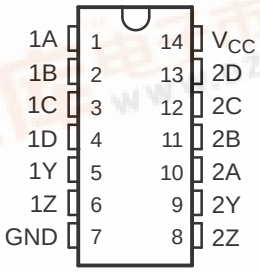
RAD-TOLERANT CLASS V, DUAL DIFFERENTIAL LINE DRIVER

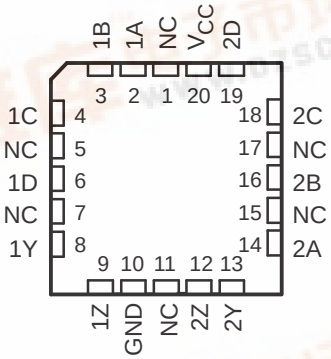
FEATURES

- Single 5-V Supply
- Differential Line Operation
- Dual Channels
- TTL Compatibility
- Short-Circuit Protection of Outputs
- Output Clamp Diodes to Terminate Line Transients
- High-Current Outputs
- Quad Inputs
- Single-Ended or Differential AND/NAND Outputs
- Designed for Use With Dual Differential Drivers SN55182 and SN75182
- Designed to Be Interchangeable With National Semiconductor DS7830 and DS8830
- Rad-Tolerant: >40 KRad(Si) TID
- QML-V Qualified, SMD 5962-79008

SN55183 . . . J OR W PACKAGE
(TOP VIEW)



SN55183 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

DESCRIPTION

The SN55183 dual differential line driver is designed to provide differential output signals with high current capability for driving balanced lines, such as twisted pair, at normal line impedances without high power dissipation. The device can be used as a TTL expander/phase splitter, because the output stages are similar to TTL totem-pole outputs.

The driver is of monolithic single-chip construction, and both halves of the dual circuits use common power supply and ground terminals.

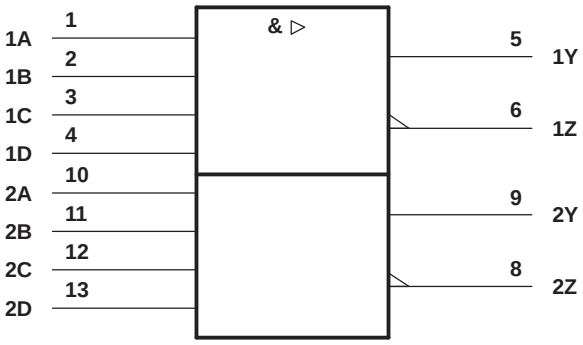
The SN55183 is characterized for operation over the full military temperature range of –55°C to 125°C.

PACKAGING/ORDERING INFORMATION(1)

T_A	PACKAGE(2)	ORDERABLE PART NUMBER	TOP-SIDE MARKING
–55°C to 125°C	J package	5962-7900801VCA	5962-7900801VCA
	W package	5962-7900801VDA	5962-7900801VDA

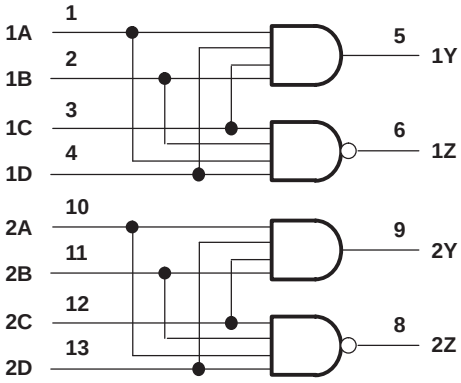
(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI Web site at www.ti.com.
(2) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

Logic Symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the J and W packages.

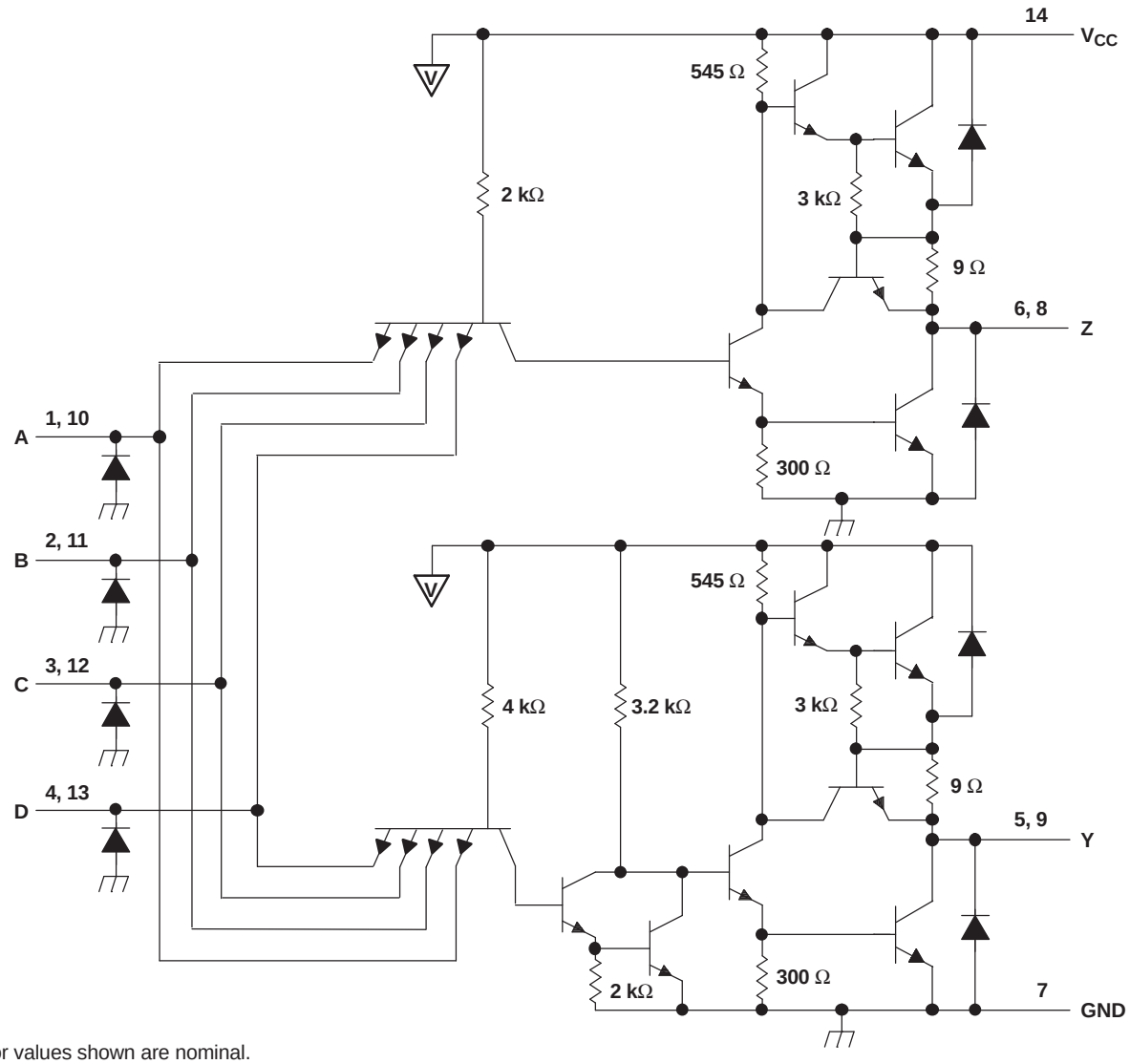
Logic Diagram (Positive Logic)



Positive logic: y = ABCD, Z = $\overline{ABCD}$

Pin numbers shown are for the J and W packages.

Schematic (Each Driver)



Resistor values shown are nominal.
Pin numbers shown are for the J and W packages.

ABSOLUTE MAXIMUM RATINGS(1)

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage(2)			7	V
V_I	Input voltage			5.5	V
	Duration of output short circuit(3)			1	s
	Continuous total power dissipation		See Dissipation Ratings Table		
T_{stg}	Storage temperature range		–65	150	°C
	Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	J or W package		300	°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 voltages, are with respect to network ground terminal.
(3) Not more than one output should be shorted to ground at any one time.

DISSIPATION RATINGS

PACKAGE(1)	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 125°C$ POWER RATING
J	1375 mW	11.0 mW/°C	880 mW	275 mW
W	1000 mW	8.0 mW/°C	640 mW	200 mW

(1) SN55183 chips are alloy mounted.

RECOMMENDED OPERATING CONDITIONS

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

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
I_{OH}	High-level output current			–40	mA
I_{OL}	Low-level output current			40	mA
T_A	Operating free-air temperature	–55		125	°C

ELECTRICAL CHARACTERISTICS

over recommended ranges of V_{CC} and operating free-air temperature (unless otherwise noted)

PARAMETER			TEST CONDITIONS			MIN	TYP(1)	MAX	UNIT
V_{OH}	High-level output voltage	Y (AND) outputs	V_{IH} = 2 V	I_{OH} = –0.8 mA		2.4			V
				I_{OH} = –40 mA		1.8	3.3		
V_{OL}	Low-level output voltage	Y (AND) outputs	V_{IL} = 0.8 V	I_{OL} = 32 mA			0.2		V
				I_{OL} = 40 mA			0.22	0.4	
V_{OH}	High-level output voltage	Z (NAND) outputs	V_{IL} = 0.8 V	I_{OH} = –0.8 mA		2.4			V
				I_{OH} = –40 mA		1.8	3.3		
V_{OL}	Low-level output voltage	Z (NAND) outputs	V_{IH} = 2 V	I_{OL} = 32 mA			0.2		V
				I_{OL} = 40 mA			0.22	0.4	
I_{IH}	High-level input current		V_{IH} = 2.4 V					120	µA
I_I	Input current at maximum input voltage		V_{IH} = 5.5 V					2	mA
I_{IL}	Low-level input current		V_{IL} = 0.4 V					–4.8	mA
I_{OS}	Short-circuit output current(2)		V_{CC} = 5 V,	T_A =125°C(3)		–40	–100	–120	mA
I_{CC}	Supply current (average per driver)		V_{CC} = 5 V,	All inputs at 5 V,	No load		10	18	mA

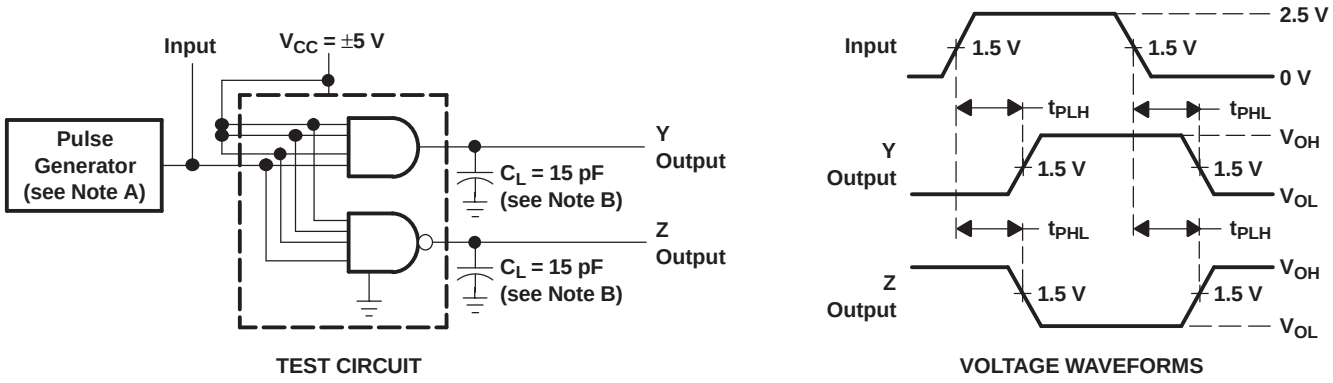
(1) All typical values are at V_{CC} = 5 V, T_A = 25°C.
(2) Not more than one output should be shorted to ground at a time, and duration of the short circuit should not exceed one second.
(3) T_A = 125°C is applicable to SN55183 only.

SWITCHING CHARACTERISTICS

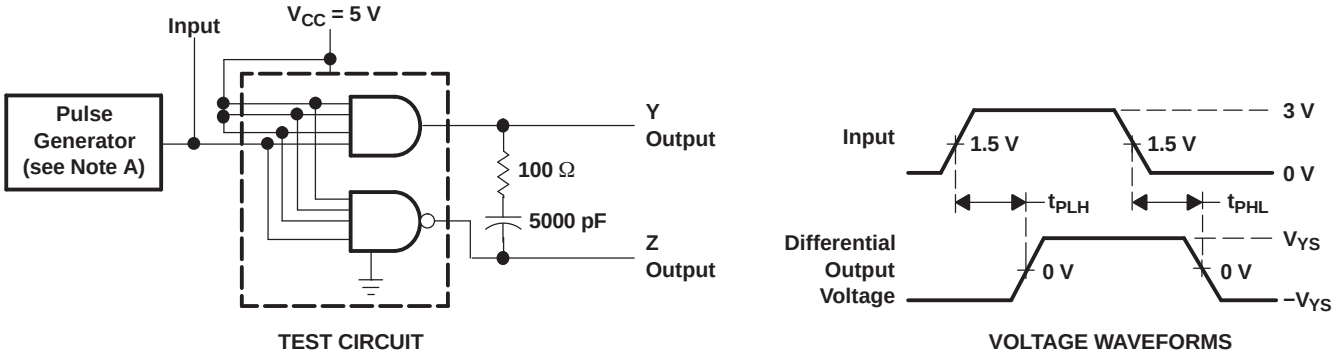
V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low- to high-level Y output	AND gates	C_L = 15 pF, See FIgure 1(a)		8	12	ns
t_{PHL}	Propagation delay time, high- to low-level Y output	AND gates	C_L = 15 pF, See FIgure 1(a)		12	18	ns
t_{PLH}	Propagation delay time, low- to high-level Z output	NAND gates	C_L = 15 pF, See FIgure 1(a)		6	12	ns
t_{PHL}	Propagation delay time, high- to low-level Z output	NAND gates	C_L = 15 pF, See FIgure 1(a)		6	8	ns
t_{PLH}	Propagation delay time, low- to high-level differential output	Y output with respect to Z output, R_L = 100 Ω in series with 5000 pF, See Figure 1(b)			9	16	ns
t_{PHL}	Propagation delay time, high- to low-level differential output	Y output with respect to Z output, R_L = 100 Ω in series with 5000 pF, See Figure 1(b)			8	16	ns

PARAMETER MEASUREMENT INFORMATION



(a) OUTPUTS Y AND Z



(b) DIFFERENTIAL OUTPUT

NOTES: A. The pulse generators have the following characteristics: Z_O = 50 Ω, $t_r \le 10$ ns, $t_f \le 10$ ns, t_w = 0.5 µs, PRR ≤ 1 MHz.
B. C_L includes probe and jig capacitance.
C. Waveforms are monitored on an oscilloscope with $r_i \ge 1$ MΩ.

Figure 1. Test Circuits and Voltage Waveforms

TYPICAL CHARACTERISTICS(1)

INPUT THRESHOLD VOLTAGE
vs
FREE-AIR TEMPERATURE

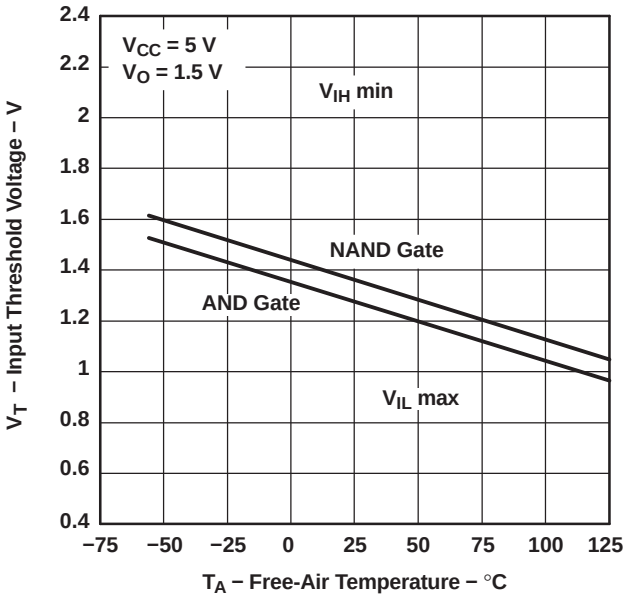


Figure 2.

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

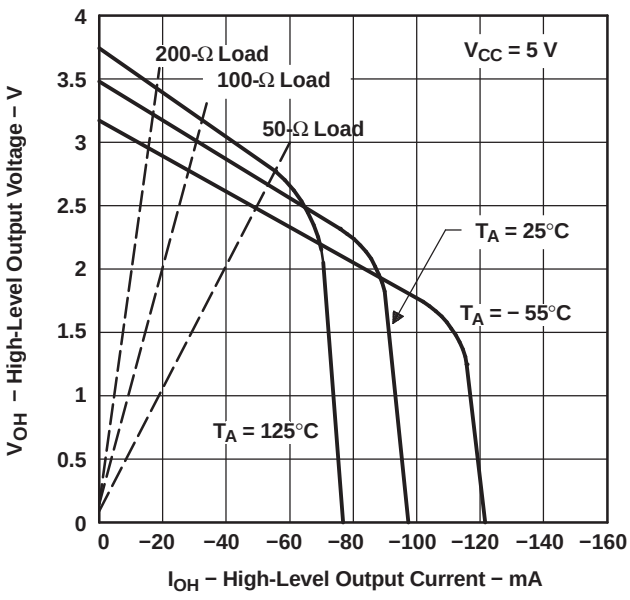


Figure 3.

DIFFERENTIAL OUTPUT VOLTAGE
vs
DIFFERENTIAL OUTPUT CURRENT

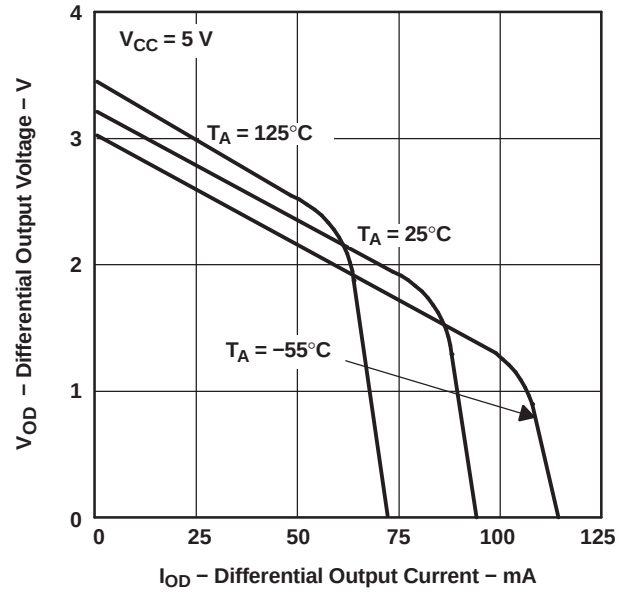


Figure 4.

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

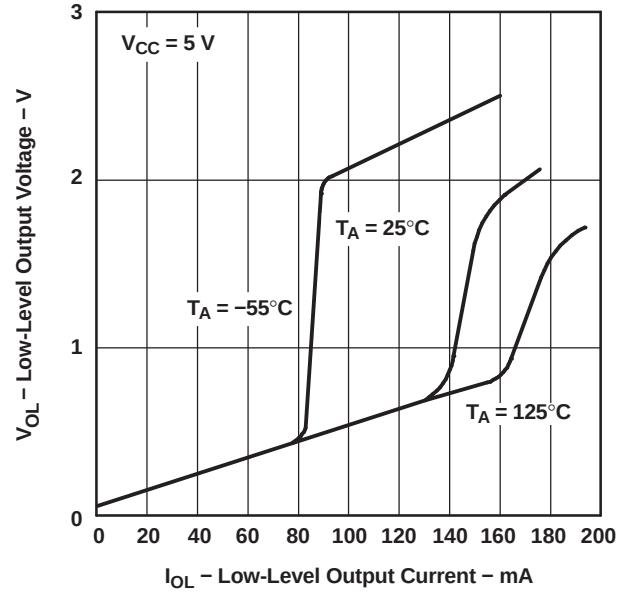


Figure 5.

(1) Operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied.

TYPICAL CHARACTERISTICS(2) (continued)

PROPAGATION DELAY TIME (DIFFERENTIAL OUTPUT) vs FREE-AIR TEMPERATURE

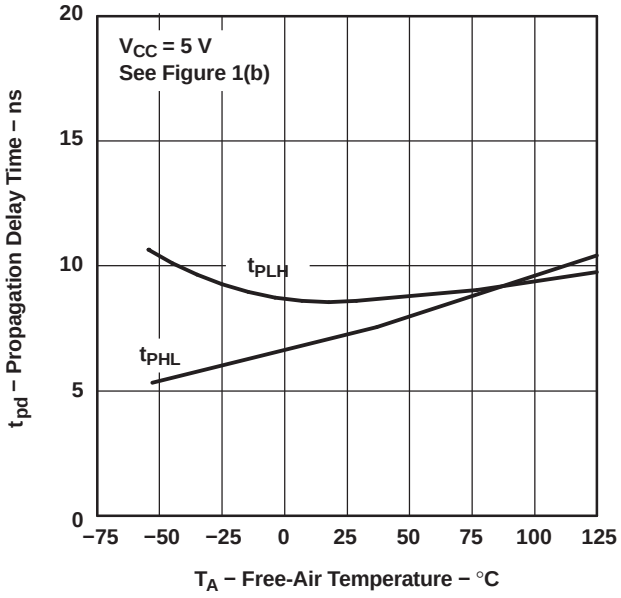


Figure 6.

TOTAL POWER DISSIPATION (BOTH DRIVERS) vs FREQUENCY

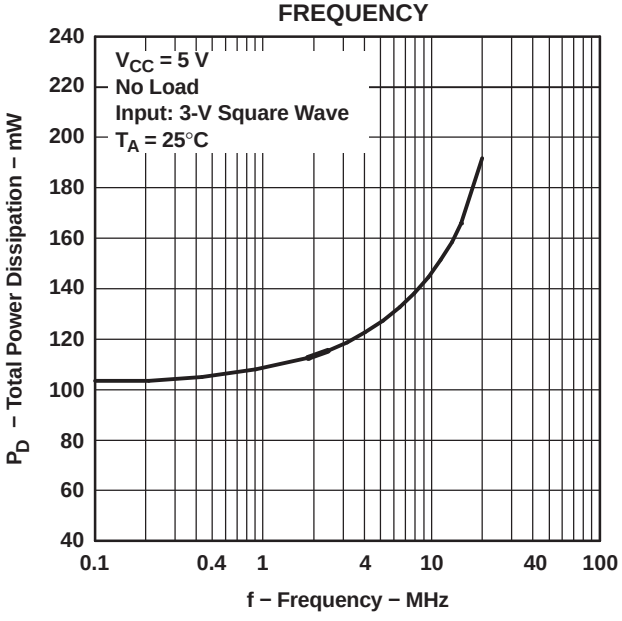
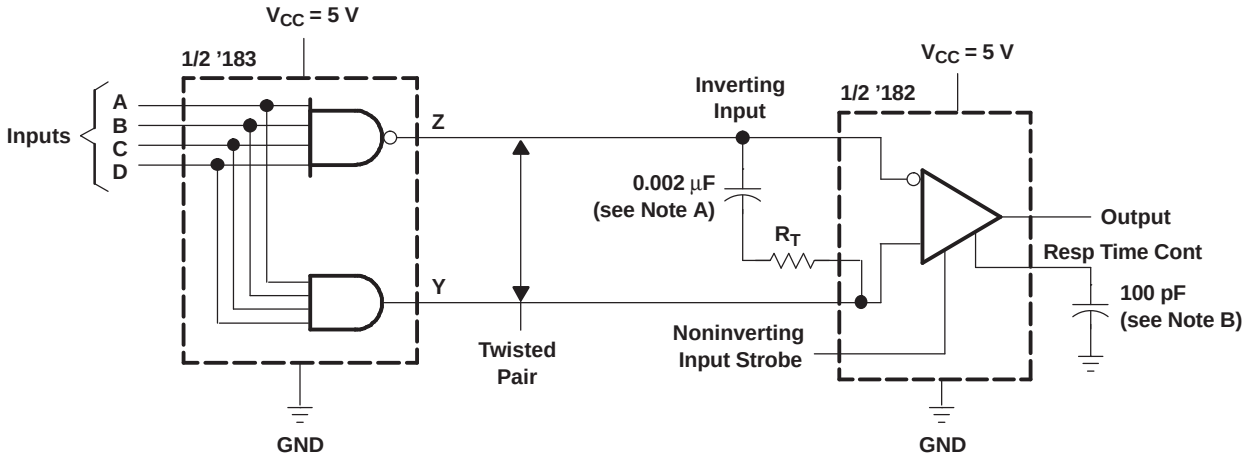


Figure 7.

APPLICATION INFORMATION



NOTES: A. When the inputs are open circuited, the output is high. A capacitor may be used for dc isolation of the line-terminating resistor. At the frequency of operation, the impedance of the capacitor should be relatively small.

Example: let f = 5 MHz
C = 0.002 μF

$$Z_{(circuit)} = \frac{1}{2\pi fC} = \frac{1}{2\pi\left(5 \times 10^{6}\right)\left(0.002 \times 10^{-6}\right)}$$

$$Z_{(circuit)} \approx 16\Omega$$

B. Use of a capacitor to control response time is optional.

Figure 8. Transmission of Digital Data Over Twisted-Pair Line

PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
5962-7900901VCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type

[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)

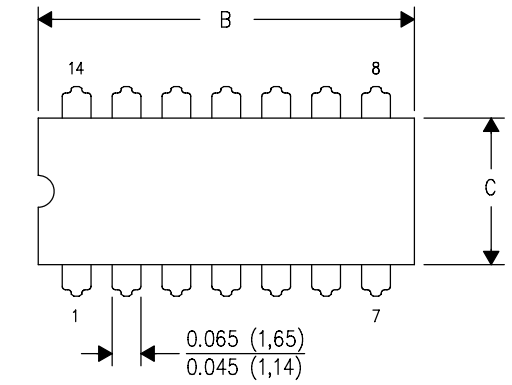
[3] MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

OTHER QUALIFIED VERSIONS OF SN55183-SP :
- Catalog: SN55183

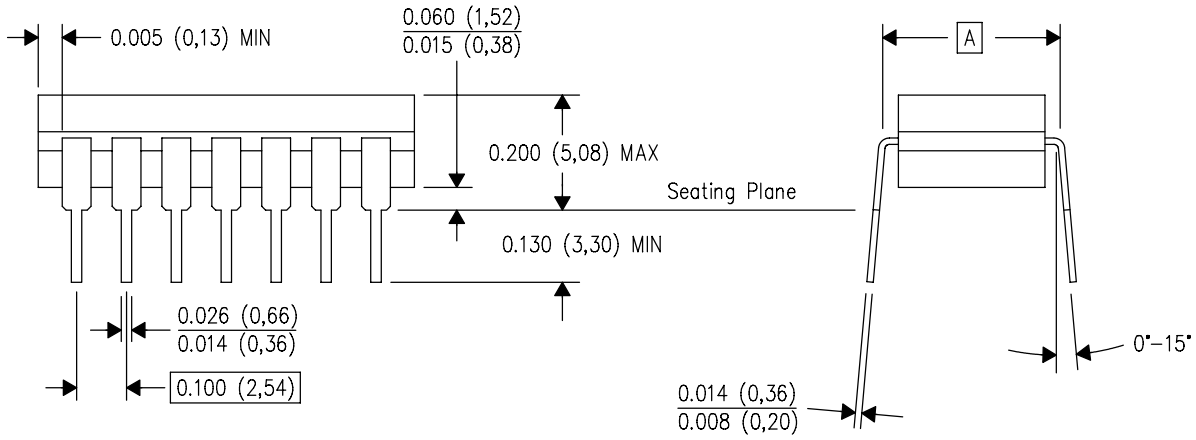
NOTE: Qualified Version Definitions:
- Catalog - TI's standard catalog product

J (R–GDIP–T**) CERAMIC DUAL IN–LINE PACKAGE

14 LEADS SHOWN



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

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