



RF Energy Harvesting



Imagine a world where your device never needs to be plugged in to charge but is powered from free, unused energy that is in the air around us.

Freevolt™ is a brand new innovative technology that provides power for Low Energy Internet of Things (LE-IoT) devices. It's a patented, pioneering passive Radio Frequency (RF) energy harvesting technology component that absorbs energy from cell towers, Wi-Fi access points and TV broadcasters to trickle charge LE-IoT devices.

The unique Freevolt design is small, low cost, can be used in any orientation to harvest RF energy, and can be scaled up in a rectenna and harvester array configuration to deliver higher power. It works in your pocket, on your wrist, in your home or office or mounted on a wall. Smart sensors, retail beacons, fitness bands and building sensors are just some of the devices that can now be freed from replacement batteries or charging cables by utilising commercially available Freevolt technology.

Why Freevolt?

The number of IoT devices is predicted to be in the billions by 2020¹. Many of these IoT devices will be 'low energy', such as sensors and beacons, which are currently being engineered to use a battery for power that will require changing or cable charging multiple times during the lifetime of the device. Battery swap or cable charging is one of the biggest limitations to the mass-market deployment in the LE-IoT industry, economically and environmentally. Freevolt RF energy harvesting breaks down this barrier to LE-IoT adoption by significantly extending the lifetime of the battery, improving device aesthetics and enables devices to be hermetically and safely sealed.

Energy usability

With the increasing number of Wi-Fi and cellular small cell hotspots appearing in city and retail environments, more RF energy is available to harvest. Freevolt RF energy harvesting operates in urban, office, home, retail and industrial environments and Freevolt patented technology has been designed to harvest energy, with high efficiency, from multiple RF sources.

Harvesting efficiency

RF Energy density in offices and retail environments can be in the nW/cm² or µW/cm² range creating design challenges for RF harvesting engineers seeking ways to harvest enough usable energy. Freevolt technology has overcome this issue with a patented rectifier design that captures the maximum amount of RF energy as part of the rectifying process. Combined with multiband antennas, the result is a compact, low cost, yet highly efficient Freevolt technology that produces enough energy to power low energy devices. The energy can be stored in many types of energy storage devices from Li-Ion batteries to graphene super-capacitors or charge a low cost printable battery for example.

Freevolt energy budget

The energy that can be delivered by Freevolt is dependent on a number of factors. Key among those is the size of the antenna. A credit card sized Freevolt rectenna can, in a typical high-energy environment, like an office or home, deliver up to 100µW and will harvest energy in any orientation. The simple scalability of Freevolt means that two or more rectennas can be combined in an array to harvest more energy, up to 3mW for example, for applications that require a greater energy budget. With this energy harvesting flexibility LE-IoT designers can start to engineer products based on Freevolt energy budgets using different antenna arrays.

Applications

The applications for Freevolt are themselves seemingly endless and like any good technology it will be the creativity and innovation of the international developer community that will truly realise the potential of Freevolt.

Freevolt technology can power Low Energy IoT sensors. These include sensors for air quality as demonstrated by the CleanSpace Tag™ – a personal air pollution sensor that is totally portable – and with Freevolt technology means users never need worry about plug-in charging or changing batteries.

Building sensors, powered by Freevolt can be built into the very fabric of new offices or homes enabling architects and designers to monitor and measure everything from air flows, temperatures, stress factors and vibration, bringing a new level of architectural pre- and post-construction monitoring to building design and control.

A Freevolt enabled beacon can be powered, extending the battery life-time and reducing the cost of installation, as well as the economic and manpower cost of regular replacement or theft of batteries.

Wearable Freevolt powered sensors in fitness bands, clothing and medical garments will remove the hassle of battery charging and swapping.

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¹ Forecasts from Cisco, ABI, Gartner, IDC, Ericsson

About Drayson Technologies

Drayson Technologies Ltd is a development stage electronics and software company headquartered in London with offices in Silicon Valley focused in the field of wireless energy transfer. Drayson Technologies is exploiting a new proprietary technology, called Freevolt™ that "harvests" energy from ambient wireless radio frequency networks, (Wi-Fi, Cellular, Broadcast TV) to power low-energy electrical devices and eliminate the need for cable charging or changing batteries. The initial implementation of Freevolt RF energy harvesting is in the CleanSpace™ Tag, a personal air pollution sensor that is totally portable.

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