

SAAB – Basic Electronics Training

Scilabus

- Analogue Devices & Circuits
- Digital Devices & Circuits
- Embedded Programming
- Schematic Capturing & PCB Design
- Mechanical CAD

Topics

Analogue Devices & Circuits

1. Basic Mathematics (mainly Algebraic Manipulation)
2. Using Unit Prefixes (e.g. giga, mega, kilo, milli, micro, nano, pico, etc.)
3. Electricity, Magnetism and Atomic Structure of Conductors & Semiconductors
4. Potential Difference (V), Current (A), Power (Watts & Decibel), Frequency (Hz)
5. Passive Components and Symbols: Resistance (Ω), Capacitance (F), Inductance (H), Transformer, Diode
6. Passive Component Circuits/Applications – Source, Path, Load
7. Transfer Functions - DC Analysis/AC Analysis
8. Laws and their practical usage & benefits – Ohm, Norton, Thevenin, Kirchhoff (KCL/KVL)
9. Introduction to - Active Components/Circuit Application: Transistors
10. Basics on Using Datasheets (e.g. Features, Performance, Min/Max Characteristics, Diagram, Waveforms, Dimensions, Applications)

Analog Circuit Simulation

Components

File explorer

Search Components

Meters

Probe

Voltmeter

Ammeter

Frequency Meter

Oscope

Logic Analyzer

Sources

Fixed Voltage

Clock

Wave Generator

Voltage Source

Current Source

Controlled Source

Battery

Rail

Ground (0 V)

Switches

Push

Switch (all)

Switch Dip

Relay (all)

KeyPad

Passive

Resistors

Resistor

ResistorDip

Potentiometer

Variable Resistor

Resistive Sensors

Reactive

Active

Rectifiers

Transistors

Other Active

Outputs

Leds

Displays

Motors

SimulIDE-1.1.0-SR1 - 555Timer.sim1

Stopped

Simulation Time:
00:01:09 s 402 ms 700 µs 000 ns 001 ps

Target Speed: 100.00 %
Real Speed: 000.00 %

Engine Load: 000.00 %
Update Load: 000.00 %

Real FPS: 0

Simulation Running...

Simulation Stopped

Circuit Saved:
/home/llewellyn/Documents/SimulIDE_workspace/Basic_Electronics/555Timer.sim1

Topics

Digital Devices & Circuits

1. Analogue & Digital Systems
2. Binary Digits & Logic Levels
3. Digital Waveforms
4. Pulse Definitions
5. Periodic Pulse Waveforms
6. Timing Diagrams
7. Serial & Parallel Data
8. Basic Logic Functions (AND, OR, NOT, XOR)
9. Basic System Functions (Latches, Comparator, MUX, DEMUX, Arithmetic, Encoding, Decoding, Counters)
10. Integrated Circuits
11. Test & Measurement Instruments (Oscilloscope, Multimeter, Logic Analyzer)
12. Programmable Logic (PLD, FPGA, Microcontrollers)

Digital Circuit Simulation

Components

File explorer

Search Components

MCS65

Z80

Arduino

Shields

Sensors

Peripherals

Logic

Gates

Buffer

And Gate

Or Gate

Xor Gate

Arithmetic

Memory

Converters

Other Logic

ADC

DAC

7 Seg BCD

LM555

Ternary

Digital Potentio...

IC 74

IC CD

USSR IC

Other IC

Keys

Led display

Tools

Connectors

Bus

Tunnel.

Socket

Header

Graphical

Image

Text

Rectangle

Stopped

5 V

A B

R1 1 kΩ R2 1 kΩ

Half Adder

Carry Sum

Simulation Time: 00:00:10 s 250 ms 000 μs 000 ns 001 ps

Target Speed: 100.00 %

Real Speed: 000.00 %

Engine Load: 000.00 %

Update Load: 000.00 %

Real FPS: 0

Simulation Running...

Simulation Stopped

Circuit Saved: /home/lllewellyn/Documents/SimulIDE workspace/Basic Electronics/Half Adder.sim1

Topics

Embedded Programming

1. Digital I/O
2. Analog Input (ADC)
3. Analog Output (PWM)
4. Sensors (e.g. temperature, light, or motion sensors)
5. Actuators (e.g. buzzers, servo and DC motors)
6. Serial Communication (UART, I2C, SPI)
7. Timers & Counters and Delays
8. Software Structure
9. Integrated Development Environment

Embedded Circuit Simulation

Components

File explorer

Search Components

Meters

Probe

Voltmeter

Ammeter

Frequency Meter

Oscope

Logic Analyzer

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Wave Generator

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Switch Dip

Relay (all)

KeyPad

Passive

Resistors

Resistor

ResistorDip

Potentiometer

Variable Resistor

Resistive Sensors

SimulIDE-1.1.0-SR1 - Arduino_Hardware.sim1

Stopped

The circuit diagram shows an Arduino Uno microcontroller board connected to a 5V power source. The 5V source is connected to a network of resistors and switches. Resistors R5 and R6 are 1 kΩ. Resistors R1, R2, R3, and R4 are 220 Ω. The Arduino Uno is connected to the circuit via its digital pins. The board's pin headers are labeled: 0 RX, 1 TX, 2, 3 PWM, 4, 5 PWM, 6 PWM, 7, 8, 9 PWM, 10 PWM, 11 PWM, 12, 13, GND, Aref, A5, A4, A3, A2, A1, A0, Vin, GND, 5V, 3V3, and RST. The simulation status is 'Stopped'.

Simulation Time: 00:00:00 s 000 ms 000 μs 000 ns 000 ps

Target Speed: 100.00 %

Real Speed: 000.00 %

Engine Load: 000.00 %

Update Load: 000.00 %

NEW CIRCUIT

Initializing 1@mega328-109

1@mega328-109 Initialized

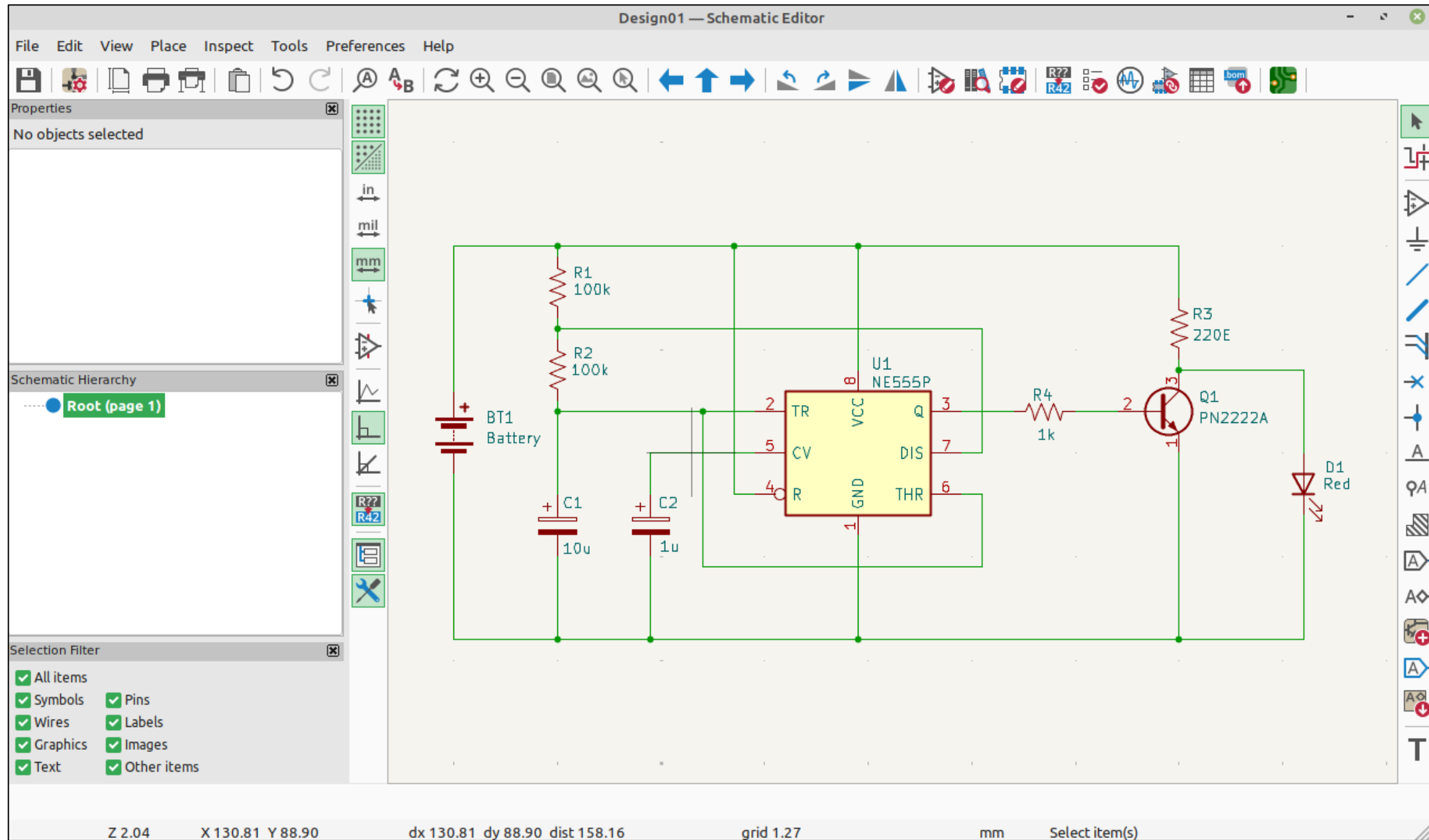
Circuit Loaded:

Topics

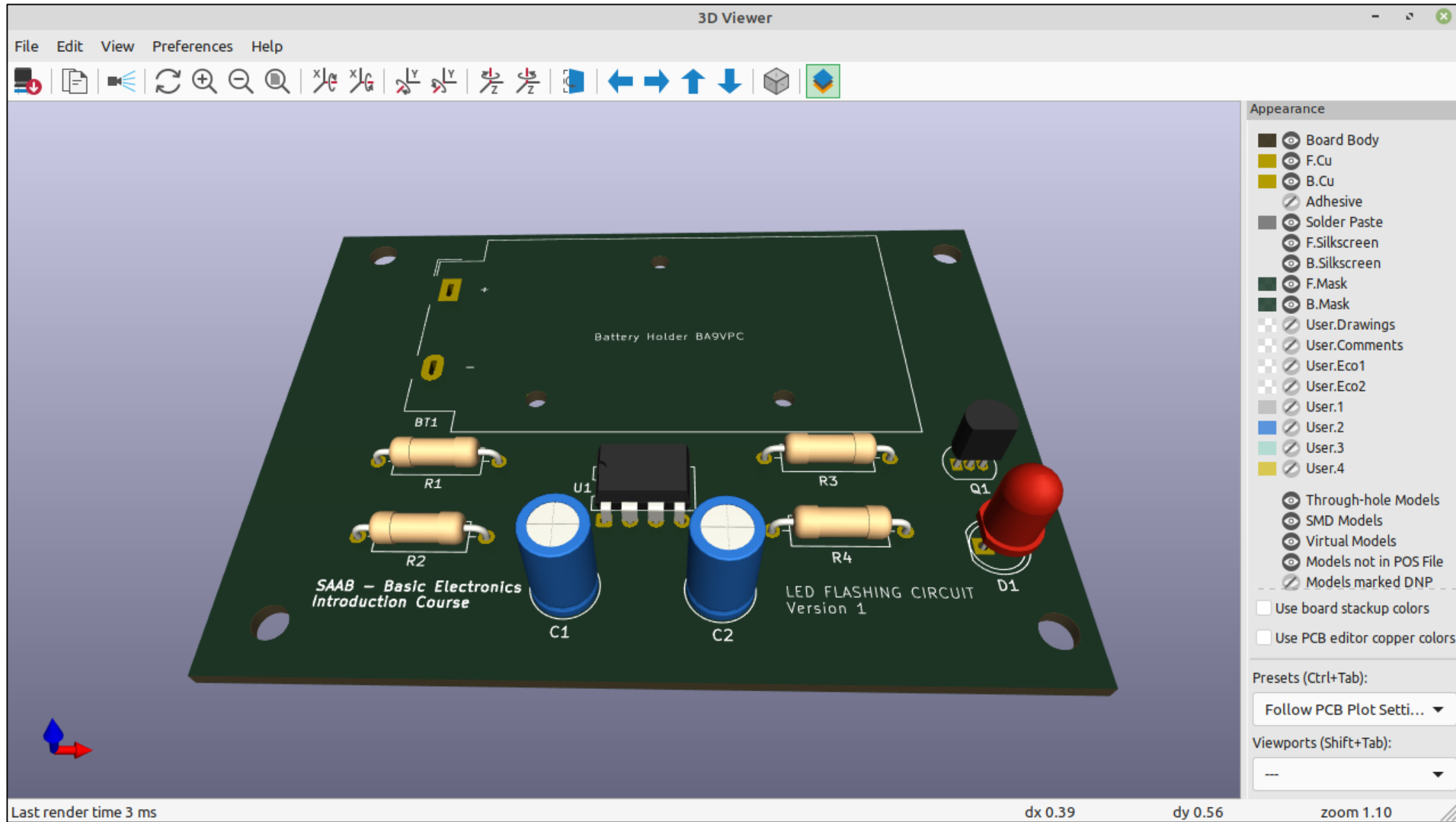
Schematic Capturing & PCB Design

1. Schematic Symbol
2. PCB Footprint
3. Schematic Layout
4. Electrical Rule Check (ERC)
5. PCB Layout
6. Design Rule Check (DRC)
7. PCB Rooting
8. PCB Manufacturing
9. PCB Assembly & Testing

Schematic Capture



PCB Layout 3D Model



Topics

Mechanical CAD

1. Sketcher Workbench Basics
2. Part Design Workbench
3. Turning sketches into 3D parts
4. Fillets, chamfers, and draft angles
5. Editing the model tree
6. Importing STEP files
7. Creating Assemblies
8. Inserting and constraining parts
9. Technical Drawings with Draft & TechDraw Workbenches
10. Adding dimensions, annotations, and title blocks
11. Exporting to PDF or DXF
12. Tolerances and fit basics

Mechanical CAD

