

SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

SLLS376C– MAY 2000 – REVISED DECEMBER 2000

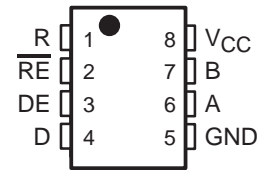
- High-Speed Low-Power LinBiCMOS™ Circuitry Designed for Signaling Rates† Up to 30 Mbps
- Bus-Pin ESD Protection Exceeds 12 kV HBM
- Compatible With ANSI Standard TIA/EIA-485-A and ISO 8482:1987(E)
- Low Skew
- Designed for Multipoint Transmission on Long Bus Lines in Noisy Environments
- Very Low Disabled Supply-Current Requirements . . . 700 μ A Maximum
- Common Mode Voltage Range of -7 V to 12 V
- Thermal-Shutdown Protection
- Driver Positive and Negative Current Limiting
- Open-Circuit Fail-Safe Receiver Design
- Receiver Input Sensitivity . . . ± 200 mV Max
- Receiver Input Hysteresis . . . 50 mV Typ
- Glitch-Free Power-Up and Power-Down Protection
- Available in Q-Temp Automotive High Reliability Automotive Applications Configuration Control / Print Support Qualification to Automotive Standards

description

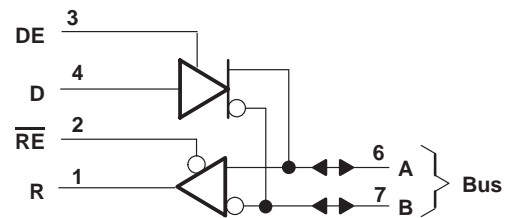
The SN65LBC176A, SN65LBC176AQ, and SN75LBC176A differential bus transceivers are monolithic, integrated circuits designed for bidirectional data communication on multipoint bus-transmission lines. They are designed for balanced transmission lines and are compatible with ANSI standard TIA/EIA-485-A and ISO 8482. The A version offers improved switching performance over its predecessors without sacrificing significantly more power.

SN65LBC176AQD (Marked as B176AQ)
SN65LBC176AD (Marked as BL176A)
SN65LBC176AP (Marked as 65LBC176A)
SN75LBC176AD (Marked as LB176A)
SN75LBC176AP (Marked as 75LBC176A)

(TOP VIEW)



logic diagram (positive logic)



Function Tables

DRIVER

INPUT D	ENABLE DE	OUTPUTS	
		A	B
H	H	H	L
L	H	L	H
X	L	Z	Z
Open	H	H	L

RECEIVER

DIFFERENTIAL INPUTS $V_A - V_B$	ENABLE \overline{RE}	OUTPUT R
$V_{ID} \geq 0.2$ V	L	H
-0.2 V $< V_{ID} < 0.2$ V	L	?
$V_{ID} \leq -0.2$ V	L	L
X	H	Z
Open	L	H

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



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.

† Signaling rate by TIA/EIA-485-A definition restrict transition times to 30% of the bit length, and much higher signaling rates may be achieved without this requirement as displayed in the *TYPICAL CHARACTERISTICS* of this device.

LinBiCMOS and LinASIC are trademarks 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.

 **TEXAS
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2000, Texas Instruments Incorporated

SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

SLLS376C– MAY 2000 – REVISED DECEMBER 2000

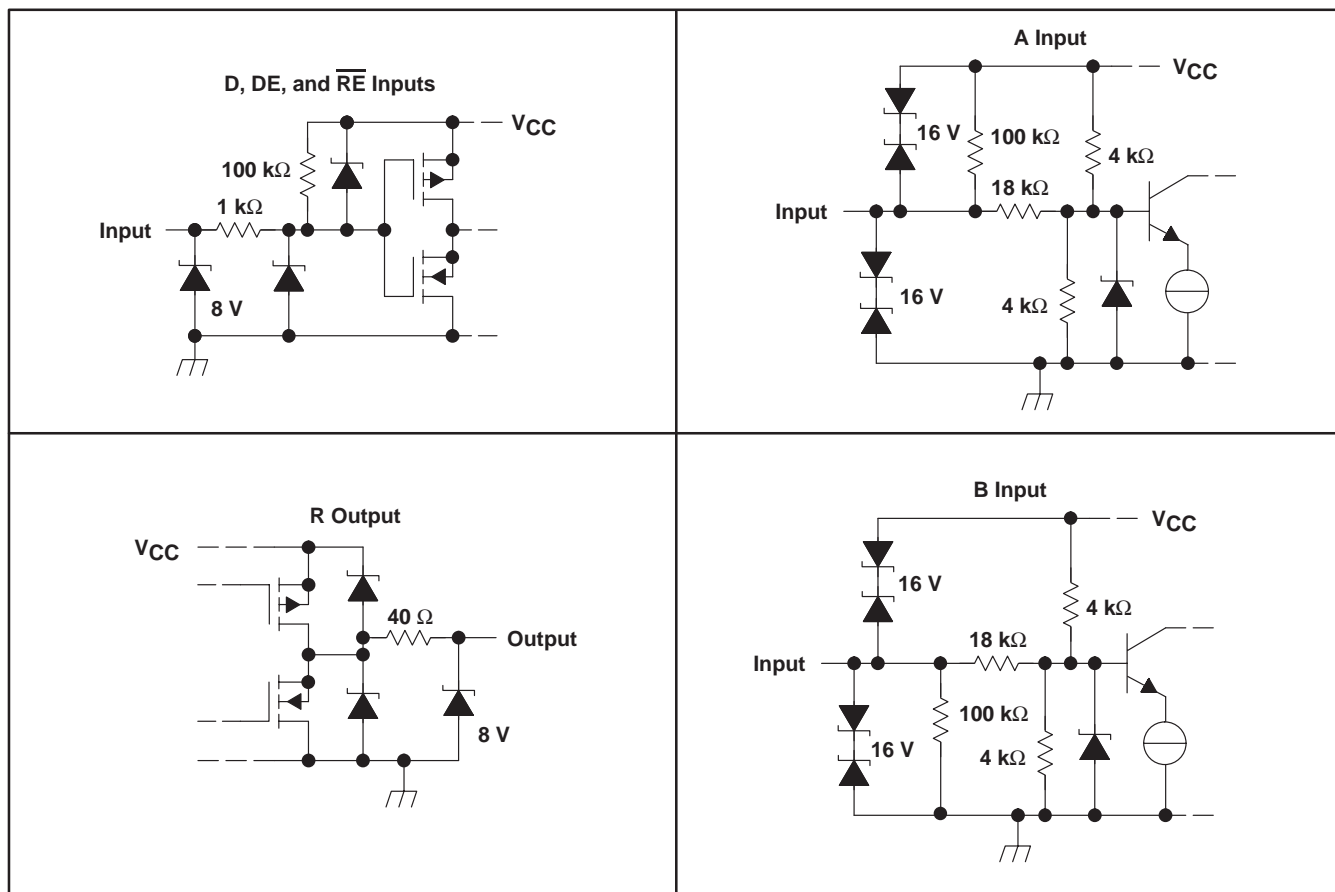
description (continued)

The SN65LBC176A, SN65LBC176AQ, and SN75LBC176A combine a 3-state, differential line driver and a differential input line receiver, both of which operate from a single 5-V power supply. The driver and receiver have active-high and active-low enables, respectively, which can externally connect together to function as a direction control. The driver differential outputs and the receiver differential inputs connect internally to form a differential input/output (I/O) bus port that is designed to offer minimum loading to the bus whenever the driver is disabled or $V_{CC} = 0$. This port features wide positive and negative common-mode voltage ranges, making the device suitable for party-line applications. Very low device supply current can be achieved by disabling the driver and the receiver.

AVAILABLE OPTIONS

T _A	PACKAGE	
	SMALL OUTLINE (D)	PLASTIC DUAL-IN-LINE
0°C to 70°C	SN75LBC176AD	SN75LBC176AP
–40°C to 85°C	SN65LBC176AD	SN65LBC176AP
–40°C to 125°C	SN65LBC176AQD	—

schematics of inputs and outputs



SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

SLLS376C– MAY 2000 – REVISED DECEMBER 2000

absolute maximum ratings†

Supply voltage, V_{CC} (see Note 1)	–0.3 V to 6 V
Voltage range at any bus terminal (A or B)	–10 V to 15 V
Input voltage, V_I (D, DE, R, or \overline{RE})	–0.3 V to $V_{CC} + 0.5$ V
Electrostatic discharge: Bus terminals and GND, Class 3, A: (see Note 2)	12 kV
Bus terminals and GND, Class 3, B: (see Note 2)	400 V
All terminals, Class 3, A:	3 kV
All terminals, Class 3, B:	400 V
Continuous total power dissipation (see Note 3)	See Dissipation Rating Table
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, except differential I/O bus voltage, are with respect to network ground terminal.
 2. The maximum operating junction temperature is internally limited. Use the dissipation rating table to operate below this temperature.
 3. Tested in accordance with MIL–STD–883C, Method 3015.7

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	$T_A = 125^\circ\text{C}$ POWER RATING
D	725 mW	5.8 mW/°C	464 mW	377 mW	145 mW
P	1000 mW	8.0 mW/°C	640 mW	520 mW	—

‡ This is the inverse of the junction-to-ambient thermal resistance when board-mounted and with no air flow.

recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.75	5	5.25	V
Voltage at any bus terminal (separately or common mode), V_I or V_{IC}		–7		12	V
High-level input voltage, V_{IH} (output recessive)	D, DE, and \overline{RE}	2		V_{CC}	V
Low-level input voltage, V_{IL} (output dominant)	D, DE, and \overline{RE}	0		0.8	V
Differential input voltage, V_{ID} (see Note 4)		–12§		12	V
High-level output current, I_{OH}	Driver	–60			mA
	Receiver	–8			
Low-level output current, I_{OL}	Driver			60	mA
	Receiver			8	
Operating free-air temperature, T_A	SN65LBC176AQ	–40		125	°C
	SN65LBC176A	–40		85	
	SN75LBC176A	0		70	

§ The algebraic convention, in which the least positive (most negative) limit is designated as minimum, is used in this data sheet.

NOTE 4: Differential input/output bus voltage is measured at the noninverting terminal A with respect to the inverting terminal B.



SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

SLLS376C– MAY 2000 – REVISED DECEMBER 2000

driver electrical characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}	Input clamp voltage	$I_I = -18$ mA		-1.5	-0.8		V
$ V_{OD} $	Differential output voltage	$I_O = 0$	SN65LBC176AQ	1.5	4	6	V
			SN65LBC176A, SN75LBC176A		4		
		$R_L = 54 \Omega$, See Figure 1	SN65LBC176AQ	0.9	1.5	6	V
			SN65LBC176A	1	1.5	3	
			SN75LBC176A	1.1	1.5	3	
		$V_{test} = -7$ V to 12 V, See Figure 2	SN65LBC176AQ	0.9	1.5	6	V
SN65LBC176A	1		1.5	3			
SN75LBC176A	1.1		1.5	3			
$\Delta V_{OD} $	Change in magnitude of differential output voltage	See Figures 1 and 2		-0.2		0.2	V
$V_{OC(SS)}$	Steady-state common-mode output voltage	See Figure 1	SN65LBC176AQ	1.8	2.4	3	V
$\Delta V_{OC(SS)}$	Change in steady-state common-mode output voltage†		SN65LBC176A, SN75LBC176A	1.8	2.4	2.8	
			SN65LBC176AQ	-0.2		0.2	
			SN65LBC176A, SN75LBC176A	-0.1		0.1	
I_{OZ}	High-impedance output current	See receiver input currents					
I_{IH}	High-level enable input current	$V_I = 2$ V		-100			μ A
I_{IL}	Low-level enable input current	$V_I = 0.8$ V		-100			μ A
I_{OS}	Short-circuit output current	-7 V $\leq V_O \leq 12$ V		-250	± 70	250	mA
I_{CC}	Supply current	$V_I = 0$ or V_{CC} , No load	Receiver disabled and driver enabled		5	9	mA
			Receiver disabled and driver disabled		0.4	0.7	
			Receiver enabled and driver enabled		8.5	15	

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

driver switching characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER	TEST CONDITIONS	SN65LBC176AQ			SN65LBC176A SN75LBC176A			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
t_{PLH}	Propagation delay time, low-to-high-level output		2	12	2	6	12	ns
t_{PHL}	Propagation delay time, high-to-low-level output		2	12	2	6	12	ns
$t_{sk(p)}$	Pulse skew ($ t_{PLH} - t_{PHL} $)			2		0.3	1	ns
t_r	Differential output signal rise time		1.2	11	4	7.5	11	ns
t_f	Differential output signal fall time		1.2	11	4	7.5	11	ns
t_{PZH}	Propagation delay time, high-impedance-to-high-level output			22		12	22	ns
t_{PZL}	Propagation delay time, high-impedance-to-low-level output			25		12	22	ns
t_{PHZ}	Propagation delay time, high-level-to-high-impedance output			22		12	22	ns
t_{PLZ}	Propagation delay time, low-level-to-high-impedance output			22		12	22	ns

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



SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

SLLS376C– MAY 2000 – REVISED DECEMBER 2000

receiver electrical characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT	
V_{IT+}	Positive-going input threshold voltage	$I_O = -8$ mA			0.2	V	
V_{IT-}	Negative-going input threshold voltage	$I_O = 8$ mA	-0.2			V	
V_{hys}	Hysteresis voltage ($V_{IT+} - V_{IT-}$)			50		mV	
V_{IK}	Enable-input clamp voltage	$I_I = -18$ mA	-1.5	-0.8		V	
V_{OH}	High-level output voltage	$V_{ID} = 200$ mV, $I_{OH} = -8$ mA, See Figure 6	4	4.9		V	
V_{OL}	Low-level output voltage	$V_{ID} = 200$ mV, $I_{OL} = 8$ mA, See Figure 6		0.1	0.8	V	
I_{OZ}	High-impedance-state output current	$V_O = 0$ to V_{CC}	SN65LBC176AQ		-10	10	μ A
			SN65LBC176A, SN75LBC176A		-1	1	
I_I	Bus input current	$V_{IH} = 12$ V, $V_{CC} = 5$ V	Other input at 0 V		0.4	1	mA
		$V_{IH} = 12$ V, $V_{CC} = 0$			0.5	1	
		$V_{IH} = -7$ V, $V_{CC} = 5$ V			-0.8	-0.4	
		$V_{IH} = -7$ V, $V_{CC} = 0$			-0.8	-0.3	
I_{IH}	High-level enable-input current	$V_{IH} = 2$ V	-100			μ A	
I_{IL}	Low-level enable-input current	$V_{IL} = 0.8$ V	-100			μ A	
I_{CC}	Supply current	$V_I = 0$ or V_{CC} , No load	Receiver enabled and driver disabled		4	7	mA
			Receiver disabled and driver disabled		0.4	0.7	
			Receiver enabled and driver enabled		8.5	15	

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

receiver switching characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER	TEST CONDITIONS	SN65LBC176AQ			SN65LBC176A SN75LBC176A			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
t_{PLH}	Propagation delay time, output↑	7	30	30	7	13	20	ns
t_{PHL}	Propagation delay time, output↓							
$t_{sk(p)}$	Pulse skew ($ t_{PHL} - t_{PLH} $)							
t_r	Rise time, output	5	5	5	2.1	3.3	ns	
t_f	Fall time, output							
t_{PZH}	Output enable time to high level	50	50	50	30	45	ns	
t_{PZL}	Output enable time to low level							
t_{PHZ}	Output disable time from high level							
t_{PLZ}	Output disable time from low level							

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



SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

SLLS376C– MAY 2000 – REVISED DECEMBER 2000

PARAMETER MEASUREMENT INFORMATION

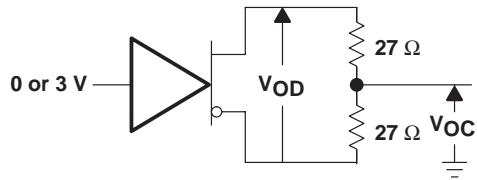
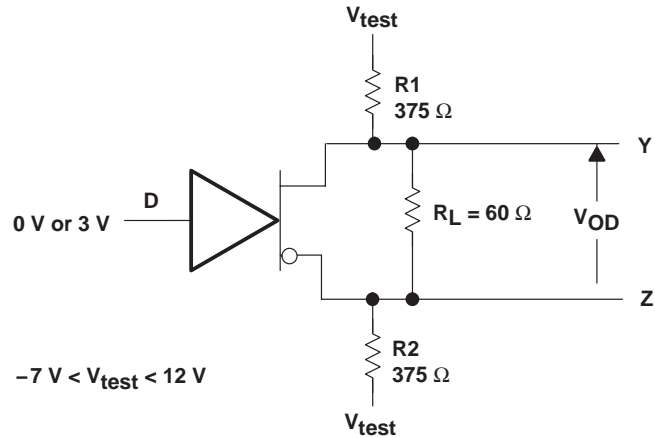
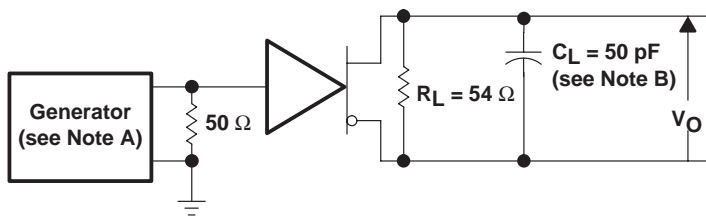


Figure 1. Driver V_{OD} and V_{OC}

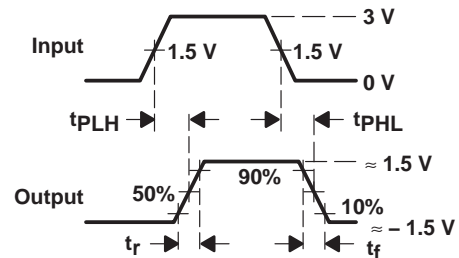


$-7\text{ V} < V_{\text{test}} < 12\text{ V}$

Figure 2. Driver V_{OD3}



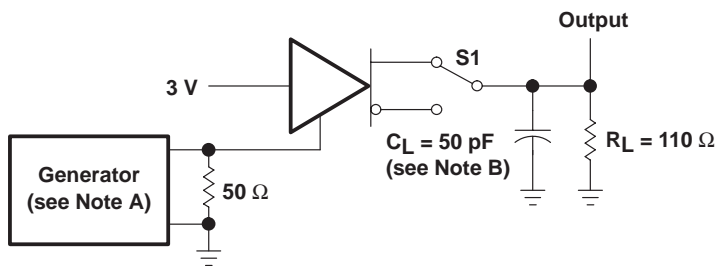
TEST CIRCUIT



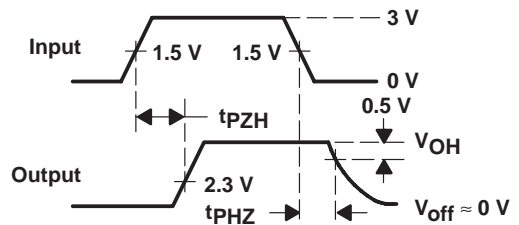
VOLTAGE WAVEFORMS

- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $\text{PRR} \leq 1\text{ MHz}$, 50% duty cycle, $t_r \leq 6\text{ ns}$, $t_f \leq 6\text{ ns}$, $Z_O = 50\ \Omega$.
B. C_L includes probe and jig capacitance.

Figure 3. Driver Test Circuit and Voltage Waveforms



TEST CIRCUIT

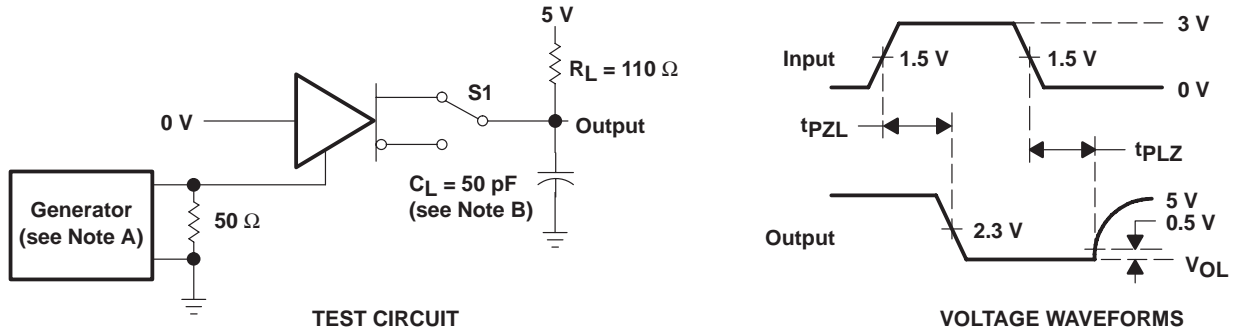


VOLTAGE WAVEFORMS

- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $\text{PRR} \leq 1\text{ MHz}$, 50% duty cycle, $t_r \leq 6\text{ ns}$, $t_f \leq 6\text{ ns}$, $Z_O = 50\ \Omega$.
B. C_L includes probe and jig capacitance.

Figure 4. Driver Test Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 1$ MHz, 50% duty cycle, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_0 = 50 \Omega$.
B. C_L includes probe and jig capacitance.

Figure 5. Driver Test Circuit and Voltage Waveforms

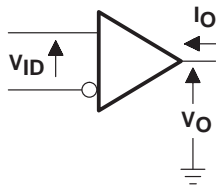
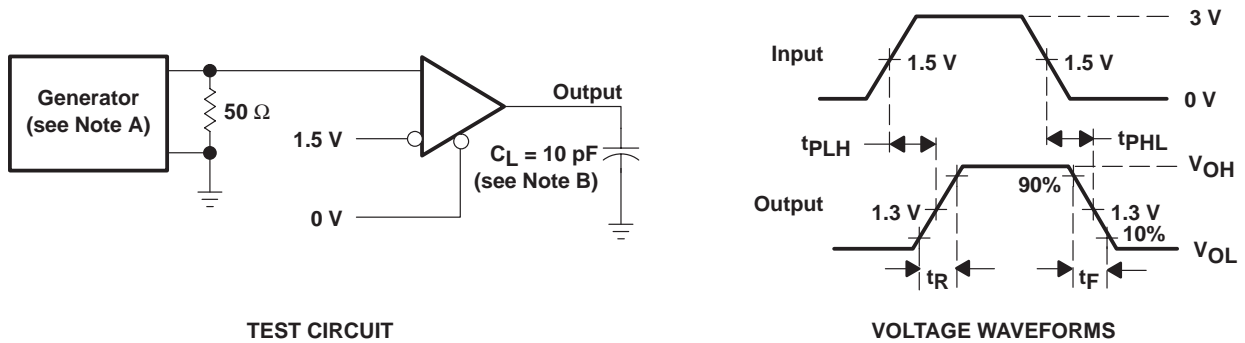


Figure 6. Receiver V_{OH} and V_{OL}



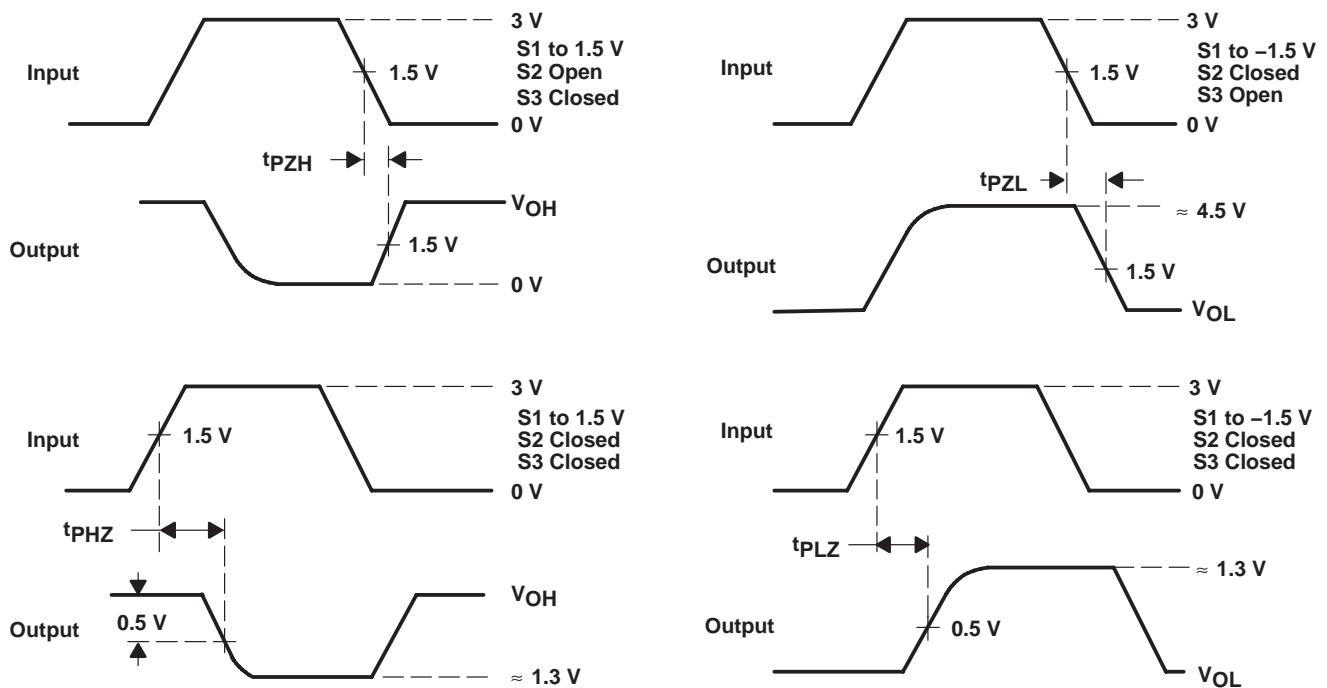
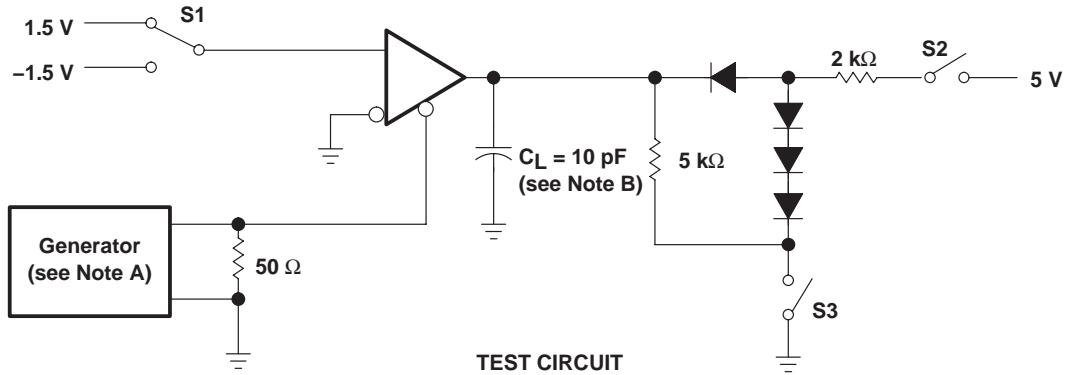
- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 1$ MHz, 50% duty cycle, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_0 = 50 \Omega$.
B. C_L includes probe and jig capacitance.

Figure 7. Receiver Test Circuit and Voltage Waveforms

SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

SLLS376C– MAY 2000 – REVISED DECEMBER 2000

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR \leq 1 MHz, 50% duty cycle, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_O = 50 \Omega$.
 B. C_L includes probe and jig capacitance.

Figure 8. Receiver Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

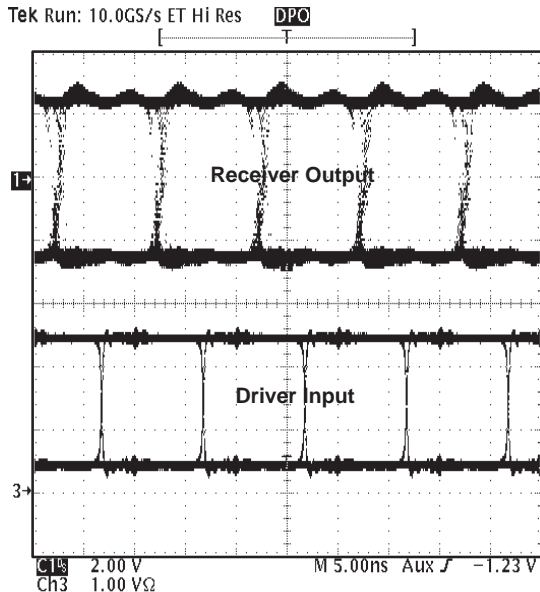


Figure 9. Typical Waveform of Non-Return-To-Zero (NRZ), Pseudorandom Binary Sequence (PRBS) Data at 100 Mbps Through 15m, of CAT 5 Unshielded Twisted Pair (UTP) Cable

TIA/EIA-485-A defines a maximum signaling rate as that in which the transition time of the voltage transition of a logic-state change remains less than or equal to 30% of the bit length. Transition times of greater length perform quite well even though they do not meet the standard by definition.

SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

SLLS376C – MAY 2000 – REVISED DECEMBER 2000

TYPICAL CHARACTERISTICS

AVERAGE SUPPLY CURRENT
vs
FREQUENCY

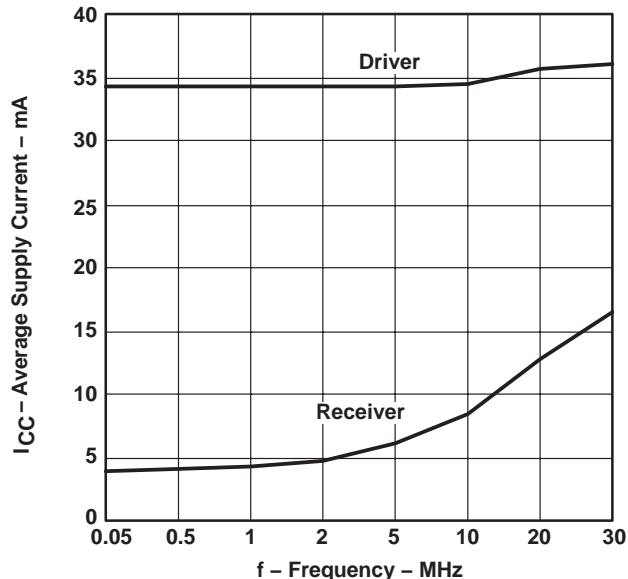


Figure 10

LOGIC INPUT CURRENT
vs
INPUT VOLTAGE

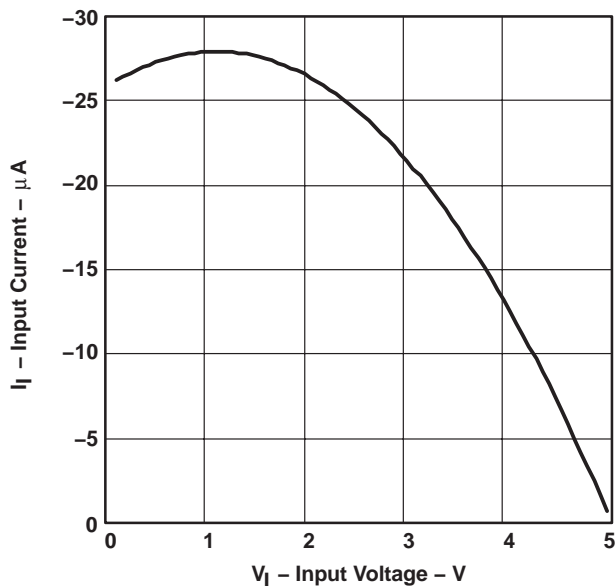


Figure 11

INPUT CURRENT
vs
INPUT VOLTAGE

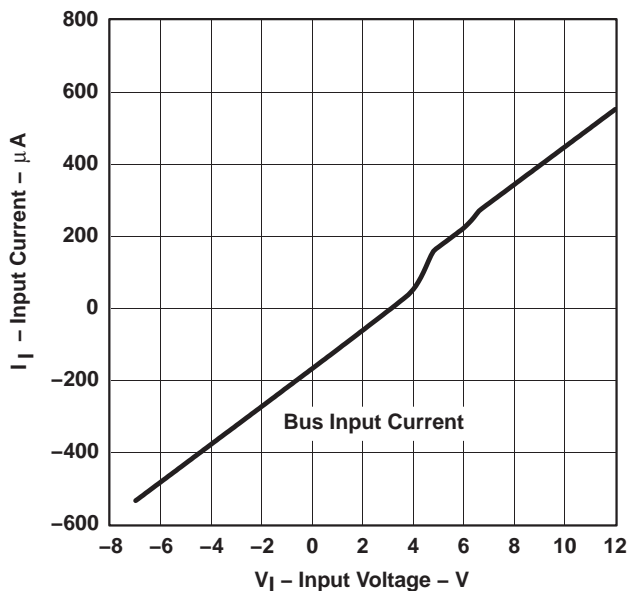


Figure 12

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

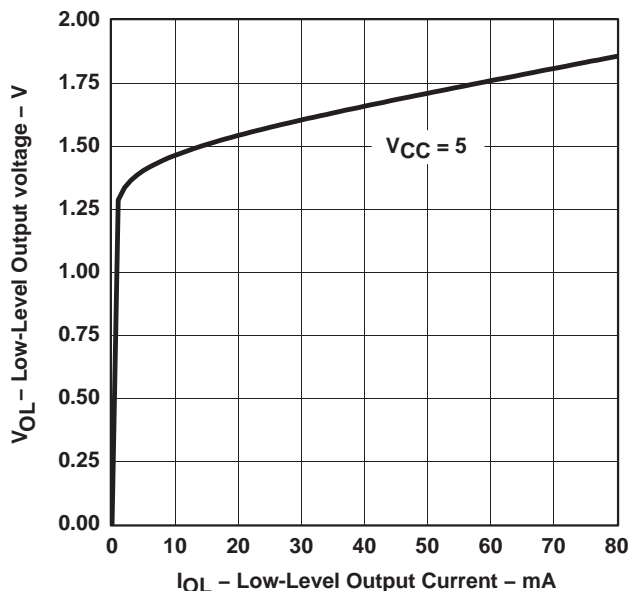


Figure 13



TYPICAL CHARACTERISTICS

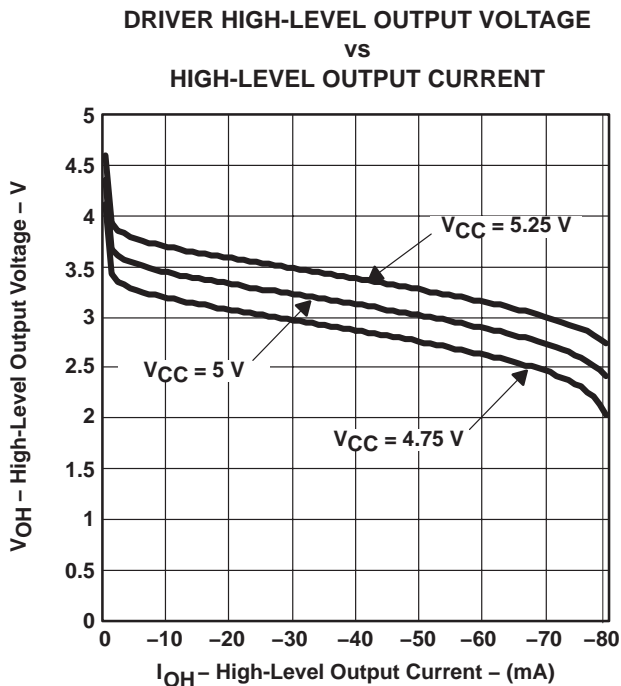


Figure 14

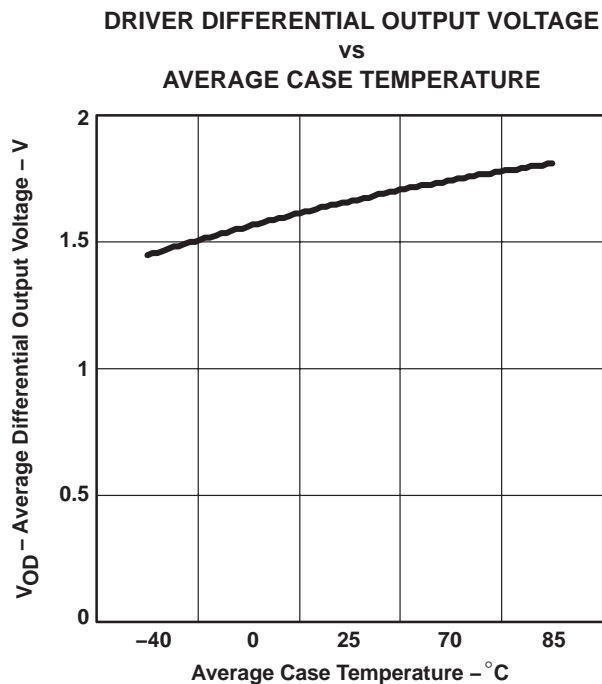


Figure 15

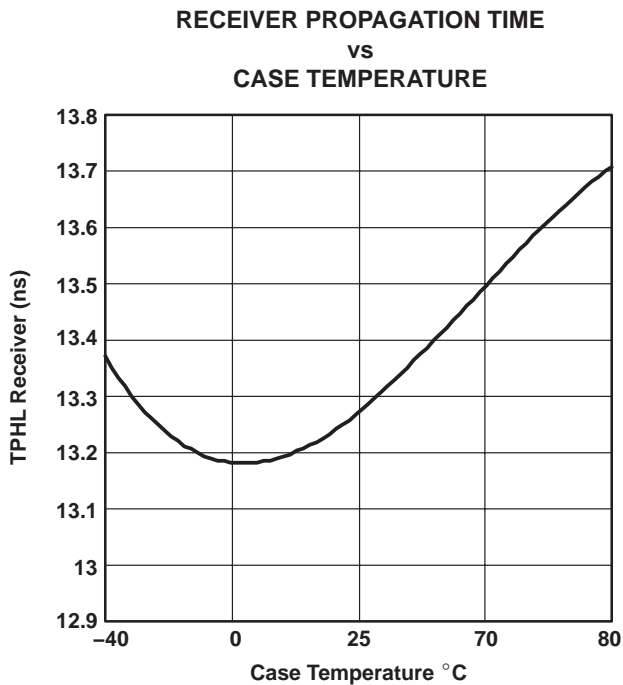


Figure 16

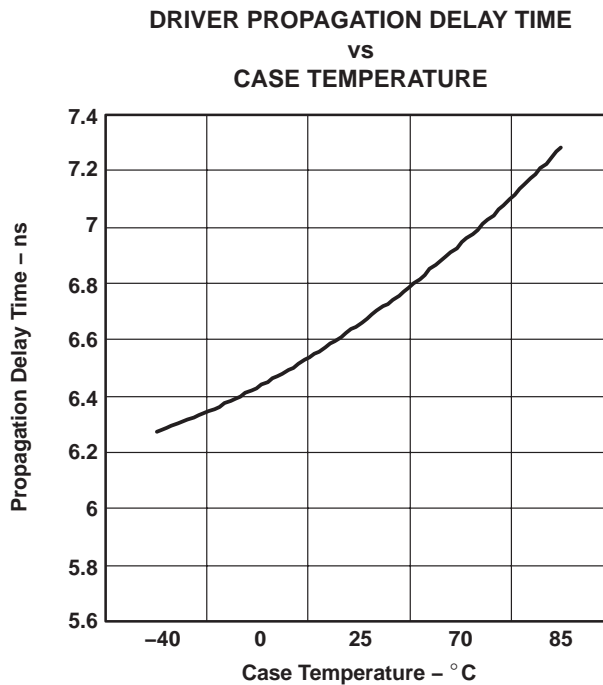


Figure 17

SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

SLLS376C– MAY 2000 – REVISED DECEMBER 2000

TYPICAL CHARACTERISTICS

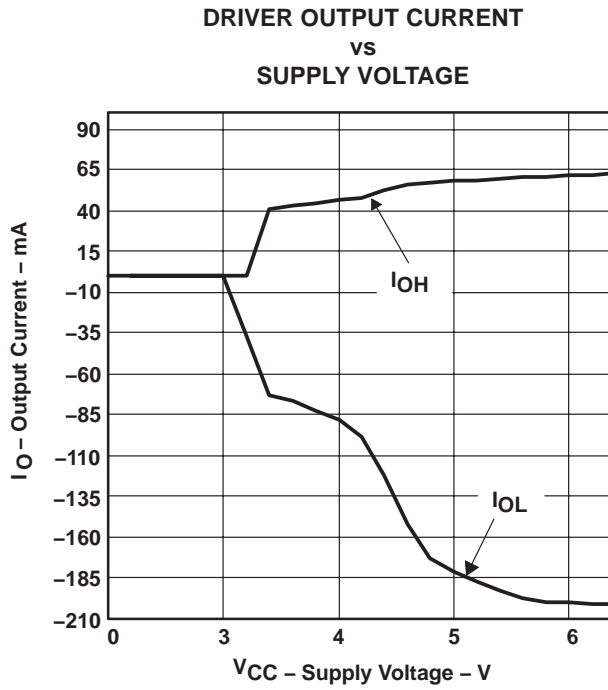


Figure 18

SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

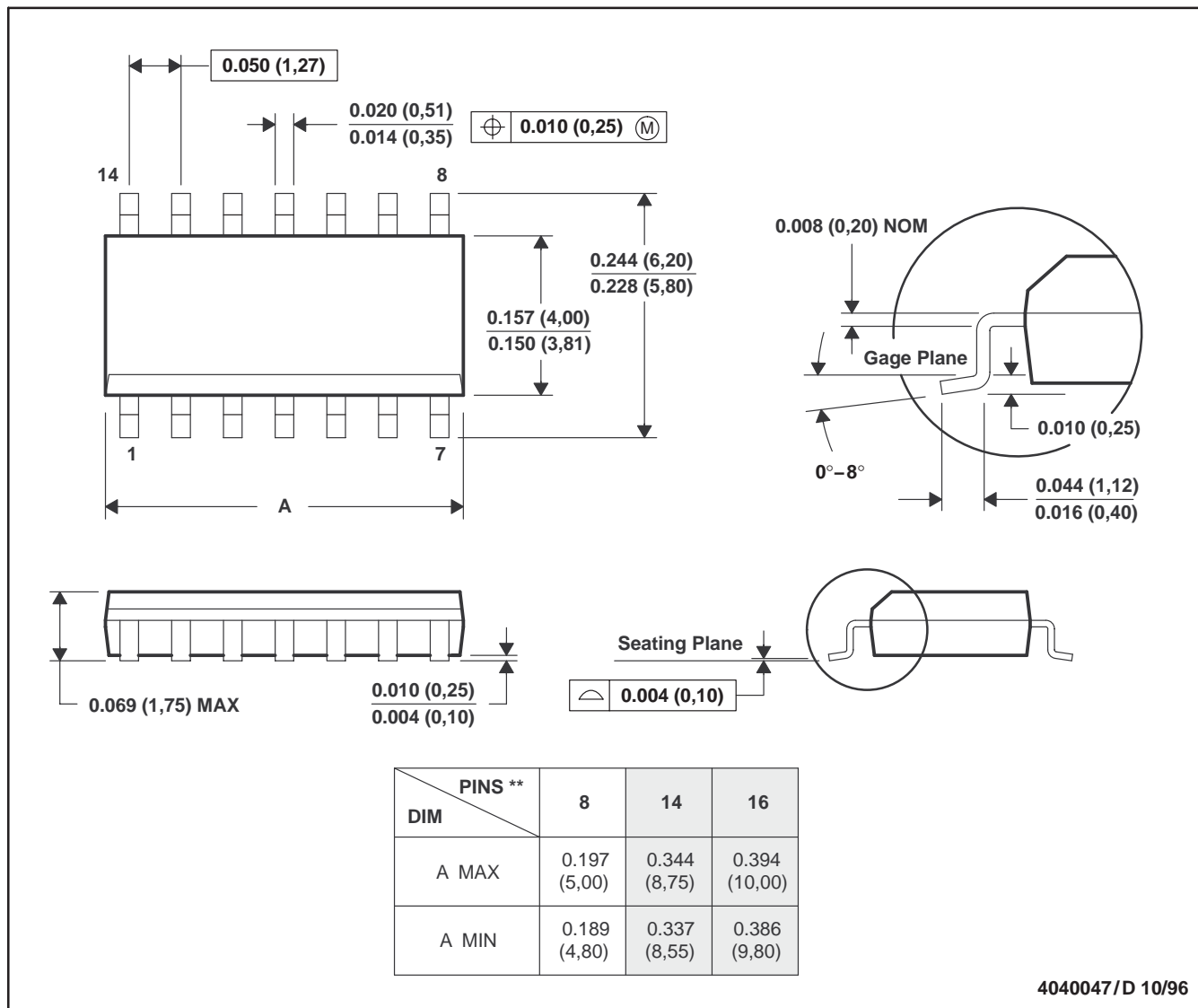
SLLS376C- MAY 2000 - REVISED DECEMBER 2000

MECHANICAL INFORMATION

D (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS 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

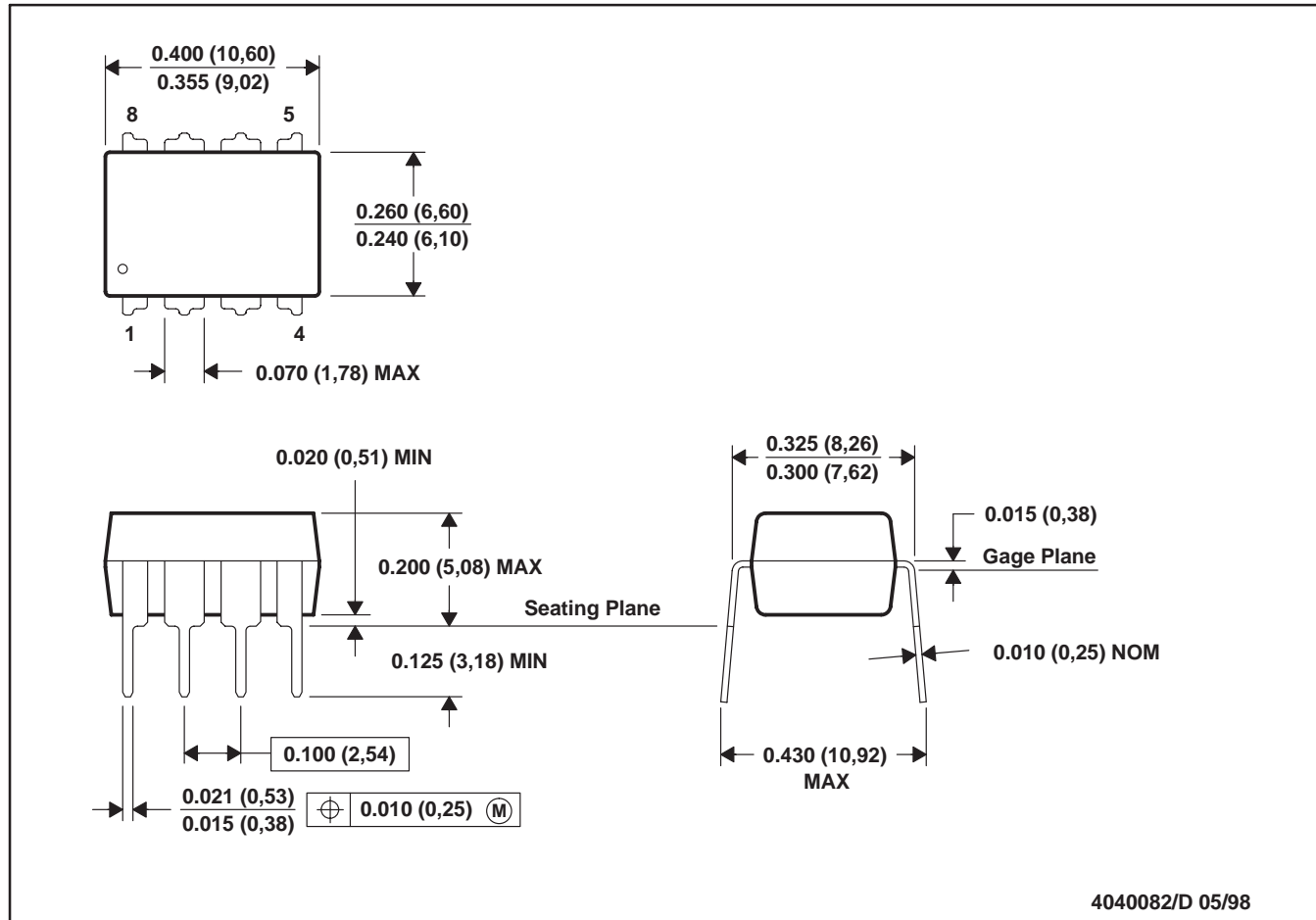
SN65LBC176A, SN75LBC176A DIFFERENTIAL BUS TRANSCEIVERS

SLLS376C- MAY 2000 - REVISED DECEMBER 2000

MECHANICAL INFORMATION

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE



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

For the latest package information, go to http://www.ti.com/sc/docs/package/pkg_info.htm



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN65LBC176AD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65LBC176ADG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65LBC176ADR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65LBC176ADRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65LBC176AP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN65LBC176APE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN65LBC176AQD	ACTIVE	SOIC	D	8	75	TBD	CU NIPDAU	Level-1-220C-UNLIM
SN65LBC176AQDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65LBC176AQDR	ACTIVE	SOIC	D	8	2500	TBD	CU NIPDAU	Level-1-220C-UNLIM
SN65LBC176AQDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC176AD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC176ADG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC176ADR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC176ADRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75LBC176AP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75LBC176APE4	ACTIVE	PDIP	P	8	50	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.

TAPE AND REEL INFORMATION



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
SN65LBC176ADR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
SN65LBC176ADR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
SN75LBC176ADR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
SN75LBC176ADR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

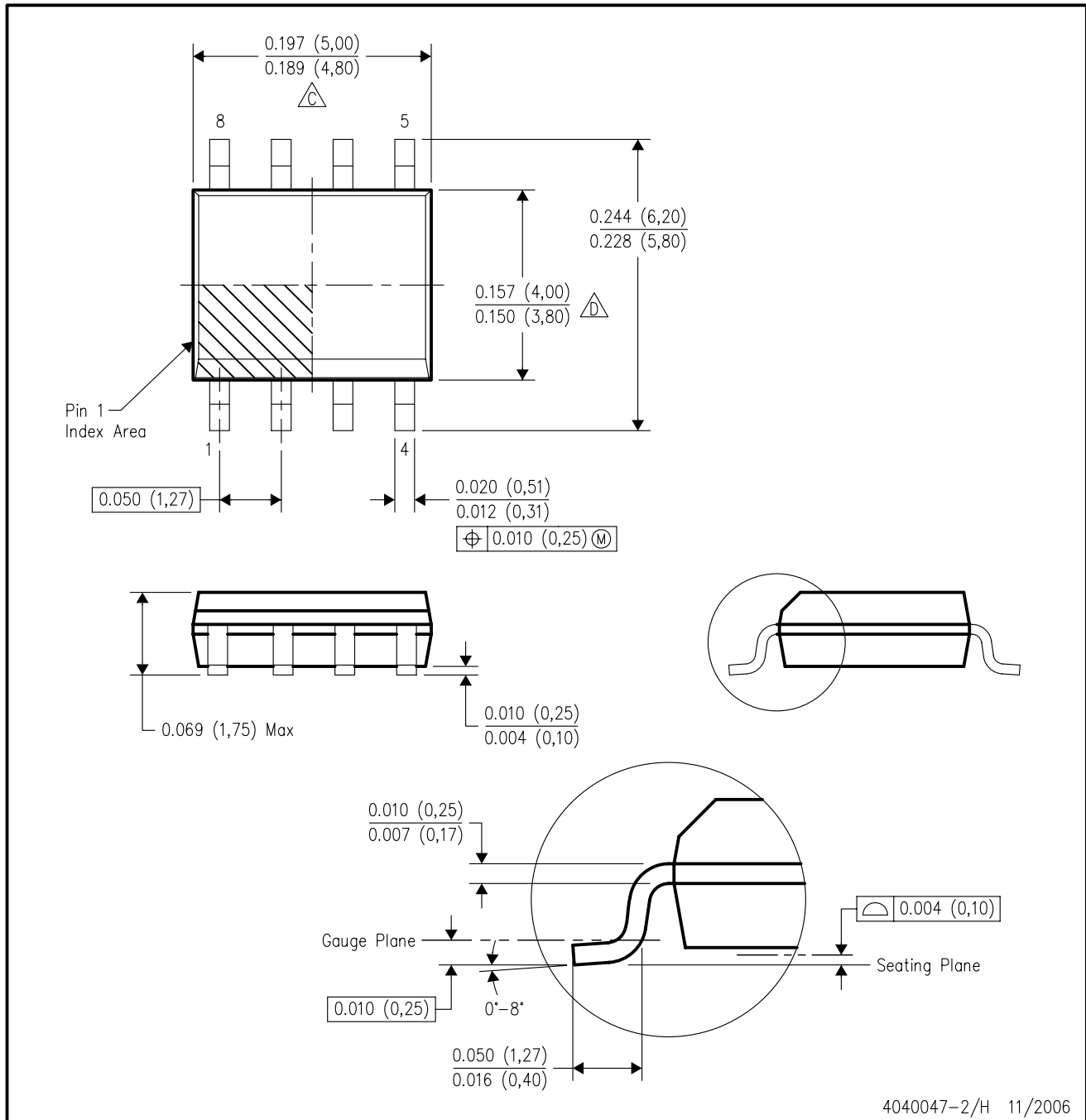


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN65LBC176ADR	SOIC	D	8	2500	342.9	338.1	20.6
SN65LBC176ADR	SOIC	D	8	2500	346.0	346.0	29.0
SN75LBC176ADR	SOIC	D	8	2500	346.0	346.0	29.0
SN75LBC176ADR	SOIC	D	8	2500	342.9	338.1	20.6

D (R-PDSO-G8)

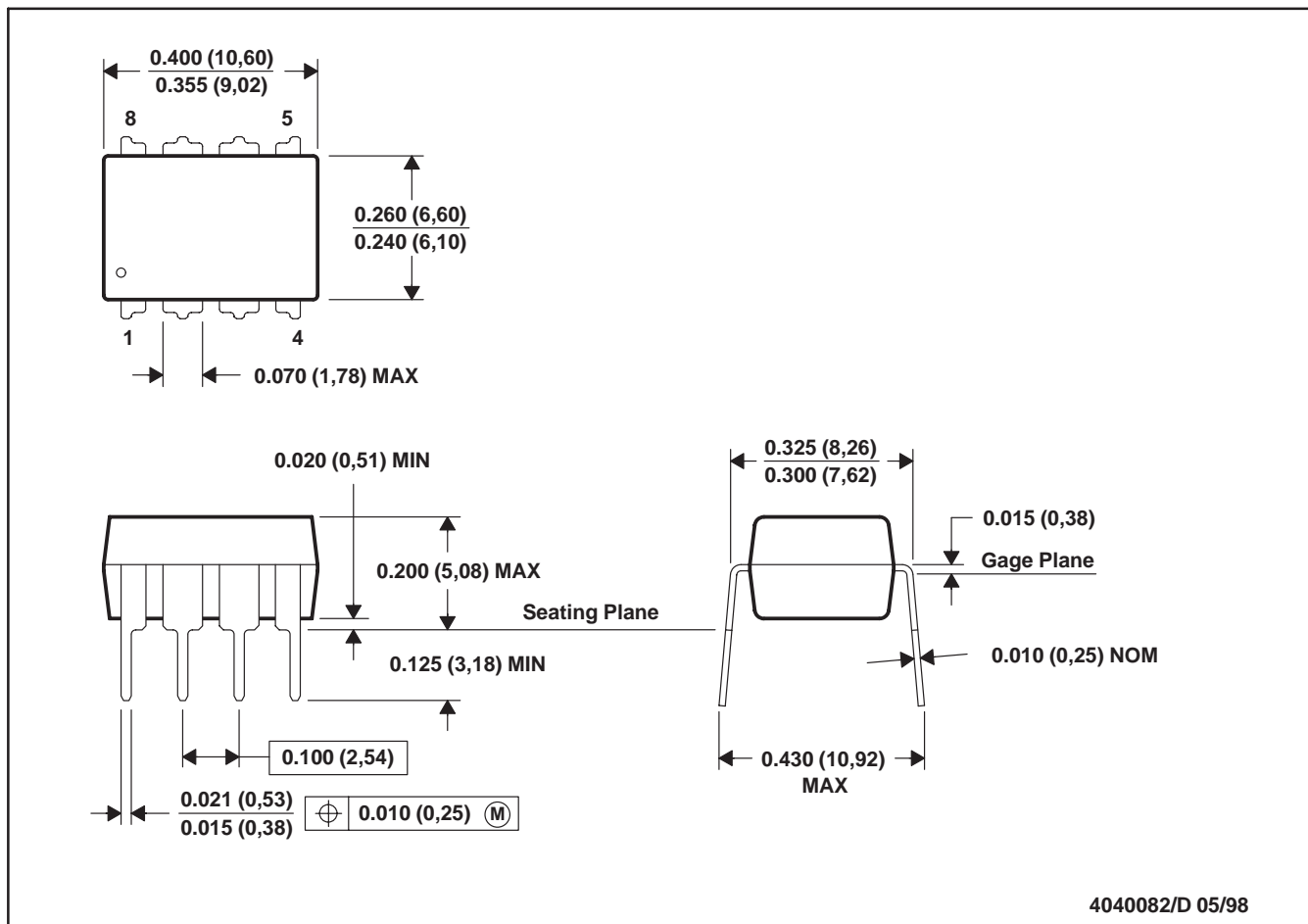
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
 - E. Reference JEDEC MS-012 variation AA.

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE



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

For the latest package information, go to http://www.ti.com/sc/docs/package/pkg_info.htm



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