

The Company Profile...

Xilinx

Thumbnail Sketch

Headquarters: 2100 Logic Drive, San Jose, California 95124, USA; www.xilinx.com
FY 2008 Sales: \$1,841 million
R&D: 19% of sales
Net Margin: 20.3%
Net Cash Provided by Operating Activities: \$581 million
Employees: 3,500
Sales per Employee: \$526,000
Working Capital: \$1.475 billion as of December 27, 2008
Stockholders' Equity: \$1.668 billion as of December 27, 2008
Market Capitalization: \$5.12 billion as of February 6, 2009

Automotive

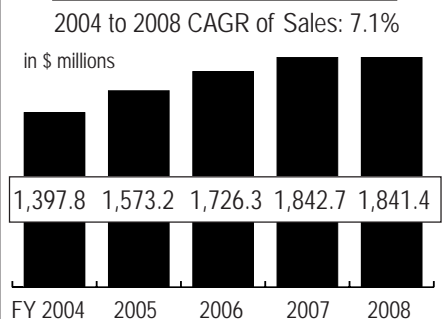
FY 2008 Sales Estimate: \$60 million (*Hansen Report estimate*)
Main Product: Field programmable gate arrays
Leading Applications: Infotainment, driver information, driver assistance
Leading Solutions: Image processing and recognition, video and graphics, vehicle networking and connectivity
The 2008 fiscal year ended March 29, 2008

Background

Xilinx was founded and incorporated in 1984 as a fabless manufacturer, outsourcing all aspects of chip production including wafer fabrication, sorting, assembly and test. Xilinx is a world leader in the design and development of programmable logic devices (PLDs). Also included in Xilinx's portfolio are software design tools to program the PLDs, predefined system functions (IP cores), design services, customer training, field engineering and tech support.

The largest end market for Xilinx PLDs is the communications industry. Automotive accounts for just 3% of total sales today, according to our estimate, but the business has been growing by more than 20% per year since 2004, when Xilinx created a team to focus on the automotive market. Even with the drastic downturn automotive production has taken in the last several quarters, Xilinx expects automotive sales for its fiscal year ending

Xilinx Sales and Net Margin

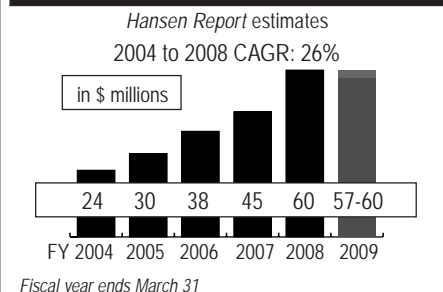


Net Margin by Fiscal Year

2004	21.7%
2005	19.9%
2006	20.5%
2007	19.0%
2008	20.3%

Fiscal year ends March 31.

Xilinx Automotive Sales by Fiscal Year (Estimated)

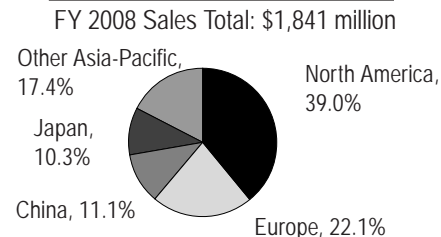


March 31, 2009, will be flat or down just 5%. The company expects sales to rebound in fiscal 2010, aided by a number of new 2010 model year programs scheduled to launch this summer. Xilinx's top automotive applications are infotainment, navigation and rear seat entertainment systems.

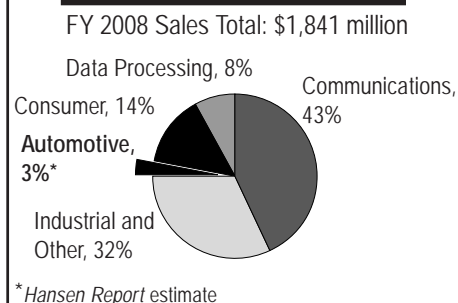
Xilinx's automotive team is made up of automotive industry veterans, each with many years of OEM, tier-one or automotive semiconductor supplier experience. These applications experts work directly with customers in North America, Europe and Japan, supported by teams of field application engineers, quality specialists, sales engineers and manufacturer's reps.

Harvey Steele is vice president of Xilinx's Automotive, Consumer and ISM (Industrial Scientific and Medical) business. He is responsible for automotive

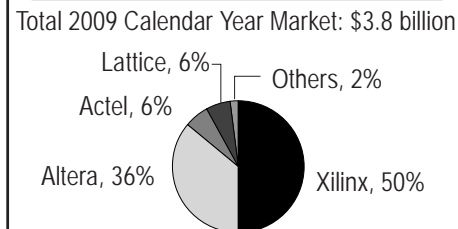
Xilinx Sales by Region



Xilinx Sales by End Market



Global Programmable Logic Device Market by Supplier



strategy and directs marketing, product planning and the development of targeted design platforms. Mr. Steele has been involved in the auto industry for more than 25 years. Before coming to Xilinx he worked for On Semiconductor, Analog Devices, ST Microelectronics and Ford Electronics.

Kevin Tanaka, senior manager of worldwide automotive marketing and product planning, is responsible for leading the development of Xilinx's automotive product line of FPGAs and CPLDs. Mr. Tanaka joined Xilinx in 2004 from NEC Electronics America.

Global Market for FPGAs

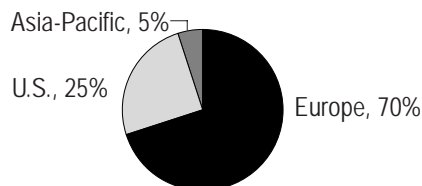
The automotive market for FPGAs developed fastest in Europe; about 70% of what Xilinx sells to automotive customers ends up there. That percentage will

The Company Profile Continued

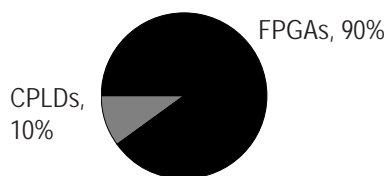
Xilinx Automotive Sales FY 2008 Total: \$60 Million

All are Hansen Report estimates

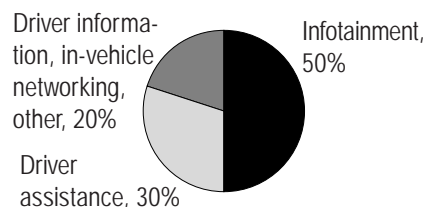
By Region Based on Ship-to Address



By Product



By Application



change soon, as design activity has picked up elsewhere, especially in the U.S. and Japan. In Japan alone, the company is working on more than 50 projects involving FPGAs and CPLDs. Xilinx expects well over half of those projects will come to market in the coming years. Five years from now, Xilinx expects that European customers will account for half its automotive business, with U.S. and Asian customers accounting for the rest.

The Japanese automotive industry rarely makes significant purchases of technology from Western suppliers unless the technology is not available from Japanese suppliers. "We are in a unique position in that this is probably the only semiconductor technology of any significance that can't be supplied by the Japanese," noted Mr. Steele. Xilinx, which often calls on engineers at Honda, Toyota and Nissan, has been working closely with Denso, Panasonic Automotive Systems and Honda Elesys, among others.

A Case for FPGAs

Xilinx designs, develops and markets field programmable gate arrays (FPGAs),

Xilinx's Top Five Automotive Customers

Listed Alphabetically:

Autoliv
 Bosch
 Continental
 Delphi
 Harman International

Distinctions Claimed by Xilinx

- ◆ Invented the field programmable gate array in 1984
- ◆ Xilinx has generated positive cash flows every year since it became a publicly traded company in 1990.
- ◆ The first semiconductor company to establish a fabless manufacturing business
- ◆ The first programmable logic company to employ 180-, 150-, 130-, 90-, 65- and 45-nanometer process technologies
- ◆ Xilinx delivers 98% of all high-end 65nm FPGAs made, worldwide.
- ◆ Greater than 50% share of the automotive market for programmable logic devices

which are programmable logic devices (PLDs) programmed in the field by the customer.

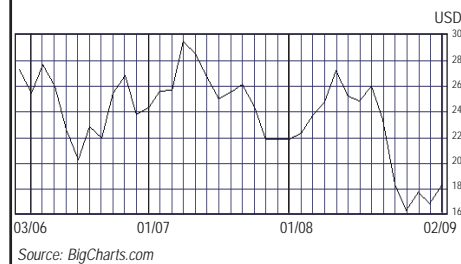
Based on a matrix of configurable logic blocks connected via programmable interconnects, each device is essentially a blank slate. The program bitstream, or code, is stored somewhere in the system, often in flash memory, and each time the power is turned on the bitstream is downloaded to the FPGA, making it a functioning hardware part.

◆ Shorter Development Cycle

The most appealing thing about FPGAs is they can be brought to market much more quickly and less expensively than ASICs (application specific integrated circuits) or ASSPs (application specific standard products), whose designs are fixed at the foundry and can't be changed without redoing the chip. No layout, mask or other manufacturing steps are needed in FPGA production.

Automotive OEMs struggling to close the gap with consumer electronics cycle times can appreciate the benefits of designing FPGAs into their infotainment

Xilinx Three-Year Stock Price History



systems. "We are seeing the demands of the industry changing very quickly. The cycle times are shortening, and FPGA is really a technology that allows our customers to be able to keep up with those demands," noted Mr. Tanaka.

In some typical automotive infotainment and driver assistance applications, FPGAs can speed up time to market by six to 12 months compared with similar systems that use ASICs. Infotainment applications using FPGAs typically take 18 to 24 months to develop; driver assistance applications take two and a half to three years.

◆ Reduced System Costs

FPGA chips are larger compared to ASIC or ASSP chips, so at a pure silicon level, in high volumes, FPGAs are always more expensive per unit. But when development costs are taken into account, FPGAs are often a less expensive solution, particularly when unit volumes are in the hundreds of thousands to low millions. And since FPGAs can take on various logic, processor and DSP functions, a single device can substitute for a number of components, further reducing system cost.

The case for FPGAs improves as chip geometries shrink with each new generation. "Over the last 8 to ten years, process capability has yielded a 10-times reduction in cost," said Mr. Steele.

"We have been moving faster than Moore's Law," pointed out Mr. Tanaka, "because of the process nodes and because we can use the same silicon, since it's blank silicon, across so many different applications and different markets. We get terrific economies of scale." Automotive FPGAs from Xilinx range in cost from about \$2 at 90nm up to \$30 each.

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Xilinx

Most of the Xilinx FPGAs used today in automotive applications are made using 90nm processes, but in February 2009 Xilinx introduced its next generation flagship, high-performance Virtex product family and low-cost Spartan FPGAs. These devices are built on 45nm process technology, which will further improve the economic case for FPGAs. Built for connectivity and low power, the Spartan-6 family will let automotive developers meet demand for new features while reducing system costs by up to half for lower power products.

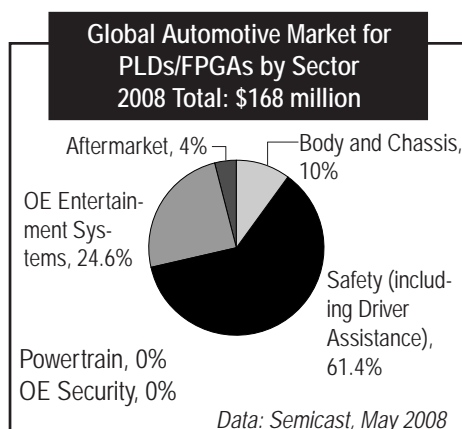
◆ Reprogrammability

Another advantage of FPGAs is their reprogrammability. "Because the program is stored in flash memory or in the memory on a micro, if a carmaker finds a bug or wants to add a feature after the vehicle is built, a new bitstream can be downloaded, perhaps at the dealership," explained Mr. Tanaka. "With new consumer electronics features coming out so quickly, some tier ones are actually leaving 10% to 25% of the FPGA density unused so more functions can be added during the life of the vehicle."

◆ Platform Scalability

One feature of Xilinx's product line that makes it especially suitable to automotive applications and further distinguishes FPGAs from ASICs, is the way FPGA solutions can be scaled to meet different vehicle platform requirements for an OEM or tier one. Mr. Steele noted, "There are issues with changing standards and interfaces, and there is a drive to platform-based designs. A tier one needs to be able to do one hardware implementation that they could scale to, for example, a low-line, mid-line and high-line vehicle platform within an OEM, or one they could differentiate for several OEMs."

For example, the Xilinx Spartan-3E FPGA comes in five different logic densities. Three of the variants—250K, 500K and 1.2 million system gates—use the same package. "That lets the customer develop one board and if it is for a high-end car, you put in a 1.2 million system gate device because you need all the features. If it is a mid-tier car, you can put in



a 500K device and only apply the functions you need," explained Mr. Tanaka.

Applications

Infotainment systems including head units and rear-seat entertainment account for half of Xilinx's automotive applications. Not only is the infotainment market fragmented, which limits production volumes, but because it is subject to quickly changing consumer tastes, product lifecycles are relatively short. And that makes FPGAs, which are relatively inexpensive to develop, a good fit. FPGAs are well suited to high-resolution video. They have also been especially useful in driver assistance systems which process raw video images in real time.

A Tipping Point

With each generational step in semiconductor densities, the case for FPGAs replacing ASICs and ASSPs improves. Not only does the cost of each FPGA chip decline, but because the fixed costs to develop ASICs and ASSPs dramatically goes up with each new generation, larger and larger markets are needed to make the investments in ASIC and ASSP development pay off. Each year there are fewer and fewer ASIC starts.

"We are getting close to a tipping point in some automotive applications, and past it in others, where it makes sense to use FPGAs in place of ASICs and ASSPs," declared Mr. Tanaka. "ASICs and ASSPs will always have some segments of the market, especially where volumes are high (such as in powertrain controllers and basic radios). But in the infotainment and driver assistance applications we have targeted, we are seeing more and more market fragmentation. Those

Accelerating Growth of Automotive FPGA Usage

\$ millions

	2008	2015	CAGR
ASIC (Gate arrays and standard cell logic ICs)	1,618	2,033	3.32%
ASSP (32-/64-bit uC and DSP)	2,392	4,155	8.21%
PLD/FPGA	168	414	13.75%

Data: Semicast, May 2008

Another promising application of FPGAs is in hybrid instrument clusters, which combine analog instruments with multifunction displays. Also promising are driver assistance applications such as lane departure warning, and sign and pedestrian recognition that benefit from the parallel processing power available from Xilinx's DSP48a MACs. Xilinx low-end Spartan-3A DSP FPGAs can achieve some of the highest DSP performance, calculating more than 350 billion multiply-accumulate operations per second.

Programming FPGAs

Despite the many advantages of FPGAs, one obstacle to their adoption in the automotive industry has been the way they are programmed. Most of the engi-

lower volumes definitely favor FPGAs."

"We already have DSP capability in the FPGA and we have 32-bit soft microprocessors," added Mr. Steele. "And in our high-end FPGAs we have hard microprocessors. There are many automotive applications where FPGAs can be the central chip."



The Company Profile Continued

R&D Facilities

Xilinx R&D Centers
 San Jose, California
 Austin, Texas
 Longmont, Colorado
 Dublin, Ireland
 Singapore
 Edinburgh, Scotland
 Hyderabad, India

Xilinx Alliance Program Member Facilities
 Xylon – Croatia
 Mocean Laboratories – Sweden
 Si-Gate – Germany

Xilinx collaborates with Alliance Program members and others to supply development platforms that include Xilinx silicon devices, demo/development boards, application specific IP, software libraries and design tools optimized for automotive requirements. Other Alliance Program members include Apical and OmniVision Technologies.

Xilinx supplied integrated XA (automotive) FPGA and connectivity IP for Intel's Low Power In-Vehicle Infotainment Reference Design targeting automotive head units.

neers who program DSPs and microcontrollers use C language. But FPGAs are programmed using VHDL or Verilog, two high-definition programming languages.

“That has been a barrier, but it's coming down,” said Mr. Tanaka. “Over the last few years Xilinx has provided training to numerous automotive engineers on VHDL and Verilog, and we are working on a number of initiatives with partners who are developing tools.” So-called “C-to-gates” tools are being developed that will convert C programs into FPGA bitstreams. The company is also working with The Mathworks to let engineers generate bitstreams directly from the MATLAB environment.

CPLDs

Roughly 10% of Xilinx's automotive sales comes from CPLDs (complex programmable logic devices), which are essentially low cost, less-than-two-dollar versions of FPGAs. CPLDs usually have fewer than 10,000 system gates. A typical automotive application uses CPLDs to complement microprocessors that don't have enough pins to handle LED backlighting in instrument clusters. They are also used for I/O interfacing, bridging various electrical standards for getting sig-

nals on and off the chips, and to fix logic problems that come up from time to time with ASICs.

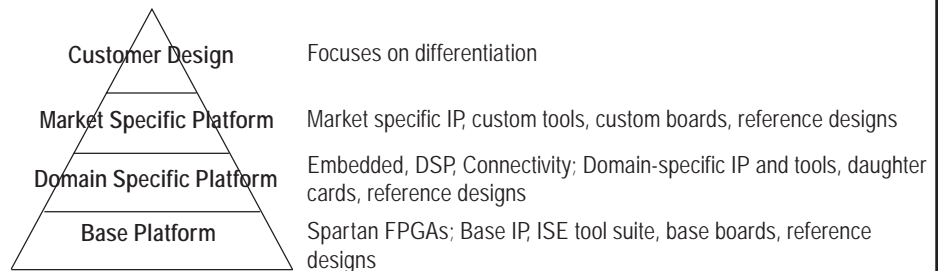
Targeted Design Platforms

The fact that FPGAs start out as blanks has made it difficult for some customers to embrace what is so special about them: their remarkable flexibility. So the company has picked out three automotive applications—driver assistance, driver information and infotainment—where FPGAs are especially worthwhile and developed *targeted design platforms* for each of them. These targeted design platforms put on the table much of what is required to bring the application to market, while leaving room for the customer to innovate.”

Working together with third parties, who are part of the Xilinx Ecosystem, and Xilinx's own internal IP groups, each design platform contains FPGA silicon, blocks of IP, demonstration boards, development platforms, tools and more, so customers can spend less time developing the infrastructure of an application and more time creating their unique value in the design. ♦

Targeted Design Platform Breakout

Xilinx has invested in three targeted design platforms covering driver assistance, driver information and infotainment system applications.



Key Applications of Xilinx XA Automotive Parts

Driver Assistance	Head up displays	USB Plug & Play
Night vision	Hybrid instrument clusters	In-Vehicle Networking
Lane departure warning	Infotainment	Integration of key networks:
Park assist	GPS navigation	MOST
Back guide monitor	Audio/multimedia systems	FlexRay
Adaptive cruise control	Rear seat entertainment	CAN
Collision warning	Head units	APIX
Active occupancy detection	DVD/HDD/MP3 players	
Driver Information	Game consoles	
Voice recognition	Integrated mobile phones	
Echo cancellation	Digital/satellite radio	

Xilinx's Best-Selling Automotive Product Lines

All are based on 90nm process technology.

♦ **XA Spartan-3E:** Introduced in late 2006, Xilinx's lowest cost per cell device is widely used in high-volume infotainment and driver assistance applications. Devices in this product line are produced with between 2.2K and 33.2K logic cells.

♦ **XA Spartan-3A:** Used in I/O intensive applications where pin counts are high, the device is typically used to interconnect between different network protocols and also in hybrid instrument clusters that require LED backlighting. Introduced in January 2008.

♦ **XA Spartan-3A DSP:** Introduced in January 2008, this product line includes DSP48a MACs in hardware, allowing for optimized parallel digital signal processing for applications such as camera-based driver assistance and fully reconfigurable clusters.