

Xilinx Virtex UltraScale MGT Power Supplies (PMP10520)



System Description

This TI Design demonstrates a proven design for the Multi-Gigabit Transceiver (MGT) power supply rails on the Xilinx Virtex UltraScale platform. It features +1.0V/20A output for the MGTAVCC, +1.2V/30A output for the MGTAVTT, and +1.8V/4A output for the MGTVCCAUX rails. This design is powered from a +5V input voltage and also provides power-up and power-down sequencing. The 20A and 30A rails feature integrated MOSFETs and lossless FET current sensing.

Featured Applications

- FPGA

Design Resources

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

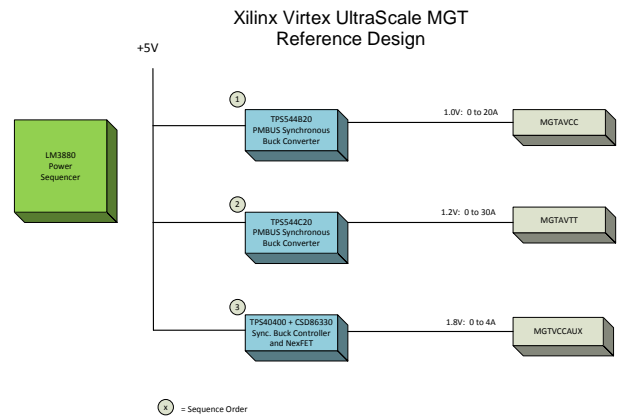
Design Features

- 5V Input Voltage
- Full power solution for MGT rails
 - +1.0V/20A MGTAVCC
 - +1.2V/30A MGTAVTT
 - +1.8V/4A MGTVCCAUX
- Internal FET lossless current sensing
- Power-up and power-down sequencing
- PMBUS compatible interface
- Selectable PMBUS address

Design Photo



Block Diagram



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Associated Part Numbers

<u>Part Number</u>	<u>Part Description</u>
TPS544C20	Non-isolated DC-DC SWIFT converter that is PMBus compatible and capable of high-frequency operation. Input voltage ranges from 4.5 to 18V and has an output current of 30A.
TPS544B20	Non-isolated DC-DC SWIFT converter that is PMBus compatible and capable of high-frequency operation. Input voltage ranges from 4.5 to 18V and has an output current of 20A.
TPS40400	Synchronous buck controller that operates from a nominal 3V to 20V supply. It is an analog PWM controller that allows programming and monitoring via the PMBus interface.
CSD86330Q3D	Synchronous buck NexFET power block MOSFET pair designed for applications offering high current, efficiency, and frequency capability with a 5V gate drive.
LM3880	Power sequencer that can control power up and power down of multiple power supplies using a precision enable pin and three output flags.
TS3A5017RGY	Dual single-pole quadruple-throw (4:1) analog switch designed to operate from 2.3 to 3.6V. This device can handle both digital and analog signals.

Design Considerations:

This design goal is to provide a power supply module to power MGT rails (MGTA VCC, MGTA VTT, MGT VCCAUX) on a Xilinx Virtex UltraScale platform and meet the current and voltage requirements. The solution is meant to fit into a 1.95" x 3.00" form factor and include all MGT rails and plug into a customer host characterization platform through mating connectors on the bottom layer. PMBUS, telemetry, sequencing, and low noise were all a requirement for this application.

MGTA VCC – The MGTA VCC rail required +1.0V/20A with +/-10mV output ripple and 3% tolerance on load transients.

- 1) TPS544B20 was chosen since it's a 20A integrated MOSFET step down converter with internal current sense. This eliminated the need to use an external sense resistor to monitor current which in turn reduces loss since the resistor is not there to dissipate extra power. TPS544B20 also has telemetry through PMBUS which give it the necessary flexibility for this application.

MGTA VTT – The MGTA VTT rail required +1.2V/30A with +/-10mV output ripple and 3% tolerance on load transients.

- 1) TPS544C20 was chosen since it's a 30A integrated MOSFET step down converter with internal current sense. This eliminated the need to use an external sense resistor to monitor current which in turn reduces loss since the resistor is not there to dissipate extra power. TPS544C20 also has telemetry through PMBUS which give it the necessary flexibility for this application.



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MGTVCCAUX – The MGTVCCAUX rail required +1.8V/4A with +/-10mV output ripple and 3% tolerance on load transients.

- 1) TPS40400 controller along with a CSD86330 MOSFET was chosen since it provides all the necessary PMBUS telemetry and can meet all the necessary specifications along with providing a lower cost. An external sense resistor is still needed with this option but since it's only running 4A, the losses are much smaller than the other two rails.

Sequencing – Power-up and power-down sequencing was a requirement for this design.

- 1) A LM3880 was selected to provide 1-2-3 power-up and 3-2-1 power down sequencing.

PMBUS Address Selection – The TSA3A501RGY is a SP4T switch that gives four different options for PMBUS address for each of the rails. By configuring ALT_PMBUS_ADDR0 and ALT_PMBUS_ADDR1, the user can select between each of the four addresses.

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