

# DATA SHEET

**74F353**

Dual 4-input multiplexer (3-State)

Product specification

1996 Jan 05

IC15 Data Handbook

# Dual 4-input multiplexer (3-State)

# 74F353

## FEATURES

- Inverting version of 74F253
- 3-State outputs for bus interface and multiplex expansion
- Common select inputs
- Separate Output Enable Inputs

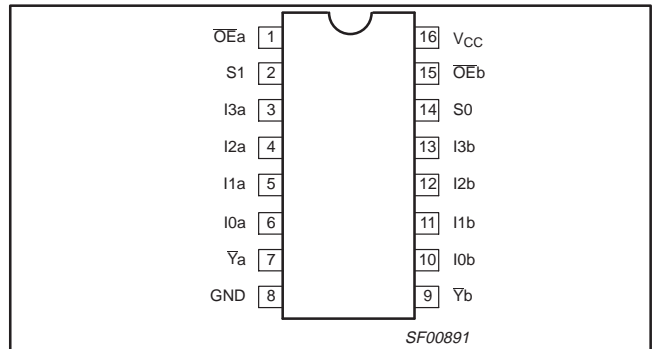
## DESCRIPTION

The 74F353 has two identical 4-input multiplexers with 3-State outputs which select two bits from four sources selected by common Select inputs (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 (Hi-Z) state.

The 74F353 is the logic implementation of a 2-pole, 4-position switch; the position of the switch being determined by the logic levels supplied to the two 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 active at a time.

## PIN CONFIGURATION



TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F353	6.0ns	11mA

## ORDERING INFORMATION

DESCRIPTION	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$	PACKAGE DRAWING NUMBER
16-pin plastic DIP	N74F353N	SOT38-4
16-pin plastic SO	N74F353D	SOT162-1

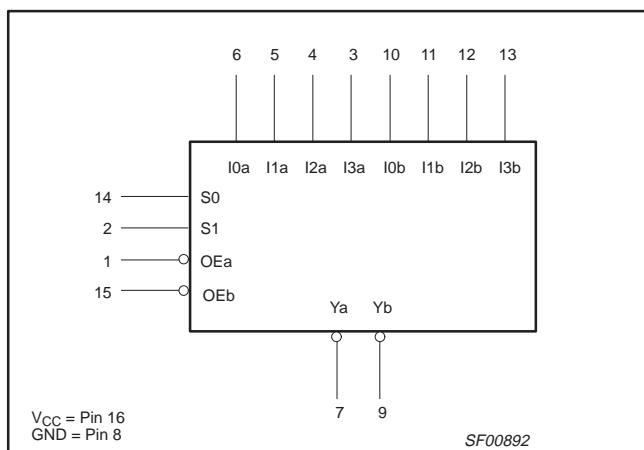
## INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
I0a–I3a	Port A data inputs	1.0/1.0	20 $\mu$ A/0.6mA
I0b–I3b	Port B data inputs	1.0/1.0	20 $\mu$ A/0.6mA
S0, S1	Common Select inputs	1.0/1.0	20 $\mu$ A/0.6mA
$\overline{OE}a$	Port A Output Enable input (active Low)	1.0/1.0	20 $\mu$ A/0.6mA
$\overline{OE}b$	Port B Output Enable input (active Low)	1.0/1.0	20 $\mu$ A/0.6mA
$\overline{Y}a$ , $\overline{Y}b$	3-State outputs	150/40	3mA/24mA

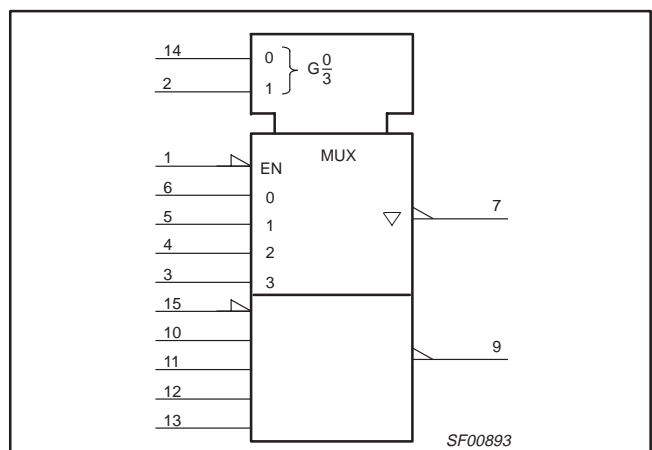
### NOTE:

One (1.0) FAST unit load is defined as: 20 $\mu$ A in the High state and 0.6mA in the Low state.

## LOGIC SYMBOL



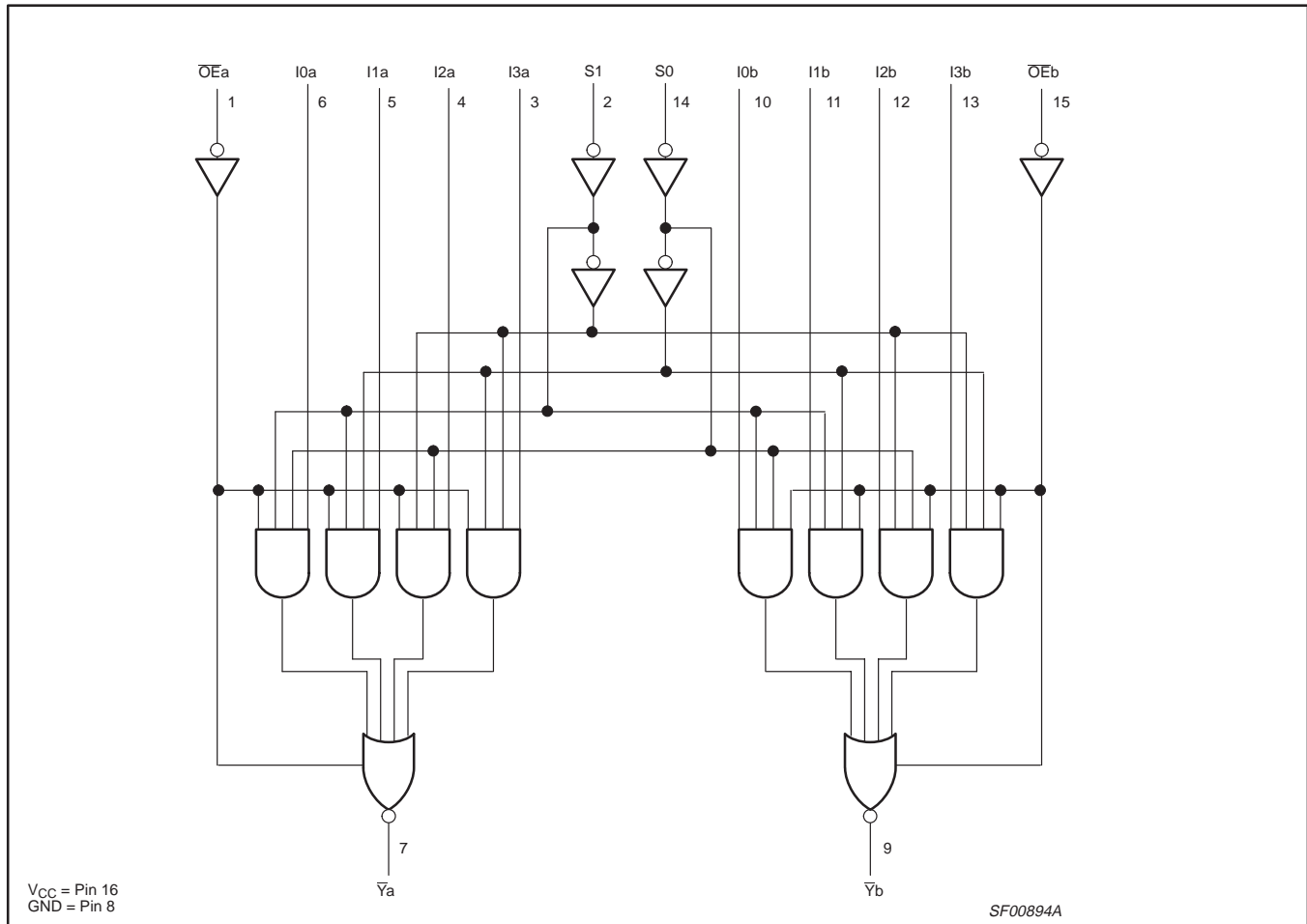
## IEC/IEEE SYMBOL



# Dual 4-input multiplexer (3-State)

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## LOGIC DIAGRAM



## FUNCTION TABLE

INPUTS							OUTPUT
S0	S1	I0	I1	I2	I3	OE	Y
X	X	X	X	X	X	H	Z
L	L	L	X	X	X	L	H
L	L	H	X	X	X	L	L
H	L	X	L	X	X	L	H
H	L	X	H	X	X	L	L
L	H	X	X	L	X	L	H
L	H	X	X	H	X	L	L
H	H	X	X	X	L	L	H
H	H	X	X	X	H	L	L

### NOTES:

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

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**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	-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			-3	mA
I <sub>OL</sub>	Low-level output current			24	mA
T <sub>amb</sub>	Operating free-air temperature range	0		70	°C

**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> = MIN, V <sub>IL</sub> = MAX, V <sub>IH</sub> = MIN, I <sub>OH</sub> = MAX	±10%V <sub>CC</sub>	2.4		V	
			±5%V <sub>CC</sub>	2.7	3.3	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> = MAX	±10%V <sub>CC</sub>		0.35 0.50	V	
			±5%V <sub>CC</sub>		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	-1.2	V	
I <sub>I</sub>	Input current at maximum input voltage	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7.0V			100	μA	
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> = 0.5V			-0.6	mA	
I <sub>OZH</sub>	Off-state output current High-level voltage applied	V <sub>CC</sub> = MAX, V <sub>O</sub> = 2.7V			50	μA	
I <sub>OZL</sub>	Off-state output current Low-level voltage applied	V <sub>CC</sub> = MAX, V <sub>O</sub> = 0.5V			-50	μA	
I <sub>OS</sub>	Short-circuit output current <sup>3</sup>	V <sub>CC</sub> = MAX	-60		-150	mA	
I <sub>CC</sub>	Supply current (total)	V <sub>CC</sub> = MAX	I <sub>CCH</sub>	0EEn=Sn=In=GND	9	14	mA
			I <sub>CCL</sub>	0EEn=Sn=GND, In=4.5V	11	20	mA
			I <sub>CCZ</sub>	0EEn=4.5V, Sn=In=GND	13	23	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.
- Not more than one output should be shorted at a time. For testing I<sub>OS</sub>, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a High output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I<sub>OS</sub> tests should be performed last.

# Dual 4-input multiplexer (3-State)

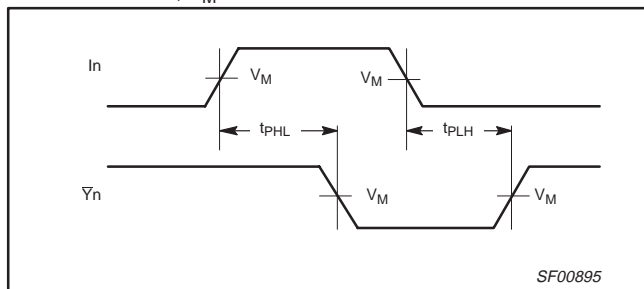
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## AC ELECTRICAL CHARACTERISTICS

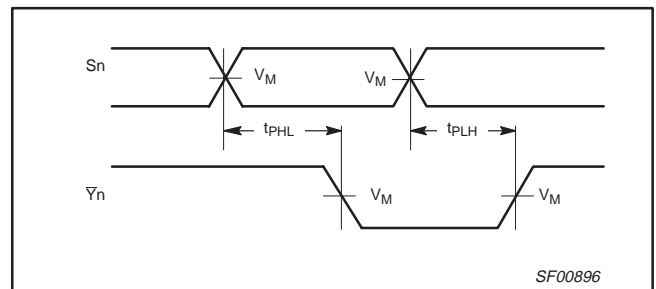
SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			V <sub>CC</sub> = 5V T <sub>amb</sub> = +25°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω			V <sub>CC</sub> = 5V ± 10% T <sub>amb</sub> = 0°C to +70°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω		
			MIN	TYP	MAX	MIN	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay In to $\bar{Y}_n$	Waveform 1	3.0 1.5	5.0 3.0	7.0 5.0	3.0 1.0	8.0 5.5	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay S <sub>n</sub> to $\bar{Y}_n$	Waveform 2	5.0 3.0	9.0 6.0	12.0 8.5	4.5 3.0	12.5 9.5	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable time to High or Low level	Waveform 3 Waveform 4	4.0 4.0	6.0 6.5	8.0 8.0	3.5 3.5	9.0 9.0	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable time from High or Low level	Waveform 3 Waveform 4	2.5 1.5	4.0 2.5	5.5 6.0	2.0 1.5	6.0 7.0	ns

## AC WAVEFORMS

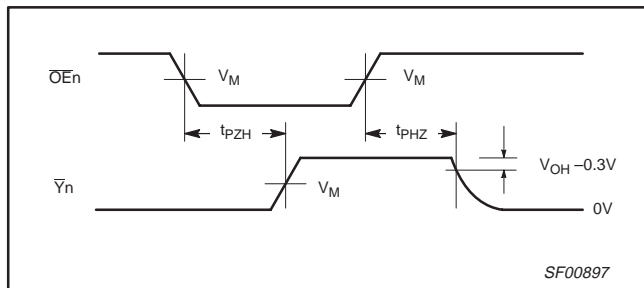
For all waveforms, V<sub>M</sub> = 1.5V



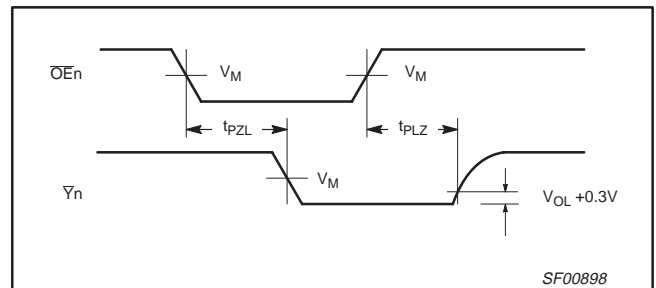
Waveform 1. Propagation Delay, Data to Output



Waveform 2. Propagation Delay, Select to Output



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

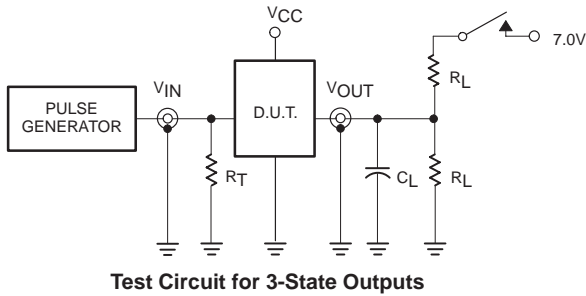


Waveform 4. 3-State Output Enable Time to Low Level and Output Disable Time from Low Level

# Dual 4-input multiplexer (3-State)

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## TEST CIRCUIT AND WAVEFORMS



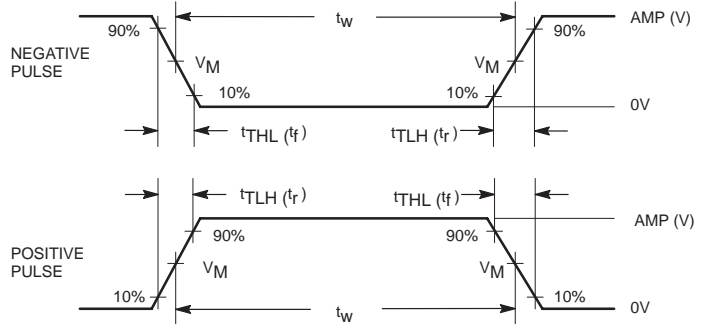
Test Circuit for 3-State Outputs

### SWITCH POSITION

TEST	SWITCH
$t_{PLZ}$	closed
$t_{PZL}$	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

family	INPUT PULSE REQUIREMENTS					
	amplitude	$V_M$	rep. rate	$t_w$	$t_{TLH}$	$t_{THL}$
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

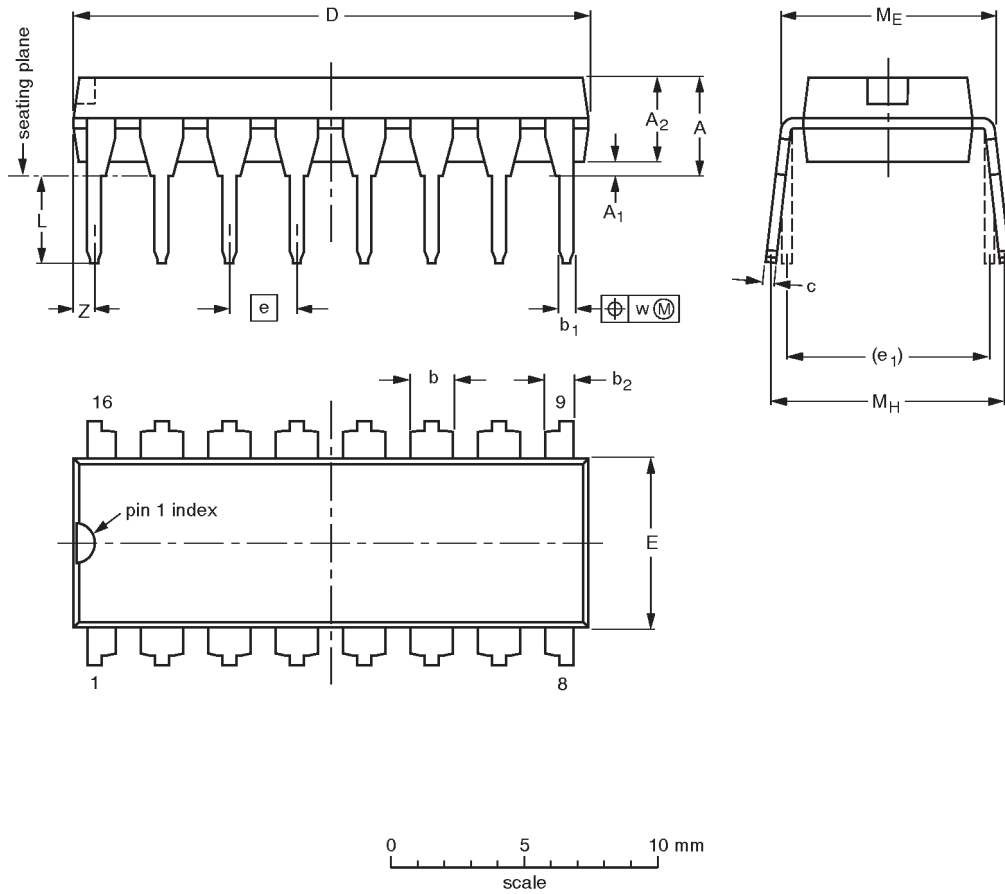
SF00777

# 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.

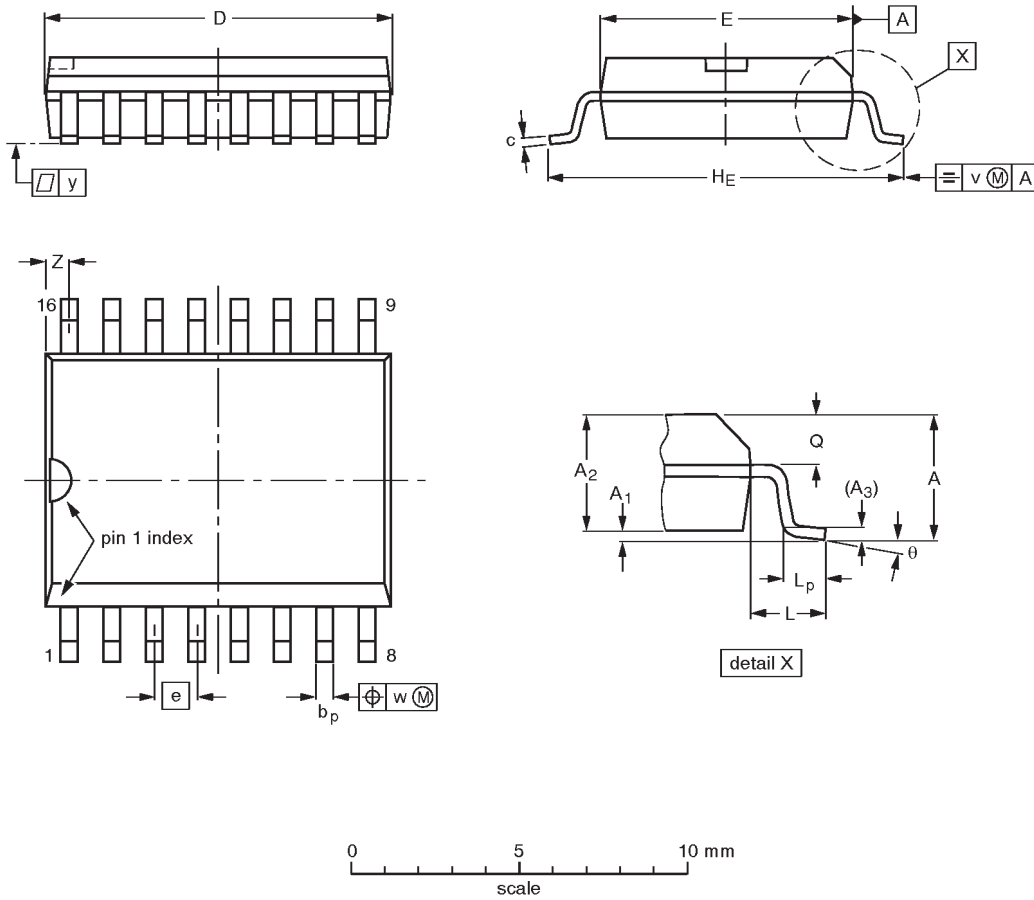
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

# Dual 4-input multiplexer (3-State)

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SO16: plastic small outline package; 16 leads; body width 7.5 mm

SOT162-1



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	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	10.5 10.1	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.41 0.40	0.30 0.29	0.050	0.42 0.39	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

**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			
SOT162-1	075E03	MS-013AA				-92-11-17 95-01-24



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Dual 4-input multiplexer (3-State)

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**NOTES**

## Dual 4-input multiplexer (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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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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