

Features and Benefits of Innoveta's High Efficiency Open Frame DC-DC Converters

Innoveta's on-board DC-DC power modules are intended for use in distributed power systems as well as in communications and computer equipment. Their high efficiency (87% to 91%) and reliability make them ideally suited for operation in a wide range of applications and environments. All modules are manufactured using highly automated processes and are backed by Innoveta's commitment to deliver world class quality and reliability and exceed customer's expectations.

In a technological world that yearns for ever increasing usable power in harsher and harsher environments, where PCB real estate is becoming a scarcer and scarcer commodity, where the Equipment Providers' customers are continually clamoring for aggressive price reduction and have zero tolerance for equipment failures, Innoveta's rugged power modules provide a solution of choice.

Innoveta's current portfolio consists of five product families:

Family	Form Factor	Dimensions (mm) / (in.)	Input Voltage Range (V)	Output Voltage (V)	Output Current (A)	Output Power (W)
Bellesta	Micro-Brick	47.8X29.4X10.2 / 1.88X1.16X0.40	36-75	5; 3.3; 2.5	6; 7.5; 8.8	30; 25; 22
Bellesta	Half-Brick	61.0X57.9X12.7 / 2.40X2.28X0.50	36-75	5; 3.3;	6; 7.5;	30; 25;
Dualeta	Quarter-Brick	58.4X38.1X12.7 / 2.30X1.50X0.50	36-75	5/3.3; 3.3/2.5	15	75; 50
Veta	Half-Brick	61.0X57.9X12.7 / 2.40X2.28X0.50	36-75	3.3; 2.5	60	198; 150
Maxeta	Full-Brick	116.8X61.0X12.7 / 2.40 X4.60X0.50	36-75	12	42	504

The Bellesta Micro-Brick and Half-Brick families are open frame, unencapsulated, single multilayer Printed Circuit Board (PCB) power modules. The remaining three families are unencapsulated power modules consisting of an Insulated Metal Substrate (IMS) power board merged with a multilayer PCB control card to enhance thermal performance. For simplicity's sake, these designs shall also be referred to as open frame power modules.

Open frame power modules offer significant benefits over conventionally encapsulated power modules. Eliminating the need for an encapsulant leads to a greatly simplified, faster, environmentally friendlier, more controllable and higher yielding assembly process. Furthermore, past experience has demonstrated a direct correlation between manufacturing first pass yield and product field performance: A higher yielding assembly process produces higher quality and more reliable power modules. This in turn generates significant social, materials and assembly cost savings as well as a lower product cost of ownership. The overall weight of the finished product is also significantly reduced. This facilitates handling, reduces mounting PCB warpage and improves mounting PCB attachment reliability. When a field failure does occur, the absence of encapsulant enables a faster and more accurate root cause analysis leading to better and faster corrective action implementation. Innoveta's extensive product portfolio of high efficiency, open frame power modules clearly illustrates its strong commitment to bring a superior value proposition to the customer.

The following features are common to all product families:

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1. Operation over a wide 36-75Vdc input voltage range.
2. Basic insulation
3. UL1950, CSA C22.2 No 950-95, VDE 0805 Safety markings pending
4. Operating temperature range: $T_c^* = -40^\circ\text{C}$ to $+110^\circ\text{C}$.
5. Constant switching frequency
6. Low output voltage noise
7. Tightly regulated output voltage with monotonic startup characteristic
8. Back-drive protection
9. Input under-voltage lockout with built-in hysteresis (UVLO)
10. Positive or negative logic remote on/off
11. Adjustable output voltage (Trim)
12. Output over-voltage, current and temperature protection (OVP, OCP, OTP)
13. Impervious to transient input voltage of 100Vdc for = 100 mS
14. Storage temperature range of -55°C to $+125^\circ\text{C}$
15. Standard pin length of 0.145" with a 0.110" option

* : T_c is the temperature measured at the location specified in the thermal measurement figure in the product data sheet. The Veta family operating temperature range is -40°C to $+120^\circ\text{C}$. The Maxeta family operating temperature range is -40°C to $+105^\circ\text{C}$.

The Dualeta, Veta and Maxeta families have, in addition, input over-voltage lockout with built-in hysteresis (OVLO).

Product Family Specific Benefits and Features

The Belleta Micro-Brick Family

The inherently high efficiency of the Belleta Micro-Brick family enables the delivery of full output power, in a natural convection (60LFM) cooling environment, with an ambient temperature of up to 70°C . In the 2" by 1" arena, with its 30W output power capability, the Belleta Micro-Brick family offers, by far, the highest usable power and power density on the market today. It can compete favorably with 30 to 50 W half-bricks and quarter-bricks.

Another unique feature of the Belleta Micro-Brick family is its user selectable remote on/off logic. This feature enables a 50% reduction in the quantity of distinct part numbers in the end user part portfolio, entailing a substantially lower part cost of ownership.

The Belleta Half-Brick Family

The open frame, single multilayer PCB, Belleta Half-Brick family is essentially a physical redesign of the leading edge Belleta Micro-Brick family. It is intended to be a very cost effective drop-in replacement for conventional industry standard 30 to 50W half-bricks.

The inherently high efficiency of the Belleta Half-brick family enables the delivery of full output power, in a natural convection (60LFM) cooling environment, with an ambient temperature in excess of 80°C . Thus heat sink use is no longer required in all 30W applications, providing further cost reduction opportunities. Furthermore, because of its high efficiency and superior thermal performance, the Belleta Half-Brick family can be substituted for conventional industry standard 50W half-bricks in all but the most benign 50W applications.

The Dualeta Family

In the fast evolving universe of distributed power architecture design, where output voltage and load requirements swiftly proliferate and are often ephemeral in nature, the Dualeta Family is a

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welcome addition to the weary designer's arsenal. Furthermore, the superior versatility of the Dualeta family substantially reduces the quantity of distinct part numbers in the end user part portfolio, entailing a substantially lower part cost of ownership.

The Dualeta Family is a 75W family of highly versatile, independently regulated, dual output quarter-brick power modules with output voltage tracking at turn-on and turn-off. It has the highest 5V output power rating of all the dual quarter bricks currently available. It is offered in an industry standard dual quarter-brick package. Its output current loading scheme is fully flexible: 0 to 15A can be drawn from either output with no minimum load requirements, provided that the total output power does not exceed 75W. An ultra wide range independent output trim allows the realization of all possible dual output voltage combinations between 1.5 and 5.5V. The only constraint is that the main output voltage must always be at least 0.3V higher than the secondary output voltage. The Dualeta Family with the independent output trim option is available in an industry standard dual quarter-brick package with an extra pin located between the output return and the main output voltage pins.

The Veta Family

Its 90% efficiency and superior thermal performance make the Veta Family of power modules ideally suited for power-hungry applications in demanding thermal environments.

With a total power and current output capability of 198W and 60A respectively, the Veta Family of power modules offers the highest usable output power and current in an industry standard half-brick package. A wide output voltage trim range, -46 to +10%, and remote sensing are standard features enhancing versatility. Active current sharing for applications requiring N+1 or parallel operation is available as an option. External clock synchronization for enhanced Electromagnetic Interference (EMI) characteristics is also available on the enhanced offering.

The Maxeta Family

The Maxeta Family is ideally suited for extremely high density distributed power architectures where the plethora of voltage and substantial load requirements mandate the creation of a robust local intermediate 12Vdc distribution bus.

With 91% efficiency, a power density greater than 90W per cubic inch and a total power and current output capability of 504W and 42A respectively, the Maxeta Family of power modules offers the highest efficiency, power density and usable output power in a full brick package currently available. A constant current limit startup allows large capacitive loads. Single wire democratic load sharing for applications requiring N+1 or parallel operation, a wide output voltage trim range, -40 to +10%, remote sensing, a power good indicator and a 7V to 12V auxiliary logic output are standard features enhancing versatility. Innoveta's patented technology prevents reverse current flow in parallel operation. External clock synchronization for enhanced EMI characteristics is also available as an option.