

The SN74LS16 is obsolete
and is no longer supplied.

SN54LS06, SN74LS06, SN74LS16 HEX INVERTER BUFFERS/DRIVERS WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS

SDLS020E – MAY 1990 – REVISED FEBRUARY 2004

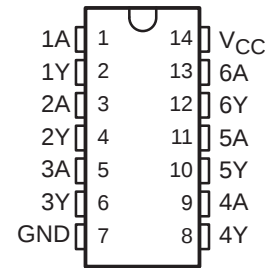
- Convert TTL Voltage Levels to MOS Levels
- High Sink-Current Capability
- Input Clamping Diodes Simplify System Design
- Open-Collector Driver for Indicator Lamps and Relays
- Inputs Fully Compatible With Most TTL Circuits

description/ordering information

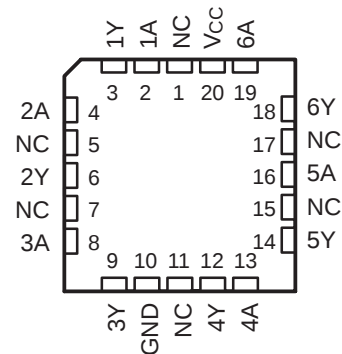
These hex inverter buffers/drivers feature high-voltage open-collector outputs to interface with high-level circuits (such as MOS), or for driving high-current loads, and also are characterized for use as inverter buffers for driving TTL inputs. The 'LS06 devices have a rated output voltage of 30 V, and the SN74LS16 has a rated output voltage of 15 V. The maximum sink current for the SN54LS06 is 30 mA, and for the SN74LS06 and SN74LS16 it is 40 mA.

These devices are compatible with most TTL families. Inputs are diode-clamped to minimize transmission effects, which simplifies design. Typical power dissipation is 175 mW, and average propagation delay time is 8 ns.

SN54LS06 . . . J PACKAGE
SN74LS06, SN74LS16 . . . D, DB, N, OR NS PACKAGE
(TOP VIEW)



SN54LS06 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

ORDERING INFORMATION

T _A	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN74LS06N	SN74LS06N
	SOIC – D	Tube	SN74LS06D	LS06
		Tape and reel	SN74LS06DR	
	SOP – NS	Tape and reel	SN74LS06NSR	74LS06
	SSOP – DB	Tape and reel	SN74LS06DBR	LS06
–55°C to 125°C	CDIP – J	Tube	SN54LS06J	SN54LS06J
		Tube	SNJ54LS06J	SNJ54LS06J
	LCCC – FK	Tube	SNJ54LS06FK	SNJ54LS06FK

[†] Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at 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.

**TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2004, Texas Instruments Incorporated
On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

SN54LS06, SN74LS06, SN74LS16

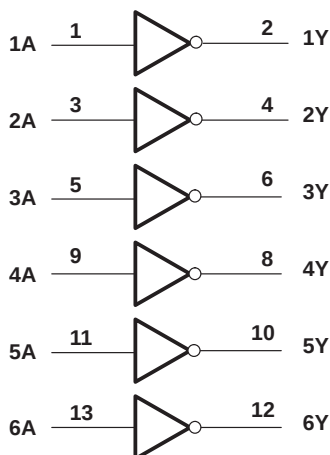
HEX INVERTER BUFFERS/DRIVERS

WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS

SDLS020E – MAY 1990 – REVISED FEBRUARY 2004

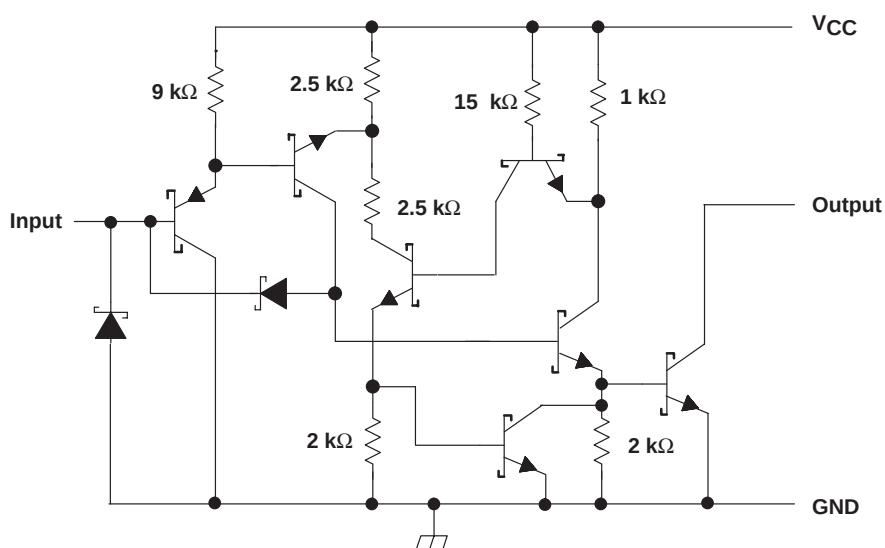
The SN74LS16 is obsolete
and is no longer supplied.

logic diagram (positive logic)



Pin numbers shown are for the D, DB, J, N, and NS packages.

schematic (each gate)



Resistor values shown are nominal.

The SN74LS16 is obsolete
and is no longer supplied.

SN54LS06, SN74LS06, SN74LS16 HEX INVERTER BUFFERS/DRIVERS WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS

SDLS020E – MAY 1990 – REVISED FEBRUARY 2004

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage, V_{CC}	7 V
Input voltage, V_I (see Note 1)	7 V
Output voltage, V_O (see Notes 1 and 2): SN54LS06, SN74LS06	30 V
SN74LS16	15 V
Package thermal impedance, θ_{JA} (see Note 3): D package	86°C/W
DB package	96°C/W
N package	80°C/W
NS package	76°C/W
Storage temperature range, T_{stg}	–65°C to 150°C

[†] 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. All voltage values are with respect to GND.
2. This is the maximum voltage that should be applied to any output when it is in the off state.
3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 4)

			SN54LS06			SN74LS06 SN74LS16			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage		4.5	5	5.5	4.75	5	5.25	V
V _{IH}	High-level input voltage		2			2			V
V _{IL}	Low-level input voltage		0.8			0.8			V
V _{OH}	High-level output voltage	'LS06	30			30			V
		SN74LS16				15			
I _{OL}	Low-level output current		30			40			mA
T _A	Operating free-air temperature		−55 125			0 70			°C

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS [‡]		SN54LS06			SN74LS06 SN74LS16			UNIT
			MIN	TYP [§]	MAX	MIN	TYP [§]	MAX	
V_{IK}	$V_{CC} = \text{MIN}$, $I_I = -12 \text{ mA}$				–1.5			–1.5	V
I_{OH}	$V_{CC} = \text{MIN}$, $V_{IL} = 0.8 \text{ V}$	'LS06, $V_{OH} = 30 \text{ V}$			0.25			0.25	mA
		SN74LS16, $V_{OH} = 15 \text{ V}$						0.25	
V_{OL}	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$	$I_{OL} = 16 \text{ mA}$		0.25	0.4		0.25	0.4	V
		$I_{OL} = 30 \text{ mA}$			0.7				
		$I_{OL} = 40 \text{ mA}$						0.7	
I_I	$V_{CC} = \text{MAX}$, $V_I = 7 \text{ V}$			1			1		mA
I_{IH}	$V_{CC} = \text{MAX}$, $V_I = 2.4 \text{ V}$			20			20		μA
I_{IL}	$V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$			–0.2			–0.2		mA
I_{CCH}	$V_{CC} = \text{MAX}$			18			18		mA
I_{CCL}	$V_{CC} = \text{MAX}$			60			60		mA

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

[§] All typical values are at $V_{CC} = 5 \text{ V}$, and $T_A = 25^\circ\text{C}$.



SN54LS06, SN74LS06, SN74LS16
HEX INVERTER BUFFERS/DRIVERS
WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS

SDLS020E – MAY 1990 – REVISED FEBRUARY 2004

The SN74LS16 is obsolete
and is no longer supplied.

switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$ (see Figure 1)

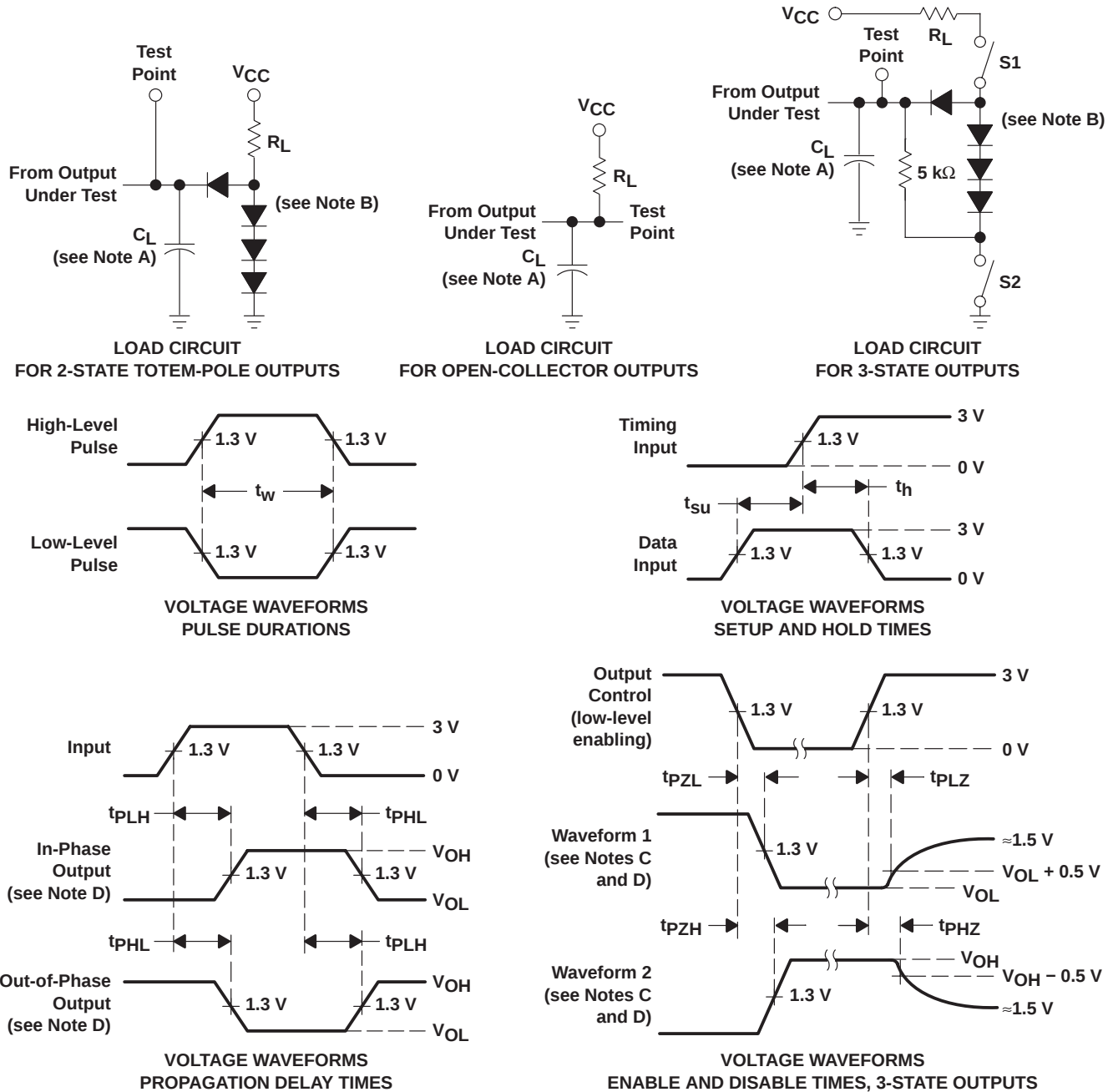
PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	MAX	UNIT
t_{PLH}	A	Y	$R_L = 110\ \Omega$, $C_L = 15\text{ pF}$	7	15	ns
t_{PHL}				10	20	

The SN74LS16 is obsolete
and is no longer supplied.

SN54LS06, SN74LS06, SN74LS16 HEX INVERTER BUFFERS/DRIVERS WITH OPEN-COLLECTOR HIGH-VOLTAGE OUTPUTS

SDLS020E – MAY 1990 – REVISED FEBRUARY 2004

PARAMETER MEASUREMENT INFORMATION



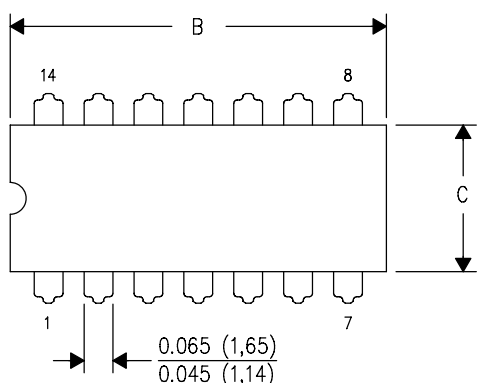
- NOTES: A. C_L includes probe and jig capacitance.
B. All diodes are 1N3064 or equivalent.
C. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
D. S1 and S2 are closed for t_{PLH} , t_{PHL} , t_{PHZ} , and t_{PLZ} ; S1 is open and S2 is closed for t_{PZH} ; S1 is closed and S2 is open for t_{PZL} .
E. Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.
F. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O \approx 50 \Omega$, $t_r \leq 1.5$ ns, $t_f \leq 2.6$ ns.
G. The outputs are measured one at a time, with one input transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

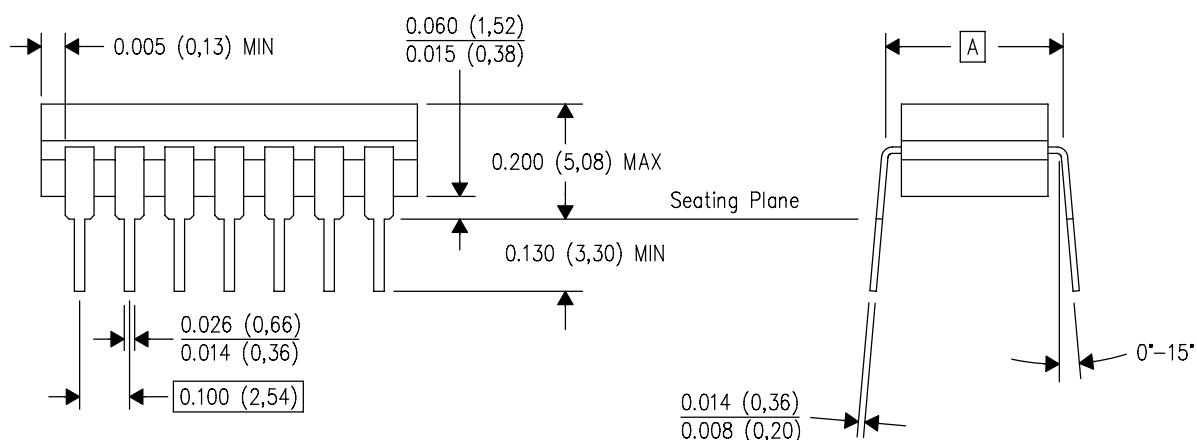
J (R-GDIP-T**)

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)



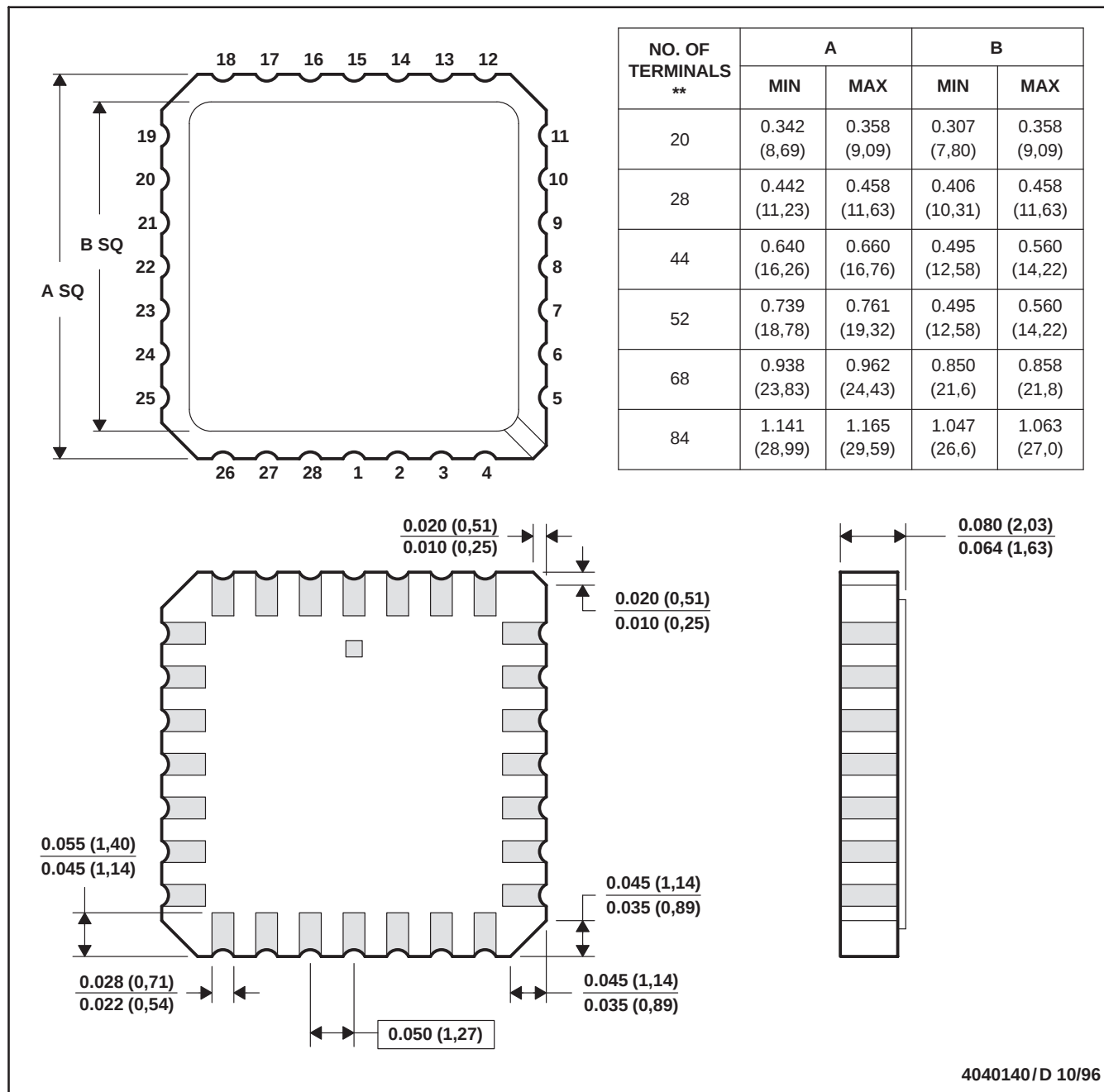
4040083/F 03/03

- 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.

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

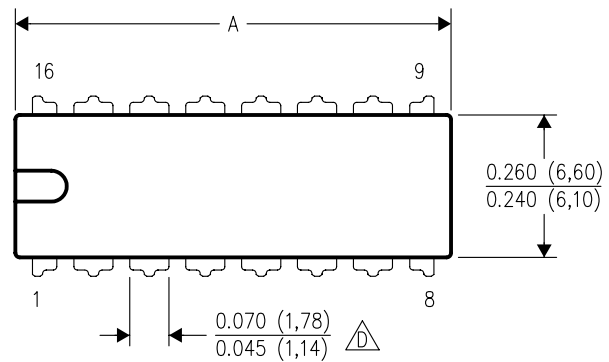


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a metal lid.
 - D. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

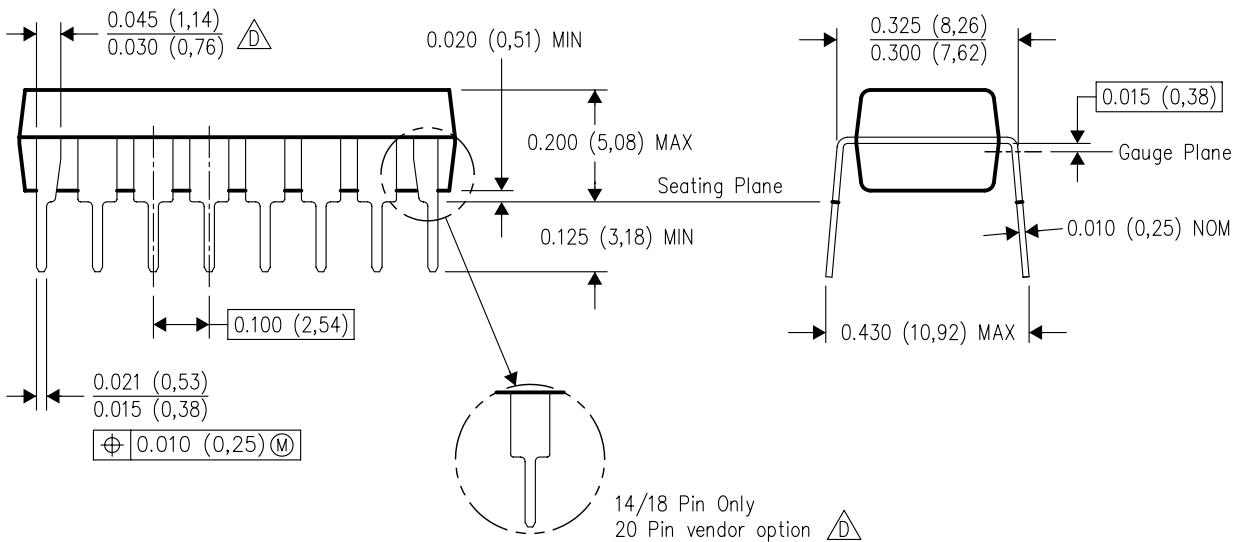
N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS **	14	16	18	20
DIM				
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



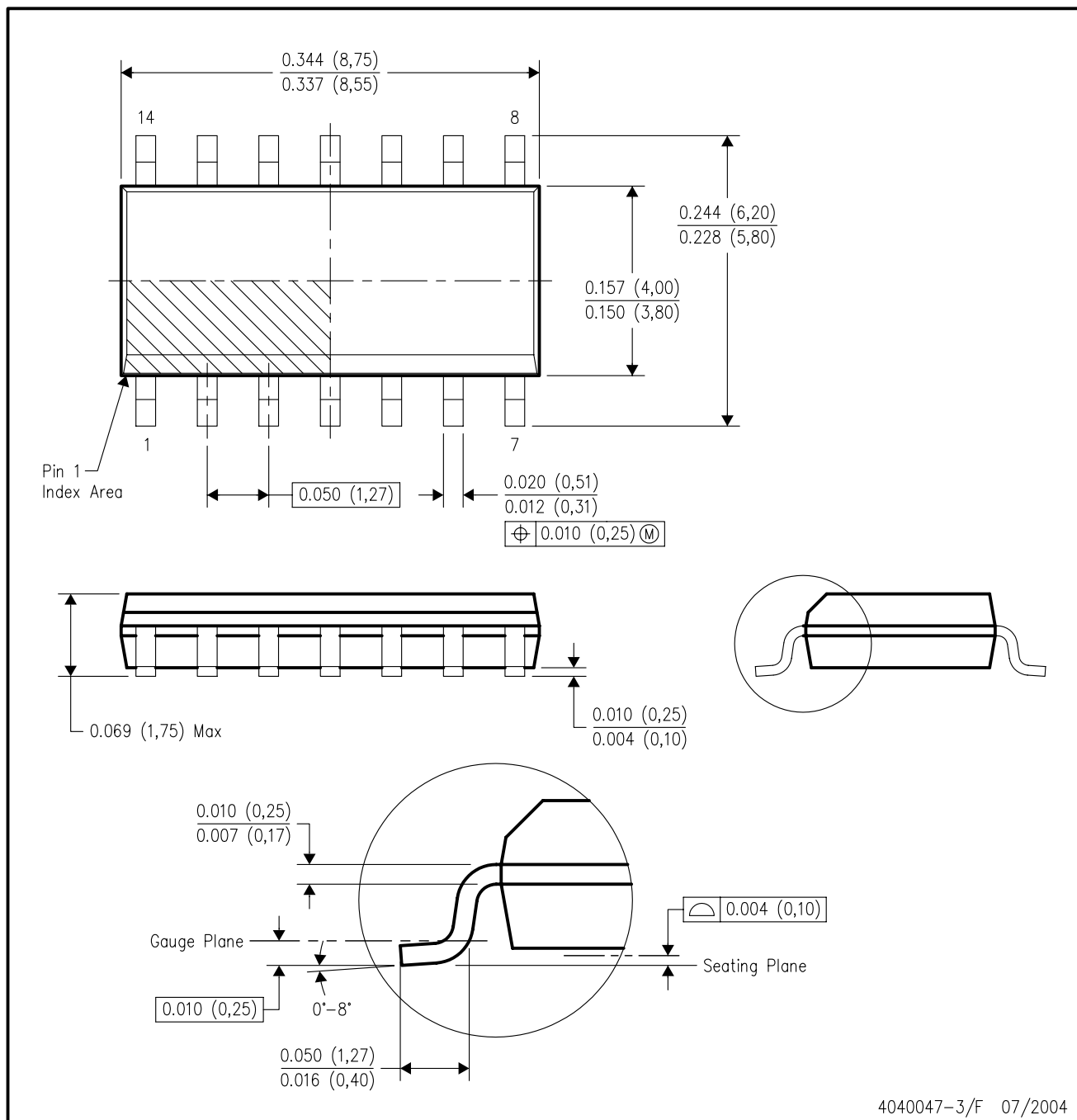
14/18 Pin Only
20 Pin vendor option

4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



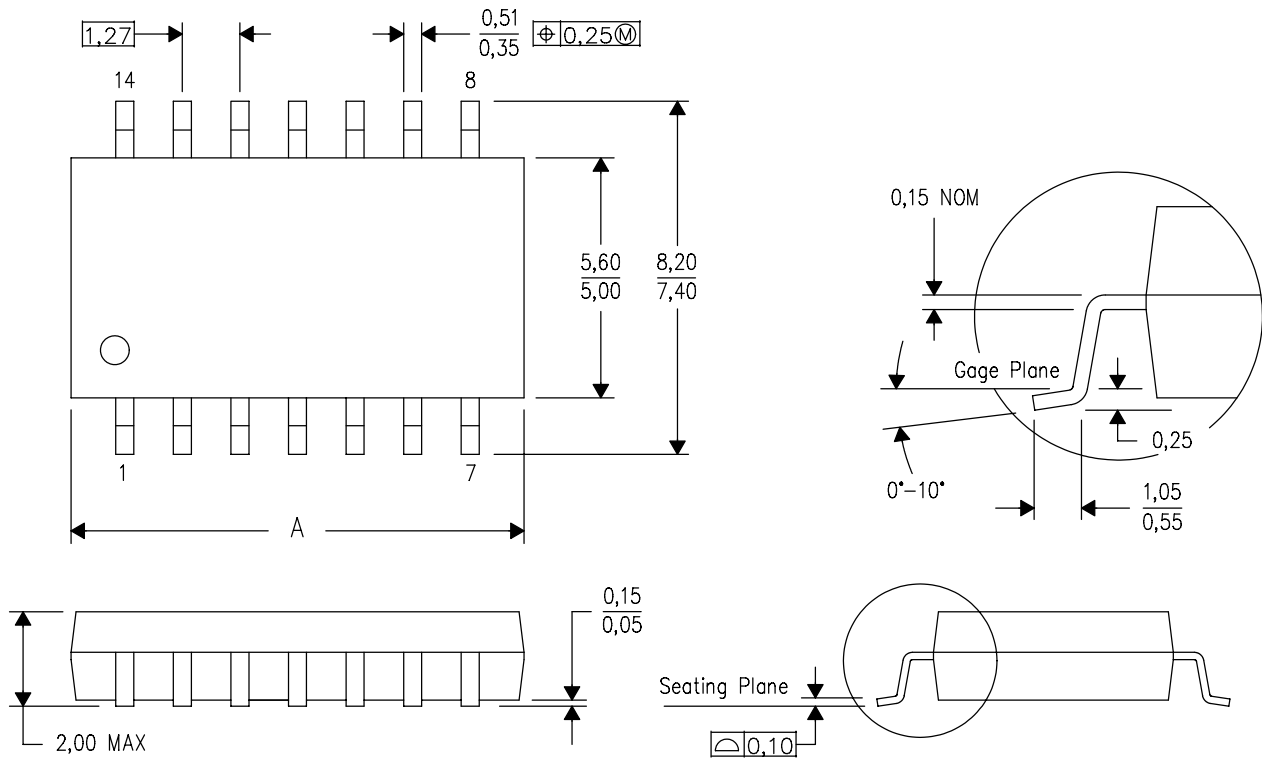
4040047-3/F 07/2004

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

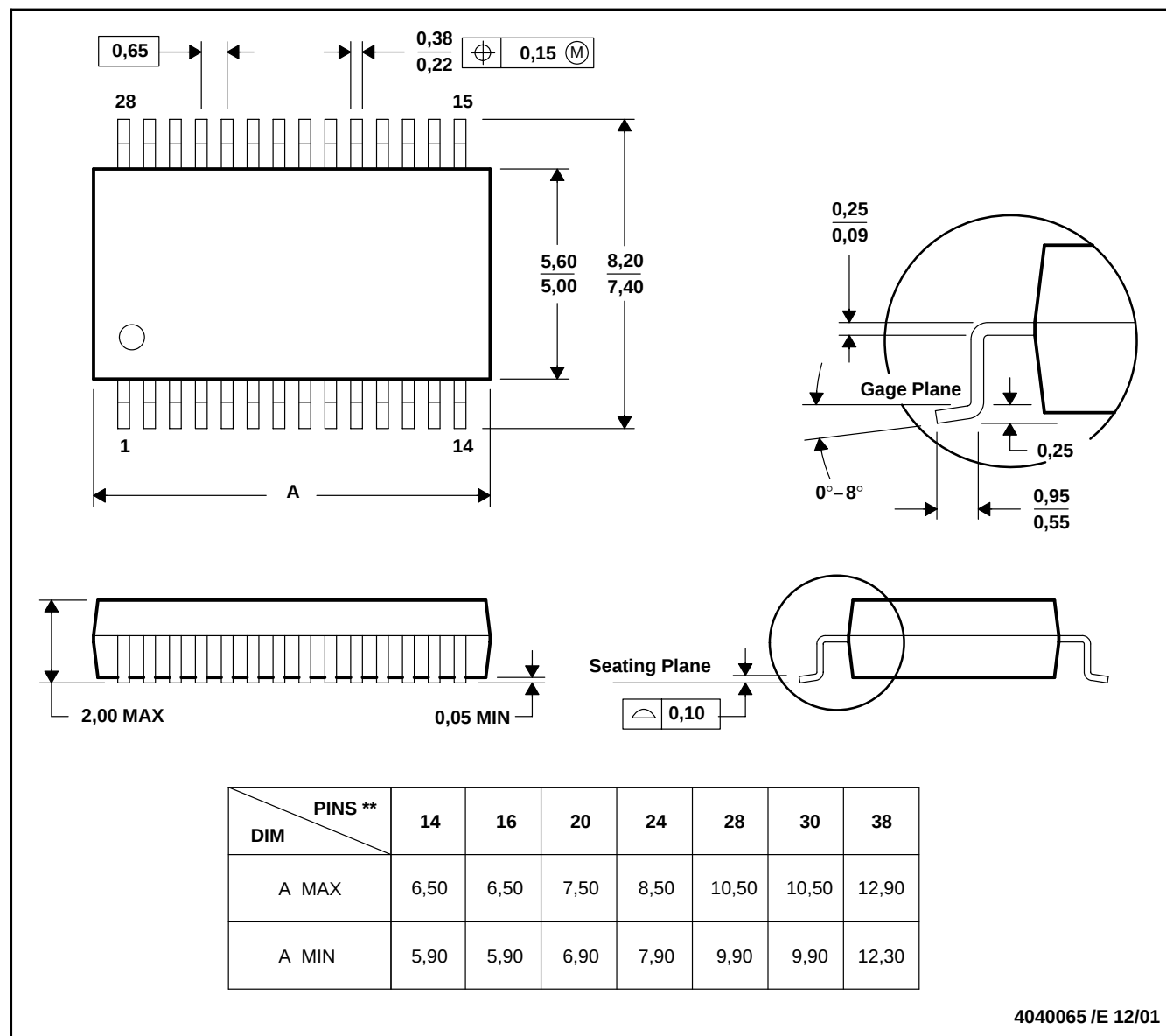
4040062/C 03/03

- 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.

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

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 © 2004, Texas Instruments Incorporated