which utilized MCPD-3000 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

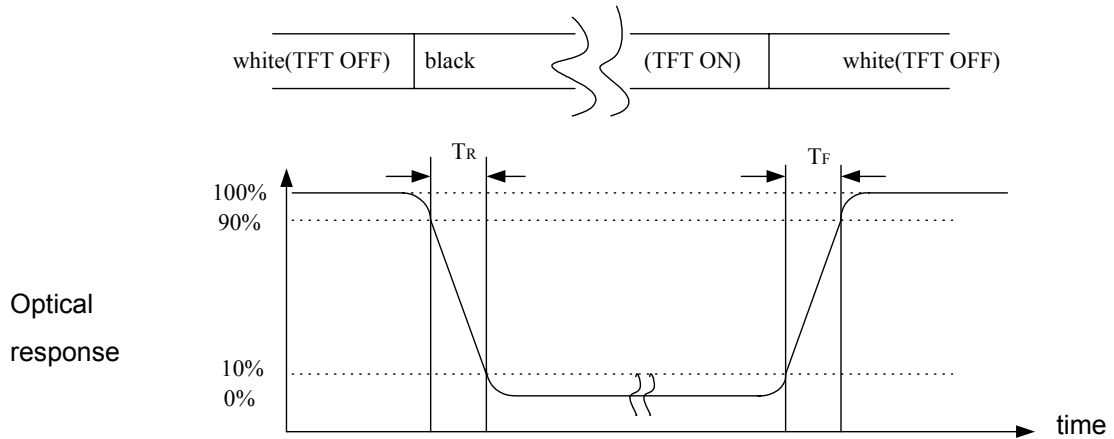
$$CR = \frac{\text{Luminance with all pixels white (L255)}}{\text{Luminance with all pixels black (L0)}}$$



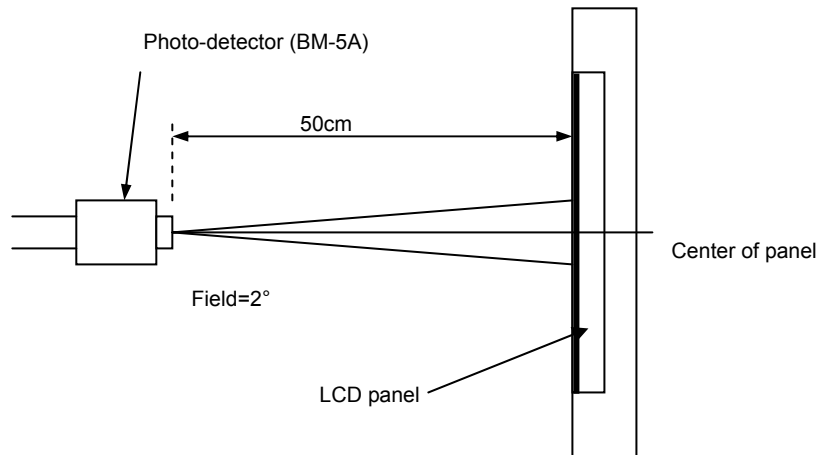
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Note (3) Definition of Response Time: Sum of T_R and T_F



Note (4) Optical characteristic measurement setup



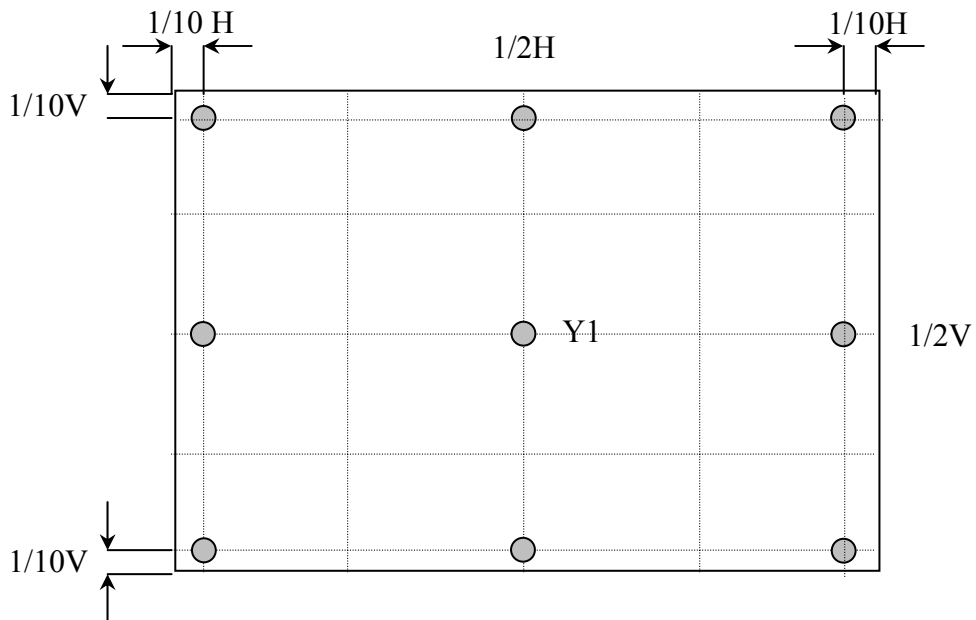


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Note (5) Definition of Luminance of White
Luminance (center) = Y1

Note (6) Definition of brightness uniformity(9pt)

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





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

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

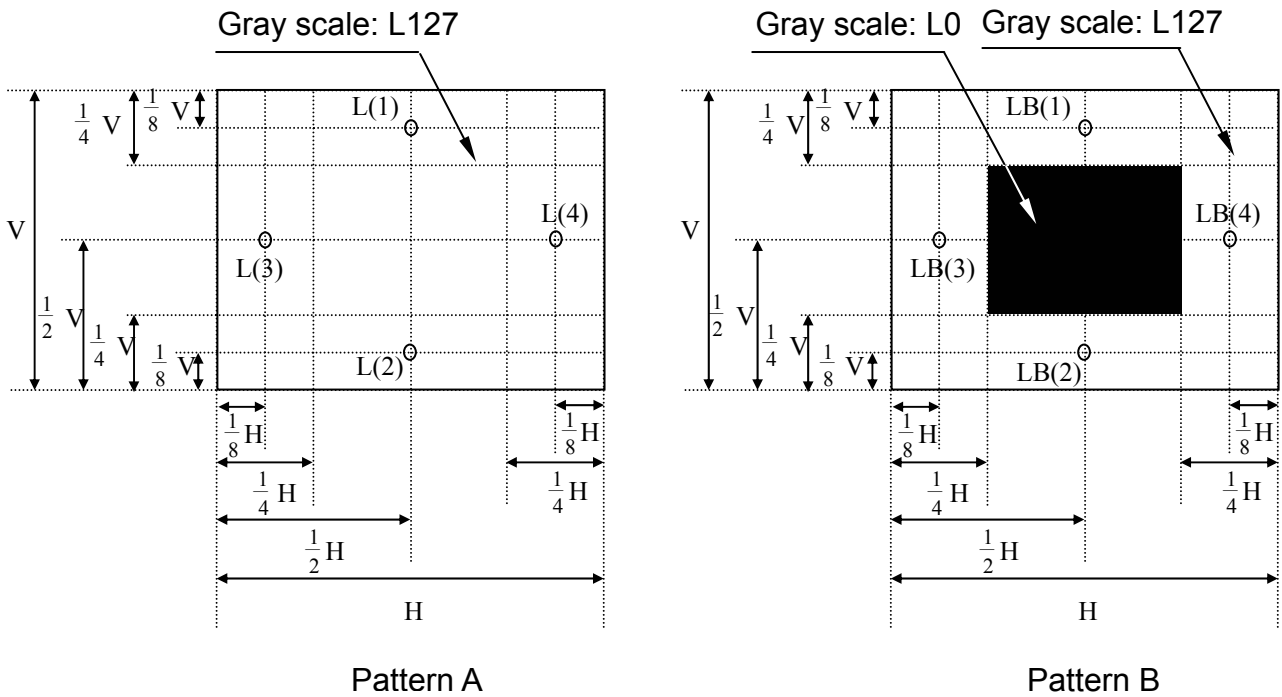
Where L(n) = Luminance of point “n” at pattern A (cd/m²) , n=1~4

LB(n) = Luminance of point “n” at pattern B (cd/m²) , n=1~4

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

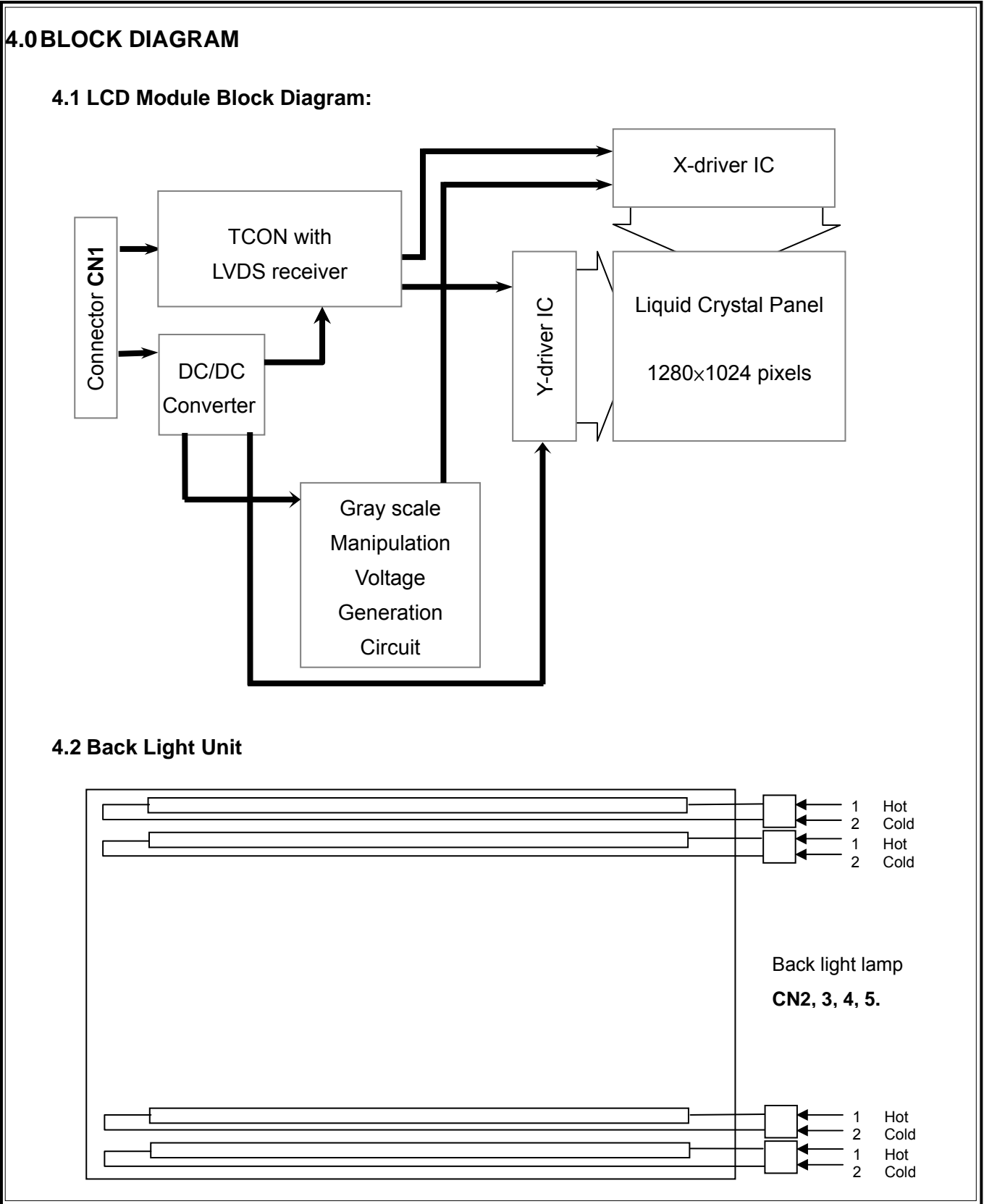
L0: Luminance with all pixels black

L255: Luminance with all pixels white





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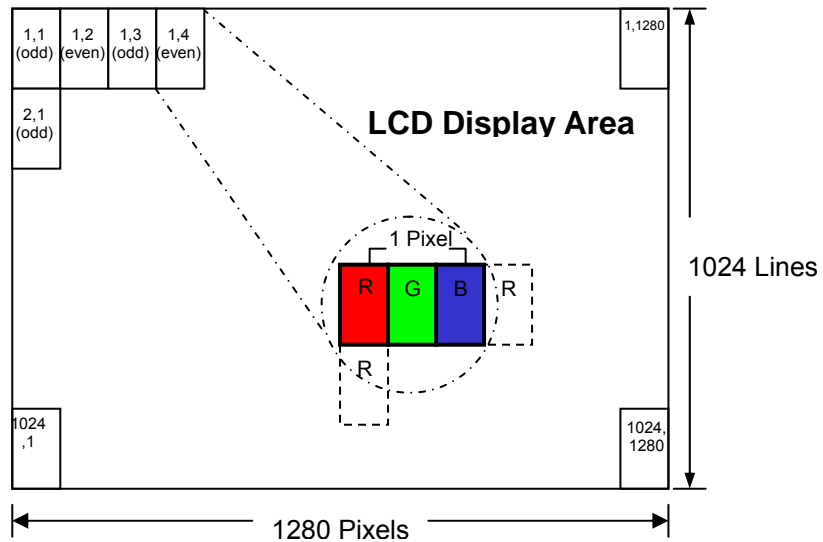
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4.3 Pixel Format





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4.4 Relationship between Displayed Color and Input

Display	MSB				LSB				MSB				LSB				Gray scale Level									
	R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0		B7	B6	B5	B4	B3	B2	B1	B0	
Basic color	Black	L	L	L	L	L	L	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	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	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	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	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
	Light	H	H	H	H	H	L	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
		H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255	
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
	Light	L	L	L	L	L	L	L	L	H	H	H	H	L	H	H	L	L	L	L	L	L	L	L	L252	
		L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L253	
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L254	
Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	Green L255		
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	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	L	L	L	L	L	L	H	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	H	H	H	L252
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	H	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L254
Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255		
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L1	
		L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L	L2	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251	
	Light	H	H	H	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	L	H	H	H	L252		
		H	H	H	H	H	L	H	H	H	H	H	H	L	H	H	H	H	H	H	L	H	H	L253		
		H	H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	L254		
White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L255		



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5.0 I/O CONNECTION PIN ASSIGNMENT

5.1 Interface Connector (30-pins)

CN1(INPUT SIGNAL) :JAE: FI-X30S-HF

Mating Connector: FI-X30H or equivalent

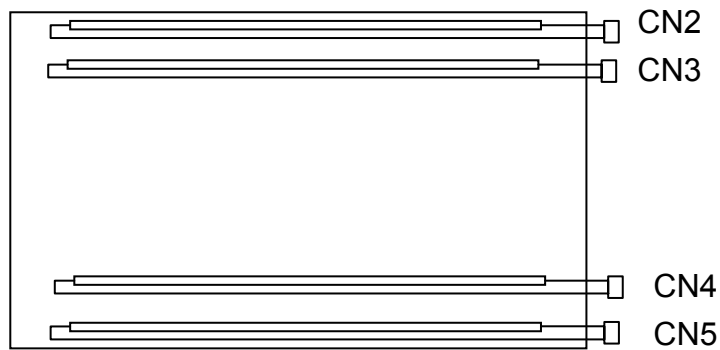
Pin No.	Signal	Description
1	RinO0-	Receiver Signal (-)
2	RinO0+	Receiver Signal (+)
3	RinO1-	Receiver Signal (-)
4	RinO1+	Receiver Signal (+)
5	RinO2-	Receiver Signal (-)
6	RinO2+	Receiver Signal (+)
7	VSS	Ground
8	RinOC-	Clock Signal (-)
9	RinOC+	Clock Signal (+)
10	RinO3-	Receiver Signal (-)
11	RinO3+	Receiver Signal (+)
12	RinE0-	Receiver Signal (-)
13	RinE0+	Receiver Signal (+)
14	VSS	Receiver Signal (+)
15	RinE1-	Receiver Signal (-)
16	RinE1+	Receiver Signal (+)
17	VSS	Ground
18	RinE2-	Receiver Signal (-)
19	RinE2+	Receiver Signal (+)
20	RinEC-	Clock Signal (-)
21	RinEC+	Clock Signal (+)
22	RinE3-	Receiver Signal (-)
23	RinE3+	Receiver Signal (+)
24	VSS	Ground
25	VSS	Ground
26	VSS	Ground
27	VSS	Ground
28	VDD+5V	Power Supply, 5V (Typical)
29	VDD+5V	Power Supply, 5V (Typical)
30	VDD+5V	Power Supply, 5V (Typical)



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5.2 Back Light Unit (CCFL) Connectors:



CN2,3,4,5: CCFL Power Source (BHSR-02VS-1/JST MFG Co., LTD)

Mating connector: (SBHT-002T-P0.5) / JAPAN SOLDERLESS TERMINAL MFG CO.

Pin No.	Symbol	Color	Function
1	Hot	Pink	CCFL power supply (High voltage)
2	Cold	White	Ground



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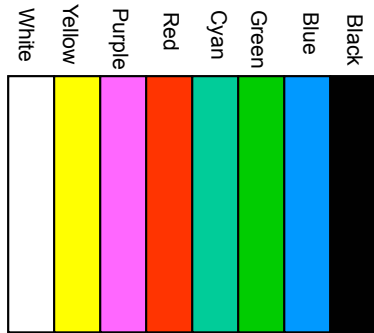
6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module:

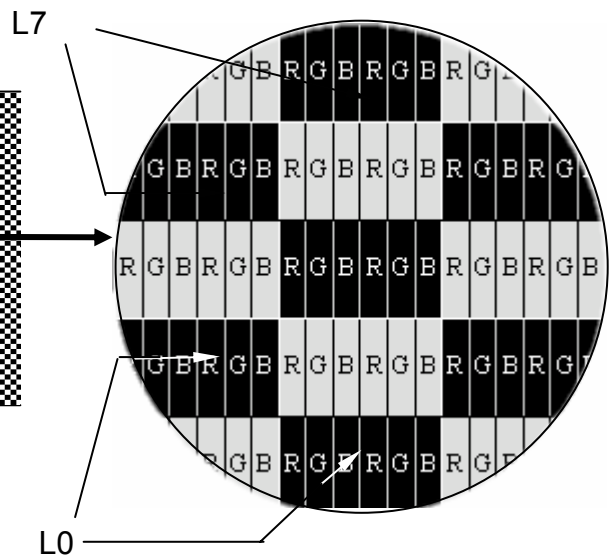
Item	Symbol	Min.	Typ.	Max.	Unit	Note	
Voltage of power supply	V_{DD}	4.5	5.0	5.5	V		
Current of power supply	V-Color	I_{DD1}	330	430	530	mA	(1)(2)
	Mosaic	I_{DD2}	380	480	580	mA	(1)(2)
Vsync frequency	f_V	--	60	75	Hz	ref 6.5 t1	
Hsync frequency	f_H	--	63.19	75	kHz	ref 6.5 t4	
Frequency	f_{DCLK}	--	54	67.5	MHz	ref 6.5 t7	
Input rush current	I_{RUSH}	--	--	1.5	A	(2)	

Note (1)

1). V-Color :



2). Mosaic : Dot checker image



Grey scale: L0~L255.

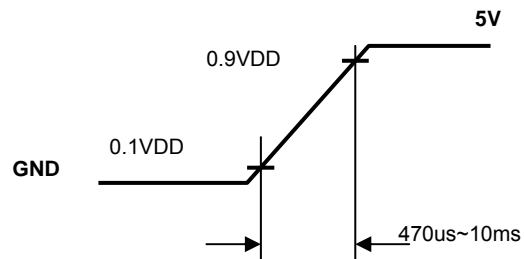
L0: Luminance with all pixels black.

L255: Luminance with all pixels white.



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Note (2) Input Rush Current condition



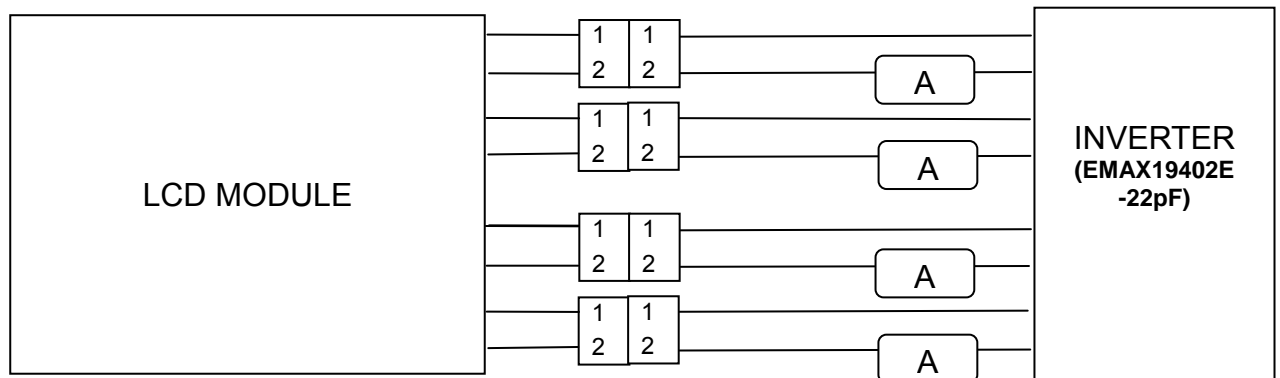
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6.2 Back-Light Unit

The back-light system is an edge-lighting type with 4 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	8.5	mA(rms.)	(1)
Lamp voltage	VL	570	640	700	V(rms.)	$I_L=8.0mA$
Frequency	fL	35	50	80	kHz	(2)
Operating lamp life time	Hr	30,000	--	--	Hour	(3)
Startup voltage	Vs	1210	--	--	V(rms.)	at 25°C
		1540				at 0°C

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 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 : $T_a=25\pm 3^\circ C$, Typical IL value indicated in the above table and $f_L=50kHz$ until the brightness becomes less than 50%

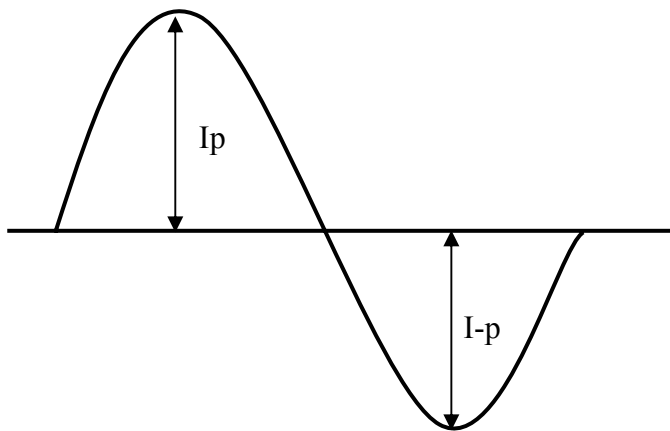
Note (4) CCFL inverter should be able to provide a voltage over specified value (Vs) in the above table. Lamp units need at least Vs value shown above to ignition.

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.

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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.

- The asymmetry rate of the inverter waveform should be less than 10%.
- The distortion rate of the waveform should be within $\pm 10\%$.
- The inverter output waveform should be better similar to the ideal sine wave.



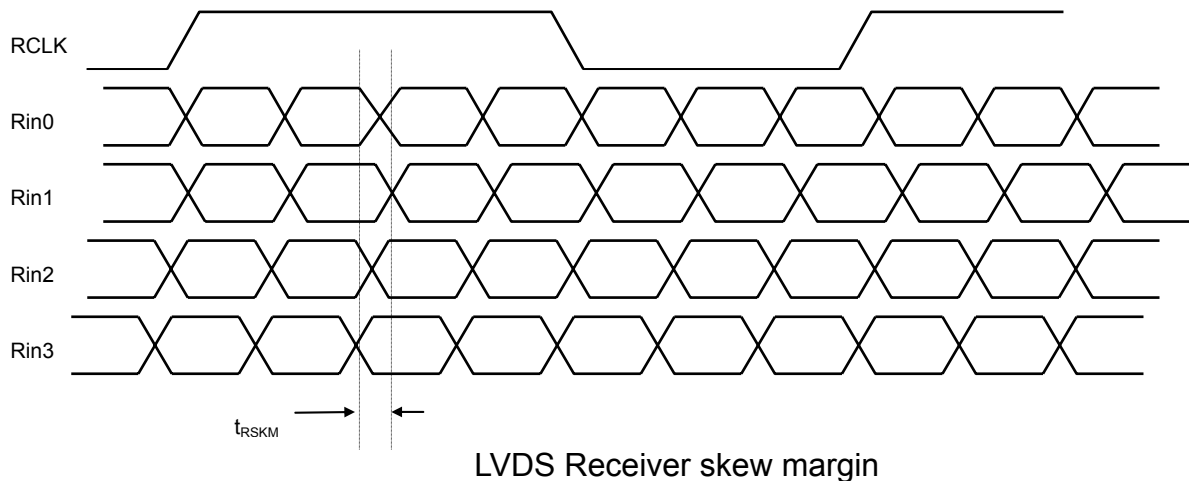
$$\text{Asymmetry rate} = |I_p - I_p| / I_{rms} \times 100\%$$

$$\text{Distortion rate} = I_p \text{ (or } I_p) / I_{rms}$$

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6.3 Switching Characteristics for LVDS Receiver

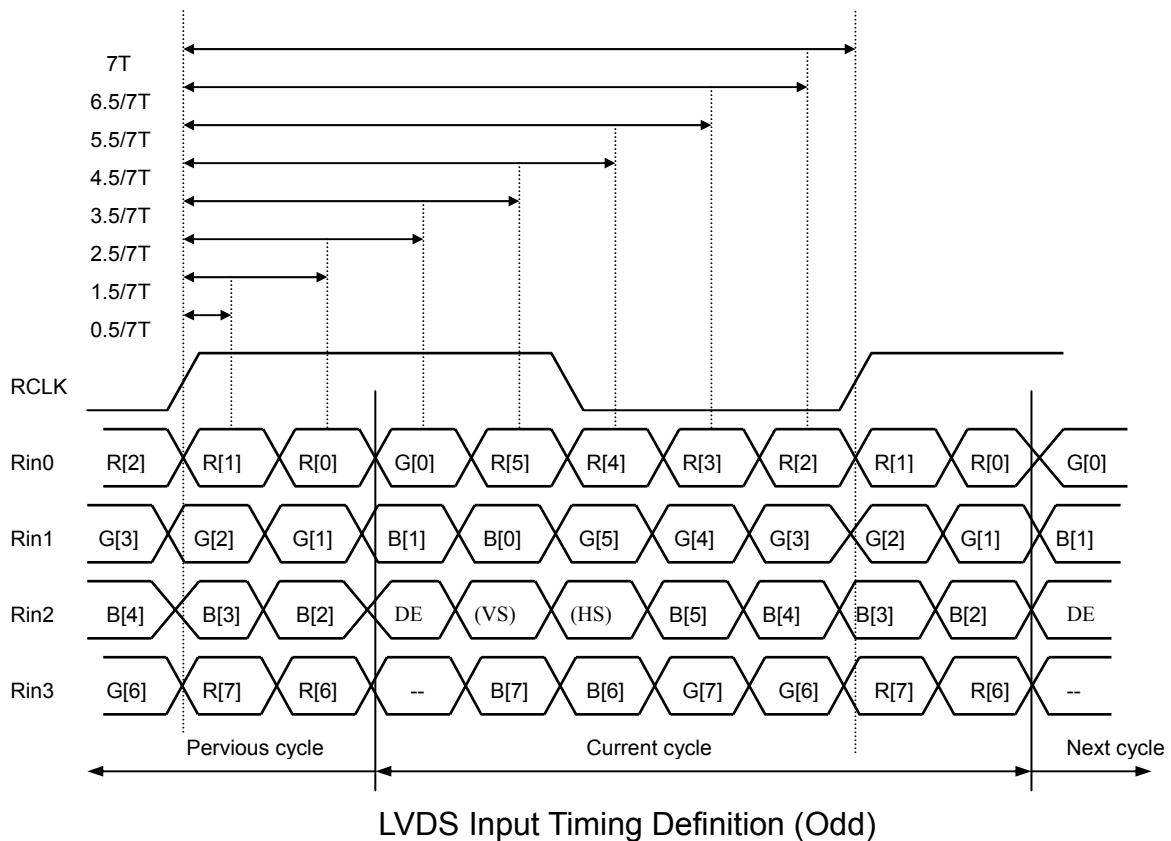
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V_{th}	-	-	100	mV	$V_{CM}=1.2V$
Differential Input Low Threshold	V_{tl}	-100	-	-	mV	
Input Current	I_{IN}	-	-	± 10	μA	$V_{IN}=1.78V, V_{DD}=3.6V$
		-	-	± 10	μA	$V_{IN}=0.8V, V_{DD}=3.6V$
Input Voltage Range(Signal ended)	V_{IN}	$1.1-(V_{ID})/2$	-	$1.45+(V_{ID})/2$	V	
Differential input Voltage	$ V_{ID} $	0.1	-	0.6	V	
Common Mode Voltage Offset	V_{CM}	1.1	-	1.45	V	
Clock Frequency	f_c	-	54	-	MHz	
LVDS Skew Margin	t_{RSKM}	-	-	400	pS	At $f_c=65MHz$
LVDS Input Clock Jitter Tolerance	-	-	-	± 2.5	%	center spread





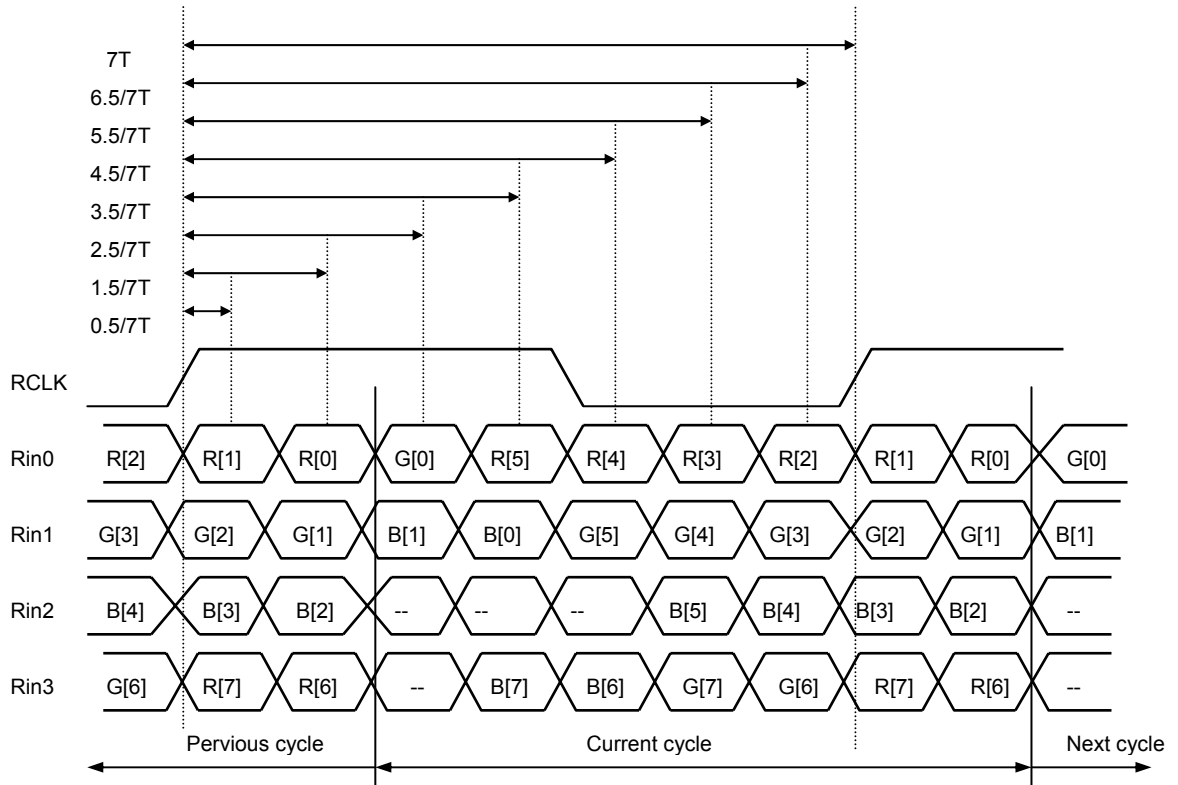
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6.4 Bit Mapping & Interface Definition





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LVDS Input Timing Definition (Even)



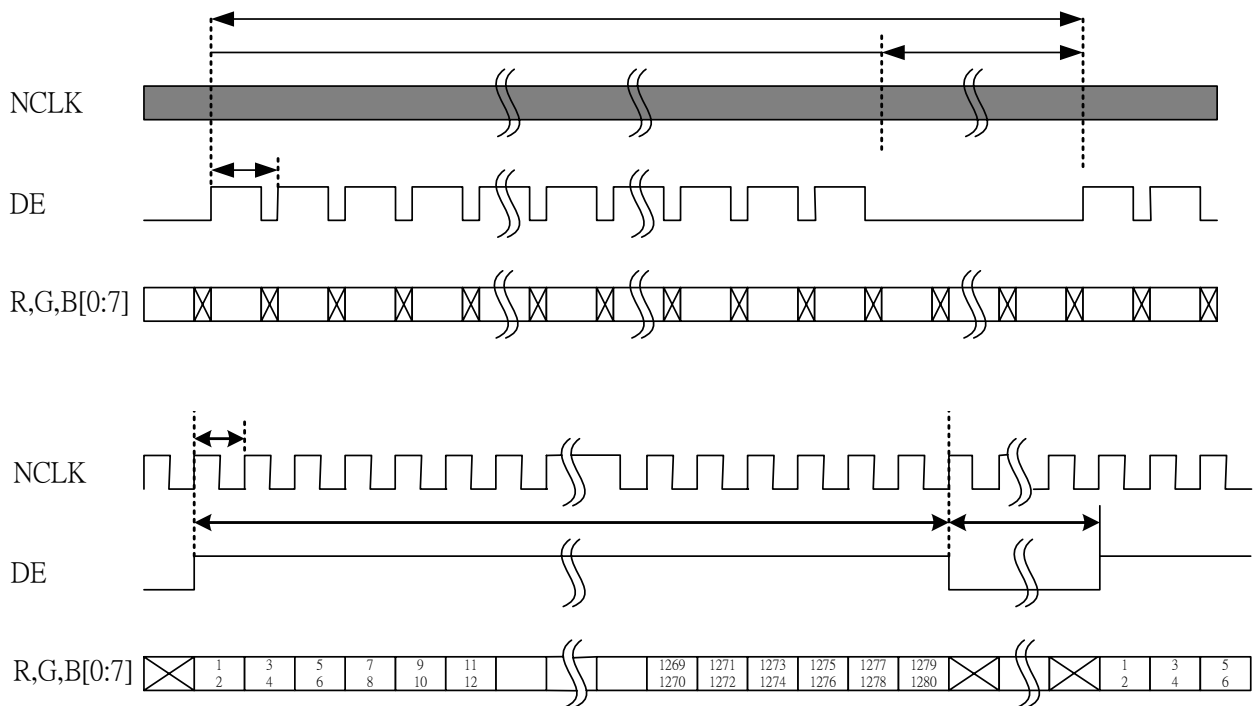
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6.5 Interface Timing (DE mode) ¹⁾²⁾³⁾⁴⁾⁵⁾⁶⁾

Item	Symbol	Min.	Typ.	Max.	Unit
Frame Period	t1	1028	1066	1150	line
Vertical Display Time	t2	—	1024	—	line
Vertical Blanking Time	t3	4	—	—	line
1 Line Scanning Time	t4	720	844	875	CLK
Horizontal Display Time	t5	—	640	—	CLK
Horizontal Blanking Time	t6	80	—	—	CLK
Clock Period	t7(CLK)	14.715	15.385	16.127	ns

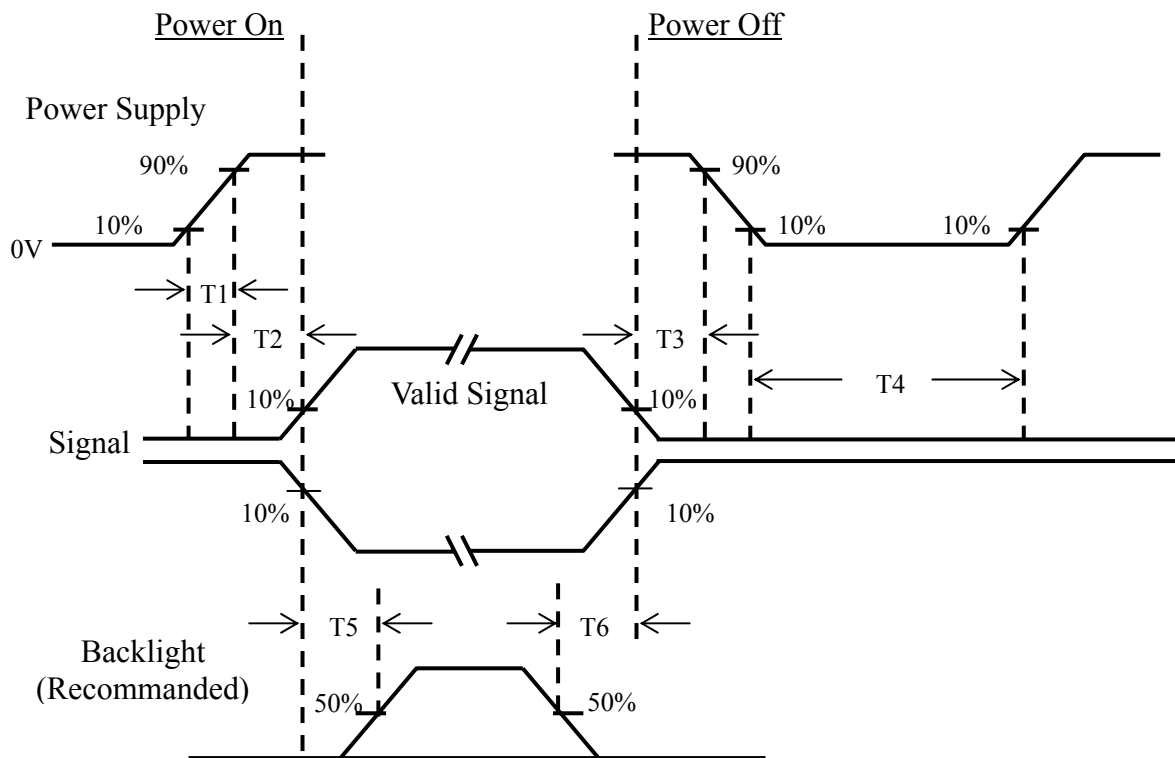
(frame rate=60Hz)

Timing Diagram of Interface Signal (DE mode)



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6.6 Power ON/OFF Sequence



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

- Note (1) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.
- (2) In case of $V_{DD} = \text{off level}$, please keep the level of input signal on 0 voltage.
- (3) T4 should be measured after the module has been fully discharged between power off and on period.

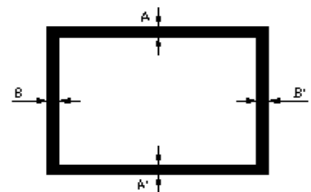
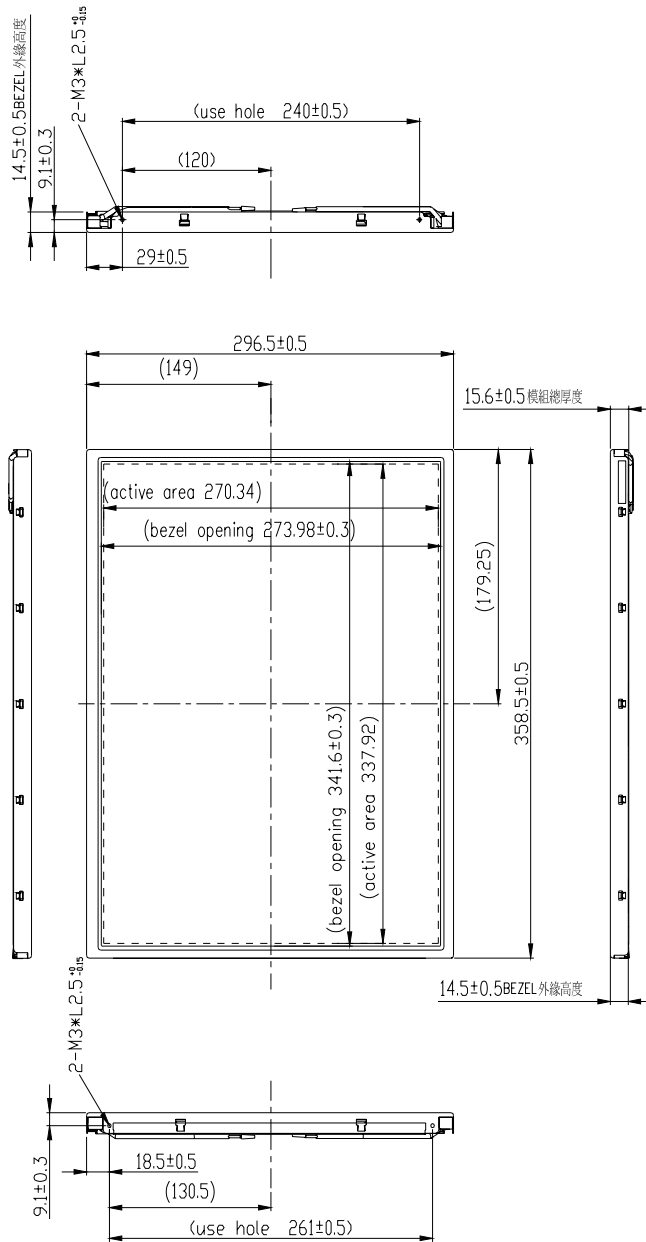


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7.0 OUTLINE DIMENSION

Unit : mm

7.1 Front View:



BM Assembly Tolerance

$$|A-A'| \leq 1 \text{ (mm)}$$

$$|B-B'| \leq 1 \text{ (mm)}$$

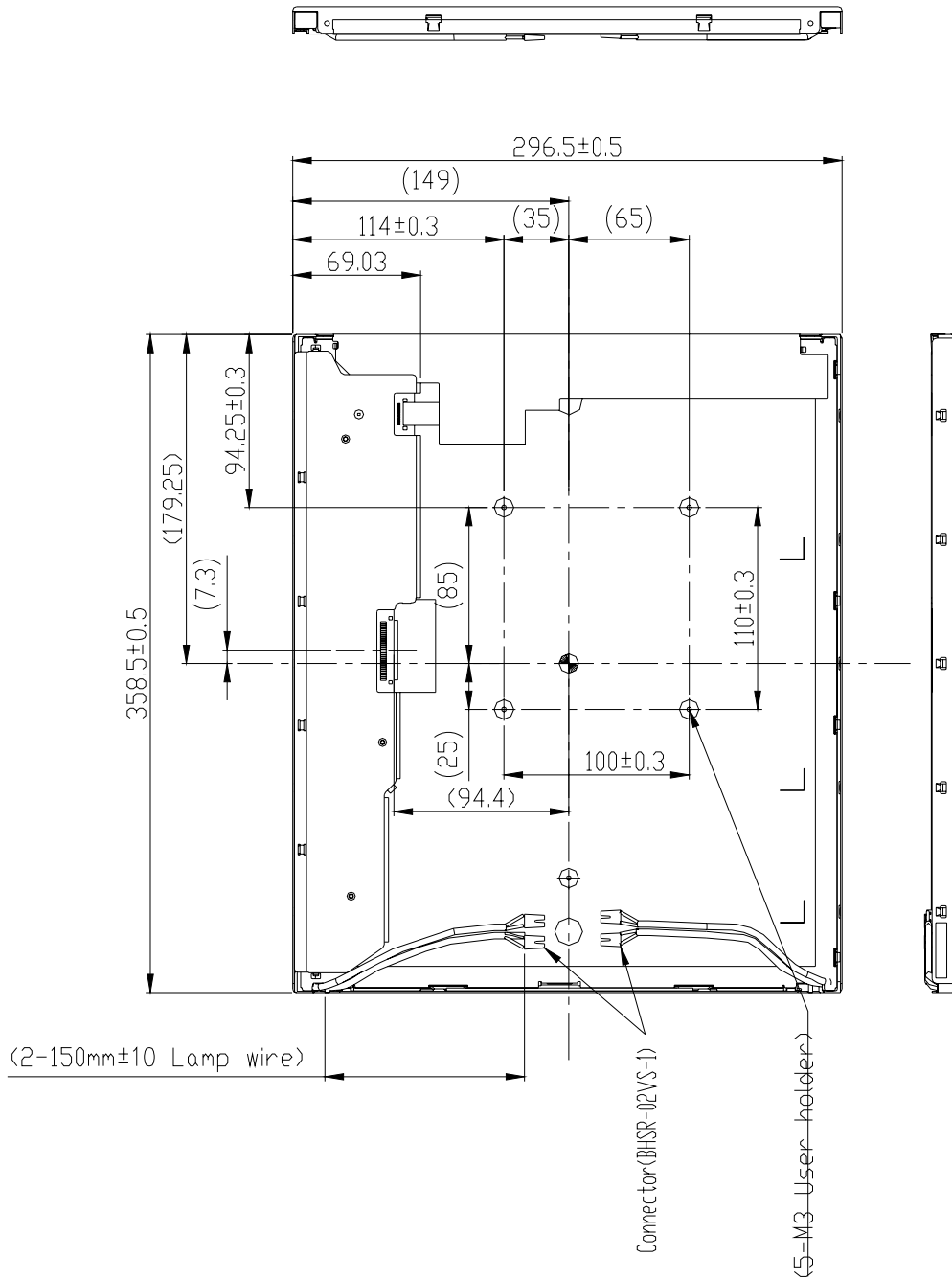
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7.2 Back View:

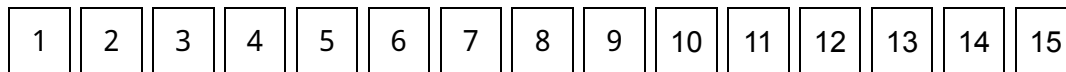


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8.0 LOT MARK

8.1 Lot Mark



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

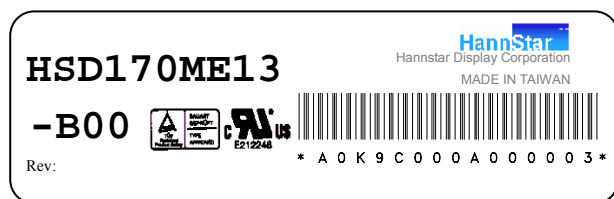
Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mark	9	0	1	2	3	4	5	6	7	8

Note (2) Production Month

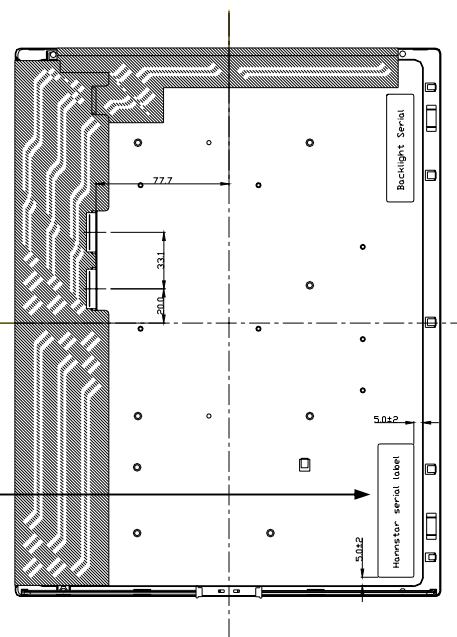
Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

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.

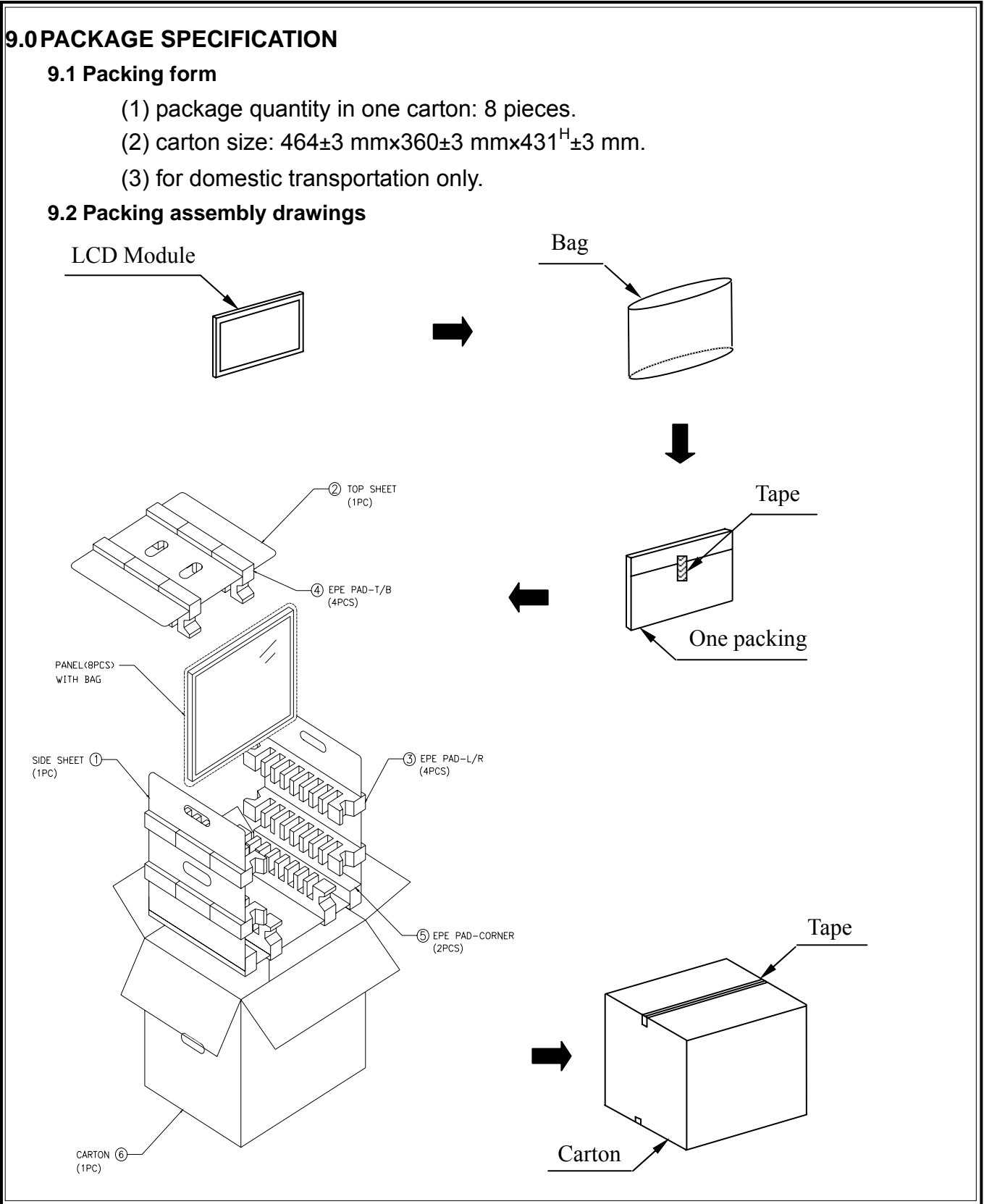


Lot mark





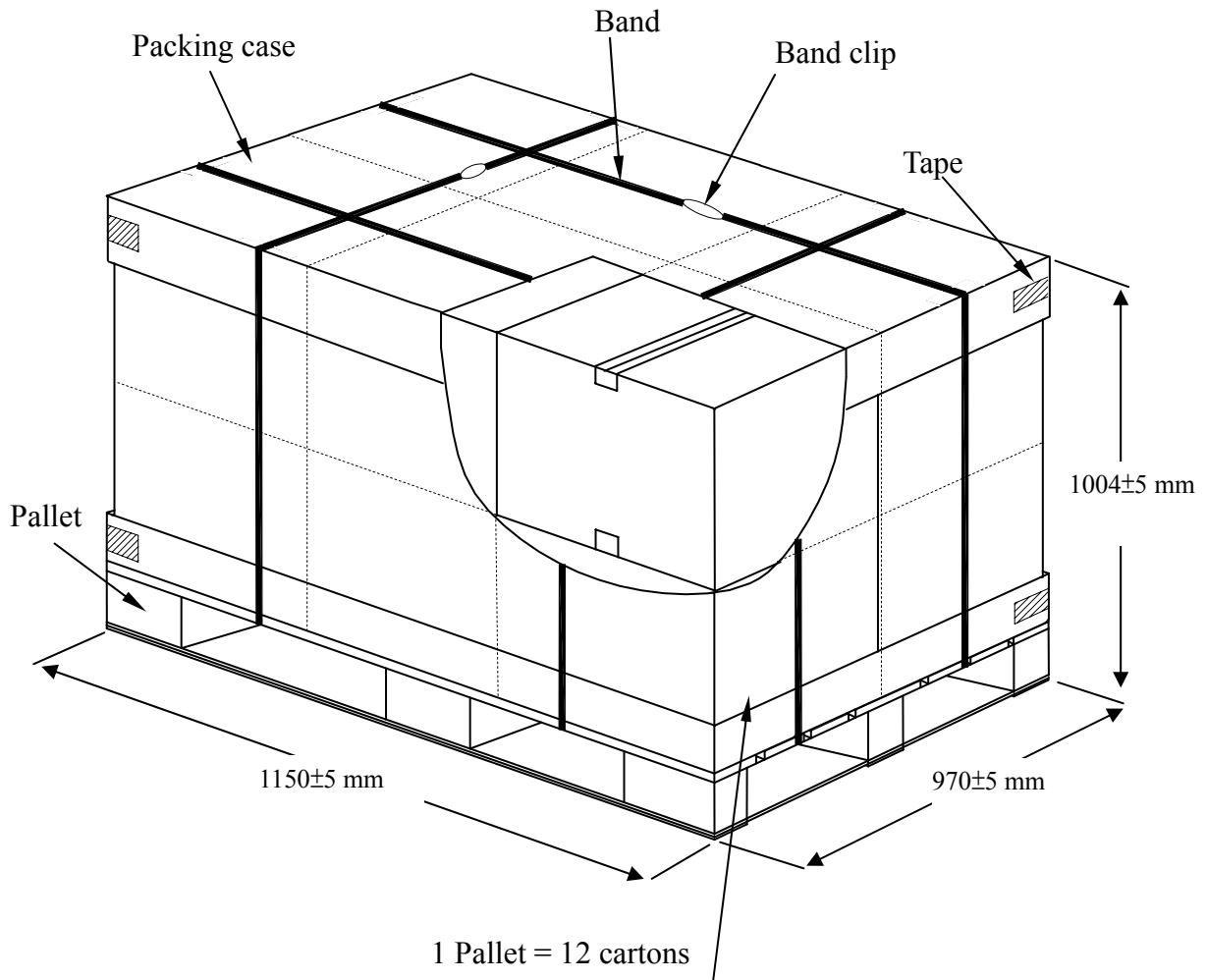
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9.3 Pallet transportation specification





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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

- 10.3.1 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.
- 10.3.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- 10.3.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- 10.3.4 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 employing 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. Use fingerstalls of soft gloves in order to keep clean display quality, when persons Handle the LCD module for incoming inspection or assembly.
- 10.6.2 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- 10.6.3 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.
- 10.6.4 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.



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

10.8.3 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.