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
  - 1.5A (TPS54110) and 3A (TPS54310) synchronous SWIFT devices are pin-pin compatible
- Use of the TPS54x10 adjustable devices allow
  - use of smallest inductor and/or specific type of output capacitor
  - 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
  - Integrated soft-start configured with an capacitor to provide 10 ms rise time for V_{CCINT} and V_{CCO}
  - 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/xilinxfpga 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.

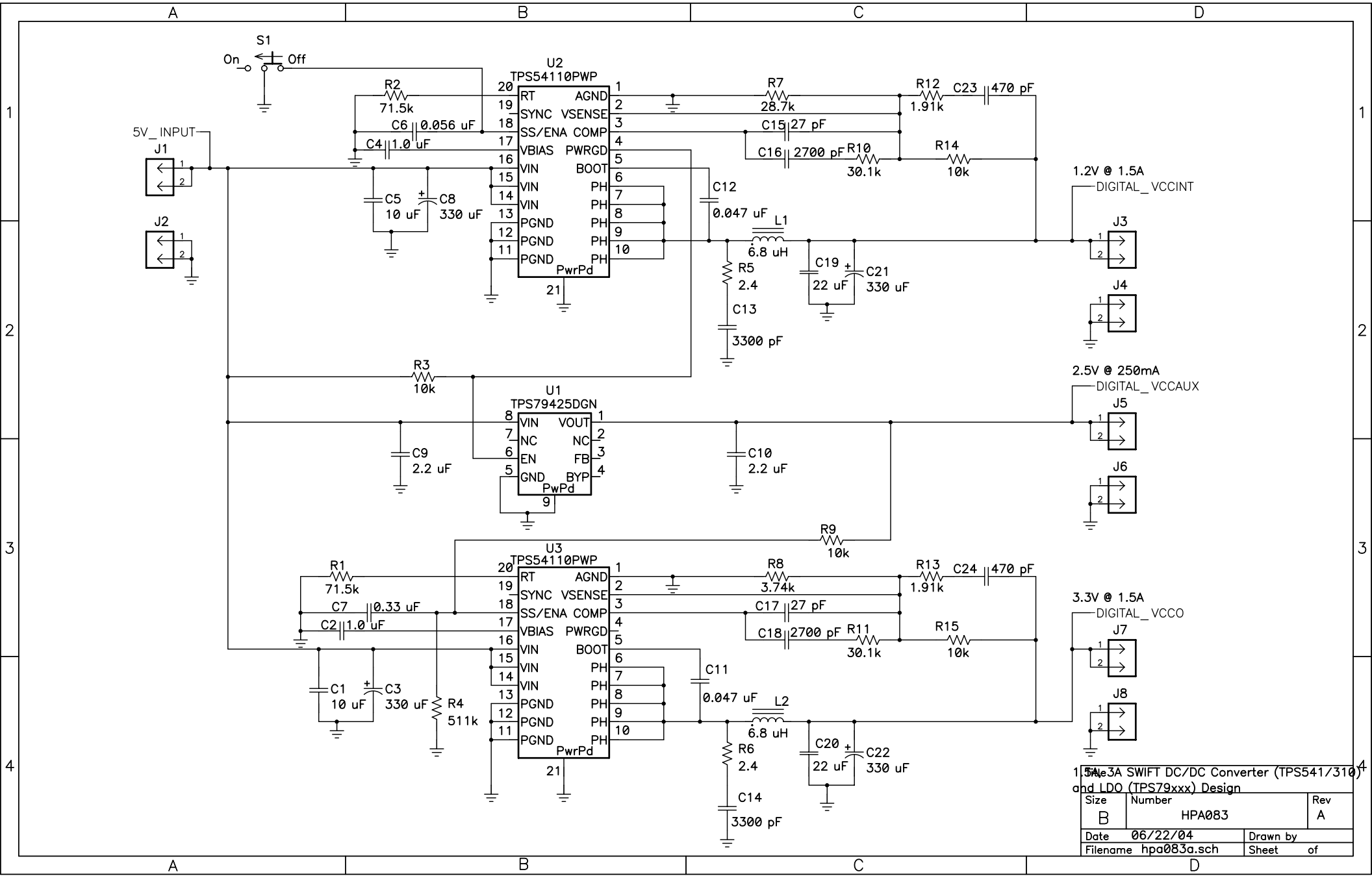
IMPLEMENTATION NOTES:

- **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:**
  - 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 milli-second.
- **Modifications:**
  - Adapt for V_{IN} = 3.3 V by omitting U3.

QUESTIONS?

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


S1
On
Off
5V_INPUT
J1
J2
U2
TPS54110PWP
RT
SYNC
SS/ENA
VBIAS
VIN
VIN
VIN
PGND
PGND
PGND
AGND
VSENSE
COMP
PWRGD
BOOT
PH
PH
PH
PH
PH
PwrPd
R2
71.5k
C6 0.056 uF
C4 1.0 uF
C5
10 uF
C8
330 uF
R7
28.7k
C15 27 pF
C16 2700 pF
R10
30.1k
R12
1.91k
C23 470 pF
R14
10k
1.2V @ 1.5A
DIGITAL_VCCINT
J3
J4
C12
0.047 uF
L1
6.8 uH
R5
2.4
C13
3300 pF
C19
22 uF
C21
330 uF
R3
10k
U1
TPS79425DGN
VIN
NC
EN
GND
VOUT
NC
FB
BYP
PwPd
C9
2.2 uF
C10
2.2 uF
2.5V @ 250mA
DIGITAL_VCCAUX
J5
J6
R9
10k
U3
TPS54110PWP
R1
71.5k
C7 0.33 uF
C2 1.0 uF
C1
10 uF
C3
330 uF
R4
511k
R8
3.74k
C17 27 pF
C18 2700 pF
R11
30.1k
R13
1.91k
C24 470 pF
R15
10k
3.3V @ 1.5A
DIGITAL_VCCO
J7
J8
C11
0.047 uF
L2
6.8 uH
R6
2.4
C14
3300 pF
C20
22 uF
C22
330 uF
1.5A/3A SWIFT DC/DC Converter (TPS541/310) and LDO (TPS79xxx) Design
Size B
Number HPA083
Rev A
Date 06/22/04
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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.

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