

XILINXPWR-083 (HPA-083)
SWIFT™ (TPS54xxx series) DC/DC Converter-based Power Management Solution
Providing $I_{CCINT}=1.5A$ from $V_{IN}=5V$

SUPPORTS:

- Spartan™-3

FEATURES:

- High efficiency minimizes heat
- Interchange SWIFT™ device to support 1.5 A to 3 A load currents
 - o 1.5A (TPS54110) and 3A (TPS54310) 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.
- 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:

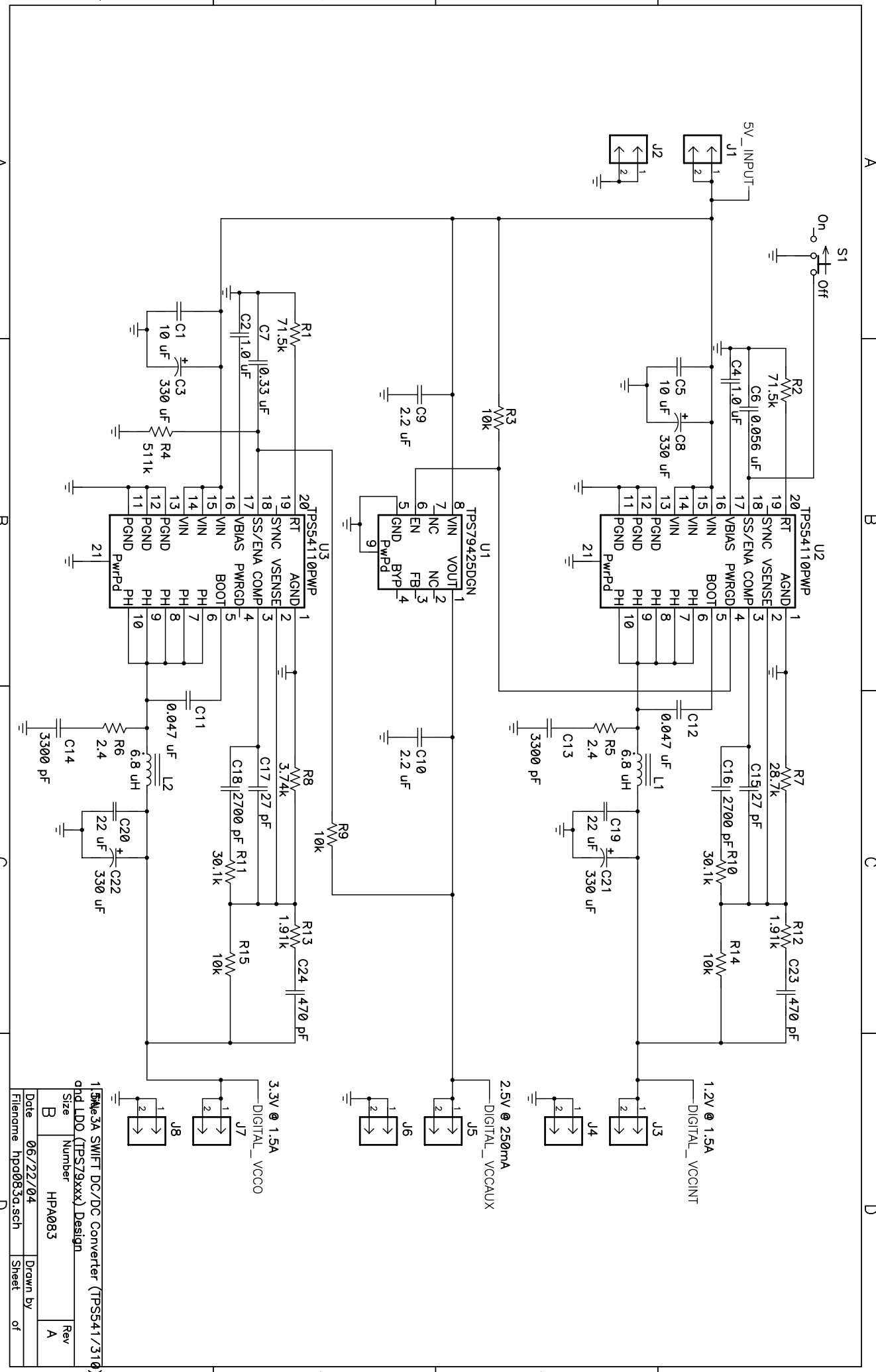
- Link to the TI home page for Xilinx FPGA power management solutions at <http://www.ti.com/xilinuxfpga> for more information and other reference designs.
- Link to datasheets at <http://focus.ti.com/lit/ds/symlink/TPS54110.pdf>.
- Link to SWIFT™ design software tool at <http://focus.ti.com/docs/toolsw/folders/print/swift-sw.html> 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 TPS54110'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.
- **Modifications:**
 - o Adapt for V_{IN} = 3.3 V by omitting U3.

QUESTIONS?

- Send an email to fpgasupport@list.ti.com



1.5A @ 3A SWIFT DC/DC Converter (TPS54110PWP)
 and LDO (TPS79425DGN) Design

Date	06/22/04	Drawn by	HPA083
Size	B	Number	HPA083
Filename	hpa083a.sch	Sheet	A
		of	

Filename: HPA083A_bom.xls					
Date: 06/22/2004					
HPA083A BOM					
COUNT	RefDes	DESCRIPTION	SIZE	MFR	PART NUMBER
2	C1, C5	Capacitor, Ceramic, 10-uF, 6.3-V, X5R, 10%	805	muRata	GRM21BR60J106KE01
2	C11, C12	Capacitor, Ceramic, 0.047-uF, 25-V, X7R, 10%	603	muRata	GRM188R71E473KA01
2	C13, C14	Capacitor, Ceramic, 3300-pF, 50-V, X7R, 10%	603	muRata	GRM188R71H332KA01
2	C15, C17	Capacitor, Ceramic, 27-pF, 50-V, C0G, 5%	603	muRata	GRM1885C1H270JA01D
2	C16, C18	Capacitor, Ceramic, 2700-pF, 50-V, X7R, 10%	603	muRata	GRM188R71H272KA01D
2	C19, C20	Capacitor, Ceramic, 22-uF, 10-V, X5R, 10%	1210	muRata	GRM32ER61A226KA65
2	C2, C4	Capacitor, Ceramic, 1.0-uF, 6.3-V, X5R, 10%	603	muRata	GRM188R60J105KA01
2	C23, C24	Capacitor, Ceramic, 470-pF, 50-V, X7R, 10%	603	muRata	GRM188R71H471KA01
4	C3, C8, C21, C22	Capacitor, Tantalum, 330-uF, 6.3-V, 600-milliohm, 20%	7343(D)	Vishay	293D337X96R3D2
1	C6	Capacitor, Ceramic, 0.056-uF, 16-V, X7R, 10%	603	muRata	GRM188R71C563KC01
1	C7	Capacitor, Ceramic, 0.33-uF, 10-V, X5R, 10%	603	muRata	GRM188R61A334KA61
2	C9, C10	Capacitor, Ceramic, 2.2-uF, 6.3-V, X5R, 10%	805	muRata	GRM21BR60J225KC01
8	J1 - J8	Header, 2-pin, 100mil spacing, (36-pin strip)	0.100 x 2	Sullins	PTC36SAAN
2	L1, L2	Inductor, SMT, 6.8-uH, 2.2-A, 75-milliohm	0.51x0.37	Coilcraft	DS3316P-682
3	R1, R2, R9	Resistor, Chip, 71.5k-Ohms, 1/16-W, 1%	603	Std	Std
2	R10, R11	Resistor, Chip, 30.1k-Ohms, 1/16-W, 1%	603	Std	Std
2	R12, R13	Resistor, Chip, 1.91k-Ohms, 1/16-W, 1%	603	Std	Std
3	R3, R14, R15	Resistor, Chip, 10k-Ohms, 1/16-W, 1%	603	Std	Std
1	R4	Resistor, Chip, 511k-Ohms, 1/16-W, 1%	603	Std	Std
2	R5, R6	Resistor, Chip, 2.4-Ohms, 1/8-W, 1%	1206	Std	Std
1	R7	Resistor, Chip, 28.7k-Ohms, 1/16-W, 1%	603	Std	Std
1	R8	Resistor, Chip, 3.74k-Ohms, 1/16-W, 1%	603	Std	Std
1	S1	Switch, 1P2T, Slide, PC-mount, 200-mA	79900	E_Switch	EG1218
1	U1	IC, Utralow-Noise, High PSRR, Fast RF 250 mA, LDO Linear Regulators, 2.5-V	MSOP-8	TI	TPS79425DGN
2	U2, U3	IC, SWIFT Power Controller, Adj-V, 1.5A	PWP20	TI	TPS54110PWP
1	--	PCB, 3.1 In x 2.4 In x .062 In		Any	HPA083
Notes:					
1. These assemblies are ESD sensitive, ESD precautions shall be observed.					
2. These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.					
3. These assemblies must comply with workmanship standards IPC-A-610 Class 2.					
4. Ref designators marked with an asterisk (***) cannot be substituted.					
All other components can be substituted with equivalent MFG's components.					

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265