The CEOs of the Power Electronics Industry
Navigating Through Tough Times
The power electronics industry should be well-positioned, given the emphasis on supporting alternative energy and green technologies.

The gut-wrenching news in the economy seems to get more painful daily. Economists make predictions on how and when things will turn around; analysts play the blame game as to how we got into this mess in the first place. Cut it any way you like: on multiple fronts, we have experienced a mind-boggling crisis of leadership — leadership so poor it can be most easily explained as utter incompetency and/or criminal negligence.

Still, in spite of all the negative headlines, for most of us, life goes on more or less as usual. (Well, make that mainly less!) The electronics sector is waiting to see just how great the fallout from mortgages, banking and automakers will be on semiconductors and on power electronics. At an even more personal level, we hope that we are at individual companies that have been carefully and responsibly managed to survive the economic vicissitudes.

In light of this, it is an opportune time to produce our annual CEO Special Report, and to talk to CEOs at some of the leading companies in the power electronics industry. Well-managed companies not only get through tough times, but can position themselves to continue growing now and as the economy recovers. Good leadership is important in all economic climates, but is really put to the test in times such as these.

Going forward, the power electronics industry should be especially well-positioned given the emphasis of the incoming Obama administration on supporting alternative energy and green technologies. Obama’s has released a plan that includes the following planks:

• Help create 5 million new jobs by investing $150 billion over the next 10 years to catalyze private efforts to build a clean energy future.
• Put 1 million plug-in hybrid cars — cars that can get up to 150 miles per gallon — on the road by 2015, cars to be built in America.
• Ensure 1% of the electricity in the United States comes from renewable sources by 2012 and 25% by 2025
• Implement an economy-wide cap-and-trade program to reduce greenhouse gas emissions 80% by 2050.

Whatever side of the political spectrum their leaders might be on, those power companies that can catch this coming wave should be able to ride the power efficiency through these tough times and into the next cycle of growth.

We trust this CEO issue will provide some insight from thoughtful leaders who will steer their companies to a bright future.
Finding Opportunity in Tough Economic Times

These are challenging times for business leaders. This year’s CEO Roundtable provides insight into what it is like for CEOs successfully steering their ships through the rough seas of turbulent economic times, while keeping their sites on long-term growth and ongoing challenges such as quality control and environmental responsibility. Participating in this year’s roundtable are Michael Hsing, Monolithic Power Systems; Oleg Khaykin, International Rectifier; Jack Radgowski, Central Semiconductor; and Greg Acopian, Acopian Technical Co.
Power Electronics Technology: Given the current state of the economy, what do you identify as the growth opportunities for the power industry in the coming year and for the long term?

Greg Acopian:
After the current economic crisis has been resolved, the total demand for electronic equipment will continue to grow and almost every piece of it will require some kind of power supply. Some will be integrated into the equipment design, and some requirements will be satisfied with low-cost commodity “bricks” coming from offshore. A fast-growing part of the market requires power supplies either customized for the application and/or with interactive capability, ranging from simple things such as remote inhibiting and manual controls right on up to complex digital systems. And that’s where some good opportunities are, because customized solutions can’t be readily done offshore.

Jack Radgowski:
Out of necessity, growth opportunities in the present economic situation are coming about by reason of and by virtue of the fact that the necessity begets efficiency in all we must do in order to pull ourselves out of the economic calamity we are immersed in. Efficient use of power electronics must take a leading role in the emergence out of the abyss.

Michael Hsing:
We continue to execute on our plan to further penetrate into the flat-panel TV and LCD monitor market with higher efficiency and reduced system BOM cost solutions. In addition, we see new growth opportunities in Blu-ray disc players. For the long term, we are focused on applications that continue to require new levels of efficiency. This includes portable power applications in netbooks and notebook PCs, as well as industrial and telecom enterprise applications. The common thread is that they all require high current, small size and >90% high-efficiency, while operating directly from a battery voltage or power-supply rail between 12 V and 24 V.

Oleg Khaykin:
With global energy consumption expected to double between 2005 and 2030, new legislation and regulations, and growing consumer demand and awareness are driving growth in energy-efficient end products, particularly in the appliances, lighting, home entertainment systems, computing and communications, and automotive markets. Demand for hybrid and electric vehicles, for example, is increasing as a result of the pressure to cut carbon emissions and concerns regarding the stability of supply and the cost of oil. These same concerns are also fuelling demands to make conventional petrol- and diesel-powered automobiles more efficient. As we move forward, semiconductors will play a key role in the development of ever-more efficient vehicles — and the other end products that we depend on in our daily lives. It is for this reason that IR is developing new technologies and products that will meet the rapidly evolving needs of the designers of energy-efficient applications.

PET: What impact do you think the Obama presidency will have on the power industry?

Hsing:
I believe the Obama presidency can bring about new tax incentives and “green initiatives” for power conservation in all kinds of offline products from consumer goods such as TVs and white goods to enterprise-storage equipment. This fits perfectly with MPS’ long-term strategy.
Radgowski: The Obama presidency will need to make and show an economic change quite expeditiously in order for him to make good on campaign promises. The president-elect will need to rely on all factors that can help him achieve his goals. He has expressed strong support of green and clean technologies, and utilizing power electronics effectively will help achieve those goals.

Acopian: An increased emphasis on scientific development, renewable energy, high tech and infrastructure renewal — Internet II, for example — should accelerate market growth. Just how much, we will have to wait and see. Everyone is hoping President-Elect Obama will make wise decisions that with both long- and short-term benefits for the economy. Also, I think he has the ability to inspire the country. The power industry needs what all industries need — a healthy economy that produces a need for its products.

PET: How do you think the volatility in the financial markets will play out and how will it impact your business?

Acopian: The world’s economic balance will be affected in ways we can’t clearly imagine or predict, so, along with every other business, we will be hoping for the best and preparing for the worst.

Radgowski: Being in business since founding our company nearly 35 years ago in 1974, we have been through many downturns in the economic cycle and, not only have we survived, but we have done so without ever having a single layoff. During each downturn, we have always focused on being super conservative in all that we do and most of all, with the knowledge that the cycle always turns up, we focus on our being certain that we will be ready when business picks up. The financial market volatility and the associated tightness of lending indeed have an impact on debt-funded institutions and will cause an industry shakeout of weakly capitalized companies. Our company has been most fortunate in that we are not dependant on borrowing for our existence. We don’t know what the future holds, but we feel well-positioned to face and overcome the challenges we may be faced with.

PET: Do you see environmental compliance issues as having a major impact on your business? If so, how are you addressing these issues?

Radgowski: Many of our customers have required us to...
certify our compliance with certain environmental requirements such as lead and halogen free statements.

Acopian:

At Acopian, we feel very strongly about protecting the environment. Sarkis Acopian, my father and the company’s founder, never threw anything away that could be reused or recycled, and he taught everyone around him to do the same. I still remember the totally non-commercial National Geographic article reprint entitled “What on Earth are We Doing” that he sent out back in 1990 instead of a product bulletin that would have increased our sales. Not all of our customers appreciated that bulletin back then, but the environment is that important.

PET: In the face of downward price pressure, how are you currently addressing quality-control issues?

Acopian:

There are different ways to look at quality. Acopian’s engineering department uses components very conservatively to assure that our products will have what we call design quality. Other companies may have power supplies priced lower than ours, but no one beats our reliability. Our customers often tell us about units that have been in continuous service for 30 years or more without a problem.

Radgowski:

Our members are indoctrinated from the first day that quality of product and quality in all that we do is essential for the continued success of our company and for the job security of all on the Central team.

PET: How do you see volatile energy prices having an effect on your business?

Radgowski:

Rising energy costs have had a definite impact on our bottom line, especially since the increased costs are difficult to pass on to customers in our industry.

Acopian:

Energy is not a large portion of our manufacturing cost, so increased energy pricing is not a major factor for us directly. However, as energy costs rise in coming years, efficiency may become as important a specification of our products as performance. Where our Pennsylvania facility is located, electric power deregulation in 2010 is expected to abruptly increase the cost per kilowatt hour by about 35%. So just as with consumer appliances, potential customers will be willing to pay more for more efficient products with short-term payback of their cost premium. Everyone wins.

Khaykin:

Electric motors present a major opportunity for significant energy savings. Consuming over 50% of the world’s electricity, more than 80% of electric motors are wastefully controlled electromechanically. Designs are moving toward variable-speed permanent magnet motors that are smaller, lighter and lower cost, and as long as you have a good control technique, permanent magnet inverterized motor control can achieve 95% efficiency by co-designing the power train and the driver, and an algorithm to control them. IR’s design platform for variable-speed motors brings digital, analog and power silicon together with algorithms, packaging, development software and design tools to deliver a complete solution.

The data-center marketplace is another area that demonstrates how we can save energy and increase performance. Through close ties with our customers, we have developed products that can deliver the highest efficiencies in power management for this key sector.

IR’s GaN-based power device technology platform will provide improvements in key application-specific factors of merit (FOM) of up to a factor of 10 compared to state-of-the-art silicon-based technology platforms. GaN-based power devices will eventually be used in most of the same applications as current silicon based power devices, as well as potentially new applications, currently not possible with silicon devices. These applications will evolve in accordance with well known market development behaviors over the coming decades, as GaN-based power devices replace silicon-based power devices as the technology platform of choice. Power-conversion applications currently targeted for GaN-based power devices include ac-dc converters, dc-dc converters, motor drives, class D audio and lighting systems.
Monolithic Power Systems (MPS) is a high-performance analog semiconductor company headquartered in San Jose, Calif., with more than 550 employees working in design centers and sales offices in Japan, Europe, China, Korea, Taiwan and the United States. Founded in 1997, the company has three core strengths: deep system-level and applications knowledge, strong analog design expertise and an innovative proprietary process technology. These combined advantages enable MPS to deliver highly integrated monolithic products that offer energy-efficient, cost-effective solutions.

MPS' systems and applications expertise stems from a team of industry veterans who possess a combination of highly technical electronics knowledge, sophisticated system and IC-level design capabilities, and extensive customer application experience. This allows the company to work closely with customers to identify new product opportunities, reduce time to market and competently support its applications. In addition, MPS has developed a portfolio of intellectual property and proprietary processes that enhance its products and market share.

MPS proprietary BCD Plus process technology is a focal point to its competitive advantage. Many conventional analog technologies are handicapped by an inability to support the integration of power devices at high power levels. This results in unacceptably large semiconductors and/or significant levels of power loss. High power loss results in significant heat dissipation. This must be managed to avoid damaging or reducing the overall performance and efficiency of the system. Other analog semiconductor vendors rely on multiple chip solutions to avoid these issues.

In contrast, MPS' BCD Plus process technology resolves each of these issues. Implemented at standard CMOS foundries, this unique process integrates BiCMOS signal transistors with a highly efficient DMOS power transistor. This allows MPS to design and deliver smaller, single-chip power management ICs that are highly efficient and accurate. In addition, MPS' single-process technology simplifies the design process and is applicable across a wide range of analog applications. The result is higher productivity and significant cost advantages for any MPS customer.

MPS is a fabless semiconductor company, working with third-party foundries. However, in contrast to many other fabless companies that use standard process technologies, MPS works with its foundry partners to install its own proprietary process technology in their facilities for use solely by MPS.

MPS' innovated family of products includes:
- DC-DC converter ICs that provide the supply voltage to a variety of electronic devices
- LED driver ICs used in lighting displays, such as those found in cellular handsets and handheld computing devices
- Cold cathode fluorescent lamp (CCFL) backlight inverter ICs used in lighting LCD displays, such as those found in notebook computers, flat-panel displays and televisions
- Class D audio amplifier ICs, which are well-suited for small form factor and portable electronic devices
- Linear ICs including operational and current-sense amplifiers
- Battery chargers and protection devices
- Power over Ethernet (PoE) powered-device solutions.

Michael R. Hsing is the founder, president and CEO of MPS. He is an inventor of versatile high-speed, high-power semiconductor process technology, including many patents related to the semiconductor devices. Under his leadership, MPS has grown to be one of the fastest and most profitable companies in the semiconductor industry with recognition from Wall Street. Prior to founding MPS, Hsing held various senior technical positions at Supertex and Micrel.

Hsing enjoys kayaking, competitive tennis and is an avid pilot of acrobat flying. CEO
Acopian Technical Company was founded by Sarkis Acopian, who came to the United States to obtain a college education and decided to stay to pursue the American dream. After an interruption in his education to serve in the U.S. Army, he graduated from Lafayette College in Easton, Pa., in 1951, and decided to settle in Easton.

Initially, he worked for Weller Electric Corp., designing a power sander and a soldering gun that became two of the company’s most popular products. He then began the pursuit of his dream of going into business for himself, launching Acopian Technical Company.

His first product was the first-ever solar radio, which was acclaimed as a milestone of 1957 technology. The Acopian Solar Radio was promoted as “Revolutionary — No Batteries or Outside Electrical Plug-ins — Uses Light for its Source of Energy.” However, the market for solar radios wasn’t large enough to serve as the company’s springboard to growth, so Mr. Acopian also did electronics subcontracting as he searched for an appropriate market niche with growth potential.

At one point, he urgently needed some power supplies for a subcontract and couldn’t obtain them quickly enough, so he made them himself. He then realized that many other engineers were experiencing the same problem. He had an outstanding aptitude for organization and efficiency, and personally set up every aspect of a versatile production line that enabled the assembly of many different models of power supplies very quickly with minimum labor. When he advertised that “power supplies shipped within three days,” orders flooded in.

As the power-supply line grew, larger and more complicated power supplies were introduced, but the same philosophy was followed for these larger supplies — “up to two pieces of these would ship within nine days after receipt of order.” Acopian still prides itself in this remarkable ability. To this day, none of Acopian’s competitors can consistently match the company’s shipping promise dates.

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In addition to the speed of assembly, the manner in which the production lines were set up had several other advantages. Acopian’s competitors stocked popular models, but if the models ordered were out of stock, the customer might have to wait weeks until the competitors’ stock was replenished. Worse yet, if the order was for an infrequently ordered model that wasn’t even scheduled for a production run, the wait could be months.

But with Acopian’s approach of building per order, even one very infrequently ordered model could be manufactured and shipped just as quickly as the most popular models. And there were never problems with obsolescent stock or its age (power supplies contain electrolytic capacitors that tend to degrade with time, particularly in storage), so there was no need for a large warehouse and no financial burden for funds tied up in finished goods inventory.

Mr. Acopian retired in 1991 and was succeeded by his sons Greg and Jeff, who have turned the advantages of their father’s manufacturing acumen in a new direction. Acopian is now manufacturing and shipping “special” (modified for a specific application) power supplies in about the same amount of time as standard models. In addition, Acopian’s proprietary modular metalwork and an array of circuit boards for special functions permit the design, manufacture and shipment of complete multiple-output power-supply systems that include the customer’s wish list of features — such as metering, LED indicators, failure alarm contacts, audible alarms, binding posts and special connectors — within nine days. The company also ships redundant output power systems for critical applications within the same time frame.

In celebrating its 52nd anniversary, Acopian continues to develop new lines of power supplies for the constantly changing needs of industry. But one thing that will never change is the company’s commitment to serving its valued customers with quality products made entirely in the United States, its three-day shipping guarantee and its unsurpassed customer service.
Up to and including the 1970s, diodes and transistors were the mainstay of all active electronic components and were not referred to as “discretes,” simply because integrated circuits were mainly experimental and the term “IC” had not yet been coined. Although germanium diodes and transistors were in the process of being replaced by the more temperature-tolerant silicon diodes and transistors, many germanium devices had been designed in and approved for many applications; substitutions were not quick and easy to accomplish. The void thus created brought about an opportunity for a continuing manufacturing source of supply for germanium products, particularly power devices.

Armed with a BSEE degree and quality and reliability management experience at electronics manufacturing facilities — from microwave waveguide components at Litton Industries to discrete semiconductor components at Bendix Semiconductor and General Instrument — Jack Radgowski founded Central Semiconductor Corp. in 1974.

As ICs began to catch on and become popular, most major semiconductor manufacturers ceased appropriating capital for discretes of all kinds in favor of IC technology, thus creating another void and opportunity for a continuous manufacturing source for all discretes.

In addition to continuing to manufacture older technology products, Central also has been at the forefront of new and innovative discrete devices. The company is technology-driven, with customers’ requirements in mind, by developing state-of-the-art devices that continue to be smaller, lighter, faster, and more energy efficient and cost effective.

Radgowski’s passion for exceeding customers’ expectations has evolved into a corporate culture devoted to this goal. This continued commitment is a strong indication of a company deep rooted with dedication to servicing its customers. This company is truly led by example, by a steadfast leader who instituted complete customer satisfaction as the cornerstone of Central’s philosophy. Radgowski is not willing to compromise on anything less than perfection, and he drives the concepts of perfect quality, continuous improvement and innovation throughout the organization.

To exist in a largely commodity-based industry, an innovative and efficient new product development team is essential. Central’s New Technology Roadmap outlines a path for the development of smaller, more energy-efficient devices. Central’s team constantly explores the development of niche devices often overlooked by other manufacturers. Success of this development process is evident in the multitude of industry firsts Central has received and how designers recognize Central as a manufacturer of innovative solutions.

In an industry where change is a constant, discrete semiconductor manufacturers need strong leaders to provide guidance and vision to ensure a successful and profitable future. Central Semiconductor Corp. of Hauppauge, N.Y., has such an individual in its founder and CEO Jack Radgowski.

Central’s employees are all “members” of the Central team, dedicated to complete customer satisfaction. Perfect quality, exceptional service and on-time delivery stand as Central’s commitment to its customers. This is clearly evident in the company’s outstanding achievement awards, including Discrete Semiconductor Supplier of the Year, which Central received for the third-straight year from a leading avionics instrumentation company. Accolades such as these are a true testament to a company’s success.

“Our perpetual challenge is the pursuit of achieving excellence in everything we do, and we strive to accomplish this by utilizing ongoing training for continuous improvement in all areas,” Radgowski explains. “We recognize that customer satisfaction results in repeat business.”

Clearly, Radgowski’s philosophy and presence has been the driving force that has guided the long-term success of Central Semiconductor Corp. CEO
International Rectifier’s (IR) mission is saving energy. By improving the efficiency of electricity end uses, including heating and lighting, and the expanded use of electric technologies such as hybrid electric vehicles, worldwide energy consumption could be cut by 30%. However, although IR’s power-management and power-conversion technologies and solutions play a critical role, the real power savings are in its customers’ designs.

While the challenge to make more efficient computers, appliances and cars lies with the Intel, Electrolux and Toyotas of this world, what IR brings to the customer is an understanding of the end application and the right solution to meet the design challenge. Many years ago, one of the most important applications demanding attention was the computer. The engineering vision was to make it small enough to fit on a desktop to create a “personal computer.” However, the chief design challenge rested with replacing the big and bulky linear power supply with a new and improved switched-mode power supply (SMPS). An innovative power device from IR, the HEXFET power MOSFET enabled high-speed switching at the high voltages and currents required for the conversion process. Without the energy-efficiency gains provided by the SMPS, adoption of PCs would have been slower and the cost higher.

Like the power MOSFET some 30 years ago, the introduction of IR’s GaN-based power device technology platform heralds a new era for efficient power design. Combined with device structures that yield excellent conductivity, this provides such devices with a far superior tradeoff between operating voltage and on-resistance resulting in much smaller devices for the same application. GaN-based devices are also capable of operating efficiently at much higher frequencies than comparable silicon-based devices. This allows the reduction in size of power-conversion solutions, a key enabling feature in today’s power-hungry end application markets. In addition, very efficient lateral devices are possible using GaN-based technology that allows relatively simple scaling with operating voltage, as well as for improved integration with other circuit functions, compared to state-of-the-art vertical silicon-based power devices.

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This GaN-based power device technology platform will provide improvements in key application-specific factors of merit (FOM) of up to a factor of 10 compared to state-of-the-art silicon-based technology platforms. GaN-based power devices will eventually be used in most of the same applications as current silicon-based power devices in ac-dc converters, dc-dc converters, motor drives and lighting systems, as well as potentially new applications currently not possible with silicon devices.

The advent of GaN on silicon epitaxial technology, together with the ability to develop a process that is compatible with IR’s silicon manufacturing facilities, allows IR to take advantage of this historic opportunity to offer its customers commercially viable products using GaN-based power devices.

Early adopters will be those market segments and applications that take full advantage of the revolutionary capability of transforming the value realization of the key features of power density, power-conversion efficiency and cost — all leading to power-efficient designs that deliver real energy savings. CEO