DIGITAL POWER ICs

High Growth Opportunities for IC and Foundry Vendors

ABSTRACT

The purpose of this report is to deliver an up-to-date understanding of the digital power IC market landscape from five major perspectives:

- Digital power ICs technology and market
- Market dynamics, segmentation, and growth trends
- Competitive vendor positions and approaches
- Digital power ICs technology segments, drivers and trends
- In-depth analyses of the digital power product lines of 22 IC vendors

Texas Instruments	Fairchild Semiconductor	Analog Devices
Microchip Technology	Intersil (Zilker Labs)	International Rectifier
Exar (FyreStorm)	Freescale Semiconductor	STMicroelectronics
Akros Silicon	Silicon Labs	Marvell Technology Group
iWatt	Infineon Technologies (Primarion)	Volterra Semiconductor
Powervation	Maxim Integrated Products	Summit Microelectronics
CHiL Semiconductor	Linear Technology	IDT (Tundra/Potentia Semiconductor)
Power-One		

The findings in this report are based on a bottom-up analysis of vendor product offerings; it is our experience that only such an effort can result in a pragmatic formulation and validation of market size, growth, and segmentation. A key benefit of our report is that it is comprehensive; it provides both a Big Picture view and detailed product analyses.

The report removes the hype and misunderstandings regarding this complex and now high-growth market segment. Audiences who will benefit from this report include decision-makers in business development, competitive intelligence, strategic and product marketing, and general management areas.

The landscape of Digital Power ICs is changing fast because the market has entered its high-growth stage – 2009-2014 CAGR of 34%. By 2014 the Digital Power IC market will be a multibillion business; its control IC segment will be about six times larger than its management IC segment or about 86% of total Digital Power IC revenues.

Our bottom-up analysis shows that its 2009 revenues were more than five times larger than the estimates made by other data sources. Despite the high growth, by 2014 penetration rates will still remain relatively low, providing large future growth opportunities as the market transitions into a more mature stage driven by mainstream applications.

Digital power management (DPM) ICs	30%
Digital power control (DPC) ICs	34%
▪ **AC/DC and DC/AC** power conversion ICs	35%
▪ **Switching DC/DC** power conversion ICs	35%
-- Controllers	30%
-- Converters	46%
Total	**34%**

This report covers the present high growth stage of the digital power market lifecycle in terms of introduced product types, end-market segments, and end-equipment applications. Despite high market growth, the penetration rates will remain relatively low, providing significant growth opportunities for well-positioned vendors by 2014 and beyond.

The report analyzes IC vendors' strategies in emerging and legacy Digital Power IC market opportunities. From the power supply system viewpoint power conversion ICs are analog power devices -- regardless of how they are internally implemented. Therefore, digital power IC vendors must possess extensive analog business know-how in addition to digital design know-how. Therefore, this report should also be viewed as a companion report to our Analog Power Conversion ICs report which focuses on analog power ICs.

Digital control techniques can be applied at several points within a power system, both internal to power conversion devices (power control) and at the system level (power management) for the purpose of implementing control and monitoring. This report covers both applications of digital power control. Power management and control solutions using digital techniques have been used since the early 1980s in applications such as motor control. However, new applications and the emergence of power buses have dramatically accelerated the need for digital power management and control.

There is a broad range of digital design implementations used by IC vendors to address an even broader range of applications. This report provides an in-depth view of the major implementation approaches illustrated with numerous specific design examples of the 22 IC vendors analyzed. There are five major integration approaches to implementing full digital power conversion solutions ranging from discrete to modules. Each major integration approach features a range of integration variants, some of which require specialized processing technologies.

Implementation	Integration Options			Tradeoffs	Representative IC Vendors
Module	ICs, power MOSFETs/IGBTs, passives			Faster design-in with complete power conversion solutions	**Marvell, IRF, Volterra, TI**
Single-chip	Digital controller + Drivers	Power MOSFETs	Passive components	Cost and size tradeoffs	**Marvell, Akros, Volterra**
Chipset	Digital controller	Drivers + Power MOSFETs			**TI, Infineon (Primarion), Volterra**
Integrated (controller + driver)	Digital controller + drivers	Power MOSFETs/ IGBTs			**Exar, iWatt, Marvell**
Discrete (IC)	Digital controller	Drivers		Design felixibility and efficiency focus	**14 out of 21 analyzed IC vendors**

The report maps how the analyzed Digital Power IC vendors address the five major integration options of digital power solutions (including hybrid implementations).

Market segment by product category	High end computing	High end storage	High end networking	Telecom infrastructure	Solar, lighting	Power over Ethernet	Motor control	High end digital consumer	Automotive
Digital power management (DPM) ICs ▪ Board level ▪ Chip level (SoC)	●	●	●	●				●	
Digital power control (DPC) ICs ▪ Software programmable ▪ User-configurable hardware based ▪ Fixed configuration hardware based	● ●	● ●	● ●	● ●	 ● ●	 ●	 ●	● ● ●	● ●

Digital power technology has broadly penetrated to different degrees practically all major end-market segments. Their currently low penetration rates provide a broad base of opportunities. The key market penetration requirement is achieving cost parity with the established analog power solutions.

Understanding the nature of a Digital Power IC vendor's business is critical for investors and foundries engaging with those vendors in order to maximize their longer term business potential beyond the early market entry stage; many entrants have already failed.

IC Vendor	High-end				Solar, Llighting	Power over Ethernet	Motor control	High-end consumer
	Computing	Storage	Networking	Telecom				
Texas Instruments	•	•	•	•			•	
Microchip	•	•		•			•	
Exar	•	•	•	•				•
Akros			•	•		•		
iWatt			•		•			•
Powervation	•	•	•					
CHiL Semiconductor	•	•						
Fairchild	•		•	•	•			•
Intersil	•	•	•	•				
Freescale							•	
Silicon Labs			•				•	•
Infineon	•	•	•	•				
Maxim	•	•	•	•				
Linear Technology	•		•					
Analog Devices	•		•	•				
International Rectifier							•	
STMicroelectronics					•		•	
Marvell	•	•	•	•				•
Volterra	•	•	•					•
Summit Microelectronics								•
IDT		•	•					

Digital Power ICs have numerous and significant implications for silicon foundries. The playing field for foundries is larger in comparison to traditional analog opportunities. The nature of the digital power IC business is favorable to foundries from several aspects:

- New market entrants are fables vendors or IDMs in need of finer process nodes
- Accelerated nodal migration when compared to analog power products
- Potential for larger volume business per customer and product type

Digital power solutions enable and motivate IC vendors to enter into the module business, which has traditionally been the domain of power system vendors. This trend could reshape the traditional business boundary between power system and IC vendors.

The report is structured into seven sections. Section 2 serves as an executive summary providing key findings and implications. Section 3 scopes the digital power IC market and technology trends from seven perspectives:

- Power system design trends
- Power distribution architecture trends
- Power conversion component and material trends
- Digital versus analog power control and management
- Segmentation of digital power control and management ICs
- Segmentation of digital power ICs implementation approaches
- Digital versus hybrid versus analog power ICs – benefits and limitations

Section 4 scopes the market dynamics and segmentation trends from four perspectives:

- Market landscape trends
- Market segmentation of digital power ICs
- Market penetration opportunities and strategies
- Market size and growth trends (2009 to 2014)

Section 5 provides a view of the competitive positions of the 21 participating IC vendors in terms of:

- Comparison of key product portfolio attributes
- Alliances, partnerships, and acquisitions

- Market entry business and product strategies
- End-equipment application targets

Section 6 focuses on the technology aspects of digital power ICs:
- Integration trends
- Process and nodal technology trends
- Implications and opportunities for silicon foundries

Section 7 covers each of the 22 IC vendors in terms of their product portfolios and how they approach the market opportunities for digital power ICs. The coverage of the Power-One power systems vendor is included because its patented technology has significant implications for the overall market for digital power systems as well as for IC vendors.

The high growth market for digital power ICs is in a state of flux characterized by acquisitions, formation of partnerships, and increasing competition. Digital power ICs are not only changing the power management market landscape, but also the role of foundries in the analog/mixed signal market.

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