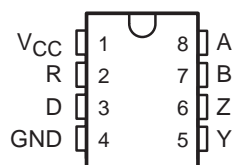


SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

SLLS173C – JANUARY 1994 – REVISED JANUARY 2000

- Designed for High-Speed Multipoint Data Transmission Over Long Cables
- Operate With Pulse Widths as Low as 30 ns
- Low Supply Current . . . 5 mA Max
- Meets or Exceeds the Standard Requirements of ANSI RS-485 and ISO 8482:1987(E)
- Common-Mode Voltage Range of -7 V to 12 V
- Positive- and Negative-Output Current Limiting
- Driver Thermal Shutdown Protection
- Pin Compatible With the SN75179B

D OR P PACKAGE
(TOP VIEW)



Function Tables

DRIVER

INPUT D	OUTPUTS	
	Y	Z
H	H	L
L	L	H

RECEIVER

DIFFERENTIAL INPUTS A-B	OUTPUT R
$V_{ID} \geq 0.2 \text{ V}$	H
$-0.2 \text{ V} < V_{ID} < 0.2 \text{ V}$?
$V_{ID} \leq -0.2 \text{ V}$	L
Open circuit	H

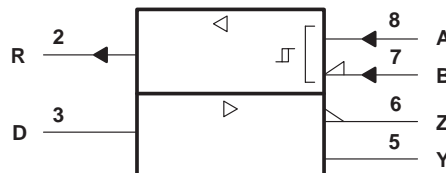
H = high level, L = low level,
? = indeterminate

description

The SN65LBC179, SN65LBC179Q, and SN75LBC179 differential driver and receiver pairs are monolithic integrated circuits designed for bidirectional data communication over long cables that take on the characteristics of transmission lines. They are balanced, or differential, voltage mode devices that meet or exceed the requirements of industry standards ANSI RS-485 and ISO 8482:1987(E). Both devices are designed using TI's proprietary LinBiCMOS™ with the low power consumption of CMOS and the precision and robustness of bipolar transistors in the same circuit.

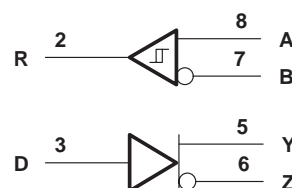
The SN65LBC179, SN65LBC179Q, and SN75LBC179 combine a differential line driver and differential line receiver and operate from a single 5-V supply. The driver differential outputs and the receiver differential inputs are connected to separate terminals for full-duplex operation and are designed to present minimum loading to the bus when powered off ($V_{CC} = 0$). These parts feature a wide common-mode voltage range making them suitable for point-to-point or multipoint data bus applications. The devices also provide positive- and negative-current limiting and thermal shutdown for protection from line fault conditions. The line driver shuts down at a junction temperature of approximately 172°C.

logic symbol†



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

logic diagram (positive logic)



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 Incorporated.

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

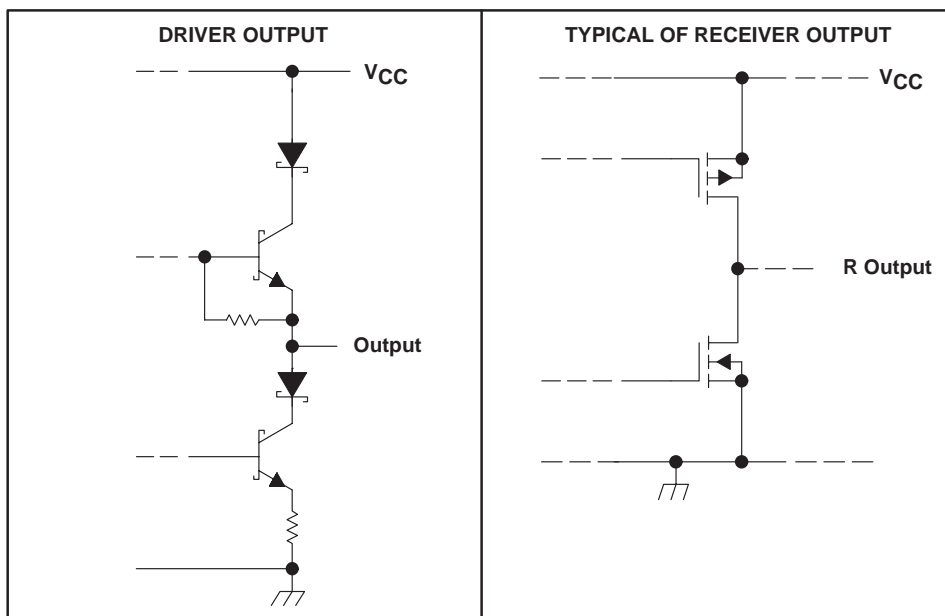
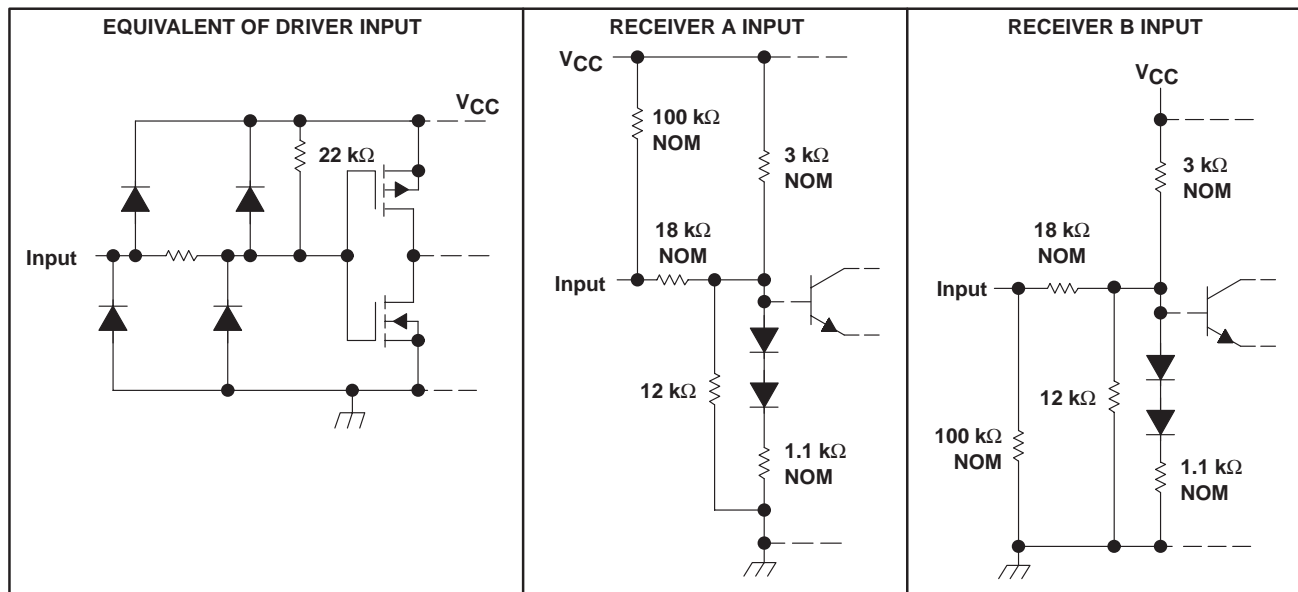
SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

SLLS173C – JANUARY 1994 – REVISED JANUARY 2000

description (continued)

The SN65LBC179, SN65LBC179Q, and SN75LBC179 are available in the 8-pin dual-in-line and small-outline packages. The SN75LBC179 is characterized for operation over the commercial temperature range of 0°C to 70°C. The SN65LBC179 is characterized over the industrial temperature range of -40°C to 85°C. The SN65LBC179Q is characterized over the extended industrial or automotive temperature range of -40°C to 125°C.

schematics of inputs and outputs



SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

SLLS173C – JANUARY 1994 – REVISED JANUARY 2000

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

Supply voltage range, V_{CC}	–0.3 V to 7 V
Voltage range at A, B, Y, or Z (see Note 1)	–10 V to 15 V
Voltage range at D or R (see Note 1)	–0.3 V to $V_{CC} + 0.5$ V
Continuous total power dissipation (see Note 2)	Internally limited
Total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A : SN65LBC179	–40°C to 85°C
SN65LBC179Q	–40°C to 125°C
SN75LBC179	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. The maximum operating junction temperature is internally limited. Uses the dissipation rating table to operate below this temperature.

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	725 mW	5.8 mW/°C	464 mW	377 mW
P	1100 mW	8.8 mW/°C	704 mW	572 mW

recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.75	5	5.25	V
High-level input voltage, V_{IH}	D	2			V
Low-level input voltage, V_{IL}	D			0.8	V
Differential input voltage, V_{ID}		–6 [‡]		6	V
Voltage at any bus terminal (separately or common-mode), V_O , V_I , or V_{IC}	A, B, Y, or Z	–7		12	V
High-level output current, I_{OH}	Y or Z			–60	mA
	R			–8	
Low-level output current, I_{OL}	Y or Z			60	mA
	R			8	
Operating free-air temperature, T_A	SN65LBC179	–40		85	°C
	SN65LBC179Q	–40		125	
	SN75LBC179	0		70	

[‡] The algebraic convention, in which the least positive (most negative) limit is designated as minimum, is used in this data sheet for differential input voltage, voltage at any bus terminal (separately or common mode), operating temperature, input threshold voltage, and common-mode output voltage.



SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

SLLS173C – JANUARY 1994 – REVISED JANUARY 2000

DRIVER SECTION

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	V
$ V_{OD} $	Differential output voltage (see Note 3)	$R_L = 54 \Omega$, See Figure 1	SN65LBC179, SN65LBC179Q	1.1	2.2	5	V
			SN75LBC179	1.5	2.2	5	
		$R_L = 60 \Omega$, See Figure 2	SN65LBC179, SN65LBC179Q	1.1	2.2	5	
			SN75LBC179	1.5	2.2	5	
$\Delta V_{OD} $	Change in magnitude of differential output voltage (see Note 4)	See Figures 1 and 2				± 0.2	V
V_{OC}	Common-mode output voltage	$R_L = 54 \Omega$, See Figure 1		1	2.5	3	V
$\Delta V_{OC} $	Change in magnitude of common-mode output voltage (see Note 4)					± 0.2	V
I_O	Output current with power off	$V_{CC} = 0$,	$V_O = -7$ V to 12 V			± 100	μ A
I_{IH}	High-level input current	$V_I = 2.4$ V				-100	μ A
I_{IL}	Low-level input current	$V_I = 0.4$ V				-100	μ A
I_{OS}	Short-circuit output current	-7 V $\leq V_O \leq 12$ V				± 250	mA
I_{CC}	Supply current	No load	SN65LBC179, SN75LBC179		4.2	5	mA
			SN65LBC179Q		4.2	7	mA

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

NOTES: 3. The minimum V_{OD} specification of the SN65179 may not fully comply with ANSI RS-485 at operating temperatures below 0°C . System designers should take the possibly lower output signal into account in determining the maximum signal transmission distance.

4. $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ are the changes in the steady-state magnitude of V_{OD} and V_{OC} , respectively, that occur when the input is changed from a high level to a low level.

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

PARAMETER		TEST CONDITIONS		MIN	MAX	UNIT
$t_{d(OD)}$	Differential-output delay time	$R_L = 54 \Omega$,	See Figure 3	7	18	ns
$t_{t(OD)}$	Differential transition time			5	20	ns



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

SLLS173C – JANUARY 1994 – REVISED JANUARY 2000

RECEIVER SECTION

electrical characteristics over recommended operating conditions (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IT+} Positive-going input threshold voltage	$I_O = -8 \text{ mA}$			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_{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	$V_{ID} = -200 \text{ mV}$, $I_{OL} = 16 \text{ mA}$		0.3	0.5	V
I_I Bus input current	$V_I = 12 \text{ V}$, Other inputs at 0 V, $V_{CC} = 5 \text{ V}$	SN65LBC179, SN75LBC179	0.7	1	mA
		SN65LBC179Q	0.7	1.2	mA
	$V_I = 12 \text{ V}$, Other inputs at 0 V, $V_{CC} = 0 \text{ V}$	SN65LBC179, SN75LBC179	0.8	1	mA
		SN65LBC179Q	0.8	1.2	mA
	$V_I = -7 \text{ V}$, Other inputs at 0 V, $V_{CC} = 5 \text{ V}$	SN65LBC179, SN75LBC179	-0.5	-0.8	mA
		SN65LBC179Q	-0.5	-1.0	mA
$V_I = -7 \text{ V}$, Other inputs at 0 V, $V_{CC} = 0 \text{ V}$	SN65LBC179, SN75LBC179	-0.5	-0.8	mA	
	SN65LBC179Q	-0.5	-1.0	mA	

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PHL} Propagation delay time, high- to low-level output	$V_{ID} = -1.5 \text{ V to } 1.5 \text{ V}$, See Figure 4	15		30	ns
t_{PLH} Propagation delay time, low- to high-level output		15		30	ns
$t_{sk(p)}$ Pulse skew ($ t_{PHL} - t_{PLH} $)	See Figure 4		3	6	ns
t_t Transition time			3	5	ns

PARAMETER MEASUREMENT INFORMATION

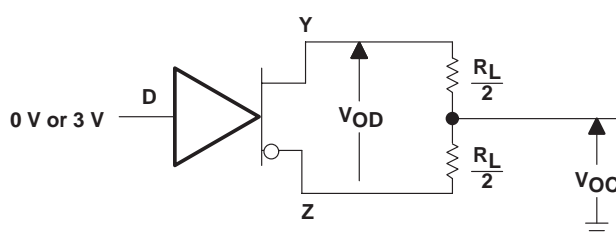


Figure 1. Differential and Common-Mode Output Voltage Test Circuit

SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

SLLS173C – JANUARY 1994 – REVISED JANUARY 2000

PARAMETER MEASUREMENT INFORMATION

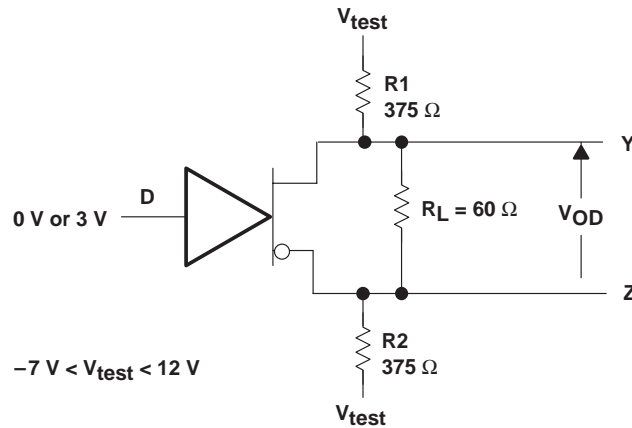


Figure 2. Differential Output Voltage Test Circuit

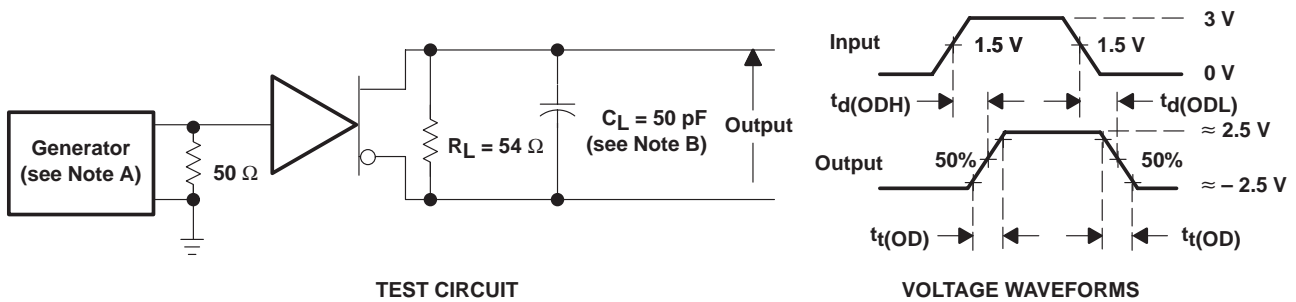


Figure 3. Driver Test Circuits and Differential Output Delay and Transition Time Voltage Waveforms

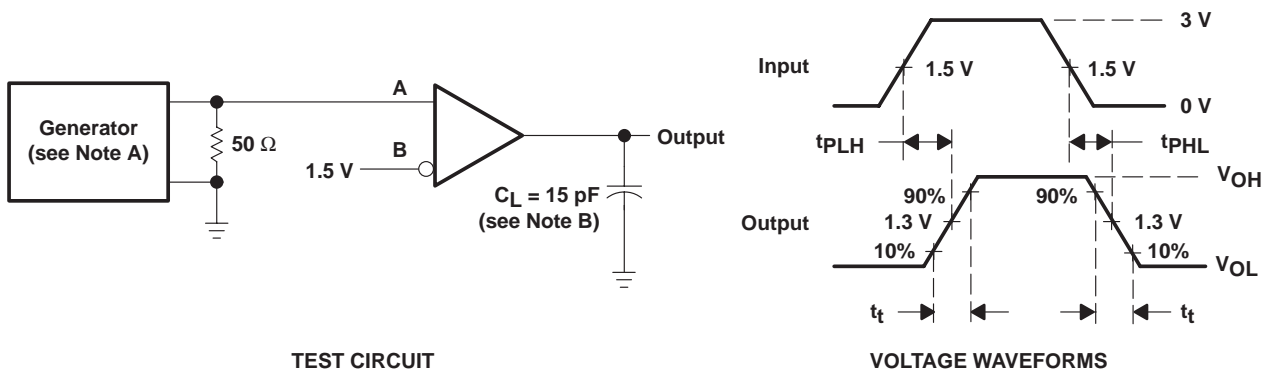


Figure 4. Receiver Test Circuit and Propagation Delay and Transition Time Voltage Waveforms

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.

SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

SLLS173C – JANUARY 1994 – REVISED JANUARY 2000

TYPICAL CHARACTERISTICS

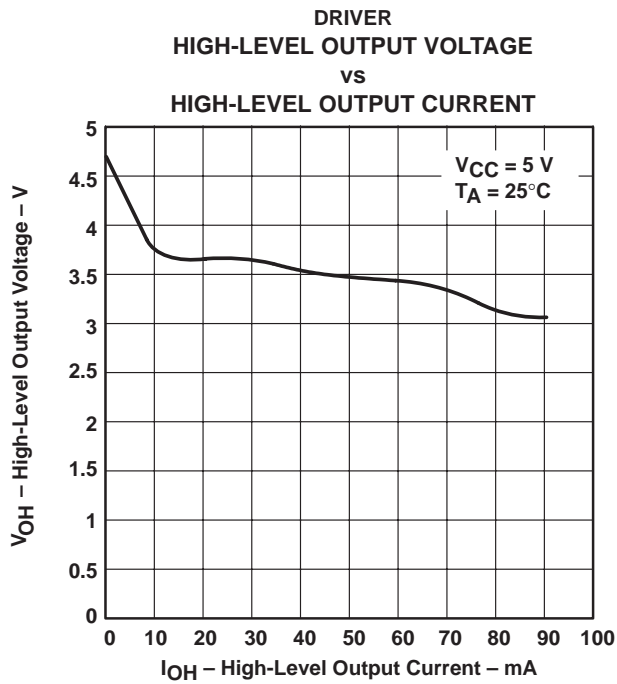


Figure 5

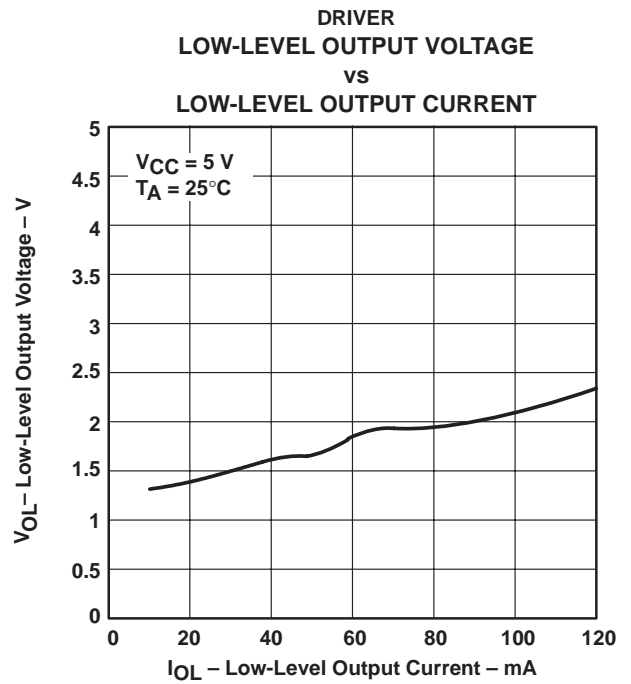


Figure 6

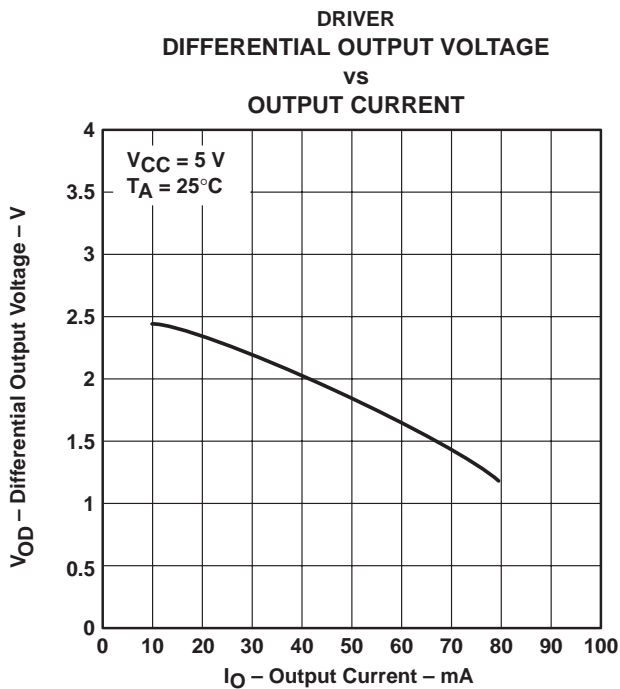


Figure 7

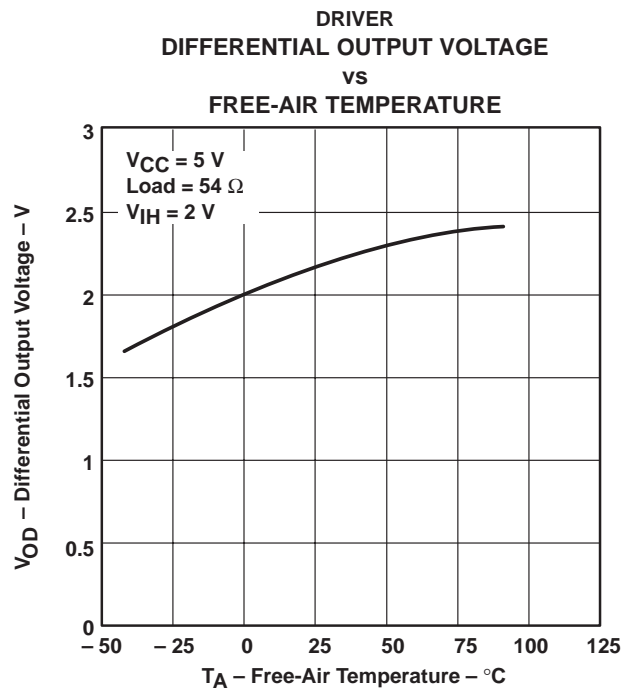


Figure 8

SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

SLLS173C – JANUARY 1994 – REVISED JANUARY 2000

TYPICAL CHARACTERISTICS

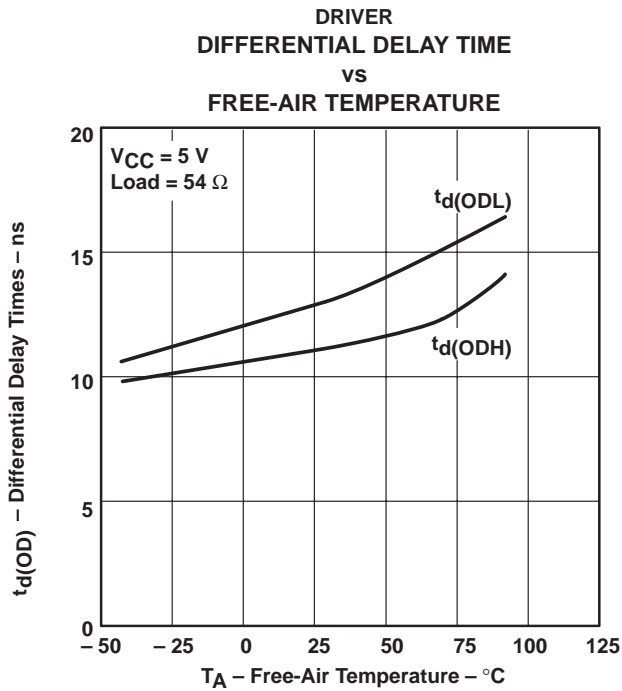


Figure 9

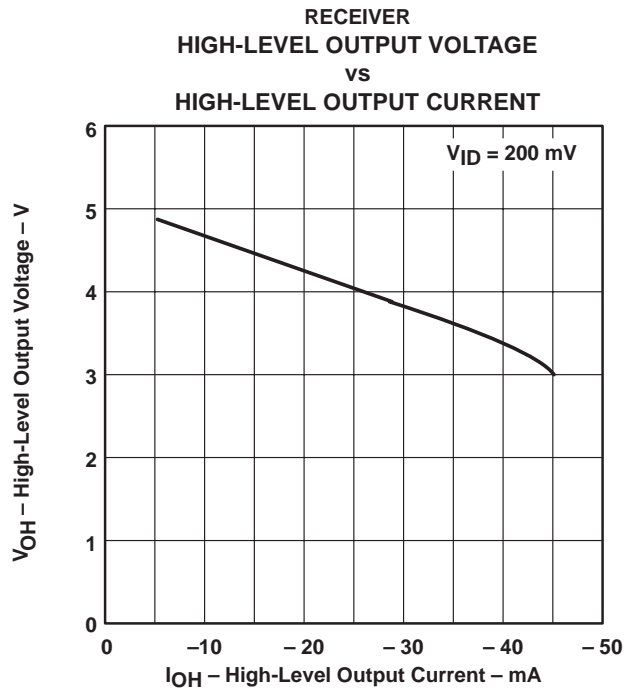


Figure 10

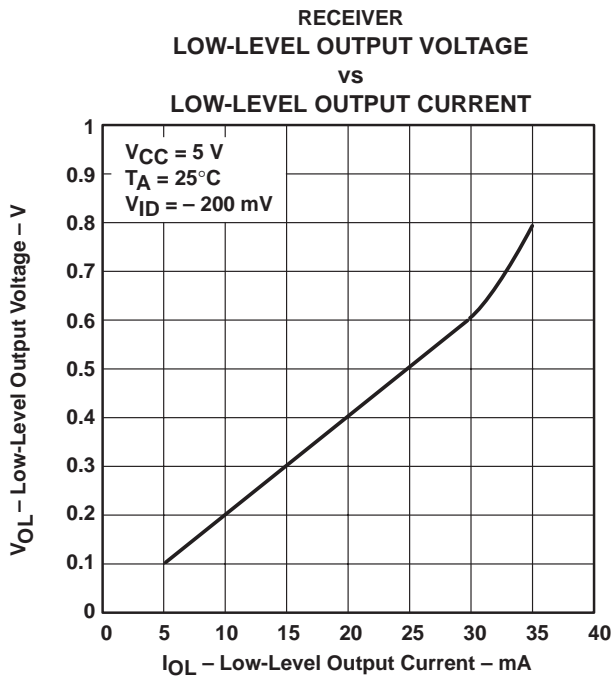


Figure 11

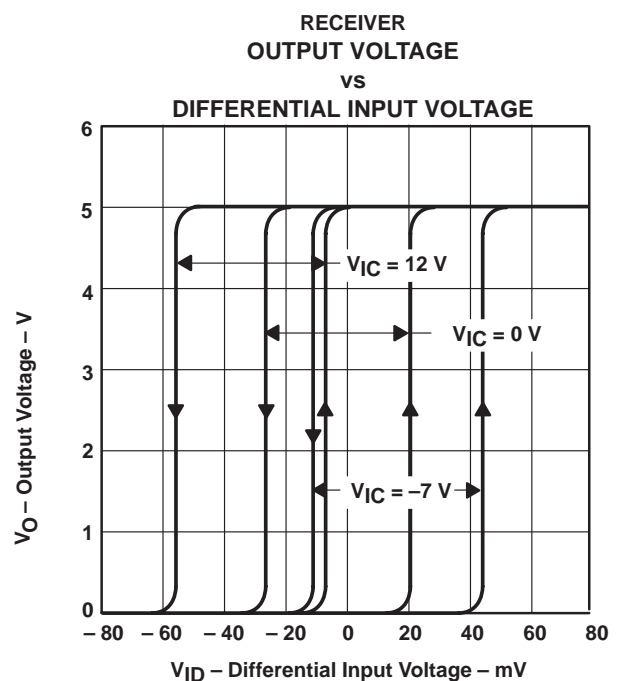
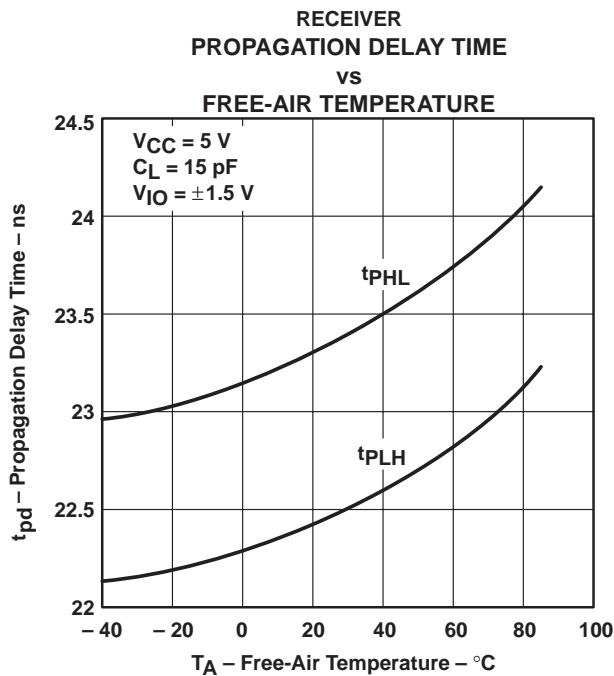
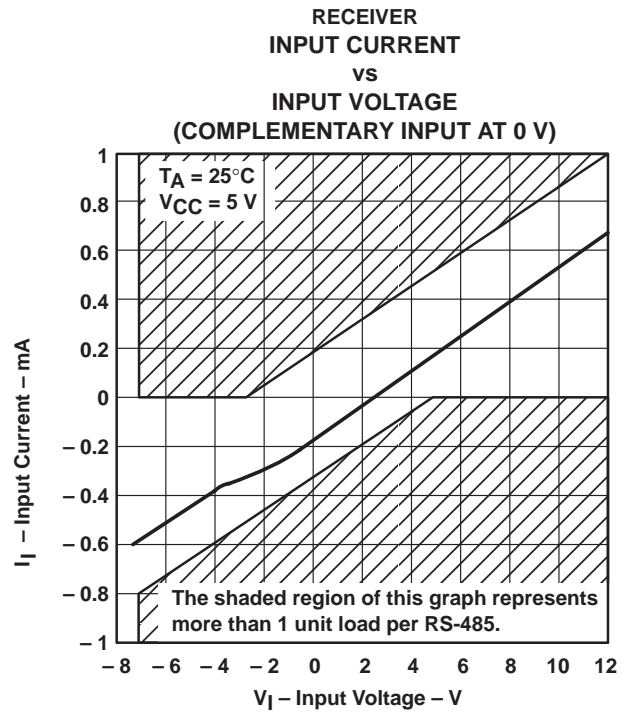
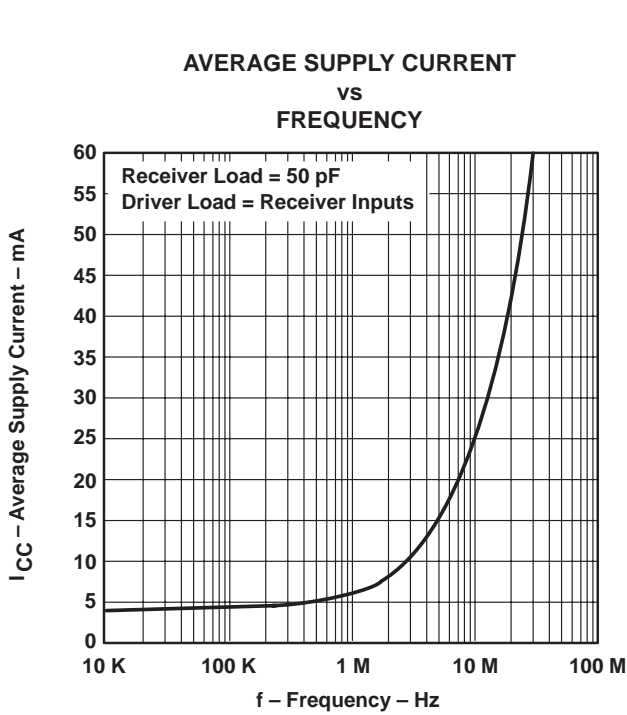


Figure 12

SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

SLLS173C – JANUARY 1994 – REVISED JANUARY 2000

TYPICAL CHARACTERISTICS



SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

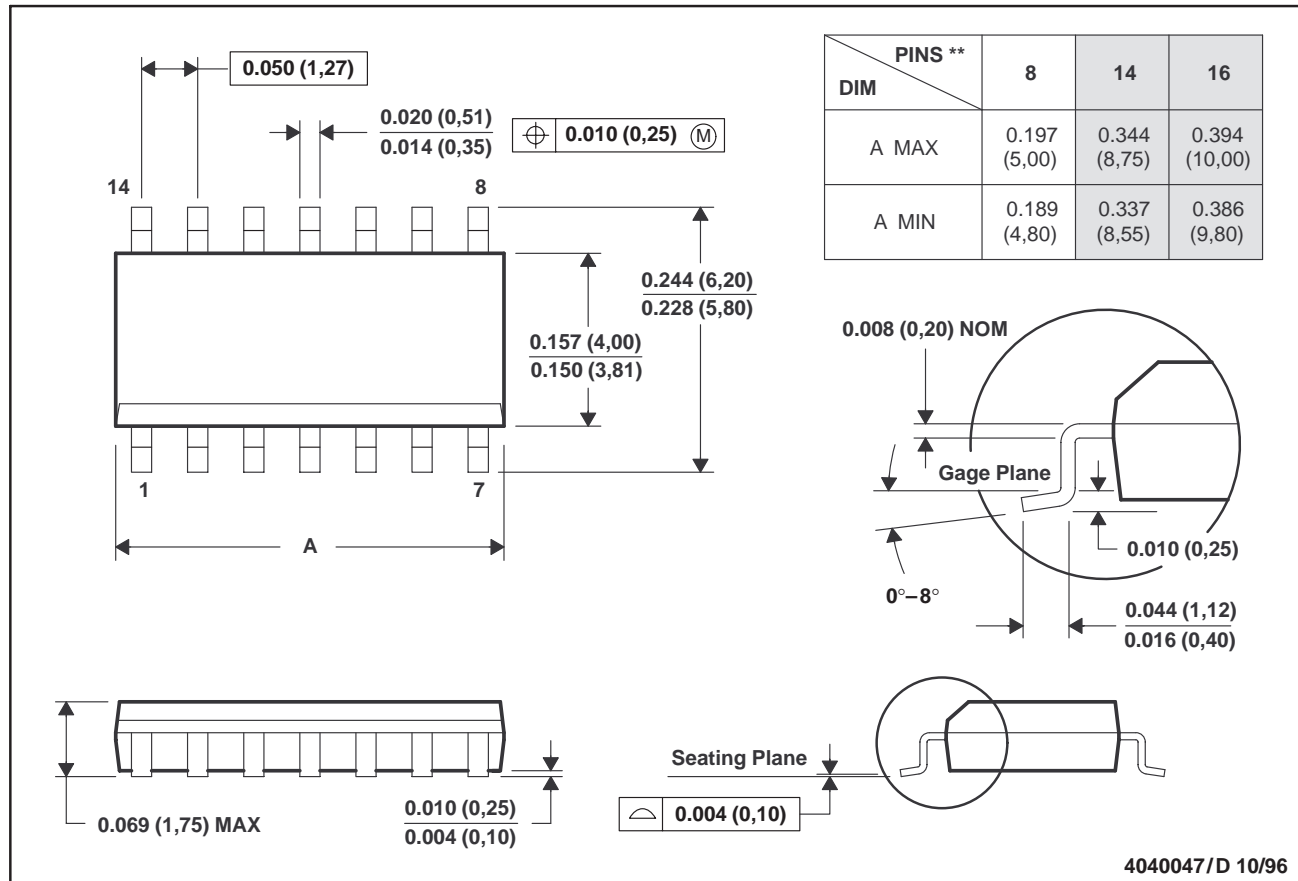
SLLS173C – JANUARY 1994 – REVISED JANUARY 2000

MECHANICAL INFORMATION

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

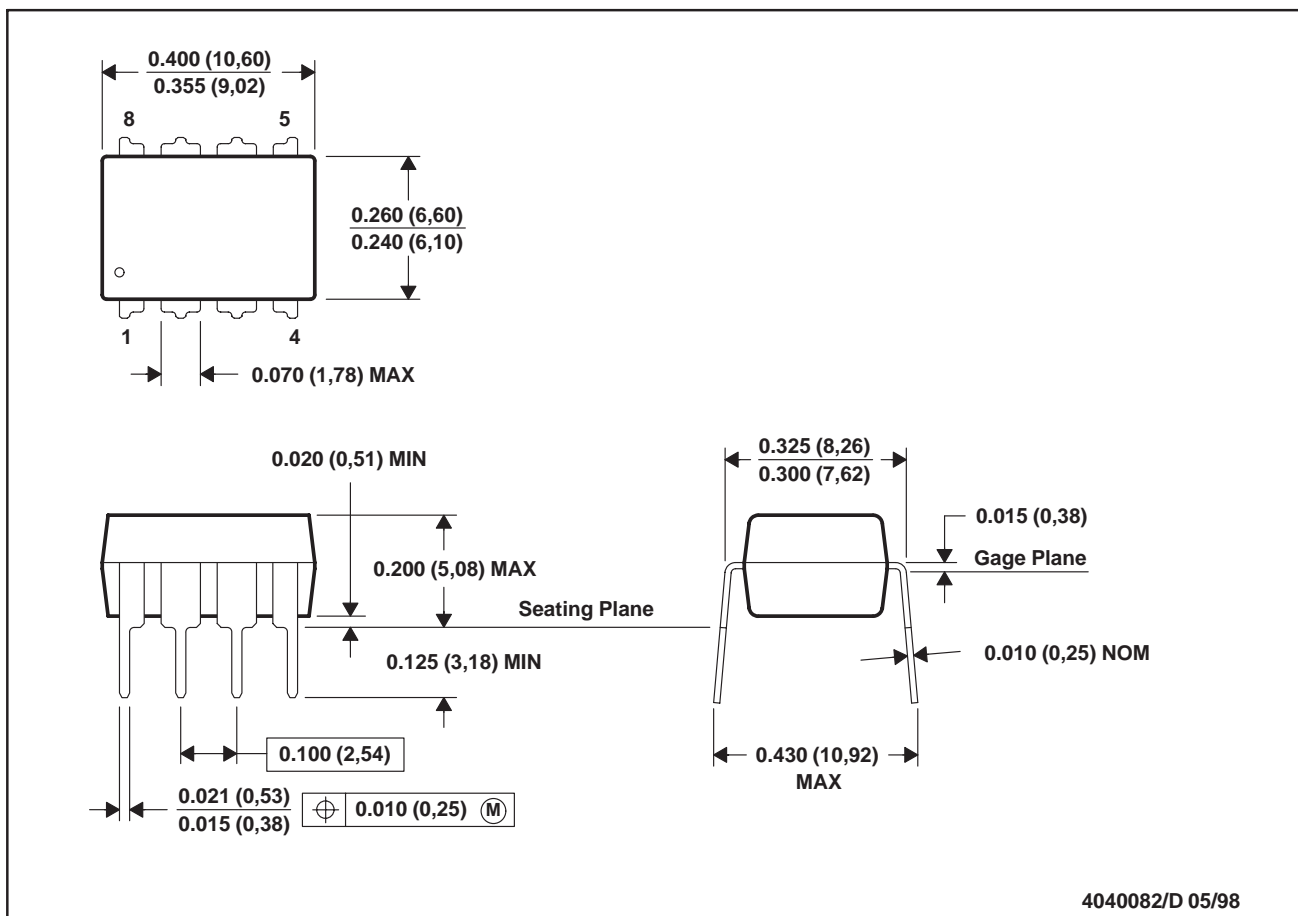
SN75LBC179, SN65LBC179, SN65LBC179Q LOW-POWER DIFFERENTIAL LINE DRIVER AND RECEIVER PAIRS

SLLS173C – JANUARY 1994 – REVISED JANUARY 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

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.