

INDUSTRIAL STRENGTH... Start Your Application From YOURITECH

Integration support

Obsolescence Management

PCAP

Embedded Systems

Human Machine Interface

Touch Solutions

Software

Quality Management

Open Frame Monitors

LCD Controller

Research & Development

Firmware

EMC tests

on-site service

Optical Bonding

In-house Manufacturing

Cover glass

System solutions

OEM Solutions

Custom Display

Production Custom designs Installation

Mechanical design



Shenzhen Youritech Technology Co.,Limited

PRODUCT SPECIFICATIONS

For Customer: _____

☐ : APPROVAL FOR SPECIFICATION

Customer Model No. _____

☐ : APPROVAL FOR SAMPLE

Module No.: ET035HV01-Z

Date : 2019-09-12

Table of Contents

No.	Item	Page
1	Cover Sheet(Table of Contents)	P1
2	Revision Record	P2
3	General Specifications	P3
4	Outline Drawing	P4
5	Absolute Maximum Ratings	P5
6	Electrical Specifications	P6-P12
7	Optical Characteristics	P13-P16
8	Reliability Test Items and Criteria	P17
9	Precautions for Use of LCD Modules	P18-P19

For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT
SSX	YGM		

2. Revision Record

2

Shenzhen Youritech Technology Co.,Limited

3. General Specifications

ET035HV01-Z is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light unit . The 3.5'' display area contains 320X(RGB)x480 pixels and can display up to 16.7M colors. This product accords with ROHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	16.7M		1
Viewing Direction	ALL	O'Clock	
Operating temperature	-20~+70	℃	
Storage temperature	-30~+80	℃	
Module size	55.0X85.2X3.8	mm	2
Active Area(W×H)	48.96X73.44	mm	
Number of Dots	320×480	dots	
Controller	ILI9488	-	
Power Supply Voltage	2.8	V	
Backlight	8S-LEDs (white)	pcs	
Weight	---	g	
Interface	MIPI	-	

Note 1: Color tune is slightly changed by temperature and driving voltage.

Note 2: Without FPC and Solder.



Shenzhen Youritech Technology Co., Limited

5. Absolute Maximum Ratings($T_a=25^{\circ}\text{C}$)

5.1 Electrical Absolute Maximum Ratings.($V_{ss}=0\text{V}$, $T_a=25^{\circ}\text{C}$)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	-0.3	3.3	V	1, 2
	VDDIO	-0.3	3.3	V	1, 2

Notes:1. If the module is above these absolute maximum ratings. It may become permanently damaged.

Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.

2. $V_{DD} > V_{SS}$ must be maintained.

3. Please be sure users are grounded when handing LCD Module.

5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30°C	80°C	-20°C	70°C	1,2
Humidity	-	-	-	-	3

1. The response time will become lower when operated at low temperature.

2. Background color changes slightly depending on ambient temperature.

The phenomenon is reversible.

3. $T_a \leq 40^{\circ}\text{C}$: 85%RH MAX.

$T_a > 40^{\circ}\text{C}$: Absolute humidity must be lower than the humidity of 85%RH at 40°C .

Shenzhen Youritech Technology Co.,Limited

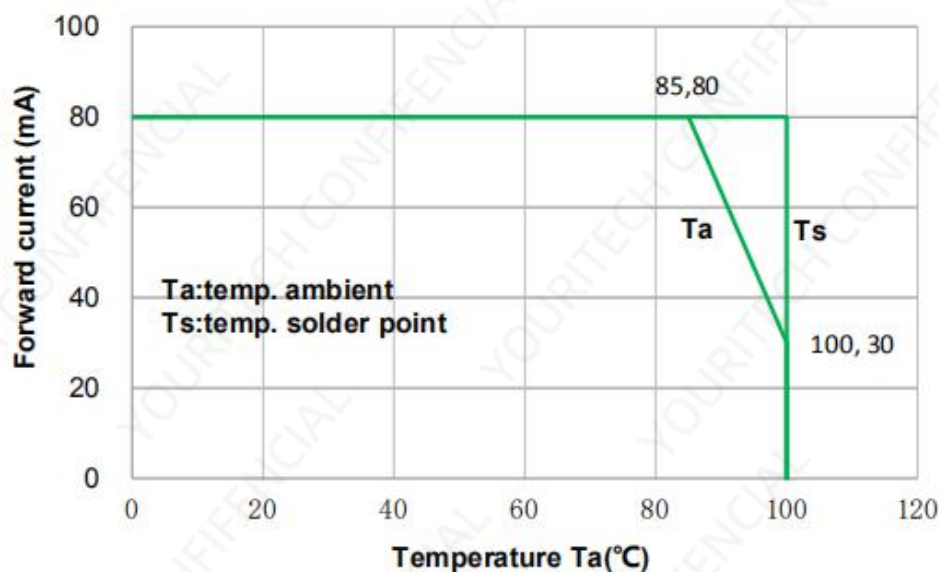
6. Electrical Specifications

6.1 Electrical characteristics($V_{SS}=0V$, $T_a=25^{\circ}C$)

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		VDD	$T_a=25^{\circ}C$	2.5	2.8	3.3	V	
		VDDIO	$T_a=25^{\circ}C$	1.65	1.8	3.3	V	
Input voltage	'H'	V_{IH}	$T_a=25^{\circ}C$	$0.7 \cdot V_{DDIO}$	-	VDDIO	V	
	'L'	V_{IL}	$T_a=25^{\circ}C$	-0.3	-	$0.3 \cdot V_{DDIO}$	V	

6.2 LED backlight specification($V_{SS}=0V$, $T_a=25^{\circ}C$)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V_f	$I_f=40mA$	20	-	25.6	V	
Uniformity	ΔB_p	$I_f=40mA$	75	80	-	%	
Life Time	time	$I_f=40mA$	-	20K		hours	1



Note 1: Brightness to be decreased to 50% of the initial value at ambient temperature $T_a=25^{\circ}C$

Shenzhen Youritech Technology Co.,Limited

6.3 Interface signals

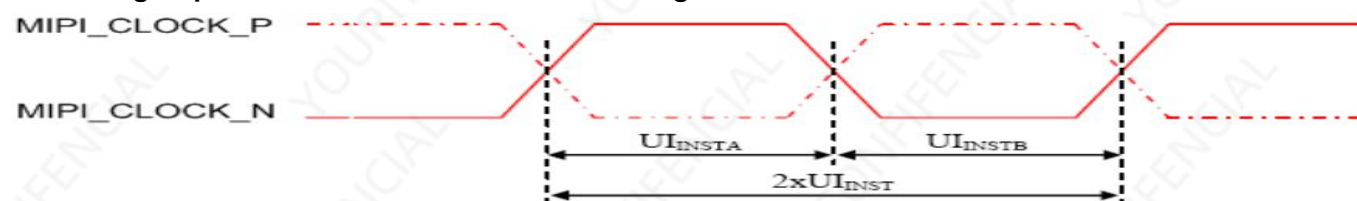
Pin No.	Symbol	I/O	Function
1-2	GND	P	Ground.
3	MIPI_DN	I	MIPI differential data input
4	GND	P	Ground.
5	MIPI_DP	I	MIPI differential data input
6	RESET	I	Reset pin,active “L”
7-8	GND	P	Ground.
9	MIPI_CKN	I	MIPI clock differential data input
10	VDDIO	P	Power supply for I/O.
11	MIPI_CKP	I	MIPI clock differential data input
12	VDD	P	Power supply.
13-14	GND	P	Ground.
15-16	NC	-	No connection.
17	LEDA	P	LED back light(Anode).
18	LEDK	P	LED back light(Cathode).
19	LEDA	P	LED back light(Anode).
20	LEDK	P	LED back light(Cathode).

Shenzhen Youritech Technology Co., Limited

6.4 AC Characteristics

6.4.1 Timing Characteristics of the DSI

6.4.1.1 High Speed Mode - Clock Channel Timing



Signal	Symbol	Parameter	Min	Max	Unit
MIPI_CLOCK_P/N	$2xUI_{INST}$	Double UI instantaneous	4	25	ns
MIPI_CLOCK_P/N	UI_{INSTA}, UI_{INSTB} (Note 1)	UI instantaneous Half	2 (Note 2)	12.5	ns

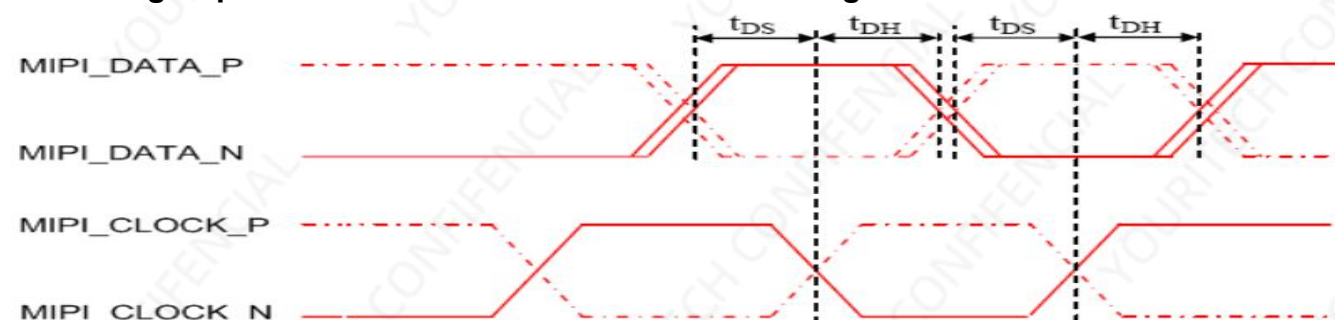
Notes:

1. $UI = UI_{INSTA} = UI_{INSTB}$
2. See Table 45 for the minimum value of 24 UI per Pixel.

6.4.1.2 Clock Channel Speed Limited

Data type	One Lanes speed	Unit
Data Type = 00 1110 (0Eh), RGB 565, 16 UI per Pixel	500M	bps
Data Type = 01 1110 (1Eh), RGB 666, 18 UI per Pixel	500M	bps
Data Type = 10 1110 (2Eh), RGB 666 Loosely, 24 UI per Pixel	500M	bps
Data Type = 11 1110 (3Eh), RGB 888, 24 UI per Pixel	500M	bps

6.4.2 High Speed Mode - Data Clock Channel Timing

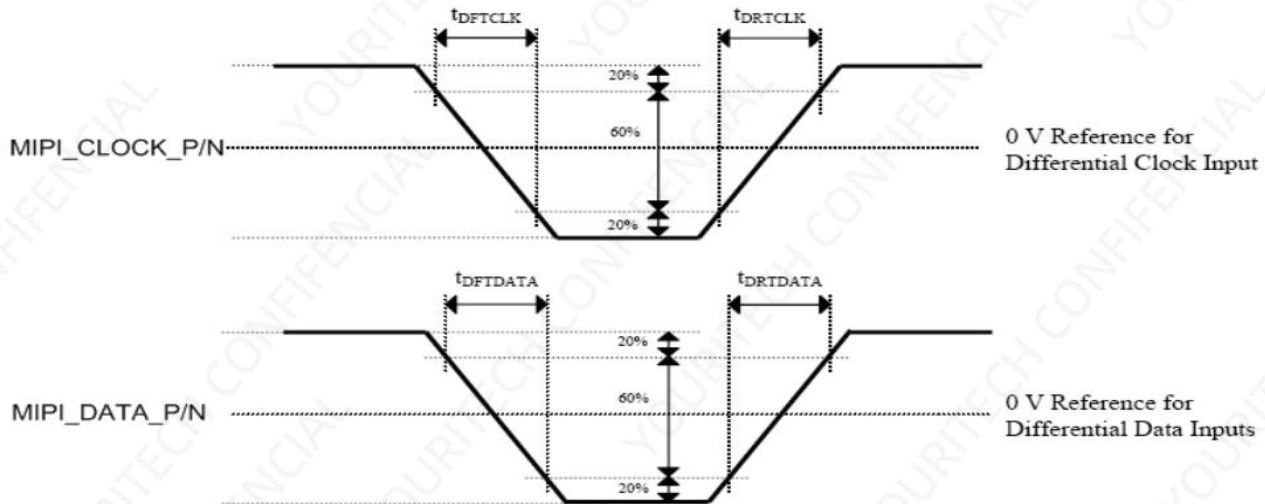


Signal	Symbol	Parameter	Min	Max	Unit
MIPI_DATA_P/N	t_{DS}	Data to Clock Setup time	$0.15xUI$	-	ps
MIPI_DATA_P/N	t_{DH}	Clock to Data Hold Time	$0.15xUI$	-	ps

Shenzhen Youritech Technology Co., Limited

6.4.3 High Speed Mode - Rising and Falling Timings

Rising and Falling Timings on Clock and Data Channels



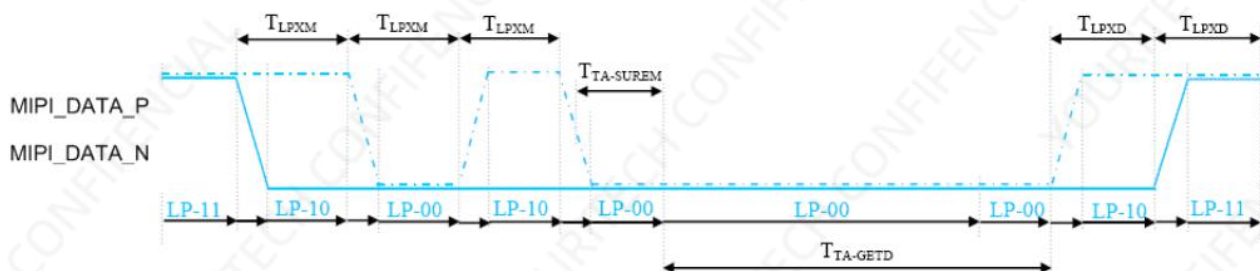
Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Differential Rise Time for Clock	t_{DRTCLK}	MIPI_CLOCK_P/N	-	-	900	ps
Differential Rise Time for Data	$t_{DRTDATA}$	MIPI_DATA_P/N	-	-	900	ps
Differential Fall Time for Clock	t_{DFTCLK}	MIPI_CLOCK_P/N	-	-	900	ps
Differential Fall Time for Data	$t_{DFTDATA}$	MIPI_DATA_P/N	-	-	900	ps

Note: The display module has to meet timing requirements, which are defined for the transmitter (MCU) on MIPI D-Phy standard

6.4.4 Low Power Mode - Bus Turnaround

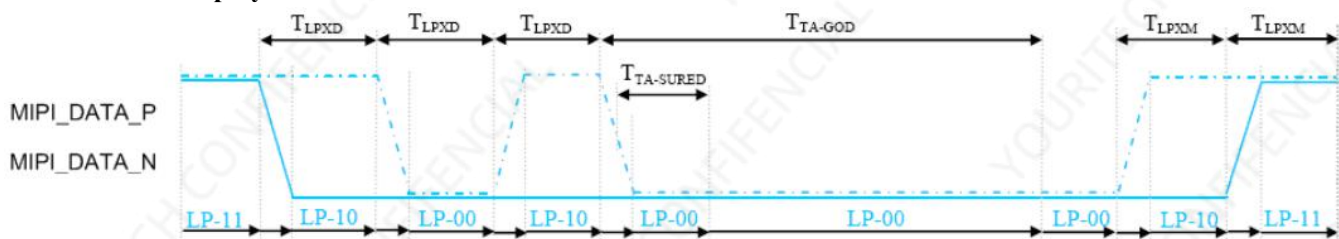
Low Power Mode and its State Periods on the Bus Turnaround (BTA) from the MCU to the display module (ILI9488) sequence are illustrated below for reference purpose.

BTA from the MCU to the Display Module



Low Power Mode and its State Periods on the Bus Turnaround (BTA) from the display module (ILI9488) to the MCU sequence are illustrated below for reference purpose.

BTA from the Display Module to the MCU



Shenzhen Youritech Technology Co., Limited

Low Power State Period Timings - A

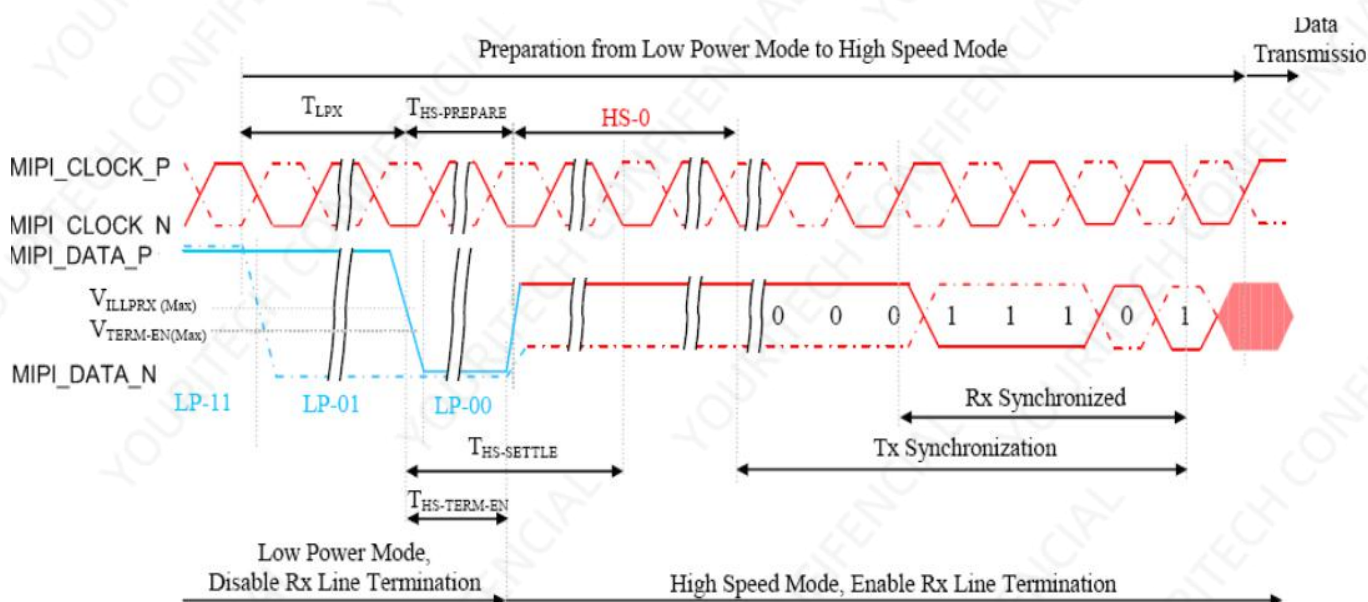
Signal	Symbol	Description	Min	Max	Unit
Input (MIPI_DATA_P/N)	T_{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MCU → Display Module (ILI9488)	50	75	ns
Output (MIPI_DATA_P/N)	T_{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module (ILI9488) → MCU	50	75	ns
Input (MIPI_DATA_P/N)	$T_{TA-SUREM}$	Time-out before the ILI9488 starts driving	T_{LPXM}	$2 \times T_{LPXM}$	ns
Output (MIPI_DATA_P/N)	$T_{TA-SURED}$	Time-out before the MCU starts driving	T_{LPXD}	$2 \times T_{LPXD}$	ns

Low Power State Period Timings - B

Signal	Symbol	Description	Time	Unit
Input (MIPI_DATA_P/N)	$T_{TA-GETD}$	Time to drive LP-00 by the ILI9488	$5 \times T_{LPXD}$	ns
Output (MIPI_DATA_P/N)	T_{TA-GOD}	Time to drive LP-00 after turnaround request – MCU	$4 \times T_{LPXD}$	ns

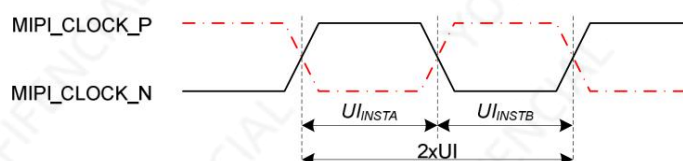
6.4.5 Data Lanes from Low Power Mode to High Speed Mode

Data Lanes – Low Power Mode to High Speed Mode Timings



Signal	Symbol	Description	Min	Max	Unit
Input (MIPI_DATA_P/N)	T_{LPX}	Length of any Low Power State Period	50	-	ns
Input (MIPI_DATA_P/N)	$T_{HS-PREPARE}$	Time to Drive LP-00 to prepare for HS Transmission	$40 + 4 \times UI$	$85 + 6 \times UI$	ns
Input (MIPI_DATA_P/N)	$T_{HS-TERM-EN}$	Time to enable Data Lane Receiver line termination measured from when D_n crosses V_{ILMAX}	-	$35 + 4 \times UI$	ns

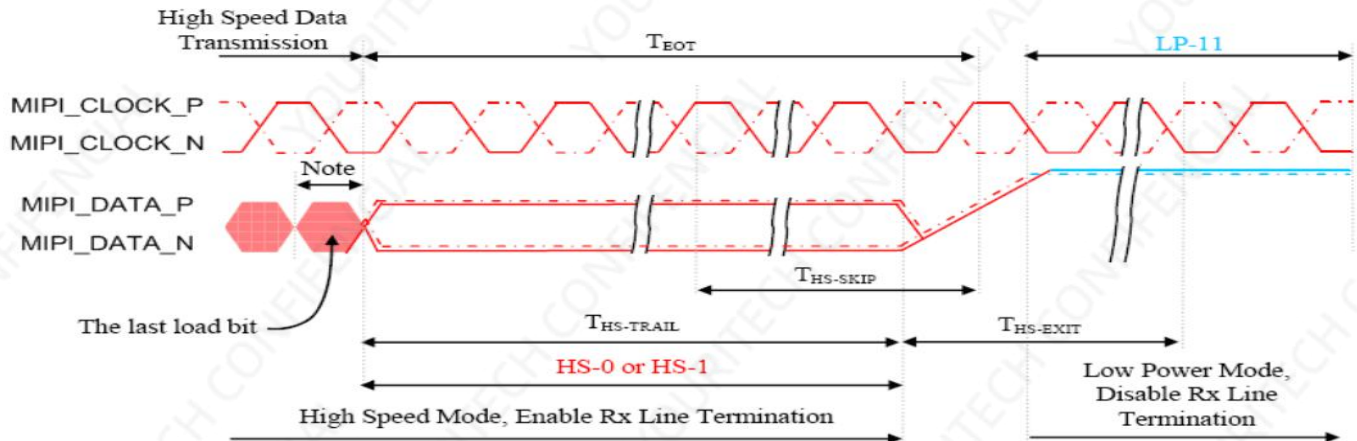
Note: $UI = UI_{INSTA} = UI_{INSTB}$



Shenzhen Youritech Technology Co., Limited

6.4.6 Data Lanes from High Speed Mode to Low Power Mode

Data Lanes – High Speed Mode to Low Power Mode Timings



Note:

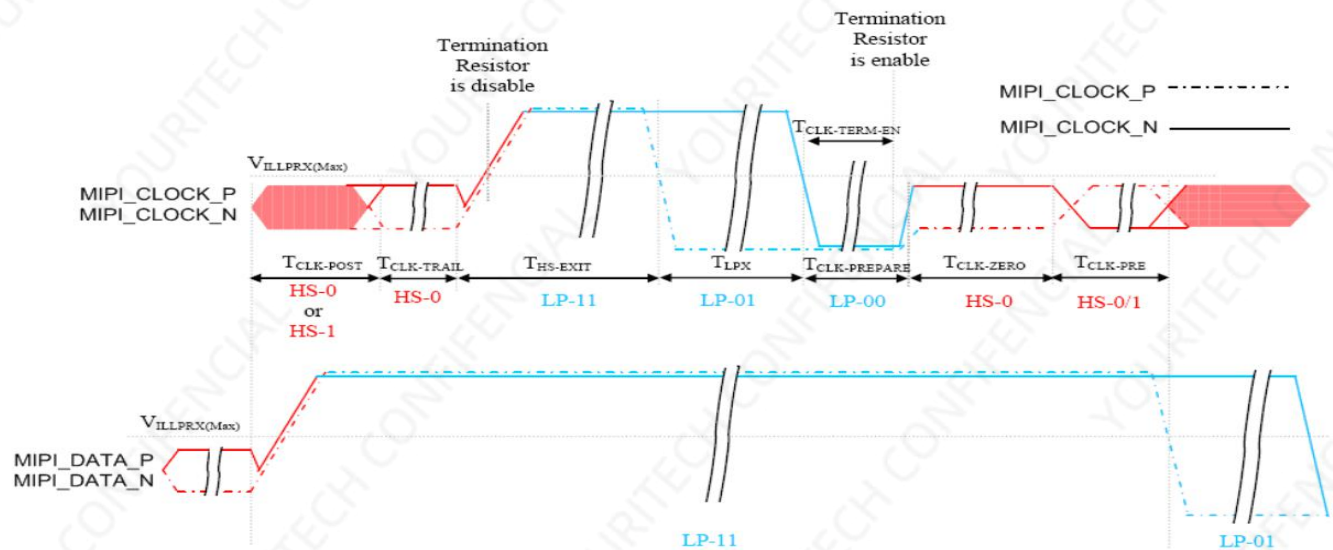
If the last load bit is HS-1, the transmitter changes from HS-1 to HS-0.

If the last load bit is HS-0, the transmitter changes from HS-0 to HS-1.

Signal	Symbol	Description	Min	Max	Unit
Input (MIPI_DATA_P/N)	$T_{HS-SKIP}$	Time-out at the ILI9488 to Ignore Transition Period of EoT	40	$50+4 \times UI$	ns
Input (MIPI_DATA_P/N)	$T_{HS-EXIT}$	Time to Driver LP-11 after HS burst	100	-	ns

6.4.7 DSI Clock Burst – High Speed Mode to/from Low Power Mode

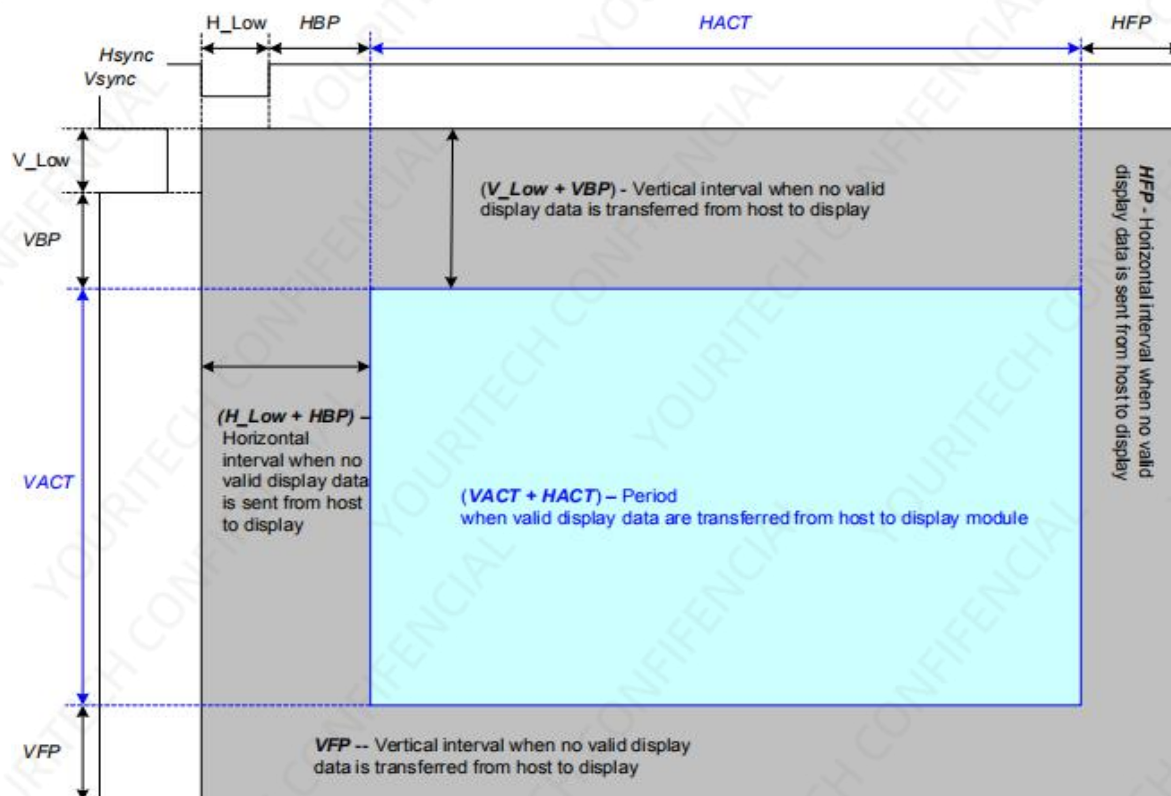
Clock Lanes – High Speed Mode to/from Low Power Mode Timings



Signal	Symbol	Description	Min	Max	Unit
Input (MIPI_CLOCK_P/N)	$T_{CLK-POST}$	Time that the MCU shall continue sending HS clock after the last associated Data Lanes has transitioned to LP mode	$60+52 \times UI$	-	ns
Input (MIPI_CLOCK_P/N)	$T_{CLK-TRAIL}$	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	ns
Input (MIPI_CLOCK_P/N)	$T_{HS-EXIT}$	Time to drive LP-11 after HS burst	100	-	ns
Input (MIPI_CLOCK_P/N)	$T_{CLK-PREPARE}$	Time to drive LP-00 to prepare for HS transmission	38	95	ns
Input (MIPI_CLOCK_P/N)	$T_{CLK-TERM-EN}$	Time-out at Clock Lane to enable HS termination	-	38	ns
Input (MIPI_CLOCK_P/N)	$T_{CLK-PREPARE}$	Minimum lead HS-0 drive period before starting Clock	300	-	ns
Input (MIPI_CLOCK_P/N)	$T_{CLK-PRE}$	Time that the HS clock shall be driven prior to any associated Data Lane beginning the transition from LP to HS mode	$8 \times UI$	-	ns

Shenzhen Youritech Technology Co.,Limited

6.5 Input Timing Table



Parameters	Symbols	Min.	Typ.	Max.	Units
Horizontal Synchronization	H_Low	3	-	$H_Low + HBP < 192$	DOTCLK
Horizontal Back Porch	HBP	3	-		DOTCLK
Horizontal Front Porch	HFP	3	-	255	DOTCLK
Horizontal Address	$HACT$	-	320	-	DOTCLK
Horizontal Frequency		-	-	33	KHz
Vertical Synchronization	V_Low	1	-	$V_Low + VBP + VFP < 32$	Line
Vertical Back Porch	VBP	2	-		Line
Vertical Front Porch	VFP	2	-		Line
Vertical Address	$VACT$	-	480	-	Line
Vertical Frequency		60	-	70	Hz
DOTCLK cycle		100	-	50	ns
DOTCLK Frequency		10	-	20	MHz

Example : DOTCLK = 20Mhz, TE=70Hz, $V_Low + VBP = 2$, $VFP = 2$, $H_Low + HBP = 100$, $HFP = 170$.

Note: $VBP[4:0]/HBP[7:0]$ (Blanking Porch Control, RB5h) define as follows:



Shenzhen Youritech Technology Co., Limited

7. Optical Characteristics

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note	
Brightness	Bp		$\theta=0^{\circ}$ $\Phi=0^{\circ}$	-	1000	-	Cd/m ²	1	
Uniformity	△Bp			75	80	-	%	1,2	
Viewing Angle	3:00		Cr≥10	-	80	-	Deg	3	
	6:00			-	80	-			
	9:00			-	80	-			
	12:00			-	80	-			
Contrast Ratio	Cr		$\theta=0^{\circ}$ $\Phi=0^{\circ}$	-	700	-	-	4	
Response Time	T _r +T _f			-	30	-	ms		
Color of CIE Coordinate	W	x	$\theta=0^{\circ}$ $\Phi=0^{\circ}$	Typ. -0.05	TBD	Typ. +0.05	-	1,6	
		y			TBD		-		
	R	x			TBD		-		
		y			TBD		-		
	G	x			TBD		-		
		y			TBD		-		
	B	x			TBD		-		
		y			TBD		-		
NTSC Ratio	S			-	69	-	%		

Note: The parameter is slightly changed by temperature, driving voltage and materiel

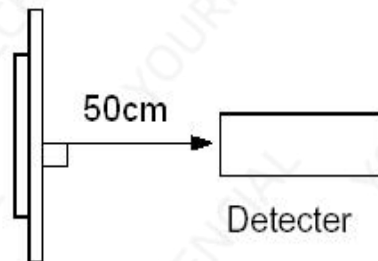
Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment BM-7 (Φ5mm)

Measuring condition:

Shenzhen Youritech Technology Co., Limited

- Measuring surroundings: Dark room.
- Measuring temperature: $T_a = 25^\circ\text{C}$.
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.

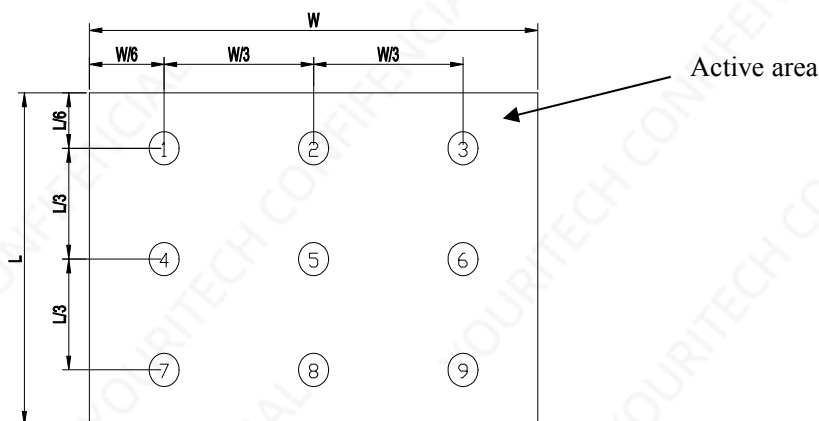


Note 2: The luminance uniformity is calculated by using following formula.

$$\Delta Bp = Bp (\text{Min.}) / Bp (\text{Max.}) \times 100 (\%)$$

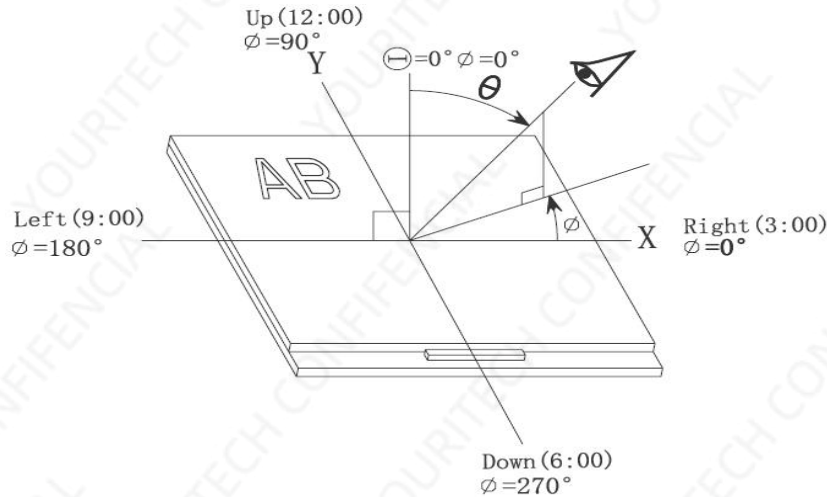
$Bp (\text{Max.})$ = Maximum brightness in 9 measured spots

$Bp (\text{Min.})$ = Minimum brightness in 9 measured spots.

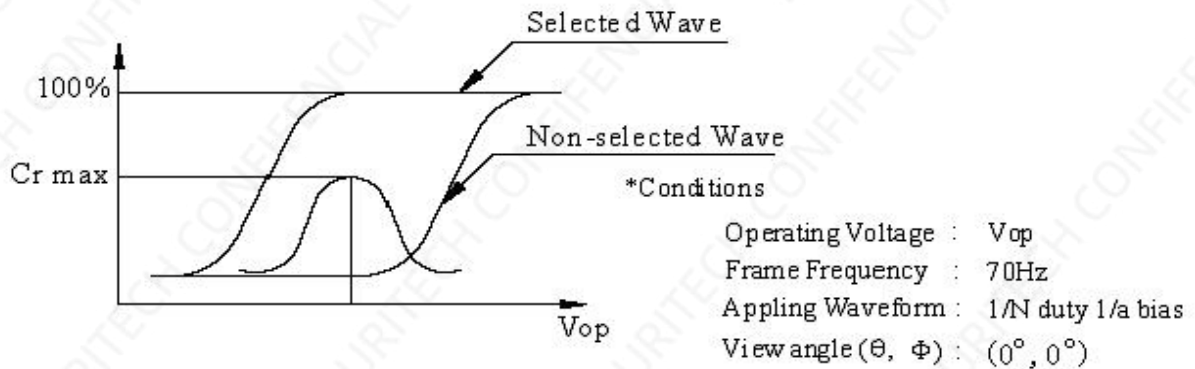


Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and ϕ



Note 4: Definition of contrast ratio.(Test LCD using DMS501)

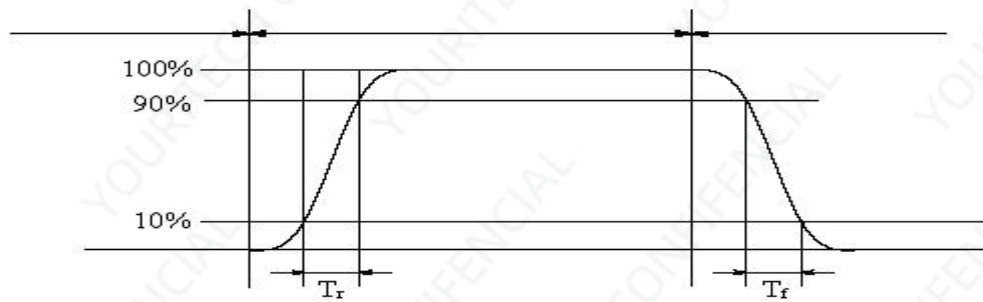


$$\text{Contrast ratio}(Cr) = \frac{\text{Brightness of selected dots}}{\text{Brightness of non-selected dots}}$$

Note 5: Definition of Response time. (Test LCD using DMS501):

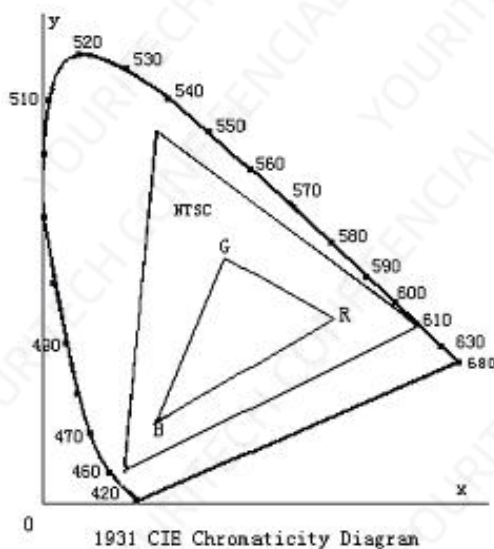
The output signals of photo detector are measured when the input signals are changed from "black" to "white" (falling time) and from "white" to "black" (rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.

Shenzhen Youritech Technology Co.,Limited



The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.

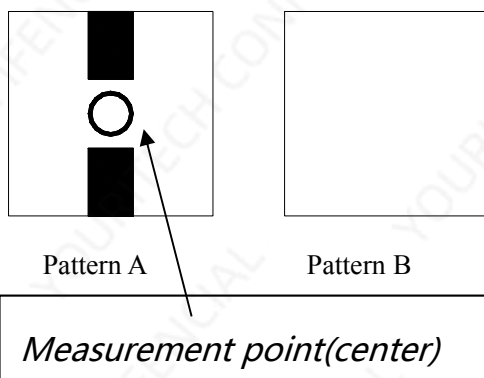


Color gamut:

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 7: Definition of cross talk.

$$\text{Cross talk ratio(\%)} = \frac{|\text{pattern A Brightness} - \text{pattern B Brightness}|}{\text{pattern A Brightness}} \times 100$$



Electric volume value = 3F +/- 3Hex

Shenzhen Youritech Technology Co., Limited

8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80°C±2°C 96H Restore 2H at 25°C Power off	1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice of initial value.
2	Low Temperature Storage	-30°C±2°C 96H Restore 2H at 25°C Power off	
3	High Temperature Operation	70°C±2°C 96H Restore 2H at 25°C Power on	
4	Low Temperature Operation	-20°C±2°C 96H Restore 4H at 25°C Power on	
5	High Temperature/Humidity Operation	60°C±2°C 90%RH 96H Power on	
6	Temperature Cycle	-30°C ←————→ 80°C 30min 5min 30min after 5 cycle, Restore 2H at 25°C Power off	

Note: Operation: Supply 2.8V for logic system.

The inspection terms after reliability test, as below

ITEM	Inspection
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone+/-0,05

Shenzhen Youritech Technology Co., Limited

9. Precautions for Use of LCD Modules

9.1 Handling Precautions

9.1.1 *The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.*

9.1.2 *If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.*

9.1.3 *Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.*

9.1.4 *The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.*

9.1.5 *If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:*

— Isopropyl alcohol — Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer.

Especially, do not use the following:

— Water — Ketone — Aromatic solvents

9.1.6 *Do not attempt to disassemble the LCD Module.*

9.1.7 *If the logic circuit power is off, do not apply the input signals.*

9.1.8 *To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.*

-
- a. Be sure to ground the body when handling the LCD Modules.*
 - b. Tools required for assembly, such as soldering irons, must be properly ground.*
 - c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.*
 - d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.*

9.2 Storage precautions

9.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

9.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : $0^{\circ}\text{C} \sim 40^{\circ}\text{C}$

Relatively humidity: $\leq 80\%$

9.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

9.3 *The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.*

END