

- State-of-the-Art Advanced BiCMOS Technology (ABT) Design for 3.3-V Operation and Low Static Power Dissipation
- Support Mixed-Mode Signal Operation (5-V Input and Output Voltages With 3.3-V  $V_{CC}$ )
- Support Unregulated Battery Operation Down to 2.7 V
- Typical  $V_{OLP}$  (Output Ground Bounce) < 0.8 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model ( $C = 200$  pF,  $R = 0$ )
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Bus-Hold Data Inputs Eliminate the Need for External Pullup Resistors
- Supports Live Insertion
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), Ceramic Flatpacks (W), and Ceramic DIPs (J)

### description

These octal buffers and line drivers are designed specifically for low-voltage (3.3-V)  $V_{CC}$  operation, but with the capability to provide a TTL interface to a 5-V system environment.

The 'LVT244 is organized as two 4-bit line drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, the device passes data from the A inputs to the Y outputs. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

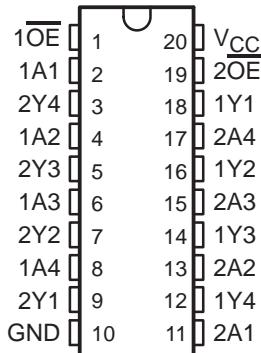
Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

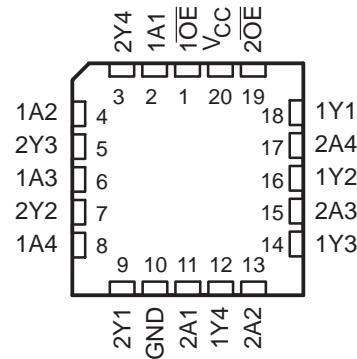
The SN74LVT244 is packaged in TI's shrink small-outline package (DB), which provides the same I/O pin count and functionality of standard small-outline packages in less than half the printed-circuit-board area.

The SN54LVT244 is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN74LVT244 is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

SN54LVT244 . . . J OR W PACKAGE  
SN74LVT244 . . . DB, DW, OR PW PACKAGE  
(TOP VIEW)



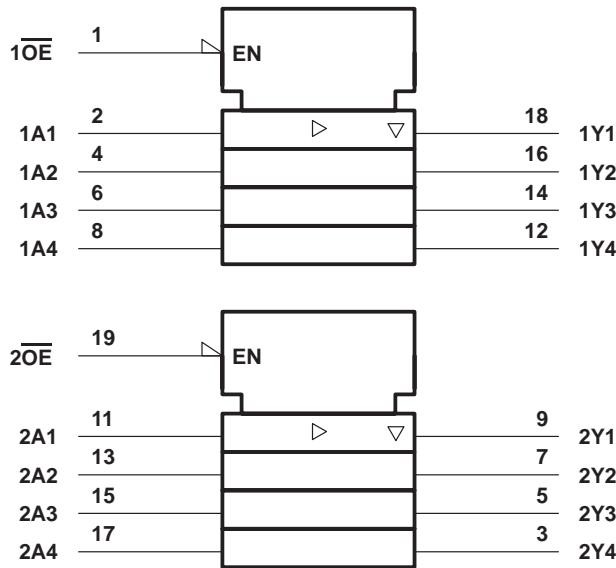
SN54LVT244 . . . FK PACKAGE  
(TOP VIEW)



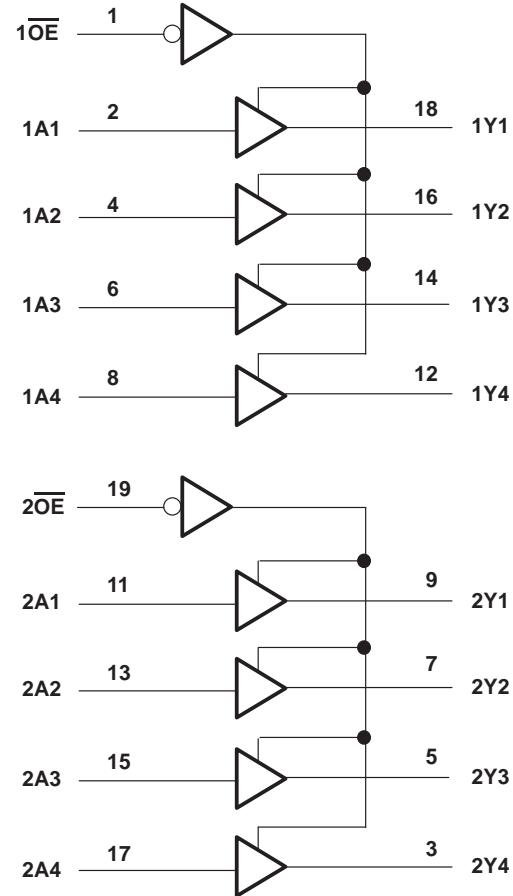
# SN54LVT244, SN74LVT244 3.3-V ABT OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCBS135B – AUGUST 1992 – REVISED MARCH 1994

## logic symbol†



## logic diagram (positive logic)



**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡**

‡ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.  
 2. This current will only flow when the output is in the high state and  $V_O > V_{CC}$ .  
 3. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils.  
 For more information, refer to the *Package Thermal Considerations* application note.



**recommended operating conditions (see Note 4)**

		SN54LVT244		SN74LVT244		UNIT
		MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage	2.7	3.6	2.7	3.6	V
V <sub>IH</sub>	High-level input voltage	2		2		V
V <sub>IL</sub>	Low-level input voltage		0.8		0.8	V
V <sub>I</sub>	Input voltage		5.5		5.5	V
I <sub>OH</sub>	High-level output current		-24		-32	mA
I <sub>OL</sub>	Low-level output current		48		64	mA
Δt/Δv	Input transition rise or fall rate	Outputs enabled		10	10	ns/V
T <sub>A</sub>	Operating free-air temperature	-55	125	-40	85	°C

NOTE 4: Unused or floating control inputs must be held high or low.

**SN54LVT244, SN74LVT244  
3.3-V ABT OCTAL BUFFERS/DRIVERS  
WITH 3-STATE OUTPUTS**

SCBS135B – AUGUST 1992 – REVISED MARCH 1994

**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

PARAMETER	TEST CONDITIONS	SN54LVT244			SN74LVT244			UNIT
		MIN	TYPT†	MAX	MIN	TYPT†	MAX	
$V_{IK}$	$V_{CC} = 2.7 \text{ V}$ , $I_I = -18 \text{ mA}$			-1.2			-1.2	V
$V_{OH}$	$V_{CC} = \text{MIN to MAX}^‡$ , $I_{OH} = -100 \mu\text{A}$	$V_{CC} - 0.2$			$V_{CC} - 0.2$			V
	$V_{CC} = 2.7 \text{ V}$ , $I_{OH} = -8 \text{ mA}$	2.4			2.4			
	$V_{CC} = 3 \text{ V}$ , $I_{OH} = -24 \text{ mA}$	2						
	$V_{CC} = 3 \text{ V}$ , $I_{OH} = -32 \text{ mA}$				2			
$V_{OL}$	$V_{CC} = 2.7 \text{ V}$ , $I_{OL} = 100 \mu\text{A}$	0.2			0.2			V
	$V_{CC} = 2.7 \text{ V}$ , $I_{OL} = 24 \text{ mA}$	0.5			0.5			
	$V_{CC} = 3 \text{ V}$ , $I_{OL} = 16 \text{ mA}$	0.4			0.4			
	$V_{CC} = 3 \text{ V}$ , $I_{OL} = 32 \text{ mA}$	0.5			0.5			
	$V_{CC} = 3 \text{ V}$ , $I_{OL} = 48 \text{ mA}$	0.55						
	$V_{CC} = 3 \text{ V}$ , $I_{OL} = 64 \text{ mA}$				0.55			
$I_I$	$V_{CC} = 0 \text{ or MAX}^‡$ , $V_I = 5.5 \text{ V}$	50			10			$\mu\text{A}$
	$V_{CC} = 3.6 \text{ V}$ , $V_I = V_{CC} \text{ or GND}$	Control pins	$\pm 1$		$\pm 1$			
	$V_{CC} = 3.6 \text{ V}$ , $V_I = V_{CC}$		1		1			
	$V_{CC} = 3.6 \text{ V}$ , $V_I = 0$		-5		-5			
$I_{off}$	$V_{CC} = 0$ , $V_I \text{ or } V_O = 0 \text{ to } 4.5 \text{ V}$				$\pm 100$			$\mu\text{A}$
$I_{I(\text{hold})}$	$V_{CC} = 3 \text{ V}$ , $V_I = 0.8 \text{ V}$	A inputs	75		75			$\mu\text{A}$
	$V_{CC} = 3 \text{ V}$ , $V_I = 2 \text{ V}$		-75		-75			
$I_{OZH}$	$V_{CC} = 3.6 \text{ V}$ , $V_O = 3 \text{ V}$				1			$\mu\text{A}$
$I_{OZL}$	$V_{CC} = 3.6 \text{ V}$ , $V_O = 0.5 \text{ V}$				-1			$\mu\text{A}$
$I_{CC}$	$V_{CC} = 3.6 \text{ V}$ , $I_O = 0$ , $V_I = V_{CC} \text{ or GND}$	Outputs high	0.12	0.39	0.12	0.19		$\text{mA}$
		Outputs low	8.6	14	8.6	12		
		Outputs disabled	0.12	0.39	0.12	0.19		
$\Delta I_{CC}^§$	$V_{CC} = 3 \text{ V to } 3.6 \text{ V}$ , One input at $V_{CC} - 0.6 \text{ V}$ , Other inputs at $V_{CC} \text{ or GND}$				0.3			$\text{mA}$
$C_I$	$V_I = 3 \text{ V or } 0$	4			4			$\text{pF}$
$C_O$	$V_O = 3 \text{ V or } 0$	8			8			$\text{pF}$

† All typical values are at  $V_{CC} = 3.3 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

§ This is the increase in supply current for each input that is at the specified TTL voltage level rather than  $V_{CC}$  or GND.

SN54LVT244, SN74LVT244  
**3.3-V ABT OCTAL BUFFERS/DRIVERS  
 WITH 3-STATE OUTPUTS**  
 SCBS135B – AUGUST 1992 – REVISED MARCH 1994

switching characteristics over recommended operating free-air temperature range,  $C_L = 50 \text{ pF}$  (unless otherwise noted) (see Note 5)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54LVT244				SN74LVT244				UNIT
			V <sub>CC</sub> = 3.3 V ± 0.3 V		V <sub>CC</sub> = 2.7 V		V <sub>CC</sub> = 3.3 V ± 0.3 V		V <sub>CC</sub> = 2.7 V		
			MIN	MAX	MIN	MAX	MIN	TYP	MAX	MIN	MAX
t <sub>PLH</sub>	A	Y	0.5	4.7	5.2	1	2.5	4.3	5	ns	
t <sub>PHL</sub>			0.5	4.4	5.4	1	2.5	4.2	5.2		
t <sub>PZH</sub>	$\overline{OE}$	Y	0.8	5.4	6.5	1	2.7	5.2	6.3	ns	
t <sub>PZL</sub>			0.8	5.4	7.6	1.1	3.1	5.2	6.7		
t <sub>PHZ</sub>	$\overline{OE}$	Y	1.5	6.2	6.9	2.1	3.9	5.6	6.3	ns	
t <sub>PLZ</sub>			1.2	5.5	6	1.8	3.2	5.1	5.6		

NOTE 5: Load circuit and voltage waveforms are shown in Section 1.



**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
SN74LVT244DBLE	OBsolete	SSOP	DB	20		TBD	Call TI	Call TI
SN74LVT244DW	OBsolete	SOIC	DW	20		TBD	Call TI	Call TI
SN74LVT244DWR	OBsolete	SOIC	DW	20		TBD	Call TI	Call TI
SN74LVT244PWLE	OBsolete	TSSOP	PW	20		TBD	Call TI	Call TI
SNJ54LVT244FK	OBsolete	LCCC	FK	20		TBD	Call TI	Call TI
SNJ54LVT244J	OBsolete	CDIP	J	20		TBD	Call TI	Call TI
SNJ54LVT244W	OBsolete	CFP	W	20		TBD	Call TI	Call TI

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBsolete:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

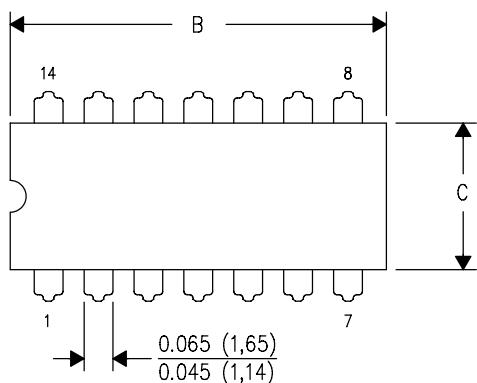
**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

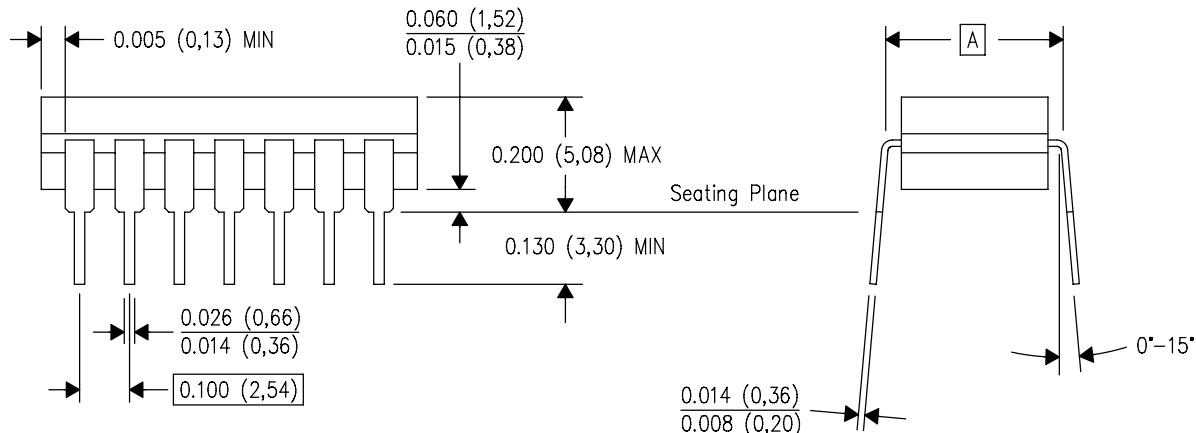
J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

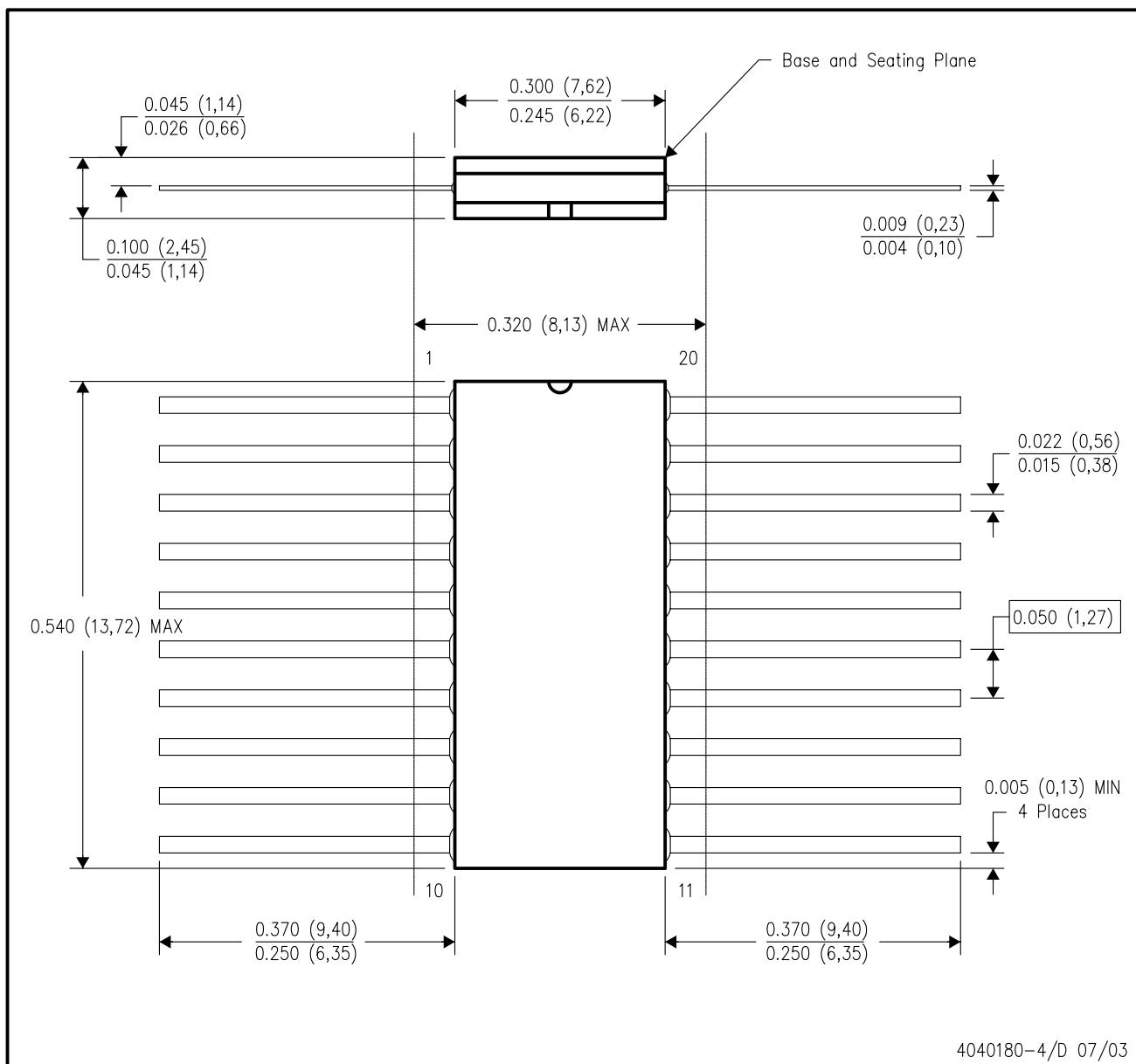


4040083/F 03/03

NOTES: A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.  
C. This package is hermetically sealed with a ceramic lid using glass frit.  
D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.  
E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



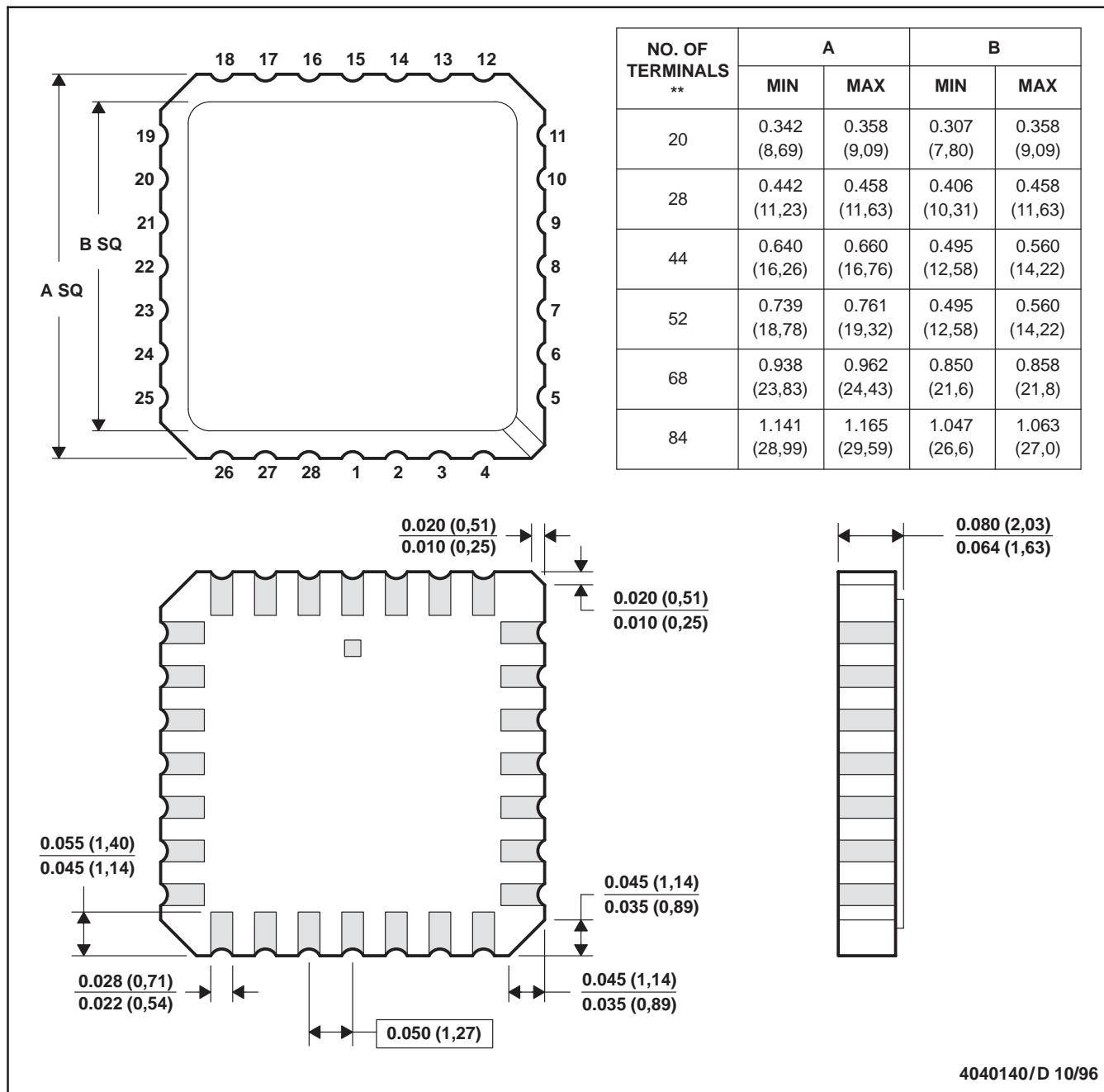
NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only.
- E. Falls within Mil-Std 1835 GDFP2-F20

## FK (S-CQCC-N\*\*)

## LEADLESS CERAMIC CHIP CARRIER

## 28 TERMINAL SHOWN

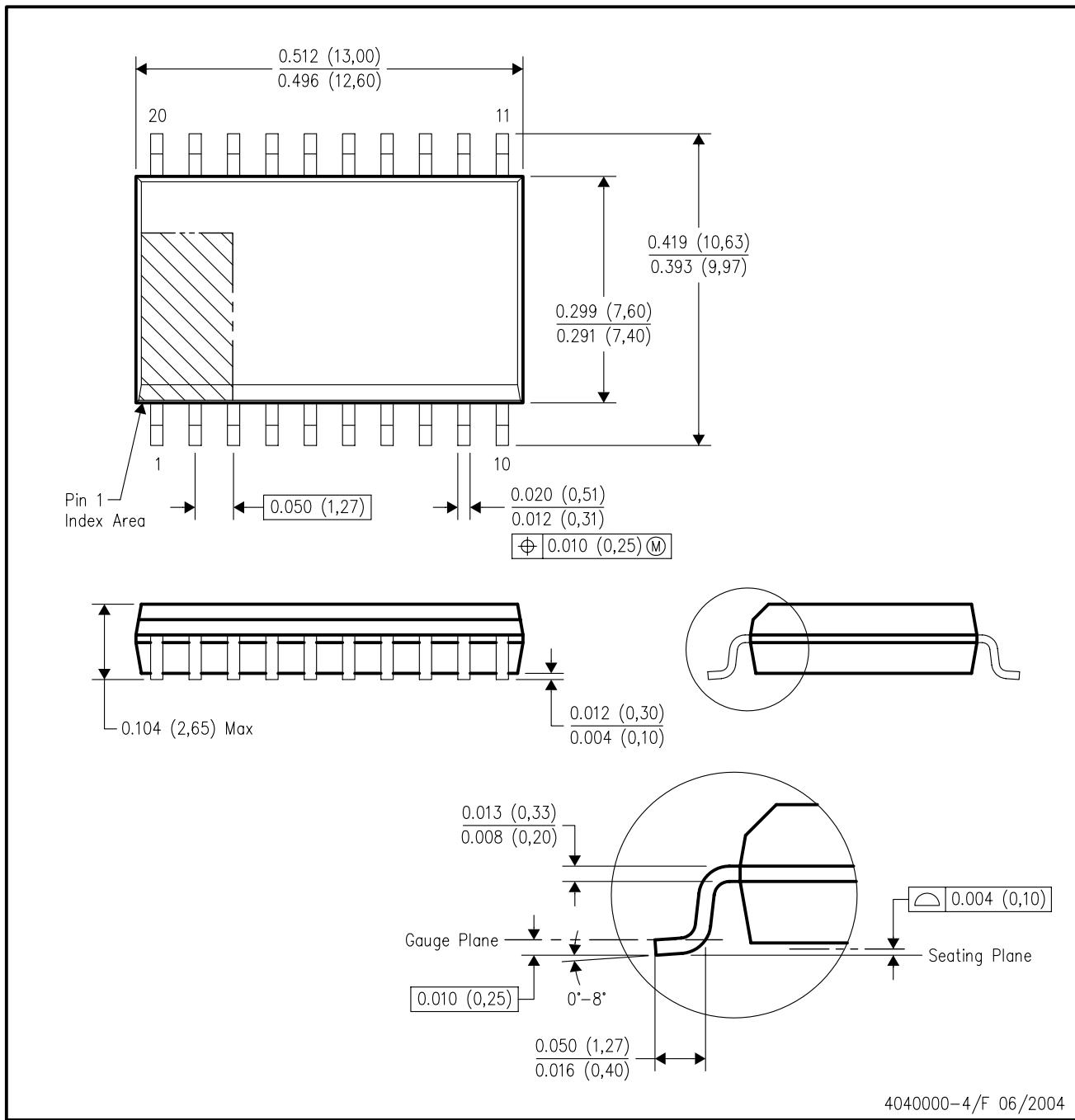


NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a metal lid.
- D. The terminals are gold plated.
- E. Falls within JEDEC MS-004

## DW (R-PDSO-G20)

## PLASTIC SMALL-OUTLINE PACKAGE



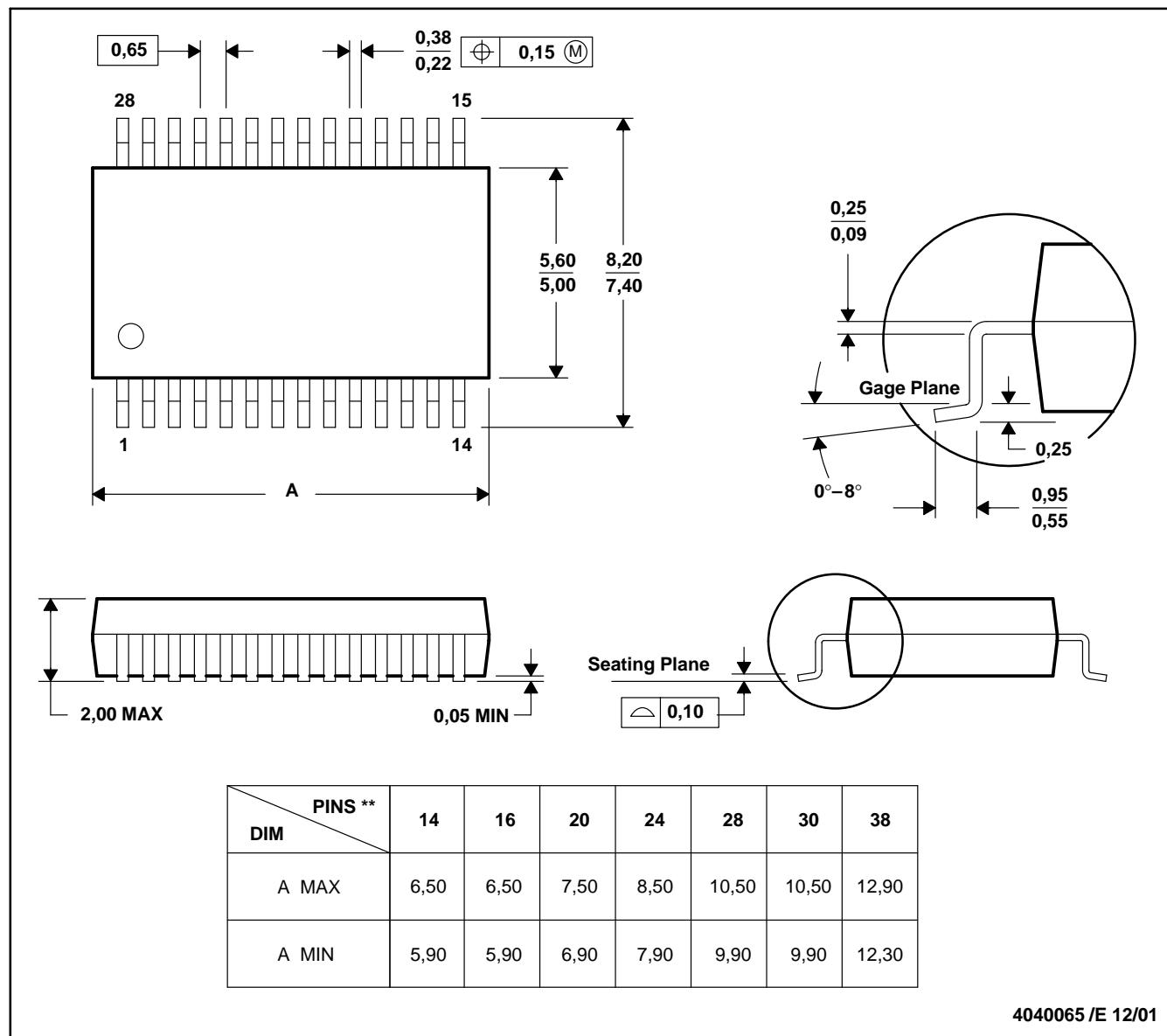
NOTES:

- All linear dimensions are in inches (millimeters).
- This drawing is subject to change without notice.
- Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
- Falls within JEDEC MS-013 variation AC.

## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

28 PINS SHOWN

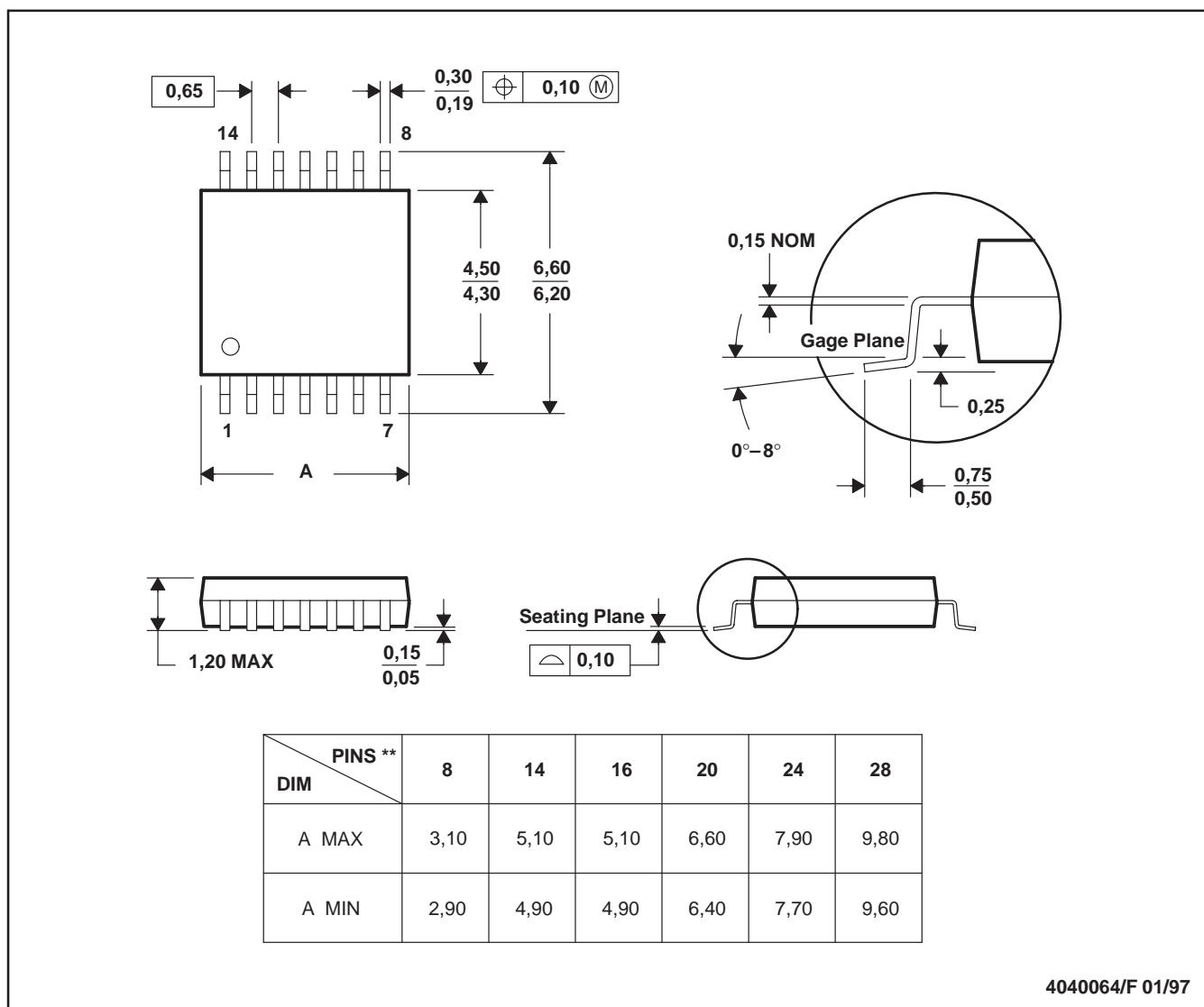


NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

## PW (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



NOTES:

- All linear dimensions are in millimeters.
- This drawing is subject to change without notice.
- Body dimensions do not include mold flash or protrusion not to exceed 0,15.
- Falls within JEDEC MO-153

## 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:

<b>Products</b>		<b>Applications</b>	
Amplifiers	amplifier.ti.com	Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Data Converters	dataconverter.ti.com	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
DSP	dsp.ti.com	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Interface	interface.ti.com	Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Logic	logic.ti.com	Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Power Mgmt	power.ti.com	Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Microcontrollers	microcontroller.ti.com	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 © 2005, Texas Instruments Incorporated