ROHM’s silicon-carbide devices put them one step ahead of the rest.

The Future of Power

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<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>TECH COLUMN</td>
<td>How to GaN: eGaN FETs in High Frequency Resonant Designs</td>
</tr>
<tr>
<td>10</td>
<td>TECH ARTICLE</td>
<td>“Re-inforced” Converters for Maximized Patient Protection</td>
</tr>
<tr>
<td>16</td>
<td>COVER INTERVIEW</td>
<td>David Doan - Sr. Product Marketing Manager at ROHM</td>
</tr>
<tr>
<td>22</td>
<td>FEATURED ARTICLE</td>
<td>ROHM’s SiC 1200V MOSFET Technology</td>
</tr>
<tr>
<td>26</td>
<td>TECH ARTICLE</td>
<td>WiTricity: A New Era of Wireless Power Technology</td>
</tr>
<tr>
<td>32</td>
<td>PRODUCT HIGHLIGHT</td>
<td>International Rectifier’s SupiRBuck Regulator Eval Board</td>
</tr>
</tbody>
</table>
How To GaN: eGaN FETs in High Frequency Resonant & Soft-Switching Designs

The eGaN® FET Journey Continues

Alex Lidow
CEO of Efficient Power Conversion (EPC)
To achieve higher switching frequencies and densities than possible in traditional hard-switching "brick" converters, resonant topologies may be considered. Resonant and soft-switching techniques can improve performance in converters by reducing switching related losses compared to conventional hard-switching converters. This is accomplished by creating operating conditions where the transistor does not encounter simultaneous high voltage and high current during the switching commutation. Resonant topologies are particularly beneficial in DC/DC transformer applications, also known as a DCX, or an unregulated bus converter, due to the removal of the regulation requirements. This allows the converter to always operate at the resonant frequency, demonstrating of these advantages, we built resonant and soft-switching designs. To demonstrate the advantages of eGaN FETs in high frequency applications. This installment will discuss the advantages of eGaN® FETs and their potential to achieve higher efficiencies and improved packaging, the active footprint area shrank significantly, reducing the power stage size by 30% compared to the Si MOSFET benchmark design.

The experimental switching waveforms for the designs at 1.2 MHz are shown in Figure 3. Both designs have the same magnetizing inductance built into the transformer via an air gap to achieve ZVS during the device off state. Due to almost a factor of 2 decrease in output charge provided by the primary and secondary eGaN FETs, the ZVS transition is achieved in a proportionally shorter period, increasing the effective duty cycle and improving the overall converter performance. For the Si MOSFET design, the dead time required for ZVS is 87 ns and the effective duty cycle for each device is limited to 34%. With the faster switching eGaN FETs, the dead time is reduced to 42 ns, resulting in a 42% duty cycle for each device and allowing for an extended power delivery period. From the switching waveforms, the gate drive speed for the eGaN FET is significantly faster than the Si MOSFET counterpart even when driven with a lower gate drive voltage, providing both faster switching speed and reduced gate losses.

The frequency capability of resonant and soft-switching topologies is also significantly impacted by the gate charge, $Q_g$. The gate charge is the amount of charge required to fully turn on and off the transistor, and is dissipated each switching cycle.

To demonstrate the opportunities enabled by converting from silicon-based power MOSFETs to enhancement mode GaN devices in soft-switching applications, we chose the topology as shown in Figure 1 that employs a resonant technique utilizing the transformer’s magnetizing inductance ($L_m$) and resonance of the leakage inductance ($L_i$), together with a small output capacitance ($C_O$), to achieve ZVS, limit turn-off current, and eliminate body diode conduction.

To obtain a direct comparison in performance between eGaN FETs and Si MOSFETs in an isolated converter, having identical layouts and using the same topology is critical. Devices with similar on-resistance were selected, the same circuit topology was used, and a similar printed circuit board (PCB) layout was maintained for both designs. Two experimental prototypes, shown in figure 2, were designed and tested based on the schematic in Figure 1 (a) to run at a switching frequency of 1.2 MHz. By using eGaN FETs with lower on resistance per unit die area and

![Figure 1: High frequency bus converter (a) Schematic (b) Operating waveforms (1)](image)

![Figure 2: Experimental 48 V to 12 V bus converters operating at a switching frequency of 1.2 MHz constructed with (a) silicon MOSFETs, and (b) gallium nitride eGaN FETs)](image)
Power Developer

a one-percentage point improvement in peak efficiency over its Si MOSFET counterpart, resulting in about 25% less power loss. Since products based on this type of design are thermally limited, the reduction in power loss translates directly into higher output power handling capability. In this case, the eGaN FET converter can increase the output power capability by up to 65 W while maintaining a 14 W total converter loss when compared to the benchmark Si MOSFET design. Assuming an approximate 12 W maximum power loss for both designs, the output power of the eGaN FET-based converter can be increased from 270 W to 325 W.

SUMMARY

It has been previously shown that eGaN FETs have a distinct advantage over silicon MOSFETs in hard-switching applications. In this column we show that eGaN FETs can also provide significant improvements in the efficiency of resonant and soft-switching converters when compared to Si MOSFETs. In high frequency applications, the reduction in:

1) Output capacitance can decrease circulating energy and commutation time required to achieve ZVS, thus increasing the effective power delivery intervals and improving overall efficiency.

2) Gate capacitance provided by the eGaN FETs results in faster switching speeds at reduced driving voltages, which provide reduced gate drive losses.

Putting eGaN FETs to work in high frequency, soft switching applications can help push up power density without major system redesign.

The EPC9105 demo board, a 48 V to 12 V, 1.2 MHz intermediate bus converter is available from EPC for evaluation. Please visit epc.co.com for more information.

REFERENCES


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“Re-inforced” Converters for Maximized Patient Protection

Electrical equipment used on patients must conform to the medical safety standard EN 60601-1 and DC/DC-converters are often used to provide the required electrical isolation. Reinforced isolation offers an additional level of safety beyond the standard, but up to now, it has been extremely difficult to find compact DC/DC-converters with the large air and creepage distances required to meet the definition for reinforced isolation. However, RECOM has achieved this with a new technology (patent filed) and can offer reinforced isolation converters in a standard SIP8 or DIP24 case with up to 10kVDC isolation.
Generally, the patient environment is defined as the area in which the patient may access medical equipment or where he may be connected to medical equipment in the course of an examination. To avoid electrical shock, the medical safety standard demands galvanic isolation between the supply, the equipment casing, and the diagnostic tools.

Medical Applications Require Reinforced Isolation

The isolation of DC/DC-converters approved for medical applications depend not only on the level of the isolation voltage, but also on the quality of isolation. For industrial applications a functional isolation usually suffices, whereby the primary and secondary windings can be overlapped and the windings are thereby insulated just by the coating on the wires. This method of construction gives high conversion efficiency because of the close proximity of the windings to each other, and although the insulating wire enamel is very thin, it can withstand up to 4kVDC as long as it is not damaged. However, damage during the manufacturing process or excessive stresses in the windings can reduce the dielectric strength over time and can eventually cause isolation failure in the equipment.

UL (Underwriter Laboratories Inc.) has thus defined different “qualities” of isolation: Basic, Supplementary and Reinforced. The insulation class not only demands additional physical insulating barriers between input and output in case the functional isolation fails but also proscript minimum creepage and clearance distances depending on the input voltage. For a basic isolation DC/DC-converter with an input voltage of up to 75V, a clearance of 0.7mm is mandatory. For a similar converter with reinforced isolation, the clearance must be 2.4mm, i.e., three times bigger. The same applies for the creepage distance which needs to be 4.6mm for a reinforced converter instead of only 1.3mm for a basic isolated one.

Converters with Conventional “Reinforced” Technology Show Lower Efficiency

To meet the isolation class criteria, the primary and secondary windings can no longer be overlapping and must be physically apart. The winding scheme determines the size of the transformer and also the efficiency, since the magnetic fields are now no longer optimally overlapped with the increased separation.

An example: The efficiency of a conventionally isolated converter with overlapping primary and secondary windings is approx. 85%, whilst a reinforced converter in conventional design achieves only 75%.

Table 1: This table shows the defined air gap and creepage distances depending on the input voltage. The values for reinforced isolation are approx. three times greater than for basic isolation.
All the forces in the world are not as powerful as an idea whose time has come.

— Victor Hugo, 1800

Power Developer contains new ideas that come every month.

— Power Developer Editors, 2013

The difference in efficiency has a marked influence on the performance of the converter. The losses for a standard isolated 3 Watt converter are around 500mW (3W/0.85 - 3W = 0.529W), whilst they are twice as high for a conventionally manufactured reinforced-converter with the same output power (3W/0.75 - 3W = 1W). The higher internal heat dissipation reduces the maximum operating temperature from +85°C down to only +75°C.

"Re³-inflected" Technology Represents a Breakthrough

Development engineers at RECOM in Austria and in Taiwan were able to design a transformer which meets all the conflicting requirements for wide clearance and creepage distances, multiple layers of insulation and a compact size. This new concept has been filed for a patent under the designation “Re³-inflected”. DC/DC-converters incorporating this new design achieve a higher isolation, better efficiency and more rated power than comparable standard products. Apart from the higher isolation of up to 10kVDC, it was also possible to reduce the winding capacitance by a factor of three down to 20pF. This leads to extremely low leakage currents, also a common requirement for medical applications. These new converters are continuously short circuit and overload protected and can optionally be supplied with under voltage lockout and a remote on/off pin. They are certified to EN60601-1, CSA C22.2 601-1 and UL60601-1.

Five Product Families to Choose from – All With a 3-Year Warranty

For 1 and 2 Watt power rating, RECOM offers three new product families. The Rxx/Pxx-R and RxxP2xx-R series (1W and 2W respectively) are isolated up to 8kVDC and available in a space-saving SIP7 case size. The 2 watt version is also available in a DIP24 case (RV series), making a changeover to the new technology simple without requiring a new PCB layout in many cases. The efficiency is close to 88% - so the ambient operating temperature can be up to +85°C with conventional cooling alone and without any derating.

The REC3.5 and REC6 series have 3.5 and 6W power rating, are isolated up to 10kVDC and come in a standard DIP24 case. They have an approximately 20% higher power rating than their counterparts with standard isolation and reach efficiencies up to 86%. The maximum ambient temperature is +85°C for the REC3.5 with natural convection cooling and without derating. The more powerful REC6 works, up to +75°C under the same operating conditions. For both series the case temperature can reach +105°C.

Despite higher specification, world-wide certified safety and higher power rating, the prices are not significantly higher than the models with standard isolation and offer a substantial saving than comparable competitive products.

Fig. 2: A comparison of the new reinforced isolated REC 3.5 (right) with a standard isolated REC3 DC/DC converter. Although the reinforced transformer is larger, the overall case size and pin out remain the same.
ROHM is a leading semiconductor company based in Kyoto, Japan. The company’s broad product portfolio has allowed them to diversify their offerings and become a major player in a variety of markets. More recently, ROHM has become a major player in the burgeoning silicon-carbide industry, developing an entire line of silicon-carbide power devices. The benefits of silicon-carbide allow ROHM’s power products to achieve significant switching performance and durability under high temperatures.

Power Developer spoke with David Doan, the Sr. Technical Product Marketing Manager at ROHM, about the company’s diversified product lines, some key advantages of using silicon-carbide, and what ROHM has done to differentiate itself from its competitors.
A few years ago, ROHM—a Japanese-based company—decided that in order to diversify and become an international company, it needed design centers all over the world. Their mission over the last few years was to start a product design and development center here in the U.S. The result has been an ever-increasing semiconductor product line geared towards international trends in the industry.

Could you sum up some of ROHM’s product lines?

ROHM is a very diversified semiconductor company. In terms of product lines, we make everything from discrete resistors and transistors, which are probably what most customers in the U.S. come to us for. However, this is only around 30 to 40% of our revenue. If you look at our full product line in addition to discrete, there’s a whole line of semiconductor ICs, everything from sensors to LED lighting as well as power devices like silicon-carbide (SiC). A lot has changed in the past couple of years. The product lines have expanded tremendously.

Three years ago, we bought OKI Semiconductor. OKI made low-power micro, memory devices, and audio and video processing ICs. When you go to our website, and you look at our line-up, it pretty much covers everything that you could think of, which is probably both a strength and a weakness. If we go to a customer, the chances are very good that we can provide them with something they can use. The downside, in some cases, is that our line-up might not be broad enough to satisfy every application in that area. We also acquired a company called Kionix, who specializes in MEMS sensors like 3D accelerometers and gyroscopes. They’ve now become a subsidiary of ROHM, so when we present our portfolio, it includes everything from the companies we’ve acquired along with our products.

What are some of your new products that stand out in your portfolio?

In terms of differentiation in a new product, the MEMS sensors that I previously mentioned are quite important. I’d say in the power area, it is the silicon-carbide devices, which are really good for high-powered applications. It’s really an ideal material for power electronics. Today, when you look at the power markets, there are actually only two players in the silicon-carbide MOSFET area—Cree and ROHM. Silicon-carbide and MEMS are big for us, but the other area is in general power management. Silicon-carbide does fall into the power area, but that’s on the high-power side. Power management is like, for example, a smart phone or tablet, which includes standard products such as DC/DC, LDOS, and hundreds of other products. We also do other highly complex power management ICs, such as those we acquired through the Intel processor. ROHM is actually a partner with Intel in developing two or three chipsets for their next generation processor. Intel is highly selective when they choose a partner—they think they only choose one or two partners for each of their lines, and we are one of them.

What has ROHM done to differentiate itself with its silicon-carbide products?

ROHM has been involved in silicon-carbide development for many years now, but the product production has only begun in the last two or three years. The reason for that is that we are a Japanese company, so a lot of the time the lead customers are in Japan. This means that there’s a lot of time between what we see in Japan and the product introduction in the U.S.

ROHM has gotten involved with the silicon-carbide through Kyoto University in Japan with a Japanese equipment manufacturer over seven years ago. In terms of products in the U.S., we didn’t introduce it until around three years ago. Silicon-carbide belongs to a class of semiconductor called wide band gap. “Wide” in the sense of the silicon that we see in today’s semiconductors, which has a band gap of 1.1 electron volts. The band gap of silicon-carbide is three times that. One of the consequences of that is that it can withstand very high electric fields without breaking down. What that means is that you can make a device that is very small that can withstand up to 10s of kilovolts. One of the consequences of making it such a small size is that the resistance and loss is much lower.

Normally, for silicon to withstand high voltages, you have to make a very large device. That means that the resistance and everything else increases as well. This means the loss is much lower and the efficiency is higher. The main advantage of silicon-carbide compared to silicon is that the switching performance when you make a transistor and you turn it on and off, there’s a loss every time you do that. That loss in silicon-carbide is much lower than silicon. When the loss is lower, that means you can...
Silicon-carbide can also operate at much higher temperatures. This is due to the fact that the band gap is very large. Theoretically, it can go up to 500 to 700 degrees Celsius.

What types of applications are you looking into for silicon-carbide?

In terms of applications, silicon-carbide power devices are used in everything from power supplies—from 1 kilowatt up to 10x of kilowatts—to things like an air-conditioner for a home. This is because there’s a big push from the government to get higher efficiency wherever possible—so we are trying to make air-conditioning more cost-sensitive. Solar is another big market for silicon-carbide—not only in the central inverter, but also in what they call a micro-inverter. Normally, a solar panel converts to DC and you tie a bunch of panels together and you convert it back into AC. The micro-inverter is converting directly whatever current is generated by one panel directly to AC.

To go back a little bit—when we talk about silicon-carbide devices, we are actually only talking about only a few types of devices. One is a diode and the other is a transistor. The transistor can come in many flavors—like BJT, JFET, and MOSFET—and there’s also a power module where you take a bunch of diode transistors, and make a very high power module.

What about the wireless modules? Is that a big market for ROHM?

ROHM actually has offerings in everything from WiFi 802.11, ZigBee, Bluetooth classic and Bluetooth LE. We have both IC and module for those. Honestly, our focus is more on the industrial control market, not the mass consumer market. Let’s say I have a WiFi module for an office printer—there’s a need for me to have an extremely high data rate for you to stream audio and video in the home. This is really intended for small applications for, at most, 100k per year for each customer. These are for customers whose expertise is not communication, they just want to provide connectivity to the system, whether it’s an office printer or even for customers who want to control their air conditioning in their home to turn it on and off.

Today, our focus is on Bluetooth LE (low energy). In our cellphones, we all have some form of Bluetooth, but the most recent smartphones have Bluetooth 4.0, which comes in two brands—the smart LE and LE only. Bluetooth LE is intended for very low power design like in sensors where you can put them everywhere. These can be put in everything from industrial control to things like Nike’s Fuelband. So everything from healthcare devices like patient monitoring to environmental control—Bluetooth LE is everywhere.

The number one area is power. That includes power management—everything from DC/DC to the power management IC for Intel processor to silicon-carbide. This is an area where ROHM has expertise, market-share, and customers. What areas do you think ROHM may expand into in the next five years?

Last year, ROHM got a new president. Before that, the company had been ran by our founder, but he retired around a year ago. Basically, we have these three areas to focus on. The number one area is power, that includes power management—everything from DC/DC to the power management IC for Intel processor to silicon-carbide. This is an area where ROHM has expertise, market-share, and customers.

The second area is in LED lighting. Pretty much everyone has been involved in LED lighting, whether it be making fixtures or drivers. This is an area we believe has a lot of market potential. In that area, we provide the IC controller/driver that control these LEDs. The third area is sensors, which is why three years ago we acquired Kionix because of their MEMS sensor product line. We now have a broad sensor line that has some cool technology like imaging sensors, thermal sensors that you can use as a safety feature like at night that can allow you to see the road ahead of you at night. We also have a UV sensor that will be implanted in a smartphone, so if you go out on the beach, you can see how bad the UV rays are that day to prevent skin damage.
The ROHM 1200V SiC MOSFETs offer an attractive alternative to Si MOSFETs and IGBTs in HV applications, including power factor correction and offline power converters.
ROHM is the first in the industry to integrate an SiC MOSFET with an SiC SDB (Schottky Barrier Diode) in the same package.

**Technology**
Compared to Si, SiC has a higher breakdown field and higher carrier concentration leading to a device combining the three desirable characteristics of high voltage, low ON-resistance, and fast switching. Innovations such as gate oxidizing conditions enable an ON-resistance per unit area 29% lower than conventional products, resulting in the lowest ON-resistance at 1200V in the TO247 MOSFET class. ROHM is the first in the industry to integrate an SiC MOSFET with an SiC SDB (Schottky Barrier Diode) in the same package. This eliminates the need for additional free-wheeling diodes, saving cost and PCB area. Compared to silicon MOSFETs, ROHM Silicon Carbide MOSFETs offer lower ON-resistance. SiC MOSFET ON-resistance, unlike Si MOSFETs, increases only moderately with temperature. This favorable temperature characteristic leads to potentially higher permissible die temperatures and a more space efficient thermal design.

**High Reliability**
Smaller die size combined with improved processes (related to crystal defects) and an optimized device structure ensure high reliability. Reduced Power Converter Size and Cost Combining lower forward voltage drop with an integrated fast SiC diode allows designers to design power converters having greater efficiency and higher switching frequency along with reduced magnetics, capacitor, EMI filter, and heatsink size.

**Efficiency and Temperature**
Compared to Silicon IGBTs, turn-off loss is reduced by 90% and compared to silicon diodes turn-off loss is 73% lower. SiC SBDs in the ROHM SiC MOSFETs have markedly lower reverse recovery current, reverse recovery loss, and noise emission than the silicon FRD (fast recovery diodes) found in Si MOSFETs. Additionally, these superior characteristics do not change significantly over temperature. The ROHM integrated SiC diode, having a reverse recovery time of approximately 30ns, is twenty times faster than the body diode of a typical Si MOSFET.

**Applications Literature**
The applicable ROHM datasheets are very detailed and include a thermal model suitable for SPICE thermal modeling. For those wishing to learn more about these devices see the ROHM Application Note SiC Power Devices and Modules.
“Wires suck,” says WiTricity’s CEO Eric Giler. Whether knotted up behind our desks or entertainment centers, or interfering with our view of the landscape, these entangled messes have placated our insatiable demand for electricity for over a hundred years.

Since 2007 however, WiTricity has been working towards a cure for our attachment disorder. Based upon the highly resonant wireless electric power transfer technology spearheaded by the company’s founder, Professor Marin Soljačić of MIT, WiTricity has been developing technologies that deliver safe and efficient wireless electric power ranging from milliwatts to kilowatts and over distances spanning a few centimeters to several meters.
“Soljačić’s team lit up a 60-watt incandescent lamp using power transferred between two coils separated by a little more than two meters.”

**Taming the Electron**

Delivering electric power from one point to another without wires is not a new idea. Nikola Tesla worked on wireless power transfer using electromagnetic induction in the 1890s. Discovered by Michael Faraday in 1831, electromagnetic induction is the process of inducing current in a wire via current flowing through another wire nearby. According to Kaynam Hedayat, Director of Product Management at WiTricity, most people use this type of wireless power on a daily basis. “Perfect examples of induction are today’s rechargeable electric toothbrushes, which get charged by resting in their charging bases. This type of magnetic induction is a type of wireless power transfer since the toothbrush itself is not plugged directly into the wall.” Other familiar applications of electromagnetic induction include recharging mats for small electronic devices.

Electromagnetic induction has certainly opened up the market for many different wireless charging applications, but as Hedayat explained, this technology has major limitations. “With this type of magnetic induction, the products that can be developed must work in very close proximity to the charging unit, with very limited positional freedom. This means that products have to be designed so they are positioned precisely on the charging units. For example, with induction charging mats for mobile phones, you have to ‘play’ with the phone until it couples with the mat correctly. It’s not very user friendly.”

**Going the Distance**

In 2007, Soljačić and colleagues at MIT published a paper for a solution to the distance problem and reported an experimental demonstration of their technique in 2007. Using a concept called highly resonant wireless power transfer, Soljačić’s team lit up a 60-watt incandescent light bulb using power transferred between two coils separated by a little more than two meters. How did they do it? In a recent TED talk, WiTricity CEO Eric Giler explained, “Imagine a coil. For those of you that are engineers, there’s a capacitor attached to it too. And if you can cause the coil to resonate, what will happen is it will pulse at alternating current frequency—at a fairly high frequency by the way. And if you can bring another device close enough to the source, that will only work at exactly that frequency, you can actually get them to do what’s called strongly couple, and transfer magnetic energy between them. And then what you do is, you start out with electricity, turn it into magnetic field, take that magnetic field, turn it back into electricity, and then you can use it.”

Unlike traditional magnetic induction technology that loses efficiency as the distance between the device and power source increases, WiTricity’s magnetic resonance technology has been shown to stretch the distance over which energy can travel significantly. “For automotive applications, we have achieved distances of up to 15 centimeters that provide over 90% of efficiency for...”
Utilizing WiTricity Technology

WiTricity’s technology is designed to be directly embedded in the products and systems of OEMs and the company provides all the necessary tools, services, and training to streamline the process. Last month, WiTricity unveiled WiCAD, a subscription based software product that helps developers quickly model, design, and fine-tune their wireless products.

“WiCAD provides simulation and modeling for wireless power transfer systems ranging from milliwatts to kilowatts. At a high level, our goal is to help customers reduce their time-to-market by leveraging our years of experience in electromagnetic simulation, modeling, and electronics for resonant wireless power systems. We focus on helping our customers accelerate the integration of resonant wireless power so they can focus on the value proposition of their products,” Hedayat told us.

For companies that do not have the necessary in-house expertise or experience to create their own designs, WiTricity provides consulting services that typically involve simulation and modeling, followed by a product design and prototype they provide the customer. At the end of the engagement, WiTricity provides a technology transfer to their customers.

Applications

WiTricity resonant wireless power technology has applications in a number of markets, but as Hedayat explained, “The automotive industry has been one of the first markets that has shown strong interest in our technology, primarily because induction simply does not work in EV charging applications. Currently, there is no viable solution that brings the coils close enough for inductive charging in vehicles. With the ability to transfer power over a distance, resonant wireless power is the first technology that the automotive industry is embracing.”

Beyond that, the medical field is another interesting market where induction has a lot of challenges—the challenges are primarily around the proximity of coils. When you develop a device you can’t have a transmitter touching the receiver. In the industrial and military, there are a lot of applications where wireless power for charging over distances is a must requirement.

With highly resonant wireless power transfer technology, WiTricity has ushered in a new era that will fundamentally change the way we use electricity. The applications and implications of resonant wireless power are far reaching, but moreover, they promise to cure our attachment disorder for good.

3.3 kilowatts of power transfer,” indicated Hedayat.

But, the distance between the power source and the device is far from the ultimate limit. Properly applied, magnetic resonance technology can be used to power an entire room or even a house. As Dr. Katie Hall, WiTricity’s Chief Technology Officer told EEWeb last April, “Another interesting thing about the technology is that the resonators don’t just have to be in sources that supply power and devices that capture it; you can have what are called repeaters – resonators that aren’t attached to anything at all but can be used to extend the transmission distance. Some people think of it as if the power or energy is hopping from one resonator to another. Imagine you want to get from one side of a stream to the other side without getting wet, but it’s too far to make it in one jump. You could hop from rock-to-rock to get to the other side without falling in.”

“WiCAD provides simulation and modeling for wireless power transfer systems ranging from milliwatts to kilowatts.”
SupIRBuck IR3846 Buck Regulator from IR

The SupIRBuck IR3846 Synchronous Buck Regulator from IR is a highly integrated, easy-to-use, and very efficient DC/DC regulator that is capable of up to 35 amps. Some typical applications for this buck regulator would include a Netcom server or other storage applications, as well as telecom systems.
Included Hardware

**SupIRBuck IR3846**
Buck Regulator Evaluation Board

- **Voltage Controls**
  - $V_{IN}$: +12V (No Vcc required)
  - $V_{OUT}$: Capable of 35A

- **Power Inductor** (250nH)
- **IR3846 Buck Regulator**
- **Test Points**
- **Transient Load Setup**
- **Additional Test Points**

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**Setup & Use**

The IR3846 is configured for 12 volts input, which is what you should have on your programmable supply. The IR3846 can do up to 35 amps of output, which is very impressive for such a small package.

The device features a proprietary modulator scheme that enables jitter-free and noise-free operation. In turn, this allows both higher frequency and higher bandwidth operation for better transient response, which could offer 20% space savings on your PCB.

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**Conclusion**

If you have a need for a low voltage, high current regulator, then you should consider the IR3846. With such a small footprint and ease of use, it’s suitable for almost any Netcom server or storage applications.

To purchase the SupIRBuck IR3846 visit IR's website.

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Watch Video