Synth-A-Scope Module

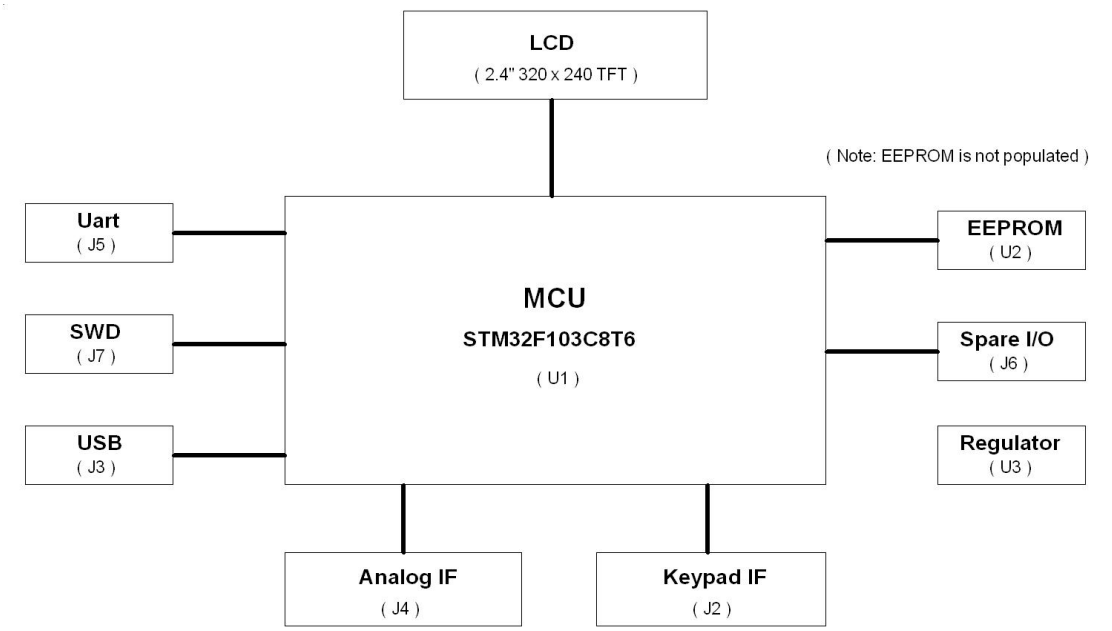
Summary

The Synth-A-Scope Module single-channel oscilloscope controller is based on ARM Cortex-M3 micro-controller STM32F103C8T6 from ST and consists of an on-board 2.4" 320x240 TFT LCD display, analog interface, and keypad interface. UART, USB, and spare I/O ports are also provided for possible expansion (these ports have no function as of current firmware).

The Synth-A-Scope Module oscilloscope controller uses +5V from the keypad interface (J2) as power supply.

SWD (Single Wire Debugger) port (J3) is for programming the micro-controller U1.

Alternatively, the micro-controller can also be programmed via the UART port.



Block diagram of the controller

Interfaces

Analog Interface

Pin	Signal Name	Dir	Function
1	VSENSEL1	In	Position detect of sensitivity selection switch 1
2	ADCIN	In	ADC input (from analog channel)
3	VSENSEL2	In	Position detect of sensitivity selection switch 2
4	TL_PWM	Out	PWM signal for trigger level generation
5	CPLSEL	In	Position detect of couple switch
6	TRIG	In	Trigger signal
7	GND	-	Ground
8	GND	-	Ground

Keypad Interface

Pin	Signal Name	Dir	Function
1	BTN2	In	Button 2 detection
2	BTN1	In	Button 1 detection
3	BTN4	In	Button 4 detection
4	BTN3	In	Button 3 detection
5	LED	Out	Driving LED
6	NC	-	No connection
7	+5V	-	+5V power supply input
8	+5V	-	+5V power supply input
9	GND	-	Ground
10	GND	-	Ground

Specifications

Electrical

Parameters	Values	Remarks
Power supply voltage	4.5V --- 7V	
Power supply current	70mA (typical)	
Low level input voltage	1.1V (max)	For digital input pins except BTN[1:4]
High level input voltage	2.2V (min)	For digital input pins except BTN[1:4]
Low level input voltage	0.8V (max)	For BTN[1:4]
High level input voltage	2.0V (min)	For BTN[1:4]
Output low level voltage	0.4V (max)	At 8mA current
Output high level voltage	2.9V (min)	At 8mA current
ADC input voltage range	0V – 3.3V	

General

Parameters	Values
Real-time sampling rate	1MSPS (max)
Sensitivity	10mV/div – 5V/div (in “1-2-5” steps)
Timebase	10us/div – 500s/div (in “1-2-5” steps)
Capture buffer size	1024 bytes
Trigger modes	Auto/Norm/Single
Display size	2.4”
Display resolution	320 x 240

Application Information

Power Supply

Power is supplied through connector J2. It should be in the range 4.5V to 7V

Connection to Analog Channel

The connector J4 is for connecting to the analog channel. The schematic shows a typical analog channel and how it is connected to the analog interface of the Synth-A-Scope Module.

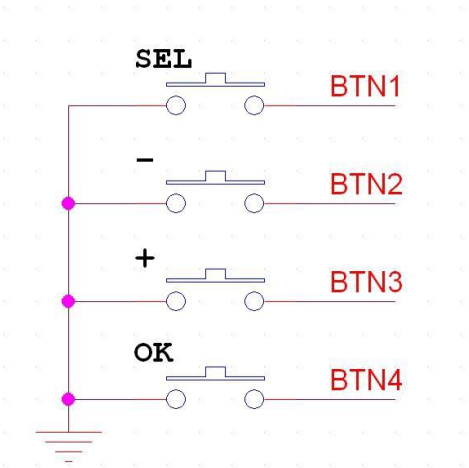
The signals CPLSEL, VSENSEL1, and VSENSEL2 are used to detecting switch position by measuring the voltage generated by a resistor divider that relates to switch setting.

The signal TL_PWM is fed to a low-pass filter to extract its DC component and used as trigger level input to a comparator.

ADCIN is the output of analog channel. The comparator compares analog output with the trigger level and produces trigger signal TRIG.

Button Connections

The connector J2 is for connecting to operation buttons.



Illustrating the typical connections for buttons.

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Operations

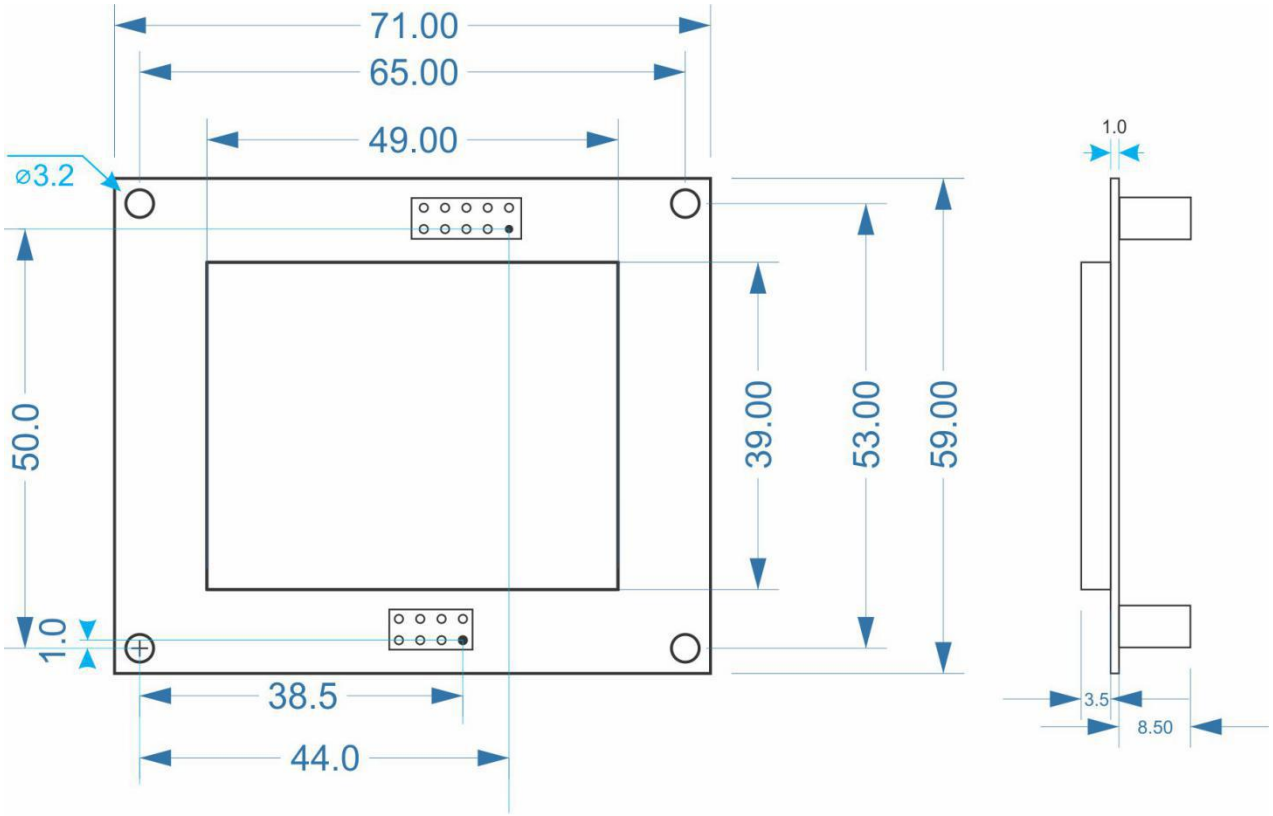
1) Basic operations

- Select the parameter to be adjusted by pressing the [SEL] button. The selected parameter will be highlighted.
- Use [+] or [–] buttons to change the selected parameter to the value you want.
- Pressing the [OK] button will make the scope enter HOLD state and freeze the displayed waveform. Pressing the same button again will de-freeze display and scope returns to normal state.

2) Advanced operations

Functions	Operations
VPos Alignment	Set Couple Switch to GND position. Push SEL to highlight vertical position indicator and hold down OK button for about 3 seconds.
Measurements ON/OFF	Push SEL to highlight timebase and hold down [OK] button for about 3 seconds. This will turn ON or OFF on-screen display of measurements including Vmax, Vmin, Vavr, Vpp, Vrms, Freq., Cycle, Pulse width, and Duty cycle.
Save Waveform	Press SEL & + simultaneously to save currently displayed waveform to EEPROM. The existing data in EEPROM will be over-written.
Recall Waveform	Press SEL & - simultaneously to display saved waveform. Recalled waveform is always displayed in Hold state.
Default Restore	Hold down + and - buttons simultaneously for about 3 seconds to restore factory default settings.
Center HPos	Push SEL to highlight horizontal position indicator and hold down OK button for about 3 seconds. This will make the center portion of waveform displayed.
Center Trigger Level	Push SEL to highlight trigger level indicator and hold down OK button for about 3 seconds. This will set the trigger level to the medium value of current signal amplitude.

Mechanical



Schematic

See attached