

# The Rise of BCD Technology in Power ICs

## Where and Why

### ABSTRACT

Our report delivers a definitive and up-to-date view of high growth power management IC market opportunities and drivers. It focuses on BCD (Bipolar/CMOS/DMOS) technology as one of the key enablers of this growth. Additionally, this report delivers insights into the opportunities and trends of BCD technology relative to alternative approaches.

There is currently a renewed interest in BCD-based PMICs among IC vendors and foundries due to specific market requirements and technology node migration. However, competitive cost-performance dynamics among competing solutions, as well as segment size and growth trends by product and application types, are less understood. A key reason is that traditional segmentation of this complex analog market is both obsolete and misleading.

Our approach utilizes one of our core capabilities by providing a detailed bottom-up product and application analysis of leading PMIC vendors. This analysis identifies and validates mainstream segments, their drivers, and revenue potential. We are aware that such an in-depth understanding has not been publicly available—although it is a necessity for effective investment and strategy decisions.

Contents of this report are presented in eight Sections. Sections 1 and 2 consist of the Introduction and Key Findings, respectively.

Section 3 delivers a big picture view of broader power management market landscape trends in terms of market size, growth, segments, and vendor market shares.

Section 4 captures the highly fragmented PMIC implementation approaches and solutions along three major dimensions: technology segmentation, product segmentation, and key product attributes. Product segmentation focuses on PMIC integration aspects in terms of functional content and the integration of power stages.

Section 5 addresses end-equipment application trends and drivers. It focuses on applications that are the primary users and beneficiaries of various segments of BCD process technologies.

Section 6 addresses process technology trends in PMICs with a focus on BCD technology. Here, we introduce our PMIC Technology Cube model and scope technology segmentation strategies.

Section 7 summarizes BCD PMIC market and application trends, while Section 8 provides analyses of 19 analog vendors. Detailed analyses are provided for 11 leading vendors representing nearly 60 percent of total analog market in 2008.

### TABLE of CONTENTS

#### 1 Introduction

Report Purpose, Benefits and Methodology

#### 2 Key Findings

#### 3 Power Management Market Overview for ICs and Discretes

- Two Views on the Recessionary Impact on IC Demand
- 3.1 Discrete Power Transistor Market
  - Discrete Power Transistor Vendor and Segment Market Shares

- 3.2 Trends in Discrete Power MOSFET Market
- Power Management IC (PMIC) Market
- IC Market Overview – The Big Picture
- Power Management IC Market Segmentation
- Our PMIC Market Size Findings

#### **4 PMIC Approaches and Solutions**

- 4.1 PMIC Products Segmentation
  - General-purpose PMICs
  - Application-specific PMICs
- 4.2 PMIC Generic Model
- 4.3 PMIC Product Types
- 4.4 Key PMIC Product Trends
  - 4.4.1 Power Device Integration Trends
  - 4.4.2 Digital Control vs. Analog Control Trends
  - 4.4.3 System Function Integration Trends
  - 4.4.4 Specific End-Equipment Integration Trends
  - 4.4.5 Specific End-Market Integration Trends
- 4.5 Key PMIC Product Dimensions
  - 4.5.1 Voltage and Current Capability Dimensions
    - Voltage segmentation of the PMIC power plane
    - Current capability dimension of the PMIC power plane
  - 4.5.2 Functional Integration Dimensions
  - 4.5.3 Other PMIC Product Dimension
  - 4.5.4 Insights

#### **5 End-Equipment Application Trends and Drivers vs. BCD Opportunities**

- 5.1 Power Conversion and Regulation Applications
- 5.2 LED Lighting Applications
- 5.3 Battery Charger Applications
- 5.4 Printer Motor and Print Head Driver Applications
- 5.5 Digital Camera Lens Driver Applications
- 5.6 Hard Disk Drive Motor Driver Applications
- 5.7 Audio Power Amplifier Applications
- 5.8 Automotive Applications
- 5.9 Industrial Applications

#### **6 BCD Technology Trends in PMICs**

- 6.1 Process Technology Overview
  - 6.1.1 Function-Oriented Process Technologies
  - 6.1.2 Systems-Oriented Process Technologies
  - 6.1.3 Process Technology Segmentation
- 6.2 PMIC Products vs. Process Technology Trends
- 6.3 BCD vs. Competing Technology Types
  - 6.3.1 Bipolar processes
  - 6.3.2 BiCMOS (Bipolar-CMOS) Processes
  - 6.3.3 BCD (Bipolar-CMOS-DMOS) Processes
  - 6.3.4 CDMOS (CMOS-DMOS) Processes
- 6.4 Analog Signal Processing System Integration vs. Process Technologies
- 6.5 BCD Usage Trends Among PMIC Vendors and Foundries
- 6.6 Alternative Approaches to BCD Integration

#### **7 BCD PMIC Market and Application Trends**

- General-purpose versus Application-specific BCD PMIC Market

BCD PMIC Market Shares  
Bifurcated Nodal Distribution of BCD PMICs  
BCD PMIC Nodal Distribution (2004 to 2014)  
Summary BCD PMIC Market Overview

## **8 Vendor-Specific Analyses**

### **8.1 Detailed Analyses of Leading Vendors**

- 8.1.1 Texas Instruments (TI)
- 8.1.2 National Semiconductor
- 8.1.3 Linear Technology
- 8.1.4 STMicroelectronics (STM)
- 8.1.5 Freescale Semiconductor
- 8.1.6 Infineon Technologies
- 8.1.7 Intersil
- 8.1.8 Maxim Integrated Products
- 8.1.9 ON Semiconductor
- 8.1.10 Analog Devices
- 8.1.11 NXP Semiconductor

### **8.2 Overview of Other Analyzed Vendors**

- 8.2.1 Semtech
- 8.2.2 Richtek Technology
- 8.2.3 Micrel
- 8.2.4 Power Analog Microelectronics (PAM)
- 8.2.5 Monolithic Power Systems (MPS)
- 8.2.6 Dialog Semiconductor
- 8.2.7 AnalogicTech
- 8.2.8 Rohm Semiconductor

## **LIST of FIGURES**

- 3.1 Post-recession IC Market Growth
- 3.2 Semiconductor Market Overview—2008
- 3.3 Semiconductor Products Classes
- 3.4 Top 20 O-S-D Vendors
- 3.5 Discrete Semiconductor Market—2008
- 3.6 Power Transistor Market—2008
- 3.7 Power MOSFET (below 200V) Market—2008
- 3.8 AMI Process Portfolio Example Based on Voltage and Gate Count
- 3.9 STM's VIPower Products
- 3.10 IC Market Overview
- 3.11 IC Sector Perspectives
- 3.12 PMIC Market Trends
- 3.13 General-Purpose and Application-Specific PMICs
- 3.14 2008 PMIC Vendor Market Shares (\$21B)
- 3.15 GP and AS PMIC Market Shares
- 4.1 PMIC Products Segmentation
- 4.2 Generic PMIC Model
- 4.3 PMIC Power Plane (100V-30A example)
- 5.1 ADI's Linear Voltage Regulator (LDO) (BCD)
- 5.2 Linear's DC/DC Switching Regulator (BCD)
- 5.3 Freescale's LED Driver (BCD)
- 5.4 Freescale's Battery Charger (BCD)
- 5.5 Printer Motor Driver Applications
- 5.6 SABRe Motor Control Driver (BCD)

- 5.7 Print Head Driver PMIC Application (BCD)
- 5.8 Camera Lens Driver Application (BCD)
- 5.9 Hard Disk Drive Motor Driver Applications (BCD)
- 5.10 Audio Power Amplifier Applications (BCD)
- 5.11 STM's Automotive Applications (BCD)
- 5.12 Freescale's Automotive Application (BCD)
- 5.13 ADI's Industrial Control Application (BCD)
- 6.1 Process Technology Triangle
- 6.2 Power IC Process Technology Segmentation - *PMIC Technology Cube*
- 6.3 PMIC Process Technology Segmentation vs. End-Equipment Applications
- 6.4 PMIC Products vs. Process Technologies
- 6.5 Overview of Integrated Device Structures
- 6.5 A Integrated Device Structures vs. Current Flow
- 6.6 Analog Signal Processing System Integration vs. Process Technologies
- 6.7 Select Analog Vendors and Merchant Foundries Using BCD Technology
- 6.8 PMIC and BCD Revenues of Leading Analog Vendors
- 7.1 2008 General-Purpose vs. Application-Specific BCD PMICs
- 7.2 General-Purpose vs. Application Specific PMIC Market
- 7.3 2008 BCD PMIC Market Shares
- 7.4 BCD PMIC Nodal Distribution
- 7.5 BCD PMIC Market Overview and Market Shares