

The Maxi, Mini, Micro Family of DC-DC converters are an integral part of the company's overall component power solution strategy (Figure 1.1), which includes advanced factory and design automation. The modules are available in an unlimited variety of standard versions, to the extent that the line between custom and standard DC-DC converter bricks becomes almost indistinguishable.

The design of the control, magnetic, switching and packaging elements of the module resulted in a component with a power density of up to 120W/in³ (7,3W/cm³) in three package sizes:

Maxi 4.6 x 2.2 x 0.5in [117 x 55,9 x 12,7mm]

Mini 2.28 x 2.2 x 0.5in [57,9 x 55,9 x 12,7mm]

Micro 2.28 x 1.45 x 0.5in [57,9 x 36,8 x 12,7mm]

The modules have one-third the number of parts of their predecessors.

While the natural by-products of this reduction in parts count has improved reliability and lower cost. The extra space also means that the bulk of the converter can now be devoted almost exclusively to the power train (i.e., the magnetic and switching elements at the core of the design).

Resistors can be used to trim the output voltage up or down, if necessary. Six pin styles, three baseplate options and a variety of data collection and reporting options are available. The devices have an operating temperature range of -55 to 100°C and come in five product grades – E, C, T, H and M.

Other specifications include a typical no-load to full-load regulation of $\pm 0.5\%$, a programmable output of 10 – 110%, conversion efficiencies of up to 92% depending on the voltage combination and power level chosen, and an input-to-output isolation test voltage of 3,000V_{RMS} [4,242V_{DC}]. All models are parallelable with N+M fault tolerance and current sharing. Paralleling architectures feature DC- or AC-coupled interface.

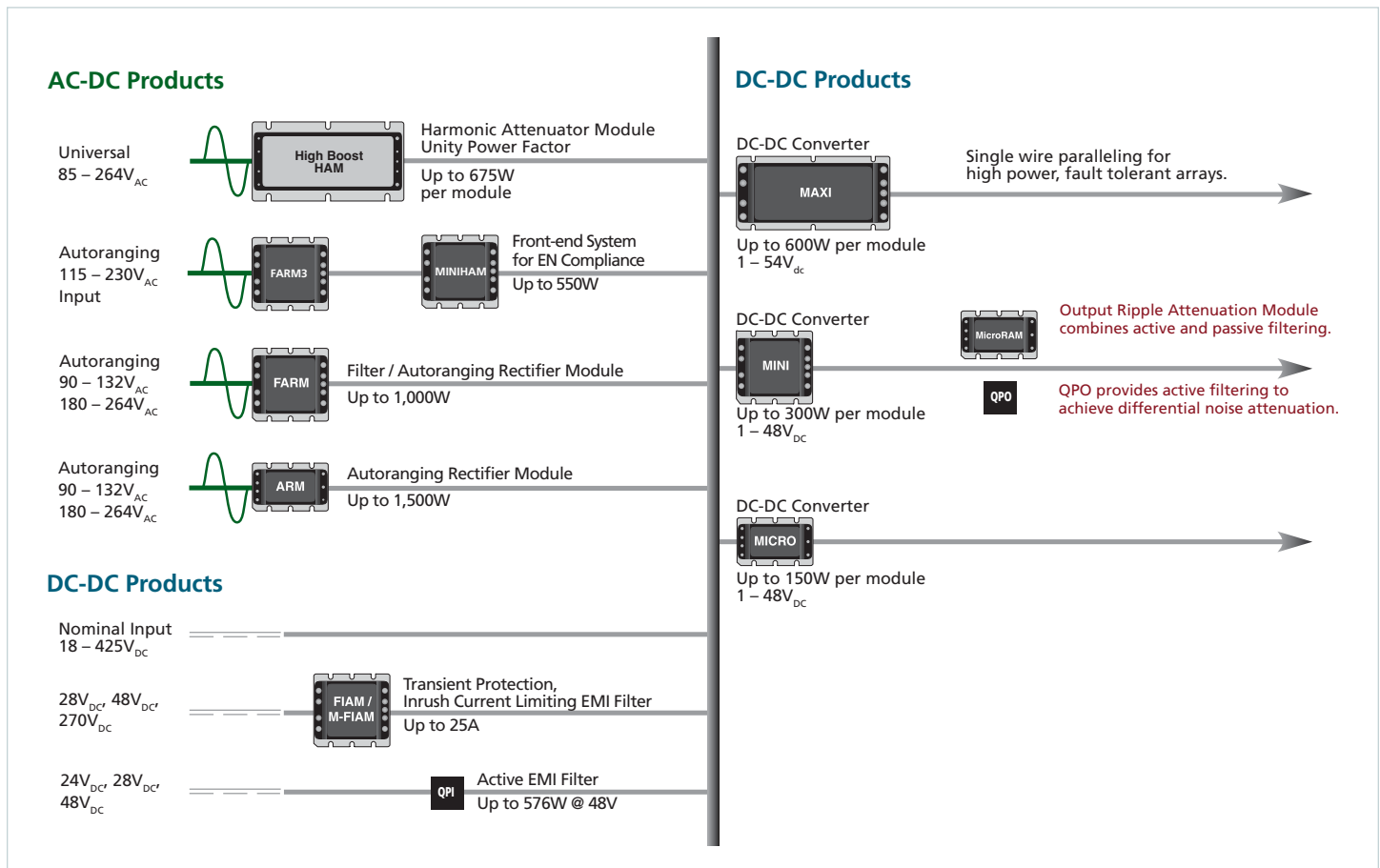


Figure 1.1 — Component power solutions with the Maxi, Mini, Micro Family

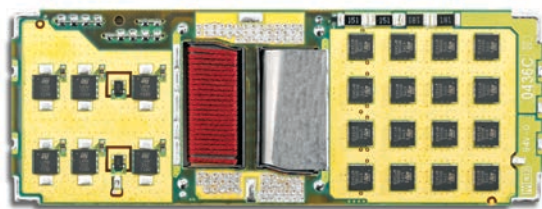
Key to the design of Maxi, Mini, Micro converters is its high level of component-level integration. (Figure 1.2) With the aid of hybrid technology, the device packs all control functions and active circuitry into two (primary and secondary side) ICs occupying a total volume of less than $1/10\text{in}^3$ [$1,6\text{cm}^3$] each.

With Maxi, Mini, Micro devices, the plated-cavity transformer cores use copper armor, plated onto the ferrite core, to more closely confine the magnetic flux to couple widely separated primary and secondary windings. The wider separation provides greater isolation and therefore lowers input-to-output parasitic capacitance and noise. The plated cavity also serves to conduct heat away from the transformer to the baseplate, thus increasing the power-handling capability of the powertrain and minimizing temperature rise.

The powertrain assembly is contained between the baseplate and a terminal-block assembly, with input and output pins recessed. This allows the converter body to be mounted into an aperture in the PCB to reduce the height above board. The modules may be wave soldered or plugged into through-hole or surface-mount sockets.

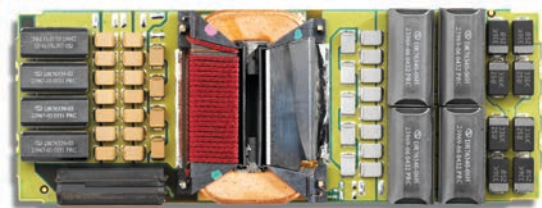
The Maxi, Mini, Micro devices use a proprietary, low-noise, integrated power device that has an order of magnitude lower parasitic effect.

The advances made in the overall design of the Maxi, Mini, Micro Family DC-DC converters have been complemented by equally significant advances in the technology used to manufacture them. Vicor invested in a custom, fully-automated assembly line specifically designed for the assembly of Maxi, Mini, Micro power components. To further augment its Maxi, Mini, Micro product offering, Vicor has created an online user-interface tool, [PowerBench™](#), that allows customers to specify DC-DC module requirements anytime, anywhere via the internet.



Bottom View

- Standard MLP power devices
- Efficient pick-and-place assembly



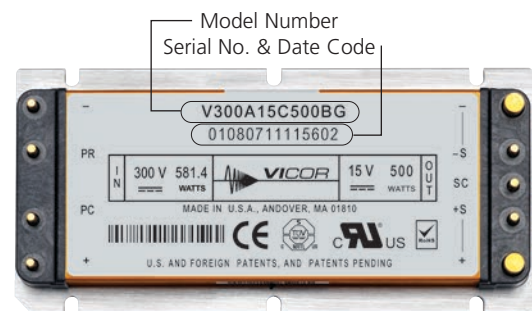
Top View

- Surface-mount components for greater manufacturing efficiency
- Standard reflow process



Baseplate

- Simplified baseplate construction



Complete Assembly

- Insert molded terminal block for more accurate pin positioning
- One-piece cover with label
- Encapsulated for superior thermal performance

Figure 1.2 — Maxi assembly shows high level of integration

The Maxi, Mini, Micro's ZCS / ZVS power-processing architecture (Figure 1.3) enables efficient, low-noise, high-frequency operation. The main switch is common drain for improved thermal and noise management. The reset switch located within the primary control IC is common source for ease of control.

The control circuitry is integrated into two (primary- and secondary-side) ICs. The result is a significant reduction in parts with the ensuing savings in cost and increase in reliability. This integration also provides extra room for the power train.

Maxi, Mini, Micro transformers place the primary and secondary windings far apart, but contain the magnetic flux using a copper armor plated onto the ferrite core. The armor also conducts excess heat to the baseplate.

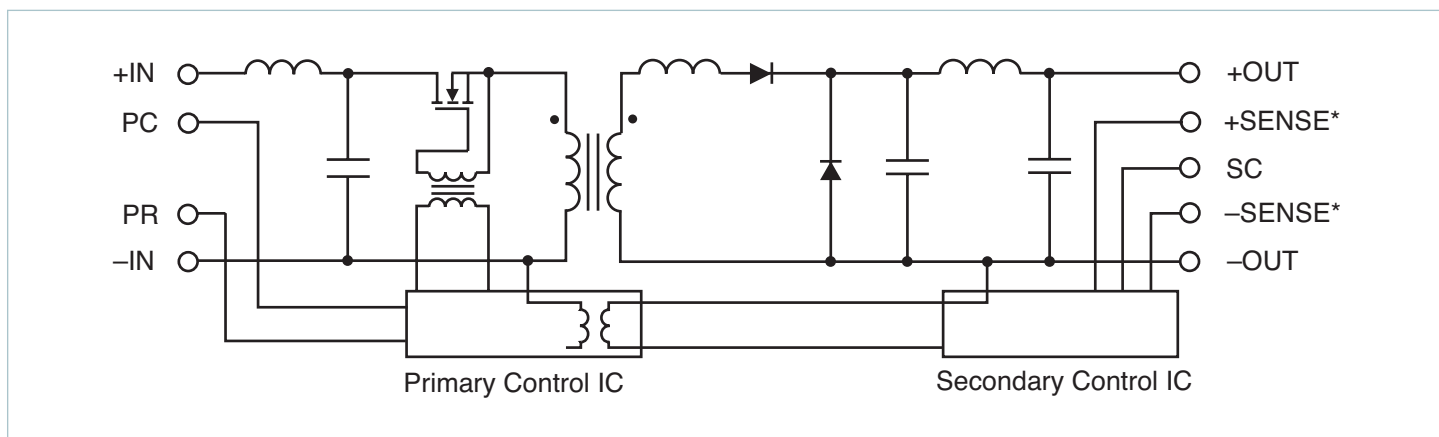


Figure 1.3 — Maxi, Mini, Micro: Basic powertrain and control (*Not included in Micro family)