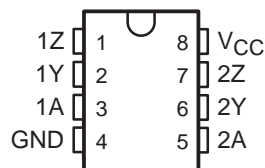


# SN75158 DUAL DIFFERENTIAL LINE DRIVER

SLLS085B – JANUARY 1977 – REVISED MAY 1995

- Meets or Exceeds the Requirements of ANSI EIA/TIA-422-B and ITU Recommendation V.11
- Single 5-V Supply
- Balanced-Line Operation
- TTL Compatible
- High Output Impedance in Power-Off Condition
- High-Current Active-Pullup Outputs
- Short-Circuit Protection
- Dual Channels
- Input Clamp Diodes

D, P, OR PS† PACKAGE  
(TOP VIEW)



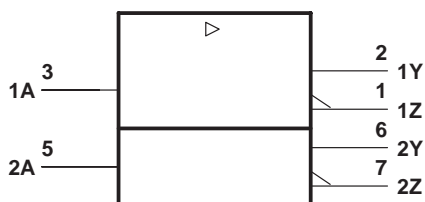
† The PS package is only available left-end taped and reeled, i.e., order SN75158PSLE.

## description

The SN75158 is a dual differential line driver designed to satisfy the requirements set by the ANSI EIA/TIA-422-B and ITU V.11 interface specifications. The outputs provide complementary signals with high-current capability for driving balanced lines, such as twisted pair, at normal line impedance without high power dissipation. The output stages are TTL totem-pole outputs providing a high-impedance state in the power-off condition.

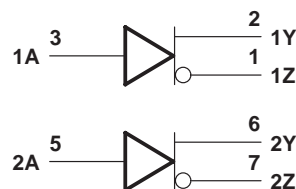
The SN75158 is characterized for operation from 0°C to 70°C.

## logic symbol‡



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

## logic diagram (positive logic)



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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**

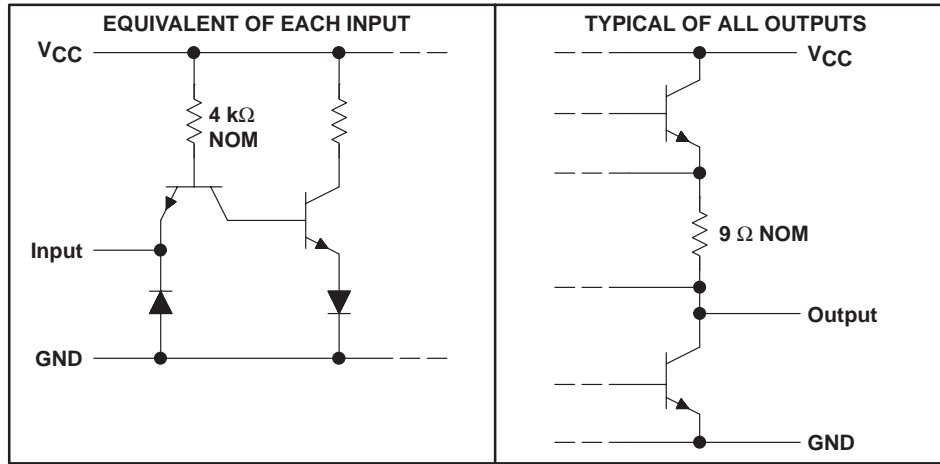
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# SN75158 DUAL DIFFERENTIAL LINE DRIVER

SLLS085B – JANUARY 1977 – REVISED MAY 1995

## schematics of inputs and outputs



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

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage, $V_I$	5.5 V
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, $T_A$	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.

NOTE 1: All voltage values, except differential output voltage  $V_{OD}$ , are with respect to network ground terminal.  $V_{OD}$  is at the Y output with respect to the Z output.

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
D	725 mW	5.8 mW/°C	464 mW
P	1000 mW	8.0 mW/°C	640 mW
PS	450 mW	3.6 mW/°C	288 mW

### recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, $V_{CC}$	4.75	5	5.25	V
High-level input voltage, $V_{IH}$	2			V
Low-level input voltage, $V_{IL}$			0.8	V
High-level output current, $I_{OH}$			-40	mA
Low-level output current, $I_{OL}$			40	mA
Operating free-air temperature, $T_A$	0		70	°C



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**electrical characteristics over operating free-air temperature range (unless otherwise noted)**

PARAMETER		TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = -12 mA	-0.9	-1.5		V
V <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = -40 mA	2.4	3		V
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V, I <sub>OL</sub> = 40 mA		0.2	0.4	V
V <sub>OD1</sub>	Differential output voltage	V <sub>CC</sub> = MAX, I <sub>O</sub> = 0		3.5	2×V <sub>OD2</sub>	V
V <sub>OD2</sub>	Differential output voltage	V <sub>CC</sub> = MIN	2	3		V
ΔV <sub>OD</sub>	Change in magnitude of differential output voltage§	V <sub>CC</sub> = MIN		±0.02	±0.4	V
V <sub>OC</sub>	Common-mode output voltage¶	V <sub>CC</sub> = MAX		1.8	3	V
		V <sub>CC</sub> = MIN		1.5	3	
ΔV <sub>OC</sub>	Change in magnitude of common-mode output voltage§	V <sub>CC</sub> = MIN or MAX		±0.02	±0.4	V
I <sub>O</sub>	Output current with power off	V <sub>CC</sub> = 0	V <sub>O</sub> = 6 V	0.1	100	μA
			V <sub>O</sub> = -0.25 V	-0.1	-100	
			V <sub>O</sub> = -0.25 to 6 V		±100	
I <sub>I</sub>	Input current at maximum input voltage	V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V			1	mA
I <sub>IH</sub>	High-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V			40	μA
I <sub>IL</sub>	Low-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V		-1	-1.6	mA
I <sub>OS</sub>	Short-circuit output current#	V <sub>CC</sub> = MAX	-40	-90	-150	mA
I <sub>CC</sub>	Supply current (both drivers)	V <sub>CC</sub> = MAX, Inputs grounded, T <sub>A</sub> = 25°C, No load		37	50	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V<sub>CC</sub> = 5 V and T<sub>A</sub> = 25°C except for V<sub>OC</sub>, for which V<sub>CC</sub> is as stated under test conditions.

§ ΔV<sub>OD</sub> and Δ|V<sub>OC</sub>| are the changes in magnitudes 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.

¶ In ANSI Standard EIA/TIA-422-B, V<sub>OC</sub>, which is the average of the two output voltages with respect to ground, is called output offset voltage, V<sub>OS</sub>.

# Only one output should be shorted at a time, and duration of the short circuit should not exceed one second.

**switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C**

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Propagation delay time, low-to-high-level output	See Figure 2, Termination A		16	25	ns
t <sub>PHL</sub>	Propagation delay time, high-to-low-level output			10	20	ns
t <sub>PLH</sub>	Propagation delay time, low-to-high-level output	See Figure 2, Termination B		13	20	ns
t <sub>PHL</sub>	Propagation delay time, high-to-low-level output			9	15	ns
t <sub>TLH</sub>	Transition time, low-to-high-level output	See Figure 2, Termination A		4	20	ns
t <sub>TLH</sub>	Transition time, high-to-low-level output			4	20	ns
	Overshoot factor	See Figure 2, Termination C			10%	

# SN75158 DUAL DIFFERENTIAL LINE DRIVER

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## PARAMETER MEASUREMENT INFORMATION

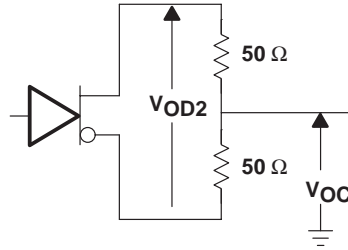
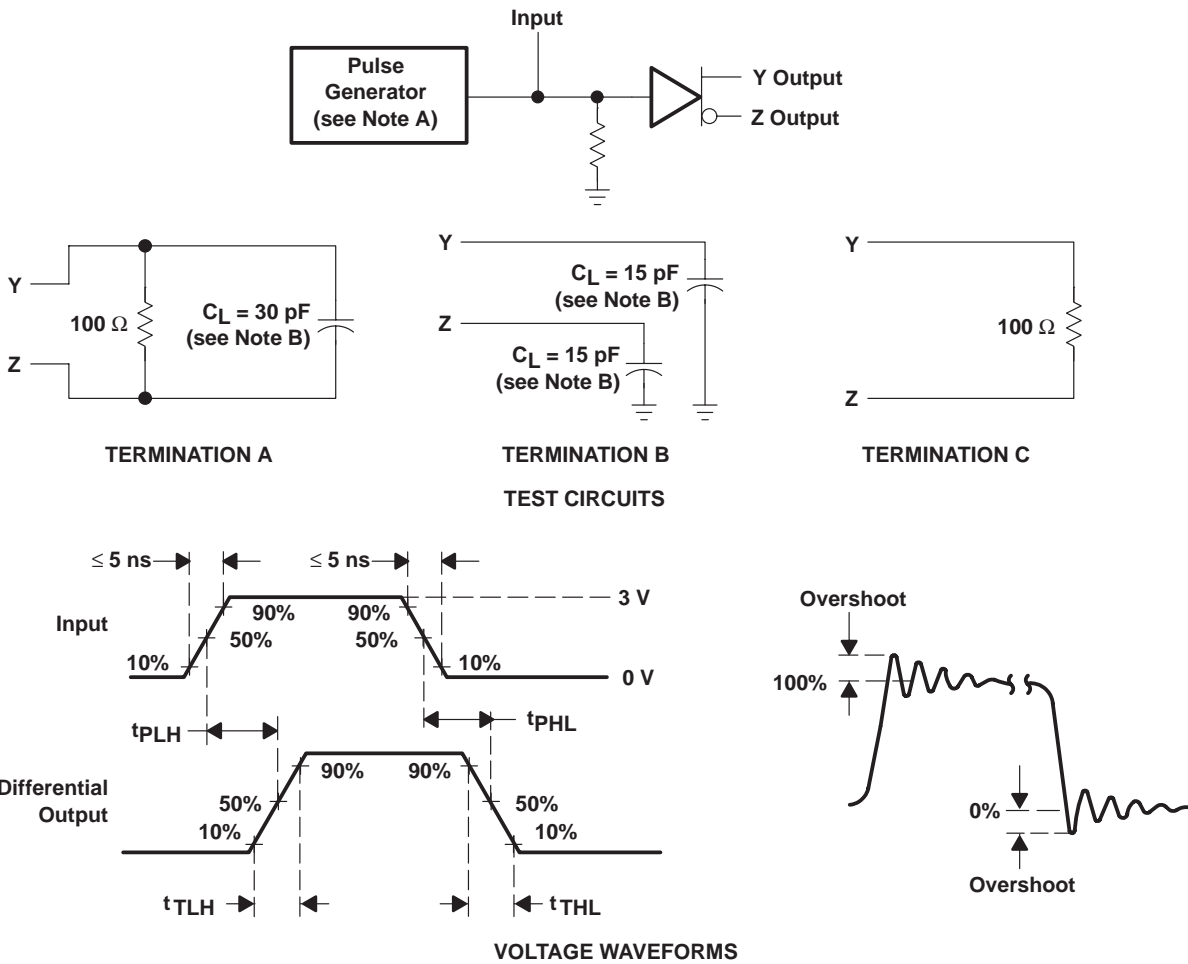


Figure 1. Differential and Common-Mode Output Voltages



NOTES: A. The pulse generator has the following characteristics:  $Z_O = 50 \Omega$ ,  $t_w = 25 \text{ ns}$ ,  $\text{PRR} \leq 10 \text{ MHz}$ .  
B.  $C_L$  includes probe and jig capacitance.

Figure 2. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

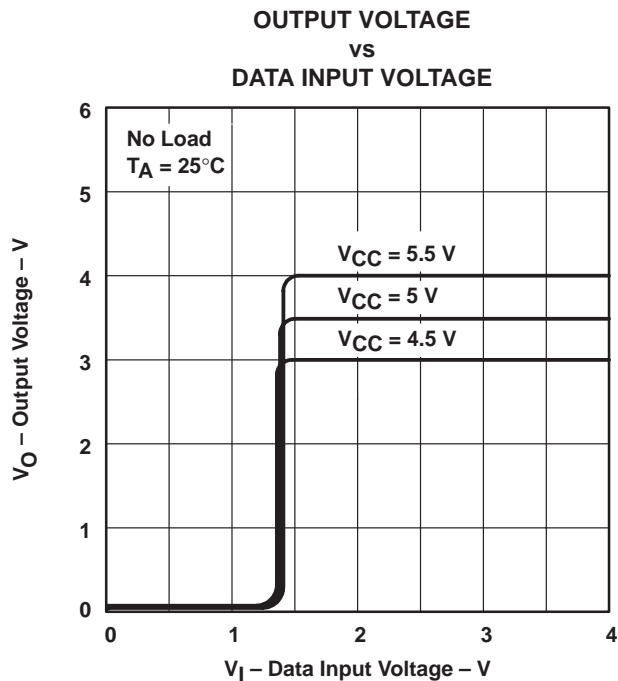


Figure 3

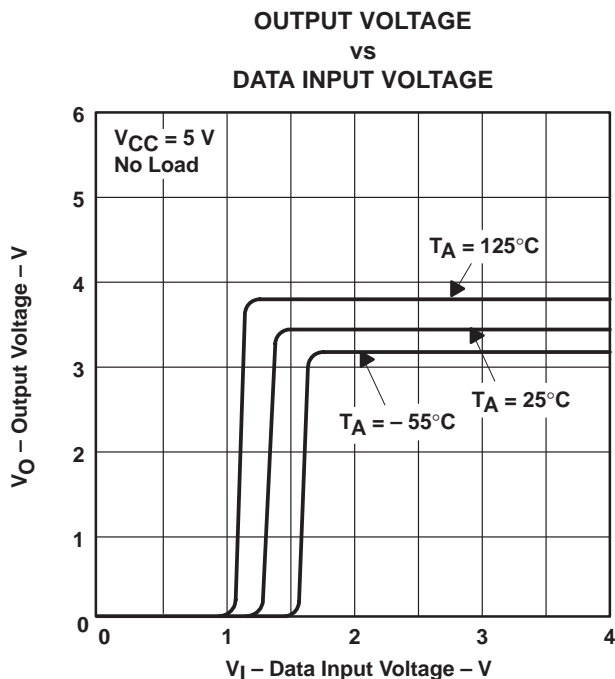


Figure 4

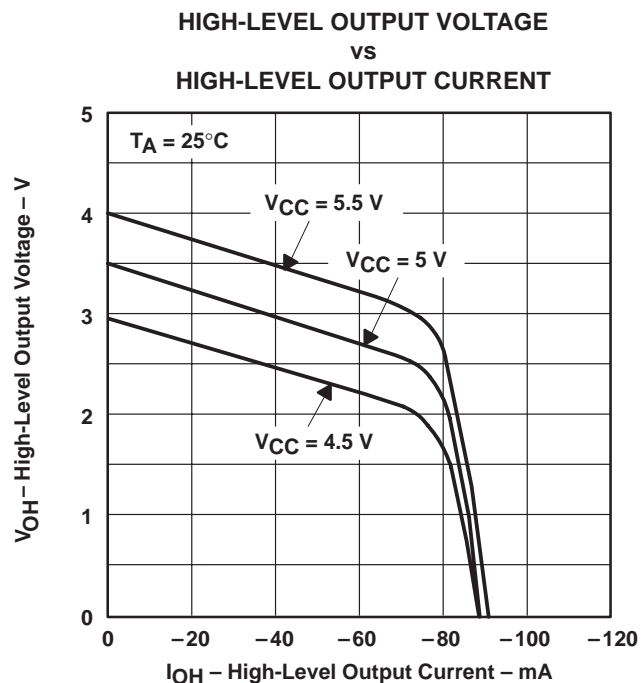


Figure 5

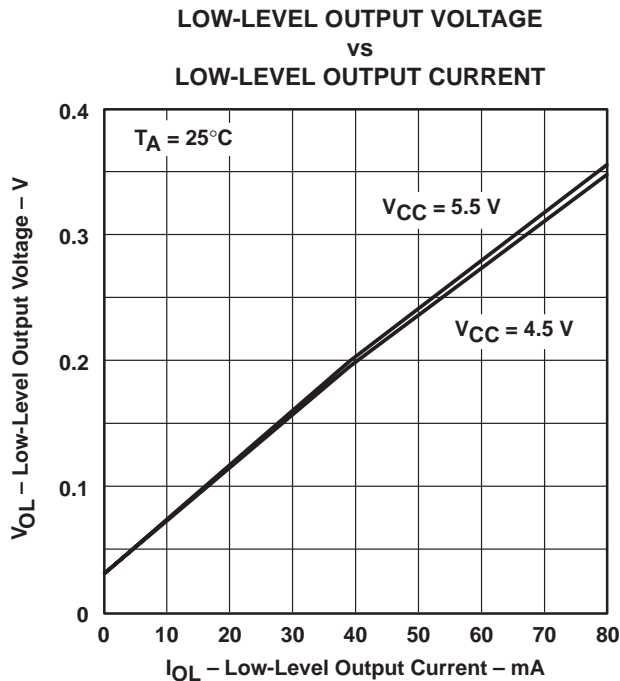


Figure 6

# SN75158 DUAL DIFFERENTIAL LINE DRIVER

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## TYPICAL CHARACTERISTICS

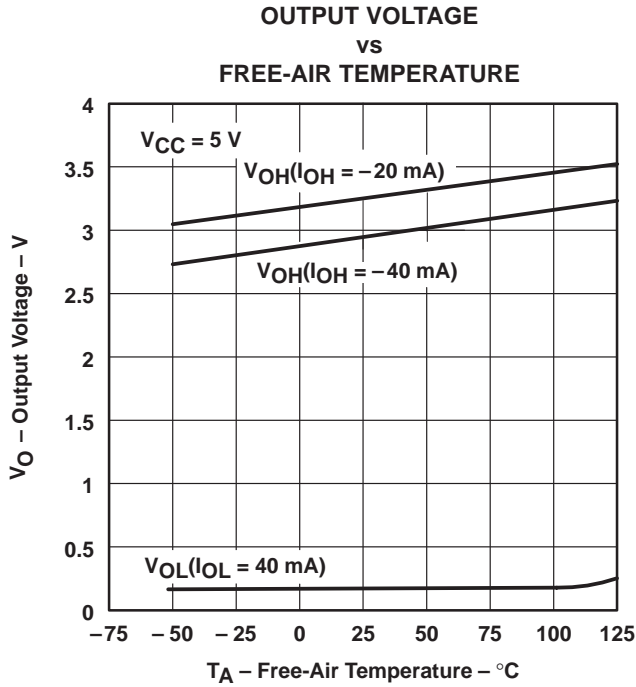


Figure 7

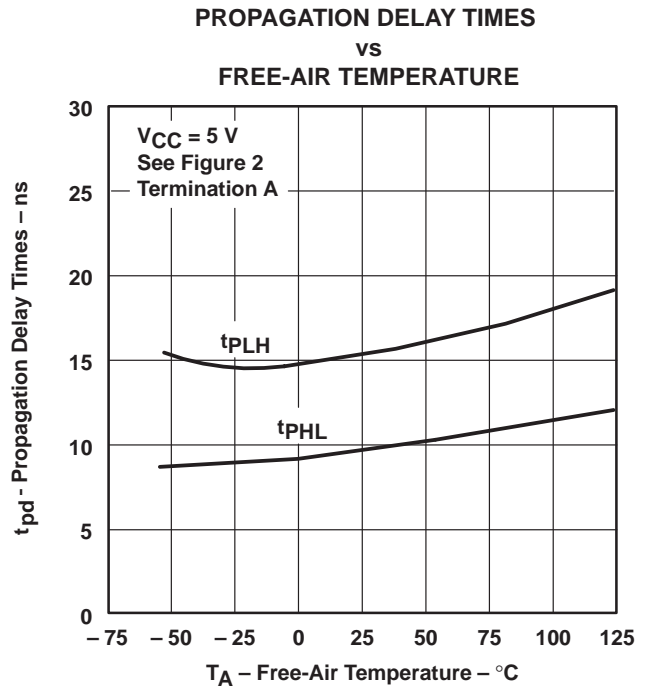


Figure 8

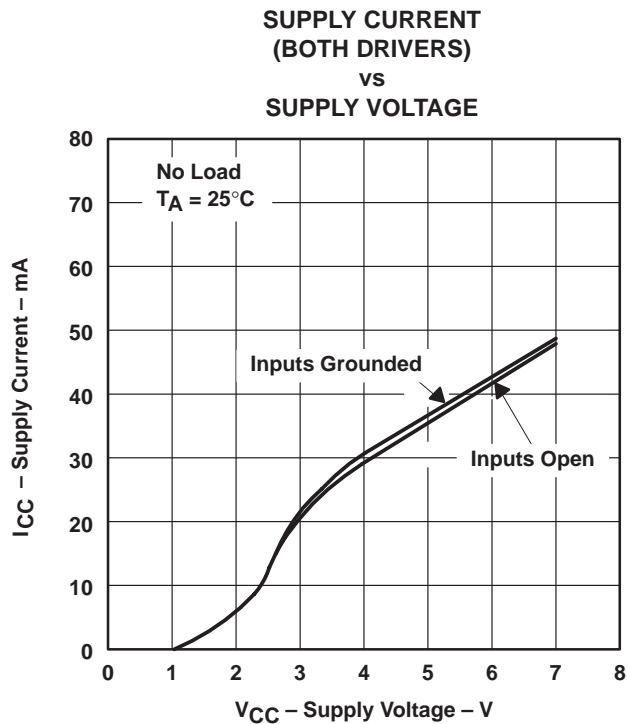


Figure 9

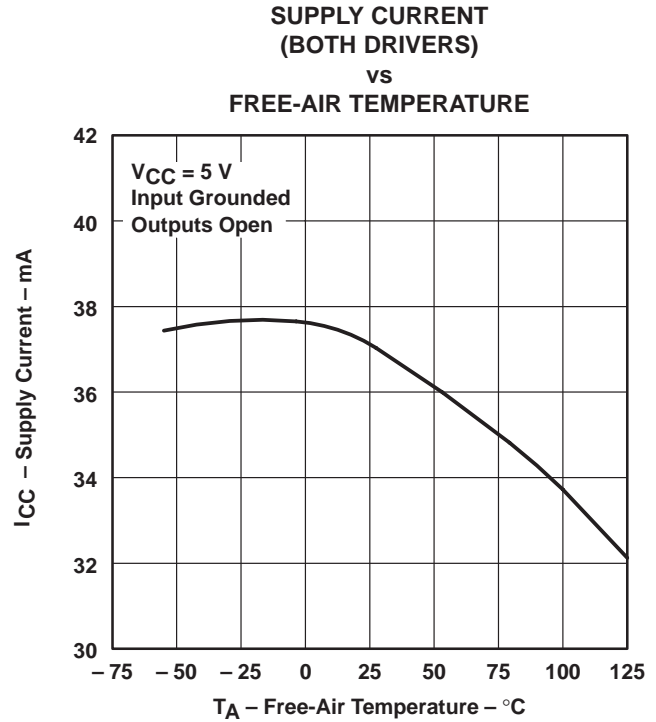


Figure 10

TYPICAL CHARACTERISTICS

SUPPLY CURRENT  
(BOTH DRIVERS)  
vs  
FREQUENCY

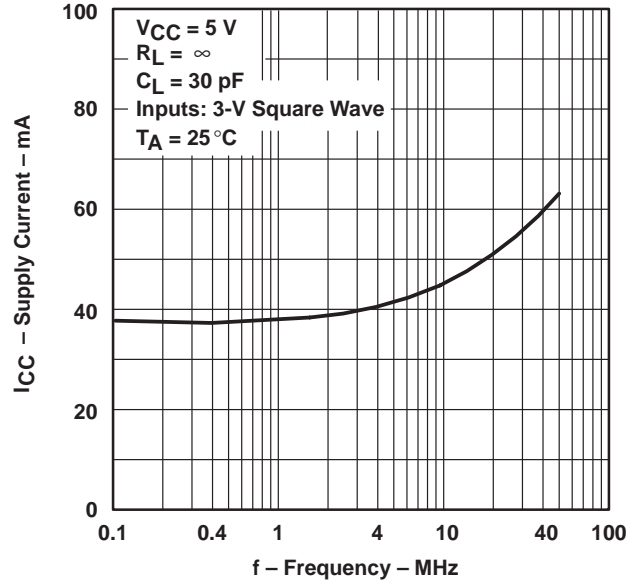


Figure 11

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**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
SN75158D	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75158DE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75158DG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75158DR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75158DRE4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75158DRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75158P	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75158PE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75158PSLE	OBSOLETE	SO	PS	8		TBD	Call TI	Call TI
SN75158PSR	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75158PSRE4	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75158PSRG4	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> 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.

<sup>(2)</sup> 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)

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

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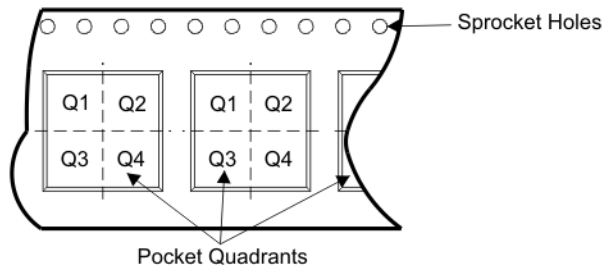
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**TAPE AND REEL BOX INFORMATION**



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
SN75158DR	D	8	SITE 27	330	12	6.4	5.2	2.1	8	12	Q1
SN75158PSR	PS	8	SITE 41	330	16	8.2	6.6	2.5	12	16	Q1

**TAPE AND REEL BOX DIMENSIONS**



Device	Package	Pins	Site	Length (mm)	Width (mm)	Height (mm)
SN75158DR	D	8	SITE 27	342.9	336.6	20.64
SN75158PSR	PS	8	SITE 41	346.0	346.0	33.0

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE

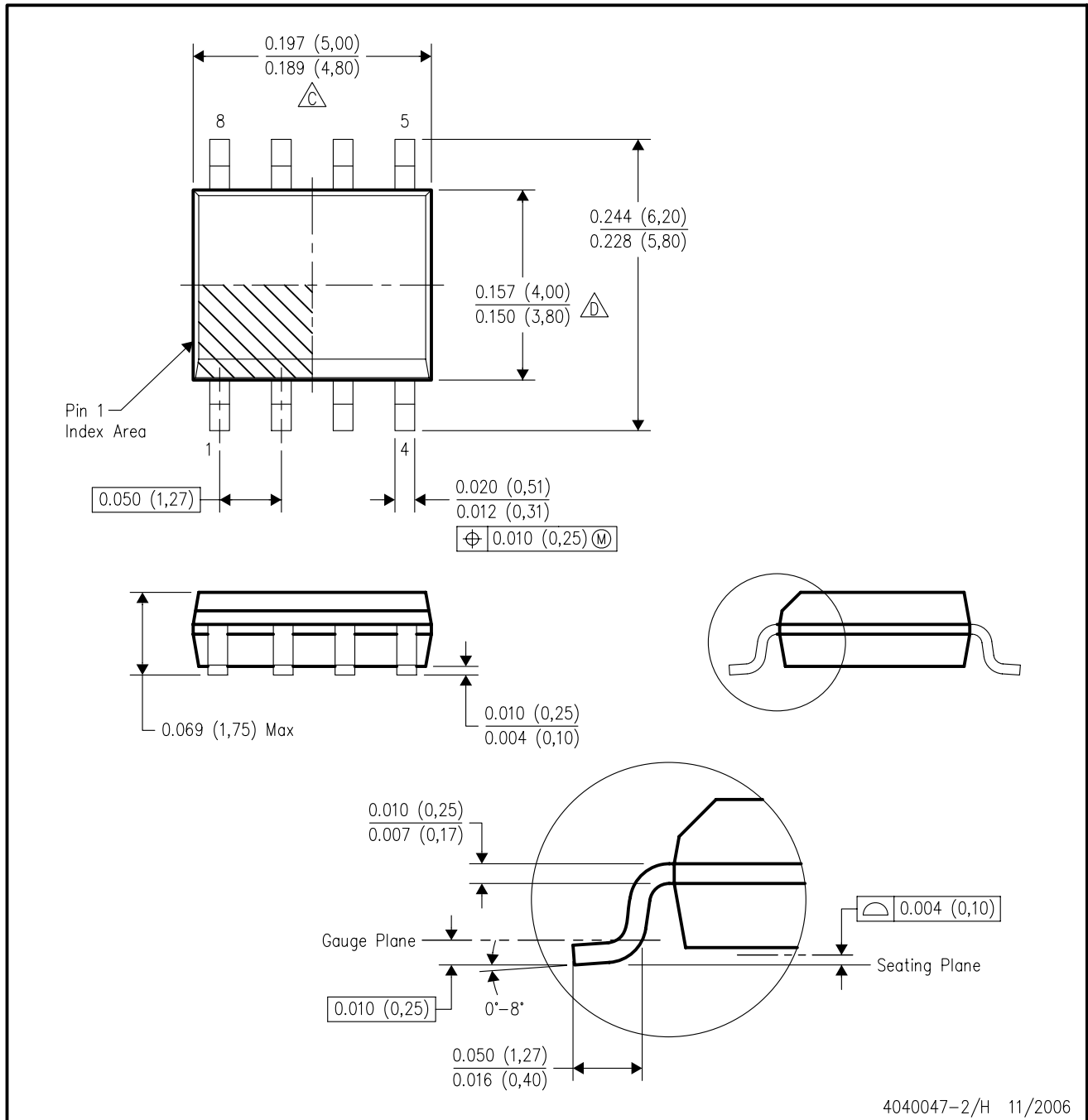




- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Falls within JEDEC MS-001

For the latest package information, go to [http://www.ti.com/sc/docs/package/pkg\\_info.htm](http://www.ti.com/sc/docs/package/pkg_info.htm)

D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  -  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.
  -  Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AA.

## MECHANICAL DATA

PS (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



- 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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DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
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