Application Report
SLVA349–July 2009

Simple Power Solution Using LDOs For TMS320C2834x Microcontrollers

Ambreesh Tripathi *PMP - DC/DC Low-Power Converters*

ABSTRACT

This reference design is intended for users designing with theTMS320C2834x Microcontrollers. This design, employing sequenced power supplies, describes a system with an input voltage of 5V, and uses LDOs for a simple, small design.

Contents

List of Figures

List of Tables

1 Introduction

In dual voltage architectures, coordinated management of power supplies is necessary to avoid potential problems and obtain reliable performance. Power supply designers must consider the timing and voltage differences between core and I/O voltage supplies during power up and power down operations.

Sequencing refers to the order, timing, and differential in which the two voltage rails are powered up and down. A system designed without proper sequencing may be at risk for two types of failures. The first failure represents a threat to the long term reliability of the dual voltage device, while the second failure poses the possibility of immediate damage to interface circuits in the processor or system devices such as memory, logic or data converter ICs.

Another potential problem with improper supply sequencing is bus contention. Bus contention is a condition when the processor and another device both attempt to control a bi-directional bus during power up, which may also affect I/O reliability. Power supply designers should check the requirements regarding bus contention for individual devices.

The power-on sequencing for TMS320C2834x Microcontrollers are shown in the Power Requirements table below. As mentioned in the table all voltage rails should be powered up within 5ms.

2 Power Requirements

The power requirements are as specified in Table 1.

Table 1. TMS320C2834x Power Specs

	PIN NAME(s)	VOLTAGE (V)	Imax (mA)	TOLERANCE	SEQUENCING ORDER	TIMING DELAY
Core	VDD	1.1 / 1.2 (1)	1000 (2)	±5%	1	All voltage rails should be powered up within 5ms
I/O	VDD18	1.8	80	±5%	2	
I/O	VDDIO	3.3	200	±5%	2	

(1) CVDD = 1.2V for 300MHz devices; CVDD = 1.1V for 200MHz.
(2) Max current on VDD at 300MHz is 1000mA; max current on VDD at 200MHz is 600mA.

2.1 Features

The design uses the following LDOs

Devices:	TPS74801 (for 1.2V), TPS74701 (for 3.3V), TPS71718(1.8)
Power supply specs:	
Vin	5 V ± 10%
Vout1	1.1 V/1.2 V ± 5% at 1000 mA
Vout2	1.8 V ± 5% at 80 mA
Vout3	3.3 V ± 5% at 200 mA
Sequencing	1) Vout1 2) Vout2 and Vout3

TPS74801 and TPS74701

- VOUT Range: 0.8V to 3.6V
- 2% Accuracy Over Line/Load/Temperature
- Programmable Soft-Start Provides Linear Voltage Startup
- Stable with Any Output Capacitor ≥ 2.2µF
- Available in a Small 3mm × 3mm × 1mm SON-10 and 5 × 5 QFN-20 Packages

TPS71718

- 150mA Low-Dropout Regulator with Enable
- Low Noise: 30µV typical (100Hz to 100kHz)
- Excellent Load/Line Transient Response
- Small SC70-5, 2mm × 2mm SON-6, and 1.5mm × 1.5mm SON-6 Packages

More information on the Devices can be found from the datasheets.

TPS74801 –SBVS074F

TPS74701 –SBVS099D

TPS71718 –SBVS068G

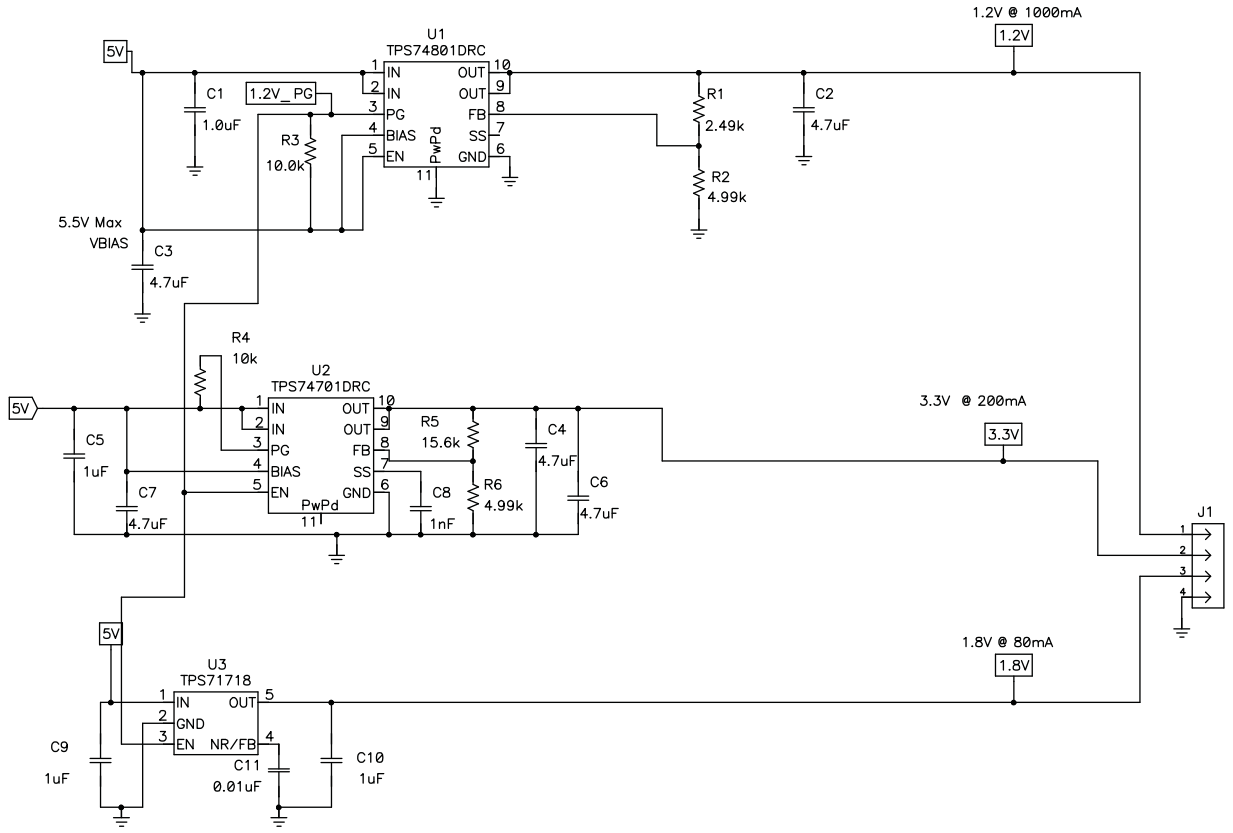

Figure 1. PMP4999 Reference Design Schematic

Proper sequencing is achieved in the design with the use of enable pins. The Core 1.2V at 1000mA (TPS74801) comes first, the PG output then enables the TPS74701 and TPS71718 devices, thus following the required sequence.

3 List of Material

Table 2. PMP4999 List of Materials

Count	RefDes	Value	Description	Size	Part Number	MFR	Area
1	C1	1.0 µF	Capacitor, Ceramic, 25V, X5R, 10%	0603	C1608X5R1E105K	TDK	5650
1	C2	4.7 µF	Capacitor, Ceramic, 6.3V, X5R, 10%	0603	C1608X5R0J106M	TDK	5650
1	C3	4.7 µF	Capacitor, Ceramic, 6.3V, X5R, 10%	0603	C1608X5R0J475K	TDK	5650
3	C4	4.7 µF	Capacitor, Ceramic,4.7 µF, 6.3V, X5R	0603	C1608X5R0J475M	TDK	5650
1	C5	1 µF	Capacitor, Ceramic,1 µF, 16V, X5R	0603	C1608X5R1C105K	TDK	5650
	C6	4.7 µF	Capacitor, Ceramic,4.7 µF, 6.3V, X5R	0603	C1608X5R0J475M	TDK	5650
	C7	4.7 µF	Capacitor, Ceramic,4.7 µF, 6.3V, X5R	0603	C1608X5R0J475M	TDK	5650
1	C8	1 nF	Capacitor, Ceramic, 1000 pF, 50V, X7R, 10%	0603	C1608X7R1H102K	TDK	5650
2	C9	1 µF	Capacitor, Ceramic, 6.3V, X5R, 20%	0603	C1608X5R1E105M	TDK	5650
	C10	1 µF	Capacitor, Ceramic, 6.3V, X5R, 20%	0603	C1608X5R1E105M	TDK	5650
1	C11	0.01 µF	Capacitor, Ceramic, 50V, COG, 10%	0402	Std	Std	2800
1	J1	PEC36SAAN	Header, Male 4-pin, 100mil spacing, (36-pin strip)	0.100 inch x 4	PEC36SAAN	Sullins	50000
1	R1	2.49k	Resistor, Chip, 1/16W, 1%	0603	Std	Std	5650
1	R2	4.99k	Resistor, Chip, 1/16W, 1%	0603	Std	Std	5650
1	R3	10.0k	Resistor, Chip, 1/16W, 1%	0603	Std	Std	5650
1	R4	10k	Resistor, Chip, 10kΩ 1/16W, 5%	0603	Std	Std	5,650

Table 2. PMP4999 List of Materials (continued)

Count	RefDes	Value	Description	Size	Part Number	MFR	Area
1	R5	15.6k	Resistor, Chip, 2k49 Ω, 1/16W, 5%	0603	Std	Std	5,650
1	R6	4.99k	Resistor, Chip, 4k99 Ω, 1/16W, 5%	0603	Std	Std	5,650
1	U1	TPS74801DRC	IC, 1.5A LDO Regulator with Soft-Start	SON-10	TPS74801DRC	TI	30400
1	U2	TPS74701DRC	IC, 1.5A LDO Regulator with Soft-Start	SON-10	TPS74701DRC	TI	30400
1	U3	TPS71718	IC, 150mA, Low Iq, Wide Bandwdth, LDO Linear Regulators	SC70	TPS71718	TI	18600

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.

4 Test Result

The startup waveform, shown in Figure 2, demonstrates that the required sequencing order is followed.

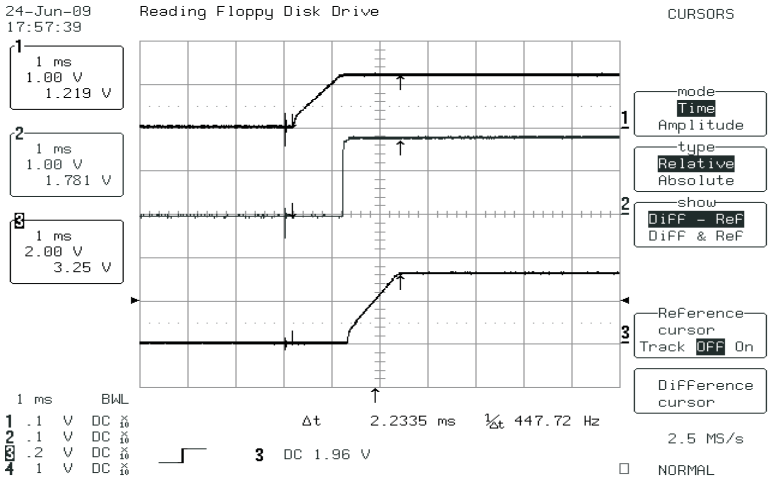

Figure 2. Shows Sequencing in Start up Waveform

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 TI 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. Information of third parties may be subject to additional restrictions.

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.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

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
DLP® Products	www.dlp.com	Broadband	www.ti.com/broadband
DSP	dsp.ti.com	Digital Control	www.ti.com/digitalcontrol
Clocks and Timers	www.ti.com/clocks	Medical	www.ti.com/medical
Interface	interface.ti.com	Military	www.ti.com/military
Logic	logic.ti.com	Optical Networking	www.ti.com/opticalnetwork
Power Mgmt	power.ti.com	Security	www.ti.com/security
Microcontrollers	microcontroller.ti.com	Telephony	www.ti.com/telephony
RFID	www.ti-rfid.com	Video & Imaging	www.ti.com/video
RF/IF and ZigBee® Solutions	www.ti.com/lprf	Wireless	www.ti.com/wireless

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