

SN54HC541, SN74HC541 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SCLS305A – JANUARY 1996 – REVISED MAY 1997

- High-Current 3-State Outputs Drive Bus Lines Directly or up to 15 LSTTL Loads
- Data Flow-Through Pinout (All Inputs on Opposite Side From Outputs)
- Package Options Include Plastic Small-Outline (DW), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

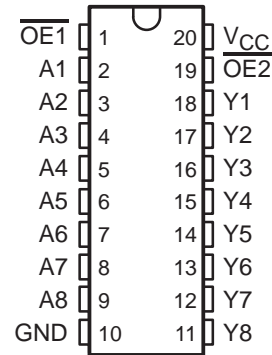
description

These octal buffers and line drivers feature the performance of the 'HC240 and a pinout with inputs and outputs on opposite sides of the package. This arrangement greatly enhances printed circuit board layout.

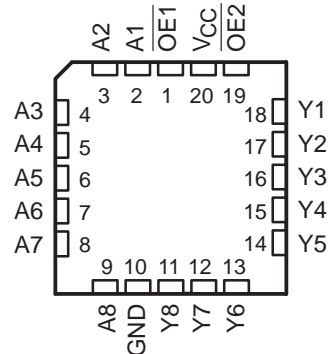
The 3-state control gate is a 2-input NOR. If either output-enable ($\overline{OE1}$ or $\overline{OE2}$) input is high, all eight outputs are in the high-impedance state. The 'HC541 provide true data at the outputs.

The SN54HC541 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74HC541 is characterized for operation from -40°C to 85°C .

SN54HC541 . . . J OR W PACKAGE
SN74HC541 . . . DW, N, OR PW PACKAGE
(TOP VIEW)



SN54HC541 . . . FK PACKAGE
(TOP VIEW)



FUNCTION TABLE
(each buffer/driver)

INPUTS			OUTPUT
$\overline{OE1}$	$\overline{OE2}$	A	Y
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z



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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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recommended operating conditions

		SN54HC541			SN74HC541			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	2	5	6	2	5	6	V
V _{IH}	High-level input voltage	V _{CC} = 2 V		1.5	1.5		V	
		V _{CC} = 4.5 V		3.15	3.15			
		V _{CC} = 6 V		4.2	4.2			
V _{IL}	Low-level input voltage	V _{CC} = 2 V		0	0.5	0	0.5	V
		V _{CC} = 4.5 V		0	1.35	0	1.35	
		V _{CC} = 6 V		0	1.8	0	1.8	
V _I	Input voltage	0	V _{CC}		0	V _{CC}		V
V _O	Output voltage	0	V _{CC}		0	V _{CC}		V
t _t	Input transition (rise and fall) time	V _{CC} = 2 V		0	1000	0	1000	ns
		V _{CC} = 4.5 V		0	500	0	500	
		V _{CC} = 6 V		0	400	0	400	
T _A	Operating free-air temperature	-55		125	-40		85	°C

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

PARAMETER	TEST CONDITIONS		V _{CC}	T _A = 25°C			SN54HC541		SN74HC541		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	V _I = V _{IH} or V _{IL}	I _{OH} = -20 μA	2 V	1.9	1.998		1.9		1.9	V	
			4.5 V	4.4	4.499		4.4		4.4		
			6 V	5.9	5.999		5.9		5.9		
		I _{OH} = -6 mA	4.5 V	3.98	4.3		3.7		3.84		
		I _{OH} = -7.8 mA	6 V	5.48	5.8		5.2		5.34		
V _{OL}	V _I = V _{IH} or V _{IL}	I _{OL} = 20 μA	2 V		0.002	0.1		0.1		V	
			4.5 V		0.001	0.1		0.1			0.1
			6 V		0.001	0.1		0.1			0.1
		I _{OL} = 6 mA	4.5 V		0.17	0.26		0.4			0.33
		I _{OL} = 7.8 mA	6 V		0.15	0.26		0.4			0.33
I _I	V _I = V _{CC} or 0	6 V		±0.1	±100		±1000		±1000	nA	
I _{OZ}	V _O = V _{CC} or 0	6 V		±0.01	±0.5		±10		±5	μA	
I _{CC}	V _I = V _{CC} or 0, I _O = 0	6 V			8		160		80	μA	
C _i		2 V to 6 V		3	10		10		10	pF	

**SN54HC541, SN74HC541
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WITH 3-STATE OUTPUTS**

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switching characteristics over recommended operating free-air temperature range, $C_L = 50 \text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC541		SN74HC541		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	2 V		40	115		171		144	ns
			4.5 V		12	23		34		29	
			6 V		10	20		29		25	
t_{en}	\overline{OE}	Y	2 V		80	150		224		188	ns
			4.5 V		17	30		45		38	
			6 V		15	26		38		32	
t_{dis}	\overline{OE}	Y	2 V		40	150		224		188	ns
			4.5 V		18	30		45		38	
			6 V		17	26		38		32	
t_t		Y	2 V		28	60		90		75	ns
			4.5 V		8	12		18		15	
			6 V		6	10		15		13	

switching characteristics over recommended operating free-air temperature range, $C_L = 150 \text{ pF}$ (unless otherwise noted) (see Figure 1)

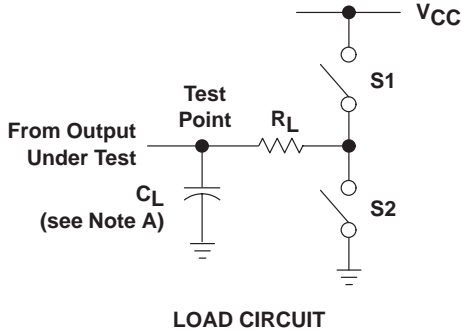
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC}	$T_A = 25^\circ\text{C}$			SN54HC541		SN74HC541		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	A	Y	2 V		65	165		246		206	ns
			4.5 V		16	33		49		41	
			6 V		14	28		42		35	
t_{en}	\overline{OE}	Y	2 V		100	200		298		250	ns
			4.5 V		20	40		60		50	
			6 V		17	34		51		43	
t_t		Y	2 V		45	210		315		265	ns
			4.5 V		17	42		63		53	
			6 V		13	36		53		45	

operating characteristics, $T_A = 25^\circ\text{C}$

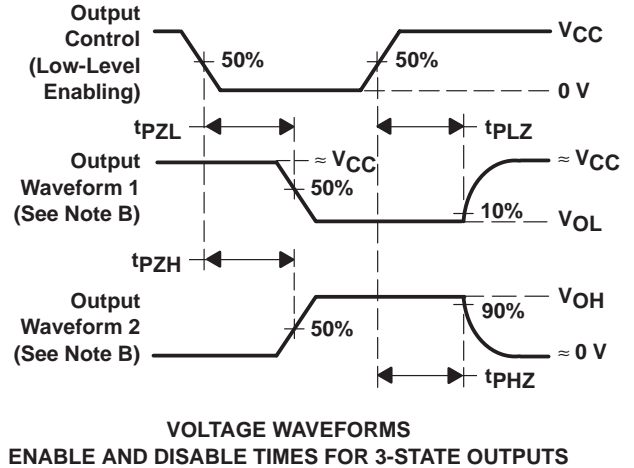
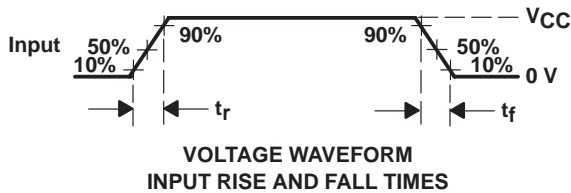
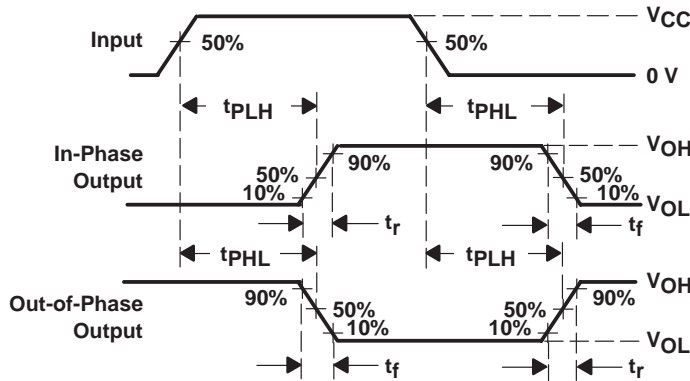
PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{pd} Power dissipation capacitance per buffer/driver	No load	35	pF



PARAMETER MEASUREMENT INFORMATION



PARAMETER	R_L	C_L	S1	S2
t_{en}	1 k Ω	50 pF or 150 pF	Open	Closed
			Closed	Open
t_{dis}	1 k Ω	50 pF	Open	Closed
			Closed	Open
t_{pd} or t_t	—	50 pF or 150 pF	Open	Open



- NOTES:
- A. C_L includes probe and test-fixture capacitance.
 - B. 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.
 - C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
 - D. The outputs are measured one at a time with one input transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - F. t_{PZL} and t_{PZH} are the same as t_{en} .
 - G. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

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