Why Low Quiescent Current Matters for Longer Battery Life

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Abstract

Battery life is getting increased scrutiny as our devices continue to shrink but are still expected to deliver more functionality and performance than ever before. Effectively extending battery life in future devices will require mastery of low quiescent current. This paper examines the role of low quiescent current in delivering the battery life essential for today's (and tomorrow's) wearable, mobile, and other smart, connected devices.

Introduction

What makes all the talk and trends for wearables and the internet of things (IoT) possible? Medical patches that measure body temperature, deliver insulin, and monitor heart rate must run long and reliably. In addition, these devices typically sit in storerooms and medicine cabinets for a long period of time before any patient use. Doctors and users need certainty that their device's batteries will be alive and well at the time of use. Similarly, smartwatches, earbuds, and video game controllers must run for a long time between charges **(Figure 1)**. Who wants to keep charging or changing the batteries, or have the device stop working when it's still needed? Imagine having to stop for a charge during a lengthy triathlon-style event. Furthermore, devices like electricity meters, gas detectors, and building automation systems, as well as flocks of field sensors, must have reliable uptime in the field, where they're expected to perform continuously in the background and cannot be charged or maintained on a frequent basis. From healthcare and biosensing to wearables and environmental sensing, nearly all IoT devices rely on batteries that must perform reliably and over an extended period of time in a variety of conditions. Indeed, battery life has reached a critical juncture.

According to Global Industry Analysts, Inc., the global market for portable battery-powered products is anticipated to reach US$865.4 billion by 2020, "driven by the growing need for ubiquitous mobility in the current emerging wireless age of networking."[1] Every IoT node needs a battery to run. A typical household of two people could have anywhere from 30 to 60 batteries in use.[2] Each device, of course, will have its own unique energy use patterns.

Let's examine how battery life is calculated, and discuss why quiescent current is important.

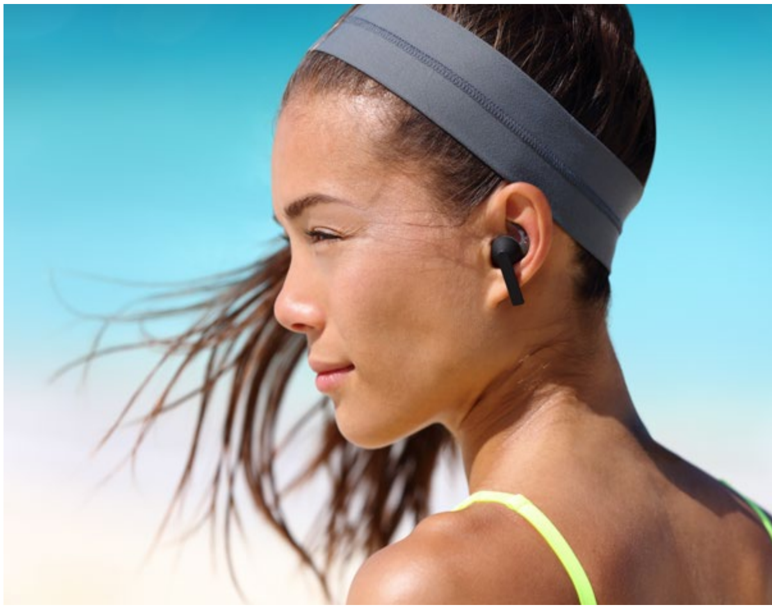

Figure 1. Smartwatches and earbuds are examples of systems where long battery life is essential.

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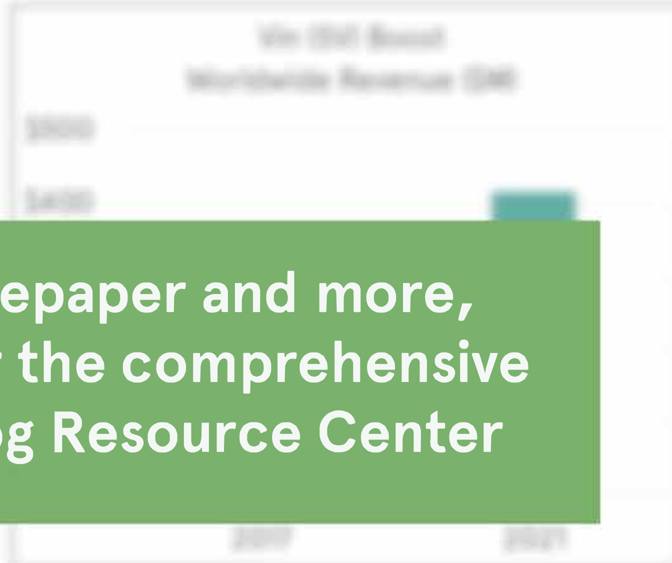

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