

Low Cost Logic Analyzer Demo

Riverside Raspberry
May 13, 2019

John Sheehan

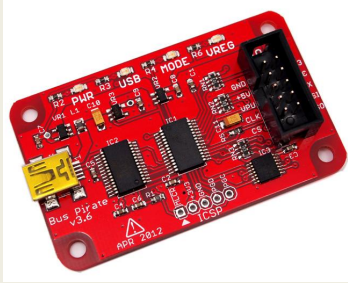
Introduction

What is a logic analyzer and how is it different than an oscilloscope?

- A logic analyzer measures and records digital (binary) waveforms
- Oscilloscope is about the voltage/waveform (analog)
- Logic analyzer is about the bits (digital)
- Oscilloscope will show quality of signal (ripple & spikes)
- Logic analyzer will just show logic (1s & 0s based on threshold)
- Logic analyzer can decode signals to show purpose
- Both show timing

Introduction

There are a number of different logic analyzer devices out there:



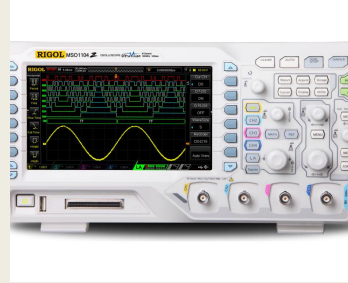
Bus Pirate



DSO Nano



Saleae



MSO Oscilloscope



Bitscope

Introduction

This one is a clone of a Saleae from a few years ago

- You can find them on ebay, Amazon, and AliExpress for \$6-\$20
- Cheap enough for any hobbyist to have one on hand
- Easy to use
- Utilizes open-source software

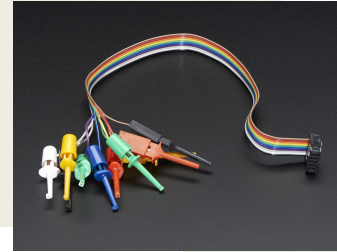


Features

- Digital only (but so is the Raspberry Pi so...)
- It's cheap!
- Open-source software is very versatile and expandable
- 8 input channels (vs 16 or 24 of more expensive ones)
- Relatively limited bandwidth (24mhz vs 100mhz or more)
- Great for hobbyist use
- Includes case

Probes

- F-F dupont jumpers (included)
- F-M dupont jumpers
- Probe hook set
(same as bus pirate v3 w/10 points)
- Roll your own
(FC-10P IDC Socket Connector)



Software

Saleae Logic

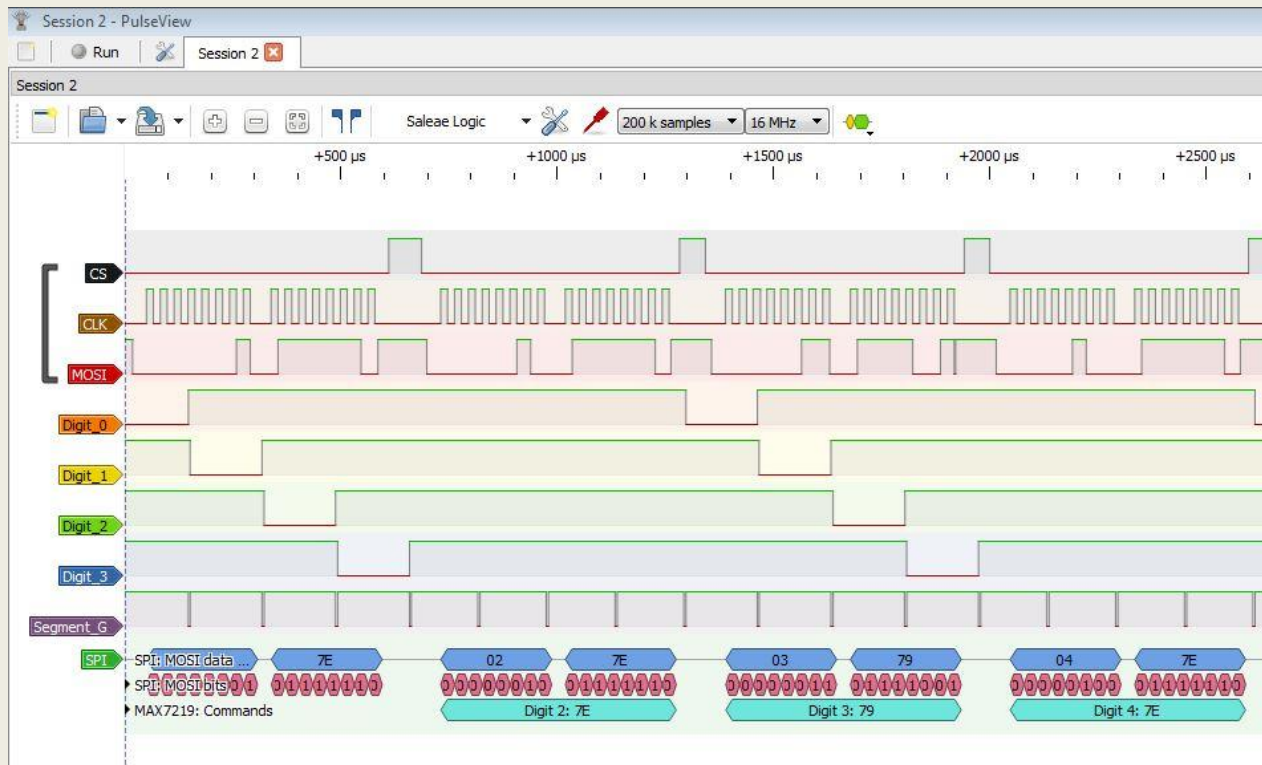
- Proprietary
- May not work with cloned hardware

Sigrok Pulseview

- <https://sigrok.org/doc/pulseview/unstable/manual.html>
- Cross platform (do self-diagnosis on RasPi?)
- Can be used with multiple devices (LA, DSO, MSO, DMM?)
- Extensible using Python (Create your own decoders!)

Software

Overview



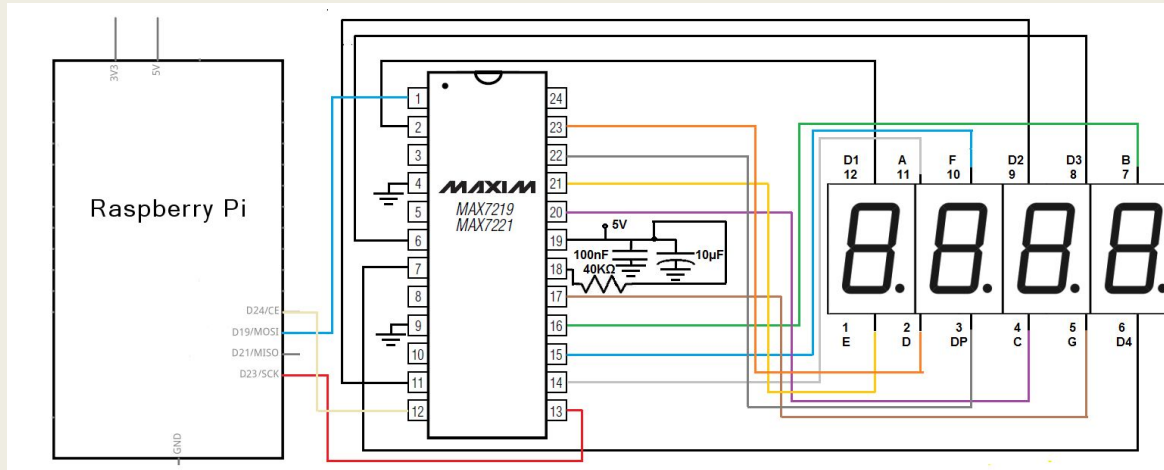
DEMO!

- Basic settings
 - Channels
 - Sample number & sample frequency
- Data Capture
 - Run / Stop
 - Zoom level
 - Cursors
- Triggers
 - Low / High
 - Falling / Rising / Both
- Decoders
 - Decoder Stacking

DEMO!

Example Circuit

- Raspberry Pi with SPI
- MAX7219 LED Display Driver
- 4 Digit 7-Segment LED Display
- Logic Level Shifter (changes 3.3V signals to 5V)



Resources

- Hardware:

<https://www.amazon.com/gp/product/B077LSG5P2>

https://www.ebay.com/sch/i.html?_nkw=8+channel+logic+analyzer

<https://www.aliexpress.com/af/8-channel-logic-analyzer.html?SearchText=8+channel+logic+analyzer>

- Sigrok Pulseview

https://sigrok.org/wiki/Main_Page