

# DATA SHEET

**74F153**

Dual 4-line to 1-line multiplexer

Product specification

1996 Jan 05

IC15 Data Handbook

Dual 4-line to 1-line multiplexer

74F153

FEATURES

- Non-inverting outputs
- Separate enable for each section
- Common select inputs
- See 74F253 for 3-State version

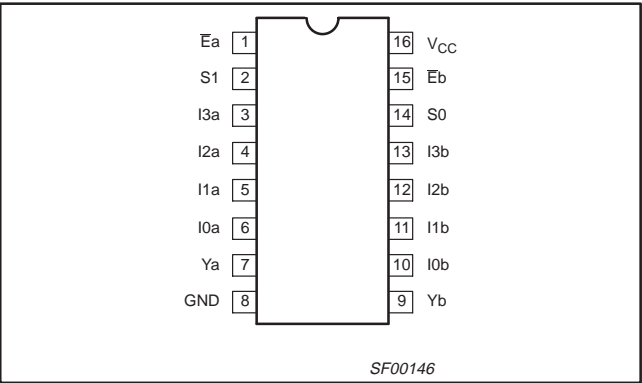
DESCRIPTION

The 74F153 is a dual 4-input multiplexer that can select 2 bits of data from up to four sources selected by common Select inputs (S0, S1). The two 4-input multiplexer circuits have individual active-Low Enables ( $\overline{Ea}$ ,  $\overline{Eb}$ ) which can be used to strobe the outputs independently. Outputs (Ya, Yb) are forced Low when the corresponding Enables ( $\overline{Ea}$ ,  $\overline{Eb}$ ) are High.

The 74F153 is the logic implementation of a 2-pole, 4-position switch where the switch is determined by the logic levels supplied to the common select inputs.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F153	7.0ns	12mA

PIN CONFIGURATION



ORDERING INFORMATION

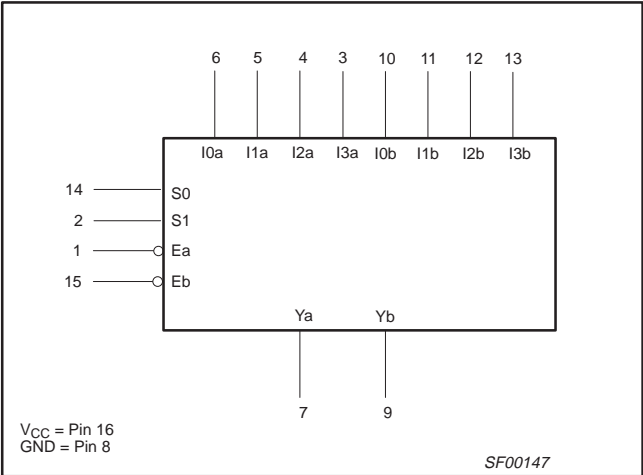
DESCRIPTION	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C \text{ to } +70^{\circ}C$	PKG. DWG. #
16-pin plastic DIP	N74F153N	SOT38-4
16-pin plastic SO	N74F153D	SOT109-1

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

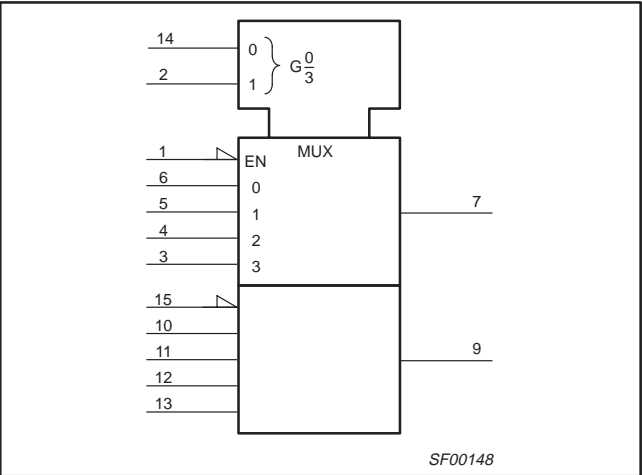
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
I0a – I3a	Port A data inputs	1.0/1.0	20 $\mu$ A/0.6mA
I0b – I3b	Port B data inputs	1.0/1.0	20 $\mu$ A/0.6mA
S0, S1	Common Select inputs	1.0/1.0	20 $\mu$ A/0.6mA
$\overline{Ea}$	Port A Enable input (active Low)	1.0/1.0	20 $\mu$ A/0.6mA
$\overline{Eb}$	Port B Enable input (active Low)	1.0/1.0	20 $\mu$ A/0.6mA
Ya, Yb	Port A, B data outputs	50/33	1.0 $\mu$ A/20mA

**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



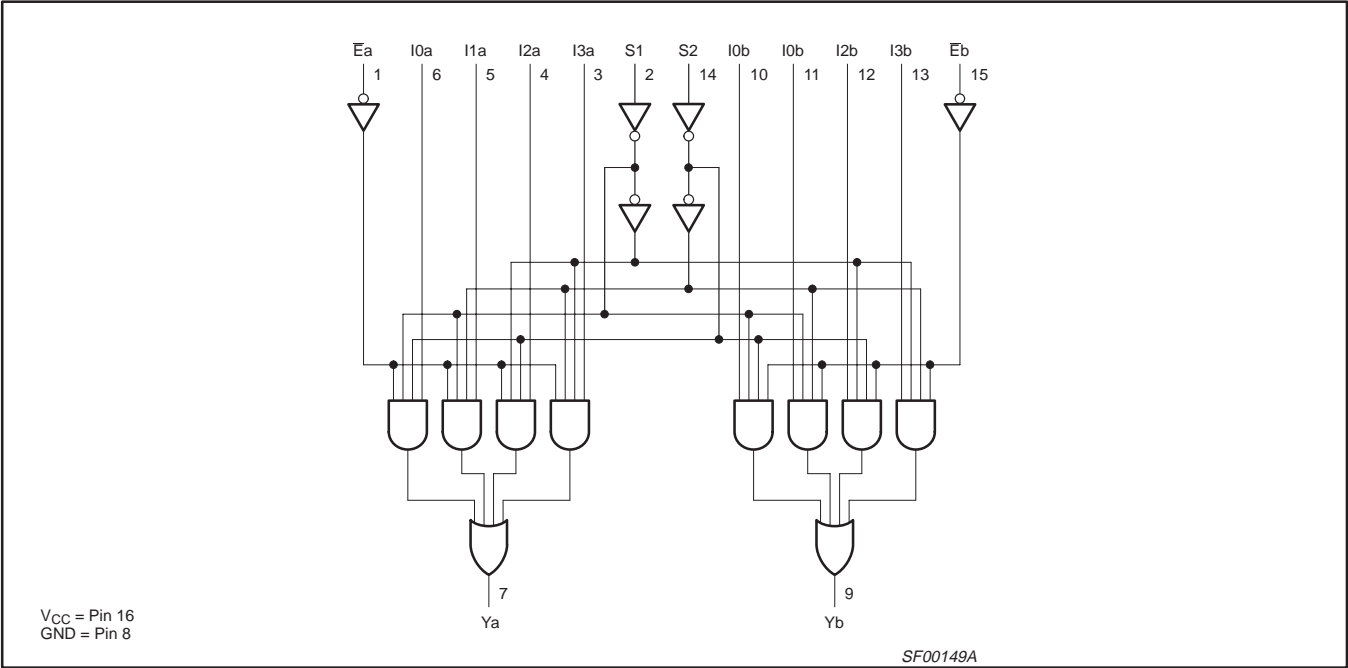
IEC/IEEE SYMBOL



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LOGIC DIAGRAM



FUNCTION TABLE

INPUTS							OUTPUT
S0	S1	$\bar{E}n$	I0n	I1n	I2n	I3n	Yn
X	X	H	X	X	X	X	L
L	L	L	L	X	X	X	L
L	L	L	H	X	X	X	H
H	L	L	X	L	X	X	L
H	L	L	X	H	X	X	H
L	H	L	X	X	L	X	L
L	H	L	X	X	H	X	H
H	H	L	X	X	X	L	L
H	H	L	X	X	X	H	H

H = High voltage level  
L = Low voltage level  
X = Don't care

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## ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limits 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
$V_{CC}$	Supply voltage	−0.5 to +7.0	V
$V_{IN}$	Input voltage	−0.5 to +7.0	V
$I_{IN}$	Input current	−30 to +5	mA
$V_{OUT}$	Voltage applied to output in High output state	−0.5 to $V_{CC}$	V
$I_{OUT}$	Current applied to output in Low output state	40	mA
$T_{amb}$	Operating free-air temperature range	0 to +70	°C
$T_{stg}$	Storage temperature range	−65 to +150	°C

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5.0	5.5	V
$V_{IH}$	High-level input voltage	2.0			V
$V_{IL}$	Low-level input voltage			0.8	V
$I_{IK}$	Input clamp current			−18	mA
$I_{OH}$	High-level output current			−1	mA
$I_{OL}$	Low-level output current			20	mA
$T_{amb}$	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	±10%V <sub>CC</sub>	2.5			V
			V <sub>IH</sub> = MIN, I <sub>OH</sub> = MAX	±5%V <sub>CC</sub>	2.7	3.4		
V <sub>OL</sub>	Low-level output voltage		V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX	±10%V <sub>CC</sub>		0.30	0.50	V
			V <sub>IH</sub> = MIN, I <sub>OL</sub> = MAX	±5%V <sub>CC</sub>		0.30	0.50	
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>OS</sub>	Short-circuit output current <sup>3</sup>		V <sub>CC</sub> = MAX		−60		−150	mA
I <sub>CC</sub>	Supply current (total)	I <sub>CCH</sub>	V <sub>CC</sub> = MAX	E <sub>n</sub> = GND, S <sub>n</sub> =I <sub>n</sub> =4.5V		12	20	mA
		I <sub>CCL</sub>		E <sub>n</sub> =S <sub>n</sub> =I <sub>n</sub> =GND		12	20	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  $V_{CC} = 5\text{V}$ ,  $T_{amb} = 25^\circ\text{C}$ .
- Not more than one output should be shorted at a time. For testing  $I_{OS}$ , 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,  $I_{OS}$  tests should be performed last.

Dual 4-line to 1-line multiplexer

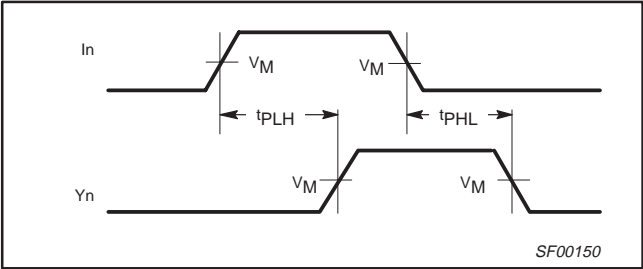
74F153

AC ELECTRICAL CHARACTERISTICS

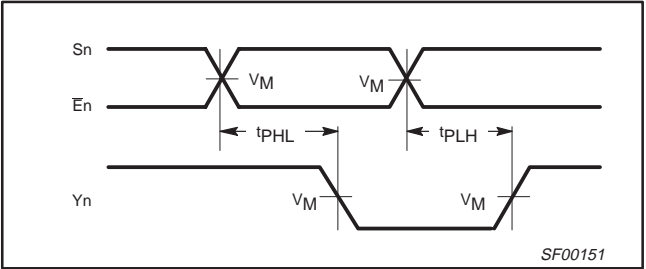
SYMBOL	PARAMETER	TEST CONDITION	LIMITS					UNIT
			V <sub>CC</sub> = +5.0V T <sub>amb</sub> = +25°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω			V <sub>CC</sub> = +5.0V ± 10% T <sub>amb</sub> = 0°C to +70°C C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω		
			MIN	TYP	MAX	MIN	MAX	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay In to Yn	Waveform 1	3.0 3.0	4.5 5.0	7.0 7.5	2.5 2.5	8.0 8.0	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay Sn to Yn	Waveform 2	5.0 5.0	8.0 8.0	10.5 10.5	4.5 4.5	12.0 12.0	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay En to Yn	Waveform 2	5.0 4.0	7.5 5.5	9.0 7.0	4.5 3.5	10.5 8.0	ns

AC WAVEFORMS

For all waveforms,  $V_M = 1.5V$ .

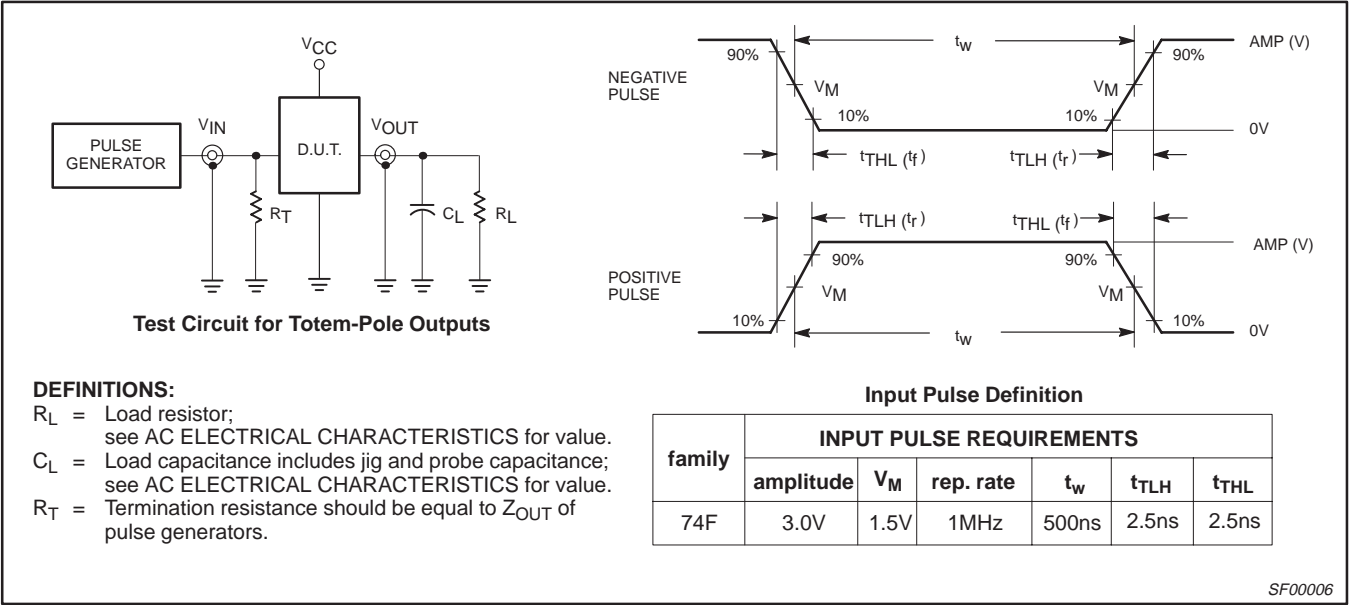


Waveform 1. Propagation Delay, Data to Output



Waveform 2. Propagation Delay, Enable and Select to Output

TEST CIRCUIT AND WAVEFORMS



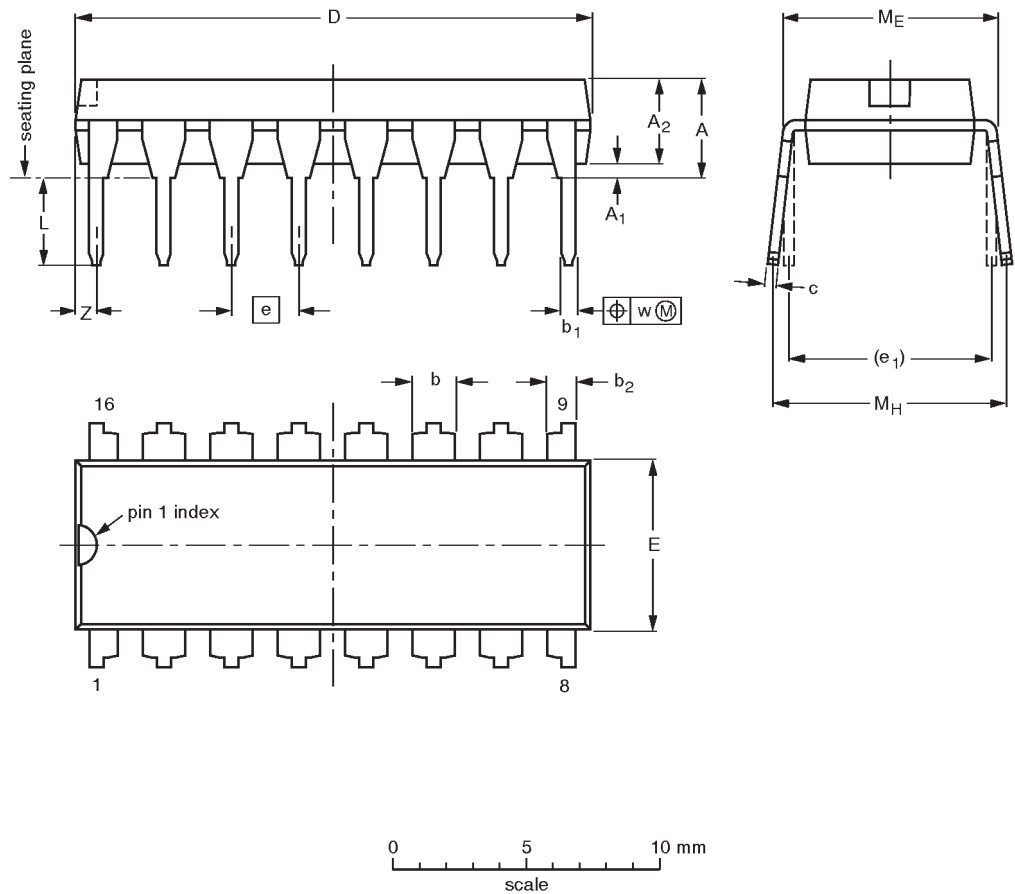
SF00006

Dual 4-line to 1-line multiplexer

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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.

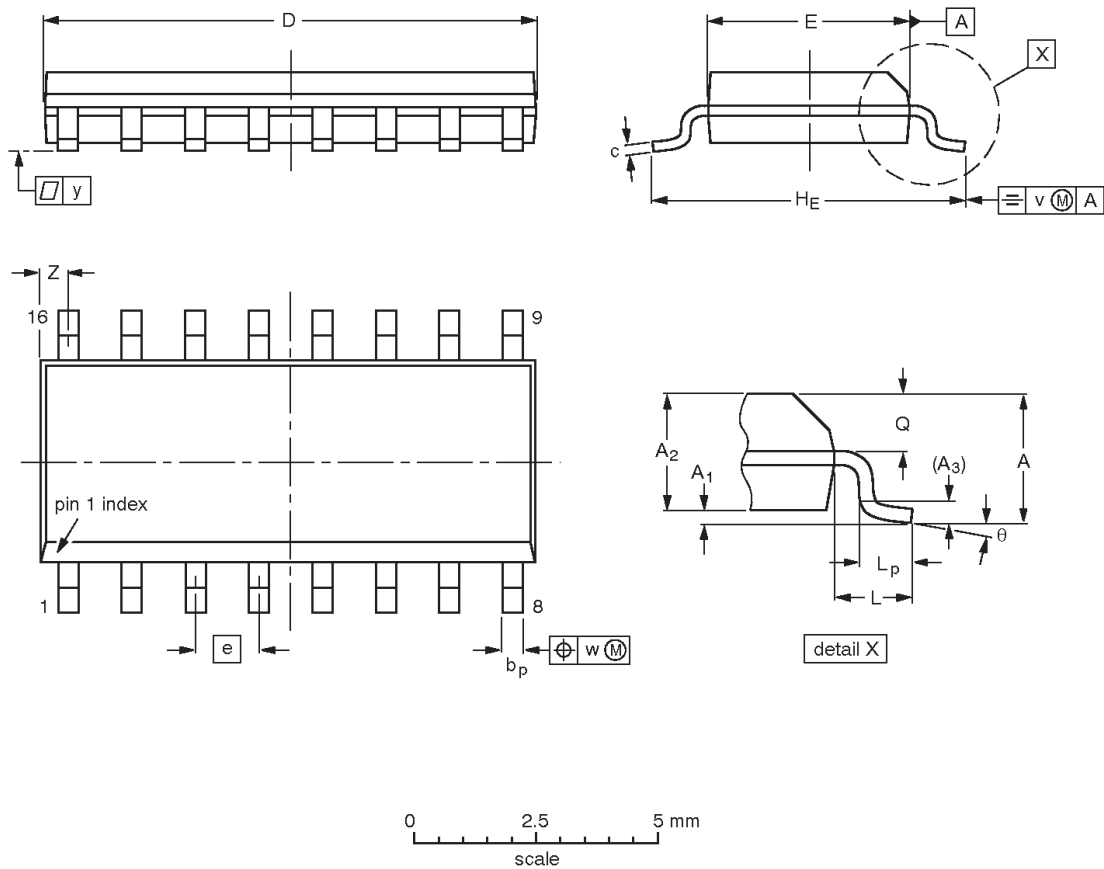
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

Dual 4-line to 1-line multiplexer

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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	0.010 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

## Dual 4-line to 1-line multiplexer

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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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