

White Paper

# Freescal e Advances into Multi-Market Analog and Power Management

By Databeans, Inc.

---





# Abstract

---

Freescale Semiconductor has a deep-rooted history in the analog market. The company has rejuvenated its analog focus and has committed to reengage by bringing to market new, innovative products that combine high-performance analog with embedded control. The company today controls a significant share of the analog market and is currently ranked seventh worldwide. With more than 25 years of experience in signal conditioning and control, Freescale is poised for significant growth in the dynamic analog market—a market worth \$37 billion in 2006.

This white paper summarizes Freescale’s plans for executing a strategy that is expected to drive a significant increase in the company’s served markets in application-specific analog and to propel the company into broader multi-market areas and power management. With core competencies and smart power technologies already in place, Freescale is well positioned to succeed in its analog growth strategy.

# Contents

---

- Worldwide Analog ..... 1
- Freescale’s Current Position in the Analog Market.....4
- Building Momentum .....5
- SMARTMOS .....6
- Advancing Analog Expertise .....6
- Balanced Technical Sales Strategy.....7
- Conclusion .....7

# Worldwide Analog Market

The market for analog components is thriving, with an estimated compound annual growth rate of 12 percent, outperforming many other digital integrated circuit markets. At this pace, the analog market is expected to reach \$68 billion with nearly 139 billion units shipped by 2012. The largest consumption region for analog is Asia Pacific, but design and production take place all over the world.

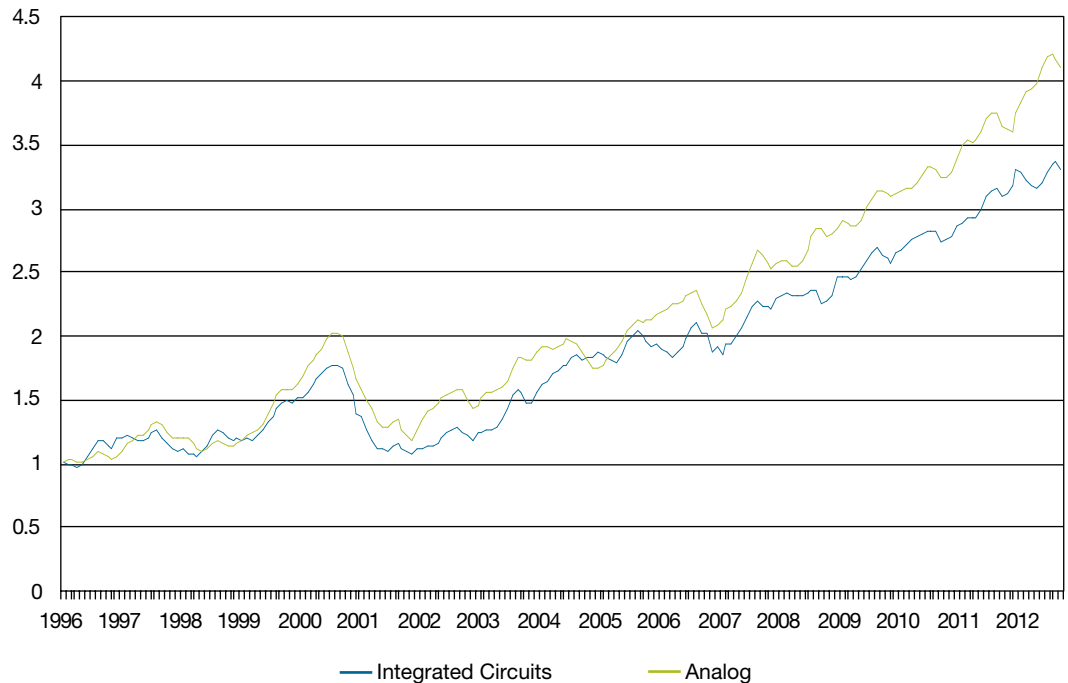
Analog is a highly competitive market, with some players focused on specific product categories, while others have comprehensive portfolios that feature products in all areas of analog. Business start-up activity has accelerated. There has been considerable activity with new business development in analog, particularly in developing new technologies, but the barriers to entry remain great as engineering talent, channel strength, and the requirement for a global presence make it difficult for start-ups to get a foothold.

Figure 1 illustrates the trend in analog demand as compared to the digital circuit market. Excluding the unpredictable memory market, the figure shows how analog growth has consistently outperformed the digital market since the late 1990s, and how the disparity in the trend curves is expanding.

Paradoxically, analog growth has been stimulated by the tremendous worldwide increase in digital media content. Not only has traditional media been replaced by digital, such as with DVDs replacing VHS tapes, but the capability to create content has risen exponentially.

**Figure 1: Worldwide Integrated Circuit and Analog Revenue Normalized Growth Curves Compared**

Source: Databeans Estimates, July 2007



This means that the average consumer now has the ability to create and store a digital experience, be it on YouTube, a cell phone address book, or digital pictures of the family vacation stored on a home PC. All of this burgeoning content drives the need for access. This consumer need, in turn, is enabling the market for digital electronics capable of delivering a rich multimedia experience, thanks in part to high-performance analog circuitry. iPod (and soon iPhone), Wii and Blu-ray are all examples of new products that have been brought to market with overwhelming success.

In 2006, worldwide analog revenue reached nearly \$37 billion and constituted 18 percent of the integrated circuit market. The analog market consists of application-specific circuits and multi-market products that condition, convert, regulate and amplify real-world signals so that they can be used by digital electronics. As consumers use more digital electronic products, the demand for the required analog components will continue to rise.

**Table 1: Worldwide Analog Market Forecast**

Source: Databeans Estimates, July 2007

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2007-2012 CAGR
<b>\$M</b>	31,367	31,922	36,940	38,685	43,780	48,911	53,142	59,264	66,863	12%
<b>MU</b>	52,305	57,922	69,925	76,621	86,170	99,189	108,669	122,223	138,969	13%
<b>ASP</b>	\$0.60	\$0.55	\$0.53	\$0.50	\$0.51	\$0.49	\$0.49	\$0.48	\$0.48	-1%

Multi-market analog products include those that convert analog signals to digital, perform power conversion and provide interconnects between subsystems. Each product plays an exclusive role in digital designs, while crossing over into other application markets. For example, the same power management circuit used in a mobile phone might also be used in an in-vehicle multimedia system. Analog product design is trending toward higher performance devices that garner higher margins in excess of 60 percent.

**The multi-market products in analog are segmented as follows:**

- Amplifiers—high speed, precision, low power, low voltage and general purpose
- Comparators—high speed and general purpose
- Data Converters—analog to digital, digital to analog, switches and muxes
- Interface—serial, parallel and high speed
- Power—linear regulators, switching regulators, hot swap, Power over Ethernet (PoE), references, smart battery management and digital power

Along with high margins, the multi-market product segment has stable prices and longevity in terms of design in life. Some segments are trending toward higher prices, particularly data conversion and power—two product areas where customers are demanding higher performance and precision.

Application-specific analog products are highly integrated solutions that combine two or more analog functions, providing a lower system cost solution optimized for a specific electronic design. The trade-off is lower margins, in some cases—but more importantly, a large market opportunity is presented in high-volume electronics, such as mobile phones and computers.

**Analog application markets are segmented as follows:**

- Automotive—safety systems, drivetrain, entertainment and comfort
- Computers—mass storage motor control, peripheral interface and displays
- Consumer—media players, home media and appliances
- Communications—mobile phones, data networking and infrastructure
- Industrial—health care, commercial/process control, test equipment and military/aerospace

The fastest growth markets for all analog components are communications and consumer. Freescale plans to target both of these markets. Voltage regulators, smart battery management and special-purpose wireless analog all contribute to the 15 percent growth rate expected on average in communications. In the consumer space, power, interface and integrated special-purpose analog all contribute significantly. The consumer market for analog is expected to increase 12 percent each year on average.

**Table 2: Worldwide Analog Market Forecast by Market Segment**

Source: Databeans Estimates, July 2007

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2007-2012 CAGR%
<b>Automotive</b>	4,537	4,372	5,084	5,819	6,341	6,997	7,289	7,555	8,129	7%
<b>Computer</b>	5,442	6,027	6,543	6,687	6,908	7,901	8,680	9,139	10,354	9%
<b>Consumer</b>	6,706	6,326	7,381	7,470	8,562	9,382	10,451	11,562	13,019	12%
<b>Wireless</b>	8,661	9,330	11,273	12,253	15,494	17,513	19,056	23,142	26,352	17%
<b>Wired</b>	1,481	1,737	1,794	1,878	1,551	1,872	2,035	1,779	2,543	6%
<b>Industrial</b>	4,541	4,130	4,864	4,579	4,923	5,246	5,632	6,088	6,466	7%
<b>Total</b>	31,367	31,922	36,940	38,685	43,780	48,911	53,142	59,264	66,863	12%

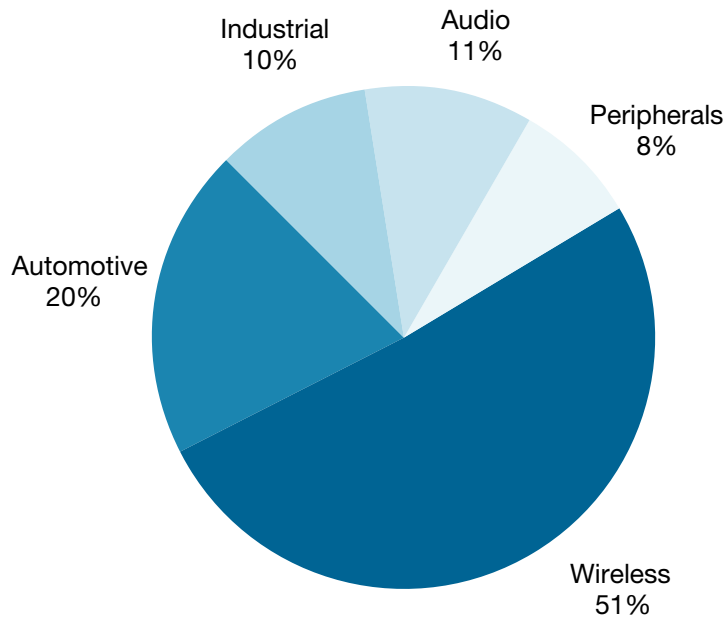
## Freescale's Current Position in the Analog Market

According to a survey of semiconductor suppliers administered in January 2007, Freescale is the seventh largest analog supplier worldwide. Freescale's analog offering consists of power management solutions, radio frequency (RF) ICs, integrated transceivers and switches for application-specific markets.

Databeans estimates that the company's Served Available Market (SAM) has reached \$18 billion. This market includes application-specific analog products used for audio, computer peripherals, wireless, automotive and industrial motor control.

**Figure 3: 2006 Worldwide Freescale Current SAM by Product Class**

Source: Databeans Estimates, July 2007



**2006 Freescale SAM = \$18.4 Billion**

These markets, including wireless and audio specifically, are growing nicely. Combined revenue garnered from these specific analog markets is expected to increase at an average annual growth rate of 11 percent.

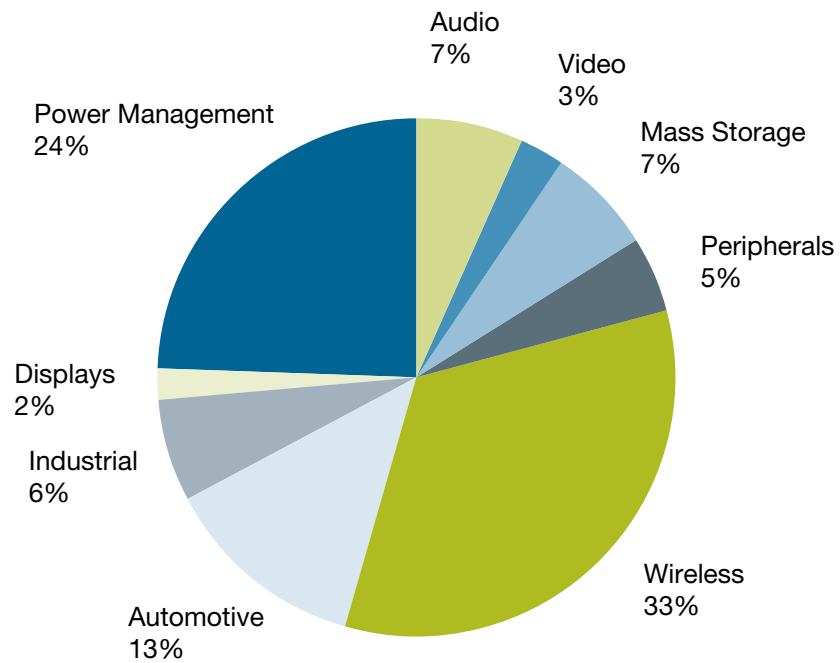
Following a planned full-scale initiative, Freescale's current served market is expected to increase dramatically to a market worth \$29 billion. This market includes the current segments in which Freescale currently plays, as well as new areas that are driving analog revenue.

This new and revised SAM is growing at a faster rate than Freescale's current SAM, and is expected to be 40 percent larger by 2012, due to the high-growth areas of digital consumer and efficient power management. The broader SAM is well diversified, too, which provides stability during changing microeconomic conditions.

With the successful completion of this initiative and with Freescale's longstanding reputation as a top player in embedded control and automotive, the company's perception as a leader in analog is expected to see significant growth.

**Figure 3: 2006 Worldwide Freescale Target SAM by Product Class**

Source: Databeans Estimates, July 2007



**2006 Freescale Target SAM = \$28.6 Billion**

## Building Momentum

Freescale has been a major player in the analog market for more than 25 years. The company's SMARTMOS™ differentiated process technology is an enabler for highly integrated, high-performance analog and power management products. Leveraging this technology, Freescale plans to compete in this new SAM by bringing to market vertically focused integrated solutions for the digital consumer—smart power and products that span across multiple high growth market segments and applications, such as MP3 players, mobile phones and chargers, digital televisions and medical electronics.



# SMARTMOS

---

Freescale's SMARTMOS technology provides a means for integrating high-performance analog blocks along with high-performance processing cores, creating a system-level solution on a single chip or in a single package. The company plans to augment this technology by increasing the current level of analog engineering expertise and implementing a balanced technical selling strategy using both direct sales execution and pooling existing distribution channels.

SMARTMOS technology is, in essence, the ability to provide "intelligent integration." It enables Freescale to bring to market analog products combined with a microcontroller and memory. As one of the world's largest suppliers of microcontrollers, Freescale is an acknowledged market leader, known for innovation and technology advancements in embedded control solutions.

SMARTMOS is a high-voltage, mixed-signal process in which high-density logic and precision analog co-exist. The process also provides the capability to add power MOSFETs, transient protection, system diagnostics and control onto a single die. For high power designs, Freescale offers a system-in-package solution, in which HDTMOS devices are combined with a SMARTMOS device for today's industrial applications and other embedded designs.

Freescale's plans for SMARTMOS technology have already begun in power management and will soon branch out into other product areas. Freescale's Power over Ethernet (PoE) solution is an example of the SMARTMOS technology advantage. PoE enables electronic equipment to draw power over standard LAN cables, eliminating the need for additional power cords and outlets.

This Freescale solution, announced last fall, combines a microcontroller along with a PWM controller to provide a cost-effective alternative to AC power for a wide variety of electronics in both the consumer and commercial networking space. PoE technology is gaining momentum quickly and already supports devices that require up to 13 watts of power. A standard is under development that will enable PoE to support up to 30 watts.

## **Freescale's SMARTMOS technology enables single-chip solution development for power management specifically in the following areas:**

- High-voltage/high-current power circuitry controlled by high density logic
- Advanced low  $RDS_{ON}$ , low-gate charge, performance MOSFETs
- Integrated loop compensation components

Freescale will unveil additional analog and power management devices as the company executes its analog growth strategy in the second half of 2007 and beyond. Plans under development include new market solutions that may result in next-generation designs that increase reliability and performance while reducing discrete component usage by up to 50 percent.

## **Advancing Analog Expertise**

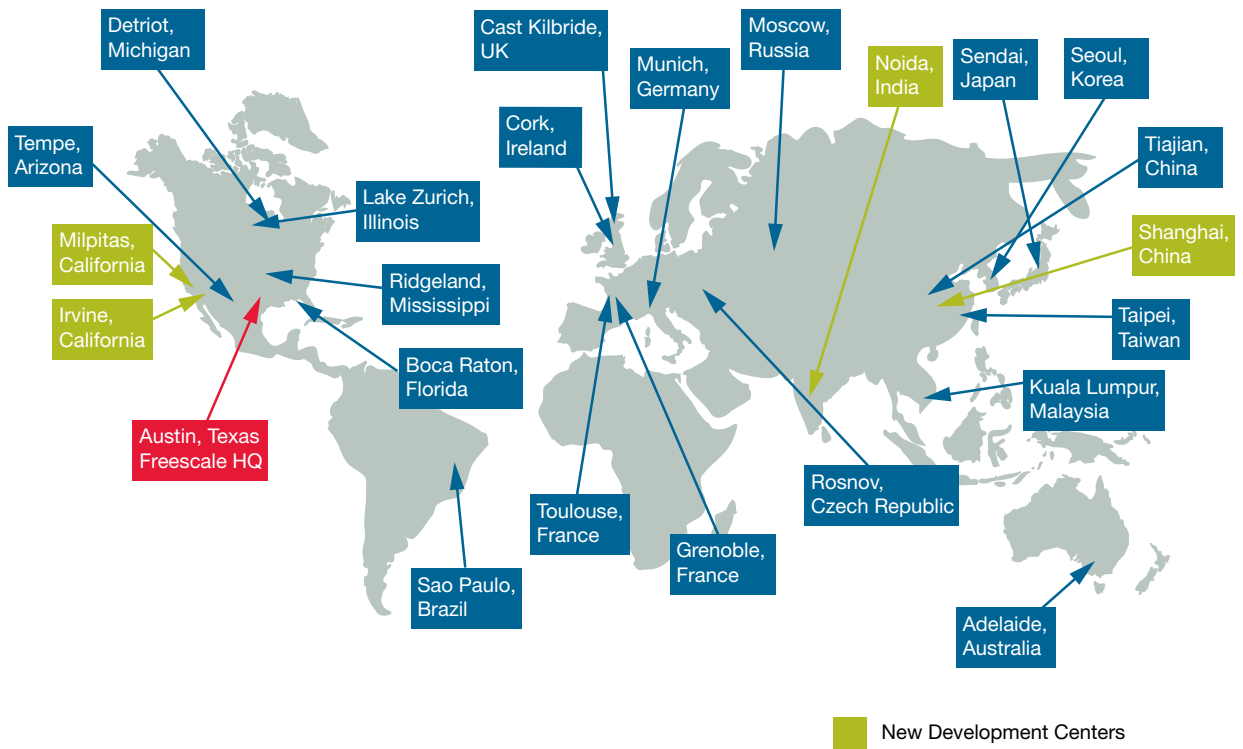
---

Adding to its enabling SMARTMOS technology, Freescale plans to increase its current level of analog design expertise. Freescale has added four new analog development centers worldwide with two in India and China, two hotbed regions in terms of analog demand. The other two centers are located in Northern California's Silicon Valley and in Southern California.

Through strategic recruitment, the company plans to increase the level of analog engineers to meet the current requirements of its analog growth initiative. By adding new design engineers, specifically in China and India, the gap between the customer base and supplier is drawing closer. Responsiveness to customer requirements is quickly growing as a priority for OEMs choosing IC providers. A regional presence is critically important in all IC markets, and particularly in the analog industry.

**Figure 4: Freescale Semiconductor Analog Development Centers Worldwide**

Source: Freescale Semiconductor



## Balanced Technical Sales Strategy

Freescale has a world-class sales force that extends globally and is well-positioned in the highly active China market and other countries in the Asia-Pacific region. By targeting high-growth application markets and by using the high-volume distribution channel for analog, Freescale will be able to connect new customers with new products. Combined, Freescale's process technology capability, added analog expertise and focused sales strategy create the potential for profitable advantages in the larger analog market.

## Conclusion

---

The analog market is attracting many new competitors, and many will struggle for market share gains as they work to create the right mix of products to meet customer demands. Few will achieve the right balance. With core competencies in place and a recharged focus on high-performance analog markets, Freescale is advancing in this industry with the right mix of signal conditioning and embedded control.

Databeans considers Freescale to be a significant player today in the analog market. With the successful execution of its analog growth strategy, Freescale can strengthen its impact upon market segments now dominated by other analog suppliers. With resources that are already available, and a market to serve with the right mix of analog products and technologies, the perception of Freescale as a leading microcontroller provider will expand as the company creates a new reality of being a system solution provider capable of successfully combining both digital control and high-performance analog technologies.

## About Databeans, Inc.

---

Databeans, Inc., headquartered in Reno, Nevada, USA, is an internationally recognized market research firm focused on the semiconductor and electronics industry. Databeans offers a full coverage research service that covers over 150 electronic applications, 90 different semiconductor products, and over 80 suppliers. For more information, please visit [www.databeans.net](http://www.databeans.net).

## How to Reach Us:

### Home Page:

[www.freescale.com](http://www.freescale.com)

### Web Support:

[www.freescale.com/support](http://www.freescale.com/support)

### USA/Europe or Locations Not Listed:

Freescale Semiconductor, Inc.  
Technical Information Center, EL516  
2100 East Elliot Road  
Tempe, Arizona 85284  
+1-800-521-6274 or +1-480-768-2130  
[www.freescale.com/support](http://www.freescale.com/support)

### Europe, Middle East, and Africa:

Freescale Halbleiter Deutschland GmbH  
Technical Information Center  
Schatzbogen 7  
81829 Muenchen, Germany  
+44 1296 380 456 (English)  
+46 8 52200080 (English)  
+49 89 92103 559 (German)  
+33 1 69 35 48 48 (French)  
[www.freescale.com/support](http://www.freescale.com/support)

### Japan:

Freescale Semiconductor Japan Ltd.  
Headquarters  
ARCO Tower 15F  
1-8-1, Shimo-Meguro, Meguro-ku,  
Tokyo 153-0064, Japan  
0120 191014  
+81 3 5437 9125  
[support.japan@freescale.com](mailto:support.japan@freescale.com)

### Asia/Pacific:

Freescale Semiconductor Hong Kong Ltd  
Technical Information Center  
2 Dai King Street  
Tai Po Industrial Estate,  
Tai Po, N.T., Hong Kong  
+800 2666 8080  
[support.asia@freescale.com](mailto:support.asia@freescale.com)

### For Literature Requests Only:

Freescale Semiconductor  
Literature Distribution Center  
P.O. Box 5405  
Denver, Colorado 80217  
1-800-441-2447  
303-675-2140  
Fax: 303-675-2150  
[LDCForFreescaleSemiconductor@hibbertgroup.com](mailto:LDCForFreescaleSemiconductor@hibbertgroup.com)

### Databeans, Inc.

Home Page: [www.databeans.net](http://www.databeans.net)  
e-mail: [sales@databeans.net](mailto:sales@databeans.net)  
Phone: 1-775-624-2881

Information in this document is provided solely to enable system and software implementers to use Freescale Semiconductor products. There are no express or implied copyright license granted hereunder to design or fabricate any integrated circuits or integrated circuits based on the information in this document.

Freescale Semiconductor reserves the right to make changes without further notice to any products herein. Freescale Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Freescale Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Freescale Semiconductor does not convey any license under its patent rights nor the rights of others. Freescale Semiconductor products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Freescale Semiconductor product could create a situation where personal injury or death may occur. Should Buyer purchase or use Freescale Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold Freescale Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Freescale Semiconductor was negligent regarding the design or manufacture of the part.



Freescale™ and the Freescale logo are trademarks of Freescale Semiconductor, Inc.  
All other product or service names are the property of their respective owners.  
© Freescale Semiconductor, Inc. 2007  
Document Number: DATABEANWP  
REV 0

