SPECIFICATION
FOR
TFT LCD MODULE

CUSTOMER : _____

CUSTOMER MODULE : _____

HG MODEL : HG123HD012

☐**Preliminary Specification**

■**Final Specification**

Customer Confirmation column:

Approved by : _____ Dept. : _____ Data : _____

Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

Designed by	Checked by	Approved by

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

12.3inch module is a color active matrix TFT LCD module using amorphous silicon TFT‘ s (Thin Film Transistors) as an active switching devices. It is a transmissive type display operating in the normal black. The TFT-LCD has a 12.3 inch diagonally measured active area with resolutions (1920 horizontal by 720 vertical pixel arrays). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this panel can display 16.7M colors.

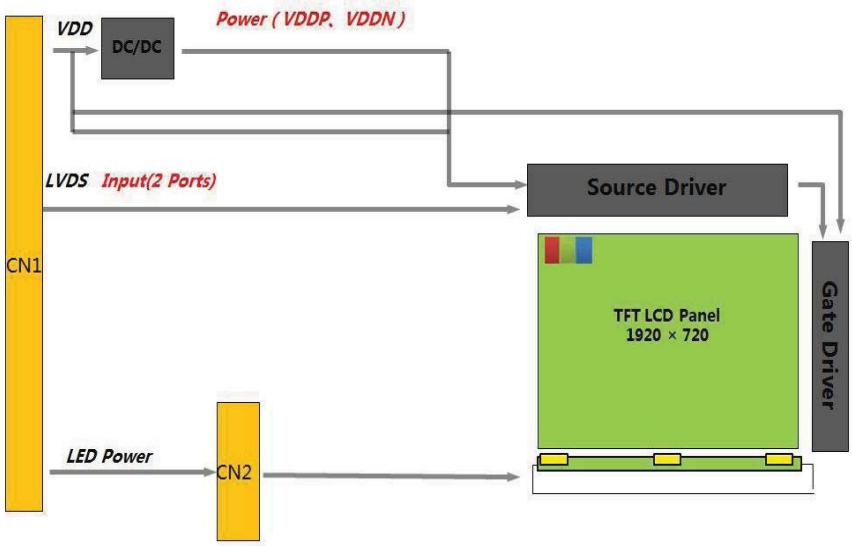


Figure 1-1 Block Diagram

1.2 Features

- Wide viewing angle (U/D/L/R) 88/88/88/88
- Color Gamut
- Cell thickness
- LVDS Interface

1.3 Application

- **Vehicle-mounted Production**

1.4 General Specification

<Table 1-1 General Specifications>

Parameter	Specification	Unit	Remarks
Active area	292.032 (H) × 109.512 (V)	mm	8：3
Number of pixels	1920(H) ×720(V)	pixels	
Pixel pitch	0.1521(H) ×RGB×0.1521 (V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M	colors	
Color gamut	72%	%	Typ.
Display mode	Normally black		
Module outline	307(H) x 126 (V)	mm	
Surface Treatment	HC		CF Pol
Viewing Direction (Human Eye)	U/D/L/R Min 80/80/80/80 Typ 88/88/88/88		
Driver IC	3*IHX8290A 1*HX8695-E-LT		Single gate 3S+1G IC方案

Note:
1.At the U/D/L/R direction, the viewing angle is same;
2.The TFT and CF Align Direction;

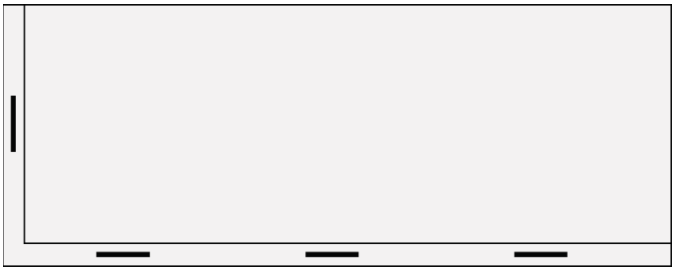


Figure 1-2 The TFT and CF Align Direction

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2-1

< Table 2-1 Environment Absolute Maximum Ratings>

Parameter	Symbol	Min.	Max.	Unit	Remarks
LC operating Voltage *1)	V_{OP}	-	5.7	V	Ta=25+/-2°C
Operating Temperature (Humidity)	T_{OP}	-20	+70	℃	
	RH	-	90	%	At 60°C
Storage Temperature (Humidity)	T_{ST}	-30	+80	℃	
	RH	-	90	%	At 60°C

*1)Liquid Crystal driving voltage
Due to the characteristics of LC Material, this voltage varies with environmental temperature.

3.0 ELECTRICAL SPECIFICATIONS

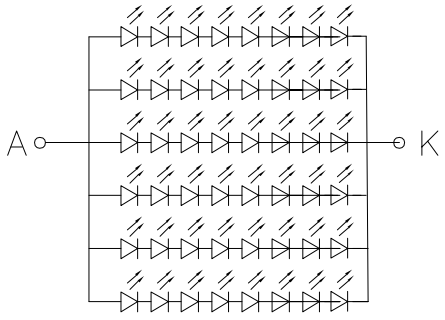
3.1 Electrical Specifications

Ta=25+/-2°C

Parameter	Symbol	Values			Unit	Notes
		Min	Typ.	Max		
TFT Gate ON Voltage	VGH	16	-	18	V	
TFT Gate OFF Voltage	VGL	-15	-	-10 5	V	
TFT Common Electrode Voltage	VCOM	-2.75	-	-0.2	V	
Voltage of VCC		3	-	3.5	V	
Current of VCC		150	-	550	mA	
Supply current of LED backlight	Per string			50	mA	8LED
Total Supply current of LED Backlight	I_{LED}Total			240	mA	6 strings
Supply voltage of LED backlight	Per string	24.0	24.0	26.4	V	6 strings

Notes :
1: AVDD should be set to satisfy the characteristic of LC .
2: VGH should be set to satisfy charging ratio of TFT pixel.
3 : VCOM should be adjusted to make the flicker level be minimum and optimize display quality.
4: Frame rate=60HZ
5: BLU LED : 灯共48颗, 6并8串, 电流值max 300mA, 每串max 50mA

300



If=300mA;Vf=24V

Figure 3-1 LED&NTC Diagram

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. The center of the measuring spot on the Display surface shall stay fixed.

The backlight should be operating for 30 minutes prior to measurement.

<Table 4-1 Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	80	88	-	Deg.	Note 1
		Θ_9		80	88	-	Deg.	
	Vertical	Θ_{12}		80	88	-	Deg.	
		Θ_6		80	88	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0° (Center) Normal Viewing Angle	850	1100	-		
White luminance uniformity		ΔY		70	80		%	Note 4
NTSC		%			72%			
White Chromaticity		x_w		Typ-0.03	0.285	Typ+0.03	-	Note 5
		y_w			0.315		-	
Reproduction of color	Red	x_R			0.648		-	
		y_R			0.326		-	
		x_G			0.317		-	
		y_G			0.625		-	
	Blue	x_B			0.148		-	
		y_B			0.060		-	
Response Time (Rising / Falling)		T_{RT}	25℃ -20℃ -30℃	-	-	25 200 350	ms	Note 6
BLU Derating		T	65℃	-	-	30%		F 5-4

Parameter	Condition	Min.	Typ.	Max.	Remark
Luminance	Θ = 0° (Center) Normal Viewing Angle	650	700	-	
Dimming minimum brightness				1.5nit	
Flicker		-	-	-20dB	Interval Gray Pattern between L0 and L127, after 30s light up stably

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
2. Contrast measurements shall be made at viewing angle of and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Center trans of white is defined as the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 4 for a total of the measurements per display.
4. The White luminance uniformity on LCD surface is then expressed as :
   ΔY = (Minimum Luminance of 9points / Maximum Luminance of 9points) * 100
5. The color chromaticity coordinates specified in Table 4. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurement condition is C - light source.
6. The electro-optical response time measurements shall be made as FIGURE 5 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the transmittance to change from 10% to 90% is Tr, and 90% to 10% is Tf.

5.0 OPTICAL TEST APPENDIX

Figure 5-1 The Definition of Vth & Vsat

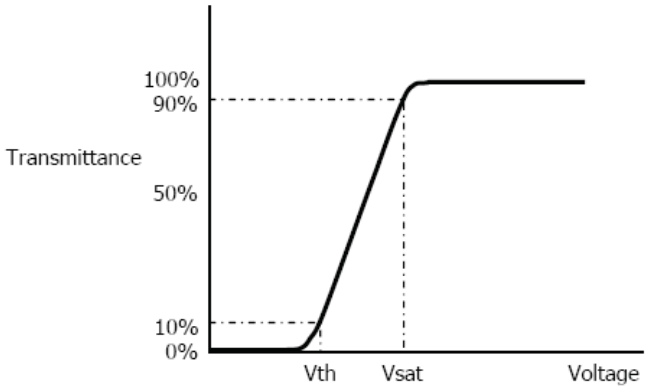


Figure 5-2 Measurement Set Up

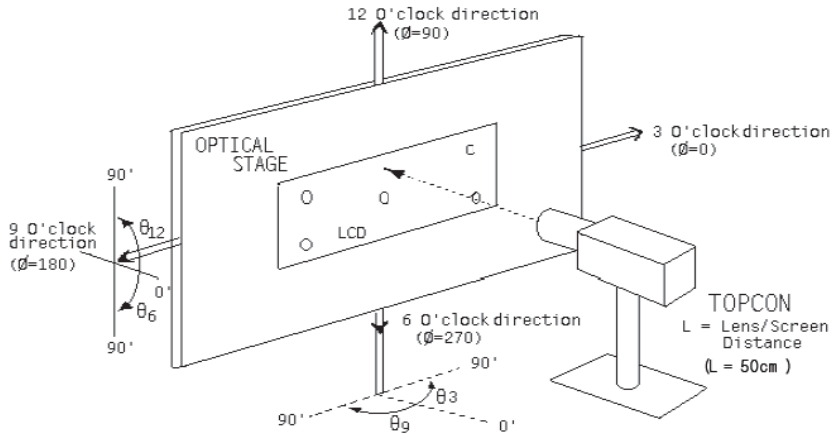


Figure 5-3 Response Time Testing

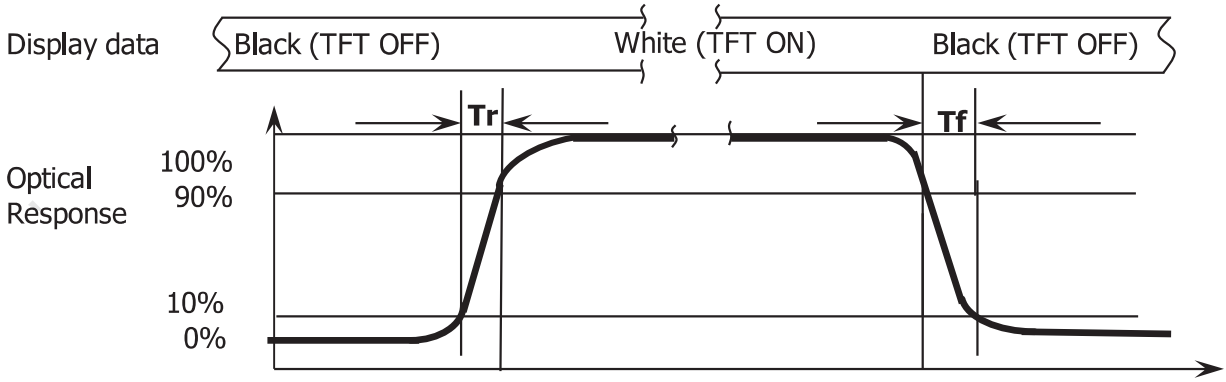
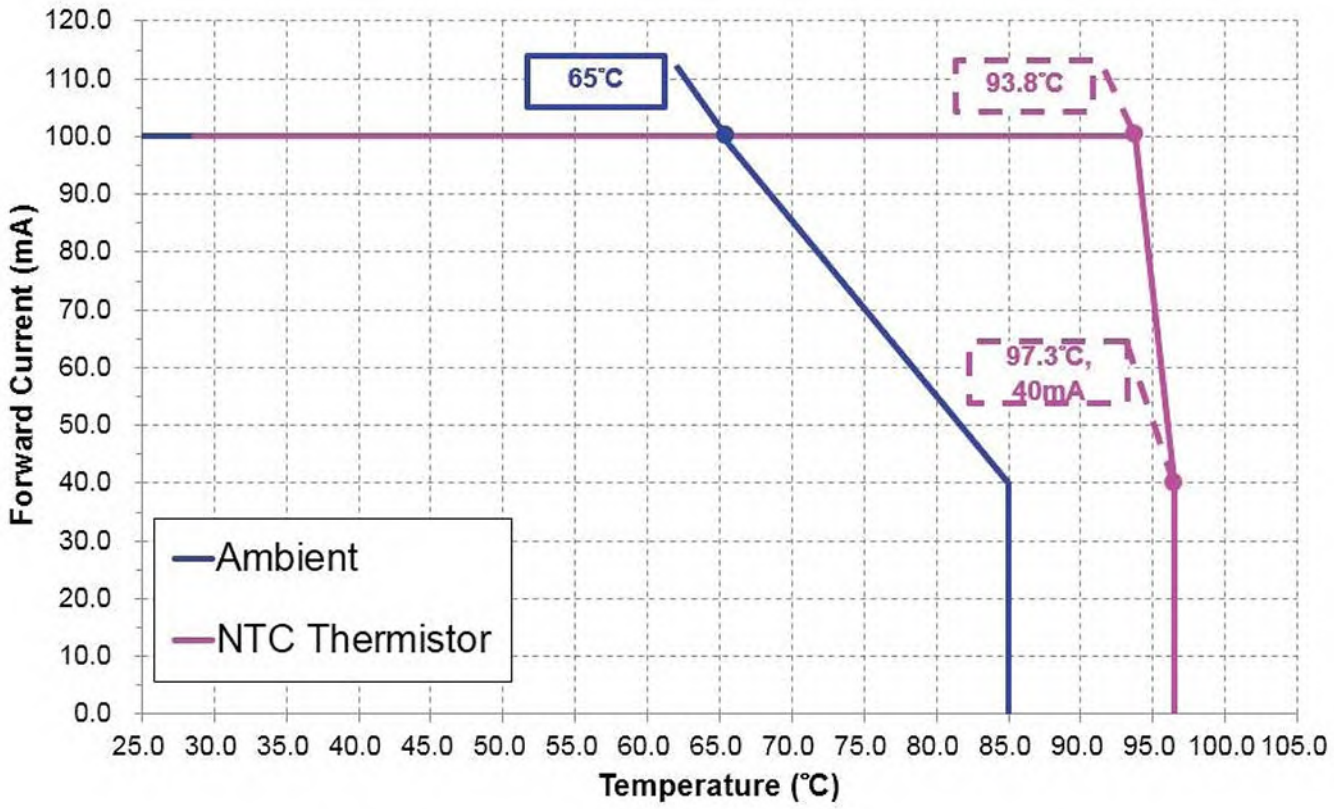


Figure 5-4 Derating.



6.0 MECHANICAL CHARACTERISTICS

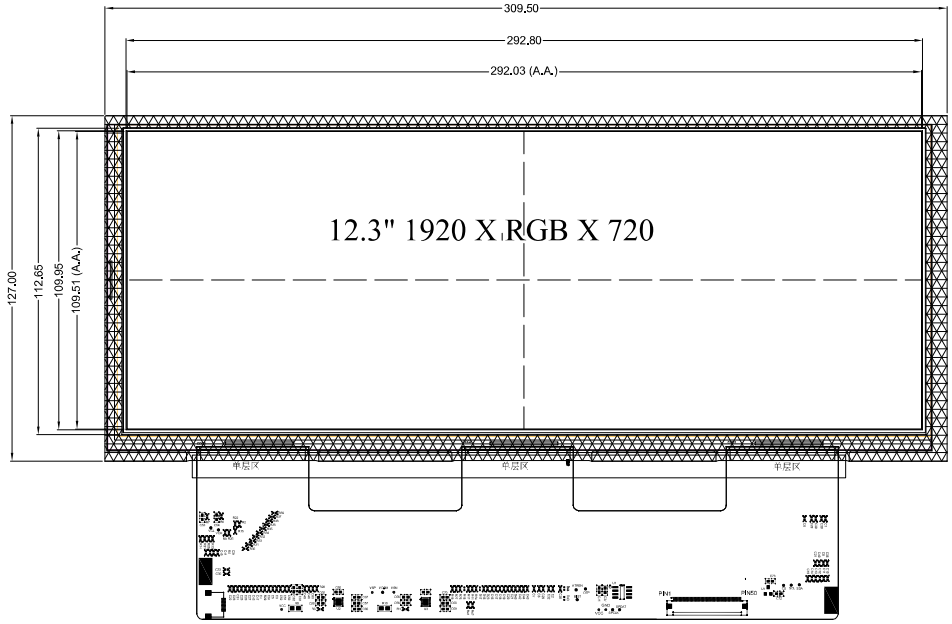
6.1 Dimensional Requirements

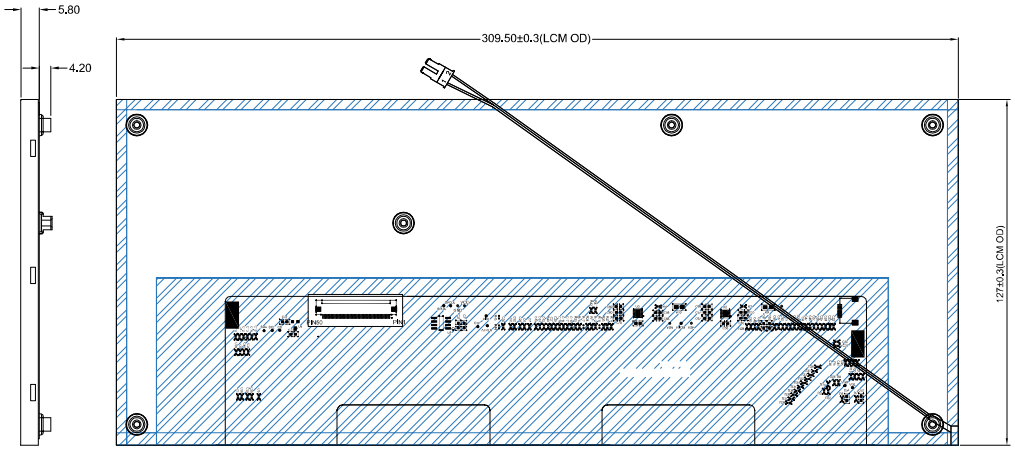
Figure in next page shows mechanical outlines for the panel

<Table 6-1 Dimensional Parameters>

Parameter	Specification	Unit
Active Area	292.032 (H) × 109.512 (V)	mm
Number of pixels	1920(H) ×720(V)	Pixels
Pixel pitch	0.1521(H) ×RGB×0.1521 (V)	mm
Pixel arrangement	RGB Vertical stripe	
Display colors	16 7M	colors
Display mode	Normally black	
Module thickness	7.2 / 10.7	mm
Module outline	309.5*127*5.8	mm
AA-MDL outline L/R/U/D	9.068/5.9/5.5/10.988	mm

7.0 MDL Outline Dimension





8.0 RELIABILITY TEST

<Table 8-1 Reliability test>

No	Test Items	Conditions	Remark
1	High temperature storage test	Ta = 80 ℃, 500 hrs	Note1
2	Low temperature storage test	Ta = -30 ℃, 500 hrs	
3	High temperature operation test	Ta = 70℃, 500 hrs	
4	Low temperature operation test	Ta = -20 ℃, 500 hrs	
5	High temperature & high humidity operation test	Ta = 65 ℃, 90%RH, 500 hrs	
6	Thermal shock	Ta = 20 ℃ ↔ 70 (0.5 hr), 100 cycle	Non-operation
7	Image Sticking	5*5 Pattern, 2hrs 25℃ check pattern Gray 127,Spec:≤L2	
8	ESD test	Air Voltage:±15KV Contact Voltage:±8KV R: 330Ω C: 150pF 5 time	Note2
9	Vibration Test	Random: 0.015G^2/Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ 8H	

Note1
测试完成2H后，恢复室温25℃点灯

Note2
Class B，有异常而可恢复，比如闪屏
因为整机ESD水平不仅与模组相关，也与系统相关。此处承诺配合客户整机达到要求，
如需要将进行ESD改善。

9.0 INTERFACE CONNECTION

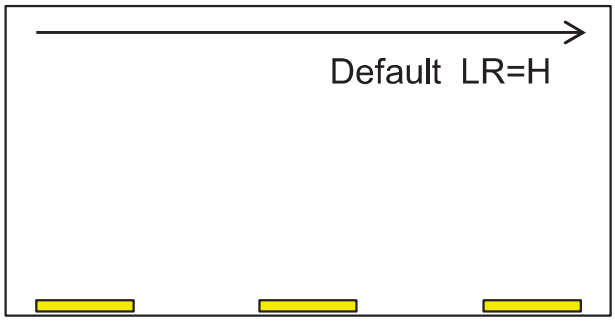
9.1 The LCD Module Electrical Interface Connection

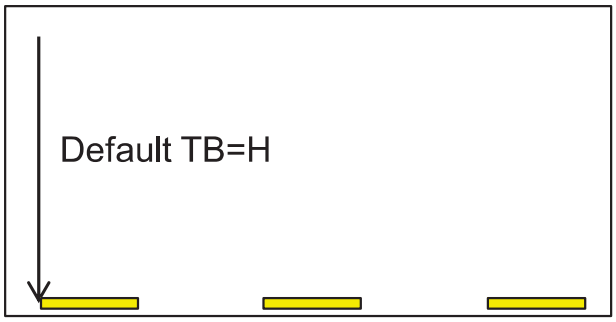
FPC connector is used for electronics interface.
AORORA F31L-1A7H1-21050 , 50PIN

Pin no.	Symbol	Function
1	GND	Power Ground
2	NC	No connector
3	VCC	Digital Power
4	VCC	Digital Power
5	GND	Power Ground
6	GND	Power Ground
7	NC	No connector
8	NC	No connector
9	GND	Power Ground
10	ORXIN0-	Odd pixel negative LVDS differential clock input
11	ORXIN0+	Odd pixel positive LVDS differential clock input
12	ORXIN1-	Odd pixel negative LVDS differential clock input
13	ORXIN1+	Odd pixel positive LVDS differential clock input
14	ORXIN2-	Odd pixel negative LVDS differential clock input
15	ORXIN2+	Odd pixel positive LVDS differential clock input
16	ORXCLKIN-	Odd pixel negative LVDS differential clock input
17	ORXCLKIN+	Odd pixel positive LVDS differential clock input
18	ORXIN3-	Odd pixel negative LVDS differential clock input
19	ORXIN3+	Odd pixel positive LVDS differential clock input
20	ERXIN0-	Even pixel negative LVDS differential clock input
21	ERXIN0+	Even pixel positive LVDS differential clock input
22	ERXIN1-	Even pixel negative LVDS differential clock input
23	ERXIN1+	Even pixel positive LVDS differential clock input
24	ERXIN2-	Even pixel negative LVDS differential clock input
25	ERXIN2+	Even pixel positive LVDS differential clock input
26	ERXCLKIN-	Even pixel negative LVDS differential clock input
27	ERXCLKIN+	Even pixel positive LVDS differential clock input
28	ERXIN3-	Even pixel negative LVDS differential clock input

29	ERXIN3+	Even pixel positive LVDS differential clock input
30	GND	Power Ground
31	OTP_VDD(NC)	No connector
32	RESETB	Global reset pin,active low.
33	STBYB	Standby mode,active low.
34	CA3	Cascade signal pin. Abnormal signal detection indicator. Combine HV/DE/Clock/STV/UVP detection result.
35	SCL(NC)	Serial interface clock input.(User NC)
36	SDA(NC)	Serial interface data input/output.(User NC)
37	CSB(NC)	Serial interface chip enable.(User NC)
38	GND	Power Ground
39	GND	Power Ground
40	NC	No connector
41	LEDA	LED power (Anode)
42	LEDA	LED power (Anode)
43	LEDA	LED power (Anode)
44	NC	No connector
45	LEDK1	Cathode 1
46	LEDK2	Cathode 2
47	LEDK3	Cathode 3
48	LEDK4	Cathode 4
49	NTC_A	NTC_Anode
50	NTC_K	NTC_Cathode

Note 1：





10.0 SIGNAL SPECIFICATION

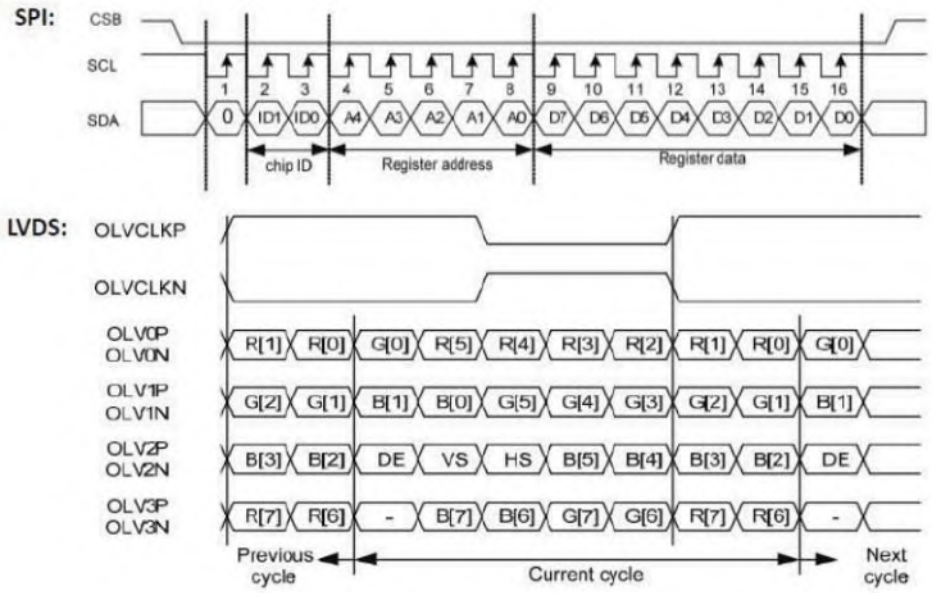
10.1 LVDS Signal Timing

Table 10-1 LVDS Signal Timing

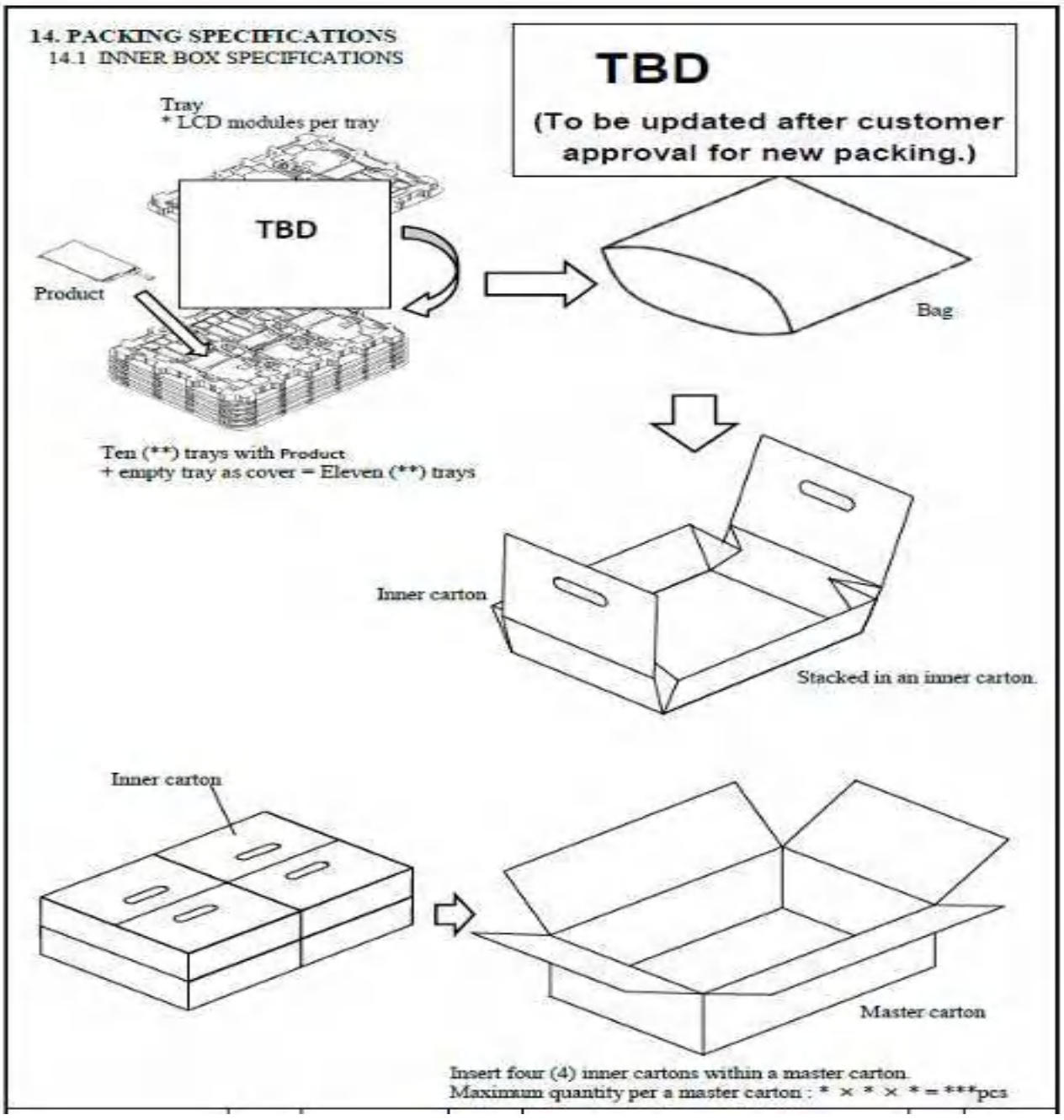
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	RxFCLK		44.1		MHz	
Horizontal Display Area	thd		960		DCLK	
HS Period	th	984	992	1005	DCLK	
HS Blanking	Thb+thfp		32		DCLK	
Vertical Display Area	tvd		720		TH	
VS Period	tv	730	741	753	TH	
VS Blanking	Tvbp+tvfp		21		TH	
Input data skew margin	TRSKM	400			ps	
Clock high time	TLVCH	2.45	3	4.55	ns	
Clock low time	TLVCL	2.45	4	4.55	ns	
PLL wake-up time	TenPLL			150	us	

10.2 Signal Format

Table 10-2 Signal Format



11. Package


14. PACKING SPECIFICATIONS
14.1 INNER BOX SPECIFICATIONS
TBD
(To be updated after customer approval for new packing.)
Tray
* LCD modules per tray
TBD
Product
Bag
Ten (**) trays with Product
+ empty tray as cover = Eleven (**) trays
Inner carton
Stacked in an inner carton.
Inner carton
Master carton
Insert four (4) inner cartons within a master carton.
Maximum quantity per a master carton : * × * × * = ***pcs