Power in your hands

Jacques Lavernhe, Head of power applications division at **ON Semiconductor**, outlines the potential drawbacks of highly integrated handset design

The advent of the smartphone era has led to handsets that boast a far greater array of functionality than previously possible. Although this has presented consumers with more exciting interactive experiences, they still expect handset battery life to be at least as good (if not better) than before.

Development of handset functionality has outstripped advances in battery technology. As a result more sophisticated power management methodologies are needed for the latest handset models that will stop battery duty cycles from being curtailed. One strategy for achieving this is to integrate more functions into increasingly complex power management ICs. The case for integrating in order to reduce PCB real estate and manufacturing costs seems strong. However, it may not always be the best course of action.

The vast majority of consumer/professional portable devices use Li-Ion batteries to supply them with power. One way to offset the slow moving evolution of battery technology and lengthen the time needed between recharges would be to increase the battery size, but this goes against OEMs' overriding principle to keep their handsets sleek and streamlined.

An alternative approach is to extend the battery operating range by reducing the low voltage safety margin and running the system at lower voltages. Some new battery technologies currently under development should be able to support this, but will require more sophisticated power management techniques, higher control granularity and a larger number of power domains - increasing system complexity.

Constraints, such as available board space, unit cost and manufacturing considerations could drive designers to employ highly integrated ICs, but this brings additional design challenges with it, in terms of thermal management and signal routing. These may lead to the use of a separate IC on top of the main power management IC.

Main image: Next generation handsets offer highly integrated systems to deliver high level performance

Thermal management issues

When using highly integrated ICs with several regulators, DC-DC converters and other analogue functions all included, designers should be aware that the maximum power dissipation allowed by the package will be much lower than the power the silicon may potentially have to dissipate to remain at an acceptable operating temperature.

The need for a thermal management mechanism to be added will again increase design complexity, requiring engineers to calculate and monitor the maximum current each regulator has to supply and the maximum heat the power management IC must dissipate, for every power domain. This will affect PCB layout and component placement, as thermal failure could impinge on the operation of components.

Depending on the system specification and architecture, one solution to help solve thermal issues, is sharing the workload of a large power management IC between several smaller ICs. From a system standpoint this can make sense, with each separate chip being dedicated to a given function. For handsets that incorporate video or gaming functions, designers may benefit from supplying each module of functionality as an independent subsystem controlled by the main processor. If the main power management IC's power dissipation is still too high, designers can put other analogue user interface functions (display supply, backlight, etc) in separate 'heat safe' sub-systems.

Jacques Lavernhe works at ON Semiconductor's Design Center in Toulouse, France, where he leads the application team in charge of Low Voltage and Power Management ICs

The inflexibility of a highly integrated device makes it difficult at a later stage for new functionalities, suddenly required by consumers, to be added. In addition, use of highly integrated solutions will not always allow short design cycles to be achieved.

With highly integrated solutions, any modification to system requirements, uncovered via customer research, will generally result in heavy design alterations. Potentially this will affect the core of the system, making it risky from a business perspective. Taking a less integrated approach allows a modular core design to be implemented that is easier to maintain, modify and release with different options within a short timeframe.

In summary, though next generation handsets will continue to look towards highly integrated systems for their core functions, in order to deliver high level performance in simple cost-effective designs, other considerations such as long-term reliability and heat dissipation mean the benefits of integration throughout are not so clear cut. The poor levels of design flexibility, and long chip/chipset development cycles that an integrated strategy brings with it must also be considered. The rapid turn out rates required for new handset designs can make separate sub-systems more preferable. This tact combines the benefits that are characteristic of integration, but at the same time furnishes design teams with a high degree of flexibility and improved reliability.

ON Semiconductor
www.onsemi.com

Enter 234

CONNECTINGINDUSTRY.COM/

Electronics

FEBRUARY 2010

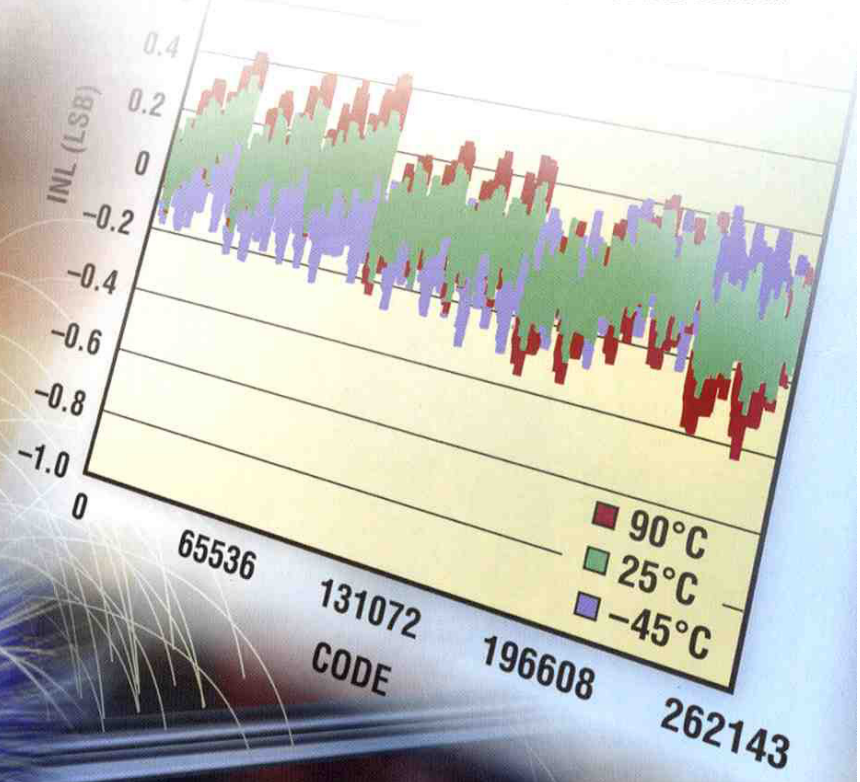
PRODUCTS AND APPLICATIONS FOR ELECTRONICS DESIGN

DISTRIBUTION

Deeply embedded

EDA

Well managed



LTC2757
18-Bit DAC

ENCLOSURES

Size is a virtue

Converting finite precision data

LINEAR TECHNOLOGY

POWER: Power in your hands