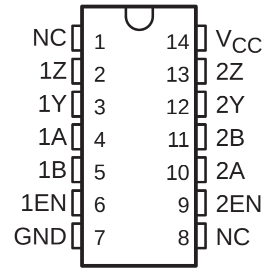
- **Meets or Exceeds the Requirements of ANSI EIA/TIA-422-B and ITU Recommendation V.11**
- **Single 5-V Supply**
- **Balanced Line Operation**
- **TTL Compatible**
- **High-Impedance Output State for Party-Line Applications**
- **High-Current Active-Pullup Outputs**
- **Short-Circuit Protection**
- **Dual Channels**
- **Clamp Diodes at Inputs**

D OR N PACKAGE
(TOP VIEW)



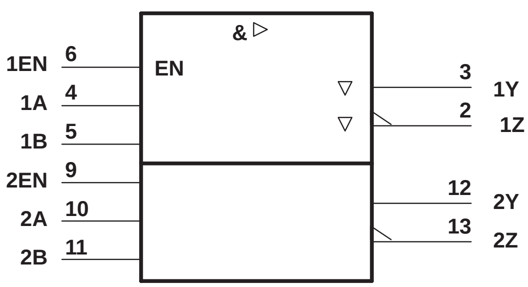
NC – No internal connection

description

The SN75159 dual differential line driver with 3-state outputs is designed to provide all the features of the SN75158 line driver with the added feature of driver output controls. There is an individual control for each driver. When the output control is low, the associated outputs are in a high-impedance state and the outputs can neither drive nor load the bus. This permits many devices to be connected together on the same transmission line for party-line applications.

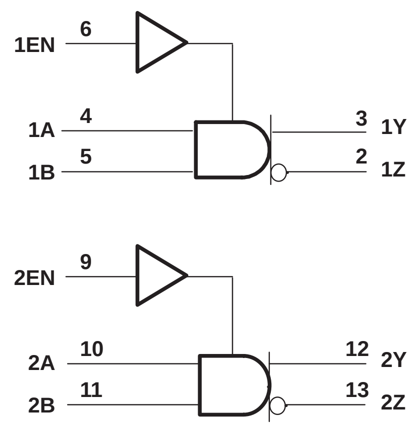
The SN75159 is characterized for operation from 0°C to 70°C.

logic symbol†



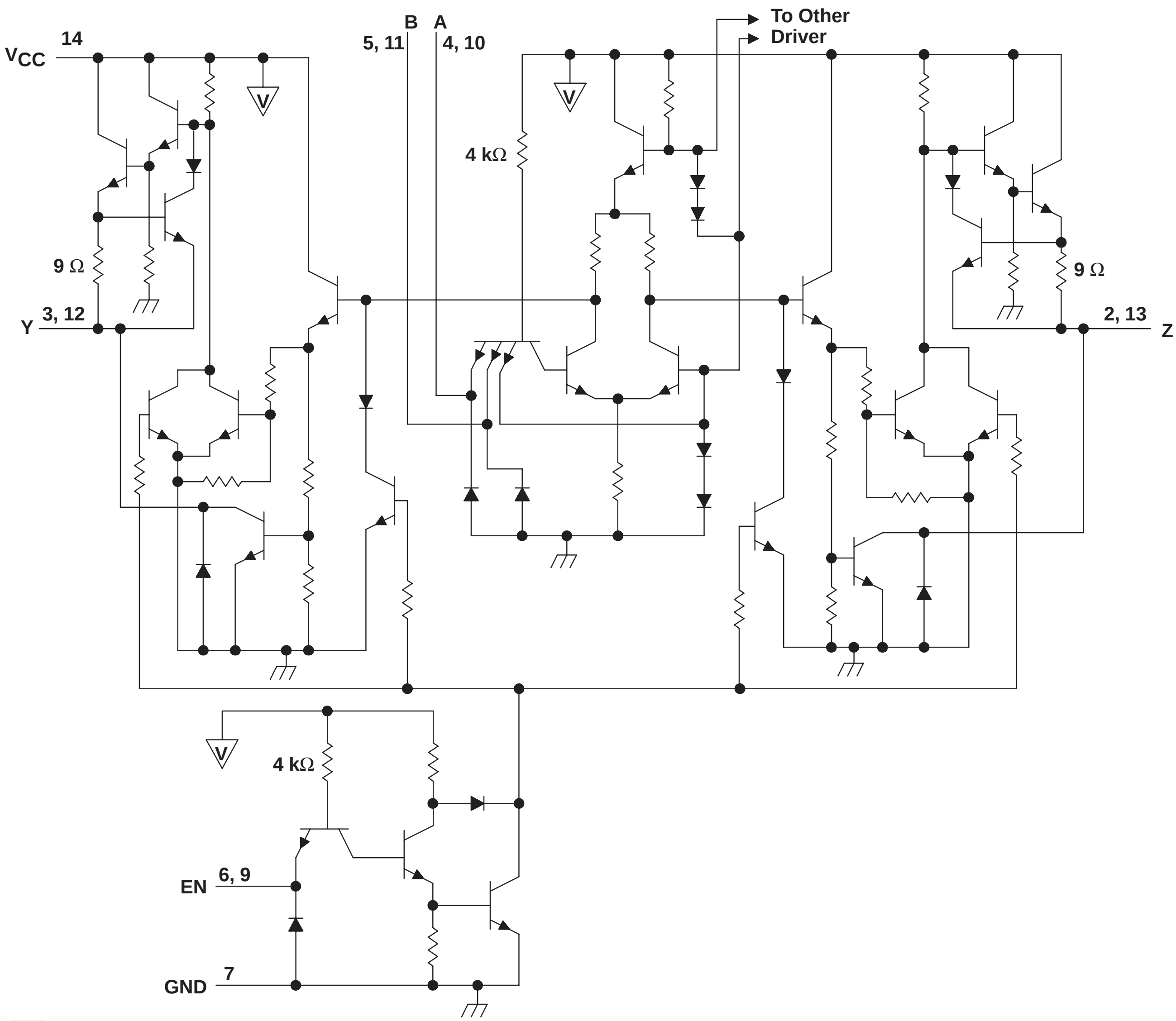
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



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.

schematic (each driver)



V . . . V_{CC} bus

Resistor values shown are nominal.

TEXAS INSTRUMENTS
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

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
Off-state voltage applied to open-collector outputs . . . . 12 V
Continuous total 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 the network ground terminal. V_{OD} is at the Y output with respect to the Z output.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW
N	1150 mW	9.2 mW/°C	736 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 voltage, I_{OH}			–40	mA
Low-level output current, I_{OL}			40	mA
Operating free-air temperature, T_A	0		70	°C

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

PARAMETER		TEST CONDITIONS			MIN	TYP†	MAX	UNIT
V_{IK}	Input clamp voltage	V_{CC} = 4.75 V,	I_I = –12 mA			–0.9	–1.5	V
V_{OH}	High-level output voltage	V_{CC} = 4.75 V, V_{IH} = 2 V,	V_{IL} = 0.8 V, I_{OH} = –40 mA		2.4	3		V
V_{OL}	Low-level output voltage	V_{CC} = 4.75 V, V_{IH} = 2 V,	V_{IL} = 0.8 V, I_{OL} = 40 mA			0.25	0.4	V
V_{OK}	Output clamp voltage	V_{CC} = 5.25 V,	I_O = –40 mA			–1.1	–1.5	V
V_O	Output voltage	V_{CC} = 4.75 V to 5.25 V,	I_O = 0		0		6	V
$\|V_{OD1}\|$	Differential output voltage	V_{CC} = 5.25 V,	I_O = 0			3.5	$2V_{OD2}$	V
$\|V_{OD2}\|$	Differential output voltage	V_{CC} = 4.75 V			2	3		V
$\Delta\|V_{OD}\|$	Change in magnitude of differential output voltage‡	V_{CC} = 4.75 V	R_L = 100 Ω, See Figure 1			±0.02	±0.4	V
V_{OC}	Common-mode output voltage§	V_{CC} = 5.25 V	R_L = 100 Ω, See Figure 1			1.8	3	V
		V_{CC} = 4.75 V	R_L = 100 Ω, See Figure 1			1.5	3	V
$\Delta\|V_{OC}\|$	Change in magnitude of common-mode output voltage‡	V_{CC} = 4.75 V to 5.25 V	R_L = 100 Ω, See Figure 1			±0.01	±0.4	V
I_O	Output current with power off	V_{CC} = 0	V_O = 6 V			0.1	100	μA
			V_O = –0.25 V			–0.1	–100	μA
			V_O = –0.25 V to 6 V				±100	μA
I_{OZ}	Off-state (high-impedance state) output current	V_{CC} = 5.25 V, Output controls at 0.8 V	T_A = 25°C	V_O = 0 to V_{CC}			±10	μA
			T_A = 70°C	V_O = 0			–20	μA
				V_O = 0.4 V			±20	μA
				V_O = 2.4 V			±20	μA
				V_O = V_{CC}			20	μA
I_I	Input current at maximum input voltage	V_{CC} = 5.25 V,	V_I = 5.5 V				1	mA
I_{IH}	High-level input current	V_{CC} = 5.25 V,	V_I = 2.4 V				40	μA
I_{IL}	Low-level input current	V_{CC} = 5.25 V,	V_I = 0.4 V			–1	–1.6	mA
I_{OS}	Short-circuit output current¶	V_{CC} = 5.25 V			–40	–90	–150	mA
I_{CC}	Supply current (both drivers)	V_{CC} = 5.25 V, T_A = 25°C,	Inputs grounded, No load			47	65	mA

† All typical values are at V_{CC} = 5 V and T_A = 25°C except for V_{OC}, for which V_{CC} is as stated under test conditions.
‡ $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ are the changes in magnitudes of V_{OD} and V_{OC}, respectively, that occur when the input is changed from a high level to a low level.
§ In ANSI Standard EIA/TIA-422-B, V_{OC}, which is the average of the two output voltages with respect to GND, is called output offset voltage, V_{OS}.
¶ Only one output should be shorted at a time, and duration of the short circuit should not exceed one second.

switching characteristics over operating free-air temperature range, V_{CC} = 5 V

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	C_L = 30 pF, R_L = 100 Ω, See Figure 2, Termination A		16	25	ns
t_{PHL}	Propagation delay time, high-to-low-level output			11	20	ns
t_{PLH}	Propagation delay time, low-to-high-level output	C_L = 15 pF, See Figure 2, Termination B		13	20	ns
t_{PHL}	Propagation delay time, high-to-low-level output			9	15	ns
t_{TLH}	Transition time, low-to-high-level output	C_L = 30 pF, R_L = 100 Ω, See Figure 2, Termination A		4	20	ns
t_{THL}	Transition time, high-to-low-level output			4	20	ns
t_{PZH}	Output enable time to high level	C_L = 30 pF, R_L = 180 Ω, See Figure 3		7	20	ns
t_{PZL}	Output enable time to low level	C_L = 30 pF, R_L = 250 Ω, See Figure 4		14	40	ns
t_{PHZ}	Output disable time from high level	C_L = 30 pF, R_L = 180 Ω, See Figure 3		10	30	ns
t_{PLZ}	Output disable time from low level	C_L = 30 pF, R_L = 250 Ω, See Figure 4		17	35	ns
	Overshoot factor	R_L = 100 Ω, See Figure 2, Termination C			10%	

† All typical values are at T_A = 25°C.

SYMBOL EQUIVALENTS

DATA-SHEET PARAMETER	EIA/TIA-422-B
V_O	V_{oa}, V_{ob}
$\|V_{OD1}\|$	V_o
$\|V_{OD2}\|$	V_t
$\Delta\|V_{OD}\|$	$\|\,\|V_t\| - \|\overline{V}_t\|\,\|$
V_{OC}	$\|V_{os}\|$
$\Delta\|V_{OC}\|$	$\|V_{os} - \overline{V}_{os}\|$
I_{OS}	$\|I_{sa}\|$, $\|I_{sb}\|$
I_O	$\|I_{xa}\|$, $\|I_{xb}\|$

PARAMETER MEASUREMENT INFORMATION

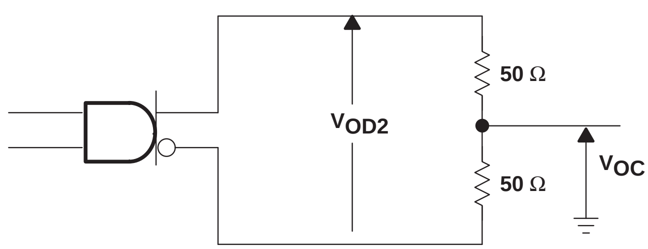
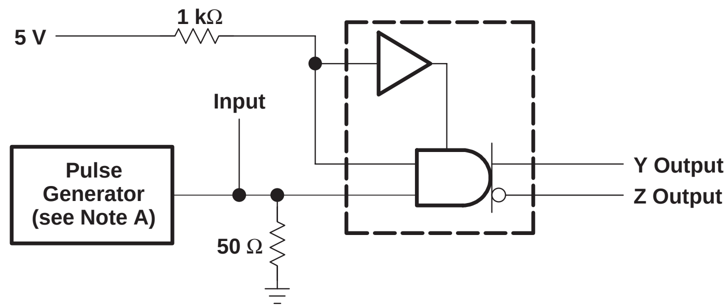
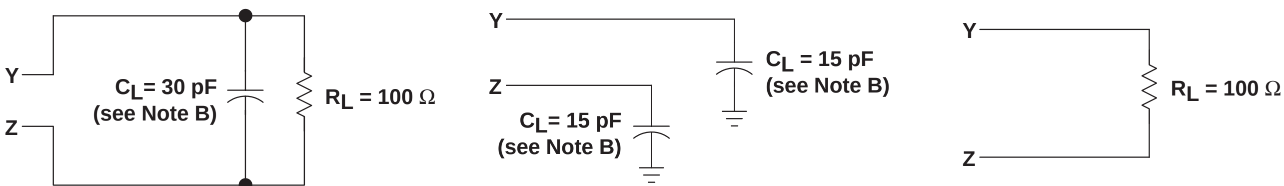


Figure 1. Differential and Common-Mode Output Voltages

PARAMETER MEASUREMENT INFORMATION



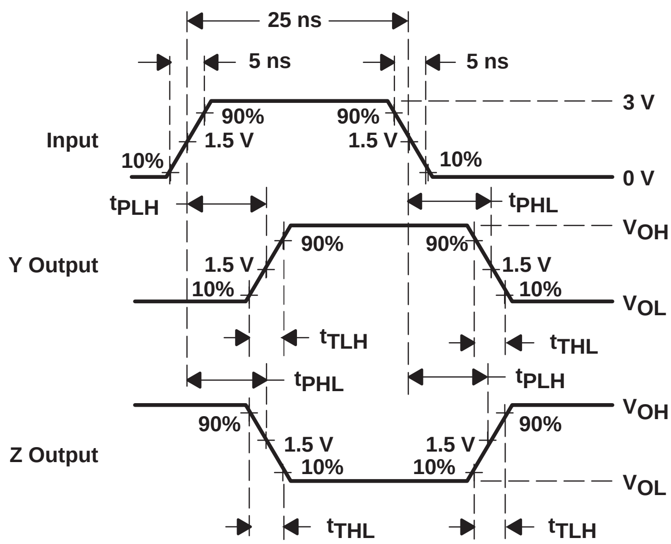


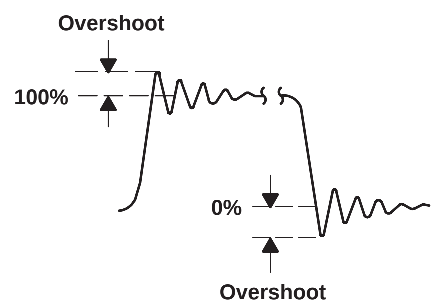
TERMINATION A

TERMINATION B

TERMINATION C

TEST CIRCUITS



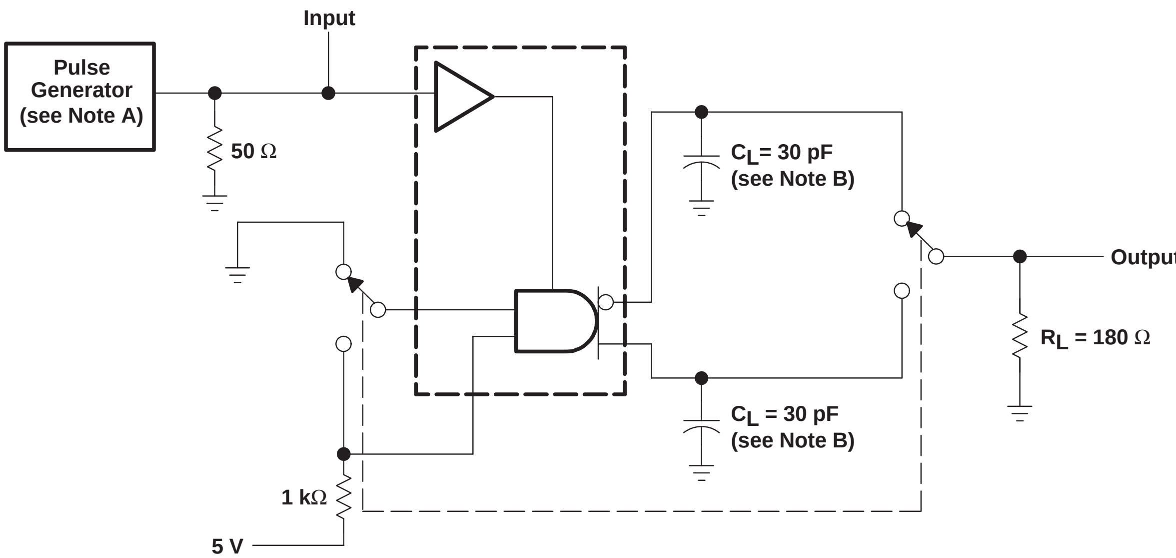


VOLTAGE WAVEFORMS

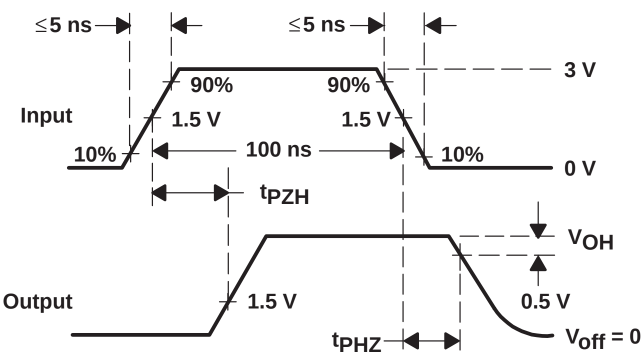
NOTES: A. The pulse generator has the following characteristics: Z_O = 50 Ω, PRR ≤ 10 MHz.
B. C_L includes probe and jig capacitance.

Figure 2. Test Circuits, Voltage Waveforms, and Overshoot Factor

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

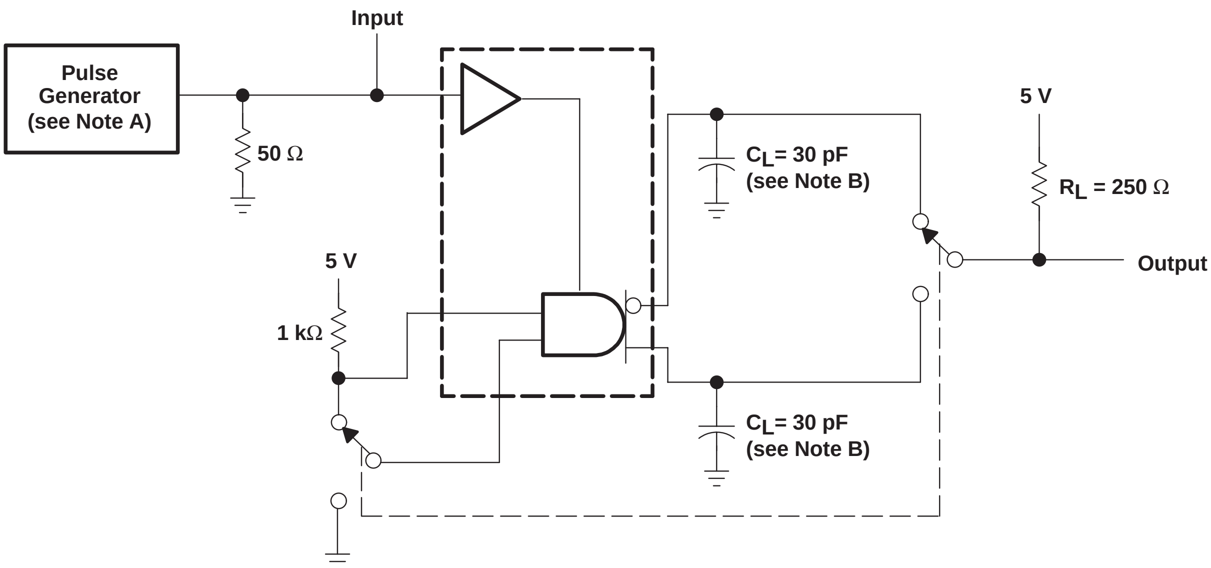


VOLTAGE WAVEFORMS

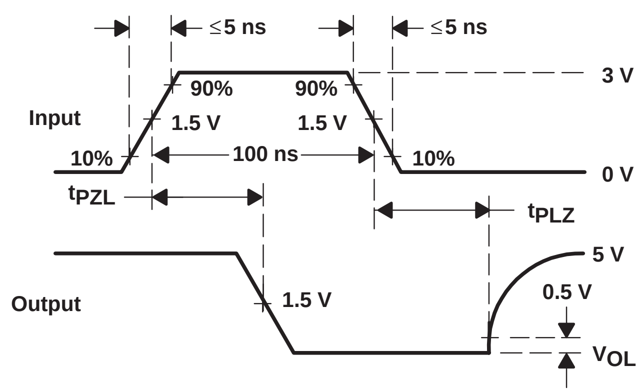
NOTES: A. The pulse generator has the following characteristics: Z_O = 50 Ω, PRR ≤ 500 kHz.
B. C_L includes probe and jig capacitance.

Figure 3. Test Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The pulse generator has the following characteristics: Z_O = 50 Ω, PRR ≤ 500 kHz.
B. C_L includes probe and jig capacitance.

Figure 4. Test Circuit and Voltage Waveform

TYPICAL CHARACTERISTICS

OUTPUT VOLTAGE vs DATA INPUT VOLTAGE

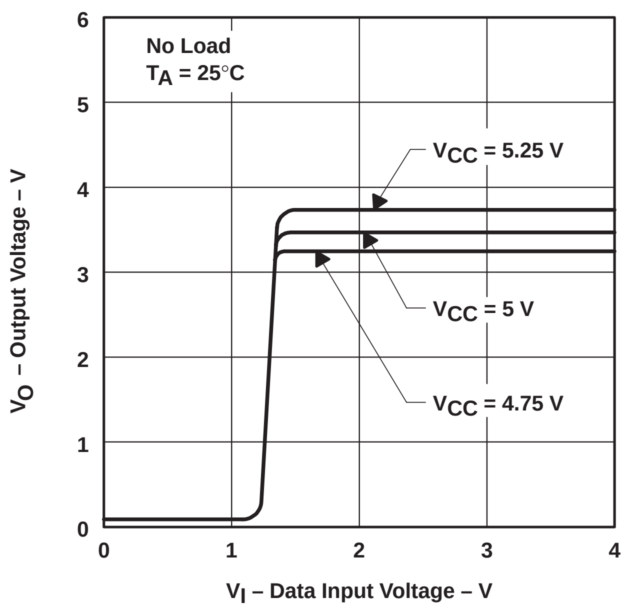


Figure 5

OUTPUT VOLTAGE vs DATA INPUT VOLTAGE

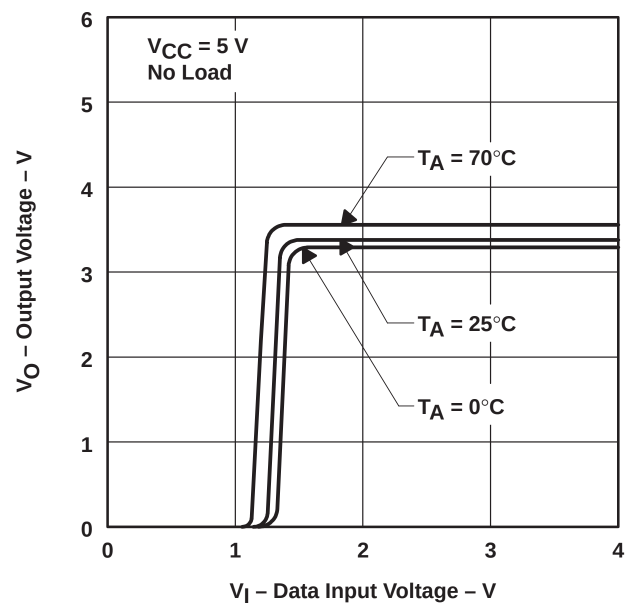


Figure 6

OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

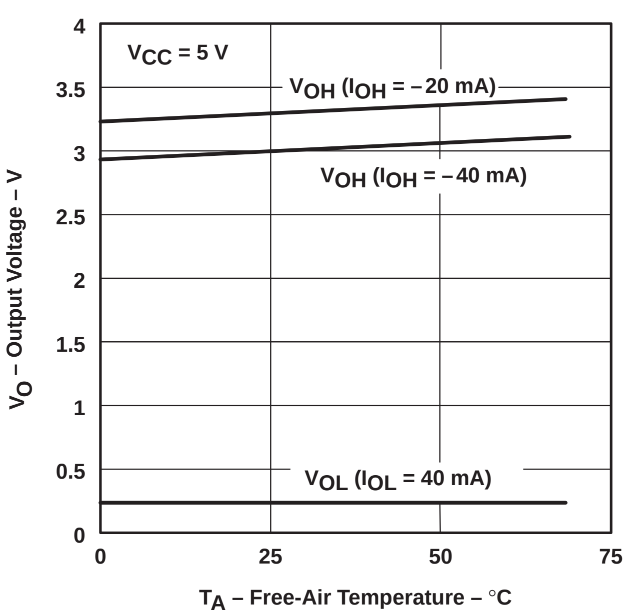


Figure 7

HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT

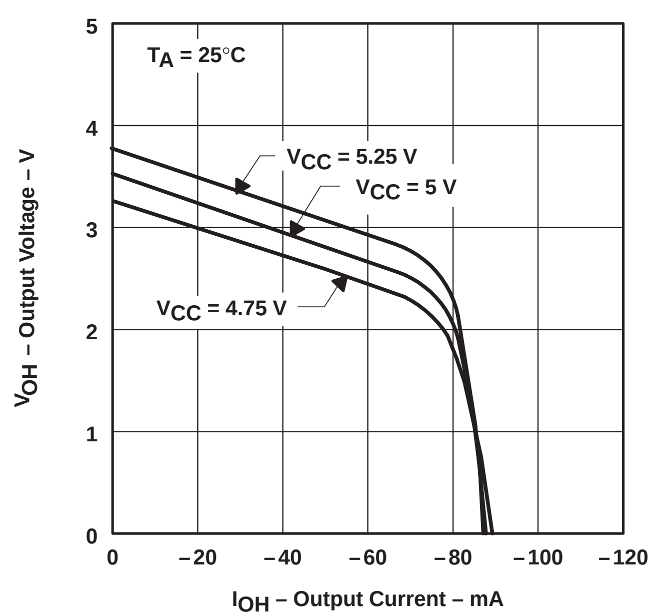


Figure 8

TYPICAL CHARACTERISTICS

**LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT**

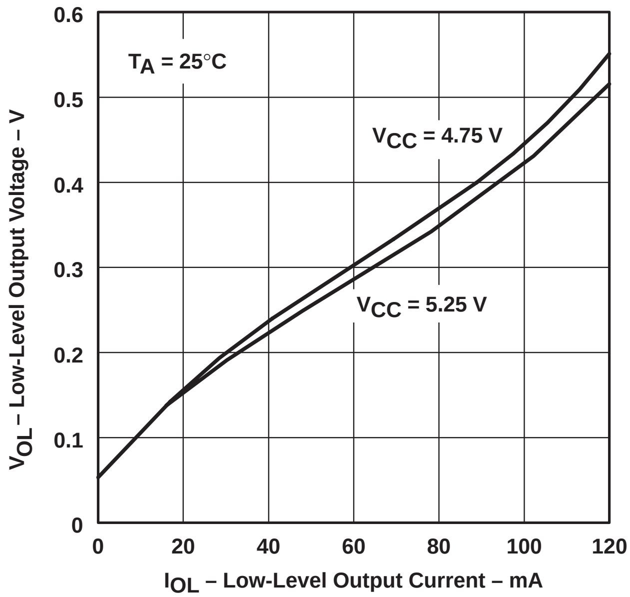


Figure 9

**SUPPLY CURRENT
(BOTH DRIVERS)
vs
SUPPLY VOLTAGE**

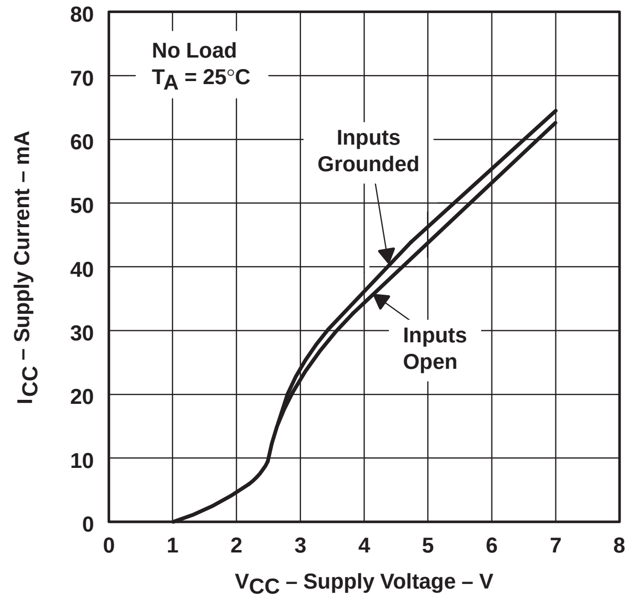


Figure 10

**SUPPLY CURRENT
(BOTH DRIVERS)
vs
FREE-AIR TEMPERATURE**

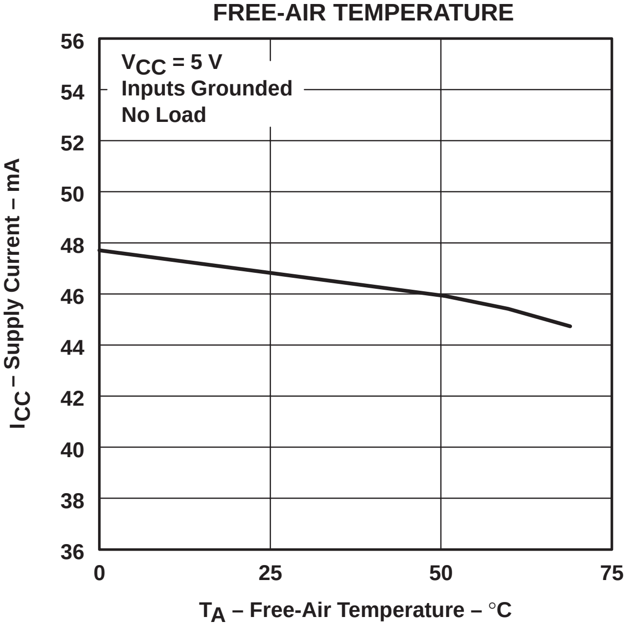


Figure 11

**SUPPLY CURRENT
(BOTH DRIVERS)
vs
FREQUENCY**

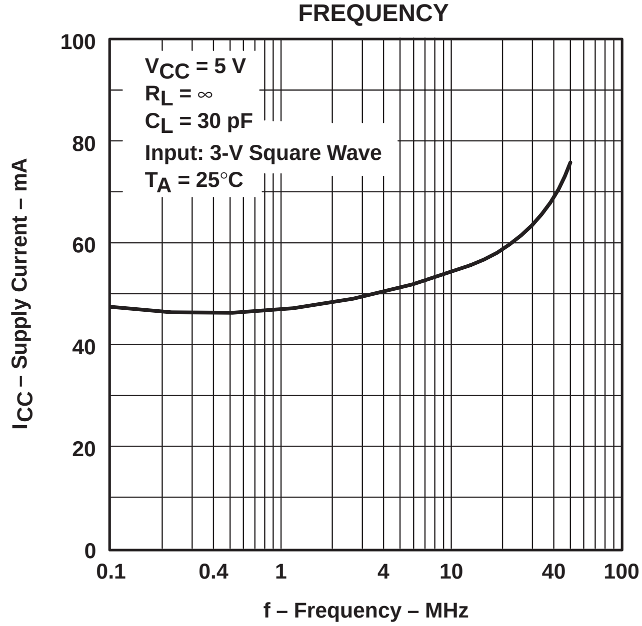


Figure 12

TYPICAL CHARACTERISTICS

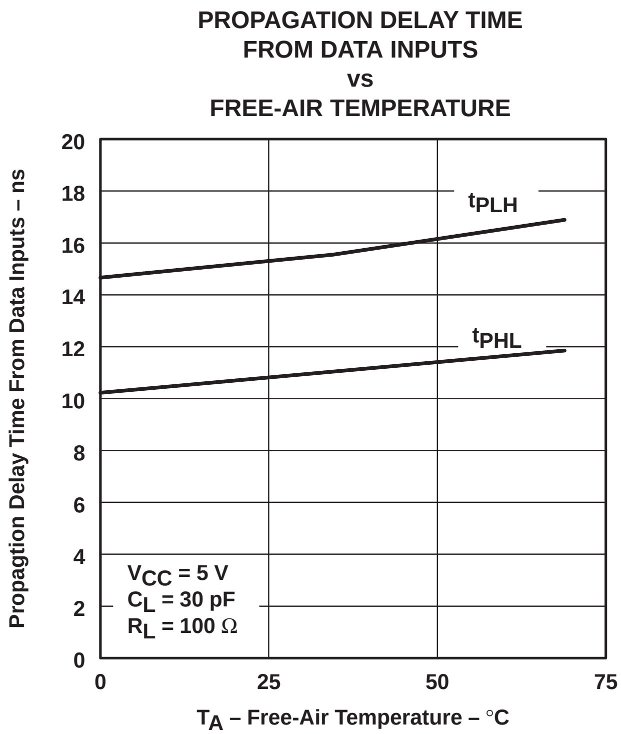


Figure 13

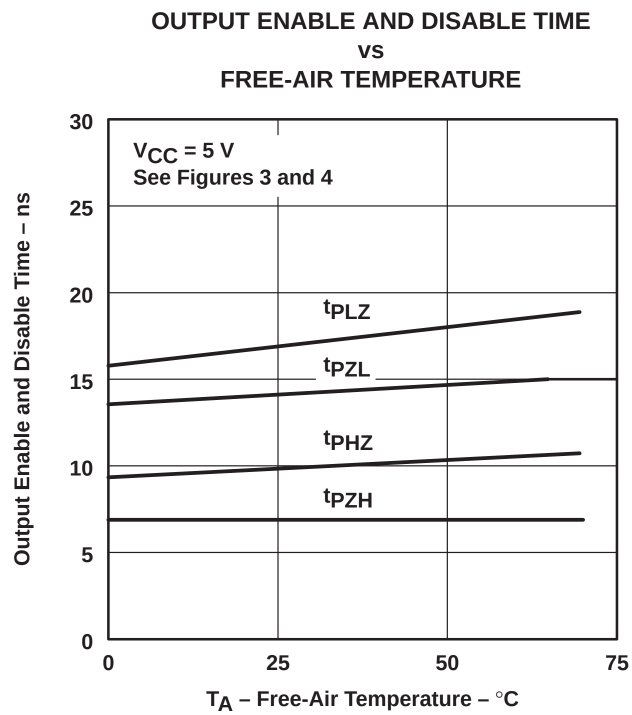


Figure 14

IMPORTANT NOTICE