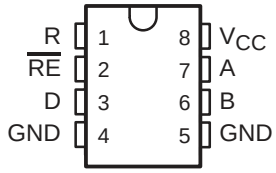
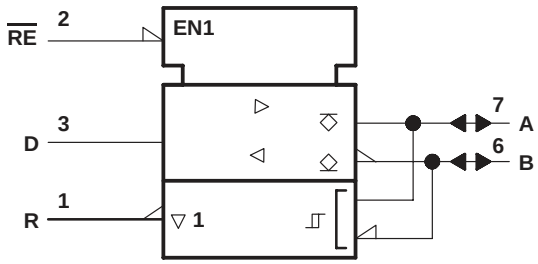
- **Bidirectional Transceiver**
- **Designed for Multipoint Transmission in Noisy Environments Such as Automotive Applications**
- **3-State Driver and Receiver Outputs**
- **Individual Driver and Receiver Enables**
- **Wide Positive and Negative Input/Output Bus Voltage Ranges**
- **Driver Output Capability . . . ±10 mA Max**
- **Thermal Shutdown Protection**
- **Driver Positive and Negative Current Limiting**
- **Receiver Input Impedance . . . 12 kΩ Min**
- **Receiver Input Sensitivity . . . ±200 mV**
- **Receiver Input Hysteresis . . . 50 mV Typ**
- **Operates From Single 5-V Supply**
- **Low Power Requirements**

D OR P PACKAGE
(TOP VIEW)

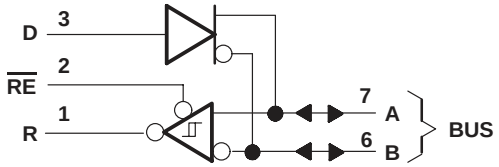


logic symbol†



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

logic diagram (positive logic)



description

The SN65076B and SN75076B differential bus transceivers are monolithic integrated circuits designed for bidirectional data communication on multipoint bus transmission lines. They are designed for noisy environments, where a low-impedance termination to ground is required.

The SN65076B and SN75076B combine a differential line driver and a differential input line receiver, both of which operate from a single 5-V power supply. The receiver has an active-low enable. The driver differential outputs and the receiver differential inputs are connected internally to form differential input/output (I/O) bus ports that are designed to offer minimum loading to the bus whenever the driver is disabled or V_{CC} = 0. These ports feature wide positive and negative common-mode voltage ranges making the device suitable for party-line applications.

Function Tables

DRIVER

INPUT	OUTPUTS	
D	A	B
H	H	L
L	L†	H†

† These levels assume that the open-collector outputs (A) and the open-emitter outputs (B) are connected to a pullup and pulldown resistor, respectively.

RECEIVER

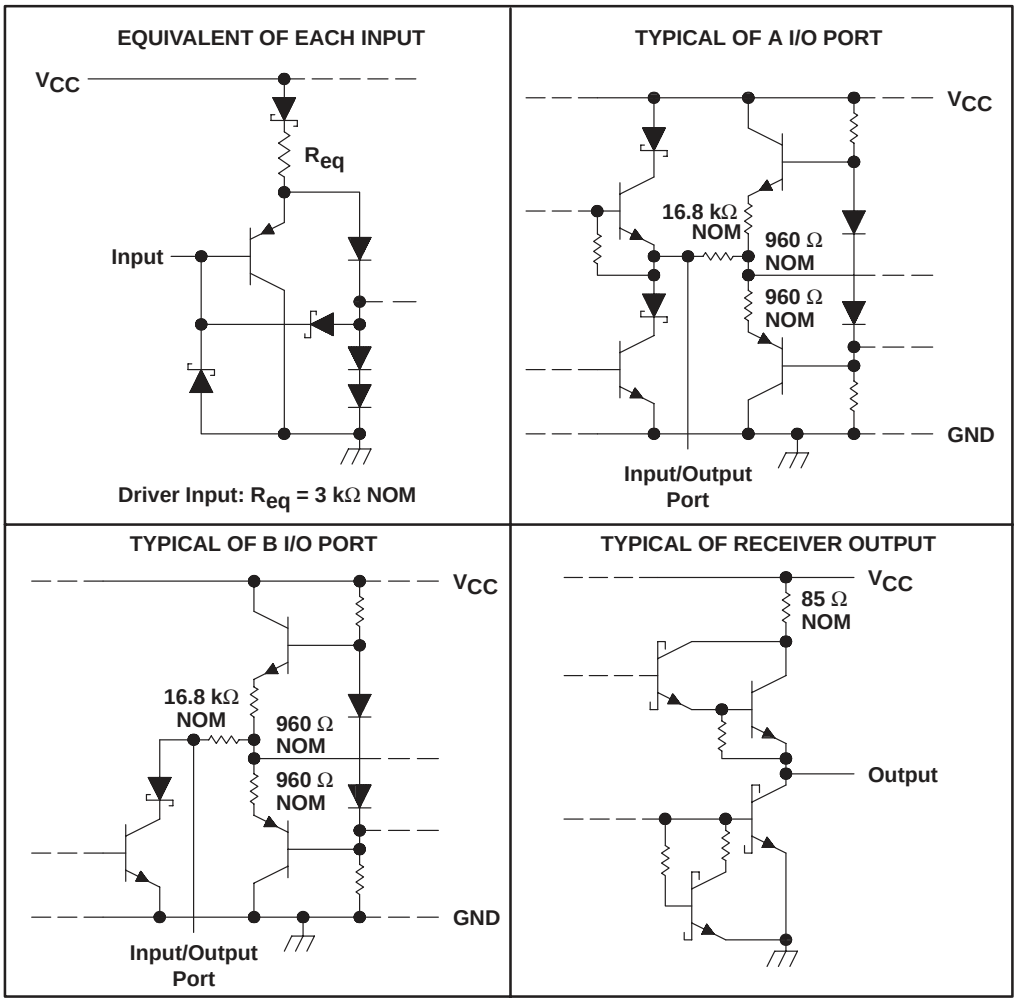
DIFFERENTIAL INPUTS A – B	ENABLE $\overline{RE}$	OUTPUT R
$V_{ID} \geq 0.2$ V	L	L
-0.2 V < V_{ID} < 0.2 V	L	?
$V_{ID} \leq -0.2$ V	L	H
X	H	Z

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

description (continued)

The driver is designed to handle loads up to 10 mA of sink and source current. The driver features positive- and negative-current limiting and thermal shutdown for protection from line fault conditions. Thermal shutdown is designed to occur at a junction temperature of approximately 150°C in the P package and 170°C in the D package. The receiver features a minimum input impedance of 12 kΩ, an input sensitivity of ±200 mV, and a typical input hysteresis of 50 mV.

The SN65076B is characterized for operation from –40°C to 105°C and the SN75076B is characterized for operation from 0°C to 70°C.



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

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Voltage range at any bus terminal . . . . . –10 V to 15 V
Enable input voltage . . . . . 5.5 V
Continuous total power dissipation . . . . . See Dissipation Rating Table
Operating free-air temperature range: SN65076B . . . . . –40°C to 105°C
SN75076B . . . . . 0°C to 70°C
Storage temperature range . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from the case for 10 seconds . . . . . 260°C

NOTE 1: All voltage values, except differential input/output bus voltage, are with respect to network ground terminal.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 105°C$ POWER RATING
D	725 mW	5.8 mW/°C	464 mW	261 mW
P	1100 mW	8.8 mW/°C	702 mW	396 mW

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}				12	V
				–7	
High-level input voltage, V_{IH}	D and $\overline{RE}$	2			V
Low-level input voltage, V_{IL}	D and $\overline{RE}$			0.8	V
Differential input voltage, V_{ID} (see Note 2)				±12	V
High-level output current, I_{OH}	Driver (A)			–10	mA
	Receiver			–400	µA
Low-level output current, I_{OL}	Driver (B)			10	mA
	Receiver			8	
Operating free-air temperature, T_A	SN65076B	–40		105	°C
	SN75076B	0		70	

NOTE 2: Differential-input/output bus voltage is measured at the noninverting terminal A with respect to the inverting terminal B.

DRIVER SECTION

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature

PARAMETER		TEST CONDITIONS		MIN	MAX	UNIT
V_{IK}	Input clamp voltage	I_I = –18 mA			–1.5	V
V_O	Output voltage	V_I = 2 V, I_O = 0		0	6	V
V_{OD1}	Differential output voltage	I_O = 0		1.5	6	V
V_{OD2}	Differential output voltage	See Figure 1		1.5	5	V
I_O	Output current	V_I = 0.8 V	V_O = 12 V		1	mA
			V_O = –7 V		–0.8	
I_{IH}	High-level input current	V_I = 2.4 V			20	µA
I_{IL}	Low-level input current	V_I = 0.4 V			–400	µA
I_{OS}	Short-circuit output current	V_O = –7 V			–250	mA
		V_O = 0			–150	
		V_O = V_{CC}			250	
		V_O = 12 V			250	
I_{CC}	Supply current (total package)	No load			30	mA

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{on}	Differential-output turn-on time	See Figure 3		60	90	ns
t_{off}	Differential-output turn-off time			75	110	ns

RECEIVER SECTION

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{T+}	Positive-going input threshold voltage	V_O = 2.7 V,	I_O = –0.4 mA			0.2	V
V_{T-}	Negative-going input threshold voltage	V_O = 0.5 V,	I_O = 8 mA	–0.2‡			V
V_{hys}	Hysteresis ($V_{T+} - V_{T-}$)				50		mV
V_{IK}	Enable-input clamp voltage	I_I = –18 mA				–1.5	V
V_{OH}	High-level output voltage	V_{ID} = –200 mV, See Figure 2	I_{OH} = –400 μA,	2.7			V
V_{OL}	Low-level output voltage	V_{ID} = –200 mV, See Figure 2	I_{OL} = 8 mA,			0.45	V
I_{OZ}	High-impedance-state output current	V_O = 0.4 V to 2.4 V				±20	μA
I_I	Line input current	Other input = 0 V, V_I = –7 V,	V_I = 12 V, See Note 3			1 –0.8	mA
I_{IH}	High-level enable-input current	V_{IH} = 2.7 V				20	μA
I_{IL}	Low-level enable-input current	V_{IL} = 0.4 V				–100	μA
r_i	Input resistance			12			kΩ
I_{OS}	Short-circuit output current			–15		–85	mA
I_{CC}	Supply current (total package)	No load				30	mA

† All typical values are at V_{CC} = 5 V, T_A = 25°C.
‡ The algebraic convention, in which the less-positive (more-negative) limit is designated minimum, is used in this data sheet for threshold voltage levels only.
NOTE 3: This applies for both power on and power off.

switching characteristics, V_{CC} = 5 V, C_L = 15 pF, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high level output	V_{ID} = 0 to 3 V, See Figure 4		21	35	ns
t_{PHL}	Propagation delay time, high-to-low level output			23	35	ns
t_{PZH}	Output enable time to high level	See Figure 5		10	20	ns
t_{PZL}	Output enable time to low level			12	20	ns
t_{PHZ}	Output disable time from high level	See Figure 5		20	35	ns
t_{PLZ}	Output disable time from low level			17	25	ns

PARAMETER MEASUREMENT INFORMATION

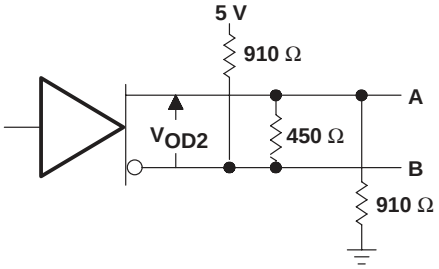


Figure 1. Driver V_{OD2}

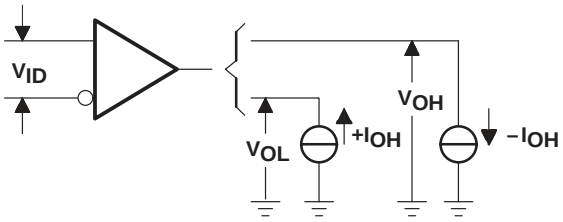
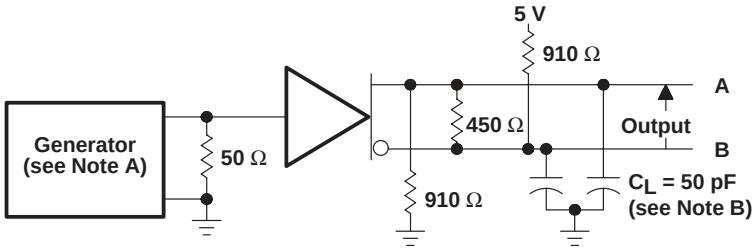
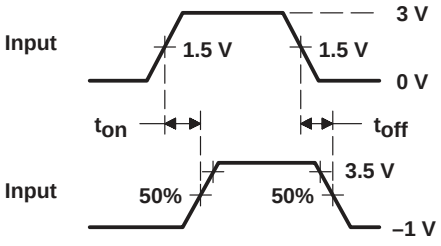


Figure 2. Receiver V_{OH} and V_{OL}

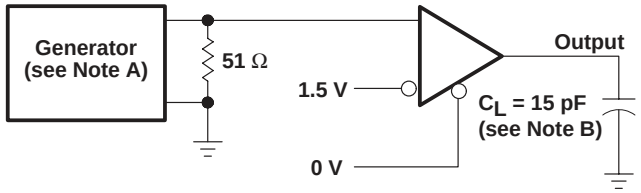


TEST CIRCUIT

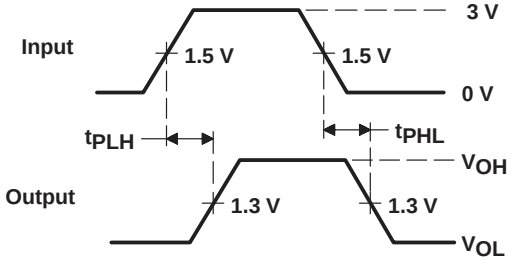


VOLTAGE WAVEFORMS

Figure 3. Driver Differential-Output Delay Times



TEST CIRCUIT



VOLTAGE WAVEFORMS

Figure 4. Receiver Test Circuit and Voltage Waveforms Propagation Delay Times

NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 500 kHz, 50% duty cycle, t_r ≤ 6 ns, t_f ≤ 6 ns, Z_O = 50 Ω.
B. C_L includes probe and jig capacitance.

PARAMETER MEASUREMENT INFORMATION

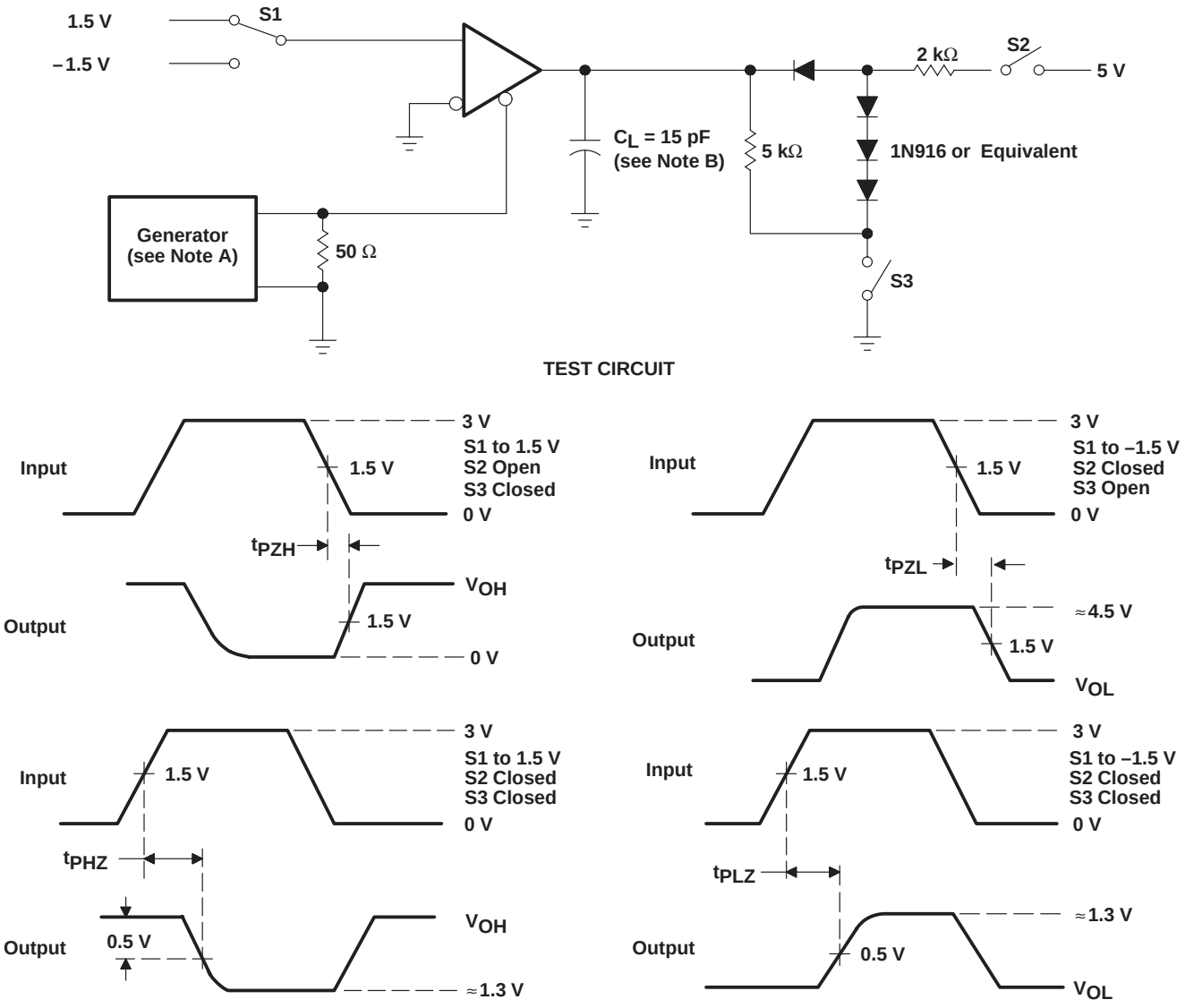


Figure 5. Receiver Output Enable and Disable Times

NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 500 kHz, 50% duty cycle, t_r ≤ 6 ns, t_f ≤ 6 ns, Z_O = 50 Ω.
B. C_L includes probe and jig capacitance.

TYPICAL CHARACTERISTICS

RECEIVER HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT

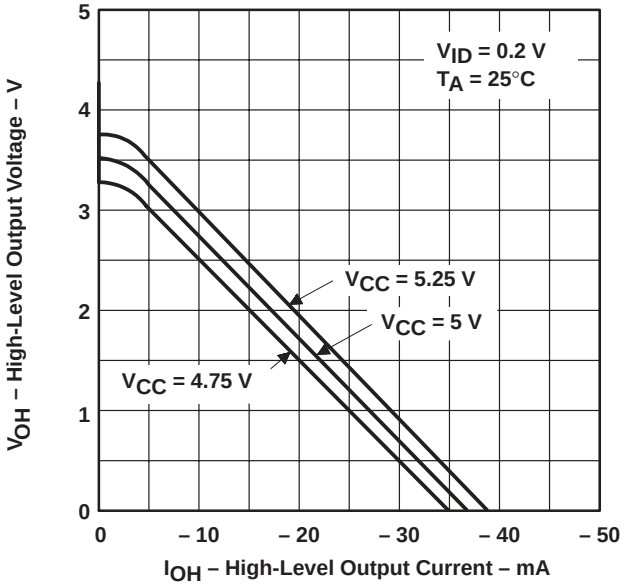


Figure 6

RECEIVER HIGH-LEVEL OUTPUT† vs FREE-AIR TEMPERATURE

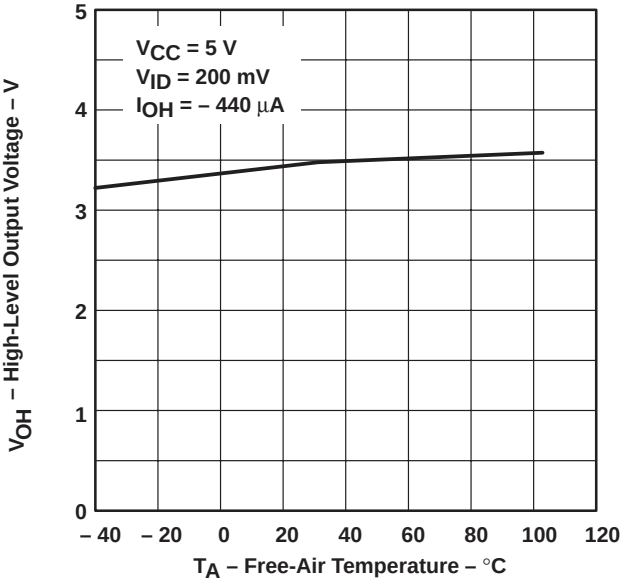


Figure 7

RECEIVER LOW-LEVEL OUTPUT VOLTAGE vs RECEIVER LOW-LEVEL OUTPUT CURRENT

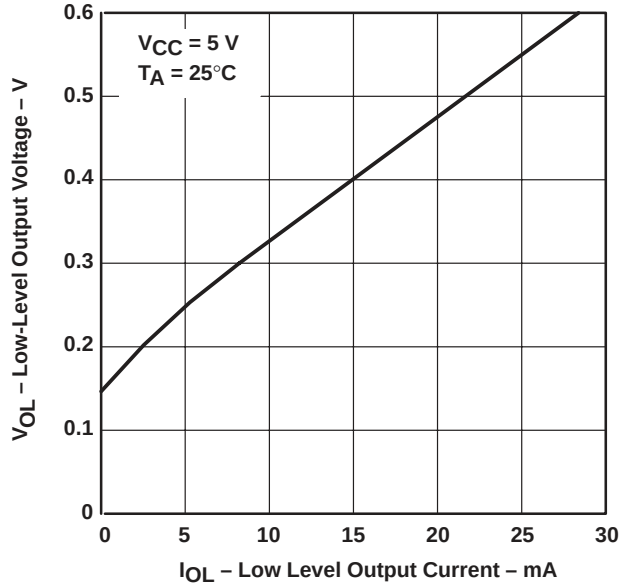


Figure 8

RECEIVER LOW-LEVEL OUTPUT VOLTAGE† vs FREE-AIR TEMPERATURE

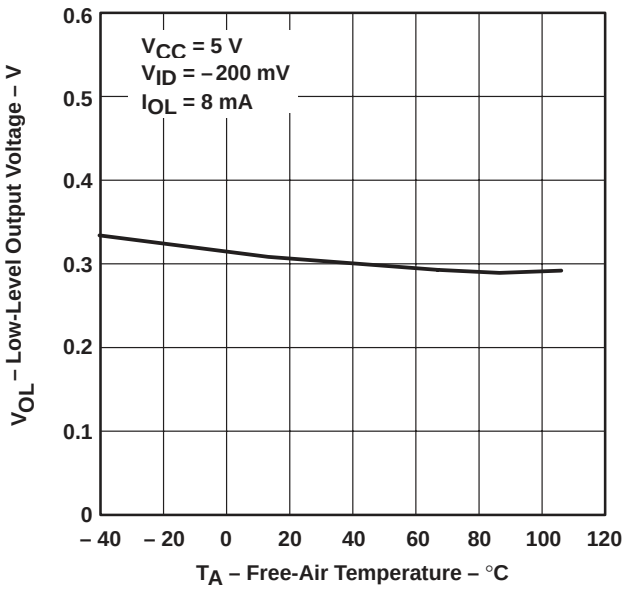


Figure 9

† Only the 0°C to 70°C portion of the curve applies for the SN75076B.

TYPICAL CHARACTERISTICS

RECEIVER OUTPUT VOLTAGE vs ENABLE VOLTAGE

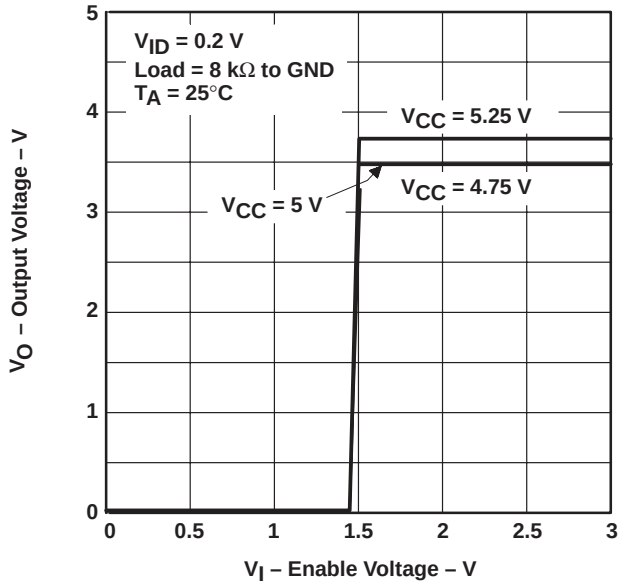


Figure 10

RECEIVER OUTPUT VOLTAGE vs ENABLE VOLTAGE

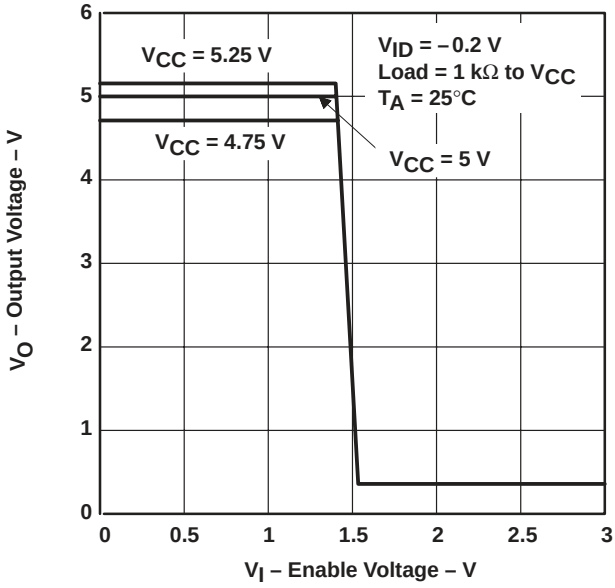


Figure 11

APPLICATION INFORMATION

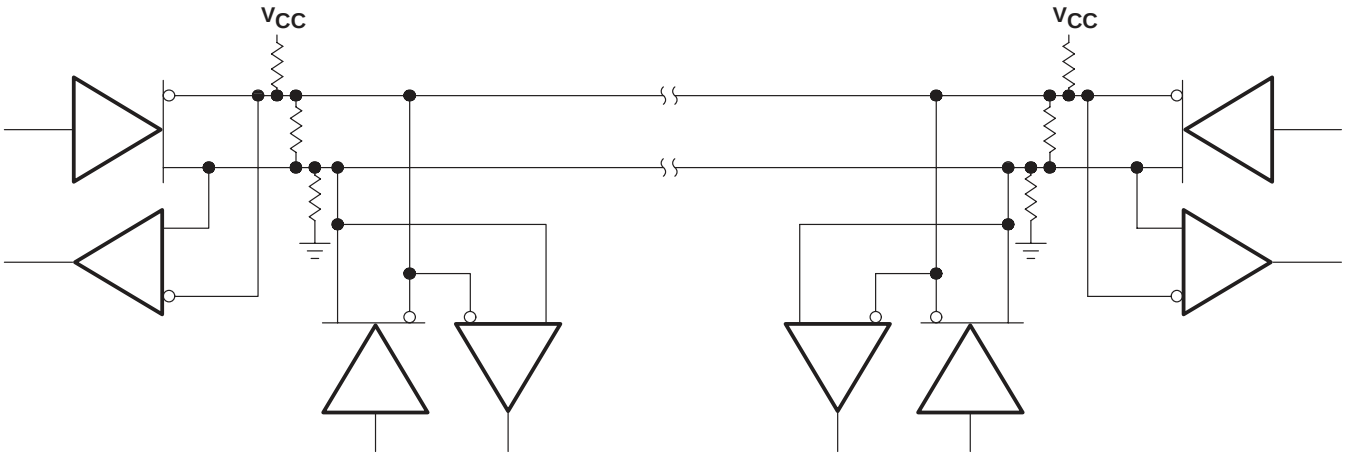


Figure 12. Typical Application Circuit

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
SN75076BP	OBSOLETE	PDIP	P	8		TBD	Call TI	Call TI

(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) 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.
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 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