

Project No. 项目编号	10.1 inch WXGA
Customer 客户名称	
Module No. 客户型号	
Product type 产品内容	Standard LCD Module 800 x 3RGB x 1280 Dots 10.1" TFT IPS LCD
Signature by customer:	

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1. Document revision history:

DOCUMENT REVISION	DATE	DESCRIPTION	PREPARED XHC	APPROVED
A	2019.01.22	First Release.		xhc

2. General Description

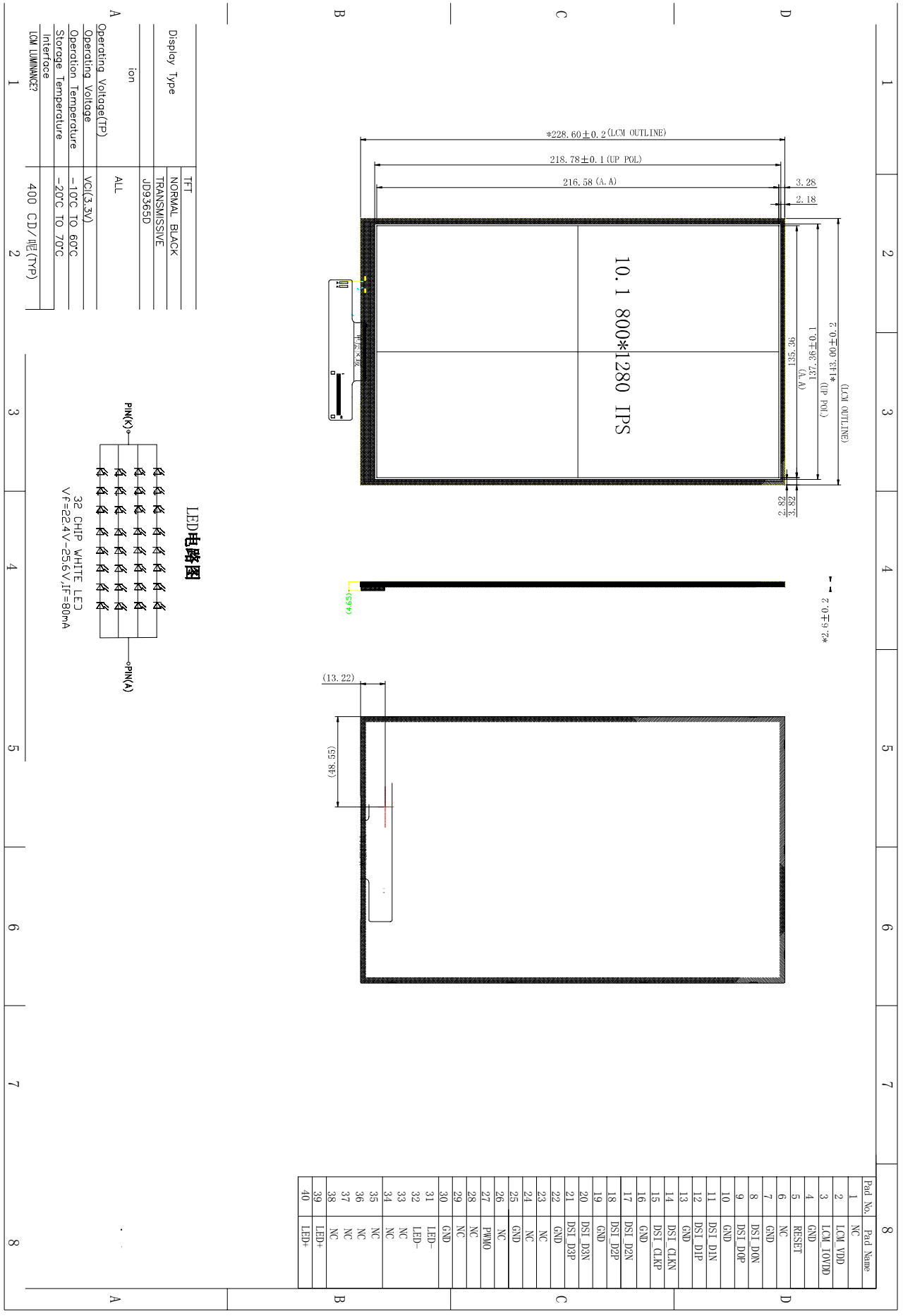
- 10.1inch configuration, 800 x3 RGB x 1280 dots, 16.7M colors, Transmissive ,IPS, TFT LCD module
- Viewing Direction: ALL
- Driving IC: JD9365DA-H3
- MIPI interface
- Logic voltage: 1.8/3.3V (typ.).
- Without touch panel

3. Mechanical Specifications

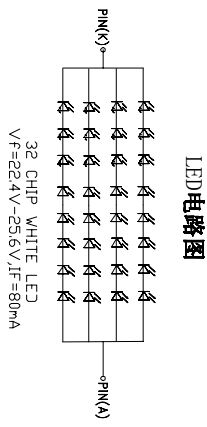
The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

Parameter		Specifications	Unit
Outline dimensions		143(W) x 228.6(H) x 2.6(D)	mm
Color TFT 320xRGBx480	TP view area	-	mm
	TP active area	-	mm
	LCD active area	135.36(W) x216.58(H)	mm
	Display format	800x3 RGB x 1280	dots
	Color configuration	RGB stripes	-
	Pixel pitch	0.1692(H) x 0.1692(V)	mm
Weight			grams



Display Type	TFI
	NORMAL BLACK
	TRANSMISSIVE
	JD9365D
ion	ALL
Operating Voltage(TP)	VCL(3.3V)
Operation Temperature	-10°C TO 60°C
Storage Temperature	-20°C TO 70°C
Interface	400 CD/INCH(TYP)
LCM DIMINANCE?	



Pin No.	Pad Name
1	NC
2	LCM VDD
3	LCM I/OVDD
4	GND
5	RESET
6	NC
7	GND
8	DSI_D0N
9	DSI_D0P
10	GND
11	DSI_D1N
12	DSI_D1P
13	GND
14	DSI_CLKN
15	DSI_CLKP
16	GND
17	DSI_D2N
18	DSI_D2P
19	GND
20	DSI_D3N
21	DSI_D3P
22	GND
23	NC
24	NC
25	GND
26	NC
27	PMMO
28	NC
29	NC
30	GND
31	LED-
32	LED-
33	NC
34	NC
35	NC
36	NC
37	NC
38	NC
39	LED+
40	LED+

4. Interface signals

Table 2: Pin assignment

No.	Signal	Fuction
1	NC	No connection
2	VDD	Power supply(3.3v)
3	VDDIO	Power supply(1.8v/3.3v)
4	GND	Ground
5	RESET	Global reset pin
6	NC	No connection
7	GND	Ground
8	<i>MIPI_TDN0</i>	MIPI-DSI data Lane 0 negative -end input/output pin
9	<i>MIPI_TDP0</i>	MIPI-DSI data Lane 0 positive -end input/output pin
10	GND	Ground
11	<i>MIPI_TDN1</i>	MIPI-DSI data Lane 1 negative -end input/output pin
12	<i>MIPI_TDP1</i>	MIPI-DSI data Lane 1 positive -end input/output pin
13	GND	Ground
14	MIPI_TCN	MIPI-DSI clock Lane negative-end input pin
15	MIPI_TCP	MIP'I-DSI clock Lane positive-end input pin
16	GND	Ground
17	<i>MIPI_TDN2</i>	MIPI-DSI data Lane 2 negative -end input/output pin
18	<i>MIPI_TDP2</i>	MIPI-DSI data Lane2 positive -end input/output pin
19	GND	Ground
20	MIPI_TDN3	MIPI-DSI data Lane 3 negative -end input/output pin
21	MIPI_TDP3	MIPI-DSI data Lane 3 positive -end input/output pin
22	GND	Ground
23	NC	No connection
24	NC	No connection
25	GND	Ground
26	NC	No connection
27	PWMO	PWM control signal for LED driver(CABC)
28	NC	No connection
29	NC	No connection
30	GND	Ground
31	LEDK	LED Cathode
32	LEDK	LED Cathode
33	NC	No connection
34	NC	No connection
35	NC	No connection
36	NC	No connection
37	NC	No connection
38	NC	No connection
39	LEDA	LED Anode
40	LEDA	LED Anode

5. Absolute Maximum Ratings

5.1 Electrical Maximum Ratings – for IC Only

Table 3: Electrical Maximum Ratings – for IC

Parameter	Symbol	Min.	Max.	Unit	Note
Power supply voltage (VCC)	VCC	-0.3	+3.6	V	1
Power supply voltage (IOVCC)	IOVCC	-0.3	+3.6	V	1

Note:

1. VCC, GND must be maintained.
2. The modules may be destroyed if they are used beyond the absolute maximum ratings.

5.2 Environmental Condition

Table 4

Item	Operating temperature (Topr)		Storage temperature (TSgt) (Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient temperature	-10°C	+60°C	-20°C	+70°C	Dry
Humidity (Note 1)	80% max. RH for $T_a \leq 40^\circ\text{C}$ < 50% RH for $40^\circ\text{C} < T_a \leq$ Maximum operating temperature				No condensation

Note 1: Product cannot sustain at extreme storage conditions for long time.

6. Electrical Specifications

Typical Electrical Characteristics

At $T_a = 25^\circ\text{C}$, $V_{CC} = IOVCC = 2.6\text{V}$ to 3.3V , $GND = 0\text{V}$.

Table 5

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (logic)	VCC-GND		2.6	3.3	3.3	V
Supply voltage (logic)	IOVCC-GND		1.65	1.8/3.3	3.3	V
Supply current (Logic & LCD)	ICC	VDD=2.8V	-	-	20	mA
Supply voltage of white LED backlight	$V_{LED} = V_{(BL+)} - V_{(BL-)}$	Forward current = 140mA	-	24	-	V
Luminance (on the module surface)		Number of LED dies = 21	-	400	-	cd/m ²

7. Optical Characteristics

Table 7: Optical specifications

Items	Symbol	Condition	Specifications			Unit	Note
			Min.	Typ.	Max.		

Contrast Ratio		CR	-	800	-	-	
Response Time		T_{R+T_F}	-	35	40	ms	
Chromaticity	Red	X_R	0.636	0.656	0.676	-	
		Y_R	0.300	0.320	0.340	-	
	Green	X_G	0.268	0.288	0.308	-	
		Y_G	0.569	0.589	0.609	-	
	Blue	X_B	0.118	0.138	0.158	-	
		Y_B	0.059	0.079	0.099	-	
White	X_W	0.287	0.307	0.327	-		
	Y_W	0.306	0.326	0.346	-		
Viewing angle	Hor.	$\phi 1(3 \text{ o'clock})$	-	80	-	deg.	Center $CR \geq 10$
		$\phi 2(9 \text{ o'clock})$	-	80	-		
	Ver.	$\theta 2(12 \text{ o'clock})$	-	80	-		
		$\theta 1(6 \text{ o'clock})$	-	80	-		
NTSC ratio				65		%	

Note 1:

1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

- Surface luminance is the center point across the TFT-LCD surface 240 mm from the surface with all pixels displaying white.
- Response time is the time required for the display to transition from black to white(Rise Time, T_r) and from white to black(Falling Time, T_f).
- Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the TFT-LCD surface.
- Optimum contrast is obtained by adjusting the TFT-LCD Threshold voltage(V_{th} & V_{sat})

Note 2: Definition of Response Time: The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

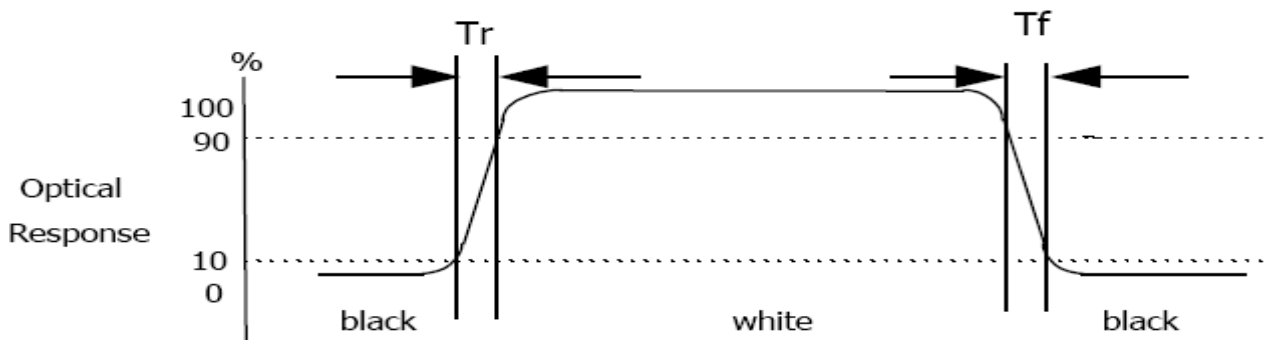


Figure 2. The definition of Response Time

Note 3: Viewing Angle

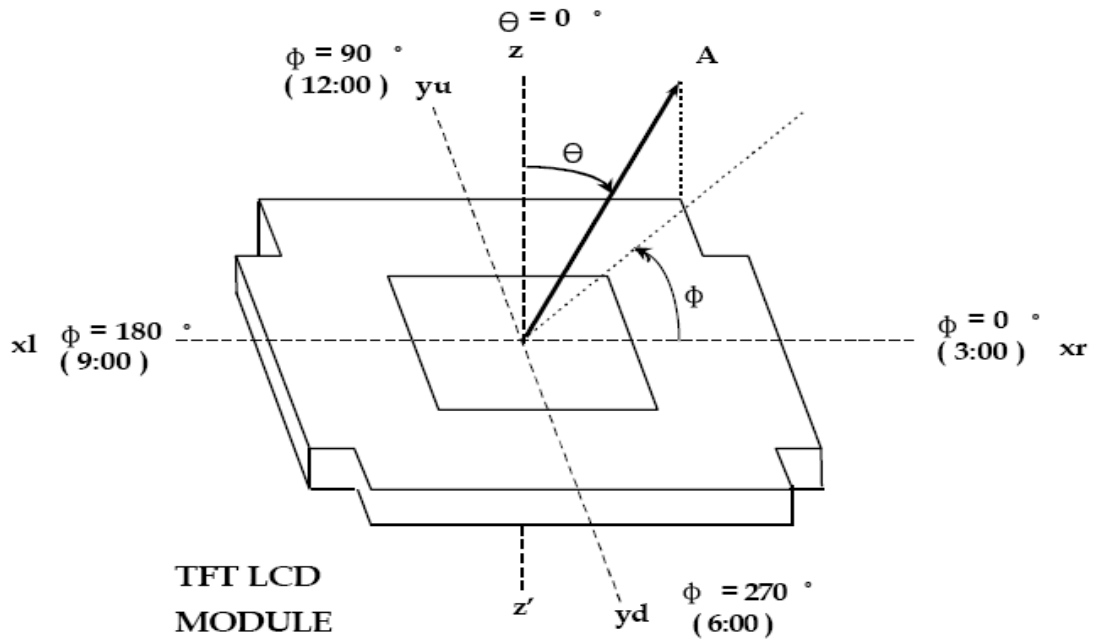


Figure 3 The definition of viewing angle

Note 4: Measurement Set-Up:

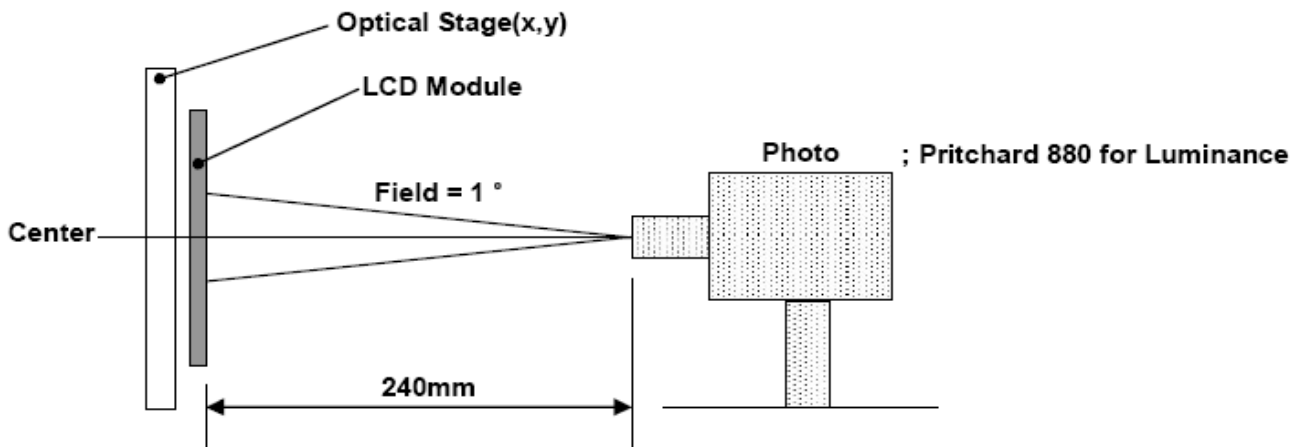


Figure 5

Measuring Condition ;

-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 30 minutes while backlight turning on.

8. Timing Characteristics

8.1 High Speed Mode

Table 8: Normal Write Mode (VCC =2.4~3.3V, IOVCC=1.65~3.3V)

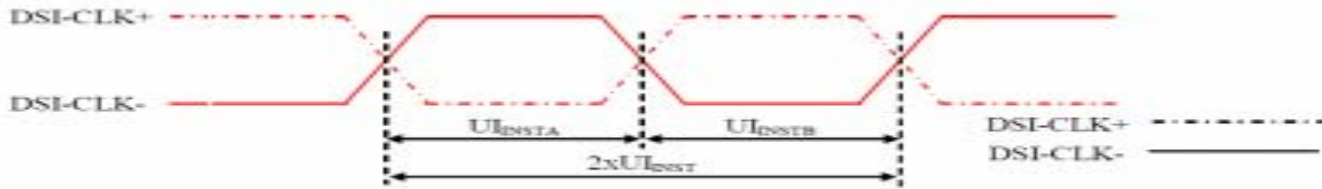


Figure 114 DSI Clock Channel Timing

Table 45 DSI Clock Channel Timing

Signal	Symbol	Parameter	Min	Max	Unit
DSI-CLK+/-	$2xUI_{INST}$	Double UI instantaneous	4	25	ns
DSI-CLK+/-	UI_{INSTA}, UI_{INSTB}	UI instantaneous Half	2	12.5	ns

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

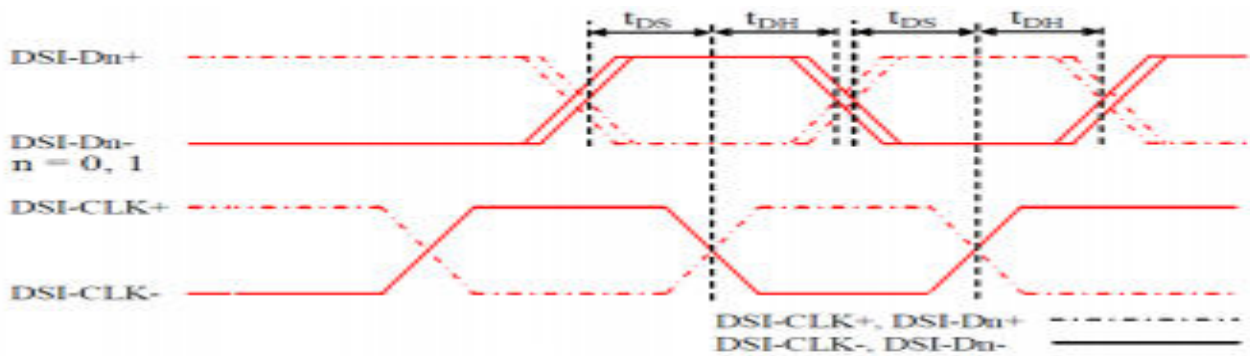


Figure 115 DSI Data to Clock Channel Timings

Table 46 DSI Data to Clock Channel Timings

Signal	Symbol	Parameter	Min	Max
DSI-Dn+/- , n=0 and 1	t_{DS}	Data to Clock Setup time	$0.15xUI$	-
	t_{DH}	Clock to Data Hold Time	$0.15xUI$	-

Figure 7. High Speed Mode Timing

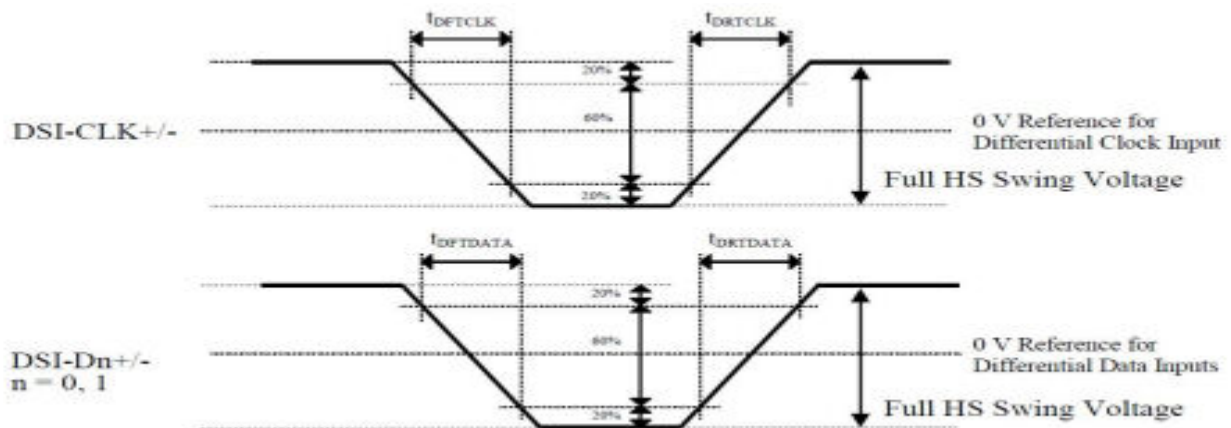


Figure 116 Rise and Fall Timings on Clock and Data Channels

Table 47 Rise and Fall Timings on Clock and Data Channels

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Differential Rise Time for Clock	$t_{DRTCCLK}$	DSI-CLK+/-	-	-	150 (Note)	ps
Differential Rise Time for Data	$t_{DRTDATA}$	DSI-Dn+/- n=0 and 1	-	-	150 (Note)	ps
Differential Fall Time for Clock	$t_{DFTCCLK}$	DSI-CLK+/-	-	-	150 (Note)	ps
Differential Fall Time for Data	$t_{DFTDATA}$	DSI-Dn+/- n=0 and 1	-	-	150 (Note)	ps

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

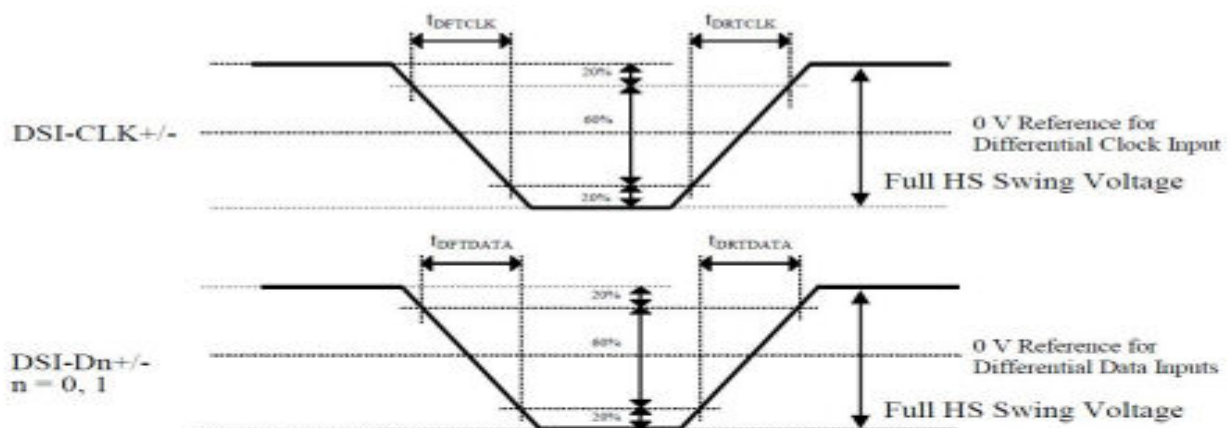


Figure 116 Rise and Fall Timings on Clock and Data Channels

Table 47 Rise and Fall Timings on Clock and Data Channels

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Differential Rise Time for Clock	$t_{DRTCCLK}$	DSI-CLK+/-	-	-	150 (Note)	ps
Differential Rise Time for Data	$t_{DRTDATA}$	DSI-Dn+/- n=0 and 1	-	-	150 (Note)	ps
Differential Fall Time for Clock	$t_{DFTCCLK}$	DSI-CLK+/-	-	-	150 (Note)	ps
Differential Fall Time for Data	$t_{DFTDATA}$	DSI-Dn+/- n=0 and 1	-	-	150 (Note)	ps

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

Low Power Mode

Lower Power Mode and its State Periods are illustrated for reference purposes on the Bus Turnaround (BTA) from the MPU to the Display Module (ILI9806E) sequence below.

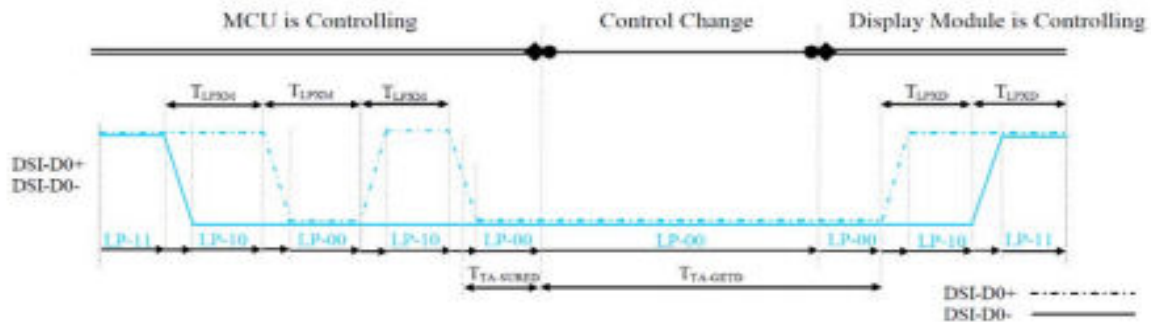


Figure 117 BTA from the MPU to the Display Module

Lower Power Mode and its State Periods are illustrated for reference purposes on the Bus Turnaround (BTA) from the Display Module (ILI9806E) to the MPU sequence below.

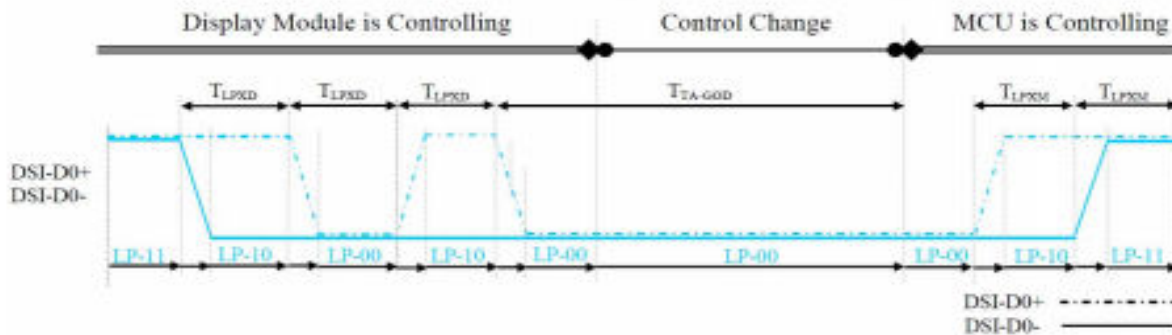


Figure 118 BTA from the Display Module to the MPU

Table 48 Low Power State Period Timings – A

Signal	Symbol	Description	Mn	Max	Unit
DSI-D0+/-	T_{LPKM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU → Display Module (ILI9806E)	50	75	ns
DSI-D0+/-	T_{LPKD}	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module (ILI9806E) → MPU	50	75	ns
DSI-D0+/-	$T_{TA-REQD}$	Time-out before the Display Module (ILI9806E) starts driving	T_{LPKD}	$2 \times T_{LPKD}$	ns

Table 49 Low Power State Period Timings – B

Signal	Symbol	Description	Time	Unit
DSI-D0+/-	$T_{TA-REQD}$	Time to drive LP-00 by Display Module (ILI9806E)	$5 \times T_{LPKD}$	ns
DSI-D0+/-	T_{TA-GRD}	Time to drive LP-00 after turnaround request = MPU	$4 \times T_{LPKD}$	ns

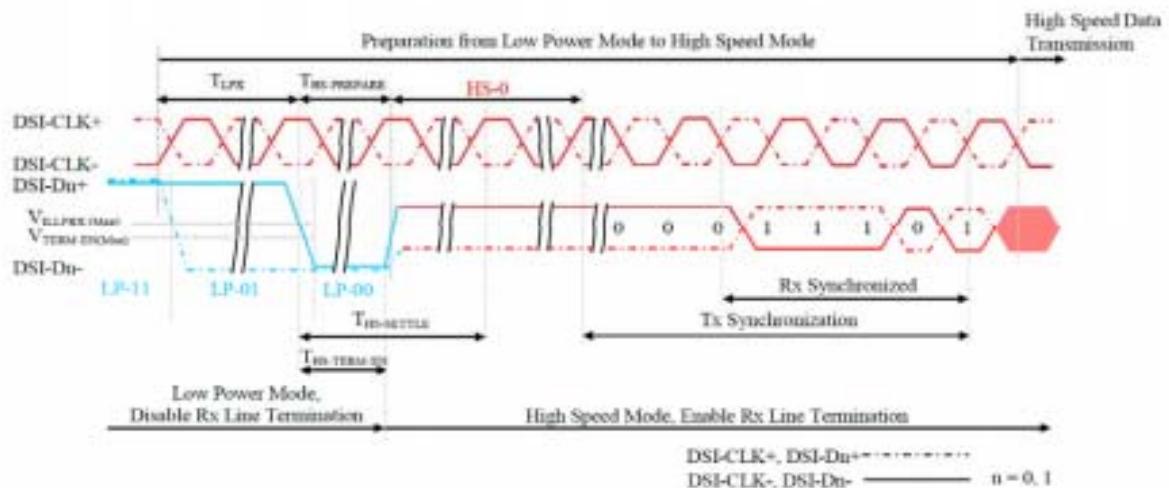


Figure 119 Data Lanes – Low Power Mode to High Speed Mode Timings

Table 50 Data Lanes – Low Power Mode to High Speed Mode Timings

Signal	Symbol	Description	Min	Max	Unit
DSI-Dn+/-, n=0 and 1	T _{LP}	Length of any Low Power State Period	50	•	ns
DSI-Dn+/-, n=0 and 1	T _{LP-prepare}	Time to drive LP-00 to prepare for HS Transmission	40+4xUI	85+6xUI	ns
DSI-Dn+/-, n=0 and 1	T _{HS-termination}	Time to enable Data Lane Receiver line termination measured from when Dn crosses VILMAX	•	35+4xUI	ns

8.2 Reset Operation of IC

Table 9: Reset Timing Characteristics (VCC = 2.4~3.3V, IOVCC=1.65~3.3V)

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low-level width	tRES	ms	1	-	-
Reset rise time	trRES	μs	-	-	10



Figure 8: Reset Timing

9. Initial code

```
params->dsi.vertical_sync_active=4  
params->dsi.vertical_backporch=20  
params->dsi.vertical_frontporch=20  
params->dsi.horizontal_sync_active=20  
params->dsi.horizontal_backporch=20  
params->dsi.horizontal_frontporch=40  
params->dsi.PLL_CLOCK=210MHZ
```

```
LCD_nReset=1;  
Delays(5);  
LCD_nReset=0;  
Delays(10);  
LCD_nReset=1;  
Delays(120);
```

```
{REGFLAG_DELAY,10,{}},
```

```
{0xE0,1,{0x00}},  
{0xE1,1,{0x93}},  
{0xE2,1,{0x65}},  
{0xE3,1,{0xF8}},  
{0x80,1,{0x03}},
```

```
{0xE0,1,{0x01}},  
{0x00,1,{0x00}},  
{0x01,1,{0x3B}},  
{0x0C,1,{0x74}},  
{0x17,1,{0x00}},  
{0x18,1,{0xAF}},  
{0x19,1,{0x00}},  
{0x1A,1,{0x00}},  
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{0x02,1,{0xB3}},
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{0x0E,1,{0x48}},

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{0xE7,1,{0x0C}},
{0x11,1,{0x00}},

{REGFLAG_DELAY,120}

10. Suggestions for using LCD modules

10.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.
2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.
3. Don't apply excessive force on the surface of the LCM.
4. If the surface is contaminated ,clean it with soft cloth. If the LCM is severely contaminated , use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer . The following solvents is especially prohibited: water , ketone Aromatic solvents etc.
5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
7. Don't disassemble the LCM.
8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Be sure to ground the body when handling the LCD modules.
 - Tools required for assembling, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
 - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
9. Do not alter, modify or change the the shape of the tab on the metal frame.

10. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
11. Do not damage or modify the pattern writing on the printed circuit board.
12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector
13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
14. Do not drop, bend or twist LCM.

10.2 Storage

1. Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.
2. Storage in a clean environment, free from dust, active gas, and solvent.
3. Store in antistatic container

11. Packing (Reference only)

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