# Crocodile Clips 3
# Example Designs

**Designs marked with a D are available with the demo version as well as with the full version. Designs not marked with a D are only available with the full version of the software.**

**To open the example designs,**

- **click Open in the File menu in Crocodile Clips**
- **open the ‘examples’ folder in your ‘Crocclip’ folder**
- **click on the design you want to open**
- **click on the ‘open’ button**

| Switches | | |
|---|---|---|
| **car1.ckt** | The push-button switch is the brake pedal and the toggle switch controls the head-lamps and rear-lamps. | **D** |
| **car2.ckt** | Same as car1.ckt but with 1Hz flashing indicators. | **D** |
| **doorbell.ckt** | Household doorbell circuit. | **D** |
| **fridge.ckt** | The push-to-break switch turns off the lamp as the fridge door closes. | **D** |
| **landing.ckt** | Two SPDT switches demonstrate how stair landing lights can be operated from the top or bottom of the stairs. | **D** |
| **maze.ckt** | Which switch turns the lamp on? | **D** |
| **motor.ckt** | Operate the DPDT switch to reverse the direction of rotation. | **D** |
| **puzzle.ckt** | Operate the switches so that the lamp turns on. This demonstrates battery shorting and the concept of a circuit. | **D** |
| **Light Outputs** | | |
| **dimmer.ckt** | A variable resistor and a variable voltage supply control the brightness of lamps. | **D** |
| **initials.ckt** | Draw your initials with lamps. In this case the letters P and S demonstrate parallel and series connected lamps. | **D** |
| **torch1.ckt**<br>**torch2.ckt** | A four cell flashlight with the batteries incorrectly connected, and a four cell flashlight with the batteries correctly connected. | **D**<br>**D** |
| **Logic** | | |
| **adder.ckt** | An AND gate and a exclusive-OR gate act as a binary half adder circuit. | **D** |

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| **alarm.ckt** | Imagine the push-button is mounted within a window frame or a car door. If the window is opened the alarm switches on and remains on even if the window is closed again. Operate the toggle switch to reset the alarm. | **D** |
| **decade.ckt** | Decade counter followed by a 4-to-10 line decoder. | **D** |
| **dice.ckt** | A 4-bit binary counter is used in an electronic dice. | **D** |
| **gates.ckt** | A NAND, AND, OR, NOR, exclusive-OR and an inverter. | **D** |
| **nrider.ckt** | "Night Rider" LEDs controlled by a decoded decade counter. | **D** |
| **traffic.ckt** | A 2-bit D-type synchronous counter is decoded for traffic lights. | **D** |
| **traffic2.ckt** | A 2-bit JK synchronous counter is decoded for traffic lights. | **D** |

## Sensors

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| **fuse.ckt** | The fuse blows if too many lamps are switched on at the same time. | **D** |
| **ldr.ckt** | A light detection circuit with variable sensitivity. As the input light intensity is increased the transistor is turned off causing the output LED to turn on. | **D** |
| **optics.ckt** | This is a simple illustration of optical communications. Imagine that the light source and LDR are linked by an optical fibre. | **D** |
| **optics2.ckt** | The optics.ckt circuit plus a transistor amplifier with a gain of 100. | **D** |
| **overheat.ckt** | If the temperature rises above a preset level an alarm sounds. | **D** |
| **pressure.ckt** | The two forces correspond to typical weights of a person and a household animal. This design is an intruder alarm which is set off if a human stands on the pressure sensor, but not if a pet crosses it. | **D** |

## Discrete Semiconductors

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| **darling.ckt** | Two transistors combined as a darlington pair with a current gain of a 100 x 100 = 10 000. Push the button to turn-off the lamp for a fixed period determined by the 100k resistor and the 100uF capacitor. The darlington pair switches on when the base voltage reaches about 1.4V. | **D** |
| **pyramid.ckt** | A pyramid of lamps demonstrates the unidirectional behaviour of diodes. | **D** |
| **rectify.ckt** | This is a basic AC to DC bridge rectifier. For the circuit to simulate correctly set the graph time-per-division to 10mS (or less). Also set the scope Y-limits to +10V and -10V. To see the AC input waveform select the red trace differential option in the scope settings dialog box. | **D** |
| **rectify2.ckt** | The rectify.ckt circuit with a capacitor added to smooth the D.C. voltage. | **D** |
| **rectify3.ckt** | rectify2.ckt with a transformer to step down the mains voltage. | |
| **scr.ckt** | A thyristor is used to control a motor. | **D** |

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| **trans.ckt** | A transistor used as a switch. The transistor turns on when its base-emitter voltage is about 0.7V or more. Note, it is always safer to include a series base resistor to limit the base current. | **D** |

## Linear ICs

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| **555 mono.ckt** | 555 timer IC configured as a mono-stable. Click the push-button to trigger the 555, causing the 555 output, the relay and the lamp to turn on for a fixed period. Probes are in place to observe the 555 waveforms on the graph. | **D** |
| **555 osc.ckt** | 555 timer IC configured as an oscillator. This devious circuit causes two LEDs to flash alternatively. | **D** |
| **invert.ckt** | Op-amp configured as a x10 inverting amplifier. | **D** |
| **non inv.ckt** | Op-amp configured as a x10 non-inverting amplifier. | |
| **opamp.ckt** | This operational amplifier circuit demonstrates the large open loop voltage gain of op-amps, in this case 20 000. This experiment is difficult is reproduce on the bench because imperfections cause real op-amps to give a zero output voltage when the differential input voltage is a few milli-volts. Also resistor tolerances will cause a further imbalance. | **D** |

## Mechanics Experiments

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| **accel.ckt** | The three different masses will accelerate at different rates under the action of the same force. Click the pause button to release the masses. Demonstrates Newton's Second law in action. | |
| **bikegear.ckt** | The effects of gears on rotation speeds. The gear ratios are 8:24and 16:24. | **D** |
| **cart1.ckt** | Graphing the position and velocity of a constantly accelerating mass against time. A weight falling under gravity is attached to the mass via a pulley to provide the accelerating force. | |
| **cart2.ckt** | Graphing the velocity and kinetic energy of a constantly accelerating mass against time. | |
| **cart3.ckt** | Graphing the velocity and acceleration of a constantly accelerating mass against time. | |
| **coll_e1.ckt** | Two carts with the same mass in an elastic collision. Click pause to release the carts. Graphs of velocity and energy against time are drawn, showing that momentum and energy are conserved. To rerun the experiment, reload the design file. | |
| **coll_e2.ckt** | Two carts with the same mass in an elastic collision. Click pause to release the carts. Graphs of position and energy against time are drawn. To rerun the experiment, reload the design file. | |
| **coll_e3.ckt** | The effects of varying the mass [and hence, the momentum] in an elastic collision. Click pause to release the carts. Graphs of velocity and energy against time are drawn. To rerun the experiment, reload the design file. | |

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| coll_w1.ckt | Two carts with the same mass in a wooden collision - halfway between elastic and inelastic. Click pause to release the carts. Graphs of position and energy against time are drawn. To rerun the experiment, reload the design file. | |
| coll_w2.ckt | Two carts with the same mass in a wooden collision. Click pause to release the carts. Graphs of position and energy against time are drawn. To rerun the experiment, reload the design file. | |
| coll_w3.ckt | The effects of varying the mass [and hence, the momentum] in a wooden collision. Click pause to release the carts. Graphs of velocity and energy against time are drawn. To rerun the experiment, reload the design file. | |
| coll_i1.ckt | Two carts with the same mass in an inelastic collision . Click pause to release the | D |
| coll_i2.ckt | Two carts with the same mass in an inelastic collision. Click pause to release the carts. Graphs of position and energy against time are drawn. To rerun the experiment, reload the design file. | |
| coll_i3.ckt | The effects of varying the mass [and hence, the momentum] in an inelastic collision. Click pause to release the carts. Graphs of velocity and energy against time are drawn. To rerun the experiment, reload the design file. | |
| forces.ckt | See the results of combining different forces on a moving mass. The graph shows velocity and acceleration. | D |
| gravity.ckt | Showing that, where $g = 9.81\ m/s^2$ , a mass of 1 kg (the mass on the pulley) has a weight of 9.81 N. | D |
| inertia.ckt | Three wheels of different moments of inertia accelerate and decelerate at different rates when the motor is switched on and off. | D |
| mechanic.ckt | The mechanical design from page 11 of the introductory booklet. | D |
| modelcar.ckt | The model car design from the box and brochure. The variable resistor acts as an accelerator control, and the DPDT switch is a forward and reverse control, changing the direction of the motor. | D |
| Newton1.ckt | A demonstration of Newton's first law of motion. The state of motion (velocity) of the mass will not change unless a force is applied to it.**Newton3.ckt** | |
| shm.ckt | A demonstration of simple harmonic motion. The oscillation period is proportional to the square of the mass, so the second mass oscillates with a period twice that of the first, and the third with a period three times that of the first. This is shown on the graph. | |
| shm1.ckt | Simple harmonic motion with graphing of position and kinetic energy against time. | |
| shm2.ckt | Simple harmonic motion with graphing of position and velocity against time, showing that velocity is at a maximum when the displacement from the equilibrium is at a minimum, and vice versa. | D |

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| **shm3.ckt** | Simple harmonic motion with graphing of velocity and kinetic energy against time, showing that the kinetic energy is related to the square of the velocity. | |

## Miscellaneous Circuits

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| **counter.ckt** | A device to count from 0 to 9, using the 7-segment display. Press the push-button switch to add one to the count. | **D** |
| **counter2.ckt** | A counting device with a clock input, which will count from 0 to 99. | **D** |
| **example.ckt** | The circuit referred to on page 4 of the Quickstart section of the introductory booklet. | **D** |
| **noise.ckt** | A 555 oscillator circuit used in conjunction with the loudspeaker. Although the noise produced is not particularly pleasant, it does show how varying the resistance in a 555 circuit alters the oscillation frequency, and consequently the sound produced by the loudspeaker. | |
| **ohms law.ckt** | A simple demonstration of Ohm's law. Change the voltage across the resistors and the resistor current changes proportionally. | **D** |
| **organ.ckt** | A simulation of an electric organ made by setting the source frequencies to the frequencies of musical notes. | **D** |
| **oscill.ckt** | The 50 Hz 555 oscillator circuit referred to on page 25 of the introductory booklet. | **D** |
| **pot.ckt** | A potentiometer used as a potential divider. | **D** |
| **radio.ckt** | A simple Amplitude Modulation (AM) 'transmitter' and 'receiver', broadcasting a 500Hz wave on a 30kHz carrier. The transformer simulates the antennae, and the band-pass filters to tune the radios have been left out. | **D** |
| **rcdecay.ckt** | The capacitor discharge circuit referred to on page 26 of the introductory booklet. | **D** |
| **relay.ckt** | A relay turned on using a transistor circuit. | **D** |
| **trials.ckt** | A 'relay' implementation of alarm.ckt. | **D** |
| **wheat.ckt** | A Wheatstone bridge is used to measure the LDR dark resistance. | **D** |