

# Xilinx Kintex UltraScale FPGA Power Solution (PMP9444)



## System Description

The PMP9444 reference design provides all the power supply rails necessary to power Xilinx's Kintex UltraScale family of FPGAs. It features two UCD90120A's for flexible power up and power down sequencing as well as voltage monitoring, current monitoring, and voltage margining through the PMBus interface. This design uses a 12V input.

## Featured Applications

- FPGA

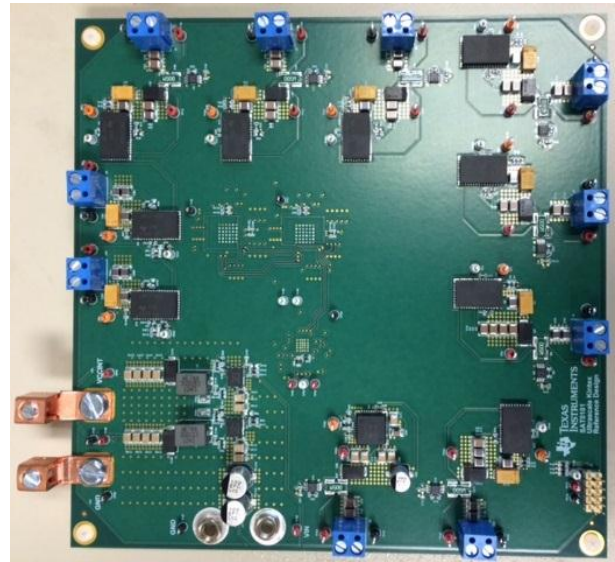
## Design Resources

- Block Diagram and Schematic
- Test Data
- Gerber Files
- Design Files
- Bill of Materials

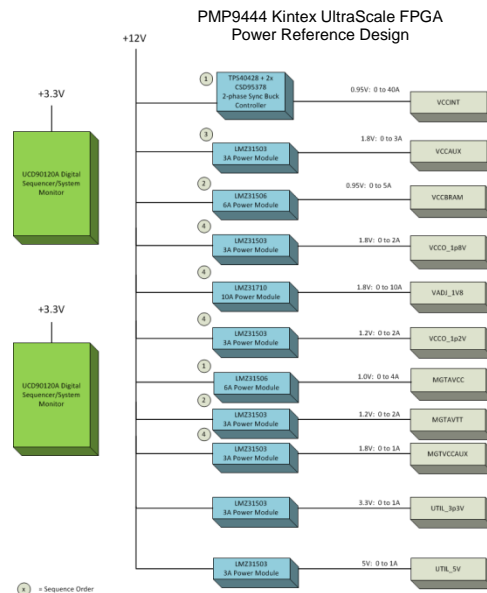
## Design Features

- 12V Input Voltage
- Provides all the power supply rails needed to power a Xilinx Kintex UltraScale FPGA
- Power-up and power-down sequencing
- PMBUS compatible interface
- Module design for ease of use

## Design Photo



## Block Diagram



## Jump start system design and speed time to market

Comprehensive designs include schematics or block diagrams, BOMs, design files and test reports by experts with deep system and product knowledge. Designs span TI's portfolio of analog, embedded processor and connectivity products and supports a board range of applications including industrial, automotive, medical, consumer, and more. To explore the designs, go to <http://www.ti.com/tidesigns>

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### Associated Part Numbers

| <u>Part Number</u> | <u>Part Description</u>   |
|--------------------|---|
| TPS40428           | Stackable PMBus synchronous buck converter with a driverless controller. It can be configured for dual output or 2-phase operation. Input voltage ranges from 5 to 12V and can support load current up to 120A. |
| CSD95378BQ5M       | Synchronous buck NexFET smart power stage with TAO offset. Has a continuous operating current capability of 60A.  |
| LMZ31710           | Simple switcher power module that combines a 10A DC/DC converter with power MOSFETs, a shielded inductor, and passives. Its input can range from 2.95 to 17V.   |
| LMZ31503           | Simple switcher power module that combines a 3A DC/DC converter with power MOSFETs, a shielded inductor, and passives. Its input can range from 4.5 to 14.5V.   |
| LMZ31506           | Simple switcher power module that combines a 6A DC/DC converter with power MOSFETs, a shielded inductor, and passives. Its input can range from 2.95 to 14.5V.  |
| UCD90120A          | 12-rail PMBus/I2C addressable power-supply sequencer and monitor with ACPI support.   |
| INA333             | Low power, precision instrumentation amplifier with excellent accuracy.   |

### Design Considerations:

The design goal is to provide a full solution to power a Xilinx Kintex UltraScale FPGA; including core, transceiver, auxiliary, and I/O power. The design must also provide power up and power down sequencing, voltage and current monitoring, and voltage margining through a PMBus interface.

### Core Supply –

The core supply required 0.95V at 40A. The TPS40428 two phase driverless controller was used with 2xCSD95378 NexFET smart power stages. A 2 phase design was used to reduce the output voltage ripple and keep the power dissipation manageable without an external heat sink. A PMBus interface allowed telemetry functions such as voltage and current reporting as well as flexibility with voltage margining.

### Transceiver Power Supplies –

The transceiver supplies were designed with low output noise in mind, limiting the voltage ripple to <10mV. MGTAVCC required 1.0V at 4A, MGTAVTT required 1.2V at 2A, and MGTVCCAUX required 1.8V at 1A. These rails use an external sense resistor with an INA333 op amp for current reporting through a UCD90120A system health monitor.



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## *TI Designs*

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### **I/O Power Supplies** –

LMX3x series simple switcher modules were used to provide the remaining power supply rails for this system. These modules feature integrated inductors for ease of design and require minimal external components. These power supply rails were designed to keep output ripple at a minimum and DC & AC errors <3%.

### **Telemetry, Sequencing, and Margining** –

Two UCD90120A system health monitors are used to provide flexible power up and down sequencing, voltage monitoring, current reporting, and voltage margining for the entire set of power supply rails. These devices are interface through PMBus to TI's Digital Fusion GUI to allow for easy configuration.



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