This summer I had conversations about
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Freescale, Infineon, STMicroelectronics
and NXP. Here's some of what I learned.

More Talk of Second Sourcing

Whether or not customers are showing
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"It is mostly the big components—
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Japanese Vehicle-to-
Infrastructure Safety
System Stalled

Half of all fatalities from accidents in
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years of research and field tests, the Japa-
nese government planned to equip 4,000
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deployment by 2011.

A few years ago, ¥15 billion ($195 mil-
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cession since World War II.

Thus far only 15 intersections have
been equipped with DSSS in Japan, seven
in Tokyo and eight in Kanagawa—not
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they will get a safety benefit. In order to
get the DSSS warnings, customers have to
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In Japan, VICS distributes traffic infor-
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seven percent of Japanese vehicles on the
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Hottest Semiconductor Products/Applications

According to top managers at the following semiconductor suppliers, these are their hottest
automotive products and applications.

**Freescale**
- 32-bit microcontrollers
- Advanced driver assistance systems
- Infotainment
- Motor control

**Infineon**
- AURIX multicore microcontrollers
- IGBTs and MOSFETs for hybrid and
electric vehicles
- Smart Power Technology, 9th Generation

**NXP**
- Car-to-car communications chips
- Near field communications (NFC) chips
- Partial networking chips
- Software defined radio

**Renesas**
- 32-bit microcontrollers
- First to offer devices based on 40
nanometer feature sizes, based on V850
core
- Distinguishing graphics
- Marriage of infotainment and instrumenta-
tion

**STMicroelectronics**
- 32-bit microcontrollers
- Audio amplifiers that can handle the wide
voltage swings in start-stop vehicles
- Multifunction receivers with DAB (digital
audio broadcast) capability for Germany

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Model Year 2012-13 Feature Trends

Safety
According to ABI Research (New York), the global market for advanced driver assistance systems (ADAS) will balloon from $10 billion in 2011 to $130 billion in 2016. While radar-based ADAS features such as adaptive cruise control, blind spot detection and collision avoidance systems with active steering and braking are becoming available in an increasing number of models, they remain a fairly expensive option, except at the highest trim levels, even in many luxury class vehicles from BMW, Mercedes, Audi and Lexus. BMW’s driver assistance package for the $75,500 MY 2012 740Li, for example, is $3,500. Adding adaptive cruise control to that costs another $2,400, according to bmwusa.com.

But the cost of radar sensors has fallen enough that it is no longer a barrier to the penetration of advanced safety and convenience features in high volume, moderately priced vehicles.

Movement down market is underway especially for features that can be enabled with low cost camera systems. In Europe, Ford offers a Driver Assistant Pack option on the 2012 Focus that includes traffic sign recognition, automatic high beam adjustment, Active City Stop low-speed collision avoidance with automatic braking, lane-departure warning and lane-keeping assist, blind-spot warning and drowsy-driver monitoring—for a little more than $1,200.

Ford plans to equip nearly 90% of its models with electric power assisted steering (EPAS) by next year, which it said not only improves fuel economy by up to 5% but also will facilitate a broader offering of automatic parking. Ford’s active park assist is currently available on the Lincoln MKS and MKT, and on the Ford Flex, Escape, Explorer and Focus.

Some versions of Volkswagen’s new Up subcompact due in 2013 will offer a lidar based collision avoidance system that can automatically brake at speeds under 18 mph to prevent an accident.

Toyota has publically stated its intent to install active safety systems on high volume models such as the Corolla, but has not announced any details or timeline.

Fuel Saving
All carmakers are working on improving fuel economy, mainly to comply with stricter government requirements for lower fuel consumption and greenhouse gas emissions. In the United States, an EPA rating of 40 mpg in high volume, gasoline-engine small cars is becoming almost expected. But only a handful of non-hybrid cars sold in the U.S. employ start-stop systems, a feature well established in Western Europe. Fuel savings from shutting down the engine when the vehicle comes to a stop range from 4% to 10%, and come at a relatively low cost.

The lagging market in the U.S. is largely due to the fact that the EPA’s fuel economy testing does not factor in the full benefit of start-stop, and carmakers have seen no advantage to including it in order to meet CAFÉ targets. The new CAFÉ regulations covering model years 2017 to 2025, however, will allow technology credits (measured in grams of CO2 per mile) for fuel saving features, including start-stop, electric heat pumps, high efficiency alternators, active grille shutters and others.

Johnson Controls, which makes the batteries used to implement start-stop, predicts that start-stop penetration could reach 70% in Europe by 2015. Pike Research (Boulder, Colorado) forecasts 32% annual growth in the global market for start-stop vehicles between 2011 and 2016, reaching a total market of 37 million vehicles in 2016.

In December 2010, Ford announced it would start rolling out start-stop in non-hybrids, SUVs and crossovers beginning in 2012. General Motors is taking a different approach. The 2013 Chevrolet Malibu, which goes on the market in early 2012, and the 2012 Buick LaCrosse and Regal are equipped with GM’s E-Assist system. Like a hybrid propulsion system, E-Assist uses a separate lithium-ion battery and electric motor generator to provide a power boost for acceleration and to provide electric power when the engine is off, and it recharges the battery with regenerative braking energy. GM estimates E-Assist will improve fuel economy by 20% to 25%. The Malibu, LaCrosse and Cruze ECO achieve further fuel savings with active grille shutters, which remain closed unless air is required to cool the engine compartment.

Connectivity
While consumers’ desire for uninterrupted connectivity to Internet services and to each other will continue to exacerbate the problem of driver distraction, carmakers are working to meet the demand for connected cars that provide those services safely and conveniently.

IMS Research (Wellingborough, UK) forecasts the world market for connected cars—light vehicles with a two-way data connection either through a cell phone or embedded modem—will explode from 5.4 million units in 2010 to more than 40.5 million units in 2017.

Following the Ford Sync model, solutions that rely on the customer’s smartphone and data plan to provide connectivity can substitute for much more expensive embedded options such as navigation, emergency notification, diagnostics, vehicle tracking and remote lock/unlock, and there is even an app that monitors the distance to the car ahead and warns the driver of a potential collision. Forty-five percent of smartphone owners use their smartphone as a navigation tool in their car.

FROM PAGE 1

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Second Sourcing...

Freescale’s Stephan Lehmann has also seen growing interest in the subject. “I have had several discussions with different car OEMs, and they confirm there is a lot of activity but this is not the first time people have thought about second sourcing. I’m not convinced that OEMs are ready to spend the money necessary. Second sourcing doesn’t come for free.”

Probably the biggest obstacle to second sourcing is the cost of qualification. Every semiconductor must be fully tested by the component manufacturer; and every ECU must be fully tested by both the tier one and again by the carmaker, who must install the ECU in real vehicles, often for both summer and winter testing. Qualification by the tier one can cost anywhere from $80,000 to $250,000 for each ECU.

Second sourcing multiple components would make the qualification process daunting. “It would mean the tier one would have to qualify each ECU in different configurations,” said NXP’s Mr. Sievers. “There are as many as 10 or 20 ICs in each ECU. If each one of them is second sourced, you would need to qualify all the different possible combinations.”

Because it has the largest share of the world’s automotive semiconductor business, Renesas, whose production capacity was damaged in the earthquake, stands the most to lose if second sourcing is widely adopted. “We hear the concerns from some of our customers that you can’t be in just one region. This earthquake has really brought attention to that. [So] we are really focused on redundancy—making sure we can offer our products from multiple fabs and from multiple regions,” said Renesas’ Jim Trent. “In most cases that is less costly for our customers than doing dual source with two different suppliers. ... We have proprietary cores, which makes second sourcing difficult.”

Renesas can produce wafers at factories in two prefectures in Japan, and at contract manufacturers TSMC in Taiwan and Global Foundries in Singapore.

“To have a real second-sourcing solution, where you can switch the volumes at any point in time, you need to use both solutions in parallel,” said Freescale’s Mr. Lehmann. “Otherwise the fab’s parameters could be changed and two years later you’d have slightly different products.”

Still, as Infineon’s Shawn Slusser points out, simply qualifying second sources may not be sufficient to insure a backup source of supply. “Suppliers are not going to run their factories at 50% utilization rates just in case something happens and you need to quickly double production. ... The idea of second sourcing goes against the tier one strategy of limiting their supply base.”

After witnessing the earthquake’s effect on the electronics parts supply, some in the industry will take a fresh look at the qualification process. Does it really need to be so rigorous? “During the emergency, customers facing serious parts shortages showed flexibility and optimized their [qualification] processes for faster cycle times. We and our customers afterward asked ‘If this [accelerated qualification] works this time, why shouldn’t it work all the time?’” said Mr. Lehmann. Suppliers and OEMs will be closely monitoring these products’ performance in the field, and if in three or four years no reliability problems emerge, they could possibly discuss modifications to the process, but Mr. Lehmann believes any changes would come in small increments.

Semiconductor Costs Continue Downward

Practically every year since the founding of the automotive electronics industry in the 1950s, advances in semiconductor technology have helped carmakers consistently provide more features for less money. That expectation has become so ingrained that tier one suppliers who buy a lot of semiconductors routinely demand and receive annual price reductions averaging three to five percent, at least.

Some of the advances in automotive semiconductors, at least those associated with digital electronics, can be explained by Moore’s Law, which states that the number of transistors that can be placed on an integrated circuit roughly doubles every two years. Since the auto industry favors more mature technology, its microcontrollers and microprocessors will continue to benefit from Moore’s Law ten or more years longer than leading edge consumer applications that use the newest technologies will.

“Typically automotive is one or two nodes behind consumer and wireless applications, which are at 28 or 22 nanometers, heading in subsequent generations even to 14 and to 8 nanometers. Automotive is still busy with 40, 55 and 90 nanometers,” said ST’s Mr. Grimme.

As feature sizes go deeper into the sub-micron dimensions, supply voltages may have to go lower as well. “As circuits get smaller it will get more and more difficult to keep reducing the prices. The auto industry may want to again consider going to three-volt I/Os and get away from five-volt I/Os,” suggested Renesas’ Mr. Trent.

“It’s a topic that will be discussed.”

Moore’s Law affects only the silicon part of the device, not its assembly, the plastic packaging or the testing. “The chip accounts for only about one-third of a device’s product cost,” noted Freescale’s Mr. Lehmann.

And further, as Infineon’s Mr. Slusser points out, “Moore’s Law won’t apply to power semiconductors.” Still, semiconductor makers have other means at their disposal to lower costs, even in the non-digital realm. Producing wafers with higher yields of good die reduces unit costs, as does making ever larger wafers. Infineon plans to produce power semiconductors on 300 mm (approximately 12 inches) wafers, an industry first according to the company. “The state of the art today is 8-inch,” said Mr. Slusser.

Features...

Continued from page 2

owners surveyed in J.D. Power and Associates’ 2011 U.S. Automotive Emerging Technologies Study wanted the ability to use their smartphones to remotely start and unlock their vehicles.

In-vehicle voice texting and social media access is offered by several carmakers. According to Edmunds.com, “Bluetooth is nearly ubiquitous in new vehicles across all segments,” but phone pairing and compatibility problems that arise from the car and the handset using different Bluetooth profiles can make voice activation of features a frustrating experience for consumers.
Background

Motorola spun off its semiconductor production sector as Freescale Semiconductor in July 2004, through a $1.58 billion IPO of roughly 121.6 million shares of Class A common stock at $13 per share, about 30% of the company’s equity. Together with a debt offering, Freescale raised approximately $2 billion. Motorola retained its 67.5% ownership of Freescale until December 2004, when the parent company distributed all its Class B stock to Motorola shareholders. The company was taken private in 2006 and public again in 2011.

With more than 50 years of experience in technology development, Freescale serves the automotive, consumer, industrial and networking markets with a broad range of microprocessors, microcontrollers, analog ICs and sensors. Headquartered in Austin, Texas, the company maintains design, R&D, manufacturing and sales operations in more than 20 countries.

Highly Leveraged

Take a glance at Freescale’s balance sheet and it is impossible to overlook its enormous long-term debt—$6,593 million as of July 1, 2011. To service its debt, Freescale made $537 million in cash interest payments in 2010. Many more years of high interest payments will limit Freescale’s future ability to raise capital, make acquisitions, or invest in new facilities, equipment or technology.

Freescale got into its balance sheet predicament in December 2006, when a group of private equity investors including Blackstone Group, TPG Capital, Carlyle Group and Permira Advisors bought Freescale for $17.6 billion, paying a 36% premium for Freescale shares. The equity firms used just $7 billion of their own funds; the balance was borrowed by Freescale.

Freescale’s financial sponsors were betting that the company would continue to grow and remain profitable, which would allow them to soon sell it at a premium in an initial public offering. But sales declined significantly from 2006, and Freescale experienced disastrous operating losses: $2.1 billion in 2006, $1.7 billion in 2007 and $7.8 billion in 2008.

Freescale was confronted by terrible news on two fronts. Its largest customer, Continental Automotive, which accounted for $535 million, or 31% of 2010 automotive sales,

Other Expenses* by Year in $ Millions

<table>
<thead>
<tr>
<th>Year</th>
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<tbody>
<tr>
<td>2004</td>
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*Primarily interest expenses associated with long-term debt for the years since the company was bought by private equity in 2006

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Motorola, was losing share in the competitive cellular phone market, which led Freescale to exit the mobile handset chip market, and in 2009, Freescale's automotive business was in a deep dive.

One of the most appealing things about serving automotive OEMs has always been that business was pretty steady, but that changed dramatically in 2009 when automotive production fell sharply. Light vehicle production saw steep declines in the two regions where Freescale had the bulk of its business: NAFTA production was down 32.1% for the year and Europe was down 20.7%. Freescale's total sales declined by 33% in 2009, and it had another big operating loss for the year, this one totaling $1.2 billion.

On June 1, 2011, with the world's economic tides turning positive, Freescale's financial sponsors completed an initial public offering in which they sold 43.5 million common shares of the company at $18 per share. The IPO netted $742 million in proceeds, all of which went to pay down debt. The $18 per share valuation is just a little more than half of what the equity firms paid per share in 2006. None of those owners sold shares in the offering. On September 6, 2011, Freescale was trading at $10.80.

Still, there is some positive news to report. Since December 2006 when it was taken private, Freescale has managed to pay off more than $3 billion in debt. Most of the company's debt won't mature until 2016 or later, so it has time before some of the company's debt won't mature until 2016 or later, so it has time before some of the company's debt won't mature until

Note: While Freescale does make software available to its customers to help them get to market more quickly, software accounts for only about one percent of the company's automotive revenues, a percentage that isn't likely to change significantly in the coming years.

Freescale and the Automotive Market
According to Strategy Analytics (Milton Keynes, UK) the automotive semiconductor market totaled $20.7 billion in 2010. Freescale's share of that market has fallen—from 11% in 2006 to 8.4% in 2010, following the merger that year of Renesas and NEC. Once the market leader, Freescale is now number three in market share, behind Renesas and Infineon. Strategy Analytics expects the market to grow 12% annually until 2013.

Freescale has upped its investment in Japan following the merger of NEC and Renesas, which left Japanese customers with only one source for numerous automotive semiconductors. Japan accounts for just 6% of Freescale's automotive sales. Since it was taken private in 2006, Freescale's relationship with the auto industry has run hot and cold, at least in terms of the R&D investment it has been willing to make on behalf of automotive projects. At times it has favored its other markets, notably the booming mobile phone industry.

"In the past we were motivated by the very large market for mobile phone technology where we made some significant investments," said Stephan Lehmann, director of global automotive marketing. "But we recognized that to have a com-
Freescale Semiconductor

Wafer Fabrication
- Chandler, Arizona: 8-inch
- Austin, Texas: 8-inch
- Oak Hill: 8-inch
- Austin Technology and Manufacturing: 8-inch
- Toulouse, France: 6-inch
- Sendai, Japan: 6-inch (Closed and will not re-open)

Final Manufacturing
- Tianjin, China
- Kuala Lumpur, Malaysia

Note: To lower future capital expenses, Freescale has adopted an “asset-light” strategy, meaning the company will no longer build new wafer fabs. Instead, it will get its next-generation wafers from outside foundries. In 2010, 25% of front-end manufacturing was outsourced.

Major Automotive Facilities
- Austin, Texas: Microcontrollers
- Tempe, Arizona: Analog and sensors
- Toulouse, France: Analog and sensors
- Munich, Germany: Microcontrollers
- Other R&D locations include Mexico, Russia, India, China and Japan

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Motive 32-bit revenues today are derived from Freescale’s 250-nanometer MCUs, but as demand for these devices peaks, revenues from 130-nm devices are increasing. A family of 90-nm Power Architecture MCUs started production at the beginning of 2010, and Freescale’s new Qorivva MCU families built on 55-nm process technology are planned for early 2012.

Probably the biggest application of Freescale’s 32-bit MCUs is electronic stability control (ESC) braking systems, an application that is nearing 100% penetration in Europe and North America, but growing rapidly in China and elsewhere in Asia as braking systems transition first to ABS and then to ESC. Braking applications are also driving strong demand for Freescale’s analog devices.

MagniV
Just as 32-bit devices are taking over more applications from 16-bits, Freescale is seeing 16-bit micros move into applications previously handled by 8-bit micros. This past June, Freescale introduced the first single-chip device from its MagniV mixed signal microcontroller family, which is based on the S12 16-bit MCU family. Designed for use with DC motors in window lift and sunroof applications, the new device combines on one chip the MCU, LIN physical layers, voltage regulators and low- and high-side drivers. The device is expected to receive AEC-100 qualification in early 2012.

The next parts planned for the S12 MagniV family are single-chip solutions for applications such as brushless DC motor control, LED lighting, stepper-motor control, generic LIN slave nodes and a general purpose MCU combined with high-voltage I/O.

MagniV is also available in a multichip solution, a version of which was recently introduced for battery sensing.

i.MX 32-bit ARM Applications Processors
Freescale also has high expectations for its i.MX 32-bit ARM processors, which are aimed at infotainment and telematics applications. The i.MX516 processor is used in the Ford Sync connectivity package and the i.MX51 processor powers the MyFord Touch multimedia infotainment platform.

Alliance with Bosch
Bosch and Freescale will collaborate to create an airbag reference platform designed especially for emerging markets. The platform is based on chips from each of the partners: Freescale’s Qorivva MPC560xF MCU family and Bosch’s CG147 airbag ASSP family (a single, integrated airbag system IC that combines power supply, firing loops, sensor interfaces and safety controller). The Bosch ASSP works with acceleration sensors from either company. Qorivva is based on Power Architecture.

“You cannot just give a data sheet to a customer in India or China and expect that they will be able to develop the product,” said Mr. Lehmann. “We want to empower them by giving them an optimized and validated platform that includes demonstration software so they can see that it really works.” The platform boards, which were demonstrated last month at Freescale Technology Forums in India and China, will be available in the first quarter of 2012. Freescale and Bosch are planning to continue collaborating in the future.

Other Key Alliances
- First semiconductor supplier to join AUTOSAR development partnership
- Founding member of Local Interconnect Network (LIN) consortium
- Founding member of Nexus 5001 Forum
- Active member of JASPAR supporting Japanese automotive electronics standardization
- Founding member of the DSI consortium with Denso and TRW
- Associate member of the PSI5 consortium
- Member of Genivi Alliance
- Jointly developing automotive microcontrollers with STMicroelectronics
- Working with Fuji Electric on developing high-power IGBTs and exploring market opportunities
The Hansen Report on Automotive Electronics, Portsmouth, NH USA www.hansenreport.com September 2011, Page 7

FlexRay
Freescale cofounded the FlexRay consortium with BMW, Daimler and NXP Semiconductors in 2000, but the industry’s adoption of devices based on the fault-tolerant communication protocol has been very slow. FlexRay was initially targeted for electric brakes, which proved too costly. Later, it was thought that FlexRay could be a higher-bandwidth alternative to CAN networks, but that hasn’t happened either.

“While FlexRay isn’t replacing CAN, it is being adopted more and more in powertrain and chassis and safety applications,” said Mr. Lehmann. “In future vehicles we have at least 10 or 15 FlexRay nodes in some mid- and higher-range vehicles. We offer a double-digit number of 32-bit MCUs that contain FlexRay IP.”

Most Promising Applications
Freescale sees four application areas as especially promising for future automotive sales: advanced driver assistance systems, infotainment, electric motor control and communications networks.

◆ ADAS
Freescale produces silicon germanium radar sensors, microcontrollers and system basis chips, all of which are becoming essential to ADAS. “A lot of our customers are talking to us about this right now,” said Mr. Lehmann. Freescale has a leading position in radar applications with Qoriva MCUs and RF ICs and is expanding its offering for vision systems. ADAS requires high processing performance and are a technology driver for Freescale’s multicore architecture.

◆ Infotainment
The company has seen much interest in its i.MX 32-bit ARM applications processors, which are scalable from single to dual and quad-core devices, all pin and software compatible. “That is very attractive and unique in the market,” noted Mr. Lehmann. Freescale says it is supporting all four infotainment operating systems: Android, Microsoft, QNX and Linux. GM’s OnStar and Ford Sync are powered by Freescale processors.

◆ Motor Control
Freescale has been engaged in motor control applications for decades, in automotive and other markets, providing not just motor-control hardware but software algorithms as well. “As OEMs make vehicles more fuel efficient and as the number of hybrid and electric vehicles grows, we are seeing more and more electric motors in cars,” said Mr. Lehmann. “Instead of driving loads with an engine belt, we are powering them electrically with motors. Fuel pumps, oil pumps, water pumps, air conditioning—they are all going electric. It’s an area where we are investing and where we see strong demand.”

◆ Communications Networks
“With the number of sensors growing, we are seeing more and more traffic on vehicle buses; it is an area that is exploding,” said Mr. Lehmann. “We have seen vehicles with as many as seven CAN networks in a single ECU,” he said. Freescale has devices for all of the automotive networks including CAN, FlexRay, MOST, Ethernet and [the airbag networks] PSI5 and DSI 3. With the proliferation of network types aboard the vehicle, Freescale is seeing growing interest in gateways where data is exchanged from one network to another.

Convinced that Ethernet will be widely used in cars not only for diagnostics and data downloads to the vehicle, but also for camera networking and ultimately as a high-speed communications backbone, Freescale has been working with pioneers BMW and Daimler to develop microcontrollers that support Ethernet applications.

Freescale and BMW cooperated in the definition of the Qoriva MPC5604E 32-bit ECU, designed to transmit high-resolution compressed video data over Fast Ethernet for a 360-degree surround view of the vehicle to help make parking simpler and safer. BMW has said it will ship its surround-view camera system in 2013.

The Company Profile Continued
Supplier and OEM Ten-Year Growth Rankings

The most important strategic question any company can answer is who to serve. If the future is anything like the past, as a tier one I would most want to serve the fastest growing Asian carmakers, notably Hyundai-Kia. As a tier two, I would look to serve Hyundai Mobis and Continental.

<table>
<thead>
<tr>
<th>Major Suppliers’ Sales and CAGR 2000–2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier and OEM Ten-Year Growth Rankings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supplier</th>
<th>2000 Sales in USD*</th>
<th>2010 Sales in USD*</th>
<th>CAGR in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyundai Mobis</td>
<td>1.8 billion</td>
<td>12.3 billion</td>
<td>21.2</td>
</tr>
<tr>
<td>Continental Automotive</td>
<td>4.4 billion</td>
<td>23.0 billion</td>
<td>18.0</td>
</tr>
<tr>
<td>Asim Seiki</td>
<td>14.7 billion</td>
<td>29.4 billion</td>
<td>7.2</td>
</tr>
<tr>
<td>Autoliv</td>
<td>4.1 billion</td>
<td>7.2 billion</td>
<td>5.8</td>
</tr>
<tr>
<td>Denso</td>
<td>26.3 billion</td>
<td>40.8 billion</td>
<td>4.5</td>
</tr>
<tr>
<td>TRW</td>
<td>11.0 billion</td>
<td>14.4 billion</td>
<td>2.7</td>
</tr>
<tr>
<td>JCI (FY ends Sept. 30)</td>
<td>12.7 billion</td>
<td>16.6 billion</td>
<td>2.7</td>
</tr>
<tr>
<td>Bosch Automotive Technology</td>
<td>32.1 billion</td>
<td>40.6 billion</td>
<td>2.4</td>
</tr>
<tr>
<td>Valeo</td>
<td>13.2 billion</td>
<td>13.9 billion</td>
<td>0.5</td>
</tr>
<tr>
<td>Lear</td>
<td>14.1 billion</td>
<td>12.0 billion</td>
<td>-1.6</td>
</tr>
<tr>
<td>Delphi</td>
<td>29.1 billion</td>
<td>13.8 billion</td>
<td>-7.2</td>
</tr>
<tr>
<td>Visteon</td>
<td>19.5 billion</td>
<td>7.5 billion</td>
<td>-9.1</td>
</tr>
</tbody>
</table>

1 Continental made large acquisitions during the period.
2 Fiscal years ending March 31, 2001, and March 31, 2011

<table>
<thead>
<tr>
<th>Major Carmakers’ Unit Production and Global Market Share 2000 and 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carmakers with Unit Production &gt;1 million in 2010</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carmakers with Unit Production &gt;1 million in 2010</th>
<th>2000 Production (units)</th>
<th>2000 Market Share</th>
<th>2010 Production (units)</th>
<th>2010 Market Share</th>
<th>CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chana Automobile</td>
<td>203,127</td>
<td>0.3%</td>
<td>1,102,683</td>
<td>1.4%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Tata</td>
<td>193,580</td>
<td>0.3%</td>
<td>1,011,343</td>
<td>1.3%</td>
<td>18.0%</td>
</tr>
<tr>
<td>Hyundai-Kia</td>
<td>2,488,321</td>
<td>4.3%</td>
<td>5,764,918</td>
<td>7.4%</td>
<td>8.8%</td>
</tr>
<tr>
<td>Suzuki</td>
<td>1,457,056</td>
<td>2.5%</td>
<td>2,892,945</td>
<td>5.1%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Nissan</td>
<td>2,628,783</td>
<td>4.5%</td>
<td>3,982,162</td>
<td>5.1%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Honda</td>
<td>2,505,256</td>
<td>4.3%</td>
<td>3,643,057</td>
<td>4.7%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Toyota</td>
<td>5,954,723</td>
<td>10.2%</td>
<td>8,557,351</td>
<td>11.0%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Mazda</td>
<td>925,876</td>
<td>1.6%</td>
<td>1,307,540</td>
<td>1.7%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Mitsubishi</td>
<td>1,827,186</td>
<td>3.1%</td>
<td>1,174,383</td>
<td>1.5%</td>
<td>-4.3%</td>
</tr>
<tr>
<td>Total Asia</td>
<td>18,183,908</td>
<td>31.1%</td>
<td>29,436,382</td>
<td>37.9%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Europe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMW</td>
<td>834,628</td>
<td>1.4%</td>
<td>1,481,253</td>
<td>1.9%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Volkswagen Group</td>
<td>5,106,749</td>
<td>8.7%</td>
<td>7,341,065</td>
<td>9.4%</td>
<td>3.7%</td>
</tr>
<tr>
<td>Daimler</td>
<td>1,488,178</td>
<td>2.5%</td>
<td>1,940,465</td>
<td>2.5%</td>
<td>2.7%</td>
</tr>
<tr>
<td>PSA</td>
<td>2,879,422</td>
<td>4.9%</td>
<td>3,605,524</td>
<td>4.6%</td>
<td>2.3%</td>
</tr>
<tr>
<td>Renault</td>
<td>2,514,897</td>
<td>4.3%</td>
<td>2,716,286</td>
<td>3.5%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Fiat</td>
<td>2,641,444</td>
<td>4.5%</td>
<td>2,410,021</td>
<td>3.1%</td>
<td>-0.9%</td>
</tr>
<tr>
<td>Total Europe</td>
<td>15,465,318</td>
<td>26.5%</td>
<td>19,494,614</td>
<td>25.1%</td>
<td>2.3%</td>
</tr>
<tr>
<td>North America</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Motors</td>
<td>8,133,375</td>
<td>13.9%</td>
<td>8,476,192</td>
<td>10.9%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Ford</td>
<td>7,322,951</td>
<td>12.5%</td>
<td>4,988,031</td>
<td>6.4%</td>
<td>-3.8%</td>
</tr>
<tr>
<td>Chrysler</td>
<td>3,178,462</td>
<td>5.4%</td>
<td>1,578,488</td>
<td>2.0%</td>
<td>-6.8%</td>
</tr>
<tr>
<td>Total North America</td>
<td>18,634,788</td>
<td>31.9%</td>
<td>15,042,711</td>
<td>19.3%</td>
<td>-2.1%</td>
</tr>
<tr>
<td>Others</td>
<td>6,108,632</td>
<td>10.5%</td>
<td>13,770,155</td>
<td>17.7%</td>
<td>8.5%</td>
</tr>
<tr>
<td>Total Production</td>
<td>58,392,376</td>
<td>100.0%</td>
<td>77,743,862</td>
<td>100.0%</td>
<td>2.9%</td>
</tr>
</tbody>
</table>

Data: OICA, Chrysler, Daimler