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MDT0096AIH-SPI	80 x 160	SPI Interface	TFT Module

Specification

Version: 1	Date: 26/06/2018

Revision

1	25/06/2018	First issue

Display Features	
Display Size	0.96”
Resolution	80 x 160
Orientation	Portrait
Appearance	RGB
Logic Voltage	3.3V
Interface	SPI
Brightness	500 cd/m^2
Touchscreen	---
Module Size	13.50 x 27.95 x 1.40mm
Operating Temperature	-20°C ~ +70°C
Pinout	13 way FFC
Pitch	0.8mm

RoHS compliant

Box Quantity	Weight / Display
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* - For full design functionality, please use this specification in conjunction with the ST7735S specification.(Provided Separately)

Display Accessories	
Part Number	**Description**

Optional Variants	
Appearances	**Voltage**

Summary

MDT0096AIH-SPI is a color active matrix thin film transistor (TFT) liquid crystal empty cell. This model is composed of amorphous silicon TFT as a switching device. It is a transmissive type display operating in the normally black mode.

This TFT LCD has a 0.96-inch diagonally measured active display area with 80 x 160 dot (80 horizontal by 160 vertical pixel) resolution. Each pixel is divided into Red, Green, Blue dots which are arranged in vertical stripes.

General Specifications

- Size: 0.96 inch
- Dot Matrix: 80 x RGB x 160(TFT) dots
- Module dimension: 13.5(W) x 27.95(H) x 1.40(D) mm
- Active area: 10.8 x 21.696 mm
- Dot pitch: 0.135 x 0.1356 mm
- LCD type: TFT, Normally black, Transmissive
- Viewing Angle: 80/80/80/80
- Aspect Ratio: 1:2
- IC: ST7735S
- Backlight Type: LED,Normally White
- With /Without TP: Without TP
- Surface: Glare

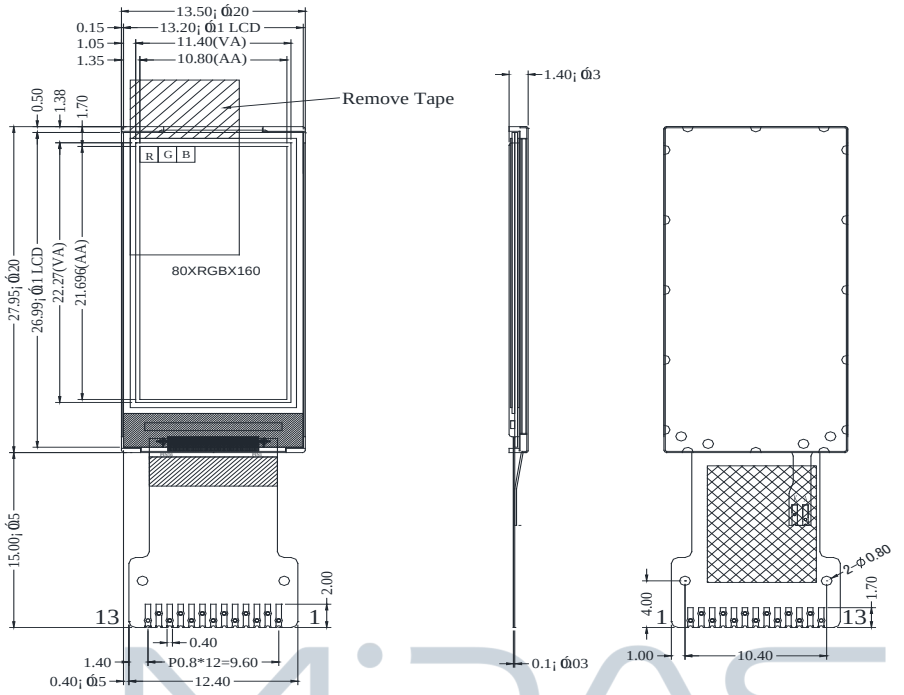
*Color tone slight changed by temperature and driving voltage.

Interface

1. LCM PIN Definition

Pin	Symbol	Function	Remark
1	SPI4W	SPI4W='0', 3-wire SPI. SPI4W='1', 4-wire SPI.	
2	NC	No connection	
3	SDA	Serial interface data	
4	SCL	Serial interface clock	
5	RS	Data/command selection pin (4-wire SPI use)	
6	RES	Reset pin (low active)	
7	CS	Chip selection pin (low active)	
8	GND	Ground	
9	NC	No connection	
10	VCC	Power supply.	
11	LEDK	Back light cathode	
12	LEDA	Back light anode	
13	GND	Ground	

Contour Drawing



PIN NO.	SYMBOL
1	SPI4W
2	NC
3	SDA
4	SCL
5	RS
6	RES
7	CS
8	GND
9	NC
10	VCC
11	LEDK
12	LEDA
13	GND

The non-specified tolerance of dimension is ¡ ó0.3 mm .

Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	℃
Storage Temperature	TST	-30	—	+80	℃

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. ≦60℃, 90% RH MAX. Temp.＞60℃, Absolute humidity shall be less than 90% RH at 60℃

Electrical Characteristics

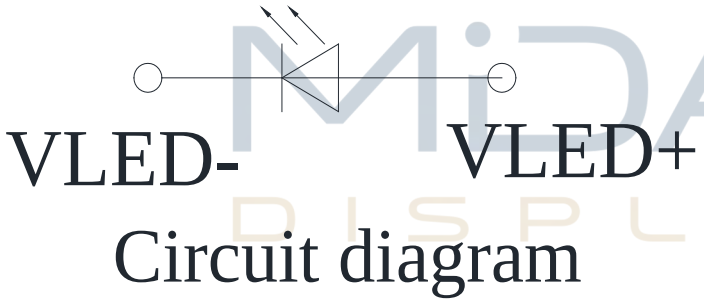
1. Operating conditions:

Item	Symbol	Min	Typ	Max	Unit
Supply Voltage	VCC	3.0	3.3	3.6	V
Supply LCM current	ICC	—	—	2	mA

2.LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	ILED	—	20	—	mA	
LED voltage	VLED	2.8	3.1	3.3	V	Note 1
LED Life Time		—	50000	—	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



Circuit diagram

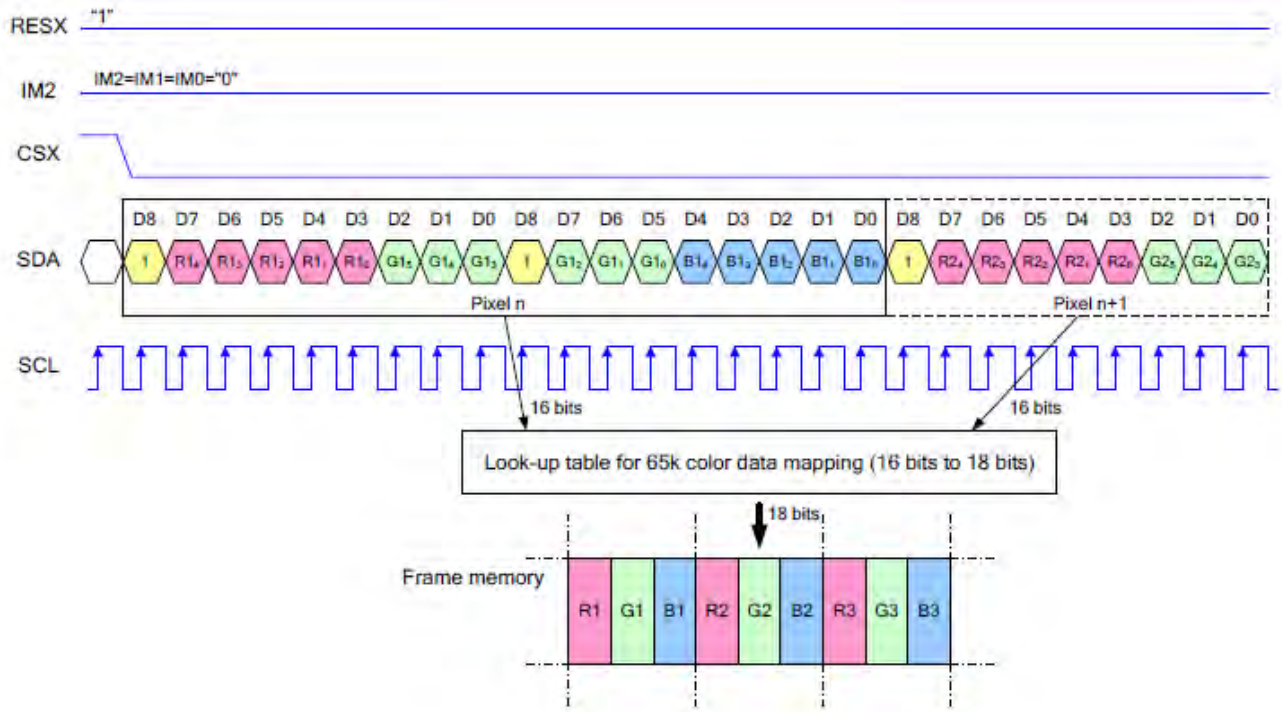
Note 2 : Ta = 25 ℃

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

Data Color Coding

1. 3-Wire SPI Mode: RGB 5-6-5-bit Input, 65K-Colors, 3AH="05h"

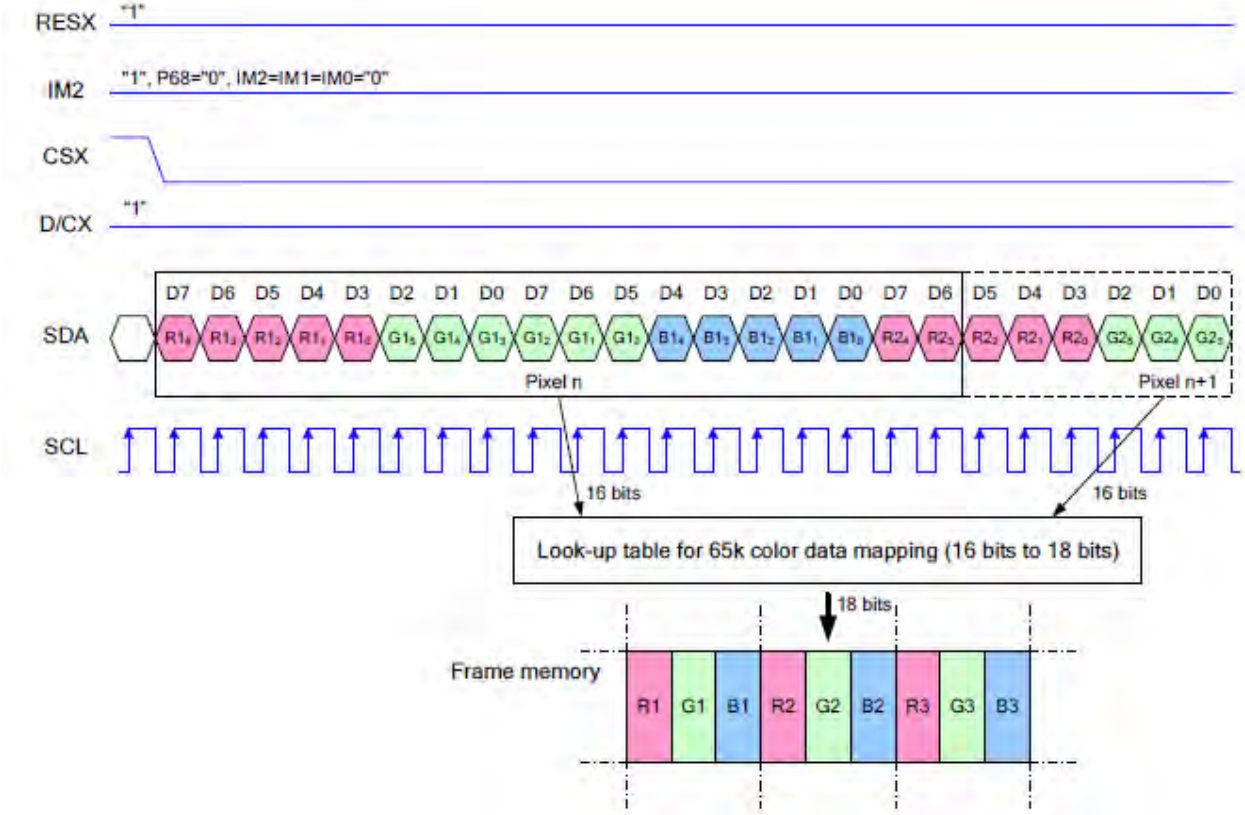


Note 1: Pixel data with the 16-bit color depth information

Note 2: The most significant bits are: Rx4, Gx5 and Bx4

Note 3: The least significant bits are: Rx0, Gx0 and Bx0

2. 4-Wire SPI Mode: RGB 5-6-5-bit Input, 65K-Colors, 3AH="05h"



Note 1. Pixel data with the 16-bit color depth information

Note 2. The most significant bits are: Rx4, Gx5 and Bx4

Note 3. The least significant bits are: Rx0, Gx0 and Bx0

Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	θ=0°、Φ=0°	-	30	40	.ms	Note 3,5
		Tf						
Contrast ratio		CR	At optimized viewing angle	-	800	-	-	Note 4,5
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.26	0.31	0.36		Note 2,6,7
		Wy		0.28	0.33	0.38		
Viewing angle	Hor.	ΘR	CR≧10	-	80	-	Deg.	Note 1
		ΘL		-	80	-		
	Ver.	ΦT		-	80	-		
		ΦB		-	80	-		
Brightness		-	-	400	500	-	cd/m^2	Center of display

Ta=25±2℃

Note 1: Definition of viewing angle range

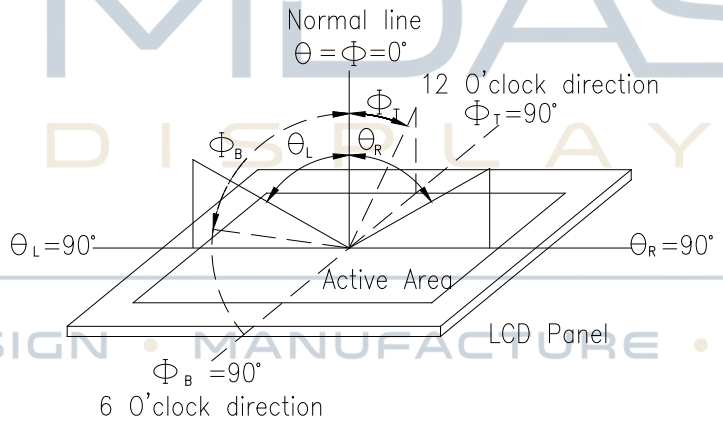


Fig.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

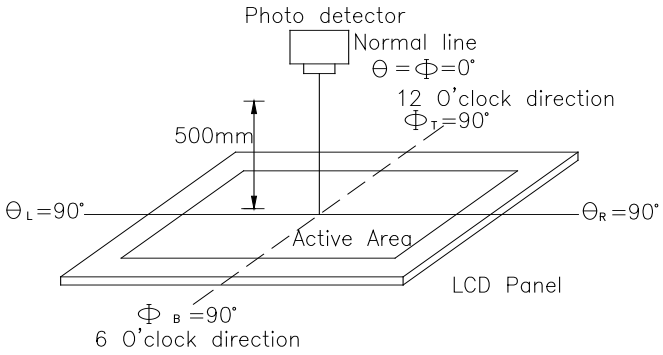
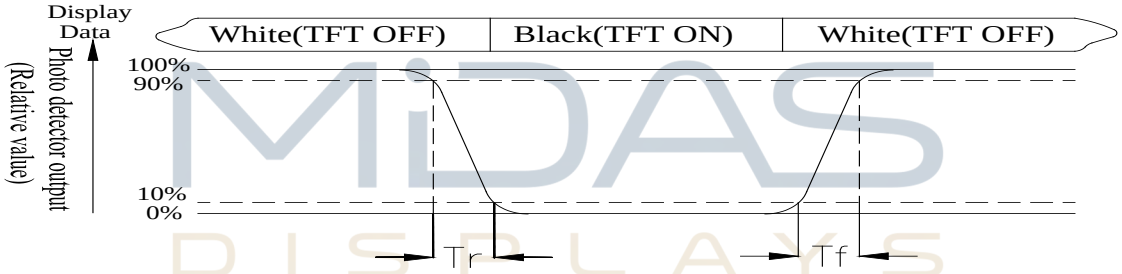


Fig. 2. Optical measurement system setup

Note 3: Definition of Response time:
The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time, Tr, is the time between photo detector output intensity changed from 90%to 10%. And fall time, Tf, is the time between photo detector output intensity changed from 10%to 90%



Note 4: Definition of contrast ratio:
The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White Vi = Vi50 ± 1.5V
Black Vi = Vi50 ± 2.0V
“±” means that the analog input signal swings in phase with VCOM signal.
“±” means that the analog input signal swings out of phase with VCOM signal.
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Reliability

Content of Reliability Test (Wide temperature, -20℃~70℃)

Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 200hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃,90%RH max	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20℃ 25℃ 70℃ 30min 5min 30min 1 cycle	-20℃/70℃ 10 cycles	——
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact) ,±800v(air), RS=330Ω CS=150pF 10 times	——

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.