

Reach - a non-regulatory announcement
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Frontier IP Group Plc
("Frontier IP" or the "Group")

Portfolio news - Pulsiv releases the world's most efficient 65W USB-C reference design

Frontier IP, a specialist in commercialising intellectual property, today welcomes the following announcement from portfolio company Pulsiv Limited (the "Company" or "Pulsiv") that it has launched the world's most efficient 65 Watt USB-C reference design.

The ground-breaking technology promises to expand and open up new markets for the USB-C fast charging global standard because it enables operation at much lower temperatures, minimizes energy loss as power is converted, and reduces the size of critical components. Frontier IP holds an 18.2 per cent equity stake in the Company as at the 31 December 2023, the last reporting date.

Pulsiv's 65W USB-C fast charger works at temperatures 30 per cent lower than equivalent technologies on the market today, based on thermal measurements taken after 30 minutes running at full load. It operates at 96 per cent efficiency, meaning only 4 per cent of the converted electricity is lost through heat, a number which has been independently verified.

The Company believes the performance is a world best. The design is ideal for applications where space and heat sensitivity are an issue. The Company is initially targeting in-wall plug sockets that incorporate USB C charging.

Including a USB-C port in a socket removes the need for plugs and power converters. The global market is already worth an estimated \$1.5 billion a year, but growth has been constrained by concerns about overheating, reliability and potential fire risks caused by high operating temperatures.

For consumers, because the Pulsiv USB-C charger wastes much less energy, then the costs of charging and powering their devices are much lower. The Company is also looking to launch more designs in the coming months which will further push the boundaries of power conversion.

The 65W USB-C charger technology has already attracted interest from potential customers.

Neil Crabb, Frontier IP Chief Executive Officer, said: *"The launch of this world-leading USB-C fast charging technology is a tremendous achievement for Pulsiv. It paves the way to making in-wall sockets featuring USB-C ports ubiquitous, among many other possible applications, and enabling the USB-C standard to reach its full potential."*

Pulsiv statement begins:

Pulsiv releases the world's most efficient 65W USB-C design with 30 per cent lower temperatures integrated half-active bridge and 96% efficiency

Cambridge 14th August 2024

Pulsiv Limited, the Cambridge (UK) innovator of power electronics technology, announce the release of the world's most efficient* 65W USB-C GaN optimised reference design developed to address the complex challenges associated with thermal performance in power supplies. This ground-breaking and highly anticipated development is set to revolutionize the USB-C fast charging space by offering a unique combination of features and benefits not seen in other designs.

The PSV-RDAD-65USB reference design combines Pulsiv OSMIUM technology with an industry standard QR Flyback and highly optimized, ultra-compact magnetics. It represents the first in a series of designs aimed at pushing the boundaries of power conversion by drastically lowering operating temperatures, minimizing losses, and reducing size to create a sustainable platform for the USB-C standard.

Pulsiv's Chief Product Officer, Dr Tim Moore has been managing the development of this design and comments: *"Our mantra has always been focused on developing solutions that "do more while using less" and this design demonstrates how Pulsiv OSMIUM technology can deliver fast charging without the associated complexity of managing high temperatures. The demand for more power and faster charging of cordless products is rapidly increasing which impacts everything from mobile phones to power tools. This means more power is needed in a small form factor which is even more critical when developing in-wall/desk solutions which are sensitive to heat. With 30% lower component temperatures, no inrush current, and high efficiency, we enable designs to become safer, smaller, and be more reliable."*

Specification Overview

Input Voltage Range:	90 - 265VAC (no input voltage derating)
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Input Voltage Range:	50 - 250V AC (no input voltage derating)
Output Voltage	5 - 20VDC supporting PD3.0, QC4.0, BC1.2, & PPS (Fast Charging)
Output Power	65W max
Transformer Temperature	30.3°C above ambient
Operating Frequency	125kHz
Peak Efficiency	96%
Average Efficiency	95%
Half-Active Bridge	Included
Line Currents	0.5A max
Inrush Current	Eliminated
GaN Optimised	Yes
DC-DC Converter	Quasi-Resonant (QR) Flyback

Taking ultra-cool operation & fast charging to a whole new level

The Pulsiv OSMIUM reference design demonstrates a significant improvement in thermal performance and reduces critical component temperatures by more than 30% compared to other designs. At full load, the Flyback transformer reaches an impressive 33.9°C at 230VAC and 30.3°C at 265V above an ambient temperature of 26.1°C. This incredible achievement is likely to set a new benchmark and enables 65W fast charging in space constrained environments and/or heat sensitive applications such as in-wall plug sockets that incorporate USB-C connectivity.

Optimize efficiency and space with a half-active bridge

Pulsiv OSMIUM technology senses AC line voltage and frequency to adjust capacitor charging time, therefore the circuit draws no line current at the AC zero voltage crossing. This enables a simple half-active bridge implementation to increase efficiency, especially at low line conditions. MOSFETs in the lower half of the AC to DC bridge are carefully controlled, in combination with high-side diodes. The half-active bridge in this design strikes the delicate balance between efficiency, cost, and complexity and supports universal input with efficiency gains of 0.7% at full load from a 115V AC supply.

Innovative magnetics reduce transformer size by 20%

Pulsiv OSMIUM technology generates a HVDC output that varies between the peak AC input and 150V to drive the QR Flyback at maximum efficiency. The wider voltage range significantly reduces primary side inductance to enable the use of an EQ20 transformer which was developed in partnership with magnetics experts Frenetic. Their CEO Chema Molina comments: *"Our team of magnetics experts have demonstrated that Pulsiv OSMIUM technology maximises efficiency and reduces the size of the Flyback Transformer to a level we've not seen before. This significant development will enable customers to improve performance, reduce size, and lower the cost of their design and we're excited to be part of such an innovative solution"*. This results in a 20% size reduction & 50% efficiency improvement compared to an RM8 core typically used in other designs.

Minimize losses with GaN optimization

GaN Transistors from Innoscience have lowered the RDSon and parasitic capacitance to reduce losses and optimize cost in both the flyback and synchronous rectifier sub-systems. General Manager for Innoscience EMEA Denis Marcon adds: *"We've demonstrated that GaN technology is perfectly suited to increasing efficiency, reducing losses, and optimising cost but Pulsiv OSMIUM technology adds further benefits by significantly improving the overall performance and reducing energy waste. Their technology is truly game-changing, and I'm delighted that Pulsiv has chosen to incorporate Innoscience GaN devices in this reference design."*

Design package & evaluation boards

The PSV-RDAD-65USB document package is available to download free from the Pulsiv website and includes a Datasheet, Schematics, Bill of Materials, & Altium files. The PSV-EBAD-65USB evaluation board enables rapid lab testing and can be pre-ordered now for delivery in the 2nd half of August through a network of franchised distribution partners including global stockist Digikey.
(Pulsiv PSV-EBAD-65USB Evaluation Board)

For more information on this ground-breaking design, please visit www.pulsiv.com

Pulsiv Chief Product Officer Dr Tim Moore

Pulsiv statement ends

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ABOUT PULSIV

Pulsiv was founded in 2013 by Dr Zaki Ahmed after he successfully patented new & intelligent methods for improving power conversion efficiency. Located in Cambridge (UK) and Plymouth (UK), we design & develop world-leading electronic solutions for AC to DC Power Supplies and Solar Energy applications using a growing suite of over 85 patents. Our unique power electronics technology can benefit billions of consumer & industrial devices whilst also enhancing every photovoltaic installation around the world.

Our goal is to maximize performance, simplify thermal management, and reduce overall energy waste enabling future products to become safer, more reliable, and less harmful to the environment. Our team combines expertise in Scientific Research, Intellectual Property, Product Design, Semiconductors, Consumer Devices, Sales, Marketing, & Distribution to deliver best-in-class products that can be successfully deployed on a global scale.

www.pulsiv.com

ABOUT FRONTIER IP

Frontier IP unites science and commerce by identifying strong intellectual property and accelerating its development through a range of commercialisation services. A critical part of the Group's work is involving relevant industry partners at an early stage of development to ensure technology meets real world demands and needs.

The Group looks to build and grow a portfolio of equity stakes and licence income by taking an active involvement in spin-out companies, including support for fund raising and collaboration with relevant industry partners at an early stage of development.

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