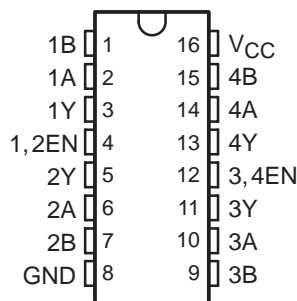


SN65175, SN75175 QUADRUPLE DIFFERENTIAL LINE RECEIVERS

SLLS145C – OCTOBER 1990 – REVISED NOVEMBER 2006

- Meet or Exceed the Requirements of ANSI Standard EIA/TIA-422-B, RS-423-B, and RS-485
- Meet ITU Recommendations V.10, V.11, X.26, and X.27
- Designed for Multipoint Bus Transmission on Long Bus Lines in Noisy Environments
- 3-State Outputs
- Common-Mode Input Voltage Range –12 V to 12 V
- Input Sensitivity . . . ± 200 mV
- Input Hysteresis . . . 50 mV Typ
- High Input Impedance . . . 12 k Ω Min
- Operate From Single 5-V Supply
- Low-Power Requirements
- Plug-In Replacement for MC3486

D OR N PACKAGE
(TOP VIEW)



description

The SN65175 and SN75175 are monolithic quadruple differential line receivers with 3-state outputs. They are designed to meet the requirements of ANSI Standards EIA/TIA-422-B, RS-423-B, and RS-485, and several ITU recommendations. These standards are for balanced multipoint bus transmission at rates up to 10 megabits per second. Each of the two pairs of receivers has a common active-high enable.

The receivers feature 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. The SN65175 and SN75175 are designed for optimum performance when used with the SN75172 or SN75174 quadruple differential line drivers.

The SN65175 is characterized for operation from -40°C to 85°C . The SN75175 is characterized for operation from 0°C to 70°C .

FUNCTION TABLE
(each receiver)

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

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



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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**

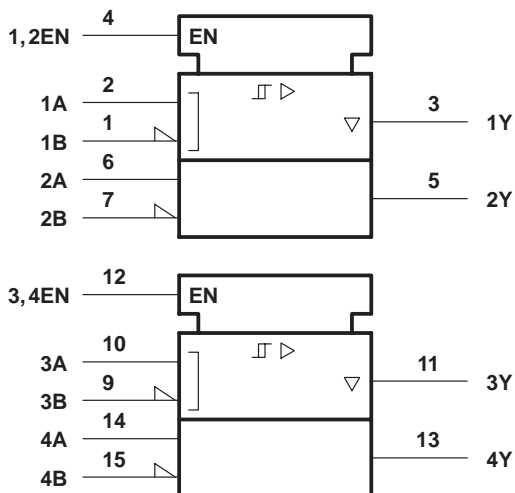
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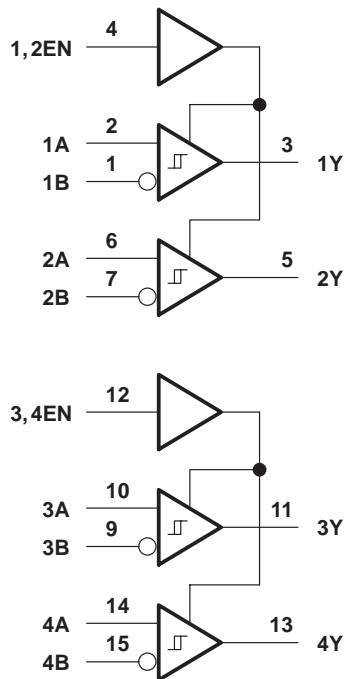
SN65175, SN75175 QUADRUPLE DIFFERENTIAL LINE RECEIVERS

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logic symbol†

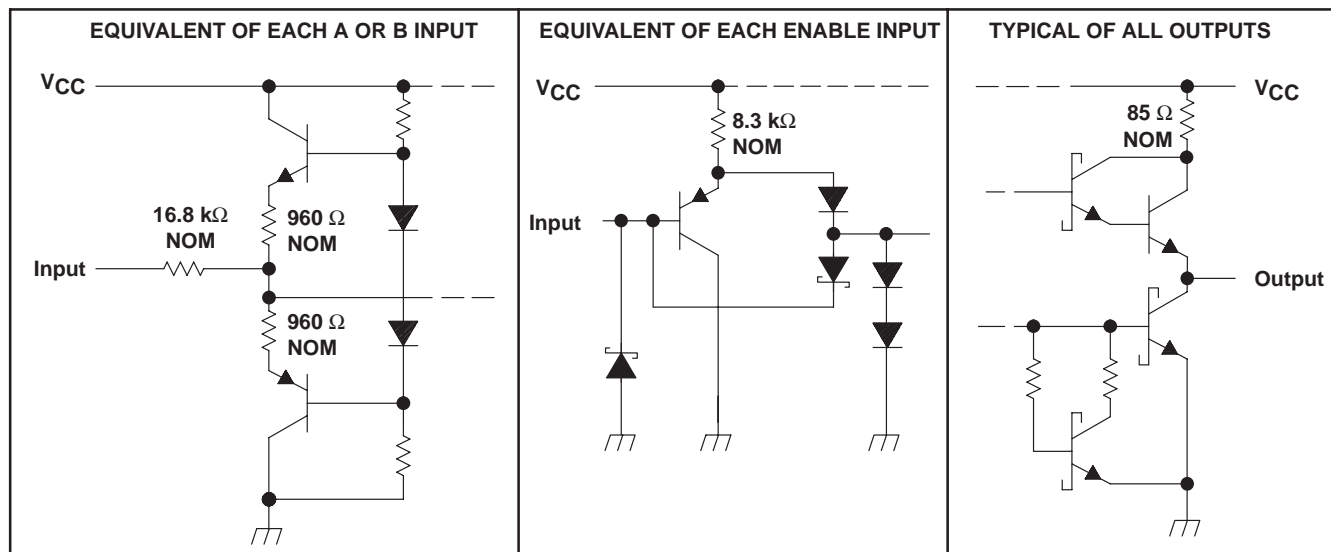


logic diagram (positive logic)



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

schematics of inputs and outputs



SN65175, SN75175 QUADRUPLE DIFFERENTIAL LINE RECEIVERS

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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
Input voltage V_I , (A or B inputs)	± 25 V
Differential input voltage, V_{ID} (see Note 2)	± 25 V
Enable input voltage, V_I , EN	7 V
Low-level output current, I_{OL}	50 mA
Continuous total dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A : SN65175	–40°C to 85°C
SN75175	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, except differential input voltage, are with respect to network ground terminal.
 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	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW	494 mW
N	1150 mW	9.2 mW/°C	736 mW	598 mW

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
Common-mode input voltage, V_{IC}			± 12	V
Differential input voltage, V_{ID}			± 12	V
High-level enable-input voltage, V_{IH}	2			V
Low-level enable-input voltage, V_{IL}			0.8	V
High-level output current, I_{OH}			–400	μA
Low-level output current, I_{OL}			16	mA
Operating free-air temperature, T_A	SN65175	–40	85	°C
	SN75175	0	70	

SN65175, SN75175 QUADRUPLE DIFFERENTIAL LINE RECEIVERS

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electrical characteristics over recommended ranges of common-mode input voltage, supply voltage and operating free-air temperature

PARAMETER	TEST CONDITIONS	MIN	TYP†	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	$V_O = 0.5\text{ V}$, $I_O = 16\text{ mA}$	$-0.2\ddagger$			V
V_{hys} Hysteresis voltage ($V_{IT+} - V_{IT-}$)	See Figure 4		50		mV
V_{IK} Enable-input clamp voltage	$I_I = -18\text{ mA}$			-1.5	V
V_{OH} High-level output voltage	$V_{ID} = 200\text{ mV}$, $I_{OH} = -400\text{ }\mu\text{A}$, See Figure 1		2.7		V
V_{OL} Low-level output voltage	$V_{ID} = -200\text{ mV}$, See Figure 1			$I_{OL} = 8\text{ mA}$	0.45
				$I_{OL} = 16\text{ mA}$	0.5
I_{OZ} High-impedance-state output current	$V_O = 0.4\text{ V to }2.4\text{ V}$			± 20	μA
I_I Line input current	Other input at 0 V, See Note 3			$V_I = 12\text{ V}$	1
				$V_I = -7\text{ V}$	-0.8
I_{IH} High-level enable-input current	$V_{IH} = 2.7\text{ V}$			20	μA
I_{IL} Low-level enable-input current	$V_{IL} = 0.4\text{ V}$			-100	μA
r_i Input resistance			12		$\text{k}\Omega$
I_{OS} Short-circuit output current§		-15		-85	mA
I_{CC} Supply current	Outputs disabled			70	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 as minimum, is used in this data sheet for threshold voltage levels only.

§ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

NOTE 3: Refer to ANSI Standards EIA/TIA-422-B, RS-423-B, and RS-485 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	See Figure 2		22	35	ns
t_{PHL} Propagation delay time, high- to low-level output			25	35	ns
t_{PZH} Output enable time to high level	See Figure 3		13	30	ns
t_{PZL} Output enable time to low level			19	30	ns
t_{PHZ} Output disable time from high level	See Figure 3		26	35	ns
t_{PLZ} Output disable time from low level			25	35	ns

PARAMETER MEASUREMENT INFORMATION

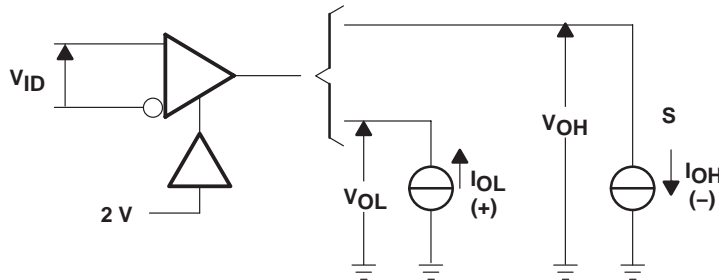
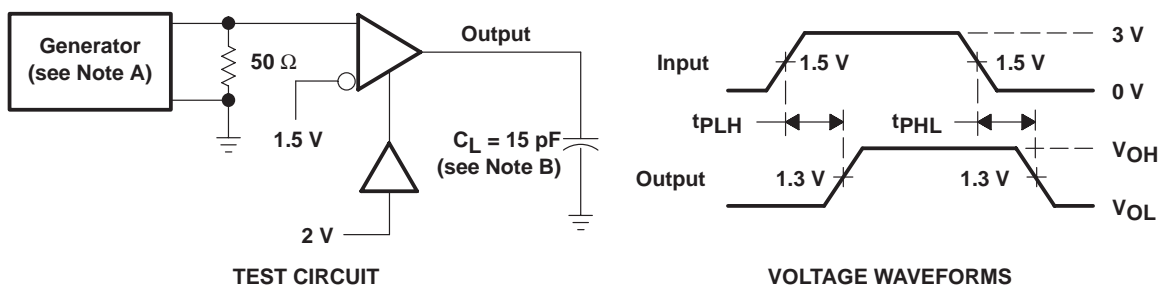


Figure 1. V_{OH} , V_{OL}



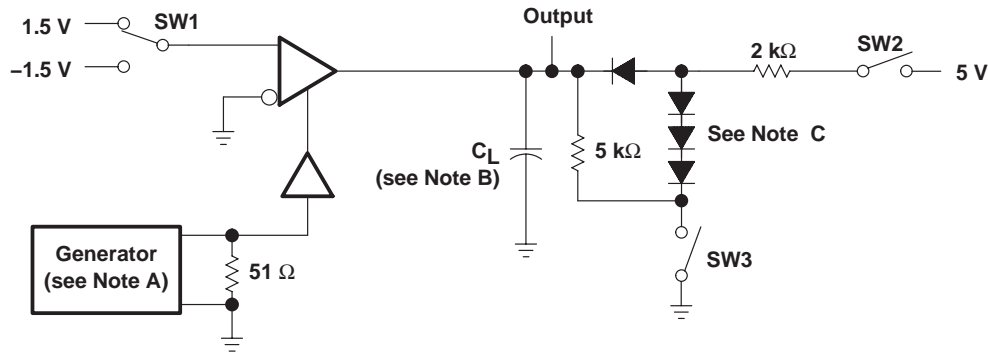
- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 1$ MHz, duty cycle = 50%, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_O = 50 \Omega$.
 B. C_L includes probe and stray capacitance.

Figure 2. Test Circuit and Voltage Waveforms

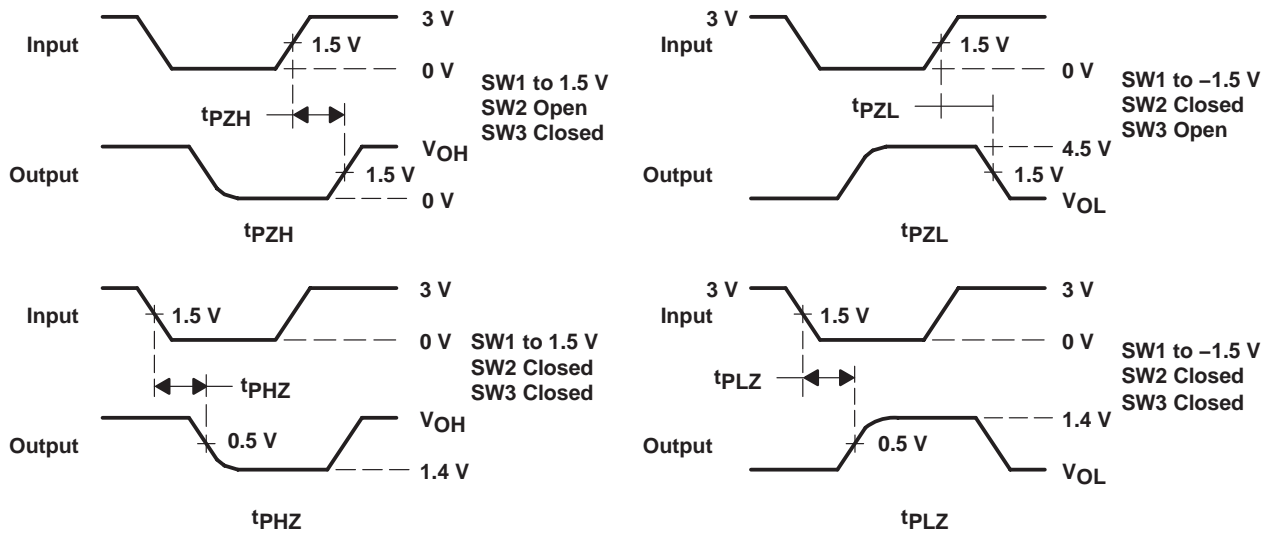
SN65175, SN75175 QUADRUPLE DIFFERENTIAL LINE RECEIVERS

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PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

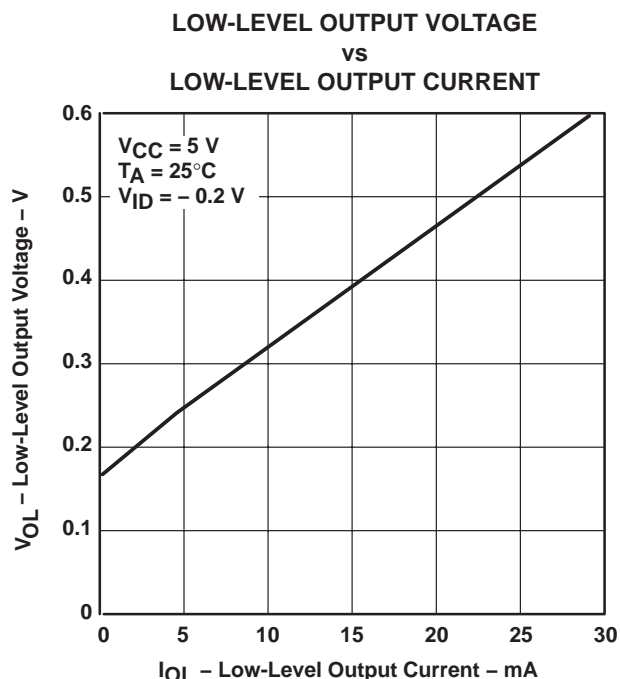
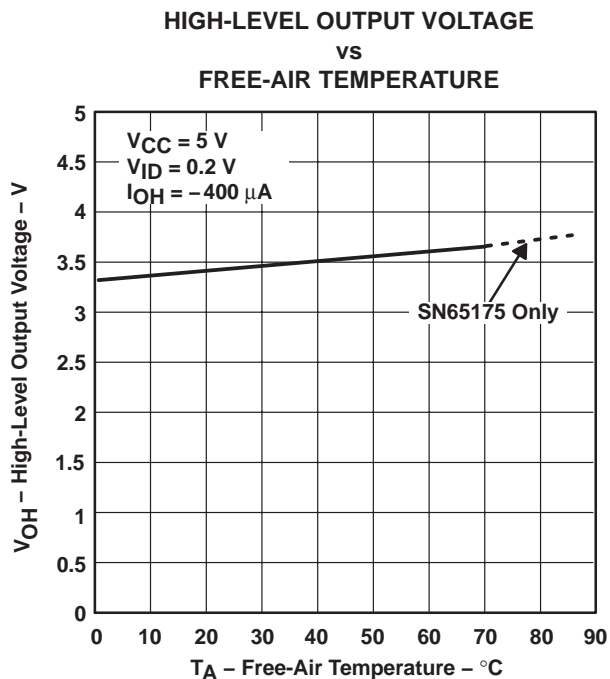
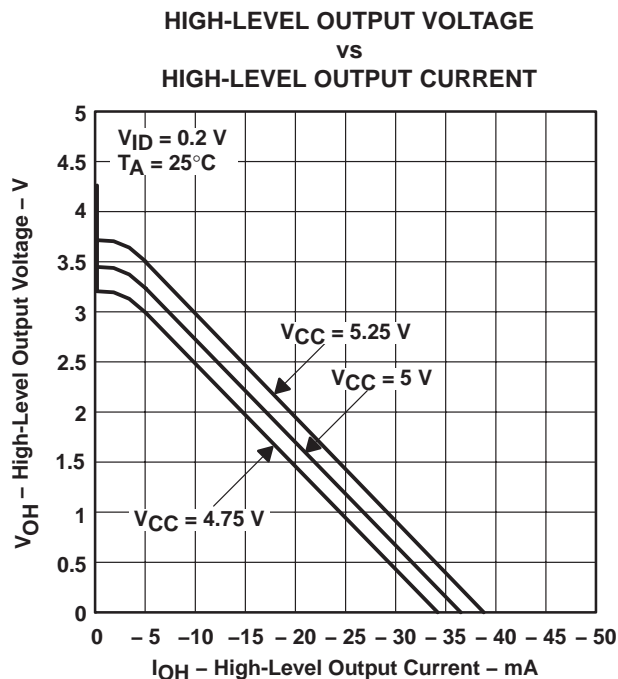
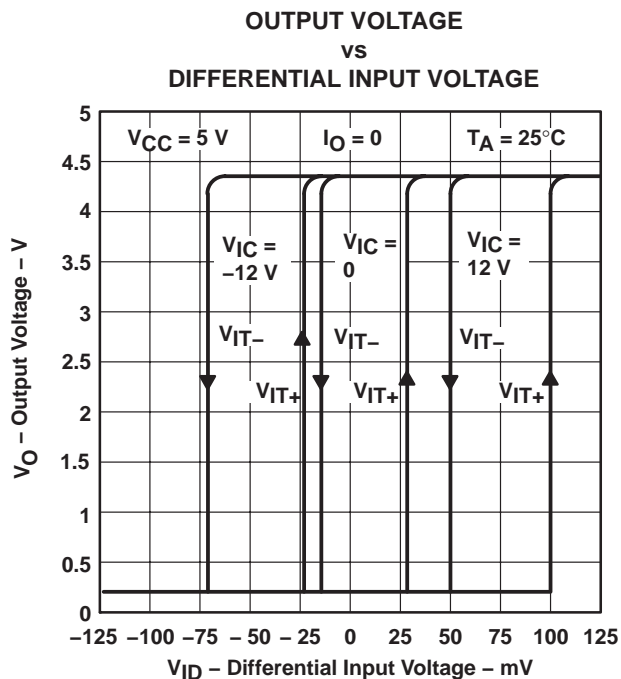


VOLTAGE WAVEFORMS

- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 1$ MHz, duty cycle = 50%, $t_f \leq 6$ ns, $t_r \leq 6$ ns, $Z_O = 50 \Omega$.
 B. C_L includes probe and stray capacitance.
 C. All diodes are 1N916 or equivalent.

Figure 3. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS



SN65175, SN75175 QUADRUPLE DIFFERENTIAL LINE RECEIVERS

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TYPICAL CHARACTERISTICS

LOW-LEVEL OUTPUT VOLTAGE
vs
FREE-AIR TEMPERATURE

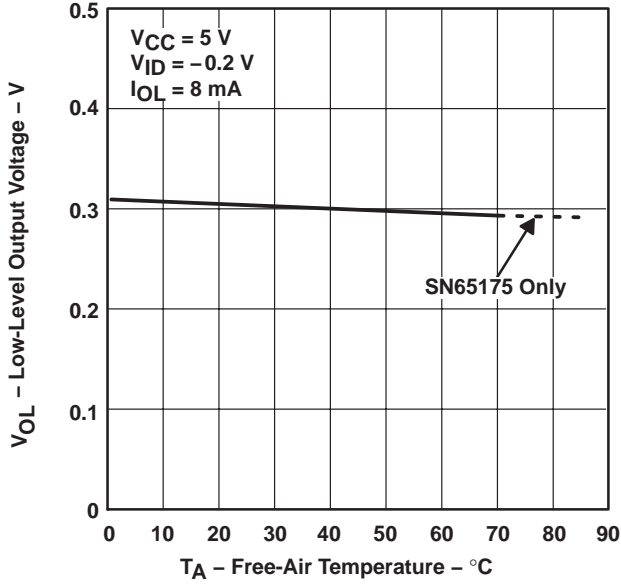


Figure 8

OUTPUT VOLTAGE
vs
ENABLE G VOLTAGE

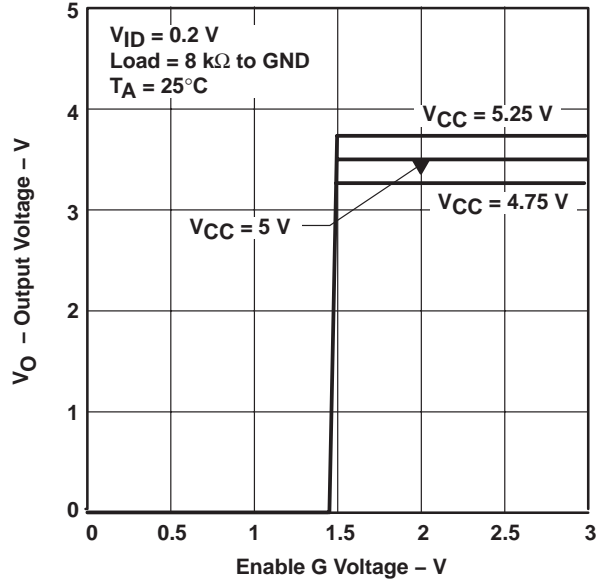


Figure 9

OUTPUT VOLTAGE
vs
ENABLE G VOLTAGE

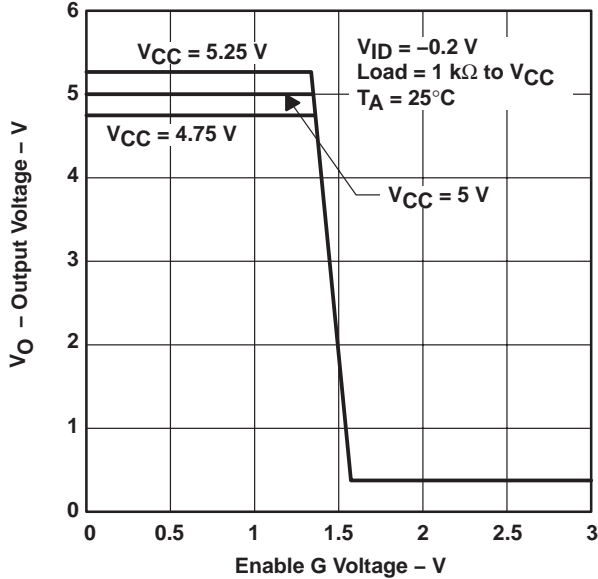


Figure 10

SUPPLY CURRENT (ALL RECEIVERS)
vs
SUPPLY VOLTAGE

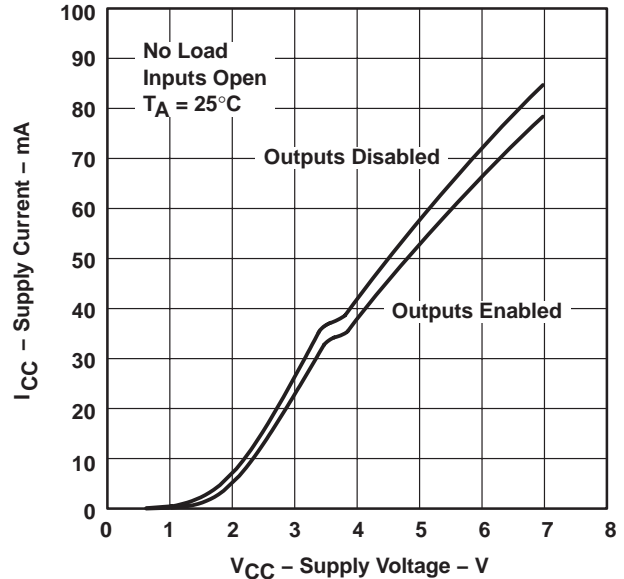
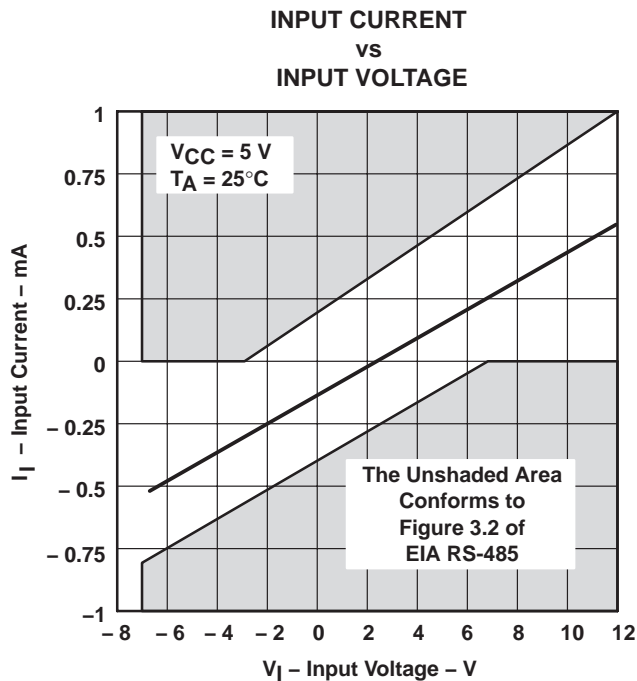
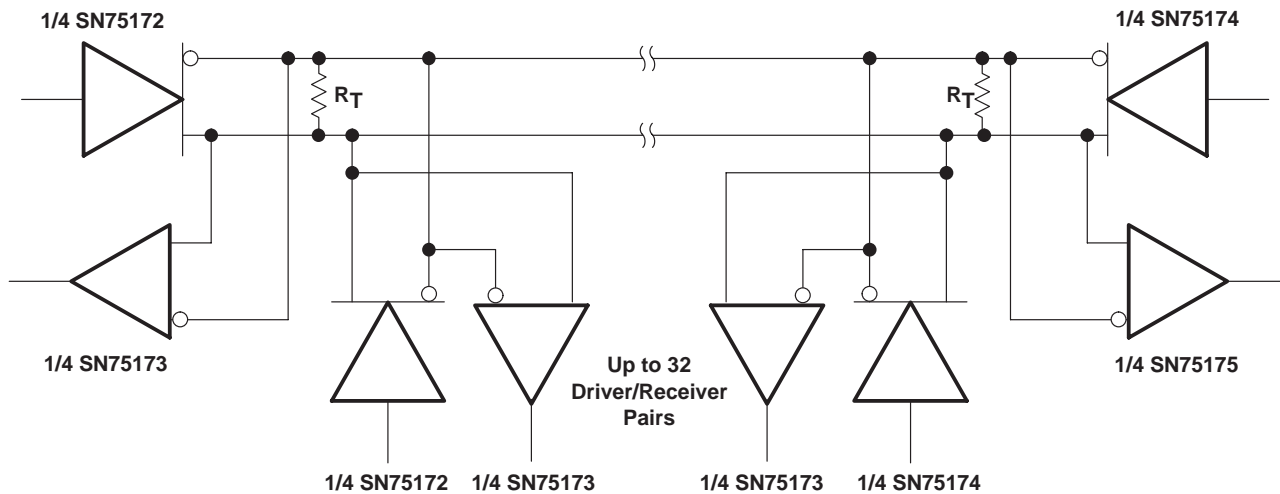


Figure 11

TYPICAL CHARACTERISTICS



APPLICATION INFORMATION



NOTE A: 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 13. 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⁾
SN65175D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65175DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65175DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65175DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65175DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65175DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75175D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75175DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75175DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75175DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75175DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75175DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75175J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI
SN75175N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75175NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75175NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75175NSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75175NSRG4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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.

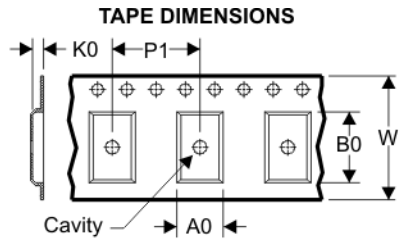
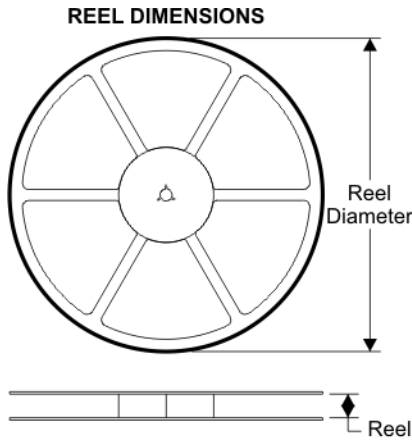
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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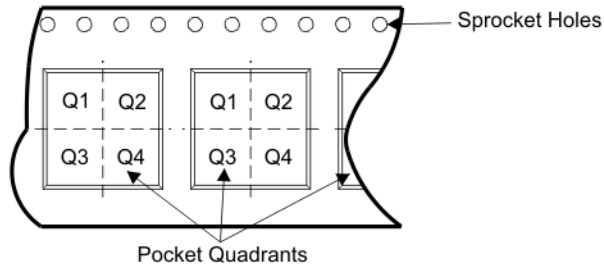
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TAPE AND REEL BOX INFORMATION



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



Device	Package	Pins	Site	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN65175DR	D	16	SITE 27	330	16	6.5	10.3	2.1	8	16	Q1
SN75175DR	D	16	SITE 27	330	16	6.5	10.3	2.1	8	16	Q1
SN75175DR	D	16	SITE 41	330	16	6.5	10.3	2.1	8	16	Q1
SN75175NSR	NS	16	SITE 41	330	16	8.2	10.5	2.5	12	16	Q1

TAPE AND REEL BOX DIMENSIONS



Device	Package	Pins	Site	Length (mm)	Width (mm)	Height (mm)
SN65175DR	D	16	SITE 27	342.9	336.6	28.58
SN75175DR	D	16	SITE 27	342.9	336.6	28.58
SN75175DR	D	16	SITE 41	346.0	346.0	33.0
SN75175NSR	NS	16	SITE 41	346.0	346.0	33.0

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package is hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

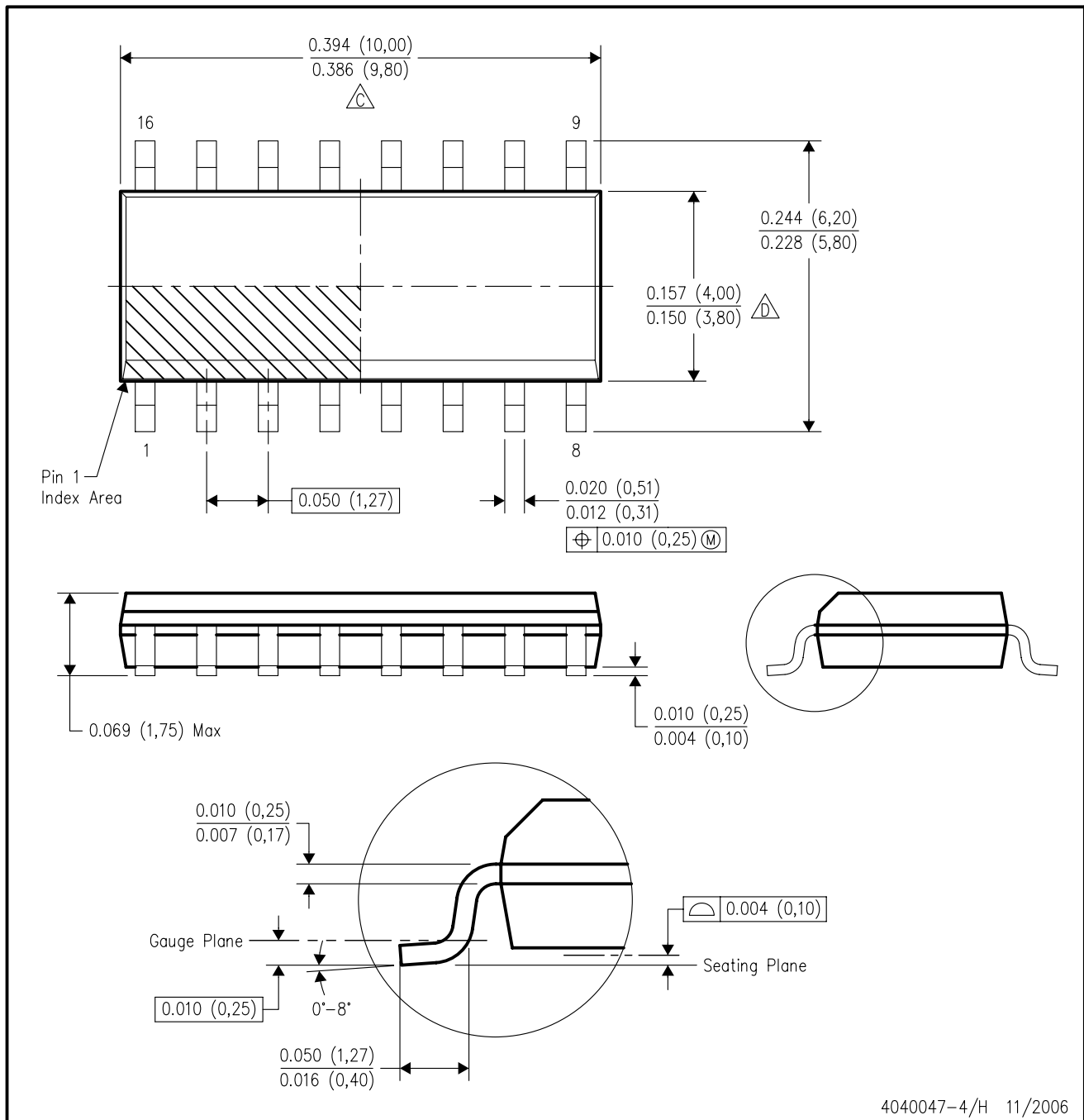
16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
 - E. Reference JEDEC MS-012 variation AC.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- 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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