

Keysight Technologies

Maximizing Battery Life of IoT Smart Devices with Keysight Solutions

The biggest challenge for Internet of Things (IoT) devices is maximizing the life of their small, on-board batteries. These devices, including smart home appliances and industrial sensor-nodes, must work for long periods of time between charges. For wearable medical devices such as pacemakers, battery failure is not an option. Therefore, it is essential to understand the power consumption patterns and battery life of these devices. It is only with the complete characterization of power consumption patterns of the device that designers can identify opportunities to reduce power consumption and maximize its battery life.

Your Challenges

Design and Test Challenges for Design and Verification Engineers



Wide range of currents

I need to perform full characterization on the power consumption pattern of my device over a wide range of power or current levels

- Many devices spend the majority of their time in standby or sleep mode and are only active at brief intervals to send or receive data. The device may draw up to hundreds of milliamperes in active mode, but draw only microamperes while in sleep mode. Therefore, handling a 1,000,000-to-1 ratio between minimum and maximum current levels becomes the main challenge.



Fast transient effects

I need equipment that can capture fast transient effects

- IoT devices are turned on and off frequently to reduce power consumption. This results in high narrow current spikes that cause quick transient effects, which can drain unnecessary battery life if left undetected.



Low power

I need to accurately measure very low currents

- IoT smart devices are designed to operate at low power or current to ensure that their small, on-board battery can last for long hours without recharging.



Long operation time

I need to design my devices to operate over long periods of time without failure or recharging

- Depending on application, devices are expected to operate for hours, days or even years between charges. For example, smart watches and fitness trackers are expected to operate for days without recharging; wearable medical devices such as pacemakers and hearing-aids must work for long hours without failure; industrial sensors with their on-board battery are expected to last for over 10 years without failure or recharging.



Debug design down to sub-circuit level

I need effective equipment to debug device performance down to the sub-circuit level

- Oscilloscopes are one of the commonly used troubleshooting tool for any engineer or technician. However, narrow dynamic range, inaccuracies and noise specifications limit their usefulness.

Test Challenges for Manufacturing Engineers



Reduce cost-of-test

I need a cost-effective power consumption test solution that can accurately measure low power

- Most IoT devices are expected to be manufactured at low costs, and vendors must make a tradeoff between what they need to test and what they can afford to test. Digital multimeters (DMM) are commonly used to measure current or voltage, but most DMMs lack the dynamic range needed to measure low sleep mode currents up to high active mode currents.



Increase test throughput

I need to increase test throughput for high-volume IoT device manufacturing

- For high-volume manufacturing, having equipment that can measure multiple test points or multiple devices-under-test (DUTs) simultaneously is one effective way to increase throughput. However, this can drive the cost of equipment higher, resulting in expensive test setups.

Your Solutions

Design and Verification Solutions



Keysight CX3300 Series device current waveform analyzers

- Industry's lowest current measurements down to 100 pA to analyze sleep mode abnormalities
- Ideal for low-power IoT, chipset, or device measurements
- Max. bandwidth: 200 MHz - capture sharp current spikes and quick transient effects
- Current range: 100 pA to 10 A
- Max. sampling rate: 1 GSa/s



Keysight N6705B DC power analyzer and N6781A/N6785A source measure unit

- Gain insights of your DUT power consumption in minutes (without writing a single line of code)
- Visualize current drain from nA to A in one pass
- Performs wide dynamic range current measurements using patented seamless current ranging technology and gapless measurement sweep
- Plug in the SMU modules to N6700B modular system for automated test



Keysight InfiniiVision oscilloscope (3000 X-Series, 4000 X-Series, 6000 X-Series) with N2820A high-sensitivity current probe

- Essential troubleshooting tool for any engineer or technician
- Measure wide range of current from 50 μ A to 5 A
- Probing with the Make-Before-Break connector

Manufacturing Solutions



Keysight 34465A/34470A Truevolt digital multimeters

- Most basic tool to measure current consumption and voltage
- Measure high active mode current and ensure current drops below a certain level during sleep mode
- Cost-effective
- Current range: 1 μ A to 10 A



Keysight 34972A multi channel LXI DAQ & shunt resistor

- Low-cost per channel solution
- Ideal for multi-point, multi-DUT high volume production test
- Easy setup with built-in AC/DC current channels (with 34901A module)

For more information:

Device current waveform analyzer: www.keysight.com/find/cx3300

DC power analyzer: www.keysight.com/find/dcpoweranalyzer

InfiniiVision oscilloscope: www.keysight.com/find/infiniivision

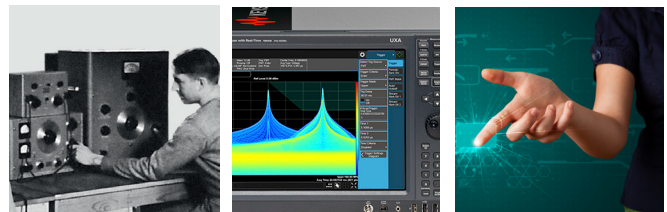
N2820A high sensitivity current probe: www.keysight.com/find/n2820a

Truevolt digital multimeters: www.keysight.com/find/truevolt

LXI data acquisition unit: www.keysight.com/find/34972a

Evolving

Our unique combination of hardware, software, support, and people can help you reach your next breakthrough. **We are unlocking the future of technology.**



From Hewlett-Packard to Agilent to Keysight