

SN54AHC257, SN74AHC257 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS WITH 3-STATE OUTPUTS

SCLS349C – MAY 1996 – REVISED JULY 1998

- Operating Range 2-V to 5.5-V V_{CC}
- EPIC™ (Enhanced-Performance Implanted CMOS) Process
- Package Options Include Plastic Small-Outline (D), Shrink Small-Outline (DB), Thin Very Small-Outline (DGV), Thin Shrink Small-Outline (PW), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) DIPs

description

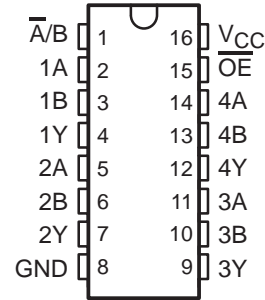
These quadruple 2-line to 1-line data selectors/multiplexers are designed for 2-V to 5.5-V V_{CC} operation.

The 'AHC257 devices are designed to multiplex signals from 4-bit data sources to 4-output data lines in bus-organized systems. The 3-state outputs do not load the data lines when the output-enable (\overline{OE}) input is at a high logic level.

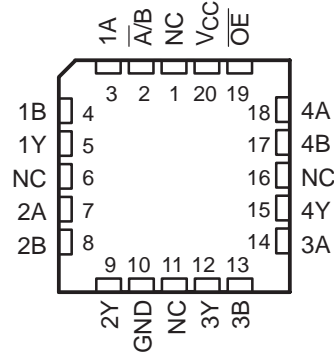
To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54AHC257 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74AHC257 is characterized for operation from -40°C to 85°C .

SN54AHC257 . . . J OR W PACKAGE
SN74AHC257 . . . D, DB, DGV, N, OR PW PACKAGE
(TOP VIEW)



SN54AHC257 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE

INPUTS				OUTPUT Y
\overline{OE}	$\overline{A/B}$	A	B	
H	X	X	X	Z
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H



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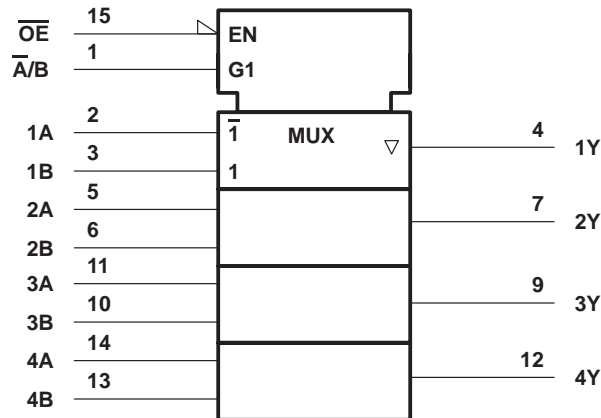
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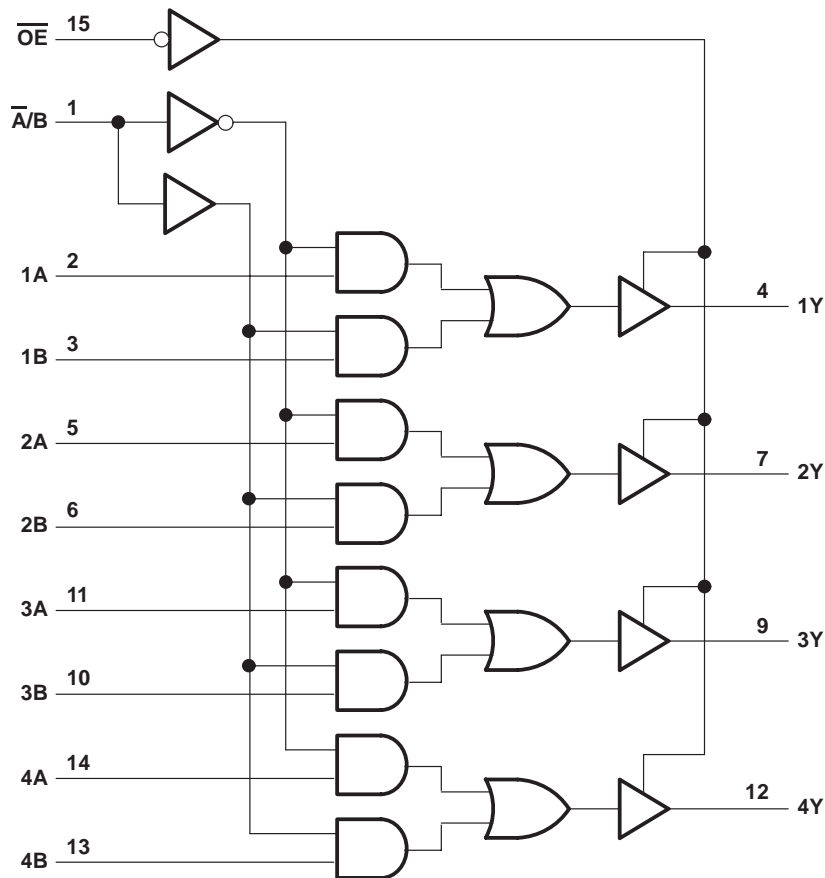
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logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the D, DB, DGV, J, N, PW, and W packages.

logic diagram (positive logic)



Pin numbers shown are for the D, DB, DGV, J, N, PW, and W packages.

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

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Output voltage range, V_O (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	–20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	±20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±25 mA
Continuous current through V_{CC} or GND	±50 mA
Package thermal impedance, θ_{JA} (see Note 2): D package	113°C/W
DB package	131°C/W
DGV package	180°C/W
N package	78°C/W
PW package	149°C/W
Storage temperature range, T_{stg}	–65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The package thermal impedance is calculated in accordance with JESD 51, except for through-hole packages, which use a trace length of zero.

recommended operating conditions (see Note 3)

		SN54AHC257		SN74AHC257		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	2	5.5	2	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 2$ V		1.5		V
		$V_{CC} = 3$ V		2.1		
		$V_{CC} = 5.5$ V		3.85		
V_{IL}	Low-level input voltage	$V_{CC} = 2$ V		0.5		V
		$V_{CC} = 3$ V		0.9		
		$V_{CC} = 5.5$ V		1.65		
V_I	Input voltage	0	5.5	0	5.5	V
V_O	Output voltage	0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 2$ V		–50		μ A
		$V_{CC} = 3.3$ V ± 0.3 V		–4		
		$V_{CC} = 5$ V ± 0.5 V		–8		
I_{OL}	Low-level output current	$V_{CC} = 2$ V		50		μ A
		$V_{CC} = 3.3$ V ± 0.3 V		4		
		$V_{CC} = 5$ V ± 0.5 V		8		
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 3.3$ V ± 0.3 V		100		ns/V
		$V_{CC} = 5$ V ± 0.5 V		20		
T_A	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			SN54AHC257		SN74AHC257		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	I _{OH} = -50 μA	2 V	1.9	2		1.9		1.9	V	
		3 V	2.9	3		2.9		2.9		
		4.5 V	4.4	4.5		4.4		4.4		
	I _{OH} = -4 mA	3 V	2.58			2.48		2.48		
	I _{OH} = -8 mA	4.5 V	3.94			3.8		3.8		
V _{OL}	I _{OL} = 50 μA	2 V			0.1		0.1	0.1	V	
		3 V			0.1		0.1	0.1		
		4.5 V			0.1		0.1	0.1		
	I _{OL} = 4 mA	3 V			0.36		0.5	0.44		
	I _{OL} = 8 mA	4.5 V			0.36		0.5	0.44		
I _I	V _I = V _{CC} or GND	5.5 V			±0.1		±1	±1	μA	
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			4		40	40	μA	
I _{OZ}	V _O = V _{CC} or GND	5.5 V			±0.25		±2.5	±2.5	μA	
C _i	V _I = V _{CC} or GND	5 V							pF	

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switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN54AHC257				UNIT	
				$T_A = 25^\circ\text{C}$			MIN		MAX
				MIN	TYP	MAX			
t_{PLH}^*	A or B	Y	$C_L = 15\text{ pF}$				ns		
t_{PHL}^*									
t_{PLH}^*	\bar{A}/B	Y	$C_L = 15\text{ pF}$				ns		
t_{PHL}^*									
t_{PZH}^*	\overline{OE}	Y	$C_L = 15\text{ pF}$				ns		
t_{PZL}^*									
t_{PHZ}^*	\overline{OE}	Y	$C_L = 15\text{ pF}$				ns		
t_{PLZ}^*									
t_{PLH}	A or B	Y	$C_L = 50\text{ pF}$				ns		
t_{PHL}									
t_{PLH}	\bar{A}/B	Y	$C_L = 50\text{ pF}$				ns		
t_{PHL}									
t_{PZH}	\overline{OE}	Y	$C_L = 50\text{ pF}$				ns		
t_{PZL}									
t_{PHZ}	\overline{OE}	Y	$C_L = 50\text{ pF}$				ns		
t_{PLZ}									

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN74AHC257				UNIT	
				$T_A = 25^\circ\text{C}$			MIN		MAX
				MIN	TYP	MAX			
t_{PLH}	A or B	Y	$C_L = 15\text{ pF}$				ns		
t_{PHL}									
t_{PLH}	\bar{A}/B	Y	$C_L = 15\text{ pF}$				ns		
t_{PHL}									
t_{PZH}	\overline{OE}	Y	$C_L = 15\text{ pF}$				ns		
t_{PZL}									
t_{PHZ}	\overline{OE}	Y	$C_L = 15\text{ pF}$				ns		
t_{PLZ}									
t_{PLH}	A or B	Y	$C_L = 50\text{ pF}$				ns		
t_{PHL}									
t_{PLH}	\bar{A}/B	Y	$C_L = 50\text{ pF}$				ns		
t_{PHL}									
t_{PZH}	\overline{OE}	Y	$C_L = 50\text{ pF}$				ns		
t_{PZL}									
t_{PHZ}	\overline{OE}	Y	$C_L = 50\text{ pF}$				ns		
t_{PLZ}									

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switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN54AHC257					UNIT
				$T_A = 25^\circ\text{C}$			MIN	MAX	
				MIN	TYP	MAX			
t_{PLH}^*	A or B	Y	$C_L = 15\text{ pF}$					ns	
t_{PHL}^*									
t_{PLH}^*	\bar{A}/B	Y	$C_L = 15\text{ pF}$					ns	
t_{PHL}^*									
t_{PZH}^*	\overline{OE}	Y	$C_L = 15\text{ pF}$					ns	
t_{PZL}^*									
t_{PHZ}^*	\overline{OE}	Y	$C_L = 15\text{ pF}$					ns	
t_{PLZ}^*									
t_{PLH}	A or B	Y	$C_L = 50\text{ pF}$					ns	
t_{PHL}									
t_{PLH}	\bar{A}/B	Y	$C_L = 50\text{ pF}$					ns	
t_{PHL}									
t_{PZH}	\overline{OE}	Y	$C_L = 50\text{ pF}$					ns	
t_{PZL}									
t_{PHZ}	\overline{OE}	Y	$C_L = 50\text{ pF}$					ns	
t_{PLZ}									

* On products compliant to MIL-PRF-38535, this parameter is not production tested.

switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	SN74AHC257					UNIT
				$T_A = 25^\circ\text{C}$			MIN	MAX	
				MIN	TYP	MAX			
t_{PLH}	A or B	Y	$C_L = 15\text{ pF}$					ns	
t_{PHL}									
t_{PLH}	\bar{A}/B	Y	$C_L = 15\text{ pF}$					ns	
t_{PHL}									
t_{PZH}	\overline{OE}	Y	$C_L = 15\text{ pF}$					ns	
t_{PZL}									
t_{PHZ}	\overline{OE}	Y	$C_L = 15\text{ pF}$					ns	
t_{PLZ}									
t_{PLH}	A or B	Y	$C_L = 50\text{ pF}$					ns	
t_{PHL}									
t_{PLH}	\bar{A}/B	Y	$C_L = 50\text{ pF}$					ns	
t_{PHL}									
t_{PZH}	\overline{OE}	Y	$C_L = 50\text{ pF}$					ns	
t_{PZL}									
t_{PHZ}	\overline{OE}	Y	$C_L = 50\text{ pF}$					ns	
t_{PLZ}									

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noise characteristics $V_{CC} = 5\text{ V}$, $C_L = 50\text{ pF}$, $T_A = 25^\circ\text{C}$ (see Note 4)

PARAMETER	SN74AHC257			UNIT
	MIN	TYP	MAX	
$V_{OL(P)}$ Quiet output, maximum dynamic V_{OL}				V
$V_{OL(V)}$ Quiet output, minimum dynamic V_{OL}				V
$V_{OH(V)}$ Quiet output, minimum dynamic V_{OH}				V
$V_{IH(D)}$ High-level dynamic input voltage				V
$V_{IL(D)}$ Low-level dynamic input voltage				V

NOTE 4: Characteristics are for surface-mount packages only.

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

PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{pd} Power dissipation capacitance	No load, $f = 1\text{ MHz}$		pF

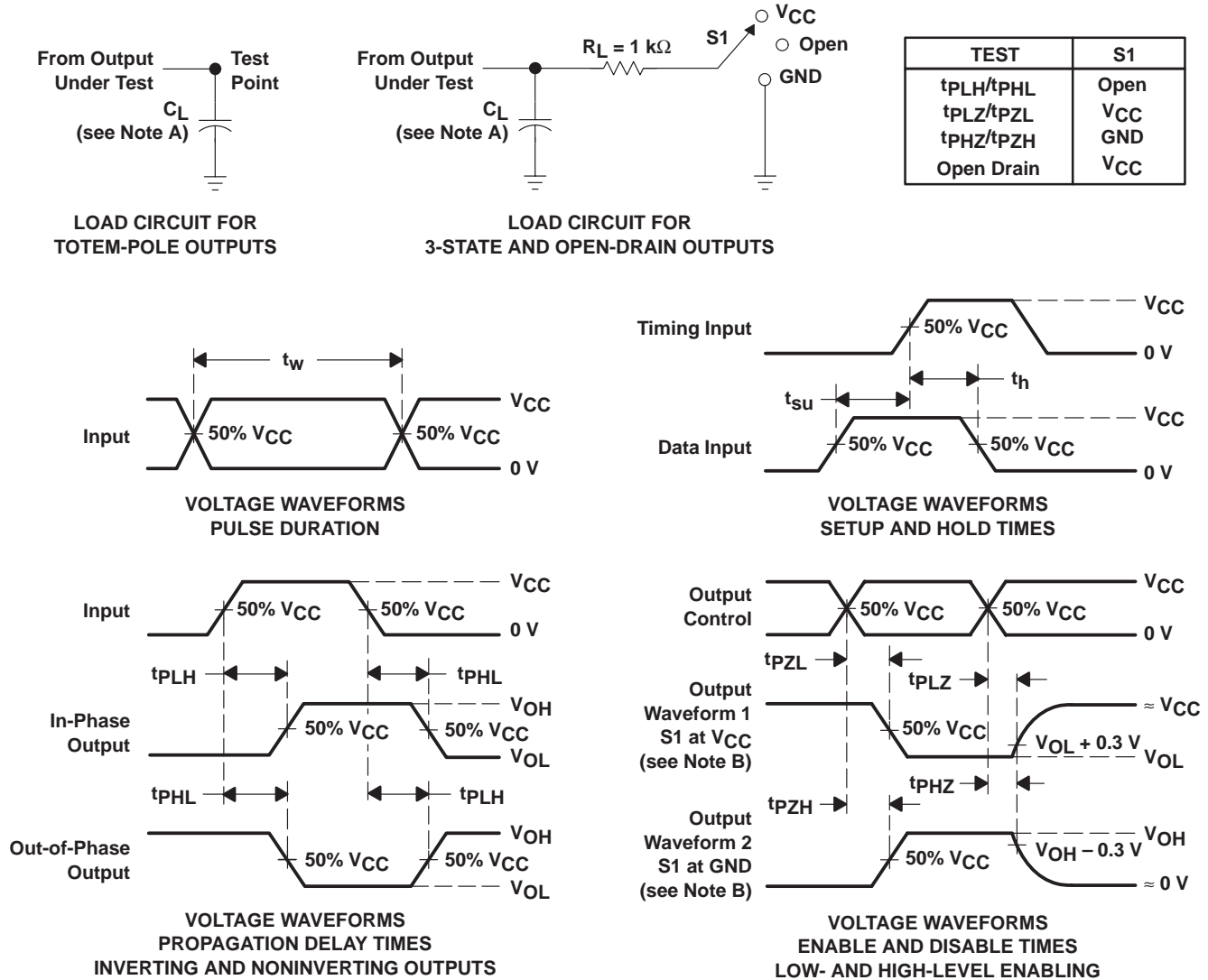
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PARAMETER MEASUREMENT INFORMATION



- NOTES:
- C_L includes probe and jig capacitance.
 - 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.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
 - The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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