PR411
TMS320x281x Design 4
TPS767D3XX

FEATURES:

- Meets the sequencing requirements (Option 2) of the TMS320F281x processor. Can be simplified to power the TMS320C281x and TMS320R281x.
- /RESET delay fixed at 200 ms minimum.
- Dual-channel TPS767D3XX low-dropout (LDO) linear regulator in thermally enhanced PowerPAD^{TM} package saves cost and space.
- The Q1 version of the TPS767D3XX operates up to T_A = 125 C and is automotive qualified.
- Linear regulators start-up fast, allowing large in-rush currents for charging bulk capacitors at start-up. The current draw on the input power supply is minimized by sequencing first the I/O rail then the core rail.

IMPORTANT WEB LINKS:

- Link to the TI power management home page at http://power.ti.com then select the TI DSP Solutions link for more information and other reference designs.
- Link to datasheets at http://focus.ti.com/lit/ds/symlink/tps767d301-q1.pdf,
- Link to application note SLVA118 http://focus.ti.com/lit/an/slva118/slva118.pdf to explore the thermal considerations in using linear regulators.

IMPLEMENTATION NOTES:

- **Component selection:**
  - If different capacitors are used for C4 and C5 than recommended per the BOM, they must meet the ESR requirements per the datasheet.
- **Power Dissipation/Thermal Issues:**
  - The maximum output current per channel of the dual regulator is dependent on the device's power dissipation. The following equation can be used to compute actual power dissipation and/or maximum output current per channel:

    $$P_{Dact} = (V_{IN} - V_{DD\text{-}3.3V}) * I_{Vdd\text{-}3.3V} + (V_{IN} - V_{DD\text{-}CORE})*I_{Vdd\text{-}core}$$

    For example, the IC can only dissipate 1.25Wat $T_A = 85^o$ C and no airflow.
  - The maximum power dissipation of which the package is capable is

    $$P_{Dmax} = (T_{Jmax} - T_A)/R_{\Theta JA}$$

    where T_{Jmax} is the maximum junction temperature of the device and $R_{\Theta JA}$ is the thermal resistance for a given board type and set of ambient conditions.
  - Refer to the application section of the datasheet for thermal resistances at different ambient temperatures, airflows and ground plane heatsink area.

- **Modifications**
  - **For C281x and R281x DSPs:** Since sequencing is not required for the TMS320C281x or the TMS320R281x, transistor Q1 and resistors R1, R2 and R7 can be omitted and both /EN1 and /EN2 can be tied together, thereby allowing both regulators to be enabled at the same time and removing power rail sequencing. However, sequencing is still recommended since it helps to prevent the input power supply from being pulled down at start-up due to in-rush currents for charging each rail's bulk capacitors.
- **Waveforms:**
  Waveforms were generated while powering an ezDSP TMS320F2812 evaluation board and with the 1.8-V rail pulling 200 mA and the 3.3-V rail pulling 175 mA steady state.

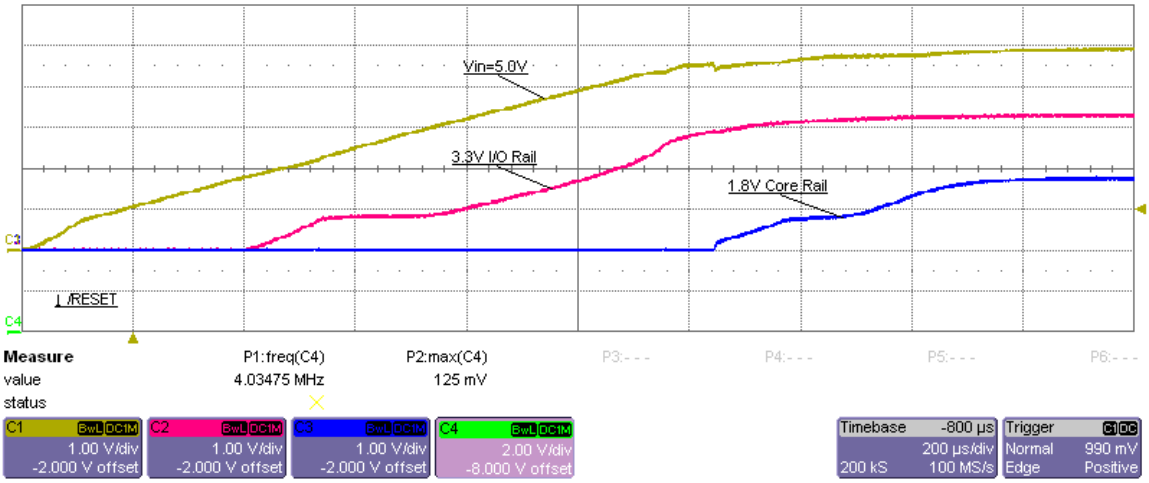


Figure 1 - Power up with V_{IN} = 5.0 V, /EN grounded

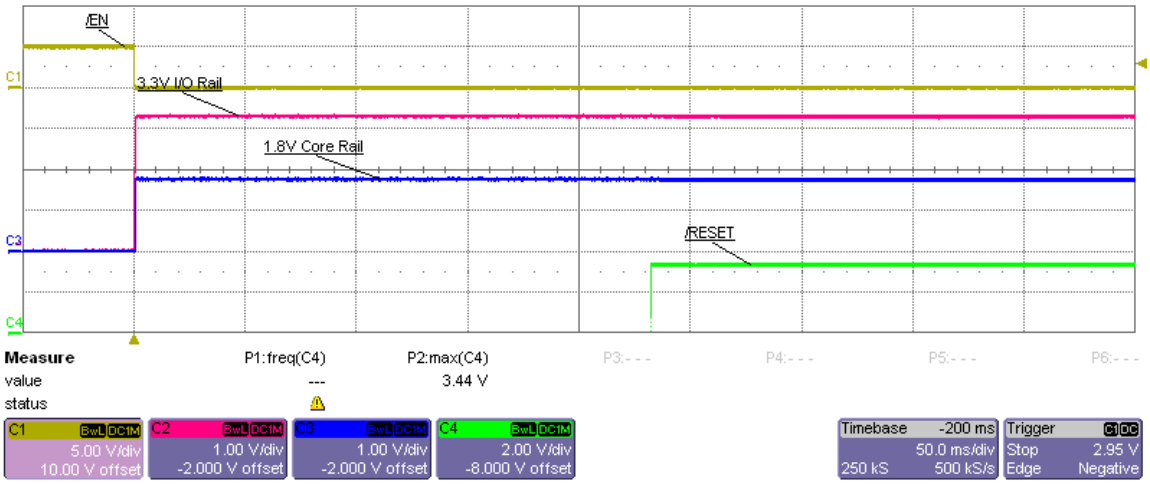


Figure 2 - Power up from enable when V_{IN} = 5.0 V

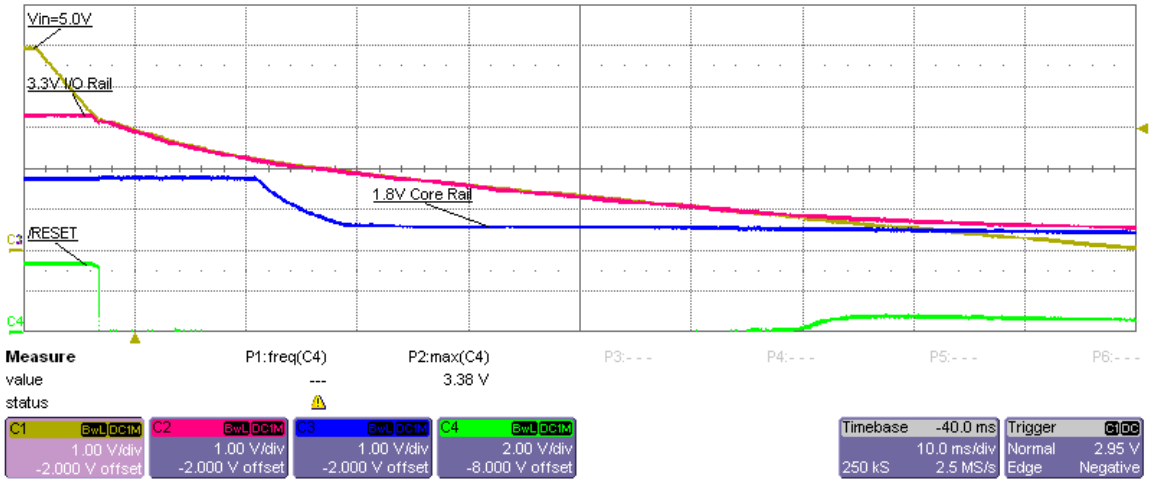


Figure 3 - Power down with V_{IN} = 5.0 V, /EN grounded

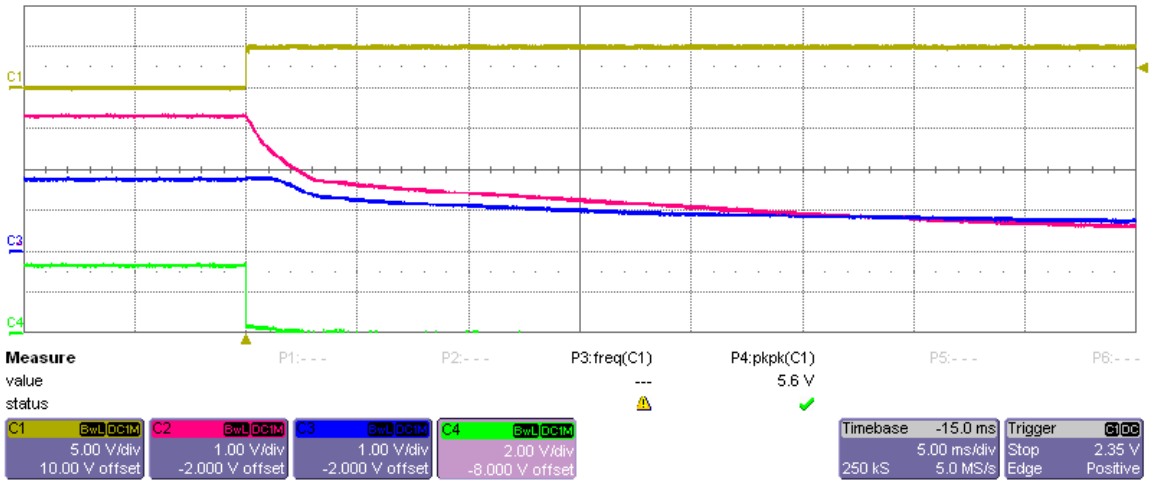


Figure 4 - Power down from enable when V_{IN} = 5.0 V

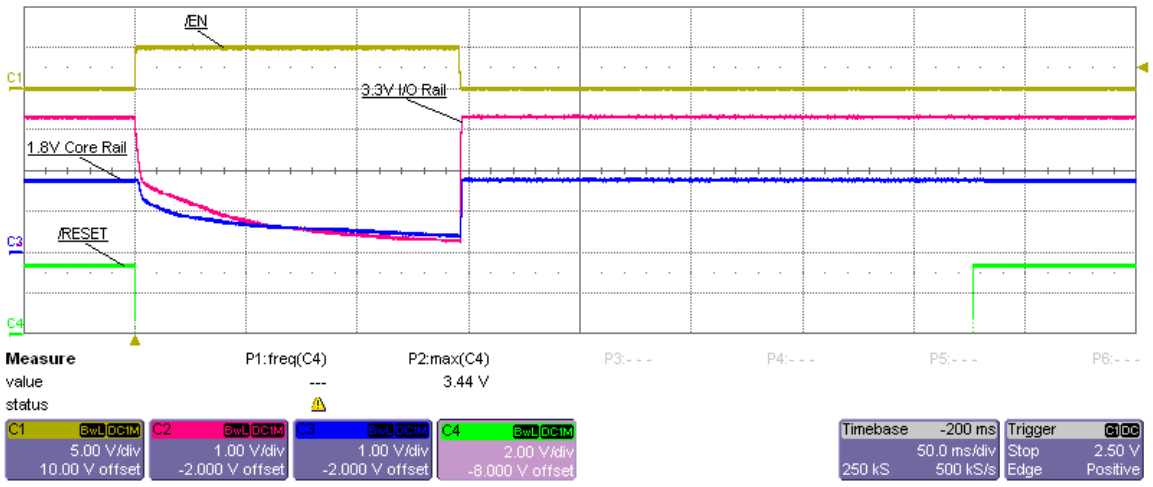


Figure 5 - RESET and recovery after V_{DD} = 3.3V fails

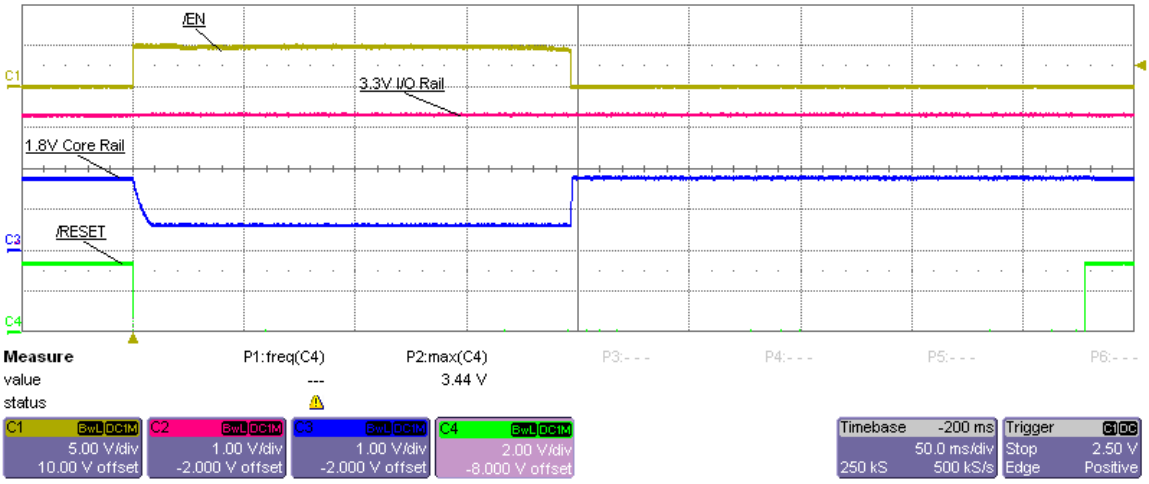
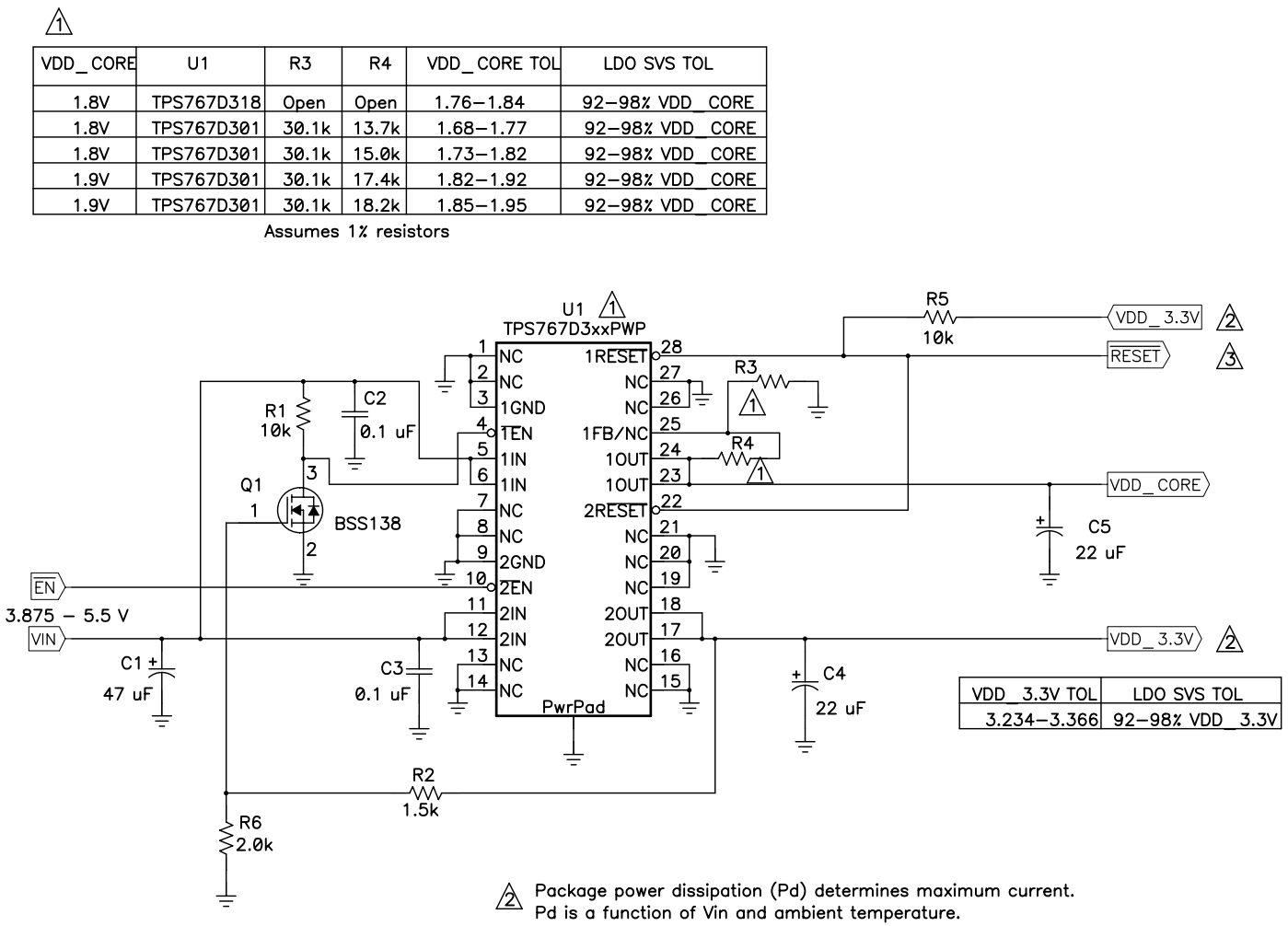


Figure 6 - RESET and recovery after V_{DD} = 1.8V fails

QUESTIONS?

Send an email to mailto:**dsppower@list.ti.com**


1
VDD_CORE
U1
TPS767D318
R3
Open
R4
Open
VDD_CORE TOL
1.76–1.84
LDO SVS TOL
92–98% VDD_CORE
U1
TPS767D301
30.1k
13.7k
1.68–1.77
92–98% VDD_CORE
U1
TPS767D301
30.1k
15.0k
1.73–1.82
92–98% VDD_CORE
1.9V
TPS767D301
30.1k
17.4k
1.82–1.92
92–98% VDD_CORE
1.9V
TPS767D301
30.1k
18.2k
1.85–1.95
92–98% VDD_CORE
Assumes 1% resistors
U1
TPS767D3xxPWP
1 NC
2 NC
3 1GND
4 TEN
5 1IN
6 1IN
7 NC
8 NC
9 2GND
10 2EN
11 2IN
12 2IN
13 NC
14 NC
28 1RESET
27 NC
26 NC
25 1FB/NC
24 1OUT
23 1OUT
22 2RESET
21 NC
20 NC
19 NC
18 2OUT
17 2OUT
16 NC
15 NC
PwrPad
R1
10k
C2
0.1 uF
Q1
BSS138
R5
10k
R3
R4
C5
22 uF
EN
3.875 – 5.5 V
VIN
C1
47 uF
C3
0.1 uF
C4
22 uF
R2
1.5k
R6
2.0k
VDD_3.3V
RESET
VDD_CORE
VDD_3.3V
VDD_3.3V TOL
LDO SVS TOL
3.234–3.366
92–98% VDD_3.3V
2
Package power dissipation (Pd) determines maximum current.
Pd is a function of Vin and ambient temperature.
3
/RESET on the TPS767xx has a 200ms delay and an open drain
output which requires an external pullup resistor (R5 on this design).
Title
TMS320x281x Design 4 TPS767D3XX
Size
B
Number
PR411
Rev
Date
1/04/05
Drawn by
Filename
pr411.sch
Sheet
of

Filename: PR411_bom.xls

Date: 12/15/2004

PR411 BOM

COUNT									
-001	-002	-003	-004	-005	RefDes	Description	Size	Part Number	MFR
1	1	1	1	1	C1	Capacitor, Tantalum, 47-uF, 6.3-V, 1.4-milliohm, 20%	B Case	293D476X6R3B2	Vishay
2	2	2	2	2	C2, C3	Capacitor, Ceramic, 0.1-uF, 25-V, X7R, 10%	0603	C1608X7R1E104KT	TDK
2	2	2	2	2	C4, C5	Capacitor, Tantalum, 22-uF, 6.3-V, 570-milliohm, 20%	B Case	595D226X96R3B2	Vishay
1	1	1	1	1	Q1	MOSFET, N-ch, 50-V, 0.2-A, 5 Ohms	SOT23	BSS138	Fairchild
2	2	2	2	2	R1, R5	Resistor, Chip, 10k-Ohms, 1/16-W, 1%	0603	Std	Std
1	1	1	1	1	R2	Resistor, Chip, 1.5k-Ohms, 1/16-W, 1%	0603	Std	Std
0					R3	Resistor, Chip, xx-Ohms, 1/16-W, yy%	0603		
	1	1	1	1		Resistor, Chip, 30.1k-Ohms, 1/16-W, yy%	0603	Std	Std
0					R4	Resistor, Chip, xx-Ohms, 1/16-W, yy%	0603		
	1					Resistor, Chip, 13.7k-Ohms, 1/16-W, 1%	0603	Std	Std
		1				Resistor, Chip, 15.0k-Ohms, 1/16-W, 1%	0603	Std	Std
			1			Resistor, Chip, 17.4k-Ohms, 1/16-W, 1%	0603	Std	Std
				1		Resistor, Chip, 18.2k-Ohms, 1/16-W, 1%	0603	Std	Std
1	1	1	1	1	R6	Resistor, Chip, 2.0k-Ohms, 1/16-W, 1%	0603	Std	Std
1					U1	IC, Dual 1-A Low-Dropout Regulator	PWP28	TPS767D318PWP	TI
	1	1	1	1		IC, Dual 1-A Low-Dropout Regulator	PWP28	TPS767D301PWP	TI

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