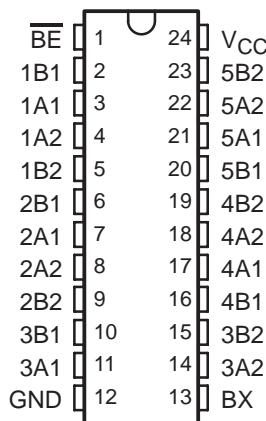


SN74CB3T3383  
10-BIT FET BUS-EXCHANGE SWITCH  
2.5-V/3.3-V LOW-VOLTAGE BUS SWITCH WITH 5-V-TOLERANT LEVEL SHIFTER

SCDS158A – OCTOBER 2003 – REVISED DECEMBER 2004

- Output Voltage Translation Tracks V<sub>CC</sub>
- Supports Mixed-Mode Signal Operation On All Data I/O Ports
  - 5-V Input Down To 3.3-V Output Level Shift With 3.3-V V<sub>CC</sub>
  - 5-V/3.3-V Input Down To 2.5-V Output Level Shift With 2.5-V V<sub>CC</sub>
- 5-V-Tolerant I/Os With Device Powered Up or Powered Down
- Bidirectional Data Flow, With Near-Zero Propagation Delay
- Low ON-State Resistance (r<sub>on</sub>) Characteristics (r<sub>on</sub> = 5 Ω Typical)
- Low Input/Output Capacitance Minimizes Loading (C<sub>io(OFF)</sub> = 8 pF Typical)
- Data and Control Inputs Provide Undershoot Clamp Diodes
- Low Power Consumption (I<sub>CC</sub> = 20 μA Max)
- V<sub>CC</sub> Operating Range From 2.3 V to 3.6 V
- Data I/Os Support 0- to 5-V Signaling Levels (0.8 V, 1.2 V, 1.5 V, 1.8 V, 2.5 V, 3.3 V, 5 V)
- Control Inputs Can Be Driven by TTL or 5-V/3.3-V CMOS Outputs
- I<sub>off</sub> Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Performance Tested Per JESD 22
  - 2000-V Human-Body Model (A114-B, Class II)
  - 1000-V Charged-Device Model (C101)
- Supports Digital Applications: Level Translation, Memory Interleaving, Bus Isolation
- Ideal for Low-Power Portable Equipment

DBQ, DGV, DW, OR PW PACKAGE  
(TOP VIEW)



### description/ordering information

#### ORDERING INFORMATION

T <sub>A</sub>	PACKAGE <sup>†</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
−40°C to 85°C	SOIC – DW	Tube	SN74CB3T3383DW	CB3T3383
		Tape and reel	SN74CB3T3383DWR	
	SSOP (QSOP) – DBQ	Tape and reel	SN74CB3T3383DBQR	CB3T3383
	TSSOP – PW	Tube	SN74CB3T3383PW	KS383
		Tape and reel	SN74CB3T3383PWR	
	TVSOP – DGV	Tape and reel	SN74CB3T3383DGVR	KS383

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

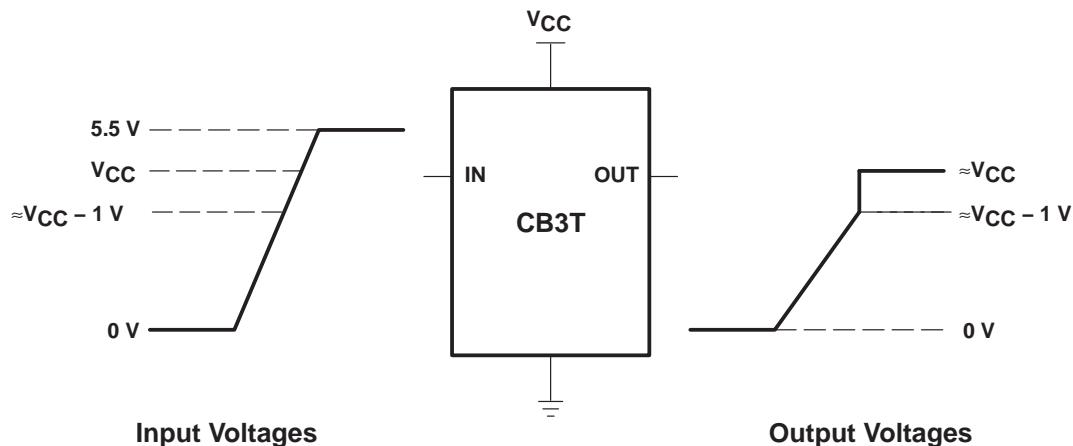
Copyright © 2004, Texas Instruments Incorporated

 **TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

## description/ordering information (continued)

The SN74CB3T3383 is a high-speed TTL-compatible FET bus-exchange switch with low ON-state resistance ( $r_{on}$ ), allowing for minimal propagation delay. The device fully supports mixed-mode signal operation on all data I/O ports by providing voltage translation that tracks  $V_{CC}$ . The SN74CB3T3383 supports systems using 5-V TTL, 3.3-V LVTTL, and 2.5-V CMOS switching standards, as well as user-defined switching levels (see Figure 1).



NOTE A: If the input high voltage ( $V_{IH}$ ) level is greater than or equal to  $V_{CC} - 1$  V, and less than or equal to 5.5 V, then the output high voltage ( $V_{OH}$ ) level will be equal to approximately the  $V_{CC}$  voltage level.

**Figure 1. Typical DC Voltage Translation Characteristics**

The SN74CB3T3383 is organized as a 10-bit bus switch or as a 5-bit bus-exchange with enable ( $\overline{BE}$ ) input. When used as a 5-bit bus-exchange, the device provides data exchanging between four signal ports. When  $\overline{BE}$  is low, the bus-exchange switch is ON, and the select input (BX) controls the data path. When  $\overline{BE}$  is high, the bus-exchange switch is OFF, and a high-impedance state exists between the A and B ports.

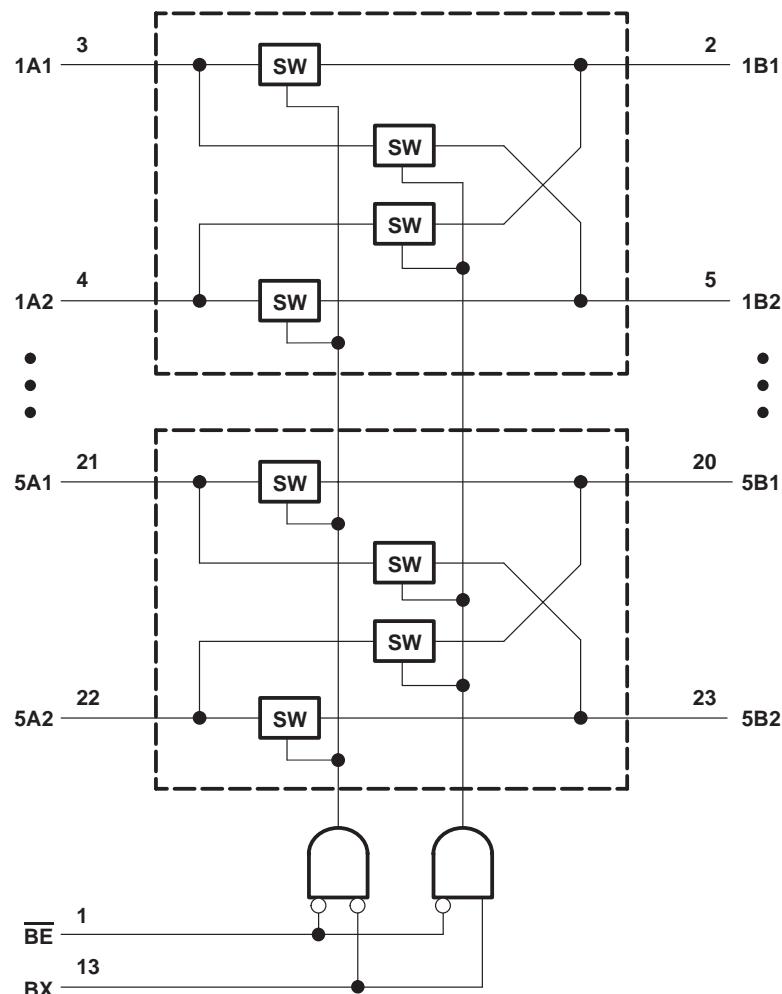
This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  feature ensures that damaging current will not backflow through the device when it is powered down. The device has isolation during power off.

To ensure the high-impedance state during power up or power down,  $\overline{BE}$  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.

**FUNCTION TABLE**  
(each 5-bit switch)

INPUTS		INPUTS/OUTPUTS		FUNCTION
$\overline{BE}$	$B_X$	A1	A2	
L	L	B1	B2	A1 port = B1 port A2 port = B2 port
L	H	B2	B1	A1 port = B2 port A2 port = B1 port
H	X	Z	Z	Disconnect

**logic diagram (positive logic)**



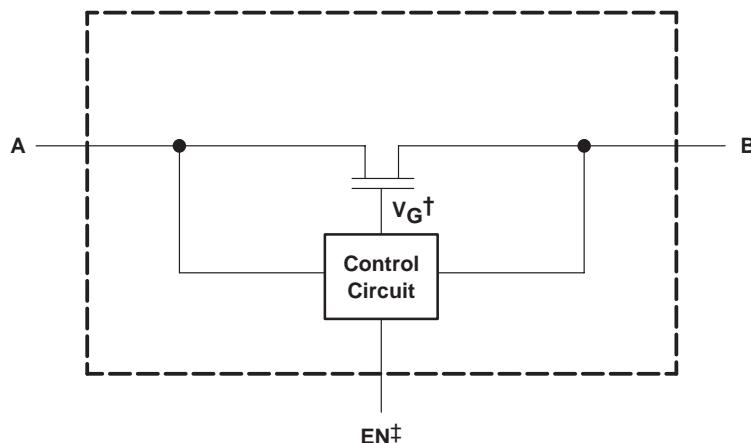
**SN74CB3T3383**

## 10-BIT FET BUS-EXCHANGE SWITCH

## 2.5-V/3.3-V LOW-VOLTAGE BUS SWITCH WITH 5-V-TOLERANT LEVEL SHIFTER

SCDS158A – OCTOBER 2003 – REVISED DECEMBER 2004

### **simplified schematic, each FET switch (SW)**



$\dagger$  Gate Voltage ( $V_G$ ) is approximately equal to  $V_{CC} + V_T$  when the switch is ON and  $V_I > V_{CC} + V_T$ .

† EN is the internal enable signal applied to the switch.

**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 effect device reliability.

NOTES: 1. All voltages are with respect to ground unless otherwise specified.

1. All voltages are with respect to ground unless otherwise specified.
2. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
3.  $V_I$  and  $V_O$  are used to denote specific conditions for  $V_{I/O}$ .
4.  $I_I$  and  $I_O$  are used to denote specific conditions for  $I_{I/O}$ .
5. The package thermal impedance is calculated in accordance with JEDEC 51-7.

recommended operating conditions (see Note 6)

			MIN	MAX	UNIT
$V_{CC}$	Supply voltage		2.3	3.6	V
$V_{IH}$	High-level control input voltage	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7	5.5	V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	2	5.5	
$V_{IL}$	Low-level control input voltage	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0	0.7	V
		$V_{CC} = 2.7\text{ V to }3.6\text{ V}$	0	0.8	
$V_{I/O}$	Data input/output voltage		0	5.5	V
$T_A$	Operating free-air temperature		-40	85	°C

NOTE 6: All unused control inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



SN74CB3T3383  
**10-BIT FET BUS-EXCHANGE SWITCH**  
**2.5-V/3.3-V LOW-VOLTAGE BUS SWITCH WITH 5-V-TOLERANT LEVEL SHIFTER**  
SCDS158A – OCTOBER 2003 – REVISED DECEMBER 2004

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

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V <sub>IK</sub>		V <sub>CC</sub> = 3 V, I <sub>I</sub> = -18 mA			-1.2	V
V <sub>OH</sub>		See Figures 3 and 4				
I <sub>IN</sub> ‡	Control inputs	V <sub>CC</sub> = 3.6 V, V <sub>IN</sub> ‡ = 3.6 V to 5.5 V or GND			±10	µA
I <sub>I</sub>		V <sub>CC</sub> = 3.6 V, Switch ON, V <sub>IN</sub> = V <sub>CC</sub> or GND	V <sub>I</sub> = V <sub>CC</sub> - 0.7 V to 5.5 V		±20	µA
			V <sub>I</sub> = 0.7 V to V <sub>CC</sub> - 0.7 V		-40	
			V <sub>I</sub> = 0 to 0.7 V		±5	
I <sub>OZ</sub> §		V <sub>CC</sub> = 3.6 V, V <sub>O</sub> = 0 to 5.5 V, V <sub>I</sub> = 0, Switch OFF, V <sub>IN</sub> = V <sub>CC</sub> or GND			±10	µA
I <sub>off</sub>		V <sub>CC</sub> = 0, V <sub>O</sub> = 0 to 5.5 V, V <sub>I</sub> = 0,			10	µA
I <sub>CC</sub>		V <sub>CC</sub> = 3.6 V, I <sub>I/O</sub> = 0, Switch ON or OFF, V <sub>IN</sub> = V <sub>CC</sub> or GND	V <sub>I</sub> = V <sub>CC</sub> or GND		20	µA
			V <sub>I</sub> = 5.5 V		20	
ΔI <sub>CC</sub> ¶	Control inputs	V <sub>CC</sub> = 3 V to 3.6 V, One input at V <sub>CC</sub> - 0.6 V, Other inputs at V <sub>CC</sub> or GND			300	µA
C <sub>in</sub>	Control inputs	V <sub>CC</sub> = 3.3 V, V <sub>IN</sub> = V <sub>CC</sub> or GND			4	pF
C <sub>io(OFF)</sub>		V <sub>CC</sub> = 3.3 V, V <sub>I/O</sub> = 5.5 V, 3.3 V, or GND, Switch OFF, V <sub>IN</sub> = V <sub>CC</sub> or GND			8	pF
C <sub>io(ON)</sub>		V <sub>CC</sub> = 3.3 V, Switch ON, V <sub>IN</sub> = V <sub>CC</sub> or GND	V <sub>I/O</sub> = 5.5 V or 3.3 V		7	pF
			V <sub>I/O</sub> = GND		21	
r <sub>on</sub> ¶		V <sub>CC</sub> = 2.3 V, TYP at V <sub>CC</sub> = 2.5 V, V <sub>I</sub> = 0	I <sub>O</sub> = 24 mA		5	Ω
			I <sub>O</sub> = 16 mA		5	
		V <sub>CC</sub> = 3 V, V <sub>I</sub> = 0	I <sub>O</sub> = 64 mA		5	
			I <sub>O</sub> = 32 mA		5	

† All typical values are at V<sub>CC</sub> = 3.3 V (unless otherwise noted), T<sub>A</sub> = 25°C.

‡ V<sub>IN</sub> and I<sub>IN</sub> refer to control inputs. V<sub>I</sub>, V<sub>O</sub>, I<sub>I</sub>, and I<sub>O</sub> refer to data pins.

§ For I/O ports, the parameter I<sub>OZ</sub> includes the input leakage current.

¶ This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V<sub>CC</sub> or GND.

# Measured by the voltage drop between A and B terminals at the indicated current through the switch. ON-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

**SN74CB3T3383****10-BIT FET BUS-EXCHANGE SWITCH****2.5-V/3.3-V LOW-VOLTAGE BUS SWITCH WITH 5-V-TOLERANT LEVEL SHIFTER**

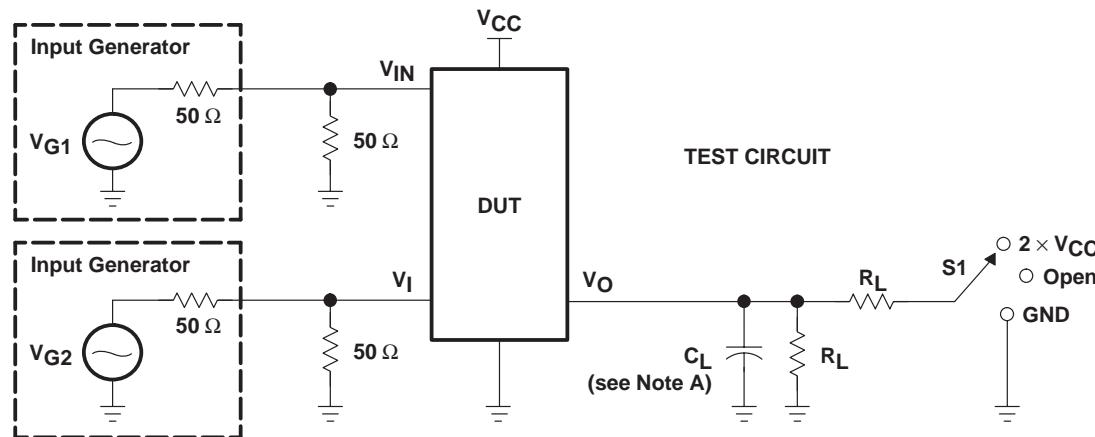
SCDS158A – OCTOBER 2003 – REVISED DECEMBER 2004

switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 2)

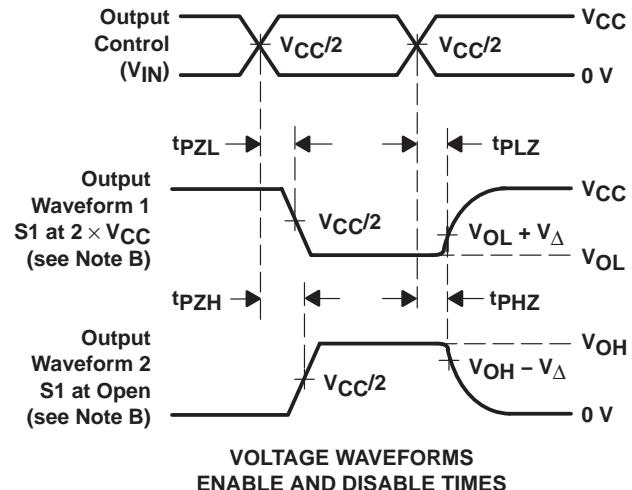
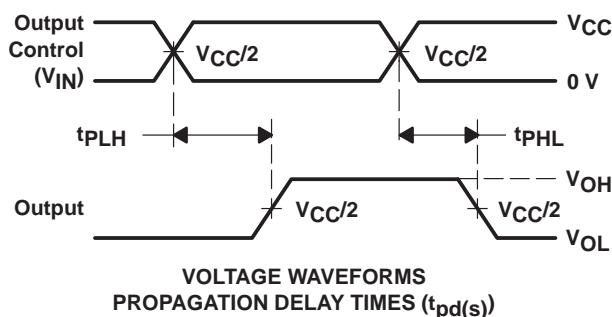
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$		$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	
$t_{pd}^{\dagger}$	A or B	B or A	0.15		0.25		ns
$t_{pd(s)}$	BX	A or B	1	15	1	10	
$t_{en}$	$\overline{BE}$	A or B	1	13.5	1	9	ns
$t_{dis}$	$\overline{BE}$	A or B	1	7	1	8.5	ns

<sup>†</sup> The propagation delay is the calculated RC time constant of the typical ON-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

PARAMETER MEASUREMENT INFORMATION



TEST	$V_{CC}$	$S_1$	$R_L$	$V_I$	$C_L$	$V_\Delta$
$t_{pd(s)}$	$2.5 \text{ V} \pm 0.2 \text{ V}$ $3.3 \text{ V} \pm 0.3 \text{ V}$	Open Open	$500 \Omega$ $500 \Omega$	$3.6 \text{ V}$ or $0 \text{ V}$ $5.5 \text{ V}$ or $0 \text{ V}$	$30 \text{ pF}$ $50 \text{ pF}$	
$t_{PLZ}/t_{PZL}$	$2.5 \text{ V} \pm 0.2 \text{ V}$ $3.3 \text{ V} \pm 0.3 \text{ V}$	$2 \times V_{CC}$ $2 \times V_{CC}$	$500 \Omega$ $500 \Omega$	$0 \text{ V}$ $0 \text{ V}$	$30 \text{ pF}$ $50 \text{ pF}$	$0.15 \text{ V}$ $0.3 \text{ V}$
$t_{PHZ}/t_{PZH}$	$2.5 \text{ V} \pm 0.2 \text{ V}$ $3.3 \text{ V} \pm 0.3 \text{ V}$	Open Open	$500 \Omega$ $500 \Omega$	$3.6 \text{ V}$ $5.5 \text{ V}$	$30 \text{ pF}$ $50 \text{ pF}$	$0.15 \text{ V}$ $0.3 \text{ V}$



NOTES:

- A.  $C_L$  includes probe and jig capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2.5 \text{ ns}$ ,  $t_f \leq 2.5 \text{ ns}$ .
- D. The outputs are measured one at a time, with one transition per measurement.
- E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
- G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd(s)}$ . The  $t_{pd}$  propagation delay is the calculated RC time constant of the typical ON-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).
- H. All parameters and waveforms are not applicable to all devices.

Figure 2. Test Circuit and Voltage Waveforms

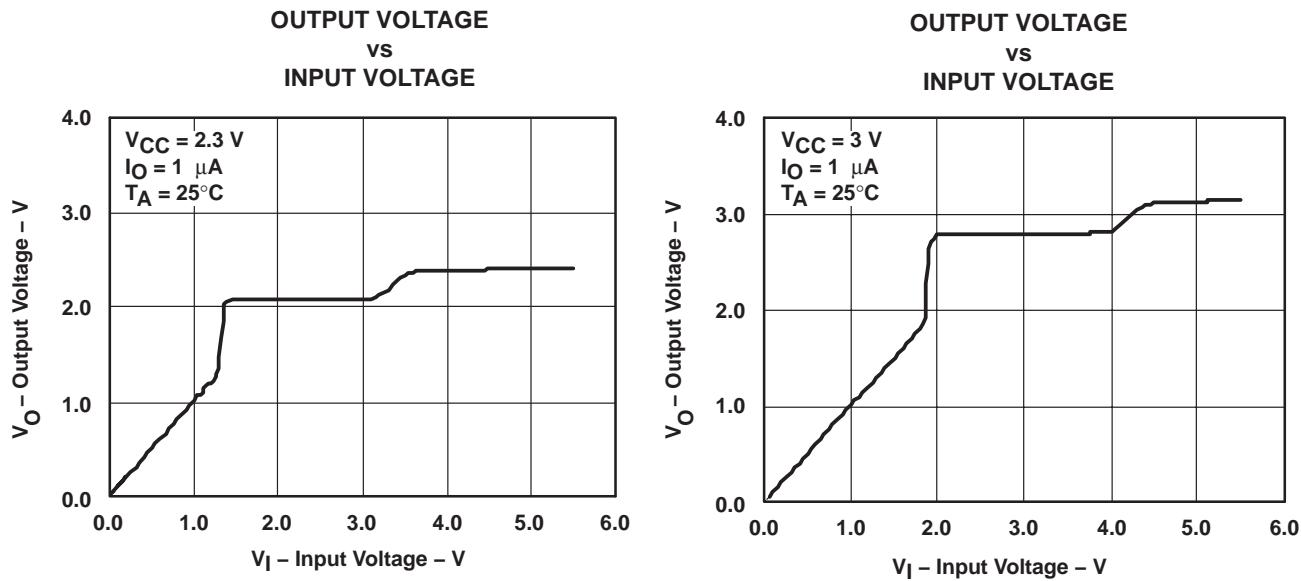
SN74CB3T3383

10-BIT FET BUS-EXCHANGE SWITCH

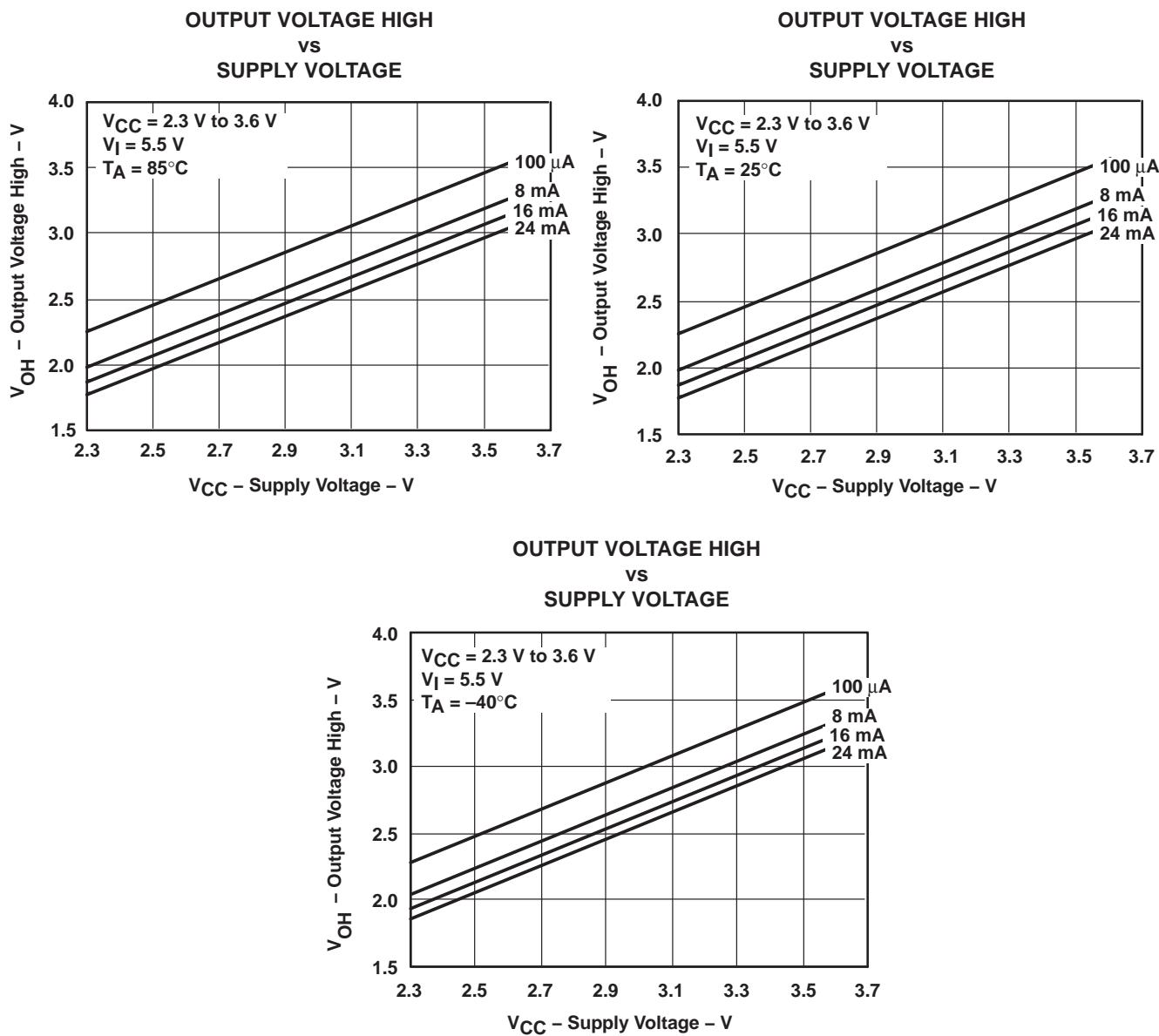
2.5-V/3.3-V LOW-VOLTAGE BUS SWITCH WITH 5-V-TOLERANT LEVEL SHIFTER

SCDS158A – OCTOBER 2003 – REVISED DECEMBER 2004

### TYPICAL CHARACTERISTICS



**TYPICAL CHARACTERISTICS (continued)**



**Figure 4.  $V_{OH}$  Values**

**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>
74CB3T3383DBQRE4	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
74CB3T3383DBQRG4	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
74CB3T3383DGVRE4	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74CB3T3383DGVRG4	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383DBQR	ACTIVE	SSOP/ QSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
SN74CB3T3383DGVR	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383DW	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383DWE4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383DWG4	ACTIVE	SOIC	DW	24	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383DWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383DWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383DWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383PW	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383PWE4	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383PWG4	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383PWR	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383PWRE4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74CB3T3383PWRG4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<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), Pb-Free (RoHS Exempt), 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.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and

---

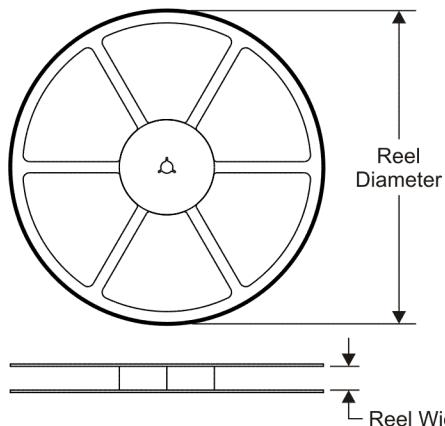
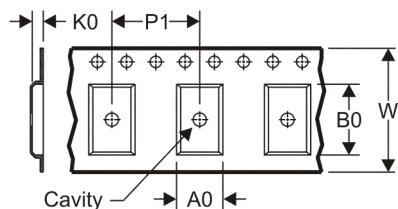
package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**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)

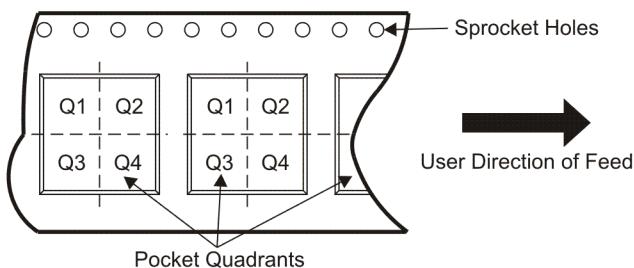
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

**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.

**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


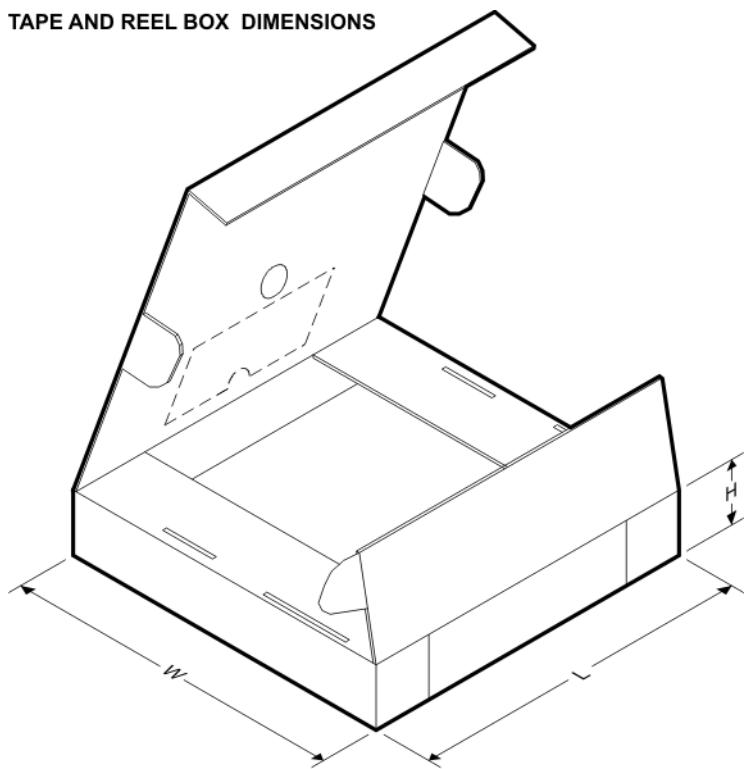
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74CB3T3383DBQR	SSOP/ QSOP	DBQ	24	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74CB3T3383DGVR	TVSOP	DGV	24	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1
SN74CB3T3383DWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74CB3T3383PWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1

**TAPE AND REEL BOX DIMENSIONS**



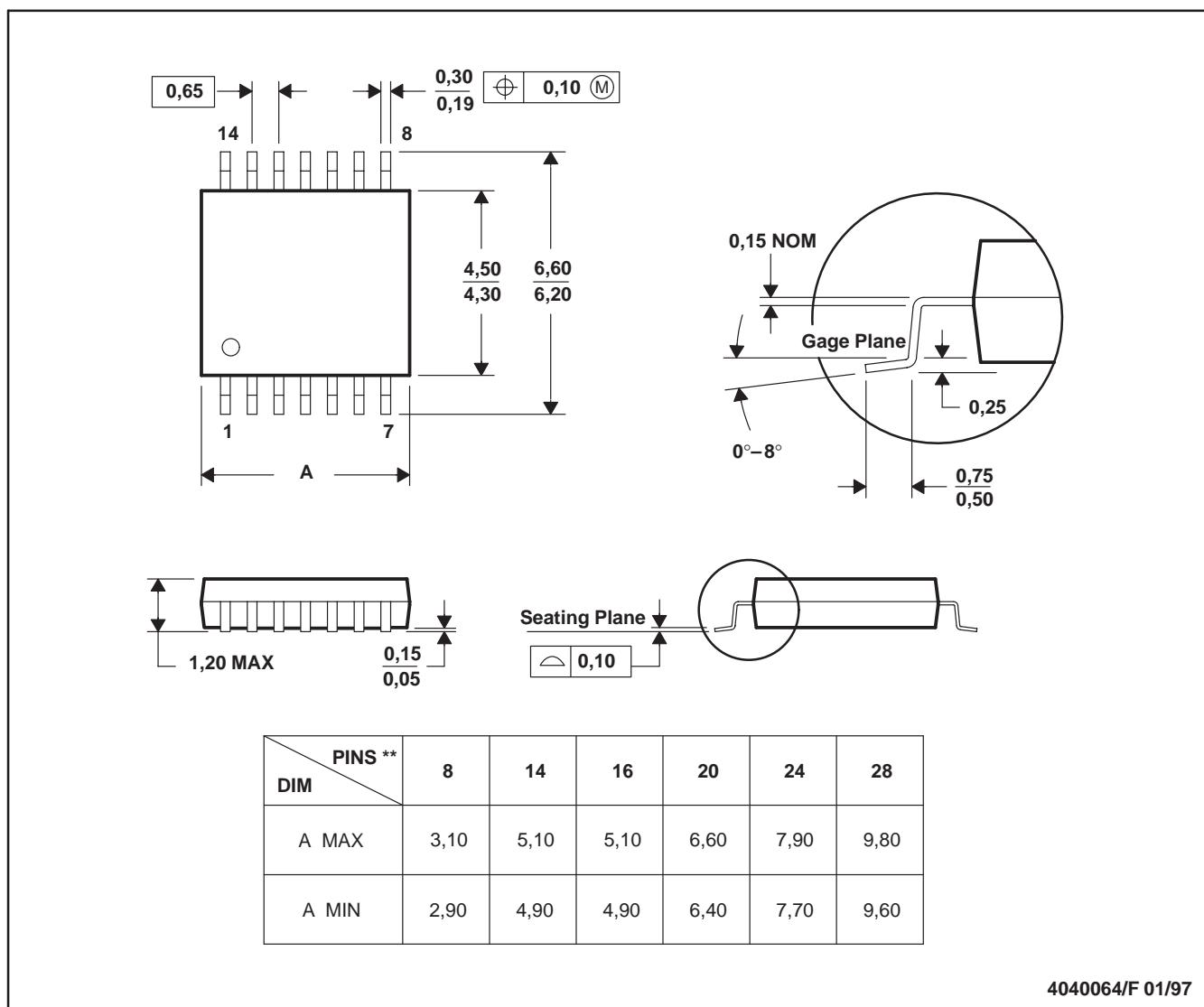
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74CB3T3383DBQR	SSOP/QSOP	DBQ	24	2500	346.0	346.0	33.0
SN74CB3T3383DGVR	TVSOP	DGV	24	2000	346.0	346.0	29.0
SN74CB3T3383DWR	SOIC	DW	24	2000	346.0	346.0	41.0
SN74CB3T3383PWR	TSSOP	PW	24	2000	346.0	346.0	33.0

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

## PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN

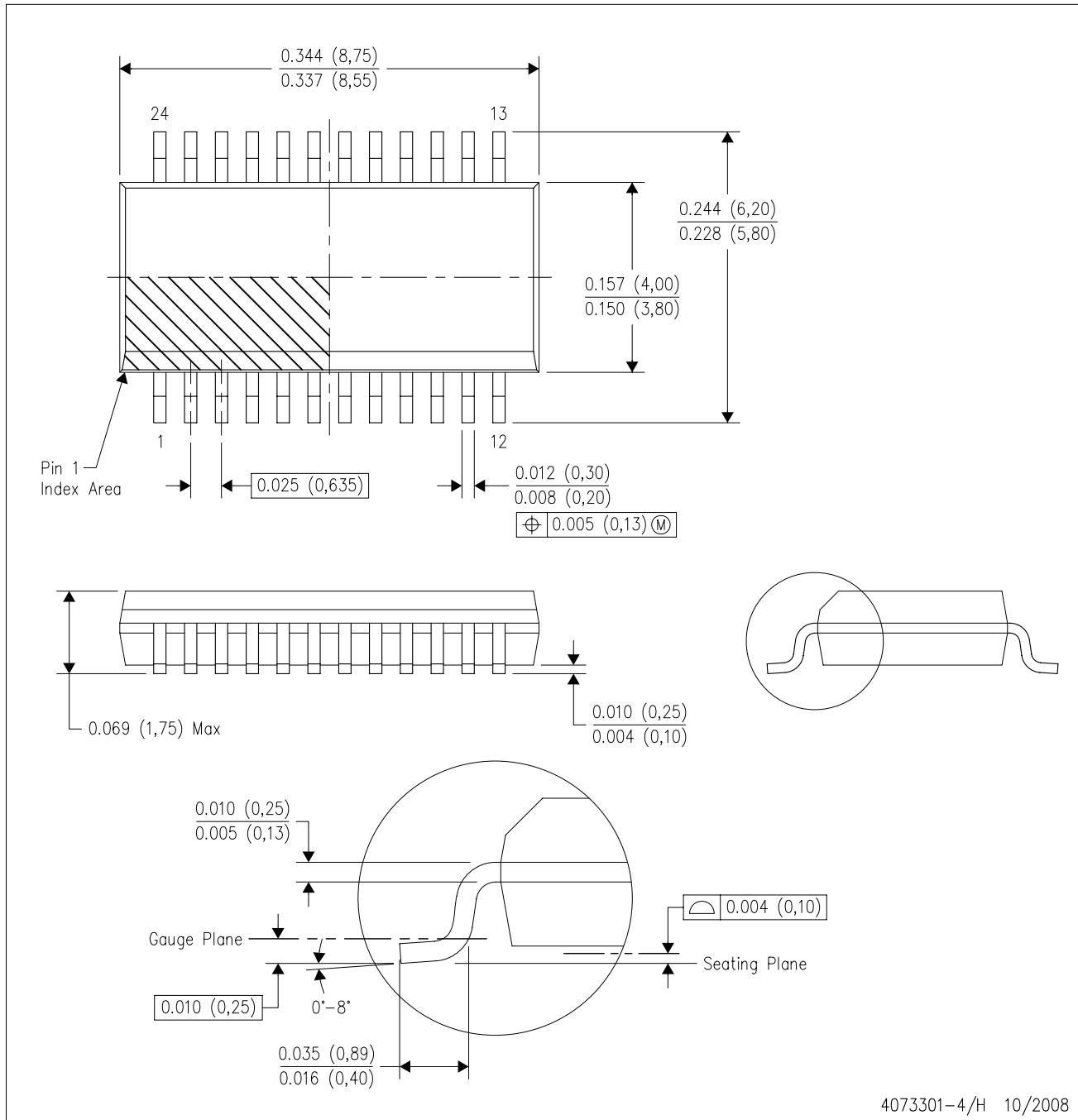


NOTES:

- 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

DBQ (R-PDSO-G24)

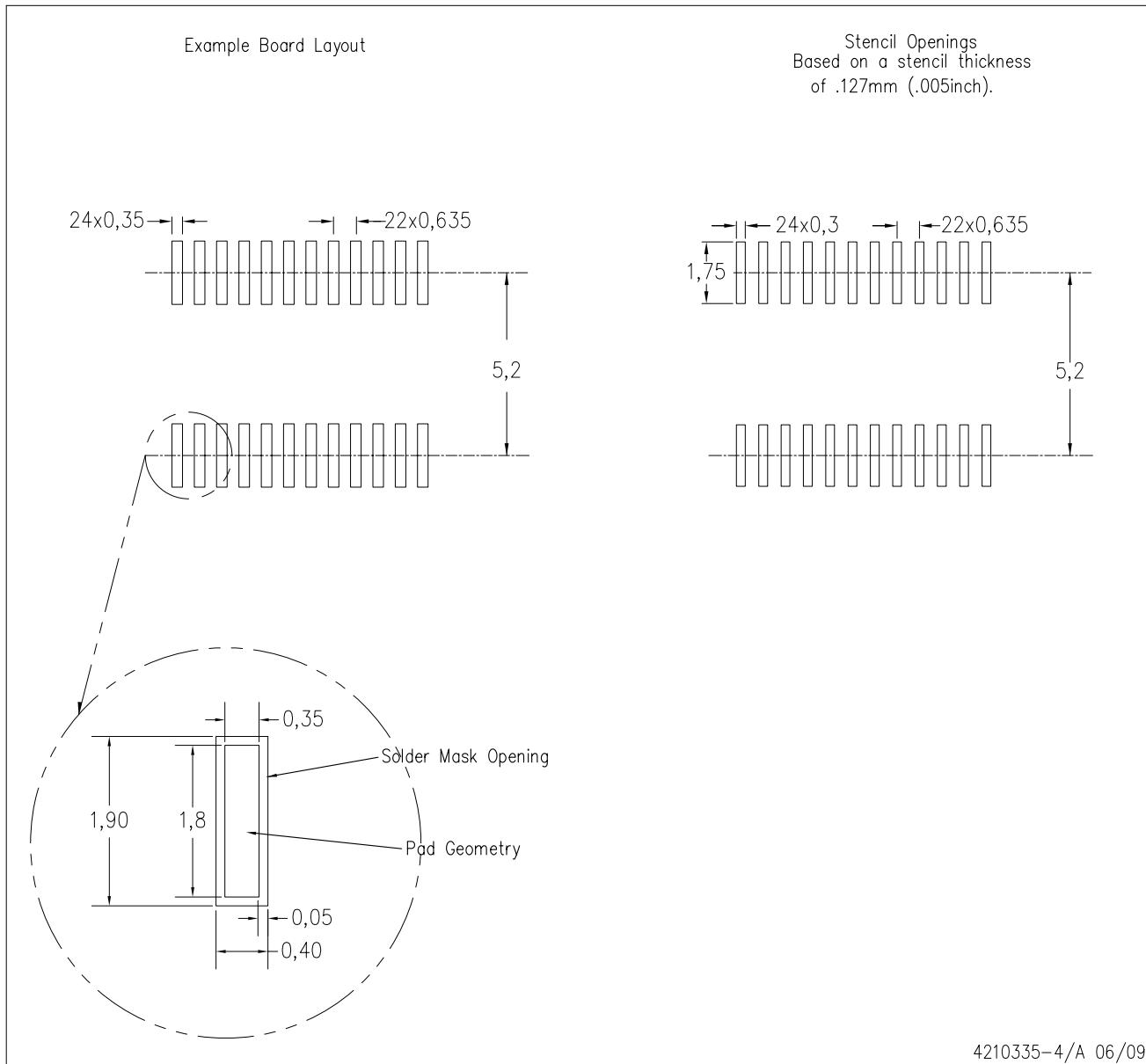
PLASTIC SMALL-OUTLINE PACKAGE



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) per side.
- Falls within JEDEC MO-137 variation AE.

## DBQ (R-PDSO-G24)



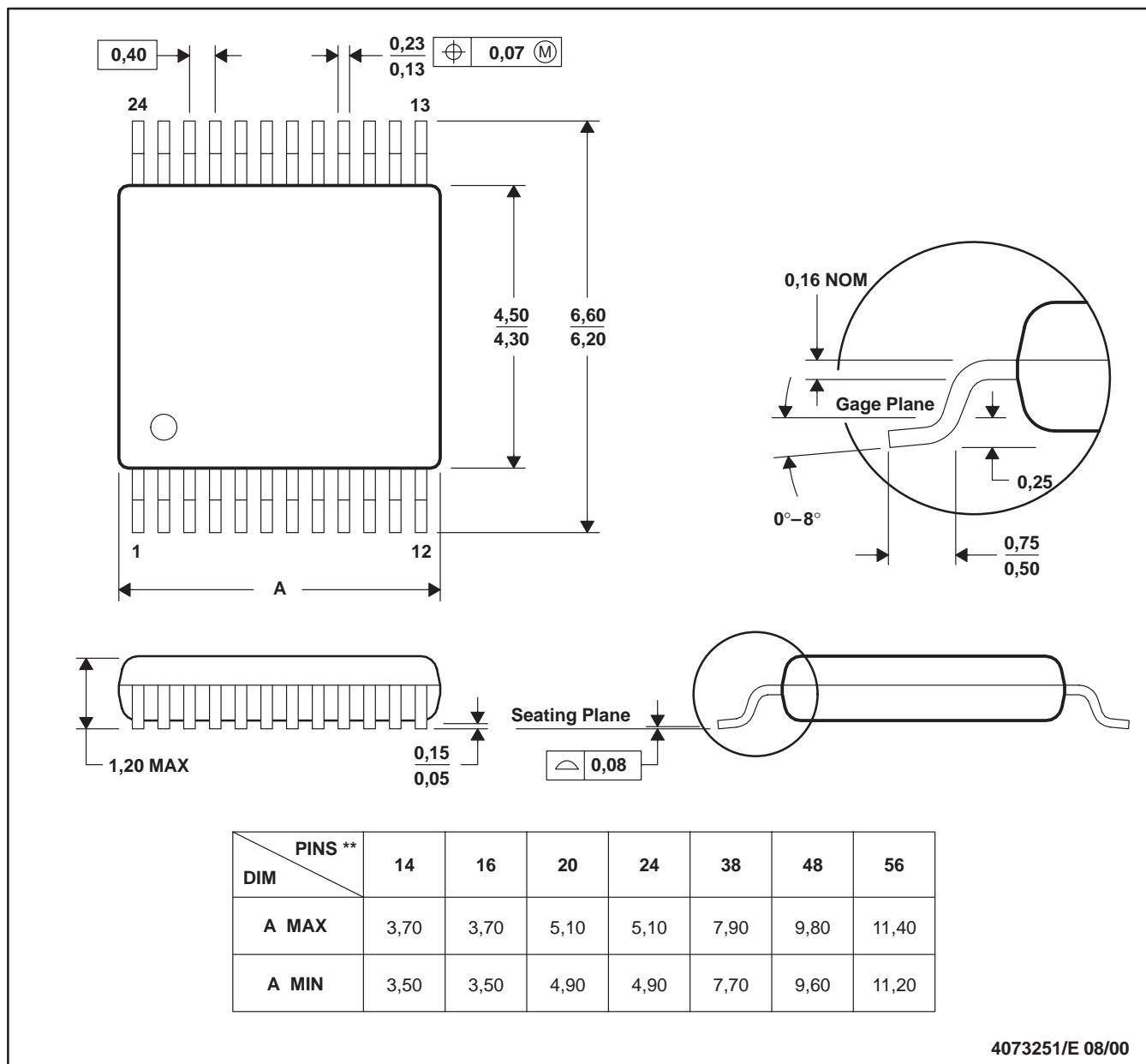
NOTES:

- All linear dimensions are in millimeters.
- This drawing is subject to change without notice.
- Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
- Publication IPC-7351 is recommended for alternate designs.
- Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

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

## PLASTIC SMALL-OUTLINE

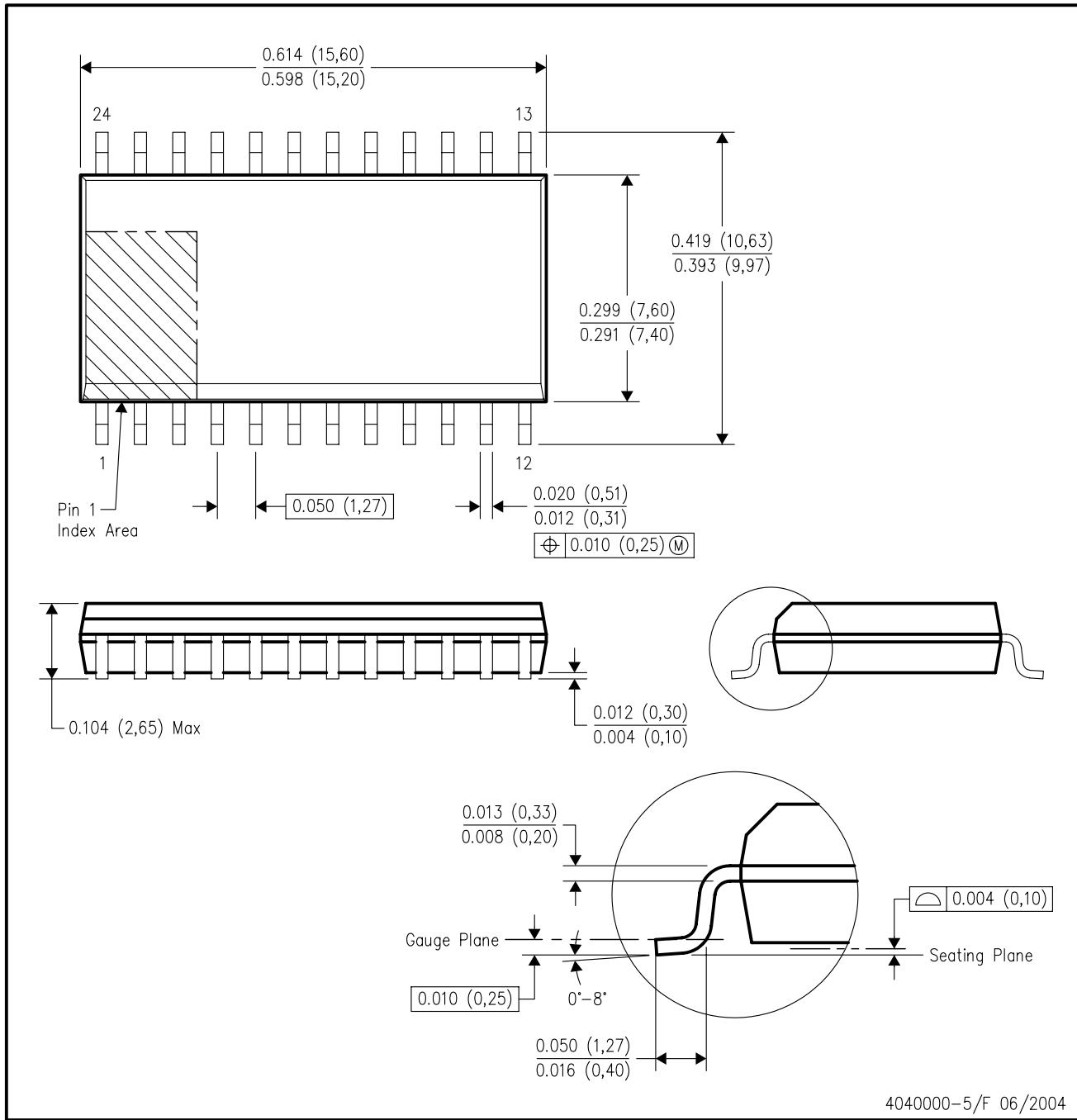
24 PINS SHOWN



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 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

## DW (R-PDSO-G24)

## 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 AD.

## 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>
DLP® Products	<a href="http://www.dlp.com">www.dlp.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 © 2009, Texas Instruments Incorporated