

# DATA SHEET

**74ALS253**

Dual 4-input multiplexer (3-State)

Product specification  
IC05 Data Handbook

1991 Feb 08



# Dual 4-input multiplexer (3-State)

# 74ALS253

## FEATURES

- 3-State outputs for bus interface and multiplex operation
- Common select inputs
- Separate output enable inputs

## DESCRIPTION

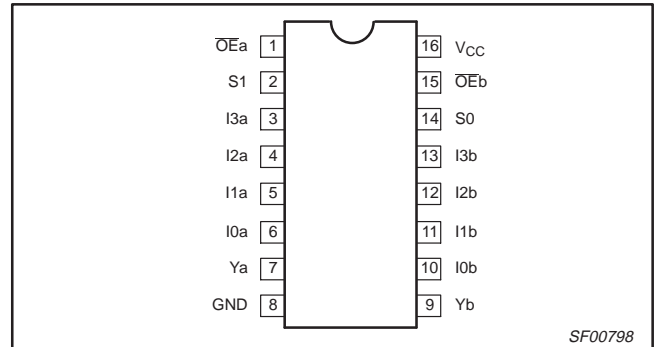
The 74ALS253 has two identical 4-input multiplexers with 3-State outputs which select 2 bits from four sources by using common select input (S0, S1). When the individual output enable ( $\overline{OE}a$ ,  $\overline{OE}b$ ) inputs of the 4-input multiplexers are High, the outputs are forced to a High impedance (Z) state.

The 74ALS253 is the logic implementation of 2-pole, 4-position switch being determined by the logic levels supplied to the common select inputs.

To avoid exceeding the maximum current ratings when the outputs of the 3-State devices are tied together, all but one device must be in the High impedance state. Therefore, only one output enable must be achieved at a time.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74ALS253	7.0ns	8mA

## PIN CONFIGURATION



## ORDERING INFORMATION

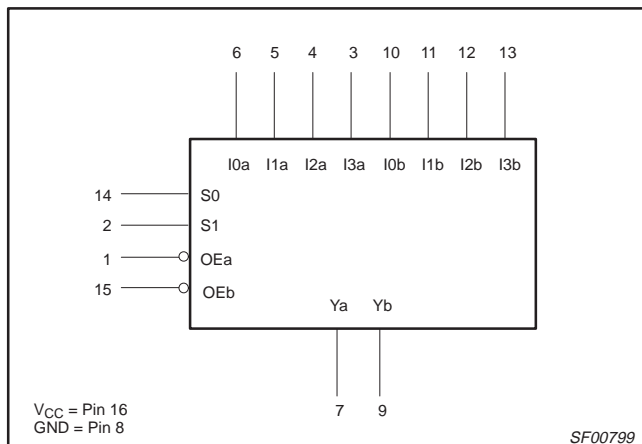
DESCRIPTION	ORDER CODE	DRAWING NUMBER
	COMMERCIAL RANGE V <sub>CC</sub> = 5V ±10%, T <sub>amb</sub> = 0°C to +70°C	
16-pin plastic DIP	74ALS253N	SOT38-4
16-pin plastic SO	74ALS253D	SOT109-1
16-pin plastic SSOP Type II	74ALS253DB	SOT338-1

## INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

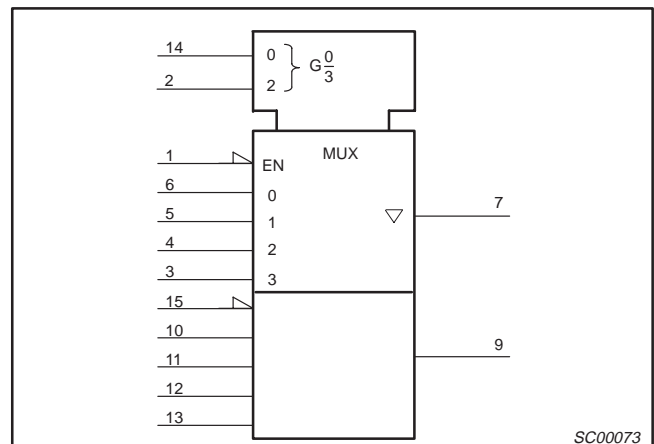
PINS	DESCRIPTION	74ALS (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
I0a – I3a	Port A data inputs	1.0/1.0	20µA/0.1mA
I0b – I3b	Port B data inputs	1.0/1.0	20µA/0.1mA
S0, S1	Common select inputs	1.0/1.0	20µA/0.1mA
$\overline{OE}a$	Port A Output Enable input (active-Low)	1.0/1.0	20µA/0.1mA
$\overline{OE}b$	Port B Output Enable input (active-Low)	1.0/1.0	20µA/0.1mA
Ya – Yb	3-State outputs	130/240	2.6mA/24mA

**NOTE:** One (1.0) ALS unit load is defined as: 20µA in the High state and 0.1mA in the Low state.

## LOGIC SYMBOL



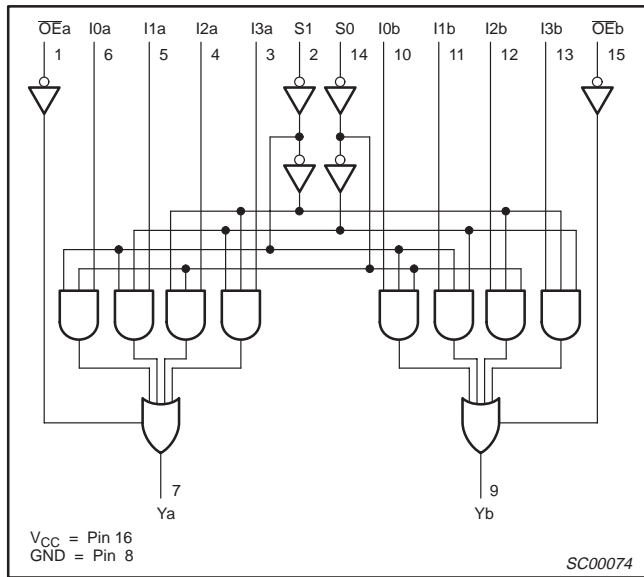
## IEC/IEEE SYMBOL



# Dual 4-input multiplexer (3-State)

# 74ALS253

### LOGIC DIAGRAM



### FUNCTION TABLE

INPUTS							OUTPUTS
S0	S1	I0	I1	I2	I3	OE <sub>n</sub>	Y <sub>n</sub>
X	X	X	X	X	X	H	Z
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
H	L	X	L	X	X	L	L
H	L	X	H	X	X	L	H
L	H	X	X	L	X	L	L
L	H	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

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

## Dual 4-input multiplexer (3-State)

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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 <sub>OH</sub>	High-level output voltage	V <sub>CC</sub> ±10%, V <sub>IL</sub> = MAX, V <sub>IH</sub> = MIN	I <sub>OH</sub> = -0.4mA	V <sub>CC</sub> - 2		V	
			I <sub>OH</sub> = -2.6mA	2.4		V	
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX, V <sub>IH</sub> = MIN	I <sub>OL</sub> = 12mA		0.25	0.40	V
			I <sub>OL</sub> = 24mA		0.35	0.50	V
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>		-0.73	-1.5	V	
I <sub>I</sub>	Input current at maximum input voltage	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7.0V			0.1	mA	
I <sub>IH</sub>	High-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7V			20	μA	
I <sub>IL</sub>	Low-level input current	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4V			-0.1	mA	
I <sub>OZH</sub>	Off-state output current, High-level voltage applied	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7V			20	μA	
I <sub>OZL</sub>	Off-state output current, Low-level voltage applied	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4V			-20	μA	
I <sub>O</sub>	Output current <sup>3</sup>	V <sub>CC</sub> = MAX, V <sub>O</sub> = 2.25V	-30		-112	mA	
I <sub>CC</sub>	Supply current (total)	V <sub>CC</sub> = MAX	I <sub>CC</sub>	7.0	12	mA	
			I <sub>CCZ</sub>	9.0	14	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<sub>CC</sub> = 5V, T<sub>amb</sub> = 25°C.
- The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I<sub>OS</sub>.

## AC ELECTRICAL CHARACTERISTICS

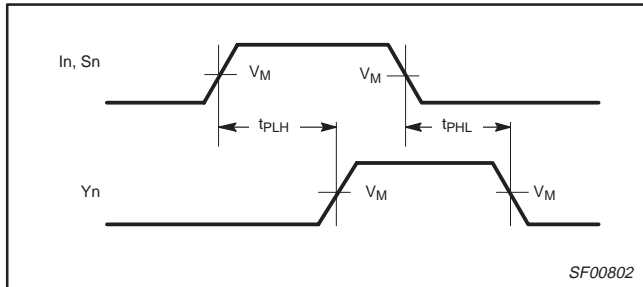
SYMBOL	PARAMETER	TEST CONDITION	LIMITS		UNIT
			T <sub>amb</sub> = 0°C to +70°C V <sub>CC</sub> = +5.0V ± 10% C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω		
			MIN	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay In to Yn	Waveform 1	4.0 4.0	12.0 12.0	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay Sn to Yn	Waveform 1	5.0 7.0	15.0 16.0	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output enable time, High or Low level ŌEn to Yn	Waveform 2 Waveform 3	1.0 3.0	8.0 9.0	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output disable time, High or Low level ŌEn to Yn	Waveform 2 Waveform 3	1.0 1.0	7.0 7.0	ns

# Dual 4-input multiplexer (3-State)

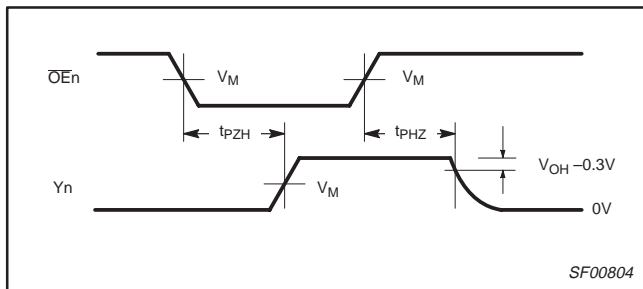
# 74ALS253

## AC WAVEFORMS

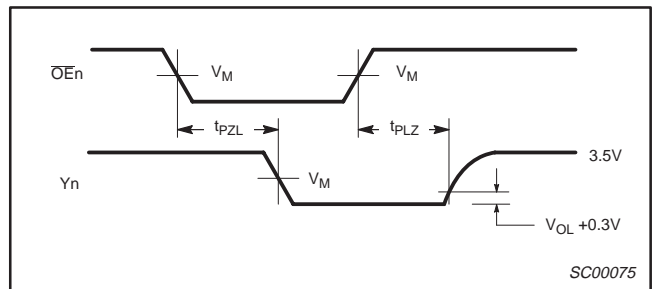
For all waveforms,  $V_M = 1.3V$ .



Waveform 1. Propagation Delay for Data and Select to Output



Waveform 2. 3-State Output Enable Time to High Level and Output Disable Time from High Level



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

## TEST CIRCUIT AND WAVEFORMS

**Test Circuit for 3-State Outputs**

SWITCH POSITION	
TEST	SWITCH
$t_{PZL}, t_{PLZ}$	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**

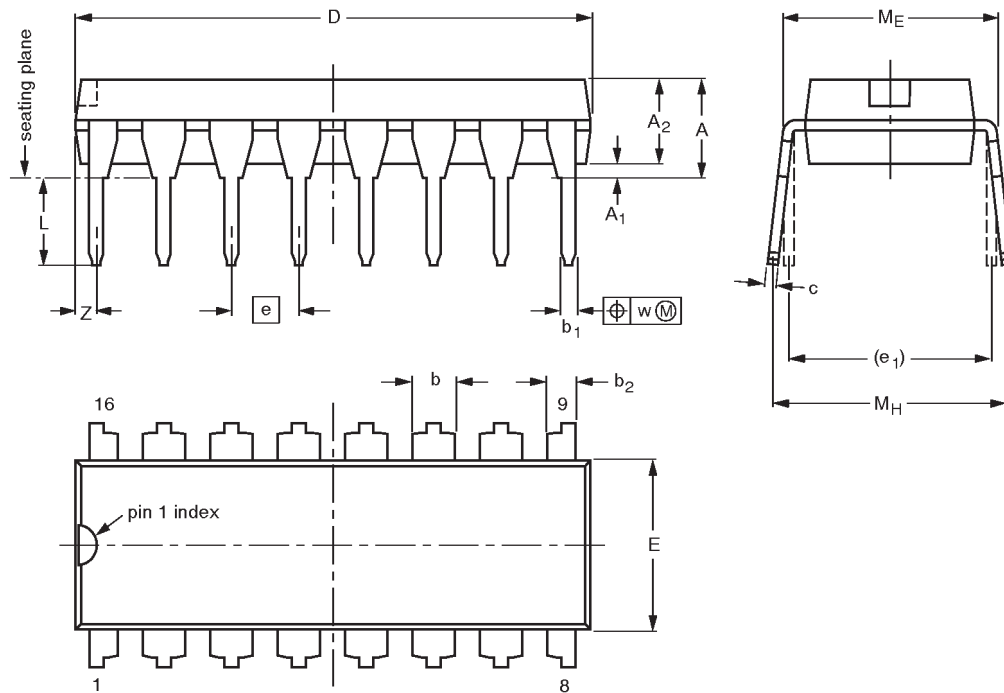
Family	INPUT PULSE REQUIREMENTS					
	Amplitude	$V_M$	Rep.Rate	$t_w$	$t_{TLH}$	$t_{THL}$
74ALS	3.5V	1.3V	1MHz	500ns	2.0ns	2.0ns

Dual 4-input multiplexer (3-State)

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DIP16: plastic dual in-line package; 16 leads (300 mil)

SOT38-4



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

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	b <sub>2</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	1.25 0.85	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	0.76
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.049 0.033	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.030

Note

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

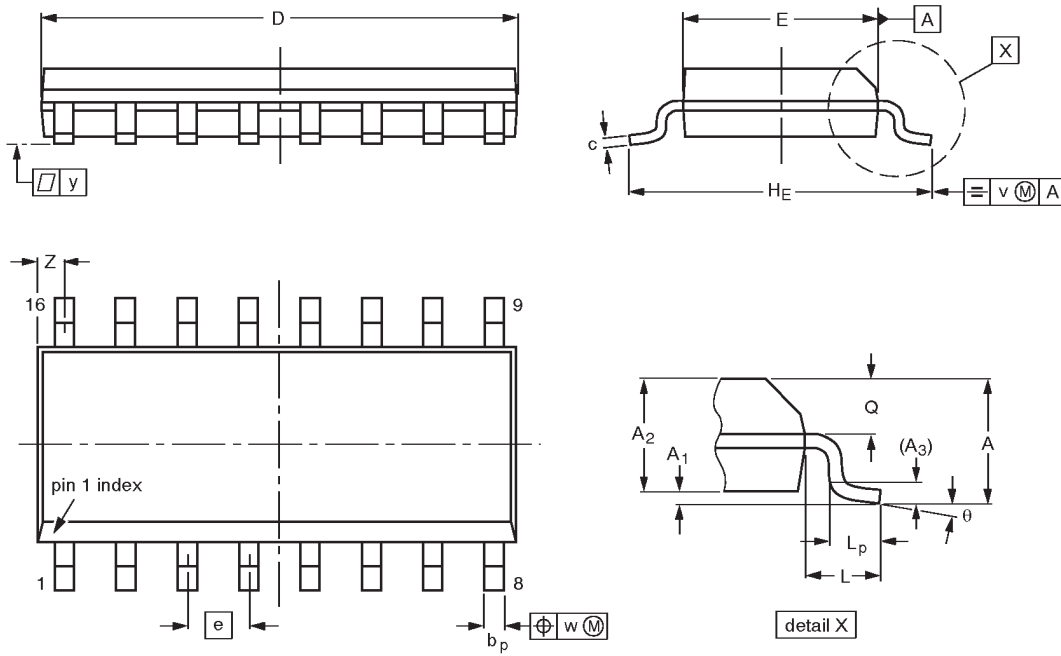
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

Dual 4-input multiplexer (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 <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	0.0098 0.0039	0.057 0.049	0.01	0.019 0.014	0.0098 0.0075	0.39 0.38	0.16 0.15	0.050	0.24 0.23	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.

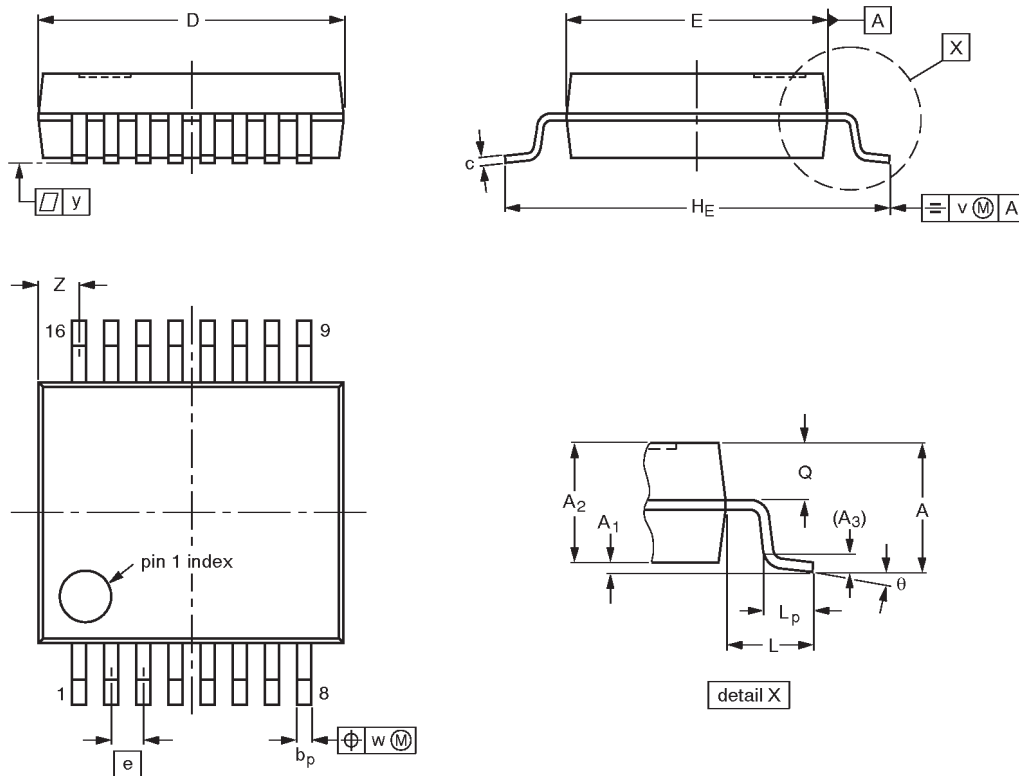
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT109-1	076E07S	MS-012AC				91-08-13 95-01-23

Dual 4-input multiplexer (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 <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



## Dual 4–input multiplexer (3–State)

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## DEFINITIONS

Data Sheet Identification	Product Status	Definition
<i>Objective Specification</i>	<b>Formative or in Design</b>	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
<i>Preliminary Specification</i>	<b>Preproduction Product</b>	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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