

54LS244, 54S244 Buffers

Octal Buffers (3-State)

Product Specification

Military Logic Products

FUNCTION TABLE

INPUTS				OUTPUTS	
OE _a	I _a	OE _b	I _b	Y _a	Y _b
L	L	L	L	L	L
L	H	L	H	H	H
H	X	H	X	(Z)	(Z)

H = High voltage level
L = Low voltage level
X = Don't care
(Z) = High impedance (off) state

ORDERING INFORMATION

DESCRIPTION	ORDER CODE
20-Pin Ceramic DIP	54LS244/BRA, 54S244/BRA
20-Pin Ceramic Flat Pack	54LS244/BSA, 54S244/BSA
20-Pin Ceramic LLCC	54LS244/B2A, 54S244/B2A

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

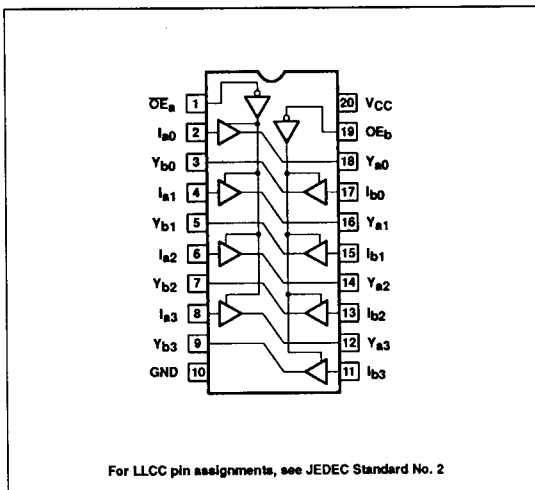
PINS	DESCRIPTION	54S	54LS
All	Inputs	1SUL	1LSUL
All	Output	24SUL	30LSUL

NOTE: A 54S Unit Load (SUL) is a 50µA I_{IH}, and -2.0mA I_{IL}, and a 54LS Unit Load (LSUL) is 20µA I_{IH} and -0.4mA I_{IL}.

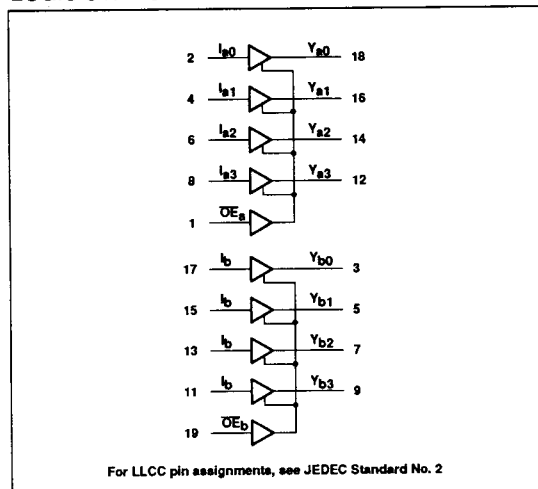
ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	54LS	54S	UNIT
V _{CC}	Supply voltage	7.0	7.0	V
V _I	Input voltage range	-0.5 to +7.0	-0.5 to +7.0	V
I _I	Input current range	-30 to +1	-30 to +5	mA
V _O	Voltage applied to output in High output state range	-0.5 to +V _{CC}	-0.5 to +V _{CC}	V
T _{STG}	Storage temperature range	-65 to +150	-65 to +150	°C

PIN CONFIGURATION



LOGIC SYMBOL



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RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	54LS			54S			UNIT
		Min	Nom	Max	Min	Nom	Max	
V _{CC}	Supply voltage	4.5	5.0	5.5	4.5	5.0	5.5	V
V _{IH}	High-level input voltage	2.0			2.0			V
V _{IL}	Low-level input voltage			+0.7			+0.8	V
I _{IK}	Input clamp current			-18			-18	mA
I _{OH}	High-level output current			-12			-12	mA
I _{OL}	Low-level output current			12			48	mA
T _A	Operating free-air temperature range	-55		+125	-55		+125	°C

DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS ¹	54LS240, 241			54S240, 241			UNIT
			Min	Typ ²	Max	Min	Typ ²	Max	
ΔV _T	Hysteresis (V _{T+} - V _{T-}) ⁵	V _{CC} = Min	0.2	0.4		0.2	0.4		V
V _{OH}	High-level output voltage	V _{CC} = Min, V _{IH} = Min, V _{IL} = 0.5V, I _{OH} = Max	2.0			2.0			V
		V _{CC} = Min, V _{IH} = Min, V _{IL} = Max, I _{OH} = -3mA	2.4	3.4		2.4			V
V _{OL}	Low-level output voltage	V _{CC} = Min, V _{IH} = Min, V _{IL} = Max, I _{OL} = Max			0.4			0.55	V
V _{IK}	Input clamp voltage	V _{CC} = Min, I _I = I _{IK}			-1.5			-1.2	V
I _{OZH}	Offstate output current, High-level voltage applied	V _{CC} = Max, V _{IH} = Min, V _{IL} = Max	V _O = 2.7V		20				μA
			V _O = 2.4V					50	μA
I _{OZL}	Offstate output current, Low-level voltage applied	V _{CC} = Max, V _{IH} = Min, V _{IL} = Max	V _O = 0.4V		-20				μA
			V _O = 0.5V					-50	μA
I _{IH2}	Input current at maximum input voltage	V _{CC} = Max	V _I = 5.5V					1.0	mA
			V _I = 7.0V			0.1			mA
I _{IH1}	High-level input current	V _{CC} = Max, V _I = 2.7V			20			50	μA
I _{IL}	Low-level input current	V _{CC} = Max	V _I = 0.4V		-0.2				mA
			V _I = 0.5V	OE inputs				-2.0	mA
			Other inputs					-0.4	mA
I _{OS}	Short-circuit output current ³	V _{CC} = Max	-40		-130	-80		-180	mA
I _{CC}	Supply current ⁴ (total)	V _{CC} = Max	I _{CC} H Outputs High	17	27	95	147		mA
			I _{CC} L Outputs Low	27	46	120	170		mA
			I _{CC} Z Outputs Off	32	54	120	170		mA

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AC ELECTRICAL CHARACTERISTICS $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$

SYMBOL	PARAMETER	TEST CONDITIONS	54LS		54S		UNIT
			$C_L = 50\text{pF}$		$C_L = 50\text{pF}$		
			Min	Max	Min	Max	
t_{PLH}	Propagation delay	Waveform 1		18		9	ns
t_{PHL}	Propagation delay	Waveform 1		18		9	ns
t_{PZH}	Enable to High	Waveform 2		23		12	ns
t_{PZL}	Enable to Low	Waveform 3		30		15	ns
t_{PHZ}	Disable from High	Waveform 2, $C_L = 5\text{pF}^6$		18		9	ns
t_{PLZ}	Disable from Low	Waveform 3, $C_L = 5\text{pF}^6$		25		15	ns
t_{PHZ}	Disable from High	Waveform 2, $C_L = 50\text{pF}$		34		14	ns
t_{PLZ}	Disable from Low	Waveform 3, $C_L = 50\text{pF}$		27		16.5	ns

AC ELECTRICAL CHARACTERISTICS $T_A = -55^\circ\text{C}$ and $+125^\circ\text{C}$, $V_{CC} = 5.0\text{V}^5$

SYMBOL	PARAMETER	TEST CONDITIONS	54LS		54S		UNIT
			$C_L = 50\text{pF}$		$C_L = 50\text{pF}$		
			Min	Max	Min	Max	
t_{PLH}	Propagation delay	Waveform 1		23		16	ns
t_{PHL}	Propagation delay	Waveform 1		23		12	ns
t_{PZH}	Enable to High	Waveform 2		30		16	ns
t_{PZL}	Enable to Low	Waveform 3		39		20	ns
t_{PHZ}	Disable from High	Waveform 2, $C_L = 5\text{pF}^6$		24		12	ns
t_{PLZ}	Disable from Low	Waveform 3, $C_L = 5\text{pF}^6$		33		20	ns
t_{PHZ}	Disable from High	Waveform 2, $C_L = 50\text{pF}$		44		18	ns
t_{PLZ}	Disable from Low	Waveform 3, $C_L = 50\text{pF}$		35		22	ns

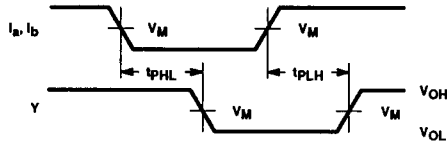
NOTES:

1. For conditions shown as Min or Max, use the appropriate value specified under recommended operating conditions for the applicable type and function table operating mode.
2. All typical values are at $V_{CC} = 5\text{V}$, $T_A = 25^\circ\text{C}$.
3. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.
4. I_{CC} is measured with outputs open.
5. These parameters are guaranteed, but not tested.
6. Guaranteed by 50pF limits, but not tested.

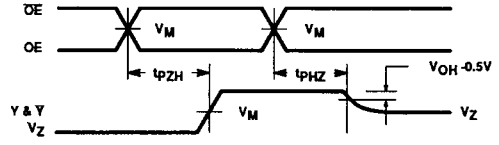
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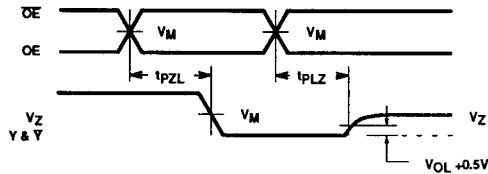
AC WAVEFORMS



Waveform 1. Waveform for Non-Inverting Outputs



Waveform 2. 3-State Enable Time to High Level and Disable Time from High Level



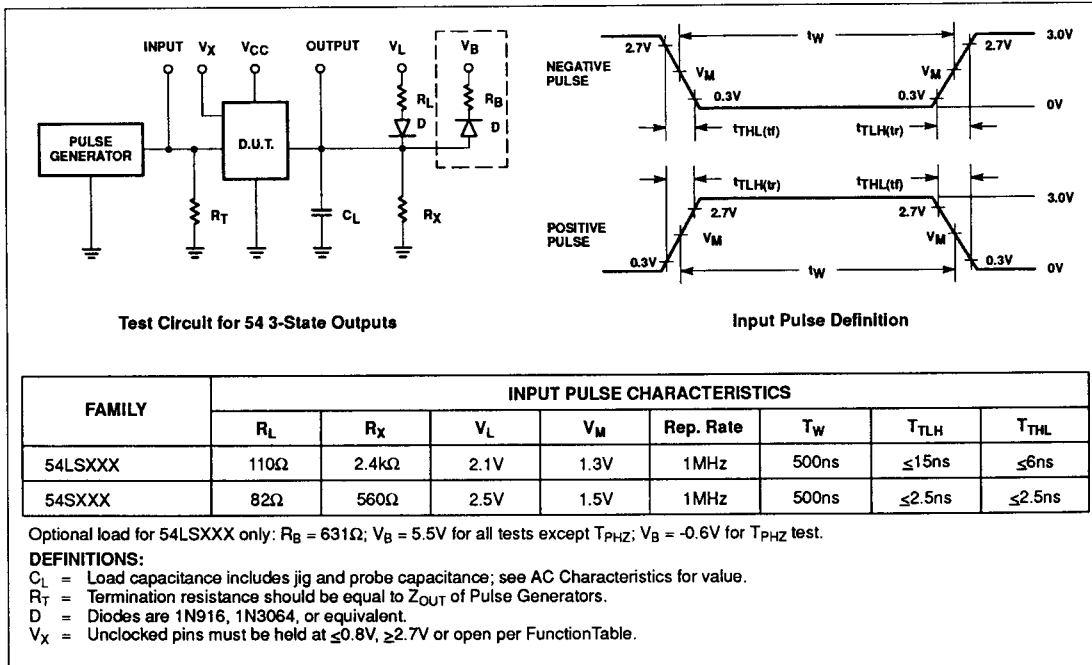
Waveform 3. 3-State Enable Time to Low Level and Disable Time from Low Level

FAMILY	V_M	V_{M2L}	V_{M2H}	V_Z
54LSXXX	1.3V	0.7V	1.9V	1.45V
54SXXX	1.5V	0.7V	2.0V	1.65V

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TEST CIRCUIT AND WAVEFORM



Test Circuit for 54 3-State Outputs

Input Pulse Definition

FAMILY	INPUT PULSE CHARACTERISTICS							
	R_L	R_X	V_L	V_M	Rep. Rate	T_W	T_{TLH}	T_{THL}
54LSXXX	110Ω	2.4kΩ	2.1V	1.3V	1MHz	500ns	≤15ns	≤6ns
54SXXX	82Ω	560Ω	2.5V	1.5V	1MHz	500ns	≤2.5ns	≤2.5ns

Optional load for 54LSXXX only: $R_B = 631\Omega$; $V_B = 5.5V$ for all tests except T_{PHZ} ; $V_B = -0.6V$ for T_{PHZ} test.

DEFINITIONS:

- C_L = Load capacitance includes jig and probe capacitance; see AC Characteristics for value.
- R_T = Termination resistance should be equal to Z_{OUT} of Pulse Generators.
- D = Diodes are 1N916, 1N3064, or equivalent.
- V_X = Unlocked pins must be held at ≤0.8V, ≥2.7V or open per FunctionTable.