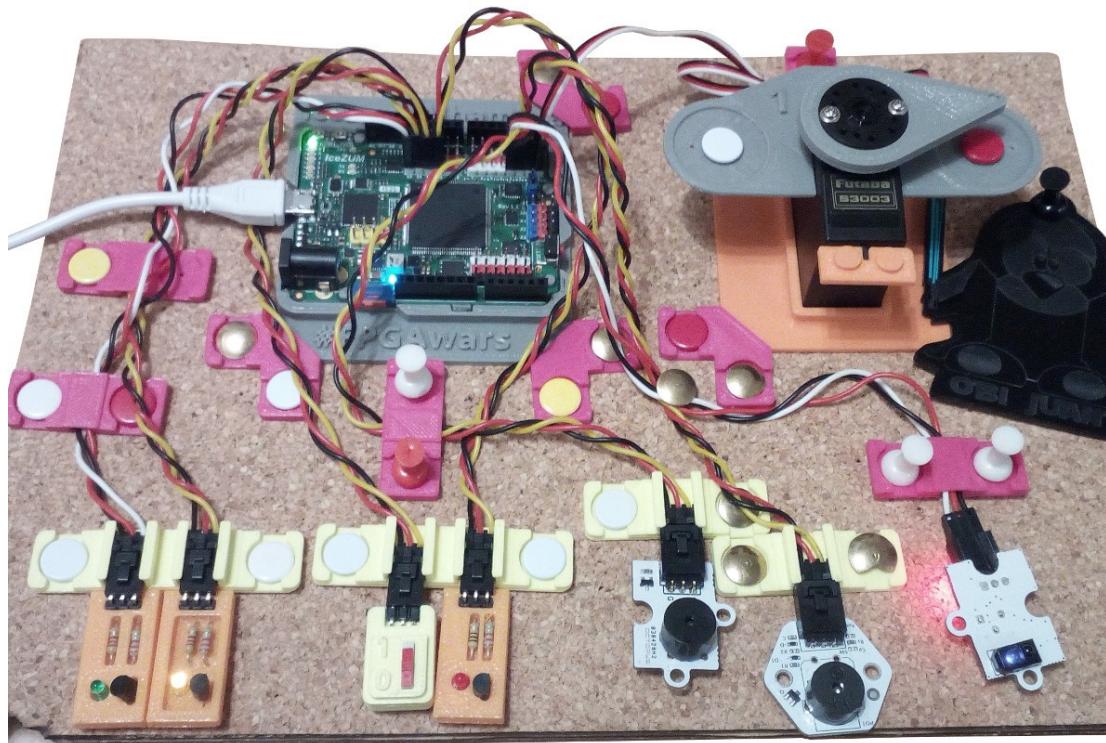




Electrónica digital divertida con FPGAs Libres



Programa de Enriquecimiento Educativo
para Alumnos con Altas Capacidades

Juan González Gómez (Obijuan)

<https://github.com/Obijuan>



5 de Mayo de 2017,
I.E.S Juan de la Cierva
MÁDRID

<https://github.com/Obijuan/myslides>



Contenido

Parte I: Electrónica digital

Parte II: Demo: Montando un circuito digital

Mundo digital

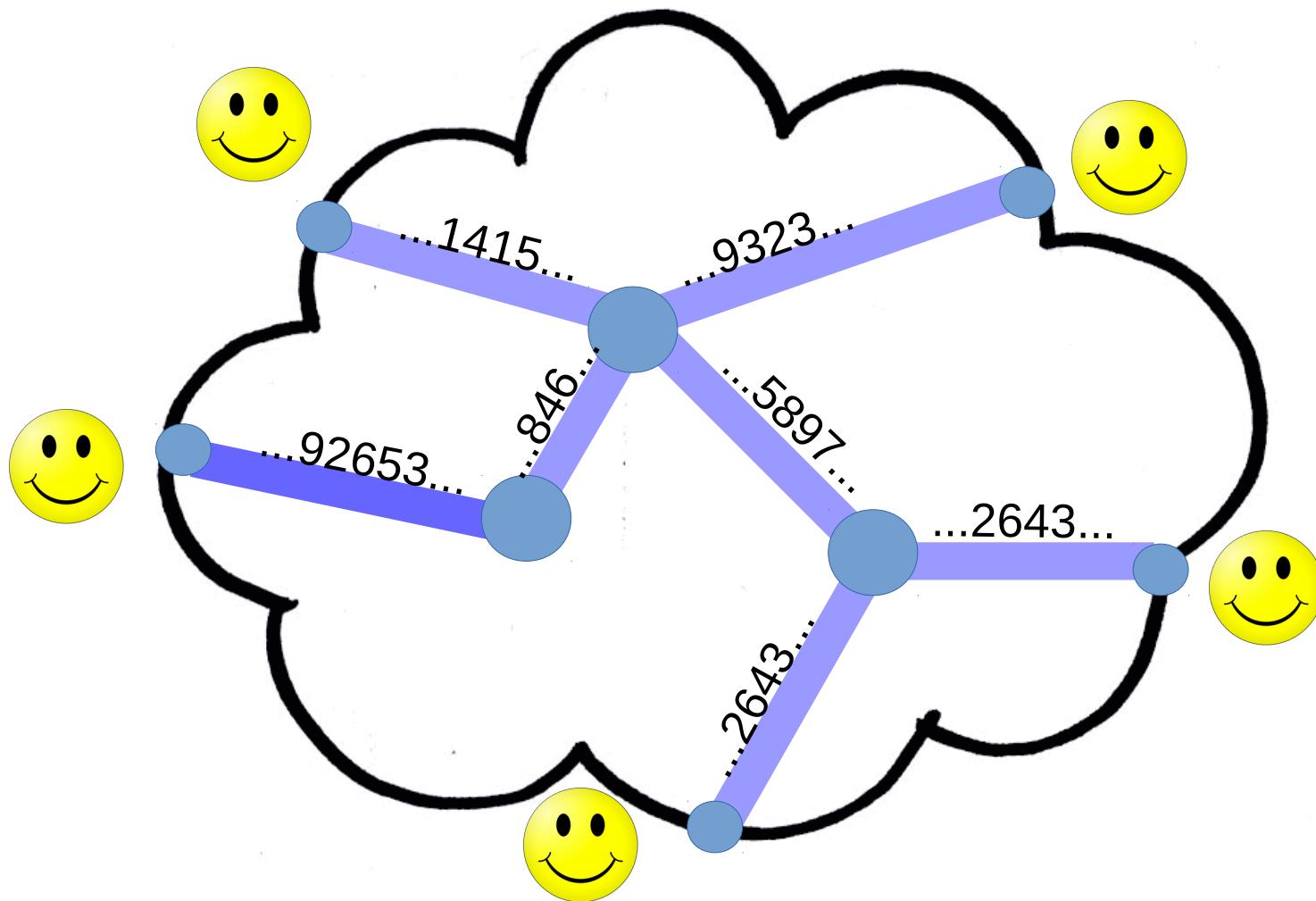


1415926535 8979323846 2643383279
5028841971 6939937510 5820974944
5923078164 0628620899 8628034825
3421170679 8214808651 3282306647

7245870066 0631558817 4881520920
9628292540 9171536436 7892590360
0113305305 4882046652 1384146951
9415116094 3305727036 5759591953
0921861173 8193261179 3105118548
0744623799 6274956735 1885752724
8912279381 8301194912 9833673362
4406566430 8602139494 6395224737
1907021798 6094370277 0539217176
2931767523 8467481846 7669405132

TODO SON NÚMEROS

Internet

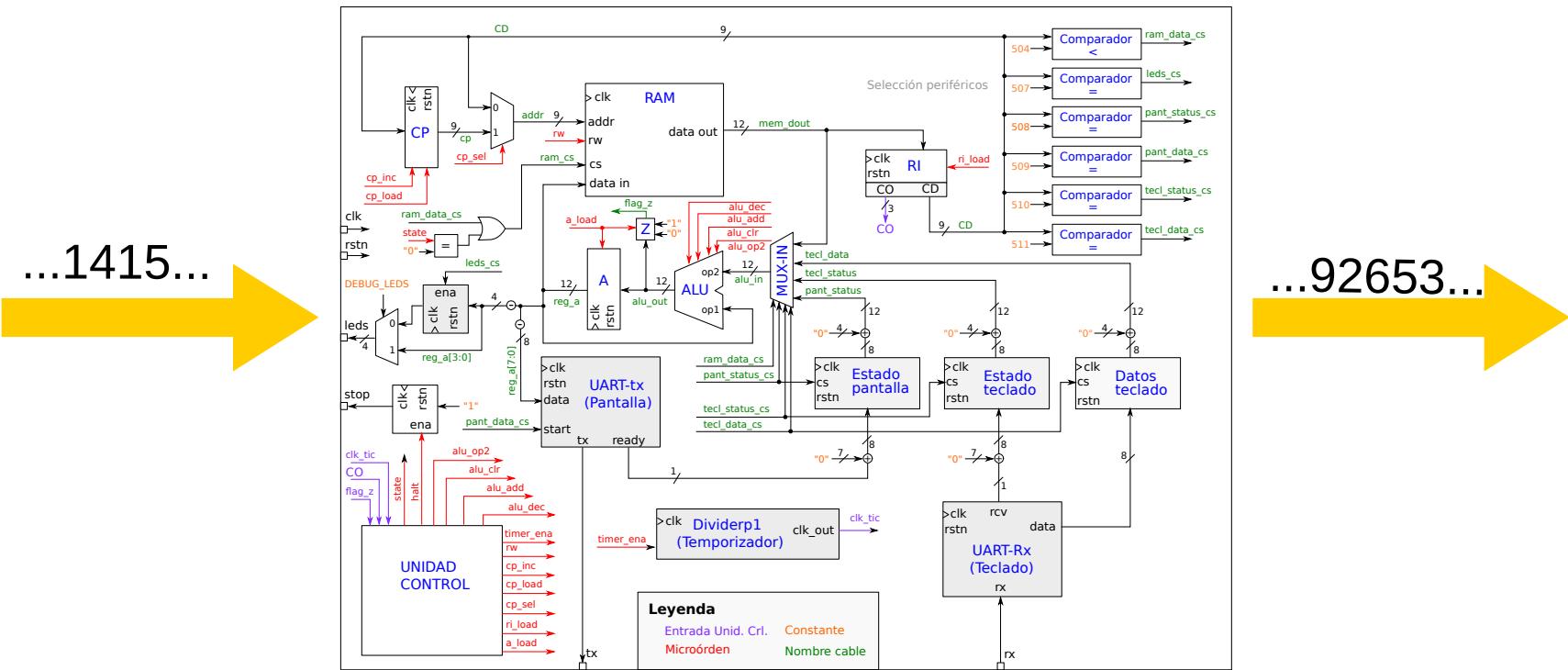


*Transporte, almacenamiento y manipulación
de NÚMEROS*

Los pitagóricos estarían orgullosos



Electrónica digital (I)



**Circuitos electrónicos que manipulan,
transportan y almacenan NÚMEROS**

Bits

14159265358979323846264338327950288
4197169399 375105820974944592307816



0

1

0001 0100 0001 0101 1001 0010 0110 0101 0011
0101 1000 1001 0111 1001 0101 0000 0010 1000
1000 0100 0001 0001 1001 0111 0001 0110 0111

TODO se reduce a 1s y 0s

Ser o no ser

Par o impar

Verdadero o falso

Todo o nada

Yin y Yang

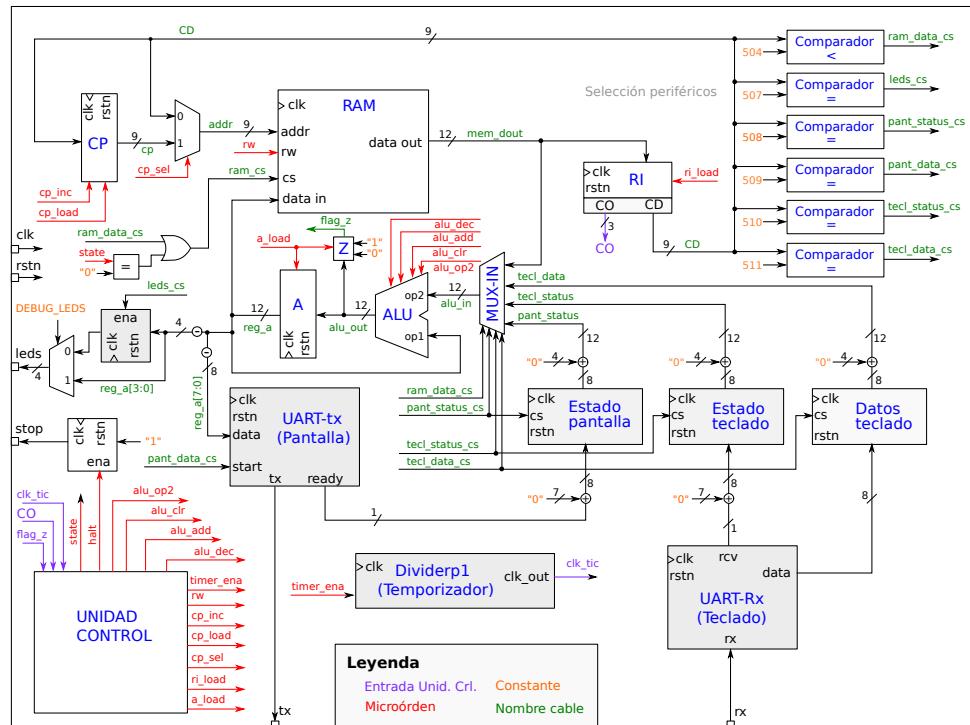
Culo o codo...

Electrónica digital (II)

...00010100...

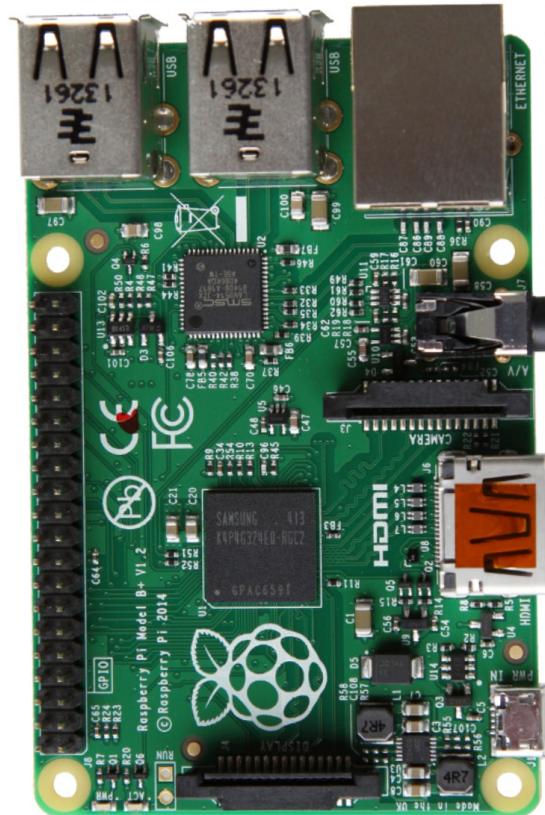


...10010010...



**Circuitos electrónicos que manipulan,
transportan y almacenan BITS**

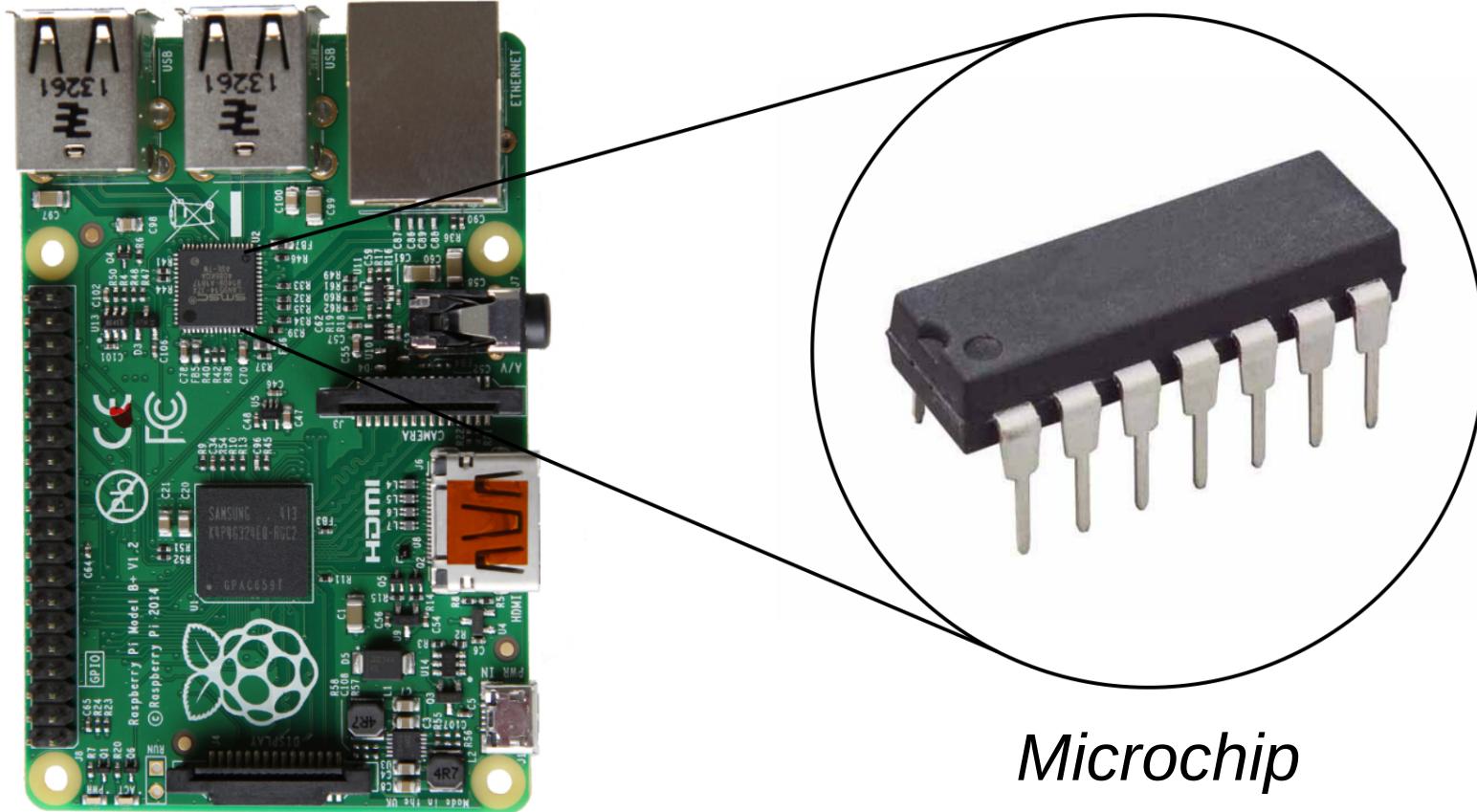
Viaje al interior de la electrónica (I)



Producto electrónico

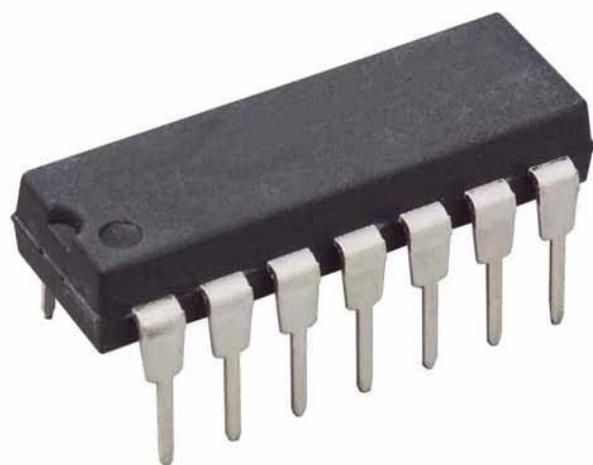
Circuito electrónico

Viaje al interior de la electrónica (II)

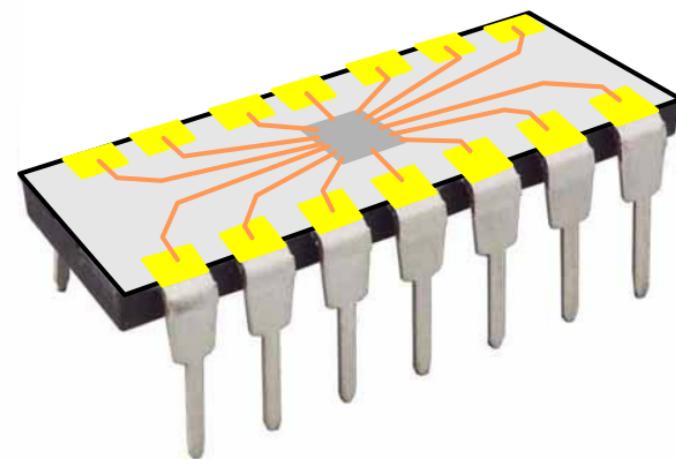


Circuito electrónico

Viaje al interior de la electrónica (III)

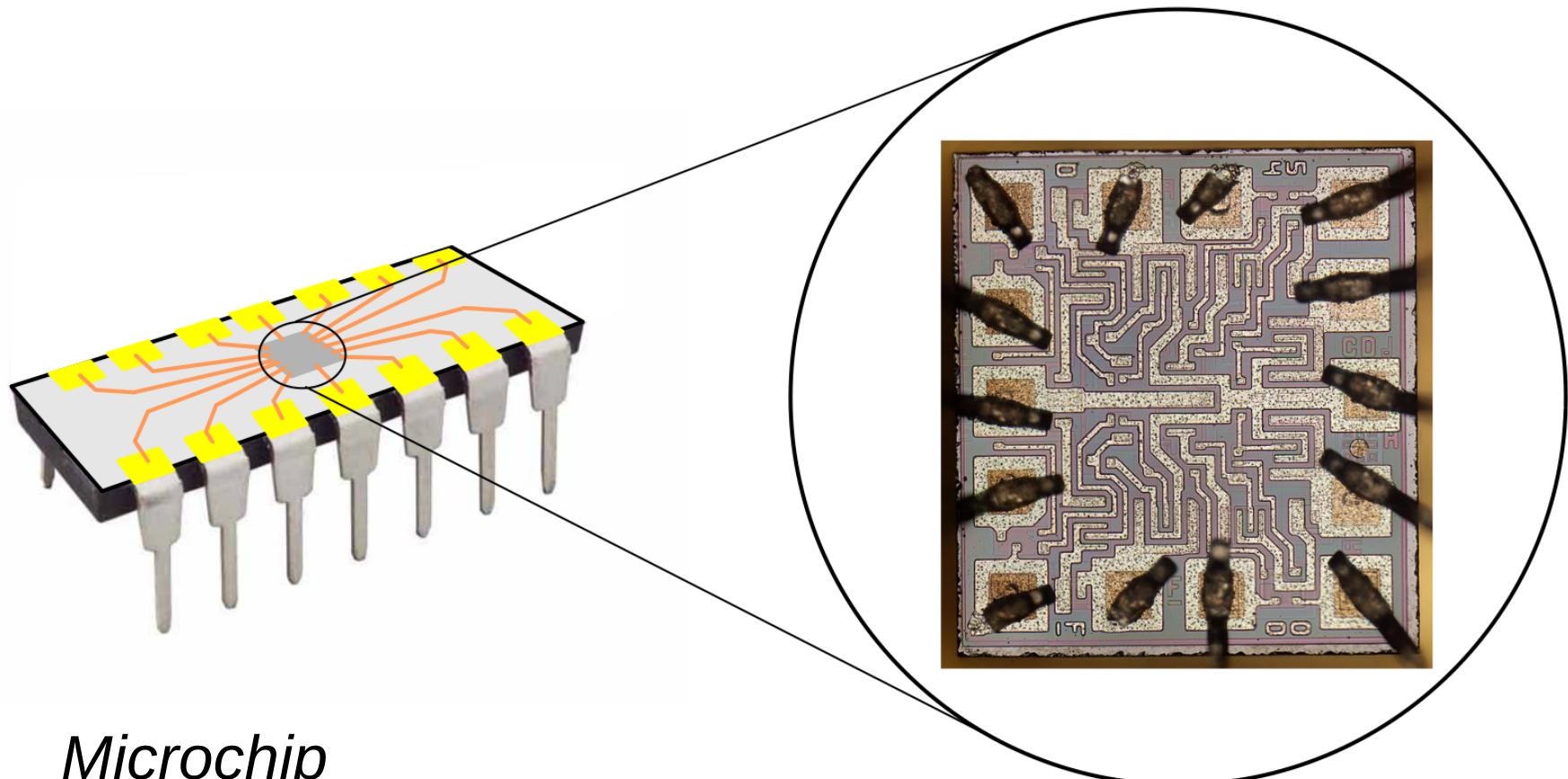


Microchip



Microchip

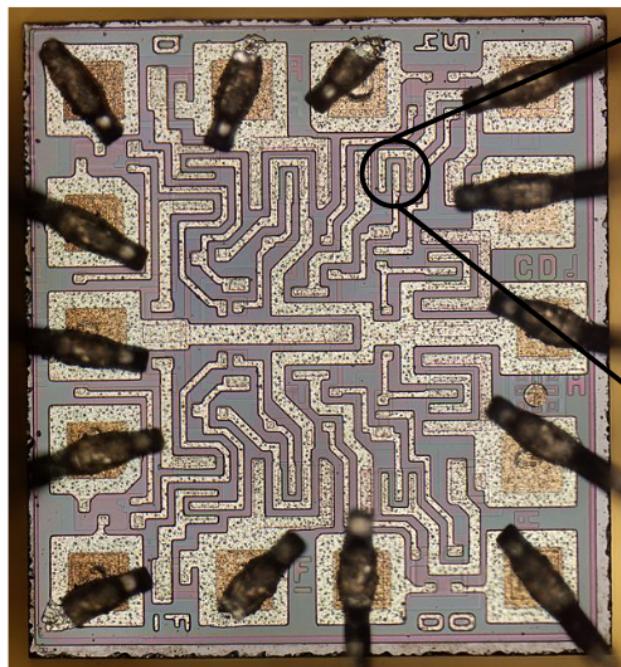
Viaje al interior de la electrónica (IV)



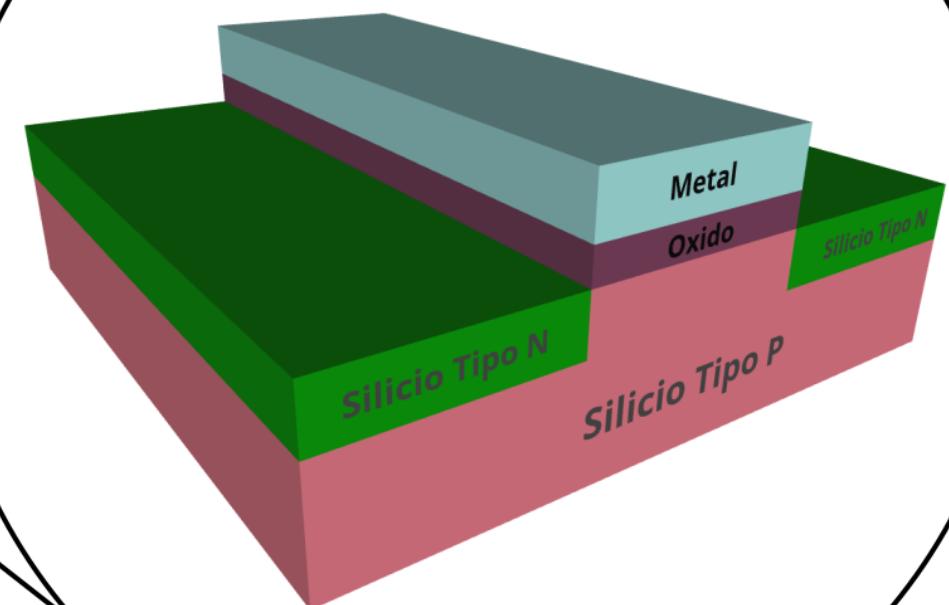
Microchip

Dado

Viaje al interior de la electrónica (V)

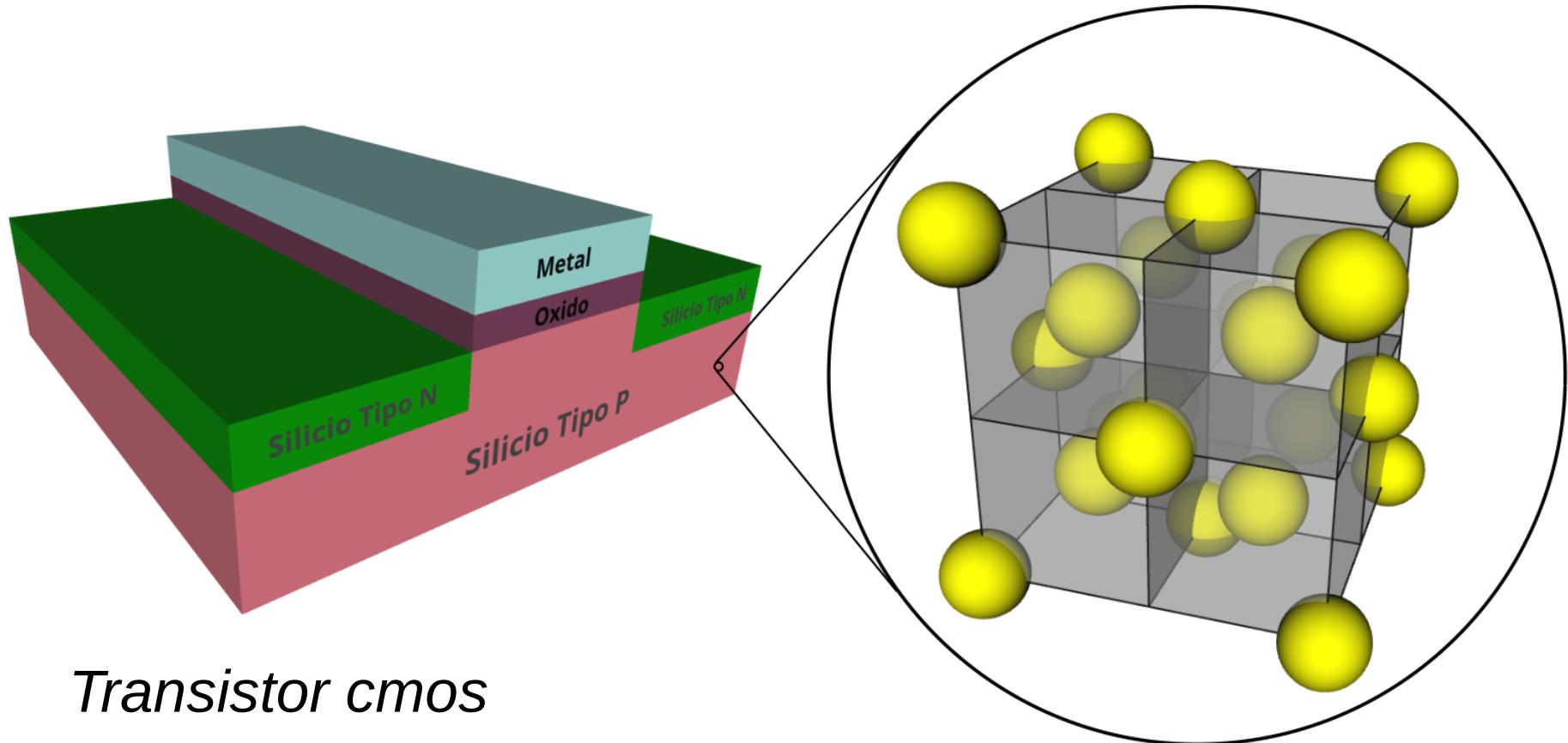


Dado



Transistor cmos

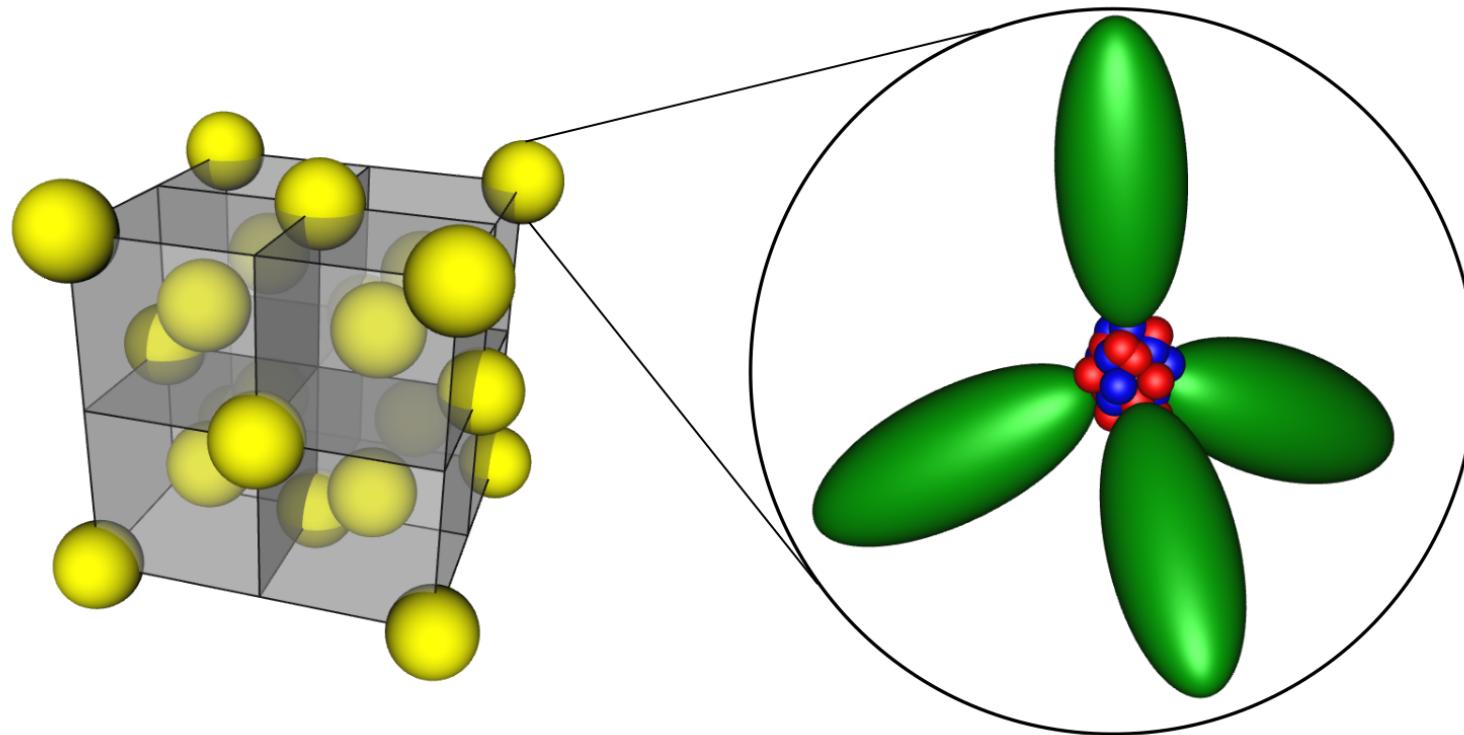
Viaje al interior de la electrónica (VI)



Transistor cmos

Cristal de silicio

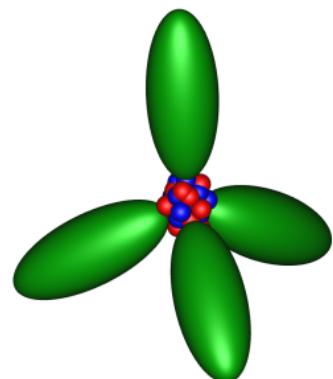
Viaje al interior de la electrónica (VII)



Cristal de silicio

Átomo de Silicio

Agrupación en niveles



Nivel 1: Átomos

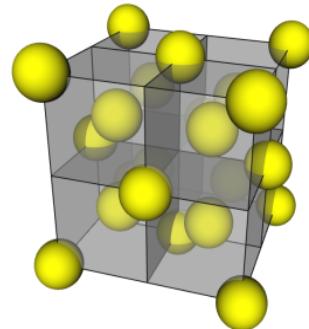
Átomo de silicio

Física, Química

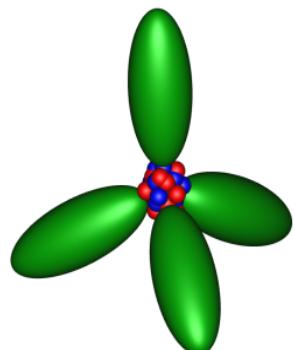
Agrupación en niveles (II)

Cristal de silicio

Física del estado sólido



Nivel 2: Materiales

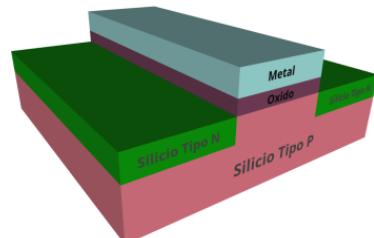


Nivel 1: Átomos

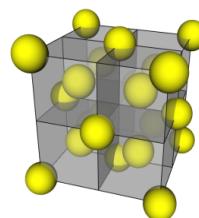
Agrupación en niveles (III)

Uniones PN

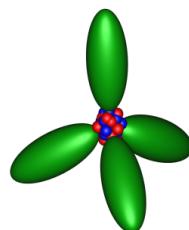
Electrónica de dispositivos



Nivel 3: Semiconductores

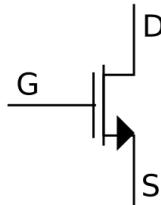


Nivel 2: Materiales



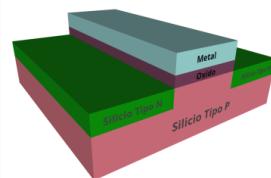
Nivel 1: Átomos

Agrupación en niveles (IV)



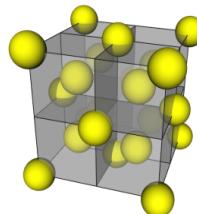
Nivel 4: Transistor

Transistor

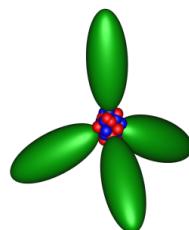


Nivel 3: Semiconductores

Microelectrónica



Nivel 2: Materiales

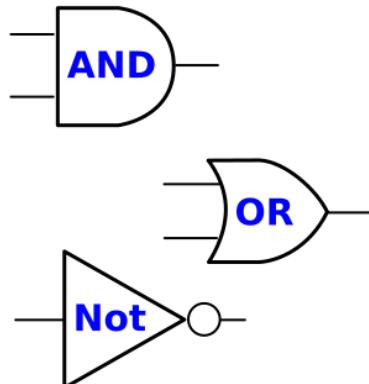


Nivel 1: Átomos

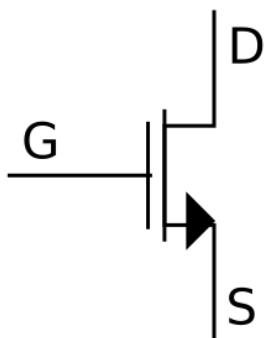
Agrupación en niveles (V)

Puertas Lógicas

Electrónica Digital



Nivel 5: Puertas Lógicas



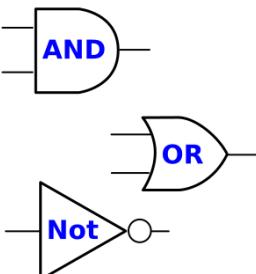
Nivel 4: Transistor

Agrupación en niveles (VI)

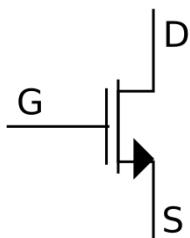
*Microprocesador
Arquitectura Ordenadores*



Nivel 6: Microprocesador



Nivel 5: Puertas Lógicas



Nivel 4: Transistor

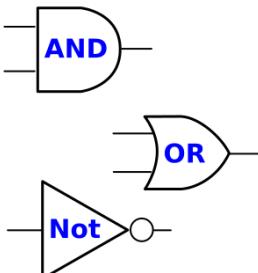
Agrupación en niveles (VII)



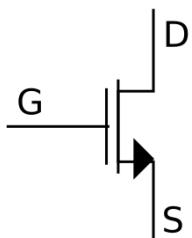
Nivel 7: Software



Nivel 6: Microprocesador



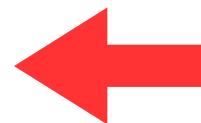
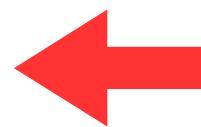
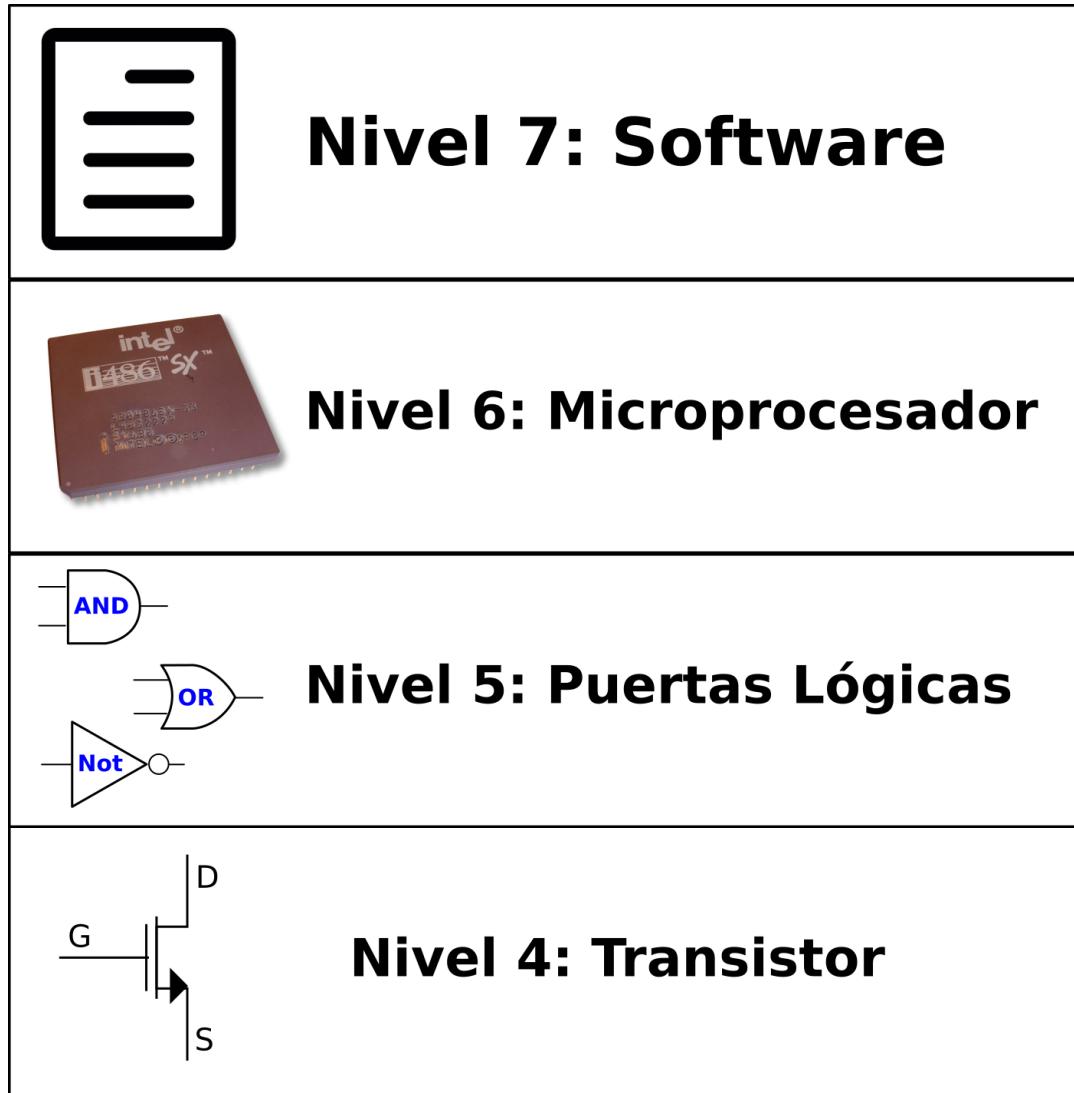
Nivel 5: Puertas Lógicas



Nivel 4: Transistor

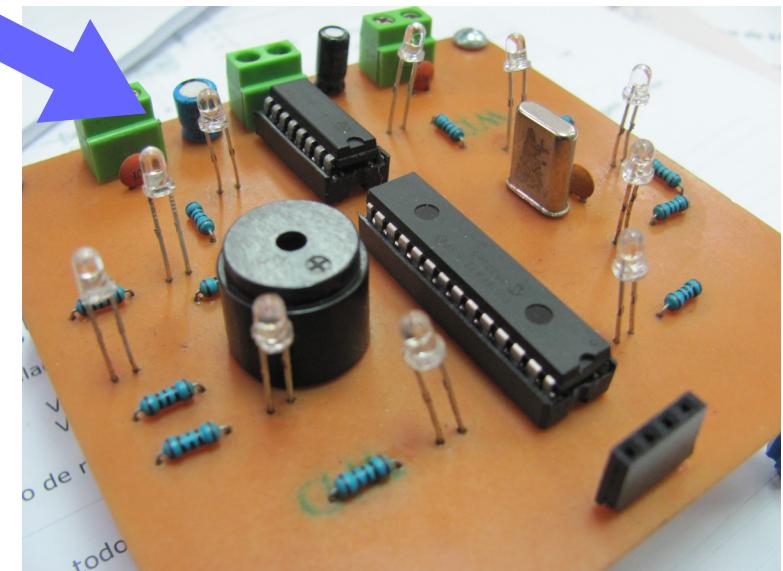
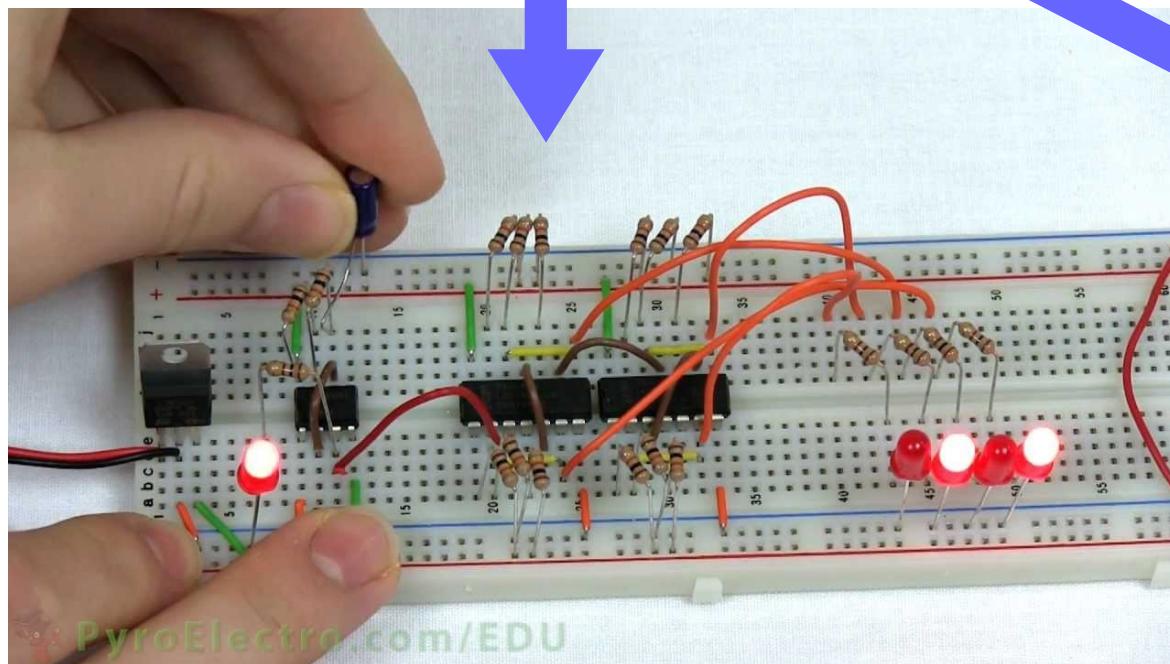
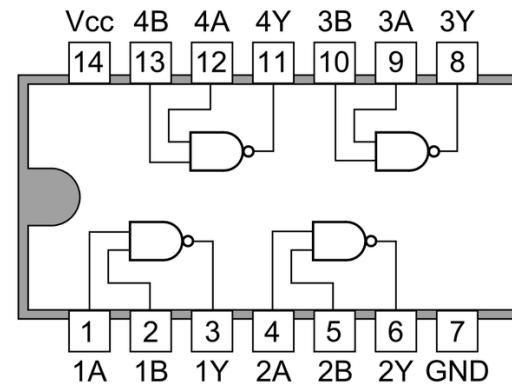
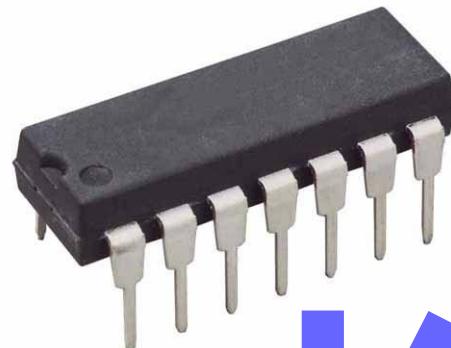
*Software
Programación*

Arduino y Electrónica digital

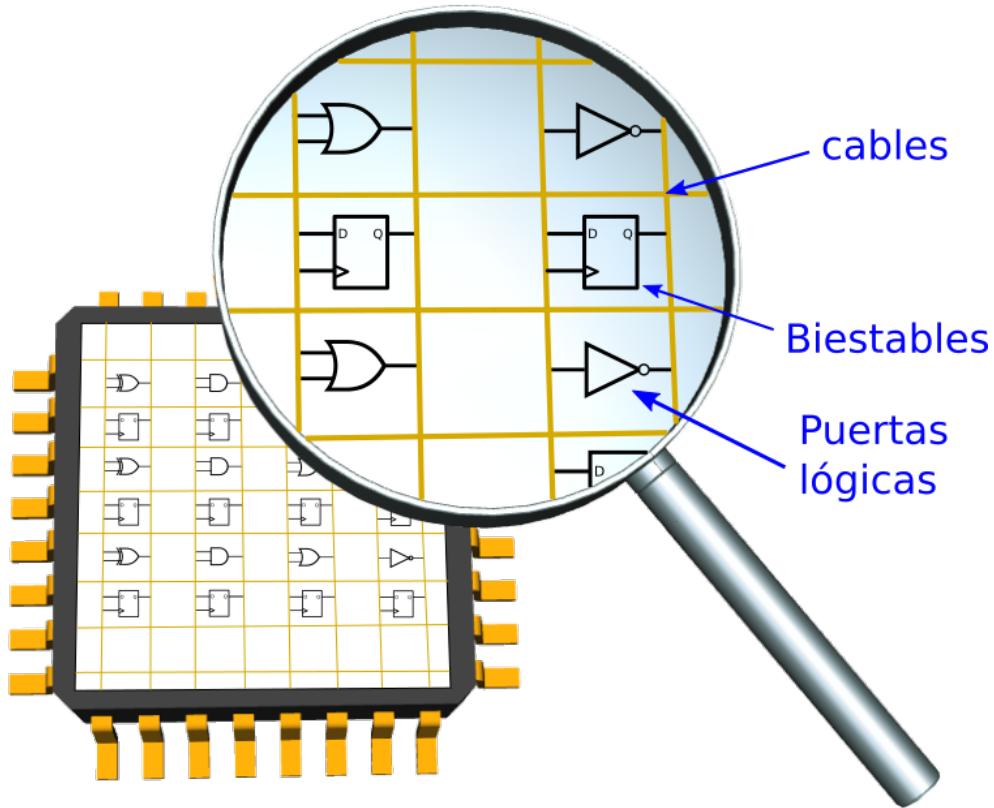


*Electrónica
digital*

¿Cómo se hacen los circuitos digitales?

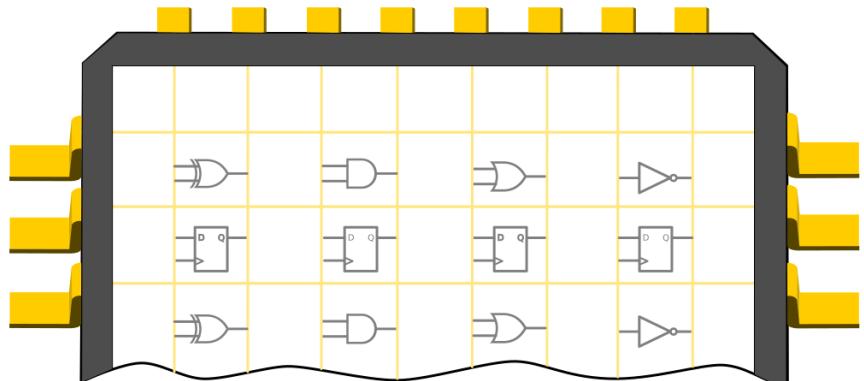


Tecnología FPGA

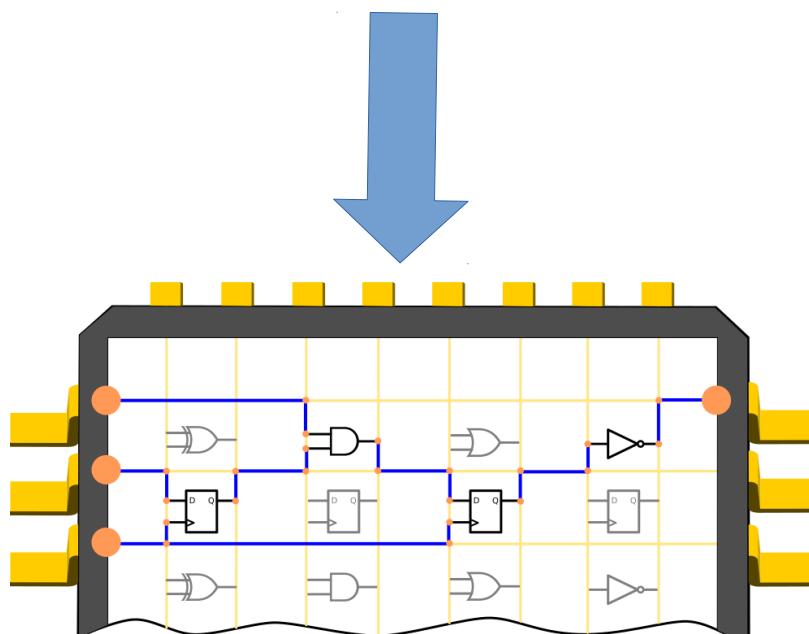


FPGA: Chip “en blanco” que contiene una matriz con los 3 componentes básicos: puertas lógicas, biestables y cables

Electrónica digital con FPGAs



FPGA en Blanco



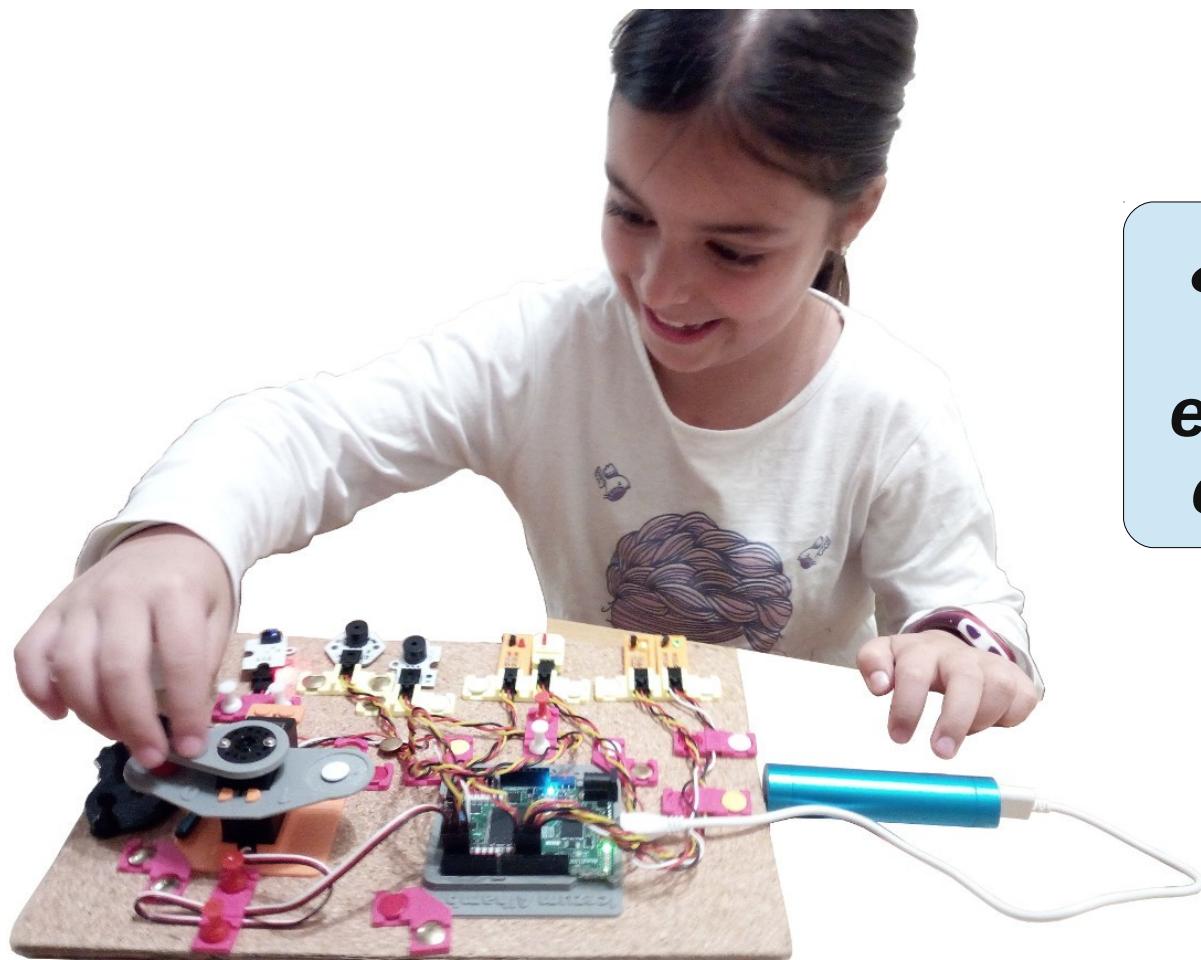
FPGA configurada

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

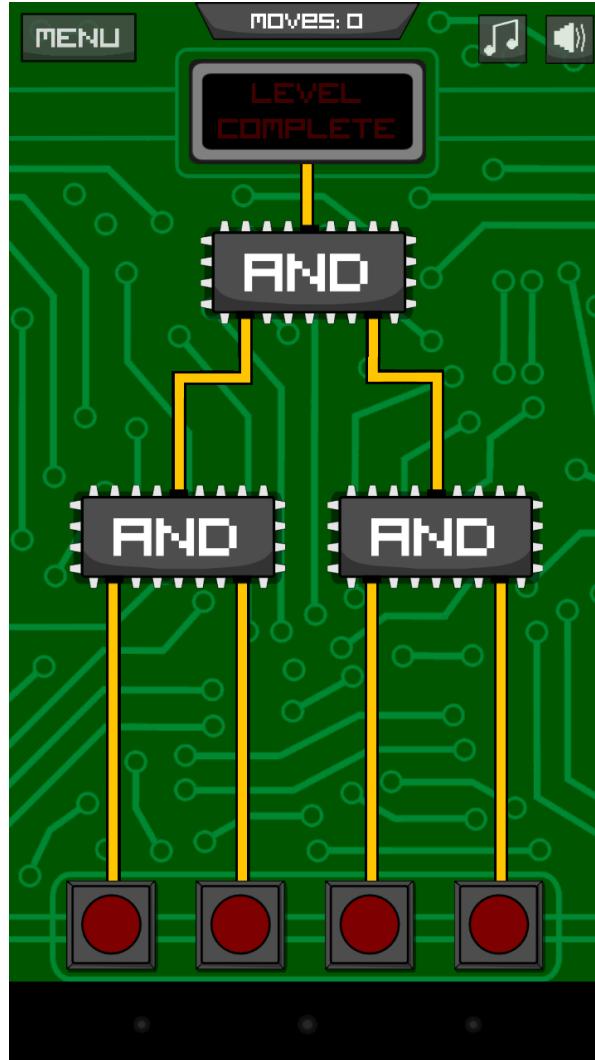
Parte II: Demo: Montando un circuito digital

Motivación

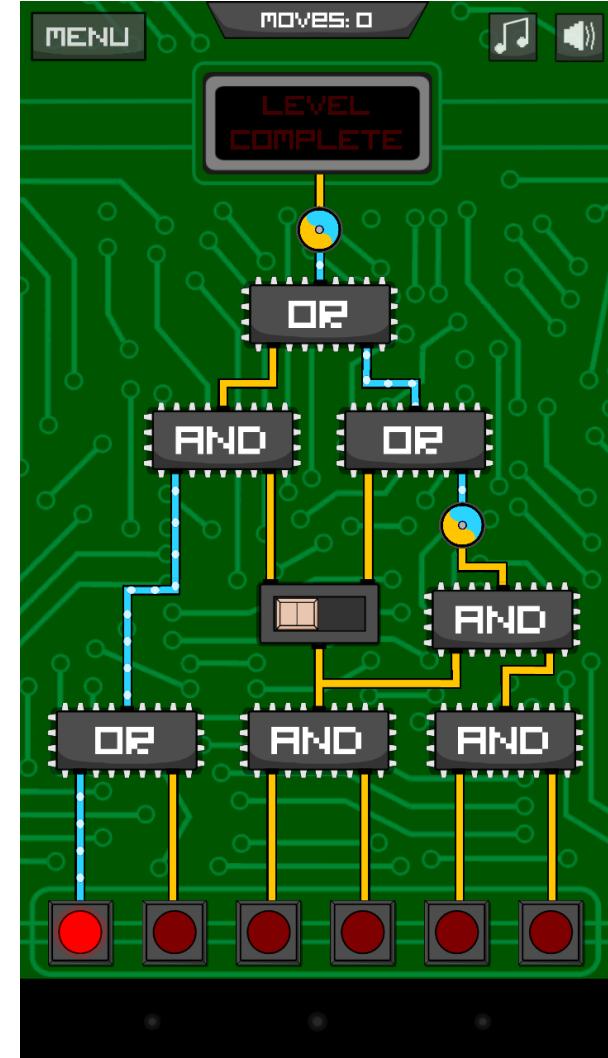
Electrónica digital accesible



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

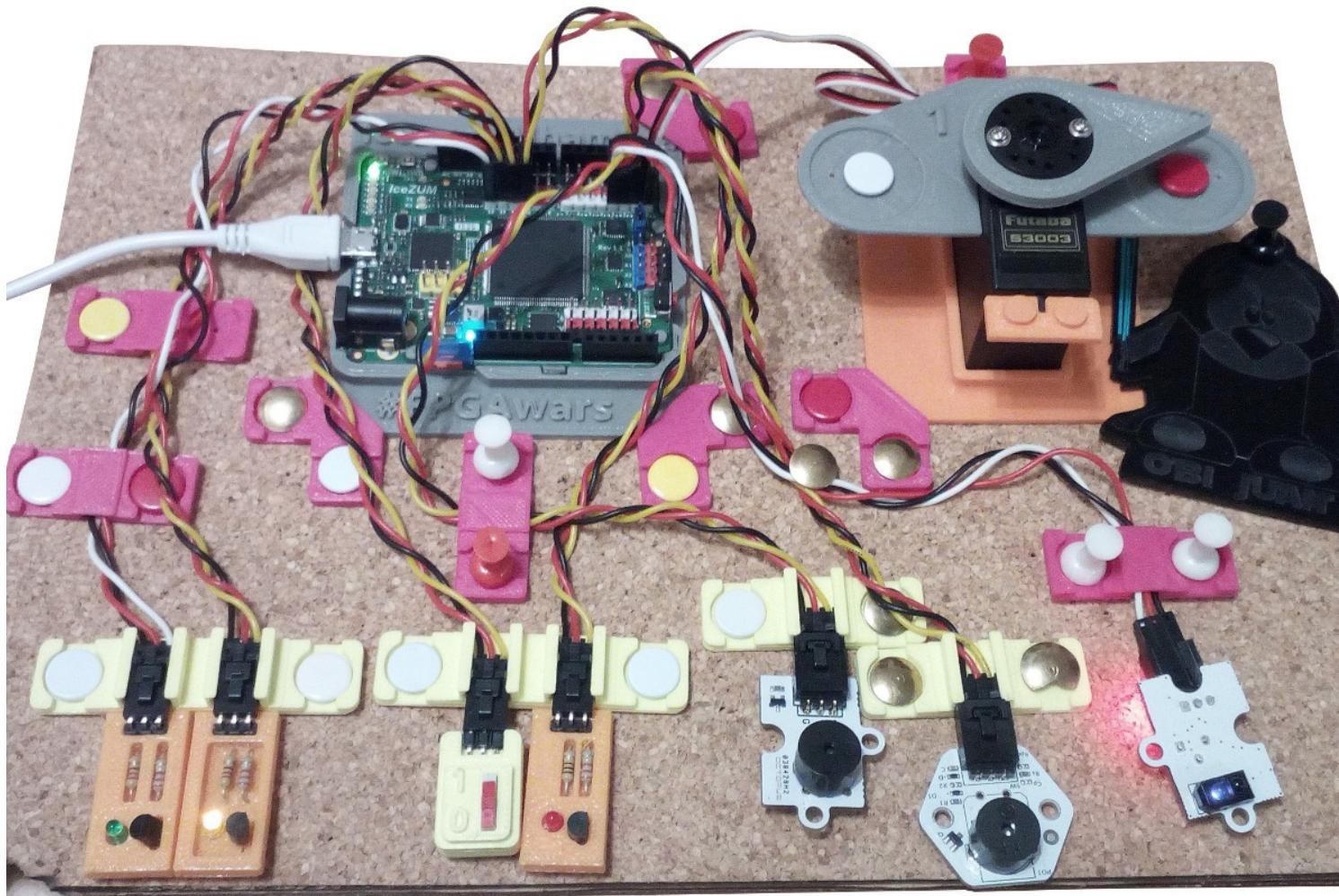


APP:
Circuit
Scramble



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

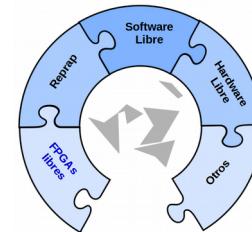
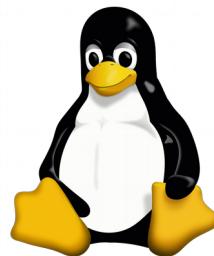
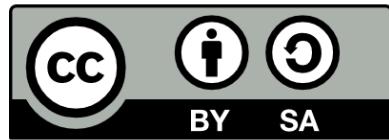
Demo/Tutorial: Sistema de alarma por proximidad



You're leaving the Privative sector...



A partir de aquí: Sólo tecnologías libres

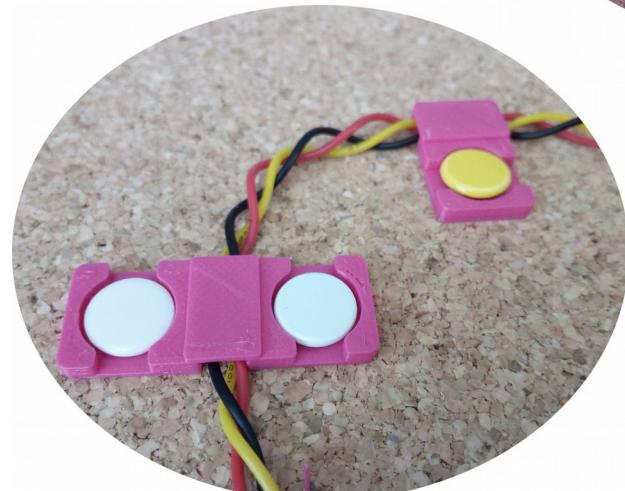


¿Qué vamos a usar?

Panel de corcho (28x19cm)

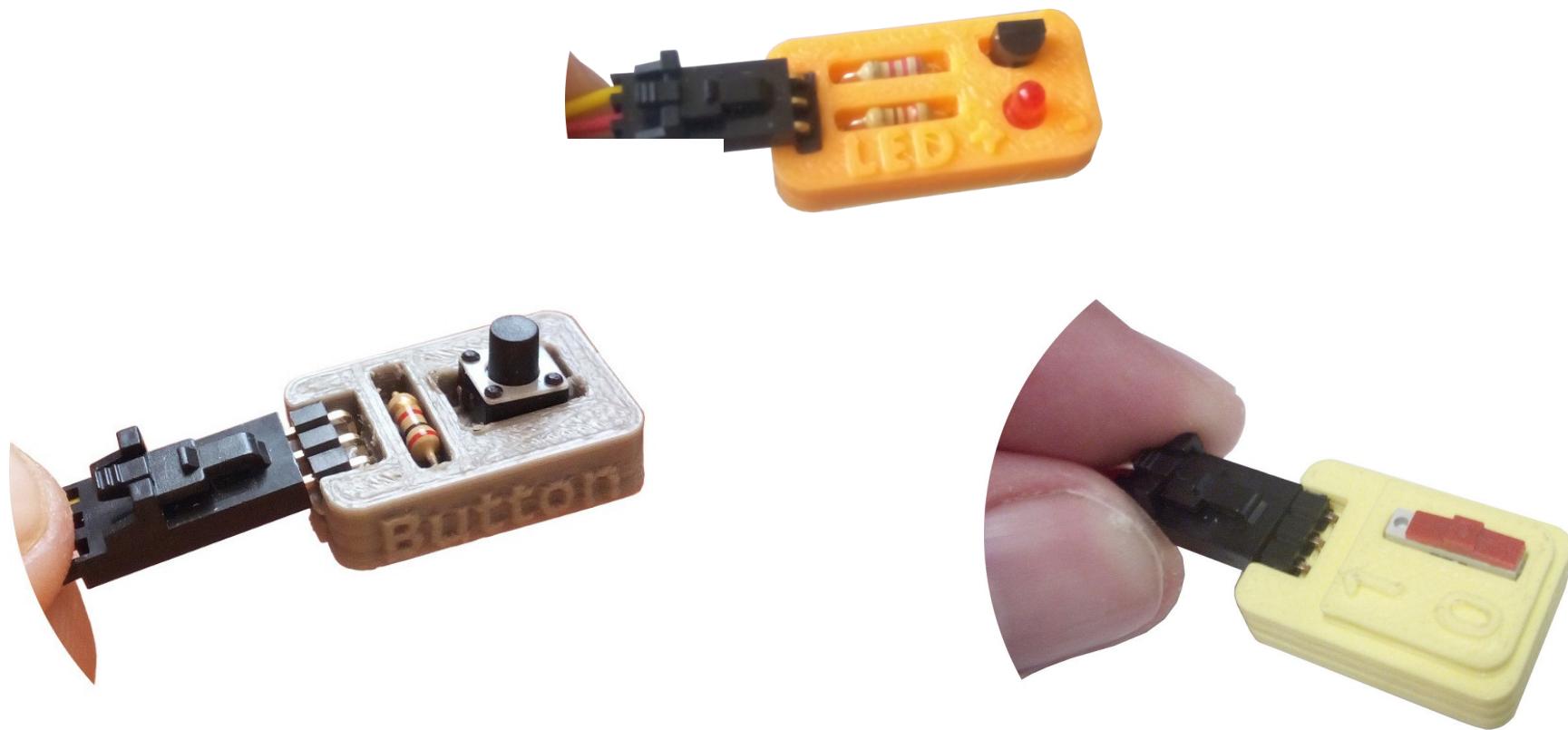


Piezas Impresas en 3D para fijar elementos al corcho



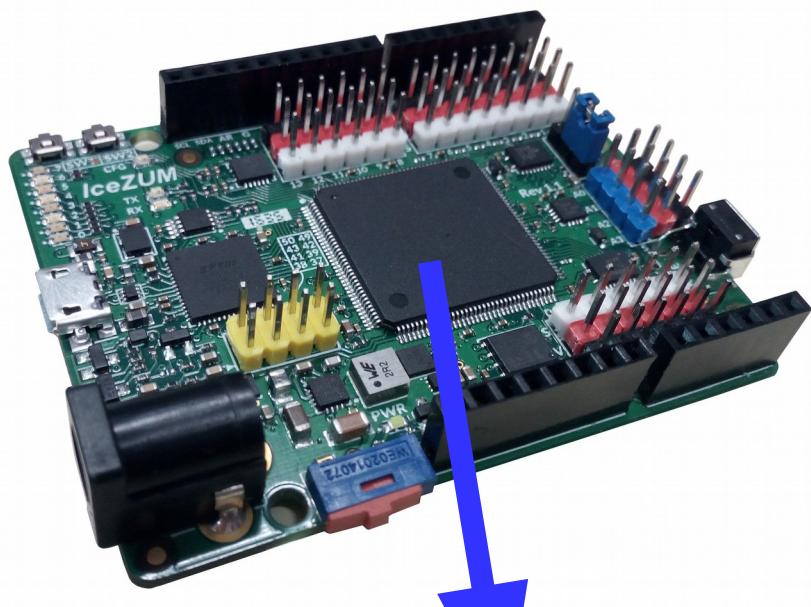
Periféricos

PCBprints: Mini-circuitos impresos en 3D



Icezum Alhambra v1.1

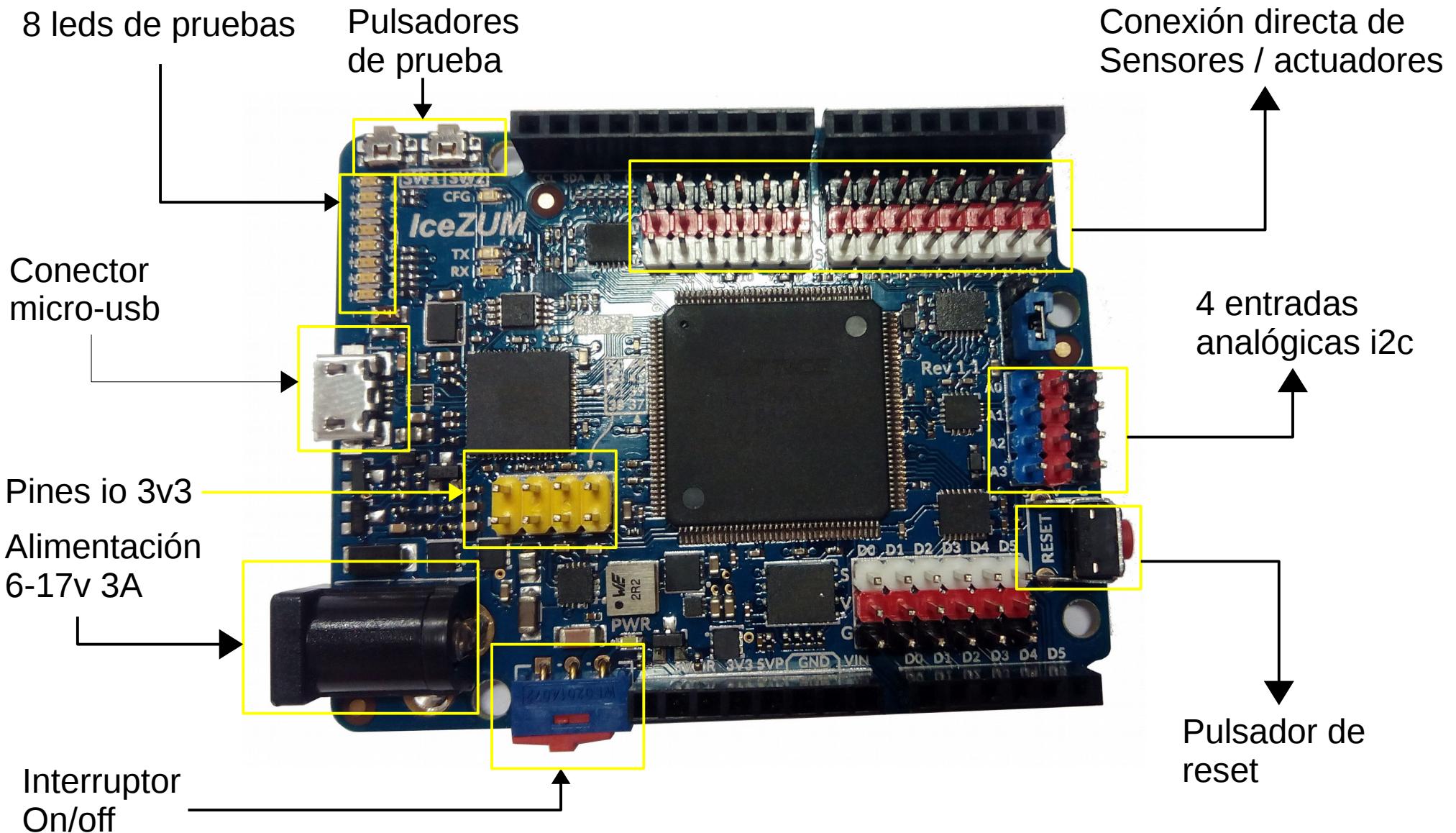
<https://github.com/FPGAwars/icezum/wiki>



FPGA Libre

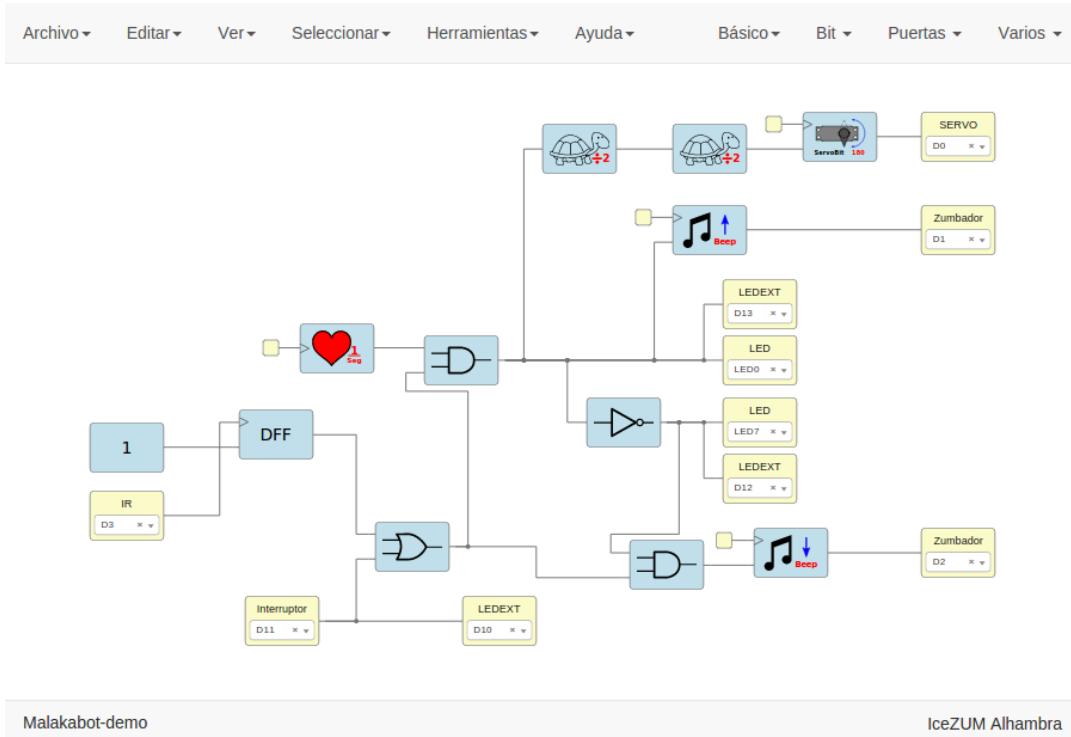
- Autor: **Eladio Delgado**
- Diseñada en Pinos del Valle (Granada)
- Arduino de las **FPGAs**
- Compatible Arduino
- Fácil conexión de circuitos externos/sensores/servos
- Reutilización de los shields de arduino
- 20 entradas/salidas de 5v
- 3A corriente de entrada
- Perfecta para hacer robots

Icezum Alhambra v1.1





icesstudio



Malakabot-demo

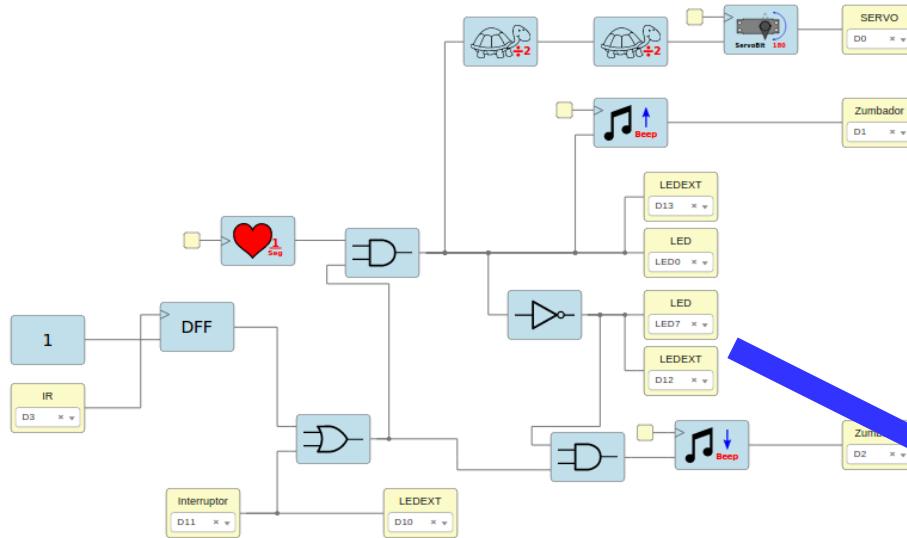
IceZUM Alhambra

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

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

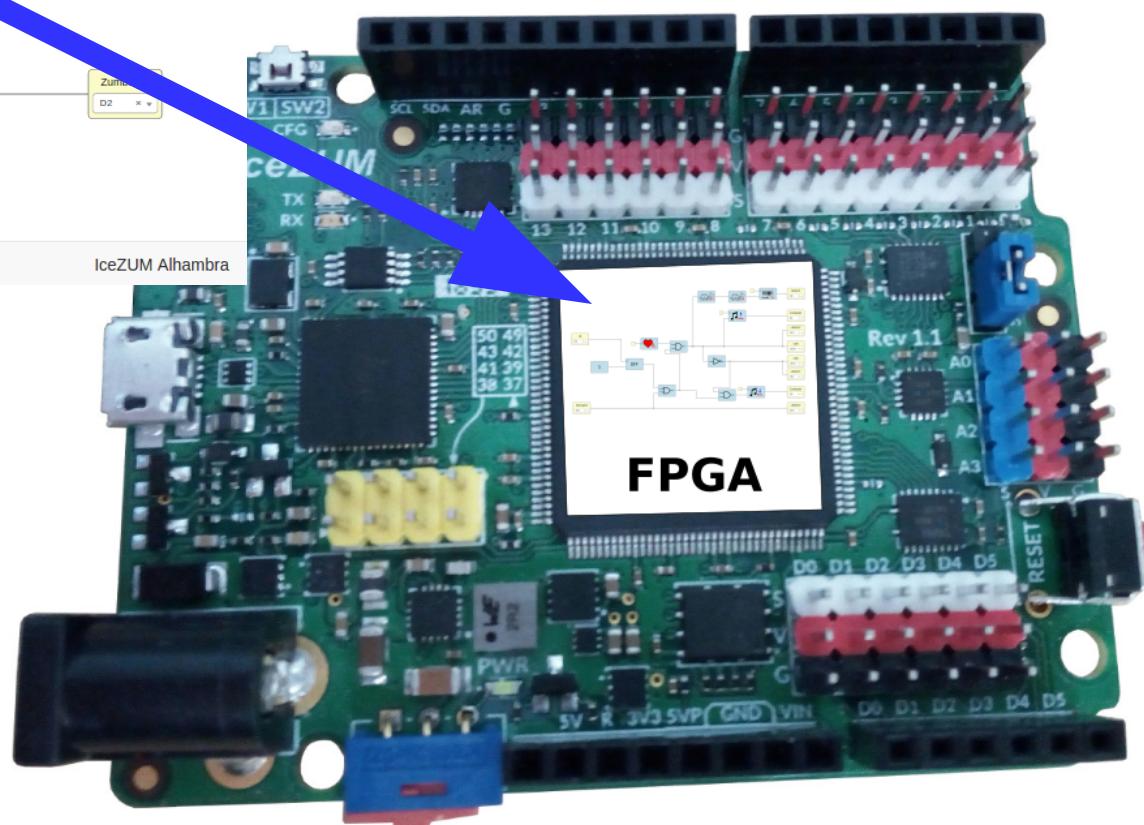
La magia de las FPGAs

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

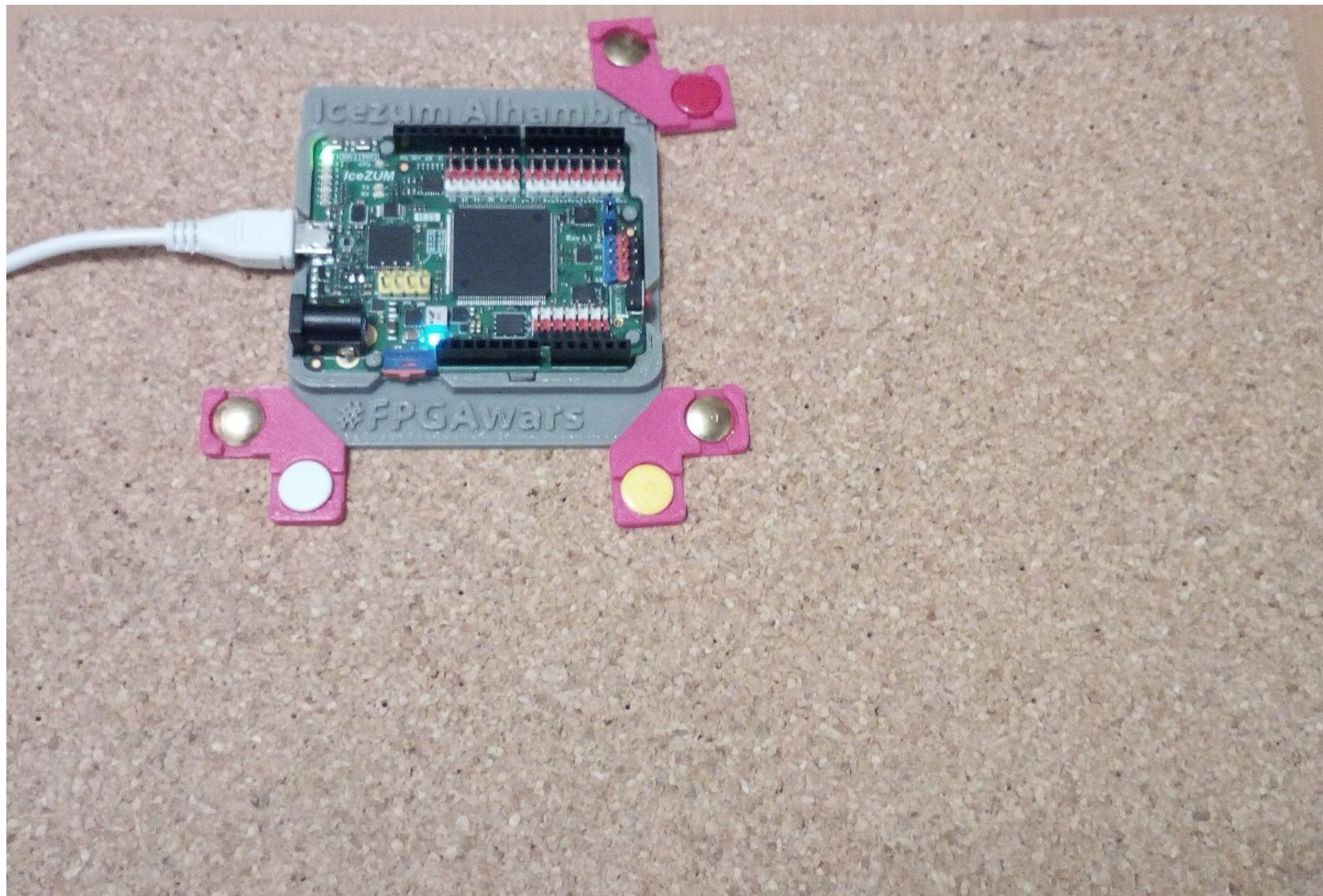


Malakabot-demo

IceZUM Alhambra



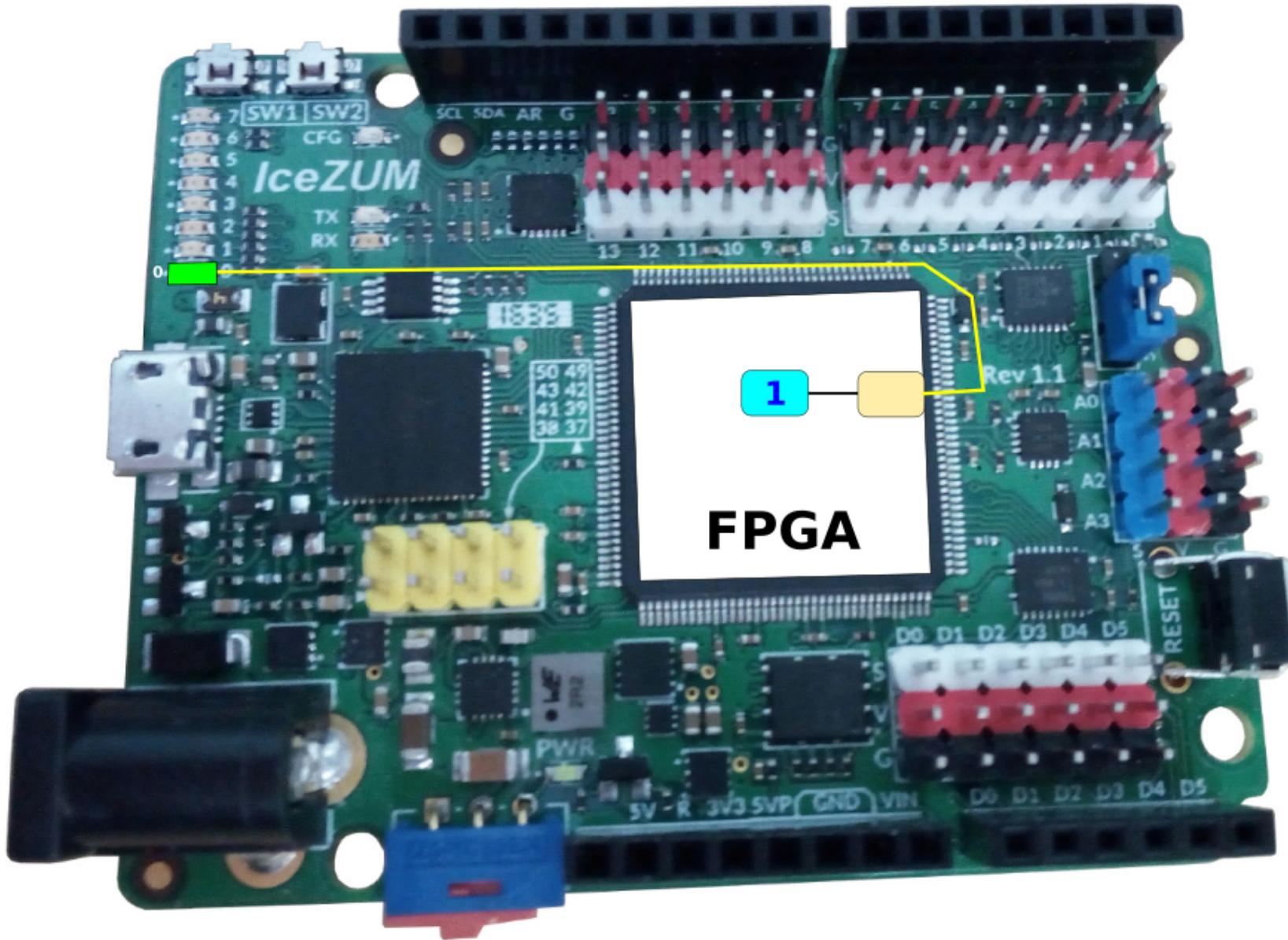
¡Empezamos!



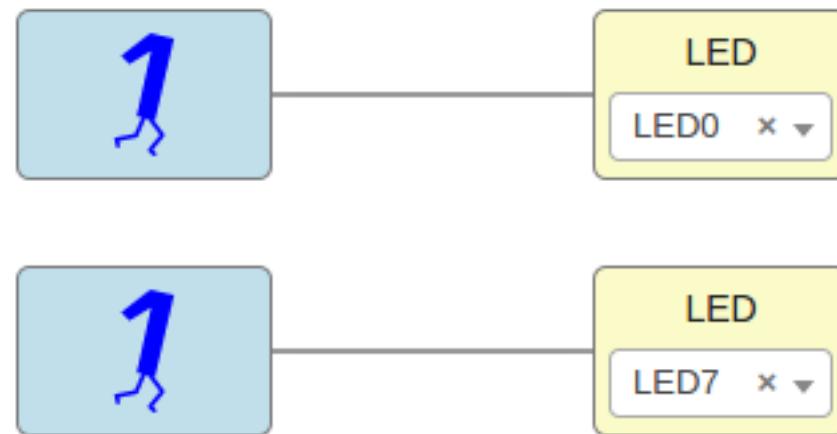
Ejemplo 1: Hola Mundo



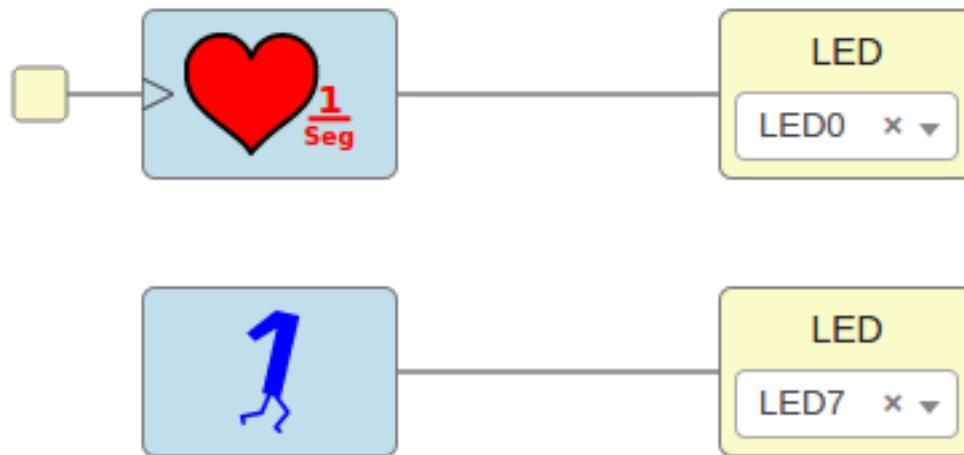
Hola mundo: Implementación física



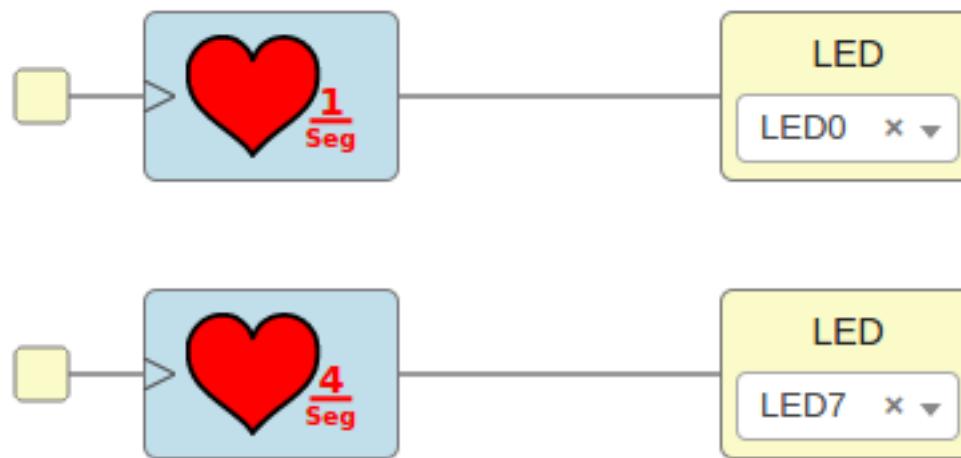
Ejemplo 2: Dos leds en paralelo



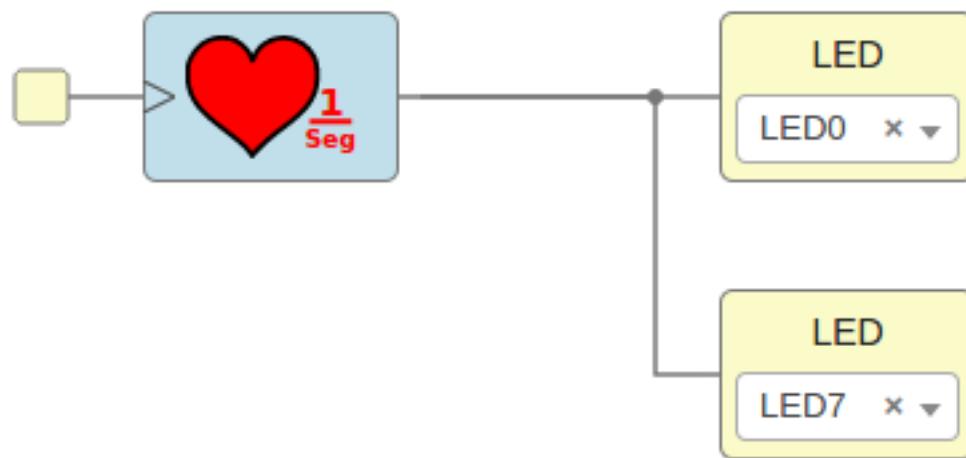
Ejemplo 3: Led pulsante



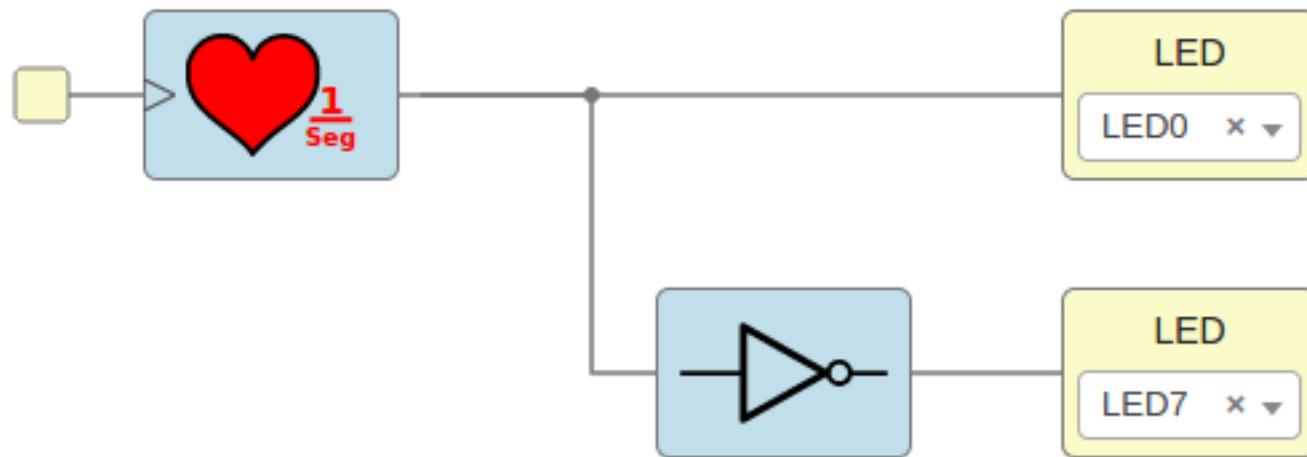
Ejemplo 4: Leds pulsantes Diferentes ritmos



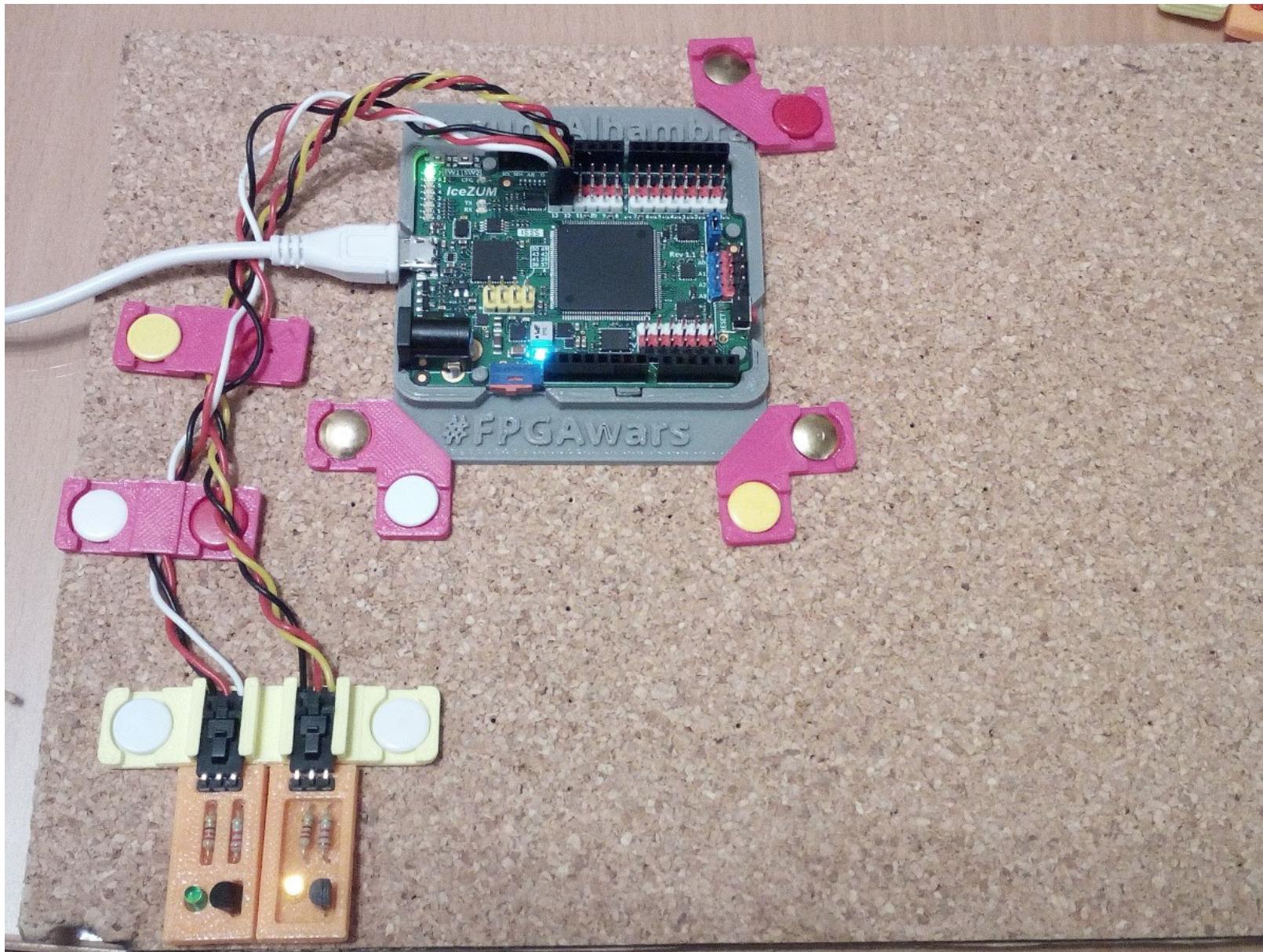
Ejemplo 5: Leds pulsantes Mismo ritmo



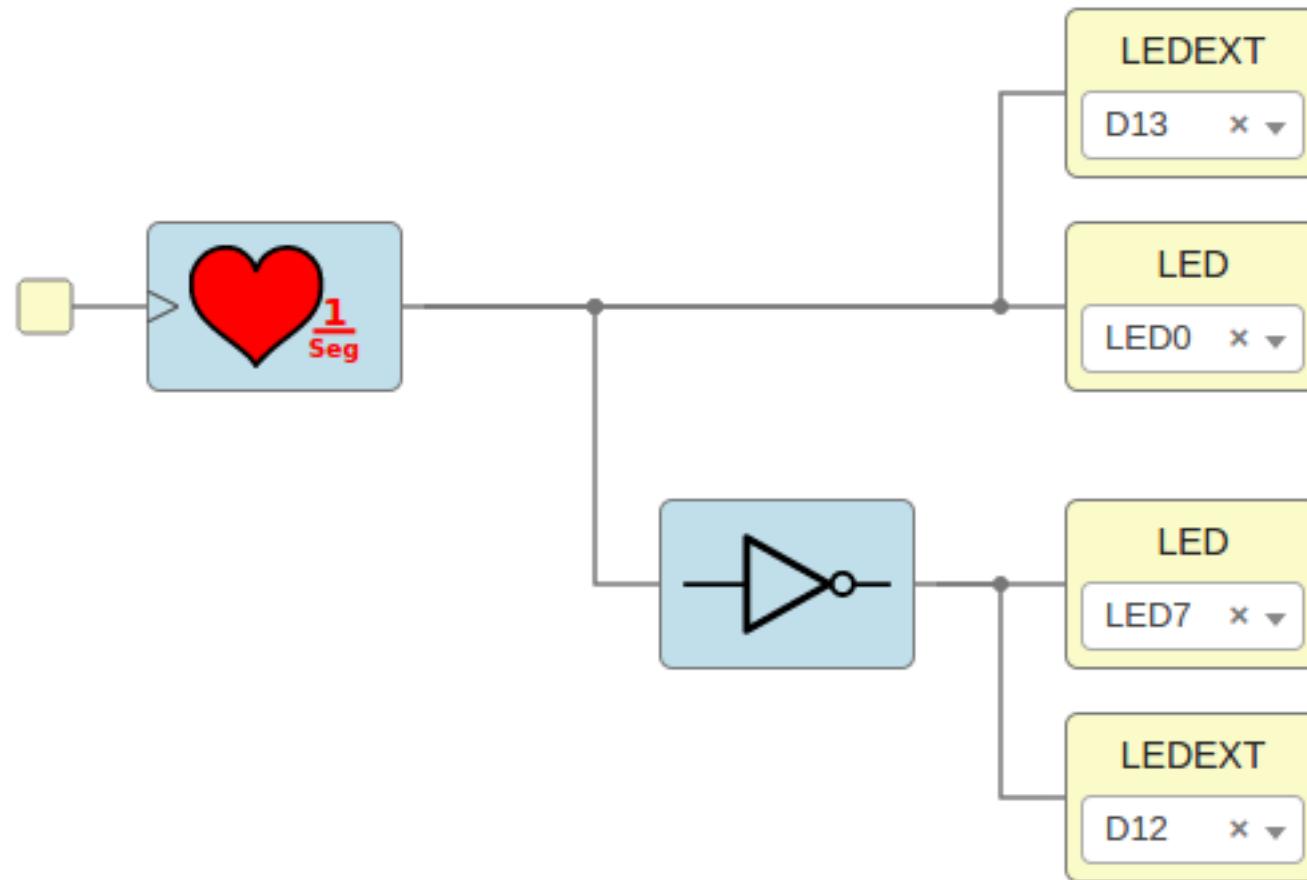
Ejemplo 6: Leds alternativos



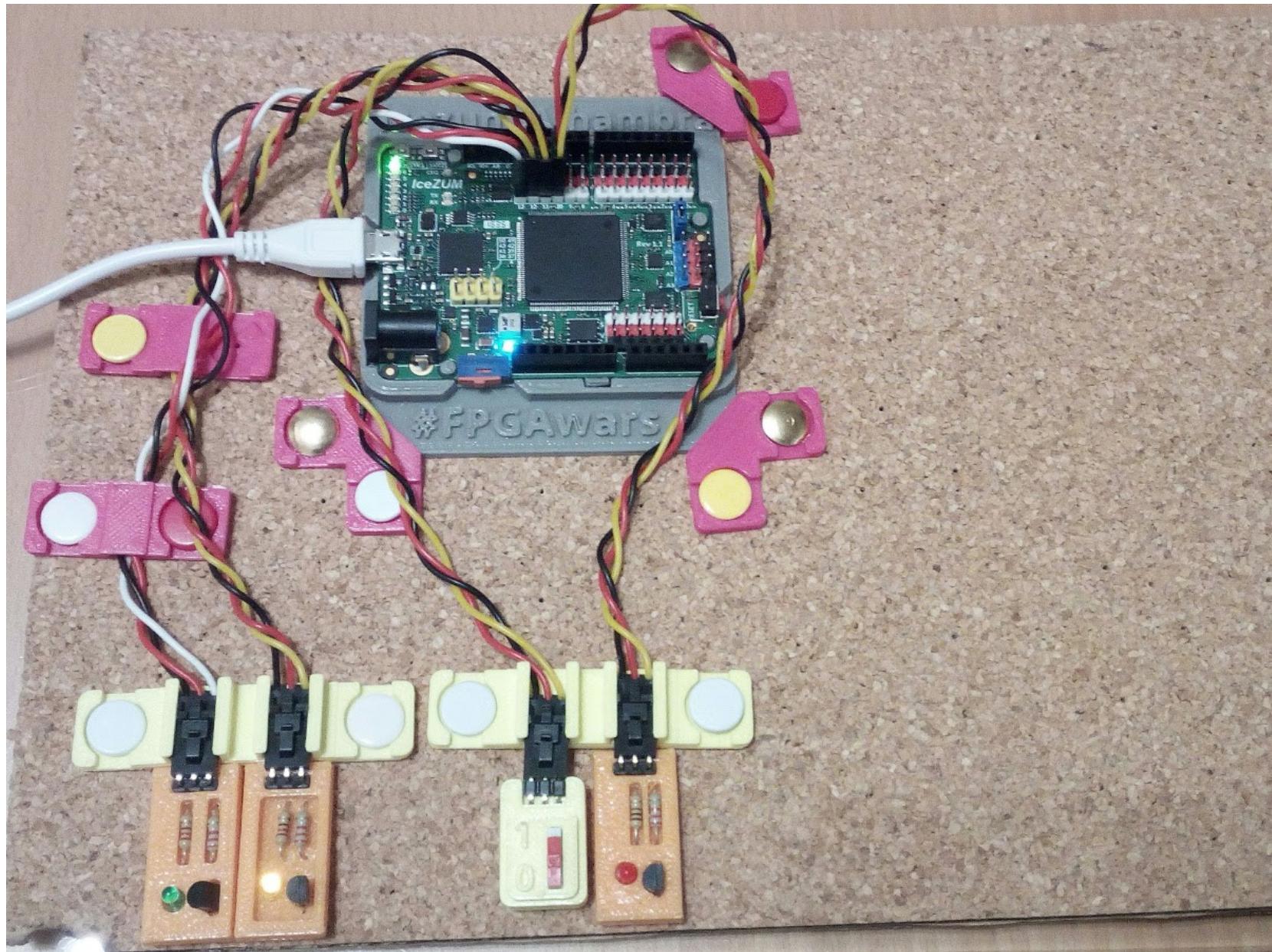
Periféricos: Leds externos



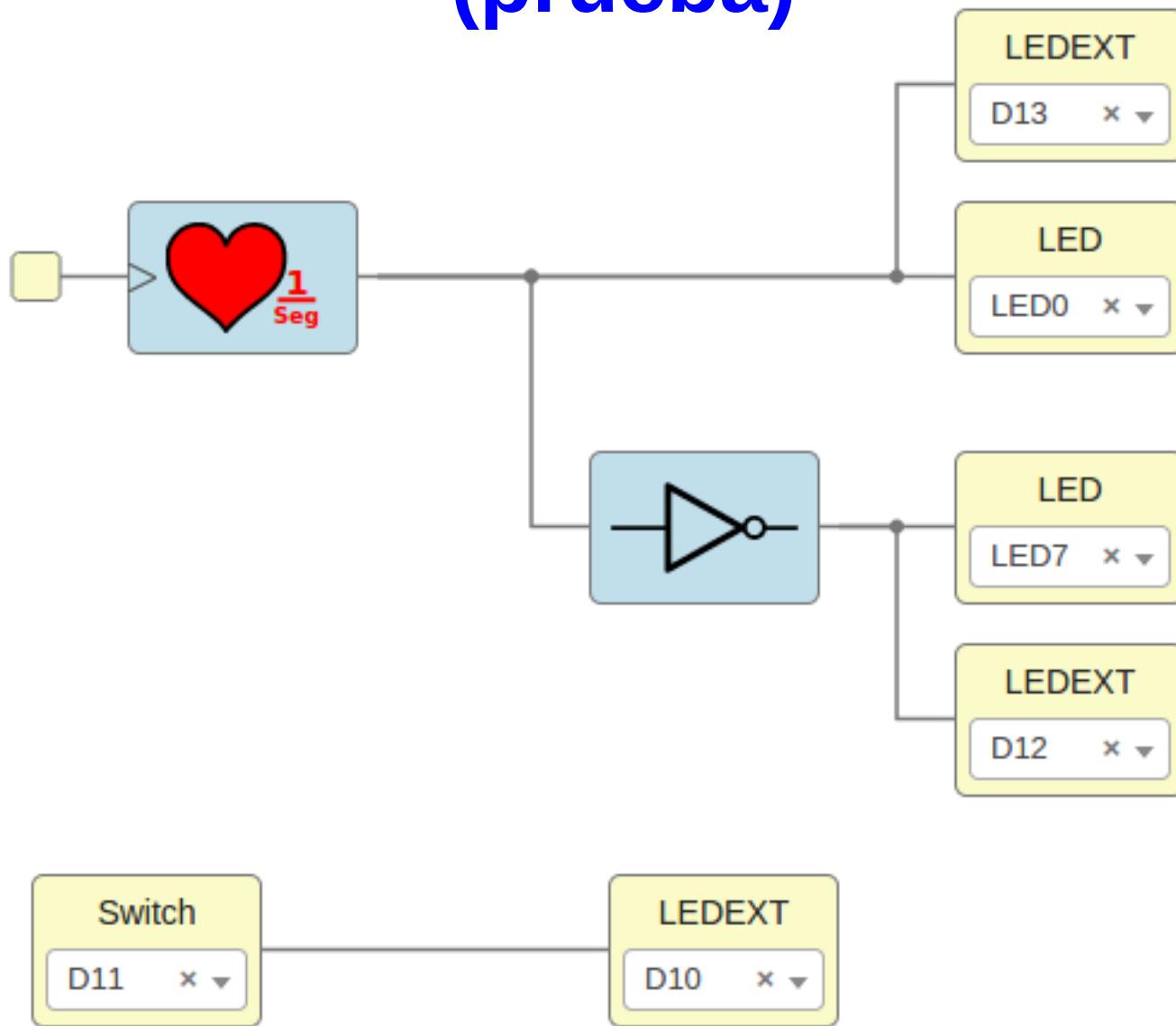
Ejemplo 7: Leds externos



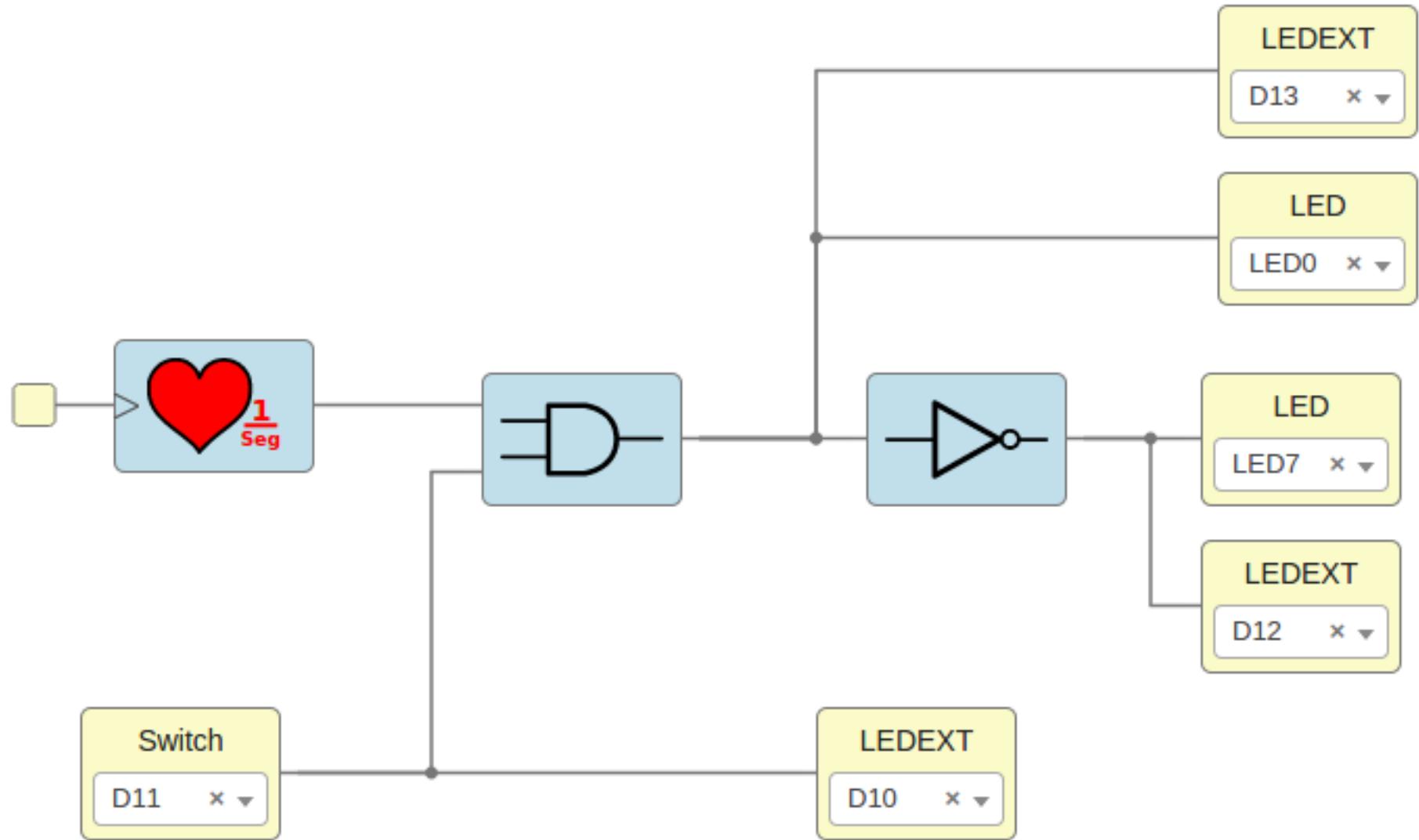
Periféricos: Interruptor externo



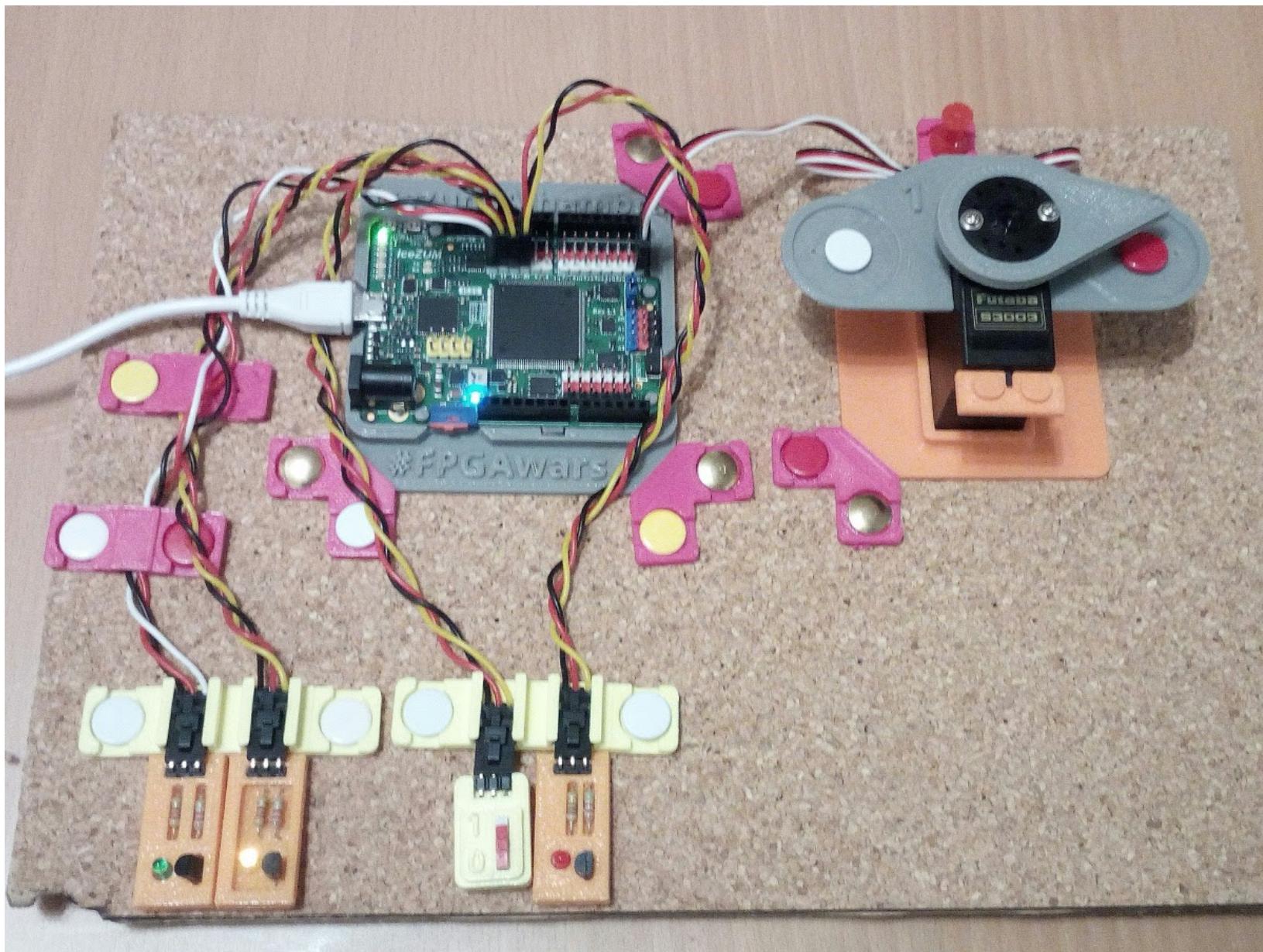
Ejemplo 8: Interruptor Externo (prueba)



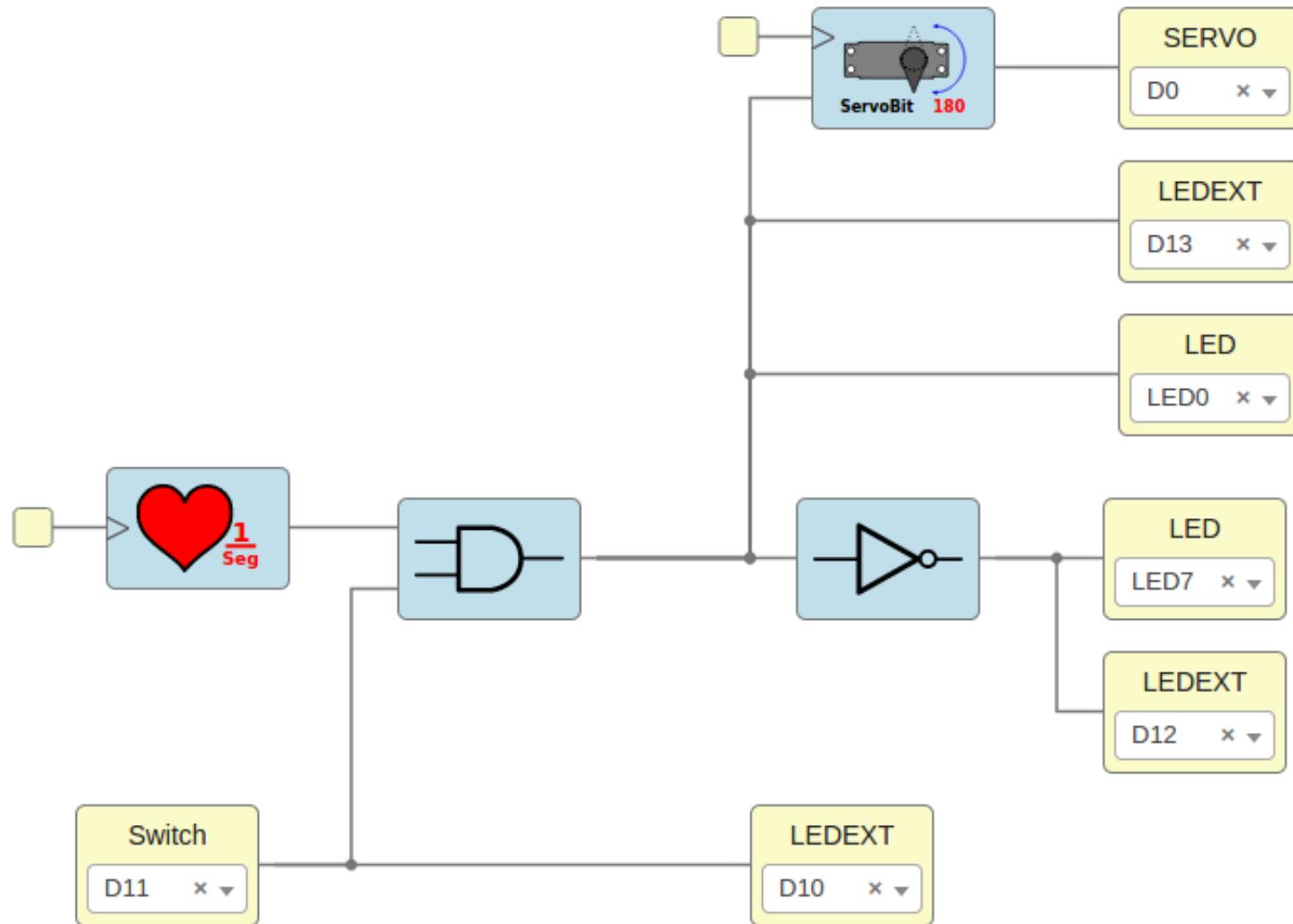
Ejemplo 9: Interruptor Externo



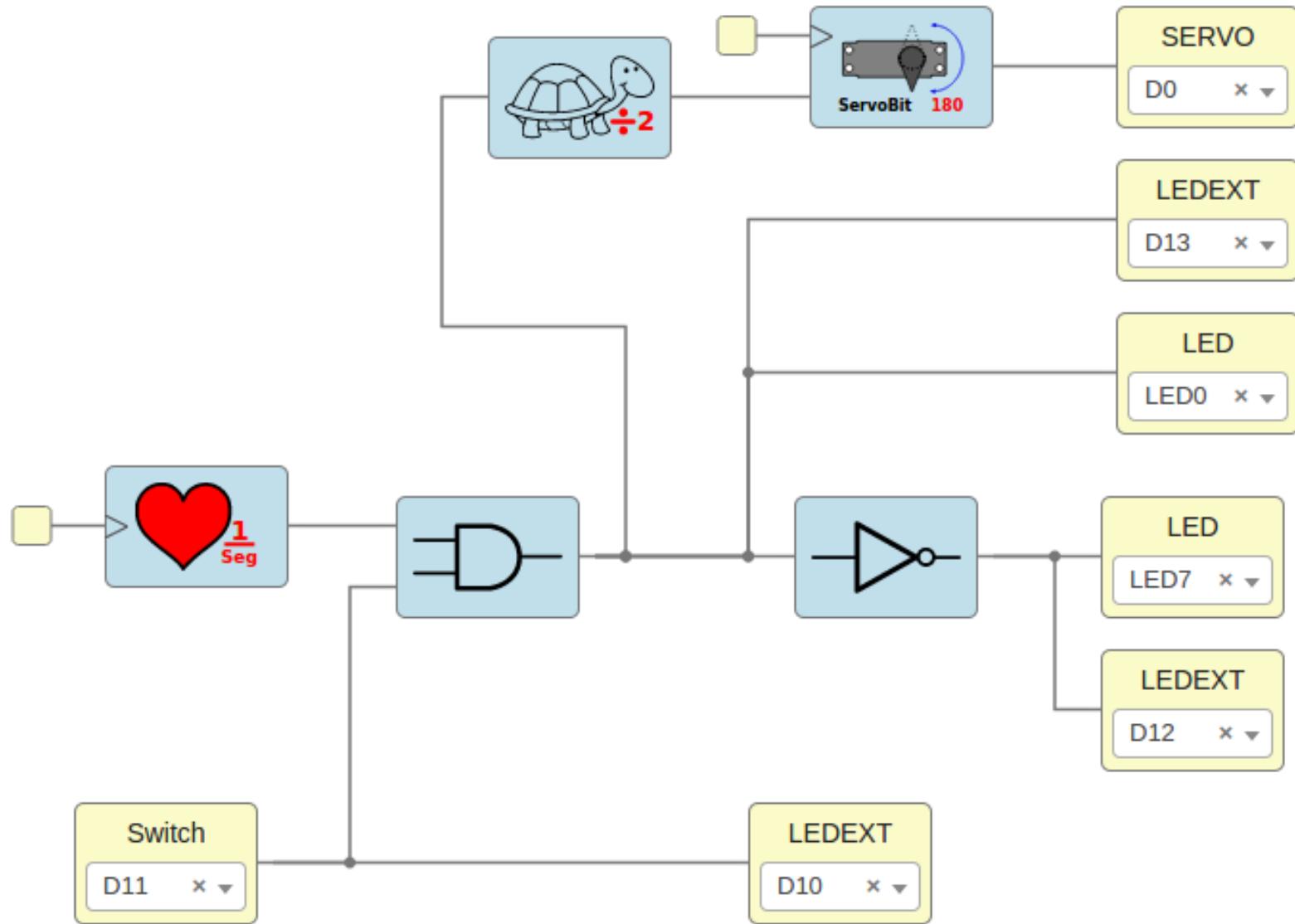
Periféricos: Servo



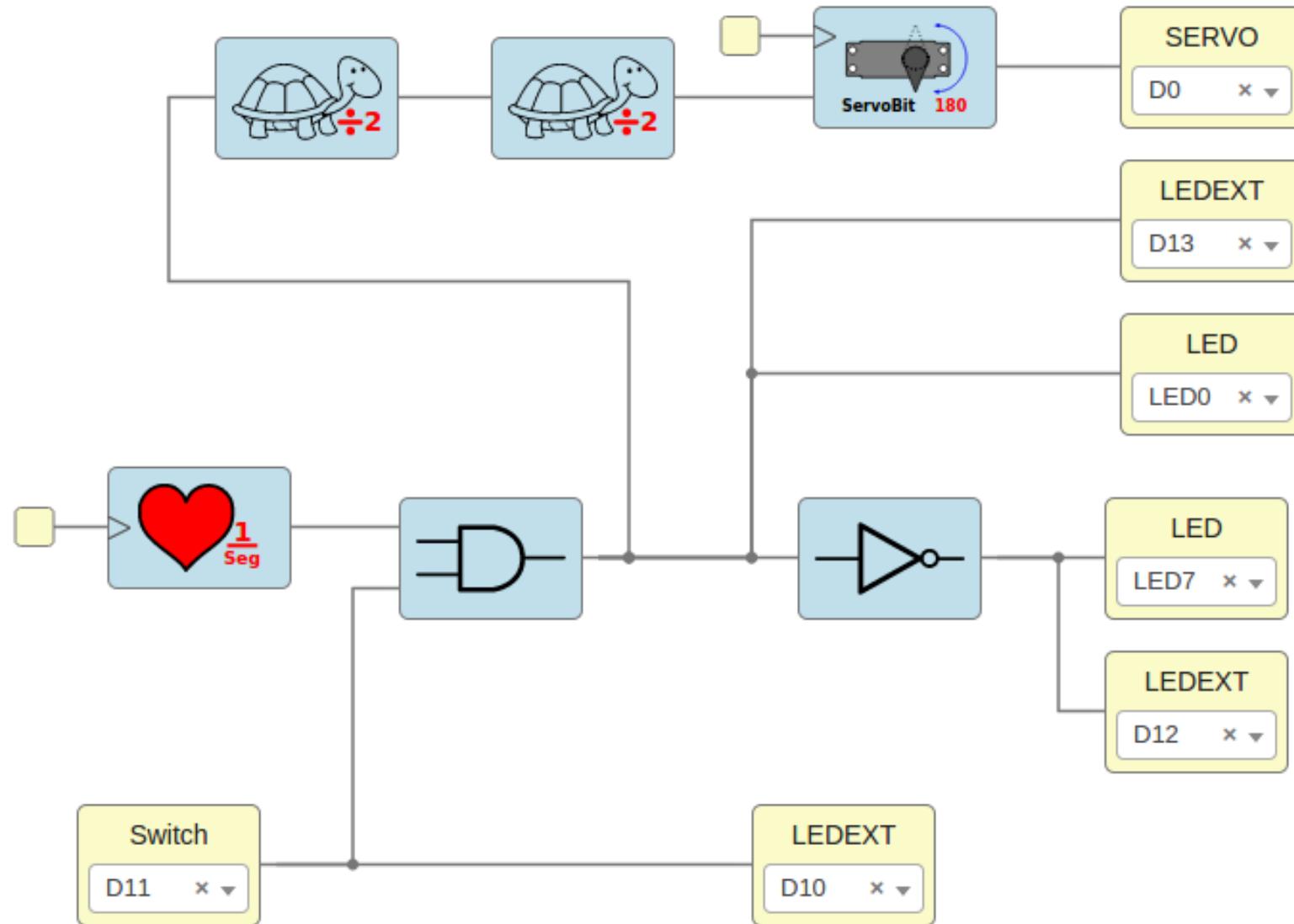
Ejemplo 10: Servo binario



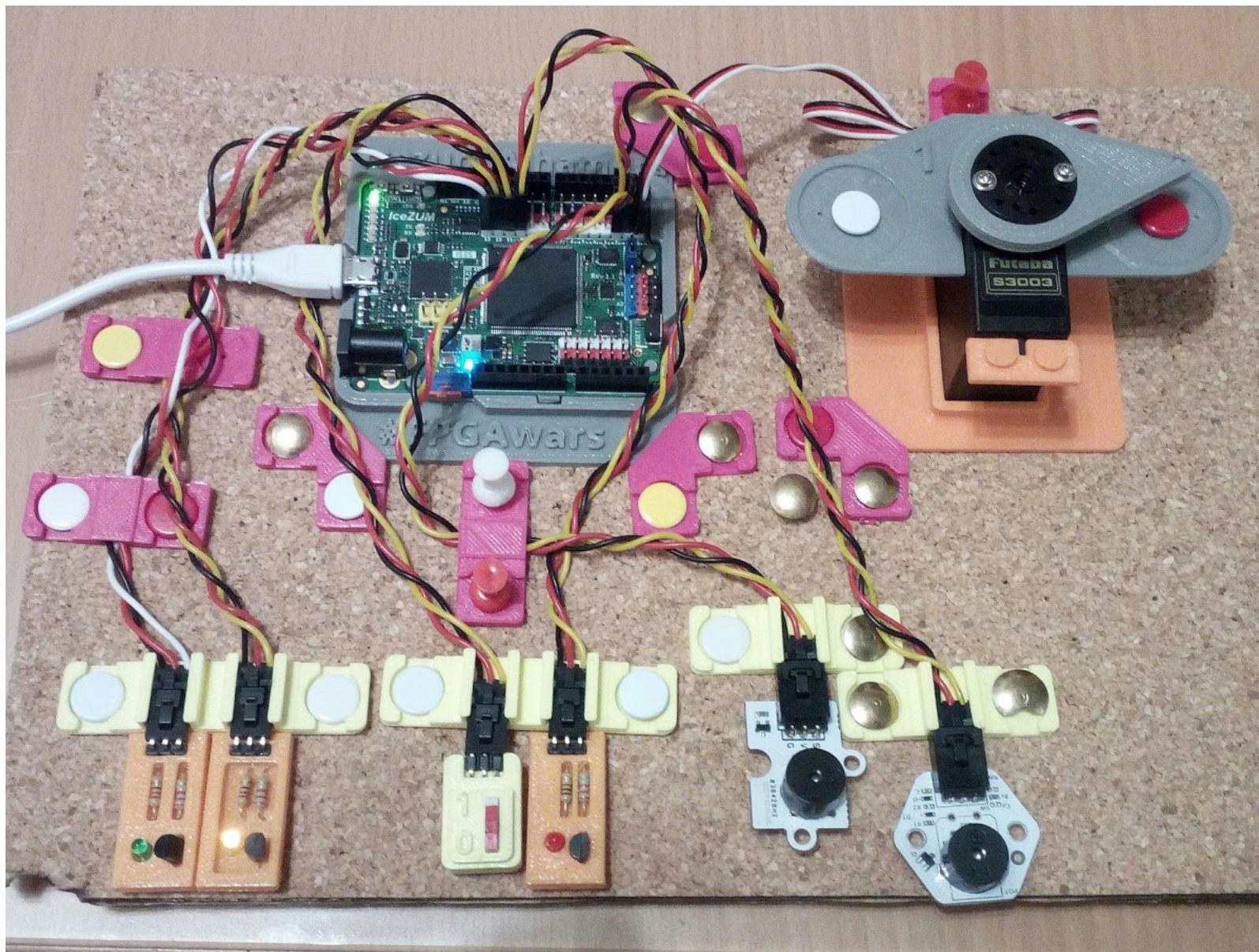
Ejemplo 11: Bajando el ritmo



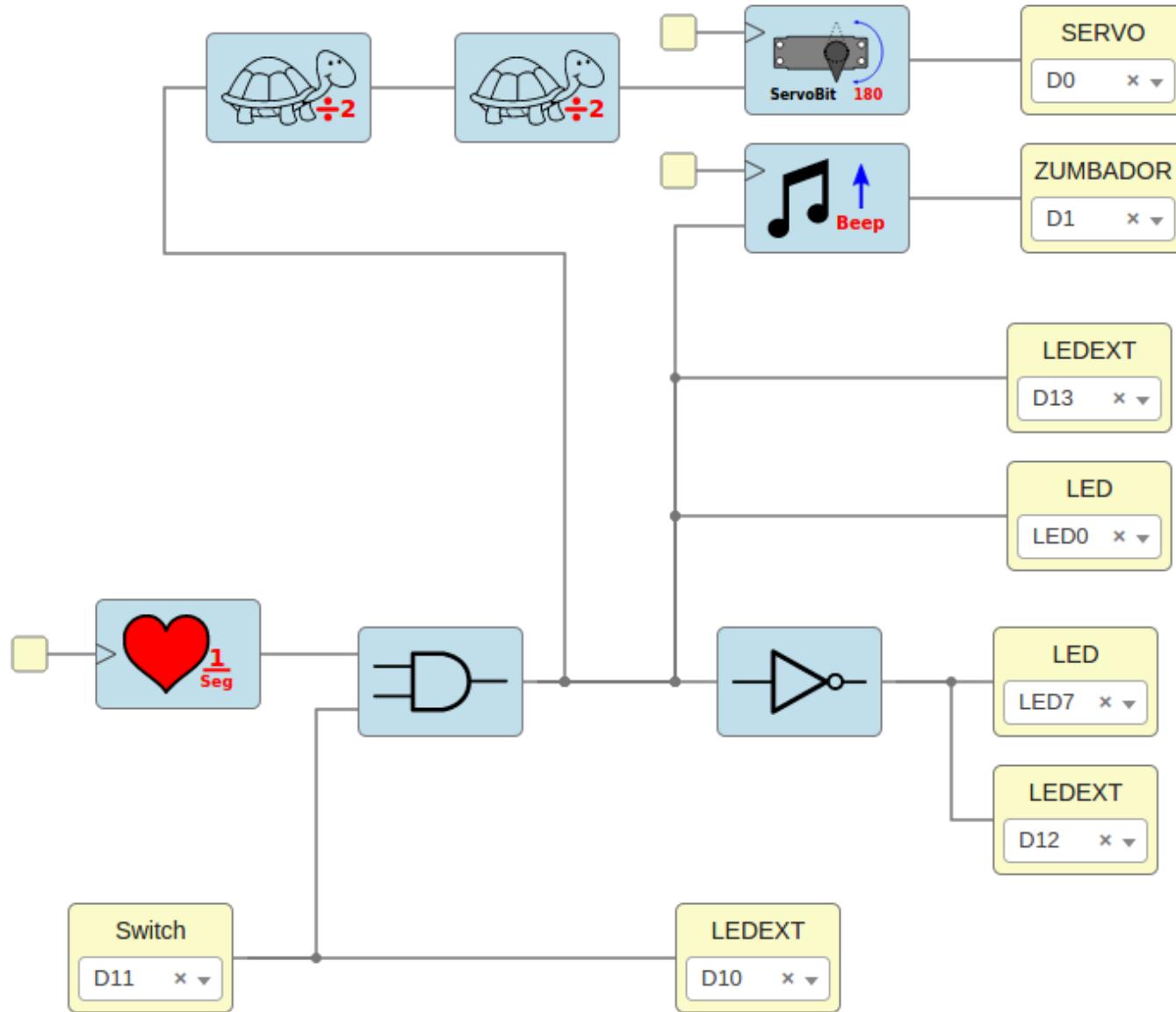
Ejemplo 12: Bajando el ritmo más



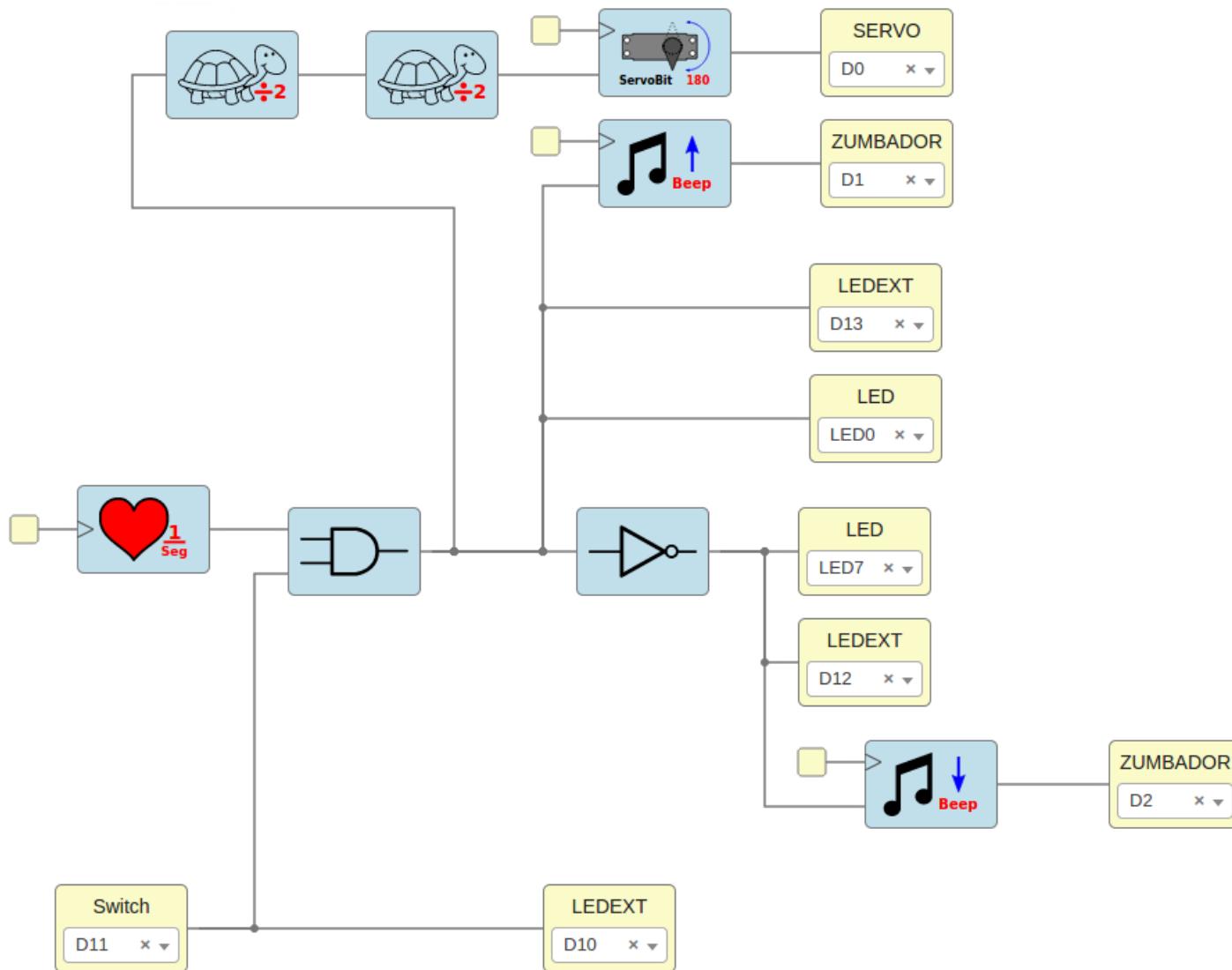
Periféricos: Zumbadores



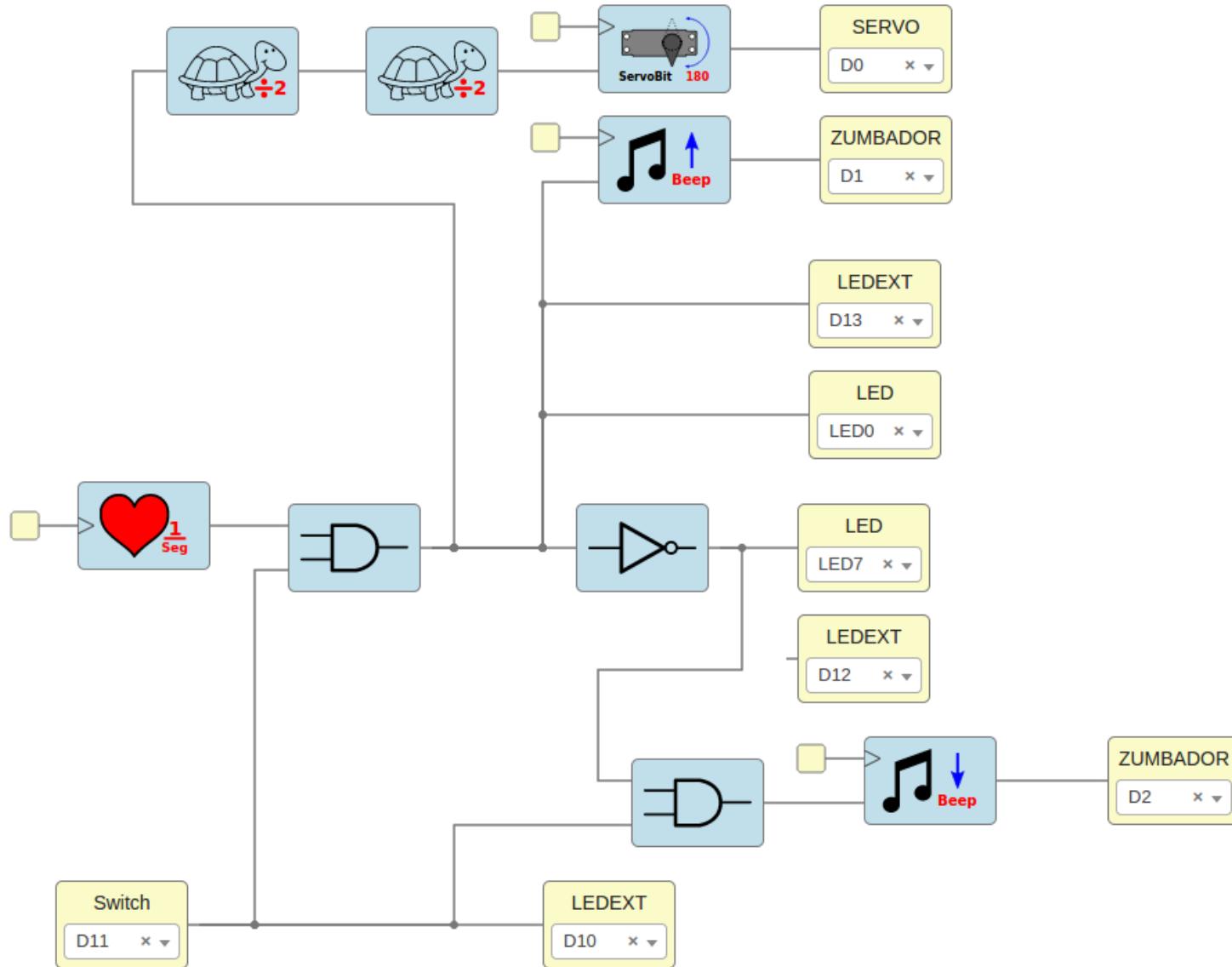
Ejemplo 13: Zumbador



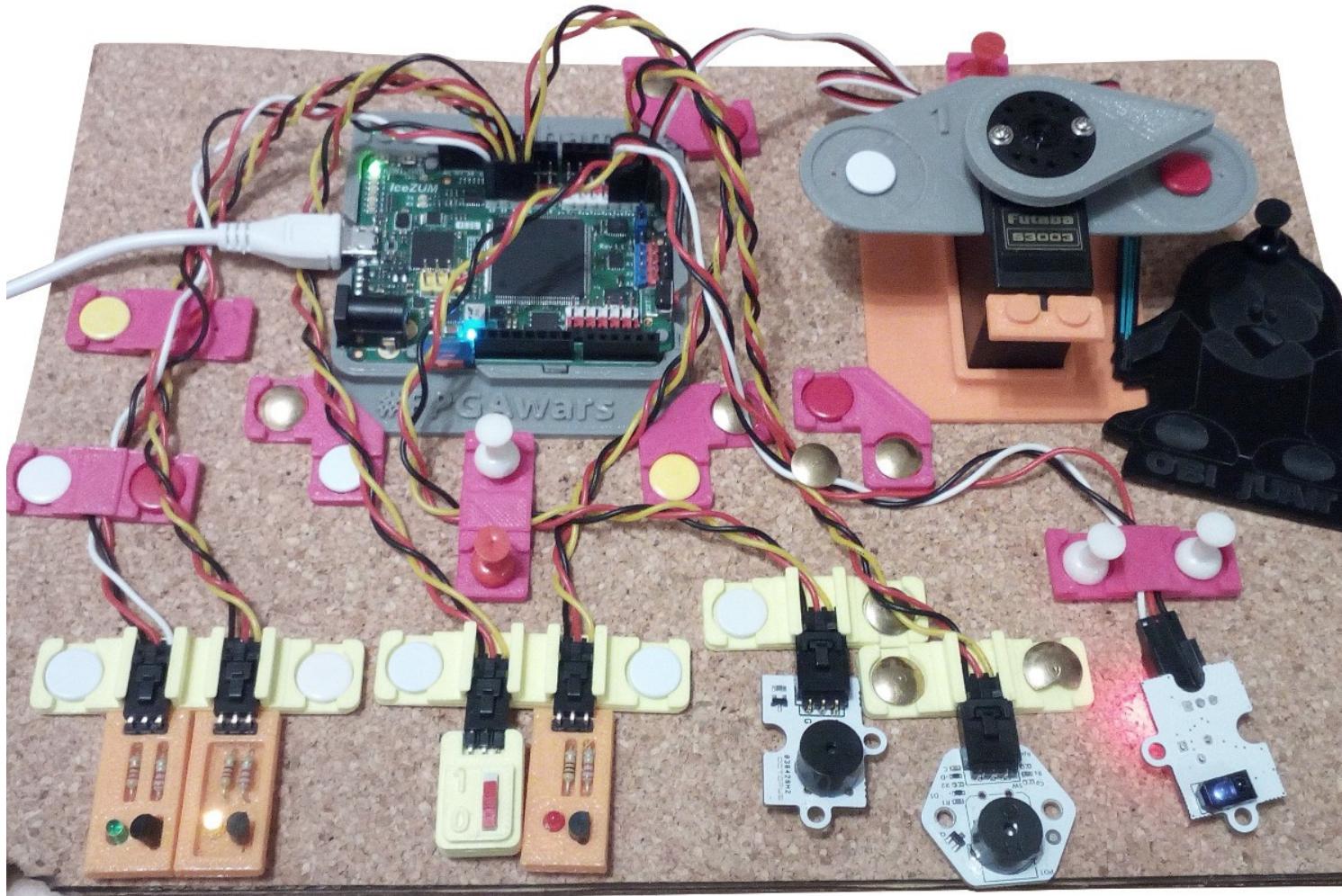
Ejemplo 14: Sirena



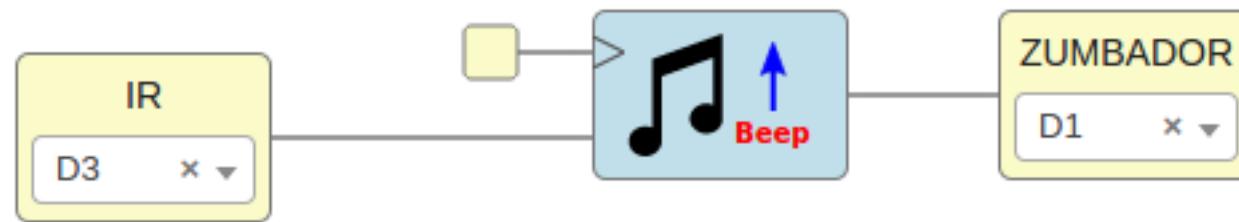
Ejemplo 15: Sirena v2



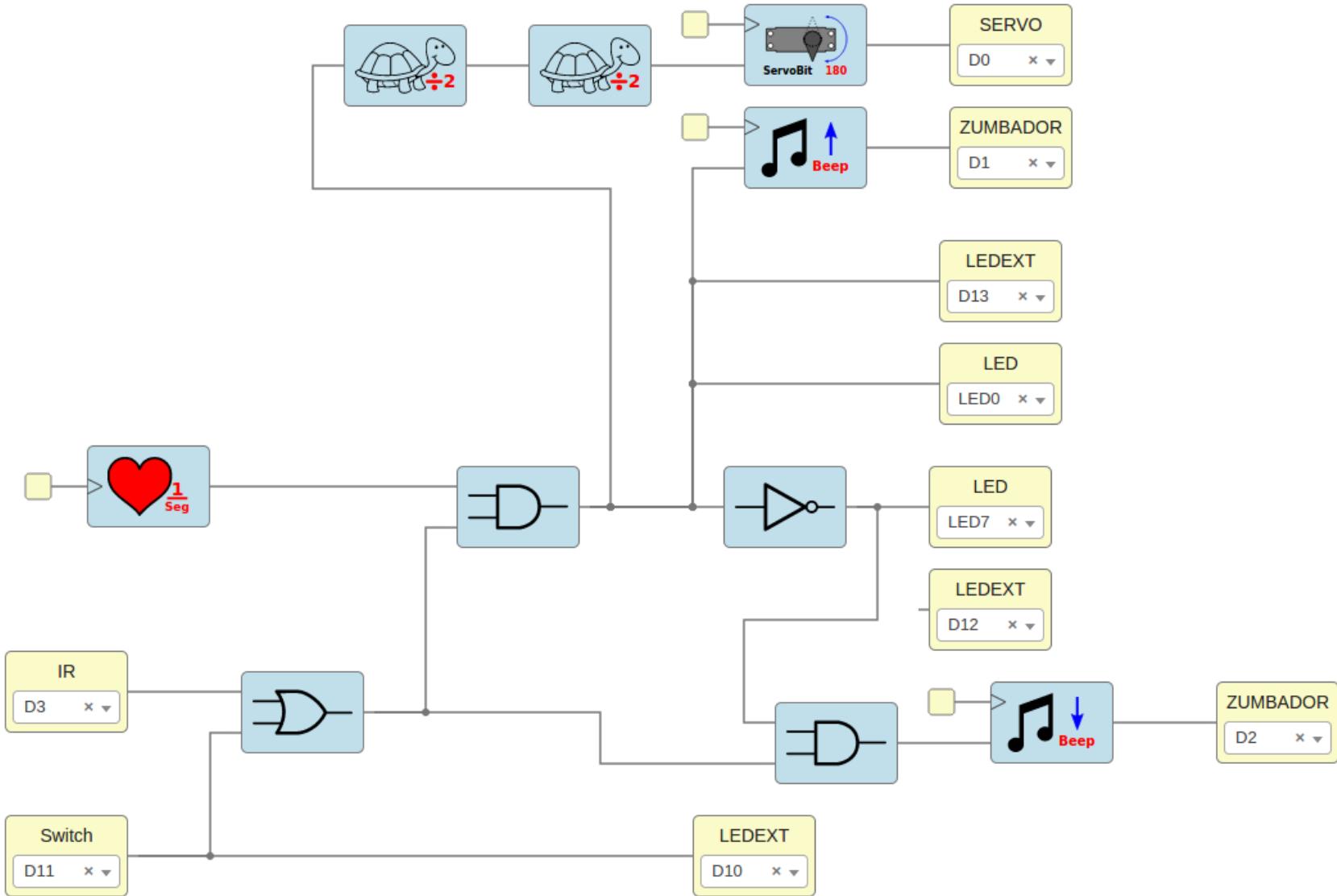
Periférico: Infrarrojos (IR)



Ejemplo 16: Test IR



Ejemplo 17: Alarma v1.0

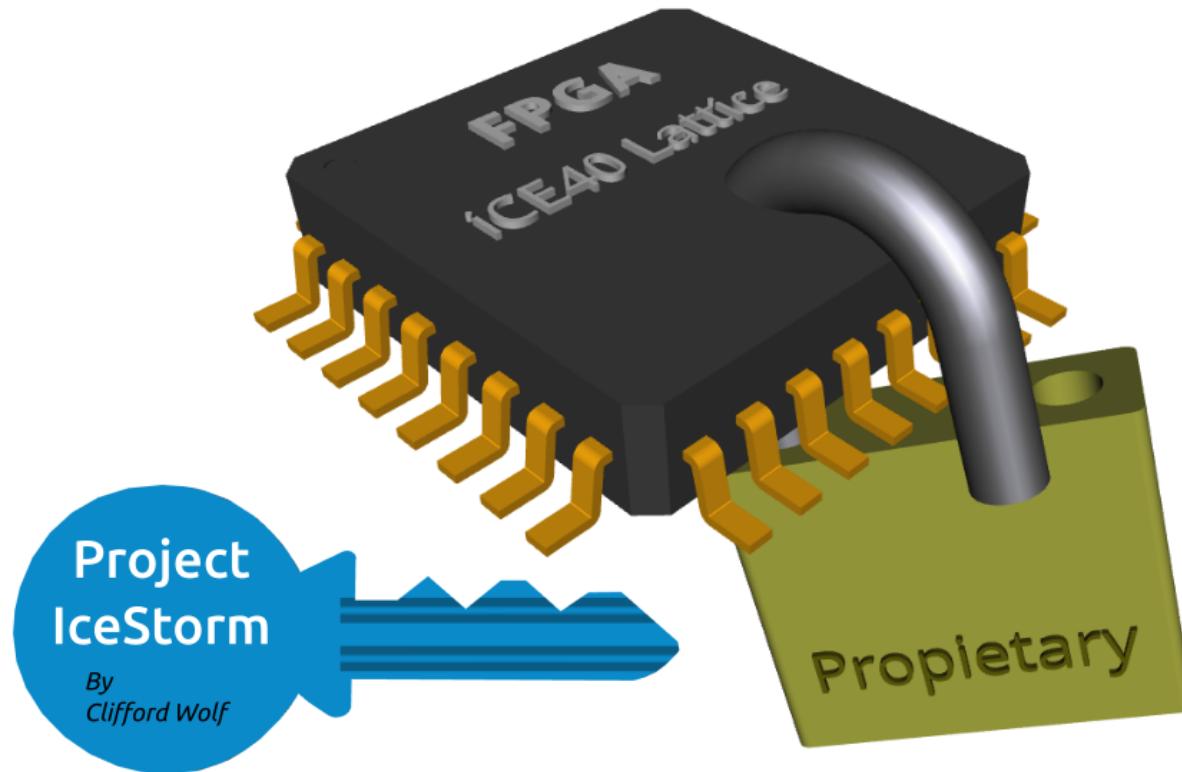


Larby: Robot modular



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

FPGAs libres: El renacimiento



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

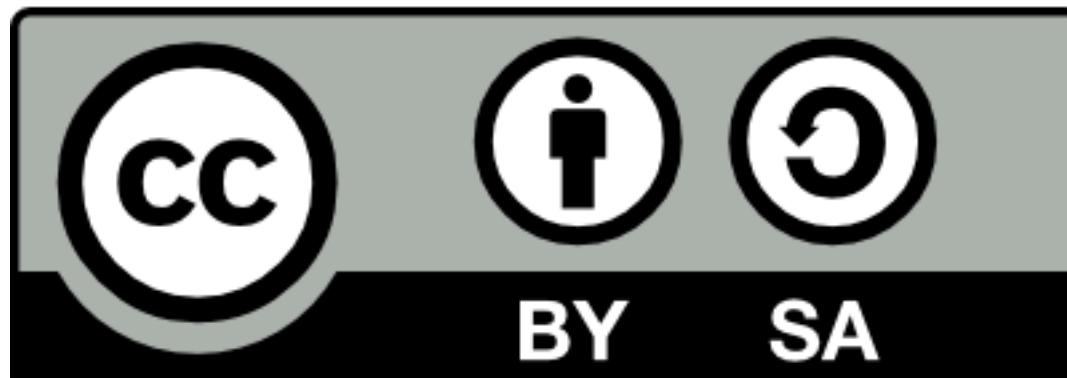
Comunidad FPGAwars



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

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

¡Comparte con la comunidad!

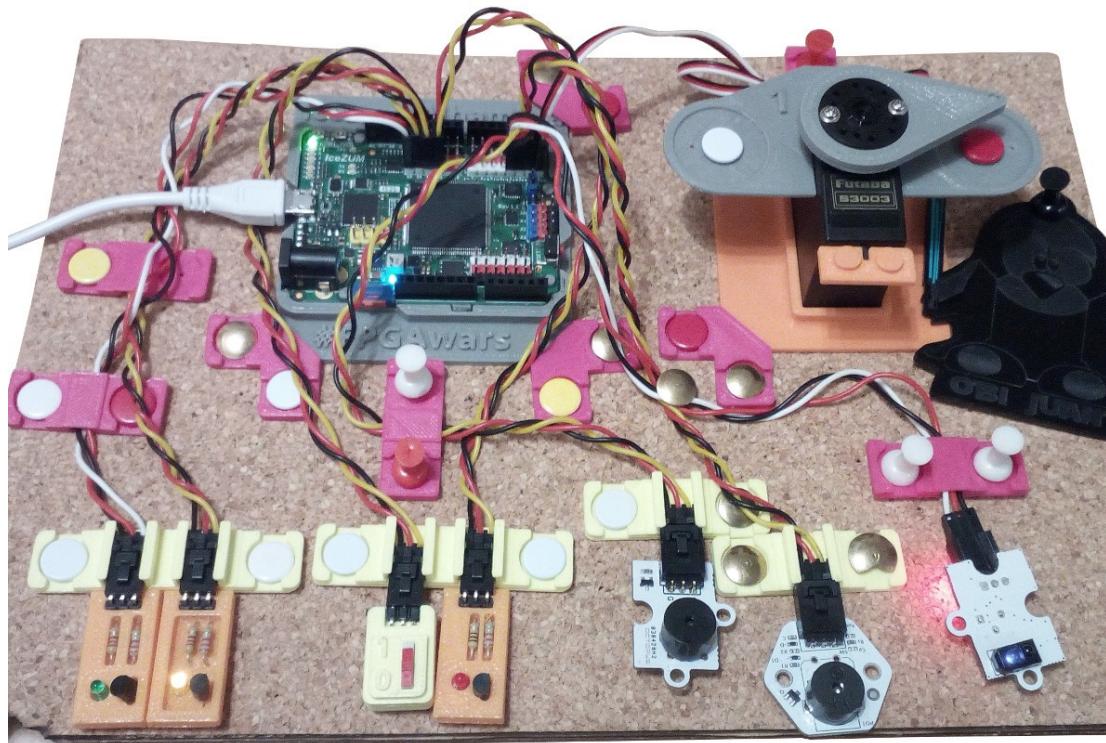


¡Que las FPGAs libres os acompañen!





Electrónica digital divertida con FPGAs Libres



Juan González Gómez (Obijuan)

<https://github.com/Obijuan>



5 de Mayo de 2017,
I.E.S Juan de la Cierva
MÁDRID

<https://github.com/Obijuan/myslides>

