



# Anki Drive Teardown

Teardown of the Anki Drive starter Kit, October 23, 2013.

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## INTRODUCTION

We've been itching to get our hands on the Anki Drive system since it was first unveiled at Apple's WWDC. Now that it's finally rolled in, it feels like Christmas morning at iFixit, with itty bitty plastic cars zipping overland and underfoot. But as much as we'd like to keep reenacting our favorite scenes from *The Fast and the Furious* films, it's time to find out what lies under those tiny robotic hoods.

Looking for the inside track on iFixit? Enjoy our drive-thru [Instagram](#), park it on our [Facebook](#) page, or race on over to our [Twitter](#) feed.



### TOOLS:

- [Phillips #0 Screwdriver](#) (1)
  - [Phillips #00 Screwdriver](#) (1)
  - [Soldering Workstation](#) (1)
  - [Tweezers](#) (1)
  - [Spudger](#) (1)
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## Step 1 — Anki Drive Teardown



- Anki is a tech startup aiming to bring artificial intelligence and adaptability to objects in the physical world. Their first offering to the masses: Anki Drive.
- The starter kit we laid hands on contains the following:
  - Two Intelligent Cars
  - Two Charging Cases
  - Fast Charger
  - 3.5' x 8.5' Race Mat
  - Tire Cleaning Pad
- ① We had to dig into the Tips menu of the accompanying iOS app, but we finally discovered our gooey stamp pad is for cleaning tires. It removes dust from the wheels, improving handling *and* teardown photos.

## Step 2



- There was no way we were going to proceed to the teardown without trying the Anki Drive first.
- So guess what we did.

## Step 3



- With no special hardware in the track, and only a rudimentary image sensor and microcontroller in the car, just how does Anki Drive work?
- Looking closely at the track, we found its surface is covered in tiny ridges of varied patterns.
  - With unique patterns along the track, the Anki car can read a single mark and know exactly where it is—then read a second and know where it's going, and at what speed.
- ⓘ As excited as we are for a car that can [drive by Braille](#), we worry that new dents (caused by an ill-placed foot or overexcited dog) might confuse the racers' sensors.



## Step 4



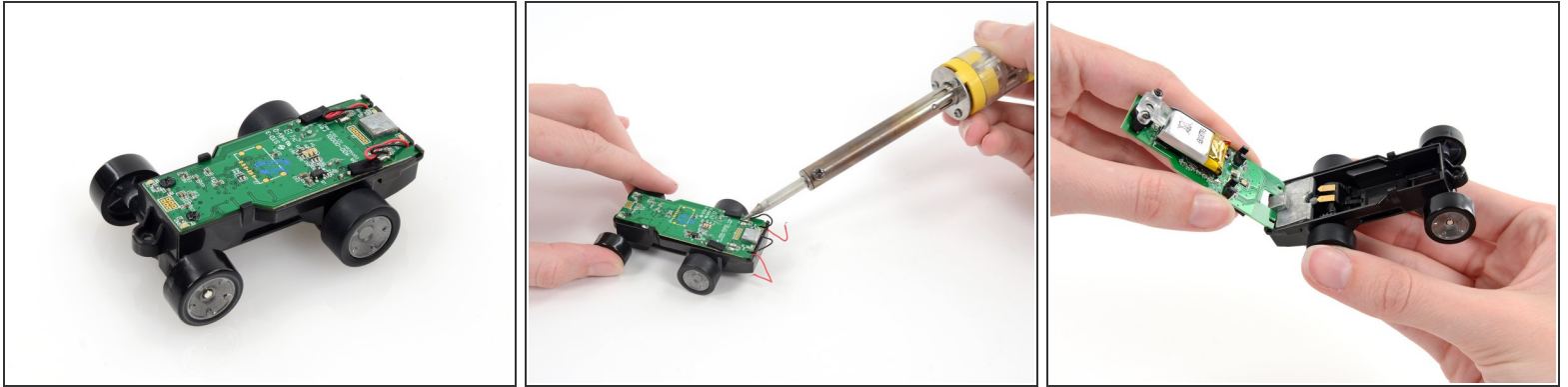
- The Anki Drive starter kit includes two cars equipped with optical sensors, wireless chips, and motors.
- Not a lot of processing happens in the Anki car itself—a base station iPhone or iPad running the Anki app interprets data, plans out the car's strategy, and sends control information back.
- The cars come with heavy-duty plastic cases that double as charging cradles, connecting via micro-USB to the Fast Charger.
- ⓘ According to Anki, a full charge takes 8 to 10 minutes and provides 20 minutes of high-speed action.

## Step 5



- A single Phillips #0 screw secures the body to the chassis.
- That means no adhesive, no security screws, and no complications of any kind to hinder chassis replacement.
- ① We'll consider that an invitation to [soup](#) this bad boy up.

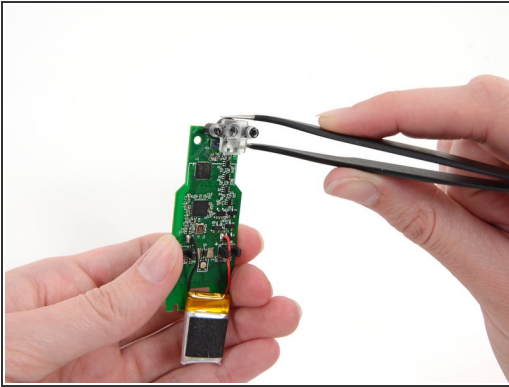
## Step 6



- With all of the fancy processing tasks offloaded to your iDevice, the Anki car needs very little to survive in the wild.
- After desoldering the dual motors' leads, the motherboard lifts easily out of the chassis, bringing all of the sensory, communication, and control circuitry out with it.
- It even hosts two gear guides to keep the drive gears aligned to their motors, making this motherboard a true multitasker.

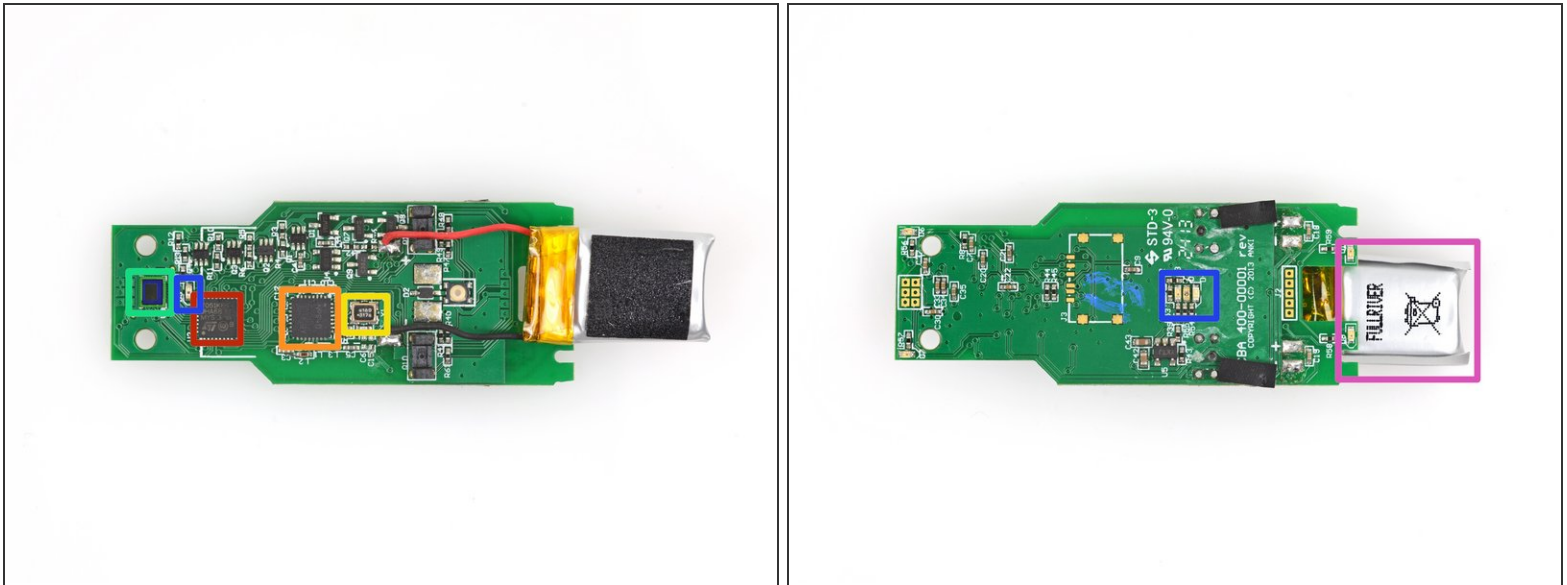


## Step 7



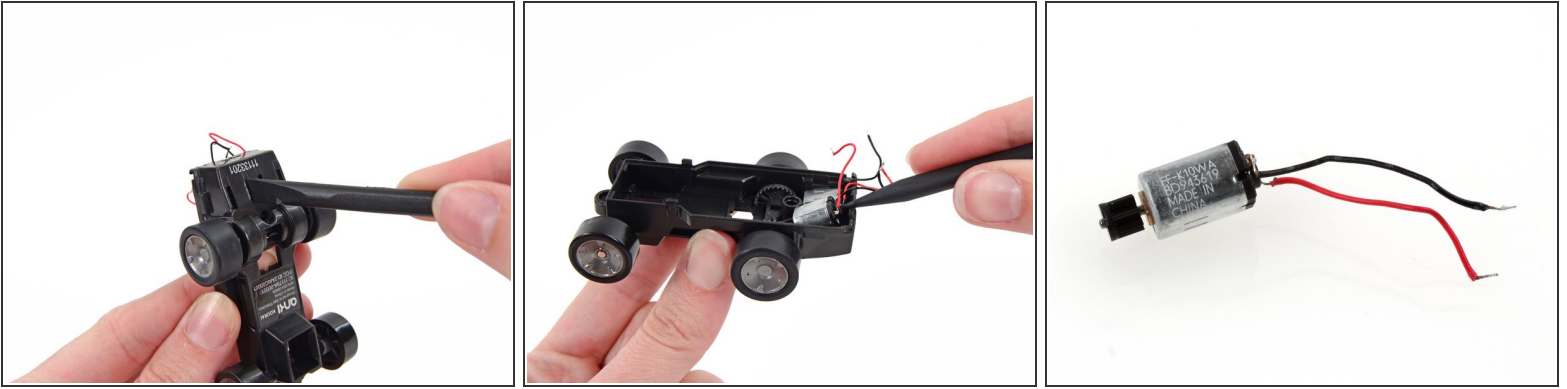
- This little guy reads its position hundreds of times per second; we must figure out how!
- The likely suspect seems to be hiding behind a light guide/lens assembly. We brought it in for questioning.
  - The lens/guide unit is anchored by two plastic fasteners. They may be lightweight, but the removal process limits their future fastening ability.
- The infrared light from an LED is channeled through the light guide to illuminate the track, allowing the imaging sensor to read the patterns as they whiz by the lens—a lot like an optical mouse.

## Step 8



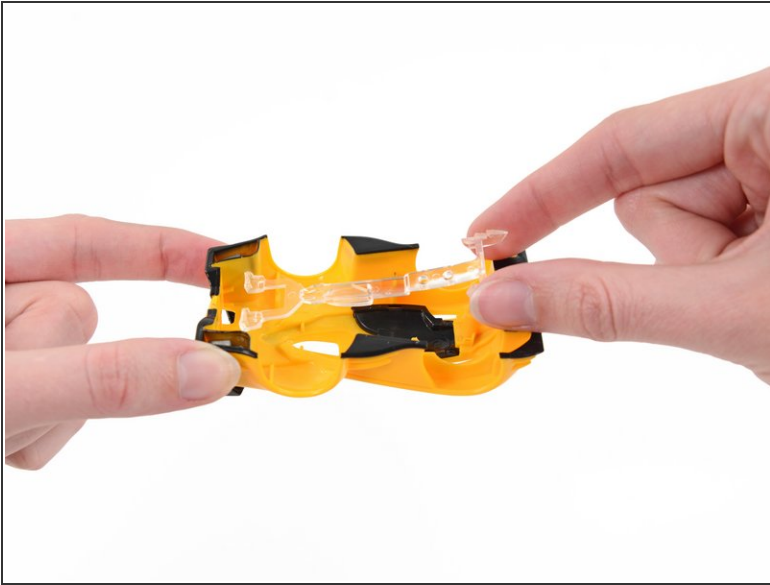
- The front side of the motherboard:
  - STMicroelectronics [F051K86](#) Entry-level ARM Cortex-M0 MCU with 64 Kbytes Flash, 48 MHz CPU, Motor Control and CEC Functions
  - Nordic Semiconductor [NRF8001](#) Single-Chip Bluetooth Low Energy Connectivity IC
  - e160 317a
- There are a few additional components on the board:
  - Imaging sensor
  - Four LEDs: one on the front side and a row of three on the back side
  - Fullriver 3.7 V lithium battery

## Step 9



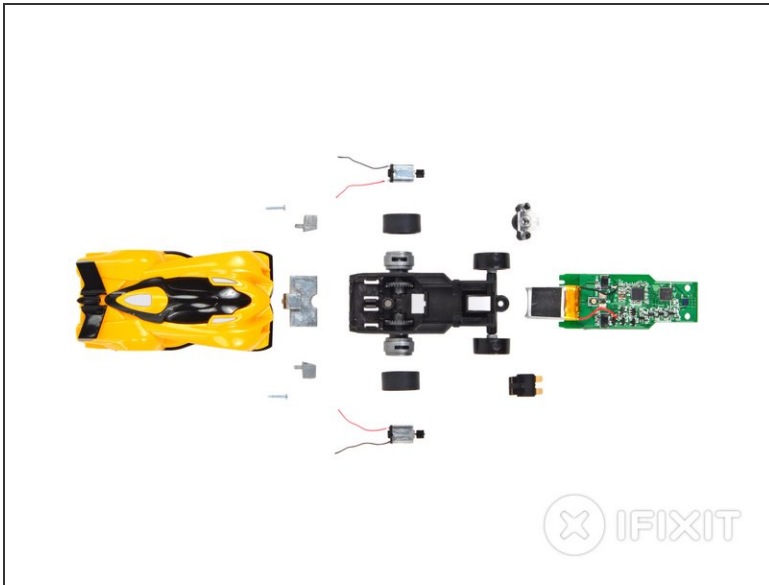
- With the help of a spudger, we remove the motors from this zippy little guy, leaving him ... [unzipped](#).
- Twin motors help the rear wheels do double duty, providing both propulsion and some surprisingly snappy steering.
  - With its motors hanging way out back of the rear axle, this little Ankimobile definitely hails from the controversial [Porsche 911 school of car design](#).
- The front wheels' only job is to [not fall off](#). (It's always the little things.)

## Step 10

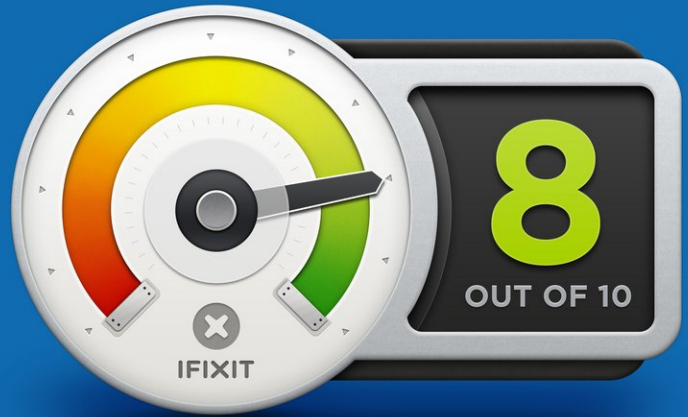


- There isn't much inside the Anki Drive, so we make sure to pull out every little component.
- To be thorough, we remove the light guide and 7.1 grams of various weights, used to keep the cars from flying off the track.
- ❗ Here's hoping future editions allow the cars to be thrown from the track when shot with the pulse carbine ... resulting in fiery explosions!
- Sadly, we suspect exploding toy cars [might not pass CPSC muster](#).

## Step 11



## REPAIRABILITY SCORE:



- Anki Drive Repairability Score: **8 out of 10** (10 is easiest to repair)
- The device contains only three screws, all non-proprietary. Removing a single screw frees the chassis.
- There's no adhesive to obstruct repairs. In fact, the only adhesive to be found is a light foam tape that helps secure the battery.
- The battery and motors are soldered to the motherboard, requiring specialized repair knowledge.
- The track is hefty but easy to dent. While unconfirmed, this may lead to future usability issues.
- The wheels and drive gears appear to be glued and/or riveted in and non-replaceable.

To reassemble your device, follow these instructions in reverse order.