

Intel® Home Energy Management Proof of Concept Reference Design

Energizing residential customers with a flexible home control and energy management panel



Captivate Customers

Grabbing the attention of consumers these days is enormously difficult. They lead demanding lives and are inundated with mass media, gadgets and countless other distractions. As a utility operator, how do you capture more mindshare?

Offer customers a universal control panel that's worthy of being the command center for the home. Not only will they be able to better manage their energy usage and benefit from smart thermostats, they can download wide-ranging applications, like

home security, weather and yellow pages, to round out a comprehensive home control system. The device can also implement demand response programs that steer customers toward off-peak usage, thus allowing utility operators to manage their load more efficiently and save money. Making development easy, the Intel® Home Energy Management Proof of Concept Reference Design enables utility operators and equipment manufacturers to deliver a compelling device that rises to the level of cell phones, iPads* and netbooks.

Interactive Panel

Put consumers in control through the use of a multi-function panel based on the Intel® reference design that runs an assortment of applications via an App Store. It goes well beyond traditional home energy management systems, typically single purpose and monochromatic, by featuring interactive and useful applications that draw in consumers. The reference design's sleek user interface and appealing graphics help to engage users over the long term, resulting in more effective home energy management deployments and consequently, a higher return on investment. There's enough computing headroom and application flexibility to future-proof the device by allowing it to evolve, thereby increasing its useful life.

Feature-Rich

Enable your customers to manage energy consumption by providing them with a home command center, or Dashboard, that recommends solutions, sets effective goals and helps household members make optimum decisions when implementing efficiency measures. The device can support demand response and complex pricing structures in addition to a range of services, some of which could create new revenue streams. With the touch of a button, the flexible home control and energy management panel displays weather, records family video messages, arms the security system, indicates energy usage and sets the temperature, just to name a few functions (Figure 1).



Energy Management

- > Indicates energy usage
- > Makes recommendations



Comfort

- > Sets temperature
- > Helps reduce energy usage



Weather

- > Reports weather conditions
- > Shows the extended forecast



Family Message Board

- > Records video messages
- > Sends out messages



Home Surveillance

- > Controls security system
- > Displays webcam streams

Figure 1. Example Applications

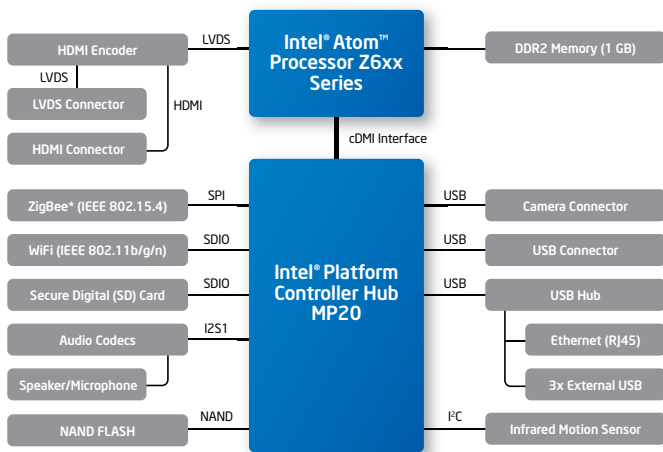


Figure 2: Reference Design Block Diagram

Small Wireless Platform

Greatly reducing development time and cost, the Intel Home Energy Management Proof of Concept Reference Design is a manufacturing-ready platform supporting both WiFi and ZigBee* wireless connectivity. The solution can wirelessly control almost anything in Plug & Play fashion, while addressing common security and power consumption challenges. Now, equipment manufacturers and utility operators can quickly introduce a home energy management system based on a validated Intel® Atom™ processor-based platform. The Intel® Atom™ processor Z6xx series, along with the Intel® Platform Controller Hub MP20, meets the needs of small form factor systems that require low power. The platform was designed with innovative power management features, including new ultra-low power states and integrated support for backup battery. Enabling a device to sleep longer and save power, the design implements a tickless operating system that wakes up when needed – instead of at predefined intervals. The system also incorporates Intel® Burst Performance Technology, which enables the processor

to dynamically increase performance “on-demand” for short intervals of time, thermal conditions permitting. Further decreasing power consumption and increasing performance, the processor integrates a DDR2 memory controller that supports up to 2 GB of memory.

The platform, illustrated in Figure 2, performs video encoding (capture) and decoding (playback), as well as runs the growing number of rich media, High Definition (HD) video and Internet applications, providing the utmost choice of software. It supports LVDS and HDMI display interfaces, secure digital (SD) cards, Ethernet and connectivity for various components, including a camera, microphone and stereo speakers. There is also an infrared motion sensor that detects someone passing by and wakes up the device display, and an SPI interface is available for connecting common peripherals found in embedded systems. Cutting cost, the design eliminates common specialty devices, such as a dedicated ROM for the BIOS and a trusted platform module (TPM), whose security features are now integrated in the Intel® chipset.

Bundled Software Stack

The reference design also includes a software stack with applications for customers and an open software API for developers. Some of the applications include:

- **Energy Manager:** Provides an at-a-glance view of utility rates, usage and billing. Users can set monthly energy targets, learn where energy is used, and take control.
- **Clock Screen:** Displays a color-coded clock screen that reminds users of time-of-day energy pricing schedules and proactively alerts them when they need to check in with the dashboard.
- **Smart Thermostat:** Enables users to reduce energy expenditures by adapting settings based on weather conditions, current energy prices and the household’s usage patterns.
- **Remote Management:** Allows users – away from home – to remotely view and control thermostats, appliances and security systems from a mobile phone or PC.
- **Extendable Applications:** Includes an open API that facilitates adding more applications such as video memos, email tracking, weather updates, highway traffic reports, trip planning, plant watering and other home management tools.

The reference design is available through a royalty-free license granted by Intel. It consists of three main components: hardware platform, software stack and enclosure design. Equipment manufacturers and utility operators may request the schematics, detailed bill of materials and Gerber files for the board, which can be modified or used as-is for manufacturing. The thermal solution, thermal models and drawings for an enclosure are also available from Intel. A number of systems were built for validation purposes and are available for a limited time; please contact your Intel Field Sales representative for more information.

To learn more about energy solutions from Intel, please visit <http://www.intel.com/go/energy>.

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL® PRODUCTS. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER, AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY RELATING TO SALE AND/OR USE OF INTEL PRODUCTS, INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT, OR OTHER INTELLECTUAL PROPERTY RIGHT. INTEL MAY MAKE CHANGES TO SPECIFICATIONS, PRODUCT DESCRIPTIONS, AND PLANS AT ANY TIME, WITHOUT NOTICE.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked “reserved” or “undefined.” Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information. The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request. Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order. Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or by visiting Intel's Web Site at <http://www.intel.com>.

Copyright © 2010 Intel Corporation. All rights reserved. Intel, the Intel logo and Intel Atom are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States or other countries.

*Other names and brands may be claimed as the property of others. Printed in USA 0910/MS/SD/PDF ♻️ Please Recycle 323XXX-001 US

