

DISPLAY Elektronik GmbH

DATA
SHEET

TFT MODULE

DEM 480800C VMH-PW-N

4,0" TFT

Product Specification

Version: 0

28.08.2017

Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	28.08.2017		First Issue

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1. Summary

TFT 4.0" is a IPS transmissive type color active matrix TFT liquid crystal display. In-Plane Switching (IPS) was one of the first refinements to produce significant gains in the light-transmissive characteristics of TFT panels. It is a technology that addresses the two main issues of a standard twisted nematic (TN) TFT display: colour and viewing angle.

2. General Specifications

- Size: 3.97 Inch
- Dot Matrix: 480 x RGB x 800 dots
- Module Dimension: 57.14 x 96.85 x 1.90 mm
- Active Area: 51.84 x 86.40 mm
- Dot Pitch: 0.108 x 0.108 mm
- LCD Type: IPS TFT, Normally Black, Transmissive
- View Direction: Full View
- Aspect Ratio: Portrait
- Driver IC: JD9161
- Backlight Type: LED ,Normally White
- With /Without TP: Without Touch
- Surface: Anti-Glare

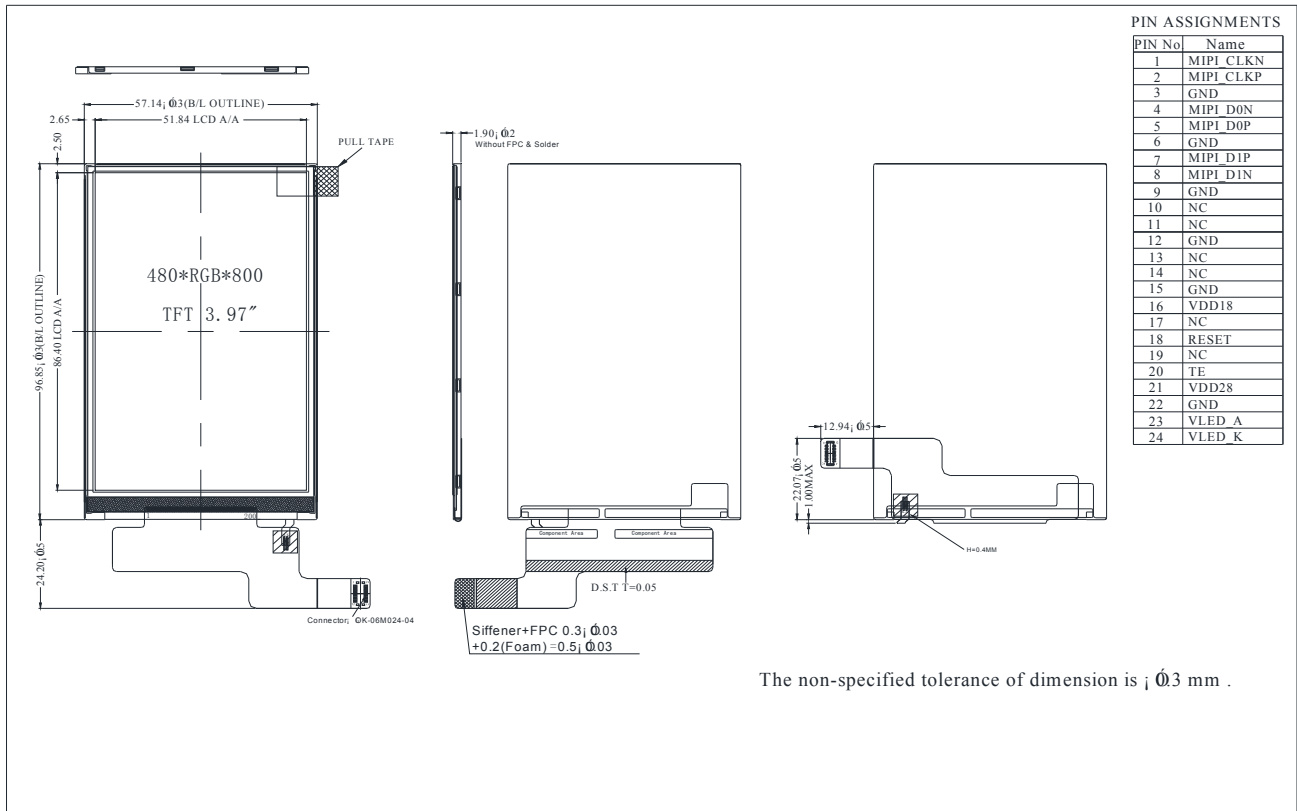
*Color tone slight changed by temperature and driving voltage.

3. Interface

3.1. LCM PIN Definition

Pin	Symbol	Function	I/O
1	MIPI_CLKN	MIPI DSI differential clock pair	I
2	MIPI_CLKP		
3	GND	Power ground	P
4	MIPI_D0N	MIPI DSI differential data pair (Data lane 0)	I/O
5	MIPI_D0P		
6	GND	Power ground	P
7	MIPI_D1P	MIPI DSI differential data pair(Data lane 1)	I/O
8	MIPI_D1N		
9	GND	Power ground	P
10	NC	No connect	-
11	NC	No connect	-
12	GND	Power ground	P
13	NC	No connect	-
14	NC	No connect	-
15	GND	Power ground	P
16	VDD18	I/O and interface power supply (1.8V)	P
17	NC	No connect	-
18	RESET	Reset input	I
19	NC	No connect	-
20	TE	Tearing effect output pin.	O
21	VDD28	Analog power supply (2.8V)	P
22	GND	Power ground	P
23	VLED_A	Power for LED backlight anode	P
24	VLED_K	Power for LED backlight cathode	P

4. Counter Drawing



PIN ASSIGNMENTS

PIN No	Name
1	MIPI_CLKN
2	MIPI_CLKP
3	GND
4	MIPI_D0N
5	MIPI_D0P
6	GND
7	MIPI_D1P
8	MIPI_D1N
9	GND
10	NC
11	NC
12	GND
13	NC
14	NC
15	GND
16	VDD18
17	NC
18	RESET
19	NC
20	TE
21	VDD28
22	GND
23	VLED_A
24	VLED_K

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

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

6. Electrical Characteristics

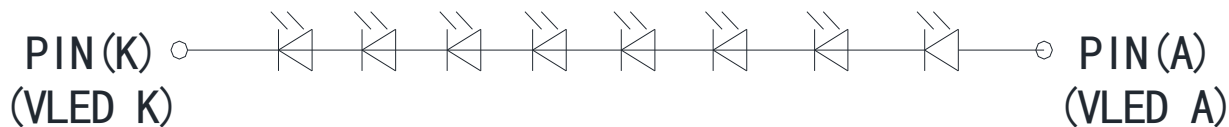
6.1. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Interface Supply Voltage	VDD18	1.65	-	3.3	V	
Power Voltage	VDD28	2.5	-	4.8	V	
Current for Driving (Black)	IDD	-	7	8	mA	VDD=3.3V

6.2. Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I _{LED}	-	20	-	mA	
LED voltage	V _{LED+}	-	25.6	-	V	Note 1
LED Life Time		30000	-	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



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. Interface Timing

7.1. MIPI interface characteristics

High Speed Data Transmission

Figure 1 shows the sequence of events during the transmission of a Data Burst. Transmission can be started and ended independently for any Lane by the protocol. However, for most applications the Lanes will start synchronously but may end at different times due to an unequal amount of transmitted bytes per Lane.

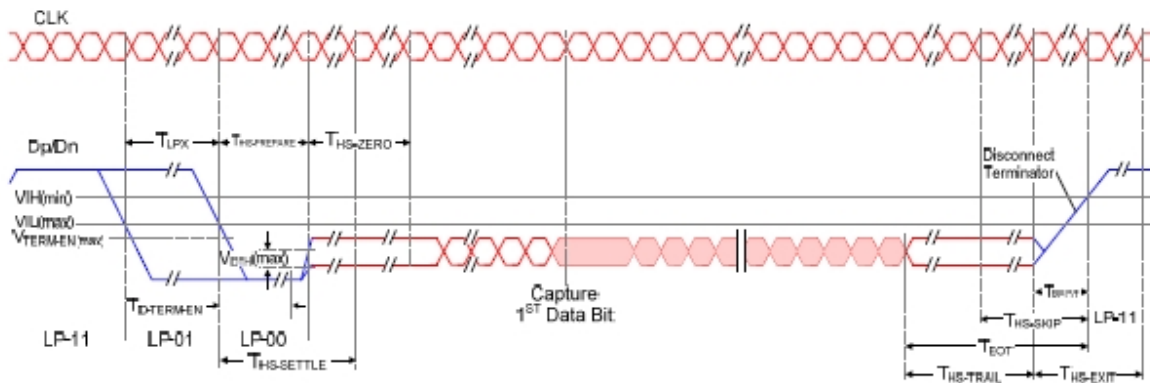


Figure 1 High-Speed Data Transmission in Bursts

High Speed Clock Transmission

In High-Speed mode the Clock Lane provides a low-swing, differential DDR (half-rate) clock signal from Master to Slave for High-Speed Data Transmission. The Clock signal shall have quadrature-phase with respect to a toggling bit sequence on a Data Lane in the Forward direction and a rising edge in the center of the first transmitted bit of a burst. The detail Clock Start and Stop procedures are shown in Figure 2.

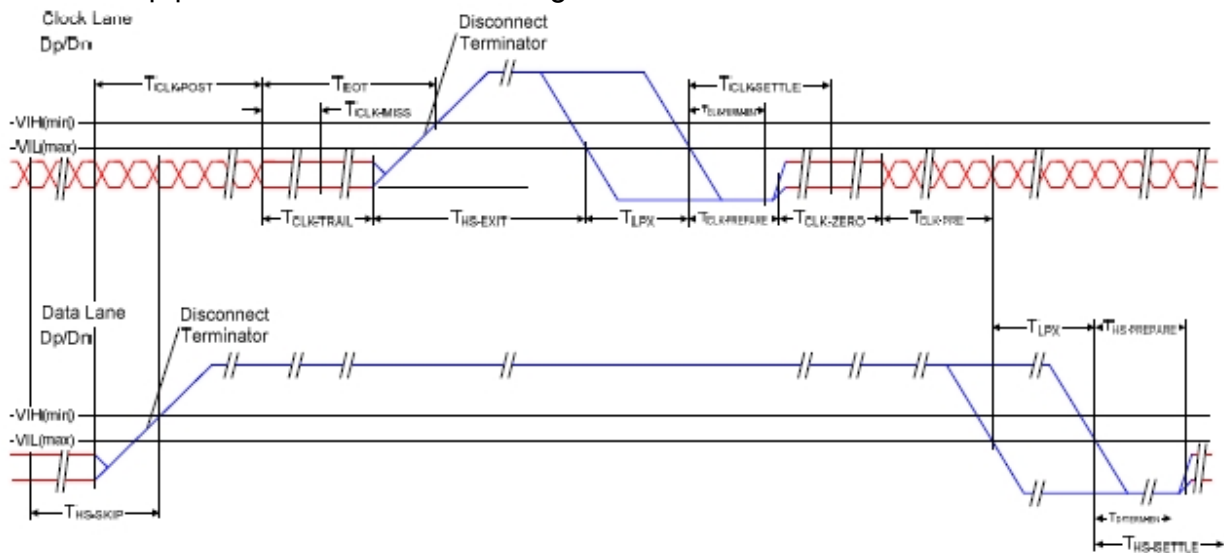
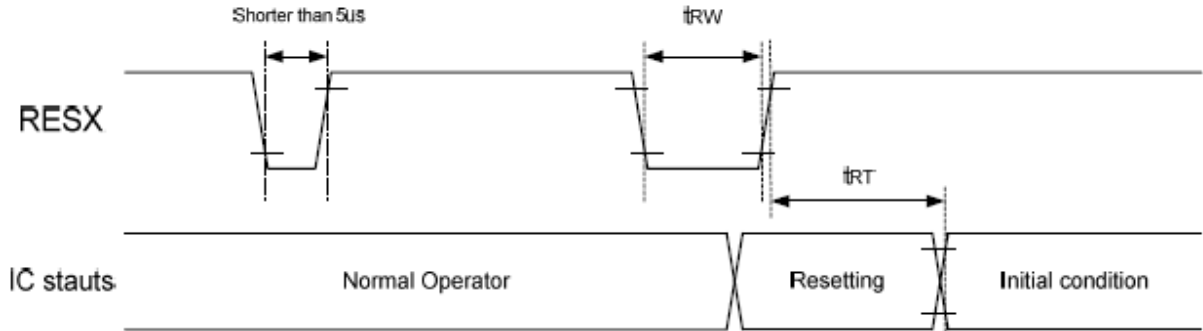


Figure 2: Switching the Clock Lane between Clock Transmission and Low-Power Mode

7.2. Reset Timing



Symbol	Parameter	Related pins	Min.	Max	Unit
tRW	Reset pulse width ⁽²⁾	Resx	10	-	us
tRT	Reset complete time ⁽³⁾			5 (Note 5)	ms
				120 (Note6,7)	ms

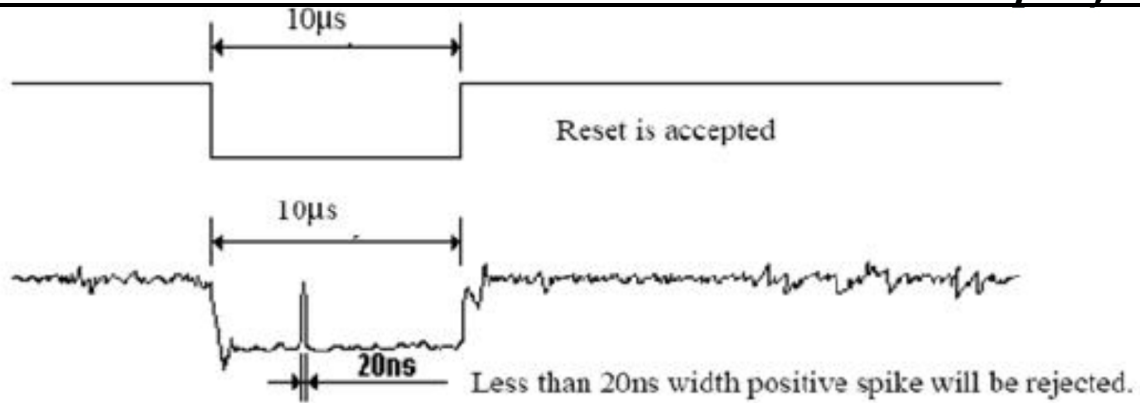
Note: (1) The reset complete time also required time for loading ID bytes from OTP to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

(2) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5 µs	Reset Rejected
Longer than 10 µs	Reset
Between 5 µs and 10 µs	Reset Start

(3) During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then returns to Default condition for H/W reset.

(4) Spike Rejection also applies during a valid reset pulse as shown below:



- (5) When Reset is applied during Sleep In Mode.
- (6) When Reset is applied during Sleep Out Mode.
- (7) It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

8. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response Time	Tr	$\theta=0^\circ$ 、 $\phi=0^\circ$	-	35	-	.ms	Note 3,5	
	Tf		-	35	-	.ms		
Contrast Ratio	CR	At optimized viewing angle	550		-	-	Note 4,5	
Color Chromaticity	White	$\theta=0^\circ$ 、 $\phi=0$	Wx	0.265	-	0.385		Note 2,6,7
			Wy	0.265	-	0.385		
Viewing Angle	Hor.	$CR \geq 10$	Θ_R	-	80	-	Deg.	Note 1
			Θ_L	-	80	-		
	Ver.		Φ_T	-	80	-		
			Φ_B	-	80	-		
Brightness	-	-	200	230	-	cd/m ²	Center of display	

Ta=25°C ± 2°C

Note 1: Definition of viewing angle range

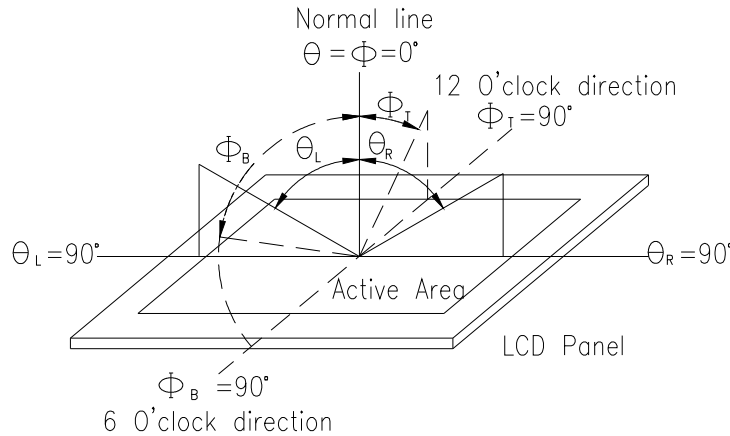


Fig. 9.1. Definition of viewing angle

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-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

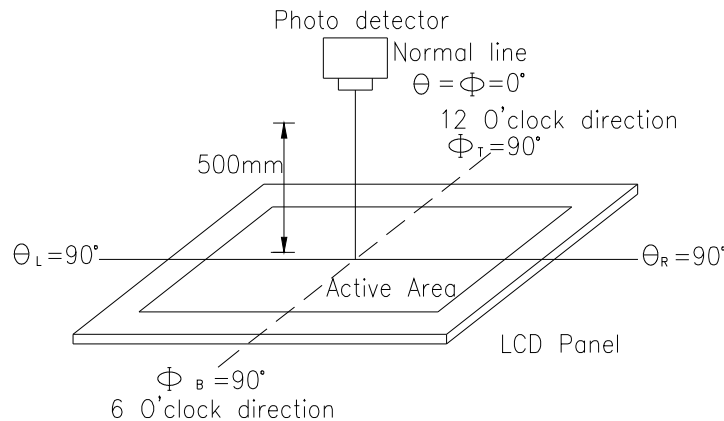
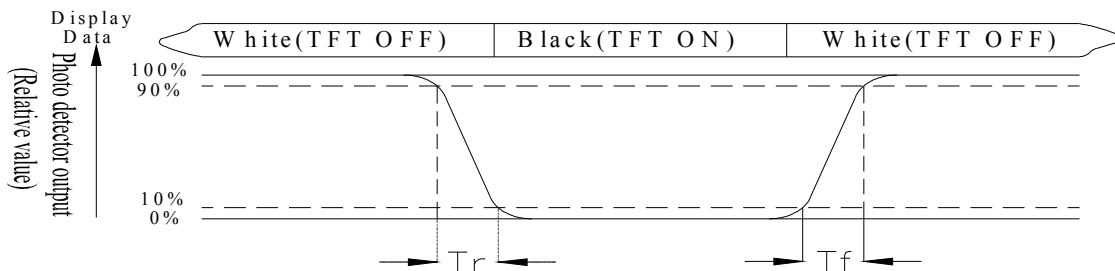


Fig. 9.2. Optical measurement system setup

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: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

“±” 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.

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%, 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.