

# Data selector/multiplexer

# 74ALS257/74ALS258

**74ALS257** Quad 2-input data selector, non-inverting (3-State)

**74ALS258** Quad 2-input data selector, inverting (3-State)

## DESCRIPTION

The 74ALS257 is a quad 2-input multiplexer which selects 4 bits of data from one of two sources under the control of a common select input (S). The output enable input ( $\overline{OE}$ ) is active when Low. When  $\overline{OE}$  is High, all of the outputs ( $Y_n$ ) are forced to a High impedance state (3-State) regardless of all other input conditions.

Moving data from two registers to a common output bus is a typical use of the 74ALS257. The state of the select input determines the particular register from which data comes.

The device is the logic implementation of 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the select input. The 74ALS258 is similar but has inverting outputs ( $\overline{Y}_n$ ).

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74ALS257	7.0ns	7mA
74ALS258	7.0ns	7mA

## ORDERING INFORMATION

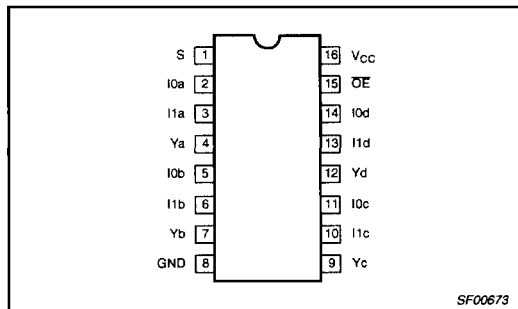
DESCRIPTION	ORDER CODE	DRAWING NUMBER
	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^\circ C \text{ to } +70^\circ C$	
16-pin plastic DIP	74ALS257N, 74ALS258	SOT38-4
16-pin plastic SO	74ALS257D, 74ALS258D	SOT109-1
16-pin plastic SSOP Type II	74ALS257DB, 74ALS258DB	SOT338-1

## INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

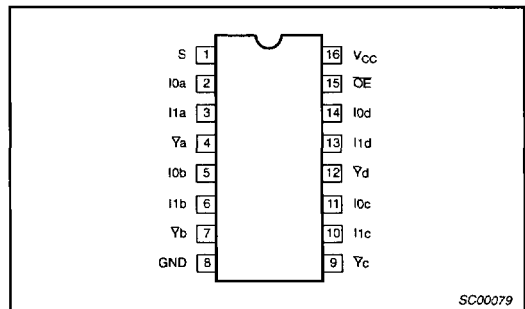
PINS	DESCRIPTION	74ALS (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
I <sub>1a</sub> , I <sub>1b</sub> , I <sub>1c</sub> , I <sub>1d</sub>	Data inputs	1.0/1.0	20 $\mu$ A/0.1mA
S	Select input	1.0/1.0	20 $\mu$ A/0.1mA
$\overline{OE}$	Enable input	1.0/1.0	20 $\mu$ A/0.1mA
Y <sub>a</sub> – Y <sub>d</sub> , $\overline{Y}_a$ – $\overline{Y}_d$	Data outputs	20/240	0.4mA/24mA

NOTE: One (1.0) ALS unit load is defined as: 20 $\mu$ A in the High state and 0.1mA in the Low state.

## PIN CONFIGURATION – 74ALS257



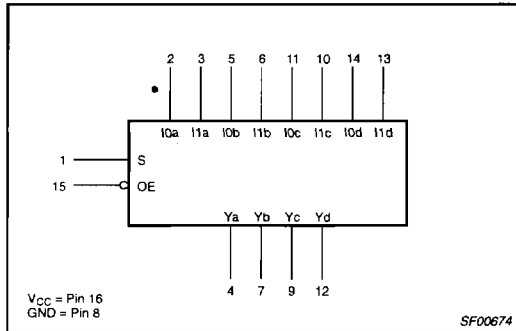
## PIN CONFIGURATION – 74ALS258



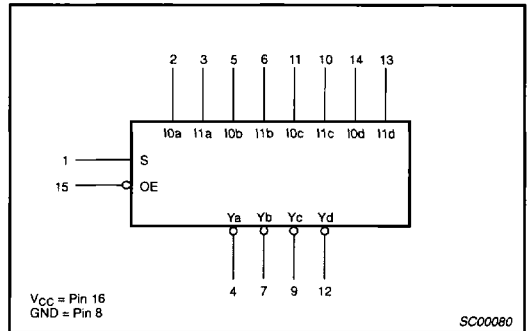
# Data selector/multiplexer

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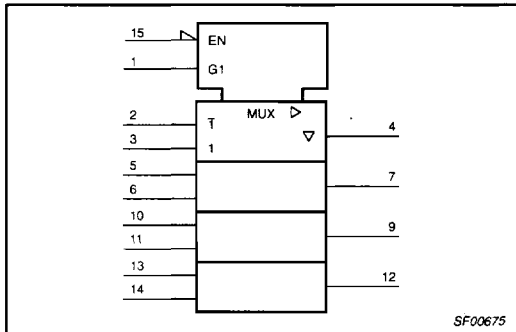
**LOGIC SYMBOL – 74ALS257**



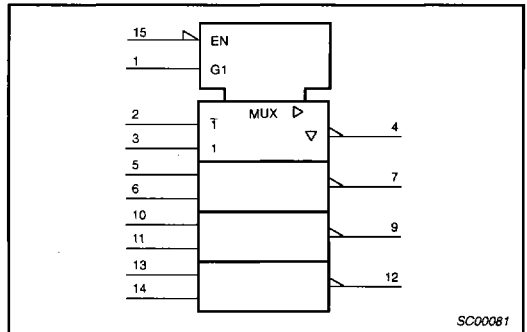
**LOGIC SYMBOL – 74ALS258**



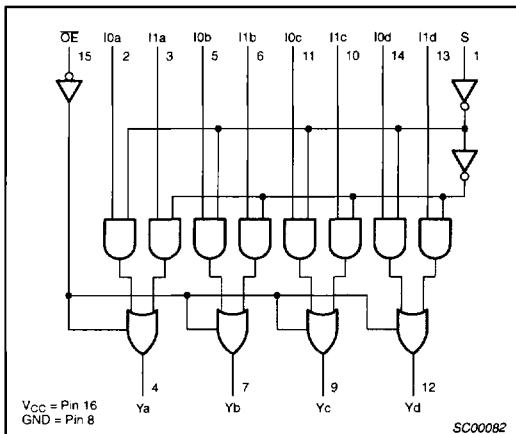
**IEC/IEEE SYMBOL – 74ALS257**



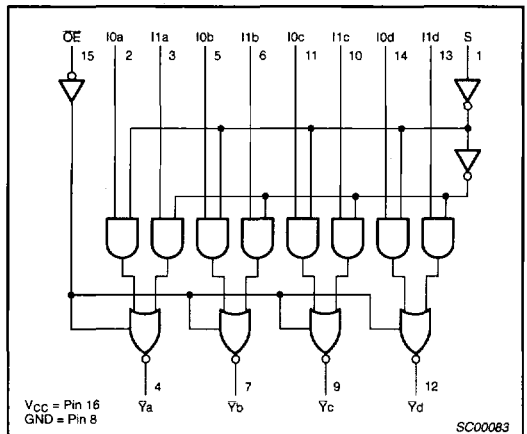
**IEC/IEEE SYMBOL – 74ALS258**



**LOGIC DIAGRAM – 74ALS257**



**LOGIC DIAGRAM – 74ALS258**



## Data selector/multiplexer

## 74ALS257/74ALS258

FUNCTION TABLE – 74ALS257

INPUTS				OUTPUT
OE	S	I0n	I1n	Yn
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

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

FUNCTION TABLE – 74ALS258

INPUTS				OUTPUT
OE	S	I0n	I1n	Yn
H	X	X	X	Z
L	L	L	X	H
L	L	H	X	L
L	H	X	L	H
L	H	X	H	L

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

## ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limit set forth in this table may impair the useful life of the device.  
 Unless otherwise noted these limits are over the operating free air temperature range.)

SYMBOL	PARAMETER	RATING	UNIT
V <sub>CC</sub>	Supply voltage	-0.5 to +7.0	V
V <sub>IN</sub>	Input voltage	-0.5 to +7.0	V
I <sub>IN</sub>	Input current	-30 to +5	mA
V <sub>OUT</sub>	Voltage applied to output in High output state	-0.5 to V <sub>CC</sub>	V
I <sub>OUT</sub>	Current applied to output in Low output state	48	mA
T <sub>amb</sub>	Operating free-air temperature range	0 to +70	°C
T <sub>stg</sub>	Storage temperature range	-65 to +150	°C

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5.0	5.5	V
V <sub>IH</sub>	High-level input voltage	2.0			V
V <sub>IL</sub>	Low-level input voltage			0.8	V
I <sub>IK</sub>	Input clamp current			-18	mA
I <sub>OH</sub>	High-level output current			-2.6	mA
I <sub>OL</sub>	Low-level output current			24	mA
T <sub>amb</sub>	Operating free-air temperature range	0		+70	°C

## Data selector/multiplexer

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**DC ELECTRICAL CHARACTERISTICS**

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

SYMBOL	PARAMETER	TEST CONDITIONS <sup>1</sup>	LIMITS			UNIT	
			MIN	TYP <sup>2</sup>	MAX		
$V_{OH}$	High-level output voltage	$V_{CC} = \pm 10\%$ , $V_{IL} = \text{MAX}$ , $V_{IH} = \text{MIN}$	$I_{OH} = -0.4\text{mA}$	$V_{CC} - 2$		V	
			$I_{OH} = \text{MAX}$	2.4	3.2	V	
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN}$ , $V_{IL} = \text{MAX}$ , $V_{IH} = \text{MIN}$	$I_{OL} = 12\text{mA}$		0.25	0.40	V
			$I_{OL} = 24\text{mA}$		0.35	0.50	V
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}$ , $I_I = I_{IK}$		-0.73	-1.5	V	
$I_I$	Input current at maximum input voltage	$V_{CC} = \text{MAX}$ , $V_I = 7.0\text{V}$			0.1	mA	
$I_{IH}$	High-level input current	$V_{CC} = \text{MAX}$ , $V_I = 2.7\text{V}$			20	$\mu\text{A}$	
$I_{IL}$	Low-level input current	$V_{CC} = \text{MAX}$ , $V_I = 0.4\text{V}$			-0.1	mA	
$I_{OZH}$	Off-state output current, High-level voltage applied	$V_{CC} = \text{MAX}$ , $V_I = 2.7\text{V}$			20	$\mu\text{A}$	
$I_{OZL}$	Off-state output current, Low-level voltage applied	$V_{CC} = \text{MAX}$ , $V_I = 0.4\text{V}$			-20	$\mu\text{A}$	
$I_O$	Output current <sup>3</sup>	$V_{CC} = \text{MAX}$ , $V_O = 2.25\text{V}$	-30		-112	mA	
$I_{CC}$	Supply current (total)	74ALS257	$I_{CCH}$	$V_{CC} = \text{MAX}$	3	6	mA
			$I_{CCL}$		8	12	mA
			$I_{CCZ}$		9	14	mA
		74ALS258	$I_{CCH}$		2.5	4	mA
			$I_{CCL}$		7	11	mA
			$I_{CCZ}$		9	13	mA

**NOTES:**

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at  $V_{CC} = 5\text{V}$ ,  $T_{amb} = 25^\circ\text{C}$ .
- The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

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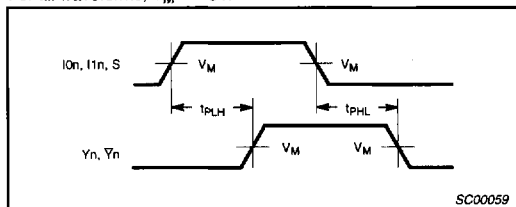
74ALS257/74ALS258

AC ELECTRICAL CHARACTERISTICS

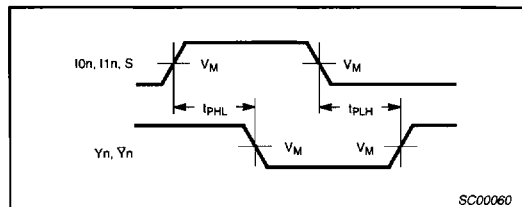
SYMBOL	PARAMETER	TEST CONDITION	LIMITS		UNIT
			$T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$ $V_{CC} = +5.0V \pm 10\%$ $C_L = 50pF, R_L = 500\Omega$		
			MIN	MAX	
$t_{PLH}$ $t_{PHL}$	Propagation delay $I0n$ or $I1n$ to $Yn$	Waveform 1	2.0	9.0	ns
			2.0	9.0	
$t_{PLH}$ $t_{PHL}$	Propagation delay $S$ to $Yn$	Waveform 1, 2	4.0	12.0	ns
			4.0	12.0	
$t_{PZH}$ $t_{PZL}$	Output enable time $OE$ to $Yn$	Waveform 3	3.0	11.0	ns
		Waveform 4	4.0	12.0	
$t_{PHZ}$ $t_{PLZ}$	Output disable time $OE$ to $Yn$	Waveform 3	2.0	9.0	ns
		Waveform 4	5.0	12.0	
$t_{PLH}$ $t_{PHL}$	Propagation delay $I0n$ or $I1n$ to $Yn$	Waveform 1	2.0	8.0	ns
			2.0	8.0	
$t_{PLH}$ $t_{PHL}$	Propagation delay $S$ to $Yn$	Waveform 1, 2	4.0	12.0	ns
			4.0	12.0	
$t_{PZH}$ $t_{PZL}$	Output enable time $OE$ to $Yn$	Waveform 3	3.0	11.0	ns
		Waveform 4	4.0	12.0	
$t_{PHZ}$ $t_{PLZ}$	Output disable time $OE$ to $Yn$	Waveform 3	2.0	9.0	ns
		Waveform 4	5.0	12.0	

AC WAVEFORMS

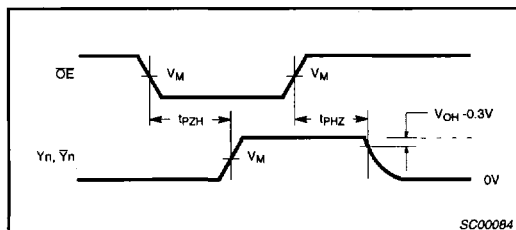
For all waveforms,  $V_M = 1.3V$ .



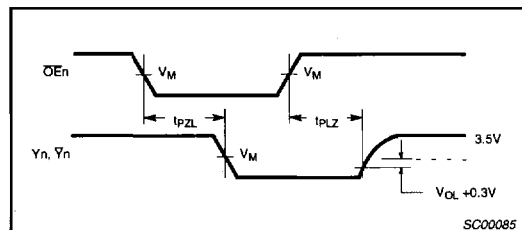
Waveform 1. Propagation Delay for Data and Select to Outputs



Waveform 2. Propagation Delay for Data and Select to Outputs



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



Waveform 4. 3-State Output Enable Time to Low Level and Output Disable Time from Low Level

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TEST CIRCUIT AND WAVEFORMS

**Test Circuit for 3-State Outputs**

SWITCH POSITION	
TEST	SWITCH
$t_{PLZ}$ , $t_{PZL}$	closed
All other	open

**DEFINITIONS:**  
 $R_L$  = Load resistor; see AC electrical characteristics for value.  
 $C_L$  = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.  
 $R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of pulse generators.

**Input Pulse Definition**

INPUT PULSE REQUIREMENTS						
Family	Amplitude	$V_M$	Rep.Rate	$t_w$	$t_{TLH}$	$t_{THL}$
74ALS	3.5V	1.3V	1MHz	500ns	2.0ns	2.0ns

SC00072