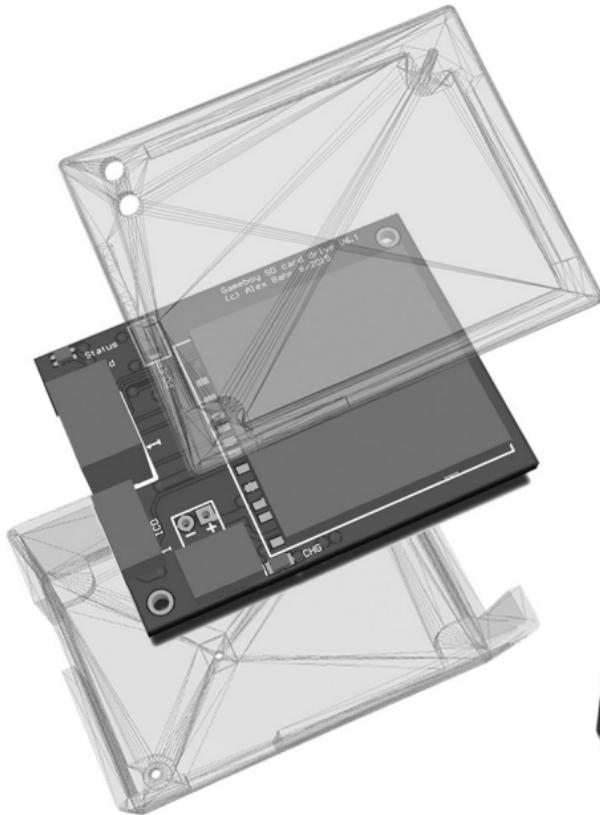


BITBOY



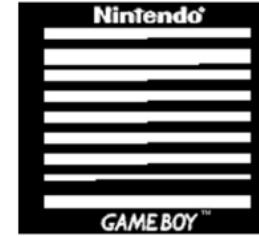
Development Brief



Introduction

The BitBoy Project came about as the result of a hack that was thought up for the book, *Endboss: Extraleben Teil 3* (2012) by author Constantin Gillies - a hack used in order to break out of a makeshift prison cell using a Game Boy and Game Boy Camera, by which the camera sensor is ripped out and the Game Boy Camera electronics are thereby turned into a logic analyzer. The parts are then wired to the cable which connects the door's code lock to the validation server, and the camera electronics are used to capture the code and display its 1's and 0's as light and dark bars on the Game Boy's screen.

Familiarizing myself with the Game Boy Camera, I noticed that there is no easy way to get the pictures off the camera other than by using Nintendo's thermal printer. That lack inspired the idea to design an SD-card drive which would "disguise" itself as a printer and then store the pictures on a card.



Translating the process of printing on paper to writing on an SD-card was not always straightforward. A lot of time went into testing the BitBoy with the camera and with all the games that make use of the printer functionality in order to ensure 100% compatibility and faithful reproduction.

Since 2011 the project has grown in collaboration with GameBoyPhoto, bringing together people from different continents and backgrounds (an author, a musician, a photographer, an engineer, and a journalist.) In five years, the hardware has developed in many stages. This development brief will outline those stages, and explain the decisions that were made honing on the BitBoy's final design.

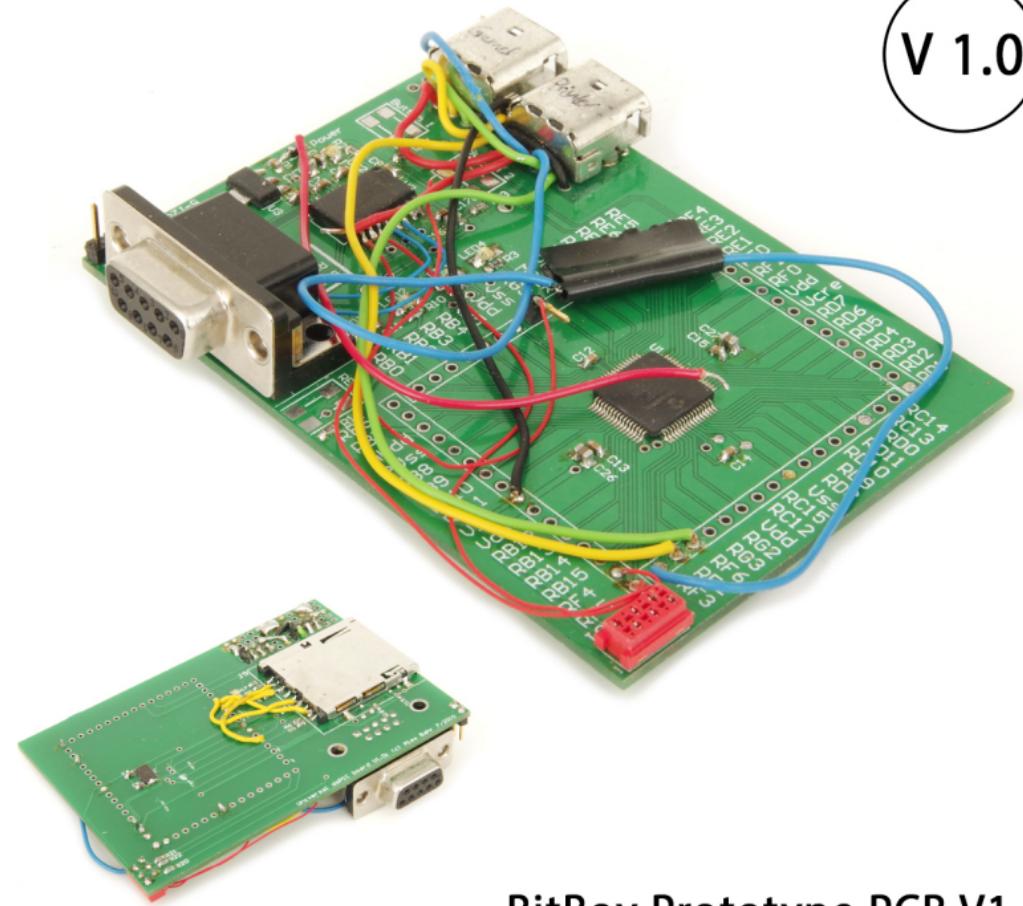
- Alexander Bahr, designer

V 1.0

Prototype PCB V1.0

Originally designed on a microcontroller development board, this prototype PCB is essentially the microcontroller with all its pins placed into 4 pinout rows, with some prototyping space in the top left corner. Two DMG link connectors salvaged from a 4-player adapter are placed on top. The backside already has the SD-card connector soldered in place.

The idea of having two connectors was to connect the Game Boy to one and the printer to the other, in order to listen to the signal traffic at first: without sending the appropriate answers back, the Game Boy stops sending information immediately. By making sure that our code was able to parse the data coming from the Game Boy correctly, we could prepare BitBoy to send the correct replies (just like the printer) and, of course, store the picture as well.



BitBoy Prototype PCB V1.0

V 1.0

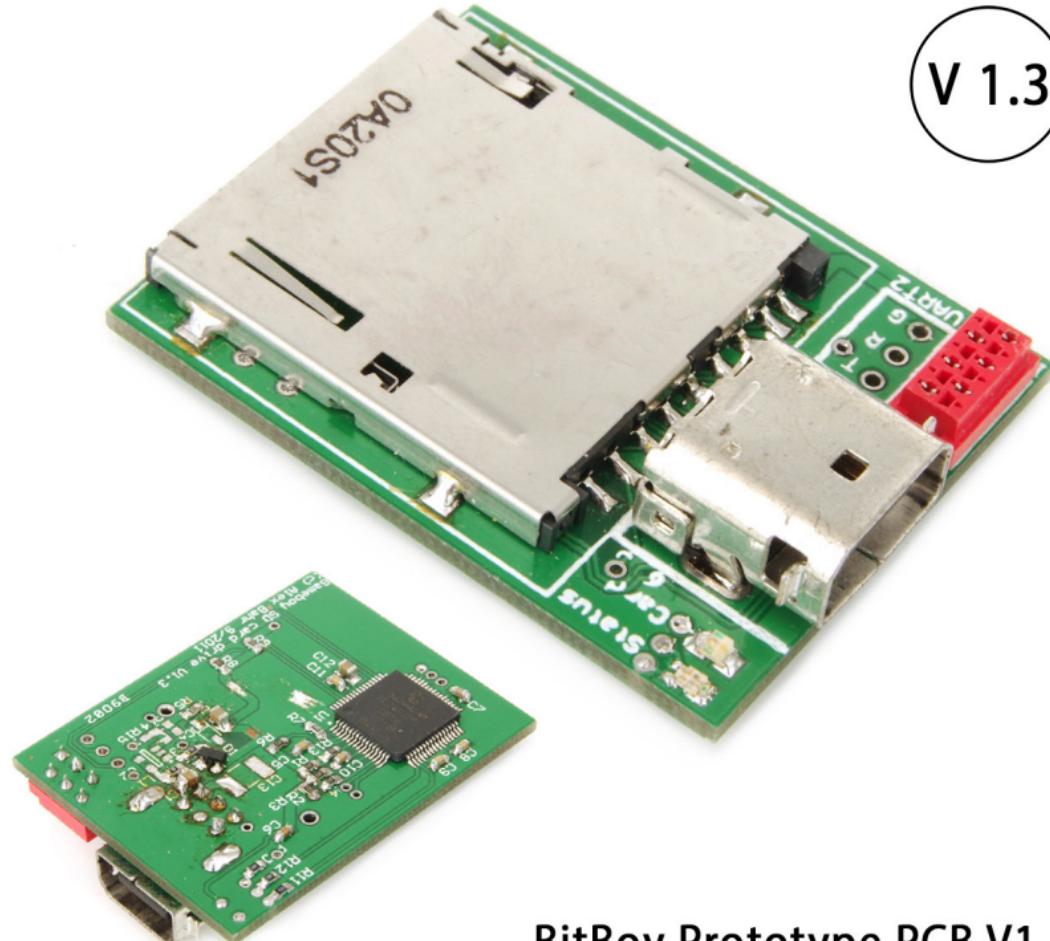
V 1.3

Prototype PCB V1.3

V1.3 was the first dedicated PCB made for BitBoy.

Once again, a salvaged DMG connector resides on top, and the unit is powered by the Game Boy. Drawing power from the Game Boy of course means needing a cable through which one can wire the 5V line. This also tends to overload the Game Boy's internal up-converter quite a bit (the display becomes noticeably dimmer.)

While this unit did function for image transfer processes, it did risk overloading (and therefore breaking) users' Game Boys if it were produced and distributed widely.



BitBoy Prototype PCB V1.3

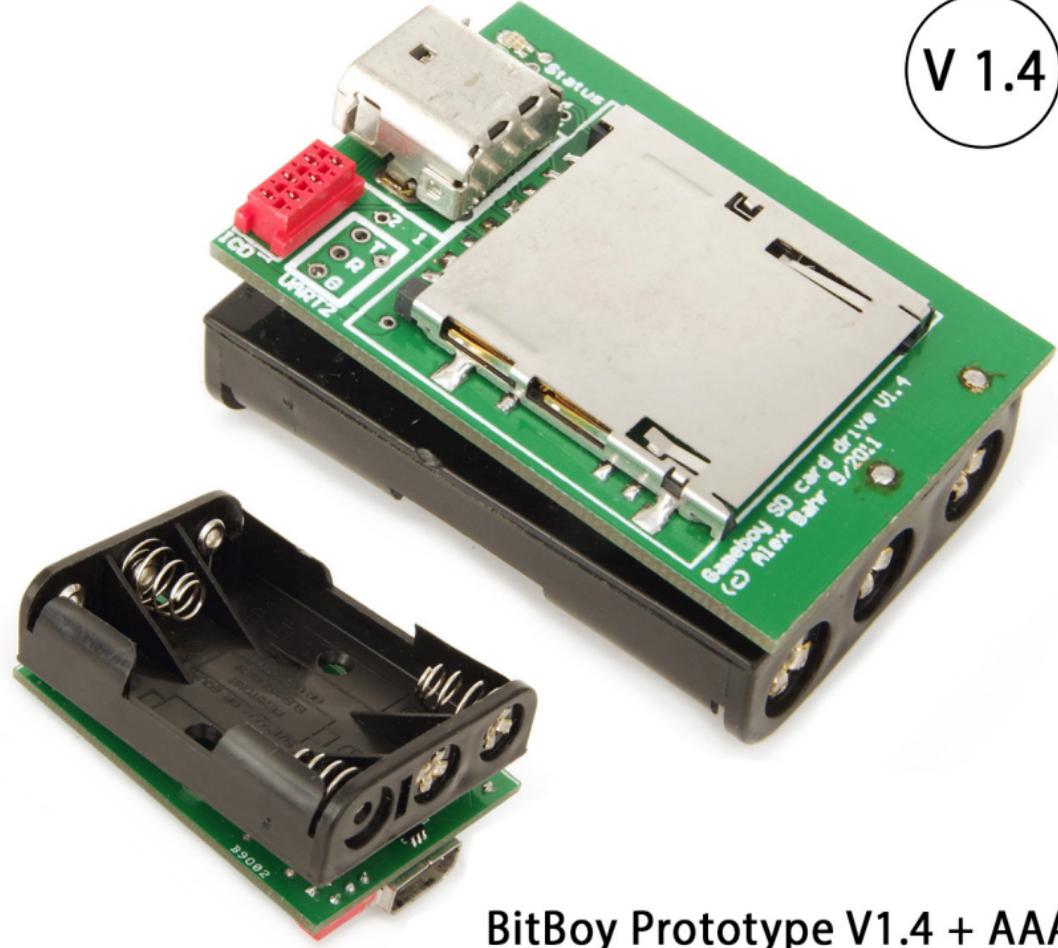
V 1.4

Prototype V1.4 + AAA

This is V1.4 with a AAA-battery dedicated power source.

This version added the 3 AAA-battery cage, and used the 5V line solely to switch the BitBoy on and off.

While this unit did function for image transfer processes, it was relatively delicate, bulky, and required replacement of its disposable batteries regularly.



BitBoy Prototype V1.4 + AAA

V 3.1

BitBoy Prototype V3.1

Since continuing to salvage DMG connectors from old 4-player adapters would make a production run difficult, Prototype V3.1 was designed using a different method of connecting the Game Boy.

V3.1 replaced the Gamelink connector with a 6-pin screw terminal. The idea here was to cut a Gamelink cable (widely available in large quantities,) and wire in all the individual strands within the cable straight to the PCB. This link connector has two ends: one for GBP/GBC/GBA and one for DMG-001 Original Game Boy.

In a larger production run, this unit would have looked very hacked, and would have been very difficult to manufacture in mass quantities.



BitBoy Prototype V3.1

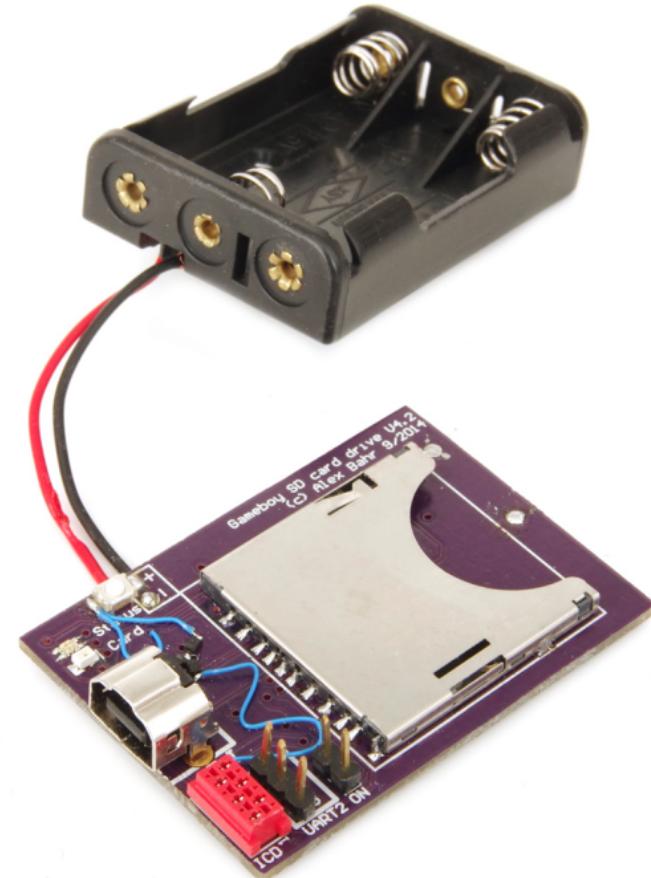
V 4.2

BitBoy Prototype V4.2

This V4.2 (pictured) is hacked to try changes implemented in the next version: in it, a white push-button replaces the jumper, in order to accomodate users that decide to use a link cable which does not have the 5V line wired through. This unit is still powered by 3 AAA batteries, although the battery cage is not mounted onto the PCB directly: the cage is removed as this way the unit is thinner than 2.5cm, allowing for it to be sent cheaply as a letter via Swiss mail. The idea was to provide a double-sided sticker on the back so that people would stick the battery cage to the back after receiving the unit.

By V4.2, we abandoned experimenting with screwing hacked Gamelink cables to screw terminals, and instead had a batch of Gamelink connectors made.

V 4.2



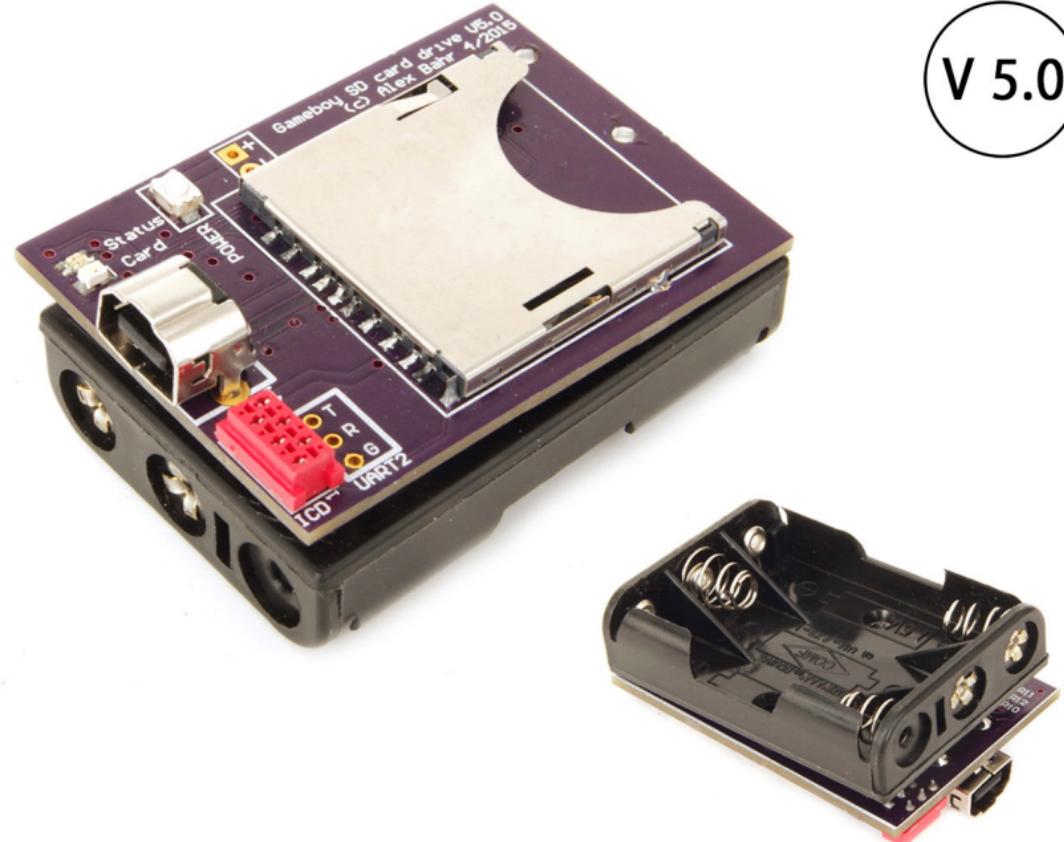
BitBoy Prototype V4.2

V 5.0

BitBoy Prototype V5.0

V5.0 retains a white push-button which replaces the jumper, in order to accomodate users that decide not to use a link cable which does not have the 5V line wired through.

This unit is still powered by 3 AAA batteries, and the AAA battery cage is now mounted at the base of the BitBoy PCB directly.



BitBoy Prototype V5.0

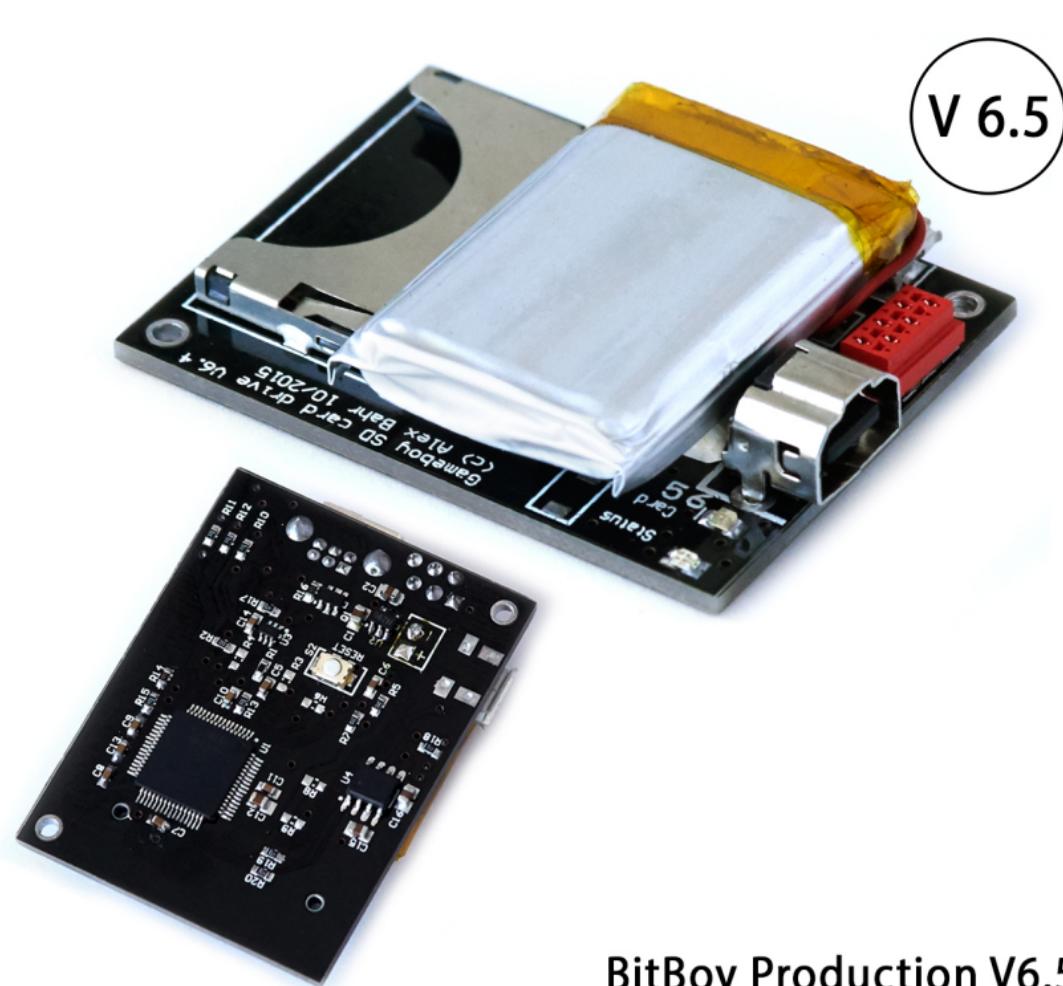
V 6.5

BitBoy Production V6.5

BitBoy V6.5 is the production-ready version of BitBoy. This version is the first one with a custom 3D-printed housing. This unit no longer needs a power button, as it is now powered on/off by the Game Boy.

This version adds a reset button to the base, accessible through the 3D-printed housing. Two lightrods are installed in the 3D-printed housing, in order to enable the LED status lights to shine brightly.

One dedicated 500mAh lithium-ion battery is connected directly to the PCB, and charges via a MicroUSB port. This version also has a charge controller to ensure proper charging.



BitBoy Production V6.5

V 2.0

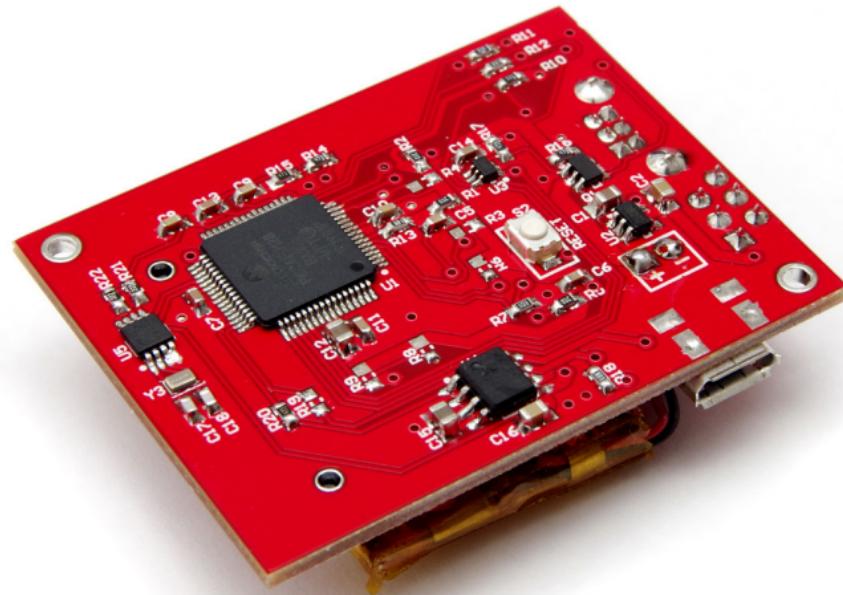
BitBoy V2.0

BitBoy V2.0 is no longer a Prototype. Released in 2018, this version is the first BitBoy with an injection mold housing. The V2.0 folder structure now enables direct image transfer from the Game Boy Camera, to SD-card, to iOS and Android devices.

This version adds a Real Time Clock. With RTC, the BitBoy can now accurately record date and time for each Game Boy Camera photo transferred.

U5 is the RTC chip itself; Y3 is the RTC's crystal.

V 2.0



BitBoy V2.0

Acknowledgments

Alexander Bahr, designer of BitBoy

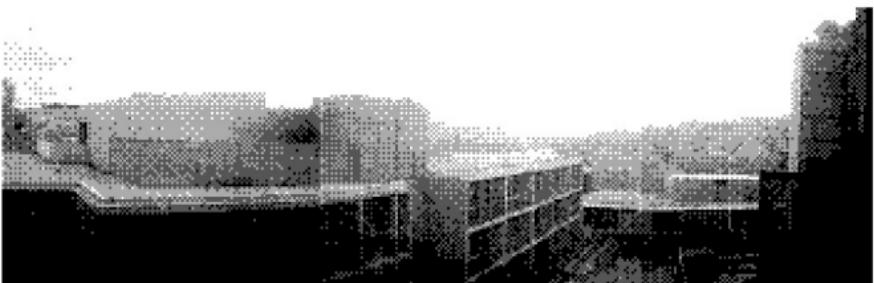
Constantin Gillies, author of *Endboss: Extraleben Teil 3* (2012)

Daniel Akselrad & Erik Goyenechea, GameBoyPhoto

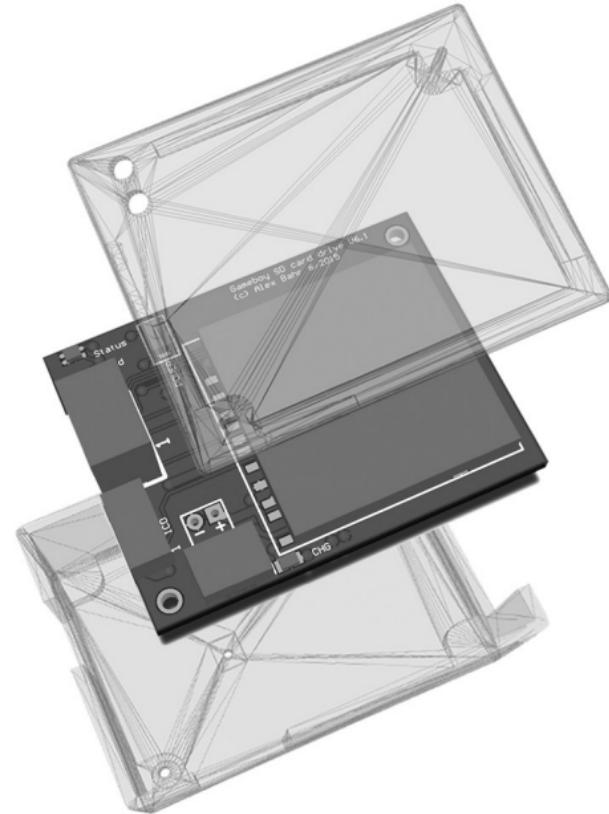
Doctor Popular, game designer and super nerd

Jeremy Parish, games journalist with USGamer

Oliver Wittchow, creator of Nanoloop



BITBOY



Designed by Alex Bahr
in collaboration with
GameBoyPhoto

Development Brief

BitBoy is not a Nintendo product.