



# Flex Power Modules 48 V to Load Direct Conversion

DC/DC Power Conversion for Data Center & Open Compute Applications

# Flex Power Modules: 48 V to Load Direct Conversion

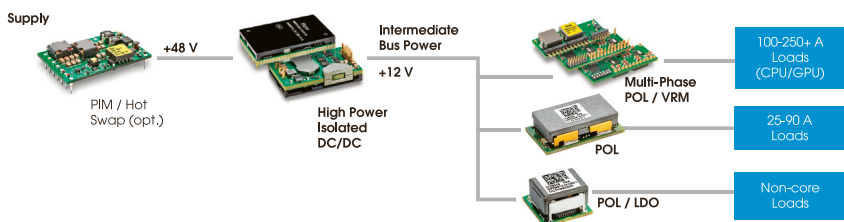
High-density cloud applications, such as big data analytics, autonomous vehicles, AI and deep learning, will demand an exponential increase in Data Centers' performance.

As board power requirements continue to increase into the multi-kW range, higher voltage buses, such as 48 Vdc, are increasingly being used to reduce distribution losses and copper costs, while simplifying installations.

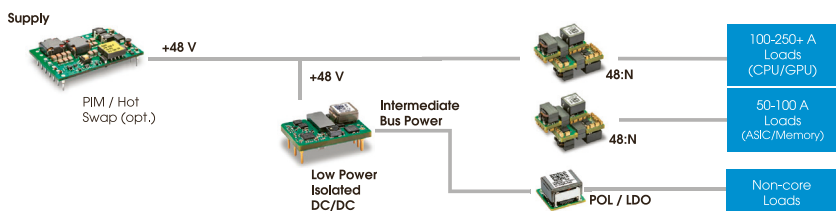
Flex Power Modules' Direct Conversion products eliminate a power conversion stage, converting directly from 48 V to silicon core voltages as low as 0.5 Vdc.

The picture below demonstrates Direct Conversion changes when moving from an IBA (Intermediate Bus Architecture) to a hybrid approach employing Direct Conversion for the highest current GPU/CPU/Memory requirements.

## BEFORE DIRECT CONVERSION

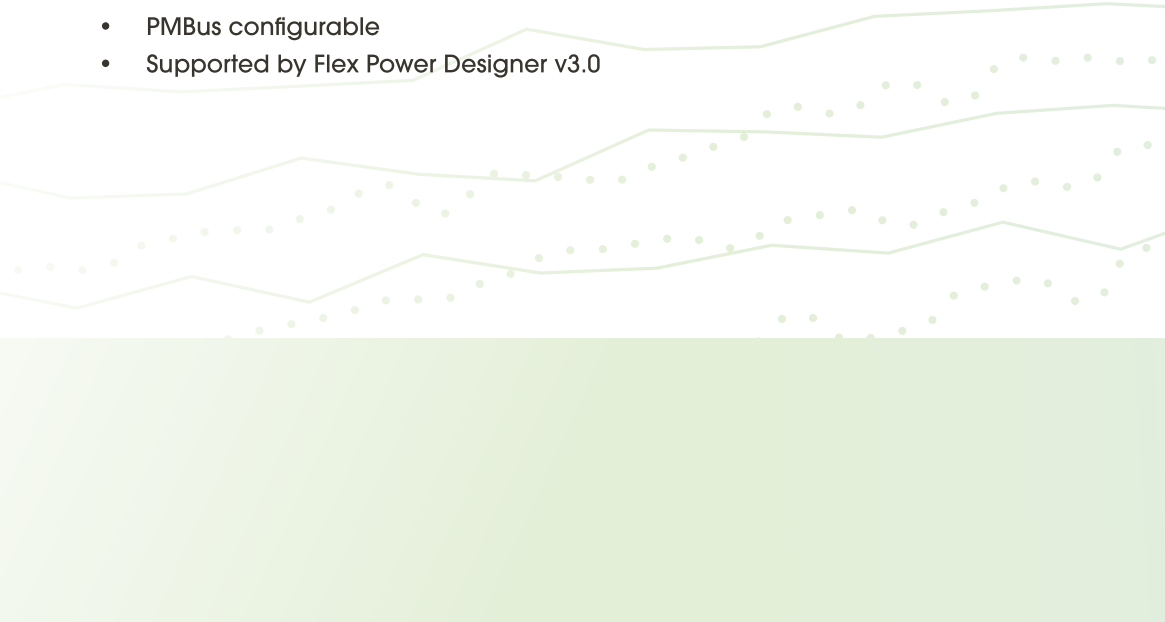


## WITH DIRECT CONVERSION



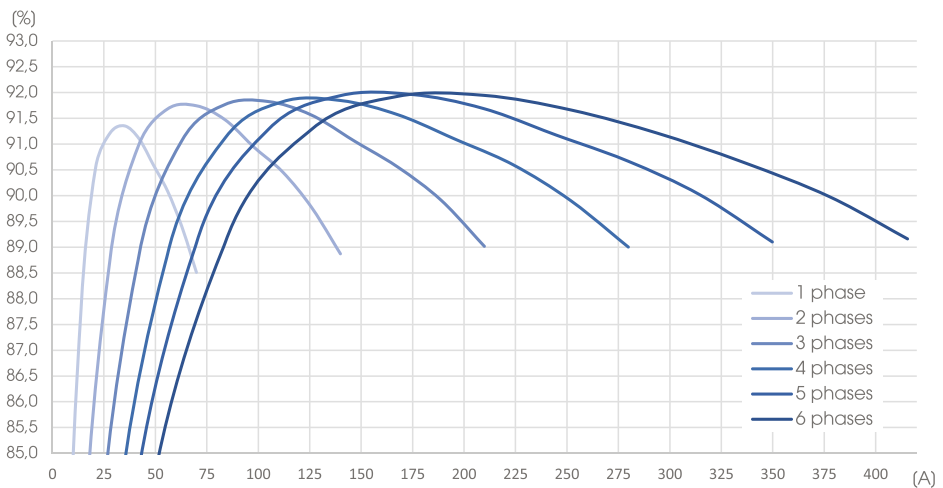
# Benefits of 48 V to Load Direct Conversion

48V Direct Conversion benefits include:

- Higher Efficiency with an increase of 2% - 3% over traditional dual stage conversion from 48 V to 12 V to 1 V – reduced need for Intermediate Bus
  - Reduction in board space due to the elimination of potentially several power converters, such as quarter bricks, reaching board savings up to 50% or more
  - Reduces distribution challenges - up to 1/16 of copper loss vs. 12 V bus
  - Architecture automatically adjusts to maintain optimal efficiency across a wide load range
  - Mechanically and electrically sized to meet the demand of server applications
  - High-volume manufacturing capability with industry standard processes and components
  - Future-proof: The demand for higher core current solutions is expected to grow with a scalability up to 6 modules and higher current up to 600A+
  - Full digital control on the secondary side
  - Compliant with PMBus, AVSBus and Intel SVID
  - PMBus configurable
  - Supported by Flex Power Designer v3.0
- 

# Automatic Efficiency Optimization

Flex Power Modules' Direct Conversion modules offer optimal efficiency across a wide range of loads. As previously mentioned, the Flex Power Modules' Direct Conversion architecture can be configured with 1 phase up to a maximum of 6. When the current demand increases or decreases during operation, the controller in the Main unit automatically enables or disables Satellites to maintain optimal efficiency across a wide current range. The figure below shows the efficiency of six BMR 481 units providing above 90% efficiency at 1V from loads of approximately 25A to 375A.



Picture: Efficiency versus load current

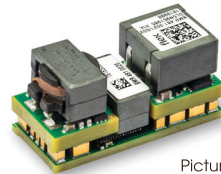
# Flex Power Modules Solution: BMR 481

Flex Power Modules' complete power supply system includes one Main unit and up to 5 Satellite units (in total 1-6 phases).

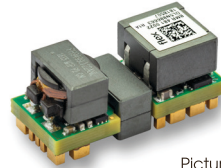
## BMR 481

The key features of the BMR 481 series are :

- Efficiency up to 92% @ 53 V / 1V
- Input range: 40V to 60V
- Output Voltage range: 0.5V to 1.35V
- Output Current: up to 70A / phase, 420 A
- Isolated Power Train
- PMBus v1.3
- Supported by Flex Power Designer Software

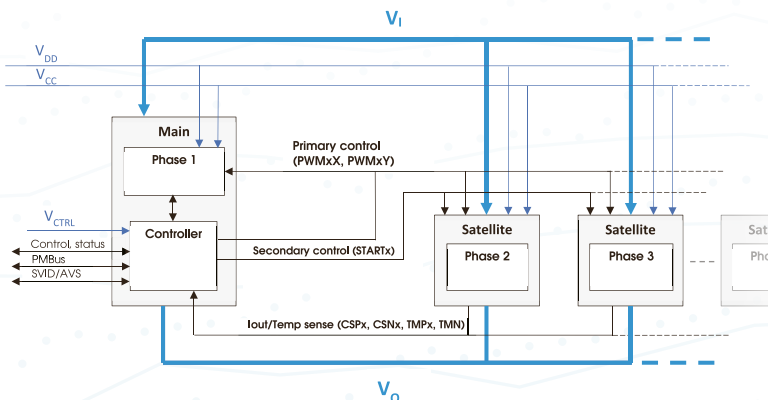


Picture: BMR 481 Main



Picture: BMR 481 Satellite

**Mechanical information:**  
Satellite: 27.7 x 12.0 x 12.6 mm  
Main: 27.2 x 12.0 x 14.0 mm  
Pinning: SMT Box Pins / LGA



Picture: DiCon Architecture



# What comes next?

The BMR 482 is planned to be launched in [2019](#) and has the following key features:

## BMR 482

- Anticipated Efficiency up to 94% @ 53 V / 1.8V
- Input range of 40V to 60V
- Output Voltage range: 1.2V to 2.4 V
- Output Current: 100A+ / phase, 600A max
- Isolated Power Train
- Supported by Flex Power Designer Software
- Compliant with PMBus, AVSBus and Intel SVID
- Supports PSA Specifications

### Mechanical information:

Satellite: 30.0 x 12.7 mm

Main: 30.0 x 12.7 mm

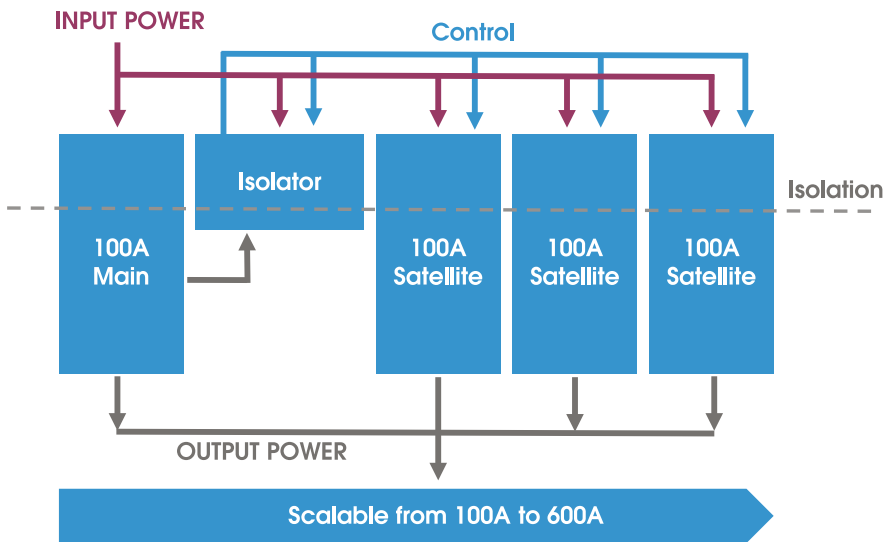
Pinning: SMT Box Pins / LGA

## Order Information

Available products are:

Part number	Type	V <sub>in</sub>	Output
<b>BMR 481 0021/002</b>	Main	40-60V	1.0V/70A
<b>BMR 481 0022</b>	Satellite	40-60V	1.0V/70A

Flex is a founding member of Power Stamp Alliance (PSA). The Power Stamp Alliance (PSA) was formed in 2018 to promote the benefits of Direct Conversion while addressing the industry's need for multiple sourcing. The PSA has been formed to define standard product footprints and functions that provide standard power modules solutions for converting 48V<sub>in</sub> to low voltage, silicon voltages in high current applications such as CPUs, DDR memory, ASICs, etc.





For more information visit [flex.com/powermodules](https://flex.com/powermodules)

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