

# DATA SHEET

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## **74ALS151** 8-input multiplexer

Product specification

1991 Feb 08

IC05 Data Handbook

# 8-input multiplexer

# 74ALS151

### FEATURES

- 8-to-1 multiplexing
- On chip decoding
- Multi-function capability
- Complementary outputs
- See 74ALS251 for 3-State version

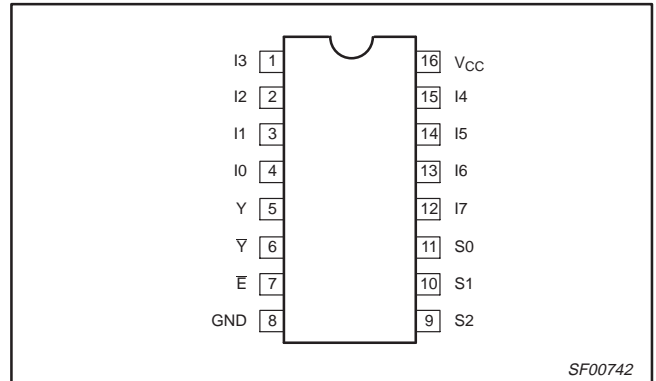
### DESCRIPTION

The 74ALS151 is a logic implementation of a single 8-position switch with the switch position controlled by the state of three select (S0, S1, S2) inputs. True (Y) and complementary ( $\bar{Y}$ ) outputs are both provided.

The enable ( $\bar{E}$ ) is active-Low. When  $\bar{E}$  is High, Y output is Low and the  $\bar{Y}$  output is High regardless of all other inputs.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74ALS151	8.0ns	8.0mA

### PIN CONFIGURATION



### ORDERING INFORMATION

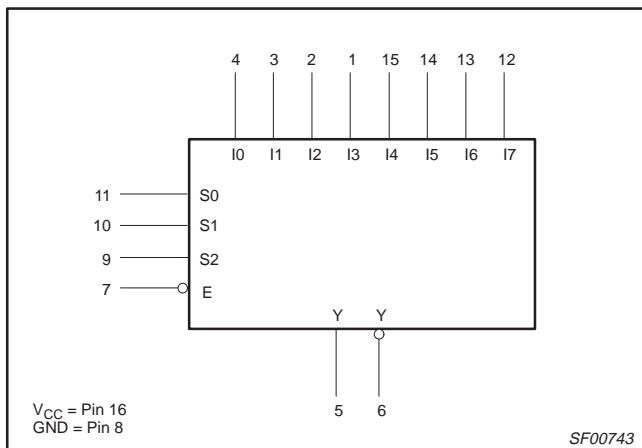
DESCRIPTION	ORDER CODE	DRAWING NUMBER
	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$	
16-pin plastic DIP	74ALS151N	SOT38-4
16-pin plastic SO	74ALS151D	SOT109-1

### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

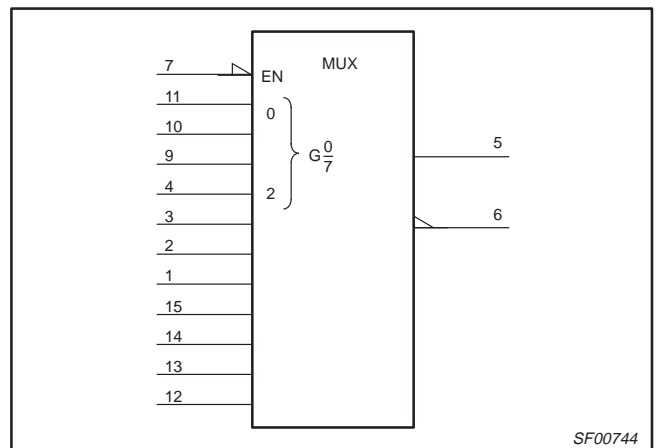
PINS	DESCRIPTION	74ALS (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
I0 – I7	Data inputs	1.0/1.0	20 $\mu$ A/0.1mA
S0 – S2	Select inputs	1.0/1.0	20 $\mu$ A/0.1mA
$\bar{E}$	Enable input (active-Low)	1.0/1.0	20 $\mu$ A/0.1mA
Y, $\bar{Y}$	Data outputs	130/240	2.6mA/24mA

**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



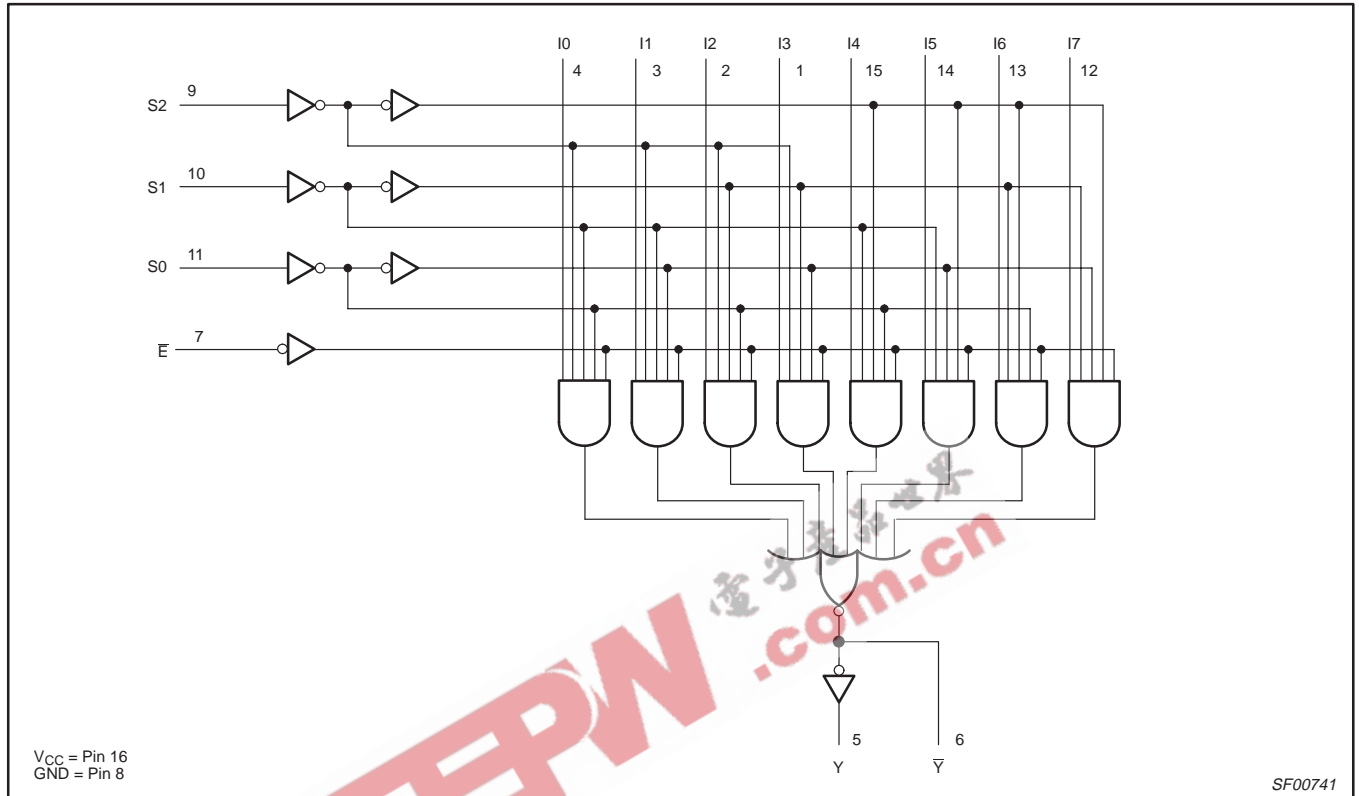
### IEC/IEEE SYMBOL



# 8-input multiplexer

74ALS151

## LOGIC DIAGRAM



## FUNCTION TABLE

INPUTS			$\bar{E}$	OUTPUTS	
S2	S1	S0		Y	$\bar{Y}$
X	X	X	H	L	H
L	L	L	L	I0	$\bar{I}0$
L	L	H	L	I1	$\bar{I}1$
L	H	L	L	I2	$\bar{I}2$
L	H	H	L	I3	$\bar{I}3$
H	L	L	L	I4	$\bar{I}4$
H	L	H	L	I5	$\bar{I}5$
H	H	L	L	I6	$\bar{I}6$
H	H	H	L	I7	$\bar{I}7$

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

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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
$V_{CC}$	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	$\mu\text{A}$	
$I_{IL}$	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)	$V_{CC} = \text{MAX}$		8.0	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,  $I_{OS}$ .

# 8-input multiplexer

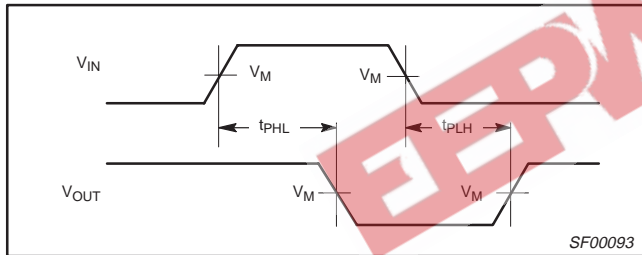
# 74ALS151

## AC ELECTRICAL CHARACTERISTICS

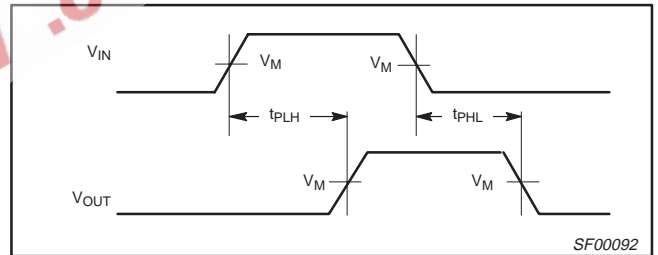
SYMBOL	PARAMETER	TEST CONDITION	LIMITS		UNIT
			$T_{amb} = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ $V_{CC} = +5.0\text{V} \pm 10\%$ $C_L = 50\text{pF}, R_L = 500\Omega$		
			MIN	MAX	
$t_{PLH}$ $t_{PHL}$	Propagation delay In to Y	Waveform 1	3.0 5.0	12.0 12.0	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay In to $\bar{Y}$	Waveform 2	3.0 5.0	15.0 15.0	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay $S_n$ to Y	Waveform 1, 2	5.0 7.0	15.0 16.0	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay $S_n$ to $\bar{Y}$	Waveform 1, 2	5.0 5.0	15.0 16.0	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay $\bar{E}$ to Y	Waveform 1	4.0 4.0	12.0 12.0	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay $\bar{E}$ to $\bar{Y}$	Waveform 1	4.0 5.0	12.0 14.0	ns

## AC WAVEFORMS

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

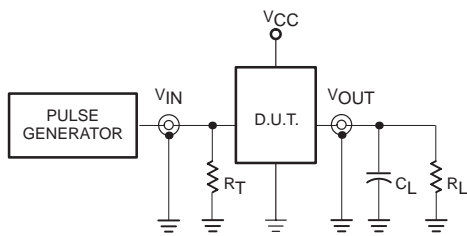


Waveform 1. Propagation Delay for Inverting Output

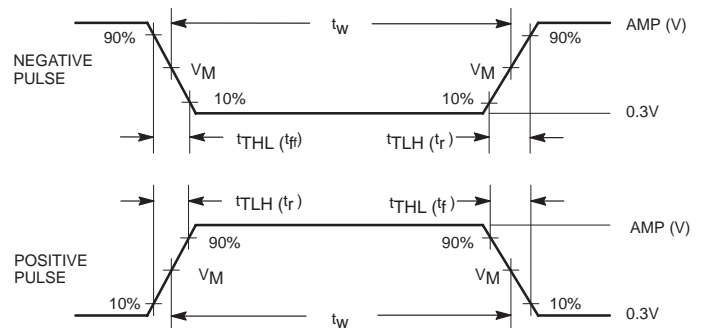


Waveform 2. Propagation Delay for Non-inverting Output

## 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

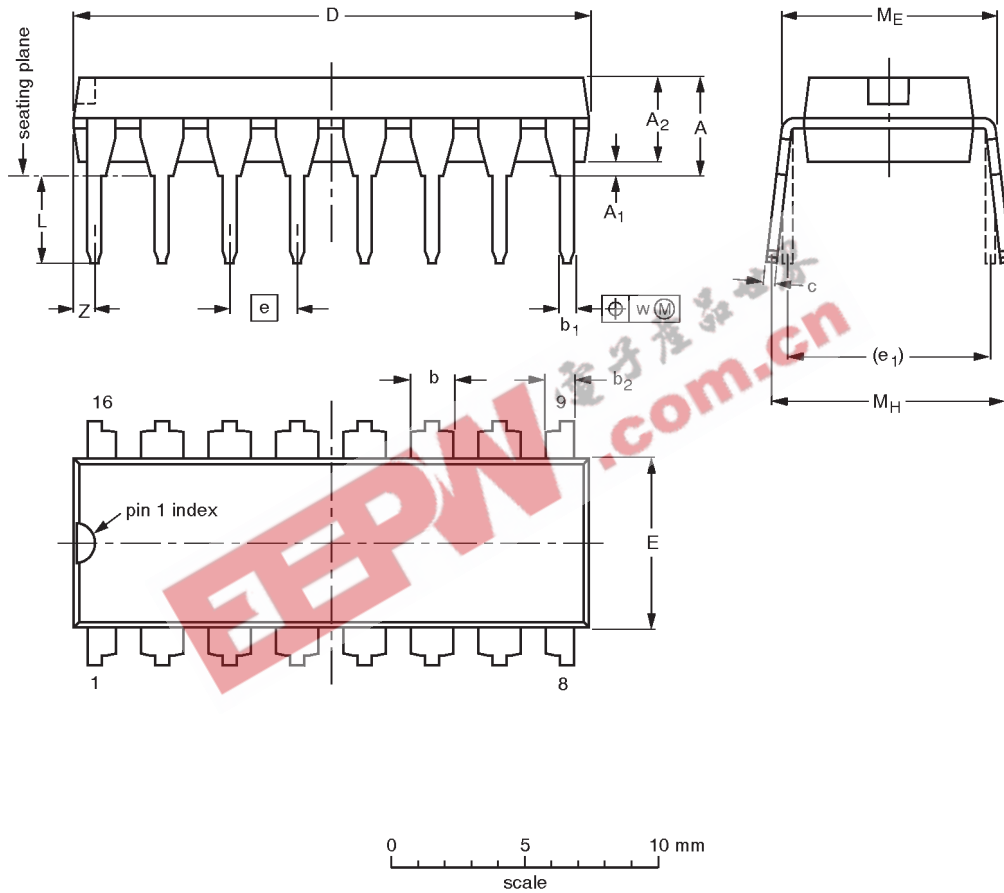
SC00005

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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.

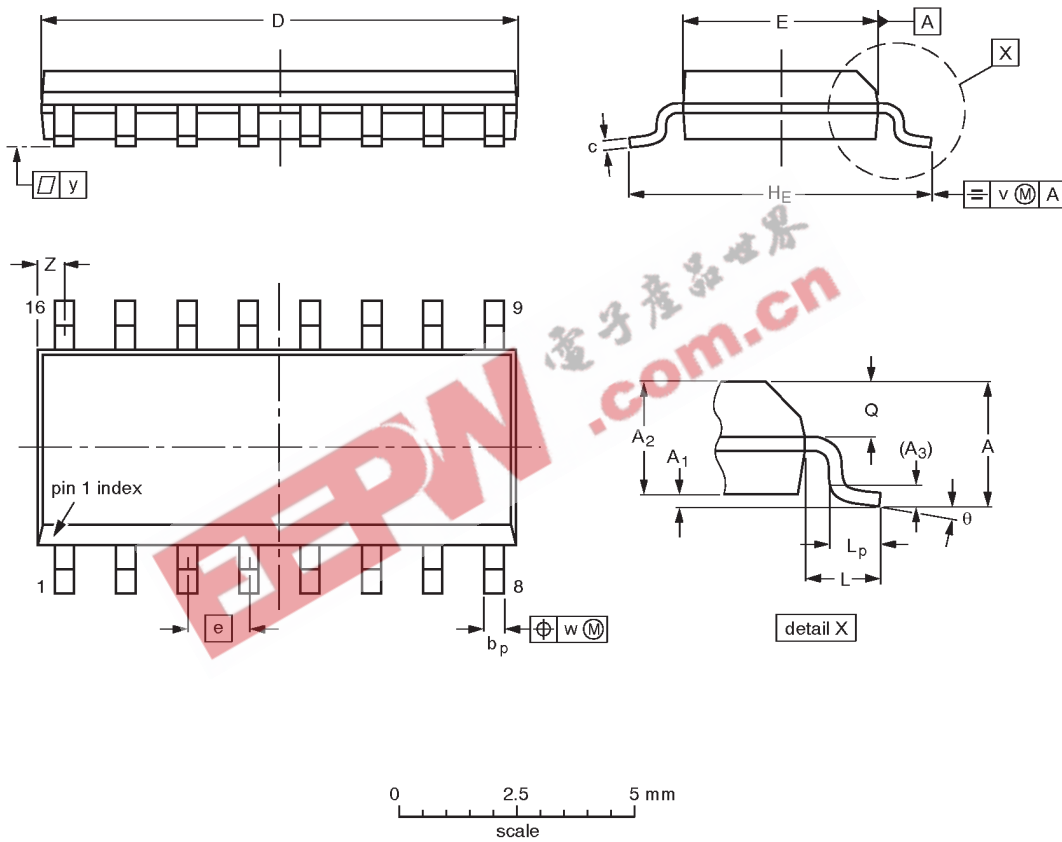
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

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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>	$\theta$
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

## 8-input multiplexer

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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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