

PR220
Virtex-II Pro™ Design 2
SWIFT™ (TPS54xxx series) DC/DC Converter-based Power Management Solution
Providing $I_{CCINT}=6A$ from $V_{IN}=5V$

FEATURES:

- High efficiency minimizes heat
- Interchange SWIFT™ device to support 1.5 A to 9 A load currents
 - o 1.5A and 3A synchronous SWIFT devices are pin-pin compatible
 - o 6A, 8A, and 9A synchronous SWIFT devices are pin-pin compatible
- Use of the TPS54x10 adjustable devices allow
 - o use of smallest inductor and/or specific type of output capacitor
 - o flexibility to re-compensate as needed, depending on the bypass/decoupling capacitors used with the FPGA
- In-rush current (for charging decoupling caps and FPGA start-up) that places a demand on the input power supply is minimized by the use of optional
 - o Integrated soft-start configured with an capacitor to provide 10 ms rise time for V_{CCINT} and V_{CCO}
 - o Sequencing of V_{CCINT} , V_{CCAUX} , then V_{CCO} using PWRGD and ENABLE
- High UVLO trip point and integrated soft-start of the SWIFT™ devices eliminates the need for an external Supply Voltage Supervisor (SVS) to monitor the input rail.
- RocketIO™ powered by ultra-low noise, high PSRR (for rejecting noise at the input, preventing it from translating to the output) low dropout linear regulators (LDOs), TPS79xxx and TPS786xx. This series has been qualified by Xilinx to replace LT1963.
- Additional V_{CCO} rails easily added and sequenced (if desired) using the TPS54xxx PWRGD and ENABLE.
- The design meets Xilinx's V_{CCINT} and V_{CCO} start-up profile requirements, where applicable, including monotonic voltage ramp, in-rush current and power voltage ramp time requirements.

IMPORTANT WEB LINKS:

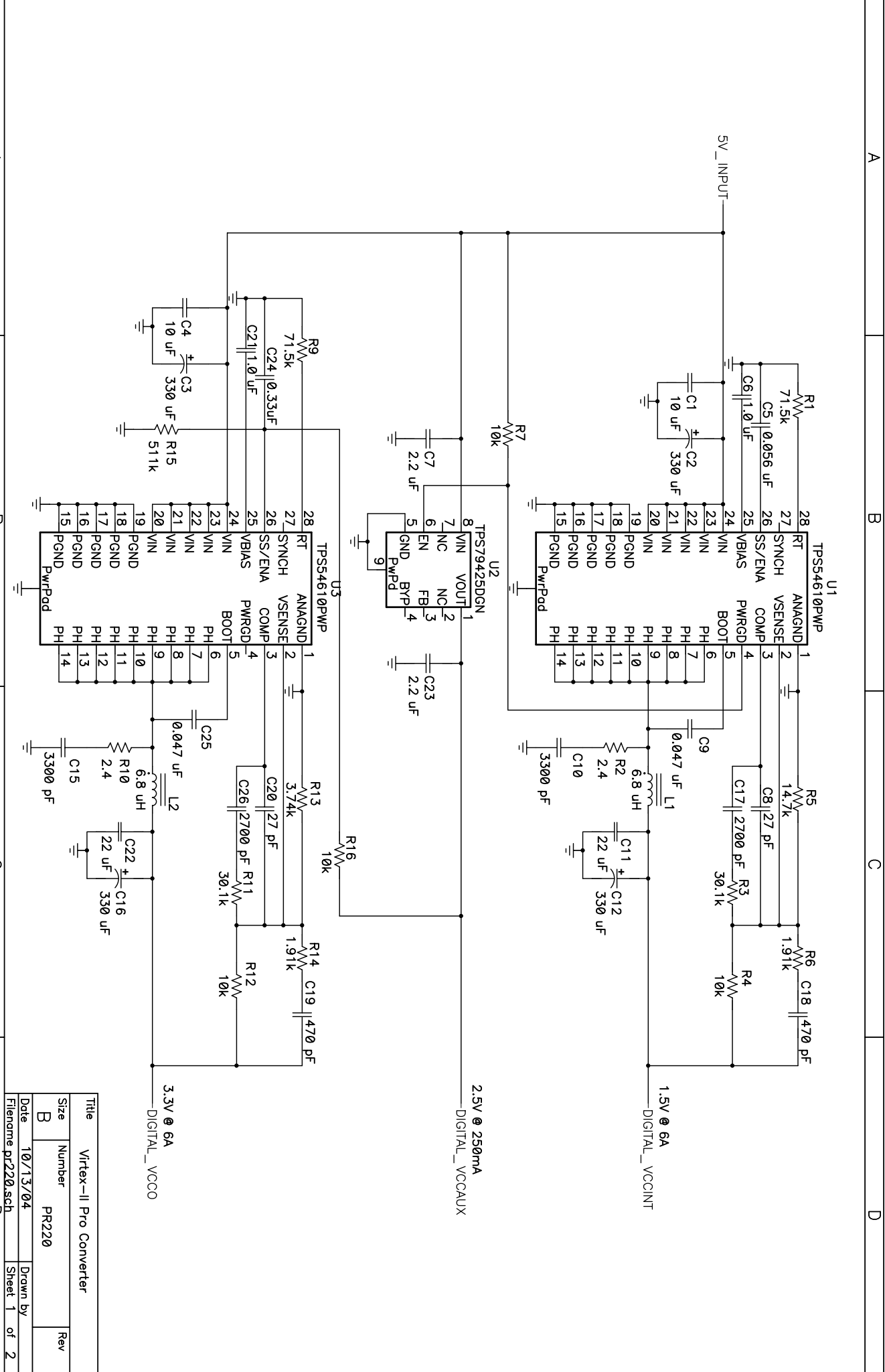
- Link to the TI home page for Xilinx FPGA power management solutions at <http://www.ti.com/xilinuxfpga> for more information and other reference designs.
- Link to datasheets at <http://focus.ti.com/lit/ds/symlink/TPS54610.pdf> and <http://focus.ti.com/lit/ds/symlink/tps79425.pdf>.
- Link to SWIFT™ design software tool at <http://focus.ti.com/docs/toolsw/folders/print/swift-sw.html> to assist further optimization/customization of design.

IMPLEMENTATION NOTES:

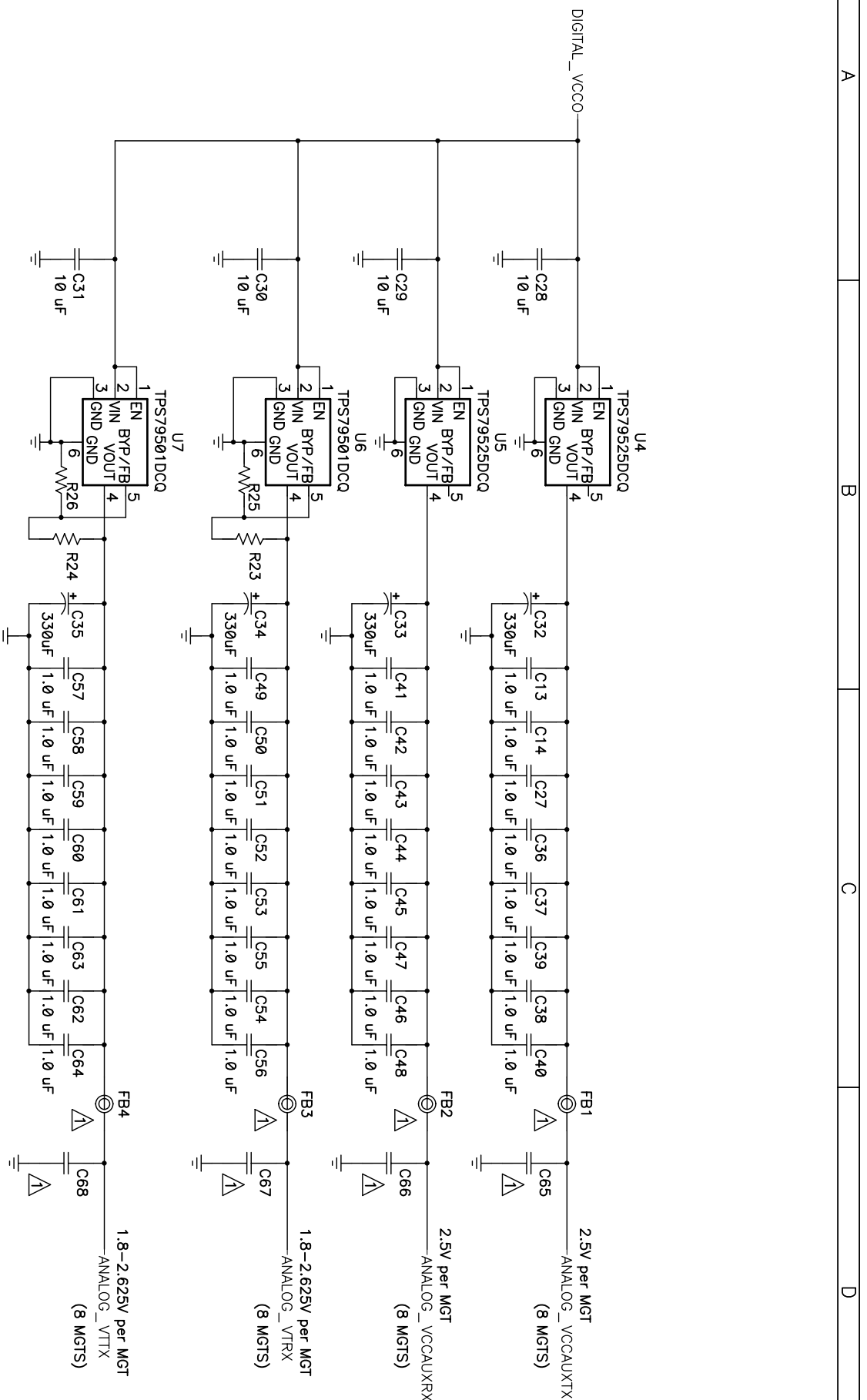
- **Sequencing:** Although Xilinx FPGAs **do NOT require it**, this reference design employs sequencing. This practice is consistent with good power supply design and prevents the input power supply from being pulled down due to supporting in-rush currents for charging large capacitive loads.
- **Additional Capacitance:**
 - o The TPS54610's have been compensated to allow for up to the following additional capacitance on each rail:
 - 12 uF in ceramics in parallel with
 - two 330 uF capacitors, each with ESR between 0.1 and 2 ohms.
 If more bypass capacitance or bulk capacitors with ESR outside the range above is used, each TPS54x10 control loop may need to be re-compensated using the SWIFT design software.
- **V_{CCAUX} :** V_{CCAUX} powers time-critical resources in the FPGA, including the Digital Clock Managers (DCMs). Therefore, this supply voltage is especially susceptible to power supply noise. V_{CCAUX} can share a power plane with V_{CCO}, but only if V_{CCO} does not have excessive noise. Changes in V_{CCAUX} voltage beyond 200 mV peak-to-peak should take place no faster than 10 mV per millisecond.
- **RocketIO:** When powering the RocketIO:
 - o AV_{CCAUXTX}, V_{CCAUXRX}, AV_{TRX}, and AV_{TTX} may each be powered by their own linear regulator or by the same regulator if their voltages are the same. Keep power dissipation capability of the linear regulator package in mind.
 - o Select the appropriate TPS79xxx or TPS786xx based on the load current requirement, and the power dissipation capability of the package. In general, the lower the current rating, the lower the price of the linear regulator. Power dissipation of linear regulators is explained in TI Application Note SLVA118.
 - o For the TPS79x01 adjustable devices, size the feedback resistors according to the datasheet. These resistors are not populated on the schematic.
 - o All unused RocketIO transceivers must be connected to power (2.5V) and ground.
- **Modifications:**
 - o Adapt for V_{IN} = 3.3 V by omitting U3.

QUESTIONS?

- Send an email to <mailto:fpgasupport@list.ti.com>



Title		Virtex-II Pro Converter	
Size	Number	PR220	Rev
B			
Date	10/13/04		Drawn by
Filename pr220.sch		Sheet 1 of 2	



Refer to Xilinx's Rocket IO Transceiver User Guide (UG024) for component values

Title		Virtex-II Pro Converter	
Size	Number	PR220	Rev
Date	10/13/04	Drawn by	
Filename	pr220.sch	Sheet 2	of 2

Filename: PR220_bom.xls					
Date: 04/22/2004					
PR220 BOM					
COUNT	RefDes	DESCRIPTION	SIZE	MFR	PART NUMBER
2	C1, C4	Capacitor, Ceramic, 10-uF, 6.3-V, X5R, 10%	805	muRata	GRM21BR60J106KE01
2	C10, C15	Capacitor, Ceramic, 3300-pF, 50-V, X7R, 10%	603	muRata	GRM188R71H332KA01
2	C11, C22	Capacitor, Ceramic, 22-uF, 10-V, X5R, 10%	1210	muRata	GRM32ER61A226KA65
2	C17, C26	Capacitor, Ceramic, 2700-pF, 50-V, X7R, 10%	603	muRata	GRM188R71H272KA01D
2	C18, C19	Capacitor, Ceramic, 470-pF, 50-V, X7R, 10%	603	muRata	GRM188R71H471KA01
4	C2, C3, C12, C16	Capacitor, Tantalum, 330-uF, 6.3-V, 600-milliohm, 20%	7343(D)	Vishay	293D337X96R3D2
1	C24	Capacitor, Ceramic, 0.33-uF, 10-V, X5R, 10%	603	muRata	GRM188R61A334KA61
1	C5	Capacitor, Ceramic, 0.056-uF, 16-V, X7R, 10%	603	muRata	GRM188R71C563KC01
2	C6, C21	Capacitor, Ceramic, 1.0-uF, 6.3-V, X5R, 10%	603	muRata	GRM188R60J105KA01
10	C7, C23, C28, C29, C30, C31, C32, C33, C34, C35	Capacitor, Ceramic, 2.2-uF, 6.3-V, X5R, 10%	805	muRata	GRM21BR60J225KC01
2	C8, C20	Capacitor, Ceramic, 27-pF, 50-V, C0G, 5%	603	muRata	GRM1885C1H270JA01D
2	C9, C25	Capacitor, Ceramic, 0.047-uF, 25-V, X7R, 10%	603	muRata	GRM188R71E473KA01
2	L1, L2	Inductor, SMT, 6.8-uH, 18-A, 22-milliohm	0.51 x 0.51	Vishay	IHLP-5050CERZ6R8M01
3	R1, R9, R16	Resistor, Chip, 71.5k-Ohms, 1/16-W, 1%	603	Std	Std
1	R13	Resistor, Chip, 3.74k-Ohms, 1/16-W, 1%	603	Std	Std
1	R15	Resistor, Chip, 511k-Ohms, 1/16-W, 1%	603	Std	Std
2	R2, R10	Resistor, Chip, 2.4-Ohms, 1/8-W, 1%	1206	Std	Std
0	R23, R24, R25, R26	Resistor, Chip, xx-Ohms, 1/16-W, yy%	603	Std	Std
2	R3, R11	Resistor, Chip, 30.1k-Ohms, 1/16-W, 1%	603	Std	Std
3	R4, R7, R12	Resistor, Chip, 10k-Ohms, 1/16-W, 1%	603	Std	Std
1	R5	Resistor, Chip, 14.7k-Ohms, 1/16-W, 1%	603	Std	Std
2	R6, R14	Resistor, Chip, 1.91k-Ohms, 1/16-W, 1%	603	Std	Std
2	U1, U3	IC, IFET Power controller, Adj-V, 6-A	PWP28	TI	TPS54610PWP
1	U2	IC, Ultralow-Noise, High PSRR, Fast RF 250 mA, LDO Linear Regulators, 2.5V	MSOP 8	TI	TPS79425DGN
2	U4, U5	IC, LDO Linear Regulator Ultralow-Noise High PSRR Fast RF, 500mA, 2.5V	SOT223-6	TI	TPS79525DCQ
2	U6, U7	IC, Ultralow-Noise, High PSRR, Fast RF 250 mA, LDO Linear Regulators, Adj V	SOT223-6	TI	TPS79401DCQ

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