

# 74HC257; 74HCT257

Quad 2-input multiplexer; 3-state

Rev. 03 — 20 September 2005

Product data sheet

## 1. General description

The 74HC257; 74HCT257 is a high-speed Si-gate CMOS device and is pin compatible with Low-power Schottky TTL (LSTTL).

The 74HC257; 74HCT257 has four identical 2-input multiplexers with 3-state outputs, which select 4 bits of data from two sources and are controlled by a common data select input (S).

The data inputs from source 0 (1I0 to 4I0) are selected when input S is LOW and the data inputs from source 1 (1I1 to 4I1) are selected when S is HIGH. Data appears at the outputs (1Y to 4Y) in true (non-inverting) form from the selected inputs.

The 74HC257; 74HCT257 is the logic implementation of a 4-pole, 2-position switch, where the position of the switch is determined by the logic levels applied to S. The outputs are forced to a high-impedance OFF-state when  $\overline{OE}$  is HIGH.

The logic equations for the outputs are:

$$1\bar{Y} = \overline{OE} \times (1I1 \times S + 1I0 \times \bar{S})$$

$$2\bar{Y} = \overline{OE} \times (2I1 \times S + 2I0 \times \bar{S})$$

$$3\bar{Y} = \overline{OE} \times (3I1 \times S + 3I0 \times \bar{S})$$

$$4\bar{Y} = \overline{OE} \times (4I1 \times S + 4I0 \times \bar{S})$$

The 74HC257; 74HCT257 is identical to the 74HC258 but has non-inverting (true) outputs.

## 2. Features

- Non-inverting data path
- 3-state outputs interface directly with system bus
- Complies with JEDEC standard no. 7A
- ESD protection:
  - ◆ HBM EIA/JESD22-A114-C exceeds 2000 V
  - ◆ MM EIA/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  $+125\text{ }^{\circ}\text{C}$

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### 3. Quick reference data

**Table 1: Quick reference data**

$GND = 0\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ;  $t_r = t_f = 6\text{ ns}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>74HC257</b>						
$t_{PHL}$ , $t_{PLH}$	propagation delay nI0, nI1 to nY	$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	-	11	-	ns
	propagation delay S to nY	$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	-	14	-	ns
$C_i$	input capacitance		-	3.5	-	pF
$C_{PD}$	power dissipation capacitance (per multiplexer)	$V_I = GND\text{ to }V_{CC}$	[1]	45	-	pF
<b>74HCT257</b>						
$t_{PHL}$ , $t_{PLH}$	propagation delay nI0, nI1 to nY	$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	-	13	-	ns
	propagation delay S to nY	$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	-	17	-	ns
$C_i$	input capacitance		-	3.5	-	pF
$C_{PD}$	power dissipation capacitance (per multiplexer)	$V_I = GND\text{ to }V_{CC} - 1.5\text{ V}$	[1]	45	-	pF

- [1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$  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.

### 4. Ordering information

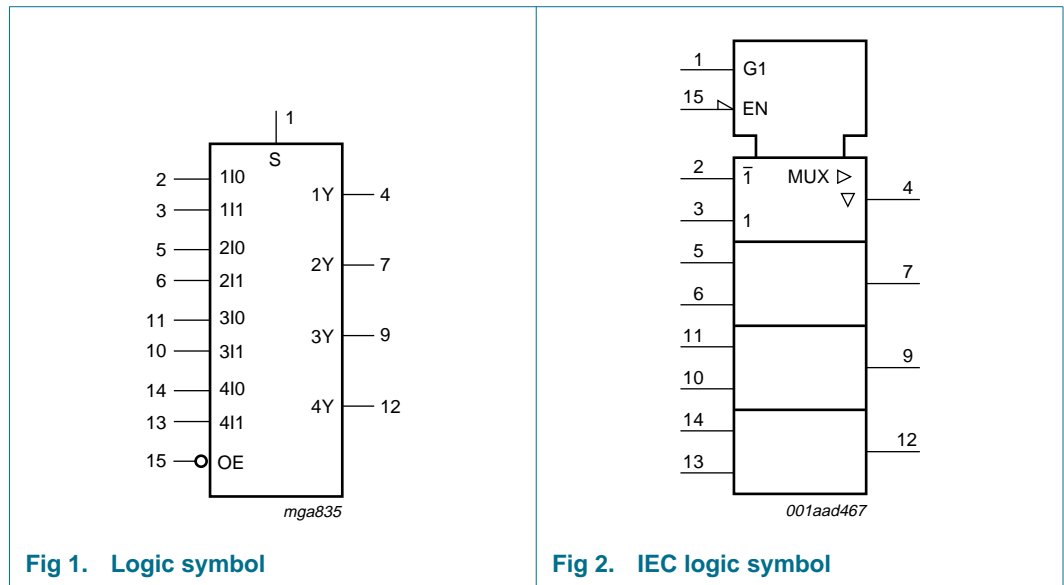
**Table 2: Ordering information**

Type number	Package			
	Temperature range	Name	Description	Version
74HC257N	-40 °C to +125 °C	DIP16	plastic dual in-line package; 16 leads (300 mil); long body	SOT38-1
74HC257D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HC257DB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74HC257PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74HCT257N	-40 °C to +125 °C	DIP16	plastic dual in-line package; 16 leads (300 mil); long body	SOT38-1

**Table 2: Ordering information ...continued**

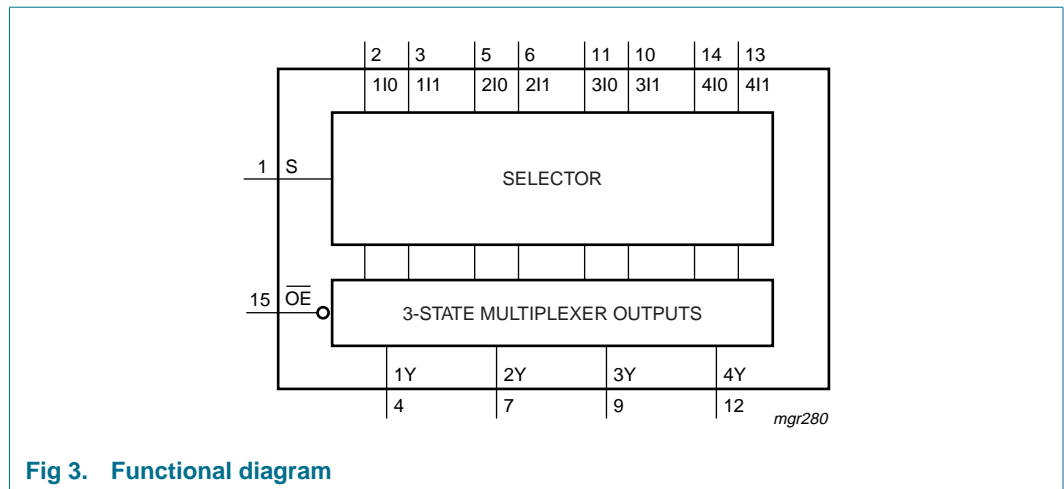
Type number	Package			Version
	Temperature range	Name	Description	
74HCT257D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HCT257DB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74HCT257PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1

## 5. Functional diagram

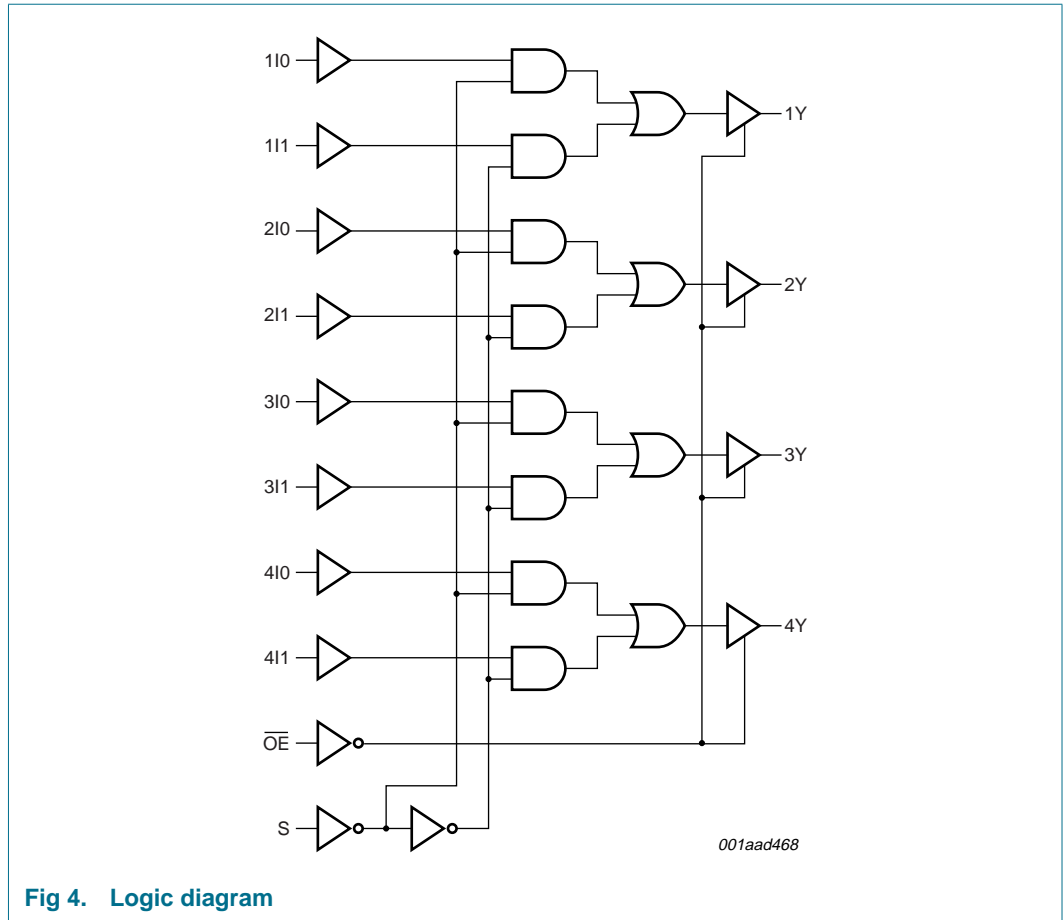


**Fig 1. Logic symbol**

**Fig 2. IEC logic symbol**

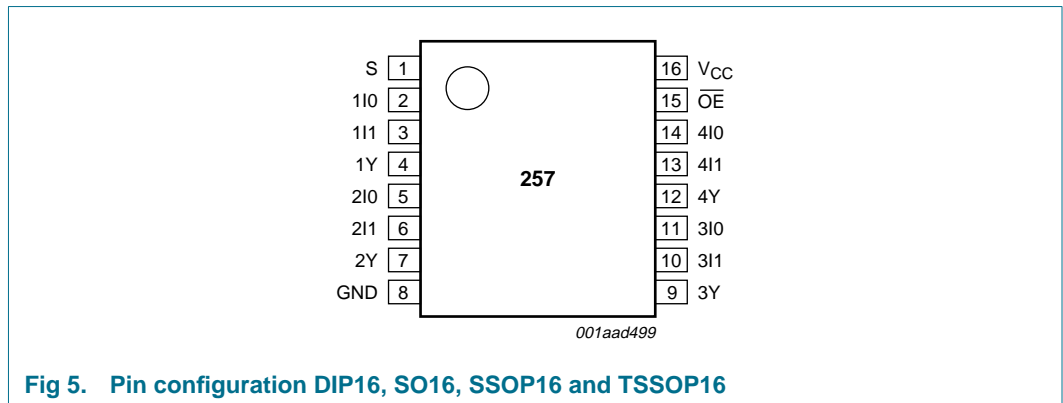


**Fig 3. Functional diagram**



## 6. Pinning information

### 6.1 Pinning



## 6.2 Pin description

Table 3: Pin description

Symbol	Pin	Description
S	1	common data select input
1I0	2	data input 1 from source 0
1I1	3	data input 1 from source 1
1Y	4	3-state multiplexer output 1
2I0	5	data input 2 from source 0
2I1	6	data input 2 from source 1
2Y	7	3-state multiplexer output 2
GND	8	ground (0 V)
3Y	9	3-state multiplexer output 3
3I1	10	data input 3 from source 1
3I0	11	data input 3 from source 0
4Y	12	3-state multiplexer output 4
4I1	13	data input 4 from source 1
4I0	14	data input 4 from source 0
$\overline{\text{OE}}$	15	3-state output enable input (active LOW)
V <sub>CC</sub>	16	supply voltage

## 7. Functional description

### 7.1 Function table

Table 4: Function table <sup>[1]</sup>

Control		Input		Output
$\overline{\text{OE}}$	S	nI0	nI1	nY
H	X	X	X	Z
L	H	X	L	L
		X	H	H
L	L	L	X	L
		H	X	H

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

## 8. Limiting values

**Table 5: 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	V
$I_{IK}$	input clamping current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_{OK}$	output clamping current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$	-	$\pm 20$	mA
$I_O$	output current	$V_O = -0.5\text{ V}$ to $V_{CC} + 0.5\text{ V}$	-	$\pm 35$	mA
$I_{CC}$	quiescent supply current		-	+70	mA
$I_{GND}$	ground current		-	-70	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation				
	DIP16 package		[1] -	750	mW
	SO16 package		[2] -	500	mW
	SSOP16 package		[3] -	500	mW
	TSSOP16 package		[3] -	500	mW

[1] For DIP16 packages: above 70 °C,  $P_{tot}$  derates linearly with 12 mW/K.

[2] For SO16 packages: above 70 °C,  $P_{tot}$  derates linearly with 8 mW/K.

[3] For SSOP16 and TSSOP16 packages: above 60 °C,  $P_{tot}$  derates linearly with 5.5 mW/K.

## 9. Recommended operating conditions

**Table 6: Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Type 74HC257</b>						
$V_{CC}$	supply voltage		2.0	5.0	6.0	V
$V_I$	input voltage		0	-	$V_{CC}$	V
$V_O$	output voltage		0	-	$V_{CC}$	V
$t_r, t_f$	input rise and fall times	$V_{CC} = 2.0\text{ V}$	-	-	1000	ns
		$V_{CC} = 4.5\text{ V}$	-	6.0	500	ns
		$V_{CC} = 6.0\text{ V}$	-	-	400	ns
$T_{amb}$	ambient temperature		-40	-	+125	°C
<b>Type 74HCT257</b>						
$V_{CC}$	supply voltage		4.5	5.0	5.5	V
$V_I$	input voltage		0	-	$V_{CC}$	V
$V_O$	output voltage		0	-	$V_{CC}$	V
$t_r, t_f$	input rise and fall times	$V_{CC} = 4.5\text{ V}$	-	6.0	500	ns
$T_{amb}$	ambient temperature		-40	-	+125	°C

## 10. Static characteristics

**Table 7: Static characteristics type 74HC257**
*At recommended operating conditions; voltages are referenced to GND (ground = 0 V).*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
V <sub>IH</sub>	HIGH-state input voltage	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	V
		V <sub>CC</sub> = 4.5 V	3.15	2.4	-	V
		V <sub>CC</sub> = 6.0 V	4.2	3.2	-	V
V <sub>IL</sub>	LOW-state input voltage	V <sub>CC</sub> = 2.0 V	-	0.8	0.5	V
		V <sub>CC</sub> = 4.5 V	-	2.1	1.35	V
		V <sub>CC</sub> = 6.0 V	-	2.8	1.8	V
V <sub>OH</sub>	HIGH-state output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	V
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	V
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 6.0 V	5.9	6.0	-	V
		I <sub>O</sub> = -6.0 mA; V <sub>CC</sub> = 4.5 V	3.98	4.32	-	V
V <sub>OL</sub>	LOW-state output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 20 µA; V <sub>CC</sub> = 2.0 V	-	0	0.1	V
		I <sub>O</sub> = 20 µA; V <sub>CC</sub> = 4.5 V	-	0	0.1	V
		I <sub>O</sub> = 20 µA; V <sub>CC</sub> = 6.0 V	-	0	0.1	V
		I <sub>O</sub> = 6.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.26	V
		I <sub>O</sub> = 7.8 mA; V <sub>CC</sub> = 6.0 V	-	0.16	0.26	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±0.1	µA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±0.5	µA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V	-	-	8.0	µA
C <sub>i</sub>	input capacitance		-	3.5	-	pF
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
V <sub>IH</sub>	HIGH-state input voltage	V <sub>CC</sub> = 2.0 V	1.5	-	-	V
		V <sub>CC</sub> = 4.5 V	3.15	-	-	V
		V <sub>CC</sub> = 6.0 V	4.2	-	-	V
V <sub>IL</sub>	LOW-state input voltage	V <sub>CC</sub> = 2.0 V	-	-	0.5	V
		V <sub>CC</sub> = 4.5 V	-	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	-	1.8	V
V <sub>OH</sub>	HIGH-state output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 2.0 V	1.9	-	-	V
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 4.5 V	4.4	-	-	V
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 6.0 V	5.9	-	-	V
		I <sub>O</sub> = -6.0 mA; V <sub>CC</sub> = 4.5 V	3.84	-	-	V
		I <sub>O</sub> = -7.8 mA; V <sub>CC</sub> = 6.0 V	5.34	-	-	V

**Table 7: Static characteristics type 74HC257 ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OL</sub>	LOW-state output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V	-	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	-	0.1	V
		I <sub>O</sub> = 6.0 mA; V <sub>CC</sub> = 4.5 V	-	-	0.33	V
		I <sub>O</sub> = 7.8 mA; V <sub>CC</sub> = 6.0 V	-	-	0.33	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±1.0	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±5.0	μA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V	-	-	80	μA
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
V <sub>IH</sub>	HIGH-state input voltage	V <sub>CC</sub> = 2.0 V	1.5	-	-	V
		V <sub>CC</sub> = 4.5 V	3.15	-	-	V
		V <sub>CC</sub> = 6.0 V	4.2	-	-	V
V <sub>IL</sub>	LOW-state input voltage	V <sub>CC</sub> = 2.0 V	-	-	0.5	V
		V <sub>CC</sub> = 4.5 V	-	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	-	1.8	V
V <sub>OH</sub>	HIGH-state output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>		-		
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V	1.9	-	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	-	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V	5.9	-	-	V
		I <sub>O</sub> = -6.0 mA; V <sub>CC</sub> = 4.5 V	3.7	-	-	V
		I <sub>O</sub> = -7.8 mA; V <sub>CC</sub> = 6.0 V	5.2	-	-	V
V <sub>OL</sub>	LOW-state output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>		-		
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V	-	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	-	0.1	V
		I <sub>O</sub> = 6.0 mA; V <sub>CC</sub> = 4.5 V	-	-	0.4	V
		I <sub>O</sub> = 7.8 mA; V <sub>CC</sub> = 6.0 V	-	-	0.4	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±1.0	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±10.0	μA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V	-	-	160	μA

**Table 8: Static characteristics type 74HCT257**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
V <sub>IH</sub>	HIGH-state input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	1.6	-	V
V <sub>IL</sub>	LOW-state input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	1.2	0.8	V
V <sub>OH</sub>	HIGH-state output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V				
		I <sub>O</sub> = -20 μA	4.4	4.5	-	V
		I <sub>O</sub> = -6 mA	3.98	4.32	-	V



**Table 8: Static characteristics type 74HCT257 ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OL}$	LOW-state output voltage	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5$ V				
		$I_O = 20$ $\mu$ A	-	0	0.1	V
		$I_O = 6.0$ mA	-	0.15	0.26	V
$I_{LI}$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5$ V	-	-	$\pm 0.1$	$\mu$ A
$I_{OZ}$	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 5.5$ V; $V_O = V_{CC}$ or GND per input pin; other inputs at $V_{CC}$ or GND; $I_O = 0$ A	-	-	$\pm 0.5$	$\mu$ A
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	8.0	$\mu$ A
$\Delta I_{CC}$	additional quiescent supply current (per input pin)	$V_I = V_{CC} - 2.1$ V; other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5$ V to 5.5 V; $I_O = 0$ A				
		nI0 input	-	40	144	$\mu$ A
		nI1 input	-	40	144	$\mu$ A
		$\overline{OE}$ input	-	135	486	$\mu$ A
		S input	-	70	252	$\mu$ A
$C_i$	input capacitance		-	3.5	-	pF
<b><math>T_{amb} = -40</math> °C to <math>+85</math> °C</b>						
$V_{IH}$	HIGH-state input voltage	$V_{CC} = 4.5$ V to 5.5 V	2.0	-	-	V
$V_{IL}$	LOW-state input voltage	$V_{CC} = 4.5$ V to 5.5 V	-	-	0.8	V
$V_{OH}$	HIGH-state output voltage	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5$ V				
		$I_O = -20$ $\mu$ A	4.4	-	-	V
		$I_O = -6$ mA	3.84	-	-	V
$V_{OL}$	LOW-state output voltage	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5$ V				
		$I_O = 20$ $\mu$ A	-	-	0.1	V
		$I_O = 6.0$ mA	-	-	0.33	V
$I_{LI}$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5$ V	-	-	$\pm 1.0$	$\mu$ A
$I_{OZ}$	OFF-state output current	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 5.5$ V; $V_O = V_{CC}$ or GND per input pin; other inputs at $V_{CC}$ or GND; $I_O = 0$ A	-	-	$\pm 5.0$	$\mu$ A
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	80	$\mu$ A
$\Delta I_{CC}$	additional quiescent supply current (per input pin)	$V_I = V_{CC} - 2.1$ V; other inputs at $V_{CC}$ or GND; $V_{CC} = 4.5$ V to 5.5 V; $I_O = 0$ A				
		nI0 input	-	-	180	$\mu$ A
		nI1 input	-	-	180	$\mu$ A
		$\overline{OE}$ input	-	-	608	$\mu$ A
		S input	-	-	315	$\mu$ A
<b><math>T_{amb} = -40</math> °C to <math>+125</math> °C</b>						
$V_{IH}$	HIGH-state input voltage	$V_{CC} = 4.5$ V to 5.5 V	2.0	-	-	V
$V_{IL}$	LOW-state input voltage	$V_{CC} = 4.5$ V to 5.5 V	-	-	0.8	V
$V_{OH}$	HIGH-state output voltage	$V_I = V_{IH}$ or $V_{IL}$ ; $V_{CC} = 4.5$ V				
		$I_O = -20$ $\mu$ A	4.4	-	-	V
		$I_O = -6$ mA	3.7	-	-	V

**Table 8: Static characteristics type 74HCT257 ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OL</sub>	LOW-state output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V				
		I <sub>O</sub> = 20 μA	-	-	0.1	V
		I <sub>O</sub> = 6.0 mA	-	-	0.4	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V	-	-	±1.0	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = V <sub>CC</sub> or GND per input pin; other inputs at V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A	-	-	±10	μA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	160	μA
ΔI <sub>CC</sub>	additional quiescent supply current (per input pin)	V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 4.5 V to 5.5 V; I <sub>O</sub> = 0 A				
		nI0 input	-	-	196	μA
		nI1 input	-	-	196	μA
		$\overline{OE}$ input	-	-	662	μA
		S input	-	-	343	μA

## 11. Dynamic characteristics

**Table 9: Dynamic characteristics type 74HC257**

Voltages are referenced to GND (ground = 0 V); C<sub>L</sub> = 50 pF, unless otherwise specified.

For test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
t <sub>PHL</sub> , t <sub>PLH</sub>	propagation delay nI0 to nY or nI1 to nY	see <a href="#">Figure 6</a>				
		V <sub>CC</sub> = 2.0 V	-	36	110	ns
		V <sub>CC</sub> = 4.5 V	-	13	22	ns
		V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF	-	11	-	ns
	propagation delay S to nY	V <sub>CC</sub> = 6.0 V	-	10	19	ns
		see <a href="#">Figure 6</a>				
		V <sub>CC</sub> = 2.0 V	-	47	150	ns
		V <sub>CC</sub> = 4.5 V	-	17	30	ns
t <sub>PZH</sub> , t <sub>PZL</sub>	3-state output enable time $\overline{OE}$ to nY	V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF	-	14	-	ns
		V <sub>CC</sub> = 6.0 V	-	14	26	ns
		see <a href="#">Figure 7</a>				
		V <sub>CC</sub> = 2.0 V	-	33	150	ns
		V <sub>CC</sub> = 4.5 V	-	12	30	ns
t <sub>PHZ</sub> , t <sub>PLZ</sub>	3-state output disable time $\overline{OE}$ to nY	V <sub>CC</sub> = 6.0 V	-	10	26	ns
		see <a href="#">Figure 7</a>				
		V <sub>CC</sub> = 2.0 V	-	41	150	ns
		V <sub>CC</sub> = 4.5 V	-	15	30	ns
		V <sub>CC</sub> = 6.0 V	-	12	26	ns

**Table 9: Dynamic characteristics type 74HC257 ...continued**

Voltages are referenced to GND (ground = 0 V);  $C_L = 50$  pF, unless otherwise specified.

For test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$t_{THL}$ , $t_{TLH}$	output transition time	see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	14	60	ns	
		$V_{CC} = 4.5$ V	-	5	12	ns	
		$V_{CC} = 6.0$ V	-	4	10	ns	
$C_{PD}$	power dissipation capacitance (per multiplexer)	$V_I = \text{GND to } V_{CC}$	[1]	-	45	pF	
<b><math>T_{amb} = -40</math> °C to <math>+85</math> °C</b>							
$t_{PHL}$ , $t_{PLH}$	propagation delay nI0 to nY or nI1 to nY	see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	-	140	ns	
		$V_{CC} = 4.5$ V	-	-	28	ns	
			$V_{CC} = 6.0$ V	-	-	24	ns
	propagation delay S to nY	see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	-	190	ns	
$V_{CC} = 4.5$ V		-	-	38	ns		
		$V_{CC} = 6.0$ V	-	-	33	ns	
$t_{PZH}$ , $t_{PZL}$	3-state output enable time $\overline{OE}$ to nY	see <a href="#">Figure 7</a>					
		$V_{CC} = 2.0$ V	-	-	190	ns	
		$V_{CC} = 4.5$ V	-	-	38	ns	
		$V_{CC} = 6.0$ V	-	-	33	ns	
$t_{PHZ}$ , $t_{PLZ}$	3-state output disable time $\overline{OE}$ to nY	see <a href="#">Figure 7</a>					
		$V_{CC} = 2.0$ V	-	-	190	ns	
		$V_{CC} = 4.5$ V	-	-	38	ns	
		$V_{CC} = 6.0$ V	-	-	33	ns	
$t_{THL}$ , $t_{TLH}$	output transition time	see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	-	75	ns	
		$V_{CC} = 4.5$ V	-	-	15	ns	
		$V_{CC} = 6.0$ V	-	-	13	ns	
<b><math>T_{amb} = -40</math> °C to <math>+125</math> °C</b>							
$t_{PHL}$ , $t_{PLH}$	propagation delay nI0 to nY or nI1 to nY	see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	-	165	ns	
		$V_{CC} = 4.5$ V	-	-	33	ns	
			$V_{CC} = 6.0$ V	-	-	28	ns
	propagation delay S to nY	see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	-	225	ns	
$V_{CC} = 4.5$ V		-	-	45	ns		
		$V_{CC} = 6.0$ V	-	-	38	ns	

**Table 9: Dynamic characteristics type 74HC257 ...continued**

Voltages are referenced to GND (ground = 0 V);  $C_L = 50$  pF, unless otherwise specified.

For test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{PZH}$ , $t_{PZL}$	3-state output enable time $\overline{OE}$ to nY	see <a href="#">Figure 7</a>				
		$V_{CC} = 2.0$ V	-	-	225	ns
		$V_{CC} = 4.5$ V	-	-	45	ns
		$V_{CC} = 6.0$ V	-	-	38	ns
$t_{PHZ}$ , $t_{PLZ}$	3-state output disable time $\overline{OE}$ to nY	see <a href="#">Figure 7</a>				
		$V_{CC} = 2.0$ V	-	-	225	ns
		$V_{CC} = 4.5$ V	-	-	45	ns
		$V_{CC} = 6.0$ V	-	-	38	ns
$t_{THL}$ , $t_{TLH}$	output transition time	see <a href="#">Figure 6</a>				
		$V_{CC} = 2.0$ V	-	-	90	ns
		$V_{CC} = 4.5$ V	-	-	18	ns
		$V_{CC} = 6.0$ V	-	-	15	ns

[1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu$ W).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$  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.

**Table 10: Dynamic characteristics type 74HCT257**

Voltages are referenced to GND (ground = 0 V);  $C_L = 50$  pF, unless otherwise specified.

For test circuit see [Figure 8](#).

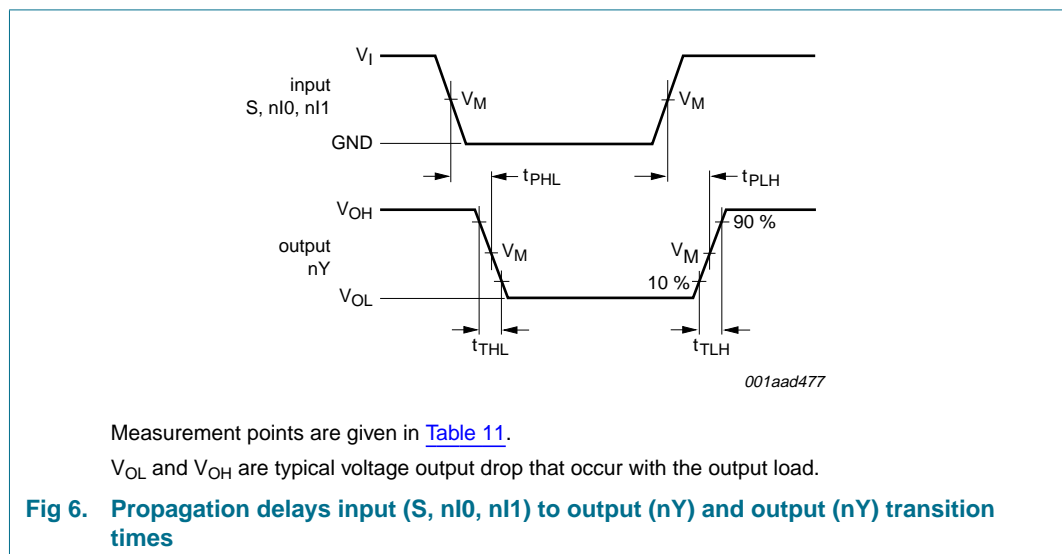
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{amb} = 25</math> °C</b>						
$t_{PHL}$ , $t_{PLH}$	propagation delay nI0 to nY or nI1 to nY	see <a href="#">Figure 6</a>				
		$V_{CC} = 4.5$ V	-	16	30	ns
		$V_{CC} = 5.0$ V; $C_L = 15$ pF	-	13	-	ns
	propagation delay S to nY	see <a href="#">Figure 6</a>				
		$V_{CC} = 4.5$ V	-	20	35	ns
		$V_{CC} = 5.0$ V; $C_L = 15$ pF	-	17	-	ns
$t_{PZH}$ , $t_{PZL}$	3-state output enable time $\overline{OE}$ to nY	$V_{CC} = 4.5$ V; see <a href="#">Figure 7</a>	-	15	30	ns
$t_{PHZ}$ , $t_{PLZ}$	3-state output disable time $\overline{OE}$ to nY	$V_{CC} = 4.5$ V; see <a href="#">Figure 7</a>	-	16	30	ns
$t_{THL}$ , $t_{TLH}$	output transition time	$V_{CC} = 4.5$ V; see <a href="#">Figure 6</a>	-	5	12	ns
<b><math>T_{amb} = -40</math> °C to <math>+85</math> °C</b>						
$t_{PHL}$ , $t_{PLH}$	propagation delay nI0 to nY or nI1 to nY	$V_{CC} = 4.5$ V; see <a href="#">Figure 6</a>	-	-	38	ns
	propagation delay S to nY	$V_{CC} = 4.5$ V; see <a href="#">Figure 6</a>	-	-	44	ns

**Table 10: Dynamic characteristics type 74HCT257 ...continued**  
 Voltages are referenced to GND (ground = 0 V);  $C_L = 50 \text{ pF}$ , unless otherwise specified.  
 For test circuit see [Figure 8](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{PZH}, t_{PZL}$	3-state output enable time $\overline{OE}$ to nY	$V_{CC} = 4.5 \text{ V}$ ; see <a href="#">Figure 7</a>	-	-	38	ns
$t_{PHZ}, t_{PLZ}$	3-state output disable time $\overline{OE}$ to nY	$V_{CC} = 4.5 \text{ V}$ ; see <a href="#">Figure 7</a>	-	-	38	ns
$t_{THL}, t_{TLH}$	output transition time	$V_{CC} = 4.5 \text{ V}$ ; see <a href="#">Figure 6</a>	-	-	15	ns
<b><math>T_{amb} = -40 \text{ }^\circ\text{C to } +125 \text{ }^\circ\text{C}</math></b>						
$t_{PHL}, t_{PLH}$	propagation delay nI0 to nY or nI1 to nY	$V_{CC} = 4.5 \text{ V}$ ; see <a href="#">Figure 6</a>	-	-	45	ns
	propagation delay S to nY	$V_{CC} = 4.5 \text{ V}$ ; see <a href="#">Figure 6</a>	-	-	53	ns
$t_{PZH}, t_{PZL}$	3-state output enable time $\overline{OE}$ to nY	$V_{CC} = 4.5 \text{ V}$ ; see <a href="#">Figure 7</a>	-	-	45	ns
$t_{PHZ}, t_{PLZ}$	3-state output disable time $\overline{OE}$ to nY	$V_{CC} = 4.5 \text{ V}$ ; see <a href="#">Figure 7</a>	-	-	45	ns
$t_{THL}, t_{TLH}$	output transition time	$V_{CC} = 4.5 \text{ V}$ ; see <a href="#">Figure 6</a>	-	-	18	ns
$C_{PD}$	power dissipation capacitance (per multiplexer)	$V_I = \text{GND to } V_{CC}$	[1]	45	-	pF

- [1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$  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



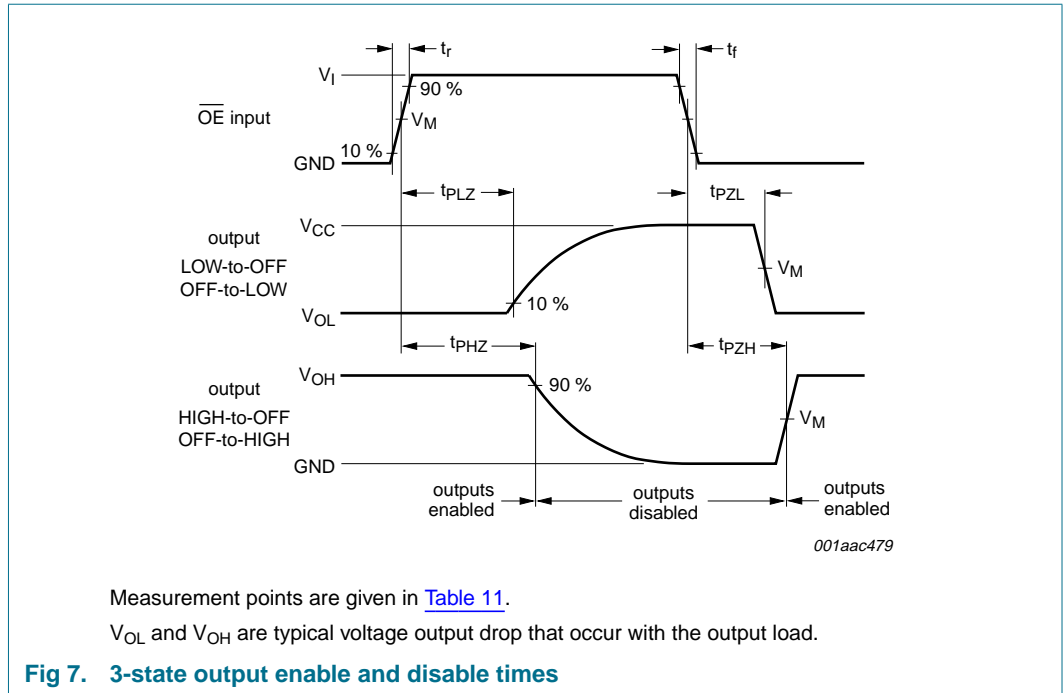
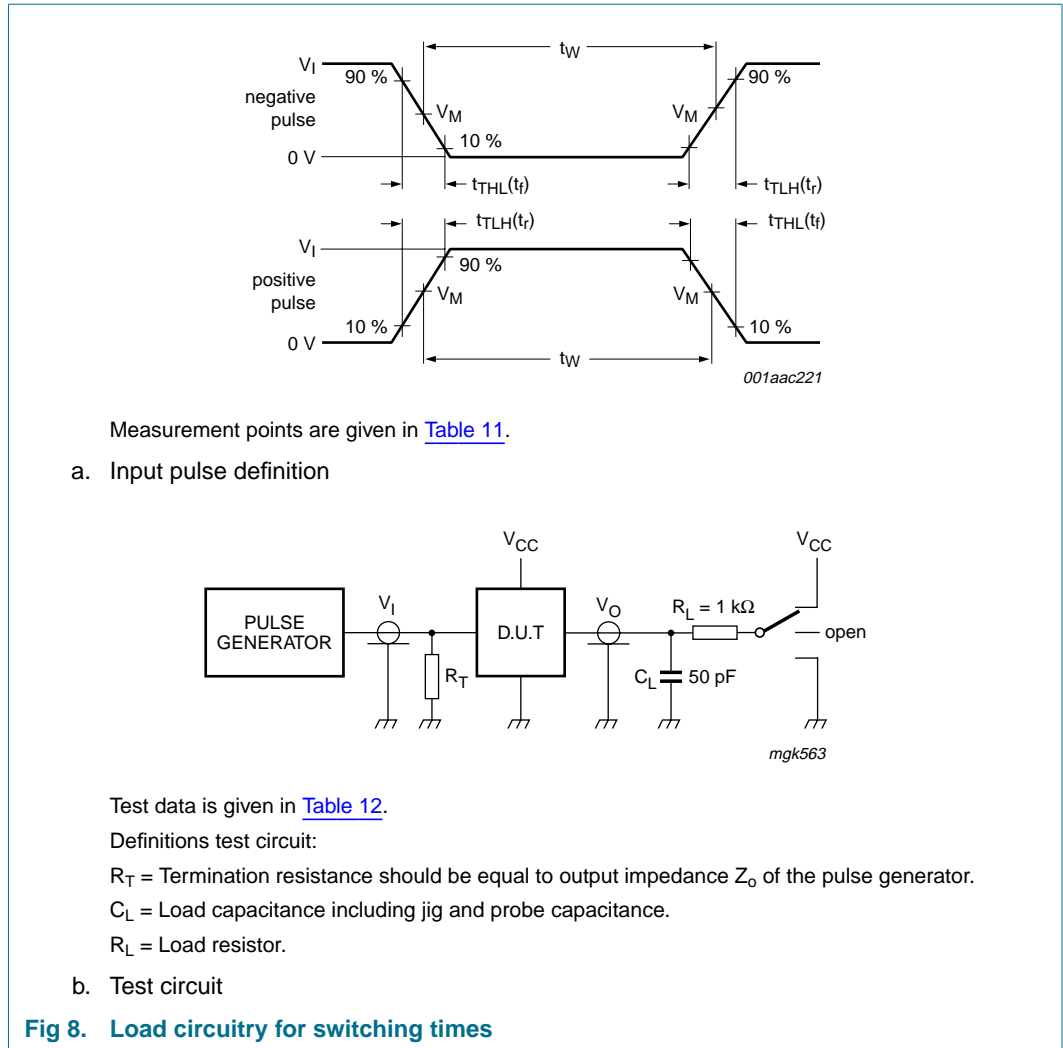


Table 11: Measurement points

Type	Input	Output
	$V_M$	$V_M$
74HC257	$0.5V_{CC}$	$0.5V_{CC}$
74HCT257	1.3 V	1.3 V



**Table 12: Test data**

Type	Input		Switch position		
	$V_I$	$t_r, t_f$	$t_{PHL}, t_{PLH}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
74HC257	$V_{CC}$	6 ns	open	GND	$V_{CC}$
74HCT257	3 V	6 ns	open	GND	$V_{CC}$

13. Package outline

DIP16: plastic dual in-line package; 16 leads (300 mil); long body

SOT38-1

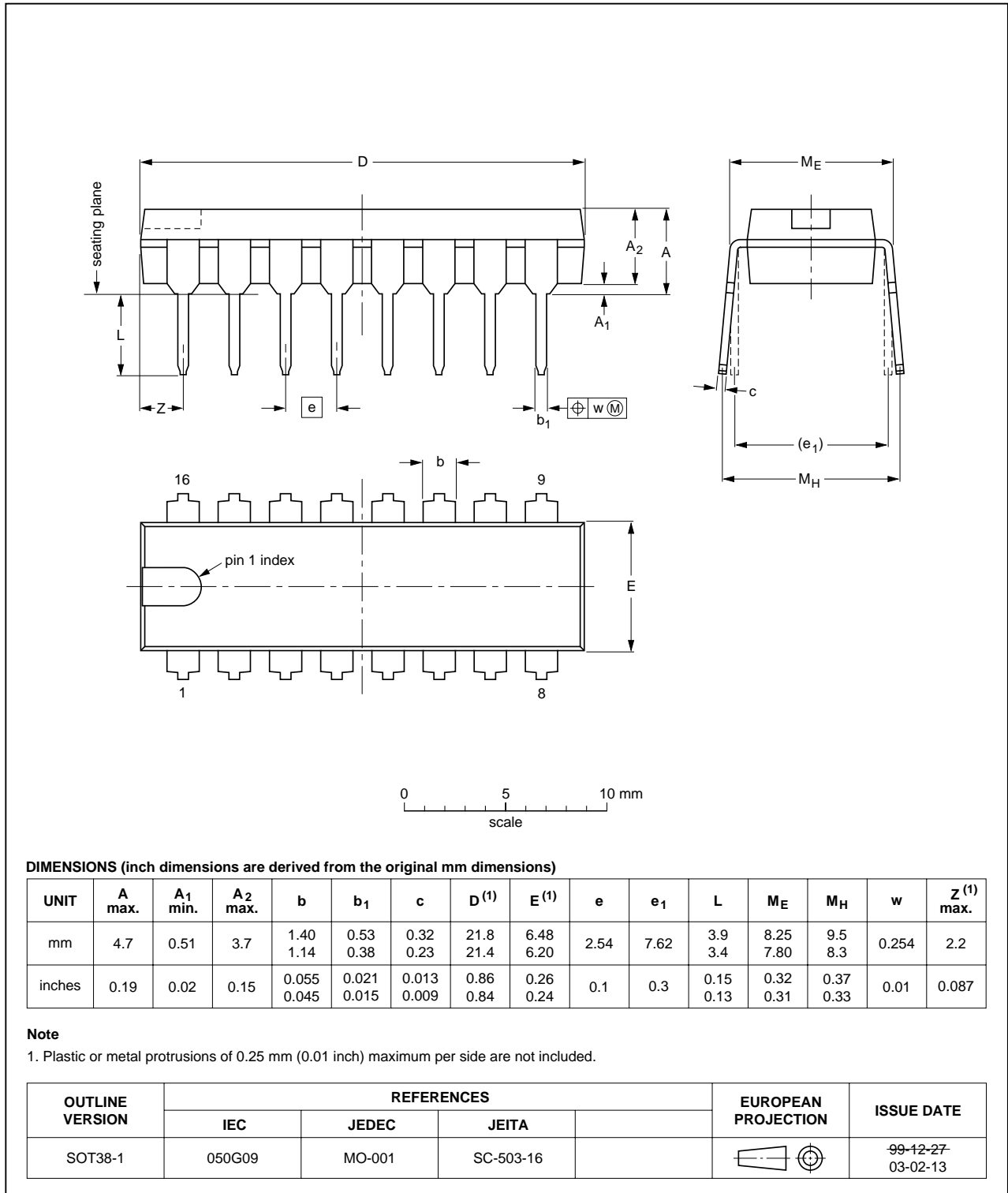


Fig 9. Package outline SOT38-1 (DIP16)



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

SOT109-1

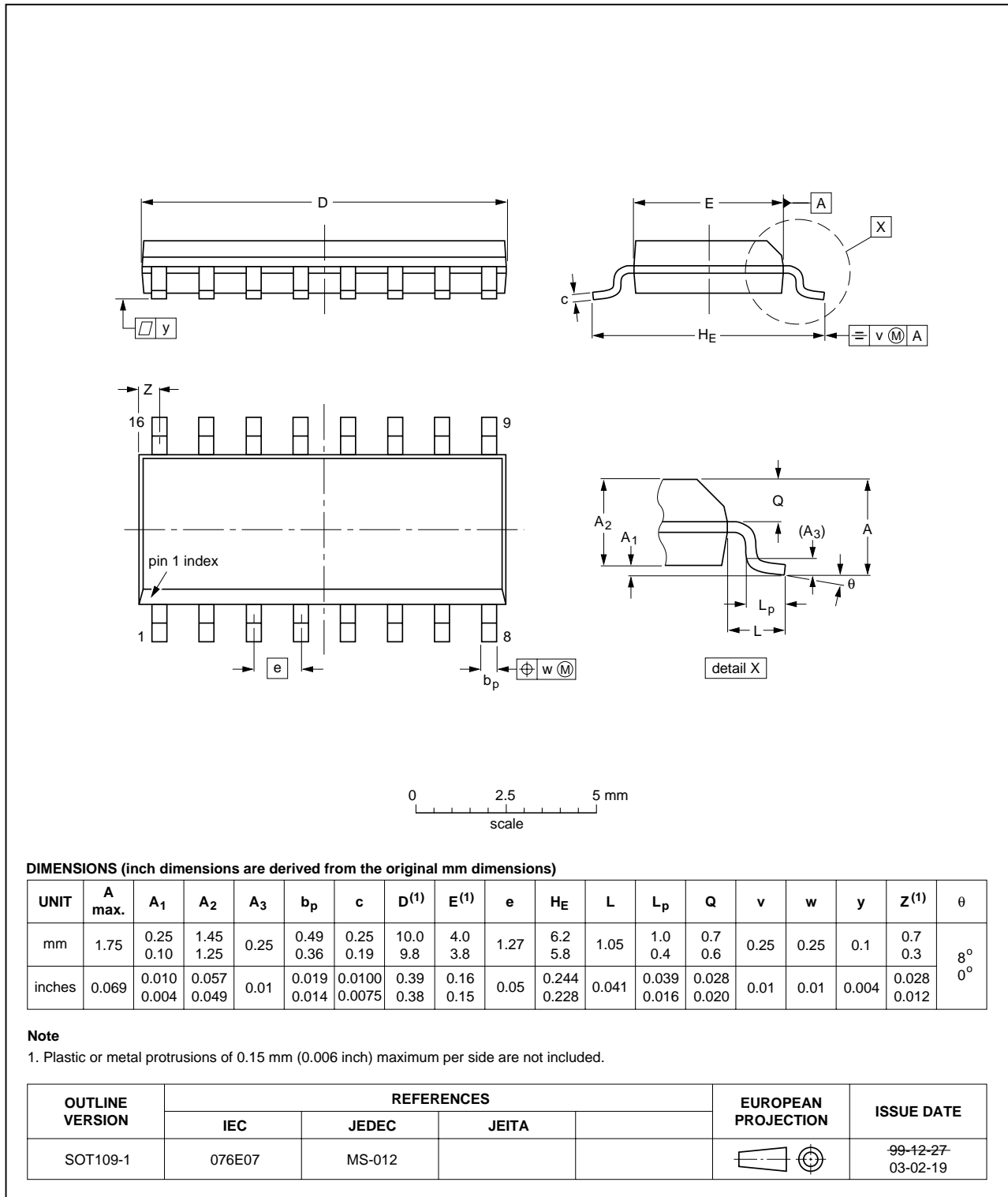


Fig 10. Package outline SOT109-1 (SO16)

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

SOT338-1

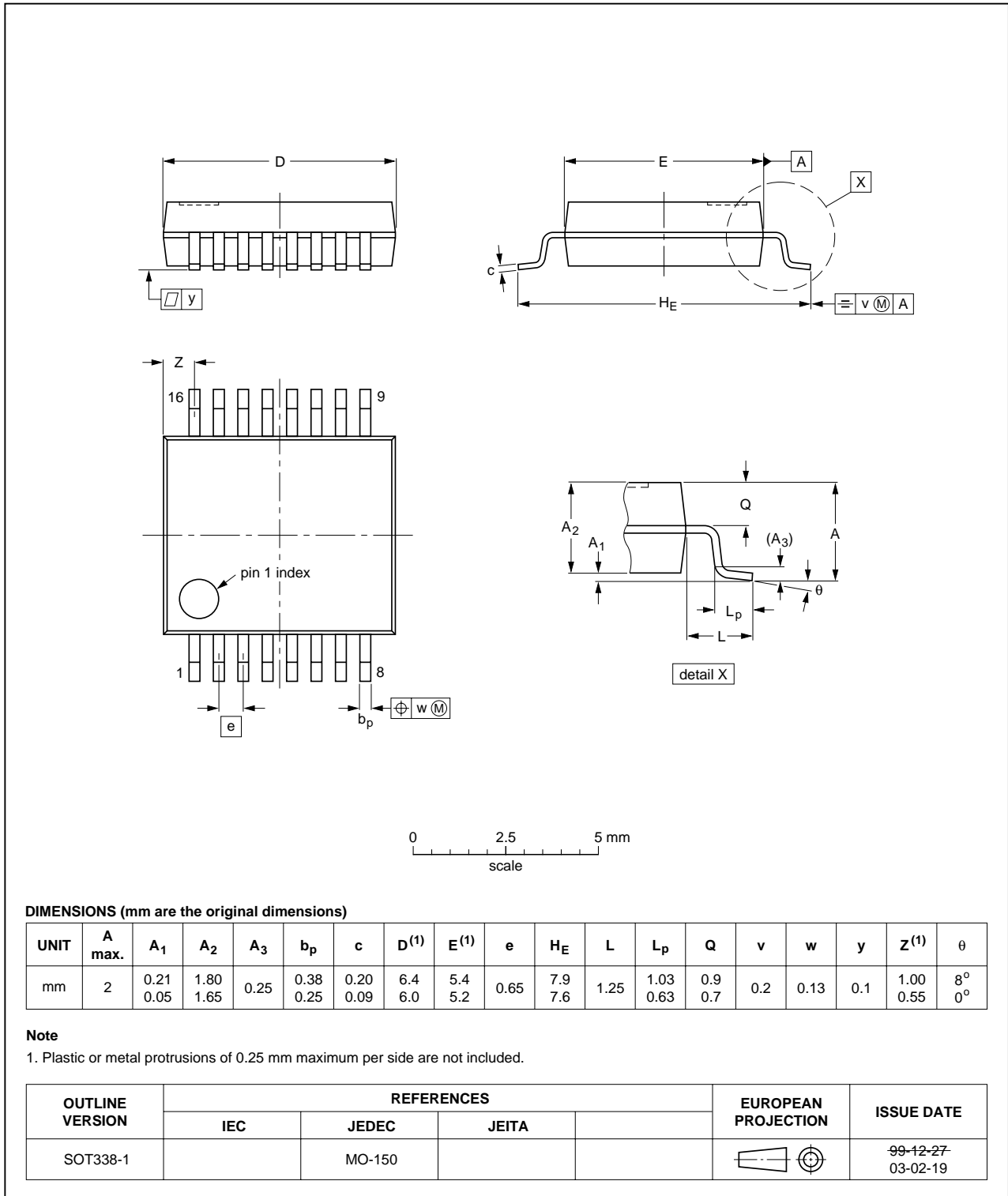


Fig 11. Package outline SOT338-1 (SSOP16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

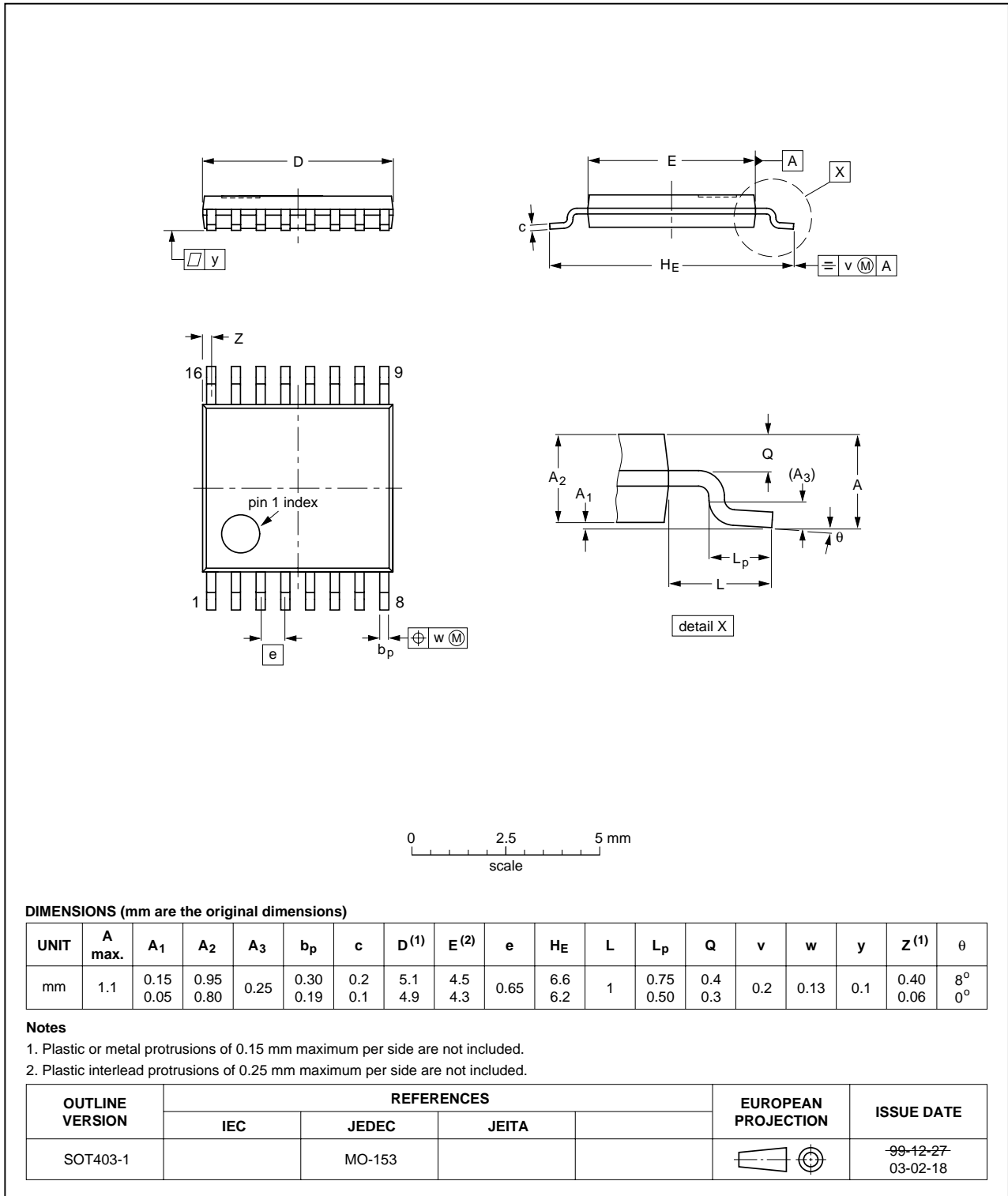


Fig 12. Package outline SOT403-1 (TSSOP16)

## 14. Revision history

**Table 13: Revision history**

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
74HC_HCT257_3	20050920	Product data sheet	-	-	74HC_HCT257_CNV_2
Modifications:	<ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.</li><li>• Added family specifications.</li></ul>				
74HC_HCT257_CNV_2	19980930	Product specification	-	-	-

## 15. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup> <sup>[3]</sup>	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Date of release: 20 September 2005  
Document number: 74HC\_HCT257\_3

Published in The Netherlands