Sauls Wharf House
Crittens Road
Great Yarmouth
Norfolk
NR31 0AG

Telephone +44 (0)1493 602602
Email:sales@midasdisplays.com
Email:tech@midasdisplays.com
www.midasdisplays.com

MDT020002	480x360	MIPI Interface	TFT Module
Specification			
Version: 1		Date: 08/04/2020	
Revision			
1	06/04/2020	First issue	

Display Features	
Display Size	2.00"
Resolution	480x360
Orientation	Landscape
Appearance	RGB
Logic Voltage	2.8V
Interface	MIPI
Brightness	620 cd/m^2
Touchscreen	---
Module Size	46.10 x 40.96 x 2.53 mm
Operating Temperature	-30°C ~ +85°C
Pinout	40 way FFC
Pitch	0.50 mm

RoHS compliant

Created By	Checked By
CL	TSB
Box Quantity	Weight / Display
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* - For full design functionality, please use this specification in conjunction with the ST7701S display driver specification.(Provided Separately)

Display Accessories

Part Number	Description
MBID-40FP	40 Way FFC to cable and wires. Driven by any driver board that can be wired to a 1mm pitch SHDR-40V-S-B receptacle.
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.

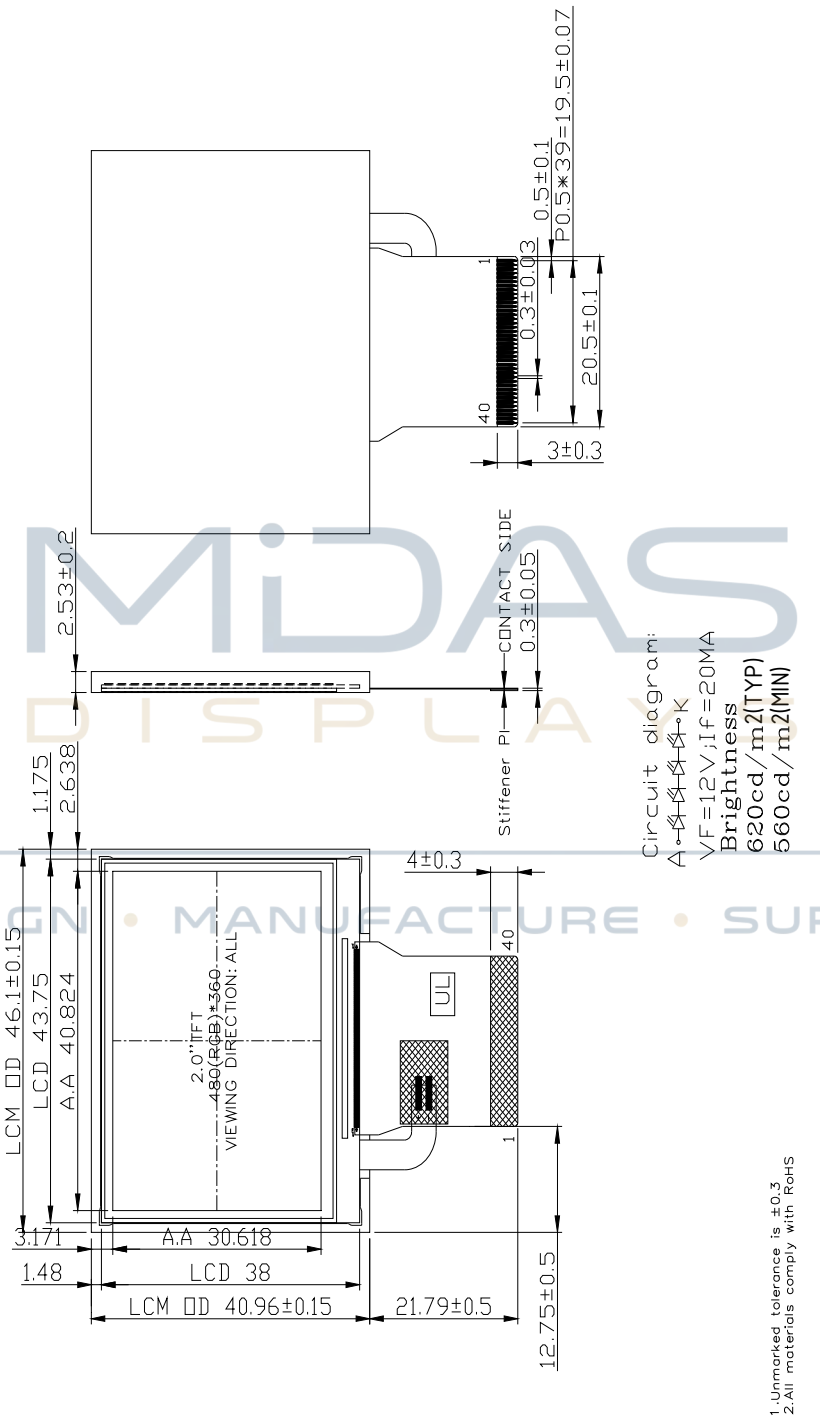
Optional Variants

Appearances	Voltage

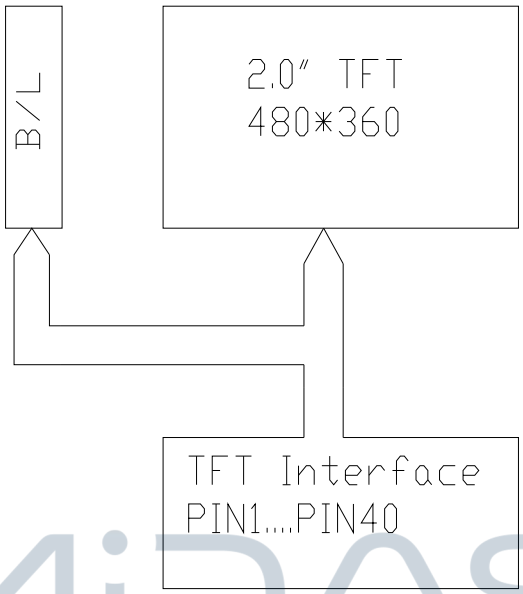
1. GENERAL SPECIFICATIONS

ITEM	STANDARD VALUE	UNIT
LCD SIZE	2.0 TTF	inch
LCD TYPE	TFT/IPS/ NORMALLY BLACK/TRANSMISSIVE	
MODULE SIZE	46.10*40.96*2.53	mm
ACTIVE AREA	40.824*30.618	mm
PIXEL PITCH (W*H)	85.05*85.05	um
NUMBER OF PIXELS	480*360	
DRIVER IC	ST7701S	
INTERFACE TYPE	MIPI	
RECOMMEND VIEWING DIRECTION	ALL	O'clock
GRAY SCALE INVERSION DIRECTION	-	O'clock
COLORS	16.7 M	
BACKLIGHT TYPE	4-DIES WHITE LED	

2. EXTERNAL DIMENSIONS



3. BLOCK DIAGRAM



4. PIN ASSIGNMENT

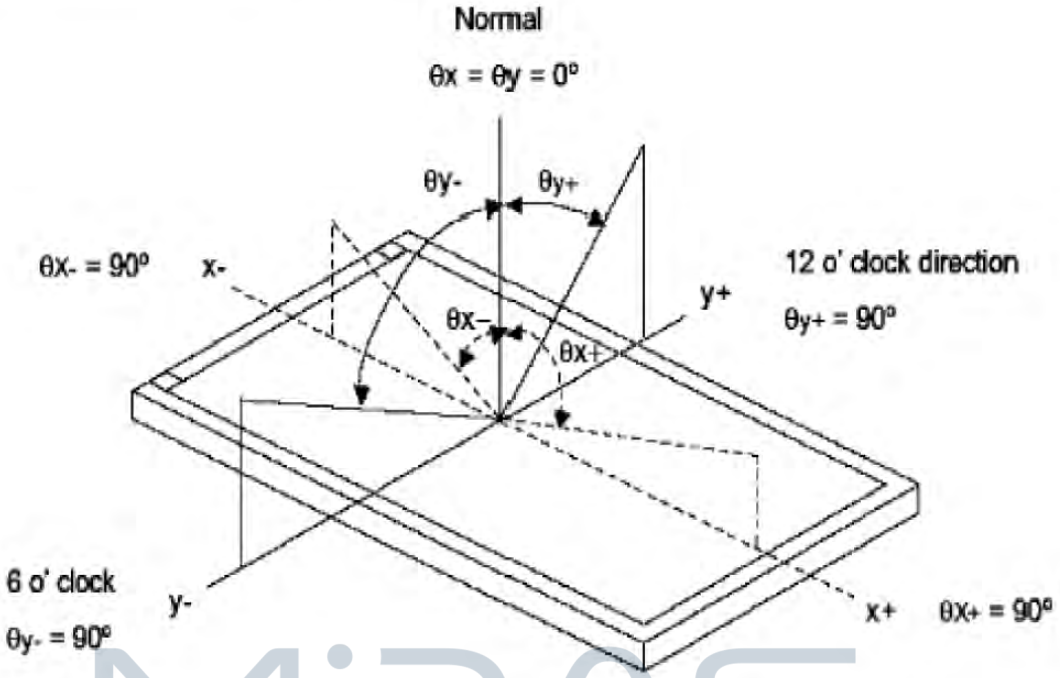
Pin No.	Symbol	Description
1	LEDK	Cathode of LED
2	LEDA	Anode of LED
3	GND	Power ground
4	VCI	Power supply for analog
5	DN0	MIPI Data lane0 input (negative)
6	DP0	MIPI Data lane0 input (positive)
7	GND	Power ground
8	CKN	MIPI CLK input(negative)
9	CKP	MIPI CLK input(positive)
10	GND	Power ground
11	DN1	MIPI Data lane1 input (negative)
12	DP1	MIPI Data lane1 input (positive)
13	GND	Power ground
14	GND	Power ground
15	GND	Power ground
16	GND	Power ground
17	GND	Power ground
18	GND	Power ground
19	GND	Power ground
20	GND	Power ground
21	GND	Power ground
22	GND	Power ground
23	GND	Power ground
24	GND	Power ground
25	GND	Power ground
26	GND	Power ground
27	GND	Power ground
28	GND	Power ground
29	GND	Power ground
30	GND	Power ground
31	GND	Power ground
32	GND	Power ground
33	GND	Power ground

34	RESET	Reset pin
35	GND	Power ground
36	GND	Power ground
37	GND	Power ground
38	GND	Power ground
39	IOVCC	Power supply for I/O system
40	IOVCC	Power supply for I/O system

5. OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
				MIN	TYP.	MAX		
Luminance		L		560	620	-	Cd/㎡	
Contrast ratio		CR	θ =0°	800	1000			
Response time	Rising	$T_{R+}T_F$			35	45	ms	
	Falling							
CIE COLOUR COORDINATE	RED	XR	VIEWING NORMAL ANGLE	0.615	0..635	0.655		
		YR		0.316	0.336	0.356		
	GREEN	XG		0.278	0.298	0.318		
		YG		0.556	0.576	0.596		
	BLUE	XB		0.114	0.134	0.154		
		YB		0.105	0.125	0.145		
	WHITE	XW		0.300	0.320	0.340		
		YW		0.321	0.341	0.361		
VIEWING ANGLE	Hor.	θ x+	CR≥10	75	80		Degree	
		θ x−		75	80			
	Ver.	θ y+		75	80			
		θ y−		75	80			

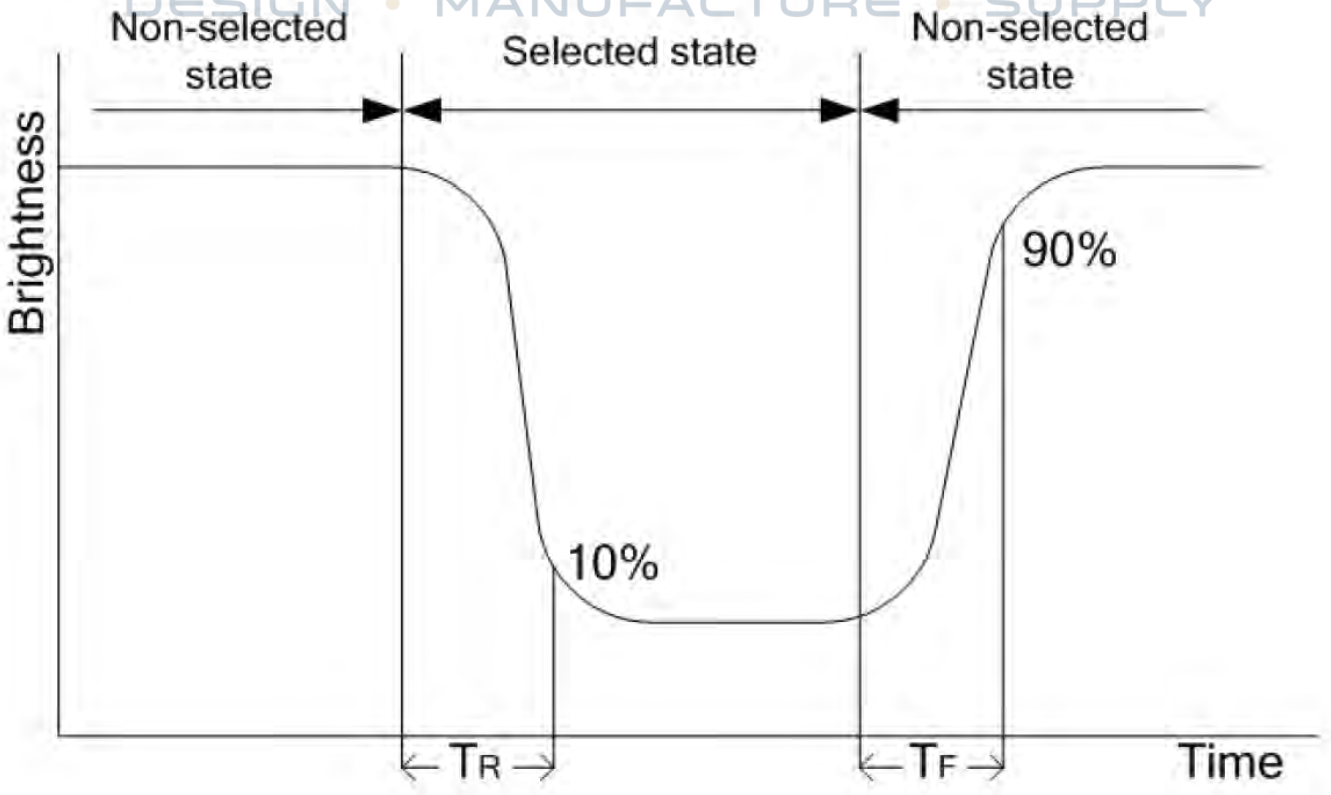
Note 1 : Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

$$CR = \frac{\text{Brightness of non-selected dots (white)}}{\text{Brightness of selected dots (black)}}$$

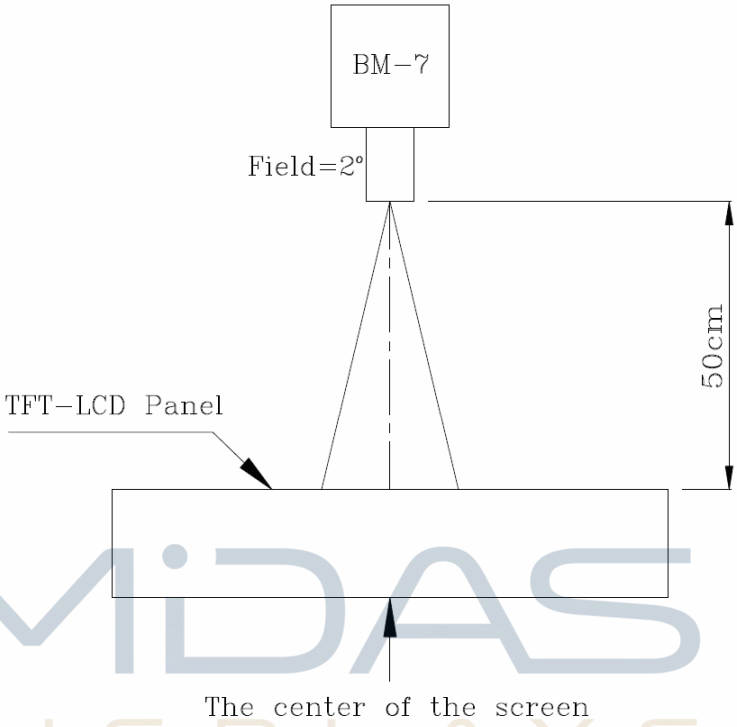
Note 3: Definition of response time (T_R, T_F)



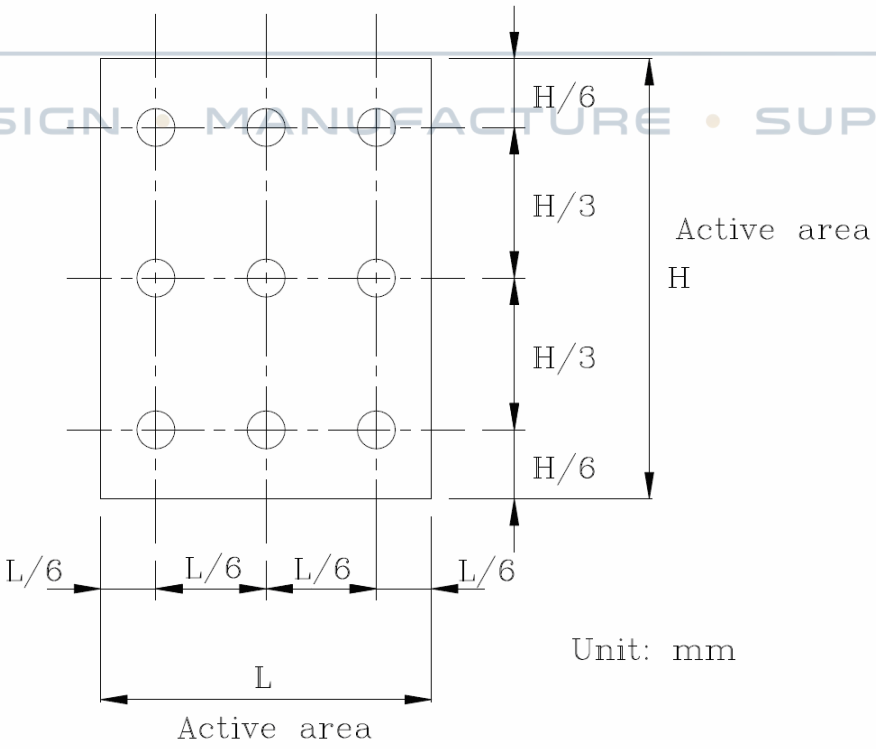
Note 4: Definition of Luminance

①The Brightness Test Equipment Setup

Field=2° (As measuring "black" image, field=2° is the best testing condition)



②The Brightness Test Point Setup



6. ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage	VCI	-0.3	4.6	V
Supply Voltage (Logic)	IOVCC	-0.3	4.6	
Operating temperature	Top	-30	+85	℃
Storage temperature	Tst	-30	+85	℃

7. ELECTRICAL CHARACTERISTICS

7.1 BLACKLIGHT DRIVING CONDITIONS

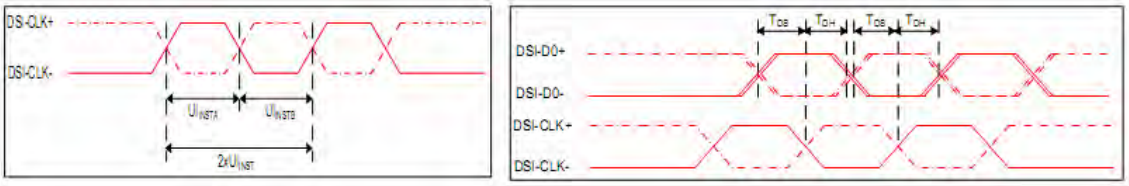
ITEM	SYMBOL	SPECIFICATIONS			UNIT	REMARK
		MIN	TYP.	MAX		
Supply Voltage	Vf		12		V	
Supply Current	IL		20		mA	
Power consumption	P		0.24		W	
LED lifetime			50,000		H_r	

7.2 ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	MIN	TYP.	MAX	UNIT
Supply voltage for analog	VCI	2.5	2.8	3.6	V
Interface Operation Voltage	IOVCC	1.65	1.8	3.3	V
Input voltage	Vil	GND		0.3IOVCC	V
	Vih	0.7IOVCC		IOVCC	V

8. TIMING CHARACTERISTICS

8.1 High Speed Mode



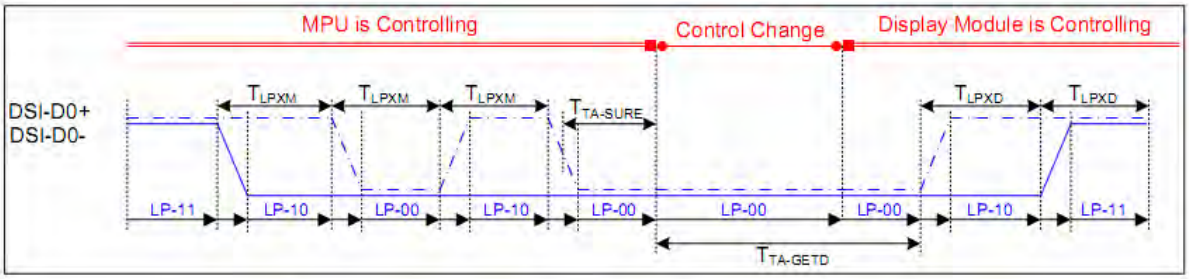
DSI clock channel timing

VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 °C

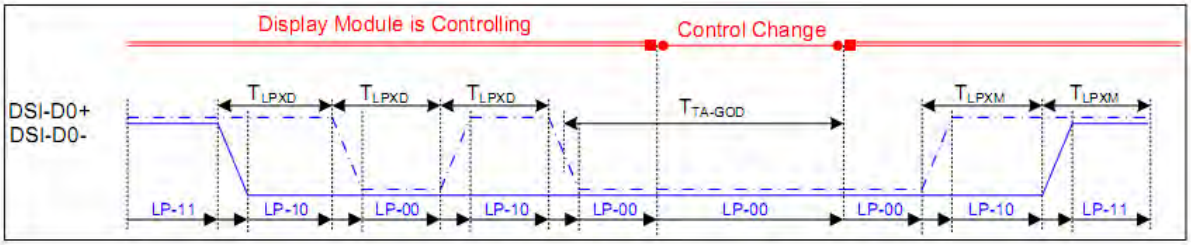
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-CLK+/-	$2xUI_{INSTA}$	Double UI instantaneous	2.5	25	ns	
DSI-CLK+/-	UI_{INSTA} UI_{INSTB}	UI instantaneous halfs	1.25	12.5	ns	$UI = UI_{INSTA} = UI_{INSTB}$
DSI-Dn+/-	tDS	Data to clock setup time	0.15	-	UI	
DSI-Dn+/-	tDH	Data to clock hold time	0.15	-	UI	

Mipi Interface- High Speed Mode Timing Characteristics

8.2 Lowe Power Mode



Bus Turnaround (BTA) from display module to MPU Timing



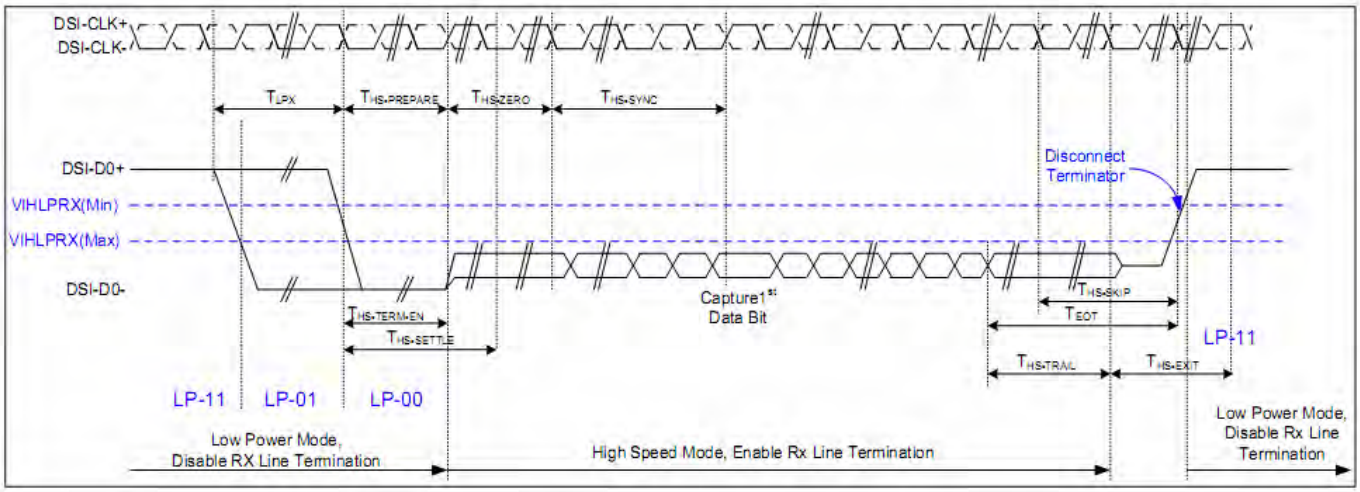
Bus Turnaround (BTA) from MPU to display module Timing

VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 °C

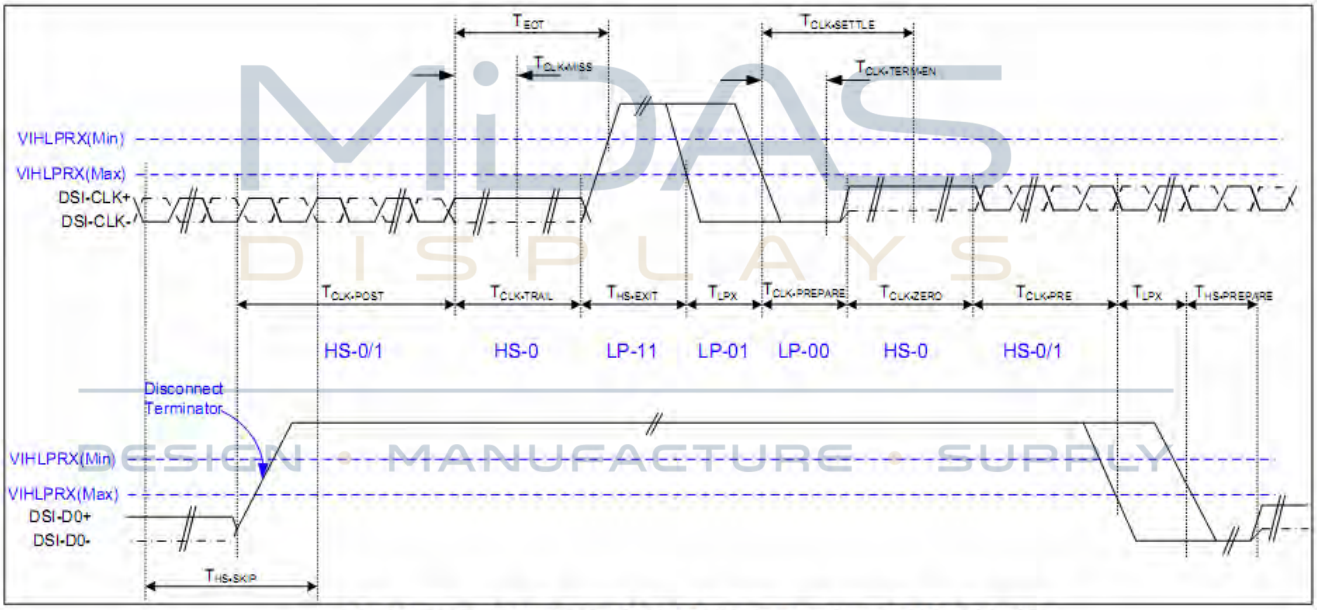
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-D0+/-	TLPXM	Length of LP-00,LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Input
DSI-D0+/-	TLPXD	Length of LP-00,LP-01, LP-10 or LP-11 periods MPU→Display Module	50	75	ns	Output
DSI-D0+/-	TTA-SURED	Time-out before the MPU start driving	T_{LPXD}	$2xT_{LPXD}$	ns	Output
DSI-D0+/-	TTA-GETD	Time to drive LP-00 by display module	$5xT_{LPXD}$		ns	Input
DSI-D0+/-	TTA-GOD	Time to drive LP-00 after turnaround request-MPU	$4xT_{LPXD}$		ns	Output

Mipi Interface Low Power Mode Timing Characteristics

8.3 DSI Bursts Mode



Data lanes-Low Power Mode to/from High Speed Mode Timing



Clock lanes- High Speed Mode to/from Low Power Mode Timing

VDDI=1.8,VDD=2.8, AGND=DGND=0V, Ta=25 ℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
Low Power Mode to High Speed Mode Timing						
DSI-Dn+/-	TLPX	Length of any low power state period	50	-	ns	Input
DSI-Dn+/-	THS-PREPARE	Time to drive LP-00 to prepare for HS transmission	40+4 UI	85+6 UI	ns	Input
DSI-Dn+/-	THS-TERM-EN	Time to enable data receiver line termination measured from when Dn crosses VILMAX	-	35+4 UI	ns	Input
DSI-Dn+/-	THS-PREPARE + THS-ZERO	THS-PREPARE + time to drive HS-0 before the sync sequence	140+ 10UI	-	ns	Input
High Speed Mode to Low Power Mode Timing						
DSI-Dn+/-	THS-SKIP	Time-out at display module to ignore transition period of EoT	40	55+4 UI	ns	Input
DSI-Dn+/-	THS-EXIT	Time to drive LP-11 after HS burst	100	-	ns	Input
DSI-Dn+/-	THS-TRAIL	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60+4 UI	-	ns	Input
High Speed Mode to/from Low Power Mode Timing						
DSI-CLK+/-	TCLK-POS	Time that the MPU shall continue sending HS clock after the last associated data lane has transition to LP mode	60+5 2UI	-	ns	Input
DSI-CLK+/-	TCLK-TRAIL	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	ns	Input
DSI-CLK+/-	THS-EXIT	Time to drive LP-11 after HS burst	100	-	ns	Input
DSI-CLK+/-	TCLK-PREPARE	Time to drive LP-00 to prepare for HS transmission	38	95	ns	Input
DSI-CLK+/-	TCLK-TERM-EN	Time-out at clock lan display module to enable HS transmission	--	38	ns	Input
DSI-CLK+/-	TCLK-PREPARE + TCLK-ZERO	Minimum lead HS-0 drive period before starting clock	300	-	ns	Input
DSI-CLK+/-	TCLK-PRE	Time that the HS clock shall be driven prior to any associated data lane beginning the transition from LP to HS mode	8UI	-	ns	Input
DSI-CLK+/-	TEOT	Time form start of TCLK-TRAIL period to start of LP-11 state	-	105n s+12 UI	ns	Input

9. RELIABILITY TEST

NO.	TEST ITEM	CONDITIONS
1	HIGH TEMPERATURE STORAGE	TA=85℃ 240H
2	LOW TEMPERATURE STORAGE	TA=-30℃ 240H
3	HIGH TEMPERATURE OPERATION	TA=85℃ 240H
4	LOW TEMPERATURE OPERATION	TA=-30℃ 240H
5	HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	+60℃, 90%RH 240H
6	THERMAL SHOCK	-30℃→+80℃, 0.5H;100CYCLES;1H/ CYCLES

10. LCD MODULES HANDLING PRECAUTIONS

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If
- the substance come into contact with your skin or clothes promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.
- 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 module.
  -Tools required for assembly, such as soldering irons, must be properly grounded.
  -To reduce the amount of static electricity generated, do not conduct assembly 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.
- Storage precautions
  When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0℃).Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

11. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.
- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.
- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
  - Exposed area of the printed circuit board
  - Terminal electrode sections.