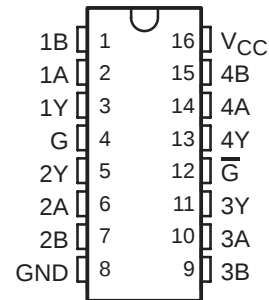


SN65LBC173, SN75LBC173 QUADRUPLE LOW-POWER DIFFERENTIAL LINE RECEIVERS

SLLS170E – OCTOBER 1993 – REVISED AUGUST 2000

- Meets or Exceeds the Requirements of ANSI Standards EIA/TIA-422-B, EIA/TIA-423-B, RS-485, and ITU Recommendations V.10 and V.11.
- Designed to Operate With Pulse Durations as Short as 20 ns
- Designed for Multipoint Bus Transmission on Long Bus Lines in Noisy Environments
- Input Sensitivity . . . ± 200 mV
- Low-Power Consumption . . . 20 mA Max
- Open-Circuit Fail-Safe Design
- Pin Compatible With SN75173 and AM26LS32

D OR N PACKAGE
(TOP VIEW)



description

The SN65LBC173 and SN75LBC173 are monolithic quadruple differential line receivers with 3-state outputs. Both are designed to meet the requirements of the ANSI standards EIA/TIA-422-B, EIA/TIA-423-B, RS-485, and ITU Recommendations V.10 and V.11. The devices are optimized for balanced multipoint bus transmission at data rates up to and exceeding 10 million bits per second. The four receivers share two ORed enable inputs, one active when high, the other active when low.

Each receiver features high input impedance, input hysteresis for increased noise immunity, and input sensitivity of ± 200 mV over a common-mode input voltage range of 12 V to -7 V. Fail-safe design ensures that if the inputs are open circuited, the output is always high. Both devices are designed using the Texas Instruments proprietary LinBiCMOS™ technology that provides low power consumption, high switching speeds, and robustness.

These devices offer optimum performance when used with the SN75LBC172 or SN75LBC174 quadruple line drivers. The SN65LBC173 and SN75LBC173 are available in the 16-pin DIP (N) and SOIC (D) packages.

The SN65LBC173 is characterized over the industrial temperature range of -40°C to 85°C . The SN75LBC173 is characterized for operation over the commercial temperature range of 0°C to 70°C .

FUNCTION TABLE
(each receiver)

DIFFERENTIAL INPUTS A-B	ENABLES G $\overline{\text{G}}$		OUTPUT Y
$V_{ID} \geq 0.2$ V	H X	X L	H H
-0.2 V $< V_{ID} < 0.2$ V	H X	X L	? ?
$V_{ID} \leq -0.2$ V	H X	X L	L L
X	L	H	Z
Open Circuit	H X	X L	H H

H = high level, L = low level, X = irrelevant,
Z = high impedance (off), ? = indeterminate



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.

LinBiCMOS is a trademark of Texas Instruments.

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.



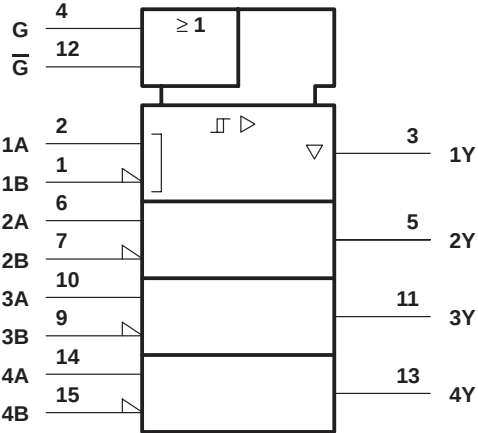
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2000, Texas Instruments Incorporated

SN65LBC173, SN75LBC173 QUADRUPLE LOW-POWER DIFFERENTIAL LINE RECEIVERS

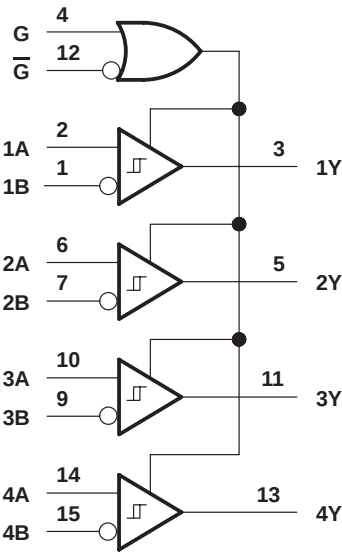
SLLS170E – OCTOBER 1993 – REVISED AUGUST 2000

logic symbol†

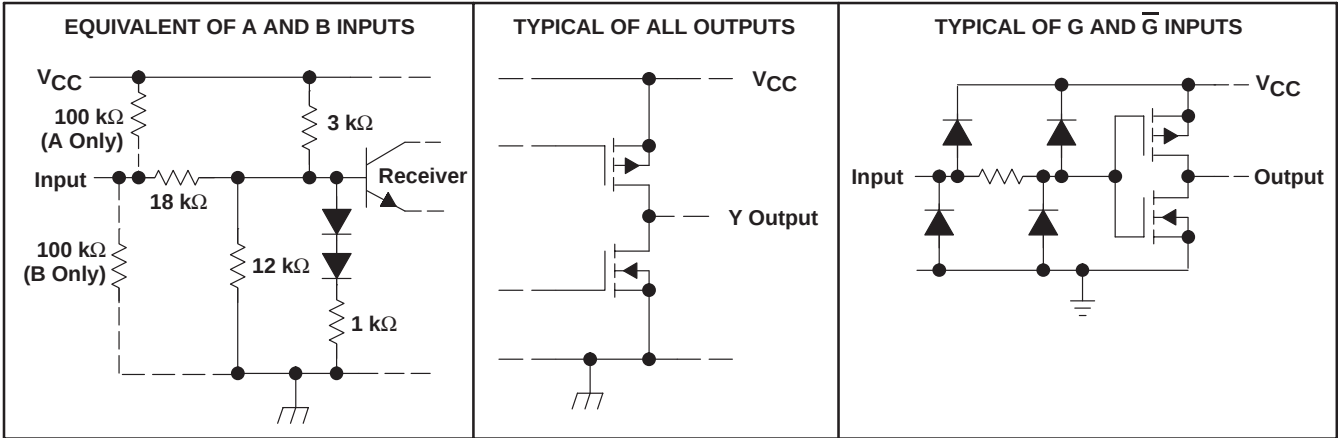


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



schematics of inputs and outputs



SN65LBC173, SN75LBC173 QUADRUPLE LOW-POWER DIFFERENTIAL LINE RECEIVERS

SLLS170E – OCTOBER 1993 – REVISED AUGUST 2000

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

Supply voltage range, V_{CC} (see Note 1)	–0.3 V to 7 V
Input voltage, V_I (A or B inputs)	±25 V
Differential input voltage, V_{ID} (see Note 2)	±25 V
Voltage range at Y, G, $\overline{G}$	–0.3 V to $V_{CC} + 0.5$ V
Continuous total dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A : SN65LBC173	–40°C to 85°C
SN75LBC173	0°C to 70°C
Storage temperature range, T_{stg}	–65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°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. Differential input voltage is measured at the noninverting input with respect to the corresponding inverting input.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING
D	1100 mW	8.7 mW/°C	708 mW	578 mW
N	1150 mW	9.2 mW/°C	736 mW	598 mW

recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.75	5	5.25	V
Common-mode input voltage, V_{IC}		–7		12	V
Differential input voltage, V_{ID}				±6	V
High-level input voltage, V_{IH}	G inputs	2			V
Low-level input voltage, V_{IL}				0.8	V
High-level output current, I_{OH}				–8	mA
Low-level output current, I_{OL}				8	mA
Operating free-air temperature, T_A	SN65LBC173	–40		85	°C
	SN75LBC173	0		70	



SN65LBC173, SN75LBC173

QUADRUPLE LOW-POWER DIFFERENTIAL LINE RECEIVERS

SLLS170E – OCTOBER 1993 – REVISED AUGUST 2000

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT
V_{IT+}	Positive-going input threshold voltage	$I_O = -8 \text{ mA}$			0.2	V
V_{IT-}	Negative-going input threshold voltage	$I_O = 8 \text{ mA}$	-0.2			V
V_{hys}	Hysteresis voltage ($V_{IT+} - V_{IT-}$)			45		mV
V_{IK}	Enable input clamp voltage	$I_I = -18 \text{ mA}$		-0.9	-1.5	V
V_{OH}	High-level output voltage	$V_{ID} = 200 \text{ mV}$, $I_{OH} = -8 \text{ mA}$	3.5	4.5		V
V_{OL}	Low-level output voltage	$V_{ID} = -200 \text{ mV}$, $I_{OL} = 8 \text{ mA}$		0.3	0.5	V
I_{OZ}	High-impedance-state output current	$V_O = 0 \text{ V to } V_{CC}$			± 20	μA
I_I	Bus input current	A or B inputs	$V_{IH} = 12 \text{ V}$, $V_{CC} = 5 \text{ V}$, Other inputs at 0 V	0.7	1	mA
			$V_{IH} = 12 \text{ V}$, $V_{CC} = 0 \text{ V}$, Other inputs at 0 V	0.8	1	
			$V_{IH} = -7 \text{ V}$, $V_{CC} = 5 \text{ V}$, Other inputs at 0 V	-0.5	-0.8	
			$V_{IH} = -7 \text{ V}$, $V_{CC} = 0 \text{ V}$, Other inputs at 0 V	-0.4	-0.8	
I_{IH}	High-level input current	$V_{IH} = 5 \text{ V}$			± 20	μA
I_{IL}	Low-level input current	$V_{IL} = 0 \text{ V}$			-20	μA
I_{OS}	Short-circuit output current	$V_O = 0$		-80	-120	mA
I_{CC}	Supply current	Outputs enabled, $I_O = 0$, $V_{ID} = 5 \text{ V}$		11	20	mA
		Outputs disabled		0.9	1.4	

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

switching characteristics, $V_{CC} = 5 \text{ V}$, $C_L = 15 \text{ pF}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL}	Propagation delay time, high- to low-level output	11	22	30	ns
t_{PLH}	Propagation delay time, low- to high-level output	11	22	30	ns
t_{PZH}	Output enable time to high level		17	30	ns
t_{PZL}	Output enable time to low level		18	30	ns
t_{PHZ}	Output disable time from high level		35	45	ns
t_{PLZ}	Output disable time from low level		25	40	ns
$t_{sk(p)}$	Pulse skew ($ t_{PHL} - t_{PLH} $)		0.5	6	ns
t_t	Transition time		5	10	ns

SN65LBC173, SN75LBC173 QUADRUPLE LOW-POWER DIFFERENTIAL LINE RECEIVERS

SLLS170E – OCTOBER 1993 – REVISED AUGUST 2000

PARAMETER MEASUREMENT INFORMATION

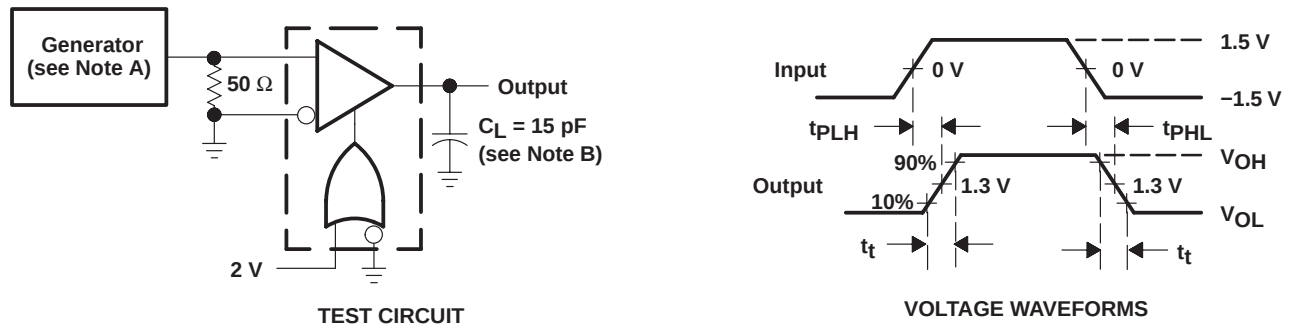
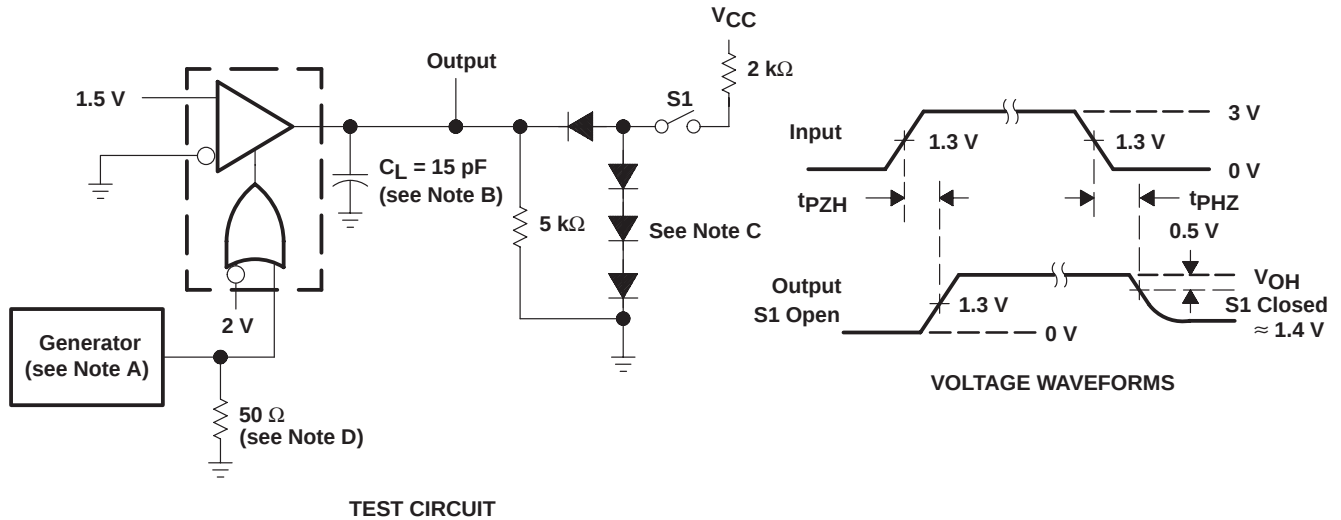


Figure 1. t_{pd} and t_f Test Circuit and Voltage Waveforms



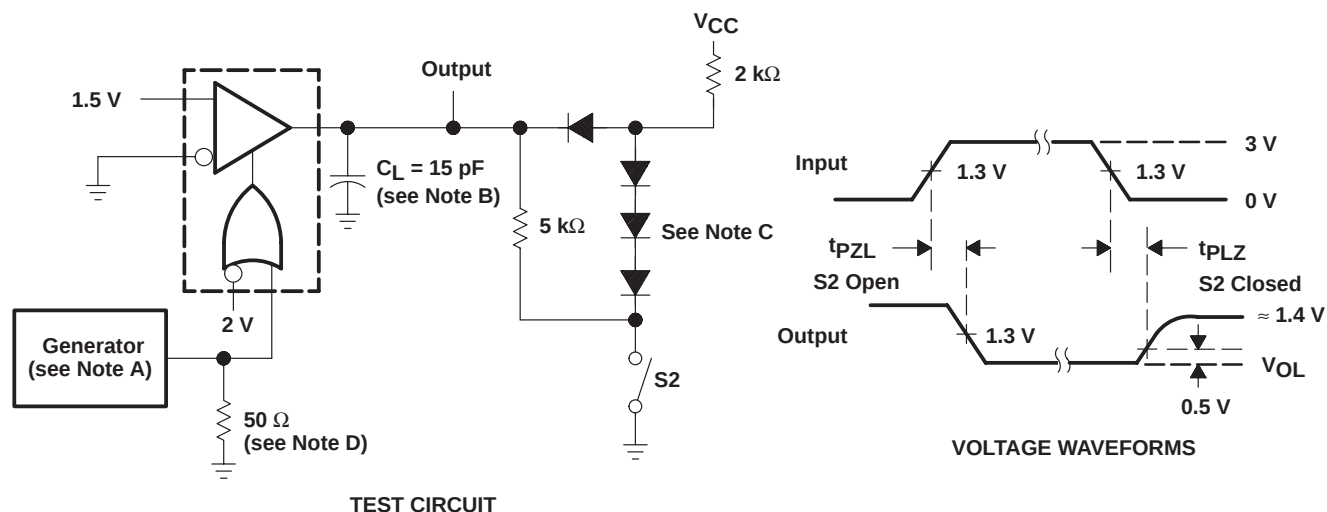
- NOTES:
- A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz, duty cycle = 50%, $t_f \leq 6$ ns, $t_r \leq 6$ ns, $Z_O = 50 \Omega$.
 - B. C_L includes probe and jig capacitance.
 - C. All diodes are 1N916 or equivalent.
 - D. To test the active-low enable $\overline{G}$, ground $\overline{G}$ and apply an inverted input waveform to $\overline{G}$.

Figure 2. t_{PHZ} and t_{PZH} Test Circuit and Voltage Waveforms

SN65LBC173, SN75LBC173 QUADRUPLE LOW-POWER DIFFERENTIAL LINE RECEIVERS

SLLS170E – OCTOBER 1993 – REVISED AUGUST 2000

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz, duty cycle = 50%, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_O = 50 \Omega$.
 B. C_L includes probe and jig capacitance.
 C. All diodes are 1N916 or equivalent.
 D. To test the active-low enable $\overline{G}$, ground G and apply an inverted input waveform to $\overline{G}$.

Figure 3. t_{PZL} and t_{PLZ} Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

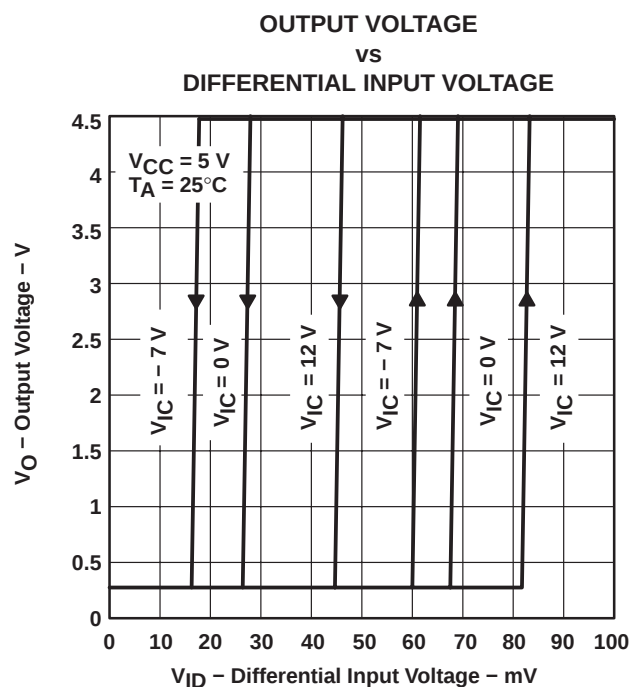


Figure 4

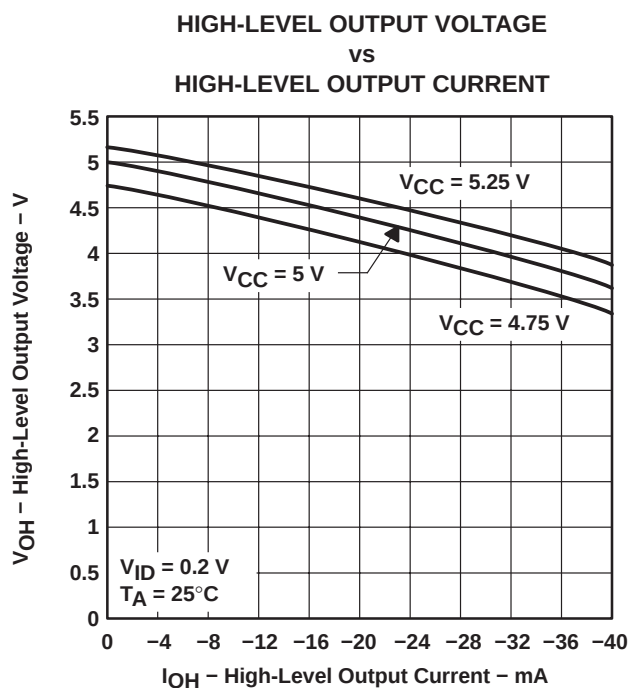


Figure 5

SN65LBC173, SN75LBC173 QUADRUPLE LOW-POWER DIFFERENTIAL LINE RECEIVERS

SLLS170E – OCTOBER 1993 – REVISED AUGUST 2000

TYPICAL CHARACTERISTICS

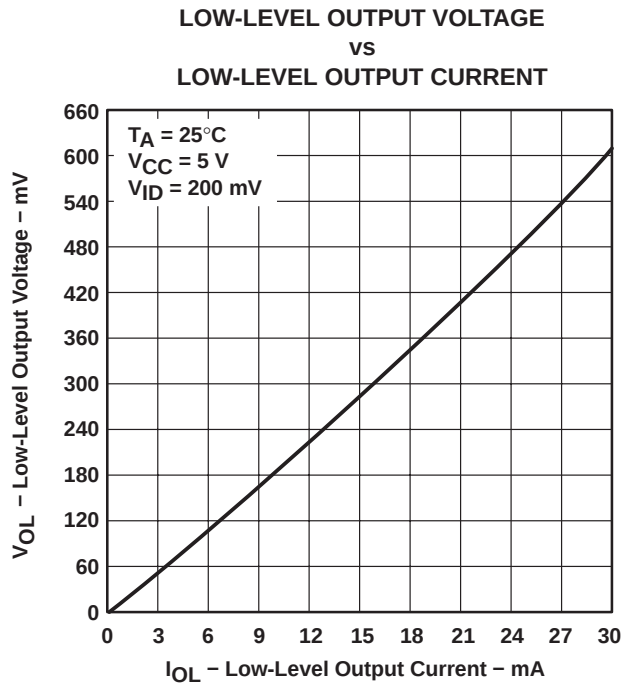


Figure 6

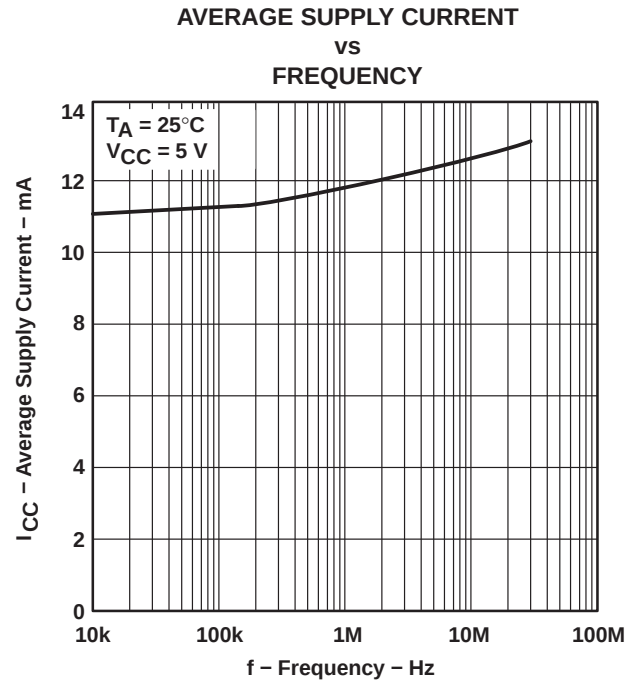


Figure 7

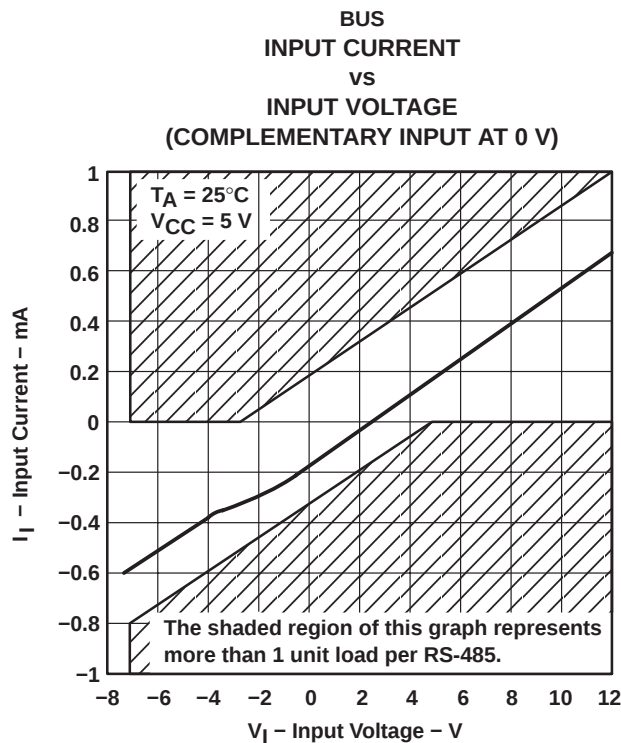


Figure 8

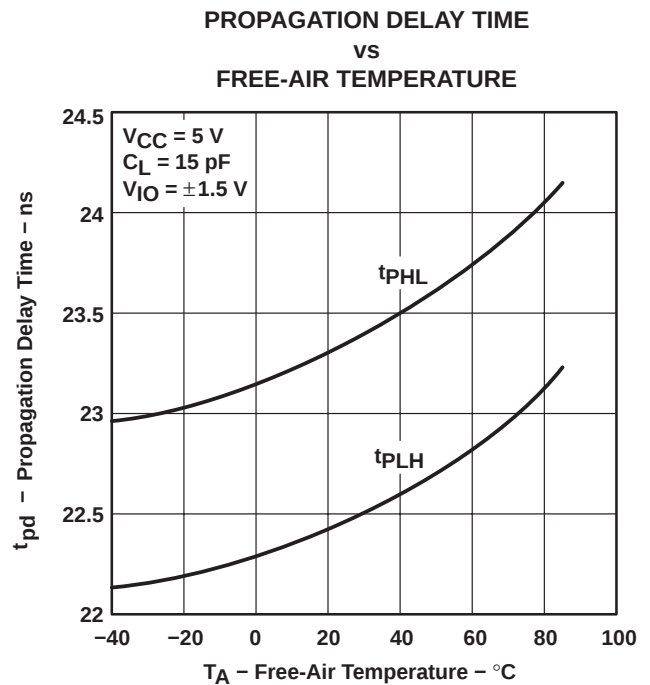


Figure 9

SN65LBC173, SN75LBC173
QUADRUPLE LOW-POWER DIFFERENTIAL LINE RECEIVERS

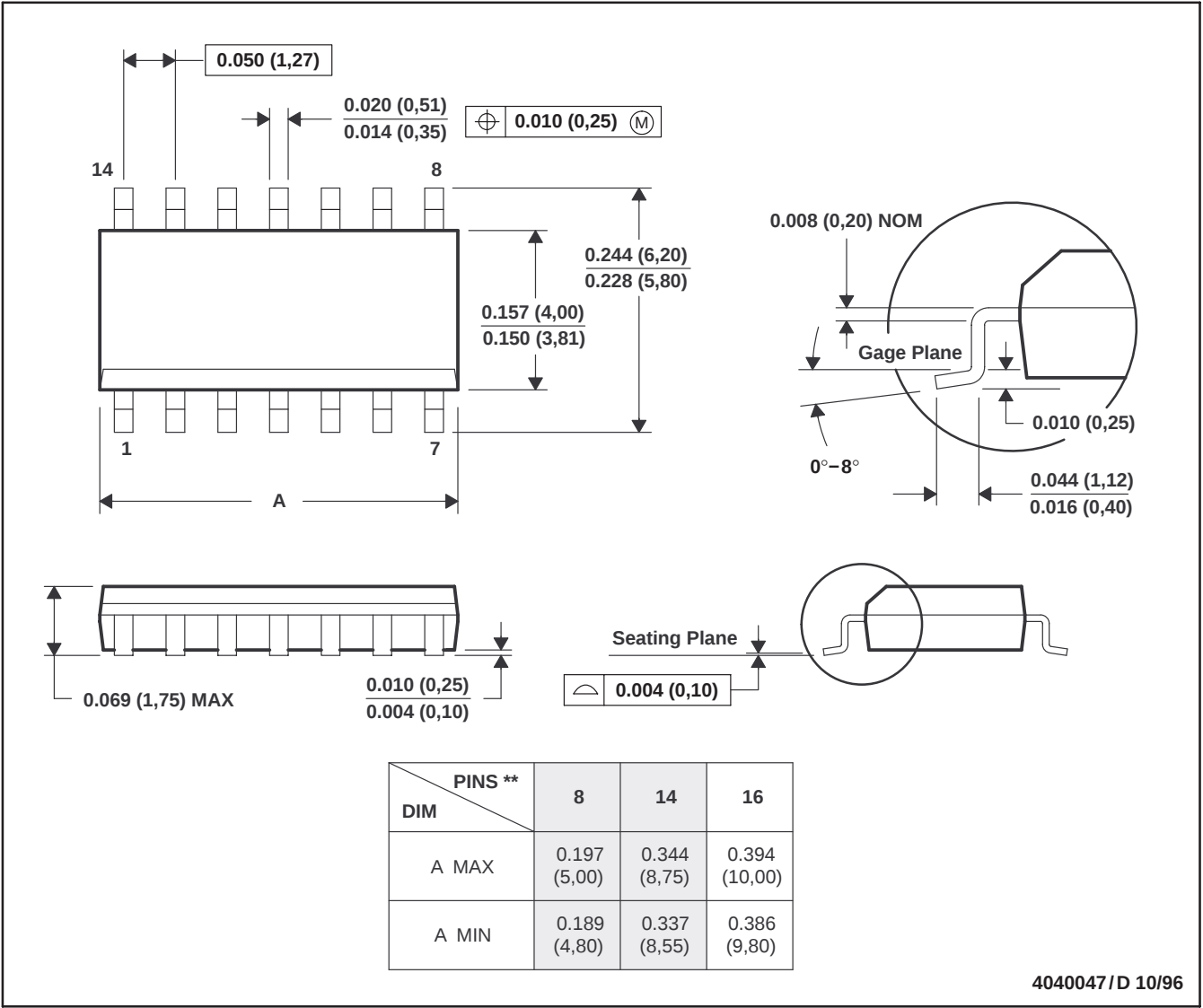
SLLS170E – OCTOBER 1993 – REVISED AUGUST 2000

MECHANICAL DATA

D (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PIN SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
D. Falls within JEDEC MS-012

SN65LBC173, SN75LBC173 QUADRUPLE LOW-POWER DIFFERENTIAL LINE RECEIVERS

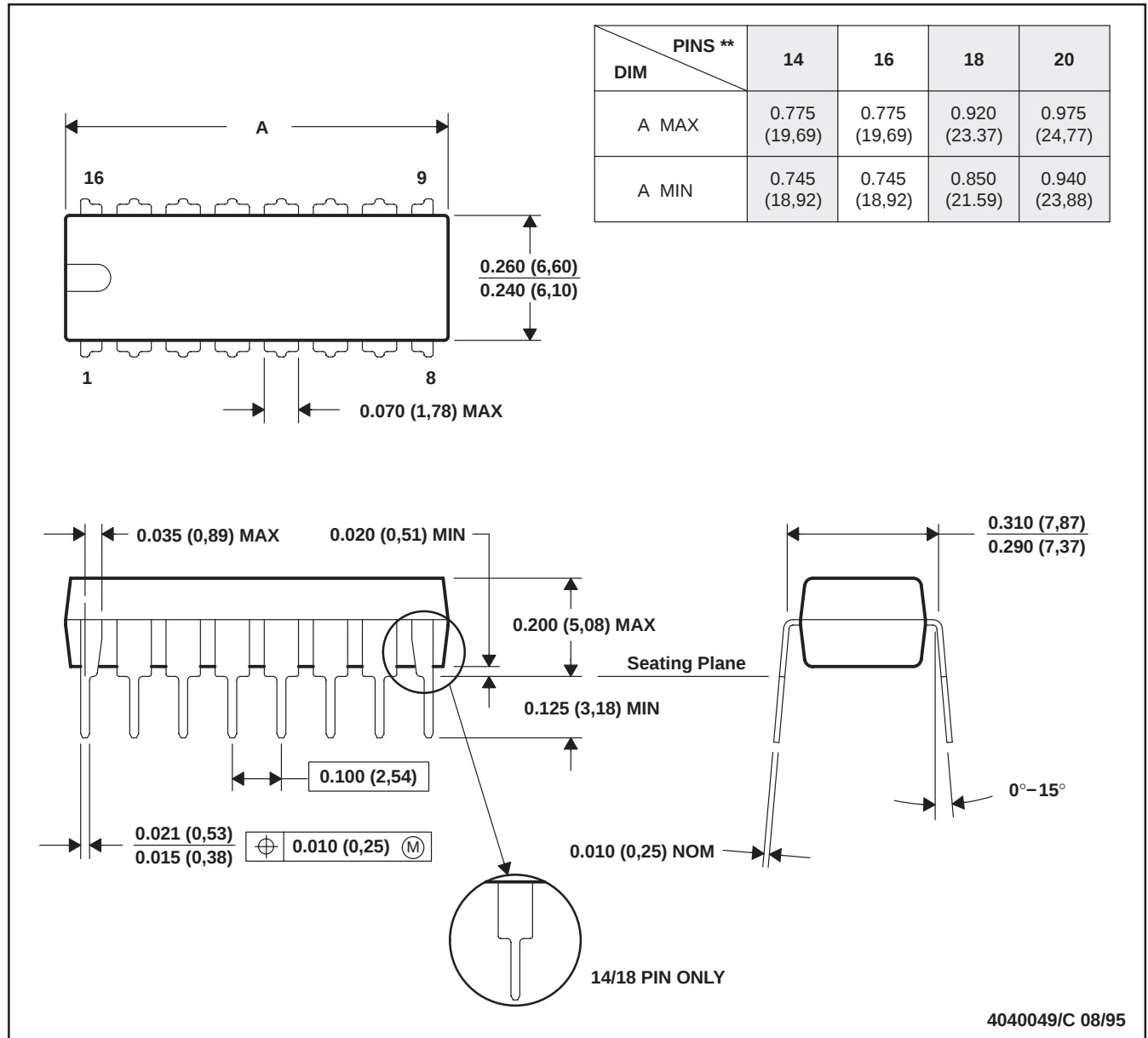
SLLS170E – OCTOBER 1993 – REVISED AUGUST 2000

MECHANICAL DATA

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PIN SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Falls within JEDEC MS-001 (20 pin package is shorter than MS-001.)

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN65LBC173D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65LBC173DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65LBC173DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65LBC173DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65LBC173N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN65LBC173NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75LBC173D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC173DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC173DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC173DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC173N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75LBC173NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type

⁽¹⁾ 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.

⁽²⁾ 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.

OTHER QUALIFIED VERSIONS OF SN75LBC173 :

- Military: [SN55LBC173](#)

NOTE: Qualified Version Definitions:

- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION



*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
SN65LBC173DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN65LBC173DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN75LBC173DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN75LBC173DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	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)
SN65LBC173DR	SOIC	D	16	2500	333.2	345.9	28.6
SN65LBC173DR	SOIC	D	16	2500	346.0	346.0	33.0
SN75LBC173DR	SOIC	D	16	2500	346.0	346.0	33.0
SN75LBC173DR	SOIC	D	16	2500	333.2	345.9	28.6

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	amplifier.ti.com
Data Converters	dataconverter.ti.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
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 © 2008, Texas Instruments Incorporated