

SN54LS240, SN54LS241, SN54LS244, SN54S240, SN54S241, SN54S244 SN74LS240, SN74LS241, SN74LS244, SN74S240, SN74S241, SN74S244 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SDLS144 – APRIL 1985 – REVISED MARCH 1988

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- PNP Inputs Reduce D-C Loading
- Hysteresis at Inputs Improves Noise Margins

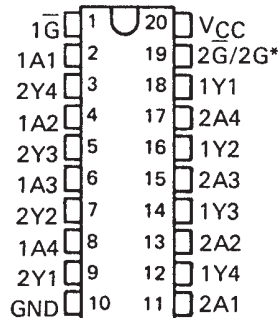
description

These 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 noninverting outputs, symmetrical \bar{G} (active-low output control) inputs, and complementary G and \bar{G} inputs. These devices feature high fan-out, improved fan-in, and 400-mV noise-margin. The SN74LS' and SN74S' can be used to drive terminated lines down to 133 ohms.

The SN54' family is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74' family is characterized for operation from 0°C to 70°C .

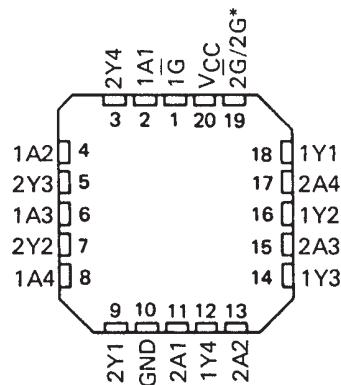
SN54LS', SN54S' . . . J OR W PACKAGE
SN74LS', SN74S' . . . DW OR N PACKAGE

(TOP VIEW)



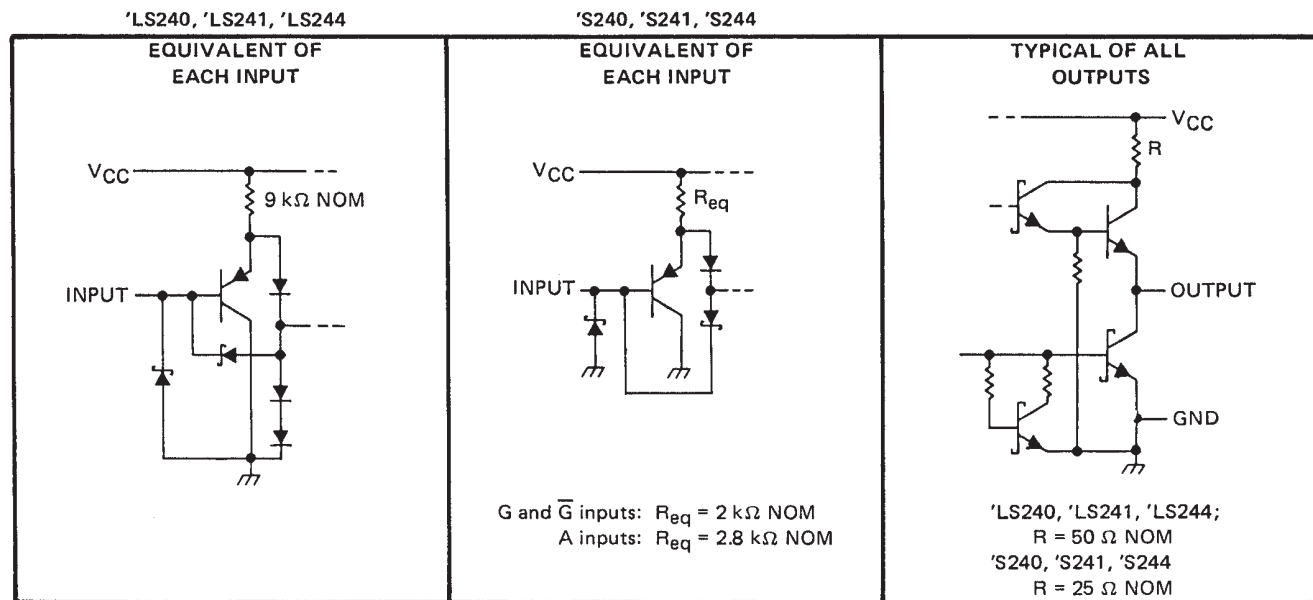
SN54LS', SN54S' . . . FK PACKAGE

(TOP VIEW)



*2G for 'LS241 and 'S241 or 2G for all other drivers.

schematics of inputs and outputs



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

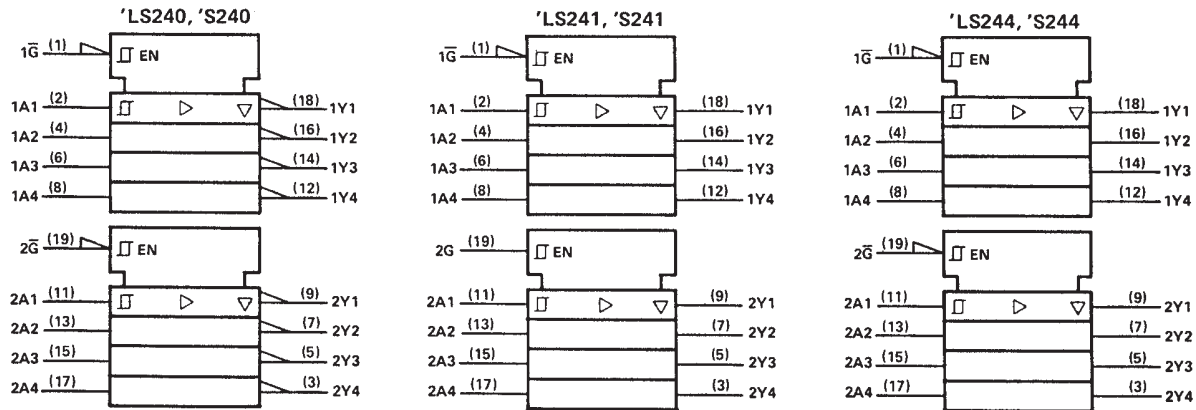
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SN54LS240, SN54LS241, SN54LS244, SN54S240, SN54S241, SN54S244 SN74LS240, SN74LS241, SN74LS244, SN74S240, SN74S241, SN74S244 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

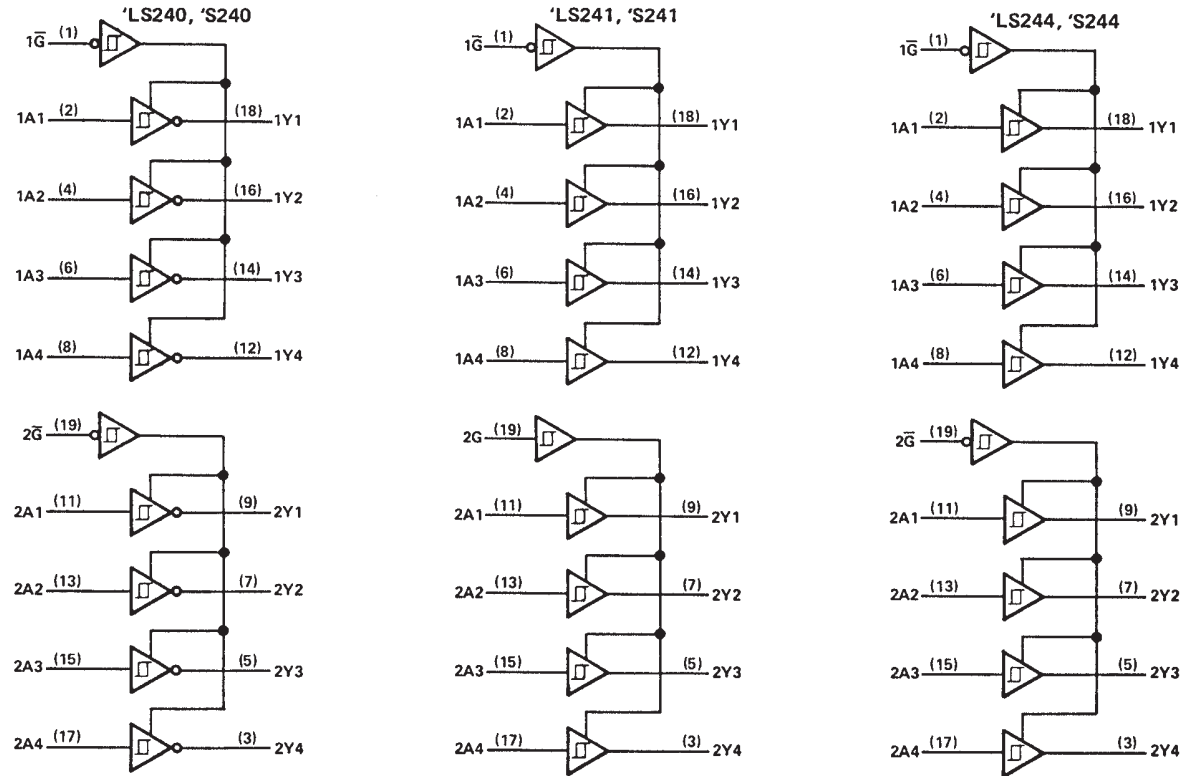
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logic symbols†



†These symbols are in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

logic diagrams (positive logic)



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

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

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: 'LS Circuits	7 V
'S Circuits	5.5 V
Off-state output voltage	5.5 V
Operating free-air temperature range: SN54LS', SN54S' Circuits	-55°C to 125°C
SN74LS', SN74S' Circuits	0°C to 70°C
Storage temperature range	-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.



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**SN54LS240, SN54LS241, SN54LS244, SN54S240, SN54S241, SN54S244
SN74LS240, SN74LS241, SN74LS244, SN74S240, SN74S241, SN74S244
OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS**

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recommended operating conditions

PARAMETER	SN54LS'			SN74LS'			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage (see Note 1)	4.5	5	5.5	4.75	5	5.25	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage			0.7			0.8	V
I _{OH} High-level output current			-12			-15	mA
I _{OL} Low-level output current			12			24	mA
T _A Operating free-air temperature	-55		125	0		70	°C

NOTE 1: Voltage values are with respect to network ground terminal.

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

PARAMETER	TEST CONDITIONS†	SN54LS'		SN74LS'		UNIT		
		MIN	TYP‡	MAX	MIN		TYP‡	MAX
V _{IK}	V _{CC} = MIN, I _I = -18 mA			-1.5		-1.5	V	
Hysteresis (V _{T+} - V _{T-})	V _{CC} = MIN	0.2	0.4		0.2	0.4	V	
V _{OH}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX, I _{OH} = -3 mA	2.4	3.4		2.4	3.4	V	
	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.5 V, I _{OH} = MAX	2			2			
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = MAX	I _{OL} = 12 mA		0.4		0.4	V	
		I _{OL} = 24 mA				0.5		
I _{OZH}	V _{CC} = MAX, V _{IH} = 2 V, V _O = 2.7 V			20		20	μA	
I _{OZL}	V _{IL} = MAX, V _O = 0.4 V			-20		-20		
I _I	V _{CC} = MAX, V _I = 7 V			0.1		0.1	mA	
I _{IH}	V _{CC} = MAX, V _I = 2.7 V			20		20	μA	
I _{IL}	V _{CC} = MAX, V _{IL} = 0.4 V			-0.2		-0.2	mA	
I _{OS} §	V _{CC} = MAX	-40		-225	-40	-225	mA	
I _{CC}	V _{CC} = MAX, Output open	All		17	27	17	27	mA
		'LS240		26	44	26	44	
		'LS241, 'LS244		27	46	27	46	
		'LS240		29	50	29	50	
		'LS241, 'LS244		32	54	32	54	

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

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

§ Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS	'LS240		'LS241, 'LS244		UNIT	
		MIN	TYP	MAX	MIN		TYP
t _{PLH}	R _L = 667 Ω, C _L = 45 pF, See Note 2	9	14		12	18	ns
t _{PHL}		12	18		12	18	ns
t _{PZL}		20	30		20	30	ns
t _{PZH}		15	23		15	23	ns
t _{PLZ}	R _L = 667 Ω, C _L = 5 pF, See Note 2	10	20		10	20	ns
t _{PHZ}		15	25		15	25	ns

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.



SN54LS240, SN54LS241, SN54LS244, SN54S240, SN54S241, SN54S244 SN74LS240, SN74LS241, SN74LS244, SN74S240, SN74S241, SN74S244 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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recommended operating conditions

PARAMETER	SN54S'			SN74S'			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC} Supply voltage, (see Note 1)	4.5	5	5.5	4.75	5	5.25	V
V _{IH} High-level input voltage	2			2			V
V _{IL} Low-level input voltage	0.8			0.8			V
I _{OH} High-level output current	- 12			- 15			mA
I _{OL} Low-level output current	48			64			mA
External resistance between any input and V _{CC} or ground							
			40			40 kΩ	
T _A Operating free-air temperature (see Note 3)	- 55		125		0		70 °C

NOTES: 1. Voltage values are with respect to network ground terminal.

3. 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_{θCA}, of not more than 40°C/W.

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

PARAMETER	TEST CONDITIONS†		SN54S'			SN74S'			UNIT	
			MIN	TYP‡	MAX	MIN	TYP‡	MAX		
V _{IK}	V _{CC} = MIN, I _I = - 18 mA		- 1.2			- 1.2			V	
Hysteresis (V _{T+} - V _{T-})	V _{CC} = MIN		0.2	0.4		0.2	0.4		V	
V _{OH}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OH} = - 1 mA					2.7			V	
	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OH} = - 3 mA		2.4	3.4		2.4	3.4			
	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.5 V, I _{OH} = MAX		2			2				
V _{OL}	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OL} = MAX		0.55			0.55			V	
I _{OZH}	V _{CC} = MAX, V _{IH} = 2 V, V _O = 2.4 V		50			50			μA	
I _{OZL}	V _{IL} = 0.8 V, V _O = 0.5 V		- 50			- 50				
I _I	V _{CC} = MAX, V _I = 5.5 V		1			1			mA	
I _{IH}	V _{CC} = MAX, V _I = 2.7 V		50			50			μA	
I _{IL}	Any A	V _{CC} = MAX, V _I = 0.5 V		- 400			- 400			μA
	Any G			- 2			- 2			mA
I _{OS} §	V _{CC} = MAX		- 50	- 225		- 50	- 225		mA	
I _{CC}	Outputs high	V _{CC} = MAX, Outputs open	'S240		80	123	80		135	mA
			'S241, 'S244		95	147	95		160	
	Outputs low		'S240		100	145	100		150	
			'S241, 'S244		120	170	120		180	
	Outputs disabled		'S240		100	145	100		150	
			'S241, 'S244		120	170	120		180	

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

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C.

§ Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.



SN54LS240, SN54LS241, SN54LS244, SN54S240, SN54S241, SN54S244
 SN74LS240, SN74LS241, SN74LS244, SN74S240, SN74S241, SN74S244
 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

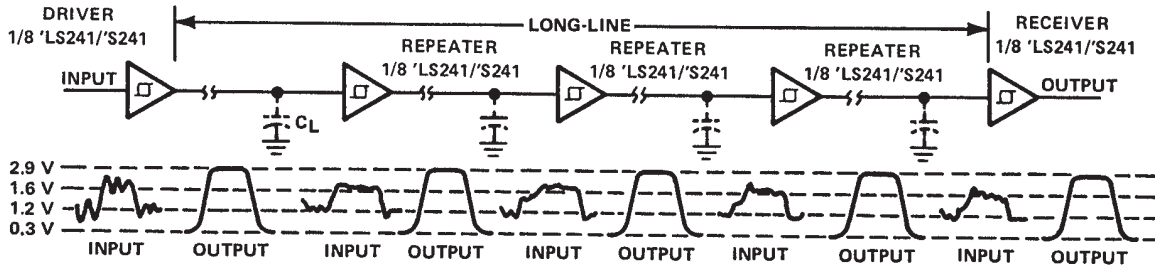
PARAMETER	TEST CONDITIONS	'S240			'S241, 'S244			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
t _{PLH}	R _L = 90 Ω, See Note 4 C _L = 50 pF,	4.5	7		6	9	ns	
t _{PHL}		4.5	7		6	9	ns	
t _{PZL}		10	15		10	15	ns	
t _{PZH}		6.5	10		8	12	ns	
t _{PLZ}	R _L = 90 Ω, See Note 4 C _L = 5 pF,	10	15		10	15	ns	
t _{PHZ}		6	9		6	9	ns	

NOTE 4: Load circuits and voltage waveforms are shown in Section 1.

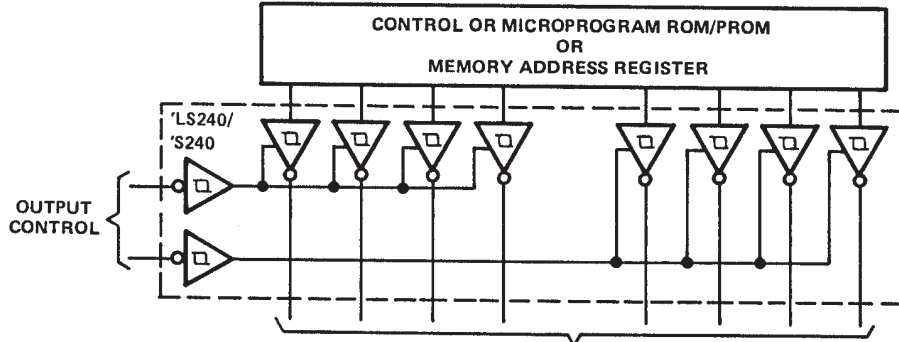


SN54LS240, SN54LS241, SN54LS244, SN54S240, SN54S241, SN54S244 SN74LS240, SN74LS241, SN74LS244, SN74S240, SN74S241, SN74S244 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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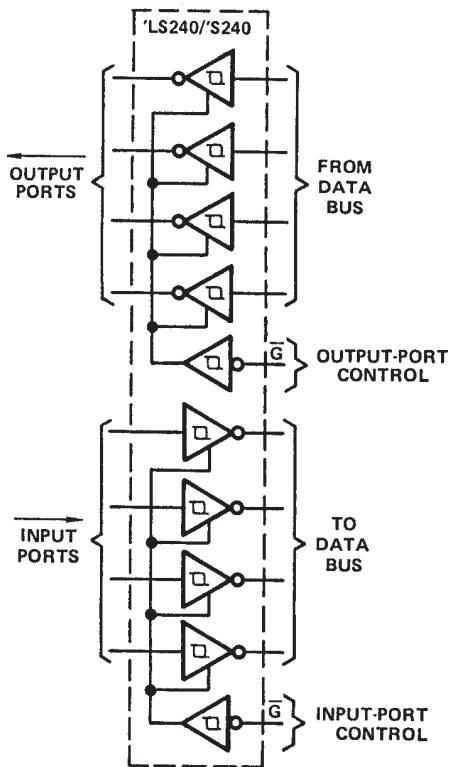


'LS241, 'S241 USED AS REPEATER/LEVEL RESTORER

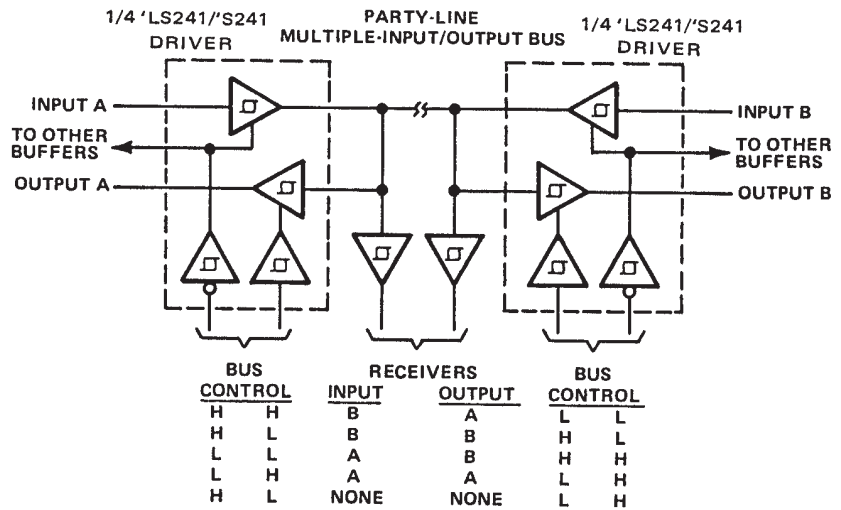


SYSTEM AND/OR MEMORY-ADDRESS BUS

'LS240/'S240 USED AS SYSTEM AND/OR MEMORY BUS DRIVER—4-BIT ORGANIZATION CAN BE APPLIED TO HANDLE BINARY OR BCD



INDEPENDENT 4-BIT BUS DRIVERS/RECEIVERS IN A SINGLE PACKAGE



PARTY-LINE BUS SYSTEM WITH MULTIPLE INPUTS, OUTPUTS, AND RECEIVERS

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SN74LS240, Octal buffers and line drivers

DEVICE STATUS: **ACTIVE**

PARAMETER NAME	SN74LS240
Voltage Nodes (V)	5
Vcc range (V)	4.75 to 5.25
Input Level	TTL
Output Level	TTL
No. of Outputs	8
Output Drive (mA)	-15/24
tpd(max) (ns)	18
Static Current	35.5
Logic	Inv

FEATURES

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- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- PNP Inputs Reduce D-C Loading
- Hysteresis at Inputs Improves Noise Margins

DESCRIPTION[▲ Back to Top](#)

These 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 noninverting outputs, symmetrical G_L (active-low output control) inputs, and complementary G and G_L inputs. These devices feature high fan-out, improved fan-in, and 400-mV noise-margin. The SN74LS' and SN74S' can be used to drive terminated lines down to 133 ohms.

The SN54' family is characterized for operation over the full military temperature range of -55°C to 125°C. The SN74' family is characterized for operation from 0°C to 70°C.

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- [Documentation Rules \(SAP\) And Ordering Information](#) (SZZU001B, 4 KB - Updated: 05/06/1999)
- [Logic Selection Guide Second Half 2000](#) (SDYU001N, 5035 KB - Updated: 04/17/2000)
- [MicroStar Junior BGA Design Summary](#) (SCET004, 167 KB - Updated: 07/28/2000)
- [More Power In Less Space - Technical Article](#) (SCAU001A, 850 KB - Updated: 03/01/1996)

PRICING/AVAILABILITY[▲ Back to Top](#)

<u>ORDERABLE DEVICE</u>	<u>PACKAGE</u>	<u>PINS</u>	<u>TEMP (°C)</u>	<u>STATUS</u>	<u>BUDGETARY PRICE</u> <u>US\$/UNIT</u>	<u>PACK QTY</u>	<u>PRICING/AVAILABILITY</u>
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					<u>QTY=1000+</u>		
SN74LS240DW	<u>DW</u>	20	0 TO 70	ACTIVE	0.50	25	<u>Check stock or order</u>
SN74LS240DWR	<u>DW</u>	20	0 TO 70	ACTIVE	0.53	2000	<u>Check stock or order</u>
SN74LS240J	<u>J</u>	20	0 TO 70	OBSOLETE			
SN74LS240N	<u>N</u>	20	0 TO 70	ACTIVE	0.47	20	<u>Check stock or order</u>
SN74LS240N3	<u>N</u>	20	0 TO 70	OBSOLETE			
SN74LS240NSR	<u>NS</u>	20	0 TO 70	ACTIVE	0.59	2000	<u>Check stock or order</u>

MODELS
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- [Octal Buffer and Line Driver With 3-State Outputs](#) (SDLM007, 65 KB - Updated: 08/08/2000)
[Octal Buffer and Line Driver With 3-State Outputs](#) (SDLM007, 10 KB, ZIP - Updated: 08/08/2000)

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PRODUCT SUPPORT: [TRAINING](#)

SN74LS244, Octal Buffers And Line Drivers With 3-State Outputs

DEVICE STATUS: **ACTIVE**

PARAMETER NAME	SN74LS244
Voltage Nodes (V)	5
Vcc range (V)	4.75 to 5.25
Input Level	TTL
Output Level	TTL
Output Drive (mA)	-15/24
t _{pd} (max) (ns)	18
Static Current	36.5

FEATURES

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- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- PNP Inputs Reduce D-C Loading
- Hysteresis at Inputs Improves Noise Margins

DESCRIPTION

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SN74LS244DBR	<u>DB</u>	20	0 TO 70	ACTIVE	0.50	2000	Check stock or order
SN74LS244DW	<u>DW</u>	20	0 TO 70	ACTIVE	0.50	25	Check stock or order
SN74LS244DWR	<u>DW</u>	20	0 TO 70	ACTIVE	0.53	2000	Check stock or order
SN74LS244J	<u>J</u>	20	0 TO 70	OBSOLETE			
SN74LS244N	<u>N</u>	20	0 TO 70	ACTIVE	0.47	20	Check stock or order
SN74LS244N3	<u>N</u>	20	0 TO 70	OBSOLETE			
SN74LS244NSR	<u>NS</u>	20	0 TO 70	ACTIVE	0.59	2000	Check stock or order

MODELS
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- [Octal Buffer and Line Driver With 3-State Outputs](#) (SDLM008, 65 KB - Updated: 08/08/2000)
[Octal Buffer and Line Driver With 3-State Outputs](#) (SDLM008, 10 KB, ZIP - Updated: 08/08/2000)

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