

## SNx5176B Differential Bus Transceivers

Check for Samples: [SN65176B](#), [SN75176B](#)

### FEATURES

- Bidirectional Transceivers
- Meet or Exceed the Requirements of ANSI Standards TIA/EIA-422-B and TIA/EIA-485-A and ITU Recommendations V.11 and X.27
- Designed for Multipoint Transmission on Long Bus Lines in Noisy Environments
- 3-State Driver and Receiver Outputs
- Individual Driver and Receiver Enables
- Wide Positive and Negative Input/Output Bus Voltage Ranges
- $\pm 60$ -mA Max Driver Output Capability
- Thermal Shutdown Protection
- Driver Positive and Negative Current Limiting
- 12-k $\Omega$  Min Receiver Input Impedance
- $\pm 200$ -mV Receiver Input Sensitivity
- 50-mV Typ Receiver Input Hysteresis
- Operate From Single 5-V Supply

### DESCRIPTION

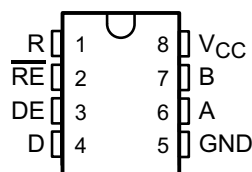
The SN65176B and SN75176B differential bus transceivers are integrated circuits designed for bidirectional data communication on multipoint bus transmission lines. They are designed for balanced transmission lines and meet ANSI Standards TIA/EIA-422-B and TIA/EIA-485-A and ITU Recommendations V.11 and X.27.

The SN65176B and SN75176B devices 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, that can be connected together externally to function as a direction control. 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 when 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.

The driver is designed for up to 60 mA of sink or 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. The receiver features a minimum input impedance of 12 k $\Omega$ , an input sensitivity of  $\pm 200$  mV, and a typical input hysteresis of 50 mV.

The SN65176B and SN75176B devices can be used in transmission-line applications employing the SN75172 and SN75174 quadruple differential line drivers and SN75173 and SN75175 quadruple differential line receivers.

**SN65176B D OR P PACKAGE  
SN75176B D, P, OR PS PACKAGE  
(TOP VIEW)**



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.

# SN65176B, SN75176B

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This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## Function Tables

### Driver<sup>(1)</sup>

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

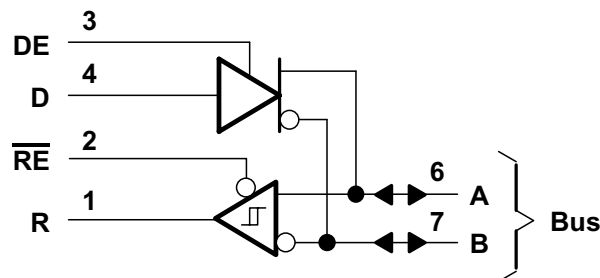
- (1) H = high level,  
L = low level,  
? = indeterminate,  
X = irrelevant,  
Z = high impedance (off)

### Receiver<sup>(1)</sup>

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

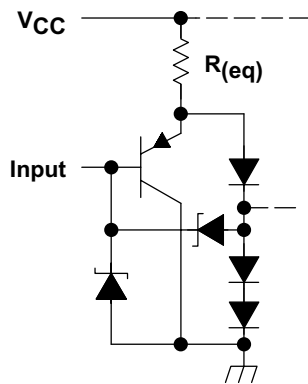
- (1) H = high level,  
L = low level,  
? = indeterminate,  
X = irrelevant,  
Z = high impedance (off)

## Logic Diagram (Positive Logic)



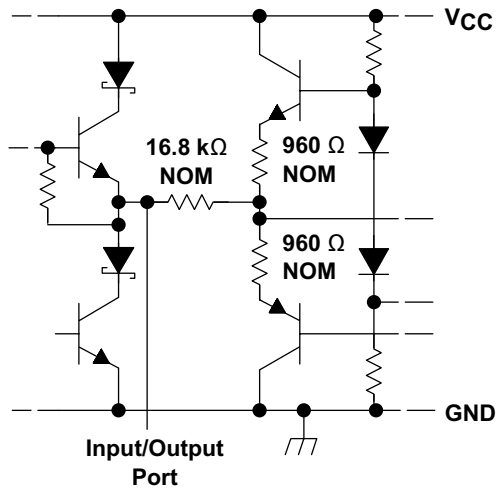
## SCHEMATICS OF INPUTS AND OUTPUTS

**EQUIVALENT OF EACH INPUT**

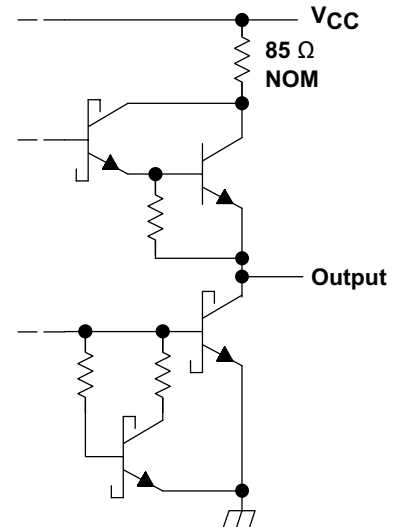


Driver input:  $R_{(eq)} = 3\text{ k}\Omega\text{ NOM}$   
 Enable inputs:  $R_{(eq)} = 8\text{ k}\Omega\text{ NOM}$   
 $R_{(eq)}$  = Equivalent Resistor

**TYPICAL OF A AND B I/O PORTS**



**TYPICAL OF RECEIVER OUTPUT**



# SN65176B, SN75176B

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## Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage <sup>(2)</sup>		7	V
	Voltage range at any bus terminal	–10	15	V
V <sub>I</sub>	Enable input voltage		5.5	V
θ <sub>JA</sub>	Package thermal impedance <sup>(3)(4)</sup>	D package	97	°C/W
		P package	85	
		PS package	95	
T <sub>J</sub>	Operating virtual junction temperature		150	°C
	Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds		260	°C
T <sub>stg</sub>	Storage temperature range	–65	150	°C

- (1) 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.
- (2) All voltage values, except differential input/output bus voltage, are with respect to network ground terminal.
- (3) Maximum power dissipation is a function of T<sub>J(max)</sub>, θ<sub>JA</sub>, and T<sub>A</sub>. The maximum allowable power dissipation at any allowable ambient temperature is P<sub>D</sub> = (T<sub>J(max)</sub> – T<sub>A</sub>) / θ<sub>JA</sub>. Operating at the absolute maximum T<sub>J</sub> of 150°C can affect reliability.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

## Recommended Operating Conditions

			MIN	TYP	MAX	UNIT
V <sub>CC</sub>	Supply voltage		4.75	5	5.25	V
V <sub>I</sub> or V <sub>IC</sub>	Voltage at any bus terminal (separately or common mode)				12	V
					–7	
V <sub>IH</sub>	High-level input voltage	D, DE, and $\overline{RE}$	2			V
V <sub>IL</sub>	Low-level input voltage	D, DE, and $\overline{RE}$			0.8	V
V <sub>ID</sub>	Differential input voltage <sup>(1)</sup>				±12	V
I <sub>OH</sub>	High-level output current	Driver			–60	mA
		Receiver			–400	µA
I <sub>OL</sub>	Low-level output current	Driver			60	mA
		Receiver			8	
T <sub>A</sub>	Operating free-air temperature	SN65176B	–40		105	°C
		SN75176B	0		70	

- (1) 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 (unless otherwise noted)

PARAMETER		TEST CONDITIONS <sup>(1)</sup>	MIN	TYP <sup>(2)</sup>	MAX	UNIT
V <sub>IK</sub>	Input clamp voltage	I <sub>I</sub> = –18 mA			–1.5	V
V <sub>O</sub>	Output voltage	I <sub>O</sub> = 0	0		6	V
V <sub>OD1</sub>	Differential output voltage	I <sub>O</sub> = 0	1.5	3.6	6	V
V <sub>OD2</sub>	Differential output voltage	R <sub>L</sub> = 100 Ω, see Figure 1	1/2 V <sub>OD1</sub> or 2 <sup>(3)</sup>			V
		R <sub>L</sub> = 54 Ω, see Figure 1	1.5	2.5	5	
V <sub>OD3</sub>	Differential output voltage	See <sup>(4)</sup>	1.5		5	V
Δ V <sub>OD</sub>	Change in magnitude of differential output voltage <sup>(5)</sup>	R <sub>L</sub> = 54 Ω or 100 Ω, see Figure 1			±0.2	V
V <sub>OC</sub>	Common-mode output voltage	R <sub>L</sub> = 54 Ω or 100 Ω, see Figure 1			+3 –1	V
Δ V <sub>OC</sub>	Change in magnitude of common-mode output voltage <sup>(5)</sup>	R <sub>L</sub> = 54 Ω or 100 Ω, see Figure 1			±0.2	V
I <sub>O</sub>	Output current	Output disabled <sup>(6)</sup>	V <sub>O</sub> = 12 V		1	mA
			V <sub>O</sub> = –7 V		–0.8	
I <sub>IH</sub>	High-level input current	V <sub>I</sub> = 2.4 V			20	μA
I <sub>IL</sub>	Low-level input current	V <sub>I</sub> = 0.4 V			–400	μA
I <sub>OS</sub>	Short-circuit output current	V <sub>O</sub> = –7 V			–250	mA
		V <sub>O</sub> = 0			–150	
		V <sub>O</sub> = V <sub>CC</sub>			250	
		V <sub>O</sub> = 12 V			250	
I <sub>CC</sub>	Supply current (total package)	No load	Outputs enabled		42	mA
			Outputs disabled		26	

- (1) The power-off measurement in ANSI Standard TIA/EIA-422-B applies to disabled outputs only and is not applied to combined inputs and outputs.
- (2) All typical values are at V<sub>CC</sub> = 5 V and T<sub>A</sub> = 25°C.
- (3) The minimum V<sub>OD2</sub> with a 100-Ω load is either 1/2 V<sub>OD1</sub> or 2 V, whichever is greater.
- (4) See ANSI Standard TIA/EIA-485-A, Figure 3.5, Test Termination Measurement 2.
- (5) Δ|V<sub>OD</sub>| and Δ|V<sub>OC</sub>| are the changes in magnitude of V<sub>OD</sub> and V<sub>OC</sub>, respectively, that occur when the input is changed from a high level to a low level.
- (6) This applies for both power on and off; refer to ANSI Standard TIA/EIA-485-A for exact conditions. The TIA/EIA-422-B limit does not apply for a combined driver and receiver terminal.

### Switching Characteristics

V<sub>CC</sub> = 5 V, R<sub>L</sub> = 110 Ω, T<sub>A</sub> = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>d(OD)</sub>	Differential-output delay time	R <sub>L</sub> = 54 Ω, see Figure 3		15	22	ns
t <sub>t(OD)</sub>	Differential-output transition time	R <sub>L</sub> = 54 Ω, see Figure 3		20	30	ns
t <sub>PZH</sub>	Output enable time to high level	See Figure 4		85	120	ns
t <sub>PZL</sub>	Output enable time to low level	See Figure 5		40	60	ns
t <sub>PHZ</sub>	Output disable time from high level	See Figure 4		150	250	ns
t <sub>PLZ</sub>	Output disable time from low level	See Figure 5		20	30	ns

**Symbol Equivalents**

DATA SHEET PARAMETER	TIA/EIA-422-B	TIA/EIA-485-A
$V_O$	$V_{oa}, V_{ob}$	$V_{oa}, V_{ob}$
$ V_{OD1} $	$V_o$	$V_o$
$ V_{OD2} $	$V_t (R_L = 100 \Omega)$	$V_t (R_L = 54 \Omega)$
$ V_{OD3} $		$V_t$ (test termination measurement 2)
$\Delta V_{OD} $	$   V_t  -  \bar{V}_t   $	$   V_t  -  \bar{V}_t   $
$V_{OC}$	$ V_{os} $	$ V_{os} $
$\Delta V_{OC} $	$ V_{os} - \bar{V}_{os} $	$ V_{os} - \bar{V}_{os} $
$I_{OS}$	$ I_{sa} ,  I_{sb} $	
$I_O$	$ I_{xa} ,  I_{xb} $	$I_{ia}, I_{ib}$

**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 <sup>(1)</sup>	MAX	UNIT
$V_{IT+}$ Positive-going input threshold voltage	$V_O = 2.7 \text{ V}$ , $I_O = -0.4 \text{ mA}$			0.2	V
$V_{IT-}$ Negative-going input threshold voltage	$V_O = 0.5 \text{ V}$ , $I_O = 8 \text{ mA}$	-0.2 <sup>(2)</sup>			V
$V_{hys}$ Input hysteresis voltage ( $V_{IT+} - V_{IT-}$ )			50		mV
$V_{IK}$ Enable Input clamp voltage	$I_I = -18 \text{ mA}$			-1.5	V
$V_{OH}$ High-level output voltage	$V_{ID} = 200 \text{ mV}$ , $I_{OH} = -400 \mu\text{A}$ , see <a href="#">Figure 2</a>		2.7		V
$V_{OL}$ Low-level output voltage	$V_{ID} = -200 \text{ mV}$ , $I_{OL} = 8 \text{ mA}$ , see <a href="#">Figure 2</a>			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 = $0 \text{ V}$ <sup>(3)</sup>	$V_I = 12 \text{ V}$		1	mA
		$V_I = -7 \text{ V}$		-0.8	
$I_{IH}$ 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	$V_I = 12 \text{ V}$		12		k $\Omega$
$I_{OS}$ Short-circuit output current		-15		-85	mA
$I_{CC}$ Supply current (total package)	No load	Outputs enabled	42	55	mA
		Outputs disabled	26	35	

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

(2) The algebraic convention, in which the less positive (more negative) limit is designated minimum, is used in this data sheet for common-mode input voltage and threshold voltage levels only.

(3) This applies for both power on and power off. Refer to EIA Standard TIA/EIA-485-A for exact conditions.

**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	$V_{ID} = 0$ to $3 \text{ V}$ , see <a href="#">Figure 6</a>		21	35	ns
$t_{PHL}$ Propagation delay time, high- to low-level output			23	35	
$t_{PZH}$ Output enable time to high level	See <a href="#">Figure 7</a>		10	20	ns
$t_{PZL}$ Output enable time to low level			12	20	
$t_{PHZ}$ Output disable time from high level	See <a href="#">Figure 7</a>		20	35	ns
$t_{PLZ}$ Output disable time from low level			17	25	

## Parameter Measurement Information

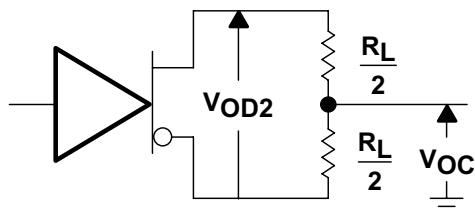


Figure 1. Driver  $V_{OD}$  and  $V_{OC}$

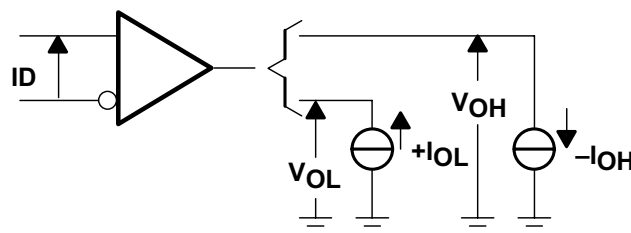
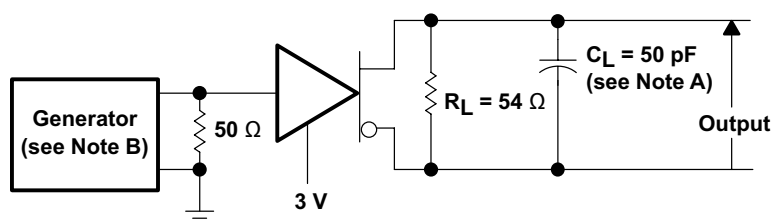


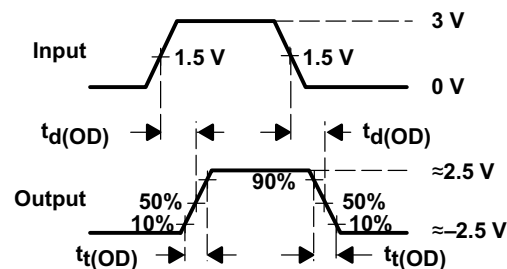
Figure 2. Receiver  $V_{OH}$  and  $V_{OL}$



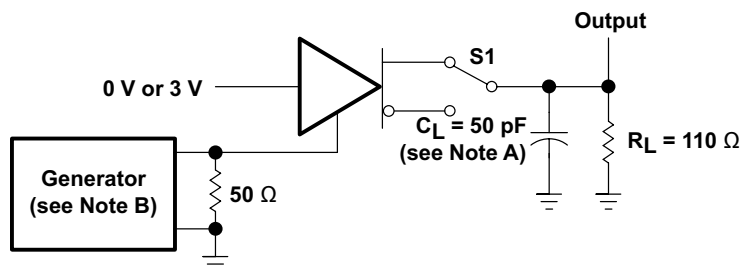
### TEST CIRCUIT

- A.  $C_L$  includes probe and jig capacitance.
- B. 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,  $Z_O = 50 \Omega$ .

Figure 3. Driver Test Circuit and Voltage Waveforms



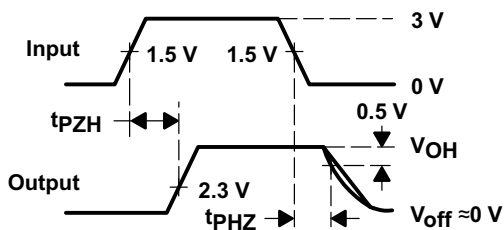
### VOLTAGE WAVEFORMS



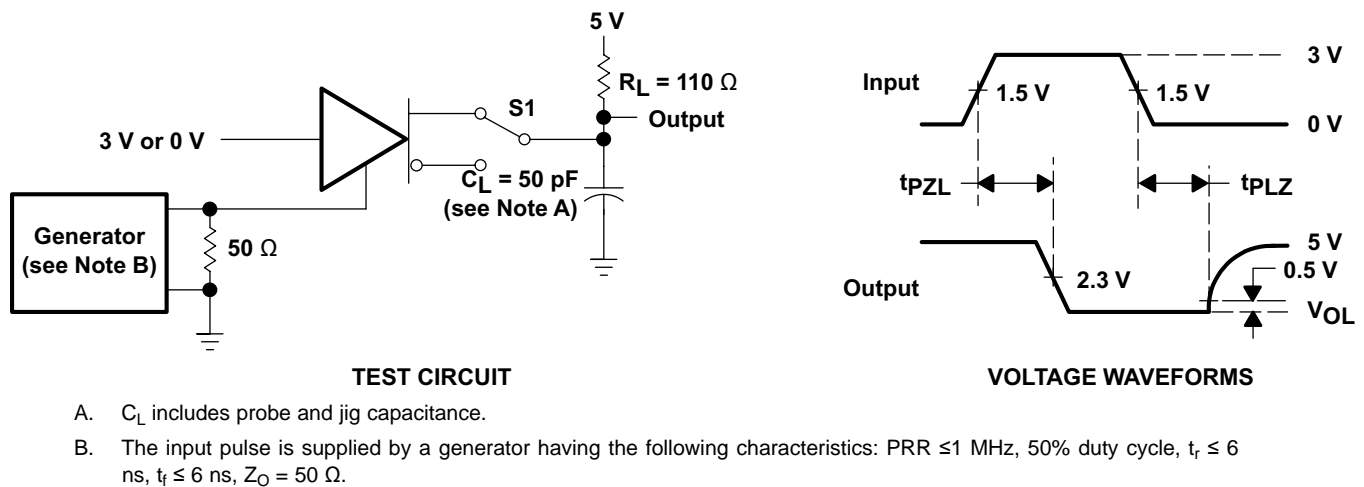
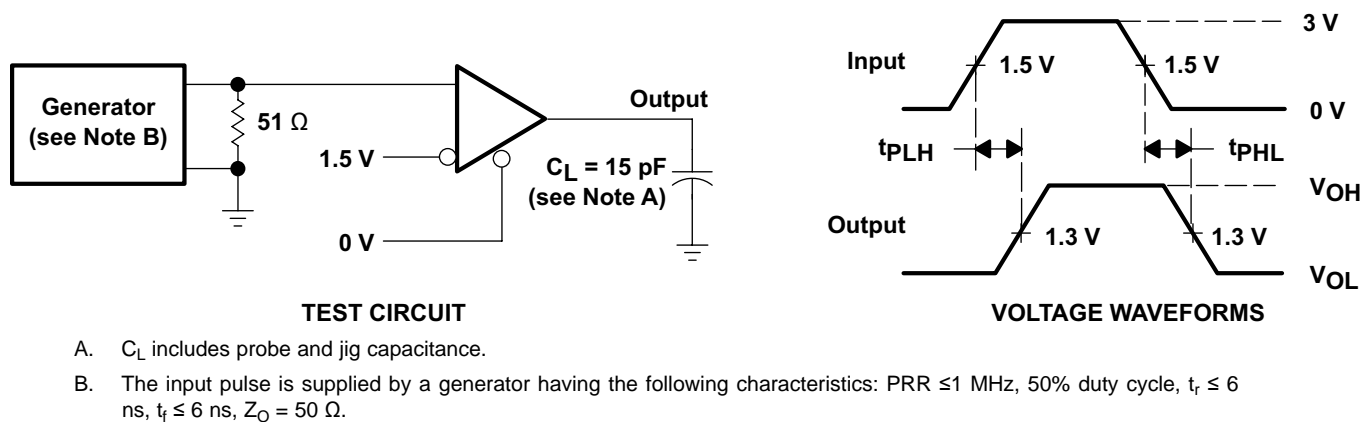
### TEST CIRCUIT

- A.  $C_L$  includes probe and jig capacitance.
- B. 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,  $Z_O = 50 \Omega$ .

Figure 4. Driver Test Circuit and Voltage Waveforms

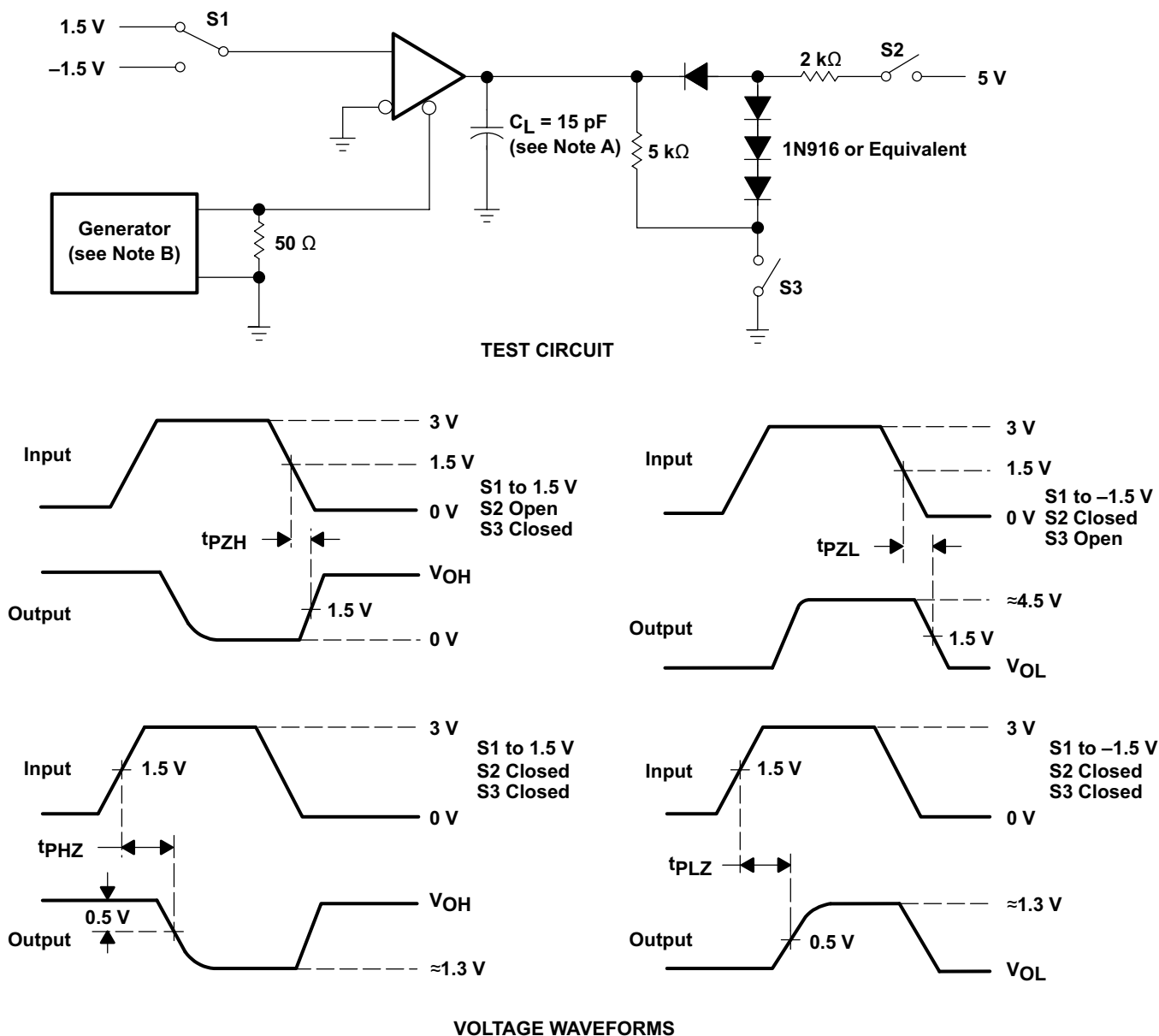


### VOLTAGE WAVEFORMS

**Parameter Measurement Information (continued)**

**Figure 5. Driver Test Circuit and Voltage Waveforms**

**Figure 6. Receiver Test Circuit and Voltage Waveforms**



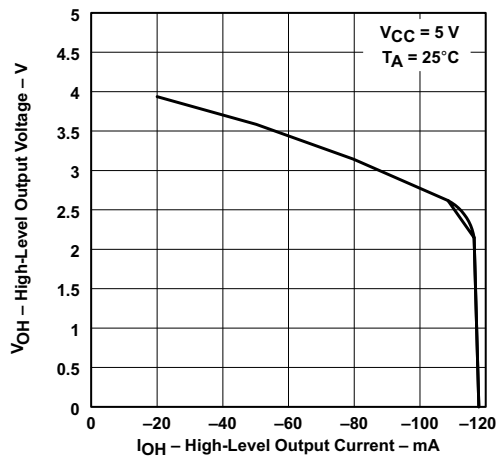
## Parameter Measurement Information (continued)



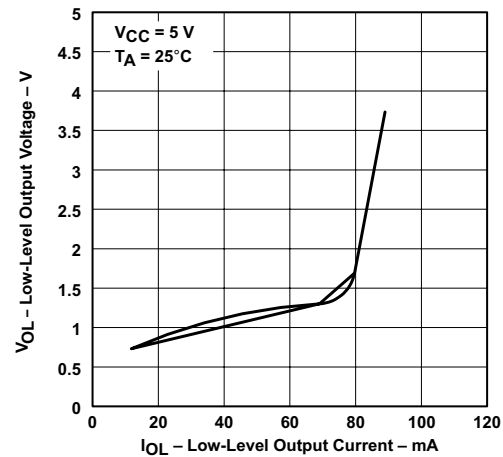
- A.  $C_L$  includes probe and jig capacitance.
- B. The input pulse is supplied by a generator having the following characteristics: PRR  $\leq 1$  MHz, 50% duty cycle,  $t_r \leq 6$  ns,  $t_f \leq 6$  ns,  $Z_O = 50 \Omega$ .

**Figure 7. Receiver Test Circuit and Voltage Waveforms**

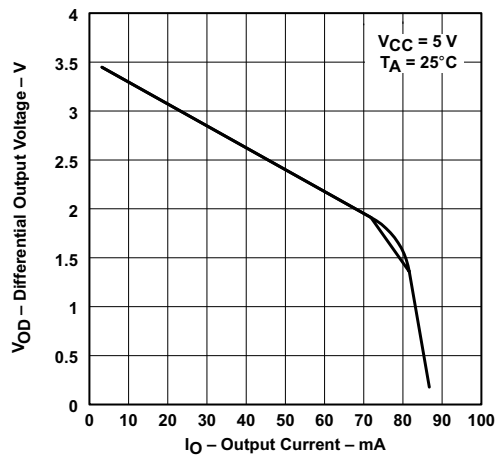
## Typical Characteristics



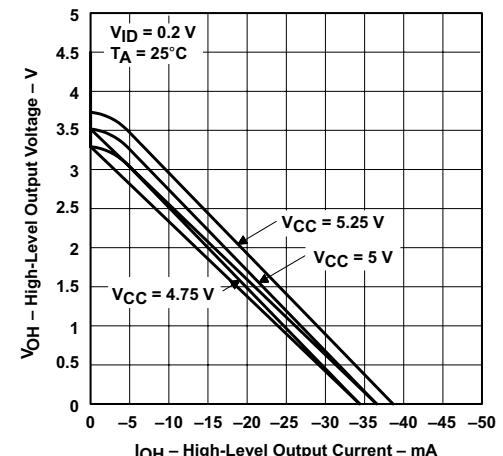
**Figure 8. Driver High-Level Output Voltage vs High-Level Output Current**



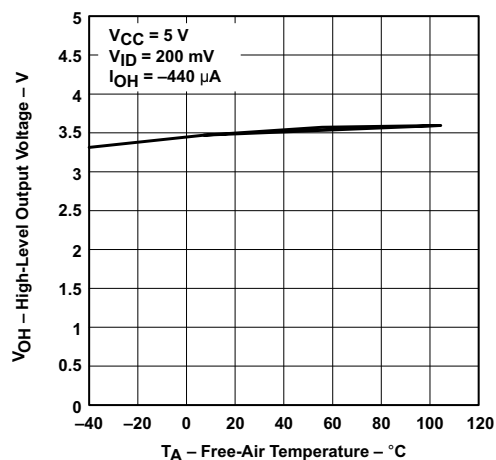
**Figure 9. Driver Low-Level Output Voltage vs Low-Level Output Current**



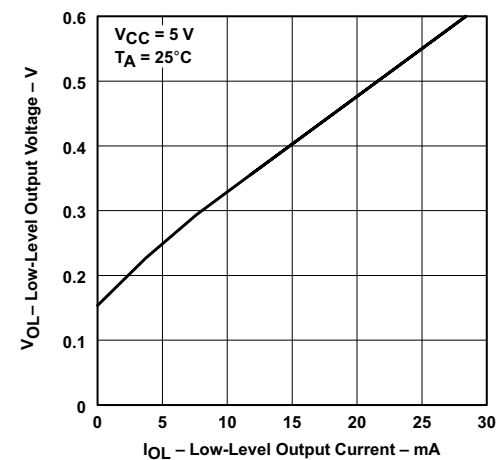
**Figure 10. Driver Differential Output Voltage vs Output Current**



**Figure 11. Receiver High-Level Output Voltage vs High-Level Output Current**



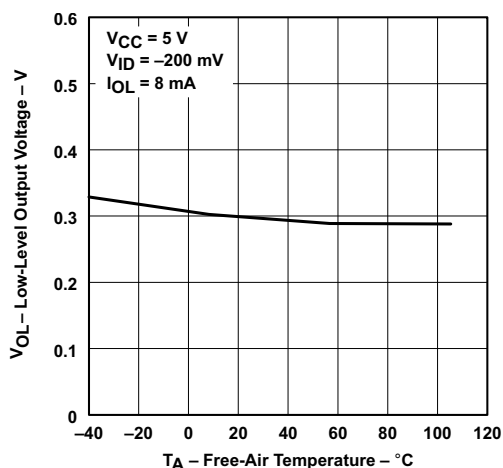
**Figure 12. Receiver High-Level Output Voltage vs Free-Air Temperature**



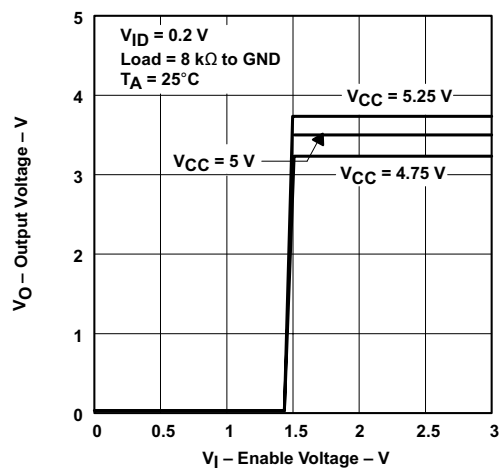
**Figure 13. Receiver Low-Level Output Voltage vs Low-Level Output Current**

Only the 0°C to 70°C portion of the curve applies to the SN75176B device.

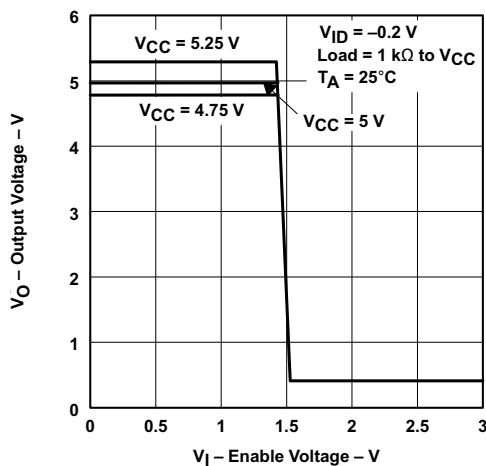
## Typical Characteristics (continued)



**Figure 14. Receiver Low-Level Output Voltage  
vs  
Free-Air Temperature**



**Figure 15. Receiver Output Voltage  
vs  
Enable Voltage**



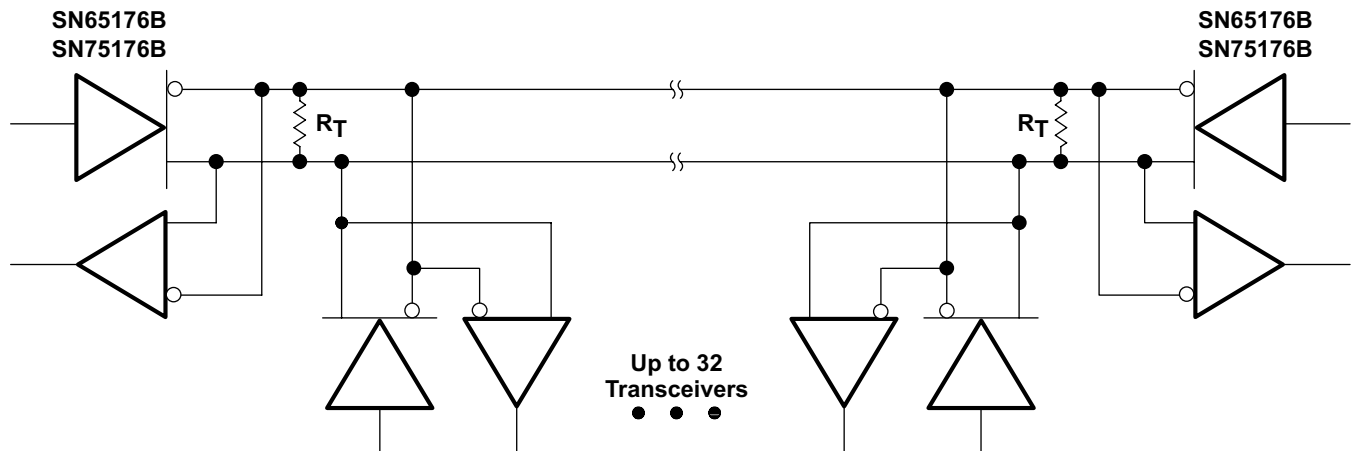
**Figure 16. Receiver Output Voltage  
vs  
Enable Voltage**

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## APPLICATION INFORMATION



The line should be terminated at both ends in its characteristic impedance ( $R_T = Z_0$ ). Stub lengths off the main line should be kept as short as possible.

**Figure 17. Typical Application Circuit**

## REVISION HISTORY

Changes from Revision D (April 2003) to Revision E	Page
• Updated document to new TI data sheet format - no specification changes. ....	<a href="#">1</a>
• Deleted Ordering Information table. ....	<a href="#">1</a>
• Added ESD warning. ....	<a href="#">2</a>

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN65176BD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 105	65176B	<a href="#">Samples</a>
SN65176BDE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 105	65176B	<a href="#">Samples</a>
SN65176BDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 105	65176B	<a href="#">Samples</a>
SN65176BDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU   CU SN	Level-1-260C-UNLIM	-40 to 105	65176B	<a href="#">Samples</a>
SN65176BDRE4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 105	65176B	<a href="#">Samples</a>
SN65176BDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 105	65176B	<a href="#">Samples</a>
SN65176BP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 105	SN65176BP	<a href="#">Samples</a>
SN65176BPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 105	SN65176BP	<a href="#">Samples</a>
SN75176BD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	75176B	<a href="#">Samples</a>
SN75176BDE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	75176B	<a href="#">Samples</a>
SN75176BDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	75176B	<a href="#">Samples</a>
SN75176BDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU   CU SN	Level-1-260C-UNLIM	0 to 70	75176B	<a href="#">Samples</a>
SN75176BDRE4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	75176B	<a href="#">Samples</a>
SN75176BDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	75176B	<a href="#">Samples</a>
SN75176BP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN75176BP	<a href="#">Samples</a>
SN75176BPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN75176BP	<a href="#">Samples</a>
SN75176BPSR	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	A176B	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN75176BPSRG4	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	A176B	<a href="#">Samples</a>

(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.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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**TAPE AND REEL INFORMATION**


\*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
SN65176BDR	SOIC	D	8	2500	330.0	12.8	6.4	5.2	2.1	8.0	12.0	Q1
SN65176BDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
SN65176BDRG4	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
SN75176BDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
SN75176BDR	SOIC	D	8	2500	330.0	12.8	6.4	5.2	2.1	8.0	12.0	Q1
SN75176BDRG4	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
SN75176BPSR	SO	PS	8	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1



## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN65176BDR	SOIC	D	8	2500	364.0	364.0	27.0
SN65176BDR	SOIC	D	8	2500	340.5	338.1	20.6
SN65176BDRG4	SOIC	D	8	2500	340.5	338.1	20.6
SN75176BDR	SOIC	D	8	2500	340.5	338.1	20.6
SN75176BDR	SOIC	D	8	2500	364.0	364.0	27.0
SN75176BDRG4	SOIC	D	8	2500	340.5	338.1	20.6
SN75176BPSR	SO	PS	8	2000	367.0	367.0	38.0

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



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

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



## NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AA.

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

# MECHANICAL DATA

PS (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



4040063/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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