SYNACKTIV

# Fixing Nintendo Switch for Fun and Profit?

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# Whoami?

SYNACKTIV

- Baptiste MOINE (**@Creased_**)
- **Security researcher** at Synacktiv (VR/RE)
- Company specialized in offensive security: **penetration testing**, **reverse engineering**, software development, trainings, etc.
- Around **180 experts** over 6 offices in France (Lille, Paris, Rennes, Toulouse Lyon and Bordeaux)
- **We are recruiting!**

# How It All Started

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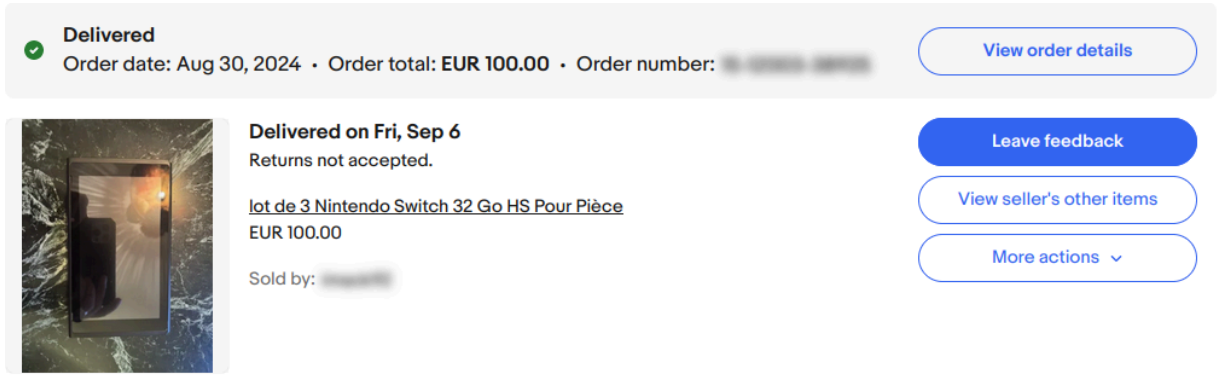
- An eBay listing for three non-functional Nintendo Switch consoles
- No history of any potential repairs
- No explanation provided for the bulk sale



# How It All Started

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- Repair of my Dell XPS
- Investment in equipment for micro-soldering
- Potential resale value (~€50 for non-functional / ~€90 in good condition)
- **Technical challenge and training**

# Disclaimer

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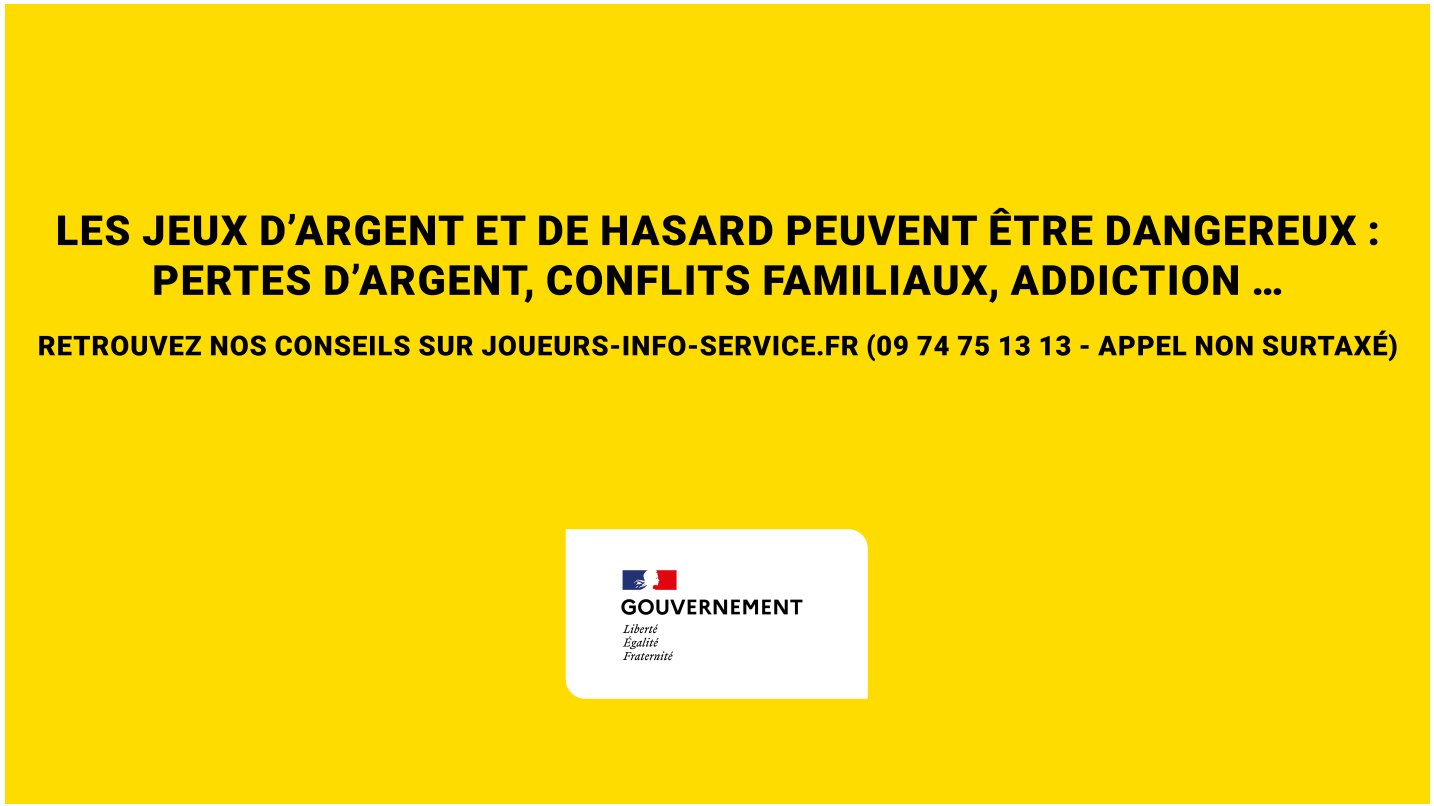


This is not a tutorial.

# Tools - Disassembly

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- **Anti-static Spudger:** iFixit Spudger (~€8 for a set)
- **Tweezers:** Mechanic Aax-17 (~€5)
- **Screwdriver Set:** iFixit Mako (~€40)
- **Reusable Adhesive Putty:** Blu Tack (~€5)

- **Total: ~60€**

# Tools - Cleaning

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- **Cotton Buds:** ~€1 for 160
- **Toothbrush:** ~€2 for 4
- **Isopropyl Alcohol:** MG Chemicals 824 (~€7)
- **Contact Cleaner:** WD-40 (~€9)
- **Microfiber Cloths:** ~€5 for 8

- **Total: ~€24**

# Tools - Diagnostic

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- **Digital Multimeter:** AstroAI TRMS 4000 (~€25)
- **Precision Probes:** Proster Kit (~€25)
- **USB-C Load Tester:** Keweisi 2301C (~€5)
- **Official Transformer:** HAC-002-EUR (~€10)

- **Total: ~€65**

# Tools - Soldering

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- **Soldering Iron:** Pinecil v2 (~€25)
- **Hot Air Station:** YIHUA 8786D (~€60)
- **Low-Temperature Solder (⚠️):** TY-V866 0.6mm (~€2)
- **Flux (⚠️):** RMA-223 (~€2)
- **Brass Sponge:** Weller (~€10)
- **Desoldering Braid:** Mechanic R350 (~€2)
- **Desoldering Pump:** ~€2
- **Thermal Pad:** Arctic TP-2 (~€6)
- **Kapton Tape:** ~€2

- **Total: ~€111**

# Expenses

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- **Tools:** €260 (minimum)
- **Consoles:** €100 for three
- **Spare Parts:** ???

# SW01 - Initial Observation

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- **Overall Condition:** Very good
- **Power Issue:** Does not power on
- **USB-C Port:** Damaged

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# SW01 - Visual Inspection

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- No signs of previous disassembly
- Original Battery
- Original USB-C Port
- **Dry Thermal Paste**
- No signs of water damage
- **Before proceeding further: disconnect the battery!**

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# SW01 - Repair Attempt

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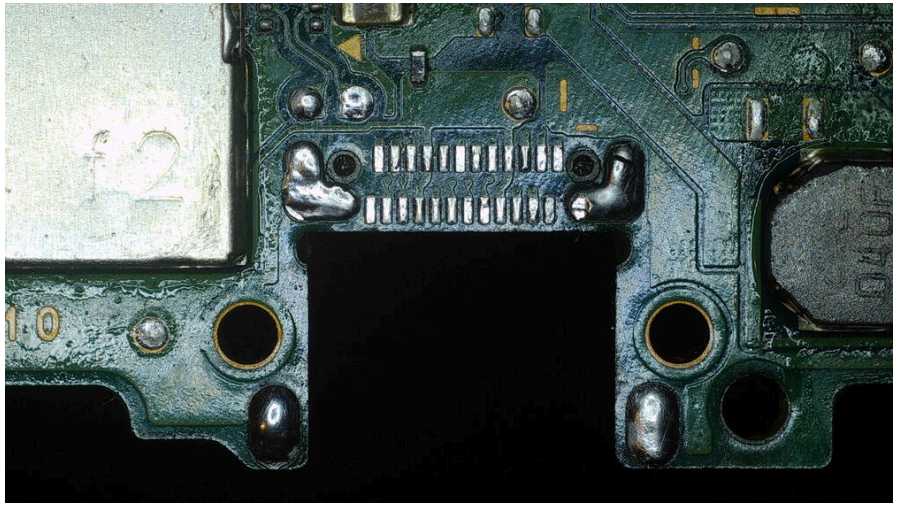
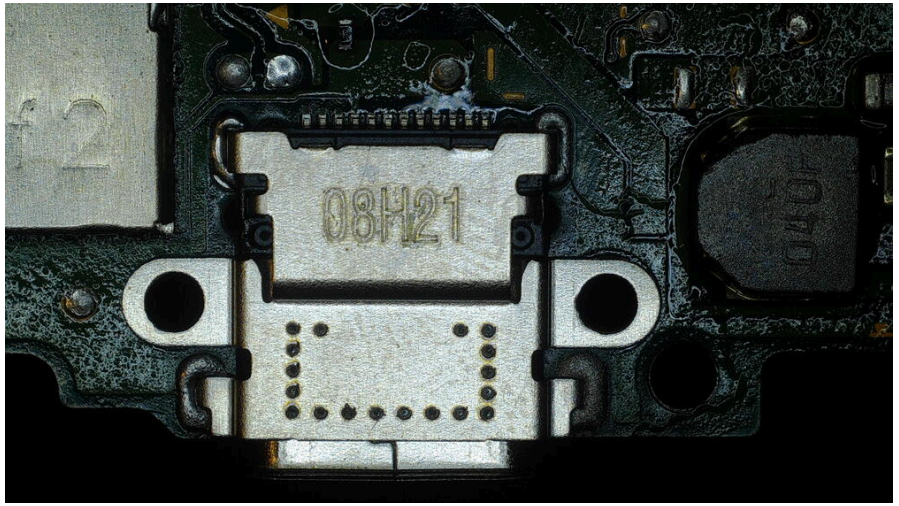
- Replacement of USB-C Port: (~€2)
- Use of Low-Temperature Solder (⚠️)
- Hot Air Station at 400°C with 50% Airflow



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# SW01 - Test

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- Reassembly with new thermal paste
- Booted after 10 minutes of battery charging
- Fast Charging: OK
- Speakers: OK
- Wi-Fi: OK
- Bluetooth: OK
- Joy-Cons: OK
- **Touchscreen: NOK**
- **Game Reader: NOK**
- **HDMI: NOK**

# Main Components - Motherboard

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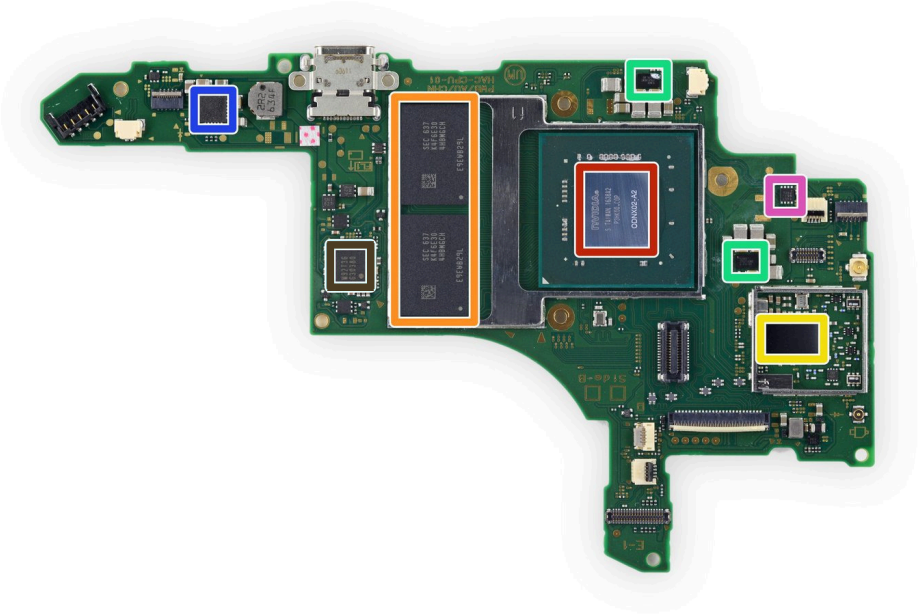
- 🟥 **NVIDIA ODNX02-A2** NVIDIA Tegra X1 SoC with Maxwell GPU
- 🟧 **Samsung K4F6E304HB-MGCH** 2 GB LPDDR4 DRAM (4GB total with two chips)
- 🟨 **Broadcom BCM4356** Wi-Fi 802.11ac + Bluetooth 4.1 combo chip
- 🟩 **Maxim Integrated MAX77621AEWI+T** Triple-phase buck regulator (x2)
- 🟫 **M92T36 630380** Power delivery management IC
- 🟦 **Texas Instruments BQ24193** Single-cell battery charger
- 🟪 **Texas Instruments TMP451** Remote/local temperature sensor



# Main Components - Motherboard

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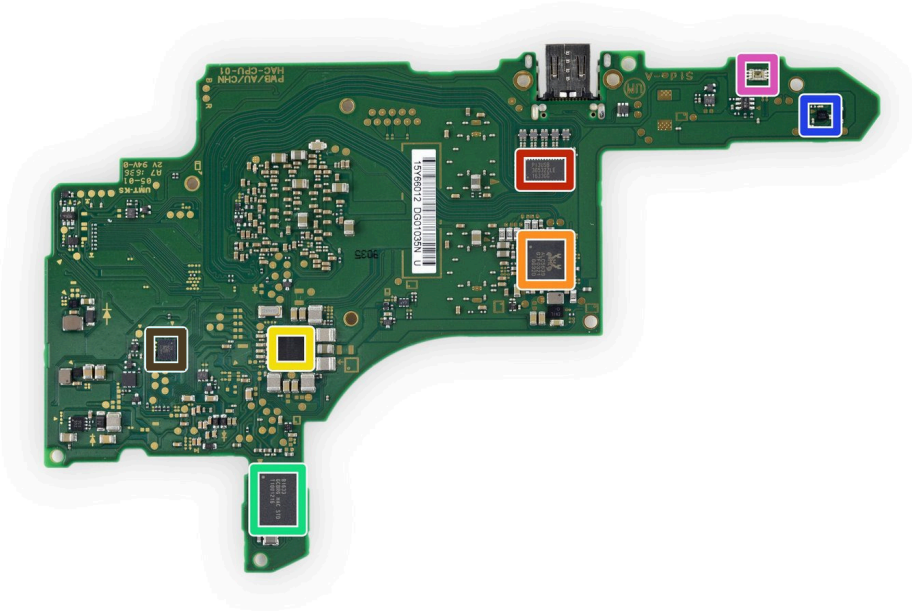
- 🟥 **Pericom Semiconductor PI3USB30532** USB 3.2 Gen1/DP1.2 Crossbar Switch for Type-C
- 🟧 **Realtek ALC5639** Audio Codec
- 🟨 **Maxim Integrated MAX77620AEWJ+T** Power management IC
- 🟩 **B1633 GCBRG HAC STD T1001216** Nintendo application-specific integrated circuit
- 🟫 **STMicroelectronics LSM6DS3H3** 6-axis inertial measurement unit
- 🟦 **Maxim Integrated MAX17050** Battery fuel gauge
- 🟪 **Rohm BH1603FVC** Ambient light sensor



# Main Components - Game Card Reader

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- 🟥 **STMicroelectronics FingerTip FT9CJ** Multi-Touch Screen Controller with Ultra-Low Power
- 🟧 Touch Screen Digitizer FPC connector
- 🟨 3.5mm Jack Female Audio Connector
- 🟩 Game Card Slot
- 🟫 Motherboard FPC connector

# SW01 - Troubleshooting

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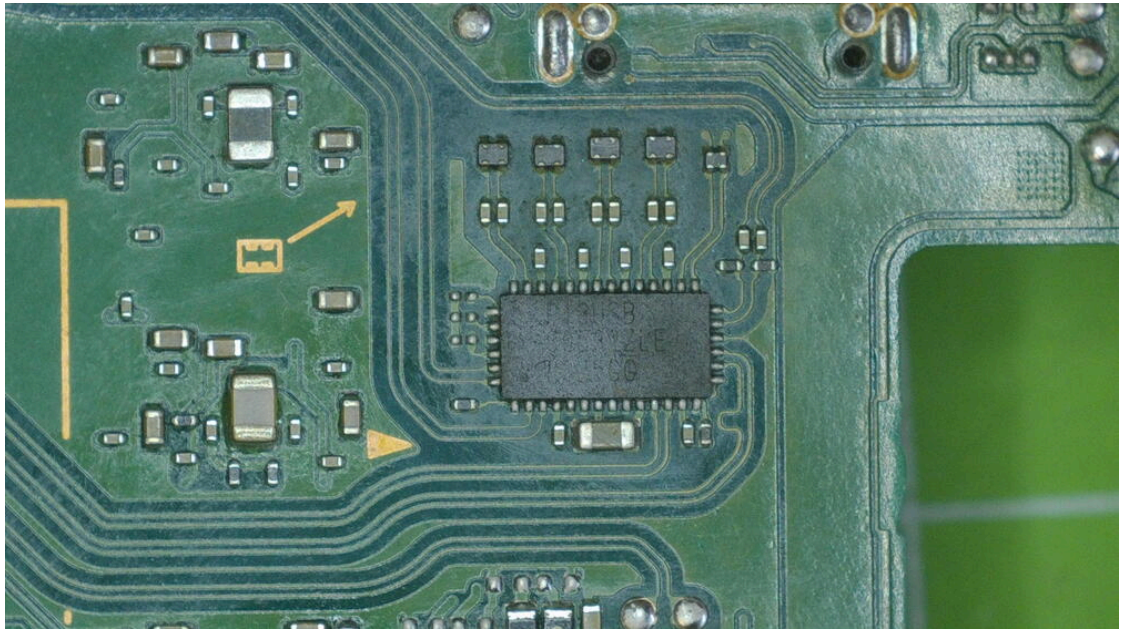
- Checking for a potential short circuit:
  - Continuity test to ground
  - Ohmmeter to rule out false positives
- Continuity test on the filters:
  - Straight-line continuity: OK
  - Diagonal continuity: NOK
- **Filter on the right replaced (~€7 for 10)**



# SW01 - Troubleshooting

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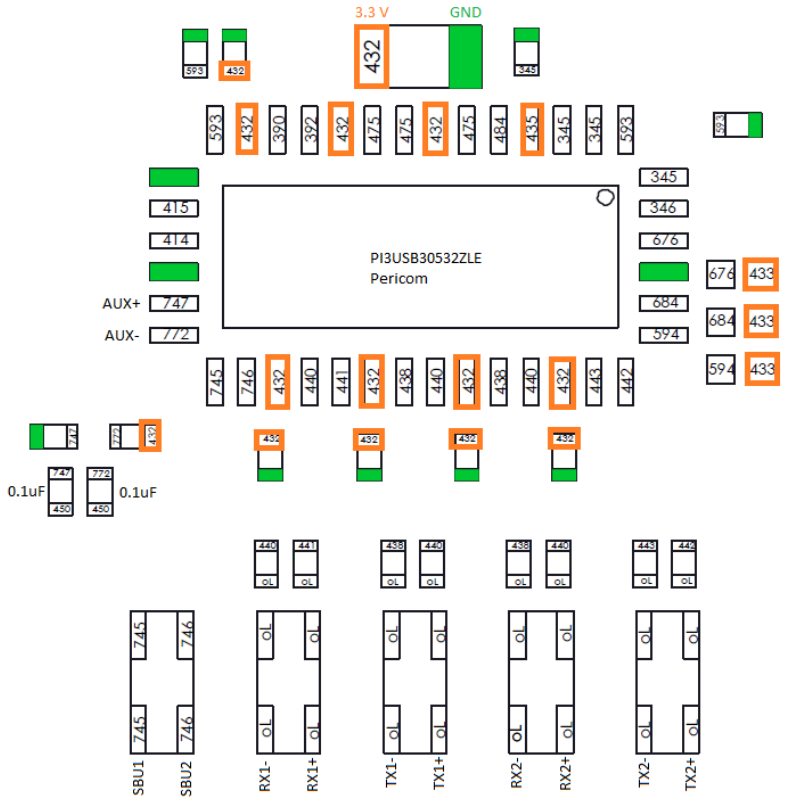
- Diode mode check:
  - Is current flowing in only one direction?
  - Voltage reading: voltage drop across the component
  - OL: open line, no conduction
  - 0V: potential short circuit
- No short circuit
- Diode mode test: OK



# SW01 - Test

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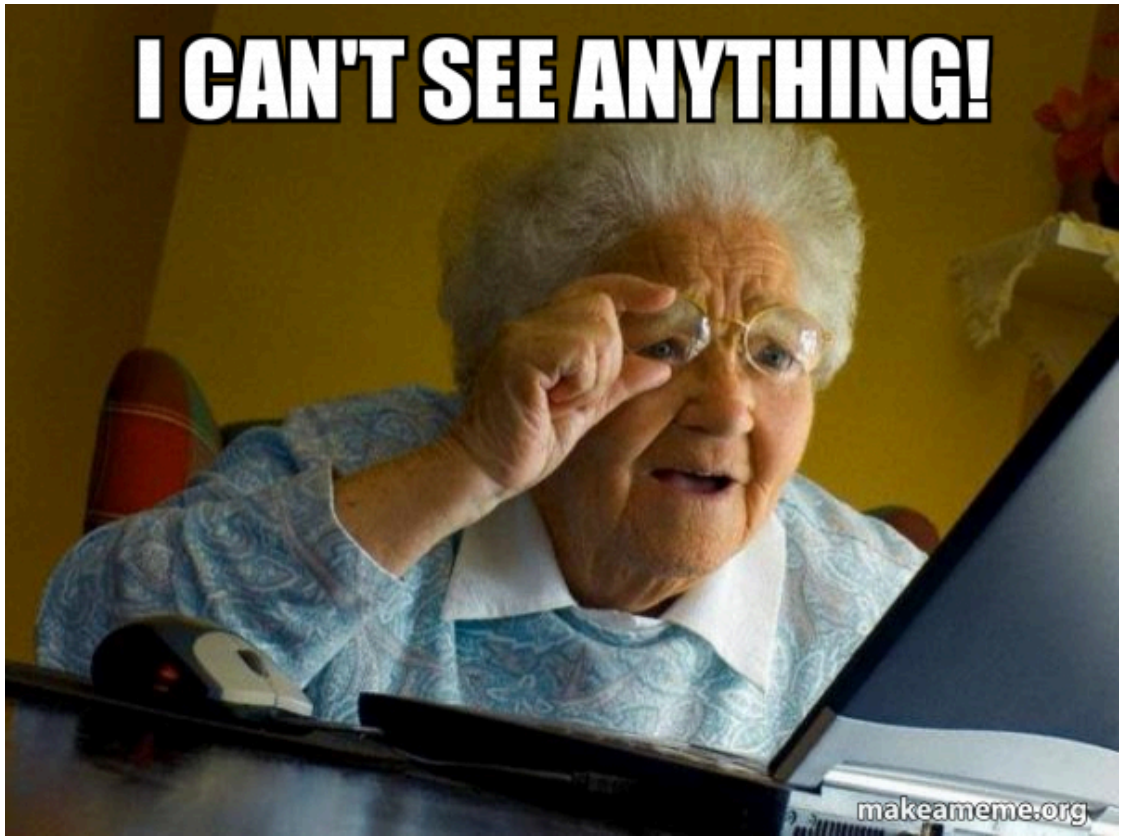
- Quick reassembly
- Trying to keep the thermal paste
- Still no HDMI 😔



# SW01 - Troubleshooting

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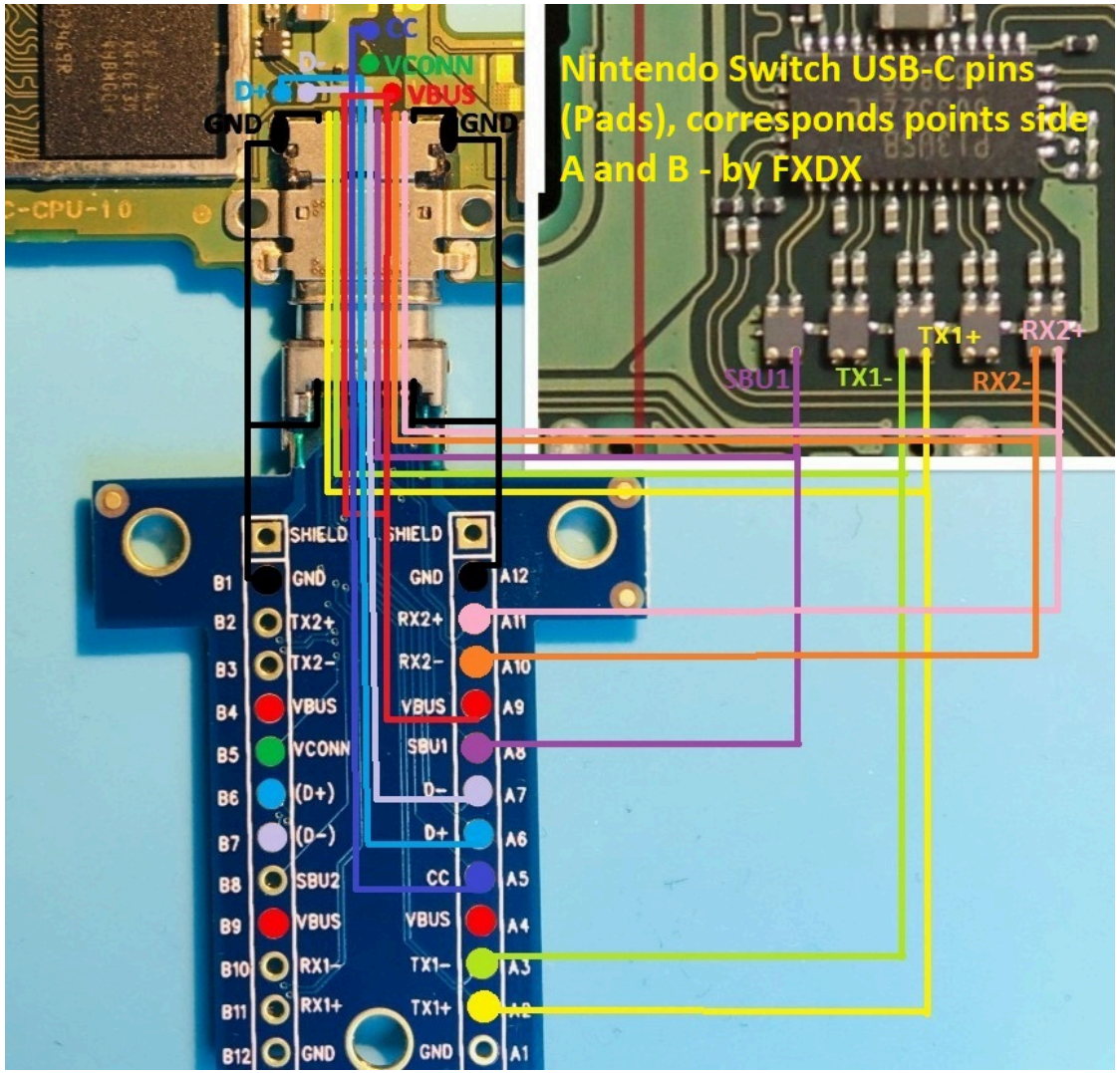
- Using a USB-C breakout board
- Continuity test on data and power lines
- Only GND and VBUS are functioning



# SW01 - Repair Attempt

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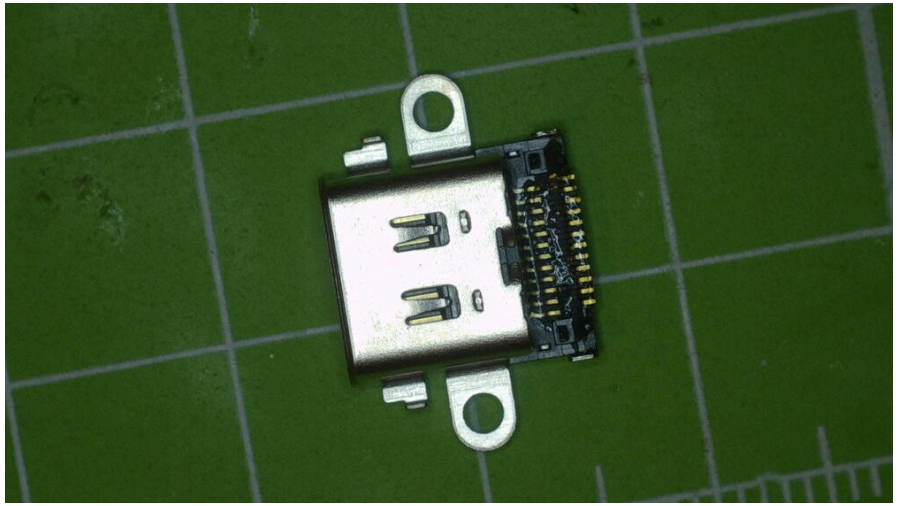
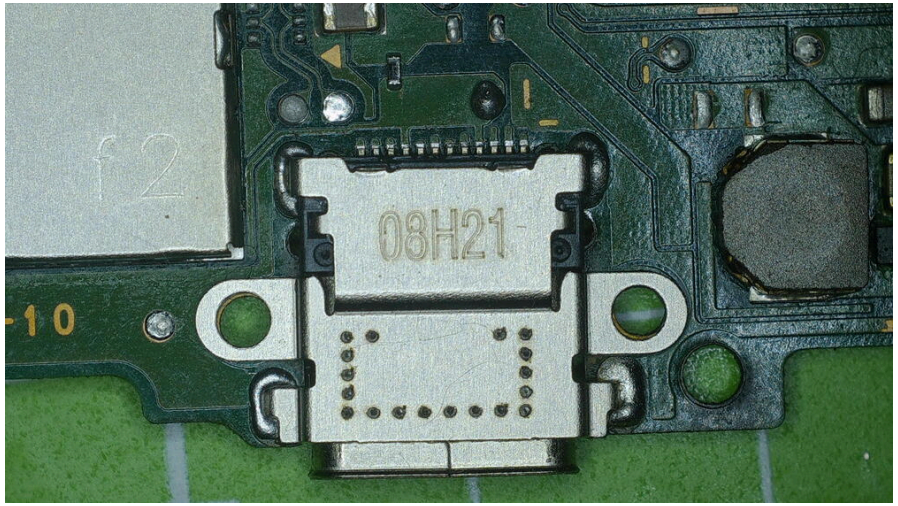
- We learn from our mistakes
- Make sure to tin the USB-C pins
- Remove the small plastic tabs
- If we mess up, we start over...



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# SW01 - Repair Attempt

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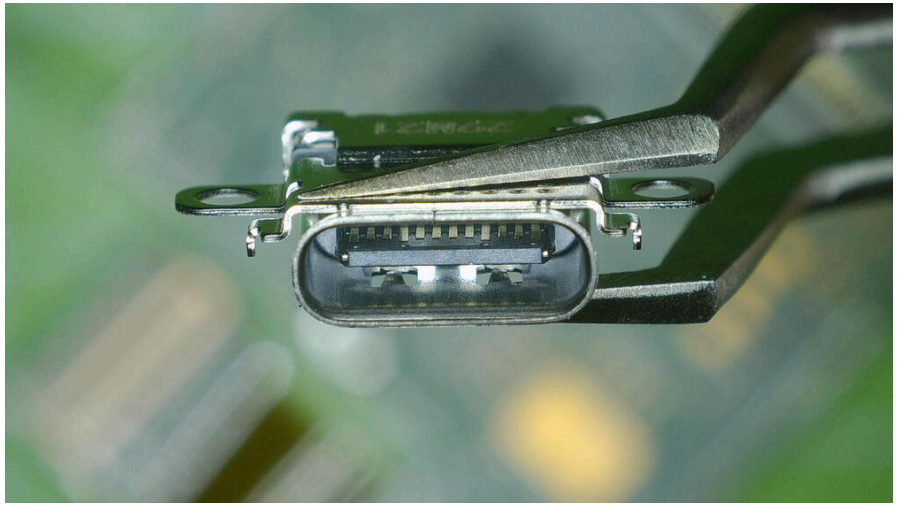
- Still no continuity through the breakout board
- Continuity through the pins
- Are the pins too short?
- Testing with a connector from another seller (~€2)



# SW01 - Test

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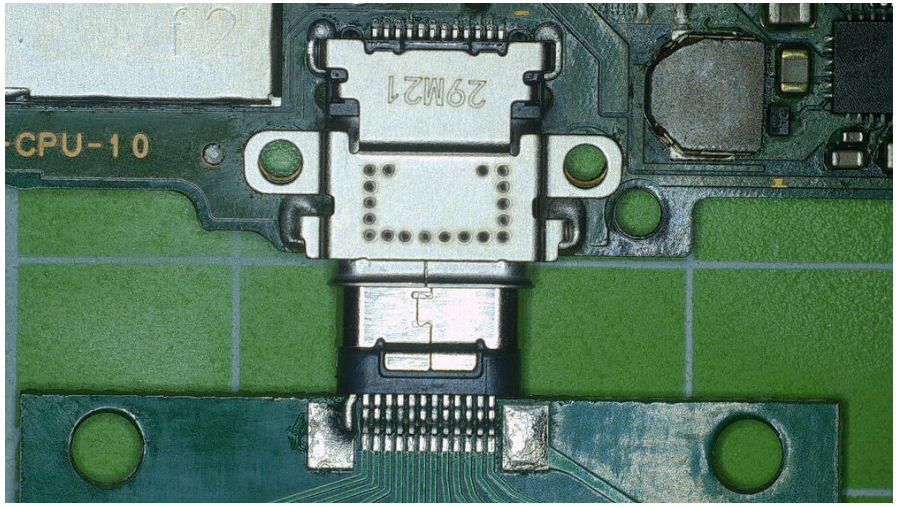
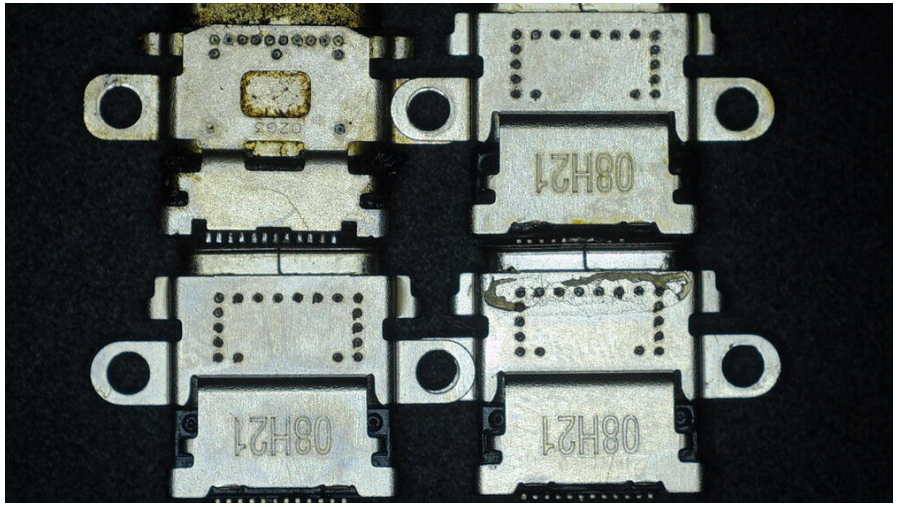
- Replacement of the card reader (~€8)
- Replacement of a filter (~€7 for 10)
- 4 USB-C ports used (~€2 each)

- **Total for parts: ~€17**
- **Total for SW01: ~€50**



# SW01 - Test

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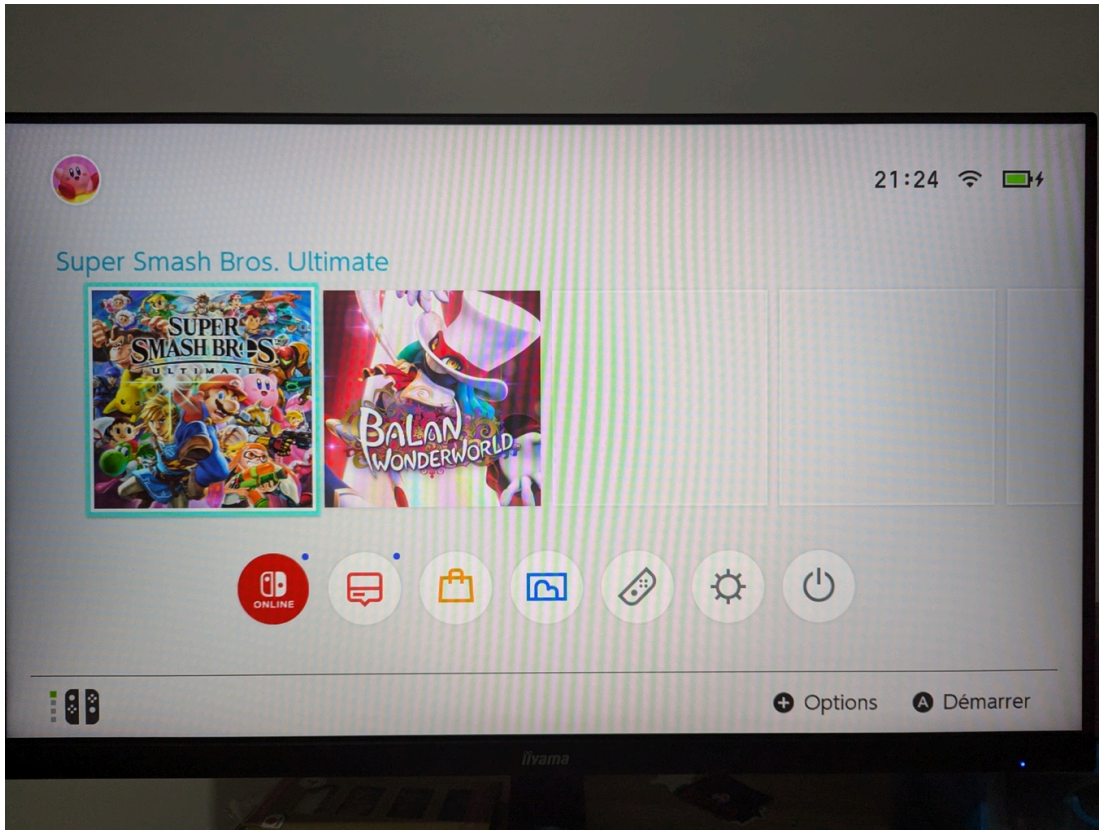
- **Touchscreen:** OK
- **Game Reader:** OK
- **HDMI:** OK
- 10 minutes of gameplay without overheating



# Conclusion

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- No profit guaranteed if the goal is resale
- New tools and confidence for other projects
- A good training experience
- Two more to go 💪

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