

# DATA SHEET

## **74LVC257A**

Quad 2-input multiplexer with 5 Volt  
tolerant inputs/outputs (3-State)

Product specification  
Superceded data of 1997 Sep 26  
IC24 Data Handbook

1998 Jul 29

# Quad 2-input multiplexer with 5 Volt tolerant inputs/outputs (3-State)

## 74LVC257A

### FEATURES

- Wide supply voltage range of 1.2 to 3.6 V
- In accordance with JEDEC standard no. 8-1A
- CMOS lower power consumption
- Direct interface with TTL levels
- Output drive capability 50  $\Omega$  transmission lines at 85°C
- 5 Volt tolerant inputs/outputs, for interfacing with 5 Volt logic

### DESCRIPTION

The 74LVC257A is a high-performance, low-power, low-voltage, Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

Inputs can be driven from either 3.3V or 5.0V devices. In 3-State operation, outputs can handle 5V. This feature allows the use of these devices as translators in a mixed 3.3V/5V environment.

The 74LVC257A is a quad 2-input multiplexer with 3-state outputs, which select 4 bits of data from two sources and are controlled by a common data select input (S). The data inputs from source 0 (1<sub>0</sub> to 4<sub>0</sub>) are selected when input S is LOW and the data inputs from source 1 (1<sub>1</sub> to 4<sub>1</sub>) are selected when S is HIGH. Data appears at the outputs (1Y to 4Y) in true (non-inverting) form from the selected inputs. The 74LVC257A is the logic implementation of a 4-pole, 2-position switch, where the position of the switch is determined by the logic levels applied to S. The outputs are forced to a high impedance OFF-state when OE is HIGH.

### QUICK REFERENCE DATA

GND = 0 V; T<sub>amb</sub> = 25°C; t<sub>r</sub> = t<sub>f</sub> ≤ 2.5 ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t <sub>PHL</sub> /t <sub>PLH</sub>	Propagation delay n <sub>0</sub> , n <sub>1</sub> to nY S to nY	C <sub>L</sub> = 50 pF; V <sub>CC</sub> = 3.3 V	3.9 3.5	ns
C <sub>I</sub>	Input capacitance		5.0	pF
C <sub>PD</sub>	Power dissipation capacitance per channel	V <sub>I</sub> = GND to V <sub>CC</sub> <sup>1</sup>	30	pF

#### NOTE:

1. C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in  $\mu$ W)

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

f<sub>i</sub> = input frequency in MHz; C<sub>L</sub> = output load capacitance in pF;

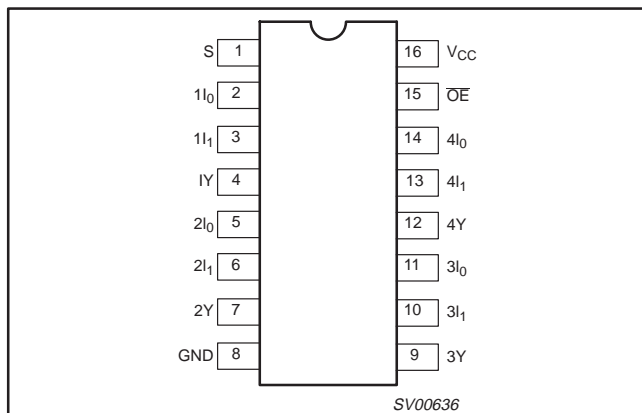
f<sub>o</sub> = output frequency in MHz; V<sub>CC</sub> = supply voltage in V;

$\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

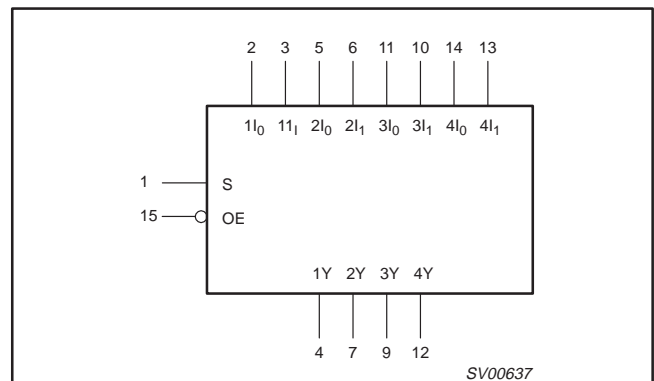
### ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	PKG. DWG. #
16-Pin Plastic SO	-40°C to +85°C	74LVC257A D	74LVC257A D	SOT109-1
16-Pin Plastic SSOP Type II	-40°C to +85°C	74LVC257A DB	74LVC257A DB	SOT338-1
16-Pin Plastic TSSOP Type I	-40°C to +85°C	74LVC257A PW	74LVC257APW DH	SOT403-1

### PIN CONFIGURATION



### LOGIC SYMBOL



# Quad 2-input multiplexer with 5 Volt tolerant inputs/outputs (3-State)

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## PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
1	S	Common data select input
2, 5, 11, 14	1I <sub>0</sub> to 4I <sub>0</sub>	Data inputs from source 0
3, 6, 10, 13	1I <sub>1</sub> to 4I <sub>1</sub>	Data outputs from source 1
4, 7, 9, 12	1Y to 4Y	3-State multiplexer outputs
8	GND	Ground (0 V)
15	OE	3-State output enable input (active LOW)
16	V <sub>CC</sub>	Positive supply voltage

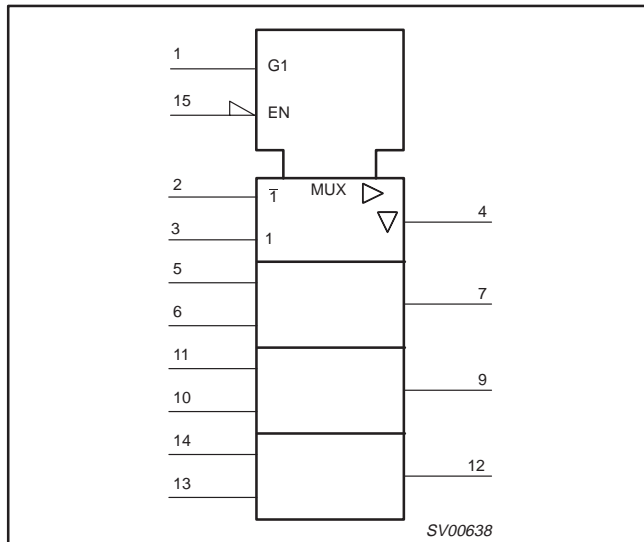
## FUNCTION TABLE

INPUTS				OUTPUTS
OE	S	nI <sub>0</sub>	nI <sub>1</sub>	nY
H	X	X	X	Z
L	H	X	L	L
L	H	X	H	H
L	L	L	X	L
L	L	H	X	H

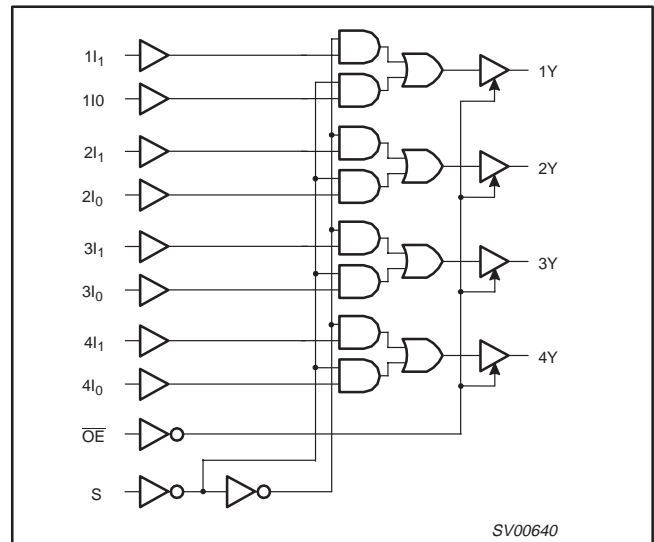
### NOTES:

- H = HIGH voltage level
- L = LOW voltage level
- X = don't care
- Z = high impedance OFF-state

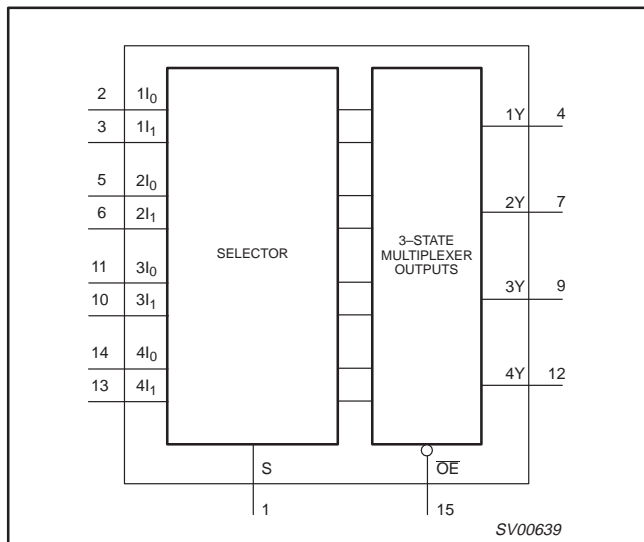
## LOGIC SYMBOL (IEEE/IEC)



## LOGIC DIAGRAM



## FUNCTIONAL DIAGRAM



# Quad 2-input multiplexer with 5 Volt tolerant inputs/outputs (3-State)

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## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	LIMITS		UNIT
			MIN	MAX	
$V_{CC}$	DC supply voltage (for max. speed performance)		2.7	3.6	V
	DC supply voltage (for low-voltage applications)		1.2	3.6	
$V_I$	DC input voltage range		0	5.5	V
$V_O$	DC input voltage range; output HIGH or LOW state		0	$V_{CC}$	V
	DC output voltage range; output 3-State		0	5.5	
$T_{amb}$	Operating free-air temperature range		-40	+85	°C
$t_p, t_f$	Input rise and fall times	$V_{CC} = 1.2$ to $2.7V$	0	20	ns/V
		$V_{CC} = 2.7$ to $3.6V$	0	10	

## ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

In accordance with the Absolute Maximum Rating System (IEC 134); Voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
$V_{CC}$	DC supply voltage		-0.5 to +6.5	V
$I_{IK}$	DC input diode current	$V_I < 0$	-50	mA
$V_I$	DC input voltage	Note 2	-0.5 to +5.5	V
$I_{OK}$	DC output diode current	$V_O > V_{CC}$ or $V_O < 0$	± 50	mA
$V_O$	DC output voltage; output HIGH or LOW	Note 2	-0.5 to $V_{CC} + 0.5$	V
	DC output voltage; output 3-State	Note 2	-0.5 to 6.5	
$I_O$	DC output source or sink current	$V_O = 0$ to $V_{CC}$	± 50	mA
$I_{GND}, I_{CC}$	DC $V_{CC}$ or GND current		± 100	mA
$T_{stg}$	Storage temperature range		-65 to +150	°C
$P_{TOT}$	Power dissipation per package – plastic mini-pack (SO) – plastic shrink mini-pack (SSOP and TSSOP)	above +70°C derate linearly with 8 mW/K	500	mW
		above +60°C derate linearly with 5.5 mW/K	500	

### NOTES:

- Stresses beyond those listed 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.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

# Quad 2-input multiplexer with 5 Volt tolerant inputs/outputs (3-State)

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## DC ELECTRICAL CHARACTERISTICS

Over recommended operating conditions voltages are referenced to GND (ground = 0V)

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT
			Temp = -40°C to +85°C			
			MIN	TYP <sup>1</sup>	MAX	
V <sub>IH</sub>	HIGH level Input voltage	V <sub>CC</sub> = 1.2V	V <sub>CC</sub>			V
		V <sub>CC</sub> = 2.7 to 3.6V	2.0			
V <sub>IL</sub>	LOW level Input voltage	V <sub>CC</sub> = 1.2V			GND	V
		V <sub>CC</sub> = 2.7 to 3.6V			0.8	
V <sub>OH</sub>	HIGH level output voltage	V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = -12mA	V <sub>CC</sub> - 0.5			V
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = -100μA	V <sub>CC</sub> - 0.2	V <sub>CC</sub>		
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = -18mA	V <sub>CC</sub> - 0.6			
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = -24mA	V <sub>CC</sub> - 0.8			
V <sub>OL</sub>	LOW level output voltage	V <sub>CC</sub> = 2.7V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 12mA			0.40	V
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100μA		GND	0.20	
		V <sub>CC</sub> = 3.0V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 24mA			0.55	
I <sub>I</sub>	Input leakage current	V <sub>CC</sub> = 3.6V; V <sub>I</sub> = 5.5V or GND		± 0.1	± 5	μA
I <sub>OZ</sub>	3-State output OFF-state current	V <sub>CC</sub> = 3.6V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND		0.1	± 5	μA
I <sub>OFF</sub>	Power off leakage current	V <sub>CC</sub> = 0.0V; V <sub>I</sub> or V <sub>O</sub> = 5.5V		0.1	± 10	μA
I <sub>CC</sub>	Quiescent supply current	V <sub>CC</sub> = 3.6V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0		0.1	10	μA
ΔI <sub>CC</sub>	Additional quiescent supply current per input pin	V <sub>CC</sub> = 2.7V to 3.6V; V <sub>I</sub> = V <sub>CC</sub> - 0.6V; I <sub>O</sub> = 0		5	500	μA

### NOTES:

1. All typical values are at V<sub>CC</sub> = 3.3V and T<sub>amb</sub> = 25°C.

## AC CHARACTERISTICS

GND = 0 V; t<sub>r</sub> = t<sub>f</sub> ≤ 2.5 ns; C<sub>L</sub> = 50 pF; R<sub>L</sub> = 500Ω; T<sub>amb</sub> = -40°C to +85°C

SYMBOL	PARAMETER	WAVEFORM	LIMITS							UNIT
			V <sub>CC</sub> = 3.3V ± 0.3V			V <sub>CC</sub> = 2.7V			V <sub>CC</sub> = 1.2V	
			MIN	TYP <sup>1</sup>	MAX	MIN	TYP <sup>1</sup>	MAX	TYP	
t <sub>PHL</sub> /t <sub>PLH</sub>	Propagation delay n <sub>0</sub> to n <sub>Y</sub> n <sub>1</sub> to n <sub>Y</sub>	Figures 1, 3	1.5	3.9	5.1	1.5	3.3	6.1	11	ns
t <sub>PHL</sub> /t <sub>PLH</sub>	Propagation delay S to n <sub>Y</sub>	Figures 1, 3	1.5	3.5	6.4	1.5	4.3	7.5	14	ns
t <sub>PZH</sub> /t <sub>PZL</sub>	3-state output enable time OE to n <sub>Y</sub>	Figures 2, 3	1.5	3.7	6.5	1.5	4.6	7.5	15	ns
t <sub>PHZ</sub> /t <sub>PLZ</sub>	3-state output disable time OE to n <sub>Y</sub>	Figures 2, 3	1.5	3.2	5.2	1.5	3.5	6.2	12	ns

### NOTE:

1. These typical values are at V<sub>CC</sub> = 3.3V and T<sub>amb</sub> = 25°C.

# Quad 2-input multiplexer with 5 Volt tolerant inputs/outputs (3-State)

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### AC WAVEFORMS

$V_M = 0.5 \times V_{CC}$  at  $V_{CC} < 2.7\text{ V}$   
 $V_M = 1.5\text{ V}$  at  $V_{CC} \geq 2.7\text{ V}$   
 $V_X = V_{OL} + 0.3\text{ V}$  at  $V_{CC} \geq 2.7\text{ V}$   
 $V_X = V_{OL} + 0.1 \times V_{CC}$  at  $V_{CC} < 2.7\text{ V}$   
 $V_Y = V_{OH} - 0.3\text{ V}$  at  $V_{CC} \geq 2.7\text{ V}$   
 $V_Y = V_{OH} - 0.1 \times V_{CC}$  at  $V_{CC} < 2.7\text{ V}$   
 $V_{OL}$  and  $V_{OH}$  are the typical output voltage drop that occur with the output load.

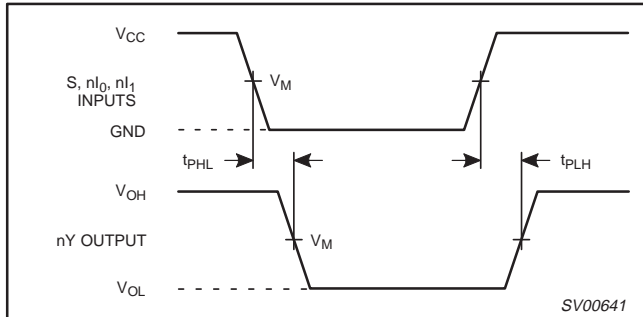


Figure 1. Input (S, nI<sub>0</sub>, nI<sub>1</sub>) to output (nY) propagation delays.

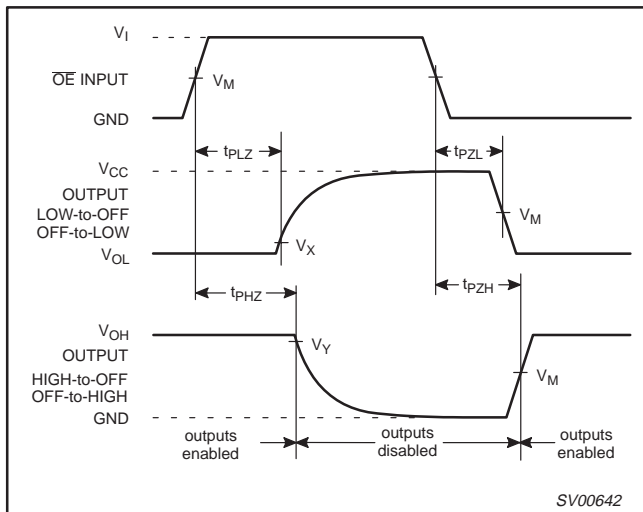


Figure 2. 3-state enable and disable times.

### TEST CIRCUIT

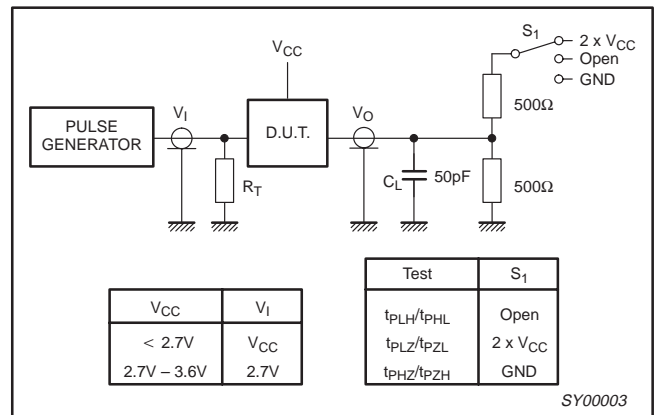


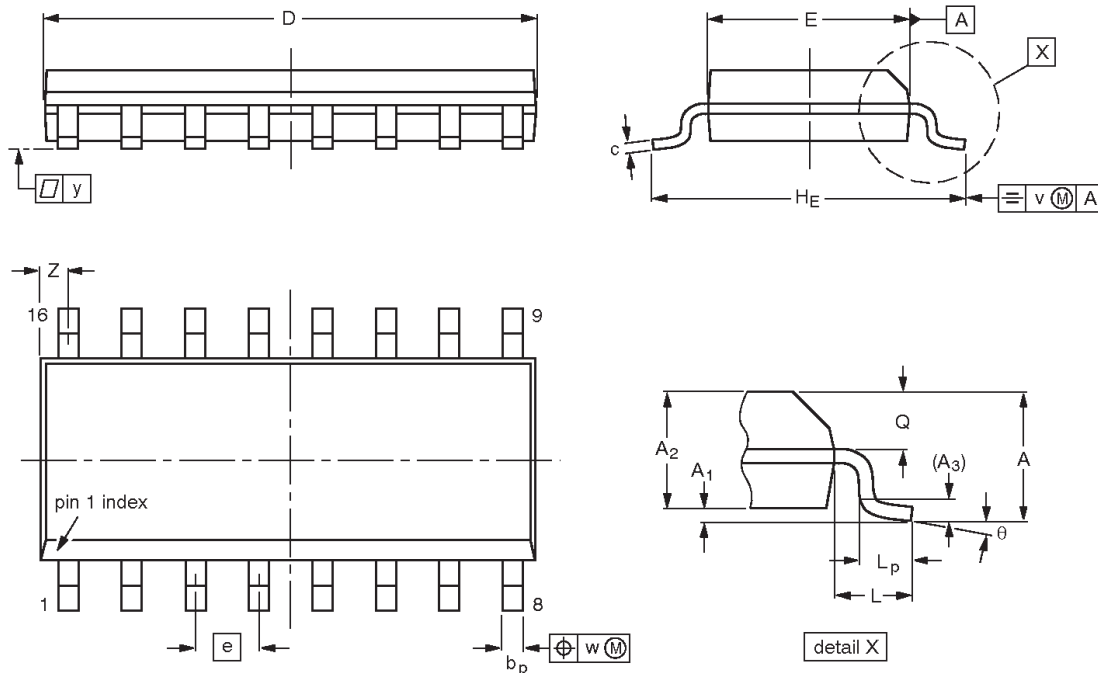
Figure 3. Load circuitry for switching times.

# Quad 2-input multiplexer with 5 Volt tolerant inputs/outputs (3-State)

## 74LVC257A

**SO16: plastic small outline package; 16 leads; body width 3.9 mm**

**SOT109-1**



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

UNIT	A <sub>max.</sub>	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.39 0.38	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

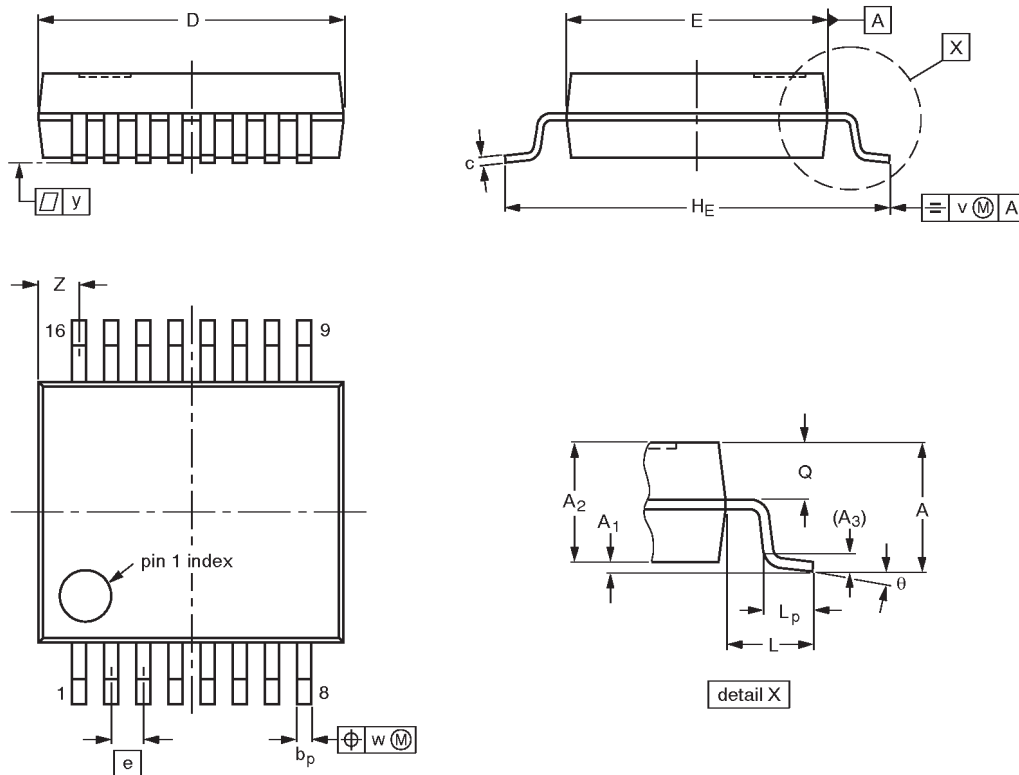
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT109-1	076E07S	MS-012AC				95-01-23 97-05-22

# Quad 2-input multiplexer with 5 Volt tolerant inputs/outputs (3-State)

74LVC257A

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2.0	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.00 0.55	8° 0°

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT338-1		MO-150AC				94-01-14- 95-02-04

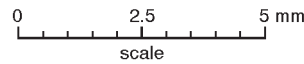
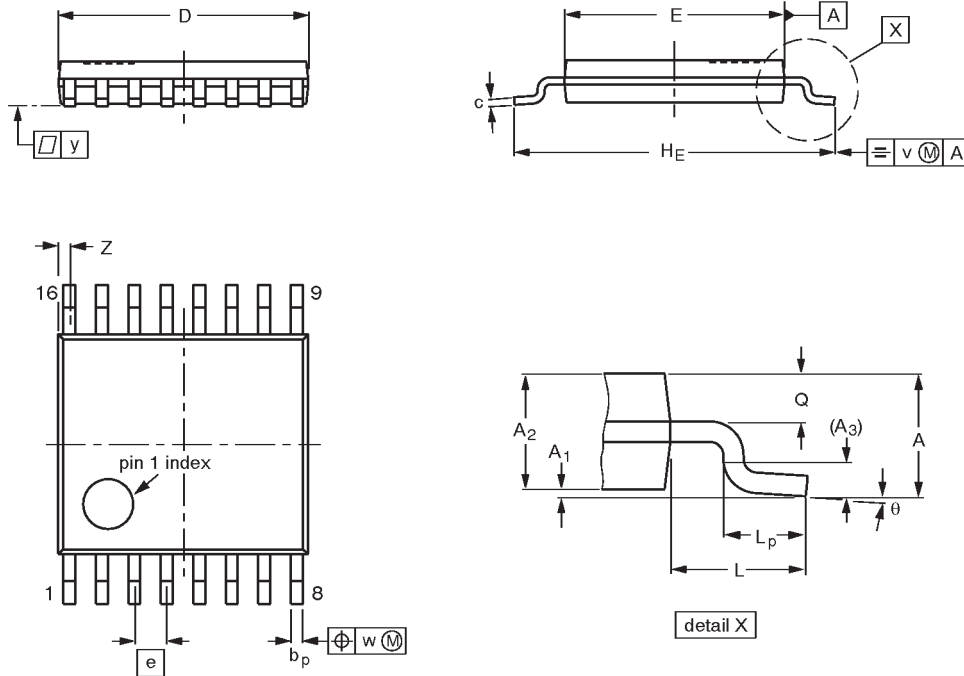


# Quad 2-input multiplexer with 5 Volt tolerant inputs/outputs (3-State)

## 74LVC257A

**TSSOP16:** plastic thin shrink small outline package; 16 leads; body width 4.4 mm

**SOT403-1**



**DIMENSIONS (mm are the original dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT403-1		MO-153				94-07-12 95-04-04

# Quad 2-input multiplexer with 5 Volt tolerant inputs/outputs (3-State)

74LVC257A

## Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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