BCD-based Integration Platform for Analog ICs
A Significant Value-Added Opportunity for IC Vendors

ABSTRACT

The report focuses on an important new opportunity for traditional analog IC vendors as well as new market entrants – an opportunity to significantly increase their market valuation and profitability. The historic path to sustained profitability was to participate in analog domain businesses; an area dominated by entrenched traditional analog IC vendors. The voltage gap between digital core devices and sensors, actuators, and power supplies has created a separate group of highly profitable analog IDM vendors – their well entrenched positions have been built since the IC industry's inception. Traditionally such analog products have been high-performance single-function ICs fabricated by proprietary processes and consistently generating 50%+ gross margins.

Insights provided in this report are the result of our analyses of analog IC vendors and, especially, of markets for power management ICs (PMICs) and increasing use of BCD (Bipolar-CMOS-DMOS) technology in PMICs. The BCD technology platform opens new business and market opportunities to nontraditional analog vendors as well as to new market entrants. The BCD value-added platform is an enabling technology vehicle for accomplishing profit and valuation improvement objectives. It is a technology that offers an attractive new strategic option for entering into the analog domain business in order to exploit the emerging integration opportunities, including previously discrete power transistors.

A system-oriented BCD platform has emerged in the analog domain, and its implementation has been accelerating in both the mainstream and advanced technology nodes since 2005. The BCD integration platform has already made traditional market segmentation and market size estimates largely obsolete.

Report findings are based on our bottom-up analyses of businesses, products, and technologies of 20 analog vendors currently representing more than 60 percent of the total analog market. We validate and illustrate the change by numerous examples ranging from single-function ICs to highly integrated SoC solutions; the platform has already been implemented in all available application types, across the entire analog domain and levels of integration.

Section 2 provides an executive overview of nineteen key findings and their implications.

Section 3 confirms that analog IC vendors have sustained high profitability and valuation; however, major changes in profitability and valuation of IC vendors have started and the economic crisis will accelerate them. Small fables analog IC vendors are now achieving high performance previously reserved for established traditional vendors. The section introduces Petrov Group model of the analog signal processing system and relevant integration issues. It provides a comparison of alternative analog integration platforms in how they address those issues, and highlights the competitive advantages of the BCD technology platform. This section demonstrates with actual examples the technology platform's broad range applicability and cost-effectiveness contrary to popular perception.

Section 4 presents select actual product types and applications using the BCD technology platform to integrate the functionality of analog signal processing systems from sensors to actuators to power supplies. In this section, we relate these products to our model in order to reveal the current scope of analog integration and emerging trends. The main purpose of this section is to demonstrate the current proliferation extent of the BCD technology platform across a broad range of applications and products.
Section 5 scopes the impact of the BCD technology platform on analog market segmentation and the competitive landscape. In addition, it reveals the emerging market opportunities for fables, fab-lite, and foundry vendors as well as new market entrants. This section introduces Petrov Group’s analog market segmentation model that takes into account the emerging analog integration trends and exposes the actual analog market size and growth.

TABLE of CONTENTS

1 Introduction
   Report purpose, benefits and methodology

2 Key Findings and Implications
   Nineteen Key Findings and Their Implications

3 Value-Added Integration Platform for Analog ICs
   3-1 Profitability and Valuation Trends of IC Vendors
   3-2 Attributes of an Ideal Analog Integration Platform
   3-3 Comparison of Analog Integration Platforms
   3-4 Resolving the Intractable Voltage Gap Challenge
   3-5 Wafer versus System Perspective on Platform Cost
      Wafer cost
      Packaging cost
      System implementation costs
   3-6 Platform Cost Myth versus Reality—Examples
   3-7 Petrov Group Model of the Analog Signal Processing System
   3-8 The Analog Perimeter is a Subset of the Analog Domain

4 Examples of Integration Platform Deployment across the Analog Landscape
   4-1 Analog Front-End Performance Boost
   4-2 Analog Front-End and Mixed-Signal Buffer Integration
   4-3 Analog Back-End and Mixed-Signal Buffer integration
   4-4 Power Management Single-Function Performance Boost
   4-5 Power Management Multi-Function Integration
   4-6 Power Management, Mixed-Signal, and Analog Back-End Integration
   4-7 Application-Specific Power Management Integration
   4-8 Analog Back-End Integration
   4-9 Analog Back-End, Mixed-Signal, and Digital Core Integration
   4-10 Analog Domain Integration
   4-11 Analog SoC Integration

5 Petrov Group Model of Analog IC Market Segmentation
   5-1 Traditional Analog IC Market Segmentation
   5-2 Petrov Group Analog IC Market Segmentation
   5-3 Analog Domain Integration Trends
   5-4 Alternative Approaches to System-Level Integration
      Two-die in a package solutions
      External discrete power MOSFET solutions
      Micro modules
   5-5 Analog Products and Technology Segmentation
   5-6 Analog Integration Platform Changes Competitive Arena
   5-7 Software Programmability Trends
LIST of FIGURES

1 FY2004 ADI Revenue Distribution per Customer
2 2004 Valuation versus Revenue Ratios
3 Market Valuation and Gross Margin Revisited
4 Valuation / Revenue Ratio and GM Ranking
5 Valuation / Revenue Ratio and GM Patterns
6 Analog Platforms versus Attributes of an Ideal Integration Platform
7 The Voltage Gap Challenge
8 Bridging the Voltage Gap with Process Technologies
9 Impact of the Technology Platform on the End-Equipment Cost and Performance
   9-A Analog Front-End and Mixed-Signal Buffer Integration
   9-B Analog Back-End and Mixed-Signal Buffer Integration
10 Petrov Group Model of Analog Signal Processing System
11 Analog Perimeter Functions are a Subset of Analog Domain
12 Functional Content of the Cell-Phone System Board
13 Cell-Phone System Board Functional Content
14 Analog Front-End Single-Function Performance Boost
15 Analog Front-End and Mixed-Signal Integration with Software Programmable Inputs
16 Application-Specific Analog Back-End and Mixed-Signal Buffer integration
17 Analog Back-End and Mixed-Signal Buffer Integration—Smart Analog Switch
18 Analog Back-End and Mixed-Signal Buffer Integration
19 Power Management Single-Function Performance Boost
20 Power Management Multi-Function Integration
21 Analog-Back-End, Mixed-Signal Buffer, and Power Management Integration
22 Application-Specific Power Management Integration
23 Analog Back-End Integration
24 Analog SoC Integration with Software Programmability
25 Analog Domain Integration
26 Emerging Analog SoCs
27 Traditional Analog IC Market Segmentation
28 Analog Domain Integration Impact on PMIC Market Size
29 Petrov Group Analog IC Product Segmentation
30 Analog Domain Integration Trends
31 Semiconductor Market View of the Analog Market Trends
32 Analog Domain Market View of the Analog Market Trends
33 Integration Trends of Analog Signal Processing Functionality
34 Analog Product Segmentation versus Process Technology Platforms
35 Process Technology Triangle
36 Advanced Analog Technology Segmentation
37 Linkage of Process Technologies and End-Equipment Applications