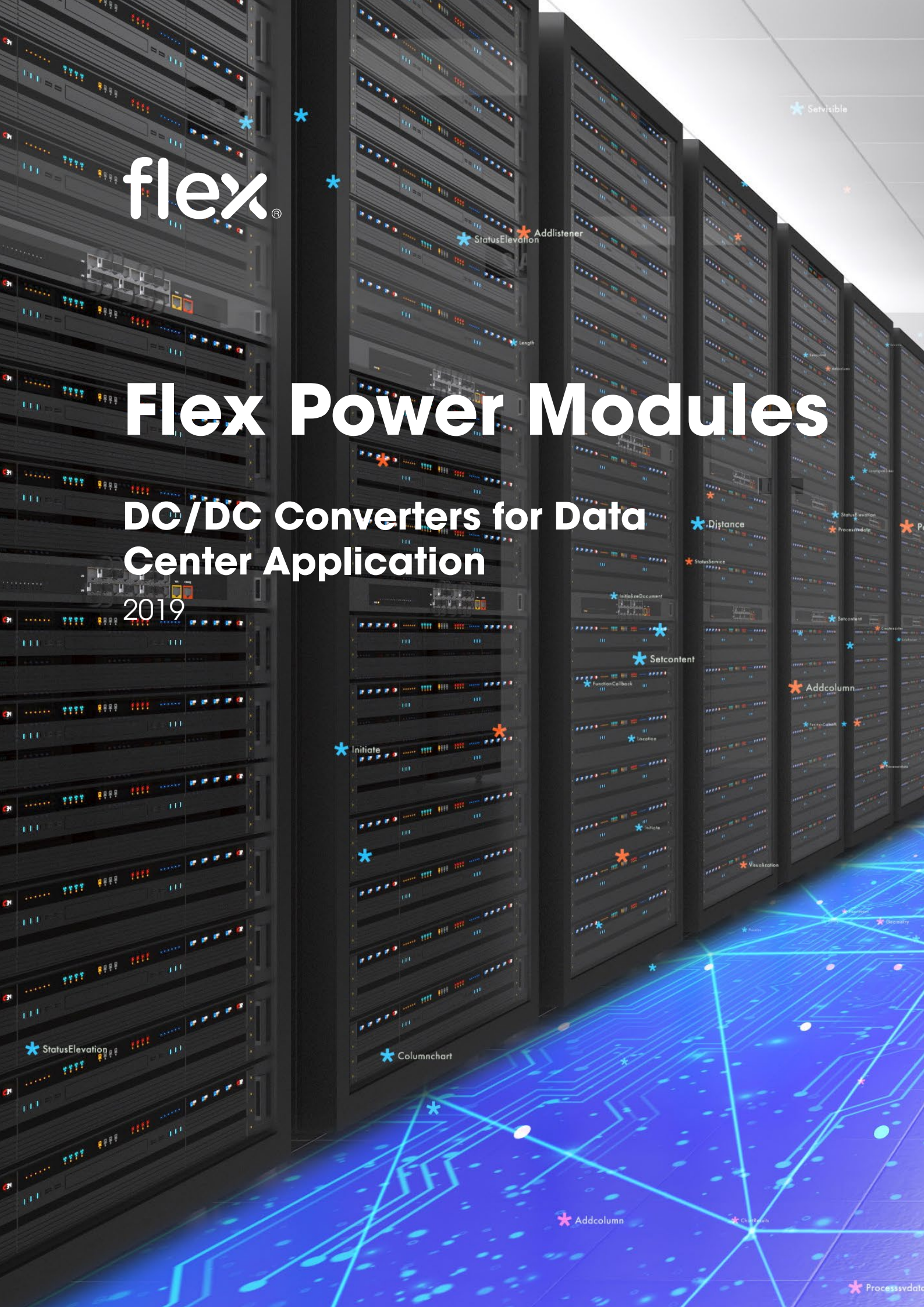


flex®

Flex Power Modules

DC/DC Converters for Data Center Application

2019



Introduction

Flex Power Modules, formerly Ericsson Power Modules, has a long, successful track record in DC/DC power solutions with more than 30 years in central office and data center applications. In the field of digital power, we are one of the leading players driven by innovations, technical know-how and open-standard software.

One of our main business area is data center applications, which typically runs on a 40-60Vin supply voltage as compared to telecom which uses 36-75Vin. We have developed a comprehensive product portfolio of power solutions for both market segments.

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

- » Digital DC/DC converters
- » Direct conversion devices from 48V to core voltages < 1.0V
- » Power surface multiplier package (PSMP) / vertical blade IBC 300W
- » Switched capacitor intermediate bus converter



You can find more technical and other information on our webpage:

www.flex.com/powermodules

Digital DC/DC Converters

We have an outstanding track record in digital power, and the products presented below represent the very latest generation of products. We registered more than 15 patents reflecting the latest design methods during the development of these product families, and they achieve exceptionally high efficiency levels offering superior thermal behavior.

BMR 480 - digital quarter-brick DC/DC

Key facts:

- » Output power: 900W to 1300W
- » Input range: 40-60V or 45-56V
- » Output voltage: 10.4V or 12V (adjustable)
- » High efficiency: 97% at 53Vin /10.4V/ half load
- » Isolation: 1500 Vdc
- » MTBF: up to 6.2 Mhrs

Main features:

- » Efficiency of 97% at 53Vin and half load
- » Hybrid Regulated Ratio (HRR) technology, bringing together the benefits of both regulated and fixed-ratio topologies in one device
- » Paralleling - two or more BMR 480 modules can be connected in parallel either via droop load sharing or active current sharing
- » PMBus compliant
- » Supported by [Flex Power Designer Software](#), which offers extensive monitoring, configuration and control

Dimensions:

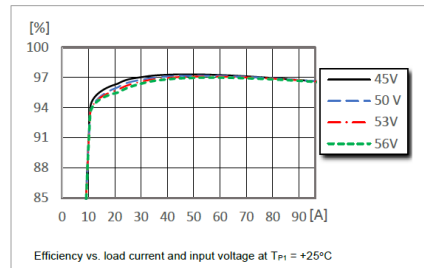
- » 58.4 x 36.8 x 14.5 mm; 2.3 x 1.45 x 0.57 in.



BMR 480

Typical Characteristics
10.4 V / 1000 W

Efficiency



Efficiency vs. load current and input voltage at $T_{P1} = +25^{\circ}\text{C}$

Efficiency curve with max at 97%

BMR 490 - digital quarter brick DC/DC

The BMR 490 is the latest product in the IBC family. It includes many new refinements to deliver an efficiency of 97.3% and an output power up to 1300W.

Key Facts:

- » Output power: up to 1300W
- » Peak power: up to 1600W
- » Input range: 40-60V
- » Output voltage: 12V at 53Vin
- » High efficiency: 97.3 % at 53Vin/half load
- » Isolation: non-isolated*
- » Hybrid regulated ratio

* Next BMR 490 variant will be isolated

Dimensions:

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

Main features:

The BMR 490 incorporates enhanced thermal conduction for superior heat transfer through the baseplate, achieving delivered power up to 1300W with a much lower thermal gradient.



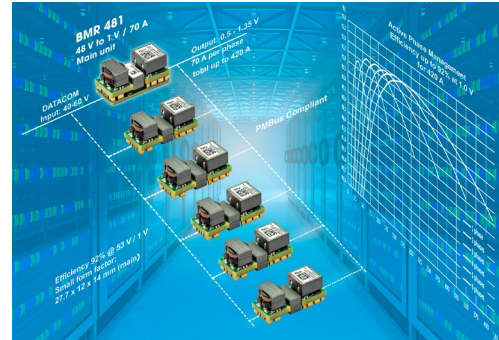
BMR 490

48 V to Load Direct Conversion

High-density cloud applications, such as big data analytics, autonomous vehicles, AI and deep learning, will demand an exponential increase in data centers' performance and board power requirements. Our power modules' direct conversion products convert directly from 48V to silicon core voltages as low as 0.5Vdc, thereby optimizing system level efficiencies and board space.

Benefits of 48V to Load Direct Conversion:

- » 2-3% higher system efficiency over dual stage conversion from 48V to 12V 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 600A +
- » Future-proofed concept that can keep up with higher core current requirements



Scalability of BMR 481

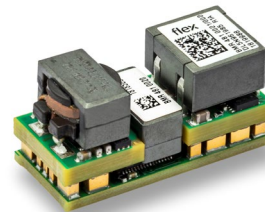
BMR 481

Key facts:

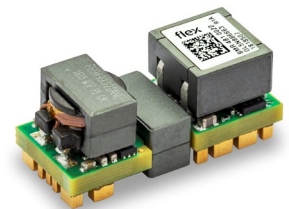
- » Input range: 40-60V
- » Output voltage range: 0.5V-1.35V
- » Output current: up to 70A / phase 420A total
- » Efficiency: 92% at 53V/ 1V
- » Isolation: 1500 Vdc, power train only
- » PMBus 1.3 compliant
- » Supported by Flex Power Designer Software

Dimensions:

- » Satellite: 27.7 x 12.0 x 12.6 mm; 1.1 x 0.47 x 0.49 in.
- » Main: 27.2 x 12.0 x 14.0 mm; 1.07 x 0.47 x 0.55 in.



BMR 481/Main



BMR 481/Satellite

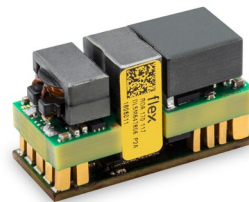
Order Information:

Part Number	Type	Vin	Output
BMR 481 0021/002	Main	40-60V	1.0V/70A
BMR 4810022	Satellite	40-60V	1.0V/70A

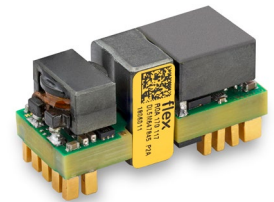
BMR 482

Key Facts:

- » Input range: 40-60V
- » Output voltages:
 - 0.5-1.35V / up to 120A (optimized for 0.75V)
 - 0.5 - 2.4V / 100A (optimized for 1.8V)
- » Anticipated efficiency: 94% at 53V/ 1.8V
- » Isolation: 1500Vdc
- » PMBus 1.3 compliant
- » Supported by Flex Power Designer Software
- » Power Stamp Alliance (PSA) compliant
- » To be released in Q4/2019



BMR 482/Main



BMR 482/Satellite



Power Surface Multiplier Package (PSMP)/ Vertical Blade IBC 300W

The PSMP blade concept is derived from the need to reduce board space allocated to power conversion. This is the first generation of vertical IBCs that make use of the z-axis height which is often available in server environments. Another criterion was the demand to improve cooling conditions by increasing the cooling surface area and integrating the heatsinks for maximum output power density. In response to these needs, we introduced the BMR 520 family.

BMR 520

Key facts:

- » Input range: 36-75V
- » Output voltage range: 12V
- » Power: 300W
- » Current: 25A
- » Efficiency: 95%
- » Isolation: 1500V
- » To be released in Q3/2019

Main features:

- » PSMP concept consists of 1-3 vertical blade units and one controller assembly (CA) which can control up to 3 blades.
- » 3 PSMP blades mounted in parallel equals the approximate footprint of one quarter-brick.
- » Each blade has heatsinks on both sides to increase cooling surface area.
- » BMR 520 is based on the phase-shifted full bridge technology.
- » Innovative vertical layout contributes to an efficient board design and reduces the total cost of ownership.

Dimensions:

- » Blade: 40 x 17 x 20 mm; 1.57 x 0.67 x 0.8 in.
- » Controller Assembly: 17 x 17 x 11.6 mm; 0.67 x 0.67 x 0.47 in.



BMR 520 - Blade and
Controller Assembly

Order Information:

Part Number	Vin	Description
BMR 520 2010 001	36-75V	Power Blade
BMR 520 2020 001	36-75V	Control Assembly - integrated control board and house keeping power board

Switched Capacitor Intermediate Bus Converter

Our switched capacitor intermediate bus converter achieves >98% efficiency and power level up to 900W in a compact laydown and vertical mount package.

Main features:

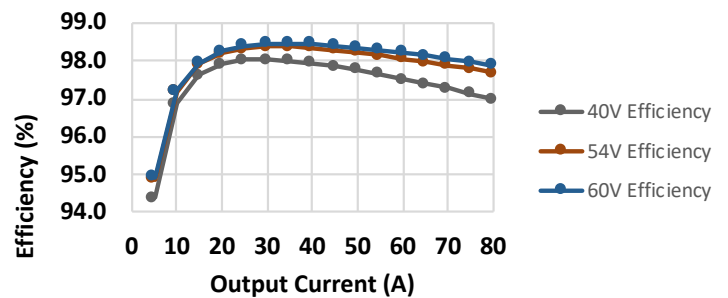
- » Target applications are data centers and high power systems moving from AC-12V to AC-48V
- » Efficiency at >98% provides a significant reduction in TCO
- » 6mm height is ideal for low profile systems with large heatsinks / cold plates
- » Maximum power density improves board space utilization in your application
- » Vertical and horizontal mounting options
- » Open-frame, baseplated or integrated heatsink available
- » Parallel design via passive droop load sharing
- » Digital communication and control using open-standard PMBus

Key Facts:

- » Input range: 40-60V
- » Output voltage range: 10-15V (4:1 unregulated)
- » Power:
 - SIP: 600W
 - Laydown: 800W to 900W
- » Peak power: 1000W (for one second range)
- » Efficiency: >98%
- » Isolation: Non-isolated
- » To be released in Q3/2019

Dimensions:

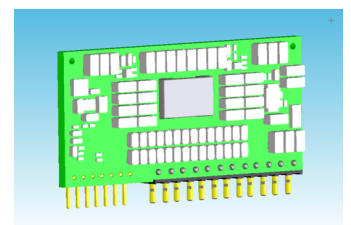
- » Horizontal: 58.0 x 25 x 6mm; 2.28 x 0.98 x 0.23 in.
- » Vertical: 58.0 x 6 x 25mm; 2.28 x 0.23 x 0.98 in.



Efficiency curves for Switched Cap IBC



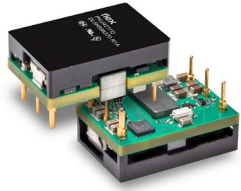
Surface-mounted



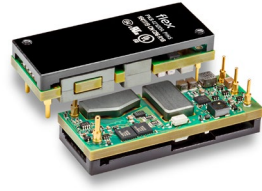
Vertical-mounted

Other High Performance DC/DC Converters

We have a wide range of standard DC/DC converters within the input voltage of 40- 60V in different form factors, power levels and adoption rates.



PKU-D



PKB-D



BMR 458



PKM-NH

Product Names	V _{in} (V)	V _{out} (V)	P _{out} (W)	I _{out} (A)	Efficiency %	Dimensions
PKU4217D	36-60	10.4	260	62	94.4	Sixteenth Brick
PKB 4413DPIHS	36-60	12	450	37.5	96	Eighth Brick
BMR 458	40-60	12.2	650	54.2	96.6	Quarter Brick
PKM4817NH	40-60	10.8	756	70	97	Quarter Brick



For more information, please visit www.flex.com/powermodules or email us at pm.info@flex.com

Flex is the Sketch-to-Scale® solutions provider that designs and builds Intelligent Products for a Connected World®. With approximately 200,000 professionals across 30 countries, Flex provides innovative design, engineering, manufacturing, real-time supply chain insight and logistics services to companies of all sizes in various industries and end-markets. Flex – Live Smarter™.

Copyright © 2019, Flex. All rights reserved. No part of this document may be reproduced in any form without the prior written permission of Flex.

