

Display Elektronik GmbH

DATA SHEET

TFT MODULE

DEM 080160A VMH-PW-N

0,96“ TFT

Product Specification

Ver.: 2

16.07.2019

Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	25.06.2018		First Issue
1	19.09.2018		Modify Contour Drawing
2	16.07.2019		Modify Backlight

Contents

1. Summary
2. General Specification
3. Interface
4. Counter Drawing
5. Absolute Maximum Ratings
6. Electrical Characteristics
7. Data Color Coding
8. Optical Characteristics
9. Reliability

1. Summary

DEM 080160A VMH-PW-N 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 IPS 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.

2. General Specifications

- n Size: 0.96 Inch
- n Dot Matrix: 80 x RGB x 160 Dots
- n Module Dimension: 13.50 x 27.95 x 1.54 mm
- n Active Area: 10.80 x 21.70 mm
- n Dot Pitch: 0.135 x 0.1356 mm
- n LCD Type: TFT, IPS, Normally Black, Transmissive
- n Viewing Angle: Full View, 80°/80°/80°/80°
- n Aspect Ratio: 1:2
- n IC: ST7735S (Sitronix)
- n Interface: SPI
- n Backlight Type: LED, Normally White
- n With /Without TP: No Touch
- n Surface: Glare

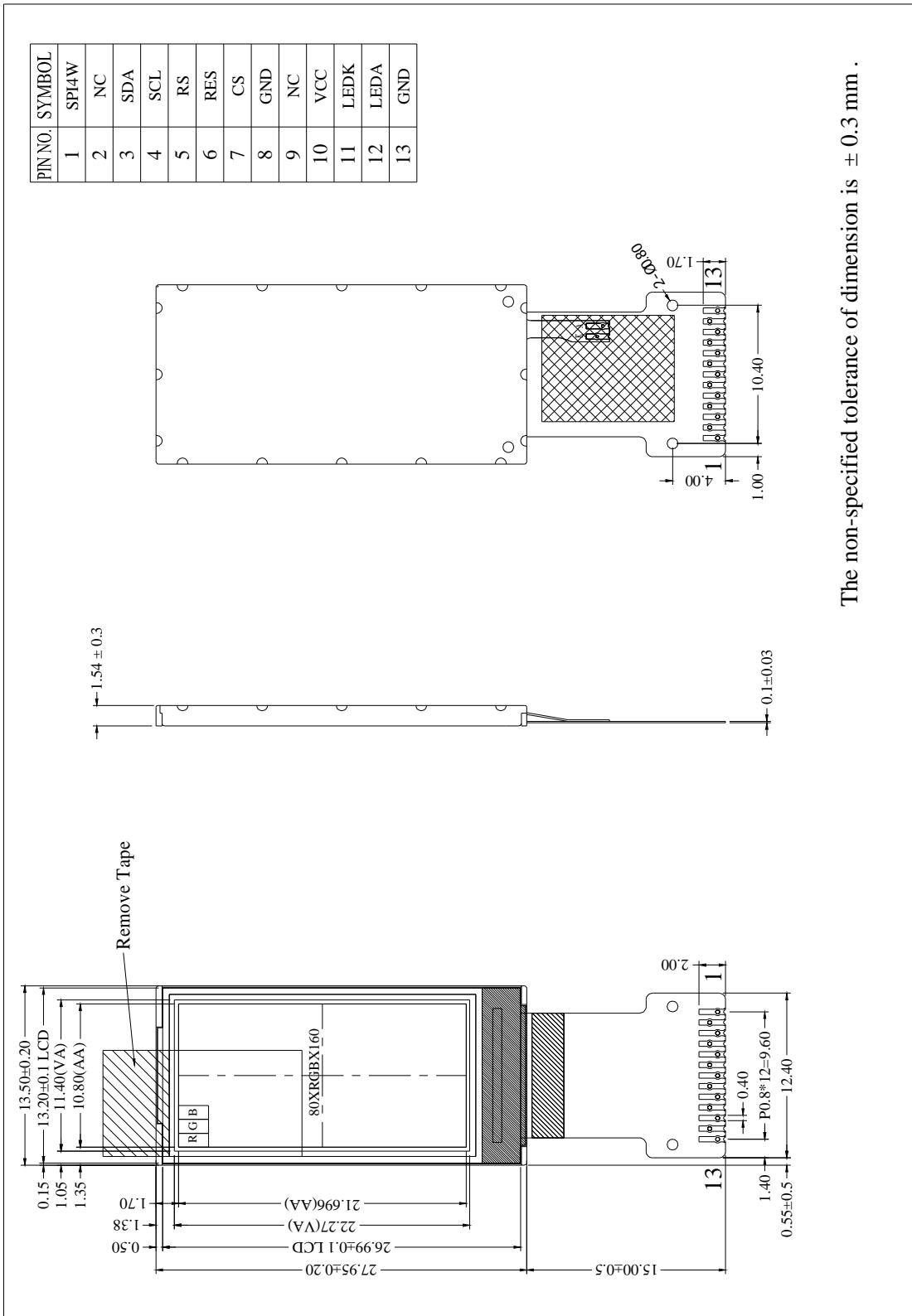
*Color tone slight changed by temperature and driving voltage.

3. Interface

3.1. 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	Backlight Cathode	-
12	LEDA	Backlight Anode	-
13	GND	Ground	-

4. Counter Drawing



The non-specified tolerance of dimension is ± 0.3 mm .

Note: FPC for soldering.

5. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	T _{OP}	-20	-	+70	°C
Storage Temperature	T _{ST}	-30	-	+80	°C

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

1. Temp. □60°C, 90% RH MAX. Temp. > 60°C,
Absolute humidity shall be less than 90% RH at 60°C.

6. Electrical Characteristics

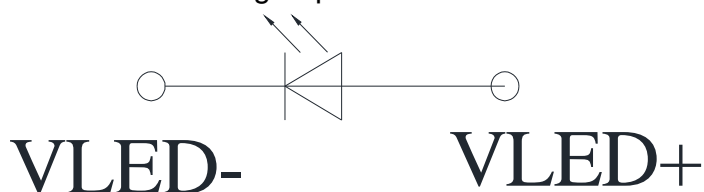
6.1. Operating conditions:

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

6.2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Current	I _{LED}	-	20	-	mA	
LED Voltage	V _{LED}	2.8	3.1	3.3	V	Note 1
LED Lifetime (25°C)		-	50000	-	Hr	Note 2,3,4

Note 1: There are 1 groups LED



Circuit diagram

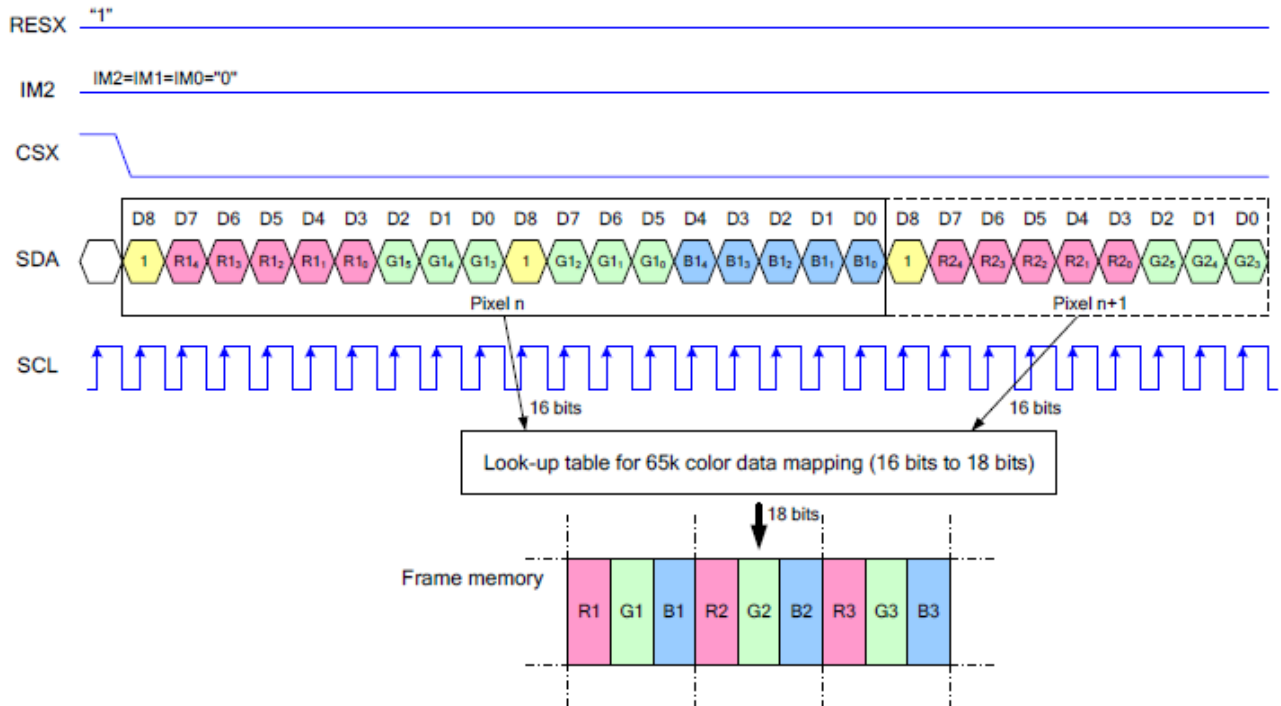
Note 2: Ta = 25°C

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

Note 4: The single LED lamp case

7. Data Color Coding

7.1. 3-Wire SPI Mode: RGB 5-6-5-Bit Input, 65k-Colors, 3AH="05h"

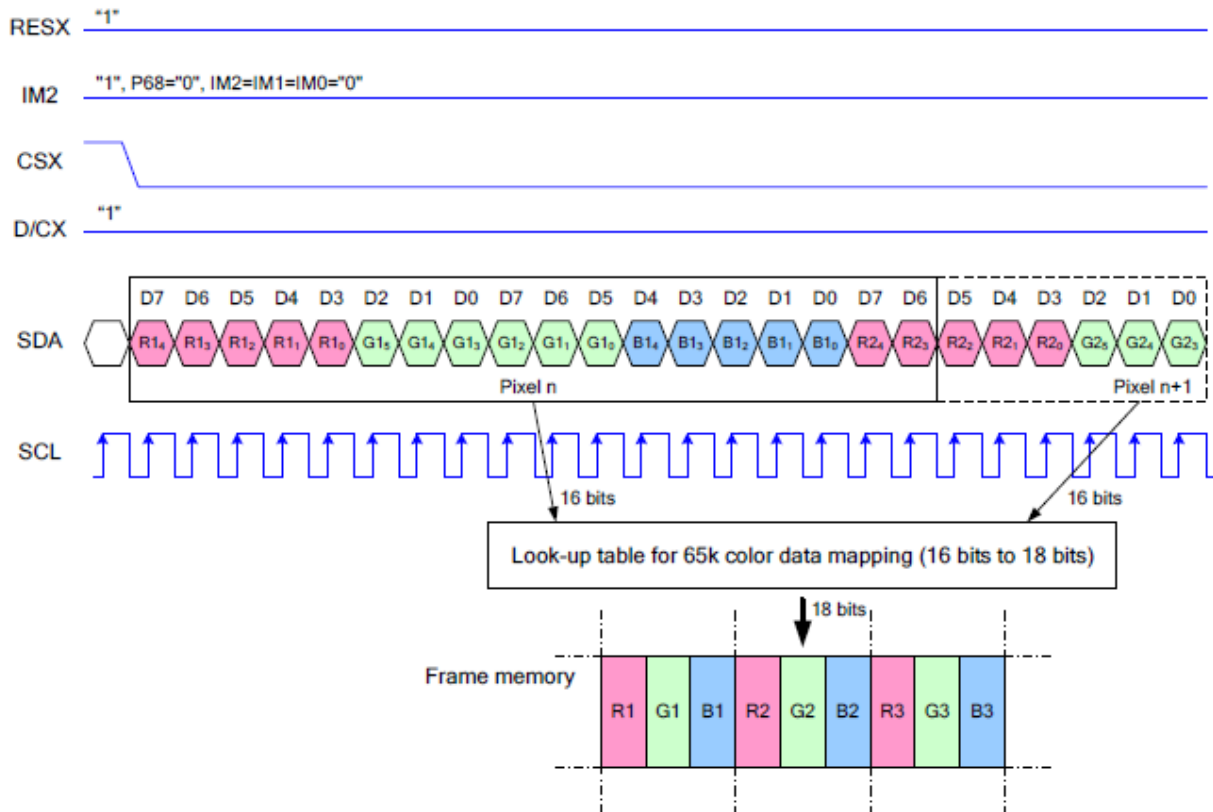


Note 1: Pixel Data with the 16-Bit Color Depth Information

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

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

7.2. 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

8. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response Time	Tr	$\theta=0^\circ, \phi=0^\circ$	-	30	40	.ms	Note 3	
	Tf							
Contrast Ratio	CR	At optimized Viewing Angle	-	800	-	-	Note 4	
Color Chromaticity	White	Wx	$\theta=0^\circ, \phi=0$	0.26	0.31	0.36	Note 2,6,7	
		Wy		0.28	0.33	0.38		
Viewing angle	Hor.	Θ_R	$CR \geq 10$	-	80	-	Deg.	Note 1
		Θ_L		-	80	-		
	Ver.	Φ_T		-	80	-		
		Φ_B		-	80	-		
Brightness	-	-	400	500	-	cd/m ²	Center of display	
Uniformity	(U)	-	75	-	-	%	Note 5	

Ta=25°C ± 2°C

Note 1: Definition of viewing angle range

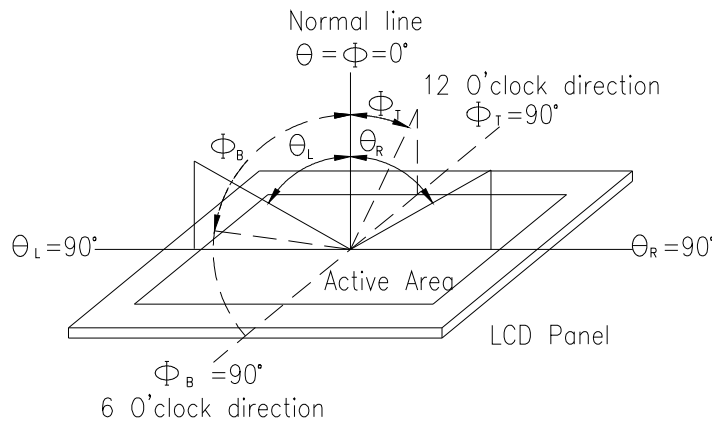


Fig.9.1. Definition of viewing angle

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.

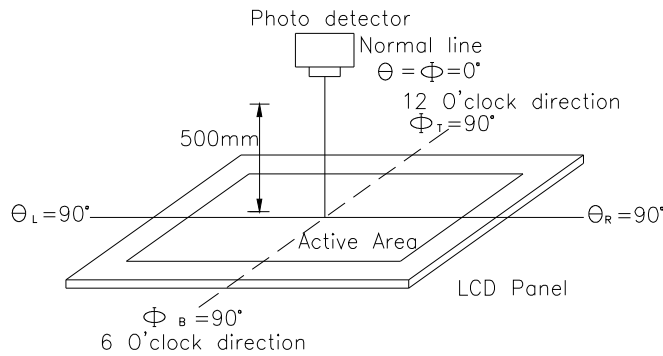
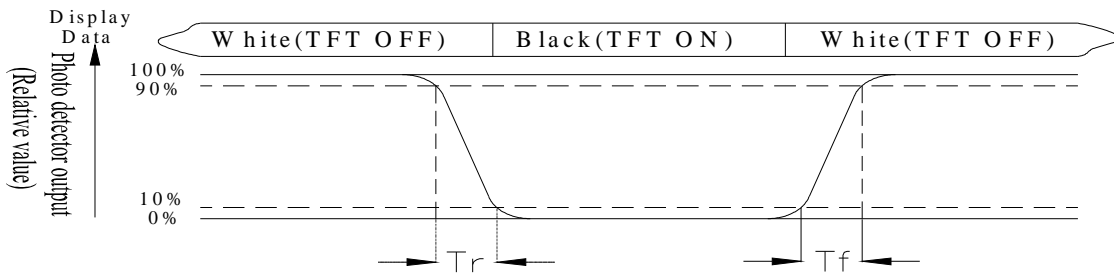


Fig. 9.2. Optical measurement system setup

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, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , 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: Definition of Luminance Uniformity

Active area is divided into 3 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = $L_{min}/L_{max} \times 100\%$

L = Active area length

W = Active area width

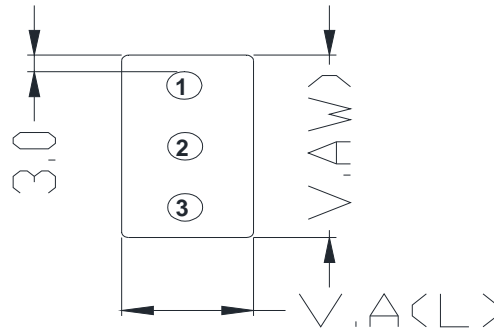


Fig9.3. Definition of uniformity

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.

9. Reliability

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

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°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 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°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at +60°C,90%RH max	+60°C,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation <div style="text-align: center;"> <p style="margin: 0;">-20°C +25°C +70°C</p> <p style="margin: 0;">30min 5min 30min</p> <p style="margin: 0;">1 cycle</p> </div>	-20°C/+70°C 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.