



74HC257-Q100; 74HCT257-Q100

Quad 2-input multiplexer; 3-state

Rev. 3 — 22 March 2024

Product data sheet

1. General description

The 74HC257-Q100; 74HCT257-Q100 is a quad 2-input multiplexer with 3-state outputs. Inputs include clamp diodes. It enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

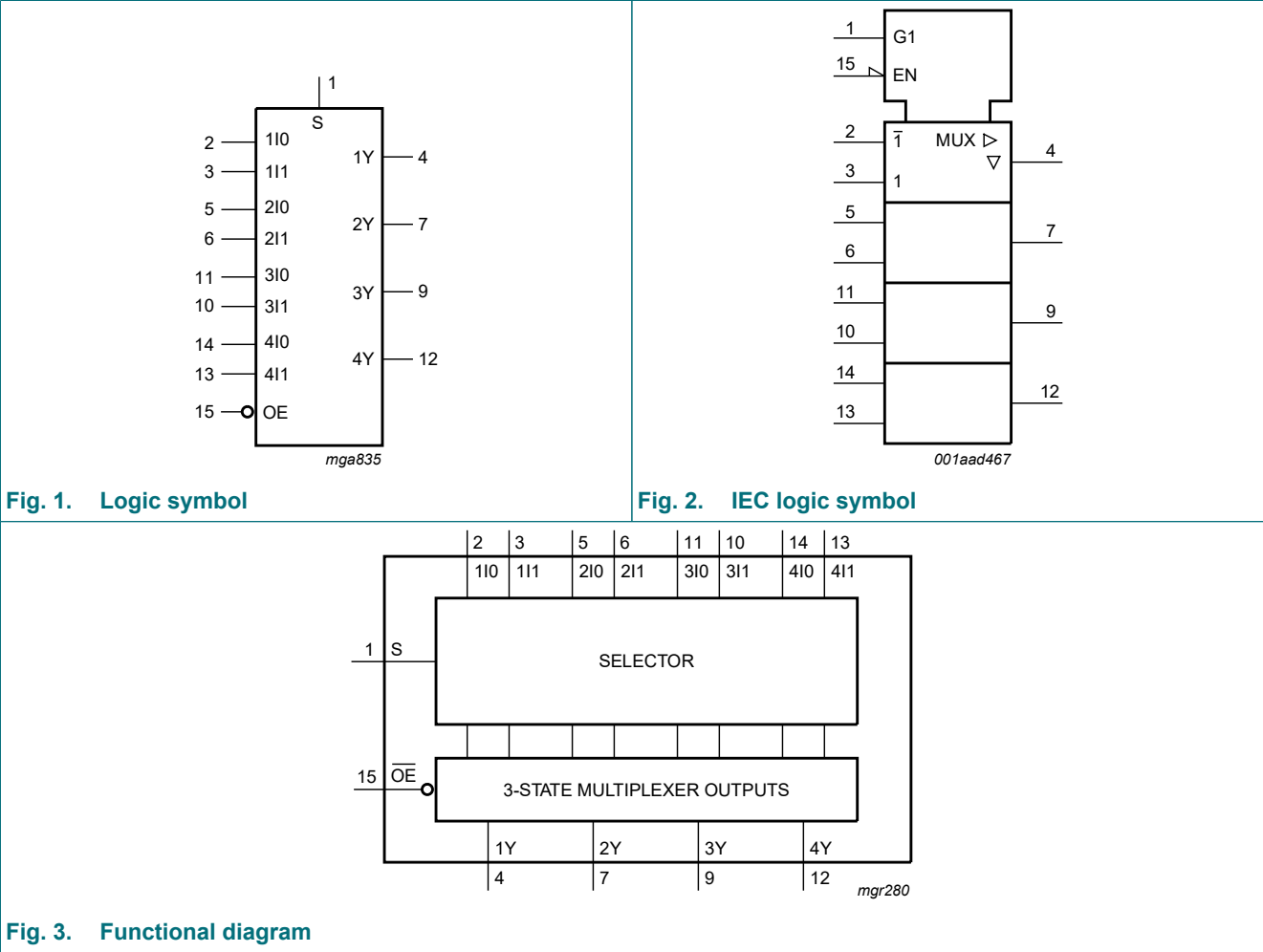
- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
 - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Wide supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards:
 - JESD8C (2.7 V to 3.6 V)
 - JESD7A (2.0 V to 6.0 V)
- Non-inverting data path
- 3-state outputs interface directly with system bus
- Input levels:
 - For 74HC257-Q100: CMOS level
 - For 74HCT257-Q100: TTL level
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V

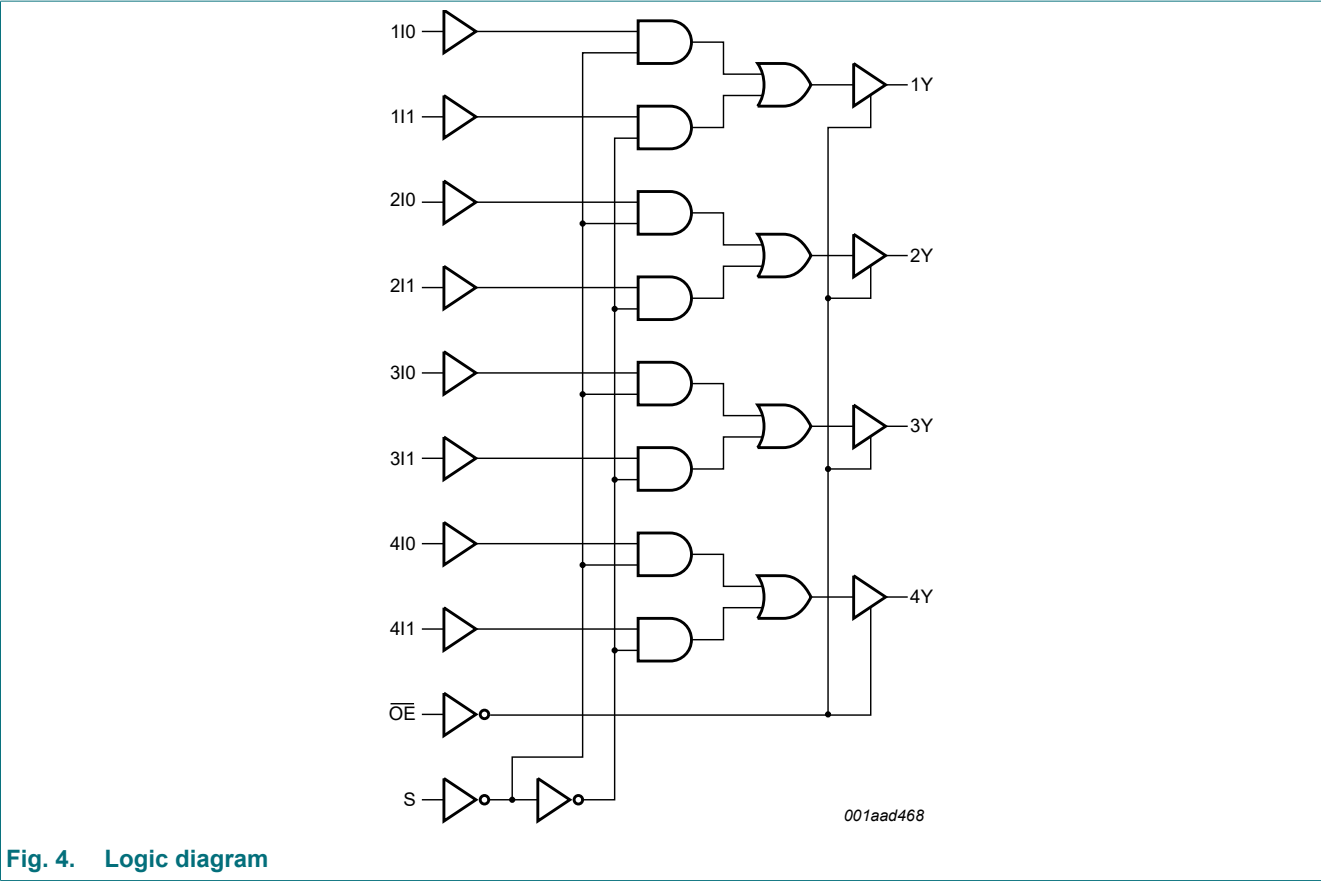
3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC257D-Q100 74HCT257D-Q100	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HC257PW-Q100 74HCT257PW-Q100	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1

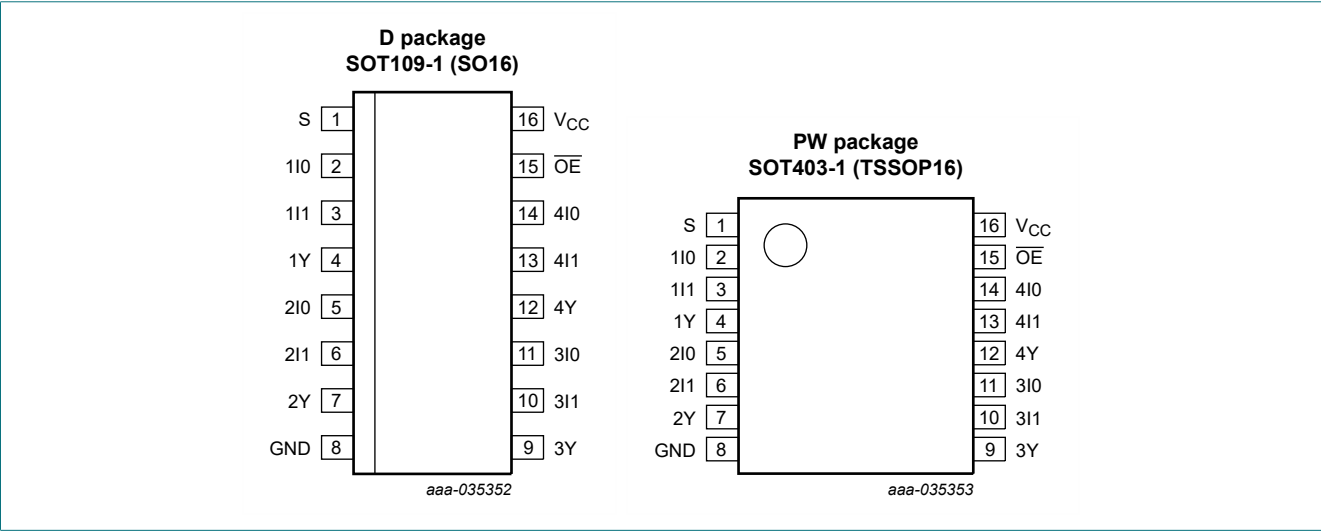
4. Functional diagram





5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

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

6. Function description

Table 3. Function table

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

Control		Input		Output
OE	S	nI0	nI1	nY
H	X	X	X	Z
L	H	X	L	L
L	H	X	H	H
L	L	L	X	L
L	L	H	X	H

7. 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	V
I _{IK}	input clamping current	V _I < -0.5 V or V _I > V _{CC} + 0.5 V [1]	-	±20	mA
I _{OK}	output clamping current	V _O < -0.5 V or V _O > V _{CC} + 0.5 V [1]	-	±20	mA
I _O	output current	V _O = -0.5 V to V _{CC} + 0.5 V	-	±35	mA
I _{CC}	supply current		-	+70	mA
I _{GND}	ground current		-70	-	mA
T _{stg}	storage temperature		-65	+150	°C
P _{tot}	total power dissipation	[2]	-	500	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] For SOT109-1 (SO16) package: P_{tot} derates linearly with 12.4 mW/K above 110 °C.
For SOT403-1 (TSSOP16) package: P_{tot} derates linearly with 8.5 mW/K above 91 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74HC257-Q100			74HCT257-Q100			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	+25	+125	-40	+25	+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

9. 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	
74HC257-Q100										
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
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 _{CC} = 6.0 V; V _O = V _{CC} or GND	-	-	±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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
C _I	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT257-Q100										
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	-	0.33	-	0.4	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 _{CC} = 5.5 V; V _O = V _{CC} or GND	-	-	±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: nI0, nI1	-	40	144	-	180	-	196	µA
		OE input	-	135	486	-	608	-	662	µA
		S input	-	70	252	-	315	-	343	µA
C _I	input capacitance		-	3.5	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); For test circuit see Fig. 7.

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC257-Q100										
t _{pd}	propagation delay	nI0 to nY or nI1 to nY; see Fig. 5 [1]								
		V _{CC} = 2.0 V	-	36	110	-	140	-	165	ns
		V _{CC} = 4.5 V	-	13	22	-	28	-	33	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	11	-	-	-	-	-	ns
		V _{CC} = 6.0 V	-	10	19	-	24	-	28	ns
		S to nY; see Fig. 5								
		V _{CC} = 2.0 V	-	47	150	-	190	-	225	ns
		V _{CC} = 4.5 V	-	17	30	-	38	-	45	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	14	-	-	-	-	-	ns
		V _{CC} = 6.0 V	-	14	26	-	33	-	38	ns
t _{en}	enable time	OE to nY; see Fig. 6 [2]								
		V _{CC} = 2.0 V	-	33	150	-	190	-	225	ns
		V _{CC} = 4.5 V	-	12	30	-	38	-	45	ns
		V _{CC} = 6.0 V	-	10	26	-	33	-	38	ns
t _{dis}	disable time	OE to nY; see Fig. 6 [3]								
		V _{CC} = 2.0 V	-	41	150	-	190	-	225	ns
		V _{CC} = 4.5 V	-	15	30	-	38	-	45	ns
		V _{CC} = 6.0 V	-	12	26	-	33	-	38	ns
t _t	transition time	see Fig. 5 [4]								
		V _{CC} = 2.0 V	-	14	60	-	75	-	90	ns
		V _{CC} = 4.5 V	-	5	12	-	15	-	18	ns
		V _{CC} = 6.0 V	-	4	10	-	13	-	15	ns
C _{PD}	power dissipation capacitance	per multiplexer; V _I = GND to V _{CC} [5]	-	45	-	-	-	-	-	pF

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HCT257-Q100										
t _{pd}	propagation delay	nI0 to nY or nI1 to nY; see Fig. 5 [1]								
		V _{CC} = 4.5 V	-	16	30	-	38	-	45	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	13	-	-	-	-	-	ns
		S to nY; see Fig. 5								
		V _{CC} = 4.5 V	-	20	35	-	44	-	53	ns
		V _{CC} = 5.0 V; C _L = 15 pF	-	17	-	-	-	-	-	ns
t _{en}	enable time	OE to nY; V _{CC} = 4.5 V; see Fig. 6 [2]	-	15	30	-	38	-	45	ns
t _{dis}	disable time	OE to nY; V _{CC} = 4.5 V; see Fig. 6 [3]	-	16	30	-	38	-	45	ns
t _t	transition time	V _{CC} = 4.5 V; see Fig. 5 [4]	-	5	12	-	15	-	18	ns
C _{PD}	power dissipation capacitance	per multiplexer; V _I = GND to V _{CC} - 1.5 V [5]	-	45	-	-	-	-	-	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).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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;
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

10.1. Waveforms and test circuit

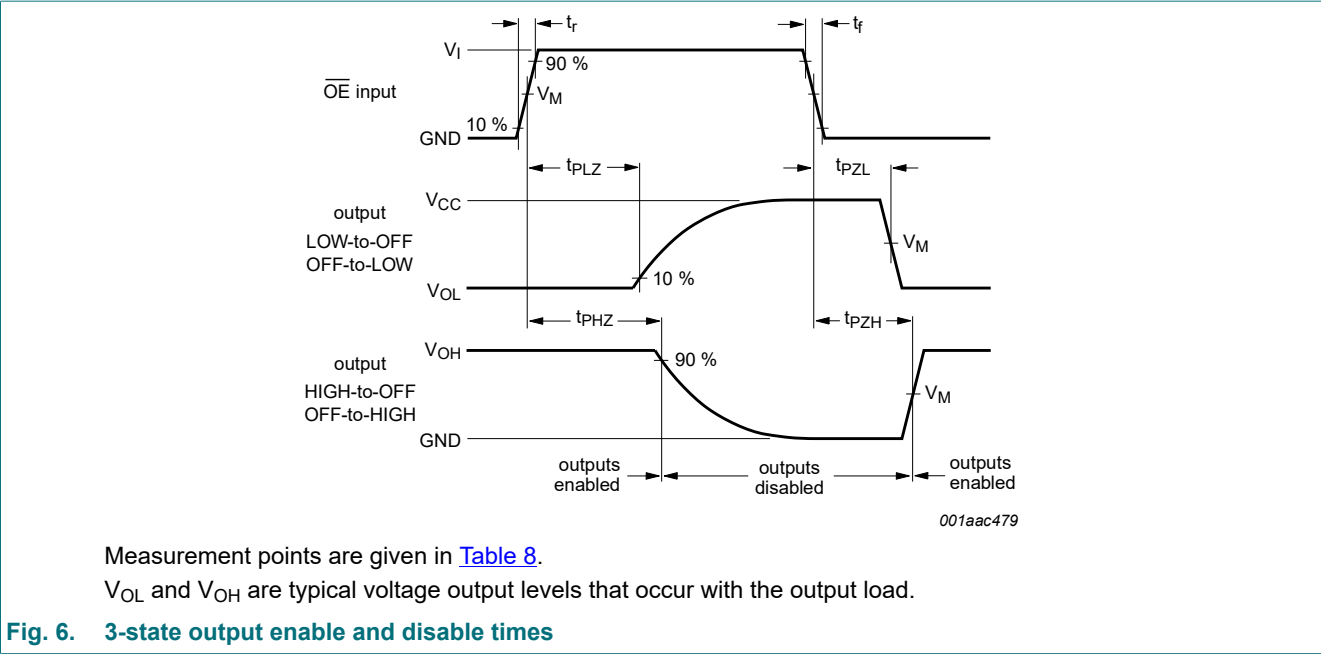
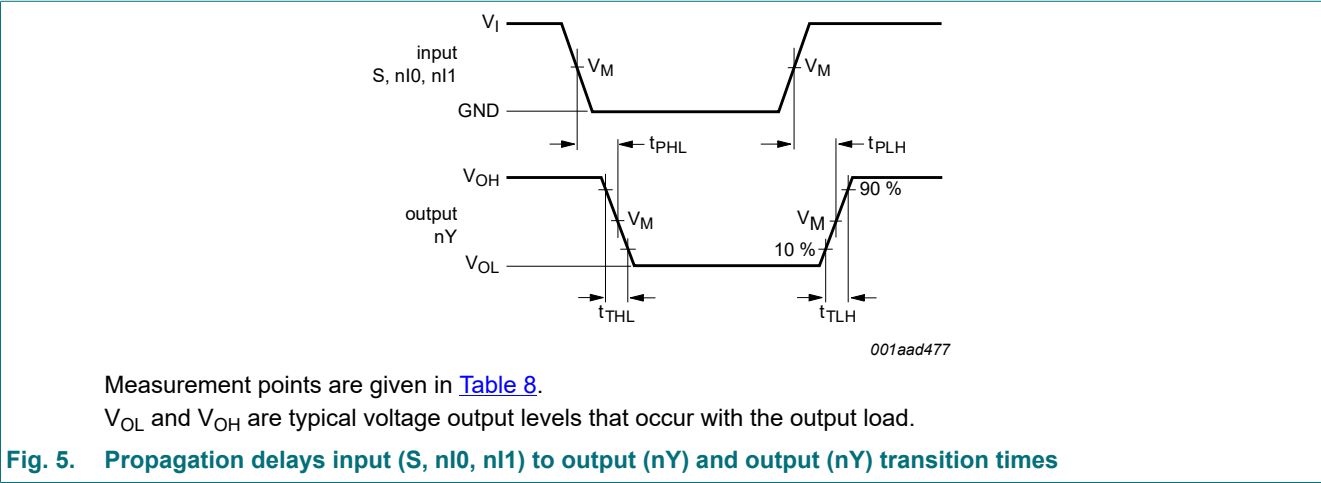


Table 8. Measurement points

Type	Input	Output
	V_M	V_M
74HC257-Q100	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
74HCT257-Q100	1.3 V	1.3 V

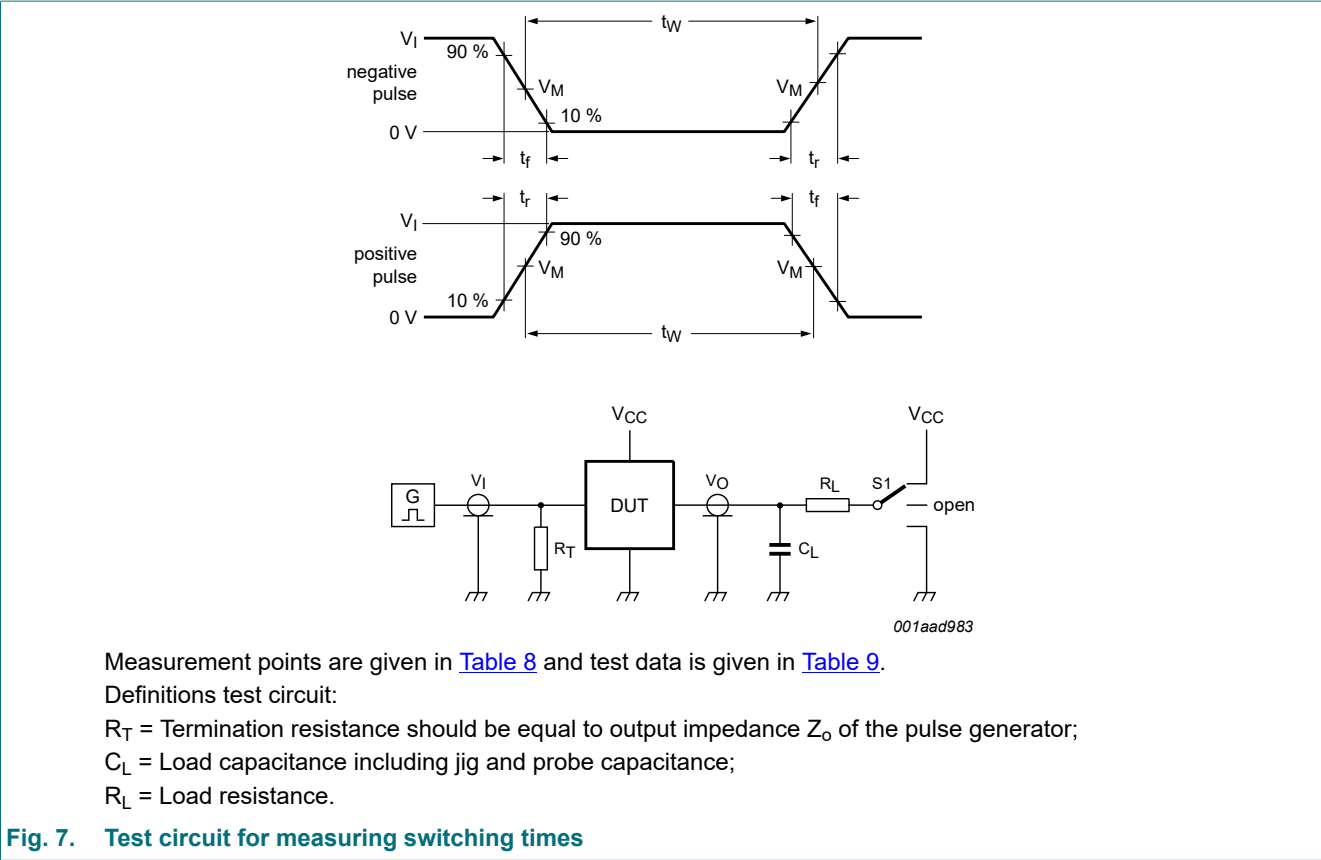


Fig. 7. Test circuit for measuring switching times

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}
74HC257-Q100	V_{CC}	6 ns	50 pF	1 kΩ	open	GND	V_{CC}
74HCT257-Q100	3 V	6 ns	50 pF	1 kΩ	open	GND	V_{CC}

11. Package outline

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

SOT109-1

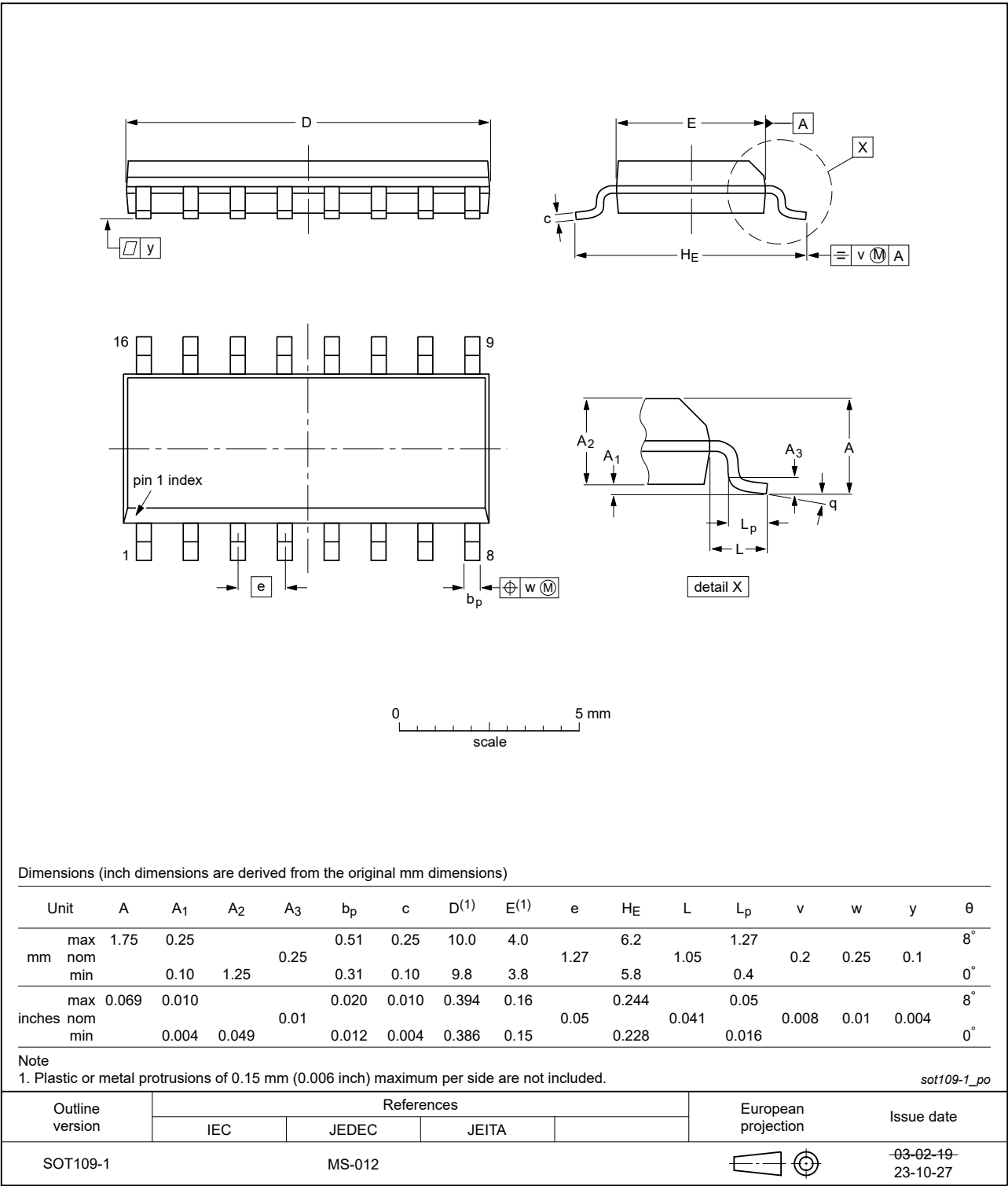


Fig. 8. Package outline SOT109-1 (SO16)

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

SOT403-1

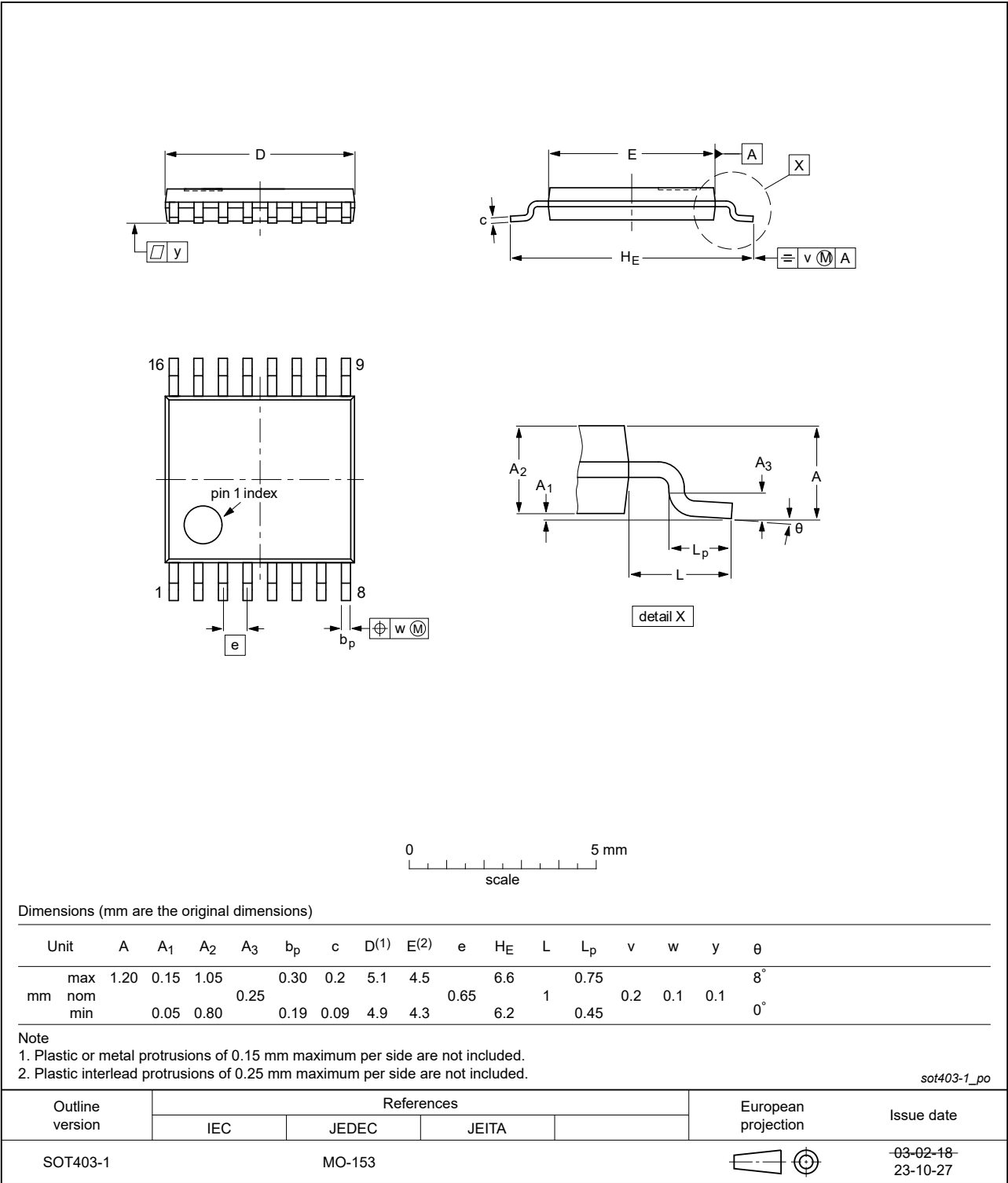


Fig. 9. Package outline SOT403-1 (TSSOP16)

12. Abbreviations

Table 10. Abbreviations

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

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT257_Q100 v.3	20240322	Product data sheet	-	74HC_HCT257_Q100 v.2
Modifications:	Section 2: ESD specification updated according to the latest JEDEC standard. Fig. 8, Fig. 9: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153			
74HC_HCT257_Q100 v.2	20210209	Product data sheet	-	74HC_HCT257_Q100 v.1
Modifications:	- The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. - Legal texts have been adapted to the new company name where appropriate. Section 2 updated. Section 7: Derating values for P_{tot} total power dissipation have changed. Section 10: Conditions for I_{OZ} have changed for 74HCT257-Q100. (errata)			
74HC_HCT257_Q100 v.1	20150727	Product data sheet	-	-

14. Legal information

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.

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