

DATA SHEET

74LVC257A

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

Product specification
Superseded data of 1997 Sep 26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 Ω 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 (1₀ to 4₀) are selected when input S is LOW and the data inputs from source 1 (1₁ to 4₁) 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_{amb} = 25°C; t_r = t_f ≤ 2.5 ns

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t _{PHL} /t _{PLH}	Propagation delay n ₀ , n ₁ to nY S to nY	C _L = 50 pF; V _{CC} = 3.3 V	3.9 3.5	ns
C _I	Input capacitance		5.0	pF
C _{PD}	Power dissipation capacitance per channel	V _I = GND to V _{CC} ¹	30	pF

NOTE:

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW)

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

f_i = input frequency in MHz; C_L = output load capacitance in pF;

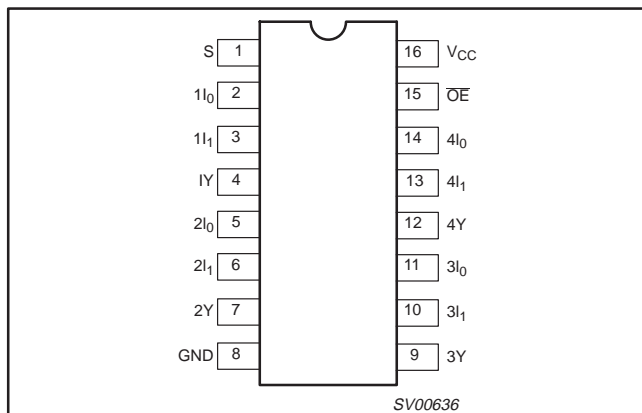
f_o = output frequency in MHz; V_{CC} = supply voltage in V;

∑ (C_L × V_{CC}² × f_o) = sum of the outputs.

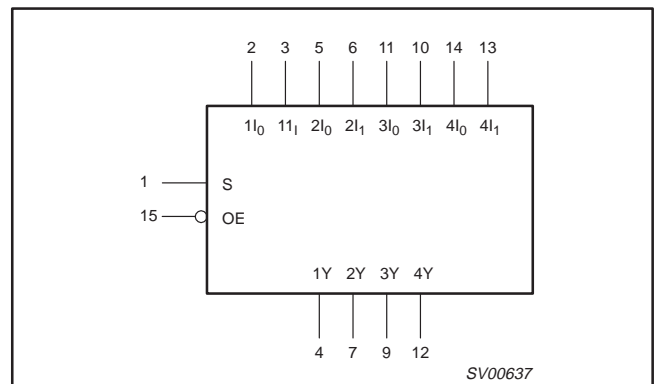
ORDERING INFORMATION

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



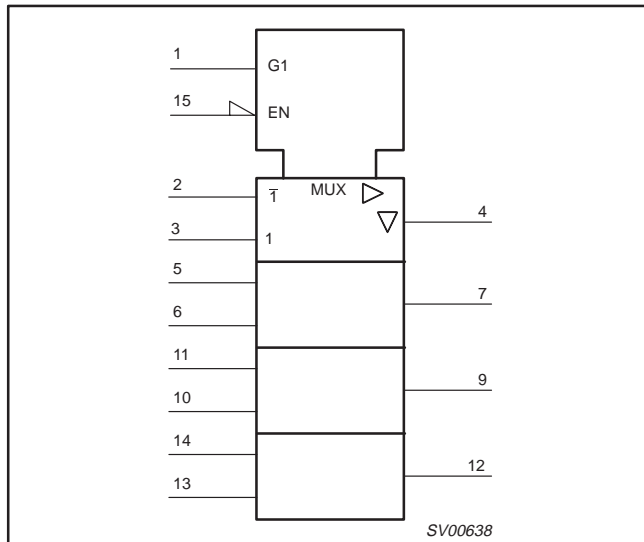
Quad 2-input multiplexer with 5 Volt tolerant inputs/outputs (3-State)

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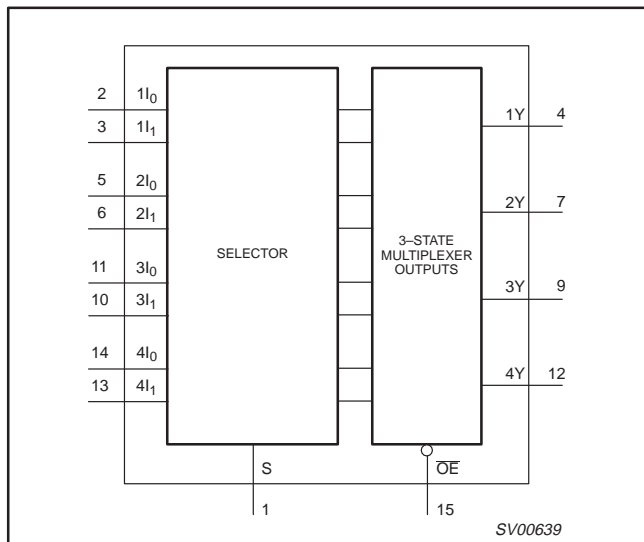
PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
1	S	Common data select input
2, 5, 11, 14	1I ₀ to 4I ₀	Data inputs from source 0
3, 6, 10, 13	1I ₁ to 4I ₁	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 _{CC}	Positive supply voltage

LOGIC SYMBOL (IEEE/IEC)



FUNCTIONAL DIAGRAM



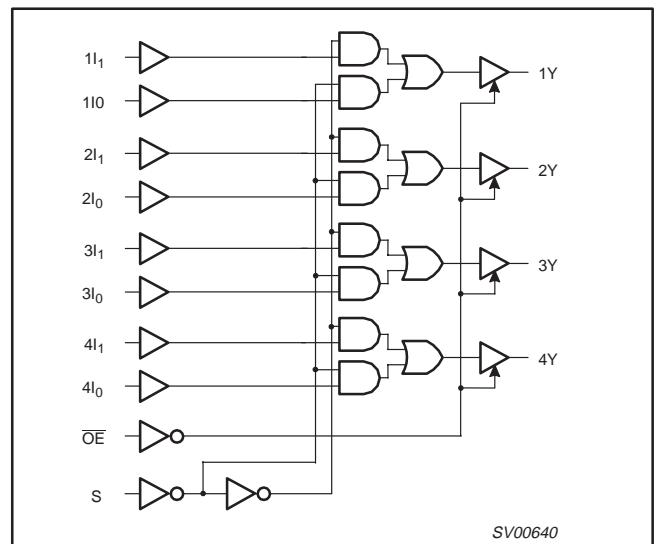
FUNCTION TABLE

INPUTS				OUTPUTS
OE	S	nI ₀	nI ₁	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 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 RATINGS¹

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 above +60°C derate linearly with 5.5 mW/K	500 500	mW

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.

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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 ¹	MAX	
V _{IH}	HIGH level Input voltage	V _{CC} = 1.2V	V _{CC}			V
		V _{CC} = 2.7 to 3.6V	2.0			
V _{IL}	LOW level Input voltage	V _{CC} = 1.2V			GND	V
		V _{CC} = 2.7 to 3.6V			0.8	
V _{OH}	HIGH level output voltage	V _{CC} = 2.7V; V _I = V _{IH} or V _{IL} ; I _O = -12mA	V _{CC} - 0.5			V
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = -100μA	V _{CC} - 0.2	V _{CC}		
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = -18mA	V _{CC} - 0.6			
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = -24mA	V _{CC} - 0.8			
V _{OL}	LOW level output voltage	V _{CC} = 2.7V; V _I = V _{IH} or V _{IL} ; I _O = 12mA			0.40	V
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = 100μA		GND	0.20	
		V _{CC} = 3.0V; V _I = V _{IH} or V _{IL} ; I _O = 24mA			0.55	
I _I	Input leakage current	V _{CC} = 3.6V; V _I = 5.5V or GND		±0.1	±5	μA
I _{OZ}	3-State output OFF-state current	V _{CC} = 3.6V; V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND		0.1	±5	μA
I _{OFF}	Power off leakage current	V _{CC} = 0.0V; V _I or V _O = 5.5V		0.1	±10	μA
I _{CC}	Quiescent supply current	V _{CC} = 3.6V; V _I = V _{CC} or GND; I _O = 0		0.1	10	μA
ΔI _{CC}	Additional quiescent supply current per input pin	V _{CC} = 2.7V to 3.6V; V _I = V _{CC} - 0.6V; I _O = 0		5	500	μA

NOTES:

1. All typical values are at V_{CC} = 3.3V and T_{amb} = 25°C.

AC CHARACTERISTICS

GND = 0 V; t_r = t_f ≤ 2.5 ns; C_L = 50 pF; R_L = 500Ω; T_{amb} = -40°C to +85°C

SYMBOL	PARAMETER	WAVEFORM	LIMITS							UNIT
			V _{CC} = 3.3V ±0.3V			V _{CC} = 2.7V			V _{CC} = 1.2V	
			MIN	TYP ¹	MAX	MIN	TYP ¹	MAX	TYP	
t _{PHL} /t _{PLH}	Propagation delay n ₀ to n _Y n ₁ to n _Y	Figures 1, 3	1.5	3.9	5.1	1.5	3.3	6.1	11	ns
t _{PHL} /t _{PLH}	Propagation delay S to n _Y	Figures 1, 3	1.5	3.5	6.4	1.5	4.3	7.5	14	ns
t _{PZH} /t _{PZL}	3-state output enable time OE to n _Y	Figures 2, 3	1.5	3.7	6.5	1.5	4.6	7.5	15	ns
t _{PHZ} /t _{PLZ}	3-state output disable time OE to n _Y	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_{CC} = 3.3V and T_{amb} = 25°C.

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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.

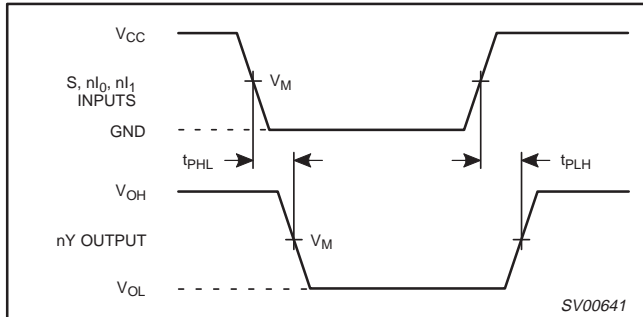


Figure 1. Input (S, nI₀, nI₁) to output (nY) propagation delays.

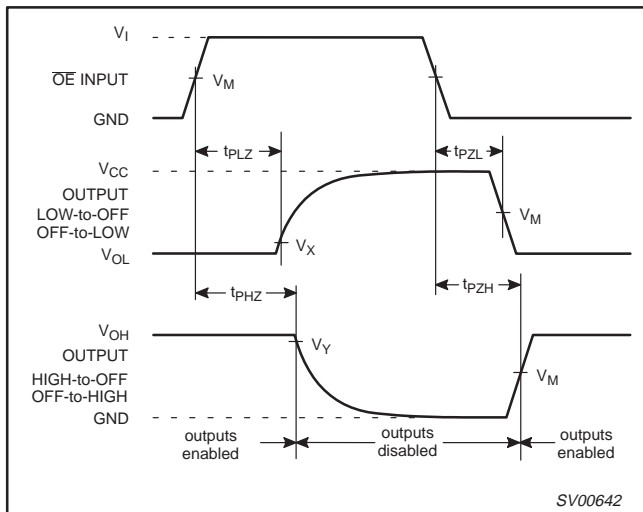


Figure 2. 3-state enable and disable times.

TEST CIRCUIT

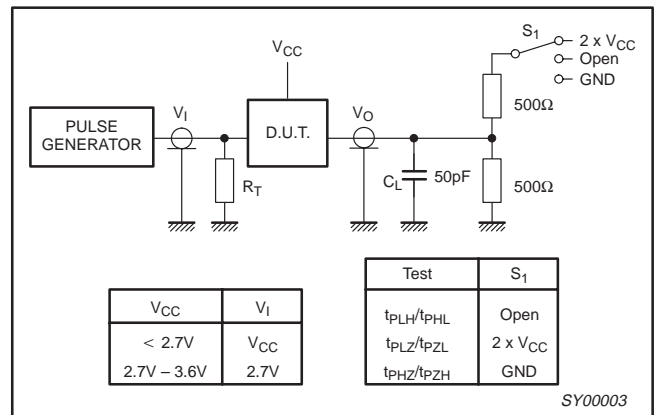


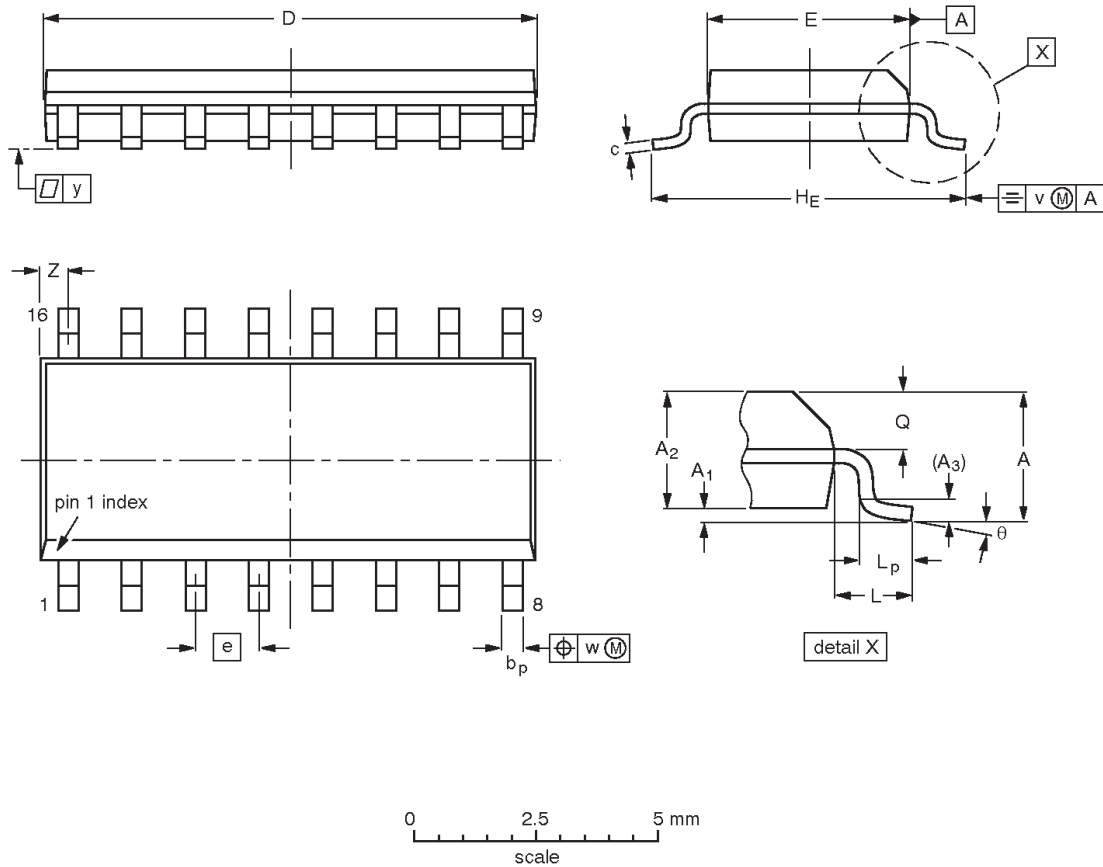
Figure 3. Load circuitry for switching times.

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

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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 max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	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.

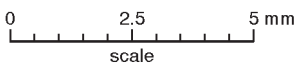
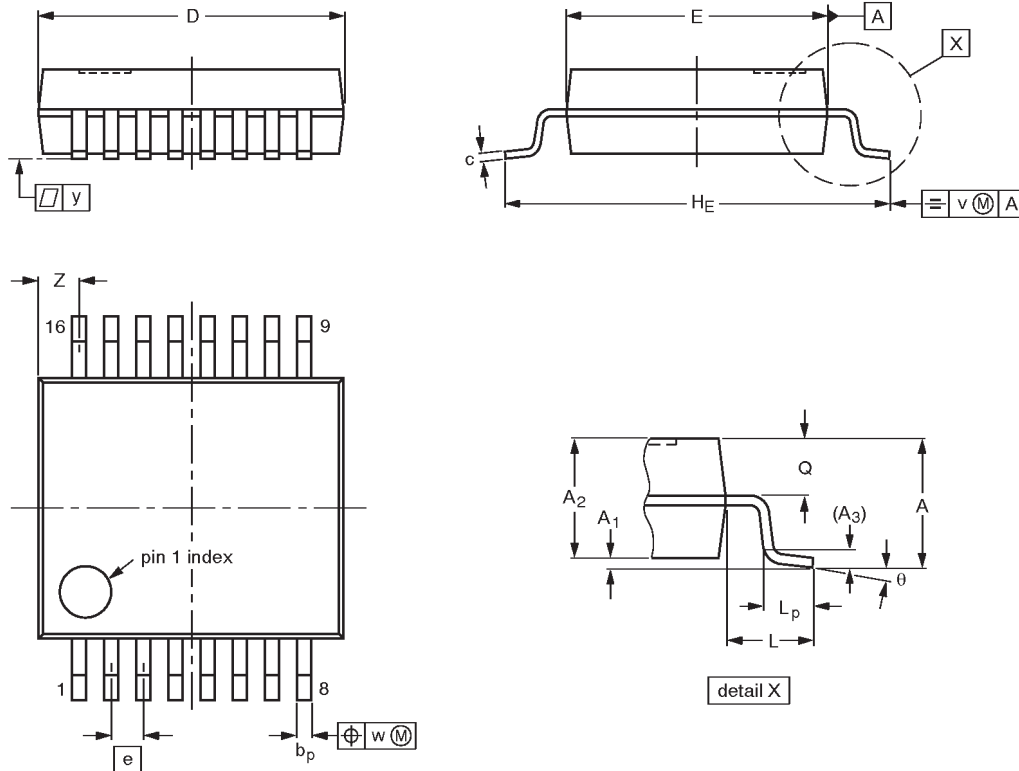
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT109-1	076E07S	MS-012AC				95-01-23 97-05-22

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

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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 ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽¹⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	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.

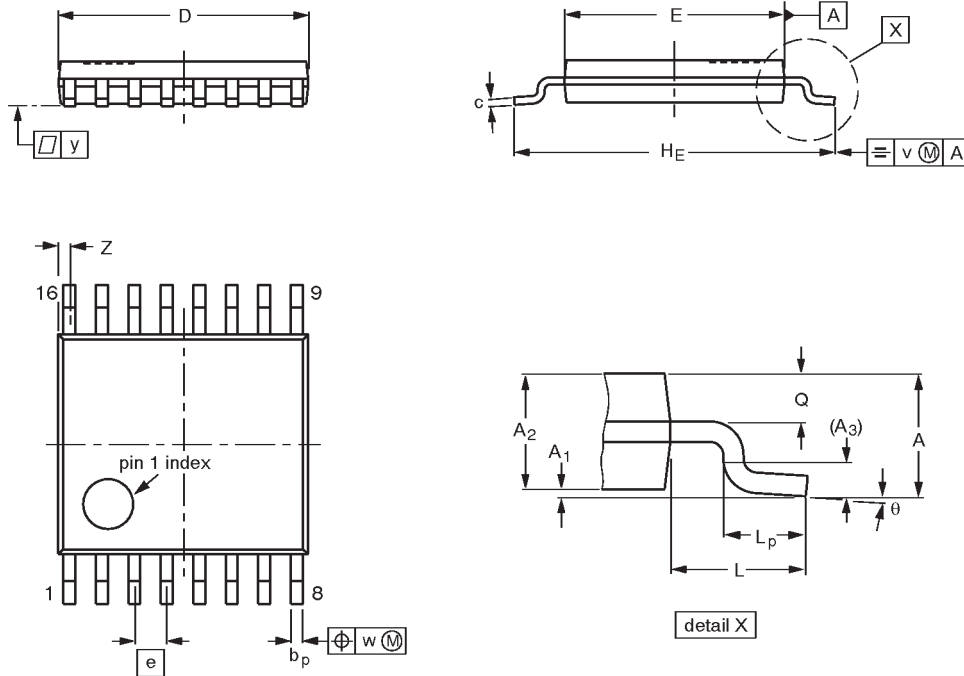
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT338-1		MO-150AC				94-01-14- 95-02-04

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

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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 ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽²⁾	e	H _E	L	L _p	Q	v	w	y	Z ⁽¹⁾	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)

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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.
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