74HC257; 74HCT257

Quad 2-input multiplexer; 3-state Rev. 6 — 26 January 2015

Product data sheet

General description 1.

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

The 74HC257 and 74HCT257 have 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 (110 to 410) are selected when input S is LOW and the data inputs from source 1 (111 to 411) 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 and 74HCT257 are 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 OE is HIGH.

The logic equations for the outputs are:

$$1\overline{Y} = \overline{OE} \bullet (111 \bullet S \bullet 110 \bullet \overline{S})$$

$$2\overline{Y} = \overline{OE} \bullet (2I1 \bullet S \bullet 2I0 \bullet \overline{S})$$

$$3\overline{Y} = \overline{OE} \bullet (3I1 \bullet S \bullet 3I0 \bullet \overline{S})$$

$$4\overline{Y} = \overline{OE} \bullet (4I1 \bullet S \bullet 4I0 \bullet \overline{S})$$

Except for their non-inverting (true) outputs the 74HC257; 74HCT257 are identical to the 74HC258.

Features and benefits 2.

- Non-inverting data path
- 3-state outputs interface directly with system bus
- Complies with JEDEC standard no. 7A
- ESD protection:
 - HBM JESD22-A114F exceeds 2000 V
 - MM JESD22-A115-A exceeds 200 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

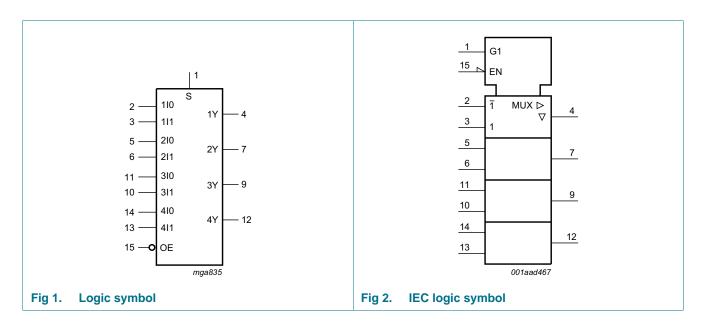


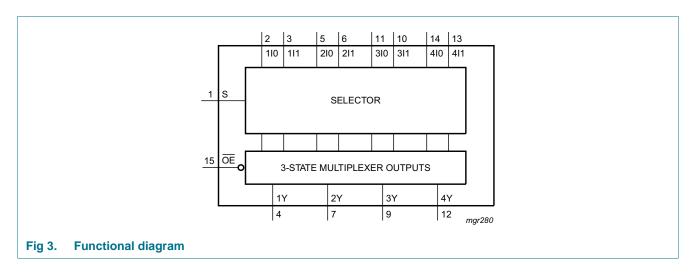
3. Ordering information

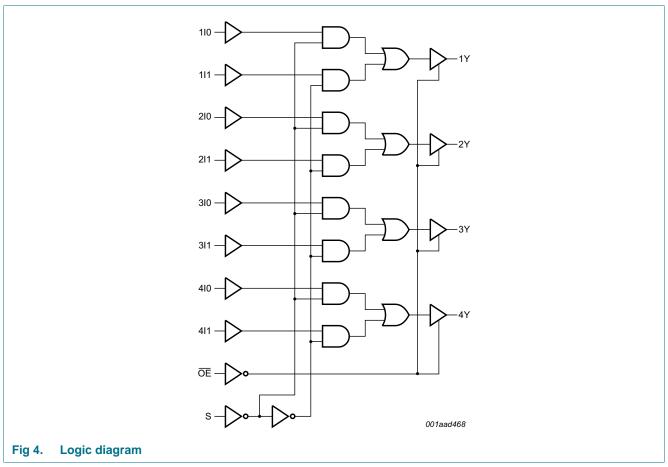
Table 1. Ordering information

Type number	Package									
	Temperature range	Name	Description	Version						
74HC257N	−40 °C to +125 °C	DIP16	plastic dual in-line package; 16 leads (300 mil)	SOT38-4						
74HCT257N	-									
74HC257D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1						
74HCT257D	-									
74HC257DB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads;	SOT338-1						
74HCT257DB	-		body width 5.3 mm							
74HC257PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads;	SOT403-1						
74HCT257PW	-		body width 4.4 mm							

4. Functional diagram

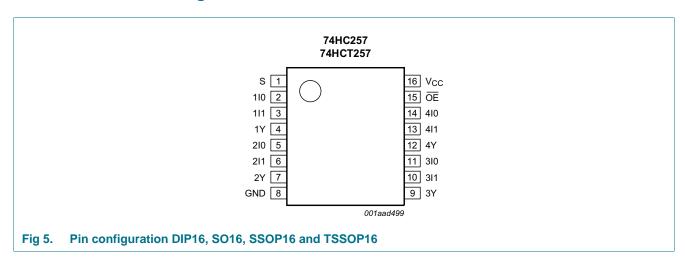






5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
S	1	common data select input
110 to 410	2, 5, 11, 14	data input from source 0
1I1 to 4I1	3, 6, 10, 13	data input from source 1
1Y to 4Y	4, 7, 9, 12	3-state multiplexer output
GND	8	ground (0 V)
ŌE	15	3-state output enable input (active LOW)
V _{CC}	16	supply voltage

6. Functional description

6.1 Function table

Table 3. Function table [1]

		Input	Input				
OE	S		nl1	nY			
Н	X	X	X	Z			
L	Н	Х	L	L			
L	Н	Х	Н	Н			
L	L	L	X	L			
L	L	Н	X	Н			

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

74HC_HCT257

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	Mir	Max	Unit
V _{CC}	supply voltage		-0.	5 +7	V
I _{IK}	input clamping current	$V_I < -0.5 \text{ V or}$ $V_I > V_{CC} + 0.5 \text{ V}$	-	±20	mA
I _{OK}	output clamping current	$V_O < -0.5 \text{ V or} $ $V_O > V_{CC} + 0.5 \text{ V} $	-	±20	mA
Io	output current	$V_{O} = -0.5 \text{ V to } V_{CC} + 0.5 \text{ V}$	-	±35	mA
I _{CC}	supply current		-	+70	mA
I _{GND}	ground current		-	-70	mA
T _{stg}	storage temperature		-65	+150	°C
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.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
74HC257				,		
V _{CC}	supply voltage		2.0	5.0	6.0	V
VI	input voltage		0	-	V _{CC}	V
Vo	output voltage		0	-	V _{CC}	V
Δt/ΔV	input transition rise and	V _{CC} = 2.0 V	-	-	625	ns
	fall rates	V _{CC} = 4.5 V	-	1.67	139	ns
		V _{CC} = 6.0 V	-	-	83	ns
T _{amb}	ambient temperature		-40	-	+125	°C
74HCT257				,		
V _{CC}	supply voltage		4.5	5.0	5.5	V
VI	input voltage		0	-	V _{CC}	V
Vo	output voltage		0	-	V _{CC}	V
Δt/ΔV	input transition rise and fall rates	V _{CC} = 4.5 V	-	1.67	139	ns
T _{amb}	ambient temperature		-40	-	+125	°C

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

^[3] For SSOP16 and TSSOP16 packages: above 60 °C, Ptot derates linearly with 5.5 mW/K.

9. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions		25 °C		_	°C to 5 °C	–40 °C to +125 °C		Unit
			Min	Тур	Max	Min	Max	Min	Max	
74HC25	7									
V _{IH}	HIGH-level	V _{CC} = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
	input voltage	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	V _{CC} = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
	input voltage	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	$V_I = V_{IH}$ or V_{IL}								
	output voltage	$I_{O} = -20 \mu A; V_{CC} = 2.0 V$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_{O} = -20 \mu A; V_{CC} = 4.5 V$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_{O} = -20 \mu A; V_{CC} = 6.0 V$	5.9	6.0	-	5.9	-	5.9	-	V
		$I_{O} = -6.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.98	4.32	-	3.84	-	3.7	-	V
		$I_{O} = -7.8 \text{ mA}; V_{CC} = 6.0 \text{ V}$	5.48	5.81	-	5.34	-	5.2	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL}								
	output voltage	$I_O = 20 \mu A; V_{CC} = 2.0 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 4.5 V$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20 \mu A; V_{CC} = 6.0 \text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 6.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	0.15	0.26	-	0.33	-	0.4	V
		$I_{O} = 7.8 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	0.16	0.26	-	0.33	-	0.4	V
I _I	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$	-	-	±0.1	-	±1.0	±1.0	±1.0	μΑ
l _{OZ}	OFF-state output current	$V_I = V_{IH} \text{ or } V_{IL};$ $V_O = V_{CC} \text{ or GND};$ $V_{CC} = 6.0 \text{ V}$	-	-	±0.5	-	±5.0	±10.0	±10.0	μА
I _{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 6.0 \text{ V}$	-	-	8.0	-	80	160	160	μΑ
C _i	input capacitance		-	3.5	-					pF
74HCT2	57			1	1		1			
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	-	8.0	-	8.0	V
V _{OH}	HIGH-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$								
	output voltage	I _O = -20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		$I_O = -6 \text{ mA}$	3.98	4.32	-	3.84	-	3.7	-	V
V _{OL}	LOW-level	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 4.5 \text{ V}$				-	0.1	-	0.1	
	output voltage	I _O = 20 μA	-	0	0.1	-	0.33	-	0.4	V
		I _O = 6.0 mA	-	0.15	0.26	-	±1.0	-	±1.0	V
I	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5 \text{ V}$	-	-	±0.1	-	±5.0	-	±10	μΑ

74HC_HCT257

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 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	Тур	Max	Min	Max	Min	Max	
l _{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	-	-	±0.5	-	80	-	160	μА
I _{CC}	supply current	$V_1 = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5 \text{ V}$	-	-	8.0					μΑ
Δl _{CC}	additional supply current	$V_I = V_{CC} - 2.1 \text{ V};$ other inputs at V_{CC} or GND; $V_{CC} = 4.5 \text{ V}$ to 5.5 V; $I_O = 0 \text{ A}$								
		per input pin; nI0, nI1 inputs	-	40	144	-	180	-	196	μΑ
		per input pin; OE input	-	135	486	-	608	-	662	μΑ
		per input pin; S input	-	70	252	-	315	-	343	μΑ
Cı	input capacitance		-	3.5	-					pF

10. 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	
				Тур	Max	Max	Max		
74HC257	7								
t _{pd}	propagation delay	nl0 to nY or nl1 to nY; see Figure 6	[1]						
		V _{CC} = 2.0 V		36	110	140	165	ns	
		V _{CC} = 4.5 V		13	22	28	33	ns	
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$		11	-	-	-	ns	
		V _{CC} = 6.0 V		10	19	24	28	ns	
		S to nY; see Figure 6							
		V _{CC} = 2.0 V		47	150	190	225	ns	
		V _{CC} = 4.5 V		17	30	38	45	ns	
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$		14	-	-	-	ns	
		V _{CC} = 6.0 V		14	26	33	38	ns	
t _{en}	enable time	OE to nY; see Figure 7	[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 Figure 7	[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	

74HC_HCT257

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 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	
				Тур	Max	Max	Max	
t _t	transition time	see Figure 6	[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}	<u>[5]</u>	45	-			pF
74HCT25	57		l		1			
t _{pd}	propagation delay	nl0 to nY or nl1 to nY; see Figure 6	<u>[1]</u>					
		V _{CC} = 4.5 V		16	30	38	45	ns
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$		13	-	-		ns
		S to nY; see Figure 6						
		V _{CC} = 4.5 V		20	35	44	53	ns
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$		17	-			ns
t _{en}	enable time	$\overline{\text{OE}}$ to nY; V _{CC} = 4.5 V; see Figure 7	[2]	15	30	38	45	ns
t _{dis}	disable time	\overline{OE} to nY; $V_{CC} = 4.5 \text{ V}$; see Figure 7	[3]	16	30	38	45	ns
t _t	transition time	V _{CC} = 4.5 V; see Figure 6			12	15	18	ns
C _{PD}	power dissipation capacitance	per multiplexer; V _I = GND to V _{CC} – 1.5 V	<u>[5]</u>	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).

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

 f_i = input frequency in MHz;

 f_o = output frequency in MHz;

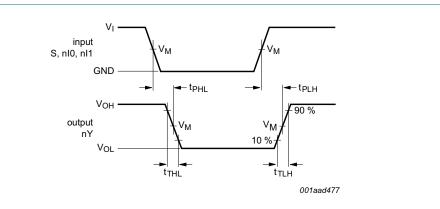
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

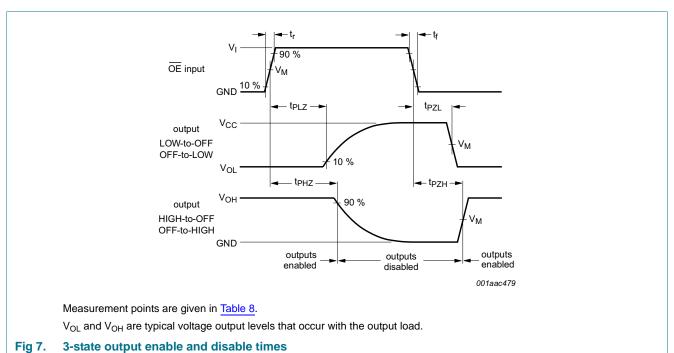
11. Waveforms



Measurement points are given in Table 8.

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

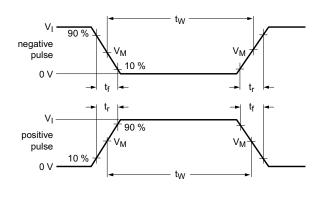
Fig 6. Propagation delays input (S, nI0, nI1) to output (nY) and output (nY) transition times

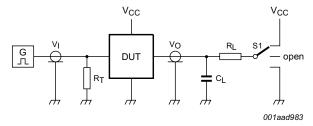


1 ig 7. 5-state output enable and disable time

Table 8. Measurement points

Туре	Input	Output
	V_{M}	V _M
74HC257	0.5V _{CC}	0.5V _{CC}
74HCT257	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

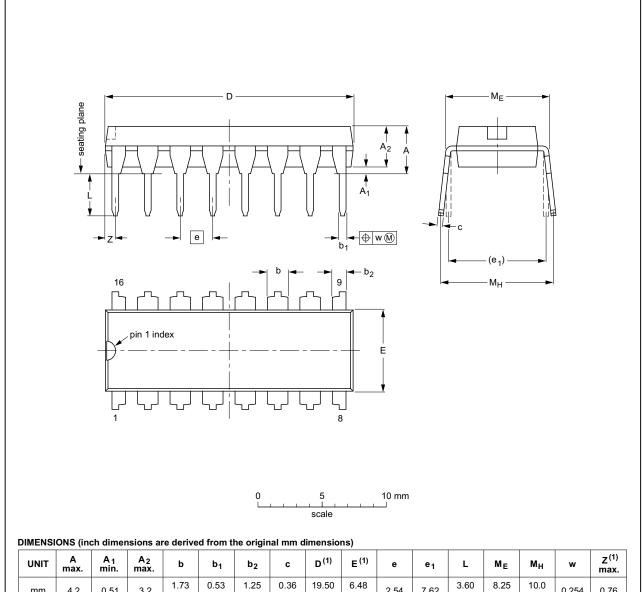
Table 9. Test data

Туре	Input I		Load		Switch position			
	VI	t _r , t _f	C _L R _L		t _{PHL} , t _{PLH} t _{PZH} , t _{PHZ}		t _{PZL} , t _{PLZ}	
74HC257	V _{CC}	6 ns	50 pF	1 kΩ	open	GND	V _{CC}	
74HCT257	3 V	6 ns	50 pF	1 kΩ	open	GND	V _{CC}	

12. Package outline

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

SOT38-4



UNIT	A max.	A ₁ min.	A ₂ max.	b	b ₁	b ₂	С	D ⁽¹⁾	E ⁽¹⁾	е	e ₁	L	ME	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	0.02	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	0.1	0.3	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.03

Note

1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

OUTLINE		REFER	RENCES	EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA	PROJECTION	ISSUE DATE
SOT38-4					95-01-14 03-02-13

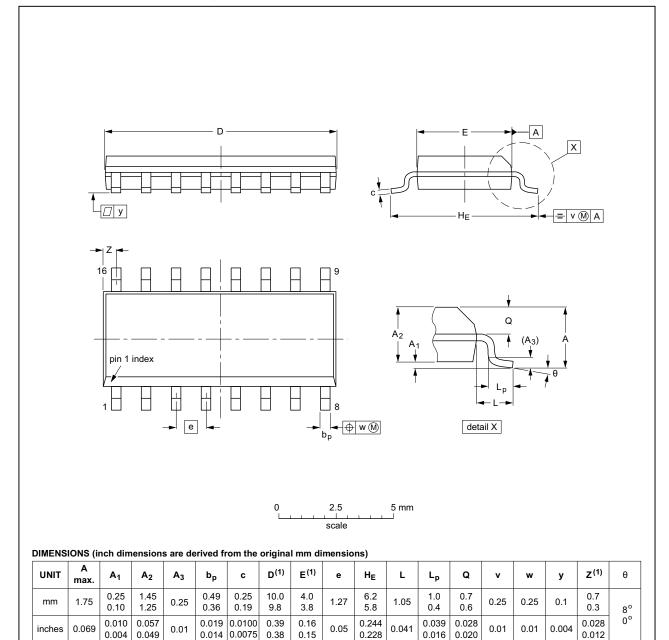
Fig 9. Package outline SOT38-4 (DIP16)

74HC_HCT257

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

SOT109-1



Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

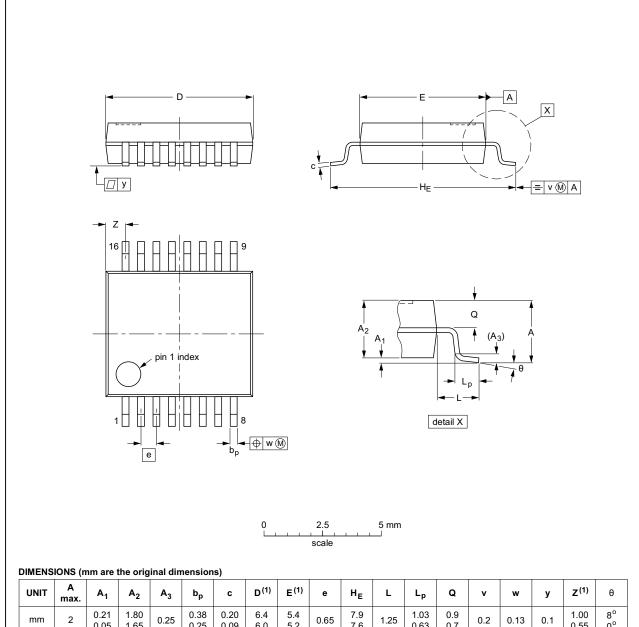
OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT109-1	076E07	MS-012				99-12-27 03-02-19

Fig 10. Package outline SOT109-1 (SO16)

74HC_HCT257

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

SOT338-1



_					,		-,												
	UNIT	A max.	A ₁	A ₂	A ₃	b _p	С	D ⁽¹⁾	E ⁽¹⁾	е	HE	L	Lp	Q	v	w	у	Z ⁽¹⁾	θ
	mm	2	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		REFER	ENCES		EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT338-1		MO-150				99-12-27 03-02-19
				•		

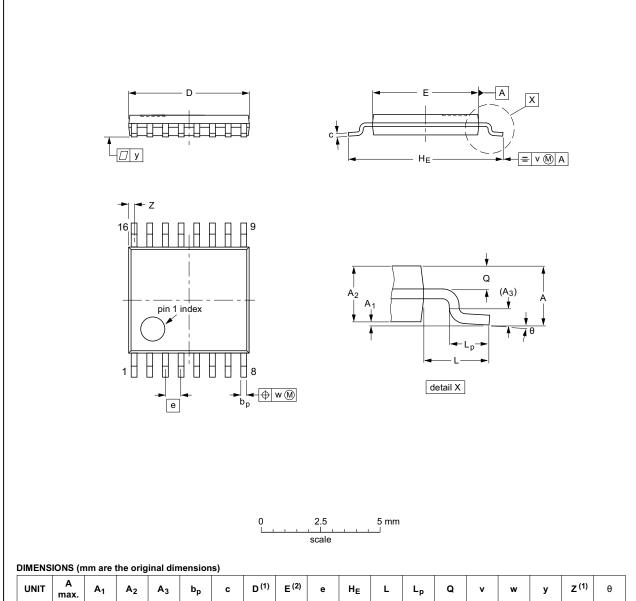
Fig 11. Package outline SOT338-1 (SSOP16)

74HC_HCT257

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

SOT403-1



UNI	Г A max	. A ₁	A ₂	A ₃	bp	C	D ⁽¹⁾	E (2)	е	HE	L	Lp	Q	v	w	у	Z ⁽¹⁾	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

Notes

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
SOT403-1		MO-153				-99-12-27 03-02-18
	VERSION	VERSION IEC	VERSION IEC JEDEC	VERSION IEC JEDEC JEITA	VERSION IEC JEDEC JEITA	VERSION IEC JEDEC JEITA PROJECTION

Fig 12. Package outline SOT403-1 (TSSOP16)

74HC_HCT257

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13. Abbreviations

Table 10. Abbreviations

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

14. Revision history

Table 11. Revision history

B IB	D. I I. (.	B. 4 1 4. 4. 4	01	0
Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT257 v.6	20150126	Product data sheet	-	74HC_HCT257 v.5
Modifications:	• <u>Table 7</u> : Pov	wer dissipation capacitance	condition for 74H	CT257 is corrected.
74HC_HCT257 v.5	20100113	Product data sheet	-	74HC_HCT257 v.4
Modifications:	• <u>Table 7</u> : cha	anged 3OE to OE		
74HC_HCT257 v.4	20090608	Product data sheet	-	74HC_HCT257 v.3
74HC_HCT257 v.3	20050920	Product data sheet	-	74HC_HCT257_CNV v.2
74HC_HCT257_CNV v.2	19980930	Product specification	-	-

15. Legal information

15.1 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.nxp.com.

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74HC_HCT257

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74HC257; 74HCT257

Quad 2-input multiplexer; 3-state

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17. Contents

1	General description	. 1
2	Features and benefits	. 1
3	Ordering information	. 2
4	Functional diagram	. 2
5	Pinning information	4
5.1	Pinning	. 4
5.2	Pin description	. 4
6	Functional description	4
6.1	Function table	. 4
7	Limiting values	. 5
8	Recommended operating conditions	. 5
9	Static characteristics	6
10	Dynamic characteristics	. 7
11	Waveforms	9
12	Package outline	11
13	Abbreviations	
14	Revision history	15
15	Legal information	16
15.1	Data sheet status	16
15.2	Definitions	16
15.3	Disclaimers	16
15.4	Trademarks	17
16	Contact information	17
17	Contents	18

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