

MDT028000	240x320	SPI Interface	TFT Module
Specification			
Version: 1		Date: 22/02/2023	
Revision			
1	20/02/2023	First issue	

Display Features			
Display Size	2.80"		
Resolution	240x320		
Orientation	Portrait		
Appearance	RGB		
Logic Voltage	2.8V		
Interface	SPI		
Brightness	500 cd/m ²		
Touchscreen	---		
Module Size	50.50 x 69.70 x 2.60 mm		
Operating Temperature	-20°C ~ +70°C	Created By	Checked By
Pinout	18 way FFC	CL	TSB
Pitch	0.50 mm	Box Quantity	Weight / Display
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* - For full design functionality, please use this specification in conjunction with the ST7789V display driver specification.(Provided Separately)

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



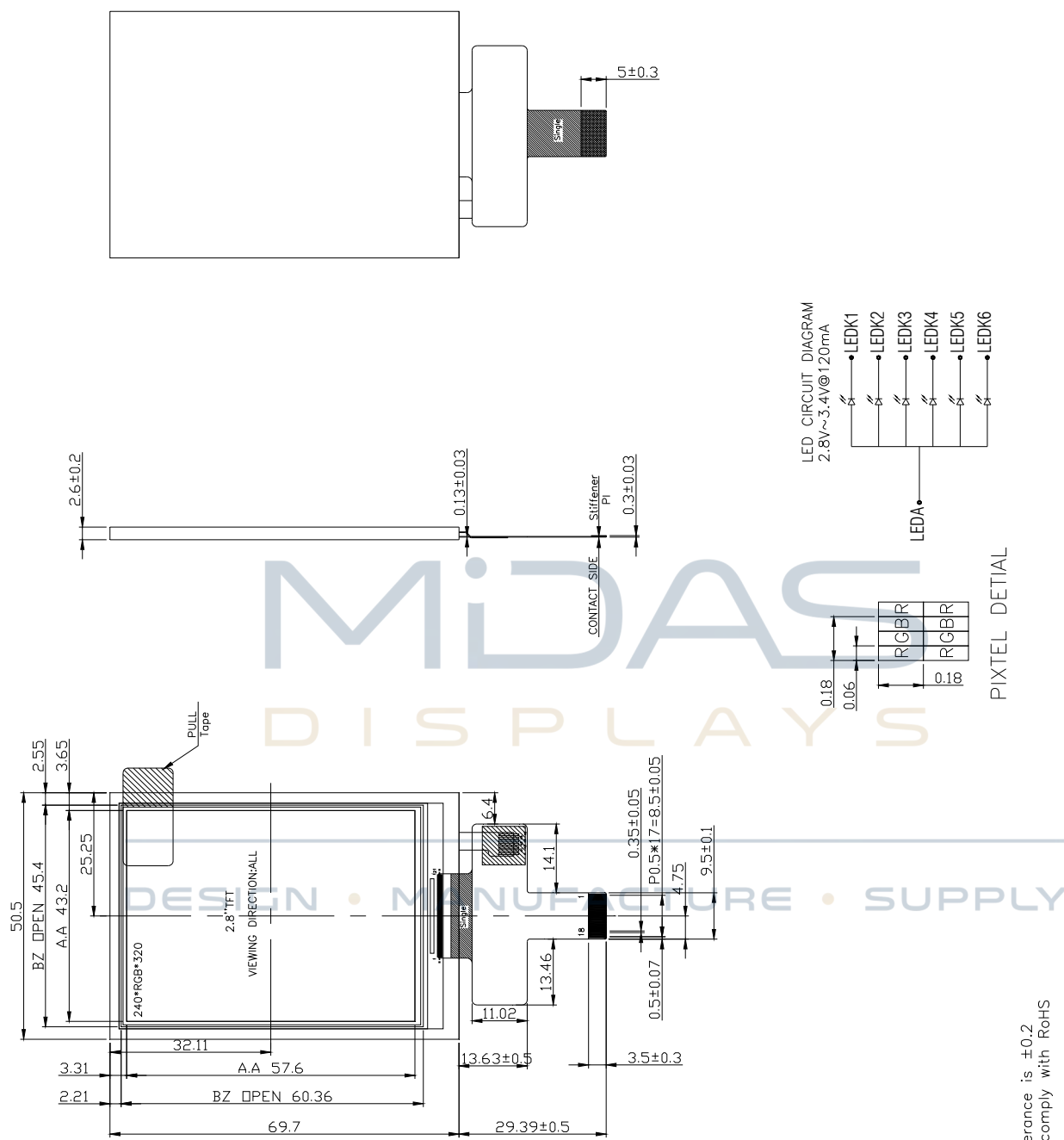
1. GENERAL SPECIFICATIONS

Item	Contents	Unit
LCD TYPE	TFT/IPS/NORMALLY BLACK/TRANSMISSIVE	
MODULE SIZE(W*H*T)	50.50*69.70*2.60	mm
ACTIVE SIZE(W*H)	43.20*57.60	mm
PIXEL PITCH(W*H)	0.18*0.18	mm
NUMBER OF DOTS	240*320	
DRIVER IC	ST7789V	
INTERFACE TYPE	4-line SPI	
RECOMMEND VIEWING DIRECTION	ALL	O’CLOCK
GRAY SCALE INVERSION DIRECTION	---	O’CLOCK
COLORS	262K	
BACKLIGHT TYPE	6-DIES WHITE LED	
TOUCH PANEL TYPE	WITHOUT	

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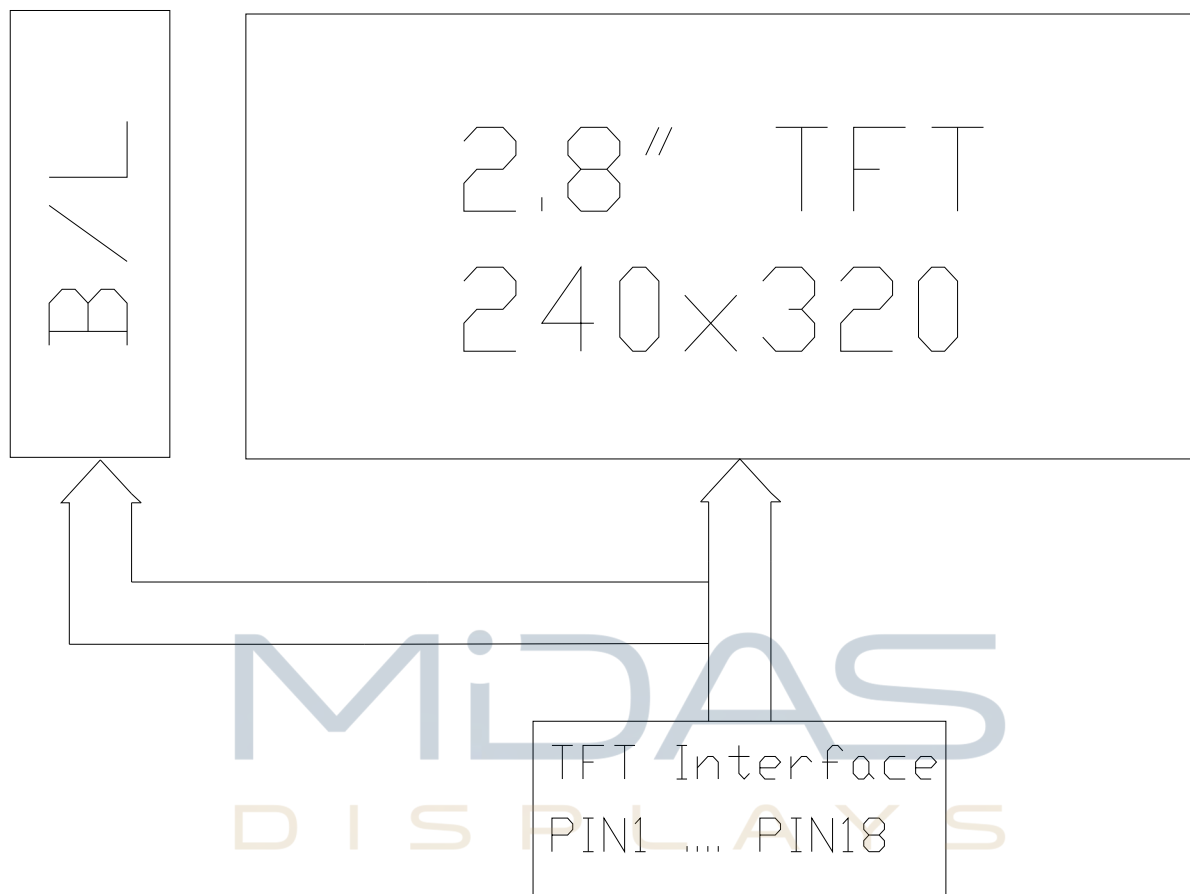
2. EXTERNAL DIMENSIONS



Remark:

1. Unmarked tolerance is ± 0.2
2. All materials comply with RoHS

3. BLOCK DIAGRAM



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4. PIN ASSIGNMENT

PIN NO.	SYMBOL	DESCRIPTION
1	LEDK6	Cathode of LED backlight
2	LEDK5	
3	LEDK4	
4	LEDK3	
5	LEDK2	
6	LEDK1	
7	LEDA	Anode of LED backlight
8	GND	Power ground
9	VDD	Power supply
10	VDDI	Power Supply for I/O System.
11	RESX	This signal will reset the device and it must be applied to properly Initialize the chip. Signal is active low.
12	CSX	Chip selection pin
13	SCL	This pin is used to be serial interface clock.
14	D/CX	Display data/command selection pin in 4-line serial interface.
15	SDA	The data is latched on the rising edge of the SCL signal.
16	TE	Tearing effect signal is used to synchronize MCU to frame memory
17	GND	Power ground
18	NC	No connect

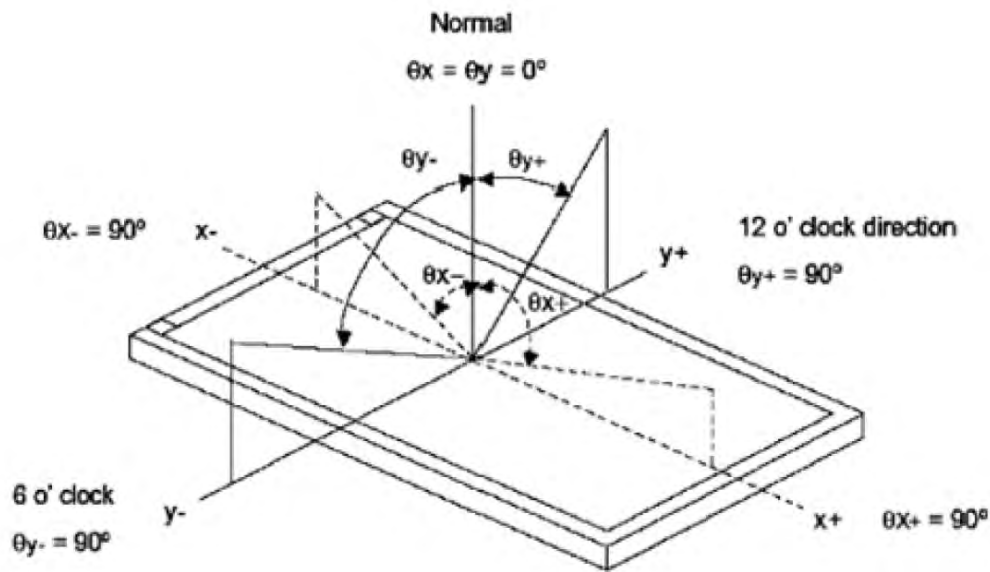


5. OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
				MIN	TYP.	MAX		
Luminance		L		400	500	600	Cd/m ²	
Contrast ratio		CR	$\theta = 0^\circ$	600	800			
Response time		Ton+ Toff	25℃		30	40	ms	
CIE COLOUR COORDINATE	RED	XR	VIEWING NORMAL ANGLE	0.621	0.641	0.661		
		YR		0.317	0.337	0.357		
	GREEN	XG		0.254	0.274	0.294		
		YG		0.540	0.560	0.580		
	BLUE	XB		0.121	0.141	0.161		
		YB		0.093	0.113	0.133		
	WHITE	XW		0.288	0.308	0.328		
		YW		0.310	0.330	0.350		
VIEWING ANGLE	Hor.	θ_{x+}	CR $\geq$ 10		80		Degree	
		θ_{x-}			80			
	Ver.	θ_{y+}			80			
		θ_{y-}			80			



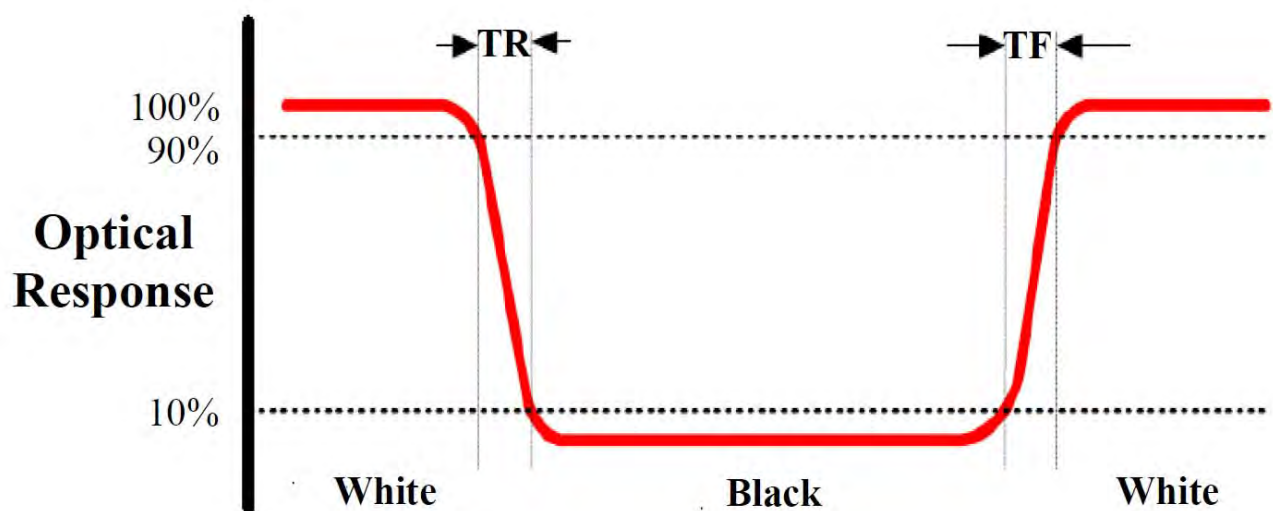
Note 1: Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

$$CR = \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

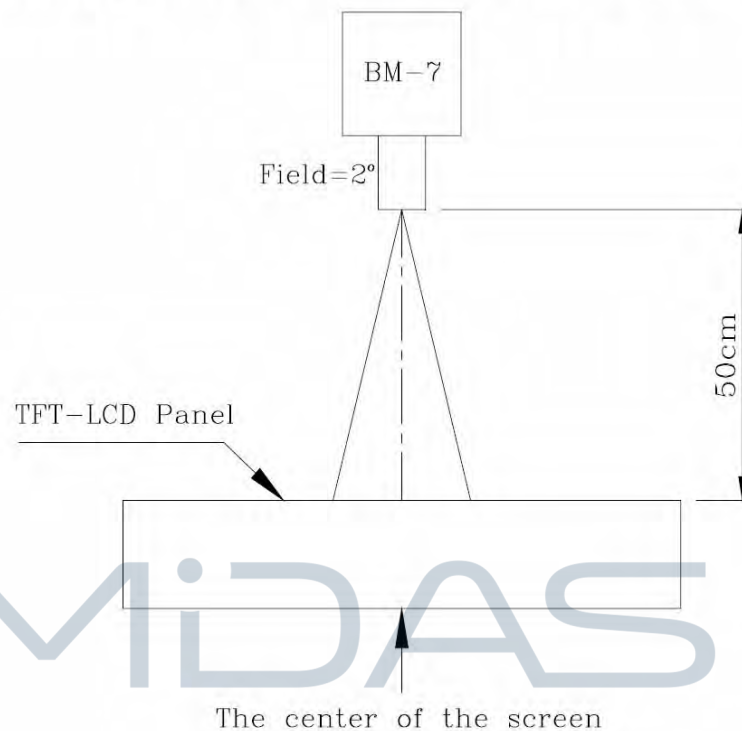
Note 3: Definition of Response Time(T_r, T_f)



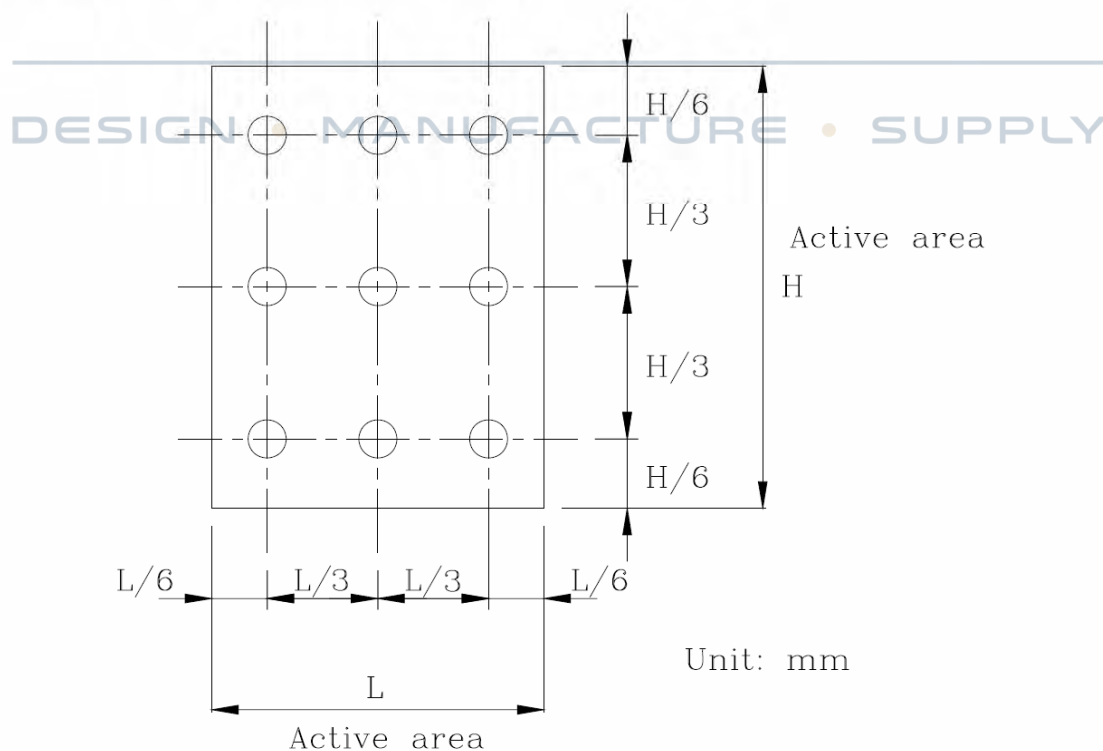
Note 4: Definition of Luminance

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 for analog	VDD	-0.3	4.6	V
Supply voltage for logic	VDDI	-0.3	4.6	V
Operating temperature	T_{OP}	-20	+70	°C
Storage temperature	T_{ST}	-30	+80	°C

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

7. ELECTRICAL CHARACTERISTICS

7.1 Input Power

Item	Symbol	Min	Typ.	Max	Unit	Applicable terminal
Supply voltage for analog	VDD	2.5	2.8	3.3	V	
Supply voltage for logic	VDDI	1.65	2.8	3.3	V	
Input voltage	V_{IL}	GND	-	0.3VDDI	V	
	V_{IH}	0.8VDDI	-	VDDI	V	

7.2 Backlight Driving Conditions

Item	Symbol	Value			Unit	Remark
		Min	Typ.	Max		
Voltage for LED backlight	V_L	2.8	3.2	3.4	V	
Current for LED backlight	I_L	-	120	-	mA	
Power consumption	P	-	0.384	-	W	
LED life time		30000	50000		H _r	



8. TIMING CHARACTERISTICS

8.1 SERIAL INTERFACE CHARACTERISTICS (4-LINE SERIAL):

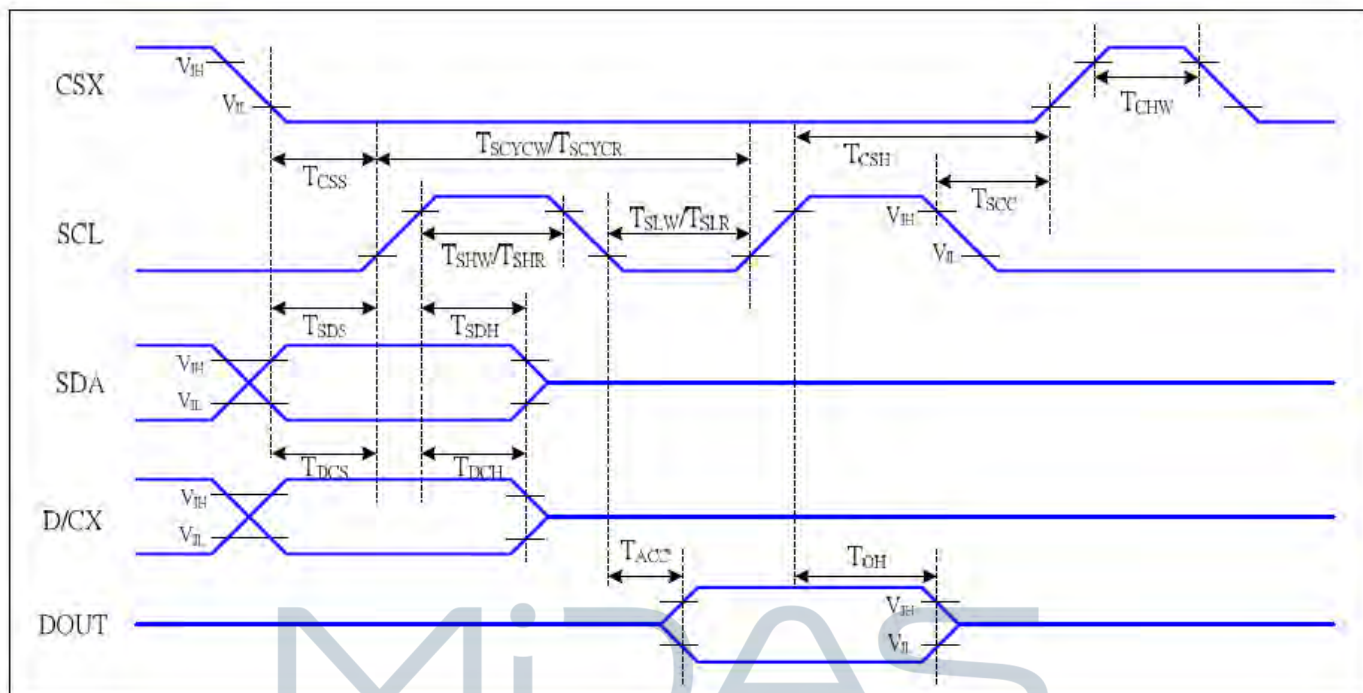


Figure 5 4-line serial Interface Timing Characteristics

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25°C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	-read command & data ram
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T_{DCS}	D/CX setup time	10		ns	
	T_{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T_{OH}	Output disable time	15	50	ns	For minimum CL=8pF

Table 6 4-line serial Interface Characteristics

9. RELIABILITY TEST

NO.	TEST ITEM	CONDITIONS
1	HIGH TEMPERATURE STORAGE	TA=80℃, 240H
2	LOW TEMPERATURE STORAGE	TA=-30℃, 240H
3	HIGH TEMPERATURE OPERATION	TA=70℃, 240H
4	LOW TEMPERATURE OPERATION	TA=-20℃, 240H
5	HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	+60℃, 90%RH, 240H
6	THERMAL SHOCK	-30℃↔+80℃ (0.5Hr) , 10 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.

MIDAS
DISPLAYS

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