



HAIDAR TECHNOLOGY, LLC.
The Next Generation Of Intelligent Embedded GUI Systems

WWW.haidartechnology.com

(614) 389-3022

Sales@haidartechnology.com

SegeMax
Serial Enabled Graphic Engine for Color Displays
Hardware Manual

REV 1.00

Revision 1.00

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1. Overview:

The SegeMax Board provides a complete Graphical User interface controller for embedded systems. SegeMax includes everything you need to drive TFT LCD (up to 800X480 and at 16bpp) with touch panel. It just needs to be attached to a simple display interface board and the human interface is ready for production. It is based on our intelligent and easy to use graphic engine “SEGE” (Serial Enabled Graphic Engine). SEGE uses the same techniques used in objective oriented programming (OOP) to create the embedded GUI without any additional code for the LCD or the touch panel. A powerful set of objects and a window based software “LCDMaster” are used to make this task extremely easy, fast and simple. LCDMaster is a true WYSIWYG visual GUI builder for color displays. It allows you to design the GUI application visually from your PC screen using simple Drag-and-Drop tools with absolutely no coding for the GUI design.

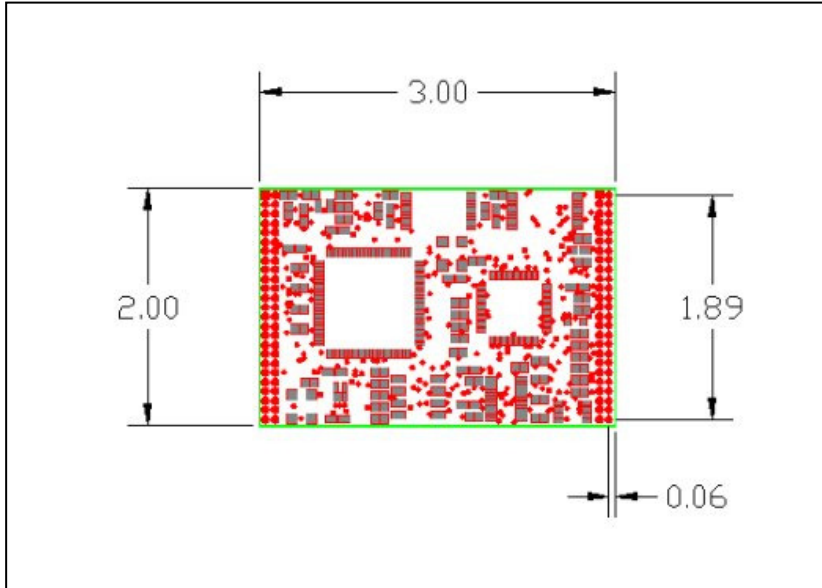
The predefined object set which includes Screen, Bargraph, Button, Textbox, Picturebox, Numberbox, Image, Slider, Needle and Shape are the GUI building blocks. Similar to OOP, each object has properties, methods and events. Each object has also a touch zone which can be enabled or disabled at design time. When the user touch one of those zones, touch event will be generated to notify the host controller and to execute user defined macro without the host supervision.

Using SegeMax is simply the quickest way to create stunning GUI without any graphical programming!

2. Features:

- Can drive any TFT Color LCD up to WVGA (800X480) and at 16BPP color depth
- Powerful 32-bit processor running at 80MHZ on board
- Powerful graphic controller with 1024KB RAM on board
- Powerful resistive touch screen and 4X4 keypad controller on board
- 16Mbyte Flash memory for bitmaps, fonts and GUI storage
- 7-bit, 100K (128 levels) Digital Pot for software brightness control
- CMOS (3.3V) RS232 and RS485 up to 115.2kb/sec serial interface
- 3 layers of graphic with Alpha blending and transparency
- Single Power supply operation (3.3V)
- Small size 50X76 mm
- Low Cost
- ROHS Compliant

3. Board dimensional drawing:



All dimensions are in inches

4. Dimensions:

| | |
|--------|--------------|
| Width | 2.0" / 50mm |
| Length | 3.0" / 76mm |
| Depth | 0.43" / 11mm |

5. Electrical Characteristics:

SegeMax requires 3.3V DC. Exceeding the supply voltage over the typical value (3.3V) will cause a permanent damage to the board and to the attached LCD and void your warranty.

Current draw is as follows:

| Configuration | Typical Current (A) at 3.3V | Max Current (A) at 3.3V |
|------------------------------|-----------------------------|-------------------------|
| SegeMax with no LCD attached | 0.15A | 0.2A |

6. Environmental:

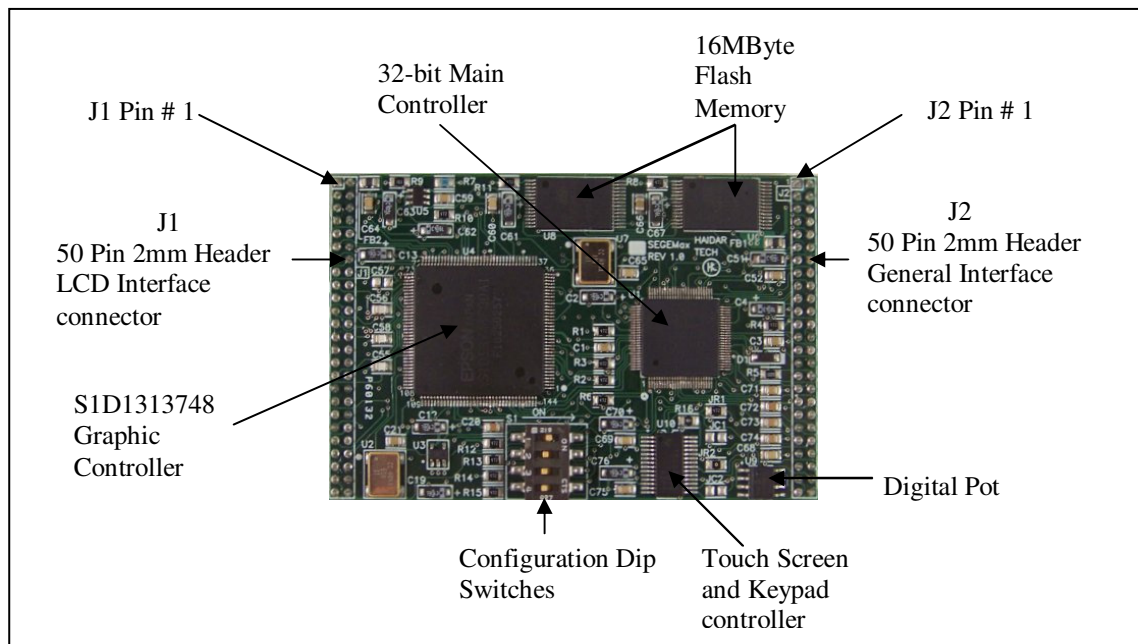
The standard SegeMax board is rated for commercial temperature operation of 0 to 70°C. The Industrial Temperature -40 to 85°C version is available as a special order.

7. Electrical Specifications:

| Parameter | Symbol | Min. | Typ. | Max. | Units |
|--|--------|--------|------|--------|-------|
| Input Supply Voltage | VDD | - | 3.3 | 3.7 | V |
| High Level Input Voltage (VDD = 3.3V) | VIH | 0.7VDD | - | VDD | V |
| Low Level Input Voltage (VDD = 3.3V) | VIL | 0 | - | 0.3VDD | V |
| Digital sink/source current | Id | - | - | 25 | MA |
| Analog input voltage | Va | 0 | - | 3.3V | V |
| RS232 TX/RX | | 0.7VDD | - | VDD | V |

Warning: RX and TX use a CMOS level of 3.3V. Connecting them to standard (PC) RS232 with +/- 12V or other will damage the controller and void your warranty.

8. Board Picture:



9. Pin Description J1 and J2:

J1 (50Pos, 2mm, DIL Header)

| J1 Pin Name | Pin # | Type | Tolerance | Description |
|-------------|---------|------|-----------|--|
| LCD_PWR | 1 | PWR | 3.3V | LCD 3.3V Power. Connect to the LCD Power input. |
| LCD_PWR | 2 | PWR | 3.3V | LCD 3.3V Power. Connect to the LCD Power input. |
| GND | 3 | PWR | 0V | Power Ground |
| GND | 4 | PWR | 0V | Power Ground |
| ENAB | 5 | DOUT | 3.3V | LCD Data Enable (DE) or Data Ready signal (DRDY). The active state of this signal indicates that the data in the RGB bus is valid and should be latched |
| HSYNC | 6 | DOUT | 3.3V | LCD Horizontal Synchronization signal. It is also known as FPLINE or LP. This signal indicates the end of the line and the following valid pixels are part of the next line. |
| VSYNC | 7 | DOUT | 3.3V | LCD Vertical Synchronization signal. It is also known as FPFAME or FLM. This signal indicates the end of the current frame. |
| PCLK | 8 | DOUT | 3.3V | LCD Pixel Data clock signal. The active state of this signal will latch the RGB data. |
| B0 | 9 | DOUT | 3.3V | Blue Data 0 (LSB) |
| B1 | 10 | DOUT | 3.3V | Blue Data 1 |
| B2 | 11 | DOUT | 3.3V | Blue Data 2 |
| G0 | 12 | DOUT | 3.3V | Green Data 0 (LSB) |
| G1 | 13 | DOUT | 3.3V | Green Data 1 |
| G2 | 14 | DOUT | 3.3V | Green Data 2 |
| R0 | 15 | DOUT | 3.3V | Red Data 0 (LSB) |
| R1 | 16 | DOUT | 3.3V | Red Data 1 |
| R2 | 17 | DOUT | 3.3V | Red Data 2 |
| B3 | 18 | DOUT | 3.3V | Blue Data 3 |
| B4 | 19 | DOUT | 3.3V | Blue Data 4 |
| B5 | 20 | DOUT | 3.3V | Blue Data 5 (MSB) |
| G3 | 21 | DOUT | 3.3V | Green Data 3 |
| G4 | 22 | DOUT | 3.3V | Green Data 4 |
| G5 | 23 | DOUT | 3.3V | Green Data 5 (MSB) |
| R3 | 24 | DOUT | 3.3V | Red Data 3 |
| R4 | 25 | DOUT | 3.3V | Red Data 4 |
| R5 | 26 | DOUT | 3.3V | Red Data 5 (MSB) |
| NC | 27 | | | Do not connect. Leave open. |
| NC | 28 | | | Do not connect. Leave open. |
| NC | 29 | | | Do not connect. Leave open. |
| NC | 30 | | | Do not connect. Leave open. |
| NC | 31 | | | Do not connect. Leave open. |
| NC | 32 | | | Do not connect. Leave open. |
| GND | 33 | PWR | 0V | Power Ground |
| GND | 34 | PWR | 0V | Power Ground |
| NC | 35 - 50 | | | Do not connect. Leave open. |

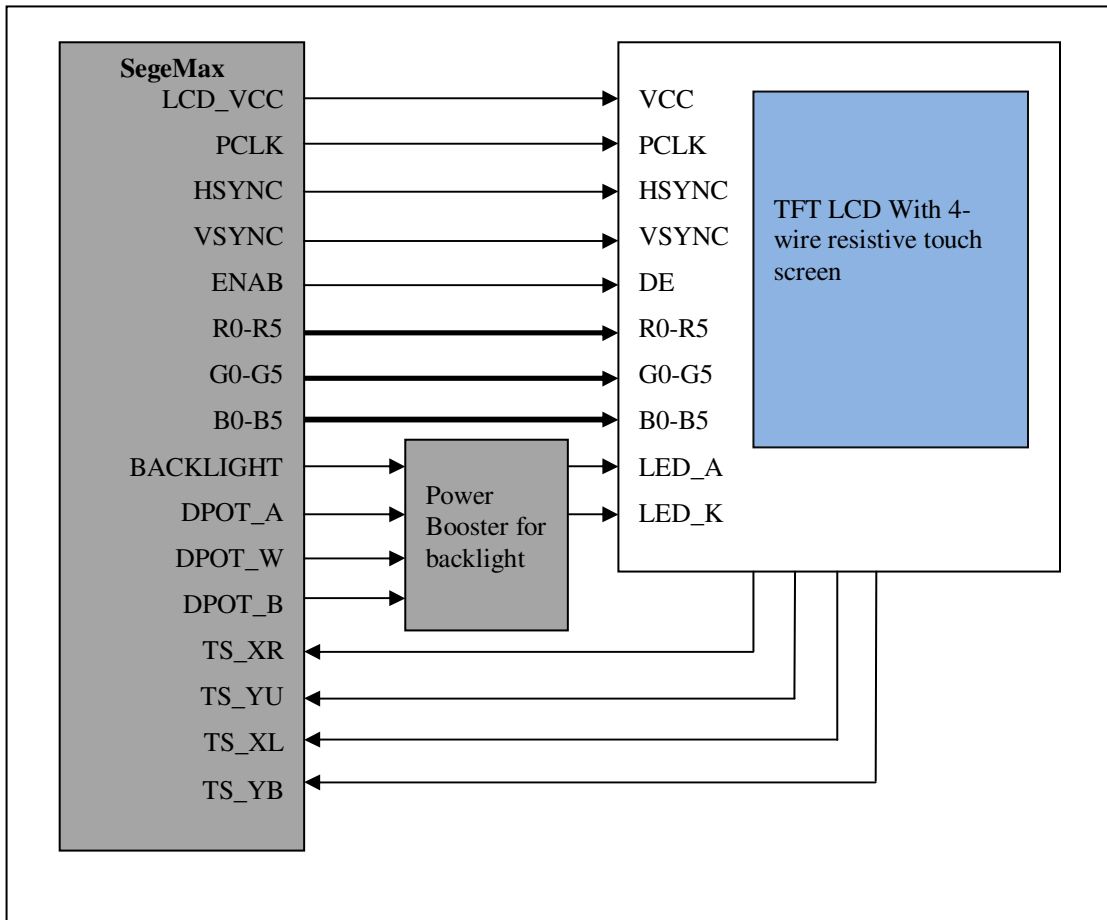
J2 (50Pos, 2mm, DIL Header)

| J2 Pin Name | Pin # | Type | Tolerance | Description |
|--------------------|--------------|-------------|------------------|--|
| ICSP_VPP | 1 | PWR | - | Leave Open. This pin is used to program the microcontroller on board |
| VCC | 2 | PWR | 3.3V | 3.3V Power Input |
| VCC | 3 | PWR | 3.3V | 3.3V Power Input |
| GND | 4 | PWR | 0V | Power Ground |
| GND | 5 | PWR | 0V | Power Ground |
| NC | 6 | | | Not Connected. Leave Open. |
| ICSP_PGD | 7 | DIO | 3.3V | Leave Open. This pin is used to program the microcontroller on board |
| NC | 8 | | | Not Connected. Leave Open. |
| ICSP_PGC | 9 | DIO | 3.3V | Leave Open. This pin is used to program the microcontroller on board |
| NC | 10 | | | Not Connected. Leave Open. |
| NC | 11 | | | Not Connected. Leave Open. |
| NC | 12 | | | Not Connected. Leave Open. |
| NC | 13 | | | Not Connected. Leave Open. |
| NC | 14 | | | Not Connected. Leave Open. |
| RX | 15 | DIN | 3.3V | UART Receiver Input. This pin should be connected to the host UART Tx. |
| TX | 16 | DOUT | 3.3V | UART Transmitter Output. This pin should be connected to the host UART RX. |
| NC | 17 | | | Not Connected. Leave Open. |
| NC | 18 | | | Not Connected. Leave Open. |
| NC | 19 | | | Not Connected. Leave Open. |
| NC | 20 | | | Not Connected. Leave Open. |
| NC | 21 | | | Not Connected. Leave Open. |
| GND | 22 | PWR | 0V | Power Ground |
| RS485_DE | 23 | DOUT | 3.3V | Active High. This pin is used to turn the RS485/RS422 Transmitter On or Off. |
| BACKLIGHT | 24 | DOUT | 3.3V | Active High. This pin is used to turn the LCD backlight power converter On or Off |
| NOTIFYHOST | 25 | DOUT | 3.3V | Active High. This pin is used to Notify the host (if is enabled by software) if an object (like button) has been touched by the user. A pulse of 10msec width will be generated every time an object is touched. This pin should be connected to the host external interrupt. |
| READY/BUSY | 26 | DOUT | 3.3V | Active Low. This pin is used to indicate the status of the controller. If it is Low, then the controller is Ready for a new command. If it is High, then the controller is Busy and the Host should wait before sending any new commands. This pin should be connected to one of the host GPIO and the host needs to check it before sending commands. |
| LED_HB | 27 | DOUT | 3.3V | Active High. This pin is used to drive the Heart Beat LED. The Heart Beat LED will flicker normally at a rate of |

| | | | | |
|---------|----|------|------|---|
| | | | | 10HZ. This pin should be connected to a LED through a limiting resistor |
| BUZZER | 28 | DOUT | 3.3V | Active High. This pin is used to turn a Buzzer On or Off |
| LED_TX | 29 | DOUT | 3.3V | Active High. This pin is used to drive a Transmitter LED through a limiting resistor. The TX LED will turn on every time SegeMax send data to the host. |
| LED_RX | 30 | DOUT | 3.3V | Active High. This pin is used to drive a Receiver LED through a limiting resistor. The RX LED will turn on every time SegeMax receive data from the host. |
| NC | 31 | | | Do not connect. Leave open. |
| RESET | 32 | DIN | 3.3V | Active Low. This pin is used to reset SegeMax. Leave open if not used. |
| NC | 33 | | | Do not connect. Leave open. |
| NC | 34 | | | Do not connect. Leave open. |
| DPOT_A | 35 | ANA | 3.3V | Digital POT A Terminal. |
| DPOT_W | 36 | ANA | 3.3V | Digital POT Wiper Terminal. |
| DPOT_B | 37 | ANA | 3.3V | Digital POT B Terminal. |
| NC | 38 | | | Do not connect. Leave open. |
| TS_XR | 39 | ANA | 3.3V | Touch Screen X Right. |
| TS_YU | 40 | ANA | 3.3V | Touch Screen Y Up. |
| TS_XL | 41 | ANA | 3.3V | Touch Screen X Left. |
| TS_YB | 42 | ANA | 3.3V | Touch Screen Y Bottom. |
| KP_ROW1 | 43 | DIO | 3.3V | Key Pad Row 1 |
| KP_ROW2 | 44 | DIO | 3.3V | Key Pad Row 2 |
| KP_ROW3 | 45 | DIO | 3.3V | Key Pad Row 3 |
| KP_ROW4 | 46 | DIO | 3.3V | Key Pad Row 4 |
| KP_COL1 | 47 | DIO | 3.3V | Key Pad Colum 1 |
| KP_COL2 | 48 | DIO | 3.3V | Key Pad Colum 2 |
| KP_COL3 | 49 | DIO | 3.3V | Key Pad Colum 3 |
| KP_COL4 | 50 | DIO | 3.3V | Key Pad Colum 4 |

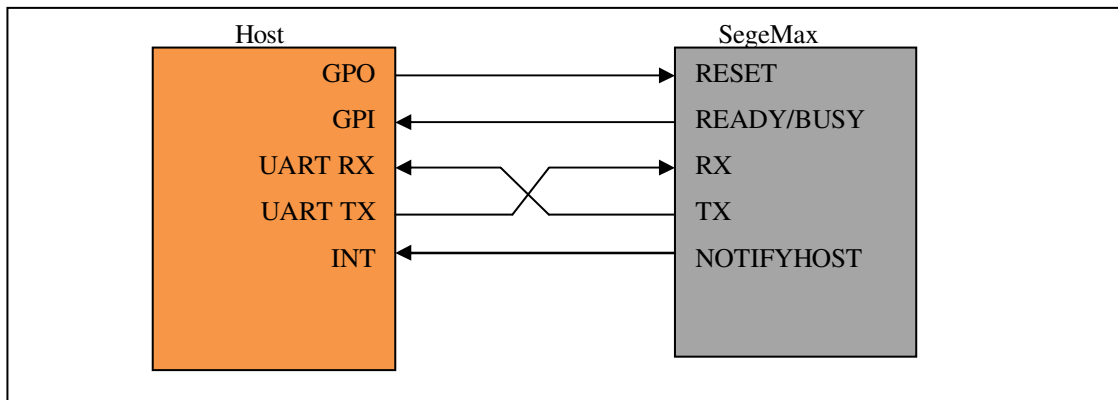
10. LCD Interface:

SegeMax can drive a TFT color LCD with 6-Bit Digital RGB bus or 8-Bit Digital RGB bus. The figure below shows how to interface SegeMax to 6-bit RGB LCD.



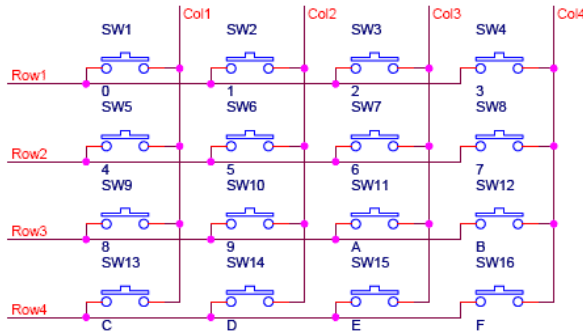
11. Host Interface:

SegeMax can be interfaced to any microcontroller or processor with UART. With SegeMax, even 8-bit microcontroller can have a color touch surface. The figure below shows the basic interface between SegeMax and general microcontroller.



12. External Keyboard:

SegeMax has a 4X4 matrix keypad controller. Two keys can be pressed simultaneously, and will generally be decoded correctly by the keypad scanning circuitry. The keypad de-Bounce time is set to 50msec.



13. Dip Switches:

SegeMax has 4 Dip-Switches which can be used by the user to configure the board. The power must be turned off and then on for the new settings to be active.

| Dip Switch # | OFF Position | ON Position | Default Position |
|--------------|-----------------------|------------------------|------------------|
| 1 | Normal Operation | Demo Mode | ON |
| 2 | Normal Operation | Programming Mode | OFF |
| 3 | Default Configuration | User Configuration | OFF |
| 4 | Normal Operation | Calibrate Touch Screen | OFF |

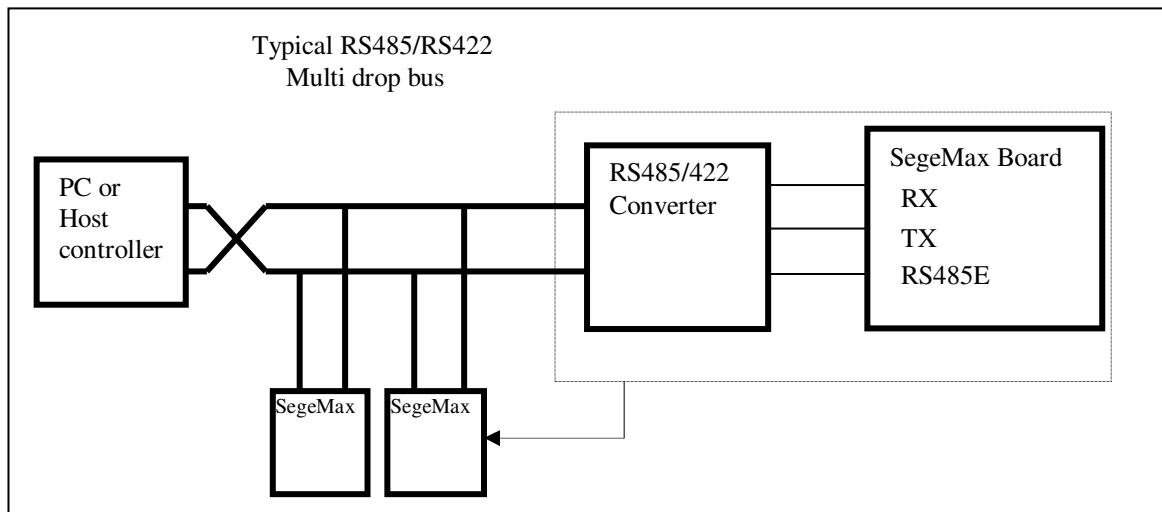
For normal operation, keep dip switch 1, 2 and 4 in OFF position. At power-on or after a reset, the board will read the configuration bytes from the program memory (default) if dip switch 3 is OFF or from the flash memory (user) if dip switch position is ON. See SEGE software manual for more information about the configuration bytes.

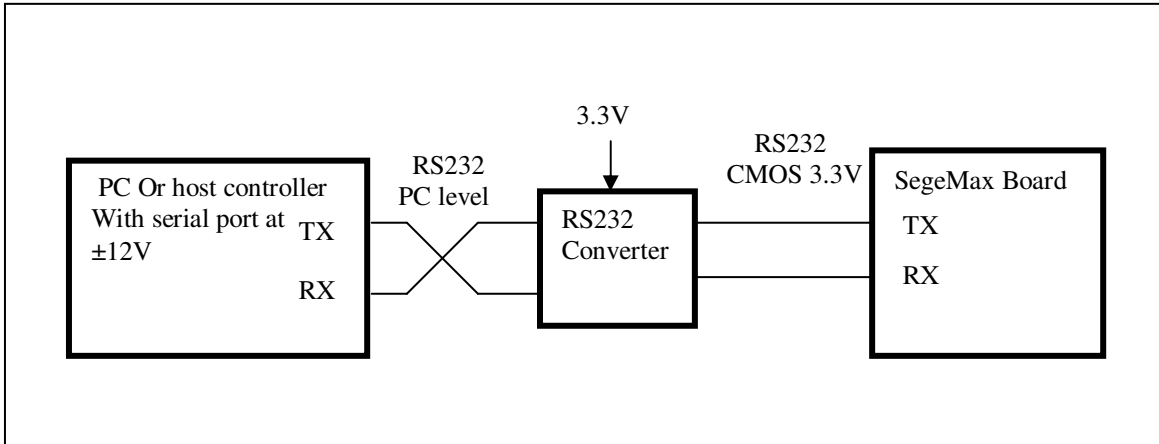
14. RS232 and RS485 communication:

SegeMax has one serial port, which can be used as RS232, RS422 or RS485. All signals (RX, TX and RS485-DE) are at CMOS level (3.3V). By default, the serial communication is 115.2KB/Sec baud, 8 data bits, and no parity with one stop bit. For PC RS232 communication, RS232 driver (like MAX3232) is needed to convert the signal level from 3.3V to $\pm 12V$.

Multipoint RS485/422 communication bus can be also used by the host controller to communicate with multiple SegeMax boards. Each board must have a unique address (from 1 to 254) or DeviceID (DVID) which can be set in software. The default DVID is 16.

RS485_DE output is used to enable/disable the RS485/422 transmitter driver.





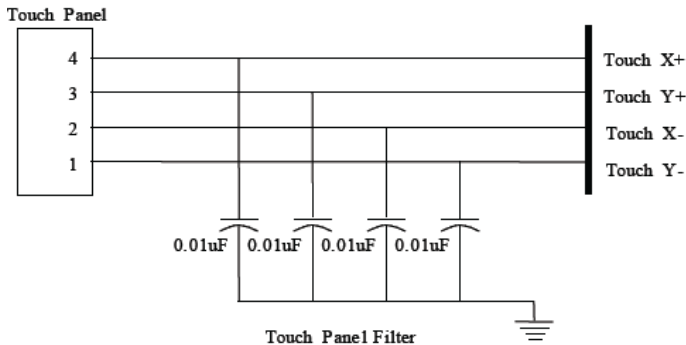
15. Digital POT:

SegeMax has one MCP4141 7-Bit Digital POT from Microchip. It can be used to control the brightness of the LCD or any other functions. The wiper position is not saved in the EEPROM and the host needs to adjust it at every reset or power-on. Keep the voltage at DPOT_A or DPOT_B at 3.3V or lower.

16. Touch Screen:

SegeMax can drive any 4-wire resistive touch screen. Four 0.01uF capacitors are needed from each touch screen pin to GND. Place those capacitors as close as possible to the touch screen connector.

Touch Panel Filter+

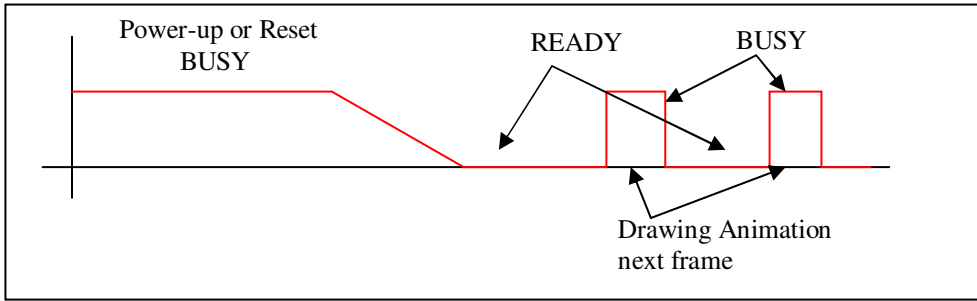


17. Grounding:

In order for the touch screen to work properly with a panel that has a CCFL backlight, the panel metal frame must be grounded to the board ground. The panel frame must be connected to ground directly or through a transient protection diode for ESD. This is not necessary if the panel has LED backlight.

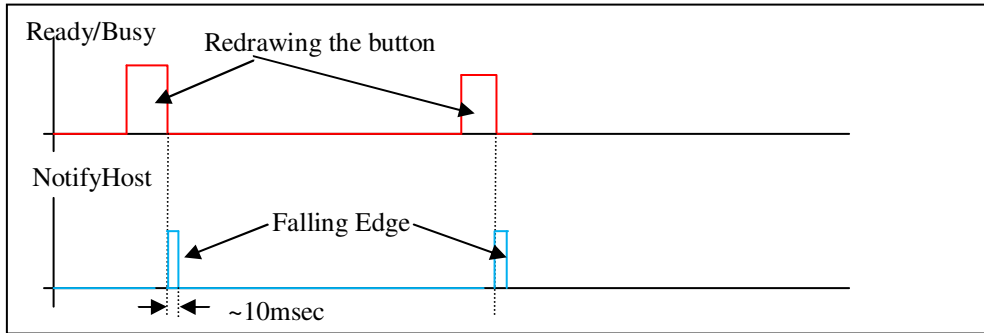
18. Ready/Busy signal:

The Ready/Busy signal indicates if SegeMax is Busy or Ready for a new command. After power-up or reset, SegeMax goes into busy (high) state for 500msec and then goes to ready (low). Animation and all other objects that required to be redrawn after receiving a touch event like Button and Slider will cause SegeMax to be busy for certain period of time. During this period, SegeMax may not process any received command. The host needs to monitor this signal and send only new commands when it is in ready state. The figure below shows the typical Ready/Busy signal with animation running.



19. NOTIFYHOST Signal:

NotifyHost signal indicates if an object has been touched by the user. A pulse of 10msec with 10msec width will be generated (if it is enabled by software) if the object is touched and immediately after redrawing the object. This pulse can be used to interrupt the host at the falling edge. At the ISR, the host needs to send the object command “Screen/Window_GetUIMsg”. The figure below shows NotifyHost signal for a button.



20. Software Command Reference:

The software commands and GUI are described in a separate document, **the SegeMax Software Reference manual**.

21. Manual Change History:

| Date | Revision | Change |
|-----------|----------|--------------------------------|
| 1/08/2011 | REV1.00 | Initial version of this manual |
| | | |
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Hardware Limited Warranty

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Return freight charges following repair of items under warranty shall be paid by Haidar, shipping by standard ground carrier. In the event repairs are found to be non-warranty, return freight costs shall be paid by the purchaser.