

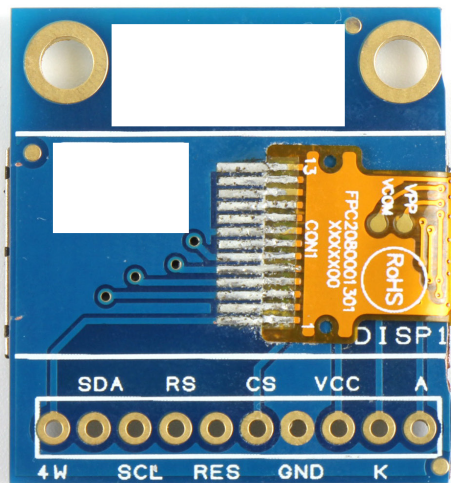
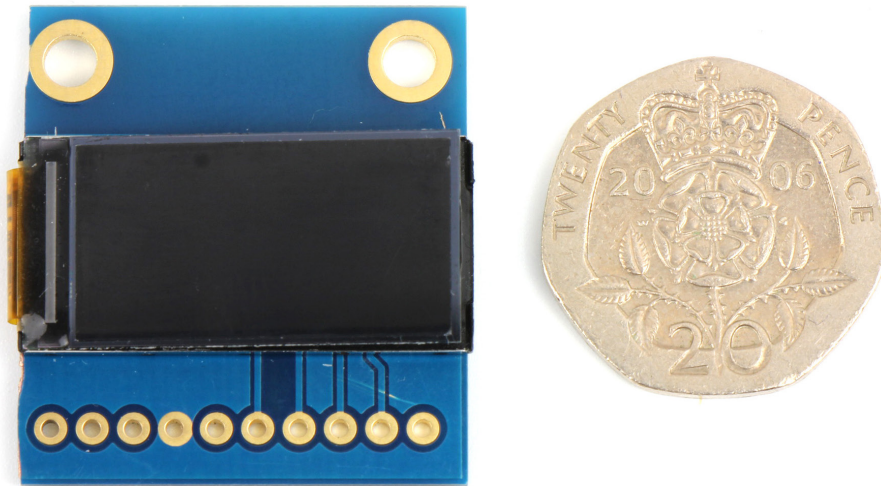


Every part matters

EN

# Instruction Manual

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## Overview

An IPS, full colour TFT module, offering 80 degree viewing angles all round, with a 500nit backlight. 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.

## Technical Specifications

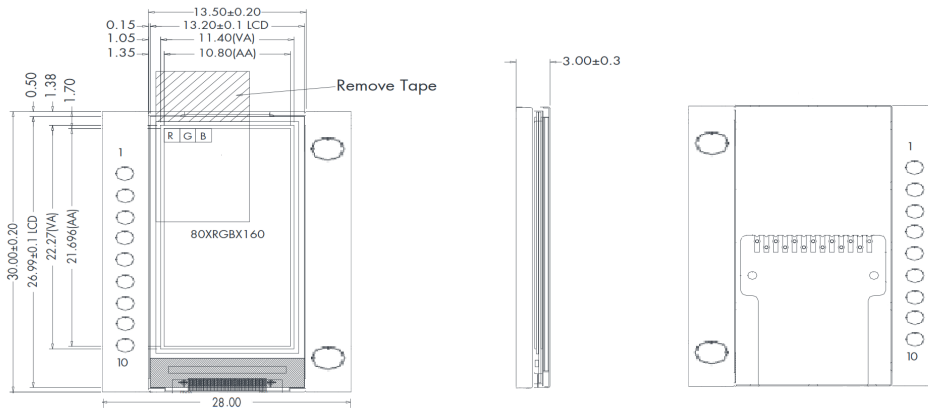
- Size: 0.96 inch
- Dot Matrix: 80 x RGB x 160(TFT) dots
- Module dimension: 30.00(W) x 28.00(H) x 3.00(D) mm
- Active area: 10.8 x 21.696 mm
- Dot pitch: 0.135 x 0.1356 mm
- LCD type: TFT, Normally black, Transmissive
- Viewing Angle: 80/80/80/80
- Aspect Ratio: 1:2
- IC: ST7735S
- Backlight Type: LED, Normally White
- With /Without TP: Without TP
- Surface: Glare

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

## Interface

Pin	Symbol	Function	Remark
1	SPI4W	SPI4W='0', 3-wire SPI.	
		SPI4W='1', 4-wire SPI.	
2	SDA	Serial interface data	
3	SCL	Serial interface clock	
4	RS	Data/command selection pin (4-wire SPI use)	
5	RES	Reset pin (low active)	
6	CS	Chip selection pin (low active)	
7	GND	Ground	
8	VCC	Power supply.	
9	LEDK	Back light cathode	
10	LEDA	Back light anode	

## Technical Drawing



PIN No.	Symbol
1	SPI4W
2	SDA
3	SCL
4	RS
5	RES
6	CS
7	GND
8	VCC
9	LEDK
10	LEDA

The non-specified tolerance of dimension is  $\pm 0.3$  mm .

## Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	-	+70	°C
Storage Temperature	TST	-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  $60^{\circ}\text{C}$ .

## Electrical Characteristics

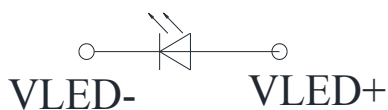
Operating conditions:

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

## 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 Life Time		-	50000	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



Circuit diagram

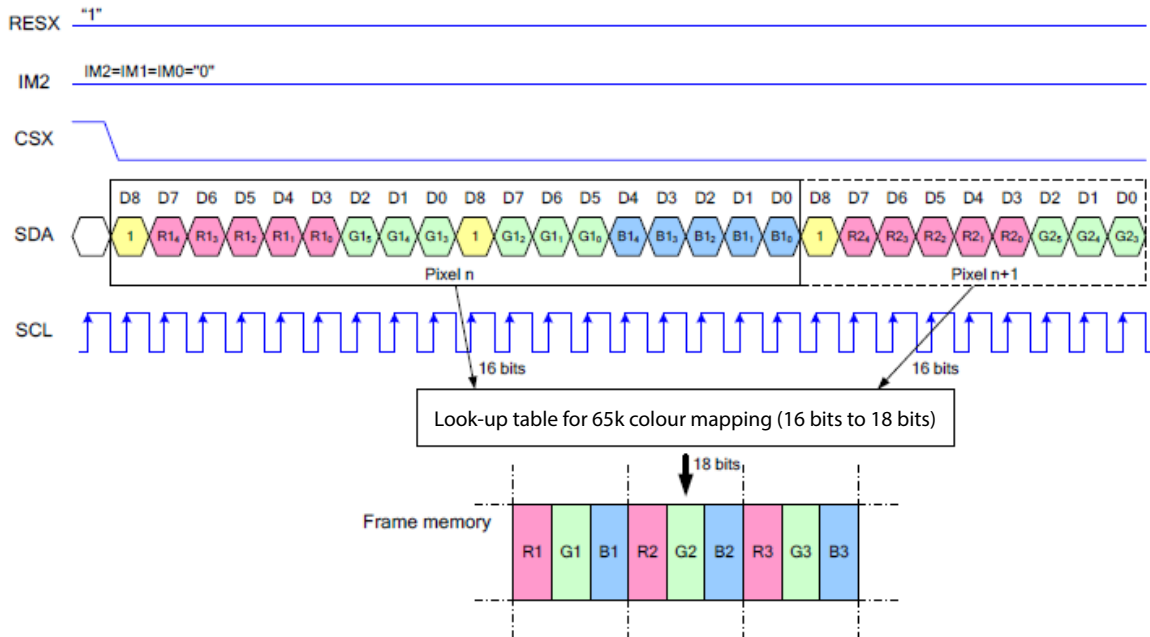
Note 2 :  $T_a = 25^{\circ}\text{C}$

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

Note 4 : The single LED lamp case

## Data Colour Coding

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

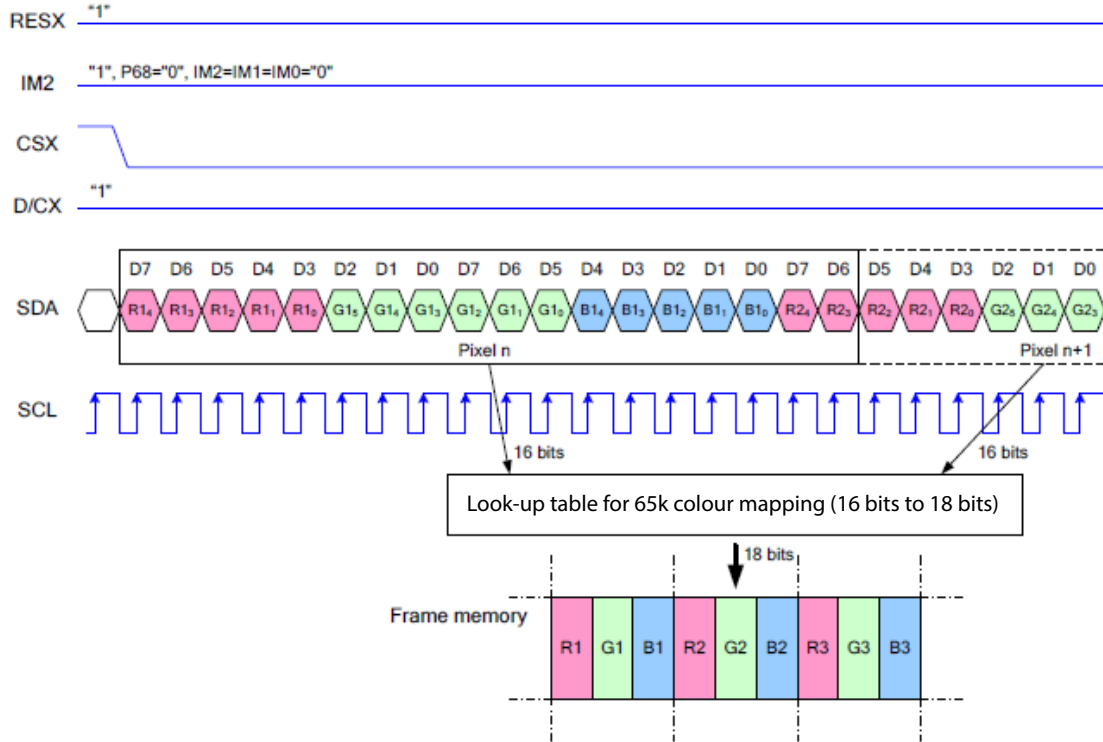


Note 1: Pixel data with the 16-bit colour depth information

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

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

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



- Note 1. Pixel data with the 16-bit colour depth information
- Note 2. The most significant bits are: Rx4, Gx5 and Bx4
- Note 3. The least significant bits are: Rx0, Gx0 and Bx0

**Display Options available**

Display on pcb no mounting



TFT display as a stand-alone item

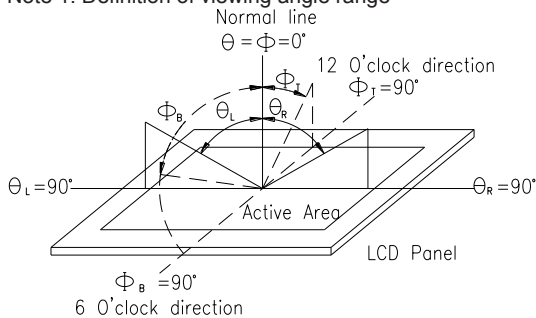


## Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	$\theta=0^\circ \phi=0^\circ$	-	30	40	.ms	Note 3,5
		Tf						
Contrast ratio		CR	At optimized viewing angle	-	800	-	-	Note 4,5
Colour 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.	$\theta_R$	$CR \geq 10$	-	80	-	Deg.	Note 1
		$\theta_L$		-	80	-		
	Ver.	$\phi_T$		-	80	-		
		$\phi_B$		-	80	-		
Brightness		-	-	400	500	-	cd/m2	Center of display

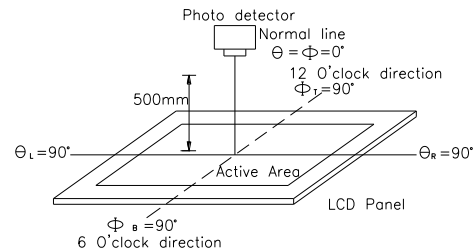
Ta=25±2°C

Note 1: Definition of viewing angle range



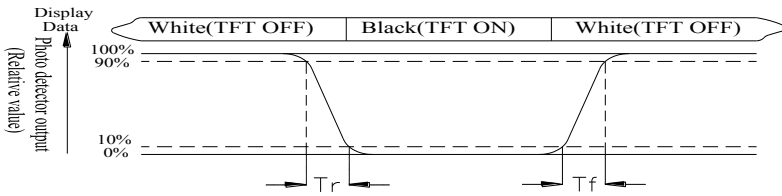
Note 2: Test equipment setup:

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.



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%.



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 colour chromaticity (CIE 1931)  
Colour coordinates measured at the center point of LCD

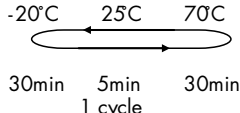
Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.



## Reliability

### Content of Reliability Test (Wide temperature, -20°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  	-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.