Flex Power Modules

DC/DC converters for data center applications

October 2021

flex

Powering your innovation

About Flex Power Modules

Flex Power Modules designs and manufactures scalable DC/DC converter solutions primarily for the ICT (Telecom & Datacom), Industrial & Transportation markets.

Offering a wide range of both isolated and non-isolated solutions, we are world leaders in digitally enabled DC-DC converters. In particular, we deliver PMBus compatibility which is supported by our powerful design tool – Flex Power Designer.

Our purpose

By providing innovative, reliable and high-performance power conversion system solutions and unrivalled expertise, we help our customers to gain a competitive advantage in the markets they serve.

Our location

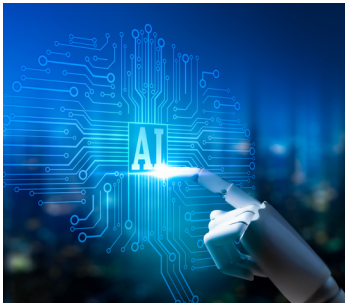
We are headquartered in Stockholm, Sweden and have design centers in Kalmar, Sweden and Shanghai, China. The latter is also our production site which has delivered more than 100 million power modules during the last 40 years. Our sales locations are distributed globally offering local support within AMCS, APAC and EMEA. We are supported by a global network of partners.

Our priority

We can only claim success if our customers have gained success using our solutions. Our leading-edge products deliver high levels of efficiency, power density and reliability to support the most demanding applications within the AI, Cloud/Storage/Hyperscale Computing, Network Security & Routers, Telecom, Industrial/Rail markets. Our products meet all associated standards including the latest EN/UL 62368-1 safety standard and EN 50155 for railways.

Our track record

We have a long, successful track record in high quality DC/DC power solutions with more than 40 years in this business area.



In the field of digital power, we are one of the leading players driven by innovations, technical know-how and open standard software.

Datacom applications

We have a comprehensive product portfolio of power solutions for data centers. Data center applications typically run on a narrow 40-60 V supply voltage. This is different from telecom which requires a wider 36-72 V voltage range.

For general data center loads, such as storage and CPUs in servers, there's a need for a 12V rail, which can deliver ever-increasing levels of power to meet the increasing demands of high-performance IT equipment. This means that power systems need to maximize power density, so everything can fit into the smallest space possible, while maintaining efficiency – thus keeping overall costs lower. To achieve this kind of high efficiency and density, without compromising on thermal performance, new approaches are needed. For instance, Flex Power Modules has developed Hybrid Regulated Ratio (HRR) converters, which combine the benefits of fixed ratio DC/DC conversion with those of full regulation – enabling digital DC/DC converters such as Flex Power Modules' BMR491 to achieve high efficiency around 98% and above, while delivering up to 2450W of peak power in a quarter brick package.

In order to reduce power system losses it has become more common to eliminate the isolation requirement for 48V power supplies in data center racks. High efficiency Intermediate Bus Converters (IBCs) such as Flex Power Modules' BMR310 Switched Capacitance Converter (SCC) is a non-isolated topology providing a 12V supply locally from the 48V supply where required.

Structure of brochure

In this brochure we provide an overview of our latest power solutions for data center applications, including:

- Digital Intermediate Bus Converters (IBCs)
- Voltage Regulator Modules (VRMs)
- 48V to load Direct Conversion Modules
- Switched Capacitor Intermediate Bus Converters
- Power Surface Multiplier Package IBC
- Other high performance DC/DC Converters

For technical support please contact us under pm.support@flex.com

Table of Contents

We have an outstanding track record in digital power, and the products presented below represent the very latest generation of products. They achieve exceptionally high efficiency levels as well as offering superior thermal behavior.

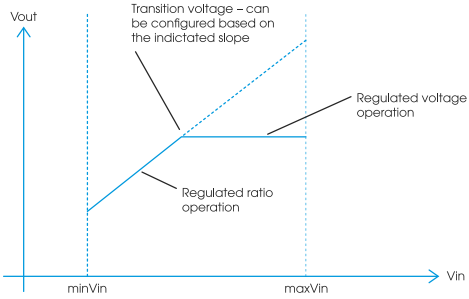
Hybrid Regulated Ratio IBCs

Many of our products mentioned in this category have the capability of Hybrid Regulated Ratio (HRR).

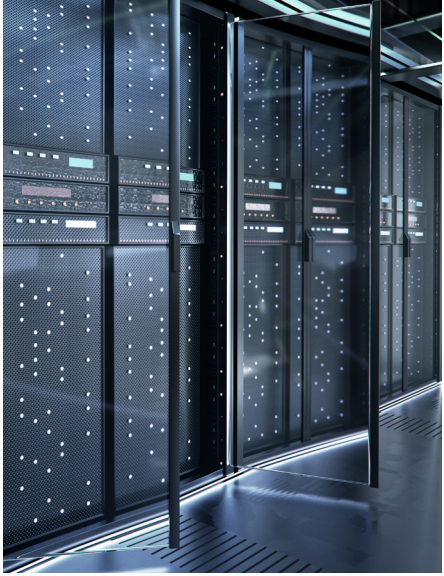
HRR is a concept that adds the benefit of regulation to fixed ratio DC/DC conversion. Traditional fixed ratio conversion operates at a fixed duty cycle which can lead to power train optimization for efficiency and filtering. Using a fixed duty cycle leads to an output to input voltage relationship that is a fixed scalar, typically a divide by an integer value such as divide by 4 or divide by 5.

Adding ratio regulation to the fixed ratio conversion can be accomplished by making the duty cycle a control element. A relatively small range is required to allow operation that controls the duty cycle to maintain a regulated ratio. Now, the benefits of regulation can be accrued where the ratio can be maintained as the load varies from no load to full load and much improved transient response can be achieved.

Further advantage can be gained by introducing the ability to transition from regulating the ratio to regulating a constant output voltage, this is called hybrid regulated ratio (HRR). Combining the regulation schemes with the flexibility to choose the transition voltage provides improved efficiency and filtering performance and reduces the variation of the output voltage over the input voltage range.



BMR350 – digital quarter brick DC/DC converter (up to 1200 W)



Main features

- Next generation of high-power DC/DC converter with more than 98% efficiency
- Fully regulated output
- Peak power capabilities up to 1200 W
- Continuous power up to 860 W
- Digital interface and compatible with DOSA 7-pin standard
- Black box function – module fault event recorder
- Parallelable with up to 3 units

BMR 350

Dimensions

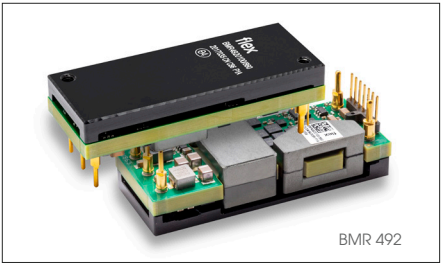
58.4 x 36.8 x 12.5 mm /2.3 x 1.45 x 0.54 in

PRODUCT NO.	V_{OUT} (V)	V_{IN} (V)	I_{OUT} (A)	P_{OUT_PEAK} (W)	P_{OUT} (W)	η (%)
BMR3502100/031	12	40-60	100	1200	860	97.7

BMR492 – digital eighth brick DC/DC (up to 1100 W)

Main features

- Efficiency up to 97.3%
- High power module with continuous power 800 W regulated variants and peak power up to 1100 W < 1 sec
- HRR (hybrid regulated ratio) available for selected models
- Digital interface in 7 pin DOSA standard
- Through hole mount package
- Pre-bias start up
- 1500 V isolation
- MTBF up to 6.6 Mhrs



BMR 492

Dimensions

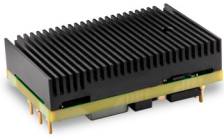
PRODUCT NO.	V_{OUT} (V)	V_{OUT} range (V)	V_{IN} (V)	P_{OUT} (W)	P_{PEAK} (W)	η (%)
BMR492 0302/861	12	8-13.2	40-60	600	—	96.7
BMR492 0303/862	12	9.5-12	40-60	500	—	96.7
BMR492 0300/864	12	9.5-12	40-60	800	1100	97.3
BMR492 0300/001*	9.5-10.4	8-13.2	40-60	700	950	97.4

* Possible variants

BMR491 – digital quarter brick DC/DC (up to 2450 W)

BMR491 is the latest generation of high-power digital DC/DC with continuous power up to 1540 W and a peak capability up to 2450 W.

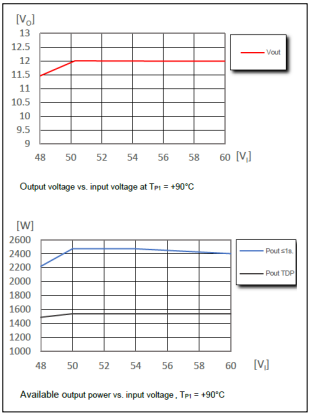
BMR 491



BMR 491 with heatsink

Main features

- High efficiency up to 98%
- Hybrid regulated ratio (HRR)
- Peak power capabilities: < 1 sec up to 2450 W
- Fixed regulated 12 V output voltage
- Excellent thermal behavior
- Digital interface available in 4 and 7 pin DOSA standard
- Some variants are available with heatsink
- 1500 V isolation
- MTBF up to 7.7 Mhrs



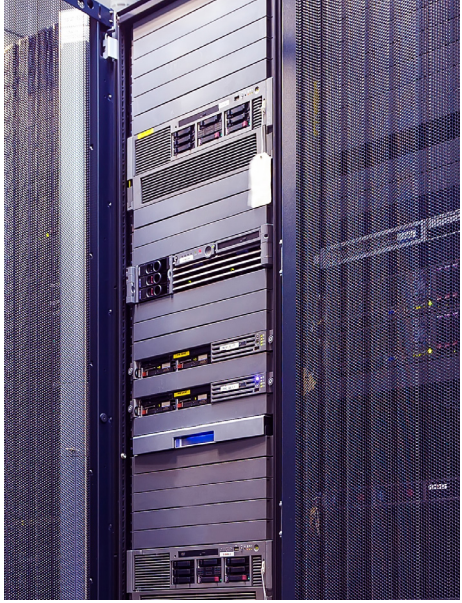
Dimensions

58.4 x 36.8 x 14 mm; 2.3 x 1.45 x 0.57 in.

PRODUCT NO.	V_{OUT} (V)	V_{OUT} range (V)	V_{IN} (V)	P_{OUT} (W)	P_{PEAK} (W)	η (%)
BMR4910203/851	12	8-13.2	40-60	1300	—	97.4
BMR491xx02/853*	12	—	40-60	1300	—	97.2
BMR49102014/852	12	8-13.2	48-60	1300	1850	97.4
BMR4912408/857 (HRR)	12	8-13.2	48-60	1540	2450	97.5
BMR491xx07/856 (HRR)	12	8-13.2	48-60	1400	2400	97.6

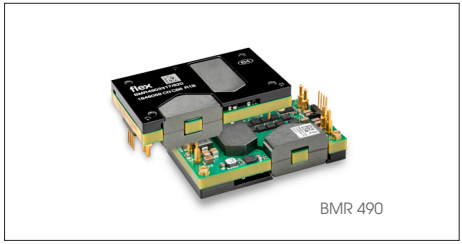
* Active current share

BMR490 – digital quarter brick DC/DC (1300W)



Main features

- DC/DC converter with high power and high efficiency up to 97.7%
- Excellent thermal performance
- Paralleling: two or more BMR490 modules can be connected in parallel either via Droop Load Sharing (DLS) or Active Current Sharing (ACS)
- Non-isolated
- MTBF up to 6 Mhrs
- Event recorder (black box) available for some variants
- Cost-efficient solution with one power train
- Optimized for air cooling
- Fully compliant with PMBus 1.3



BMR 490

Dimensions

58.4 x 36.8 x 14.5 mm; 2.3 x 1.45 x 0.57 in.

PRODUCT NO.	V_{OUT} (V)	V_{IN} (V)	I_{OUT} (A)	P_{OUT} (W)	η (%)
BMR4903317/820	12	40-60	139	1300	97.7
BMR4904318/033*	12	40-60	139	1300	97.7
BMR490xx17/823**	12	40-60	139	1300	97.7

*Active Current Sharing
** Black Box Monitoring

BMR480 – digital quarter brick DC/DC (900-1300W)

Main features

- Efficiency 97.3% at 53 V_{in} and half load
- Hybrid Regulated Ratio (HRR) technology
- Paralleling with two or more BMR480 modules via Droop Load Sharing (DLS) or Active Current Sharing (ACS)
- Digital interface and PMBus compliant
- Isolation 1500 V
- MTBF up to 6.2 Mhrs

Dimensions

58.4 x 36.8 x 14.5 mm; 2.3 x 1.45 x 0.57 in.

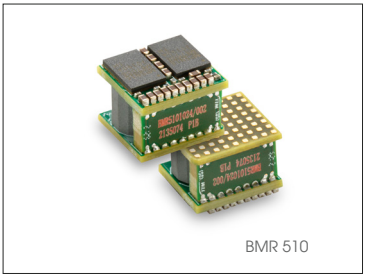
BMR 480

PRODUCT NO.	V_{OUT} (V)	V_{IN} (V)	I_{OUT} (A)	P_{OUT} (W)	η (%)
BMR4800114/003	10.4	40-60	96.2	1000	97.3
BMR4800100/001	10.4	45-56	96.2	1000	97.3
BMR4801102/ Parallelable	12	40-60	75	900	96.7
BMR4800106/ Parallelable	12	45-60	108.3	1300	97.3

BMR510 – digital 2 phase VRM module (up to 80 A)

Main features

- Output current: 40 A TDC (70 A) peak per phase)
- Wide input range with 4.5 – 16 V
- Optimized for top-side cooling
- Current and temperature sense
- Accepts tri-state PWM signals
- Over-temperature and current limit protection
- LGA mount
- Halogen-free
- AI design compatible due to high power and tight board space requirements



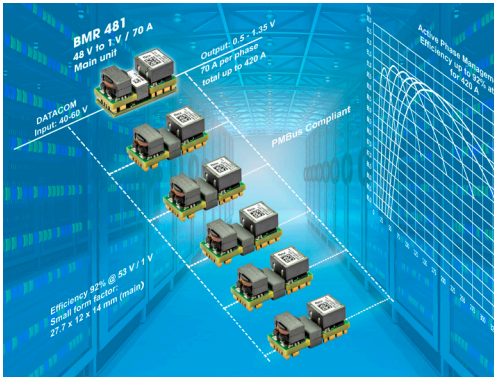
BMR 510

Dimensions BMR510

10.3 x 9.2 x 7,6 mm // 0.406 x 0.362 x 0.29 in

PRODUCT NO.	V_{OUT} (V)	V_{IN} (V)	I_{OUT} (A)	I_{OUT_PEAK} (A)	η (%)
BMR5101024/002*	0.5-1.3	4.5-16	40 A (TDC)** 80 A (TDC)	70 A peak per phase 140 A total peak	89.4% at Vin 10.4 V / Vout 0.8 V 88.5% at Vin 13.5 /Vout 0.8 V

*LGA ** TDC= thermal design current



BMR481 & BMR482

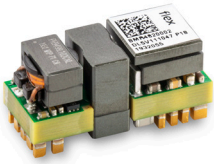
Our direct conversion products convert 48 V directly to silicon core voltages as low as 0.5 Vdc, thereby optimizing system level efficiencies and board space. The complete power system includes 1 main unit and up to 5 satellites.

Main features

- 2-3% higher efficiency over dual stage conversion from 48 V to 12 V to 1V
- Reduction in board space due to the elimination of IBC and several power components
- Scalability through paralleling up to 6 modules delivering up to 600 A +
- Supported by Flex Power Designer Tool
- BMR482 is Power Stamp Alliance compatible

POWER STAMP ALLIANCE

BMR 481/Main



BMR 482/Satellite

Dimensions BMR481

Main: 27.7 x 12.0 x 14.0 mm; 1.07 x 0.47 x 0.55 in.
Satellite: 27.7 x 12.0 x 12.6 mm; 1.1 x 0.47 x 0.49 in.

Dimensions BMR482

Main: 30 x 12.7 x 16.8 mm; 1.18 x 0.5 x 0.66 in.
Satellite: 30 x 12.7 x 15.4 mm; 1.18 x 0.5 x 0.61 in.

PRODUCT NO.	V_{OUT} (V)	V_{OUT} range (V)	V_{IN} (V)	I_{OUT} (A)	P_{OUT} (W)	η (%)
BMR4810021/002 (main unit)	1.0	0.5-1.35	40-60	70	70	92
BMR4810022 (satellite unit)	1.0	0.5-1.35	40-60	70	70	92
BMR4820001/003 (main unit)	0.8	0.5-1.35	40-60	110	75	92
BMR4820002 (satellite unit)	0.8	0.5-1.35	40-60	110	75	92

Power Surface Multiplier Package (PSMP)

BMR520 - vertical blade IBC (up to 900 W)

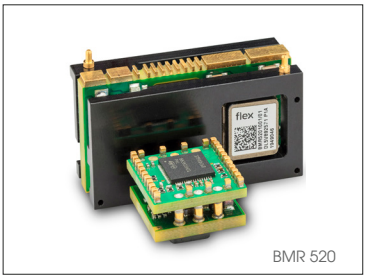
Main features

- BMR520 combines 1 Controller Assembly (CA) unit with 1, 2, or 3 Blades for 300W, 600W, or 900W operation
- 3 BMR520s equals approximately same board space as a quarter brick
- Integrated heatsinks on both sides for self-contained thermal management
- Phase shifted full bridge technology

Dimensions

Blade: 40 x 17 x 20 mm; 1.57 x 0.67 x 0.8 in.

CA: 17 x 17 x 11.6 mm; 0.67 x 0.67 x 0.47 in.



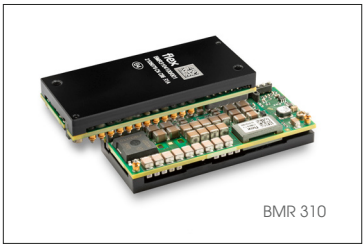
BMR 520

PRODUCT NO.	V_{OUT} (V)	V_{IN} (V)	I_{OUT} (A)	P_{OUT} (W)	η (%)
BMR5202010 001 (blade unit)	12	42-75	25	300	95
BMR5202020/001 (controller assembly unit)	—	42-75	—	—	—

Fixed Ratio Unregulated
Intermediate Bus Converter (IBC)

BMR310 - digital switched capacitor converter (up to 1060 W)

Introducing the BMR310, an Intermediate Bus Converter based on switched capacitor technology providing >98% efficiency and power levels up to 860 W continuous and peak power up to 1060 W < 1 sec in compact horizontal package.



BMR 310

Main features

- Non-isolated and unregulated converter
- Compact design
- 10.3 mm height is ideal for low-profile systems with large heatsinks / cold plates
- Maximum power density improves board space utilization
- Horizontal mounting
- SMD mounting and baseplated
- Parallel design via passive Droop Load Sharing (DLS)
- Digital communication and control using PMBus
- Protection functions: OVP, UVP, OCP and OTP

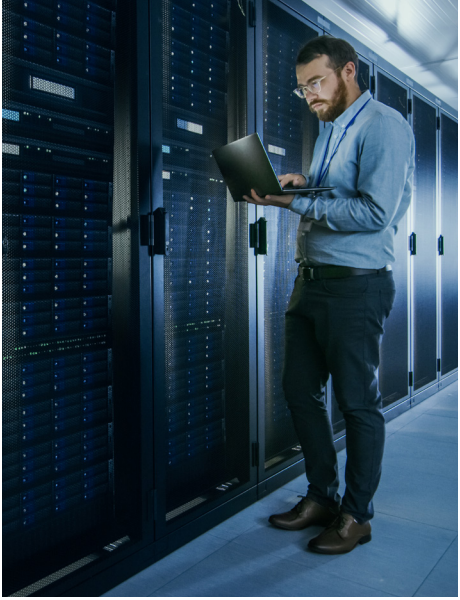
Dimensions

58.0 x 25 x 10.3 mm; 2.28 x 0.98 x 0.41

PRODUCT NO.	V_{OUT} range (V)	V_{IN} (V)	I_{OUT} (A)	P_{OUT} (W)	P_{OUT_PEAK}	η (%)
BMR3104100/001	10-15*	40-60	65	650 - 860	1060	>98

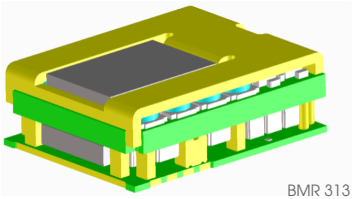
*Divide by 4

BMR313- ultra small Intermediate Bus Converter (up to 3000 W)*



Main features

- Compact non-isolated unregulated DC/DC converter
- Peak power capabilities with up to 3000 W
- High density IBC up to 14.875 W/in^3 (908 W/cm^3)
- Digital PMBus interface
- LGA industry standard footprint and pinout
- Optimized thermal design for cold wall mounting
- High efficiency > 98 % peak



BMR 313

Dimensions

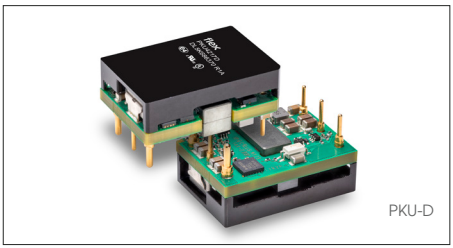
23.5 x 17.9 x 7.6 mm / 0.92 x 0.7 x 0.29 in

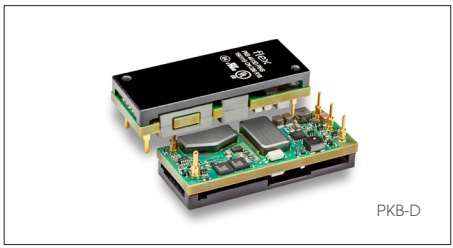
PRODUCT NO.	V_{OUT} range (V)	V_{IN} (V)	P_{OUT} (W)	P_{OUT_PEAK} (W)	η (%)
BMR3131011/001C	10-15	40-60	1000	3000	>98

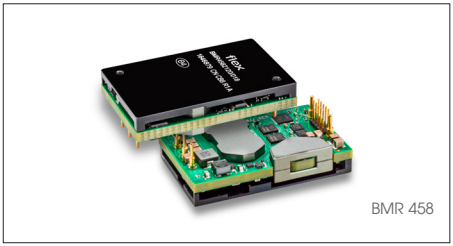
* planned to be released in the beginning of 2022

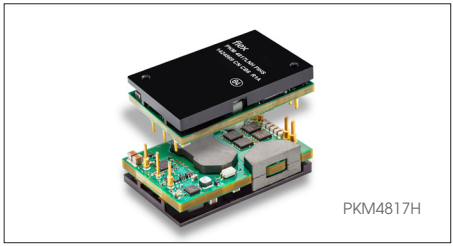
Other High Performance DC/DC Converters

A small selection of other high-performance parts suitable for data center applications are shown below. However, while this brochure is intended to highlight the latest solutions specifically targeting the data center market, many of our wider input voltage range telecom devices (36-75Vin) can also be used in these applications. For more information on our entire range of products in this area, please see our Telecom DC/DC Solutions brochure and/or our Selection Guide.


PKU-D


PKB-D


BMR 458

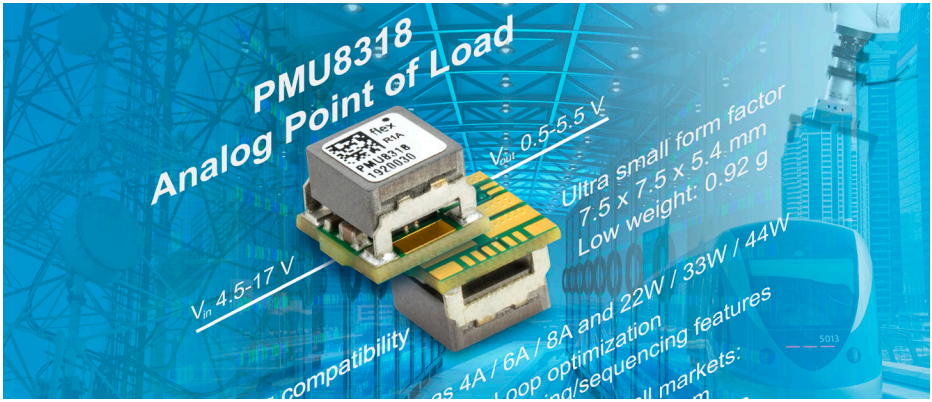

PKM4817H

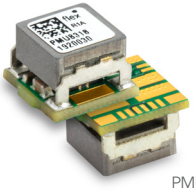
PRODUCT NAME	V_{IN} (V)	V_{OUT} (V)	P_{OUT} (W)	I_{OUT} (A)	η (%)	Dimensions
PKU4217D	36-60	10.4	260	62	94.4	Sixteenth brick
PKB4413DPIHS	36-60	12	450	37.5	96	Eighth brick
BMR458	40-60	12.2	650	54.2	96.6	Quarter brick
PKM4817NH	40-60	10.8	756	70	97	Quarter brick

Point of Load Converters 4A to 120A

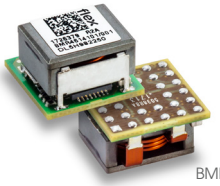
We also have a wide range of Point of Load (PoL) products. Here is a selection of our PoL options applicable for data center applications. The BMR-families below incorporate a digital interface for easy monitoring, configuration and control.

PRODUCT NO.	V_{IN} (V)	V_{OUT} (V)	I_{OUT} (A)	η (%)	Package	Size
PMU8218	4.5-17	0.6-5	4	95	LGA	7.5 x 7.5 x 5.4 mm/ 0.3 x 0.3 x 0.21 in
PMU8318	4.5-17	0.6-5	6	95	LGA	7.5 x 7.5 x 5.4 mm/ 0.3 x 0.3 x 0.21 in
PMU8418	4.5-17	0.6-5	8	95	LGA	7.5 x 7.5 x 5.4 mm/ 0.3 x 0.3 x 0.21 in
BMR461	4.5.-14	0.6-5	6/12/18	96	LGA (BGA)	12.2×12.2×8 mm/ 0.48×0.48×0.31 in
BMR462	4.5.-14	0.6-5	12	97	TH/SMD/SIP	21×12.7×8.2 mm/ 0.83×0.5×0.32 in
BMR463	4.5.-14	0.6-3	20/25	97	TH/SMD/SIP	25.65×13.8×8.2 mm/ 1.01×0.54×0.32 in
BMR464	4.5.-14	0.6-3.3	40/50	97	TH/SMD/SIP	30.85×20×8.2 mm/ 1.21×0.79×0.32 in
BMR466	4.5.-14	0.6-1.8	60	95	LGA (BGA)	25.1×14.1×7 mm/ 0.99×0.56×0.28 in
BMR465	7.5-14	0.6-1.8	90	94	TH/SMD/SIP	50.8×19.05×10 mm/ 2×0.75×0.39 in
BMR467	7.5-14	0.6-1.8	120	93	TH/SMD/SIP	50.8×19.05×10.4 mm/ 2×0.75×0.41 in
BMR4696001	7.5-14	0.6-5.5 (dual)	2x25	94	BGA	50.8×19.05×10 mm/ 2×0.75×0.39 in
BMR4690000	7.5-14	0.6-5.5 (dual)	2x40	93	SMD	25.4×12.7×11.6 mm/ 1×0.5×0.46 in
BMR474	6-15	0.6-3.3	80	95	SIP	33 x 8.6 x 19 mm/ 1.3 x 0.34 x 0.75 in



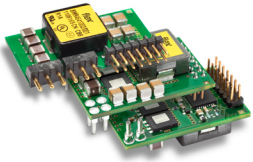


PMU8318 (4-8 A)

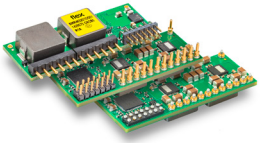


BMR461 (6-18 A)

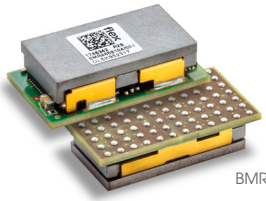
BMR463 (20-25 A)



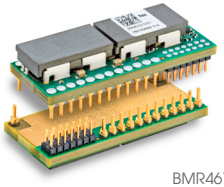
BMR464 (40-50 A)



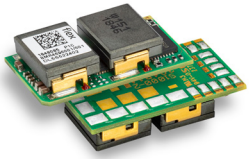
BMR465 (90 A)



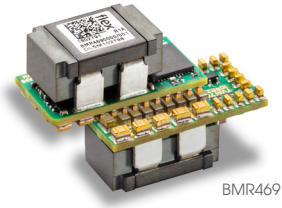
BMR466 (60 A)



BMR467 (120 A)



BMR469 (2x 25 A)



BMR469 (2x 40 A)

BMR474

For more information, please visit flexpowermodules.com or mail us to pm.info@flex.com.

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