

MDT035001	320x480	SPI + RGB Interface	TFT Module
Specification			
Version: 1		Date: 15/09/2021	
Revision			
1	13/09/2021	First issue	

Display Features		 RoHS compliant	
Display Size	3.5"		
Resolution	320x480		
Orientation	Portrait		
Appearance	RGB		
Logic Voltage	2.8V		
Interface	SPI + RGB		
Brightness	360 cd/m ²		
Touchscreen	---		
Module Size	54.66 x 82.94 x 2.20 mm		
Operating Temperature	-20°C ~ +70°C	Created By	Checked By
Pinout	45 way FFC	CL	TSB
Pitch	0.30 mm	Box Quantity	Weight / Display
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* - For full design functionality, please use this specification in conjunction with the ILI9488 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



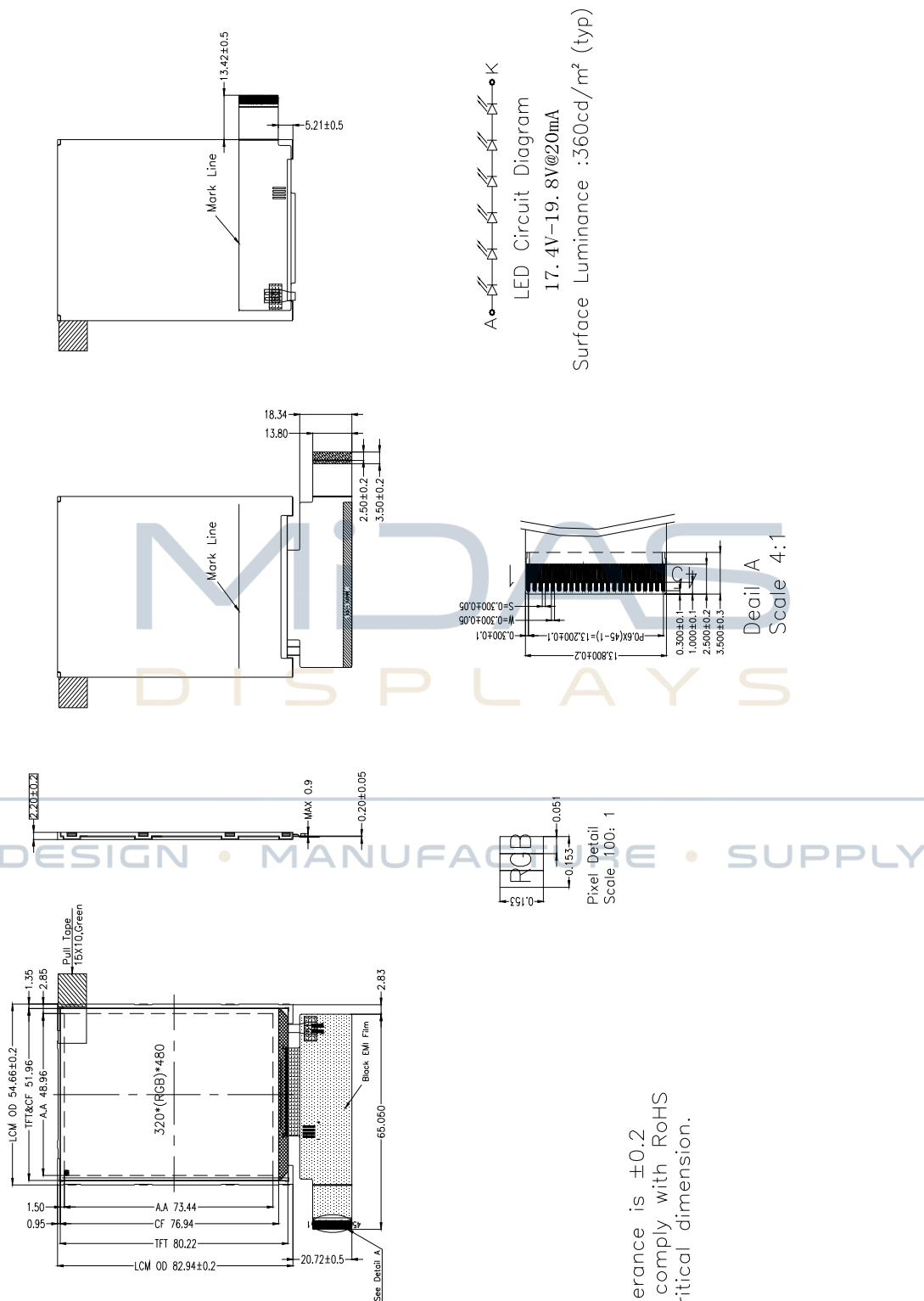
1. GENERAL SPECIFICATIONS

ITEM	STANDARD VALUE	UNIT
LCD TYPE	TFT/IPS/ NORMALLY BLACK/TRANSMISSIVE	
MODULE SIZE	54.66*82.94*2.20	mm
ACTIVE AREA	48.96*73.44	mm
PIXEL PITCH (W*H)	0.153*0.153	
NUMBER OF PIXELS	320*480	
DIVER IC	ILI9488	
INTERFACE TYPE	SPI+RGB	
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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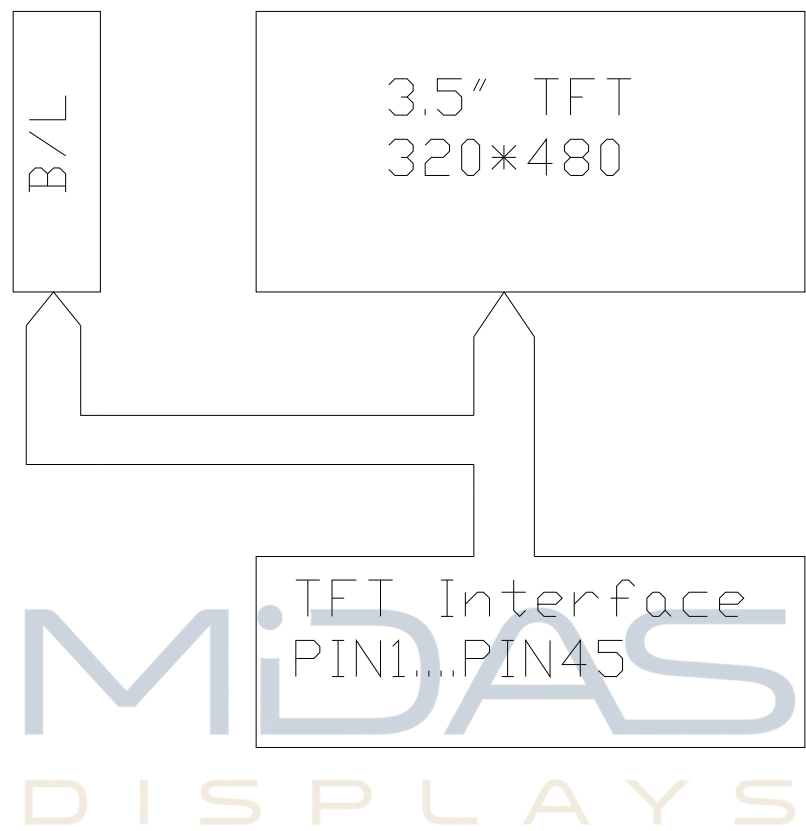
2. EXTERNAL DIMENSIONS



Remark:

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

3. BLOCK DIAGRAM



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4. PIN ASSIGNMENT

PIN NO.	SYMBOL	DESCRIPTION
1	GND	Power ground.
2	A	Anode of LED backlight.
3	A	Anode of LED backlight.
4	K	Cathode of LED backlight.
5	K	Cathode of LED backlight.
6	GND	Power ground.
7	GND	Power ground.
8	VCC	Power supply for analog voltage.
9	IOVCC	Power supply for logic voltage.
10	RESET	This signal will reset the device and it must be applied to properly initialize the chip. Signal is active low.
11	VSYN	Vertical synchronizing input signal for RGB interface operation.
12	HSYN	Horizontal synchronizing input signal for RGB interface operation.
13	GND	Power ground.
14	DOTCLK	Dot clock signal in RGB interface.
15	GND	Power ground
16	DE	Data enable signal for RGB interface operation.
17~34	DB17~DB0	Data bus.
35	SDO	SPI interface output pin. The data is outputted on the falling edge of the SCL signal.
36	SDI	SPI interface input/output pin. The data is latched on the rising edge of the SCL signal.
37	RDX	Read enable in 8080 MCU parallel interface. Low-active.
38	WRX/SCL	Write enable in MCU parallel interface. In SPI mode, this pin is used as SCL.
39	D/CX	Display data/command selection (RS) pin in MCU interface. DCX='1': display data or parameter. DCX='0': register index / command.
40	CSX	Chip selection pin. Low-active
41	TE	Tearing effect output.
42	NC(XR)	No Connection
43	NC(YD)	No Connection
44	NC(XL)	No Connection
45	NC(YU)	No Connection

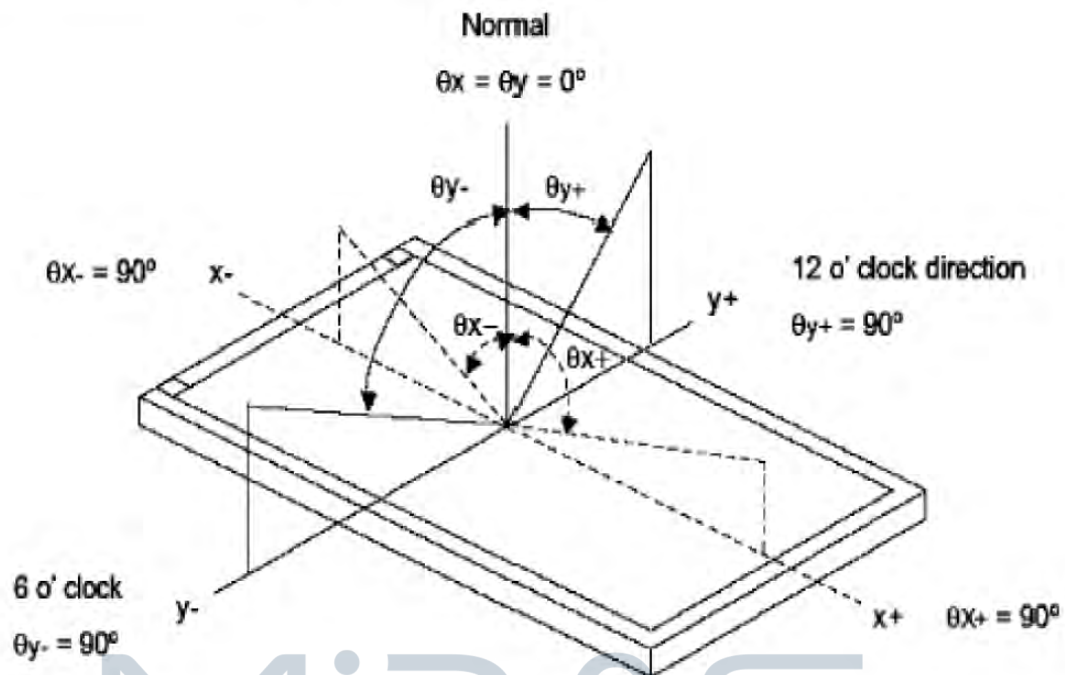


5. OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
				MIN	TYP.	MAX		
Luminance		L			360	-	Cd/m²	
Contrast ratio		CR	$\theta = 0^\circ$		700			
Response time	Rising	T _R	25°C		30		ms	
	Falling	T _F						
CIE COLOUR COORDINATE	RED	XR	VIEWING NORMAL ANGLE		0.660			
		YR			0.325			
	GREEN	XG			0.277			
		YG			0.568			
	BLUE	XB			0.145			
		YB			0.072			
	WHITE	XW			0.309			
		YW			0.332			
VIEWING ANGLE	Hor.	θ_{x+}	CR ≥ 10		80		Degree	
		θ_{x-}			80			
	Ver.	θ_{y+}			80			
		θ_{y-}			80			



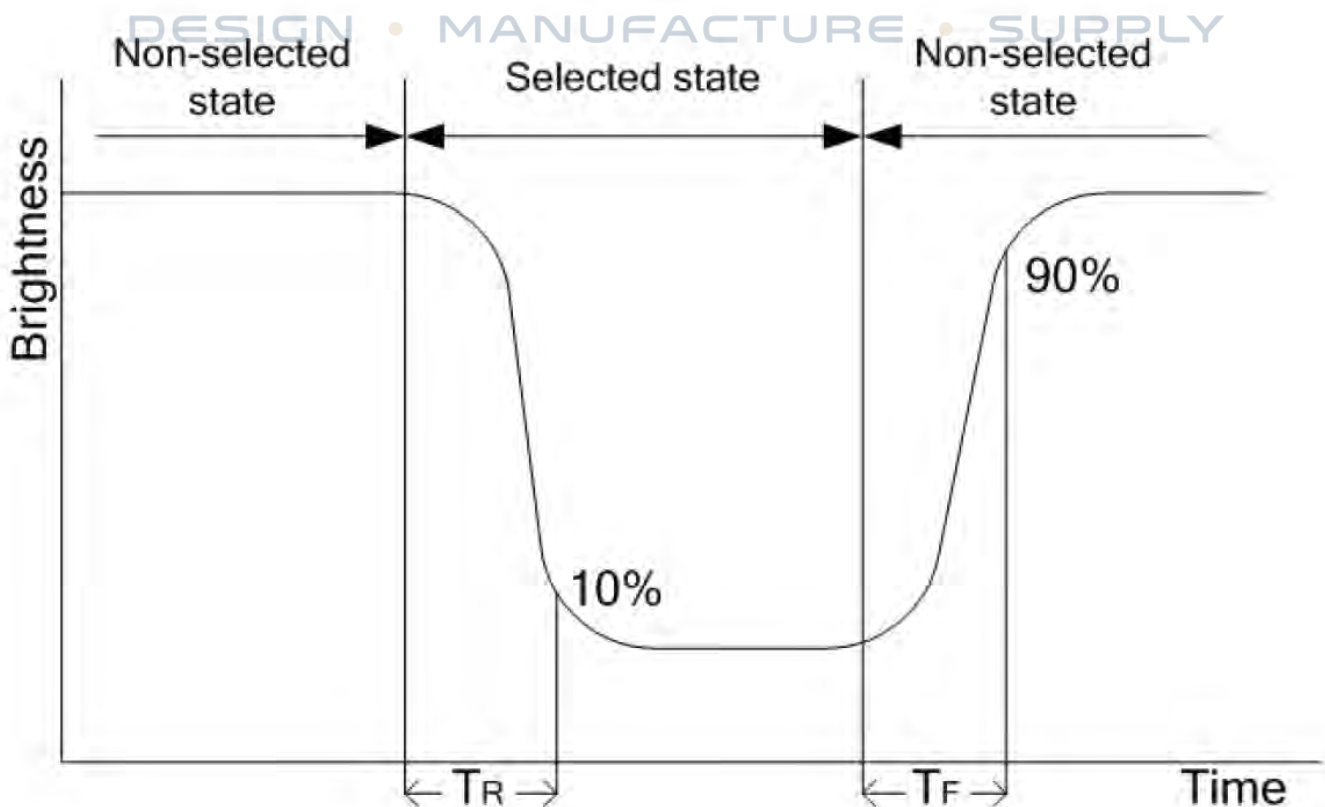
Note 1 : Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

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

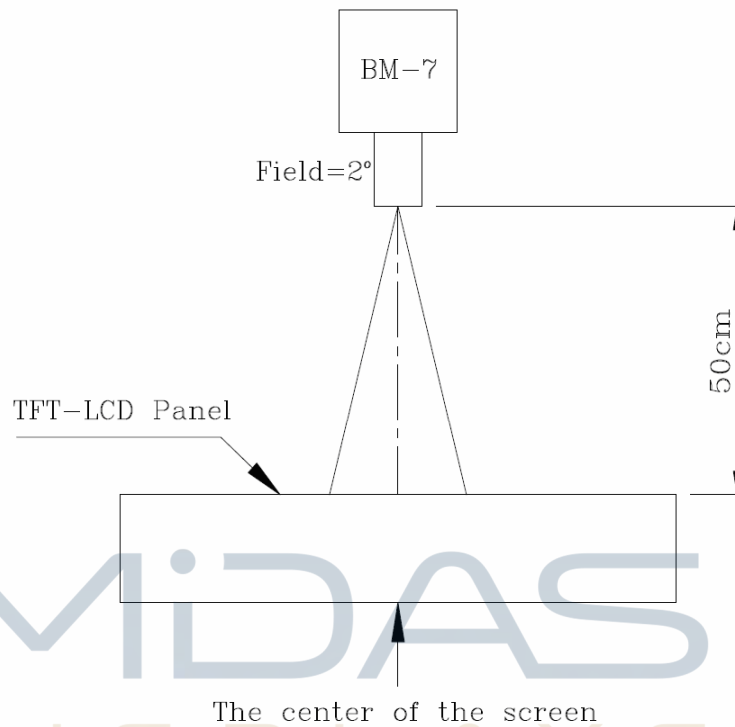
Note 3: Definition of response time (T_R , T_F)



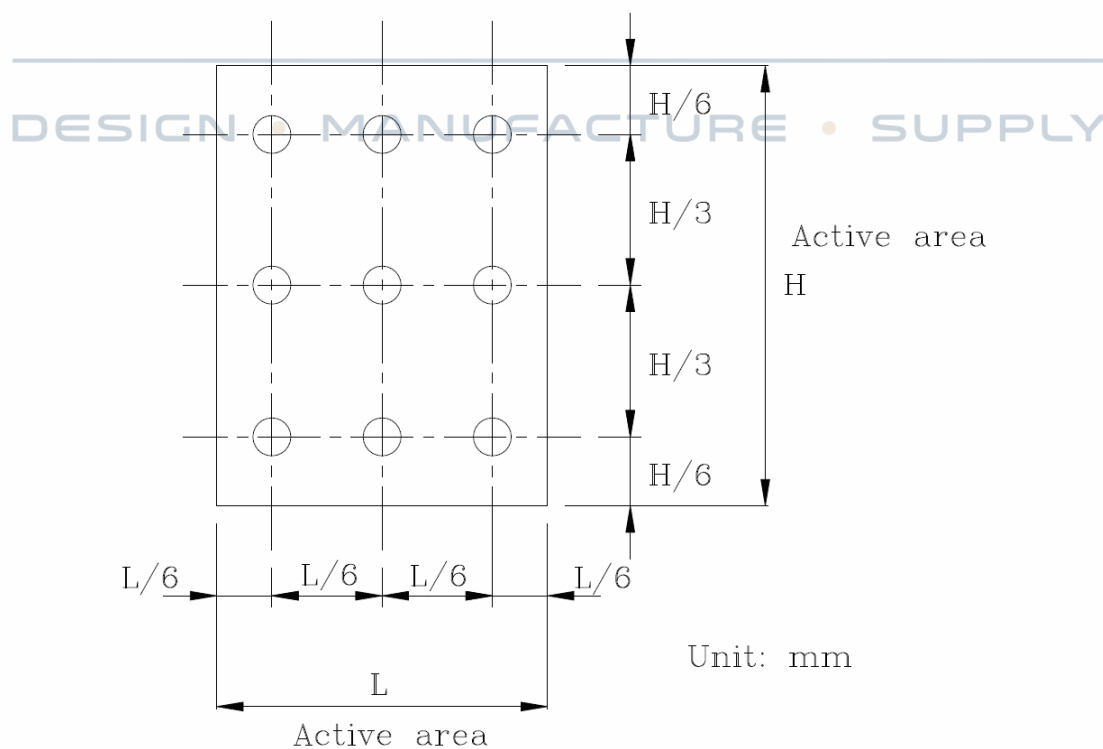
Note 4: Definition of Luminance

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	VCC	-0.3	3.3	V
Supply Voltage (Logic)	IOVCC	-0.3	3.3	
Operating temperature	Top	-20	+70	°C
Storage temperature	Tst	-30	+80	°C

7. ELECTRICAL CHARACTERISTICS

7.1 BLACKLIGHT DRIVING CONDITIONS

ITEM	SYMBOL	SPECIFICATIONS			UNIT	REMARK
		MIN	TYP.	MAX		
Supply Voltage	Vf	17.4		19.8	V	
Supply Current	IL		20		mA	
Power consumption	P	0.348		0.396	W	
LED lifetime			50,000		Hr	

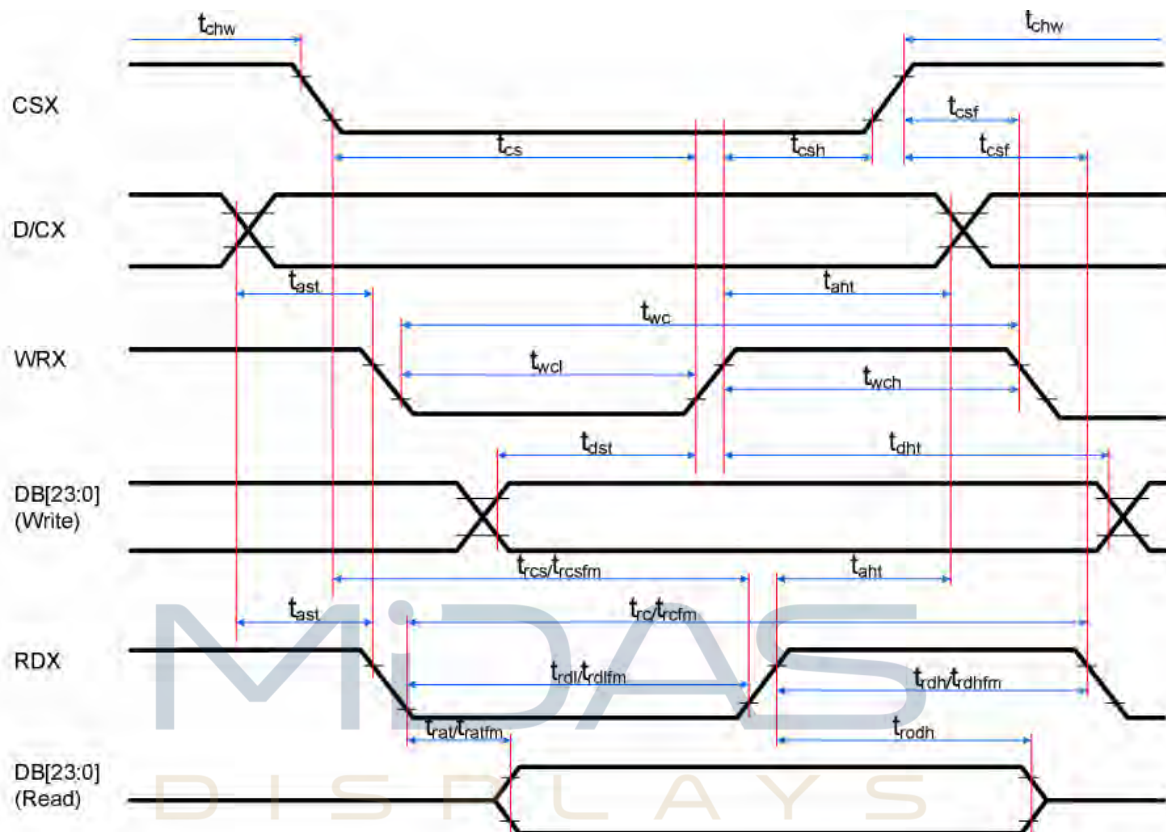
7.2 ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	MIN	TYP.	MAX	UNIT
System Voltage	VCC	2.5	2.8	3.3	V
Interface Operation Voltage	IOVCC	1.65	1.8	3.3	V
Logic-High Input Voltage	VIH	0.7IOVCC		IOVCC	
Logic-Low Input Voltage	VIL	GND		0.3IOVCC	



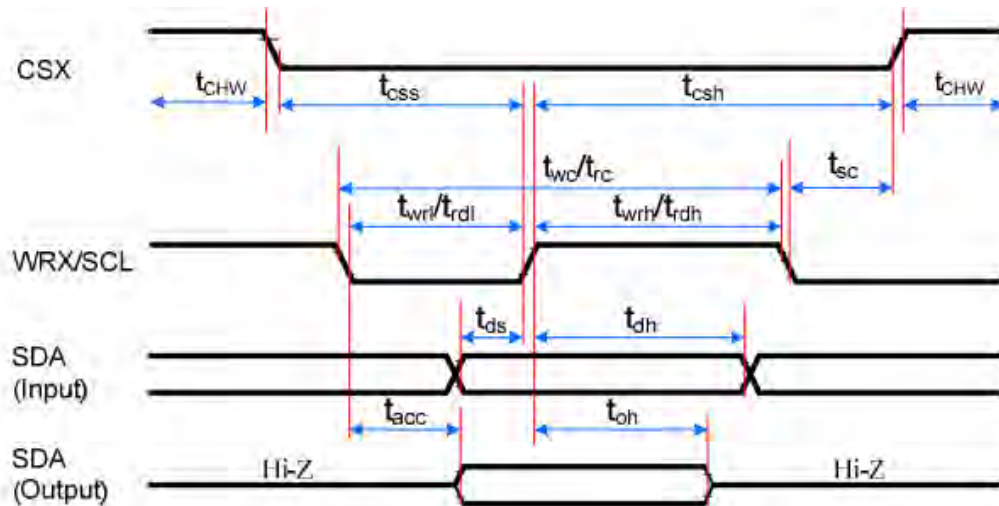
8 .TIMING CHARACTERISTICS

8.1 8080 Series MCU Parallel Interface Characteristics:



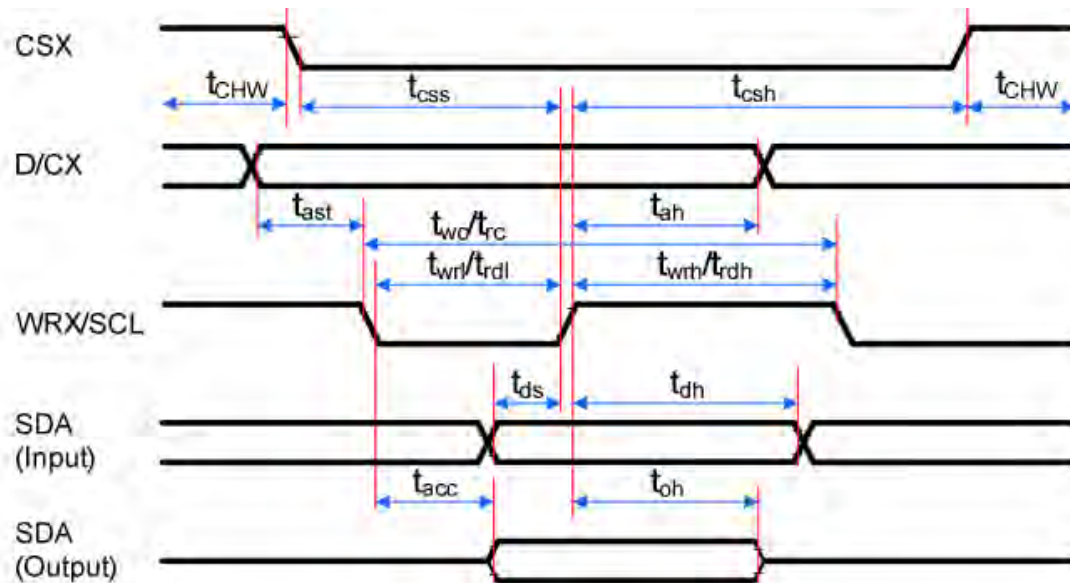
Signal	Symbol	Parameter	min	max	Unit	Description
DCX	t _{ast}	Address setup time	0	-	ns	-
	t _{ahh}	Address hold time (Write/Read)	0	-	ns	-
CSX	t _{chw}	CSX "H" pulse width	0	-	ns	-
	t _{cs}	Chip Select setup time (Write)	15	-	ns	-
	t _{rcs}	Chip Select setup time (Read ID)	45	-	ns	-
	t _{rcsfm}	Chip Select setup time (Read FM)	355	-	ns	-
	t _{csf}	Chip Select Wait time (Write/Read)	0	-	ns	-
WRX	t _{wc}	Write cycle	30	-	ns	-
	t _{wrh}	Write Control pulse H duration	15	-	ns	-
	t _{wrl}	Write Control pulse L duration	15	-	ns	-
RDX (FM)	t _{rcfm}	Read Cycle (FM)	450	-	ns	When read from Frame Memory
	t _{rdhfm}	Read Control H duration (FM)	90	-	ns	
	t _{rdlfm}	Read Control L duration (FM)	355	-	ns	
RDX (ID)	t _{rc}	Read cycle (ID)	160	-	ns	When read ID data
	t _{rdh}	Read Control pulse H duration	90	-	ns	
	t _{rdl}	Read Control pulse L duration	45	-	ns	
DB [23:0], DB [17:0], DB [15:0], DB [8:0], DB [7:0]	t _{dst}	Write data setup time	10	-	ns	For maximum, CL=30pF For minimum, CL=8pF
	t _{dht}	Write data hold time	10	-	ns	
	t _{rat}	Read access time	-	40	ns	
	t _{ratfm}	Read access time	-	340	ns	
	t _{rod}	Read output disable time	20	80	ns	

8.2 Serial Interface Characteristics (3-line serial):



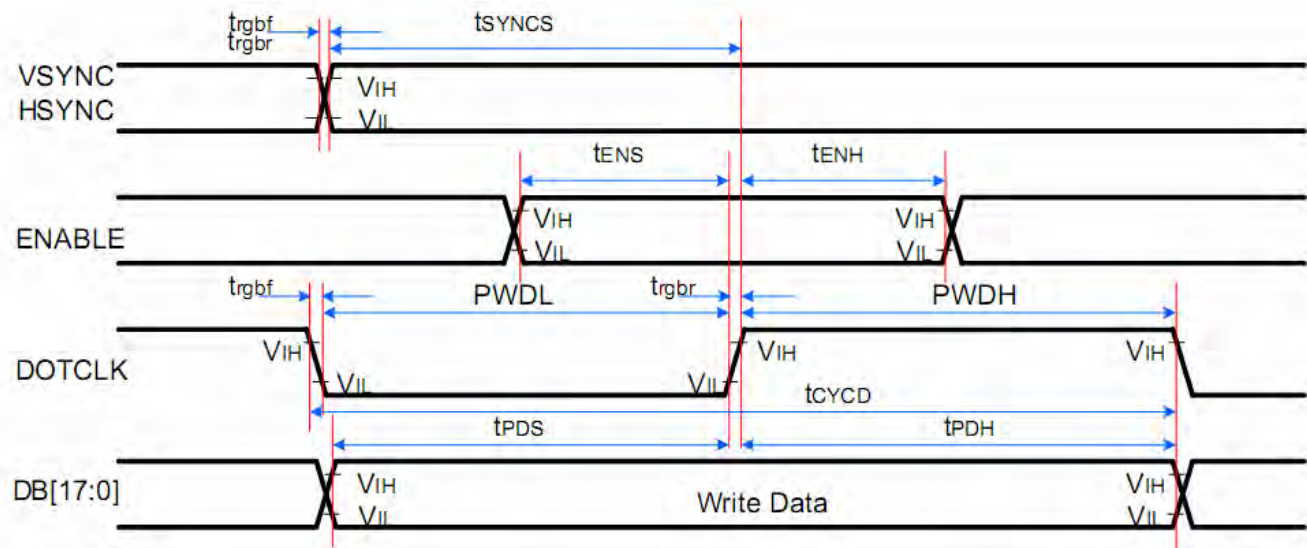
Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tsc	SCL-CSX	15	-	ns	
	tchwh	CSX H Pulse Width	40	-	ns	
	tcss	Chip select time (Write)	60	-	ns	
	tcsh	Chip select hold time (Read)	65	-	ns	
SCL	twc	Serial Clock Cycle (Write)	66	-	ns	
	twrh	SCL H Pulse Width (Write)	15	-	ns	
	twrl	SCL L Pulse Width (Write)	15	-	ns	
	trc	Serial Clock Cycle (Read)	150	-	ns	
	trdh	SCL H Pulse Width (Read)	60	-	ns	
	trdl	SCL L Pulse Width (Read)	60	-	ns	
SDA/SDI (Input)	tds	Data setup time (Write)	10	-	ns	
	tdh	Data hold time (Write)	10	-	ns	
SDA/SDO (Output)	tacc	Access time (Read)	10	50	ns	For maximum CL=30pF
	toh	Output disable time (Read)	15	50	ns	For minimum CL=8pF

8.3 Serial Interface Characteristics (4-line serial):



Signal	Symbol	Parameter	min	max	Unit	Description
CSX	t_{css}	Chip select time (Write)	15	-	ns	
	t_{csh}	Chip select hold time (Read)	15	-	ns	
	t_{CHW}	CS H pulse width	40	-	ns	
SCL	t_{wc}	Serial clock cycle (Write)	50	-	ns	
	t_{wrh}	SCL H pulse width (Write)	10	-	ns	
	t_{wrl}	SCL L pulse width (Write)	10	-	ns	
	t_{rc}	Serial clock cycle (Read)	150	-	ns	
	t_{rdh}	SCL H pulse width (Read)	60	-	ns	
	t_{rdl}	SCL L pulse width (Read)	60	-	ns	
D/CX	t_{as}	D/CX setup time	10	-	ns	
	t_{ah}	D/CX hold time (Write/Read)	10	-	ns	
SDA/SDI (Input)	t_{ds}	Data setup time (Write)	10	-	ns	
	t_{dh}	Data hold time (Write)	10	-	ns	
SDA/SDO (Output)	t_{acc}	Access time (Read)	10	50	ns	For maximum CL=30pF
	t_{od}	Output disable time (Read)	15	50	ns	For minimum CL=8pF

8.4 RGB interface:



Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC/ HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	16-/18-/24-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
ENABLE	t_{ENS}	ENABLE setup time	15	-	ns	
	t_{ENH}	ENABLE hold time	15	-	ns	
DB [23:0]	t_{PDS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	20	-	ns	
	PWDL	DOTCLK low-level period	20	-	ns	
	t_{CYCD}	DOTCLK cycle time	50	-	ns	
	t_{grbf}, t_{grbr}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

9. RELIABILITY TEST • MANUFACTURE • SUPPLY

NO.	TEST ITEM	CONDITIONS	
1	HIGH TEMPERATURE STORAGE	TA=80℃	96H
2	LOW TEMPERATURE STORAGE	TA=-30℃	96H
3	HIGH TEMPERATURE OPERATION	TA=70℃	96H
4	LOW TEMPERATURE OPERATION	TA=-20℃	96H
5	HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	+60℃, 90%RH	96H
6	THERMAL SHOCK	-30℃ → +80℃,	0. 5H:5CYCLES



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°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

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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.

