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74HC253; 74HCT253

Dual 4-input multiplexer; 3-state

Rev. 6 — 1 February 2016

Product data sheet

1. General description

The 74HC253; 74HCT253 is a dual 4-bit multiplexer, each with four binary inputs (nI0 to nI3), an output enable input (nOE) and shared select inputs (S0 and S1). One of the four binary inputs is selected by the select inputs and routed to the output nY. A HIGH on nOE causes the outputs to assume a high-impedance OFF-state. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

2. Features and benefits

- Non-inverting data path
- 3-state outputs interface directly with system bus
- Complies with JEDEC standard no. 7A
- Common select inputs
- Separate output enable inputs
- Input levels:
 - ◆ For 74HC253: CMOS level
 - ◆ For 74HCT253: TTL level
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and from $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$

3. Applications

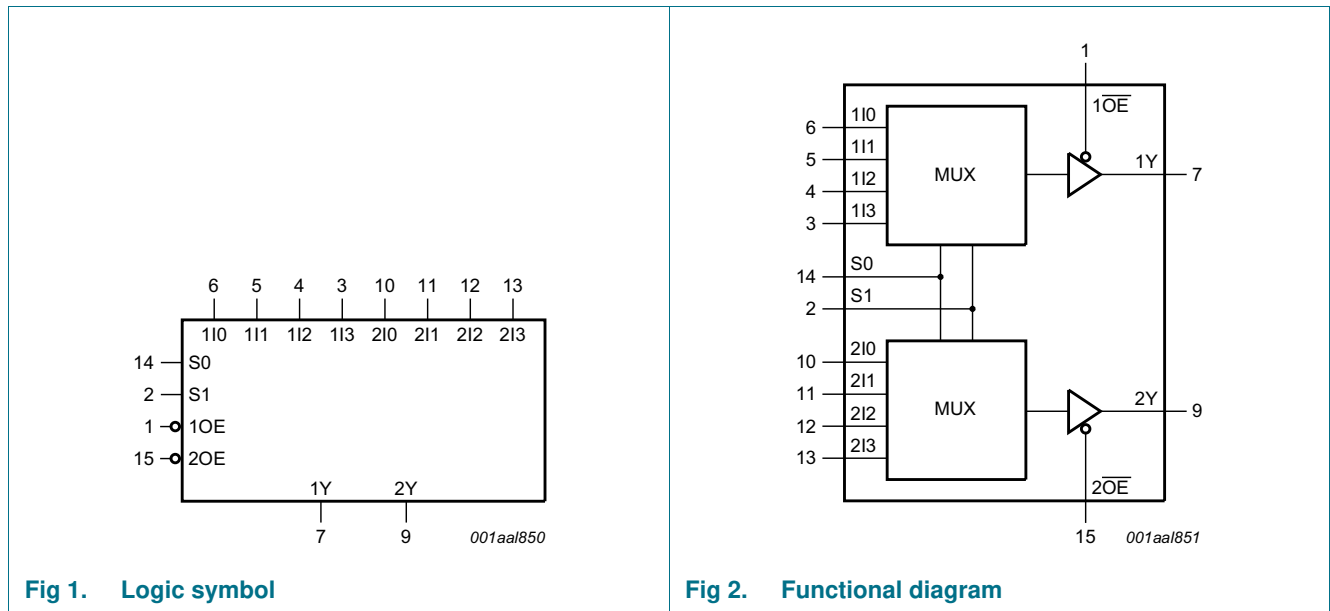
- Data selectors
- Data multiplexers

4. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74HC253D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HCT253D				
74HC253DB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74HCT253DB				

5. Functional diagram



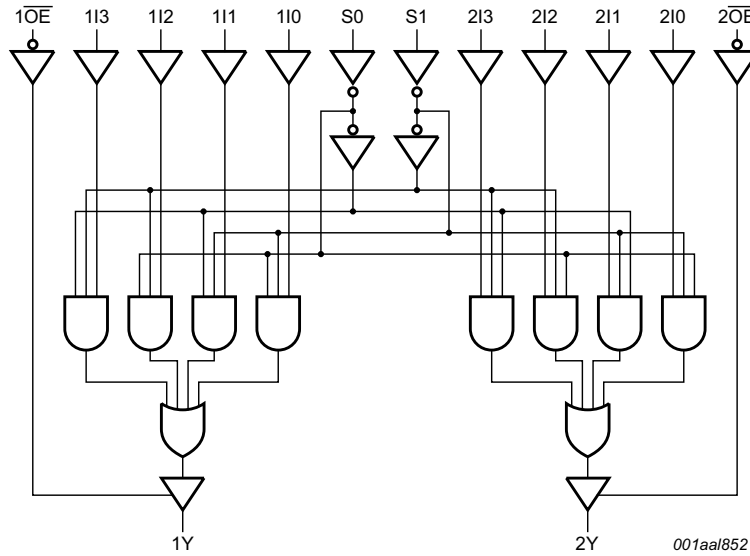


Fig 3. Logic diagram

6. Pinning information

6.1 Pinning

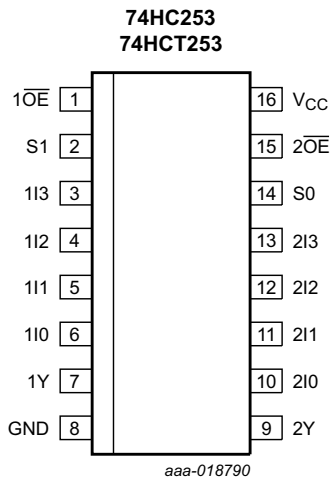


Fig 4. Pin configuration SO16

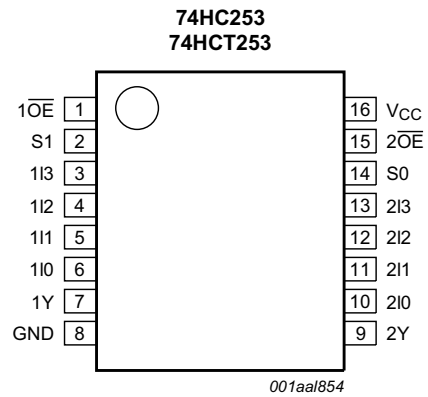


Fig 5. Pin configuration SSOP16

6.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
$1\overline{OE}$, $2\overline{OE}$	1, 15	output enable inputs (active LOW)
S0, S1	14, 2	data select inputs
1I0, 1I1, 1I2, 1I3	6, 5, 4, 3	data inputs source 1
1Y	7	multiplexer output source 1
GND	8	ground (0 V)
2Y	9	multiplexer output source 2
2I0, 2I1, 2I2, 2I3	10, 11, 12, 13	data inputs source 2
V _{CC}	16	supply voltage

7. Functional description

Table 3. Function table^[1]

select inputs		data inputs				output enable	output
S0	S1	nI0	nI1	nI2	nI3	n \overline{OE}	nY
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

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

8. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		-0.5	+7.0	V
I _{IK}	input clamping current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ [1]	-	±20	mA
I _{OK}	output clamping current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ [1]	-	±50	mA
I _O	output current	$-0.5\text{ V} < V_O < V_{CC} + 0.5\text{ V}$	-	±35	mA
I _{CC}	supply current		-	70	mA
I _{GND}	ground current		-70	-	mA
T _{stg}	storage temperature		-65	+150	°C

Table 4. Limiting values ...continued

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
P _{tot}	total power dissipation	T _{amb} = -40 °C to +125 °C			
		SO16 package [2]	-	500	mW
		SSOP16 package [3]	-	500	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] P_{tot} derates linearly with 8 mW/K above 70 °C.

[3] P_{tot} derates linearly with 5.5 mW/K above 60 °C.

9. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74HC253			74HCT253			Unit
			Min	Typ	Max	Min	Typ	Max	
V _{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V _I	input voltage		0	-	V _{CC}	0	-	V _{CC}	V
V _O	output voltage		0	-	V _{CC}	0	-	V _{CC}	V
T _{amb}	ambient temperature		-40	-	+125	-40	-	+125	°C
Δt/ΔV	input transition rise and fall rate	V _{CC} = 2.0 V	-	-	625	-	-	-	ns/V
		V _{CC} = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V _{CC} = 6.0 V	-	-	83	-	-	-	ns/V

10. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC253										
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
		V _{CC} = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V _{CC} = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
		V _{CC} = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V _{CC} = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}								
		I _O = -20 μA; V _{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I _O = -20 μA; V _{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -20 μA; V _{CC} = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		I _O = -6.0 mA; V _{CC} = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
	I _O = -7.8 mA; V _{CC} = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V	

Table 6. Static characteristics ...continued

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}								
		I _O = 20 μA; V _{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 20 μA; V _{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 20 μA; V _{CC} = 6.0 V	-	0	0.1	-	0.1	-	0.1	V
		I _O = 6.0 mA; V _{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I _O = 7.8 mA; V _{CC} = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 6.0 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 6.0 V	-	-	±0.5	-	±5.0	-	±10.0	μA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 6.0 V	-	-	8.0	-	80	-	160	μA
C _I	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT253										
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V								
		I _O = -20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -6 mA	3.98	4.32	-	3.84	-	3.7	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V								
		I _O = 20 μA	-	0	0.1	-	0.1	-	0.1	V
		I _O = 6.0 mA	-	0.15	0.26	-	0.33	-	0.4	V
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 5.5 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 V	-	-	±0.5	-	±5.0	-	±10	μA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	8.0	-	80	-	160	μA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 2.1 V; other inputs at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V; I _O = 0 A								
		per input pin; 1In, 2In inputs	-	40	144	-	180	-	196	μA
		per input pin; $\overline{\text{OE}}$ input	-	110	396	-	495	-	539	μA
		per input pin; Sn input	-	110	396	-	495	-	539	μA
C _I	input capacitance		-	3.5	-	-	-	-	-	pF

11. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); For test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	25 °C		-40 °C to +85 °C	-40 °C to +125 °C	Unit
			Typ	Max	Max	Max	
74HC253							
t_{pd}	propagation delay	1In to 1Y or 2In to 2Y; see Figure 6 [1]					
		$V_{CC} = 2.0\text{ V}$	55	175	220	265	ns
		$V_{CC} = 4.5\text{ V}$	20	35	44	53	ns
		$V_{CC} = 5.0\text{ V}; C_L = 15\text{ pF}$	17	-	-	-	ns
		$V_{CC} = 6.0\text{ V}$	16	30	37	45	ns
		Sn to nY; see Figure 6					
		$V_{CC} = 2.0\text{ V}$	58	175	220	265	ns
		$V_{CC} = 4.5\text{ V}$	21	35	44	53	ns
		$V_{CC} = 5.0\text{ V}; C_L = 15\text{ pF}$	18	-	-	-	ns
		$V_{CC} = 6.0\text{ V}$	17	30	37	45	ns
t_{en}	enable time	\overline{nOE} to nY; see Figure 7 [2]					
		$V_{CC} = 2.0\text{ V}$	30	100	125	150	ns
		$V_{CC} = 4.5\text{ V}$	11	20	25	30	ns
		$V_{CC} = 6.0\text{ V}$	9	17	21	26	ns
t_{dis}	disable time	\overline{nOE} to nY; see Figure 7 [3]					
		$V_{CC} = 2.0\text{ V}$	41	150	190	225	ns
		$V_{CC} = 4.5\text{ V}$	15	30	38	45	ns
		$V_{CC} = 6.0\text{ V}$	12	26	33	38	ns
t_t	transition time	see Figure 6 [4]					
		$V_{CC} = 2.0\text{ V}$	14	60	75	90	ns
		$V_{CC} = 4.5\text{ V}$	5	12	15	18	ns
		$V_{CC} = 6.0\text{ V}$	4	10	13	15	ns
C_{PD}	power dissipation capacitance	per multiplexer; $V_I = \text{GND to } V_{CC}$ [5]	55	-	-	-	pF
74HCT253							
t_{pd}	propagation delay	1In to 1Y or 2In to 2Y; see Figure 6 [1]					
		$V_{CC} = 4.5\text{ V}$	20	38	48	57	ns
		$V_{CC} = 5.0\text{ V}; C_L = 15\text{ pF}$	17	-	-	-	ns
		Sn to nY; see Figure 6					
		$V_{CC} = 4.5\text{ V}$	22	40	50	60	ns
		$V_{CC} = 5.0\text{ V}; C_L = 15\text{ pF}$	19	-	-	-	ns
t_{en}	enable time	\overline{nOE} to nY; $V_{CC} = 4.5\text{ V}$; see Figure 7 [2]	14	30	38	45	ns

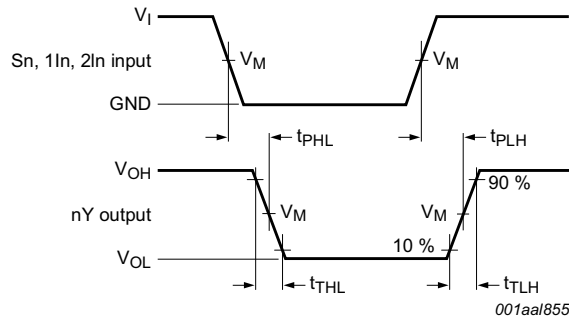
Table 7. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); For test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	25 °C		-40 °C to +85 °C	-40 °C to +125 °C	Unit
			Typ	Max	Max	Max	
t_{dis}	disable time	\overline{nOE} to nY; $V_{CC} = 4.5\text{ V}$; see Figure 7 [3]	13	30	38	45	ns
t_t	transition time	$V_{CC} = 4.5\text{ V}$; see Figure 6	5	12	15	18	ns
C_{PD}	power dissipation capacitance	per multiplexer; $V_I = \text{GND to } V_{CC} - 1.5\text{ V}$ [5]	55	-	-	-	pF

- [1] t_{pd} is the same as t_{PHL} , t_{PLH} .
- [2] t_{en} is the same as t_{PZH} , t_{PZL} .
- [3] t_{dis} is the same as t_{PHZ} , t_{PLZ} .
- [4] t_t is the same as t_{THL} , t_{TLH} .
- [5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$ where:
 f_i = input frequency in MHz;
 f_o = output frequency in MHz;
 C_L = output load capacitance in pF;
 V_{CC} = supply voltage in V;
 N = number of inputs switching;
 $\sum(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

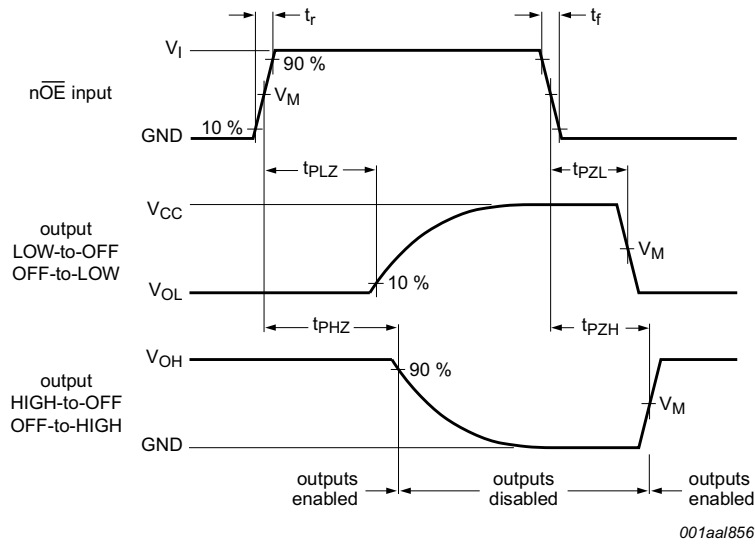
12. Waveforms



Measurement points are given in [Table 8](#).

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 6. Propagation delays input (S_n , 1In, 2In) to output (nY) and output (nY) transition times

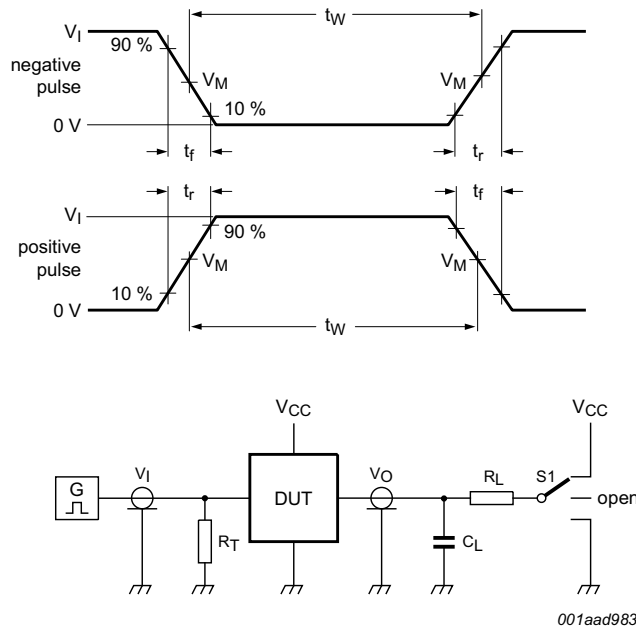


Measurement points are given in [Table 8](#).
 V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 7. 3-state output enable and disable times

Table 8. Measurement points

Type	Input	Output
	V_M	V_M
74HC253	$0.5V_{CC}$	$0.5V_{CC}$
74HCT253	1.3 V	1.3 V



Measurement points are given in [Table 8](#) and test data is given in [Table 9](#).

Definitions test circuit:

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistor.

Fig 8. Test circuit for measuring switching times

Table 9. Test data

Type	Input		Load		Switch position		
	V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
74HC253	V_{CC}	6 ns	50 pF	1 k Ω	open	GND	V_{CC}
74HCT253	3 V	6 ns	50 pF	1 k Ω	open	GND	V_{CC}

13. Package outline

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

SOT109-1

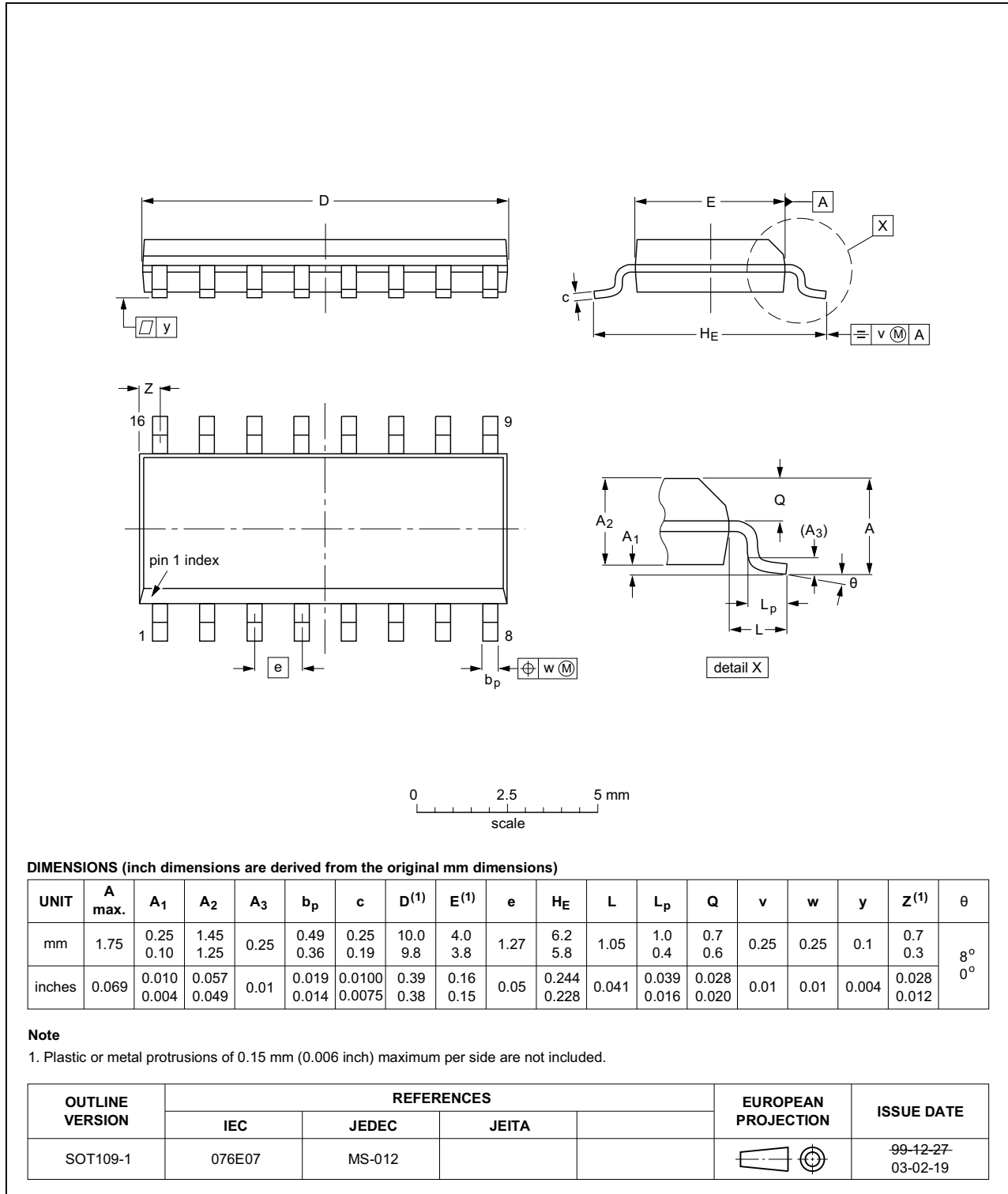


Fig 9. Package outline SOT109-1 (SO16)

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

SOT338-1

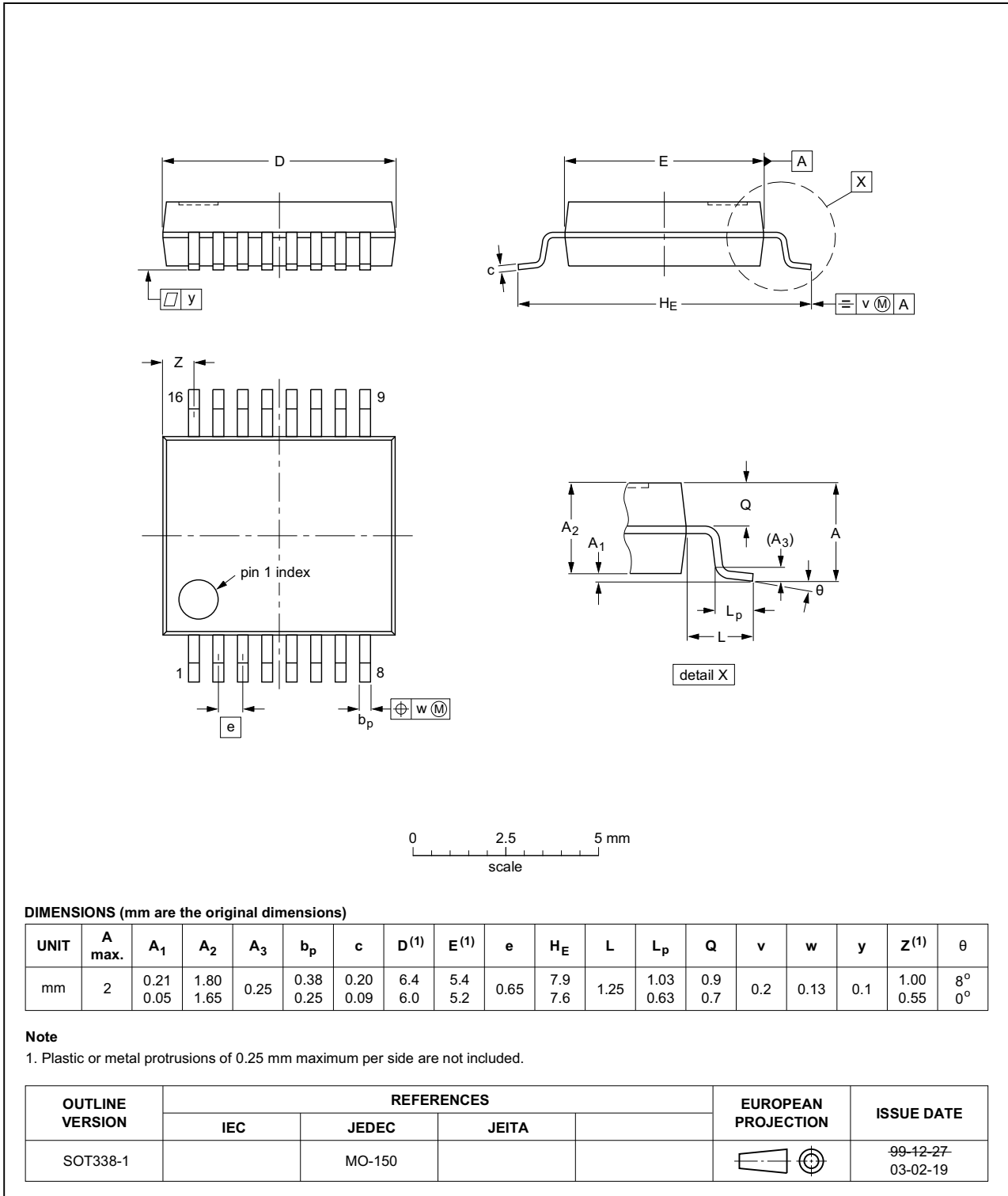


Fig 10. Package outline SOT338-1 (SSOP16)

14. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

15. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT253 v.6	20160201	Product data sheet	-	74HC_HCT253 v.5
Modifications:	<ul style="list-style-type: none"> Type numbers 74HC253N and 74HCT253N (SOT38-4) removed. 			
74HC_HCT253 v.5	20150121	Product data sheet	-	74HC_HCT253 v.4
Modifications:	<ul style="list-style-type: none"> Table 7: Power dissipation capacitance condition for 74HCT253 is corrected. 			
74HC_HCT253 v.4	20111212	Product data sheet	-	74HC_HCT253 v.3
Modifications:	<ul style="list-style-type: none"> Legal pages updated. 			
74HC_HCT253 v.3	20100422	Product data sheet	-	74HC_HCT253_CNV v.2
74HC_HCT253_CNV v.2	970828	Product specification	-	-

16. Legal information

16.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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17. Contact information

For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: salesaddresses@nexperia.com

18. Contents

1	General description	1
2	Features and benefits	1
3	Applications	1
4	Ordering information	2
5	Functional diagram	2
6	Pinning information	3
6.1	Pinning	3
6.2	Pin description	4
7	Functional description	4
8	Limiting values	4
9	Recommended operating conditions	5
10	Static characteristics	5
11	Dynamic characteristics	7
12	Waveforms	8
13	Package outline	11
14	Abbreviations	13
15	Revision history	13
16	Legal information	14
16.1	Data sheet status	14
16.2	Definitions	14
16.3	Disclaimers	14
16.4	Trademarks	15
17	Contact information	15
18	Contents	16