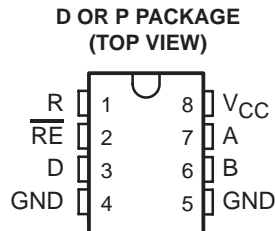


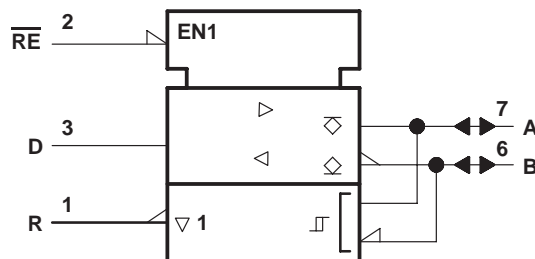
# SN65076B, SN75076B DIFFERENTIAL BUS TRANSCEIVERS

SLLS061 – D3407, JANUARY 1990

- 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 . . .  $\pm 10$  mA Max
- Thermal Shutdown Protection
- Driver Positive and Negative Current Limiting
- Receiver Input Impedance . . . 12 k $\Omega$  Min
- Receiver Input Sensitivity . . .  $\pm 200$  mV
- Receiver Input Hysteresis . . . 50 mV Typ
- Operates From Single 5-V Supply
- Low Power Requirements



## logic symbol†



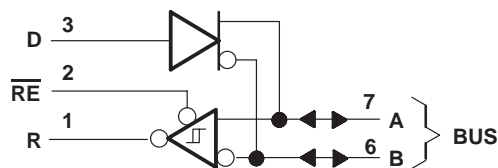
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## 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.

## logic diagram (positive logic)



## Function Tables

### DRIVER

INPUT D	OUTPUTS	
	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 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)

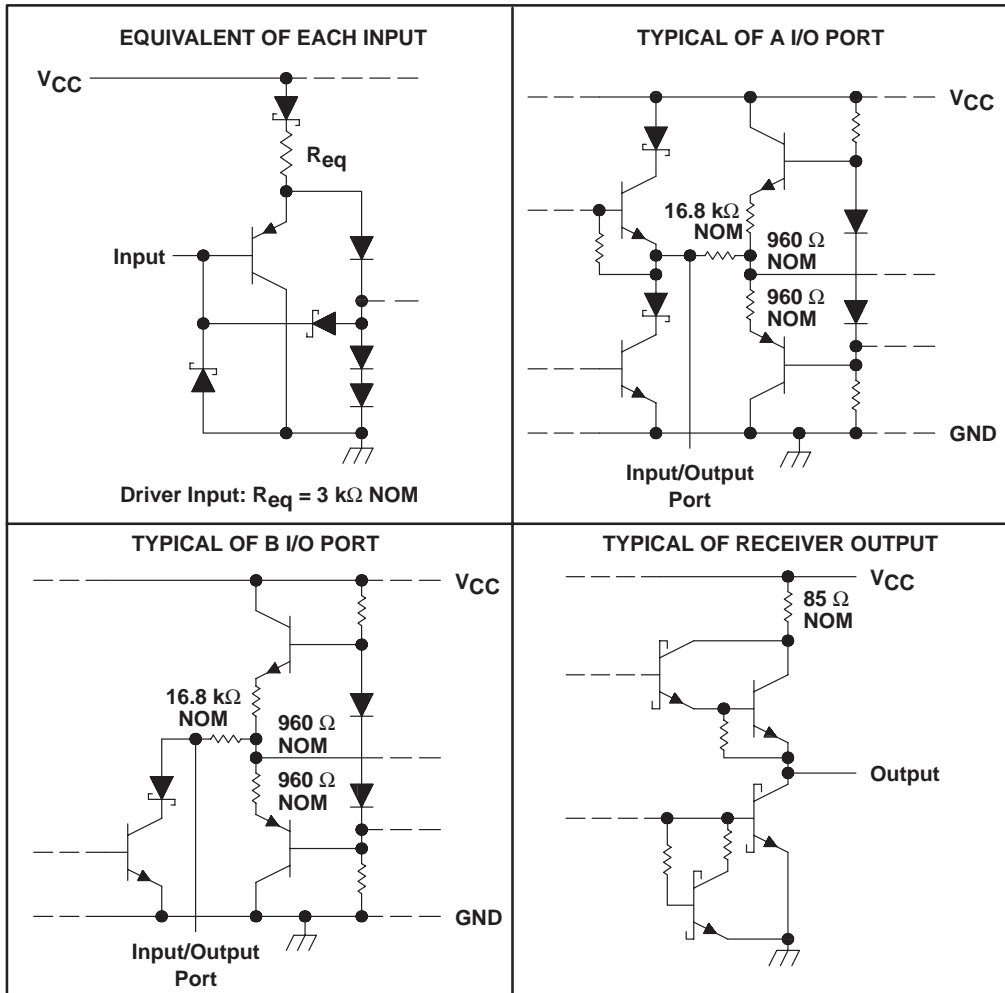
# SN65076B, SN75076B DIFFERENTIAL BUS TRANSCEIVERS

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## 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.



# SN65076B, SN75076B DIFFERENTIAL BUS TRANSCEIVERS

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## 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	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 105^\circ\text{C}$ 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.



# SN65076B, SN75076B DIFFERENTIAL BUS TRANSCEIVERS

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## 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	$I_I = -18 \text{ mA}$		-1.5	V
$V_O$	Output voltage	$V_I = 2 \text{ V}, I_O = 0$	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	$V_I = 0.8 \text{ V}$	$V_O = 12 \text{ V}$	1	mA
			$V_O = -7 \text{ V}$	-0.8	
$I_{IH}$	High-level input current	$V_I = 2.4 \text{ V}$		20	$\mu\text{A}$
$I_{IL}$	Low-level input current	$V_I = 0.4 \text{ V}$		-400	$\mu\text{A}$
$I_{OS}$	Short-circuit output current		$V_O = -7 \text{ V}$	-250	mA
			$V_O = 0$	-150	
			$V_O = V_{CC}$	250	
			$V_O = 12 \text{ V}$	250	
$I_{CC}$	Supply current (total package)	No load		30	mA

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

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	$V_O = 2.7\text{ V}$ , $I_O = -0.4\text{ mA}$			0.2	V
$V_{T-}$	Negative-going input threshold voltage	$V_O = 0.5\text{ V}$ , $I_O = 8\text{ mA}$	$-0.2\ddagger$			V
$V_{hys}$	Hysteresis ( $V_{T+} - V_{T-}$ )			50		mV
$V_{IK}$	Enable-input clamp voltage	$I_I = -18\text{ mA}$			-1.5	V
$V_{OH}$	High-level output voltage	$V_{ID} = -200\text{ mV}$ , See Figure 2		2.7		V
$V_{OL}$	Low-level output voltage	$V_{ID} = -200\text{ mV}$ , See Figure 2			0.45	V
$I_{OZ}$	High-impedance-state output current	$V_O = 0.4\text{ V to }2.4\text{ V}$			$\pm 20$	$\mu\text{A}$
$I_I$	Line input current	Other input = 0 V, $V_I = 12\text{ V}$ , $V_I = -7\text{ V}$ , See Note 3			1 -0.8	mA
$I_{IH}$	High-level enable-input current	$V_{IH} = 2.7\text{ V}$			20	$\mu\text{A}$
$I_{IL}$	Low-level enable-input current	$V_{IL} = 0.4\text{ V}$			-100	$\mu\text{A}$
$r_i$	Input resistance			12		k $\Omega$
$I_{OS}$	Short-circuit output current			-15	-85	mA
$I_{CC}$	Supply current (total package)	No load			30	mA

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

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{PLH}$	Propagation delay time, low-to-high level output	$V_{ID} = 0\text{ to }3\text{ V}$ , 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

# SN65076B, SN75076B DIFFERENTIAL BUS TRANSCEIVERS

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## PARAMETER MEASUREMENT INFORMATION

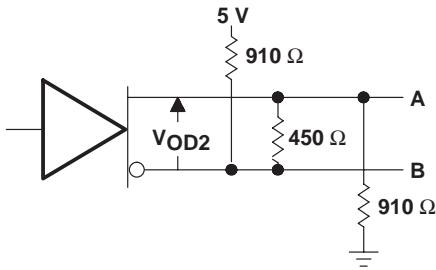


Figure 1. Driver  $V_{OD2}$

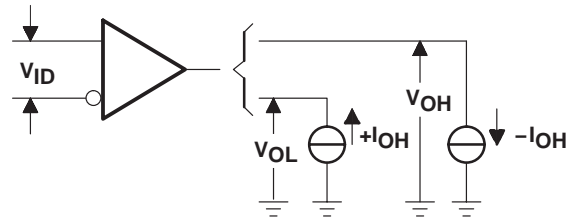
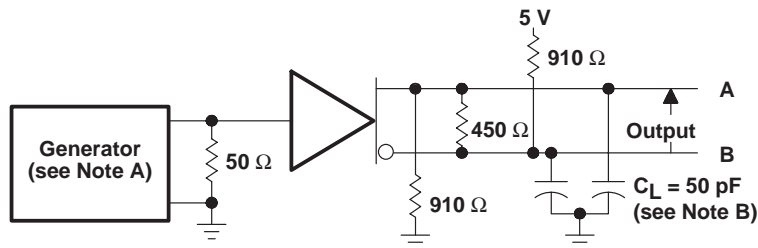
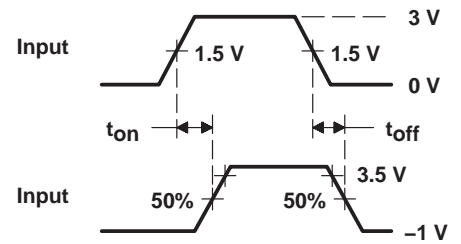


Figure 2. Receiver  $V_{OH}$  and  $V_{OL}$

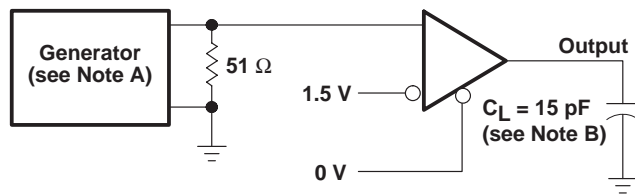


TEST CIRCUIT

Figure 3. Driver Differential-Output Delay Times

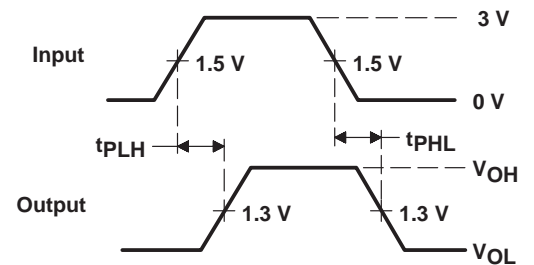


VOLTAGE WAVEFORMS



TEST CIRCUIT

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



VOLTAGE WAVEFORMS

- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR  $\leq$  500 kHz, 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.

PARAMETER MEASUREMENT INFORMATION

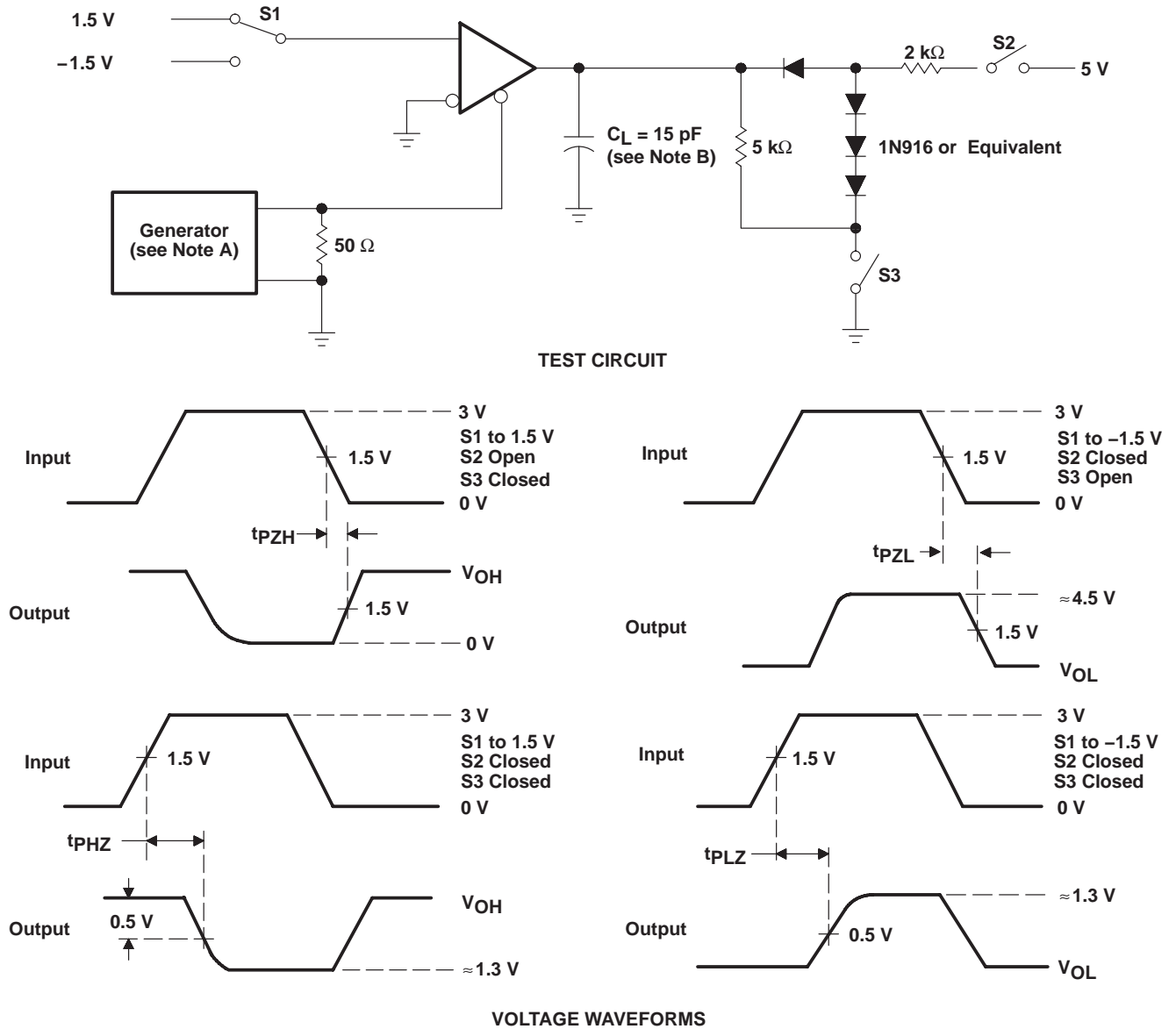


Figure 5. Receiver Output Enable and Disable Times

- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR  $\leq$  500 kHz, 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.

# SN65076B, SN75076B DIFFERENTIAL BUS TRANSCEIVERS

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## TYPICAL CHARACTERISTICS

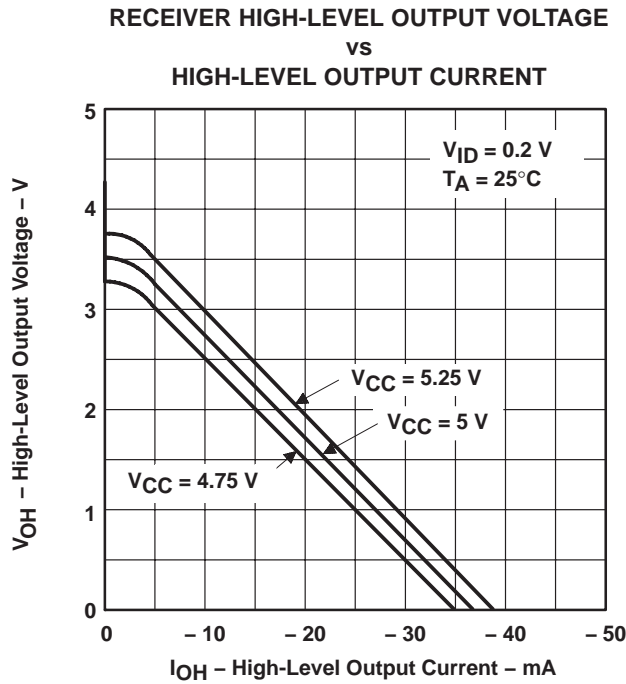


Figure 6

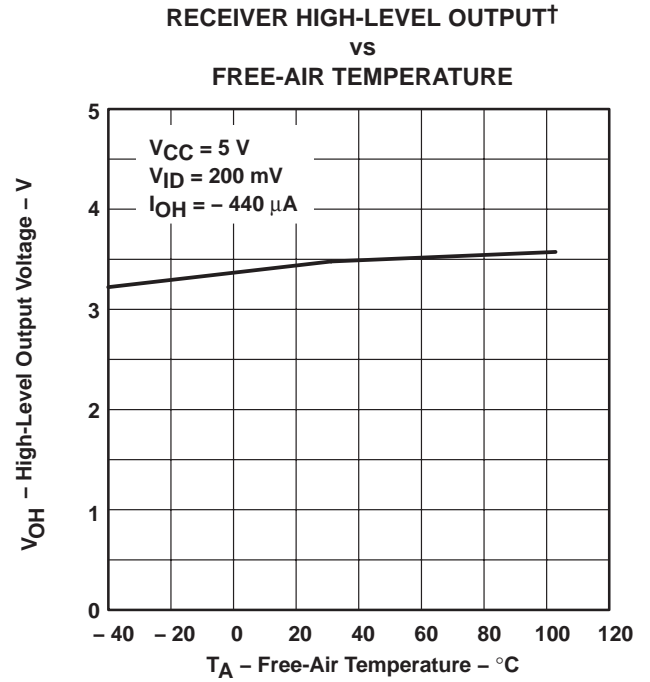


Figure 7

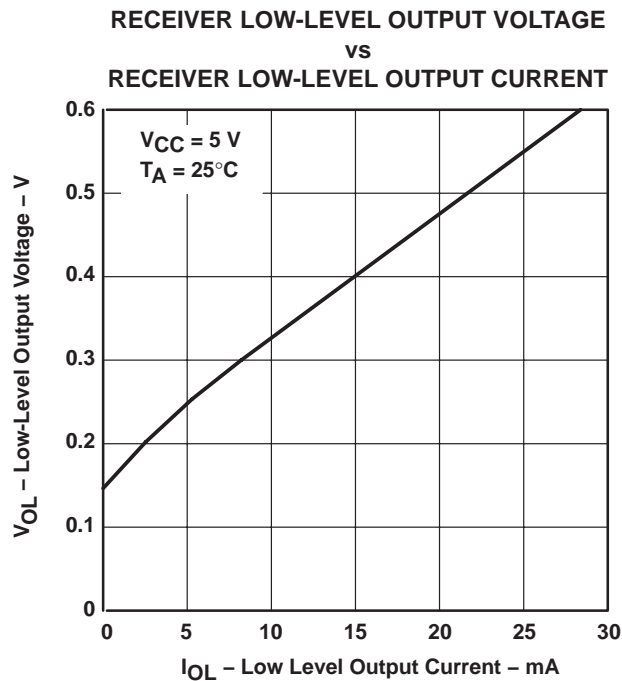


Figure 8

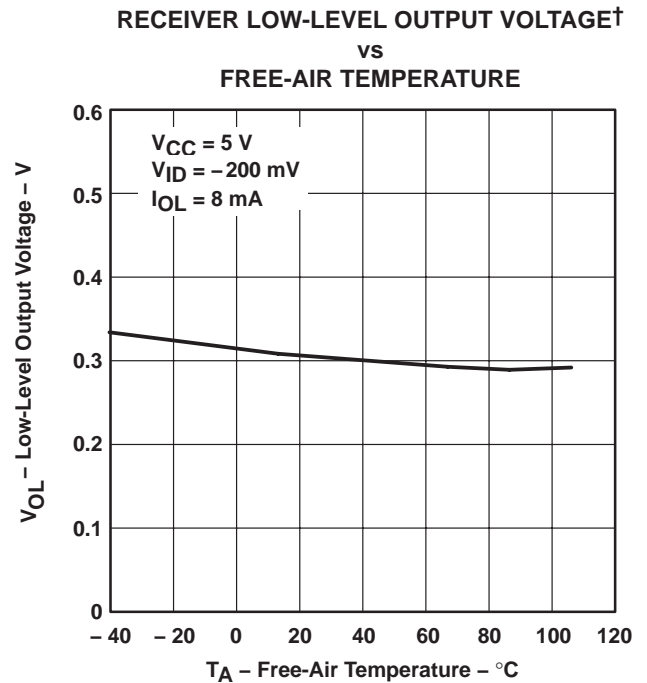


Figure 9

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



TYPICAL CHARACTERISTICS

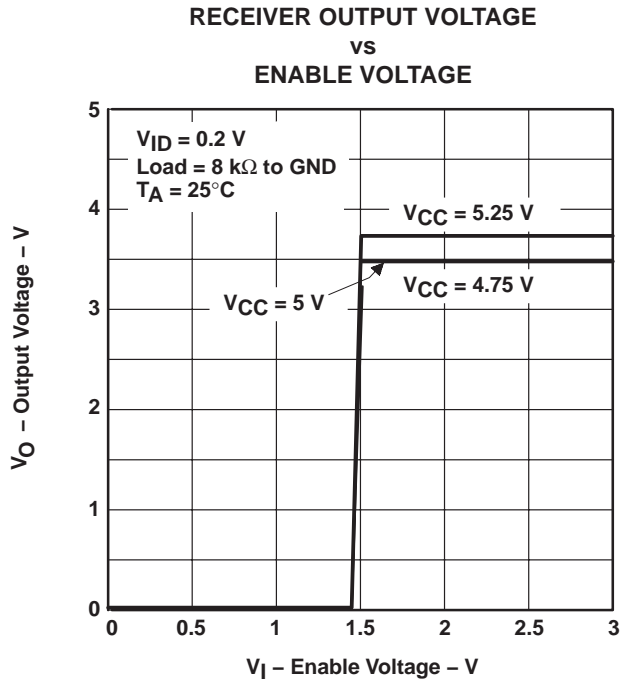


Figure 10

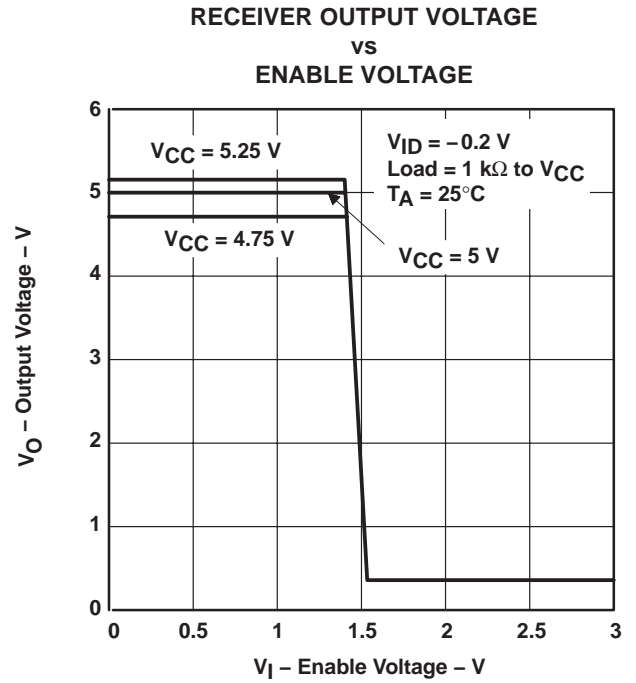


Figure 11

APPLICATION INFORMATION

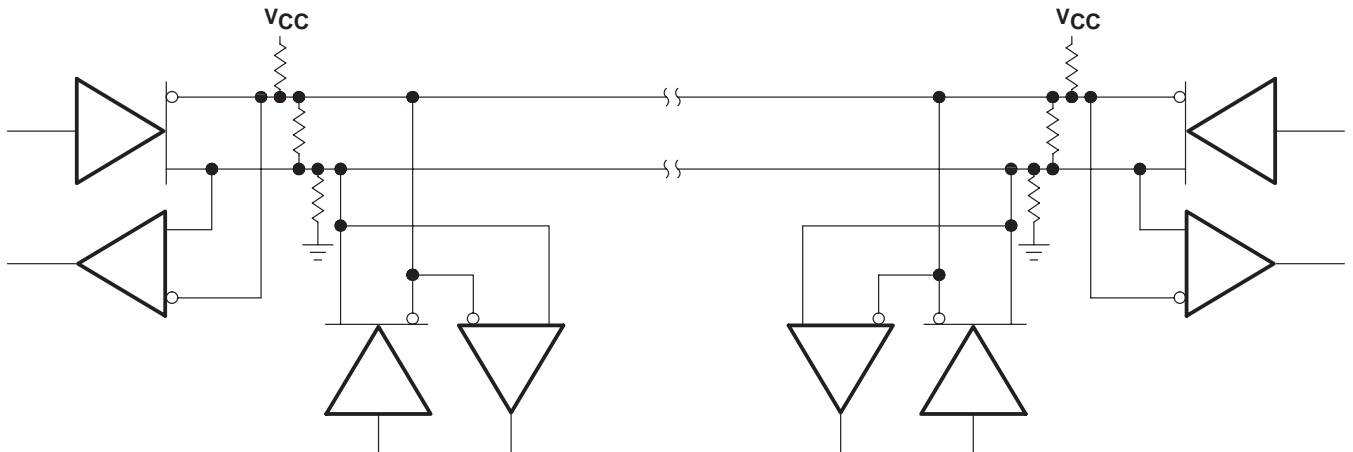


Figure 12. Typical Application Circuit

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RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>	Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
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