eGaN® FETs and ICs for 48 V Buck Converters

EFFICIENT POWER CONVERSION

Benefits of eGaN FETs and ICs in 48 V Buck Converters:

- Increase output current while reducing size
- Ultra low Q_{GD} and zero Q_{RR} = efficient switching of high current *and* high voltage
- Wafer level package = low inductance, low noise, low cost
- High frequency switching = smaller, cheaper passives and faster transient response
- Ultra-low capacitance = high efficiency at light load

Rethink Data Center Server Power Architecture: eGaN FETs and ICs Enable Single Stage Conversion

Data centers consume vast amounts of electrical energy. Operating power for these centers runs from megawatts to tens of megawatts.

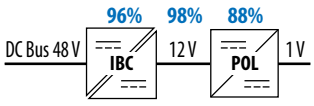
Power conversion design today in the data center is focused on improving energy efficiency and reducing operation costs.

Buck conversion is a very economical way to convert 48 V to lower voltages data centers require.

While all levels of power conversion would benefit from wide bandgap semiconductors, the biggest impact on overall efficiency is at the lowest voltage. This is where eGaN® FETs as a switch for the control and rectifier functions in the 48 V Buck design have a huge advantage over MOSFETs and will significantly improve data center efficiency.

GaN Enables Single-Stage Conversion from 48 V to Point of Load

Traditional Multi-Stage Conversion: Intermediate Bus Architecture

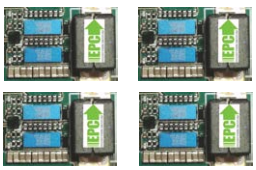


EPC9115 Demo Circuit

f_{SW} = 300 kHz 550 W/in³

Featuring eGaN FETs EPC2020 and EPC2021

EPC9059 Half Bridge Development Board



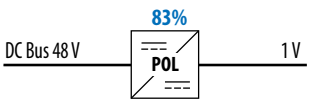
f_{SW} = 1 MHz 500 W/in³

Featuring eGaN FET EPC2100

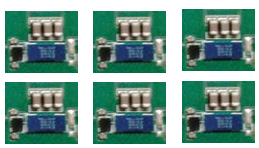
Efficiency Ratio with GaN

96% x 98% x 88%
≈ 83%
≈250 W/in³

Single-Stage Conversion: DC Bus Architecture



EPC9041 Half Bridge Development Board



f_{SW} = 300 kHz 500 W/in³

Featuring eGaN FET EPC2105

Efficiency Ratio with GaN

≈ 83%
≈ 300 W/in³

Did You Know? ...

A single stage, GaN-based approach in telecom and datacom systems can yield higher power densities and lower system cost with similar system efficiencies.

Demo Circuits

Part Number	Description	V_{IN}	V_{OUT}	I_{OUT}	Featured Product
EPC9115	48 V to 12 V 1/8th Brick Converter	48 V - 60 V	12 V	42 A	EPC2020 EPC2021

Half Bridge Development Boards

Part Number	Description	V_{DS}	I_D (max RMS)	Featured Product
EPC9059	Half Bridge Parallel Evaluation for High Current Applications	30	50	EPC2100
EPC9041	Power Stage evaluation of monolithic GaN half bridge	80	20	EPC2105

Recommended Devices for 48 V Buck Converters

Part Number	Configuration	V_{DS}	Max $R_{DS(on)}$ (mΩ) @ 5 V_{GS}	Q_G typ (nC)	Q_{GS} typ (nC)	Q_{GD} typ (nC)	Q_{OSS} typ (nC)	Q_{RR} (nC)	I_D (A)	Pulsed I_D (A)	Package (mm)	Development Board
EPC2108	Dual with Sync Boot	60	240 3300	0.24 0.044	0.106 0.02	0.047 0.004	0.71 0.93 0.134	0	1.7 0.5	5.5 0.5	BGA 1.35 x 1.35	EPC9064
EPC2102	Dual	60	4.9	8	2.5	1.5	26 31	0	30	220	BGA 6.05 x 2.3	EPC9038
EPC2031	Single	60	3	16	5	3	48	0	48	450	BGA 4.6 x 2.6	EPC9061
EPC2101	Half Bridge	60	11.5 2.8	3.3 13	1.1 3.9	0.5 2.2	9.3 45	0	10 40	80 350	BGA 6.05 x 2.3	EPC9037
EPC2020	Single	60	2.2	16	3.9	2.3	50	0	90	470	LGA 6.05 x 2.3	EPC9033
EPC2103	Dual	80	5.5	6.5	2.2	1.1	30 34	0	30	195	BGA 6.05 x 2.3	EPC9039
EPC2029	Single	80	3.2	13	3.4	1.9	53	0	48	360	BGA 4.6 x 2.6	EPC9046
EPC2105	Half Bridge	80	14.5 3.6	2.7 11	0.9 3	0.5 2.1	11 51	0	10 40	70 300	BGA 6.05 x 2.3	EPC9041
EPC2021	Single	80	2.5	15	3.4	2.3	63	0	90	420	LGA 6.05 x 2.3	EPC9034
EPC2206	Single - AEC Q101	80	2.2	15	4.1	3	72	0	90	390	LGA 6.05 x 2.3	n/a
EPC2107	Dual with Sync Boot	100	390 3300	0.19 0.044	0.077 0.02	0.041 0.004	1.25 0.9 0.134	0	1.7 0.5	3.8 0.5	BGA 1.35 x 1.35	EPC9510
EPC2106	Half Bridge	100	70	0.73	0.24	0.140	3.96 4.68	0	1.7	18	BGA 1.35 x 1.35	EPC9055
EPC2007C	Single	100	30	1.6	0.6	0.3	8.3	0	6	40	LGA 1.7 x 1.1	EPC9006C
EPC2051	Single	100	25	1.7	0.6	0.3	7.3	0	1.7	37	BGA 1.3 x 0.85	EPC9091
EPC2016C	Single	100	16	3.4	1.1	0.55	16	0	18	75	LGA 2.1 x 1.6	EPC9010C
EPC2052	Single	100	12.5	3.7	1.4	0.5	13	0	8.2	70	BGA 1.5 x 1.5	EPC9092
EPC2001C	Single	100	7	7.5	2.40	1.20	31	0	36	150	LGA 4.1 x 1.6	EPC9002C
EPC2045	Single	100	7	5.9	1.9	0.8	25	0	16	130	BGA 2.5 x 1.5	EPC9078
EPC2104	Half Bridge	100	6.8	6.8	2.3	1.4	35 41	0	30	180	BGA 6.05 x 2.3	EPC9040
EPC2032	Single	100	4	12	3	2	66	0	48	340	BGA 4.6 x 2.6	EPC9062
EPC2053	Single	100	4	12.0	4.1	1.5	43	0	32	240	BGA 3.5 x 2	EPC9093
EPC2022	Single	100	3.2	13.2	3.4	2.4	71	0	90	390	LGA 6.05 x 2.3	EPC9035

Note: Table data subject to change. Please refer to the Product section on www.epc-co.com.

Design Support Materials @ www.epc-co.com

Wireless Power Handbook

DC-DC Converter Handbook
DC-DC Power Conversion Application Page
EPC9041 - 80 V, 20 A Development Board
EPC9059 - High Power GaN Point-of-Load
EPC9115 - 500 W 1/8th Brick Converter
GaN Transistors for Efficient Power Conversion Textbook

Re-Thinking Server Design in the Age of GaN
GaN is Eyeing Silicon's Data Center Lunch
Demo Boards
Assembly Guides
Reliability Reports
Device Models

EFFICIENT POWER CONVERSION

For More Information

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