

TFT-Display Datenblatt

Modell SL2724ML-L1

Kurzdaten

Hersteller	STI
Diagonale	24,4" / 62 cm
Format	25:7
Auflösung	1920 x 540
Backlight	LED / 500 cd/m ²
Interface	LVDS
Touchscreen	nein
Temperatur	0... +50°C (Betrieb)



Specification

SL2724ML-L1

- (◆) Preliminary Specification
- () Final Specification

MODEL : SL2724ML-L1
SURFFIX : A
VERSION : 0.1
DATE : 2012-07-23
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Signature	Data
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Please return 1 copy for your information with your signature and comments

Approved by	Data
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Product Engineering Dept.
Systems Technology Inc.

The Information Described in this Specification is Preliminary and can be changed without prior notice



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Revision History

Date	Rev.No	Page	Description
2012 / 07 / 23	0.1		Preliminary Specifications.



1. PRECAUTIONS

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open or modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of the LED lightbar edge. Instead, press at the far ends of the LED light bar edge softly. Otherwise the TFT Module may be damaged.
- 10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 11) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
- 12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
- 13) Please avoid touching COF position while you are doing mechanical design.
- 14) When storing modules as spares for a long time, the following precaution is necessary:
Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.

2. General Description

This specification applies to the 24 inch-FHD Color a-Si TFT-LCD Module [SL2724ML-L1](#). The display supports the FHD - 1920(H) x 540(V) screen format and 16.7M colors (RGB 8-bits). The light source of this TFT-LCD module is W-LED. All input signals are 2-channel LVDS interface and this module doesn't contain a driver for backlight.

2.1 Display Characteristics

The following items are characteristics summary on the table under 25°C condition:

Items	Unit	Specifications
Screen Diagonal	[inch]	24.4
Active Area	[mm]	597.60(H) x 168.08(V)
Pixels H x V		1920 x 540
Pixel Pitch	[um]	311.25 (per one triad) x311.25
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		VA Mode, Normally Black
Nominal Input Voltage VDD	[Volt]	+5.0 typ.
Typical Power Consumption (VDD line + LED line)	[Watt]	32.5W (Typ.) (without LED Driver, all white pattern)
Physical Size	[mm]	630.0(H)x 205.3(V) x 11.5D)
Electrical Interface		Dual channel LVDS
Surface Treatment		Anti-Glare, 3H
Support Color		16.7M colors (RGB 8-bits)
Temperature Range		
Operating	[°C]	0 to +50
Storage (Shipping)	[°C]	-20 to +60

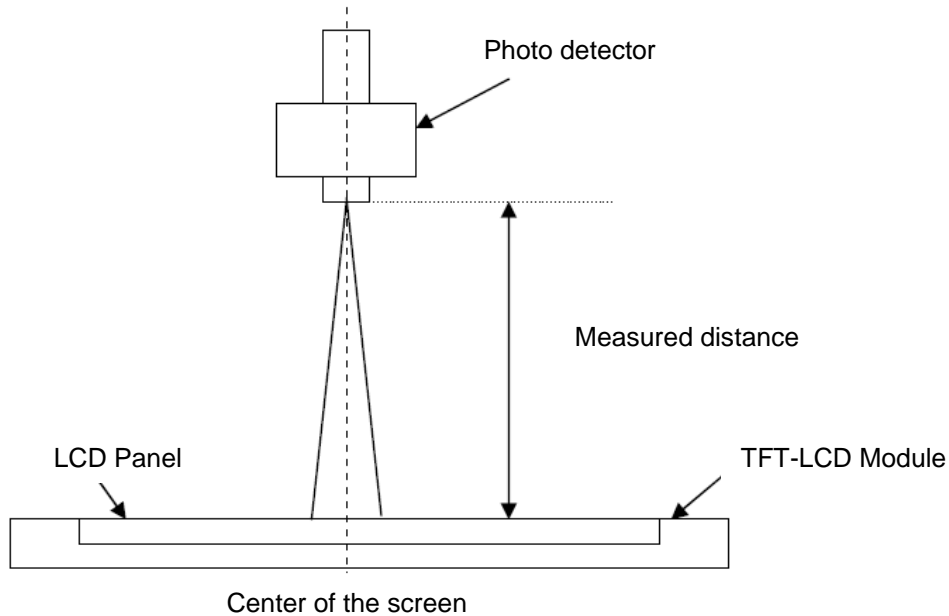
2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C:

Items	Unit	Specifications	Min	Typ	Max	note
Viewing Angle	degree	Horizontal (Right) CR = 10 (Left)	150	178	-	2
		Vertical (Right) CR = 10 (Left)	150	178	-	
Contrast ratio		Normal Direction	4000	5000	-	3
Response Time	msec	Raising Time (TrR)	-	7	9	4
		Falling Time (TrF)	-	5	7	
		TrR + TrF	-	12	16	
Color / Chromaticity Coordinates (CIE)		Red x	0.651	0.645	0.675	5
		Red y	0.304	0.334	0.364	
	Green x	0.301	0.331	0.361		
		Green y	0.599	0.629	0.659	
	Blue x	0.125	0.155	0.185		
		Blue y	0.017	0.047	0.077	
	White x	0.283	0.313	0.343		
White y	0.299	0.329	0.359			
Center Luminance	Cd/m ²		400	500	-	6
Uniformity	%		75	80	-	7
Crosstalk (in 60Hz)	%				1.5	8
Flicker	dB				-20	9

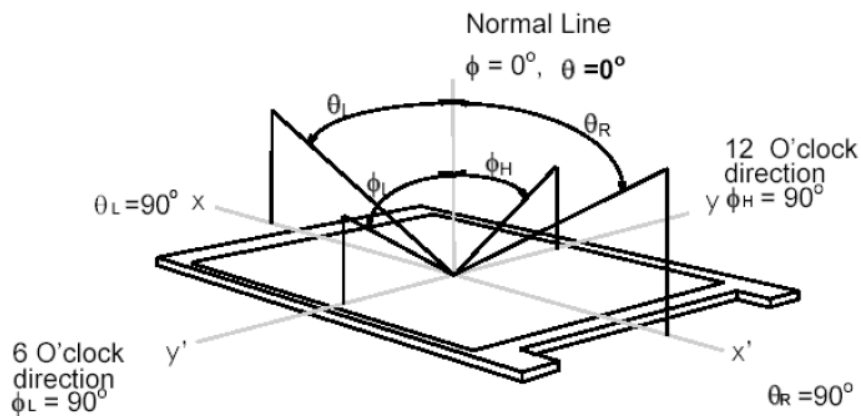
Note 1: Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring (at surface 35°C). In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.

**Note 2: Definition of viewing angle**

Measured by ELDIM. (EZContrast 88)

Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90° (Θ) horizontal left and right and 90° (Φ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.

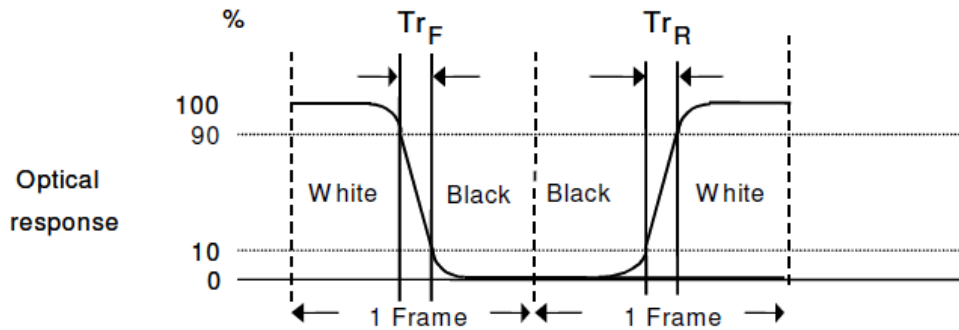


Note 3: Contrast ratio

Measured by TOPCON SR-3

Note 4 : Definition of Response time measured by Westar TRD-100A

The output signals of photo detector are measured when the input signals are changed from “Full Black” to “Full White” (rising time, TrR), and from “Full White” to “Full Black” (falling time, TfF), respectively. The response time is interval between the 10% and 90% (1 frame at 60 Hz) of amplitudes.



TrR + TfF = 12 msec (typ.).

Algorithm : | Gray Level A – Gray Level B | ≥ 16, then the average gray to gray response time is 2ms,(F= 60 Hz).

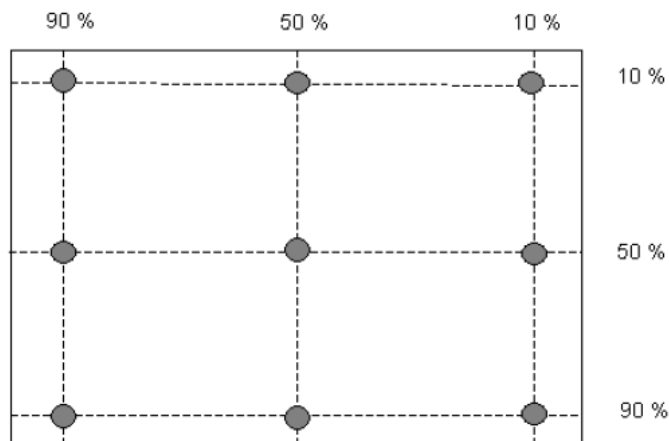
Note 5: Color chromaticity and coordinates (CIE)

Measured by TOPCON SR-3

Note 6: Central luminance

Measured by TOPCON SR-3

Note 7: Luminance uniformity of these 9 points is defined as below and measured by TOPCON SR-3



$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 points (1-9)}}{\text{Maximum Luminance in 9 Points (1-9)}}$$

Note 8: Crosstalk

Defined as below and measured by TOPCON SR-3

$$CT = | YB - YA | / YA \times 100 (\%)$$

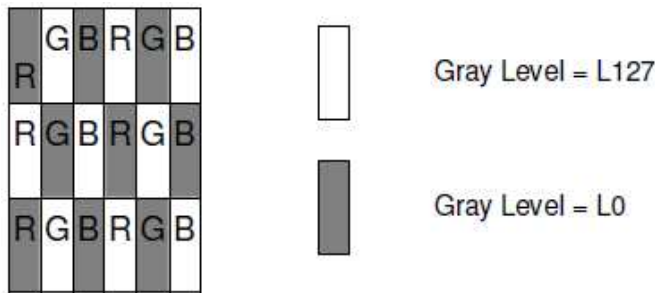
Where

YA = Luminance of measured location without gray level 0 pattern (cd/m²)

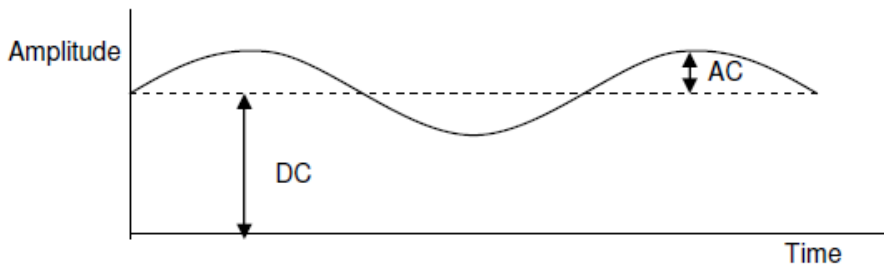
YB = Luminance of measured location with gray level 0 pattern (cd/m²)



Note 9: Test Pattern : Sub-checker Pattern measured by TOPCON SR-3



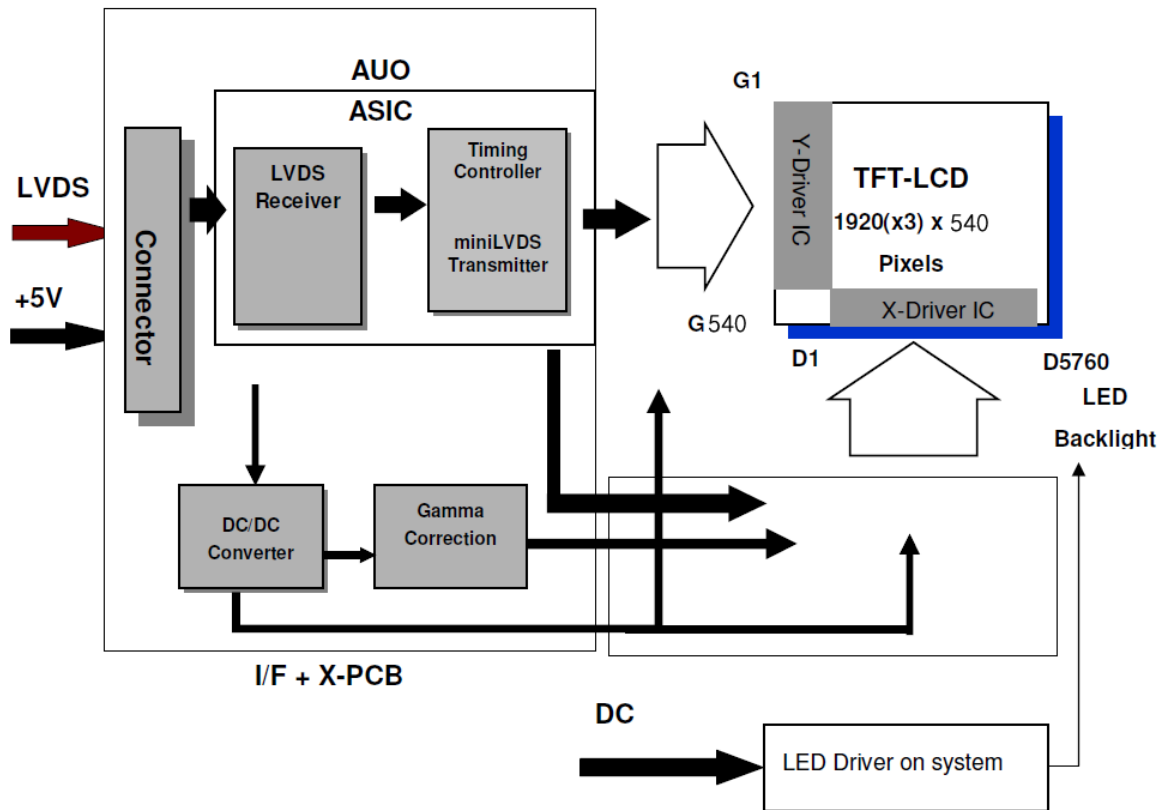
Method : Record dBV & DC value with TRD-100



$$\text{Flicker (dB)} = 20 \log \frac{\text{AC Level (at 30 Hz)}}{\text{DC Level}}$$

3. Functional Block Diagram

The following diagram shows the functional block of the 24 inch Color TFT-LCD Module :



I/F PCB Interface:

FI-XPB30SRLAHF11
01-187121-30091-3(A)

Mating Type:

FI-X30HL(Locked Type)

4. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following :

4.1 TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VDD	0	5.5	[Volt]	Note 1, 2

4.2 Backlight Unit

Item	Symbol	Min	Max	Unit	Conditions
LED Current	I _{LED}	120	126	[mA]	Note 1, 2

4.3 Absolute Ratings of Environment

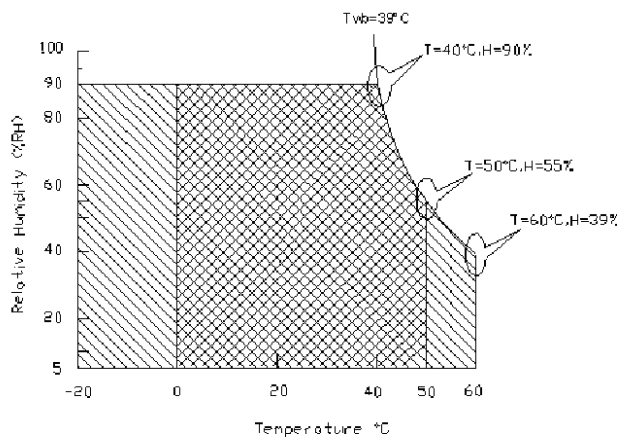
Item	Symbol	Min	Max	Unit	Conditions
Operating Temperature	TOP	0	+50	[°C]	Note 3
Center Glass surface temperature (operation)	TGS	0	+50	[°C]	
Operation Humidity	HOP	5	90	[%RH]	
Storage Temperature	TST	-20	+60	[°C]	
Storage Humidity	HST	5	90	[%RH]	

Note 1 : With in Ta (25°C)

Note 2 : Permanent damage to the device may occur if exceeding maximum values

Note 3 : Temperature and relative humidity range are shown as the below figure.

1. 90% RH Max (Ta ≤ 39°C)
2. Max wet-bulb temperature at 39°C or less. (Ta ≤ 39°C)
3. No condensation



Operating Range Storage Range +

5. Electrical Specifications

5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are as following :

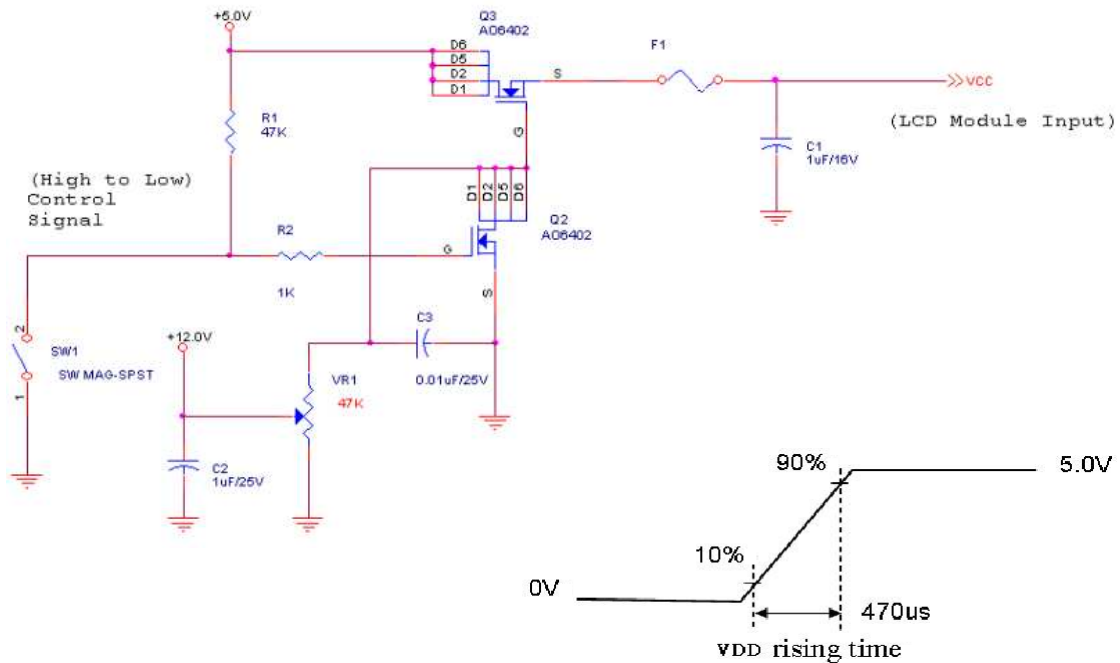
Symbol	Parameter	Min	Typ	Max	Units	Note
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	±10%
IDD	Input Current	-	0.8	1.0	[A]	1
		-	0.9	1.1		2
PDD	VDD Power	-	4.0	5.0	[Watt]	1
		-	4.5	5.5		2
IRush	Inrush Current	-	-	2	[A]	3
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	500	[mV] p-p	2

Note 1 : VDD= 5.0V, All White Pattern At 60Hz

Note 2 : VDD= 5.0V, All White Pattern At 75Hz

Note 3 : Measurement conditions:

The duration of rising time of power input is 470us.



5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off. Please refer to specifications of SN75LVDS82DGG (Texas Instruments) in detail.

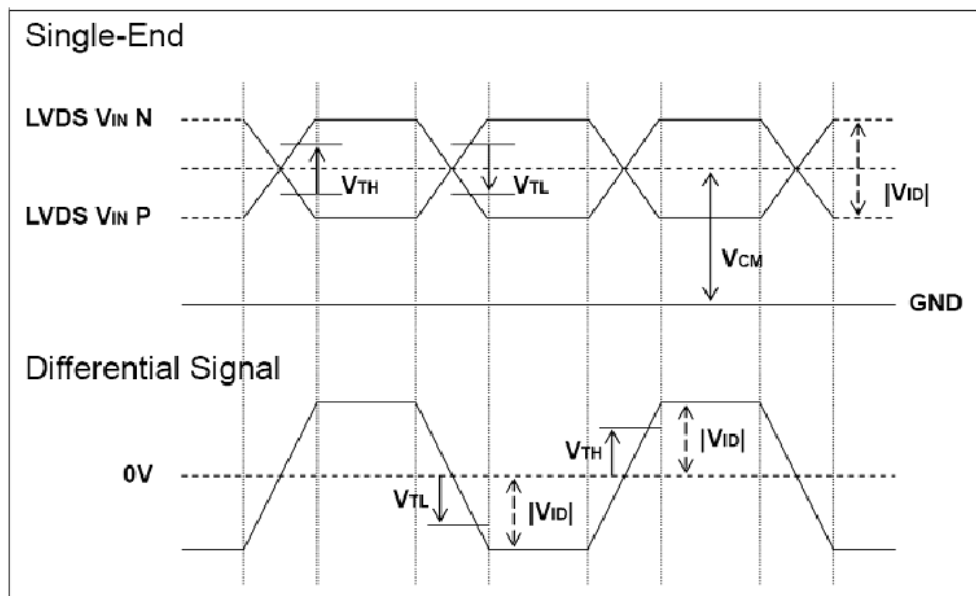
1. DC Characteristics of each signal are as following :

Symbol	Parameter	Min	Typ	Max	Units	Note
V _{TH}	Differential Input High Threshold	-	-	+100	[mV]	1, 3
V _{TL}	Differential Input Low Threshold	-100	-	-	[mV]	1, 3
V _{ID}	Input Differential Voltage	100	-	600	[mV]	3
V _{ICM}	Differential Input Common Mode Voltage	+1.0	+1.2	+1.5	[V]	2, 3

Note 1 : V_{ICM} = 1.2V

Note 2 : V_{TH}-V_{TL} = 200mV (max)

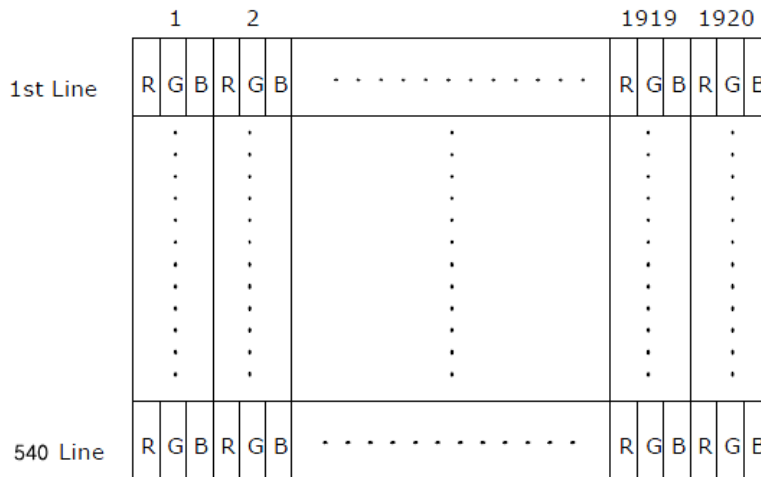
Note 3 : LVDS Signal Waveform



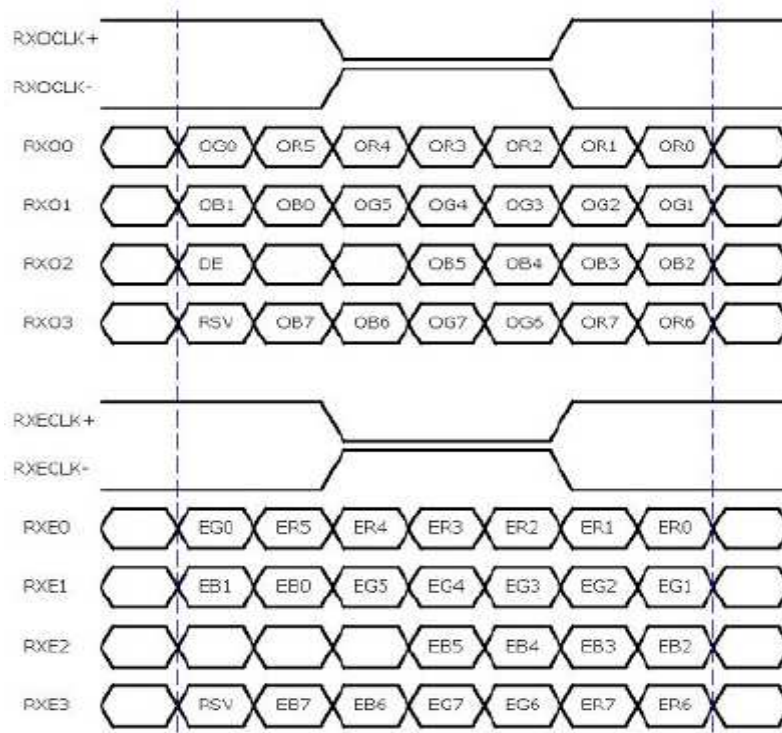
6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



6.2 The input data format



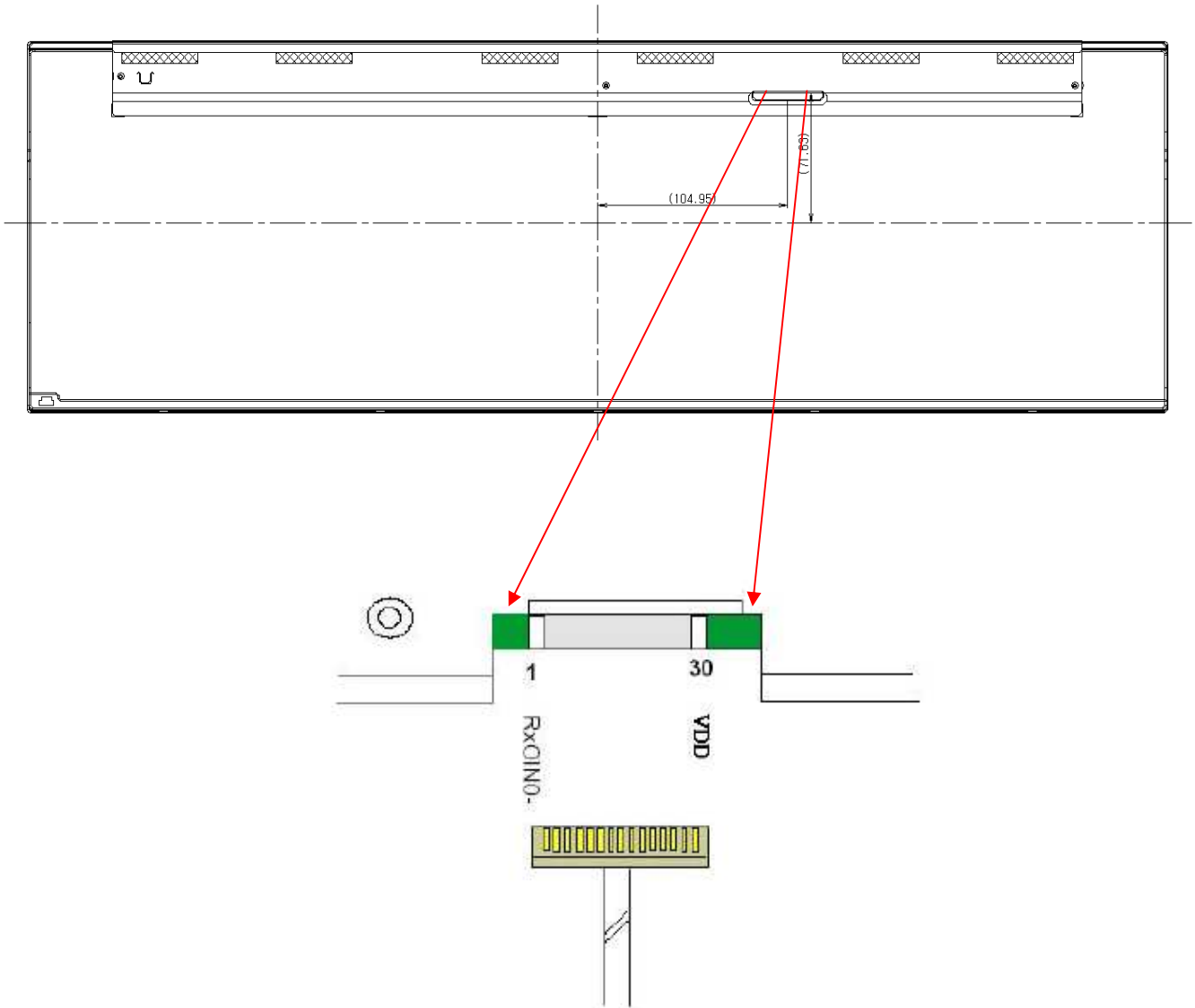
Note 1 : R/G/B data 7:MSB, R/G/B data 0:LSB O = "Odd Pixel Data" E = "Even Pixel Data"

6.3 Interface Connections

The module using one LVDS receiver SN75LVDS82(Texas Instruments). LVDS is a differential signal technology for LCD interface and high speed data transfer device. LVDS transmitters shall be SN75LVDS83(negative edge sampling). The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

PIN #	SIGNAL NAME	DESCRIPTION
1	RxOIN0-	Negative LVDS differential data input (Odd data)
2	RxOIN0+	Positive LVDS differential data input (Odd data)
3	RxOIN1-	Negative LVDS differential data input (Odd data)
4	RxOIN1+	Positive LVDS differential data input (Odd data)
5	RxOIN2-	Negative LVDS differential data input (Odd data, DSPTMG)
6	RxOIN2+	Positive LVDS differential data input (Odd data, DSPTMG)
7	GND	Power Ground
8	RxOCLK-	Negative LVDS differential clock input (Odd clock)
9	RxOCLK+	Positive LVDS differential clock input (Odd clock)
10	RxOIN3-	Negative LVDS differential clock input (Odd clock)
11	RxOIN3+	Positive LVDS differential clock input (Odd clock)
12	RxEIN0-	Negative LVDS differential data input (Even data)
13	RxEIN0+	Positive LVDS differential data input (Even data)
14	GND	Power Ground
15	RxEIN1-	Positive LVDS differential data input (Even data)
16	RxEIN1+	Negative LVDS differential data input (Even data)
17	GND	Power Ground
18	RxEIN2-	Negative LVDS differential data input (Even data)
19	RxEIN2+	Positive LVDS differential data input (Even data)
20	RxECLK-	Negative LVDS differential clock input (Even clock)
21	RxECLK+	Positive LVDS differential clock input (Even clock)
22	RxEIN3-	Negative LVDS differential data input (Even data)
23	RxEIN3+	Positive LVDS differential data input (Even data)
24	GND	Power Ground
25	NC	No connection
26	NC	No connection
27	NC	No connection
28	VDD	Power +5V
29	VDD	Power +5V
30	VDD	Power +5V

Note 1 : Start from left side



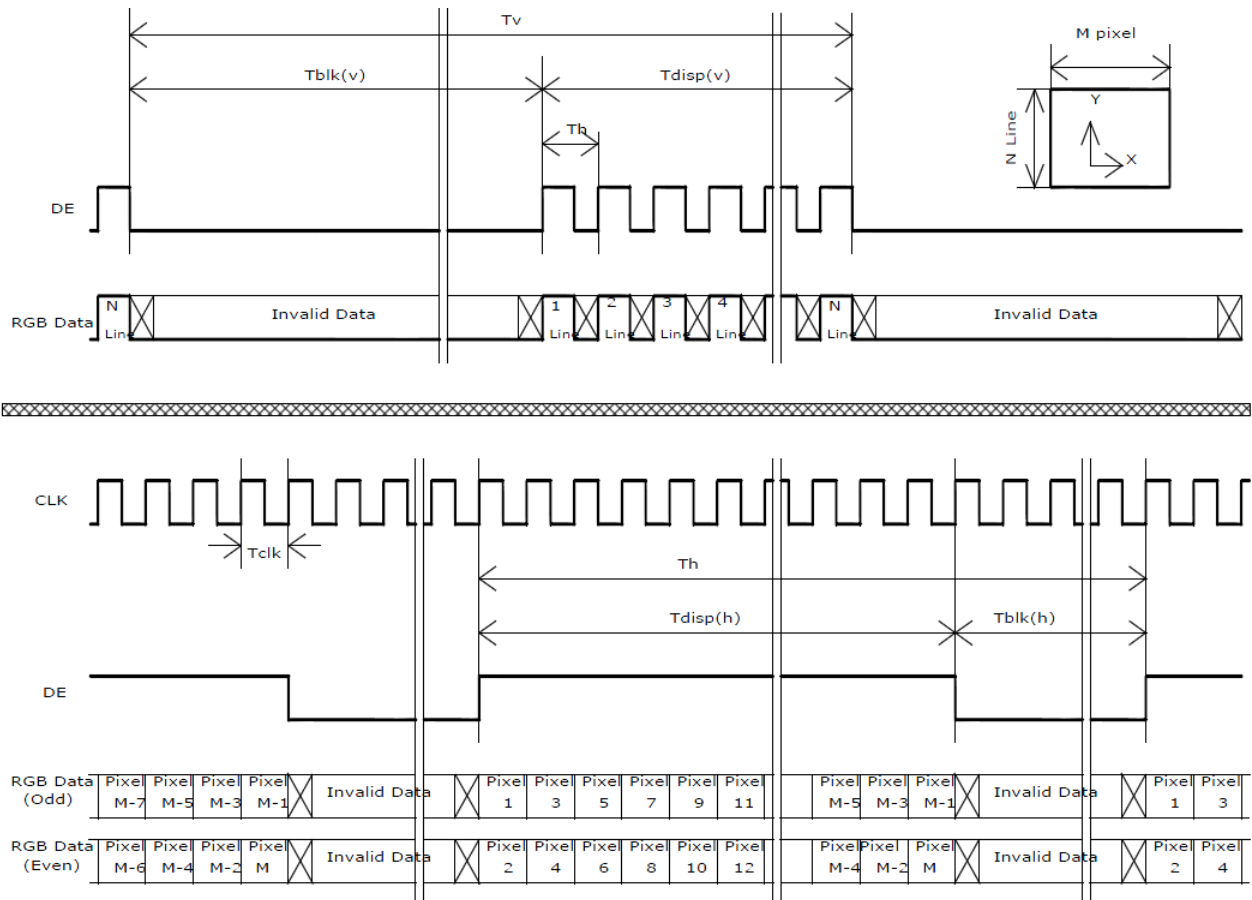
Note 2 : Input signals of odd and even clock shall be the same timing.

6.4 Timing Characteristics

Basically, interface timing described here is not actual input timing of LCD module but close to output timing of SN75LVDS82DGG (Texas Instruments) or equivalent.

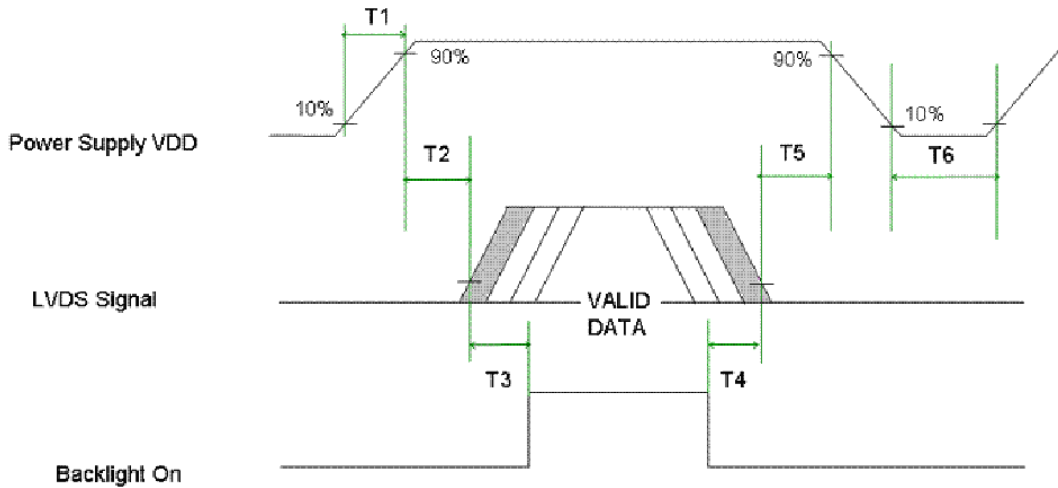
Item	Symbol	Min	Typ	Max	Unit	
Data CLK	Tclk	40	72	85	[MHz]	
H-section	Period	Th	1004	1050	2047	[Tclk]
	Display Area	Tdisp(h)	960	960	960	[Tclk]
	Blanking	Tblk(h)	44	90	1087	[Tclk]
V-section	Period	Tv	1088	1130	2047	[Th]
	Display Area	Tdisp(v)	1080	1080	1080	[Th]
	Blanking	Tblk(v)	8	50	967	[Th]
Frame Rate	F	50	60	75	[Hz]	

6.5 Timing Diagram



6.6 Power ON/OFF Sequence

VDD power and lamp on/off sequence are as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	500	-	-	ms
T4	200	-	-	ms
T5	0	-	50	ms
T6	1000	-	-	ms

7. Connector & Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	JAE P-TWO
Type Part Number	FI-XPB30SRLA-HF11 01-187121-30091-3(A)
Mating Housing Part Number	FI-X30HL (Locked Type)

7.1.1 Pin Assignment

Pin No	Signal Name	Pin No	Signal Name
1	RxOIN0-	2	RxOIN0+
3	RxOIN1-	4	RxOIN1+
5	RxOIN2-	6	RxOIN2+
7	GND	8	RxOCLKIN-
9	RxOCLKIN+	10	RxOIN3-
11	RxOIN3+	12	RxEIN0-
13	RxEIN0+	14	GND
15	RxEIN1-	16	RxEIN1+
17	GND	18	RxEIN2-
19	RxEIN2+	20	RxECLKIN-
21	RxECLKIN+	22	RxEIN3-
23	RxEIN3+	24	GND
25	NC (for AUO test only. Do not connect)	26	NC (for AUO test only. Do not connect)
27	NC (for AUO test only. Do not connect)	28	VDD
29	VDD	30	VDD

7.2 Connector on Backlight Unit.

This connector is mounted on LED light-bar.

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	ENTERY INDUSTRIAL CO., LTD.
Type Part Number	3707K-Q06N-01R

7.2.1 Pin Assignment

Pin No	Signal Name
1	IRLED (current out)
2	IRLED (current out)
3	VLED (voltage in)
4	VLED (voltage in)
5	IRLED (current out)
6	IRLED (current out)

8. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50°C , 80%RH, 300hours	
High Temperature Operation (HTO)	Ta= 50°C , 50%RH, 300hours	
Low Temperature Operation (LTO)	Ta= 0°C , 300hours	
High Temperature Storage (HTS)	Ta= 60°C , 300hours	
Low Temperature Storage (LTS)	Ta= -20°C , 300hours	
Vibration Test (Non-operation)	Acceleration: 1.5 Grms Wave: Random Frequency: 10 - 200 Hz Duration: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction: ±X, ±Y, ±Z (one time for each Axis)	
Drop Test	Height: 46 cm, package test	
Thermal Shock Test (TST)	-20°C/30min, 60°C/30min, 100 cycles	1
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 15 points, 25 times/ point.	2
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 15 points, 25 times/ point.	
Altitude Test	Operation:10,000 ft Non-Operation:30,000 ft	

Note 1: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20°C to 60°C, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

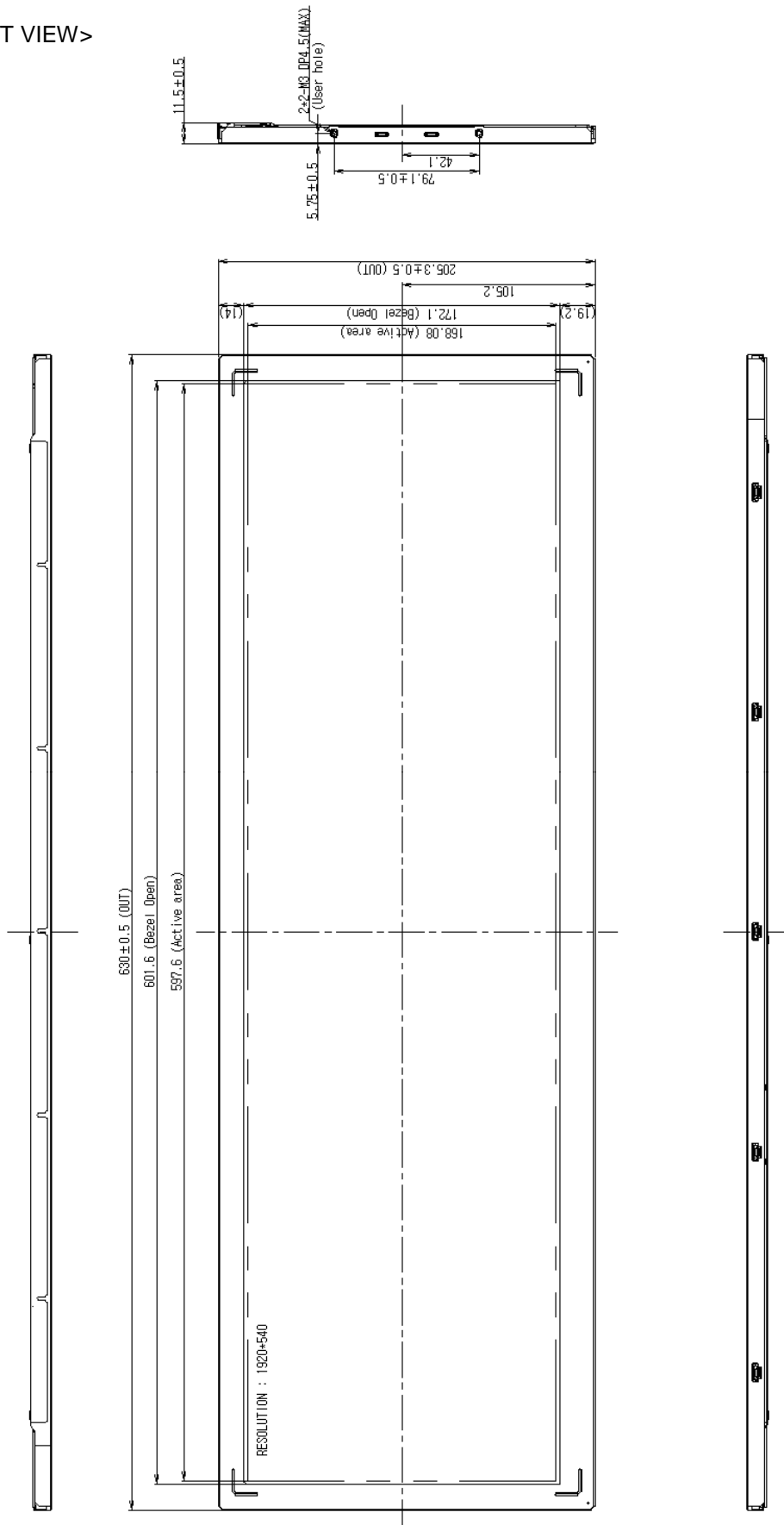
Note 2: EN61000-4-2, [ESD class B](#) : Certain performance degradation allowed
 No data lost
 Self-recoverable
 No hardware failures.

9. Mechanical Characteristics

Item	Value	
Outline Dimension	Horizontal	630.0mm
	Vertical	205.3 mm
	Depth	11.5 mm
Bezel Area	Horizontal	601.6mm
	Vertical	172.1mm
Active Display Area	Horizontal	597.6mm
	Vertical	168.08mm
Weight	2.22Kg	

Note : Please refer to a mechanical drawing in terms of tolerance at the next page.

<FRONT VIEW>



<REAR VIEW>

