FocusLCDs.com
LCDs MADE SIMPLE®

Ph. 480-503-4295 | NOPP@FocusLCD.com

TFT | CHARACTER | UWVD | FSC | SEGMENT | CUSTOM | REPLACEMENT

TFT Display Module

Part Number

E45RG64885LW2M350-N

Overview:

- 4.5-inch TFT: (61.90x96.04mm)
- 480(RGB)x854 pixels
- 3SPI+16/18/24-bit RGB Interface
- Top View
- White LED back-light

- Transmissive/ Normally White
- No Touch Panel
- 350 NITS
- Controller: ILI9806E
- RoHS Compliant

Description

This is a color active matrix TFT (Thin Film Transistor) LCD (Liquid Crystal Display) that uses amorphous silicon TFT as a switching device. This model is composed of a transmissive type TFT-LCD Panel, driver circuit and a backlight unit. The resolution of the 4.5" TFT-LCD contains 480x854 pixels and can display up to 65K/262K/16.7M colors.

TFT Features

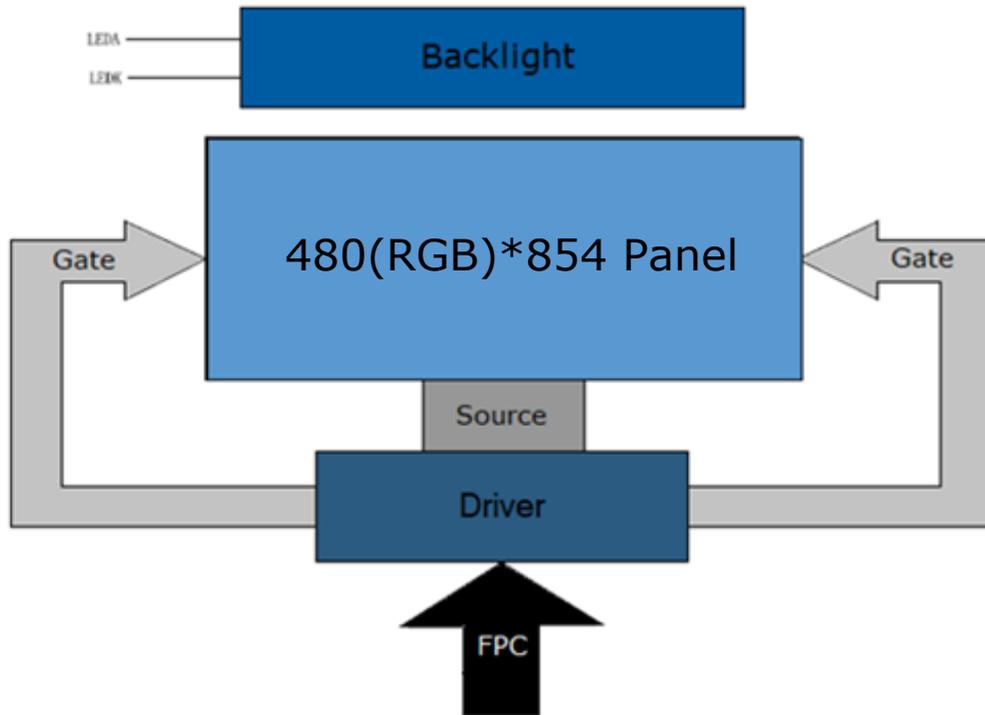Low Input Voltage: 3.3V (TYP)

Display Colors: 65K/262K/16.7M

TFT Interfaces: 3SPI+16/18/24-bit RGB

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Display area (AA)	55.44 (H) x 98.64 (V) (4.5 inch)	mm	-
Driver element	TFT active matrix	-	-
Display colors	65K/262K/16.7M	colors	-
Number of pixels	480(RGB)x854	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.1155 (H) x 0.1155 (V)	mm	-
Viewing angle	12:00	o'clock	-
TFT Controller IC	ILI9806E	-	-
Display mode	Transmissive/ Normally White	-	-
Operating temperature	-20～+70	℃	-
Storage temperature	-30～+80	℃	-

Mechanical Information

Item		Min	Typ.	Max	Unit	Note
Module size	Height (H)		61.54		mm	-
	Vertical (V)		110.09		mm	-
	Depth (D)		2.55		mm	-
Weight			TBD		g	-

1.   Block Diagram

2. Outline Dimensions

FRONT

BACK

FPC

4.46" TN
480RGB × 854

61.54±0.2 BL OUT
57.64±0.15 BEZEL OPEN
57.04±0.3 UP POL
55.44 LCD AA

2.55±0.2(TOTAL)

110.09±0.2 BL OUT 100.84
±0.15 BEZEL OPEN
100.24±0.3 UP POL
98.64 LCD AA

47.81±0.5
20.03±0.5
3.50
4.50

W=0.30
P0.5*44=22.00±0.05
23.00±0.1
52.54±0.5

R0.30

0.13±0.03 FPC
0.30±0.03(Conduct+Stiffener)

1.00 21.00
5.00 3.00
1.00
2.00
FPC

9.77±0.5
15.61±0.5
1.00MAX

FPC

LEDA — LEDK

CIRCUIT DIAGRAM

NOTES:
1. DISPLAY TYPE: 4.46", TFT-LCD(16:9)
2. DISPLAY MODE: NORMALLY WHITE(TN)
3. VIEWING DIRECTION: 12 o 'clock
4. DRIVER IC: ILI9806E (COG)
5. VCI: 3.3V(TYP),IOVCC:1.65~3.3V
6. OPERATING TEMP: -20℃ TO 70℃
   STORAGE TEMP: -30℃ TO 80℃
7. BACK LIGHT: LED WHITE, 8 LED, 40mA, 12.8±0.2V,LV: 350cd/m2
8. RoHS COMPLIANT.

NOTE: RGB interface DB Used.

RGB Interface	DB Pin in use
16 Bit RGB interface	DB20-DB16,DB13-DB8,DB4-DB0,
18 Bit RGB interface	DB21-DB16,DB13-DB8,DB5-DB0,
24 Bit RGB interface	DB23-DB0

NOTE: If used RGB mode must select serial interface!

NO.	Pin Name
1	XR
2	YD
3	XL
4	YU
5	GND
6	GND
7	VCI
8	IOVCC
9	SDO
10	SDI
11	SCL
12	CS
13	RESET
14	DB23(R7)
15	DB22(R6)
16	DB21(R5)
17	DB20(R4)
18	DB19(R3)
19	DB18(R2)
20	DB17(R1)
21	DB16(R0)
22	DB15(G7)
23	DB14(G6)
24	DB13(G5)
25	DB12(G4)
26	DB11(G3)
27	DB10(G2)
28	DB9(G1)
29	DB8(G0)
30	DB7(B7)
31	DB6(B6)
32	DB5(B5)
33	DB4(B4)
34	DB3(B3)
35	DB2(B2)
36	DB1(B1)
37	DB0(B0)
38	DE
39	PCLK
40	HSYNC
41	VSYNC
42	NC
43	LEDK
44	NC
45	LEDA

FocusLCDs.com
LCDs MADE SIMPLE®

	DRAWING NAME	
TOLERANCE( )	PARTS NO.	E45RG64885LW2M350-N

ReV	Revision content description	Date
V0	FIRST	2017/02/23

TOLERANCE UNLESS	X.X±0.3	Drawn		Unit
OTHERWISE SPECIFIED	X.XX±0.2	Checked		mm
Scale 1:1		Approve		Page 1/1

3. Input Terminal Pin Assignment

Recommended Connector: FH12S-45S-0.5SH(55)

NO.	Symbol	Description	I/O
1	XR(NC)	Touch panel right glass terminal	A/D
2	YD(NC)	Touch panel bottom film terminal	A/D
3	XL(NC)	Touch panel left glass terminal	A/D
4	YU(NC)	Touch panel top film terminal	A/D
5	GND	Ground	P
6	GND	Ground	P
7	VCI	Supply voltage (3.3V)	P
8	IOVCC	I/O power supply voltage	P
9	SDO	SPI interface output pin. The data is output on the falling edge of the SCL signal. If not used, leave open.	O
10	SDI	Data lane in 1 data lane serial interface. Latched on the rising edge of the SCL signal.	I
11	SCL	"Data or command" in the parallel interface. When D/CX = '1', data is selected. When D/CX='0', command is selected. This pin is used as clock in serial interface, 3-wire 9-bit/ 4-wire 8-bit serial. When to used pin to VCI or GND.	I
12	CS	Chip select input pin ("low enable"). Fix to VCI or GND when not used.	I
13	RESET	Reset pin. Setting low initializes the LSI. Must be reset after power is supplied.	I
14-37	DB23-DB0	24-bit parallel bi-directional data bus for MCU system and RGB interface. Fix to GND when not used.	I/O
38	DE	Data enable signal for RGB interface. Fix to VCI or GND when not used.	I
39	DOTCLK	Dot clock signal for RGB interface. Fix to VCI or GND when not used.	I
40	HSYNC	Line synchronizing signal for RGB interface. Fix to VCI or GND when not used.	I
41	VSYNC	Frame synchronizing signal for RGB interface. Fix to VCI or GND when not used.	I
42	NC		
43	LEDK	Cathode pin of backlight	P
44	NC		
45	LEDA	Anode pin of backlight	P

I: Input, O: Output, P: Power

4. LCD Optical Characteristics

4.1 Optical Specifications

Item		Symbol	Condition	Min	Typ.	Max	Unit	Note
Contrast Ratio		CR	θ=0 Normal viewing angle	--	800	--	%	(2)
Response Time	Rising	TR		--	4	8	ms	(4)
	Falling	TF		--	12	24	ms	
Color Gamut		S		--	58	--	%	(5)
Color Filter Chromaticity	White	W_X		0.273	0.313	0.353		(5)(6)
		W_Y		0.290	0.330	0.370		
	Red	R_X		0.604	0.624	0.644		
		R_Y		0.327	0.357	0.377		
	Green	G_X		0.343	0.363	0.383		
		G_Y		0.569	0.589	0.609		
	Blue	B_X		0.128	0.148	0.168		
		B_Y		0.055	0.075	0.095		
Viewing Angle	Hor.	ΘL	CR≥10	60	70	--	degree	(1)(6)
		ΘR		60	70	--		
	Ver.	ΘT		60	70	--		
		ΘB		40	60	--		
Option View Direction			12:00					(1)

Optical Specification Reference Notes:

(1) Definition of Viewing Angle: The viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3,9 o'clock direction and the vertical or 6,12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
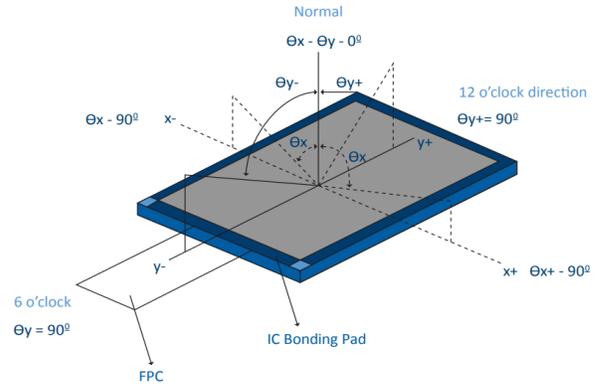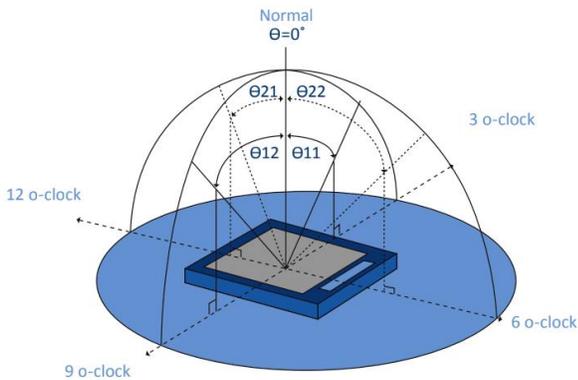

(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

$$Cr = \frac{Lw}{Ld}$$

(3) Definition of transmittance (T%): The transmittance of the panel including the polarizers is measured with electrical driving. The equation for transmittance Tr is:

$$Tr = \frac{It}{Io} \; x \; 100\%$$
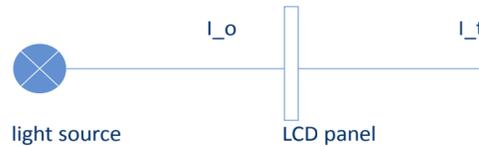
Io = the brightness of the light source.
It = the brightness after panel transmission

(4) Definition of Response Time (Tr, Tf): The rise time 'Tr' is defined as the time for luminance to change from 90% to 10% as a result of a change of the electrical condition. The fall time 'Tf' is defined as the time for luminance to change from 10% to 90% as a result of a change of the electrical condition.
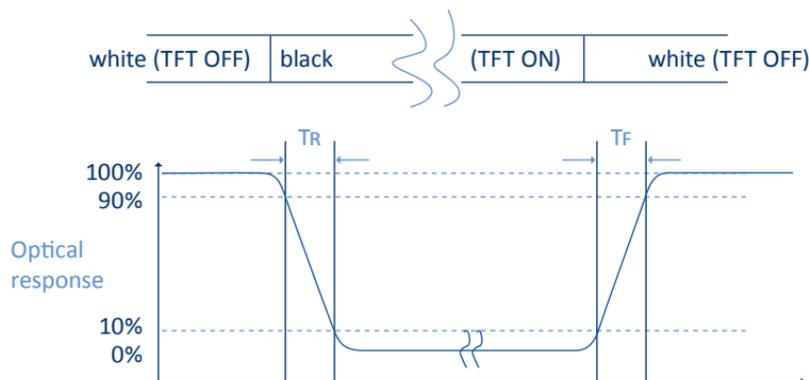
(5) Definition of Color Gamut:

Measuring machine CFT-01. NTSC's Primaries: R(x,y,Y),G(x,y,Y), B(x,y,Y). FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.The color chromaticity shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
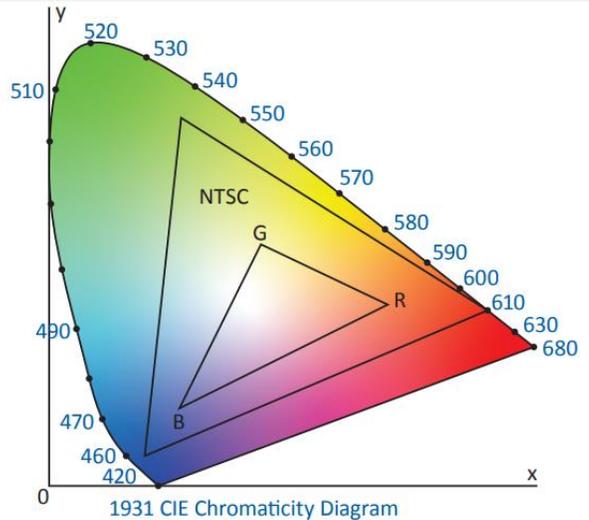

Fig. 1931 CIE chromacity diagram

$$\text{Color gamut: } S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$

(6) Definition of Optical Measurement Setup:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 20 minutes.
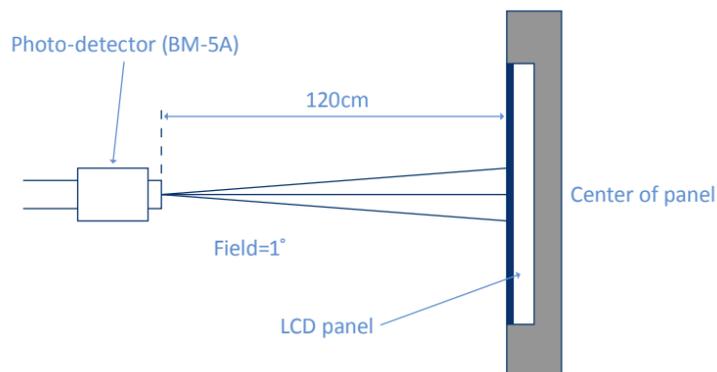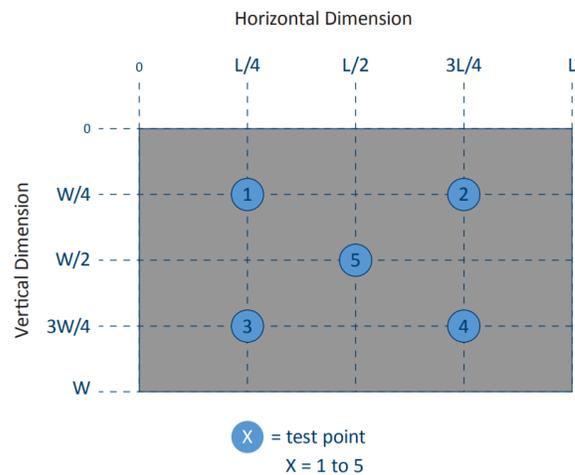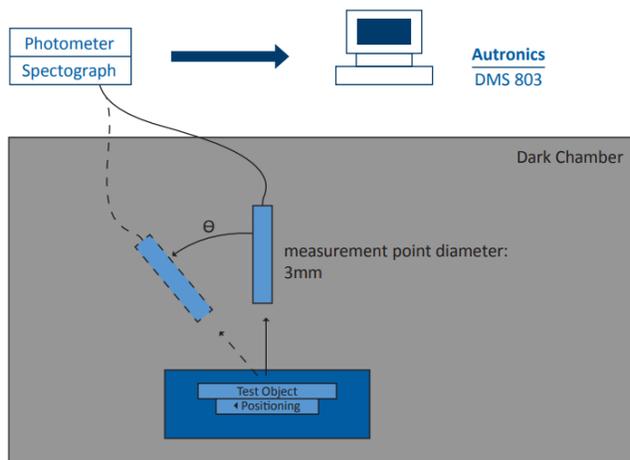
5. TFT Electrical Characteristics

5.1 Absolute Maximum Rating (Ta=25 ˚C, VSS=0V)

Characteristics	Symbol	Min	Max	Unit
Digital Supply Voltage	VCI	-0.3	4.2	V
Digital Interface Supply Voltage	IOVCC	-0.3	3.3	V
Operating Temperature	TOP	-20	+70	℃
Storage Temperature	TST	-30	+80	℃

NOTE: If the absolute maximum rating of the above parameters is exceeded, even momentarily, the quality of the product may be degraded. Absolute maximum ratings specify the values which the product may be physically damaged if exceeded. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

| Characteristics	Symbol	Min	Typ.	Max	Unit	Note
Digital Supply Voltage	VCI	2.5	2.8/3.3	3.6	V	
Digital Interface Supply Voltage	IOVCC	1.65	1.8	3.3	V	
Normal Mode Current Consumption	IDD	--	26	--	mA	
Level Input Voltage	VIH	0.7IOVCC	--	IOVCC	V	
	VIL	GND	--	0.3IOVCC	V	
Level Output Voltage	VOH	0.8IOVCC	--	IOVCC	V	
	VOL	GND	--	0.2IOVCC	V	

5.3   LED Backlight Characteristics

The backlight system is edge lighting type with 8 chips LED.

| Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	I_F	30	40	--	mA	
Forward Voltage	V_F	--	12.8	--	V	
LCM Luminance	LV	307	--	--	cd/m2	Note 3
LED lifetime	Hr	50000	--	--	hour	Note1 & 2
Uniformity	AVg	80	--	--	%	Note 3

Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25 ±3 ℃, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The "LED lifetime" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL = 40mA. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.
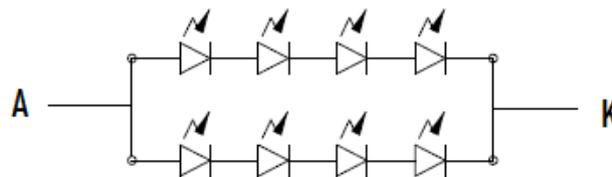
Backlight LED Circuit

Note 3: Luminance Uniformity of these 9 points is defined as below:
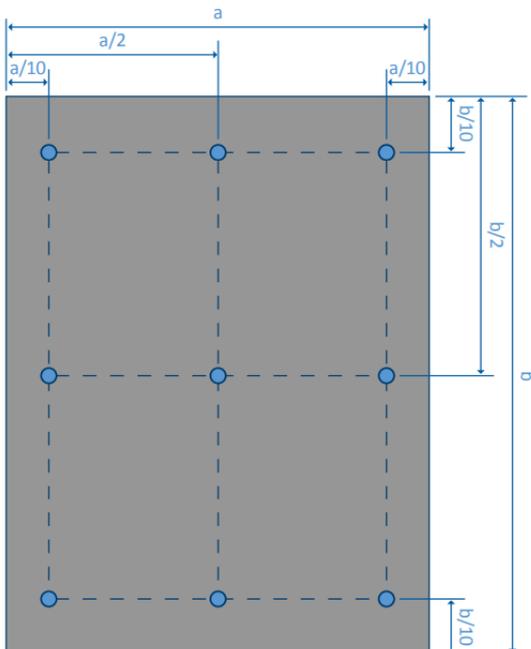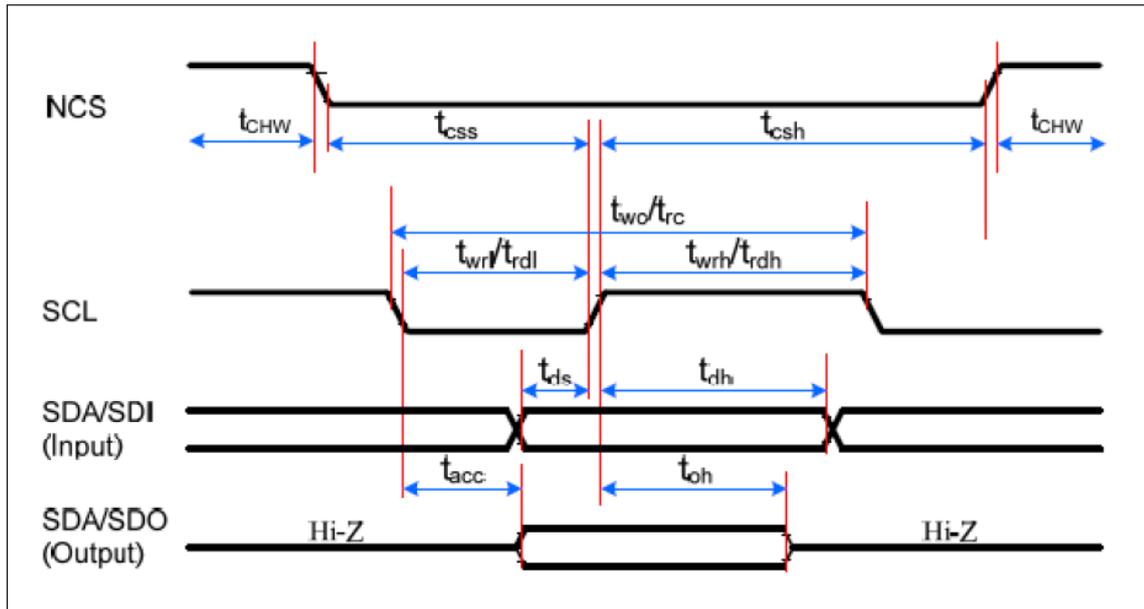

$$\text{Luminance} = \frac{\text{(Total Luminance of 9 points)}}{9}$$

$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points(1-9)}}{\text{maximum luminance in 9 points(1-9)}}$$

6. TFT AC Characteristics

## 6.1 Display Serial Interface Timing Characteristics (3-line SPI)

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	tsc	SCL-CSX	15	-	ns	
	tchw	CSX H pulse width	40	-	ns	
	tcss	Chip select time (Write)	60	-	ns	
	tcsh	Chip select hold time (Read)	65	-	ns	
SCL	twc	Serial clock cycle (Write)	66	-	ns	
	twrh	SCL H pulse width (Write)	15	-	ns	
	twrl	SCL L pulse width (Write)	15	-	ns	
	trc	Serial clock cycle (Read)	150	-	ns	
	trdh	SCL H pulse width (Read)	60	-	ns	
	trdl	SCL L pulse width (Read)	60	-	ns	
SDA	tds	Data setup time (Write)	10	-	ns	When read ID data
	tdh	Data hold time (Write)	10	-	ns	
SDA/SDO (Output)	tacc	Access time (Read)	10	50	ns	For max, CL=30pF For mini, CL=8pF
	toh	Output disale time (Read)	15	50	ns	

6.2   Parallel 24/18/16-bit RGB Interface Timing Characteristics
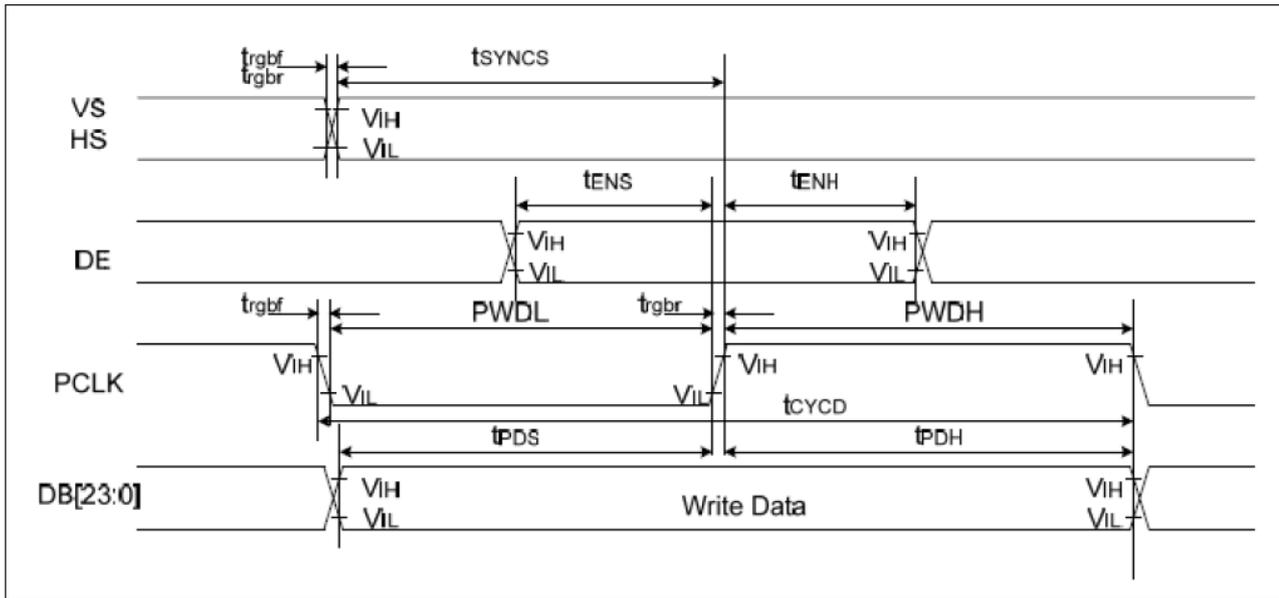
| Signal	Symbol	Parameter	Min	Max	Unit	Description
VS/ HS	tSYNCS	VSYNC/HSYNC setup time	5	-	ns	18/16-bit bus RGB interface mode
	tSYNCH	VSYNC/HSYNC hold time	5	-	ns	
DE	tENS	ENABLE setup time	5	-	ns	
	tENH	ENABLE hold time	5	-	ns	
DB[23:0]	tPOS	Data setup time	5	-	ns	
	tPDH	Data hold time	5	-	ns	
PCLK	PWDH	DOTCLK high-level period	13	-	ns	
	PWDL	DOTCLK low-level period	13	-	ns	
	tCYCD	DOTCLK cycle time	28	-	ns	
	trgbr,trgbf	DOTCLK, HSYNC, VSYNC rise/fall time	-	15	ns	

6.3 DPI Interface Timing
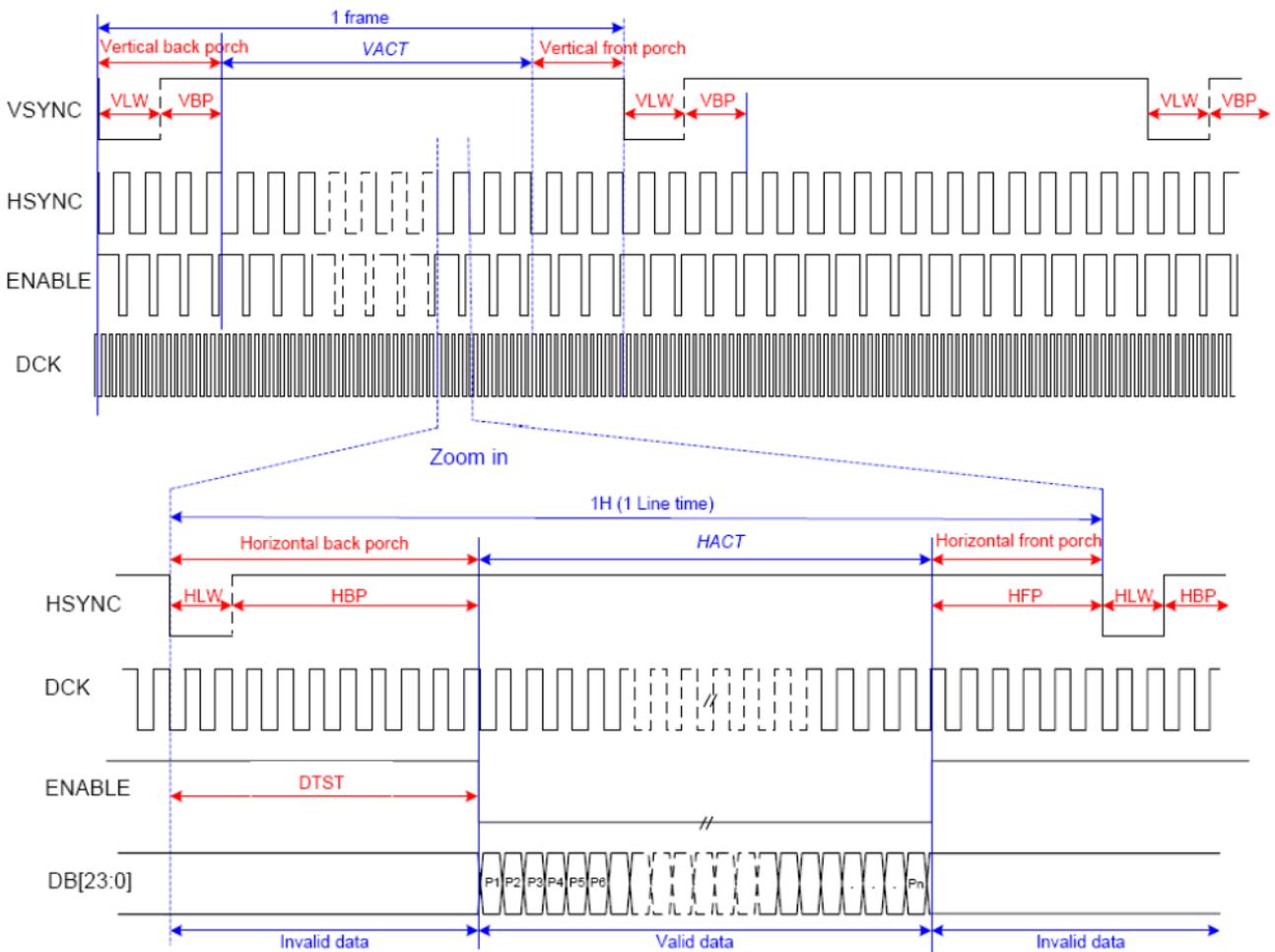
VLW : VSYNC Low pulse Width
HLW : HSYNC Low pulse Width
DTST : Data Transfer Startup Time
Pn : pixel 1, pixel 2···, pixel n.

Parameter	Symbols	Condition	Min	Typ.	Max	Units
Frame Rate	FR		54		66	fps
Horizontal Low Pulse Width	HLW		1		-	DOTCLK
Horizontal Back Porch	HBP		2		126	DOTCLK
Horizontal Address	HACT			480		DOTCLK
Horizontal Front Porch	HFP		2		-	DOTCLK
Vertical Low Pulse Width	VLW		1		126	Line
Vertical Back Porch	VBP		1		126	Line
Vertical Address	VACT				864	Line
Vertical Front Porch	VFP		1		255	Line
Data Clock	DCLK		16.6		41.7	MHz

6.4 Reset Timing
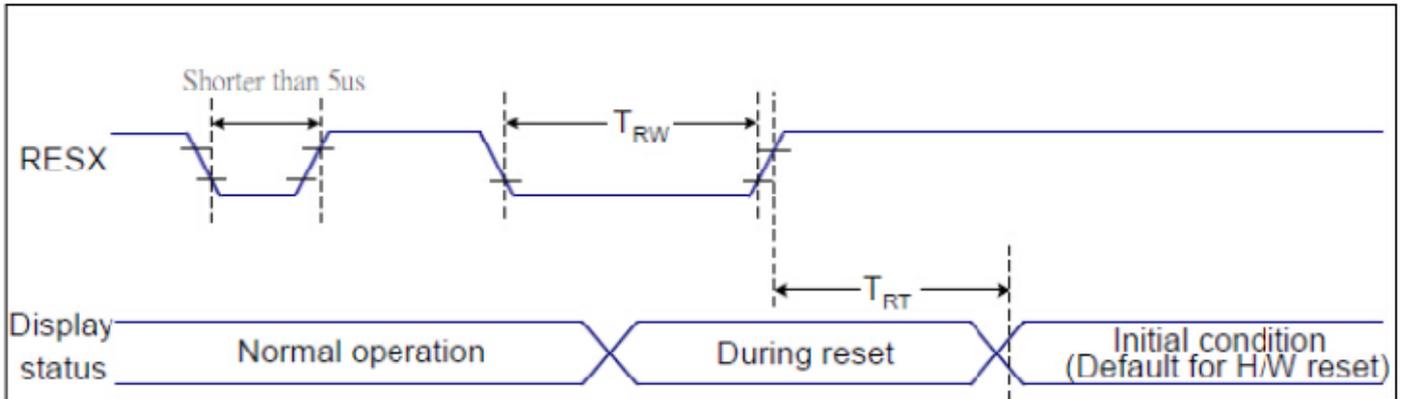
Related Pins	Symbol	Parameter	Min	Max	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1,5)	ms
				120 (Note 1, 6, 7)	ms

Notes:

1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5ms after a rising edge of RESX.

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

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9 us	Reset starts

3. During the resetting period, the display will be blanked (the display is entering blanking sequence, which maximum time is 120ms, when reset starts in Sleep Out mode. The display remains the blank state in Sleep in mode) and then return to Default condition for Hardware Reset.

4. Spike Rejection also applies during a valid reset pulse as shown below:
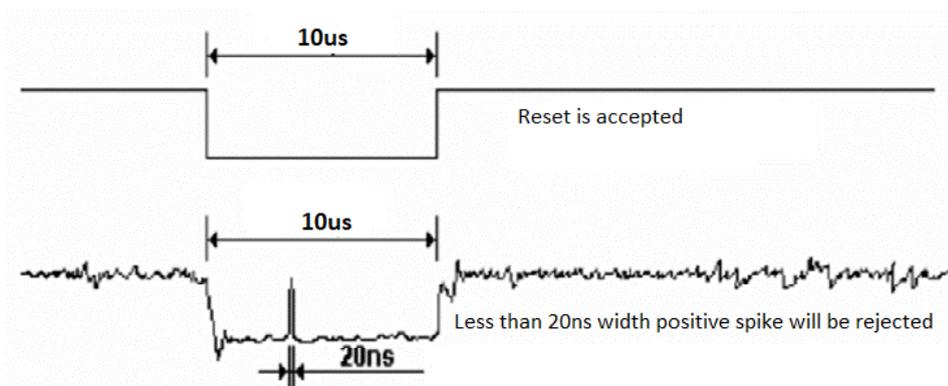
5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5ms after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120ms.

7. Cautions and Handling Precautions

7.1 Handling and Operating the Module

1. When the module is assembled, it should be attached to the system firmly. Do not warp or twist the module during assembly work.

2. Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

3. Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

4. Do not allow drops of water or chemicals to remain on the display surface. If you have the droplets for a long time, staining and discoloration may occur.

5. If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

6. The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

7. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.

8. Protect the module from static; it may cause damage to the CMOS ICs.

9. Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

10. Do not disassemble the module.

11. Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

12. Pins of I/F connector shall not be touched directly with bare hands.

13. Do not connect, disconnect the module in the "Power ON" condition.

14. Power supply should always be turned on/off by the item Power On Sequence & Power Off Sequence

8.2 Storage and Transportation.

1. Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 ℃ and relative humidity of less than 70%

2. Do not store the TFT-LCD module in direct sunlight.

3. The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

4. It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module. In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

5. This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.