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Power management ICs in portable devices represent nearly 40% of total analog IC revenues, says Petrov Group

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The annual unit growth rate for portable devices is estimated at more than 12%, from about two billion in 2008 to over 3.4 billion devices in 2013. These devices have an increasing number of features that drive the diversity and performance requirements of power management ICs. The requirement for more power-efficient and higher performance solutions in battery-powered portable devices will continue to open new market opportunities for existing IC vendors as well as new market entrants, according to Boris Petrov, managing partner of The Petrov Group.

The rate of this feature increase will continue to be much faster than the rate of advances in battery technology. This drives the need for a diverse range of new and higher performance power management ICs. Increasing requirements for battery management IC performance, new features, and power-efficiency continue to open up new opportunities for IC vendors and wafer foundries. Lithium-Ion/Pol batteries, in particular, are changing the competitive landscape and continue to increase battery management and safety protection requirements.

Power management ICs represent a growth market segment that is of significant importance to analog IC vendors, both IDMs and fabless, as well as to foundry service providers. Power management ICs in portable devices alone accounted for more than US$14 billion in revenues and more than 26 billion units in 2008. This represents nearly 40% of total analog IC revenues and one-third of total analog IC units reported by WSTS. By 2013, the dominance of power management ICs in portable devices alone is expected to further increase to nearly one-half of total analog IC revenues and units (about US$21 billion and 47 billion units, respectively).

The highly fragmented power management IC market for portable devices is served by a variety of business and product strategies. Not all are sustainable and profitable; identifying the appropriate market segments and understanding their market drivers is critical for developing viable business models, says Boris Petrov.

There are three distinct categories of portable devices: (1) PC-based devices characterized by high-current requirements and a relatively large form factor powered by a battery pack, (2) handheld devices (excluding cell phones) characterized by very low-power requirements and a broad range of device types, and (3) cell phones characterized by very low power requirements, highly integrated processor-oriented power management ICs, and a large unit volume.

The total unit number of power management ICs in portable devices and their resulting revenues is significantly underestimated. Most market analyses focus on a few large power management ICs, typically "companion ICs" to processors. The actual market for power management ICs includes a large number of "uncounted" power management ICs; these ICs typically have superior margins due to their high-performance attributes.

As an illustration, in 2009 the typical number of power management ICs ranged from about 20 in notebooks to about seven ICs in devices like Bluetooth headsets. This large and fragmented market generates revenues for nearly all analog IC vendors, including Analog Devices, AnalogicTech (AATI), Dialog Semiconductor, Freescale, Infineon, Intersil, Linear, Maxim, Monolithic Power Systems (MPS), National, Power Analog Microelectronics (PAM),

STMicroelectronics, Texas Instruments, Rohm Semiconductor, and at least 40 other firms, said the Petrov Group.

The power management ICs market in portable devices is very fragmented at the product level, providing extensive differentiation opportunities to participating vendors. These opportunities should be targeted at tightly linked application, product, and technology levels. There are about eleven distinct power applications in portable devices; they include all power management ICs (over 26 billion units in 2008). A large number of specific product types are required to support the performance requirements of these applications in all portable devices.

In ten out of twelve major portable device types, revenues derived from power management ICs exceed those derived from system ICs (defined as all portable device ICs less system processors and memory as well as power management ICs). The two exceptions are notebooks and high-end multimedia/smart cell phones due to their relatively large number of peripherals (computing and communications, respectively). This insight illustrates the importance of power management IC market opportunities outside the notebook and cell phone domains, so called "horizontal" markets which have lower unit volumes per device type but typically much higher margins.

Among the eleven portable device power applications, system power and lighting management applications dominate the total unit count (29% and 17%, respectively), and represent nearly one-half of total power management IC revenues. The next significant application is battery charging and management with 9% of total units and 13% of total revenues (excluding battery management ICs built into battery packs). Most analog vendors strongly focus on the above three applications, according to the Petrov Group.

The system power application represents the most significant portable device application in both IC units and revenues. Therefore, power management IC vendors focus on this power application area. Sensor power and lighting management application units and revenues are derived mostly from cell phones. When cell phone devices are excluded, the three dominant applications in terms of units and revenues are system power, core and I/O power, and battery charging and management.

Portable medical device meters at present have relatively small revenues derived from power management ICs with an overall volume ASP of US$0.63. ASPs range from US$0.46 to US$0.98. Battery charging/management and system power applications dominate revenues and represent about 42% of total revenue each. Power management IC units are dominated by the system power application, followed by battery charging/management (55% and 27% of total, respectively). This is an emerging high-growth application increasingly targeted by nearly all major analog vendors (for example TI and ADI) attempting to benefit from an early entry into this market segment.

The total volume price for the eleven portable device applications ranges widely from US$0.16 to US$5.75. The highest value power management IC content is in the system power application, from US$0.81 to US$5.75 with an average of US$2.3. The battery charging and management application features the second largest content value, ranging from US$0.59 to US$5.74 with an average of US$1.85. The third largest content value is in the core and I/O power application, from US$0.43 to US$3.90 with an average of US$1.60. The lighting management application features a content value ranging from US$0.35 to US$1.48 with an average of US$0.82. Four out of eleven portable device power applications represent the most significant revenue opportunities for power management ICs: system power, battery charging/management, core and I/O power, and lighting management.

There are six power management IC integration domains; they are all-inclusive, that is, into these "buckets" one can place each and every power management IC in portable devices. This segmentation approach provides an effective and useful strategic planning tool. Therefore, a seemingly random and "infinite" number of power management IC opportunities could be

characterized in a systematic manner, providing invaluable strategic and product planning insights. This is critical in the power management IC market, which has a multitude of segments.

The six integration domains provide a methodology for analog IC vendors to evaluate trends and integration opportunities in portable devices and enable them to profitably target select market segments. The market for power ICs will continue to be of major strategic importance to most end-system and IC vendors. Insights into the integration domains of power ICs explain, for example, why a 60-transistor power IC often exceeds the price and profitability of a PMU with hundreds of thousand transistors. There is a strong correlation between vendor gross margins and the type of power management ICs they target, said Petrov.

There are two major power management IC segments in portable devices from the process technology node perspective:

- Power management ICs that do not integrate system functions. These represent the volume IC business in horizontal and select vertical end-markets such as cell phones. Nodal migrations are relatively slow but steady-the 250nm level is currently the most advanced technology node in volume production. This nodal migration pattern will remain in the foreseeable future unless digital design implementations of power management ICs take off in volume.
- Power management ICs that integrate system functions. These represent volume IC business in vertical and select horizontal end-markets. System functions (such as an audio codec or processor) bring on-chip digital design implementations; hence, the need for finer technology nodes - 130nm is currently the most advanced technology node in volume production with 65nm reportedly planned in 2010/11.

Petrov Group: Number of PWM ICs used and total volume pricing in smartphones and media phones (an example of twelve portable devices analyzed)

	Category	Number of ICs	Total High-Vol Price (US$)
1	Battery charging and management	1	0.98
2	Lighting management	3	1.53
3	Core and I/O power	2	3.05
4	RF power (supply and control)	1	1.08
5	Sensor power	2	1.35
6	Memory-card power and interface	0	0.00
7	Motor control power	1	0.75
8	Audio power	0	0.00
9	Display power	1	0.75
10	System power	7	2.80
11	Memory and bus power	0	0.00
	TOTAL	**18**	**12.28**

Source: Petrov Group, compiled by Digitimes, August 2010

Process technologies used to implement power management ICs without system functions focus on analog performance and the high(er) current and voltage requirements of power management

ICs. These technologies include BiCMOS (Bipolar/CMOS) and BCD (Bipolar/CMOS/DMOS). An increasing use of BCD technology is driven by the trend to integrate on-chip discrete power MOSFET devices. Process technologies used to implement power management ICs with system functions (the second above segment) focus on ultra low leakage and functional integration. These technologies include CMOS and CDMOS (CMOS/DMOS).

In 2010 a major trend toward implementations in BCD platform technology has emerged, a trend that has major implications for foundries. Foundry service providers have recognized the large and growing market potential for power management ICs by introducing state-of-the-art wafer manufacturing/processing capabilities broadly meeting the above technology requirements of power management ICs. This provides significant opportunities to the fabless analog IC vendors who can now successfully compete with traditional analog IC vendors. This also enables traditional analog IC vendors to outsource their manufacturing (e.g., Intersil, Maxim).

Petrov Group: Typical Number of PWM ICs in key portable electronic device types	
Portable Electronic Device Type	**Typical # of Power Management Ics (2008)**
Notebook	20
High multimedia / Smartphone	18
MID (Mobile Internet Device)	18
Digital still camera	18
GPS / PND	16
Digital picture frame	15
Portable ultrasound	15
Entry / regular phone	13
Netbook	13
Portable medical device (Meters)	11
Digital media player	7
Bluetooth headset	7

Source: Petrov Group, compiled by Digitimes, August 2010

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