

Display Elektronik GmbH

# DATA SHEET

*TFT MODULE*

**DEM 080160A VMH-PW-N**

**0,96“ TFT**

Product Specification

Ver.: 2

16.07.2019

## **Revision History**

<b>VERSION</b>	<b>DATE</b>	<b>REVISED PAGE NO.</b>	<b>Note</b>
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

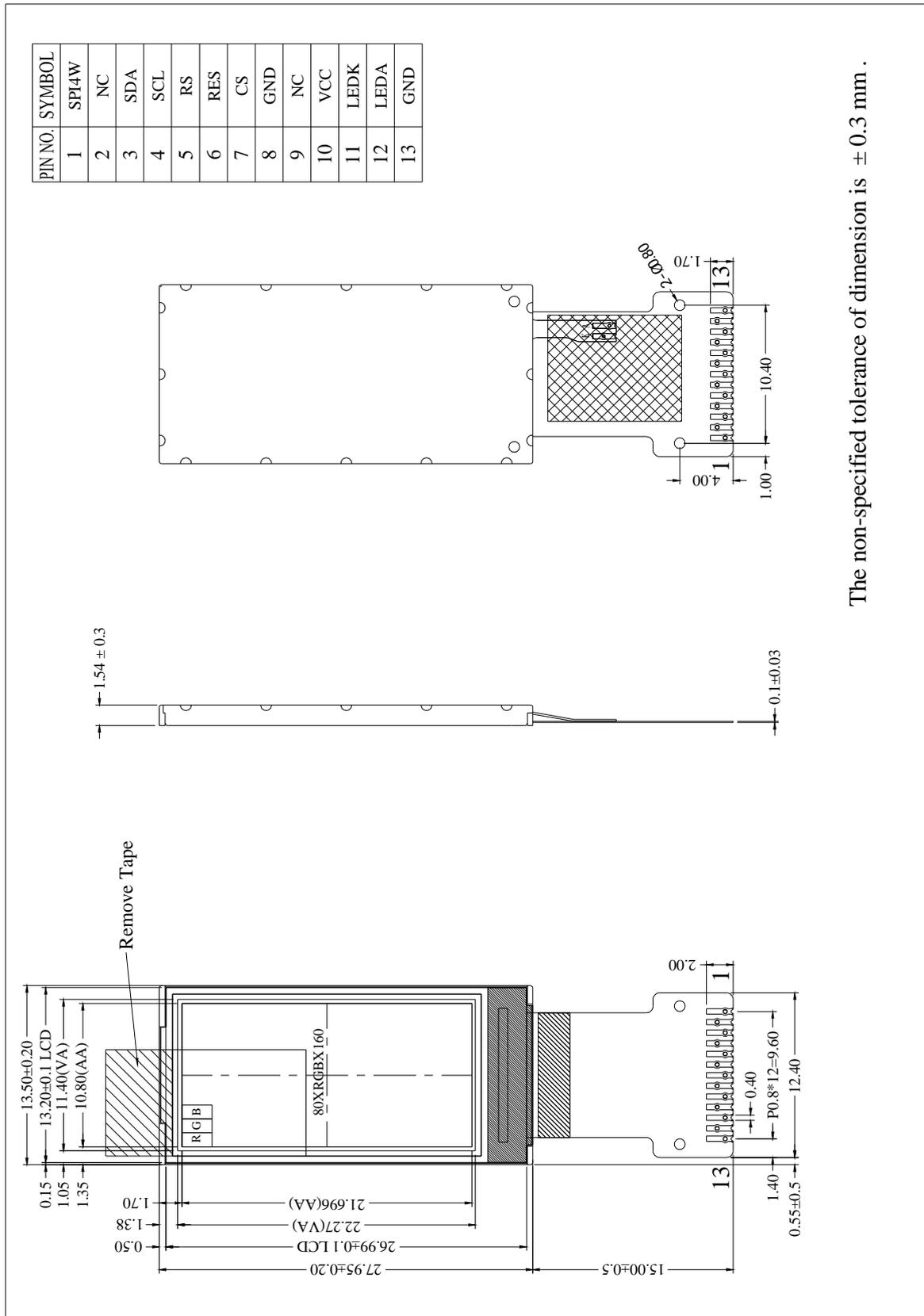
\*Color tone slight changed by temperature and driving voltage.

### 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 .

## **5. Absolute Maximum Ratings**

<b>Item</b>	<b>Symbol</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Unit</b>
Operating Temperature	T <sub>OP</sub>	-20	—	+70	°C
Storage Temperature	T <sub>ST</sub>	-30	—	+80	°C

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

1. Temp.  $\leq 60^{\circ}\text{C}$ , 90% RH MAX. Temp.  $> 60^{\circ}\text{C}$ , Absolute humidity shall be less than 90% RH at  $60^{\circ}\text{C}$ .

## 6. Electrical Characteristics

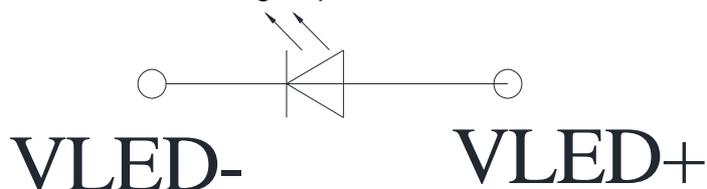
### 6.1. Operating conditions:

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 <sub>LED</sub>	—	20	—	mA	
LED Voltage	V <sub>LED</sub>	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

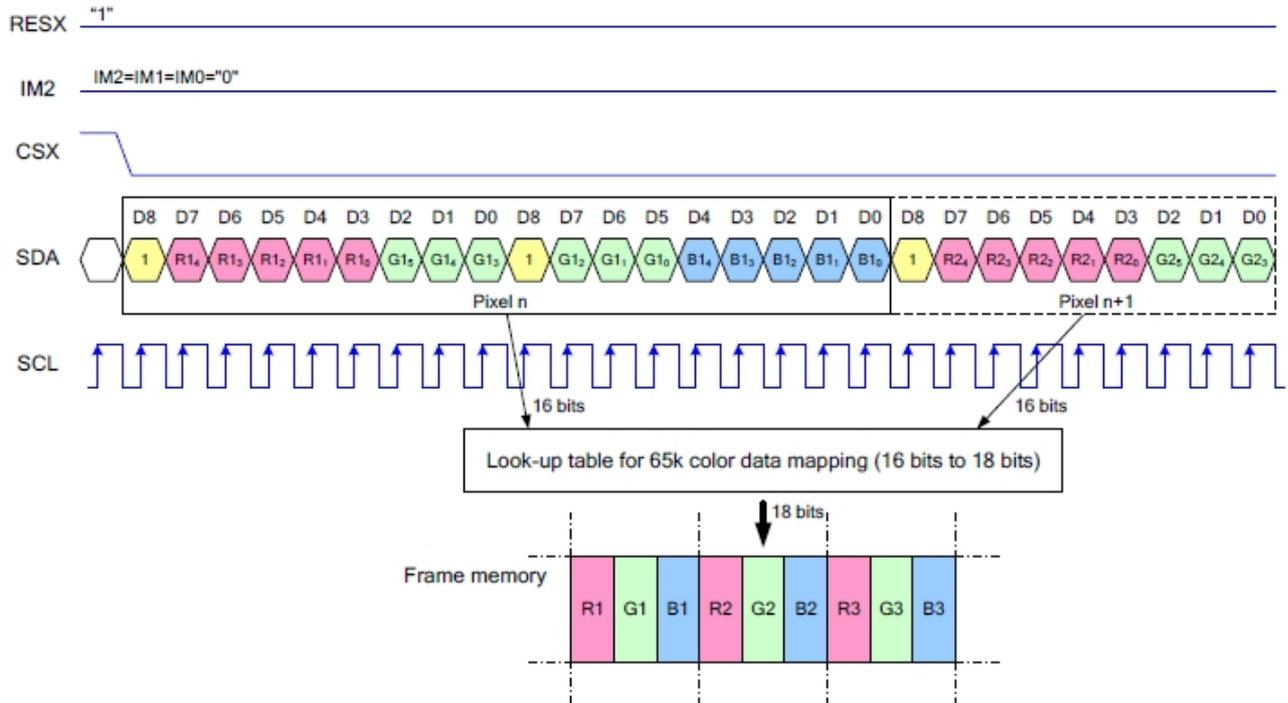
Note 2: Ta = 25°C

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"

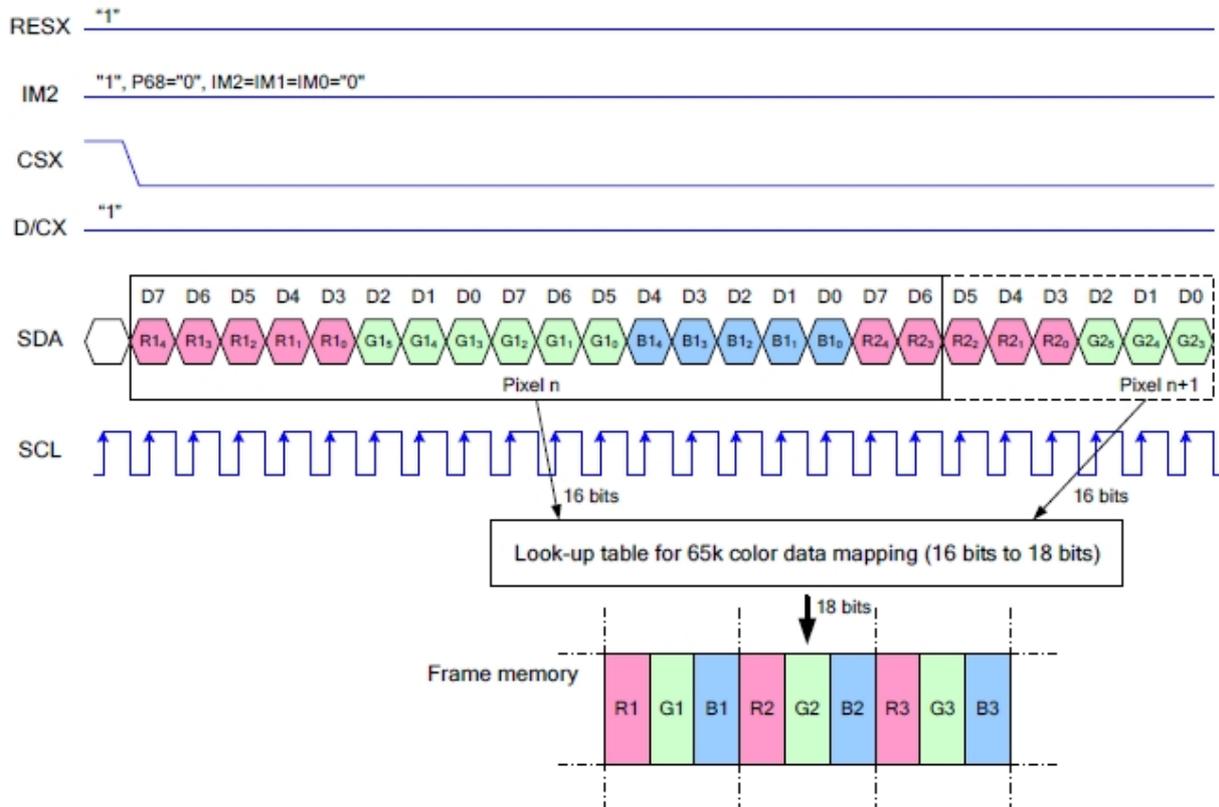


Note 1: Pixel Data with the 16-Bit Color Depth Information

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	$\theta=0^\circ \cdot \phi=0^\circ$	-	30	40	.ms	Note 3	
	Tf							
Contrast Ratio	CR	At optimized Viewing Angle	-	800	-	-	Note 4	
Color Chromaticity	White	$\theta=0^\circ \cdot \phi=0$	0.26	0.31	0.36		Note 2,6,7	
								Wy
Viewing angle	Hor.	CR $\geq$ 10	$\Theta_R$	-	80	-	Deg.	Note 1
			$\Theta_L$	-	80	-		
	Ver.		$\Phi_T$	-	80	-		
			$\Phi_B$	-	80	-		
Brightness	-	-	400	500	-	cd/m <sup>2</sup>	Center of display	
Uniformity	(U)	-	75	-	-	%	Note 5	

Ta=25°C ± 2°C

Note 1: Definition of viewing angle range

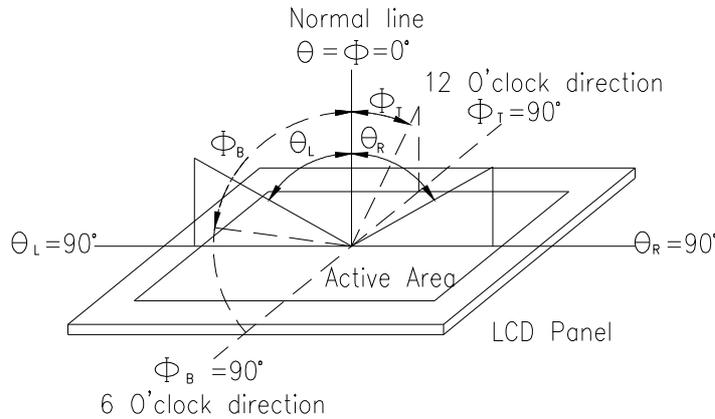


Fig.9.1. Definition of viewing angle

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.

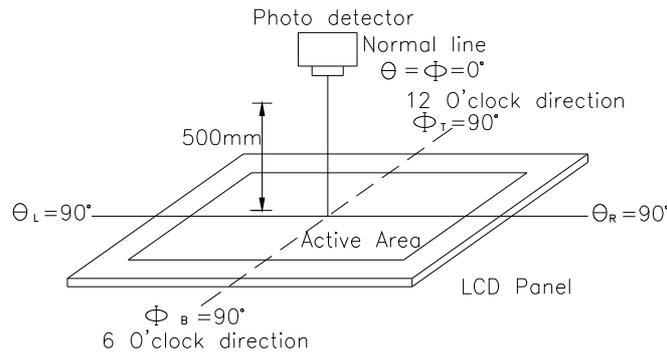
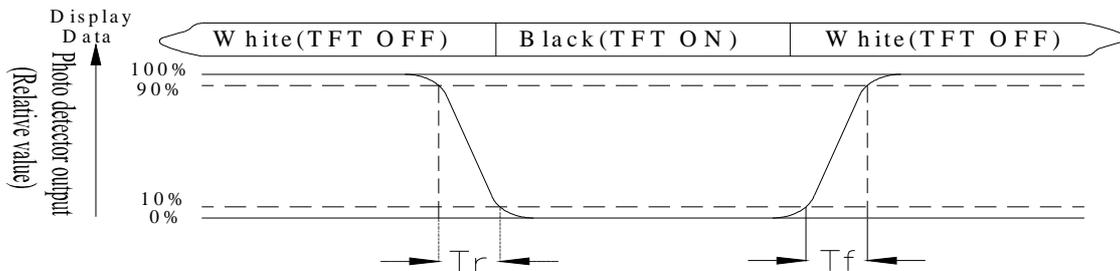


Fig. 9.2. Optical measurement system setup

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

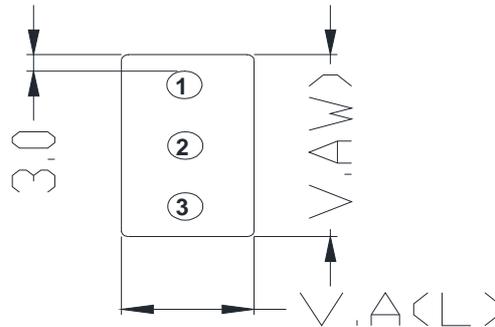


Fig9.3. Definition of uniformity

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.