

Flashlight and Movie-Light Supplies Using the TPS61058 and TPS61059 Synchronous Boost Converters

Sahana Chandra

PMP Portable Power

ABSTRACT

The application examples and reference designs shown in this document can be used to design flashlight and movie-light applications for 1.8-V and 2.8-V logic. The TPS61058/9 devices are optimized for driving high-power, single-cell white LEDs up to 800 mA from a 2.7-V to 5.5-V input. The LED current can be programmed to different levels (e.g., torch, flashlight) by a set of external resistors. The TPS61059 reference design and its bill of materials can be modified to accommodate the various torch or movie-light applications.

1 Features

- 80% Efficient Synchronous Boost Converter
 - 500-mA LED Current From 3.3-V Input (TPS61058)
 - 800-mA LED Current From 3.3-V Input (TPS61059)
- Input Voltage Range: 2.7 V to 5.5 V
- Fixed Frequency 650 kHz (Typ) Operation
- LED Disconnect During Shutdown
- Open/Shorted LED Protection
- Over-Temperature Protection
- Low Shutdown Current: 100 nA (Typ)
- Total Solution Of Less Than 80 mm²
- Small 3mm x 3mm QFN-10 Package

2 TPS61059 Reference Design

The reference design shown in Figure 1 uses the TPS61059 high-current boost converters for white-light photo flash applications. The TPS61058/9 has an externally programmed LED current so that the LED can be used as a flash for still photography and as a torch, or movie light, for digital movies.

The design includes one white-flash LED, the TPS61059 converter, and a timing circuit used to make the design a stand-alone flash module.

2.1 Schematic and Bill of Materials

This section provides the TPS6105xEVM-141 schematic and bill of materials.

2.1.1 Schematic

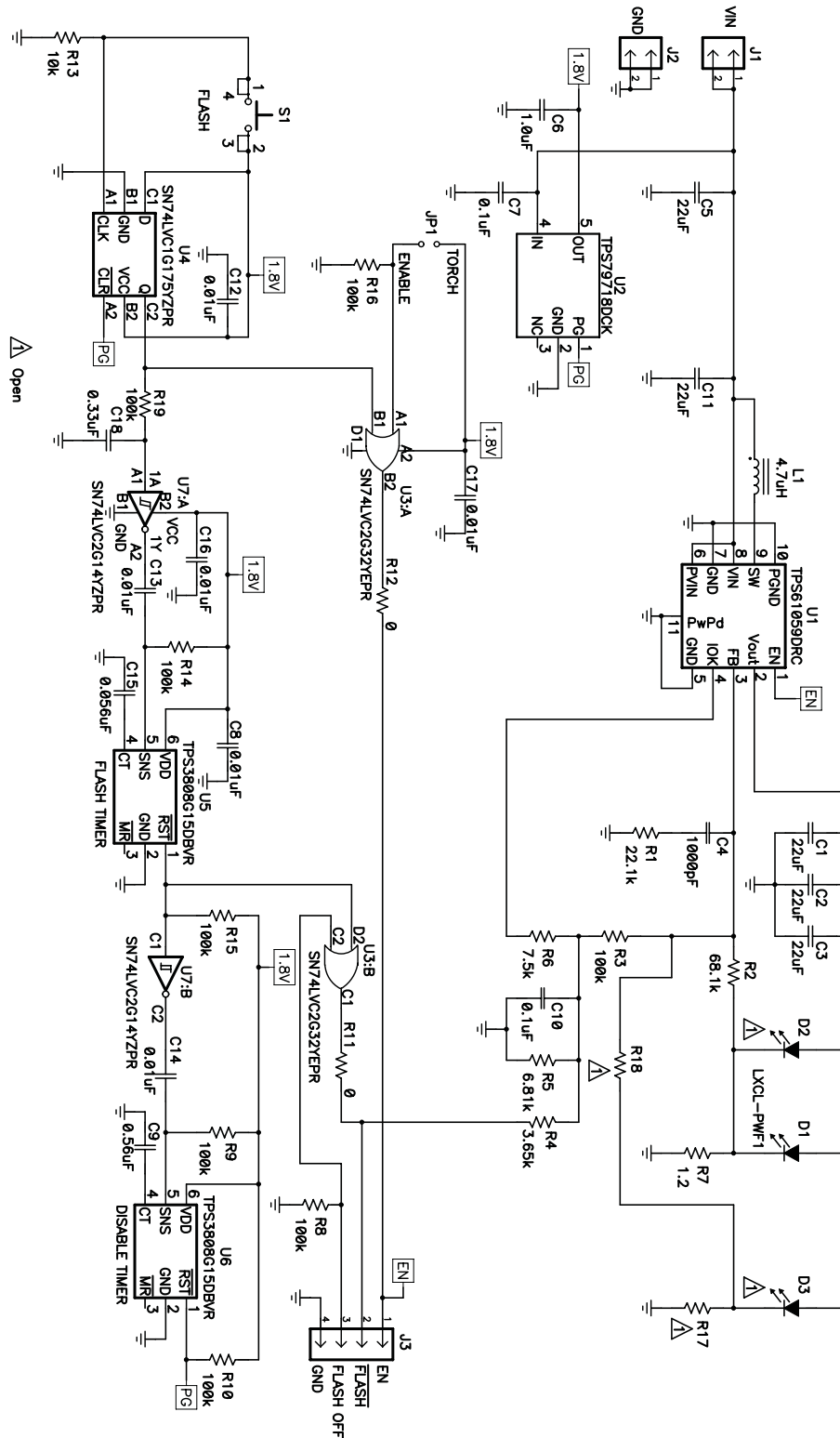


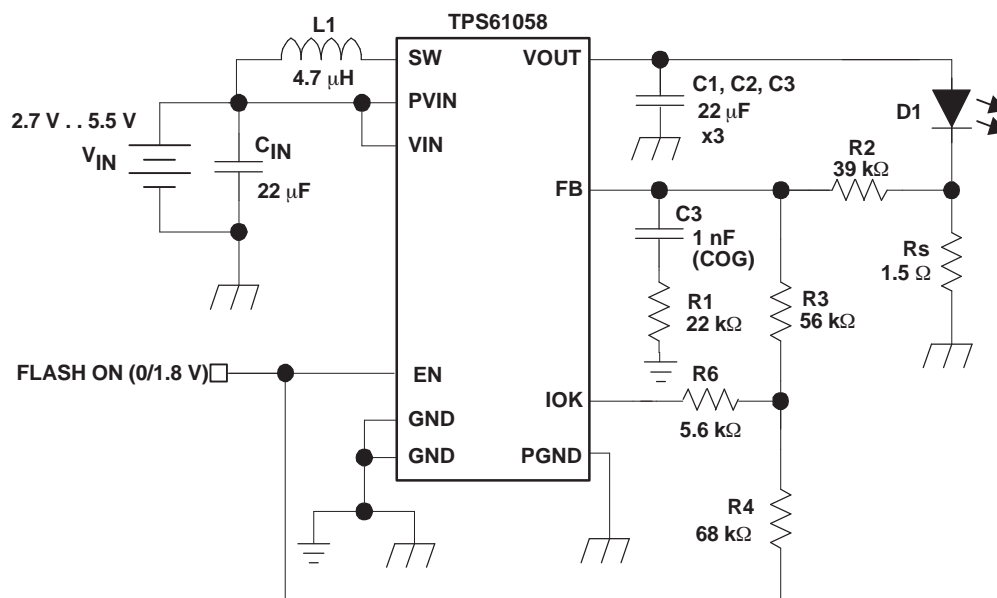
Figure 1. TPS6105x EVM-141 Schematic

2.1.2 Bill of Materials
Table 1. HPA141A Bill of Materials

COUNT	Ref Des	Value	Description	Size	Part Number	MFR
4	C1, C2, C3, C11	22 μ F	Capacitor, Ceramic, 6.3V, X5R, 20%	0805	C2012X5R0J226MTJ	TDK
1	C10	0.1 μ F	Capacitor, Ceramic, 25V, X5R, 10%	0402	C1005X5R1E104K	TDK
1	C15	0.056 μ F	Capacitor, Ceramic, 16V, X7R, 10%	0603	GRM188R71C563KC01	Murata
1	C18	0.33 μ F	Capacitor, Ceramic, 10V, X5R, 10%	0603	C1608X5R1A334KB	TDK
1	C4	1000 pF	Capacitor, Ceramic, 25V, C0G, 5%	0402	C1005C0G1E102K	TDK
1	C5	22 μ F	Capacitor, Ceramic, 10V, X5R, 10%	1206	C3216X5R1A226K	TDK
1	C6	1.0 μ F	Capacitor, Ceramic, 25V, X5R, 10%	0603	C1608X5R1E105K	TDK
1	C7	0.1 μ F	Capacitor, Ceramic, 50V, X7R, 15%	0603	C1608X7R1H104K	TDK
6	C8, C12, C13, C14, C16, C17	0.01 μ F	Capacitor, Ceramic, 25V, C0G, 5%	0603	C1608C0G1E103K	TDK
1	C9	0.56 μ F	Capacitor, Ceramic, 10V, X5R, 10%	0603	C0603C564K8PACTU	Kemet
1	D1		Diode, Flash, 1amp, Vfwd 3.9V	0.065 \times 0.080	LXCL-PWF1	Lumileds Lighting
0	D2	Open	Diode, LED	1210		
0	D3	Open	Diode, Flash, 1amp, Vfwd 3.9V	0.065 \times 0.080		
2	J1, J2		Header, 2 pin, 100mil spacing, (36-pin strip)	0.100 \times 2	PTC36SAAN	Sullins
1	J3		Header, 4 pin, 100mil spacing, (36-pin strip)	0.100 \times 4	PTC36SAAN	Sullins
1	JP1		Header, 2 pin, 100mil spacing, (36-pin strip)	0.100 \times 2	PTC36SAAN	Sullins
1	L1	4.7 μ H	Inductor, SMT, 1.1A, 120 m Ω	0.177 \times 0.185	VL5014AT-4R7M1R1	TDK
1	R1	22.1k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
2	R11, R12	0	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	R13	10k	Resistor, Chip, 1/16W, 1%	0603	Std	Std
0	R17	Open	Resistor, Chip, 1/10W, 1%	0805		
0	R18	Open	Resistor, Chip, 1/16W, 1%	0402		
1	R2	68.1k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
1	R3	100k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
1	R4	3.65k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
1	R5	6.81k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
1	R6	7.5k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
1	R7	1.2	Resistor, Chip, 1/10W, 1%	0805	Std	Std
7	R8, R9, R10, R14, R15, R16, R19	100k	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	S1		Switch, SPST, PB Momentary, Sealed Washable	0.245 \times 0.251	KT11P2JM	C & K
1	U1		IC, Synchronous Boost Converter With Down Mode High Power White LED Driver	SON-10	TPS61059DRC	TI
1	U2		IC, Regulator, LDO, Micropower, 1.1 μ A at 10mA. Vin 0.30–5.5V	SOP-5 (DCK)	TPS79718DCK	TI
1	U3		IC, Dual 2-Input Positive-OR Gates	WCSP-8	SN74LVC2G32YEPR	TI
1	U4		IC, Single D-Type Flip-Flop With Asynchronous Clear	WCSP-6	SN74LVC1G175YZPR	TI
2	U5, U6		IC, Low Quiescent Current, Programmable 1.5V, Delay Time: 1.25ms to 10s	SOT23-6	TPS3808G15DBVR	TI
1	U7		IC, Dual Schmitt-Trigger Inverter	WCSP-6	SN74LVC2G14YZPR	TI
1	—		PCB, 2 In \times 1.9 In \times 0.062 In		HPA141	Any
1	—		Shunt, 100-mil, Black	0.100	929950-00	3M

2.2 Application Examples for Torch and Movie-Light Supplies

With modifications to the external components, the TPS61058 and TPS61059 devices can be used for multiple flashlight and movie-light applications. Included in each of the following designs are specific inductor and capacitor values.

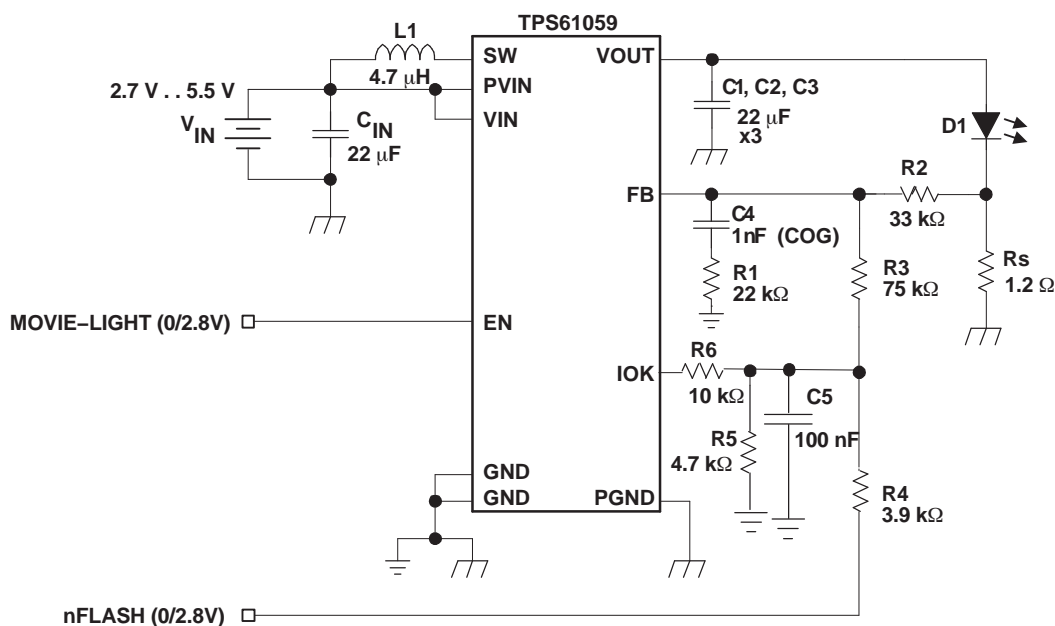


List of Components:

L1 = COILCRAFT LPS3015-4R7

C1, C2, C3 = TDK C2012X5R0J226MTJ

Figure 2. 500 mA Flashlight Application - 1.8 V Logic



List of Components:

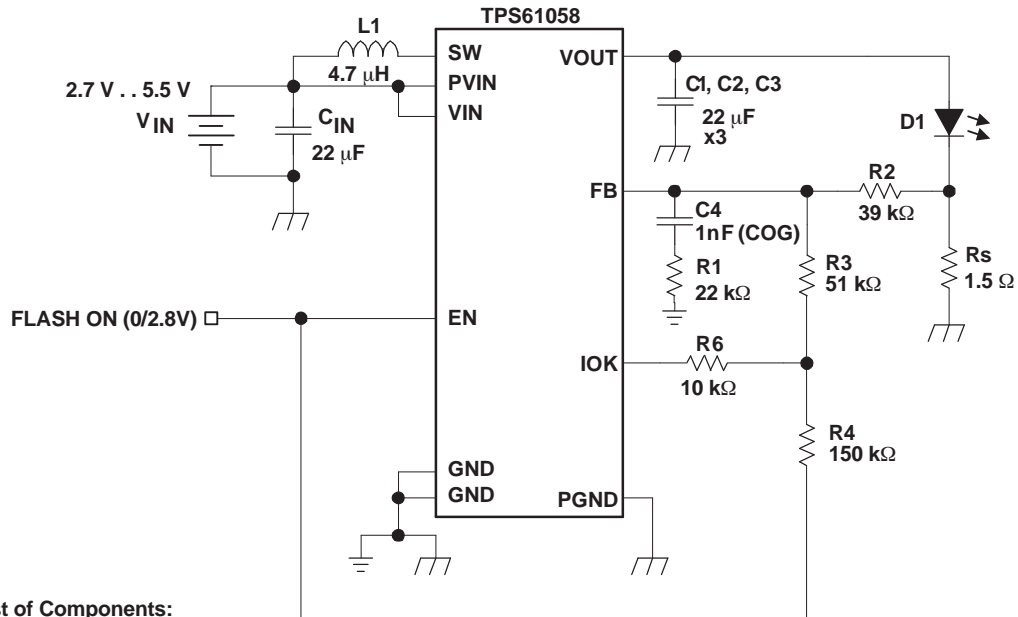
L1 = TDK VLF5014AT-4R7

C1, C2, C3 = TDK C2012X5R0J226MTJ

MOVIE- LIGHT	nFLASH	ILED
0	0	OFF
0	1	OFF
1	0	FLASHLIGHT
1	1	MOVIE - LIGHT

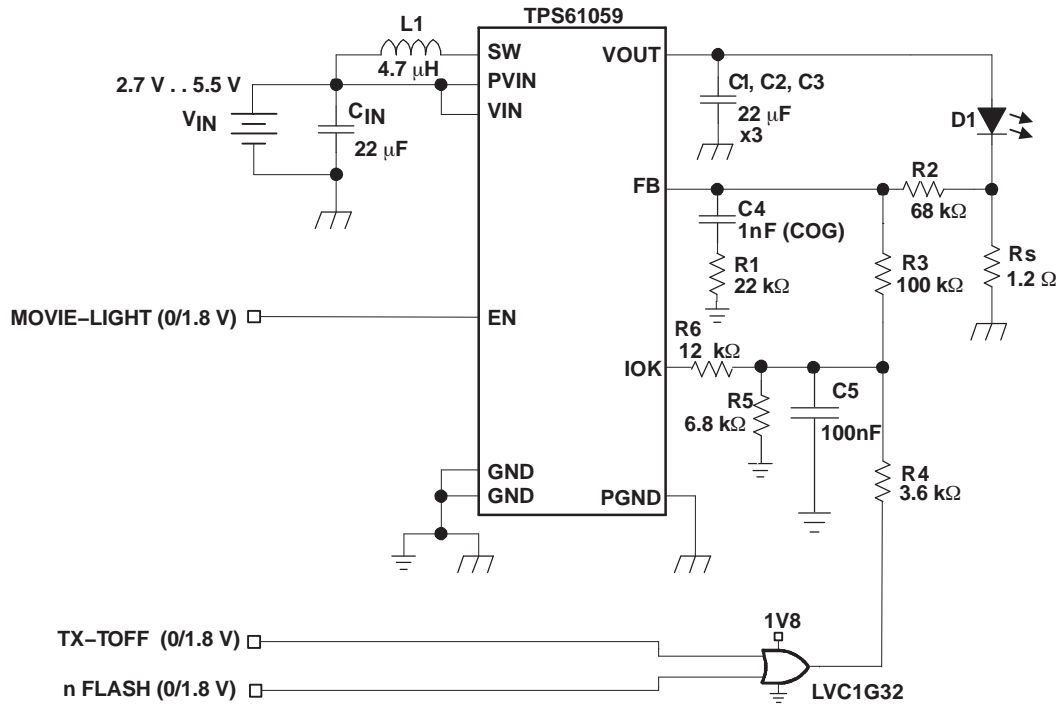
Note: Before turning into the flashlight mode, the device to be driven into movie-light mode. See the Design Procedure section for more details.

Figure 3. 150 mA Movie-Light/600 mA Flashlight Application - 2.8 V Logic



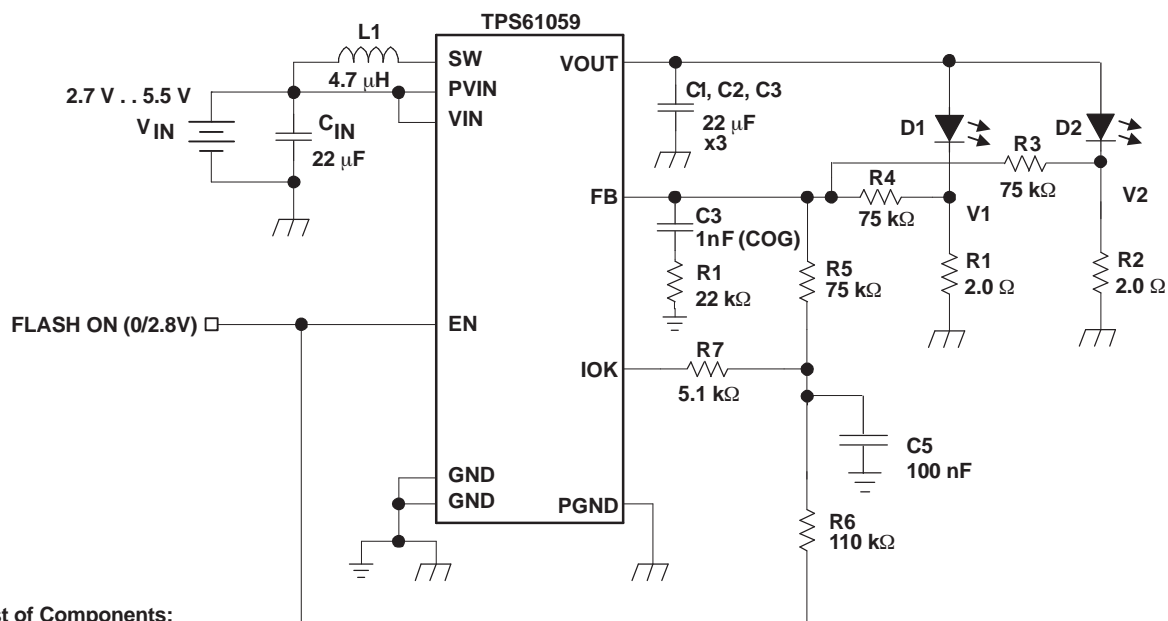
- List of Components:
 L1 = COILCRAFT LPS3015-4R7
 C1,C2, C3 = TDK C2012X5R0J226MTJ

Figure 4. 500 mA Flashlight Application - 2.8 V Logic



- List of Components:
 L1 = TDK VLF5014AT-4R7
 C1,C2, C3 = TDK C2012X5R0J226MTJ

Figure 5. 150 mA Movie-Light/700 mA Flashlight with No-Latency Current Reduction



List of Components:

L1 = TDK VLF5014AT-4R7

C1,C2, C3 = TDK C2012X5R0J226MTJ

Figure 6. 2x 350 mA Flashlight Application - 2.8 V Logic

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

Copyright © 2006, Texas Instruments Incorporated