EM9301 Bluetooth Smart Controller Enables “Green” Low Energy Beacons

Techwire International

Marin, Switzerland – EM Microelectronic, the semiconductor company of the Swatch Group, today announced that they have successfully promoted their ultra-low power Bluetooth SmartController, the EM9301, powered only by harvested energy or low voltage, eco-friendly zinc-air batteries to send advertising broadcasts to passing smartphones. A variety of photovoltaic (PV) solar cells have been used to power the EM9301 and an EM6819 ULP 8-bit Flash microcontroller to send sensor data, such as temperature, light level, and beacon/location information to an application running on nearby smartphones using Bluetooth low energy technology. Total cost was minimized through the use of an embedded microcontroller and a perfectly matched PCB loop antenna that is directly connected to the EM9301’s antenna pins.

These “emBeacons” were tested under real-world conditions; indoor lighting, periods of darkness, cold startup, etc… and performed consistently well. Since the EM9301 can operate from as little as 0.7V, and since the “emBeacon” consumes only 150 microjoules (µJ) per beacon event, nominally occurring every 5 seconds, zinc-air capacity or energy harvester cost and size is minimized while operating lifetime is extended. For supply voltages less than 1.8V, power consumption is only 200 µJ. This figure includes ALL power consumed during sleep, wake up, calibration, sensor measurement, and wireless communications.

“EM developed a similar beacon design this past summer, intended for use with a 1V LR44 or AAA alkaline battery, but we knew that we could and should drive the power consumption down even further and provide a more ecologically friendly solution to our customers,” says Michel Willemin, EM Chief Executive Officer and general manager. “The excitement surrounding Bluetooth Smart beacon technology clearly confirmed what we started to develop a few years ago and suggests a strong market need for a cost-effective, green and completely untethered beacon hardware platform. EM is proud to offer green beacon solutions based on Bluetooth low energy technology with an attractive price and best in class power consumption profile.”

Due to its low average power consumption (5µA), the “emBeacon” is projected to last over 2 ½ years on a Renata ZA675 zinc-air battery or more than one month on a BlueSpark 101-UT1 printed battery. In energy harvested systems, the “emBeacon” can transmit in the dark for an hour on a one Farad (1F) supercapacitor, or almost 2 days on a nine Farad (9F) supercapacitor, though results are highly dependent upon the exact capacitor chosen.

The emBeacon iPhone application searches for and displays a list of all “emBeacon” devices within range. Once one particular device is selected, the sensor data (temperature, light level, battery level, received signal strength, and packets

transmitted) is displayed on a screen dedicated to that particular “emBeacon”. One interesting characteristic of this beaconing technique is that all of the beacons within range are visible to all the smartphones in the vicinity. That is to say that all beacons can be viewed simultaneously by multiple phones, in contrast to a “connected” model, where beacons are “paired” with a phone and then become invisible to other phones in the area. The app was developed by KS Technologies, an EM technology partner that specializes in Bluetooth Smart application development, firmware creation, and hardware. KST has recently begun to focus on Bluetooth Smart beaconing technology and applications and has released iPhone apps such as Particle Detector and BTLExplorer which allow a phone to detect and display data received from unconnected Bluetooth Smart beacons.

Optimized for ultra-low power wireless sensing, remote control, and monitoring applications, the EM9301 operates on as little as 0.8V. It can be powered by a wide range of common single-cell batteries or energy harvesters such as solar cells, piezo-electric and electro-magnetic elements. The EM9301 is fully Bluetooth Smart qualified for single-mode master and slave applications and combines the Physical layer, Link layer, and Host Controller Interface (HCI) layer in one flexible chip.

The EM9301, when paired with a low-power host controller, comprises a cost/performance/size optimized solution for most Bluetooth Smart applications such as wireless health and fitness monitoring, electronic leashes, and smartphone-based sensing and controls.

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