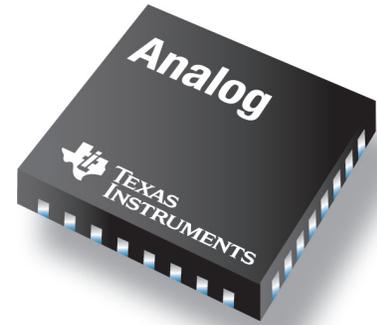
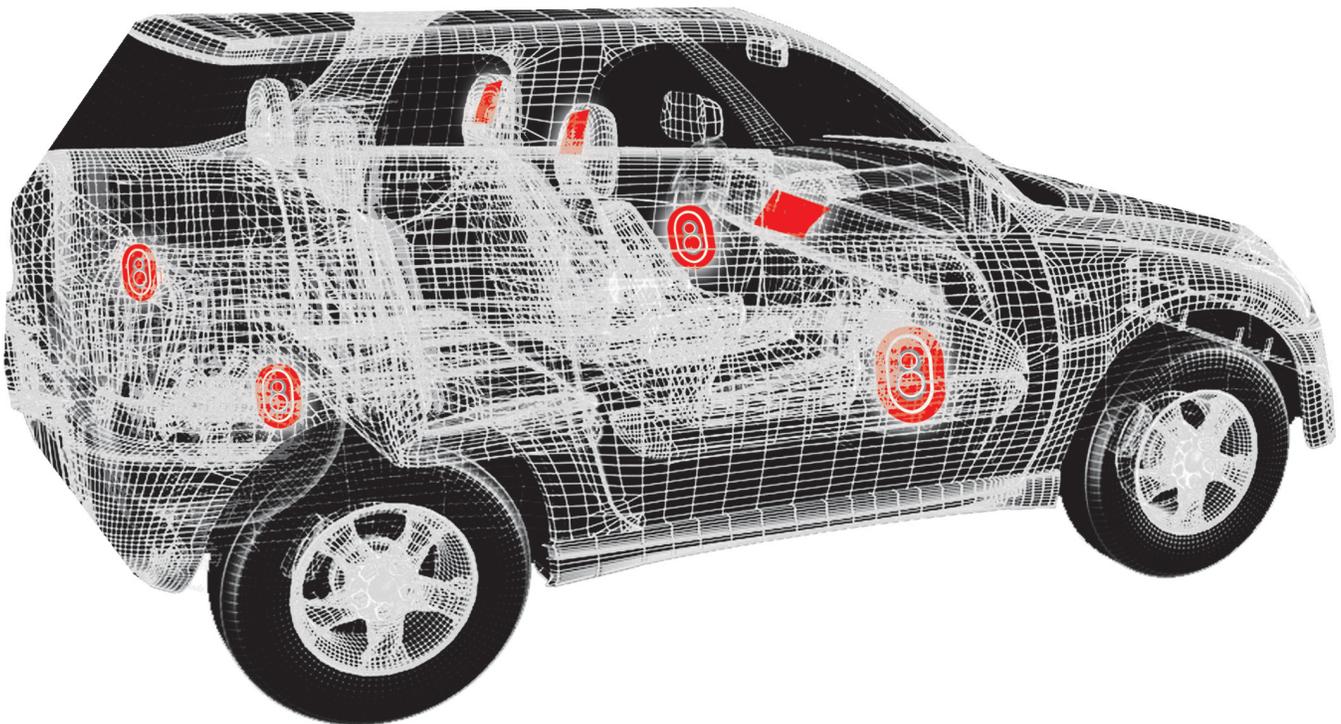


# Automotive Infotainment Guide



Amplifiers  
Data Converters  
Interface  
Power Management



## Overview

With the race to deliver the best features in new cars escalating, the infotainment system is now a key focus in the automotive design process. To support the growing importance of infotainment, Texas Instruments offers a strong portfolio and design support. TI's broad analog and digital embedded and applications processing portfolio provides improved audio quality and system speed, efficient power management and low power consumption for applications such as car audio, navigation systems, power supply, as well as in-car and personal entertainment.

### Automotive Analog Switches

Device	Product Description	Key Specifications
CD74HC4051-Q1	High-Speed, CMOS Logic, Analog Multiplexers/Demultiplexers	2-V to 6-V Supply Voltage, High-Noise Immunity NIL = 30%, NIH = 30% of $V_{CC}$ , $V_{CC} = 5V$
SN74HC4851-Q1	8-Channel, Analog Multiplexer/Demultiplexer with Injection-Current Effect Control	2-V to 6-V $V_{CC}$ Supply, 2 to 6 Node Voltage, Low Crosstalk Between Switches
SN74HC4852-Q1	Dual, 4-to-1 Channel, Analog Multiplexer/Demultiplexer	2-V to 6-V $V_{CC}$ Supply, Injection-Current Cross Coupling < 1 mV/mA, $I_{CC} 10 \mu A$

### Automotive Digital Audio Amplifiers - Class D

Device	Product Description	Key Specifications
TAS5414A-Q1	4-Channel, Single-Ended Analog Inputs, Digital Amplifier	8-V to 22-V Supply, 4x45W/2W/10%, 0.02% THD+N, 75-dB PSRR, Load Diagnostics, Qualified Per AEC-Q100, Automotive EMC Levels
TAS5424A-Q1	4-Channel, Differential Analog Inputs, Digital Amplifier	8-V to 22-V Supply, 4x45W/2W/10%, 0.02% THD+N, 75-dB PSRR, Load Diagnostics, Qualified Per AEC-Q100, Automotive EMC Levels
TPA2000D1-Q1	2-W Filterless, Mono, Class-D Audio Power Amplifier	Extremely Efficient, Third-Generation, 5-V Class-D Technology, 2.7-V to 5.5-V Supply, 77-dB PSRR, Integrated Depop Circuitry
TPA2005D1-Q1	1.4-W Mono, Filter-Free, Class-D Audio Power Amplifier	2.5-V to 5.5-V Supply, 2.8mA $I_Q$ , 75-dB PSRR, 84% Efficiency, Improved RF-Rectification Immunity

### Automotive ADCs

Device	Product Description	Key Specifications
ADS5204-Q1	Dual, 10-Bit, 40 MSPS Low-Power ADC with PGA	10-Bit, 40 MSPS, Pipeline, 275mW, 60.5-dB SNR, ENOB = 9.7, 2 Input Channels
TLC2543-Q1	12-Bit ADC with Serial Control and 11 Analog Inputs	12-Bit, 66 kSPS, SAR, 5mW, 10- $\mu$ s Conversion Time Over Operating Temperature, $\pm 1$ LSB (max)
TLV1548-Q1	Low-Voltage, 10-Bit ADC with Serial Control and 8 Analog Inputs	2.7-V to 5.5-V Supply, 10-Bit, 85 kSPS, SAR, Conversion Time $\leq 10 \mu$ s
TLV5535-Q1	8-Bit, 35-MSPS ADC, Single-Channel and Low Power	Meets AEC-Q100-011 C3A CDM Classification, 3.3-V Single Supply, 8-Bit, 35 MSPS

### Automotive Audio Codecs

Device	Product Description	Key Specifications
TLV320AIC23B-Q1	Stereo Audio CODEC, 8 to 96 kHz, with Integrated Headphone Amp	24-Bit, 96 kHz, 100-dB DAC / 90-dB ADC, SPI, I <sup>2</sup> C Interface, 23mW, 2.7-V to 3.6-V Analog Supply, 1.42-V to 3.6-V Digital Supply
TWL1103T-Q1	Voice-Band Audio Processor (VBAP)	2.7-V Operation, On-Chip I <sup>2</sup> C Bus, ESD Protection Exceeds 2 kV, Transmit and Receive Filtering for Voice-Band Communications Systems

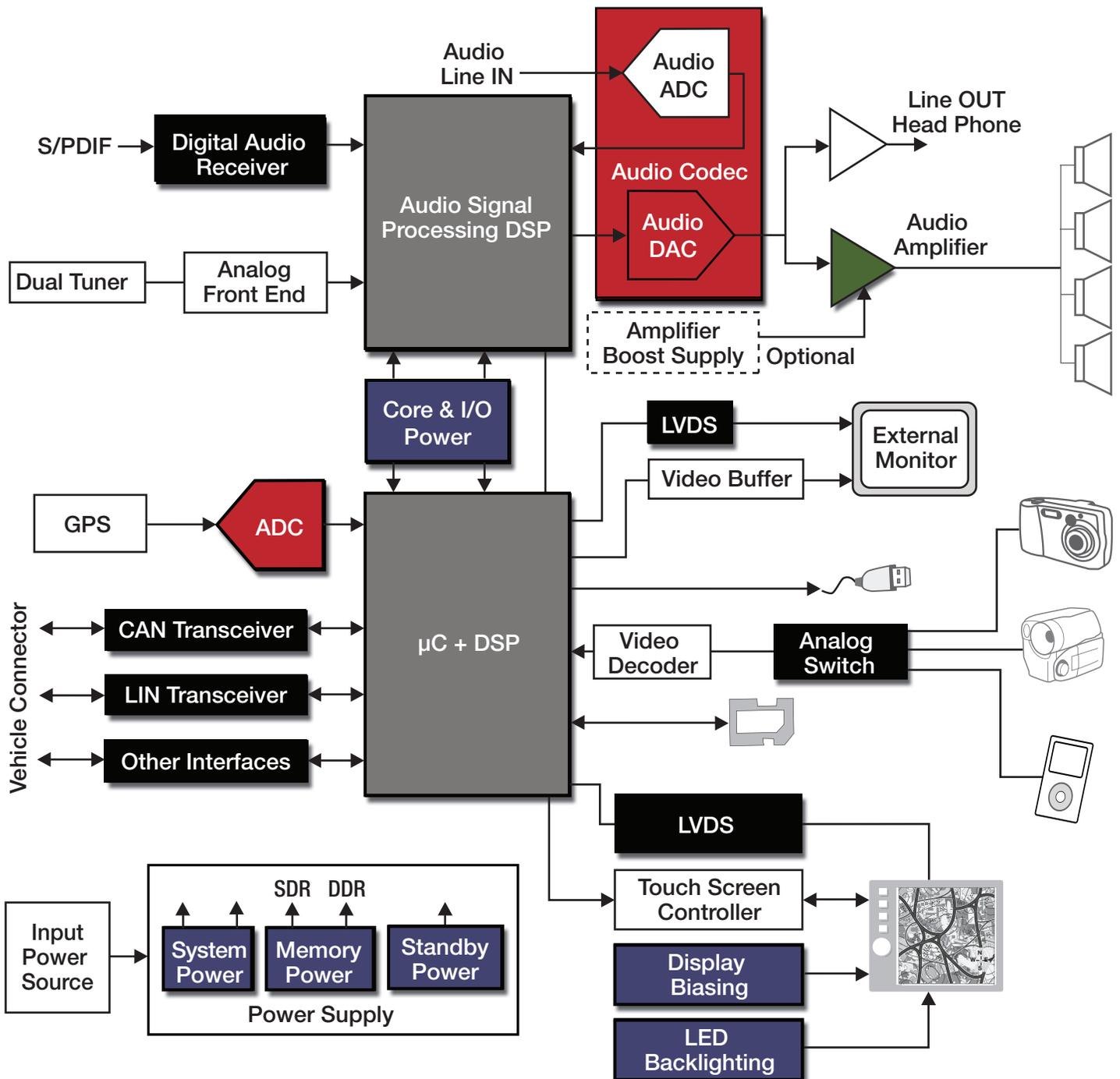
### Automotive Audio DACs

Device	Product Description	Key Specifications
PCM1681-Q1	105-dB, 8-Channel, TDM DAC	24-Bit, 192-kHz, 8-Channel Audio DAC, D-Range/SNR: 105 dB, 3-Way Control Interface (SPI/I <sup>2</sup> C/HW)

### Automotive CAN Transceivers

Device	Product Description	Key Specifications
SN65HVD1040A-Q1	High-Speed CAN Transceiver with Wake-Up	Compliant to ISO4898-5, EMC Optimized, 12 kV Bus ESD Protection
SN65HVD1050A-Q1	High-Speed CAN Transceiver	Compliant to ISO4898-5, EMC Optimized, 12 kV Bus ESD Protection

# Automotive Infotainment Block Diagram



## Automotive Qualified Products (Q1)

TI's automotive qualified products are indicated by the Q1 suffix. The Q1 indicates that a product has met TI's stringent automotive standards and includes:

- 180-day product change notification from final notice
- Extended temperature qualification
- Automotive documentation service
- Target zero defects

### Automotive LVDS

Device	Product Description	Key Specifications
SN65LVDS051-Q1	Dual, High-Speed LVDS Transmitter/Receiver	Single 3.3-V Supply, Meets ANSI TIA/EIA-644-1995 Standard, Signaling Rates up to 400 Mbps
SN65LVDM050-Q1	Dual, High-Speed LVDS Transmitter/Receiver	Single 3.3-V Supply, Signaling Rates up to 500 Mbps
SN65LVDM051-Q1	Dual, High-Speed LVDS Transmitter/Receiver	Single 3.3-V Supply, Signaling Rates up to 500 Mbps, TIA/EIA-644 Standard Compliant Devices
SN65LVDS84A-Q1	FlatLink Transmitter	3.3-V Supply Voltage, 197-Mbps Data Rate, Very Low EMI, 21 Data Channels Plus Clock-In Low-Voltage TTL Inputs and 3 Data Channels Plus Clock-Out Low-Voltage Differential Signaling (LVDS) Outputs
SN65LVDS86A-Q1	FlatLink Receiver	21 inputs, 163 MBs

### Automotive LIN Transceivers

Device	Product Description	Key Specifications
TPIC1021A-Q1	LIN Physical Interface	LIN Specification 2.0 Compliant, Interfaces to MCU with 5-V or 3.3-V I/O Pins, Low Current Consumption

### Automotive Digital Audio Interface Receivers

Device	Product Description	Key Specifications
DIR9001-Q1	96-kHz Digital Audio Interface Receiver	28-kHz to 108-kHz Sample Frequency, Low Clock Jitter: 50ps (typ), 100ps (max), 3.3-V, Single Supply, 5-V, Tolerant Digital Input

### Other Automotive Interfaces

Device	Product Description	Key Specifications
TPS2022-Q1	USB Power Distribution Switch	2.7-V to 5.5-V Supply, 50-mΩ N-Channel MOSFET, High-Side Power Switches, Short-Circuit and Thermal Protection
TPS2024-Q1	USB Power Distribution Switch	2.7-V to 5.5-V Supply, 50-mΩ N-Channel MOSFET, High-Side Power Switches, Short-Circuit and Thermal Protection
TPS2030-Q1	USB Power Distribution Switch	2.7-V to 5.5-V Supply, 50-mΩ N-Channel MOSFET, High-Side Power Switches, Short-Circuit and Thermal Protection
TPS2042B-Q1	USB Dual, Current-Limited Power-Distribution Switches	2.7-V to 5.5-V Supply, 70-mΩ N-Channel MOSFET, High-Side Power Switches, Short-Circuit and Thermal Protection
TPS2051B-Q1	USB Dual, Current-Limited Power-Distribution Switches	2.7-V to 5.5-V Supply, 70-mW N-Channel MOSFET, High-Side Power Switches, Short-Circuit and Thermal Protection

### Automotive Power Management

Device	Product Description	Key Specifications
TPIC74100-Q1	Buck/Boost Switch-Mode Regulator	Wide-Input-Voltage-Range 1.5-V to 40-V, Fixed 5V Output, Programmable Slew Rate and Frequency Modulation for EMI Consideration
TPS40200-Q1	Wide-Input Range, Nonsynchronous Voltage-Mode Controller	4.5-V to 52-V Supply, 35 kHz to 500 kHz, Integrated 200-mA PMOS-FET Driver
TPS5430-Q1	3-A, Wide-Input Range, Step-Down SWIFT™ Converter	5.5-V to 36-V Supply, Switching Frequency 500kHz Fixed, High Efficiency Due to Low $r_{DS(on)}$
TPS5420-Q1	2-A, Wide-Input Range, Step-Down SWIFT™ Converter	5.5 V to 36 V, 95% Efficiency, Adjustable-Output Voltage
TLE4275-Q1	5-V, Low-Dropout Voltage Regulator	5.5-V to 42-V Supply, 2% Accuracy, Very Low Current Consumption and ESD Protection > 6kV
TPS76501-Q1	5-V, Low-Dropout Voltage Regulator	150 mA, 3% Tolerance, Open-Drain Power Good Output with Thermal Shutdown Protection
TPS76950-Q1	Ultra-low Power, 100 mA, Low-Dropout Linear Regulator	Adjustable Voltage, 1-μA Quiescent Current in Standby Mode, Over-Current Limitation

## Automotive Display Biasing and LED Backlighting

Device	Product Description	Key Specifications
UCC2813-1-Q1	Low-Power BICMOS Current-Mode PWM	500- $\mu$ A Operating Supply Current, Operation to 1 MHz, Ideal for Battery Operated Systems
TPS65140-Q1	4-Channel Power Supply for LCD Monitor (5V)	2.7-V to 5.8-V Input-Voltage-Range, 1.6-MHz Fixed Switching Frequency, Internal Power-On Sequencing
TPS65145-Q1	Triple-Output LCD Supply with Linear Regulator and Power-Good Output	2.7-V to 5.8-V, 1.6-MHz Fixed Frequency, Internal Power-On Sequencing, Thermal Shutdown
TPS40200-Q1	Wide-Input Range, Nonsynchronous Voltage-Mode Controller	4.5-V to 52-V, 200-mA Internal P-FET Driver, UVLO, External Synchronization
TPS61040-Q1	Low-Power DC/DC Boost Converter	1.8-V to 6-V, Adjustable Output Voltage up to 28 V, Lower Output Voltage Ripple, Low Quiescent Current
TPS61041-Q1	Low-Power DC/DC Boost Converter	1.8-V to 6-V, SOT-23 Package, Small Overall Solution Size, Lower Output Voltage Ripple

## Semiconductor News for the Automotive Industry



- Product releases
- Automotive design articles
- Industry events
- Automotive guides
- Video casts



### Register Now

for the quarterly **Automotive e-Newsletter** from Texas Instruments to get the latest on automotive products, literature, contributed articles and video casts.

To register go to  
[www.ti.com/automotivenewsletter](http://www.ti.com/automotivenewsletter)

# TI Worldwide Technical Support

## Internet

**TI Semiconductor Product Information Center Home Page**

[support.ti.com](http://support.ti.com)

**TI Semiconductor KnowledgeBase Home Page**

[support.ti.com/sc/knowledgebase](http://support.ti.com/sc/knowledgebase)

## Product Information Centers

### Americas

Phone +1(972) 644-5580  
Fax +1(972) 927-6377  
Internet/Email [support.ti.com/sc/pic/americas.htm](http://support.ti.com/sc/pic/americas.htm)

### Europe, Middle East, and Africa

Phone  
European Free Call 00800-ASK-TEXAS  
(00800 275 83927)  
International +49 (0) 8161 80 2121  
Russian Support +7 (4) 95 98 10 701

**Note:** The European Free Call (Toll Free) number is not active in all countries. If you have technical difficulty calling the free call number, please use the international number above.

Fax +(49) (0) 8161 80 2045  
Internet [support.ti.com/sc/pic/euro.htm](http://support.ti.com/sc/pic/euro.htm)

### Japan

Fax International +81-3-3344-5317  
Domestic 0120-81-0036  
Internet/Email International [support.ti.com/sc/pic/japan.htm](http://support.ti.com/sc/pic/japan.htm)  
Domestic [www.tij.co.jp/cic](http://www.tij.co.jp/cic)

© 2008 Texas Instruments Incorporated  
The platform bar is a trademark of Texas Instruments.  
All other trademarks are the property of their respective owners.

## Asia

Phone  
International +91-80-41381665  
Domestic Toll-Free Number  
Australia 1-800-999-084  
China 800-820-8682  
Hong Kong 800-96-5941  
India 1-800-425-7888  
Indonesia 001-803-8861-1006  
Korea 080-551-2804  
Malaysia 1-800-80-3973  
New Zealand 0800-446-934  
Philippines 1-800-765-7404  
Singapore 800-886-1028  
Taiwan 0800-006800  
Thailand 001-800-886-0010  
Fax +886-2-2378-6808  
Email [tiasia@ti.com](mailto:tiasia@ti.com)  
[ti-china@ti.com](mailto:ti-china@ti.com)  
Internet [support.ti.com/sc/pic/asia.htm](http://support.ti.com/sc/pic/asia.htm)

**Important Notice:** The products and services of Texas Instruments Incorporated and its subsidiaries described herein are sold subject to TI's standard terms and conditions of sale. Customers are advised to obtain the most current and complete information about TI products and services before placing orders. TI assumes no liability for applications assistance, customer's applications or product designs, software performance, or infringement of patents. The publication of information regarding any other company's products or services does not constitute TI's approval, warranty or endorsement thereof.

Printed in U.S.A. by Arizona Lithographers, Tucson, AZ

♻️ Printed on recycled paper

This FSC Certified paper contains 50% recycled fiber content and 25% post-consumer recovered fiber.

**B010208**



**SLYB139**



14950 F.A.A. Blvd.  
Fort Worth, Texas 76155

Address service requested

PRSR STD  
U.S. POSTAGE  
**PAID**  
DALLAS, TEXAS  
PERMIT NO.  
2758

## 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

Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>

### Applications

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2008, Texas Instruments Incorporated