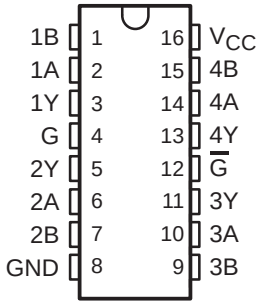
SLLS008D – JUNE 1986 – REVISED MAY 1995

- **Meets or Exceeds ANSI Standard EIA/TIA-422-B and EIA/TIA-423-A and ITU Recommendations V.10 and V.11**
- **Designed for Multipoint Bus Transmission on Long Bus Lines in Noisy Environments**
- **3-State Outputs**
- **Common-Mode Input Voltage Range –7 V to 7 V**
- **Input Sensitivity . . . ±200 mV**
- **Input Hysteresis . . . 120 mV Typ**
- **High Input Impedance . . . 12 kΩ Min**
- **Operates from Single 5-V Supply**
- **Low Supply Current Requirement 35 mA Max**
- **Improved Speed and Power Version of the AM26LS32A**

SN75ALS193 . . . D, J OR N PACKAGE
(TOP VIEW)



description

The SN75ALS193 is a monolithic quadruple line receiver with 3-state outputs designed using advanced low-power Schottky technology. This technology provides combined improvements in bar design, tooling production, and wafer fabrication. This, in turn, provides significantly lower power requirements and permits much higher data throughput than other designs. This device meets the specifications of ANSI Standards EIA/TIA-422-B and EIA/TIA-423-A and ITU Recommendations V.10 and V.11. It features 3-state outputs that permit direct connection to a bus-organized system with a fail-safe design that ensures the outputs will always be high if the inputs are open.

The device is optimized for balanced multipoint bus transmission at rates up to 20 megabits per second. The input features high input impedance, input hysteresis for increased noise immunity, and an input sensitivity of ± 200 mV over a common-mode input voltage range of –7 to 7 V. It also features active-high and active-low enable functions that are common to the four channels. The SN75ALS193 is designed for optimum performance when used with the ’ALS192 quadruple differential line driver.

The SN75ALS193 is characterized for operation from 0°C to 70°C.

FUNCTION TABLE
(each receiver)

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

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

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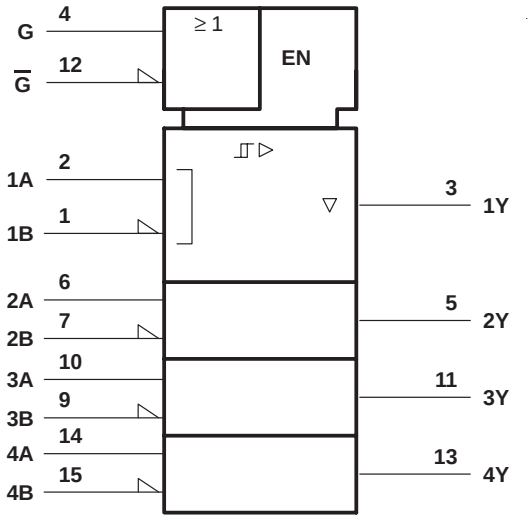
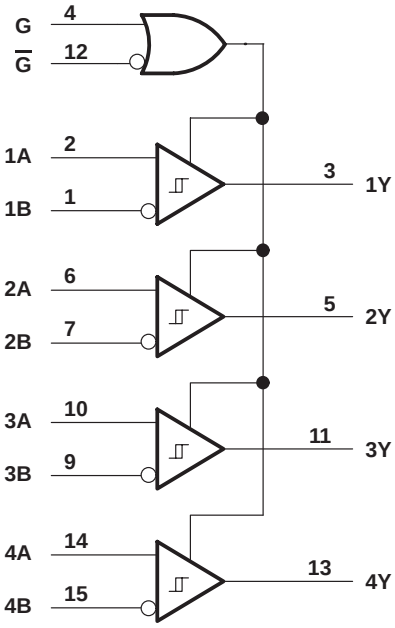
logic symbol†

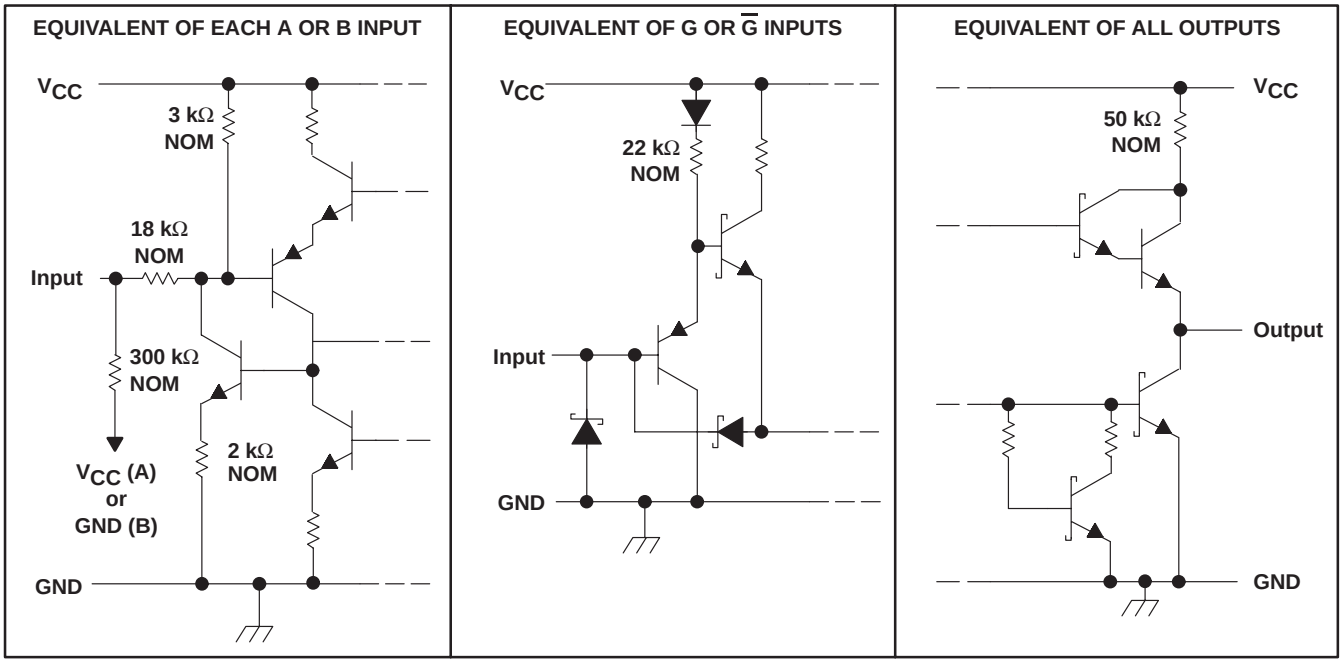


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



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 (A or B) . . . . . ±15 V
Differential input voltage, V_{ID} (see Note 2) . . . . . ±15 V
Enable input voltage, V_I . . . . . 7 V
Low-level output current, I_{OL} . . . . . 50 mA
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 60 seconds . . . . . 300°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 conditons 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	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING
J	1025 mW	8.2 mW/°C	656 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
Common-mode input voltage, V_{IC}			±7	V
Differential input voltage, V_{ID}			±12	V
High-level input voltage, V_{IH}	2			V
Low-level 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	0		70	°C

electrical characteristics over recommended range of common-mode input voltage, supply voltage, and operating free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		MIN	TYP‡	MAX	UNIT
V_{IT+}	Positive-going input threshold voltage					200	mV
V_{IT-}	Negative-going input threshold voltage			−200§			mV
V_{hys}	Hysteresis voltage ($V_{IT+} - V_{IT-}$)				120		mV
V_{IK}	Enable-input clamp voltage	V_{CC} = MIN,	I_I = – 18 mA			−1.5	V
V_{OH}	High-level output voltage	V_{CC} = MIN, I_{OH} = −400 μA,	V_{ID} = 200 mV, See Figure 1	2.5	3.6		V
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{ID} = −200 mV, See Figure 1	I_{OL} = 8 mA			0.45	V
			I_{OL} = 16 mA			0.5	
I_{OZ}	High-impedance-state output current	V_{CC} = MAX	V_O = 2.4 V			20	μA
			V_O = 0.4 V			−20	
I_I	Line input current	Other input at 0, See Note 3	V_{CC} = MIN, V_I = 15 V		0.7	1.2	mA
			V_{CC} = MIN, V_I = −15 V		−1.0	−1.7	
I_{IH}	High-level enable-input current	V_{CC} = MAX	V_{IH} = 2.7 V			20	μA
			V_{IH} = MAX			100	
I_{IL}	Low-level enable-input current	V_{CC} = MAX,	V_{IL} = 0.4 V			–100	μA
	Input resistance			12	18		kΩ
I_{OS}	Short-circuit output current	V_{CC} = MAX, V_O = 0,	V_{ID} = 3 V, See Note 4	−15	−78	−130	mA
I_{CC}	Supply current	V_{CC} = MAX,	Outputs disabled		22	35	mA

† For conditions shown as MIN or MAX, use the appropriate values specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.
§ The algebraic convention, in which the less positive limit is designated minimum, is used in this data sheet for threshold voltage levels only.
NOTES: 3. Refer to ANSI Standard EIA/TIA-422-B and EIA/TIA-423-A for exact conditions.
4. Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

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 output	V_{ID} = −2.5 V to 2.5 V, C_L = 15 pF,	See Figure 2		15	22	ns
t_{PHL}	Propagation delay time, high-to-low-level output				15	22	
t_{PZH}	Output enable time to high level	C_L = 15 pF,	See Figure 3		13	25	
t_{PZL}	Output enable time to low level				11	25	
t_{PHZ}	Output disable time from high level	C_L = 5 pF,	See Figure 3		13	25	
t_{PLZ}	Output disable time from low level				15	22	

PARAMETER MEASUREMENT INFORMATION

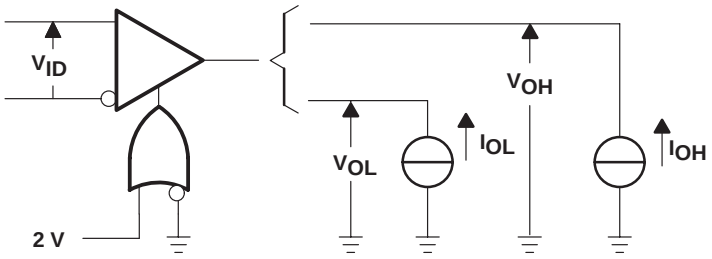
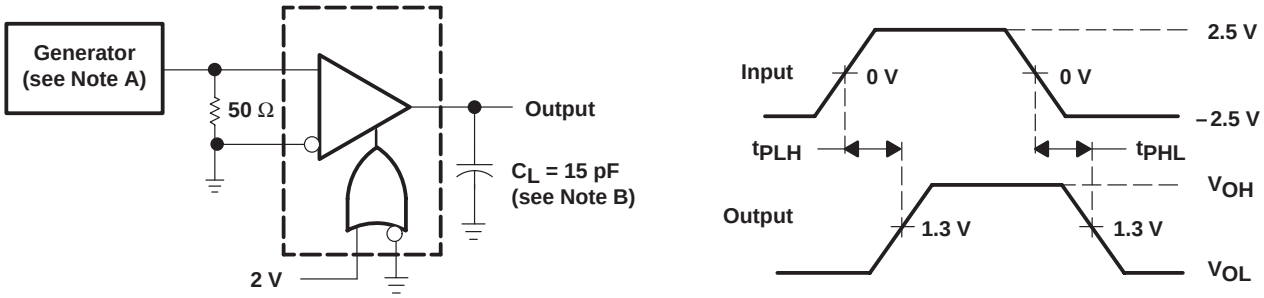


Figure 1. V_{OH}, V_{OL}

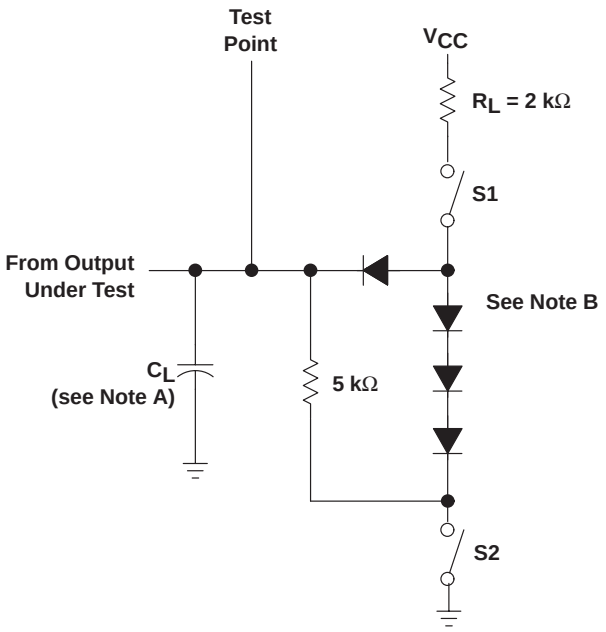


TEST CIRCUIT **VOLTAGE WAVEFORMS**

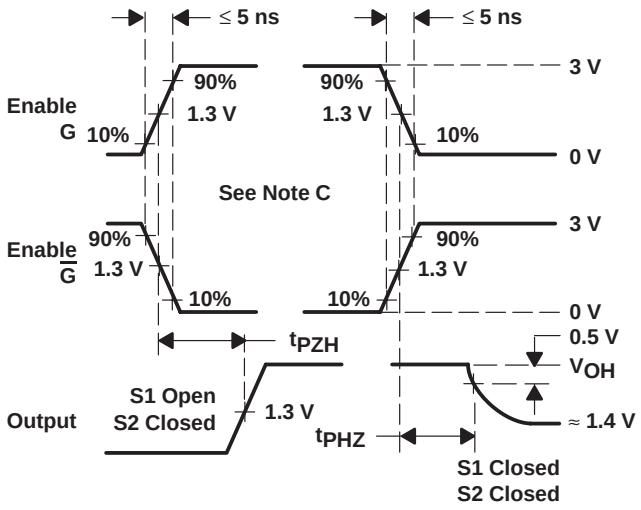
NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 1 MHz, duty cycle ≤ 50%, Z_O = 50 Ω, t_r ≤ 6 ns, t_f ≤ 6 ns.
B. C_L includes probe and jig capacitance.

Figure 2. Test Circuit and Voltage Waveforms

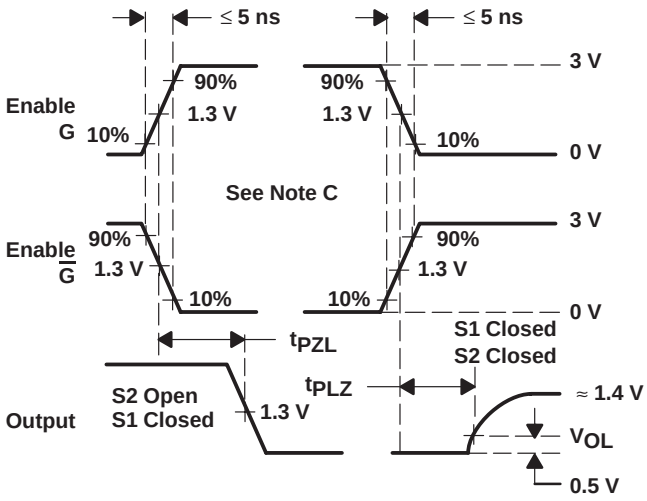
PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT



VOLTAGE WAVEFORMS FOR t_{PHZ}, t_{PZH}



VOLTAGE WAVEFORMS FOR t_{PLZ}, t_{PZL}

NOTES: A. C_L includes probe and jig capacitance.
B. All diodes are 1N3064 or equivalent.
C. Enable G is tested with $\overline{G}$ high; $\overline{G}$ is tested with G low.

Figure 3. Load Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

OUTPUT VOLTAGE vs ENABLE VOLTAGE

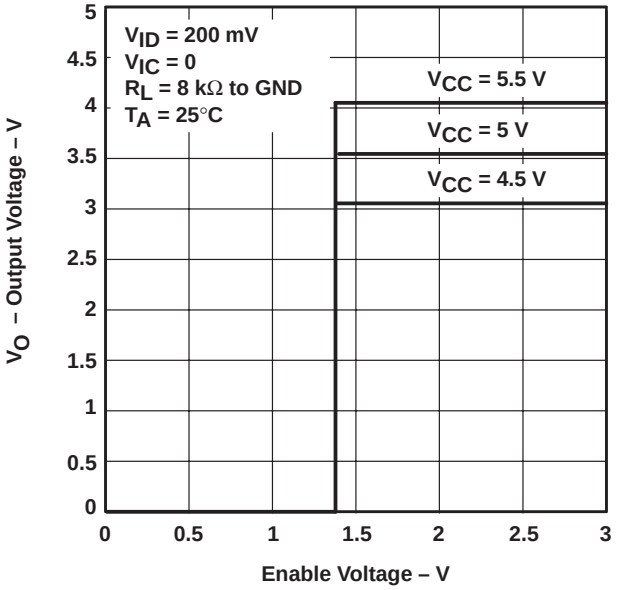


Figure 4

OUTPUT VOLTAGE vs ENABLE VOLTAGE

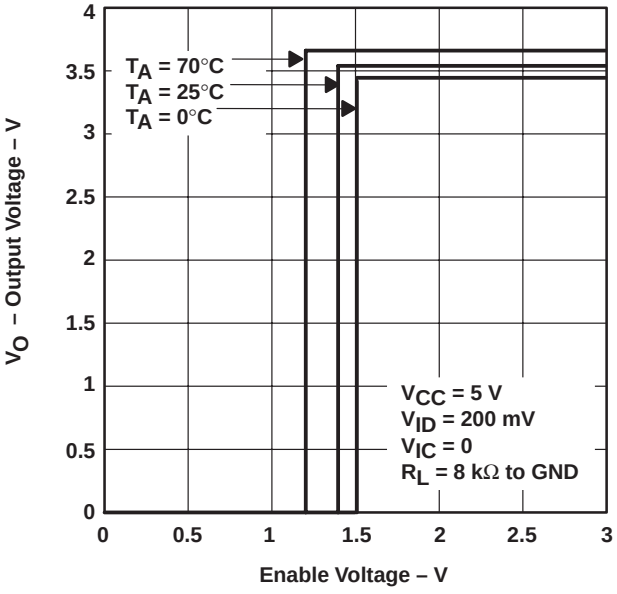


Figure 5

OUTPUT VOLTAGE vs ENABLE VOLTAGE

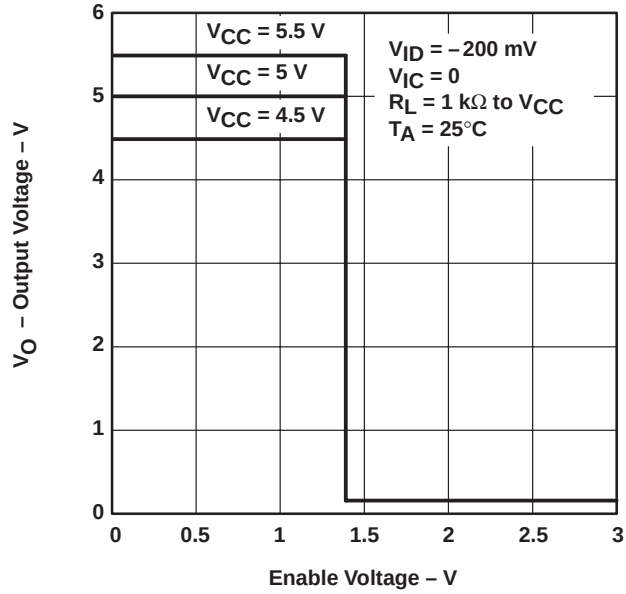


Figure 6

OUTPUT VOLTAGE vs ENABLE VOLTAGE

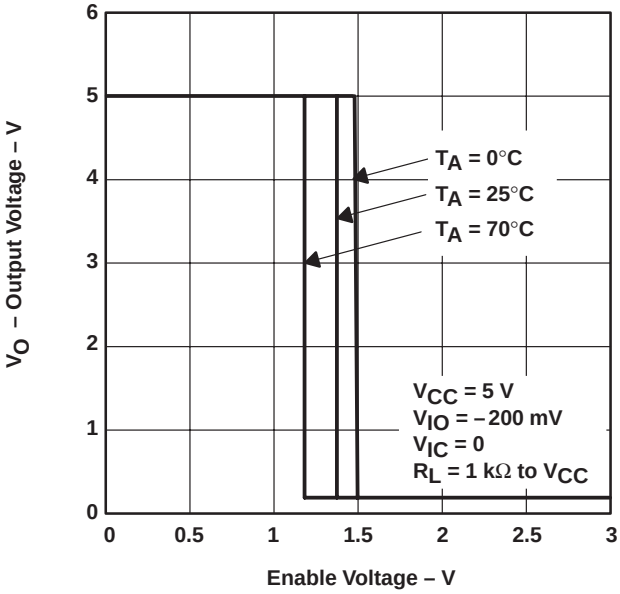


Figure 7

TYPICAL CHARACTERISTICS

OUTPUT VOLTAGE vs DIFFERENTIAL INPUT VOLTAGE

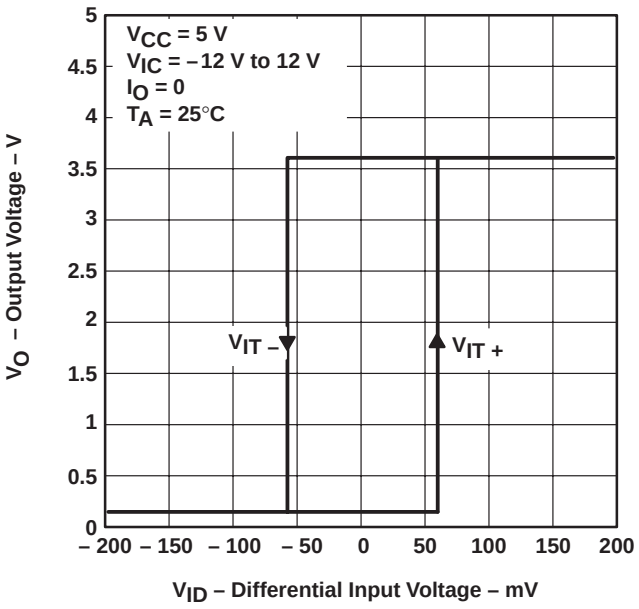


Figure 8

HIGH-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

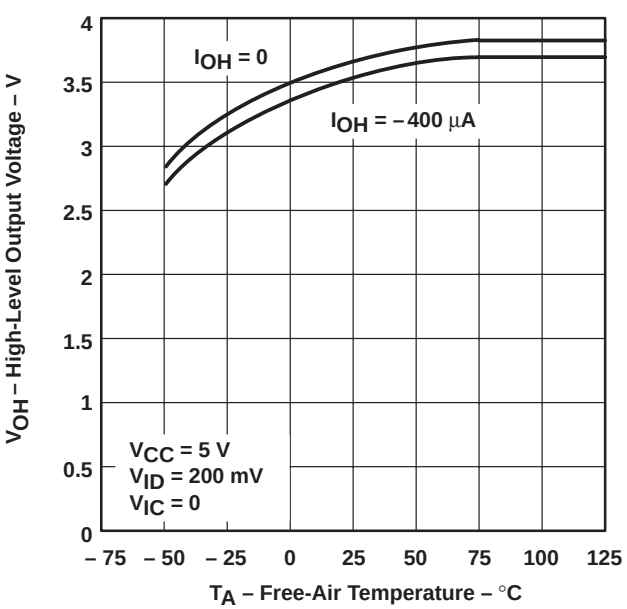


Figure 9

HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT

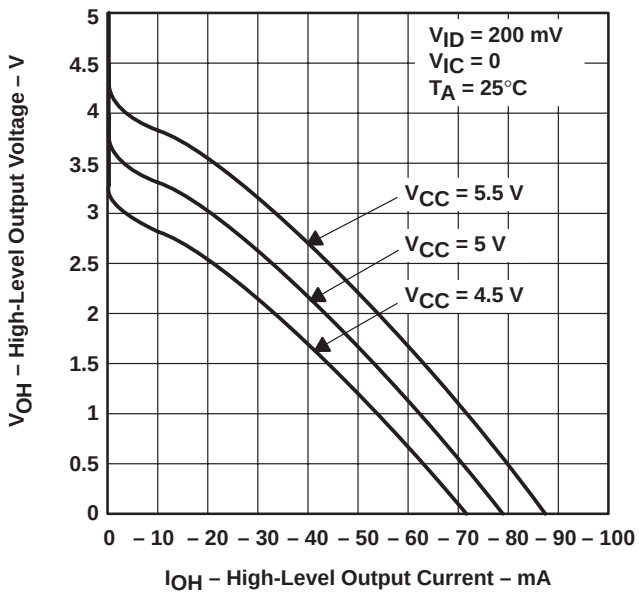


Figure 10

HIGH-LEVEL OUTPUT VOLTAGE vs HIGH-LEVEL OUTPUT CURRENT

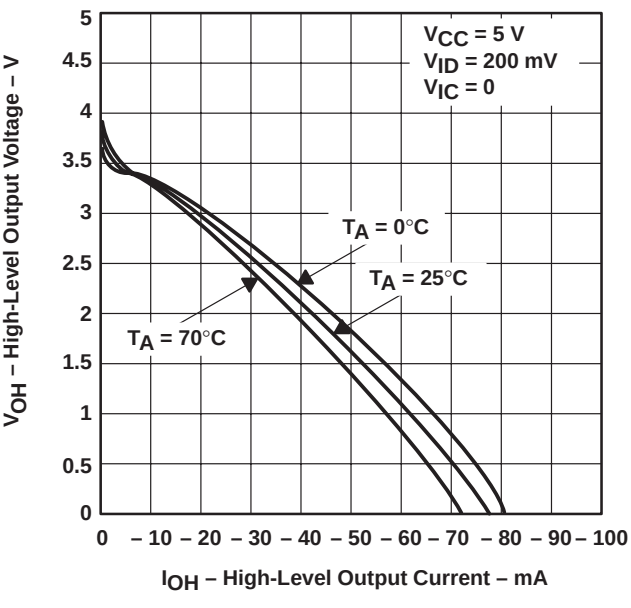


Figure 11

TYPICAL CHARACTERISTICS

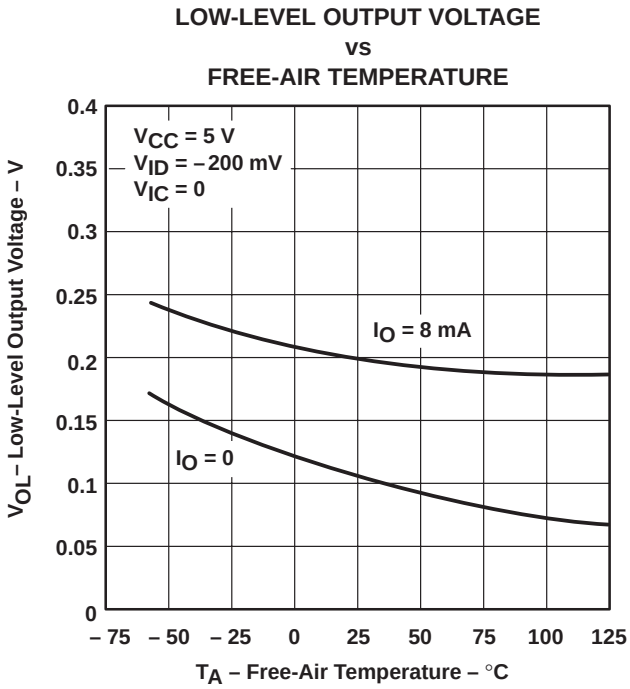


Figure 12

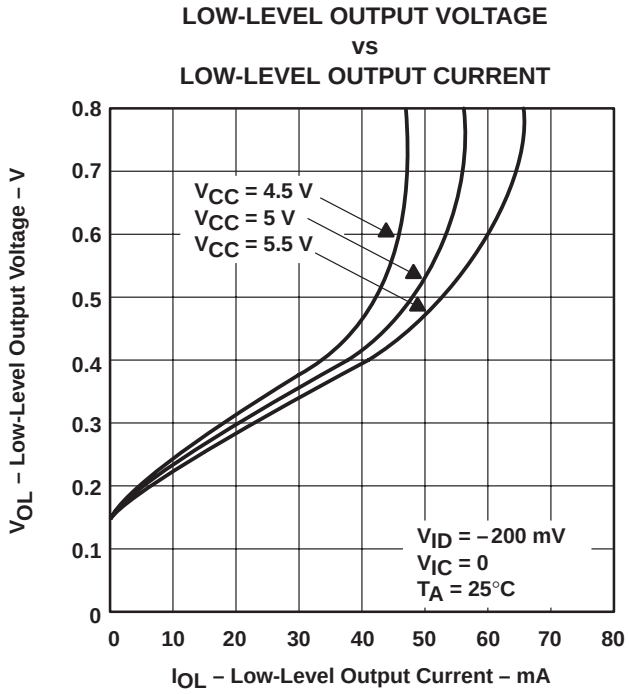


Figure 13

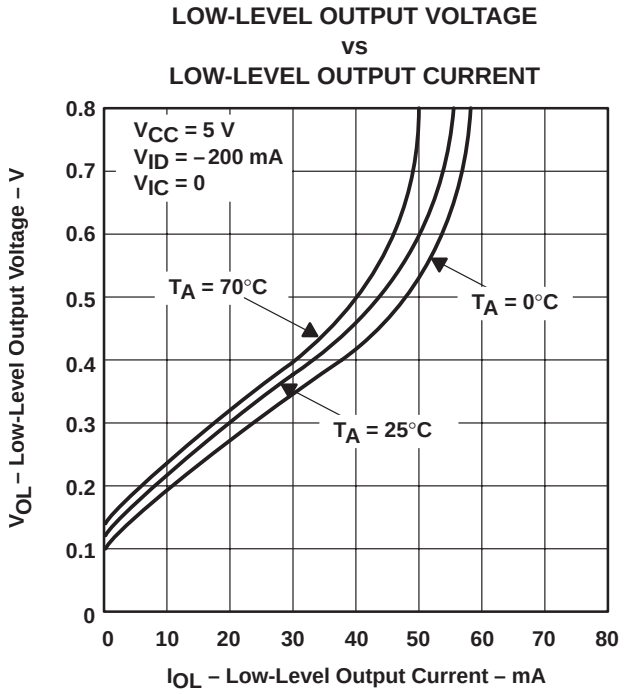


Figure 14

TYPICAL CHARACTERISTICS

SUPPLY CURRENT vs SUPPLY VOLTAGE

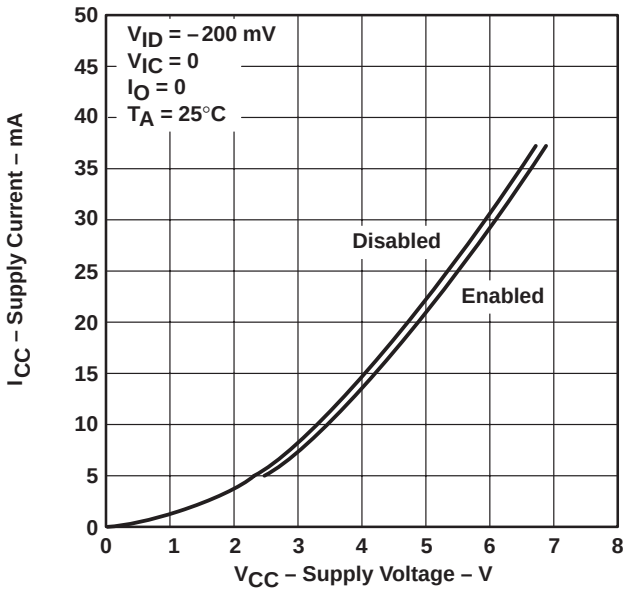


Figure 15

SUPPLY CURRENT vs FREE-AIR TEMPERATURE

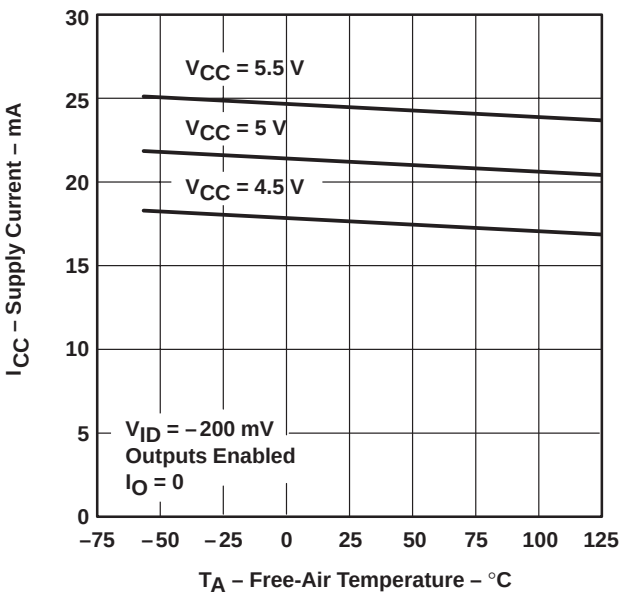


Figure 16

SUPPLY CURRENT vs DIFFERENTIAL INPUT VOLTAGE

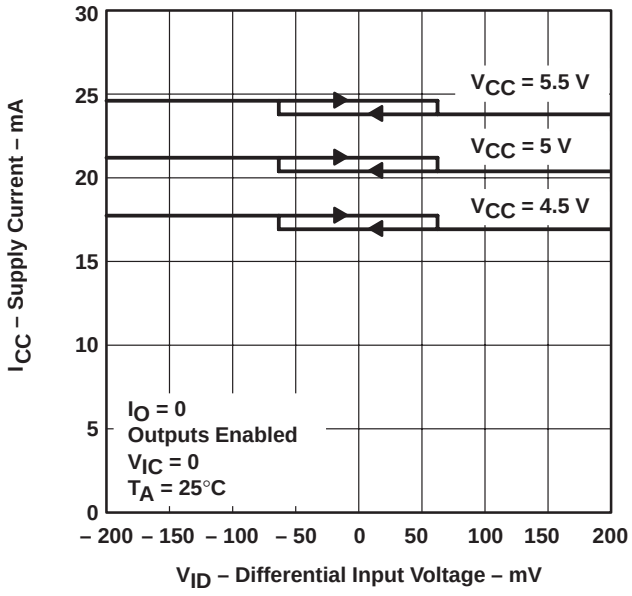


Figure 17

SUPPLY CURRENT vs FREQUENCY

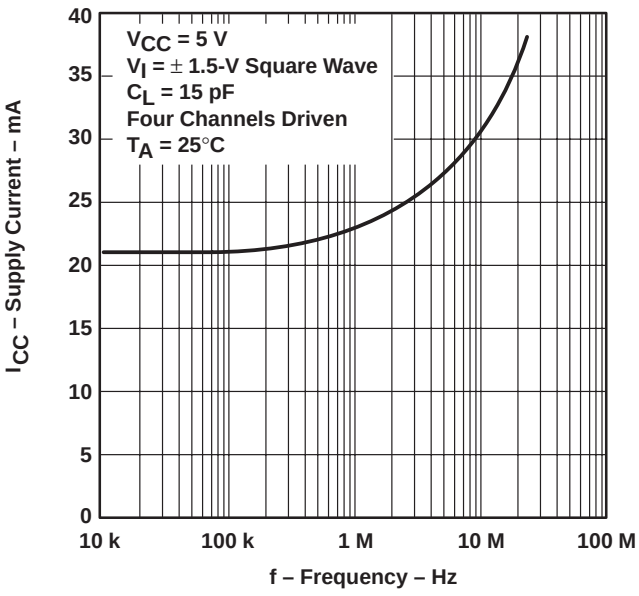


Figure 18

TYPICAL CHARACTERISTICS

INPUT RESISTANCE vs FREE-AIR TEMPERATURE

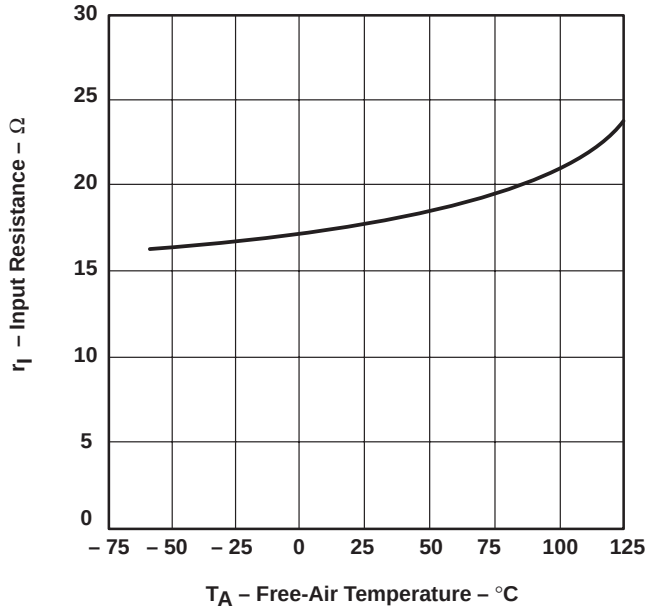


Figure 19

INPUT CURRENT vs INPUT VOLTAGE TO GND

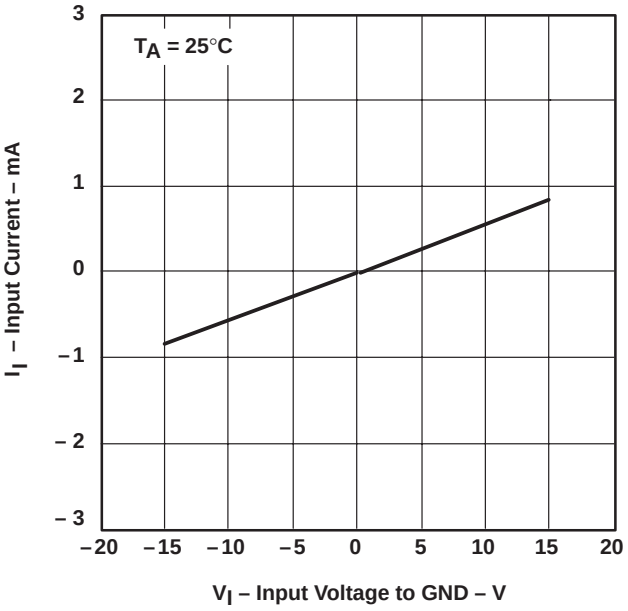


Figure 20

SWITCHING TIME vs FREE-AIR TEMPERATURE

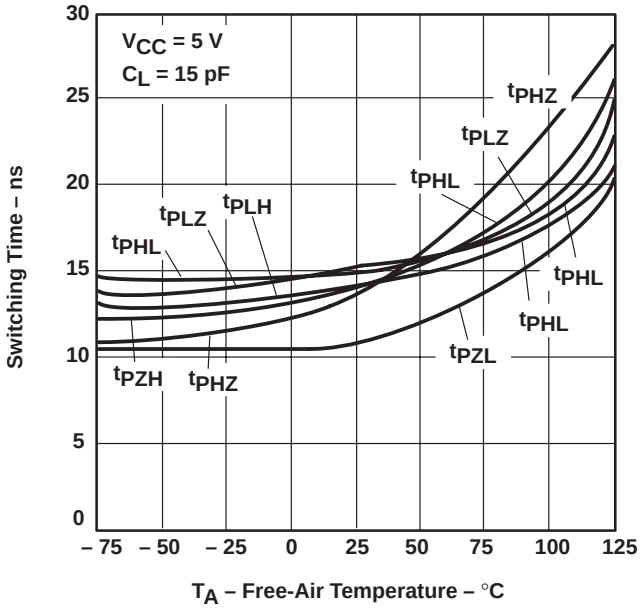


Figure 21

PROPAGATION DELAY TIME vs SUPPLY VOLTAGE

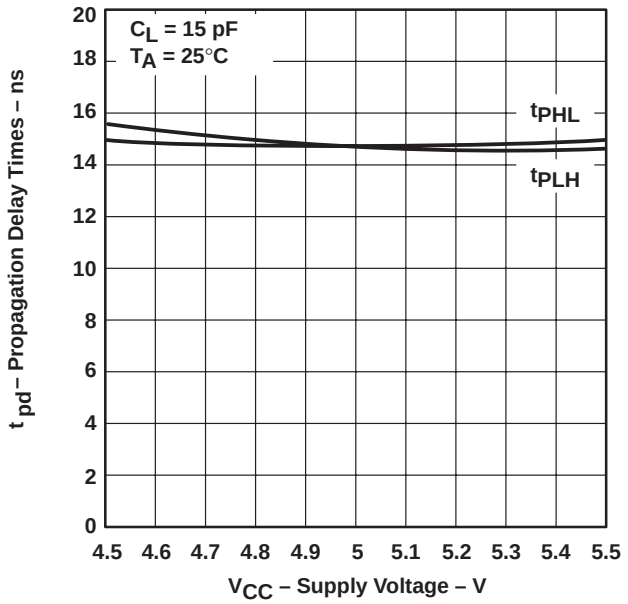


Figure 22

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