

# DATA SHEET

## **74ALS153** Dual 4-input multiplexer

Product specification

1991 Feb 08

IC05 Data Handbook

# Dual 4-input multiplexer

# 74ALS153

## FEATURES

- Non-inverting outputs
- Common select outputs
- Separate enable for each section
- See 74ALS253 for 3-State version

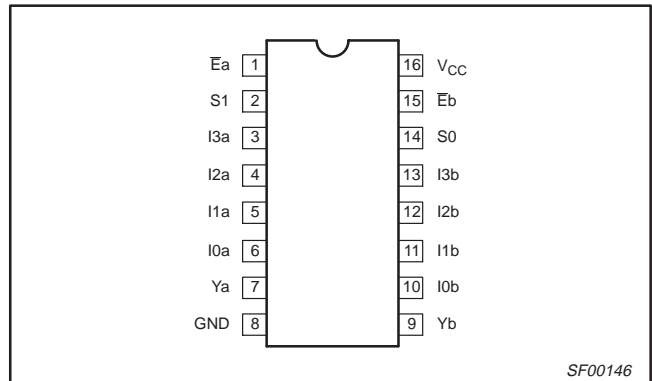
## DESCRIPTION

The 74ALS153 has two identical 4-input multiplexer with 3-State outputs which selects two bits of data from four sources by using common select inputs (S0, S1). The two 4-input multiplexer circuits have individual active-Low enables ( $\bar{E}a$ ,  $\bar{E}b$ ) which can be used to strobe the outputs independently. Outputs (Ya, Yb) are forced Low when the corresponding enable is high.

The 74ALS153 is the logic implementation of a 2-pole, 4-position switch where the position of the switch is determined by the logic levels supplied to the common select inputs.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74ALS153	7.0ns	6.5mA

## PIN CONFIGURATION



## ORDERING INFORMATION

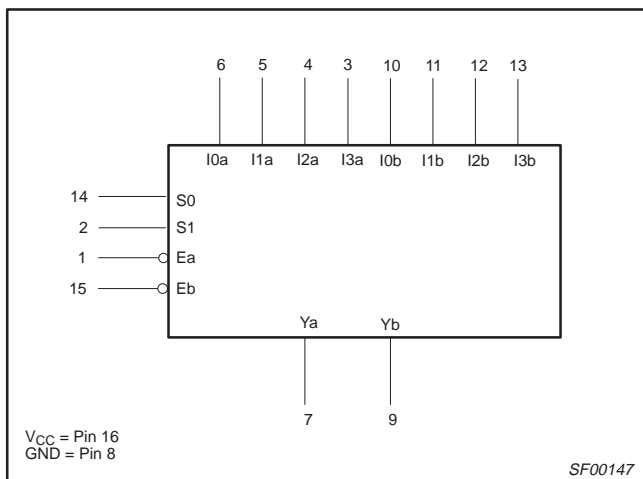
DESCRIPTION	ORDER CODE	DRAWING NUMBER
	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$	
16-pin plastic DIP	74ALS153N	SOT38-4
16-pin plastic SO	74ALS153D	SOT109-1
16-pin plastic SSOP Type II	74ALS153DB	SOT338-1

## INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

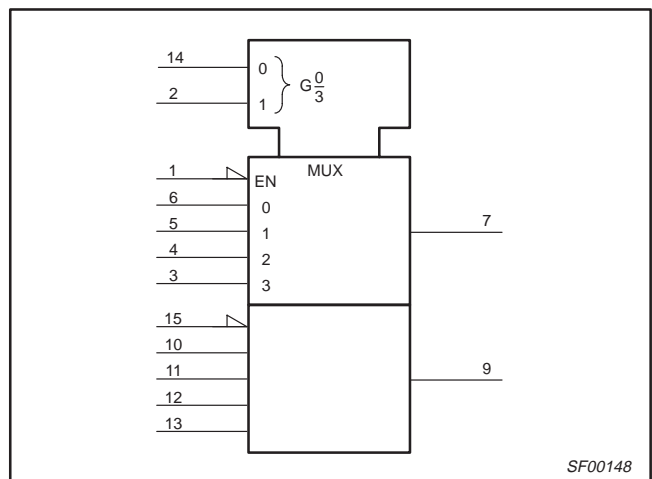
PINS	DESCRIPTION	74ALS (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
I0a – I3a	Port A data inputs	1.0/1.0	20 $\mu$ A/0.1mA
I0b – I3b	Port B data inputs	1.0/1.0	20 $\mu$ A/0.1mA
S0, S1	Common select inputs	1.0/1.0	20 $\mu$ A/0.1mA
$\bar{E}a$	Port A enable input	1.0/1.0	20 $\mu$ A/0.1mA
$\bar{E}b$	Port B enable input	1.0/1.0	20 $\mu$ A/0.1mA
Ya, Yb	Data outputs	130/240	2.6mA/24mA

NOTE: One (1.0) ALS unit load is defined as: 20 $\mu$ A in the High state and 0.1mA in the Low state.

## LOGIC SYMBOL



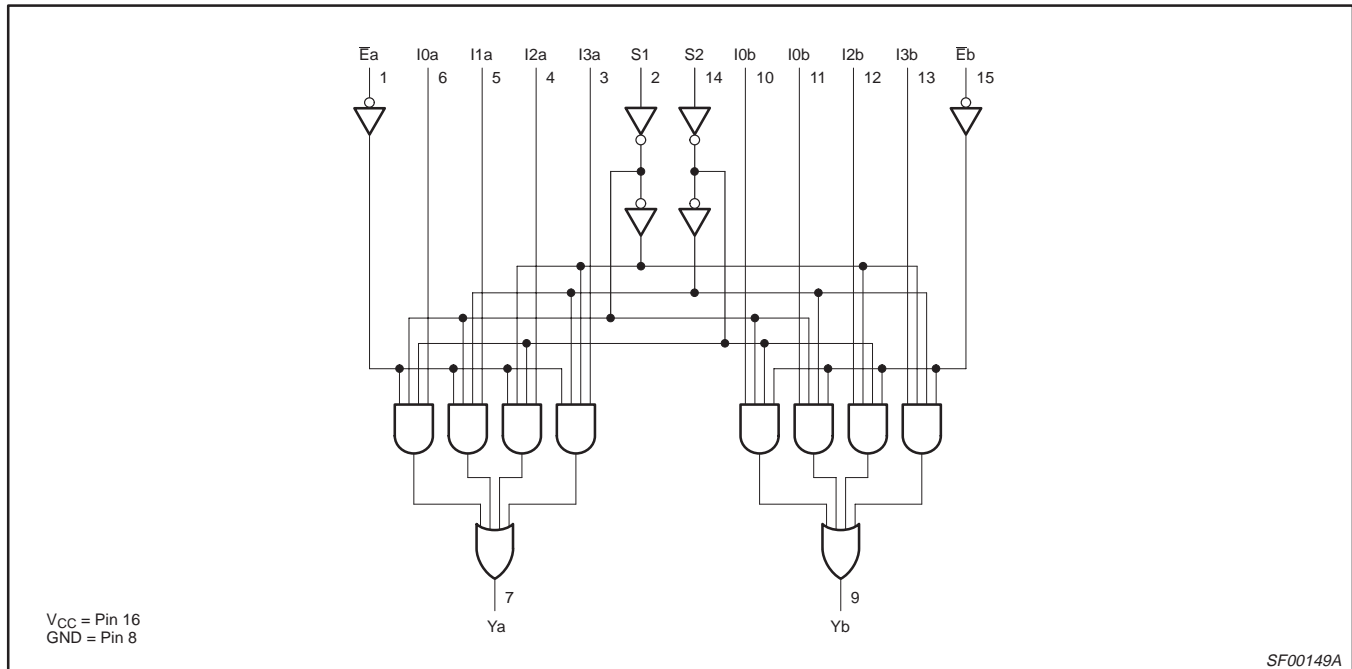
## IEC/IEEE SYMBOL



# Dual 4-input multiplexer

# 74ALS153

## LOGIC DIAGRAM



## FUNCTION TABLE

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

## Dual 4-input multiplexer

74ALS153

**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
$V_{CC}$	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	48	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			-2.6	mA
$I_{OL}$	Low-level output current			24	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		
$V_{OH}$	High-level output voltage	$V_{CC} = \pm 10\%$ , $V_{IL} = \text{MAX}$ , $V_{IH} = \text{MIN}$	$I_{OH} = -0.4\text{mA}$	$V_{CC} - 2$		V	
			$I_{OH} = \text{MAX}$	2.4	3.2	V	
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN}$ , $V_{IL} = \text{MAX}$ , $V_{IH} = \text{MIN}$	$I_{OL} = 12\text{mA}$		0.25	0.40	V
			$I_{OL} = 24\text{mA}$		0.35	0.50	V
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}$ , $I_I = I_{IK}$		-0.73	-1.5	V	
$I_I$	Input current at minimum input voltage	$V_{CC} = \text{MAX}$ , $V_I = 7.0\text{V}$			0.1	mA	
$I_{IH}$	High-level input current	$V_{CC} = \text{MAX}$ , $V_I = 2.7\text{V}$			20	μA	
$I_{IL}$	Low-level input current	$V_{CC} = \text{MAX}$ , $V_I = 0.4\text{V}$			-0.1	mA	
$I_O$	Output current <sup>3</sup>	$V_{CC} = \text{MAX}$ , $V_O = 2.25\text{V}$	-30		-112	mA	
$I_{CC}$	Supply current (total)	$V_{CC} = \text{MAX}$		6.5	12	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  $V_{CC} = 5\text{V}$ ,  $T_{amb} = 25^\circ\text{C}$ .
- The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

# Dual 4-input multiplexer

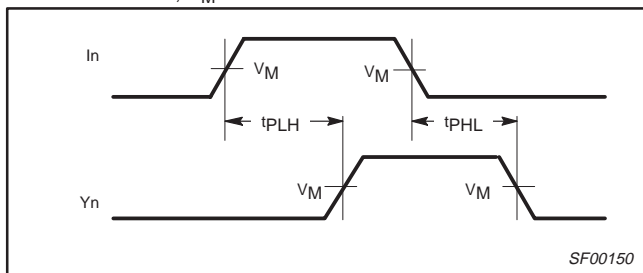
# 74ALS153

## AC ELECTRICAL CHARACTERISTICS

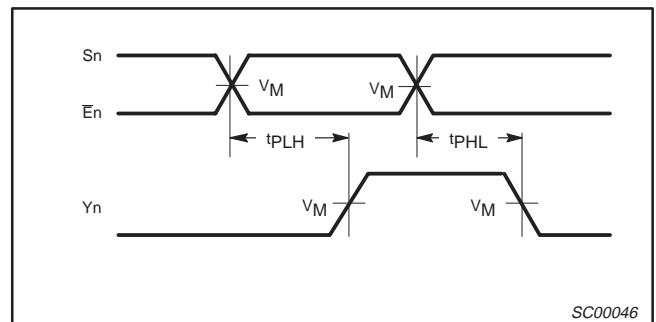
SYMBOL	PARAMETER	TEST CONDITION	LIMITS		UNIT
			$T_{amb} = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ $V_{CC} = +5.0\text{V} \pm 10\%$ $C_L = 50\text{pF}, R_L = 500\Omega$		
			MIN	MAX	
$t_{PLH}$ $t_{PHL}$	Propagation delay In to $Y_n$	Waveform 1	4.0 4.0	12.0 12.0	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay $S_n$ to $Y_n$	Waveform 2	5.0 7.0	15.0 16.0	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay $E_n$ to $Y_n$	Waveform 2	3.0 5.0	10.0 12.0	ns

## AC WAVEFORMS

For all waveforms,  $V_M = 1.3\text{V}$ .

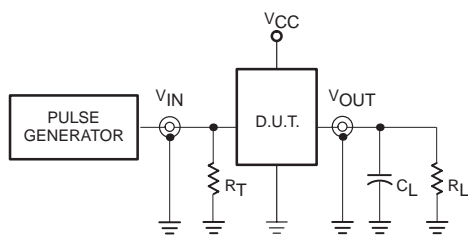


Waveform 1. Propagation Delay for Data to Output

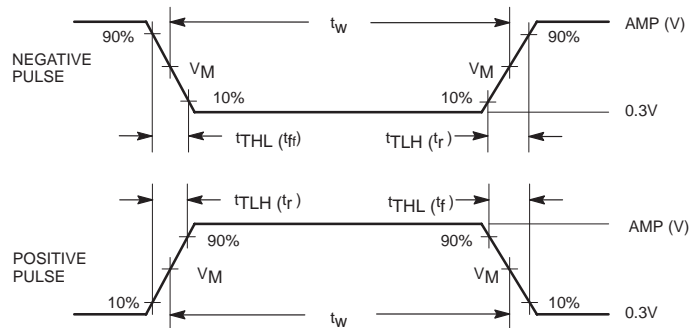


Waveform 2. Propagation Delay for Select or Enable to Output

## TEST CIRCUIT AND WAVEFORMS



Test Circuit for Totem-pole Outputs



Input Pulse Definition

### 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.

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

SC00005

# Dual 4-input multiplexer

## 74ALS153

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.

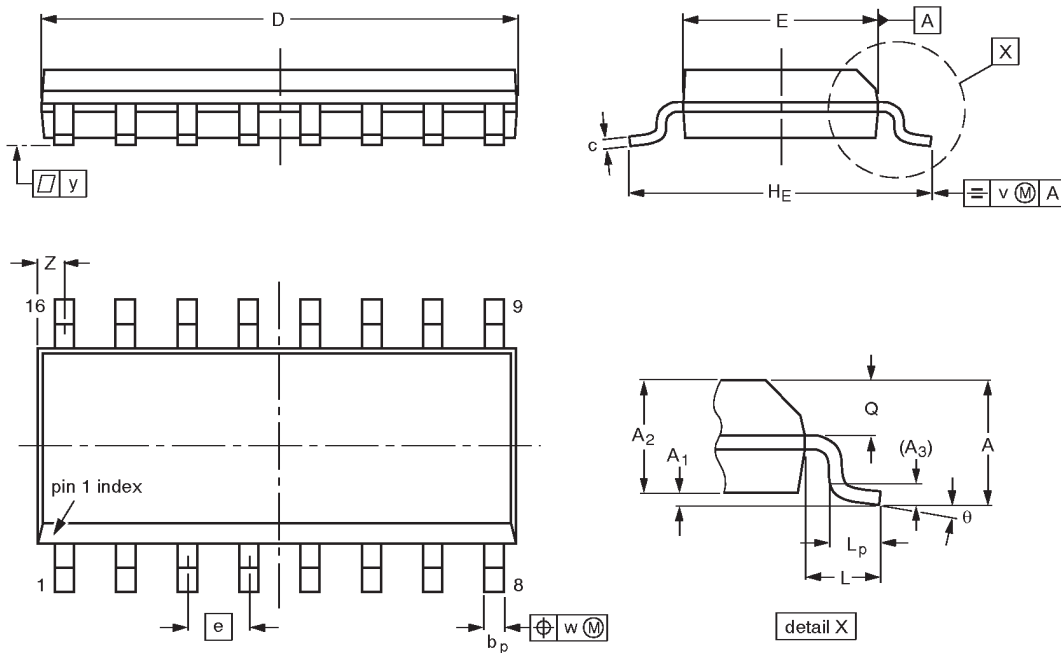
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

# Dual 4-input multiplexer

# 74ALS153

**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>	$\theta$
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.

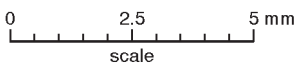
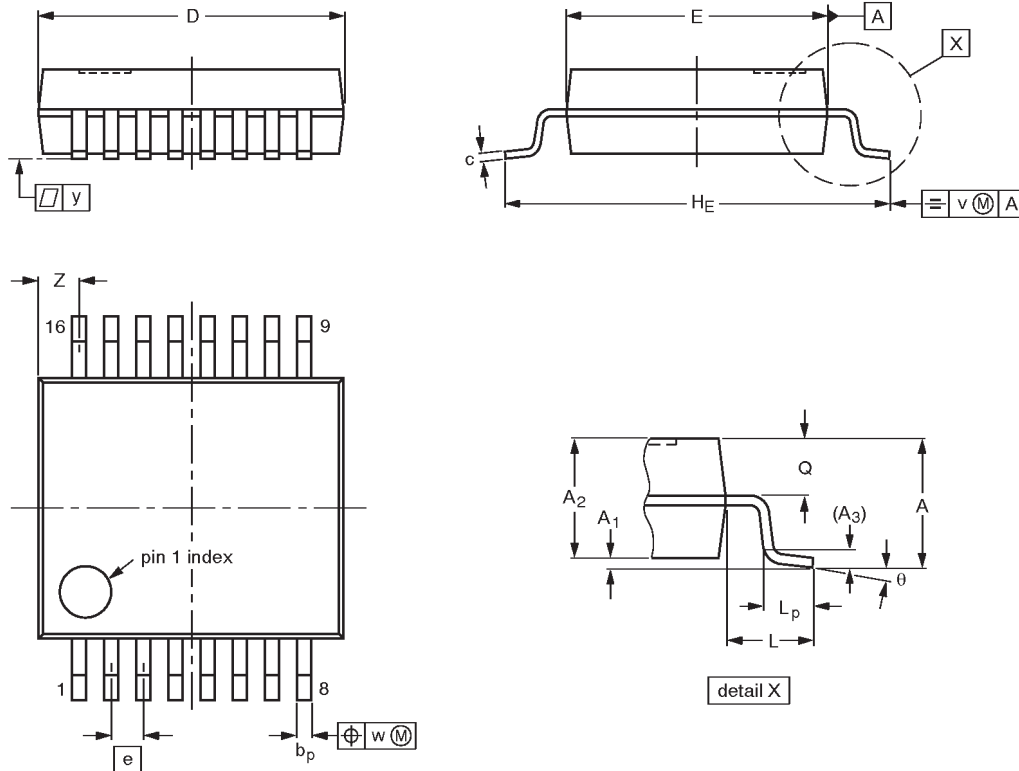
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT109-1	076E07S	MS-012AC				91-08-13 95-01-23

# Dual 4-input multiplexer

# 74ALS153

**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

74ALS153

## 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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