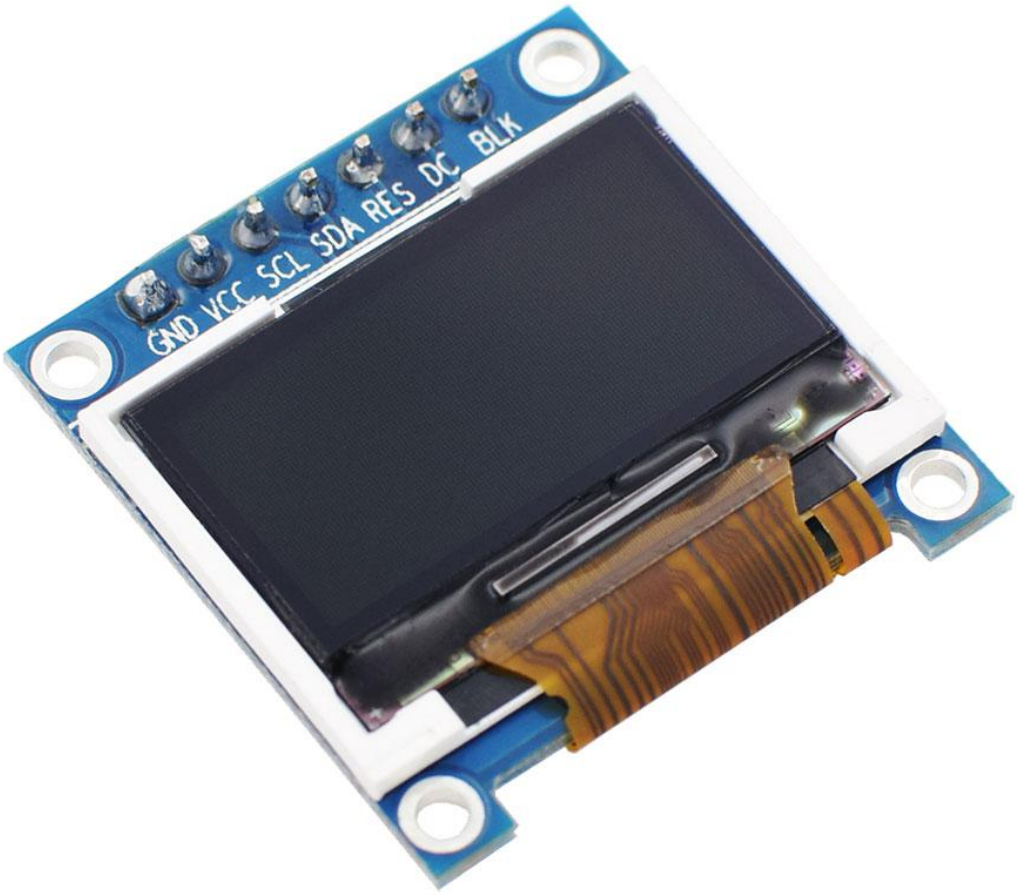
DisplayModule



DM-TFT096-398

0.96" 128 × 64 TFT LCD DISPLAY MODULE - SPI

Contents

1 Revision History

Date	Changes
2019-08-27	First release

2 Main Features

Item	Specification	Unit
Diagonal Size	0.96	inch
LCD Type	TFT TRANSMISSIVE	-
Display Colors	262K	Colors
Resolution	128(RGB) x 64	pixel
Controller IC	ST7735S	-
Interface	4 wire SPI	-
Active Area	21.744 x 10.864	mm
Module Dimension	26.7 x 19.26 x 1.6	mm
Viewing Direction	12:00	O' Clock
Backlight Type	1 LED	-
Weight	6	g

3 Pin Description

3.1 Panel Pin Description

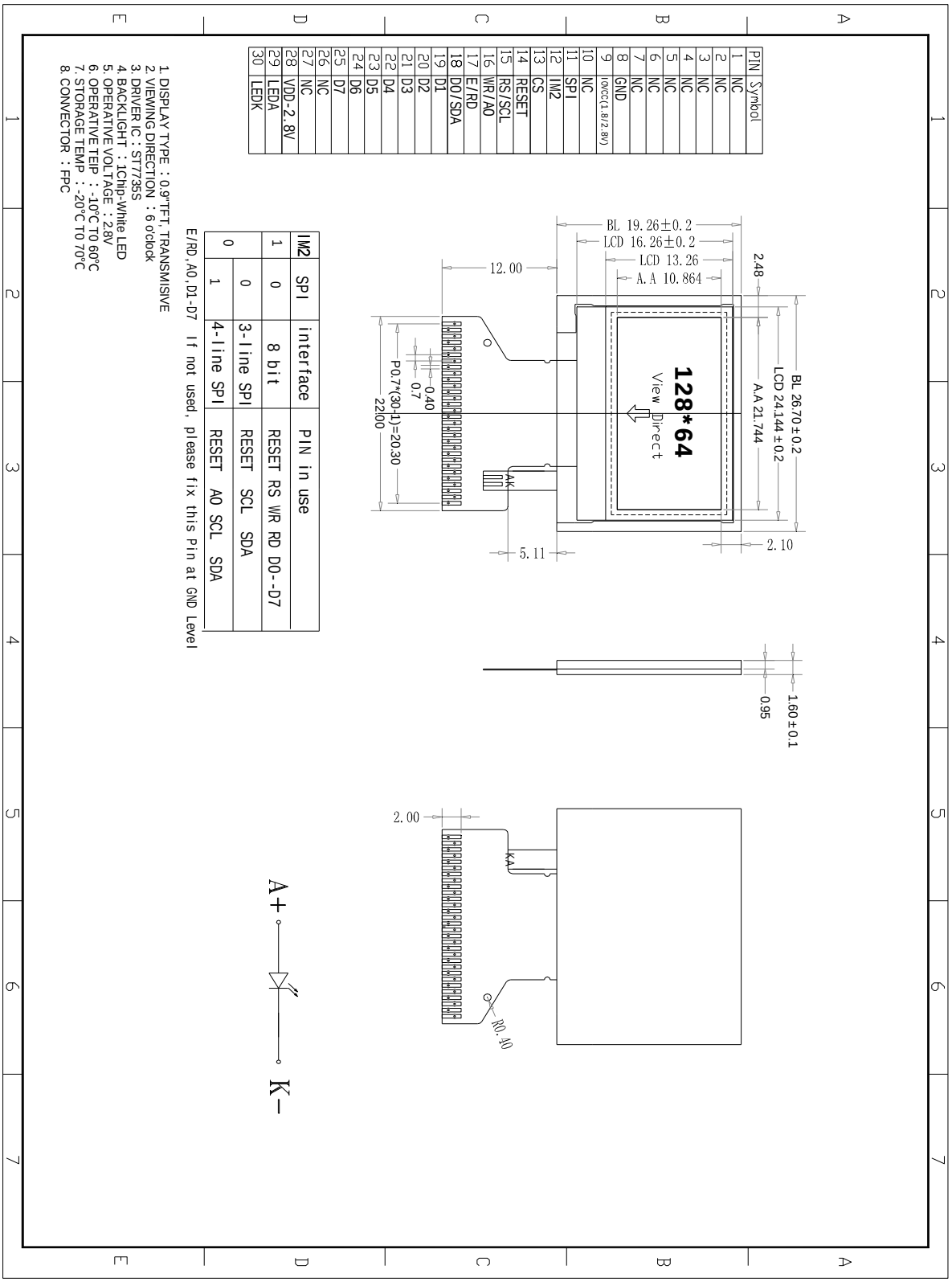
<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Function Description</th></tr>
<tr><td>1~7</td><td>NC</td><td>No Connect</td></tr>
<tr><td>8</td><td>GND</td><td>Ground</td></tr>
<tr><td>9</td><td>IOVCC</td><td>Power Supply for I/O system.(1.8V or VDD)</td></tr>
<tr><td>10</td><td>NC</td><td>No Connect</td></tr>
<tr><td>11</td><td>SPI</td><td rowspan="2">
<table>
<tr><th>IM2</th><th>SPI</th><th>Interface</th><th>PIN in use</th></tr>
<tr><td>1</td><td>0</td><td>8 bit</td><td>RESET RS、WR、RD、D0~D7</td></tr>
<tr><td rowspan="2">0</td><td>0</td><td>3-line SPI</td><td>RESET SCL、SDA</td></tr>
<tr><td>1</td><td>4-line SPI</td><td>RESET A0、SCL、SDA</td></tr>
</table>
If not used, please fix the SPI pin at DGND Level.
</td></tr>
<tr><td>12</td><td>IM2</td></tr>
<tr><td>13</td><td>CS</td><td>chip select signal input</td></tr>
<tr><td>14</td><td>RESET</td><td>A reset pin.</td></tr>
<tr><td>15</td><td>RS/SCL</td><td>Display data/command Selection Pin in MCU Interface. In Serial Interface, this is used as SCL.
If not used, please fix this pin at VDDI or DGND level.</td></tr>
<tr><td>16</td><td>WR/A0</td><td>Write Enable in MCU Parallel Interface.
In 4-line SPI, this pin is used as D/CX (data/ command selection). If not used, please fix this pin at VDDI or DGND level.</td></tr>
<tr><td>17</td><td>E/RD</td><td>Read Enable in 8080 MCU Parallel Interface.
If not used, please fix this pin at VDDI or DGND level.</td></tr>
<tr><td>18</td><td>D0/SDA</td><td>D0 are used as MCU parallel interface data bus.
D0 is the serial input/output signal in serial interface mode.</td></tr>
<tr><td>19~25</td><td>D1~D7</td><td>D1~7 are used as MCU parallel interface data bus.
In serial interface, D1~7are not used and should be fixed at VDDI or DGND level.</td></tr>
<tr><td>26,27</td><td>NC</td><td>No Connect</td></tr>
<tr><td>28</td><td>VDD</td><td>Power Supply for Analog, Digital System and Booster Circuit.</td></tr>
<tr><td>29</td><td>LED-A</td><td>back light power supply positive</td></tr>
<tr><td>30</td><td>LED-K</td><td>back light power supply negative</td></tr>
</table>

3.2 Module Pin Description

Pin No.	Symbol	Function Description
1	GND	Ground
2	VCC	Power Supply
3	SCL	SPI Clock
4	SDA	SPI DATA
5	RES	Reset Pin
6	DC	SPI Data/Command Select Pin
7	BLK	LCD Backlight Control The default is float.

4 Mechanical Drawing

4.1 Panel Mechanical Drawing



5 Optics & Electrical Characteristics

5.1 Optical Characteristics

Item	Symbol	Min	Typ	Max	Unit	Remark	
View Angles TOP	ΘU	-	30	-	°	25℃; CR≧2	
View Angles Bottom	ΘD	-	30	-	°		
View Angles Right	ΘR	-	30	-	°		
View Angles Left	ΘL	-	30	-	°		
Operating Volt.	V_{LCD}	-	-	-	V	-10℃	θ=0°
		-	8.5	-	V	25℃	
		-	-	-	V	60℃	
Response Time	Rise Time (Tr)	-	-	-	ms	-10℃	
	Decay Time (Td)	-	-	-	ms		
	Rise Time (Tr)	-	-	240	ms	25℃	
	Decay Time (Td)	-	-	240	ms		
	Rise Time (Tr)	-	-	-	ms	60℃	
	Decay Time (Td)	-	-	-	ms		
Contrast Ratio	CR	3	4.5	-	-	θ=0°	

5.2 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Logic Supply Voltage	$V_{CC}1$,$V_{CC}2$	-0.3	4.6	V
Input Voltage	V_{IN}	-0.3	V_{CC}+0.3	V
Operating Temperature	T_{OP}	-20	70	℃
Storage Temperature	T_{STG}	-30	80	℃
Humidity	RH	-	90%(Max60C)	RH

5.3 Backlight Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Forward Voltage	Vf	2.8	3.0	3.2	V	
Luminance	Lv	-	180	-	cd/m^2	If=20mA
Number of LED	-		1		Piece	
Connection mode	P		-		-	

Using condition: constant current driving method If = 20mA(+/-10%)

5.4 DC Characteristics

Item	Symbol	Min	Typ.	Max	Unit
Logic Supply Voltage	V_{CC} - V_{SS}	2.4	2.8	3.2	V
Input Current	I_{DD}	-	10	-	mA
Low Level Input Voltage	V_{IL}	-V_{SS}	-	0.2 x V_{DD}	V
High Level Input Voltage	V_{IH}	0.7 x V_{DD}	-	V_{DD}	V
Low Level Output Voltage	V_{OL}	0	0	0.2 x V_{CC}	V
High Level Output Voltage	V_{OH}	0.8 x V_{CC}	-	V_{CC}	V

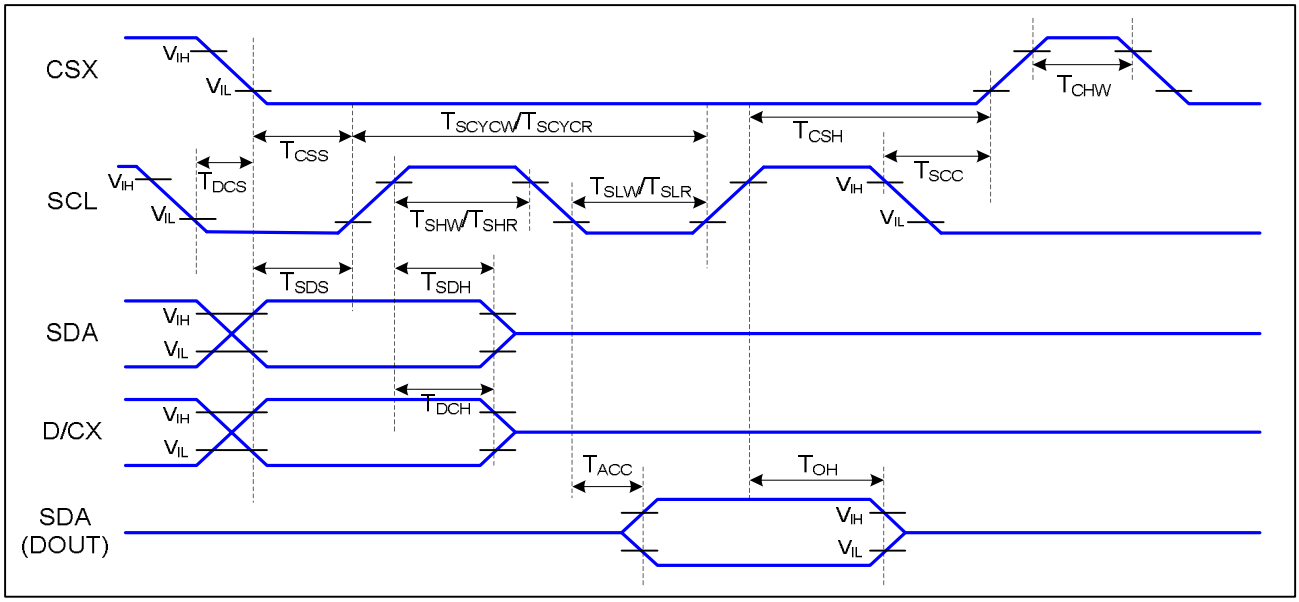
5.5 AC Characteristics

5.5.1 4-wire Serial Interface Timing Characteristics:

Signal	Symbol	Description	Min	Max	Unit	Remark
CSX	TCSS	Chip Select Setup Time (Write)	45	-	ns	
	TCSH	Chip Select Hold Time (Write)	45	-	ns	
	TCSS	Chip Select Setup Time (Read)	60	-	ns	
	TSCC	Chip Select Hold Time (Read)	65	-	ns	
	TCHW	Chip Select "H" Pulse Width	40	-	ns	
SCL	TSCYCW	Serial Clock Cycle (Write)	66	-	ns	-Write Command & Data Ram
	TSHW	SCL "H" Pulse Width (Write)	15	-	ns	
	TSLW	SCL "L" Pulse Width (Write)	15	-	ns	
	TSCYCR	Serial Clock Cycle (Read)	150	-	ns	-Read Command & Data Ram
	TSHR	SCL "H" Pulse Width (Read)	60	-	ns	
	TSLR	SCL "L" Pulse Width (Read)	60	-	ns	
D/CX	TDCS	D/CX Setup Time	10	-	ns	
	TDCH	D/CX Hold Time	10	-	ns	
SDA (DIN) (DOUT)	TSDS	Data Setup Time	10	-	ns	For Maximum CL=30pF For Minimum CL=8pF
	TSDH	Data Hold Time	10	-	ns	
	TACC	Access Time	10	50	ns	
	TOH	Output Disable Time	15	50	ns	

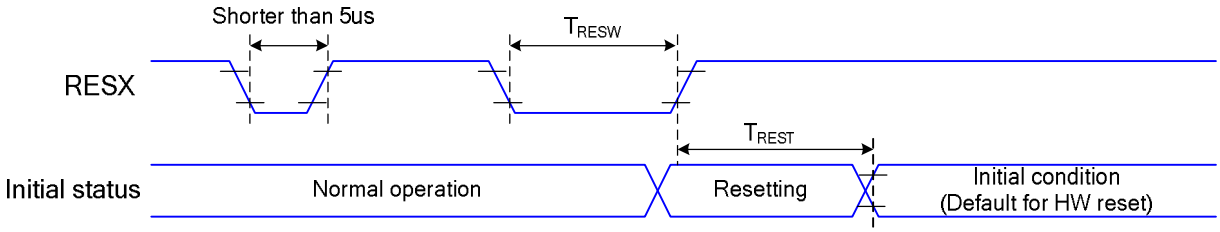
Ta=25 ℃, VDDI=1.65 ~ 3.7V, VDD=2.5 ~ 4.8V

4-line Serial Interface Timing



5.5.2 Display RESET Timing Characteristics

Reset input timing



Related Pins	Symbol	Parameter	Min	Typ	Max	Unit
RESX	t_{RESW}	Reset Pulse Duration	10	-	-	µs
	t_{REST}	Reset Cancel	-	-	5	ms
			-	-	120	ms

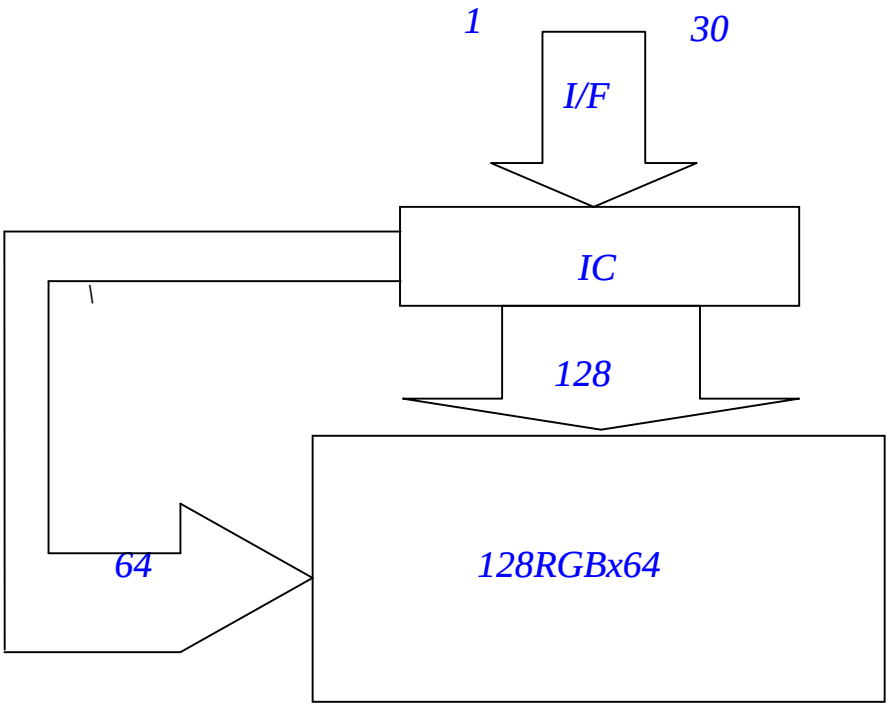
Notes:

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 5 ms after a rising edge of RESX.

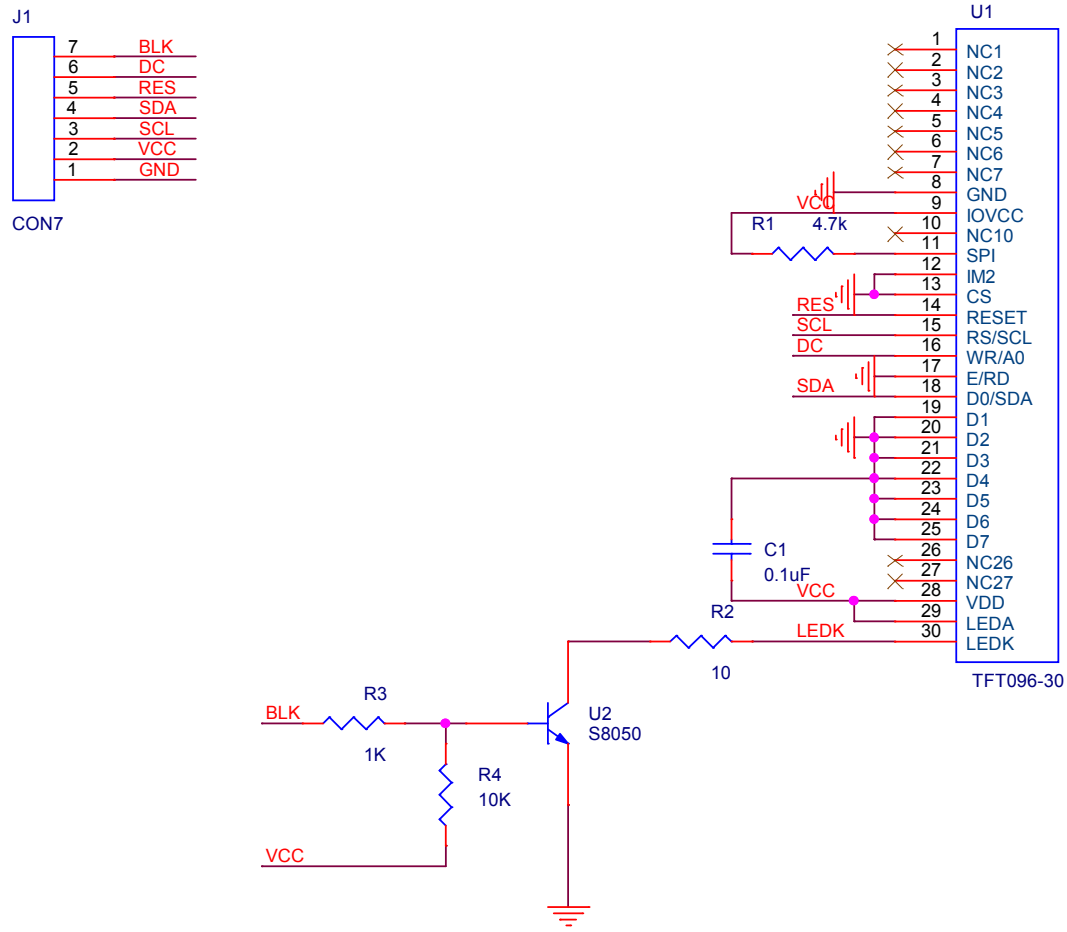
2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

RESX Pulse	Action
Shorter than 5µs	Reset Rejected
Longer than 9µs	Reset
Between 5µs and 9µs	Reset Starts

6 BLOCK DIAGRAM OF LCM



7 Module Schematic



8 Reliability

Test Item	Content of Test	Test Condition	Note
High Temperature Storage	Endurance test applying the high storage temperature for a long time.	80℃±2℃ 96H Restore 2H at 25℃ Power off	2
Low Temperature Storage	Endurance test applying the high storage temperature for a long time.	-30℃±2℃ 96H Restore 2H at 25℃ Power off	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℃±2℃ 96H Restore 2H at 25℃ Power on	-
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃±2℃ 96H Restore 4H at 25℃ Power on	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃,90%RH max, for 96hrs under no-load condition excluding the polarizer. Then taking it out and drying it at normal temperature.	60℃±2℃ 90%RH 96H Power on	1,2
Thermal Shock Resistance	The sample should be allowed stand the following 10 cycles of operation	-30℃←→25℃←→80℃ 30min 5min 30min after 10cycle, Restore 2H at 25℃ Power off	-

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 rest chamber.

9 Warranty and Conditions

http://www.displaymodule.com/pages/faq HYPERLINK "http://www.displaymodule.com/pages/faq"