

SN55LBC173 QUADRUPLE LOW-POWER DIFFERENTIAL RECEIVER

SGLS081A – MARCH 1995 – REVISED JUNE 2000

- Meets EIA Standards RS-422-A, RS-423-A, RS-485, and CCITT 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

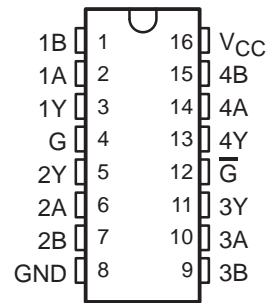
description

The SN55LBC173 is a monolithic quadruple differential line receiver with 3-state outputs designed to meet the requirements of the EIA standards RS-422-A, RS-423-A, RS-485, and CCITT V.11. This device is 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. The SN55LBC173 is designed using the Texas Instruments proprietary LinBiCMOS™ technology that provides low power consumption, high switching speeds, and robustness.

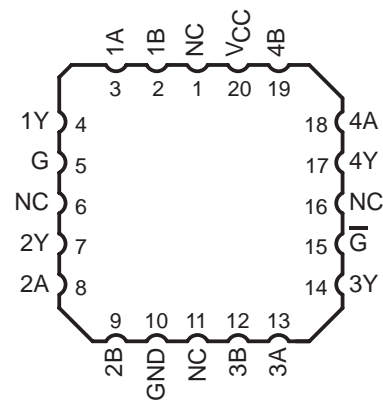
This device offers optimum performance when used with the SN55LBC172M quadruple line driver. The SN55LBC173 is available in the 16-pin CDIP (J), the 16-pin CPAK (W), or the 20-pin LCCC (FK) packages.

The SN55LBC173 is characterized over the military temperature range of -55°C to 125°C .

J OR W PACKAGE
(TOP VIEW)



FK PACKAGE
(TOP VIEW)



NC – No internal connection



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

SN55LBC173
QUADRUPLE LOW-POWER DIFFERENTIAL RECEIVER

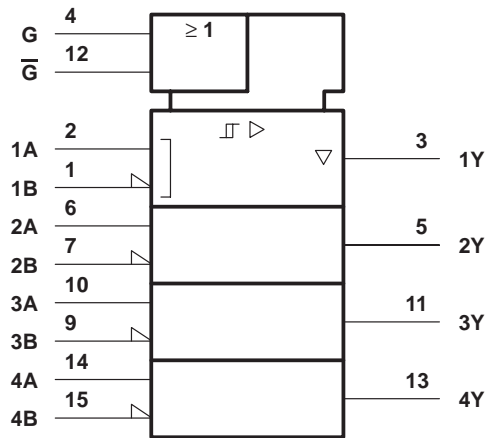
SGLS081A – MARCH 1995 – REVISED JUNE 2000

FUNCTION TABLE
(each receiver)

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

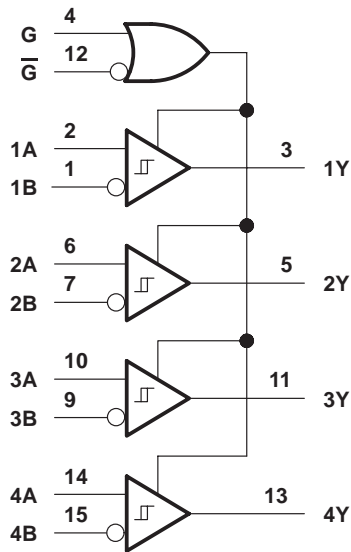
H = high level, L = low level, X = irrelevant,
Z = high impedance (off), ? = indeterminate

logic symbol†

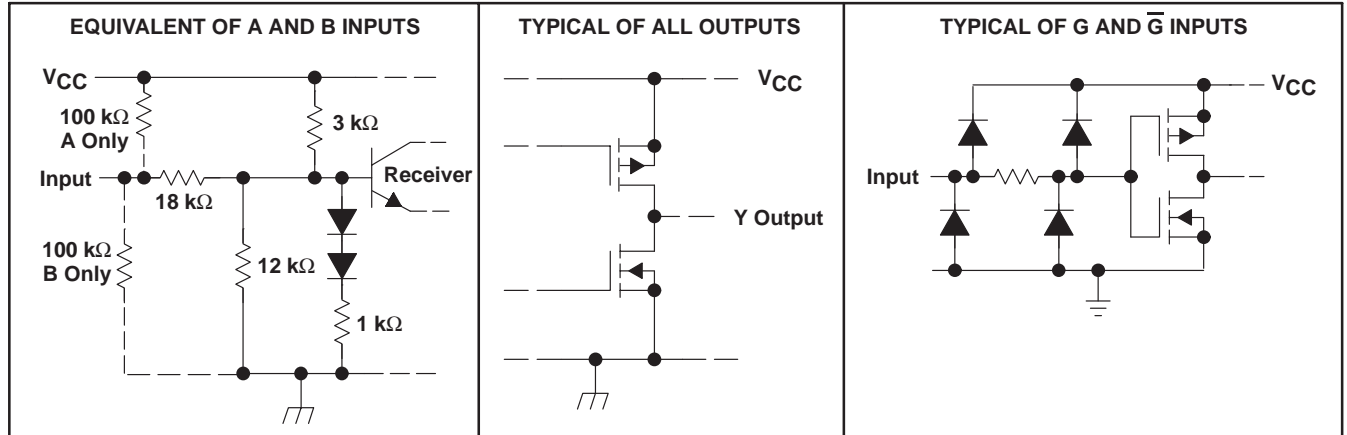


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the J or W package.

logic diagram (positive logic)



schematics of inputs and outputs



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
Data and control voltage range	–0.3 V to 7 V
Continuous total dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A	–55°C to 125°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 $T_A = 25^\circ\text{C}$	$T_A = 125^\circ\text{C}$ POWER RATING
FK	1375 mW	11.0 mW/°C	275 mW
J	1375 mW	11.0 mW/°C	275 mW
W	1000 mW	8.0 mW/°C	200 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}	2			V
Low-level input voltage, V_{IL}				V
High-level output current, I_{OH}			–8	mA
Low-level output current, I_{OL}			16	mA
Operating free-air temperature, T_A	–55		125	°C

SN55LBC173

QUADRUPLE LOW-POWER DIFFERENTIAL RECEIVER

SGLS081A – MARCH 1995 – REVISED JUNE 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
		$V_{ID} = -200 \text{ mV}$, $I_{OL} = 8 \text{ mA}$, $T_A = 125^\circ\text{C}$			0.7	
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 $T_A = 25^\circ\text{C}$.

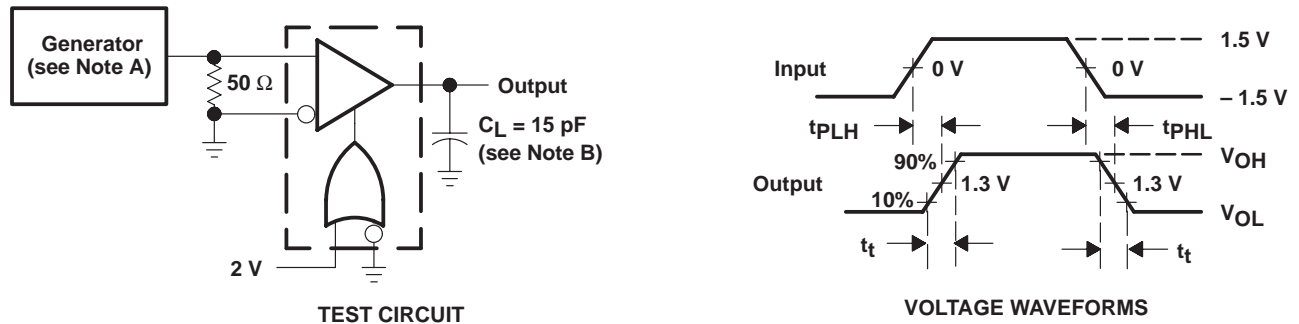
switching characteristics, $V_{CC} = 5 \text{ V}$, $C_L = 15 \text{ pF}$

PARAMETER		TEST CONDITIONS	T _A	MIN	TYP	MAX	UNIT
t _{PHL}	Propagation delay time, high-to-low-level output	V _{ID} = −1.5 V to 1.5 V, See Figure 1	25°C	11	22	30	ns
			−55°C to 125°C	11		35	
t _{PLH}	Propagation delay time, low-to-high-level output	V _{ID} = −1.5 V to 1.5 V, See Figure 1	25°C	11	22	35	ns
			−55°C to 125°C	11		35	
t _{PZH}	Output enable time to high level	See Figure 2	25°C		17	40	ns
			−55°C to 125°C			45	
t _{PZL}	Output enable time to low level	See Figure 3	25°C		18	30	ns
			−55°C to 125°C			35	
t _{PHZ}	Output disable time from high level	See Figure 2	25°C		30	40	ns
			−55°C to 125°C			55	
t _{PLZ}	Output disable time from low level	See Figure 3	25°C		25	40	ns
			−55°C to 125°C			45	
t _{sk(p)}	Pulse skew (t _{PHL} − t _{PLH})	See Figure 1	25°C		0.5	6	ns
			−55°C to 125°C			7	
t _t	Transition time	See Figure 1	25°C		5	10	ns
			−55°C to 125°C			16	



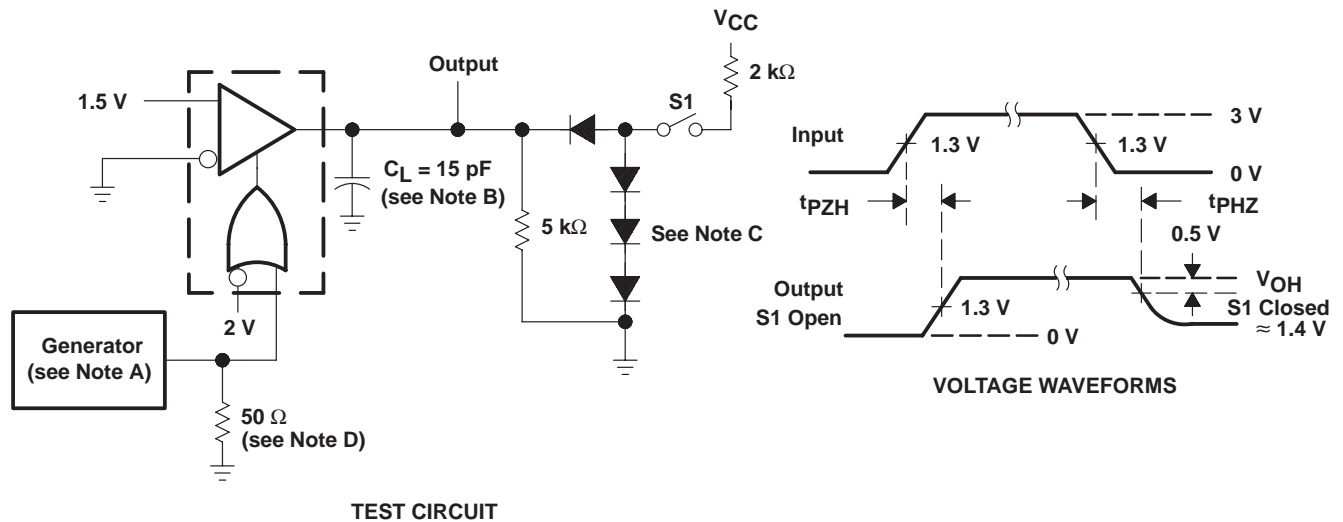
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

PARAMETER MEASUREMENT INFORMATION



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

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



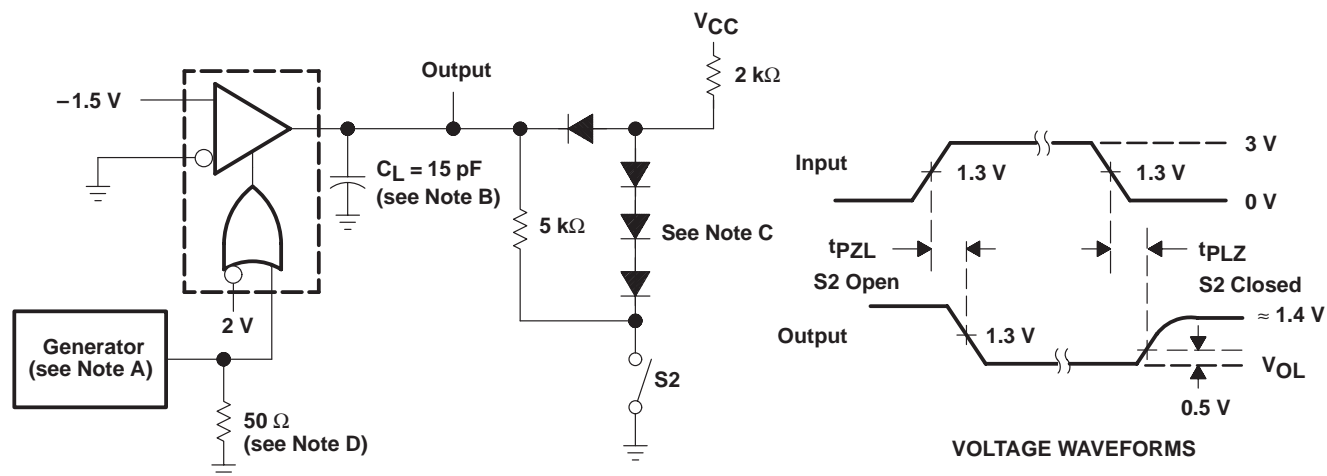
- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR = 1 MHz, duty cycle $\leq 50\%$, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_O = 50 \Omega$.
B. C_L includes probe and jig capacitance.
C. All diodes are 1N916 or equivalent.
D. To test the active-low enable \overline{G}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

Figure 2. t_{pZH} and t_{pHZ} Test Circuit and Voltage Waveforms

SN55LBC173 QUADRUPLE LOW-POWER DIFFERENTIAL RECEIVER

SGLS081A – MARCH 1995 – REVISED JUNE 2000

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

- 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

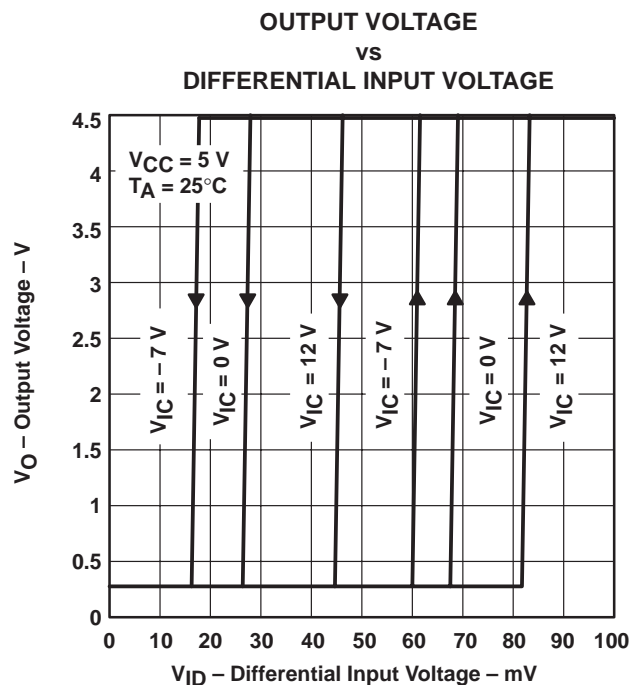


Figure 4

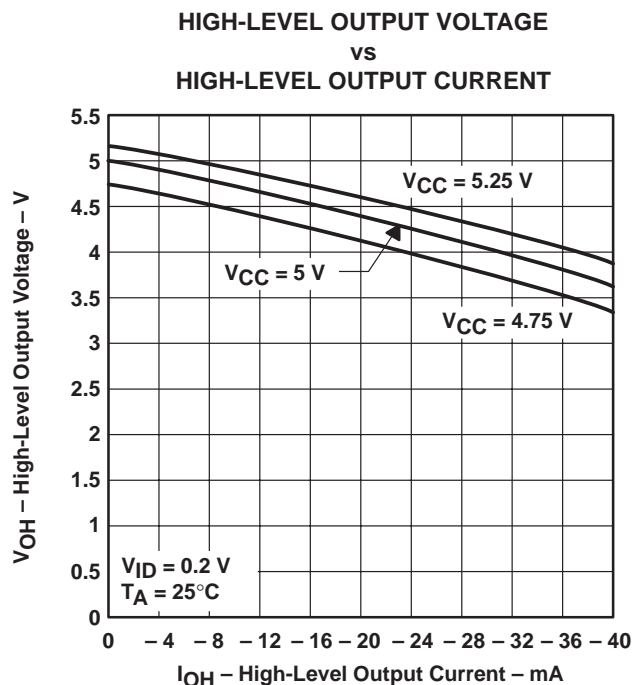


Figure 5

TYPICAL CHARACTERISTICS

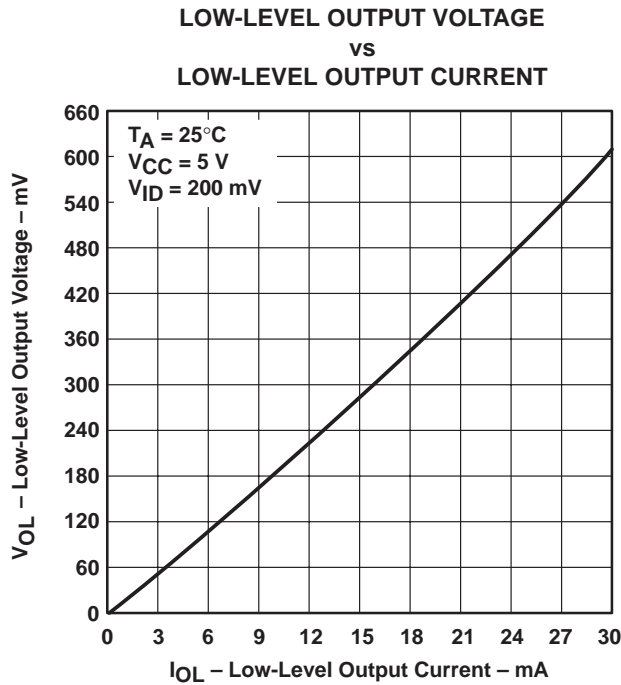


Figure 6

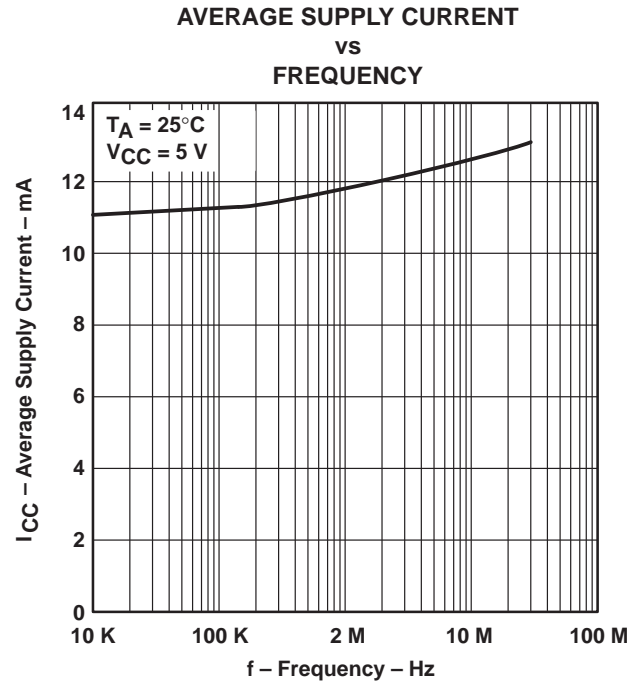


Figure 7

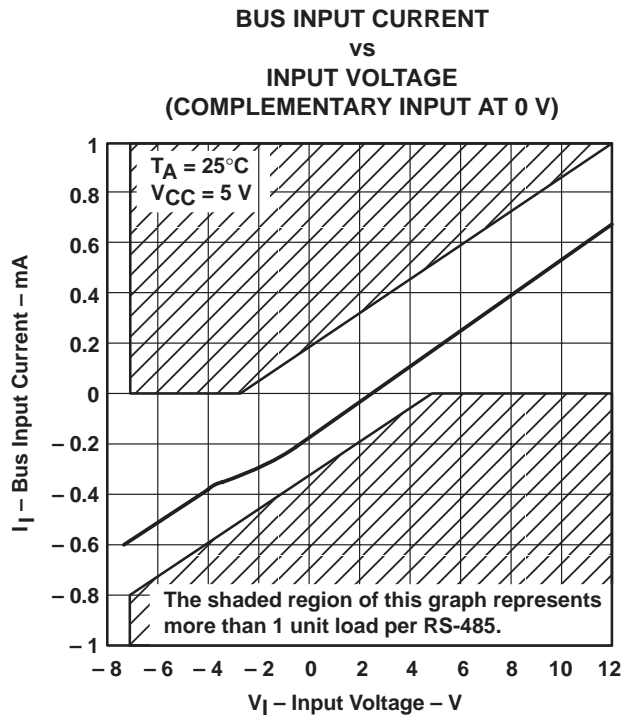


Figure 8

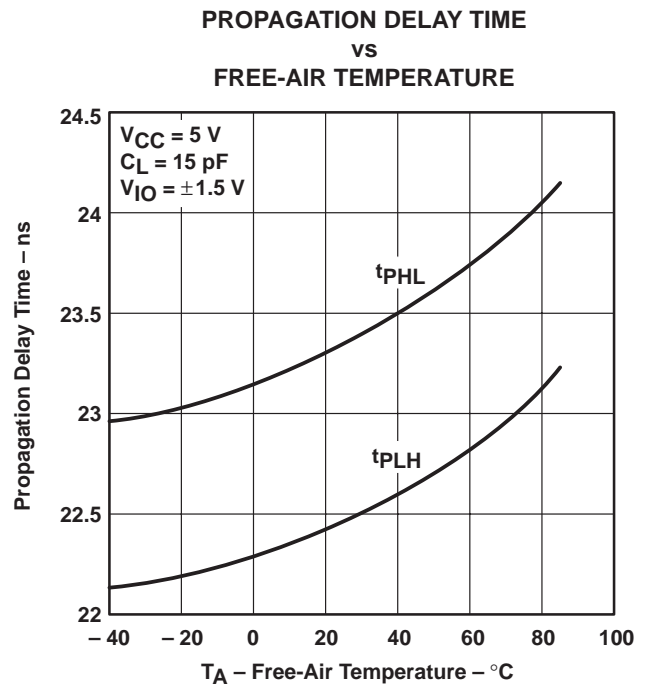


Figure 9

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 acknowledgment, 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.

Customers are responsible for their applications using TI components.

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.