TEXAS INSTRUMENTS

SN54LS240, SN54LS241, SN54LS244, SN54S240, SN54S241, SN54S244
SN74LS240, SN74LS241, SN74LS244, SN74S240, SN74S241, SN74S244

SDLS144D – APRIL 1985 – REVISED OCTOBER 2016

SNx4LS24x, SNx4S24x Octal Buffers and Line Drivers With 3-State Outputs

1 Features

- Inputs Tolerant Down to 2 V, Compatible With 3.3-V or 2.5-V Logic Inputs
- Maximum t_{pd} of 15 ns at 5 V
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- PNP Inputs Reduce DC Loading
- Hysteresis at Inputs Improves Noise Margins

2 Applications

- Servers
- LED Displays
- Network Switches
- Telecom Infrastructure
- Motor Drivers
- I/O Expanders

3 Description

The SNx4LS24x, SNx4S24x octal buffers and line drivers are designed specifically to improve both the performance and density of three-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The designer has a choice of selected combinations of inverting and non-inverting outputs, symmetrical, active-low output-control ($\overline{G}$) inputs, and complementary output-control (G and $\overline{G}$) inputs. These devices feature high fan-out, improved fan-in, and 400-mV noise margin. The SN74LS24x and SN74S24x devices can be used to drive terminated lines down to 133 Ω.

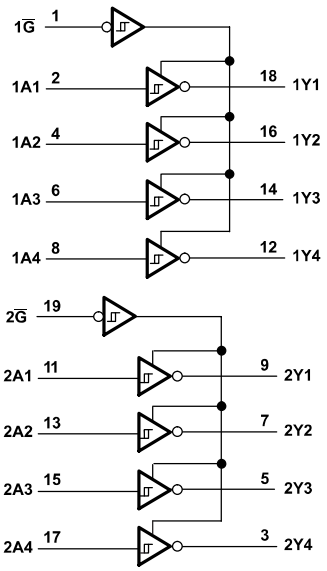
Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN54LS24x, SN54S24x	CDIP (20) – J	24.20 mm × 6.92 mm
	CFP (20) – W	7.02 mm × 13.72 mm
	LCCC (20) – FK	8.89 mm × 8.89 mm
SN74LS240, SN74LS244	SSOP (20) – DB	7.20 mm × 5.30 mm
SN74LS24x, SN74S24x	SOIC (20) – DW	12.80 mm × 7.50 mm
	PDIP (20) – N	24.33 mm × 6.35 mm
SN74LS24x	SOP (20) – NS	7.80 mm × 12.60 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Logic Diagram (Positive Logic)

'LS240, 'S240



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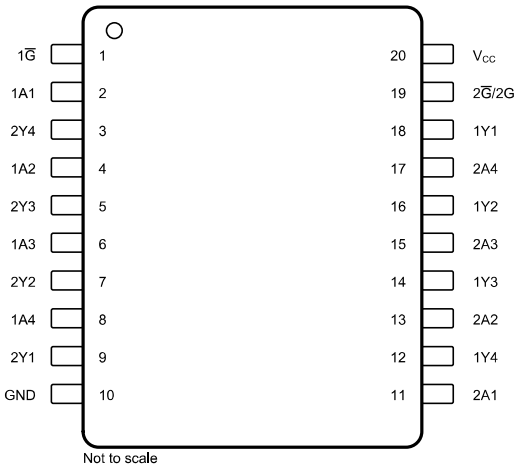
4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

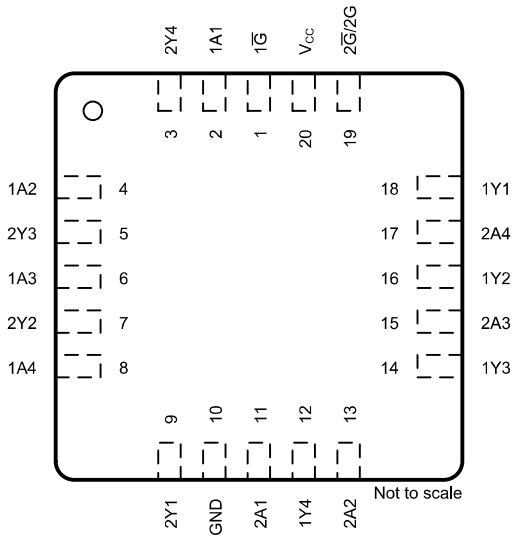
Changes from Revision C (May 2010) to Revision D	Page
• Added *Applications* section, *ESD Ratings* table, *Feature Description* section, *Device Functional Modes*, *Application and Implementation* section, *Power Supply Recommendations* section, *Layout* section, *Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section	1
• Deleted Ordering Information table; see POA at the end of the data sheet	1
• Changed $R\theta_{JA}$ values in the *Thermal Information* table from 70 to 94.3 (DB), from 58 to 90.3 (DW), from 69 to 50.6 (N), and from 60 to 76.6 (NS)	5

5 Pin Configuration and Functions

DB, DW, J, N, NS, or W Package
20-Pin SSOP, SOIC, CDIP, PDIP, SOP, or CFP
Top View



FK Package
20-Pin LCCC
Top View



Pin Functions

PIN		I/O	DESCRIPTION
NO.	NAME		
1	1G̅	I	Channel 1 output enable
2	1A1	I	Channel 1, A side 1
3	2Y4	O	Channel 2, Y side 4
4	1A2	I	Channel 1, A side 2
5	2Y3	O	Channel 2, Y side 3
6	1A3	I	Channel 1, A side 3
7	2Y2	O	Channel 2, Y side 2
8	1A4	I	Channel 1, A side 4
9	2Y1	O	Channel 2, Y side 1
10	GND	—	Ground
11	2A1	I	Channel 2, A side 1
12	1Y4	O	Channel 1, Y side 4
13	2A2	I	Channel 2, A side 2
14	1Y3	O	Channel 1, Y side 3
15	2A3	I	Channel 2, A side 3
16	1Y2	O	Channel 1, Y side 2
17	2A4	I	Channel 2, A side 4
18	1Y1	O	Channel 1, Y side 1
19	2G̅/2G(1)	I	Channel 2 output enable
20	V_{CC}	—	Power supply

(1) 2G for SNx4LS241 and SNx4S241 or 2G̅ for all other drivers.

6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

		MIN	MAX	UNIT
Supply voltage, V_{CC}(2)			7	V
Input voltage, V_I	SNx4LS24x		7	V
	SNx4S24x		5.5	
Off-state output voltage			5.5	V
Storage temperature, T_{stg}		–65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) Voltage values are with respect to network ground terminal.

6.2 ESD Ratings

			VALUE	UNIT
ALL PACKAGES				
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	500	V
N PACKAGE				
$V_{(ESD)}$	Electrostatic discharge	Charged device model (CDM), per JEDEC specification JESD22-C101(2)	500	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6.3 Recommended Operating Conditions

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

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage(1)	SN54xS24x	4.5	5	5.5	V
		SN74xS24x	4.75	5	5.25	
V_{IH}	High-level input voltage		2			V
V_{IL}	Low-level input voltage	SN54LS24x			0.7	V
		SN54S24x, SN74xS24x			0.8	
I_{OH}	High-level output current	SN54xS24x			–12	mA
		SN74xS24x			–15	
I_{OL}	Low-level output current	SN54LS24x			12	mA
		SN54S24x			48	
		SN74LS24x			24	
		SN74S24x			64	
	External resistance between any input and V_{CC} or ground (SNx4S24x only)				40	kΩ
T_A	Operating free-air temperature(2)	SN54xS24x	–55		125	°C
		SN74xS24x	0		70	

(1) Voltage values are with respect to network ground terminal.
(2) An SN54S241J operating at free-air temperature above 116°C requires a heat sink that provides a thermal resistance from case to free air, $R_{\theta CA}$, of not more that 40°C/W.

6.4 Thermal Information

THERMAL METRIC[1]		SN74LS240, SN74LS244	SN74LS24x, SN74S24x		SN74LS24x	UNIT
		DB (SSOP)	DW (SOIC)	N (PDIP)	NS (SOP)	
		20 PINS	20 PINS	20 PINS	20 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance[2][3]	94.3	90.3	50.6	76.6	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	55.9	45.5	37.4	42.9	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	49.5	48.1	31.5	44.1	°C/W
ψ_{JT}	Junction-to-top characterization parameter	21.3	19.4	24	19.2	°C/W
ψ_{JB}	Junction-to-board characterization parameter	49.1	47.6	31.4	43.7	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report.
(2) Voltage values are with respect to network ground terminal.
(3) The package thermal impedance is calculated in accordance with JESD 51-7.

6.5 Electrical Characteristics – SNx4LS24x

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

PARAMETER	TEST CONDITIONS[1]			MIN	TYP[2]	MAX	UNIT
V_{IK}	V_{CC} = MIN, I_I = –18 mA					–1.5	V
Hysteresis ($V_{T+} - V_{T-}$)	V_{CC} = MIN			0.2	0.4		V
V_{OH}	V_{CC} = MIN, I_{OH} = –3 mA, V_{IH} = 2 V, V_{IL} = MAX			2.4	3.4		V
	V_{CC} = MIN, I_{OH} = MAX, V_{IH} = 2 V, V_{IL} = 0.5 V			2			
V_{OL}	V_{CC} = MIN, V_{IL} = MAX, V_{IH} = 2 V		I_{OL} = 12 mA, SN54LS24x			0.4	V
			I_{OL} = 24 mA, SN74LS24x			0.5	
I_{OZH}	V_{CC} = MAX, V_{IL} = MAX, V_{IH} = 2 V, V_O = 2.7 V					20	µA
I_{OZL}	V_{CC} = MAX, V_{IL} = MAX, V_{IH} = 2 V, V_O = 0.4 V					–20	µA
I_I	V_{CC} = MAX, V_I = 7 V					0.1	mA
I_{IH}	V_{CC} = MAX, V_I = 2.7 V					20	µA
I_{IL}	V_{CC} = MAX, V_{IL} = 0.4 V					–0.2	mA
I_{OS}[3]	V_{CC} = MAX			–40		–225	mA
I_{CC}	V_{CC} = MAX, output open	Outputs high	All		17	27	mA
		Outputs low	SNx4LS240		26	44	
			SNx4LS241, SNx4LS244		27	46	
		Outputs disabled	SNx4LS240		29	50	
			SNx4LS241, SNx4LS244		32	54	

(1) For conditions shown as minimum or maximum, use the appropriate value specified under recommended operating conditions.
(2) All typical values are at V_{CC} = 5 V and T_A = 25°C.
(3) Not more than one output must be shorted at a time, and duration of the short-circuit must not exceed one second.

6.6 Electrical Characteristics – SNx4S24x

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

PARAMETER	TEST CONDITIONS[1]	MIN	TYP[2]	MAX	UNIT
V_{IK}	V_{CC} = MIN, I_I = –18 mA			–1.2	V
Hysteresis ($V_{T+} - V_{T-}$)	V_{CC} = MIN	0.2	0.4		V
V_{OH}	V_{CC} = MIN, I_{OH} = –1 mA, V_{IH} = 2 V, V_{IL} = 0.8 V, SN74S24x only	2.7			V
	V_{CC} = MIN, I_{OH} = –3 mA, V_{IH} = 2 V, V_{IL} = 0.8 V	2.4	3.4		
	V_{CC} = MIN, I_{OH} = MAX, V_{IH} = 2 V, V_{IL} = 0.5 V	2			
V_{OL}	V_{CC} = MIN, V_{IL} = MAX, V_{IH} = 2 V, I_{OL} = 0.8 V			0.55	V

(1) For conditions shown as minimum or maximum, use the appropriate value specified under recommended operating conditions.
(2) All typical values are at V_{CC} = 5 V, T_A = 25°C.

Electrical Characteristics – SNx4S24x (continued)

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

PARAMETER	TEST CONDITIONS[1]			MIN	TYP[2]	MAX	UNIT
I_{OZH}	V_{CC} = MAX, V_{IL} = 0.8 V, V_{IH} = 2 V, V_O = 2.4 V					50	µA
I_{OZL}	V_{CC} = MAX, V_{IL} = MAX, V_{IH} = 2 V, V_O = 0.5 V					–50	µA
I_I	V_{CC} = MAX, V_I = 5.5 V					1	mA
I_{IH}	V_{CC} = MAX, V_I = 2.7 V					50	µA
I_{IL}	V_{CC} = MAX, V_{IL} = 0.5 V		Any A			–400	µA
			Any G			–2	mA
I_{OS}[3]	V_{CC} = MAX			–50		–225	mA
I_{CC}	V_{CC} = MAX, output open	Outputs high	SN54S240		80	123	mA
			SN74S240		80	135	
			SN54S241, SN54S244		95	147	
			SN74S241, SN74S244		95	160	
		Outputs low	SN54S240		100	145	
			SN74S240		100	150	
			SN54S241, SN54S244		120	170	
			SN74S241, SN74S244		120	180	
		Outputs disabled	SN54S240		100	145	
			SN74S240		100	150	
			SN54S241, SN54S244		120	170	
			SN74S241, SN74S244		120	180	

(3) Not more than one output must be shorted at a time, and duration of the short-circuit must not exceed one second.

6.7 Switching Characteristics – SNx4LS24x

V_{CC} = 5 V, T_A = 25°C (see *SN54LS24x and SN74LS24x Devices*)

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	R_L = 667 Ω, C_L = 45 pF	SNx4LS240		9	14	ns
		SNx4LS241, SNx4LS244		12	18	
t_{PHL}	R_L = 667 Ω, C_L = 45 pF			12	18	ns
t_{PZL}	R_L = 667 Ω, C_L = 45 pF			20	30	ns
t_{PZH}	R_L = 667 Ω, C_L = 45 pF			15	23	ns
t_{PLZ}	R_L = 667 Ω, C_L = 5 pF			10	20	ns
t_{PHZ}	R_L = 667 Ω, C_L = 5 pF			15	25	ns

6.8 Switching Characteristics – SNx4S24x

V_{CC} = 5 V and T_A = 25°C (see *SN54S24x and SN74S24x Devices*)

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	R_L = 90 Ω, C_L = 50 pF	SNx4S240		4.5	7	ns
		SNx4S241, SNx4S244		6	9	
t_{PHL}	R_L = 90 Ω, C_L = 50 pF	SNx4S240		4.5	7	ns
		SNx4S241, SNx4S244		6	9	
t_{PZL}	R_L = 90 Ω, C_L = 50 pF			10	15	ns
t_{PZH}	R_L = 90 Ω, C_L = 50 pF	SNx4S240		6.5	10	ns
		SNx4S241, SNx4S244		8	12	
t_{PLZ}	R_L = 90 Ω, C_L = 5 pF			10	15	ns
t_{PHZ}	R_L = 90 Ω, C_L = 5 pF			6	9	ns

6.9 Typical Characteristics

V_{CC} = 5 V, T_A = 25°C, C_L = 45 pF, and R_L = 667 Ω (unless otherwise noted)

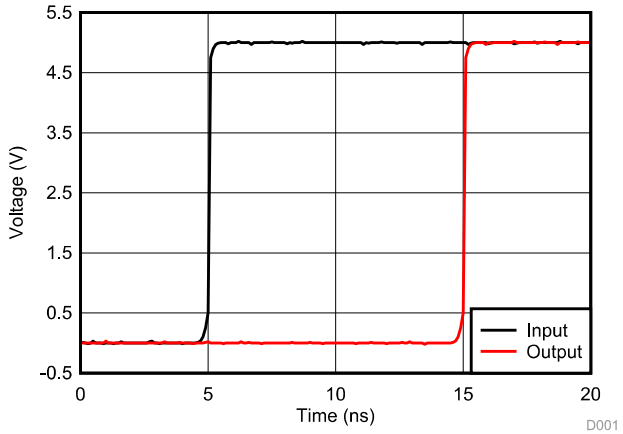


Figure 1. Simulated Propagation Delay From Input to Output

7 Parameter Measurement Information

7.1 SN54LS24x and SN74LS24x Devices

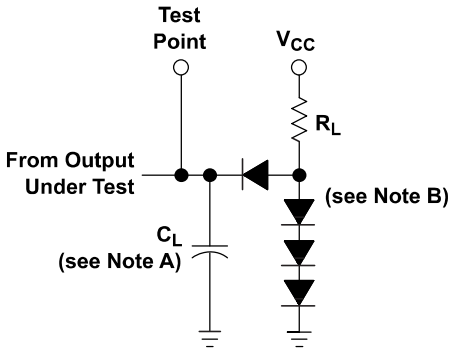


**Figure 2. Load Circuit,
For 2-State Totem-Pole Outputs**

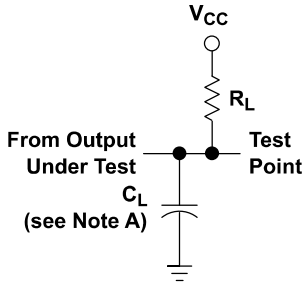


**Figure 3. Load Circuit,
For Open-Collector Outputs**

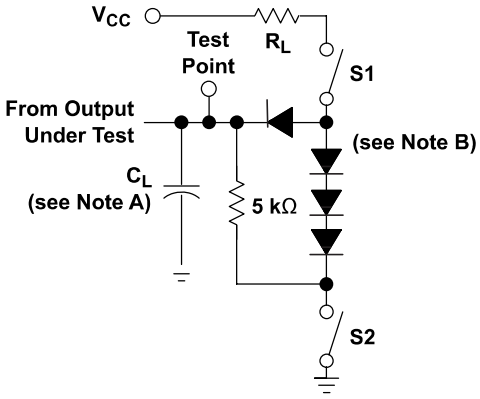


**Figure 4. Load Circuit,
For 3-State Outputs**

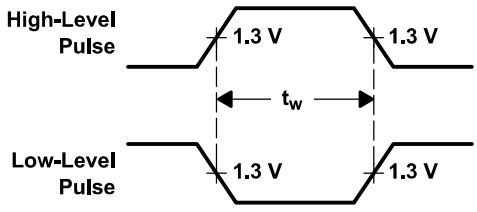


**Figure 5. Voltage Waveforms,
Pulse Durations**

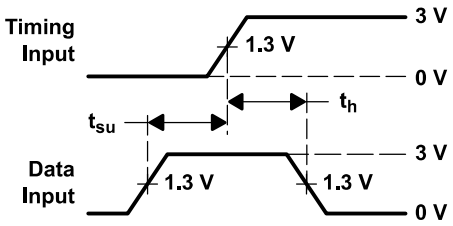


Figure 6. Voltage Waveforms, Setup and Hold Times

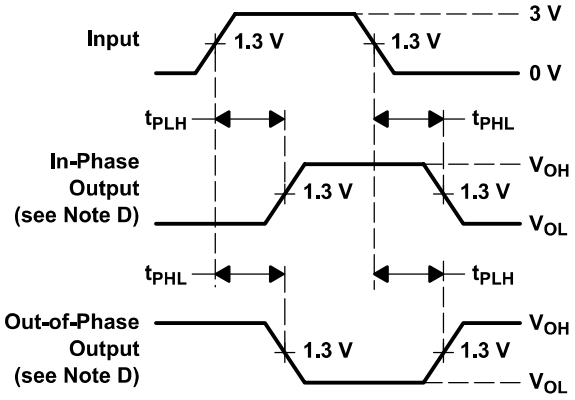
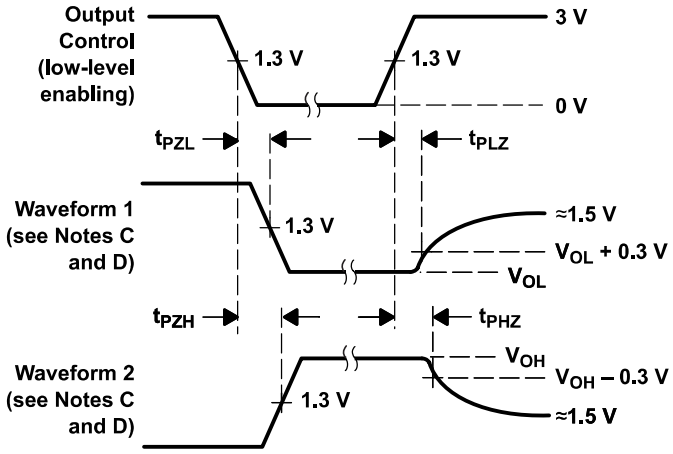


Figure 7. Voltage Waveforms, Propagation Delay Times



A. C_L includes probe and jig capacitance.

B. All diodes are 1N3064 or equivalent.

C. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

D. S1 and S2 are closed for t_{PLH}, t_{PHL}, t_{PHZ}, and t_{PLZ}; S1 is open and S2 is closed for t_{PZH}; S1 is closed and S2 is open for t_{PZL}.

E. Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.

F. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O is approximately 50 Ω, t_r ≤ 15 ns, t_f ≤ 6 ns.

G. The outputs are measured one at a time with one input transition per measurement.

Figure 8. Voltage Waveforms, Enable and Disable Times, 3-State Outputs

7.2 SN54S24x and SN74S24x Devices

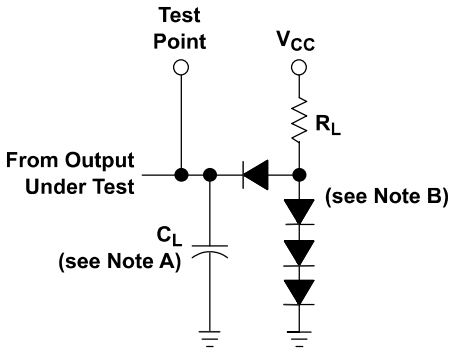


Figure 9. Load Circuit, For 2-State Totem-Pole Outputs

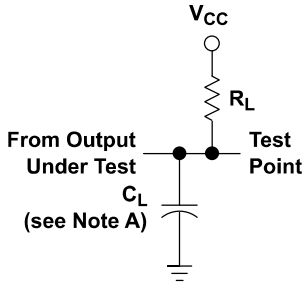


Figure 10. Load Circuit, For Open-Collector Outputs

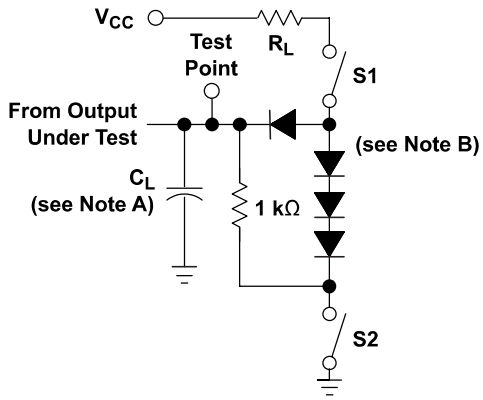


Figure 11. Load Circuit, For 3-State Outputs

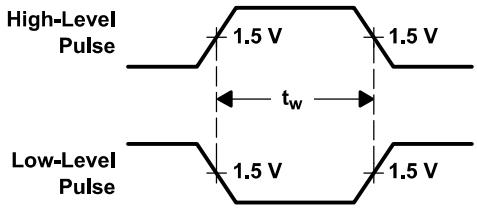


Figure 12. Voltage Waveforms, Pulse Durations

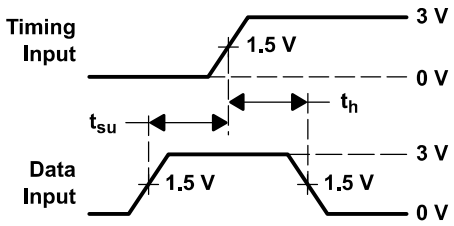


Figure 13. Voltage Waveforms, Setup and Hold Times

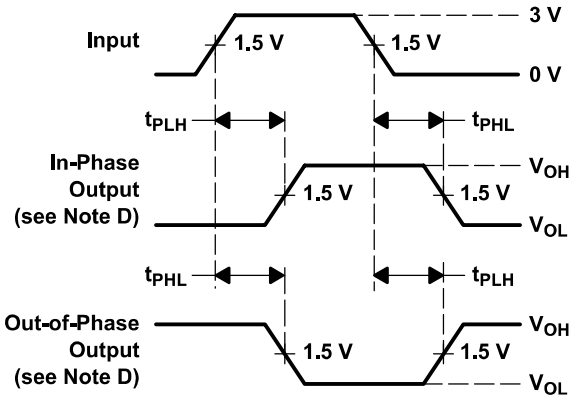
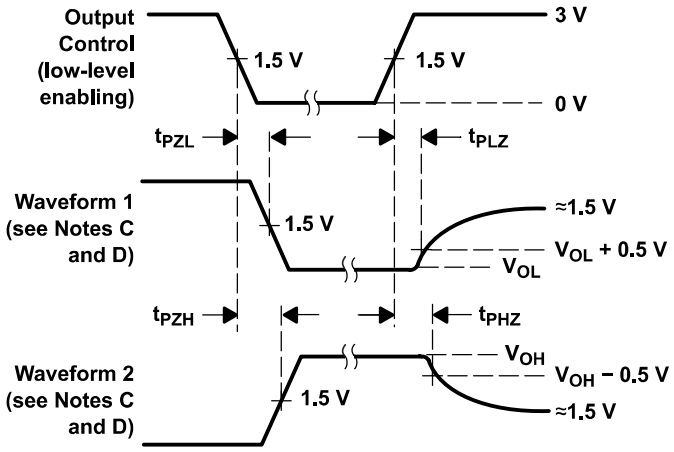


Figure 14. Voltage Waveforms, Propagation Delay Times



A. C_L includes probe and jig capacitance.

B. All diodes are 1N3064 or equivalent.

C. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

D. S1 and S2 are closed for t_{PLH}, t_{PHL}, t_{PHZ}, and t_{PLZ}; S1 is open and S2 is closed for t_{PZH}; S1 is closed and S2 is open for t_{PZL}.

E. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O is approximately 50 Ω; t_r and t_f ≤ 7 ns for SN54LS24x and SN74LS24x devices, and t_r and t_f ≤ 2.5 ns for SN54S24x and SN74S24x devices.

F. The outputs are measured one at a time with one input transition per measurement.

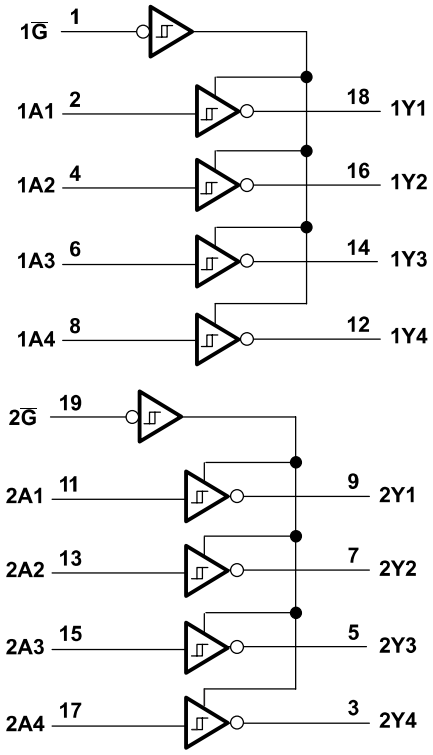
Figure 15. Voltage Waveforms, Enable and Disable Times, 3-State Outputs

8 Detailed Description

8.1 Overview

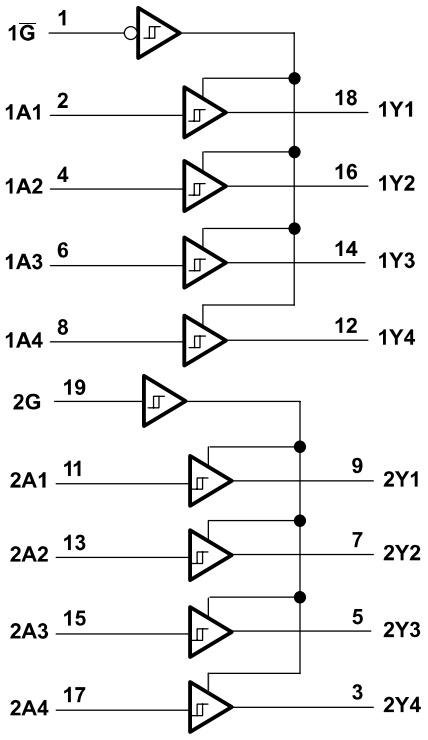
This device is organized as two 4-bit buffers and drivers with separate output-enable ($\overline{G}$) inputs. When $\overline{G}$ is low, the device passes data from the A inputs to the Y outputs. When $\overline{G}$ is high, the outputs are in the high impedance state. Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of this device as a translator in a mixed 3.3-V and 5-V system environment. To ensure the high-impedance state during power up or power down, $\overline{G}$ must be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

8.2 Functional Block Diagrams



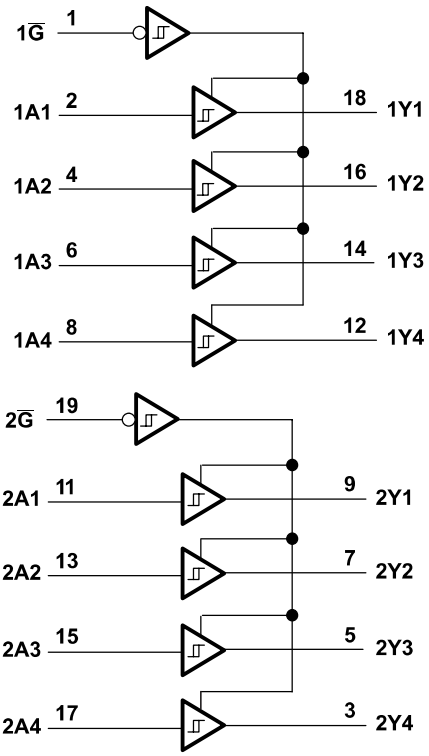
Pin numbers shown are for DB, DW, J, N, NS, and W packages

Figure 16. SNx4LS240 and SNx4S240 Logic Diagram



Pin numbers shown are for DB, DW, J, N, NS, and W packages

Figure 17. SNx4LS241 and SNx4S241 Logic Diagram



Pin numbers shown are for DB, DW, J, N, NS, and W packages

Figure 18. SNx4LS244 and SNx4S244 Logic Diagram

8.3 Feature Description

8.3.1 3-State Outputs

The 3-state outputs can drive bus lines directly. All outputs can be put into high impedance mode through the $\overline{G}$ pin.

8.3.2 PNP Inputs

This device has PNP inputs which reduce dc loading on bus lines.

8.3.3 Hysteresis on Bus Inputs

The bus inputs have built-in hysteresis that improves noise margins.

8.4 Device Functional Modes

The SNx4LS24x and SNx4S24x devices can be used as inverting and non-inverting bus buffers for data line transmission and can isolate input to output by setting the $\overline{G}$ pin HIGH. Table 1, Table 2, and Table 3 list the function tables for all devices.

Table 1. SNx4LS240 and SNx4S240 Function Table

INPUTS		OUTPUTS
$\overline{G}$	A	Y
L	L	H
L	H	L
H	X	Z

Table 2. SNx4LS241 and SNx4S241 Function Table

CHANNEL 1			CHANNEL 2		
INPUTS		OUTPUT	INPUTS		OUTPUT
$1\overline{G}$	1A	1Y	2G	2A	2Y
L	L	L	H	L	L
L	H	H	H	H	H
H	X	Z	L	X	Z

Table 3. SNx4LS244 and SNx4S244 Function Table

INPUTS		OUTPUTS
$\overline{G}$	A	Y
L	L	L
L	H	H
H	X	Z

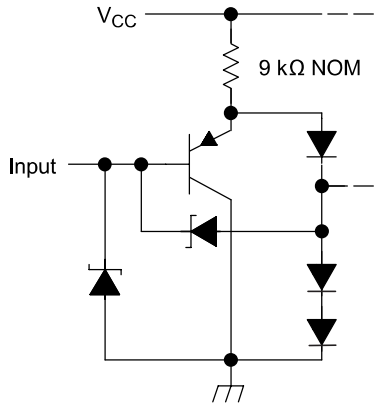
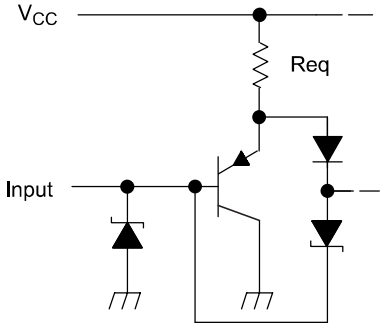


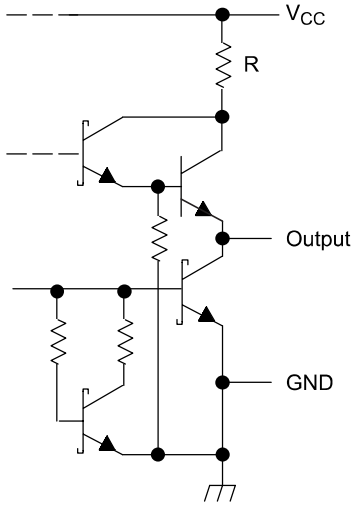
Figure 19. SNx4LS240, SNx4LS241, SNx4LS244 Equivalent of Each Input



G and $\overline{G}$ inputs: R_{eq} = 2 kΩ NOM

A inputs: R_{eq} = 2.8 kΩ NOM

Figure 20. SNx4S240, SNx4S241, SNx4S244 Equivalent of Each Input



SNx4LS240, SNx4LS241, SNx4LS244:
R = 50 Ω NOM

SNx4S240, SNx4S241, SNx4S244:
R = 25 Ω NOM

Figure 21. Typical of All Outputs

9 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information

The SNx4LS24x, SNx4S24x octal buffers and line drivers are designed to be used for a multitude of bus interface type applications where output drive or PCB trace length is a concern.

9.2 Typical Application

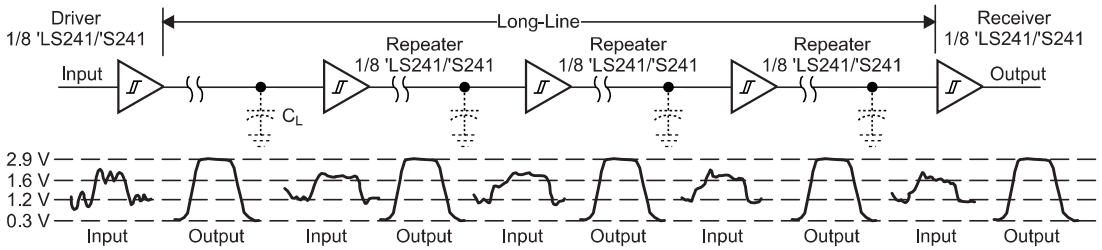


Figure 22. SNx4LS241 and SNx4S241 Used as Repeater or Level Restorer

9.2.1 Design Requirements

This device uses Schottky transistor logic technology. Take care to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive creates fast edges into light loads, so routing and load conditions must be considered to prevent ringing.

9.2.2 Detailed Design Procedure

- Power Supply
  - Each device must maintain a supply voltage between 4.5 V and 5.5 V.
- Inputs
  - Input signals must meet the V_{IH} and V_{IL} specifications in *Electrical Characteristics – SNx4LS24x*.
  - Inputs leakage values (I_I, I_{IH}, I_{IL}) from *Electrical Characteristics – SNx4LS24x* must be considered.
- Outputs
  - Output signals are specified to meet the V_{OH} and V_{OL} specifications in *Electrical Characteristics – SNx4LS24x* as a minimum (the values could be closer to V_{CC} for high signals or GND for low signals).
  - TI recommends maintaining output currents as specified in *Recommended Operating Conditions*.
  - The part can be damaged by sourcing or sinking too much current (see *Electrical Characteristics – SNx4LS24x* for details).

Typical Application (continued)

9.2.3 Application Curve

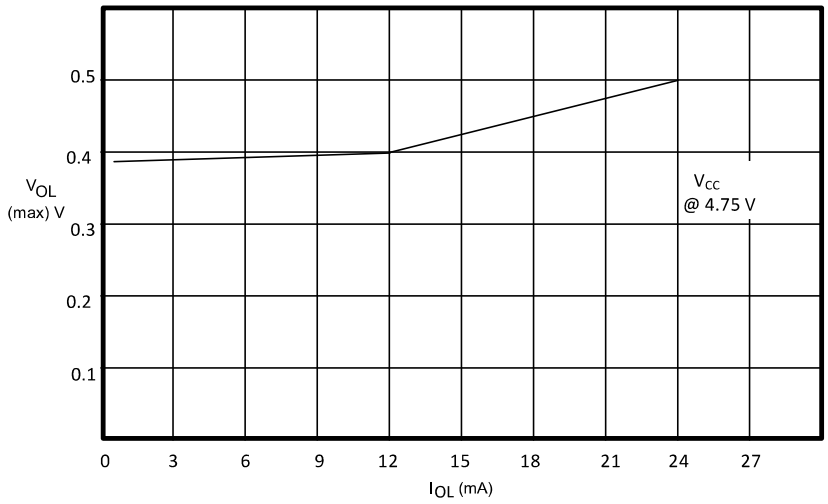
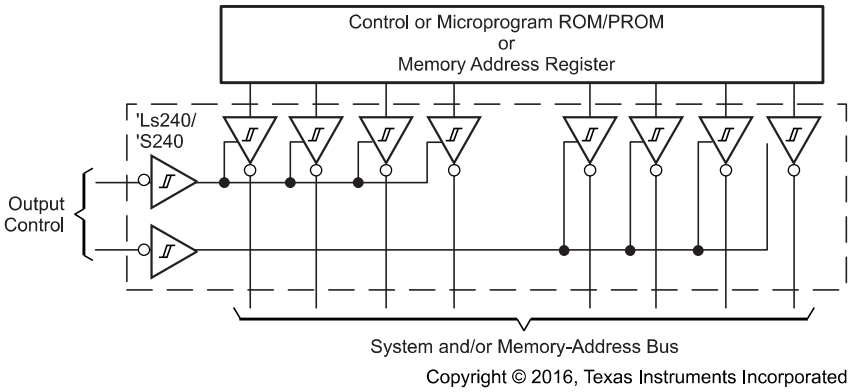


Figure 23. V_{OL} vs I_{OL}

9.3 System Examples

The SNx4LS240 and SNx4S240 devices can be used to buffer signals along a memory bus. The increased output drive helps data transmission reliability. Figure 24 shows a schematic of this example.



4-bit organization can be applied to handle binary or BCD

Figure 24. SNx4LS240 and SNx4S240 Used as System or Memory Bus Driver

The SNx4LS240 and SNx4S240 devices have two independently controlled 4-bit drivers, and can be used to buffer signals in a bidirectional manner along a data bus. Figure 25 shows the SNx4LS240 or SNx4S240 used in this manner.

System Examples (continued)

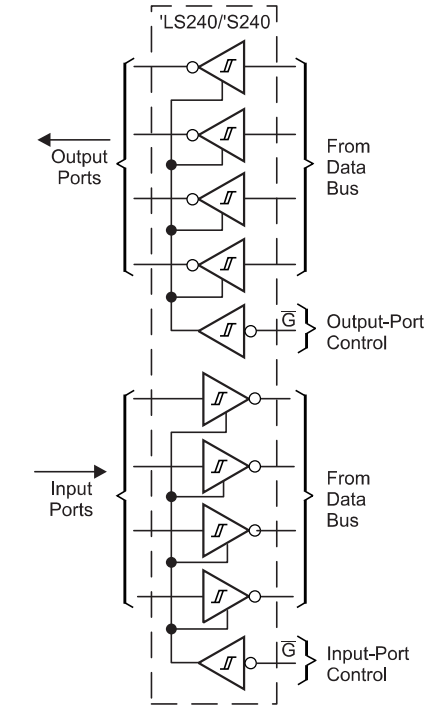


Figure 25. Independent 4-Bit But Drivers/Receivers in a Single Package

The enable pins on the SNx4LS241 and SNx4S241 devices can be used to help direct signals along a shared party-line bus. Figure 26 shows a general configuration of how to implement this structure. Take care to ensure that bus contention does not occur.

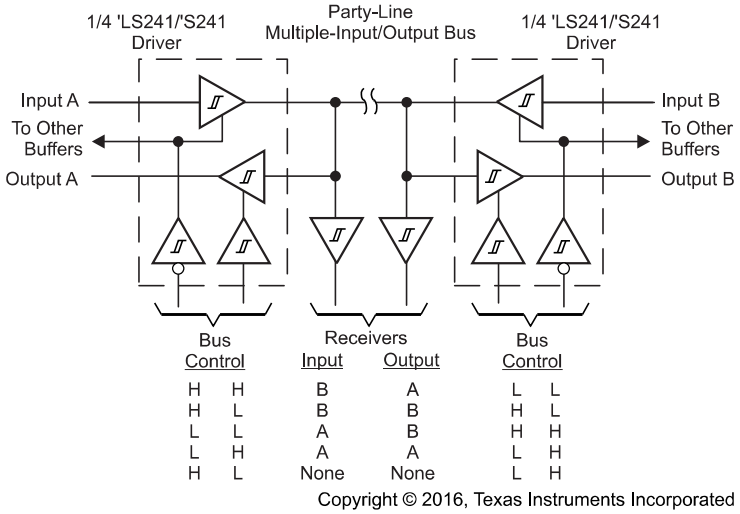


Figure 26. Party-Line Bus System With Multiple Inputs, Outputs, and Receivers

10 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in *Recommended Operating Conditions*. Each V_{CC} pin must have a good bypass capacitor to prevent power disturbance. For devices with a single supply, TI recommends a 0.1-µF bypass capacitor. If there are multiple V_{CC} pins, TI recommends a 0.01-µF or 0.022-µF bypass capacitors for each power pin. It is acceptable to parallel multiple bypass capacitors to reject different frequencies of noise. Two bypass capacitors of value 0.1 µF and 1 µF are commonly used in parallel. For best results, install the bypass capacitor(s) as close to the power pin as possible.

11 Layout

11.1 Layout Guidelines

When using multiple bit logic devices, inputs must not be left floating. In many applications, some channels of the SNx4LS24x, SNx4S24x are unused, and thus must be terminated properly. Because each transceiver channel pin can be either an input or an output, they must be treated as both when being terminated. Ground or V_{CC} (whichever is more convenient) can be used to terminate unused inputs; however, each unused channel should be terminated to the same logic level on both the A and Y side. For example, in Figure 27 unused channels are terminated correctly with both sides connected to the same voltage, while channel 8 is terminated incorrectly with each side being tied to a different voltage. The $\overline{G}$ input is also unused in this example, and is terminated directly to ground to permanently enable all outputs.

11.2 Layout Example

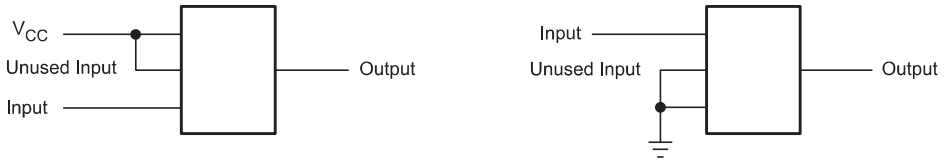


Figure 27. Example Demonstrating How to Terminate Unused Inputs and Channels of a Transceiver

12 Device and Documentation Support

12.1 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

Table 4. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	SUPPORT & COMMUNITY
SN54LS240	Click here	Click here	Click here	Click here
SN74LS241	Click here	Click here	Click here	Click here
SN74LS244	Click here	Click here	Click here	Click here
SN54S240	Click here	Click here	Click here	Click here
SN54S241	Click here	Click here	Click here	Click here
SN54S244	Click here	Click here	Click here	Click here
SN74LS240	Click here	Click here	Click here	Click here
SN74LS241	Click here	Click here	Click here	Click here
SN74LS244	Click here	Click here	Click here	Click here
SN74S240	Click here	Click here	Click here	Click here
SN74S241	Click here	Click here	Click here	Click here
SN74S241	Click here	Click here	Click here	Click here

12.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

12.3 Community Resource

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

TI E2E™ Online Community ***TI's Engineer-to-Engineer (E2E) Community.*** Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support ***TI's Design Support*** Quickly find helpful E2E forums along with design support tools and contact information for technical support.

12.4 Trademarks

E2E is a trademark of Texas Instruments.
All other trademarks are the property of their respective owners.

12.5 Electrostatic Discharge Caution

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

12.6 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.