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Lighting Company Takes a Shine to Power Electronics Engineers

by David G. Morrison, Editor, How2Power Today

If you prefer dealing with human resources (HR) managers who don't have a clue about power electronics, and can't tell a power supply designer apart from any other EE, then please stay away from Maureen Crawford. And if you're comfortably accustomed to HR personnel who have difficulty stifling a yawn as they skim through your too-short summaries of your triumphs and innovations as a power supply designer, then certainly steer clear of Crawford. She's just going to be too interested in your resume and how you might possibly help her company solve the next lighting-design challenge.

For many in the electronics industry, it's almost conventional wisdom that power electronics isn't glamorous. But you won't hear that from Crawford, who is the U.S. manager of talent acquisition, development and compliance at Osram Sylvania in Danvers, Mass. Even in this down economy, she still digs through resumes to find the right blend of skills and experience to fill diverse job requirements for power electronics engineers at her company, which, like others in the lighting industry, is developing products in an environment of rapid technological change. "Power electronics and lighting," she says are her company's "bread and butter." So perhaps it's not surprising that she is passionate about both subjects—to the point where Crawford already has visions of her 7-month old going off to Virginia Tech one day to study power electronics.

"Power electronics is the backbone of our lighting business," says Crawford, who expects to nearly double the number of power electronics engineers at her company by the end of this summer. Much of this growth is being driven by development of solid-state lighting (SSL, a.k.a. LED lighting) as attested to by the current batch of job listings on the Osram Sylvania website (see the table.) However, there are also demands for ballast designers for fluorescent and other lamp technologies. Demand for higher energy efficiency and better user experience are among the customer requirements driving development of SSL and other lighting products. Power electronics is critical to the success of these products, and enables further innovation.

When asked whether she has difficulty finding power electronics (PE) engineers, Crawford says, "I do and I don't." Although there are many qualified candidates who have the PE design skills her company is looking for, there are three factors that can get in the way of hiring these candidates—a lack of awareness among PE engineers of the opportunities in lighting, poor packaging of the engineer's experience, and overall competition for PE engineers from various industries.

Lack of Awareness

Oftentimes power electronics specialists overlook lighting as an area where their skills are needed. For those candidates, Crawford has to find them, and then "persuade them that lighting is the sexy wave of the future." Fortunately for Crawford, many engineers are sensitive to the message that lighting has a big environmental impact and that by designing power electronics for lighting, engineers can have a big impact on energy consumption. "The person who figures out how to do really sophisticated LED lighting on a very big scale is going to impact our energy footprint in the world" says Crawford.

Poor Packaging

Many engineers have the power electronics skills that Osram Sylvania seeks, but aren't very good at presenting that experience. "People have to understand that engineers aren't generally looking for engineers, it's HR people looking for engineers. So it's very important that resumes not only have the technical details required but also use the layman's language," says Crawford.

Through experience, Crawford, who is not an engineer, has become familiar with the technical jargon of power electronics and can correlate PE terminology on a resume with specific job requirements. However, engineering applicants need to keep in mind that this is not always the case. Many junior-level recruiters won't be familiar with PE terminology. Therefore, Crawford recommends that engineers break out their experience by competency. "Here's my power electronics experience, here's my embedded software experience, here's my electrical experience dealing with PCB design, and so on" she explains.

Crawford provides some other pointers that can help applicants for PE engineering positions. Much of this advice will be valuable when applying to other lighting companies and companies in other fields:

- *Avoid ambiguous descriptions.* If you have design experience, state that experience in clear terms. Don't use expressions like "worked on power supplies" when you mean "designed power supplies." The latter implies a much more intimate knowledge of the subject. Another example, don't say "responsible for ballast production" when you mean "responsible for ballast design."

- *Don't take your experience or credentials for granted.* If you've graduated from one of the well-known PE programs like CPES, CoPEC, or U. Of Wisconsin at Madison, that will probably be recognized. But Crawford advises that you make it clear to recruiters—without overdoing it—that you know what it means to have graduated from a top power electronics program. Crawford says, this helps get across the message that "power electronics is not just one of a number of electrical engineering things you can do, it's your focus."

- *Don't be afraid to express your interests.* Lighting companies such as Osram Sylvania have different niches to fill. They need designers for LED power supplies, LED drivers, fluorescent ballasts, etc. If you have a specific interest or strength in ac-dc power supplies, dc-dc converters, or another area, express it when asked what you'd like to work on. Though you may be wary of pigeon-holing yourself into a position that doesn't exist, there are diverse PE opportunities in lighting. To a recruiter like Crawford, "anything is fine" is a bad answer.

- *Technical skills are not the only requirements.* "You have to be bilingual, you have to speak engineer and layman terms," says Crawford "We want people who are creative and innovative and want to do rapid development. And just because you're a power electronics engineer doesn't mean you have all that." She also explains that her company values active participation by engineers in industry organizations . "For example, if you're interested in solid-state lighting I want to see you up on Solid-State Lighting Pioneers group on Linked In, posting and answering questions, or something along those lines," says Crawford. "While we don't want people who will give away the store, we do want people who are interested in furthering the profession of power electronics."

Competition

From Crawford's perspective, power electronics engineers are very much in demand. Her company has to vie for engineers with its competitors in lighting as well as companies in other industries. But rather than targeting engineers who work for her competitors, Crawford says she looks to draw talent away from smaller companies that may not be in lighting. Her pitch: "If you're going to work 90 hours a week at your startup company, come here and work a nice 40 hours, get rewarded much better, and have the ability to work with a global company."

Looking ahead

Lighting companies such as Osram Sylvania are global, so they can offer engineers opportunities, not just in the U.S. but also in Europe or Asia. However, there are some caveats. For example, if you're a power electronics design consultant, Osram Sylvania probably won't hire you as such. The company seeks employees rather than consultants because they want their engineers together in one place to facilitate dialogue with one another, says Crawford. Also, if you're applying for a power electronics engineering position with the company here in the U.S. you'll need to live and work in Danvers, Mass. where Osram Sylvania is headquartered.

This requirement is shared across many industries. However, there may be more flexibility in the years ahead. As demand for PE engineers grows, we may see lighting companies opening up regional design centers just as the U.S. semiconductor manufacturers have done. Although Crawford notes that her company has no immediate plans to do so, she acknowledges that there are many places around the country where a design center would put the company close to its customers while taking advantage of local engineering talent.

Table. Sampling of recently posted job listings at lighting (and related) companies for EEs with power electronics background.

Company	Job Title (location)	Description of position(s)	Qualifications sought
Osram Sylvania (these listings were downloaded 2-9-2010, also see 4450_Solid State Lighting Engineers / all levels)	Firmware Engineer for LEDs (Danvers, Mass.)	Firmware engineering position focused on the development of LED power supplies and controls for Solid State Lighting applications. This entails embedded system design to control LED drive circuits with AC or DC input for voltage-controlled or current-controlled systems. Manage product development from concept through launch with cross-functional global team. Bring your expertise to add new features to SSL Systems including color mixing and adaptive sensor control loops. You will work with a high level of technical creativity and independence to solve unique and complex technical problems. You will be a key project contributor and a project leader with accountability for specific project results. Your development activities include: • Write microcontroller firmware in C/C++ for lighting control products • Work with bleeding-edge digital and analog electronics designs • Perform product design and development activities with a high degree of independence and creativity. Be responsible from start to finish of new product development including product definition, design, parts selection and qualification. • Interface with cross-functional departments: marketing, manufacturing, quality, logistics, senior management and external customers. • Work closely with product development teams at OSRAM • Generate engineering documentation e.g. specifications and qualification reports • Following programming guidelines and usage of a version control system	Minimum education requirement: BS Electrical Engineering or Computer Science with at least 5 years of experience. MS/PhD degree and at least 2 years experience is preferred. The ideal candidate will also have demonstrated technical competence in Analog/Digital and Microcontroller based designs. • Expertise in design, analysis and testing of microcontroller operated digital and analog electronics • Specialist experience in software design of embedded systems, e.g. with ARM processors • Working knowledge of programming languages Visual Basic.NET or Visual C++.NET and C/C++ • Working knowledge of communication interfaces like UART or I²C is preferable • Knowledge of lighting system requirements and electronic power supplies preferable • Knowledge of communication protocols like USB or TCP/IP a plus • Knowledge of wireless communications protocols (IR, Zigbee) a plus • Excellent command of oral and written English • Commitment to working independently and in a team environment • Demonstrated commitment to continuous improvement of products and processes
Osram Sylvania	LED Lighting Systems Electronics Engineer (Danvers, Mass.)	Design & Development of LED power supplies (including controls) for Solid State Lighting applications. This entails electrical design of the LED drive circuits with AC or DC input for voltage-controlled or current-controlled systems. Manage product development from concept through launch with cross-functional global team. Bring your expertise to improve the energy efficiency of SSL systems while adding new	This position can be hired at any level from Jr. Engineer to Sr. Principal Engineer, depending upon experience. At minimum, BS degree in engineering required; MS in Electrical Engineering plus 2 years design experience very strongly preferred. PhD entry level and PhD experience level candidates are also welcome to apply for consideration at higher levels.

		features including color mixing and adaptive sensor control loops. You will work with a high level of technical creativity and independence to solve unique and complex technical problems. You will be a key project contributor and a project leader with accountability for specific project results. Your development activities include: • Perform product design and development activities with a high degree of independence and creativity. • Generate engineering documentation e.g. specification, schematics, layouts, BOM and qualification reports • Work with the regulatory agencies (e.g. UL, FCC) to obtain relevant approvals • Perform/Support qualification tests related to electrical, thermal, EMC and environmental requirements. • Be responsible from start to finish of new product development including product definition, design, parts selection and qualification. • Work closely with our manufacturing and quality department • Interface with cross-functional departments: marketing, logistics, senior management and external customers.	The ideal candidate will also have demonstrated technical competence in Analog/Digital and Micro-controller based designs. Demonstrated competencies in design of power electronics is a must • Working knowledge of switched-mode power supplies and its power conversion topologies like PFC, boost/buck/flyback converter • Understanding of current and voltage waveforms in power conversion circuits • Experience in power component selection and design of magnetic parts • Must have significant experience in project leadership. • Working knowledge of UL and EMI requirements for lighting systems and electronic power supplies • Excellent written and oral skills • Commitment to working independently and in a team environment
Osram Sylvania	LED Power Supply Electronics Engineer--Sr. Level (Danvers, Mass.)	Design & Development of LED power supplies (including controls) for Solid State Lighting applications. This entails electrical design of the LED drive circuits with AC or DC input for voltage-controlled or current-controlled systems. Manage product development from concept through launch with cross-functional global team. Bring your expertise to improve the energy efficiency of Solid State Lighting systems while adding new features including color mixing and adaptive sensor control loops. You will work with a high level of technical creativity and independence to solve unique and complex technical problems. You will be a key project contributor and a project leader with accountability for specific project results. Your development activities include: • Perform product design and development activities with a high degree of independence and creativity. • Generate engineering documentation e.g. specification, schematics, layouts, BOM and qualification reports • Work with the regulatory agencies (e.g. UL, FCC) to obtain relevant approvals • Perform/Support qualification tests related to electrical, thermal, EMC and environmental requirements.	At minimum, MS degree in EE required; MS in Electrical Engineering plus 5 years design experience preferred: PhD entry level or PhD with experience very strongly preferred. The ideal candidate will also have demonstrated technical competence in Power Supply design and Analog/Digital and Micro-controller based designs. • Demonstrated competencies in design of power electronics is a must • Working knowledge of switched-mode power supplies and its power conversion topologies like PFC, boost/buck/flyback converter • Understanding of current and voltage waveforms in power conversion circuits • Experience in power component selection and design of magnetic parts • Must have significant experience in project leadership. • Working knowledge of UL and EMI requirements for lighting systems and electronic power supplies • Excellent written and oral skills • Commitment to working independently and in a team

		• Be responsible from start to finish of new product development including product definition, design, parts selection and qualification. • Work closely with our manufacturing and quality department • Interface with cross-functional departments: marketing, logistics, senior management and external customers. We have a number of openings at OSI. These positions can be hired at any level from Senior Engineer to Principal Engineer, depending upon experience.	environment
Osram Sylvania	Solid State Lighting Electrical Engineer Jr. / Sr. Level (Danvers, Mass.)	Design & Develop innovative electrical solutions for Solid State Lighting applications. This entails electrical design of the LED based lighting products with AC or DC input. Responsibility for product development from concept through launch. You will be working with a team of optical and mechanical engineers to solve unique and complex technical problems. As a key project contributor and a project leader with accountability for specific project results; you'll have the opportunity to work alongside of the finest talent in the industry in a fast paced, dynamic professional environment. • Design of electrical circuits including linear and switched mode circuits and components for solid state (LED) lighting. • Generate engineering documentation e.g. specification, schematics, BOM and qualification reports • Perform/Support qualification tests related to electrical, thermal, EMC and environmental requirements. • Work with the regulatory agencies (e.g. UL, FCC) to obtain relevant approvals • Be responsible from start to finish of new product development including product definition, design, parts selection and qualification. • Work closely with manufacturing and quality department • Interface with cross-functional departments: marketing, logistics, senior management and external customers.	BS EE entry level is the minimum requirement. BS+ 2 years of design experience or MSEE entry level or with experience are preferred qualifications. Candidate will be hired at level appropriate to experience. REQUIRED: • Working knowledge and hands on experience with electronic systems-analog and digital, microcontrollers programming interfacing and switch mode power supplies. • Excellent electrical circuit analysis and circuit modeling (PSPICE etc) skills. • Commitment to working independently and in a team environment • Excellent written and oral communication skills PREFERRED • Experience with regulatory approvals and requirements (FCC, UL) is preferable
Osram Sylvania	Solid State Lighting Electrical Engineer Sr./ Principal (Danvers, Mass.)	Design & Develop innovative electrical solutions for Solid State Lighting applications. This entails electrical design of the LED based lighting products with AC or DC input. Responsibility for product development from concept through launch. You will be working with a team of optical and mechanical engineers to solve unique and complex technical problems. As a key project contributor and a project leader with accountability for specific project results;	Educational Requirements BS+ 5 years of design experience or MSEE entry level is the minimum requirement for this position. MS +2 years and up; PhD entry level or PhD experience are preferred qualifications. Candidate will be hired at level appropriate to credentials. REQUIRED:

		you'll have the opportunity to work alongside of the finest talent in the industry in a fast paced, dynamic professional environment. • Design of electrical circuits including linear and switched mode circuits and components for solid state (LED) lighting. • Generate engineering documentation e.g. specification, schematics, BOM and qualification reports • Perform/Support qualification tests related to electrical, thermal, EMC and environmental requirements. • Work with the regulatory agencies (e.g. UL, FCC) to obtain relevant approvals • Be responsible from start to finish of new product development including product definition, design, parts selection and qualification. • Work closely with manufacturing and quality department • Interface with cross-functional departments: marketing, logistics, senior management and external customers.	• Analysis and design of switched mode power supplies and selection of parts. • Proficiency in modeling of electrical systems with PSPICE. • Microcontroller programming and interfacing. • Experience with regulatory approvals and requirements (FCC, UL) • Commitment to working independently and in a team environment • Excellent written and oral communication skills
Osram Sylvania	Electronics Ballast Designer / Power Engineer (Danvers, Mass.)	…. Power Electronics Design Engineer working on developing new products (electronic ballasts) and processes for Electronics and Controls Division. Will work to solve unique and complex technical problems with high level of autonomy and creativity. Will be a key project contributor, and a project leader with accountability for specific project results. … We have several positions available, and can hire candidates at the Senior I or II level or the Principal I or II level, depending upon experience.	•BS Eng and 5+ years; or MS Eng entry level are the minimum qualifications. •Requires proficiency in power electronics & control, design, analysis, bread-boarding and testing. •Perform product design and development activities with a high degree of independence. •Responsible from start to finish of new product development including product definition, design, parts selection and qualification. •Requires proficiency is software simulation tools. •Working knowledge of lighting system requirements and electronic ballast design •Proficiency in the software design and implementation of micro-controller based systems (with emphasis on programming languages such as C and assembly) is desirable. •Must be familiar with EMC / EMI requirements. •Serve as technical lead and professional mentor to less senior electrical engineers and interns. •Perform other tasks as required such as, failure analysis, and some technician support functions.
General Electric Theses listings downloaded 2-11-	Electrical Engineer – Lumination ShangHai, China	•Design, improve and qualify LED power supply and driver. Select electronics components based on design requirement and cost target. •Responsible for electronics product development cycles from concept design till the launch of mass production.	Qualifications/Requirements •Bachelor degree or plus in Electronics/Electrical Engineering or equivalent •4 years plus electronics design experience for AC/DC power supply or driver. P-Spice, ORCAD, or equivalent

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General Electric	Component Engineer ShangHai, China	Essential Responsibilities: ●Lead Lighting Electronics component qualification (including both active and passive parts) following GE process. ●Support component quality issues across all GE Global Lighting Electronics product lines including Ballast, LED and Controls. ●Work with global technology teams on program execution including component recommendation, sample preparation, failure analysis, component reliability testing etc. ●Work with suppliers to ensure component on-time delivery to meet given program qualification schedules. ●Communicate effectively the component status to gloabl design teams ●Develop component suppliers according to GE qualification requirement and provide guidence to improve supplier competency. ●Develop new components together with suppliers to meet GE design and application requirements. ●Organize component techncial trainings to global design team. ●Other Responsibility:Environmental, Health & Safety (EHS) Compliance and Expectations:To ensure your 100% compliance with the Safe Production Law of P.R. China and with GE's EHS Policy (20.3), all CTC employees must: understand and comply with CTC's EHS Policy, safety instructions and established job specific	Qualifications/Requirements: ●Bachelor Degree in Electrical, Electronics Engineering or equivalent ●Minimum 5 year working experience in electronic components. ●Familiar with latest passive and active component technology trends. ●General knowledge of lighting technology, familiar with component manufacturing, qualification and reliability evaluation procedures.. ●Understanding of related electronics industry regulatories(RoHS, UL, IEC etc) ●Demonstrated project management skills. Able to handle multiple tasks at the same time. ●Effective communication in English and Chinese ●Team player ●Good interpersonal skills. ●Quick learner ●Desired Characteristics ●Power Electronics circuit design and analytical skills ●Understanding of Six Sigma and Reliability methodology and tools (FMEA, DOE, Weibull etc.)

		safety procedures and rules; correctly use and maintain personal protective equipment (PPE); obey PPE signals; complete applicable EHS training; participate in accident, injury & illness prevention activities; enhance their knowledge of risk mitigation and emergency response skills ; and timely report near-miss cases, unsafe conditions and acts.	
Cree	Power Electronics Design Engineer Durham, NC or Hong Kong (position can be located in either city)	Cree is looking for a self-motivated, hands-on electrical engineer to design power electronics for LED based lighting products. Working within cross functional groups consisting of marketing, engineering and manufacturing to research, develop, design, qualify and introduce component and integrated component products and systems into production. Responsibilities will include support of product introduction and on-site technical support. A successful candidate will be a resourceful problem solver that is able to work around technical obstacles and will be adept at the implementation of practical solutions. DUTIES AND RESPONSIBILITIES: ●Develop, sustain and improve LED drivers, power supplies and control systems for general illumination products. ●Lead design from concept to production hand-off including component selection, simulation, test, prototype build, safety approvals and production integration. ●Lead compliance effort for EMC and safety approvals both US and worldwide. ●Work directly with Manufacturing Operations and Engineering to ramp new products and processes into production. ●Interface with component suppliers to evaluate second source components and resolve technical issues that may arise in manufacturing. ●Indentify, initiate and implement solutions for process/product development that improves performance, reduces cost, strengthens yield, and increases capability. ●Provide technical support and instruction to staff and customers regarding equipment standards, and help solve specific, difficult in-service engineering problems. ●Provide training to other personnel to improve overall capabilities and knowledge. ●Work across company functional organizations to ensure project success.	MINIMUM QUALIFICATIONS: ●B.S. in Electrical Engineering or other technical related field. ●5+ years in power electronic design with working knowledge in high frequency magnetic design, control, topology selection and simulation. ●Strong technical background in electronic device performance and passive components. ●Ability to troubleshoot analog and power electronics with equipment such as; oscilloscopes, power meters, AC and DC power supplies and multimeters. ●Proficient with Mathcad, pspice and schematic capture tools, preferably Orcad. ●Ability to work independently and be self-sufficient while managing multiple projects. ●Excellent written and verbal communication skills. ●Self-starter with strong personal work ethic. Must have a "whatever it takes" attitude. ●Willing to travel – both domestic and international. PREFERRED SKILLS: Experience with LED products a plus.
Micron Technology	Sr. LED Power Supply Systems Engineer Boise, ID	As a Sr. LED Power Supply Systems Engineer at Micron, you will be responsible for the design and development of power supply hardware for LED illumination products. You will be a member of a cross-functional systems development team with hands-on responsibility for the design and support of integrated LED illumination products. In this extremely hands-on role, you will be	Successful candidates for this position will have: ●A minimum of 5 years electrical engineering experience with 3 years of switching Power Supply design. ●Extensive knowledge of high frequency switching power supply topologies, power factor correction, and control architectures.

		responsible for product development from cradle to grave as well as future technology development. Your responsibilities include, but are not limited to, the following: ●Analyzing system electrical requirements to determine feasibility of design performance, time and cost constraints. Determining design architectures, approaches and parameters. ●Choosing appropriate LEDs and influent LEDs specification. ●Designing and testing power supply systems taking into consideration power factor correction, converter design, EMI filtering, transient protection, analog design, component selection, simulation/test, PCB layout, and product functional specifications. ●Design and testing of digital and analog control electronics. ●Design validation and reliability engineering. ●Reviewing vendor capability to support development. ●Diagnosing, troubleshooting, and solving technical issues with manufacturing and customers. ●Assisting with the resolution of supplier technical issues. ●Using electrical expertise to design, develop, and enhance low cost power solutions. ●Participating as a key team member from product conception through manufacturing production. ●Providing overall project planning including development schedules, generating test and qualification plans, and originating the objective specifications. ●Providing technical leadership to engineering staff and direct day-to-day activities for engineering aide (technicians). ●Interfacing with internal organizations, external suppliers and contract manufacturers. ●Other job related duties as assigned by your manager.	●A minimum of 2 years experience in power supply miniaturization. ●Familiarity with high power LEDs and various LED drivers topology. ●Experience in computer simulation of analog circuitry. ●Experience with responsibility for running projects from concept to production release required. Experience in manufacturing/production support. Quality practices such as 6 Sigma, Halt, MTBF & ISO. ●Familiarity with EMC, UL, Power Factor, Utility codes. ●EMI/EMC Specific power conversion design skills include: power conversion circuit design and analysis, circuit simulation, layout considerations, feedback control theory, EMC and Safety agency compliance, and logic/interface circuit design, Digital control experience desirable. ●Utilize grounding and signal integrity techniques. ●Familiarity with PCB layout, thermal analysis utilizing Altium. Board-level component selection and sourcing. ●Design for high-volume, cost-sensitive applications. ●Design for manufacturing, testing, quality improvement and process development. ●Knowledge of embedded micro-controller application and programming a plus. ●The ability to manage and prioritize multiple projects at once. ●Good interpersonal skills to interface with Design Engineering, Manufacturing and Test departments. ●Self-motivated and detail oriented. Excellent team and individual contributor leadership skills ●Strong interpersonal and communication skills (verbal and written). Education: • BSEE in Electrical Engineering, Master's or PhD preferred.