POWER TO DO ANYTHING

Your ultimate power resource

AC-to-Processor: Powering Tomorrow's Datacenters with TI GaN

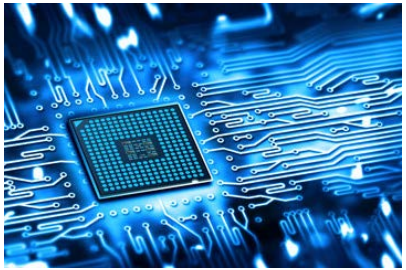
March 27-29, 2017

For questions please contact masoud@ti.com

AC-to-Processor at Over 2X the Power Density

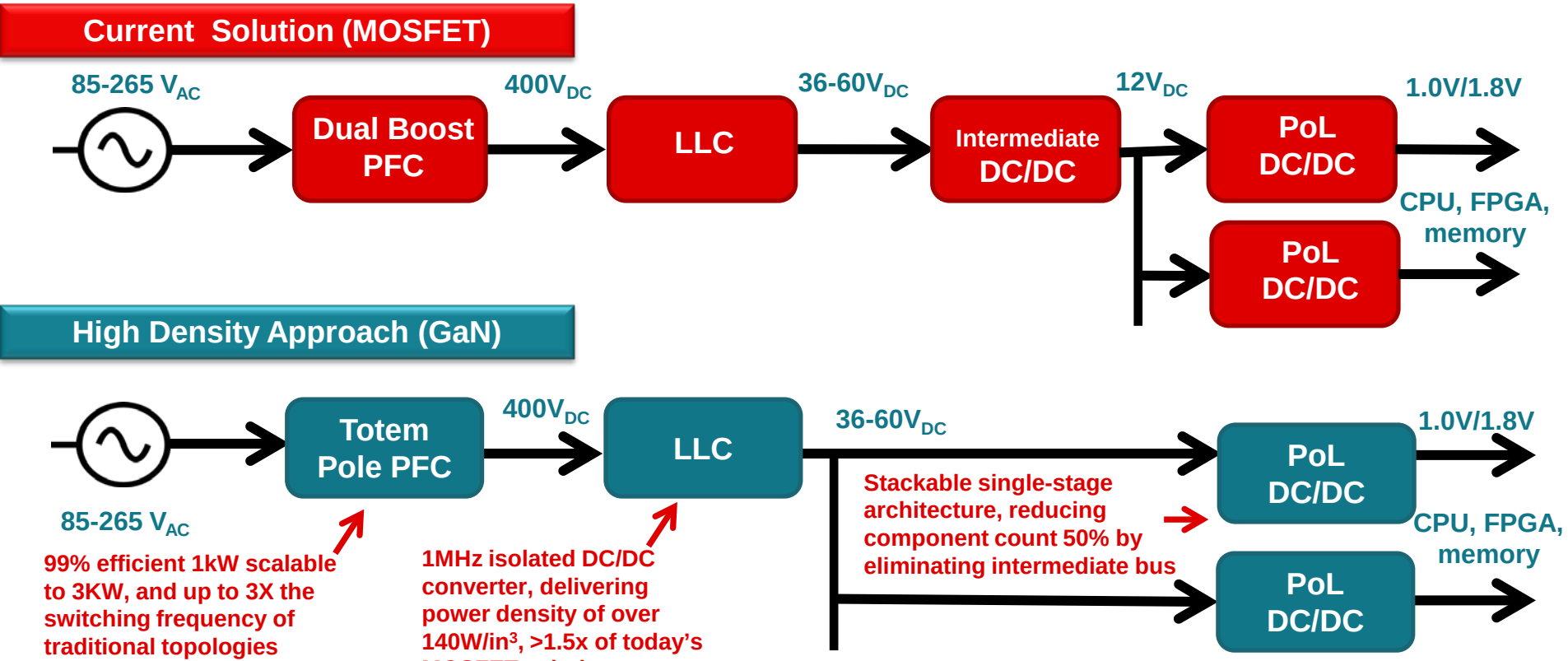
- TI **GaN** enables **>2X power density improvements from AC to point-of load**, by **solutions** that are:
  - ***Cooler:*** 99% Efficient Totem Pole PFC scalable to 3kW
  - ***Faster:*** 1MHz - 140W/in^3 isolated DC/DC LLC converter
  - ***Smaller:*** 2x75A stackable, single-stage 48V-to-POL solution
  - ***Easier:*** Industry most integrated GaN with the largest ecosystem and solution footprint

Do *More*
With *Less* Power



Learn more at www.ti.com/GaN

TI GaN: *Rethink* your AC to PoL Power Design



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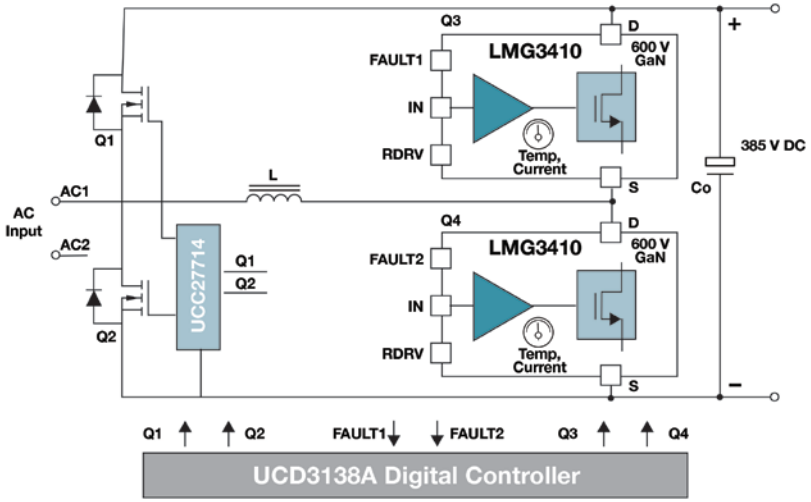
PFC Solution: 1kW 140kHz Totem-Pole CCM



Specifications

- Continuous Conduction Mode PFC
- Universal AC line input
- 385V DC bus output
- 1 kW output across universal input

Features

- LMG3410 GaN FET implemented with LMG3410-HB-EVM
- Highly integrated UCD3138A digital solution offering superior performance
- Advanced control algorithm
- Adaptive dead time control
- Excellent THD and PF

Increase Density by 2X to 125 w/in^3

Excludes EMI

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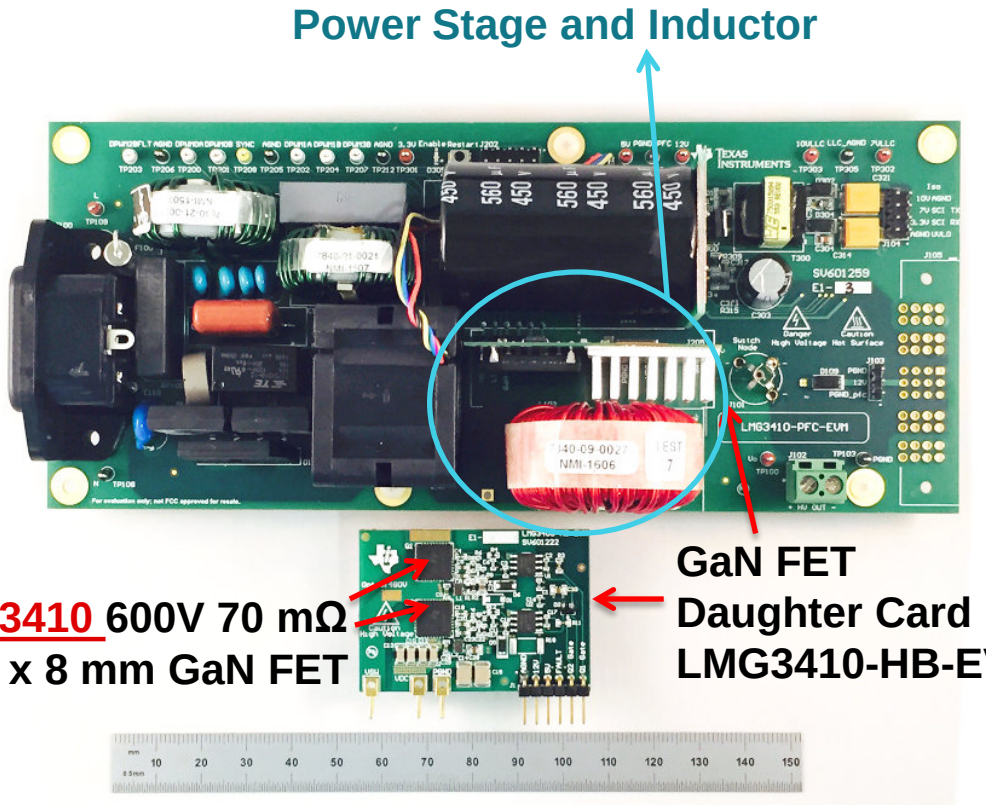
PFC Solution: 1kW 140kHz Totem-Pole CCM



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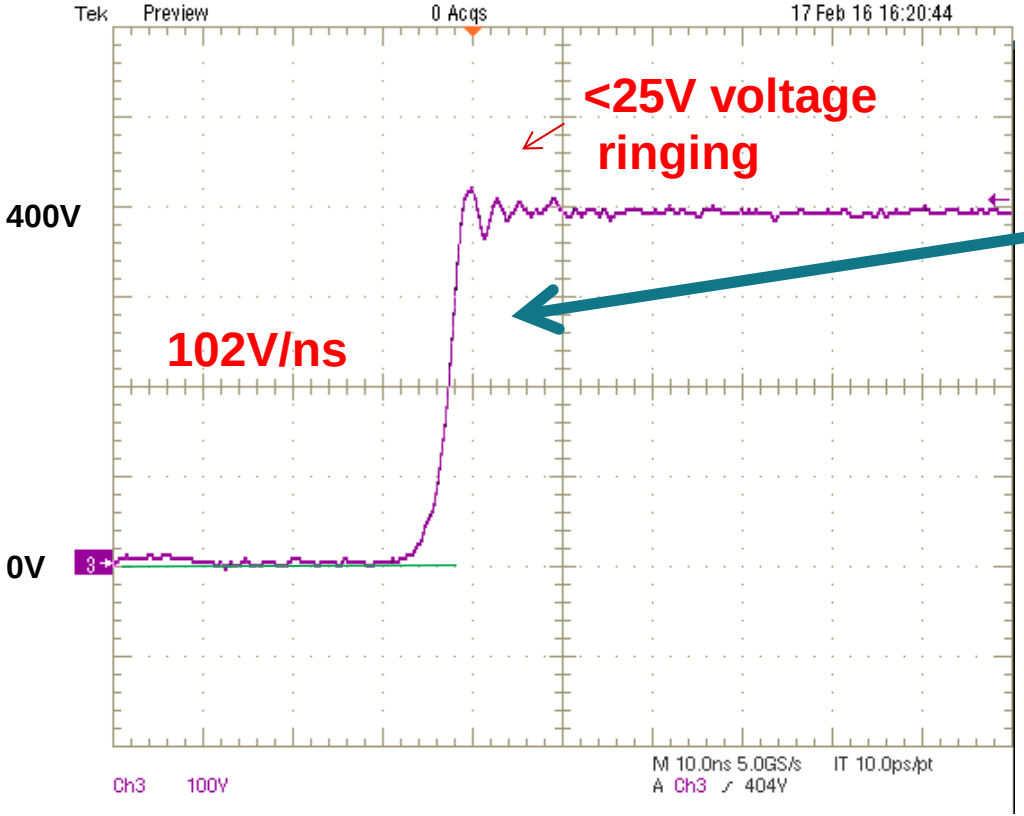
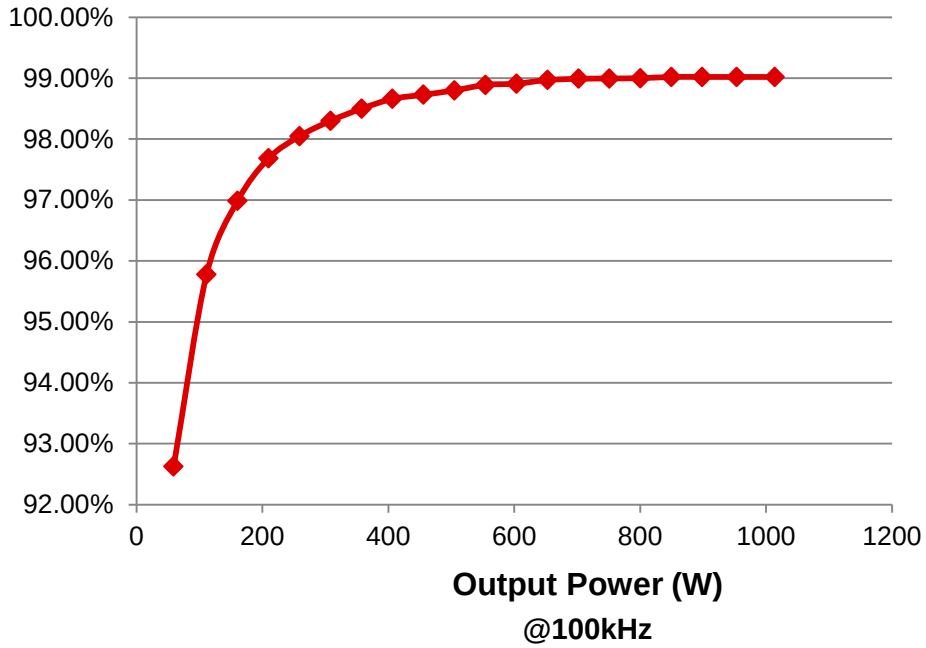
PFC Solution: Switching Node Waveform



Zero to 400V in 4ns With TI-GaN

Learn more at www.ti.com/GaN

PFC Solution: Efficiency



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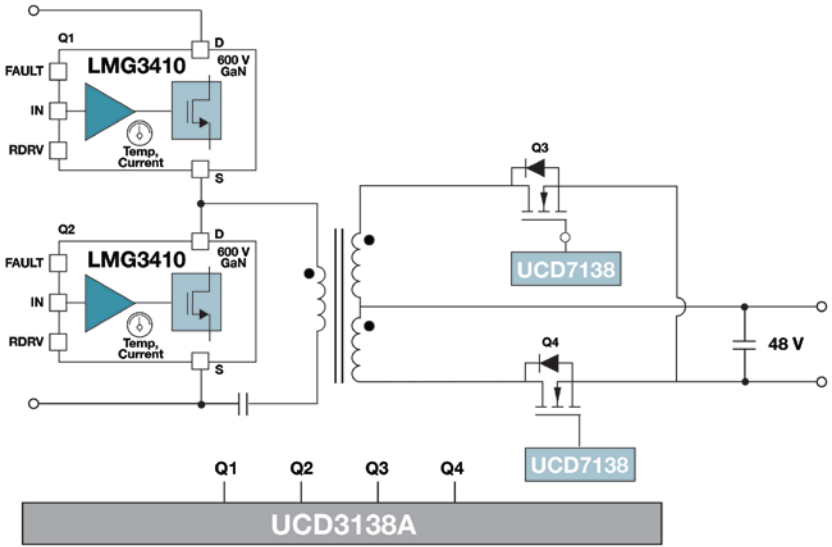
LLC Solution: 1MHz Isolated DC/DC Converter

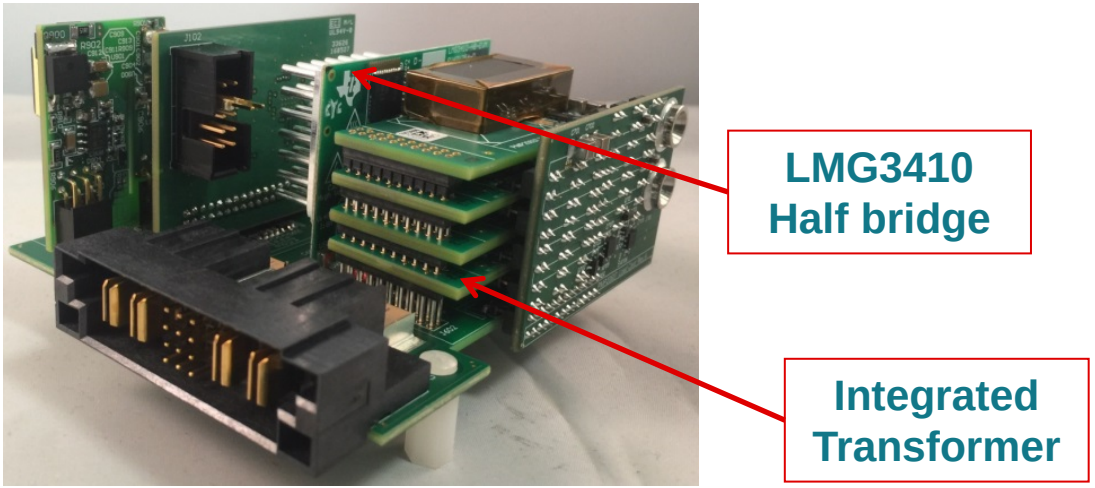


	Specification
Input voltage (V)	380 ~ 400
Output voltage (V)	48V Nom unregulated
Power (W)	1000
Size (in)	2 x 2.1 x 1.7
Power density (W/in^3)	140 **High power density**
Efficiency	>97% **High Efficiency**
Switching frequency	1 MHz

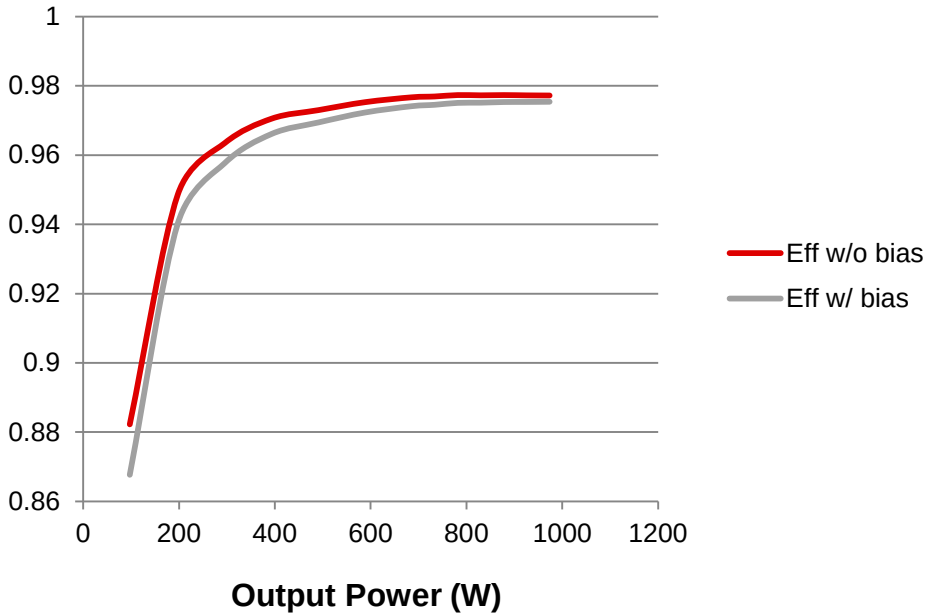
Increase Density by 1.5X to 140 w/in^3

Learn more at www.ti.com/GaN

LLC Solution: 1MHz Isolated DC/DC Converter



LLC Solution: Efficiency



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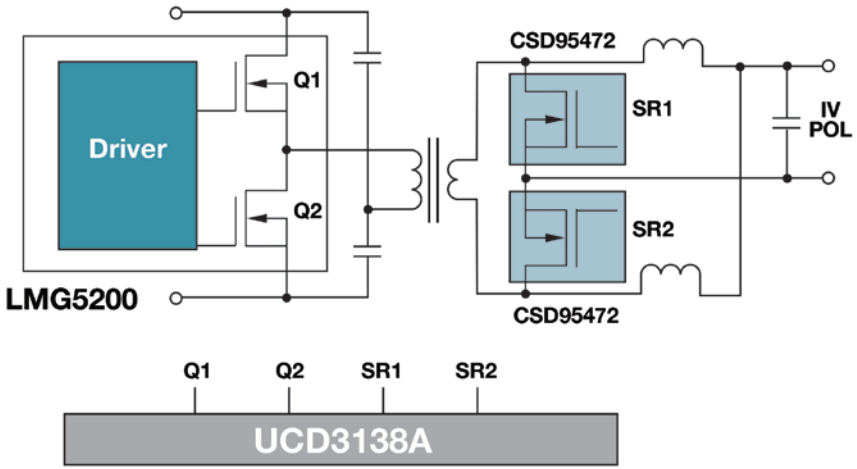
48V-to-POL: 2x75A Stackable Single-Stage Solution

One 75A Power Stage



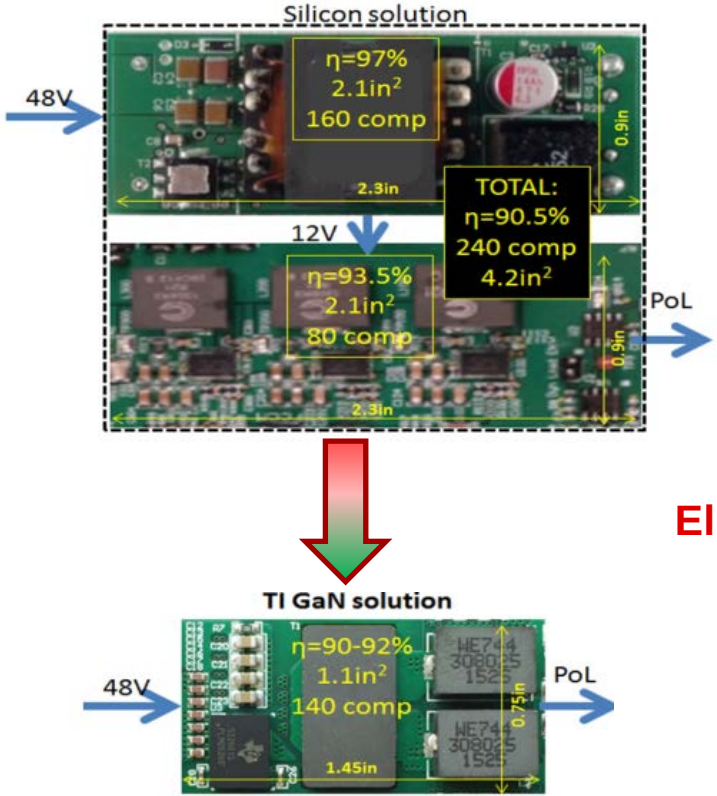
Increase Density by 4X to 160 w/in^3

Single vs Two-Stage Solution:

- GaN enables an efficient hard-switched converters at higher voltages
- The LMG5200 is ideal for single-stage power conversion. Applications include server and telecom POL, as well wide Vin industrial power supplies
- The single conversion reduces component count in half, and increases power density by 4X

Learn more at www.ti.com/GaN

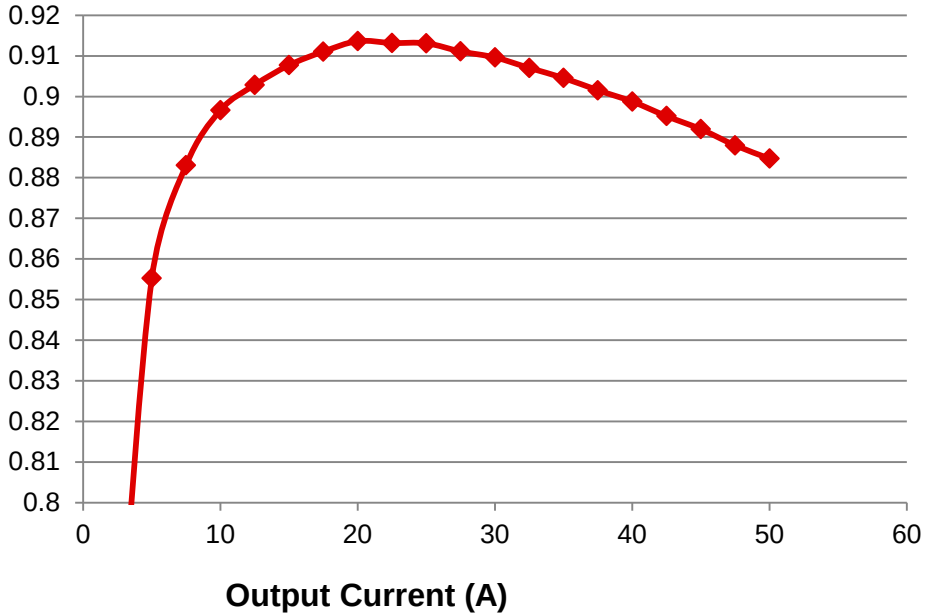
48V-to-POL: 2x75A Stackable Single-Stage Solution



Eliminate the Intermediate Bus Converter (IBC)

Learn more at www.ti.com/GaN

48V-to-POL: Efficiency



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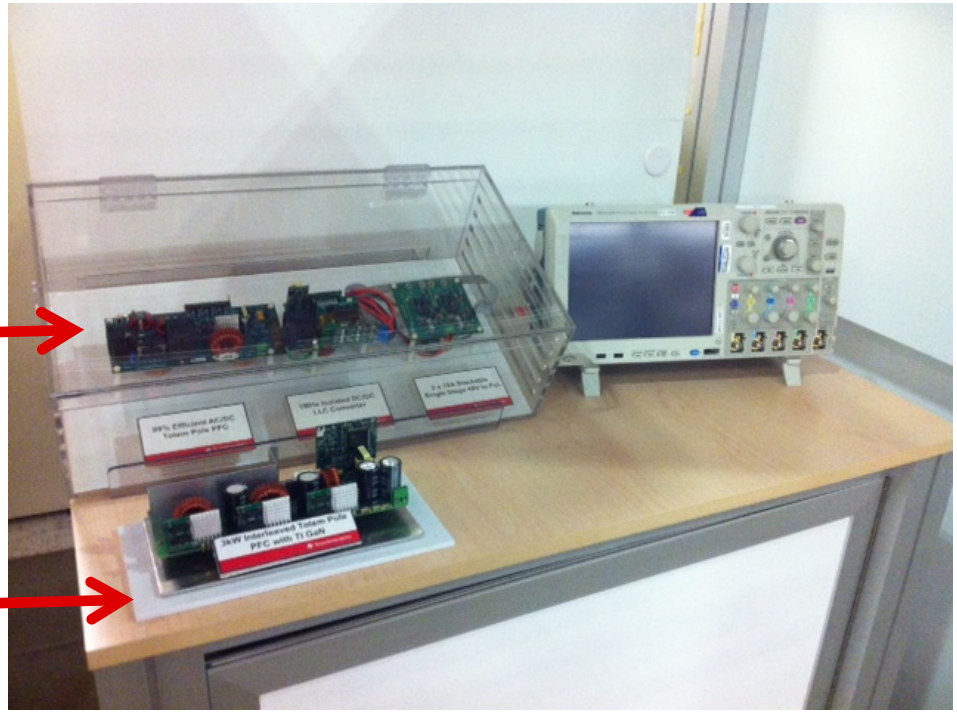
AC-to-Processor :
Powering Tomorrow's Datacenters with TI GaN

1kW PFC,
LLC,
48:POL

3kW PFC
(static)



Learn more at www.ti.com/GaN

Product Information

LMG3410: 600 V GaN Power Stage

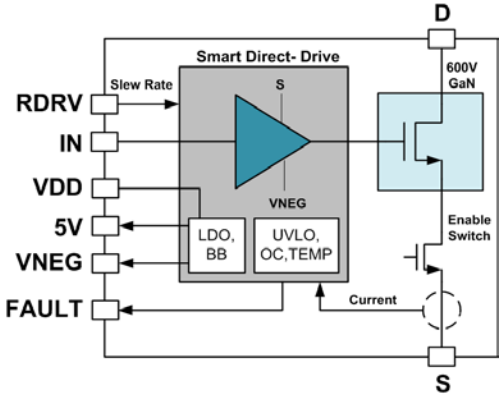
Features

- 70mΩ RDSon Drain to Source
- Integrated GaN Gate Driver
  - TI Direct-Driver technology switches the GaN directly
  - Internal buck-boost generates negative drive voltage
  - Only single +12V unregulated supply needed
  - 5V LDO to power external isolator
- External resistor sets drive strength (RDRV pin)
  - 30 V/ns to 100 V/ns adjustability
  - No compromise in gate-drive inductance
- Fault monitoring and protection
  - UVLO protection
  - Over-current protection (20nS)
  - Over-temperature protection
- SPICE model and EVM at ti.com
- Package: 8 x 8 mm QFN

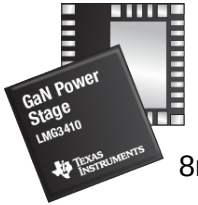
Applications

- AC rectifier to 12V/48V
- High-voltage DC distribution in server/telecom
- Photo-voltaic inverters

Functional Block Diagram



Packaging



8mm x 8mm QFN

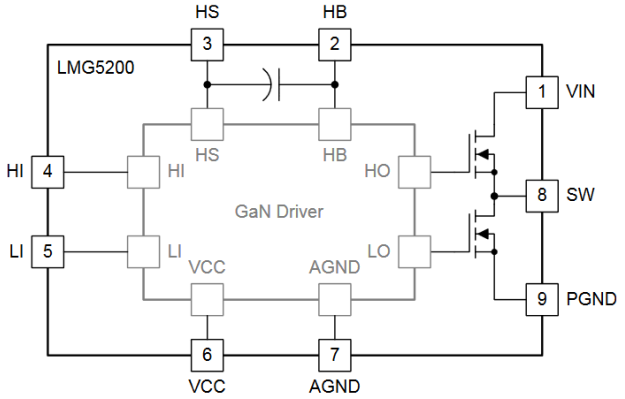
Learn more at www.ti.com/GaN

LMG5200: 80 V/10 A GaN Half-Bridge Power Stage

Features

- 80-V 18 mΩ devices for 10 A DC operation
- Integrated High-side and Low-side GaN driver and FETs
- Internal bootstrap supply voltage clamping to prevent GaN FET overdrive (5.2 V)
- Fast Propagation delay (25 ns)
- Excellent HS and LS matching (2 ns)
- Package: 6 x 8 mm QFN
- SPICE model at ti.com
- EVM available at ti.com

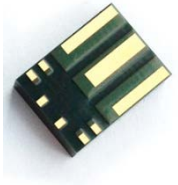
Block Diagram



Applications

- High speed synchronous buck converters
- Wide V_{IN} to point-of-load single step converters
  Isolated DC/DC
- Class D Audio Amp
- 48-V Motor drive

Packaging



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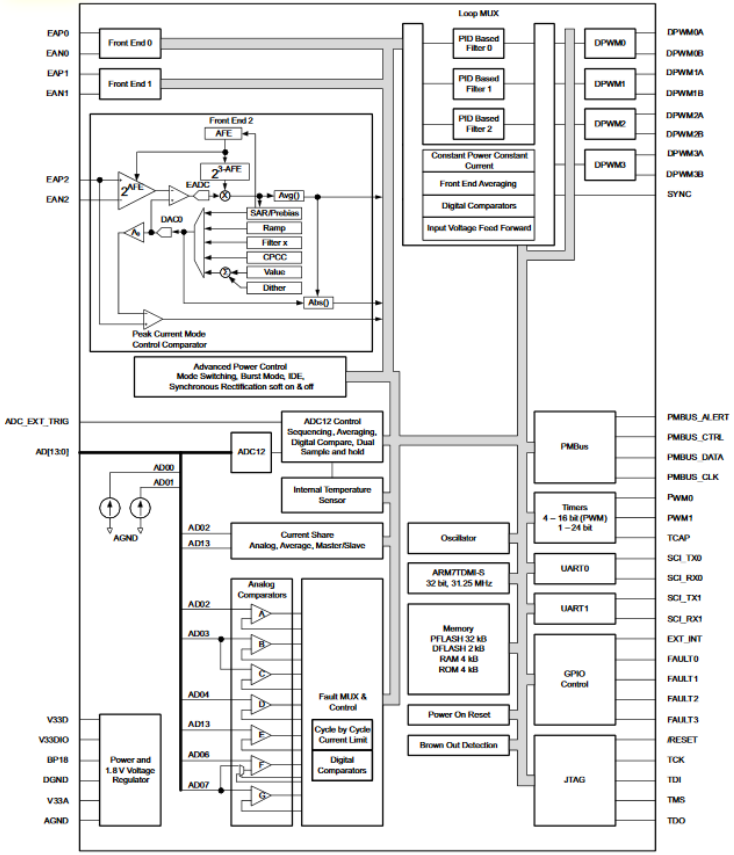
UCD3138: Advanced Digital Power Controller



Key Features

- 3 Independent, Multi-Nestable Feedback Loops
- 16MHz Error Analog to Digital Converter (EADC)
- 14-bit (effective) DAC for control loop reference
- Dedicated PID hardware, 2p/2z configurable
- 8 High Resolution DPWM Outputs with Leading, Trailing or Dual Edge (Triangular) Modulation
- 4ns Freq resolution, 250ps Pulse Width resolution
- 2MHz Max Switching Frequency

- High-Performance 31.25MHz, 32-bit ARM7 Processor
- On-Chip Program & Data Flash, RAM and ROM
- 14 Channel, 12-bit, 267ksps general purpose ADC
- 2 UART's + PMBus Interface + JTAG Debug port
- 7 50ns Analog Comparators, Cycle-by-cycle I_{LIMIT}
- On-chip (BOD / POR), Single Supply Operation (3.3V)
- External Interrupt + Fault Input & Output
- Bootload using ROM (PMBUS) and Program Flash (UART)

- Configurable Feedback Control
  - Voltage Mode
  - Average Current Mode
  - Peak Current Mode with slope compensation and programmable blanking time
  - Constant Current, Constant Power
- Configurable Modulation Methods
- Multiple Light Load Efficiency Modes
- Integrated Copper Trace Current Sensing

- -40° C to +125° C Extended Temp Range
- 64pin and 40pin QFN packages

Learn more at www.ti.com/GaN

- White papers
- Applications notes
- Device samples and EVM
- Spice models
- Online “E2E” community forums

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