DATA SHEET

74ALS253

Dual 4–input multiplexer (3–State)

Philips
Semiconductors

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Dual 4-input multiplexer (3-State)

74ALS253

FEATURES

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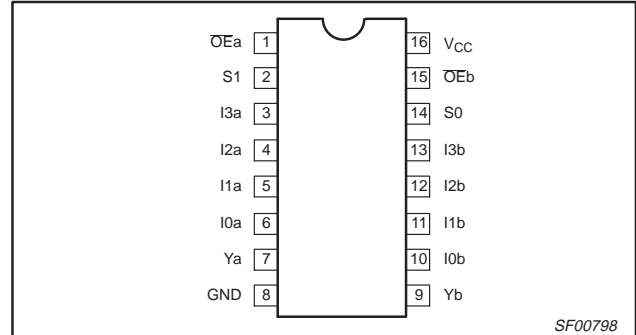- Separate output enable inputs

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

$\overline{OE}a$	1	16	V_{CC}
S1	2	15	$\overline{OE}b$
I3a	3	14	S0
I2a	4	13	I3b
I1a	5	12	I2b
I0a	6	11	I1b
Ya	7	10	I0b
GND	8	9	Yb

SF00798

ORDERING INFORMATION

| DESCRIPTION	ORDER CODE	DRAWING NUMBER
	COMMERCIAL RANGE V_{CC} = 5V ±10%, T_{amb} = 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

V_{CC} = Pin 16
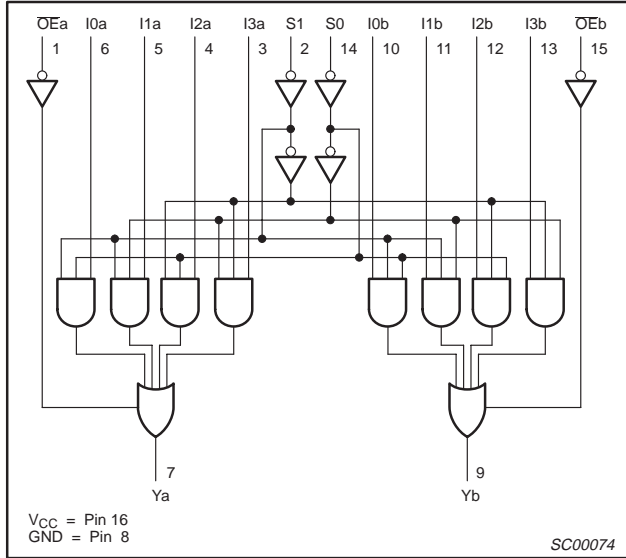GND = Pin 8
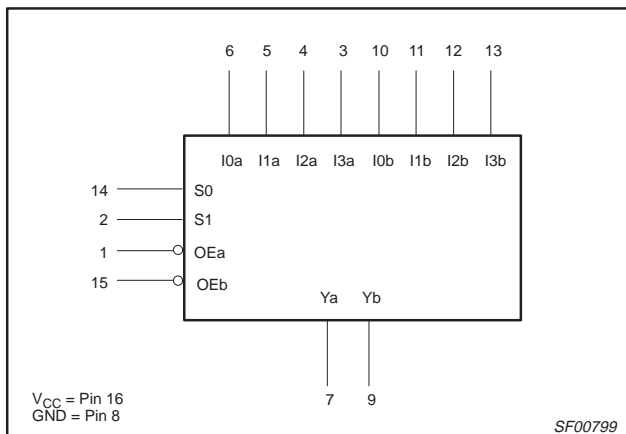
SF00799

IEC/IEEE SYMBOL
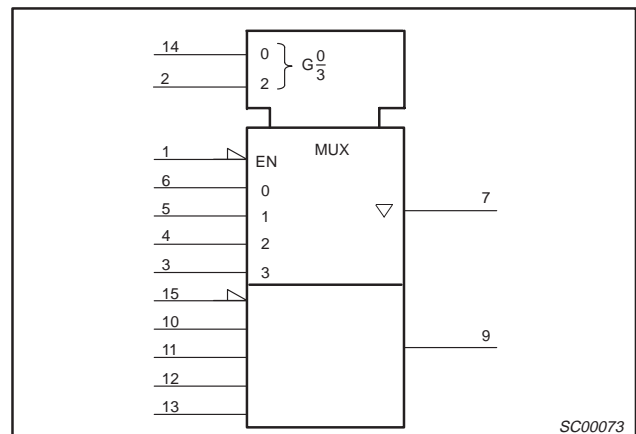
SC00073

Dual 4-input multiplexer (3-State)

74ALS253

LOGIC DIAGRAM

V_{CC} = Pin 16
GND = Pin 8

SC00074

FUNCTION TABLE

INPUTS							OUTPUTS
S0	S1	I0	I1	I2	I3	$\overline{OE}n$	Yn
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_{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

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DC ELECTRICAL CHARACTERISTICS
(Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS[1]		LIMITS			UNIT
				MIN	TYP[2]	MAX	
V_{OH}	High-level output voltage	$V_{CC} \pm 10\%$, V_{IL} = MAX, V_{IH} = MIN	I_{OH} = −0.4mA	$V_{CC} - 2$			V
			I_{OH} = −2.6mA	2.4			V
V_{OL}	Low-level output voltage	V_{CC} = MIN, V_{IL} = MAX, V_{IH} = MIN	I_{OL} = 12mA		0.25	0.40	V
			I_{OL} = 24mA		0.35	0.50	V
V_{IK}	Input clamp voltage	V_{CC} = MIN, $I_I = I_{IK}$			−0.73	−1.5	V
I_I	Input current at maximum input voltage	V_{CC} = MAX, V_I = 7.0V				0.1	mA
I_{IH}	High-level input current	V_{CC} = MAX, V_I = 2.7V				20	μA
I_{IL}	Low-level input current	V_{CC} = MAX, V_I = 0.4V				−0.1	mA
I_{OZH}	Off-state output current, High-level voltage applied	V_{CC} = MAX, V_I = 2.7V				20	μA
I_{OZL}	Off-state output current, Low-level voltage applied	V_{CC} = MAX, V_I = 0.4V				−20	μA
I_O	Output current[3]	V_{CC} = MAX, V_O = 2.25V		−30		−112	mA
I_{CC}	Supply current (total)	I_{CC}	V_{CC} = MAX		7.0	12	mA
		I_{CCZ}			9.0	14	mA

NOTES:
1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
2. All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
3. The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.

AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS T_{amb} = 0°C to +70°C V_{CC} = +5.0V ± 10% C_L = 50pF, R_L = 500Ω		UNIT
			MIN	MAX	
t_{PLH} t_{PHL}	Propagation delay In to Yn	Waveform 1	4.0 4.0	12.0 12.0	ns
t_{PLH} t_{PHL}	Propagation delay Sn to Yn	Waveform 1	5.0 7.0	15.0 16.0	ns
t_{PZH} t_{PZL}	Output enable time, High or Low level $\overline{OE}$n to Yn	Waveform 2 Waveform 3	1.0 3.0	8.0 9.0	ns
t_{PHZ} t_{PLZ}	Output disable time, High or Low level $\overline{OE}$n to Yn	Waveform 2 Waveform 3	1.0 1.0	7.0 7.0	ns

Dual 4-input multiplexer (3-State)
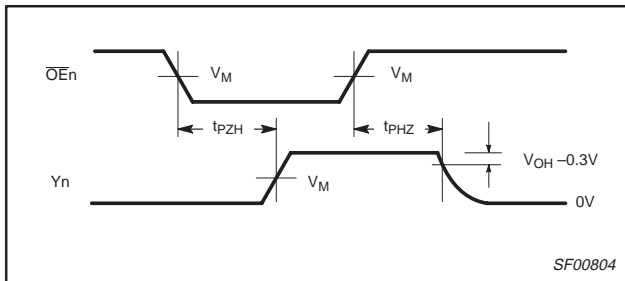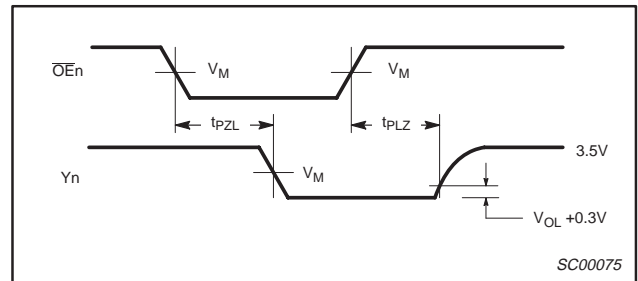
74ALS253

AC WAVEFORMS

For all waveforms, $V_M = 1.3V$.
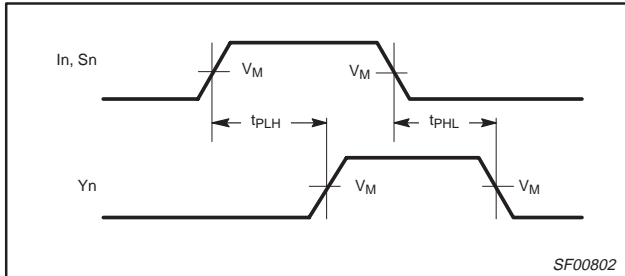
Waveform 1. Propagation Delay for Data and Select to Output
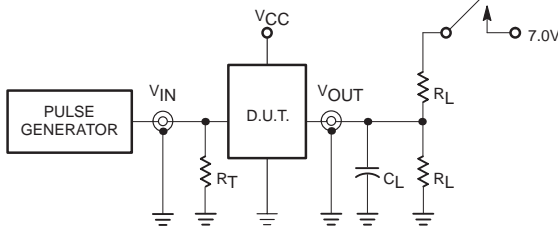

Waveform 2. 3-State Output Enable Time to High Level and Output Disable Time from High Level

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_{PLZ}, 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.
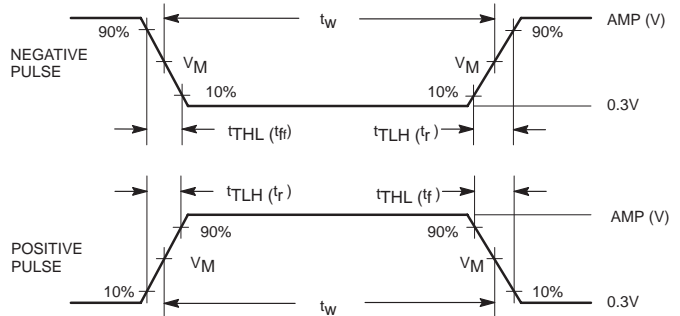
Input Pulse Definition

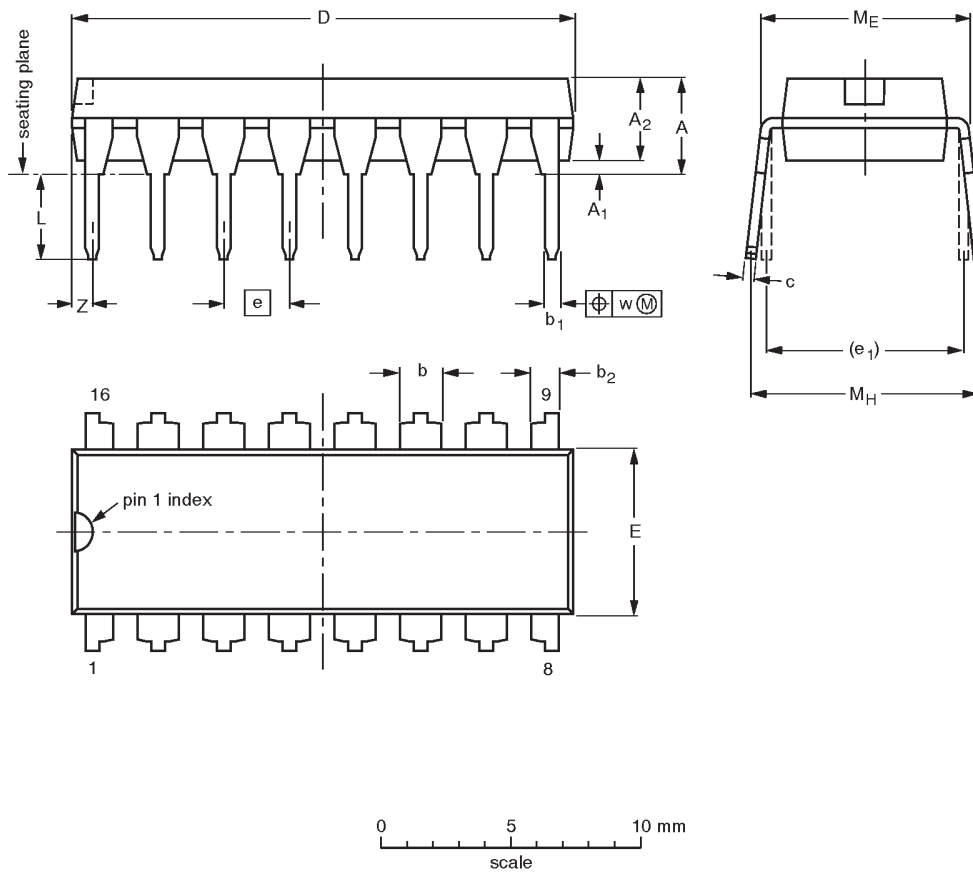| Family	INPUT PULSE REQUIREMENTS					
	Amplitude	V_M	Rep.Rate	t_w	t_{TLH}	t_{THL}
74ALS	3.5V	1.3V	1MHz	500ns	2.0ns	2.0ns

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_1 min.	A_2 max.	b	b_1	b_2	c	D [1]	E [1]	e	e_1	L	M_E	M_H	w	Z [1] 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)

74ALS253

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1
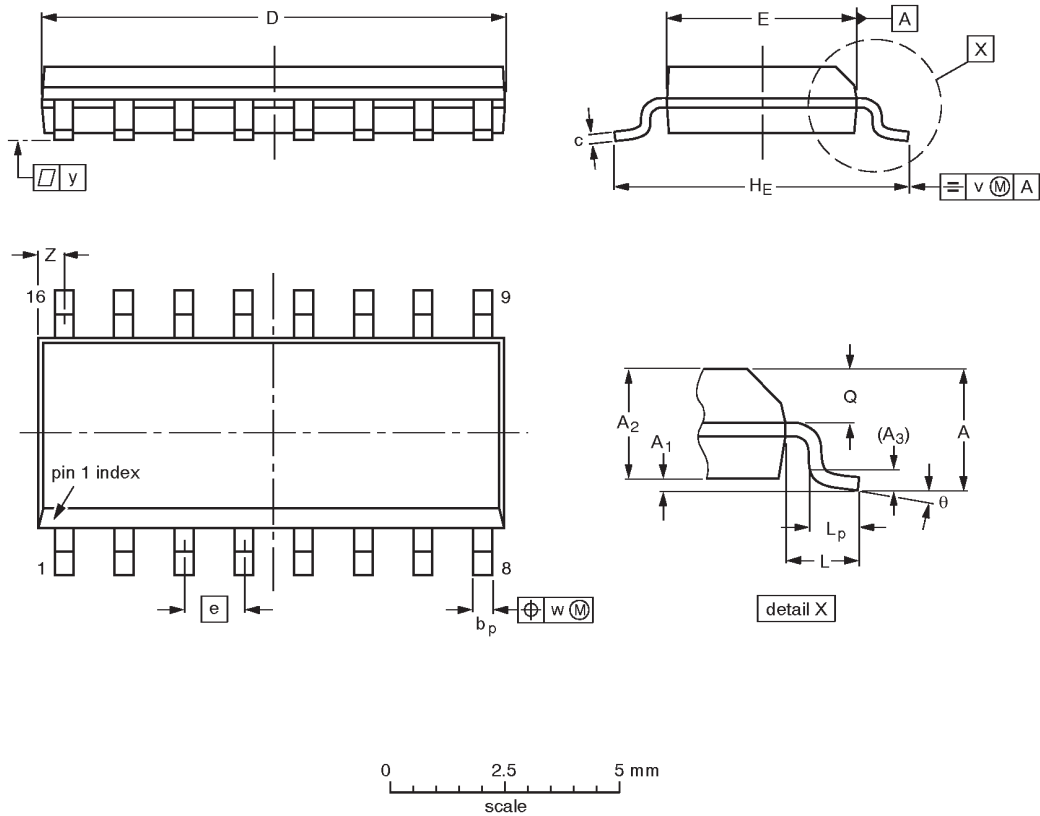
DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	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)
74ALS253

SSOP16:   plastic shrink small outline package; 16 leads; body width 5.3 mm
SOT338-1

pin 1 index

detail X

0   2.5   5 mm
scale
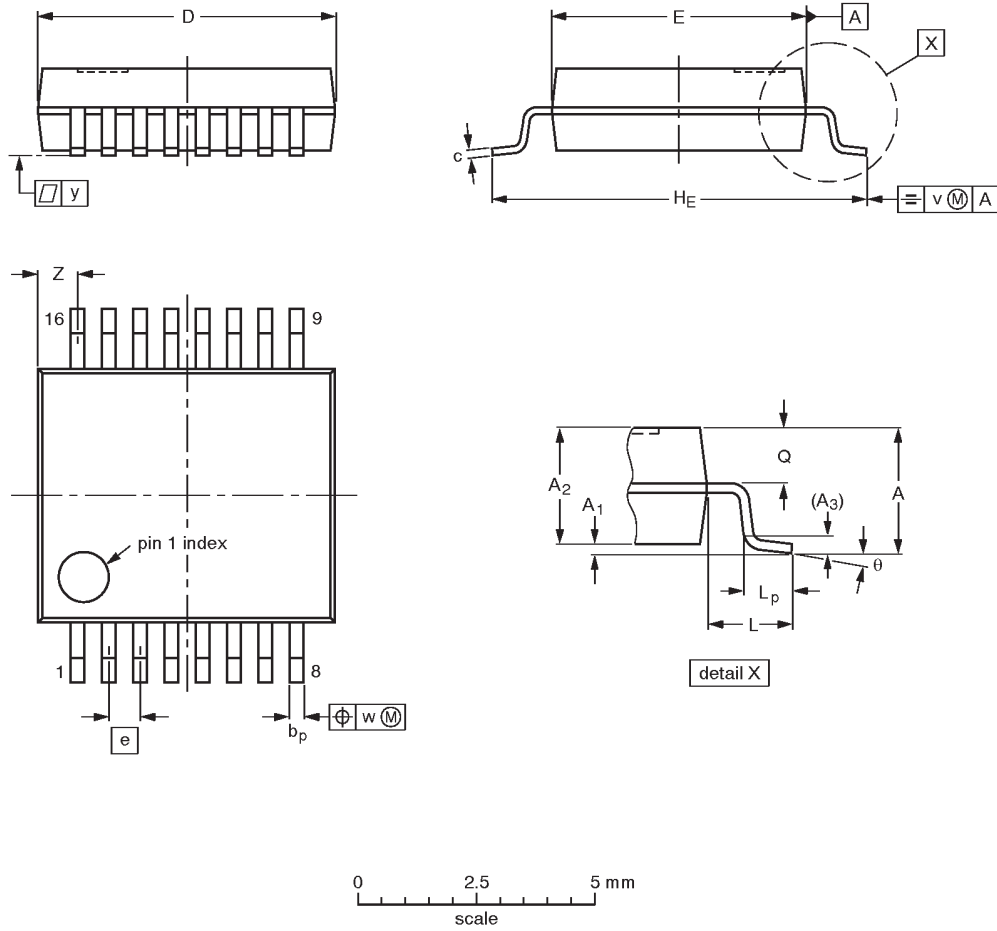
DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	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

DEFINITIONS

Data Sheet Identification	Product Status	Definition
Objective Specification	**Formative or in Design**	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
Preliminary Specification	**Preproduction Product**	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.
Product Specification	**Full Production**	This data sheet contains Final Specifications. 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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