

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

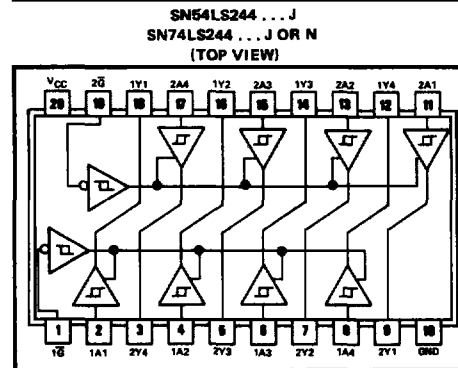
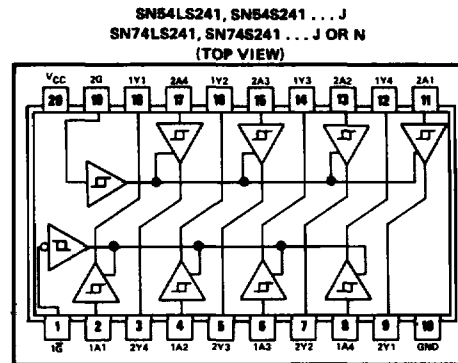
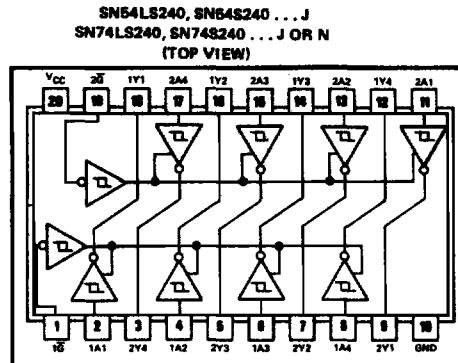
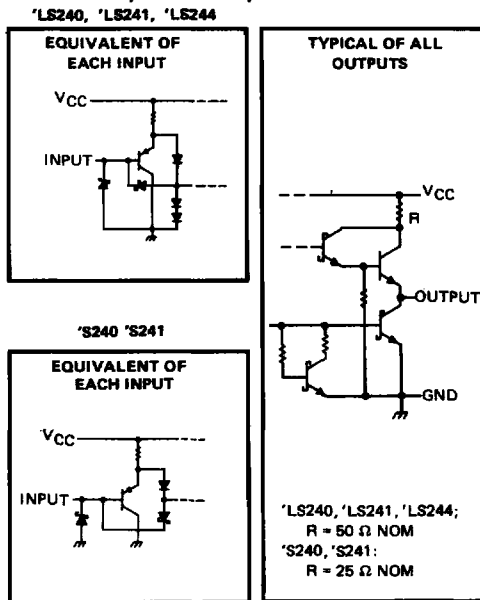
	Typical	Typical	Typical Propagation		Typical	Typical Power	
	I _{OL} (Sink Current)	I _{OH} (Source Current)	Delay Times	Delay Times		Enable/ Disable Times	Dissipation (Enabled)
SN54LS'	12 mA	-12 mA	Inverting 10.5 ns	Noninverting 12 ns	18 ns	Inverting 130 mW	Noninverting 135 mW
SN74LS'	24 mA	-15 mA	Inverting 10.5 ns	Noninverting 12 ns	18 ns	Inverting 130 mW	Noninverting 135 mW
SN54S'	48 mA	-12 mA	Inverting 4.5 ns	Noninverting 6 ns	9 ns	Inverting 450 mW	Noninverting 538 mW
SN74S'	64 mA	-15 mA	Inverting 4.5 ns	Noninverting 6 ns	9 ns	Inverting 450 mW	Noninverting 538 mW

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- P-N-P 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.

schematics of inputs and outputs



TYPES SN54LS240, SN54LS241, SN54LS244, SN74LS240, SN74LS241, SN74LS244 BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

recommended operating conditions

PARAMETER	SN54LS*			SN74LS*			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC} (see Note 1)	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-12			-15	mA
Low-level output current, I_{OL}			12			24	mA
Operating free-air temperature, T_A	-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_{IH} High-level input voltage		2			2			V
V_{IL} Low-level input voltage				0.7			0.8	V
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -18 \text{ mA}$			-1.5			-1.5	V
Hysteresis ($V_{T+} - V_{T-}$)	$V_{CC} = \text{MIN}$	0.2	0.4		0.2	0.4		V
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}, I_{OH} = -3 \text{ mA}$	2.4	3.4		2.4	3.4		V
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.5 \text{ V}, I_{OH} = \text{MAX}$	2			2			V
	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = V_{IL \text{ max}}$			0.4			0.4	V
I_{OZH} Off-state output current, high-level voltage applied	$V_{CC} = \text{MAX}, V_{IH} = 2 \text{ V}, V_{OL} = 2.7 \text{ V}$			20			20	μA
I_{OZL} Off-state output current, low-level voltage applied	$V_{CC} = \text{MAX}, V_{IL} = V_{IL \text{ max}}, V_{OH} = 0.4 \text{ V}$			-20			-20	μA
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 7 \text{ V}$			0.1			0.1	mA
I_{IH} High-level input current, any input	$V_{CC} = \text{MAX}, V_I = 2.7 \text{ V}$			20			20	μA
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_{IL} = 0.4 \text{ V}$			-0.2			-0.2	mA
I_{OS} Short-circuit output current*	$V_{CC} = \text{MAX}$	-40		-225	-40		-225	mA
I_{CC} Supply current	Outputs high	$V_{CC} = \text{MAX}$	All	13	23	13	23	mA
	Outputs low		'LS240	26	44	26	44	
	All outputs disabled	Outputs open	'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 $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$.

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

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

PARAMETER	TEST CONDITIONS	'LS240		'LS241, 'LS244		UNIT
		MIN	MAX	MIN	MAX	
t_{PLH} Propagation delay time, low-to-high-level output	$C_L = 45 \text{ pF}, R_L = 687 \Omega$, See Note 2	9	14	12	18	ns
t_{PHL} Propagation delay time, high-to-low-level output		12	18	12	18	ns
t_{pZL} Output enable time to low level		20	30	20	30	ns
t_{pZH} Output enable time to high level		15	23	15	23	ns
t_{PLZ} Output disable time from low level	$C_L = 5 \text{ pF}, R_L = 687 \Omega$, See Note 2	15	25	15	25	ns
t_{PHZ} Output disable time from high level		10	18	10	18	ns

NOTE 2: Load circuit and voltage waveforms are shown on page 3-11.

TYPES SN54S240, SN54S241, SN74S240, SN74S241

BUFFERS/LINE DRIVERS/LINE RECEIVERS WITH 3-STATE OUTPUTS

REVISED AUGUST 1977

recommended operating conditions

PARAMETER	SN54S'			SN74S'			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC} (see Note 1)	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-12			-15	mA
Low-level output current, I_{OL}			48			64	mA
Operating free-air temperature, T_A (see Note 3)	-65		125	0		70	$^{\circ}$ C

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

3. An SN54S241J operating at free-air temperature above 116 $^{\circ}$ C requires a heat sink that provides a thermal resistance from case to free-air, $R_{\theta CA}$, of not more than 40 $^{\circ}$ C/W.

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

PARAMETER	TEST CONDITIONS†	'S240			'S241			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IH} High-level input voltage		2			2			V
V_{IL} Low-level input voltage		0.8			0.8			V
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}$, $I_I = -18 \text{ mA}$	-1.2			-1.2			V
Hysteresis ($V_{T+} - V_{T-}$)	$V_{CC} = \text{MIN}$	0.2	0.4		0.2	0.4	V	
V_{OH} High-level output voltage	SN74S'	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OH} = -1 \text{ mA}$		2.7	2.7		V	
	SN54S' and SN74S'	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OH} = -3 \text{ mA}$		2.4	3.4	3.4		
	SN54S' and SN74S'	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.5 \text{ V}$, $I_{OH} = \text{MAX}$		2	2			
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $I_{OL} = \text{MAX}$	0.55		0.55		V		
I_{OZH} Off-state output current, high-level voltage applied	$V_{CC} = \text{MAX}$, $V_O = 2.4 \text{ V}$	50			50			μ A
I_{OZL} Off-state output current, low-level voltage applied	$V_{IH} = 2 \text{ V}$, $V_{IL} = 0.8 \text{ V}$, $V_O = 0.5 \text{ V}$	-50			-50			μ A
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$	1			1			mA
I_{IH} High-level input current, any input	$V_{CC} = \text{MAX}$, $V_I = 2.7 \text{ V}$	50			50			μ A
I_{IL} Low-level input current	Any A	-400			-400			μ A
	Any G	-2			-2			mA
I_{OS} Short-circuit output current*	$V_{CC} = \text{MAX}$	-50	-225	-50	-225	mA		
I_{CC} Supply current	Outputs high	$V_{CC} = \text{MAX}$, Outputs open	SN54S'	80	123	95	147	mA
			SN74S'	80	135	95	160	
	Outputs low		SN54S'	100	145	120	170	
			SN74S'	100	150	120	180	
	Outputs disabled		SN54S'	100	145	120	170	
			SN74S'	100	150	120	180	

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

‡ All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}\text{C}$.

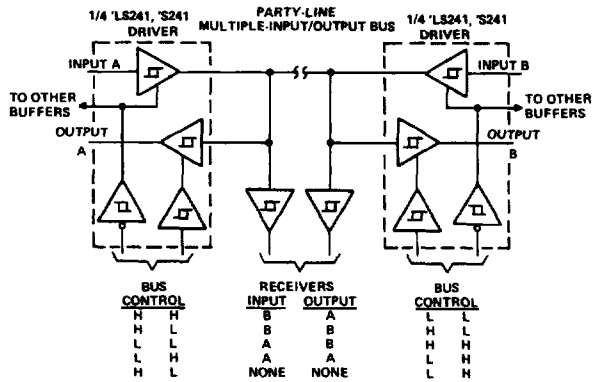
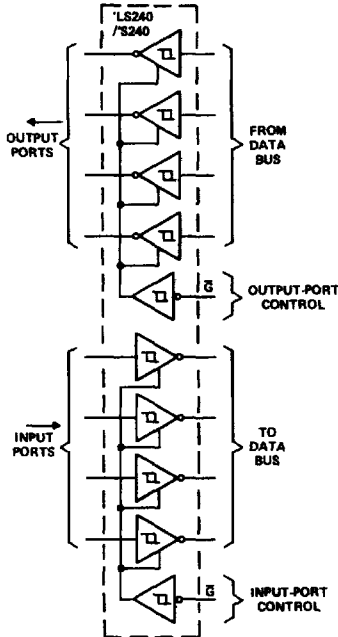
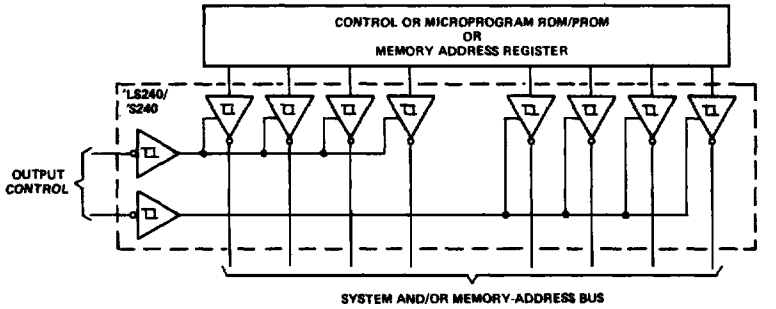
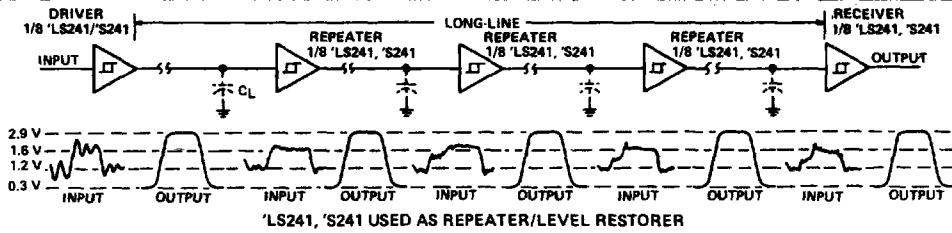
* Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

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

PARAMETER	TEST CONDITIONS	'S240			'S241			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH} Propagation delay time, low-to-high-level output	$C_L = 50 \text{ pF}$, $R_L = 90 \Omega$, See Note 4	4.5	7		6	9	ns	
t_{PHL} Propagation delay time, high-to-low-level output		4.5	7		6	9	ns	
t_{PZL} Output enable time to low level		10	15		10	15	ns	
t_{PZH} Output enable time to high level		6.5	10		8	12	ns	
t_{PLZ} Output disable time from low level	$C_L = 5 \text{ pF}$, $R_L = 90 \Omega$, See Note 4	10	15		10	15	ns	
t_{PHZ} Output disable time from high level		6	9		6	9	ns	

NOTE 4: Load circuit and voltage waveforms are shown on page 3-10.

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



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