Become an expert on power profiling your application

Nordic Tech Webinar

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Today's hosts

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Technical Marketing Manager

Product Marketing Team

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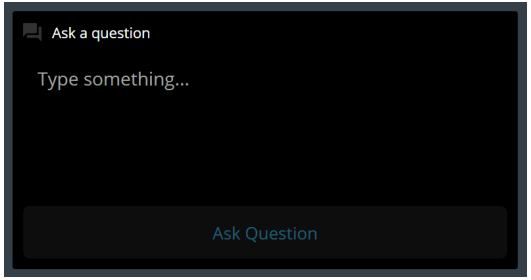
Practicalities

- Duration: about 60 minutes
- 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 towards the end
- The chat is not anonymous, and do not use for questions
- Go to DevZone if you have more questions
- A recording of the webinar will be available together with the presentation at webinars.nordicsemi.com



{ DevZone

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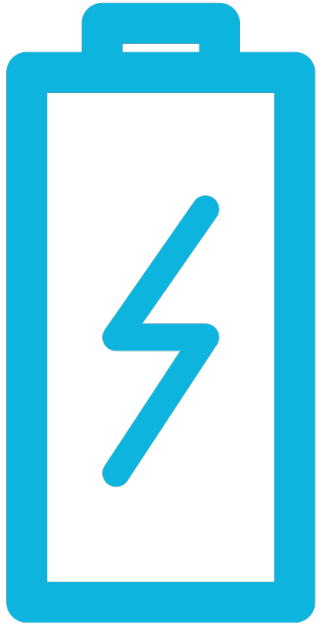
Have you ever asked yourself?

- How much power does my application actually use?
- How do I reduce the power consumption of my application?
- How do I extend battery lifetime without sacrificing the functionality of my application?
- What tools do I need to power optimize my product?



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Agenda

- Reasons why your application might consume more power than intended, and how to measure it
- Recommendation of tools to use for power optimization of products
- Introduction to our latest release Power Profiler Kit II
- PPK2 demonstration
- Questions and answers

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Possible reasons

- Not going to sleep
- Logging enabled
  - RTT (Logging over debug port)
  - UART
- Premature wakeup
- SoC peripherals running when not needed

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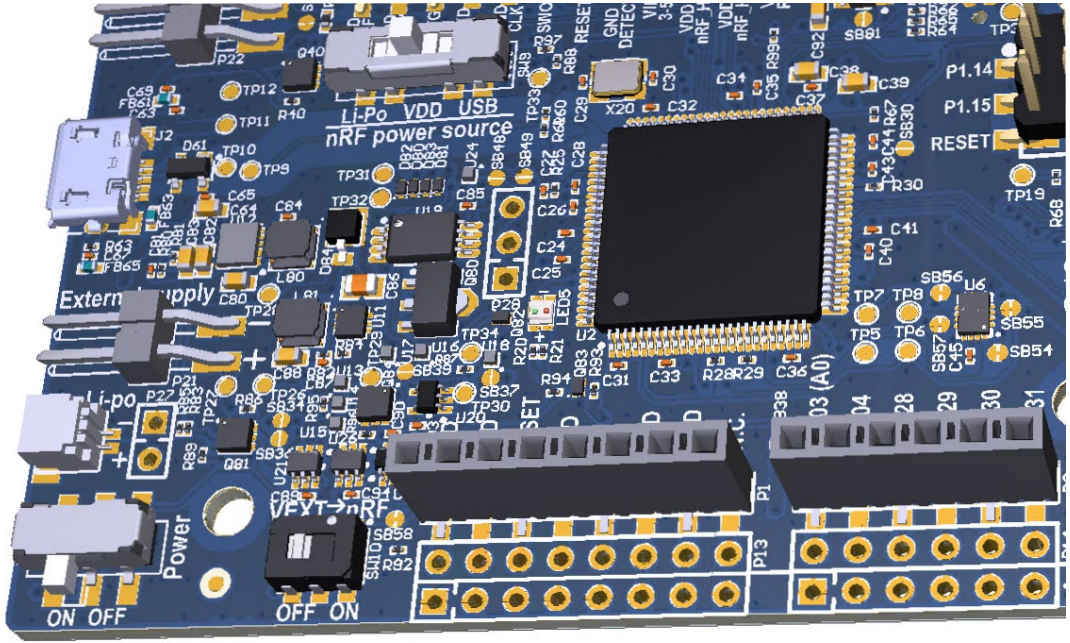
Important to think about



- Sensors
  - Enable only wheen needed
- Power
  - Select carefully
- Pulldowns
  - Large, but not too large.

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Tools

- Debugger
- Logic analyzer
- Multimeter
- Oscilloscope
- Power Analyzer
- Power Profiler Kit
- **Power Profiler Kit II**

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Debugger

- Pros
  - Analyze what is happening in your code
  - Set break points at events of interest
  - TRACE
- Cons
  - During development

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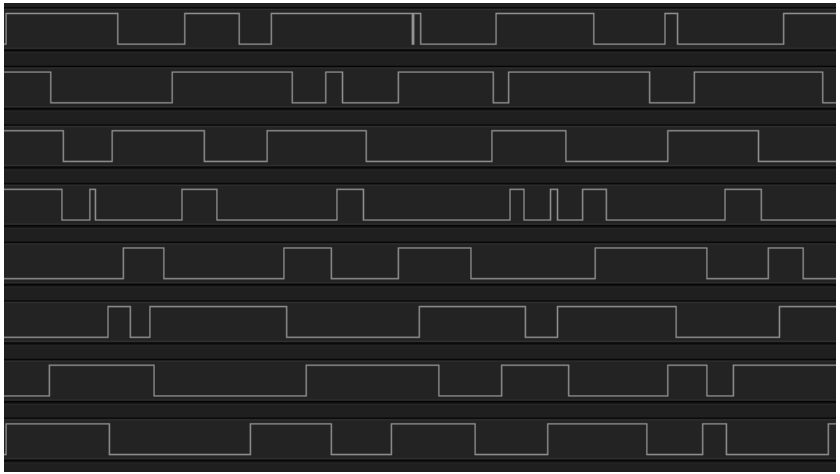
Logic analyzer

- Pros
  - Read digital lines to measure the timing of your application
- Cons
  - Not for production
  - Price
  - No current consumption information



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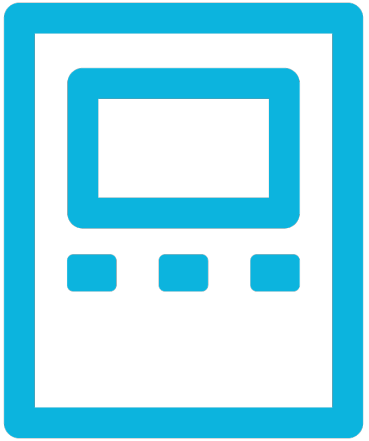
Multimeter

- Pros
  - Easy to use
  - Can be used for final product measurements
- Cons
  - Low resolution
  - Low detail
  - Instantanious measurement



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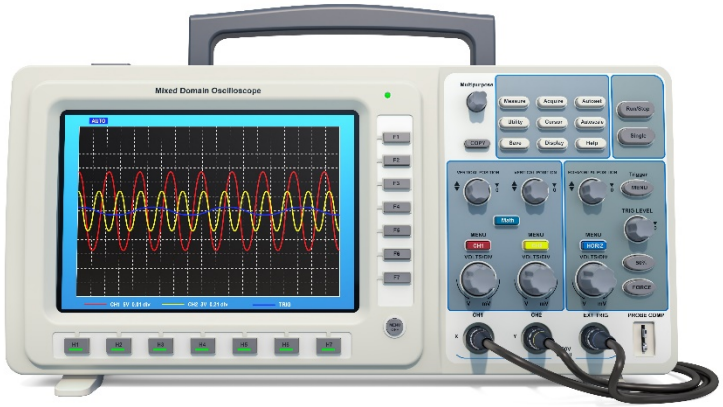
Oscilloscope



- Pros
  - Can be used for final product
  - Good accuracy for both timing and current
- Cons
  - Measuring voltage drop over a given resistor values
  - Accuracy drops with larger timescale.
  - Expensive

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Power Analyzer

- Pros
  - Very accurate for both timing and current consumption measurements
- Cons
  - Expensive
  - Large and heavy

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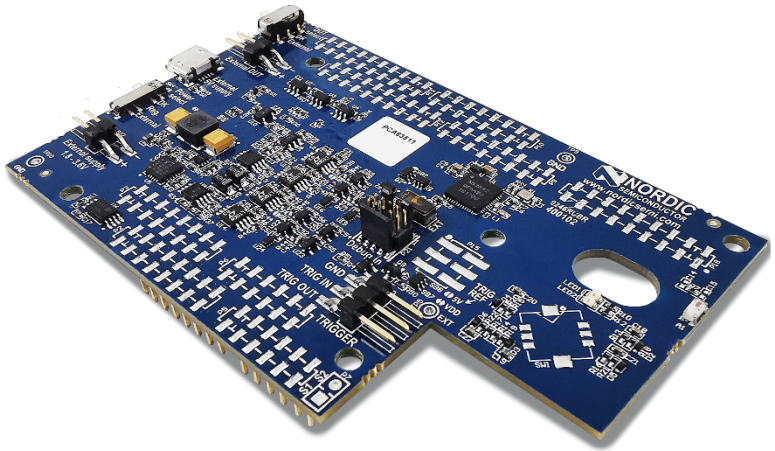
Power Profiler Kit



- Pros
  - Tailored for low power devices
  - Affordable
  - Tiny
  - Dynamic range switching
- Cons
  - Up to ~70mA
  - Low bandwidth
  - Needs external debugger

Power Profiler Kit II

Power Profiling tool for embedded development

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Power Profiler Kit II

- High measurement range
- Measure and analyze any embedded HW, including all Nordic DKs.
- Supported by a Power Profiler app in nRF Connect for Desktop
- Kit content
  - One PPK2
  - 4-pin current measurement cable
  - 10-pin logic port cable

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Power Profiler Kit II – logic port

- 8 digital inputs for low-end logic analyzer support
  - Connect I/O pin(s) on DUT to digital input(s)

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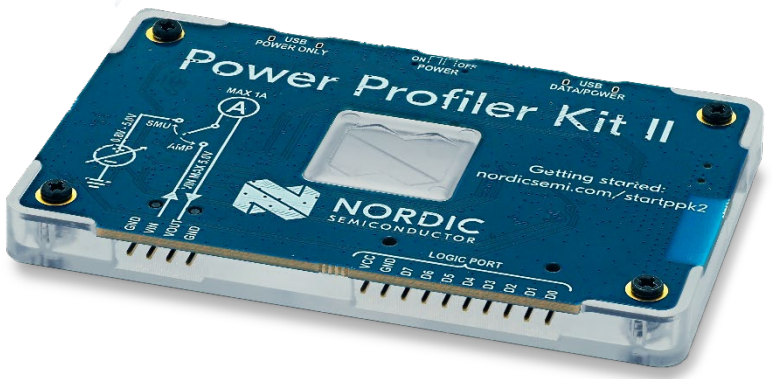
Power Profiler Kit II - highlights

- Max 1A current measurement range
  - 200nA to 1A current range with resolution varying between 100nA and 1mA
  - Supports cellular nRF9160 DK
- 10x faster sampling than first generation PPK
- Ampere meter mode
- Source mode
  - DUT powered via PPK2 (0.8-5V voltage source)
- Standalone



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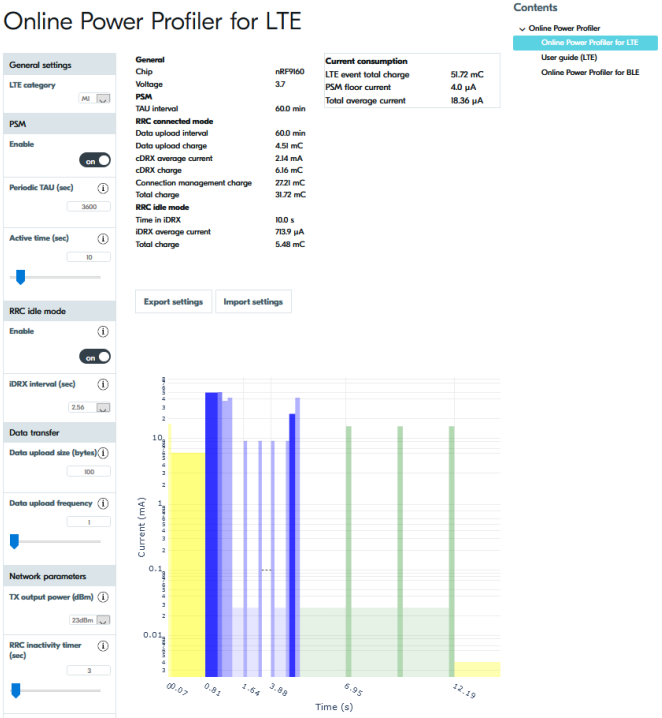
Online Power Profiler Tool



- Complemented by [Online Power Profiler] for nRF52 and nRF91 Series
- Possible to export LTE settings, import settings into an [nRF9160 UDP example], build and flash to an nRF9160 DK and then measure actual current via PPK2
- Useful to see if you are achieving optimal current consumption values in real life

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Why do developers need this?

- Useful tool to track power consumption
- Non-intrusive to final product
- Detailed data to estimate power consumption and battery life
- Spot and debug unwanted current drain during entire engineering cycle
- Simple and cost-efficient ($89 retail price)
- Updated without any debugger

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Demonstration

- Using PPK2 in ampere meter mode
- nRF9160-DK
  - Running asset tracker example
- nRF52840-DK
  - Running beacon examples
  - PWM driver example with digital pins

Q&A

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