

MDT039500	480x480	SPI+RGB Interface	TFT Module
Specification			
Version: 1		Date: 22/06/2024	
Revision			
1	20/06/2024	First issue	

Display Features			
Display Size	3.95"		
Resolution	480x480		
Orientation	Landscape		
Appearance	RGB		
Logic Voltage	2.8V		
Interface	SPI+RGB		
Brightness	400 cd/m ²		
Touchscreen	---		
Module Size	77x 80 x 2.3 mm		
Operating Temperature	-30°C ~ +85°C	Created By	Checked By
Pinout	40 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 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



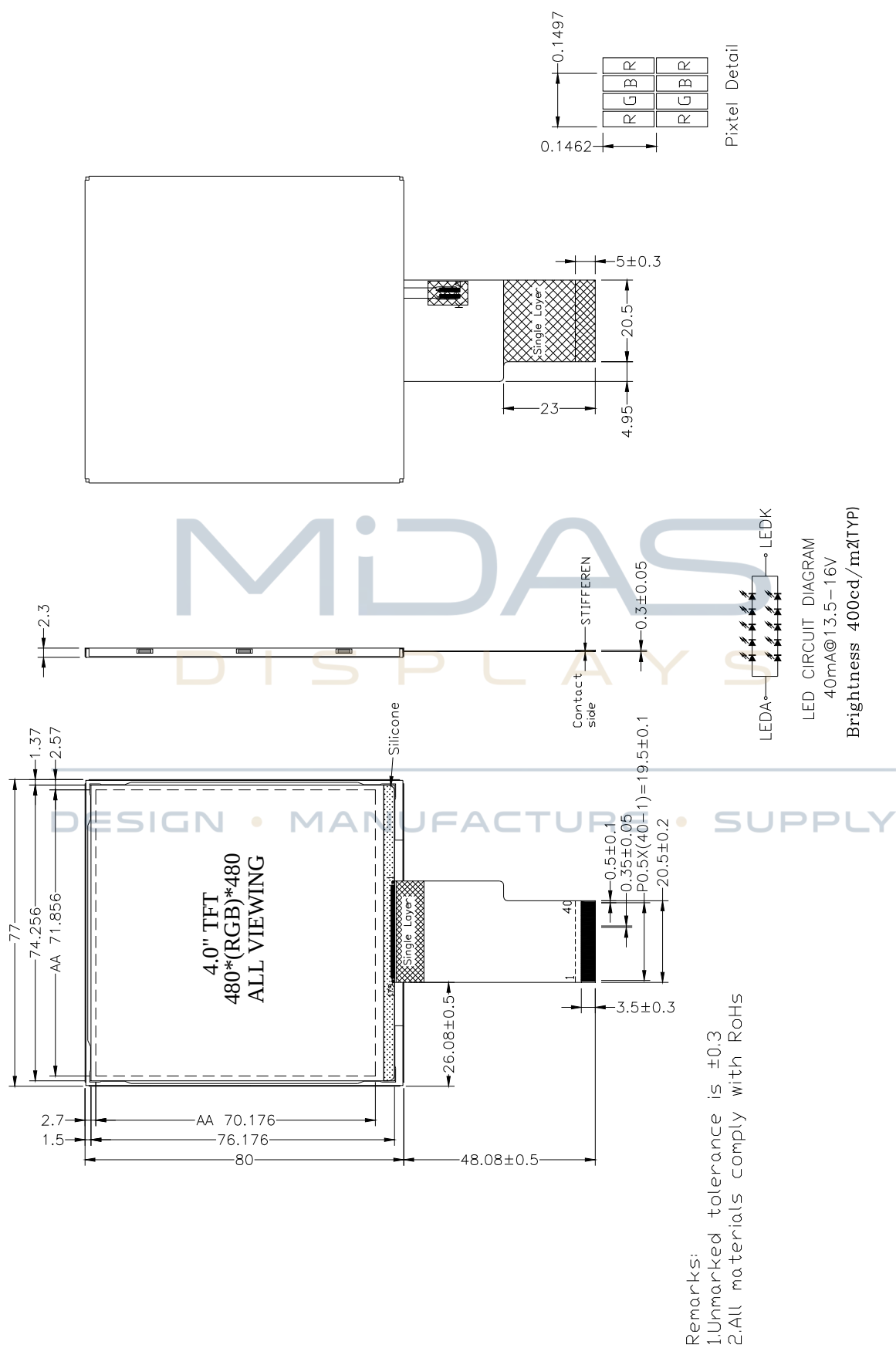
1. GENERAL SPECIFICATIONS

ITEM	STANDARD VALUE	UNIT
LCD SIZE	4.0	inch
LCD TYPE	TFT/IPS/ NORMALLY BLACK/TRANSMISSIVE	
MODULE SIZE	77*80*2.3	mm
ACTIVE AREA	71.856*70.176	mm
PIXEL PITCH (W*H)	0.1497*0.1462	mm
NUMBER OF PIXELS	480*480	
DRIVER IC	ST7701S	
INTERFACE TYPE	SPI+RGB	
RECOMMEND VIEWING DIRECTION	ALL	O'clock
GRAY SCALE INVERSION DIRECTION	-	O'clock
COLORS	16.7 M	
BACKLIGHT TYPE	10-DIES WHITE LED	

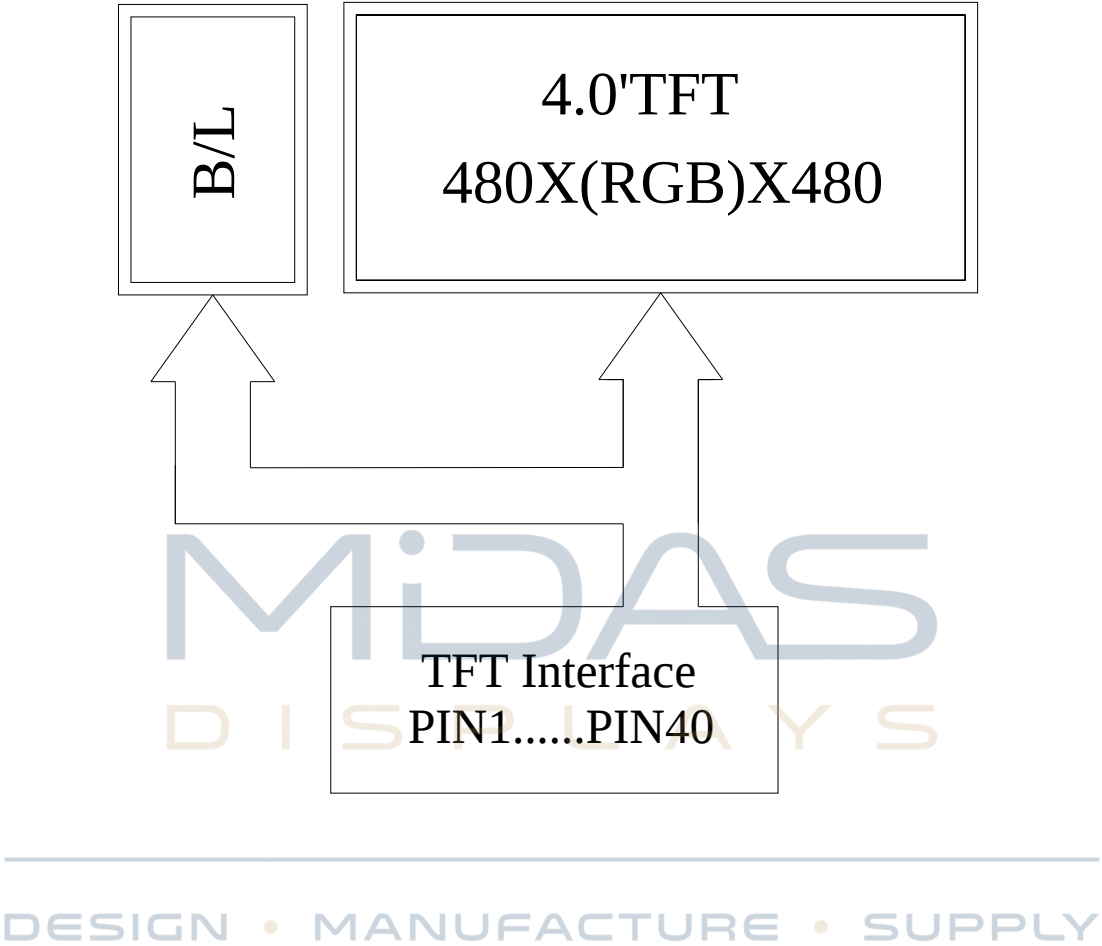
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2. EXTERNAL DIMENSIONS



3. BLOCK DIAGRAM



4. PIN ASSIGNMENT

PIN NO.	SYMBOL	DESCRIPTION
1	GND	Power ground
2	RESET	The external reset input Initializes the chip with a low input. Be sure to execute a power-on reset after supplying power.
3	CS	A chip select signal Low: the chip is selected and accessible High: the chip is not selected and not accessible
4	SCLK	Serial clock input for SPI interface.
5	NC	Not connection
6	SDI	Serial data input/output bidirectional pin for SPI Interface.
7	SDO	Serial data output pin used for the SPI Interface.
8	DB0	Data bus
9	DB1	Data bus
10	DB2	Data bus
11	DB3	Data bus
12	DB4	Data bus
13	DB5	Data bus
14	DB6	Data bus
15	DB7	Data bus
16	DB8	Data bus
17	DB9	Data bus
18	DB10	Data bus
19	DB11	Data bus
20	DB12	Data bus
21	DB13	Data bus
22	DB14	Data bus
23	DB15	Data bus
24	DB16	Data bus
25	DB17	Data bus
26	GND	Power Ground
27	VS	Frame synchronizing signal for RGB interface operation
28	HS	Line synchronizing signal for RGB interface operation
29	DOTCLK	Dot clock signal for RGB interface operation
30	ENAELE	Data enable signal for RGB interface operation Low: access enabled High: access inhibited
31	GND	Power Ground
32	IOVCC	Power Supply for I/O System.
33	VCC	Power Supply for Analog
34	XR	Not connection
35	YD	Not connection
36	XL	Not connection



37	YU	Not connection
38	LEDA	LED Anode
39	LEDK	LED Cathode
40	NC	Not connection

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DISPLAYS

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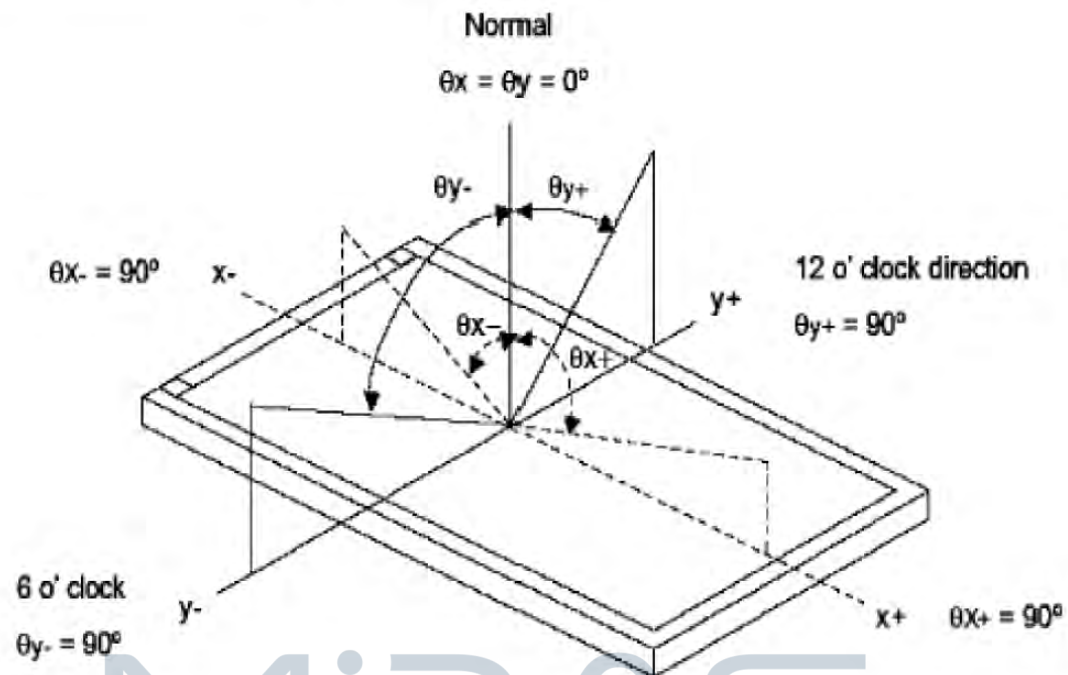


5. OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
				MIN	TYP.	MAX		
Luminance		L		-	400	-	Cd/m ²	
Contrast ratio		CR	$\theta = 0^\circ$	640	800	-		
Response time	Rising	T _R	25°C	-	25	35	msec	
	Falling	T _F						
CIE COLOUR COORDINATE	RED	XR	VIEWING NORMAL ANGLE	-	0.624	-		
		YR		-	0.329	-		
	GREEN	XG		-	0.288	-		
		YG		-	0.522	-		
	BLUE	XB		-	0.136	-		
		YB		-	0.137	-		
	WHITE	XW		-	0.302	-		
		YW		-	0.325	-		
VIEWING ANGLE	Hor.	θ_{x+}	CR ≥ 10	70	80	-	Degree	
		θ_{x-}		70	80	-		
	Ver.	θ_{y+}		70	80	-		
		θ_{y-}		70	80	-		



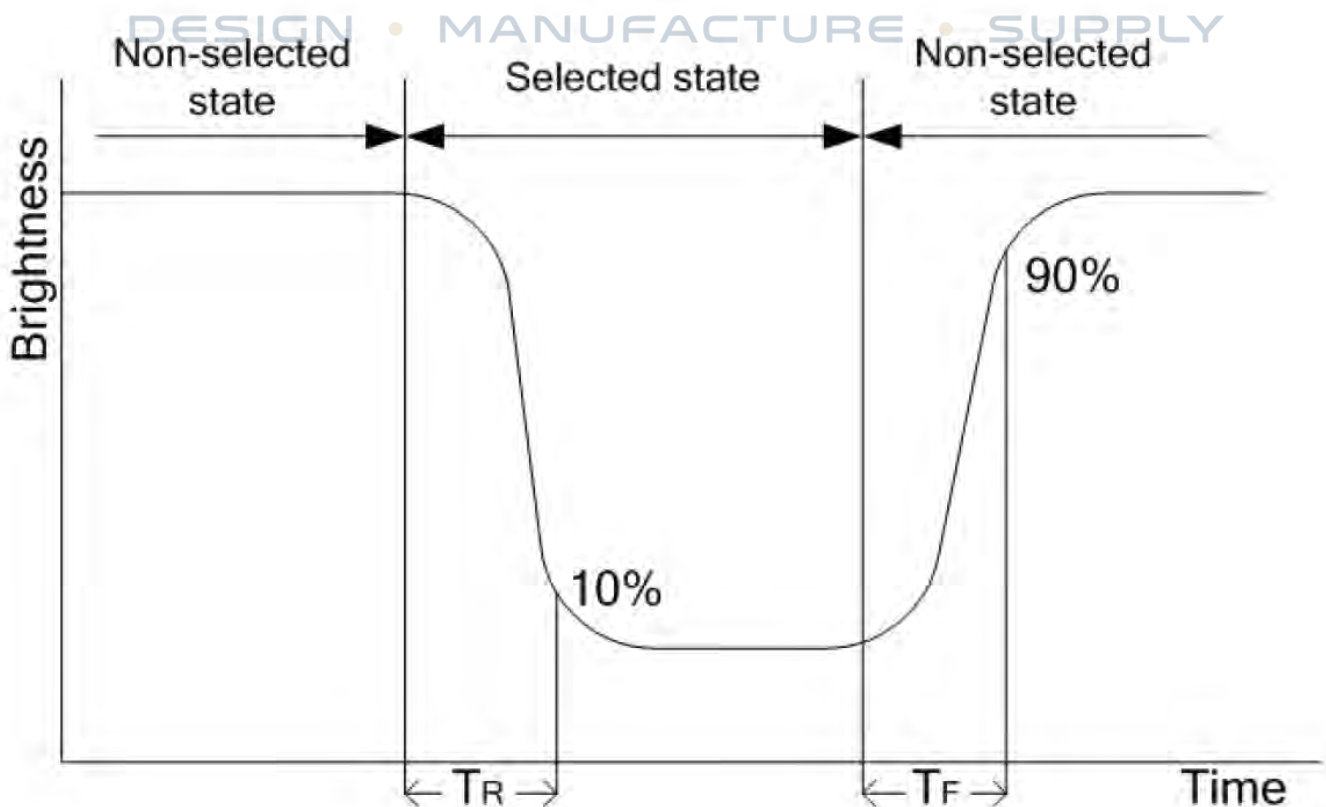
Note 1 : Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

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

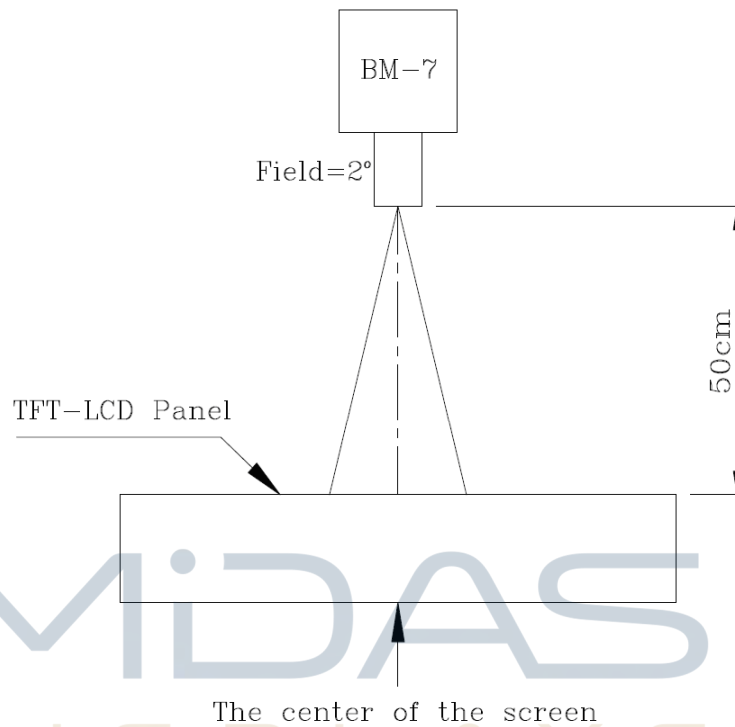
Note 3: Definition of response time (T_R , T_F)



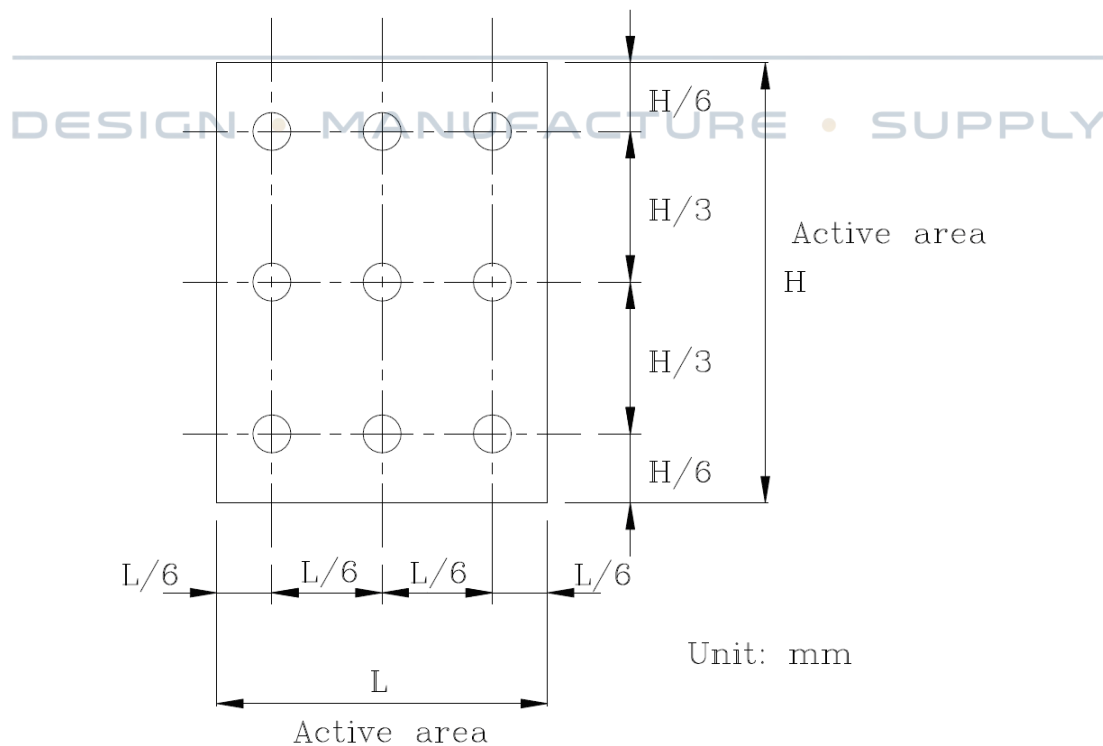
Note 4: Definition of Luminance

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 (Analog)	VDD	-0.3	4.6	V
Supply Voltage (I/O)	VDDIO	-0.3	4.6	V
Operating temperature	Top	-30	+85	°C
Storage temperature	Tst	-40	+90	°C
Operation and storage humidity		10%	90%	RH

7. ELECTRICAL CHARACTERISTICS

7.1 Input Power

ITEM	SYMBOL	MIN	TYP.	MAX	UNIT
Power Supply Voltage	VDD	2.5	2.8	3.6	V
IO Supply Voltage	VDDIO	1.65	1.8	3.3	V
Input voltage	Vil	GND	-	0.3VDDIO	V
	Vih	0.7VDDIO	-	VDDIO	V

7.2 Backlight Driving Conditions

ITEM	SYMBOL	SPECIFICATIONS			UNIT	REMARK
		MIN	TYP.	MAX		
Voltage for LED backlight	Vf	13.5		19.2	V	Il=40mA
Current for LED backlight	Il		40		mA	
Power consumption	P	0.54		0.64	W	
Led life time			50,000		Hr	Note



8. TIMING CHARACTERISTICS

RGB Interface Characteristics:

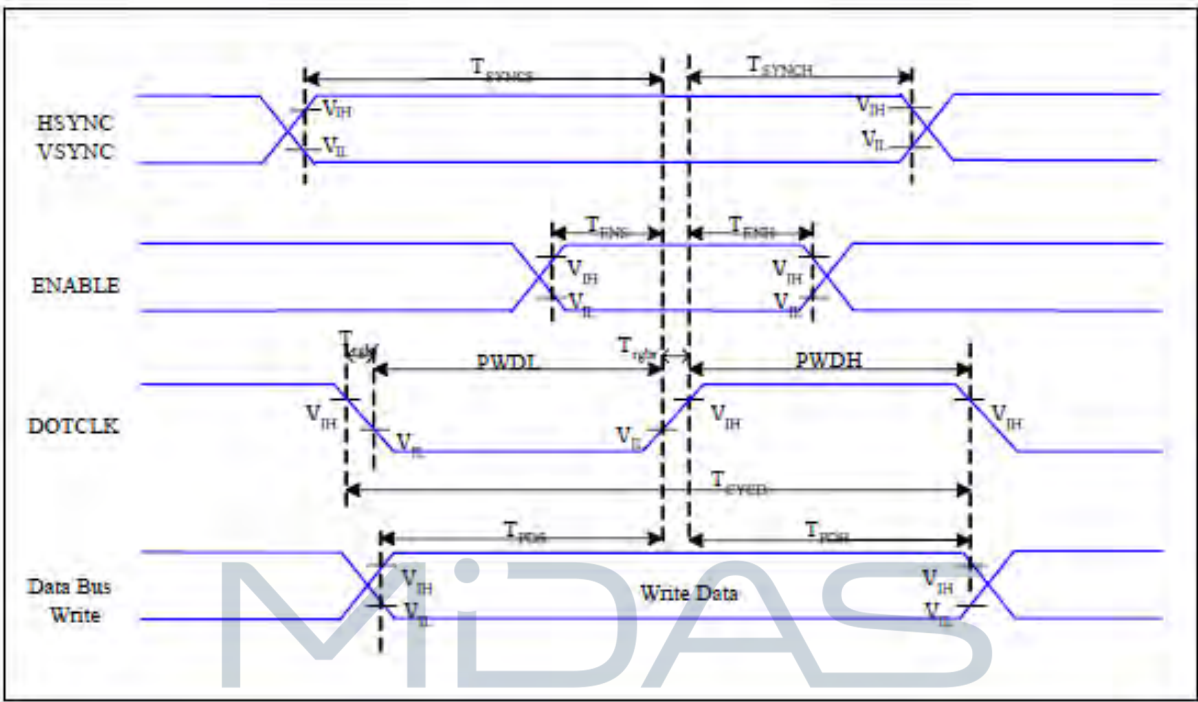


Figure 3 RGB Interface Timing Characteristics

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

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYSNC, HSYNC Setup Time	5	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	5	-	ns	
	T_{ENH}	Enable Hold Time	5	-	ns	
DOTCLK	$PWDH$	DOTCLK High-level Pulse Width	15	-	ns	
	$PWDL$	DOTCLK Low-level Pulse Width	15	-	ns	
	T_{CycD}	DOTCLK Cycle Time	33	-	ns	
	$T_{\text{rghr}}, T_{\text{rghf}}$	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	5	-	ns	
	T_{PDH}	PD Data Hold Time	5	-	ns	

Table 6 18/16 Bits RGB Interface Timing Characteristics

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=90℃	240H
4	LOW TEMPERATURE OPERATION	TA=-40℃	240H
5	HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	+60℃, 90%RH	240H



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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.

