

MDT103000	1920 x 720	LVDS Interface	TFT Module
Specification			
Version: 1		Date: 31/03/2021	
Revision			
1	29/03/2021	First issue	

Display Features			
Display Size	10.3"		
Resolution	1920 x 720		
Orientation	Landscape		
Appearance	RGB		
Logic Voltage	3.3V		
Interface	LVDS		
Brightness	1500 cd/m ²		
Touchscreen	---		
Module Size	255.24 x 106.68 x 7.00 mm		
Operating Temperature	-30°C ~ +85°C	Created By	Checked By
Pinout	50 way connector	CL	WE
Pitch	0.50 mm	Box Quantity	Weight / Display
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Display Accessories	
Part Number	Description
MDIB-CC1	Interconnect board for standard pitch pinouts to fine pitch wires. Providing pinouts for 2.54 pinout. 1.27, 1, 0.845, 0.8, 0.7, 0.65, 0.62, 0.6, 0.5 & 0.3 pads.

Optional Variants	
Appearances	Voltage



1. Handling 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) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 10) 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.

2. General Description

2.1 Overview

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This specification applies to the Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display a LED backlight system. The screen format is intended to support HD (1920(H) x720(V)) screen and 16.7M colors.

2.2 Features

- High brightness display, 1500nits by LED backlight.
- Long operation lifetime BLU design
- RoHS Compliance
- Wide operation temperature
- Wide view angle

2.3 Application

Industrial, automotive applications.



2.4 Display specifications

Items	Unit	Specification
Screen Diagonal	inch	10.30"
Active Area	mm	243.648 (H) X 91.368 (V)
Pixels H x V	pixels	1280 x3(RGB) x 720
Pixels Pitch	um	126.9 (per one triad) x 126.9
Pixel Arrangement		RGB Vertical stripe
Display mode		Normally black
White luminance (center)	Cd/m ²	1500 (Typ)
Contrast ratio		1300:1 (Typ.)
Optical Response Time	msec	27 ms (Typ. On/off)
Normal Input Voltage VDD	Volt	3.3
Power Consumption (Vcc Line + LED backlight)	Watt	TBD (VDD line=TBD; LED lines= 14.04 W)
Weight	Grams	TBD
Physical size	mm	255.24 (W)×106.68 (H)×7.0 (D)
Electrical Interface		LVDS
Support colors		16.7M colors
Surface Treatment		Anti-glare and hard-coating 3H
Temperature range		
Operating	°C	-30 ~ 85 (TFT surface)
Storage	°C	-40 ~ 90
RoHS Compliance		RoHS Compliance



2.5 Optical characteristics

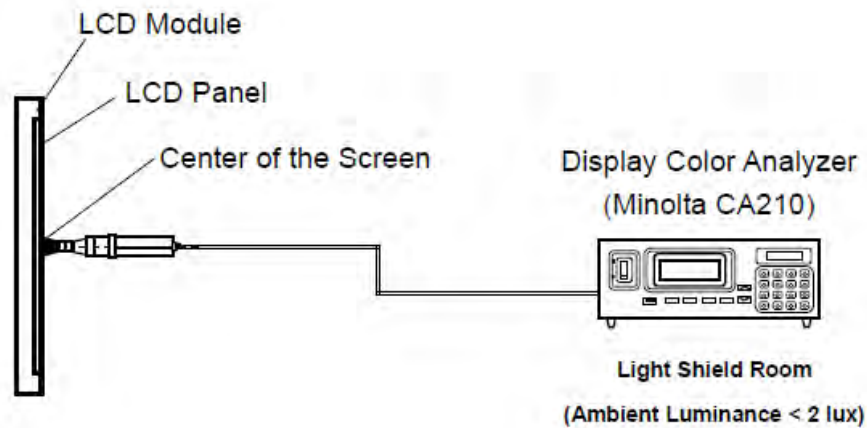
The following optical characteristics are measured under stable condition at 25 °C

Items	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing angle	Deg.	Horizontal (Right)	80			2
		CR=10 (Left)	80			
		Vertical (Up)	80			
		CR=10 (Down)	80			
Contrast Ratio		Normal Direction	1000	1300		3
Response Time	msec	Raising + Falling		27		4
Color / Chromaticity Coordinates (CIE)		Red x	-0.05	0.651	+0.05	5
		Red y		0.336		
		Green x		0.321		
		Green y		0.598		
		Blue x		0.149		
		Blue y		0.055		
		White x		0.310		
		White y		0.330		
Color coordinates (CIE) White						
Center Luminance	Cd/m ²		1200	1500		6
Luminance Uniformity	%		70	75		7
Crosstalk (in 60 Hz)	%				1.5	
Flicker	dB				-20	

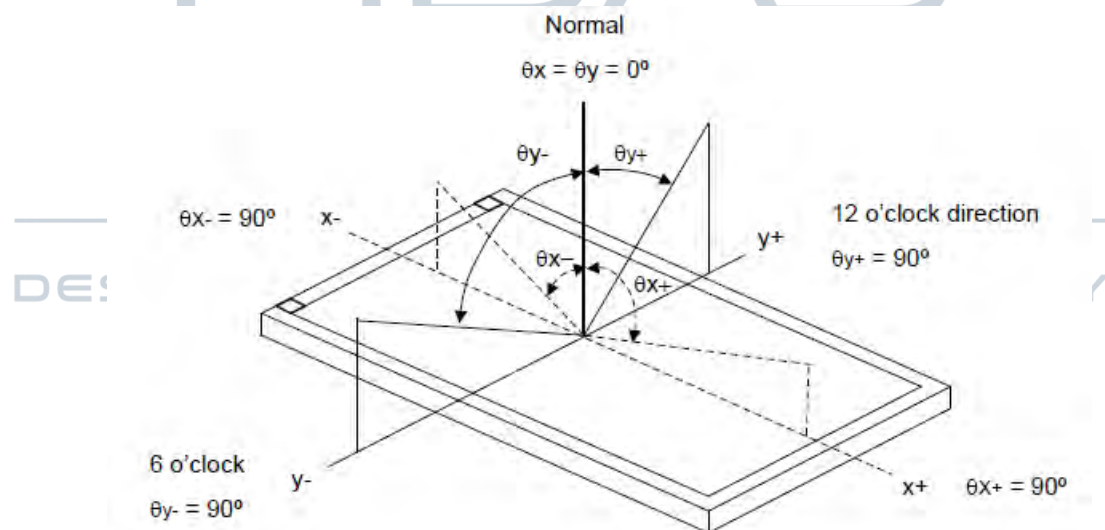


Note 1: Measurement method

The LCD module should be stabilized at given temperature for 0.5 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



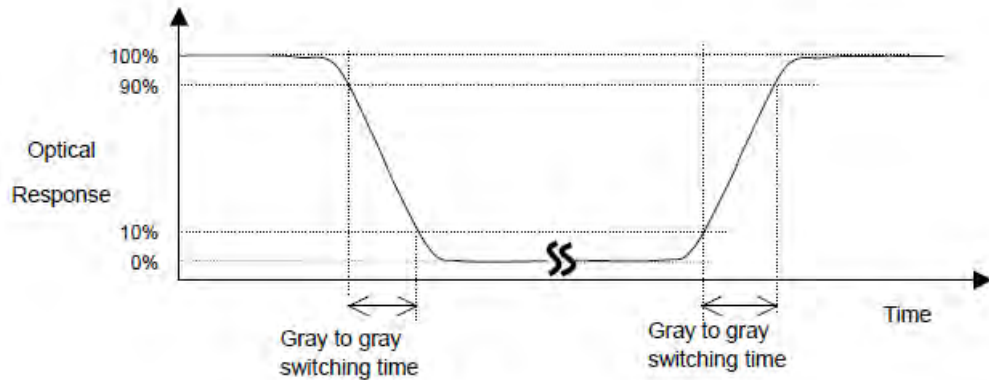
Note 2: Definition of viewing angle



Note 3: Contrast ratio is measured by Minolta CA210

Note 4: Definition of Response time

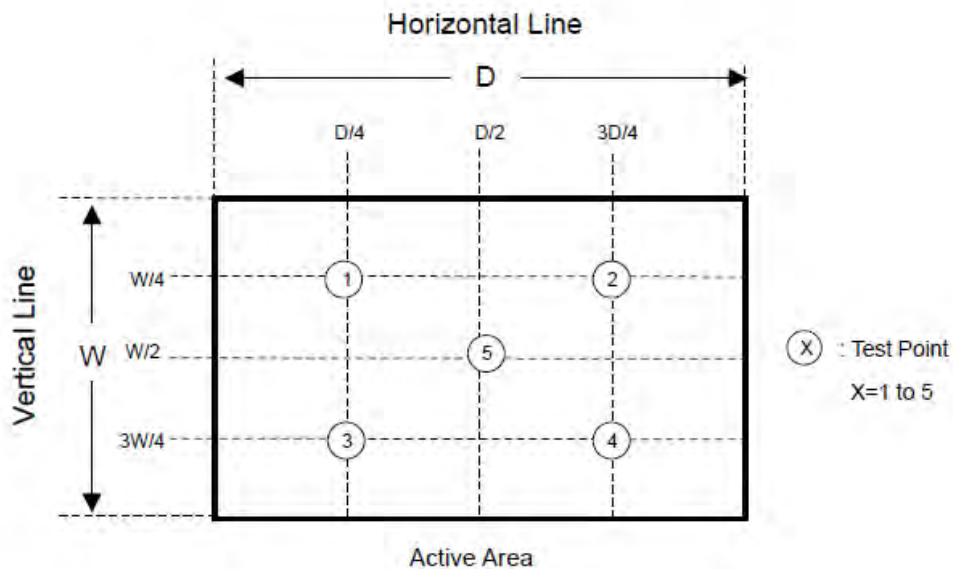
The output signals of photo detector are measured when the input signals are changed from “Full Black” to “Full White” (rising time), and from “Full White” to “Full Black” (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes. Please refer to the figure as below.



Note 5: Color chromaticity and coordinates (CIE) is measured by Minolta CA210

Note 6: Center luminance is measured by Minolta CA210

Note 7: Luminance uniformity of these 5 points is defined as below and measured by Minolta CA210



$$\text{Uniformity} = (\text{Min. Luminance of 5 points}) / (\text{Max. Luminance of 5 points})$$



3. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

3.1 TFT LCD module

Items	Symbol	Min	Max	Unit	Conditions
Power supply voltage	V_{DD}	-0.3	4.0	Volt	Note 1, 2

3.2 Backlight unit

Items	Symbol	Min	Max	Unit	Conditions
LED bar input current			600	mA	

3.3 Environment

Items	Symbol	Values			Unit	Conditions
		Min.	Typ.	Max.		
Operation temperature	T_{OS}	-30	-	85	$^{\circ}\text{C}$	Note 3
Operation Humidity	H_{OP}	10		85	%	
Storage temperature	T_{ST}	-40		90	$^{\circ}\text{C}$	
Storage Humidity	H_{ST}	5		90	%	

Note 1: With in $T_a = 25^{\circ}\text{C}$

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

Note 3: For quality performance, please refer to IIS (Incoming Inspection Standard).

4. Electrical characteristics

4.1 LCD electronics specification

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V_{DD}	3.1	3.3	3.5	V	Note 1,2
Power Supply Input Current	I_{DD}	-	TBD	TBD	mA	Note 3
Input logic high voltage	V_{IH}	$0.7 V_{DD}$	-	$V_{DD}+0.3$	V	Note 4
Input logic low voltage	V_{IL}	GND-0.3	-	$0.3 V_{DD}$	V	

Note 1: V_{DD} setting should match the signals output voltage of customer's system board.

Note 2: The ripple voltage should be controlled under 5% of V_{DD}

Note 3: Full white pattern.

Note 4: RESET, STBYB, L/R, U/D, BIST, PINCTL, SDI, SCL, CSB

4.2 Backlight unit

Parameter	Min	Typ	Max	Unit	Note
LED voltage (VL)		36		[V]	2
LED current (IL)		260		[mA]	2
LED power (PL)		14.04		[W]	
LED lite time (MTBF)		100,000		[Hour]	1

Note 1: The "LED lift time" is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25°C and typical LED Current at 260 mA

Note 2: The variance of LED Light Bar power consumption is $\pm 10\%$. Calculator value for reference ($IL \times VL \times 2 = P_{LED}$)

4.3 Interface connector

4.3.1 TFT connector(CN1)

PCBa connector is used for the module electronics interface. The recommended model is IMSA-12003S-50Y901 manufactured by IRISO.

Pin	Input signal name	I/O pin (I:input, O:output, P:power)	Typical voltage (Volt)		description
1	GND	P	0V	power supply	Ground
2	VDD	P	3.3V	power supply	External main and I/O power supply ; Power3V3
3	VDD	P	3.3V	power supply	External main and I/O power supply : Power3V3
4	VPP_TRIM	P		power supply	LCD Maker Internal Use (If not use please keep floating.)
5	RESET	I		Function	Global reset pin, set logic High for normal display operation
6	STBYB	I		Function	Standby mode setting pin, set logic High for normal display operation
7	GND	P	0V	power supply	Ground
8	ELV3P	I		LVDS signal	LVDS even data 3+
9	ELV3N	I		LVDS signal	LVDS even data 3-
10	GND	P	0V	power supply	Ground
11	ELV2P	I		LVDS signal	LVDS even data 2+
12	ELV2N	I		LVDS signal	LVDS even data 2-
13	GND	P	0V	power supply	Ground
14	ELVCLKP	I		LVDS signal	LVDS even clk +
15	ELVCLKN	I		LVDS signal	LVDS even clk -
16	GND	P	0V	power supply	Ground
17	ELV1P	I		LVDS signal	LVDS even data 1+
18	ELV1N	I		LVDS signal	LVDS even data 1-
19	GND	P	0V	power supply	Ground
20	ELV0P	I		LVDS signal	LVDS even data 0+
21	ELV0N	I		LVDS signal	LVDS even data 0-
22	GND	P	0V	Power supply	Ground
23	OLV3P	I		LVDS signal	LVDS odd data 3+
24	OLV3N	I		LVDS signal	LVDS odd data 3-
25	GND	P	0V	power supply	Ground
26	OLV2P	I		LVDS signal	LVDS odd data 2+
27	OLV2N	I		LVDS signal	LVDS odd data 2-
28	GND	P	0V	power supply	Ground

29	OLVCLKP	I		LVDS signal	LVDS odd clk +
30	OLVCLKN	I		LVDS signal	LVDS odd clk -
31	GND	P	0V	power supply	Ground
32	OLV1P	I		LVDS signal	LVDS odd data 1+
33	OLV1N	I		LVDS signal	LVDS odd data 1-
34	GND	P	0V	power supply	Ground
35	OLV0P	I		LVDS signal	LVDS odd data 0+
36	OLV0N	I		LVDS signal	LVDS odd data 0-
37	GND	P	0V	power supply	Ground
38	BIST	I	0V	Function	Normal Operation/BIST pattern select, set logic Low for normal display operation.
39	L/R	I	3.3V	Function	Horizontal shift direction (source output) selection. L/R = 1: Left -> Right L/R = 0: Right -> Left
40	U/D	I	3.3V	Function	Vertical shift direction (gate output) selection. U/D = 1: Top -> Bottom U/D = 0: Bottom->Top
41	GND	P	0V	power supply	Ground
42	GND	P	0V	power supply	Ground
43	GND	P	0V	power supply	Ground
44	PINCTL	I	3.3V	Function	Select Pin/Register control. (default: Customer to Pull high for Pin Control only) PINCTL = 1: Pin/Register control function controlled by Pin. PINCTL = 0: Pin/Register control function controlled by Register.
45	AB_IND	O			Abnormal signal detection indicator. Combine the HV / DE / Clock / STV / UVP detection result. (When normal operating, AB_IND is "1" level, When abnormal detected, AB_IND is "0" level.)
46	SDI	I			Serial communication data input pin, set logic High if no use.
47	NC	-			Please keep floating.
48	SCL	I			Serial communication clock input pin, set logic High if no use.
49	CSB	I			Serial communication chip selection, set logic High if no use.
50	GND	P	0V	power supply	Ground

4.3.2 Backlight connector(CN2、CN3)

Recommended connector : JOIN TEK JT1025-1021 (BHSR-02VS-1 manufactured by JST)

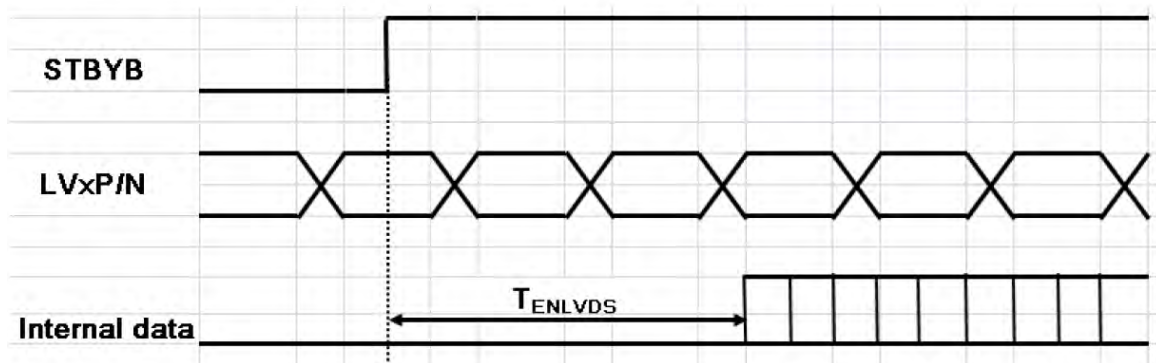
Pin no	Symbol	Description	Note
1	V _{LED+}	Backlight LED anode	Red
2	V _{LED-}	Backlight LED cathode	Black

5. Timing characteristics

5.1 LVDS AC electrical characteristics

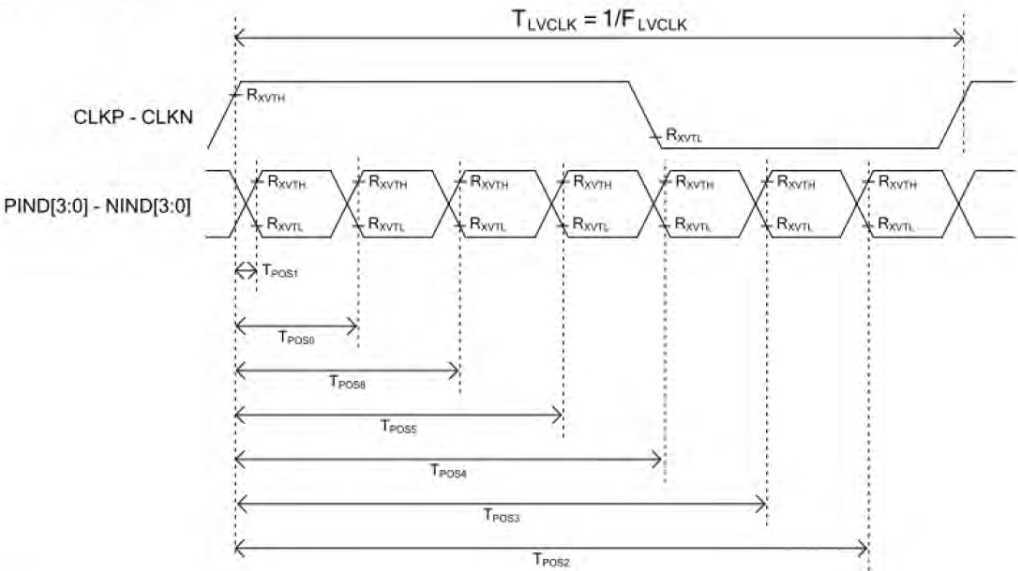
Parameter	Symbol	Spec.			Unit	Remark
		Min.	Typ.	Max.		
Clock frequency	FLVCLK	25	-	85	MHz	Frame rate=60Hz
Clock Period	TLVCLK	40	-	11.76	ns	Frame rate=60Hz
1 data bit time	UI	-	1/7	-	TLVCLK	-
Position 1	TPOS1	-0.2	0	0.2	UI	Note9
Position 0	TPOS0	0.8	1	1.2	UI	
Position 6	TPOS6	1.8	2	2.2	UI	
Position 5	TPOS5	2.8	3	3.2	UI	
Position 4	TPOS4	3.8	4	4.2	UI	
Position 3	TPOS3	4.8	5	5.2	UI	
Position 2	TPOS2	5.8	6	6.2	UI	
LVDS wake up time	T_{ENLVDS}	-	-	150	us	

Note9 : Please refer to "Input Clock and Data Timing Diagram"

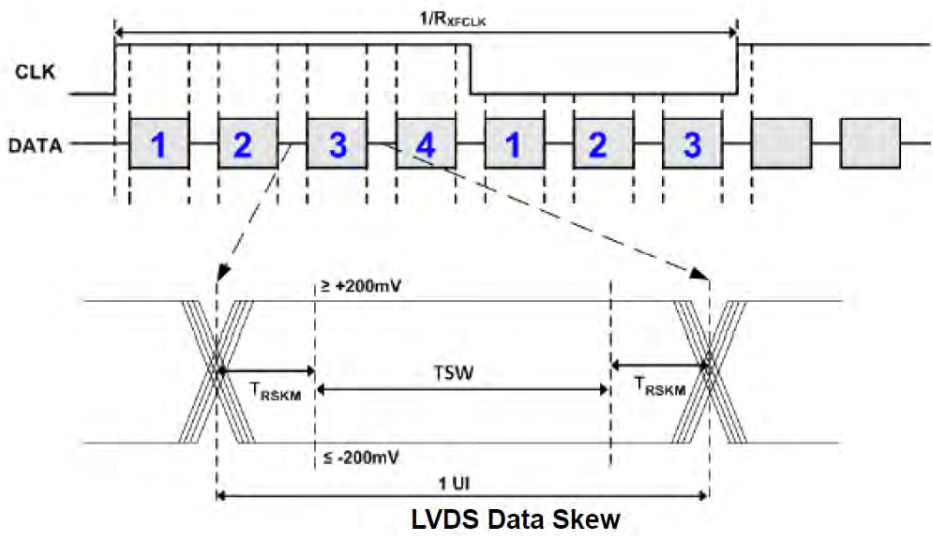


Input Clock and Data Timing Diagram

LVDS input timing:



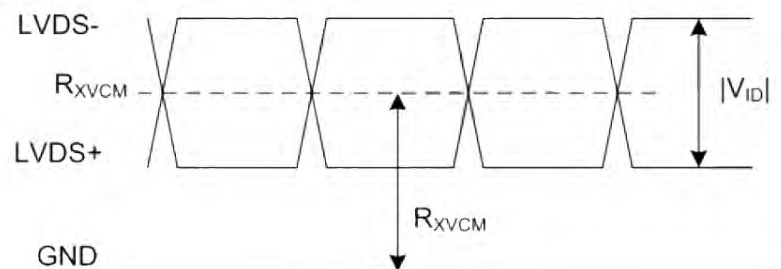
Differential:



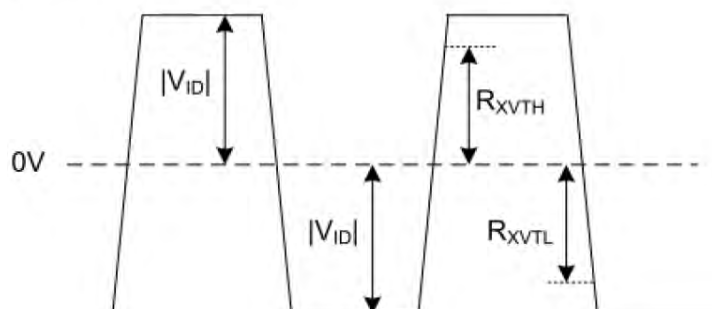
5.2 LVDS DC electrical characteristics

Parameter	Symbol	Spec.			Unit	Remark
		Min.	Typ.	Max.		
Differential input high Threshold voltage	R_{XVTH}	-	-	+200	mV	
Differential input low Threshold voltage	R_{XVTL}	-200	-	-	mV	
Differential input common Mode voltage	R_{XVCM}	1.0	1.2	$1.7 - V_{ID} /2$	V	
Differential input voltage	$ V_{ID} $	200	-	600	mV	
Differential input leakage Current	I_{XVLK}	-10	-	+10	μA	
Termination Resistor	Z_{id}	90	100	110	Ω	

Single-end Signal



Differential Signal

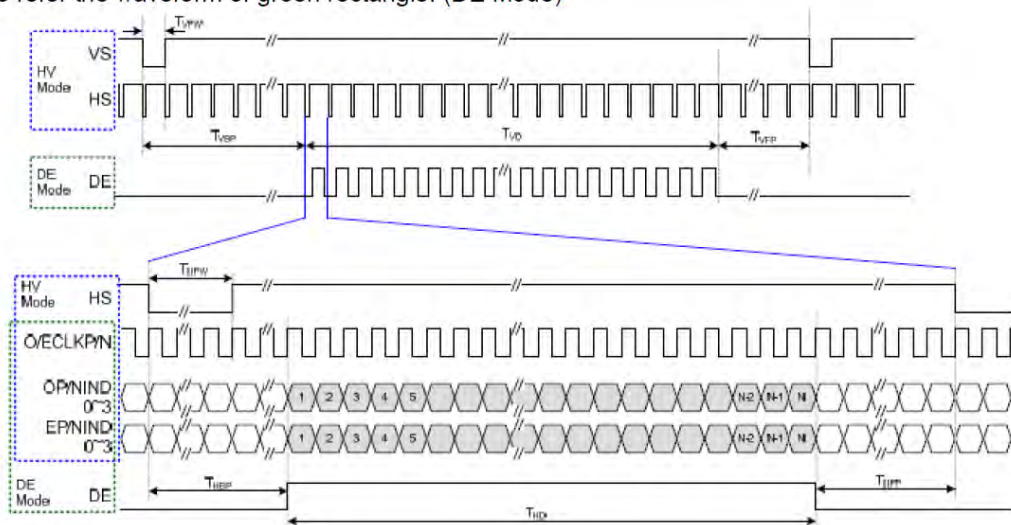


5.3 Timing

Parameter	Symbol	1920xRGBx720 (Two Port LVDS)			Unit
		Min.	Typ.	Max.	
CLK frequency	F_{CLK}	45.19	47.06	50.2	MHz
Horizontal display area	T_{HD}	960			CLK
HS period time	T_H	1015	1032	1060	CLK
Vertical display area	T_{VD}	720			H
VS period time	T_V	742	760	790	H
Frame rate	FR	60			Hz

Note : DE mode only.

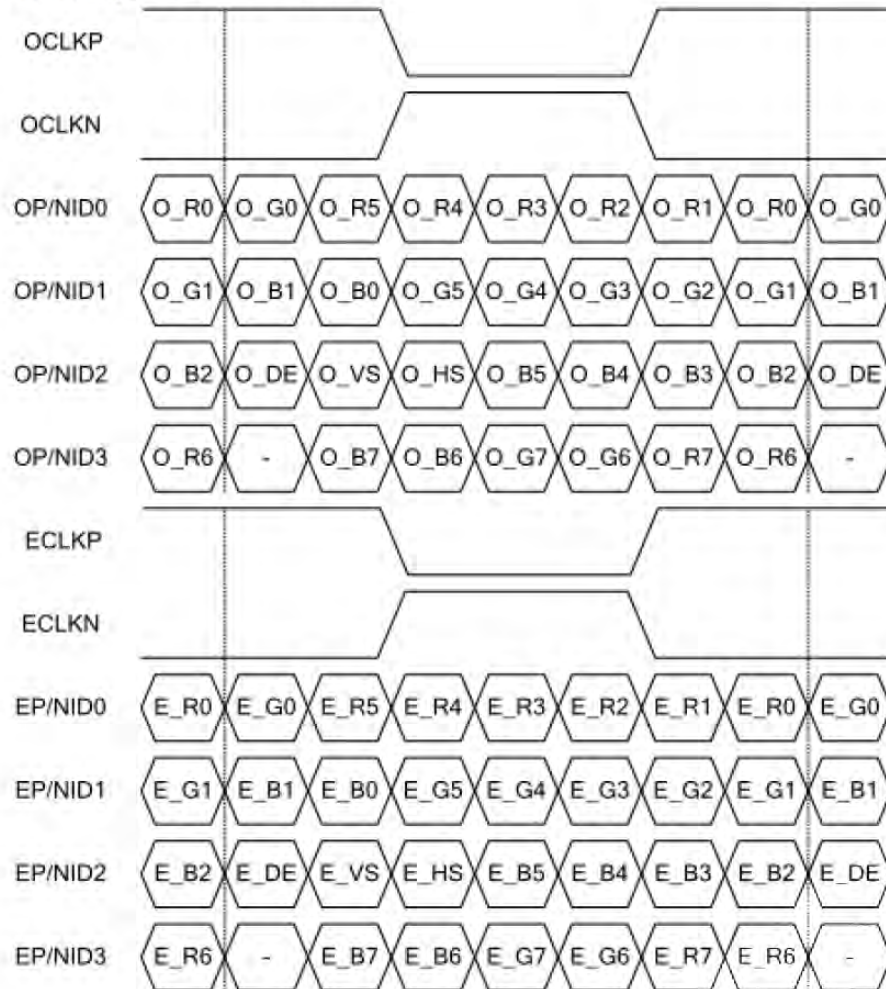
Please refer the waveform of green rectangle. (DE Mode)



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5.4 Data input format

LVDS, 8-bit, two port, VESA format:



6. Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta=40°C , 80%RH, 240hours	
High Temperature Operation (HTO)	Ts= 85°C , 240hours	3
Low Temperature Operation (LTO)	Ta= -30°C , 240hours	
High Temperature Storage (HTS)	Ta= 90°C , 240hours	
Low Temperature Storage (LTS)	Ta= -40°C , 240hours	
Thermal Shock Test (TST)	-20°C/30min, 60°C/30min, 100 cycles	
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (ElectroStatic Discharge)	Contact Discharge: $\pm$ 8KV, 150pF(330 Ω) 1sec, 9 points, 25 times/ point.	
	Air Discharge: $\pm$ 15KV, 150pF(330 Ω) 1sec 9 points, 25 times/ point.	

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 -10°C to 50°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: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost. Self-recoverable. No hardware failures.

Note 3: TFT surface.

8. Mechanical Characteristics

