*Where To Find Custom Power Magnetics For Your Application**

by David G. Morrison, Editor, How2Power.com

For power electronics (PE) applications where off-the-shelf magnetic components are inadequate, custom inductors, chokes, transformers, EMI filters and other magnetic devices are available from numerous magnetics manufacturers. For some magnetics manufacturers, custom work is part of a larger business which includes a standard portfolio of products. For others, custom magnetics is the main or sole focus of the business.

Some of these companies develop magnetics for a broader range of uses such as RF and networking, while others focus exclusively on power. Some also bring experience in power supply design to the job. The vendors may offer further specialization in areas such as planar magnetics, or have special experience in developing components for certain power levels or end applications such as automotive, industrial or mil/aerospace. These companies may also offer expertise in meeting compliance requirements and various aspects of component design and manufacturing.

This feature provides the results of a survey of magnetics manufacturers offering custom magnetic components for power electronics. Companies were surveyed regarding the types of components they offer, their areas of specialization—either by power level, applications or industries served—and special strengths of the company in terms of design, manufacturing, delivery, pricing, or other aspects of the business. Survey questions and vendor responses are shown below in the tables.

The tables below will updated periodically with additional vendor information. To submit your information, complete the survey below and email your responses to me.

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*Survey on Custom Magnetics For Power Electronics (PE)***

Question 1. Which component types does your company offer? (Power inductors, chokes, transformers, EMI filters?)

Question 2. Wound and planar?

Question 3. Which power levels, applications, and industries does your company address?

Question 4. What are the specials strengths of your company in this area? These could relate to design, manufacturing, delivery, pricing, or other aspects of providing custom magnetic components.

***All answers should pertain to custom magnetics for power electronics.*

Vendor Responses

Survey question 1. Which component types does your company offer? (Power inductors, chokes, transformers, EMI filters?) Survey question 2. Wound and planar?

Table 1. Vendor responses to questions above.

Manufacturer	Component types offered for PE	Wound and planar?
BI Technologies	All of the above (power inductors, chokes, transformers, EMI filters). A wide variety of through hole and surface mount, both from customer designs as well as our solutions based on their parameters.	Wound for now. Planar parts are in the development stage.
Champs Technologies	Mostly transformers and power inductors.	Yes [A]
Coilcraft	Surface-mount and through-hole power inductors, coupled inductors, high-temp/automotive-grade inductors, inductors for Class D, non-magnetic power inductors, toroid magnetics, flyback transformers, high-isolation transformers, PoE magnetics, planar magnetic, current sensors, common-mode chokes, EMI filters, etc.	Yes
Cramer Coil & Transformer	Flyback transformers, inductors, chokes, through hole and surface mount, and isolation transformers.	Yes
Gowanda Electronics	We offer custom solutions in all these component types (power inductors, chokes, transformers, EMI filters?) both surface mount and thru hole.	Wound only
ICE Components	All of the above (power inductors, chokes, transformers, EMI filters).	Yes, if planar refers to low profile. No, if planar refers to integrated into the circuit board.
Magnetic Design Labs	Power transformers, inductors, chokes and specialty magnetics like magnetic amplifiers & LVDT linear displacement transducers.	Yes
Payton Planar	Payton's business model is 99% custom. Payton will design the best possible solution for the application using planar magnetics or conventional magnetics or a combination of the two. Customer specs and expectations determine which approach is used. Specs that drive the type of design are temperature, cooling of the magnetics and switching frequency. Expectations are size, cost and efficiency.	Yes
Precision	• Power Inductors • Reactors • PFC inductors • Common-mode chokes • Differential-mode chokes • High-frequency transformers • Line-frequency transformers • Current-sense transformers	Primarily wound magnetics
Premier Magnetics	Transformers, inductors, filters, common-mode chokes, dc-	Bobbin, toroidal, and 60-Hz laminated

	dc converters.[B]	steel wound
Pulse Electronics	All power magnetics are possible for custom component requests including inductors, power transformers, gate-drive transformers, common-mode chokes and current-sense magnetics provided that they meet opportunity thresholds for ROI.	Yes
Standex-Meder Electronics	Planar transformers and inductors, current sense, low and high-frequency transformers, and common-mode chokes.	Yes
Vishay	Power inductors, chokes, transformers, EMI filters, and telemetry coils.	Yes
Wurth Electronics Midcom	All of the above (power inductors, chokes, transformers, EMI filters).	Bobbin wound and toroidal; some planar products.

Notes:

A. Champs Technologies' forte is in planar and we leverage design wins in that area to open up opportunities for wound components. However, wound component solutions must be competitive from the standpoint of cost.

B. Premier Magnetics: In order to design a custom and cost-effective solution to meet the required efficiency level and a design that will comply with the necessary safety standards, leakage reduction, interwinding capacitance, temperature rise, power loss and other operational characteristics, we need to know what semiconductor chip they are using, the input voltage, output (current), physical space on PCB (max height/width), operating environment and any safety agency requirements (creepage/clearance) they need to meet.

Survey question: Which power levels, applications, and industries does your company address?

Table 2. Vendor responses to question above.

Manufacturer	Power levels, applications and industries served in custom magnetics for PE
BI Technologies	Typically 5 A and above. Applications across the board from automotive to industrial to medical. No 50 or 60 Hz though.
Champs Technologies	The predominant application space is telecom covering an input voltage range of 9 to 36, 18 to 72 or 36 to 72 V. Power levels range typically from 20 to 200 W. This application space is mostly served by planar devices and standard inductors. As one gets to higher power in the 600- to 1500-W level the transformer can be planar as well but may often be a hybrid or wound component. Generally speaking the higher the power level the more opportunities for customization as a key aspect of design is getting the heat out and that task can be solved in innumerable ways. Another application space is offline or power factor corrected off line, where the input voltage can range typically from 150 to 400 V. The industry here is much broader. The device realization can be in the form of bias or housekeeping transformers which can range from 2 to 5 W to main bus converter transformers, which can range in power levels from 2 to 20 kW and supply dc bus to a system at voltage levels of 28 V or 48 V typically. Categories include wind, solar and automotive which use and exploit the same parts but the power conversion topologies may differ and so the magnetics take on a different mechanical and electrical design and as such are customized as well as standard designs.
Coilcraft	We offer standard power inductors with current ratings ranging from milliamps to 100 A. Our products are designed into a wide range of industries/applications including, data/networking, solid state drives, building/factory automation equipment, automotive, computing and telecommunications, portable/smart devices, IoT, energy harvesting and others.
Cramer Coil & Transformer	From single watt to kilo watts, we address a wide range of applications and industries including appliances, lighting, medical, industrial control, building control, automotive, alternative energy, and others.
Gowanda Electronics	Power levels up to 1 kW. Communications, defense, aerospace and space.
ICE Components	SMPS transformer ~ 3 kW Off-line (50/60Hz) ~ 600 W • Voltage regulator modules (VRMs), VRDs (embedded) • High-frequency, high-current switching power supplies; ac-dc converters • Off-line switch-mode power supplies, conducted EMI filters • Dc-dc converters including synchronous buck and POL converters • Memory • Gate-drive transformers, isolated pulse and signal transformers • LED drivers, smart grid, energy harvesting, high power reactors, solar PV, HV PFC, advanced power electronics, motor controls • Medical, industrial control, telecom, audio/class D, PCs/servers • Instrumentation, white goods, solar, LED lighting, electric vehicles
Magnetic Design Labs	Military/ruggedized and hi-rel/commercial. Power levels from 1 W up to 25 kVA.

Payton Planar	Payton offers custom magnetics with a max of 1000 V in and 1000 A. Power levels from a few watts to 100 kW on a single transformer for full military environments, automotive and industrial.
Precision	Switch-mode power supplies: 1 to 10 kW Inverters: up to 5 MW (reactors) Applications: • LED applications • Switch-mode power supplies • Ac-dc converters • Dc-dc converters • Power factor correction • Solar micro inverters • Dc-ac inverters Industries • Medical • Aerospace & military • Industrial Controls • Instrumentation • HVAC • Telecommunications • Consumer electronics
Premier Magnetics	Power levels: Typically 1 to 300 W (up to 500 W) Applications: Our products are currently being used in a variety of applications including cabin lighting/galley equipment (Boeing 737s) and in-flight entertainment systems (Boeing and Airbus), medical equipment, low-cost/high-volume audio amplifiers, professional quality amplifiers and speakers, Hollywood motion-picture set lighting, phone chargers, power meters, computer-video interfaces, switchers, configurable control systems, distribution amplifiers, computer-video scan converters, household appliances, guided munitions, and many more. Our broad range of magnetic components serves the communications, computer, industrial, commercial, medical, defense, audio and lighting, and avionics industries.
Pulse Electronics	The power sweet spot is ≤300 W for wirewound transformers and ~1 kW for planar and for inductors typically below 80 A. Pulse concentrates on computing, datacom, industrial control, PV inverters, LED lighting and smart grid applications and markets.
Standex-Meder Electronics	Power levels: 10 W to 30 kW Applications and industries: ac-dc resonant designs, aerospace and military (high reliability/repeatability), appliances, automotive, electric and hybrid vehicles, battery chargers (12 V, 24 V, 48 V, 1 kW to 10 kW), dc-dc converters (100 W to 1200 W) in distributed power systems, distributed isolated power, feedback control, high-current POL converters, high-power LED lighting, industrial power, welding, isolated inverters, isolated (non-regulated) bus converters (Vout = 9 V to 12 V), renewable energy—wind and photovoltaic power systems, servers—data centers (400 V dc), telecom applications ("sweet spot" at Vin = 36 V to 72 and output = 40 W to 250 W), welding, lasers, and test equipment.
Vishay	Power levels: Switched-mode power supplies to 20 kW, inverters to 1 MW, and planars to 8 kW Applications: Implantable medical products for cardiac management and neuro stimulation, external medical devices including surgical navigation, hearing devices, and external defibrillators, avionics and military including cockpit controls, entertainment system power, mobile communications, radar systems, engine controllers, landing systems, communication satellites, hybrid electric inverters for

	automobiles, commercial solar string inverters, power supplies for semiconductor manufacturing equipment and electric power line monitoring. Industries: All industries that require high-reliability magnetic components where quality is critical, including medical, industrial, avionics, military, and space.
Wurth Electronics Midcom	We prefer to design for power levels up to 150 W. Applications include offline, lighting, metering, PoE, dc-dc converter, industrial controls, white goods, DSL, telecom, CMC, PFC, charging, and standby power. Industries are lighting, metering, telecom, industrial, home appliance, building automation/security systems, and more

Survey question: What are the specials strengths of your company in this area? These could relate to design, manufacturing, delivery, pricing, or other aspects of providing custom magnetic components.

Table 3. Vendor responses to question above.

Manufacturer	Strengths of company in custom magnetics for PE
BI Technologies	We excel in customer service, offer competitive pricing, are easier to work with as compared to some of our competitors, and have low minimum order requirements. Our Malaysia facility is accredited to TS16949, ISO14000, ISO 13485, and OSHAS 18000.
Champs Technologies	Champs Technologies offers the widest array of planar solutions for every application space. So we adapt planar for different power levels and sizes. One of the difficulties in doing this is having the tooling available for all of the myriad turns combinations and possibilities. Champs has amassed, over the years, a significant stock level for all these sizes and turns and so we almost always have a part we can supply or modify in order to fulfill a design request. We are very active in reference designs which, by definition, will involve a standard product. However, customers always present their unique requests which usually take the form of modified input voltage range or power level or means for optimizing the thermal performance. Some cases are as simple as offering through-hole versions of surface-mount components. Other cases revolve around cost-effective thermal solutions.
Coilcraft	Our strength in providing custom magnetics is our experience in both the design and manufacture of a wide range of magnetic components. Being able to draw on a wide range of inductor styles and material types, and serving a broad application space, gives us a full tool box from which to find the optimum solution for any particular customer situation.
Cramer Coil & Transformer	Cramer's focus is on custom design and engineering support. We have manufacturing in China and the U.S. with extensive investment in automated winding equipment.
Gowanda Electronics	Hi-rel work to Mil-Std-981 and NASA EEE INST-002. Solder certification to NASA 87393, QPL designs to Mil-Prf-27, in-house mold fabrication, in-house environmental lab to support test plans.
ICE Components	Design and engineering support is our primary strength: We help the engineers with UL designs, UL listings, offer engineering support to meet difficult specs and achieve desired performance. We understand environmental temp requirements, high ambient and low temp rise, potted units for dirty environment, high current and voltage apps.
Magnetic Design Labs	Design in house, design assistance or complete design to specs offered, high-voltage, manufacturing in house, expedited delivery offered. Also, we can provide test data that characterizes the custom magnetics for high-frequency SMPS use.
Payton Planar	Payton can provide a full proposal on a custom solution within 24 hours. Payton can provide a working sample within days. Engineering and manufacturing locations around the world. Best of the best customer service and support. Magnetics designers with power supply design experience. Full technical in-house expertise. Payton has over 200 years combined design experience in magnetics.
Precision	Precision specializes in high-frequency, high-efficiency and high-power-density magnetics for power electronics applications. Precision utilizes Ansys Maxwell 2D/3D state-of-the-art electromagnetic simulation software to optimize power electronic magnetics. Combining strong domestic and offshore manufacturing presence, Precision offers price-competitive magnetic components.
Premier Magnetics	We have over 23 years in the industry with unmatched quality and on time-delivery records, as well as customer retention rates. Unlike any of our magnetic

	competitors, when needed, we will also provide a complete power circuit schematic when needed. We are experts in magnetic design but have a strong understanding up to the circuit level and power topologies. We work closely with several of the top power semiconductor manufacturers to insure compatibility with their products, which enhances the end-users' successful implementation.
Pulse Electronics	• Demonstrated engineering and high-volume product launch expertise • Strong relationships with leading electronic OEMs • Excellent value and outstanding quality products delivered from high-volume production facilities • Geographic proximity to customers' design and production • Regional Pulse FAE support • 3D finite element analysis tool for electromagnetic field simulations • 3D mechanical modeling for Solidworks and other software tools. • Rapid prototyping (3D printer for unique shapes)
Standex-Meder Electronics	Our unique advantages include patented header (U.S. PAT. 7,129,809) and terminal (U.S. PAT. 7,460,002) design yielding superior thermal management, direct thermal contact between bottom of ferrite core and heat-dissipating substrate, ability to attach to a substrate/heatsink with controlled temperature, stable and precise co-planarity of terminals on both sides, excellent solderability characteristics, planar turn surface in direct contact core backwall (thus greatly improving thermal conductivity and reducing EMI), flexible low-impedance terminations, ability to operate without any air flow for cooling, and compliance with the required min. 8-mm clearance and creepage. Electrical and mechanical specs: low-profile, low-leakage inductance, repeatable leakage inductance, capacitance, volumetric efficiency (small size), low turns count (which improves copper loss), and optimized core cross section (which lowers core loss.)
Vishay	Our strength is in our vast engineering design resources and extensive experience in custom magnetic design with finite element analysis software and 3D mechanical modeling. We are a technology leader in all major market segments with multiple world class manufacturing sites and low-cost labor options. Factory certifications include ITAR, ISO-9001, ISO-13485, and TS-16949. We have extensive in-house capabilities for tooling and have a certified test lab for certification testing for the automotive, military and space-grade applications.
Wurth Electronics Midcom	We encourage customers to leave the design to us. Let us do what we're good at—serving customers by designing a product that fulfills their needs, especially in regards to meeting required safety standards. All three of our manufacturing facilities have identical quality control processes, which allows for shift of product in the event of issues at a specific plant. We are continuously seeking ideas for flexible manufacturing and automation opportunities, which increases efficiency, and decreases lead times. In 2014, we logged over 1800 reference designs with IC houses. Spice models, an Eagle Library and 3D models are available for our custom products.

Company Links and Locations

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