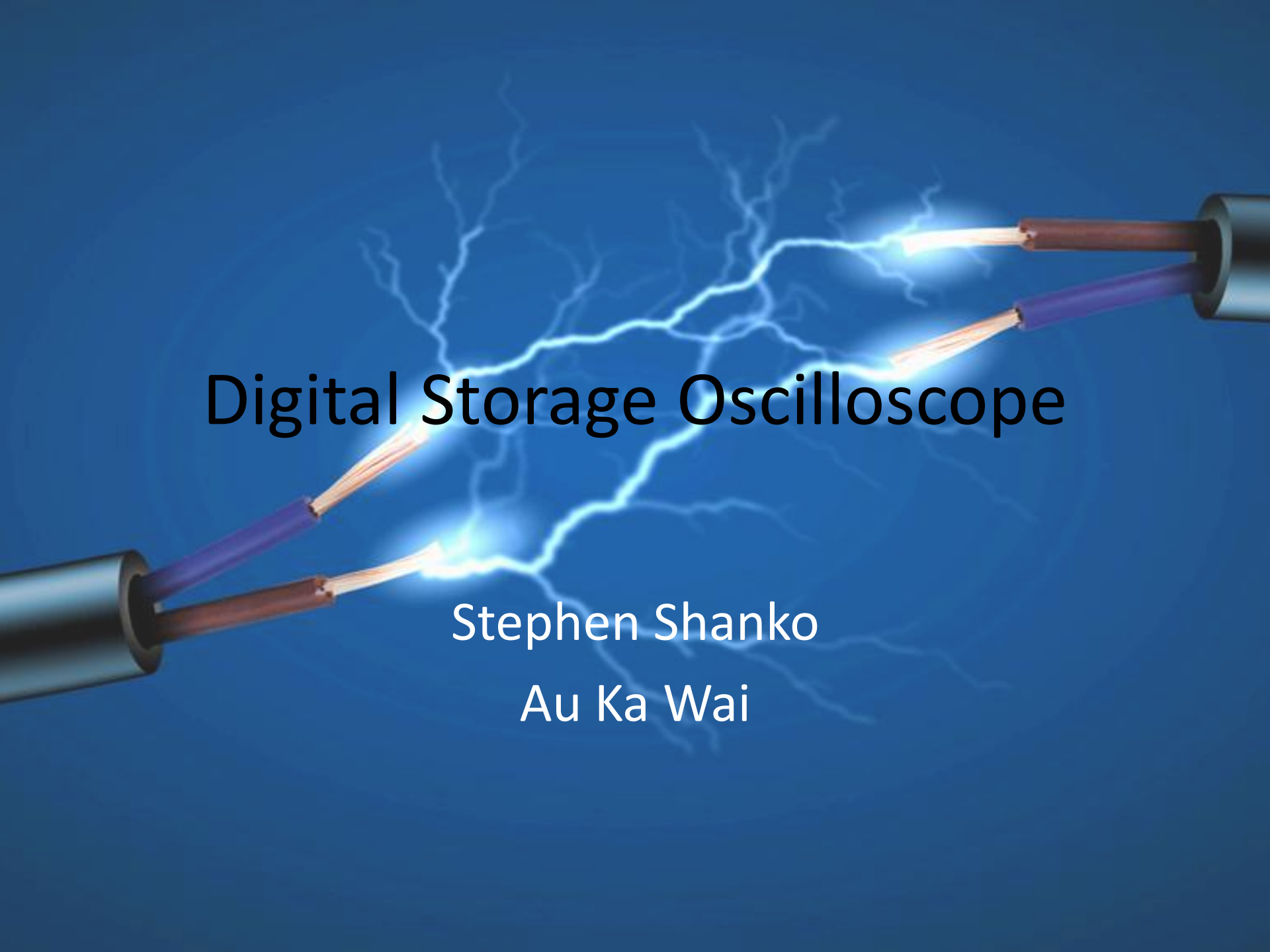


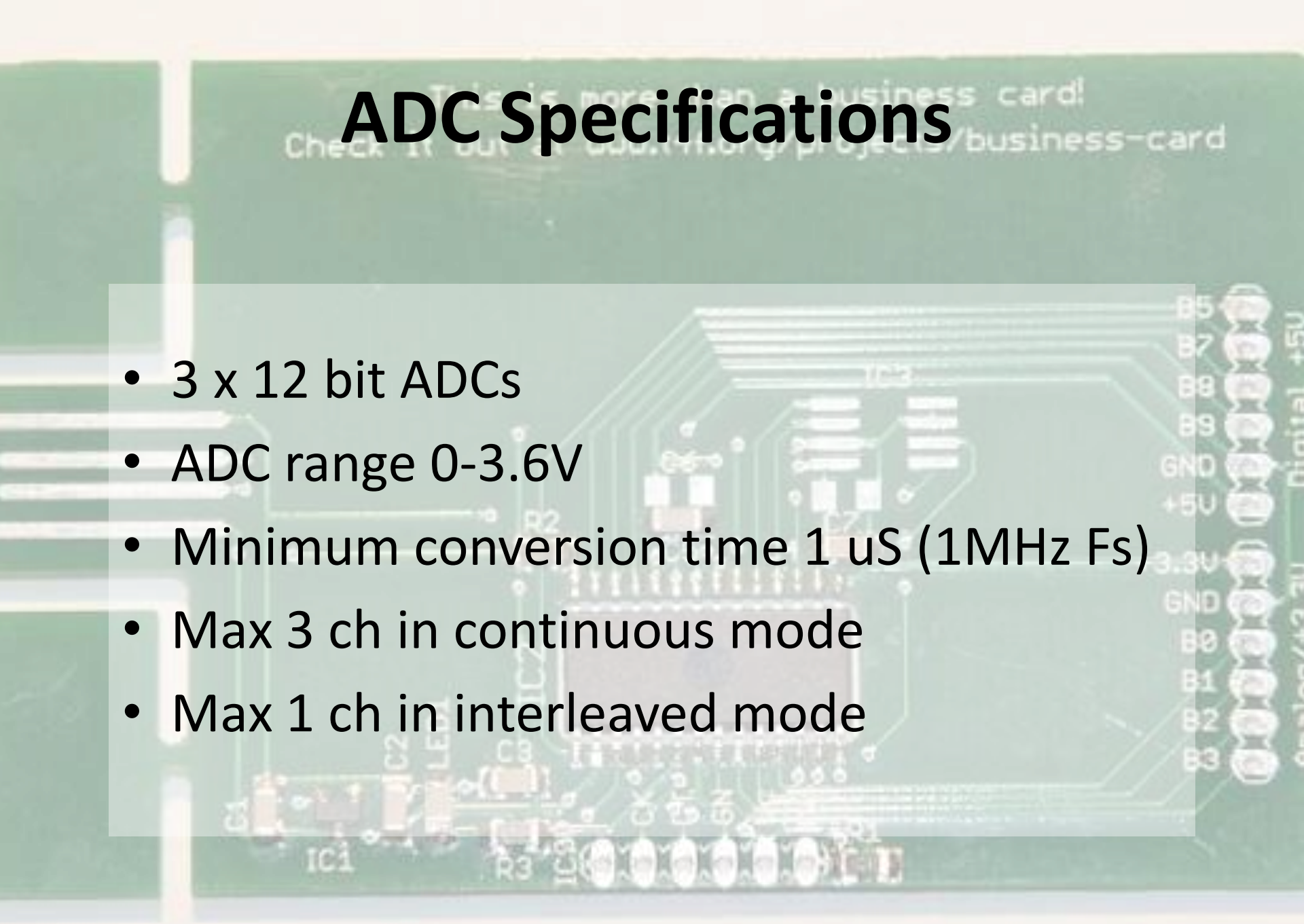
Digital Storage Oscilloscope

Stephen Shanko

Au Ka Wai

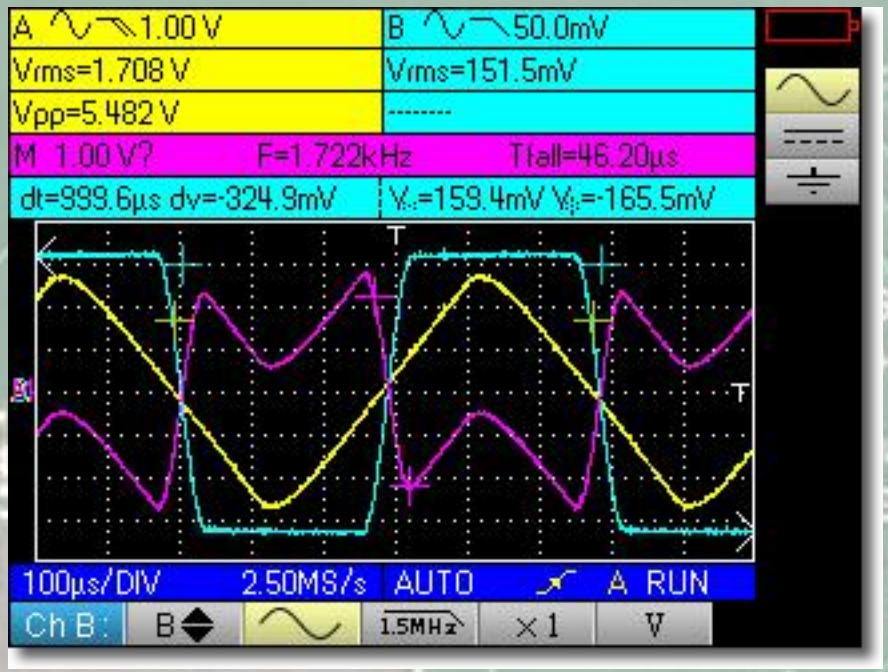
ADC Specifications

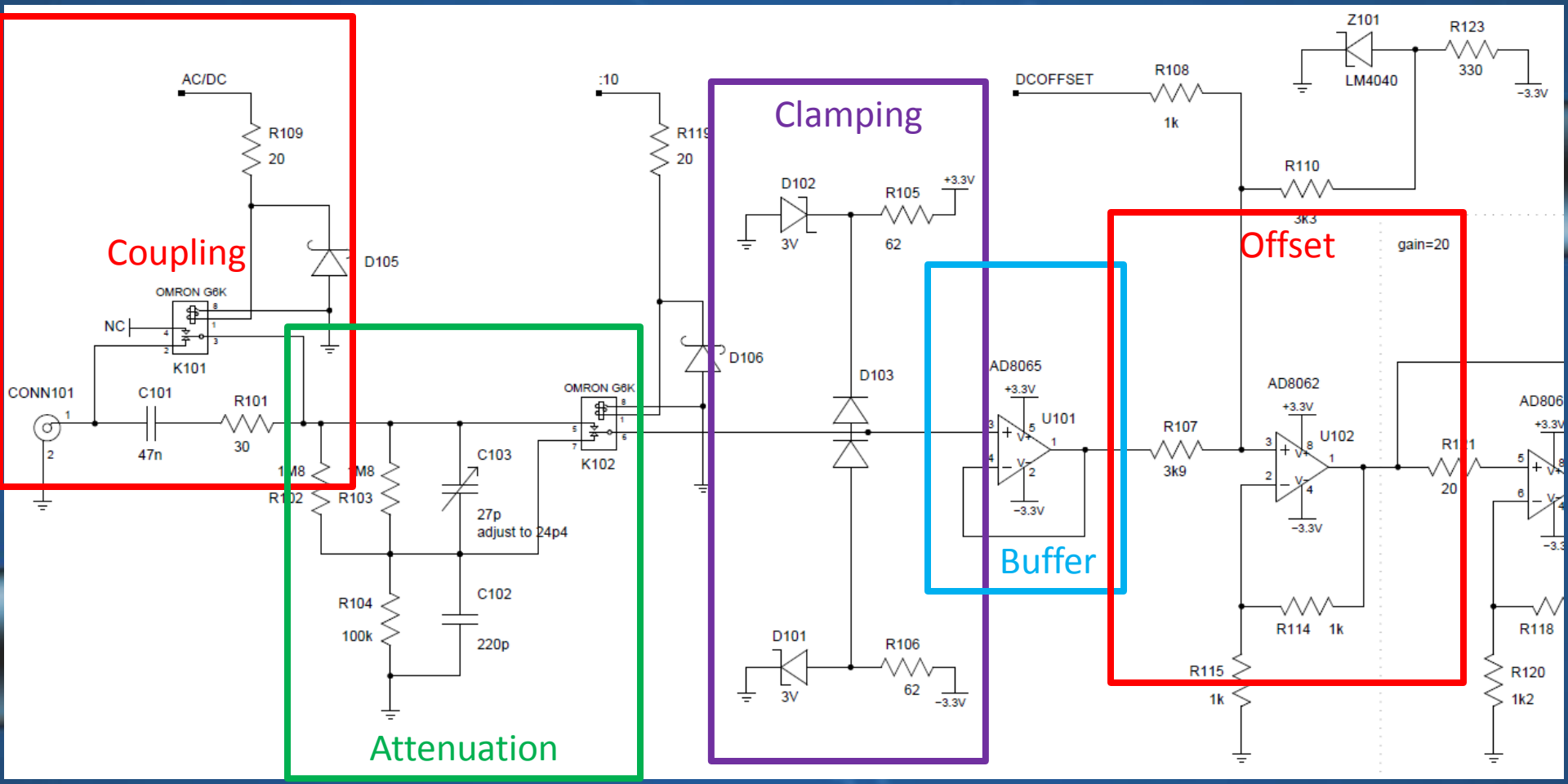
- 3 x 12 bit ADCs
- ADC range 0-3.6V
- Minimum conversion time 1 uS (1MHz Fs)
- Max 3 ch in continuous mode
- Max 1 ch in interleaved mode



Interface Features

- Display waveforms from -6V to +6V peak to peak
- Two channels of data
- Frequency analysis of waveform
- Touch control of settings and axis scaling
- Simple computations such as peak voltage, RMS voltage, cursors, phase difference, signal addition and subtraction, to be implemented in software





Analog Input Stage designed by Stephan Walter

LCD Touchscreen Display

- Touch gestures to control features such as time scale, amplitude scale, DC offset, etc
- Hardware detects gestures and touches and communicates with STM32 via I2C
- Color LCD allows for each channel to have a different color
- LCD is controlled via GPIO bus

Capacitive Touch Panel Registers

Address	Name	B7	B6	B5	B4	B3	B2	B1	B0	Access
00h	DEVICE_MODE		Device Mode [2..0]							R/W
01h	GEST_ID	Gesture ID [7..0]								R
02h	TD_STATUS						Touch Points [3..0]			R
03h	TOUCH1_XH	Event Flag				1st Touch X Position MSB [11..8]				R
04h	TOUCH1_XL	1st Touch X Position LSB [7..0]								R
05h	TOUCH1_YH	Touch ID [3..0]				1st Touch Y Position MSB [11..8]				R
06h	TOUCH1_YL	1st Touch Y Position LSB [7..0]								R
07h										R

LCD Control

We will use different colors each channel, and have dedicated channel selection buttons on the touchscreen

$$\frac{T\ sec}{div} * x\ div * Fs * \frac{1}{H\ px} = \frac{samples}{px}$$

Fs and H are fixed based on the implementation, the user will select T, and we will calculate how many samples will represent each pixel

~Range $20Hz \rightarrow 500kHz$ $\frac{5mS}{div} \rightarrow \frac{.5uS}{div}$

~Domain $-6 \rightarrow 6V$ $\frac{10mV}{div} \rightarrow \frac{1V}{div}$

For the domain $0 \rightarrow 3.6V$ maps to 272 pixels

For example:

A 4.3" Screen contains 480x272 px

10 x divisions and 6 y divisions with Fs=1Mhz

User inputs T = 10uS

$$\frac{10^7}{480} * T = \frac{samples}{px} = \frac{.208\text{samples}}{\text{px}}$$

In the real system there are two distinct cases where $\frac{samples}{px} > 1\ and\ where \frac{samples}{px} < 1$

These correspond to averaging and interpolating and with a fixed Fs this is based entirely on T