Vincotech Goes Mini

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Abstract:
Vincotech goes mini with the next smaller housing size, taking another step towards small power applications where discrete components have figured so prominently in the past. Various topologies featuring diodes, IGBTs and MOSFETs may be implemented with the new housing to help miniaturize devices, minimize stray inductance and maximize efficiency.

Introduction:
Today's frequency inverters for pumps and fans, power supplies and other power applications are often equipped with discrete components, especially frequency inverters between 300 W and 1500 W and power supplies ranging up to 6000 W. One drawback of discrete components is that it takes a handful to build a complete application; another is assembly time. When operating at different potentials, these components have to be isolated to the heatsink. Legacy power modules are simply too large and inadequate for the purpose. They take up too much space, are a poor match for the requisite topologies and far more expensive than conventional solutions. Vincotech's new compact *flow*0B housing prevails over these drawbacks.

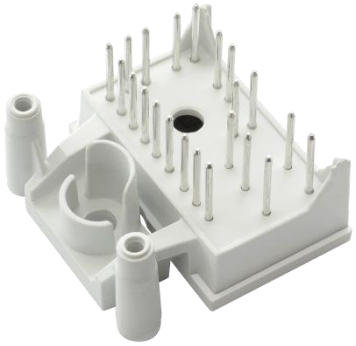

Figure 1: The *flow*0B

Only one screw is needed to mount this small, innovative new housing to the heatsink. The mounting bridge works like a clamp, exerting plenty of pressure to wed the housing to the DCB and heatsink. This compact version offers all the features of its larger siblings, including free pin positioning, a stress-relieved zone for pins and a pre-bent DCB. Press-fit pins and pre-applied phase-change material are optionally available for *flow* 0B power modules. What's more, all modules are equipped with an NTC to measure the heatsink temperature below the power module.

Current ratings stated in Vincotech's datasheets, which have been determined during the characterization of the modules, reference a heat sink temperature of 80°C. This is usually more in line with practical application environments. However, DIP molded as well as some TO-2xx modules often relate to a heat sink temperature of 25 °C.

AC to DC to AC conversion: PIM + PFC configuration

Single-phase, low-power applications generally have to meet the specifications for energy-using products set out in the EU Ecodesign Directive. Often these applications use an active PFC circuit to increase efficiency and reduce harmonic distortion. This is why the first topology to feature in the *flow*0B housing is a PIM + PFC configuration. A single-phase rectifier, PFC switch and PFC diode as well as a three-phase inverter with 650 V semiconductors are integrated. This is an open emitter configuration enabling independent current measurement in each leg.

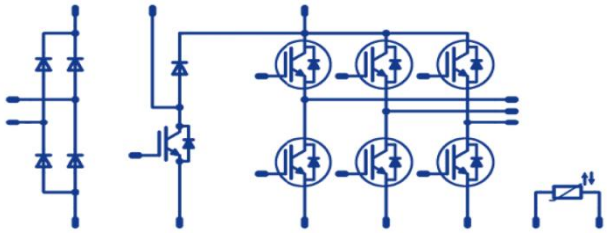

Figure 2: Components in the *flow*0B PIM + PFC

The *flow*0B module with the highest current rating features a PFC circuit based on a nominal chip current of 15 A and an inverter section equipped with 10 A components. This PFC circuit consists of very fast IGBT and diode components. Switching frequencies up to 100 kHz are achievable. The inverter section's fast reverse-conducting components are usually driven at 16 kHz to 30 kHz.

Smaller versions with 6 A and 4 A inverter chip currents are also available to cover a wide power range.

This module is also well-suited for use in common frequency inverters as well as for servo drives. In many cases, a brake chopper will not be necessary for low power levels so this topology is also available on demand without brake chopper/PFC components.

AC conversion: Three-phase inverter configuration

The second topology slated for launch targets frequency inverters, and servo drive applications especially. This standard inverter topology with six IGBTs and freewheeling diodes will be available in 1200 V and 600 V versions.

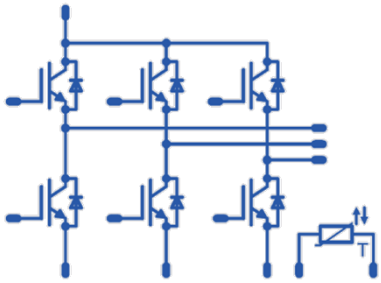

Figure 3: Components in the *flow*0B PACK

This module also comes in an open emitter configuration to enable easy shunt current measurement. The 600 V version covers currents ranging from 6 A to 30 A, and the 1200 V variant currents ranging from 4 A to 15 A. The implemented IGBT technologies are designated for use at drive applications' usual switching frequencies, which range from 4 kHz to 20 kHz depending on the voltage rating.

Boost + H-Bridge:
The *flow*0B's application range is not limited to motor drives. With its new and very fast 650 V components, it is an interesting proposition for small, single-phase PV applications as well as for all kinds of power supplies. Both applications need a circuit to boost incoming voltage levels and a circuit to convert DC voltage into AC voltage.

To this end, Vincotech developed a semiconductor-based solution for switching frequencies between 40 kHz and 100 kHz. Lower switching frequencies are also possible.

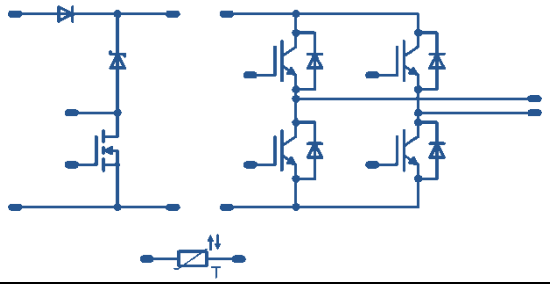

Figure 4: Components in the IGBT version of the *flow*0B Boost + H-Bridge

The *flow*0B provides room for a boost/PFC and for an H-bridge as shown in Figure 4.
Topologies with new IGBT H5/F5 components were engineered with price/performance considerations in mind, while topologies with MOSFET and SiC diode components are designed to satisfy the highest performance demands.
This topology also features 100% reactive power capability. R&D is underway to address the power range up to 5 kW using high-speed 50 A semiconductors, and studies have reached an advanced stage.

Conclusion:
The new *flow*0B is the little brother to the *flow*0, a popular housing that has proven its merits many times over in the real world. The *flow*0B meets application requirements in embedded drives, the usual frequency inverters, solar applications and switching mode power supplies.

The new housing's benefits are many: It allows various topologies to be implemented and devices to be miniaturized; all while driving stray inductance down and efficiency up. All the practical features of the line, including free pin positioning, a stress-relieved zone for pins and a pre-bent DCB, have been implemented here.