

BBC micro:bit V2

The history and future of the BBC micro:bit

Jonny Austin

CTO Micro:bit Educational Foundation

Today's hosts

Jonny Austin



CTO

Micro:bit Educational
Foundation

Bjørn Kvaale

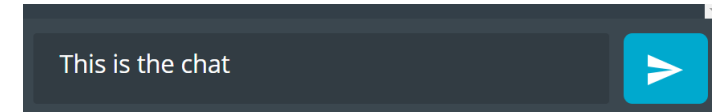
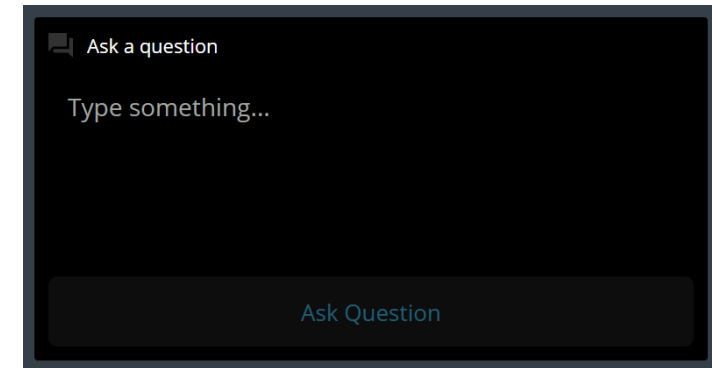


Product Marketing
Engineer



Practicalities

- Duration: 50-60 mins
- Questions are encouraged!
- Please type questions in the top of the right sidebar
 - All questions are anonymous
 - Try to keep them relevant to the topic
- We will answer questions towards the end
- The chat is not anonymous, and should **not** be used for questions
- If you have more questions:
 - Go to DevZone for Nordic related questions
 - Go to support.microbit.org for help with BBC micro:bit
- A recording of the webinar will be available together with the presentation at webinars.nordicsemi.com



{ DevZone



Introduction to the BBC micro:bit V2

History & Future of the micro:bit project

Jonathan Austin, Chief Technology Officer

© Micro:bit Educational Foundation 2020



What we're going to cover

...for a mixed audience



- Some history
- What is the BBC micro:bit?
- Introduction to BBC micro:bit V2
- Who are the Micro:bit Educational Foundation?
- How are people teaching with the micro:bit?
- Q&A



The Story



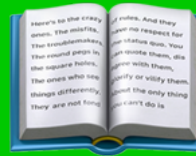
Demonstration

How it Works



Analysis





The Story

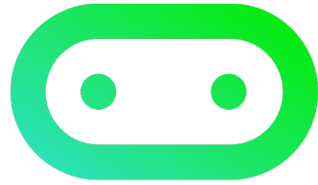
1981

BBC Micro

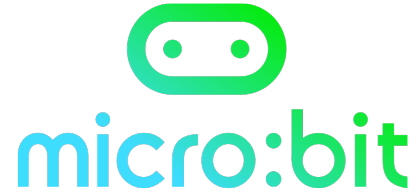


2015

BBC



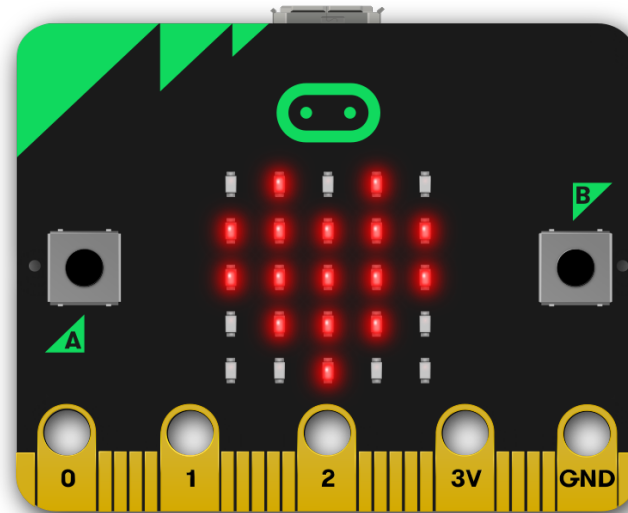
micro:bit



BBC micro:bit

Versatile, programmable
IoT device that is
**designed for use in the
classroom**

Available in 70 countries
for ~£10 in volume



Low floor, high ceiling

***Designed by a coalition of
29 partners! Including
Nordic Semiconductor***

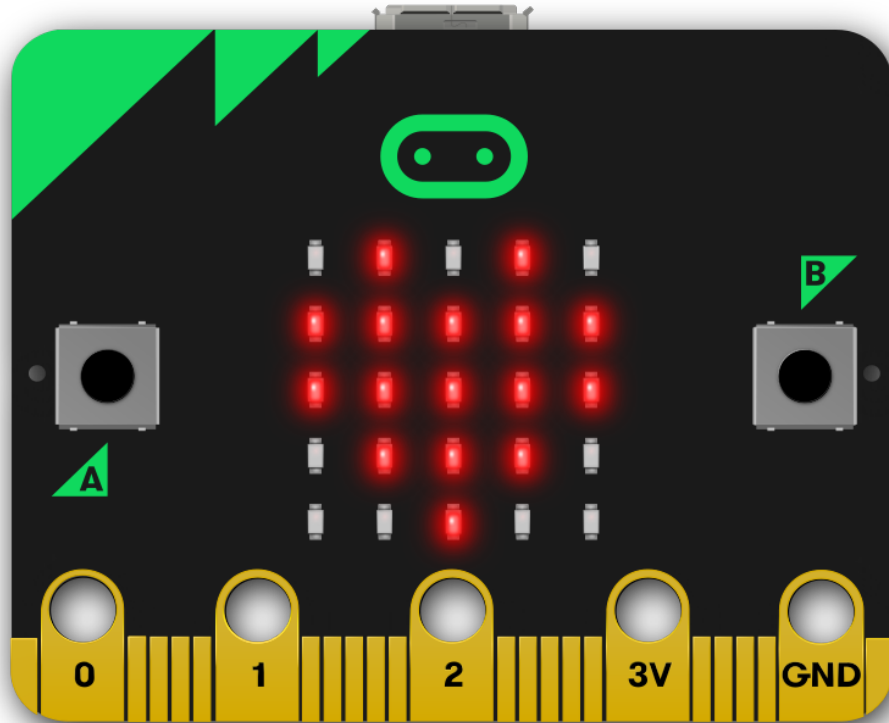
Easy to program, no
installation or drivers

Simple wireless
communication

Battery powered

Built-in motion sensors,
instantly interactive

Hundreds of sensors and
accessories



x 5,000,000



Display

5x5 LED Matrix

Touch and Input/Output Pins

(for connecting other
components and sensors)

Push buttons

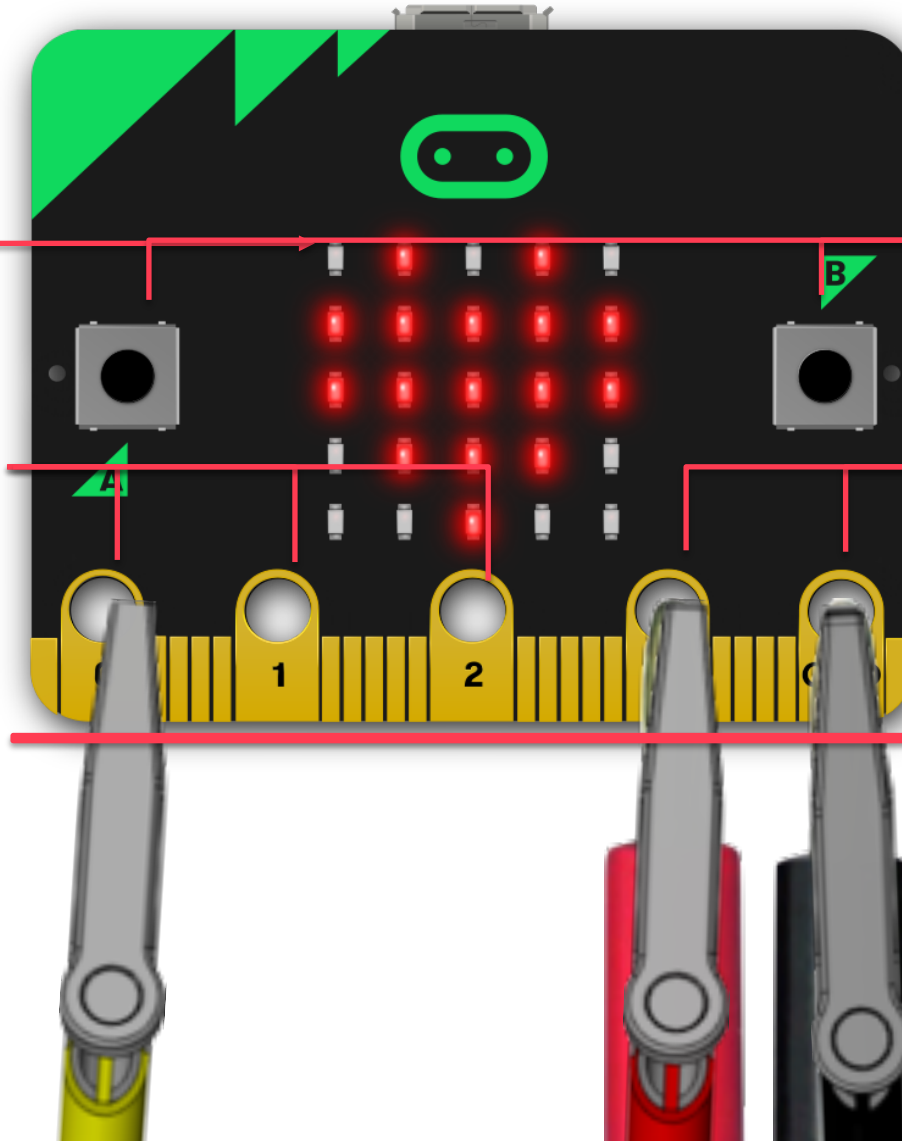
External Power supply

3.3V in or battery V out

Holes for banana plugs

Pads for crocodile clips

"Edge Connector"



Micro USB

Power and Programming

Reset Button

Antenna (Bluetooth & Custom
2.4GHz radio)

Main Processor

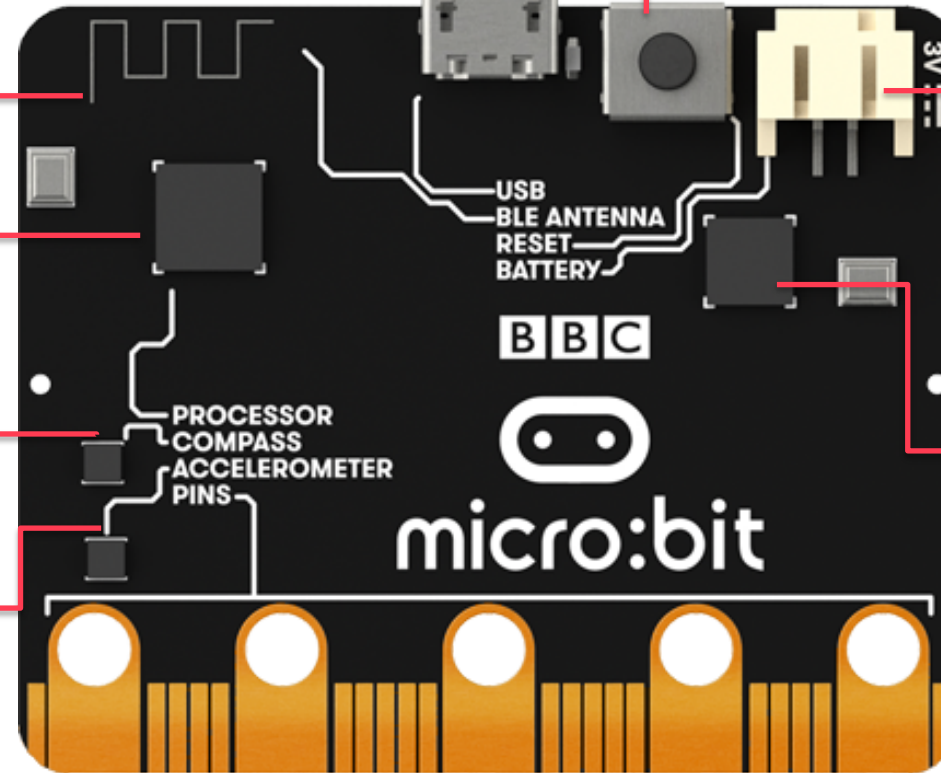
Nordic nRF51822 on V1
Nordic nRF52833 on V2

Magnetometer

Accelerometer

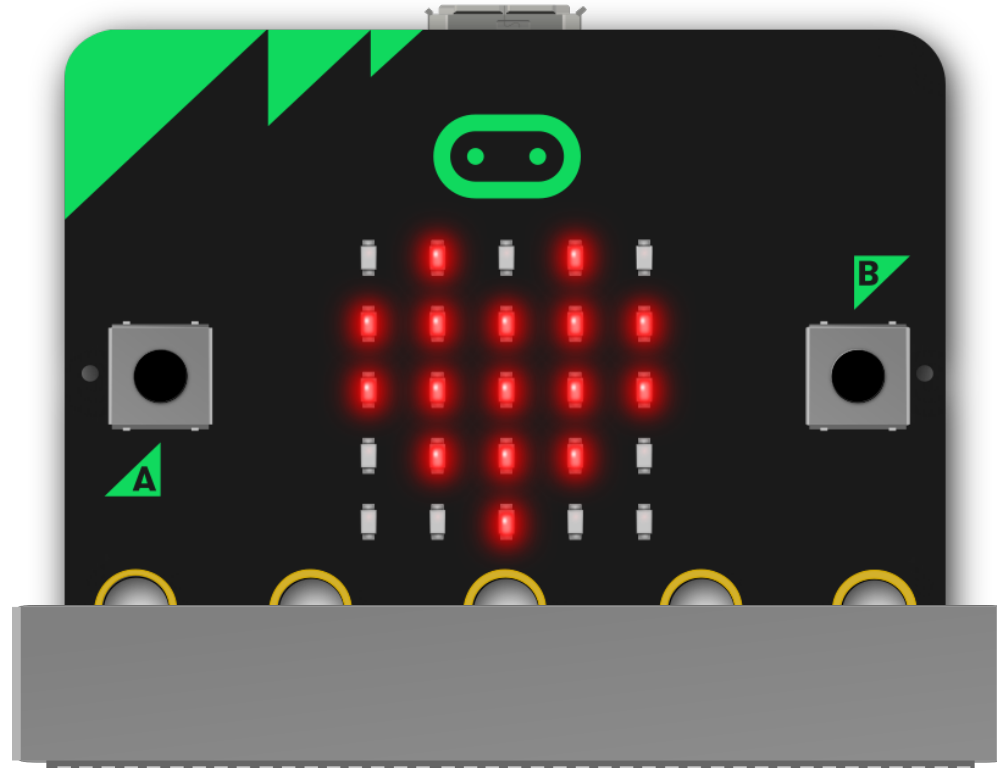
Battery connector
(2xAAA)

Interface Processor
Provides drag-and-drop

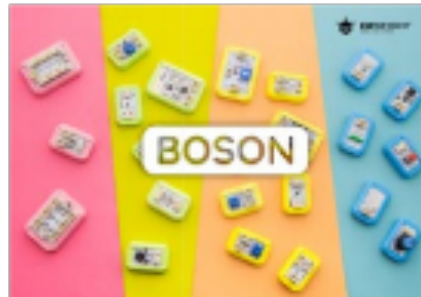
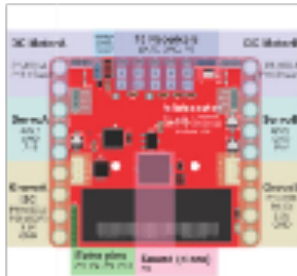
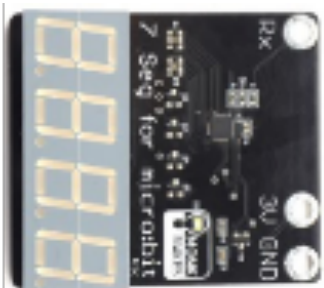


Edge Connector

Enables a huge ecosystem of accessories and extensions around the core micro:bit platform



- Innovative
- Robust
- Adaptable
- Easy for kids to use
- Easy to adopt in hardware
- No fragile pins to bend
- No soldering

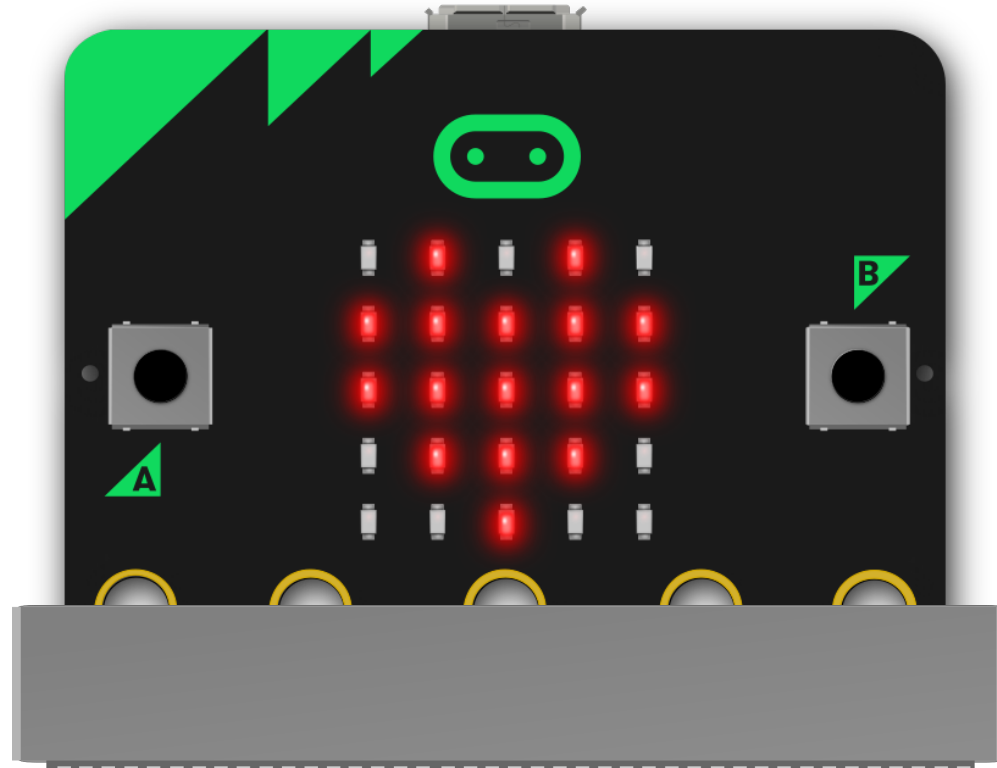


16V 2A Maximum

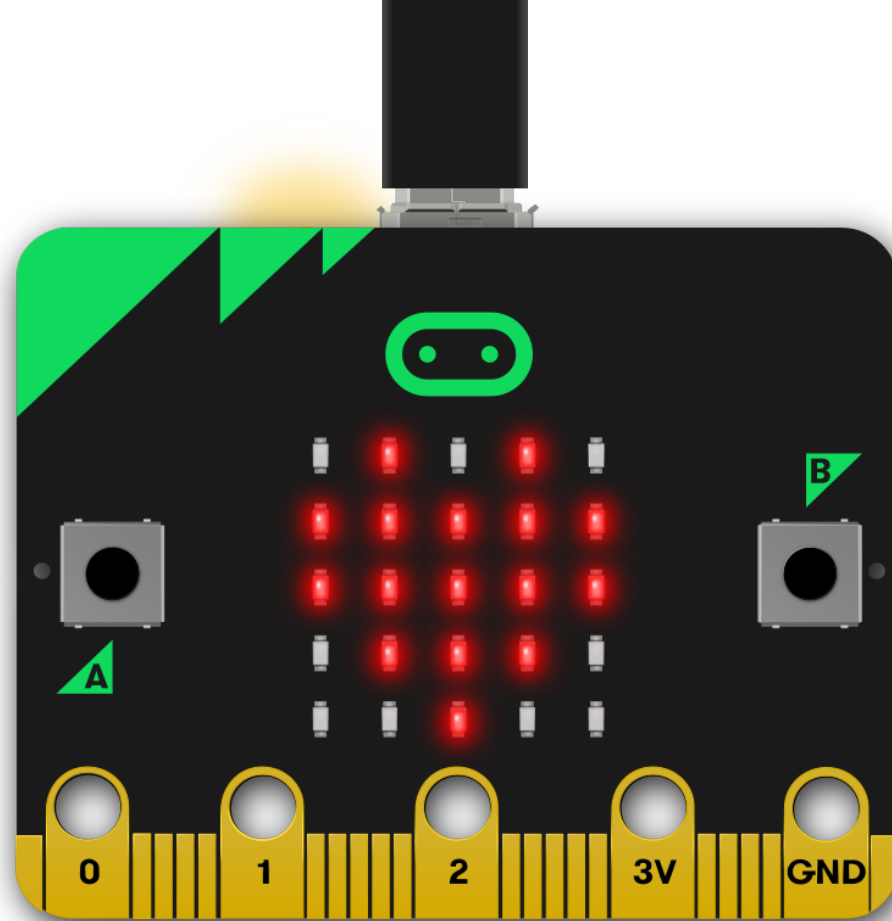


Edge Connector

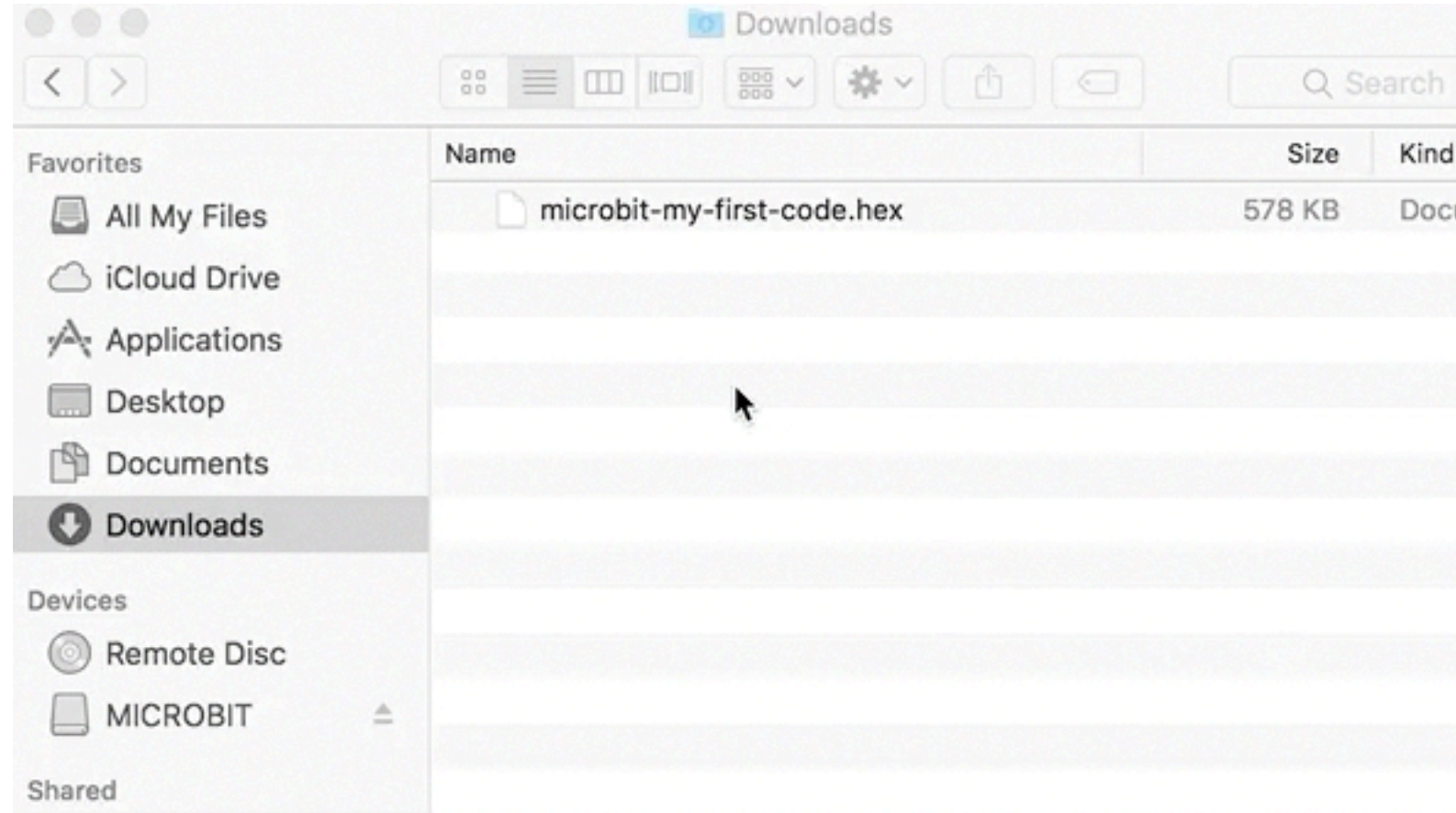
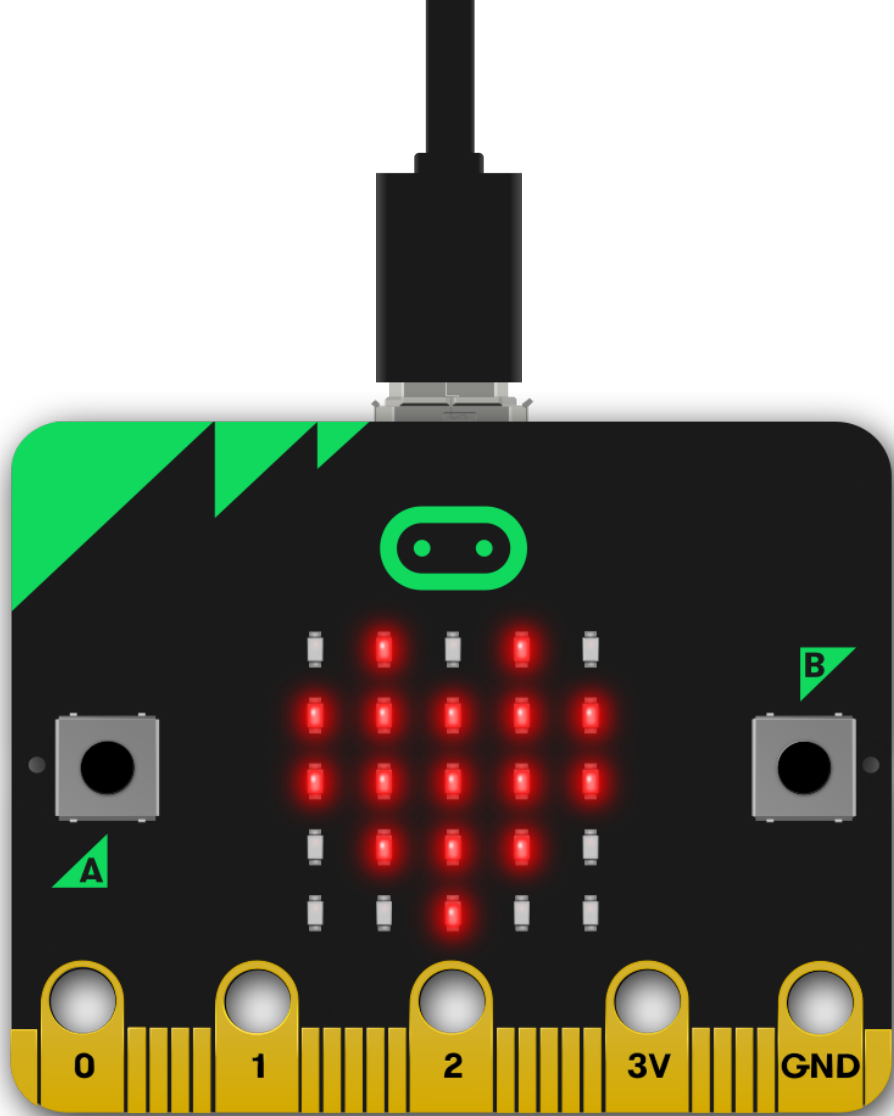
Enables a huge ecosystem of accessories and extensions around the core micro:bit platform



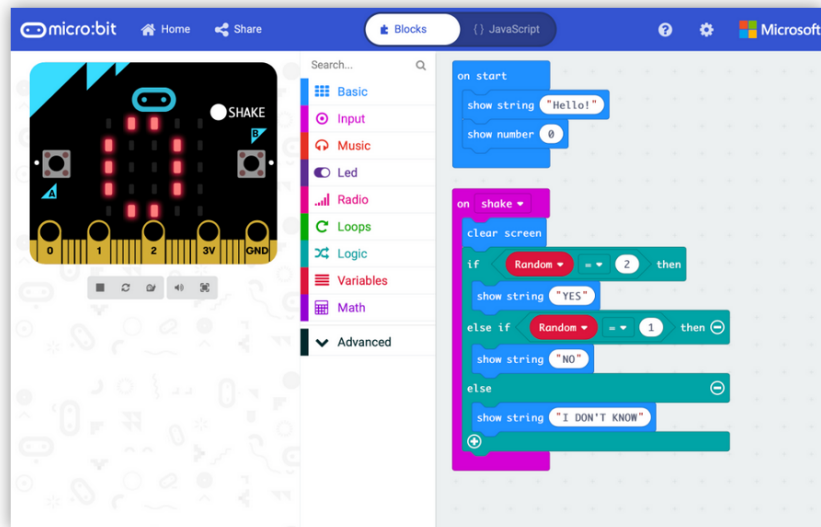
- Innovative
- Robust
- Adaptable
- Easy for kids to use
- Easy to adopt in hardware
- No fragile pins to bend
- No soldering



micro:bit 'is a USB Drive'



**micro:bit is a USB
Drive**



MakeCode Editor

The MakeCode editor provided by Microsoft makes it easy to program your micro:bit with blocks and JavaScript.

We have [recently updated the editor](#), and the [previous version is still available](#) for anyone that needs it. If you have any issues accessing the editor, check that it isn't [blocked](#) in your school.

[Let's Code](#)

[Reference](#)

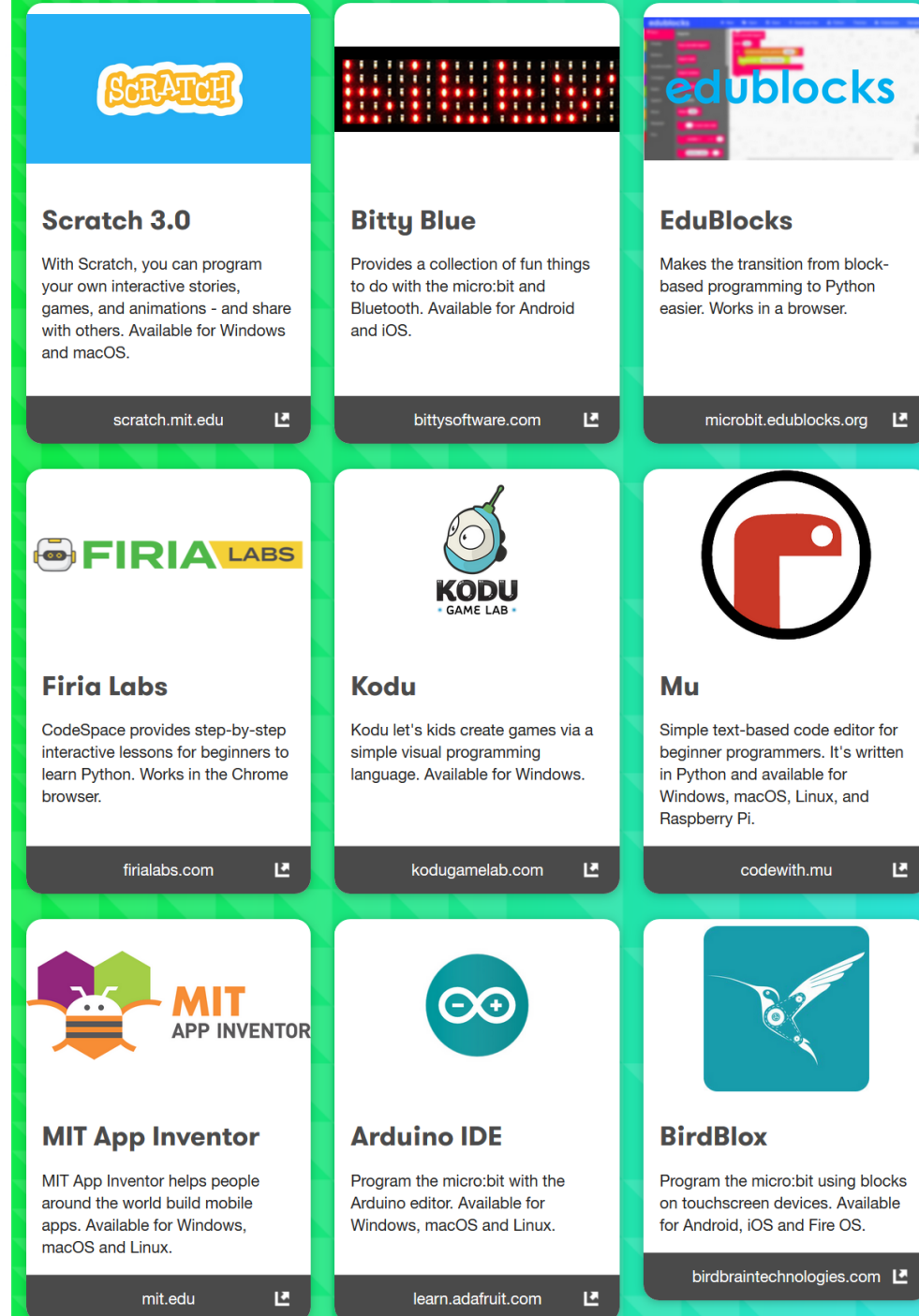
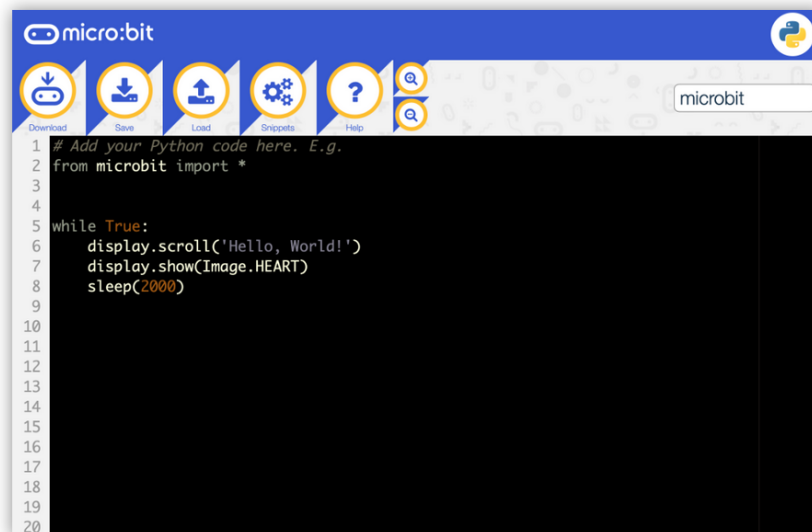
[Lessons](#)

Python Editor

Our Python editor is perfect for those who want to push their coding skills further. A selection of snippets and a range of premade images and music give you a helping hand with your code. Powered by the global Python Community.

[Let's Code](#)

[Reference](#)





200 accessories



200 accessories



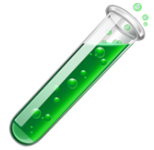
16 Third party editors



200 accessories



16 Third party editors



1000 Testers on the mailing list



200 accessories



16 Third party editors



1000 Testers on the mailing list



800 Developers on Slack



200 accessories



16 Third party editors



1000 Testers on the mailing list



800 Developers on Slack



15 (?) Student projects



200 accessories



16 Third party editors



1000 Testers on the mailing list



800 Developers on Slack



15 (?) Student projects



571 translators



200 accessories



16 Third party editors



1000 Testers on the mailing list



800 Developers on Slack



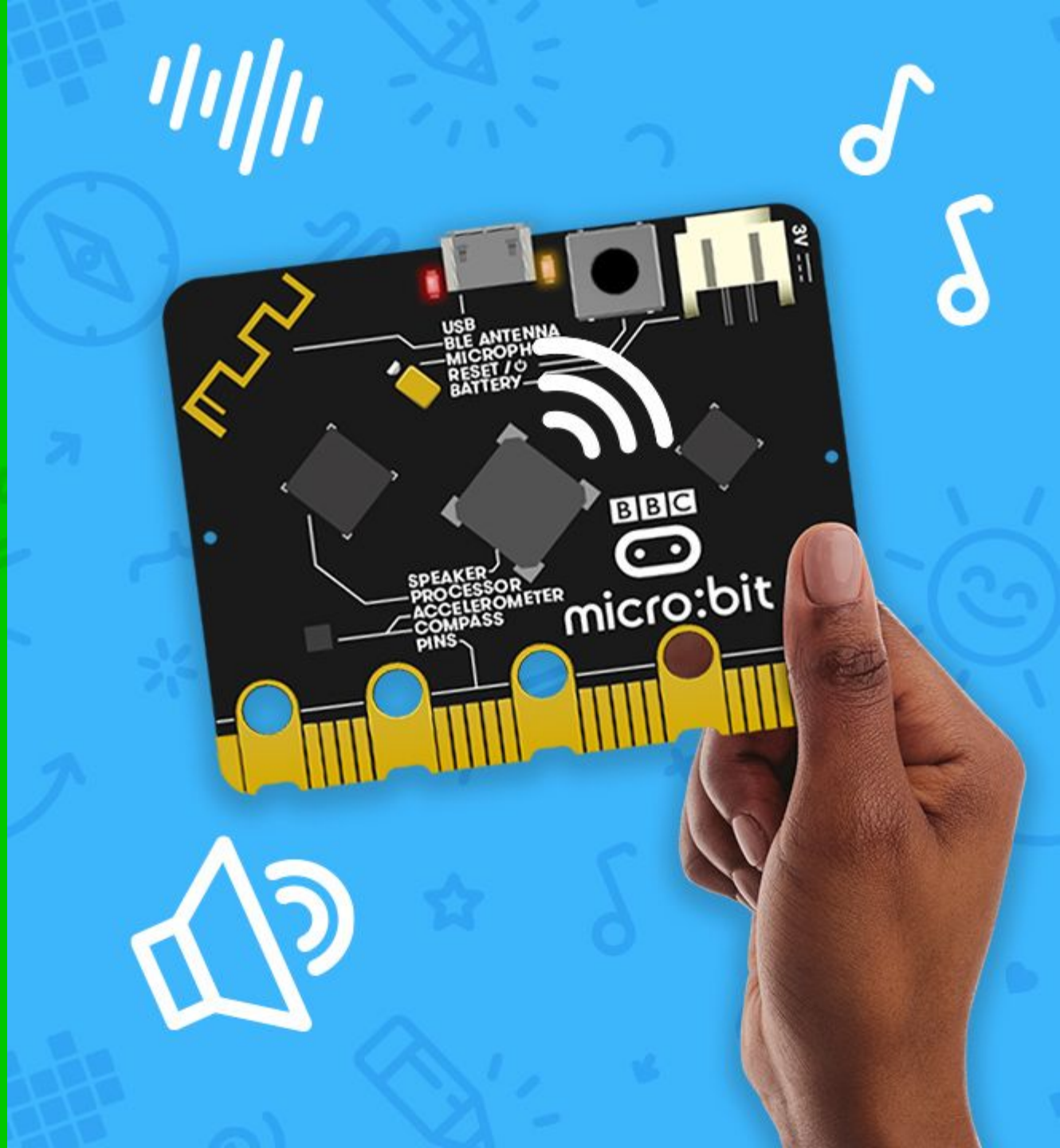
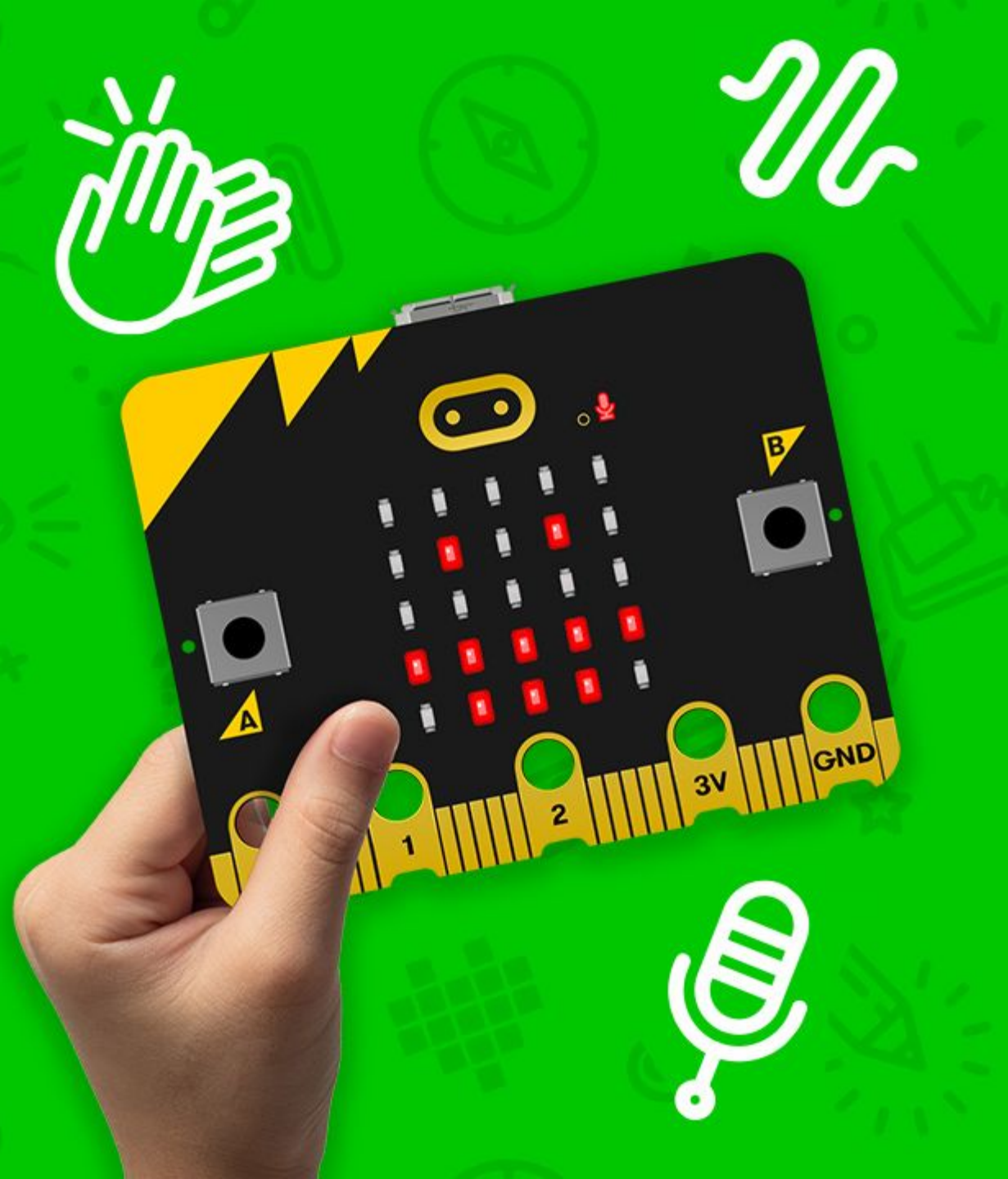
15 (?) Student projects



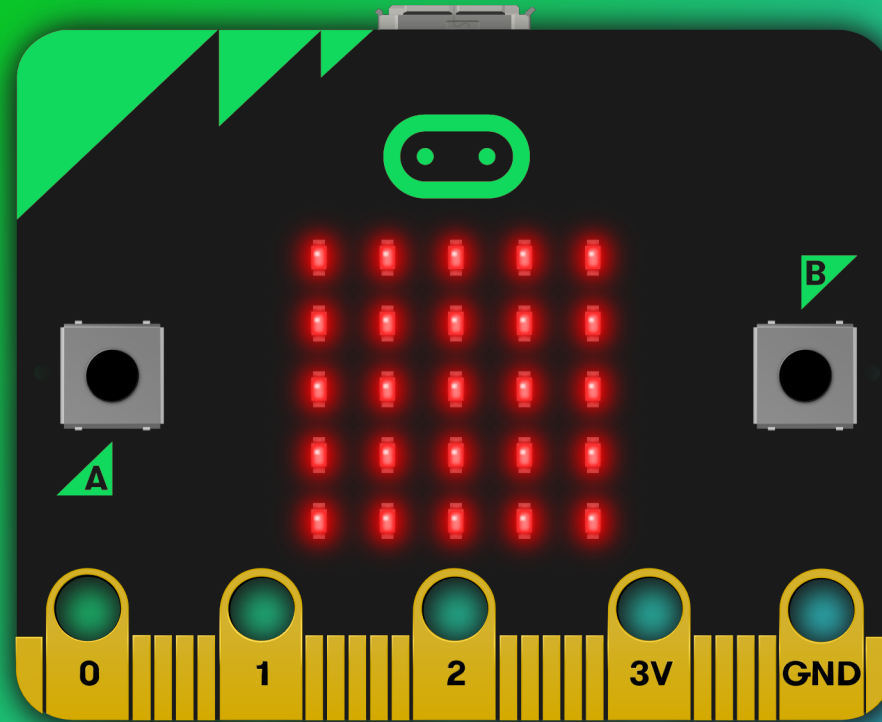
571 translators



150 approved Microsoft MakeCode extensions

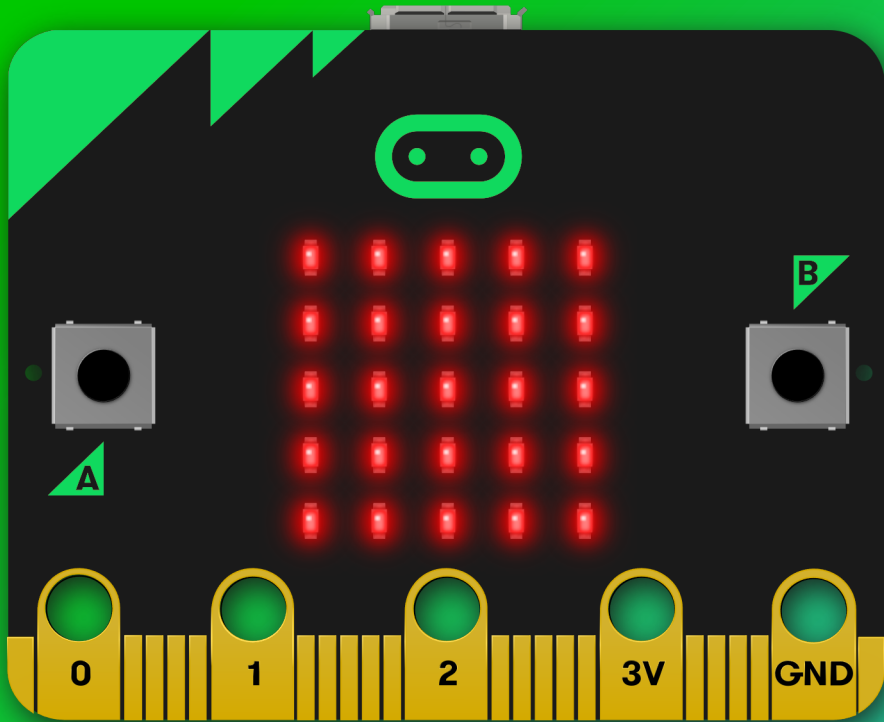


micro:bit

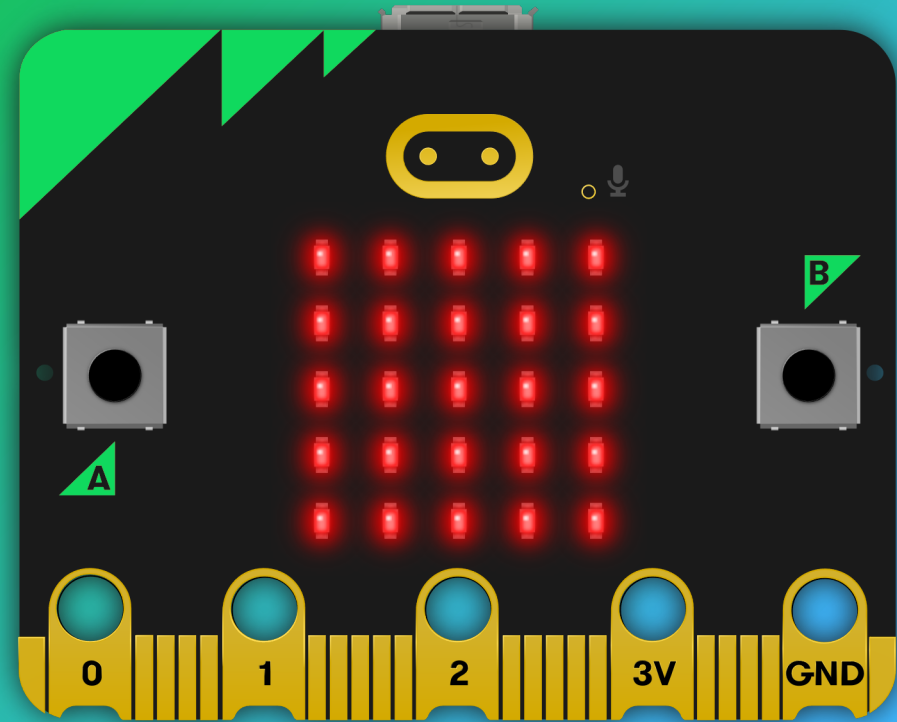


This is a BBC micro:bit

micro:bit

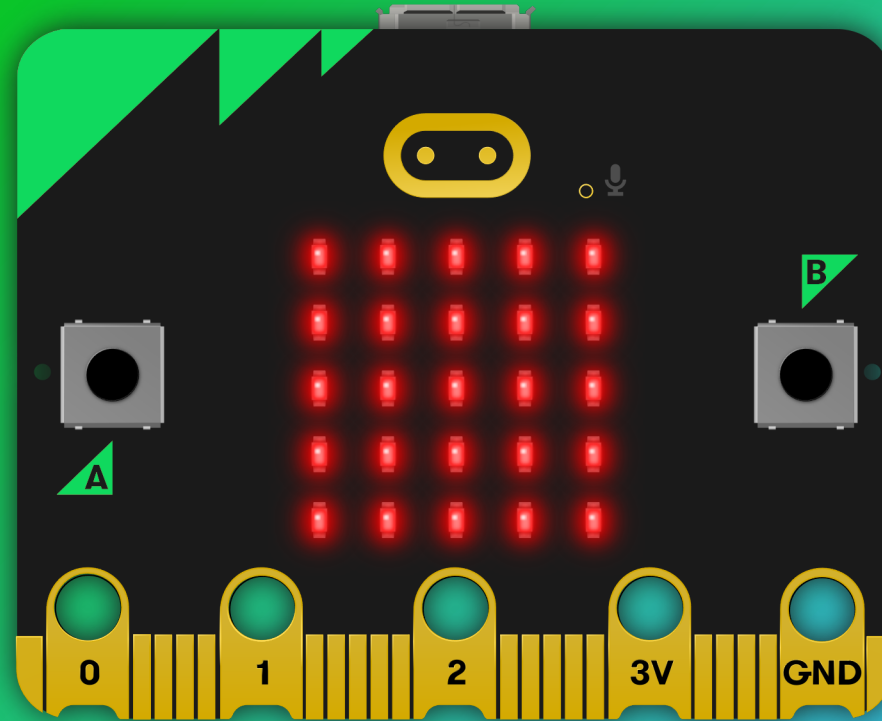


This is a BBC micro:bit



This is a BBC micro:bit (V2)

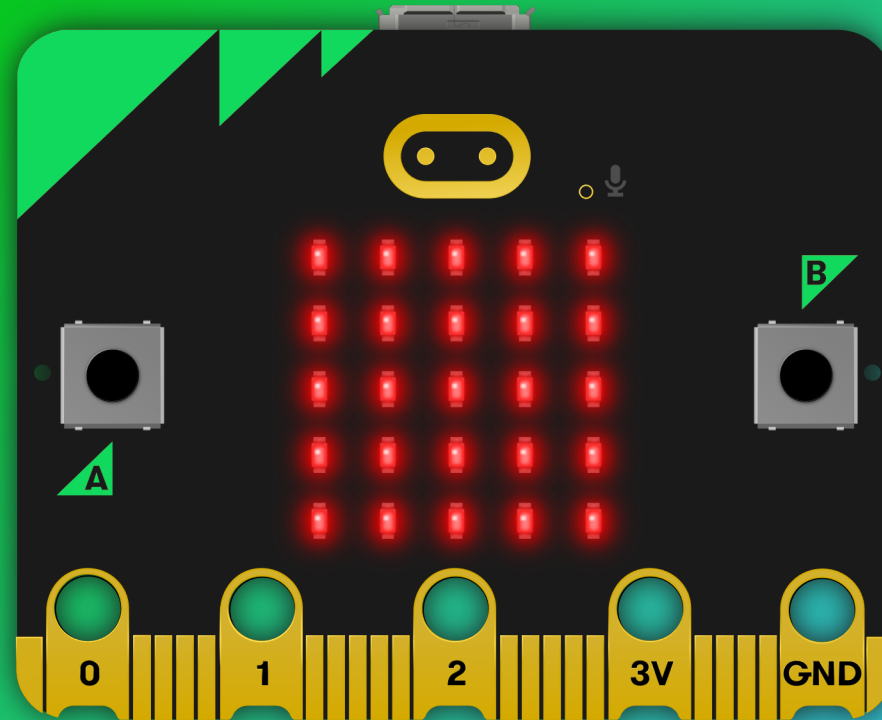
micro:bit



This is a BBC micro:bit (V2)

This is a BBC micro:bit (V2)

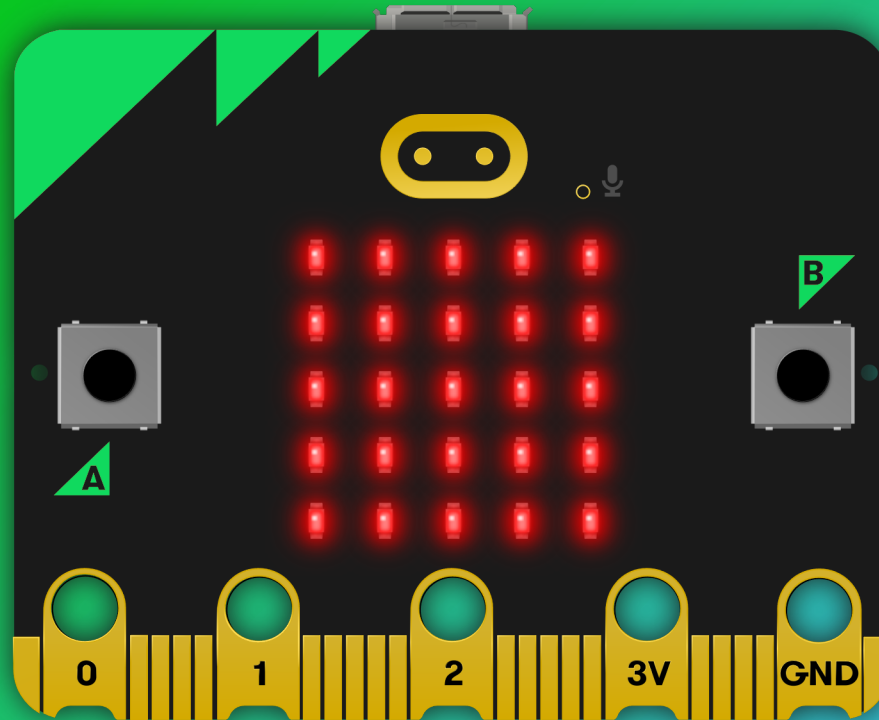
It does everything the original micro:bit does



And also...

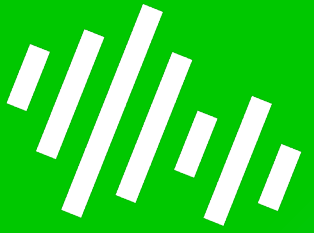
This is a BBC micro:bit (V2)

It does everything the original micro:bit does



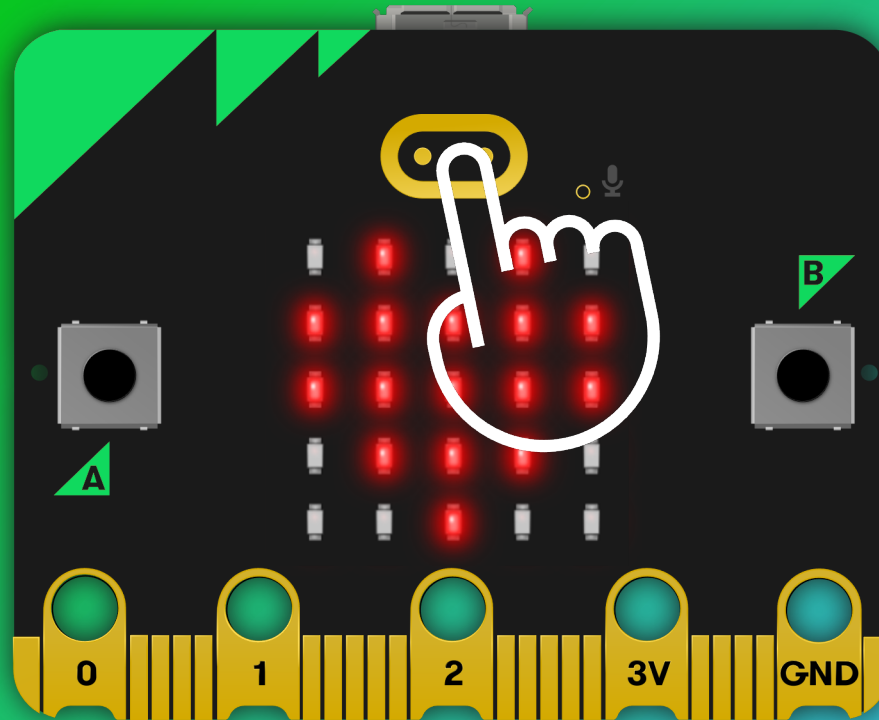
And also...

It can make and sense sound



This is a BBC micro:bit (V2)

It does everything the original micro:bit does

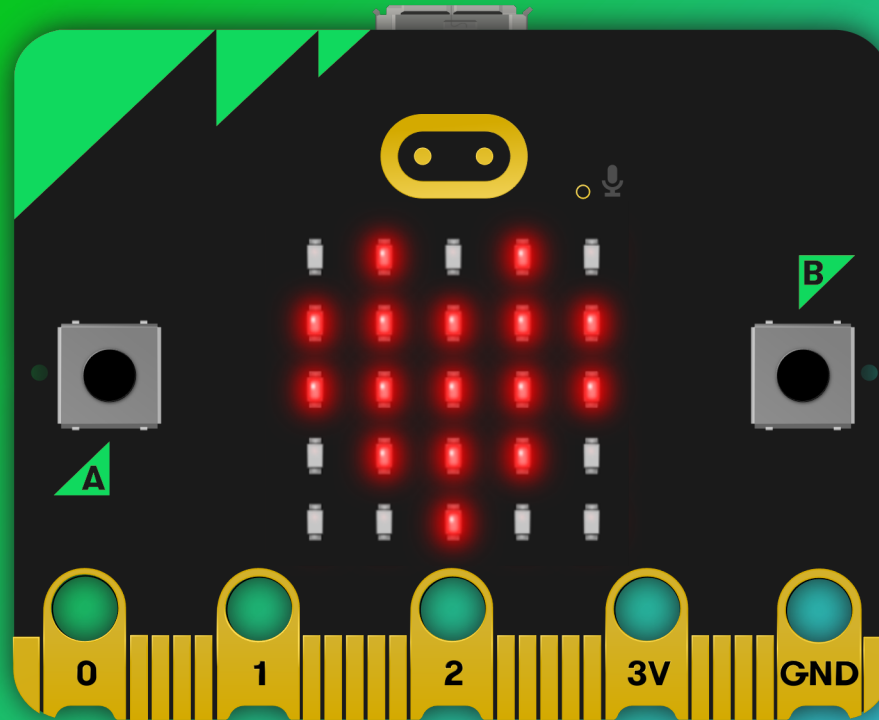


And also...

It can make and sense sound
It can detect touches on the logo

This is a BBC micro:bit (V2)

It does everything the original micro:bit does



And also...

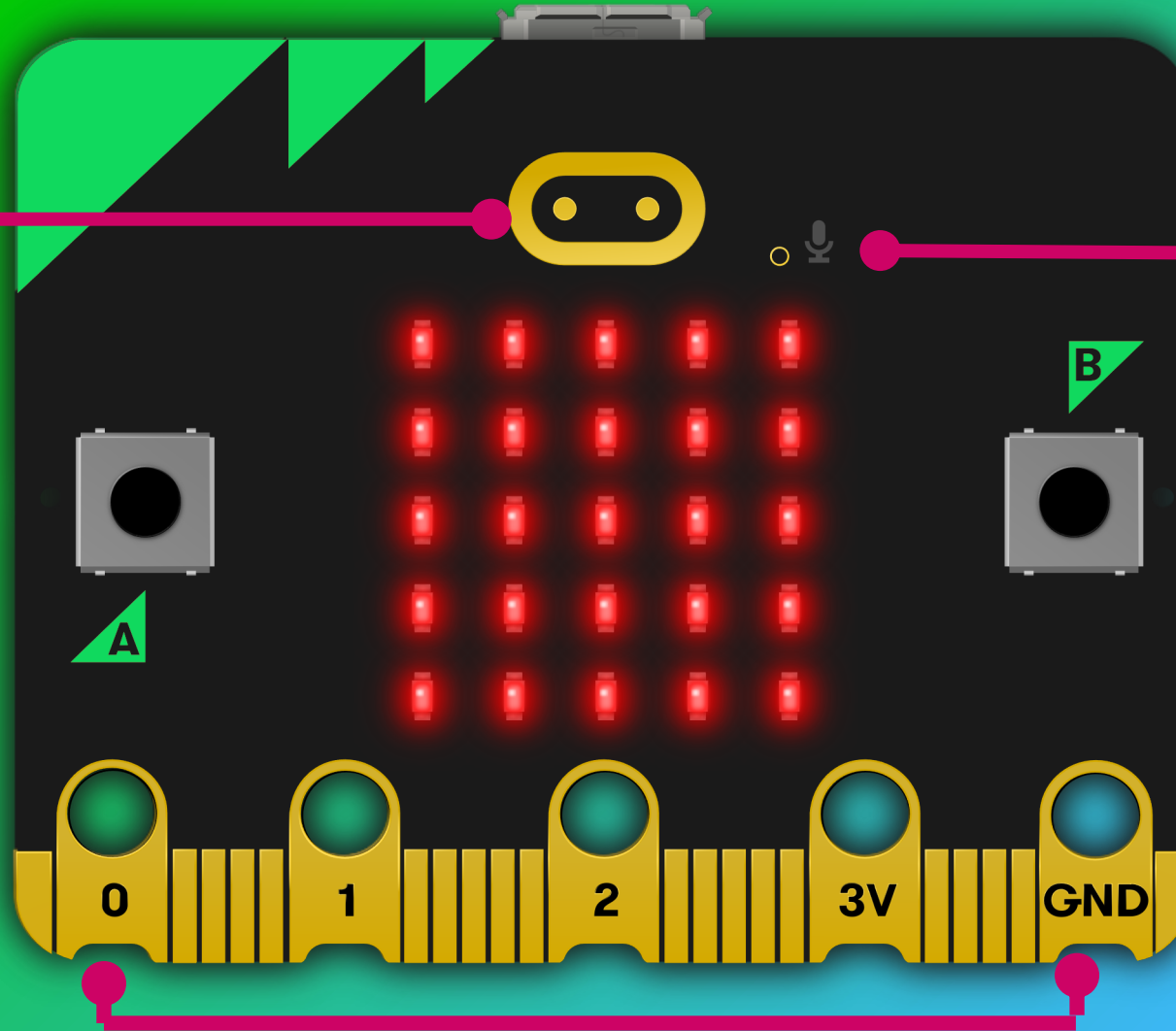
It can make and sense sound

It can detect touches on the logo

It uses a Nordic nRF52833 – enough power for AI and ML experiments

Touch sensitive logo

Microphone activity indicator

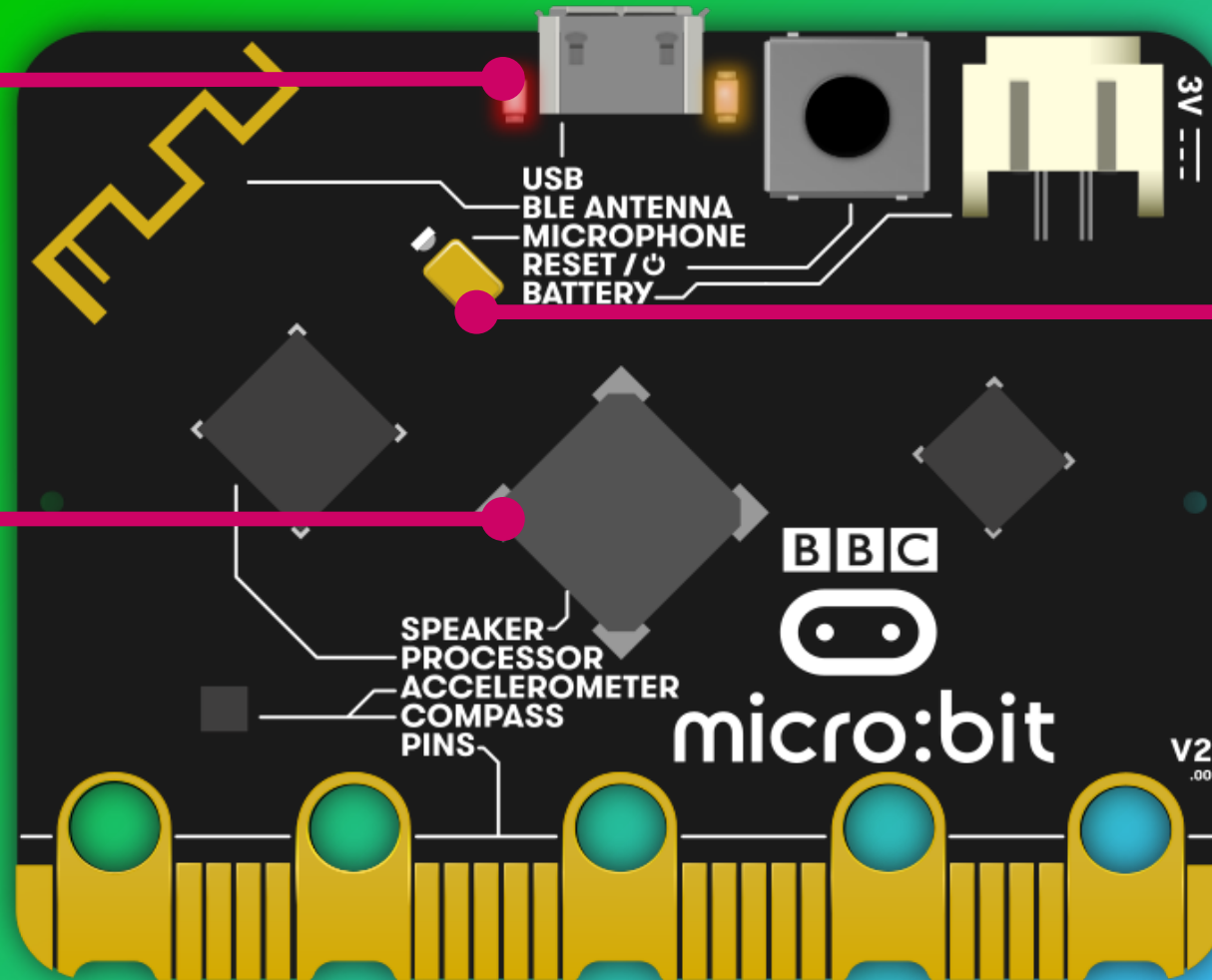


Notched Edge Connector

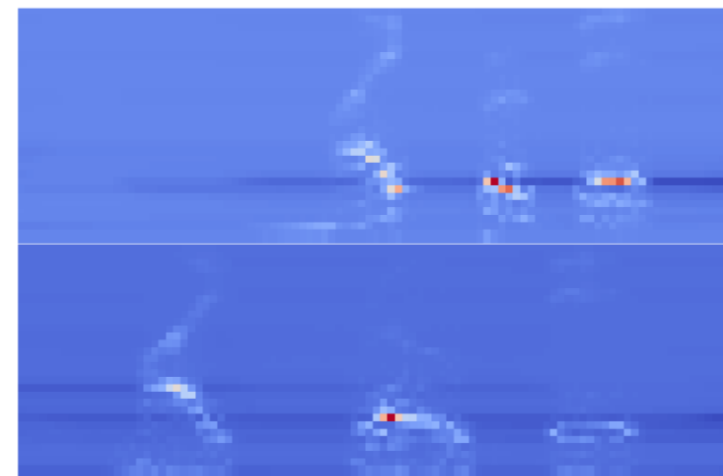
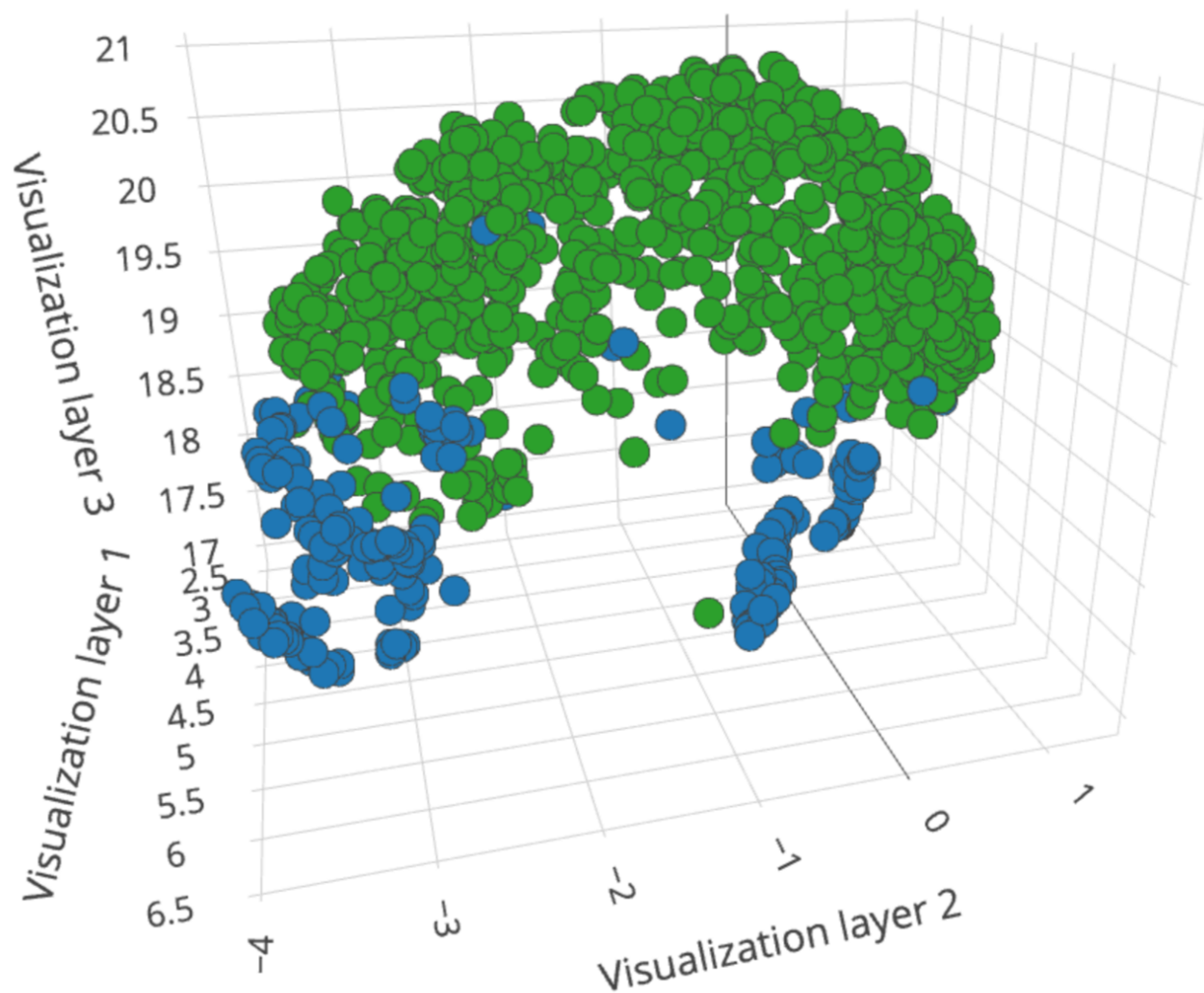
Power indicator

Speaker

Microphone



- microbit
- noise
- unknown



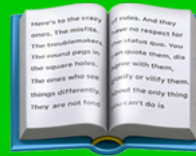
micro:bit voice print



PROJECT

MICRO:BIT PROJECT: MACHINE LEARNING DANCE MOVE DETECTOR

a dance detecting micro:bit



The Story

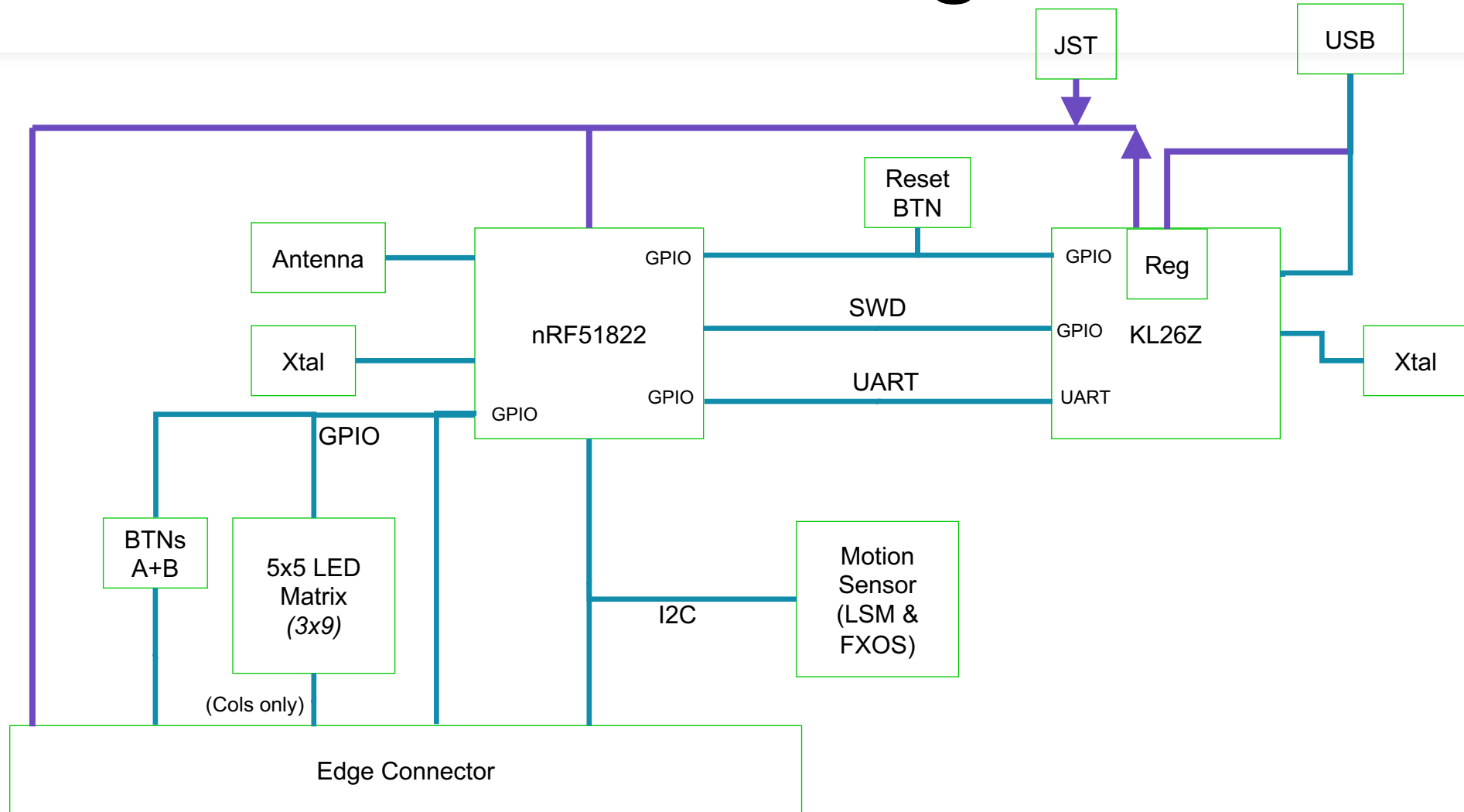


Demonstration

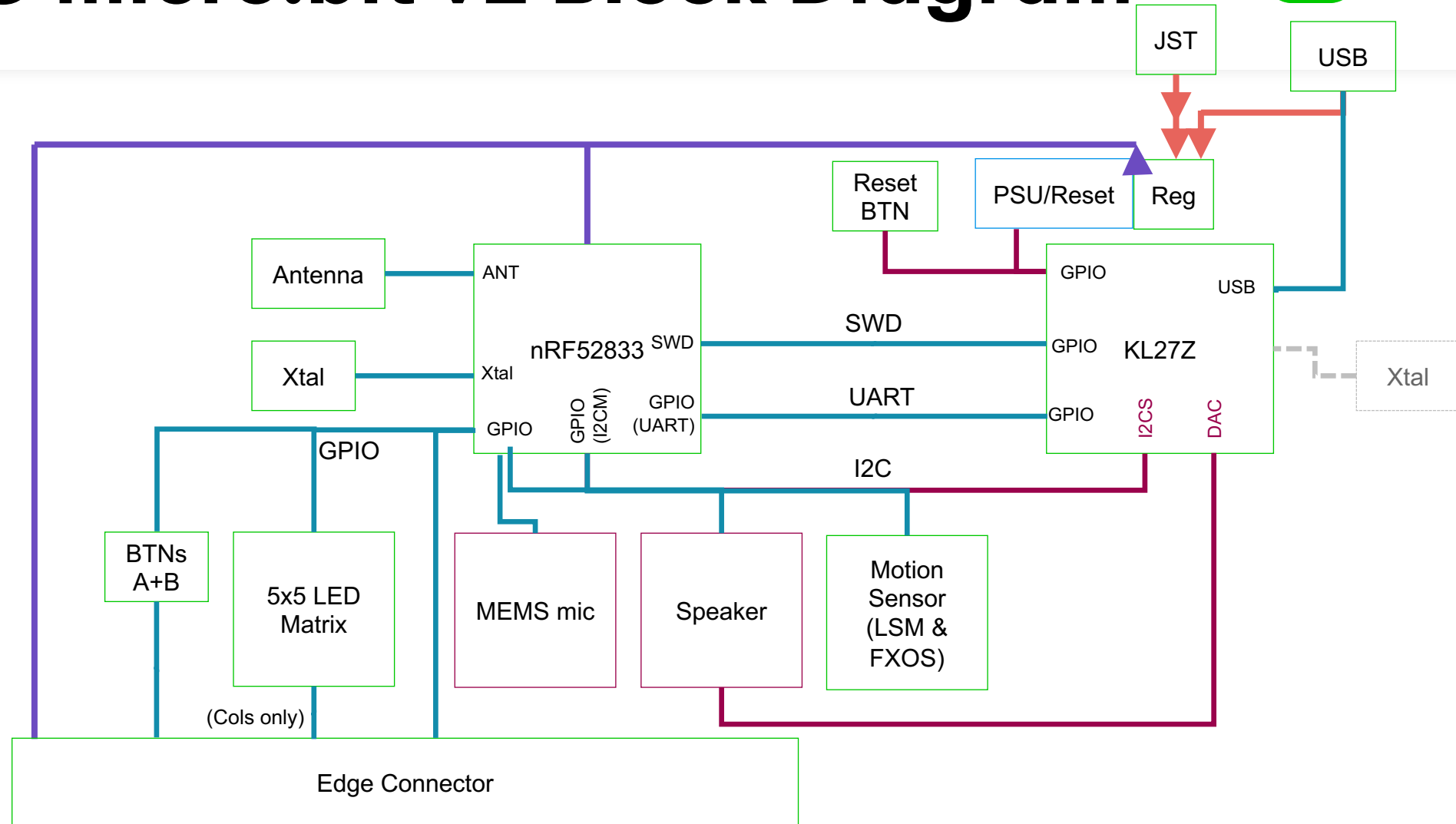
How it Works



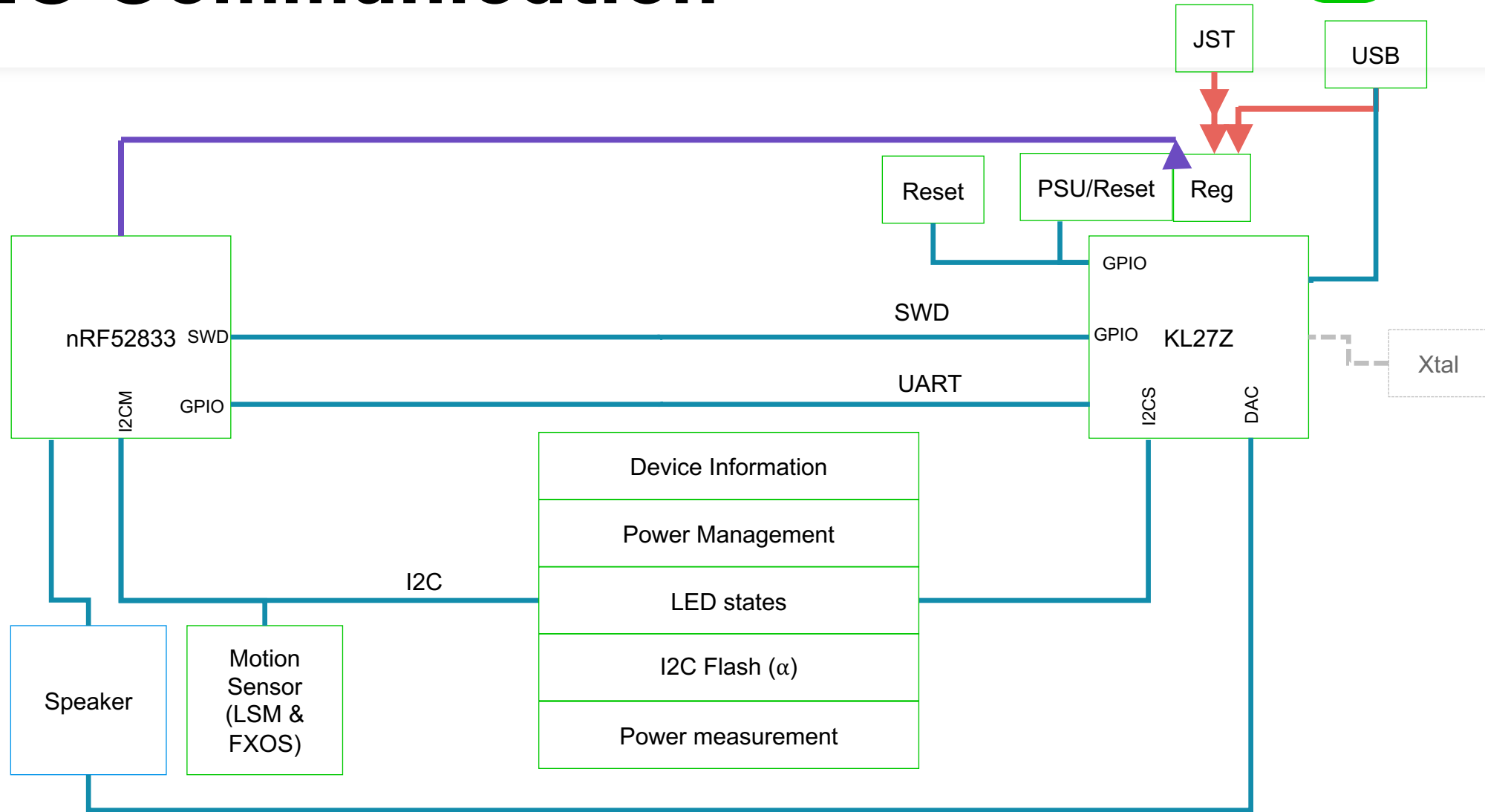
BBC micro:bit v1 Block Diagram



BBC micro:bit v2 Block Diagram



I2C Communication

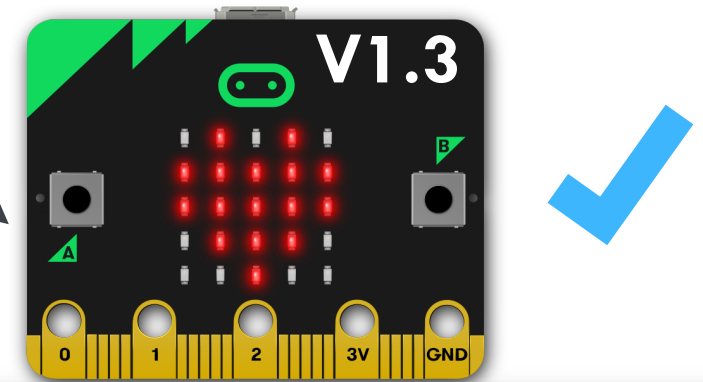
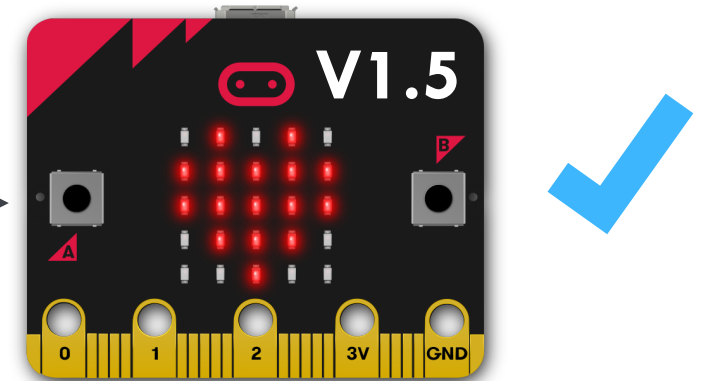
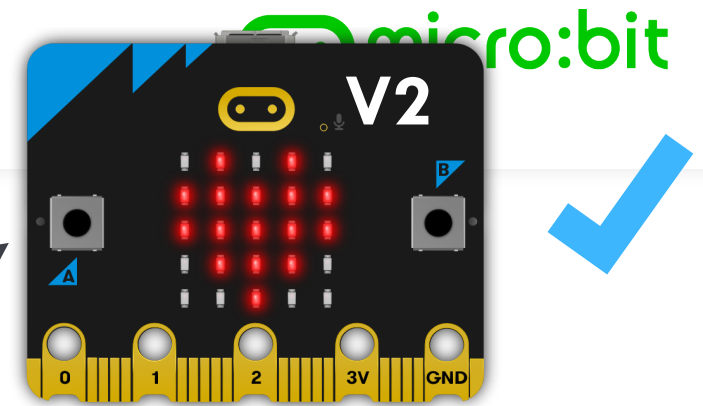
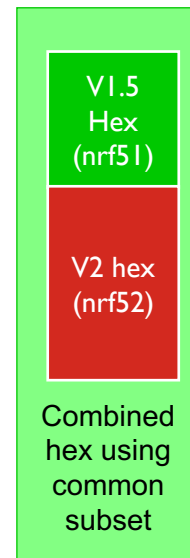


- Users will not have to select their board version to use any existing micro:bit features.
- Users will see blocks for V2 boards listed in a special category in the block explorer
 - If you only use features that are common to V1 and V2, your code will still work on V1
 - If your code uses blocks that are for V2 only, it will throw an error on a V1 (929)
 - The simulator will show a micro:bit V2 whenever V2 blocks are used.
- In MicroPython access to V2 features will be via specific APIs that throw errors on V1 hardware

One hex file will work on all boards

...except when it uses v2 only blocks

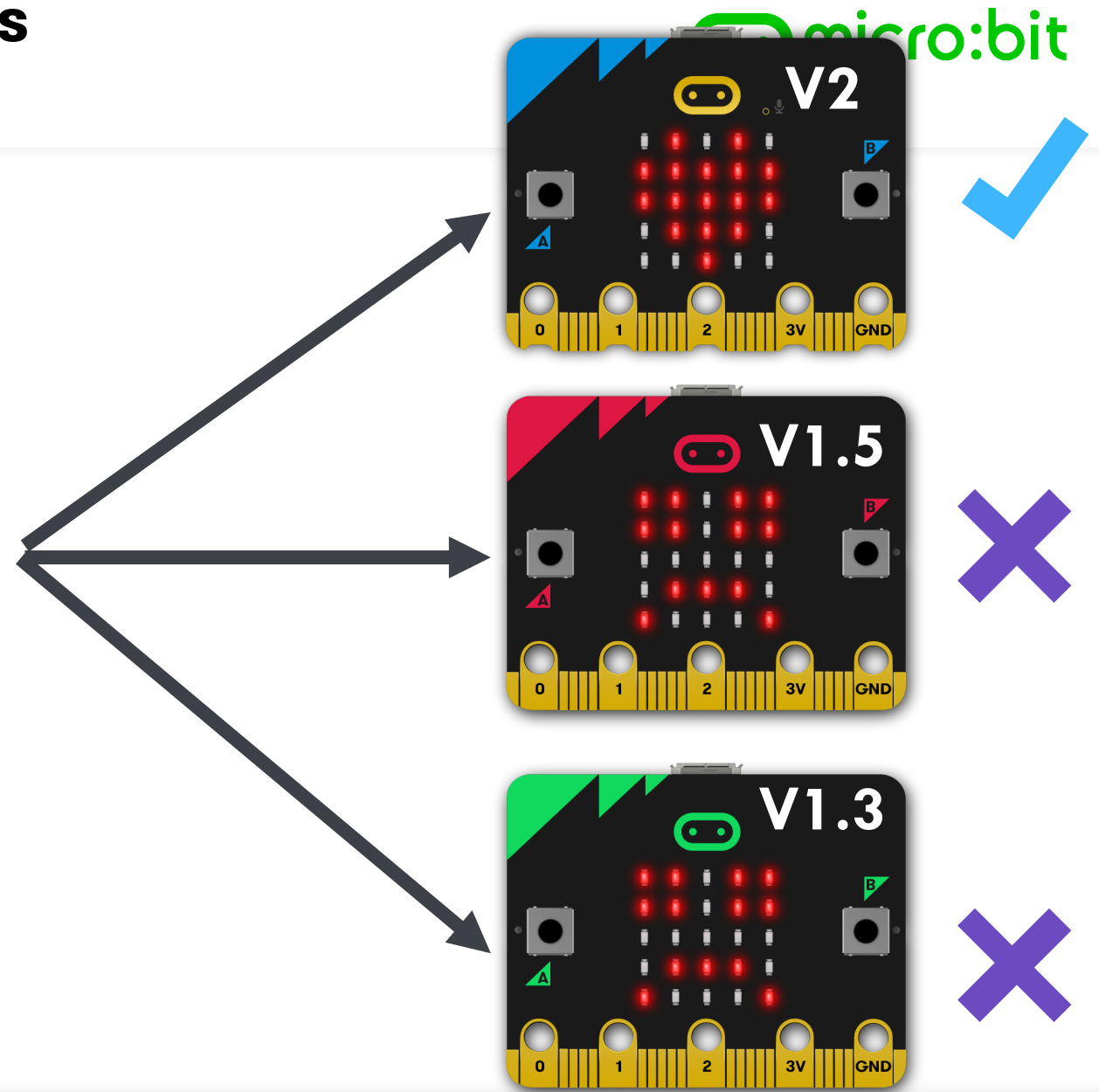
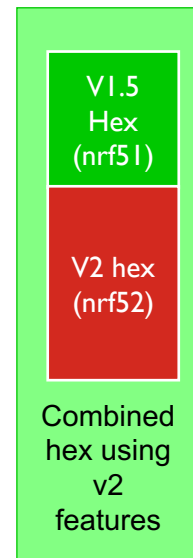
If a hex file uses the
common subset of features
only, it will work on all
boards



One hex file works on all boards

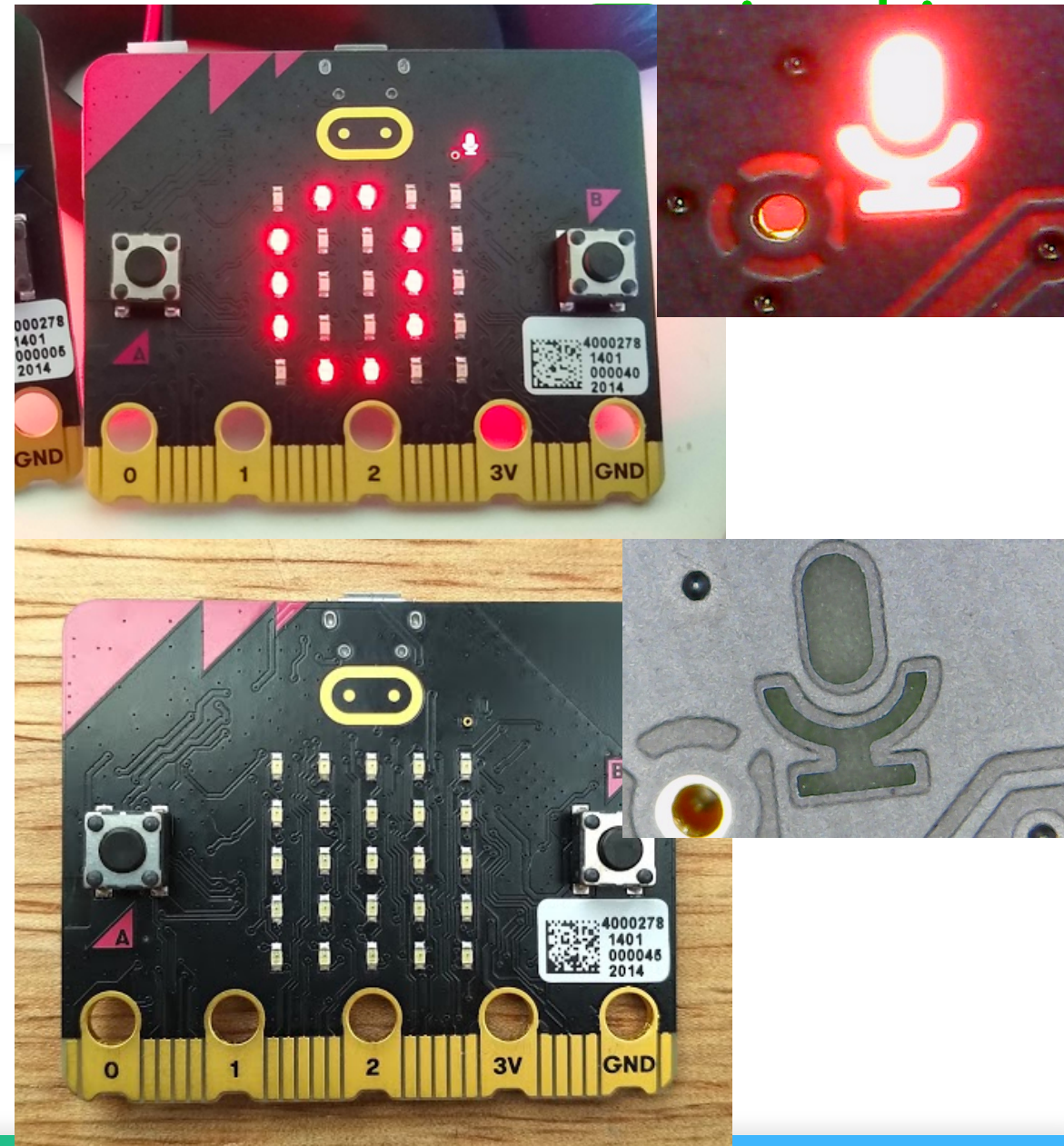
...except when it uses v2 only blocks

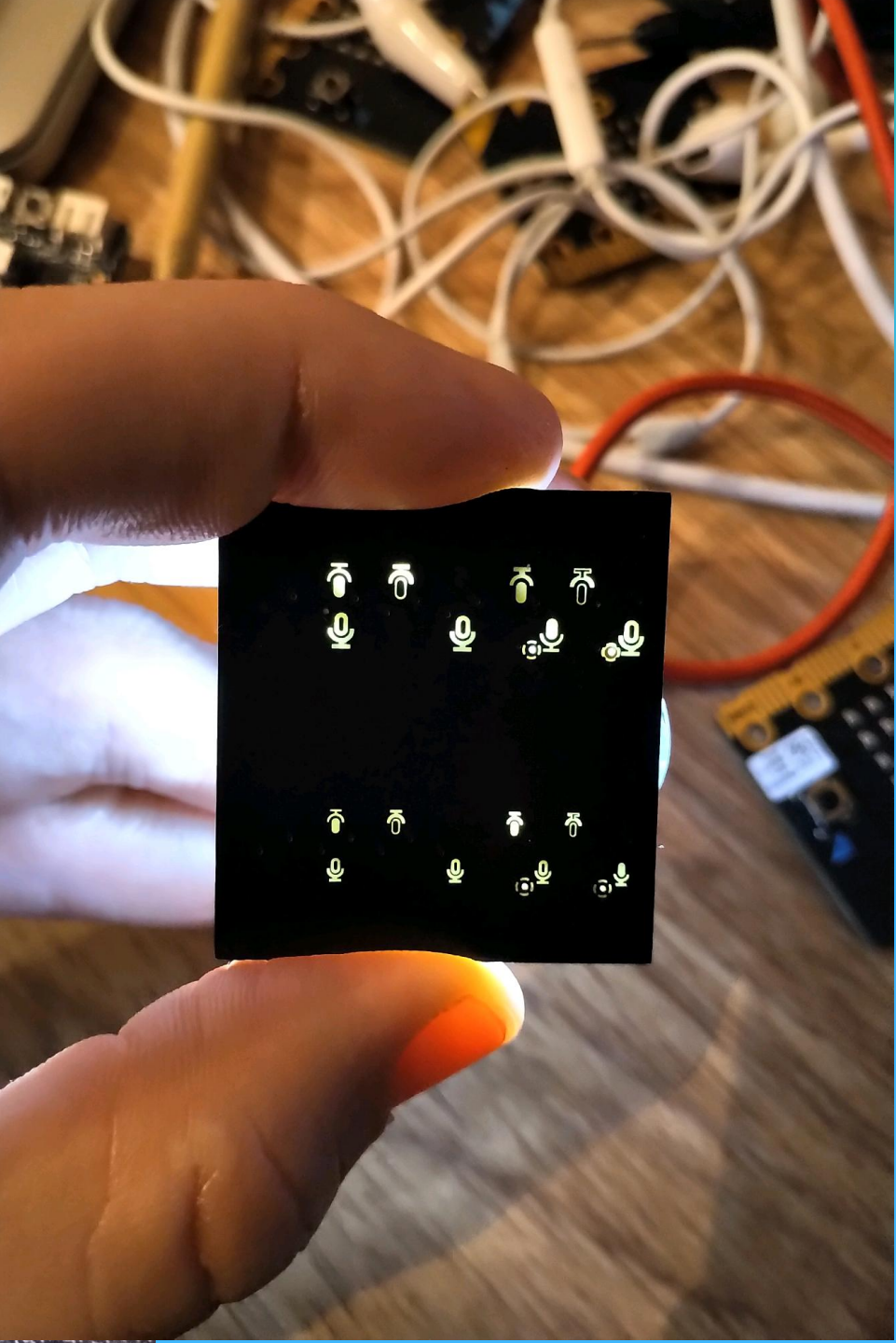
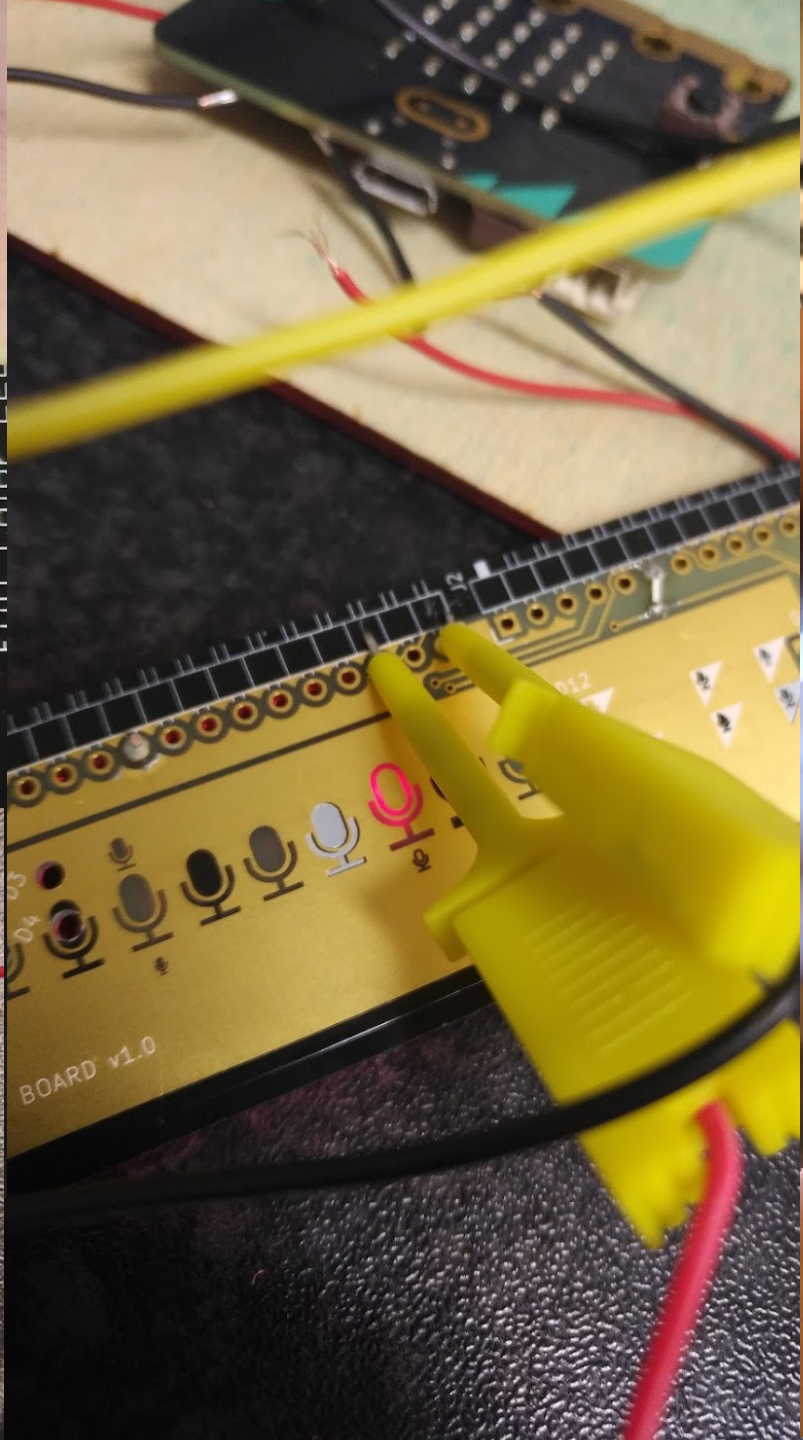
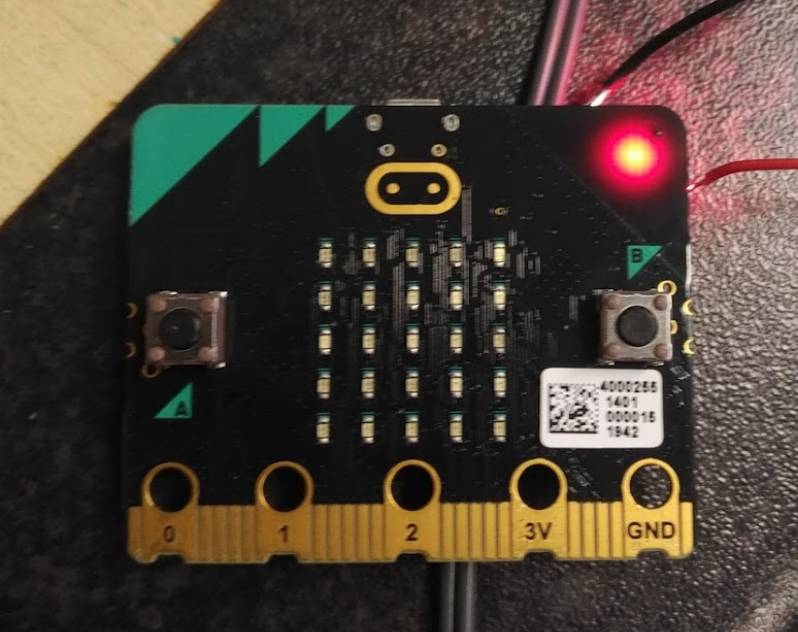
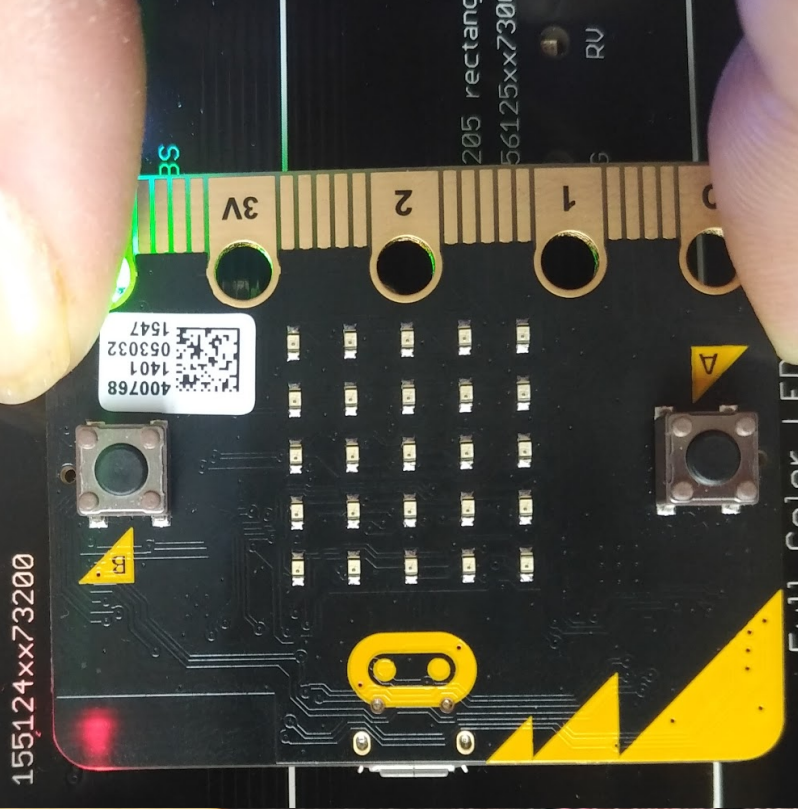
- If a hex file uses features that are v2 only, it will not work on a v1 board
 - The error will occur as soon as a feature is used
 - This means 'at startup' for 'On sound' events
- The error will be visual on the display

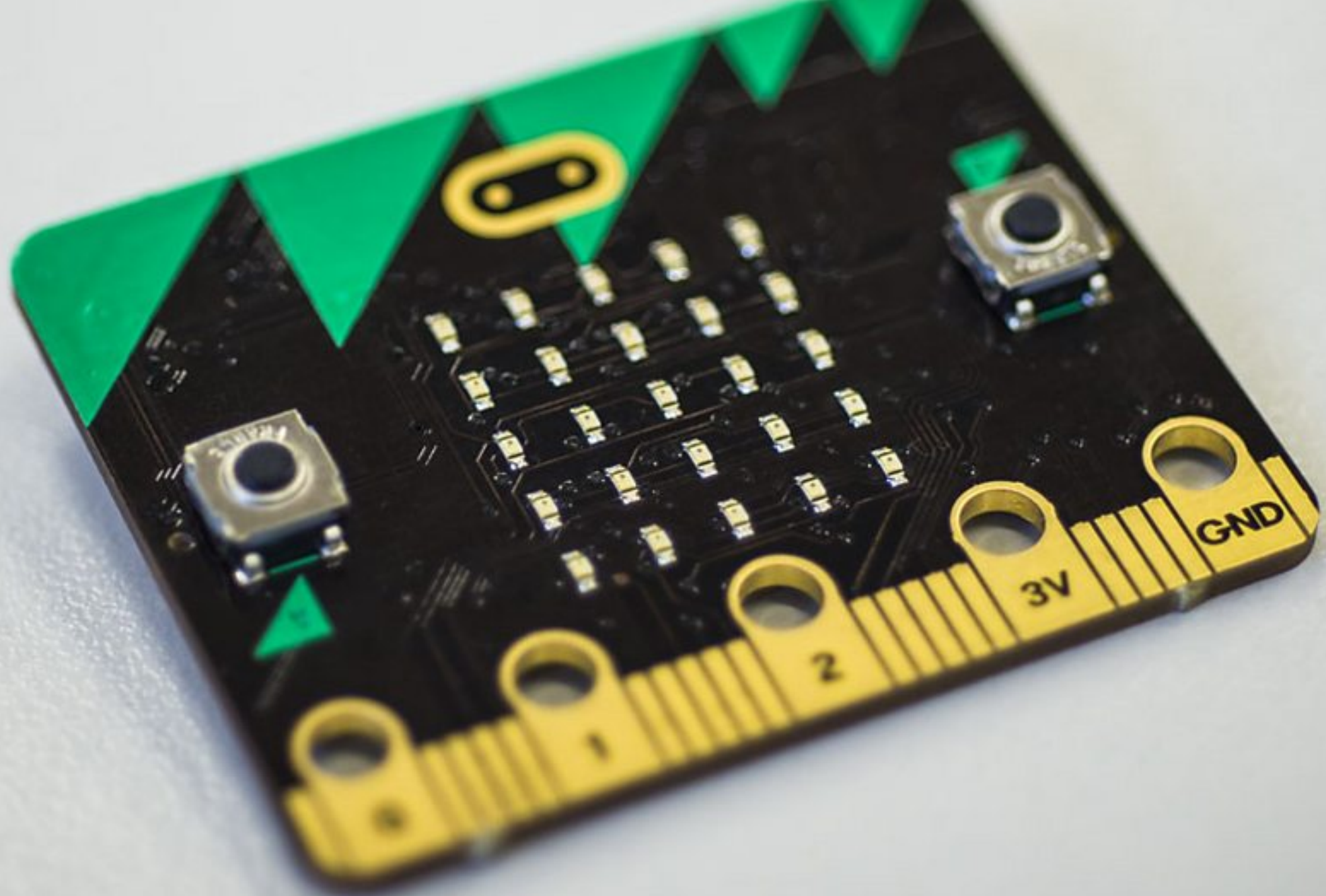


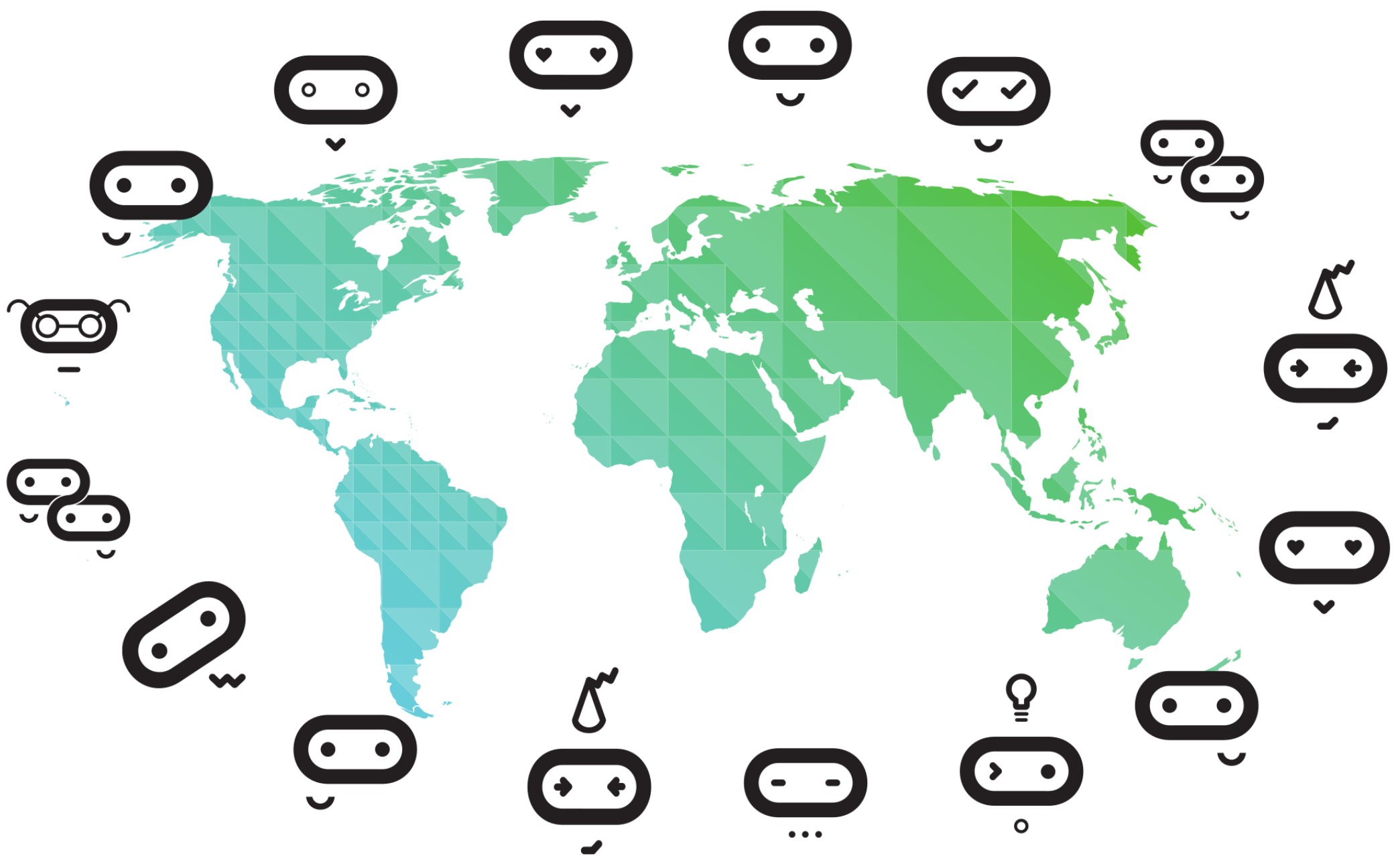
Microphone indicator

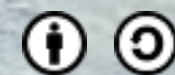
- When the microphone is recording there will be an indicator on the front of the board that it is 'listening'.
- When the microphone is not recording, the indicator is not really visible/doesn't detract from the look of the device
- We want to make a feature of the privacy questions around a microphone







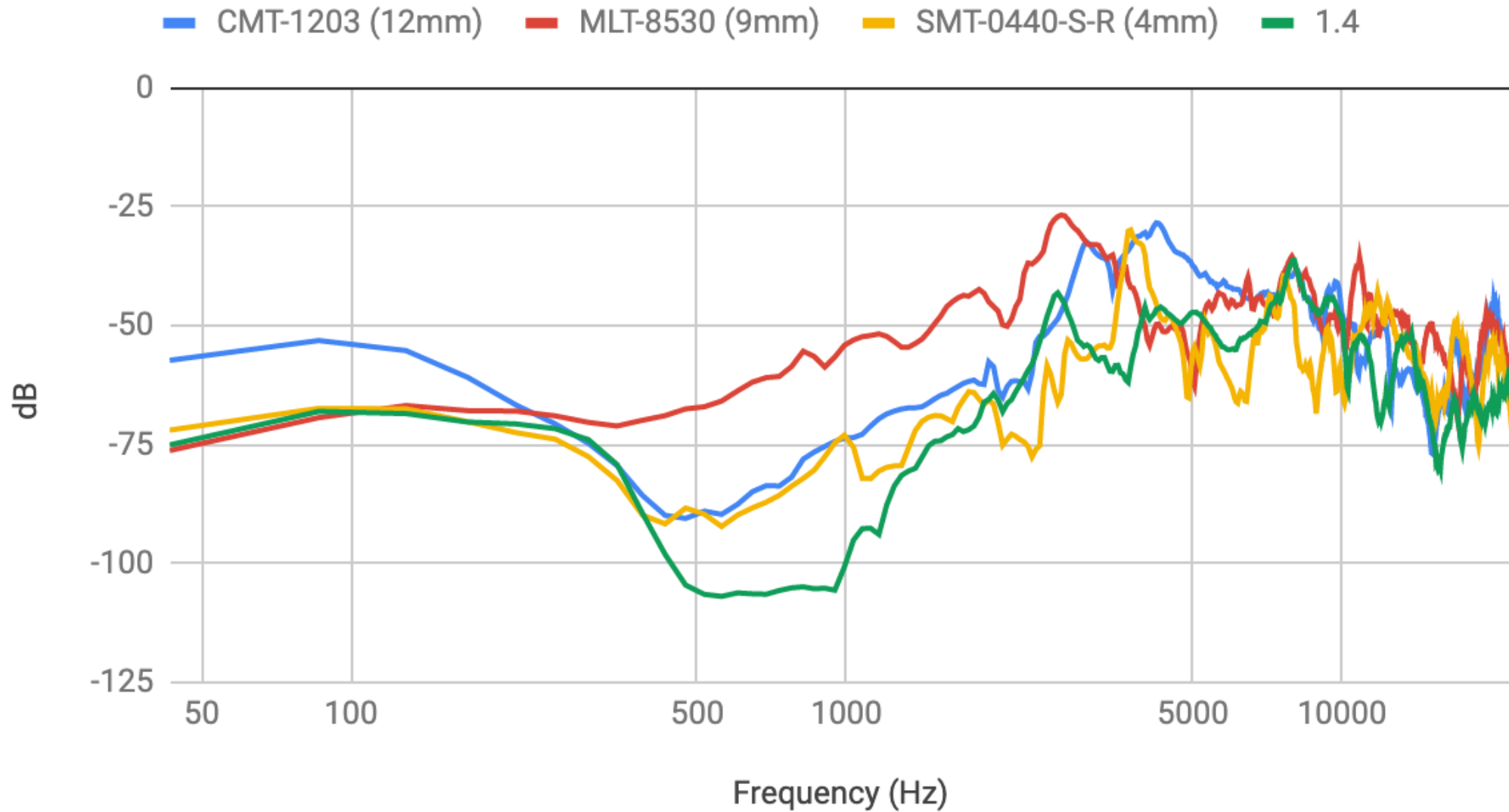




[BennyOnTheLoose](#)



CMT-1203, MLT-8530, SMT-0440-S-R and 1.4





README.md

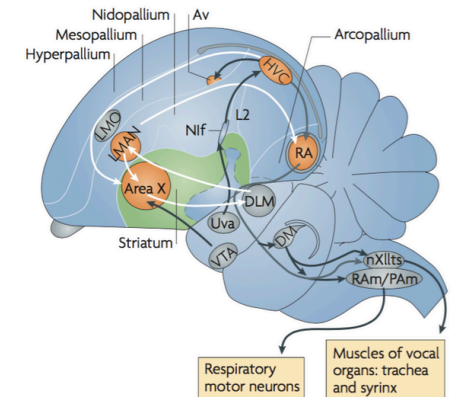
Birdsong generation project

Generating birdsongs with Wavenet!

- [Listen to natural song at soundcloud](#)
- [Listen to generated song at soundcloud](#)

Table of Contents

- [Quick execution](#)
 - [Requirements](#)
 - [Command](#)
 - [Generated song](#)
- [Overview](#)
 - [Abstract](#)

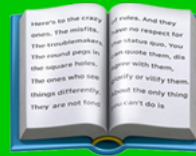








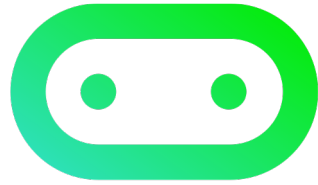
Demonstration



The Story

2015

BBC



micro:bit

2016



The BBC



Micro:bit Educational Foundation



Micro:bit Educational Foundation

**Inspiring every child to create
their best digital future**

Mission

We enable and inspire all children to participate in the digital world, with particular focus on girls and those from disadvantaged groups.

We make micro:bit the easiest and most effective learning tool for digital skills and creativity.

We work in collaboration with educators to create and curate exceptional curriculum materials, training programmes and resources.

We build and support communities of educators and partners to remove the barriers to learning digital skills.

Make it: code it

Quick projects to suit all ages, searchable by computing topic, level, coding language and micro:bit feature

Programming language

- ☐ MakeCode (71)
- ☐ Python (65)
- ☐ Scratch (6)

Subjects & topics

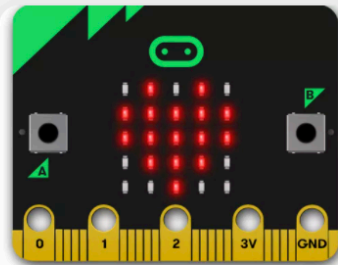
- ☐ Computational thinking >
- ☐ Computer systems >
- ☐ Digital arts >

[All levels](#)
☐ Beginner

☐ Intermediate

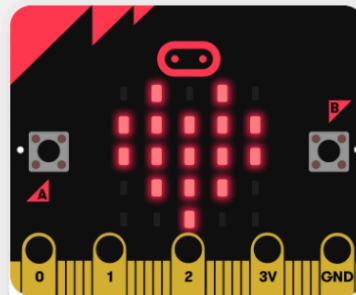
☐ Advanced

79 results



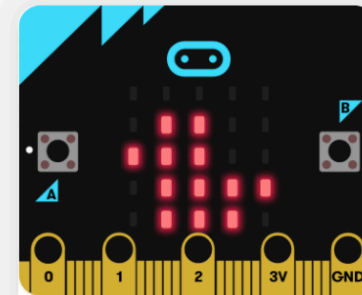
Heart

Light up your micro:bit with lov...

☐ Beginner


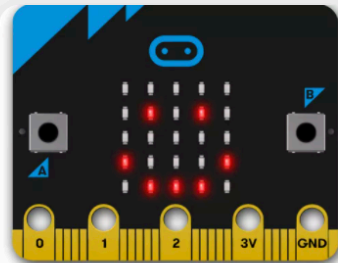
Beating heart

Make your micro:bit's heart...

☐ Beginner


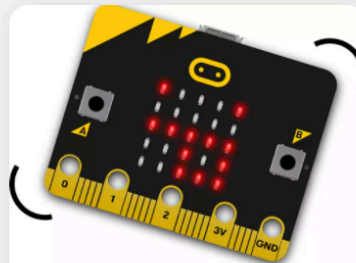
Animated animals

Animate your own animals on the...

☐ Beginner


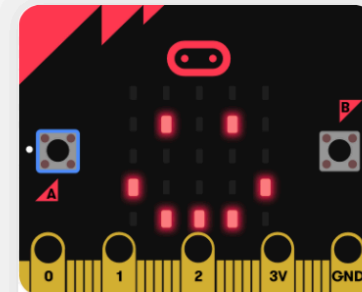
Emotion badge

Use your micro:bit



Get silly

Shake your



Flashing emotions

Make flashing

Other projects

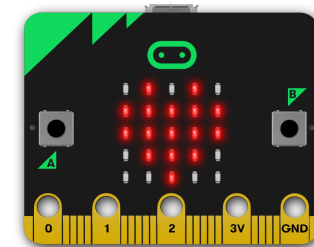
Easily manage and review students' code across lessons



micro:bit units (by age)

| 7-8 | 8-9 | 9-10 | 10-11 | 11-12 |
|--------------------|-----------------------|-------------------|----------------|------------------------|
| Nature art | Volcano animations | Data handling | Getting active | Computing fundamentals |
| Digital flashcards | Electrical conductors | Musical micro:bit | | |

| 11-14 |
|--------------------------------|
| Health tech |
| Sensory classroom |
| Introduction to cyber security |
| Cryptography |



Source: microbit.org
→ Select: Lessons

**Education with the micro:bit is about
kids inventing things and expressing
themselves, with technology as a
tool.**

The idea comes first!

The idea comes first!

- This approach is one of the key things that sets micro:bit apart
 -And one of our key tools in making micro:bit relevant and engaging for children that might not currently think computer science/engineering is for them
- We want children to feel confidence and ownership over their technology



Demonstration

How it Works

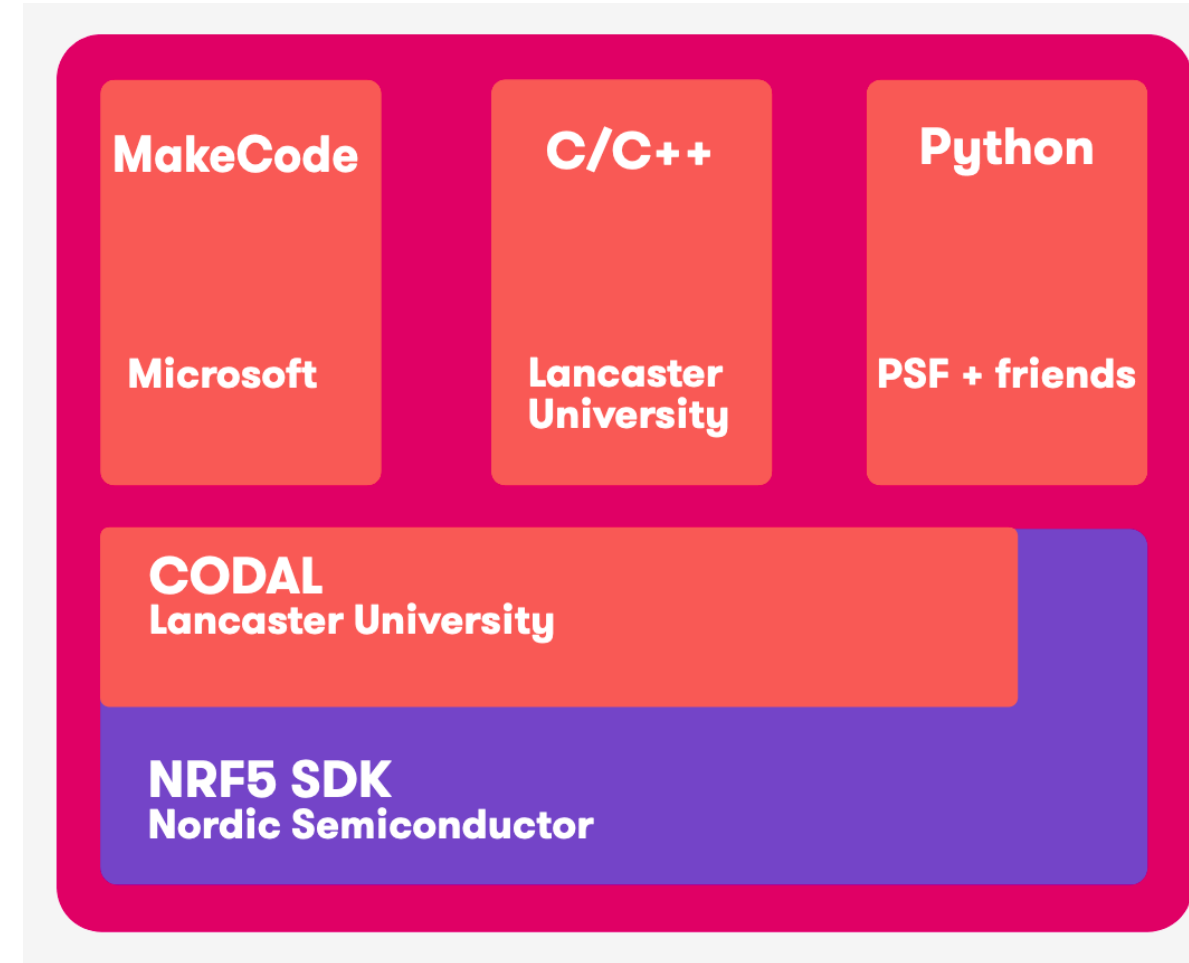


<https://tech.microbit.org/>

Device Abstraction

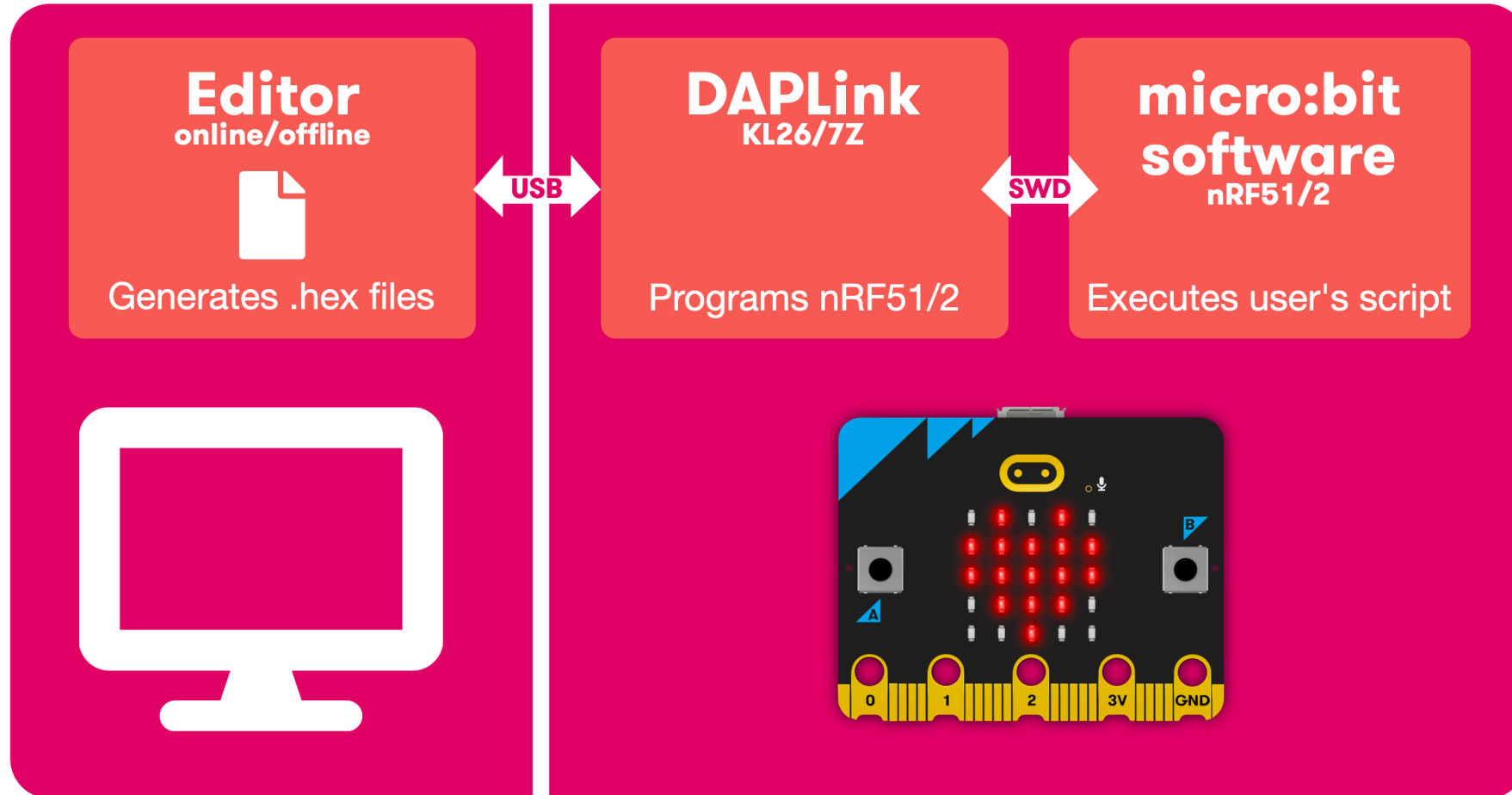
Ensuring a consistent experience across multiple editors & enabling ecosystem

- Courtesy of Lancaster University
- “Device Abstraction Layer” – DAL
- Now used well beyond the micro:bit project
- C++
 - Strong inheritance model for components
- EventBus for synchronisation
- Lightweight ‘fibers’ not threads
- Resource efficient



Dedicated USB chip

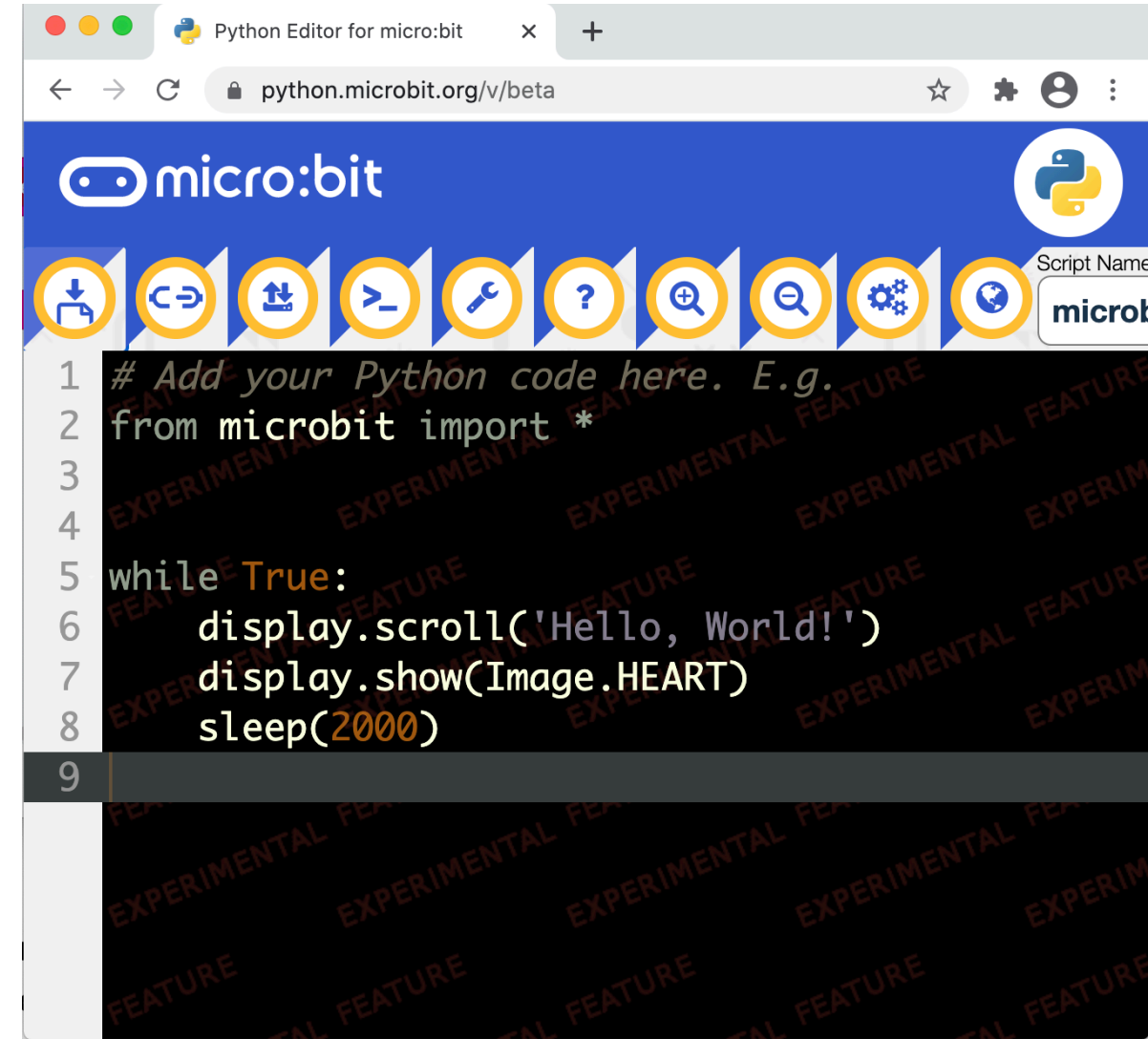
Ensures robustness and ease of programming. Also a debugger



Web-based editors

No installation or drivers

- Avoid compilation – there are a lot of micro:bits (!) and building the project takes time and computing resources
- Combine a pre-compiled blob with the user's script
- In the case of MicroPython: Interpreter+filesystem generated in browser
- In the case of MakeCode, compile script to machine code in browser
- Reduces compile time
- Works offline



Offline, every time there is a new micro:bit runtime release

pxt/touchdevelop wrapper
C++

micro:bit runtime
C++

ARM mbed & nRF SDK
C++

Compile with yotta/gcc

Partial/"Shell" hex file
ARM binary

x1

In the browser (javascript) every time the user clicks 'compile'

Blocks Script

Block compiler

Javascript (pxt) or
TouchDevelop

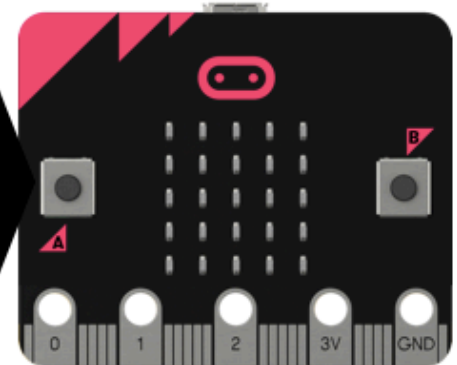
In-browser compiler

Users's program hex
ARM binary

Partial/"Shell" hex file
ARM binary

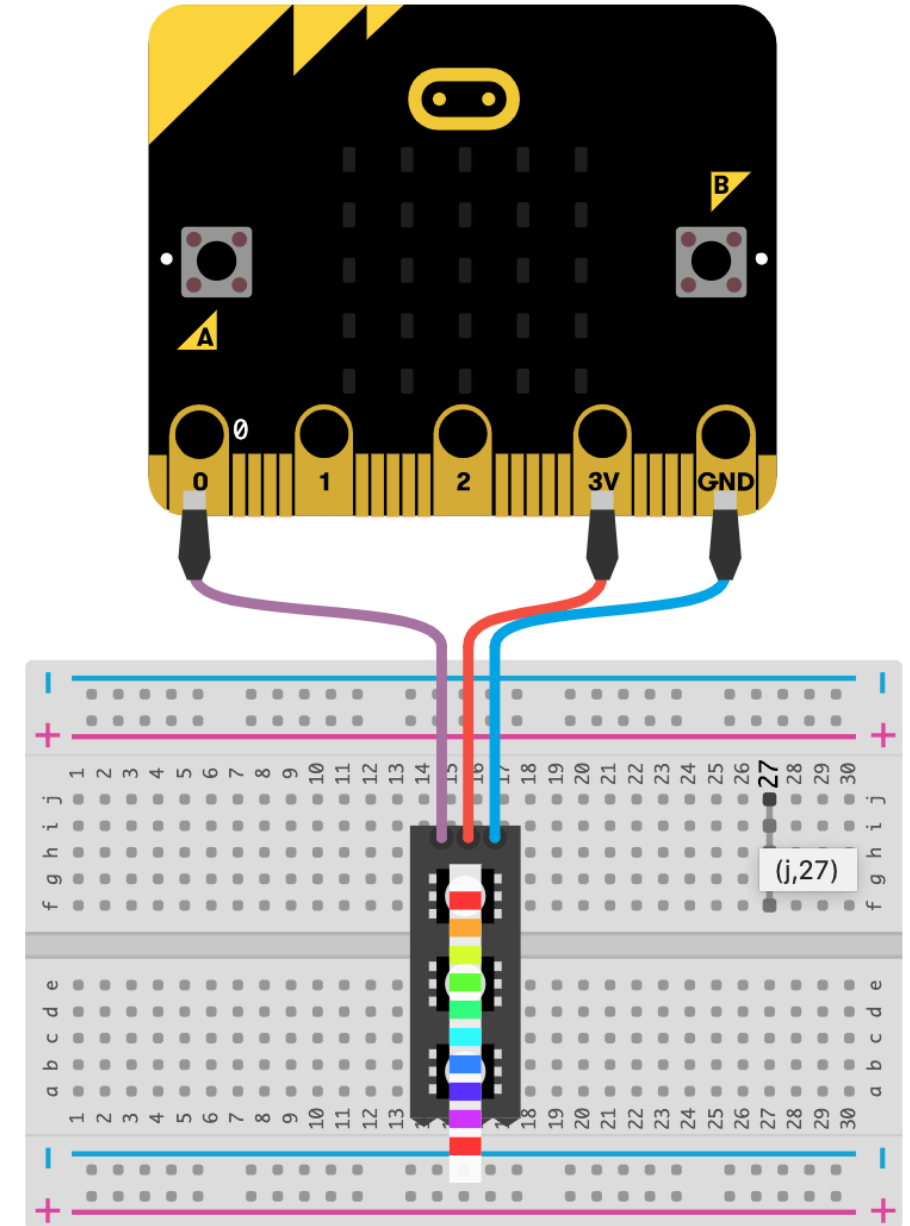
Combine
and
download

x millions



Simulation

- Kids don't even need physical device, and the test cycle is massively reduced
- This was possible because there was a compiler team working in a large collaborative project
 - Bringing in the heritage of TouchDevelop
 - But also building on .Net Gadgeteer
- +Ongoing project with Arm to extend simulation capability



We're right at the beginning



Q&A

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