Samsung Galaxy Watch Teardown

Teardown of the Samsung Galaxy Watch in February 2019.

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INTRODUCTION

In the age of Galaxy smartphones and Galaxy tablets, Samsung adds a Galaxy Watch to its mobile Universe. There was already some gear floating in space, forming a belt around the Samsung sun, but a few months ago, this new celestial body has emerged. Today we'll go where no tinkerer has gone before, and probe the depths of this timepiece with a teardown. Everyone, ahead full, sensors ready—and set weapons to Dismantle.

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TOOLS:

- Tri-point Y00 Screwdriver (1)
- iFixit Opening Tools (1)
- Halberd Spudger (1)
- Tweezers (1)
- Heat Gun (1)
- iFixit Opening Picks set of 6 (1)
- Flat Needle Nose Pliers (1)

Step 1 — Samsung Galaxy Watch Teardown

- Our initial telemetry of the Galaxy Watch brings up:
  - 1.3” (33 mm) circular Super AMOLED with 360 × 360 display (1.2" / 30 mm on the smaller 42 mm version)
  - Dual-core, 1.15 GHz Exynos 9110 processor
  - 1.5 GB RAM + 4 GB internal memory (768 MB RAM for the Bluetooth version)
  - Wireless charging and 5 ATM water resistance with IP68 rating
  - 472 mAh battery (270 mAh for the 42 mm version)

Step 2

- A quick orbital survey reveals twin mechanical buttons on one side of the watch, with a small ~~worm~~hole for the microphone.
- On the far side, we spot three more holes for the loudspeaker. There's also a heart rate sensor cluster at the bottom.
- There seems to be an additional small opening on the rear face, possibly for a proximity sensor or pressure valve.

Step 3



- This Galaxy's official designation is SM-R805F.
- The standardized 22 mm arms of this galaxy are rather easy to detach from the center …
- … and reveal access to a five-pin port at the lower end of the centerpiece.

ⓘ Is that a USB+1 for emergency wired charging and service?

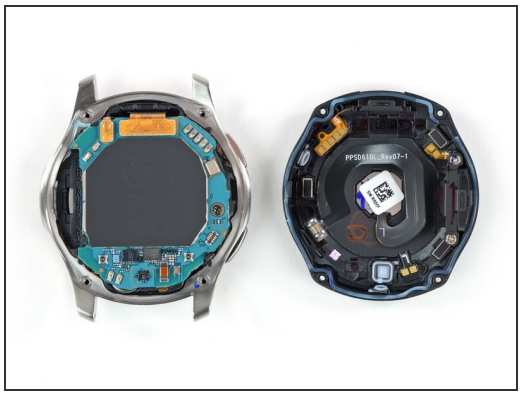
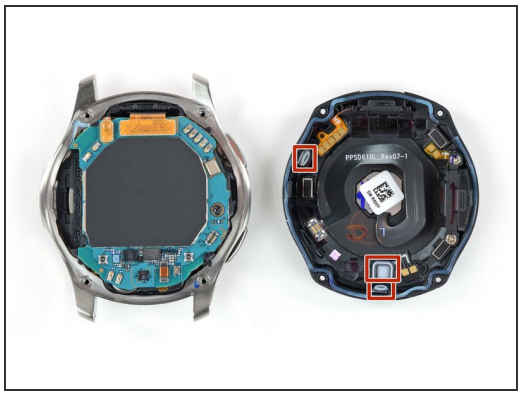
Step 4



- Equipped with our aluminum Precision Bit Driver with swivel cap, we tackle the vortex-shaped tri-point screws.
- These screws seem to be attracted by three magnetic fields that handle docking to the wireless charging stand.
- But we are not distracted by that common fundamental interaction and crack open the watch core with a little *stronger force*.

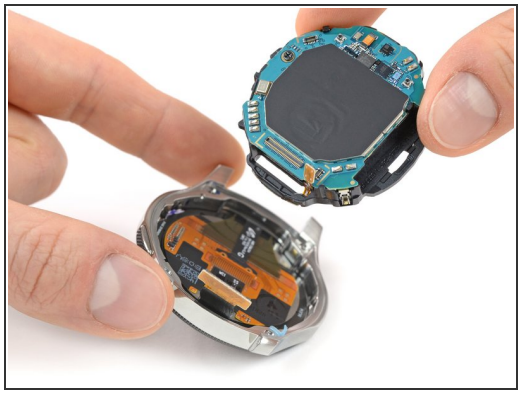
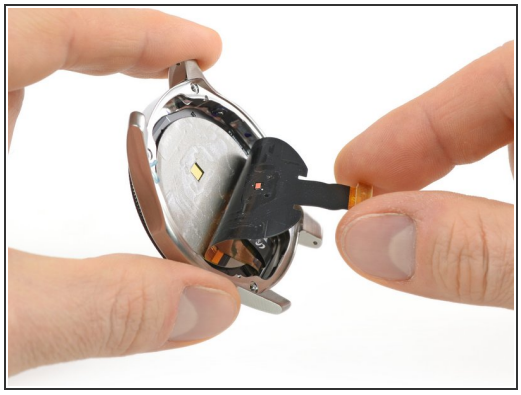
The Galaxy Watch is rated IP68 and therefore offers some resistance—but we know this is futile.

Step 5

- Expecting a booby trap, we're surprised by the generously long ribbon cable connecting the heart rate sensor back to the internals.
- The blue rubber seal around the Galaxy's edge might need replacing before reassembly if damaged, but there's no glue so far—we like that.
  - Speaking of sealing: We also spot rubber gaskets for the microphone, ambient light sensor, and pressure sensor.

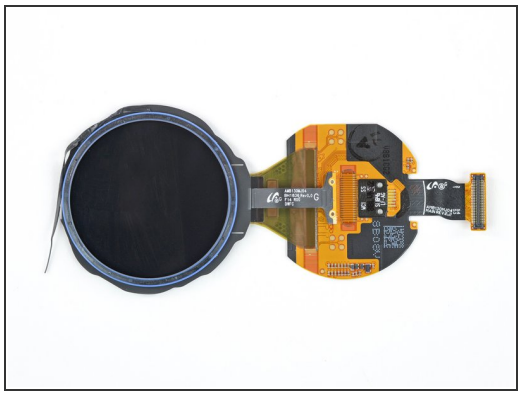
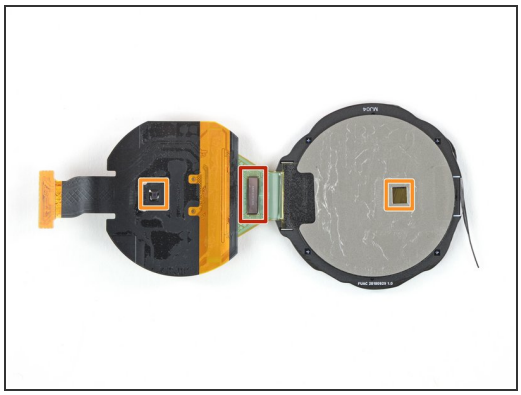
Step 6


- After disconnecting the display, this nucleus separates nicely into a few smaller elements. Encouragingly, there is still no sign of that fifth fundamental force: glue.
- The display's flex ~~cable~~ carpet carries the ambient light sensor, which peeps through a small hole in the display to gaze at the outside world.

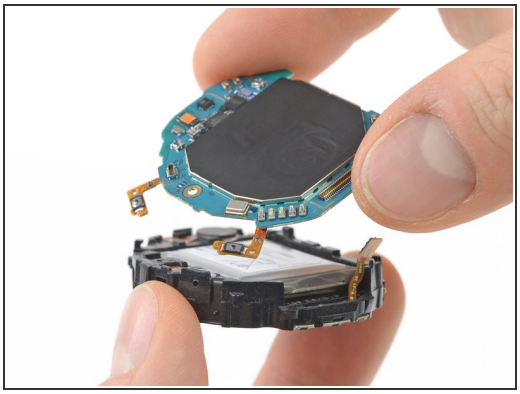
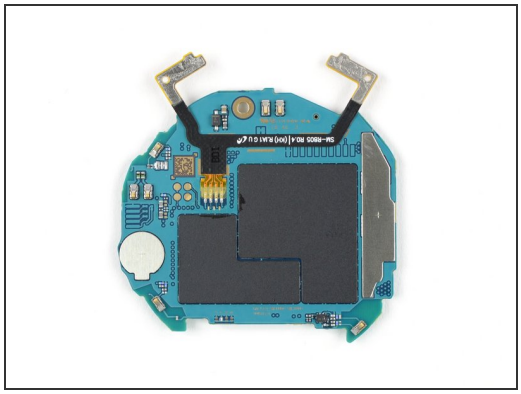
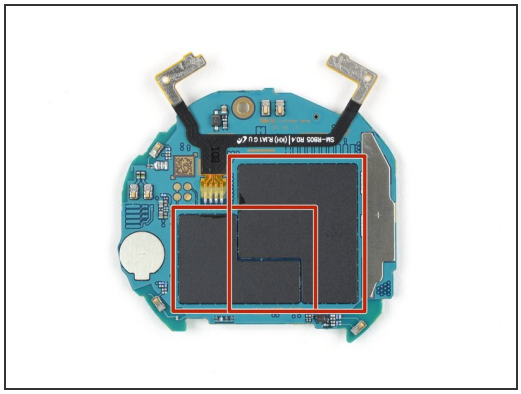
⚠ Ripping the cable carpet away like we did will most likely damage the display. If you plan on exploring your own Galaxy, be warned, and keep an eye out for our official guides.

Step 7

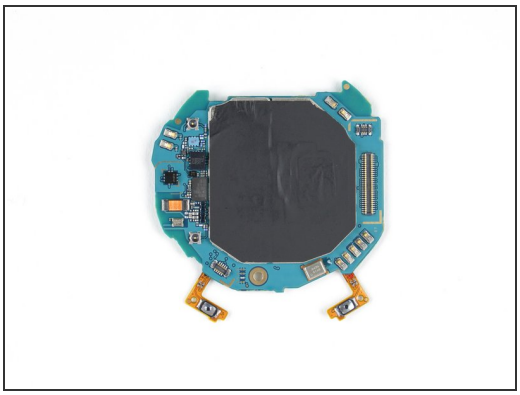
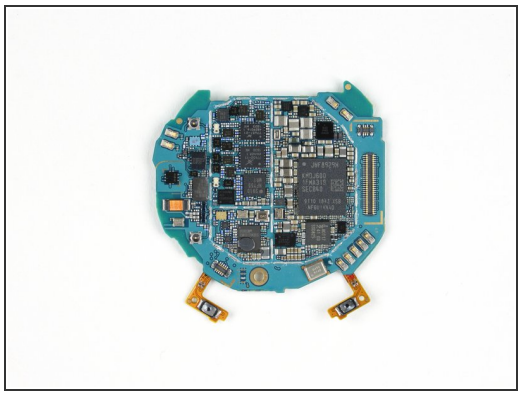
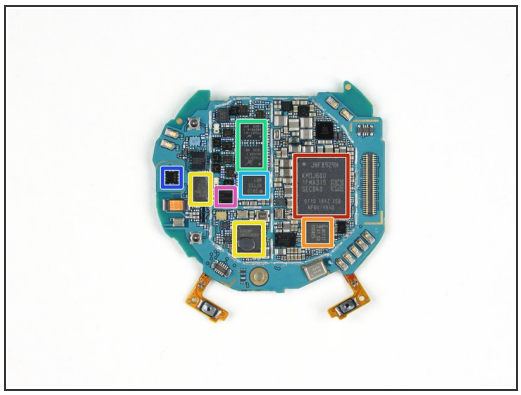
- Although the display is circular, it is not spherical—which seems to support the controversial "flat display theory." With foldable displays coming in the near future though, this theory may soon be disproved for good.
- The Super AMOLED display on our 46 mm version has a diameter of 1.3" (33 mm). The vertical and horizontal max resolution is 360 pixels.
  - We spot a chip with the markings S88YA1YF1X01 (most likely Samsung's AMOLED driver)
  - ... and the ambient light sensor with its peep hole.

Step 8

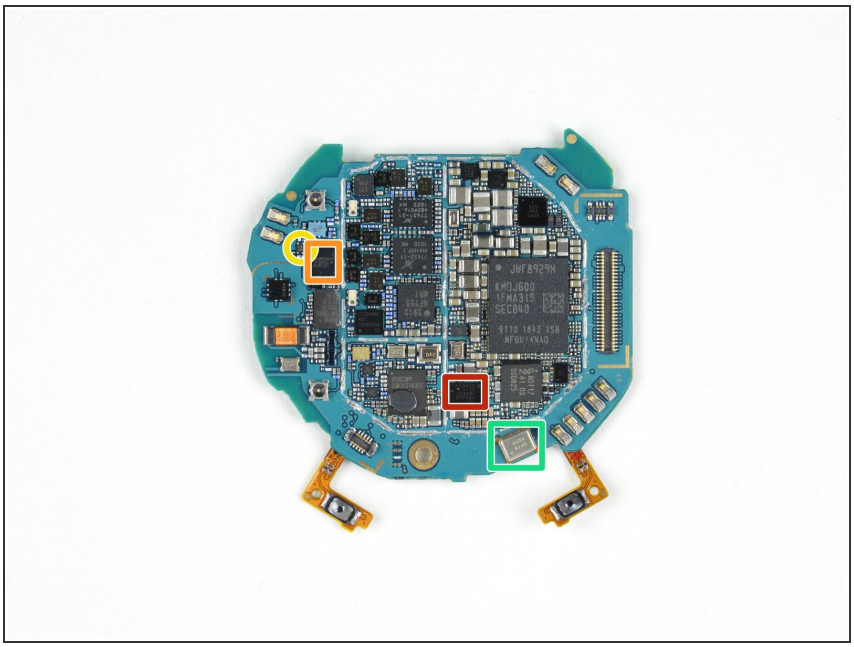
- The ~~gravitational~~ computational center of the galaxy looks like a little flat bug's head, with its two button cables as antennae.
- There's not much else to show on this side, save for two flat monolith-ish blocks of resin—similar to the one in the Apple Watch Series 4.

Step 9

- The other side though has a bit more to offer:
  - Samsung Exynos 9110 SoC (dual-core, 1.15 GHz)
  - NXP Semiconductor PN80T NFC controller w/ secure element
  - Broadcom BCM430131 WiFi/BT chip and BCM47758 GPS/GLONASS w/ sensor hub chip
  - Skyworks SKY77651-21 and SKY77652-11 multimode/multiband power amplifier modules for 3G/LTE
  - Samsung Shannon 910 envelope tracker (likely)
  - STMicroelectronics LPS22HH barometric pressure sensor
  - ST Micro ST33G1M2 32-bit ARM® SecurCore® SC300 (secure element)

Step 10



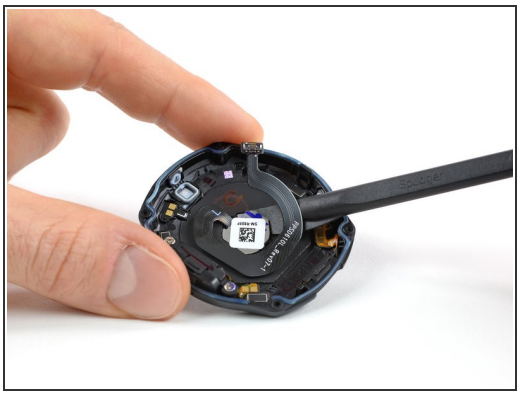
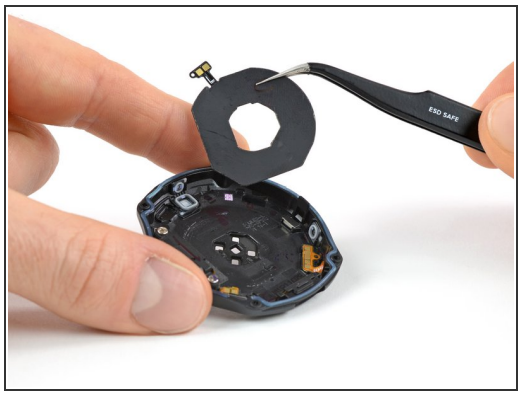
- ... and even more ID:
  - Renesas (Formerly IDT) P9222S wireless power receiver
  - STMicroelectronics LSM6DS3 3-axis accelerometer/gyroscope (likely)
  - NXP Semiconductor BGU8309 GPS/GLONASS/Galileo/COMPASS low noise amplifier
  - Goertek MEMS microphone

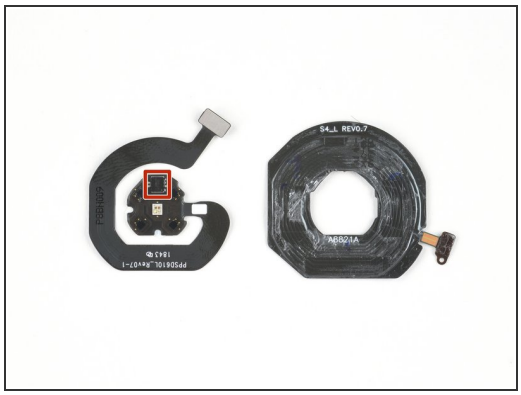
Step 11

- Structural integrity is provided by a midframe, which also houses the power source that makes this galaxy spin.
- With the push of a finger, we can pop out the 3.85 V battery with its 472 mAh offering 1.81 Wh.

ⓘ That means this Galaxy surpasses the 1.47 Wh of the Gear S3 (380 mAh @ 3.85 V) and the 1.113 Wh of the Apple Watch Series 4 (291.8 mAh @ 3.81 V).

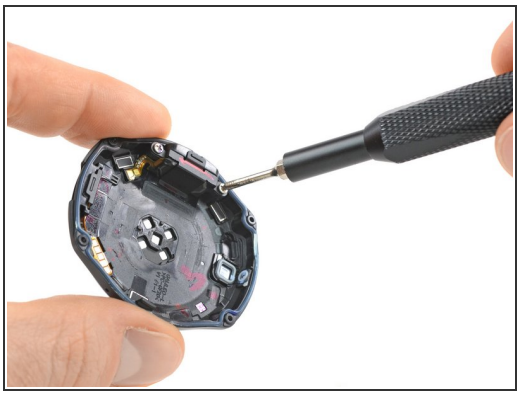
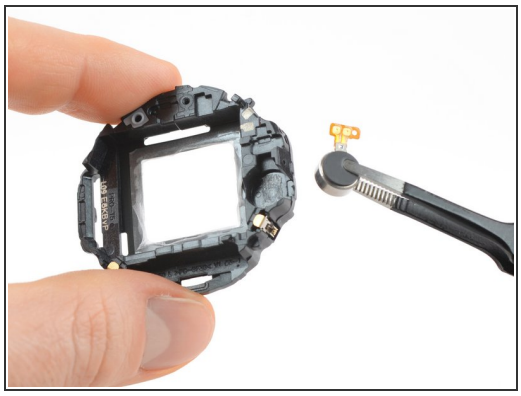
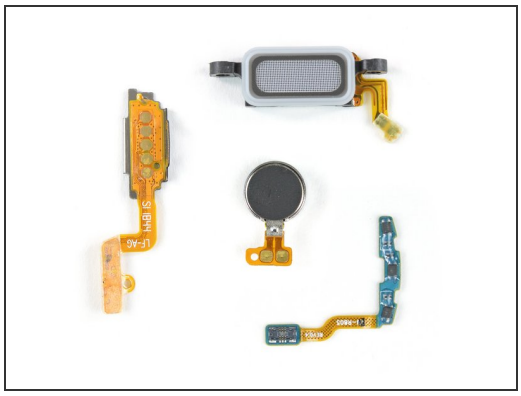
Step 12



- We return to the back cover in search of satellite components. Equipped with a halberd spudger, we probe the heart rate sensor and the wireless charging coil.
- The four photo cells of the heart rate sensor are gathered around the light source in the middle.
  - On board is a single Texas Instruments SN1712025 ultra-small, integrated AFE (analog front end) heart rate sensor chip

Step 13

- The last parts to come out of the back cover are the service port and the loudspeaker, held fast by two Phillips screws, with a rubber gasket for ingress protection.
- From the midframe, we extract an ordinary vibration motor and a hall sensor array, which we set aside to investigate later with the rotating bezel.

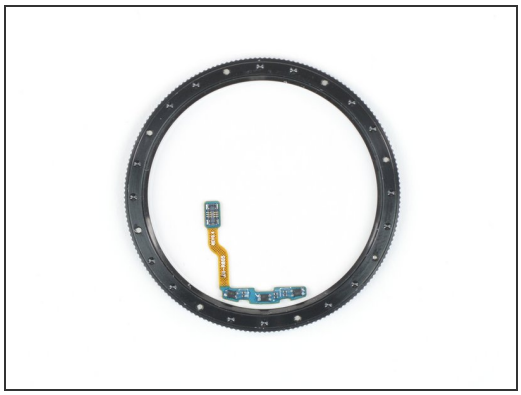
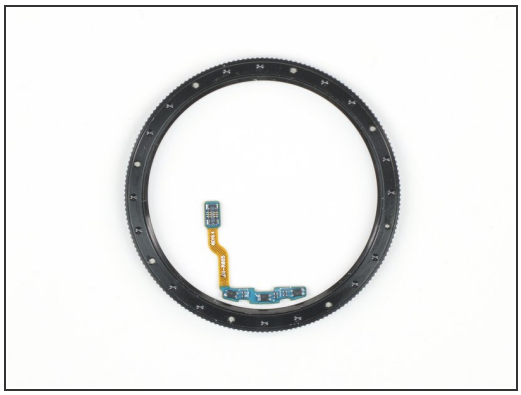
Step 14



- This galaxy has its own outer ring, and we are eager to lift it free. An opening pick helps us push the ring out of its orbit.
- What comes to light is a separate plastic ring and four metal ball bearings.

Each of the bearings sits on a spring recessed in the aluminum casing, generating a snappy lock when the bezel is turned and the bearing constellation aligns with the grooves in the bezel.

Step 15

- To read the turning of the bezel, the Galaxy Watch uses a different approach than the optical encoder of the Apple Watch.
  - There are three hall sensors (Seiko Instruments) on the small PCB, at the same distance from each other as the grooves on the bezel.
  - And every third groove has a small magnet inside.
  - When the bezel is turned, two of the three sensors read a change in their magnetic field (either on/off or off/on). The third sensor does not read a change. With this method, it can be clearly determined in which direction the bezel is rotated.

Step 16



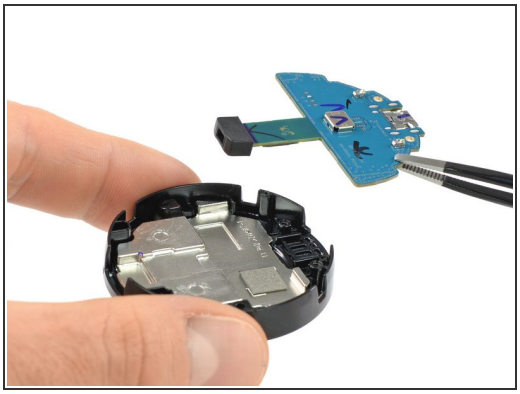
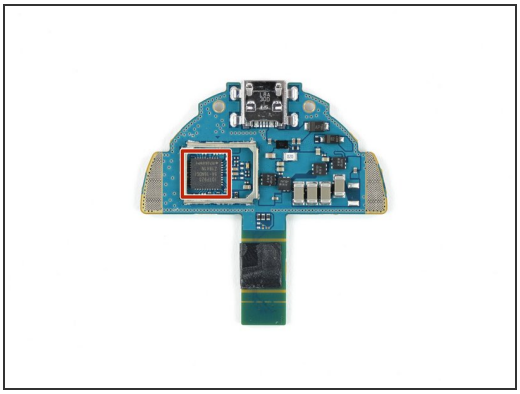
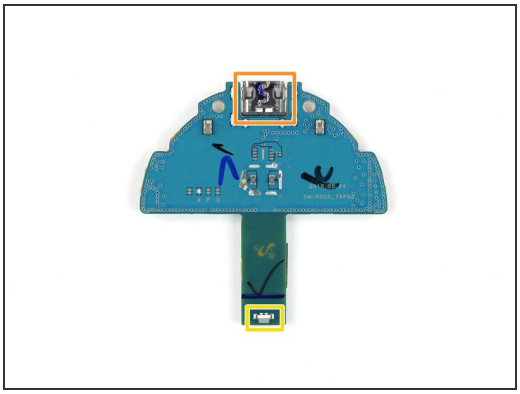
- What happens when this man-made galaxy stops spinning? It gets recharged of course.
- And its charger shall not remain a mystery. Again we grab our precision bit driver, and go for a spin ourselves.

Step 17



- This one won't give away its secrets that easily, so we have to bring out our thermally-enhanced particle accelerator (also known as an ordinary heat gun).
- Eventually we succeed with strong (hand) force and the use of a pair of flat needle nose pliers ...
- ... which lays bare the charging coil with its ~14 windings (front and back).

Step 18

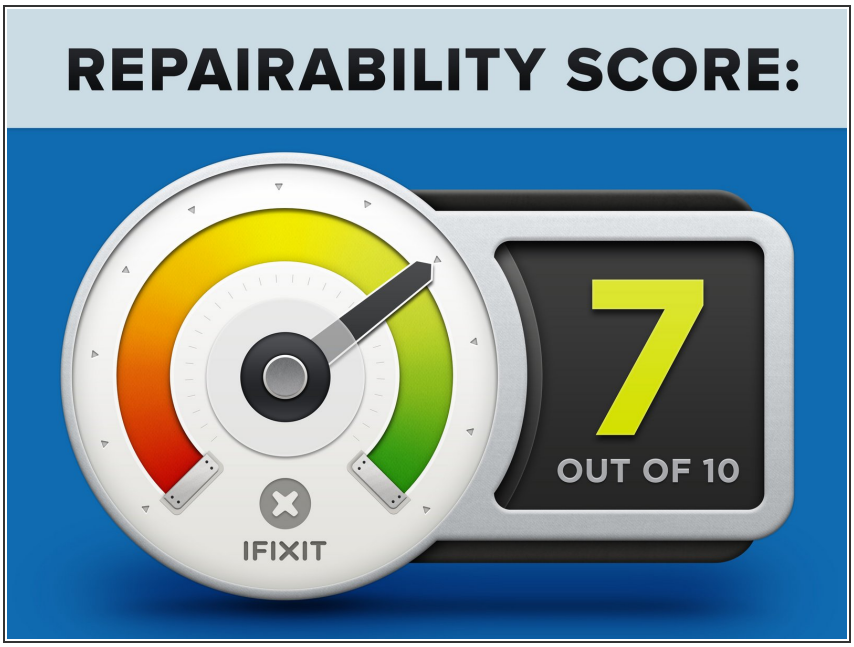
- A small ~~warship~~ PCB lifts off from the charger, and it's carrying some new silicon:
  - Renesas (Formerly IDT) P9235A-16NDGI wireless power transmitter with a 32 bit ARM® Cortex®-M0 processor
  - Micro USB for power supply
  - Not four, not five, but *one* LED light on the tail.

This charger's layout could be similar to the Gear S3 charging dock, which provides 700 mA of output current at 5 V.

Step 19

- All the pieces of this Galaxy are now spread across the ~~sky~~ table.
- Our galactic journey ends here. The space-time continuum remains stable and we filled our explorational void with a little knowledge and insight.
- So stay tuned for future teardowns, and remain curious.

Step 20 — Final Thoughts



- The Samsung Galaxy Watch earns a **7 out of 10** on our repairability scale (10 is the easiest to repair):
  - Display repair is prioritized.
  - No overlapping design of cables, no fragile ZIF connectors.
  - Despite the water-resistant construction, the opening procedure is straightforward and glueless (though it requires an uncommon tri-point driver).
  - The battery only uses mild adhesive, but the motherboard must be removed for access.
  - A lot of components are modular and can be replaced separately—except for the frequently-used twin button cables, which are soldered to the motherboard.
  - The glass digitizer and screen are fused together—meaning a full replacement will be quick and easy, but glass-only repairs will be impractical.