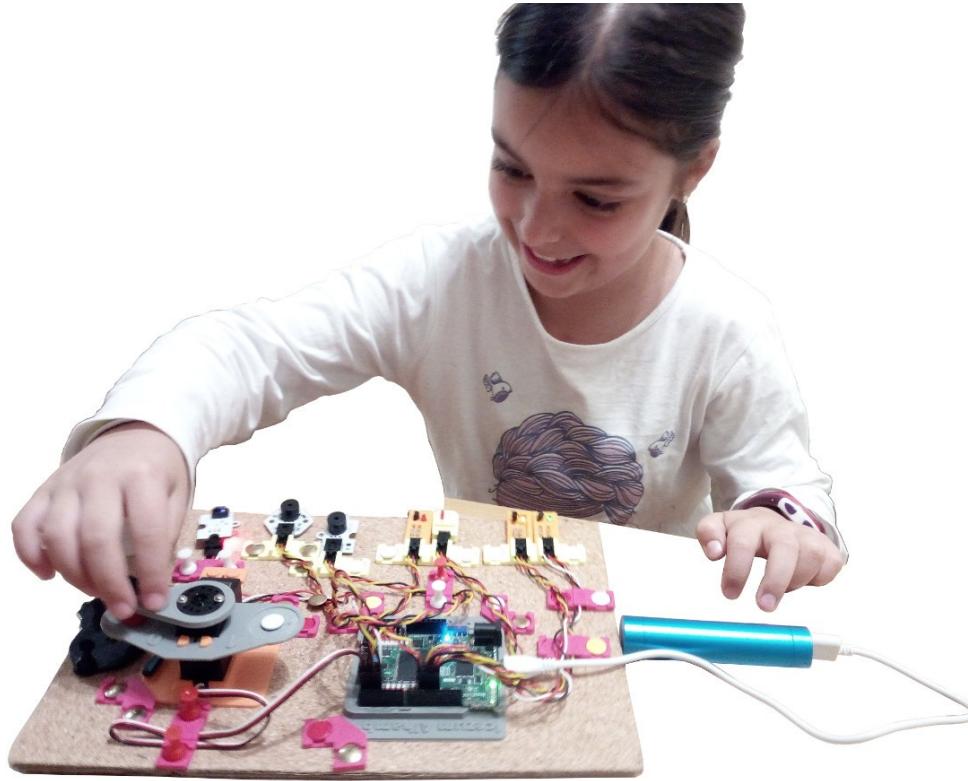


# Electrónica digital para todos con FPGAs Libres



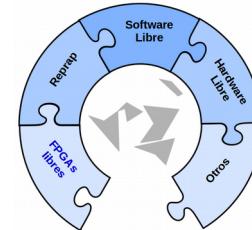
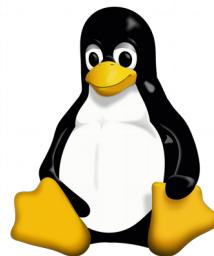
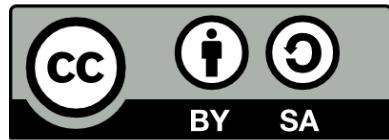
Juan González Gómez (Obijuan)

<https://github.com/Obijuan>

# You're leaving the Privative sector...

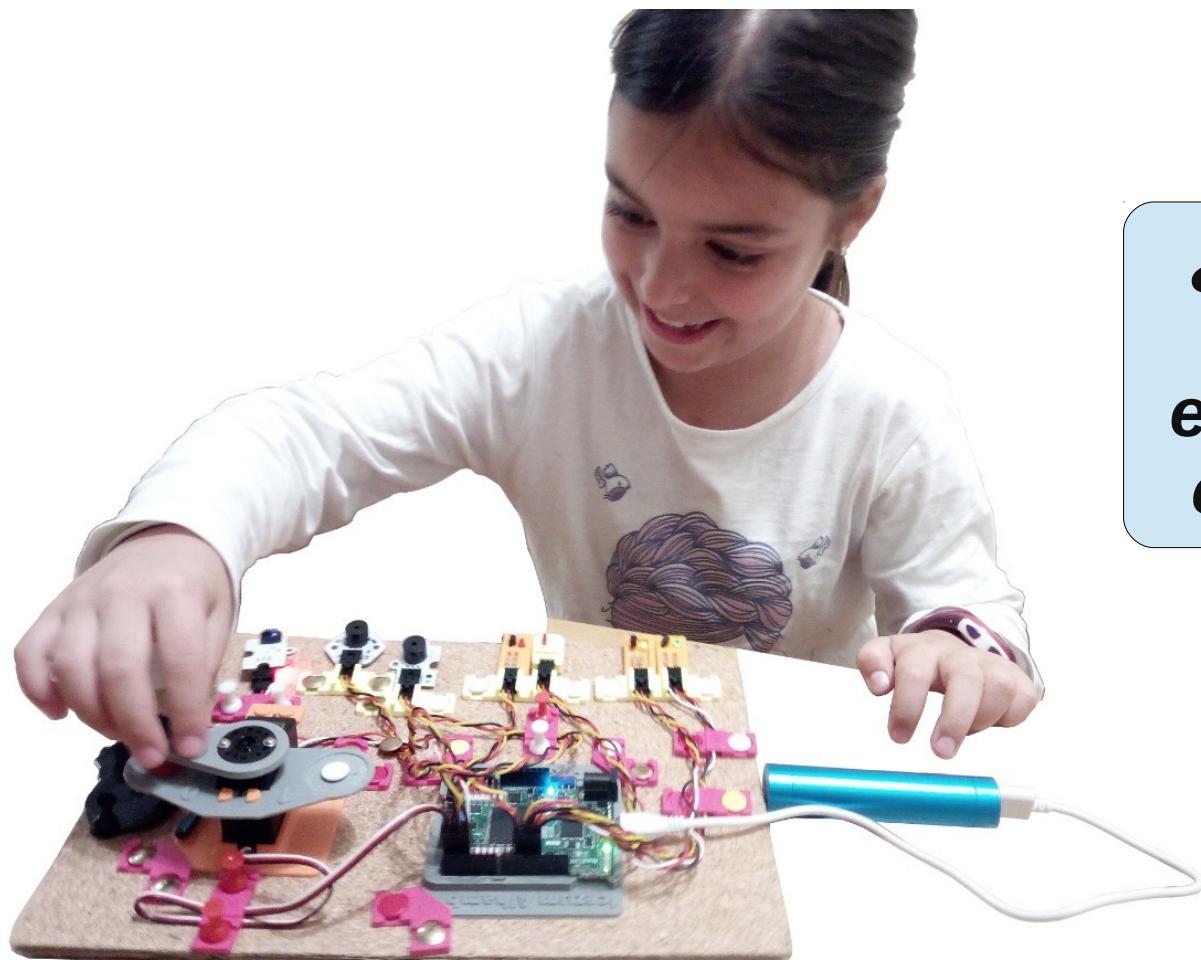


## A partir de aquí: Sólo tecnologías libres

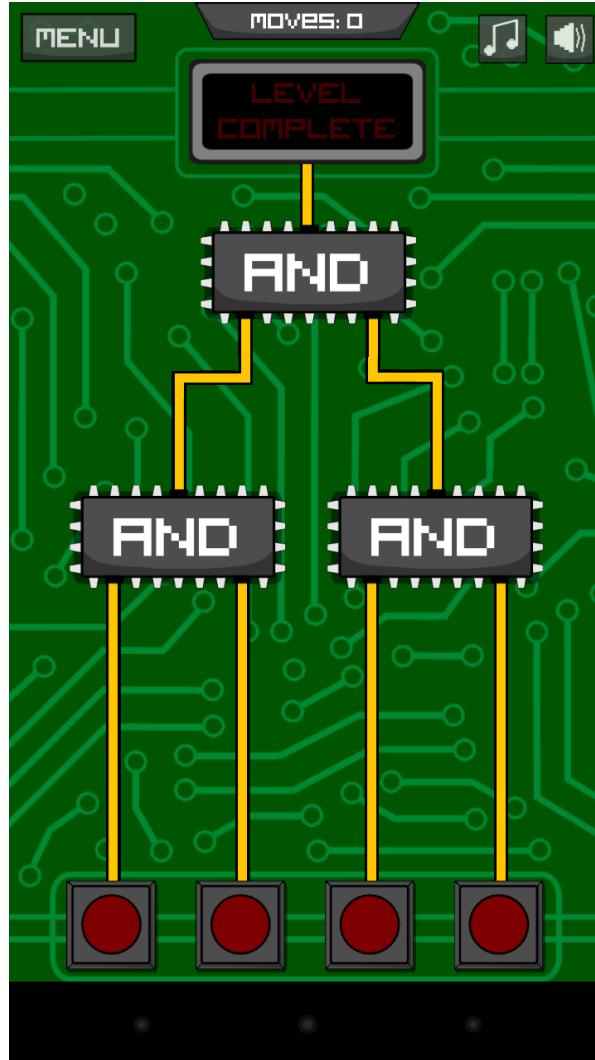


# Motivación

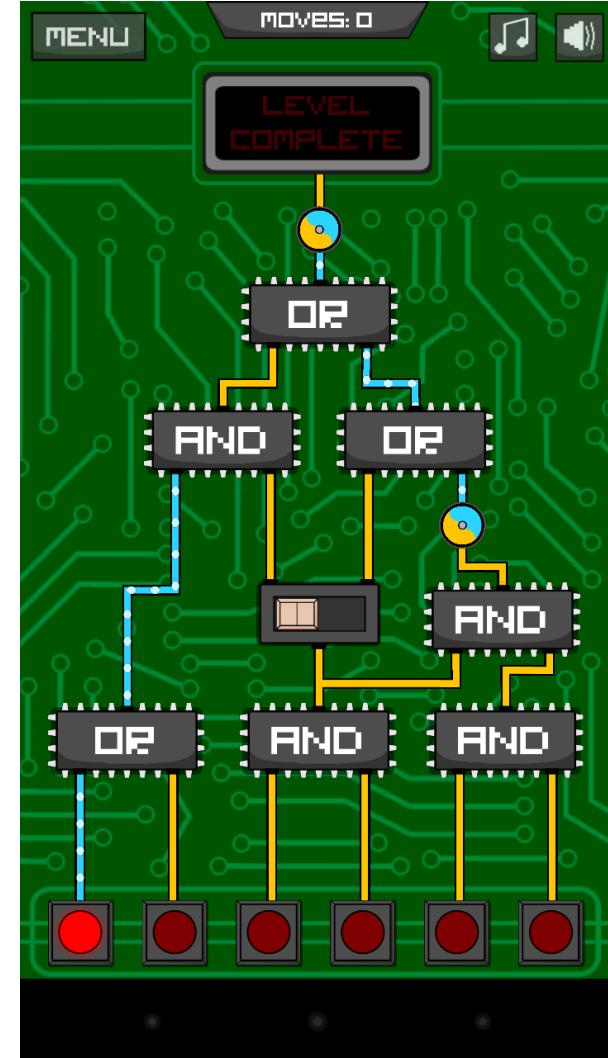
## Electrónica digital accesible



*¿Cómo podrían los  
niños y los no  
electrónicos diseñar  
circuitos digitales?*



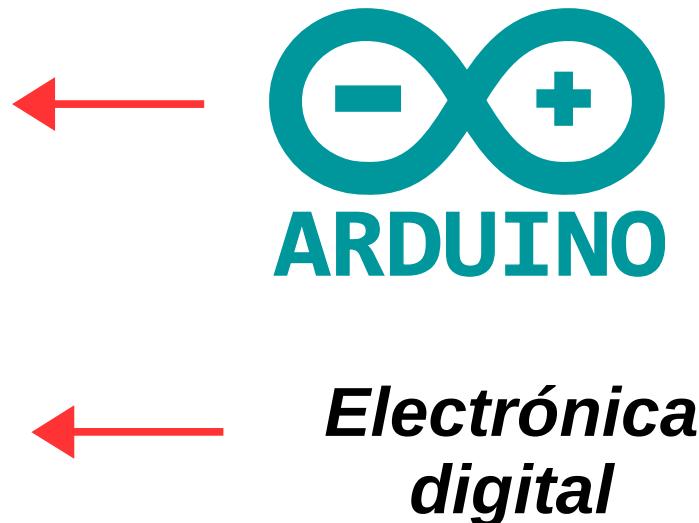
APP:  
Circuit  
Scramble



La electrónica digital es intuitiva y...  
¡Divertida!

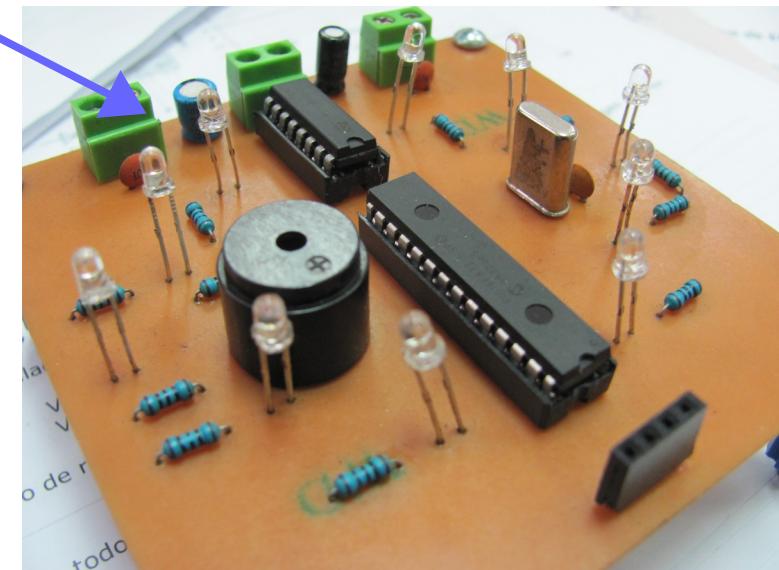
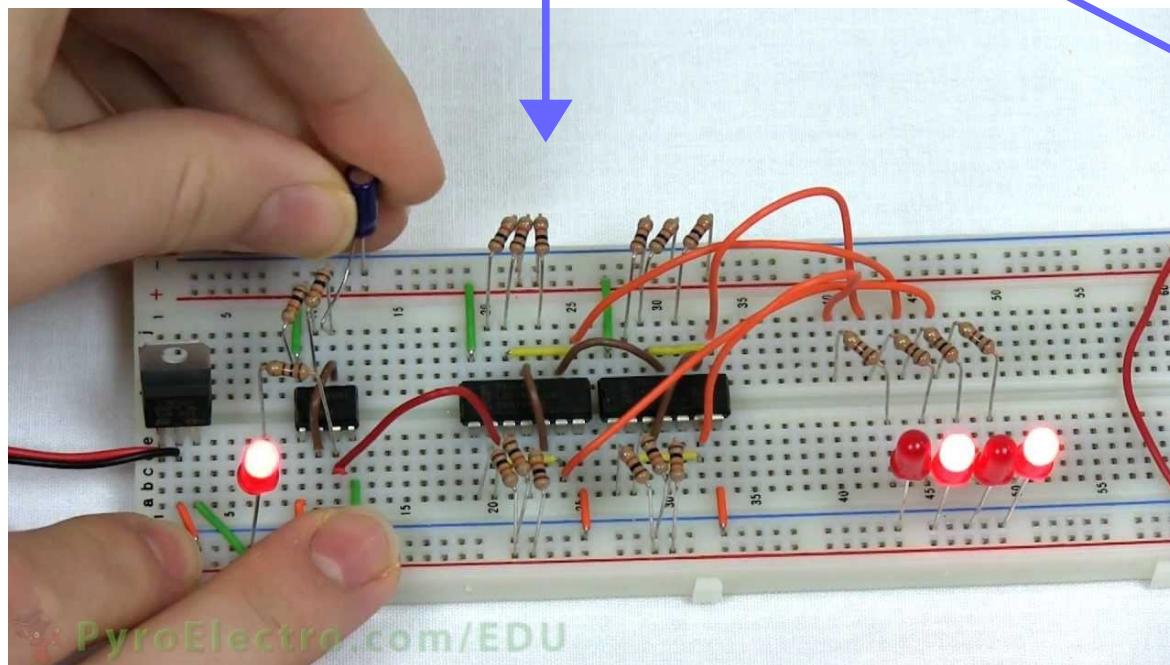
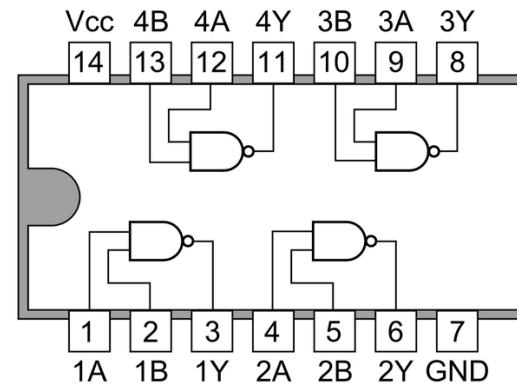
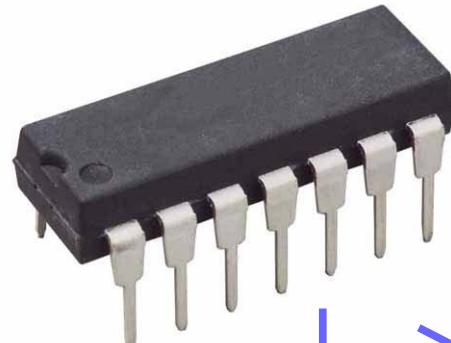
# Arduino y Electrónica digital

	<b>Nivel 7:</b> Software
	<b>Nivel 6:</b> Microprocesador
	<b>Nivel 5:</b> Puertas lógicas
	<b>Nivel 4:</b> Transistor
	<b>Nivel 3:</b> Semiconductores
	<b>Nivel 2:</b> Materiales
	<b>Nivel 1:</b> Átomos

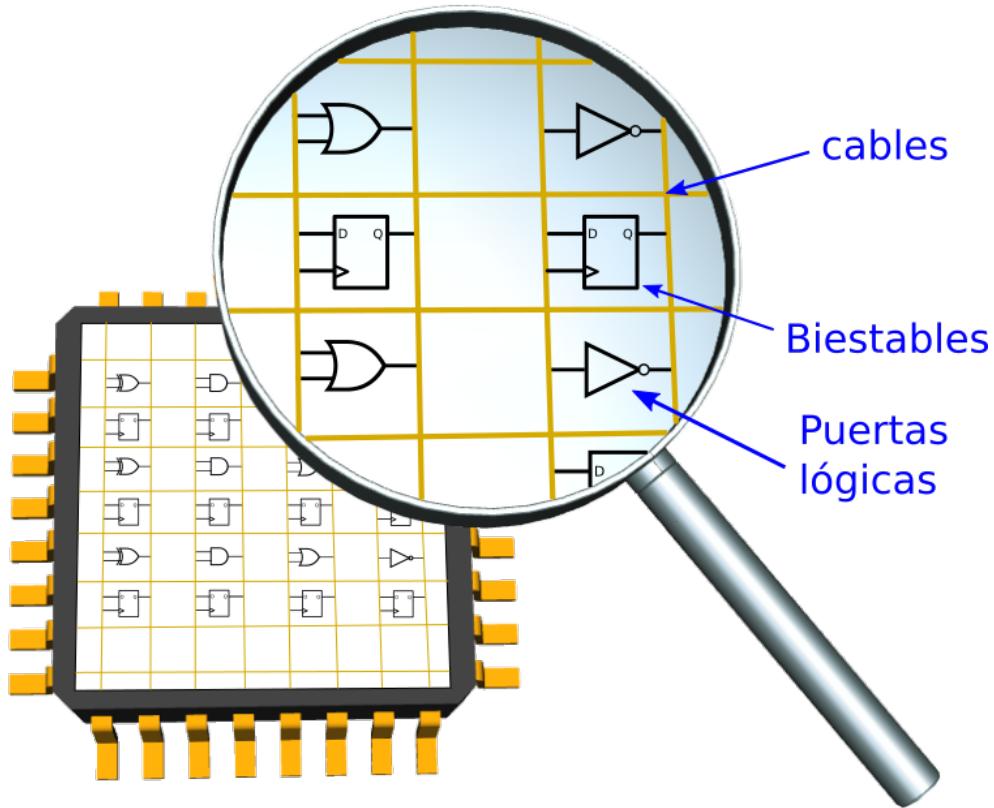


**Electrónica  
digital**

# ¿Cómo se hacen los circuitos digitales?

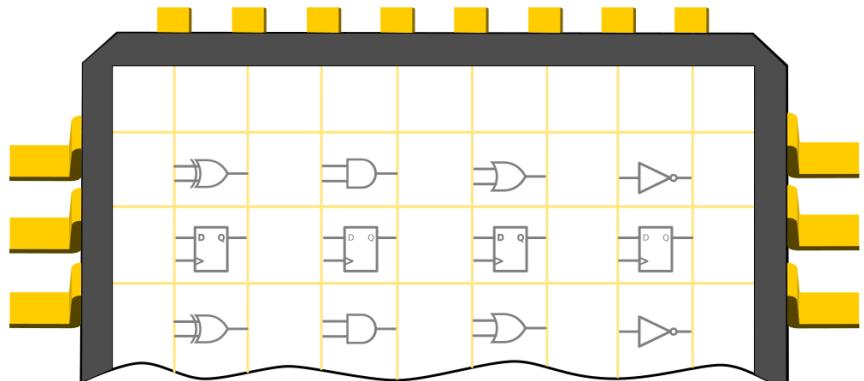


# Tecnología FPGA

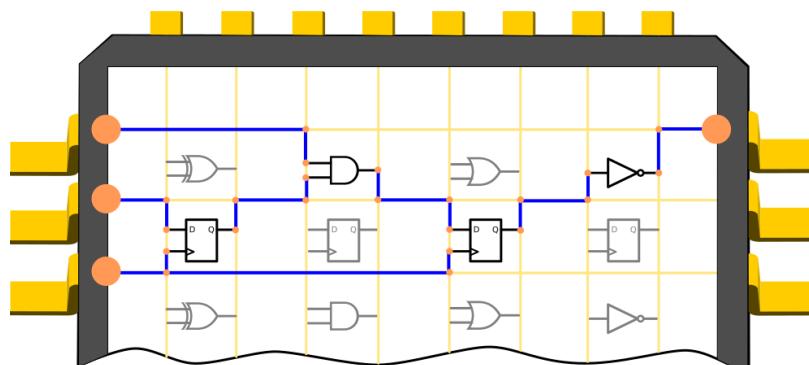


**FPGA:** Chip “en blanco” que contiene una matriz con los 3 componentes básicos: puertas lógicas, biestables y cables

# Electrónica digital con FPGAs

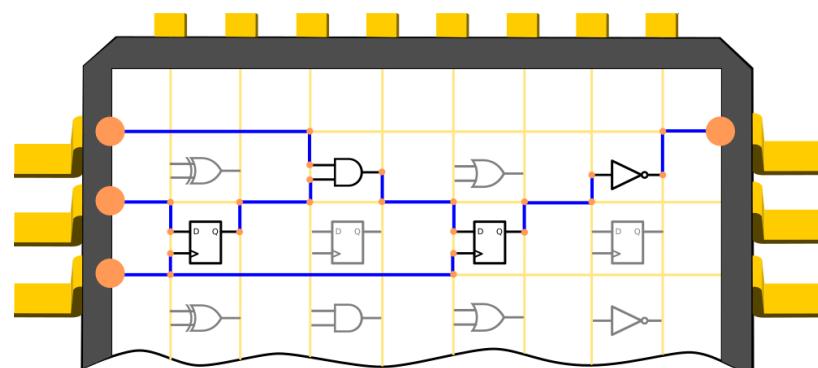
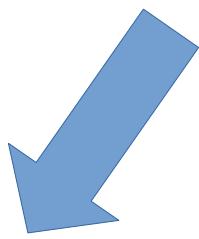
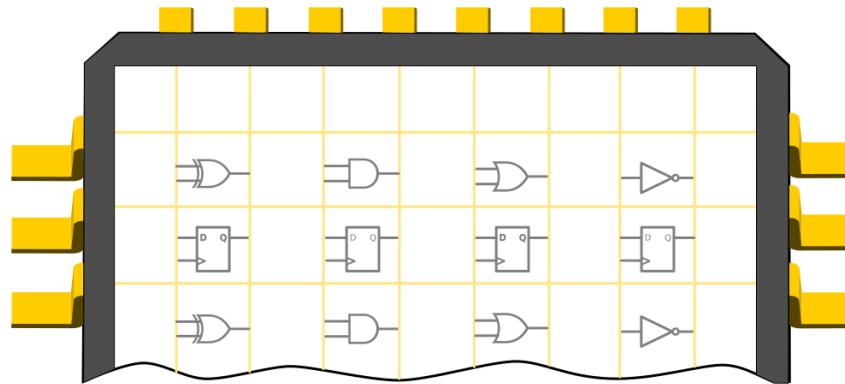


FPGA en Blanco

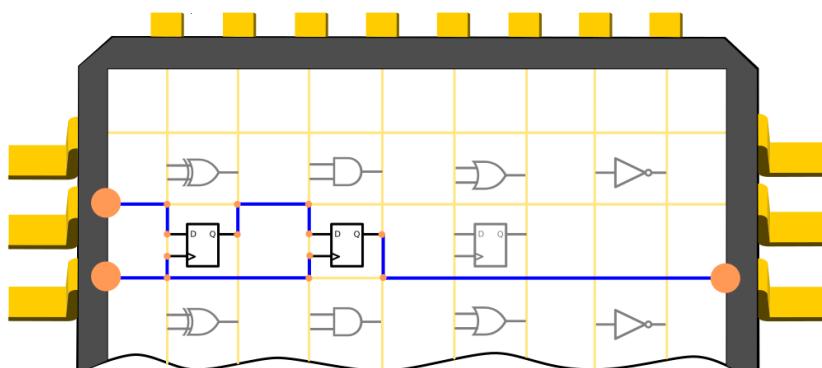
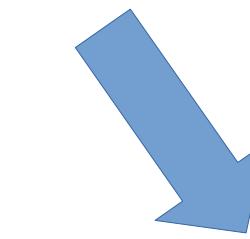


FPGA configurada

**Circuito creado** configurando las uniones entre los elementos básicos de la FPGA

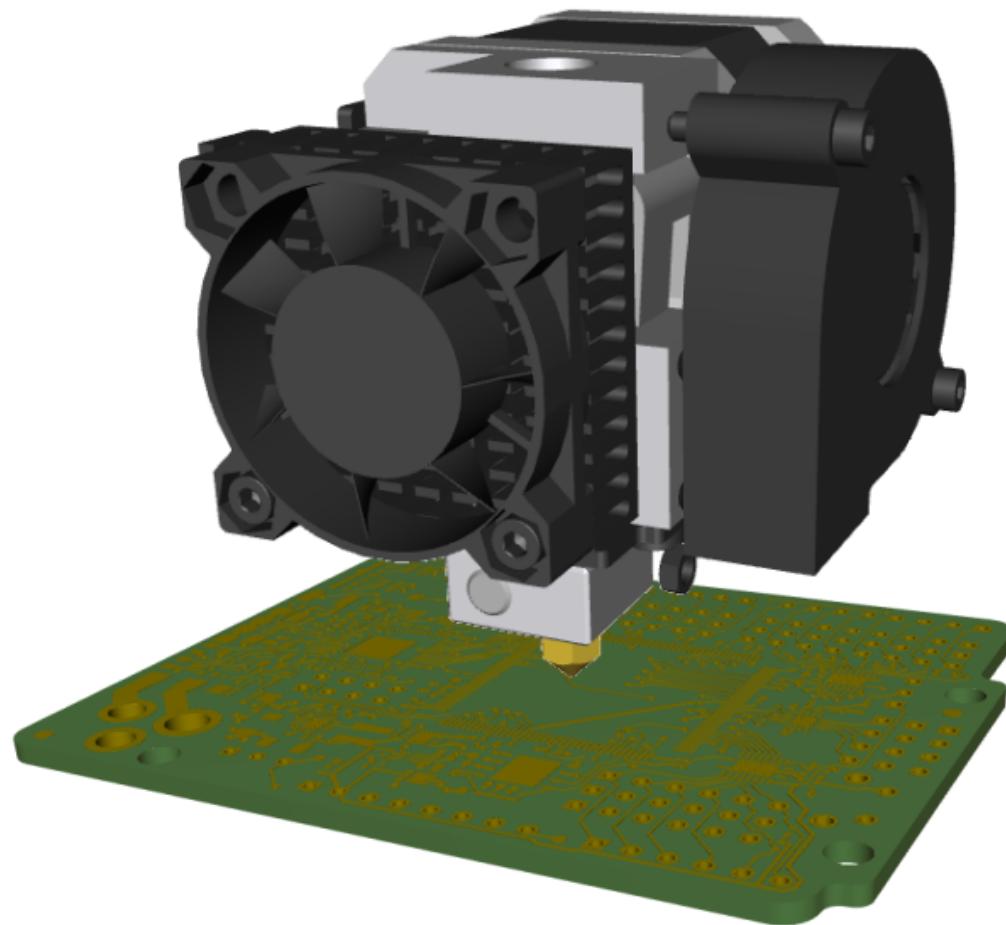


**Circuito 1**

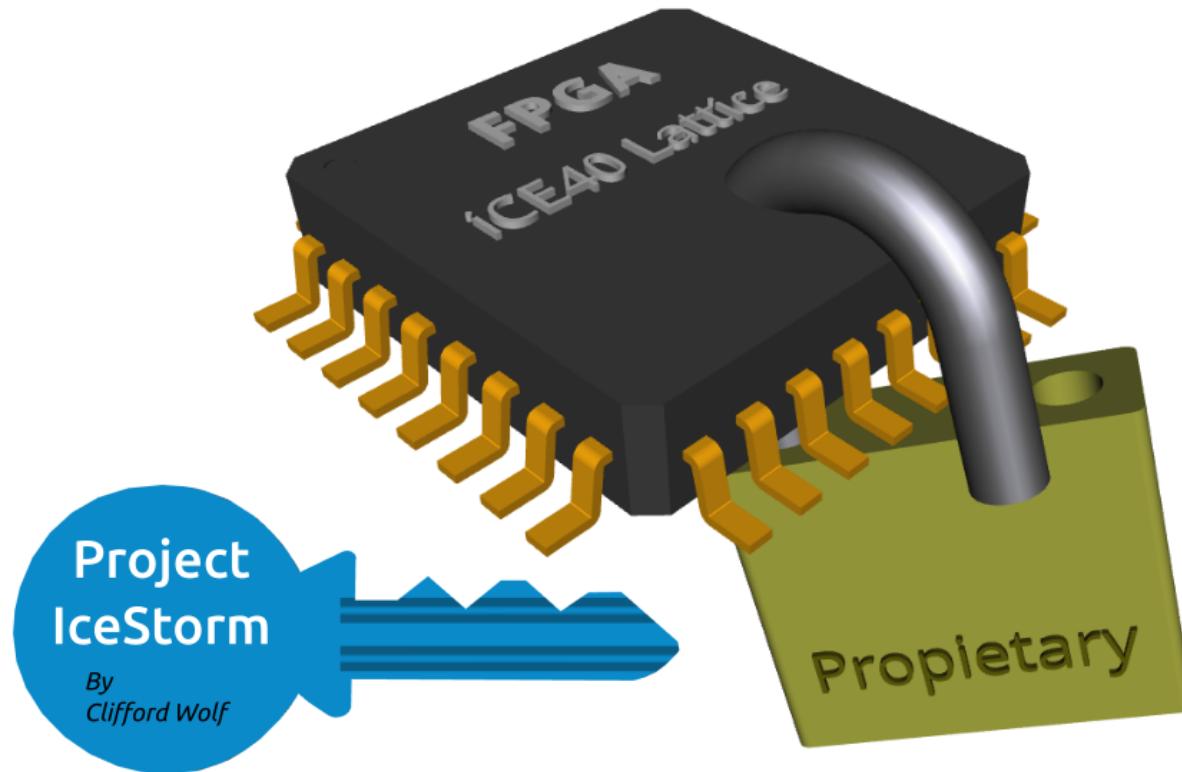


**Circuito 2**

**¡FPGAs = Impresoras 3D de circuitos digitales!**



# FPGAs libres: El renacimiento



- Proyecto Icestorm (Mayo, 2015)
- La primera *toolchain* que permiten pasar de Verilog al bitstream usando sólo Herramientas libres

# Comunidad FPGAwars



- Comunidad para **compartir conocimiento** relacionado con **FPGAs libres**
- Es el **clonewars** de las FPGAs, pero en modesto :-)
- Idioma: Castellano
- 435 miembros
- Cualquier pregunta / comentario / sugerencia → Correo a la lista :-)

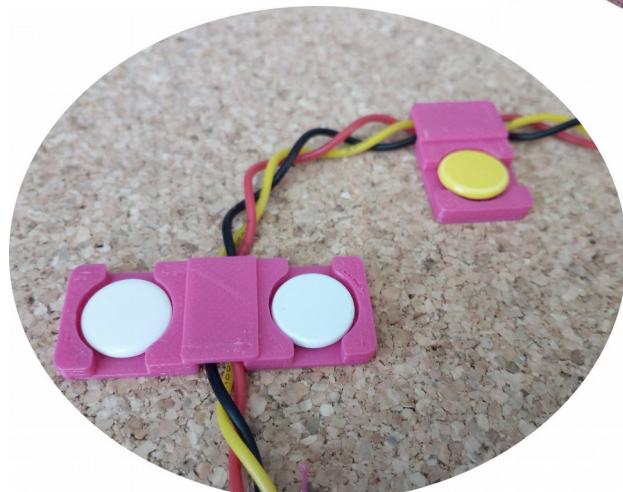
<http://fpgawars.github.io/>

# Vamos a frikear :-)

**Panel de corcho (28x19cm)**



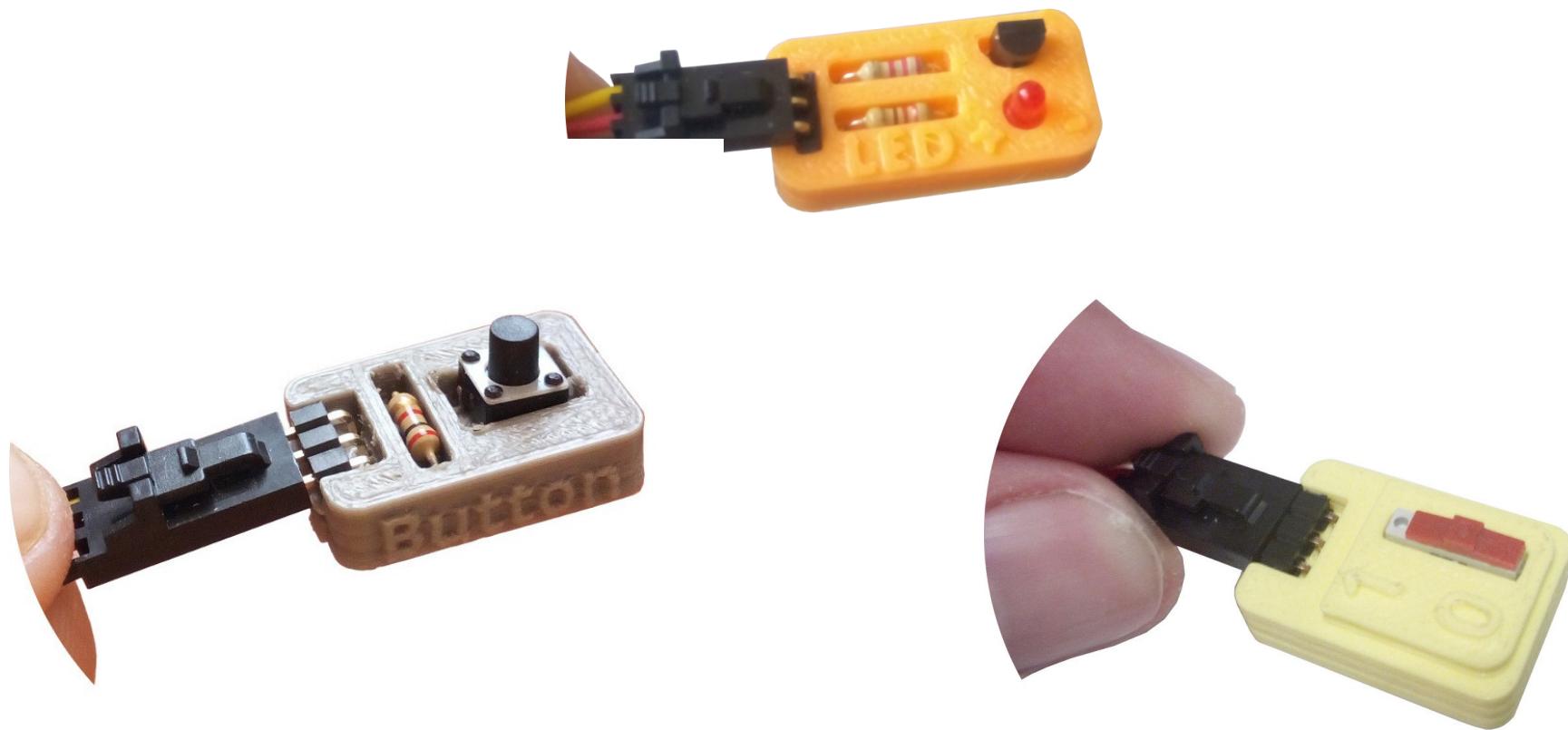
**Piezas Impresas en 3D para fijar elementos al corcho**



<https://github.com/Obijuan/3D-parts/wiki>

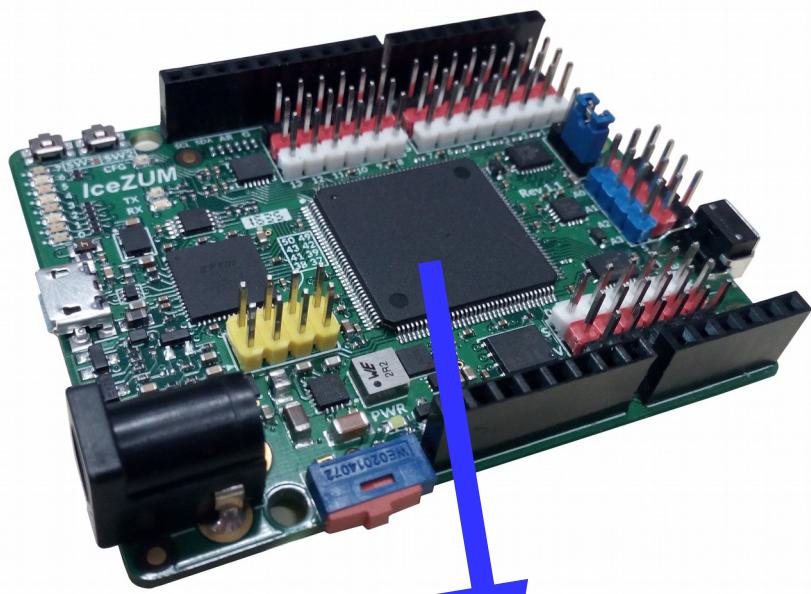
# Periféricos

**PCBprints:** Mini-circuitos impresos en 3D



# Icezum Alhambra v1.1

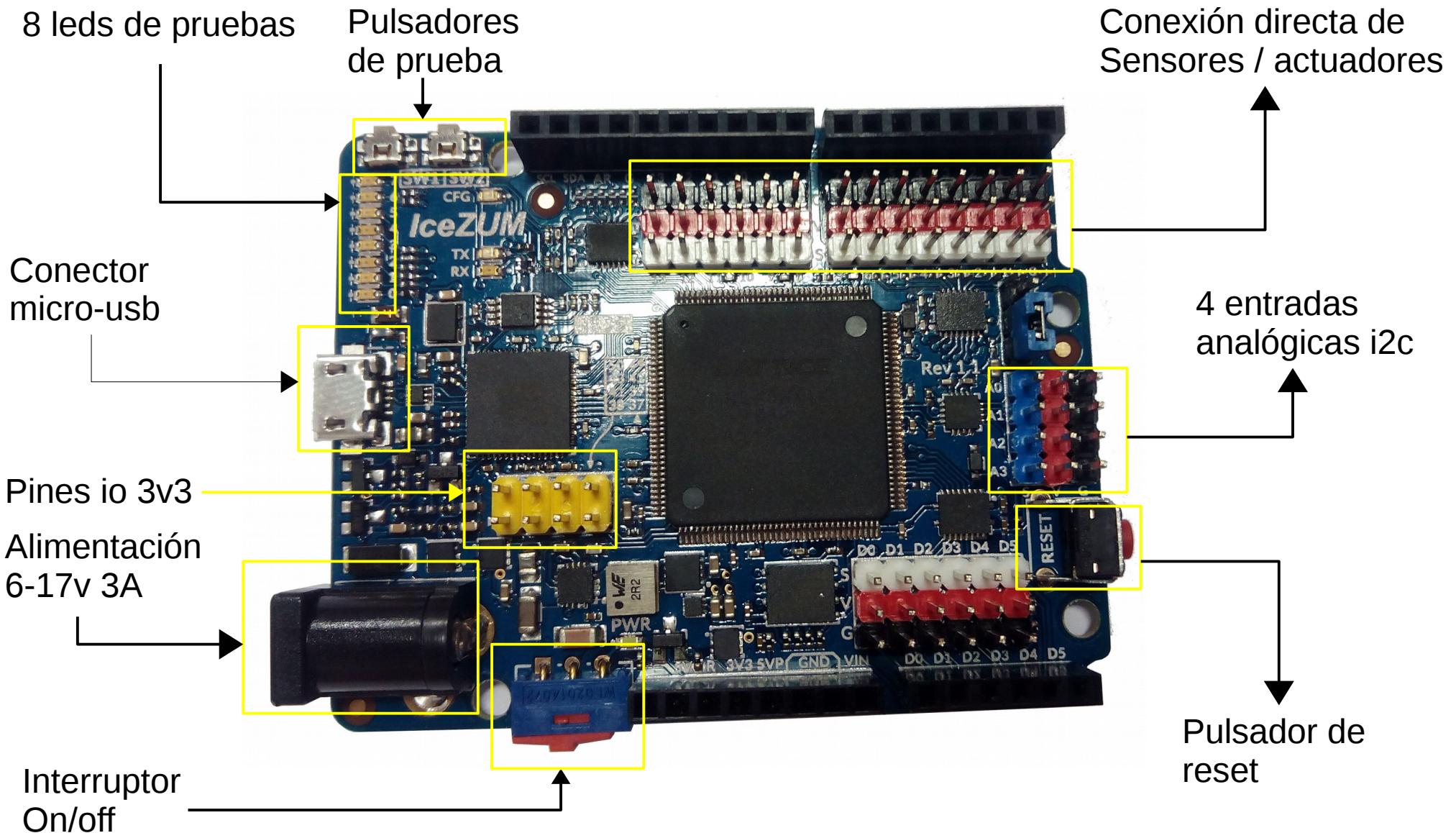
<https://github.com/FPGAwars/icezum/wiki>



**FPGA Libre**

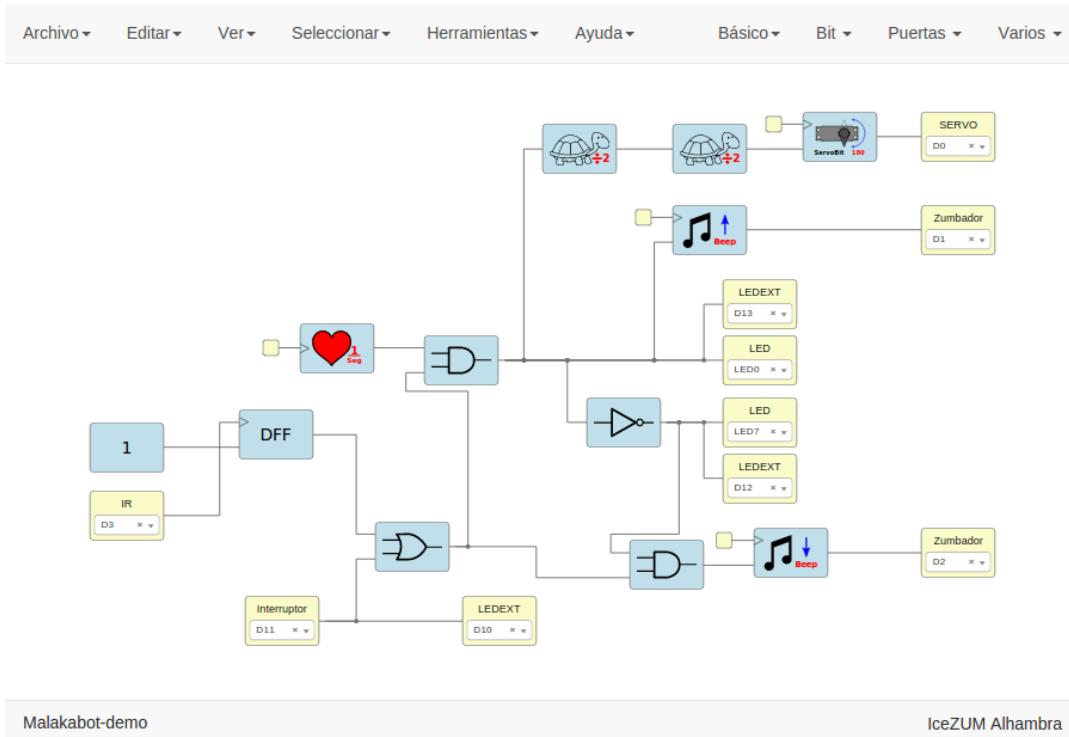
- Autor: **Eladio Delgado**
- Diseñada en Pinos del Valle (Granada)
- Arduino de las **FPGAs**
- Compatible Arduino
- Fácil conexión de circuitos externos/sensores/servos
- Reutilización de los shields de arduino
- 20 entradas/salidas de 5v
- 3A corriente de entrada
- Perfecta para hacer robots

# Icezum Alhambra v1.1





# icesstudio



Malakabot-demo

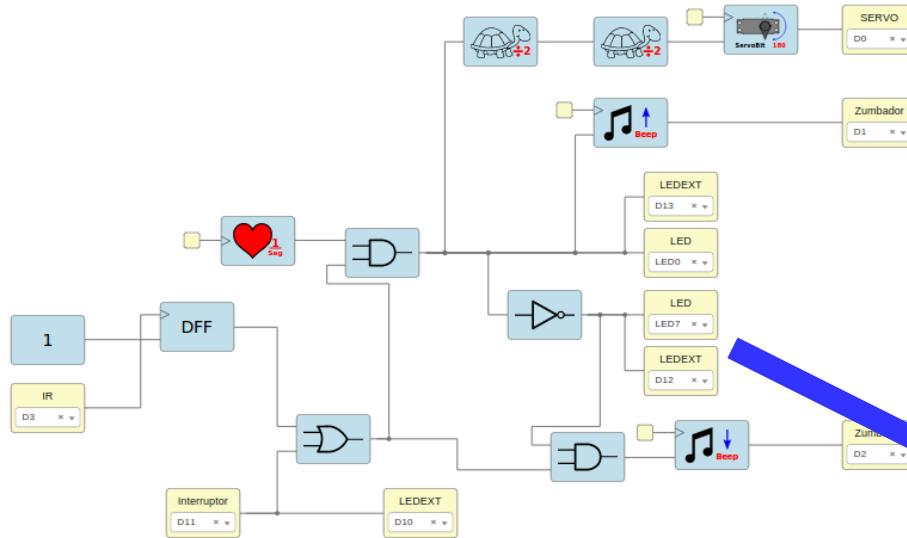
IceZUM Alhambra

<https://github.com/FPGAwars/icesstudio>

- Autor: **Jesús Arroyo**
- Electrónica digital para todos
- Herramienta visual
- Traduce a verilog

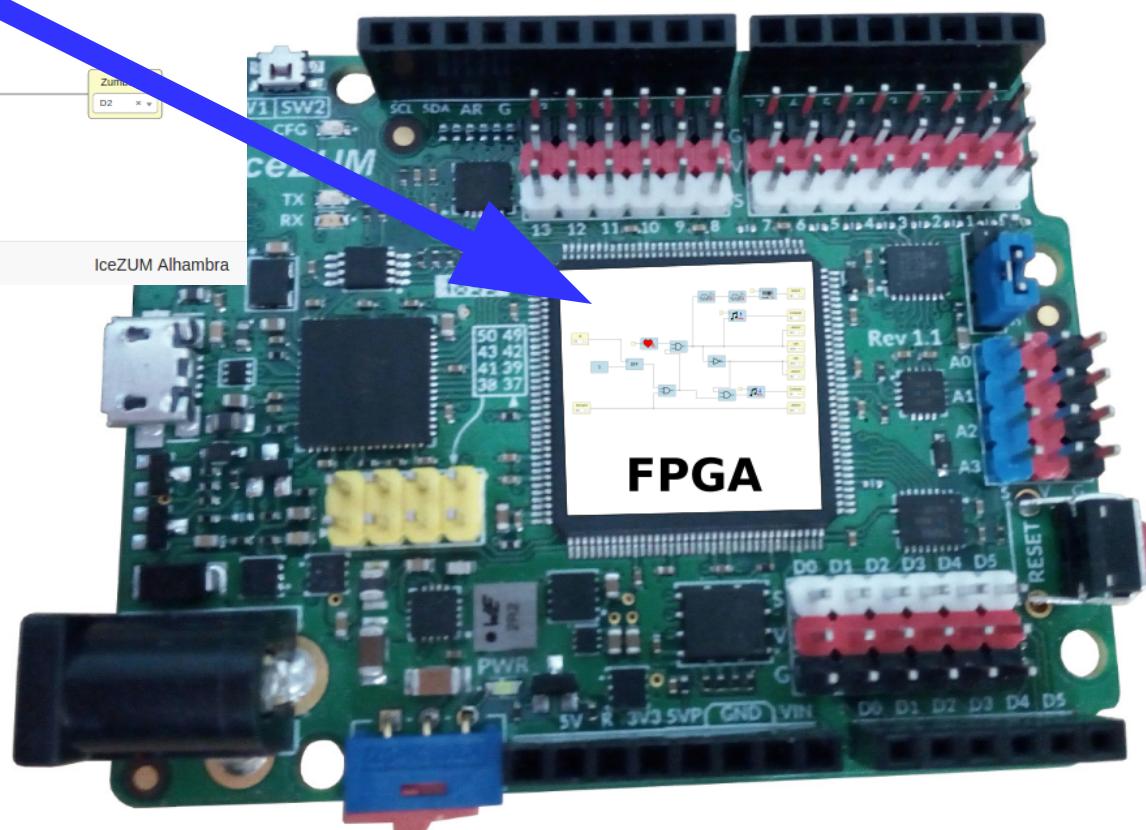
# La magia de las FPGAs

Archivo ▾ Editar ▾ Ver ▾ Seleccionar ▾ Herramientas ▾ Ayuda ▾ Básico ▾ Bit ▾ Puertas ▾ Varios ▾

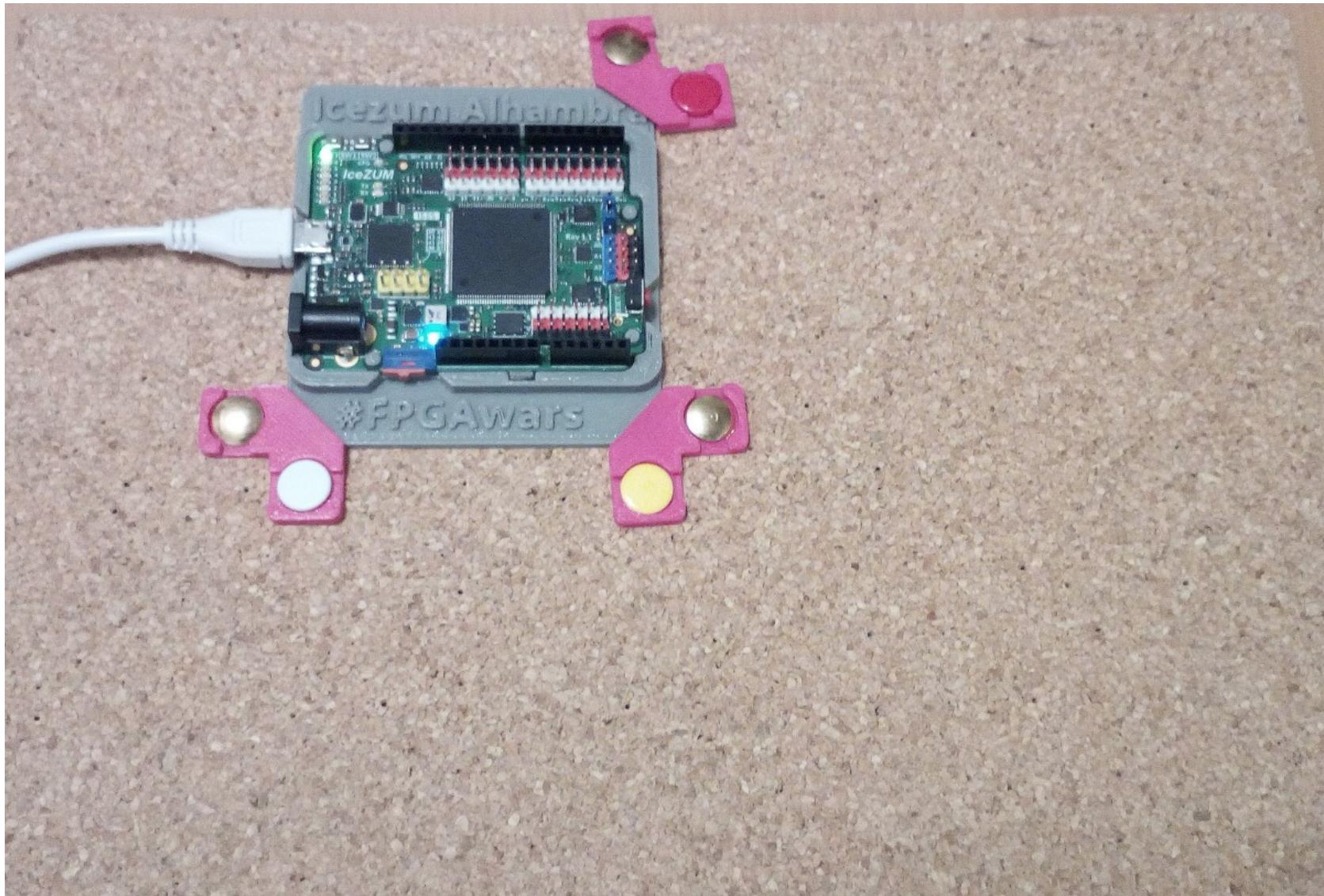


Malakabot-demo

IceZUM Alhambra



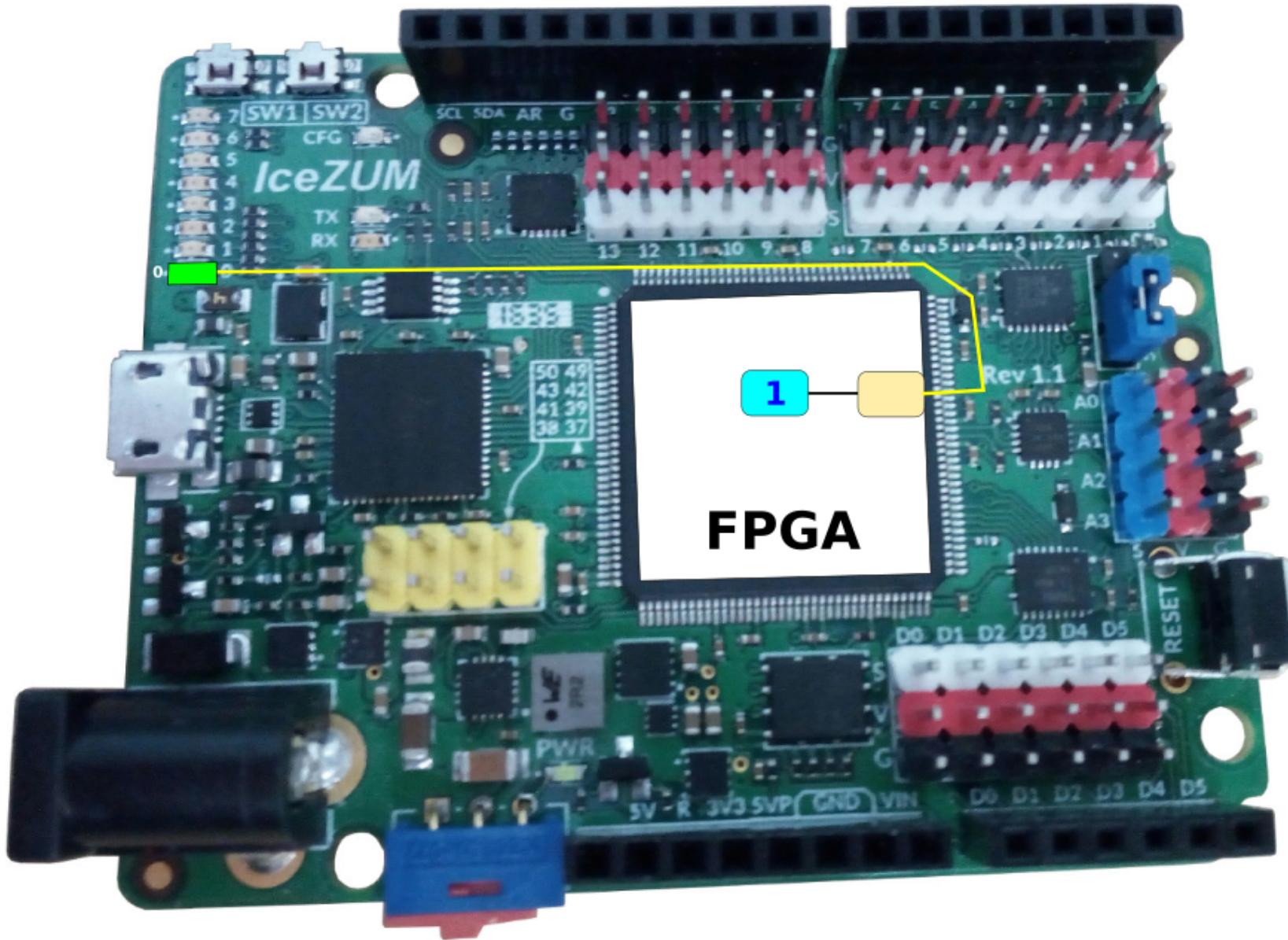
# ¡Empezamos!



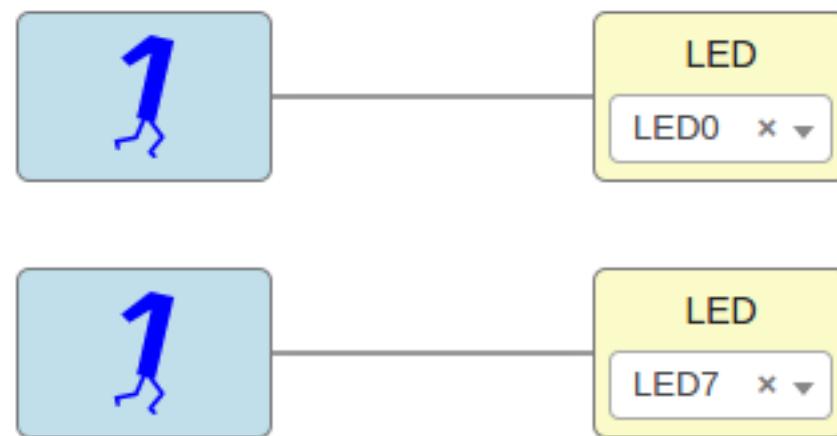
# Ejemplo 1: Hola Mundo



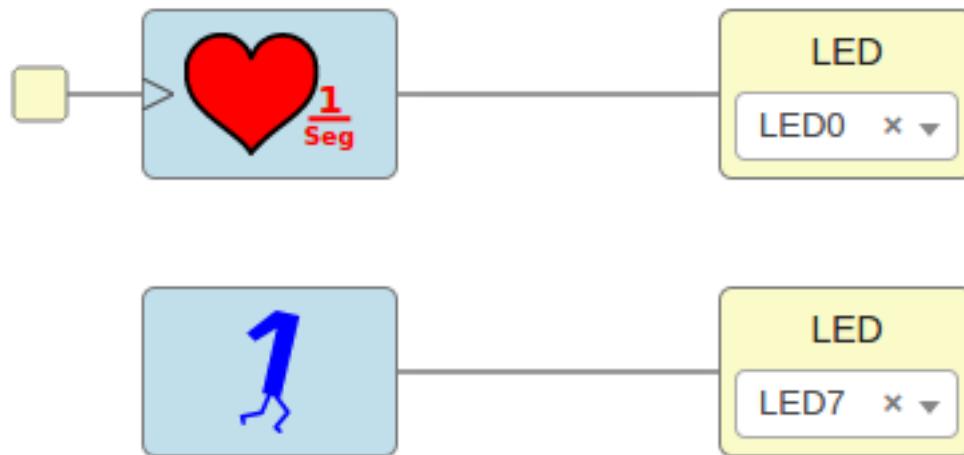
# Hola mundo: Implementación física



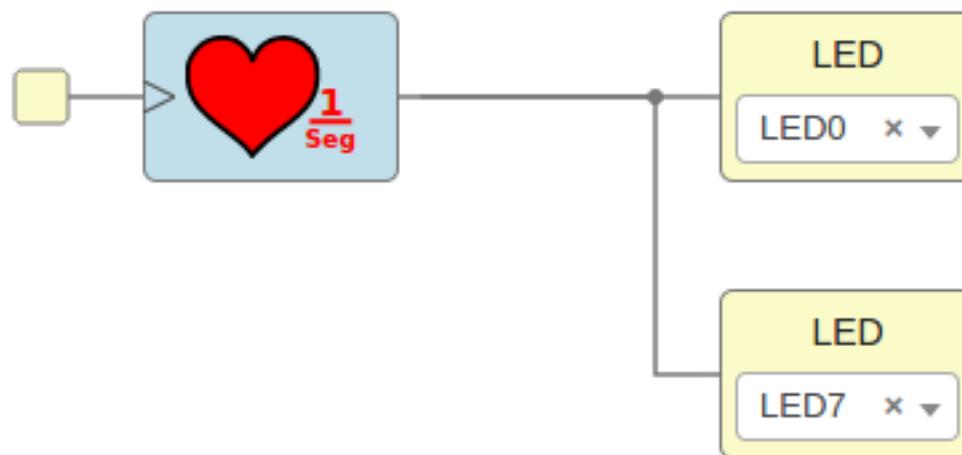
# Ejemplo 2: Dos leds en paralelo



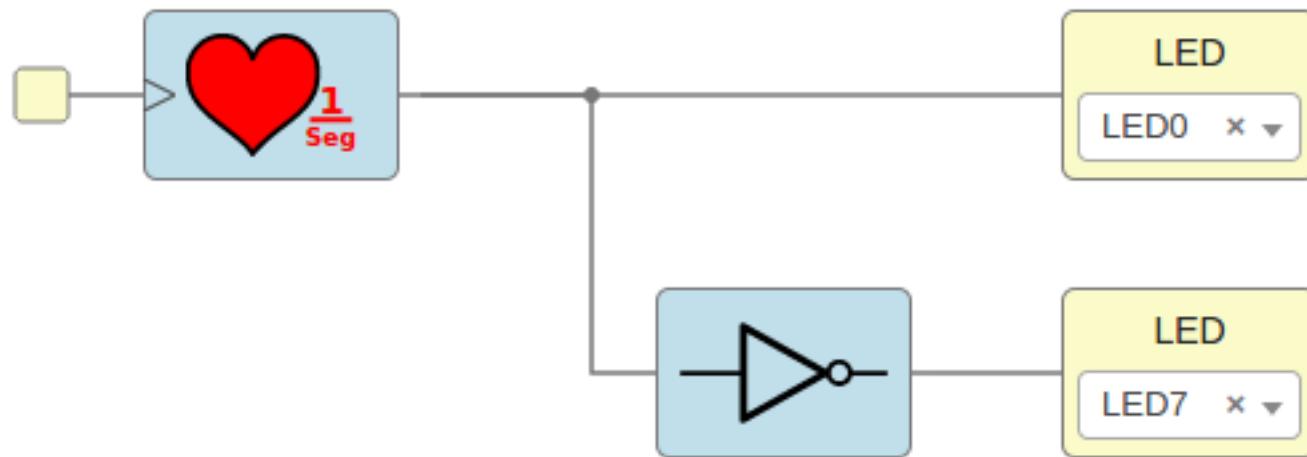
# Ejemplo 3: Led pulsante



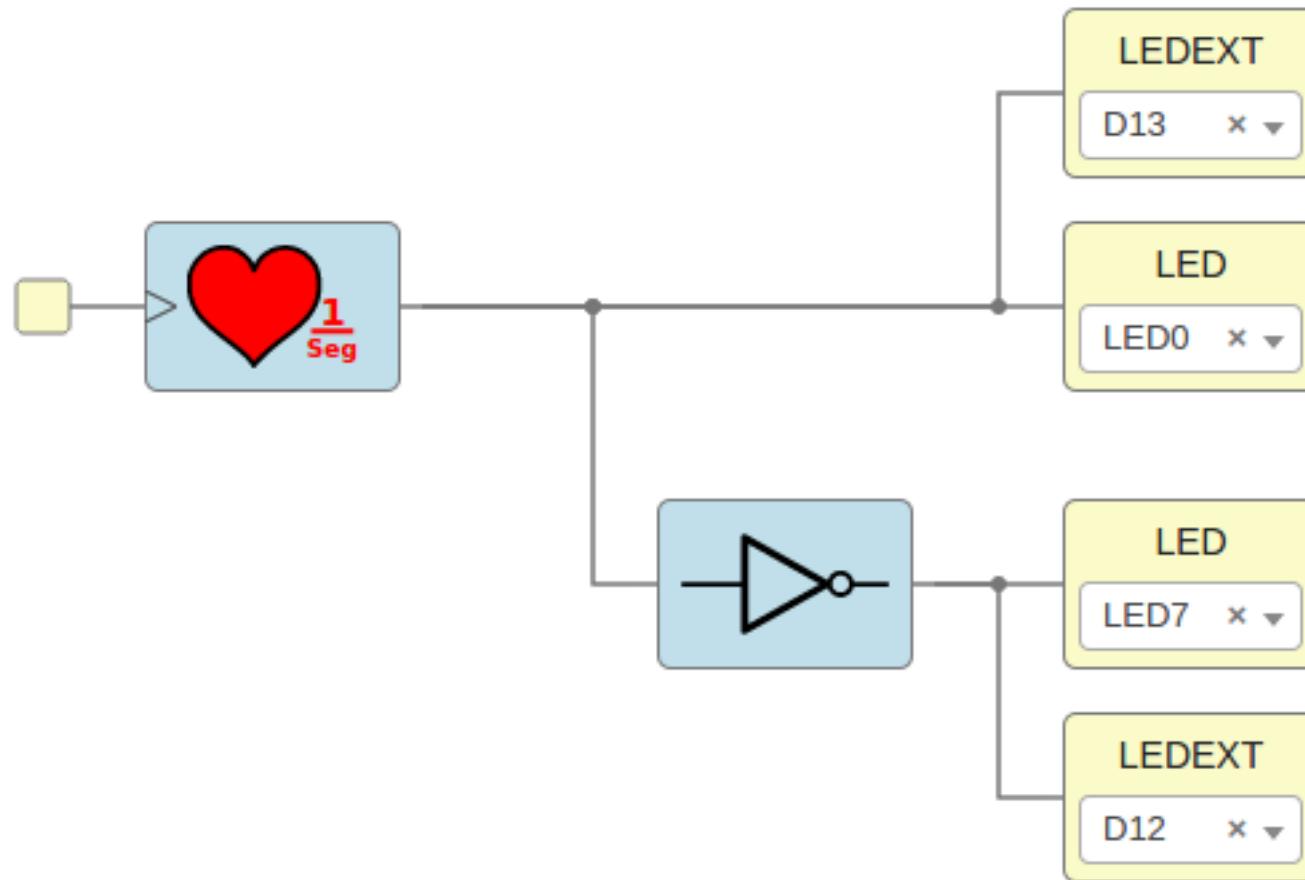
# Ejemplo 4: Leds pulsantes Mismo ritmo



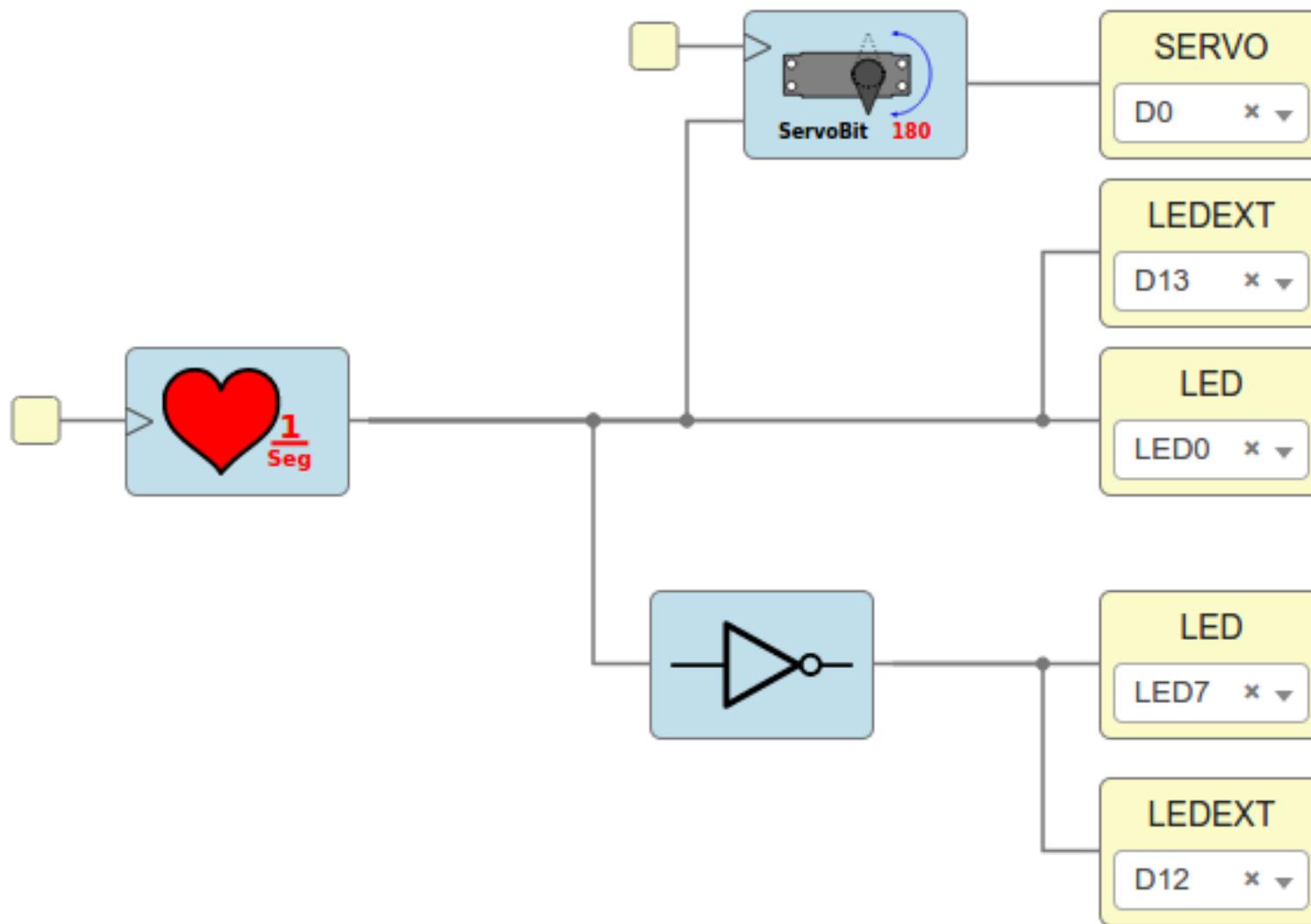
# Ejemplo 5: Leds alternativos



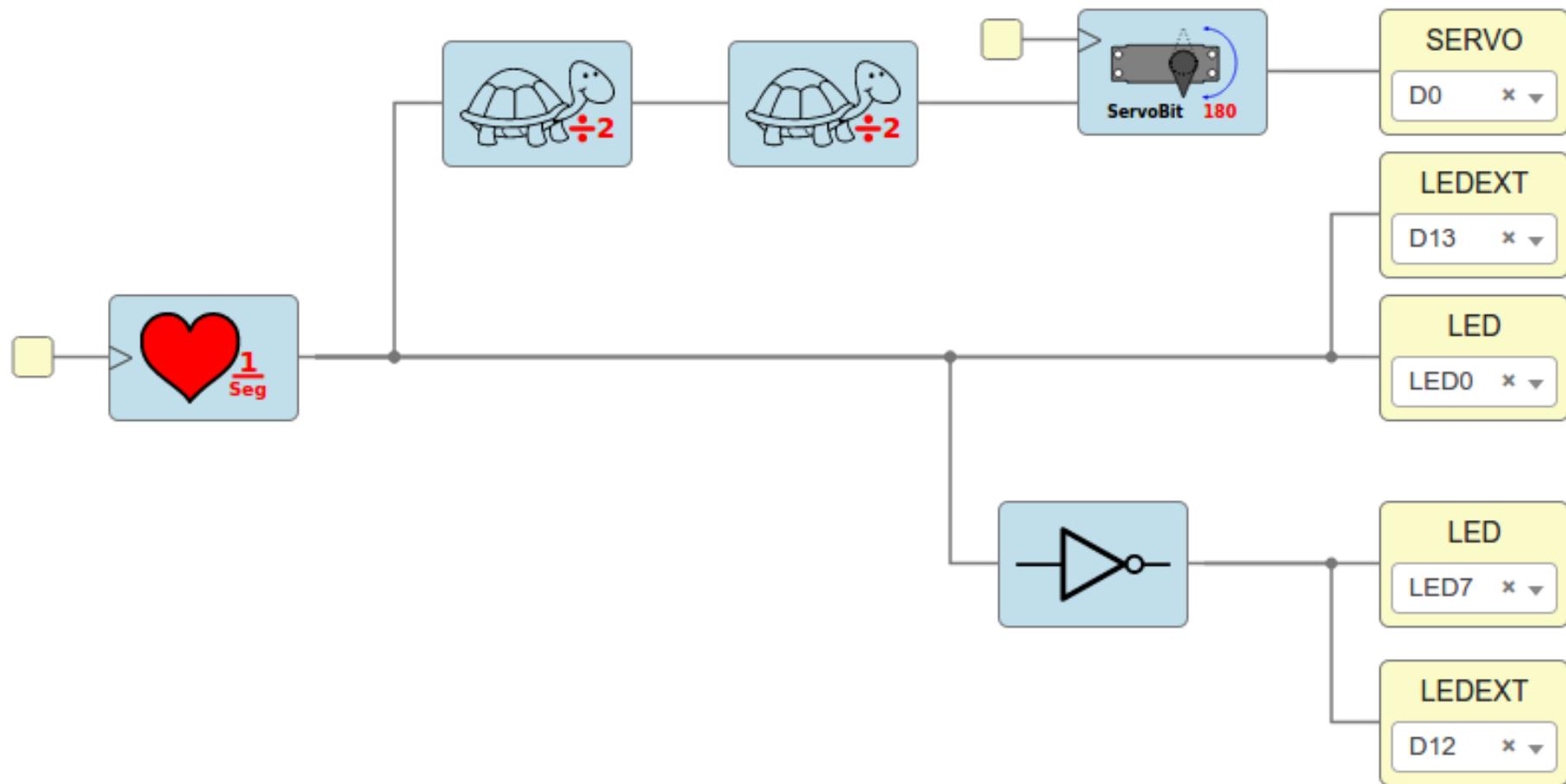
# Ejemplo 6: Leds externos



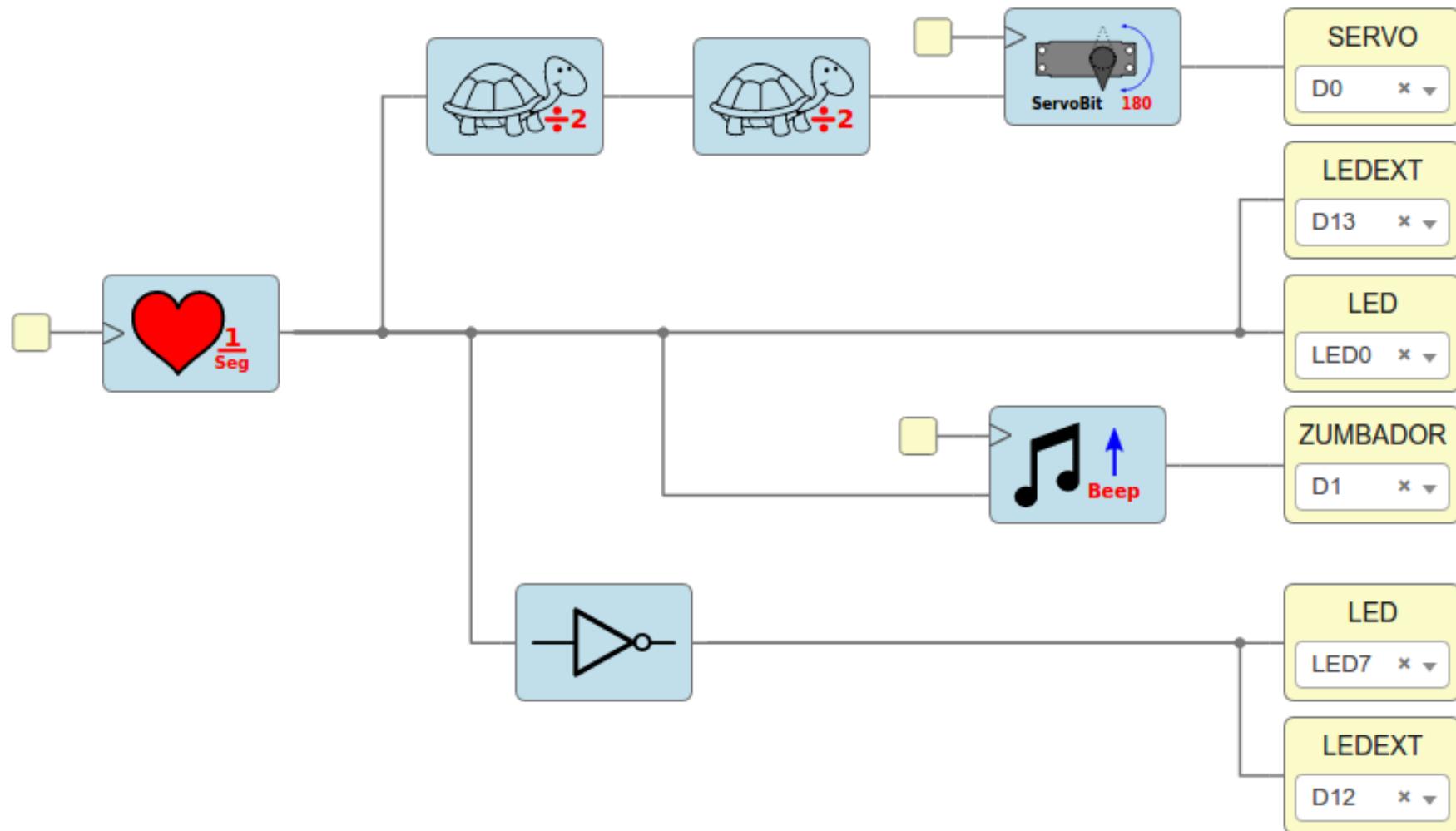
# Ejemplo 7: Servo binario



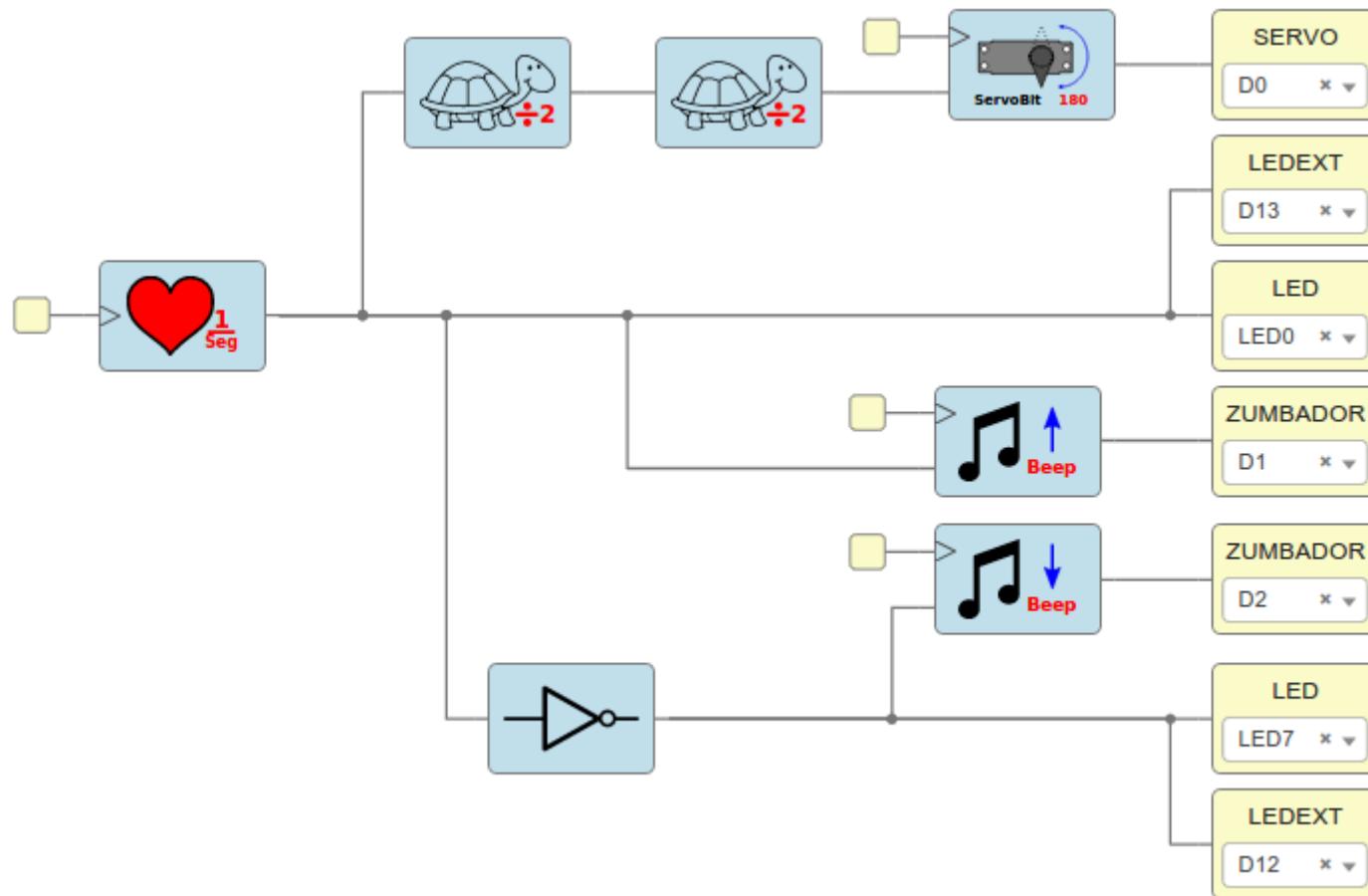
# Ejemplo 8: Bajando el ritmo



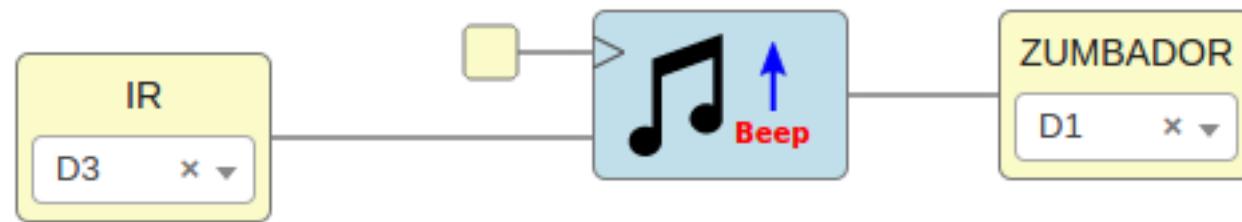
# Ejemplo 9: Zumbador



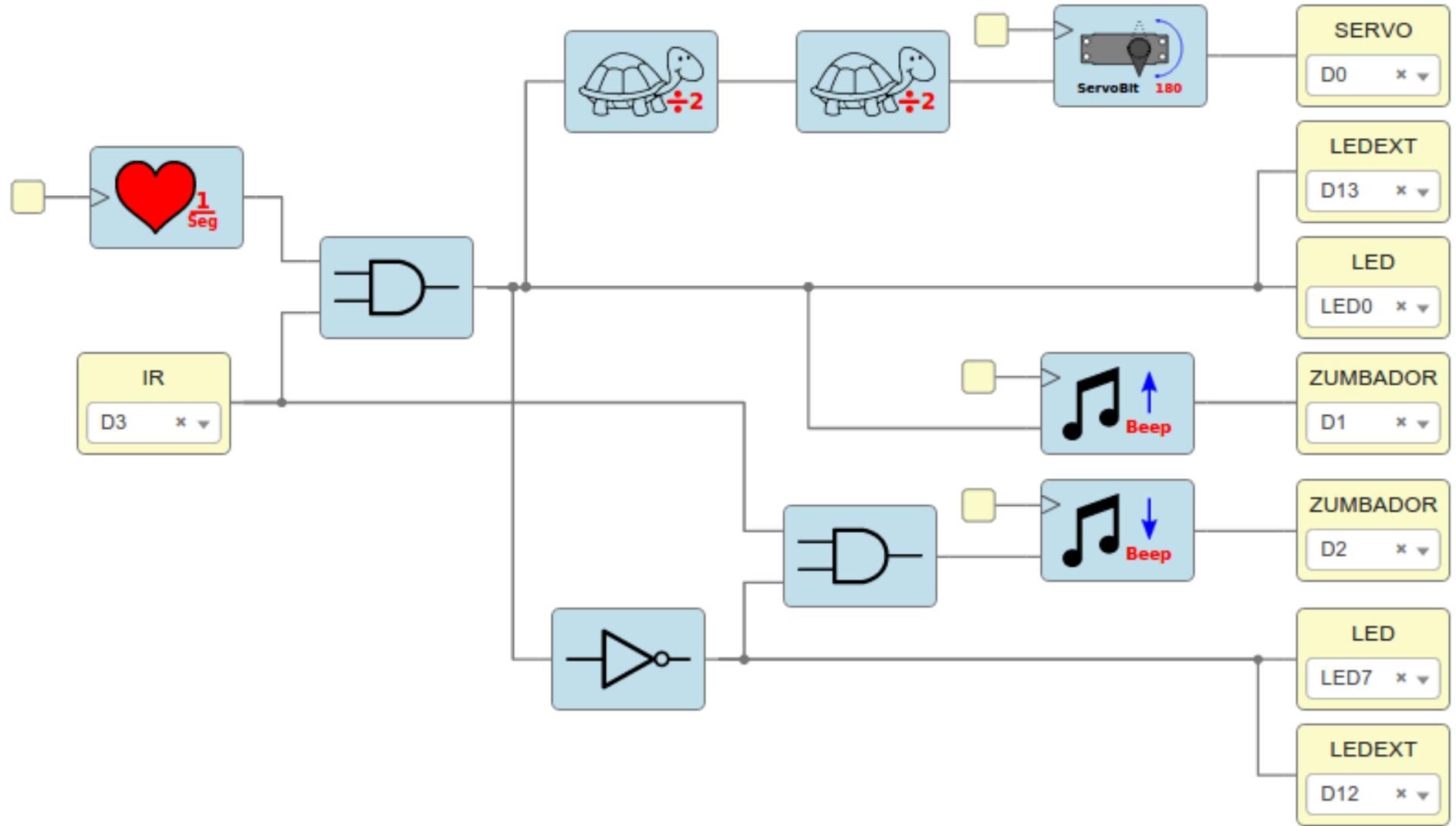
# Ejemplo 10: Sirena



# Ejemplo 11: Test IR



# Ejemplo 12: Alarma v1.0



# Larby: Robot modular

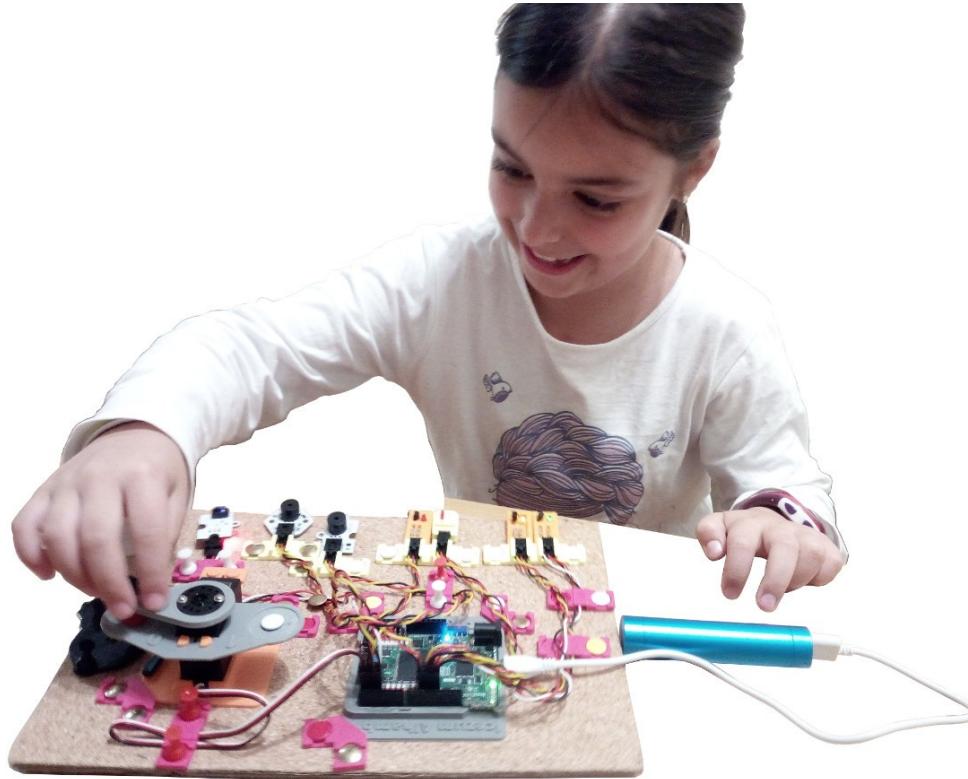


- Servos conectados directamente a Icezum Alhambra
- Configuración mínima pitch-pitch
- Módulo impresos en 3D

# ¡Que las FPGAs libres os acompañen!



# Electrónica digital para todos con FPGAs Libres



Juan González Gómez (Obijuan)

<https://github.com/Obijuan>