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MDT173000	1920 x 1080	LVDS Interface	TFT Module
Specification			
Version: 1		Date: 28/08/2019	
Revision			
1	26/08/2019	First issue	

Display Features	
Display Size	17.3”
Resolution	1920 x 1080
Orientation	Landscape
Appearance	RGB
Logic Voltage	3.3V
Interface	LVDS
Brightness	2,000 cd/m^2
Touchscreen	---
Module Size	403.00 x 240.00 x 12.50 mm
Operating Temperature	-10°C ~ +70°C
Pinout	30 way connector
Pitch	1.0 mm

RoHS compliant

Created By	Checked By
CL	TSB
Box Quantity	Weight / Display
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Display Accessories	
Part Number	**Description**
MBID-30FP	30 way FFC/FPC 0.5mm to 30 way JST 1mm crimp header
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 Specifications

2.1 Over view

MDT173000 is a 17.3” TFT Liquid Crystal Display module with LED Backlight unit and 40 pins LVDS interface. This module supports 1920 x 1080 Full HD mode and can display 16.7M colors (RGB 6-bits + HiFRC data). All input signals are LVDS interface compatible.
The LED driver is not included

2.2 Features

- Sunlight readable brightness, 2000 nits.
- LED backlight
- RoHS Compliance

2.3 Application

Industrial Application.

2.4 Display Specifications

Items	Unit	Specification
Screen Diagonal	inch	17.3
Active Area	mm	381.888 (W) × 214.812 (H) mm
Pixels H x V	pixels	1920 × 3(RGB) × 1080
Pixels Pitch	mm	0.1989 × 0.1989
Pixel Arrangement		RGB Vertical stripe
Display mode		TN mode, normally white
White luminance (center)	Cd/m^2	2,000 (Typ.)
Contrast ratio		600:1 (Typ.)
Optical Response Time	msec	40 ms (Typ. on/off)
Normal Input Voltage VDD	Volt	3.3
Power Consumption (Vcc Line + LED L Lines)	Watt	37.4 (VDD line=5.0; LED line=32.4 W)
Weight	Grams	1080 typ.
Physical size	mm	403 (H) x 240 (V) x 12.5 (D) (Typ)
Electrical Interface		2 Channel LVDS
Support Colors		16.7M colors (RGB 6-bit data + HiFRC data)
Surface Treatment		Anti-Glare, 3H
Temperature range Operating Storage (Shipping)	 ^0C ^0C	 -10 ~ 70 (LCD surface) -20 ~ 70
RoHS Compliance		RoHS Compliance

2.5 Optical Characteristics

The following optical characteristics are measured under stable condition at 25 ^{0}C

Items	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing angle	Deg.	Horizontal (Right) CR=10 (Left)	140	160		2
		Vertical (Up) CR=10 (Down)	120	140		
Contrast Ratio		Normal Direction	500	600		3
Response Time	msec	Raising time (T_{rR})		37	50	4
		Falling time (T_{rF})		3	10	
		Raising + Falling		40	60	
Color / Chromaticity Coordinates (CIE)		Red x	-0.05	0.64	+0.05	5
		Red y		0.35		
		Green x		0.31		
		Green y		0.62		
		Blue x		0.15		
		Blue y		0.06		
Color coordinates (CIE) White		White x		0.31		
		White y		0.34		
Center Luminance	Cd/m^2		1600	2000		6
Luminance Uniformity	%		70			7

Note 1 : Definition of viewing angle range

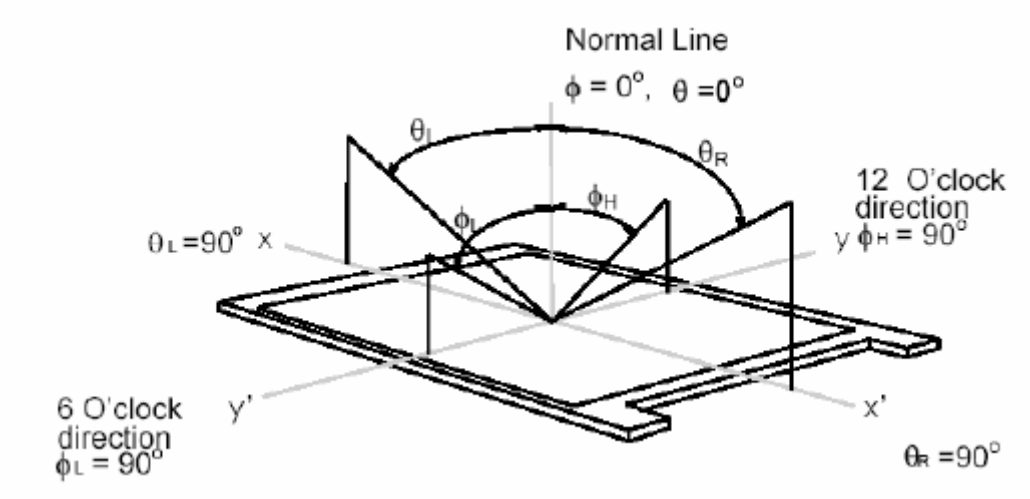


Fig. 4.1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

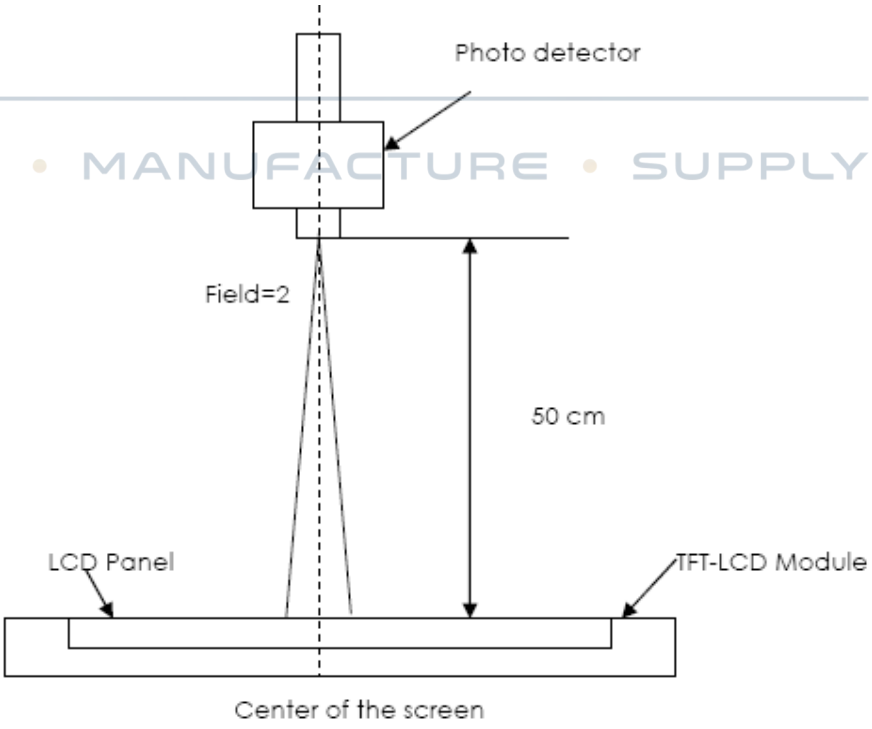
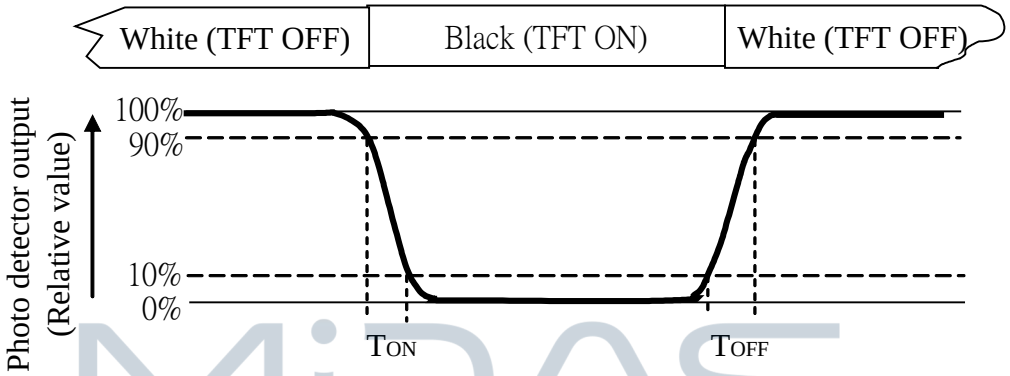


Fig. 4.2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



Note 4: Definition of Contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL= 400mA .

Note 7: Definition of Luminance Uniformity

Active area is divided into measuring areas (Refer to Fig. 4.4). Every measuring point is placed at the center of each measuring area.

δW5p = {Minimum [L (1)~ L (5)] / Maximum [L (1)~ L (5)]}*100%

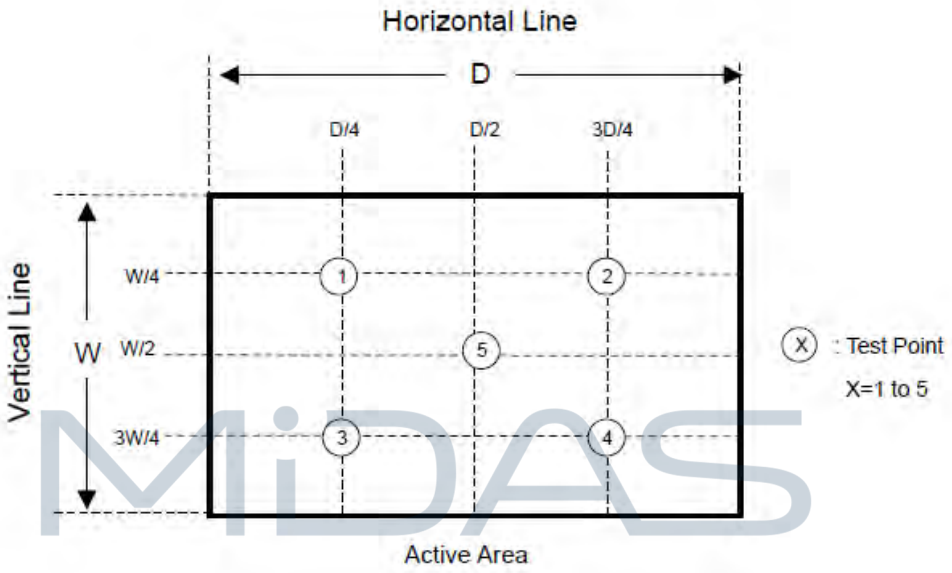


Fig. 4.4 Definition of measuring points

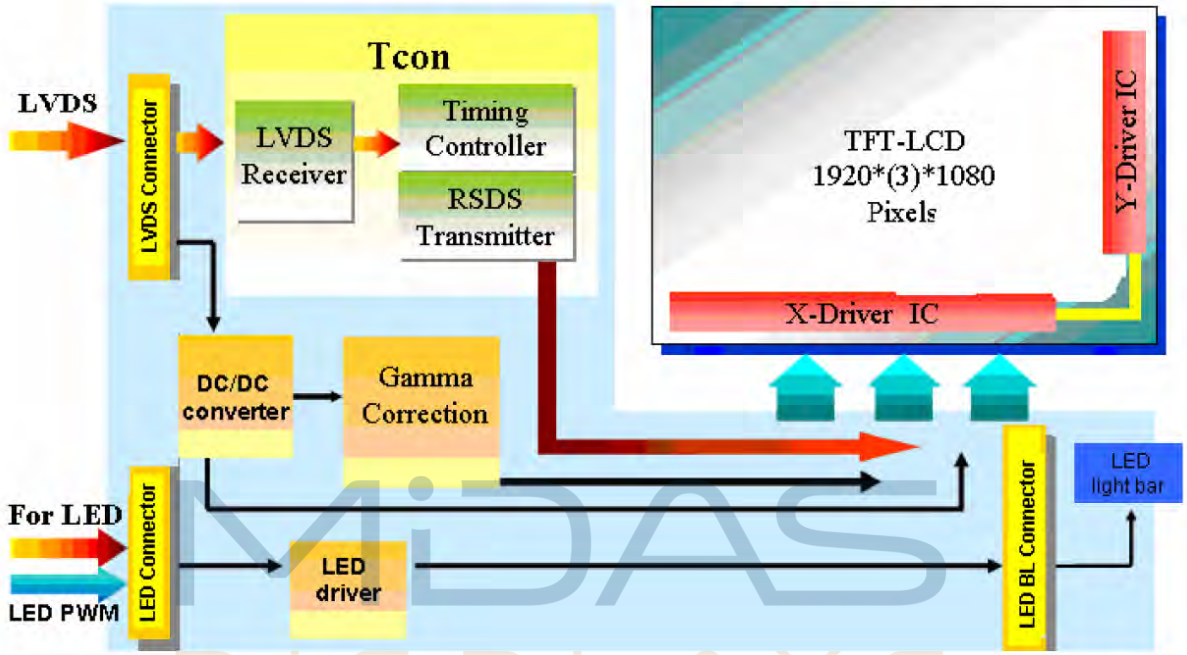
Bmax: The measured maximum luminance of all measurement position.

Bmin: The measured minimum luminance of all measurement position.

3 Functional Block Diagram

3.1 FUNCTION BLOCK DIAGRAM

The following diagram shows the functional block of the 17.3 inches wide Color TFT/LCD



LCD Module input connector:

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	HRS
Type Part Number	MDF76TW-30S-1H
Mating Type Part Number	MDF76-30P-1C

Backlight unit connector:

BHSR-02VS-1 manufactured by JST

4 Absolute Maximum Ratings

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Values			Unit	Remark
		Min.	Typ	Max.		
Power Supply Voltage	V_{DD}	-0.3	-	3.6	V	Note 1, 2
Logic Input Voltage	Vin	-0.3		3.6		

Note (1) Stresses beyond those listed in above “ELECTRICAL ABSOLUTE RATINGS” may cause permanent damage to the device. Normal operation should be restricted to the conditions described in “ELECTRICAL CHARACTERISTICS”.

4.2 Absolute Ratings of Environment

Item	**Symbol**	**Values**			**Unit**	**Remark**
		Min.	**Typ.**	**Max.**		
Operating	TOP	-10	-	70	℃	Note 3
Storage Temperature	TST	-20	-	70	℃	Note 3

Note 1 : At Ta (25℃)

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

Note 3 : For quality performance, please refer to IIS

5 Electrical characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are as follows:

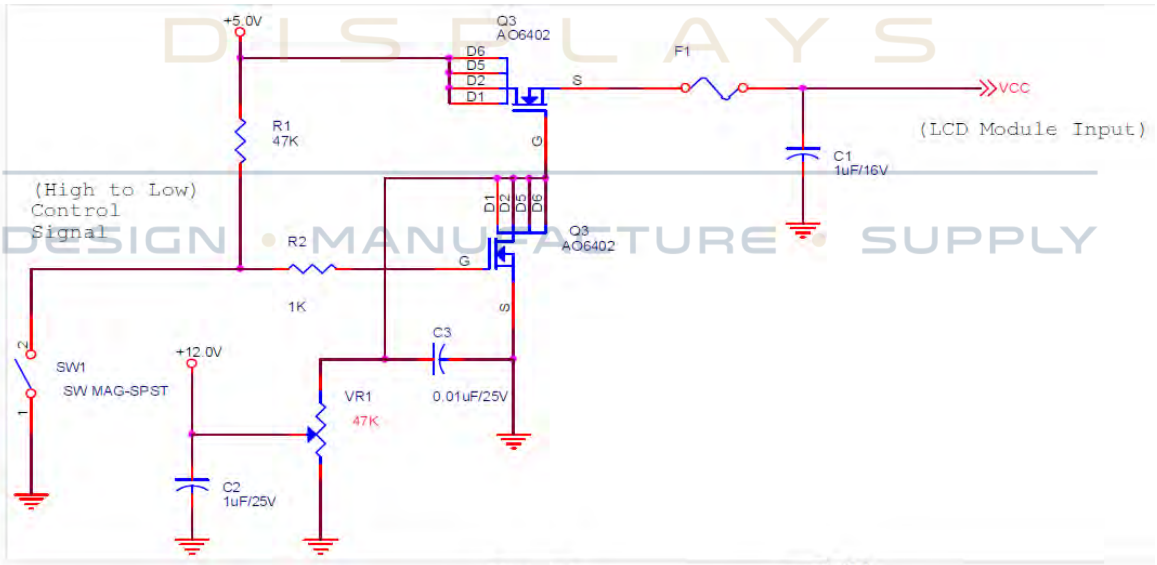
Symble	Parameter	Min.	Typ.	Max.	Unit	Condition
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	±10%
IDD	Input Current	-	1200	1400	[mA]	VDD= 5.0V, All Black Pattern At 75Hz, +30%
PDD	VDD Power	-	5	6	[Watt]	VDD= 5.0V, All Black Pattern At 75Hz , Note 1
IRush	Inrush Current	-	-	2000	[A]	Note 2
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV] p-p	VDD= 3.3V, All Black Pattern At 75Hz

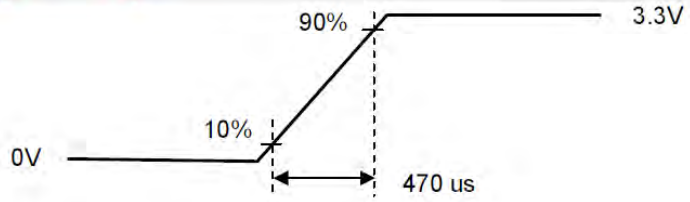
Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) IRUSH: the maximum current when VDD is rising

IIS: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: mosaic





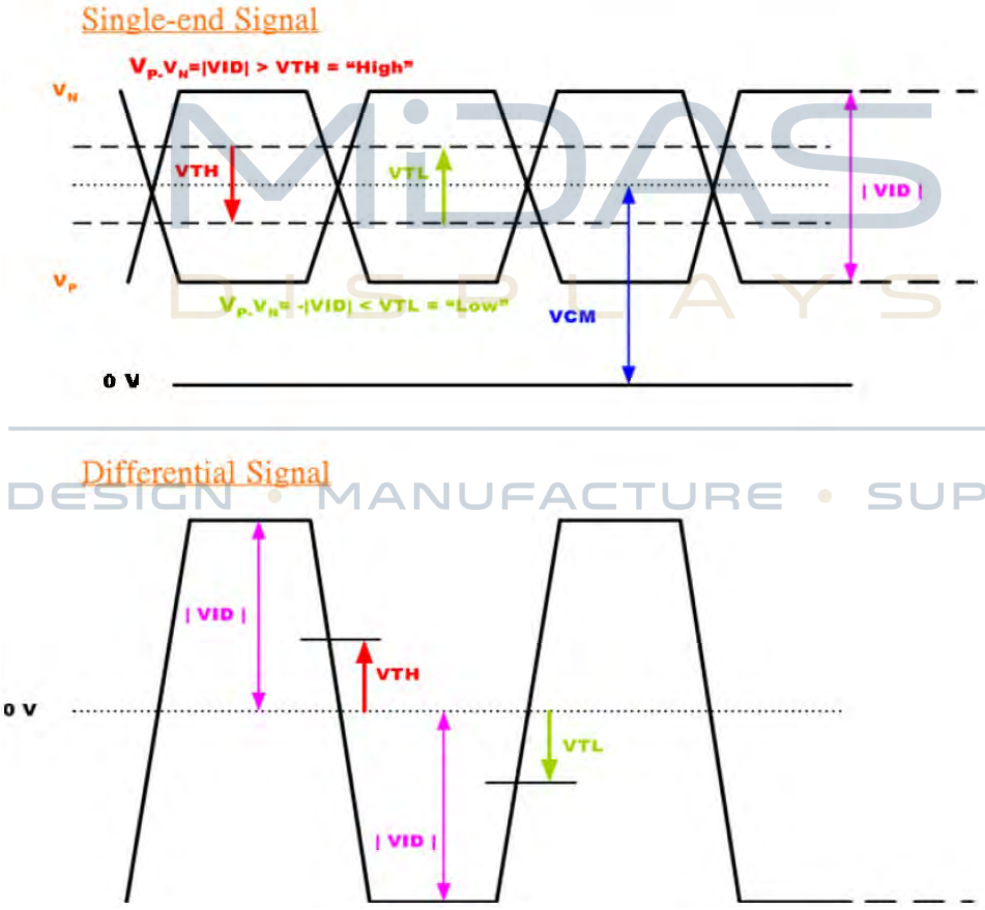
Vin rising time

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
VTH	Differential Input High Threshold	-	-	100	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	-100	-	-	[mV]	VCM=1.2V
| VID |	Input Differential Voltage	100	400	600	[mV]	
VICM	Differential Input Common Mode Voltage	1.125	-	1.375	[V]	VTH/VTL=+-100mV

5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

Note: LVDS Signal Waveform.



5.2. Backlight Unit

Ta = 25 ± 2 ºC

Connector: BHSR-02VS-1 manufactured by JST

Parameter	Symbol	Value			Unit	Note
		Min	Typ	Max		
LED Light bar power supply voltage	V_L		36		V	
LED Light bar power supply current	I_L		450		mA	
Power consumption	P_L		32.4		W	
LED lifetime	L_{BL}	50,000			Hrs	1,2

Note (1) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

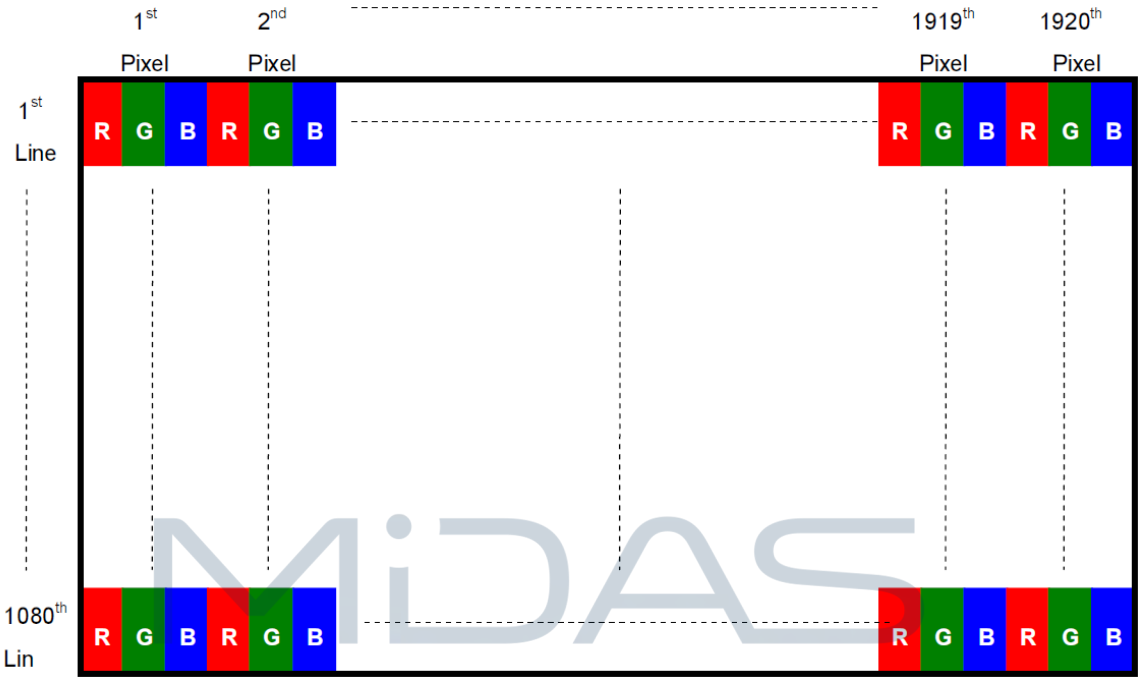
Note (2) PL = IL ×VL x2 (Without LED converter transfer efficiency)

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ºC and IL = 450 mA until the brightness becomes ≦ 50% of its original value.

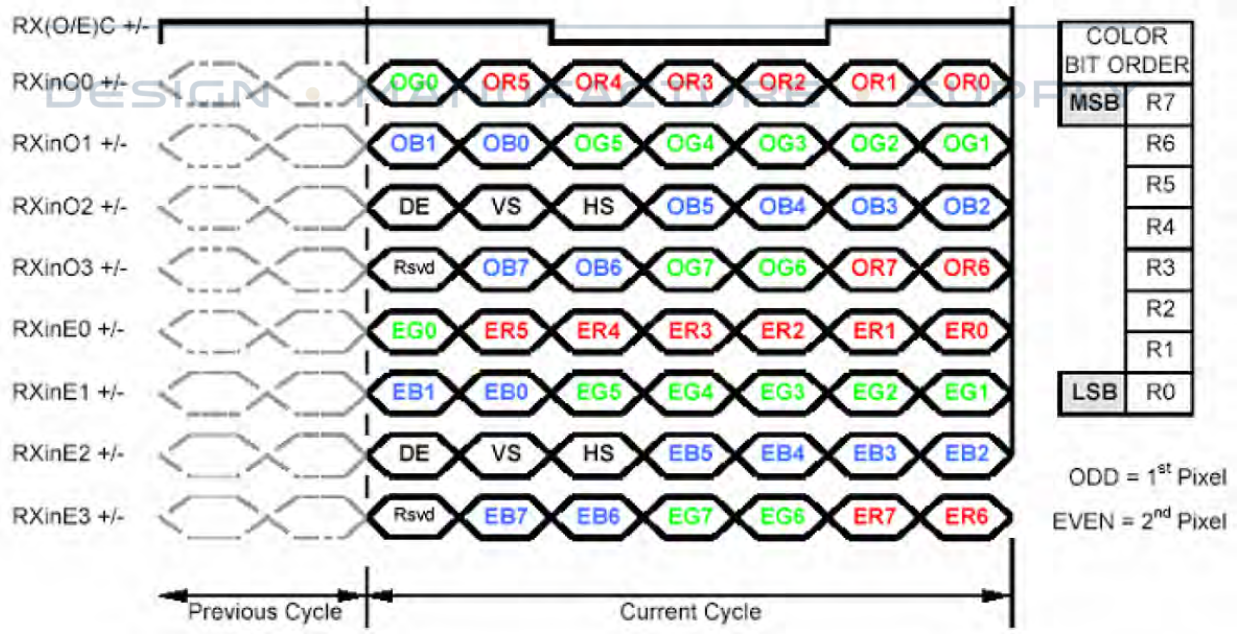
6 Signal Characteristic

6.1 Pixel Format Image

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



6.2 The Input Data Format



Note1: Normally, DE, VS, HS on EVEN channel are not used.

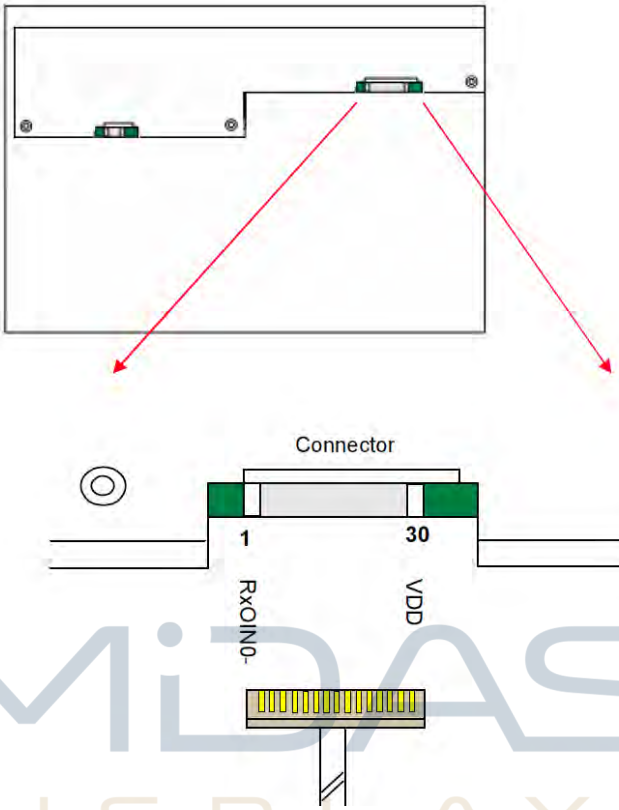
Note2: 8-bit in

6.3 Signal Description

The module using a pair of LVDS receiver SN75LVDS82(Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83(negative edge sampling) or compatible. 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, H-Sync,V-Sync,DSPTMG)
6	RxOIN2+	Positive LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
7	VSS	Power Ground
8	RxOCLKIN-	Negative LVDS differential clock input (Odd clock)
9	RxOCLKIN+	Positive LVDS differential clock input (Odd clock)
10	RxOIN3-	Negative LVDS differential data input (Odd data)
11	RxOIN3+	Positive LVDS differential data input (Odd data)
12	RxEIN0-	Negative LVDS differential data input (Even data)
13	RxEIN0+	Positive LVDS differential data input (Even data)
14	VSS	Power Ground
15	RxEIN1-	Negative LVDS differential data input (Even data)
16	RxEIN1+	Positive LVDS differential data input (Even data)
17	VSS	Power Ground
18	RxEIN2-	Negative LVDS differential data input (Even data)
19	RxEIN2+	Positive LVDS differential data input (Even data)
20	RxECLKIN-	Negative LVDS differential clock input (Even clock)
21	RxECLKIN+	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	VSS	Power Ground
25	VSS	Power Ground
26	VSS	Power Ground
27	VSS	Power Ground
28	VDD	+3.3V Power Supply
29	VDD	+3.3V Power Supply
30	VDD	+3.3V Power Supply

Note (1) Start from left side



Note2: Input signals of odd and even clock shall be the same timing.

Note3: Please follow PSWG.

6.4 Interface Timing

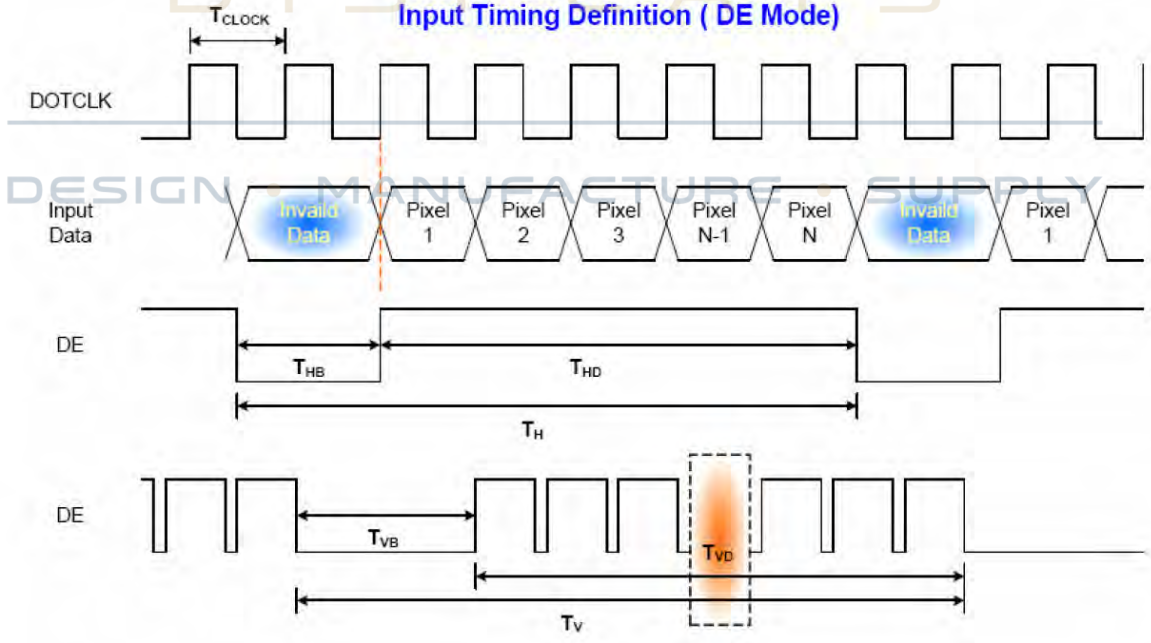
6.4.1 Timing Characteristics

Basically, interface timings should match the 1920X1080 / 60Hz manufacturing guide line timing.

Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate		-	50	60	-	Hz
Clock frequency		1/ T_{Clock}	50	74.9	85	MHz
Vertical Section	Period	T_V	1088	1130	1680	T_{Line}
	Active	T_{VD}	1080			
	Blanking	T_{VB}	8	50	-	
Horizontal Section	Period	T_H	990	1050	-	T_{Clock}
	Active	T_{HD}	960			
	Blanking	T_{HB}	30	90	-	

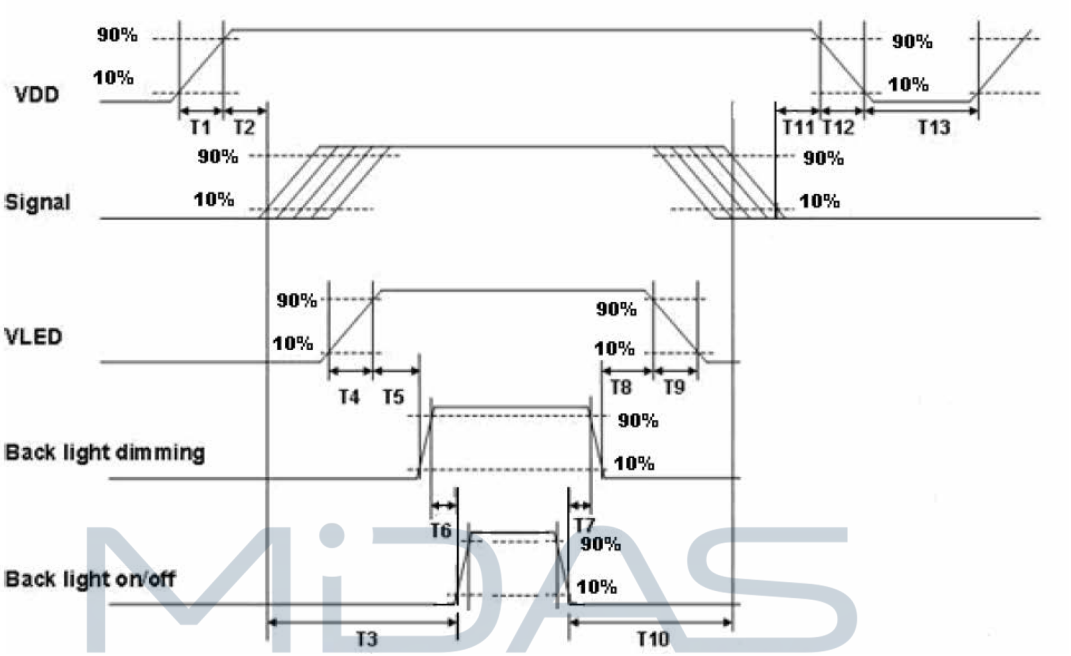
DE mode only

6.4.2 Timing Diagram



6.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence is 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.



Power Sequence Timing

Power Sequence Timing				
Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	50	
T3	200	-	--	
T4	0.5	-	10	
T5	10	-	-	
T6	10	-	-	
T7	0	-	-	
T8	10	-	-	
T9	-	-	10	
T10	110	-	-	
T11	0		50	
T12	0		10	
T13	500	-	-	

7. RELIABILITY TEST ITEM

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50℃, 80%RH, 240 hours	
High Temperature Operation (HTO)	Ta= 70℃, 240 hours	3
Low Temperature Operation (LTO)	Ta= -10℃, 240 hours	
High Temperature Storage (HTS)	Ta= 70℃, 240 hours	
Low Temperature Storage (LTS)	Ta= -20℃, 240 hours	
Thermal Shock Test (TST)	-20℃/30min, 60℃/30min, 50 cycles	1
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (ElectroStatic Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 9 points, 25 times/ point.	2
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 9 points, 25 times/ point.	2
Vibration Test (Non-operation)	Acceleration: 1.5 G Wave: Random Frequency: 10 - 200 - 10 Hz Sweep: 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)	

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℃ to 60℃, 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.

9. Mechanical Drawing (mm)