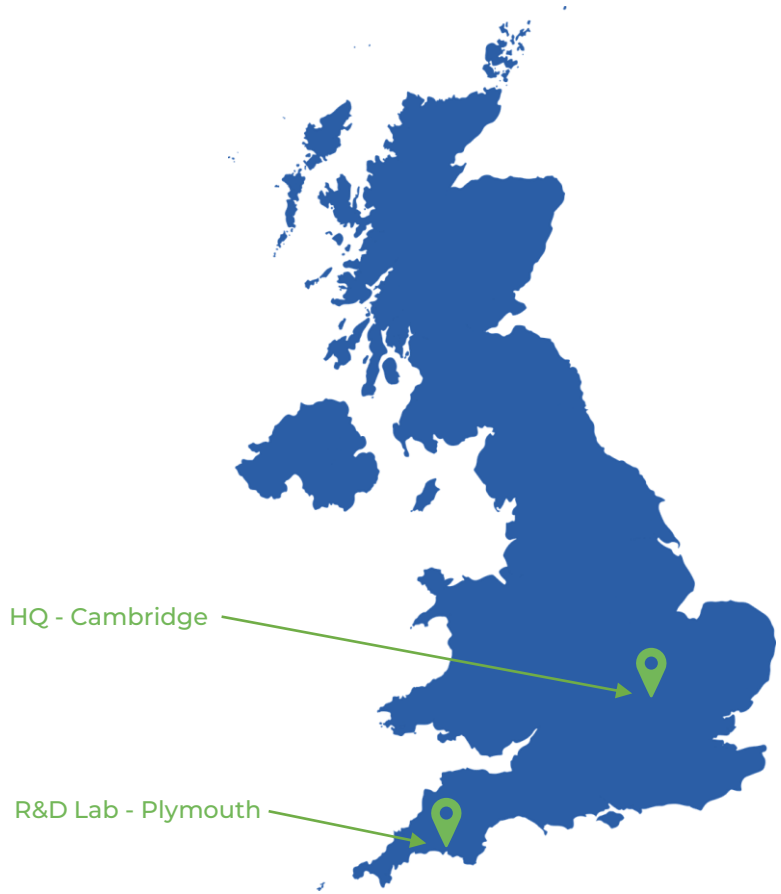
The World's Most Advanced Power Electronics Technology

Milton Hall, Ely Road, Cambridge CB24 6WZ

www.pulsiv.co.uk

Who Are We?

- British technology innovation company founded in 2013
- Design, develop, and deliver best in class power electronic designs
- Strategic focus on:
  - ✓ *Increasing low-load & average efficiency*
  - ✓ *Lowering production cost*
  - ✓ *Reducing environmental impact*
  - ✓ *Improving energy waste*



About The Founder – Dr Zaki Ahmed

- Former associate professor at The University of Plymouth, UK
- Holder of more than 50 worldwide patents
- More than 86 peer-reviewed publications as an academic
- Inventor of PulsiV OSMIUM™ technology

UNIVERSITY OF PLYMOUTH

Pulsiv Executive Team

Highly motivated, experienced, and professional executive team

Darrel Kingham – Chief Executive Officer

Former head of ARM's European sales operation, and passionate about developing strategic relationships with industry to deploy Pulsiv OSMIUM technology on a global scale.

Dr Zaki Ahmed – Founder & Inventor

Former associate professor of Engineering, Computing & Mathematics at The University of Plymouth. Now founder of Pulsiv and inventor of the company's intellectual property portfolio.

Nick Theodoris – Director of Sales & Distribution

More than 25 years' experience in the electronics manufacturing industry specialising in the sales, marketing, & distribution of power supplies, electronic components and EMC solutions.

Dr Tim Moore – Chief Product Officer

Former Chief Technology Officer at global consumer brands SharkNinja and GHD with a strong background in P&L, M&A and strategic product development projects.

Non-Executive Board Members

Combination of board members highly skilled in finance & engineering

Mark Gerhard – Chairman

Former CEO & CTO of Jagex, which he sold for $250m and currently CEO & CTO of PlayFusion, a UK video games developer. Additionally holds the position of Chairman at MarketWise (NASDAQ:MKTW)

Neil Crabb – CEO of Frontier IP Group plc

CEO of Frontier IP Group Plc, an AIM quoted IP commercialisation company. Co-founded AIM-quoted Sigma Capital Group plc and has considerable experience as an investor/director of a wide range of technology and university spin-out companies.

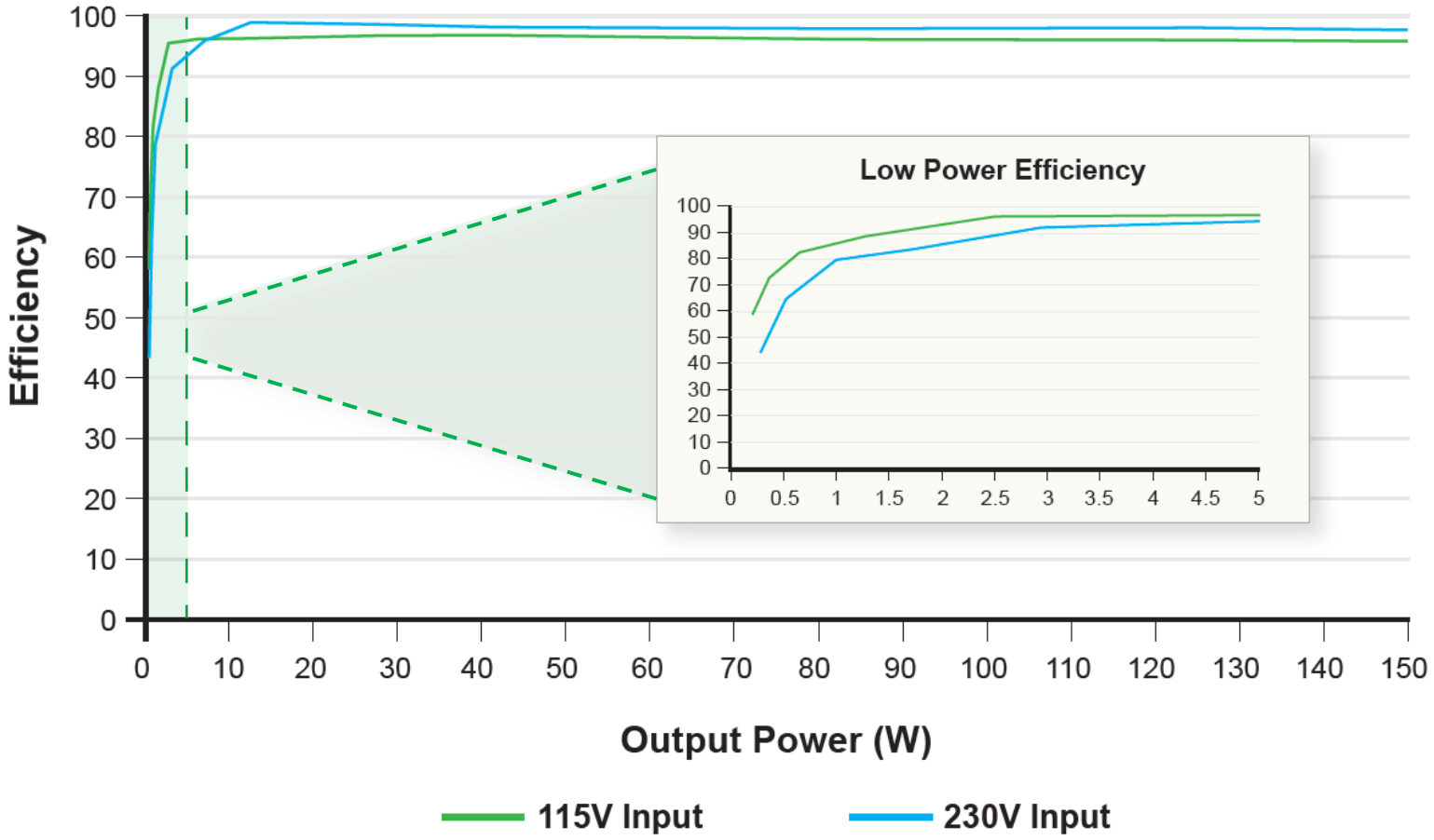
Professor Kevin Jones – University of Plymouth

Professor of Computing Science and Executive Dean of the Faculty of Science and Engineering at the University of Plymouth, responsible for around 600 academic, technical and professional staff.

What is Pulsiv OSMIUM Technology?

What is Pulsiv OSMIUM technology?

The **ONLY** power electronics architecture to deliver a completely **flat efficiency profile** across all load conditions



AC to DC front-end efficiency profile

- 99.5% peak
- 97.5% average
- 90% at just 2W
- Flat profile across all load conditions
- Enables product to meet EcoDesign

European Commission

What is Pulsiv OSMIUM technology?

Delivering a unique combination of game changing benefits in power electronics designs

Average Efficiency	Peak Efficiency	Power Factor	Output Power	Inrush Current	Input Voltage	Input Voltage Derating
97.5%	99.5%	96-98%	250W*	Zero	Universal	Zero
Flat from 5 – 100% Load	Flat from 5 – 100% Load	Variable	And beyond	Eliminated	85V – 265VAC	Eliminated

Energy Waste	Magnetics Size	Overall Cost	Thermal Impact	Flyback Limit	GaN	Eco Design
↓	↓	↓	↓	↑	Optional	Enables
Up to 88%	Up to 20%	Up to 20%	Up to 50%	Up to 200W	Compliments	Compliance

**Power levels to 650W under development*

Target Customers

PulsiV OSMIUM™

EMEA

USA

ASIA

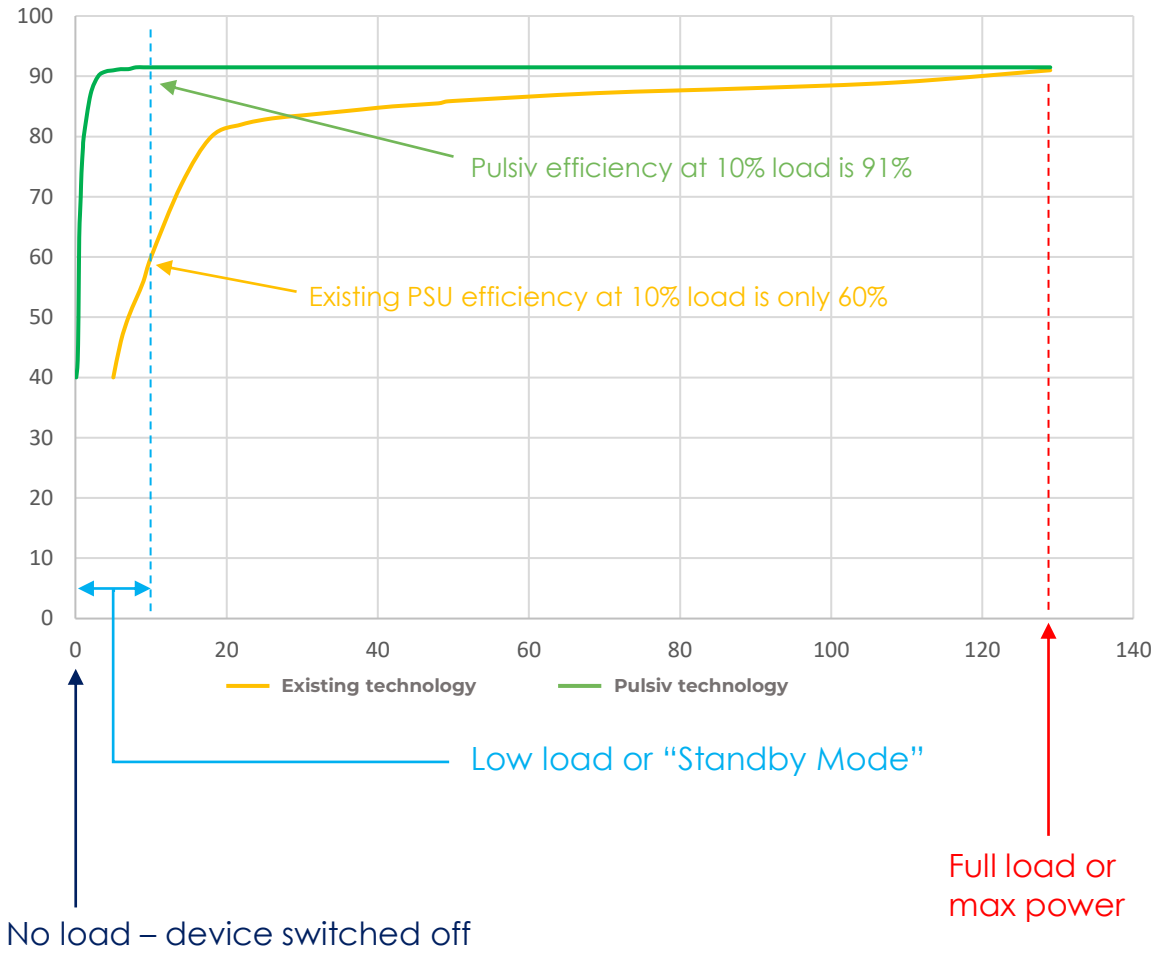
What is Pulsiv OSMIUM technology?

"It's all about efficiency!"

Pulsiv Executive Team

All about efficiency

EXAMPLE: Efficiency Vs Output Power (130W PSU@48V)



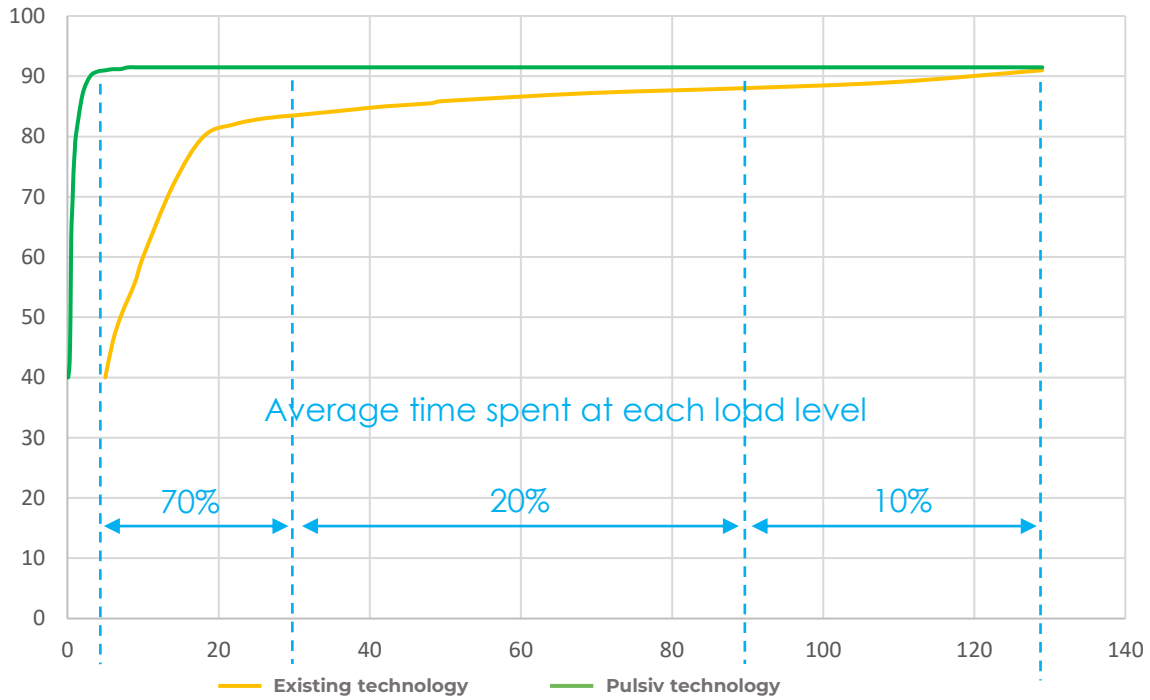
In this example, when compared to existing technology Pulsiv:

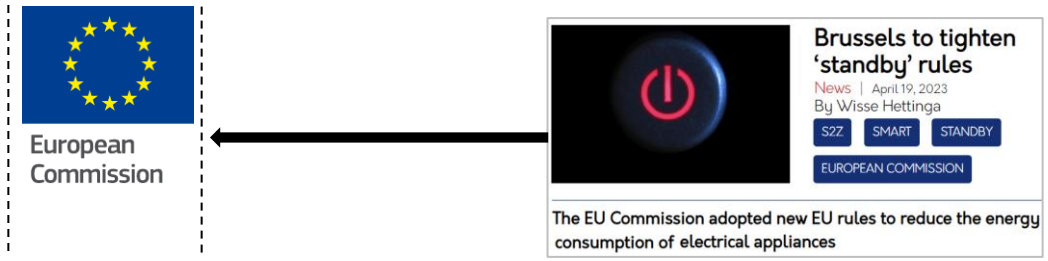
- Is 51% more efficient at 10% load
- Maintains a flat efficiency as load increases
- Delivers more power in standby mode conditions

The only technology that can improve efficiency at low load conditions

All about efficiency

EXAMPLE: Efficiency Vs Output Power (130W PSU@48V)





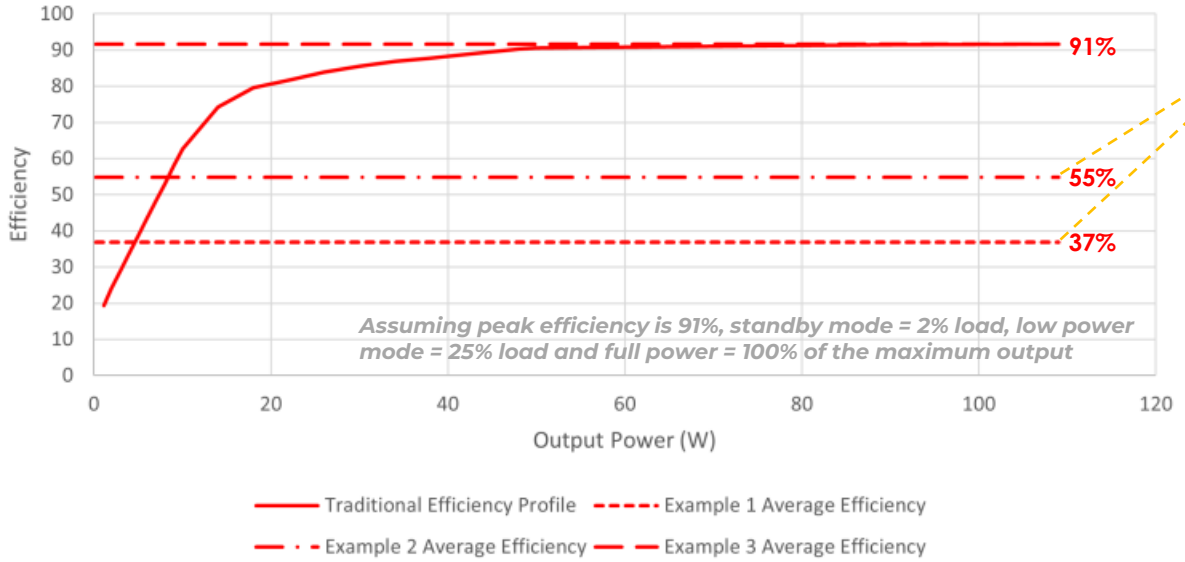
Most products spend significant time operating at lower load conditions where they are least efficient and this:

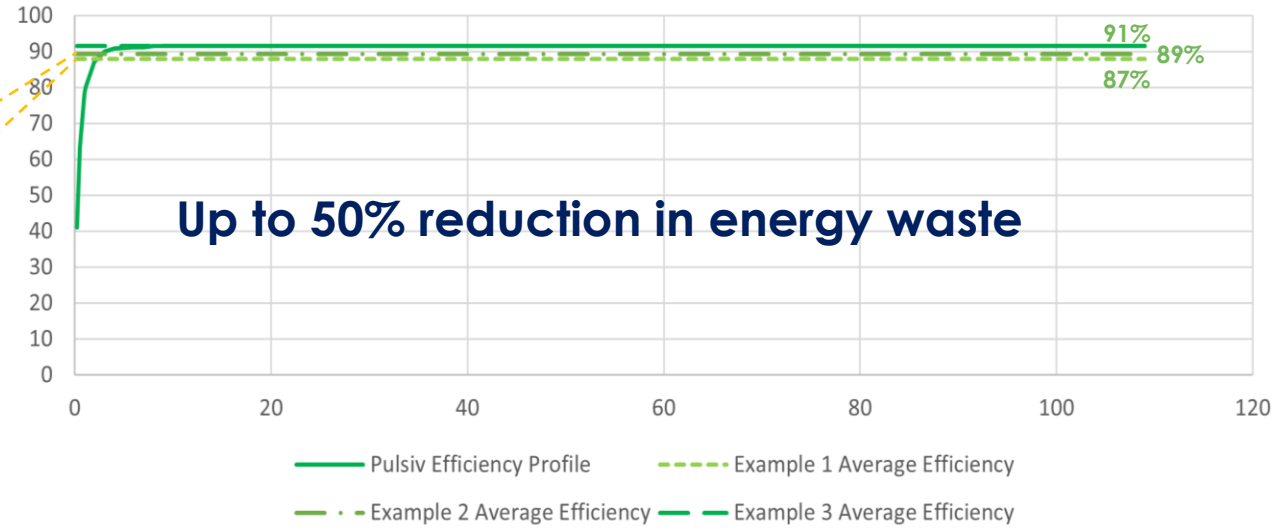
- Directly impacts the amount of energy wasted
- Determines the average efficiency of the device
- Becomes more important than a claimed peak efficiency

Can reduce the energy wasted by billions of end products

All about efficiency

Impact on average efficiency based on where the device spends most of its time





Example 1: average efficiency of just **37%** when
80% of time is spent in standby-mode - 10% in low-power mode - 10% at full power.

Example 2: average efficiency of just **55%** when
50% of time is spent in standby-mode - 40% in low-power mode - 10% at full power

Example 3: average efficiency of **91%** when
100% of time is spent at full power – unrealistic operating conditions

Example 1: average efficiency increases to **87%**

Example 2: average efficiency increases to **89%**

Example 3: maintains average efficiency of **91%** across all operating loads

All about efficiency

Enabling manufacturers to comply with the latest standards

European Commission

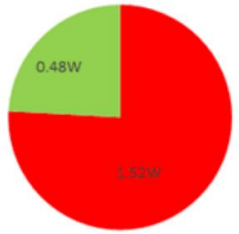
SAVE ENERGY
SAVE OUR PLANET

Total Available Power

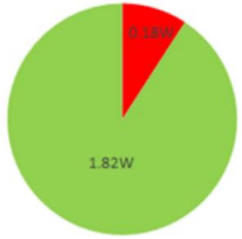
Wasted Power

At 2W

Typical Boost PFC and LLC Power Supply Performance:
2W Ecodesign Power Budget



Pulsiv OSMIUM Flyback Power Supply Performance:
2W Ecodesign Power Budget

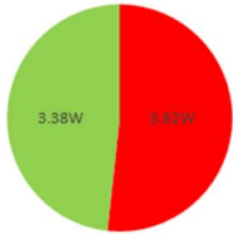


4 x more power!

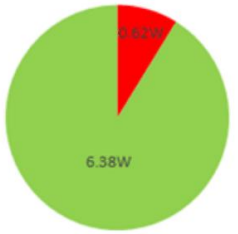
Energy waste reduced by 88%!

At 7W

Typical Boost PFC and LLC Power Supply Performance:
7W Ecodesign Power Budget



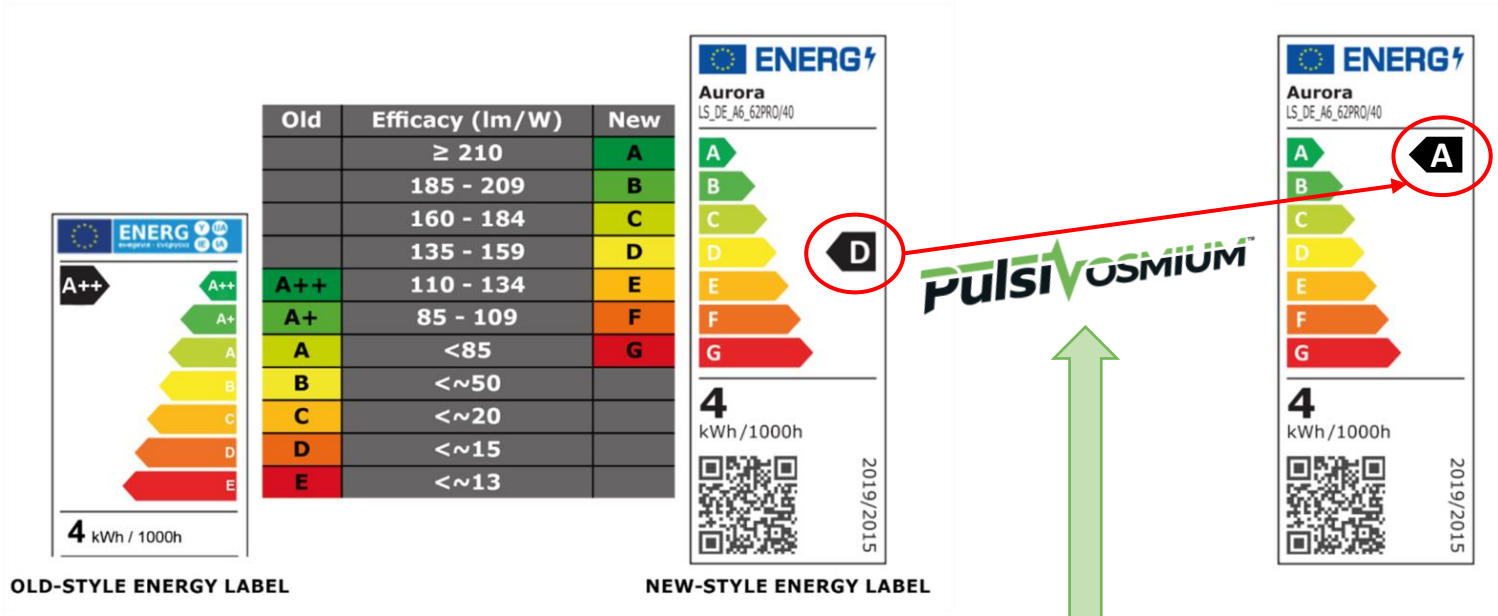
Pulsiv OSMIUM Flyback Power Supply Performance:
7W Ecodesign Power Budget



2 x more power!

Energy waste reduced by 83%!

All about efficiency



Pulsiv OSMIUM patented technology can help the problem!

- Can be paired with DC motors to improve overall efficiency
- Reduces size, weight, & cost
- Improved efficiency directly impacts energy label rating

All about efficiency

EPREL - European Product Registry for Energy Labelling (Database)

Type of Appliance	Total No. of Registered Appliances in the EU Database	% of Total Appliances Per Label Rating						
		A	B	C	D	E	F	G
Washing Machines	14,189	34%	19%	13.5%	23%	8%	3%	0.27%
Washer Dryers	2126	38%	19.5%	24%	14.5%	5%	0.14%	0%
Dishwashers	9830	3.5%	7.5%	17%	25%	39%	7%	1%
Refrigerators	35,309	0.28%	0.61%	3%	8.5%	35%	45%	8.5%
TV / Displays	19,825	1.26%	0.71%	1.5%	3%	21%	33%	41%
Light Sources	367,115	0.5%	1.3%	6%	13%	24%	36%	20%

Represents energy labelled products where Pulsiv OSMIUM technology can be used

Represents where Pulsiv OSMIUM technology can have the biggest impact & benefit

What We Do?

What We Do?

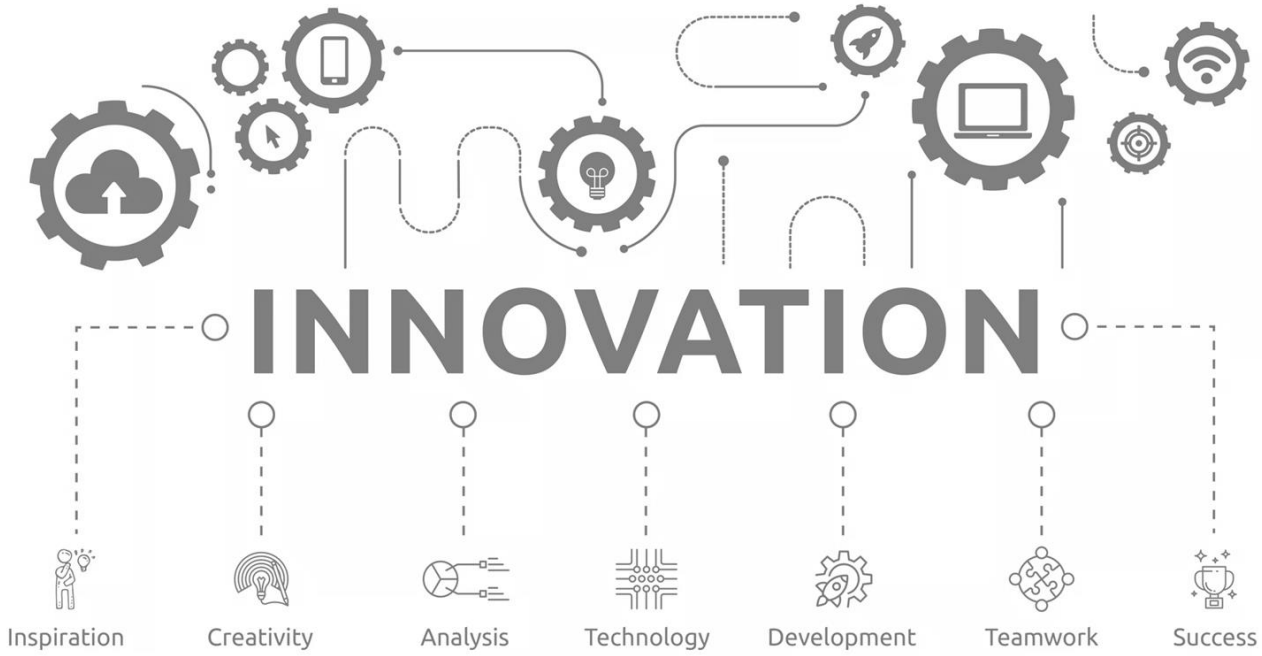
Step 1 – Applying the Pulsiv unique & patented technology

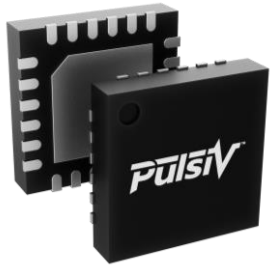
Apply Pulsiv's top secret, & patented intelligence

Manage the AC to DC power conversion process

Implement IP protection to prevent reverse engineering, cloning and theft

Utilise industry standard, unmodified, & multi-functional semiconductor devices

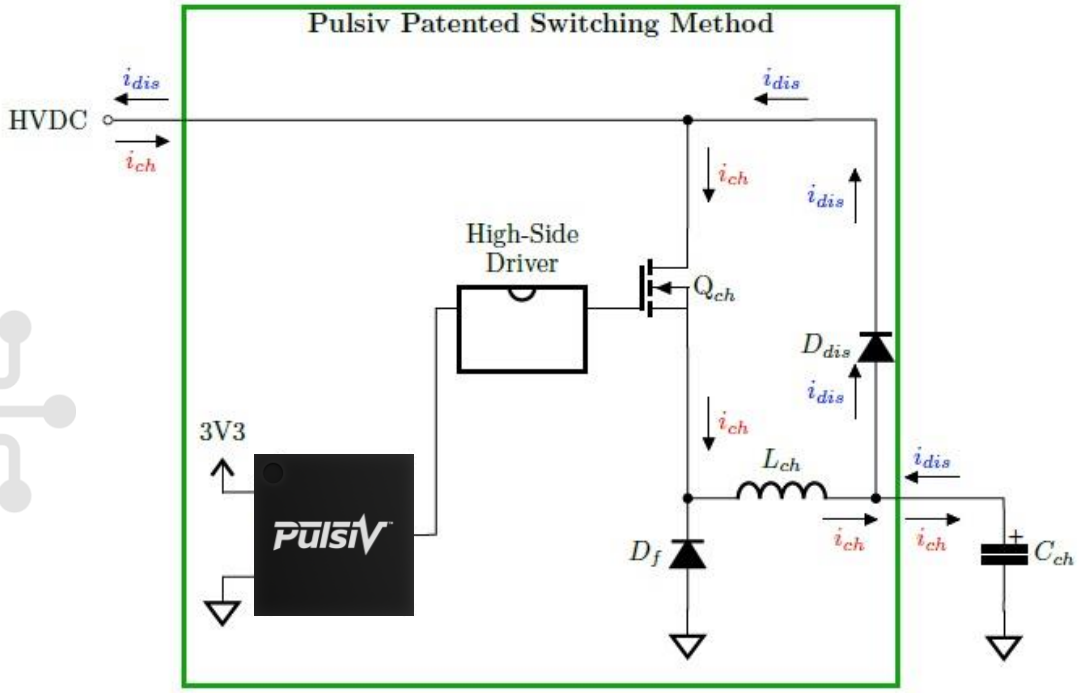




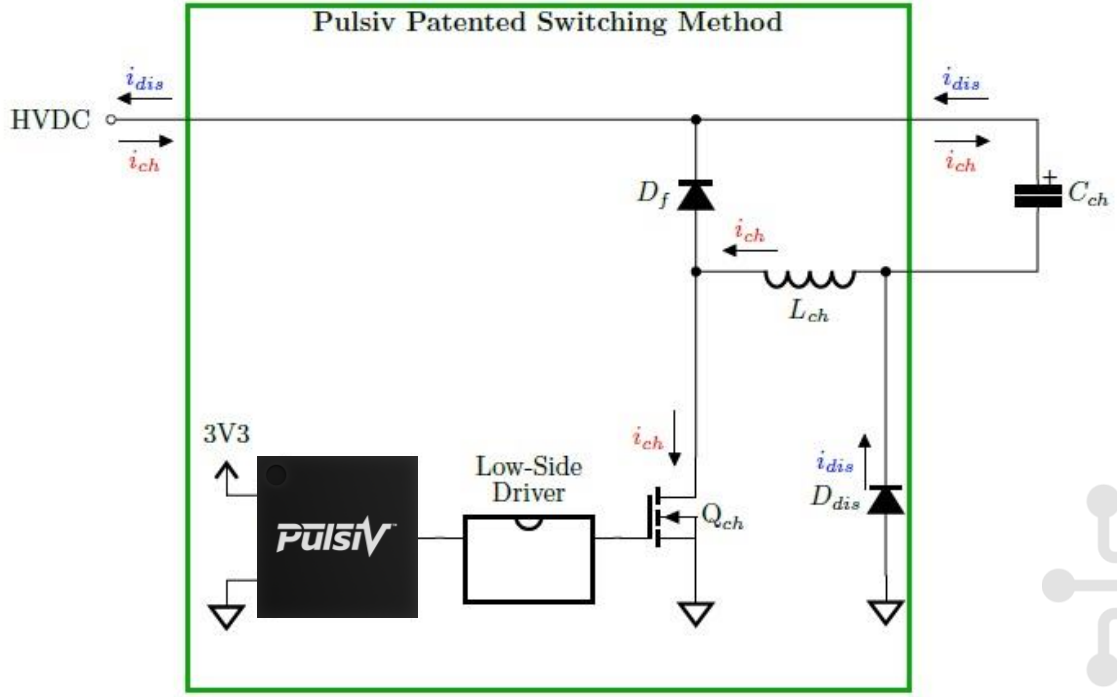
Pulsiv OSMIUM Microcontroller

What We Do?

Step 2 - Design & develop the AC to DC front-end power electronics circuit



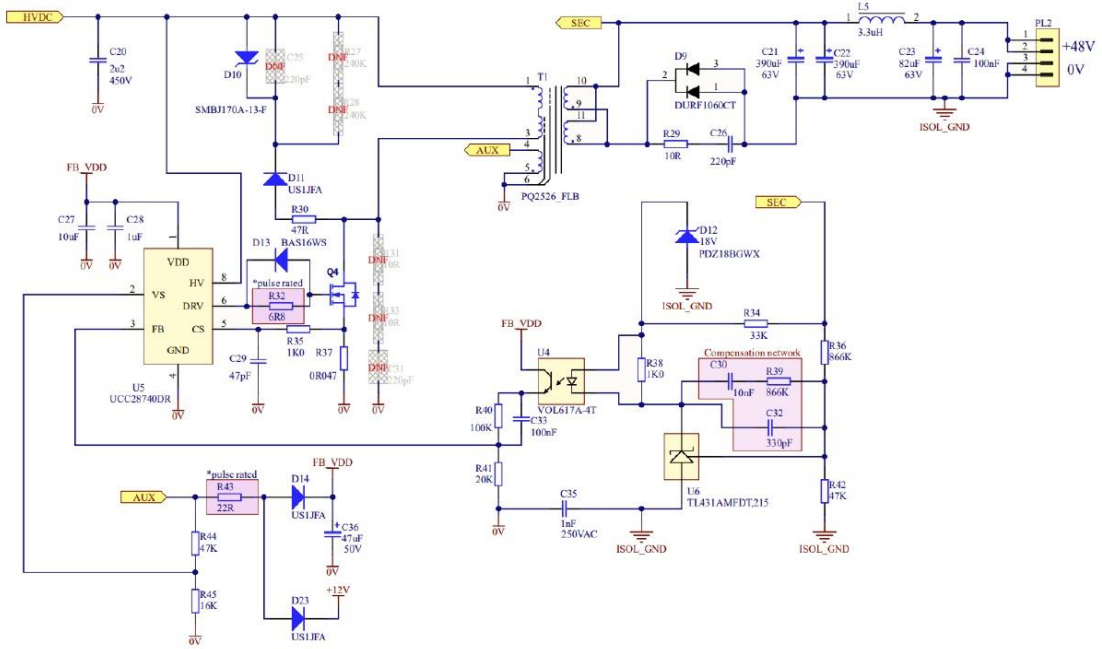
Output Power: 10W – 250W



Output Power: 250W – 650W

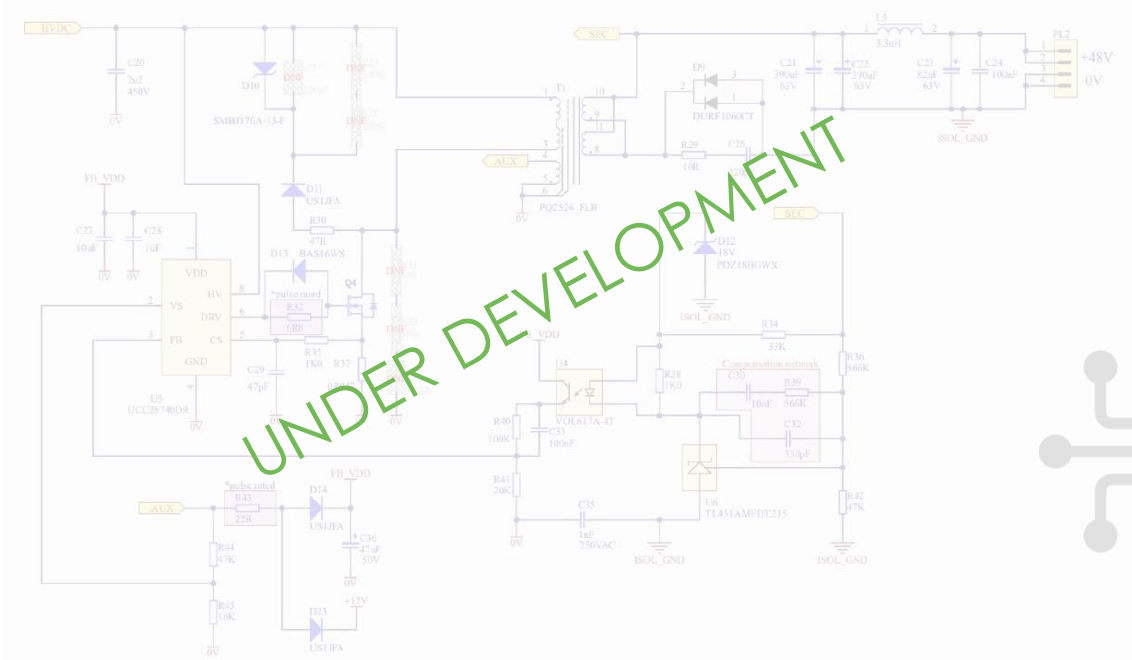
What We Do?

Step 3 - Select a suitable DC-DC converter based on the power level



Output Power: 10W – 250W

Industry standard DC-DC topologies including:
Flybacks, Forward Converters, or Asymmetric Half Bridge Designs



Output Power: 250W – 650W

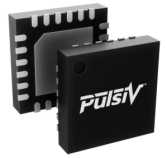
250W – 400W: 2 Switch Forward Converter, Asymmetric Half Bridge
400W – 650W: Current Source DC-DC Converter (planned for 2025)

What We Do?

Step 4 – Provide deliverables to ensure fast customer adoption

Microcontrollers

- Various models available
- Delivered securely programmed
- IP protection provisions



→ Available from stock through a network of global distributors

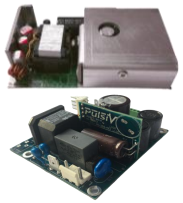
Reference Designs

- Downloadable document package
- Limited customer development required
- Copy & paste model for multiple applications

→ www.pulsiv.co.uk

Evaluation Boards

- Evaluation boards readily available
- Enables fast customer evaluation
- Demonstrates Pulsiv OSMIUM technology



→ Front-end only or Full solution

Vertical Solutions

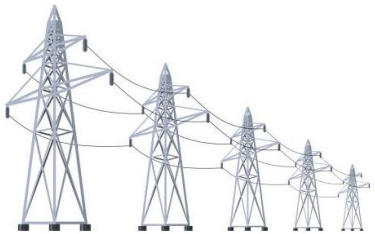
- Fully assembled finished modules
- Optimised for industry vertical solutions
- Enables fast customer adoption

→ Plug & Play Solutions

Global Deployment

Pulsiv OSMIUM technology market deployment

AC Voltage
Mains Power



AC to DC Power Supplies
& Battery chargers

Powered by DC
Voltage

Pulsiv's semiconductor devices are adopted during the design of AC to DC power supplies & battery chargers which are integrated into billions of end products within a diverse range of vertical markets

Pulsiv OSMIUM technology market deployment

Pulsiv OSMIUM™

Global network of demand creation & stocking distribution partners

ASTUTE

ISMOsys — AN ASTUTE ELECTRONICS COMPANY —

A Member of WPG Holdings
wpg
WPG EMEA

FORTEC ELEKTRONIK AG

CATS

PANKAJ
PANKAJ ELECTRONICS

BC Bescom Global Co., Ltd.

eps

CrossRoads Electronic Marketing inc

Saelig
unique electronics

DigiKey

Coming soon

RS

Farnell®
AN AVNET COMPANY

MOUSER ELECTRONICS

Pulsiv OSMIUM technology market deployment

Global Electronics Vertical Segments

Consumer	Industrial	Lighting	Factory Automation	Medical	Telecoms
Audio & Broadcast	Oil & Gas	Infrastructure	Instruments	Security	Computing
Rail	Marine	Military	Aerospace	Renewable Energy	Data Centres

Pulsiv OSMIUM technology market deployment

Consumer

Lighting

Industrial

Pulsiv has strategically chosen to focus on 3/18 vertical markets based on:

- Global market value
- Growth in number of units over the next 7 – 10 years
- Technical and commercial differentiation
- Existing market/customer experience & feedback

Pulsiv OSMIUM technology market deployment

Consumer			Lighting	Industrial	
USB-C (In-wall Sockets & Chargers)	DC Motors in Home Appliances	TV/Monitors	LED Drivers	2/3-Wheeler EV Chargers	Smart Meters
65W – 240W	c.200W	350W – 1000W	30W – 180W	100W – 700W	10W – 50W
$42.4B in 2023 $106B by 2033	$8.5B in 2022 $17.3B by 2032	$177B in 2022 $255B by 2030	$25.7B in 2023 $150.8B by 2033	$14.1B in 2021 $41.9B by 2030	$27.2B in 2022 $65B by 2032
CAGR 9.6%	CAGR 8.21%	CAGR 16.3%	CAGR 19.4%	CAGR 12.7%	CAGR 9.2%

2021 – 2033 market value increase from $294.9B to $636B

Pulsiv OSMIUM technology market deployment

Consumer			Lighting	Industrial	
USB-C (In-wall Sockets & Chargers)	DC Motors in Home Appliances	TV/Monitors	LED Drivers	2/3-Wheeler EV Chargers	Smart Meters
65W – 240W	c.200W	350W – 1000W	30W – 180W	100W – 700W	10W – 50W
2.3B units in 2023 19.5B units by 2033	162M units in 2022 534M units by 2032	500M units in 2023 600M units by 2028	15B units in 2022 27B units by 2030	5K units in 2023 1.3M units by 2030	3.9M units in 2022 250M units by 2030
Global				India Only	

Pulsiv OSMIUM technology market deployment

Consumer			Lighting	Industrial	
USB-C (In-wall Sockets & Chargers)	DC Motors in Home Appliances	TV/Monitors	LED Drivers	2/3-Wheeler EV Chargers	Smart Meters
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Global				India Only	

Rollout throughout 2024

Pulsiv OSMIUM technology market deployment

USB-C Target Applications

Adapters/Chargers

In-wall Sockets

Portable OEM Products*

*Mandatory adoption of USB-C by Dec 2024 (Laptops by 2026) as per EU regulations. However, many more devices/appliances are adopting USB-C as standard.

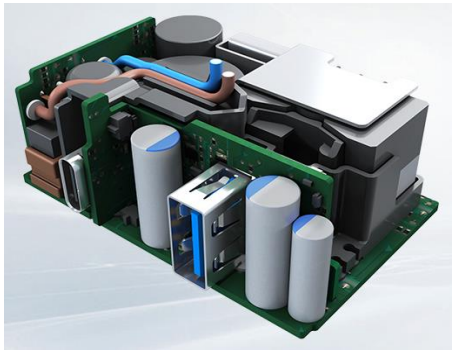
Pulsiv OSMIUM technology market deployment

Deploying USB-C solutions on a global scale

Reference Design

- 65W, 70W, 100W, 140W, 240W
- Downloadable document package (Datasheet, Schematic, BoM)
- Multiple configurations (1C, 1C1A, 2C1A)
- Requires customer layout, component sourcing, manufacturing, and compliance/regulations.
- Requires only Pulsiv OSMIUM microcontroller available through a network of distributors.

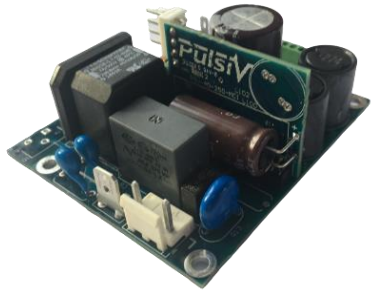
Finished Module



Not the actual product. Image for illustration purposes only

- 65W, 70W, 100W, 140W, 240W
- Fully manufactured and assembled "Plug N Play" module for fast integration.
- Multiple configurations (1C, 1C1A, 2C1A)
- No design, layout, PCB or manufacturing required
- Ideal for all volumes, No MOQ and available through a network of distributors

Evaluation Board

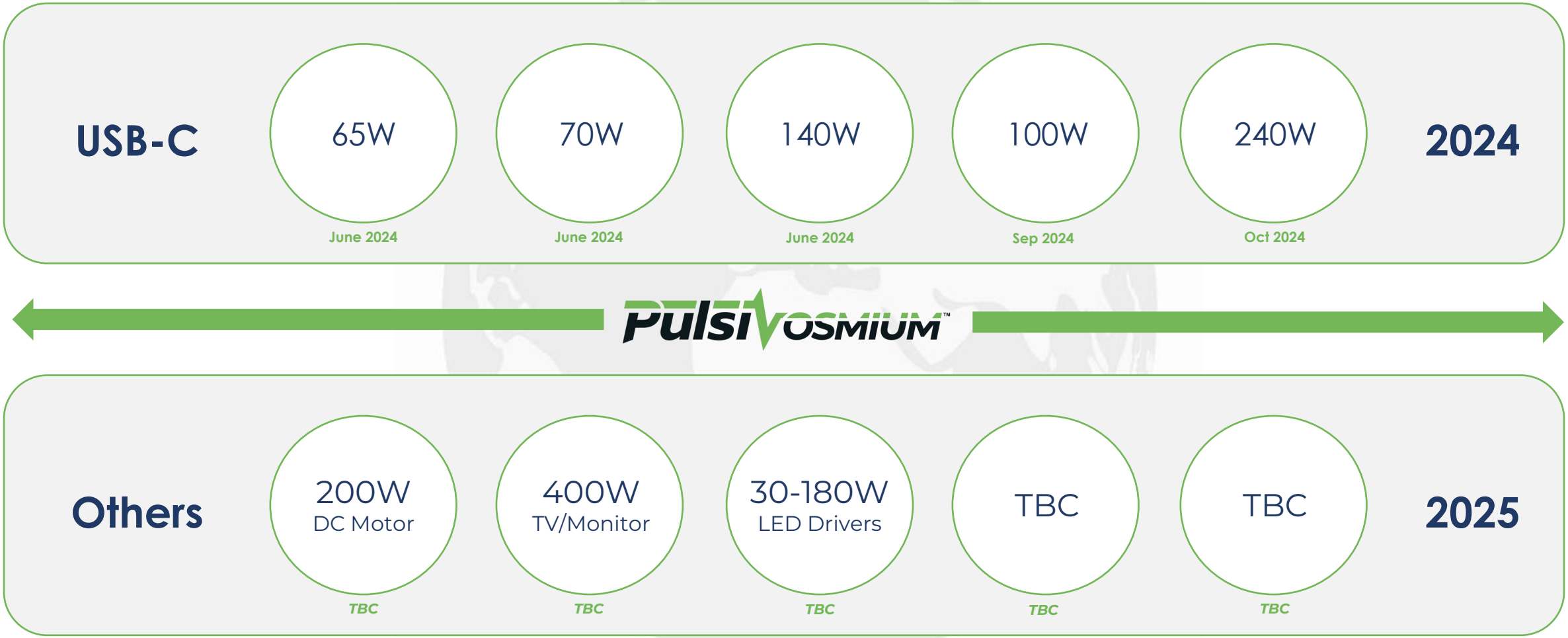


Not the actual product. Image for illustration purposes only

- 65W, 70W, 100W, 140W, 240W
- Development board for fast and easy customer evaluation.
- Available through a network of distributors.
- Perfect for performance and thermal analysis
- Includes components not used in production but necessary for evaluation such (E.g. Terminal Blocks)

Pulsiv OSMIUM technology market deployment

Vertical Solutions Roadmap



Target Applications

Consumer Products / Home Appliances / IoT Devices

Television, Monitor, Laptop, Set Top Box, Games Console, Soundbar, Hi-Fi, Microwave, Dishwasher, Oven, Air Fryer, Blender, Toaster, CCTV, Routers, Smart Speakers, Vacuum Cleaners etc

LED Lighting

Streetlamp, Lighting for Homes, Offices, Warehouses, Stage/Theatre Commercial Buildings, Stadiums, Highways etc. LED Drivers

Target Applications

Industrial Power Supplies

COTS & Custom Power Supplies

USB Adapters / Chargers

USB-C Chargers & Adapters, Desktop/Laptop Power Supplies

Target Applications

Battery Charged Devices

E-Bikes, Scooters, Mobility Chairs, Upright & Robot Vacuum Cleaners, Power Tools, Garden Tools, EV Chargers

Other Categories

- Factory Automation
- Instrumentation
- Medical
- Audio / Broadcast
- Infrastructure
- Transportation
- Military
- Aerospace
- Defence
- Marine
- Security
- Communications
- Computing
- Fitness
- UPS Systems
- Renewable Energy
- Data Centre
- Server
- IoT

Thank you for your attention.

We look forward to working with you.

Please visit our website www.pulsiv.co.uk for more information on Pulsiv OSMIUM technology.